Panasonic
INDUSTRY

Your Committed Enabler

Conductive Polymer Capacitor

General Catalog 2025

- Conductive Polymer Aluminum Electrolytic Capacitors
- Conductive Polymer Tantalum Solid Capacitors
- Conductive Polymer Aluminum Solid Capacitors
- Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

SP-Cap POSCAP OS-CON Hybrid

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Electrolytic capacitors with conductive polymer to meet the needs of all electronic equipments in the world

SP-Cap, POSCAP, OS-CON, Hybrid

By using a high conductive polymer as the electrolyte, it has achieved in lower equivalent series resistance that could help and contribute excellent noise reduction and smoothing to an electrical fluctuation.
In addition to that, that has excellence in product operational life, reliability and heat resistance.

Features

* For details, see the right page

- **Low ESR**
  - Suitable as a decoupling capacitor to remove noises, because its impedance has ideal frequency characteristics.
  - Suitable as a smoothing capacitor for switching power supply or a backup capacitor for CPU because it allows large ripple current.
  - Suitable as a backup capacitor for the circuits that consumes large current at a high speed.
- **Temperature characteristics**
  - ESR has stable characteristics at when operating between -55℃ to 150℃, suitable for applications used at low emperatures (under 0 ℃).
- **Long life**
- **Super low ESR**
- **Small size / Low profile**
- **Rush current resistance characteristics**
- **Wide capacitance range**
- **High voltage High reliability**
- **Environmental responsibility**

Environmental responsibility

Principle

Industrial Solutions Company Group, Panasonic Corporation,
Fulfills both environmental contribution and business growth, takes care of biodiversity,
and contributes to create harmonization of environment, economy and society and to achieve a sustainable society.

RoHS compliance

All capacitors comply with RoHS directive (2011/65/EU) and (EU)2015/863.

Lead-free stance

All complete parts and homogenous materials of capacitors are lead-free. (JEITA, PHASE3)

Restricted Substance

Restricted substances of RoHS directive

- ◆Cadmium(Cd) and it's compounds
- ◆Lead(Pb) and it's compounds
- ◆Mercury(Hg) and it's compounds
- ◆Hexavalent chromium(Cr+6)
- ◆Polybrominated biphenyls(PBBs)
- ◆Polybrominated diphenyl ethers(PBDEs)
- ◆Bis(2-ethylhexyl) phthalate (DEHP)
- ◆Benzyl butyl phthalate (BBP)
- ◆Dibutyl phthalate (DBP)
- ◆Diisobutyl phthalate (DIBP)

ISO/IATF(ISO/TS)Certified

(1) Quality Approval

Factory(Site) Applicable standard	Organization	Certificate number	Acquisition years
•Uji factory (Kyoto)			
ISO 9001:2015	JQA	JQA-2524	1998.07.31
IATF 16949:2016	JQA	JQA-AU0162-14	2016.09.13
•Yamaguchi factory (Yamaguchi)			
ISO 9001:2015	JQA	JQA-2524	1998.07.31
IATF 16949:2016	JQA	JQA-AU0162-1	2007.02.23
•Panasonic Industrial Devices Saga Co., Ltd. (Former:SAGA SANYO Industries Co., Ltd.) (Saga)			
ISO 9001:2015	JQA	JQA-2524	1998.07.31
IATF 16949:2016	JQA	JQA-AU0162-10	2006.07.31
•PIDSG (Singapore)			
ISO 9001:2015	BSI	FM 612824	1994.12.08
•PICID (Former:SJC) (Indonesia)			
ISO 9001:2015	SGS	ID17/03853, ID19/04586	2006.03.26
IATF 16949:2016	SGS	ID19/04510	2011.03.01

(2) Environment Approval

Factory(Site) Applicable standard	Organization	Certificate number	Acquisition years
•Uji factory (Kyoto)			
ISO 14001:2015	JACO	EC10J0027	1996.12.26
•Yamaguchi factory (Yamaguchi)			
ISO 14001:2015	JACO	EC10J0027	1997.12.22
•Panasonic Industrial Devices Saga Co., Ltd. (Former:SAGA SANYO Industries Co., Ltd.) (Saga)			
ISO 14001:2015	JACO	EC10J0027	1998.03.10
•PIDSG (Singapore)			
ISO 9001:2015	AJA	AJA98/1151	1998.04.09
ISO 14001:2015	SGS	16/03617	2010.02.15
ISO 14001:2015	SGS	17/04090	2011.11.04

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Safety and Legal Matters to Be Observed

Product specifications and applications

■ Please be advised that this product and product specifications are subject to change without notice for improvement purposes. Therefore, please request and confirm the latest delivery specifications that explain the specifications in detail before the final design, or purchase or use of the product, regardless of the application. In addition, do not use this product in any way that deviates from the contents of the company's delivery specifications.

■ Unless otherwise specified in this catalog or the product specifications, this product is intended for use in general electronic equipment (AV products, home appliances, commercial equipment, office equipment, information and communication equipment, etc.).
When this product is used for the following special cases, the specification document suited to each application shall be signed/sealed (with Panasonic Industry and the user) in advance..These include applications requiring special quality and reliability, wherein their failures or malfunctions may directly threaten human life or cause harm to the human body (e.g.: space/aircraft equipment, transportation/traffic equipment, combustion equipment, medical equipment, disaster prevention/crime prevention equipment, safety equipment, etc.).

Safety design and product evaluation

■ Please ensure safety through protection circuits, redundant circuits, etc., in the customer's system design so that a defect in our company's product will not endanger human life or cause other serious damage.

■ This catalog shows the quality and performance of individual parts. The durability of parts varies depending on the usage environment and conditions. Therefore, please ensure to evaluate and confirm the state of each part after it has been mounted in your product in the actual operating environment before use.
If you have any doubts about the safety of this product, then please notify us immediately, and be sure to conduct a technical review including the above protection circuits and redundant circuits at your company.

Laws / Regulations / Intellectual property

■ The transportation of dangerous goods as designated by UN numbers, UN classifications, etc., does not apply to this product. In addition, when exporting products, product specifications, and technical information described in this catalog, please comply with the laws and regulations of the countries to which the products are exported, especially those concerning security export control.

■ Each model of this product complies with the RoHS Directive (Restriction of the use of hazardous substances in electrical and electronic equipment) (2011/65/EU and (EU) 2015/863). The date of compliance with the RoHS Directive and REACH Regulation varies depending on the product model.
Further, if you are using product models in stock and are not sure whether or not they comply with the RoHS Directive or REACH Regulation, please contact us by selecting "Sales Inquiry" from the inquiry form.

■ During the manufacturing process of this product and any of its components and materials to be used, Panasonic Industry does not intentionally use ozone-depleting substances stipulated in the Montreal Protocol and specific bromine-based flame retardants such as PBBs (Poly-Brominated Biphenyls) / PBDEs (Poly-Brominated Diphenyl Ethers). In addition, the materials used in this product are all listed as existing chemical substances based on the Act on the Regulation of Manufacture and Evaluation of Chemical Substances.

■ With regard to the disposal of this product, please confirm the disposal method in each country and region where it is incorporated into your company's product and used.

■ The technical information contained in this catalog is intended to show only typical operation and application circuit examples of this product. This catalog does not guarantee that such information does not infringe upon the intellectual property rights of Panasonic Industry or any third party, nor imply that the license of such rights has been granted.

■ Design, materials, or process related to technical owned by Panasonic Industry are subject to change without notice.

Panasonic Industry will assume no liability whatsoever if the use of our company's products deviates from the contents of this catalog or does not comply with the precautions. Please be advised of these restrictions.

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Conductive polymer capacitor of Panasonic Industry

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors (Stack Type)

- Super Low ESR
- Low profile
- Large capacitance

POSCAP

Conductive Polymer Tantalum Solid Capacitors (Sintered Type)

- Low ESR
- Small size
- Large capacitance

OS-CON

Conductive Polymer Alunimum Solid Capacitors (Wound Type)

- Low ESR
- High voltage
- Large capacitance

Hybrid

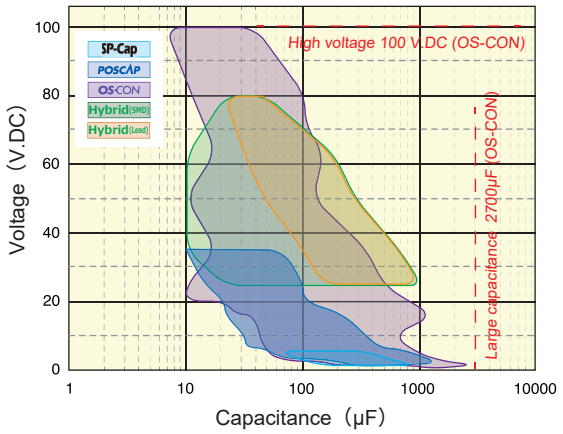
Conductive Polymer Hybrid Aluminum Electrolytic Capacitors (Wound Type) Conductive Polymer＋Electrolyte

- Low ESR
- High voltage
- High reliability

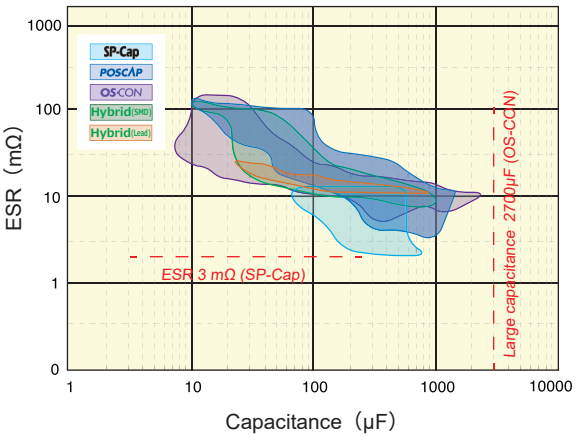
Characteristics Portfolio

Full coverage of the capacitor conductive market

Voltage vs. Capacitance

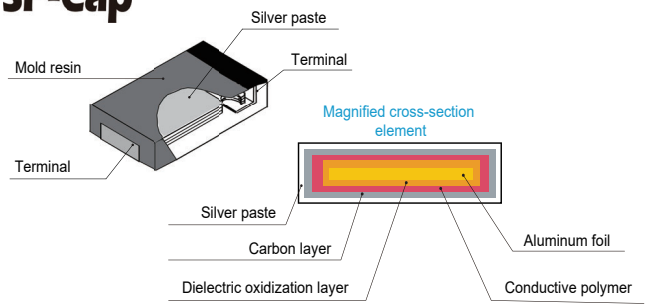


Capacitance vs. ESR

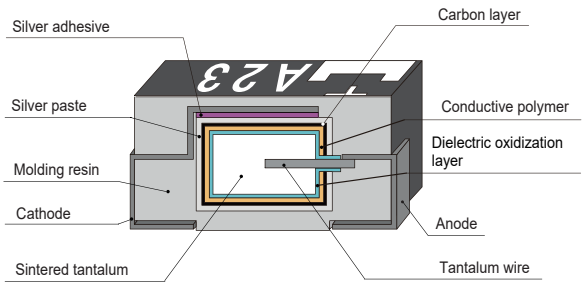


Basic structure

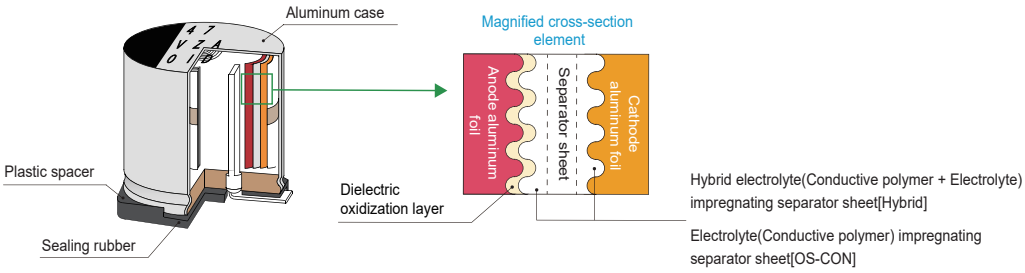
SP-Cap



POSCAP



OS-CON Hybrid



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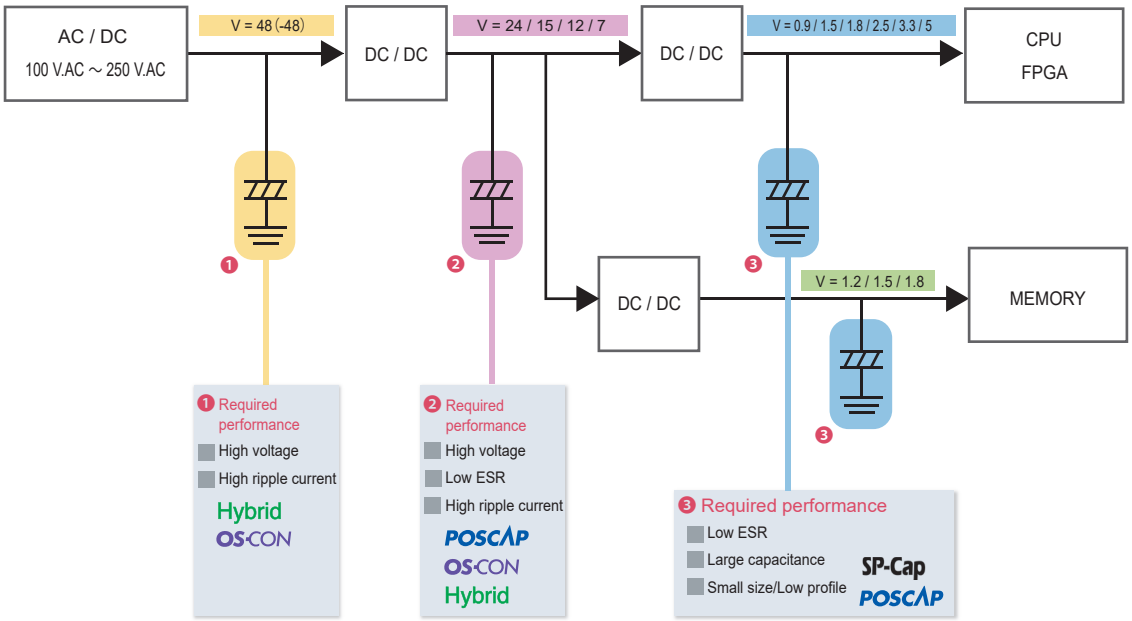
Examples of common use case four conductive products



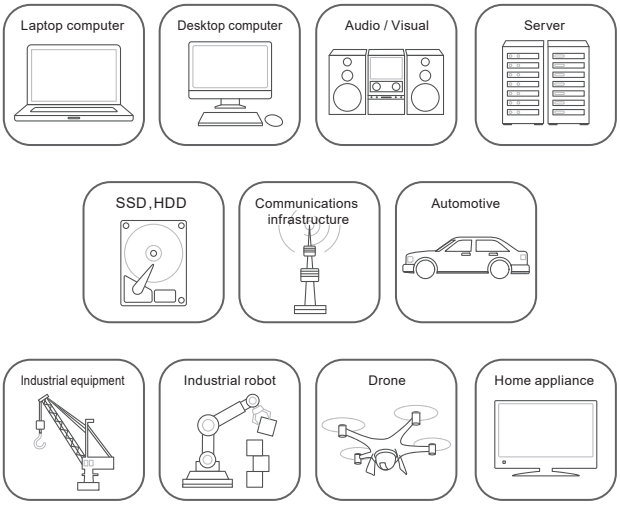
● You can select the optimal article from "size form and total cost" etc. besides an electrical property.

Application

		SP-Cap	POSCAP	OS-CON	Hybrid
Laptop computer		●	●		
Desktop computer				●	•
Audio/Visual		•	•	●	•
Server		●	•	●	•
Communications infrastructure		●	●	●	●
SSD, HDD			●		
Automotive			• ※		●
Home appliance				•	•
Industry	Industrial equipment	●		●	●
	Industrial robot		•	●	•
	Drone etc.	•	•		

※ This product is not intended for use in any driving application or any other critical functions that affect passenger safety (e.g. Powertrain, ABS, Engine ECU, Airbag, etc.)
If the intended use of TA/TV series products is for use in other automotive related applications, please contact our sales team.
All requests are subject to approval.

●Main market



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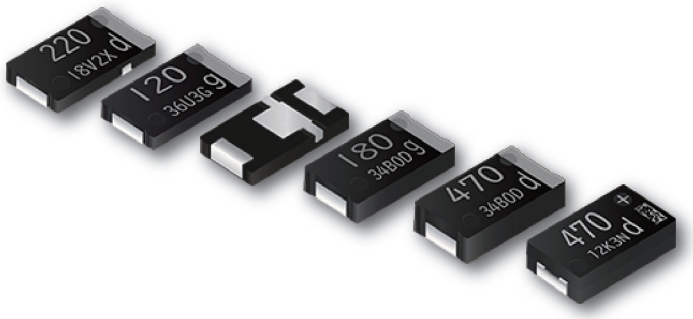
Conductive Polymer Aluminum Electrolytic Capacitors

SP-Cap™



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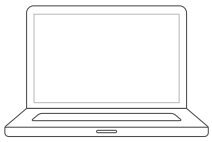
Applications

Main market

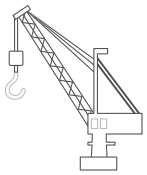
Laptop computer



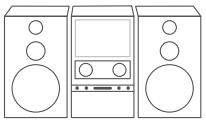
Server

Communications infrastructure

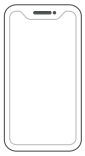
Industrial equipment



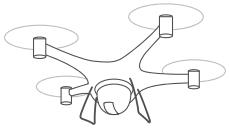
Audio / Visual



Smart phone
Tablet



Drone



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Matters to Be Observed When Using This Product

(Conductive Polymer Aluminum Electrolytic Capacitors / SP-Cap)

Intended use

**SP-Cap (all series) does not meet the quality standards required for automotive-related equipment.
Therefore, we are unable to support compliance with related standards (such as AEC-Q200, PPAP, etc.).
We shall not be responsible for any issues arising from the use of these products in such applications.**

Use environments and cleaning conditions

■ This product (capacitor) is intended for standard general-purpose use in electronic equipment, and is not designed for use in the specific environments described below. Using the product in such specific environments or service conditions, therefore, may affect the performance of the product.
Please check with us about the performance and reliability of the product first before using the product.

(1) Used in liquid, such as water, oil, chemicals, and organic solvents.
(2) Used in a place exposed to direct sunlight, an outdoor place with no shielding, or a dusty place.
(3) Used in a wet place (dew concentration on a resistor, water leakage, etc.), a place exposed to sea breeze, or a place filled with a corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_X.
(4) Used in an environment where static electricity and electromagnetic waves are strong.
(5) The product is located close to a heating component or a flammable material, such as a vinyl cable, is placed near the product.
(6) The product is used sealed with a resin, etc.
(7) Solder flux of the soldered product is cleansed with a solvent, water, and a water-soluble cleaner.
(Be careful with water soluble solder flux.)
(8) Used in an environment where an acidic or alkali atmosphere is present.
(9) Used in an environment where excessive vibration or impact is applied to the product.
(10) Used under a low atmospheric pressure condition or depressurized condition.

■ After soldering, clean the circuit board at a temperature of 60 °C or lower for 5 minutes or less. However, ensure to thoroughly rinse and dry it (at 100 °C for 20 minutes or less). The applicable solvents are as follows.

Pine Alpha ST-100S, Clean-thru 750H/750L/710M, Aqua Cleaner 210SEP, Sunelec B-12, DK be-clear CW-5790, Techno Cleaner 219, Cold Cleaner P3-375, Terpene Cleaner EC-7R, Techno Care FRW-17/FRW-1/FRV-1, AXREL 32, IPA (isopropyl alcohol)

(1) Please contact us in advance for the use of cleaning agents other than those listed above and water except pure water.
(2) Avoid using ozone-depleting substances as cleaning agents to protect the global environment.
(3) Performing ultrasonic cleaning may cause terminal disconnection, which requires prior evaluation.

■ Do not apply strong force to this product. Doing so may adversely affect mounting by causing the deformation of electrode terminals or other defects.
In addition, the application of strong force may also lead to short circuits, disconnection, increased leakage currents, and damage to the outer packaging of the product. Do not hold the body of the product or apply force even after it is attached to the circuit board.

■ When the capacitor is used in a circuit where an impact voltage is applied or a high voltage is applied in a short period (transient phenomenon) or a high pulse voltage is applied, make sure to use the capacitor at a voltage equal to or lower than its rated voltage.

Response to anomalies and handling conditions

If this product heats up abnormally, then smoke may be generated from the exterior resin. In this case, immediately turn off the main power of the equipment and stop using it. Also, keep your face and hands away from the product as it may become hot and cause burns.

Reliability and product life

■ Most of the failure modes are "short circuits" or "increased leakage currents." The main causes of failures are thermal stress, electrical stress, and mechanical stress due to reflow and operating temperature environments.
Even within the range of the specified use conditions, it is possible to reduce the failure rate by mitigating the operating conditions such as the temperature and voltage. Therefore, please design equipment with a sufficient margin.

■ The estimated failure rate is 8.2 Fit or less (estimated at 105 °C when the rated voltage is applied) based on data obtained from the company's reliability test, while the estimated market failure rate is 0.13 Fit or less (estimated at c = 0 and a confidence level of 60 %).

Circuit design and circuit board design

- Do not use this product in high-impedance voltage holding circuits, coupling circuits, time constant circuits, and those that are significantly affected by leakage currents. Also, do not connect two or more units of this product in series.

- Applying overvoltage that exceeds the rated voltage specified in the specifications or reverse voltage to this product may cause an increase in leakage currents or short circuits.
  Applied voltage refers to the voltage value applied to a circuit, including the effects of the peak values of ripple voltage and transient instantaneous voltage, and does not only indicate the steady line voltage value. Design circuits so that the peak voltage does not exceed the specified voltage.
  Use this product by regulating the operating voltage to keep it lower than or equal to the rated voltage even for impulse voltage circuits, applications involving transient phenomena where a considerably high voltage is applied in a short time, and cases where high pulse voltages are applied.

- Keep the operating temperature within the range stipulated in the specifications. Design your equipment in consideration of not only the ambient temperature where the equipment is placed and its internal temperature, but also the radiant heat from heating elements (power transistors, resistors, etc.) inside the equipment, and the temperature of this product, including self-heating due to ripple current.

- Regulate the ripple current within the rated range specified in the specifications when using the product.
  Excessive ripple current causes increased leakage currents and short circuit failures due to self-heating.
  Even if the ripple current is within the rated range, prevent the ripple voltage from applying overvoltage or reverse voltage to the product.

- The ESR rating is the value at the time of shipment from the factory. The ESR value may vary depending on the customer's usage conditions.

- Leakage currents may increase after reflow soldering, and also under no-load conditions at high temperatures, in high temperature and high humidity environments, or with sudden temperature changes, even if the operating environment is within the specified range. However, in most cases, SP-Cap reduces leakage currents due to its self-recovery action when voltage is applied.

- Insulate the circuit board surface directly under the mounting area of this product. Lay out your circuit board by defining the dimensions of lands with reference to the mounting specifications stipulated in the requirements.
  The dimensions of the actual design circuit should enable the optimum mounting depending on conditions such as the circuit board, parts, and reflow.

Mounting and storage conditions

- Check the rating (capacitance, rated voltage), polarity, and land dimensions of this product before mounting it on the circuit board. When using mounting equipment, large pressure applied during mounting may lead to an increase in leakage currents, short circuits, disconnection, or falling off from the circuit board.

- Do not use flow and dip soldering. Reflow soldering can be used with the following methods. Please refer to the mounting specifications for the recommended conditions for using the atmospheric heat conduction method.
  Please contact us for the recommended conditions for using the VPS method.

  (1) Atmospheric heat conduction method (infrared ray/hot-air system)
  (2) VPS method (target series: CX, CT, SX, ST, GX, LX, LT, and HX)

- This product is not designed for simultaneous double sided reflow soldering of printed circuit boards.

- Soldering must be performed at a temperature of 350 °C or lower at the tip of the soldering iron and within an operation time of 10 seconds, without applying excessive force to the product.
  In addition, do not remove this product for reuse once it is mounted. Soldering outside the specified conditions can cause short circuit failures, an increase in ESR, and other defects.

- Store this product in an environment with a temperature ranging from 5 °C to 30 °C and a humidity of 70% or lower by using a moisture barrier bag. The storage period before opening the moisture barrier bag is two years after manufacture, and after opening the bag is seven days. If these conditions are exceeded, then the outer package may be damaged due to thermal stress during mounting caused by moisture absorption by the package.
  After opening the bag, use up all pieces of this product within the specified storage period.

- This product is composed of various metals and resins, requiring disposal as industrial waste.

Reference information

Guidelines

The matters to be observed when using this product cite the technical report issued by the Japan Electronics and Information Technology Industries Association, and EIAJ RCR-2367D issued in October 2017, "Safety application guide for fixed aluminum electrolytic capacitors for use in electronic equipment." Please refer to the above technical report for details.

Intellectual property

Panasonic Group provides customers with safe products and services. We are also making great efforts to protect our intellectual property rights for Panasonic Group products. Typical patents related to this product are as follows.

[U.S. patent]

USP Nos. 7787234

Line up

■ Long life products

Series	Part No.	Feature	Low profile	Low ESR	Low ESL	Large cap.	High temp.	Long life	High voltage	Category temperature (℃)	Rated voltage (V)	ESR (mΩ)	Capacitance (μF)	Size (mm) L x W 7.3x4.3 H
JX	EEFJX---	Guaranteed at 125 ℃ 3000 h		●			●	●		-55 to 125	2 to 6.3	3 to 15	120 to 470	1.9
KX	EEFKX---	Guaranteed at 125 ℃ 5500 h		●			●	●		-55 to 125	2 to 6.3	3 to 15	120 to 470	1.9
TX	EEFTX---	Guaranteed at 135 ℃ 5500 h		●			●	●		-55 to 135	2 to 6.3	3 to 15	120 to 470	1.9
JZ	EEFJZ---	Guaranteed at 125 ℃ 3000 h Large capacitance		●		●	●	●		-55 to 125	2	3 to 9	560	2.2
KZ	EEFKZ---	Guaranteed at 125 ℃ 5500 h Large capacitance		●		●	●	●		-55 to 125	2	3 to 9	560	2.2
TZ	EEFTZ---	Guaranteed at 135 ℃ 5500 h Large capacitance		●		●	●	●		-55 to 135	2	3 to 9	560	2.2

■ Standard products

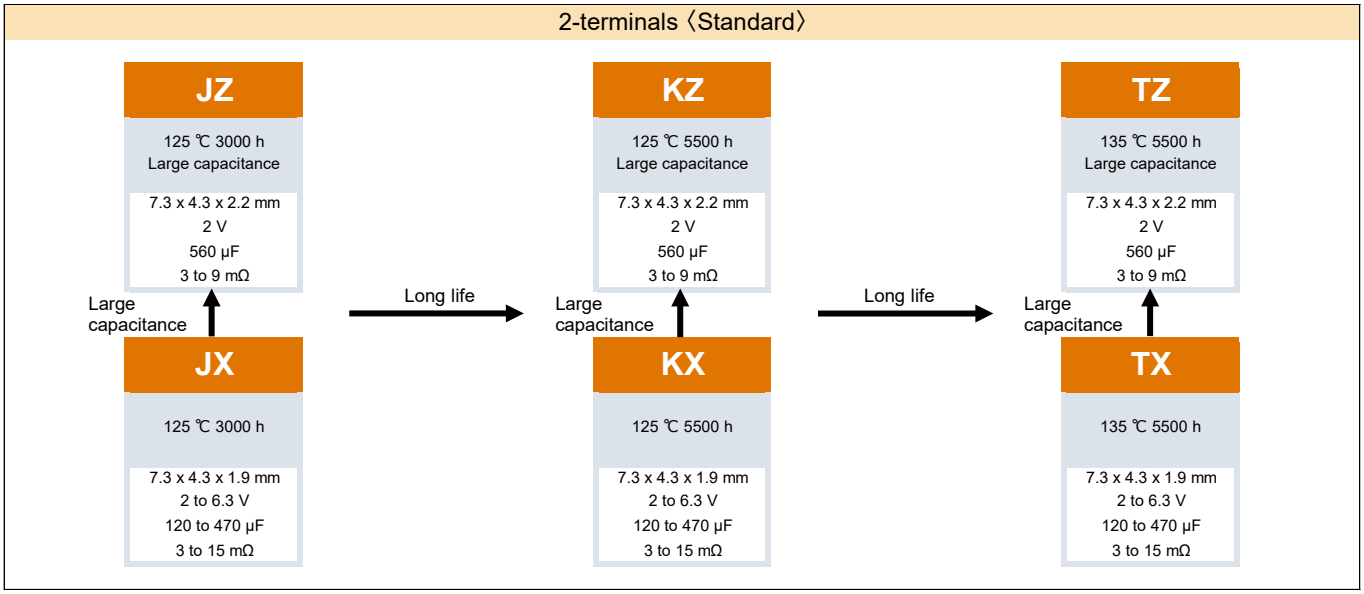
Series	Part No.	Feature	Low profile	Low ESR	Low ESL	Large cap.	High temp.	Long life	High voltage	Category temperature (℃)	Rated voltage (V)	ESR (mΩ)	Capacitance (μF)	Size (mm) L x W 7.3x4.3 H
CX	EEFCX---	Standard							●	-55 to 105	2 to 35	12 to 40	15 to 560	1.9
CT	EEFCT---	Low profile	●						●	-55 to 105	4 to 35	15 to 40	15 to 180	1.4
CS	EEFCS---	Low profile	●						●	-55 to 105	4 to 35	15 to 40	10 to 120	1.1
SX*	EEFSX---	Low ESR		●						-55 to 105	2 to 6.3	4.5 to 9	82 to 560	1.9
GX	EEFGX---	Super low ESR High ripple current		●						-55 to 105	2, 2.5	3	330 to 560	1.9
LX	EEFLX---	Low ESR・Low ESL		●	●					-55 to 105	2, 2.5	4.5 to 6	330 to 560	1.9
ST	EEFST---	Low profile・Low ESR	●	●						-55 to 105	2, 2.5	6	270 to 330	1.4
LT	EEFLT---	Low profile Low ESR・Low ESL	●	●	●					-55 to 105	2, 2.5	6	270 to 330	1.4
SS	EEFSS---	Low profile・Low ESR	●	●						-55 to 105	2, 2.5	6	180 to 220	1.1
LS	EEFLS---	Low profile Low ESR・Low ESL	●	●	●					-55 to 105	2, 2.5	6	180 to 220	1.1
SR	EEFSR---	Low profile (1.0 mm max.) Low ESR	●	●						-55 to 105	2 to 6.3	4.5 to 9	68 to 220	1.0max.
LR	EEFLR---	Low profile (1.0 mm max.) Low ESR・Low ESL	●	●	●					-55 to 105	2 to 6.3	4.5 to 9	68 to 220	1.0max.
GY	EEFGY---	Super low ESR / High ripple current / Height 3.0 mm max.		●		●				-55 to 105	2, 2.5	3	680 to 820	2.8
CY	ECGCY---	Guaranteed at 85 °C Height 3.0 mm max.				●				-55 to 85	4, 6.3	15	330 to 470	2.8
SY	ECGSY---	Low ESR / Guaranteed at 85 °C / Height 3.0 mm max.		●		●				-55 to 85	4, 6.3	9	330 to 470	2.8
HX	EEFHX---	Guaranteed at 125 ℃					●		●	-55 to 125	2 to 25	4.5 to 40	15 to 470	1.9

- **2 to 6.3 V : On sale**
- **10 to 35 V : Not recommended for new design**
- **Click here for Replacement (10 to 35 V)**

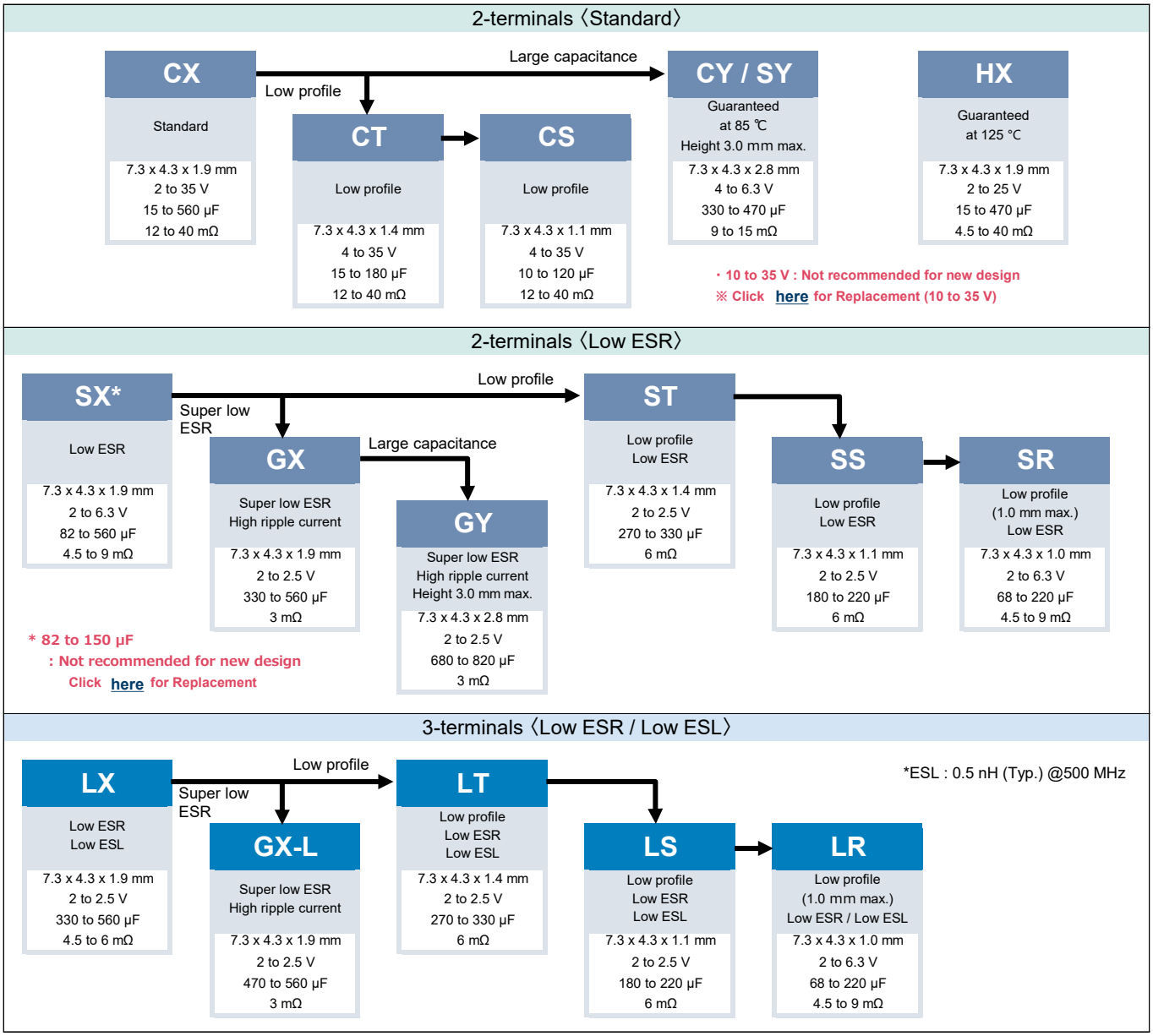
*** 82 to 150 μF: Not recommended for new design**
Click here for Replacement

Series flow chart

■ Long life products



■ Standard products



Voltage - Capacitance table (Vol. : 2.0 to 6.3 V / Cap. : 10 to 120 μF)

Series
(ESR mΩ)

V \ μF	10	15	22	33	47	56	68	82	100	120
2.0										
2.5										
4.0								SX (9)	SX (9)	CS (15)
										SR (9)
										LR (9)
6.3							CS (15)		CT (15)	CX (15)
							SR (9)		CX (15)	SX (7)
							LR (9)			JX (15)
										KX (15)
										TX (15)

Size list LxWxH (mm)

SR, LR	7.3 x 4.3 x 1.0 max.	CX, GX, LX, LX, JX, KX, TX, HX	7.3 x 4.3 x 1.9
SS, LS, CS	7.3 x 4.3 x 1.1	JZ, KZ, TZ	7.3 x 4.3 x 2.2
CT, ST, LT	7.3 x 4.3 x 1.4	CY, SY	7.3 x 4.3 x 2.8

Voltage - Capacitance table (Vol. : 2.0 to 6.3 V / Cap. : 150 to 820 μF)

Series
(ESR mΩ)

V \ μF	150	180	220	270	330	390	470	560	680	820
2.0		SX (9)	CX (15)	CX (12)	CX (15,12)	CX (15)	CX (15)	CX (15)		GY (3)
			SX (9)	SX (9,6,4.5)	SX (9,6,4.5)	SX (9,6,4.5)	SX (9,6,4.5)	SX (4.5)		
			SR (6,4.5)		GX (3)		GX (3)	GX (3)		
			LR (6,4.5)		LX (6,4.5)		GX-L (3)	GX-L (3)		
			SS (6)		ST (6)		LX (6,4.5)	LX (6,4.5)		
			LS (6)		LT (6)		JX (9,4.5,3)	JZ (9,4.5,3)		
					JX (9)		KX (9,4.5,3)	KZ (9,4.5,3)		
					KX (9)		HX (15,9,6,4.5)	TZ (9,4.5,3)		
					TX (9)		TX (9,4.5,3)			
2.5	SX (9)	SX (9)	CX (15)	SX (7)	CX (15)	CX (15)	CX (15)		GY (3)	
		SR (6,4.5)	SX (9,7)	ST (6)	SX (9,6)	SX (9,6,4.5)	SX (9,6,4.5)			
		LR (6,4.5)	JX (9)	LT (6)	GX (3)	JX (9,4.5,3)	GX (3)			
		SS (6)	KX (9)		LX (6,4.5)	KX (9,4.5,3)	GX-L (3)			
		LS (6)	TX (9)		JX (9)	TX (9,4.5,3)	LX (6,4.5)			
					KX (9)		JX (9,4.5,3)			
					HX (15,9,6,4.5)		KX (9,4.5,3)			
					TX (9)		HX (15,9,6,4.5)			
4.0	CX (15)	CT (15)	CX (15, 12)	CX (15)	CX (15)		CY (15)			
	SX (9,7)	CX (15,12)	SX (9)	SX (9)	SX (9,6)		SY (15)			
	JX (15)	SX (9)	JX (15)							
	KX (15)	JX (15)	KX (15)							
	TX (15)	KX (15)	TX (15)							
		TX (15)								
6.3	CX (15,12)	CX (15)	CX (15)		CY (15)					
	SX (9)	SX (9)	SX (9)		SY (9)					
	JX (15)									
	KX (15)									
	TX (15)									

Size list LxWxH (mm)

SR, LR	7.3 x 4.3 x 1.0 max.	CX, GX, LX, LX, JX, KX, TX, HX	7.3 x 4.3 x 1.9
SS, LS, CS	7.3 x 4.3 x 1.1	JZ, KZ, TZ	7.3 x 4.3 x 2.2
CT, ST, LT	7.3 x 4.3 x 1.4	CY, SY	7.3 x 4.3 x 2.8

Explanation of part numbers

◇ Part number system

EEF	CX	0E	471	R
Product classification 3 figures	Series 2 figures	Voltage code 2 figures	Capacitance code 3 figures	Special code 1 to 2 figures

Series	Product classification
JX	EEF
KX	EEF
TX	EEF
JZ	EEF
KZ	EEF
TZ	EEF
CX	EEF
CT	EEF
CS	EEF
SX	EEF
LX	EEF
GX	EEF
ST	EEF
LT	EEF
SS	EEF
LS	EEF
SR	EEF
LR	EEF
GY	EEF
CY	ECG
SY	ECG
HX	EEF

Series	Code
JX	JX
KX	KX
TX	TX
JZ	JZ
KZ	KZ
TZ	TZ
CX	CX
CT	CT
CS	CS
SX	SX
LX	LX
GX	GX
ST	ST
LT	LT
SS	SS
LS	LS
SR	SR
LR	LR
GY	GY
CY	CY
SY	SY
HX	HX

Voltage (V)	Code
2	0D
2.5	0E
4	0G
6.3	0J
10	1A
16	1C
20	1D
25	1E
35	1V

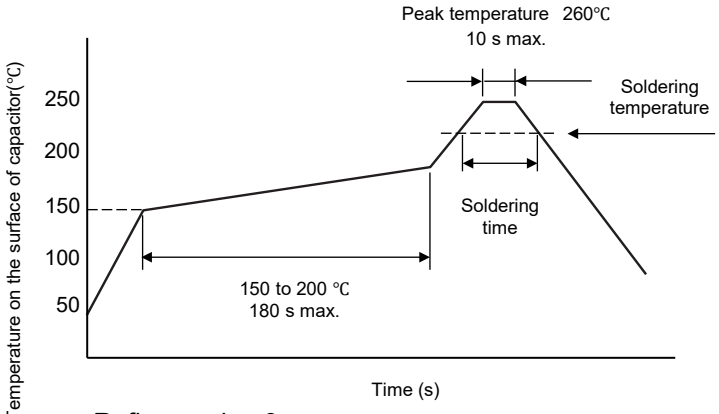
Cap. (μF)	Code
10	100
15	150
22	220
33	330
47	470
56	560
68	680
100	101
120	121
150	151
180	181
220	221
270	271
330	331
390	391
470	471
560	561
680	681
820	821

Height (mm)	Series	Special code	ESR (mΩ max.)	Terminals 2	Terminals 3
1.9 ± 0.1	JX KX TX	RF	15	○	
		RE	9	○	
		RC	4.5	○	
		RB	3	○	
2.2 ± 0.1	JZ KZ TZ	RE	9	○	
		RC	4.5	○	
		RB	3	○	
1.9 ± 0.1	CX	R	15 (to 6.3 V), 40 (10 V to 35 V)	○	
		XR	12	○	
	SX	ER	9	○	
		E7	7	○	
		XE	6	○	
		E4	4.5	○	
	GX	R	3	○	
		L	3		○
	LX	R	6		○
		R4	4.5		○
	HX	R	15 (to 2.5 V), 40 (10 V to 25 V)	○	
		R9	9	○	
		R6	6	○	
		R4	4.5	○	
1.4 ± 0.1	CT	R	15 (to 6.3 V), 40 (10 V to 35 V)	○	
	ST	R	6	○	
	LT	R	6		○
1.1 ± 0.1	CS	R	15 (to 6.3 V), 40 (10 V to 35 V)	○	
	SS	R	6	○	
	LS	R	6		○
1.0 (max.)	SR	R	6 (to 2.5 V), 9 (4 V to 6.3 V)	○	
		R4	4.5	○	
	LR	R	6 (to 2.5 V), 9 (4 V to 6.3 V)		○
		R4	4.5		○
2.8 ± 0.2	GY	R	3	○	
	CY	R	15	○	
	SY	R	9	○	

Downloaded from Arrow.com.

Mounting specification

● Recommendable reflow soldering



Reflow cycle : 3 max.

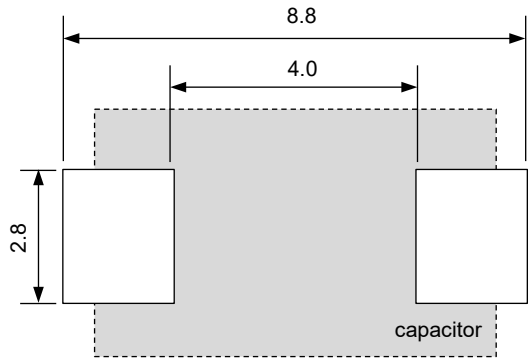
Soldering temperature and soldering time

Temperature	Time
≧ 255℃	30 s max.
≧ 230℃	130 s max.
≧ 217℃	150 s max.

SP-Cap recommended profile condition of the IPC/J-STD-020F standard

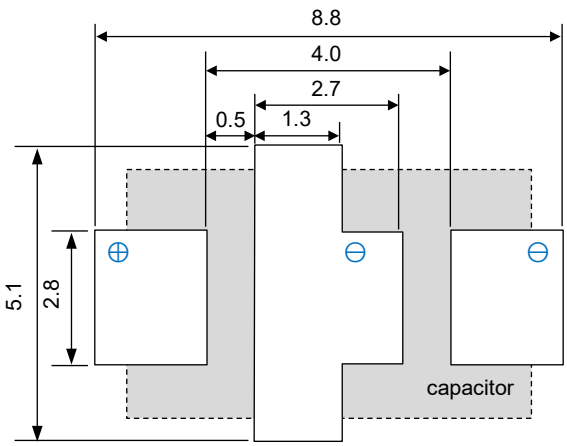
● Typical land pattern

□ 2-terminals
For standard terminal（C＊, S＊, G＊, J＊, K＊, T＊, HX series）

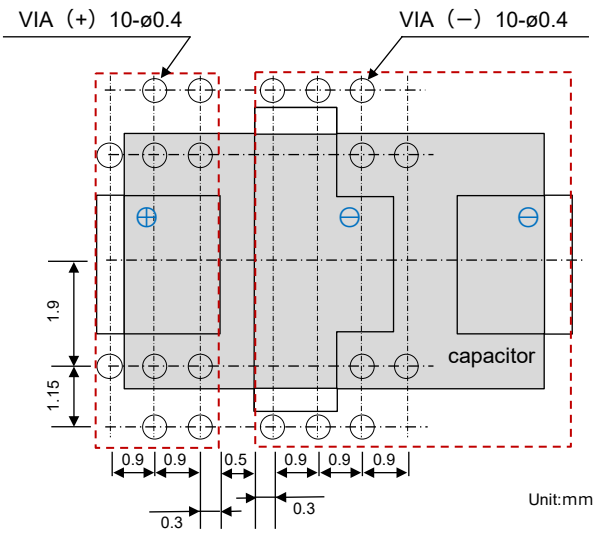


Unit:mm

□ 3-terminals
For low ESL terminal（L＊, GX-L series）



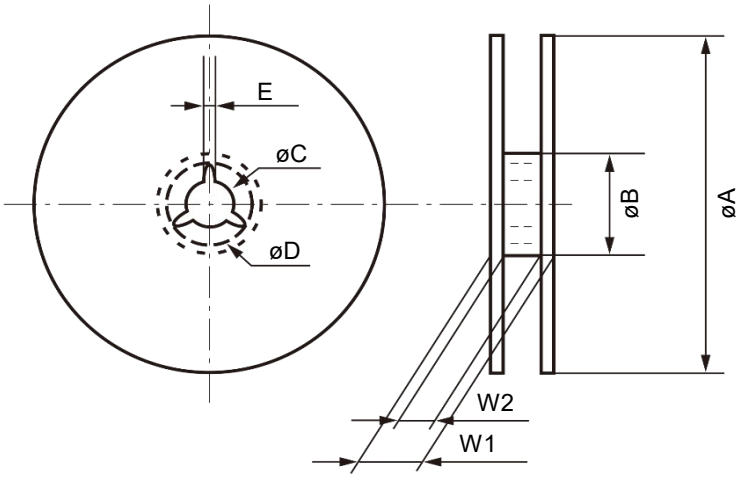
〈VIA〉
For low ESL terminal（L＊, GX-L series）



Unit:mm

Packaging specifications

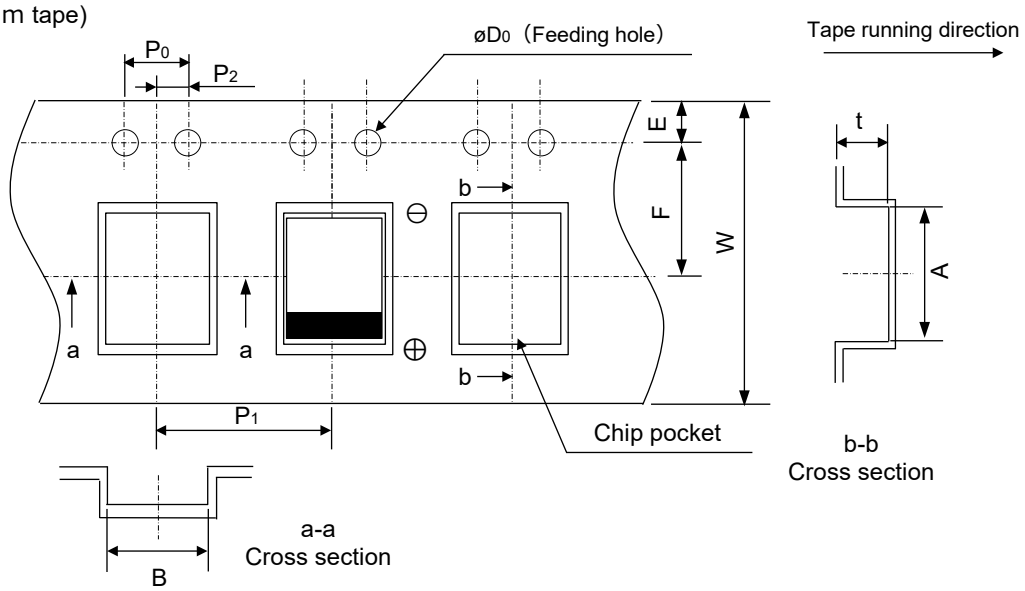
● Reel dimensions



Unit:mm

Reel	øA	øB	øC	øD	E	W1	W2
ø330	330 ± 2	80 ± 1	13 ± 0.2	21 ± 0.8	2 ± 0.5	17.5 ± 1	13.5 ± 1

● Embossed taping
(12mm tape)

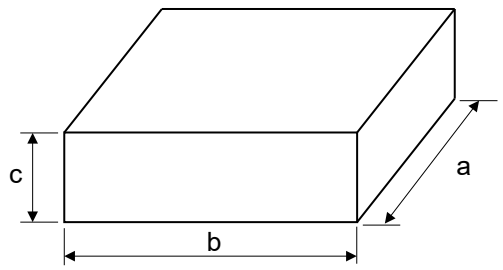


Unit:mm

A	B	W	F	E	P_1	P_2	P_0
7.6 ± 0.2	4.5 ± 0.2	12 ± 0.3	5.5 ± 0.1	1.75 ± 0.1	8.0 ± 0.1	2.0 ± 0.1	4.0 ± 0.1

$øD_0$	Upper row : Product height / Lower berth : t			
	to 1.1	1.4 to 1.9	2.2	2.8
$1.5^{+0.1}_{0}$	1.5 ± 0.2	2.4 ± 0.2	2.9 ± 0.2	3.5 ± 0.2

● Packaging box dimensions



Unit:mm

Reel	a	b	c
ø330	400 max.	400 max.	135 max.

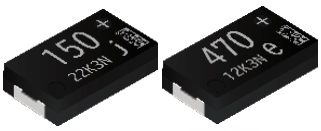
Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

JX series [High temperature long life product]



No Automotive

Use of the general series is not recommended for these applications.
For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
・Products in the JX Series must not be used for automotive applications. For automotive use, please select the AX Series.

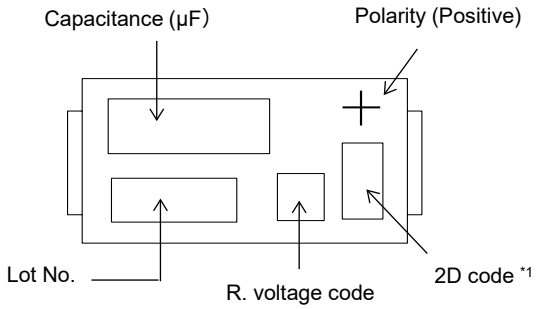
Features

- Endurance 125 °C 3000 h
- Damp heat 85°C 85% 1000 h
- Low ESR (3 to 15 mΩ)
- RoHS compliance, Halogen free

Specifications

Series	JX			
Category temp. range	–55 °C to +125 °C			
Rated voltage range	2.0 V to 6.3 V			
Category voltage range	1.6 V, 2.0 V, 3.2 V, 5.0 V			
Rated cap. range	120 µF to 470 µF			
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	I ≤ 0.1 CV (µA) 2 minutes			
Dissipation factor (tan δ)	≤ 0.1 (120 Hz / + 20 °C)			
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)			
Endurance	+125 °C 3000 h, category voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		
Damp heat (Steady state)	+85 °C, 85 % RH, 1000 h, No-applied voltage			
	Capacitance change of initial measurd value	2.0 V, 2.5 V	4.0 V	6.3 V
		+70 %, –20 %	+60 %, –20 %	+50 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	≤ 5 times of the initial limit		

Marking



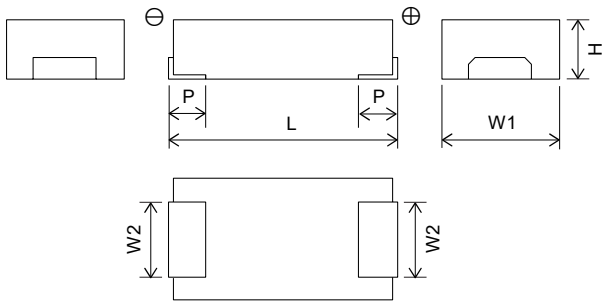
Rated voltage code

d	2.0	g	4.0
e	2.5	j	6.3

Unit : V

*1: Internal management information

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
JX	7.3	4.3	2.4	1.9	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Explanation of part numbers

◇ Part number system

e.g.: EEFJX0D331RE

EEF

Series	Product classifi-cation
JX	EEF

JX

Series	Code
JX	JX

0D

Rated Voltage (V)	Code
2.0	0D
2.5	0E
4.0	0G
6.3	0J

331

Capacitance (μF)	Code	Capacitance (μF)	Code
120	121	330	331
150	151	390	391
180	181	470	471
220	221		

RE

ESR (mΩ)	Special code
3	RB
4.5	RC
9	RE
15	RF

Characteristics list

Series	Rated voltage [105 °C] (V)	Category voltage [125 °C] (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
				L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
JX	2.0	1.6	330	7.3	4.3	1.9	6300	9	EEFJX0D331RE	3500
			470	7.3	4.3	1.9	6300	9	EEFJX0D471RE	3500
				7.3	4.3	1.9	8500	4.5	EEFJX0D471RC	3500
				7.3	4.3	1.9	10200	3	EEFJX0D471RB	3500
	2.5	2.0	220	7.3	4.3	1.9	6300	9	EEFJX0E221RE	3500
			330	7.3	4.3	1.9	6300	9	EEFJX0E331RE	3500
			390	7.3	4.3	1.9	6300	9	EEFJX0E391RE	3500
				7.3	4.3	1.9	8500	4.5	EEFJX0E391RC	3500
				7.3	4.3	1.9	10200	3	EEFJX0E391RB	3500
			470	7.3	4.3	1.9	6300	9	EEFJX0E471RE	3500
				7.3	4.3	1.9	8500	4.5	EEFJX0E471RC	3500
				7.3	4.3	1.9	10200	3	EEFJX0E471RB	3500
	4.0	3.2	150	7.3	4.3	1.9	5100	15	EEFJX0G151RF	3500
			180	7.3	4.3	1.9	5100	15	EEFJX0G181RF	3500
			220	7.3	4.3	1.9	5100	15	EEFJX0G221RF	3500
	6.3	5.0	120	7.3	4.3	1.9	5100	15	EEFJX0J121RF	3500
			150	7.3	4.3	1.9	5100	15	EEFJX0J151RF	3500

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for "Reflow conditions" and "Taping specifications".

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 125 °C
2.0 V to 6.3 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

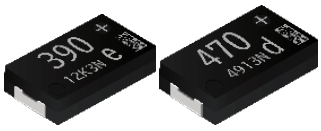
Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

KX series [High temperature long life product]



No Automotive

Use of the general series is not recommended for these applications.
For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
・Products in the KX Series must not be used for automotive applications. For automotive use, please select the AX Series.

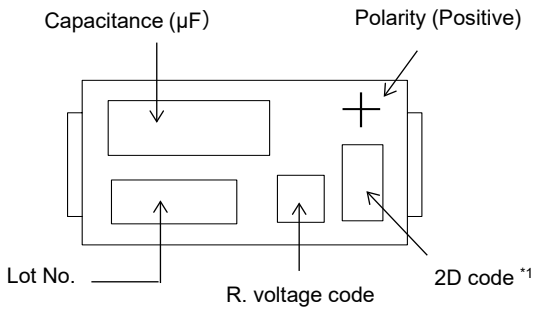
Features

- Endurance 125 °C 5500 h
- Damp heat 85°C 85% 1000 h
- Low ESR (3 ~ 15 mΩ max.)
- RoHS compliance, Halogen free

Specifications

Series	KX			
Category temp. range	–55 °C to +125 °C			
Rated voltage range	2.0 V to 6.3 V			
Category voltage range	1.6 V, 2.0 V, 3.2 V, 5.0 V			
Rated cap. range	120 µF to 470 µF			
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	I ≤ 0.1 CV (µA) 2 minutes			
Dissipation factor (tan δ)	≤ 0.1 (120 Hz / + 20 °C)			
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)			
Endurance	+125 °C 5500 h, category voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		
Damp heat (Steady state)	+85 °C, 85 % RH, 1000 h, No-applied voltage			
	Capacitance change of initial measurd value	2.0 V, 2.5 V	4.0 V	6.3 V
		+70 %, –20 %	+60 %, –20 %	+50 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	≤ 5 times of the initial limit		

Marking



R. voltage code

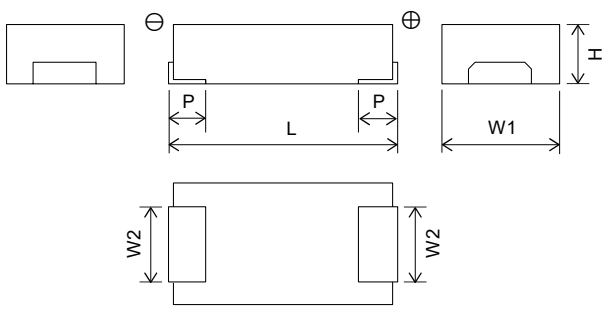
d	2.0
e	2.5

Unit : V

g	4.0
j	6.3

*1: Internal management information

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
KX	7.3	4.3	2.4	1.9	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Explanation of part numbers

◇ Part number system

e.g.: EEFKX0D331RE

EEF

Series	Product classifi-cation
KX	EEF

KX

Series	Code
KX	KX

0D

Rated Voltage (V)	Code
2.0	0D
2.5	0E
4.0	0G
6.3	0J

331

Capacitance (μF)	Code	Capacitance (μF)	Code
120	121	330	331
150	151	390	391
180	181	470	471
220	221		

RE

ESR (mΩ)	Special code
3	RB
4.5	RC
9	RE
15	RF

Characteristics list

Series	Rated voltage [105 °C] (V)	Category voltage [125 °C] (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
				L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
KX	2.0	1.6	330	7.3	4.3	1.9	6300	9	EEFKX0D331RE	3500
			470	7.3	4.3	1.9	6300	9	EEFKX0D471RE	3500
				7.3	4.3	1.9	8500	4.5	EEFKX0D471RC	3500
				7.3	4.3	1.9	10200	3	EEFKX0D471RB	3500
	2.5	2.0	220	7.3	4.3	1.9	6300	9	EEFKX0E221RE	3500
			330	7.3	4.3	1.9	6300	9	EEFKX0E331RE	3500
			390	7.3	4.3	1.9	6300	9	EEFKX0E391RE	3500
				7.3	4.3	1.9	8500	4.5	EEFKX0E391RC	3500
				7.3	4.3	1.9	10200	3	EEFKX0E391RB	3500
			470	7.3	4.3	1.9	6300	9	EEFKX0E471RE	3500
				7.3	4.3	1.9	8500	4.5	EEFKX0E471RC	3500
				7.3	4.3	1.9	10200	3	EEFKX0E471RB	3500
	4.0	3.2	150	7.3	4.3	1.9	5100	15	EEFKX0G151RF	3500
			180	7.3	4.3	1.9	5100	15	EEFKX0G181RF	3500
			220	7.3	4.3	1.9	5100	15	EEFKX0G221RF	3500
	6.3	5.0	120	7.3	4.3	1.9	5100	15	EEFKX0J121RF	3500
			150	7.3	4.3	1.9	5100	15	EEFKX0J151RF	3500

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 125 °C
2.0 V to 6.3 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

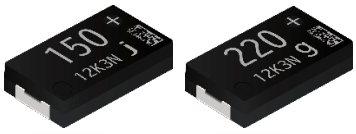
Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

TX series [High temperature long life product]



Use of the general series is not recommended for these applications.
For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
・Products in the TX Series must not be used for automotive applications. For automotive use, please select the AX Series.

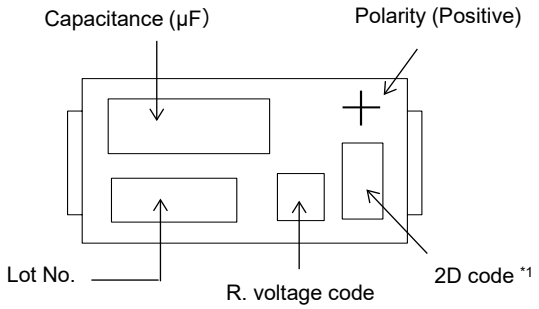
Features

- Endurance 135 °C 5500 h
- Damp heat 85°C 85% 1000 h
- Low ESR (3 ~ 15 mΩ max.)
- RoHS compliance, Halogen free

Specifications

Series	TX			
Category temp. range	–55 °C to +135 °C			
Rated voltage range	2.0 V to 6.3 V			
Category voltage range	1.6 V, 2.0 V, 3.2 V, 5.0 V			
Rated cap. range	120 µF to 470 µF			
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	I ≤ 0.1 CV (µA) 2 minutes			
Dissipation factor (tan δ)	≤ 0.1 (120 Hz / + 20 °C)			
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)			
Endurance	+135 °C 5500 h, category voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		
Damp heat (Steady state)	+85 °C, 85 % RH, 1000 h, No-applied voltage			
	Capacitance change of initial measurd value	2.0 V, 2.5 V	4.0 V	6.3 V
		+70 %, −20 %	+60 %, −20 %	+50 %, −20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	≤ 5 times of the initial limit		

Marking



R. voltage code

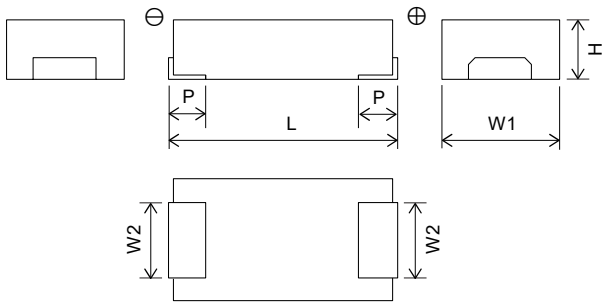
d	2.0
e	2.5

Unit : V

g	4.0
j	6.3

*1: Internal management information

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
TX	7.3	4.3	2.4	1.9	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
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Explanation of part numbers

◇ Part number system

e.g.: EEFTX0D331RE

EEF

Series	Product classification
TX	EEF

TX

Series	Code
TX	TX

0D

Rated Voltage (V)	Code
2.0	0D
2.5	0E
4.0	0G
6.3	0J

331

Capacitance (μF)	Code	Capacitance (μF)	Code
120	121	330	331
150	151	390	391
180	181	470	471
220	221		

RE

ESR (mΩ)	Special code
3	RB
4.5	RC
9	RE
15	RF

Characteristics list

Series	Rated voltage [105 °C] (V)	Category voltage [135 °C] (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
				L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
TX	2.0	1.6	330	7.3	4.3	1.9	6300	9	EEFTX0D331RE	3500
			470	7.3	4.3	1.9	6300	9	EEFTX0D471RE	3500
				7.3	4.3	1.9	8500	4.5	EEFTX0D471RC	3500
				7.3	4.3	1.9	10200	3	EEFTX0D471RB	3500
	2.5	2.0	220	7.3	4.3	1.9	6300	9	EEFTX0E221RE	3500
			330	7.3	4.3	1.9	6300	9	EEFTX0E331RE	3500
			390	7.3	4.3	1.9	6300	9	EEFTX0E391RE	3500
				7.3	4.3	1.9	8500	4.5	EEFTX0E391RC	3500
				7.3	4.3	1.9	10200	3	EEFTX0E391RB	3500
	4.0	3.2	150	7.3	4.3	1.9	5100	15	EEFTX0G151RF	3500
			180	7.3	4.3	1.9	5100	15	EEFTX0G181RF	3500
			220	7.3	4.3	1.9	5100	15	EEFTX0G221RF	3500
	6.3	5.0	120	7.3	4.3	1.9	5100	15	EEFTX0J121RF	3500
			150	7.3	4.3	1.9	5100	15	EEFTX0J151RF	3500

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 135 °C
2.0 V to 6.3 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

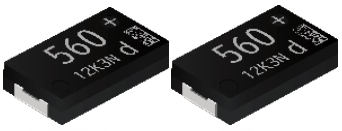
Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

JZ series [High temperature long life product]



No Automotive

Use of the general series is not recommended for these applications.
For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
・Products in the JZ Series must not be used for automotive applications. For automotive use, please select the AX Series.

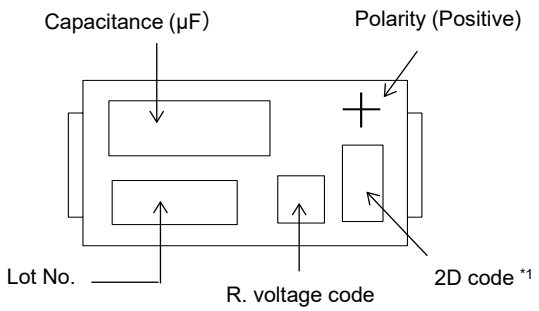
Features

- Endurance 125 °C 3000 h
- Damp heat 85°C 85% 1000 h
- Low ESR (3 to 9 mΩ)
- RoHS compliance, Halogen free

Specifications

Series	JZ	
Category temp. range	–55 ℃ to +125 ℃	
Rated voltage range	2.0 V	
Category voltage range	1.6 V	
Rated cap. range	560 μF	
Capacitance tolerance	±20 % (120 Hz / +20 ℃)	
DC leakage current	I ≦ 0.1 CV (μA) 2 minutes	
Dissipation factor (tan δ)	≦ 0.1 (120 Hz / + 20 ℃)	
Surge voltage (V)	Rated voltage × 1.25 (15 ℃ to 35 ℃)	
Endurance	+125 ℃ 3000 h, category voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tan δ)	≦ 2 times of the initial limit
	DC leakage current	≦ 3 times of the initial limit
Damp heat (Steady state)	+85 ℃, 85 % RH, 1000 h, No-applied voltage	
	Capacitance change of initial measurd value	2.0 V
		+70 %, –20 %
	Dissipation factor (tan δ)	≦ 2 times of the initial limit
	DC leakage current	≦ 5 times of the initial limit

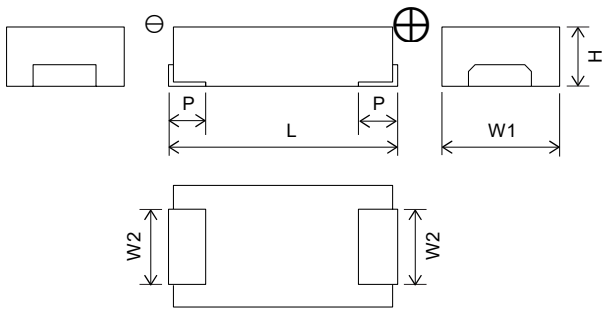
Marking



Rated voltage code	Unit : V
d	2.0

*1: Internal management information

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
JZ	7.3	4.3	2.4	2.2	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Explanation of part numbers

◇ Part number system

e.g.: EEFJZ0D561RE

EEF

Series	Product classifi-cation
JZ	EEF

JZ

Series	Code
JZ	JZ

0D

Rated Voltage (V)	Code
2.0	0D

561

Capacitance (μF)	Code
560	561

RE

ESR (mΩ)	Special code
3	RB
4.5	RC
9	RE

Characteristics list

Series	Rated voltage [105 ℃] (V)	Category voltage [125 ℃] (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
				L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
JZ	2.0	1.6	560	7.3	4.3	2.2	6300	9	EEFJZ0D561RE	3000
				7.3	4.3	2.2	8500	4.5	EEFJZ0D561RC	3000
				7.3	4.3	2.2	10200	3	EEFJZ0D561RB	3000

*1: Ripple current (100 kHz / +45 ℃)
*2: ESR (100 kHz / +20 ℃)
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Temperature coefficient of ripple current

Temperature		T ≦ 45 ℃	45 ℃ < T ≦ 85 ℃	85 ℃ < T ≦ 125 ℃
2.0 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

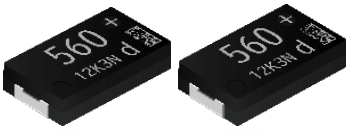
Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

KZ series [High temperature long life product]



No Automotive

Use of the general series is not recommended for these applications.
For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
・Products in the KZ Series must not be used for automotive applications. For automotive use, please select the AX Series.

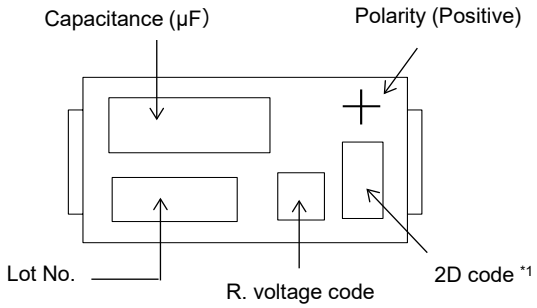
Features

- Endurance 125 °C 5500 h
- Damp heat 85°C 85% 1000 h
- Low ESR (3 to 9 mΩ)
- RoHS compliance, Halogen free

Specifications

Series	KZ	
Category temp. range	–55 °C to +125 °C	
Rated voltage range	2.0 V	
Category voltage range	1.6 V	
Rated cap. range	560 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
DC leakage current	I ≤ 0.1 CV (µA) 2 minutes	
Dissipation factor (tan δ)	≤ 0.1 (120 Hz / + 20 °C)	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance	+125 °C 5500 h, category voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit
Damp heat (Steady state)	+85 °C, 85 % RH, 1000 h, No-applied voltage	
	Capacitance change of initial measurd value	2.0 V
		+70 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	≤ 5 times of the initial limit

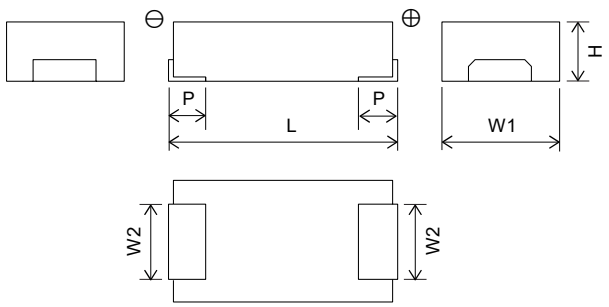
Marking



Rated voltage code	Unit : V
d	2.0

*1: Internal management information

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
KZ	7.3	4.3	2.4	2.2	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Explanation of part numbers

◇ Part number system

e.g.: EEFKZ0D561RE

EEF

Series	Product classifi-cation
KZ	EEF

KZ

Series	Code
KZ	KZ

0D

Rated Voltage (V)	Code
2.0	0D

561

Capacitance (μF)	Code
560	561

RE

ESR (mΩ)	Special code
3	RB
4.5	RC
9	RE

Characteristics list

Series	Rated voltage [105 °C] (V)	Category voltage [125 °C] (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
				L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
KZ	2.0	1.6	560	7.3	4.3	2.2	6300	9	EEFKZ0D561RE	3000
				7.3	4.3	2.2	8500	4.5	EEFKZ0D561RC	3000
				7.3	4.3	2.2	10200	3	EEFKZ0D561RB	3000

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 125 °C
2.0 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

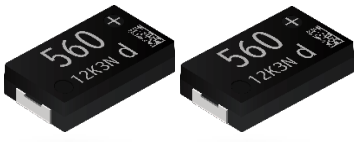
Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

TZ series [High temperature long life product]



No Automotive

Use of the general series is not recommended for these applications.
For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
・Products in the TZ Series must not be used for automotive applications. For automotive use, please select the AX Series.

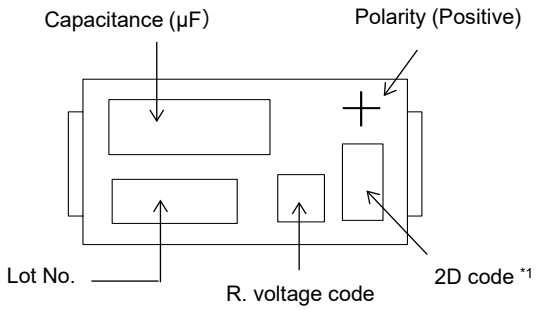
Features

- Endurance 135 °C 5500 h
- Damp heat 85°C 85% 1000 h
- Low ESR (3 to 9 mΩ)
- RoHS compliance, Halogen free

Specifications

Series	TZ	
Category temp. range	–55 °C to +135 °C	
Rated voltage range	2.0 V	
Category voltage range	1.6 V	
Rated cap. range	560 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
DC leakage current	I ≤ 0.1 CV (µA) 2 minutes	
Dissipation factor (tan δ)	≤ 0.1 (120 Hz / + 20 °C)	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance	+135 °C 5500 h, category voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit
Damp heat (Steady state)	+85 °C, 85 % RH, 1000 h, No-applied voltage	
	Capacitance change of initial measurd value	2.0 V
		+70 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	≤ 5 times of the initial limit

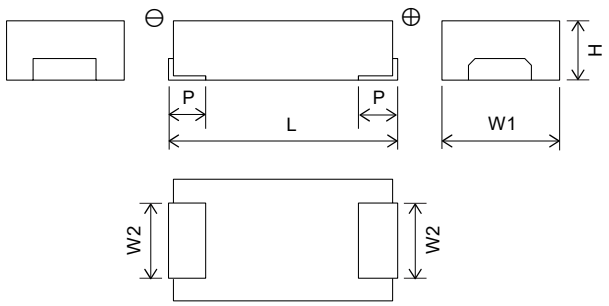
Marking



Rated voltage code	Unit : V
d	2.0

*1: Internal management information

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
TZ	7.3	4.3	2.4	2.2	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Explanation of part numbers

◇ Part number system

e.g.: EEFTZ0D561RE

EEF

Series	Product classifi-cation
TZ	EEF

TZ

Series	Code
TZ	TZ

0D

Rated Voltage (V)	Code
2.0	0D

561

Capacitance (μF)	Code
560	561

RE

ESR (mΩ)	Special code
3	RB
4.5	RC
9	RE

Characteristics list

Series	Rated voltage [105 °C] (V)	Category voltage [135 °C] (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
				L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
TZ	2.0	1.6	560	7.3	4.3	2.2	6300	9	EEFTZ0D561RE	3000
				7.3	4.3	2.2	8500	4.5	EEFTZ0D561RC	3000
				7.3	4.3	2.2	10200	3	EEFTZ0D561RB	3000

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 135 °C
2.0 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Panasonic INDUSTRY

- 2 to 6.3 V : On sale
- 10 to 35 V : Not recommended for new design

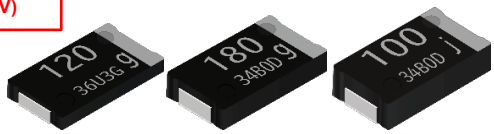
※ Click here for Replacement (10 to 35 V)

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

CS/CT/CX series



When using SP-Cap in applications that operate under continuous high loads-such as accelerators, switches, routers, and base stations-we strongly recommend the long-life series (J*/K*/T* Series).
We do not recommend using the general series (C*/S*/G*/L*/H* series).
Use of the general series (C*/S*/G*/L*/H* series) is not recommended for these applications. For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]

- **Products in the CS/CT/CX series must not be used for automotive applications. For automotive use, please select the AX series.**
- **Products in the CS/CT/CX series must not be used for accelerator applications or other continuous high-load applications. For these applications, please select the J*/K*/T* series.**

Features

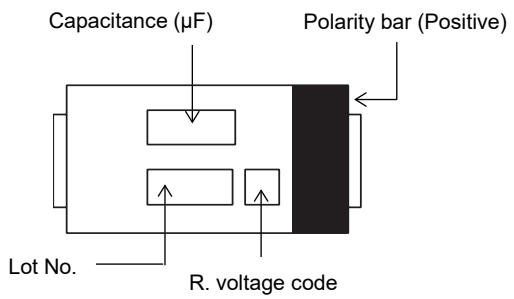
- High voltage (35 V max.)
- Low profile (Height 1.0 mm max.)
- High ripple current (5600 mA rms max.)
- RoHS compliance, Halogen free

Specifications

Series	CS	CT	CX
Category temp. range	–55 °C to +105 °C		
Rated voltage range	4.0 V to 35 V		2.0 V to 35 V
Rated cap. range	10 µF to 120 µF	15 µF to 180 µF	15 µF to 560 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
DC leakage current	I ≤ 0.1 CV(µA) [2.0 V to 6.3 V, 2 min], I ≤ 0.3 CV(µA) [10 V to 35 V, 2 min]		
Dissipation factor (tan δ)	≤ 0.06 (120 Hz / + 20 °C)		
Surge voltage (V)	Rated voltage × 1.25 [2.0 V to 16 V], × 1.15 [20 V to 35 V] (15 °C to 35 °C)		

Endurance	+105 °C 2000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit : 2.0 V to 6.3 V Within the initial limit : 10 V to 35 V		
Damp heat (Steady state)	+60 °C, 90 % RH, 500 h, No-applied voltage			
	Capacitance change of initial measurd value	2.0 V to 2.5 V	4.0 V, 10 V to 35 V	6.3 V
		+70 %, –20 %	+60 %, –20 %	+50 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	Within the initial limit : 2.0 V to 6.3 V ≤ 3 times of the initial limit : 10 V to 35 V		

Marking

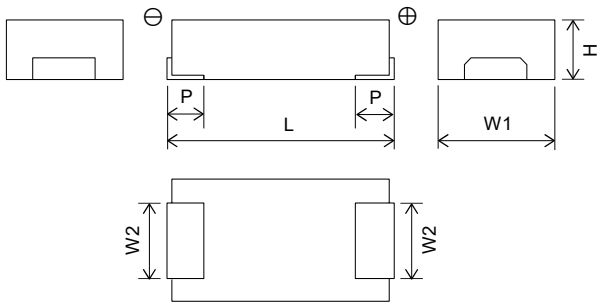


R. voltage code

Unit : V

d	2.0	j	6.3	D	20
e	2.5	A	10	E	25
g	4.0	C	16	V	35

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
CS	7.3	4.3	2.4	1.1	1.3
CT	7.3	4.3	2.4	1.4	1.3
CX	7.3	4.3	2.4	1.9	1.3

✻ Externals of figure are the reference.

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Explanation of part numbers

◇ Part number system

e.g.: EEFCS0G121R

EEF

Series	Product classifi-cation
CS	EEF
CT	
CX	

CS

Series	Code
CS	CS
CT	CT
CX	CX

0G

Rated Voltage (V)	Code
2.0	0D
2.5	0E
4.0	0G
6.3	0J
10	1A
16	1C
20	1D
25	1E
35	1V

121

Capacitance (μF)	Code	Capacitance (μF)	Code
10	100	150	151
15	150	180	181
22	220	220	221
33	330	270	271
47	470	330	331
56	560	390	391
68	680	470	471
100	101	560	561
120	121		

R

ESR (mΩ)	Special code
15 (2.0 to 6.3 V) 40 (10 to 35 V)	R
12	XR

Characteristics list

■ 2.0 V to 6.3 V

Series	Rated voltage (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
			L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
CS	4.0	120	7.3	4.3	1.1	5100	15	EEFCS0G121R	3500
	6.3	68	7.3	4.3	1.1	5100	15	EEFCS0J680R	3500
CT	4.0	180	7.3	4.3	1.4	5100	15	EEFCT0G181R	3500
	6.3	100	7.3	4.3	1.4	5100	15	EEFCT0J101R	3500
CX	2.0	220	7.3	4.3	1.9	5100	15	EEFCX0D221R	3500
		270	7.3	4.3	1.9	5600	12	EEFCX0D271XR	3500
		330	7.3	4.3	1.9	5100	15	EEFCX0D331R	3500
			7.3	4.3	1.9	5600	12	EEFCX0D331XR	3500
		390	7.3	4.3	1.9	5100	15	EEFCX0D391R	3500
		470	7.3	4.3	1.9	5100	15	EEFCX0D471R	3500
		560	7.3	4.3	1.9	5100	15	EEFCX0D561R	3500
	2.5	220	7.3	4.3	1.9	5100	15	EEFCX0E221R	3500
		330	7.3	4.3	1.9	5100	15	EEFCX0E331R	3500
		390	7.3	4.3	1.9	5100	15	EEFCX0E391R	3500
		470	7.3	4.3	1.9	5100	15	EEFCX0E471R	3500
	4.0	150	7.3	4.3	1.9	5100	15	EEFCX0G151R	3500
		180	7.3	4.3	1.9	5100	15	EEFCX0G181R	3500
			7.3	4.3	1.9	5600	12	EEFCX0G181XR	3500
		220	7.3	4.3	1.9	5100	15	EEFCX0G221R	3500
			7.3	4.3	1.9	5600	12	EEFCX0G221XR	3500
		270	7.3	4.3	1.9	5100	15	EEFCX0G271R	3500
		330	7.3	4.3	1.9	5100	15	EEFCX0G331R	3500
	6.3	100	7.3	4.3	1.9	5100	15	EEFCX0J101R	3500
		120	7.3	4.3	1.9	5100	15	EEFCX0J121R	3500
		150	7.3	4.3	1.9	5100	15	EEFCX0J151R	3500
			7.3	4.3	1.9	5600	12	EEFCX0J151XR	3500
		180	7.3	4.3	1.9	5100	15	EEFCX0J181R	3500
		220	7.3	4.3	1.9	5100	15	EEFCX0J221R	3500

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
2.0 V to 6.3 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
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If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Characteristics list

■ **10 V to 35 V** **Not Recommended for New Design** **For replacement**

Series	Rated voltage (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
			L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
CS	10	47	7.3	4.3	1.1	3200	40	EEFCS1A470R	3500
	16	15	7.3	4.3	1.1	3200	40	EEFCS1C150R	3500
		22	7.3	4.3	1.1	3200	40	EEFCS1C220R	3500
		33	7.3	4.3	1.1	3200	40	EEFCS1C330R	3500
	20	10	7.3	4.3	1.1	3200	40	EEFCS1D100R	3500
		15	7.3	4.3	1.1	3200	40	EEFCS1D150R	3500
		22	7.3	4.3	1.1	3200	40	EEFCS1D220R	3500
	25	10	7.3	4.3	1.1	3200	40	EEFCS1E100R	3500
		15	7.3	4.3	1.1	3200	40	EEFCS1E150R	3500
	35	10	7.3	4.3	1.1	3200	40	EEFCS1V100R	3500
CT	10	68	7.3	4.3	1.4	3200	40	EEFCT1A680R	3500
	16	47	7.3	4.3	1.4	3200	40	EEFCT1C470R	3500
	20	33	7.3	4.3	1.4	3200	40	EEFCT1D330R	3500
		47	7.3	4.3	1.4	3200	40	EEFCT1D470R	3500
	25	22	7.3	4.3	1.4	3200	40	EEFCT1E220R	3500
	35	15	7.3	4.3	1.4	3200	40	EEFCT1V150R	3500
CX	10	47	7.3	4.3	1.9	3200	40	EEFCX1A470R	3500
		68	7.3	4.3	1.9	3200	40	EEFCX1A680R	3500
		100	7.3	4.3	1.9	3200	40	EEFCX1A101R	3500
	16	15	7.3	4.3	1.9	3200	40	EEFCX1C150R	3500
		22	7.3	4.3	1.9	3200	40	EEFCX1C220R	3500
		33	7.3	4.3	1.9	3200	40	EEFCX1C330R	3500
		47	7.3	4.3	1.9	3200	40	EEFCX1C470R	3500
		68	7.3	4.3	1.9	3200	40	EEFCX1C680R	3500
	20	22	7.3	4.3	1.9	3200	40	EEFCX1D220R	3500
		33	7.3	4.3	1.9	3200	40	EEFCX1D330R	3500
		47	7.3	4.3	1.9	3200	40	EEFCX1D470R	3500
		56	7.3	4.3	1.9	3200	40	EEFCX1D560R	3500
	25	15	7.3	4.3	1.9	3200	40	EEFCX1E150R	3500
		22	7.3	4.3	1.9	3200	40	EEFCX1E220R	3500
		33	7.3	4.3	1.9	3200	40	EEFCX1E330R	3500
	35	15	7.3	4.3	1.9	3200	40	EEFCX1V150R	3500
		22	7.3	4.3	1.9	3200	40	EEFCX1V220R	3500

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for "Reflow conditions" and "Taping specifications".

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
10 V to 35 V	Coefficient	1.0	0.8	0.5

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
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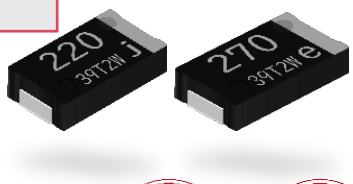
Panasonic INDUSTRY

Some part numbers are not a recommended product.
Not recommended for new design.

SP-Cap



Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

SX series [Low ESR products]

When using SP-Cap in applications that operate under continuous high loads-such as accelerators, switches, routers, and base stations-we strongly recommend the long-life series (J*/K*/T* Series).
We do not recommend using the general series (C*/S*/G*/L*/H* series).
Use of the general series (C*/S*/G*/L*/H* series) is not recommended for these applications. For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
- **Products in the SX series must not be used for automotive applications. For automotive use, please select the AX series.**
- **Products in the SX series must not be used for accelerator applications or other continuous high-load applications. For these applications, please select the J*/K*/T* series.**

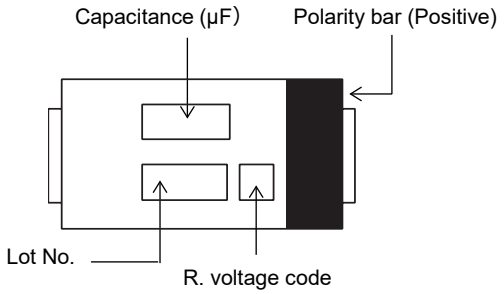
Features

- Large capacitance (560 μF max.)
- Low ESR (4.5 mΩ to 9 mΩ max.)
- High ripple current (8500 mA rms max.)
- RoHS compliance, Halogen free

Specifications

Series	SX			
Category temp. range	–55 °C to +105 °C			
Rated voltage range	2.0 V to 6.3 V			
Rated cap. range	82 μF to 560 μF			
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	I ≤ 0.1 CV (μA) 2 minutes			
Dissipation factor (tan δ)	≤ 0.06 (120 Hz / + 20 °C)			
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)			
Endurance	+105 °C 2000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		
Damp heat (Steady state)	+60 °C, 90 % RH, 500 h, No-applied voltage			
	Capacitance change of initial measurd value	2.0 V to 2.5 V	4.0 V	6.3 V
		+70 %, –20 %	+60 %, –20 %	+50 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	Within the initial limit		

Marking



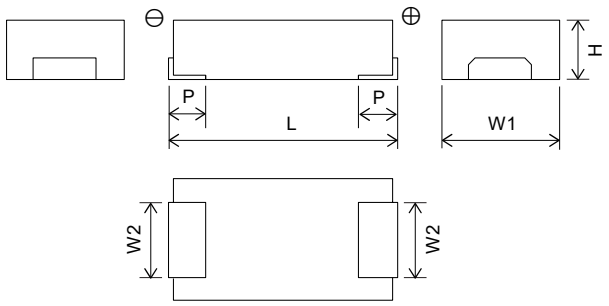
R. voltage code

d	2.0
e	2.5

Unit : V

g	4.0
j	6.3

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
SX	7.3	4.3	2.4	1.9	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
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Explanation of part numbers

◇ Part number system

e.g.: EEFSX0D271XE

EEF

Series	Product classification
SX	EEF

SX

Series	Code
SX	SX

0D

Rated Voltage (V)	Code
2.0	0D
2.5	0E
4.0	0G
6.3	0J

271

Capacitance (μF)	Code	Capacitance (μF)	Code
82	820	270	271
100	101	330	331
120	121	390	391
150	151	470	471
180	181	560	561
220	221		

XE

ESR (mΩ)	Special code
4.5	E4
6	XE
7	E7
9	ER

Characteristics list

Series	Rated voltage (V)	Capacitance (μF)	Case size (mm) L	W	H	Specification Ripple current*1 (mA rms)	ESR*2 (mΩ max.)	Part number	Min. Packaging Q'ty (pcs)
SX	2.0	180	7.3	4.3	1.9	6300	9	EEFSX0D181ER	3500
		220	7.3	4.3	1.9	6300	9	EEFSX0D221ER	3500
		270	7.3	4.3	1.9	6300	9	EEFSX0D271ER	3500
			7.3	4.3	1.9	7500	6	EEFSX0D271XE	3500
			7.3	4.3	1.9	8500	4.5	EEFSX0D271E4	3500
		330	7.3	4.3	1.9	6300	9	EEFSX0D331ER	3500
			7.3	4.3	1.9	7500	6	EEFSX0D331XE	3500
			7.3	4.3	1.9	8500	4.5	EEFSX0D331E4	3500
		390	7.3	4.3	1.9	6300	9	EEFSX0D391ER	3500
			7.3	4.3	1.9	7500	6	EEFSX0D391XE	3500
			7.3	4.3	1.9	8500	4.5	EEFSX0D391E4	3500
		470	7.3	4.3	1.9	6300	9	EEFSX0D471ER	3500
			7.3	4.3	1.9	7500	6	EEFSX0D471XE	3500
			7.3	4.3	1.9	8500	4.5	EEFSX0D471E4	3500
		560	7.3	4.3	1.9	8500	4.5	EEFSX0D561E4	3500
	2.5	150	7.3	4.3	1.9	6300	9	EEFSX0E151ER	3500
		180	7.3	4.3	1.9	6300	9	EEFSX0E181ER	3500
		220	7.3	4.3	1.9	6300	9	EEFSX0E221ER	3500
			7.3	4.3	1.9	7000	7	EEFSX0E221E7	3500
		270	7.3	4.3	1.9	7000	7	EEFSX0E271E7	3500
		330	7.3	4.3	1.9	6300	9	EEFSX0E331ER	3500
			7.3	4.3	1.9	7500	6	EEFSX0E331XE	3500
			7.3	4.3	1.9	8500	4.5	EEFSX0E331E4	3500
		390	7.3	4.3	1.9	6300	9	EEFSX0E391ER	3500
			7.3	4.3	1.9	7500	6	EEFSX0E391XE	3500
			7.3	4.3	1.9	8500	4.5	EEFSX0E391E4	3500
		470	7.3	4.3	1.9	6300	9	EEFSX0E471ER	3500
			7.3	4.3	1.9	7500	6	EEFSX0E471XE	3500
			7.3	4.3	1.9	8500	4.5	EEFSX0E471E4	3500
	4.0	NRFND 82	7.3	4.3	1.9	6300	9	EEFSX0G820ER	3500
		NRFND 100	7.3	4.3	1.9	6300	9	EEFSX0G101ER	3500
		NRFND 150	7.3	4.3	1.9	6300	9	EEFSX0G151ER	3500
			7.3	4.3	1.9	7000	7	EEFSX0G151E7	3500
		180	7.3	4.3	1.9	6300	9	EEFSX0G181ER	3500
		220	7.3	4.3	1.9	6300	9	EEFSX0G221ER	3500
		270	7.3	4.3	1.9	6300	9	EEFSX0G271ER	3500
		330	7.3	4.3	1.9	6300	9	EEFSX0G331ER	3500
			7.3	4.3	1.9	7500	6	EEFSX0G331XE	3500
	6.3	120	7.3	4.3	1.9	7000	7	EEFSX0J121E7	3500
		150	7.3	4.3	1.9	6300	9	EEFSX0J151ER	3500
		180	7.3	4.3	1.9	6300	9	EEFSX0J181ER	3500
		220	7.3	4.3	1.9	6300	9	EEFSX0J221ER	3500

*1: Ripple current (100 kHz / +45 °C) *2: ESR (100 kHz / +20 °C) NRFND Not recommended for new design

◆ Please refer to each page in this catarog for "Reflow conditions" and "Taping specifications".

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
2.0 V to 6.3 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
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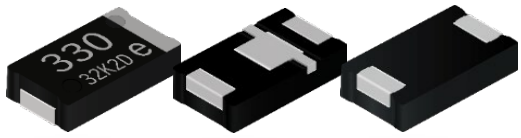
Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

GX/GX-L series [Super low ESR products]



When using SP-Cap in applications that operate under continuous high loads-such as accelerators, switches, routers, and base stations-we strongly recommend the long-life series (J*/K*/T* Series).
We do not recommend using the general series (C*/S*/G*/L*/H* series).
Use of the general series (C*/S*/G*/L*/H* series) is not recommended for these applications. For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
- **Products in the GX/GX-L series must not be used for automotive applications. For automotive use, please select the AX series.**
- **Products in the GX/GX-L series must not be used for accelerator applications or other continuous high-load applications. For these applications, please select the J*/K*/T* series.**

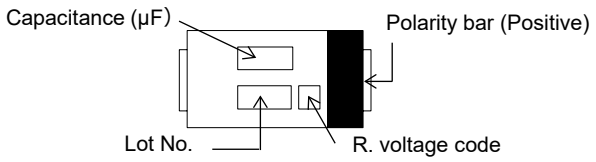
Features

- Large capacitance (560 μF max.)
- Super Low ESR (3 mΩ max.)
- Low ESL (3-terminals : 50 % less than 2-terminals) [Suffix : L]
- High ripple current (10200 mA rms max.)
- RoHS compliance, Halogen free

Specifications

Series	GX	
Category temp. range	–55 °C to +105 °C	
Rated voltage range	2.0 V to 2.5 V	
Rated cap. range	330 μF to 560 μF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
DC leakage current	I ≤ 0.1 CV (μA) 2 minutes	
Dissipation factor (tan δ)	≤ 0.06 (120 Hz / + 20 °C)	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance	+105 °C 2000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit
Damp heat (Steady state)	+60 °C, 90 % RH, 500 h, No-applied voltage	
	Capacitance change of initial measurd value	2.0 V to 2.5 V: +70 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	Within the initial limit

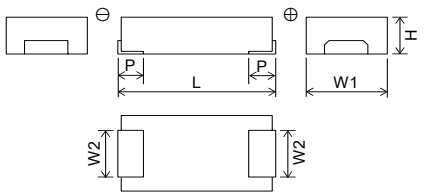
Marking



R. voltage code	Unit : V
d	2.0
e	2.5

Dimensions (not to scale)

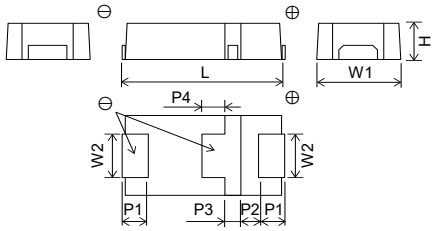
2 terminals



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
GX	7.3	4.3	2.4	1.9	1.3

3 terminals



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P1±0.3	P2±0.1	P3±0.2	P4±0.2
GX-L	7.3	4.3	2.4	1.9	1.3	1.1	0.7	1.4

✻ Externals of figure are the reference.

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Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Explanation of part numbers

◇ Part number system

e.g.: EEFGX0D331R

EEF

Series	Product classifi-cation
GX	EEF

GX

Series	Code
GX	GX

0D

Rated Voltage (V)	Code
2.0	0D
2.5	0E

331

Capacitance (μF)	Code
330	331
470	471
560	561

R

ESR (mΩ)	Special code
3	L, R

Characteristics list

Series	Rated voltage (V)	Capacitance (μF)	Case size (mm)			Specification		The number of terminals		Part number	Min. Packaging Q'ty (pcs)
			L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)	2	3		
GX	2.0	330	7.3	4.3	1.9	10200	3	○		EEFGX0D331R	3500
		470	7.3	4.3	1.9	10200	3	○		EEFGX0D471R	3500
			7.3	4.3	1.9	10200	3		○	EEFGX0D471L	3500
		560	7.3	4.3	1.9	10200	3	○		EEFGX0D561R	3500
			7.3	4.3	1.9	10200	3		○	EEFGX0D561L	3500
	2.5	330	7.3	4.3	1.9	10200	3	○		EEFGX0E331R	3500
		470	7.3	4.3	1.9	10200	3	○		EEFGX0E471R	3500
			7.3	4.3	1.9	10200	3		○	EEFGX0E471L	3500

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for "Reflow conditions" and "Taping specifications".

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
2.0 V to 2.5 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
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Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

LX series [Low ESR / Low ESL products]

When using SP-Cap in applications that operate under continuous high loads-such as accelerators, switches, routers, and base stations-we strongly recommend the long-life series (J*/K*/T* Series).
We do not recommend using the general series (C*/S*/G*/L*/H* series).
Use of the general series (C*/S*/G*/L*/H* series) is not recommended for these applications. For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
- **Products in the LX series must not be used for automotive applications. For automotive use, please select the AX series.**
- **Products in the LX series must not be used for accelerator applications or other continuous high-load applications. For these applications, please select the J*/K*/T* series.**

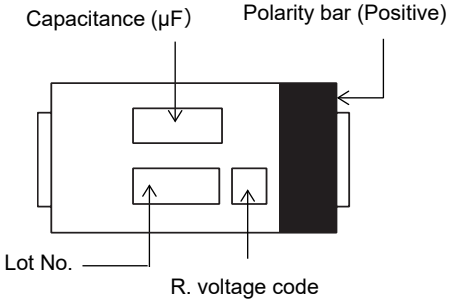
Features

- Large capacitance (560 µF max.)
- Low ESR (4.5 mΩ, 6 mΩ max.)
- Low ESL (3-terminals : 50 % less than 2-terminals)
- High ripple current (8500 mA rms max.)
- RoHS compliance, Halogen free

Specifications

Series	LX	
Category temp. range	–55 °C to +105 °C	
Rated voltage range	2.0 V to 2.5 V	
Rated cap. range	330 µF to 560 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
DC leakage current	I ≤ 0.1 CV (µA) 2 minutes	
Dissipation factor (tan δ)	≤ 0.06 (120 Hz / + 20 °C)	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance	+105 °C 2000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit
Damp heat (Steady state)	+60 °C, 90 % RH, 500 h, No-applied voltage	
	Capacitance change of initial measurd value	2.0 V to 2.5 V: +70 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	Within the initial limit

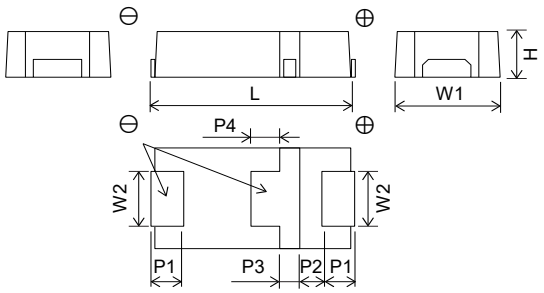
Marking



R. voltage code	Unit : V
d	2.0
e	2.5

Dimensions (not to scale)

3 terminals



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P1±0.3	P2±0.1	P3±0.2	P4±0.2
LX	7.3	4.3	2.4	1.9	1.3	1.1	0.7	1.4

∗ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
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Explanation of part numbers

◇ Part number system

e.g.: EEFLX0D331R

EEF	
Series	Product classifi-cation
LX	EEF

LX	
Series	Code
LX	LX

0D	
Rated Voltage (V)	Code
2.0	0D
2.5	0E

331	
Capacitance (μF)	Code
330	331
470	471
560	561

R	
ESR (mΩ)	Special code
4.5	R4
6	R

Characteristics list

Series	Rated voltage (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
			L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
LX	2.0	330	7.3	4.3	1.9	7500	6	EEFLX0D331R	3500
			7.3	4.3	1.9	8500	4.5	EEFLX0D331R4	3500
		470	7.3	4.3	1.9	7500	6	EEFLX0D471R	3500
			7.3	4.3	1.9	8500	4.5	EEFLX0D471R4	3500
		560	7.3	4.3	1.9	7500	6	EEFLX0D561R	3500
			7.3	4.3	1.9	8500	4.5	EEFLX0D561R4	3500
	2.5	330	7.3	4.3	1.9	7500	6	EEFLX0E331R	3500
			7.3	4.3	1.9	8500	4.5	EEFLX0E331R4	3500
		470	7.3	4.3	1.9	7500	6	EEFLX0E471R	3500
			7.3	4.3	1.9	8500	4.5	EEFLX0E471R4	3500

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
2.0 V to 2.5 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
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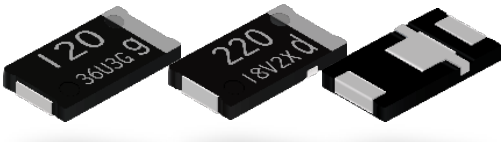
Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

SR/LR/SS/LS/ST/LT series



When using SP-Cap in applications that operate under continuous high loads-such as accelerators, switches, routers, and base stations-we strongly recommend the long-life series (J*/K*/T* Series).
We do not recommend using the general series (C*/S*/G*/L*/H* series).
Use of the general series (C*/S*/G*/L*/H* series) is not recommended for these applications. For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]

- **Products in the SR/LR/SS/LS/ST/LT series must not be used for automotive applications. For automotive use, please select the AX series.**
- **Products in the SR/LR/SS/LS/ST/LT series must not be used for accelerator applications or other continuous high-load applications. For these applications, please select the J*/K*/T* series.**

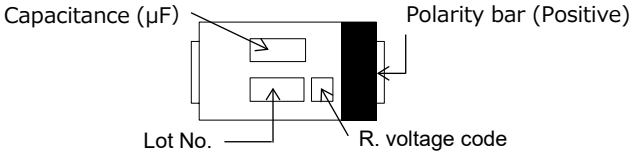
Features

- Low profile (Height 1.0 mm max.)
- Low ESR (4.5 mΩ to 9 mΩ max.)
- Low ESL (3-terminals : 50% less then 2-terminals) [LR/LS/LT series]
- High ripple current (8500 mA rms max.)
- RoHS compliance, Halogen free

Specifications

Series	SR	LR	SS	LS	ST	LT
Category temp. range	–55 °C to +105 °C					
Rated voltage range	2.0 V to 6.3 V		2.0 V to 2.5 V			
Rated cap. range	68 µF to 220 µF		180 µF to 220 µF		270 µF to 330 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)					
DC leakage current	I ≤ 0.1 CV (µA) 2 minutes					
Dissipation factor (tan δ)	≤ 0.06 (120 Hz / + 20 °C)					
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)					
Endurance	+105 °C 2000 h, rated voltage applied					
	Capacitance change	Within ±20 % of the initial value				
	Dissipation factor (tan δ)	≤ 2 times of the initial limit				
	DC leakage current	≤ 3 times of the initial limit				
Damp heat (Steady state)	+60 °C, 90 % RH, 500 h, No-applied voltage					
	Capacitance change of initial measurd value	2.0 V to 2.5 V	4.0 V	6.3 V		
		+70 %, –20 %	+60 %, –20 %	+50 %, –20 %		
	Dissipation factor (tan δ)	≤ 2 times of the initial limit				
	DC leakage current	Within the initial limit				

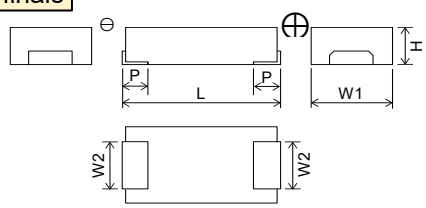
Marking



R. voltage code	Unit : V
d	2.0
e	2.5
g	4.0
j	6.3

Dimensions (not to scale)

2 terminals



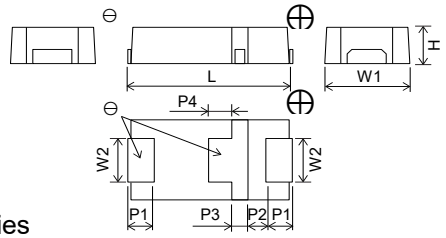
SR/SS/ST series

Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
SR	7.3	4.3	2.4	1.0*1	1.3
SS	7.3	4.3	2.4	1.1	1.3
ST	7.3	4.3	2.4	1.4	1.3

✻ Externals of figure are the reference. *1:max.

3 terminals



LR/LS/LT series

Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P1±0.3	P2±0.1	P3±0.2	P4±0.2
LR	7.3	4.3	2.4	1.0*1	1.3	1.1	0.7	1.4
LS	7.3	4.3	2.4	1.1	1.3	1.1	0.7	1.4
LT	7.3	4.3	2.4	1.4	1.3	1.1	0.7	1.4

*1:max.

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Explanation of part numbers

◇ Part number system

e.g.: EEFSR0D221R4

EEF

Series	Product classifi-cation
SR	EEF
SS	
ST	
LR	
LS	
LT	

SR

Series	Code
SR	SR
SS	SS
ST	ST
LR	LR
LS	LS
LT	LT

0D

Rated Voltage (V)	Code
2.0	0D
2.5	0E
4.0	0G
6.3	0J

221

Capacitance (μF)	Code	Capacitance (μF)	Code
68	680	220	221
120	121	270	271
180	181	330	331

R4

ESR (mΩ)	Special code
4.5	R4
6 (2.0, 2.5 V) 9 (4.0, 6.3 V)	R

Characteristics list

Series	Rated voltage (V)	Capacitance (μF)	Case size (mm)			Specification		The number of terminals		Part number	Min. Packaging Q'ty (pcs)
			L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)	2	3		
SR	2.0	220	7.3	4.3	1.0 max.	7500	6	○		EEFSR0D221R	3500
			7.3	4.3	1.0 max.	8500	4.5	○		EEFSR0D221R4	3500
	2.5	180	7.3	4.3	1.0 max.	7500	6	○		EEFSR0E181R	3500
			7.3	4.3	1.0 max.	8500	4.5	○		EEFSR0E181R4	3500
	4.0	120	7.3	4.3	1.0 max.	6300	9	○		EEFSR0G121R	3500
	6.3	68	7.3	4.3	1.0 max.	6300	9	○		EEFSR0J680R	3500
LR	2.0	220	7.3	4.3	1.0 max.	7500	6		○	EEFLR0D221R	3500
			7.3	4.3	1.0 max.	8500	4.5		○	EEFLR0D221R4	3500
	2.5	180	7.3	4.3	1.0 max.	7500	6		○	EEFLR0E181R	3500
			7.3	4.3	1.0 max.	8500	4.5		○	EEFLR0E181R4	3500
	4.0	120	7.3	4.3	1.0 max.	6300	9		○	EEFLR0G121R	3500
	6.3	68	7.3	4.3	1.0 max.	6300	9		○	EEFLR0J680R	3500
SS	2.0	220	7.3	4.3	1.1	7500	6	○		EEFSS0D221R	3500
	2.5	180	7.3	4.3	1.1	7500	6	○		EEFSS0E181R	3500
LS	2.0	220	7.3	4.3	1.1	7500	6		○	EEFLS0D221R	3500
	2.5	180	7.3	4.3	1.1	7500	6		○	EEFLS0E181R	3500
ST	2.0	330	7.3	4.3	1.4	7500	6	○		EEFST0D331R	3500
	2.5	270	7.3	4.3	1.4	7500	6	○		EEFST0E271R	3500
LT	2.0	330	7.3	4.3	1.4	7500	6		○	EEFLT0D331R	3500
	2.5	270	7.3	4.3	1.4	7500	6		○	EEFLT0E271R	3500

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for "Reflow conditions" and "Taping specifications".

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
2.0 V to 6.3 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Panasonic INDUSTRY

SP-Cap

Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

GY series [Super low ESR]

When using SP-Cap in applications that operate under continuous high loads-such as accelerators, switches, routers, and base stations-we strongly recommend the long-life series (J*/K*/T* Series).
We do not recommend using the general series (C*/S*/G*/L*/H* series).
Use of the general series (C*/S*/G*/L*/H* series) is not recommended for these applications. For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
- **Products in the GY series must not be used for automotive applications. For automotive use, please select the AX series.**
- **Products in the GY series must not be used for accelerator applications or other continuous high-load applications. For these applications, please select the J*/K*/T* series.**

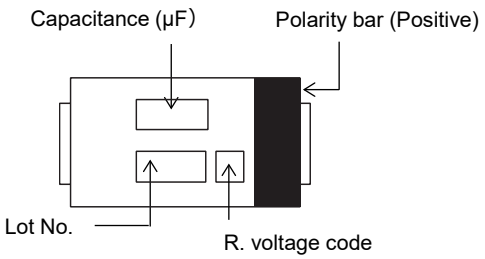
Features

- Super low ESR (3 mΩ max.)
- Large capacitance (820 μF max.)
- High ripple current (10200 mA rms max.)
- RoHS compliance, Halogen free

Specifications

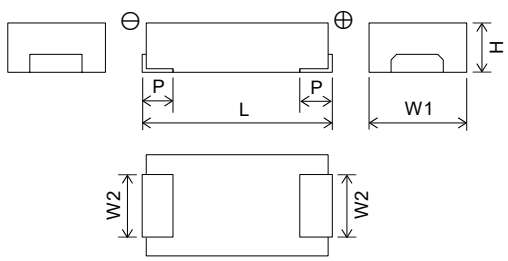
Series	GY	
Category temp. range	–55 °C to +105 °C	
Rated voltage range	2.0 V to 2.5 V	
Rated cap. range	680 μF to 820 μF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
DC leakage current	I ≤ 0.1 CV (μA) 2 minutes	
Dissipation factor (tan δ)	≤ 0.06 (120 Hz / + 20 °C)	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance	+105 °C 2000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit
Damp heat (Steady state)	+60 °C, 90 % RH, 500 h, No-applied voltage	
	Capacitance change of initial measurd value	2.0 V to 2.5 V
		+70 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	Within the initial limit

Marking



R. voltage code	Unit : V
d	2.0
e	2.5

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.2	P±0.3
GY	7.3	4.3	2.4	2.8	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
If delivery specifications suitable for the intended use was not exchanged at the time of product purchase, we will not bear any responsibility.

Explanation of part numbers

◇ Part number system

e.g.: EEFGY0D821R

EEF	
Series	Product classifi-cation
GY	EEF

GY	
Series	Code
GY	GY

0D	
Rated Voltage (V)	Code
2.0	0D
2.5	0E

821	
Capacitance (μF)	Code
680	681
820	821

R	
ESR (mΩ)	Special code
3	R

Characteristics list

Series	Rated voltage (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
			L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
GY	2.0	820	7.3	4.3	2.8	10200	3	EEFGY0D821R	2000
	2.5	680	7.3	4.3	2.8	10200	3	EEFGY0E681R	2000

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
2.0 V to 2.5 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

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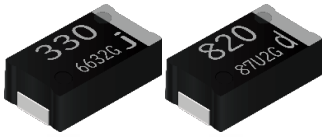
Panasonic INDUSTRY

SP-Cap



Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

CY/SY series [Guaranteed at 85 °C]

When using SP-Cap in applications that operate under continuous high loads-such as accelerators, switches, routers, and base stations-we strongly recommend the long-life series (J*/K*/T* Series).
We do not recommend using the general series (C*/S*/G*/L*/H* series).
Use of the general series (C*/S*/G*/L*/H* series) is not recommended for these applications. For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]
- **Products in the CY/SY series must not be used for automotive applications. For automotive use, please select the AX series.**
- **Products in the CY/SY series must not be used for accelerator applications or other continuous high-load applications. For these applications, please select the J*/K*/T* series.**

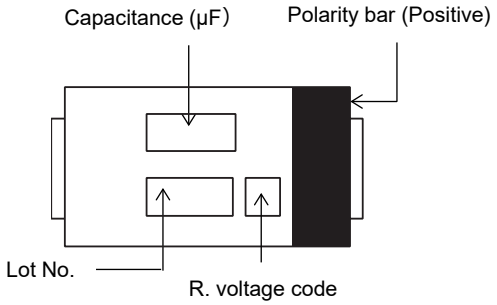
Features

- Endurance 85 °C 2000 h
- Product height (3.0 mm max.)
- High ripple current (5100 mA rms to 6300 mA rms max.)
- RoHS compliance, Halogen free

Specifications

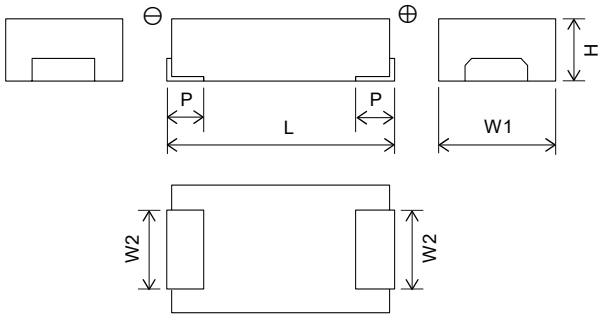
Series	CY / SY		
Category temp. range	–55 °C to +85 °C		
Rated voltage range	4.0 V, 6.3V		
Rated cap. range	330 µF to 470 µF		
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
DC leakage current	I ≤ 0.1 CV (µA) 2 minutes		
Dissipation factor (tan δ)	≤ 0.06 (120 Hz / + 20 °C)		
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)		
Endurance	+85 °C 2000 h, rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	Dissipation factor (tan δ)	≤ 2 times of the initial limit	
	DC leakage current	≤ 3 times of the initial limit	
Damp heat (Steady state)	+60 °C, 90 % RH, 500 h, No-applied voltage		
	Capacitance change of initial measurd value	4.0 V	6.3 V
		+60 %, –20 %	+50 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit	
	DC leakage current	Within the initial limit	

Marking



R. voltage code	Unit : V
g	4.0
j	6.3

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.2	P±0.3
CY / SY	7.3	4.3	2.4	2.8	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
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Explanation of part numbers

◇ Part number system

e.g.: ECGCY0G471R

ECG

Series	Product classifi-cation
CY	ECG
SY	

CY

Series	Code
CY	CY
SY	SY

0G

Rated Voltage (V)	Code
4.0	0G
6.3	0J

471

Capacitance (μF)	Code
330	331
470	471

R

ESR (mΩ)	Special code
9, 15	R

Characteristics list

Series	Rated voltage (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
			L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
CY	4.0	470	7.3	4.3	2.8	5100	15	ECGCY0G471R	2000
	6.3	330	7.3	4.3	2.8	5100	15	ECGCY0J331R	2000
SY	4.0	470	7.3	4.3	2.8	6300	9	ECGSY0G471R	2000
	6.3	330	7.3	4.3	2.8	6300	9	ECGSY0J331R	2000

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 65 °C	65 °C < T ≤ 85 °C
4.0 V to 6.3 V	Coefficient	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

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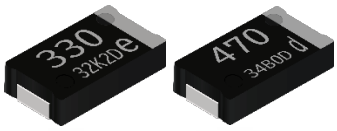
Panasonic INDUSTRY

- 2 to 6.3 V : On sale
- 10 to 35 V : Not recommended for new design

※ Click here for Replacement (10 to 35 V)

SP-Cap



Conductive Polymer Aluminum Electrolytic Capacitors

Surface Mount Type

HX series [Guaranteed at 125 °C]

When using SP-Cap in applications that operate under continuous high loads-such as accelerators, switches, routers, and base stations-we strongly recommend the long-life series (J*/K*/T* Series).
We do not recommend using the general series (C*/S*/G*/L*/H* series).
Use of the general series (C*/S*/G*/L*/H* series) is not recommended for these applications. For automotive applications such as ADAS or IVI, please consider the AX series.
[Important Notes]

- **Products in the HX series must not be used for automotive applications. For automotive use, please select the AX series.**
- **Products in the HX series must not be used for accelerator applications or other continuous high-load applications. For these applications, please select the J*/K*/T* series.**

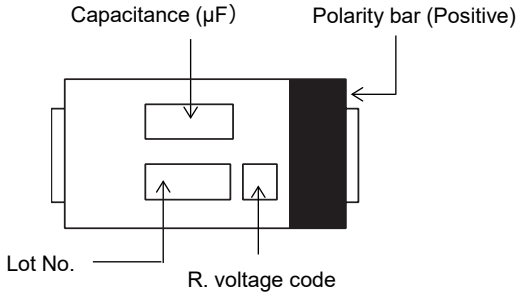
Features

- Endurance 125 °C 1000 h
- High voltage & Large capacitance (2.0 V / 470 µF to 25 V / 33 µF)
- Low ESR (4.5 mΩ max.)
- RoHS compliance, Halogen free

Specifications

Series	HX		
Category temp. range	–55 °C to +125 °C		
Rated voltage range	2.0 V to 2.5 V, 10 V to 25 V		
Category voltage range	1.6 V to 2.0 V, 8.0 V to 20 V		
Rated cap. range	15 µF to 470 µF		
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
DC leakage current	I ≤ 0.1 CV(µA) [2.0 V to 2.5 V, 2 min], I ≤ 0.3 CV(µA) [10 V to 25 V, 2 min]		
Dissipation factor (tan δ)	≤ 0.1 (120 Hz / + 20 °C)		
Surge voltage (V)	Rated voltage × 1.25 [2.0 V to 16 V], × 1.15 [20 V to 25 V] (15 °C to 35 °C)		
Endurance	+125 °C 1000 h, category voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	Dissipation factor (tan δ)	≤ 2 times of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady state)	After storing for 500 hours at +60 °C, 90 % RH		
	Capacitance change of initial measurd value	2.0 V to 2.5 V	10 V to 25 V
		+70 %, –20 %	+60 %, –20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit	
	DC leakage current	Within the initial limit : 2.0 V to 2.5 V ≤ 3 times of the initial limit : 10 V to 25 V	

Marking



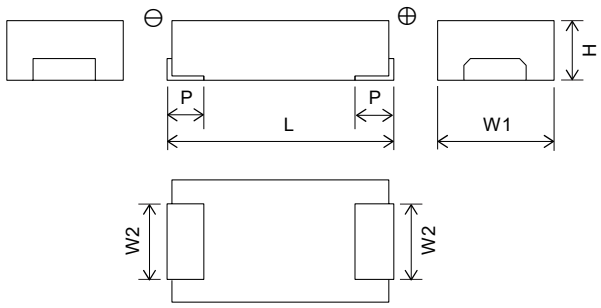
R. voltage code

d	2.0
e	2.5
A	10

Unit : V

C	16
D	20
E	25

Dimensions (not to scale)



Unit : mm

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
HX	7.3	4.3	2.4	1.9	1.3

✻ Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
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Explanation of part numbers

◇ Part number system

e.g.: EEFHX0D471R9

EEF

Series	Product classifi-cation
HX	EEF

HX

Series	Code
HX	HX

0D

Rated Voltage (V)	Code
2.0	0D
2.5	0E
10	1A
16	1C
20	1D
25	1E

471

Capacitance (μF)	Code	Capacitance (μF)	Code
15	150	68	680
22	220	100	101
33	330	330	331
47	470	470	471
56	560		

R9

ESR (mΩ)	Special Code
15 (2.0, 2.5 V) 40 (10 to 25 V)	R
4.5	R4
6	R6
9	R9

Characteristics list

■ 2.0 V to 2.5 V

Series	Rated voltage [105 °C] (V)	Category voltage [125 °C] (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
				L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
HX	2.0	1.6	470	7.3	4.3	1.9	5100	15	EEFHX0D471R	3500
				7.3	4.3	1.9	6300	9	EEFHX0D471R9	3500
				7.3	4.3	1.9	7500	6	EEFHX0D471R6	3500
				7.3	4.3	1.9	8500	4.5	EEFHX0D471R4	3500
	2.5	2.0	330	7.3	4.3	1.9	5100	15	EEFHX0E331R	3500
				7.3	4.3	1.9	6300	9	EEFHX0E331R9	3500
				7.3	4.3	1.9	7500	6	EEFHX0E331R6	3500
				7.3	4.3	1.9	8500	4.5	EEFHX0E331R4	3500
			470	7.3	4.3	1.9	5100	15	EEFHX0E471R	3500
				7.3	4.3	1.9	6300	9	EEFHX0E471R9	3500
				7.3	4.3	1.9	7500	6	EEFHX0E471R6	3500
				7.3	4.3	1.9	8500	4.5	EEFHX0E471R4	3500

■ 10 V to 25 V

Not Recommended for New Design **For replacement**

Series	Rated voltage [105 °C] (V)	Category voltage [125 °C] (V)	Capacitance (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty (pcs)
				L	W	H	Ripple current*1 (mA rms)	ESR*2 (mΩ max.)		
HX	10	8.0	47	7.3	4.3	1.9	3200	40	EEFHX1A470R	3500
			68	7.3	4.3	1.9	3200	40	EEFHX1A680R	3500
			100	7.3	4.3	1.9	3200	40	EEFHX1A101R	3500
	16	12.8	15	7.3	4.3	1.9	3200	40	EEFHX1C150R	3500
			22	7.3	4.3	1.9	3200	40	EEFHX1C220R	3500
			33	7.3	4.3	1.9	3200	40	EEFHX1C330R	3500
			47	7.3	4.3	1.9	3200	40	EEFHX1C470R	3500
			68	7.3	4.3	1.9	3200	40	EEFHX1C680R	3500
	20	16	22	7.3	4.3	1.9	3200	40	EEFHX1D220R	3500
			33	7.3	4.3	1.9	3200	40	EEFHX1D330R	3500
			47	7.3	4.3	1.9	3200	40	EEFHX1D470R	3500
			56	7.3	4.3	1.9	3200	40	EEFHX1D560R	3500
	25	20	15	7.3	4.3	1.9	3200	40	EEFHX1E150R	3500
			22	7.3	4.3	1.9	3200	40	EEFHX1E220R	3500
			33	7.3	4.3	1.9	3200	40	EEFHX1E330R	3500

*1: Ripple current (100 kHz / +45 °C) *2: ESR (100 kHz / +20 °C)

◆ Please refer to each page in this catarog for "Reflow conditions" and "Taping specifications".

Temperature coefficient of ripple current

Temperature		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C	105 °C < T ≤ 125 °C
2.0 V to 2.5 V	Coefficient	1.0	0.7	0.25	0.25
10 V to 25 V		1.0	0.8	0.5	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.
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Replacement list for “Not recommended for new design”

∗If you are using any of the following models on the deleted list,
please substitute them with the suggested alternative model as soon as possible.

Non-recommended part number						Replacement part number						
Series	Cate-gory temp. range max. (℃)	Rated voltage (V)	Capaci-tance (μF)	ESR (mΩ)	Part number	Series	Size code	Cate-gory temp. range max. (℃)	Rated voltage (V)	Capaci-tance (μF)	ESR (mΩ)	Part number
CS	105	10	47	40	EEFCS1A470R	POSCAP TQC	D15	105	16	47	55	16TQC47MYFT
						POSCAP TPE	B2	85	10	47	35	10TPE47MAZB
						OS-CON SVP	C6	105	10	47	50	10SVP47M
						Hybrid ZA	D	105	25	47	50	EEHZA1E470P
	105	16	15	40	EEFCS1C150R	POSCAP TQC	D15	105	16	47	55	16TQC47MYFT
						OS-CON SVP	B6	105	16	22	90	16SVP22M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	16	22	40	EEFCS1C220R	POSCAP TQC	D15	105	16	47	55	16TQC47MYFT
						OS-CON SVP	B6	105	16	22	90	16SVP22M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	16	33	40	EEFCS1C330R	POSCAP TQC	D15	105	16	47	55	16TQC47MYFT
						OS-CON SVPC	B6	105	16	39	27	16SVPC39MV
						Hybrid ZA	C	105	25	33	80	EEHZA1E330R
	105	20	10	40	EEFCS1D100R	POSCAP TQC	D15	105	20	47	55	20TQC47MYFT
						OS-CON SVPA	B6	105	20	10	40	20SVPA10M
						Hybrid ZA	C	105	35	10	100	EEHZA1V100R
	105	20	15	40	EEFCS1D150R	POSCAP TQC	D15	105	20	47	55	20TQC47MYFT
						OS-CON SVPA	C6	105	20	22	35	20SVPA22M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	20	22	40	EEFCS1D220R	POSCAP TQC	D15	105	20	47	55	20TQC47MYFT
						OS-CON SVPA	C6	105	20	22	35	20SVPA22M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	25	10	40	EEFCS1E100R	POSCAP TQC	D2	105	25	22	60	25TQC22MD2
						POSCAP TQS	D15	105	35	47	100	35TQS47MEX
						POSCAP TQC	D2	105	25	15	90	25TQC15MD2
						OS-CON SVPD	C6	125	25	10	65	25SVPD10M
						Hybrid ZA	C	105	35	10	100	EEHZA1V100R
	105	25	15	40	EEFCS1E150R	POSCAP TQC	D2	105	25	22	60	25TQC22MD2
						POSCAP TQS	D15	105	35	47	100	35TQS47MEX
						POSCAP TQC	D2	105	25	15	90	25TQC15MD2
						OS-CON SVPK	B6	125	25	33	35	25SVPK33M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	35	10	40	EEFCS1V100R	POSCAP TQC	D2	105	35	10	180	35TQC10MD2
						OS-CON SVPK	B6	125	35	22	35	35SVPK22M
						Hybrid ZA	C	105	35	10	100	EEHZA1V100R
CT	105	10	68	40	EEFCT1A680R	POSCAP TQC	D15	105	16	47	55	16TQC47MYFT
						POSCAP TPC	D2	105	10	100	45	10TPC100M
						OS-CON SVPC	B6	105	10	68	30	10SVPC68M
						Hybrid ZA	D8	105	25	68	30	EEHZA1E680XP
						Hybrid ZA	D8	105	35	68	35	EEHZA1V680XP
	105	16	47	40	EEFCT1C470R	POSCAP TQC	D15	105	16	47	55	16TQC47MYFT
						OS-CON SVF	B6	125	16	82	27	16SVF82M
						Hybrid ZA	D	105	25	47	50	EEHZA1E470P
	105	20	33	40	EEFCT1D330R	POSCAP TQC	D15	105	20	47	55	20TQC47MYFT
						OS-CON SVPK	B6	125	25	33	35	25SVPK33M
						Hybrid ZA	C	105	25	33	80	EEHZA1E330R
	105	20	47	40	EEFCT1D470R	POSCAP TQC	D15	105	20	47	55	20TQC47MYFT
						OS-CON SVPF	C6	105	25	47	30	25SVPF47M
						Hybrid ZA	D	105	25	47	50	EEHZA1E470P
	105	25	22	40	EEFCT1E220R	POSCAP TQC	D15	105	25	22	70	25TQC22MD2
						POSCAP TQS	D15	105	35	47	100	35TQS47MEX
						OS-CON SVPF	B6	105	25	27	40	25SVPF27MX
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	35	15	40	EEFCT1V150R	POSCAP TQC	D2	105	35	15	150	35TQC15MD2
						OS-CON SVPK	B6	125	35	22	35	35SVPK22M
						Hybrid ZA	C	105	35	22	100	EEHZA1V220R

Replacement list for “Not recommended for new design”

∗If you are using any of the following models on the deleted list,
please substitute them with the suggested alternative model as soon as possible.

Non-recommended part number						Replacement part number						
Series	Cate-gory temp. range max. (℃)	Rated voltage (V)	Capaci-tance (μF)	ESR (mΩ)	Part number	Series	Size code	Cate-gory temp. range max. (℃)	Rated voltage (V)	Capaci-tance (μF)	ESR (mΩ)	Part number
CX	105	10	100	40	EEFCX1A101R	POSCAP TPC	D2	105	10	100	45	10TPC100M
						OS-CON SVPC	C6	105	10	120	22	10SVPC120MV
						Hybrid ZA	D8	105	25	100	30	EEHZA1E101XP
	105	10	47	40	EEFCX1A470R	POSCAP TPE	D2E	105	10	68	25	10TPC100M
						POSCAP TPE	B2	85	10	47	35	10TPE47MAZB
						OS-CON SVP	C6	105	10	47	50	10SVP47M
						Hybrid ZA	D	105	25	47	50	EEHZA1E470P
	105	10	68	40	EEFCX1A680R	POSCAP TPC	D2	105	10	100	45	10TPC100M
						POSCAP TQC	D2	105	16	68	50	16TQC68MD2
						OS-CON SVPC	B6	105	10	68	23	10SVPC68MV
						Hybrid ZA	D8	105	25	68	30	EEHZA1E680XP
						Hybrid ZA	D8	105	35	68	35	EEHZA1V680XP
	105	16	15	40	EEFCX1C150R	POSCAP TQC	D2	105	16	47	55	16TQC47MD2
						POSCAP TQC	B2	105	25	15	100	25TQC15MB
						OS-CON SVP	B6	105	16	22	90	16SVP22M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	16	22	40	EEFCX1C220R	POSCAP TQC	B2	105	16	33	90	16TQC33MB2
						OS-CON SVP	B6	105	16	22	90	16SVP22M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	16	33	40	EEFCX1C330R	POSCAP TQC	B2	105	16	33	90	16TQC33MB2
						OS-CON SVPC	B6	105	16	39	27	16SVPC39MV
						Hybrid ZA	C	105	25	33	80	EEHZA1E330R
	105	16	47	40	EEFCX1C470R	OS-CON SVPF	B6	105	16	82	27	16SVPF82M
						Hybrid ZA	D	105	25	47	50	EEHZA1E470P
	105	16	68	40	EEFCX1C680R	POSCAP TQC	D2	105	16	68	50	16TQC68MD2
						POSCAP TQC	D2	105	16	100	50	16TQC100MD2
						OS-CON SVPC	C6	105	16	68	25	16SVPC68MV
						Hybrid ZA	D8	105	25	68	30	EEHZA1E680XP
						Hybrid ZA	D8	105	35	68	35	EEHZA1V680XP
	105	20	22	40	EEFCX1D220R	POSCAP TQC	D2	105	20	33	60	20TQC33MD2
						POSCAP TQC	B2	105	20	22	90	20TQC22MB2
						OS-CON SVPA	C6	105	20	22	35	20SVPA22M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	20	33	40	EEFCX1D330R	POSCAP TQC	D2	105	20	33	60	20TQC33MD2
						POSCAP TQC	D2	105	20	47	55	20TQC47MD2
						OS-CON SVPK	B6	125	25	33	35	25SVPK33M
						Hybrid ZA	C	105	25	33	80	EEHZA1E330R
	105	20	47	40	EEFCX1D470R	POSCAP TQC	D15	105	20	47	55	20TQC47MYFT
						OS-CON SVPF	C6	105	25	47	30	25SVPF47M
						Hybrid ZA	D	105	25	47	50	EEHZA1E470P
	105	20	56	40	EEFCX1D560R	POSCAP TQC	D2	105	20	100	100	20TQC100MD2
						OS-CON SVPF	B6	105	20	56	30	20SVPF56MX
						Hybrid ZA	C	105	25	56	50	EEHZA1E560P
	105	25	15	40	EEFCX1E150R	POSCAP TQC	B2	105	25	15	100	25TQC15MB
						OS-CON SVPK	B6	125	25	33	35	25SVPK33M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	25	22	40	EEFCX1E220R	POSCAP TQC	D2	105	25	22	60	25TQC22MD2
						OS-CON SVPF	B6	105	25	27	40	25SVPF27M
						Hybrid ZA	C	105	25	22	80	EEHZA1E220R
	105	25	33	40	EEFCX1E330R	POSCAP TQC	D2	105	25	22	60	25TQC22MD2
						OS-CON SVPK	B6	125	25	33	35	25SVPK33M
						Hybrid ZA	C	105	25	33	80	EEHZA1E330R
	105	35	15	40	EEFCX1V150R	POSCAP TQC	D2	105	35	15	150	35TQC15MD2
						OS-CON SVPK	B6	125	35	22	35	35SVPK22M
						Hybrid ZA	C	105	35	22	100	EEHZA1V220R
	105	35	22	40	EEFCX1V220R	POSCAP TQC	D2	105	35	15	150	35TQC15MD2
						OS-CON SVPK	B6	125	35	22	35	35SVPK22M
						Hybrid ZA	C	105	35	22	100	EEHZA1V220R

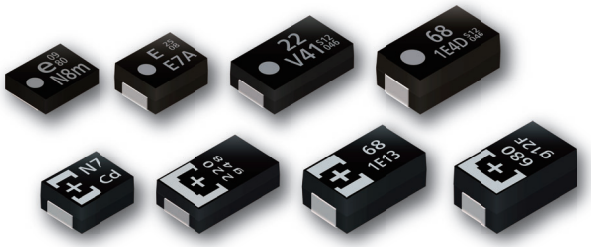
Replacement list for “Not recommended for new design”

∗If you are using any of the following models on the deleted list,
please substitute them with the suggested alternative model as soon as possible.

Non-recommended part number						Replacement part number						
Series	Cate-gory temp. range max. (℃)	Rated voltage (V)	Capaci-tance (μF)	ESR (mΩ)	Part number	Series	Size code	Cate-gory temp. range max. (℃)	Rated voltage (V)	Capaci-tance (μF)	ESR (mΩ)	Part number
HX	125	10	47	40	EEFHX1A470R	POSCAP TDC	D2	125	16	100	50	16TDC100MD2
						OS-CON SVPD	C6	125	10	56	45	10SVPD56M
						Hybrid ZC	D	125	25	47	50	EEHZC1E470P
	125	10	68	40	EEFHX1A680R	POSCAP TDC	D2	125	16	100	50	16TDC100MD2
						OS-CON SVPK	B6	125	20	68	30	20SVPK68M
						Hybrid ZC	D8	125	25	68	30	EEHZC1E680XP
	125	10	100	40	EEFHX1A101R	POSCAP TDC	D2	125	16	100	50	16TDC100MD2
						POSCAP TCF	D3L	105	10	150	15	10TCF150ML
						OS-CON SVPK	B6	125	16	100	27	16SVPK100M
						Hybrid ZC	D8	125	25	100	30	EEHZC1E101XP
	125	16	15	40	EEFHX1C150R	POSCAP TDC	D2	125	16	100	50	16TDC100MD2
						POSCAP TDC	B2	125	16	33	90	16TDC33MB2
						Hybrid ZC	C	125	25	22	80	EEHZC1E220R
	125	16	22	40	EEFHX1C220R	POSCAP TDC	D2	125	16	100	50	16TDC100MD2
						POSCAP TDC	B2	125	16	33	90	16TDC33MB2
						OS-CON SVPK	B6	125	35	22	35	35SVPK22M
						Hybrid ZC	C	125	25	22	80	EEHZC1E220R
	125	16	33	40	EEFHX1C330R	POSCAP TDC	D2	125	16	100	50	16TDC100MD2
						POSCAP TDC	B2	125	16	33	90	16TDC33MB2
						OS-CON SVPK	B6	125	25	33	35	25SVPK33M
						Hybrid ZC	C	125	25	33	80	EEHZC1E330R
	125	16	47	40	EEFHX1C470R	POSCAP TDC	D2	125	16	100	50	16TDC100MD2
						OS-CON SVPK	C6	125	35	47	27	35SVPK47M
						Hybrid ZC	D	125	25	47	50	EEHZC1E470P
	125	16	68	40	EEFHX1C680R	POSCAP TDC	D2	125	16	100	50	16TDC100MD2
						OS-CON SVF	B6	125	16	82	27	16SVF82M
						Hybrid ZC	D8	125	25	68	30	EEHZC1E680XP
	125	20	22	40	EEFHX1D220R	POSCAP TDC	B2	125	20	22	90	20TDC22MB2
						OS-CON SVPK	B6	125	35	22	35	35SVPK22M
						Hybrid ZC	C	125	25	22	80	EEHZC1E220R
	125	20	33	40	EEFHX1D330R	OS-CON SVPK	B6	125	25	33	35	25SVPK33M
						Hybrid ZC	C	125	25	33	80	EEHZC1E330R
	125	20	47	40	EEFHX1D470R	OS-CON SVPK	C6	125	35	47	27	35SVPK47M
						Hybrid ZC	D	125	25	47	50	EEHZC1E470P
	125	20	56	40	EEFHX1D560R	OS-CON SVF	B6	125	20	56	30	20SVF56M
						Hybrid ZC	D	125	25	56	50	EEHZC1E560P
	125	25	15	40	EEFHX1E150R	POSCAP TDC	D3L	125	25	68	70	25TDC68MD3
						POSCAP TDC	B2	125	25	15	100	25TDC15MB
						OS-CON SVF	B6	125	25	27	40	25SVF27M
						Hybrid ZC	C	125	25	22	80	EEHZC1E220R
	125	25	22	40	EEFHX1E220R	POSCAP TDC	D3L	125	25	68	70	25TDC68MD3
						OS-CON SVF	B6	125	25	27	40	25SVF27M
						Hybrid ZC	C	125	25	22	80	EEHZC1E220R
	125	25	33	40	EEFHX1E330R	POSCAP TDC	D3L	125	25	68	70	25TDC68MD3
						OS-CON SVPK	B6	125	25	33	35	25SVPK33M
						Hybrid ZC	C	125	25	33	80	EEHZC1E330R
SX	105	4	82	9	EEFSX0G820ER	SP-Cap SX	D	105	4	220	9	EEFSX0G221ER
	105	4	100	9	EEFSX0G101ER							
	105	4	150	9	EEFSX0G151ER							
	105	4	150	7	EEFSX0G151E7							

Conductive Polymer Tantalum Solid Capacitors

POSCAP™



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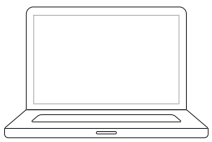
Applications

Main market

Laptop computer



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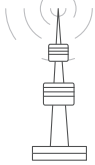

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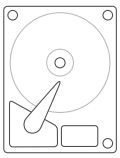

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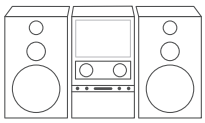
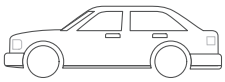
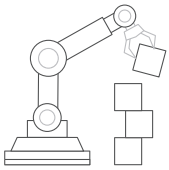


Server

Automotive



Industrial robot



Drone

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Matters to Be Observed When Using This Product
(Conductive Polymer Tantalum Solid Capacitors / POSCAP)

Use environments and cleaning conditions

■ This product (capacitor) is intended for standard general-purpose use in electronic equipment, and is not designed for use in the specific environments described below. Using the product in such specific environments or service conditions, therefore, may affect the performance of the product.
Please check with us about the performance and reliability of the product first before using the product.

(1) Used in liquid, such as water, oil, chemicals, and organic solvents.
(2) Used in a place exposed to direct sunlight, an outdoor place with no shielding, or a dusty place.
(3) Used in a wet place (dew concentration on a resistor, water leakage, etc.), a place exposed to sea breeze, or a place filled with a corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_X.
(4) Used in an environment where static electricity and electromagnetic waves are strong.
(5) The product is located close to a heating component or a flammable material, such as a vinyl cable, is placed near the product.
(6) The product is used sealed with a resin, etc.
(7) Solder flux of the soldered product is cleansed with a solvent, water, and a water-soluble cleaner.
(Be careful with water soluble solder flux.)
(8) Used in an environment where an acidic or alkali atmosphere is present.
(9) Used in an environment where excessive vibration or impact is applied to the product.
(10) Used under a low atmospheric pressure condition or depressurized condition.

■ When the capacitor is used in a circuit where an impact voltage is applied or a high voltage is applied in a short period (transient phenomenon) or a high pulse voltage is applied, make sure to use the capacitor at a voltage equal to or lower than its rated voltage.

Response to anomalies and handling conditions

■ A short mode is a major failure mode in a capacitor. A short mode is caused by thermal stress created by soldering or a high service temperature, electric stress, mechanical stress, etc. When the capacitor has shorted, take the following steps to ensure your safety.

(1) When you see smoke coming out of the shorted product, turn off the main power supply to stop using the capacitor. Do not place your face or hand near to the smoldering capacitor.
(2) The time a shorted capacitor takes to generate smoke ranges from a few seconds to a few minutes, depending on service conditions. If you incorporate a protective circuit, design the circuit to activate in the time preceding the smoke generation.
(3) In case smoke gets into your eyes or comes into your mouth, wash the eyes with water or rinse out the mouth immediately.
(4) When a current value after the short of the product is extremely large, the shorted capacitor may spark out, which, in the worst scenario, may result in ignition. Ensure the safety of the circuit by, for example, giving it a redundant circuit structure or providing it with a protective circuit.

Reliability and product life

The failure rate of the capacitor is specified based on 0.5%*/1000 h (reliability level 60%), a failure rate conforming to JIS C 5003 (failure rate level). This indicates that the possibility of occurrence of a failure is by no means zero.
One of the failure modes is a wear out failure. This happens when the period of guaranteeing the durability and high-temperature/high-humidity resistance of the capacitor is over, changes in the electrical characteristics of the capacitor (product) get larger and its electrolyte gradually deteriorates into an insulating material to create an open mode.
Another failure mode is a random failure in which a short mode results mainly because of thermal, electrical, or mechanical stress, etc.

* The failure rate of a small POSCAP of a B2 size or smaller is 1.0%.

Circuit design and circuit board design

■ Do not use this capacitor in a high-impedance voltage holding circuit, a coupling circuit, a time constant circuit, or a circuit widely affected by leak current.

■ The capacitor is incorporated and used in a circuit where the capacitor operates within a rating range specified in the specifications. Set a service temperature within a specified category temperature range. Do not let a current larger than the allowable ripple current flow in the circuit. Reduce a ripple current to the extent at which the surface temperature of the capacitor's top does not exceed the rated temperature.
(For information about TQC series, please contact us separately.)

■ Electrical characteristics values listed in a characteristics table, such as a capacitance and an ESR, are values specified at shipment of the capacitor. These values may change when departing from the specified values in the table under certain electrical or mechanical performance condition. Be careful in choosing a capacitor with the intended electrical characteristics in your design work. Besides, temperature/frequency fluctuations can cause the capacitor's electrical characteristics to change. Confirm such changes in the electrical characteristics and then proceed with your circuit design.

■ A leak current may increase even when soldering conditions are within a specified range. The leak current may increase also in a high-temperature non-load test or humidity-resistance non-load test, in which no voltage is applied, a temperature cycle test, etc. In such cases, applying a voltage at a temperature equal to or lower than the highest service temperature of the capacitor reduces the leak current gradually.

■ A flow of excessively large rush current created by rapid charge/discharge may result in short circuit or an increase in leak current. When a rush current value exceeds 20 A*, apply a protective circuit to the product.
Note that at leak current measurement, a protective resistance of about 1 kΩ is put in the circuit before the capacitance is charged or discharges.

Mounting and storage conditions

■ Set soldering conditions within a specified range. Stricter soldering conditions outside the specified range will cause the deterioration of the electrical characteristics and service life characteristics.

■ The capacitor must be kept in storage in an environment that avoids dropping soldering performance or caused trouble with soldering because of moisture absorption by an exterior resin. Store the capacitor, which is put together with a reel in an airtight moisture-proof bag, in a place where a normal temperature and humidity (15 °C to 35 °C and 45%RH to 75%RH) are maintained and direct sunlight is blocked. The storage period is 18 months or less after shipment from the factory.

■ Unseal the bag to take out the capacitor right before mounting it on a circuit. Once you take out the capacitor, make sure to use it up. Storage periods for capacitors taken out of bags are as follows.

* These products do not conform to the entire requirements defined in JEDEC J-STD-020 and J-STD-033.

(1) Level 2a : four weeks at a temperature and a humidity equal to or lower than 30 °C and 60 %RH
(2) Level 3 : 168 hours at a temperature and a humidity equal to or lower than 30 °C and 60 %RH
(3) Level 5 : 48 hours at a temperature and a humidity equal to or lower than 30 °C and 60 %RH

Reference information

Intellectual property

Panasonic Group provides customers with safe products and services. We are also making great efforts to protect our intellectual property rights for Panasonic Group products. Typical patents related to this product are as follows.

[U.S. patent]

USP Nos. 8081421, 8149569, 8456804, and 8559166

Line up

Series	Features	Small size/Low profile	Large capacitance	Low ESR	High reliability	High voltage	Guaranteed at 125℃	Category temp. range (℃)	Rated voltage (V)	ESR (mΩ)	Capacitance (μF)	Size code	Size (mm) L	Size (mm) W	Size (mm) H
TPS	Small size/Low profile Large capacitance Face down terminal	●	●					-55 to 105	2.5 to 6.3	30 to 35	150 to 330	B1S	3.5	2.8	1.1
TPSF	Low ESR/Small size Large capacitance Face down terminal	●	●	●				-55 to 105	2.0 to 2.5	6 to 9	270	B2S	3.5	2.8	1.9
TPE*1	Low ESR			●				-55 to 105	2.0 to 10	9 to 70	47 to 470	B2	3.5	2.8	1.9
								-55 to 105	2.5 to 10	7 to 45	68 to 470	D2E	7.3	4.3	1.8
								-55 to 105	2.5 to 10	9 to 40	150 to 680	D3L	7.3	4.3	2.8
								-55 to 105	2.5 to 10	10 to 40	330 to 1500	D4	7.3	4.3	3.8
TPF*1	Low ESR Large capacitance		●	●				-55 to 105	2.5 to 10	5 to 25	150 to 680	D3L	7.3	4.3	2.8
								-55 to 105	2.5 to 6.3	5 to 35	470 to 1000	D4	7.3	4.3	3.8
TQT	Super high voltage Low profile Large capacitance	●	●			●		-55 to 105	35	100	56	D15S	7.3	4.3	1.4
TQS	High voltage	●				●		-55 to 105	35	100	47	D15S	7.3	4.3	1.4
								-55 to 105	35	100	68	D2S	7.3	4.3	1.9
TQC*1	High voltage					●		-55 to 105	16 to 35	90 to 200	10 to 47	B2	3.5	2.8	1.9
								-55 to 105	16 to 25	55 to 70	22 to 47	D15	7.3	4.3	1.4
								-55 to 105	16 to 35	50 to 180	10 to 150	D2	7.3	4.3	1.9
								-55 to 105	16 to 25	50 to 70	68 to 220	D3L	7.3	4.3	2.8
TA	High reliability				●			-55 to 105	4.0 to 10	70	47 to 100	B2	3.5	2.8	1.9
								-55 to 105	2.5 to 6.3	9 to 25	150 to 470	D2E	7.3	4.3	1.8
								-55 to 105	2.5 to 10	15 to 25	150 to 680	D3L	7.3	4.3	2.8
TV	High reliability Guaranteed at 125 ℃				●		●	-55 to 125	6.3 to 10	25	68 to 150	D2E	7.3	4.3	1.8
								-55 to 125	10	25	150	D3L	7.3	4.3	2.8
TPB*1	Standard							-55 to 105	4.0 to 10	70	33 to 68	B2	3.5	2.8	1.9
								-55 to 105	4.0 to 10	40 to 55	150 to 330	D3L	7.3	4.3	2.8
								-55 to 105	6.3 to 10	35 to 40	220 to 470	D4	7.3	4.3	3.8

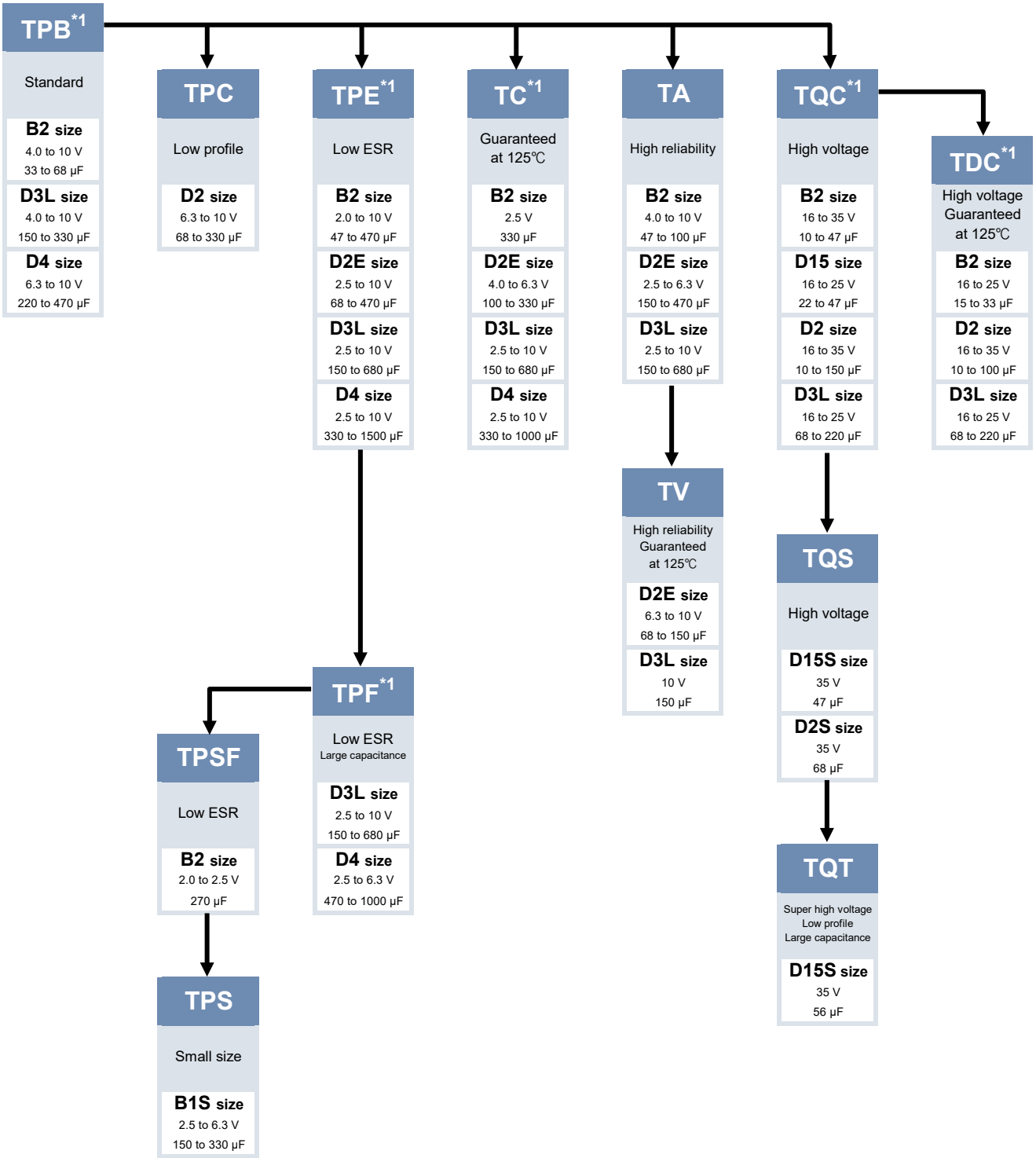
*1 : Some part numbers are not a recommended product

Line up

Series	Features	Small size/Low profile	Large capacitance	Low ESR	High reliability	High voltage	Guaranteed at 125℃	Category temp. range (℃)	Rated voltage (V)	ESR (mΩ)	Capacitance (μF)	Size code	Size (mm) L	Size (mm) W	Size (mm) H
TC*1	Guaranteed at 125 ℃						●	-55 to 125	2.5	9	330	B2	3.5	2.8	1.9
								-55 to 125	4.0 to 6.3	15 to 25	100 to 330	D2E	7.3	4.3	1.8
								-55 to 125	2.5 to 10	5 to 25	150 to 680	D3L	7.3	4.3	2.8
								-55 to 125	2.5 to 10	5 to 25	330 to 1000	D4	7.3	4.3	3.8
TDC*1	High voltage Guaranteed at 125 ℃					●	●	-55 to 125	16 to 25	90 to 100	15 to 33	B2	3.5	2.8	1.9
								-55 to 125	16 to 35	50 to 180	10 to 100	D2	7.3	4.3	1.9
								-55 to 125	16 to 25	50 to 70	68 to 150	D3L	7.3	4.3	2.8
TPC*1	Low profile	●						-55 to 105	10	45 to 100	68 to 100	D2	7.3	4.3	1.9

*1 : Some part numbers are not a recommended product

Series flow chart



:1: Some part numbers are not a recommended product

Voltage - Capacitance table (Vol. : 2.0 to 8.0 V / Cap. : 3.9 to 68 µF)

Series [Size]
(ESR mΩ)

V \ µF	3.9	4.7	5.6	6.8	8.2	10	15	22	33	47	56
2.0											
2.5											
4.0											
6.3									TPB [B2] (70)	TA [B2] (70)	
8.0											

Size list LxWxH (mm)

B1	3.5x2.8x1.1	B2	3.5x2.8x1.9	D15	7.3x4.3x1.4	D2E	7.3x4.3x1.8	D3L	7.3x4.3x2.8
B1S	3.5x2.8x1.1	B2S	3.5x2.8x1.9	D15S	7.3x4.3x1.4	D2	7.3x4.3x1.9	D4	7.3x4.3x3.8
						D2S	7.3x4.3x1.9		

Voltage - Capacitance table (Vol. : 2.0 to 8.0 V / Cap. : 100 to 1500 μF)

Series [Size]
(ESR mΩ)

V \ μF	68	100	120	150	220	270	330	470	680	1000	1500
2.0						TPSF [B2S] (9,6)		TPE [B2] (15,11)			
2.5					TPS [B1S] (30)	TPSF [B2S] (6)	TPS [B1S] (30)	TPE [D2E] (18,15,12,9,7)	TPE [D3L] (40,15,12)	TPE [D4] (15)	TPE [D4] (15,12)
					TPE [B2] (35,30,25,21,15)		TPE [B2] (35,18,9)	TPF [D3L] (10,7,6)	TPF [D3L] (10,9,7,6)	TPF [D4] (6,5)	
					TPE [D2E] (18,15,9)		TPE [D2E] (18,15,12,9,7)	TA [D2E] (25,15)	TPF [D4] (25)	TC [D4] (15,6,5)	
					TA [D2E] (25,15,9)		TA [D2E] (25,18,15)		TA [D3L] (25,15)		
							TC [B2] (9)		TC [D3L] (15,12,10,7,6)		
4.0	TPB [B2] (70)	TPE [B2] (70,40,35)		TPE [B2] (35)	TPS [B1S] (35,30)		TPE [D2E] (40,25,18)	TPE [D3L] (40,25,18,15,12)	TPF [D4] (35,15,10)		
		TA [B2] (70)		TPE [D2E] (18)	TPE [B2] (35)		TPF [D3L] (15,12,9)	TPF [D3L] (10)	TC [D4] (10)		
				TC [D2E] (18)	TPE [D2E] (45,25,18,15)		TC [D2E] (25,18)	TA [D3L] (25,18)			
					TA [D2E] (25,18)		TC [D3L] (12)	TC [D3L] (25,18,15,12,10)			
					TC [D2E] (25,18,15)						
6.3	TA [B2] (70)	TPE [B2] (70,45,40,35,25)	TPE [B2] (35)	TPS [B1S] (35,30)	TPE [B2] (35,25)		TPE [D2E] (25)	TPE [D4] (40,35,25,18)	TPE [D4] (25,18)		
	TPB [B2] (70)	TPE [D2E] (45,25,18)		TPE [B2] (35,25)	TPE [D2E] (40,25,18)		TPE [D3L] (25,18,15)	TPF [D4] (15,10)	TC [D4] (25,18)		
				TPE [D2E] (25,18,15)	TPE [D3L] (18)		TPF [D3L] (10,9)	TPB [D4] (35)			
				TPF [D3L] (25)	TPF [D3L] (25,15,12)		TA [D3L] (25)	TC [D4] (25,18,10)			
				TA [D2E] (25)	TA [D2E] (25,18)		TPB [D3L] (45,40)				
				TV [D2E] (25)	TC [D2E] (25,18)		TPB [D4] (40)				
				TC [D2E] (25,18,15)	TC [D3L] (12)		TC [D3L] (25,18,15,9)				
8.0		TPE [B2] (35)									

Size list LxWxH (mm)

B1	3.5x2.8x1.1	B2	3.5x2.8x1.9	D15	7.3x4.3x1.4	D2E	7.3x4.3x1.8	D3L	7.3x4.3x2.8
B1S	3.5x2.8x1.1	B2S	3.5x2.8x1.9	D15S	7.3x4.3x1.4	D2	7.3x4.3x1.9	D4	7.3x4.3x3.8
						D2S	7.3x4.3x1.9		

Voltage - Capacitance table (Vol. : 10 to 63 V / Cap. : 3.9 to 68 μF)

Series [Size]
(ESR mΩ)

V \ μF	3.9	4.7	5.6	6.8	8.2	10	15	22	33	47	56
10									TPB [B2] (70)	TPE [B2] (35)	
										TA [B2] (70)	
										TPB [B2] (70)	
16									TQC [B2] (90)	TQC [B2] (90)	
									TDC [B2] (90)	TQC [D15] (55)	
										TQC [D2] (55,70)	
										TDC [D2] (55,70)	
20								TQC [B2] (90)	TQC [D2] (60)	TQC [D15] (55)	
								TQC [D2] (90)	TQC [B2] (100)	TQC [D2] (55)	
								TDC [B2] (90)	TDC [D2] (60)	TDC [D2] (55)	
25							TQC [B2] (100)	TQC [B2] (100)	TQC [D2] (60)		
							TQC [D2] (90)	TQC [D2] (60)	TDC [D2] (60)		
							TDC [B2] (100)	TDC [D2] (60)			
							TDC [D2] (90)				
35						TQC [B2] (200,150)	TQC [D2] (150)	TQC [D2] (150)		TQS [D15S] (100)	TQT [D15S] (100)
						TQC [D2] (120,180)	TDC [D2] (150)	TDC [D2] (150)			
						TDC [D2] (180)					

Size list LxWxH (mm)

B1	3.5x2.8x1.1	B2	3.5x2.8x1.9	D15	7.3x4.3x1.4	D2E	7.3x4.3x1.8	D3L	7.3x4.3x2.8
B1S	3.5x2.8x1.1	B2S	3.5x2.8x1.9	D15S	7.3x4.3x1.4	D2	7.3x4.3x1.9	D4	7.3x4.3x3.8
						D2S	7.3x4.3x1.9		

Voltage - Capacitance table (Vol. : 10 to 63 V / Cap. : 100 to 1500 μF)

Series [Size]
(ESR mΩ)

V \ μF	68	100	120	150	220	270	330	470	680	1000	1500
10	TV [D2E] (25)	TPC [D2] (55,50,45)		TPE [D3L] (25)	TPE [D3L] (25,18)		TPE [D4] (25)				
	TPC [D2] (100,60,45)			TPF [D3L] (15)	TA [D3L] (25)		TPB [D4] (40)				
				TA [D3L] (25)	TPB [D3L] (40)		TC [D4] (25)				
				TV [D3L] (25)	TPB [D4] (40)						
				TPB [D3L] (55,40)	TC [D3L] (25,18)						
				TC [D3L] (15)							
16	TQC [D2] (50)	TQC [D2] (50)		TQC [D2] (50)	TQC [D3L] (50)						
	TDC [D2] (50)	TDC [D2] (50)		TQC [D3L] (50)							
				TDC [D3L] (50)							
20		TQC [D2] (100)									
		TQC [D3L] (55)									
		TDC [D3L] (55)									
25	TQC [D3L] (70)	TQC [D3L] (60)									
	TDC [D3L] (70)										
35	TQS [D2S] (100)										

Size list LxWxH (mm)

B1	3.5x2.8x1.1	B2	3.5x2.8x1.9	D15	7.3x4.3x1.4	D2E	7.3x4.3x1.8	D3L	7.3x4.3x2.8
B1S	3.5x2.8x1.1	B2S	3.5x2.8x1.9	D15S	7.3x4.3x1.4	D2	7.3x4.3x1.9	D4	7.3x4.3x3.8
						D2S	7.3x4.3x1.9		

Explanation of part numbers

◇ Part number system

2R5	TPB	330	M	L
Rated voltage 1 to 3 figures	Series name 3 to 4 figures	Rated cap. 2 to 4 figures	Cap. tolerance 1 figure	Special code 0 to 4 figures

R.voltage (V)	Code
2.0	2
2.5	2R5 or E
4.0	4
6.3	6
8.0	8
10.0	10
12.5	12
16.0	16 or 1C
20.0	20
25.0	25
35.0	35
50.0	50
63.0	63

Series	Code
TPB	TPB
TPC	TPC
TPE	TPE
TPF	TPF
TPS	TPS
TPSF	TPSF
TAB	TAB
TAE	TAE
TQC	TQC
TQS	TQS
TVE	TVE
TCE	TCE
TCF	TCF
TDC	TDC
TQT	TQT

R. cap. (μF)	Code
3.9	3R9
4.7	4R7
5.6	5R6
6.8	6R8
8.2	8R2
10	10
15	15
22	22
33	33
47	47
56	56
68	68
82	82
100	100
120	120
150	150
220	220
270	270
330	330
470	470
680	680
1000	1000
1500	1500

Cap. tolerance	Code
±20%	M

Standard		Code
TPE series		
B2	ESR 35 mΩ max.	ZB
	ESR 25 mΩ max.	PB
	ESR 21 mΩ max.	LB
	ESR 15 mΩ max.	FB
	ESR 15 mΩ / 300 kHz max.	FGB
	ESR 35 mΩ max. 85℃	AZB
	ESR 25 mΩ max. 85℃	APB
	ESR 15 mΩ max. 85℃	AFB
	ESR 13 mΩ / 300 kHz max. 85℃	ADGB
	ESR 11 mΩ / 300 kHz max. 85℃	AJGB
D2E	ESR 25 mΩ max. 85℃	AP
D3L	ESR 25 mΩ max.	L
	ESR 18 mΩ max.	IL
	ESR 15 mΩ max.	FL
	ESR 12 mΩ max.	CL
	ESR 10 mΩ max.	AL
	ESR 25 mΩ max. 85℃	AL
	ESR 9 mΩ / 500 kHz max. 85℃	A9EL
TPB series		
D3L		L
TPC series		
85 ℃		A
B1		B
TQS / TQT series		
D15S	ESR 100 mΩ / Height 1.5 mm max.	EU
D2S	ESR 100 mΩ / Height 2.0 mm max.	E2

Standard		Code
TPF series		
D3L	ESR 9 mΩ max.	9L
	ESR 7 mΩ max.	7L
	ESR 6 mΩ max.	6L
	ESR 5 mΩ max.	5L
D4	ESR 10 mΩ max.	AH
	ESR 6 mΩ max.	6H
	ESR 5 mΩ max.	5H
TQC / TDC series		
Capacitance enlarged type		YF
Capacitance enlarged type（B2 size）		YFB
Capacitance enlarged type（D15 size）		YFT
Capacitance enlarged type（D2 size）		YFD/D2
Capacitance enlarged type（D3L size）		D3
All series		
ESR 55 mΩ max.		G
ESR 45 mΩ max.		V
ESR 40 mΩ max.		W
ESR 35 mΩ max.		Z
ESR 18 mΩ max.		I
ESR 15 mΩ max.		F
ESR 12 mΩ max.		C
ESR 9 mΩ max.		9
ESR 7 mΩ max.		7
ESR 6 mΩ max.		6
ESR 5 mΩ max.		5
ESR 35 mΩ / 300 kHz max.		ZG
ESR 30 mΩ / 300 kHz max.		UG
ESR 9 mΩ / 300 kHz max.		9G
ESR 6 mΩ / 500 kHz max.		6E
ESR 4 mΩ / 500 kHz max.		4E

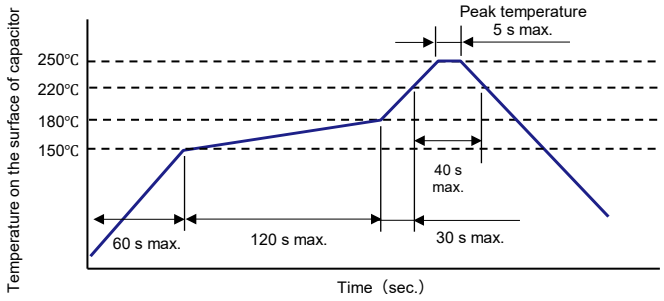
TPE/TPF/TPC/TQC series some part numbers : Not recommended for new design

Mounting specifications

◇ Recommendable reflow soldering

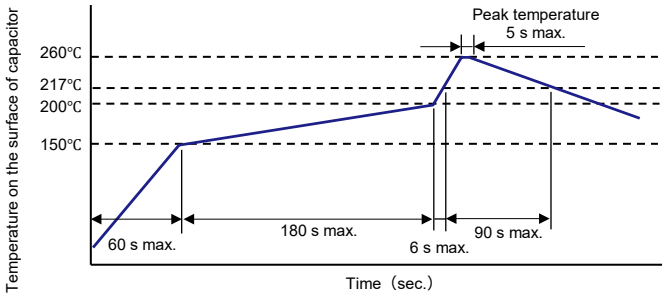
■ **Applicable series : TPS, TPSF, TPE, TPF, TA TV, TPB, TC, TPC**

Peak temperature 250 °C lead free reflow soldering profile
The cycles of reflow soldering : Twice (max.)



■ **Applicable series : TPS, TPSF, TPE, TPF, TA TV, TPB, TC, TPC**

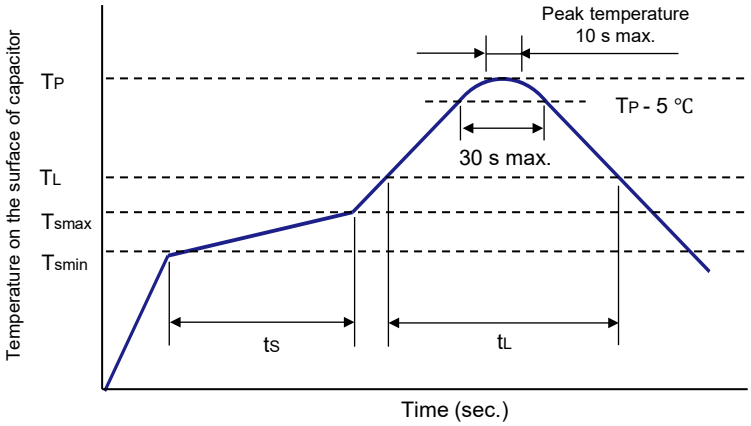
Peak temperature 260 °C lead free reflow soldering profile
The cycles of reflow soldering : Twice (max.)



Note) This reflow is limited at moisture sensitive level.
Please contact us separately concerning about detail.

■ **Applicable series : TQC, TDC, TQS, TQT**

* Refer to the characteristics list of each series for compatible part numbers.

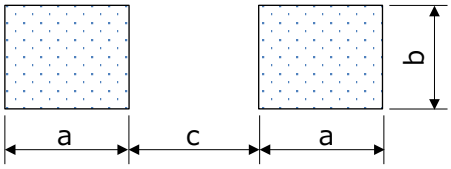


Reflow soldering		Condition A	Condition B	Condition C	Condition D
		IPC/J-STD-020 reflow profile		Peak temperature 250 °C lead free reflow profile	
Peak temperature (T_P)		260 °C	250 °C	250 °C	
Time within -5 °C of peak temperature		30 seconds max.		–	
Soldering time (t_L) above soldering temperature (T_L)	T_L ≧ 217 ℃	150 seconds max.		90 seconds max.	60 seconds max.
	T_L ≧ 200 ℃	–			70 seconds max.
Preheat	Temperature max. (T_{smax})	200 °C		180 °C	
	Temperature min. (T_{smin})	150 °C			
	Time (t_s) from (T_{smin}) to (T_{smax})	120 seconds max.			
The cycles of reflow soldering		3 times (max.)		Twice (max.)	

● Soldering with a soldering iron

Tip of a soldering iron : 350 °C max (TQC / TDC / TQS / TQT series : 400 °C max.)
Working time : 3 sec. max. (TQC / TQS / TQT series : 5 sec. max.)
(Do not let the tip of soldering iron touch the POSCAP itself. Do not subject the POSCAP itself to excessive stress when soldering)

Land pattern



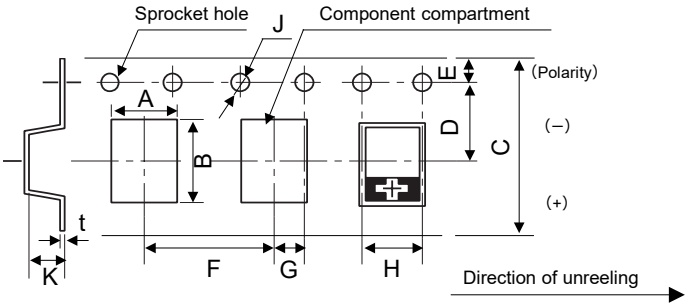
Unit : mm

Size code	a	b	c
B1, B1S, B2, B2S	1.6	2.7	1.4
D15, D2E, D2, D3L, D4	2.4	2.9	3.7
D15S	1.4 / 1.7*1	2.6	4.6
D2S	1.4	2.6	5.1

*1 : +side / −side

Packing specifications

◇ Dimension of carrier tape



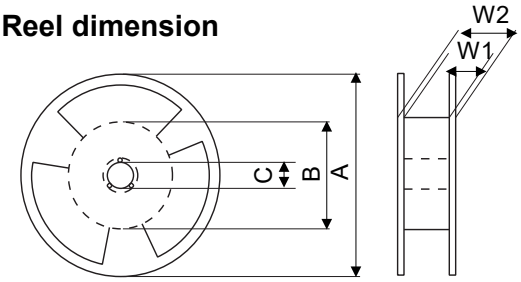
Unit : mm

Size code	A±0.2	B±0.2	C±0.3	D±0.1	E±0.1	F±0.1	G±0.1	H±0.1	J $^{+0.1}_{-0}$	K±0.1	t±0.1
B1	3.2	3.8	8.0	3.5	1.75	4.0	2.0	4.0	ø1.5	1.4	0.25
B1S	3.25	3.9	8.0	3.5	1.75	4.0	2.0	4.0	ø1.5	1.7	0.25
B2	3.3	3.8	8.0	3.5	1.75	4.0	2.0	4.0	ø1.5	2.1	0.25
B2S	3.25	4.0	8.0	3.5	1.75	4.0	2.0	4.0	ø1.5	2.1	0.25
D12	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	ø1.5	1.7	0.3
D15	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	ø1.5	2.4	0.3
D15S	4.7	7.8	12.0	5.5	1.75	8.0	2.0	4.0	ø1.5	1.7	0.3
D2E	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	ø1.5	2.4	0.3
D2	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	ø1.5	2.4	0.3
D2S	4.5	7.8	12.1	5.5	1.75	8.0	2.0	4.0	ø1.5	2.4	0.3
D3L	4.5	7.7	12.0	5.5	1.75	8.0	2.0	4.0	ø1.5	3.2	0.3
D4	4.5	7.7	12.0	5.5	1.75	8.0	2.0	4.0	ø1.5	4.2	0.3

- Dimension A and B are the measure of compartment's inside bottom.
- The (+) Polarity of the chip is placed on right side towards the unreeling direction.
- Dimension of the topcover tape.
  Thickness of cover tape: 62±10 µm, Width of cover tape : 9.5±0.2 mm 5.5±0.2 mm (ø180)

D12 size : Not recommended for new design

◇ Reel dimension



Unit : mm

A	B	C	W1	W2
ø330±2	ø80±2	ø13.0±0.2	13.5±0.5	17.5±1.0
ø180 $^{0}_{-3}$	ø60±2	ø13.0±0.2	9.0±0.5	11.4±1.0

◇ Minimum packing quantity and weight

〈ø180〉

Size code	Qty. (pcs./Reel)	Typical weight (g)
B1	3000	200
B1S	2500	200
B2, B2S	2000	200

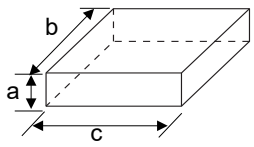
〈ø330〉

Size code	Qty. (pcs./Reel)	Typical weight (g)
D12	4500	1200
D15	3000	1000
D15S	4000	1000
D2E, D2, D2S	3000	1000
D3L	2500	1100
D4	2000	1200

※ Small order quantity (500 pcs/reel) is available with TPE, TPF and TQC series.
Please contact our sales representative if you prefer it.

D12 size : Not recommended for new design

◇ Dimension of packing case



Unit : mm

Reel size	ø180	ø330
a	90	120
b	240	360
c	240	360

◇ Units per packing case

Size code	Pieces/case
B1	15000
B1S	12500
B2, B2S	10000

Size code	Pieces/case
D12	22500
D15	15000
D15S	20000
D2E, D2, D2S	15000
D3L	12500
D4	10000

D12 size
: Not recommended for new design

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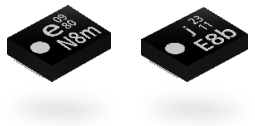
Panasonic INDUSTRY

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TPS series



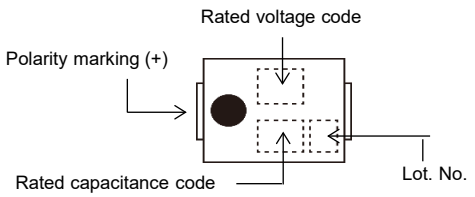
Features

- 105 °C 2000 h
- Small size, Low profile (L 3.5 × W 2.8 × H 1.2 mm max.)
- RoHS compliance, Halogen free

Specifications

Size code	B1S	
Category temp. range	–55 °C to +105 °C	
Rated voltage range	2.5 V to 6.3 V	
Category voltage range	2.5 V to 6.3 V	
Rated capacitance range	150 µF to 330 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.15	
Endurance	+105 °C 2000 h rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, −20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	≤ 3 times of the initial limit

Marking



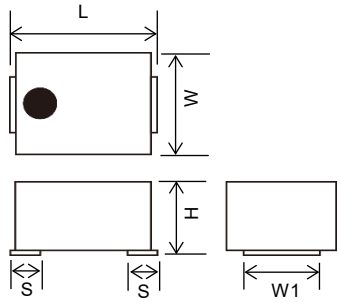
R.voltage code — Unit : V

e	2.5
g	4.0
j	6.3

R.capacitance code — Unit : µF

E8	150
J8	220
N8	330

Dimensions (not to scale)



Unit : mm

Size code	L±0.2	W±0.2	H±0.1	S±0.3	W1±0.1
B1S	3.5	2.8	1.1	0.8	2.2

* Externals of figure are the reference.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (µF)	Case size (mm) L	W	H	Size code	Specifications: Ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (µA)	Standard: Part number	Min. packaging q'ty (pcs)	Floor life level: Reflow temp ≤260°C	Reflow temp ≤250°C
2.5	105	2.5	105	220	3.5	2.8	1.1	B1S	1400	30	0.10	55.0	ETPS220MUD	2500	3	3
	105	2.5	105	330	3.5	2.8	1.1		1400	30	0.10	82.5	ETPS330MUD	2500		
4.0	105	4.0	105	220	3.5	2.8	1.1		1400	30	0.10	88.0	4TPS220MUD	2500		
6.3	105	6.3	105	150	3.5	2.8	1.1		1400	30	0.10	94.5	6TPS150MUD	2500		
	105	6.3	105		3.5	2.8	1.1		1250	35	0.10	94.5	6TPS150MZD	2500		

*1: Ripple current (100 kHz / +45 °C) *2: ESR (100 kHz / +20 °C) *3: tan δ (120 Hz / +20 °C) *4: After 5 minutes

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

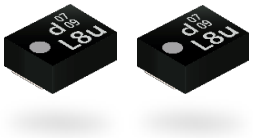
Panasonic INDUSTRY

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TPSF series



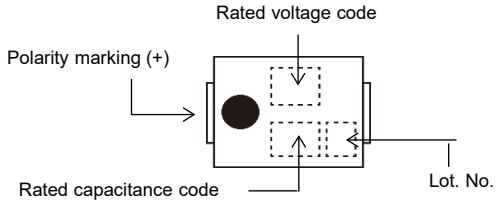
Features

- Super low ESR (6 mΩ max.)
- Super low ESL (0.7 nH max.)
- Face down terminal type
- RoHS compliance, Halogen free

Specifications

Size code	B2S	
Category temp. range	–55 °C to +105 °C	
Rated voltage range	2.0 V to 2.5 V	
Category voltage range	2.0 V to 2.5 V	
Rated capacitance range	270 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.15	
Endurance	+105 °C 1000 h rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, −20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	≤ 3 times of the initial limit

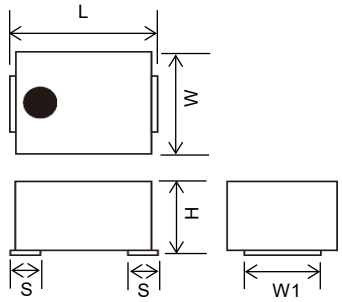
Marking



R.voltage code	Unit : V
d	2.0
e	2.5

R.capacitance code	Unit : µF
L8	270

Dimensions (not to scale)



Unit : mm

Size code	L±0.2	W±0.2	H±0.1	S±0.3	W1±0.1
B2S	3.5	2.8	1.9	0.8	2.2

* Externals of figure are the reference.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (µF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (µA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level Reflow temp ≤260°C	Reflow temp ≤250°C
2.0	105	2.0	105	270	3.5	2.8	1.9	B2S	3200	6/500 kHz	0.08	108.0	2TPSF270M6E	2000	5	5
	105	2.0	105		3.5	2.8	1.9		2400	9/300 kHz	0.08	108.0	2TPSF270M9G	2000	3	3
2.5	105	2.5	105		3.5	2.8	1.9		3200	6/500 kHz	0.08	135.0	ETPSF270M6E	2000		

*1: Ripple current (100 kHz / +45 °C) *2: ESR (100 kHz / +20 °C) *3: tan δ (120 Hz / +20 °C) *4: After 5 minutes

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

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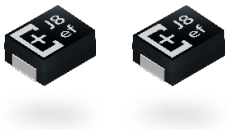
Panasonic INDUSTRY

⚠ Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP



Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TPE series B size

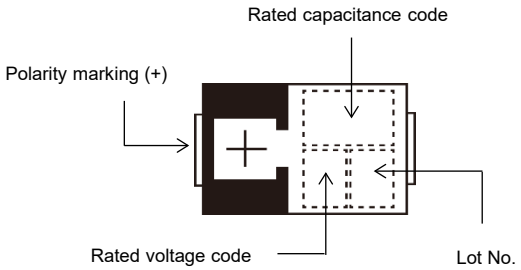
Features

- Small size (L 3.5 × W 2.8 × H 1.9 mm)
- Low ESR (15 mΩ max.)
- RoHS compliance, Halogen free

Specifications

Size code	B2	
Category temp. range	–55 °C to +105 °C	
Rated voltage range	2.0 V to 10 V	
Category voltage range	1.8 V to 8 V	
Rated capacitance range	47 µF to 470 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.15	
Endurance	+105 °C 1000 h rated voltage applied Rated temp, +85 °C Products : +85 °C 1000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage	
	Capacitance change	Within +50 %, −20 % of the initial value (2R5TPE220MAZB (MAPB, MAFB), 2R5TPE330MAZB, 2TPE470MAJGB (MAFB)
		Within +40 %, −20 % of the initial value (Except for above model)
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	≤ 3 times of the initial limit

Marking



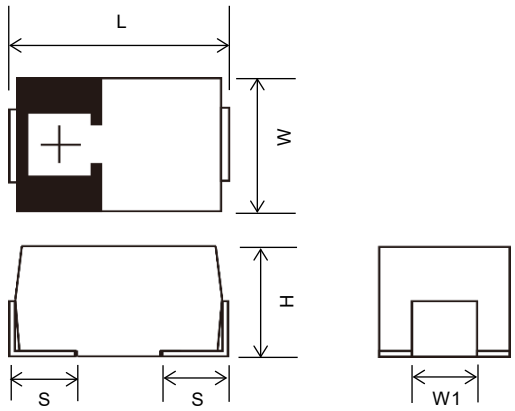
R. voltage code — Unit : V

d	2.0	g	4.0	k	8.0
e	2.5	j	6.3	A	10

R. capacitance code — Unit : µF

S7	47	E8	150	S8	470
A8	100	J8	220		
C8	120	N8	330		

Dimensions (not to scale)



Unit : mm

Size code	L±0.2	W±0.2	H±0.1	S±0.2	W1±0.1
B2	3.5	2.8	1.9	0.8	2.2

* Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
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Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level Reflow temp ≤260°C	Reflow temp ≤250°C
2.0	85	1.8	105	470	3.5	2.8	1.9	B2	2300	15	0.10	188.0	2TPE470MAFB	2000	3	3
	85	1.8	105		3.5	2.8	1.9		2300	11/300kHz	0.08	188.0	2TPE470MAJGB	2000		
2.5	85	2.0	105	220	3.5	2.8	1.9		2000	15	0.08	110.0	2R5TPE220MAFB	2000		
	105	2.5	105		3.5	2.8	1.9		1800	15/300kHz	0.08	110.0	2R5TPE220MFGB	2000		
	105	2.5	105		3.5	2.8	1.9		1700	21	0.08	55.0	2R5TPE220MLB	2000		
	85	2.0	105		3.5	2.8	1.9		1600	25	0.08	55.0	2R5TPE220MAPB	2000		
	105	2.5	105		3.5	2.8	1.9		1400	35	0.08	55.0	2R5TPE220MZB	2000		
	85	2.0	105		3.5	2.8	1.9		1400	35	0.08	55.0	2R5TPE220MAZB	2000		
	105	2.5	105		3.5	2.8	1.9		1400	30	0.08	55.0	2R5TPE220MUB	2000		
	85	2.0	105	330	3.5	2.8	1.9		1400	35	0.08	82.5	2R5TPE330MAZB	2000		
	85	2.0	105		3.5	2.8	1.9		3200	9/300kHz	0.08	165.0	ETPE330MA9GB	2000		
	105	2.5	105		3.5	2.8	1.9		3200	9/300kHz	0.08	165.0	ETPE330M9GB	2000		
	105	2.5	105		3.5	2.8	1.9		2700	15	0.08	165.0	ETPE330MFB	2000		
	105	2.5	105		3.5	2.8	1.9		2450	18	0.08	165.0	ETPE330MIB	2000		
4.0	105	4.0	105	100	3.5	2.8	1.9		1400	35	0.08	40.0	4TPE100MZB	2000		
	105	4.0	105		3.5	2.8	1.9		950	70	0.08	40.0	4TPE100MBB	2000		
	105	4.0	105		3.5	2.8	1.9		1300	40	0.08	40.0	4TPE100MWB	2000		
	85	3.2	105	150	3.5	2.8	1.9		1400	35	0.08	60.0	4TPE150MAZB	2000		
	85	3.2	105	220	3.5	2.8	1.9		1400	35	0.08	88.0	4TPE220MAZB	2000		
NRFND	105	4.0	105		3.5	2.8	1.9		1350	35	0.10	88.0	4TPE220MZB	2000		
NRFND	105	4.0	105		3.5	2.8	1.9		1150	45	0.10	88.0	4TPE220MVB	2000		
NRFND	105	4.0	105		3.5	2.8	1.9		950	70	0.10	88.0	4TPE220MBB	2000		
6.3	105	6.3	105	100	3.5	2.8	1.9		1600	25	0.08	63.0	6TPE100MPB	2000		
	85	5.0	105		3.5	2.8	1.9		1400	35	0.08	63.0	6TPE100MAZB	2000		
	105	6.3	105		3.5	2.8	1.9		1400	35	0.08	63.0	6TPE100MZB	2000		
	105	6.3	105		3.5	2.8	1.9		950	70	0.08	63.0	6TPE100MBB	2000		
	105	6.3	105		3.5	2.8	1.9		1300	40	0.08	63.0	6TPE100MWB	2000		
	105	6.3	105		3.5	2.8	1.9		1200	45	0.08	63.0	6TPE100MVB	2000		
	85	5.0	105	120	3.5	2.8	1.9		1400	35	0.08	75.6	6TPE120MAZB	2000		
	85	5.0	105	150	3.5	2.8	1.9		1600	25	0.08	94.5	6TPE150MAPB	2000		
	85	5.0	105		3.5	2.8	1.9		1400	35	0.08	94.5	6TPE150MAZB	2000		
	85	5.0	105	220	3.5	2.8	1.9		1400	35	0.10	138.6	6TPE220MAZB	2000		
	85	5.0	105		3.5	2.8	1.9		1600	25	0.10	138.6	6TPE220MAPB	2000		
NRFND	105	6.3	105		3.5	2.8	1.9		1150	45	0.10	138.6	6TPE220MVB	2000		
NRFND	105	6.3	105		3.5	2.8	1.9		950	70	0.10	138.6	6TPE220MBB	2000		
NRFND	105	6.3	105		3.5	2.8	1.9		1350	35	0.10	138.6	6TPE220MZB	2000		
8.0	85	6.3	105	100	3.5	2.8	1.9		1400	35	0.08	80.0	8TPE100MAZB	2000		
10	85	8.0	105	47	3.5	2.8	1.9		1400	35	0.08	47.0	10TPE47MAZB	2000		

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 5 minutes

NRFND Not recommended for new design

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .
◆ Small order quantity (500 pcs/reel) is available with TPE series. Please contact our sales representative if you prefer it.

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Panasonic INDUSTRY

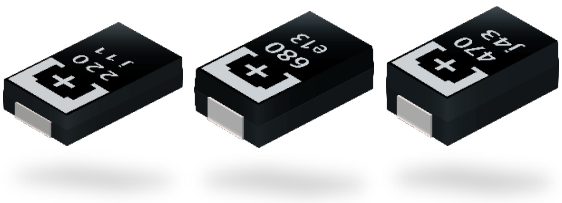
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TPE series D size



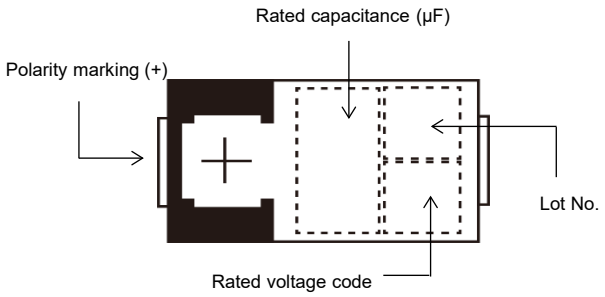
Features

- Low ESR (7 mΩ max.)
- Large capacitance (1500 μF max.)
- RoHS compliance, Halogen free

Specifications

Size code	D2E	D3L	D4
Category temp. range	–55 °C to +105 °C		
Rated voltage range	2.5 V to 10 V		
Category voltage range	2.5 V to 10 V		
Rated capacitance range	68 μF to 470 μF	150 μF to 680 μF	330 μF to 1500 μF
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage (V)	Rated voltage × 1.15		
Endurance	+105 °C 2000 h rated voltage applied Rated temp, +85 °C Products : +85 °C 1000 h, rated voltage applied (6TPE330MAP : +85 °C 2000 h, rated voltage applied)		
	Capacitance change	Within ±20 % of the initial value	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	Within the initial limit	
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage		
	Capacitance change	Within +50 %, −20 % of the initial value (2R5TPE220M (I, F, 9), 2R5TPE330M (I, F, C, 9, 7), 2R5TPE470M (I, F, C, 9, 7), 2R5TPE1000MF, 2R5TPE1500M (F, C))	
		Within +40 %, −20 % of the initial value (Except for above model)	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	≤ 3 times of the initial limit	

Marking



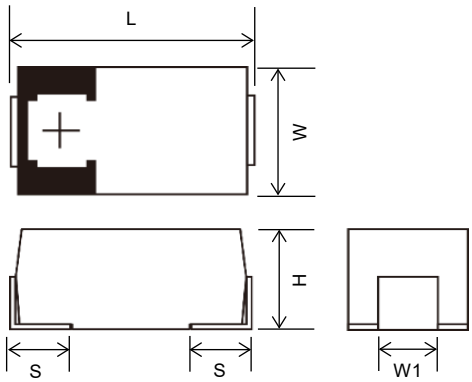
R. voltage code

e	2.5
g	4.0

Unit : V

j	6.3
A	10

Dimensions (not to scale)



Unit : mm

Size code	L±0.3	W±0.2	H	S±0.2	W1±0.1
D2E	7.3	4.3	1.8±0.1	1.3	2.4
D3L	7.3	4.3	2.8±0.2	1.3	2.4
D4	7.3	4.3	3.8±0.2	1.3	2.4

* Externals of figure are the reference.

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Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level Reflow temp ≤260°C	Reflow temp ≤250°C
2.5	105	2.5	105	220	7.3	4.3	1.8	D2E	3900	9	0.10	55.0	2R5TPE220M9	3000	3	
	105	2.5	105		7.3	4.3	1.8		3100	15	0.10	55.0	2R5TPE220MF	3000		
	105	2.5	105		7.3	4.3	1.8		2800	18	0.10	55.0	2R5TPE220MI	3000		
	105	2.5	105	330	7.3	4.3	1.8		4400	7	0.10	82.5	2R5TPE330M7	3000		
	105	2.5	105		7.3	4.3	1.8		3900	9	0.10	82.5	2R5TPE330M9	3000		
	105	2.5	105		7.3	4.3	1.8		3500	12	0.10	82.5	2R5TPE330MC	3000		
	105	2.5	105		7.3	4.3	1.8		3100	15	0.10	82.5	2R5TPE330MF	3000		
	105	2.5	105		7.3	4.3	1.8		2800	18	0.10	82.5	2R5TPE330MI	3000		
	105	2.5	105	470	7.3	4.3	1.8		4400	7	0.10	117.5	2R5TPE470M7	3000		
	105	2.5	105		7.3	4.3	1.8		3900	9	0.10	117.5	2R5TPE470M9	3000		
	105	2.5	105		7.3	4.3	1.8		3500	12	0.10	117.5	2R5TPE470MC	3000		
	105	2.5	105		7.3	4.3	1.8		3100	15	0.10	117.5	2R5TPE470MF	3000		
	105	2.5	105		7.3	4.3	1.8		2800	18	0.10	117.5	2R5TPE470MI	3000		
	105	2.5	105	680	7.3	4.3	2.8	D3L	3500	12	0.10	170.0	2R5TPE680MCL	2500		
	105	2.5	105		7.3	4.3	2.8		3100	15	0.10	170.0	2R5TPE680MFL	2500		
	105	2.5	105		7.3	4.3	2.8		1850	40	0.10	170.0	2R5TPE680MWL	2500		
	105	2.5	105	1000	7.3	4.3	3.8	D4	3900	15	0.15	250.0	2R5TPE1000MF	2000		
	105	2.5	105	1500	7.3	4.3	3.8		4400	12	0.15	375.0	2R5TPE1500MC	2000	–	
	105	2.5	105		7.3	4.3	3.8		3900	15	0.15	375.0	2R5TPE1500MF	2000		
4.0	105	4.0	105	150	7.3	4.3	1.8	D2E	2800	18	0.10	60.0	4TPE150MI	3000	3	
	105	4.0	105	220	7.3	4.3	1.8		3100	15	0.10	88.0	4TPE220MF	3000		
	105	4.0	105		7.3	4.3	1.8		2800	18	0.10	88.0	4TPE220MI	3000		
	105	4.0	105		7.3	4.3	1.8		2400	25	0.10	88.0	4TPE220M	3000		
	105	4.0	105		7.3	4.3	1.8		1750	45	0.10	88.0	4TPE220MV	3000		
	105	4.0	105	330	7.3	4.3	1.8		2800	18	0.10	132.0	4TPE330MI	3000		
	105	4.0	105		7.3	4.3	1.8		2400	25	0.10	132.0	4TPE330M	3000		
	105	4.0	105		7.3	4.3	1.8		1850	40	0.10	132.0	4TPE330MW	3000		
	105	4.0	105	470	7.3	4.3	2.8	D3L	3500	12	0.10	188.0	4TPE470MCL	2500		2a
	105	4.0	105		7.3	4.3	2.8		3100	15	0.10	188.0	4TPE470MFL	2500		
	105	4.0	105		7.3	4.3	2.8		2800	18	0.10	188.0	4TPE470MIL	2500		
	105	4.0	105		7.3	4.3	2.8		2400	25	0.10	188.0	4TPE470ML	2500		
	105	4.0	105		7.3	4.3	2.8		1850	40	0.10	188.0	4TPE470MWL	2500		
6.3	105	6.3	105	100	7.3	4.3	1.8	D2E	2800	18	0.10	63.0	6TPE100MI	3000		
	105	6.3	105		7.3	4.3	1.8		2400	25	0.10	63.0	6TPE100M	3000		
	105	6.3	105		7.3	4.3	1.8		1850	40	0.10	63.0	6TPE100MW	3000		
	105	6.3	105	150	7.3	4.3	1.8		3100	15	0.10	94.5	6TPE150MF	3000		
	105	6.3	105		7.3	4.3	1.8		2800	18	0.10	94.5	6TPE150MI	3000		
	105	6.3	105		7.3	4.3	1.8		2400	25	0.10	94.5	6TPE150M	3000		
	105	6.3	105	220	7.3	4.3	1.8		2800	18	0.10	138.6	6TPE220MI	3000		
	105	6.3	105		7.3	4.3	1.8		2400	25	0.10	138.6	6TPE220M	3000		
	85	5.0	105		7.3	4.3	1.8		2400	25	0.10	138.6	6TPE220MAP	3000		
	105	6.3	105		7.3	4.3	1.8		1850	40	0.10	138.6	6TPE220MW	3000		
	105	6.3	105		7.3	4.3	2.8	D3L	2800	18	0.10	138.6	6TPE220MIL	2500	–	
	85	5.0	105	330	7.3	4.3	1.8	D2E	2400	25	0.10	207.9	6TPE330MAP	3000	3	
	105	6.3	105		7.3	4.3	2.8		3100	15	0.10	207.9	6TPE330MFL	2500		
	105	6.3	105		7.3	4.3	2.8		2800	18	0.10	207.9	6TPE330MIL	2500		
	105	6.3	105		7.3	4.3	2.8		2400	25	0.10	207.9	6TPE330ML	2500		
	NRFND 85	5.0	105		7.3	4.3	3.8	D4	4400	10	0.10	207.9	6TPE330MAA	2000		
	105	6.3	105	470	7.3	4.3	3.8	D4	3500	18	0.15	296.1	6TPE470MI	2000		
	105	6.3	105		7.3	4.3	3.8		3000	25	0.15	296.1	6TPE470M	2000		
	105	6.3	105		7.3	4.3	3.8		2500	35	0.15	296.1	6TPE470MZ	2000		
	105	6.3	105		7.3	4.3	3.8		2350	40	0.15	296.1	6TPE470MW	2000		
	105	6.3	105	680	7.3	4.3	3.8		3500	18	0.15	428.4	6TPE680MI	2000		
	105	6.3	105		7.3	4.3	3.8		3000	25	0.15	428.4	6TPE680M	2000		
10	NRFND 105	10	105	68	7.3	4.3	1.8	D2E	2400	25	0.10	68.0	10TPE68M	3000		
	NRFND 105	10	105		7.3	4.3	1.8		1850	40	0.10	68.0	10TPE68MW	3000		
	105	10	105	150	7.3	4.3	2.8	D3L	2400	25	0.10	150.0	10TPE150MPL	2500		3
	105	10	105	220	7.3	4.3	2.8		2800	18	0.10	220.0	10TPE220MIL	2500		
	105	10	105		7.3	4.3	2.8		2400	25	0.10	220.0	10TPE220ML	2500	–	2a
	105	10	105	330	7.3	4.3	3.8	D4	3000	25	0.10	330.0	10TPE330M	2000		

*1: Ripple current (100 kHz / +45 °C) *2: ESR (100 kHz / +20 °C) *3: tan δ (120 Hz / +20 °C) *4: After 5 minutes

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

◆ Small order quantity (500 pcs/reel) is available with TPE series. Please contact our sales representative if you prefer it.

NRFND Not recommended for new design

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Panasonic INDUSTRY

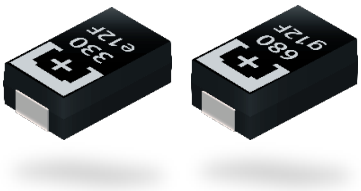
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TPF series



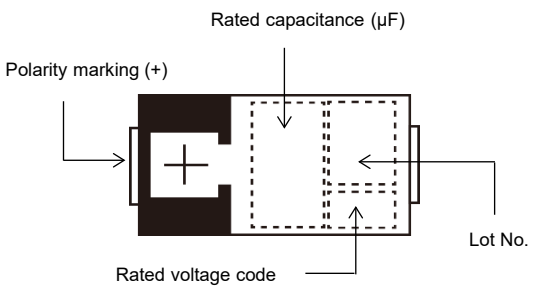
Features

- Super low ESR (5 mΩ max.)
- Large capacitance (1000 μF max.)
- RoHS compliance, Halogen free

Specifications

Size code		D3L	D4
Category temp. range		–55 °C to +105 °C	
Rated voltage range		2.5 V to 10 V	2.5 V to 6.3 V
Category voltage range		2.5 V to 10 V	2.5 V to 6.3 V
Rated capacitance range		150 μF to 680 μF	470 μF to 1000 μF
Capacitance tolerance		±20 % (120 Hz / +20 °C)	
Leakage current		Please see the attached characteristics list	
Dissipation factor(tan δ)		Please see the attached characteristics list	
Surge voltage (V)		Rated voltage × 1.15	
Endurance	+105 °C 2000 h rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	Within the initial limit	
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage		
	Capacitance change	Within +50 %, −20 % of the initial value (2TPF220M6, 2TPF330M6, ETPF1000M6H (5H))	
		Within +40 %, −20 % of the initial value (Except for above model)	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	≤ 3 times of the initial limit	

Marking



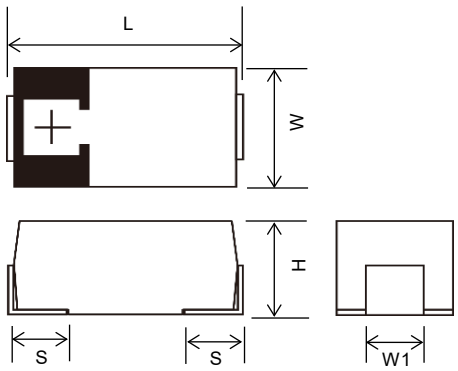
R. voltage code

e	2.5
g	4.0

Unit : V

j	6.3
A	10

Dimensions (not to scale)



Unit : mm

Size code	L±0.3	W±0.2	H	S±0.2	W1±0.1
D3L	7.3	4.3	2.8±0.2	1.3	2.4
D4	7.3	4.3	3.8±0.2	1.3	2.4

* Externals of figure are the reference.

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Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level Reflow temp ≤260°C	Reflow temp ≤250°C
2.5	105	2.5	105	470	7.3	4.3	2.8	D3L	4400	6	0.10	117.5	2R5TPF470M6L	2500	3	2a
	105	2.5	105		7.3	4.3	2.8		4400	7	0.10	117.5	2R5TPF470M7L	2500		
	105	2.5	105		7.3	4.3	2.8		4400	10	0.10	117.5	2R5TPF470ML	2500		
	NRFND 105	2.5	105		7.3	4.3	3.8	D4	6100	5	0.10	117.5	ETPF470M5H	2000		
	105	2.5	105		7.3	4.3	2.8	D3L	3850	9	0.10	117.5	2R5TPF470M9L	2500		
	105	2.5	105	680	7.3	4.3	2.8		4400	6	0.10	170.0	2R5TPF680M6L	2500		
	105	2.5	105		7.3	4.3	2.8		4400	7	0.10	170.0	2R5TPF680M7L	2500		
	105	2.5	105		7.3	4.3	2.8		4400	10	0.10	170.0	2R5TPF680ML	2500		
	105	2.5	105		7.3	4.3	3.8	D4	2700	25	0.10	170.0	ETPF680MPH	2000		
	105	2.5	105	1000	7.3	4.3	3.8		6100	5	0.10	250.0	ETPF1000M5H	2000		
	105	2.5	105		7.3	4.3	3.8		5600	6	0.10	250.0	ETPF1000M6H	2000		
4.0	105	4.0	105	330	7.3	4.3	2.8	D3L	3900	9	0.10	132.0	4TPF330M9L	2500		
	105	4.0	105		7.3	4.3	2.8		4000	12	0.10	132.0	4TPF330ML	2500		
	105	4.0	105		7.3	4.3	2.8		3550	15	0.10	132.0	4TPF330MFL	2500		
	105	4.0	105	470	7.3	4.3	2.8		4400	10	0.10	188.0	4TPF470ML	2500		
	105	4.0	105	680	7.3	4.3	3.8	D4	4400	10	0.10	272.0	4TPF680MAH	2000		
	105	4.0	105		7.3	4.3	3.8		3550	15	0.10	272.0	4TPF680MFH	2000		
	105	4.0	105		7.3	4.3	3.8		2350	35	0.10	272.0	4TPF680MZH	2000		
6.3	105	6.3	105	150	7.3	4.3	2.8	D3L	2750	25	0.10	94.5	6TPF150MPL	2500	–	
	NRFND 105	6.3	105	220	7.3	4.3	2.8		5550	6	0.10	138.6	6TPF220M6L	2500	3	
	NRFND 105	6.3	105		7.3	4.3	2.8		4600	9	0.10	138.6	6TPF220M9L	2500		
	105	6.3	105		7.3	4.3	2.8		4000	12	0.10	138.6	6TPF220ML	2500		
	105	6.3	105		7.3	4.3	2.8		3550	15	0.10	138.6	6TPF220MFL	2500		
	105	6.3	105		7.3	4.3	2.8		2750	25	0.10	138.6	6TPF220MPL	2500		
	105	6.3	105	330	7.3	4.3	2.8		3900	9	0.10	207.9	6TPF330M9L	2500		
	105	6.3	105		7.3	4.3	2.8		3650	10	0.10	207.9	6TPF330MAL	2500		
	105	6.3	105	470	7.3	4.3	3.8	D4	4400	10	0.10	296.1	6TPF470MAH	2000		
	105	6.3	105		7.3	4.3	3.8		3550	15	0.10	296.1	6TPF470MFH	2000		
10	105	10	105	150	7.3	4.3	2.8	D3L	3600	15	0.10	150.0	10TPF150ML	2500	–	

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 5 minutes

NRFND Not recommended for new design

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .
◆ Small order quantity (500 pcs/reel) is available with TPF series. Please contact our sales representative if you prefer it.

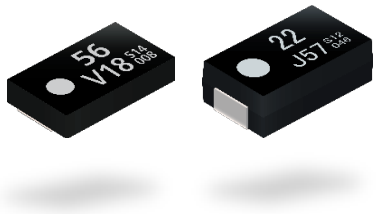
Panasonic INDUSTRY

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TQT series



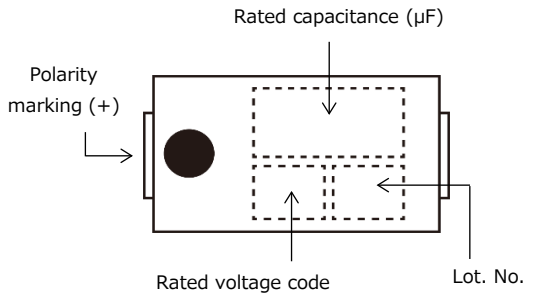
Features

- High voltage (35 V max.)
- Large capacitance
- RoHS compliance, Halogen free

Specifications

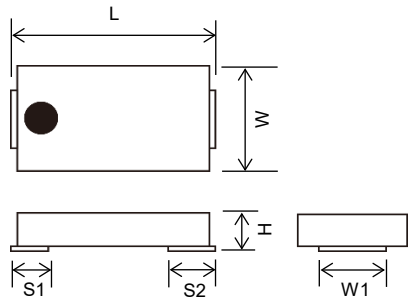
Size code	D15S	
Category temp. range	–55 ℃ ~ +105 ℃	
Rated volt. range	35 V	
Category volt. range	35 V	
Rated cap. range	56 µF	
Capacitance tolerance	±20 % (120 Hz / +20 ℃)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.15	
Endurance	+105 ℃ 2000 h rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor(tan δ)	≦ 1.5 times of the initial limit
	Leakage current	Within the initial limit
Damp heat (Steady State)	+60 ℃, 90 % to 95 % RH, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, −20 % of the initial value
	Dissipation factor(tan δ)	≦ 1.5 times of the initial limit
	Leakage current	≦ 3 times of the initial limit

Marking



R.voltage code	Unit : V
V	35

Dimensions (not to scale)



Unit : mm

Size code	L±0.3	W±0.2	H±0.1	S1±0.2	S2±0.2	W1±0.1
D15S	7.3	4.3	1.4	1.1	1.4*1	2.4

*1: – side

Characteristics list

Rated voltage (V)	Rated temperature (℃)	Category voltage (V)	Category temperature (℃)	Rated capacitance (µF)	Case size (mm)			Size code	Specifications				Standard		Floor life level	Reflow soldering
					L	W	H		Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (µA)	Part number	Min. packaging q'ty (pcs)		
35	105	35	105	56	7.3	4.3	1.4	D15S	1200	100	0.10	196	35TQT56M	4000	3	A

*1: Ripple current (100 kHz / +105 ℃)
*2: ESR (100 kHz / +20 ℃)
*3: tan δ (120 Hz / +20 ℃)
*4: After 5 minutes

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

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Panasonic INDUSTRY

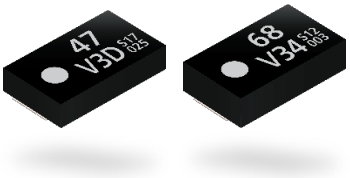
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TQS series



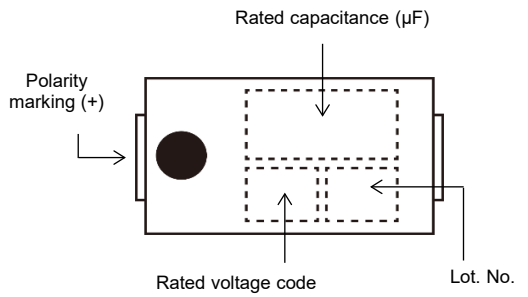
Features

- High voltage (35 V max.)
- RoHS compliance, Halogen free

Specifications

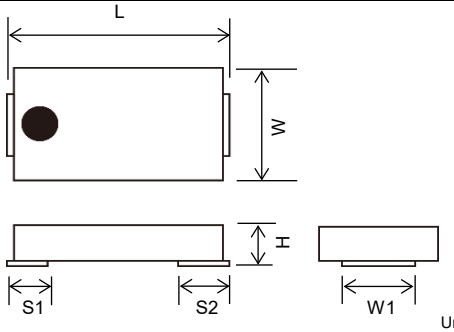
Size code	D15S	D2S
Category temp. range	–55 °C to +105 °C	
Rated voltage range	35 V	
Category voltage range	35 V	
Rated capacitance range	47 µF	68 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.15	
Endurance	+105 °C 2000 h rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, −20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	≤ 3 times of the initial limit

Marking



R.voltage code	Unit : V
V	35

Dimensions (not to scale)



Unit : mm

Size code	L±0.3	W±0.2	H±0.1	S1±0.2	S2±0.2	W1±0.1
D15S	7.3	4.3	1.4	1.1	1.4*1	2.4
D2S	7.3	4.3	1.9	1.0	1.0	2.4

*1: – side

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (µF)	Case size (mm) L	W	H	Size code	Specifications: Ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (µA)	Standard: Part number	Min. packaging q'ty (pcs)	Floor life level	Reflow soldering
35	NRFND 105	35	105	47	7.3	4.3	1.4	D15S	1200	100	0.10	164.5	35TQS47MEU	4000	3	A
	105	35	105	47	7.3	4.3	1.4	D15S	1200	100	0.10	164.5	35TQS47MEX	4000		
	105	35	105	68	7.3	4.3	1.9	D2S	1200	100	0.10	238	35TQS68ME2	3000		

*1: Ripple current (100 kHz / +105 °C) *2: ESR (100 kHz / +20 °C) *3: tan δ (120 Hz / +20 °C) *4: After 5 minutes

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" . NRFND Not recommended for new design

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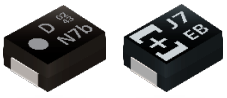
Panasonic INDUSTRY

⚠ Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP



Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TQC series B size

Features

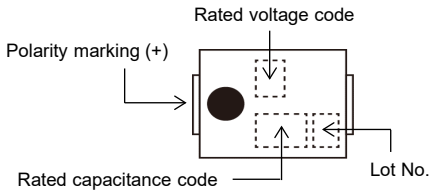
- High voltage (35 V max.)
- RoHS compliance, Halogen free

Specifications

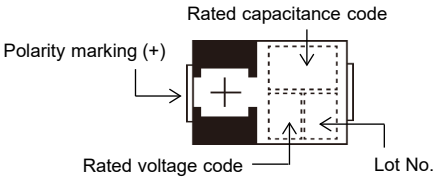
Size code	B2	
Category temp. range	–55 °C to +105 °C	
Rated voltage range	16 V to 35 V	
Category voltage range	16 V to 35 V	
Rated capacitance range	10 µF to 47 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.15	
Endurance	+105 °C 2000 h (16TQC33MYFB : 1000 h), rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, −20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	≤ 3 times of the initial limit

Marking

〈 Laser marking 〉



〈 Other than the above 〉



R. voltage code

C	16
D	20

Unit : V

E	25
V	35

R. capacitance code

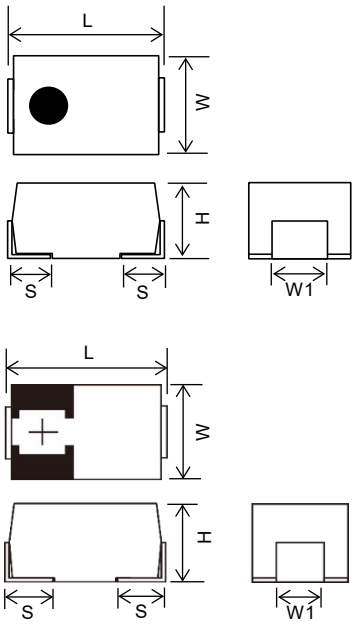
A7	10
E7	15

J7	22
N7	33

Unit : µF

S7	47

Dimensions (not to scale)



Unit : mm

Size code	L±0.2	W±0.2	H±0.1	S±0.2	W1±0.1
B2	3.5	2.8	1.9	0.8	2.2

* Externals of figure are the reference.

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Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level	Reflow soldering
16	NRFND 105	16	105	15	3.5	2.8	1.9	B2	1000	90	0.10	72.0	16TQC15M	2000	3	D
	NRFND 105	16	105	22	3.5	2.8	1.9		1000	90	0.10	35.2	16TQC22MYFB	2000		
	NRFND 105	16	105	33	3.5	2.8	1.9		1000	90	0.10	158.4	16TQC33MYFB	2000		
	105	16	105		3.5	2.8	1.9		1000	90	0.10	158.4	16TQC33MB2	2000		A
	105	16	105	47	3.5	2.8	1.9		1000	90	0.15	225.6	16TQC47MYFB	2000		
20	NRFND 105	20	105	22	3.5	2.8	1.9		1000	90	0.10	132.0	20TQC22MYFB	2000		D
	105	20	105		3.5	2.8	1.9		1000	90	0.10	132.0	20TQC22MB2	2000		A
	105	20	105	33	3.5	2.8	1.9		900	100	0.10	198.0	20TQC33MYFB	2000		
25	NRFND 105	25	105	10	3.5	2.8	1.9		900	100	0.10	25.0	25TQC10MEB	2000		D
	NRFND 105	25	105	15	3.5	2.8	1.9		900	100	0.10	112.5	25TQC15MYFB	2000		
	105	25	105		3.5	2.8	1.9		900	100	0.10	112.5	25TQC15MB	2000		A
	105	25	105	22	3.5	2.8	1.9		1100	100	0.10	165.0	25TQC22MYFB	2000		
35	105	35	105	10	3.5	2.8	1.9		900	150	0.15	105.0	35TQC10MYFB	2000		
	105	35	105		3.5	2.8	1.9		750	200	0.15	105.5	35TQC10MXB	2000		

*1: Ripple current (100 kHz / +105 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 5 minutes

NRFND Not recommended for new design

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .
◆ Small order quantity (500 pcs/reel) is available with TQC series. Please contact our sales representative if you prefer it.

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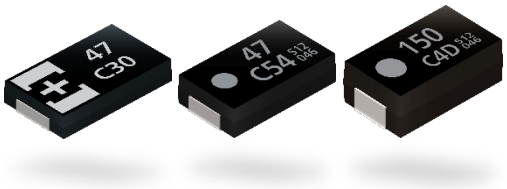
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TQC series D size



Features

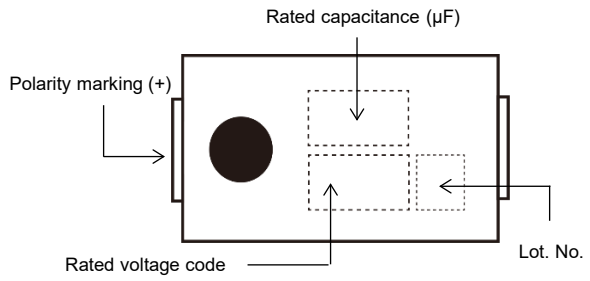
- High voltage (35 V max.)
- RoHS compliance, Halogen free

Specifications

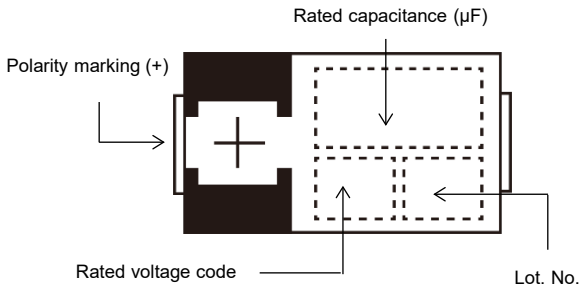
Size code	D15	D2	D3L
Category temp. range	–55 °C to +105 °C		
Rated voltage range	16 V to 25 V	16 V to 35 V	16 V to 25 V
Category voltage range	16 V to 25 V	16 V to 35 V	16 V to 25 V
Rated capacitance range	22 µF to 47 µF	10 µF to 150 µF	68 µF to 220 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage (V)	Rated voltage × 1.15		
Endurance	+105 °C 2000 h rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	Within the initial limit	
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage		
	Capacitance change	Within +40 %, −20 % of the initial value	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	≤ 3 times of the initial limit	

Marking

〈 Laser marking 〉



〈Other than the above〉



R. voltage code

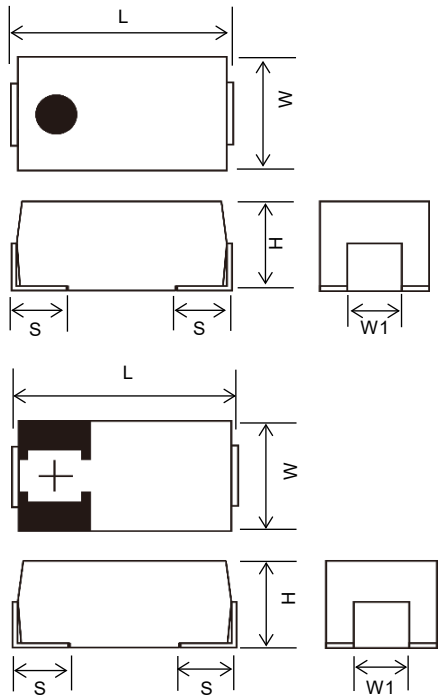
C	16
D	20

Unit : V

E*1, 1E	25
V	35

*1:Laser marking

Dimensions (not to scale)



Unit : mm

Size code	L	W±0.2	H	S±0.2	W1±0.1
D15	7.3±0.2	4.3	1.4±0.1	1.3	2.4
D2	7.3±0.2	4.3	1.9±0.1	1.3	2.4
D3L	7.3±0.3	4.3	2.8±0.2	1.3	2.4

* Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level	Reflow soldering
16	105	16	105	47	7.3	4.3	1.4	D15	1500	55	0.10	75.2	16TQC47MYFT	3000	3	D
	105	16	105		7.3	4.3	1.9	D2	1450	55	0.10	75.2	16TQC47MD2	3000		A
	105	16	105		7.3	4.3	1.9		1250	70	0.10	75.2	16TQC47MBD2	3000		
	105	16	105	68	7.3	4.3	1.9		1500	50	0.10	108.8	16TQC68MD2	3000		
	105	16	105	100	7.3	4.3	1.9		1800	50	0.10	160.0	16TQC100MD2	3000		
	105	16	105	150	7.3	4.3	1.9		1500	70	0.15	240.0	1CTQC15173F1	3000		D
	105	16	105		7.3	4.3	2.8	D3L	1800	50	0.10	240.0	16TQC150MD3	2500		B
	105	16	105	220	7.3	4.3	2.8		1750	50	0.10	352.0	16TQC220MD3	2500		C
20	105	20	105	22	7.3	4.3	1.9	D2	1200	90	0.10	44.0	20TQC22MQD	3000		D
	105	20	105	33	7.3	4.3	1.9		1400	60	0.10	66.0	20TQC33MD2	3000		A
	105	20	105	47	7.3	4.3	1.4	D15	1500	55	0.10	94.0	20TQC47MYFT	3000		D
	105	20	105		7.3	4.3	1.9	D2	1450	55	0.10	94.0	20TQC47MD2	3000		A
	105	20	105	100	7.3	4.3	1.9		1250	100	0.15	200.0	20TQC100MD2	3000		D
	105	20	105		7.3	4.3	2.8	D3L	1700	55	0.10	200.0	20TQC100MD3	2500		B
25	105	25	105	15	7.3	4.3	1.9	D2	1000	90	0.10	37.5	25TQC15MD2	3000		A
	105	25	105	22	7.3	4.3	1.9		1400	60	0.10	55.0	25TQC22MD2	3000		
	105	25	105	33	7.3	4.3	1.9		1400	60	0.10	82.5	25TQC33MD2	3000		
	105	25	105	68	7.3	4.3	2.8	D3L	1400	70	0.10	170.0	25TQC68MD3	2500		B
	105	25	105	100	7.3	4.3	2.8		1600	60	0.10	250.0	25TQC100MD3	2500		C
35	105	35	105	10	7.3	4.3	1.9	D2	820	180	0.10	35.0	35TQC10MD2	3000		A
	105	35	105	15	7.3	4.3	1.9		900	150	0.10	52.5	35TQC15MD2	3000		
	105	35	105	22	7.3	4.3	1.9		900	150	0.10	77.0	35TQC22MD2	3000		

NRFND [Not recommended for new design]

16	105	16	105	33	7.3	4.3	1.9	D2	1400	70	0.10	52.8	16TQC33MYFD	3000	3	D
	105	16	105	47	7.3	4.3	1.9		1450	55	0.10	75.2	16TQC47MYFD	3000		
	105	16	105		7.3	4.3	1.9		1250	70	0.10	75.2	16TQC47MBD	3000		
	105	16	105	68	7.3	4.3	1.9		1500	50	0.10	108.8	16TQC68MYF	3000		
	105	16	105	100	7.3	4.3	1.9		1800	50	0.10	160.0	16TQC100MYF	3000		
	105	16	105	150	7.3	4.3	2.8	D3L	1800	50	0.10	240.0	16TQC150MYF	2500		
20	105	20	105	33	7.3	4.3	1.9	D2	1400	60	0.10	66.0	20TQC33MYFD	3000		
	105	20	105	47	7.3	4.3	1.9		1450	55	0.10	94.0	20TQC47MYF	3000		
	105	20	105	100	7.3	4.3	2.8	D3L	1700	55	0.10	200.0	20TQC100MYF	2500		
25	105	25	105	15	7.3	4.3	1.9	D2	1000	90	0.10	38.0	25TQC15MYFD	3000		
	105	25	105	22	7.3	4.3	1.9		1400	60	0.10	55.0	25TQC22MYFD	3000		
	105	25	105		7.3	4.3	1.4	D15	1400	70	0.10	55.0	25TQC22MYFT	3000		
	105	25	105	33	7.3	4.3	1.9	D2	1400	60	0.10	82.5	25TQC33MYF	3000		
	105	25	105	68	7.3	4.3	2.8	D3L	1400	70	0.10	170.0	25TQC68MYF	2500		
35	105	35	105	10	7.3	4.3	1.9	D2	1000	120	0.10	35.0	35TQC10MYF	3000		
	105	35	105	15	7.3	4.3	1.9		900	150	0.10	52.5	35TQC15MYF	3000		

*1: Ripple current (100 kHz / +105 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 5 minutes

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .
◆ Small order quantity (500 pcs/reel) is available with TQC series. Please contact our sales representative if you prefer it.

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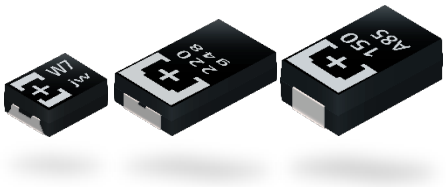
Panasonic INDUSTRY

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TA series



■ This product is not intended for use in any driving application or any other critical functions that affect passenger safety.(e.g. Powertrain, ABS, Engine ECU, Airbag, etc.)
If the intended use of TA/TV series products is for use in other automotive related applications, please contact our sales team. All requests are subject to approval.

Features

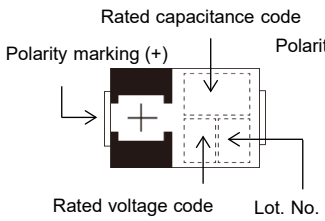
- Guaranteed at 85 °C 85 %RH
- RoHS compliance, Halogen free

Specifications

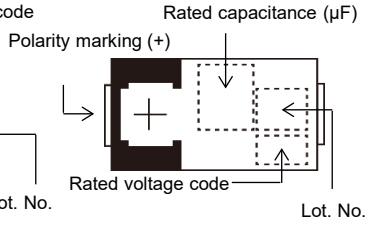
Size code	B2	D2E	D3L
Category temp. range	–55 °C to +105 °C		
Rated voltage range	4.0 V to 10 V	2.5 V to 6.3 V	2.5 V to 10 V
Category voltage range	4.0 V to 10 V	2.5 V to 6.3 V	2.5 V to 10 V
Rated capacitance range	47 µF to 100 µF	150 µF to 470 µF	150 µF to 680 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage (V)	Rated voltage × 1.15		
Endurance	+105 °C 2000 h (B2 size : 1000 h) , rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	Within the initial limit	
Damp heat (Steady State)	+85 °C, 85 % to 90 % RH, 500 h, rated voltage applied		
	Capacitance change	Within +50 %, −20 % of the initial value (2R5TAE470M (F), 2R5TAE330M (I, F), 2R5TAE220M (F, 9))	
		Within +40 %, −20 % of the initial value (Except for above model)	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	Within the initial limit	

Marking

< B2 size >



< D2E, D3L size >



R. voltage code

Unit : V

e	2.5	j	6.3
g	4	A	10

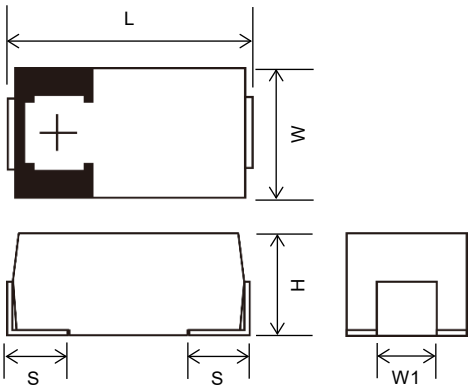
< B2 size >

R. capacitance code

Unit : µF

S7	47	W7	68	A8	100

Dimensions (not to scale)



Unit : mm

Size code	L	W±0.2	H	S±0.2	W1±0.1
B2	3.5±0.2	2.8	1.9±0.1	0.8	2.2
D2E	7.3±0.3	4.3	1.8±0.1	1.3	2.4
D3L	7.3±0.3	4.3	2.8±0.2	1.3	2.4

* Externals of figure are the reference.

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Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level Reflow temp ≤260°C	Reflow temp ≤250°C
2.5	105	2.5	105	220	7.3	4.3	1.8	D2E	3900	9	0.10	110.0	2R5TAE220M9	3000	3	3
	105	2.5	105		7.3	4.3	1.8		3100	15	0.10	55.0	2R5TAE220MF	3000		
	105	2.5	105		7.3	4.3	1.8		2400	25	0.10	55.0	2R5TAE220M	3000		
	105	2.5	105	330	7.3	4.3	1.8		3100	15	0.10	82.5	2R5TAE330MF	3000		
	105	2.5	105		7.3	4.3	1.8		2800	18	0.10	82.5	2R5TAE330MI	3000		
	105	2.5	105		7.3	4.3	1.8		2400	25	0.10	82.5	2R5TAE330M	3000		
	105	2.5	105	470	7.3	4.3	1.8		3100	15	0.10	117.5	2R5TAE470MF	3000		
	105	2.5	105		7.3	4.3	1.8		2400	25	0.10	117.5	2R5TAE470M	3000		
	105	2.5	105	680	7.3	4.3	2.8	D3L	3100	15	0.10	170.0	2R5TAE680MFL	2500		
	105	2.5	105		7.3	4.3	2.8		2400	25	0.10	170.0	2R5TAE680ML	2500		
4.0	105	4.0	105	100	3.8	2.8	1.9	B2	1100	70	0.08	40.0	4TAB100M	2000		
	105	4.0	105	220	7.3	4.3	1.8	D2E	2800	18	0.10	88.0	4TAE220MI	3000		
	105	4.0	105		7.3	4.3	1.8		2400	25	0.10	88.0	4TAE220M	3000		
	105	4.0	105	470	7.3	4.3	2.8	D3L	2800	18	0.10	188.0	4TAE470MIL	2500		
	105	4.0	105		7.3	4.3	2.8		2400	25	0.10	188.0	4TAE470ML	2500		
6.3	105	6.3	105	47	3.5	2.8	1.9	B2	1100	70	0.08	29.6	6TAB47M	2000		
	105	6.3	105	68	3.5	2.8	1.9		1100	70	0.08	42.8	6TAB68M	2000		
	105	6.3	105	150	7.3	4.3	1.8	D2E	2400	25	0.10	94.5	6TAE150M	3000		
	105	6.3	105	220	7.3	4.3	1.8		2800	18	0.10	138.6	6TAE220MI	3000		
	105	6.3	105		7.3	4.3	1.8		2400	25	0.10	138.6	6TAE220M	3000		
	105	6.3	105	330	7.3	4.3	2.8	D3L	2400	25	0.10	207.9	6TAE330ML	2500		
10	105	10	105	47	3.5	2.8	1.9	B2	1100	70	0.08	47.0	10TAB47M	2000		
	105	10	105	150	7.3	4.3	2.8	D3L	2400	25	0.10	150.0	10TAE150ML	2500		
	105	10	105	220	7.3	4.3	2.8		2400	25	0.10	220.0	10TAE220ML	2500		

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 5 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

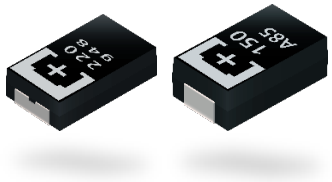
Panasonic INDUSTRY

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TV series



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If the intended use of TA/TV series products is for use in other automotive related applications, please contact our sales team. All requests are subject to approval.

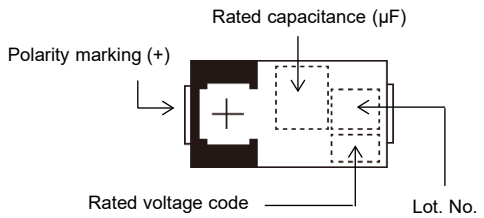
Features

- Guaranteed at 85 °C 85 %RH
- Guaranteed at 125 °C
- RoHS compliance, Halogen free

Specifications

Size code	D2E		D3L
Category temp. range	–55 °C to +125 °C		
Rated voltage range	6.3 V to 10 V		10 V
Category voltage range	4.0 V to 6.3 V		6.3 V
Rated capacitance range	68 µF to 150 µF		150 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage (V)	Rated voltage × 1.15		
Endurance	+125 °C 1000 h, category voltage applied (+105 °C 2000 h, rated voltage applied)		
	Temperature	125 °C	105 °C
	Capacitance change	Within ±20% of the initial value	Within ±20% of the initial value
	Dissipation factor(tan δ)	≤ 2 times of the initial limit	≤ 1.5 times of the initial limit
	Leakage current	≤ 2 times of the initial limit	Within the initial limit
Damp heat (Steady State)	+85 °C, 85 % to 90 % RH, 500 h, rated voltage applied		
	Capacitance change	Within +40 %, −20 % of the initial value	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	Within the initial limit	

Marking



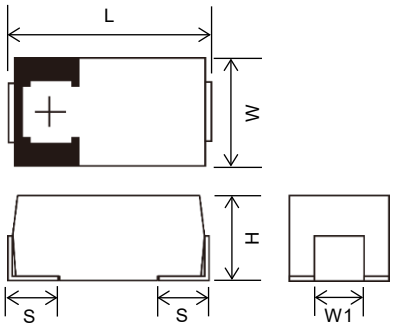
R.voltage code

j	6.3

Unit : V

A	10

Dimensions (not to scale)



Unit : mm

Size code	L±0.3	W±0.2	H	S±0.2	W1±0.1
D2E	7.3	4.3	1.8±0.1	1.3	2.4
D3L	7.3	4.3	2.8±0.2	1.3	2.4

* Externals of figure are the reference.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (µF)	Case size (mm) L	W	H	Size code	Specifications: Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (µA)	Standard: Part number	Min. packaging q'ty (pcs)	Floor life level: Reflow temp ≤260°C	Reflow temp ≤250°C
6.3	105	4.0	125	150	7.3	4.3	1.8	D2E	2400	25	0.10	94.5	6TVE150M	3000	5	3
10	105	6.3	125	68	7.3	4.3	1.8		2400	25	0.10	68.0	10TVE68M	3000		
	105	6.3	125	150	7.3	4.3	2.8	D3L	2400	25	0.10	150.0	10TVE150ML	2500		

*1: Ripple current (100 kHz / +45 °C) *2: ESR (100 kHz / +20 °C) *3: tan δ (120 Hz / +20 °C) *4: After 5 minutes

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

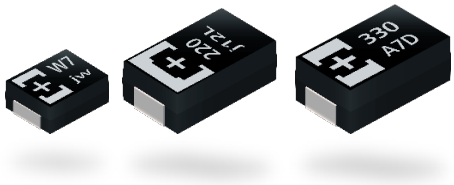
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TPB series



Features

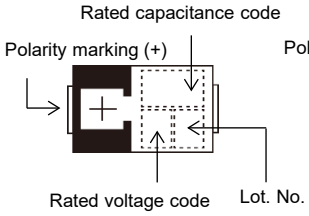
- Standard
- RoHS compliance, Halogen free

Specifications

Size code	B2	D3L	D4
Category temp. range	–55 °C to +105 °C		
Rated voltage range	4.0 V to 10 V	4.0 V to 10 V	6.3 V to 10 V
Category voltage range	4.0 V to 10 V	4.0 V to 10 V	6.3 V to 10 V
Rated capacitance range	33 µF to 68 µF	150 µF to 330 µF	220 µF to 470 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage (V)	Rated voltage × 1.15		
Endurance	+105 °C 2000 h, (B2 size : 1000 h) rated voltage applied Rated temp. +85 °C 1000 h rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	Within the initial limit	
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage		
	Capacitance change	Within +40 %, −20 % of the initial value (Except for above model)	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	≤ 3 times of the initial limit	

Marking

< B2 size >



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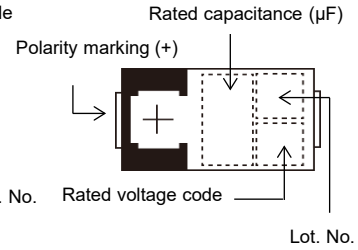

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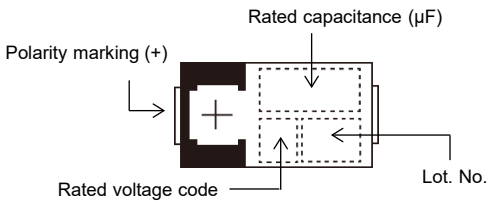


R. voltage code — Unit : V

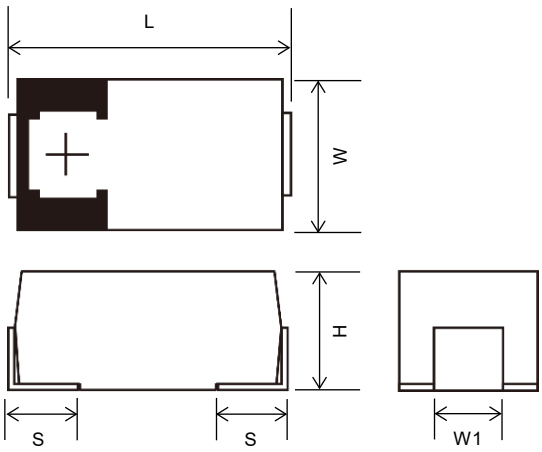
g	4.0	j	6.3	A	10

< B2 size >

R. capacitance code — Unit : µF

N7	33	S7	47	W7	68

Dimensions (not to scale)



Unit : mm

Size code	L	W±0.2	H	S±0.2	W1±0.1
B2	3.5±0.2	2.8	1.9±0.1	0.8	2.2
D3L	7.3±0.3	4.3	2.8±0.2	1.3	2.4
D4	7.3±0.3	4.3	3.8±0.2	1.3	2.4

* Externals of figure are the reference.

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Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level Reflow temp ≤260°C	Reflow temp ≤250°C
4.0	105	4.0	105	68	3.5	2.8	1.9	B2	1100	70	0.08	27.2	4TPB68M	2000	3	3
NRFND	105	4.0	105	330	7.3	4.3	2.8	D3L	2000	40	0.10	132	4TPB330ML	2500		2a
6.3	105	6.3	105	33	3.5	2.8	1.9	B2	1100	70	0.08	20.7	6TPB33M	2000		3
	105	6.3	105	68	3.5	2.8	1.9		1100	70	0.08	42.8	6TPB68M	2000		
NRFND	105	6.3	105	220	7.3	4.3	2.8	D3L	2000	40	0.10	138.6	6TPB220ML	2500		2a
NRFND	105	6.3	105		7.3	4.3	2.8		1750	50	0.10	138.6	6TPB220MTL	2500		
	85	5.0	105	330	7.3	4.3	2.8		2000	40	0.10	207.9	6TPB330MAL	2500		
	105	6.3	105		7.3	4.3	2.8		2000	40	0.10	207.9	6TPB330ML	2500		
	105	6.3	105		7.3	4.3	3.8	D4	3000	40	0.10	207.9	6TPB330M	2000		
	105	6.3	105		7.3	4.3	2.8	D3L	1850	45	0.10	207.9	6TPB330MVL	2500		
	105	6.3	105	470	7.3	4.3	3.8	D4	3000	35	0.15	296.1	6TPB470M	2000		
10	105	10	105	33	3.5	2.8	1.9	B2	1100	70	0.08	33.0	10TPB33M	2000		3
	105	10	105	47	3.5	2.8	1.9		1100	70	0.08	47.0	10TPB47M	2000		
	105	10	105	150	7.3	4.3	2.8	D3L	2000	40	0.10	150.0	10TPB150ML	2500		2a
	105	10	105		7.3	4.3	2.8		1700	55	0.10	150.0	10TPB150MGL	2500		
	105	10	105	220	7.3	4.3	2.8		2000	40	0.10	220.0	10TPB220ML	2500	–	
	105	10	105		7.3	4.3	3.8	D4	3000	40	0.10	220.0	10TPB220M	2000	3	
NRFND	105	10	105	330	7.3	4.3	3.8		3000	35	0.10	330.0	10TPB330M	2000	–	
	105	10	105		7.3	4.3	3.8		2800	40	0.10	330.0	10TPB330MW	2000		

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 5 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

NRFND Not recommended for new design

Panasonic INDUSTRY

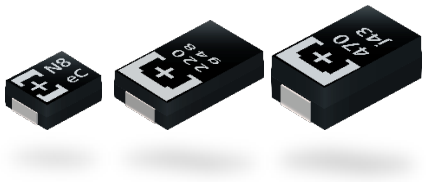
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TC series



Features

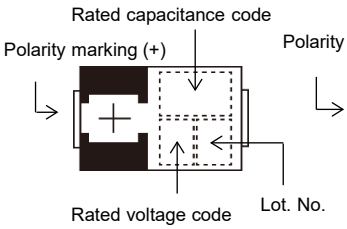
- Guaranteed at 125 °C 1000 h
- RoHS compliance, Halogen free

Specifications

Size code	B2	D2E	D3L	D4
Category temp. range	–55 °C to +125 °C			
Rated voltage range	2.5 V	4.0 V to 6.3 V	2.5 V to 10 V	
Category voltage range	2.0 V	3.2 V to 5.0 V	2.0 V to 8.0 V	
Rated capacitance range	330 µF	100 µF to 330 µF	150 µF to 680 µF	330 µF to 1000 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor(tan δ)	Please see the attached characteristics list			
Surge voltage (V)	Rated voltage × 1.15			
Endurance	+125 °C 1000 h, category voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor(tan δ)	≤ 2 times of the initial limit		
	Leakage current	≤ 2 times of the initial limit		
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage			
	Capacitance change	Within +50 %, −20 % of the initial value（ETCF1000M6H(5H)）		
		Within +40 %, −20 % of the initial value		
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit		
	Leakage current	≤ 3 times of the initial limit		

Marking

< B2 size >



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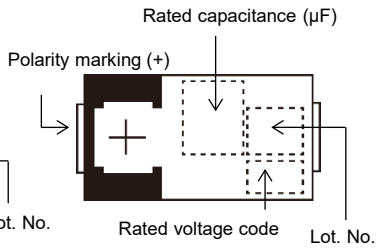


R. voltage code

e	2.5
g	4.0

Unit : V

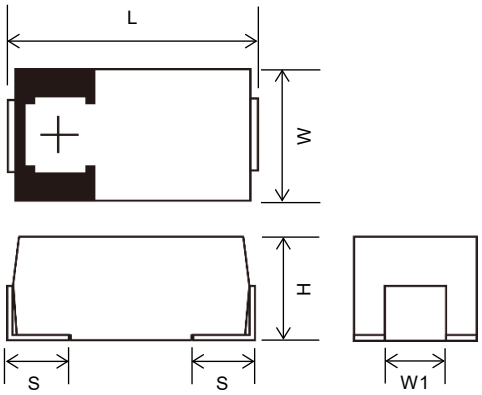
j	6.3
A	10

< B2 size >

R.capacitance code Unit : µF

N8	330

Dimensions (not to scale)



Unit : mm

Size code	L	W±0.2	H	S±0.2	W1±0.1
B2	3.5±0.2	2.8	1.9±0.1	0.8	2.2
D2E	7.3±0.3	4.3	1.8±0.1	1.3	2.4
D3L	7.3±0.3	4.3	2.8±0.2	1.3	2.4
D4	7.3±0.3	4.3	3.8±0.2	1.3	2.4

* Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Series	Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level Reflow temp ≤260°C	Reflow temp ≤250°C
TCE	2.5	105	2.0	125	330	3.5	2.8	1.9	B2	3200	9/300kHz	0.08	165.0	ETCE330M9GB	2000	3	3
		105	2.0	125	680	7.3	4.3	2.8	D3L	3500	12	0.10	170.0	ETCE680MCL	2500		2a
		105	2.0	125		7.3	4.3	2.8		3100	15	0.10	170.0	ETCE680MFL	2500		
		105	2.0	125	1000	7.3	4.3	3.8	D4	3900	15	0.15	250.0	ETCE1000MF	2000		
	4.0	105	3.2	125	150	7.3	4.3	1.8	D2E	2800	18	0.10	60.0	4TCE150MI	3000		
		105	3.2	125	220	7.3	4.3	1.8		3100	15	0.10	88.0	4TCE220MF	3000		
		105	3.2	125		7.3	4.3	1.8		2800	18	0.10	88.0	4TCE220MI	3000		
		105	3.2	125		7.3	4.3	1.8		2400	25	0.10	88.0	4TCE220M	3000		
		105	3.2	125	330	7.3	4.3	1.8		2800	18	0.10	132.0	4TCE330MI	3000		
		105	3.2	125		7.3	4.3	1.8		2400	25	0.10	132.0	4TCE330M	3000		
		105	3.2	125	470	7.3	4.3	2.8	D3L	3500	12	0.10	188.0	4TCE470MCL	2500		
		105	3.2	125		7.3	4.3	2.8		3100	15	0.10	188.0	4TCE470MFL	2500		
		105	3.2	125		7.3	4.3	2.8		2800	18	0.10	188.0	4TCE470MIL	2500		
		105	3.2	125		7.3	4.3	2.8		2400	25	0.10	188.0	4TCE470ML	2500		
	6.3	105	5.0	125	100	7.3	4.3	1.8	D2E	2800	18	0.10	63.0	6TCE100MI	3000		
		105	5.0	125		7.3	4.3	1.8		2400	25	0.10	63.0	6TCE100M	3000		
		105	5.0	125	150	7.3	4.3	1.8		3100	15	0.10	94.5	6TCE150MF	3000		
		105	5.0	125		7.3	4.3	1.8		2800	18	0.10	94.5	6TCE150MI	3000		
		105	5.0	125		7.3	4.3	1.8		2400	25	0.15	94.5	6TCE150M	3000		
		105	5.0	125	220	7.3	4.3	1.8		2800	18	0.15	138.6	6TCE220MI	3000		
		105	5.0	125		7.3	4.3	1.8		2400	25	0.15	138.6	6TCE220M	3000		
		105	5.0	125	330	7.3	4.3	2.8	D3L	3100	15	0.10	207.9	6TCE330MFL	2500		
		105	5.0	125		7.3	4.3	2.8		2800	18	0.10	207.9	6TCE330MIL	2500		
		105	5.0	125		7.3	4.3	2.8		2400	25	0.10	207.9	6TCE330ML	2500		
		105	5.0	125	470	7.3	4.3	3.8	D4	3500	18	0.15	296.1	6TCE470MI	2000		
		105	5.0	125		7.3	4.3	3.8		3000	25	0.15	296.1	6TCE470M	2000		
		105	5.0	125	680	7.3	4.3	3.8		3500	18	0.15	428.4	6TCE680MI	2000		
		105	5.0	125		7.3	4.3	3.8		3000	25	0.15	428.4	6TCE680M	2000		
	10	105	8.0	125	220	7.3	4.3	2.8	D3L	2800	18	0.10	220.0	10TCE220MIL	2500		
		105	8.0	125		7.3	4.3	2.8		2400	25	0.10	220.0	10TCE220ML	2500	–	
		105	8.0	125	330	7.3	4.3	3.8	D4	3000	25	0.10	330.0	10TCE330M	2000		
TCF	2.5	105	2.0	125	680	7.3	4.3	2.8	D3L	4400	6	0.10	170.0	ETCF680M6L	2500	3	
		105	2.0	125		7.3	4.3	2.8		4400	7	0.10	170.0	ETCF680M7L	2500		
		105	2.0	125		7.3	4.3	2.8		4400	10	0.10	170.0	ETCF680ML	2500		
		105	2.0	125	1000	7.3	4.3	3.8	D4	6100	5	0.10	250.0	ETCF1000M5H	2000		
		105	2.0	125		7.3	4.3	3.8		5600	6	0.10	250.0	ETCF1000M6H	2000		
	4.0	105	3.2	125	330	7.3	4.3	2.8	D3L	4000	12	0.10	132.0	4TCF330ML	2500		
		105	3.2	125	470	7.3	4.3	2.8		4400	10	0.10	188.0	4TCF470ML	2500		
		105	3.2	125	680	7.3	4.3	3.8	D4	4400	10	0.10	272.0	4TCF680MAH	2000		
NRFND	6.3	105	5.0	125	220	7.3	4.3	2.8	D3L	4600	9	0.10	138.6	6TCF220M9L	2500		
		105	5.0	125		7.3	4.3	2.8		4000	12	0.10	138.6	6TCF220ML	2500		
		105	5.0	125	330	7.3	4.3	2.8		3900	9	0.10	207.9	6TCF330M9L	2500		
		105	5.0	125	470	7.3	4.3	3.8	D4	4400	10	0.10	296.1	6TCF470MAH	2000		
	10	105	8.0	125	150	7.3	4.3	2.8	D3L	3600	15	0.10	150.0	10TCF150ML	2500	–	

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 5 minutes

NRFND Not recommended for new design

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

Panasonic INDUSTRY

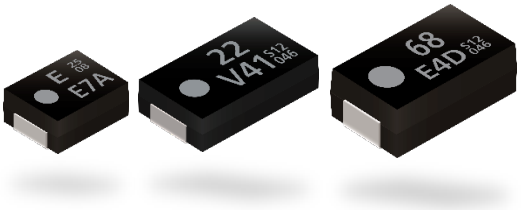
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TDC series



Features

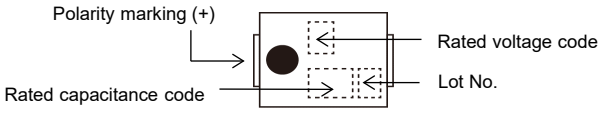
- Guaranteed at 125 °C 1000 h
- High voltage (35 V max.)
- RoHS compliance, Halogen free

Specifications

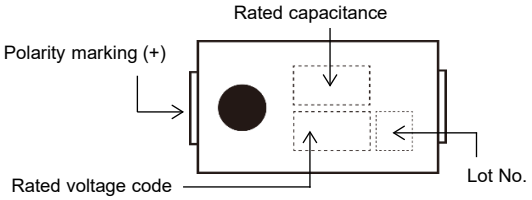
Size code	B2	D2	D3L
Category temp. range	–55 °C to +125 °C		
Rated voltage range	16 V to 25 V	16 V to 35 V	16 V to 25 V
Category voltage range	12.8 V to 20 V	12.8 V to 28 V	12.8 V to 20 V
Rated capacitance range	15 µF to 33 µF	10 µF to 100 µF	68 µF to 220 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage (V)	Rated voltage × 1.15		
Endurance	+125 °C 1000 h, category voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	Dissipation factor(tan δ)	≤ 2 times of the initial limit	
	Leakage current	≤ 2 times of the initial limit	
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage		
	Capacitance change	Within +40 %, −20 % of the initial value	
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit	
	Leakage current	≤ 3 times of the initial limit	

Marking

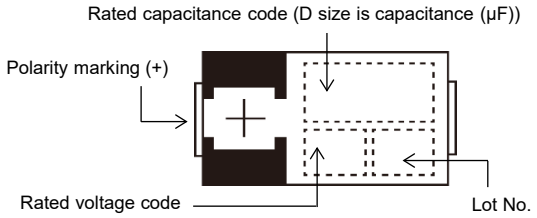
〈 Laser marking (B size) 〉



〈 Laser marking (D size) 〉



〈Other than the above〉



R. voltage code

(B size)

C	16
D	20

E	25

(D size)

C	16
D	20

*1:Laser marking

Unit : V

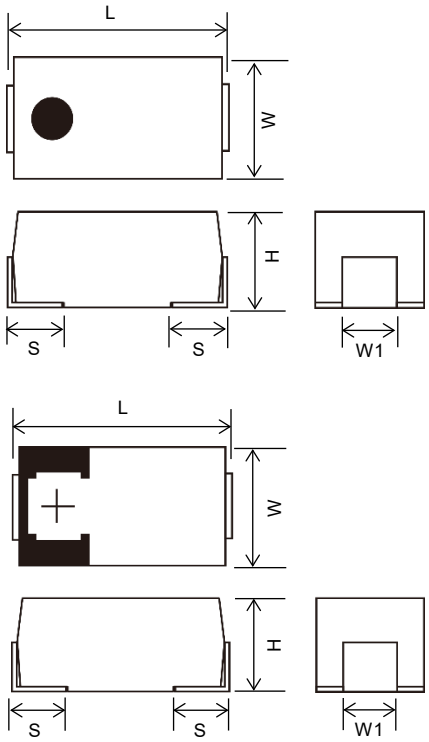
E*1	25
1E	
V	35

R. capacitance code (B size)

Unit : µF

E7	15	J7	22	N7	33

Dimensions (not to scale)



Unit : mm

Size code	L	W±0.2	H	S±0.2	W1±0.1
B2	3.5±0.2	2.8	1.9±0.1	0.8	2.2
D2	7.3±0.2	4.3	1.9±0.1	1.3	2.4
D3L	7.3±0.3	4.3	2.8±0.2	1.3	2.4

* Externals of figure are the reference.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level	Reflow soldering
16	105	12.8	125	33	3.5	2.8	1.9	B2	1000	90	0.10	158.4	16TDC33MB2	2000	3	A
	105	12.8	125	47	7.3	4.3	1.9	D2	1450	55	0.10	75.2	16TDC47MD2	3000		
	105	12.8	125		7.3	4.3	1.9		1250	70	0.10	75.2	16TDC47MBD2	3000		
	105	12.8	125	68	7.3	4.3	1.9		1500	50	0.10	108.8	16TDC68MD2	3000		
	105	12.8	125	100	7.3	4.3	1.9		1800	50	0.10	160.0	16TDC100MD2	3000		
	105	12.8	125	150	7.3	4.3	2.8	D3L	1800	50	0.10	240.0	16TDC150MD3	2500		B
	105	12.8	125	220	7.3	4.3	2.8		1750	50	0.10	352.0	16TDC220MD3	2500		C
20	105	16	125	22	3.5	2.8	1.9	B2	1000	90	0.10	132.0	20TDC22MB2	2000		A
	105	16	125	33	7.3	4.3	1.9	D2	1400	60	0.10	66.0	20TDC33MD2	3000		
	105	16	125	47	7.3	4.3	1.9		1450	55	0.10	94.0	20TDC47MD2	3000		
	105	16	125	100	7.3	4.3	2.8	D3L	1700	55	0.10	200.0	20TDC100MD3	2500		B
25	105	20	125	15	3.5	2.8	1.9	B2	900	100	0.10	112.5	25TDC15MB	2000		A
	105	20	125		7.3	4.3	1.9	D2	1000	90	0.10	37.5	25TDC15MD2	3000		
	105	20	125	22	7.3	4.3	1.9		1400	60	0.10	55.0	25TDC22MD2	3000		
	105	20	125	33	7.3	4.3	1.9		1400	60	0.10	82.5	25TDC33MD2	3000		
	105	20	125	68	7.3	4.3	2.8	D3L	1400	70	0.10	170.0	25TDC68MD3	2500		B
	105	20	125	100	7.3	4.3	2.8		1600	60	0.10	250.0	25TDC100MD3	2500		C
35	105	28	125	10	7.3	4.3	1.9	D2	820	180	0.10	35.0	35TDC10MD2	3000		A
	105	28	125	15	7.3	4.3	1.9		900	150	0.10	52.5	35TDC15MD2	3000		
	105	28	125	22	7.3	4.3	1.9		900	150	0.10	77.0	35TDC22MD2	3000		

NRFND [Not recommended for new design]

16	105	12.8	125	33	3.5	2.8	1.9	B2	1000	90	0.10	158.4	16TDC33MYFB	2000	3	D
	105	12.8	125	100	7.3	4.3	1.9	D2	1800	50	0.10	160.0	16TDC100MYF	3000		
	105	12.8	125	150	7.3	4.3	2.8	D3L	1800	50	0.10	240.0	16TDC150MYF	2500		
20	105	12.8	125	22	3.5	2.8	1.9	B2	1000	90	0.10	132.0	20TDC22MYFB	2000		
	105	12.8	125	100	7.3	4.3	2.8	D3L	1700	55	0.10	200.0	20TDC100MYF	2500		
25	105	12.8	125	15	3.5	2.8	1.9	B2	900	100	0.10	112.5	25TDC15MYFB	2000		
	105	12.8	125	68	7.3	4.3	2.8	D3L	1400	70	0.10	170.0	25TDC68MYF	2500		

*1: Ripple current (100 kHz / +105 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 5 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

Panasonic INDUSTRY

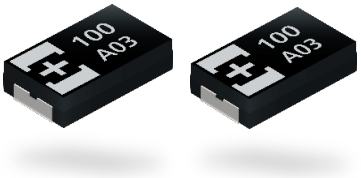
Some part numbers are not a recommended product.
Not recommended for new design.

POSCAP

Conductive Polymer Tantalum Solid Capacitors

Surface Mount Type

TPC series



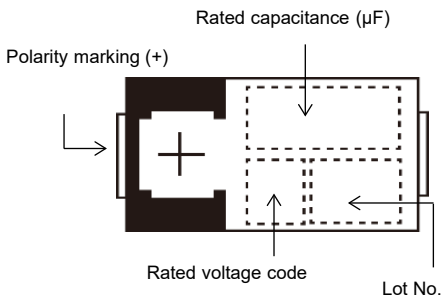
Features

- RoHS compliance, Halogen free

Specifications

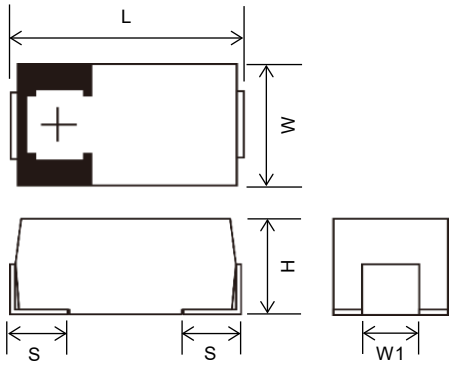
Size code	D2	
Category temp. range	–55 °C to +105 °C	
Rated voltage range	10 V	
Category voltage range	10 V	
Rated capacitance range	68 µF to 100 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.15	
Endurance	+105 °C 2000 h , rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, −20 % of the initial value
	Dissipation factor(tan δ)	≤ 1.5 times of the initial limit
	Leakage current	≤ 3 times of the initial limit

Marking



R. voltage code	Unit : V
A	10

Dimensions (not to scale)



Unit : mm

Size code	L±0.2	W±0.2	H±0.1	S±0.2	W1±0.1
D2	7.3	4.3	1.9	1.3	2.4

* Externals of figure are the reference.

Characteristics list

Rated voltage (V)	Rated temperature (°C)	Category voltage (V)	Category temperature (°C)	Rated capacitance (μF)	Case size (mm) L	W	H	Size code	Specifications Ripple*1 current (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard Part number	Min. packaging q'ty (pcs)	Floor life level Reflow temp ≤260°C	Reflow temp ≤250°C
NRFND 10	105	10	105	68	7.3	4.3	1.9	D2	1700	45	0.10	68.0	10TPC68M	3000	3	2a
	105	10	105		7.3	4.3	1.9		1450	60	0.10	68.0	10TPC68MM	3000		
	105	10	105		7.3	4.3	1.9		1100	100	0.10	68.0	10TPC68ME	3000		
	105	10	105	100	7.3	4.3	1.9		1700	45	0.10	100.0	10TPC100M	3000		
	105	10	105		7.3	4.3	1.9		1600	50	0.10	100.0	10TPC100MT	3000		
	105	10	105		7.3	4.3	1.9		1500	55	0.10	100.0	10TPC100MG	3000		

*1: Ripple current (100 kHz / +45 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 5 minutes

NRFND Not recommended for new design

◆ Please refer to each page in this catarog for “Reflow conditions” ,“Taping specifications” and "Floor life level" .

Catalog Deletion Models

The following table is a list of our items which have been deleted from our catalogs.
If you are using any of the following models on the deleted list,
please substitute them with the suggested alternative model as soon as possible.
Our company continue to supply them to customers who have already used them, for the time being.

Series	Size code	Models for deletion	Year of deletion	Alternative model
TPB	B2	2R5TPB100M	2012	4TPE100MZB
		2R5TPB220MA	2009	2R5TPE220MZB
		4TPB100M	2009	4TPE100MZB
		8TPB47M	2009	10TPE47MAZB
		6TPB47M	2009	6TPC47MB
		6TPB100MA	2009	6TPE100MAZB
		6TPB100MAV	2009	6TPE100MAZB
	D3L	2R5TPB330ML	2009	2R5TPE330M
		4TPB220ML	2009	4TPE220M
		4TPB470ML	2009	4TPE470ML
		6TPB150ML	2009	6TPE150M
		10TPB100ML	2010	10TPC100M
	D3	4TPB220M	2008	4TPE220M
		6TPB150M	2008	6TPE150M
		10TPB100M	2008	10TPC100M
	D4	2R5TPB680M	2009	2R5TPE680MFL
		2R5TPB1000M	2009	2R5TPE1000MF
		4TPB470M	2009	4TPE470ML
		4TPB680M	2009	6TPE680MI
TPC	B1	2R5TPC56M	2012	6TPB68M
		4TPC47M	2012	6TPC47MB
		6TPC33M	2012	6TPC47MB
		10TPC33MB	2013	16TQC33MYFB
	D2	2R5TPC330M	2009	2R5TPE330M
		4TPC150M	2009	4TPE150MI
		4TPC220M	2009	4TPE220M
TPE	B2	2TPE330MIB	2011	ETPE330MFB
		2TPE330MAFGB	2011	ETPE330MFB
		2R5TPE150MZB	2011	2R5TPE220MZB
		2R5TPE220MIB	2012	2R5TPE220MFGB
		4TPE150MUB	2013	4TPE150MAZB
	D2E	2R5TPE220MC	2012	2R5TPE220M9
		2R5TPE220M7	2012	2R5TPE330M7
		2R5TPE470M	2011	2R5TPE470MI
		4TPE150M	2011	4TPE150MI
	D3L	2R5TPE680ML	2012	2R5TPE680MFL
		2R5TPE680MIL	2011	2R5TPE680MFL
	D4	2R5TPE1000M	2011	2R5TPE1000MF
		2R5TPE1000MI	2012	2R5TPE1000MF
		4TPE680M	2011	6TPE680MI
		4TPE680MI	2012	6TPE680MI
		4TPE680MF	2012	4TPF680MAH
TPSF	B2S	11TPSF62MAIG	2012	–
TH	D2	4THC220M	2013	4THE220M
	D3L	2R5THB330ML	2010	–
		10THB100ML	2010	–
	D4	4THB680M	2013	–

Series	Size code	Models for deletion	Year of deletion	Alternative model
TQC	C	16TQC22M	2011	25TQC22MYFD
		20TQC15M	2011	25TQC15MYFD
		25TQC10M	2011	25TQC15MYFD
	D2	16TQC33M	2012	16TQC33MYFD
		16TQC47M	2012	16TQC47MYFD
		16TQC68MY	2012	16TQC68MYF
		20TQC22M	2012	25TQC22MYFD
		20TQC22MYFD	2015	25TQC22MYFD
		20TQC47MY	2012	20TQC47MYF
		25TQC15M	2012	25TQC15MYFD
		25TQC22M	2012	25TQC22MYFD
	D3L	16TQC68M	2012	16TQC68MYF
		20TQC47M	2012	20TQC47MYF
		25TQC33M	2012	25TQC33MYF
	D3	16TQC100M	2012	16TQC100MYF

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EOL Models

The following table is a list of the End-Of-Life (EOL) models.
Sales of these items will end as soon as we run out of its stock. We would like to express our appreciation for your business over the years with these products and we hope the new, alternative parts will continue to serve your needs. Thank you very much.

Series	Size code	Models for deletion	Year of deletion	Alternative model
TPA	C	6TPA47M	2012/9	10TPB47M
		10TPA33M	2012/9	10TPB33M
	D3	4TPA220M	2012/9	4TPE220M
		6TPA150M	2012/9	6TPE150M
		10TPA100M	2012/9	10TPC100M
TPB	B2	4TPB100MV	2012/9	4TPE100MZB
		4TPB150MA	2012/9	4TPE150MAZB
		8TPB33M	2012/9	10TPB33M
	C	2R5TPB220MC	2012/9	4TPE220MI
		4TPB150MC	2012/9	6TPE150M
		4TPB220MC	2012/9	4TPE220MI
		6TPB100MC	2012/9	6TPS150MUD
		6TPB150MC	2012/9	6TPE150M
		8TPB82MC	2012/9	8TPE100MAZB
		10TPB47MC	2012/9	10TPC68M
		10TPB68MC	2012/9	10TPC68M
		10TPB220MC	2009/10	–
	D3L	2R5TPB470ML	2012/9	2R5TPE470MI
		2R5TPB680ML	2012/9	2R5TPE680MFL
		16TPB47ML	2003/6	16TQC47MYFD
	D3	2R5TPB330M	2012/9	2R5TPE330MI
		16TPB47M	2003/6	16TQC47MYFD
TPC	C1	2R5TPC82M	2012/9	–
		4TPC56M	2012/9	–
		4TPC100M	2012/9	6TPS150MUD
		6TPC68M	2012/9	6TPS150MUD
		6TPC100MC	2012/9	6TPS150MUD
		8TPC33M	2012/9	16TQC33MYFB
	B1	6TPC47M	2024	10TPE47MAZB
		6TPC47MB	2024	10TPE47MAZB
		8TPC22M	2024	20TQC22MYFB
		8TPC150M	2024	10TPE150MPL
		12TPC10M	2024	35TQC10MYFB
		12TPC15M	2024	16TQC15M
	D2	2R5TPC220M	2012/9	2R5TPE220MI
		16TPC33M	2003/6	16TQC33MYFD
		6TPC100M	2024	6TPE100MW
		6TPC150M	2024	6TPE150M
		6TPC330MA	2024	6TPE330MAP
TPD	D4D	2R5TPD470M	2007/10	2R5TPF470ML
		2R5TPD470M5	2012/3	ETPF470M5H
		2R5TPD470M6	2012/3	2R5TPF470M6L
		2R5TPD470M8	2007/10	2R5TPF470M7L
		2R5TPD680M	2007/10	2R5TPF680ML
		2R5TPD680M5	2012/3	2R5TPF680M6L
		2R5TPD680M6	2012/3	2R5TPF680M6L
		2R5TPD680M8	2007/10	2R5TPF680M7L
		2R5TPD1000M	2012/3	ETPF1000M6H
		2R5TPD1000M8	2012/3	ETPF1000M6H
		2R5TPD1000M6	2012/3	ETPF1000M6H
		2R5TPD1000M5	2012/3	ETPF1000M5H
		4TPD330M	2007/10	4TPF330ML
		4TPD470M	2007/10	4TPF470ML
		4TPD680M	2012/3	4TPF680MAH
		6TPD220M	2007/10	6TPF220ML
		6TPD330M	2007/10	6TPF330M9L
		6TPD470M	2012/3	6TPF470MAH
		10TPD150M	2007/10	10TPF150ML
TPE	B2	2R5TPE220MPB	2012/9	2R5TPE220MLB
		2R5TPE220MDGB	2013	2R5TPE220MFGB
		2TPE330MFB	2021	ETPE330MFB
		2TPE330MAFB	2021	ETPE330MFB
		2TPE330MADGB	2021	ETPE330M9GB
TH	D2	6THC150M	2024	6TCE150M
	D3L	2R5THB470ML	2012/9	6TCE470M
	D4	2R5THB680M	2012/9	–
		2R5THB1000M	2012/9	–
	D4D	2R5THD680M	2012/3	2R5TPF680M6L
		4THD470M	2012/9	–
		6THD330M	2012/3	6TPF330M9L
TQC	B15	35TQC2R7MYF	2016	–
	B2	16TQC10M	2023	35TQC10MYFB
		20TQC8R2M	2023	35TQC10MYFB
		25TQC5R6M	2023	35TQC10MYFB
		35TQC3R9MYF	2023	35TQC10MYFB
	D12	16TQC33MYFS	2024	16TQC33MYFD
	D2	16TQC47MW	2023	16TQC47MYFD
		25TQC15MV	2023	25TQC15MYFD
		25TQC22MV	2023	25TQC22MYFD
		35TQC10M	2024	35TQC10MYF
TPH	A09	ETPH100MHA	2018	–
		4TPH68MHA	2018	–
		6TPH47MHA	2018	–
		6TPH100MAEA	2018	–
		ATPH33MAHA	2018	–
	A14	ETPH220MABC	2018	–
		ETPH220MAZC	2013	–
		4TPH150MABC	2018	–
		6TPH100MABC	2018	–
TQS	B1S	16TQS33MBD	2020	–
		25TQS10MED	2020	–
		35TQS6R8MHD	2020	–
TA	D2E	10TAE68M	2023	10TVE68M

Series	Size code	Models for deletion	Year of deletion	Alternative model
TPE	C2	2R5TPE330MFC2	2012/9	2R5TPE330MF
		2R5TPE330MIC2	2012/9	2R5TPE330MF
		2R5TPE330MCC2	2012/9	2R5TPE330MC
		2R5TPE330M9C2	2012/9	2R5TPE330M9
		4TPE220MFC2	2012/9	4TPE220MF
		4TPE220MIC2	2012/9	4TPE220MI
		4TPE220MPC2	2012/9	4TPE220MI
		6TPE150MIC2	2012/9	6TPE150MI
		6TPE150MPC2	2012/9	6TPE150M
		8TPE100MPC2	2012/9	10TPF150ML
	C3	2R5TPE330MFC	2012/9	2R5TPE330MF
		2R5TPE330MIC	2012/9	2R5TPE330MF
		2R5TPE330MPC	2012/9	2R5TPE330MF
		4TPE220MIC	2012/9	4TPE220MI
		4TPE220MPC	2012/9	4TPE220MI
		6TPE150MPC	2012/9	6TPE150M
		6TPE220MIC	2012/9	6TPE220MI
		6TPE220MPC	2012/9	6TPE220M
		10TPE150MGC	2012/9	10TPE220ML
		10TPE180MGC	2012/9	10TPE220ML
	D15E	6TPE470MAZU	2024	6TPE470M
	D2E	2TPE330M6	2011	ETPSF270M6E
		2TPE330M7	2011	2R5TPE330M7
		2TPE330M9	2011	2R5TPE330M9
		2TPE470M6	2011	2R5TPF470M6L
		2TPE470M7	2011	2R5TPE470M7
		2TPE470M9	2011	2R5TPE470M9
	D3L	6TPE330MAL	2021	6TPE330ML
TPF	D2E	2TPF470M6	2012/9	2R5TPF470M6L
		2TPF220M6	2024	ETPSF270M6E
		2TPF330M6	2024	ETPSF270M6E
	D3L	2R5TPF330M7L	2023	2R5TPF470M7L
		4TPF470M5EL	2014	–
		6TPF330M5EL	2014	–
TPG	B1G	4TPG150M	2012/9	6TPS150MUD
		6TPG68MG	2012/9	6TPS150MUD
		2R5TPG220M	2021	ETPS220MUD
		6TPG100M	2021	6TPS150MUD
		6TPG100MG	2021	6TPS150MUD
		6TPG100MZGD	2021	6TPS150MUD
		8TPG47M	2021	10TPE47MAZB
		10TPG33M	2011	16TQC33MYFB
		10TPG47M	2024	10TPE47MAZB
		12TPG33M	2024	16TQC33MYFB
	B15G	6TPG220MZG	2014	–
		2R5TPG220MUG	2021	ETPS220MUD
		4TPG220M	2021	4TPS220MUD
		6TPG150M	2021	6TPS150MUD
		6TPG150MZG	2021	6TPS150MUD
TPL	D2T	2R5TPL220MC	2012/9	–
		2R5TPL330M7	2011/7	–
		All models	2013	–
	D12T	All models	2013	–
	D15T	All models	2013	–
TPLF	D2T	2TPLF470M7	2012/9	–
		2TPLF560M6	2011/7	–
		All models	2013	–
TPSF	B2S	2TPSF270MC	2012/9	2TPSF270M9G
		2TPSF270M9	2012/9	2TPSF270M9G
	B1S	ETPSF200M9ED	2014	–
TR		TR series	–	TA series
APA	D2A	APA series	2006/4	–
APB	D1	APB series	2006/4	–
APC	D2	APC series	2009/6	–
APD	D1	APD series	2009/6	–
TPU	S08	2R5TPU22M	2012/9	–
		4TPU15M	2012/9	–
		6TPU10M	2012/9	–
	S09	2R5TPU22MSI	2011	–
		2R5TPU47MSI	2018	–
		ETPU100MSI	2018	–
		4TPU15MSI	2011	–
		4TPU33MSI	2011	–
		4TPU68MSI	2018	–
		6TPU10MSI	2018	–
		6TPU22MSI	2018	–
		6TPU47MSI	2018	–
		10TPU4R7MSI	2018	–
	S11	2R5TPU47MSK	2012/9	–
		2R5TPU68MSK	2013	–
		4TPU33MSK	2012/9	–
		4TPU47MSK	2013	–
		6TPU22MSK	2012/9	–
		6TPU33MSK	2013	–
	A09	2R5TPU100MAI	2011	–
		4TPU68MAI	2011	–
		6TPU47MAI	2011	–
		10TPU33MAI	2011	–
	B09	4TPU68MBI	2012/9	–
		6TPU47MBI	2012/9	–
		6TPU150MBI	2018	–
		8TPU33MBI	2012/9	–
TLE	B2	ETLE330MCGB	2024/4	ETPE330M9GB
		6TLE100MZB	2024/4	6TPE100MZB

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Conductive Polymer Aluminum Solid Capacitors

OS-CON™

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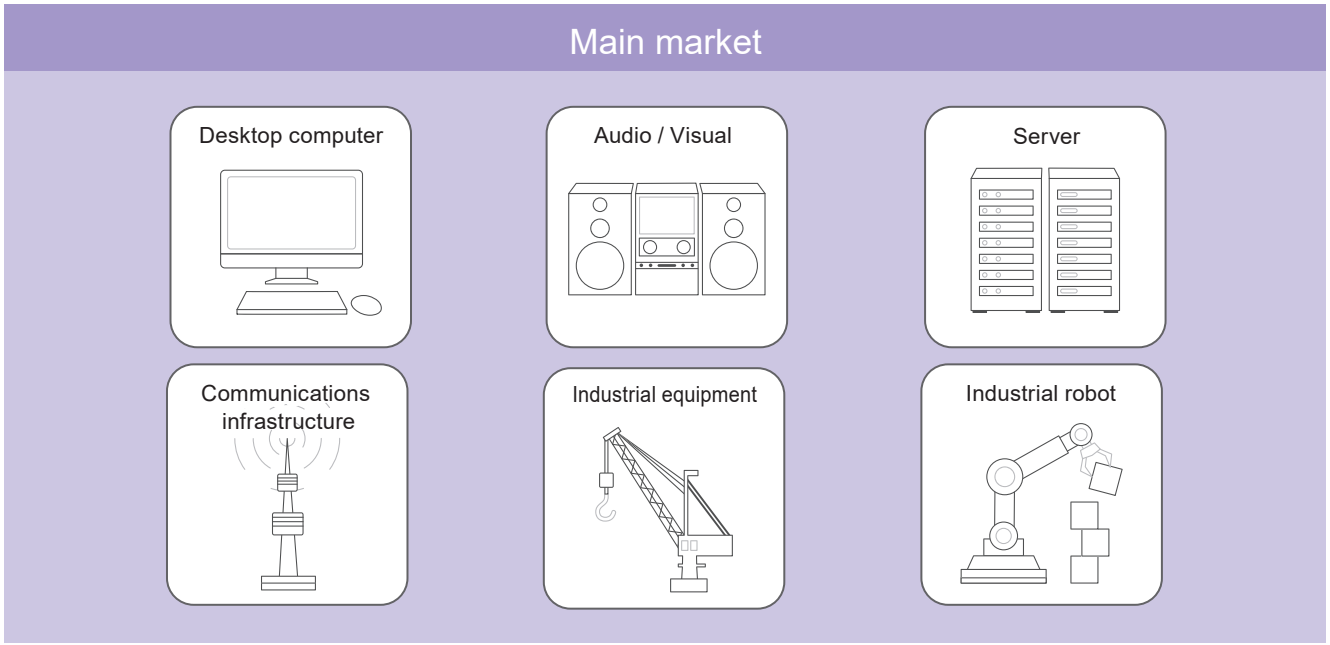
Applications

Main market



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Matters to Be Observed When Using This Product
(Conductive Polymer Aluminum Solid Capacitors / OS-CON)

Use environments and cleaning conditions

■ This product (capacitor) is intended for standard general-purpose use in electronic equipment, and is not designed for use in the specific environments described below. Using the product in such specific environments or service conditions, therefore, may affect the performance of the product.
Please check with us about the performance and reliability of the product first before using the product.

(1) Used in liquid, such as water, oil, chemicals, and organic solvents.
(2) Used in a place exposed to direct sunlight, an outdoor place with no shielding, or a dusty place.
(3) Used in a wet place (dew concentration on a resistor, water leakage, etc.), a place exposed to sea breeze, or a place filled with a corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_X.
(4) Used in an environment where static electricity and electromagnetic waves are strong.
(5) The product is located close to a heating component or a flammable material, such as a vinyl cable, is placed near the product.
(6) The product is used sealed with a resin, etc.
(7) Solder flux of the soldered product is cleansed with a solvent, water, and a water-soluble cleaner.
(Be careful with water soluble solder flux.)
(8) Used in an environment where an acidic or alkali atmosphere is present.
(9) Used in an environment where excessive vibration or impact is applied to the product.
(10) Used under a low atmospheric pressure condition or depressurized condition.

■ Cleaning can be performed with cleaning agents, including higher-grade alcohol-based cleaning solutions such as Pine Alpha ST-100S, Cleanthru 750H, 750L, 710M, 750K, Techno Care FRW14-17, CFC substitutes such as AK-225AES, and IPA. Please confirm the following precautions before cleaning.

(1) Use an immersion, ultrasonic wave, or other cleaning method, and the cleaning time should not exceed 2 minutes.
(2) The temperature of the cleaning solution should be less than or equal to 60 °C.
(3) Control contamination of cleaning agents (conductivity, pH, specific gravity, water content, etc.).
(4) After cleaning, do not store the product in the atmosphere of the cleaning solution or in an airtight container.
(5) When drying the circuit board or this product, use hot air below the upper limit temperature of their category.
(6) Please be mindful that rubbing the printed surface of this product after cleaning may erase the markings depending on the cleaning agent used.
(7) Please contact us separately for details on cleaning agents, cleaning methods, etc., and for cleaning solutions other than those listed above.

■ Fixing agents and coating agents

(1) Select appropriate materials for the outer packaging and sealing materials of this product. Do not use acetone, especially in fixing agents, coating agents, or diluents.
(2) When using a fixing agent or coating agent, ensure that no flux residue or contamination remains between the circuit board and the sealing area of this product.
(3) Allow cleaning agents, etc. to dry before using fixing agents or coating agents.
(4) Please contact us for thermal curing conditions for fixing agents or coating agents.

■ When the capacitor is used in a circuit where an impact voltage is applied or a high voltage is applied in a short period (transient phenomenon) or a high pulse voltage is applied, make sure to use the capacitor at a voltage equal to or lower than its rated voltage.

Response to anomalies and handling conditions

■ The main failure mode is a short-circuit mode caused mainly by thermal stress, electrical stress, and mechanical stress due to soldering and operating temperature environments. To prevent the occurrence of short circuits, the following measures should be adequately taken to ensure safety.

(1) If odorous gases are generated, then turn off the main power of the set equipment and stop using it. In this case, keep your face and hands away from the equipment.
(2) Depending on conditions, it may take several seconds to several minutes before odorous gases are generated. When using a protection circuit, design it so that it operates during this period.
(3) If odorous gases get into your eyes or are inhaled, immediately wash your eyes with water or gargle.
(4) Do not lick the electrolyte of the product. If the electrolyte gets on your skin, then wash it off with soap.
(5) When a current value after the short of the product is extremely large, the shorted capacitor may spark out, which, in the worst scenario, may result in ignition. Ensure the safety of the circuit by, for example, giving it a redundant circuit structure or providing it with a protective circuit.

Reliability and product life

The failure rate of the capacitor is specified based on 0.5%*/1000 h (reliability level 60%), a failure rate conforming to JIS C 5003 (failure rate level). This indicates that the possibility of occurrence of a failure is by no means zero.
One of the failure modes is a wear out failure. This happens when the period of guaranteeing the durability and high-temperature/high-humidity resistance of the capacitor is over, changes in the electrical characteristics of the capacitor (product) get larger and its electrolyte gradually deteriorates into an insulating material to create an open mode.
Another failure mode is a random failure in which a short mode results mainly because of thermal, electrical, or mechanical stress, etc.

Circuit design and circuit board design

■ Due to reasons such as increased leakage currents, do not use this product in high impedance circuits, coupling circuits, time constant circuits, and circuits that are significantly affected by leakage currents.

■ During circuit design, be mindful that the electrical characteristics of this product, such as capacitance and ESR, may fluctuate within the specified ranges even under conditions that meet the rated electrical and mechanical performance.

■ Leakage currents may increase due to mechanical and thermal stress (soldering, high-temperature no-load test, etc.). However, when the voltage (lower than or equal to the category voltage and upper limit temperature) is applied, leakage currents gradually decrease due to the self-recovery function.

■ If an excessive rush current flows due to rapid charging and discharging, then it may lead to short circuits and increased leakage currents. Therefore, apply a protection circuit to this product if the rush current value flowing through it is as follows.

(1) When a rush current of 10 A or more flows through a product whose tenfold allowable ripple current is less than 10 A.
(2) With regard to a product whose tenfold allowable ripple current is 10 A or more, when a rush current exceeding the tenfold value flows through the product.

■ The resin on the surface of the case does not guarantee insulation. In addition, there is an indefinite resistance between the case and the cathode terminal, and they are not insulated. Therefore, completely isolate the case from the cathode terminal, anode terminal, and circuit pattern.

Mounting and storage conditions

■ Soldering with a soldering iron

(1) Since the lead wire pitch dimension of the radial lead type capacitor and the printed circuit board hole pitch dimension do not match, when processing the lead wires, do not apply stress to the body before soldering.
(2) When soldering, do not apply excessive stress to the body of this product.
(3) Once the product has been soldered, when using a soldering iron to remove it, remove it after the solder has completely melted so as not to apply stress to the electrode terminals of the product.
(4) Do not allow the tip of the soldering iron to touch the body of this product.

■ Flow soldering

(1) Do not apply flow soldering to the surface mount type model of this product.
(2) Do not solder this product by immersing its body in molten solder.
(3) Solder only on the opposite side of the circuit board surface where this product is mounted.
(4) Do not allow flux to adhere to parts other than the electrode terminals.
(5) Do not allow other parts to fall over and come into contact with this product during soldering.

■ Reflow soldering

(1) Do not apply reflow soldering to the radial lead type model of this product.
(2) Please contact us separately for soldering conditions for using the VPS method.

■ Handling after soldering

Observe the following precautions to avoid applying excessive stress on this product.

(1) Do not tilt, knock over, or twist this product.
(2) Do not move the circuit board by grabbing this product.
(3) Do not hit this product with objects.
(4) When stacking circuit boards, do not allow circuit boards or other parts to come in contact with this product.

■ It is recommended that all components in the bag be used up by opening the bag immediately before use. However, if the remaining components are to be stored after opening the bag, please use them up within the following specified period* to maintain good solderability.

* The surface mount type does not comply with the JEDEC J-STD-020 specification.

(1) Surface mount type	: Within 24 months after shipment (before opening) and within 30 days after opening (packaged with carrier tape)
(2) Radial lead type (bagged product)	: Within 30 months after shipment (before opening) and within 7 days after opening
(3) Radial lead type (taped product)	: Within 24 months after shipment (before opening) and within 7 days after opening

Reference information

Intellectual property

Panasonic Group provides customers with safe products and services. We are also making great efforts to protect our intellectual property rights for Panasonic Group products. Typical patents related to this product are as follows.

＊No target

Line up

SMD type

Series	Features	Small size/Low profile	Large cap.	Low ESR	High voltage	Long life/High reliability	Category tem. range (℃)	Rated voltage range (V)	ESR (mΩ)	Rated capcitance. range (μF)	Size code	Size (mm) øD	Size (mm) L
SVT	Low ESR Large capacitnce 125 ℃ 2000 h		●	●	●	●	-55 to 125	2.5 to 16	15 to 24	100 to 820	C65	6.3	6.4
							-55 to 125	2.5 to 50	20 to 35	18 to 680	E7	8.0	6.9
							-55 to 125	16	18	560	E10	8.0	10.0
							-55 to 125	2.5 to 50	10 to 25	39 to 1500	E12	8.0	11.9
							-55 to 125	16	16	1000	F10	10.0	10.0
							-55 to 125	2.5 to 50	12 to 20	68 to 2700	F12	10.0	12.6
SVPT	Low ESR Large capacitnce 105 ℃ 20000 h		●	●	●	●	-55 to 105	2.5 to 16	15 to 24	100 to 820	C65	6.3	6.4
							-55 to 105	2.5 to 50	20 to 35	18 to 680	E7	8.0	6.9
							-55 to 105	16	18	560	E10	8.0	10.0
							-55 to 105	2.5 to 50	10 to 25	39 to 1500	E12	8.0	11.9
							-55 to 105	16	16	1000	F10	10.0	10.0
							-55 to 105	2.5 to 50	12 to 20	68 to 2700	F12	10.0	12.6
SVF	High voltage Large capacitance 125 ℃ 1000 h		●		●	●	-55 to 125	16 to 25	27 to 40	27 to 82	B6	5.0	5.9
							-55 to 125	16 to 50	22 to 40	10 to 180	C6	6.3	5.9
							-55 to 125	16 to 50	22 to 35	18 to 270	E7	8.0	6.9
							-55 to 125	16 to 50	14 to 25	39 to 560	E12	8.0	11.9
							-55 to 125	16	16	1000	F10	10.0	10.0
							-55 to 125	16 to 50	12 to 20	68 to 1000	F12	10.0	12.6
SVPK	High voltage Large capacitance 125 ℃ 1000 h		●		●	●	-55 to 125	16 to 50	27 to 80	10 to 100	B6	5.0	5.9
							-55 to 125	16 to 50	22 to 35	22 to 220	C6	6.3	5.9
							-55 to 125	16 to 50	22 to 35	33 to 330	E7	8.0	6.9
							-55 to 125	16 to 50	14 to 25	68 to 680	E12	8.0	11.9
							-55 to 125	16 to 50	12 to 20	120 to 1200	F12	10.0	12.6
UPDATE SXV	Super high voltage 125 ℃ 1000 h				●	●	-55 to 125	63 to 100	60	6.8 to 18	E7	8.0	6.9
							-55 to 125	63 to 100	50 to 60	15 to 39	F8	10.0	7.9
							-55 to 125	63 to 100	25 to 40	15 to 82	E12	8.0	11.9
							-55 to 125	63 to 100	25 to 30	18 to 150	F12	10.0	12.6
SVPG*1	Low ESR High ripple current 105 ℃ 5000 h			●		●	-55 to 105	16 to 25	25 to 30	15 to 47	B45	5.0	4.4
							-55 to 105	16	15	100	B6	5.0	5.9
							-55 to 105	16 to 25	14 to 18	82 to 220	C6	6.3	5.9
							-55 to 105	16 to 25	10 to 14	120 to 270	C8	6.3	7.9
							-55 to 105	16 to 25	8 to 13	150 to 270	C10	6.3	9.9
							-55 to 105	16	6.5	330	C10L	6.3	10.4
							-55 to 105	16 to 25	16 to 18	120 to 330	E7	8.0	6.9
							-55 to 105	16	10	560	E10	8.0	10.0
							-55 to 105	16 to 25	8 to 12	270 to 680	E12	8.0	11.9
							-55 to 105	16	9	820	F10	10.0	10.0
							-55 to 105	16 to 25	7 to 10	470 to 1200	F12	10.0	12.6
SVPF	High voltage Large capacitance 105 ℃ 5000 h		●		●	●	-55 to 105	16 to 25	27 to 40	27 to 82	B6	5.0	5.9
							-55 to 105	16 to 50	22 to 40	10 to 180	C6	6.3	5.9
							-55 to 105	16 to 50	22 to 35	18 to 270	E7	8.0	6.9
							-55 to 105	16	18	560	E10	8.0	10.0
							-55 to 105	16 to 50	14 to 25	39 to 560	E12	8.0	11.9
							-55 to 105	16	16	1000	F10	10.0	10.0
							-55 to 105	16 to 50	12 to 20	68 to 1000	F12	10.0	12.6

*1: Some part numbers are not a recommended product

Line up

SMD type

Series	Features	Small size/Low profile	Large cap.	Low ESR	High voltage	Long life/High reliability	Category tem. range (℃)	Rated voltage range (V)	ESR (mΩ)	Rated capcitance. range (μF)	Size code	Size (mm) øD	Size (mm) L
SVPA*1	Low ESR High ripple current			●			-55 to 105	2.5 to 20	30 to 40	10 to 82	B6	5.0	5.9
							-55 to 105	2.5 to 20	20 to 35	22 to 180	C6	6.3	5.9
							-55 to 105	2.5 to 20	20 to 33	47 to 330	E7	8.0	6.9
							-55 to 105	2.5 to 16	19 to 29	180 to 820	F8	10.0	7.9
SVPC	Low ESR Large capacitance		●	●			-55 to 105	2.5 to 16	19 to 35	39 to 180	B6	5.0	5.9
							-55 to 105	2.5 to 16	15 to 30	68 to 560	C6	6.3	5.9
							-55 to 105	2.5 to 16	19 to 27	120 to 680	E7	8.0	6.9
							-55 to 105	2.5 to 16	9 to 16	270 to 1500	E12	8.0	11.9
							-55 to 105	2.5	12	2700	F12	10.0	12.6
SVPD*1	Guaranteed at 125℃ High voltage 85 ℃ 85 % RH				●	●	-55 to 125	10 to 25	45 to 65	10 to 56	C6	6.3	5.9
							-55 to 125	16 to 35	40 to 70	8.2 to 82	E7	8.0	6.9
							-55 to 125	25 to 35	45 to 60	18 to 39	F8	10.0	7.9
							-55 to 125	25 to 35	30 to 50	22 to 47	E12	8.0	11.9
							-55 to 125	25 to 35	28 to 30	47 to 82	F12	10.0	12.6
SVPE	Low ESR Large capacitance		●	●			-55 to 105	2.5 to 6.3	10 to 15	150 to 390	B6	5.0	5.9
							-55 to 105	2.5 to 10	10 to 20	220 to 820	C6	6.3	5.9
							-55 to 105	2.0 to 16	8 to 11	180 to 1200	C10	6.3	9.9
							-55 to 105	16	10	470	F12	10.0	12.6
SVPS*1	Long life					●	-55 to 105	4.0 to 10	200 to 220	10 to 33	A5	4.0	5.4
							-55 to 105	4.0 to 16	30 to 90	22 to 68	B6	5.0	5.9
							-55 to 105	4.0 to 20	22 to 60	22 to 150	C6	6.3	5.9
							-55 to 105	4.0 to 25	22 to 60	10 to 270	E7	8.0	6.9
							-55 to 105	4.0 to 16	20 to 35	100 to 680	F8	10.0	7.9
SVQP*1	Guaranteed at 125 ℃					●	-55 to 105	4.0 to 20	40 to 60	22 to 150	C6	6.3	5.9
							-55 to 105	6.3 to 20	35 to 45	47 to 220	E7	8.0	6.9
SVP*1	Standard						-55 to 105	4.0 to 16	200 to 260	3.3 to 33	A5	4.0	5.4
							-55 to 105	4.0 to 20	60 to 120	10 to 68	B6	5.0	5.9
							-55 to 105	2.5 to 20	23 to 60	22 to 220	C6	6.3	5.9
							-55 to 105	4.0 to 20	35 to 45	33 to 330	E7	8.0	6.9
							-55 to 105	4.0 to 20	25 to 40	56 to 680	F8	10.0	7.9
							-55 to 105	2.5 to 20	13 to 24	100 to 680	E12	8.0	11.9
							-55 to 105	2.5 to 20	12 to 20	150 to 1500	F12	10.0	12.6

*1: Some part numbers are not a recommended product

Line up

Radial lead type (Not recommended for new design)

Series	Features	Small size/Low profile	Large cap.	Low ESR	High voltage	Long life/High reliability	Category tem. range (℃)	Rated voltage range (V)	ESR (mΩ)	Rated capcitance. range (μF)	Size code	Size (mm) øD	Size (mm) L
SEF	High voltage Large capacitance 125 ℃ 1000 h		●		●	●	-55 to 125	16 to 35	22 to 35	22 to 180	C6	6.3	5.9
							-55 to 125	16 to 35	22 to 30	39 to 270	E7	8.0	6.9
							-55 to 125	16 to 35	14 to 20	82 to 560	E12	8.0	11.9
							-55 to 125	16 to 5	12 to 18	120 to 1000	F13	8.0	12.9
SEK	High voltage Large capacitance 125 ℃ 1000 h		●		●	●	-55 to 125	25 to 50	25 to 35	22 to 82	C6	6.3	5.9
							-55 to 125	25 to 50	24 to 35	33 to 120	E7	8.0	6.9
							-55 to 125	25 to 50	16 to 25	68 to 270	E12	8.0	11.9
							-55 to 125	25 to 50	14 to 20	120 to 470	F13	8.0	12.9
SEPG	Low ESR High ripple current 105 ℃ 5000 h			●		●	-55 to 105	16	12	150	B9	5.0	8.9
							-55 to 105	16	10	270	C9	10.0	8.9
							-55 to 105	16	8	270	C10	6.3	9.9
							-55 to 105	16	8	470	E9	8.0	8.9
							-55 to 105	16	8	560	E13	8.0	12.9
SXE	Super high voltage 125 ℃ 1000 h				●	●	-55 to 125	63 to 100	60	6.8 to 18	E7	8.0	6.9
							-55 to 125	63 to 100	50 to 60	15 to 39	F8	8.0	7.9
							-55 to 125	63 to 100	25 to 40	15 to 68	E12	8.0	11.9
							-55 to 125	63 to 100	25 to 30	18 to 120	F13	8.0	12.9
SEPF	Small size Low profile High voltage Large capacitance 105 ℃ 5000 h	●	●		●	●	-55 to 105	16 to 32	30 to 35	22 to 150	C55	6.3	5.4
							-55 to 105	16 to 35	22 to 35	22 to 180	C6	6.3	5.9
							-55 to 105	16 to 35	22 to 30	39 to 270	E7	8.0	6.9
							-55 to 105	16 to 35	14 to 20	82 to 560	E12	8.0	11.9
							-55 to 105	16 to 35	12 to 18	120 to 1000	F13	10.0	12.9
SEPC	Super low ESR Large capacitance Small size Low profile 105 ℃ 5000 h	●	●	●		●	-55 to 105	2.5	7	100 to 560	B9	5.0	8.9
							-55 to 105	6.3	18	220	C55	6.3	5.4
							-55 to 105	2.5 to 16	10 to 24	100 to 560	C6	6.3	5.9
							-55 to 105	2.5 to 16	7 to 10	100 to 820	C9	6.3	8.9
							-55 to 105	2.5 to 16	8 to 22	150 to 1000	E7	8.0	6.9
							-55 to 105	2.5 to 16	5 to 10	180 to 1000	E9	8.0	8.9
							-55 to 105	16	11 to 16	180 to 270	E12	8.0	11.9
							-55 to 105	2.5 to 6.3	7 to 8	470 to 820	E13	8.0	12.9
							-55 to 105	2.5 to 16	7 to 10	470 to 2700	F13	10.0	12.9
SEQP	105 ℃ 5000 h Guaranteed at 125 ℃ Rated 32 V max.				●	●	-55 to 125	4.0 to 20	40 to 60	22 to 150	C6	6.3	5.9
							-55 to 125	4.0 to 32	35 to 100	6.8 to 330	E7	8.0	6.9
							-55 to 125	4.0 to 32	25 to 80	15 to 680	F8	10.0	7.9
							-55 to 125	4.0 to 32	13 to 50	18 to 560	E12	8.0	11.9
							-55 to 125	4.0 to 20	12 to 20	150 to 1200	F13	10.0	12.9
SEP	Standard				●	●	-55 to 105	4.0 to 20	40 to 60	22 to 150	C6	6.3	5.9
							-55 to 105	4.0 to 20	35 to 45	33 to 330	E7	8.0	6.9
							-55 to 105	4.0 to 20	25 to 40	56 to 680	F8	10.0	7.9
							-55 to 105	2.5 to 20	13 to 24	100 to 680	E12	8.0	11.9
							-55 to 105	2.5 to 20	12 to 20	150 to 1500	F12	10.0	12.9

Series flow chart

● SMD type

SVP*1
Standard

A5 size	4.0 to 16 V, 3.3 to 33 µF
B6 size	4.0 to 20 V, 10 to 68 µF
C6 size	2.5 to 20 V, 22 to 220 µF
E7 size	4.0 to 20 V, 33 to 330 µF
E12 size	2.5 to 20 V, 100 to 680 µF
F8 size	4.0 to 20 V, 56 to 680 µF
F12 size	2.5 to 20 V, 150 to 1500 µF

SVPA*1
Low ESR
High ripple current

B6 size	2.5 to 20 V, 10 to 82 µF
C6 size	2.5 to 20 V, 22 to 180 µF
E7 size	2.5 to 20 V, 47 to 330 µF
F8 size	2.5 to 16 V, 180 to 820 µF

SVPC*1
Large capacitance
Low ESR

B6 size	2.5 to 16 V, 39 to 180 µF
C6 size	2.5 to 16 V, 68 to 560 µF
E7 size	2.5 to 16 V, 120 to 680 µF
E12 size	2.5 to 16 V, 270 to 1500 µF
F12 size	2.5 V, 2700 µF

SVPF
105°C 5000h
High voltage
Large capacitance

B6 size	16 to 25 V, 27 to 82 µF
C6 size	16 to 50 V, 10 to 180 µF
E7 size	16 to 50 V, 18 to 270 µF
E10 size	16 V, 560 µF
E12 size	16 to 50 V, 39 to 560 µF
F10 size	16 V, 1000 µF
F12 size	16 to 50 V, 68 to 1000 µF

SVPE
Large capacitance
Low ESR

B6 size	2.5 to 6.3 V, 150 to 390 µF
C6 size	2.5 to 10 V, 220 to 820 µF
C10 size	2.5 to 16 V, 180 to 1200 µF
F12 size	16 V, 470 µF

SVPS*1
Long life

A5 size	4.0 to 10 V, 10 to 33 µF
B6 size	4.0 to 16 V, 22 to 68 µF
C6 size	4.0 to 20 V, 22 to 150 µF
E7 size	4.0 to 25 V, 10 to 270 µF
F8 size	4.0 to 16 V, 100 to 680 µF

SVQP
Guaranteed at 125°C

C6 size	4.0 to 20 V, 22 to 150 µF
E7 size	6.3 to 20 V, 47 to 270 µF

SVPD*1
125℃ 1000h
High voltage

C6 size	10 to 25 V, 10 to 56 µF
E7 size	16 to 35 V, 8.2 to 82 µF
E12 size	25 to 35 V, 22 to 47 µF
F8 size	25 to 35 V, 18 to 39 µF
F12 size	25 to 35 V, 47 to 82 µF

SXV
UPDATE
125°C 1000h
Super high voltage

E7 size	63 to 100 V, 6.8 to 18 µF
E12 size	63 to 100 V, 15 to 82 µF
F8 size	63 to 100 V, 15 to 39 µF
F12 size	63 to 100 V, 18 to 150 µF

SVPG*1
Low ESR
High ripple current

B45 size	16 to 25 V, 15 to 47 µF
B6 size	16 V, 100 µF
C6 size	16 to 25 V, 82 to 220 µF
C8 size	16 to 25 V, 120 to 270 µF
C10 size	16 to 25 V, 150 to 270 µF
C10L size	16 V, 330 µF
E7 size	16 to 25 V, 120 to 330 µF
E10 size	16 V, 560 µF
E12 size	16 to 25 V, 270 to 680 µF
F10 size	16 V, 820 µF
F12 size	16 to 25 V, 470 to 1200 µF

SVF
125°C 1000h
High voltage
Large capacitance

B6 size	16 to 25 V, 27 to 82 µF
C6 size	16 to 50 V, 10 to 180 µF
E7 size	16 to 50 V, 18 to 270 µF
E12 size	16 to 50 V, 39 to 560 µF
F10 size	16 V, 1000 µF
F12 size	16 to 50 V, 68 to 1000 µF

SVPK
125°C 1000h
High voltage
Large capacitance

B6 size	16 to 50 V, 10 to 100 µF
C6 size	16 to 50 V, 22 to 220 µF
E7 size	16 to 50 V, 33 to 330 µF
E12 size	16 to 50 V, 68 to 680 µF
F12 size	16 to 50 V, 120 to 1200 µF

SVPT
105°C 20000h
Low ESR
Large capacitance

C65 size	2.5 to 16 V, 100 to 820 µF
E7 size	2.5 to 50 V, 18 to 680 µF
E10 size	16 V, 560 µF
E12 size	2.5 to 50 V, 39 to 1500 µF
F10 size	16 V, 1000 µF
F12 size	2.5 to 50 V, 68 to 2700 µF

SVT
125°C 2000h
Low ESR
Large capacitance

C65 size	2.5 to 16 V, 100 to 820 µF
E7 size	2.5 to 50 V, 18 to 680 µF
E10 size	16 V, 560 µF
E12 size	2.5 to 50 V, 39 to 1500 µF
F10 size	16 V, 1000 µF
F12 size	2.5 to 50 V, 68 to 2700 µF

*1: Some part numbers are not a recommended product

Series flow chart

● Radial lead type (Not recommended for new design)

SEP
Standard

- **C6 size** 4.0 to 20 V 3.3 to 33 µF
- **E7 size** 4.0 to 20 V 33 to 330 µF
- **E12 size** 2.5 to 20 V 100 to 680 µF
- **F8 size** 4.0 to 20 V 56 to 680 µF
- **F13 size** 2.5 to 20 V 150 to 1500 µF

SEPC
105°C 5000h
Super low ESR
Large capacitance

- **B9 size** 2.5 V 100 to 560 µF
- **C55 size** 6.3 V 220 µF
- **C6 size** 2.5 to 16 V 100 to 560 µF
- **C9 size** 2.5 to 16 V 100 to 820 µF
- **E7 size** 6.3 to 16 V 150 to 1000 µF
- **E9 size** 2.5 to 16 V 180 to 1000 µF
- **E12 size** 16 V 180 to 270 µF
- **E13 size** 2.5 to 6.3 V 470 to 820 µF
- **F13 size** 2.5 to 6.3 V 470 to 2700 µF

SEPF
105°C 5000h
High voltage
Large capacitance

- **C55 size** 16 to 32 V 22 to 150 µF
- **C6 size** 16 to 35 V 22 to 180 µF
- **E7 size** 16 to 35 V 39 to 270 µF
- **E12 size** 16 to 35 V 82 to 560 µF
- **F13 size** 16 to 35 V 120 to 1000 µF

SEQP
105°C 5000h
Guaranteed at 125°C
High voltage

- **C6 size** 4.0 to 20 V 22 to 150 µF
- **E7 size** 4.0 to 32 V 6.8 to 330 µF
- **E12 size** 4.0 to 32 V 18 to 560 µF
- **F8 size** 4.0 to 32 V 15 to 680 µF
- **F13 size** 4.0 to 20 V 150 to 1200 µF

SXE
125°C 1000h
Super high voltage

- **E7 size** 63 to 100 V 6.8 to 18 µF
- **E12 size** 63 to 100 V 15 to 68 µF
- **F8 size** 63 to 100 V 15 to 39 µF
- **F13 size** 63 to 100 V 18 to 120 µF

SEF
125°C 1000h
High voltage
Large capacitance

- **C6 size** 16 to 35 V 22 to 180 µF
- **E7 size** 16 to 35 V 39 to 270 µF
- **E12 size** 16 to 35 V 82 to 560 µF
- **F8 size** 16 to 35 V 120 to 1000 µF

SEPG
105°C 50000h
Low ESR
High ripple current

- **B9 size** 16 V 150 µF
- **C9 size** 16 V 270 µF
- **C10 size** 16 V 270 µF
- **E9 size** 16 V 470 µF
- **E13 size** 16 V 560 µF

SEK
125°C 1000h
High voltage
Large capacitance

- **C6 size** 25 to 50 V 22 to 82 µF
- **E7 size** 25 to 50 V 33 to 120 µF
- **E12 size** 25 to 50 V 68 to 270 µF
- **F8 size** 25 to 50 V 120 to 470 µF

Voltage - Capacitance table (SMD type) (Vol. : 2.0 to 16 V / Cap. : 6.8 to 56 μF)

Series [Size]
(ESR mΩ)

V \ μF	6.8	10	12	15	18	22	27	33	39	47	56
2.0											
2.5											
4.0											
6.3										SVPA [B6] (30)	
										SVPS [B6] (30)	
										SVP [B6] (70)	
10										SVP [C6] (50)	SVPD [C6] (45)
											SVQP [C6] (45)
											SVP [C6] (45)
16							SVP [B6] (120)		SVPA [C6] (35,24)	SVPG [B45] (25)	SVP [E7] (45)
									SVPC [B6] (35,27)		
									SVPS [C6] (24)		
									SVQP [C6] (50)		
									SVP [C6] (50)		

Size list ø x L (mm)

A5	4.0x5.4	B45	5.0x4.4	C6	6.3x5.9	C8	6.3x7.9	E7	8.0x6.9	F8	10.0x7.9
		B6	5.0x5.9	C65	6.3x6.4	C10	6.3x9.9	E10	8.0x10.0	F10	10.0x10.0
						C10L	6.3x10.4	E12	8.0x11.9	F12	10.0x12.6

Voltage - Capacitance table (SMD type) (Vol. : 2.0 to 16 V / Cap. : 68 to 470 µF)

Series [Size]
(ESR mΩ)

V \ µF	68	82	100	120	150	180	220	270	330	390	470
2.0											
2.5						SVPC [B6] (30,24,19)	SVP [C6] (23)	SVPE [B6] (10)	SVPE [B6] (15,10)	SVPC [C6] (25,15)	
										SVPE [B6] (10)	
										SVPE [C6] (10)	
4.0	SVPS [B6] (30)				SVPC [B6] (30,23,20)			SVPA [E7] (22)	SVPC [C6] (27,21,15)		
	SVP [B6] (60)				SVPS [C6] (22)				SVP [E7] (35)		
					SVQP [C6] (40)						
					SVP [C6] (40)						
6.3		SVP [C6] (45)	SVPC [B6] (30,25)	SVPA [C6] (22)	SVPE [B6] (12)		SVPA [E7] (22)		SVT [C65] (15)	SVT [E7] (22)	SVPA [F8] (20)
			SVQP [C6] (40)	SVPC [B6] (21)			SVPC [C6] (27,15)		SVPT [C65] (15)	SVPT [E7] (22)	SVPS [F8] (20)
			SVP [C6] (40)	SVPS [C6] (22)			SVPE [B6] (15)		SVPC [C6] (17)	SVPC [E7] (22)	SVP [E12] (15)
				SVP [C6] (17)			SVPE [C6] (10)		SVP [F8] (25)		SVP [F8] (25)
							SVPS [E7] (22)				
							SVQP [E7] (35)				
							SVP [E7] (35)				
							SVP [F8] (25)				
10	SVPA [C6] (30)			SVPC [C6] (27,22)	SVPA [E7] (30)		SVPE [C6] (20)	SVPC [E7] (22)	SVPA [F8] (24)		
	SVPC [B6] (30,23)			SVQP [E7] (35)	SVPS [E7] (30)			SVP [F8] (25)	SVPC [E7] (19)		
	SVPS [C6] (30)			SVP [E7] (35)	SVPS [F8] (30)				SVPS [F8] (24)		
					SVQP [E7] (35)				SVP [E12] (17)		
					SVP [E7] (35)				SVP [F8] (25)		
					SVP [F8] (30)						
16	SVPC [C6] (30,25)	SVPA [E7] (30)	SVT [C65] (24)	SVPC [E7] (27)	SVPC [E7] (22)	SVPA [F8] (29)	SVPG [C6] (14)	SVT [E7] (22)	SVPG [C10L] (6.5)		SVPE [F12] (10)
		SVPD [E7] (40)	SVPT [C65] (24)		SVP [F8] (30)	SVPE [C10] (11)	SVPK [C6] (22)	SVPT [E7] (22)	SVPG [E7] (16)		
		SVPF [B6] (24)	SVPC [C6] (24)			SVPF [C6] (22)		SVPC [E12] (16)	SVPK [E7] (22)		
		SVPS [E7] (30)	SVPG [B6] (15)			SVPS [F8] (29)		SVPF [E7] (22)	SVP [F12] (16)		
		SVQP [E7] (40)	SVPK [B6] (27)			SVP [F8] (30)		SVPG [C8] (10)			
		SVP [E7] (40)	SVPS [F8] (35)			SVP [E12] (20)		SVPG [C10] (8)			
		SVF [B6] (25)	SVP [F8] (35)			SVF [C6] (22)		SVF [E7] (22)			

Size list ø x L (mm)

A5	4.0x5.4	B45	5.0x4.4	C6	6.3x5.9	C8	6.3x7.9	E7	8.0x6.9	F8	10.0x7.9
		B6	5.0x5.9	C65	6.3x6.4	C10	6.3x9.9	E10	8.0x10.0	F10	10.0x10.0
						C10L	6.3x10.4	E12	8.0x11.9	F12	10.0x12.6

Voltage - Capacitance table (SMD type) (Vol. : 2.0 to 16 V / Cap. : 560 to 2700 µF)

Series [Size]
(ESR mΩ)

V \ µF	560	680	820	1000	1200	1500	2700
2.0					SVPE [C10] (8)		
2.5	SVT [C65] (16)	SVT [C65] (16)	SVPA [F8] (19)			SVT [E12] (10)	SVT [F12] (12)
	SVPT [C65] (16)	SVT [E7] (20)	SVPC [E12] (9)			SVPT [E12] (10)	SVPT [F12] (12)
	SVPC [C6] (16)	SVPT [C65] (16)	SVT [C65] (16)			SVPC [E12] (10)	SVPC [F12] (12)
		SVPT [E7] (20)	SVPT [C65] (16)			SVP [F12] (12)	
		SVPC [E7] (20)					
		SVP [E12] (13)					
4.0	SVT [E7] (22)	SVPA [F8] (20)			SVPC [E12] (12)	SVT [E12] (12)	
	SVPT [E7] (22)	SVPS [F8] (20)			SVP [F12] (12)	SVPT [E12] (12)	
	SVPC [E7] (22)	SVP [F8] (25)				SVPC [E12] (12)	
	SVPC [E12] (9)						
	SVP [E12] (13)						
6.3			SVT [E12] (12)				
			SVPT [E12] (12)				
			SVPC [E12] (12)				
			SVP [F12] (12)				
10	SVP [F12] (13)						
16	SVT [E10] (18)	SVPG [E12] (8)	SVPG [F10] (9)	SVT [F10] (18)	SVPG [F12] (7)		
	SVT [E12] (14)	SVPK [E12] (14)		SVT [F12] (12)	SVPK [F12] (12)		
	SVPT [E10] (16)			SVPT [F10] (16)			
	SVPT [E12] (14)			SVPT [F12] (12)			
	SVPF [E10] (18)			SVPF [F10] (16)			
	SVPF [E12] (14)			SVPF [F12] (12)			
	SVPG [E10] (10)			SVF [F10] (16)			
	SVF [E12] (14)			SVF [F12] (12)			

Size list ø x L (mm)

A5	4.0x5.4	B45	5.0x4.4	C6	6.3x5.9	C8	6.3x7.9	E7	8.0x6.9	F8	10.0x7.9
		B6	5.0x5.9	C65	6.3x6.4	C10	6.3x9.9	E10	8.0x10.0	F10	10.0x10.0
						C10L	6.3x10.4	E12	8.0x11.9	F12	10.0x12.6

Voltage - Capacitance table (SMD type) (Vol. : 20 to 100 V / Cap. : 6.8 to 56 μF)

Series [Size]
(ESR mΩ)

V \ μF	6.8	10	12	15	18	22	27	33	39	47	56
20		SVPA [B6] (40)				SVPA [C6] (35)	SVP [C6] (60)	SVPG [B45] (27)		SVPA [E7] (33)	SVPF [B6] (30)
		SVP [B6] (120)				SVPS [C6] (60)		SVP [E7] (45)		SVPS [E7] (45)	SVP [F8] (40)
						SVQP [C6] (60)				SVQP [E7] (45)	SVF [B6] (30)
						SVP [C6] (60)				SVP [E7] (45)	
25		SVPD [C6] (65)				SVPD [E7] (48)	SVPF [B6] (40)	SVPK [B6] (35)	SVPD [F8] (45)	SVPD [E12] (30)	SVPF [C6] (30)
		SVPS [E7] (60)					SVF [B6] (40)			SVPF [C6] (30)	SVF [C6] (30)
										SVF [C6] (30)	
35					SVPD [F8] (60)	SVPD [E12] (50)			SVT [E7] (30)	SVPD [F12] (30)	
						SVPF [C6] (35)			SVPT [E7] (30)	SVPK [C6] (27)	
						SVF [C6] (35)			SVPF [E7] (30)		
						SVPK [B6] (35)			SVF [E7] (30)		
50		SVPF [C6] (40)			SVT [E7] (35)	SVPK [C6] (35)		SVPK [E7] (35)	SVT [E12] (25)		
		SVF [C6] (40)			SVPT [E7] (35)				SVPT [E12] (25)		
		SVPK [B6] (80)			SVPF [E7] (35)				SVPF [E12] (25)		
					SVF [E7] (35)				SVF [E12] (25)		
63					SXV [E7] (60)			SXV [E12] (25)	SXV [E12] (25)		SXV [E12] (25)
									SXV [F8] (50)		
72											
80			SXV [E7] (60)				SXV [E12] (35)	SXV [E12] (35)		SXV [E12] (35)	SXV [E12] (28, 35)
							SXV [F8] (55)			SXV [F12] (28)	SXV [F12] (28)
100	SXV [E7] (60)			SXV [E12] (40)	SXV [E12] (40)	SXV [F12] (30)	SXV [E12] (40)		SXV [F12] (30)		
				SXV [F8] (60)	SXV [F12] (30)		SXV [F12] (30)				

Size list ø x L (mm)

A5	4.0x5.4	B45	5.0x4.4	C6	6.3x5.9	C8	6.3x7.9	E7	8.0x6.9	F8	10.0x7.9
		B6	5.0x5.9	C65	6.3x6.4	C10	6.3x9.9	E10	8.0x10.0	F10	10.0x10.0
						C10L	6.3x10.4	E12	8.0x11.9	F12	10.0x12.6

Voltage - Capacitance table (SMD type) (Vol. : 20 to 100 V / Cap. : 68 to 470 μF)

Series [Size]
(ESR mΩ)

V \ μF	68	82	100	120	150	180	220	270	330	390	470
20	SVPK [B6] (30)		SVP [E12] (24)	SVPF [C6] (25)	SVPK [C6] (25)	SVT [E7] (25)	SVPK [E7] (25)			SVT [E12] (14)	SVPK [E12] (14)
	SVP [F8] (40)			SVF [C6] (25)	SVP [F12] (20)	SVPT [E7] (25)	SVPG [E7] (18)			SVPT [E12] (14)	SVPG [E12] (10)
				SVPG [C6] (18)		SVPF [E7] (25)				SVPF [E12] (14)	
						SVF [E7] (25)				SVF [E12] (14)	
						SVPG [C8] (14)					
						SVPG [C10] (11)					
25		SVPD [F12] (28)	SVT [E7] (24)	SVPK [E7] (24)	SVPG [C10] (13)	SVT [E12] (16)		SVPK [E12] (16)	SVT [F12] (14)		SVPK [F12] (14)
		SVPF [E7] (28)	SVPT [E7] (24)	SVPG [C8] (15)		SVPT [E12] (16)		SVPG [E12] (12)	SVPT [F12] (14)		SVPG [F12] (10)
		SVPK [C6] (25)	SVPF [E7] (24)	SVPG [E7] (17)		SVPF [E12] (16)			SVPF [F12] (14)		
		SVF [E7] (28)	SVF [E7] (24)			SVF [E12] (16)			SVF [F12] (14)		
		SVPG [C6] (18)									
35		SVT [E12] (20)		SVT [F12] (18)		SVPK [E12] (20)			SVPK [F12] (18)		
		SVPT [E12] (20)		SVPT [F12] (18)							
		SVPF [E12] (20)		SVPF [F12] (18)							
		SVF [E12] (20)		SVF [F12] (18)							
		SVPK [E7] (25)									
50	SVT [F12] (20)			SVPK [F12] (20)							
	SVPT [F12] (20)										
	SVPF [F12] (20)										
	SVF [F12] (20)										
	SVPK [E12] (25)										
63	SXV [E12] (25)	SXV [E12] (25)	SXV [F12] (25)	SXV [F12] (25)	SXV [F12] (25)						
	SXV [F12] (25)										
72		SXV [F12] (28)	SXV [F12] (28)								
80			SXV [F12] (28)								
100											

Size list ø x L (mm)

A5	4.0x5.4	B45	5.0x4.4	C6	6.3x5.9	C8	6.3x7.9	E7	8.0x6.9	F8	10.0x7.9
		B6	5.0x5.9	C65	6.3x6.4	C10	6.3x9.9	E10	8.0x10.0	F10	10.0x10.0
						C10L	6.3x10.4	E12	8.0x11.9	F12	10.0x12.6

Voltage - Capacitance table (SMD type) (Vol. : 20 to 100 V / Cap. : 560 to 2700 μF)

Series [Size]
(ESR mΩ)

V \ μF	560	680	820	1000	1200	1500	2700
20	SVT [F12] (12)	SVPK [F12] (12)					
	SVPT [F12] (12)	SVPG [F12] (9)					
	SVPF [F12] (12)						
	SVF [F12] (12)						
25							
35							
50							
63							
72							
80							
100							

Size list ø x L (mm)

A5	4.0x5.4	B45	5.0x4.4	C6	6.3x5.9	C8	6.3x7.9	E7	8.0x6.9	F8	10.0x7.9
		B6	5.0x5.9	C65	6.3x6.4	C10	6.3x9.9	E10	8.0x10.0	F10	10.0x10.0
						C10L	6.3x10.4	E12	8.0x11.9	F12	10.0x12.6

Explanation of part numbers

◇ Part number system

・Surface mount type

16	SVP	3R3	M
Rated voltage	Series	Rated capacitance	Capacitance tolerance

R.voltage (V)	Code
2.0	2
2.5	2R5
4.0	4
6.3	6
10	10
16	16
20	20
25	25
35	35
100	100

Series
SVT
SVPT
SVF
SVPK
SXV
SVPG
SVPF
SVPA
SVPB
SVPC
SVPD
SVPE
SVPS
SVQP
SVP

R.capacitance (μF)	Code
3.3	3R3
4.7	4R7
10	10
22	22
100	100
220	220
470	470
1500	1500

Cap. torerance	Code
±20%	M

・Radial lead type

16	SEPC	470	M	+	T
Rated voltage	Series	Rated capacitance	Capacitance tolerance		Taping or forming of terminal code

R.voltage (V)	Code
2.5	2R5※1
4.0	4
6.3	6
10	10
16	16
20	20
25	25
32	32
100	100

Series
SEF
SEK
SEPG
SXE
SEPC
SEPF
SEQP
SEP

R.capacitance (μF)	Code
6.8	6R8
10	10
22	22
100	100
220	220
470	470
1000	1000
2700	2700

Cap. torerance	Code
±20%	M

Taping products and lead terminal cutting products indicate process code.
Regular lead products don't have code.

※1 Code 2 is used for 2.5 V products of B9, C6, C9, E7, E9 and F13 size in SEPC series.

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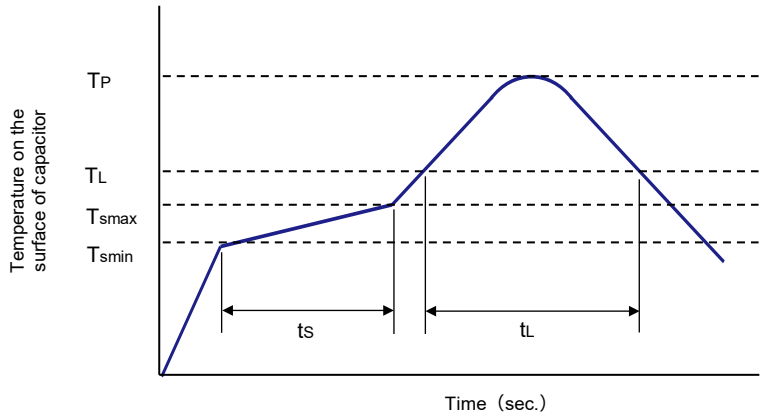
Mounting specifications

◇ Recommendable reflow soldering (SMD type)



Reflow soldering		Condition A	Condition B	Condition C
		Peak temperature 260 °C lead free soldering profile	Peak temperature 250 °C lead free soldering profile	Peak temperature 250 °C lead free soldering profile (SVPG, SVPF, SVF, SVPK, SXV)
Peak temperature (T_P)		260 °C	250 °C	250 °C
Soldering time (t_L) above soldering temperature (T_L)	$T_L \geq 245$ °C	–		30 seconds max.
	$T_L \geq 230$ °C	40 seconds max.		–
	$T_L \geq 220$ °C	50 seconds max.		–
	$T_L \geq 217$ °C	–		90 seconds max.
	$T_L \geq 200$ °C	60 seconds max.		–
Preheat	Temperature max. (T_{smax})	180 °C		200 °C*1
	Temperature min. (T_{smin})	150 °C		
	Time (t_s) from (T_{smin}) to (T_{smax})	120 seconds max.		
The cycles of reflow soldering		1 times	2 times	2 times

*1 SXV series : 180°C

◇ Flow soldering (Radial lead type)

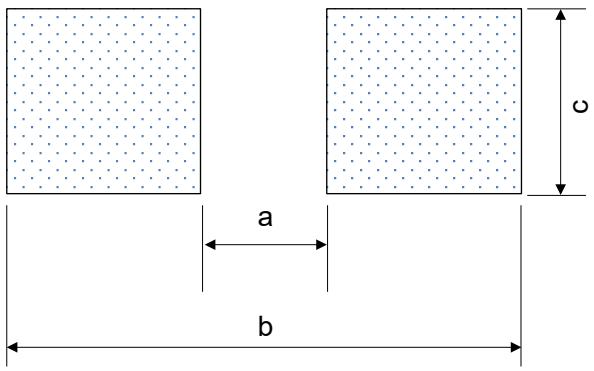
	Temperature	Time	Flow number
Preheating	120 °C or less (ambient temperature)	120 sec. or less	1 time
Soldering condition	260 °C+5 °C or less	10+1 sec. or less	2 times or less*1

*1 : When soldering 2 times, total immersion time should be 10+1 sec. or less.

◇ Soldering with a soldering iron

Tip of a soldering iron : 400 °C±10 °C
Working time : 5 sec. max.

Land Pattern



Unit : mm

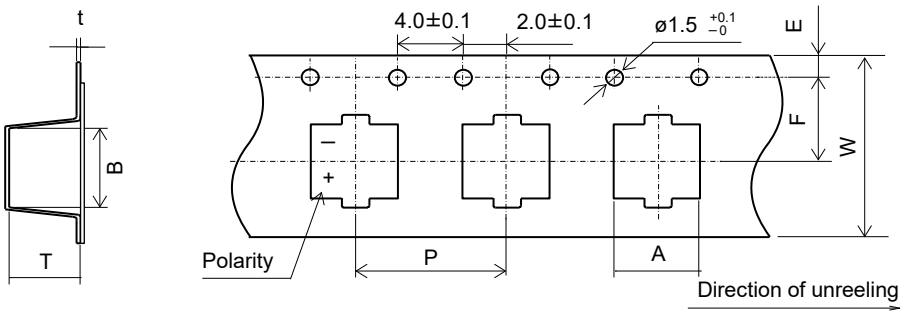
Size code	a	b	c
A5	1.0	6.2	1.6
B45	1.4	7.4	1.6
B6	1.4	7.4	1.6
C6	2.1	9.1	1.6
C65	2.1	9.1	1.6
C8	2.1	9.1	1.6
C10	2.1	9.1	1.6
C10L	2.1	9.1	2.5
E7	2.8	11.1	1.9
E10	2.8	11.1	1.9
E12	2.8	11.1	1.9
F8	4.3	13.1	1.9
F10	4.3	13.1	1.9
F12	4.3	13.1	1.9

Packing specifications

◇ SMD type

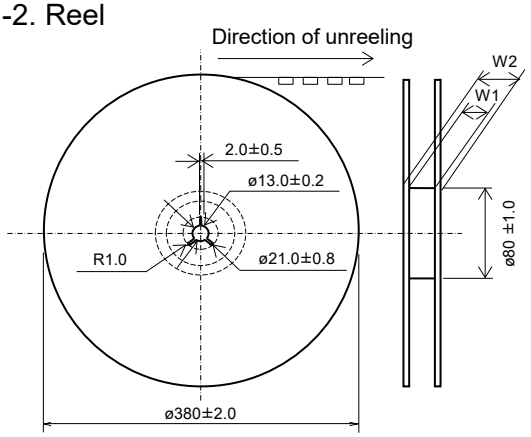
● Taping

1-1. Carrier tape



Size code	A±0.2	B±0.2	W±0.3	F±0.1	E±0.1	P±0.1	t±0.1	T±0.2
A5	4.7	4.7	12.0	5.5	1.75	8.0	0.4	5.8
B45	5.6	5.6	16.0	7.5	1.75	8.0	0.4	4.8
B6	5.6	5.6	16.0	7.5	1.75	8.0	0.4	6.2
C6	6.9	6.9	16.0	7.5	1.75	12.0	0.4	6.2
C65	6.9	6.9	16.0	7.5	1.75	12.0	0.4	6.7
C8	7.0	7.0	16.0	7.5	1.75	12.0	0.5	8.2
C10	7.0	7.0	24.0	11.5	1.75	16.0	0.5	10.5
C10L	7.0	7.0	16.0	7.5	1.75	12.0	0.5	11.0
E7	8.6	8.6	24.0	11.5	1.75	12.0	0.4	7.2
E10	8.6	8.6	24.0	11.5	1.75	16.0	0.5	11.0
E12	8.6	8.6	24.0	11.5	1.75	16.0	0.5	12.3
F8	10.7	10.7	24.0	11.5	1.75	16.0	0.4	8.2
F10	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
F12	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0

1-2. Reel



Size code	W1±0.5	W2±1.0
A5	13.0	17.5
B45, B6, C6, C65, C8, C10L	17.0	21.5
C10, E7, E10, E12, F8, F10, F12	25.0	29.5

● Minimum packing quantity and weight

Size code	Quantity (pcs./Reel, ø380)	Typical weight (g)
A5	2000	700
B45	2500	900
B6	1500	800
C6	1000	800
C65	1000	800
C8	900	800
C10	500	700
C10L	700	900

Size code	Quantity (pcs./Reel, ø380)	Typical weight (g)
E7	1000	1100
E10	500	900
E12	400	800
F8	500	1000
F10	500	1000
F12	400	1000

Packing specifications

◇ Radial lead type (Not recommended for new design)

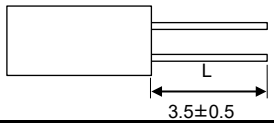
● Lead terminal process

1-1. Correspondence list

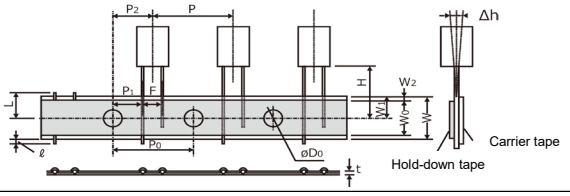
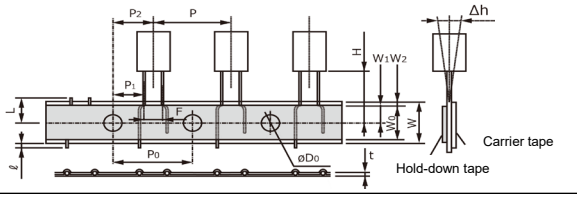
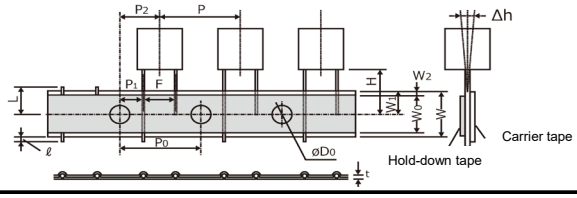
※ The following table is a standard specification. Please contact us separately concerming specifications except for that mentioned below. Because of a limit on the length of a model name, the part of process name changes to +S from +TSS, +D from +TS, +3 from +C3. Please contact us for details.

Series	Size code	Bag-packed products (lead terminal cutting)		Taping products
		Not processed	Straight cut	
SEP, SEQP, SEPC	B9, C55, C6, C9, C10, E7, E9, E12	No code	+C3 (+3)	+TSS (+S)
SEPF, SXE, SEPG	E13	No code	+C3 (+3)	+TS (+D)
SEF, SEK	F8, F13	No code	+C3 (+3)	+T

1-2. Lead terminal cutting specifications

Process names	Size code	Lead terminal cutting code	Lead terminal dimensions
Straight cut	B9 C55, C6, C9,C10 E7, E9, E12, E13 F8, F13	+C3 (+3)	 Unit : mm

1-3. Taping specifications for automatic insertion

Size code	Case size	F	Taping code	Taping dimensions
B9	ø5	F=2.0 mm	+TSS (+S)	
C55, C6, C9, C10	ø6.3	F=2.5 mm		
E7, E9, E12	ø8	F=3.5 mm		
E13	ø8	F=3.5 mm	+TS (+D)	
F8, F13	ø10	F=5.0 mm	+T	

Taping code	Case size	F $^{+0.8}_{-0.2}$	P ±1.0	P_0 ±0.2	P_1 ±0.5	P_2 ±1.0	Δh ±1.0	W ±0.5	W_0 min.	W_1 ±0.5	W_2 max.	H ±0.75	$øD_0$ ±0.2
+TSS (+S)	ø5	2.0	12.7	12.7	5.35	6.35	0	18.0	9.5	9.0	2.5	17.5	4.0
	ø6.3	2.5	12.7	12.7	5.10	6.35	0	18.0	9.5	9.0	2.5	17.5	4.0
	ø8	3.5	12.7	12.7	4.60	6.35	0	18.0	9.5	9.0	2.5	17.5	4.0
+TS (+D)	ø8	3.5	12.7	12.7	4.60	6.35	0	18.0	9.5	9.0	2.5	17.5	4.0
+T	ø10	5.0	12.7	12.7	3.85	6.35	0	18.0	9.5	9.0	2.5	18.5	4.0

Taping code	Case size	t ±0.3	ℓ max.	L max.
+TSS (+S)	ø5	0.6	0	11.0
	ø6.3	0.6	0	11.0
	ø8	0.6	0	11.0
+TS (+D)	ø8	0.6	0	11.0
+T	ø10	0.6	0	11.0

Unit : mm

● Minimum packing quantity and weight

Size code	Case size	Bag-packed products		Taping products	
		Quantity(pcs./Bag)	Typical weight(g)	Quantity(pcs./Bag)	Typical weight(g)
B9	ø5	500	180	2000	1000
C55	ø6.3	500	150	1500	650
C6	ø6.3	500	160	1500	700
C9	ø6.3	500	240	1500	1000
C10	ø6.3	500	260	1500	1100

Size code	Case size	Bag-packed products		Taping products	
		Quantity(pcs./Bag)	Typical weight(g)	Quantity(pcs./Bag)	Typical weight(g)
E7	ø8	200	110	1000	820
E9	ø8	200	130	1000	900
E12	ø8	200	200	1000	980
E13	ø8	200	160	1000	1060
F8	ø10	200	180	500	890
F13	ø10	200	280	500	940

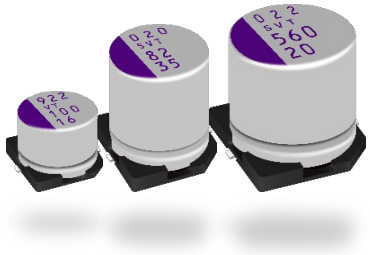
Panasonic INDUSTRY

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVT series



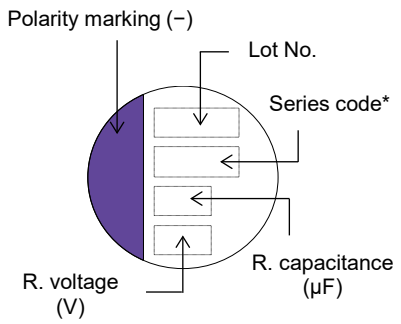
Features

- Low ESR (10 mΩ max.)
- Large capacitance (2700 μF max.)
- 125 ℃ 2000 h
- RoHS compliance, Halogen free

Specifications

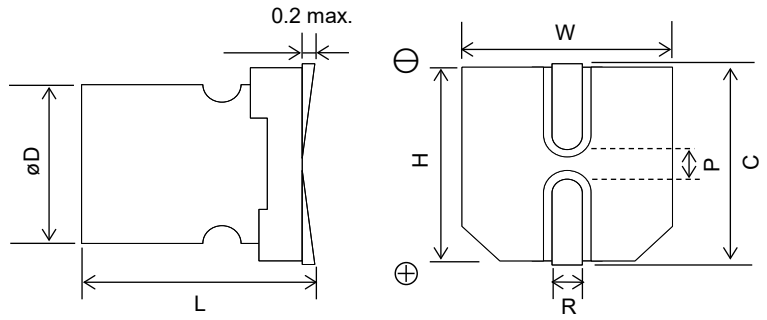
Size code	C65	E7	E10	E12	F10	F12
Category temp. range	–55 ℃ to +125 ℃					
Rated voltage range (V)	2.5 to 16	2.5 to 50	16	2.5 to 50	16	2.5 to 50
Nominal cap. range (μF)	100 to 820	18 to 680	560	39 to 1500	1000	68 to 2700
Capacitance tolerance	±20 % (120 Hz / +20 ℃)					
DC leakage current	Please see the attached characteristics list					
Dissipation factor (tan δ)	Please see the attached characteristics list					
Endurance	+125 ℃ 2000 h, rated voltage applied					
	Capacitance change	Within ±20 % of the initial value				
	Dissipation factor (tanδ)	≦ 200 % of the initial limit				
	DC leakage current	Within the initial limit				
Damp heat (Steady state)	+60 ℃, 90 % to 95 % RH, 1000 h, No-applied voltage					
	Capacitance change	Within ±20 % of the initial value				
	Dissipation factor (tanδ)	≦ 150 % of the initial limit				
	DC leakage current	Within the initial limit (after voltage processing)				

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*2
C65	6.3	6.4	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E10	8.0	10.0*1	8.3	8.3	9.0	0.8 to 1.1	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F10	10.0	10.0*1	10.3	10.3	11.0	0.8 to 1.1	4.6
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1: ±0.5, *2: Reference

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications					Standard (Reel size : ø380)	
		øD	L		Ripple current*1 (mA rms)	Allowable ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Q'ty (pcs)
2.5	560	6.3	6.4	C65	1100	3500	16	0.12	300	2R5SVT560M	1000
	680	6.3	6.4		1000	3500	16	0.12	850	2R5SVT680MX	1000
		8.0	6.9	E7	1060	3370	20	0.12	500	2R5SVT680M	1000
	820	6.3	6.4	C65	1100	3500	16	0.12	1020	2R5SVT820M	1000
	1500	8.0	11.9	E12	1620	5150	10	0.12	750	2R5SVT1500M	400
	2700	10.0	12.6	F12	1600	5070	12	0.12	1350	2R5SVT2700M	400
4.0	560	8.0	6.9	E7	1010	3220	22	0.12	500	4SVT560M	1000
	1500	8.0	11.9	E12	1480	4700	12	0.12	1200	4SVT1500M	400
6.3	330	6.3	6.4	C65	1070	3390	15	0.12	415	6SVT330M	1000
	390	8.0	6.9	E7	1010	3220	22	0.12	491	6SVT390M	1000
	820	8.0	11.9	E12	1480	4700	12	0.12	1033	6SVT820M	400
16	100	6.3	6.4	C65	780	2490	24	0.12	300	16SVT100M	1000
	270	8.0	6.9	E7	1040	3300	22	0.12	864	16SVT270M	1000
	560	8.0	10.0	E10	1230	3900	18	0.12	1792	16SVT560MX	500
	560	8.0	11.9	E12	1560	4950	14	0.12	1792	16SVT560M	400
	1000	10.0	10.0	F10	1350	4300	16	0.12	3200	16SVT1000MX	500
	1000	10.0	12.6	F12	1700	5400	12	0.12	3200	16SVT1000M	400
20	180	8.0	6.9	E7	1010	3200	25	0.12	720	20SVT180M	1000
	390	8.0	11.9	E12	1560	4950	14	0.12	1560	20SVT390M	400
	560	10.0	12.6	F12	1700	5400	12	0.12	2240	20SVT560M	400
25	100	8.0	6.9	E7	1010	3200	24	0.12	500	25SVT100M	1000
	180	8.0	11.9	E12	1470	4650	16	0.12	900	25SVT180M	400
	330	10.0	12.6	F12	1580	5000	14	0.12	1650	25SVT330M	400
35	39	8.0	6.9	E7	880	2800	30	0.12	273	35SVT39M	1000
	82	8.0	11.9	E12	1260	4000	20	0.12	574	35SVT82M	400
	120	10.0	12.6	F12	1390	4400	18	0.12	840	35SVT120M	400
50	18	8.0	6.9	E7	850	2700	35	0.12	180	50SVT18M	1000
	39	8.0	11.9	E12	1200	3800	25	0.12	390	50SVT39M	400
	68	10.0	12.6	F12	1350	4300	20	0.12	680	50SVT68M	400

*1: Ripple current (100 kHz / +105 ℃ ＜ Tx ≦ +125 ℃) / Allowable ripple current (100 kHz / Tx ≦ +105 ℃)
Tx: Temperature measured at the top surface of aluminum case including self-heating by ripple current
*2: ESR (100 kHz to 300 kHz / +20 ℃)
*3: tan δ (120 Hz / +20 ℃)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≦ f < 1 kHz	1 kHz ≦ f < 10 kHz	10 kHz ≦ f < 100 kHz	100 kHz ≦ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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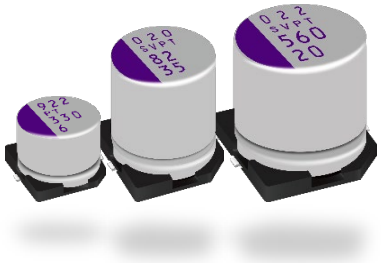
Panasonic INDUSTRY

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVPT series



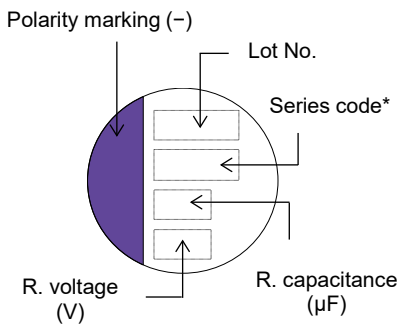
Features

- Low ESR (10 mΩ max.)
- Large capacitance (2700 μF max.)
- 105 ℃ 20000 h
- RoHS compliance, Halogen free

Specifications

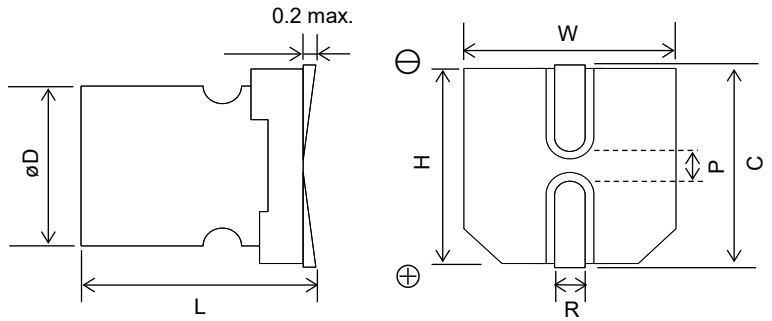
Size code	C65	E7	E10	E12	F10	F12
Category temp. range	–55 ℃ to +105 ℃					
Rated voltage range (V)	2.5 to 16	2.5 to 50	16	2.5 to 50	16	2.5 to 50
Nominal cap. range (μF)	100 to 820	18 to 680	560	39 to 1500	1000	68 to 2700
Capacitance tolerance	±20 % (120 Hz / +20 ℃)					
DC leakage current	Please see the attached characteristics list					
Dissipation factor (tan δ)	Please see the attached characteristics list					
Endurance	+105 ℃ 20000 h, rated voltage applied					
	Capacitance change	Within ±20 % of the initial value				
	Dissipation factor (tanδ)	≦ 150 % of the initial limit				
	DC leakage current	Within the initial limit				
Damp heat (Steady state)	+60 ℃, 90 % to 95 % RH, 1000 h, No-applied voltage					
	Capacitance change	Within ±20 % of the initial value				
	Dissipation factor (tanδ)	≦ 150 % of the initial limit				
	DC leakage current	Within the initial limit (after voltage processing)				

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*2
C65	6.3	6.4	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E10	8.0	10.0*1	8.3	8.3	9.0	0.8 to 1.1	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F10	10.0	10.0*1	10.3	10.3	11.0	0.8 to 1.1	4.6
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1: ±0.5, *2: Reference

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications				Standard（Reel size : ø380）	
		øD	L		Ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Q'ty (pcs)
2.5	560	6.3	6.4	C65	3500	16	0.12	300	2R5SVPT560M	1000
	680	6.3	6.4		3500	16	0.12	850	2R5SVPT680MX	1000
		8.0	6.9	E7	3370	20	0.12	500	2R5SVPT680M	1000
	820	6.3	6.4	C65	3500	16	0.12	1020	2R5SVPT820M	1000
	1500	8.0	11.9	E12	5150	10	0.12	750	2R5SVPT1500M	400
	2700	10.0	12.6	F12	5070	12	0.12	1350	2R5SVPT2700M	400
4.0	560	8.0	6.9	E7	3220	22	0.12	500	4SVPT560M	1000
	1500	8.0	11.9	E12	4700	12	0.12	1200	4SVPT1500M	400
6.3	330	6.3	6.4	C65	3390	15	0.12	415	6SVPT330M	1000
	390	8.0	6.9	E7	3220	22	0.12	491	6SVPT390M	1000
	820	8.0	11.9	E12	4700	12	0.12	1033	6SVPT820M	400
16	100	6.3	6.4	C65	2490	24	0.12	300	16SVPT100M	1000
	270	8.0	6.9	E7	3300	22	0.12	864	16SVPT270M	1000
	560	8.0	10.0	E10	3900	18	0.12	1792	16SVPT560MX	500
	560	8.0	11.9	E12	4950	14	0.12	1792	16SVPT560M	400
	1000	10.0	10.0	F10	4300	16	0.12	3200	16SVPT1000MX	500
	1000	10.0	12.6	F12	5400	12	0.12	3200	16SVPT1000M	400
20	180	8.0	6.9	E7	3200	25	0.12	720	20SVPT180M	1000
	390	8.0	11.9	E12	4950	14	0.12	1560	20SVPT390M	400
	560	10.0	12.6	F12	5400	12	0.12	2240	20SVPT560M	400
25	100	8.0	6.9	E7	3200	24	0.12	500	25SVPT100M	1000
	180	8.0	11.9	E12	4650	16	0.12	900	25SVPT180M	400
	330	10.0	12.6	F12	5000	14	0.12	1650	25SVPT330M	400
35	39	8.0	6.9	E7	2800	30	0.12	273	35SVPT39M	1000
	82	8.0	11.9	E12	4000	20	0.12	574	35SVPT82M	400
	120	10.0	12.6	F12	4400	18	0.12	840	35SVPT120M	400
50	18	8.0	6.9	E7	2700	35	0.12	180	50SVPT18M	1000
	39	8.0	11.9	E12	3800	25	0.12	390	50SVPT39M	400
	68	10.0	12.6	F12	4300	20	0.12	680	50SVPT68M	400

*1: Ripple current (100 kHz / +105 ℃)
The surface temperature of aluminum case top must not exceed 105 °C. A rise in temperature due to self-heating by ripple current should be factored in.
*2: ESR (100 kHz to 300 kHz / +20 ℃)
*3: tan δ (120 Hz / +20 ℃)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≦ f < 1 kHz	1 kHz ≦ f < 10 kHz	10 kHz ≦ f < 100 kHz	100 kHz ≦ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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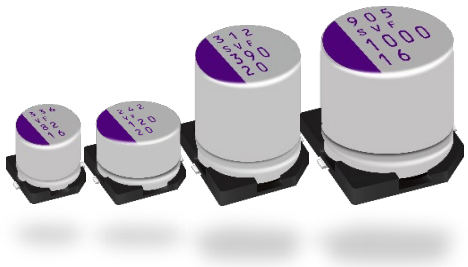
Panasonic INDUSTRY

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVF series



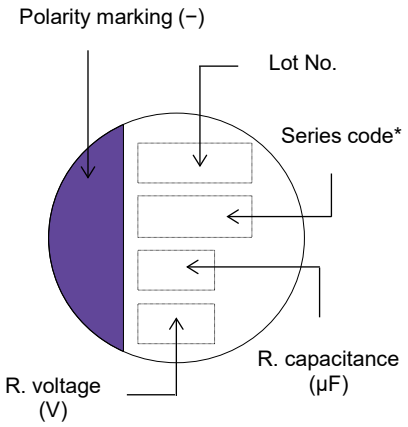
Features

- High voltage (50 V max.)
- Large capacitance (1000 μF max.)
- 125 ℃ 1000 h
- RoHS compliance, Halogen free

Specifications

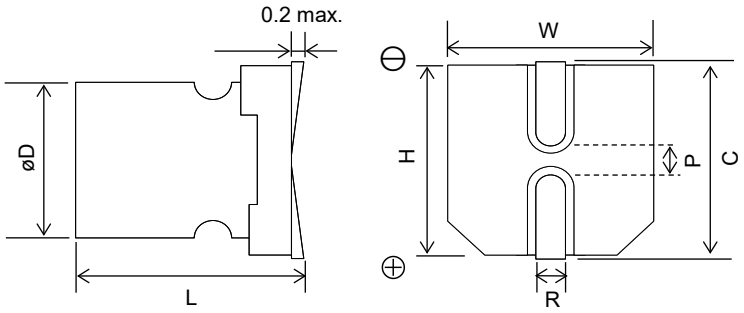
Size code	B6	C6	E7	E12	F10	F12
Category temp. range	–55 ℃ to +125 ℃					
Rated voltage range	16 V to 25 V	16 V to 50 V			16 V	16 V to 50 V
Nominal cap.range	27 μF to 82 μF	10 μF to 180 μF	18 μF to 270 μF	39 μF to 560 μF	1000 μF	68 μF to 1000 μF
Capacitance tolerance	±20 % (120 Hz / +20 ℃)					
DC leakage current	Please see the attached characteristics list					
Dissipation factor (tan δ)	Please see the attached characteristics list					
Endurance	+125 ℃ 1000 h, rated voltage applied					
	Capacitance change	Within ±20 % of the initial value				
	Dissipation factor (tanδ)	≦ 200 % of the initial limit				
	DC leakage current	Within the initial limit				
Damp heat (Steady state)	+60 ℃, 90 % to 95 % RH, 1000 h, No-applied voltage					
	Capacitance change	Within ±20 % of the initial value				
	Dissipation factor (tanδ)	≦ 150 % of the initial limit				
	DC leakage current	Within the initial limit (after voltage processing)				

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*2
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F10	10.0	10.0*1	10.3	10.3	11.0	0.8 to 1.1	4.6
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1 : ±0.5, *2 : Reference

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications					Standard (Reel size : ø380)	
		øD	L		Ripple current*1 (mA rms)	Allowable ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Q'ty (pcs)
16	82	5.0	5.9	B6	940	3000	27	0.12	262	16SVF82M	1500
	180	6.3	5.9	C6	1040	3300	22	0.12	576	16SVF180M	1000
	270	8.0	6.9	E7	1040	3300	22	0.12	864	16SVF270M	1000
	560	8.0	11.9	E12	1560	4950	14	0.12	1792	16SVF560M	400
	1000	10.0	10.0	F10	1350	4300	16	0.12	3200	16SVF1000MX	500
		10.0	12.6	F12	1700	5400	12	0.12	3200	16SVF1000M	400
20	56	5.0	5.9	B6	880	2800	30	0.12	224	20SVF56M	1500
	120	6.3	5.9	C6	1010	3200	25	0.12	480	20SVF120M	1000
	180	8.0	6.9	E7	1010	3200	25	0.12	720	20SVF180M	1000
	390	8.0	11.9	E12	1560	4950	14	0.12	1560	20SVF390M	400
	560	10.0	12.6	F12	1700	5400	12	0.12	2240	20SVF560M	400
25	27	5.0	5.9	B6	770	2450	40	0.12	135	25SVF27M	1500
	47	6.3	5.9	C6	880	2800	30	0.12	235	25SVF47M	1000
	56	6.3	5.9		880	2800	30	0.12	280	25SVF56M	1000
	82	8.0	6.9	E7	940	3000	28	0.12	410	25SVF82M	1000
	100	8.0	6.9		1010	3200	24	0.12	500	25SVF100M	1000
	180	8.0	11.9	E12	1470	4650	16	0.12	900	25SVF180M	400
	330	10.0	12.6	F12	1580	5000	14	0.12	1650	25SVF330M	400
35	22	6.3	5.9	C6	820	2600	35	0.12	154	35SVF22M	1000
	39	8.0	6.9	E7	880	2800	30	0.12	273	35SVF39M	1000
	82	8.0	11.9	E12	1260	4000	20	0.12	574	35SVF82M	400
	120	10.0	12.6	F12	1390	4400	18	0.12	840	35SVF120M	400
50	10	6.3	5.9	C6	790	2500	40	0.12	100	50SVF10M	1000
	18	8.0	6.9	E7	850	2700	35	0.12	180	50SVF18M	1000
	39	8.0	11.9	E12	1200	3800	25	0.12	390	50SVF39M	400
	68	10.0	12.6	F12	1350	4300	20	0.12	680	50SVF68M	400

*1: Ripple current (100 kHz / +105 ℃ < Tx ≦ +125 ℃) /Allowable ripple current (100 kHz / Tx ≦ +105 ℃)
*2: ESR (100 kHz to 300 kHz / +20 ℃)
*3: tan δ (120 Hz / +20 ℃)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≦ f < 1 kHz	1 kHz ≦ f < 10 kHz	10 kHz ≦ f < 100 kHz	100 kHz ≦ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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Panasonic INDUSTRY

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVPK series

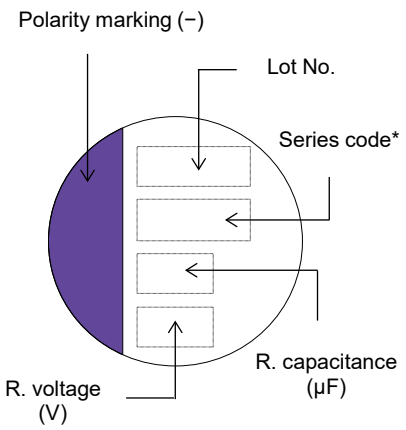
Features

- High voltage (50 V max.)
- 125 ℃ 1000 h
- RoHS compliance, Halogen free

Specifications

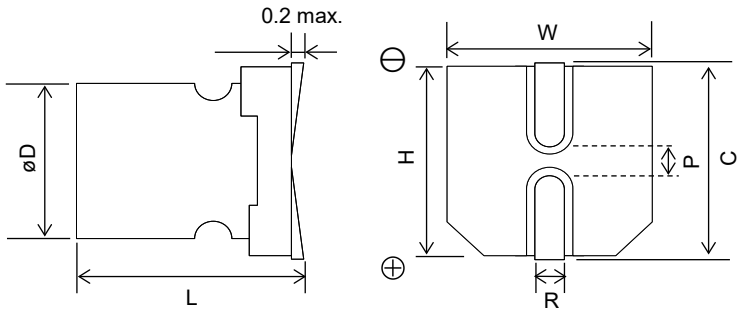
Size code	B6	C6	E7	E12	F12
Category temp. range	–55 ℃ to +125 ℃				
Rated voltage range	16 V to 50 V				
Nominal cap.range	10 μF to 100 μF	22 μF to 220 μF	33 μF to 330 μF	68 μF to 680 μF	120 μF to 1200 μF
Capacitance tolerance	±20 % (120 Hz / +20 ℃)				
DC leakage current	Please see the attached characteristics list				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Endurance	+125 ℃ 1000 h, rated voltage applied				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≦ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 ℃, 90 % to 95 % RH, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≦ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*1
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1 : Reference

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications					Standard (Reel size : ø380)	
		øD	L		Ripple current*1 (mA rms)	Allowable ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Q'ty (pcs)
16	100	5.0	5.9	B6	940	3000	27	0.12	320	16SVPK100M	1500
	220	6.3	5.9	C6	1040	3300	22	0.12	704	16SVPK220M	1000
	330	8.0	6.9	E7	1040	3300	22	0.12	1056	16SVPK330M	1000
	680	8.0	11.9	E12	1560	4950	14	0.12	2176	16SVPK680M	400
	1200	10.0	12.6	F12	1700	5400	12	0.12	3840	16SVPK1200M	400
20	68	5.0	5.9	B6	880	2800	30	0.12	272	20SVPK68M	1500
	150	6.3	5.9	C6	1010	3200	25	0.12	600	20SVPK150M	1000
	220	8.0	6.9	E7	1010	3200	25	0.12	880	20SVPK220M	1000
	470	8.0	11.9	E12	1560	4950	14	0.12	1880	20SVPK470M	400
	680	10.0	12.6	F12	1700	5400	12	0.12	2720	20SVPK680M	400
25	33	5.0	5.9	B6	820	2600	35	0.12	165	25SVPK33M	1500
	82	6.3	5.9	C6	960	3060	25	0.12	410	25SVPK82M	1000
	120	8.0	6.9	E7	1010	3200	24	0.12	600	25SVPK120M	1000
	270	8.0	11.9	E12	1470	4650	16	0.12	1350	25SVPK270M	400
	470	10.0	12.6	F12	1590	5000	14	0.12	2350	25SVPK470M	400
35	22	5.0	5.9	B6	820	2600	35	0.12	154	35SVPK22M	1500
	47	6.3	5.9	C6	930	2950	27	0.12	329	35SVPK47M	1000
	82	8.0	6.9	E7	960	3060	25	0.12	574	35SVPK82M	1000
	180	8.0	11.9	E12	1260	4000	20	0.12	1260	35SVPK180M	400
	330	10.0	12.6	F12	1390	4400	18	0.12	2310	35SVPK330M	400
50	10	5.0	5.9	B6	550	1750	80	0.12	100	50SVPK10M	1500
	22	6.3	5.9	C6	820	2600	35	0.12	220	50SVPK22M	1000
	33	8.0	6.9	E7	850	2700	35	0.12	330	50SVPK33M	1000
	68	8.0	11.9	E12	1200	3800	25	0.12	680	50SVPK68M	400
	120	10.0	12.6	F12	1350	4300	20	0.12	1200	50SVPK120M	400

*1: Ripple current (100 kHz / +105 ℃ < Tx ≦ +125 ℃) /Allowable ripple current (100 kHz / Tx ≦ +105 ℃)
*2: ESR (100 kHz to 300 kHz / +20 ℃)
*3: tan δ (120 Hz / +20 ℃)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≦ f < 1 kHz	1 kHz ≦ f < 10 kHz	10 kHz ≦ f < 100 kHz	100 kHz ≦ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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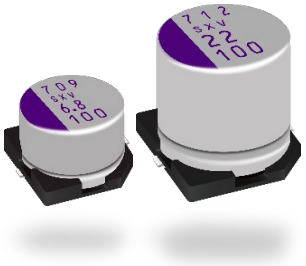
Panasonic INDUSTRY

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SXV series



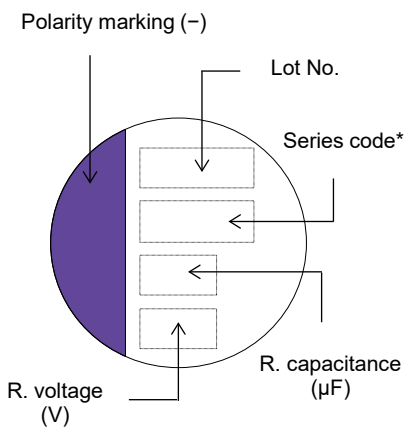
Features

- Super high voltage (100 V max.)
- 125 °C 1000 h
- RoHS compliance, Halogen free

Specifications

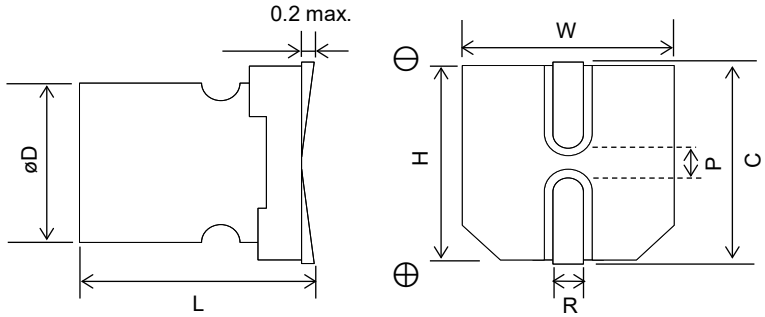
Size code	E7	E12	F8	F12
Category temp. range	–55 °C to +125 °C			
Rated voltage range	63 V to 100 V			
Nominal cap.range	6.8 µF to 18 µF	15 µF to 82 µF	15 µF to 39 µF	18 µF to 150 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Endurance	+125 °C 1000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)			
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1 : Reference

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications					Standard (Reel size : ø380)	
		øD	L		Ripple current*1 (mA rms)	Allowable ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Q'ty (pcs)
63	18	8.0	6.9	E7	340	1100	60	0.12	56	63SXV18M	1000
	33	8.0	11.9	E12	930	2950	25	0.12	104	63SXV33M	400
	39	8.0	11.9	E12	930	2950	25	0.12	122	63SXV39M	400
		10.0	7.9	F8	690	2190	50	0.12	122	63SXV39MX	500
	56	8.0	11.9	E12	930	2950	25	0.12	176	63SXV56M	400
	68	8.0	11.9	E12	930	2950	25	0.12	214	63SXV68MX	400
		10.0	12.6	F12	1030	3280	25	0.12	214	63SXV68M	400
	82	8.0	11.9	E12	930	2950	25	0.12	258	63SXV82M	400
	100	10.0	12.6	F12	1030	3280	25	0.12	315	63SXV100M	400
	120	10.0	12.6	F12	1030	3280	25	0.12	378	63SXV120M	400
	150	10.0	12.6	F12	1030	3280	25	0.12	472	63SXV150M	400
72	82	10.0	12.6	F12	980	3100	28	0.12	295	72SXV82M	400
	100	10.0	12.6	F12	980	3100	28	0.12	360	72SXV100M	400
80	12	8.0	6.9	E7	340	1100	60	0.12	48	80SXV12M	1000
	27	8.0	11.9	E12	780	2490	35	0.12	108	80SXV27M	400
		10.0	7.9	F8	660	2080	55	0.12	108	80SXV27MX	500
	33	8.0	11.9	E12	780	2490	35	0.12	132	80SXV33M	400
	47	8.0	11.9	E12	780	2490	35	0.12	188	80SXV47MX	400
		10.0	12.6	F12	980	3100	28	0.12	188	80SXV47M	400
	56	8.0	11.9	E12	780	2490	35	0.12	224	80SXV56MX	400
		10.0	12.6	F12	980	3100	28	0.12	224	80SXV56M	400
	82	10.0	12.6	F12	980	3100	28	0.12	328	80SXV82M	400
	100	10.0	12.6	F12	980	3100	28	0.12	400	80SXV100M	400
100	6.8	8.0	6.9	E7	340	1100	60	0.12	34	100SXV6R8M	1000
	15	10.0	7.9	F8	630	2000	60	0.12	75	100SXV15MX	500
		8.0	11.9	E12	730	2350	40	0.12	75	100SXV15M	400
	18	10.0	12.6	F12	940	3000	30	0.12	90	100SXV18M	400
		8.0	11.9	E12	730	2350	40	0.12	90	100SXV18MX	400
	22	10.0	12.6	F12	940	3000	30	0.12	110	100SXV22M	400
	27	8.0	11.9	E12	730	2350	40	0.12	135	100SXV27MX	400
		10.0	12.6	F12	940	3000	30	0.12	135	100SXV27M	400
	39	10.0	12.6	F12	940	3000	30	0.12	195	100SXV39M	400

*1: Ripple current (100 kHz / +105 °C < Tx ≤ +125 °C) /Allowable ripple current (100 kHz / Tx ≤ +105 °C)
*2: ESR (100 kHz to 300 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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Panasonic INDUSTRY

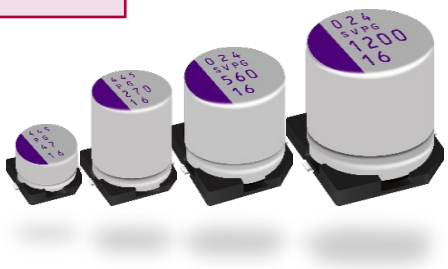
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVPG series



Features

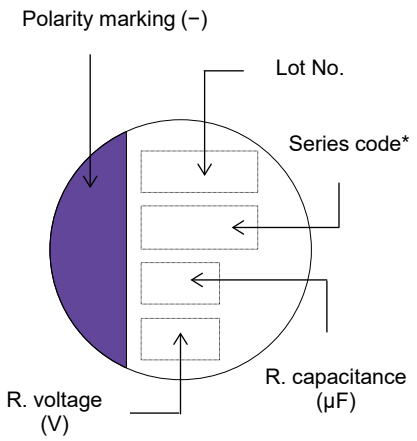
- Low profile (Height 4.5 mm max.)
- Low ESR (6.5 mΩ max.)
- High ripple current (7500 mA rms max.)
- RoHS compliance, Halogen free

Specifications

Size code	B45	B6	C6	C8	C10	C10L	E7	E10	E12	F10	F12
Category temp. range	–55 ℃ to +105 ℃										
Rated voltage range (V)	16 to 25	16	16 ～ 25			16	16 ～ 25	16	16 to 25	16	16 to 25
Nominal cap.range (μF)	15 to 47	100	82 to 220	120 to 270	150 to 270	330	120 to 330	560	270 to 680	820	470 to 1200
Capacitance tolerance	±20 % (120 Hz / +20 ℃)										
DC leakage current	Please see the attached characteristics list										
Dissipation factor (tan δ)	Please see the attached characteristics list										

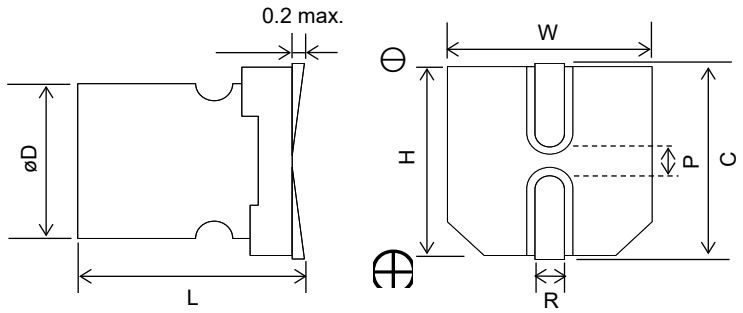
Endurance	+105 ℃ 5000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tanδ)	≦ 150 % of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 ℃, 90 % to 95 % RH, 1000 h, No-applied voltage	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tanδ)	≦ 150 % of the initial limit
	DC leakage current	Within the initial limit (after voltage processing)

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*2
B45	5.0	4.4	5.3	5.3	6.0	0.6 to 0.8	1.4
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
C8	6.3	7.9	6.6	6.6	7.3	0.6 to 0.8	2.1
C10	6.3	9.9	6.6	6.6	7.3	0.6 to 0.8	2.1
C10L	6.3	10.4	6.6	6.6	7.3	1.5 to 1.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E10	8.0	10.0*1	8.3	8.3	9.0	0.8 to 1.1	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F10	10.0	10.0*1	10.3	10.3	11.0	0.8 to 1.1	4.6
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1 : ±0.5, *2 : Reference

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications: Ripple current*1 (mA rms)	Specifications: ESR*2 (mΩ max.)	Specifications: tan δ*3	Specifications: LC*4 (μA)	Standard (Reel size : ø380): Part number	Standard (Reel size : ø380): Min. Packaging Q'ty (pcs)
16	47	5.0	4.4	B45	3200	25	0.12	150	16SVPG47M	2500
	100	5.0	5.9	B6	4000	15	0.12	320	16SVPG100M	1500
	220	6.3	5.9	C6	4100	14	0.12	704	16SVPG220M	1000
	270	6.3	7.9	C8	5080	10	0.12	864	16SVPG270MX	900
		6.3	9.9	C10	5800	8	0.12	864	16SVPG270M	500
	330	6.3	10.4	C10L	7500	6.5	0.12	1056	16SVPG330M	700
		8.0	6.9	E7	4100	16	0.12	1056	16SVPG330MX	1000
	560	8.0	10.0	E10	5200	10	0.12	1792	16SVPG560M	500
	680	8.0	11.9	E12	6500	8	0.12	2176	16SVPG680M	400
	820	10.0	10.0	F10	5700	9	0.12	2624	16SVPG820M	500
	1200	10.0	12.6	F12	7000	7	0.12	3840	16SVPG1200M	400
20	33	5.0	4.4	B45	3000	27	0.12	132	20SVPG33M	2500
	120	6.3	5.9	C6	3750	18	0.12	480	20SVPG120M	1000
	180	6.3	7.9	C8	4200	14	0.12	720	20SVPG180MX	900
		6.3	9.9	C10	4700	11	0.12	720	20SVPG180M	500
	220	8.0	6.9	E7	3750	18	0.12	880	20SVPG220M	1000
	470	8.0	11.9	E12	5850	10	0.12	1880	20SVPG470M	400
	680	10.0	12.6	F12	6200	9	0.12	2720	20SVPG680M	400
25	NRFND 15	5.0	4.4	B45	2800	30	0.12	75	25SVPG15M	2500
	82	6.3	5.9	C6	3750	18	0.12	410	25SVPG82M	1000
	120	6.3	7.9	C8	3900	15	0.12	600	25SVPG120MX	900
		8.0	6.9	E7	3800	17	0.12	600	25SVPG120M	1000
	150	6.3	9.9	C10	4200	13	0.12	750	25SVPG150M	500
	270	8.0	11.9	E12	5350	12	0.12	1350	25SVPG270M	400
	470	10.0	12.6	F12	5900	10	0.12	2350	25SVPG470M	400

*1: Ripple current (100 kHz / +105 ℃)
*2: ESR (100 kHz to 300 kHz / +20 ℃)
*3: tan δ (120 Hz / +20 ℃)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

NRFND Not recommended for new design

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≦ f < 1 kHz	1 kHz ≦ f < 10 kHz	10 kHz ≦ f < 100 kHz	100 kHz ≦ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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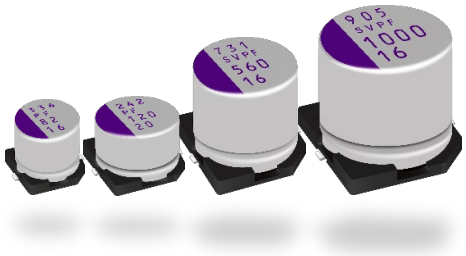
Panasonic INDUSTRY

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVPF series



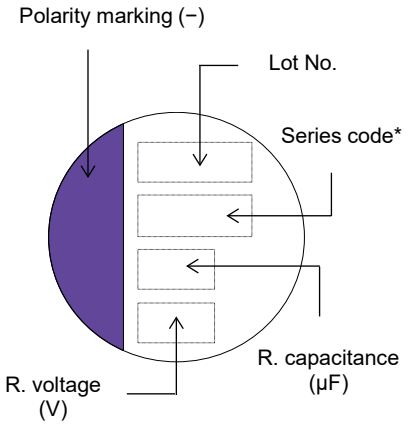
Features

- High voltage (50 V max.)
- Large capacitance (1000 μF max.)
- 105 ℃ 5000 h
- RoHS compliance, Halogen free

Specifications

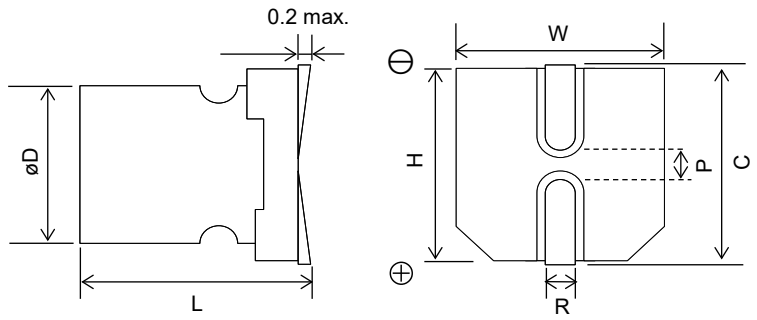
Size code	B6	C6	E7	E10	E12	F10	F12
Category temp. range	–55 ℃ to +105 ℃						
Rated voltage range (V)	16 to 25	16 to 50		16	16 to 50	16	16 to 50
Nominal cap.range (μF)	27 to 82	10 to 180	18 to 270	560	39 to 560	1000	68 to 1000
Capacitance tolerance	±20 % (120 Hz / +20 ℃)						
DC leakage current	Please see the attached characteristics list						
Dissipation factor (tan δ)	Please see the attached characteristics list						
Endurance	+105 ℃ 5000 h, rated voltage applied						
	Capacitance change	Within ±20 % of the initial value					
	Dissipation factor (tanδ)	≦ 150 % of the initial limit					
	DC leakage current	Within the initial limit					
Damp heat (Steady state)	+60 ℃, 90 % to 95 % RH, 1000 h, No-applied voltage						
	Capacitance change	Within ±20 % of the initial value					
	Dissipation factor (tanδ)	≦ 150 % of the initial limit					
	DC leakage current	Within the initial limit (after voltage processing)					

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*2
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E10	8.0	10.0*1	8.3	8.3	9.0	0.8 to 1.1	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F10	10.0	10.0*1	10.3	10.3	11.0	0.8 to 1.1	4.6
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1 : ±0.5, *2 : Reference

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications Ripple current*1 (mA rms)	Specifications ESR*2 (mΩ max.)	Specifications tan δ*3	Specifications LC*4 (μA)	Standard (Reel size : ø380) Part number	Standard (Reel size : ø380) Min. Packaging Q'ty (pcs)
16	82	5.0	5.9	B6	3000	27	0.12	262	16SVPF82M	1500
	180	6.3	5.9	C6	3300	22	0.12	576	16SVPF180M	1000
	270	8.0	6.9	E7	3300	22	0.12	864	16SVPF270M	1000
	560	8.0	10.0	E10	3900	18	0.12	1792	16SVPF560MX	500
		8.0	11.9	E12	4950	14	0.12	1792	16SVPF560M	400
	1000	10.0	10.0	F10	4300	16	0.12	3200	16SVPF1000MX	500
		10.0	12.6	F12	5400	12	0.12	3200	16SVPF1000M	400
20	56	5.0	5.9	B6	2800	30	0.12	224	20SVPF56MX	1500
	120	6.3	5.9	C6	3200	25	0.12	480	20SVPF120M	1000
	180	8.0	6.9	E7	3200	25	0.12	720	20SVPF180M	1000
	390	8.0	11.9	E12	4950	14	0.12	1560	20SVPF390M	400
	560	10.0	12.6	F12	5400	12	0.12	2240	20SVPF560M	400
25	27	5.0	5.9	B6	2450	40	0.12	135	25SVPF27MX	1500
	47	6.3	5.9	C6	2800	30	0.12	235	25SVPF47M	1000
	56	6.3	5.9		2800	30	0.12	280	25SVPF56M	1000
	82	8.0	6.9	E7	3000	28	0.12	410	25SVPF82M	1000
	100	8.0	6.9		3200	24	0.12	500	25SVPF100M	1000
	180	8.0	11.9	E12	4650	16	0.12	900	25SVPF180M	400
	330	10.0	12.6	F12	5000	14	0.12	1650	25SVPF330M	400
35	22	6.3	5.9	C6	2600	35	0.12	154	35SVPF22M	1000
	39	8.0	6.9	E7	2800	30	0.12	273	35SVPF39M	1000
	82	8.0	11.9	E12	4000	20	0.12	574	35SVPF82M	400
	120	10.0	12.6	F12	4400	18	0.12	840	35SVPF120M	400
50	10	6.3	5.9	C6	2500	40	0.12	100	50SVPF10M	1000
	18	8.0	6.9	E7	2700	35	0.12	180	50SVPF18M	1000
	39	8.0	11.9	E12	3800	25	0.12	390	50SVPF39M	400
	68	10.0	12.6	F12	4300	20	0.12	680	50SVPF68M	400

*1: Ripple current (100 kHz / +105 ℃)
*2: ESR (100 kHz to 300 kHz / +20 ℃)
*3: tan δ (120 Hz / +20 ℃)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≦ f < 1 kHz	1 kHz ≦ f < 10 kHz	10 kHz ≦ f < 100 kHz	100 kHz ≦ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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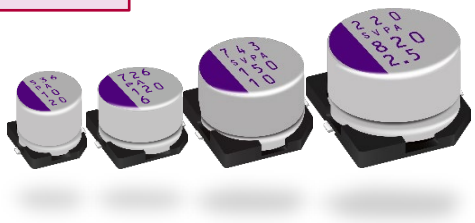
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVPA series



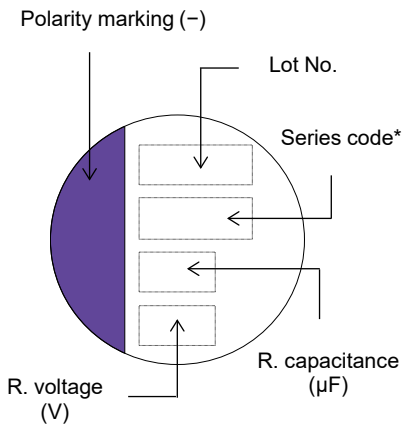
Features

- Low ESR (19 mΩ max.)
- High ripple (4240 mA rms)
- RoHS compliance, Halogen free

Specifications

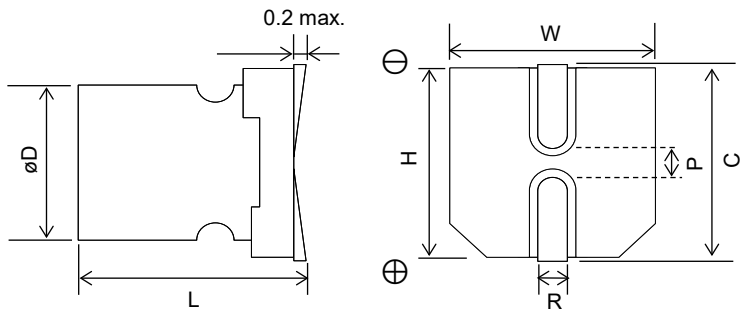
Size code	B6	C6	E7	F8
Category temp. range	–55 °C to +105 °C			
Rated voltage range	2.5 V to 20 V			2.5 V to 16 V
Nominal cap.range	10 µF to 82 µF	22 µF to 180 µF	47 µF to 330 µF	180 µF to 820 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Endurance	+105 °C 2000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*1
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6

*1 : Reference

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications: Ripple current*1 (mA rms)	Specifications: ESR*2 (mΩ max.)	Specifications: tan δ*3	Specifications: LC*4 (μA)	Standard (Reel size : ø380): Part number	Standard (Reel size : ø380): Min. Packaging Q'ty (pcs)
2.5	NRFND 82	5.0	5.9	B6	1970	30	0.12	300	2R5SVPA82MAA	1500
	NRFND 180	6.3	5.9	C6	2690	20	0.12	300	2R5SVPA180MAA	1000
	NRFND 330	8.0	6.9	E7	3370	20	0.12	500	2R5SVPA330MAA	1000
	820	10.0	7.9	F8	4240	19	0.12	500	2R5SVPA820M	500
4.0	NRFND 68	5.0	5.9	B6	1970	30	0.12	300	4SVPA68MAA	1500
	NRFND 150	6.3	5.9	C6	2570	22	0.12	300	4SVPA150MAA	1000
	270	8.0	6.9	E7	3220	22	0.12	500	4SVPA270MAA	1000
	680	10.0	7.9	F8	4130	20	0.12	544	4SVPA680M	500
6.3	47	5.0	5.9	B6	1970	30	0.12	300	6SVPA47MAA	1500
	120	6.3	5.9	C6	2570	22	0.12	300	6SVPA120MAA	1000
	220	8.0	6.9	E7	3220	22	0.12	500	6SVPA220MAA	1000
	470	10.0	7.9	F8	4130	20	0.12	592	6SVPA470M	500
10	68	6.3	5.9	C6	2200	30	0.12	300	10SVPA68MAA	1000
	150	8.0	6.9	E7	2760	30	0.12	500	10SVPA150MAA	1000
	330	10.0	7.9	F8	3770	24	0.12	660	10SVPA330M	500
16	39	6.3	5.9	C6	2040	35	0.12	300	16SVPA39MAA	1000
		6.3	5.9		2460	24	0.12	300	16SVPA39MAAY	1000
	82	8.0	6.9	E7	2760	30	0.12	262	16SVPA82MAA	1000
	180	10.0	7.9	F8	3430	29	0.12	576	16SVPA180M	500
20	10	5.0	5.9	B6	1700	40	0.12	80	20SVPA10M	1500
	22	6.3	5.9	C6	2040	35	0.12	88	20SVPA22M	1000
	47	8.0	6.9	E7	2630	33	0.12	188	20SVPA47M	1000

*1: Ripple current (100 kHz / +105 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

NRFND Not recommended for new design

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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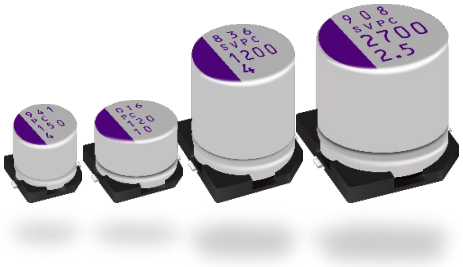
Panasonic INDUSTRY

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVPC series



Features

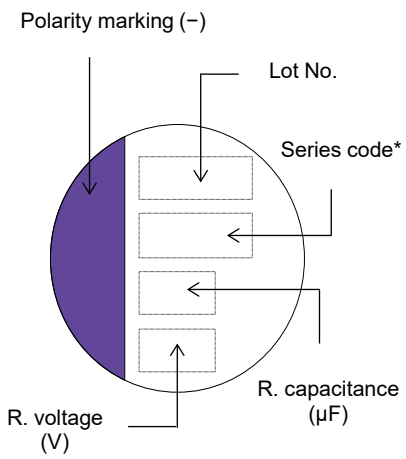
- Low ESR (9 mΩ max.)
- Large capacitance (2700 μF max.)
- RoHS compliance, Halogen free

Specifications

Size code	B6	C6	E7	E12	F12
Category temp. range	–55 ℃ to +105 ℃				
Rated voltage range	2.5 V to 16 V				2.5 V
Nominal cap.range	39 μF to 180 μF	68 μF to 560 μF	120 μF to 680 μF	270 μF to 1500 μF	2700 μF
Capacitance tolerance	±20 % (120 Hz / +20 ℃)				
DC leakage current	Please see the attached characteristics list				
Dissipation factor (tan δ)	Please see the attached characteristics list				

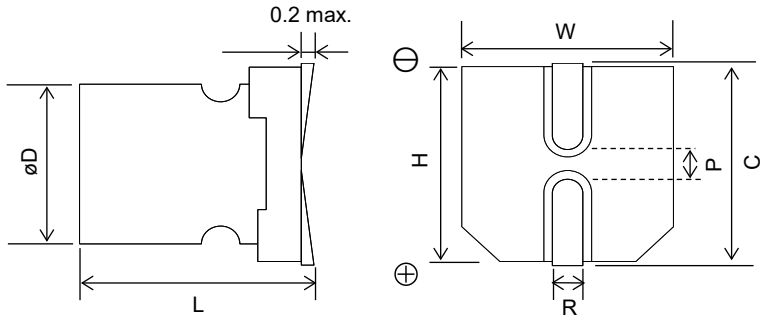
Endurance	+105 ℃ 2000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tanδ)	≦ 150 % of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 ℃, 90 % to 95 % RH, 1000 h, No-applied voltage	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tanδ)	≦ 150 % of the initial limit
	DC leakage current	Within the initial limit (after voltage processing)

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*1
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.0	3.2
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.0	4.6

*1 : Reference

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications					Standard (Reel size : ø380)	
		øD	L		Ripple current*1 (mA rms)	ESR (mΩ max.) 100 kHz / 20 ℃	ESR (mΩ max.) 300 kHz*2 / 20 ℃	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Q'ty (pcs)
2.5	180	5.0	5.9	B6	1970	30	26	0.12	300	2R5SVPC180M	1500
		5.0	5.9		2200	24	20	0.12	300	2R5SVPC180MY	1500
		5.0	5.9		2800	19	16	0.12	300	2R5SVPC180MV	1500
	390	6.3	5.9	C6	2410	25	22	0.12	300	2R5SVPC390M	1000
		6.3	5.9		3160	15	13	0.12	300	2R5SVPC390MV	1000
	560	6.3	5.9		3500	16	14	0.12	300	2R5SVPC560M	1000
	680	8.0	6.9	E7	3370	20	17	0.12	500	2R5SVPC680M	1000
	820	8.0	11.9	E12	5380	9	8	0.15	500	2R5SVPC820M	400
	1500	8.0	11.9		5150	10	9	0.15	750	2R5SVPC1500M	400
	2700	10.0	12.6	F12	5070	12	10	0.15	1350	2R5SVPC2700M	400
4.0	150	5.0	5.9	B6	1970	30	26	0.12	300	4SVPC150M	1500
		5.0	5.9		2240	23	20	0.12	300	4SVPC150MY	1500
		5.0	5.9		2730	20	17	0.12	300	4SVPC150MV	1500
	330	6.3	5.9	C6	2320	27	23	0.12	300	4SVPC330M	1000
		6.3	5.9		2630	21	18	0.12	300	4SVPC330MY	1000
		6.3	5.9		3160	15	13	0.12	300	4SVPC330MV	1000
	560	8.0	6.9	E7	3220	22	19	0.12	500	4SVPC560M	1000
		8.0	11.9	E12	5380	9	8	0.15	500	4SVPC560MX	400
	1200	8.0	11.9		4700	12	10	0.15	960	4SVPC1200M	400
	1500	8.0	11.9		4700	12	10	0.15	1200	4SVPC1500M	400
6.3	100	5.0	5.9	B6	1970	30	26	0.12	300	6SVPC100M	1500
		5.0	5.9		2150	25	21	0.12	300	6SVPC100MY	1500
	120	5.0	5.9		2660	21	18	0.12	300	6SVPC120MV	1500
	220	6.3	5.9	C6	2320	27	23	0.12	300	6SVPC220M	1000
		6.3	5.9		3160	15	13	0.12	300	6SVPC220MV	1000
	330	6.3	5.9		3390	17	15	0.12	415	6SVPC330M	1000
	390	8.0	6.9	E7	3220	22	19	0.12	491	6SVPC390M	1000
	820	8.0	11.9	E12	4700	12	10	0.15	1033	6SVPC820M	400
10	68	5.0	5.9	B6	1970	30	26	0.12	300	10SVPC68M	1500
		5.0	5.9		2540	23	20	0.12	300	10SVPC68MV	1500
	120	6.3	5.9	C6	2320	27	23	0.12	300	10SVPC120M	1000
		6.3	5.9		2600	22	19	0.12	300	10SVPC120MV	1000
	270	8.0	6.9	E7	3220	22	19	0.12	500	10SVPC270M	1000
	330	8.0	6.9		3460	19	17	0.12	660	10SVPC330M	1000
16	39	5.0	5.9	B6	1820	35	30	0.12	300	16SVPC39M	1500
		5.0	5.9		2350	27	23	0.12	300	16SVPC39MV	1500
	68	6.3	5.9	C6	2200	30	26	0.12	300	16SVPC68M	1000
		6.3	5.9		2440	25	22	0.12	300	16SVPC68MV	1000
	100	6.3	5.9		2490	24	23	0.12	300	16SVPC100M	1000
	120	8.0	6.9	E7	2900	27	23	0.12	500	16SVPC120M	1000
	150	8.0	6.9		3220	22	21	0.12	500	16SVPC150M	1000
	270	8.0	11.9	E12	4070	16	14	0.15	864	16SVPC270M	400

*1: Ripple current (100 kHz / +105 ℃) *2: Reference value at 300 kHz *3: tan δ (120 Hz / +20 ℃) *4: After 2 minutes

◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≦ f < 1 kHz	1 kHz ≦ f < 10 kHz	10 kHz ≦ f < 100 kHz	100 kHz ≦ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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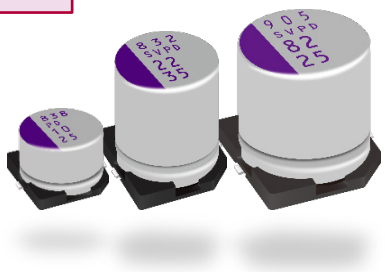
Some part numbers are not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVPD series



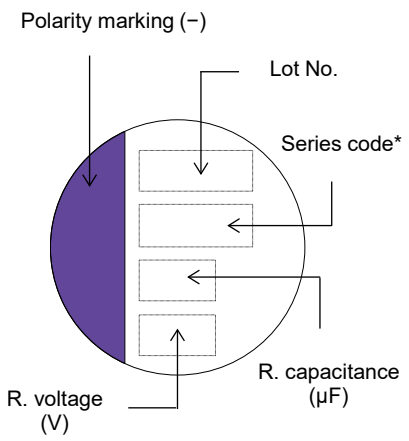
Features

- 125 ℃ 2000 h
- Guaranteed at 85 ℃ 85 %
- RoHS compliance, Halogen free

Specifications

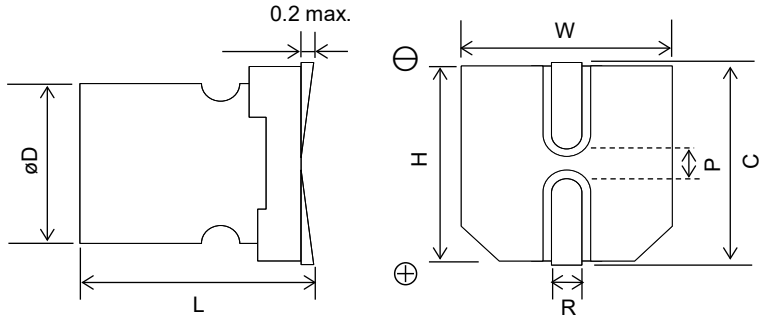
Size code	C6	E7	E12	F8	F12
Category temp. range	–55 ℃ to +125 ℃				
Rated voltage range	10 V to 25 V	16 V to 35 V	25 V to 35 V		
Nominal cap.range	10 µF to 56 µF	8.2 µF to 82 µF	22 µF to 47 µF	18 µF to 39 µF	47 µF to 82 µF
Capacitance tolerance	±20 % (120 Hz / +20 ℃)				
DC leakage current	Please see the attached characteristics list				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Endurance	+125 ℃ 2000 h, rated voltage applied				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≦ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+85 °C, 80 % to 90 % RH, 1000 h, rated voltage applied.				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≦ 200 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*1
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1 : Reference

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications					Standard (Reel size : ø380)	
		øD	L		Ripple current*1 (mA rms)	Allowable ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Q'ty (pcs)
10	56	6.3	5.9	C6	538	1700	45	0.12	112	10SVPD56M	1000
16	82	8.0	6.9	E7	670	2120	40	0.12	262	16SVPD82M	1000
25	10	6.3	5.9	C6	474	1500	65	0.10	50	25SVPD10M	1000
	22	8.0	6.9	E7	580	1835	48	0.10	110	25SVPD22M	1000
	39	10.0	7.9	F8	664	2100	45	0.10	195	25SVPD39M	500
	47	8.0	11.9	E12	943	2980	30	0.12	235	25SVPD47M	400
	82	10.0	12.6	F12	1202	3800	28	0.12	410	25SVPD82M	400
35	NRFND 8.2	8.0	6.9	E7	400	1300	70	0.10	57	35SVPD8R2M	1000
	18	10.0	7.9	F8	550	1800	60	0.10	126	35SVPD18M	500
	22	8.0	11.9	E12	700	2300	50	0.12	154	35SVPD22M	400
	47	10.0	12.6	F12	1150	3650	30	0.12	329	35SVPD47M	400

*1: Ripple current (100 kHz / +105 ℃ < Tx ≦ +125 ℃), Allowable ripple current (100 kHz / Tx ≦ +105 ℃)
*2: ESR (100 kHz to 300 kHz / +20 ℃)
*3: tan δ (120 Hz / +20 ℃)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

NRFND Not recommended for new design

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≦ f < 1 kHz	1 kHz ≦ f < 10 kHz	10 kHz ≦ f < 100 kHz	100 kHz ≦ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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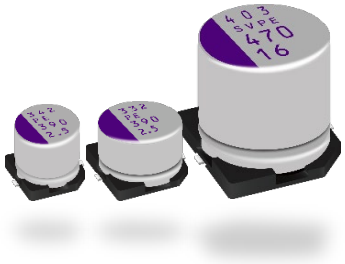
Panasonic INDUSTRY

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVPE series



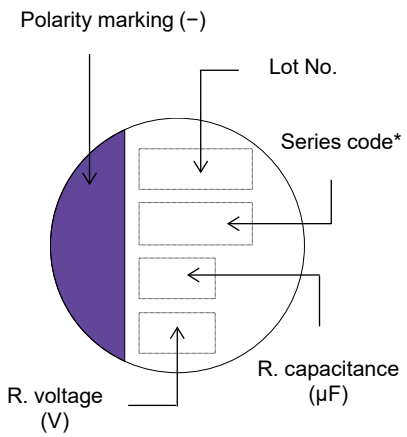
Features

- Low ESR (8 mΩ max.)
- Large capacitance (1200 μF max.)
- RoHS compliance, Halogen free

Specifications

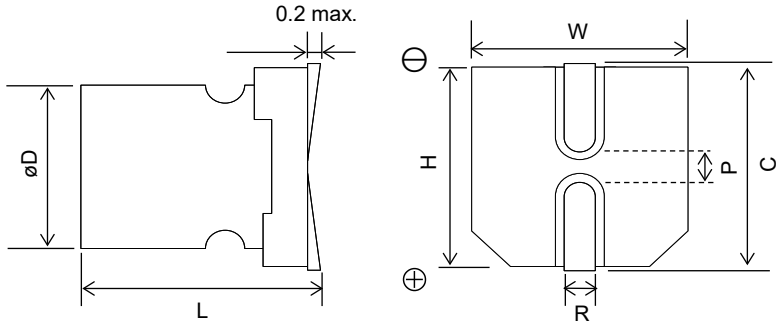
Size code	B6	C6	C10	F12
Category temp. range	–55 ℃ to +105 ℃			
Rated voltage range	2.5 V to 6.3 V	2.5 V to 10 V	2.0 V to 16 V	16 V
Nominal cap.range	150 μF to 390 μF	220 μF to 820 μF	180 μF to 1200 μF	470 μF
Capacitance tolerance	±20 % (120 Hz / +20 ℃)			
DC leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Endurance	+105 ℃ 2000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≦ 150 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 ℃, 90 % to 95 % RH, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≦ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*1
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
C10	6.3	9.9	6.6	6.6	7.3	0.6 to 0.8	2.1
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1 : Reference

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications					Standard（Reel size : ø380）	
		øD	L		Ripple current*1 (mA rms)	ESR (mΩ max.) 100 kHz / 20 ℃	ESR (mΩ max.) 300 kHz*2 / 20 ℃	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Q'ty (pcs)
2.0	1200	6.3	9.9	C10	5230	8	8	0.12	500	2SVPE1200M	500
2.5	270	5.0	5.9	B6	3860	10	9	0.12	500	2R5SVPE270M	1500
	330	5.0	5.9		3150	15	13	0.12	500	2R5SVPE330M	1500
		5.0	5.9		3860	10	9	0.12	500	2R5SVPE330MY	1500
	390	5.0	5.9		3860	10	9	0.12	700	2R5SVPE390MX	1500
		6.3	5.9	C6	3900	10	9	0.12	500	2R5SVPE390M	1000
	820	6.3	5.9		3900	10	9	0.12	1020	2R5SVPE820M	1000
6.3	150	5.0	5.9	B6	3520	12	10	0.12	500	6SVPE150M	1500
	180	5.0	5.9		3150	15	13	0.12	500	6SVPE180M	1500
	220	5.0	5.9		3150	15	13	0.12	500	6SVPE220MW	1500
		6.3	5.9	C6	3900	10	9	0.12	500	6SVPE220M	1000
	390	6.3	5.9		3900	10	9	0.12	1220	6SVPE390M	1000
10	220	6.3	5.9		2700	20	18	0.12	500	10SVPE220M	1000
16	180	6.3	9.9	C10	4460	11	10	0.12	576	16SVPE180M	500
	470	10.0	12.6	F12	6100	10	9	0.12	1504	16SVPE470M	400

*1: Ripple current (100 kHz / +105 ℃)
*2: Reference value at 300 kHz
*3: tan δ (120 Hz / +20 ℃)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≦ f < 1 kHz	1 kHz ≦ f < 10 kHz	10 kHz ≦ f < 100 kHz	100 kHz ≦ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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Panasonic INDUSTRY

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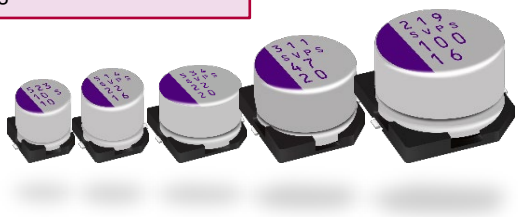
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVPS series



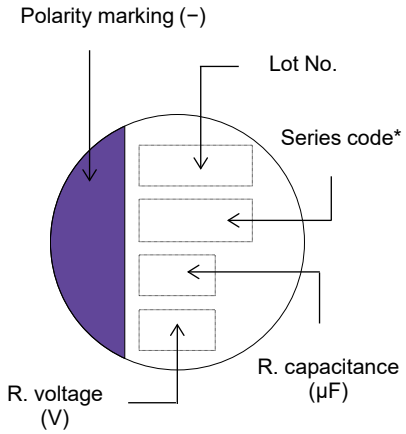
Features

- 105 °C 5000 h
- RoHS compliance, Halogen free

Specifications

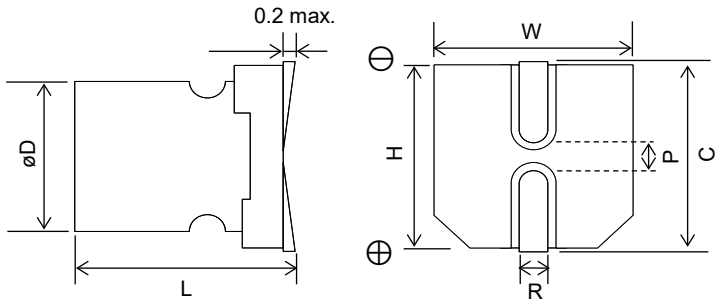
Size code	A5	B6	C6	E7	F8
Category temp. range	–55 °C to +105 °C				
Rated voltage range	4.0 V to 10 V	4.0 V to 16 V	4.0 V to 20 V	4.0 V to 25 V	4.0 V to 16 V
Nominal cap.range	10 µF to 33 µF	22 µF to 68 µF	22 µF to 150 µF	10 µF to 270 µF	100 µF to 680 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)				
DC leakage current	Please see the attached characteristics list				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Endurance	+105 °C 5000 h, rated voltage applied (25 V product : 20 V applied)				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*1
A5	4.0	5.4	4.3	4.3	5.0	0.6 to 0.8	1.0
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6

*1 : Reference

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications: Ripple current*1 (mA rms)	Specifications: ESR*2 (mΩ max.)	Specifications: tan δ*3	Specifications: LC*4 (μA)	Standard (Reel size : ø380): Part number	Standard (Reel size : ø380): Min. Packaging Q'ty (pcs)
4.0	NRFND 33	4.0	5.4	A5	740	200	0.15	66	4SVPS33M	2000
	NRFND 68	5.0	5.9	B6	1970	30	0.12	300	4SVPS68M	1500
	150	6.3	5.9	C6	2570	22	0.12	300	4SVPS150M	1000
	NRFND 270	8.0	6.9	E7	3220	22	0.12	500	4SVPS270M	1000
	680	10.0	7.9	F8	4130	20	0.12	544	4SVPS680M	500
6.3	NRFND 22	4.0	5.4	A5	740	200	0.12	69.3	6SVPS22M	2000
	47	5.0	5.9	B6	1970	30	0.12	300	6SVPS47M	1500
	120	6.3	5.9	C6	2570	22	0.12	300	6SVPS120M	1000
	220	8.0	6.9	E7	3220	22	0.12	500	6SVPS220M	1000
	470	10.0	7.9	F8	4130	20	0.12	592	6SVPS470M	500
10	NRFND 10	4.0	5.4	A5	700	220	0.10	50	10SVPS10M	2000
	NRFND 15	4.0	5.4		740	200	0.10	75	10SVPS15M	2000
	33	5.0	5.9	B6	1100	70	0.12	165	10SVPS33M	1500
	68	6.3	5.9	C6	2200	30	0.12	300	10SVPS68M	1000
	150	8.0	6.9	E7	2760	30	0.12	500	10SVPS150MX	1000
		10.0	7.9	F8	3020	30	0.12	300	10SVPS150M	500
	330	10.0	7.9		3770	24	0.12	660	10SVPS330M	500
16	22	5.0	5.9	B6	1060	90	0.10	176	16SVPS22M	1500
	39	6.3	5.9	C6	2460	24	0.12	300	16SVPS39M	1000
	82	8.0	6.9	E7	2760	30	0.12	262	16SVPS82M	1000
	100	10.0	7.9	F8	2670	35	0.12	320	16SVPS100M	500
	180	10.0	7.9		3430	29	0.12	576	16SVPS180M	500
20	22	6.3	5.9	C6	1450	60	0.10	88	20SVPS22M	1000
	47	8.0	6.9	E7	1890	45	0.12	188	20SVPS47M	1000
25	10	8.0	6.9		1500	60	0.10	125	25SVPS10M	1000

*1: Ripple current (100 kHz / +105 °C)
: The surface temperature of aluminum case top must not exceed 105 °C.
A rise in temperature due to self-heating by ripple current should be factored in.
*2: ESR (100 kHz to 300 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

NRFND Not recommended for new design

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

Panasonic INDUSTRY

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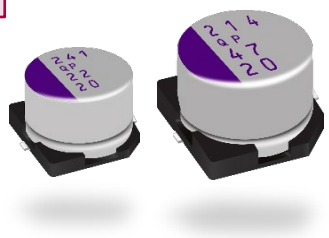
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVQP series



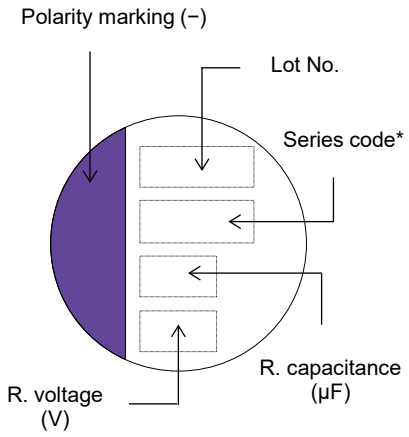
Features

- 125 °C 1000 h
- RoHS compliance, Halogen free

Specifications

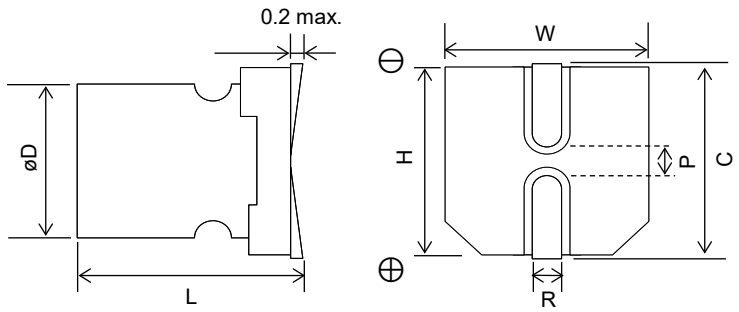
Size code	C6	E7
Category temp. range	–55 °C to +125 °C	
Rated voltage range	4.0 V to 20 V	6.3 V to 20 V
Nominal cap.range	22 µF to 150 µF	47 µF to 220 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
DC leakage current	Please see the attached characteristics list	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Endurance	+125 °C 1000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tanδ)	≤ 200 % of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tanδ)	≤ 150 % of the initial limit
	DC leakage current	Within the initial limit (after voltage processing)

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*1
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2

*1 : Reference value

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications: Ripple current*1 (mA rms)	Allowable ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard (Reel size : ø380): Part number	Min. Packaging Q'ty (pcs)
4.0	150	6.3	5.9	C6	572	1810	40	0.12	300	4SVQP150M	1000
6.3	NRFND 82	6.3	5.9		538	1700	45	0.12	258	6SVQP82M	1000
	100	6.3	5.9		572	1810	40	0.12	315	6SVQP100M	1000
	220	8.0	6.9	E7	810	2560	35	0.12	693	6SVQP220M	1000
10	56	6.3	5.9	C6	538	1700	45	0.12	280	10SVQP56M	1000
	120	8.0	6.9	E7	810	2560	35	0.12	600	10SVQP120M	1000
	150	8.0	6.9		810	2560	35	0.12	750	10SVQP150M	1000
16	39	6.3	5.9	C6	512	1620	50	0.10	312	16SVQP39M	1000
	82	8.0	6.9	E7	670	2120	40	0.12	656	16SVQP82M	1000
20	22	6.3	5.9	C6	459	1450	60	0.10	220	20SVQP22M	1000
	47	8.3	6.9	E7	598	1890	45	0.12	470	20SVQP47M	1000

*1: Ripple current (100 kHz / +105 °C < Tx ≤ +125 °C), Allowable ripple current (100 kHz / Tx ≤ +105 °C)

NRFND Not recommended for new design

*2: ESR (100 kHz to 300 kHz / +20 °C)

*3: tan δ (120 Hz / +20 °C)

*4: After 2 minutes

◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

Panasonic INDUSTRY

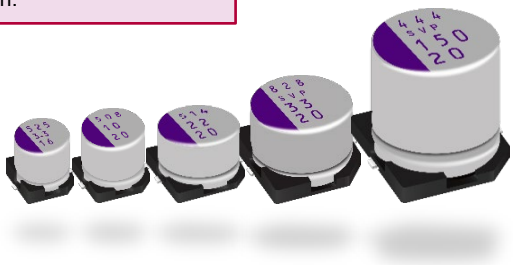
⚠ Some part numbers are not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Surface Mount Type

SVP series



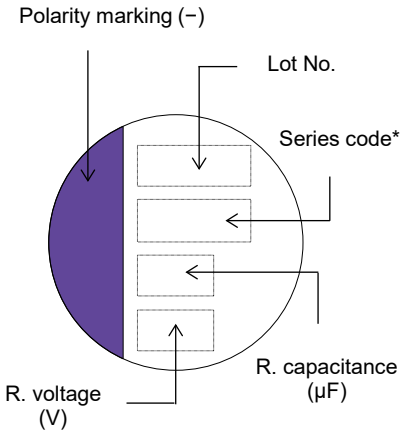
Features

- Standard
- RoHS compliance, Halogen free

Specifications

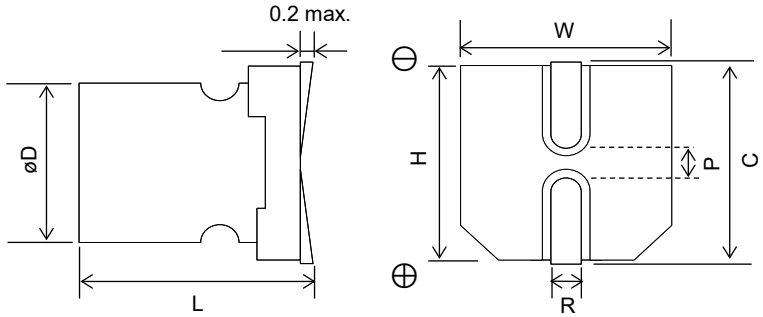
Size code	A5	B6	C6	E7	E12	F8	F12
Category temp. range	–55 °C to +105 °C						
Rated voltage range (V)	4.0 to 16	4.0 to 20	2.5 to 20	4.0 to 20	2.5 to 20	4.0 to 20	2.5 to 20
Nominal cap.range (μF)	3.3 to 33	10 to 68	22 to 220	33 to 330	100 to 680	56 to 680	150 to 1500
Capacitance tolerance	±20 % (120 Hz / +20 °C)						
DC leakage current	Please see the attached characteristics list						
Dissipation factor (tan δ)	Please see the attached characteristics list						
Endurance	+105 °C 2000 h, rated voltage applied						
	Capacitance change	Within ±20 % of the initial value					
	Dissipation factor (tanδ)	≤ 150 % of the initial limit					
	DC leakage current	Within the initial limit					
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage						
	Capacitance change	Within ±20 % of the initial value					
	Dissipation factor (tanδ)	≤ 150 % of the initial limit					
	DC leakage current	Within the initial limit (after voltage processing)					

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L +0.1 -0.4	W±0.2	H±0.2	C±0.2	R	P*1
A5	4.0	5.4	4.3	4.3	5.0	0.6 to 0.8	1.0
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

*1 : Reference

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications: Ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Standard (Reel size : ø380): Part number	Min. Packaging Q'ty (pcs)
2.5	220	6.3	5.9	C6	2390	23	0.12	110	2R5SVP220M	1000
	680	8.0	11.9	E12	4520	13	0.15	340	2R5SVP680M	400
	1500	10.0	12.6	F12	5440	12	0.18	750	2R5SVP1500M	400
4.0	NRFND 33	4.0	5.4	A5	740	200	0.15	66	4SVP33M	2000
	NRFND 39	5.0	5.9	B6	1100	70	0.12	78	4SVP39M	1500
	68	5.0	5.9		1400	60	0.12	136	4SVP68M	1500
	150	6.3	5.9	C6	1810	40	0.12	120	4SVP150MX	1000
	330	8.0	6.9	E7	2560	35	0.12	264	4SVP330M	1000
	560	8.0	11.9	E12	4520	13	0.15	448	4SVP560M	400
	680	10.0	7.9	F8	3700	25	0.12	544	4SVP680M	500
	1200	10.0	12.6	F12	5440	12	0.18	960	4SVP1200M	400
6.3	NRFND 22	4.0	5.4	A5	740	200	0.12	69.3	6SVP22M	2000
	47	5.0	5.9	B6	1100	70	0.12	148	6SVP47M	1500
	82	6.3	5.9	C6	1700	45	0.12	103	6SVP82M	1000
	100	6.3	5.9		1810	40	0.12	126	6SVP100M	1000
	120	6.3	5.9		2780	17	0.12	151	6SVP120MV	1000
	220	8.0	6.9	E7	2560	35	0.12	277	6SVP220MX	1000
		10.0	7.9	F8	3700	25	0.12	277	6SVP220M	500
	330	10.0	7.9		3700	25	0.12	416	6SVP330M	500
	470	10.0	7.9		3700	25	0.12	592	6SVP470MX	500
		8.0	11.9	E12	4210	15	0.15	592	6SVP470M	400
	820	10.0	12.6	F12	5440	12	0.15	775	6SVP820M	400
10	NRFND 4.7	4.0	5.4	A5	670	240	0.08	23.5	10SVP4R7M	2000
	NRFND 6.8	4.0	5.4		670	240	0.09	34	10SVP6R8M	2000
	NRFND 10	4.0	5.4		700	220	0.10	50	10SVP10M	2000
	NRFND 15	4.0	5.4		740	200	0.10	75	10SVP15M	2000
	33	5.0	5.9	B6	1100	70	0.12	165	10SVP33M	1500
	47	6.3	5.9	C6	1620	50	0.12	94	10SVP47M	1000
	56	6.3	5.9		1700	45	0.12	112	10SVP56M	1000
	120	8.0	6.9	E7	2560	35	0.12	240	10SVP120M	1000
	150	8.0	6.9		2560	35	0.12	300	10SVP150MX	1000
		10.0	7.9	F8	3020	30	0.12	300	10SVP150M	500
	270	10.0	7.9		3700	25	0.12	540	10SVP270M	500
	330	10.0	7.9		3700	25	0.12	660	10SVP330MX	500
		8.0	11.9	E12	3950	17	0.15	660	10SVP330M	400
	560	10.0	12.6	F12	5230	13	0.15	840	10SVP560M	400
16	NRFND 3.3	4.0	5.4	A5	660	260	0.07	26.4	16SVP3R3M	2000
	15	5.0	5.9	B6	1020	120	0.10	120	16SVP15M	1500
	22	5.0	5.9		1060	90	0.10	176	16SVP22M	1500
	39	6.3	5.9	C6	1620	50	0.10	125	16SVP39M	1000
	56	8.0	6.9	E7	1890	45	0.12	179	16SVP56M	1000
	82	8.0	6.9		2120	40	0.12	262	16SVP82M	1000
	100	10.0	7.9	F8	2670	35	0.12	320	16SVP100M	500
	150	10.0	7.9		3020	30	0.12	480	16SVP150M	500
	180	10.0	7.9		3020	30	0.12	576	16SVP180MX	500
		8.0	11.9	E12	3640	20	0.15	576	16SVP180M	400
	330	10.0	12.6	F12	4720	16	0.15	792	16SVP330M	400
20	10	5.0	5.9	B6	1020	120	0.10	100	20SVP10M	1500
	22	6.3	5.9	C6	1450	60	0.10	88	20SVP22M	1000
	27	6.3	5.9		1450	60	0.10	108	20SVP27M	1000
	33	8.0	6.9	E7	1890	45	0.12	132	20SVP33M	1000
	47	8.0	6.9		1890	45	0.12	188	20SVP47M	1000
	56	10.0	7.9	F8	2400	40	0.12	224	20SVP56M	500
	68	10.0	7.9		2400	40	0.12	272	20SVP68M	500
	100	8.0	11.9	E12	3320	24	0.15	400	20SVP100M	400
	150	10.0	12.6	F12	4320	20	0.15	600	20SVP150M	400

*1: Ripple current (100 kHz / +105 °C)
*2: ESR (100 kHz to 300 kHz/+20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Reflow conditions” and “Taping specifications”.

NRFND Not recommended for new design

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

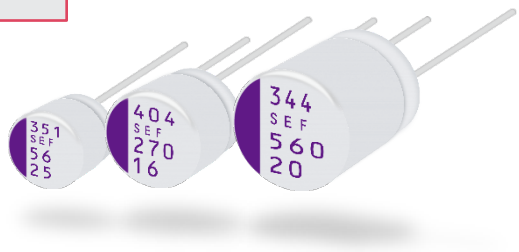
⚠ This series is not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Radial Lead Type

SEF series



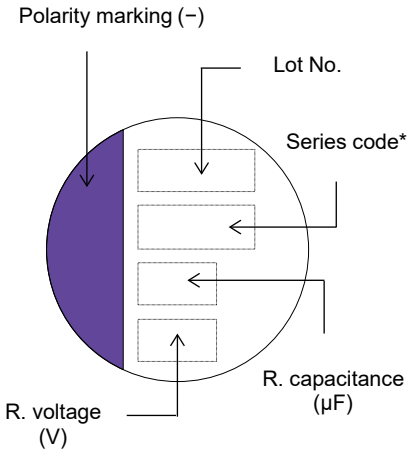
Features

- High voltage (35 V max.)
- Large capacitance (1000 μF max.)
- RoHS compliance, Halogen free

Specifications

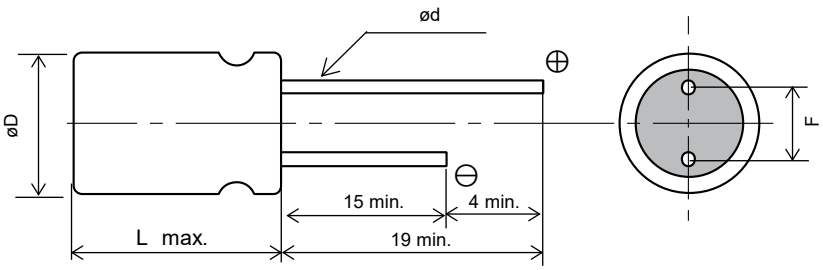
Size code	C6	E7	E12	F13
Category temp. range	–55 °C to +125 °C			
Rated voltage range	16 V to 35 V			
Nominal cap.range	22 μF to 180 μF	39 μF to 270 μF	82 μF to 560 μF	120 μF to 1000 μF
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Endurance	+125 °C 1000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≤ 200 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L max.	F±0.5	ød±0.05
C6	6.3	6.0	2.5	0.5
E7	8.0	7.0	3.5	0.5*1
E12	8.0	12.0	3.5	0.6
F13	10.0	13.0	5.0	0.6

*1: 32SEF68M 0.6±0.05

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications					Part number
		øD	L		Ripple current*1 (mA rms)	Allowable ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Click here for part number list of lead terminal cutting and lead terminal taping
16	180	6.3	6.0	C6	1040	3300	22	0.12	576	16SEF180M
	270	8.0	7.0	E7	1040	3300	22	0.12	864	16SEF270M
	560	8.0	12.0	E12	1560	4950	14	0.12	1792	16SEF560M
	1000	10.0	13.0	F13	1700	5400	12	0.12	3200	16SEF1000M
20	120	6.3	6.0	C6	1010	3200	25	0.12	480	20SEF120M
	180	8.0	7.0	E7	1010	3200	25	0.12	720	20SEF180M
	390	8.0	12.0	E12	1560	4950	14	0.12	1560	20SEF390M
	560	10.0	13.0	F13	1700	5400	12	0.12	2240	20SEF560M
25	56	6.3	6.0	C6	880	2800	30	0.12	280	25SEF56M
	82	8.0	7.0	E7	940	3000	28	0.12	410	25SEF82M
	180	8.0	12.0	E12	1470	4650	16	0.12	900	25SEF180M
	330	10.0	13.0	F13	1580	5000	14	0.12	1650	25SEF330M
32	68	8.0	7.0	E7	1010	3200	25	0.10	435	32SEF68M
35	22	6.3	6.0	C6	820	2600	35	0.12	154	35SEF22M
	39	8.0	7.0	E7	880	2800	30	0.12	273	35SEF39M
	82	8.0	12.0	E12	1260	4000	20	0.12	574	35SEF82M
	120	10.0	13.0	F13	1390	4400	18	0.12	840	35SEF120M

*1: Ripple current (100 kHz / +105 °C < Tx ≤ +125 °C) / Allowable ripple current (100 kHz / Tx ≤ +105 °C)
*2: ESR（100 kHz to 300 kHz / +20 °C）
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Flow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

Panasonic INDUSTRY

⚠ This series is not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Radial Lead Type

SEK series

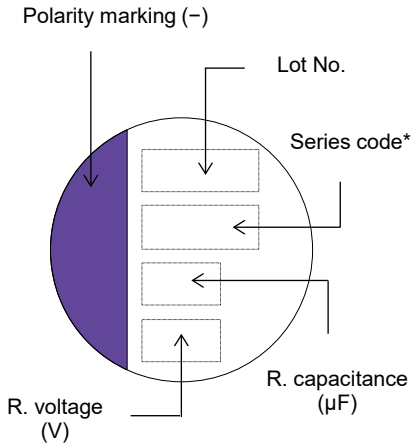
Features

- High voltage (50 V max.)
- 125 °C 1000 h
- RoHS compliance, Halogen free

Specifications

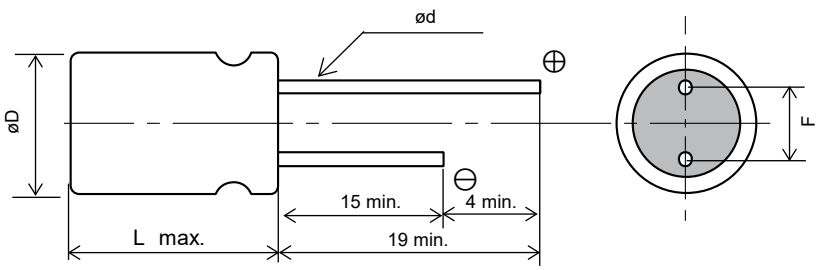
Size code	C6	E7	E12	F13
Category temp. range	–55 °C to +125 °C			
Rated voltage range	25 V to 50 V			
Nominal cap.range	22 µF to 82 µF	33 µF to 120 µF	68 µF to 270 µF	120 µF to 470 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Endurance	+125 °C 1000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≤ 200 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L max.	F±0.5	ød±0.05
C6	6.3	6.0	2.5	0.5
E7	8.0	7.0	3.5	0.5
E12	8.0	12.0	3.5	0.6
F13	10.0	13.0	5.0	0.6

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications					Part number
		øD	L		Ripple current*1 (mA rms)	Allowable ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Click here for part number list of lead terminal cutting and lead terminal taping
25	82	6.3	6.0	C6	960	3060	25	0.12	410	25SEK82M
	120	8.0	7.0	E7	1010	3200	24	0.12	600	25SEK120M
	270	8.0	12.0	E12	1470	4650	16	0.12	1350	25SEK270M
	470	10.0	13.0	F13	1590	5000	14	0.12	2350	25SEK470M
35	47	6.3	6.0	C6	930	2950	27	0.12	329	35SEK47M
	82	8.0	7.0	E7	960	3060	25	0.12	574	35SEK82M
	180	8.0	12.0	E12	1260	4000	20	0.12	1260	35SEK180M
	330	10.0	13.0	F13	1390	4400	18	0.12	2310	35SEK330M
50	22	6.3	6.0	C6	820	2600	35	0.12	220	50SEK22M
	33	8.0	7.0	E7	850	2700	35	0.12	330	50SEK33M
	68	8.0	12.0	E12	1200	3800	25	0.12	680	50SEK68M
	120	10.0	13.0	F13	1350	4300	20	0.12	1200	50SEK120M

*1: Ripple current (100 kHz / +105 °C < Tx ≤ +125 °C) / Allowable ripple current (100 kHz / Tx ≤ +105 °C)
*2: ESR (100 kHz to 300 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Flow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

⚠ This series is not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Radial Lead Type

SEPG series

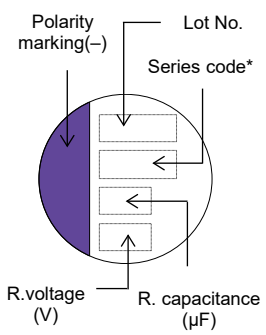
Features

- High ripple current (6100 mA rms max.)
- RoHS compliance, Halogen free

Specifications

Size code	B9	C9	C10	E9	E13
Category temp. range	–55 °C to +105 °C				
Rated voltage range	16 V				
Rated cap. range	150 µF	270 µF		470 µF	560 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Endurance	+105 °C 5000 h, rated voltage applied				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tan δ)	≤ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady State)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tan δ)	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

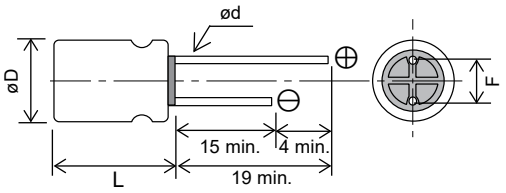
Marking



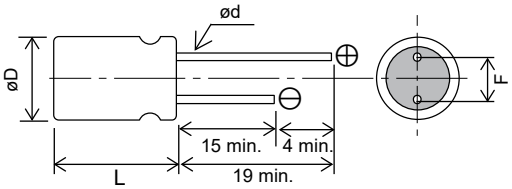
* Depends on the case size.

Dimensions (not to scale)

・E13 size



・B9, C9, C10, E9 size



Flat rubber is used for B9, C9, C10, and E9 size.

Unit : mm

Size code	øD±0.5	L max.	F±0.5	ød±0.05
B9	5.0	9.0	2.0	0.6
C9	6.3	9.0	2.5	0.6
C10	6.3	10.0	2.5	0.5
E9	8.0	9.0	3.5	0.6
E13	8.0	13.0	3.5	0.6

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications				Part number
		øD	L		Ripple current *1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Click here for part number list of lead terminal cutting and lead terminal taping
16	150	5.0	9.0	B9	4500	12	0.12	480	16SEPG150M
	270	6.3	9.0	C9	5040	10	0.12	864	16SEPG270W
		6.3	10.0	C10	5800	8	0.12	864	16SEPG270M
	470	8.0	9.0	E9	5400	8	0.12	1504	16SEPG470M
	560	8.0	13.0	E13	6100	8	0.12	1792	16SEPG560M

*1: Ripple curren (100 kHz / +105 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Flow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

Panasonic INDUSTRY

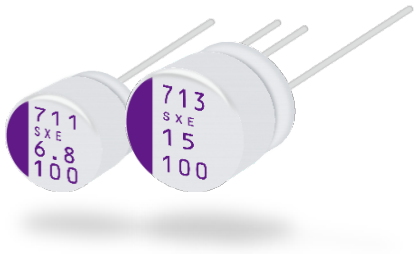
⚠ This series is not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Radial Lead Type

SXE series



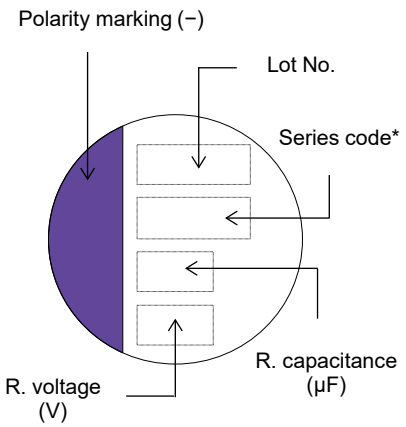
Features

- Super high voltage (100 V max.)
- 125 °C 1000 h
- RoHS compliance, Halogen free

Specifications

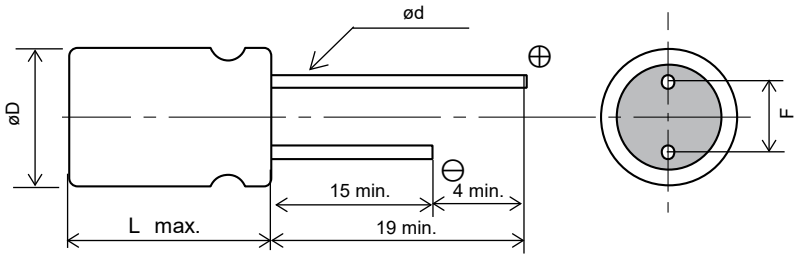
Size code	E7	E12	F8	F13
Category temp. range	–55 °C to +125 °C			
Rated voltage range	63 V to 100 V			
Nominal cap.range	6.8 µF to 18 µF	15 µF to 68 µF	15 µF to 39 µF	18 µF to 120 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Endurance	+125 °C 1000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≤ 200 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tanδ)	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L max.	F±0.5	ød±0.05
E7	8.0	7.0	3.5	0.45
E12	8.0	12.0	3.5	0.6
F8	10.0	8.0	5.0	0.5
F13	10.0	13.0	5.0	0.6

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications: Ripple current*1 (mA rms)	Specifications: Allowable ripple current*1 (mA rms)	Specifications: ESR*2 (mΩ max.)	Specifications: tan δ*3	Specifications: LC*4 (μA)	Part number (Click here for part number list of lead terminal cutting and lead terminal taping)
63	18	8.0	7.0	E7	340	1100	60	0.12	56	63SXE18M
	33	8.0	12.0	E12	930	2950	25	0.12	104	63SXE33M
	39	8.0	12.0	E12	930	2950	25	0.12	122	63SXE39M
		10.0	8.0	F8	690	2190	50	0.12	122	63SXE39MX
	56	8.0	12.0	E12	930	2950	25	0.12	176	63SXE56M
	68	8.0	12.0	E12	930	2950	25	0.12	214	63SXE68MX
		10.0	13.0	F13	1030	3280	25	0.12	214	63SXE68M
	100	10.0	13.0	F13	1030	3280	25	0.12	315	63SXE100M
	120	10.0	13.0	F13	1030	3280	25	0.12	378	63SXE120M
72	82	10.0	13.0	F13	980	3100	28	0.12	295	72SXE82M
	100	10.0	13.0	F13	980	3100	28	0.12	360	72SXE100M
80	12	8.0	7.0	E7	340	1100	60	0.12	48	80SXE12M
	27	8.0	12.0	E12	780	2490	35	0.12	108	80SXE27M
		10.0	8.0	F8	660	2080	55	0.12	108	80SXE27MX
	33	8.0	12.0	E12	780	2490	35	0.12	132	80SXE33M
	47	8.0	12.0	E12	780	2490	35	0.12	188	80SXE47MX
		10.0	13.0	F13	980	3100	28	0.12	188	80SXE47M
	56	10.0	13.0	F13	980	3100	28	0.12	224	80SXE56M
	82	10.0	13.0	F13	980	3100	28	0.12	328	80SXE82M
100	6.8	8.0	7.0	E7	340	1100	60	0.12	34	100SXE6R8M
	15	10.0	8.0	F8	630	2000	60	0.12	75	100SXE15MX
		8.0	12.0	E12	730	2350	40	0.12	75	100SXE15M
	18	10.0	13.0	F13	940	3000	30	0.12	90	100SXE18M
		8.0	12.0	E12	730	2350	40	0.12	90	100SXE18MX
	22	10.0	13.0	F13	940	3000	30	0.12	110	100SXE22M
	27	8.0	12.0	E12	730	2350	40	0.12	135	100SXE27MX
		10.0	13.0	F13	940	3000	30	0.12	135	100SXE27M
	39	10.0	13.0	F13	940	3000	30	0.12	195	100SXE39M

*1: Ripple current (100 kHz / +105 °C < Tx ≤ +125 °C) / Allowable ripple current (100 kHz / Tx ≤ +105 °C)
*2: ESR (100 kHz to 300 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Flow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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Panasonic INDUSTRY

This series is not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Radial Lead Type

SEPF series

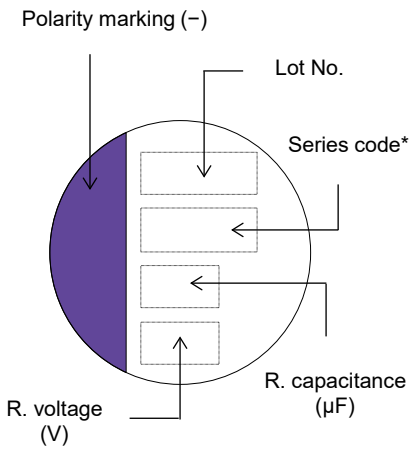
Features

- High voltage (35 V max.)
- Large capacitance (1000 µF max.)
- RoHS compliance, Halogen free

Specifications

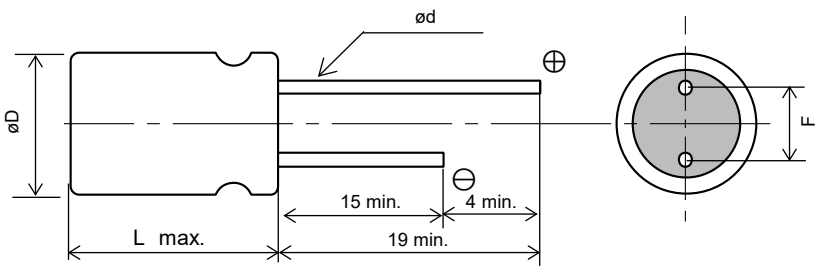
Size code	C55	C6	E7	E12	F13
Category temp. range	–55 °C to +105 °C				
Rated voltage range	16 V to 32 V	16 V to 35 V			
Nominal cap.range	22 µF to 150 µF	22 µF to 180 µF	39 µF to 270 µF	82 µF to 560 µF	120 µF to 1000 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)				
DC leakage current	Please see the attached characteristics list				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Endurance	+105 °C 5000 h, rated voltage applied				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L max.	F±0.5	ød±0.05
C55	6.3	5.5	2.5	0.45
C6	6.3	6.0	2.5	0.5
E7	8.0	7.0	3.5	0.5*1
E12	8.0	12.0	3.5	0.6
F13	10.0	13.0	5.0	0.6

*1: 32SEPF68M : 0.6±0.05

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Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm)		Size code	Specifications				Part number
		øD	L		Ripple current *1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Click here for part number list of lead terminal cutting and lead terminal taping
16	150	6.3	5.5	C55	2590	30	0.12	480	16SEPF150M
	180	6.3	6.0	C6	3300	22	0.12	576	16SEPF180M
	270	8.0	7.0	E7	3300	22	0.12	864	16SEPF270M
	560	8.0	12.0	E12	4950	14	0.12	1792	16SEPF560M
	1000	10.0	13.0	F13	5400	12	0.12	3200	16SEPF1000M
20	120	6.3	6.0	C6	3200	25	0.12	480	20SEPF120M
	180	8.0	7.0	E7	3200	25	0.12	720	20SEPF180M
	390	8.0	12.0	E12	4950	14	0.12	1560	20SEPF390M
	560	10.0	13.0	F13	5400	12	0.12	2240	20SEPF560M
25	56	6.3	6.0	C6	2800	30	0.12	280	25SEPF56M
	82	8.0	7.0	E7	3000	28	0.12	410	25SEPF82M
	180	8.0	12.0	E12	4650	16	0.12	900	25SEPF180M
	330	10.0	13.0	F13	5000	14	0.12	1650	25SEPF330M
32	22	6.3	5.5	C55	2400	35	0.12	140	32SEPF22M
	68	8.0	7.0	E7	3200	25	0.10	435	32SEPF68M
35	22	6.3	6.0	C6	2600	35	0.12	154	35SEPF22M
	39	8.0	7.0	E7	2800	30	0.12	273	35SEPF39M
	82	8.0	12.0	E12	4000	20	0.12	574	35SEPF82M
	120	10.0	13.0	F13	4400	18	0.12	840	35SEPF120M

*1: Ripple current (100 kHz / +105 °C)
*2: ESR (100 kHz to 300 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Flow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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Panasonic INDUSTRY

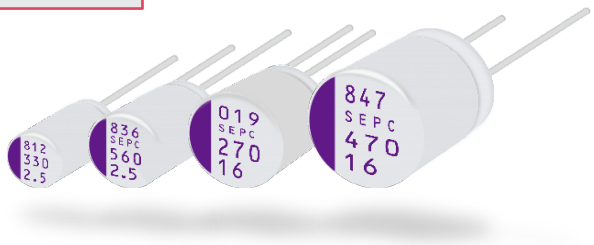
⚠ This series is not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Radial Lead Type

SEPC series



Features

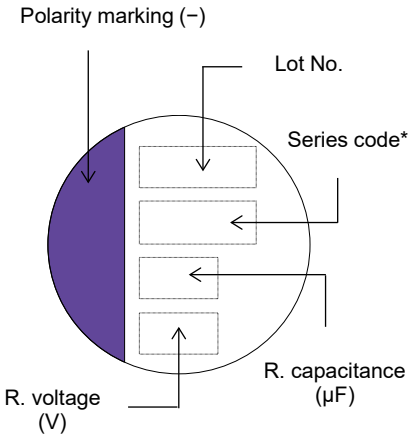
- Super low ESR (5 mΩ max.)
- Large capacitance (2700 µF max.)
- RoHS compliance, Halogen free

Specifications

Size code	B9	C55	C6	C9	E7	E9	E12	E13	F13
Category temp. range	–55 °C to +105 °C								
Rated voltage range (V)	2.5	6.3	2.5 to 16		6.3 to 16	2.5 to 16	16	2.5 to 6.3	2.5 to 16
Nominal cap.range (µF)	100 to 560	220	100 to 560	100 to 820	150 to 1000	180 to 1000	180 to 270	470 to 820	470 to 2700
Capacitance tolerance	±20 % (120 Hz / +20 °C)								
DC leakage current	Please see the attached characteristics list								
Dissipation factor (tan δ)	Please see the attached characteristics list								

Endurance	+105 °C 5000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tanδ)	≤ 150 % of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tanδ)	≤ 150 % of the initial limit
	DC leakage current	Within the initial limit (after voltage processing)

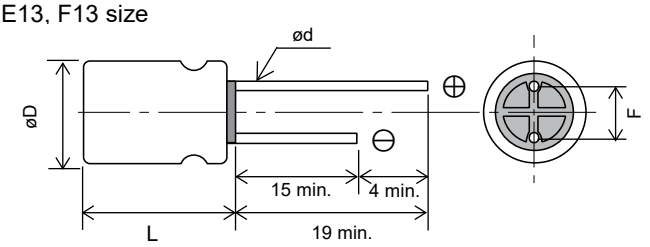
Marking



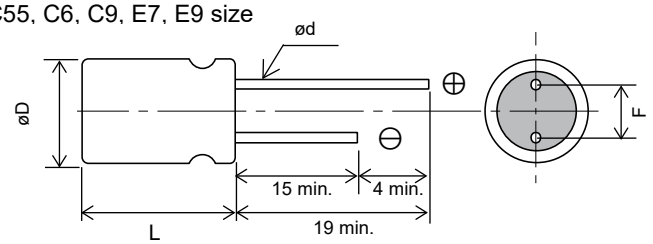
* Depends on the case size.

Dimensions (not to scale)

・E12, E13, F13 size



・B9, C55, C6, C9, E7, E9 size



Flat rubber is used for B9, C55, C6, C9, E7, and E9 size.

Unit : mm

Size code	øD±0.5	L max.	F±0.5	ød±0.05
B9	5.0	9.0	2.0	0.6
C55	6.3	5.5	2.5	0.45
C6	6.3	6.0	2.5	0.5 *1
C9	6.3	9.0	2.5	0.6
E7	8.0	7.0	3.5	0.6 *2
E9	8.0	9.0	3.5	0.6
E12	8.0	12.0	3.5	0.6
E13	8.0	13.0	3.5	0.6
F13	10.0	13.0	5.0	0.6

*1: 16SEPC100M : 0.45±0.05
*2: 16SEPC150MD、10SEPC270M : 0.45±0.05

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Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications: Ripple current *1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number (Click here for part number list of lead terminal cutting and lead terminal taping)
2.5	100	5.0	9.0	B9	4180	7	0.10	500	2SEPC100MZ
	330	5.0	9.0		4180	7	0.10	500	2SEPC330MZ
	390	6.3	6.0	C6	3900	10	0.12	500	2SEPC390M
	470	5.0	9.0	B9	4180	7	0.10	500	2SEPC470MZ
	560	5.0	9.0		4180	7	0.10	500	2SEPC560MZ
		6.3	6.0	C6	3900	10	0.12	500	2SEPC560M
		6.3	9.0	C9	5600	7	0.10	500	2SEPC560MW
		8.0	9.0	E9	4700	8	0.10	280	2SEPC560MX
	820	6.3	9.0	C9	5600	7	0.10	500	2SEPC820MW
		8.0	7.0	E7	5300	8	0.10	500	2SEPC820MD
		8.0	9.0	E9	6100	7	0.10	500	2SEPC820MX
		8.0	9.0		7200	5	0.10	500	2SEPC820MY
		8.0	13.0	E13	6100	7	0.10	500	2R5SEPC820M
	1000	8.0	9.0	E9	6100	7	0.10	500	2SEPC1000MX
	2700	10.0	13.0	F13	5560	10	0.10	1350	2SEPC2700M
4.0	560	6.3	9.0	C9	5600	7	0.10	500	4SEPC560MW
		8.0	9.0	E9	6100	7	0.10	500	4SEPC560MX
		8.0	13.0	E13	6100	7	0.10	500	4SEPC560M
	680	8.0	13.0		6100	7	0.10	544	4SEPC680M
	820	10.0	13.0	F13	6640	7	0.10	656	4SEPC820M
6.3	220	6.3	5.5	C55	2980	18	0.12	280	6SEPC220M
	470	6.3	9.0	C9	5600	7	0.10	592	6SEPC470MW
		8.0	9.0	E9	5700	8	0.10	592	6SEPC470MX
		8.0	13.0	E13	5700	8	0.10	592	6SEPC470M
	560	6.3	9.0	C9	5600	7	0.10	705	6SEPC560MW
		8.0	9.0	E9	6100	7	0.10	705	6SEPC560MX
	680	10.0	13.0	F13	6640	7	0.10	857	6SEPC680M
	1000	8.0	7.0	E7	3530	18	0.10	1260	6SEPC1000MD
	1500	10.0	13.0	F13	5560	10	0.10	1890	6SEPC1500M
10	270	8.0	7.0	E7	3220	22	0.12	500	10SEPC270MD
16	100	6.3	6.0	C6	2490	24	0.10	320	16SEPC100M
		6.3	9.0	C9	4680	10	0.10	500	16SEPC100MW
	150	8.0	7.0	E7	3220	22	0.12	500	16SEPC150MD
	180	8.0	9.0	E9	5000	10	0.10	576	16SEPC180MX
		8.0	12.0	E12	4360	16	0.10	576	16SEPC180M
	220	8.0	7.0	E7	4150	13	0.10	500	16SEPC220MD
	270	8.0	9.0	E9	5000	10	0.10	864	16SEPC270MX
		8.0	12.0	E12	5000	11	0.10	864	16SEPC270M
	470	10.0	13.0	F13	6100	10	0.10	1504	16SEPC470M

*1: Ripple current (100 kHz / +105 °C)
*2: ESR (100 kHz to 300 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Flow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

⚠ This series is not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Radial Lead Type

SEQP series

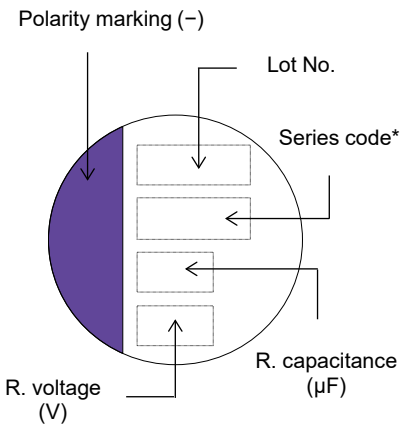
Features

- High voltage (32 V max.)
- 125 °C 1000 h
- RoHS compliance, Halogen free

Specifications

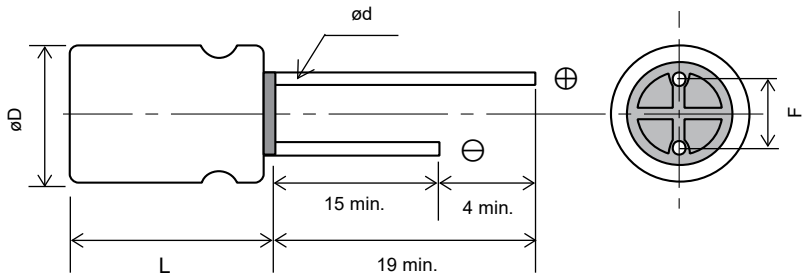
Size code	C6	E7	E12	F8	F13
Category temp. range	–55 °C to +125 °C				
Rated voltage range	4.0 V to 20 V	4.0 V to 32 V			4.0 V to 20 V
Nominal cap.range	22 µF to 150 µF	6.8 µF to 330 µF	18 µF to 560 µF	15 µF to 680 µF	150 µF to 1200 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)				
DC leakage current	Please see the attached characteristics list				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Endurance	+125 °C 1000 h / +105 °C 5000 h, rated voltage applied				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≤ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L max.	F±0.5	ød±0.05
C6	6.3	6.0	2.5	0.45
E7	8.0	7.0	3.5	0.45
E12	8.0	12.0	3.5	0.6
F8	10.0	8.0	5.0	0.5
F13	10.0	13.0	5.0	0.6

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications: Ripple current*1 (mA rms)	Allowable ripple current*1 (mA rms)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number: Click here for part number list of lead terminal cutting and lead terminal taping
4.0	150	6.3	6.0	C6	572	1810	40	0.12	300	4SEQP150M
	330	8.0	7.0	E7	810	2560	35	0.12	660	4SEQP330M
	560	8.0	12.0	E12	1430	4520	13	0.15	448	4SEQP560M
	680	10.0	8.0	F8	1170	3700	25	0.12	544	4SEQP680M
	1200	10.0	13.0	F13	1721	5440	12	0.18	960	4SEQP1200M
6.3	82	6.3	6.0	C6	537	1700	45	0.12	258	6SEQP82M
	150	8.0	7.0	E7	810	2560	35	0.12	472	6SEQP150M
	330	10.0	8.0	F8	1170	3700	25	0.12	416	6SEQP330M
	470	8.0	12.0	E12	1332	4210	15	0.15	592	6SEQP470M
	820	10.0	13.0	F13	1721	5440	12	0.15	775	6SEQP820M
10	56	6.3	6.0	C6	537	1700	45	0.12	280	10SEQP56M
	120	8.0	7.0	E7	810	2560	35	0.12	600	10SEQP120M
	270	10.0	8.0	F8	1170	3700	25	0.12	540	10SEQP270M
	330	8.0	12.0	E12	1250	3950	17	0.15	660	10SEQP330M
	560	10.0	13.0	F13	1655	5230	13	0.15	840	10SEQP560M
16	39	6.3	6.0	C6	512	1620	50	0.10	312	16SEQP39M
	82	8.0	7.0	E7	670	2120	40	0.12	656	16SEQP82M
	150	10.0	8.0	F8	955	3020	30	0.12	480	16SEQP150M
	180	8.0	12.0	E12	1151	3640	20	0.15	576	16SEQP180M
	330	10.0	13.0	F13	1493	4720	16	0.15	792	16SEQP330M
20	22	6.3	6.0	C6	458	1450	60	0.10	220	20SEQP22M
	47	8.0	7.0	E7	598	1890	45	0.12	470	20SEQP47M
	68	10.0	8.0	F8	759	2400	40	0.12	272	20SEQP68M
	100	8.0	12.0	E12	1050	3320	24	0.15	400	20SEQP100M
	150	10.0	13.0	F13	1367	4320	20	0.15	600	20SEQP150M
32	6.8	8.0	7.0	E7	440	1400	100	0.10	44	32SEQP6R8M
	15	10.0	8.0	F8	560	1800	80	0.10	96	32SEQP15M
	18	8.0	12.0	E12	790	2500	50	0.12	115	32SEQP18M

*1: Ripple current (100 kHz / +105 °C < Tx ≤ +125 °C) / Allowable ripple current (100 kHz / Tx ≤ +105 °C)
*2: ESR（100 kHz to 300 kHz / +20 °C）
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Flow conditions” and “Taping specifications”.

Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

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Panasonic INDUSTRY

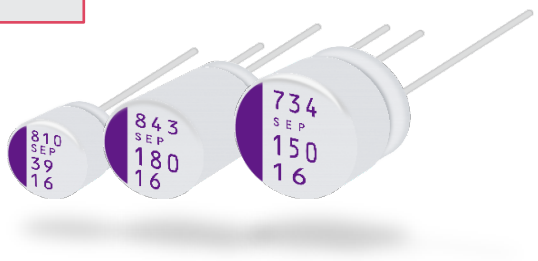
⚠ This series is not a recommended product.
Not recommended for new design.

OS-CON

Conductive Polymer Aluminum Solid Capacitors

Radial Lead Type

SEP series



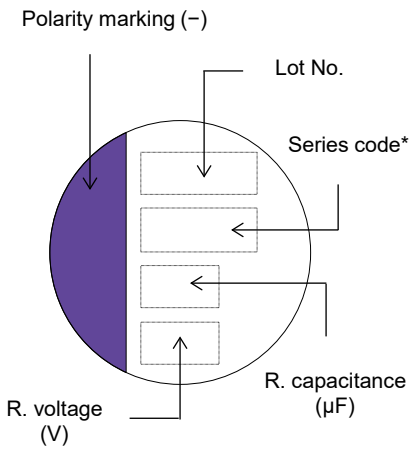
Features

- Standard
- 105 °C 3000 h
- RoHS compliance, Halogen free

Specifications

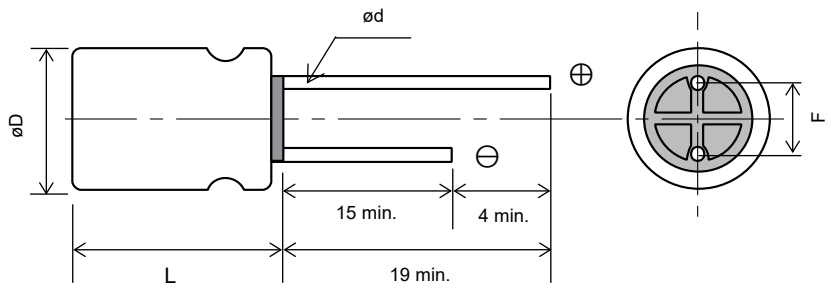
Size code	C6	E7	E12	F8	F13
Category temp. range	–55 °C to +105 °C				
Rated voltage range	4.0 V to 20 V		2.5 V to 20 V	4.0 V to 20 V	2.5 V to 20 V
Nominal cap.range	22 µF to 150 µF	33 µF to 330 µF	100 µF to 680 µF	56 µF to 680 µF	150 µF to 1500 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)				
DC leakage current	Please see the attached characteristics list				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Endurance	+105 °C 3000 h, rated voltage applied (2.5 V products : 2000 h)				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 % RH, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	Dissipation factor (tanδ)	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

Marking



* Depends on the case size.

Dimensions (not to scale)



Unit : mm

Size code	øD±0.5	L max.	F±0.5	ød±0.05
C6	6.3	6.0	2.5	0.45
E7	8.0	7.0	3.5	0.45
E12	8.0	12.0	3.5	0.6
F8	10.0	8.0	5.0	0.5
F13	10.0	13.0	5.0	0.6

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Should a safety concern arise regarding this product, please be sure to contact us immediately.

Characteristics list

Rated voltage (V)	Rated capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L	Size code	Specifications Ripple current *1 (mA rms)	Specifications ESR*2 (mΩ max.)	Specifications tan δ*3	Specifications LC*4 (μA)	Part number Click here for part number list of lead terminal cutting and lead terminal taping
2.5	680	8.0	12.0	E12	4520	13	0.15	340	2R5SEP680M
	1500	10.0	13.0	F13	5440	12	0.18	750	2R5SEP1500M
4.0	100	6.3	6.0	C6	1810	40	0.12	200	4SEP100M
	150	6.3	6.0		1810	40	0.12	300	4SEP150M
	220	8.0	7.0	E7	2560	35	0.12	440	4SEP220M
	330	8.0	7.0		2560	35	0.12	660	4SEP330M
	470	10.0	8.0	F8	3700	25	0.12	376	4SEP470M
	560	8.0	12.0	E12	4520	13	0.15	448	4SEP560M
	680	10.0	8.0	F8	3700	25	0.12	544	4SEP680M
	1200	10.0	13.0	F13	5440	12	0.18	960	4SEP1200M
6.3	82	6.3	6.0	C6	1700	45	0.12	258	6SEP82M
	150	8.0	7.0	E7	2560	35	0.12	472	6SEP150M
	330	10.0	8.0	F8	3700	25	0.12	416	6SEP330M
	470	8.0	12.0	E12	4210	15	0.15	592	6SEP470M
	820	10.0	13.0	F13	5440	12	0.15	775	6SEP820M
10	56	6.3	6.0	C6	1700	45	0.12	280	10SEP56M
	120	8.0	7.0	E7	2560	35	0.12	600	10SEP120M
	270	10.0	8.0	F8	3700	25	0.12	540	10SEP270M
	330	8.0	12.0	E12	3950	17	0.15	660	10SEP330M
	560	10.0	13.0	F13	5230	13	0.15	840	10SEP560M
16	39	6.3	6.0	C6	1620	50	0.10	312	16SEP39M
	82	8.0	7.0	E7	2120	40	0.12	656	16SEP82M
	150	10.0	8.0	F8	3020	30	0.12	480	16SEP150M
	180	8.0	12.0	E12	3640	20	0.15	576	16SEP180M
	330	10.0	13.0	F13	4720	16	0.15	792	16SEP330M
20	22	6.3	6.0	C6	1450	60	0.10	220	20SEP22M
	33	8.0	7.0	E7	1890	45	0.12	330	20SEP33M
	47	8.0	7.0		1890	45	0.12	470	20SEP47M
	56	10.0	8.0	F8	2400	40	0.12	224	20SEP56M
	68	10.0	8.0		2400	40	0.12	272	20SEP68M
	100	10.0	8.0		2570	35	0.12	400	20SEP100MX
		8.0	12.0	E12	3320	24	0.15	400	20SEP100M
	150	10.0	13.0	F13	4320	20	0.15	600	20SEP150M

*1: Ripple current (100 kHz / +105 °C)
*2: ESR (100 kHz to 300 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
*4: After 2 minutes
◆ Please refer to each page in this catarog for “Flow conditions” and “Taping specifications”.

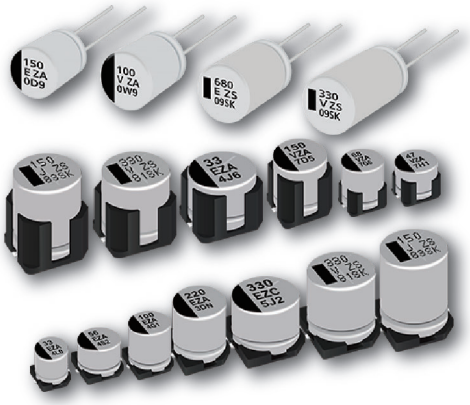
Frequency correction factor for ripple current

Frequency(f)	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Hybrid



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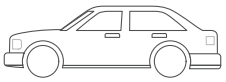
Line-up / Diagram	P159
Voltage - Capacitance table	P161
Explanation of part numbers	P163
Mounting / Packing specifications	P165
Each series	P167

Applications

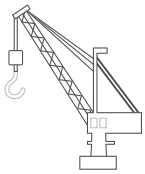
Main market

Communications infrastructure

Automotive

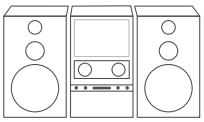


Industrial equipment



Desktop computer

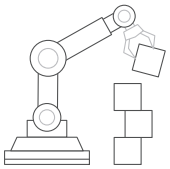
Audio / Visual



Server

Home appliance

Industrial robot



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Matters to Be Observed When Using This Product

(Conductive polymer hybrid aluminum electrolytic capacitor / Aluminum electrolytic capacitor)

Use environments and cleaning conditions

■ This product (capacitor) is intended for standard general-purpose use in electronic equipment, and is not designed for use in the specific environments described below. Using the product in such specific environments or service conditions, therefore, may affect the performance of the product.
Check with us about the performance and reliability of the product first before using the product.

(1) Used at a temperature higher than the upper limit category temperature or lower than the lower limit category temperature.
(2) Used in an environment where the product is directly exposed to water, salt water, oil, etc., or in a liquid, such as water, oil, chemicals, and organic solvents.
(3) Used in an outdoor environment where the product is exposed to direct sunlight, ozone, radiation, UV-rays, etc., or in a dusty place.
(4) Used in a wet place (dew concentration on a resistor, water leakage, etc.), a place exposed to sea breeze, or a place filled with a corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_X.
(5) Used in an environment filled with a toxic gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and chlorine compound, bromine and bromine compound, ammonia, etc.)
(6) Used in an environment where static electricity and electromagnetic waves are strong.
(7) Located close to heating component or a flammable material, such as a vinyl cable.
(8) Sealed with a resin, etc.
(9) Cleansed with a solvent, water, or a water-soluble cleaner, to remove solder flux after soldering.
(10) Used in an environment where an acidic or alkali atmosphere is present.
(11) Used in an environment where excessive vibration or mechanical shocks exceeding a specified range is applied to the product (even if the applied vibration or mechanical shocks is within the specified range, it may cause the product to resonate, in which a large vibration acceleration may be generated. Make sure to evaluate/check such vibrations or mechanical shocks applied to the product in an actual condition).
Panasonic Industry's conditions for vibration test are shown in the table below. Random waveform is not guaranteed.
For radial type, datasheet is also available if requested.

Item	Standard	Vibration-proof
Waveform	Sine	Sine
Frequency	10 - 55 Hz	5 - 2000 Hz
Direction	X, Y, Z axis	X, Y, Z axis
Duration	2 hours each direction	2 hours each direction
Max p-p amplitube	$1.5mm_{PP}$	$5mm_{PP}$
Max acceleration	90 m/s^2 (9.1 G)	294 m/s^2 (30 G)

(12) Used under a low atmospheric pressure condition or depressurized condition.

■ The capacitor withstands an immersion cleaning process where the board carrying the product is immersed in a cleaning solution of 60 °C or lower for less than 5 minutes and withstands an ultrasonic cleaning process as well. However, ensure to thoroughly rinse and dry it. Some cleaning methods erase or blur notes on the capacitor in some cases.
Some types of capacitors are not washable and some cleaning solutions cannot be used to clean a capacitor.
The following water-base solvents have been validated for cleaning. Contact a sales representative for more information.

Pine Alpha ST-100S, Cleanthrough 750H/750L/710M

■ Keep the cleaning solution under strict contamination control (conductivity, pH, specific gravity, water content, etc.).
A contaminated cleaning solution will show a high chlorine concentration, thereby corroding the interior of the capacitor in some cases. Keep the flux concentration in the cleaning solution at a 2% mass or less.

■ Unless otherwise specified in the specifications, avoid cleaning the capacitor with a halogen-based solvent, an alkaline solvent, a petroleum-based solvent, xylene, or acetone. Using a halogen-based solvent may result in a case where the solvent infiltrates (leaks) into the capacitor and break-down releasing chlorine, which reacts with aluminum which can corrode the capacitor interior. 1-1-1 trichloroethane is particularly harmful to a capacitor. Never use it to clean a capacitor.
A alkaline solvent may corrode (dissolve) an aluminum case, a petroleum-based solvent and xylene may damage the sealing rubber and accelerate its deterioration, and acetone may erase notes on the capacitor.
To protect the global environment, refrain from using an ozone depleting substance as the cleaning solution.

■ Right after the board cleaning, subject the capacitor to a forced drying process so that no cleaning solution remains between the sealing part of the capacitor and the printed board.
Set a drying temperature equal to or lower than the upper limit category temperature.

■ When an adhesive or coating agent is used to fix the capacitor and prevent dampening of the board, specific types of solvents included in some adhesives or coating agents may corrode the capacitor. Select a non-halogen solvent for the material making up the adhesive or coating agent. Do not use a chloroprene-based polymer.
Solidify and dry the adhesive or coating agent sufficiently to prevent its solvent component from remaining on the capacitor. Leave at least 1/3 of the sealing part unsealed on the surface to which the adhesive or coating agent is applied.

■ Do not use the product in a structure sealed by potting or molding. The pressure of a molding resin on a capacitor may deform the capacitor. In addition, the resin covering the capacitor may affect its heat dissipation performance or may leak into the product. These factors lead to the significant degradation of the capacitor's characteristics and reliability.
There is also a concern that an electrolytic solution permeating the sealing rubber may agglomerate and cause a short circuit.

■ When the capacitor is used in a circuit where an impact voltage is applied or a high voltage is applied in a short period (transient phenomenon) or a high pulse voltage is applied, make sure to use the capacitor at a voltage equal to or lower than its rated voltage.

■ The product contains an electrolytic. Improper use of the capacitor leads not only to the rapid degradation of its characteristics but also to electrolytic leakage. These problems damage the circuit board and may lead to destruction of the entire circuit set.

Response to anomalies and handling conditions

■ When you see gas coming out of an activated pressure relief valve of a capacitor during use of a circuit set, turn off the main power supply of the circuit set or pull the power cord plug out of the wall-outlet. If you leave the power supply on and the capacitor short-circuits, it will damage the circuit, or the gas can turn into a liquid, which will cause the circuit to short. In the worst case scenarios, these events may develop into a more serious incident, such as burnout of the circuit set. The gas coming out of the pressure relief valve of a capacitor is not smoke, but is the electrolytic solution in its gaseous state.

■ When the pressure valve of the capacitor is activated, it emits a high-temperature gas of over 100 °C. Do not bring your face near the valve. In case the gas jetting out of the valve gets in your eyes or comes into your mouth, wash your eyes with water or rinse your mouth immediately. If the gas hits your skin, wash it away with soap.

■ If you touch a terminal of the product during use of the circuit set, you will get an electric shock. The aluminum case of the product has an exposed part with no insulation. Do not touch the exposed part because it is as dangerous as the terminal.

■ Do not create a short circuit between terminals of the product by inserting a conductor therebetween. Do not splash a conductive solution, such as an acidic or alkali solution, on the capacitor. It puts the capacitor in a shorted state, which causes the circuit to fail and destroys the capacitor as well.

■ When a silicone material containing a relatively large amount of a low-molecular-weight siloxane is located close to the product, it may cause the capacitor problems with its electrical performance.

■ When electronic equipment having the capacitor built therein is exported to overseas markets, wooden packaging materials are fumigated with a halogen compound, such as methyl bromide. In such cases, if the packaging material subjected to the fumigation treatment is not dried sufficiently, halogen remaining on the packaging material may leach into the capacitor during transportation and trigger a corrosive reaction in the capacitor. When carrying out the fumigation treatment, carefully examine the dried packaging material to confirm that no halogen remains on the packaging material. Never fumigate the entire electronic equipment in its packaged state.

Reliability and product life

■ The product life is affected by temperatures. In general, a 10 °C drop in the temperature will double the life.
Use the capacitor at a temperature as low as possible from the upper limit category temperature.

■ Using a capacitor under a temperature condition outside a specified temperature range causes heavy degradation of the capacitor characteristics, which may result in breakage of the capacitor. You need to confirm not only the ambient temperature and internal temperature of the capacitor but also the temperature of the capacitor's top surface, which is given by radiant heat from built-in heating elements (a power transistor, IC, resistance, etc.) and heat generated by self-heating induced by ripple current. Do not place a heating element on the back of the capacitor.

■ The product life is given by the following equation.

$$L2 = L1 \times 2^{\frac{T1-(T2+\Delta T)}{10}} \quad \text{Where } T1 \geqq T2$$

L1 : Guaranteed life (h) at temperature T1 (°C)
L2 : Expected life (h) at temperature T2 (°C)
T1 : Upper category temperature (°C)
T2 : Ambient temperature of capacitor (°C)
⊿T : Temperature increase caused by ripple current (°C)

* In the case of a hybrid type, category temperature (°C) + temperature increase caused by rated ripple current (°C)

■ Do not use the product for a period longer than its specified service life. A capacitor with its service life ended may cause the following problems: rapid degradation of the product characteristics, short circuit, unnecessary activation of the pressure valve, electrolytic solution leakage, etc. Note that the estimated service life is not longer than 15 years due to the limited environment-resistant property of the sealing rubber.

■ When the capacitor is used under a high-temperature condition for a long period, minute cracks develop on the surface of the sealing rubber or the case surface turns brown in some cases. These phenomena, however, have no effects on the reliability of the capacitor.

■ A capacitor conforming to "AEC-Q200" refers to a capacitor having passed some or all of evaluation test items defined in AEC-Q200.
To know the detailed specifications of each capacitor or specific evaluation test scores, please contact us.
We issue a the product specifications sheet for each product ordered. Please confirm the product specifications sheet when you place an order to us.

Circuit design and circuit board design

■ The electrical characteristics change as a result of temperature/frequency fluctuations. Take electrical characteristic changes into consideration when working out a circuit design.

(1) Temperature fluctuations
High-temperature condition : increase in leak current
Low-temperature condition : decrease in capacitance, increase in the tangent to the loss angle, increase in impedance (the hybrid type is excluded), etc.
(2) Frequency fluctuations
High-frequency condition : decrease in capacitance, increase in the tangent to the loss angle, decrease in impedance, etc.
Low-frequency condition : more heat generation by ripple current as a result of an increase in equivalent series resistance

■ The group of factors described below may lead to rapid degradation of the capacitor characteristics, short circuit, or electrolytic solution leakage. They may give rise to sharp heat/gas generation, too, in which case the increasing internal pressure actuates the pressure valve, causes the electrolytic solution to leak out of the sealing part, and, in a worst-case scenario, causes an explosion or ignition incident. When a capacitor bursts, it may scatter flammable materials (electrolytic solution, etc.) in its surroundings.

(1) Reverse voltage: The capacitor has preset polarity. Do not apply a reverse voltage to the capacitor.
Confirm the polarity indicated on the capacitor and then use it.
(2) Charge/discharge: Avoid using the capacitor in a circuit that frequently repeats sharp charge/discharge cycles or a circuit that requires relatively slow but highly frequent charge/discharge cycles. In cases where you use the capacitor in such circuits, make sure to inform us of the charge/discharge conditions.
Ensure that a rush current does not exceed 100 A.
(3) ON/OFF: Avoid using the capacitor in an on/off circuit that repeatedly switches on and off more than 10,000 times a day. In cases where you use the product in such circuits, make sure to inform us of the circuit conditions, etc.
(4) Overvoltage: Do not apply an overvoltage higher than the rated voltage (higher than the surge voltage when the voltage application period is short). A peak value given by superposing a ripple voltage (AC component) on a DC voltage must be equal to or lower than the rated voltage.
(5) Ripple current: Do not allow an excessively large ripple current (larger than the rated ripple current specified in the specifications) to flow through the capacitor. Even if a ripple current flow in the capacitor is equal to or smaller than the rated ripple current, a reverse voltage flow may be generated in the capacitor when the DC bias voltage is low flow in the capacitor. Keep the ripple current flow within a range in which no reverse voltage is generated.
Even if the ripple current flow is kept equal to or smaller than the rated ripple current, using the capacitor for a period longer than its service life intensifies the degradation of the ESR characteristics, resulting in an increase in internal heating caused by the ripple current. As a result, the pressure valve is actuated, the exterior case or rubber swells, the electrolytic solution leaks, and, in a worst-case scenario, the capacitor short-circuits and ignites or explodes.

■ Because the impedance of the capacitor is close to the circuit impedance, capacitors connected in parallel in the circuit may damage the whole current balance, in which, a ripple current higher than the rated ripple current may flow in some of the capacitors. To prevent concentration of ripple current on the low-impedance side, use capacitors with the same part number and avoid the partiality of cable impedances. Do not use capacitors connected in series.

■ When the capacitor is mounted on a double-side wiring board, do not place the wiring pattern directly underneath where the product is mounted. In case the electrolytic solution leaks out, it may short-circuit the pattern and cause tracking or migration. Consider a case where the product is a radial lead capacitor and is mounted on a board with through-holes. In this case, if the sealing part of the capacitor and the board surface stick close to each other, solder flows up to the capacitor during a dip soldering process, which may cause short circuit between the anode and cathode of the capacitor. In such a case, the outer laminate of the product may be damaged. The position of holes, therefore, must be determined properly.

■ When designing a printed board carrying radial lead capacitors, make through-holes across the gap equal to the gap between the leads (terminals) of the capacitor. If the gap between the through-holes is narrower or wider than the gap between the leads, stress is applied to the leads when the capacitor is inserted in the holes.
This may result in increasing leak current, short circuit, wire breaking, or electrolytic solution leakage.

■ A capacitor which has the pressure valve on the case must be provided with a space formed above the pressure valve so that the pressure valve operates without hinderance. When the product is 6.3 mm to 16 mm in diameter, form a space of 2 mm or larger. When the product is 18 mm in diameter, form a space of 3 mm or larger.
If the space is not large enough, it will impair the operability of the pressure valve and may lead to an explosion incident.

■ Design the circuit in such that the pattern, especially a line pattern carrying high voltage or large current, is not formed above the pressure valve. Upon its activation, the pressure valve emits a flammable high-temperature gas of over 100 °C. This may cause a secondary accident, such as the gas condensing on the pattern and the wire sheathing being melted and catching on fire.

■ Be careful with resonance of the capacitor mounted on the board. When a large load is applied to the capacitor at the frequency close to the resonance frequency, it may cause the capacitor to come off or widely change its characteristics.

■ Completely isolate the case of the capacitor from the cathode terminal and the circuit pattern.

■ The laminate or outer sleeve covering of the product is for displaying information on the product and does not have a guaranteed insulating function.
The laminate may turn brown under a high-temperature condition. However, that does not cause problems with markings recognition on the product surface or electrical performance.
The outer sleeve may crack when dipped in a xylene or toluene solution and exposed to high temperature.

Mounting conditions

■ Do not reuse a capacitor that was incorporated in a circuit set and energized in the past. Do not use a capacitor that was dropped on the floor.
Do not use a capacitor in its compressed form. Compressing the capacitor makes it less airtight, resulting in poor performance, shorter guaranteed life, and electrolyte leakage.

■ A re-striking voltage is generated in a capacitor in some cases. In such a case, let the capacitor discharge through a resistor of about 1 kΩ.

■ When a capacitor is kept in storage for a long period, you may find the leak current from the capacitor has increased. In such a case, make voltage adjustment through a resistor of about 1 kΩ.

■ Before mounting the capacitor on the board, confirm the ratings (capacitance, rated voltage, etc.) and polarity of the capacitor. Before mounting a surface-mounted type capacitor, confirm its terminal dimensions and land size.
Before mounting a radial lead type capacitor, confirm its terminal interval and hole interval. If the terminal interval is not the specified one, stress is applied to internal elements, which may cause problems, such as a short circuit and insufficient mounting strength.
When the terminal interval and the hole interval of the radial lead type capacitor do not match and therefore the capacitor's leads need to be readjusted, make sure that the readjustment does not apply any stress to the capacitor's body.

■ Confirm the applied pressure when using an automatically mounting process for a surface-mounted type capacitor. Excessive pressure may result in increasing leak current, short circuit, the capacitor coming off from the board, and the like. When automatically mounting the radial lead type capacitor, check the wear of a cutter for cutting the leads and confirm that the angle of clinching the leads is not too acute with regards to the board. Clinching the leads at too acute of an angle applies tensile stress to the leads, which may lead to destruction of the capacitor.

■ Follow soldering conditions (preheating, soldering temperature/time, the number of soldering, etc.) in the specification sheet. A high peak temperature or a long heating time causes the degradation of electrical characteristics or a reduction in the guaranteed life. Note that the specified soldering conditions indicate conditions under which the degradation of capacitor characteristics do not occur but do not indicate conditions under which stable soldering can be performed. Check and set conditions under which stable soldering can be performed, on a case-by-case basis. Measure the temperature of the capacitor, using a thermocouple bonded to the top of the capacitor with an epoxy-based adhesive. This temperature measurement must be conducted in a mass-production setup.

■ The surface-mounted type capacitor is soldered by reflow soldering only. It cannot be soldered by flow soldering or dip soldering. Carry out reflow soldering with an atmospheric heat transfer method using infrared hot air, etc.
When carrying out two rounds of reflow processes, carry out the second reflow process after the capacitor's temperature settles down to a normal temperature. In the case of VPS reflow, a sharp rise in the capacitor temperature causes a change in the characteristics and appearance of the capacitor, which may give rise to a problem with capacitor mounting. We therefore recommend execution of VPS flow at a temperature rise rate of 3 °C/second or lower. For more information about this matter, please contact us.

■ Reflow soldering, under the reflow conditions we recommend, might result in discoloring or swelling of the case or crack formation on the ink mark indicating the cathode. These minor problems, however, do not affect the reliability of the capacitor at all.

■ A 6.3-mm diameter vibration-resistant capacitor has a structure that covers the auxiliary terminals to the sides of a seat plate. In cases where you confirm formation of a fillet on the sides of the auxiliary terminals by an image recognition means, etc., examine soldering conditions for the formation of a sufficient fillet on the auxiliary terminals in advance before carrying out the soldering process.
Even if the formation of a sufficient fillet on the auxiliary terminals is not confirmed, a solder junction between the lower surface of the auxiliary terminals and the board ensures vibration-resistant performance, meaning the reliability of the capacitor is not affected.

■ The radial lead type capacitor cannot be soldered by reflow soldering. Do not dip the capacitor body, except the leads, in solder. Heat from the solder raises the internal pressure of the capacitor and destroys it. Solder the capacitor according to the following soldering conditions: soldering temperature of 260 °C ±5 °C and soldering time of 10 seconds ±1 second.

■ Ensure that other components do not come in contact with the capacitor during the soldering process. When a radial lead type capacitor is set in close contact with the board, check the soldered state of the capacitor well, because its sealing rubber has no venting structure.

■ When manually soldering the capacitor, follow the soldering conditions (soldering temperature/time) specified in the specification sheet or adopt a soldering temperature of 350 °C and a soldering time of 3 seconds or less.
When you need to remove a capacitor already soldered, remove it after the solder is melted sufficiently so that no stress is applied to the terminals of the capacitor. Be careful not to let the solder iron tip touch the capacitor.
The solder iron touching the capacitor may damage the capacitor.

■ When the temperature of the capacitor becomes extremely high due to preheating, solidification of the setting resin, etc., may cause the outer sleeve of the capacitor to shrink or crack. When treating the capacitor in a thermosetting furnace, etc., place the capacitor in an atmosphere of 150 °C for 2 minutes or less.

■ Do not tilt or twist the capacitor soldered to a printed board or hold the capacitor to carry the board or hit the capacitor against something. Such actions apply a force to the internal elements through the terminals and may destroy the product.

■ Using highly active halogenous (chlorine-based or bromic) solder flux poses a concern that residual solder flux will have negative impact on the performance and reliability of the capacitor. Check the influence of residual solder flux before using such solder flux.

Storage conditions

■ A capacitor left for a long period is prone to have a greater flow of leak current. This happens because the oxide film deteriorates under a no-load condition. Voltage application to the capacitor reduces the leak current.
However, at the start of voltage application, a large flow of film recovery current increases the leak current, which may cause a circuit failure, etc.

■ The storage period of a capacitor is 42 months from the shipment inspection day. However, the storage period of capacitors not listed in the following table is specified as 12 months.
Store the capacitor in a place where a normal temperature condition (5°C to 35°C) and a normal humidity condition (45% to 85%) are maintained and direct sunlight is blocked.

Product category	Series	Storage period
Hybrid type	All hybrid series	42 months from the shipment inspection day
Surface-mounted type other than the hybrid type	S (hot lead-free reflow), HA (hot lead-free reflow) HB (hot lead-free reflow, 5.4 mm in height) HC, HD, FCA, FC, FKA, FK, FKS, FP,FT, FH, FN TG, TK, TP, TC, TCU, TQ	
Radial lead type other than the hybrid type	FC-A, FK-A, HD-A, TA-A, TP-A, FP-A	

■ Avoid storing the capacitor in environments not specified in the delivery specification sheet or in the following environments or conditions.

(1) Used at a temperature higher than the upper limit category temperature or lower than the lower limit category temperature
(2) Environments where the capacitor is exposed to water, salt water, or oil
(3) Environments where dew concentrates on the capacitor
(4) Environments filled with a toxic gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and chlorine compound, bromine and bromine compound, ammonia, etc.)
(5) Environments where the product is exposed to ozone, radiation, UV-rays, etc.
(6) Environments where vibrations or mechanical shocks exceeding a specified range is applied to the capacitor

Reference information

Guidelines

Some of the product use guidelines described herein are excerpted from JEITA RCR-2367D "Safety application guide for fixed aluminum electrolytic capacitors for use in electronic equipment," a technical report issued by the Japan Electronics and Information Technology Industries Association on October 2017. For more detailed information, please see the above technical report.

Intellectual property

Panasonic Group provides customers with safe products and services. We are also making great efforts to protect our intellectual property rights for Panasonic Group products. Typical patents related to this product are as follows. (Hybrid type)

[U.S. patent]
USP Nos. 7497879, 7621970, 9208954, 9595396, 9966200, 10453618, 10559432, 10679800, 10685788, 10790095, 10262806, 10896783, 11348739, 11094471, 12062501, 10563318, 10865494, 10373763

Lineup

Surface mount type

Series	Part No.	Features	Small size	Large cap.	High ripple	High temp.	Long life	Category temperature range (℃)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (μF)	Size code	Size (mm) øD	Size (mm) L
ZA	EEHZA---	Low ESR High ripple current Long life 105 ℃ 10000 h	●					-55 to 105	25 to 50	80 to 120	10 to 33	C	5.0	5.8
									25 to 63	50 to 120	10 to 56	D	6.3	5.8
										30 to 80	22 to 100	D8	6.3	7.7
									25 to 80	27 to 45	22 to 220	F	8.0	10.2
										20 to 36	33 to 330	G	10.0	10.2
ZC	EEHZC---	Low ESR High ripple current Long life 125 ℃ 4000 h	●				●	-55 to 125	25 to 50	80 to 120	10 to 33	C	5.0	5.8
									25 to 63	50 to 120	10 to 56	D	6.3	5.8
										30 to 80	22 to 100	D8	6.3	7.7
									25 to 80	27 to 45	22 to 220	F	8.0	10.2
										20 to 36	33 to 330	G	10.0	10.2
ZK	EEHZK---	Large capacitance High ripple current Long life 125 ℃ 4000 h	●	●	●		●	-55 to 125	25 to 35	80 to 100	33 to 47	C	5.0	5.8
										50 to 60	56 to 82	D	6.3	5.8
										30 to 35	100 to 150	D8	6.3	7.7
										27	180 to 270	F	8.0	10.2
										20	330 to 470	G	10.0	10.2
ZKU	EEHZK--U-	Large capacitance Long life 125 ℃ 4000 h	●	●	●		●	-55 to 125	25 to 35	80 to 100	39 to 56	C	5.0	5.8
										50 to 60	68 to 100	D	6.3	5.8
										30 to 35	120 to 180	D8	6.3	7.7
										27	220 to 330	F	8.0	10.2
										20	390 to 560	G	10.0	10.2
UPDATE ZL	EEHZL---	125 °C 4000 h 135 °C 4000 h	●	●	●		●	-55 to 135	25 to 63	58 to 60	47 to 82	C	5.0	5.8
										38 to 40	82 to 150	D	6.3	5.8
										24 to 26	150 to 220	D8	6.3	7.7
										18 to 20	270 to 470	F	8.0	10.2
										14 to 16	470 to 680	G	10.0	10.2
										10 to 12	220 to 1200	G16	10.0	16.5
ZT	EEHZT---	125 °C 4000 h 135 °C 4000 h		●	●		●	-55 to 135	25 to 63	22 to 32	33 to 220	F	8.0	10.2
										16 to 25	56 to 330	G	10.0	10.2
ZTU	EEHZT--U-	125 ℃ 4000 h 135 ℃ 4000 h		●	●		●	-55 to 135	25 to 35	22	220 to 330	F	8.0	10.2
										16	390 to 560	G	10.0	10.2
ZV	EEHZV---	125 °C 4000 h 135 °C 4000 h		●	●		●	-55 to 135	25 to 63	16 to 22	33 to 220	F	8.0	10.2
										12 to 17	56 to 330	G	10.0	10.2
ZVU	EEHZV--U-	125 °C 4000 h 135 °C 4000 h		●	●		●	-55 to 135	25 to 63	16 to 22	56 to 330	F	8.0	10.2
										12 to 17	100 to 560	G	10.0	10.2
UPDATE ZS	EEHZS---	125 ℃ 4000 h 135 ℃ 4000 h		●	●		●	-55 to 135	25 to 80	14 to 19	100 to 470	G12	10.0	12.5
										11 to 15	82 to 560	G16	10.0	16.5
UPDATE ZSU	EEHZS--U-	125 °C 4000 h 135 °C 4000 h		●	●		●	-55 to 135	25 to 80	14 to 19	120 to 680	G12	10.0	12.5
										11 to 15	100 to 1000	G16	10.0	16.5
ZU	EEHZU---	125 ℃ 4000 h 135 ℃ 4000 h		●	●		●	-55 to 135	25 to 63	10 to 12	100 to 470	G12	10.0	12.5
										8 to 10	150 to 560	G16	10.0	16.5
ZUU	EEHZU--U-	125 ℃ 4000 h 135 ℃ 4000 h		●	●		●	-55 to 135	25 to 63	10 to 12	120 to 680	G12	10.0	12.5
										8 to 10	180 to 1000	G16	10.0	16.5
ZE	EEHZE---	145 ℃ 2000 h 135 ℃ 4000 h				●	●	-55 to 145	25 to 63	27 to 40	33 to 220	F	8.0	10.2
										20 to 30	56 to 330	G	10.0	10.2
ZF	EEHZF---	150 ℃ 1000 h				●	●	-55 to 150	25 to 63	27 to 40	33 to 150	F	8.0	10.2
										20 to 30	56 to 270	G	10.0	10.2

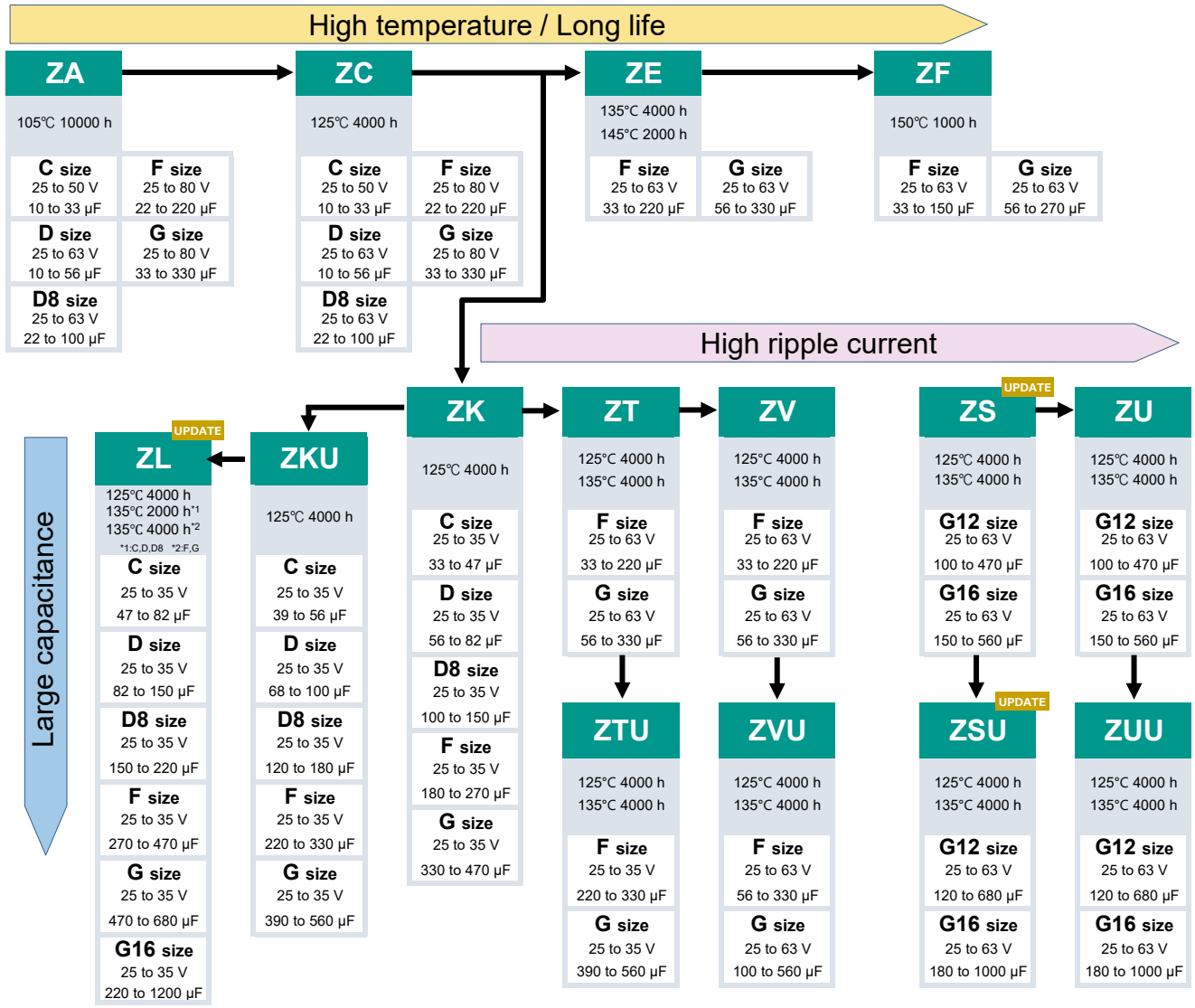
Line up

Radial lead type

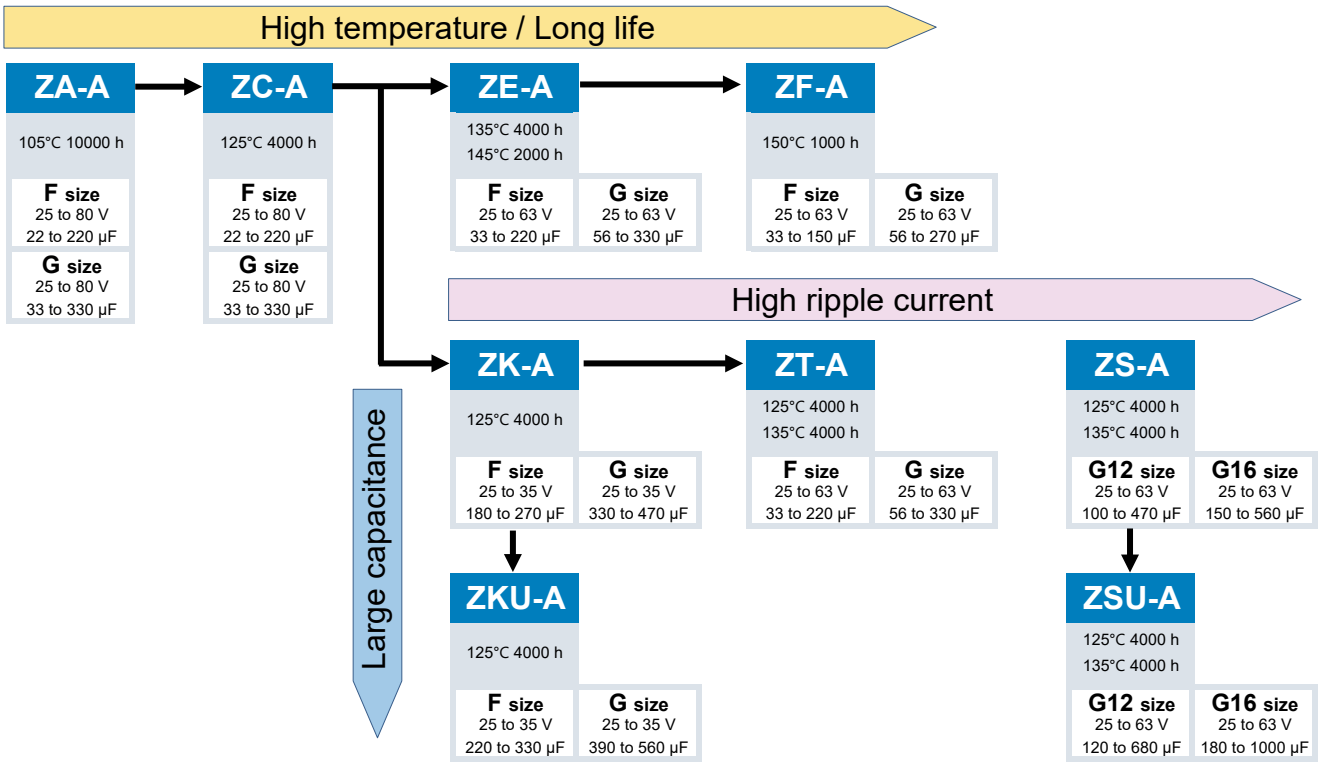
Series	Part No.	Features	Small size	Large cap.	High ripple	High temp.	Long life	Category temperature range (℃)	Rated voltage range (V)	ESR (mΩ)	Capacitance range (μF)	Size code	Size (mm) øD	Size (mm) L
ZA-A	EEHAZA---B	105 ℃ 10000 h						-55 to 105	25 to 80	27 to 45	22 to 220	F	8.0	9.5
										20 to 36	33 to 330	G	10.0	9.5
ZC-A	EEHAZC---B	125 ℃ 4000 h					●	-55 to 125	25 to 80	27 to 45	22 to 220	F	8.0	9.5
										20 to 36	33 to 330	G	10.0	9.5
ZK-A	EEHAZK---B	125 ℃ 4000 h		●	●		●	-55 to 125	25 to 35	27	180 to 270	F	8.0	9.5
										20	330 to 470	G	10.0	9.5
ZKU -A	EEHAZK--UB	125 ℃ 4000 h		●	●		●	-55 to 125	25 to 35	27	220 to 330	F	8.0	9.5
										20	390 to 560	G	10.0	9.5
ZT-A	EEHAZT---B	125 °C 4000 h 135 °C 4000 h		●	●		●	-55 to 135	25 to 63	22 to 32	33 to 220	F	8.0	9.5
										16 to 25	56 to 330	G	10.0	9.5
ZS-A	EEHAZS---B	125 °C 4000 h 135 °C 4000 h		●	●		●	-55 to 135	25 to 63	14 to 19	100 to 470	G12	10.0	11.7
										11 to 15	150 to 560	G16	10.0	15.7
ZSU-A	EEHAZS--UB	125 °C 4000 h 135 °C 4000 h		●	●		●	-55 to 135	25 to 63	14 to 19	120 to 680	G12	10.0	11.7
										11 to 15	180 to 1000	G16	10.0	15.7
ZE-A	EEHAZE---B	145 ℃ 2000 h 135 ℃ 4000 h				●	●	-55 to 145	25 to 63	27 to 40	33 to 220	F	8.0	9.5
										20 to 30	56 to 330	G	10.0	9.5
ZF-A	EEHAZF---B	150 ℃ 1000 h				●	●	-55 to 150	25 to 63	27 to 40	33 to 150	F	8.0	9.5
										20 to 30	56 to 270	G	10.0	9.5

Series flow chart

● Surface mount type



● Radial lead type



Voltage - Capacitance table (SMD type) (Vol. : 25 to 80 V / Cap. : 10 to 120 µF)

Series [Size]
(ESR mΩ)

V \ µF	10	22	27	33	39	47	56	68	82	100	120
25		ZA [C] (80)		ZA [C] (80)		ZA [D] (50)	ZA [D] (50)	ZA [D8] (30)	ZK [D] (50)	ZA [D8] (30)	
		ZC [C] (80)		ZC [C] (80)		ZC [D] (50)	ZC [D] (50)	ZC [D8] (30)	ZL [C] (58)	ZC [D8] (30)	
						ZK [C] (80)	ZKU [C] (80)	ZK [D] (50)		ZKU [D] (50)	
35	ZA [C] (100)	ZA [C] (100)	ZA [D] (60)	ZA [D] (60)	ZKU [C] (100)	ZA [D] (60)	ZK [D] (60)	ZA [D8] (35)	ZL [D] (40)	ZA [F] (27)	ZKU [D8] (35)
	ZC [C] (100)	ZC [C] (100)		ZC [D] (60)		ZC [D] (60)		ZC [D8] (35)		ZC [F] (27)	
				ZK [C] (100)		ZL [C] (60)		ZKU [D] (60)		ZK [D8] (35)	
										ZF [F] (30)	
50	ZA [C] (120)	ZA [D] (80)		ZA [D8] (40)		ZA [F] (30)	ZF [F] (35)	ZA [F] (30)	ZVU [F] (19)	ZA [G] (28)	ZC [G] (28)
	ZC [C] (120)	ZC [D] (80)		ZC [D8] (40)		ZC [F] (30)		ZC [F] (30)		ZC [G] (28)	ZT [G] (23)
								ZT [F] (25)		ZT [G] (23)	ZV [G] (15)
								ZE [F] (30)		ZE [G] (28)	
								ZV [F] (19)		ZF [G] (28)	
										ZV [G] (15)	
63	ZA [D] (120)	ZA [D8] (80)		ZA [F] (40)		ZA [F] (40)	ZA [G] (30)	ZA [G] (30)	ZA [G] (30)	ZS [G12] (19)	ZSU [G12] (19)
	ZC [D] (120)	ZC [D8] (80)		ZC [F] (40)		ZC [F] (40)	ZC [G] (30)	ZC [G] (30)	ZC [G] (30)	ZU [G12] (12)	ZUU [G12] (12)
				ZT [F] (32)		ZT [F] (32)	ZT [G] (25)	ZT [G] (25)	ZT [G] (25)	ZVU [G] (17)	
				ZE [F] (40)		ZV [F] (22)	ZE [G] (30)	ZV [G] (17)	ZE [G] (30)		
				ZF [F] (40)			ZF [G] (30)		ZV [G] (17)		
				ZV [F] (22)			ZV [G] (17)				
							ZVU [F] (22)				
80		ZA [F] (45)		ZA [G] (36)		ZA [G] (36)			ZS [G16] (15)	ZSU [G16] (15)	
		ZC [F] (45)		ZC [G] (36)		ZC [G] (36)					

Size list ø x L (mm)

C	5.0x5.8	D	6.3x5.8	F	8.0x10.2	G	10.0x10.2
		D8	6.3x7.7			G12	10.0x12.5
						G16	10.0x16.5

Voltage - Capacitance table (SMD type) (Vol. : 25 to 80 V / Cap. : 150 to 1200 μF)

Series [Size]
(ESR mΩ)

V \ μF	150	180	220	270	330	390	470	560	680	820	1000	1200
25	ZA [F] (27)	ZKU [D8] (30)	ZA [F] (27)	ZK [F] (27)	ZA [G] (20)		ZK [G] (20)	ZKU [G] (20)	ZSU [G12] (14)		ZSU [G16] (11)	ZL [G16] (10)
	ZC [F] (27)		ZC [F] (27)	ZF [G] (20)	ZC [G] (20)		ZS [G12] (14)	ZS [G16] (11)	ZUU [G12] (10)		ZUU [G16] (8)	
	ZK [D8] (30)		ZT [F] (22)		ZKU [F] (27)		ZU [G12] (10)	ZU [G16] (8)	ZL [G] (14)			
	ZF [F] (27)		ZE [F] (27)		ZT [G] (16)		ZL [F] (18)	ZTU [G] (16)				
	ZL [D] (38)		ZV [F] (16)		ZE [G] (20)			ZVU [G] (12)				
			ZL [D8] (24)		ZTU [F] (22)							
					ZV [G] (12)							
					ZVU [F] (16)							
35	ZA [F] (27)	ZK [F] (27)	ZA [G] (20)	ZA [G] (20)	ZK [G] (20)	ZKU [G] (20)	ZS [G16] (11)		ZSU [G16] (11)	ZL [G16] (11)		
	ZC [F] (27)		ZC [G] (20)	ZC [G] (20)	ZS [G12] (14)	ZTU [G] (16)	ZSU [G12] (14)		ZUU [G16] (9)			
	ZT [F] (22)		ZKU [F] (27)	ZT [G] (16)	ZU [G12] (11)	ZVU [G] (12)	ZU [G16] (9)					
	ZE [F] (27)		ZTU [F] (22)	ZE [G] (20)			ZUU [G12] (11)					
	ZF [G] (23)		ZVU [F] (16)	ZV [G] (12)			ZL [G] (16)					
	ZV [F] (16)			ZL [F] (20)								
	ZL [D8] (26)											
50	ZS [G12] (17)	ZSU [G12] (17)	ZS [G16] (13)	ZSU [G16] (13)	ZL [G16] (12)							
	ZU [G12] (12)	ZUU [G12] (12)	ZU [G16] (10)	ZUU [G16] (10)								
	ZVU [G] (15)											
63	ZS [G16] (15)	ZSU [G16] (15)	ZL [G16] (12)									
	ZU [G16] (10)	ZUU [G16] (10)										
80												

Size list ø x L (mm)

C	5.0x5.8	D	6.3x5.8	F	8.0x10.2	G	10.0x10.2
		D8	6.3x7.7			G12	10.0x12.5
						G16	10.0x16.5

Voltage - Capacitance table (Radial lead type) (Vol. : 25 to 80 V / Cap. : 22 to 150 µF)

Series [Size]
(ESR mΩ)

V \ µF	22	27	33	39	47	56	68	82	100	120	150
25											ZA [F] (27)
											ZC [F] (27)
											ZF [F] (27)
35									ZA [F] (27)		ZA [F] (27)
									ZC [F] (27)		ZC [F] (27)
									ZF [F] (30)		ZK [F] (22)
											ZE [F] (27)
											ZF [G] (23)
50					ZA [F] (30)	ZF [F] (35)	ZA [F] (30)		ZA [G] (28)	ZC [G] (28)	ZS [G12] (17)
					ZC [F] (30)		ZC [F] (30)		ZC [G] (28)	ZT [G] (23)	
							ZT [F] (25)		ZT [G] (23)		
							ZE [F] (30)		ZE [G] (28)		
									ZF [G] (28)		
63			ZA [F] (40)		ZA [F] (40)	ZA [G] (30)	ZA [G] (30)	ZA [G] (30)	ZS [G12] (19)	ZSU [G12] (19)	ZS [G16] (15)
			ZC [F] (40)		ZC [F] (40)	ZC [G] (30)	ZC [G] (30)	ZC [G] (30)			
			ZT [F] (32)		ZT [F] (32)	ZT [G] (25)	ZT [G] (25)	ZT [G] (25)			
			ZE [F] (40)			ZE [G] (30)		ZE [G] (30)			
			ZF [F] (40)			ZF [G] (30)					
80	ZA [F] (45)		ZA [G] (36)		ZA [G] (36)						
	ZC [F] (45)		ZC [G] (36)		ZC [G] (36)						

Size list ø x L (mm)

F	8.0 x 9.5	G	10.0 x 9.5	G12	10.0 x 11.7	G16	10.0 x 15.7

Voltage - Capacitance table (Radial lead type) (Vol. : 25 to 80 V / Cap. : 180 to 1000 μF)

Series [Size]
(ESR mΩ)

V \ μF	180	220	270	330	390	470	560	680	1000
25		ZA [F] (27)	ZK [F] (27)	ZA [G] (20)		ZK [G] (20)	ZKU [G] (20)	ZSU [G12] (14)	ZSU [G16] (11)
		ZC [F] (27)	ZF [G] (20)	ZC [G] (20)		ZS [G12] (14)	ZS [G16] (11)		
		ZT [F] (22)		ZKU [F] (27)					
		ZE [F] (27)		ZT [G] (16)					
				ZE [G] (20)					
35	ZK [F] (27)	ZA [G] (20)	ZA [G] (20)	ZK [G] (20)	ZKU [G] (20)	ZS [G16] (11)		ZSU [G16] (11)	
		ZC [G] (20)	ZC [G] (20)	ZS [G12] (14)		ZSU [G12] (14)			
		ZKU [F] (27)	ZT [G] (16)						
			ZE [G] (20)						
50	ZSU [G12] (17)	ZS [G16] (13)	ZSU [G16] (13)						
63	ZSU [G16] (15)								
80									

Size list ø x L (mm)

F	8.0 x 9.5	G	10.0 x 9.5	G12	10.0 x 11.7	G16	10.0 x 15.7

Explanation of part numbers

◇ Part number system

・Surface mount type

EEH	ZC	1 E	101	X	*	P
Product classification 3 figures	Series 2 figures	Voltage code 1 to 2 figures	Capacitance code 3 figures	Size code 0 to 1 figure	Special code 0 to 1 figure	Taping/ Special code 1 figure

Series	Code
ZA	ZA
ZC	ZC
ZK	ZK
ZKU	ZK
ZL	ZL
ZT	ZT
ZTU	ZT
ZV	ZV
ZVU	ZV
ZS	ZS
ZSU	ZS
ZU	ZU
ZUU	ZU
ZE	ZE
ZF	ZF

Rated voltage (V)	Code
25	1E
35	1V
50	1H
63	1J
80	1K

Cap. (μF)	Code
10	100
22	220
27	270
33	330
39	390
47	470
56	560
68	680
82	820
100	101
120	121
150	151
180	181
220	221
270	271
330	331
390	391
470	471
560	561
680	681
1000	102

øD x L	Code
6.3 x 7.7 (D8)	X

* Only D8 is marked with X

Dia øD	Code
Minia-turization product	U

Tape width (mm)	Code
12	R
16, 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

* If the total figures number of the part number exceeds 12 figures, "1" is omitted.
e.g.) 1E → E

・Radial lead type

EEHA	ZC	1 E	151	*	B
Product classification 4 figures	Series 2 figures	Voltage code 1 to 2 figure	Capacitance code 3 figures	Special code 0 to 1 figure	Taping code 1 figure

Series	Code
ZA	ZA
ZC	ZC
ZK	ZK
ZKU	ZK
ZT	ZT
ZS	ZS
ZSU	ZS
ZE	ZE
ZF	ZF

Rated voltage (V)	Code
25	1E
35	1V
50	1H
63	1J
80	1K

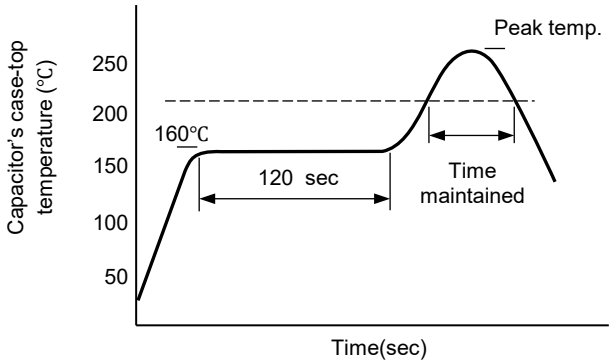
Cap. (μF)	Code
22	220
33	330
47	470
56	560
68	680
82	820
100	101
120	121
150	151
180	181
220	221
270	271
330	331
390	391
470	471
560	561
680	681
1000	102

Dia øD	Code
Minia-turization product	U

Lead space (mm)	Code
3.5, 5.0	B

* If the total figures number of the part number exceeds 12 figures, "1" is omitted.
e.g.) 1E → E

Recommended reflow soldering



Size code	C, D, D8	F, G, G12, G16	
Peak temp.	260℃ (255℃)	245℃	260℃
Time in peak temperature	≧ 250℃ 5 s (10 s)	≧ 240℃ 10 s	≧ 250℃ 5 s
Time maintained	≧ 230℃ 30 s	≧ 230℃ 30 s	≧ 230℃ 30 s
	≧ 217℃ 40 s	≧ 217℃ 40 s	≧ 217℃ 40 s
	≧ 200℃ 70 s	≧ 200℃ 70 s	≧ 200℃ 70 s
Reflow cycles	2 times	2 times	1 time

* For reflow, use a thermal condition system such as infrared and radiation (IR) or hot blas.
* Reflow temperature is measured on capacitor's case top.

Specifications for radial lead type

● Flow soldering condition

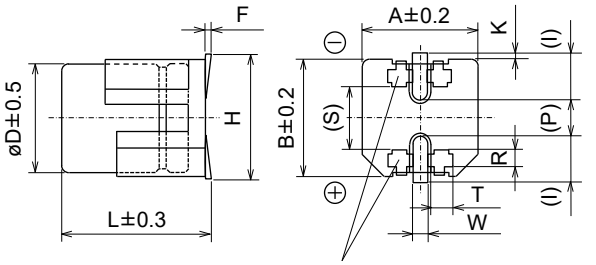
< RoHS compliant >

	Temperature	Time	Flow number
Soldering condition	260℃ + 5℃ or less	10 sec +1 sec or less	1 time

Dimensions (Vibration-proof products)

The size and shape are different frome standard products.

< Size code : D, D8 >



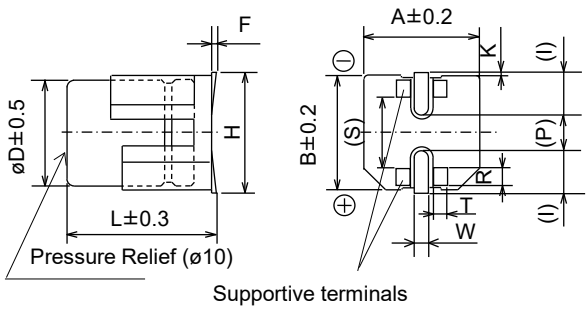
( ) Reference size

Unit : mm

Size code	øD	L	A, B	H max.	F	I	W
D	6.3	6.1	6.6	7.8	0 to +0.15	2.4	0.65±0.1
D8	6.3	8.0	6.6	7.8	0 to +0.15	2.4	0.65±0.1

Size code	P	K	R	S	T
D	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
D8	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2

< Size code : F, G, G12, G16 >



( )Reference size

Unit : mm

Size code	øD	L	A, B	H max.	F	I	W
F	8.0	10.5	8.3	10.0	0 to +0.15	3.4	1.2±0.2
G	10.0	10.5	10.3	12.0	0 to +0.15	3.5	1.2±0.2
G12	10.0	12.8	10.3	11.0*1	0 to +0.15	3.2	1.2±0.2
G16	10.0	16.8	10.3	11.0*1	0 to +0.15	3.2	1.2±0.2

*1:±0.2

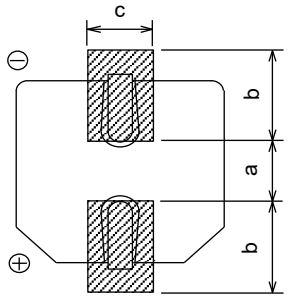
Size code	P	K	R	S	T
F	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2
G12	4.6	–	0.70±0.2	6.9	1.3±0.2
G16	4.6	–	0.70±0.2	6.9	1.3±0.2

Mounting specification

Land / Pad pattern

The circuit board land/pad pattern size for chip capacitors is specified in the following table.
The land pitch influences installation strength.

● Standard products



Land space

Unit : mm

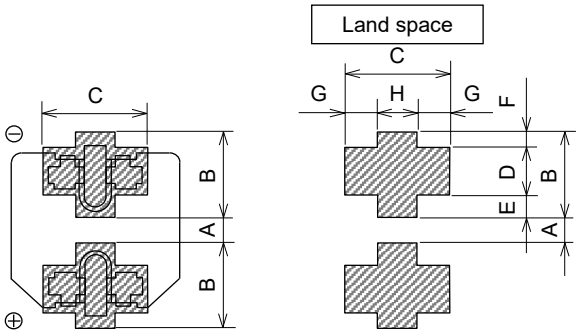
Size code	a	b	c
C : ø5×L5.8	1.5	2.8	1.6
D : ø6.3×L5.8	1.8	3.2	1.6
D8 : ø6.3×L7.7	1.8	3.2	1.6
F : ø8×L10.2	3.1	4.0	2.0
G : ø10×L10.2	4.6	4.1	2.0
G12 : ø10×L12.5	4.6	4.1	2.0
G16 : ø10×L16.5	4.6	4.1	2.0

Larger dimension of “a” may prevent back fillet from being formed adequately to obtain required solder strength.

∗Take mounting conditions, solderability and fitting strength into consideration when selecting parts for your design.

● Vibration-proof products

< Size code : D, D8 >



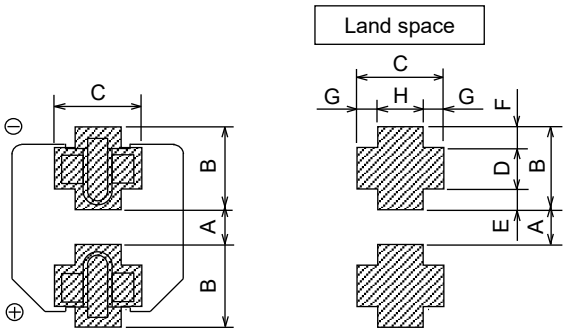
Unit : mm

Size code	A	B	C	D
D : ø6.3×L6.1	1.2	3.6	3.2	2.0
D8 : ø6.3×L8.0	1.2	3.6	3.2	2.0

Size code	E	F	G	H
D : ø6.3×L6.1	0.95	0.65	1.0	1.2
D8 : ø6.3×L8.0	0.95	0.65	1.0	1.2

Larger dimension of “A” may prevent back fillet from being formed adequately to obtain required solder strength.

< Size code : F, G, G12, G16 >



Unit : mm

Size code	A	B	C	D
F : ø8×L10.5	2.7	4.0	4.7	1.3
G : ø10×L10.5	3.9	4.4	4.7	1.3
G12 : ø10×L12.8	3.9	4.4	4.7	1.3
G16 : ø10×L16.8	3.9	4.4	4.7	1.3

Size code	E	F	G	H
F : ø8×L10.5	1.0	1.7	1.1	2.5
G : ø10×L10.5	1.2	1.9	1.1	2.5
G12 : ø10×L12.8	1.2	1.9	1.1	2.5
G16 : ø10×L16.8	1.2	1.9	1.1	2.5

Larger dimension of “A” may prevent back fillet from being formed adequately to obtain required solder strength.

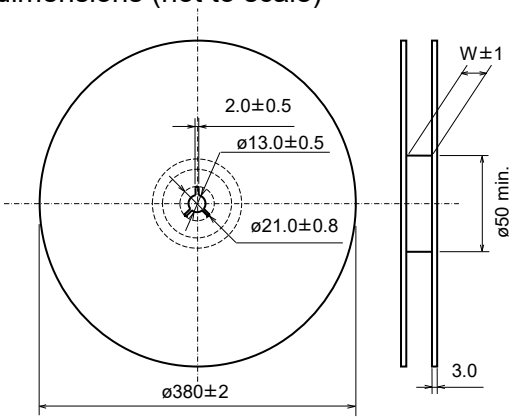
∗Take mounting conditions, solderability and fitting strength into consideration when selecting parts for your design.

∗ The vibration-proof capacitors of size ø6.3 has support terminals extending from the bottom side to the lead edge. Then, make sure to find appropriate soldering conditions to form fillet on the support terminals if required for appearance inspection.

Packaging specifications

Specifications for surface mount type

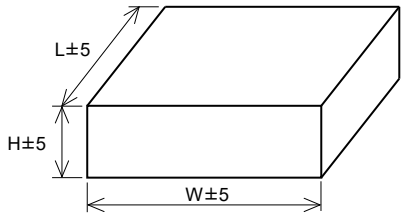
● Reel dimensions (not to scale)



Unit : mm

Size code	W
C	14.0
D, D8	18.0
F, G, G12, G16	26.0

● Dimensions of outer carton box



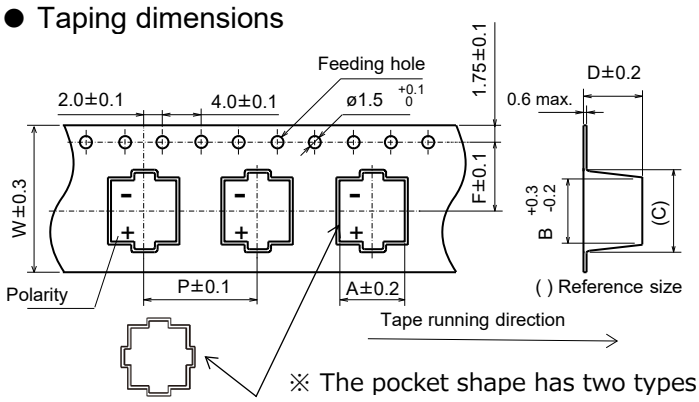
Unit : mm

Size code	H	W, L
C	180	395
D, D8	220	395
F, G, G12, G16	180	395

● Min.packing quantity

Size code	Min.packing quantity (pcs.)
C, D	1000
D8	900
F, G	500
G12	400
G16	250

● Taping dimensions



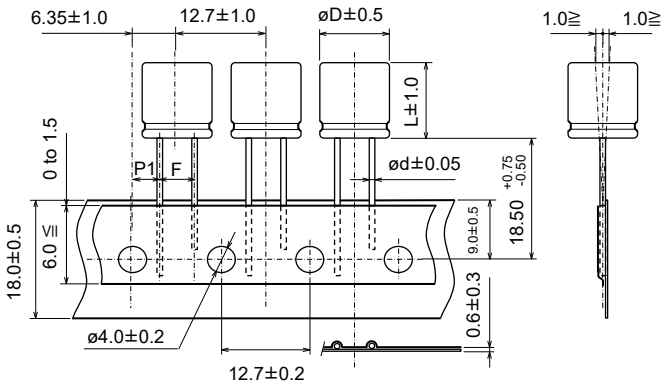
※ The pocket shape has two types depending on the size code.

Unit : mm

Size code	A	B	C	D	P	F	W
C	5.7	5.7	8.0	6.4	12.0	5.5	12.0
D	7.0	7.0	9.0	6.4	12.0	7.5	16.0
D8	7.0	7.0	9.0	8.4	12.0	7.5	16.0
F	8.7	8.7	12.5	11.0	16.0	11.5	24.0
G	10.7	10.7	14.5	11.0	16.0	11.5	24.0
G12	10.7	10.7	14.5	13.7	16.0	11.5	24.0
G16	10.7	10.7	14.5	17.5	20.0	11.5	24.0

Radial lead type

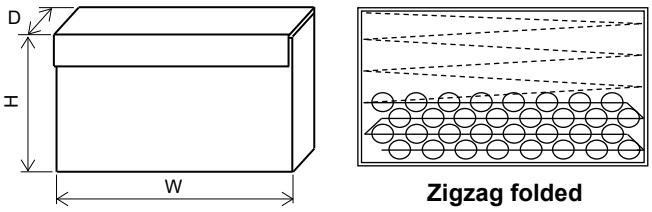
● Taping dimensions



Unit : mm

Size code	øD	L	ød	F	P1
F	8.0	9.5	0.6	3.5±0.5	4.60±0.50
G	10.0	9.5	0.6	5.0+0.8/-0.2	3.85±0.50
G12	10.0	11.7	0.8	5.0+0.8/-0.2	3.85±0.50
G16	10.0	15.7	0.8	5.0+0.8/-0.2	3.85±0.50

● Dimensions of outer carton box / Packaging method



Zigzag folded

Unit : mm

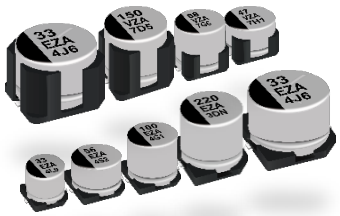
Size code	W	H	D
F	340 max.	230 max.	55 max.
G	340 max.	170 max.	55 max.
G12	340 max.	170 max.	55 max.
G16	340 max.	170 max.	55 max.

● Min.packing quantity

Size code	Min.packing quantity (pcs.)
F	1000
G	500
G12	500
G16	500

Panasonic
INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZA series **High temperature lead-free reflow**

Features

- Endurance : 10000 h at 105 °C
- Low ESR and high ripple current (over 70% lower ESR and 100% higher ripple current than V-FP)
- High voltage (to 80 V)
- Characteristics dependencies in frequency and low temperature are as small as polymer type
- Vibration-proof product is available upon request (ø6.3, ø8, ø10)
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	C	D	D8	F	G
Category temp. range	–55 °C to +105 °C				
Rated voltage range	25 V to 50 V	25 V to 63 V		25 V to 80 V	
Nominal capacitance range	10 µF to 33 µF	10 µF to 56 µF	22 µF to 100 µF	22 µF to 220 µF	33 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)				
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)				

Endurance

+105 °C ± 2 °C, 10000 h, apply the rated ripple current without exceeding the rated voltage.

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

ESR after endurance (Ω / 100 kHz)(-40 °C)

Size code	C	D	D8	F	G
	2.0	1.4	0.8	0.4	0.3

Shelf life

After storage for 1000 hours at +105 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance.
(Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)

Damp heat (Load)

+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

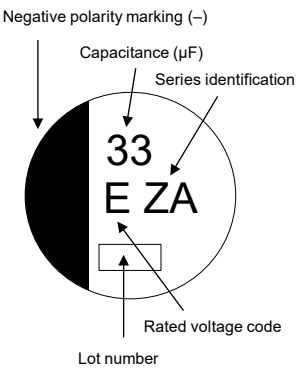
Resistance to soldering heat

After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.

Capacitance change	Within ±10% of the initial value
Dissipation factor (tan δ)	Within the initial limit
Leakage current	Within the initial limit

Marking

Example : 25 V 33 µF
Marking color : BLACK

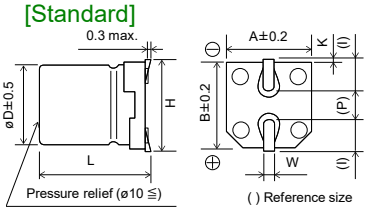


R. voltage code (Unit : V)

E	25
V	35
H	50
J	63
K	80

Dimensions (not to scale)

[Standard]

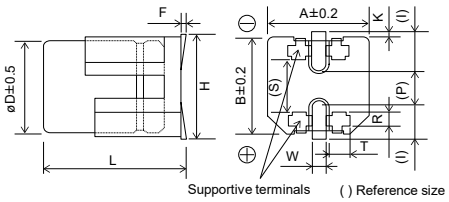


Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
C	5.0	5.8±0.3	5.3	6.5	2.2	0.65±0.1	1.5	0.35 +0.15 -0.20
D	6.3	5.8±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
D8	6.3	7.7±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
F	8.0	10.2±0.3	8.3	10	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]

< Size code : D, D8 >



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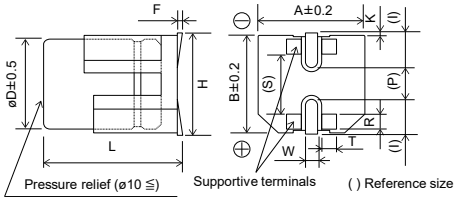

Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
D	6.3	6.1±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
D8	6.3	8.0±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZA1E220R

EEH	ZA	1E	220	X	R
Product classification	Series / Code	Rated voltage (V) / Code*	Capacitance (μF) / Code	D8 size** øDxL(mm) / Code	Tape width (mm) / Code

Series	Code
ZA	ZA

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J
80	1K

Capacitance (μF)	Code	Capacitance (μF)	Code
10	100	68	680
22	220	100	101
27	270	150	151
33	330	220	221
39	390	270	271
47	470	330	331
56	560		

D8 size** øDxL(mm)	Code
6.3 x 7.7	X

Tape width (mm)	Code
12	R
16, 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

**: Only D8 is marked with X

Characteristics list

Endurance : 105 °C 10000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L Standard	Case size (mm) L Vibration-proof	Size code	Specification Ripple current*1 (mA rms)	Specification ESR*2 (mΩ)	Specification tan δ*3	Part number Standard product	Part number Vibration-proof product	Min.packaging q'ty (pcs) Taping
25	22	5.0	5.8	-	C	900	80	0.14	EEHZA1E220R	-	1000
	33	5.0	5.8	-	C	900	80	0.14	EEHZA1E330R	-	1000
	47	6.3	5.8	6.1	D	1300	50	0.14	EEHZA1E470P	EEHZA1E470V	1000
	56	6.3	5.8	6.1	D	1300	50	0.14	EEHZA1E560P	EEHZA1E560V	1000
	68	6.3	7.7	8.0	D8	2000	30	0.14	EEHZA1E680XP	EEHZA1E680XV	900
	100	6.3	7.7	8.0	D8	2000	30	0.14	EEHZA1E101XP	EEHZA1E101XV	900
	150	8.0	10.2	10.5	F	2300	27	0.14	EEHZA1E151P	EEHZA1E151V	500
	220	8.0	10.2	10.5	F	2300	27	0.14	EEHZA1E221P	EEHZA1E221V	500
	330	10.0	10.2	10.5	G	2500	20	0.14	EEHZA1E331P	EEHZA1E331V	500
35	10	5.0	5.8	-	C	900	100	0.12	EEHZA1V100R	-	1000
	22	5.0	5.8	-	C	900	100	0.12	EEHZA1V220R	-	1000
	27	6.3	5.8	6.1	D	1300	60	0.12	EEHZA1V270P	EEHZA1V270V	1000
	33	6.3	5.8	6.1	D	1300	60	0.12	EEHZA1V330P	EEHZA1V330V	1000
	47	6.3	5.8	6.1	D	1300	60	0.12	EEHZA1V470P	EEHZA1V470V	1000
	68	6.3	7.7	8.0	D8	2000	35	0.12	EEHZA1V680XP	EEHZA1V680XV	900
	100	8.0	10.2	10.5	F	2300	27	0.12	EEHZA1V101P	EEHZA1V101V	500
	150	8.0	10.2	10.5	F	2300	27	0.12	EEHZA1V151P	EEHZA1V151V	500
	220	10.0	10.2	10.5	G	2500	20	0.12	EEHZA1V221P	EEHZA1V221V	500
	270	10.0	10.2	10.5	G	2500	20	0.12	EEHZA1V271P	EEHZA1V271V	500
50	10	5.0	5.8	-	C	750	120	0.10	EEHZA1H100R	-	1000
	22	6.3	5.8	6.1	D	1100	80	0.10	EEHZA1H220P	EEHZA1H220V	1000
	33	6.3	7.7	8.0	D8	1600	40	0.10	EEHZA1H330XP	EEHZA1H330XV	900
	47	8.0	10.2	10.5	F	1800	30	0.10	EEHZA1H470P	EEHZA1H470V	500
	68	8.0	10.2	10.5	F	1800	30	0.10	EEHZA1H680P	EEHZA1H680V	500
	100	10.0	10.2	10.5	G	2000	28	0.10	EEHZA1H101P	EEHZA1H101V	500
63	10	6.3	5.8	6.1	D	1000	120	0.08	EEHZA1J100P	EEHZA1J100V	1000
	22	6.3	7.7	8.0	D8	1500	80	0.08	EEHZA1J220XP	EEHZA1J220XV	900
	33	8.0	10.2	10.5	F	1700	40	0.08	EEHZA1J330P	EEHZA1J330V	500
	47	8.0	10.2	10.5	F	1700	40	0.08	EEHZA1J470P	EEHZA1J470V	500
	56	10.0	10.2	10.5	G	1800	30	0.08	EEHZA1J560P	EEHZA1J560V	500
	68	10.0	10.2	10.5	G	1800	30	0.08	EEHZA1J680P	EEHZA1J680V	500
	82	10.0	10.2	10.5	G	1800	30	0.08	EEHZA1J820P	EEHZA1J820V	500
80	22	8.0	10.2	10.5	F	1550	45	0.08	EEHZA1K220P	EEHZA1K220V	500
	33	10.0	10.2	10.5	G	1700	36	0.08	EEHZA1K330P	EEHZA1K330V	500
	47	10.0	10.2	10.5	G	1700	36	0.08	EEHZA1K470P	EEHZA1K470V	500

*1: Ripple current (100 kHz / +105 °C)　*2: ESR (100 kHz / +20 °C)　*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.

◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

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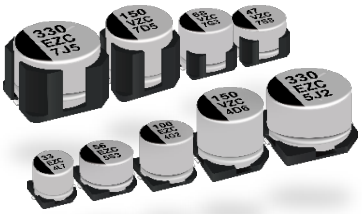
Panasonic
INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZC series **High temperature lead-free reflow**

Features

- Endurance: 4000 h at 125 °C (High temperature / Long life)
- Low ESR and high ripple current (over 85% lower ESR than V-TP)
- High-withstand voltage (to 80 V)
- Characteristics dependencies in frequency and low temperature are as small as polymer type
- Vibration-proof product is available upon request (ø6.3, ø8, ø10)
- AEC-Q200 compliant
- RoHS compliant

Specifications

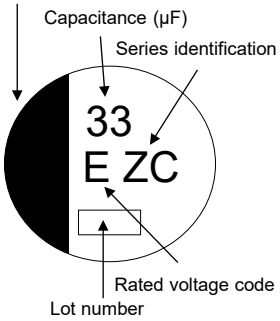
Size code	C	D	D8	F	G
Category temp. range	–55 °C to +125 °C				
Rated voltage range	25 V to 50 V	25 V to 63 V		25 V to 80 V	
Nominal capacitance range	10 µF to 33 µF	10 µF to 56 µF	22 µF to 100 µF	22 µF to 220 µF	33 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)				
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)				

Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Endurance 2	+125 °C ± 2 °C, 3000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 300 % of the initial limit
	Leakage current	Within the initial limit
Shelf life	After storage for 1000 hours at +125 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

Marking

Example : 25 V 33 µF
Marking color : BLACK

Negative polarity marking (–)

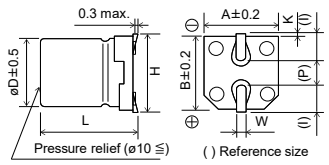


R. voltage code Unit : V

E	25
V	35
H	50
J	63
K	80

Dimensions (not to scale)

[Standard]

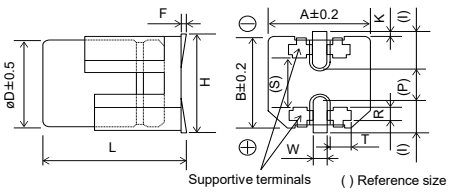


Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
C	5.0	5.8±0.3	5.3	6.5	2.2	0.65±0.1	1.5	0.35 +0.15 -0.20
D	6.3	5.8±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
D8	6.3	7.7±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
F	8.0	10.2±0.3	8.3	10	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]

< Size code : D, D8 >



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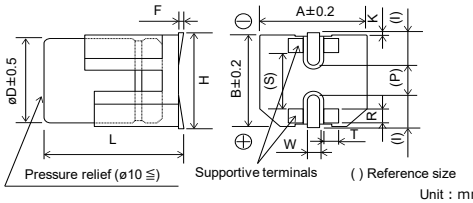

Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
D	6.3	6.1±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
D8	6.3	8.0±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZC1E220R

EEH	ZC	1E	220	X	R
Product classification	Series / Code	Rated voltage (V) / Code*	Capacitance (μF) / Code	D8 size** øDxL(mm) / Code	Tape width (mm) / Code

Series	Code
ZC	ZC

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J
80	1K

Capacitance (μF)	Code	Capacitance (μF)	Code
10	100	100	101
22	220	120	121
33	330	150	151
47	470	220	221
56	560	270	271
68	680	330	331
82	820		

D8 size** øDxL(mm)	Code
6.3 x 7.7	X

Tape width (mm)	Code
12	R
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

**: Only D8 is marked with X

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 125 °C 3000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L Standard	Case size (mm) L Vibration-proof	Size code	Specification Ripple current *1 (mA rms) Endurance 1	Specification Ripple current *1 (mA rms) Endurance 2	Specification ESR*2 (mΩ)	Specification tan δ*3	Part number Standard product	Part number Vibration-proof product	Min. packaging q'ty (pcs) Taping
25	22	5.0	5.8	–	C	550	–	80	0.14	EEHZC1E220R	–	1000
	33	5.0	5.8	–	C	550	–	80	0.14	EEHZC1E330R	–	1000
	47	6.3	5.8	6.1	D	900	–	50	0.14	EEHZC1E470P	EEHZC1E470V	1000
	56	6.3	5.8	6.1	D	900	–	50	0.14	EEHZC1E560P	EEHZC1E560V	1000
	68	6.3	7.7	8.0	D8	1400	–	30	0.14	EEHZC1E680XP	EEHZC1E680XV	900
	100	6.3	7.7	8.0	D8	1400	–	30	0.14	EEHZC1E101XP	EEHZC1E101XV	900
	150	8.0	10.2	10.5	F	1600	1900	27	0.14	EEHZC1E151P	EEHZC1E151V	500
	220	8.0	10.2	10.5	F	1600	1900	27	0.14	EEHZC1E221P	EEHZC1E221V	500
	330	10.0	10.2	10.5	G	2000	2900	20	0.14	EEHZC1E331P	EEHZC1E331V	500
35	10	5.0	5.8	–	C	550	–	100	0.12	EEHZC1V100R	–	1000
	22	5.0	5.8	–	C	550	–	100	0.12	EEHZC1V220R	–	1000
	33	6.3	5.8	6.1	D	900	–	60	0.12	EEHZC1V330P	EEHZC1V330V	1000
	47	6.3	5.8	6.1	D	900	–	60	0.12	EEHZC1V470P	EEHZC1V470V	1000
	68	6.3	7.7	8.0	D8	1400	–	35	0.12	EEHZC1V680XP	EEHZC1V680XV	900
	100	8.0	10.2	10.5	F	1600	1900	27	0.12	EEHZC1V101P	EEHZC1V101V	500
	150	8.0	10.2	10.5	F	1600	1900	27	0.12	EEHZC1V151P	EEHZC1V151V	500
	220	10.0	10.2	10.5	G	2000	2800	20	0.12	EEHZC1V221P	EEHZC1V221V	500
	270	10.0	10.2	10.5	G	2000	2800	20	0.12	EEHZC1V271P	EEHZC1V271V	500
50	10	5.0	5.8	–	C	500	–	120	0.10	EEHZC1H100R	–	1000
	22	6.3	5.8	6.1	D	750	–	80	0.10	EEHZC1H220P	EEHZC1H220V	1000
	33	6.3	7.7	8.0	D8	1100	–	40	0.10	EEHZC1H330XP	EEHZC1H330XV	900
	47	8.0	10.2	10.5	F	1250	–	30	0.10	EEHZC1H470P	EEHZC1H470V	500
	68	8.0	10.2	10.5	F	1250	–	30	0.10	EEHZC1H680P	EEHZC1H680V	500
	100	10.0	10.2	10.5	G	1600	–	28	0.10	EEHZC1H101P	EEHZC1H101V	500
	120	10.0	10.2	10.5	G	1600	–	28	0.10	EEHZC1H121P	EEHZC1H121V	500
63	10	6.3	5.8	6.1	D	700	–	120	0.08	EEHZC1J100P	EEHZC1J100V	1000
	22	6.3	7.7	8.0	D8	900	–	80	0.08	EEHZC1J220XP	EEHZC1J220XV	900
	33	8.0	10.2	10.5	F	1100	–	40	0.08	EEHZC1J330P	EEHZC1J330V	500
	47	8.0	10.2	10.5	F	1100	–	40	0.08	EEHZC1J470P	EEHZC1J470V	500
	56	10.0	10.2	10.5	G	1400	–	30	0.08	EEHZC1J560P	EEHZC1J560V	500
	68	10.0	10.2	10.5	G	1400	–	30	0.08	EEHZC1J680P	EEHZC1J680V	500
	82	10.0	10.2	10.5	G	1400	–	30	0.08	EEHZC1J820P	EEHZC1J820V	500
80	22	8.0	10.2	10.5	F	1050	–	45	0.08	EEHZC1K220P	EEHZC1K220V	500
	33	10.0	10.2	10.5	G	1360	–	36	0.08	EEHZC1K330P	EEHZC1K330V	500
	47	10.0	10.2	10.5	G	1360	–	36	0.08	EEHZC1K470P	EEHZC1K470V	500

*1: Ripple current (100 kHz / +125 °C)　*2: ESR (100 kHz / +20 °C)　*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.

◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

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Should a safety concern arise regarding this product, please be sure to contact us immediately.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

After endurance ESR（100 kHz, -40°C）

Size code	C	D	D8	F	G
ESR (Ω)	2	1.4	0.8	0.4	0.3

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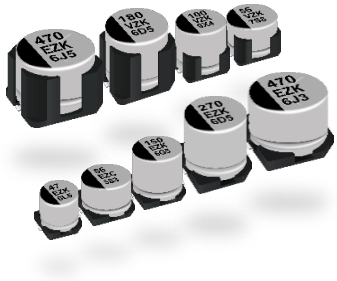


Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZK series **High temperature lead-free reflow**

Features

- High capacitance and High ripple current compared with ZC series
- Endurance : 4000 h at 125 °C (High temperature / Long life)
- Low ESR
- Characteristics dependencies in frequency and low temperature are as small as polymer type
- Vibration-proof product is available upon request (ø6.3, ø8, ø10)
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	C	D	D8	F	G
Category temp. range	–55 °C to +125 °C				
Rated voltage range	25 V to 35 V				
Nominal capacitance range	33 µF to 47 µF	56 µF to 82 µF	100 µF to 150 µF	180 µF to 270 µF	330 µF to 470 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)				
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)				

Endurance

+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

ESR after endurance (Ω / 100 kHz)(-40 °C)

Size code	C	D	D8	F	G
	2.0	1.4	0.8	0.4	0.3

Shelf life

After storage for 1000 hours at +125 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance.
(Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)

Damp heat (Load)

+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

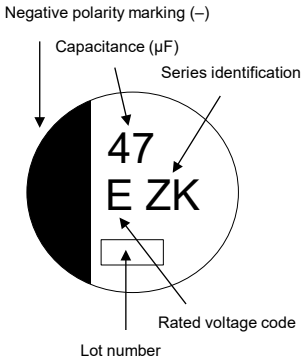
Resistance to soldering heat

After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.

Capacitance change	Within ±10% of the initial value
Dissipation factor (tan δ)	Within the initial limit
Leakage current	Within the initial limit

Marking

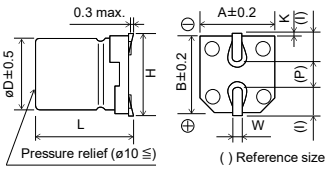
Example : 25 V 47 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35

Dimensions (not to scale)

[Standard]

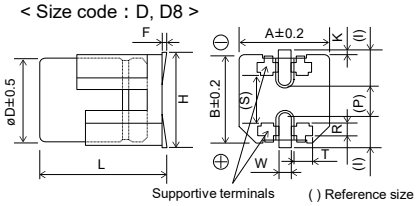


Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
C	5.0	5.8±0.3	5.3	6.5	2.2	0.65±0.1	1.5	0.35 +0.15 -0.20
D	6.3	5.8±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
D8	6.3	7.7±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
F	8.0	10.2±0.3	8.3	10	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]

< Size code : D, D8 >



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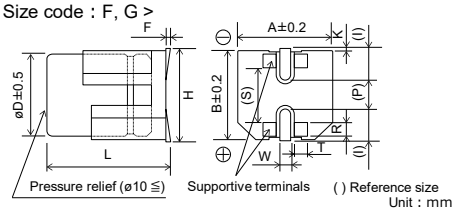

Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
D	6.3	6.1±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
D8	6.3	8.0±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZK1E470R

EEH — Product classification

ZK

Series	Code
ZK	ZK

1E

Rated voltage (V)	Code*
25	1E
35	1V

471

Capacitance (μF)	Code	Capacitance (μF)	Code
33	330	150	151
47	470	180	181
56	560	270	271
68	680	330	331
82	820	470	471
100	101		

X

D8 size** øDxL(mm)	Code
6.3 x 7.7	X

R

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

**: Only D8 is marked with X

Characteristics list

Endurance : 125 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L Standard	L Vibration-proof	Size code	Specification Ripple current*1 (mA rms)	ESR*2 (mΩ)	tan δ*3	Part number Standard product	Vibration-proof product	Min.packaging q'ty (pcs) Taping
25	47	5.0	5.8	–	C	850	80	0.14	EEHZK1E470R	–	1000
	68	6.3	5.8	6.1	D	1300	50	0.14	EEHZK1E680P	EEHZK1E680V	1000
	82	6.3	5.8	6.1	D	1300	50	0.14	EEHZK1E820P	EEHZK1E820V	1000
	150	6.3	7.7	8.0	D8	1800	30	0.14	EEHZK1E151XP	EEHZK1E151XV	900
	270	8.0	10.2	10.5	F	2000	27	0.14	EEHZK1E271P	EEHZK1E271V	500
	470	10.0	10.2	10.5	G	2800	20	0.14	EEHZK1E471P	EEHZK1E471V	500
35	33	5.0	5.8	–	C	750	100	0.12	EEHZK1V330R	–	1000
	56	6.3	5.8	6.1	D	1200	60	0.12	EEHZK1V560P	EEHZK1V560V	1000
	100	6.3	7.7	8.0	D8	1700	35	0.12	EEHZK1V101XP	EEHZK1V101XV	900
	180	8.0	10.2	10.5	F	2000	27	0.12	EEHZK1V181P	EEHZK1V181V	500
	330	10.0	10.2	10.5	G	2800	20	0.12	EEHZK1V331P	EEHZK1V331V	500

*1: Ripple current (100 kHz / +125 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.
◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.15	0.20	0.25	0.35
47 μF ≤ C < 100 μF		0.15	0.25	0.30	0.40
100 μF ≤ C		0.15	0.25	0.30	0.40

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.45	0.55	0.60	0.65
47 μF ≤ C < 100 μF		0.50	0.60	0.65	0.70
100 μF ≤ C		0.50	0.60	0.65	0.70

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.70	0.75	0.75	0.75
47 μF ≤ C < 100 μF		0.75	0.75	0.80	0.80
100 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 100 μF		0.85	0.90	1.00	1.00
100 μF ≤ C		0.85	0.90	1.00	1.00

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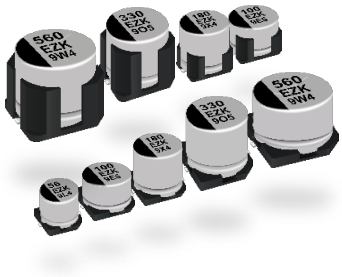
Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZKU series

High temperature lead-free reflow

Features

- Endurance : 4000 h at 125 °C (High temperature / Long life)
- Large capacitance compared with ZK series
- Low ESR
- Characteristics dependencies in frequency and low temperature are as small as polymer type
- Vibration-proof product is available upon request. (ø6.3, ø8, ø10)
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	C	D	D8	F	G
Category temp. range	–55 °C to +125 °C				
Rated voltage range	25 V to 35 V				
Nominal capacitance range	39 µF to 56 µF	68 µF to 100 µF	120 µF to 180 µF	220 µF to 330 µF	390 µF to 560 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)				
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)				
Dissipation factor (tan δ)	Please see the attached characteristics list				
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)				

Endurance

+125 °C ± 2 °C 4000 h, apply the rated ripple current without exceeding the rated voltage.

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

ESR after endurance (Ω / 100 kHz)(-40 °C)

Size code	C	D	D8	F	G
	2.0	1.4	0.8	0.4	0.3

Shelf life

After storage for 1000 hours at +125 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance.
(Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)

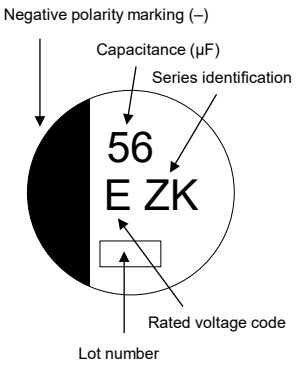
Damp heat (Load)

+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

Marking

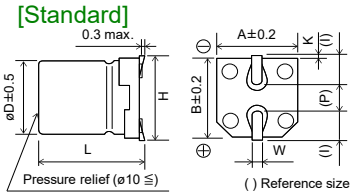
Example : 25 V 56 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35

Dimensions (not to scale)

[Standard]

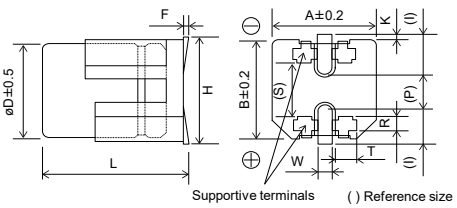


Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
C	5.0	5.8±0.3	5.3	6.5	2.2	0.65±0.1	1.5	0.35 +0.15 -0.20
D	6.3	5.8±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
D8	6.3	7.7±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
F	8.0	10.2±0.3	8.3	10	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]

< Size code : D, D8 >



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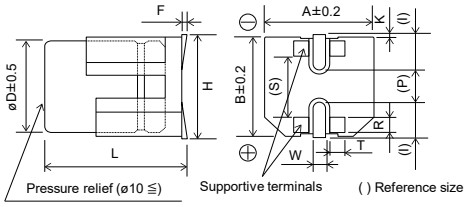

Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
D	6.3	6.1±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
D8	6.3	8.0±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZKE181XUP

EEH — Product classification

ZK

Series	Code
ZKU	ZK

E

Rated voltage (V)	Code*
25	1E
35	1V

181

Capacitance (μF)	Code
39	390
56	560
68	680
100	101
120	121
180	181
220	221
330	331
390	391
560	561

X

D8 size** øDxL(mm)	Code
6.3 x 7.7	X

U

Dia øD	Code
Minia-turized product	U

P

Tape width (mm)	Code
12	R
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

**: Only D8 is marked with X

Characteristics list

Endurance : 125 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L Standard	Case size (mm) L Vibration-proof	Size code	Specification Ripple current*1 (mA rms)	Specification ESR*2 (mΩ)	Specification tan δ*3	Part number Standard product	Part number Vibration-proof product	Min.packaging q'ty (pcs) Taping
25	56	5	5.8	-	C	850	80	0.14	EEHZK1E560UR	-	1000
	100	6.3	5.8	6.1	D	1300	50	0.14	EEHZK1E101UP	EEHZK1E101UV	1000
	180	6.3	7.7	8.0	D8	1800	30	0.14	EEHZKE181XUP	EEHZKE181XUV	900
	330	8	10.2	10.5	F	2000	27	0.14	EEHZK1E331UP	EEHZK1E331UV	500
	560	10	10.2	10.5	G	2800	20	0.14	EEHZK1E561UP	EEHZK1E561UV	500
35	39	5	5.8	-	C	750	100	0.12	EEHZK1V390UR	-	1000
	68	6.3	5.8	6.1	D	1200	60	0.12	EEHZK1V680UP	EEHZK1V680UV	1000
	120	6.3	7.7	8.0	D8	1700	35	0.12	EEHZKV121XUP	EEHZKV121XUV	900
	220	8	10.2	10.5	F	2000	27	0.12	EEHZK1V221UP	EEHZK1V221UV	500
	390	10	10.2	10.5	G	2800	20	0.12	EEHZK1V391UP	EEHZK1V391UV	500

*1: Ripple current (100 kHz / +125 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.
◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency(f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.15	0.20	0.25	0.35
47 μF ≤ C < 100 μF		0.15	0.25	0.30	0.40
100 μF ≤ C		0.15	0.25	0.30	0.40

Rated capacitance (C)	Frequency(f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.45	0.55	0.60	0.65
47 μF ≤ C < 100 μF		0.50	0.60	0.65	0.70
100 μF ≤ C		0.50	0.60	0.65	0.70

Rated capacitance (C)	Frequency(f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.70	0.75	0.75	0.75
47 μF ≤ C < 100 μF		0.75	0.75	0.80	0.80
100 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency(f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 100 μF		0.85	0.90	1.00	1.00
100 μF ≤ C		0.85	0.90	1.00	1.00

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

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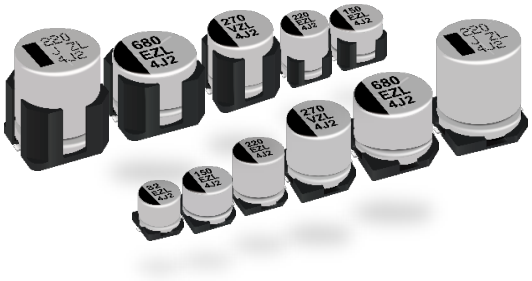
UPDATE

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZL series

High temperature lead-free reflow

Features

- Endurance : 4000 h at 125 °C / 135 °C
- Higher capacitance (max 150 % of ZKU series)
- Low ESR (max 40 %, lower ESR than ZC or ZKU series)
- Smaller than ZC series with the same capacitance
- Expanding the G16 size
  (Capacitance : max 120 % and ESR : max 20 % lower of ZSU series)
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	C	D	D8	F	G	G16
Category temp. range	–55 °C to +135 °C					
Rated voltage range	25 V to 63 V					
Nominal capacitance range	47 µF to 82 µF	82 µF to 150 µF	150 µF to 220 µF	270 µF to 470 µF	470 µF to 680 µF	220µF to 1200µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)					
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)					
Dissipation factor (tan δ)	Please see the attached characteristics list					
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)					

Endurance 1

+125 °C ± 2 °C 4000 h, apply the rated ripple current without exceeding the rated voltage.

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code					
	C	D	D8	F	G	G16
	2.0	1.4	0.8	0.4	0.3	0.3

Endurance 2

+135 °C ± 2 °C 2000 h (C,D,D8 size) or 4000 h (F,G,G16 size), apply the rated ripple current without exceeding the rated voltage.

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code					
	C	D	D8	F	G	G16
	2.0	1.4	0.8	0.4	0.3	0.3

Shelf life

After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance.
(Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)

Damp heat (Load)

+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

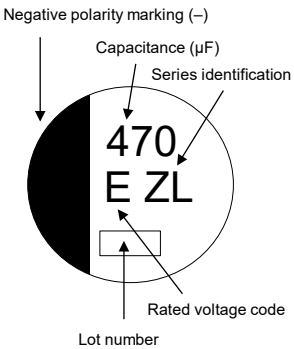
Resistance to soldering heat

After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.

Capacitance change	Within ±10 % of the initial value
Dissipation factor (tan δ)	Within the initial limit
Leakage current	Within the initial limit

Marking

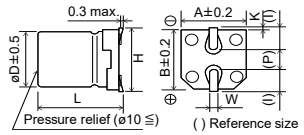
Example : 25 V 470 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)

[Standard]

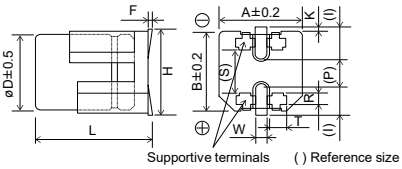


Unit : mm

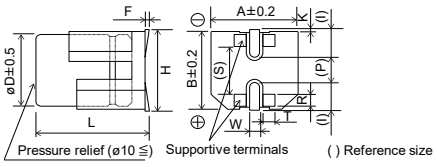
Size code	øD	L	A, B	H max.	I	W	P	K
C	5.0	5.8±0.3	5.3	6.5	2.2	0.65±0.1	1.5	0.35 +0.15 -0.20
D	6.3	5.8±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
D8	6.3	7.7±0.3	6.6	7.8	2.6	0.65±0.1	1.8	0.35 +0.15 -0.20
F	8.0	10.2±0.3	8.3	10	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2
G16	10.0	16.5±0.3	10.3	11.2	3.2	1.2±0.2	4.6	-

[Vibration-proof product]

< Size code : D, D8 >



< Size code : F, G, G16 >



Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
D	6.3	6.1±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
D8	6.3	8.0±0.3	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 +0.15 -0.20	1.1±0.2	3.3	1.05±0.2
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2
G16	10.0	16.8±0.3	10.3	11.2	0 to +0.15	3.2	1.2±0.2	4.6	-	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZL1E221XP

EEH	ZL	1E	221	X	P
Product classification	Series / Code	Rated voltage (V) / Code*	Capacitance (μF) / Code	D8 size** øDxL(mm) / Code	Tape width (mm) / Code

Series	Code
ZL	ZL

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

Capacitance (μF)	Code	Capacitance (μF)	Code
47	470	330	331
82	820	470	471
150	151	680	681
220	221	820	821
270	271	1200	122

D8 size** øDxL(mm)	Code
6.3 x 7.7	X

Tape width (mm)	Code
12	R
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.
**: Only D8 is marked with X

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 135 °C 2000 h (C, D, D8 size) / 4000 h (F, G, G16 size)

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L Standard	L Vibration -proof	Size code	Ripple current *1 (mA rms) Endurance 1 (+125°C)	Ripple current *1 (mA rms) Endurance 2 (+135°C)	ESR*2 (mΩ)	tan δ*3	Part number Standard product	Part number Vibration-proof product	Min. packaging q'ty (pcs) Taping
25	82	5.0	5.8	-	C	1000	600	58	0.14	EEHZL1E820R	-	1000
	150	6.3	5.8	6.1	D	1500	800	38	0.14	EEHZL1E151P	EEHZL1E151V	1000
	220	6.3	7.7	8.0	D8	2000	1000	24	0.14	EEHZL1E221XP	EEHZL1E221XV	900
	470	8.0	10.2	10.5	F	3000	2000	18	0.14	EEHZL1E471P	EEHZL1E471V	500
	680	10.0	10.2	10.5	G	3400	2300	14	0.14	EEHZL1E681P	EEHZL1E681V	500
NEW	1200	10.0	16.5	16.8	G16	5500	3800	10	0.14	EEHZL1E122P	EEHZL1E122V	250
35	47	5.0	5.8	-	C	900	550	60	0.12	EEHZL1V470R	-	1000
	82	6.3	5.8	6.1	D	1400	700	40	0.12	EEHZL1V820P	EEHZL1V820V	1000
	150	6.3	7.7	8.0	D8	1900	900	26	0.12	EEHZL1V151XP	EEHZL1V151XV	900
	270	8.0	10.2	10.5	F	2900	1900	20	0.12	EEHZL1V271P	EEHZL1V271V	500
	470	10.0	10.2	10.5	G	3300	2200	16	0.12	EEHZL1V471P	EEHZL1V471V	500
NEW	820	10.0	16.5	16.8	G16	5200	3500	11	0.12	EEHZL1V821P	EEHZL1V821V	250
NEW 50	330	10.0	16.5	16.8	G16	5000	3300	12	0.10	EEHZL1H331P	EEHZL1H331V	250
NEW 63	220	10.0	16.5	16.8	G16	5000	3300	12	0.08	EEHZL1J221P	EEHZL1J221V	250

*1: Ripple current (100 kHz / +125 °C or +135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.
◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency(f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
47 μF ≤ C < 150 μF	Correction factor	0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency(f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
47 μF ≤ C < 150 μF	Correction factor	0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency(f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
47 μF ≤ C < 150 μF	Correction factor	0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency(f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ 1000 kHz
47 μF ≤ C < 150 μF	Correction factor	0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

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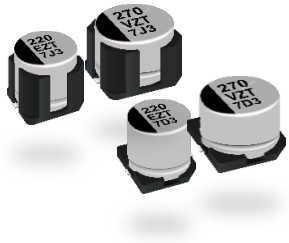
Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZT series **High temperature lead-free reflow**

Features

- Endurance: 4000 h at 135 °C / 125 °C
- Higher ripple current (75 % to 118 % higher than ZC series)
- Vibration-proof product is available upon request.
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	F	G
Category temp. range	–55 °C to +135 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	33 µF to 220 µF	56 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance 1

+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
E.S.R.	≤ 200 % of the initial limit
Leakage current	Within the initial limit

ESR after endurance (Ω / 100 kHz)(-40 °C)

Size code F	Size code G
0.4	0.3

Endurance 2

+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
E.S.R.	≤ 200 % of the initial limit
Leakage current	Within the initial limit

ESR after endurance (Ω / 100 kHz)(-40 °C)

Size code F	Size code G
0.4	0.3

Shelf life

After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance.
(Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)

Damp heat (Load)

85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
E.S.R.	≤ 200 % of the initial limit
Leakage current	Within the initial limit

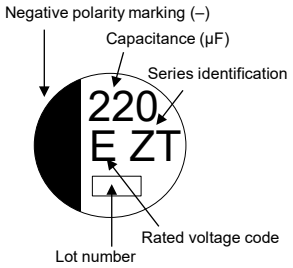
Resistance to soldering heat

After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.

Capacitance change	Within ±10% of the initial value
Dissipation factor (tan δ)	Within the initial limit
Leakage current	Within the initial limit

Marking

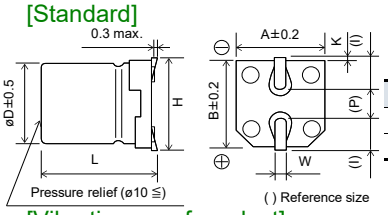
Example : 25 V 220 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)

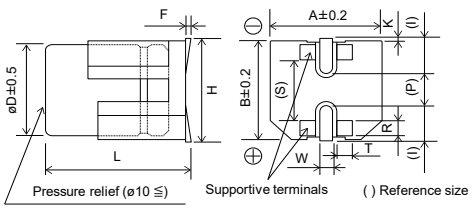
[Standard]



Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
F	8.0	10.2±0.3	8.3	10.0	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZT1E221P

EEH

Product classification

ZT

Series	Code
ZT	ZT

1E

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

221

Capacitance (μF)	Code	Capacitance (μF)	Code
33	330	120	121
47	470	150	151
56	560	220	221
68	680	270	271
82	820	330	331
100	101		

P

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm)			Size code	Specification				Part number		Min. packaging q'ty (pcs)
		øD	L			Ripple current *1 (mA rms)		ESR*2 (mΩ)	tan δ*3	Standard product	Vibration-proof product	Taping
			Standard	Vibration -proof		Endurance 1 125 °C	Endurance 2 135 °C					
25	220	8.0	10.2	10.5	F	2900	1800	22	0.14	EEHZT1E221P	EEHZT1E221V	500
	330	10.0	10.2	10.5	G	3500	2200	16	0.14	EEHZT1E331P	EEHZT1E331V	500
35	150	8.0	10.2	10.5	F	2900	1800	22	0.12	EEHZT1V151P	EEHZT1V151V	500
	270	10.0	10.2	10.5	G	3500	2200	16	0.12	EEHZT1V271P	EEHZT1V271V	500
50	68	8.0	10.2	10.5	F	2700	1700	25	0.10	EEHZT1H680P	EEHZT1H680V	500
	100	10.0	10.2	10.5	G	2900	1800	23	0.10	EEHZT1H101P	EEHZT1H101V	500
	120	10.0	10.2	10.5	G	2900	1800	23	0.10	EEHZT1H121P	EEHZT1H121V	500
63	33	8.0	10.2	10.5	F	2400	1500	32	0.08	EEHZT1J330P	EEHZT1J330V	500
	47	8.0	10.2	10.5	F	2400	1500	32	0.08	EEHZT1J470P	EEHZT1J470V	500
	56	10.0	10.2	10.5	G	2800	1700	25	0.08	EEHZT1J560P	EEHZT1J560V	500
	68	10.0	10.2	10.5	G	2800	1700	25	0.08	EEHZT1J680P	EEHZT1J680V	500
	82	10.0	10.2	10.5	G	2800	1700	25	0.08	EEHZT1J820P	EEHZT1J820V	500

*1: Ripple current (100 kHz / +125 °C or 135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.

◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

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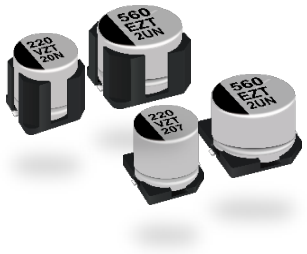
Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZTU series

High temperature lead-free reflow

Features

- Endurance: 4000 h at 135 °C / 125 °C
- Higher ripple current (max 180 % of ZC series)
- Larger capacitance (max 170 % of ZT series)
- AEC-Q200 compliant
- RoHS compliant

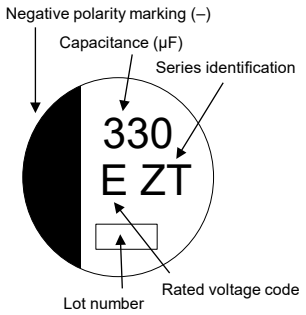
Specifications

Size code	F	G
Category temp. range	–55 °C to +135 °C	
Rated voltage range	25 V to 35 V	
Nominal capacitance range	220 µF to 330 µF	390 µF to 560 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4, G 0.3
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4, G 0.3
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

Marking

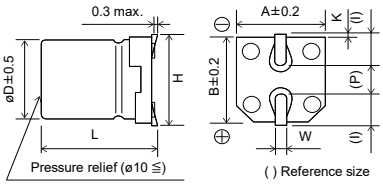
Example : 25 V 330 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35

Dimensions (not to scale)

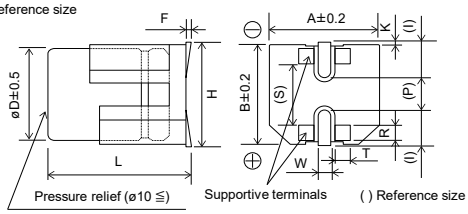
[Standard]



Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
F	8.0	10.2±0.3	8.3	10.0	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

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Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZT1E331UP

EEH

Product classification

ZT

Series	Code
ZT	ZT

1E

Rated voltage (V)	Code*
25	1E
35	1V

331

Capacitance (μF)	Code
220	221
330	331
390	391
560	561

U

Dia øD	Code
Minia-turized product	U

P

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm)			Size code	Specification				Part number		Min. packaging q'ty (pcs)
		øD	L			Ripple current *1 (mA rms)		ESR*2 (mΩ)	tan δ*3	Standard product	Vibration-proof product	Taping
			Standard	Vibration -proof		Endurance 1 (+125°C)	Endurance 2 (+135°C)					
25	330	8.0	10.2	10.5	F	2900	1800	22	0.14	EEHZT1E331UP	EEHZT1E331UV	500
	560	10.0	10.2	10.5	G	3500	2200	16	0.14	EEHZT1E561UP	EEHZT1E561UV	500
35	220	8.0	10.2	10.5	F	2900	1800	22	0.12	EEHZT1V221UP	EEHZT1V221UV	500
	390	10.0	10.2	10.5	G	3500	2200	16	0.12	EEHZT1V391UP	EEHZT1V391UV	500

*1: Ripple current (100 kHz / +125 °C or +135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.

◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)			
	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
150 μF ≤ C	0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)			
	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f ＜ 10 kHz
150 μF ≤ C	0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)			
	10 kHz ≤ f ＜ 15 kHz	15 kHz ≤ f ＜ 20 kHz	20 kHz ≤ f ＜ 30 kHz	30 kHz ≤ f ＜ 40 kHz
150 μF ≤ C	0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)			
	40 kHz ≤ f ＜ 50 kHz	50 kHz ≤ f ＜ 100 kHz	100 kHz ≤ f ＜ 500 kHz	500 kHz ≤ f ＜ 1000 kHz
150 μF ≤ C	0.85	0.90	1.00	1.00

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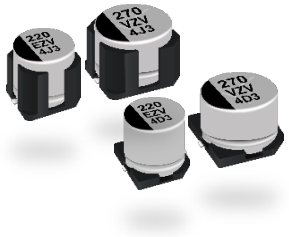
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZV series **High temperature lead-free reflow**

Features

- Endurance: 4000 h at 125 °C / 135 °C
- Low ESR (up to 39 %, Lower ESR than Current ZT series)
- Higher ripple current (max 150 % of ZT series)
- AEC-Q200 compliant
- RoHS compliant

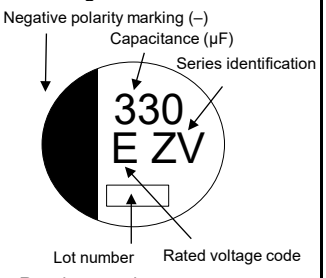
Specifications

Size code	F	G
Category temp. range	–55 °C to +135 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	33 µF to 220 µF	56 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	E.S.R.	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code F: 0.4	Size code G: 0.3
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	E.S.R.	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code F: 0.4	Size code G: 0.3
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)		
Damp heat (Load)	85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	E.S.R.	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
Resistance to soldering heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.		
	Capacitance change	Within ±10% of the initial value	
	Dissipation factor (tan δ)	Within the initial limit	
	Leakage current	Within the initial limit	

Marking

Example : 25 V 330 µF
Marking color : BLACK

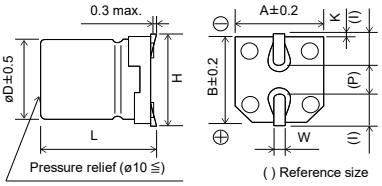


Unit : V

R. voltage code	
E	25
V	35
H	50
J	63

Dimensions (not to scale)

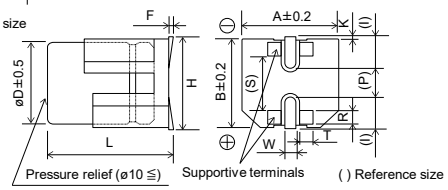
[Standard]



Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
F	8.0	10.2±0.3	8.3	10.0	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZV1E221P

EEH

Product classification

ZV

Series	Code
ZV	ZV

1E

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

221

Capacitance (μF)	Code	Capacitance (μF)	Code
33	330	120	121
47	470	150	151
56	560	220	221
68	680	270	271
82	820	330	331
100	101		

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

P

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L Standard	Case size (mm) L Vibration-proof	Size code	Specification Ripple current *1 (mA rms) Endurance 1 (+125°C)	Specification Ripple current *1 (mA rms) Endurance 2 (+135°C)	Specification ESR*2 (mΩ)	Specification tan δ*3	Part number Standard product	Part number Vibration-proof product	Min. packaging q'ty (pcs) Taping
25	220	8.0	10.2	10.5	F	3900	2900	16	0.14	EEHZV1E221P	EEHZV1E221V	500
	330	10.0	10.2	10.5	G	4600	3400	12	0.14	EEHZV1E331P	EEHZV1E331V	500
35	150	8.0	10.2	10.5	F	3900	2900	16	0.12	EEHZV1V151P	EEHZV1V151V	500
	270	10.0	10.2	10.5	G	4600	3400	12	0.12	EEHZV1V271P	EEHZV1V271V	500
50	68	8.0	10.2	10.5	F	3600	2500	19	0.10	EEHZV1H680P	EEHZV1H680V	500
	100	10.0	10.2	10.5	G	4300	3200	15	0.10	EEHZV1H101P	EEHZV1H101V	500
	120	10.0	10.2	10.5	G	4300	3200	15	0.10	EEHZV1H121P	EEHZV1H121V	500
63	33	8.0	10.2	10.5	F	3300	2300	22	0.08	EEHZV1J330P	EEHZV1J330V	500
	47	8.0	10.2	10.5	F	3300	2300	22	0.08	EEHZV1J470P	EEHZV1J470V	500
	56	10.0	10.2	10.5	G	4000	3000	17	0.08	EEHZV1J560P	EEHZV1J560V	500
	68	10.0	10.2	10.5	G	4000	3000	17	0.08	EEHZV1J680P	EEHZV1J680V	500
	82	10.0	10.2	10.5	G	4000	3000	17	0.08	EEHZV1J820P	EEHZV1J820V	500

*1: Ripple current (100 kHz / +125 °C or +135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.
◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

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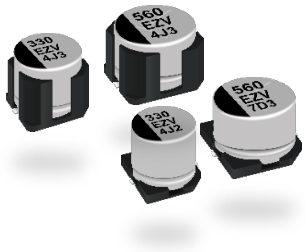
Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZVU series

High temperature lead-free reflow

Features

- Endurance: 4000 h at 125 °C / 135 °C
- Larger capacitance (max 170 % of ZV series)
- Higher ripple current (max 150 % of ZT series)
- AEC-Q200 compliant
- RoHS compliant

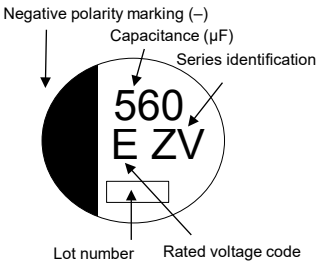
Specifications

Size code	F	G
Category temp. range	–55 °C to +135 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	56 µF to 330 µF	100 µF to 560 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4, G 0.3
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4, G 0.3
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

Marking

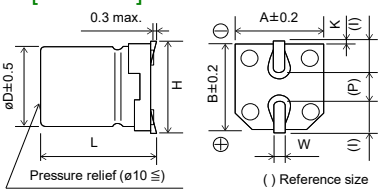
Example : 25 V 560 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)

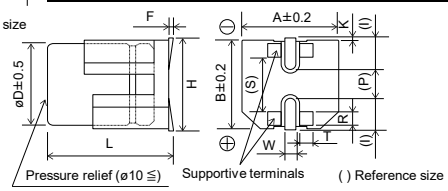
[Standard]



Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
F	8.0	10.2±0.3	8.3	10.0	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZV1E331UP

EEH	ZV	1E	331	U	P
Product classification	Series / Code	Rated voltage (V) / Code*	Capacitance (μF) / Code / Capacitance (μF) / Code	Dia øD / Code	Tape width (mm) / Code

Series	Code
ZVU	ZV

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

Capacitance (μF)	Code	Capacitance (μF)	Code
56	560	220	221
82	820	330	331
100	101	390	391
150	151	560	561

Dia øD	Code
Minia-turized product	U

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L Standard	L Vibration-proof	Size code	Ripple current *1 (mA rms) Endurance 1 (+125°C)	Ripple current *1 (mA rms) Endurance 2 (+135°C)	ESR*2 (mΩ)	tan δ*3	Part number Standard product	Part number Vibration-proof product	Min. packaging q'ty (pcs) Taping
25	330	8.0	10.2	10.5	F	3900	2900	16	0.14	EEHZV1E331UP	EEHZV1E331UV	500
	560	10.0	10.2	10.5	G	4600	3400	12	0.14	EEHZV1E561UP	EEHZV1E561UV	500
35	220	8.0	10.2	10.5	F	3900	2900	16	0.12	EEHZV1V221UP	EEHZV1V221UV	500
	390	10.0	10.2	10.5	G	4600	3400	12	0.12	EEHZV1V391UP	EEHZV1V391UV	500
50	82	8.0	10.2	10.5	F	3600	2500	19	0.10	EEHZV1H820UP	EEHZV1H820UV	500
	150	10.0	10.2	10.5	G	4300	3200	15	0.10	EEHZV1H151UP	EEHZV1H151UV	500
63	56	8.0	10.2	10.5	F	3300	2300	22	0.08	EEHZV1J560UP	EEHZV1J560UV	500
	100	10.0	10.2	10.5	G	4000	3000	17	0.08	EEHZV1J101UP	EEHZV1J101UV	500

*1: Ripple current (100 kHz / +125 °C or +135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.
◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
56 μF ≤ C < 150 μF	Correction factor	0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
56 μF ≤ C < 150 μF	Correction factor	0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
56 μF ≤ C < 150 μF	Correction factor	0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

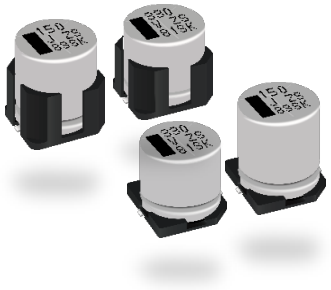
Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
56 μF ≤ C < 150 μF	Correction factor	0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

UPDATE

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZS series

High temperature lead-free reflow

Features

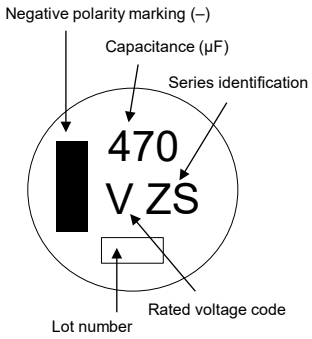
- Endurance: 4000 h at 135 °C / 125 °C
- High ripple current and High capacitance
- High-withstand voltage (to 80 V)
- Vibration-proof product is available upon request.
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	G12	G16
Category temp. range	–55 °C to +135 °C	
Rated voltage range	25 V to 63 V	25 V to 80 V
Nominal capacitance range	100 µF to 470 µF	82 µF to 560 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20°C, stabilized at +20°C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After reflow soldering and then being stabilized at +20°C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

Marking

Example : 35 V 470 µF
Marking color : BLACK

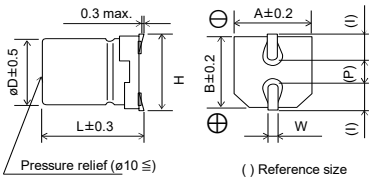


R. voltage code — Unit : V

E	25
V	35
H	50
J	63
K	80

Dimensions (not to scale)

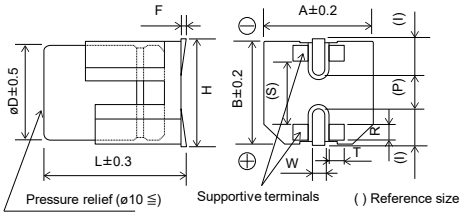
[Standard]



Unit : mm

Size code	øD	L	A, B	H	I	W	P
G12	10.0	12.5	10.3	11.0±0.2	3.2	1.2±0.2	4.6
G16	10.0	16.5	10.3	11.0±0.2	3.2	1.2±0.2	4.6

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H	F	I	W	P	R	S	T
G12	10.0	12.8	10.3	11.0±0.2	0 to +0.15	3.2	1.2±0.2	4.6	0.70±0.2	6.9	1.3±0.2
G16	10.0	16.8	10.3	11.0±0.2	0 to +0.15	3.2	1.2±0.2	4.6	0.70±0.2	6.9	1.3±0.2

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Explanation of part numbers

◇ Part number system

e.g.: EEHZS1E471P

EEH

Product classification

ZS

Series	Code
ZS	ZS

1E

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J
80	1K

471

Capacitance (μF)	Code	Capacitance (μF)	Code
82	820	330	331
100	101	470	471
150	151	560	561
220	221		

P

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L Standard	Case size (mm) L Vibration-proof	Size code	Specification Ripple current *1 (mA rms) Endurance 1 (+125°C)	Specification Ripple current *1 (mA rms) Endurance 2 (+135°C)	Specification ESR*2 (mΩ)	Specification tan δ*3	Part number Standard product	Part number Vibration-proof product	Min. packaging q'ty (pcs) Taping
25	470	10.0	12.5	12.8	G12	3500	2500	14	0.14	EEHZS1E471P	EEHZS1E471V	400
	560	10.0	16.5	16.8	G16	4000	2900	11	0.14	EEHZS1E561P	EEHZS1E561V	250
35	330	10.0	12.5	12.8	G12	3500	2500	14	0.12	EEHZS1V331P	EEHZS1V331V	400
	470	10.0	16.5	16.8	G16	4000	2900	11	0.12	EEHZS1V471P	EEHZS1V471V	250
50	150	10.0	12.5	12.8	G12	3200	2250	17	0.10	EEHZS1H151P	EEHZS1H151V	400
	220	10.0	16.5	16.8	G16	3700	2600	13	0.10	EEHZS1H221P	EEHZS1H221V	250
63	100	10.0	12.5	12.8	G12	3000	2100	19	0.08	EEHZS1J101P	EEHZS1J101V	400
	150	10.0	16.5	16.8	G16	3500	2400	15	0.08	EEHZS1J151P	EEHZS1J151V	250
NEW 80	82	10.0	16.5	16.8	G16	3500	2400	15	0.08	EEHZS1K820P	EEHZS1K820V	250

*1: Ripple current (100 kHz / +125 °C or +135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.

◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
82 μF ≤ C < 150 μF	Correction factor	0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
82 μF ≤ C < 150 μF	Correction factor	0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
82 μF ≤ C < 150 μF	Correction factor	0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
82 μF ≤ C < 150 μF	Correction factor	0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

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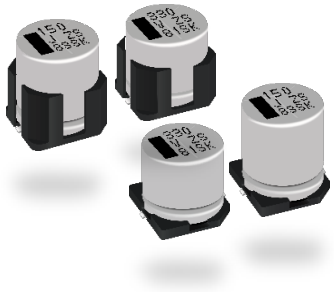
Panasonic INDUSTRY

UPDATE

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZSU series

High temperature lead-free reflow

Features

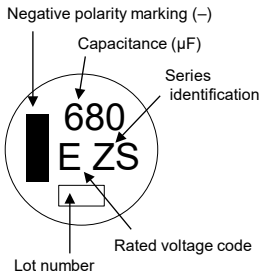
- Endurance: 4000 h at 135 °C / 125 °C
- Large capacitance compared with ZS series
- High-withstand voltage (to 80 V)
- Vibration-proof product is available upon request.
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	G12		G16
Category temp. range	–55 °C to +135 °C		
Rated voltage range	25 V to 63 V		25 V to 80 V
Nominal capacitance range	120 µF to 680 µF		100 µF to 1000 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)		
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)		
Dissipation factor (tan δ)	Please see the attached characteristics list		
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)		
Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	E.S.R.	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: G12	G16
		0.3	0.3
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	E.S.R.	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: G12	G16
		0.3	0.3
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20°C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)		
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied.		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	E.S.R.	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
Resistance to soldering heat	After reflow soldering and then being stabilized at +20°C, capacitors shall meet the following limits.		
	Capacitance change	Within ±10% of the initial value	
	Dissipation factor (tan δ)	Within the initial limit	
	Leakage current	Within the initial limit	

Marking

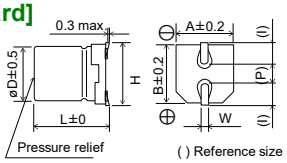
Example : 25 V 680 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35
H	50
J	63
K	80

Dimensions (not to scale)

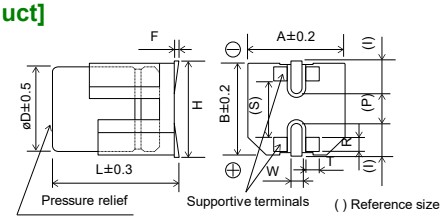
[Standard]



Unit : mm

Size code	øD	L	A, B	H	I	W	P
G12	10.0	12.5	10.3	11.0±0.2	3.2	1.2±0.2	4.6
G16	10.0	16.5	10.3	11.0±0.2	3.2	1.2±0.2	4.6

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H	F	I	W	P	R	S	T
G12	10.0	12.8	10.3	11.0±0.2	0 to +0.15	3.2	1.2±0.2	4.6	0.70±0.2	6.9	1.3±0.2
G16	10.0	16.8	10.3	11.0±0.2	0 to +0.15	3.2	1.2±0.2	4.6	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZS1E681UP

EEH — Product classification

ZS

Series	Code
ZS	ZS

1E

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J
80	1K

681

Capacitance (μF)	Code	Capacitance (μF)	Code
100	101	470	471
120	121	680	681
180	181	1000	102
270	271		

U

Dia øD	Code
Minia-turized product	U

P

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L Standard	Case size (mm) L Vibration-proof	Size code	Specification Ripple current *1 (mA rms) Endurance 1 125 °C	Specification Ripple current *1 (mA rms) Endurance 2 135 °C	Specification ESR*2 (mΩ)	Specification tan δ*3	Part number Standard product	Part number Vibration-proof product	Min. packaging q'ty (pcs) Taping
25	680	10.0	12.5	12.8	G12	3500	2500	14	0.14	EEHZS1E681UP	EEHZS1E681UV	400
	1000	10.0	16.5	16.8	G16	4000	2900	11	0.14	EEHZS1E102UP	EEHZS1E102UV	250
35	470	10.0	12.5	12.8	G12	3500	2500	14	0.12	EEHZS1V471UP	EEHZS1V471UV	400
	680	10.0	16.5	16.8	G16	4000	2900	11	0.12	EEHZS1V681UP	EEHZS1V681UV	250
50	180	10.0	12.5	12.8	G12	3200	2250	17	0.10	EEHZS1H181UP	EEHZS1H181UV	400
	270	10.0	16.5	16.8	G16	3700	2600	13	0.10	EEHZS1H271UP	EEHZS1H271UV	250
63	120	10.0	12.5	12.8	G12	3000	2100	19	0.08	EEHZS1J121UP	EEHZS1J121UV	400
	180	10.0	16.5	16.8	G16	3500	2400	15	0.08	EEHZS1J181UP	EEHZS1J181UV	250
NEW 80	100	10.0	16.5	16.8	G16	3500	2400	15	0.08	EEHZS1K101UP	EEHZS1K101UV	250

*1: Ripple current (100 kHz / +125 °C or 135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.

◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 120 Hz	120 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz
100 μF ≤ C	Correction factor	0.15	0.20	0.25	0.30

Rated capacitance (C)	Frequency (f)	500 Hz ≤ f < 1 kHz	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz
100 μF ≤ C	Correction factor	0.40	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	5 kHz ≤ f < 10 kHz	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz
100 μF ≤ C	Correction factor	0.70	0.75	0.80	0.85

Rated capacitance (C)	Frequency (f)	30 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
100 μF ≤ C	Correction factor	0.85	0.90	1.00	1.00

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic
INDUSTRY

Hybrid

Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZU series **High temperature lead-free reflow**

Features

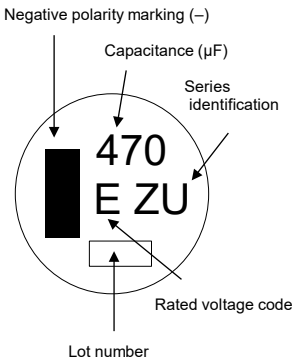
- Endurance: 4000 h at 135 °C / 125 °C
- High ripple current compared with ZS series
- Vibration-proof product is available upon request.
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	G12	G16
Category temp. range	–55 °C to +135 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	100 µF to 470 µF	150 µF to 560 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

Marking

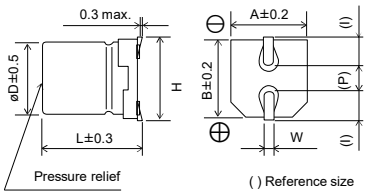
Example : 25 V 470 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)

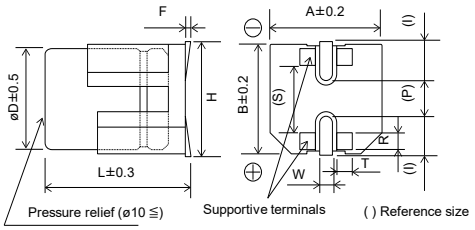
[Standard]



Unit : mm

Size code	øD	L	A, B	H	I	W	P
G12	10.0	12.5	10.3	11.0±0.2	3.2	1.2±0.2	4.6
G16	10.0	16.5	10.3	11.0±0.2	3.2	1.2±0.2	4.6

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H	F	I	W	P	R	S	T
G12	10.0	12.8	10.3	11.0±0.2	0 to +0.15	3.2	1.2±0.2	4.6	0.70±0.2	6.9	1.3±0.2
G16	10.0	16.8	10.3	11.0±0.2	0 to +0.15	3.2	1.2±0.2	4.6	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZU1E471P

EEH

Product classification

ZU

Series	Code
ZU	ZU

1E

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

471

Capacitance (μF)	Code	Capacitance (μF)	Code
100	101	330	331
150	151	470	471
220	221	560	561

P

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L Standard	L Vibration -proof	Size code	Ripple current *1 (mA rms) Endurance 1 (+125°C)	Ripple current *1 (mA rms) Endurance 2 (+135°C)	ESR*2 (mΩ)	tan δ*3	Part number Standard product	Part number Vibration-proof product	Min. packaging q'ty (pcs) Taping
25	470	10.0	12.5	12.8	G12	5000	3500	10	0.14	EEHZU1E471P	EEHZU1E471V	400
	560	10.0	16.5	16.8	G16	5800	4000	8	0.14	EEHZU1E561P	EEHZU1E561V	250
35	330	10.0	12.5	12.8	G12	4800	3300	11	0.12	EEHZU1V331P	EEHZU1V331V	400
	470	10.0	16.5	16.8	G16	5500	3800	9	0.12	EEHZU1V471P	EEHZU1V471V	250
50	150	10.0	12.5	12.8	G12	4600	3200	12	0.10	EEHZU1H151P	EEHZU1H151V	400
	220	10.0	16.5	16.8	G16	5200	3600	10	0.10	EEHZU1H221P	EEHZU1H221V	250
63	100	10.0	12.5	12.8	G12	4600	3200	12	0.08	EEHZU1J101P	EEHZU1J101V	400
	150	10.0	16.5	16.8	G16	5200	3600	10	0.08	EEHZU1J151P	EEHZU1J151V	250

*1: Ripple current (100 kHz / +125 °C or＋135°C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.
◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
100 μF ≤ C < 150 μF	Correction factor	0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
100 μF ≤ C < 150 μF	Correction factor	0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
100 μF ≤ C < 150 μF	Correction factor	0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
100 μF ≤ C < 150 μF	Correction factor	0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

After endurance ESR（100 kHz, -40°C）

Size code	G12	G16
ESR (Ω)	0.3	0.3

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

Hybrid

Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZUU series

High temperature lead-free reflow

Features

- Endurance: 4000 h at 135 °C / 125 °C
- Higher ripple current (max 160 % of ZS series)
- Larger capacitance (max 180 % of ZU series)
- AEC-Q200 compliant
- RoHS compliant

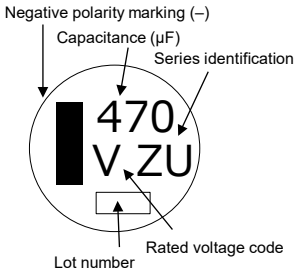
Specifications

Size code	G12	G16
Category temp. range	–55 °C to +135 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	120 µF to 680 µF	180 µF to 1000 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: G12 0.3; G16 0.3
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: G12 0.3; G16 0.3
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

Marking

Example : 35 V 470 µF
Marking color : BLACK

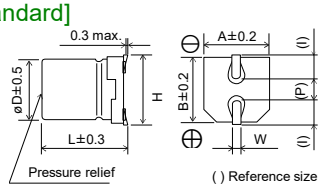


R. voltage code (Unit : V)

E	25	H	50
V	35	J	63

Dimensions (not to scale)

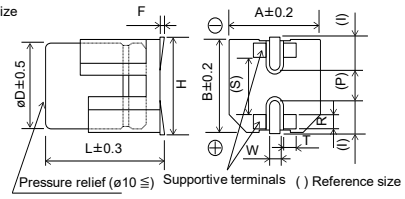
[Standard]



Unit : mm

Size code	øD	L	A, B	H	I	W	P
G12	10.0	12.5	10.3	11.0±0.2	3.2	1.2±0.2	4.6
G16	10.0	16.5	10.3	11.0±0.2	3.2	1.2±0.2	4.6

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H	F	I	W	P	R	S	T
G12	10.0	12.8	10.3	11.0±0.2	0 to +0.15	3.2	1.2±0.2	4.6	0.70±0.2	6.9	1.3±0.2
G16	10.0	16.8	10.3	11.0±0.2	0 to +0.15	3.2	1.2±0.2	4.6	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
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Explanation of part numbers

◇ Part number system

e.g.: EEHZU1E681UP

EEH

Product classification

ZU

Series	Code
ZU	ZU

1E

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

681

Capacitance (μF)	Code
120	121
180	181
270	271
470	471
680	681
1000	102

U

Dia øD	Code
Minia-turized product	U

P

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	Case size (mm) L Standard	Case size (mm) L Vibration-proof	Size code	Specification Ripple current *1 (mA rms) Endurance 1 (+125°C)	Specification Ripple current *1 (mA rms) Endurance 2 (+135°C)	Specification ESR*2 (mΩ)	Specification tan δ*3	Part number Standard product	Part number Vibration-proof product	Min. packaging q'ty (pcs) Taping
25	680	10.0	12.5	12.8	G12	5300	3700	10	0.14	EEHZU1E681UP	EEHZU1E681UV	400
	1000	10.0	16.5	16.8	G16	6100	4300	8	0.14	EEHZU1E102UP	EEHZU1E102UV	250
35	470	10.0	12.5	12.8	G12	5000	3500	11	0.12	EEHZU1V471UP	EEHZU1V471UV	400
	680	10.0	16.5	16.8	G16	5800	4100	9	0.12	EEHZU1V681UP	EEHZU1V681UV	250
50	180	10.0	12.5	12.8	G12	4800	3400	12	0.10	EEHZU1H181UP	EEHZU1H181UV	400
	270	10.0	16.5	16.8	G16	5500	3800	10	0.10	EEHZU1H271UP	EEHZU1H271UV	250
63	120	10.0	12.5	12.8	G12	4800	3400	12	0.08	EEHZU1J121UP	EEHZU1J121UV	400
	180	10.0	16.5	16.8	G16	5500	3800	10	0.08	EEHZU1J181UP	EEHZU1J181UV	250

*1: Ripple current (100 kHz / +125 °C or +135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.

◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
120 μF ≤ C < 150 μF	Correction factor	0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
120 μF ≤ C < 150 μF	Correction factor	0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
120 μF ≤ C < 150 μF	Correction factor	0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
120 μF ≤ C < 150 μF	Correction factor	0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
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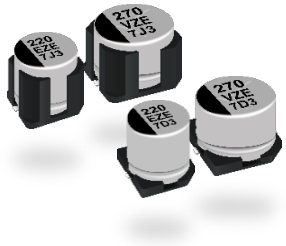
Panasonic
INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZE series

High temperature lead-free reflow

Features

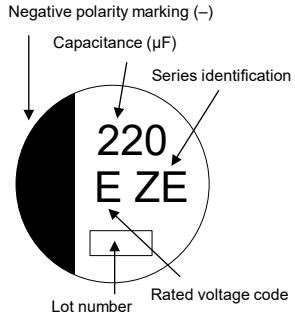
- Endurance: 2000 h at 145 °C (High temperature / Long life)
- Low ESR and high ripple current
- High-withstand voltage (to 63 V)
- Characteristics dependencies in frequency and low temperature are as small as polymer type
- Vibration-proof product is available upon request
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	F	G
Category temp. range	–55 °C to +145 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	33 µF to 220 µF	56 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance 1	+145 °C ± 2 °C, 2000 h, apply the rated ripple current without exceeding the rated voltage	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Shelf life	After storage for 1000 hours at +145 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	E.S.R.	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

Marking

Example : 25 V 220 µF
Marking color : BLACK

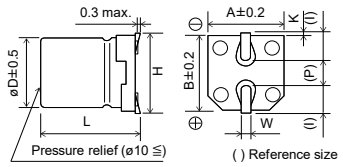


R. voltage code — Unit : V

E	25
V	35
H	50
J	63

Dimensions (not to scale)

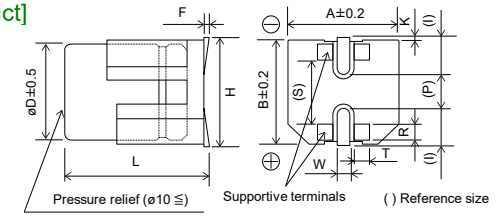
[Standard]



Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
F	8.0	10.2±0.3	8.3	10	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZE1E221P

EEH

Product classification

ZE

Series	Code
ZE	ZE

1E

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

221

Capacitance (μF)	Code	Capacitance (μF)	Code
33	330	150	151
56	560	220	221
68	680	270	271
82	820	330	331
100	101		

P

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 145 °C 2000 h

Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L Standard	L Vibration -proof	Size code	Ripple current *1 (mA rms) Endurance 1 (+145°C)	Ripple current *1 (mA rms) Endurance 2 (+135°C)	ESR*2 (mΩ)	tan δ*3	Part number Standard product	Part number Vibration-proof product	Min. packaging q'ty (pcs) Taping
25	220	8.0	10.2	10.5	F	700	1600	27	0.14	EEHZE1E221P	EEHZE1E221V	500
	330	10.0	10.2	10.5	G	900	2000	20	0.14	EEHZE1E331P	EEHZE1E331V	500
35	150	8.0	10.2	10.5	F	700	1600	27	0.12	EEHZE1V151P	EEHZE1V151V	500
	270	10.0	10.2	10.5	G	900	2000	20	0.12	EEHZE1V271P	EEHZE1V271V	500
50	68	8.0	10.2	10.5	F	600	1250	30	0.10	EEHZE1H680P	EEHZE1H680V	500
	100	10.0	10.2	10.5	G	800	1600	28	0.10	EEHZE1H101P	EEHZE1H101V	500
63	33	8.0	10.2	10.5	F	600	1100	40	0.08	EEHZE1J330P	EEHZE1J330V	500
	56	10.0	10.2	10.5	G	800	1400	30	0.08	EEHZE1J560P	EEHZE1J560V	500
	82	10.0	10.2	10.5	G	800	1400	30	0.08	EEHZE1J820P	EEHZE1J820V	500

*1: Ripple current (100 kHz / +145 °C or＋135°C) *2: ESR (100 kHz / +20 °C) *3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.

◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

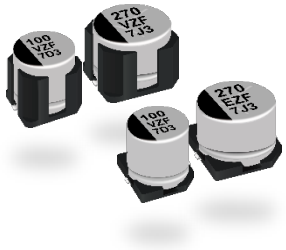
After endurance ESR（100 kHz, -40°C）

Size code	F	G
ESR (Ω)	0.4	0.3

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Surface Mount Type

ZF series

High temperature lead-free reflow

Features

- Endurance : 1000 h at 150 °C (High temperature)
- Low ESR and high ripple current
- High-withstand voltage (to 63 V)
- Vibration-proof product is available upon request
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	F	G
Category temp. range	–55 °C to +150 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	33 µF to 150 µF	56 µF to 270 µF
Capacitance tolerance	±20 % (120 Hz / +20°C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance

+150 °C ± 2 °C, 1000 h, apply the rated ripple current without exceeding the rated voltage.

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

ESR after endurance (Ω / 100 kHz)(-40 °C)

Size code F	Size code G
0.4	0.3

Shelf life

After storage for 1000 hours at +150 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance.
(Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)

Damp heat (Load)

+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied

Capacitance change	Within ±30% of the initial value
Dissipation factor (tan δ)	≤ 200 % of the initial limit
ESR	≤ 200 % of the initial limit
Leakage current	Within the initial limit

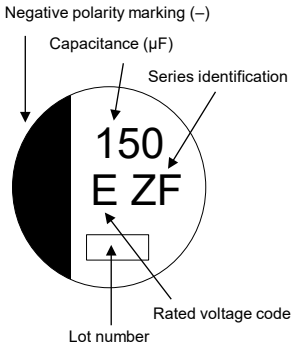
Resistance to soldering heat

After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.

Capacitance change	Within ±10% of the initial value
Dissipation factor (tan δ)	Within the initial limit
Leakage current	Within the initial limit

Marking

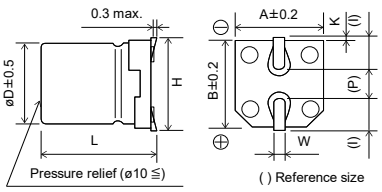
Example : 25 V 150 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)

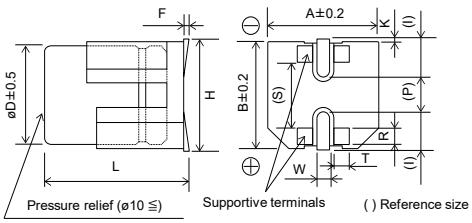
[Standard]



Unit : mm

Size code	øD	L	A, B	H max.	I	W	P	K
F	8.0	10.2±0.3	8.3	10	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0	3.5	0.90±0.2	4.6	0.70±0.2

[Vibration-proof product]



Unit : mm

Size code	øD	L	A, B	H max.	F	I	W	P	K	R	S	T
F	8.0	10.5±0.3	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3	1.3±0.2
G	10.0	10.5±0.3	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9	1.3±0.2

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHZF1E151P

EEH

Product classification

ZF

Series	Code
ZF	ZF

1E

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

151

Capacitance (μF)	Code	Capacitance (μF)	Code
33	330	150	151
56	560	270	271
100	101		

P

Tape width (mm)	Code
16 to 24	P

Replace for the following configuration

Configuration	Code
Vibration proof	V

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance : 150 °C 1000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L Standard	L Vibration-proof	Size code	Specification Ripple current*1 (mA rms)	ESR*2 (mΩ)	tan δ*3	Part number Standard product	Vibration-proof product	Min.packaging q'ty (pcs) Taping
25	150	8.0	10.2	10.5	F	800	27	0.14	EEHZF1E151P	EEHZF1E151V	500
	270	10.0	10.2	10.5	G	1000	20	0.14	EEHZF1E271P	EEHZF1E271V	500
35	100	8.0	10.2	10.5	F	770	30	0.12	EEHZF1V101P	EEHZF1V101V	500
	150	10.0	10.2	10.5	G	950	23	0.12	EEHZF1V151P	EEHZF1V151V	500
50	56	8.0	10.2	10.5	F	700	35	0.10	EEHZF1H560P	EEHZF1H560V	500
	100	10.0	10.2	10.5	G	900	28	0.10	EEHZF1H101P	EEHZF1H101V	500
63	33	8.0	10.2	10.5	F	650	40	0.08	EEHZF1J330P	EEHZF1J330V	500
	56	10.0	10.2	10.5	G	840	30	0.08	EEHZF1J560P	EEHZF1J560V	500

*1: Ripple current (100 kHz / +150 °C) *2: ESR (100 kHz / +20 °C) *3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Reflow profile” and “The taping dimensions”.

◆ The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
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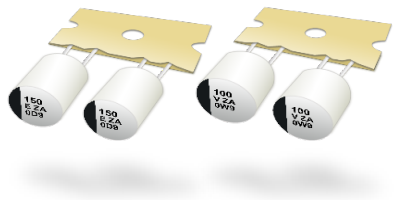
Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Radial Lead Type

ZA-A series

Features

- Endurance : 10000 h at 105 °C (105 °C standard product)
- Taping products for automatic insertion
- AEC-Q200 compliant
- RoHS compliant

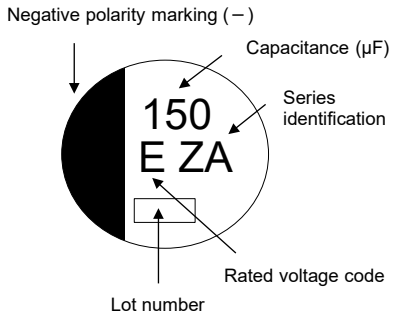
Specifications

Size code	F	G
Category temp. range	–55 °C to +105 °C	
Rated voltage range	25 V to 80 V	
Nominal capacitance range	22 µF to 220 µF	33 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / +20°C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance	+105 °C ± 2 °C, 10000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4, G 0.3
Shelf life	After storage for 1000 hours at +105 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After flow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

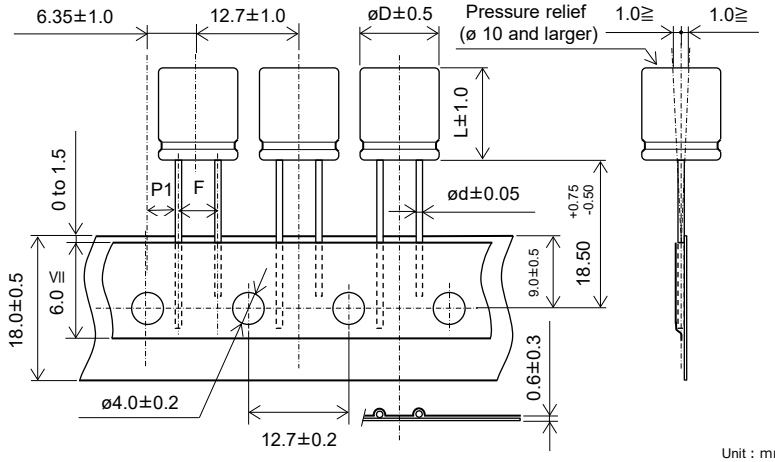
Marking

Example : 25 V 150 µF
Marking color : BLACK



R.voltage code	Unit : V
E	25
V	35
H	50
J	63
K	80

Dimensions (not to scale)



Unit : mm

Size code	øD	L	ød	F	P1
F	8.0	9.5	0.6	3.5±0.5	4.60±0.50
G	10.0	9.5	0.6	5.0 +0.8 -0.2	3.85±0.50

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHAZA1E151B

EEHA	ZA	1E	151	B
Product classification	Series: ZA, Code: ZA	Rated voltage (V) / Code*	Capacitance (μF) / Code / Capacitance (μF) / Code	Lead space (mm) / Code

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J
80	1K

Capacitance (μF)	Code	Capacitance (μF)	Code
22	220	82	820
33	330	100	101
47	470	150	151
56	560	220	221
68	680	330	331

Lead space (mm)	Code
3.5, 5.0	B

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance : 105 °C 10000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L	ød	Size code	Specification Ripple current *1 (mA rms)	ESR*2 (mΩ)	tan δ*3	Part number	Min.packaging q'ty (pcs) Taping
25	150	8.0	9.5	0.6	F	2300	27	0.14	EEHAZA1E151B	1000
	220	8.0	9.5	0.6	F	2300	27	0.14	EEHAZA1E221B	1000
	330	10.0	9.5	0.6	G	2500	20	0.14	EEHAZA1E331B	500
35	100	8.0	9.5	0.6	F	2300	27	0.12	EEHAZA1V101B	1000
	150	8.0	9.5	0.6	F	2300	27	0.12	EEHAZA1V151B	1000
	220	10.0	9.5	0.6	G	2500	20	0.12	EEHAZA1V221B	500
	270	10.0	9.5	0.6	G	2500	20	0.12	EEHAZA1V271B	500
50	47	8.0	9.5	0.6	F	1800	30	0.10	EEHAZA1H470B	1000
	68	8.0	9.5	0.6	F	1800	30	0.10	EEHAZA1H680B	1000
	100	10.0	9.5	0.6	G	2000	28	0.10	EEHAZA1H101B	500
63	33	8.0	9.5	0.6	F	1700	40	0.08	EEHAZA1J330B	1000
	47	8.0	9.5	0.6	F	1700	40	0.08	EEHAZA1J470B	1000
	56	10.0	9.5	0.6	G	1800	30	0.08	EEHAZA1J560B	500
	68	10.0	9.5	0.6	G	1800	30	0.08	EEHAZA1J680B	500
	82	10.0	9.5	0.6	G	1800	30	0.08	EEHAZA1J820B	500
80	22	8.0	9.5	0.6	F	1550	45	0.08	EEHAZA1K220B	1000
	33	10.0	9.5	0.6	G	1700	36	0.08	EEHAZA1K330B	500
	47	10.0	9.5	0.6	G	1700	36	0.08	EEHAZA1K470B	500

*1: Ripple current (100 kHz / +105 °C) *2: ESR (100 kHz / +20 °C) *3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Flow soldering profile” and “The taping dimensions”.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

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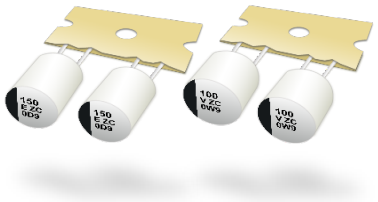
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Radial Lead Type

ZC-A series

Features

- Endurance : 4000 h at 125 °C (125 °C standard product)
- Taping products for automatic insertion
- AEC-Q200 compliant
- RoHS compliant

Specifications

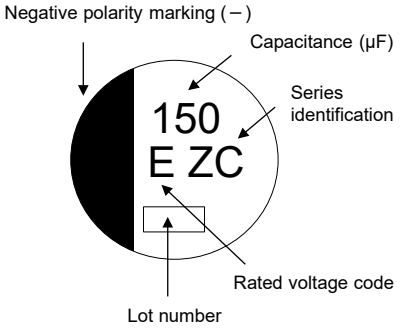
Size code	F	G
Category temp. range	–55 °C to +125 °C	
Rated voltage range	25 V to 80 V	
Nominal capacitance range	22 µF to 220 µF	33 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / +20°C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Endurance 2	+125 °C ± 2 °C, 3000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 300 % of the initial limit
	Leakage current	Within the initial limit
Shelf life	After storage for 1000 hours at +125 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance 1. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After flow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

Marking

Example : 25 V 150 µF

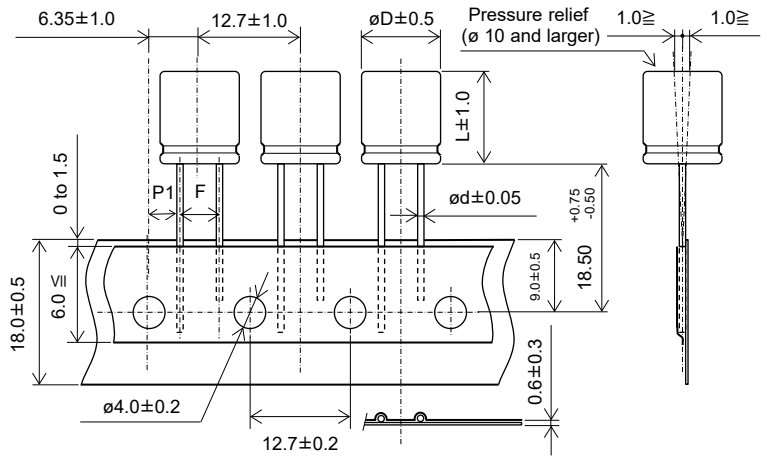
Marking color : BLACK

Negative polarity marking (–)



R.voltage code	Unit : V
E	25
V	35
H	50
J	63
K	80

Dimensions (not to scale)



Unit : mm

Size code	øD	L	ød	F	P1
F	8.0	9.5	0.6	3.5±0.5	4.60±0.50
G	10.0	9.5	0.6	5.0 +0.8 -0.2	3.85±0.50

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHAZC1E151B

EEHA	ZC	1E	151	B
Product classification	Series: ZC, Code: ZC	Rated voltage (V) / Code*	Capacitance (μF) / Code / Capacitance (μF) / Code	Lead space (mm) / Code

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J
80	1K

Capacitance (μF)	Code	Capacitance (μF)	Code
22	220	100	101
33	330	120	121
47	470	150	151
56	560	220	221
68	680	270	271
82	820	330	331

Lead space (mm)	Code
3.5, 5.0	B

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h

Endurance 2 : 125 °C 3000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L	ød	Size code	Specification: Ripple current *1 (mA rms) Endurance 1	Endurance 2	ESR*2 (mΩ)	tan δ*3	Part number	Min.packaging q'ty (pcs) Taping
25	150	8.0	9.5	0.6	F	1600	1900	27	0.14	EEHAZC1E151B	1000
	220	8.0	9.5	0.6	F	1600	1900	27	0.14	EEHAZC1E221B	1000
	330	10.0	9.5	0.6	G	2000	2900	20	0.14	EEHAZC1E331B	500
35	100	8.0	9.5	0.6	F	1600	1900	27	0.12	EEHAZC1V101B	1000
	150	8.0	9.5	0.6	F	1600	1900	27	0.12	EEHAZC1V151B	1000
	220	10.0	9.5	0.6	G	2000	2800	20	0.12	EEHAZC1V221B	500
	270	10.0	9.5	0.6	G	2000	2800	20	0.12	EEHAZC1V271B	500
50	47	8.0	9.5	0.6	F	1250	-	30	0.10	EEHAZC1H470B	1000
	68	8.0	9.5	0.6	F	1250	-	30	0.10	EEHAZC1H680B	1000
	100	10.0	9.5	0.6	G	1600	-	28	0.10	EEHAZC1H101B	500
	120	10.0	9.5	0.6	G	1600	-	28	0.10	EEHAZC1H121B	500
63	33	8.0	9.5	0.6	F	1100	-	40	0.08	EEHAZC1J330B	1000
	47	8.0	9.5	0.6	F	1100	-	40	0.08	EEHAZC1J470B	1000
	56	10.0	9.5	0.6	G	1400	-	30	0.08	EEHAZC1J560B	500
	68	10.0	9.5	0.6	G	1400	-	30	0.08	EEHAZC1J680B	500
	82	10.0	9.5	0.6	G	1400	-	30	0.08	EEHAZC1J820B	500
80	22	8.0	9.5	0.6	F	1050	-	45	0.08	EEHAZC1K220B	1000
	33	10.0	9.5	0.6	G	1360	-	36	0.08	EEHAZC1K330B	500
	47	10.0	9.5	0.6	G	1360	-	36	0.08	EEHAZC1K470B	500

*1: Ripple current (100 kHz / +125 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Flow soldering profile” and “The taping dimensions”.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

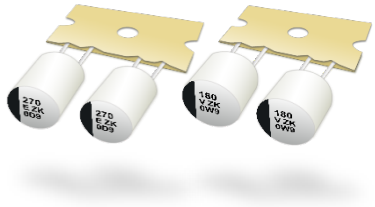
After endurance ESR (100 kHz, -40 °C)

Size code	F (ø8 x L9.5)	G (ø10 x L9.5)
ESR (Ω)	0.4	0.3

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic
INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Radial Lead Type

ZK-A series

Features

- Endurance : 4000 h at 125 °C (Large capacitance / High ripple current)
- Taping products for automatic insertion
- AEC-Q200 compliant
- RoHS compliant

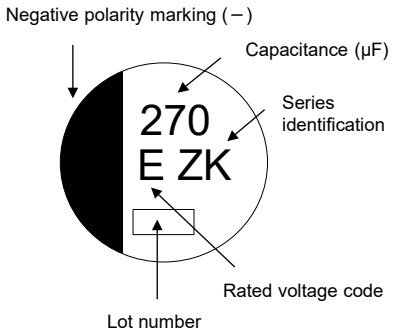
Specifications

Size code	F	G
Category temp. range	–55 °C to +125 °C	
Rated voltage range	25 V to 35 V	
Nominal capacitance range	180 µF to 270 µF	330 µF to 470 µF
Capacitance tolerance	±20 % (120 Hz / +20°C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4, G 0.3
Shelf life	After storage for 1000 hours at +125 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After flow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

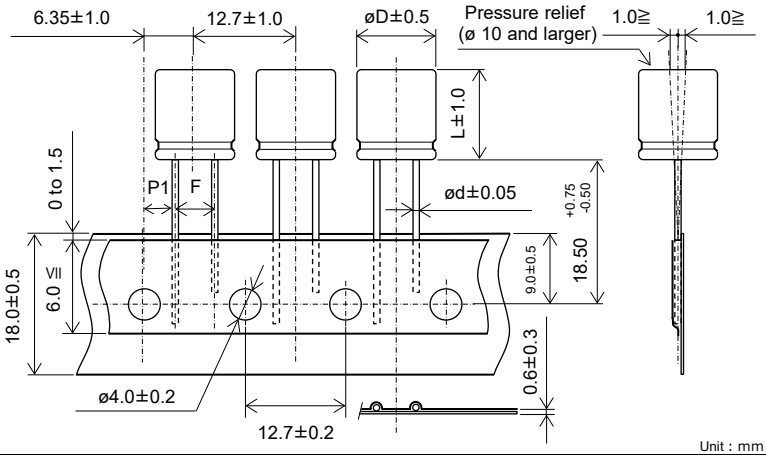
Marking

Example : 25 V 270 µF
Marking color : BLACK



R.voltage code	Unit : V
E	25
V	35

Dimensions (not to scale)



Unit : mm

Size code	øD	L	ød	F	P1
F	8.0	9.5	0.6	3.5±0.5	4.60±0.50
G	10.0	9.5	0.6	5.0 +0.8 -0.2	3.85±0.50

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Explanation of part numbers

◇ Part number system

e.g.: EEHAZK1E271B

EEHA	ZK	1E	271	B
Product classification	Series / Code	Rated voltage (V) / Code*	Capacitance (μF) / Code / Capacitance (μF) / Code	Lead space (mm) / Code

Series	Code
ZK	ZK

Rated voltage (V)	Code*
25	1E
35	1V

Capacitance (μF)	Code	Capacitance (μF)	Code
180	181	330	331
270	271	470	471

Lead space (mm)	Code
3.5, 5.0	B

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance : 125 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L	ød	Size code	Specification Ripple current*1 (mA rms)	ESR*2 (mΩ)	tan δ*3	Part number	Min.packaging q'ty (pcs) Taping
25	270	8.0	9.5	0.6	F	2000	27	0.14	EEHAZK1E271B	1000
	470	10.0	9.5	0.6	G	2800	20	0.14	EEHAZK1E471B	500
35	180	8.0	9.5	0.6	F	2000	27	0.12	EEHAZK1V181B	1000
	330	10.0	9.5	0.6	G	2800	20	0.12	EEHAZK1V331B	500

*1: Ripple current (100 kHz / +125 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
◆ Please refer to the page of “Flow soldering profile” and “The taping dimensions”.

Frequency correction factor for ripple current

Frequency (f)	100 Hz ≤ f < 120 Hz	120 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz
Correction factor	0.15	0.20	0.25	0.30

Frequency (f)	500 Hz ≤ f < 1 kHz	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz
Correction factor	0.40	0.50	0.60	0.65

Frequency (f)	5 kHz ≤ f < 10 kHz	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz
Correction factor	0.70	0.75	0.80	0.85

Frequency (f)	30 kHz ≤ f < 40 kHz	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 1000 kHz
Correction factor	0.85	0.85	0.90	1.00

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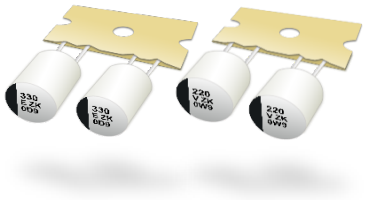
Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Radial Lead Type

ZKU-A series

Features

- Endurance : 4000 h at 125 °C (Large capacitance / High ripple current)
- Taping products for automatic insertion
- AEC-Q200 compliant
- RoHS compliant

Specifications

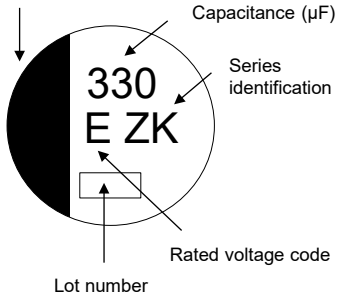
Size code	F	G
Category temp. range	–55 °C to +125 °C	
Rated voltage range	25 V to 35 V	
Nominal capacitance range	220 µF to 330 µF	390 µF to 560 µF
Capacitance tolerance	±20 % (120 Hz / +20°C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4, G 0.3
Shelf life	After storage for 1000 hours at +125 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After flow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

Marking

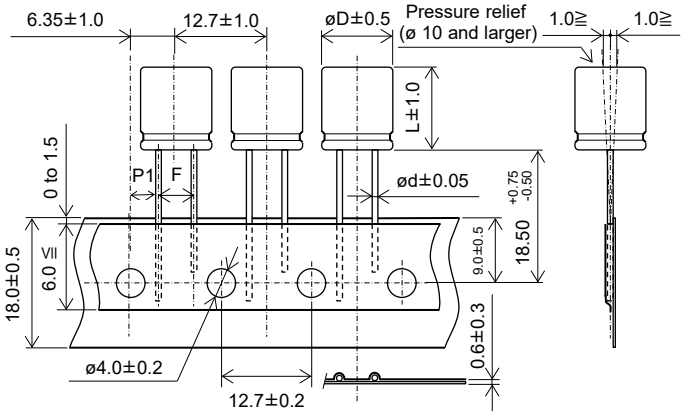
Example : 25 V 330 µF
Marking color : BLACK

Negative polarity marking (–)



R.voltage code	Unit : V
E	25
V	35

Dimensions (not to scale)



Unit : mm

Size code	øD	L	ød	F	P1
F	8.0	9.5	0.6	3.5±0.5	4.60±0.50
G	10.0	9.5	0.6	5.0 +0.8 -0.2	3.85±0.50

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Explanation of part numbers

◇ Part number system

e.g.: EEHAZKE331UB

EEHA

Product classification

ZK

Series	Code
ZKU	ZK

E

Rated voltage (V)	Code*
25	1E
35	1V

331

Capacitance (μF)	Code
220	221
330	331
390	391
560	561

U

Dia øD	Code
Minia-turization product	U

B

Lead space (mm)	Code
3.5, 5.0	B

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance : 125 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm)			Size code	Specification			Part number	Min.packaging q'ty (pcs)
		øD	L	ød		Ripple current*1 (mA rms)	ESR*2 (mΩ)	tan δ*3		Taping
25	330	8.0	9.5	0.6	F	2000	27	0.14	EEHAZKE331UB	1000
	560	10.0	9.5	0.6	G	2800	20	0.14	EEHAZKE561UB	500
35	220	8.0	9.5	0.6	F	2000	27	0.12	EEHAZKV221UB	1000
	390	10.0	9.5	0.6	G	2800	20	0.12	EEHAZKV391UB	500

*1: Ripple current (100 kHz / +125 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
◆ Please refer to the page of “Flow soldering profile” and “The taping dimensions”.

Frequency correction factor for ripple current

Frequency (f)	100 Hz ≤ f < 120 Hz	120 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz
Correction factor	0.15	0.20	0.25	0.30

Frequency (f)	500 Hz ≤ f < 1 kHz	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz
Correction factor	0.40	0.50	0.60	0.65

Frequency (f)	5 kHz ≤ f < 10 kHz	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz
Correction factor	0.70	0.75	0.80	0.85

Frequency (f)	30 kHz ≤ f < 40 kHz	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 1000 kHz
Correction factor	0.85	0.85	0.90	1.00

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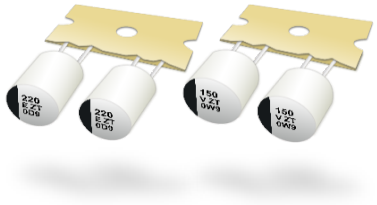
Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Radial Lead Type

ZT-A series

Features

- Endurance : 4000 h at 135 °C / 125 °C (High ripple current)
- Taping products for automatic insertion
- AEC-Q200 compliant
- RoHS compliant

Specifications

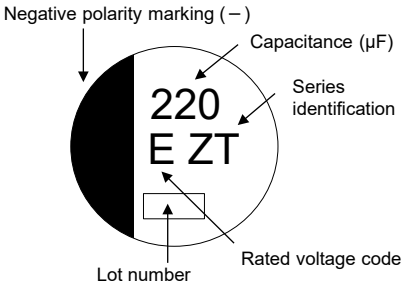
Size code	F	G
Category temp. range	–55 °C to +135 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	33 µF to 220 µF	56 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / +20°C)	
Leakage current	I ≤ 0.01 CV (µA) 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	ESR	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4	Size code: G 0.3
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	ESR	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4	Size code: G 0.3
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)		
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	ESR	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
Resistance to soldering heat	After flow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.		
	Capacitance change	Within ±10% of the initial value	
	Dissipation factor (tan δ)	Within the initial limit	
	Leakage current	Within the initial limit	

Marking

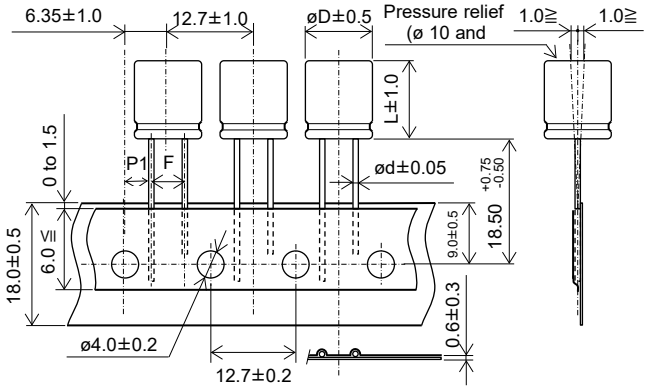
Example : 25 V 220 µF

Marking color : BLACK



R.voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)



Unit : mm

Size code	øD	L	ød	F	P1
F	8.0	9.5	0.6	3.5±0.5	4.60±0.50
G	10.0	9.5	0.6	5.0 +0.8 -0.2	3.85±0.50

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Explanation of part numbers

◇ Part number system

e.g.: EEHAZT1E221B

EEHA	ZT	1E	221	B
Product classification	Series: ZT, Code: ZT	Rated voltage (V) / Code*	Capacitance (μF) / Code	Lead space (mm) / Code

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

Capacitance (μF)	Code	Capacitance (μF)	Code
33	330	120	121
47	470	150	151
56	560	220	221
68	680	270	271
82	820	330	331
100	101		

Lead space (mm)	Code
3.5, 5.0	B

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h
Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L	ød	Size code	Specification: Ripple current*1 (mA rms) Endurance 1 (+125 °C)	Endurance 2 (+135°C)	ESR*2 (mΩ)	tan δ*3	Part number	Min.packaging q'ty (pcs) Taping
25	220	8.0	9.5	0.6	F	2900	1800	22	0.14	EEHAZT1E221B	1000
	330	10.0	9.5	0.6	G	3500	2200	16	0.14	EEHAZT1E331B	500
35	150	8.0	9.5	0.6	F	2900	1800	22	0.12	EEHAZT1V151B	1000
	270	10.0	9.5	0.6	G	3500	2200	16	0.12	EEHAZT1V271B	500
50	68	8.0	9.5	0.6	F	2700	1700	25	0.10	EEHAZT1H680B	1000
	100	10.0	9.5	0.6	G	2900	1800	23	0.10	EEHAZT1H101B	500
	120	10.0	9.5	0.6	G	2900	1800	23	0.10	EEHAZT1H121B	500
63	33	8.0	9.5	0.6	F	2400	1500	32	0.08	EEHAZT1J330B	1000
	47	8.0	9.5	0.6	F	2400	1500	32	0.08	EEHAZT1J470B	1000
	56	10.0	9.5	0.6	G	2800	1700	25	0.08	EEHAZT1J560B	500
	68	10.0	9.5	0.6	G	2800	1700	25	0.08	EEHAZT1J680B	500
	82	10.0	9.5	0.6	G	2800	1700	25	0.08	EEHAZT1J820B	500

*1: Ripple current (100 kHz / +125 °C or +135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
◆ Please refer to the page of “Flow soldering profile” and “The taping dimensions”.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

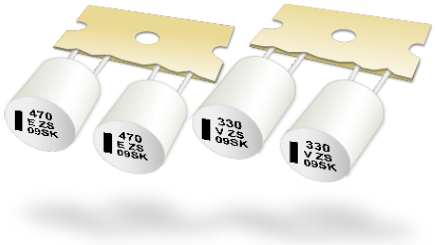
Panasonic INDUSTRY

Hybrid

Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Radial Lead Type

ZS-A series



Features

- Endurance : 4000 h at 135 °C / 125 °C (Large capacitance / High ripple current / Low ESR)
- Taping products for automatic insertion
- AEC-Q200 compliant
- RoHS compliant

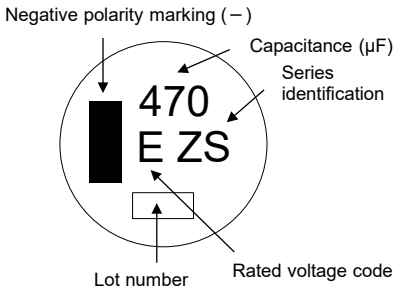
Specifications

Size code		G12	G16
Category temp. range		–55 °C to +135 °C	
Rated voltage range		25 V to 63 V	
Nominal capacitance range		100 µF to 470 µF	150 µF to 560 µF
Capacitance tolerance		±20 % (120 Hz / +20°C)	
Leakage current		I ≤ 0.01 CV (µA) 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)		Please see the attached characteristics list	
Surge voltage (V)		Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	ESR	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	ESR	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)		
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	ESR	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
Resistance to soldering heat	After flow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.		
	Capacitance change	Within ±10% of the initial value	
	Dissipation factor (tan δ)	Within the initial limit	
	Leakage current	Within the initial limit	

Marking

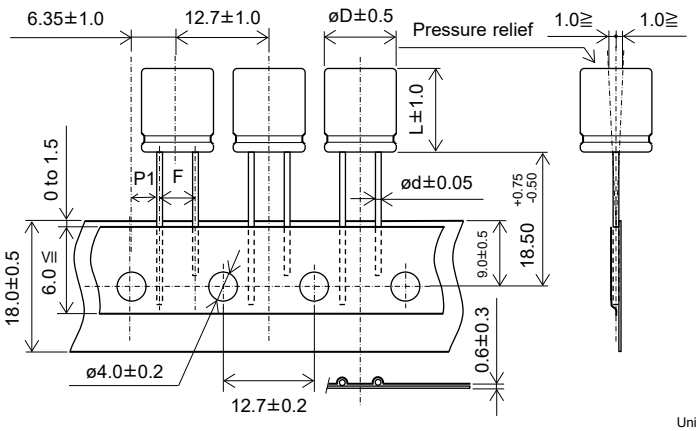
Example : 25 V 470 µF

Marking color : BLACK



R.voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)



Unit : mm

Size code	øD	L	ød	F	P1
G12	10.0	11.7	0.8	5.0 +0.8 -0.2	3.85±0.50
G16	10.0	15.7	0.8	5.0 +0.8 -0.2	3.85±0.50

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHAZS1E471B

EEHA	ZS	1E	471	B
Product classification	Series: ZS, Code: ZS	Rated voltage (V) / Code*	Capacitance (μF) / Code	Lead space (mm) / Code

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

Capacitance (μF)	Code	Capacitance (μF)	Code
100	101	330	331
150	151	470	471
220	221	560	561

Lead space (mm)	Code
3.5, 5.0	B

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h
Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L	ød	Size code	Specification: Ripple current*1 (mA rms) Endurance 1 (+125°C)	Endurance 2 (+135°C)	ESR*2 (mΩ)	tan δ*3	Part number	Min.packaging q'ty (pcs) Taping
25	470	10.0	11.7	0.8	G12	3500	2500	14	0.14	EEHAZS1E471B	500
	560	10.0	15.7	0.8	G16	4000	2900	11	0.14	EEHAZS1E561B	500
35	330	10.0	11.7	0.8	G12	3500	2500	14	0.12	EEHAZS1V331B	500
	470	10.0	15.7	0.8	G16	4000	2900	11	0.12	EEHAZS1V471B	500
50	150	10.0	11.7	0.8	G12	3200	2250	17	0.10	EEHAZS1H151B	500
	220	10.0	15.7	0.8	G16	3700	2600	13	0.10	EEHAZS1H221B	500
63	100	10.0	11.7	0.8	G12	3000	2100	19	0.08	EEHAZS1J101B	500
	150	10.0	15.7	0.8	G16	3500	2400	15	0.08	EEHAZS1J151B	500

*1: Ripple current (100 kHz / +125 °C or +135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
◆ Please refer to the page of “Flow soldering profile” and “The taping dimensions”.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
100 μF ≤ C < 150 μF	Correction factor	0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
100 μF ≤ C < 150 μF	Correction factor	0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
100 μF ≤ C < 150 μF	Correction factor	0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
100 μF ≤ C < 150 μF	Correction factor	0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

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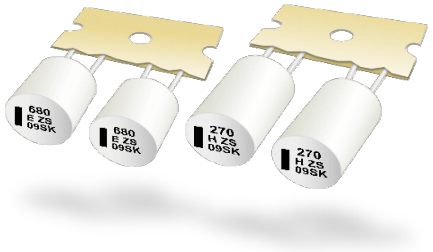
Panasonic INDUSTRY

Hybrid

Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Radial Lead Type

ZSU-A series



Features

- Endurance : 4000 h at 135 °C / 125 °C
- Large capacitance compared with ZS series
- Taping products for automatic insertion
- AEC-Q200 compliant
- RoHS compliant

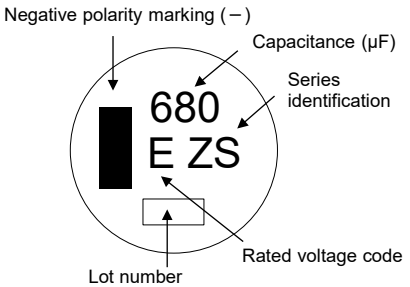
Specifications

Size code	G12		G16
Category temp. range	–55 °C to +135 °C		
Rated voltage range	25 V to 63 V		
Nominal capacitance range	120 µF to 680 µF		180 µF to 1000 µF
Capacitance tolerance	±20 % (120 Hz / +20°C)		
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)		
Dissipation factor (tan δ)	Please see the attached characteristics list		
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)		
Endurance 1	+125 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	ESR	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: G12 0.3	G16 0.3
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	ESR	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: G12 0.3	G16 0.3
Shelf life	After storage for 1000 hours at +135 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)		
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied		
	Capacitance change	Within ±30% of the initial value	
	Dissipation factor (tan δ)	≤ 200 % of the initial limit	
	ESR	≤ 200 % of the initial limit	
	Leakage current	Within the initial limit	
Resistance to soldering heat	After flow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.		
	Capacitance change	Within ±10% of the initial value	
	Dissipation factor (tan δ)	Within the initial limit	
	Leakage current	Within the initial limit	

Marking

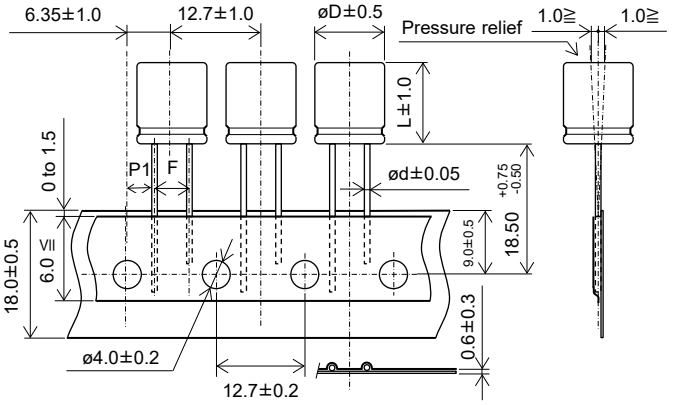
Example : 25 V 680 µF

Marking color : BLACK



R.voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)



Unit : mm

Size code	øD	L	ød	F	P1
G12	10.0	11.7	0.8	5.0 +0.8 -0.2	3.85±0.50
G16	10.0	15.7	0.8	5.0 +0.8 -0.2	3.85±0.50

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHAZSE681UB

EEHA	ZS	E	681	U	B
Product classification	Series / Code	Rated voltage (V) / Code*	Capacitance (μF) / Code	Dia øD / Code	Lead space (mm) / Code

Series	Code
ZSU	ZS

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

Capacitance (μF)	Code
120	121
180	181
270	271
470	471
680	681
1000	102

Dia øD	Code
Minia-turization product	U

Lead space (mm)	Code
3.5, 5.0	B

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 125 °C 4000 h
Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L	ød	Size code	Specification: Ripple current*1 (mA rms) Endurance 1 (+125 °C)	Endurance 2 (+135°C)	ESR*2 (mΩ)	tan δ*3	Part number	Min.packaging q'ty (pcs) Taping
25	680	10.0	11.7	0.8	G12	3500	2500	14	0.14	EEHAZSE681UB	500
	1000	10.0	15.7	0.8	G16	4000	2900	11	0.14	EEHAZSE102UB	500
35	470	10.0	11.7	0.8	G12	3500	2500	14	0.12	EEHAZSV471UB	500
	680	10.0	15.7	0.8	G16	4000	2900	11	0.12	EEHAZSV681UB	500
50	180	10.0	11.7	0.8	G12	3200	2250	17	0.10	EEHAZSH181UB	500
	270	10.0	15.7	0.8	G16	3700	2600	13	0.10	EEHAZSH271UB	500
63	120	10.0	11.7	0.8	G12	3000	2100	19	0.08	EEHAZSJ121UB	500
	180	10.0	15.7	0.8	G16	3500	2400	15	0.08	EEHAZSJ181UB	500

*1: Ripple current (100 kHz / +125 °C or +135 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
◆ Please refer to the page of “Flow soldering profile” and “The taping dimensions”.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 120 Hz	120 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz
120 μF ≤ C	Correction factor	0.15	0.20	0.25	0.30

Rated capacitance (C)	Frequency (f)	500 Hz ≤ f < 1 kHz	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz
120 μF ≤ C	Correction factor	0.40	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	5 kHz ≤ f < 10 kHz	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz
120 μF ≤ C	Correction factor	0.70	0.75	0.80	0.85

Rated capacitance (C)	Frequency (f)	30 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
120 μF ≤ C	Correction factor	0.85	0.90	1.00	1.00

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
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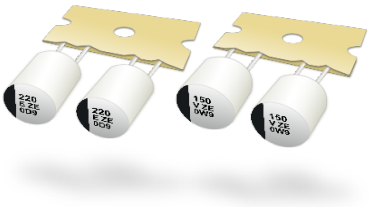
Panasonic
INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Radial Lead Type

ZE-A series

Features

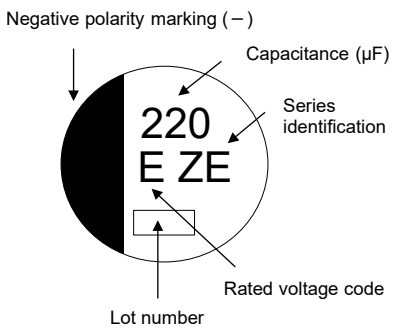
- Endurance : 2000 h at 145 °C (High temperature / Long life)
- Taping products for automatic insertion
- AEC-Q200 compliant
- RoHS compliant

Specifications

Size code	F	G
Category temp. range	–55 °C to +145 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	33 µF to 220 µF	56 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / +20°C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance 1	+145 °C ± 2 °C, 2000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Endurance 2	+135 °C ± 2 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 300 % of the initial limit
	Leakage current	Within the initial limit
Shelf life	After storage for 1000 hours at +145 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After flow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

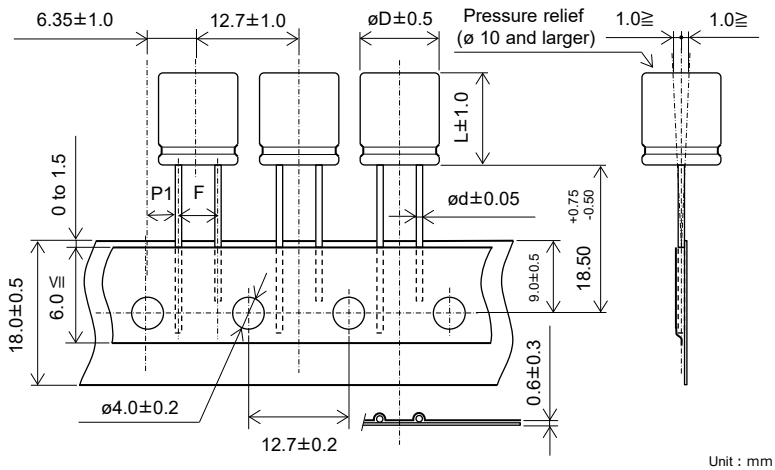
Marking

Example : 25 V 220 µF
Marking color : BLACK



R.voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)



Unit : mm

Size code	øD	L	ød	F	P1
F	8.0	9.5	0.6	3.5±0.5	4.60±0.50
G	10.0	9.5	0.6	5.0 $^{+0.8}_{-0.2}$	3.85±0.50

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHAZE1E221B

EEHA	ZE	1E	221	B
Product classification	Series: ZE, Code: ZE	Rated voltage (V) / Code*	Capacitance (μF) / Code	Lead space (mm) / Code

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

Capacitance (μF)	Code	Capacitance (μF)	Code
33	330	150	151
56	560	220	221
68	680	270	271
82	820	330	331
100	101		

Lead space (mm)	Code
3.5, 5.0	B

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance 1 : 145 °C 2000 h
Endurance 2 : 135 °C 4000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L	ød	Size code	Specification: Ripple current *1 (mA rms) Endurance 1 (+145 °C)	Endurance 2 (+135 °C)	ESR*2 (mΩ)	tan δ*3	Part number	Min.packaging q'ty (pcs) Taping
25	220	8.0	9.5	0.6	F	700	1600	27	0.14	EEHAZE1E221B	1000
	330	10.0	9.5	0.6	G	900	2000	20	0.14	EEHAZE1E331B	500
35	150	8.0	9.5	0.6	F	700	1600	27	0.12	EEHAZE1V151B	1000
	270	10.0	9.5	0.6	G	900	2000	20	0.12	EEHAZE1V271B	500
50	68	8.0	9.5	0.6	F	600	1250	30	0.10	EEHAZE1H680B	1000
	100	10.0	9.5	0.6	G	800	1600	28	0.10	EEHAZE1H101B	500
63	33	8.0	9.5	0.6	F	600	1100	40	0.08	EEHAZE1J330B	1000
	56	10.0	9.5	0.6	G	800	1400	30	0.08	EEHAZE1J560B	500
	82	10.0	9.5	0.6	G	800	1400	30	0.08	EEHAZE1J820B	500

*1: Ripple current (100 kHz / +145 °C or +135 °C) *2: ESR (100 kHz / +20 °C) *3: tan δ (120 Hz / +20 °C)

◆ Please refer to the page of “Flow soldering profile” and “The taping dimensions”.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f < 1000 kHz
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

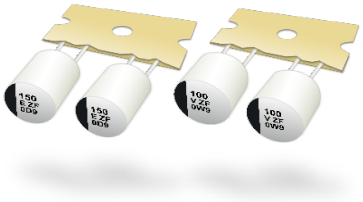
After endurance ESR (100 kHz, -40 °C)

Size code	F (ø8 x L9.5)	G (ø10 x L9.5)
ESR (Ω)	0.4	0.3

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Panasonic INDUSTRY

Hybrid



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Radial Lead Type

ZF-A series

Features

- Endurance : 1000 h at 150 °C (High temperature)
- High temperature compared with ZC series
- High-withstand voltage (to 63 V)
- Characteristics dependencies in frequency and low temperature are as small as polymer type
- Compatible with taping products for automatic insertion
- AEC-Q200 compliant
- RoHS compliant

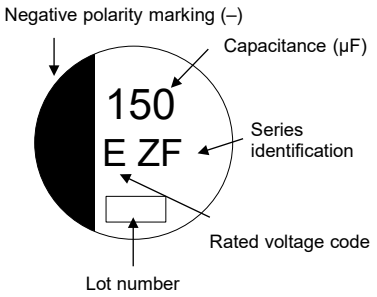
Specifications

Size code	F	G
Category temp. range	–55 °C to +150 °C	
Rated voltage range	25 V to 63 V	
Nominal capacitance range	33 µF to 150 µF	56 µF to 270 µF
Capacitance tolerance	±20 % (120 Hz / +20°C)	
Leakage current	I ≤ 0.01 CV (µA), 2 minutes after reaching rated voltage, 20 °C *CV = (Capacitance in µF) x (Rated voltage in V)	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V)	Rated voltage × 1.25 (15 °C to 35 °C)	

Endurance	+150 °C ± 2 °C, 1000 h, apply the rated ripple current without exceeding the rated voltage.	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
	ESR after endurance (Ω / 100 kHz)(-40 °C)	Size code: F 0.4, G 0.3
Shelf life	After storage for 1000 hours at +150 °C ± 2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (Capacitors are left at room temperature and humidity for 2 hours after the test. Then, apply the rated voltage for 30min with a series protection resistance of 1000 Ω ± 10 Ω. Measure electrical characteristics after discharging the capacitor.)	
Damp heat (Load)	+85 °C ± 2 °C, 85 % to 90 %RH, 2000 h, rated voltage applied	
	Capacitance change	Within ±30% of the initial value
	Dissipation factor (tan δ)	≤ 200 % of the initial limit
	ESR	≤ 200 % of the initial limit
	Leakage current	Within the initial limit
Resistance to soldering heat	After flow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	Within ±10% of the initial value
	Dissipation factor (tan δ)	Within the initial limit
	Leakage current	Within the initial limit

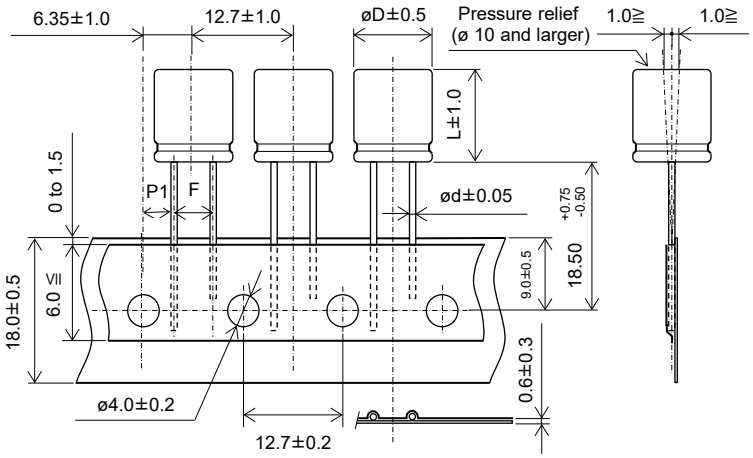
Marking

Example : 25 V 150 µF
Marking color : BLACK



R. voltage code	Unit : V
E	25
V	35
H	50
J	63

Dimensions (not to scale)



Unit : mm

Size code	øD	L	ød	F	P1
F	8.0	9.5	0.6	3.5±0.5	4.60±0.50
G	10.0	9.5	0.6	5.0 +0.8 -0.2	3.85±0.50

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.
Should a safety concern arise regarding this product, please be sure to contact us immediately.

Explanation of part numbers

◇ Part number system

e.g.: EEHAZF1E151B

EEHA	ZF	1E	151	B
Product classification	Series: ZF, Code: ZF	Rated voltage (V) / Code*	Capacitance (μF) / Code	Lead space (mm) / Code

Rated voltage (V)	Code*
25	1E
35	1V
50	1H
63	1J

Capacitance (μF)	Code	Capacitance (μF)	Code
33	330	150	151
56	560	270	271
100	101		

Lead space (mm)	Code
3.5, 5.0	B

*: If the total figures number of the part number exceeds 12 figures, "1" is omitted.

Characteristics list

Endurance : 150 °C 1000 h

Rated voltage (V)	Capacitance (±20 %) (μF)	Case size (mm) øD	L	ød	Size code	Specification Ripple current *1 (mA rms)	ESR*2 (mΩ)	tan δ*3	Part number	Min.packaging q'ty (pcs) Taping
25	150	8.0	9.5	0.6	F	800	27	0.14	EEHAZF1E151B	1000
	270	10.0	9.5	0.6	G	1000	20	0.14	EEHAZF1E271B	500
35	100	8.0	9.5	0.6	F	770	30	0.12	EEHAZF1V101B	1000
	150	10.0	9.5	0.6	G	950	23	0.12	EEHAZF1V151B	500
50	56	8.0	9.5	0.6	F	700	35	0.10	EEHAZF1H560B	1000
	100	10.0	9.5	0.6	G	900	28	0.10	EEHAZF1H101B	500
63	33	8.0	9.5	0.6	F	650	40	0.08	EEHAZF1J330B	1000
	56	10.0	9.5	0.6	G	840	30	0.08	EEHAZF1J560B	500

*1: Ripple current (100 kHz / +150 °C)
*2: ESR (100 kHz / +20 °C)
*3: tan δ (120 Hz / +20 °C)
◆ Please refer to the page of “Flow soldering profile” and “The taping dimensions”.

Frequency correction factor for ripple current

Rated capacitance (C)	Frequency (f)	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (C)	Frequency (f)	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (C)	Frequency (f)	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (C)	Frequency (f)	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

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Safty Precautions

When using our products, no matter what sort of equipment they might be used for,
be sure to confirm the applications and environmental conditions with our specifications in advance.

Panasonic INDUSTRY

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