Panasonic

2015

CATALOG

Fixed Resistors

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Panasonic

Fixed Resistors CONTENTS

All products in this catalog comply with the RoHS Directive.

The RoHS Directive is “the Directive (2011/65/EU) on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment “ and its revisions.

⚠Safety Precautions (Common precautions for Fixed Resistors)

- When using our products, no matter what sort of equipment they might be used for, be sure to make a written agreement on the specifications with us in advance. The design and specifications in this catalog are subject to change without prior notice.
- Do not use the products beyond the specifications described in this catalog.
- This catalog explains the quality and performance of the products as individual components. Before use, check and evaluate their operations when installed in your products.
- Install the following systems for a failsafe design to ensure safety if these products are to be used in equipment where a defect in these products may cause the loss of human life or other significant damage, such as damage to vehicles (automobile, train, vessel), traffic lights, medical equipment, aerospace equipment, electric heating appliances, combustion/gas equipment, rotating equipment, and disaster/crime prevention equipment.

✻ Systems equipped with a protection circuit and a protection device
✻ Systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault

(1) Precautions for use

- These products are designed and manufactured for general and standard use in general electronic equipment (e.g. AV equipment, home electric appliances, office equipment, information and communication equipment)
- These products are not intended for use in the following special conditions. Before using the products, carefully check the effects on their quality and performance, and determine whether or not they can be used.
  1. In liquid, such as water, oil, chemicals, or organic solvent
  2. In direct sunlight, outdoors, or in dust
  3. In salty air or air with a high concentration of corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_2
  4. Electric Static Discharge (ESD) Environment
     These components are sensitive to static electricity and can be damaged under static shock (ESD).
     Please take measures to avoid any of these environments.
     Smaller components are more sensitive to ESD environment.
  5. Electromagnetic Environment
     Avoid any environment where strong electromagnetic waves exist.
  6. In an environment where these products cause dew condensation
  7. Sealing or coating of these products or a printed circuit board on which these products are mounted, with resin or other materials
- These products generate Joule heat when energized. Carefully position these products so that their heat will not affect the other components.
- Carefully position these products so that their temperatures will not exceed the category temperature range due to the effects of neighboring heat-generating components. Do not mount or place heat-generating components or inflammables, such as vinyl-coated wires, near these products.
- Note that non-cleaning solder, halogen-based highly active flux, or water-soluble flux may deteriorate the performance or reliability of the products.
- Carefully select a flux cleaning agent for use after soldering. An unsuitable agent may deteriorate the performance or reliability. In particular, when using water or a water-soluble cleaning agent, be careful not to leave water residues. Otherwise, the insulation performance may be deteriorated.

(2) Precautions for storage

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of 5 °C to 35 °C and a relative humidity of 45 % to 85 %.

Even within the above guarantee periods, do not store these products in the following conditions. Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_2
2. In direct sunlight

This is all for the common precautions. Also refer to the "CAUTION AND WARNING" section located on the back of the front cover of this catalog and precautions for individual products shown in the subsequent pages.

<Package markings>
Package markings include the product number, quantity, and country of origin.
In principle, the country of origin should be indicated in English.

Thick Film Chip Resistors

Type: **ERJ XG, 1G, 2G, 3G, 6G, 8G, 14, 12, 12Z, 1T**

Features

- Small size and lightweight
- High reliability
  Metal glaze thick film resistive element and three layers of electrodes
- Compatible with placement machines
  Taping packaging available
- Suitable for both reflow and flow soldering
- Reference Standards
  IEC 60115-8, JIS C 5201-8, EIAJ RC-2134B
- AEC-Q200 qualified (Exemption ERJXG)
- RoHS compliant

■ As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,

Please see Data Files

Explanation of Part Numbers

- ERJXGN, 1GN, 2GE, 3GE, 6GE, 8GE, 14, 12, 12Z, 1T Type, ±5 %

1	2	3	4	5	6	7	8	9	10	11	12
E	R	J	3	G	E	Y	J	1	0	2	V

Product Code

Thick Film Chip Resistors

Size, Power Rating

Code	Inch	Power R.
XGN	01005	0.031 W
1GN	0201	0.05 W
2GE	0402	0.1 W
3GE	0603	0.1 W
6GE	0805	0.125 W
8GE	1206	0.25 W
14	1210	0.5 W
12	1812	0.75 W
12Z	2010	0.75 W
1T	2512	1 W

Marking

Code	Marking
Y	Value Marking on black side
*Nil	No marking

Resistance Tolerance

Code	Tolerance
J	±5 %
0	Jumper

Resistance Value

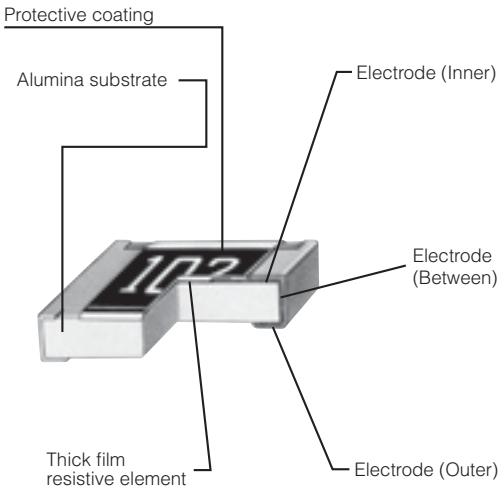
The first two digits are significant figures of resistance and the third one denotes number of zeros following.
Decimal Point is expressed by R as 4.7 = 4R7.
Jumper is expressed by R00.

Packaging Methods

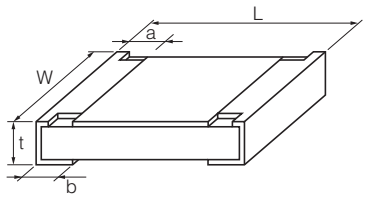
Code	Packaging	Part No.
Y	Pressed Carrier Taping W8P2, 20,000 pcs.	ERJXGN
U	Embossed Carrier Taping W4P1, 40,000 pcs.	
C	Pressed Carrier Taping 2 mm pitch, 15,000 pcs.	ERJ1GN
X	Punched Carrier Taping 2 mm pitch, 10,000 pcs.	ERJ2GE
Y	Punched Carrier Taping 2 mm pitch, 20,000 pcs.	
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJ3GE ERJ6GE ERJ8GE
U	Embossed Carrier Taping 4 mm pitch, 5,000 pcs.	ERJ14 ERJ12 ERJ12Z
	Embossed Carrier Taping 4 mm pitch, 4,000 pcs.	ERJ1T

✻ When omitted, the rest of the P/N factors shall be moved up respectively.
(Only XGN, 1GN, 2GE type)

Construction



Dimensions in mm (not to scale)



Part No. (inch size)	Dimensions (mm)					Mass (Weight) (g/1000 pcs.)
	L	W	a	b	t	
ERJXG (01005)	$0.40^{\pm0.02}$	$0.20^{\pm0.02}$	$0.10^{\pm0.03}$	$0.10^{\pm0.03}$	$0.13^{\pm0.02}$	0.04
ERJ1G (0201)	$0.60^{\pm0.03}$	$0.30^{\pm0.03}$	$0.10^{\pm0.05}$	$0.15^{\pm0.05}$	$0.23^{\pm0.03}$	0.15
ERJ2G (0402)	$1.00^{\pm0.05}$	$0.50^{\pm0.05}$	$0.20^{\pm0.10}$	$0.25^{\pm0.05}$	$0.35^{\pm0.05}$	0.8
ERJ3G (0603)	$1.60^{\pm0.15}$	$0.80^{+0.15}_{-0.05}$	$0.30^{\pm0.20}$	$0.30^{\pm0.15}$	$0.45^{\pm0.10}$	2
ERJ6G (0805)	$2.00^{\pm0.20}$	$1.25^{\pm0.10}$	$0.40^{\pm0.20}$	$0.40^{\pm0.20}$	$0.60^{\pm0.10}$	4
ERJ8G (1206)	$3.20^{+0.05}_{-0.20}$	$1.60^{+0.05}_{-0.15}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	10
ERJ14 (1210)	$3.20^{\pm0.20}$	$2.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	16
ERJ12 (1812)	$4.50^{\pm0.20}$	$3.20^{\pm0.20}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	27
ERJ12Z (2010)	$5.00^{\pm0.20}$	$2.50^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.10}$	27
ERJ1T (2512)	$6.40^{\pm0.20}$	$3.20^{\pm0.20}$	$0.65^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.10}$	45

Ratings

[For Resistor]

Part No. (inch size)	Power Rating at 70 °C (W)	Limiting Element Voltage(1) (V)	Maximum Overload Voltage(2) (V)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. ($\times10^{-6}$/°C)	Category Temperature Range (°C)
ERJXG (01005)	0.031	15	30	±5	4.7 to 1 M (E24)	<10 Ω : −100 to +600 10 Ω to 100 Ω : ±300 100 Ω< : ±200	−55 to +125
ERJ1G (0201)	0.05	25	50	±5	1 to 10 M (E24)	<10 Ω: −100 to +600 10 Ω to 1 MΩ: ±200 1 MΩ<: −400 to +150	−55 to +125
ERJ2G (0402)	0.1	50	100	±5	1 to 10 M (E24)		−55 to +155
ERJ3G (0603)	0.1	75	150	±5	1 to 10 M (E24)		−55 to +155
ERJ6G (0805)	0.125	150	200	±5	1 to 10 M (E24)		−55 to +155
ERJ8G (1206)	0.25	200	400	±5	1 to 10 M (E24)		−55 to +155
ERJ14 (1210)	0.5	200	400	±5	1 to 10 M (E24)		−55 to +155
ERJ12 (1812)	0.75	200	500	±5	1 to 10 M (E24)		−55 to +155
ERJ12Z (2010)	0.75	200	500	±5	1 to 10 M (E24)		−55 to +155
ERJ1T (2512)	1	200	500	±5	1 to 1 M (E24)		−55 to +155

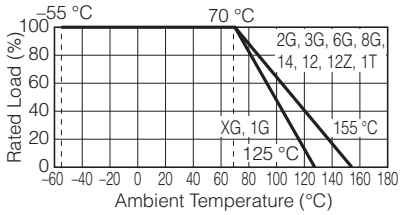
(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Values}}$, or Limiting Element Voltage listed above, whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 (Only ERJ2G=2.0) × RCWV or max. Overload Voltage listed above whichever less.

[For Jumper]

Part No. (inch size)	Rated Current (A)	Maximum Overload Current (A)
ERJXG (01005)	0.5	1
ERJ1G (0201)		
ERJ2G (0402)	1	2
ERJ3G (0603)		
ERJ6G (0805)	2	4
ERJ8G (1206)		
ERJ14 (1210)		
ERJ12 (1812)		
ERJ12Z (2010)		
ERJ1T (2512)		

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure below.



Precision Thick Film Chip Resistors

Type: **ERJ XG, 1G**
ERJ 1R, 2R, 3R, 6R
ERJ 3E, 6E, 8E, 14, 12, 1T

Features

- Small size and lightweight
- High reliability
  Metal glaze thick film resistive element and three layers of electrodes
- Compatible with placement machines
  Taping packaging available
- Suitable for both reflow and flow soldering
- Low Resistance Tolerance
  ERJXG, 1G, 2R, 3E, 6E, 8E, 14, 12, 1T Type : ±1 %
  ERJ1R, 2R, 3R, 6R Type : ±0.5 %
- Reference Standards
  IEC 60115-8, JIS C 5201-8, EIAJ RC-2134B
- AEC-Q200 qualified (Exemption ERJXG, ERJ1R)
- RoHS compliant

■ As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,

Please see Data Files

Explanation of Part Numbers

- ERJ1R, 2R, 3R, 6R Type, ±0.5 %

1	2	3	4	5	6	7	8	9	10	11	12
E	R	J	3	R	B	D	1	0	0	2	V

Product Code
Thick Film Chip Resistors

Size, Power Rating		
Code	Inch	Power R.
1R	0201	0.05 W
2R	0402	0.063 W
3R	0603	0.1 W
6R	0805	0.1 W

T.C.R. Marking	
Code	T.C.R.
H	±50×10^{-6}/°C (1R, 2R)
B	±50×10^{-6}/°C (3R, 6R)
K	±100×10^{-6}/°C (2R)
E	±100×10^{-6}/°C (3R, 6R)

Resistance Tolerance	
Code	Tolerance
D	±0.5 %

Packaging Methods		
Code	Packaging	Part No.
C	Pressed Carrier Taping 2 mm pitch, 15,000 pcs.	ERJ1R
X	Punched Carrier Taping 2 mm pitch, 10,000 pcs.	ERJ2R
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJ3R ERJ6R

Resistance Value
The first three digits are significant figures of resistance and the last one denotes number of zeros following. Example: 1002 →10 kΩ

● ERJXG, 1G, 2R, 3E, 6E, 8E, 14, 12, 1T Type, ±1 %

1	2	3	4	5	6	7	8	9	10	11	12
E	R	J	8	E	N	F	1	0	0	2	V

Product Code
Thick Film Chip Resistors

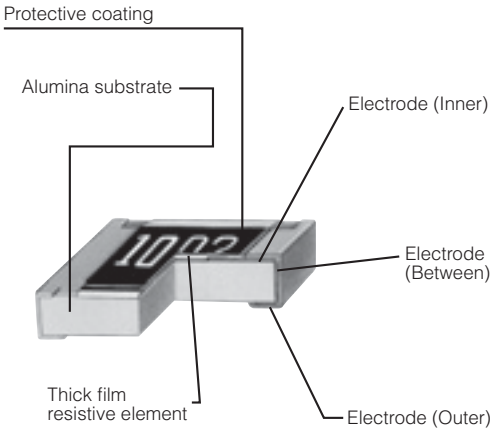
Size, Power Rating		
Code	Inch	Power R.
XGN	01005	0.031 W
1GN	0201	0.05 W
2RK	0402	0.1 W
3EK	0603	0.1 W
6EN	0805	0.125 W
8EN	1206	0.25 W
14N	1210	0.5 W
12N	1812	0.75 W
12S	2010	0.75 W
1TN	2512	1 W

Resistance Tolerance	
Code	Tolerance
F	±1 %

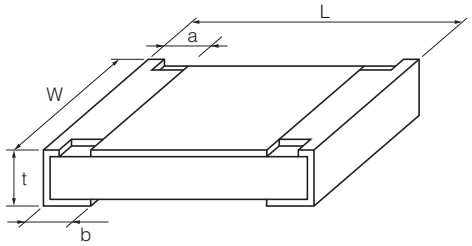
Resistance Value
The first three digits are significant figures of resistance and the last one denotes number of zeros following. Decimal point is expressed by "R". Example : 1002 → 10 kΩ

Packaging Methods		
Code	Packaging	Part No.
Y	Pressed Carrier Taping 2 mm pitch, 20,000 pcs.	ERJXGN
C	Pressed Carrier Taping 2 mm pitch, 15,000 pcs.	ERJ1GN
X	Punched Carrier Taping 2 mm pitch, 10,000 pcs.	ERJ2RK
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJ3EK ERJ6EN ERJ8EN
U	Embossed Carrier Taping 4 mm pitch, 5,000 pcs.	ERJ14N ERJ12N ERJ12S
	Embossed Carrier Taping 4 mm pitch, 4,000 pcs.	ERJ1TN

Construction



Dimensions in mm (not to scale)



Part No. (inch size)	Dimensions (mm)					Mass (Weight) [g/1000 pcs.]
	L	W	a	b	t	
ERJXG (01005)	$0.40^{\pm0.02}$	$0.20^{\pm0.02}$	$0.10^{\pm0.03}$	$0.10^{\pm0.03}$	$0.13^{\pm0.02}$	0.04
ERJ1G, 1R (0201)	$0.60^{\pm0.03}$	$0.30^{\pm0.03}$	$0.10^{\pm0.05}$	$0.15^{\pm0.05}$	$0.23^{\pm0.03}$	0.15
ERJ2R□ (0402)	$1.00^{\pm0.05}$	$0.50^{\pm0.05}$	$0.20^{\pm0.10}$	$0.25^{\pm0.05}$	$0.35^{\pm0.05}$	0.8
ERJ3R□ ERJ3EK (0603)	$1.60^{\pm0.15}$	$0.80^{+0.15}_{-0.05}$	$0.30^{\pm0.20}$	$0.30^{\pm0.15}$	$0.45^{\pm0.10}$	2
ERJ6R□ ERJ6EN (0805)	$2.00^{\pm0.20}$	$1.25^{\pm0.10}$	$0.40^{\pm0.20}$	$0.40^{\pm0.20}$	$0.60^{\pm0.10}$	4
ERJ8EN (1206)	$3.20^{+0.05}_{-0.20}$	$1.60^{+0.05}_{-0.15}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	10
ERJ14N (1210)	$3.20^{\pm0.20}$	$2.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	16
ERJ12N (1812)	$4.50^{\pm0.20}$	$3.20^{\pm0.20}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	27
ERJ12S (2010)	$5.00^{\pm0.20}$	$2.50^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.10}$	27
ERJ1TN (2512)	$6.40^{\pm0.20}$	$3.20^{\pm0.20}$	$0.65^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.10}$	45

Ratings

<±0.5 %>

Part No. (inch size)	Power Rating at 70 °C (W)	Limiting Element Voltage(1) (V)	Maximum Overload Voltage(2) (V)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. ($\times 10^{-6}$/°C)	Category Temperature Range (°C)
ERJ1RH (0201)	0.05	15	30	±0.5	1 k to 1 M (E24, E96)	±50	–55 to +125
ERJ2RH (0402)	0.063	50	100	±0.5	100 to 100 k (E24, E96)	±50	–55 to +125
ERJ2RK (0402)	0.063	50	100	±0.5	10 to 97.6 102 k to 1 M (E24, E96)	±100	–55 to +125
ERJ3RB (0603)	0.1	50	100	±0.5	100 to 100 k (E24, E96)	±50	–55 to +125
ERJ3RE (0603)	0.1	50	100	±0.5	10 to 97.6 102 k to 1 M (E24, E96)	±100	–55 to +125
ERJ6RB (0805)	0.1	150	200	±0.5	100 to 100 k (E24, E96)	±50	–55 to +125
ERJ6RE (0805)	0.1	150	200	±0.5	10 to 97.6 102 k to 1 M (E24, E96)	±100	–55 to +125

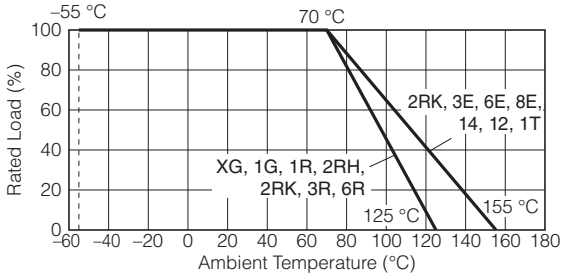
<±1 %>

Part No. (inch size)	Power Rating at 70 °C (W)	Limiting Element Voltage(1) (V)	Maximum Overload Voltage(2) (V)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. ($\times 10^{-6}$/°C)	Category Temperature Range (°C)
ERJXGN (01005)	0.031	15	30	±1	10 to 1 M (E24, E96)	<100 Ω : ±300 100 Ω ≦ : ±200	–55 to +125
ERJ1GN (0201)	0.05	25	50	±1	10 to 1 M(3) (E24, E96)	±200	–55 to +125
ERJ2RK (0402)	0.1	50	100	±1	10 to 1 M(3) (E24, E96)	±100	–55 to +155
ERJ3EK (0603)	0.1	75	150	±1	10 to 1 M (E24, E96)	±100	–55 to +155
ERJ6EN (0805)	0.125	150	200	±1	10 to 2.2 M (E24, E96)	±100	–55 to +155
ERJ8EN (1206)	0.25	200	400	±1	10 to 2.2 M (E24, E96)	±100	–55 to +155
ERJ14N (1210)	0.5	200	400	±1	10 to 1 M (E24, E96)	±100	–55 to +155
ERJ12N (1812)	0.75	200	500	±1	10 to 1 M (E24, E96)	±100	–55 to +155
ERJ12S (2010)	0.75	200	500	±1	10 to 1 M (E24, E96)	±100	–55 to +155
ERJ1TN (2512)	1	200	500	±1	10 to 1 M (E24, E96)	±100	–55 to +155

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Values}}$, or Limiting Element Voltage listed above, whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 (Only ERJ2RK ±1% =2.0) × RCWV or max. Overload Voltage listed above whichever less.
(3) Please contact us when you need a type with a resistance of less than 10 Ω.

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



Metal Film (Thin Film) Chip Resistors, High Reliability Type

Type: ERA 1A, 2A, 3A, 6A, 8A

Features

- High reliability ····· Stable at high temperature and humidity (85 °C 85 %RH rated load, Category temperature range : –55 to +155 °C)
- High accuracy ····· Small resistance tolerance and Temperature Coefficient of Resistance
- High performance ····· Low current noise, excellent linearity
- Reference Standard ····· IEC 60115-8, JIS C 5201-8, EIAJ RC-2133B
- AEC-Q200 qualified
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,** Please see Data Files

Explanation of Part Numbers

- E24 Series

1	2	3	4	5	6	7	8	9	10	11
E	R	A	3	A	E	B	1	0	2	V

Product Code

Metal Film Chip Resistors

Size, Power Rating

Code	Inch	Power Rating
1A	0201	0.05 W
2A	0402	0.063 W
3A	0603	0.1 W
6A	0805	0.125 W
8A	1206	0.25 W

Temperature Coefficient

Code	T.C.R.
R	±10×10^{-6}/°C
P	±15×10^{-6}/°C
E	±25×10^{-6}/°C
H	±50×10^{-6}/°C
K	±100×10^{-6}/°C

Resistance Tolerance

Code	Tolerance
W	±0.05 %
B	±0.1 %
C	±0.25 %
D	±0.5 %

Packaging Methods

Code	Packaging	Part No.
C	Pressed Carrier Taping 2 mm pitch, 15000 pcs.	ERA1A
X	Punched Carrier Taping 2 mm pitch, 10000 pcs.	ERA2A
V	Punched CarrierTaping 4 mm pitch, 5000 pcs.	ERA3A ERA6A ERA8A

Resistance Value

Consist of three figures for E24 series resistance value. The first two digits are significant figures of resistance and the third one denotes number of zeros following.
(example) 102 : 1 kΩ

- E96 Series and other Resistance values

1	2	3	4	5	6	7	8	9	10	11	12
E	R	A	3	A	E	B	1	0	5	1	V

Product Code

Metal Film Chip Resistors

Size, Power Rating

Code	Inch	Power Rating
1A	0201	0.05 W
2A	0402	0.063 W
3A	0603	0.1 W
6A	0805	0.125 W
8A	1206	0.25 W

Temperature Coefficient

Code	T.C.R.
R	±10×10^{-6}/°C
P	±15×10^{-6}/°C
E	±25×10^{-6}/°C
H	±50×10^{-6}/°C
K	±100×10^{-6}/°C

Resistance Tolerance

Code	Tolerance
W	±0.05 %
B	±0.1 %
C	±0.25 %
D	±0.5 %

Packaging Methods

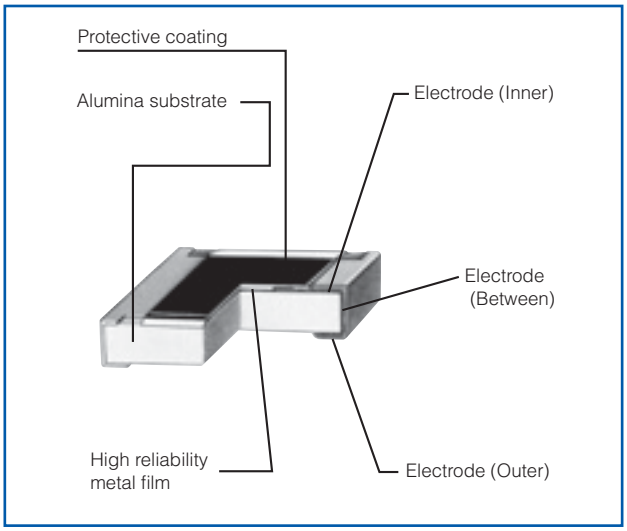
Code	Packaging	Part No.
C	Pressed Carrier Taping 2 mm pitch, 15000 pcs.	ERA1A
X	Punched Carrier Taping 2 mm pitch, 10000 pcs.	ERA2A
V	Punched CarrierTaping 4 mm pitch, 5000 pcs.	ERA3A ERA6A ERA8A

Resistance Value

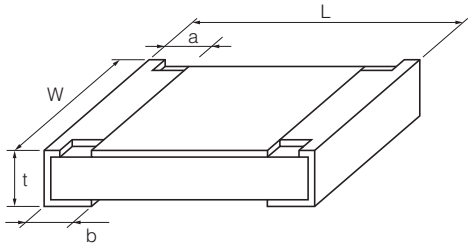
Consist of four figures for E96 series resistance value. The first three digits are significant figures of resistance and the fourth one denotes number of zeros following.
(example) 1051 : 1.05 kΩ

note : Duplicated resistance values as E24 series part numbers shall follow E24 part numbers.
(apply three digit resistance value)

Construction



Dimensions in mm (not to scale)



Part No. (inch size)	Dimensions (mm)					Mass (Weight) [g/1000 pcs.]
	L	W	a	b	t	
ERA1A (0201)	$0.60^{\pm0.03}$	$0.30^{\pm0.03}$	$0.15^{\pm0.05}$	$0.15^{\pm0.05}$	$0.23^{\pm0.03}$	0.14
ERA2A (0402)	$1.00^{\pm0.10}$	$0.50^{+0.10}_{-0.05}$	$0.15^{\pm0.10}$	$0.25^{\pm0.10}$	$0.35^{\pm0.05}$	0.6
ERA3A (0603)	$1.60^{\pm0.20}$	$0.80^{\pm0.20}$	$0.30^{\pm0.20}$	$0.30^{\pm0.20}$	$0.45^{\pm0.10}$	2
ERA6A (0805)	$2.00^{\pm0.20}$	$1.25^{\pm0.10}$	$0.40^{\pm0.25}$	$0.40^{\pm0.25}$	$0.50^{\pm0.10}$	4
ERA8A (1206)	$3.20^{\pm0.20}$	$1.60^{+0.05}_{-0.15}$	$0.50^{\pm0.25}$	$0.50^{\pm0.25}$	$0.60^{\pm0.10}$	8

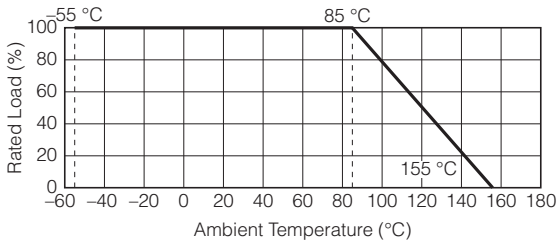
Ratings

Part No. (inch size)	Power Rating at 85 °C (W)	Limiting Element Voltage[1] (V)	Maximum Overload Voltage[2] (V)	Part No. (detail)	Resistance Tolerance (%)	T.C.R. ($\times10^{-6}$/°C)	Resistance Range[3][4] (Ω)	Category Temperature Range (°C)
ERA1A (0201)	0.05	25	50	ERA1AEB	±0.1	±25	100 to 10 k (E24, E96)	–55 to +155
				ERA1AEC	±0.25			
ERA2A (0402)	0.063	50	100	ERA2AKD	±0.5	±100	10 to 46.4 (E24, E96)	
				ERA2AED	±0.5	±25	47 to 100 k (E24, E96)	
				ERA2AEB	±0.1			
				ERA2APB	±0.1	±15	200 to 47 k (E24, E96)	
				ERA2ARC	±0.25	±10	200 to 47 k (E24, E96)	
				ERA2ARB	±0.1			
ERA3A (0603)	0.1	75	150	ERA3AHD	±0.5	±50	10 to 46.4 (E24, E96)	
				ERA3AED	±0.5	±25	47 to 330 k (E24, E96)	
				ERA3AEB	±0.1			
				ERA3APB	±0.1	±15	470 to 100 k (E24, E96)	
				ERA3ARB	±0.1	±10	1 k to 100 k (E24, E96)	
				ERA3ARW	±0.05			
ERA6A (0805)	0.125	100	200	ERA6AHD	±0.5	±50	10 to 46.4 (E24, E96)	
				ERA6AED	±0.5	±25	47 to 1 M (E24, E96)	
				ERA6AEB	±0.1			
				ERA6APB	±0.1	±15	470 to 100 k (E24, E96)	
				ERA6ARB	±0.1	±10	1 k to 100 k (E24, E96)	
				ERA6ARW	±0.05			
ERA8A (1206)	0.25	150	300	ERA8AHD	±0.5	±50	10 to 46.4 (E24, E96)	
				ERA8AED	±0.5	±25	47 to 1 M (E24, E96)	
				ERA8AEB	±0.1			
				ERA8APB	±0.1	±15	470 to 100 k (E24, E96)	
				ERA8ARB	±0.1	±10	1 k to 100 k (E24, E96)	
				ERA8ARW	±0.05			

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Rated Power} \times \text{Resistance Values}}$, or Limiting Element Voltage listed above, whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 × RCWV or max. Overload Voltage listed above whichever less.
(3) E192 series resistance values are also available. Please contact us for details.
(4) Duplicated resistance values between E96, E192 and E24 series shall follow E24 Part Numbers. (apply three digit resistance value)

Power Derating Curve

For resistors operated in ambient temperatures above 85 °C, power rating shall be derated in accordance with the figure on the right.



Thick Film Chip Resistors / Low Resistance Type

Type: **ERJ 2LW, 3LW**
2BW, 3BW, 6BW,
8BW, 8CW
ERJ 2B, 3B, 6B, 8B, 14B,
3R, 6R, 8R, 14R,
12R, 12Z, 1TR
ERJ L03, L06, L08, L14,
L12, L1D, L1W

Features

- Current Sensing resistor
- Small size and lightweight
- High reliability : Metal glaze thick film resistive element and three layers of electrodes
- Suitable for both reflow and flow soldering
- Improved high-power/resistance to pulse characteristics
  by double-sided resistive elements structure : ERJ2LW, 3LW ,2BW, 3BW, 6BW, 8BW, 8CW
- Low TCR : ±50×10^{-6}/°C (ERJ8CW)
- Low Resistance Value
  5 mΩ, 10 mΩ : ERJ3LW
  10 mΩ : ERJ2LW
  10 mΩ to 50 mΩ : ERJ8CW
  10 mΩ to 100 mΩ : ERJ6BW, 8BW
  20 mΩ to 100 mΩ : ERJ3BW, ERJL14, L12
  40 mΩ to 100 mΩ : ERJL1D, L1W
  47 mΩ to 100 mΩ : ERJ2BW, ERJL03, L06, L08
- Reference Standards : IEC 60115-8, JIS C 5201-8, JEITA RC-2144
- AEC-Q200 qualified
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**
Please see Data Files

Explanation of Part Numbers

- ERJ2LW, 3LW, 2BW, 3BW, 6BW, 8BW, 8CW <High power (double-sided resistive elements structure) type>

1	2	3	4	5	6	7	8	9	10	11	12
E	R	J	2	B	W	G	R	0	4	7	X

Product Code
Thick Film Chip Resistors

Code	Inch	Power Rating	Resistance Value
2LW	0402	0.2 W	10 mΩ
3LW	0603	0.25 W	5 mΩ,10 mΩ
2BW	0402	0.25 W	47 mΩ to 100 mΩ
3BW	0603	0.33 W	20 mΩ to 100 mΩ
6BW	0805	0.5 W	10 mΩ to 100 mΩ
8BW	1206	1 W	10 mΩ to 100 mΩ
8CW	1206	1 W	10 mΩ to 50 mΩ

Resistance Tolerance	
Code	Tolerance
F	± 1 %
G	± 2 %
J	± 5 %

Resistance Value
Shown by 4 digits or letters. (Ex.) R047 : 0.047 Ω=47 mΩ

Packaging Methods		
Code	Packaging	Part No.
X	Pressed Carrier Taping 2 mm pitch, 10,000 pcs.	ERJ2LW ERJ2BW
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJ3LW ERJ3BW ERJ6BW ERJ8BW ERJ8CW

● ERJ2BS/2BQ, 3BS/3BQ, 6BS/6BQ, 8BS/8BQ, 14BS/14BQ, 3R, 6R, 8R, 14R, 12R, 12Z, 1TR <High power type/Standard type>

1	2	3	4	5	6	7	8	9	10	11
E	R	J	8	R	Q	F	R	2	2	V

Product Code

Thick Film Chip Resistors

Size, Power Rating

Type	Inch	Power R.
2B	0402	0.166 W
3R	0603	0.1 W
3B	0603	0.25 W
6R	0805	0.125 W
6B	0805	0.33 W
8R	1206	0.25 W
8B	1206	0.5 W
14R	1210	0.25 W
14B	1210	0.5 W
12R	1812	0.5 W
12Z	2010	0.5 W
1TR	2512	1 W

Resistance Value

Code	Res. Value
S	0.1 Ω to 0.2 Ω
Q	0.22 Ω to 9.1 Ω*

* 2B : 0.22 Ω to 1.0 Ω

Resistance Tolerance

Code	Tolerance
F	± 1 %
G	± 2 %
J	± 5 %

Resistance Value

Shown by 3 digits or letters.
(Ex.) R22 : 0.22 Ω

Packaging Methods

Code	Packaging	Part No.
X	Punched Carrier Taping 2 mm pitch, 10,000 pcs.	ERJ2B
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJ3R/3B ERJ6R/6B ERJ8R/8B
U	Embossed Carrier Taping 4 mm pitch, 5,000 pcs.	ERJ14R/14B ERJ12R ERJ12Z
	Embossed Carrier Taping 4 mm pitch, 4,000 pcs.	ERJ1TR

● ERJL03, L06, L08, L14, L12, L1D, L1W <Low TCR type>

1	2	3	4	5	6	7	8	9	10	11	12
E	R	J	L	1	4	K	J	5	0	M	U

Product Code

Thick Film Chip Resistors

Size, Power Rating

Type	Inch	Power R.
L03	0603	0.2 W
L06	0805	0.25 W
L08	1206	0.33 W
L14	1210	0.33 W
L12	1812	0.5 W
L1D	2010	0.5 W
L1W	2512	1 W

Code / Res. Value

Code	Res. Value
K	Std. (20 mΩ, 22 mΩ, 33 mΩ, 39 mΩ, 47 mΩ, 50 mΩ, 100 mΩ)*
U	20 mΩ to 100 mΩ*

* L03, L06, L08 : 47 mΩ to 100 mΩ
L1D, L1W : 40 mΩ to 100 mΩ

Resistance Tolerance

Code	Tolerance
F	± 1 %
J	± 5 %

Resistance Value

Shown by 3 digits or letters.
(Ex.) 50 M:50 mΩ, 10 C:100 mΩ

Packaging Methods

Code	Packaging	Part No.
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJL03 ERJL06 ERJL08
U	Embossed Carrier Taping 4 mm pitch, 5,000 pcs.	ERJL14 ERJL12 ERJL1D
	Embossed Carrier Taping 4 mm pitch, 3,000 pcs.	ERJL1W

Ratings

<High power (double-sided resistive elements structure) type>

Part No. (inch size)	Power Rating at 70 °C (W)	Resistance Tolerance (%)	Resistance (1) Range (Ω)	T.C.R. (×10⁻⁶/°C)	Category Temperature Range (°C)
ERJ2LW (0402)	0.2	±1, ±2, ±5	10 m	0 to 500	–55 to +125
ERJ3LW (0603)	0.25	±1, ±2, ±5	5 m	0 to 700	–55 to +125
			10 m	0 to 300	–55 to +125
ERJ2BW (0402)	0.25	±1, ±2, ±5	47 m to 100 m (E24)	±300	–55 to +155
ERJ3BW (0603)	0.33	±1, ±2, ±5	20 m to 100 m (E24)	R<39m Ω : ±250 R≧39m Ω : ±150	–55 to +155
ERJ6BW (0805)	0.5	±1, ±2, ±5	10 m to 100 m (E24)	R<15m Ω : ±300 R≧15m Ω : ±200	–55 to +155
ERJ8BW (1206)	1	±1, ±2, ±5	10 m to 100 m (E24)	10 mΩ ≦ R < 20 mΩ : ±200 20 mΩ ≦ R < 47 mΩ : ±150 47 mΩ ≦ R ≦ 100 mΩ : ±100	–55 to +155
ERJ8CW (1206)	1	±1, ±2, ±5	10 m to 50 m (E24)	±75	–55 to +155 (10 m to 33 mΩ) –55 to +125 (36 m to 50 mΩ)

(1) Please contact us when resistors of irregular series are needed.

Ratings

<High power type>

Part No. (inch size)	Power Rating at 70 °C (W)	Resistance Tolerance (%)	Resistance [1] Range (Ω)	T.C.R. (×10⁻⁶/°C)	Category Temperature Range (°C)
ERJ2BS (0402)	0.166	±1, ±2, ±5	0.10 to 0.20 (E24)	±300	–55 to +125
ERJ2BQ (0402)			0.22 to 1.0 (E24)	±250	
ERJ3BS (0603)	0.25	±1, ±2, ±5	0.10 to 0.20 (E24)	±300	–55 to +125
ERJ3BQ (0603)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±200	
ERJ6BS (0805)	0.33	±1, ±2, ±5	0.10 to 0.20 (E24)	±250	–55 to +125
ERJ6BQ (0805)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±200	
ERJ8BS (1206)	0.5	±1, ±2, ±5	0.10 to 0.20 (E24)	±250	–55 to +125
ERJ8BQ (1206)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±200	
ERJ14BS (1210)	0.5	±1, ±2, ±5	0.10 to 0.20 (E24)	±200	–55 to +125
ERJ14BQ (1210)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±100	

(1) Please contact us when resistors of irregular series are needed.

<Standard type>

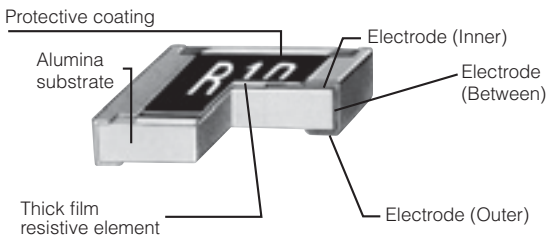
Part No. (inch size)	Power Rating at 70 °C (W)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. (×10⁻⁶/°C)	Category Temperature Range (°C)
ERJ3RS (0603)	0.1	±1, ±2, ±5	0.10 to 0.20 (E24)	±300	–55 to +125
ERJ3RQ (0603)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±200	
ERJ6RS (0805)	0.125	±1, ±2, ±5	0.10 to 0.20 (E24)	±250	–55 to +125
ERJ6RQ (0805)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±200	
ERJ8RS (1206)	0.25	±1, ±2, ±5	0.10 to 0.20 (E24)	±250	–55 to +125
ERJ8RQ (1206)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±200	
ERJ14RS (1210)	0.25	±1, ±2, ±5	0.10 to 0.20 (E24)	±200	–55 to +125
ERJ14RQ (1210)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±100	
ERJ12RS (1812)	0.5	±1, ±2, ±5	0.10 to 0.20 (E24)	±200	–55 to +125
ERJ12RQ (1812)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±100	
ERJ12ZS (2010)	0.5	±1, ±2, ±5	0.10 to 0.20 (E24)	±200	–55 to +125
ERJ12ZQ (2010)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±100	
ERJ1TRS (2512)	1	±1, ±2, ±5	0.10 to 0.20 (E24)	±200	–55 to +125
ERJ1TRQ (2512)			0.22 to 0.91 (E24)		
			1.0 to 9.1 (E24)	±100	

<Low TCR type>

Part No. (inch size)	Power Rating at 70 °C (W)	Resistance Tolerance (%)	Resistance [1] Range (Ω)	T.C.R. (×10⁻⁶/°C)	Category Temperature Range (°C)
ERJL03 (0603)	0.2	±1, ±5	47 m to 100 m	±200	–55 to +125
ERJL06 (0805)	0.25	±1, ±5	47 m to 100 m	±100	–55 to +125
ERJL08 (1206)	0.33	±1, ±5	47 m to 100 m	±100	–55 to +125
ERJL14 (1210)	0.33	±1, ±5	20 m to 100 m	R<47 mΩ : ±300 R≧47 mΩ : ±100	–55 to +125
ERJL12 (1812)	0.5	±1, ±5	20 m to 100 m		–55 to +125
ERJL1D (2010)	0.5	±1, ±5	40 m to 100 m		–55 to +125
ERJL1W (2512)	1	±1, ±5	40 m to 100 m		–55 to +125

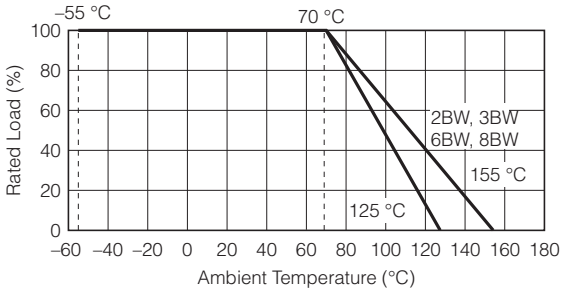
(1) Standard R.V. : 20 mΩ, 22 mΩ, 33 mΩ, 39 mΩ, 47 mΩ, 50 mΩ, 100 mΩ, Custom R.V. : Each 1 mΩ within upper range.

Construction

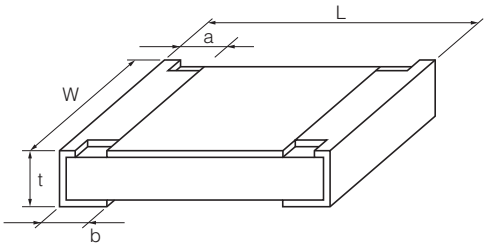


Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure below.



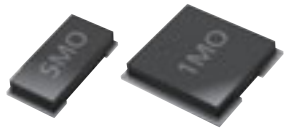
Dimensions in mm (not to scale)



Part No. (inch size)	Dimensions (mm)					Mass(Weight) [g/1000 pcs.]
	L	W	a	b	t	
ERJ2LW (0402)	$1.00^{\pm0.10}$	$0.50^{+0.10}_{-0.05}$	$0.25^{\pm0.10}$	$0.25^{\pm0.10}$	$0.40^{\pm0.05}$	0.8
ERJ2BW (0402)	$1.00^{\pm0.10}$	$0.50^{+0.10}_{-0.05}$	$0.24^{\pm0.10}$	$0.24^{\pm0.10}$	$0.35^{\pm0.05}$	0.8
ERJ2BS ERJ2BQ (0402)	$1.00^{\pm0.10}$	$0.50^{+0.10}_{-0.05}$	$0.20^{\pm0.10}$	$0.27^{\pm0.10}$	$0.35^{\pm0.05}$	0.8
ERJ3LW (5 mΩ) (0603)	$1.60^{\pm0.15}$	$0.80^{\pm0.15}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.55^{\pm010}$	3
ERJ3LW (10 mΩ) (0603) ERJ3BW	$1.60^{\pm0.15}$	$0.80^{\pm0.15}$	$0.40^{\pm0.20}$	$0.40^{\pm0.20}$	$0.55^{\pm010}$	3
ERJ3R ERJ3B (0603) ERJL03	$1.60^{\pm0.15}$	$0.80^{+0.15}_{-0.05}$	$0.30^{\pm0.20}$	$0.30^{\pm0.15}$	$0.45^{\pm0.10}$	2
ERJ6BW (0805)	$2.00^{\pm0.20}$	$1.25^{\pm0.20}$	$0.55^{\pm0.20}$	$0.55^{\pm0.20}$	$0.65^{\pm0.10}$	6
ERJ6R ERJ6B (0805) ERJL06	$2.00^{\pm0.20}$	$1.25^{\pm0.10}$	$0.40^{\pm0.20}$	$0.40^{\pm0.20}$	$0.60^{\pm0.10}$	4
ERJ8BW (1206)	$3.20^{\pm0.20}$	$1.60^{\pm0.20}$	$1.00^{\pm0.20}$	$1.00^{\pm0.20}$	$0.65^{\pm0.10}$	13
ERJ8CW (10 to 16 mΩ)	$3.20^{\pm0.20}$	$1.60^{\pm0.20}$	$1.10^{\pm0.20}$	$1.10^{\pm0.20}$	$0.65^{\pm0.10}$	13
ERJ8CW (18 to 50 mΩ)	$3.20^{\pm0.20}$	$1.60^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.20}$	$0.65^{\pm0.10}$	13
ERJ8R ERJ8B (1206) ERJL08	$3.20^{+0.05}_{-0.20}$	$1.60^{+0.05}_{-0.15}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	10
ERJ14R ERJ14B (1210) ERJL14	$3.20^{\pm0.20}$	$2.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	16
ERJ12R ERJL12 (1812)	$4.50^{\pm0.20}$	$3.20^{\pm0.20}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	27
ERJ12Z ERJL1D (2010)	$5.00^{\pm0.20}$	$2.50^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.10}$	27
ERJ1TR ERJL1W (2512)	$6.40^{\pm0.20}$	$3.20^{\pm0.20}$	$0.65^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.10}$	45
	$6.40^{\pm0.20}$	$3.20^{\pm0.20}$	$0.65^{\pm0.20}$	$1.30^{\pm0.20}$	$1.10^{\pm0.10}$	79

Current Sensing Resistors, Metal Plate Type

Type: **ERJ MS4, MS6**



Features

- Ideal for current sensing solution
- Small case size with high power
- Metal plate bonding technology. Excellent long term stability
- Outer Resin with high heat dissipation. Wide temperature range (-65 °C to +170 °C)
- AEC-Q200 qualified
- RoHS compliant

■ As for Packaging Methods, Soldering Conditions and Safety Precautions,

Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	R	J	M	S	4	S	F	2	M	0	U

Product Code
Metal Plate Chip Resistors

Type Code		
Code	Inch size	Electrode type
S4S	2512	Standard
S4H	2512	Narrow
S6S	2526	Standard

Resistance Tolerance	
Code	Tolerance
F	±1 %

Resistance Value
Shown by 3 digits or letters.Decimal point is expressed by M as 2.0 mΩ=2M0, 0.5 mΩ=M50, 10.0 mΩ=10M

Packaging Methods		
Code	Packaging	Part No.
U	Embossed Carrier Taping 4 mm pitch, 2,000 pcs.	ERJMS4
	Embossed Carrier Taping 8 mm pitch, 1,000 pcs.	ERJMS6

Ratings

Part No. (inch size)	Power Rating at 70 °C (W)	Resistance Range (mΩ)	Resistance Tolerance (%)	T.C.R. ($\times 10^{-6}$/°C)	Category Temperature Range (°C)	Terminal temp. upper limit (°C)
ERJMS4S (2512)	3	1, 2, 3, 4	F : ±1	±75	–65 to +170	130
ERJMS4H (2512)	3	5, 6	F : ±1	±75	–65 to +170	130
	2	7, 8, 9, 10	F : ±1	±75	–65 to +170	100
ERJMS6S (2526)	5	0.5, 1, 2	F : ±1	±75	–65 to +170	130

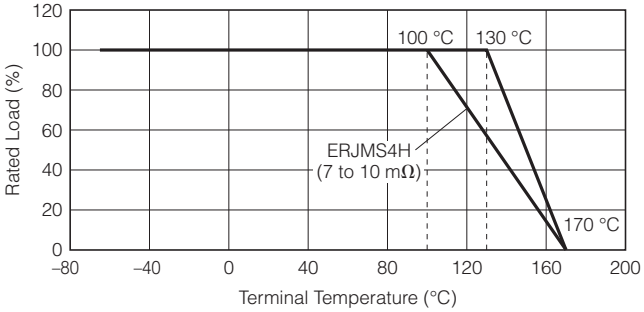
✻ Please contact us when resistors of irregular series are needed.

Power Derating Curve

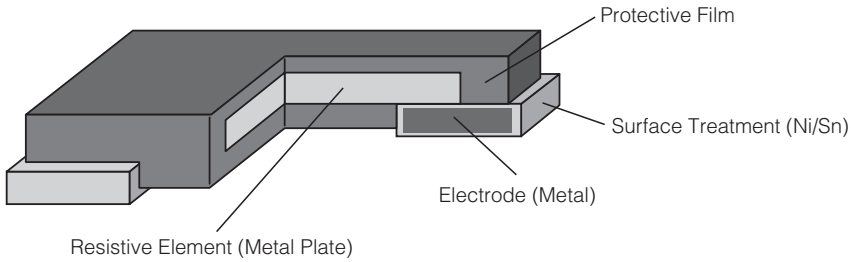
If the terminal temperature of the resistor is more than terminal temperature upper limit value of the rated table, please reduce the rated power according to the Power Derating Curve shown in the figure on the right.

<Supplemented>
In the case of the temperature measurement of the terminal portion of the resistor, Please perform under the following conditions.

1) Tarminal temperature measurement, please apply the temperature of the higher of either the left or right electrode upper surface of the resistor.
2) Please measure the temperature of the resistor in the land pattern printed of circuit board and plan to use by real conditions.

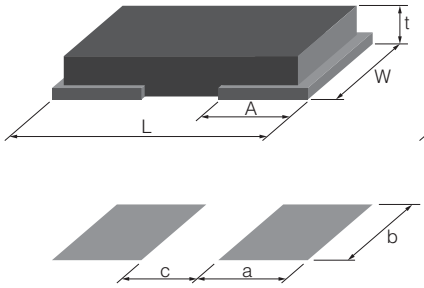


Construction

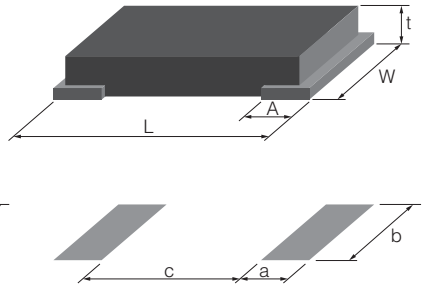


Dimensions in mm (not to scale), Recommended Land Pattern

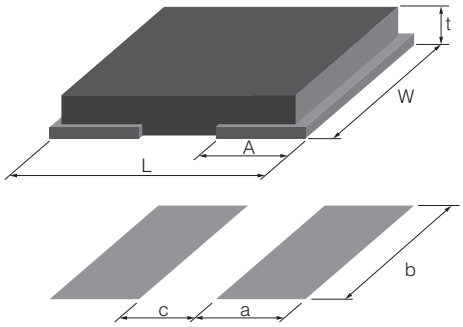
● ERJMS4S



● ERJMS4H

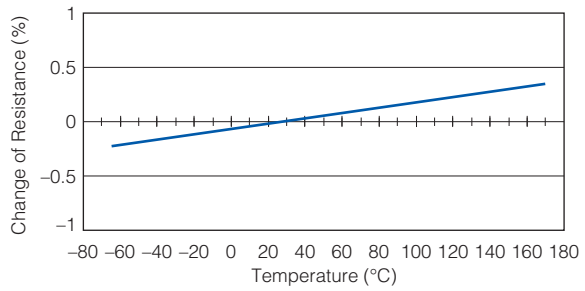


● ERJMS6S

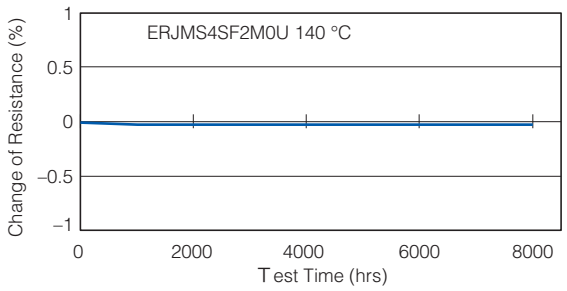


Part No. (inch size)	Dimension (mm)				Recommended Land Pattern (mm)			Mass (Weight) (g/1000 pcs.)
	L	W	A	t	a	b	c	
ERJMS4S (2512)	6.40±0.25	3.20±0.25	2.20±0.25	1.20±0.15	2.7	3.4	2.0	120
ERJMS4H (2512)	6.40±0.25	3.20±0.25	1.25±0.25	1.20±0.15	1.7	3.4	4.0	115
ERJMS6S (2526)	6.40±0.25	6.80±0.25	2.20±0.25	1.20±0.15	2.7	7.0	2.0	260

Typical Temperature dependence of electrical resistance

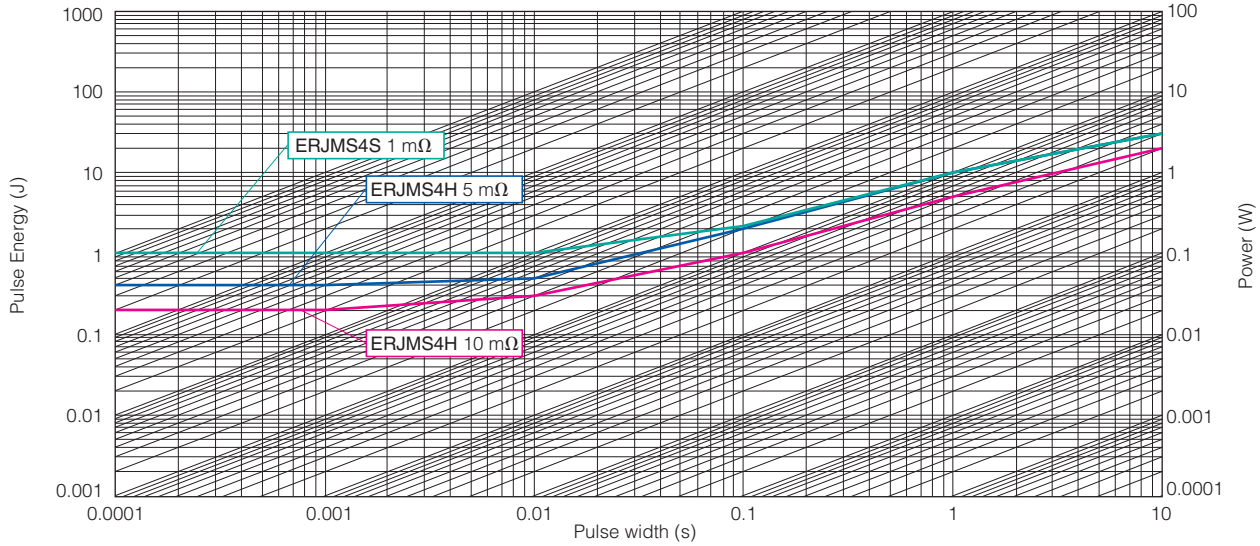


Long-term stability



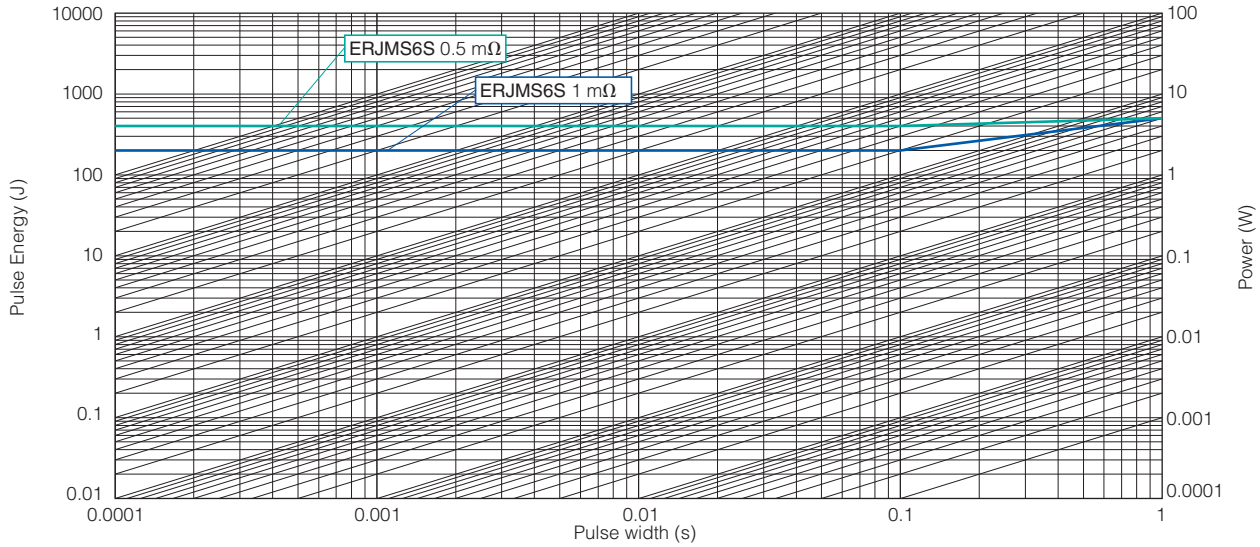
Maximum pulse energy respectively pulse power for continuous operation

● ERJMS4 type



Referance Data
Condition : Room Temperature, OFF : 10 s, 1000 cycle, Wave form : Square
Change of Resistance=±1 %

● ERJMS6 type



Referance Data
Condition : Room Temperature, OFF : 10 s, 1000 cycle, Wave form : Square
Change of Resistance=±1 %

Performance (AEC-Q200)

● ERJMS4 type

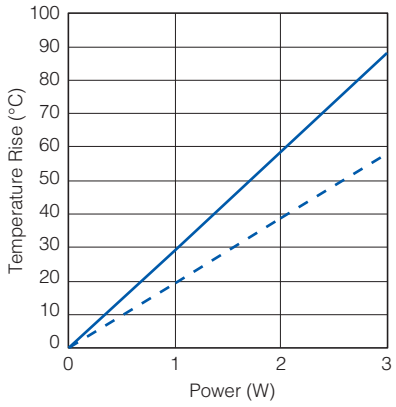
Test Item	Test Condition	Specification	Typical value
Thermal Shock	MIL-STD-202 method 107 (-55 °C / +125 °C, 25 cycle)	±0.5 %	0.05 %
Overload	MIL-R-26E (5 x rated power, 5 sec)	±0.5 %	0.02 %
Solderability	MIL-STD-202 method 208	> 95% coverage	> 95% coverage
Resistance to Solvents	MIL-STD-202 method 215, 2.1a, 2.1d	No damage	No damage
Low Temperature Storage and Operation	MIL-STD-26E (-65 °C, 24 h)	±0.5 %	0.03 %
Resistance to Soldering Heat	MIL-STD-202 method 210 (260 °C, 10s)	±0.5 %	0.10 %
Moisture Resistance	MIL-STD-202 method 106	±0.5 %	0.20 %
Shock	MIL-STD-202 method 213-A	±0.5 %	0.10 %
Vibration, High Frequency	MIL-STD-202 method 204-B	±0.5 %	0.05 %
Life	MIL-STD-26E (Rated Power, 1.5 h-ON, 0.5 h-OFF, 2000 h)	±1 %	0.30 %
Storage Life at Elevated Temperature	MIL-STD-202 method 108-F (170 °C, 2000 h)	±1 %	0.30 %
High Temperature Characteristics	140 °C, 2000 h	±0.5 %	0.05 %
Frequency Characteristics	Inductance	< 2 nH	< 2 nH

● ERJMS6 type

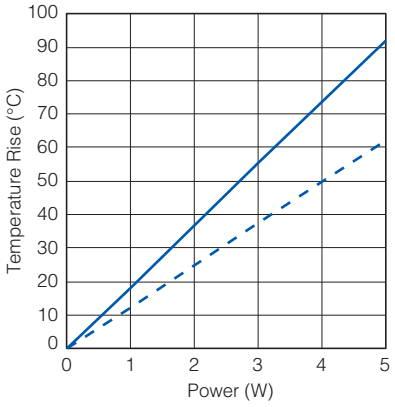
Test Item	Test Condition	Specification	Typical value
Thermal Shock	MIL-STD-202 method 107 (-55 °C / +125 °C, 25 cycle)	±0.5 %	0.10 %
Overload	MIL-R-26E (5 x rated power, 5 sec)	±0.5 %	0.02 %
Solderability	MIL-STD-202 method 208	> 95% coverage	> 95% coverage
Resistance to Solvents	MIL-STD-202 method 215, 2.1a, 2.1d	No damage	No damage
Low Temperature Storage and Operation	MIL-STD-26E (-65 °C, 24 h)	±0.5 %	0.03 %
Resistance to Soldering Heat	MIL-STD-202 method 210 (260 °C, 10s)	±0.5 %	0.10 %
Moisture Resistance	MIL-STD-202 method 106	±0.5 %	0.10 %
Shock	MIL-STD-202 method 213-A	±0.5 %	0.10 %
Vibration, High Frequency	MIL-STD-202 method 204-B	±0.5 %	0.05 %
Life	MIL-STD-26E (Rated Power, 1.5 h-ON, 0.5 h-OFF, 2000 h)	±1 %	0.20 %
Storage Life at Elevated Temperature	MIL-STD-202 method 108-F (170 °C, 2000 h)	±1 %	0.30 %
High Temperature Characteristics	140 °C, 2000 h	±0.5 %	0.05 %
Frequency Characteristics	Inductance	< 2 nH	< 2 nH

Temperature Rise

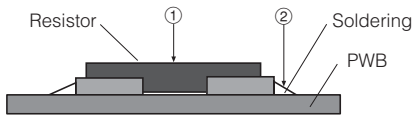
● ERJMS4HF5M0U



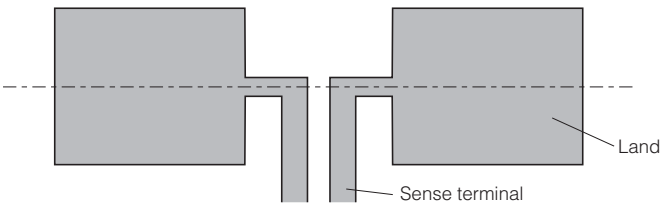
● ERJMS6SF2M0U



<Condition>
Base material : FR-4 (t1.6mm)
Copper Thickness : 70 µm, Two layer



Sense terminal-Layout



Current Sensing Resistors, Metal Plate Type

Type: **ERJM1W**

Features

- Low resistance values and high precision (1 mΩ to 20 mΩ)
- Stable resistance not influenced by measurement position
- High heat emission
- Low profile, strong body
- Inductance less than 1.0 nH for the metal plate structure
- RoHS compliant

■ As for Packaging Methods, Soldering Conditions and Safety Precautions,

Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	R	J	M	1	W	S	F	3	M	0	U

Product Code

Thick Film Chip Resistors

Size, Power Rating

Code	Inch	Power R.
M1W	2512	1 W

Code / Type

Code	Type
S	General type
T	Wide terminal type

Resistance Tolerance

Code	Tolerance
F	± 1 %
J	± 5 %

Packaging Methods

Code	Packaging
U	Embossed Carrier Taping 4 mm pitch, 3,000 pcs.

Resistance Value

Shown by 3 digits or letters.
Decimal point is expressed by M as 3 mΩ=3M0, 10 mΩ=10M

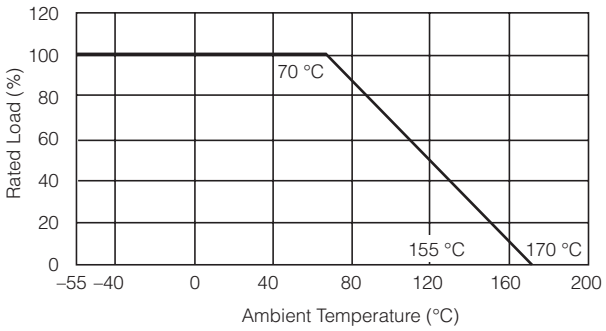
Ratings

Part No. (inch size)	Power Rating at 70 °C (W)	Standard Resistance (mΩ)	Resistance Tolerance (%)	T.C.R. ($\times 10^{-6}$/°C)	Category Temperature Range (°C)	Circuit board of use
ERJM1WS (2512)	1	3, 4	F: ±1, J: ±5	±350	–55 to +170	You should use the aluminum substrate when the added wattage exceeds 0.5 W.
		5, 6, 10, 15, 20		±100		
ERJM1WT (2512)		1, 1.5		350±100		
		2, 3, 4		100±50		

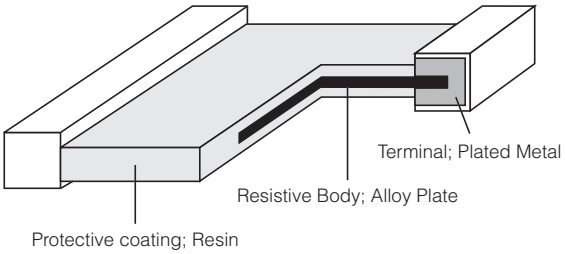
✻ Please contact the factory for other values and the range

Power Derating Curve

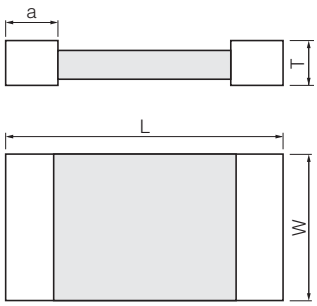
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



Construction



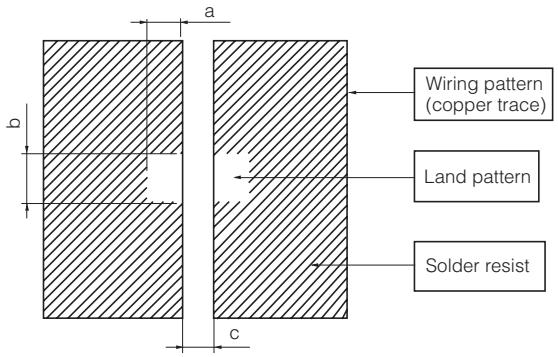
Dimensions in mm (not to scale)



Type	Part No. (inch size)	Dimensions (mm)				
		L	W	T	a	Mass (Weight) [g/1000 pcs.]
S Type	ERJM1WS (2512)	$6.40^{\pm0.25}$	$3.20^{\pm0.25}$	$0.80^{\pm0.30}$	$1.00^{\pm0.25}$	70
T Type	ERJM1WT (2512)	$6.40^{\pm0.40}$			$2.10^{\pm0.30}$	90

Recommended Land Pattern

● An example of a land pattern



Part No.	Dimensions (mm)		
	a	b	c
ERJM1WS	2.1	3.4	4.2
ERJM1WT	3.1	3.4	2.2

High Power Chip Resistors / Wide Terminal Type

Type: ERJ A1, B1, B2, B3

Features

- High solder-joint reliability by wide terminal construction
- Excellent heat dissipation characteristics by wide terminal construction
- AEC-Q200 qualified
- RoHS compliant

Recommended Applications

- Automotive electronic circuits including ECUs (Electrical control unit), anti-lock breaking systems and air-bag systems
- Current sensing for power supply circuits in a variety of equipment

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,** Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11
E	R	J	A	1	A	J	1	0	2	U

Product Code

Thick Film Chip Resistors

Size, Power Rating

Code	Inch	Power R.
A1	1225	1.33 W
B1	1020	1 W, (2 W R ≦ 10 Ω)
B2	0612	0.75 W, (1 W R ≦ 10 Ω)
B3	0508	0.33 W, (0.5 W R ≦ 1 Ω)

Resistance Value Region

A	10 Ω ≦ R
B	0.22 Ω ≦ R <10 Ω
C	0.01 Ω ≦ R < 0.22 Ω
D	0.005 Ω ≦ R < 0.01 Ω

Resistance Tolerance

F	± 1 %
G	± 2 %
J	± 5 %

Packaging Methods

Code	Packaging	Part No.
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJB2 ERJB3
U	Embossed Carrier Taping 4 mm pitch, 5,000 pcs.	ERJB1
	Embossed Carrier Taping 4 mm pitch, 4,000 pcs.	ERJA1

Resistance Value

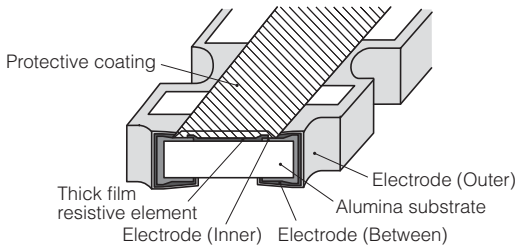
Shown by 3 digits or letters. Only when it is impossible, shown by 4 digits or letters.
(Ex.) 102 : 1.0 kΩ R01 : 0.01 Ω = 10 mΩ
4R7 : 4.7 Ω R015 : 0.015 Ω = 15 mΩ

Ratings

Part No. (inch size)	Power Rating at 70 °C (W)	Limiting Element Voltage(1) (V)	Maximum Overload Voltage(2) (V)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. (×10⁻⁶/°C)	Category Temperature Range (°C)
ERJA1 (1225)	1.33	200	400	±1	100 m to 10 k (E24)	R < 100 mΩ : ±350 100 mΩ ≦ R : ±100 (±1%) ±200 (±2%, ±5%)	–55 to +155
				±2, ±5	10 m to 10 k (E24)		
ERJB1 (1020)	1 2(R ≦ 10 Ω)	200	400	±1, ±2, ±5	10 m to 10 k (E24)	R < 22 mΩ : ±350 22 mΩ ≦ R < 47 mΩ : ±200 47 mΩ ≦ R < 100 mΩ : ±150 (±1%) ±200 (±2%, ±5%) 100 mΩ ≦ R : ±100 (±1%) ±200 (±2%, ±5%)	–55 to +155
ERJB2 (0612)	0.75 1(R ≦ 10 Ω)	200	400	±1, ±2	10 m to 1 M (E24)	R < 22 mΩ : 0 to +300 22 mΩ ≦ R < 47 mΩ : 0 to +200 47 mΩ ≦ R < 100 mΩ : 0 to +150 100 mΩ ≦ R < 220 mΩ : 0 to +150 (±1%) 0 to +200 (±2%, ±5%) 220 mΩ ≦ R : ±100 (±1%) ±200 (±2%, ±5%)	–55 to +155
				±5	5 m to 1 M (5 m to 9 m : 1mΩ step; 10 m to 1 M : E24)		
ERJB3 (0508)	0.33 0.5(R ≦ 1 Ω)	150	200	±1, ±2, ±5	20 m to 10 (E24)	R < 47 mΩ : 0 to +300 47 mΩ ≦ R ≦ 1 Ω : 0 to +200 1 Ω < R : ±100 (±1%) ±200 (±2%, ±5%)	–55 to +155

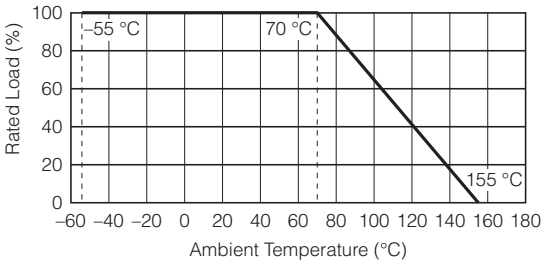
(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=√(Power Rating × Resistance Values), or Limiting Element Voltage listed above, whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 × RCWV or max. Overload Voltage listed above whichever less.

Construction (Example : ERJA1 type)



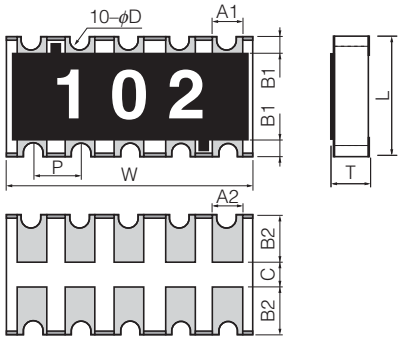
Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure below.



Dimensions in mm (not to scale)

ERJA1 type



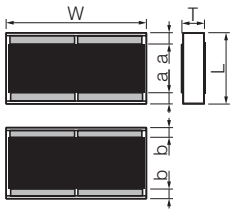
Mass (Weight) [1000 pcs.] : 40 g

Dimensions (mm)	L	W	T	A_1	B_1
	3.20±0.20	6.40±0.20	0.55±0.10	0.70±0.20	0.45±0.20

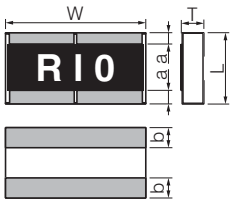
Dimensions (mm)	A_2	B_2	P	φD	C
	0.70±0.20	1.25±0.15	1.27±0.10	$0.30^{+0.10}_{-0.20}$	0.4 min.

ERJB2 type

(R< 10 mΩ)



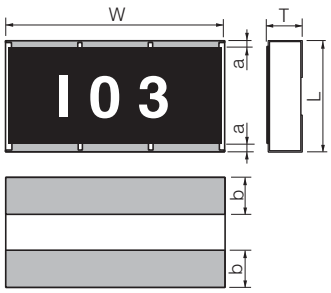
(10 mΩ ≦ R ≦ 1 MΩ)



Mass (Weight) [1000 pcs.] : 11 g

Dimensions (mm)	L	W	T	a	b
5 mΩ≦R<10 mΩ	1.60±0.15	3.20±0.20	0.65±0.15	0.30±0.20	0.30±0.20
10 mΩ≦R<220 mΩ			0.55±0.15		0.50±0.20
220 mΩ≦R≦1 MΩ				0.25±0.20	

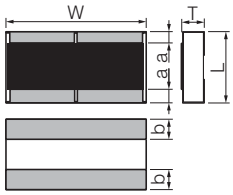
ERJB1 type



Mass (Weight) [1000 pcs.] : 27 g

Dimensions (mm)	L	W	T	a	b
	2.50±0.20	5.00±0.20	0.55±0.20	0.25±0.20	0.90±0.20

ERJB3 type

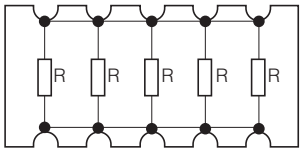


Mass (Weight) [1000 pcs.] : 4.8 g

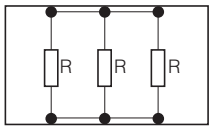
Dimensions (mm)	L	W	T	a	b
	1.25±0.10	2.00±0.15	0.50±0.10	0.25±0.20	0.40±0.20

Circuit Configuration

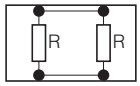
ERJA1 type



ERJB1 type

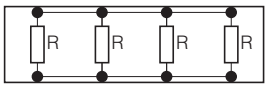


ERJB3 type

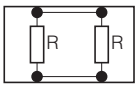


ERJB2 type

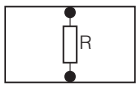
< Less than 10 mΩ >



< Low resistance zone >



< High resistance zone >



Anti-Surge Thick Film Chip Resistors

Type: ERJ P03, PA3, P06, P08, P14

Features

- ESD surge characteristics superior to standard metal film resistors
- High reliability
  Metal glaze thick film resistive element and three layers of electrodes
- Suitable for both reflow and flow soldering
- High power ···0.20 W : 0603 inch / 1608 mm size (ERJP03)
  0.25 W : 0603 inch / 1608 mm size (ERJPA3)
  0.50 W : 0805 inch / 2012 mm size (ERJP06), 1210 inch / 3225 mm size (ERJP14)
  0.66 W : 1206 inch / 3216 mm size (ERJP08)
- Reference Standards··· IEC 60115-8, JIS C 5201-8, EIAJ RC-2134B
- AEC-Q200 qualified
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**
Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	R	J	P	0	6	D	1	0	0	2	V

Product Code

Thick Film Chip Resistors

Size, Power Rating

Code	Inch	Power R.
P03	0603	0.20 W
PA3	0603	0.25 W
P06	0805	0.50 W
P08	1206	0.66 W
P14	1210	0.50 W

Resistance Tolerance

Code	Tolerance
D	± 0.5 %
F	± 1 %
J	± 5 %

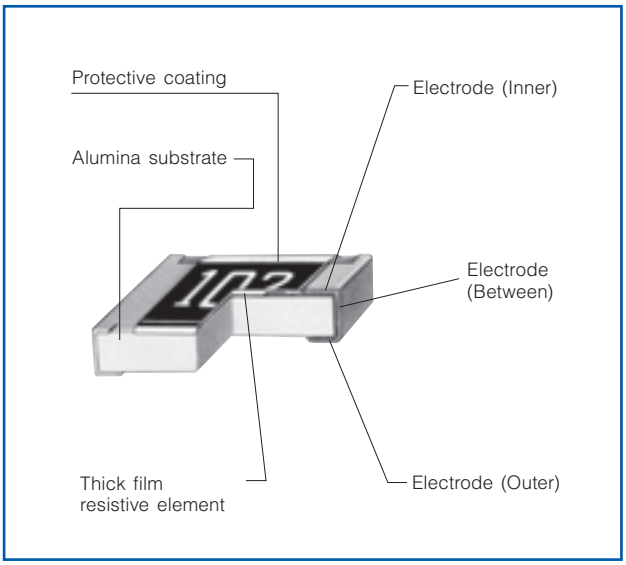
Resistance Value

The first two or three digits are significant figures of resistance and the third or 4th one denotes number of zeros following.
Three digit type (±5%),
four digit type (±1%, ±0.5%)
Example: 222→2.2 kΩ, 1002→10 kΩ

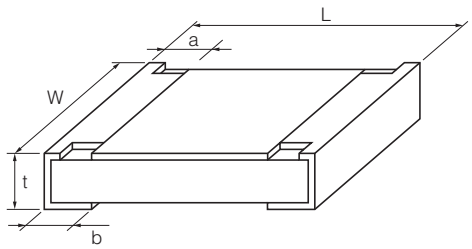
Packaging Methods

Code	Packaging	Part No.
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJP03 ERJPA3 ERJP06 ERJP08
U	Embossed Carrier Taping 4 mm pitch, 5,000 pcs.	ERJP14

Construction



Dimensions in mm (not to scale)



Part No. (inch size)	Dimensions (mm) L	W	a	b	t	Mass (Weight) [g/1000 pcs.]
ERJP03 (0603)	$1.60^{\pm0.15}$	$0.80^{\pm0.15}_{\pm0.05}$	$0.15^{\pm0.15}_{\pm0.10}$	$0.30^{\pm0.15}$	$0.45^{\pm0.10}$	2
ERJPA3 (0603)	$1.60^{\pm0.15}$	$0.80^{\pm0.15}_{\pm0.05}$	$0.15^{\pm0.15}_{\pm0.10}$	$0.25^{\pm0.10}$	$0.45^{\pm0.10}$	2
ERJP06 (0805)	$2.00^{\pm0.20}$	$1.25^{\pm0.10}$	$0.25^{\pm0.20}$	$0.40^{\pm0.20}$	$0.60^{\pm0.10}$	4
ERJP08 (1206)	$3.20^{+0.05}_{-0.20}$	$1.60^{+0.05}_{-0.15}$	$0.40^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	10
ERJP14 (1210)	$3.20^{\pm0.20}$	$2.50^{\pm0.20}$	$0.35^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	16

Ratings

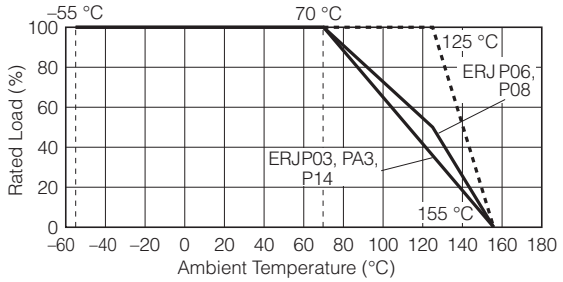
Part No. (inch size)	Power Rating[3] at 70 °C (W)	Limiting Element Voltage[1] (V)	Maximum Overload Voltage[2] (V)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. (×10^{-6}/°C)	Category Temperature Range (°C)
ERJP03 (0603)	0.20	150	200	±0.5	10 to1M (E24, E96)	±150	–55 to +155
				±1	10 to1M (E24, E96)	±200	
				±5	1 to1M (E24)	R < 10 Ω: –150 to +400 10 Ω ≦ R : ±200	
ERJPA3 (0603)	0.25	150	200	±0.5, ±1	10 to1M (E24, E96)	±100	–55 to +155
				±5	1 to1.5M (E24)	±200	
ERJP06 (0805)	0.50	400	600	±0.5, ±1	10 to1M (E24, E96)	R < 33 Ω : ±300 33 Ω ≦ R : ±100	–55 to +155
				±5	1 to 3.3M (E24)	R < 10 Ω : –100 to +600 10 Ω ≦ R < 33 Ω : ±300 33 Ω ≦ R : ±200	
ERJP08 (1206)	0.66	500	1000	±0.5, ±1	10 to1M (E24, E96)	±100	–55 to +155
				±5	1 to10M (E24)	R < 10 Ω : –100 to +600 10 Ω ≦ R : ±200	
ERJP14 (1210)	0.50	200	400	±0.5, ±1	10 to1M (E24, E96)	±100	–55 to +155
				±5	1 to1M (E24)	R < 10 Ω : –100 to +600 10 Ω ≦ R : ±200	

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Values}}$, or Limiting Element Voltage listed above, whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 × RCWV or max. Overload Voltage listed above whichever less.
(3) Use it on the condition that the case temperature is below 155 °C.

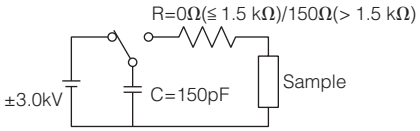
Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.

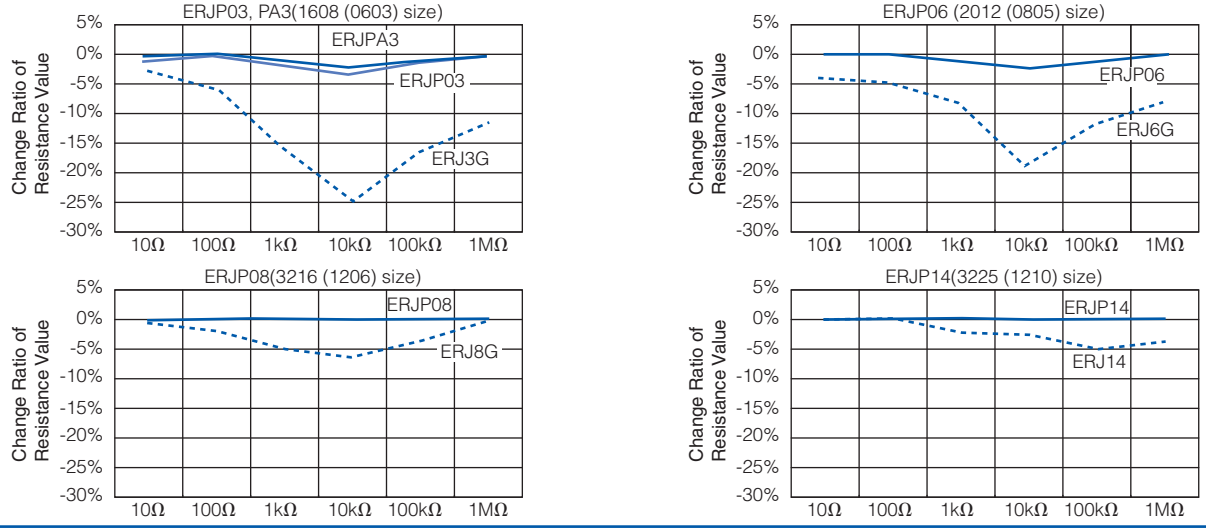
✻ When the temperature of ERJP14 is 155 °C or less, the derating start temperature can be changed to 125 °C. (See the dotted line)



ESD Characteristic



Anti-Surge Thick Film Chip Resistors(ERJP Type)
Thick Film Chip Resistors(ERJ Type)



Anti-Pulse Thick Film Chip Resistors

Type: ERJ T06, T08, T14

Features

- Anti-Pulse characteristics
  High pulse characteristics achieved by the optimized trimming specifications
- High reliability
  Metal glaze thick film resistive element and three layers of electrodes
- Suitable for both reflow and flow soldering
- High power ··· 0.25W : 0805 inch / 2012 mm size (ERJT06)
  0.33W : 1206 inch / 3216 mm size (ERJT08)
  0.50W : 1210 inch / 3225 mm size (ERJT14)
- Reference Standards···IEC 60115-8, JIS C 5201-8, EIAJ RC-2134B
- AEC-Q200 qualified
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**
Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11
E	R	J	T	0	6	J	1	0	0	V

Product Code
Thick Film Chip Resistors

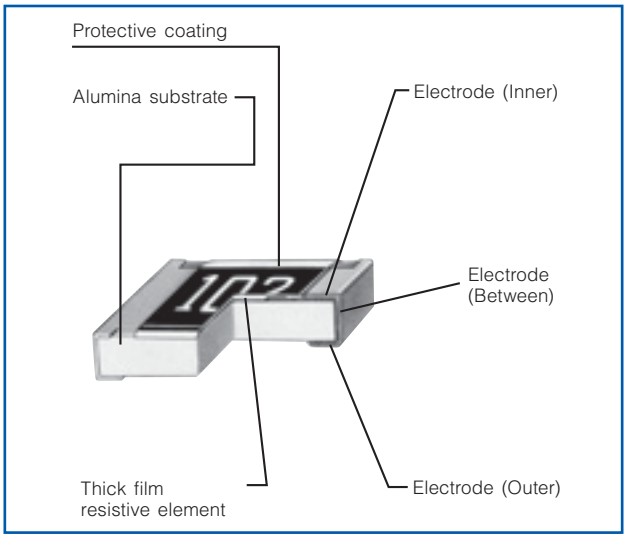
Size, Power Rating		
Code	Inch	Power R.
T06	0805	0.25 W
T08	1206	0.33 W
T14	1210	0.5 W

Resistance Tolerance	
Code	Tolerance
J	± 5 %

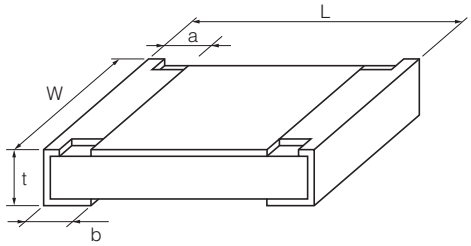
Packaging Methods		
Code	Packaging	Part No.
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJT06 ERJT08
U	Embossed Carrier Taping 4 mm pitch, 5,000 pcs.	ERJT14

Resistance Value
The first two digits are significant figures of resistance and the third one denotes number of zeros following. Example: 222→2.2 kΩ

Construction



Dimensions in mm (not to scale)



Part No. (inch size)	Dimensions (mm)					Mass (Weight) [g/1000 pcs.]
	L	W	a	b	t	
ERJT06 (0805)	$2.00^{\pm0.20}$	$1.25^{\pm0.10}$	$0.25^{\pm0.20}$	$0.40^{\pm0.20}$	$0.60^{\pm0.10}$	4
ERJT08 (1206)	$3.20^{+0.05}_{-0.20}$	$1.60^{+0.05}_{-0.15}$	$0.40^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	10
ERJT14 (1210)	$3.20^{\pm0.20}$	$2.50^{\pm0.20}$	$0.35^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	16

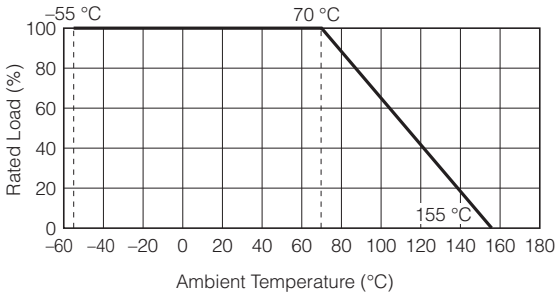
Ratings

Part No. (inch size)	Power Rating at 70 °C (W)	Limiting Element Voltage(1) (V)	Maximum Overload Voltage(2) (V)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. ($\times 10^{-6}$/°C)	Category Temperature Range (°C)
ERJT06 (0805)	0.25	150	200	±5	1 to 1 M (E24)	Less than 10 Ω : -100 to +600 Less than 33 Ω : ±300 More than 33 Ω : ±200	–55 to +155
ERJT08 (1206)	0.33	200	400	±5	1 to 1 M (E24)	Less than 10 Ω : -100 to +600 More than 10 Ω : ±200	–55 to +155
ERJT14 (1210)	0.50	200	400	±5	1 to 1 M (E24)	Less than 10 Ω : -100 to +600 More than 10 Ω : ±200	–55 to +155

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Values}}$, or Limiting Element Voltage listed above, whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 × RCWV or max. Overload Voltage listed above whichever less.

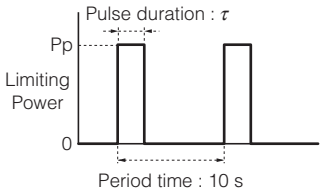
Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



Limiting Power Curve

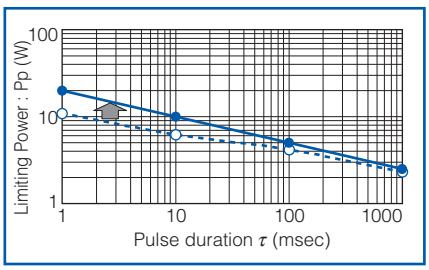
● In rush pulse Characteristic



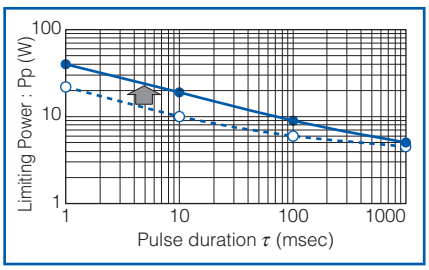
Test cycle : 1000 cycles
Spec : Resistance value = within ±5%

● : Anti-Pulse Thick Film Chip Resistors (ERJT Type)
○ : Thick Film Chip Resistors (ERJ Type)

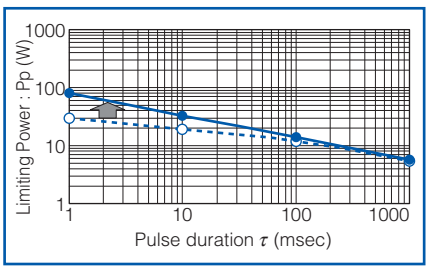
● **ERJT06** (0805 inch/2012 mm size)



● **ERJT08** (1206 inch/3216 mm size)



● **ERJT14** (1210 inch/3225 mm size)



Anti-Sulfurated Thick Film Chip Resistors

Type: **ERJ S02, S03, S06, S08, S14, S12, S1D, S1T (Au-based inner electrode type)**

Type: **ERJ U01, U02, U03, U06, U08, U14, U12, U1D, U1T, U6S, U6Q (Ag-Pd-based inner electrode type)**

Features

- High resistance to sulfurization achieved by adopting an Au-based inner electrode (ERJS type) and Ag-Pd-based inner electrode (ERJU type)
- High reliability
  Metal glaze thick film resistive element and three layers of electrodes
- Suitable for both reflow and flow soldering
- Low Resistance type···ERJU6S, U6Q : 0.1 Ω to 1.0 Ω
- Reference Standard···IEC 60115-8, JIS C 5201-8, EIAJ RC-2134B
- AEC-Q200 qualified (Exemption ERJU01)
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,** Please see Data Files

Explanation of Part Numbers

- ERJS0, S1, U0, U1 Type

1	2	3	4	5	6	7	8	9	10	11	12
E	R	J	S	0	6	F	1	0	0	2	V

Product Code
Thick Film Chip Resistors

Size, Power Rating

Code	Inch	Power R.	Code	Inch	Power R.
U01	0201	0.05 W	S14 U14	1210	0.5 W
S02 U02	0402	0.1 W	S12 U12	1812	0.75 W
S03 U03	0603	0.1 W	S1D U1D	2010	0.75 W
S06 U06	0805	0.125 W	S1T U1T	2512	1 W
S08 U08	1206	0.25 W			

Resistance Tolerance

Code	Tolerance
F	± 1 %
J	± 5 %
0	Jumper

Resistance Value
The first two or three digits are significant figures of resistance and the third or 4th one denotes number of zeros following. Jumper is expressed by R00.
Three digit type (±5%), four digit type (±1%)
Example: 222→2.2 kΩ, 1002→10 kΩ

Packaging Methods

Code	Packaging	Part No.
C	Pressed Carrier Taping 2 mm pitch, 15,000 pcs.	ERJU01
X	Punched Carrier Taping 2 mm pitch, 10,000 pcs.	ERJS02, ERJU02
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJS03, ERJU03 ERJS06, ERJU06 ERJS08, ERJU08
U	Embossed Carrier Taping 4 mm pitch, 5,000 pcs.	ERJS14, ERJU14 ERJS12, ERJU12 ERJS1D, ERJU1D
	Embossed Carrier Taping 4 mm pitch, 4,000 pcs.	ERJS1T, ERJU1T

- ERJU6S, U6Q Type

1	2	3	4	5	6	7	8	9	10	11
E	R	J	U	6	S	J	R	2	0	V

Product Code
Thick Film Chip Resistors

Size, Power Rating

Code	Inch	Power R.
U6	0805	0.25 W

Resistance Value

Code	Res. Value
S	0.1 Ω to 0.2 Ω
Q	0.22 Ω to 1 Ω

Resistance Tolerance

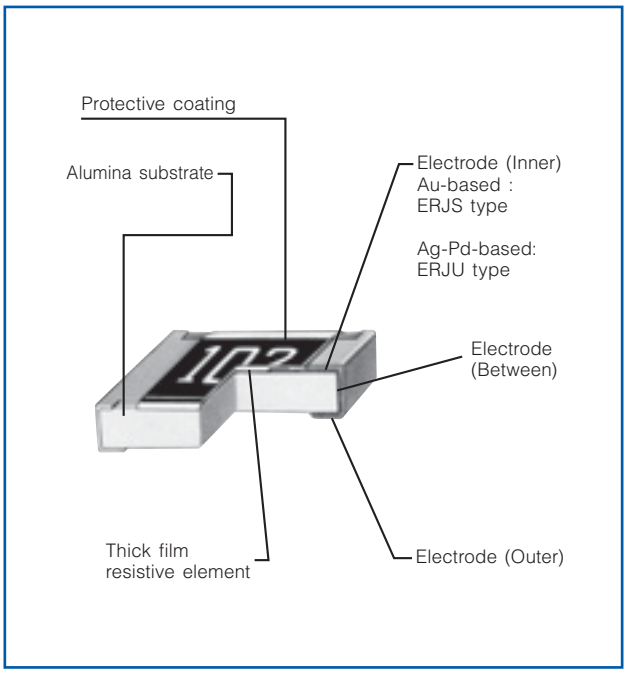
Code	Tolerance
F	±1 %
G	±2 %
J	±5 %

Resistance Value
Shown by 3 digits or letters.
(Example)
R20 : 0.20 Ω=200 mΩ
1R0 : 1.00 Ω=1000 mΩ

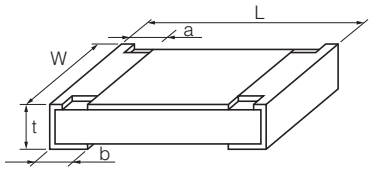
Packaging Methods

Code	Packaging	Part No.
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	ERJU6S ERJU6Q

Construction



Dimensions in mm (not to scale)



Part No. (inch size)	Dimensions (mm)					Mass (Weight) [g/1000 pcs.]
	L	W	a	b	t	
ERJU01 (0201)	$0.60^{\pm0.03}$	$0.30^{\pm0.03}$	$0.10^{\pm0.05}$	$0.15^{\pm0.05}$	$0.23^{\pm0.03}$	0.15
ERJS02 ERJU02 (0402)	$1.00^{\pm0.05}$	$0.50^{\pm0.05}$	$0.20^{\pm0.10}$	$0.25^{\pm0.10}$	$0.35^{\pm0.05}$	0.8
ERJS03 ERJU03 (0603)	$1.60^{\pm0.15}$	$0.80^{+0.15}_{-0.05}$	$0.30^{\pm0.20}$	$0.30^{\pm0.15}$	$0.45^{\pm0.10}$	2
ERJS06 ERJU06 (0805)	$2.00^{\pm0.20}$	$1.25^{\pm0.10}$	$0.40^{\pm0.20}$	$0.40^{\pm0.20}$	$0.60^{\pm0.10}$	4
ERJU6□ (0805)	$2.00^{\pm0.20}$	$1.25^{\pm0.10}$	$0.45^{\pm0.20}$	$0.45^{\pm0.20}$	$0.55^{\pm0.10}$	6
ERJS08 ERJU08 (1206)	$3.20^{+0.05}_{-0.20}$	$1.60^{+0.05}_{-0.15}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	10
ERJS14 ERJU14 (1210)	$3.20^{\pm0.20}$	$2.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	16
ERJS12 ERJU12 (1812)	$4.50^{\pm0.20}$	$3.20^{\pm0.20}$	$0.50^{\pm0.20}$	$0.50^{\pm0.20}$	$0.60^{\pm0.10}$	27
ERJS1D ERJU1D (2010)	$5.00^{\pm0.20}$	$2.50^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.10}$	27
ERJS1T ERJU1T (2512)	$6.40^{\pm0.20}$	$3.20^{\pm0.20}$	$0.65^{\pm0.20}$	$0.60^{\pm0.20}$	$0.60^{\pm0.10}$	45

Ratings

Part No. (inch size)	PowerRating at 70 °C (W)	Limiting Element Voltage(1) (V)	Maximum Overload Voltage(2) (V)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. ($\times10^{-6}$/°C)	Category Temperature Range (°C)
ERJU01 (0201)	0.05	25	50	±1	10 to 1 M (E24, E96)	<10 Ω: –100 to +600 10 Ω to 1 MΩ: ±200(±5%) ±100(±1%)* *ERJU01, ERJS02, ERJU02 : ±200 1 MΩ<: –400 to +150	-55 to +125
				±5	1 to 1 M (E24)		
ERJS02 ERJU02 (0402)	0.1	50	100	±1	10 to 1 M (E24, E96)		-55 to +155
				±5	1 to 3.3 M (E24)		
ERJS03 ERJU03 (0603)	0.1	75	150	±1	10 to 1 M (E24, E96)		-55 to +155
				±5	1 to 10 M (E24)		
ERJS06 ERJU06 (0805)	0.125	150	200	±1	10 to 1 M (E24, E96)		-55 to +155
				±5	1 to 10 M (E24)		
ERJS08 ERJU08 (1206)	0.25	200	400	±1	10 to 1 M (E24, E96)		-55 to +155
				±5	1 to 10 M (E24)		
ERJS14 ERJU14 (1210)	0.5	200	400	±1	10 to 1 M (E24, E96)		-55 to +155
				±5	1 to 10 M (E24)		
ERJS12 ERJU12 (1812)	0.75	200	500	±1	10 to 1 M (E24, E96)		-55 to +155
				±5	1 to 10 M (E24)		
ERJS1D ERJU1D (2010)	0.75	200	500	±1	10 to 1 M (E24, E96)		-55 to +155
				±5	1 to 10 M (E24)		
ERJS1T ERJU1T (2512)	1.0	200	500	±1	10 to 1 M (E24, E96)		-55 to +155
				±5	1 to 10 M (E24)		

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Values}}$, or Limiting Element Voltage listed above, whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 × RCWV or max. Overload Voltage listed above whichever less.

[Low Resistance type]

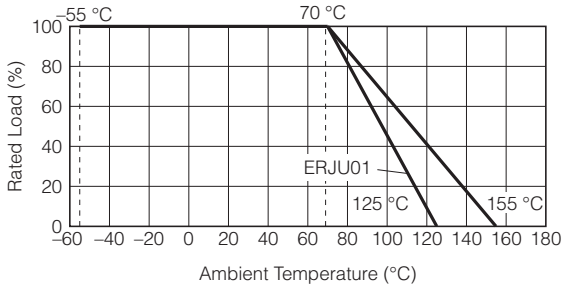
Part No. (inch size)	PowerRating at 70 °C (W)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. ($\times10^{-6}$/°C)	Category Temperature Range (°C)
ERJU6S (0805)	0.25	±1, ±2, ±5	0.1 to 0.2 (E24)	±150	-55 to +155
ERJU6Q (0805)			0.22 to 1 (E24)		

[For Jumper]

Part No. (inch size)	Rated Current (A)	Maximum Overload Current (A)
ERJU01 (0201)	0.5	1
ERJS02 ERJU02 (0402)	1	2
ERJS03 ERJU03 (0603)		
ERJS06 ERJU06 (0805)	2	4
ERJS08 ERJU08 (1206)		
ERJS14 ERJU14 (1210)		
ERJS12 ERJU12 (1812)		
ERJS1D ERJU1D (2012)		
ERJS1T ERJU1T (2512)		

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure below.



Anti-Sulfurated High Power Chip Resistors / Wide Terminal Type

Type: **ERJ C1**

Features

- High resistance to sulfurization achieved by adopting Anti-Sulfurated electrode structure and material
- High solder-joint reliability by wide terminal construction
- Excellent heat dissipation characteristics by wide terminal construction
- AEC-Q200 qualified
- RoHS compliant

Recommended Applications

- Motor control circuit of the industrial equipment
- Automotive electronic circuits including ECUs (Electrical control unit), anti-lock breaking systems and air-bag systems
- Current sensing for power supply circuits in a variety of equipment

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,** Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11
E	R	J	C	1	C	F	R	1	0	U

Product Code

Thick Film Chip Resistors

Size, Power Rating

Code	Inch	Power R.
C1	1020	2 W

Resistance Value Region

B	220 mΩ ≦ R ≦ 1 Ω
C	10 mΩ ≦ R < 220 mΩ

Resistance Tolerance

F	± 1 %
J	± 5 %

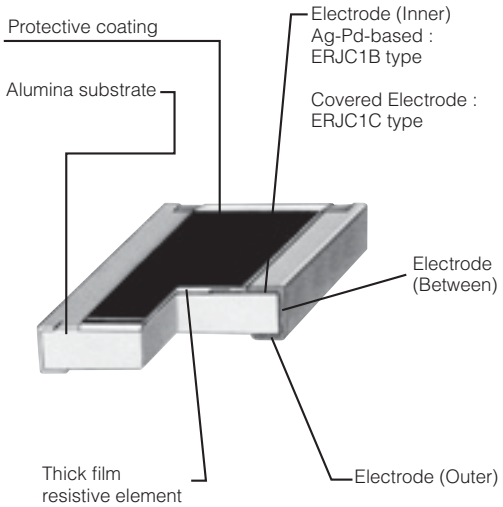
Packaging Methods

Code	Packaging	Part No.
U	Embossed Carrier Taping 4 mm pitch, 5,000 pcs.	ERJC1

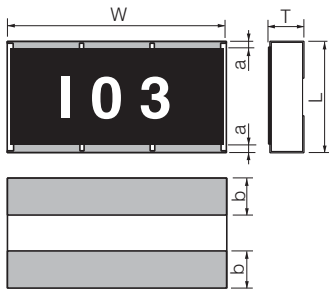
Resistance Value

Shown by 3 digits or letters. Only when it is impossible, shown by 4 digits or letters.
(ex.) R01 : 0.01 Ω = 10 mΩ R015 : 0.015 Ω = 15 mΩ

Construction



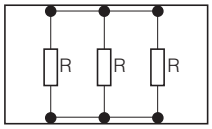
Dimensions in mm (not to scale)



Part No. (inch size)	Dimensions (mm)					Mass (Weight) [g/1000 pcs.]
	L	W	T	a	b	
ERJC1B (1020)	2.50±0.20	5.00±0.20	0.55±0.20	0.35±0.20	0.90±0.20	27
ERJC1C (1020)				0.60±0.20		

Circuit Configuration

Type ERJC1



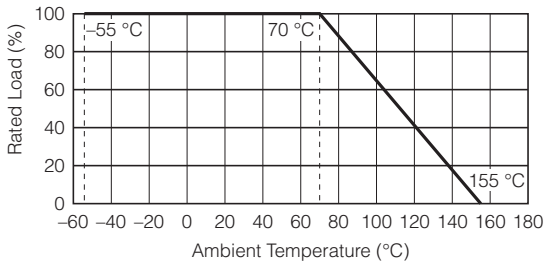
Ratings

Part No. (inch size)	Power Rating at 70 °C (1) (W)	Resistance Tolerance (%)	Resistance Range (Ω)	T.C.R. (×10^{-6}/°C)	Category Temperature Range (°C)
ERJC1 (1020)	2	±1	10 m to 1 (E24)	10 mΩ ≦ R < 22 mΩ : ±350 22 mΩ ≦ R < 47 mΩ : ±200 47 mΩ ≦ R < 100 mΩ : ±150 100 mΩ ≦ R ≦ 1 Ω : ±100	–55 to +155
		±5		10 mΩ ≦ R < 22 mΩ : ±350 22 mΩ ≦ R < 1 Ω : ±200	

(1) Use it on the condition that the case temperature is below 155 °C.

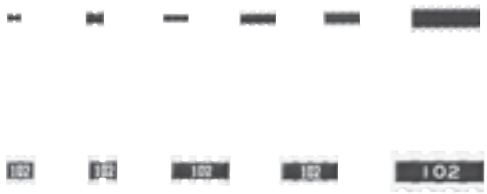
Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



Chip Resistor Array

Type: **EXB 14V, 18V, 24V, 28V, N8V, 2HV, 34V, V4V, 38V, V8V, S8V**



Features

- High density
  2 resistors in 0.8 mm × 0.6 mm size / 0302 inch size : EXB14V
  4 resistors in 1.4 mm × 0.6 mm size / 0502 inch size : EXB18V
  2 resistors in 1.0 mm × 1.0 mm size / 0404 inch size : EXB24V
  4 resistors in 2.0 mm × 1.0 mm size / 0804 inch size : EXB28V, EXBN8V
  8 resistors in 3.8 mm × 1.6 mm size / 1506 inch size : EXB2HV
  2 resistors in 1.6 mm × 1.6 mm size / 0606 inch size : EXB34V, EXBV4V
  4 resistors in 3.2 mm × 1.6 mm size / 1206 inch size : EXB38V, EXBV8V
  4 resistors in 5.1 mm × 2.2 mm size / 2009 inch size : EXBS8V
- Improvement of placement efficiency
  Placement efficiency of Chip Resistor Array is two, four or eight times of the flat type chip resistor
- Reference Standard…IEC 60115-9, JIS C 5201-9, EIAJ RC-2129
- AEC-Q200 qualified (EXB2, EXB3)
- RoHS compliant

■ As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions, Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11
E	X	B	V	8	V	4	7	2	J	V

Product Code

Thick Film Chip Resistor Networks

Size and construction

Code	Inch	Terminal type
1	0201 Array	Convex/ Flat Terminal
2	0402 Array	Convex Terminal
3	0603 Array	
N	0402 Array	Concave Terminal
V	0603 Array	
S	0805 Array	

No. of Terminal

4	4 Terminal
8	8 Terminal
H	16 Terminal

Schematics

V	Isolated type

Resistance Value

The first two digits are significant figures of resistance value and the third one denotes the number of zeros following. Jumper is expressed by R00

Example : 222 → 2.2 kΩ

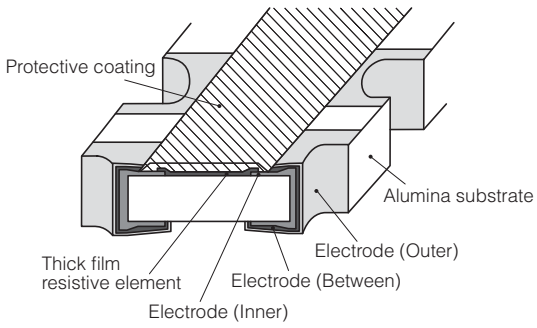
Resistance Tolerance

J	±5 %
0	Jumper

Packaging Methods

Code	Packaging	Part No.
Nil	Embossed Carrier Taping 4 mm pitch, 2,500 pcs.	EXBS8V
X	Punched Carrier Taping 2 mm pitch, 10,000 pcs.	EXB14V, 18V, 24V, 28V, N8V
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	EXB2HV, 34V, 38V, V4V, V8V

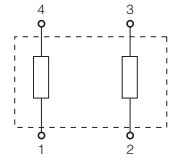
Construction (Example : Concave Terminal)



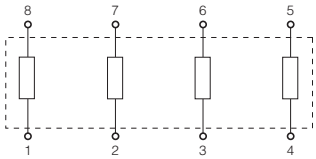
Schematics

- Isolated type

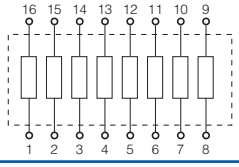
14V, 24V, 34V, V4V — 2 resistors



18V, 28V, N8V, 38V, V8V, S8V — 4 resistors



2HV — 8 resistors



Ratings

Item		Specifications
Resistance Range		10 Ω to 1 MΩ : E24 series
Resistance Tolerance		J : ±5 %
Number of Terminals	14V,24V,V4V,34V	4 terminal
	18V,28V,N8V,38V,V8V,S8V	8 terminal
	2HV	16 terminal
Number of Resistors	14V,24V,V4V,34V	2 element
	18V,28V,N8V,38V,V8V,S8V	4 element
	2HV	8 element
Power Rating at 70 °C	14V,N8V	0.031 W/element
	18V	0.031 W/element (0.1 W/package)
	24V,28V,V4V,34V,V8V,38V	0.063 W/element
	S8V	0.1 W/element
	2HV	0.063 W/element (0.25 W/package)

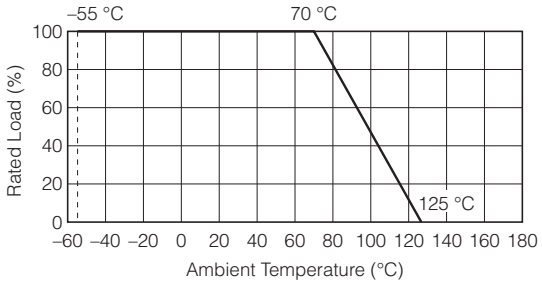
Item		Specifications
Limiting Element Voltage(1)	14V,18V	12.5 V
	2HV	25 V
	24V,28V,N8V,38V,34V,V4V,V8V	50 V
	S8V	100 V
Maximum Overload Voltage (2)	14V,18V	25 V
	2HV	50 V
	24V,28V,N8V,38V,34V,V4V,V8V	100 V
	S8V	200 V
T.C.R.		±200×10^{-6}/°C
Category Temperature Range		–55 °C to 125 °C
Jumper Array — Rated Current	14V,18V	0.5 A
	2HV,24V,28V,N8V,38V,34V,V4V,V8V	1 A
	S8V	2 A
Jumper Array — Maximum Overload Current	14V,18V	1 A
	2HV,24V,28V,N8V,38V,34V,V4V,V8V	2 A
	S8V	4 A

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Value}}$, or Limiting Element Voltage listed above, whichever less.

(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 × RCWV or max. Overload Voltage listed above whichever less.

Power Derating Curve

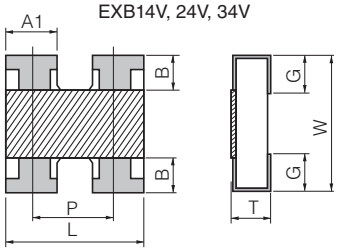
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



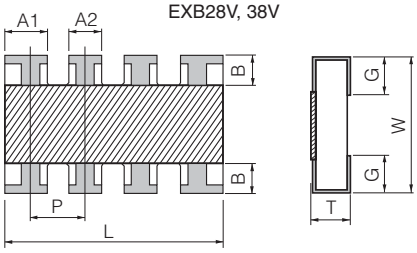
Dimensions in mm (not to scale)

(1) Convex Terminal type

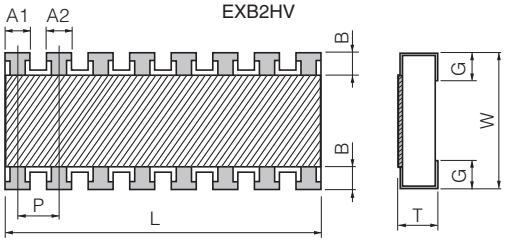
EXB14V, 24V, 34V



EXB28V, 38V



EXB2HV

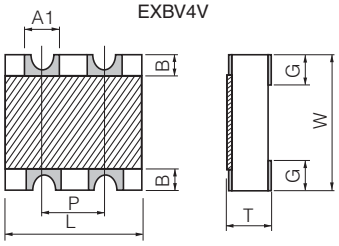


Part No. (inch size)	Dimensions (mm)								Mass (Weight) [g/1000 pcs.]
	L	W	T	A1	A2	B	P	G	
EXB14V (0201×2)	$0.80^{\pm0.10}$	$0.60^{\pm0.10}$	$0.35^{\pm0.10}$	$0.35^{\pm0.10}$	—	$0.15^{\pm0.10}$	(0.50)	$0.15^{\pm0.10}$	0.5
EXB24V (0402×2)	$1.00^{\pm0.10}$	$1.00^{\pm0.10}$	$0.35^{\pm0.10}$	$0.40^{\pm0.10}$	—	$0.18^{\pm0.10}$	(0.65)	$0.25^{\pm0.10}$	1.2
EXB28V (0402×4)	$2.00^{\pm0.10}$	$1.00^{\pm0.10}$	$0.35^{\pm0.10}$	$0.45^{\pm0.10}$	$0.35^{\pm0.10}$	$0.20^{\pm0.10}$	(0.50)	$0.25^{\pm0.10}$	2.0
EXB2HV (0402×8)	$3.80^{\pm0.10}$	$1.60^{\pm0.10}$	$0.45^{\pm0.10}$	$0.35^{\pm0.10}$	$0.35^{\pm0.10}$	$0.30^{\pm0.10}$	(0.50)	$0.30^{\pm0.10}$	9.0
EXB34V (0603×2)	$1.60^{\pm0.20}$	$1.60^{\pm0.15}$	$0.50^{\pm0.10}$	$0.65^{\pm0.15}$	—	$0.30^{\pm0.20}$	(0.80)	$0.30^{\pm0.20}$	3.5
EXB38V (0603×4)	$3.20^{\pm0.20}$	$1.60^{\pm0.15}$	$0.50^{\pm0.10}$	$0.65^{\pm0.15}$	$0.45^{\pm0.15}$	$0.30^{\pm0.20}$	(0.80)	$0.35^{\pm0.20}$	7.0

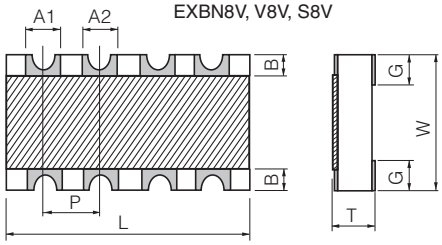
( ) Reference

(2) Concave Terminal type

EXBV4V



EXBN8V, V8V, S8V

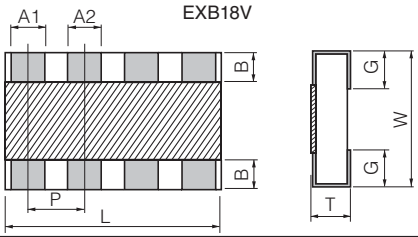


Part No. (inch size)	Dimensions (mm)								Mass (Weight) [g/1000 pcs.]
	L	W	T	A1	A2	B	P	G	
EXBN8V (0402×4)	$2.00^{\pm0.10}$	$1.00^{\pm0.10}$	$0.45^{\pm0.10}$	$0.30^{\pm0.10}$	$0.30^{\pm0.10}$	$0.20^{\pm0.15}$	(0.50)	$0.30^{\pm0.15}$	3.0
EXBV4V (0603×2)	$1.60^{+0.20}_{-0.10}$	$1.60^{+0.20}_{-0.10}$	$0.60^{\pm0.10}$	$0.60^{\pm0.10}$	—	$0.30^{\pm0.15}$	(0.80)	$0.45^{\pm0.15}$	5.0
EXBV8V (0603×4)	$3.20^{+0.20}_{-0.10}$	$1.60^{+0.20}_{-0.10}$	$0.60^{\pm0.10}$	$0.60^{\pm0.10}$	$0.60^{\pm0.10}$	$0.30^{\pm0.15}$	(0.80)	$0.45^{\pm0.15}$	10
EXBS8V (0805×4)	$5.08^{+0.20}_{-0.10}$	$2.20^{+0.20}_{-0.10}$	$0.70^{\pm0.20}$	$0.80^{\pm0.15}$	$0.80^{\pm0.15}$	$0.50^{\pm0.15}$	(1.27)	$0.55^{\pm0.15}$	30

( ) Reference

(3) Flat Terminal type

EXB18V



Part No. (inch size)	Dimensions (mm)								Mass (Weight) [g/1000 pcs.]
	L	W	T	A1	A2	B	P	G	
EXB18V (0201×4)	1.40±0.10	0.60±0.10	0.35±0.10	0.20±0.10	0.20±0.10	0.10±0.10	(0.40)	0.20±0.10	1.0

( ) Reference

Metal Film Chip Resistor Array

Type: **ERA38V**

Features

- High accuracy ····· Small resistance tolerance and Temperature Coefficient of Resistance (T.C.R.)
- High reliability ····· Stable at high temperature and humidity
  (85 °C 85 % RH rated load, Category temperature range : –55 to +155 °C)
- High performance ····· Low current noise, excellent non-linearity
- Customize ····· Different resistance values are available. Please contact us for details.
- AEC-Q200 qualified
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,** Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	R	A	3	8	V	W	X	1	0	0	1

Product Code
Metal Film Chip Resistors

Size and construction		
Code	Inch	Terminal type
3	0603 Array (1206)	Convex Terminal

No. of Terminal	
Code	No. of Terminal
8	8 Terminals

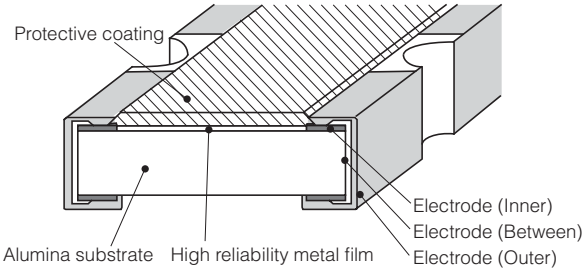
Circuit Schematics	
Code	Type
V	Isolated type

T.C.R.		
Code	Absolute	Tracking
W	±25×10^{-6}/° C	10×10^{-6}/° C
V	±25×10^{-6}/° C	15×10^{-6}/° C
U	±25×10^{-6}/° C	25×10^{-6}/° C

Resistance Tolerance		
Code	Absolute	Tracking
X	±0.1 %	0.1 %
Y	±0.25 %	0.25 %
Z	±0.5 %	0.5 %

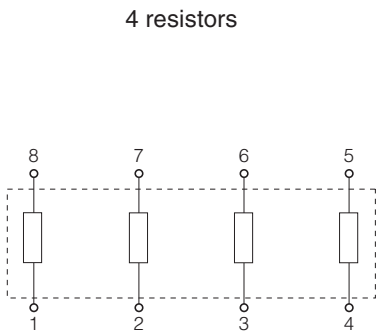
Resistance Value
The first three digits are significant figures of resistance and the fourth one denotes number of zeros following. (example) 1001: 1 kΩ

Construction



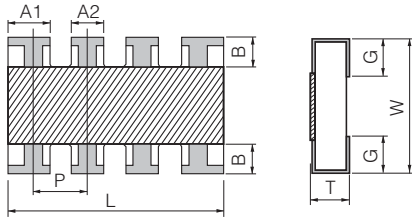
Schematics

- Isolated type



Dimensions in mm (not to scale)

Convex Terminal type



1206 inch size

Dimensions (mm)	L	W	T	A_1
	3.20±0.20	1.60±0.15	0.50±0.10	0.65±0.15

Dimensions (mm)	A_2	B	P	G
	0.45±0.15	0.30±0.20	(0.80)	0.35±0.20

Mass (Weight) [g/1000 pcs.] : 7.0 g

( ) Reference

Ratings

Part No. (inch size)	Power Rating at 70 °C (W)	Limiting Element Voltage(1) (V)	Maximum Overload Voltage(2) (V)	T.C.R. (Absolute) T.C.R. (Tracking) (×10^{-6}/°C)	Resistance Tolerance (Absolute) Resistance Tolerance (Relative) (%)	Resistance Range(3) (Ω)	Category Temperature Range (°C)
ERA38V (0603×4)	0.063/ element	75	150	Absolute : ±25 Tracking : 25 (U)	Absolute : ±0.5 Relative : 0.5 (Z)	100 to 39 k (E24)	–55 to +155
				Absolute : ±25 Tracking : 15 (V)	Absolute : ±0.25 Relative : 0.25 (Y)	1k to 39 k (E24)	
				Absolute : ±25 Tracking : 10 (W)	Absolute : ±0.1 Relative : 0.1 (X)		

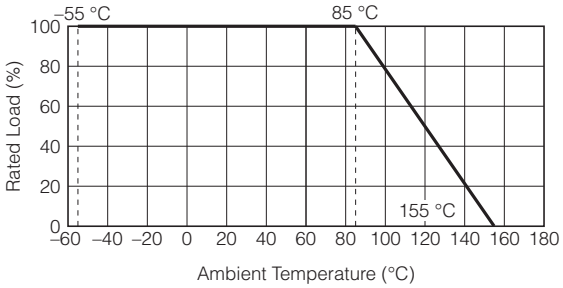
(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Value}}$, or Limiting Element Voltage listed above, whichever less.

(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 × RCWV or max. Overload Voltage listed above whichever less.

(3) E96 series resistance values are also available. Please contact us for details.

Power Derating Curve

For resistors operated in ambient temperatures above 85 °C, power rating shall be derated in accordance with the figure on the right.



Anti-Sulfurated Chip Resistor Array

Type: EXB U24, U28, U2H, U34, U38

Features

- High resistance to sulfurization achieved by adopting an Ag-Pd-based inner electrode
- High density
  2 resistors in 1.0 mm × 1.0 mm size / 0404 inch size : EXBU24
  4 resistors in 2.0 mm × 1.0 mm size / 0804 inch size : EXBU28
  8 resistors in 3.8 mm × 1.6 mm size / 1506 inch size : EXBU2H
  2 resistors in 1.6 mm × 1.6 mm size / 0606 inch size : EXBU34
  4 resistors in 3.2 mm × 1.6 mm size / 1206 inch size : EXBU38
- Improvement of placement efficiency
  Placement efficiency of Chip Resistor Array is two, four or eight times of the flat type chip resistor
- Reference Standard···IEC 60115-9, JIS C 5201-9, EIAJ RC-2129
- AEC-Q200 qualified
- RoHS compliant

■ As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions, Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11
E	X	B	U	2	8	4	7	2	J	X

Product Code

Thick Film Chip Resistor Networks

Size, Construction

Code	Inch
U2	0402 Array
U3	0603 Array
Anti-Sulfuarted Convex Terminal	

No. of Terminal

4	4 Terminal
8	8 Terminal
H	16 Terminal

Resistance Value

The first two digits are significant figures of resistance value and the third one denotes the number of zeros following. Jumper is expressed by R00

Example : 222 → 2.2 kΩ

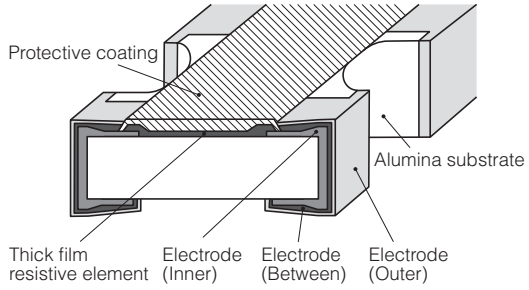
Resistance Tolerance

J	±5 %
0	Jumper

Packaging Methods

Code	Packaging	Part No.
X	Punched Carrier Taping 2 mm pitch, 10,000 pcs.	EXBU24, U28
V	Punched Carrier Taping 4 mm pitch, 5,000 pcs.	EXBU2H, U34, U38

Construction

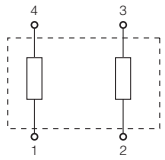


Schematics

● Isolated type

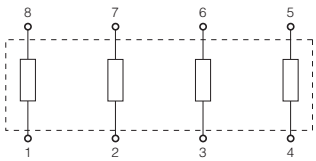
EXBU24, U34

2 resistors



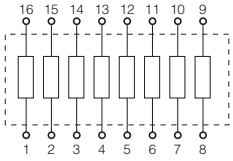
EXBU28, U38

4 resistors



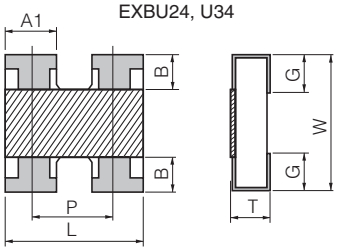
EXBU2H

8 resistors

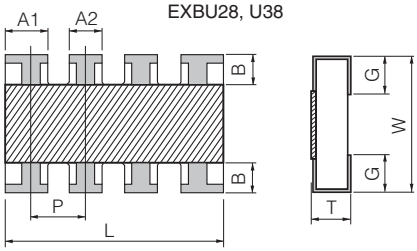


Dimensions in mm (not to scale)

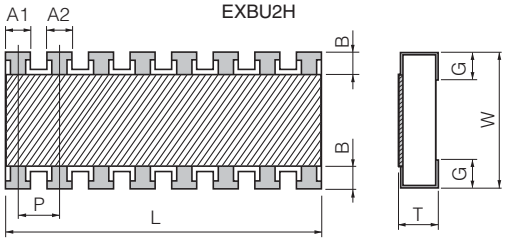
EXBU24, U34



EXBU28, U38



EXBU2H



Part No. (inch size)	Dimensions (mm)								Mass (Weight) [g/1000 pcs.]
	L	W	T	A1	A2	B	P	G	
EXBU24 (0402×2)	$1.00^{\pm0.10}$	$1.00^{\pm0.10}$	$0.35^{\pm0.10}$	$0.40^{\pm0.10}$	—	$0.18^{\pm0.10}$	(0.65)	$0.25^{\pm0.10}$	1.2
EXBU28 (0402×4)	$2.00^{\pm0.10}$	$1.00^{\pm0.10}$	$0.35^{\pm0.10}$	$0.45^{\pm0.10}$	$0.35^{\pm0.10}$	$0.20^{\pm0.10}$	(0.50)	$0.25^{\pm0.10}$	2.0
EXBU2H (0402×8)	$3.80^{\pm0.10}$	$1.60^{\pm0.10}$	$0.45^{\pm0.10}$	$0.35^{\pm0.10}$	$0.35^{\pm0.10}$	$0.30^{\pm0.10}$	(0.50)	$0.30^{\pm0.10}$	9.0
EXBU34 (0603×2)	$1.60^{\pm0.20}$	$1.60^{\pm0.15}$	$0.50^{\pm0.10}$	$0.65^{\pm0.15}$	—	$0.30^{\pm0.20}$	(0.80)	$0.30^{\pm0.20}$	3.5
EXBU38 (0603×4)	$3.20^{\pm0.20}$	$1.60^{\pm0.15}$	$0.50^{\pm0.10}$	$0.65^{\pm0.15}$	$0.45^{\pm0.15}$	$0.30^{\pm0.20}$	(0.80)	$0.35^{\pm0.20}$	7.0

( ) Reference

Ratings

Item		Specifications
Resistance Range		10 Ω to 1 MΩ E24 series
Resistance Tolerance		J: ±5 %
Number of Terminals	U24, U34	4 terminal
	U28, U38	8 terminal
	U2H	16 element
Number of Resistors	U24, U34	2 element
	U28, U38	4 element
	U2H	8 element
Power Rating at 70 °C	U24, U28, U34, U38	0.063 W/element
	U2H	0.063 W/element (0.25 W/package)

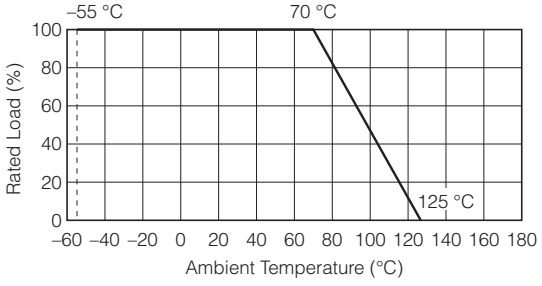
Item		Specifications
Limiting Element Voltage(1)	U2H	25 V
	U24, U28, U34, U38	50 V
Max. Overload Voltage (2)	U2H	50 V
	U24, U28, U34, U38	100 V
T.C.R.		$\pm200\times10^{-6}$/°C
Category Temperature Range		–55 °C to 125 °C
Jumper Array — Rated Current	U24, U28, U2H, U34, U38	1 A
Jumper Array — Max. Overload Current	U24, U28, U2H, U34, U38	2 A

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Value}}$, or Limiting Element Voltage listed above, whichever less.

(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5 × RCWV or max. Overload Voltage listed above whichever less.

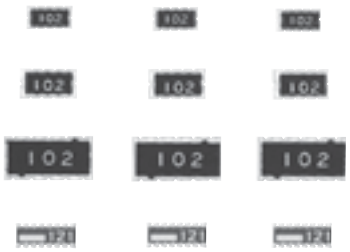
Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



Chip Resistor Networks

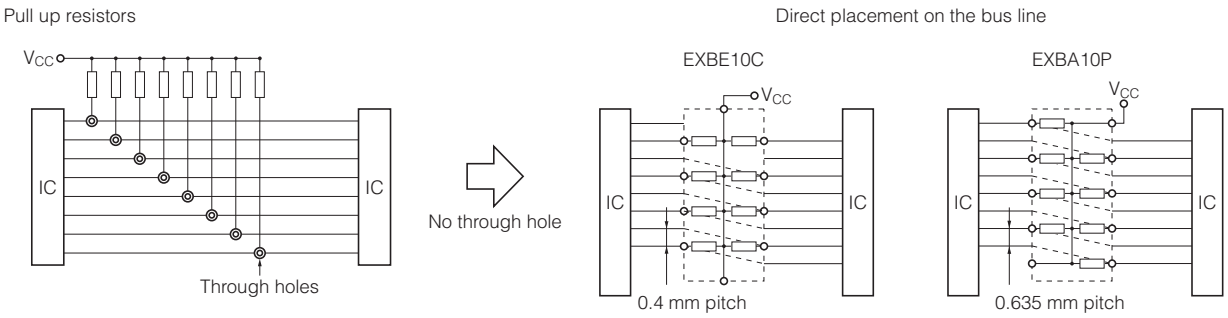
Type: **EXBD**
EXBE
EXBA
EXBQ



Features

- High density placing for digital signal circuits
  - · Bussed 8 or 15 resistors for pull up/down circuits
    EXBD: 3.2 mm × 1.6 mm × 0.55 mm, 0.635 mm pitch
    EXBE: 4.0 mm × 2.1 mm × 0.55 mm, 0.8 mm pitch
    EXBA: 6.4 mm × 3.1 mm × 0.55 mm, 1.27 mm pitch
    EXBQ: 3.8 mm × 1.6 mm × 0.45 mm, 0.5 mm pitch
  - · Available direct placing on the bus line by means of half pitch spacing without through-holes on PWB ("High density placing" is shown below)
- High speed mounting using conventional placing machine
- Reference Standard…IEC 60115-9, JIS C 5201-9, EIAJ RC-2130
- RoHS compliant

[High density placing]



■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**
Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	X	B	E	1	0	C	1	0	3	J	

Product Code

Thick Film Resistor Network

Dimension Code of Chip Resistor Network

Code	Inch	Dimensions
D	1206	3.2 mm×1.6 mm
E	1608	4.0 mm×2.1 mm
A	2512	6.4 mm×3.1 mm
Q	1506	3.8 mm×1.6 mm

Number of Terminals

10(EXBD,E,A)
16(EXBQ)

Circuit Configuration

Code	Common Terminal Position
C	Center common circuit (EXBD, EXBE)
P	Diagonal common circuit (Terminal 5 and Terminal 10) (EXBA)
P	One side common circuit (Terminal 16) (EXBQ)
E	Diagonal common circuit (Terminal 1 and Terminal 6) (EXBA)

Resistance Value

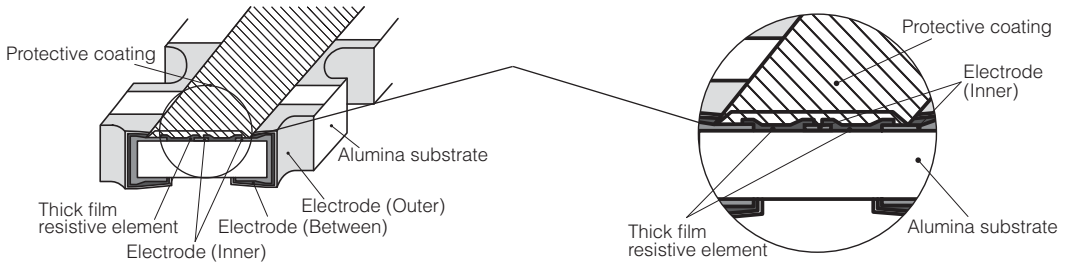
The first two digits are significant figures of resistance value and the third one denotes the number of zeros following.

Resistance Tolerance

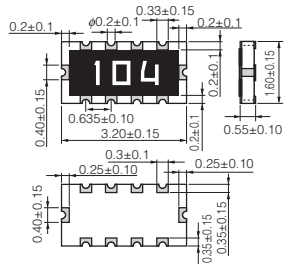
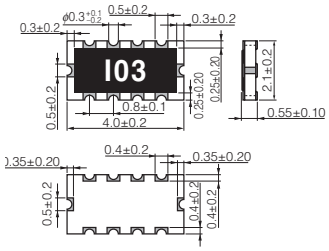
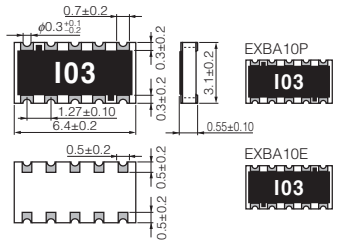
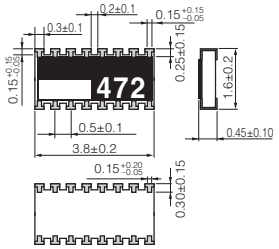
J	±5 %

Suffix for Special Requirements

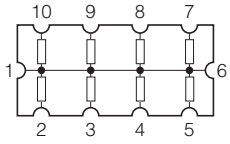
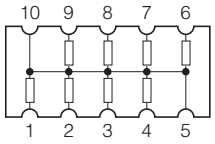
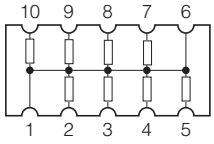
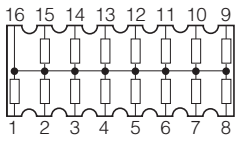
Construction (Example : EXBD)



Dimensions in mm (not to scale)

EXBD	EXBE	EXBA	EXBQ
			
Mass (Weight)[1000 pcs.] : 10 g	Mass (Weight)[1000 pcs.] : 16 g	Mass (Weight)[1000 pcs.] : 40 g	Mass (Weight)[1000 pcs.] : 9 g

Circuit Configuration

EXBD, EXBE	EXBA		EXBQ
	EXBA10P	EXBA10E	
			

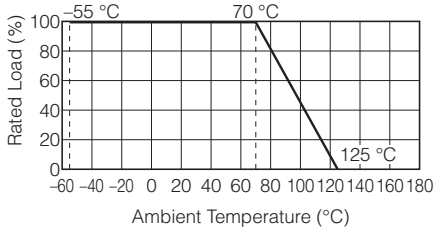
Ratings

Item	Specifications			
Series	EXBD	EXBE	EXBA	EXBQ
Resistance Range	47 Ω to 1 MΩ (E12)			100 Ω to 470 kΩ (E6 series)
Resistance Tolerance	±5%			
Number of Terminals	10 terminals			16 terminals
Number of Resistors	8 element			15 element
Power Rating at 70 °C	0.05 W/element	0.063 W/element		0.025 W/element
Limiting Element Voltage(1)	25V		50 V	25V
Maximum Overload Voltage(2)	50 V		100 V	50 V
T. C. R.	±200 × 10^{-6}/ °C			
Category Temperature Range	–55 °C to +125 °C			

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Value}}$, or Limiting Element Voltage listed above, whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determinedfrom SOTV=2.5 × RCWV* or Maximum Overload Voltage listed above whichever less.

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



Chip Attenuator

Type: **EXB 14AT**
EXB 24AT

Features

- Unbalanced π type attenuator circuit in one chip
  EXB14AT (0.8 mm × 0.6 mm), EXB24AT (1.0 mm × 1.0 mm)
- Reduced mounting area :
  EXB14AT : About 60 % smaller than the area of an attenuator circuit consisting of three 0603 chip resistors, almost equal to the area of three 0402 chip resistors
  EXB24AT : About 50 % smaller than the area of an attenuator circuit consisting of three 1005 chip resistors, almost equal to the area of three 0603 chip resistors
- Mounting cost reduction : (Only 1 chip placed as compared to 3)
- Attenuation : 1 dB to 10 dB
- RoHS compliant

Recommended Applications

- Attenuation / level control / impedance matching of high frequency
  (communication signalling equipment cellular phones(GSM, CDMA, PDC, etc.), PHS, PDAs)

■ As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,
Please see Data Files

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	X	B	1	4	A	T	3	A	R	3	X

Product Code
Thick Film Resistor Network

Code	Dimensions and Circuit Configuration
14AT	0.8 mm × 0.6 mm (inch size : 0302) π type attenuator
24AT	1.0 mm × 1.0 mm (inch size : 0404) π type attenuator

Attenuation Value
One-digit number /one letter shows attenuation value
(ex.) 1→1 dB, A→10 dB

Characteristics Impedance

A	50 Ω

Tolerance

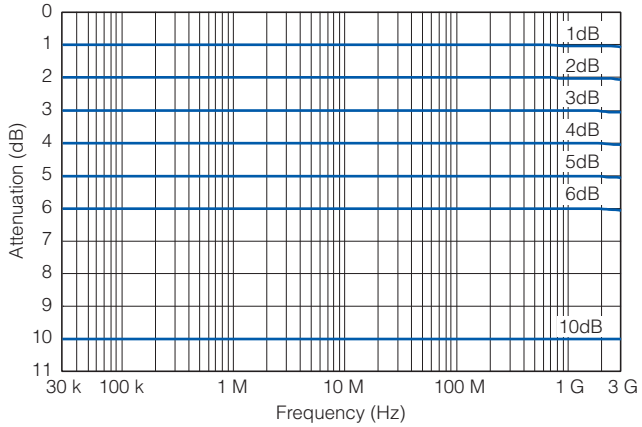
R3	±0.3 dB
R5	±0.5 dB

Packaging

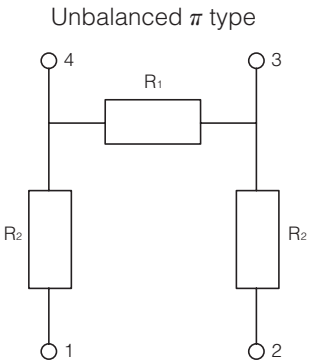
X	Punched Carrier Taping 2 mm pitch, 10,000 pcs.

Attenuation-Frequency Characteristics

(EXB14AT, EXB24AT)

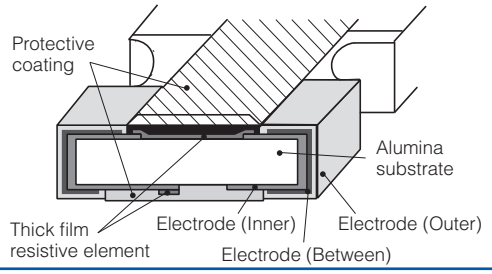


Circuit Configuration

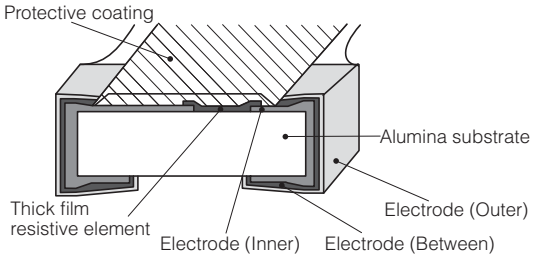


Construction

EXB14AT

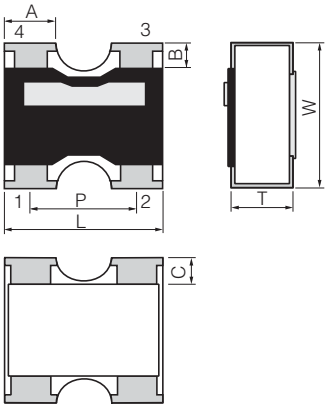


EXB24AT



Dimensions in mm (not to scale)

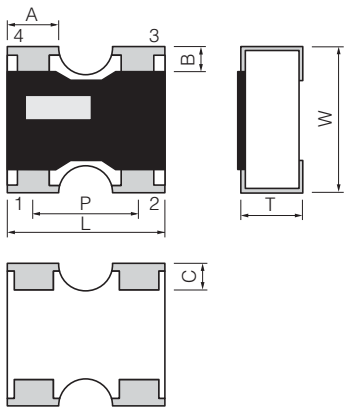
EXB14AT



Dimensions (mm)	L	W	T	A	B	C	P (typical value)
	$0.80^{\pm0.10}$	$0.60^{\pm0.10}$	$0.35^{\pm0.10}$	$0.35^{\pm0.10}$	$0.15^{\pm0.10}$	$0.15^{\pm0.10}$	0.50

<Marking Configuration>
The bar marking for recognizing terminal direction is located on the side of terminal 3, 4.
Mass (Weight) [1000 pcs.] : 0.7 g

EXB24AT



Dimensions (mm)	L	W	T	A	B	C	P (typical value)
	$1.00^{\pm0.10}$	$1.00^{\pm0.10}$	$0.35^{\pm0.10}$	$0.40^{\pm0.10}$	$0.15^{\pm0.10}$	$0.25^{\pm0.10}$	0.65

<Marking Configuration>
The bar marking for recognizing terminal direction is located on the side of terminal 4.
Mass (Weight) [1000 pcs.] : 1.1 g

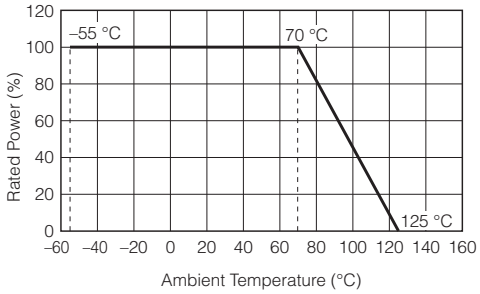
Ratings

Part No.	EXB14AT, EXB24AT
Attenuation Value	1 dB, 2 dB, 3 dB, 4 dB, 5 dB, 6 dB, 10 dB*
Attenuation Value Tolerance	1 dB, 2 dB, 3 dB, 4 dB, 5 dB : ±0.3 dB 6 dB, 10 dB : ±0.5 dB
Characteristic Impedance	50 Ω
Power Rating	0.04 W /package
Frequency Range at 70 °C	DC to 3.0 GHz
VSWR (Voltage Standing Wave Ratio)	1.3 max.
Number of Resistors	3 resistors
Number of Terminals	4 terminals
Category Temperature Range	–55 °C to +125 °C

✻ Please inquire about the other Attenuator value

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.

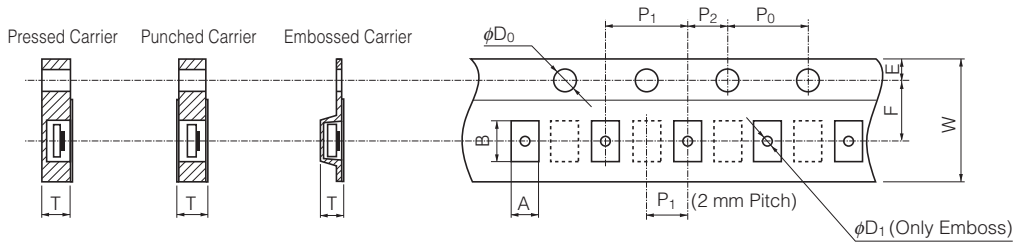


Surface Mount Resistors Series			Packaging (Standard Quantity : pcs./reel)			
Products	Part No.	Size mm (inch)	Pressed Carrier Taping (2 mm pitch)	Punched Carrier Taping (2 mm pitch)	Punched Carrier Taping (4 mm pitch)	Embossed Carrier Taping (4 mm pitch)
Thick Film Chip Resistors	ERJXGN	0402(01005)	20,000 *	—	—	4,0000 **
	ERJ1GN	0603(0201)	15,000	—	—	—
	ERJ2GE	1005(0402)	—	10,000, 20,000	—	—
	ERJ3GE	1608(0603)	—	—	5,000	—
	ERJ6GE	2012(0805)	—	—	5,000	—
	ERJ8GE	3216(1206)	—	—	5,000	—
	ERJ14	3225(1210)	—	—	—	5,000
	ERJ12	4532(1812)	—	—	—	5,000
	ERJ12Z	5025(2010)	—	—	—	5,000
	ERJ1T	6432(2512)	—	—	—	4,000
Precision Thick Film Chip Resistors	ERJXGN	0402(01005)	20,000	—	—	—
	ERJ1GN/1RH	0603(0201)	15,000	—	—	—
	ERJ2RH/2RK	1005(0402)	—	10,000	—	—
	ERJ3RB/3RE/3EK	1608(0603)	—	—	5,000	—
	ERJ6RB/6RE/6EN	2012(0805)	—	—	5,000	—
	ERJ8EN	3216(1206)	—	—	5,000	—
	ERJ14N	3225(1210)	—	—	—	5,000
	ERJ12N	4532(1812)	—	—	—	5,000
	ERJ12S	5025(2010)	—	—	—	5,000
	ERJ1TN	6432(2512)	—	—	—	4,000
Metal Film Chip Resistors, High Reliability Type	ERA1A	0603(0201)	15,000	—	—	—
	ERA2A	1005(0402)	—	10,000	—	—
	ERA3A	1608(0603)	—	—	5,000	—
	ERA6A	2012(0805)	—	—	5,000	—
	ERA8A	3216(1206)	—	—	5,000	—
Thick Film Chip Resistors/ Low Resistance Type	ERJ2LW/2BW	1005(0402)	10,000	—	—	—
	ERJ2BS/2BQ	1005(0402)	—	10,000	—	—
	ERJ3L/3B/3R/L03	1608(0603)	—	—	5,000	—
	ERJ6B/6R/L06	2012(0805)	—	—	5,000	—
	ERJ8B/8R/8C/L08	3216(1206)	—	—	5,000	—
	ERJ14B/14R/L14	3225(1210)	—	—	—	5,000
	ERJ12R/L12	4532(1812)	—	—	—	5,000
	ERJ12Z/L1D	5025(2010)	—	—	—	5,000
	ERJ1TR	6432(2512)	—	—	—	4,000
	ERJL1W	6432(2512)	—	—	—	3,000
Current Sensing Resistors, Metal Plate Type	ERJMS4	6432(2512)	—	—	—	2,000
	ERJMS6	6468(2526)	—	—	—	1,000 (8 mm Pitch)
	ERJM1W	6432(2512)	—	—	—	3,000
High Power Chip Resistors/ Wide Terminal Type	ERJA1	3264(1225)	—	—	—	4,000
	ERJB1/ERJC1(1)	2550(1020)	—	—	—	5,000
	ERJB2	1632(0612)	—	—	5,000	—
	ERJB3	1220(0508)	—	—	5,000	—

* W8P2 : Width 8 mm, Pitch 2 mm, ** W4P1 : Width 4 mm, Pitch 1 mm
(1) Anti-Sulfurated High Power Chip Resistors / Wide Terminal Type

Surface Mount Resistors Series			Packaging (Standard Quantity : pcs./reel)			
Products	Part No.	Size mm (inch)	Pressed Carrier Taping (2 mm pitch)	Punched Carrier Taping (2 mm pitch)	Punched Carrier Taping (4 mm pitch)	Embossed Carrier Taping (4 mm pitch)
Anti-Surge Thick Film Chip Resistors	ERJP03/PA3	1608(0603)	—	—	5,000	—
	ERJP06	2012(0805)	—	—	5,000	—
	ERJP08	3216(1206)	—	—	5,000	—
	ERJP14	3225(1210)	—	—	—	5,000
Anti-Pulse Thick Film Chip Resistors	ERJT06	2012(0805)	—	—	5,000	—
	ERJT08	3216(1206)	—	—	5,000	—
	ERJT14	3225(1210)	—	—	—	5,000
Anti-Sulfurated Thick Film Chip Resistors	ERJU01	0603(0201)	15,000	—	—	—
	ERJS02/U02	1005(0402)	—	10,000	—	—
	ERJS03/U03	1608(0603)	—	—	5,000	—
	ERJS06/U06 ERJU6S/U6Q	2012(0805)	—	—	5,000	—
	ERJS08/U08	3216(1206)	—	—	5,000	—
	ERJS14/U14	3225(1210)	—	—	—	5,000
	ERJS12/U12	4532(1812)	—	—	—	5,000
	ERJS1D/U1D	5025(2010)	—	—	—	5,000
	ERJS1T/U1T	6432(2512)	—	—	—	4,000
Chip Resistor Array	EXB14V	0806(0302)	—	10,000	—	—
	EXB24V	1010(0404)	—	10,000	—	—
	EXB34V	1616(0606)	—	—	5,000	—
	EXBV4V	1616(0606)	—	—	5,000	—
	EXB18V	1406(0502)	—	10,000	—	—
	EXB28V	2010(0804)	—	10,000	—	—
	EXBN8V	2010(0804)	—	10,000	—	—
	EXB38V	3216(1206)	—	—	5,000	—
	EXBV8V	3216(1206)	—	—	5,000	—
	EXBS8V	5022(2009)	—	—	—	2,500
	EXB2HV	3816(1506)	—	—	5,000	—
Metal Film Chip Resistor Array	ERA38V	3216(1206)	—	—	5,000	—
Anti-Sulfurated Chip Resistor Array	EXBU24	1010(0404)	—	10,000	—	—
	EXBU34	1616(0606)	—	—	5,000	—
	EXBU28	2010(0804)	—	10,000	—	—
	EXBU38	3216(1206)	—	—	5,000	—
	EXBU2H	3816(1506)	—	—	5,000	—
Chip Resistor Networks	EXBD	3216(1206)	—	—	5,000	—
	EXBE	4021(1608)	—	—	—	4,000
	EXBA	6431(2512)	—	—	—	4,000
	EXBQ	3816(1506)	—	—	5,000	—
Chip Attenuator	EXB14AT	0806(0302)	—	10,000	—	—
	EXB24AT	1010(0404)	—	10,000	—	—

Carrier Tape



Pressed Carrier Taping (2 mm Pitch)

● Rectangular Type

(Unit : mm)

Part No.	Size mm (inch)	A	B	W	F	E	P_1	P_2	P_0	ϕD_0	T
ERJXGN	0402(01005)	$0.24^{\pm0.03}$	$0.45^{\pm0.03}$	$8.00^{\pm0.20}$	$3.50^{\pm0.05}$	$1.75^{\pm0.10}$	$2.00^{\pm0.10}$	$2.00^{\pm0.05}$	$4.00^{\pm0.10}$	$1.50^{+0.10}_{0}$	$0.31^{\pm0.05}$
ERJ1GN ERJ1R□ ERJU01 ERA1A	0603 (0201)	$0.38^{\pm0.05}$	$0.68^{\pm0.05}$								$0.42^{\pm0.05}$
ERJ2LW	1005(0402)	$0.68^{\pm0.10}$	$1.20^{\pm0.10}$								$0.60^{\pm0.05}$
ERJ2BW	1005(0402)	$0.67^{\pm0.10}$	$1.17^{\pm0.10}$								$0.61^{\pm0.05}$

Punched Carrier Taping (2 mm Pitch)

● Rectangular Type

(Unit : mm)

Part No.	Size mm (inch)	A	B	W	F	E	P_1	P_2	P_0	ϕD_0	T
ERJ2□ ERJS02 ERJU02 ERA2A	1005 (0402)	$0.67^{\pm0.05}$	$1.17^{\pm0.05}$	$8.00^{\pm0.20}$	$3.50^{\pm0.05}$	$1.75^{\pm0.10}$	$2.00^{\pm0.10}$	$2.00^{\pm0.05}$	$4.00^{\pm0.10}$	$1.50^{+0.10}_{0}$	$0.52^{\pm0.05}$

● Chip Resistor Array / Anti-Sulfurated Chip Resistor Array / Chip Attenuator

(Unit : mm)

Part No.	Size mm (inch)	A	B	W	F	E	P_1	P_2	P_0	ϕD_0	T
EXB14V EXB14AT	0806 (0302)	$0.70^{+0.10}_{-0.05}$	$0.95^{+0.05}_{-0.10}$	$8.00^{\pm0.20}$	$3.50^{\pm0.05}$	$1.75^{\pm0.10}$	$2.00^{\pm0.10}$	$2.00^{\pm0.05}$	$4.00^{\pm0.10}$	$1.50^{+0.10}_{0}$	$0.52^{\pm0.05}$
EXB18V	1406(0502)		$1.60^{\pm0.10}$								
EXB24V EXBU24 EXB24AT	1010 (0404)	$1.20^{\pm0.10}$	$1.20^{\pm0.10}$								
EXB28V EXBU28 EXBN8V	2010 (0804)		$2.20^{\pm0.10}$								

Punched Carrier Taping (4 mm Pitch)

● Rectangular Type

(Unit : mm)

Part No.	Size mm (inch)	A	B	W	F	E	P_1	P_2	P_0	ϕD_0	T
ERJ3□ ERJ3LW(10 mΩ) ERJ3BW ERJ□□3 ERA3A	1608 (0603)	$1.10^{\pm0.10}$	$1.90^{\pm0.10}$	$8.00^{\pm0.20}$	$3.50^{\pm0.05}$	$1.75^{\pm0.10}$	$4.00^{\pm0.10}$	$2.00^{\pm0.05}$	$4.00^{\pm0.10}$	$1.50^{+0.10}_{0}$	$0.70^{\pm0.05}$
ERJ3LW(5 mΩ)											$0.84^{\pm0.05}$
ERJ6□ ERJ□06 ERJU6S, U6Q ERA6A	2012 (0805)	$1.65^{\pm0.15}$	$2.50^{\pm0.20}$								
ERJB3	1220(0508)										
ERJ6BW	2012(0805)	$1.55^{\pm0.15}$	$2.30^{\pm0.20}$								
ERJ8□ ERJ8□W ERJ□08 ERA8A	3216 (1206)	$2.00^{\pm0.15}$	$3.60^{\pm0.20}$								
ERJB2	1632(0612)										

● Chip Resistor Array / Metal Film Chip Resistor Array / Anti-Sulfurated Chip Resistor Array / Chip Resistor Networks (Unit : mm)

Part No.	Size mm (inch)	A	B	W	F	E	P_1	P_2	P_0	ϕD_0	T
EXB34V EXBU34	1616(0606)	$1.95^{\pm0.15}$	$1.95^{\pm0.20}$	$8.00^{\pm0.20}$	$3.50^{\pm0.05}$	$1.75^{\pm0.10}$	$4.00^{\pm0.10}$	$2.00^{\pm0.05}$	$4.00^{\pm0.10}$	$1.50^{+0.10}_{0}$	$0.70^{\pm0.05}$
EXB38V ERA38V EXBU38	3216(1206)		$3.60^{\pm0.20}$								
EXB2HV EXBU2H	3816(1506)		$4.10^{\pm0.15}$								
EXBV4V	1616(0606)		$1.95^{\pm0.20}$								$0.84^{\pm0.05}$
EXBV8V	3216(1206)		$3.60^{\pm0.20}$								
EXBD	3216(1206)	$2.00^{\pm0.20}$	$3.60^{\pm0.20}$								$0.84^{\pm0.10}$
EXBQ	3816(1506)	$1.90^{\pm0.20}$	$4.10^{\pm0.20}$								$0.64^{\pm0.05}$

Embossed Carrier Taping (1 mm Pitch)

● Rectangular Type (Unit : mm)

Part No.	Size mm (inch)	A	B	W	F	E	P_1	P_2	P_0	ϕD_0	T
ERJXGN	0402(01005)	$0.25^{\pm0.05}$	$0.45^{\pm0.05}$	$4.00^{\pm0.20}$	$1.80^{\pm0.05}$	$0.90^{\pm0.10}$	$1.00^{\pm0.10}$	$1.00^{\pm0.10}$	$2.00^{\pm0.10}$	$0.80^{\pm0.10}$	0.5 max.

Embossed Carrier Taping (4 mm Pitch)

● Rectangular Type (Unit : mm)

Part No.	Size mm (inch)	A	B	W	F	E	P_1	P_2	P_0	ϕD_0	T	ϕD_1
ERJ14□ ERJ□14	3225 (1210)	$2.80^{\pm0.20}$	$3.50^{\pm0.20}$	$8.00^{\pm0.30}$	$3.50^{\pm0.05}$	$1.75^{\pm0.10}$	$4.00^{\pm0.10}$	$2.00^{\pm0.05}$	$4.00^{\pm0.10}$	$1.50^{+0.10}_{0}$	$1.00^{\pm0.10}$	$1.00^{+0.10}_{0}$
ERJ12□ ERJ□12	4532 (1812)	$3.50^{\pm0.20}$	$4.80^{\pm0.20}$	$12.00^{\pm0.30}$	$5.50^{\pm0.20}$							1.5 min.
ERJ12Z ERJ12S ERJ□1D	5025 (2010)	$2.80^{\pm0.20}$	$5.30^{\pm0.20}$									
ERJB1 ERJC1	2550 (1020)											
ERJ1T□ ERJ□1T	6432 (2512)	$3.60^{\pm0.20}$	$6.90^{\pm0.20}$									
ERJL1W											$1.60^{\pm0.10}$	
ERJM1W ERJMS4											$1.50^{\pm0.20}$	
ERJA1	3264(1225)	$3.50^{\pm0.20}$	$6.80^{\pm0.20}$								$1.10^{\pm0.20}$	

● Chip Resistor Array / Chip Resistor Networks (Unit : mm)

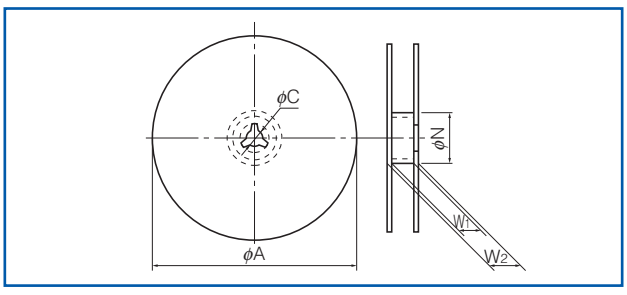
Part No.	Size mm (inch)	A	B	W	F	E	P_1	P_2	P_0	ϕD_0	T	ϕD_1
EXBS8V	5022(2029)	$2.80^{\pm0.20}$	$5.70^{\pm0.20}$	$12.00^{\pm0.30}$	$5.50^{\pm0.20}$	$1.75^{\pm0.10}$	$4.00^{\pm0.10}$	$2.00^{\pm0.05}$	$4.00^{\pm0.10}$	$1.50^{+0.10}_{0}$	1.6 max.	1.5 min.
EXBE	4021(1608)	$2.50^{\pm0.20}$	$4.40^{\pm0.20}$								$1.10^{\pm0.20}$	
EXBA	6431(2512)	$3.50^{\pm0.20}$	$6.80^{\pm0.20}$									

Embossed Carrier Taping (8 mm Pitch)

● Rectangular Type (Unit : mm)

Part No.	Size mm (inch)	A	B	W	F	E	P_1	P_2	P_0	ϕD_0	T	ϕD_1
ERJMS6	6468(2526)	$6.90^{\pm0.20}$	$7.50^{\pm0.20}$	$12.00^{\pm0.30}$	$5.50^{\pm0.05}$	$1.75^{\pm0.10}$	$8.00^{\pm0.10}$	$2.00^{\pm0.05}$	$4.00^{\pm0.10}$	$1.50^{+0.10}_{0}$	$2.10^{\pm0.10}$	1.5 min.

Taping Reel

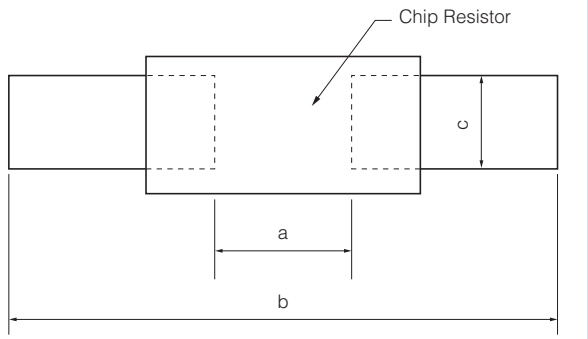


(Unit : mm)

Tape Width (W)	ϕA	ϕN	ϕC	W_1	W_2
4mm Width	$180.0^{\pm3.0}$	$60.0^{+1.0}_{0}$	$13.0^{\pm0.2}$	$4.5^{\pm0.5}$	$7.0^{\pm0.5}$
8mm Width	$180.0^{\ 0}_{-1.5}$			$9.0^{+1.0}_{0}$	$11.4^{\pm1.0}$
12mm Width				$13.0^{+1.0}_{0}$	$15.4^{\pm1.0}$
24mm Width	$380.0^{\pm2.0}$	$80.0^{\pm1.0}$		$25.4^{\pm1.0}$	$29.4^{\pm1.0}$

Recommended Land Pattern

● An example of a land pattern for the Rectangular Type is shown below.



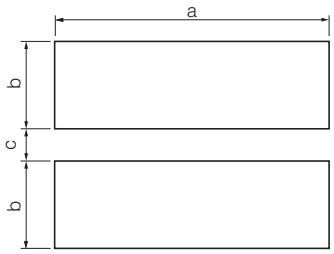
High power (double-sided resistive elements structure) type

Part No.	Size mm/inch	Dimensions (mm)		
		a	b	c
ERJ2LW/2BW	1005/0402	0.52	1.4 to 1.6	0.4 to 0.6
ERJ3LW/3BW	1608/0603	0.5 to 0.8	2.5 to 2.7	0.9 to 1.1
ERJ6BW	2012/0805	0.9	3.2 to 3.8	1.1 to 1.4
ERJ8BW	3216/1206	1.2	4.4 to 5.0	1.3 to 1.8
ERJ8CW (10 to 16 mΩ)				
ERJ8CW (18 to 50 mΩ)	3216/1206	2.0 to 2.6	4.4 to 5.0	1.2 to 1.8

Size mm/inch	Dimensions (mm)		
	a	b	c
0402/01005	0.15 to 0.20	0.5 to 0.7	0.20 to 0.25
0603/0201	0.3 to 0.4	0.8 to 0.9	0.25 to 0.35
1005/0402	0.5 to 0.6	1.4 to 1.6	0.4 to 0.6
1608/0603	0.7 to 0.9	2.0 to 2.2	0.8 to 1.0
2012/0805	1.0 to 1.4	3.2 to 3.8	0.9 to 1.4
3216/1206	2.0 to 2.4	4.4 to 5.0	1.2 to 1.8
3225/1210	2.0 to 2.4	4.4 to 5.0	1.8 to 2.8
4532/1812	3.3 to 3.7	5.7 to 6.5	2.3 to 3.5
5025/2010	3.6 to 4.0	6.2 to 7.0	1.8 to 2.8
6432/2512	5.0 to 5.4	7.6 to 8.6	2.3 to 3.5
6432/2512*	3.6 to 4.0	7.6 to 8.6	2.3 to 3.5

✻ ERJL1W

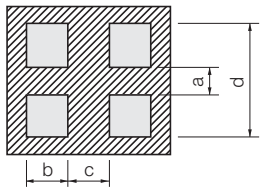
● An example of a land pattern for High Power Chip Resistors / Wide Terminal Type is shown below.

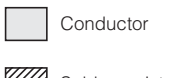


Part No.	Dimensions (mm)		
	a	b	c
ERJA1	6.4	1.70	0.60
ERJB1 ERJC1(1)	5.0	1.30	0.75
ERJB2	3.2	0.95	0.70
ERJB3	2.0	0.80	0.60

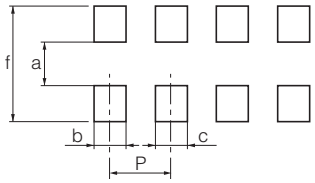
(1) Anti-Sulfurated High Power Chip Resistors / Wide Terminal Type

● An example of a land pattern for Chip Resistor Array, Metal Film Chip Resistor Array, Anti-Sulfurated Chip Resistor Array and Chip Attenuator is shown below.

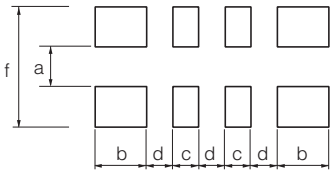




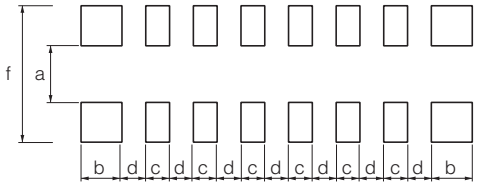
Part No.	Dimensions (mm)			
	a	b	c	d
EXB14V EXB14A	0.30	0.30	0.30	0.80 to 0.90
EXB24V EXBU24 EXB24A	0.5	0.35 to 0.40	0.30	1.4 to 1.5



Part No.	Dimensions (mm)				
	a	b	c	f	P
EXB18V	0.20 to 0.30	0.15 to 0.20	0.15 to 0.20	0.80 to 0.90	0.40
EXBV4V,V8V	0.7 to 0.9	0.4 to 0.45	0.4 to 0.45	2 to 2.4	0.80
EXB34V,38V EXBU34,U38 ERA38V	0.7 to 0.9	0.4 to 0.5	0.4 to 0.5	2.2 to 2.6	0.80
EXBS8V	1 to 1.2	0.5 to 0.75	0.5 to 0.75	3.2 to 3.8	1.27

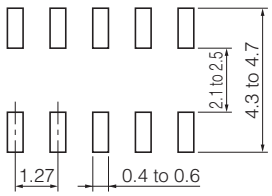
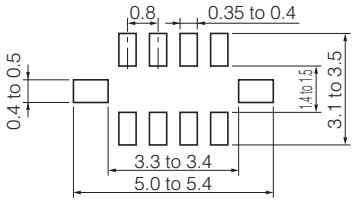
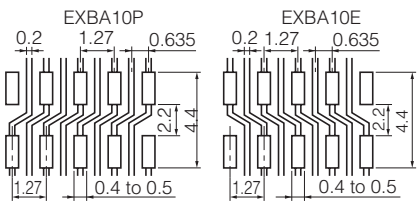
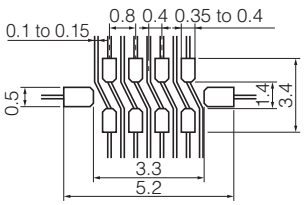
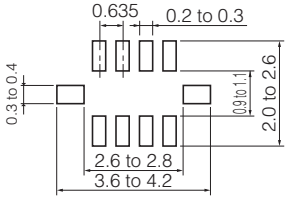
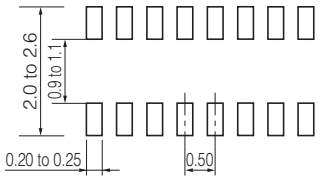


Part No.	Dimensions (mm)				
	a	b	c	d	f
EXB28V EXBU28	0.40	0.525	0.25	0.25	1.40
EXBN8V	0.45 to 0.50	0.35 to 0.38	0.25	0.25	1.40 to 2.00



Part No.	Dimensions (mm)				
	a	b	c	d	f
EXB2HV EXBU2H	1.00	0.425	0.25	0.25	2.00

● An example of a land pattern for Chip Resistor Networks is shown below.

	EXBA	EXBE
For popular pattern	Pitch 1.27 mm 	Pitch 0.8 mm 
For high density pattern*	Pitch 0.635 mm Through-hole less 	Pitch 0.4 mm Through-hole less 
	EXBD	EXBQ
For popular pattern	Pitch 0.635 mm 	Pitch 0.5 mm 

✻ When designing high density land patterns, examine the reliability of isolation among the lines and adopt the chip resistor networks.

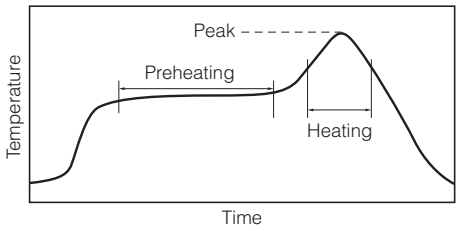
Recommended Soldering Conditions

Recommendations and precautions are described below.

● Rectagular Type

● Recommended soldering conditions for reflow

· Reflow soldering shall be performed a maximum of two times.
· Please contact us for additional information when used in conditions other than those specified.
· Please measure the temperature of the terminals and study every kind of solder and printed circuit board for solderability before actual use.



For soldering (Example : Sn/Pb)

	Temperature	Time
Preheating	140 °C to 160 °C	60 s to 120 s
Main heating	Above 200 °C	30 s to 40 s
Peak	235 ± 5 °C	max. 10 s

For lead-free soldering (Example : Sn/Ag/Cu)

	Temperature	Time
Preheating	150 °C to 180 °C	60 s to 120 s
Main heating	Above 230 °C	30 s to 40 s
Peak	max. 260 °C	max. 10 s

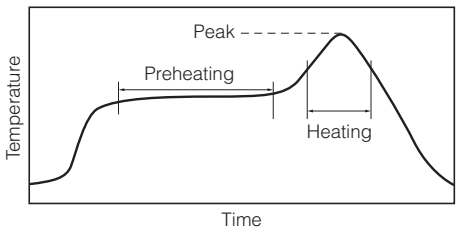
● Recommended soldering conditions for flow

	For soldering		For lead-free soldering	
	Temperature	Time	Temperature	Time
Preheating	140 °C to 180 °C	60 s to 120 s	150 °C to 180 °C	60 s to 120 s
Soldering	245 ± 5 °C	20 s to 30 s	max. 260 °C	max. 10 s

● Chip Resistor Array, Chip Resistor Networks and Chip Attenuator

● Recommended soldering conditions for reflow

· Reflow soldering shall be performed a maximum of two times.
· Please contact us for additional information when used in conditions other than those specified.
· Please measure the temperature of the terminals and study every kind of solder and printed circuit board for solderability before actual use.



For soldering (Example : Sn/Pb)

	Temperature	Time
Preheating	140 °C to 160 °C	60 s to 120 s
Main heating	Above 200 °C	30 s to 40 s
Peak	235 ± 5 °C	max. 10 s

For lead-free soldering (Example : Sn/Ag/Cu)

	Temperature	Time
Preheating	150 °C to 180 °C	60 s to 120 s
Main heating	Above 230 °C	30 s to 40 s
Peak	max. 260 °C	max. 10 s

● Flow soldering

We do not recommend flow soldering, because a solder bridge may form.
Please contact us regarding flow soldering of EXBA series.

⚠ Safety Precautions (Common precautions for Surface Mount Resistors)

The following are precautions for individual products. Please also refer to the common precautions for Fixed Resistors in this catalog.

1. Take measures against mechanical stress during and after mounting of Surface Mount Resistors (hereafter called the resistors) so as not to damage their electrodes and protective coatings.
   Be careful not to misplace the resistors on the land patterns. Otherwise, solder bridging may occur.
2. Keep the rated power and ambient temperature within the specified derating curve.
   Some circuit boards, wiring patterns, temperatures of heat generated by adjacent components, or ambient temperatures can become factors in the rise of the temperature of the resistors, regardless of the level of power applied. Therefore, check the conditions before use and optimize them so as not to damage the boards and peripheral components.
   Make sure to contact us before using the resistors under special conditions.
3. If a transient load (heavy load in a short time) like a pulse is expected to be applied, check and evaluate the operations of the resistors when installed in your products before use.
   Never exceed the rated power. Otherwise, the performance and/or reliability of the resistors may be impaired.
4. Before using halogen-based or other high-activity flux, check the possible effects of the flux residues on the performance and reliability of the resistors.
5. When soldering with a soldering iron, never touch the resistors'bodies with the tip of the soldering iron. When using a soldering iron with a high temperature tip, finish soldering as quickly as possible (within three seconds at 350 °C max.).
6. As the amount of applied solder becomes larger, the mechanical stress applied to the resistors increases, causing problems such as cracks and faulty characteristics. Avoid applying an excessive amounts of solder.
7. When the resistors' protective coatings are chipped, flawed, or removed, the characteristics of the resistors may be impaired. Take special care not to apply mechanical shock during automatic mounting or cause damage during handling of the boards with the resistors mounted.
8. Do not apply shock to the resistors or pinch them with a hard tool (e.g. pliers and tweezers). Otherwise, the resistors' protective coatings and bodies may be chipped, affecting their performance.
9. Avoid excessive bending of printed circuit boards in order to protect the resistors from abnormal stress.
10. Do not immerse the resistors in solvent for a long time. Before using solvent, carefully check the effects of immersion.
11. Transient voltage
    If there is a possibility that the transient phenomenon (significantly high voltage applied in a short time) may occur or that a high voltage pulse may be applied, make sure to evaluate and check the characteristics of Fixed Metal (Oxide) Film Resistors mounted on your product rather than only depending on the calculated power limit or steady-state conditions to complete the design or decide to use the resistors.
12. Do not apply excessive tension to the terminals.

Metal (Oxide) Film Resistors

Type: **ERG(X)S (Small size)**
(0.5 W, 1 W, 2 W, 3 W, 5 W)
ERG(X)F (Anti-heat conducting for PCB)
(1 W, 2 W, 3 W, 5 W)

Features

- Miniaturized
  50 % smaller compared to existing models
- Non-flammable
- High Reliability
- Automatic Insertion
- Reference Standards
  IEC 60115-2, IEC 60115-4, JIS C 5201-4, EIAJ RC-2138
- RoHS compliant

Explanation of Part Numbers

Ex.1 : ERX type

1	2	3	4	5	6	7	8	9	10	11	12
E	R	X		2	S	Z	J	W	1	R	0	E

Product Code	
ERX	Metal Film Resistors

Power Rating at 70 °C	
12	0.5 W
1	1 W
2	2 W
3	3 W
5	5 W

Style · Specification	
S	Small size 0.5 W to 5 W
F	Small size Anti-heat conducting type (Fe lead wire) 1 W to 5 W

Resistance Tolerance	
J	±5 %
G	±2 %

Resistance Value

The first two digits are significant figures of resistance and the third one denotes number of zeros following.
Decimal point is expressed by
(Ex.) 1R0 : 1.0 Ω

"Z" is added according to resistance.

Part No.	Resistance Tolerance	Resistance Value Range (Ω) ERX□□SZ	Resistance Value Range (Ω) ERX□□S
ERX12S	±5 %	0.10 to 0.18	0.20 to 9.1
	±2 %	0.10 to 0.91	1.0 to 9.1
ERX1S	±5 %	0.10 to 0.18	0.20 to 9.1
ERX1F	±2 %	0.10 to 0.91	1.0 to 9.1
ERX2S	±5 %	0.10 to 0.20	0.22 to 9.1
ERX2F	±2 %	0.10 to 0.91	1.0 to 9.1
ERX3S	±5 %	0.10 to 0.20	0.22 to 9.1
ERX3F	±2 %	0.10 to 0.91	1.0 to 9.1
ERX5S	±5 %	—	0.33 to 9.1
ERX5F	±2 %		1.0 to 9.1

The matrix of forming and packaging is as shown in the table below.

Code	Forming / Packaging	Forming & Taping matrix 12S	1S	2S	3S	5S	1F	2F	3F	5F
□···□	Straight lead wire type	○	○	○	○	○	○	○	○	○
□···P	Cut & Forming type	○	○	○	○	○				
□···V	Axial taping type (Straight lead)	○	○	○	○		○	○	○	
U···V	Axial taping type (Stand off)		○	○	○					
□···E	Radial taping type (E type)	○	○	○						
W···E	Radial taping type (WE type)	○	○	○	○					
□···H	Cut & Forming type						○	○	○	○
S···E	Radial taping type (SE type)						○	○	○	

The above example 1 shows a small metal film resistor, 2 W power rating, resistance value of 1.0 Ω, tolerance ±5 %, and package of radial taping.

Ex.2 : ERG type

1	2	3	4	5	6	7	8	9	10	11	12
E	R	G		2	S	J	W	1	0	3	E

Product Code	
ERG	Metal Oxide Film Resistors

Power Rating at 70 °C	
12	0.5 W
1	1 W
2	2 W
3	3 W
5	5 W

Style · Specification	
S	Small size 0.5 W to 5 W
F	Small size Anti-heat conducting type (Fe lead wire) 1 W to 5 W

Resistance Tolerance	
J	±5 %
G	±2 %

Resistance Value

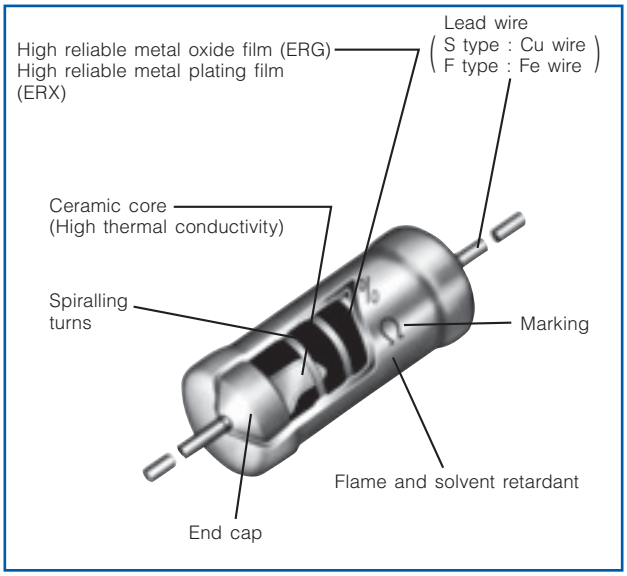
The first two digits are significant figures of resistance and the third one denotes number of zeros following.
Decimal point is expressed by
(Ex.) 103 : 10 kΩ

The matrix of forming and packaging is as shown in the table below.

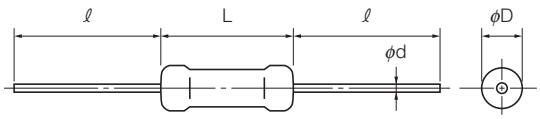
Code	Forming / Packaging	Forming & Taping matrix 12S	1S	2S	3S	5S	1F	2F	3F	5F
□···□	Straight lead wire type	○	○	○	○	○	○	○	○	○
□···P	Cut & Forming type	○	○	○	○	○				
□···V	Axial taping type(Straight lead)	○	○	○	○		○	○	○	
U···V	Axial taping type(Stand off)		○	○	○					
□···E	Radial taping type(E type)	○	○	○						
W···E	Radial taping type(WE type)	○	○	○	○					
□···H	Cut & Forming type					○	○	○	○	○
S···E	Radial taping type(SE type)					○	○	○		

The above example 2 shows a small metal oxide film resistor, 2 W power rating, resistance value of 10 kΩ, tolerance ±5 %, and package of radial taping.

Construction



Dimensions in mm (not to scale)



Part No.	Dimensions (mm)				Mass (Weight) [g/pc.]
	L	ϕD	ℓ	ϕd	
ERG(X)12S	$6.35^{+0.65}_{-0.35}$	$2.3^{+0.5}_{-0.3}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$	0.26
ERG(X)1S	$9.00^{+1.50}_{-1.00}$	$2.8^{\pm0.5}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$	0.33
ERG(X)1F				$0.80^{\pm0.05}$	
ERG(X)2S ERG(X)2F	$12.00^{+1.50}_{-1.00}$	$4.0^{\pm1.0}$	$30.0^{\pm3.0}$	$0.80^{\pm0.05}$	0.66
ERG(X)3S ERG(X)3F	$15.00^{\pm1.50}$	$5.5^{\pm1.0}$	$38.0^{\pm3.0}$	$0.80^{\pm0.05}$	1.47
ERG(X)5S ERG(X)5F	$24.00^{\pm1.50}$	$8.0^{\pm1.0}$	$38.0^{\pm3.0}$	$0.80^{\pm0.05}$	3.54

Ratings

Part No.	Power Rating at 70 °C (W)	Limiting Element Voltage(1) (V)	Maximum Overload Voltage(2) (V)	Maximum Intermittent Overload Voltage(3) (V)	Dielectric Withstanding Voltage (VAC)	Res. Tol. (%)(4)	Resistance Range (Ω)(5) min.(6)	Resistance Range (Ω)(5) max.	T.C.R. (×10⁻⁶/°C)	Standard Resistance Value
ERG(X)12S	0.5	300	600	600	350	G (±2)	1	22 k	±350	E24
						J (±5)	0.2	47 k		
ERG(X)1S ERG(X)1F	1	350	600	600	350	G (±2)	1	68 k	±350	E24
						J (±5)	0.2	100 k		
ERG(X)2S ERG(X)2F	2	350	700	1000	600	G (±2)	1	100 k	±350	E24
						J (±5)	0.22	100 k		
ERG(X)3S ERG(X)3F	3	350	700	1000	1000	G (±2)	1	100 k	±300	E24
						J (±5)	0.22	100 k		
ERG(X)5S ERG(X)5F	5	500	1000	1500	1000	G (±2)	1	100 k	±200	E24
						J (±5)	0.33	100 k		

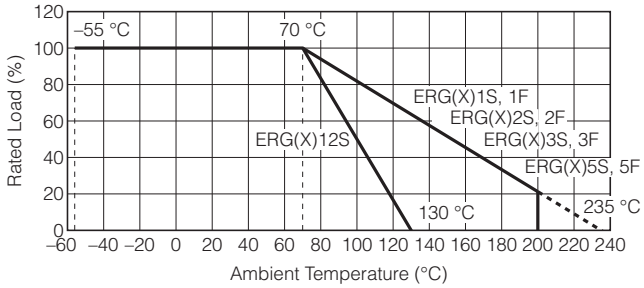
(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating}\times\text{Resistance Value}}$ or Limiting Element Voltage listed above whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5×Power Rating or max. Overload Voltage listed above whichever less.
(3) Intermittent Overload Test Voltage (IOTV) shall be determined from IOTV=4.0×Power Rating or max. Intermittent Overload Voltage listed above whichever less.
(4) Resistance tolerance is of use besides range listed, please inquire.
(5) Resistance Range Type ERG : ≧10 Ω
Type ERX : ≦9.1 Ω
(6) As for the low resistance value range, "Z" is given to the part number. (Refer to the explanation of part numbers.)

✻ Z type is non standard resistance values.

Code	Part No.	Res.Tol.	Res. Value Range	Code	Part No.	Res.Tol.	Res. Value Range
Z	12S	±2 %	0.1 to 0.91 Ω	Z	2S	±2 %	0.1 to 0.91 Ω
		±5 %	0.1 to 0.18 Ω		2F	±5 %	0.1 to 0.2 Ω
	1S	±2 %	0.1 to 0.91 Ω		3S	±2 %	0.1 to 0.91 Ω
	1F	±5 %	0.1 to 0.18 Ω		3F	±5 %	0.1 to 0.2 Ω

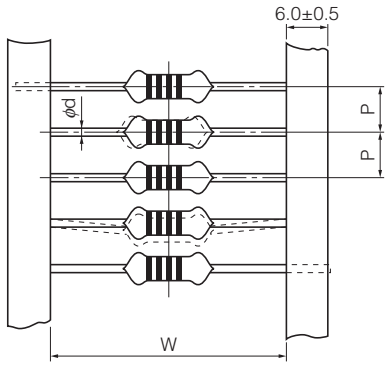
Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



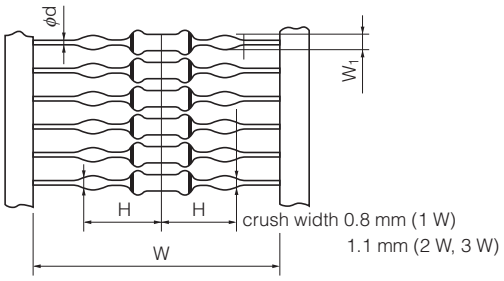
Taped & Box

ERG(X)□□S□□□□V

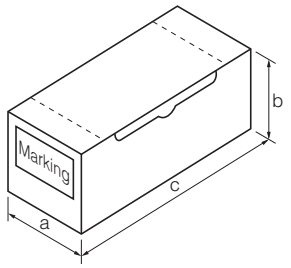


Stand-off Taped & Box

ERG(X)□□S□U□□□V

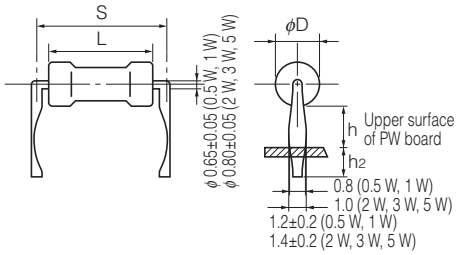


Part Number	Standard Quantity (pcs./box)	Taping (mm)						Box (mm)		
		P	50×P	W	H	W_1	ϕd	a	b	c
ERG(X) 12S□□□□□V	2,000	$5.0^{\pm0.3}$	$250^{\pm2}$	$52.0^{\pm1.5}$	—	—	$0.65^{\pm0.05}$	85	80	255
ERG(X) 1S□□□□□V	2,000	$5.0^{\pm0.3}$	$250^{\pm2}$	$52.0^{\pm1.5}$	—	—	$0.65^{\pm0.05}$	85	80	255
ERG(X) 1S□U□□□V					$12.0^{0}_{-2.0}$	$1.20^{+0.15}_{0}$				
ERG(X) 2S□□□□□V	1,000	$5.0^{\pm0.3}$	$250^{\pm2}$	$52.0^{\pm1.5}$	—	—	$0.80^{\pm0.05}$	85	80	255
ERG(X) 2S□U□□□V					$15.5^{0}_{-2.0}$	$1.40^{+0.15}_{0}$				
ERG(X) 3S□□□□□V	1,000	$10.0^{\pm0.5}$	$500^{\pm2}$	$74.0^{\pm2.0}$	—	—	$0.80^{\pm0.05}$	105	100	325
ERG(X) 3S□U□□□V					$23.0^{0}_{-2.0}$	$1.4^{+0.15}_{0}$				



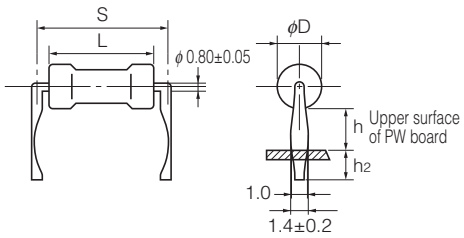
Cut & Formed Type

ERG(X)□□S□□□□P



Part Number	Standard Quantity (pcs./box)	Dimensions (mm)				
		L	ϕD	S	h	h_2
ERG(X) 12S□□□□P	1,000	$6.35^{+0.65}_{-0.35}$	$2.3^{+0.5}_{-0.3}$	$10.0^{\pm1.5}$	$4.0^{\pm1.5}$	$4.0^{\pm1.5}$
ERG(X) 1S□□□□P	1,000	$9.00^{+1.50}_{-1.00}$	$2.8^{\pm0.5}$	$12.5^{\pm1.5}$	$4.0^{\pm1.5}$	$4.0^{\pm1.5}$
ERG(X) 2S□□□□P	1,000	$12.00^{+1.50}_{-1.00}$	$4.0^{\pm1.0}$	$15.0^{\pm1.5}$	$6.0^{\pm1.5}$	$4.0^{\pm1.5}$
ERG(X) 3S□□□□P	1,000	$15.00^{\pm1.50}$	$5.5^{\pm1.0}$	$20.0^{\pm2.0}$	$6.5^{\pm1.5}$	$4.0^{\pm1.5}$
ERG(X) 5S□□□□P	500	$24.00^{\pm1.50}$	$8.0^{\pm1.0}$	$30.0^{\pm2.0}$	$7.5^{\pm1.5}$	$4.0^{\pm1.5}$

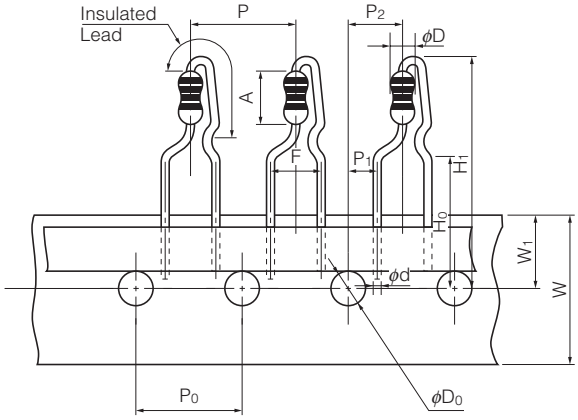
ERG(X)□F□□□□H



Part Number	Standard Quantity (pcs./box)	Dimensions (mm)				
		L	ϕD	S	h	h_2
ERG(X)1F□□□□H	1,000	$9.0^{+1.5}_{-1.0}$	$2.8^{\pm0.5}$	$12.5^{\pm1.5}$	$8^{\pm2}$	$4.0^{\pm1.5}$
ERG(X)2F□□□□H	1,000	$12.0^{+1.5}_{-1.0}$	$4.0^{\pm1.0}$	$15.0^{\pm1.5}$	$6^{\pm2}$	$5.0^{\pm1.5}$
ERG(X)3F□□□□H	1,000	$15.0^{\pm1.5}$	$5.5^{\pm1.0}$	$20.0^{\pm2.0}$	$10^{\pm2}$	$5.0^{\pm1.5}$
ERG(X)5F□□□□H	500	$24.0^{\pm1.5}$	$8.0^{\pm1.0}$	$30.0^{\pm2.0}$	$10^{\pm2}$	$5.0^{\pm1.5}$

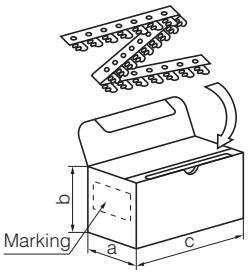
For Panasert Automatic Insertion Machine Radial Taped & Box

ERG(X)□□S□□□□E (12S, 1S, 2S)



Dimensions (mm)		Dimensions (mm)		Dimensions (mm)			Dimensions (mm)		Dimensions (mm)		
P	12.7±1.0	W	18.0±0.5		12S	32 max.		12S	$6.35^{+0.65}_{-0.35}$		12S	$2.3^{+0.5}_{-0.3}$
P0	12.7±0.3	W1	9.0±0.5	H1	1S	32 max.	A	1S	$9.0^{+1.5}_{-1.0}$	φD	1S	2.8±0.5
P1	3.85±0.70				2S	38 max.		2S	$12.0^{+1.5}_{-1.0}$		2S	4.0±1.0
P2	6.35±1.00			H0	16.0±0.5		φd	0.65±0.05				
F	5.0±0.8			φD0	4.0±0.2							

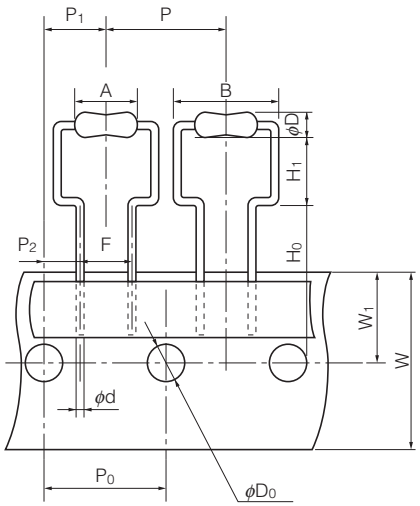
● Radial Tape Package Specifications



Part Number	Dimensions (mm)			Standard Quantity (pcs./box)
	a	b	c	
ERG(X) 12S□□□□E	46	130	335	2,000
ERG(X) 1S□□□□E	46	130	335	2,000
ERG(X) 2S□□□□E	49	100	335	1,000

For Panasert Automatic Insertion Machine Radial Taped & Box

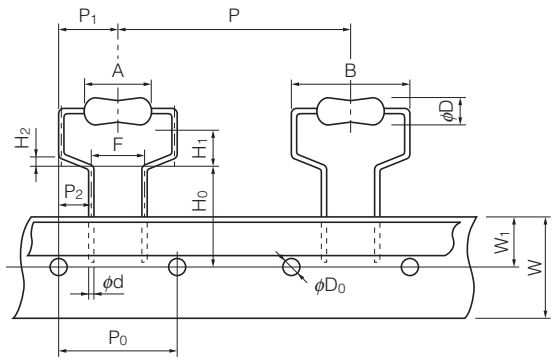
ERG(X)□□S□W□□□E (12S, 1S, 2S, 3S)



Dimensions (mm)			Dimensions (mm)		
P	12S	12.7±1.0	φD0	12S, 1S, 2S, 3S	4.0±0.2
	1S, 2S, 3S	30.0±1.0	A	12S	$6.35^{+0.65}_{-0.35}$
P0	12S	12.7±0.3		1S	$9.0^{+1.5}_{-1.0}$
	1S, 2S, 3S	15.0±0.3		2S	$12.0^{+1.5}_{-1.0}$
P1	12S	6.35±1.00		3S	15.0±1.5
	1S, 2S, 3S	7.5±1.0	B	12S	11.2 max.
P2	12S	3.85±0.70		1S	14.0 max.
	1S, 2S, 3S	3.75±0.50		2S	17.0 max.
F	12S	5.0±0.5		3S	21.0 max.
	1S, 2S, 3S	7.5±0.8	φD	12S	$2.3^{+0.5}_{-0.3}$
W	12S, 1S, 2S, 3S	18.0±0.5		1S	2.8±0.5
W1	12S, 1S, 2S, 3S	9.0±0.5		2S	4.0±1.0
H0	12S	16.0±0.5		3S	5.5±1.0
	1S, 2S	18.0±1.0	φd	12S	φ0.65±0.05
	3S	19.0±1.0		1S, 2S, 3S	φ0.80±0.05
H1	12S	$6.5^{+0.6}_{0}$			
	1S, 2S	$6.5^{+1.0}_{0}$			
	3S	$8.0^{+1.0}_{0}$			

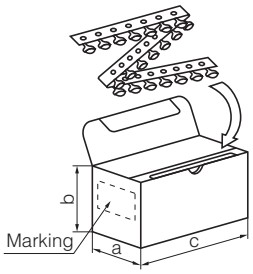
For Panasert Automatic Insertion Machine Radial Taped & Box

ERG(X)□F□S□□□E (1F, 2F, 3F)



Dimensions (mm)			Dimensions (mm)		
P	30.0±1.0		H_2	1.0±0.3	
P_0	15.0±0.3		ϕD_0	4.0±0.2	
P_1	7.5±1.0		A	1F	$9.0^{+1.5}_{-1.0}$
P_2	3.75±0.50			2F	$12.0^{+1.5}_{-1.0}$
F	7.5±0.8			3F	15.0±1.5
W	18.0±0.5		B	1F	14 max.
W_1	9.0±0.5			2F	17 max.
H_0	$16.0^{+1.0}_{0}$			3F	21 max.
H_1	1F	$7.0^{+1.0}_{0}$	ϕD	1F	2.8±0.5
	2F	$8.0^{+1.0}_{0}$		2F	4.0±1.0
	3F	$9.0^{+1.0}_{0}$		3F	5.5±1.0
			ϕd	0.80±0.05	

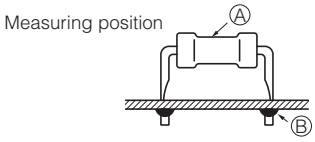
● Radial Tape Package Specifications

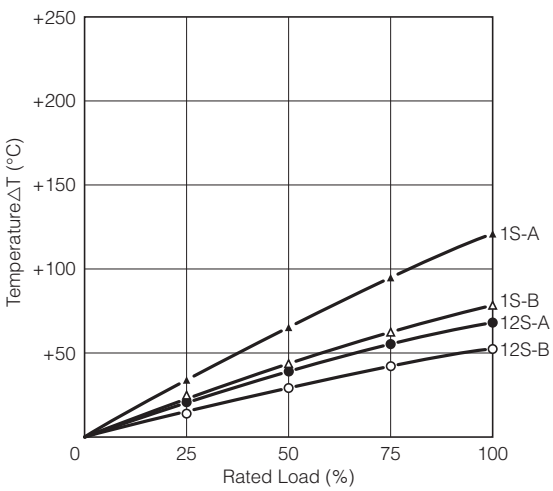


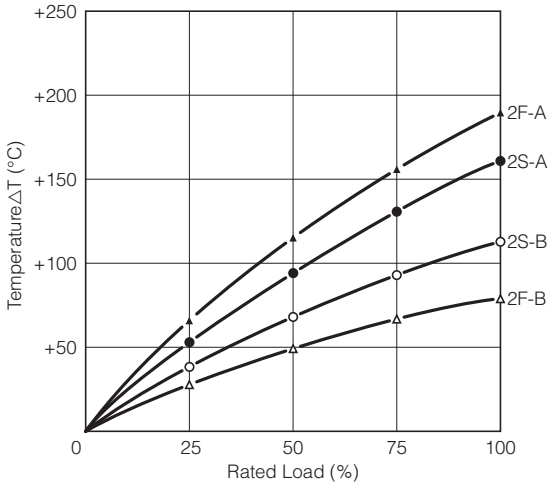
Part No.	Dimensions (mm)			Standard Quantity (pcs./box)
	a	b	c	
ERG(X)12S□W□□□E	46	145	325	2,000
ERG(X) 1S□W□□□E	49	150	317	1,000
ERG(X) 1F□ S□□□E				
ERG(X) 2S□W□□□E	49	150	317	500
ERG(X) 2F□ S□□□E				
ERG(X) 3F□ S□□□E	49	190	315	500

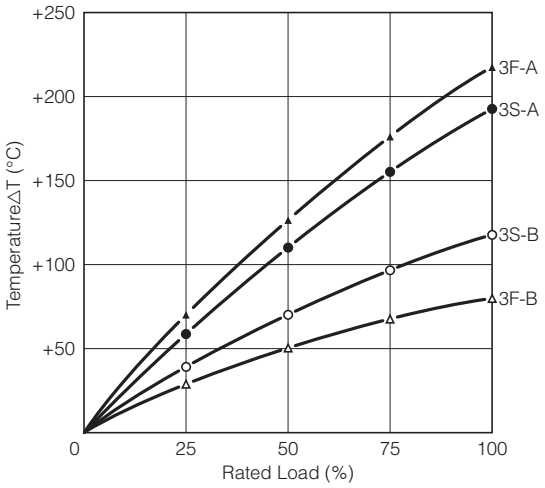
Hot-spot Temperature (for Reference)

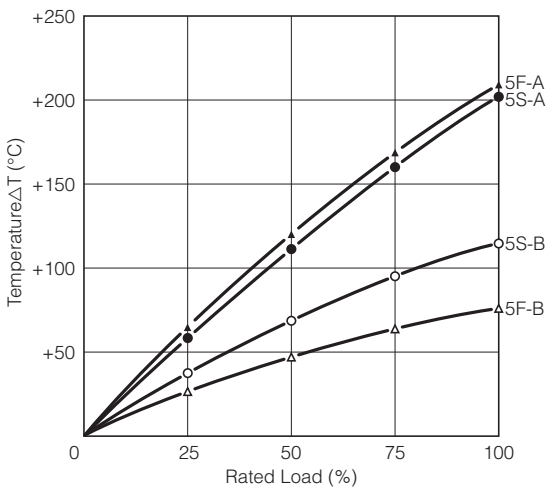
The temperature of the resistor body increases with the curve below. A touching vinyl wire may cause damages to resistor element. Do not place vinyl wires around resistors and be sure to consider where the resistors will be placed.











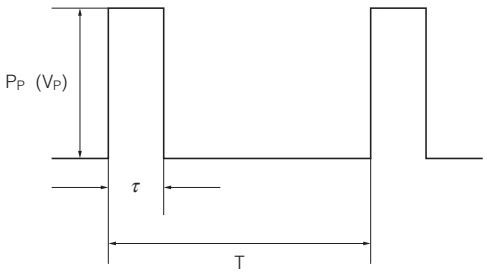
⚠ Safety Precautions

The following are precautions for individual products. Please also refer to the common precautions for Fixed Resistors in this catalog.

1. Transient voltage
   If there is a possibility that the transient phenomenon (significantly high voltage applied in a short time) may occur or that a high voltage pulse may be applied, make sure to evaluate and check the characteristics of Metal(Oxide) Film Resistors (hereafter called the resistors) mounted on your product rather than only depending on the calculated power limit or steady-state conditions to complete the design or decide to use the resistors.
2. The resistors are covered with a special coating. Do not apply shock or vibration to them, or pinch them with long-nose pliers. Otherwise, the resistors may be damaged.
3. Do not apply excessive tension to the lead-connected sections. When bending the lead wire, do not apply excessive stress to the resistors and provide the wire with a natural curvature.
4. Do not brush the resistors during or after the cleaning process, which may be conducted after soldering. Otherwise, the coating film may be damaged.

(Data for Reference)

Pulse Characteristics (Usual)



P_P : Pulse limit power (W)
V_P : Pulse limit voltage (V)
τ : Pulse continuous time (s)
T : Period (s)
V_R : Rated voltage (V)
P : Rated power (W)
R : Resistance value (Ω)
$V_{p\ max.}$: Max. pulse limit voltage (V)

Withstand pulse limit power is calculated by the next method.

$P_P = K \cdot P \cdot T/\tau$

$V_P = \sqrt{K \cdot P \cdot R \cdot T/\tau}$

Reference to the right about a fixed number of $V_{P\ max.}$

- T>1(s) → T=1(s)
- T/τ>100 → T/τ=100
- P_P<P → P stands for P_P
  (V_P<V_R → V_R stands for V_P)
- Added voltage≦$V_{p\ max.}$
- P_P or V_P is referent value
  Conditions: Pulse added time=1000 h
  Resistance change=±5 %
  Room temperature

Part No.	K	$V_{p\,max.}$ (V)
ERG(X) 12S	0.5	600
ERG(X) 1S	0.5	600
ERG(X) 2S	0.5	700
ERG(X) 3S	0.5	700
ERG(X) 5S	0.5	1000

Anti-Pulse Power Resistors

Type: **ERGD**
(0.5 W, 1 W, 2 W, 3 W)

Features

- Miniaturized
- Non-flammable
- Anti-Pulse Characteristic
- Automatic Insertion
- RoHS compliant

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	R	G		2	D	J		2	2	4	

Product Code
Anti-Pulse Power Resistors

Power Rating	
12	0.5 W
1	1 W
2	2 W
3	3 W

Resistance Tolerance	
G	±2 %
J	±5 %

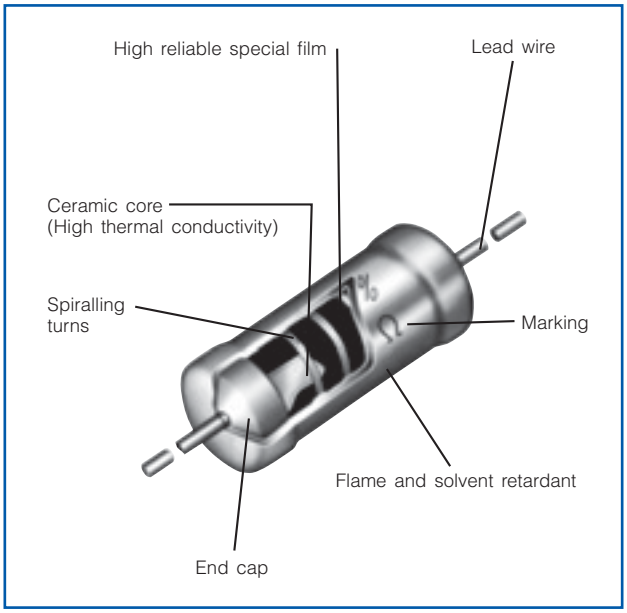
Resistance Value
The first two digits are significant figures of resistance and the third one denotes number of zeros following.

(Ex.) 224 : 220 kΩ

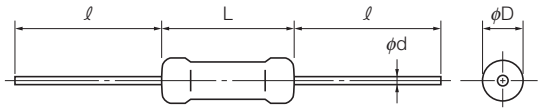
Code	Forming / Packaging	Forming & Taping matrix			
		12D	1D	2D	3D
□···□	Straight lead wire type	○	○	○	○
□···V	Axial paping type (Straight lead)	○	○	○	○
□···P	Cut & Forming type	○	○	○	○
U···V	Axial paping type (Stand off)		○	○	
□···E	Radial Taping type (E type)	○	○	○	
W···E	Radial Taping type (WE type)	○	○	○	○

The above example shows an anti-pulse resistor, 2 W power rating, resistance value of 220 k ohms, tolerance ±5 %, and package of standard bulk packing.

Construction



Dimensions in mm (not to scale)



Part No.	Dimensions (mm)				Mass (Weight) [g/pc.]
	L	ϕD	ℓ	ϕd	
ERG12D	$6.35^{+0.65}_{-0.35}$	$2.3^{+0.5}_{-0.3}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$	0.26
ERG1D	$9.00^{+1.50}_{-1.00}$	$2.8^{\pm0.5}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$	0.33
ERG2D	$12.00^{+1.50}_{-1.00}$	$4.0^{\pm1.0}$	$30.0^{\pm3.0}$	$0.80^{\pm0.05}$	0.66
ERG3D	$15.00^{\pm1.50}$	$5.5^{\pm1.0}$	$38.0^{\pm3.0}$	$0.80^{\pm0.05}$	1.47

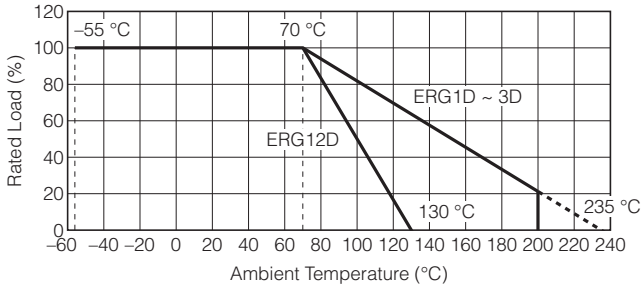
Ratings

Part No.	Power Rating at 70 °C (W)	Limiting Element Voltage(1) (V)	Maximum Overload Voltage(2) (V)	Maximum Intermittent Overload Voltage(3) (V)	Dielectric Withstanding Voltage (VAC)	Res. Tol. (%)	Resistance Range (Ω) (4) min.	Resistance Range (Ω) (4) max.	Standard Resistance Value
ERG12D	0.5	400	800	800	500	J (±5) G (±2)	51 k	240 k	E24
ERG1D	1	500	1000	1000	500	J (±5) G (±2)	110 k	330 k	E24
ERG2D	2	500	1000	1000	700	J (±5) G (±2)	110 k	510 k	E24
ERG3D	3	500	1000	1000	700	J (±5) G (±2)	110 k	750 k	E24

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating}\times\text{Resistance Value}}$ or Limiting Element Voltage listed above whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5×Power Rating or max. Overload Voltage listed above whichever less.
(3) Intermittent Overload Test Voltage (IOTV) shall be determined from IOTV=4.0×Power Rating or max. Intermittent Overload Voltage listed above whichever less.
(4) Resistance tolerance and resistance range is of use besides range listed, please inquire.

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



■ As for Packaging Methods and / or cut formed leads,

Please see Metal (Oxide) Film Resistors Packaging Methods

⚠ Safety Precautions

The following are precautions for individual products. Please also refer to the common precautions for Fixed Resistors in this catalog.

1. Transient voltage
   If there is a possibility that the transient phenomenon (significantly high voltage applied in a short time) may occur or that a high voltage pulse may be applied, make sure to evaluate and check the characteristics of Anti-Pulse Power Resistors (hereafter called the resistors) mounted on your product rather than only depending on the calculated power limit or steady-state conditions to complete the design or decide to use the resistors.
2. The resistors are covered with a special coating. Do not apply shock or vibration to them, or pinch them with long-nose pliers. Otherwise, the resistors may be damaged.
3. Do not apply excessive tension to the lead-connected sections. When bending the lead wire, do not apply excessive stress to the resistors and provide the wire with a natural curvature.
4. Do not brush the resistors during or after the cleaning process, which may be conducted after soldering. Otherwise, the coating film may be damaged.

Metal Film Resistors

Type: **ERXL (Low Resistance Value)**
(0.5 W, 1 W, 2 W)

Features

- Miniaturized
- Non-flammable
- Automatic Insertion
- RoHS compliant

Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	R	X		2	L	J		4	7	M	

Product Code	
ERX	Metal Film Resistors

Power Rating	
12	0.5 W
1	1 W
2	2 W

Special Feature	
L	Small size Low resistance value

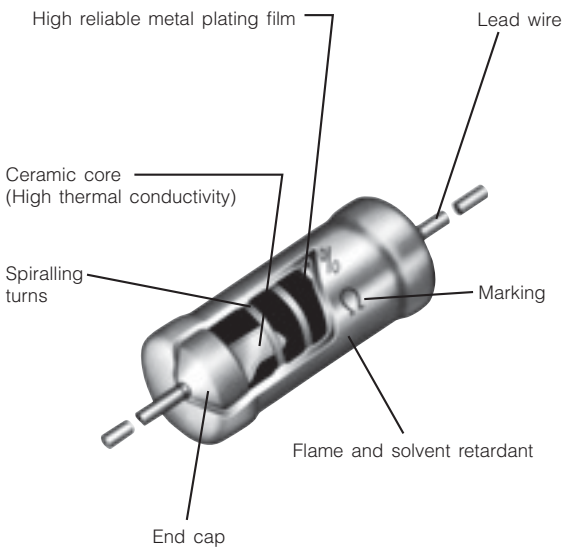
Resistance Tolerance	
J	±5 %

Resistance Value
The first two digits are significant figures of resistance and it shows by the unit of the "mΩ". Decimal point is expressed by M as 47 mΩ = 47M.

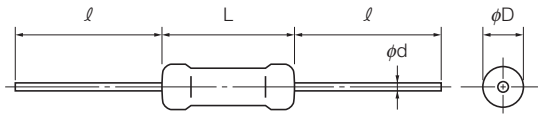
Code	Forming / Packaging	Forming & Taping matrix		
		12L	1L	2L
□···□	Straight lead wire type	○	○	○
□···V	Axial paping type (Straight lead)	○	○	○
□···P	Cut & Forming type	○	○	○
□···E	Radial Taping type (E type)	○	○	○
W···E	Radial Taping type (WE type)	○	○	○

The above example shows a small size and low resistance value metal film resistor, 2 W power rating, resistance value of 47 m ohms, tolerance ±5 %, and package of standard bulk packing.

Construction



Dimensions in mm (not to scale)



Part No.	Dimensions (mm)				Mass (Weight) [g/pc.]
	L	ϕD	ℓ	ϕd	
ERX12L	$6.35^{+0.65}_{-0.35}$	$2.3^{+0.5}_{-0.3}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$	0.26
ERX1L	$9.00^{+1.50}_{-1.00}$	$2.8^{\pm0.5}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$	0.33
ERX2L	$12.00^{+1.50}_{-1.00}$	$4.0^{\pm1.0}$	$30.0^{\pm3.0}$	$0.80^{\pm0.05}$	0.66

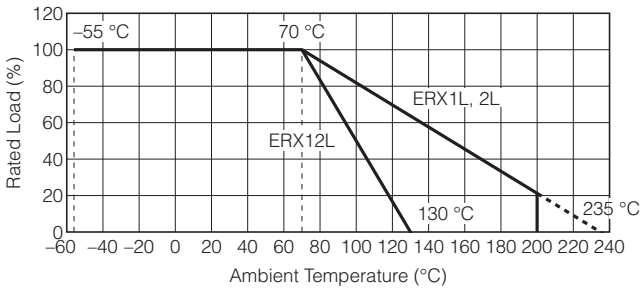
Ratings

Part No.	Power Rating at 70 °C (1) (W)	Dielectric Withstanding Voltage (VAC)	Res. Tol. (%) (2)	Resistance Range (Ω) (2)		T.C.R. (×10^{-6}/°C)	Standard Resistance Value
				min.	max.		
ERX12L	0.5	350	J (±5)	22 m	82 m	22 to 39 mΩ=±1000 47 to 82 mΩ=± 500	E12
ERX1L	1	350	J (±5)	22 m	82 m		E12
ERX2L	2	600	J (±5)	22 m	82 m		E12

(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating}\times\text{Resistance Value}}$.
(2) Resistance tolerance and resistance range is of use besides range listed, please inquire.

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



■ As for Packaging Methods and / or cut formed leads,

Please see Metal (Oxide) Film Resistors Packaging Methods

⚠ Safety Precautions

The following are precautions for individual products. Please also refer to the common precautions for Fixed Resistors in this catalog.

1. Transient voltage
   If there is a possibility that the transient phenomenon (significantly high voltage applied in a short time) may occur or that a high voltage pulse may be applied, make sure to evaluate and check the characteristics of Metal Film Resistors (hereafter called the resistors) mounted on your product rather than only depending on the calculated power limit or steady-state conditions to complete the design or decide to use the resistors.
2. The resistors are covered with a special coating. Do not apply shock or vibration to them, or pinch them with long-nose pliers. Otherwise, the resistors may be damaged.
3. Do not apply excessive tension to the lead-connected sections. When bending the lead wire, do not apply excessive stress to the resistors and provide the wire with a natural curvature.
4. Do not brush the resistors during or after the cleaning process, which may be conducted after soldering. Otherwise, the coating film may be damaged.

Metal Film Fusing Resistors

Type: **ERQA**
ERQZ
(0.25 W, 0.5 W, 1 W, 2 W coating type)

Features

- Accurate fusing
- Small size and lightweight
- Uniform quality, consistent performance and reliability
- Flame retardant, utilizing exclusive silicon insulation material
- Reference Standard
  EIAJ RC-2125
- RoHS compliant

Explanation of Part Numbers

1	2	3	4	5	6	7	8		9	10	11	12
E	R	Q		2	A	B	J		1	0	1	

Product Code
Metal Film Fusing Resistors

Power Rating at 70 °C amb.

14	0.25 W
12	0.5 W
1	1 W
2	2 W

Special Feature

A	Standard
Z	Less than 2 Ω
AB	Standard
Z	Less than 2 Ω

Resistance Tolerance

J	±5 %

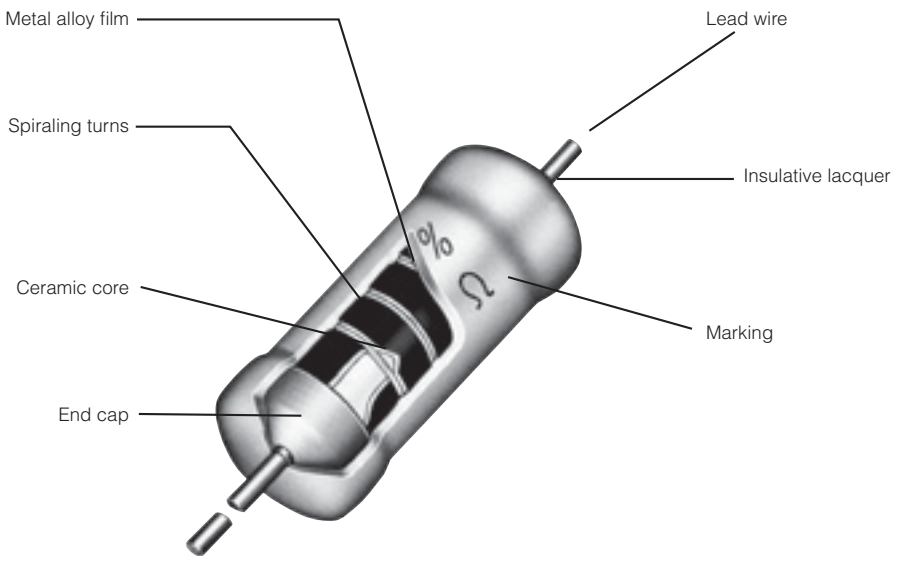
Resistance Value
The first two digits are significant figures of resistance and the third one denotes number of zeros following.Decimal point is expressed by R as 2.2=2R2.

Suffix for Packaging and/or Cut & Formed Leads

Nil	Std.bulk packing
P	P type cut & formed
P···S	P···S type cut & formed
E	Radial Taped & Box
W···E	Radial Taped & Box

The above example shows a standard Metal Film Fusing Resistors, 2 W power rating, resistance value of 100 Ω, tolerance of ±5 %, and package of standard bulk packing.

Construction



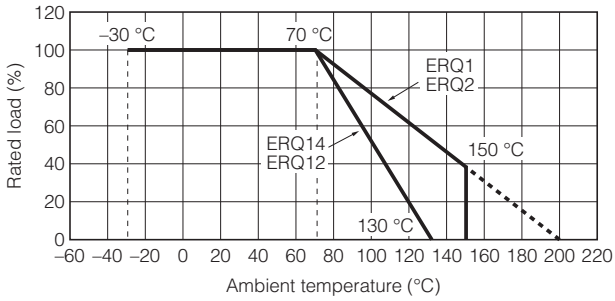
Ratings

Part No.	Power Rating at 70°C (W)	Maximum Open Circuit Voltage(1) (V)	Maximum Overload Voltage	Dielectric With-standing Voltage (V)	Resistance Tolerance (%)	Resistance Range (Ω) min.	Resistance Range (Ω) max.	T.C.R. ($\times 10^{-6}$/°C)	Standard Resistance Values	Marking Method on Body	Mass (Weight) [g/pc.]
ERQ14Z	0.25	200	3 times of rated voltage(2)	AC 350	J (± 5)	1.0	1.8	±350	E24	Color code	0.24
ERQ14A						2.0	470				
ERQ12Z	0.5	250		AC 350	J (± 5)	1.0	1.8	±350	E24	Stamp	0.32
ERQ12A						2.0	560			Color code	
ERQ1Z	1	250		AC 600	J (± 5)	1.0	1.8	±350	E24	Stamp	0.64
ERQ1AB						2.0	560				
ERQ2Z	2	250		AC 1000	J (± 5)	1.0	1.8	±350	E24	Stamp	1.54
ERQ2AB						2.0	560				

(1) Maximum Open Circuit Voltage: Referring to the maximum value of the voltage applied between terminals of the resistor when the resistor is opened in an electric circuit 1000 times power rating or voltage specified above whichever less is regarded as the maximum open circuit voltage.
(2) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Power Derating Curve

For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.

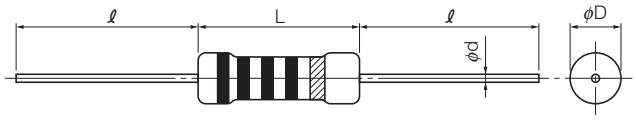


Performance Specifications

Characteristics	Specifications	Test Methods
Fusing Characteristics	See table below	The test potential shall be preadjusted using a dummy resistor and then be subjected to the test specimens. The potential shall be readjusted within two seconds to reach the exact value of specified current. This test shall be made under the conditions at 20 °C and 65 % RH (or at a temperature of 5 °C to 35 °C and 45 to 85 % RH, only when any doubt may not be caused), and the use of stabilized power source is suggested. Fusing time shall be measured as the duration until the circuit current is decreased to a 1/50 the initial test current or less.

Rated Power	Res. Value (Ω)	Limit
0.25 W 0.5 W	1 to 1.8	Open within 30 seconds at 30 times the rated power
1 W 2 W		Open within 30 seconds at 25 times the rated power
0.25 W 0.5 W 1 W 2 W	2 to 9.1	Open within 30 seconds at 16 times the rated power
0.25 W	10 to 470	Open within 30 seconds at 12 times the rated power
0.5 W 1 W 2 W	10 to 560	

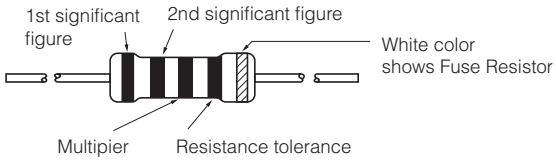
Dimensions in mm (not to scale)



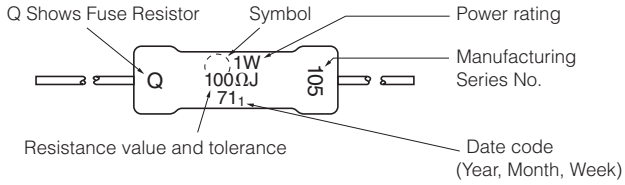
Part No.	Dimensions (mm)			
	L	ϕD	ℓ	ϕd
ERQ14	$6.3^{+1.5}_{-1.0}$	$2.3^{\pm0.5}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$
ERQ12	$9.0^{+1.5}_{-1.0}$	$2.8^{\pm0.5}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$
ERQ1	$12.0^{+1.5}_{-1.0}$	$4.0^{\pm1.0}$	$30.0^{\pm3.0}$	$0.80^{\pm0.05}$
ERQ2	$15.0^{\pm1.5}$	$5.5^{\pm1.0}$	$38.0^{\pm3.0}$	$0.80^{\pm0.05}$

Explanation of Marking

Type ERQ14, ERQ12 (0.25 W, 0.5 W)

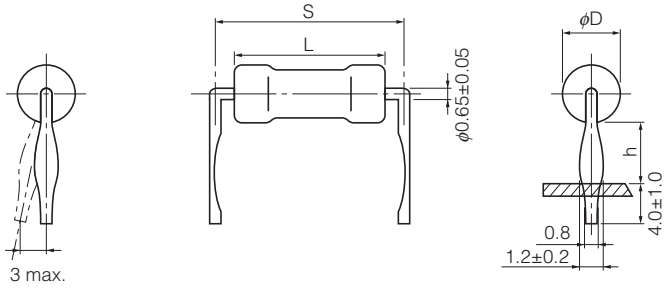


Type ERQ1, ERQ2 (1W, 2W)



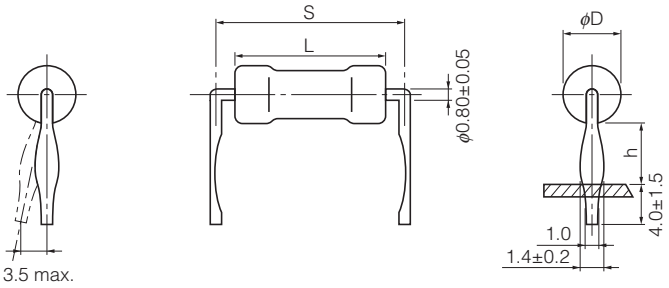
Cut & Formed Type

ERQ□□AJ□□□P
ERQ□□ZJ□□□P



Part No.	Power Rating at 70 °C (W)	Standard Q'ty/Packing (pcs.)	Dimensions (mm)			
			L	ϕD	S	h
ERQ14□J□□□P	0.25	2,000	$6.3^{+1.5}_{-1.0}$	$2.3^{\pm0.5}$	$10.0^{\pm1.5}$	$4.0^{\pm1.5}$
ERQ12□J□□□P	0.5	2,000	$9.0^{+1.5}_{-1.0}$	$2.8^{\pm0.5}$	$12.5^{\pm1.5}$	$4.0^{\pm1.5}$

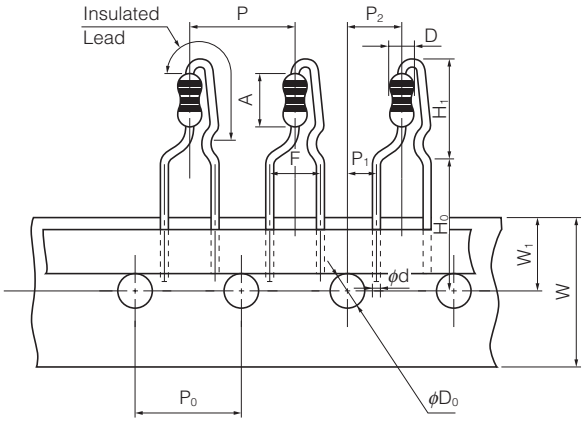
ERQ□ABJP□□□S
ERQ□ZJP□□□S



Part No.	Power Rating at 70 °C (W)	Standard Q'ty/Packing (pcs.)	Dimensions (mm)			
			L	ϕD	S	h
ERQ1□□JP□□□S	1	1,000	$12.0^{+1.5}_{-1.0}$	$4.0^{\pm1.0}$	$15.0^{\pm1.5}$	$6.0^{\pm1.5}$
ERQ2□□JP□□□S	2	1,000	$15.0^{\pm1.5}$	$5.5^{\pm1.0}$	$20.0^{\pm2.0}$	$6.5^{\pm1.5}$

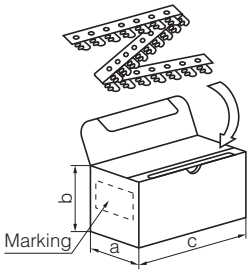
For Panasert Automatic Insertion Machine Radial Taped & Box

ERQ□□AJ□□□E
ERQ□□ZJ□□□E
(14A/14Z, 12A/12Z, 1AB/1Z)



Dimensions (mm)		Dimensions (mm)		Dimensions (mm)			Dimensions (mm)			Dimensions (mm)		
P	12.7±1.0	W	18.0±0.5	H_1	14A/14Z	12 max.	A	14A/14Z	$6.35^{+0.65}_{-0.35}$	D	14A/14Z	2.3±0.5
P_0	12.7±0.3	W_1	9.0±0.5		12A/12Z	15.5 max.		12A/12Z	$9.0^{+1.5}_{-1.0}$		12A/12Z	2.8±0.5
P_1	3.85±0.70				1AB/1Z	19 max.		1AB/1Z	$12.0^{+1.5}_{-1.0}$		1AB/1Z	4.0±1.0
P_2	6.35±1.00			H_0	16.0±0.5		ϕd	0.65±0.05				
F	5.0±0.8			ϕD_0	4.0±0.2							

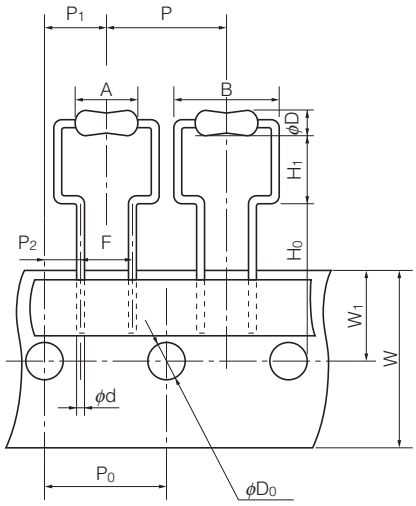
● Radial Tape Packaging Methods



Part Number	Dimensions (mm)			Standard Quantity (pcs./box)
	a	b	c	
ERQ14AJ□□□E ERQ14ZJ□□□E	46	130	335	2,000 pcs./box
ERQ12AJ□□□E ERQ12ZJ□□□E	46	130	335	2,000 pcs./box
ERQ1ABJ□□□E ERQ1ZJ□□□E	49	100	335	1,000 pcs./box

For Panasert Automatic Insertion Machine Radial Taped & Box

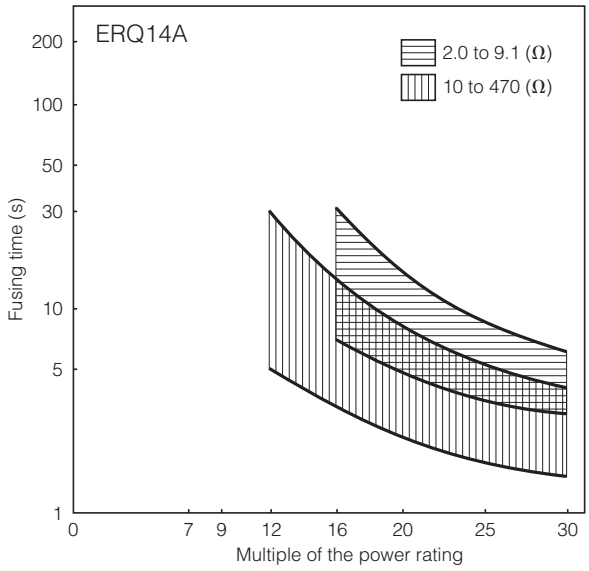
ERQ□□A/ZJW□□□E (14A/14Z, 12A/12Z, 1AB/1Z)

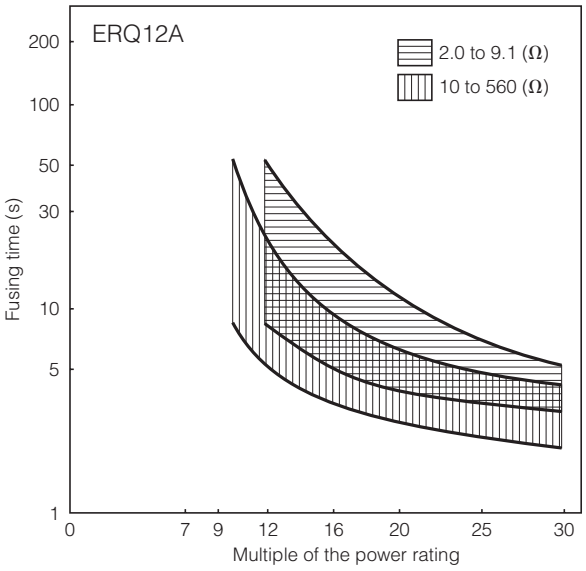


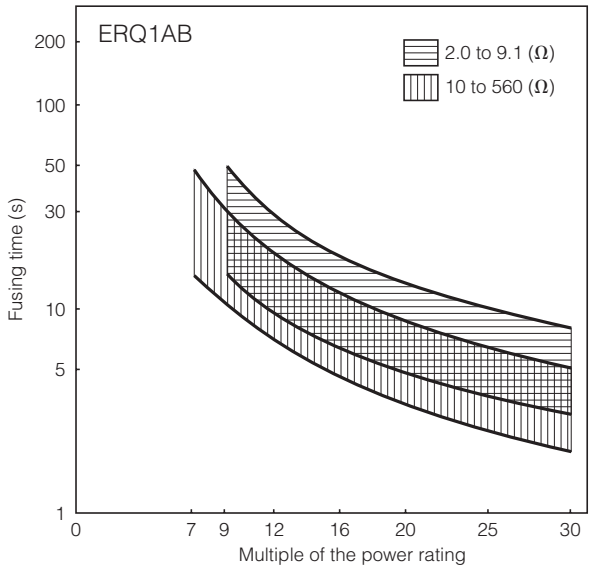
Dimensions (mm)			Dimensions (mm)		
P	14A/14Z	12.7±1.0	H_1	14A/14Z	$6.5^{+0.6}_{0}$
	12A/12Z, 1AB/1Z	30.0±1.0		12A/12Z	$6.5^{+1.0}_{0}$
P_0	14A/14Z	12.7±0.3		1AB/1Z	$6.5^{+1.0}_{0}$
	12A/12Z, 1AB/1Z	15.0±0.3	ϕD_0	4.0±0.2	
P_1	14A/14Z	6.35±1.00	A	14A/14Z	$6.35^{+0.65}_{-0.35}$
	12A/12Z, 1AB/1Z	7.5±1.0		12A/12Z	$9.0^{+1.5}_{-1.0}$
P_2	14A/14Z	3.85±0.70		1AB/1Z	$12.0^{+1.5}_{-1.0}$
	12A/12Z, 1AB/1Z	3.75±0.50	B	14A/14Z	11.2 max.
F	14A/14Z	$5.0^{+0.6}_{-0.2}$		12A/12Z	14 max.
	12A/12Z, 1AB/1Z	$7.5^{+0.6}_{-0.2}$		1AB/1Z	17 max.
W	18.0±0.5		ϕD	14A/14Z	$2.3^{+0.5}_{-0.3}$
W_1	9.0±0.5			12A/12Z	2.8±0.5
H_0	14A/14Z	16.0±0.5		1AB/1Z	4.0±1.0
	12A/12Z	18.0±1.0	ϕd	14A/14Z	0.65±0.05
	1AB/1Z	18.0±1.0		12A/12Z, 1AB/1Z	0.80±0.05

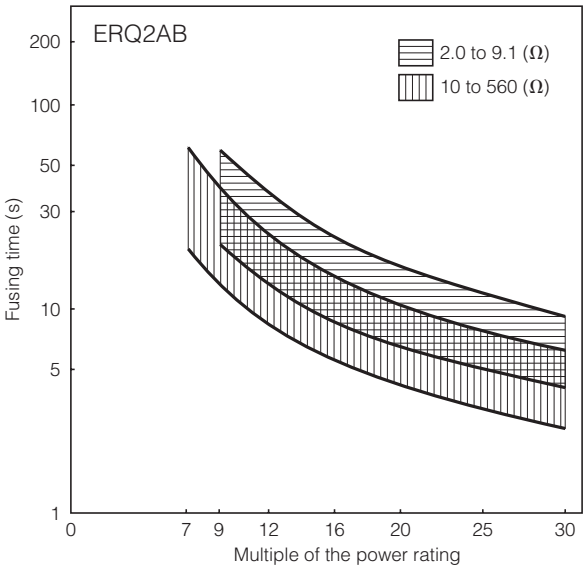
Fusing Characteristics (Constant Voltage Circuit)

This data is for reference only, specifications should be verified in written form with the engineering division.

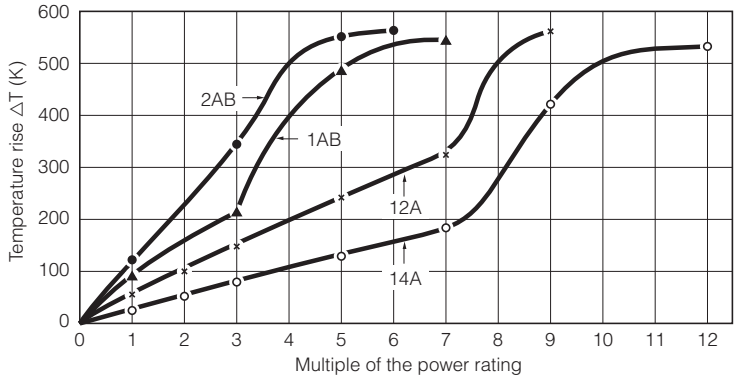


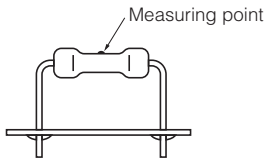






Hot Spot Temperature (for reference)





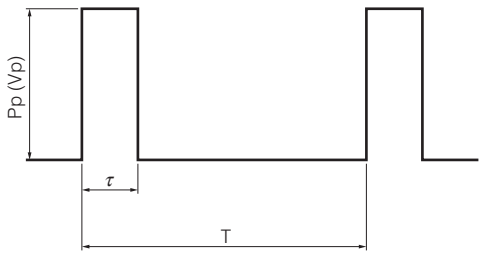
⚠ Safety Precautions

The following are precautions for individual products. Please also refer to the common precautions for Fixed Resistors in this catalog.

1. Checking the fusing conditions
   1) Fusing characteristics differ depending on the type, shape, and resistance. Check the fusing conditions before selecting the type of Metal Film Fusing Resistors (hereafter called the fusing resistor) to be used.
   2) Use the fusing resistors under the maximum open circuit voltage. Otherwise, arcing may occur when a voltage much higher than the rated one is applied in the event of an abnormality in the circuit, or when a high voltage is applied after fusing.
   3) Under abnormal conditions of a constant voltage circuit, a current of about 2 or 3 times the initial abnormal current passes through, accelerating the speed at which the fusing resistors blows. When using a constant current circuit, carefully check the conditions because the fusing resistors may not blow in a constant current circuit.
2. Checking for pulse voltage, impact voltage, and transient voltage
   Make sure to evaluate and check the fusing resistors mounted on your product if they are to be mounted on a circuit that generates an impact voltage, or if there is a possibility that the transient phenomenon (significantly high voltage applied in a short time) may occur or that a pulse voltage with a high peak voltage may be applied. Make sure to consult our sales staff before using the fusing resistors under special conditions.
3. Conditions of use in a steady state
   Make sure that the load conditions have a sufficient allowance for the power derating curve. The characteristics of the fusing resistors are set by using a constant voltage circuit.
4. The solvent resistance of the fusing resistors is not assured. If you use a solvent for cleaning after soldering or other processes, make sure to consult our sales staff before use and perform a prior test and evaluation to ensure that the solvent will not affect the reliability of the fusing resistors.

(Data for Reference)

Pulse Characteristics (Usual)



P_P : Pulse limit power (W)
V_P : Pulse limit voltage (V)
τ : Pulse continuous time (s)
T : Period (s)
V_R : Rated voltage (V)
P : Rated power (W)
R : Resistance value (Ω)
$V_{p\,max.}$: Max. pulse limit voltage (V)

Withstand pulse limit power is calculated by the next method.

$P_P = K \cdot P \cdot T/\tau$

$V_P = \sqrt{K \cdot P \cdot R \cdot T/\tau}$

Reference to the right about a fixed number of $V_{P\,max.}$

Part No.	K	$V_{p\,max.}$ (V)
ERQ14A	0.6	200
ERQ12A	0.6	250
ERQ1AB	0.6	250
ERQ2AB	0.4	250

- $T>1(s) \rightarrow T=1(s)$
- $T/\tau>100 \rightarrow T/\tau=100$
- $P_P<P \rightarrow P$ stands for P_P
  ($V_P<V_R \rightarrow V_R$ stands for V_P)
- Added voltage$\leqq V_{p\,max.}$
- P_P or V_P is reference value
  Conditions : Pulse added time=1000 h, Resistance change=±5 %
  Room temperature

Standard for Resistance Value, Resistance Tolerance and Color Code

Basis Standard

IEC Publication 60062 : Marking codes for resistors and capacitors.
IEC Publication 60063 : Preferred number series for resistors and capacitors.
JIS C 5062 : Marking codes for resistors and capacitors.
JIS C 5063 : Preferred number series for resistors and capacitors.

Resistance Values

The resistance values are notched by “Ratio” below in each series.

Series	Resistance Tolerance (Standard)	Ratio	Remarks
E6	±20 %	$\sqrt[6]{10}$≒1.46	Please refer to standard resistance values shown on this catalog.
E12	±10 %	$\sqrt[12]{10}$≒1.21	
E24	± 5 %	$\sqrt[24]{10}$≒1.10	
E48	± 2 %	$\sqrt[48]{10}$≒1.05	
E96	± 1 %	$\sqrt[96]{10}$≒1.02	

How to express the resistance value with a Panasonic part number

The resistance value expressed in ohms is identified by a three digit number or a four digit number.
The last digit specifies the number of zeroes to follow.
The letter “R” shall be used as the decimal point for less than 10 Ω.

The examples of a three digit number

Resistance Code	Value in ohms
R56	0.56
5R6	5.6
100	10
271	270
102	1 k
273	27 k
104	100 k
275	2.7 M
106	10 M
107	100 M

The examples of a four digit number

Resistance Code	Value in ohms
R562	0.562
5R62	5.62
56R2	56.2
1000	100
2711	2.71 k
1002	10 k
2713	271 k
1004	1 M
2715	27.1 M
1006	100 M

How to express the resistance tolerance with a Panasonic part number

The resistance tolerance is identified by a single letter in accordance with the following table and the code is placed just before the resistance code in the following examples.

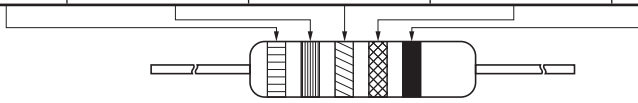
Tolerance Code	Tolerance (%)	Examples
W	±0.05	W1001 : 1000 Ω±0.05 %
B	±0.1	B1001 : 1000 Ω±0.1 %
C	±0.25	C1001 : 1000 Ω±0.25 %
D	±0.5	D1001 : 1000 Ω±0.5 %
F	±1	F1001 : 1000 Ω±1 %
G	±2	G1001 : 1000 Ω±2 %
J	±5	J101 : 100 Ω±5 %
K	±10	K101 : 100 Ω±10 %
M	±20	M101 : 100 Ω±20 %

Color code indication for the resistance value and the tolerance

Fixed resistors whose resistance value and tolerance are indicated by color code follow the standard below.

Color code

Color	First digit	Second digit	Third digit	Multiplier	Resistance tolerance	
					%	Code
Black	0	0	0	1		
Brown	1	1	1	10	±1	F
Red	2	2	2	10^2	±2	G
Orange	3	3	3	10^3	±0.05	W
Yellow	4	4	4	10^4		
Green	5	5	5	10^5	±0.5	D
Blue	6	6	6	10^6	±0.25	C
Violet	7	7	7	10^7	±0.1	B
Gray	8	8	8			
White	9	9	9			
Gold				10^{-1}	±5	J
Silver				10^{-2}	±10	K
None					±20	M



Indication example

Color code of 5 color bands

When the standard resistance value follows E48 series or 96 series, color code of the resistors are indicated by five color bands. Example below is 154 kΩ.

Example 1

1st Color	2nd Color	3rd Color	4th Color	5th Color
Brown (1)	Green (5)	Yellow (4)	Orange (1000)	Brown (±1 %)

Color code of 4 color bands

When the standard resistance value follows E6 series, 12 series or 24 series, color code of the resistors are indicated by four color bands. Example below is 15 kΩ.

Example 2

1st Color	2nd Color	3rd Color	4th Color
Brown (1)	Green (5)	Orange (1000)	Gold (±5 %)

Standard Resistance Values

E6	E12	E24	E48	E96
10	10	10	100	100
				102
			105	105
				107
		11	110	110
				113
			115	115
				118
	12	12	121	121
				124
			127	127
		13		130
			133	133
				137
			140	140
				143
			147	147
15	15	15		150
			154	154
				158
		16	162	162
				165
			169	169
				174
			178	178
	18	18		182
			187	187
				191
			196	196
		20		200
			205	205
				210

E6	E12	E24	E48	E96
			215	215
22	22	22		221
			226	226
				232
			237	237
		24		243
			249	249
				255
			261	261
				267
	27	27	274	274
				280
			287	287
				294
		30	301	301
				309
			316	316
				324
33	33	33		332
			332	340
			348	348
				357
		36		365
			365	374
				383
			383	392
	39	39	402	402
				412
			422	422
		43		432
			442	442
				453

E6	E12	E24	E48	E96
			464	464
47	47	47		475
			487	487
				499
		51	511	511
				523
			536	536
				549
	56	56	562	562
				576
			590	590
				604
		62	619	619
				634
			649	649
				665
68	68	68	681	681
				698
			715	715
				732
		75	750	750
				768
			787	787
				806
	82	82		825
			825	845
				866
			866	887
		91		909
			909	931
				953
			953	976

CAUTION AND WARNING

1. The electronic components contained in this catalog are designed and produced for use in home electric appliances, office equipment, information equipment, communications equipment, and other general purpose electronic devices.
   Before use of any of these components for equipment that requires a high degree of safety, such as medical instruments, aerospace equipment, disaster-prevention equipment, security equipment, vehicles (automobile, train, vessel),
   please be sure to contact our sales representative.
2. When applying one of these components for equipment requiring a high degree of safety, no matter what sort of application it might be, be sure to install a protective circuit or redundancy arrangement to enhance the safety of your equipment. In addition, please carry out the safety test on your own responsibility.
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The information in this catalog is valid as of May 2015.