Film capacitors – Power Electronic Capacitors

PEC ModCap MF series (medium frequency)

Series/Type:	**ModCap MF**
Ordering code:	**B25645A***
Date:	September 2024
Version:	6.0

© TDK Electronics AG 2024. Reproduction, publication and dissemination of this publication, enclosures hereto and the information contained therein without TDK Electronics' prior express consent is prohibited.

Downloaded from Arrow.com.

Rated Capacitance: 350 … 3900 µF
Rated DC Voltage: 900 … 2300 V DC

Construction A and B

Construction

- Dielectric: 100% Bio-based Polypropylene film*
- Filling material: Non PCB, PU Resin (UL 94 V-0, Fire & smoke EN 45545-2 HL2 R22-HL3R23)
- Plastic case and cover (UL 94 V-0, Fire & smoke EN 45545-2HL2 R22-HL3R23)
- Segmented film available upon request.

Features

- Modular design
- Self-healing technology
- Over-voltage capability
- Low ESL

Typical applications

- DC link for renewable energy converters (solar, wind).
- DC link for traction applications (train, tramway, metro, light train inverters)
- DC link for industrial motor drive

Reference Standards

- IEC 61071:2017, International Standard Capacitors for power electronics
- IEC 61881-1:2010, International Standard Railway Applications-Rolling stock equipment-Capacitors for power electronics
- EN 45545-2 HL3 R23, Fire safety standard

Terminals

- Optimized low inductance flat female terminals M6

Certifications

- UL Recognized up to 85ºC
- ISCC certification with 100% Bio-based PP film *

Packing

- Construction A: 4 capacitors per box
- Construction B: 3 capacitors per box

* (Mass balance approach)

Downloaded from Arrow.com.

Technical data and specifications

Characteristics	
Rated capacitance C_N	Up to 3900 µF (see table)
Tolerance	K (±10%)
Rated voltage U_N	900 to 2300 V DC (see table)
Ripple voltage U_r	Up to 424 $V_{peak-peak}$
Operation bandwidth [1)]	Up to 50 kHz
Nominal current I_N (1 kHz)	(see table)
Inductance ESL (1 MHz)	14 nH
Thermal Resistance, R_{th} [2)]	Construction A: 1.4 K/W Construction B: 1 K/W

[1)] RMS current value that corresponds to components above 50 kHz limited to 10% of total RMS. Maximum continuous losses defined for rated current at 1 kHz should not be exceed. ESR vs frequency graphs available in page 5 for losses calculation according to a specific current spectrum. For more accurate thermal calculation, please ask for FEA simulation according to your specific operation conditions.

[2)] Calculated from T_{amb} to T_{HS} considering natural convection and no transfer of heat through the terminals. For more accurate thermal calculation, please ask for FEA simulation according to your specific operation conditions.

Maximum ratings	
Maximum permissible voltage (U_{max})	U_N +10% (30 % of on-load daily duration) U_N +15% (up to 30 min daily) U_N +20% (up to 5 min daily) U_N +30% (up to 1 min daily)
Maximum permissible peak voltage	U_N +50% for 30 ms is permitted 1000 times during the lifetime of the capacitors
U_{TC} (Isolation) U_{TC} (Extinction)	5 kV 3 kV (<10 pC)

The average applied voltage shall not be higher than the specified voltage.
It should be recognised that any significant period of operation at voltages above the rated one would reduce lifetime.

Test data	
Voltage Test between terminals (U_{TT})	1.5 • U_N, DC, 10 s (room temperature)

Design data	
Weight approx.	3.7 kg (construction A), 6.1 kg (construction B)
Fixing	4 x Ø 6.5 mm

Downloaded from Arrow.com.

Terminals	
Terminations	4 x M6 x 25 x 30 mm, contact area 60 mm^2
Max. torque	6 Nm

Climatic category 40/75/56	
Θ min	–40 ºC
Θ max	+75 ºC
Storage temperature	–40 …+85 ºC
$\Theta_{hotspot}$ max.	+90 ºC (up to +105ºC with conditions defined in page 7)
Humidity	av. rel. <93%, 25 g/m^3 max.
Time test	56 days
Maximum altitude	2000 m, higher altitude upon request

Life expectancy	
Lifetime *)	Up to 200 000 h (*)
End of life criteria	C-loss: 3%

(*) U_N, I_N and 70 ºC T_{amb} (80 ºC mean dielectric temperature)

Downloaded from Arrow.com.

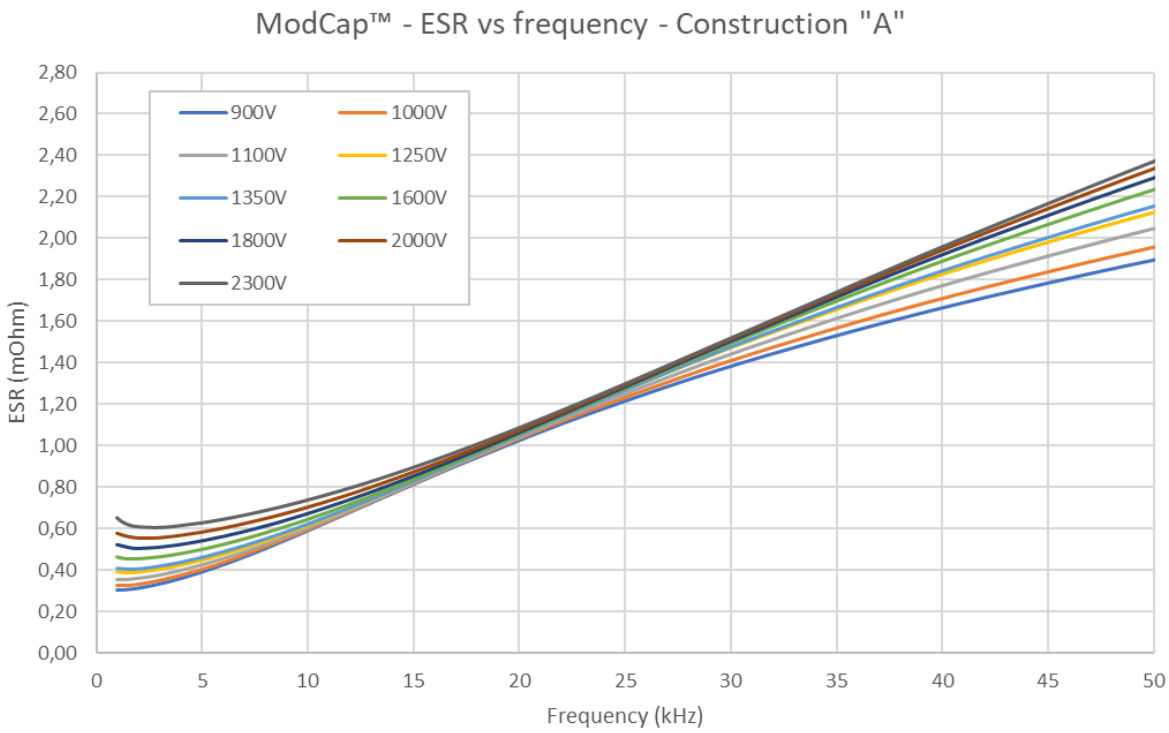
Ordering codes

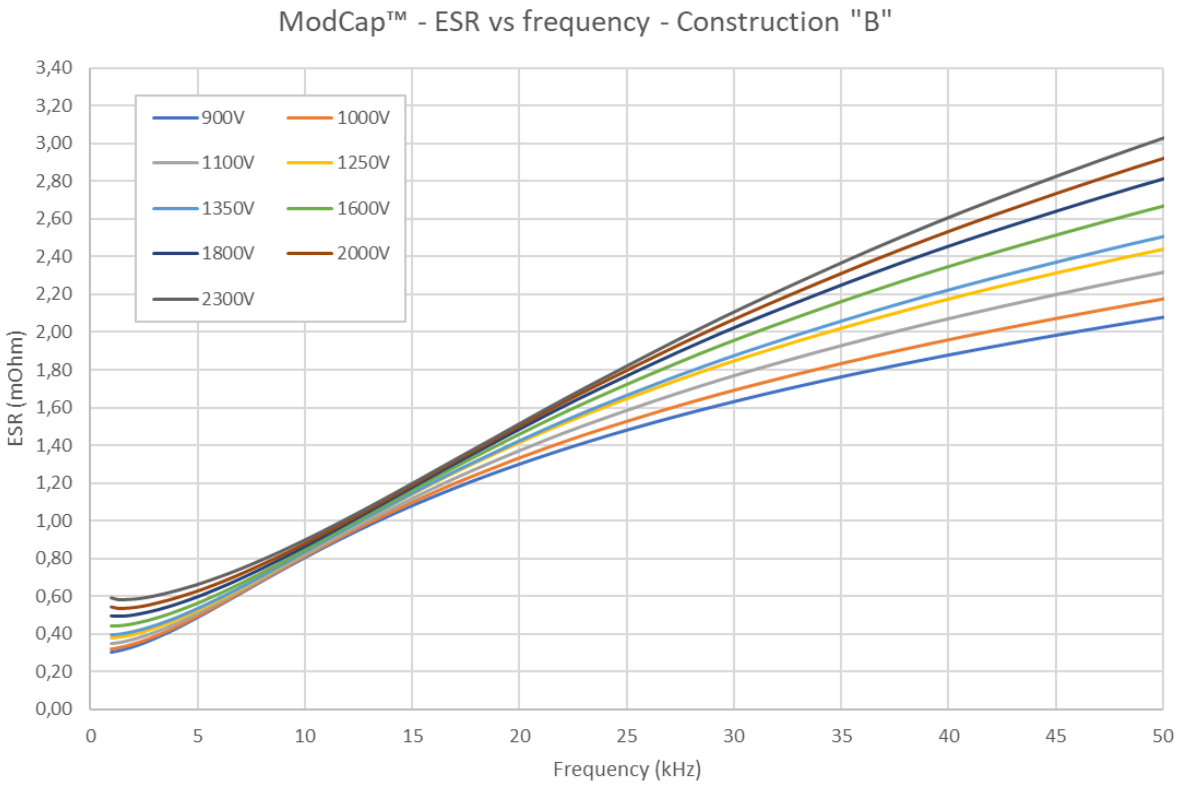
U_N V DC	C_N µF	I_N A	I_S kA	Î kA	Dimensions LxWxH mm	Design / PU	Ordering code
900	2050	200	225	5	205x90x170	A / 4pcs	B25645A9218K003
	3900	155	250	5	220x115x215	B / 3pcs	B25645A9398K003
1000	1700	190	220	5	205x90x170	A / 4pcs	B25645A1178K003
	3210	150	245	5	220x115x215	B / 3pcs	B25645A1328K003
1100	1330	180	215	5	205x90x170	A / 4pcs	B25645A1138K003
	2525	140	240	5	220x115x215	B / 3pcs	B25645A1258K003
1250	1050	170	210	5	205x90x170	A / 4pcs	B25645A1118K003
	1985	135	235	5	220x115x215	B / 3pcs	B25645A1198K003
1350	980	160	205	5	205x90x170	A / 4pcs	B25645A1108K013
	1865	130	230	5	220x115x215	B / 3pcs	B25645A1188K003
1600	720	150	200	5	205x90x170	A / 4pcs	B25645A1757K003
	1375	120	225	5	220x115x215	B / 3pcs	B25645A1138K013
1800	535	140	175	5	205x90x170	A / 4pcs	B25645A1567K003
	1025	115	220	5	220x115x215	B / 3pcs	B25645A1108K003
2000	430	130	155	5	205x90x170	A / 4pcs	B25645A2447K003
	820	110	210	5	220x115x215	B / 3pcs	B25645A2827K003
2300	350	120	140	5	205x90x170	A / 4pcs	B25645A2367K003
	670	105	200	5	220x115x215	B / 3pcs	B25645A2677K003

Remark: version with segmented film available upon request.

Downloaded from Arrow.com.

ESR vs frequency

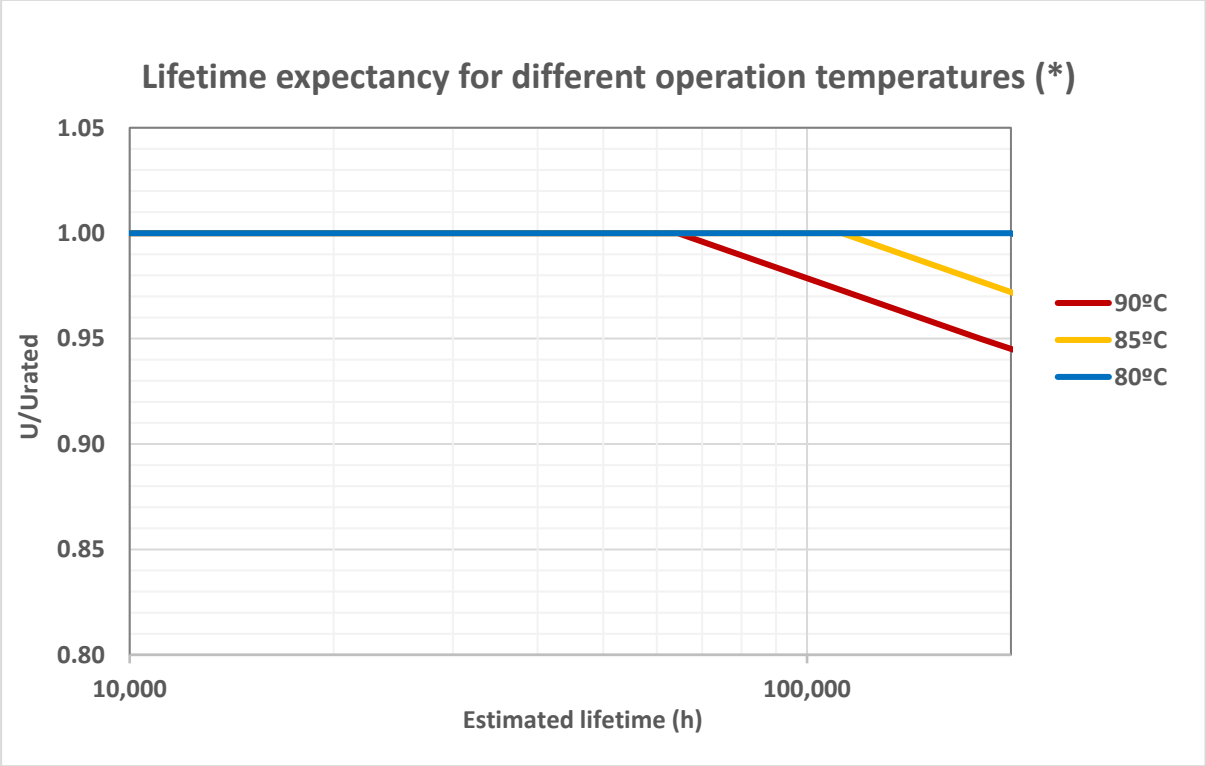




September 2024

Downloaded from Arrow.com.

Lifetime expectancy



(*) Homogeneous dielectric temperatures

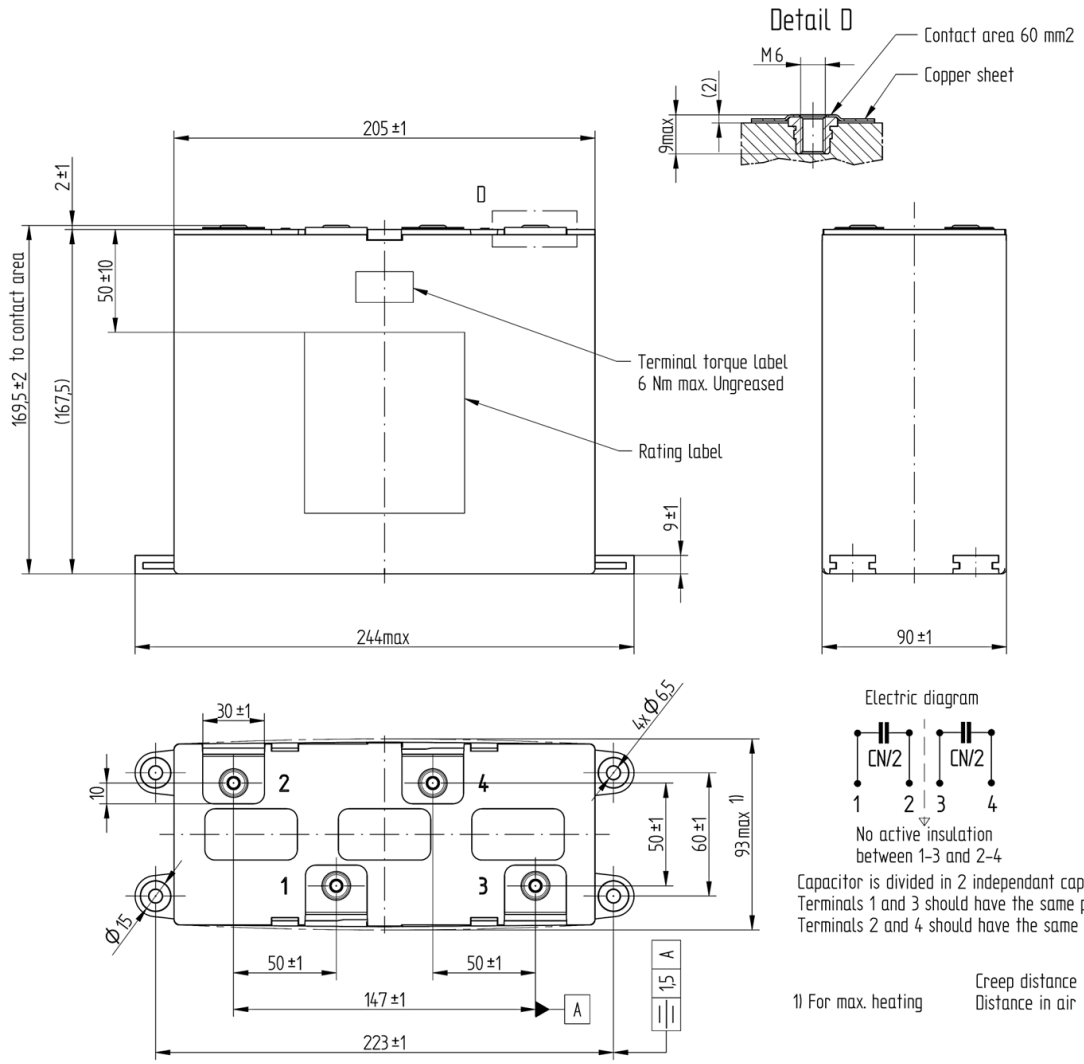
Performance at high temperature

Life expectancy at high temperature	
$\Theta_{hotspot}$ max.	+105ºC
Max. continuous voltage	0.6 x U_N
Lifetime	Up to 50 000 h, with C-loss 3%

Downloaded from Arrow.com.

Dimensional drawing

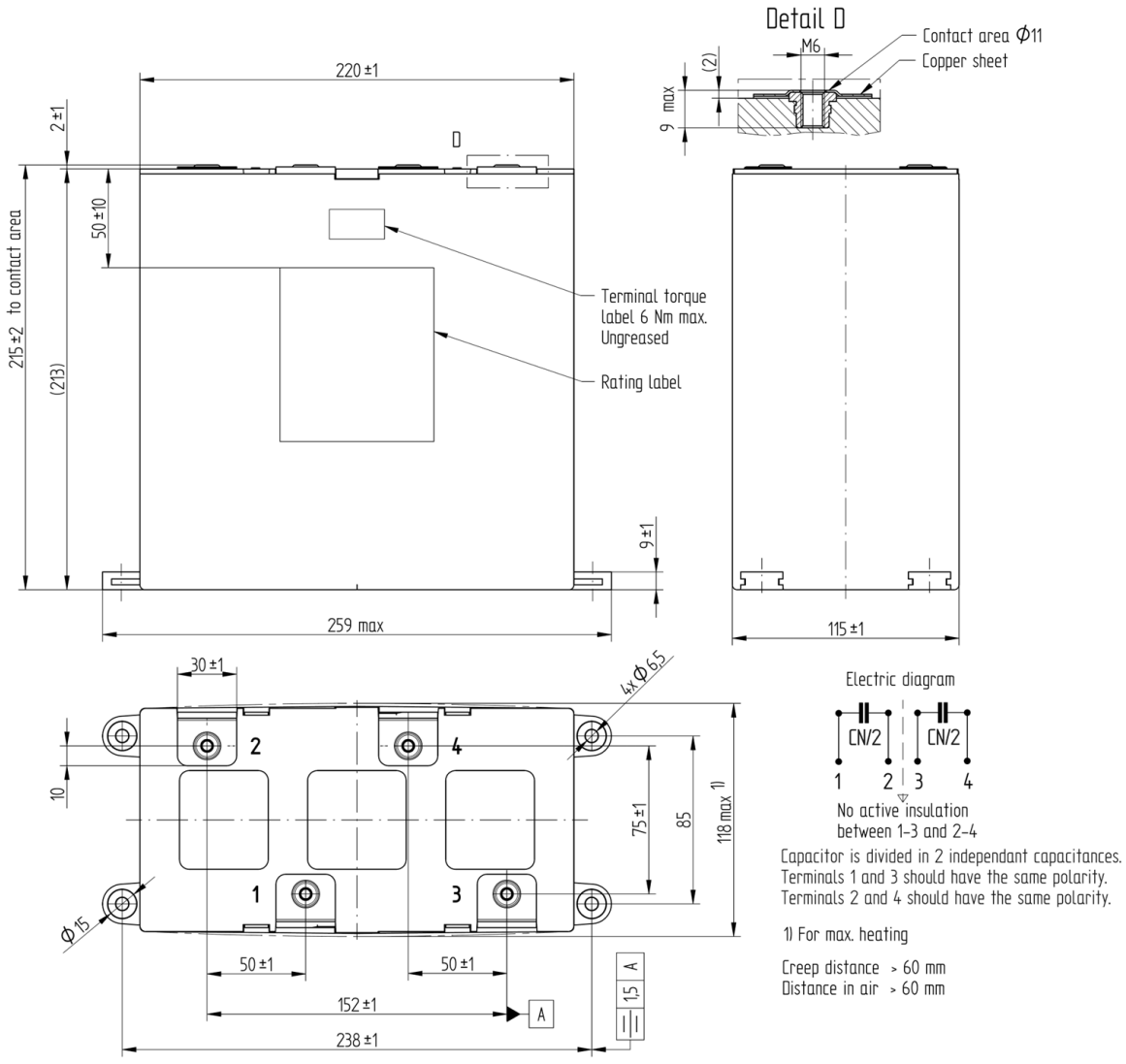
Construction A



Downloaded from Arrow.com.

Dimensional drawing

Construction B



Downloaded from Arrow.com.

Cautions and warnings

General safety recommendations

When employed in power electronics applications, the capacitors run with high energy and high currents.
The energy stored in capacitors may be lethal. To prevent any risks of shocks, the capacitor should be discharged with adequate means by qualified people and short-circuited between terminals before handling.
The capacitor can contain dangerous residual charges even after long time without operation. For this reason, the electrical terminals must remain short-circuited until the capacitors are connected in the operating circuit.

TDK Electronics cannot predict all possible stresses that a power electronic capacitor can be subjected to. There is a remaining probability of power electronic capacitors showing malfunction due to excess temperature, overvoltage, wrong application, wrong installation, faulty maintenance, mechanical damage, operation at the limits of the specification or other reasons.

Transportation and handling

- The electrical terminals must not be used for grabbing or suspending the capacitor during transportation and handling.
- Do not handle the capacitor before it is discharged.
- Handle capacitors carefully, because they may still be charged even after disconnection due to faulty discharging devices.
- Protect the capacitor properly against over current and short circuit.
- Failure to follow cautions may result, worst case, in premature failures, bursting and fire.
- Capacitors >1500V are subjected to Dual Use Category 3A201.

Fixing

- The threaded screw 4x Ø 6.5 mm in the bottom of the capacitor has to be used for fixing.

Storage and operating conditions

Capacitors must never be stored outside the specified temperature and humidity ranges.
Capacitors may not be stored in corrosive atmospheres, particularly not when chlorides, sulfides, acids, alkalis, salts, organic solvents, or similar substances are present.

Please read the Operating and safety instructions before use.

Display of ordering codes for TDK Electronics products

The ordering code for one and the same product can be represented differently in data sheets, data books, other publications, on the company website, or in order-related documents such as shipping notes, order confirmations and product labels. **The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products**. Detailed information can be found on the Internet under www.tdk-electronics.tdk.com/orderingcodes.

ModCap™: ModCap is no trademark in China

Downloaded from Arrow.com.

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application.** As a rule we are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified.** In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.tdk-electronics.tdk.com/material). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.

   We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.
6. Unless otherwise agreed in individual contracts, **all orders are subject to our General Terms and Conditions of Supply.**
7. **Our manufacturing sites serving the automotive business apply the IATF 16949 standard.** The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements (“CSR”) TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that **only requirements mutually agreed upon can and will be implemented in our Quality Management System.** For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.

Downloaded from Arrow.com.

8. The trade names EPCOS, CarXield, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, FilterCap, FormFit, InsuGate, LeaXield, MediPlas, MiniBlue, MiniCell, MKD, MKK, ModCap, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PiezoBrush, PlasmaBrush, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, SurfIND, ThermoFuse, WindCap, XieldCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.tdk-electronics.tdk.com/trademarks.

Release 2024-02

Downloaded from Arrow.com.