



Film capacitors – Power Electronic Capacitors

PEC ModCap HF series (high frequency)

Series/Type:	ModCap HF
Ordering code:	B25647A*
Date:	August 2023
Version:	3.0

Rated capacitance: 640 ... 1850 μ F
Rated DC Voltage: 900 ... 1600 V DC

Construction

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



Features

- Modular design
- High frequency performance, fully compatible with SiC semiconductors
- Self-healing technology
- Over-voltage capability
- Very low ESL
- RoHS Compliant



Typical applications

- DC link for renewable energy converters (solar, wind)
- DC link for traction applications (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
- ISCC certification with 100% Bio-based PP film*

Packing

- Construction C: 4 capacitors per box

* (Mass balance approach)

Technical data and specifications

Characteristics	
Rated capacitance C_N	Up to 1850 μ F (see table)
Tolerance	K ($\pm 10\%$)
Rated voltage range U_N	900 to 1600 V (see table)
Ripple voltage U_r	Up to 424 V _{peak-peak}
Operation bandwidth ^{1) 2)}	Up to 100 kHz
Rated current I_R (3 kHz)	(see table)
Inductance ESL (1 MHz) ²⁾	8 nH
Thermal Resistance R_{th} ³⁾	1.4 K/W

1) RMS current value that corresponds to components above 100 kHz limited to 10% of total RMS. Maximum continuous losses defined for rated current at 3 kHz should not be exceeded. ESR vs frequency graph 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) Connecting all independent capacitances by external overlapped busbar as described in page 4.

3) Calculated from T_{amb} to T_{HS} Thot-Spot considering natural convection and no transfer of heat through the terminals.

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)	4 kV
U_{TC} (Extinction)	2.5 kV (<10pC)

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 overall life.

Test data

Voltage test between terminals (U_{TT})	$1.5 \cdot U_N$, DC, 10 s (room temperature)
---	---

Design data

Weight approx.	3.6 ± 0.1 kg
Fixing	4 x \varnothing 6.5 mm

Terminals

Terminations	8 x M6 x 25 x 30 mm, contact area 60 mm ²
Max. torque	6 Nm

Climatic category 40/75/56	
Θ min	−40 °C
Θ max	+75 °C
Storage temperature	−40 °C ... +85 °C
Θ hotspot max.	+90 °C
Humidity	av. rel. < 93% 25 g/m ³ max.
Time test	56 days
Maximum altitude	2000 m, higher altitude to be requested

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

(*) U_N, and 80 °C mean dielectric temperature

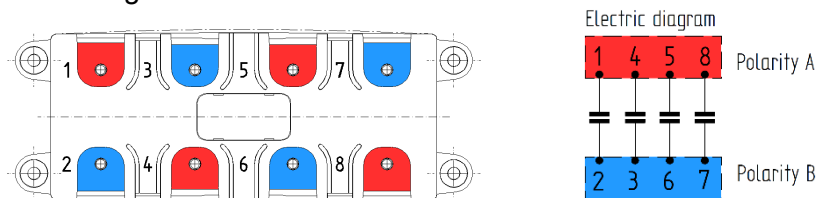
Electrical characteristics and ordering codes

U _N V	C _R μF	I _N A	I _S kA	İ kA	Dimensions LxWxH mm	Design / PU	Ordering code
900	1850	210	225	5	205x90x170	C / 4pcs	B25647A9198K003
1000	1520	200	220	5	205x90x170	C / 4pcs	B25647A1158K003
1100	1200	190	215	5	205x90x170	C / 4pcs	B25647A1128K003
1250	940	180	210	5	205x90x170	C / 4pcs	B25647A1947K003
1350	880	170	205	5	205x90x170	C / 4pcs	B25647A1887K003
1600	640	160	198	5	205x90x170	C / 4pcs	B25647A1647K003

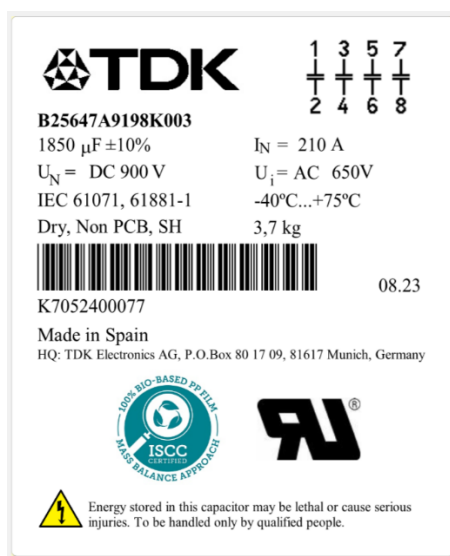
Connection via External Busbar

The ModCap is a modular solution with four independent capacitors to be connected with an external overlapped busbar.

The customer busbar shall connect the terminals according to the appropriate polarity as shown in the electrical connection diagram below.

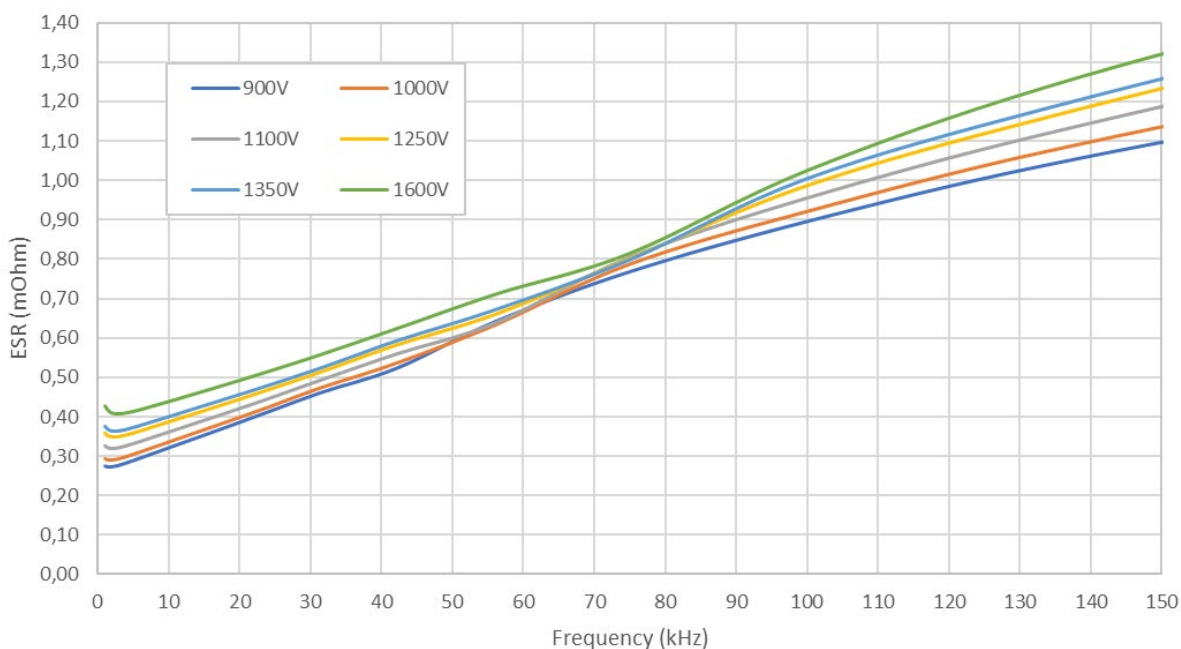


Note: The sketch on the label displays only the physical position of the assigned terminal numbering. The capacitor should be connected according to electric diagram on page 4. Further detail in the dimensional drawing.

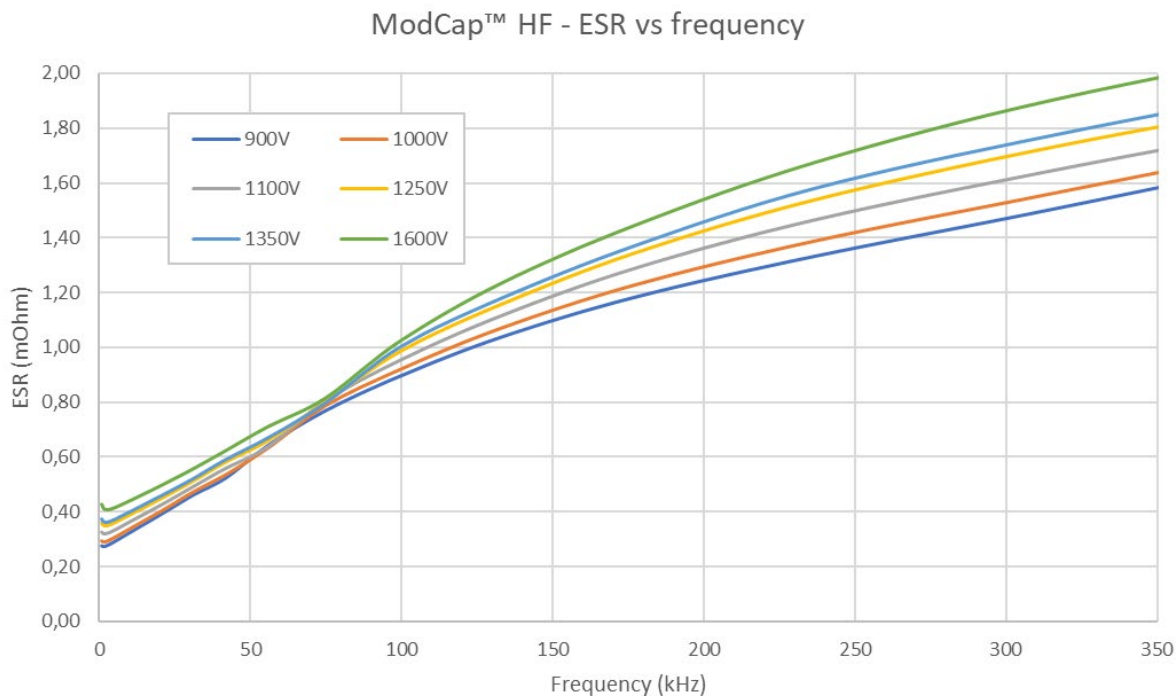


ESR vs frequency
ESR up to 150 kHz

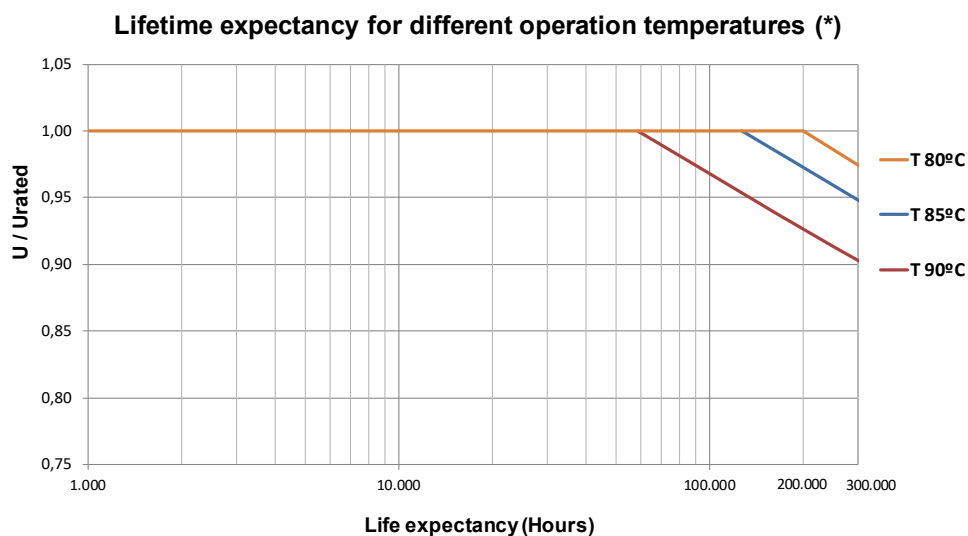
ModCap™ HF - ESR vs frequency



ESR up to 350 kHz



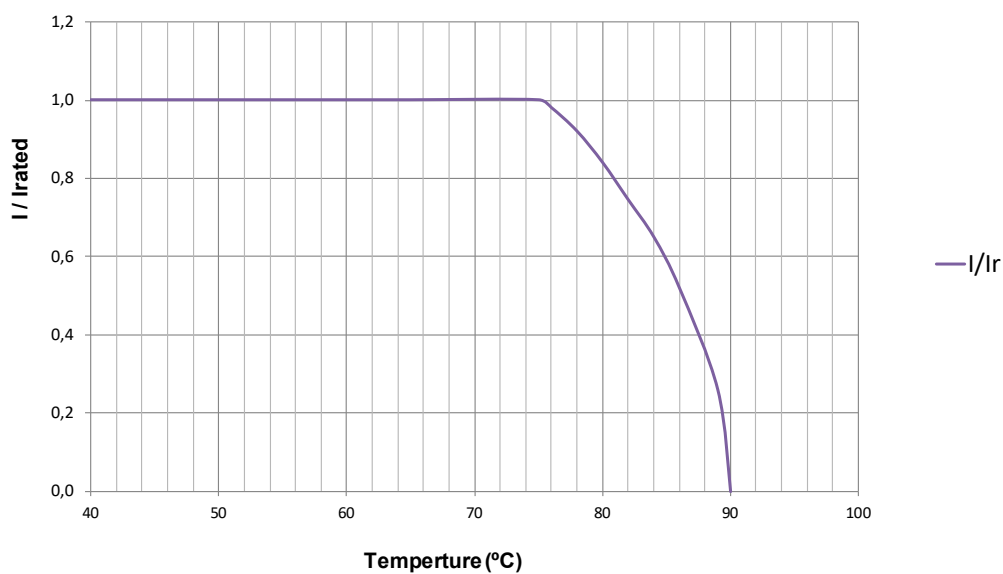
Lifetime expectancy



(*) Homogeneous dielectric temperatures

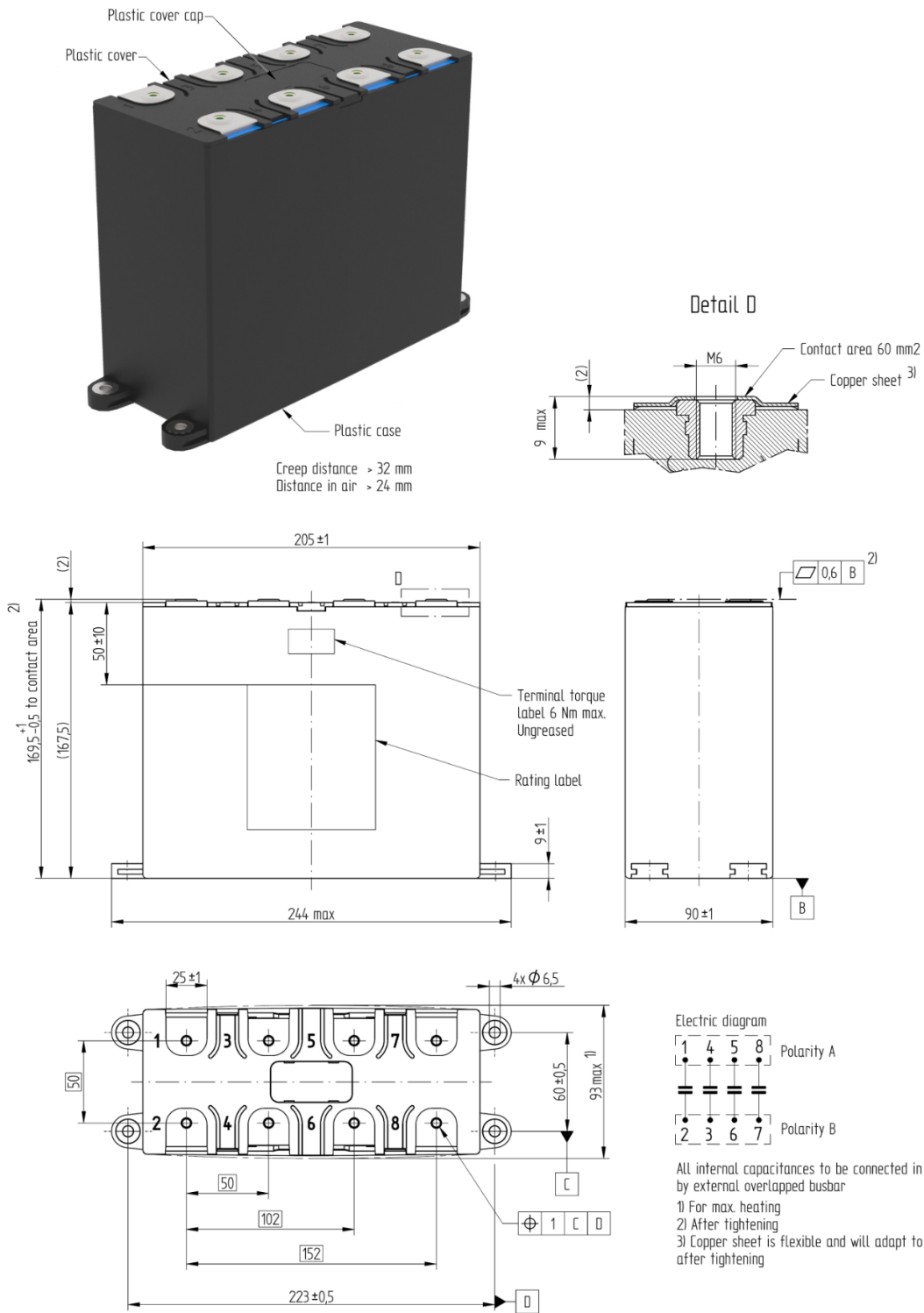
Derating vs temperature

Irms derating vs Ambient Temperature



Dimensional drawings

Construction C



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 capacitors 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.
- Capacitor subjected to Dual Use Category 3A201.

Fixing

- The threaded screw 4x Ø 6.5 mm in the bottom of the capacitor must 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.

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 |

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.

Important notes

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, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, 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 2023-07