Film capacitors – Power Electronic Capacitors

PEC ModCap HF series (high frequency)

Series/Type:	**ModCap HF**
Ordering code:	**B25647A***
Date:	September 2024
Version:	6.0

Rated capacitance: 640 … 1850 µF
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)
- Segmented film available upon request.

Features

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

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

Packing

- Construction C: 4 capacitors per box

* (Mass balance approach).

September 2024

Technical data and specifications

Characteristics	
Rated capacitance C_N	Up to 1850 µF (see table)
Tolerance	K (±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 exceed. 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 • U_N, DC, 10 s (room temperature)

Design data	
Weight approx.	3.6 ± 0.1 kg
Fixing	4 x Ø 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 ºC
Θ max	+75 ºC
Storage temperature	–40 ºC ... +85 ºC
Θ hotspot max.	+90 ºC (up to +105ºC with conditions defined in page 6)
Humidity	av. rel. < 93% 25 g/m³ 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, I_N and 70 ºC T_{amb} (80 ºC mean dielectric temperature)

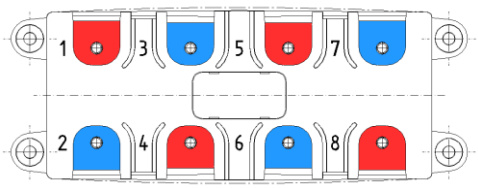
Electrical characteristics and ordering codes

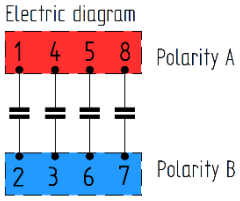
U_N V	C_R µF	I_N A	I_S kA	Î kA	Dimensions LxWxH mm	Design / PU	Ordering code
900	1850	210	225	5	205x90x170	C / 4pcs	B25647A9198K003
1000	1520	200	220	5	205x90x170	C / 4pcs	B25647A1158K003
1100	1200	190	215	5	205x90x170	C / 4pcs	B25647A1128K003
1250	940	180	210	5	205x90x170	C / 4pcs	B25647A1947K003
1350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

Remark: version with segmented film available upon request.

Connection via External Busbar

Connecting all independent capacitances by external overlapped busbar.
Customer busbar shall connect externally the terminals to the appropriate polarity according to the electrical connection diagram below:

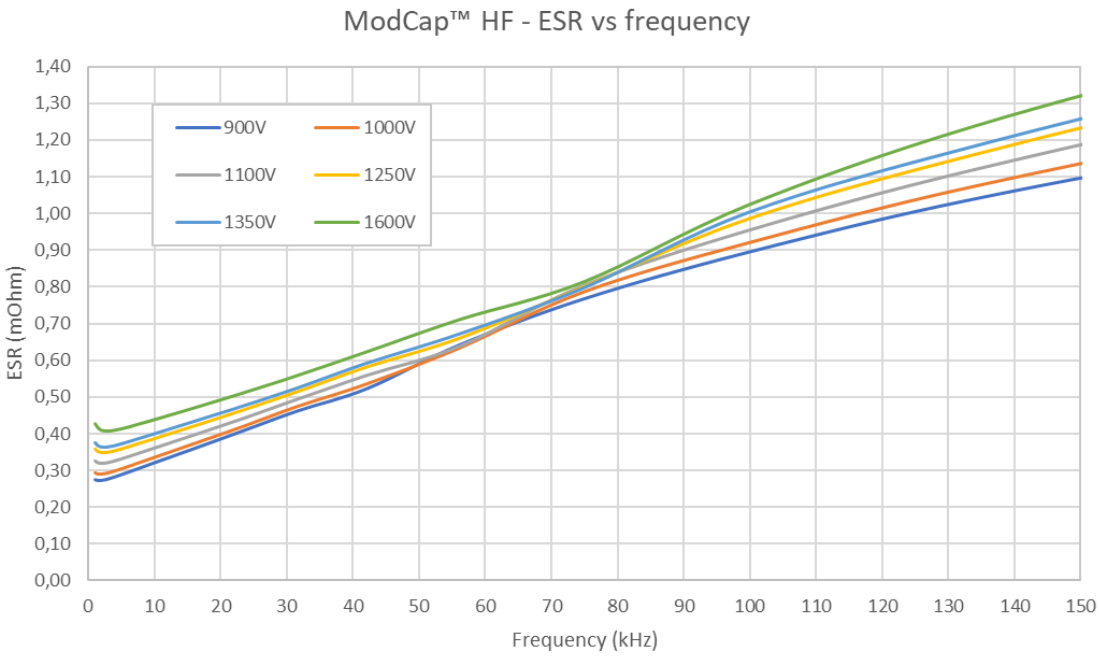




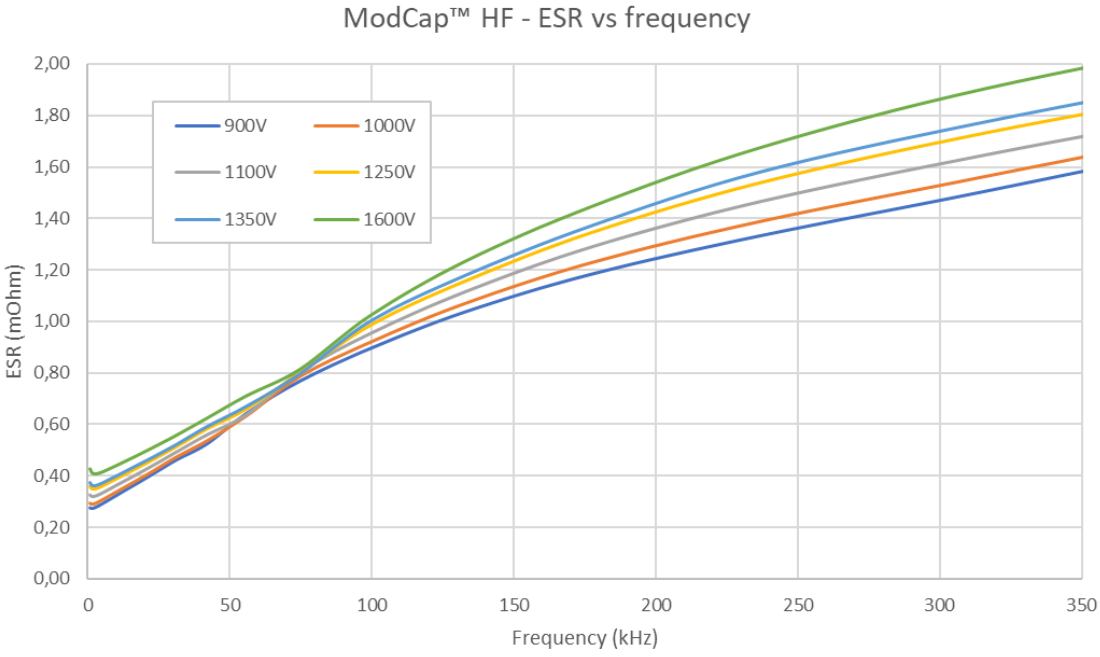
Note: the sketch in the label is the physical representation of the position of the terminals.

ESR vs frequency

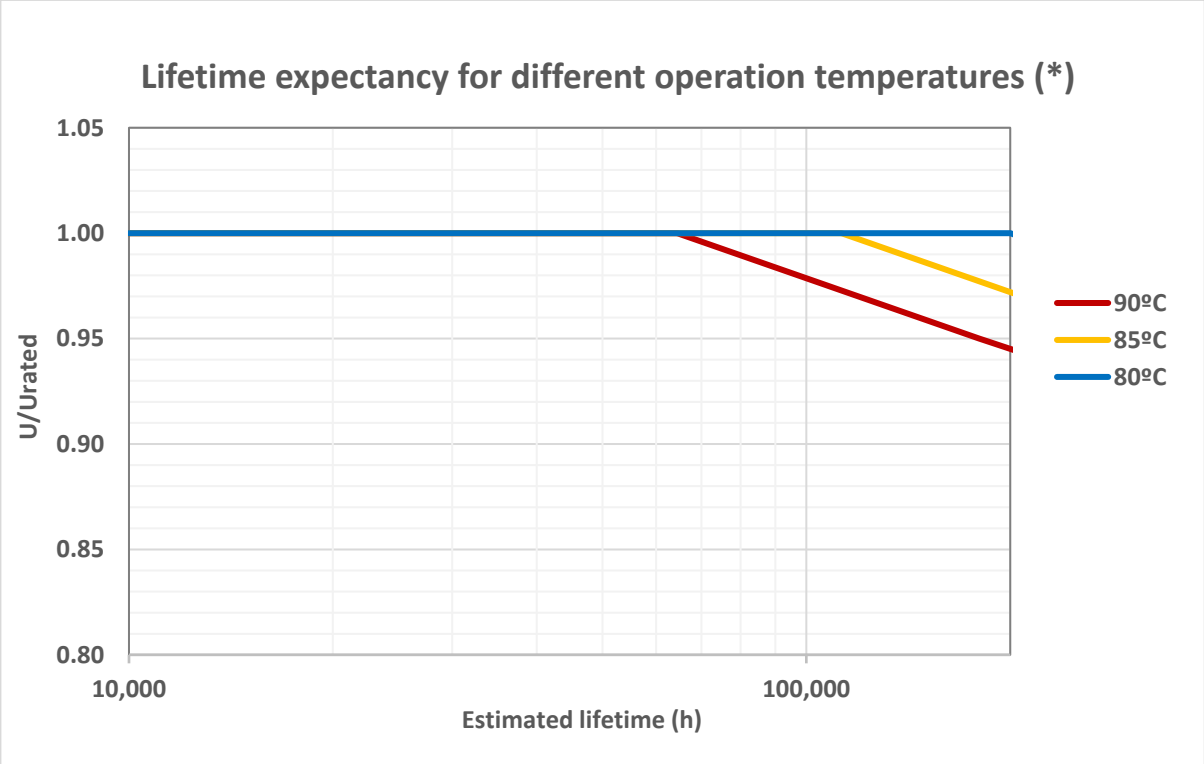
ESR up to 150 kHz



ESR up to 350 kHz



Lifetime expectancy



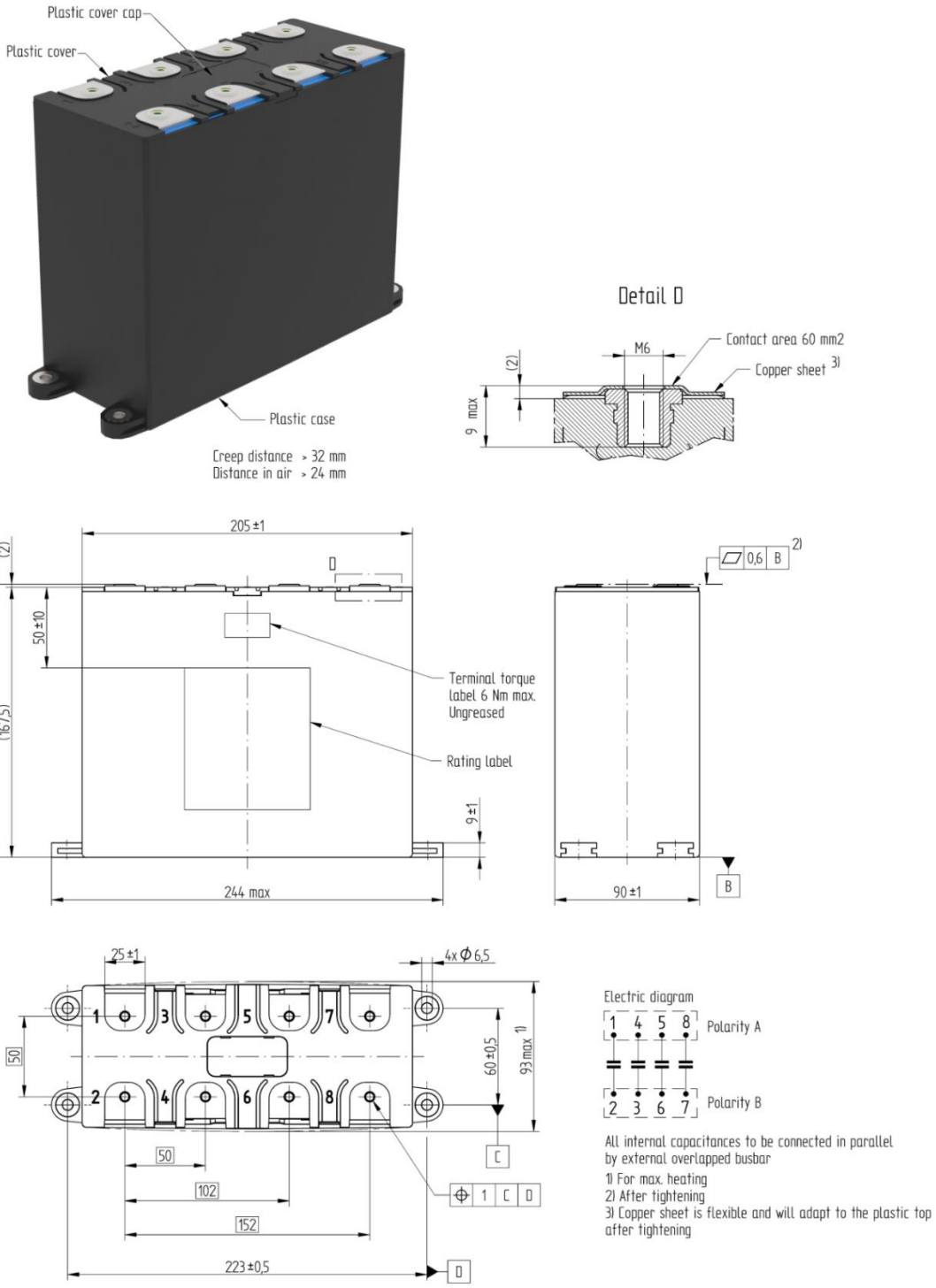
(*) Homogeneous dielectric temperatures

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%

Dimensional drawings

Construction C



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.
- 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.

Please read the Operating and safety instructions before use.

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ModCap™: ModCap is no trademark in China

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Important notes

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