




Product Brief 2023

High Power Capacitors ModCap HF

Modular high-frequency standard series in plastic case

The ModCap HF B25647 series is offered as an ultra-compact solution with highest power density for SiC.

Features

- Capacitance from 640 to 1850 μF
- Voltage from 900 to 1600 V
- Low ESL 8 nH
- Temperature up to 90 °C hotspot
- Lifetime up to 200 000 hours
- IEC 61071, IEC 61881-1, EN 45545-2 HL3 R23 (fire and smoke)
- UL recognition 
- Filled with polyurethane resin (dry technology)
- Plastic case (opened)

- Flat windings
- Modular concept for parallelization
- High-frequency performance, fully compatible with SiC semiconductors

Main applications

- Compact converters for traction
- Renewable energies
- Industrial applications



More information

www.tdk-electronics.tdk.com/en/modcap_power_capacitors
or contact your local sales office

High Power Capacitors: ModCap HF Modular High-frequency Standard Series

TDK has developed an innovative High Power Capacitor series for DC link applications especially suitable for SiC semiconductors. This new modular standard & high frequency series enables to have versatile solutions due to their wide spectrum in the voltage and capacity range. Renewable energies, traction and industrial drives are main applications for these capacitors.

ModCap HF is based on 15 years' experience designing ad-hoc resin filled solutions, using smart metal profiles to maximize self-healing capability and internal bus bars able to manage high harmonics presence. Capacitor dimensions have been fixed to be compatible with actual and upcoming SiC IGBT power modules in

order to optimize DC link footprint in dimensions and performance.

Features

ModCap HF has been designed to minimize the stray inductance and absorb high frequency harmonics; ultra low values at 8 nH are achieved for the whole series. Thanks to its reduced parasitic inductance, ModCap HF is able to supply the power to the SiC switching devices in a fast way, without developing voltage overshoots and avoiding additional devices such as snubber capacitors. This makes the ModCap HF to be the best power density and cost saving solution fully compatible with new generation of SiC semiconductors.

Technical data and specifications

Nominal voltage V_N	900 to 1600 V
Rated capacitance C_R	640 to 1850 μF
Tolerance	K ($\pm 10\%$), other tolerances upon request
Operation bandwidth*	up to 100 kHz
Rated current I_R (1 kHz)	160 to 210 A
Inductance L_e	8 nH
R_{th}^{**}	Construction C: 1.4 K/W

* 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.

** Calculated from T_{amb} to $T_{hotspot}$ 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.

Design



High Power Capacitors: ModCap HF

Modular High-frequency Standard Series

Ordering codes							
V_N	C_R	I_R	I_S	\hat{I}	Dimensions L x W x H	Design	Ordering code
V	μF	A	kA	kA	mm		
900	1850	210	225	5	205 x 90 x 170	C	B25647A9198K003
1000	1520	200	220	5	205 x 90 x 170	C	B25647A1158K003
1100	1200	190	215	5	205 x 90 x 170	C	B25647A1128K003
1250	940	180	210	5	205 x 90 x 170	C	B25647A1947K003
1350	880	170	205	5	205 x 90 x 170	C	B25647A1887K003
1600	640	160	200	5	205 x 90 x 170	C	B25647A1647K003

V_N Nominal voltage
 C_R Rated capacitance, tolerance $\pm 10\%$
 I_R Rated current
 I_S Surge current
 \hat{I} Repetitive peak current

Benefits of a modular DC link capacitor

The main advantages of a modular capacitor are reduced volume, low cost, standard design, low stray inductance and high current and energy density. Additionally, the smart mechanical design adapted to the existing SiC/IGBT power modules makes the ModCap HF the closest experience to the “plug and play” philosophy in the industry.

As a standardized product, the ModCap HF is compliant with most of the industry standards: EN 45545-2, IEC 61071, IEC61881-1, UL, and so on. Since the moment of purchasing, our customers receive a fully validated product with all the necessary documentation.

Despite of being a standard design, TDK offers a customized solution. Thanks to our wide catalog and technical support: SPICE models and electromagnetic and thermal FEA simulations; we can offer the best standard solution for your particular requirements.

Thermal stability under specific operation conditions (example)

Additionally, for precise thermal distribution inside the capacitor, TDK offers FEA simulations according to your specific electrical and mechanical conditions. We can simulate the ModCap HF in your setup, considering not only the electrical conditions, but also the rest of elements that can affect, i.e. external electromagnetic interferences, cooling system, mechanical assembly, etc.

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Thermal map, naked capacitor

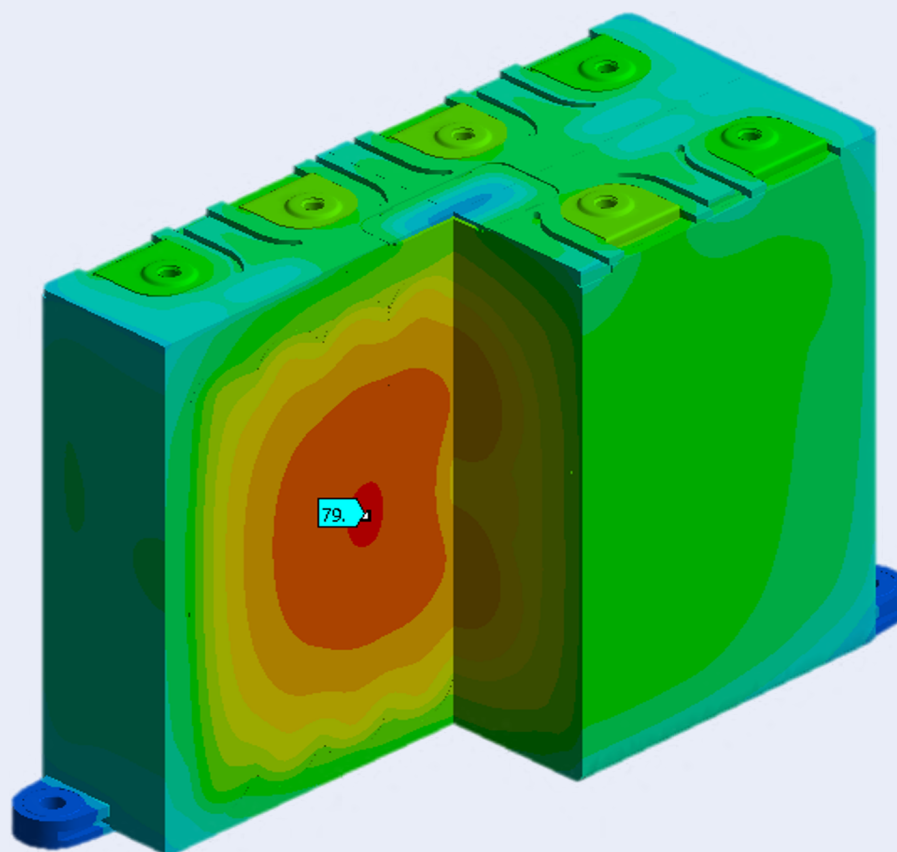
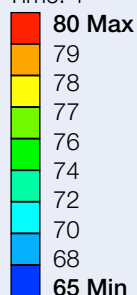
ModCap HF

Naked

Type: Temperature

Unit: °C

Time: 1



Advanced material technologies and high performance for SiC

The technology applied to the ModCap HF product is the result of TDK's long experience in the film capacitor industry. Up to 90 °C of hot-spot temperature can be achieved during operation thanks to the use of high crystallinity BOPP and our fine-tuned automated process

parameters. This makes our product more robust against self-healing events, being able to operate at higher temperatures than the rest of the market, always assuring the specified lifetime. Innovative design with 8 terminals and internal bus bar has been specifically designed for SiC semiconductors as a plus respect to ModCap MF version.

High Power Capacitors: ModCap HF Modular High-frequency Standard Series

Further information on the products can be found under
www.tdk-electronics.tdk.com/en/modcap_power_capacitors

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