

Product Brief 2022

High Power Capacitors ModCap

Modular standard DCR series in plastic case

The ModCap™ B25645 series is offered as an ultra-compact solution with highest energy density.

Features

- Capacitance
from 335 to 3900 μF
- Voltage
from 900 to 2300 V
- Low ESL <14 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)

- Filled with polyurethane resin (dry technology)
- Plastic case (opened)
- Flat windings
- Modular concept for parallelization

Main applications

- Compact converters for traction
- Renewable energies
- Industrial applications



High Power Capacitors ModCap

Modular standard DCR series

TDK has developed an innovative High Power Capacitor series for DC link applications. This new modular standard 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 this capacitors.

ModCap is based on 15 years' experience designing ad-hoc resin filled solutions and use smart metal profile to maximize self-healing capability. Capacitor dimensions have been fixed to be compatible with actual and upcoming IGBT power modules in order to optimize DC link footprint in dimensions and performance.

Features

ModCap has been designed to minimize the stray inductance; values below 14 nH are achieved for the whole series. Thanks to its reduced parasitic inductance, ModCap is able to supply the power to the switching devices in a fast way, without developing voltage overshoots and avoiding additional devices such as snubber capacitors. This makes the ModCap to be the best volume, cost saving solution and the most compact DC link solution with highest energy density.

Technical data and specifications

Nominal voltage V_N	900 to 2300 V
Rated capacitance C_R	335 to 3900 μF
Tolerance	K ($\pm 10\%$), other tolerances upon request
Operation bandwidth*	up to 50 kHz
Rated current I_R (1 kHz)	105 to 200 A
Inductance L_e	< 14 nH
R_{th}^{**}	Construction A: 1.4 K/W Construction B: 2 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 exceeded. 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

Construction A



Construction B



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Ordering codes							
V_N V	C_R μF	I_R A	I_S kA	\hat{I} kA	Dimensions L x W x H mm	Design	Ordering code
900	2075	200	225	5	243 x 169.5 x 90	A	B25645A9218K003
	3900	155	250	5	258 x 215 x 115	B	B25645A9398K003
1000	1705	190	220	5	243 x 169.5 x 90	A	B25645A1178K003
	3210	150	245	5	258 x 215 x 115	B	B25645A1328K003
1100	1330	180	215	5	243 x 169.5 x 90	A	B25645A1138K003
	2525	140	240	5	258 x 215 x 115	B	B25645A1258K003
1250	1045	170	210	5	243 x 169.5 x 90	A	B25645A1118K003
	1985	135	235	5	258 x 215 x 115	B	B25645A1198K003
1350	980	160	205	5	243 x 169.5 x 90	A	B25645A1108K013
	1865	130	230	5	258 x 215 x 115	B	B25645A1188K003
1600	710	150	200	5	243 x 169.5 x 90	A	B25645A1757K003
	1375	120	225	5	258 x 215 x 115	B	B25645A1138K013
1800	525	140	195	5	243 x 169.5 x 90	A	B25645A1567K003
	1025	115	220	5	258 x 215 x 115	B	B25645A1108K003
2000	415	130	185	5	243 x 169.5 x 90	A	B25645A2447K003
	820	110	210	5	258 x 215 x 115	B	B25645A2827K003
2300	335	120	175	5	243 x 169.5 x 90	A	B25645A2367K003
	670	105	200	5	258 x 215 x 115	B	B25645A2677K003

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 the closest experience to the “plug and play” philosophy in the industry.

As a standardized product, the ModCap 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 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.

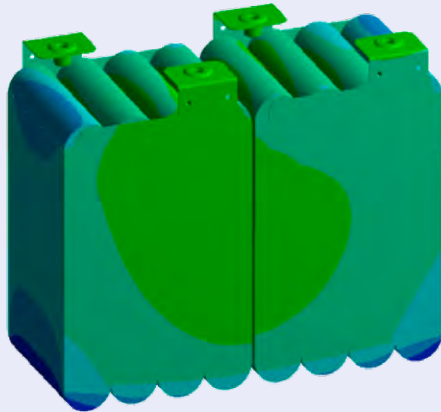
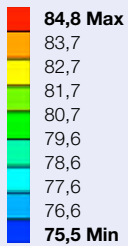
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Modular standard DCR series

Thermal map, naked capacitor

B: 2 kHz spectrum

Naked
Type: Temperature
Unit: °C
Time: 1



MKK DC-R Modular series:

- Capacitance: 1 mF
- Current: 155 A
- Power losses: **11 W**
- DeltaT = **15 K**

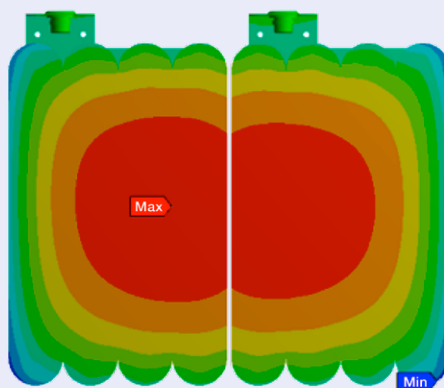
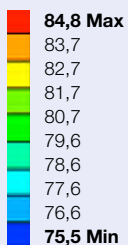
Boundary conditions considered:

- Ambient temperature: 70 °C
- Busbar temperature: 80 °C
- Natural convection

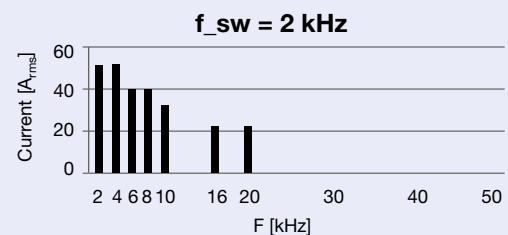
Thermal map, cross section

B: 2 kHz spectrum

Naked
Type: Temperature
Unit: °C
Time: 1



Current spectrum considered



Advanced material technologies

The technology applied to the ModCap 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.

High Power Capacitors ModCap Modular standard DCR series

Further information on the products can be found under

www.tdk-electronics.tdk.com/en/modcap_power_capacitors

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