




Product Brief 2023

# High Power Capacitors ModCap MF

## Modular medium-frequency standard series in plastic case

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

### Features

- Capacitance from 335 to 3900  $\mu\text{F}$
- 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)
- UL recognition 
- 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



### More information

[www.tdk-electronics.tdk.com/en/modcap\\_power\\_capacitors](http://www.tdk-electronics.tdk.com/en/modcap_power_capacitors)  
or contact your local sales office

# High Power Capacitors: ModCap MF

## Modular Medium-frequency Standard 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 MF 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 MF 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 MF 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 MF 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 $\mu\text{F}$
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**



# High Power Capacitors: ModCap MF

## Modular Medium-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	$\mu\text{F}$	A	kA	kA	mm		
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 MF 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)

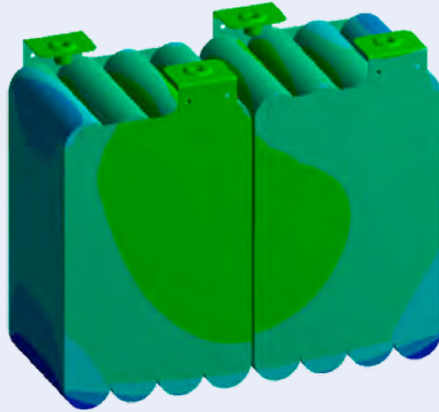
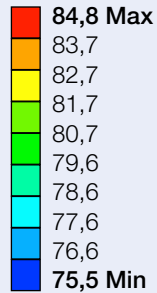
Additionally, for precise thermal distribution inside the capacitor, TDK offers FEA simulations according to your specific electrical and mechanical conditions. We can simulate the ModCap in your setup, considering not only the electrical conditions, but also the rest of elements that can affect, i.e.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

# High Power Capacitors: ModCap MF Modular Medium-frequency Standard 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

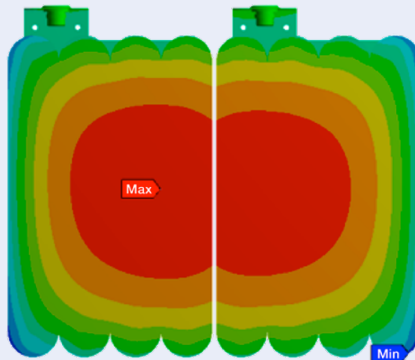
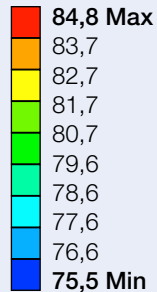
### Boundary conditions considered:

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

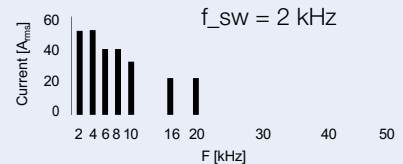
## Thermal map, cross section

### B: 2 kHz spectrum

Naked  
Type: Temperature  
Unit: °C  
Time: 1



### Current spectrum considered



## Advanced material technologies

The technology applied to the ModCap MF 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 MF Modular Medium-frequency Standard Series

Further information on the products can be found under  
[www.tdk-electronics.tdk.com/en/modcap\\_power\\_capacitors](http://www.tdk-electronics.tdk.com/en/modcap_power_capacitors)

Please forward reader inquiries to [marketing.communications@tdk.com](mailto:marketing.communications@tdk.com)

Contacts for regional media				
Region	Contact		Phone	Mail
Europe	Mr. C. JEHLE	TDK Electronics AG Munich, Germany	+49 89 54020 2441	<a href="mailto:christoph.jehle@tdk.com">christoph.jehle@tdk.com</a>
North America	Ms. D. MARTIN	TDK Electronics Inc. Fountain Hills, AZ, USA	+1 480 836 4104	<a href="mailto:debbie.martin@tdk.com">debbie.martin@tdk.com</a>
South America	Mr. C. DALL'AGNOL	TDK Electronics do Brasil Ltda., Gravataí, Brazil	+55 51 3484 7158	<a href="mailto:candido.dallagnol@tdk.com">candido.dallagnol@tdk.com</a>
India	Mr. G. DALVI	TDK India Private Ltd. Mumbai, India	+91 22 2575 0804	<a href="mailto:girish.dalvi@tdk.com">girish.dalvi@tdk.com</a>
Greater China	Ms. S. SUEN	TDK Electronics Hong Kong Limited, Hong Kong	+852 3669 8224	<a href="mailto:stella.suen@tdk.com">stella.suen@tdk.com</a>
Japan	Mr. Y. OSUGA	TDK Corporation Tokyo, Japan	+813 6778 1055	<a href="mailto:pr@jp.tdk.com">pr@jp.tdk.com</a>

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