Single Diode Module

MDO500-12N1

Features / Advantages:

- Planar passivated chips
- Very low leakage current
- Very low forward voltage drop
- Improved thermal behaviour

Backside: isolated

Applications:

- Diode for main rectification
- For single and three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors

Package: Y1

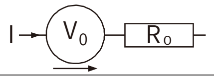
- Isolation Voltage: 4800V~
- Industry standard outline
- RoHS compliant
- Base plate: Copper internally DCB isolated
- Advanced power cycling

V_{RRM}	1200	V
I_{FAV}	560	A
V_F	0.98	V

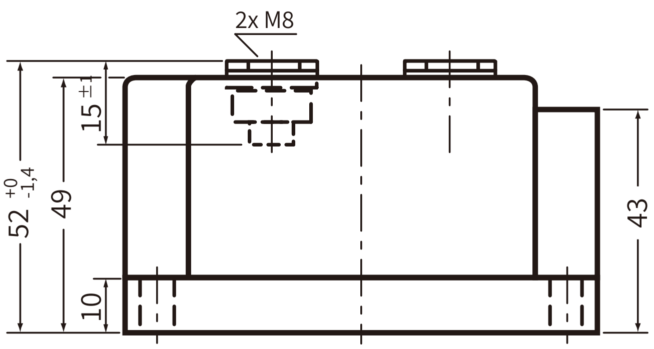
Symbol	Definition	Conditions		Ratings			
				min.	typ.	max.	Unit
V_{RSM}	max. non-repetitive reverse blocking voltage		T_{VJ} =25°C			1300	V
V_{RRM}	max. repetitive reverse blocking voltage		T_{VJ} =25°C			1200	V
I_R	reverse current	V_R = 1200 V	T_{VJ} =25°C			1	mA
		V_R = 1200 V	T_{VJ} =140°C			30	mA
V_F	forward voltage drop	I_F = 500 A	T_{VJ} =25°C			1.09	V
		I_F = 1000 A				1.24	V
		I_F = 500 A	T_{VJ} =125°C			0.98	V
		I_F = 1000 A				1.17	V
I_{FAV}	average forward current	T_C = 85°C	T_{VJ} =140°C			560	A
$I_{F(RMS)}$	RMS forward current	180° sine, d=0.5					A
V_{F0}	threshold voltage	for power loss calculation only	T_{VJ} =140°C			0.80	V
r_F	slope resistance					0.38	mΩ
R_{thJC}	thermal resistance junction to case					0.072	K/W
R_{thCH}	thermal resistance case to heatsink				0.024		K/W
P_{tot}	total power dissipation		T_C =25°C			1600	W
I_{FSM}	max. forward surge current	t=10 ms; (50 Hz),sine.	T_{VJ} =45°C			15.0	kA
		t=8.3 ms; (60 Hz), sine.	V_R =0 V			16.2	kA
		t=10 ms; (50 Hz),sine.	T_{VJ} =140°C			12.8	kA
		t=8.3 ms; (60 Hz), sine.	V_R =0 V			13.8	kA
I^2t	value for fusing	t=10 ms; (50 Hz),sine.	T_{VJ} =45°C			1.13	MA^2s
		t=8.3 ms; (60 Hz), sine.	V_R =0 V			1.09	MA^2s
		t=10 ms; (50 Hz),sine.	T_{VJ} =140°C			812.8	kA^2s
		t=8.3 ms; (60 Hz), sine.	V_R =0 V			788.8	kA^2s
C_J	junction capacitance	V_R =400 V; f=1 MHz	T_{VJ} =25°C		762		pF

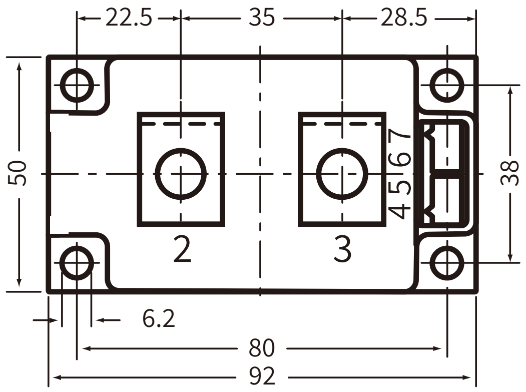
Symbol	Definition	Conditions		Ratings			
				min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal				600	A
T_{VJ}	virtual junction temperature			-40		140	℃
T_{op}	operation temperature			-40		125	℃
T_{stg}	storage temperature			-40		125	℃
	Weight				650		g
M_D	mounting torque			4.5		7	Nm
M_T	terminal torque			11		13	Nm
$d_{Spp/App}$	creepage distance on surface	terminal to terminal		16.0			mm
$d_{Spb/Apb}$	striking distance through air	terminal to backside		25.0			mm
V_{ISOL}	isolation voltage	t = 1 second	50/60 Hz, RMS;	4800			V
		t = 1 minute	I_{ISOL} ≤1 mA	4000			V

Similar Part	Package	Voltage class
MDO500-14N1	Y1-2-CU	1400
MDO500-16N1	Y1-2-CU	1600
MDO500-18N1	Y1-2-CU	1800
MDO500-20N1	Y1-2-CU	2000
MDO500-22N1	Y1-2-CU	2200

Equivalent Circuits for Simulation	*on die level	T_{Vj} =140°C	
	Rectifier		
$V_{0\,max}$	threshold voltage	0.8	V
$R_{0\,max}$	slope resistance*	0.19	mΩ

Outlines: Y1





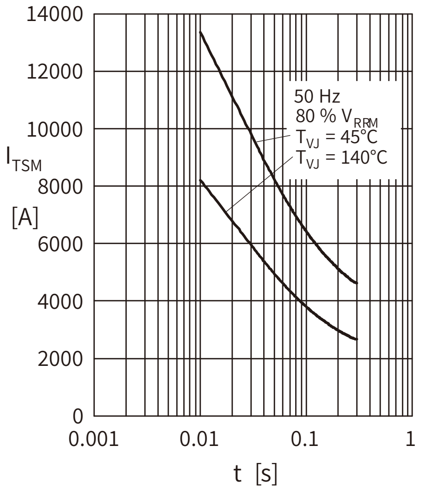


Fig. 1 Surge overload current
I_{FSM}: Crest value, t: duration

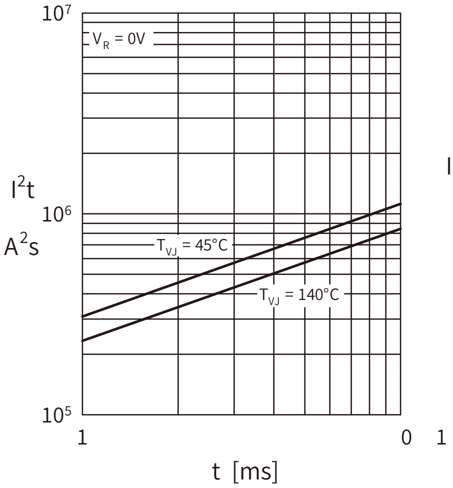


Fig. 2 I^2t versus time (1-10 ms)

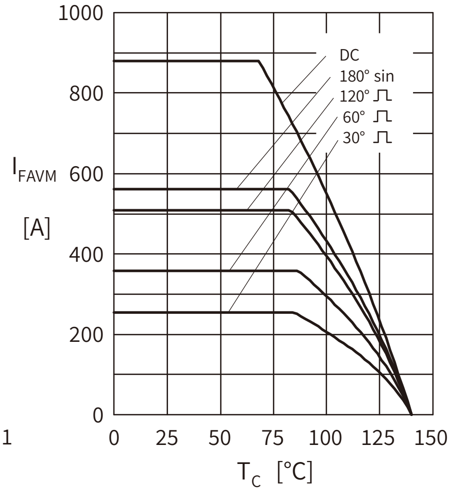


Fig. 3 Maximum forward current
at case temperature

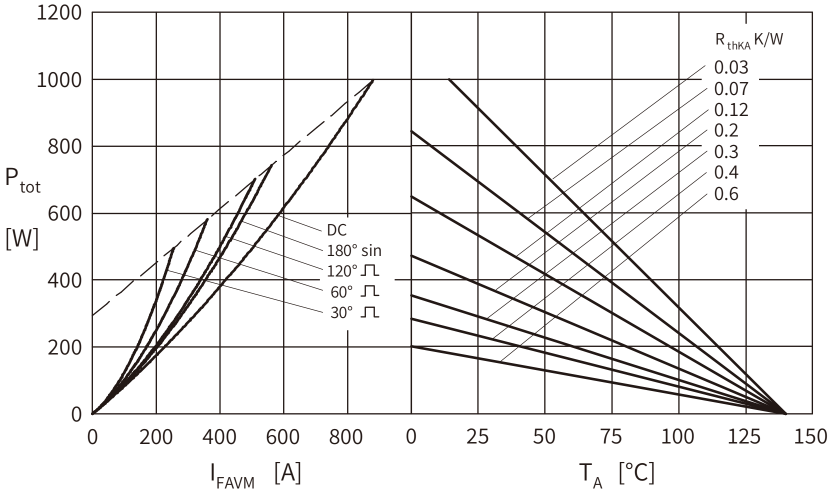


Fig. 4 Power dissipation vs. forward current and ambient temperature

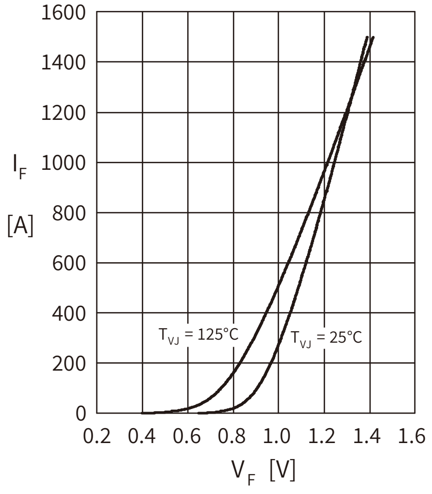


Fig. 5 Forward current
I_F versus V_F

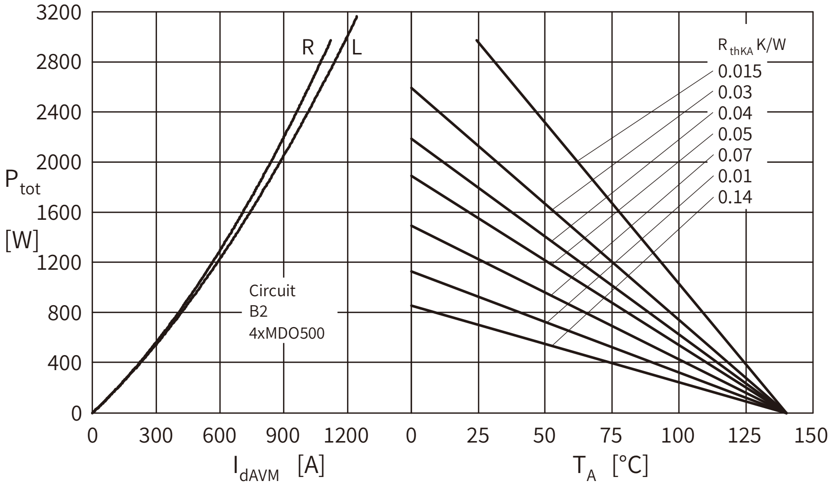


Fig. 6 Single phase rectifier bridge: Power dissipation vs direct output current
and ambient temperature. R = resistive load, L = inductive load

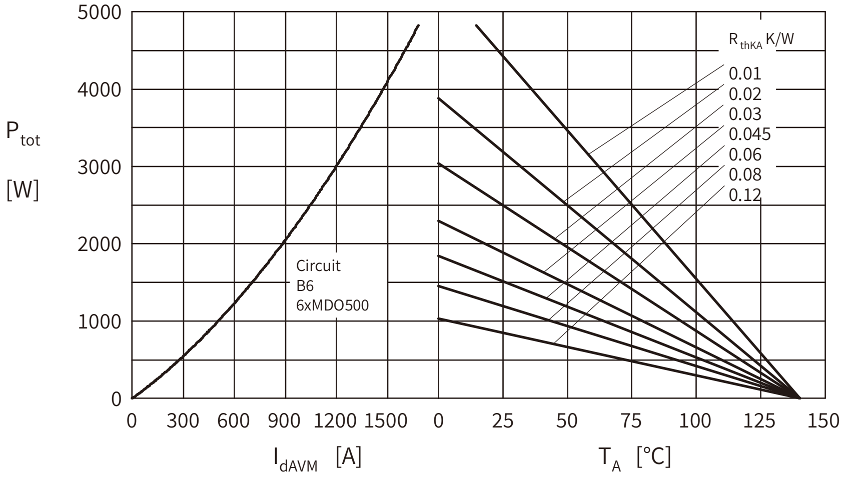


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

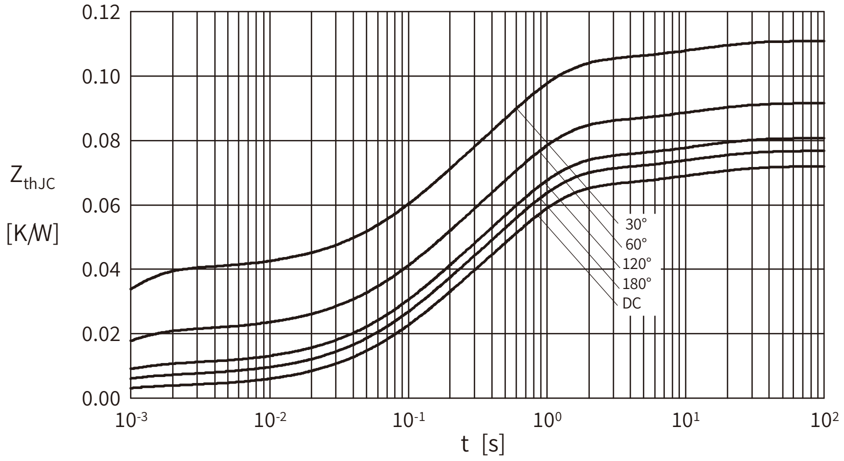


Fig. 7 Transient thermal impedance junction to case

R_{thJC} for various conduction angles d:

d	R_{thJC} (K/W)
DC	0.072
180°	0.0768
120°	0.081
60°	0.092
30°	0.111

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.0035	0.0054
2	0.0186	0.098
3	0.0432	0.54
4	0.0067	12

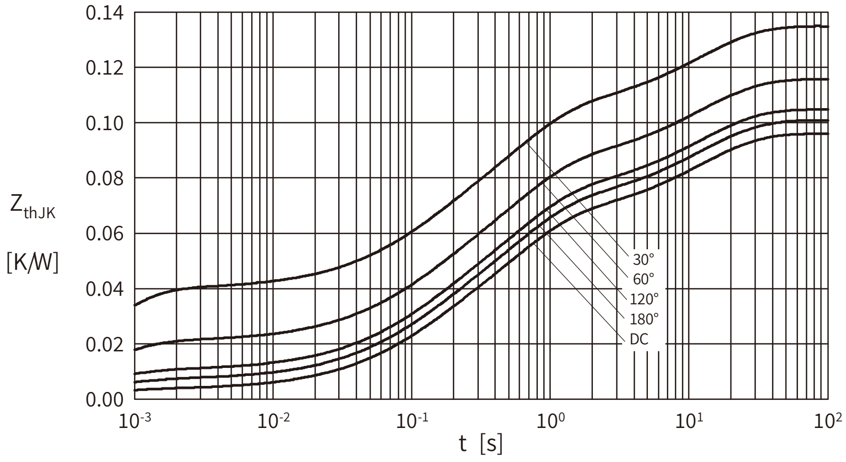


Fig. 8 Transient thermal impedance junction to heatsink

R_{thJK} for various conduction angles d:

d	R_{thJK} (K/W)
DC	0.096
180°	0.1
120°	0.105
60°	0.116
30°	0.135

Constants for Z_{thJK} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.0035	0.0054
2	0.0186	0.098
3	0.0432	0.54
4	0.0067	12
5	0.024	12