

High Voltage Standard Rectifier Module

$$\begin{aligned} V_{RRM} &= 2000\text{ V} \\ I_{FAV} &= 560\text{ A} \\ V_F &= 0,98\text{ V} \end{aligned}$$

Single Diode

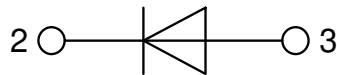
Part number

MDO500-20N1



Backside: isolated

 E72873



Features / Advantages:

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

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

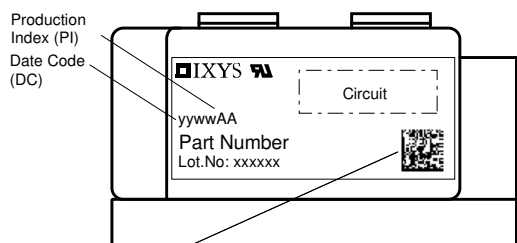
- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Base plate: Copper internally DCB isolated
- Advanced power cycling

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Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RSM}	max. non-repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				2100	V
V_{RRM}	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				2000	V
I_R	reverse current	$V_R = 2000\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			1	mA
		$V_R = 2000\text{ V}$	$T_{VJ} = 140^{\circ}\text{C}$			30	mA
V_F	forward voltage drop	$I_F = 500\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1,09	V
		$I_F = 1000\text{ A}$				1,24	V
		$I_F = 500\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			0,98	V
		$I_F = 1000\text{ A}$				1,17	V
I_{FAV}	average forward current	$T_C = 85^{\circ}\text{C}$	$T_{VJ} = 140^{\circ}\text{C}$			560	A
$I_{F(RMS)}$	RMS forward current	180° sine d = 0.5					A
V_{F0}	threshold voltage	} for power loss calculation only		$T_{VJ} = 140^{\circ}\text{C}$		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	$T_C = 25^{\circ}\text{C}$				1600	W
I_{FSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}\text{C}$			15,0	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$			16,2	kA
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 140^{\circ}\text{C}$			12,8	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$			13,8	kA
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}\text{C}$			1,13	MA ² s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$			1,09	MA ² s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 140^{\circ}\text{C}$			812,8	kA ² s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$			788,8	kA ² s
C_J	junction capacitance	$V_R = 700\text{ V}; f = 1\text{ MHz}$			576		pF

Package Y1			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			600	A
T_{VJ}	virtual junction temperature		-40		140	°C
T_{op}	operation temperature		-40		125	°C
T_{stg}	storage temperature		-40		125	°C
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 striking distance through air	terminal to terminal	16,0			mm
$d_{Spb/Apb}$		terminal to backside	25,0			mm
V_{ISOL}	isolation voltage	t = 1 second	4800			V
		t = 1 minute	4000			V



Data Matrix: part no. (1-19), DC + PI (20-25), lot.no.# (26-31), blank (32), serial no.# (33-36)

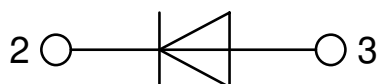
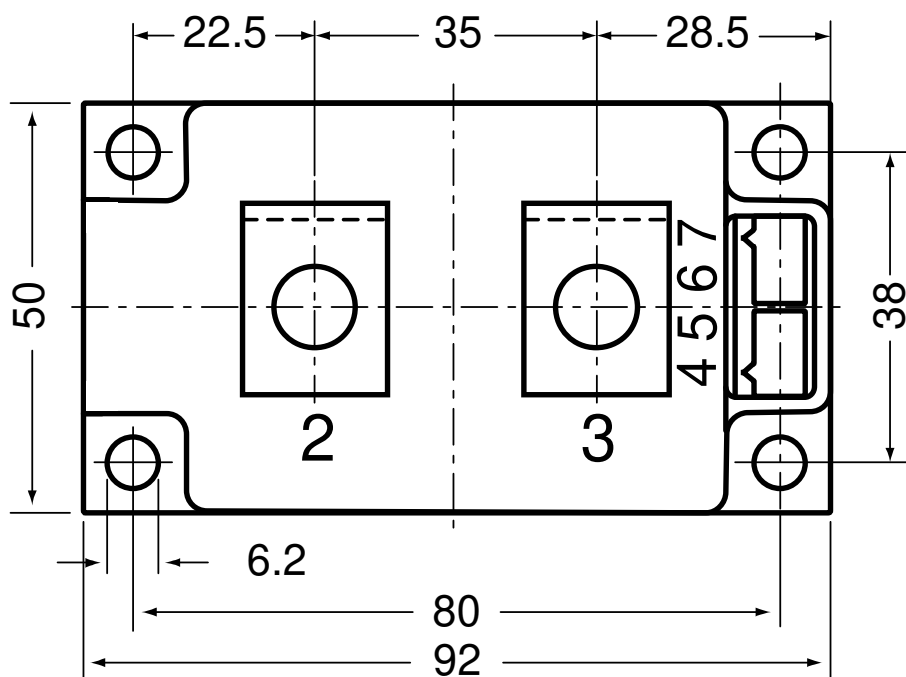
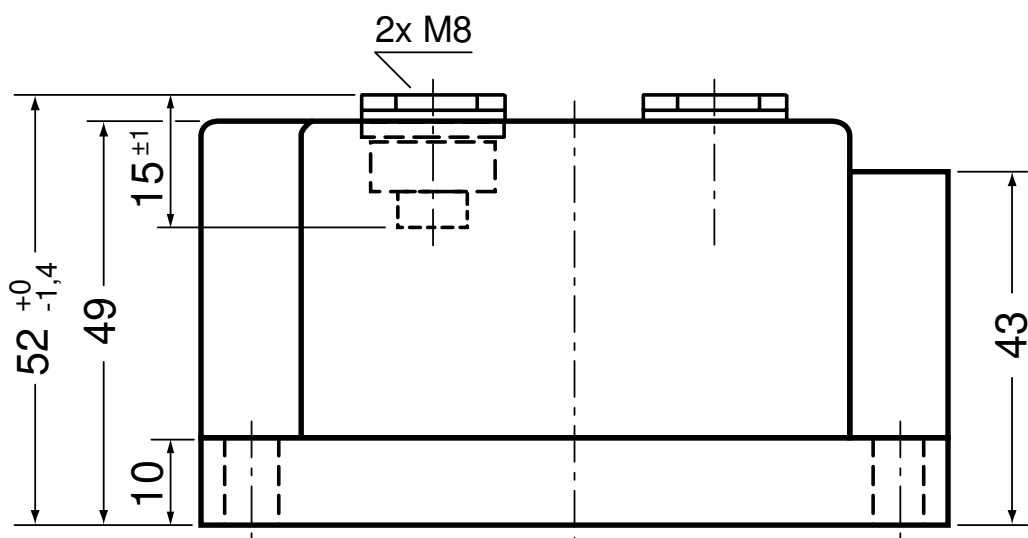
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDO500-20N1	MDO500-20N1	Box	2	467200

Similar Part	Package	Voltage class
MDO500-12N1	Y1-2-CU	1200
MDO500-14N1	Y1-2-CU	1400
MDO500-16N1	Y1-2-CU	1600
MDO500-18N1	Y1-2-CU	1800

MDO500-22N1	Y1-2-CU	2200
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Equivalent Circuits for Simulation		* on die level	$T_{VJ} = 140^{\circ}\text{C}$
		Rectifier	
$V_{0\ max}$	threshold voltage	0,8	V
$R_{0\ max}$	slope resistance *	0,19	mΩ

Outlines Y1



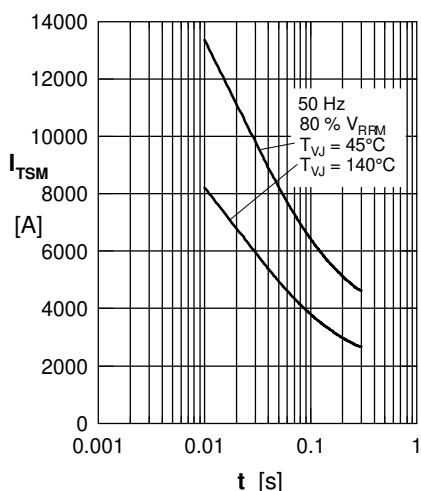
Rectifier


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

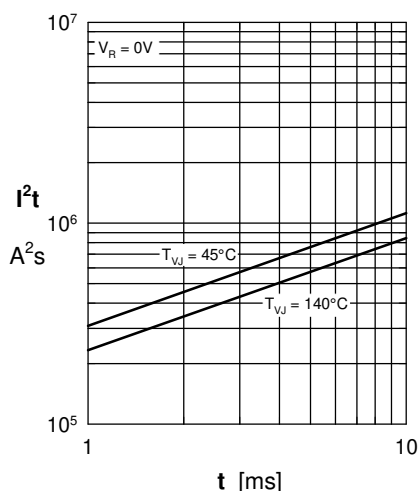


Fig. 2 I^2t versus time (1-10 ms)

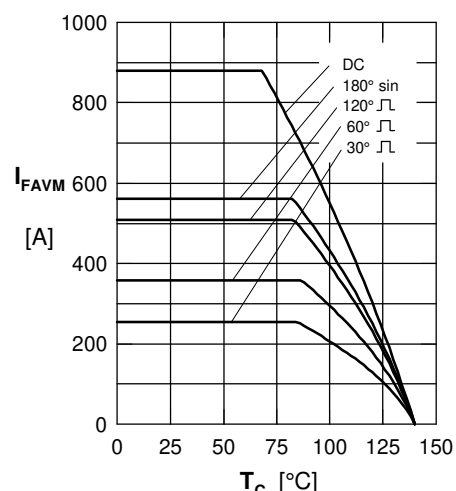


Fig. 3 Maximum forward current at case temperature

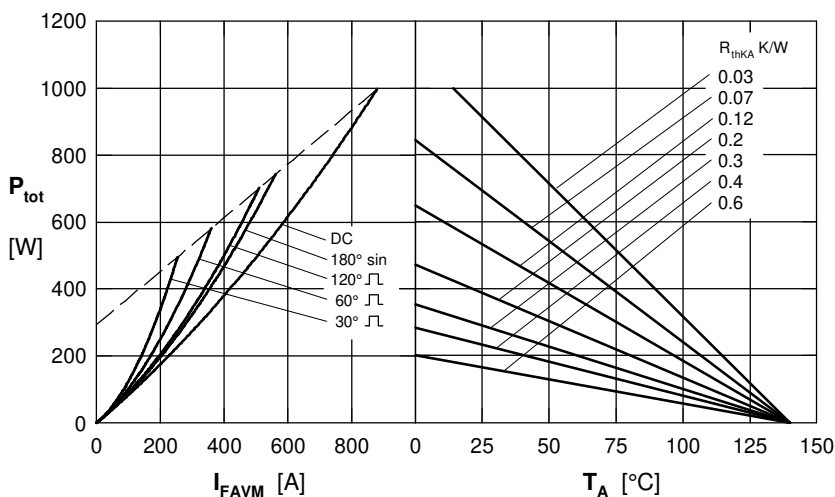


Fig. 4 Power dissipation vs. forward current and ambient temperature

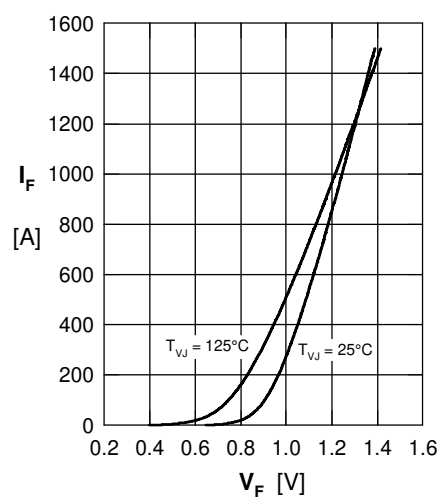


Fig. 5 Forward current
 I_F versus V_F

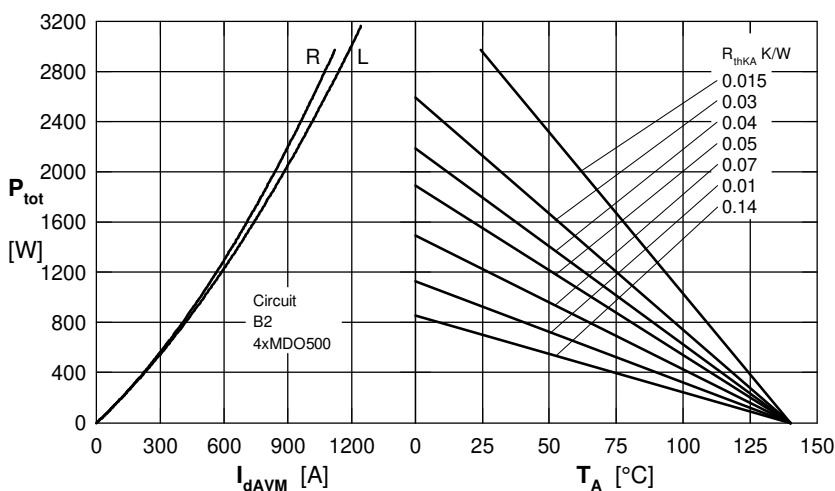


Fig. 6 Single phase rectifier bridge: Power dissipation vs. direct output current and ambient temperature. R = resistive load, L = inductive load

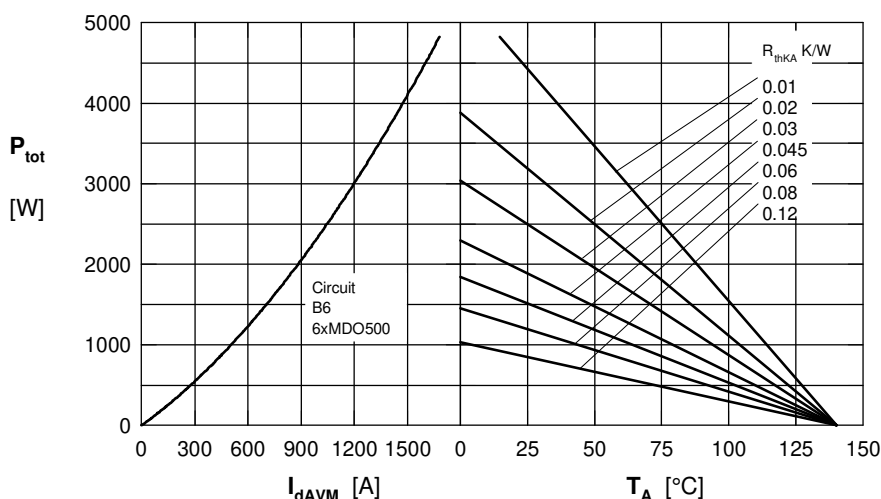
Rectifier


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

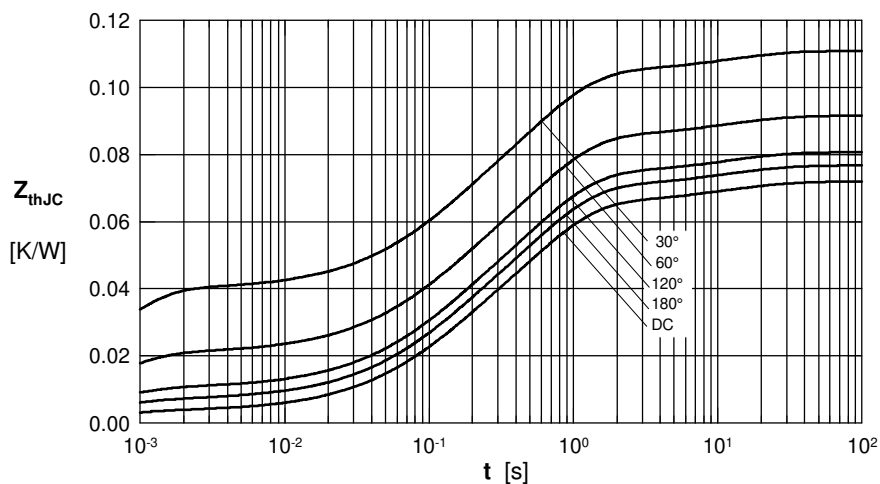


Fig. 7 Transient thermal impedance junction to case

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

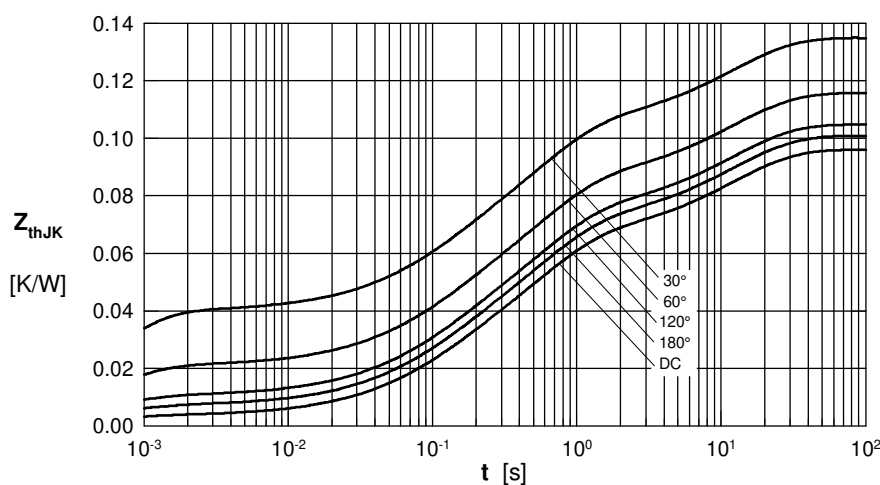


Fig. 8 Transient thermal impedance junction to heatsink

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