



# High Voltage Standard Rectifier Module

$V_{RRM} = 2000\text{ V}$

$I_{FAV} = 560\text{ A}$

$V_F = 0,98\text{ V}$

Single Diode

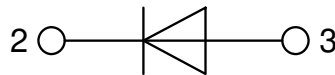
Part number

**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

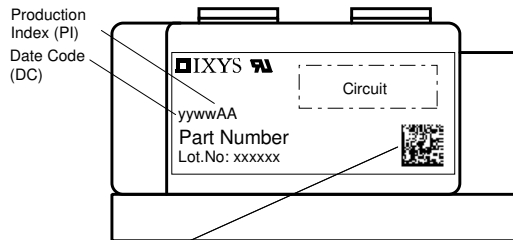
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Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM}$	max. non-repetitive reverse blocking voltage					2100	V
$V_{RRM}$	max. repetitive reverse blocking voltage					2000	V
$I_R$	reverse current	$V_R = 2000$ V		$T_{VJ} = 25^\circ\text{C}$		1	mA
		$V_R = 2000$ V		$T_{VJ} = 140^\circ\text{C}$		30	mA
$V_F$	forward voltage drop	$I_F = 500$ A		$T_{VJ} = 25^\circ\text{C}$		1,09	V
		$I_F = 1000$ A				1,24	V
		$I_F = 500$ A		$T_{VJ} = 125^\circ\text{C}$		0,98	V
		$I_F = 1000$ 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		$V_R = 0$ 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		$V_R = 0$ V		13,8	kA
$I^2t$	value for fusing	t = 10 ms; (50 Hz), sine		$T_{VJ} = 45^\circ\text{C}$		1,13	MA <sup>2</sup> s
		t = 8,3 ms; (60 Hz), sine		$V_R = 0$ V		1,09	MA <sup>2</sup> s
		t = 10 ms; (50 Hz), sine		$T_{VJ} = 140^\circ\text{C}$		812,8	kA <sup>2</sup> s
		t = 8,3 ms; (60 Hz), sine		$V_R = 0$ V		788,8	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 700$ V; f = 1 MHz		$T_{VJ} = 25^\circ\text{C}$		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
<b>Weight</b>				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



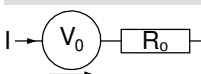
Data Matrix: part no. (1-19), DC + PI (20-25), lot.no.# (26-31), blank (32), serial no.# (33-36)

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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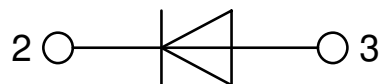
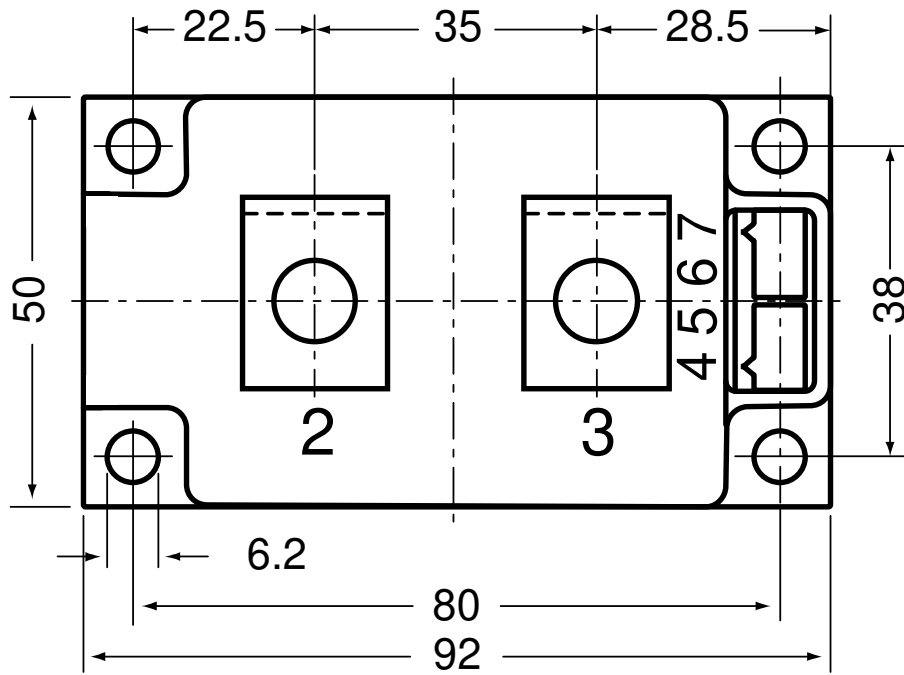
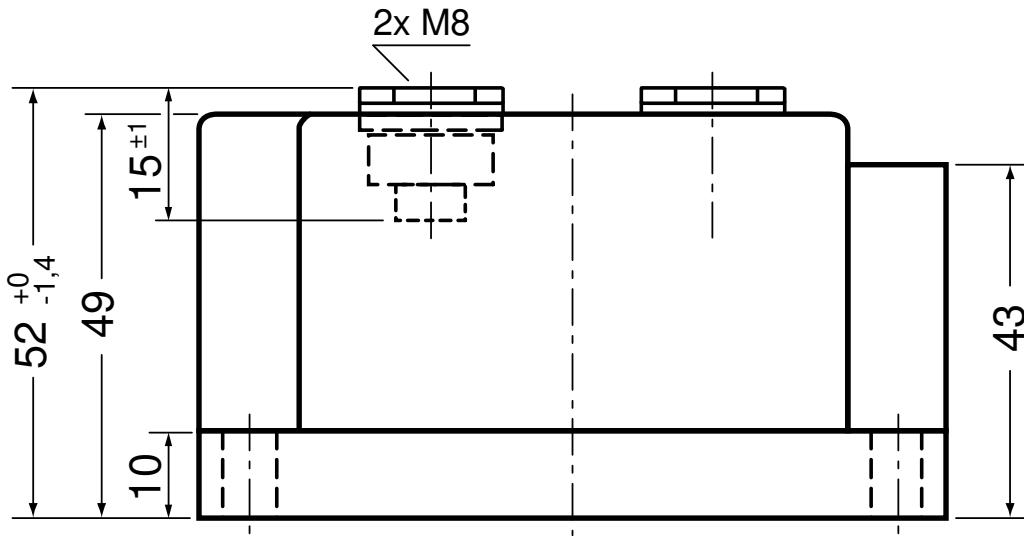
**Equivalent Circuits for Simulation** \* on die level  $T_{VJ} = 140^{\circ}C$



$V_{0\ max}$	threshold voltage	0,8	V
$R_{0\ max}$	slope resistance *	0,19	mΩ



Outlines Y1



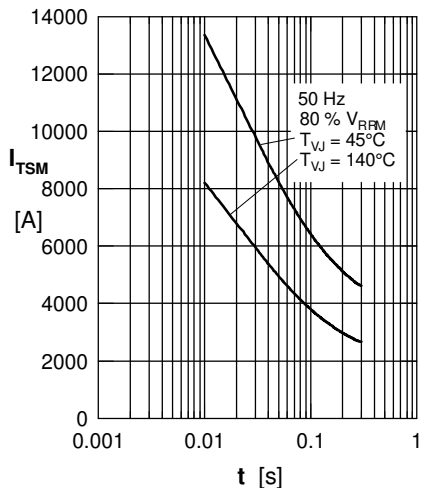
**Rectifier**


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

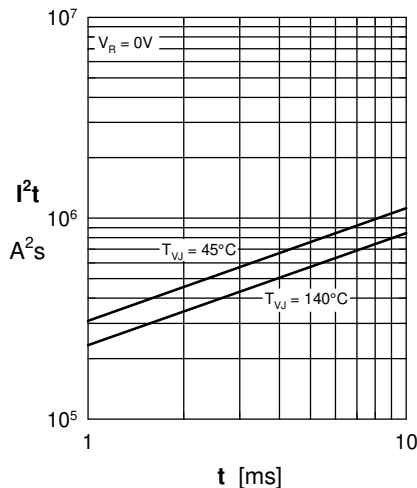


Fig. 2  $I^2t$  versus time (1-10 ms)

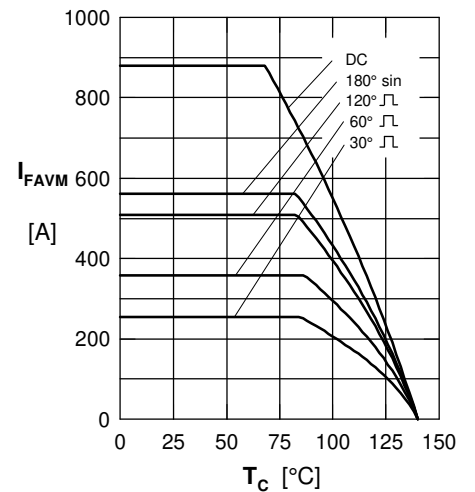


Fig. 3 Maximum forward current at case temperature

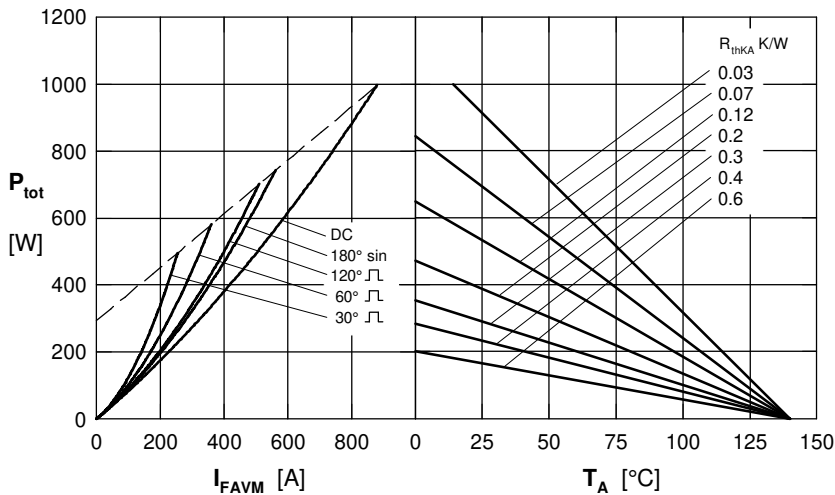


Fig. 4 Power dissipation vs. forward current and ambient temperature

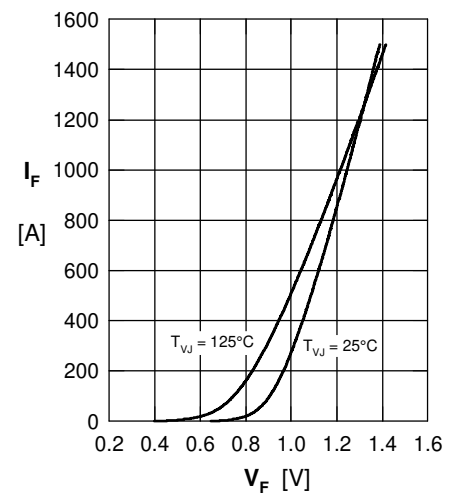


Fig. 5 Forward current  $I_F$  versus  $V_F$

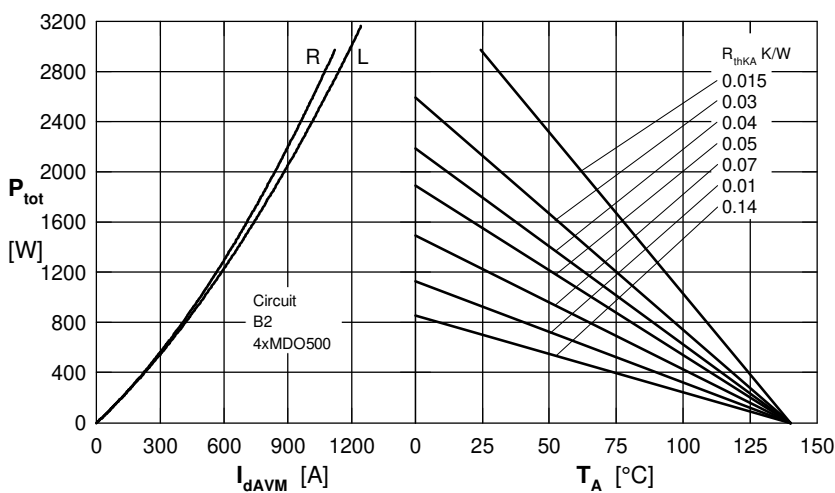


Fig. 6 Single phase rectifier bridge: Power dissipation vs. direct output current and ambient temperature. R = resistive load, L = inductive load

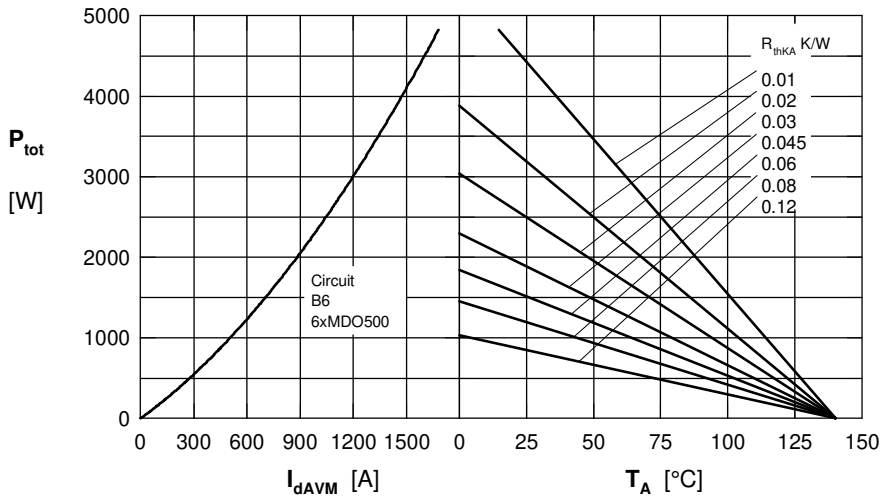
**Rectifier**


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

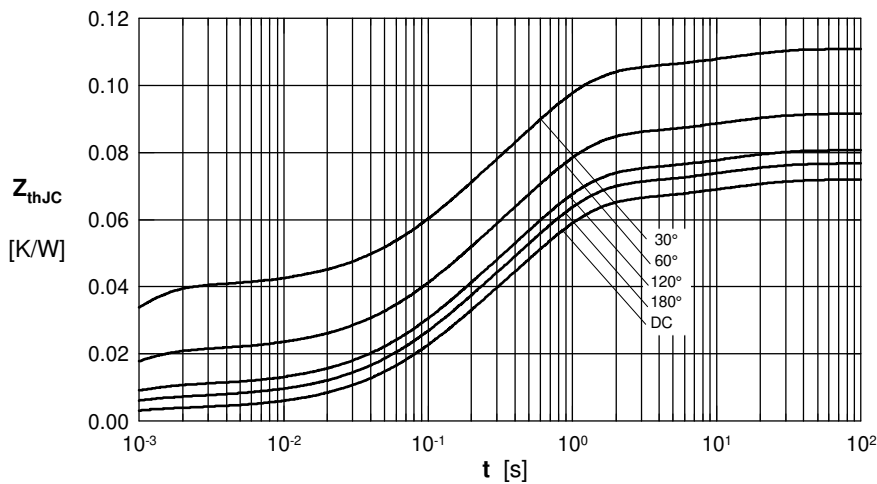


Fig. 7 Transient thermal impedance junction to case

$R_{thJC}$  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

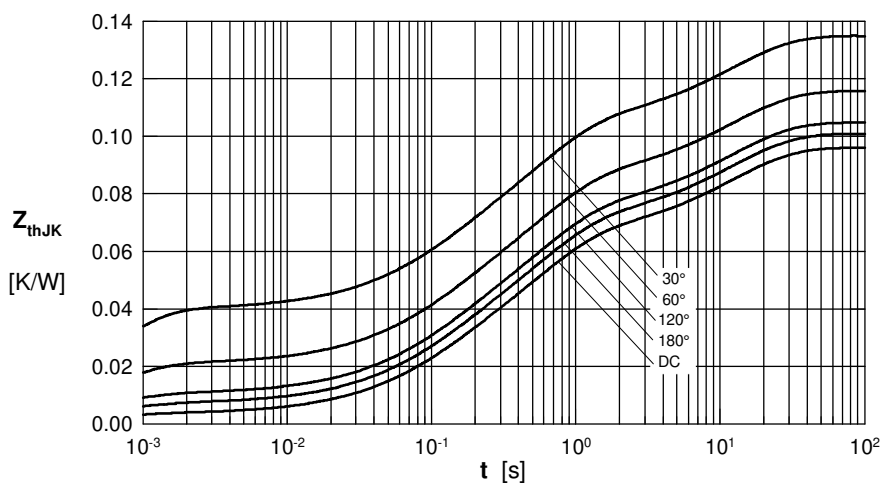


Fig. 8 Transient thermal impedance junction to heatsink

$R_{thJK}$  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