

# High Voltage Standard Rectifier Module

$$V_{RRM} = 2200 \text{ V}$$

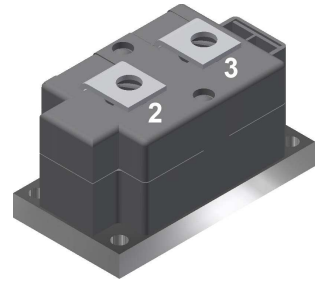
$$I_{FAV} = 560 \text{ A}$$

$$V_F = 0.98 \text{ V}$$


Single Diode

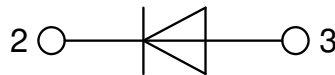
Part number

**MDO500-22N1**



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: 3600 V~
- Industry standard outline
- RoHS compliant
- Base plate: Copper internally DCB isolated
- Advanced power cycling

### Disclaimer Notice

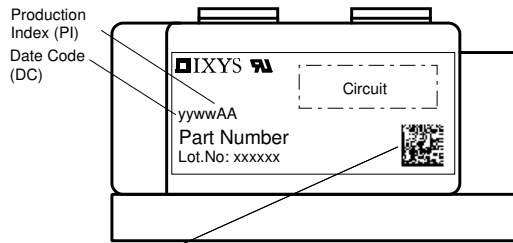
Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).



Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM}$	max. non-repetitive reverse blocking voltage					2300	V
$V_{RRM}$	max. repetitive reverse blocking voltage					2200	V
$I_R$	reverse current	$V_R = 2200\text{ V}$		$T_{VJ} = 25^\circ\text{C}$		1	mA
		$V_R = 2200\text{ V}$		$T_{VJ} = 140^\circ\text{C}$		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 <sup>2</sup> s
		t = 8,3 ms; (60 Hz), sine		$V_R = 0\text{ V}$		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		$V_R = 0\text{ V}$		788.8	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 700\text{ V}; f = 1\text{ MHz}$		$T_{VJ} = 25^\circ\text{C}$		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	3600			V
		t = 1 minute	3000			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	MDO500-22N1	MDO500-22N1	Box	2	467219

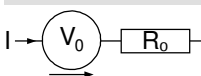
Similar Part	Package	Voltage class
MDO500-12N1	Y1-2-CU	1200
MDO500-14N1	Y1-2-CU	1400
MDO500-16N1	Y1-2-CU	1600
MDO500-18N1	Y1-2-CU	1800

MDO500-20N1	Y1-2-CU	2000
-------------	---------	------

**Equivalent Circuits for Simulation**

\* on die level

$T_{VJ} = 140^{\circ}C$

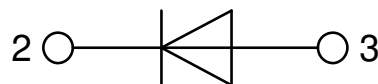
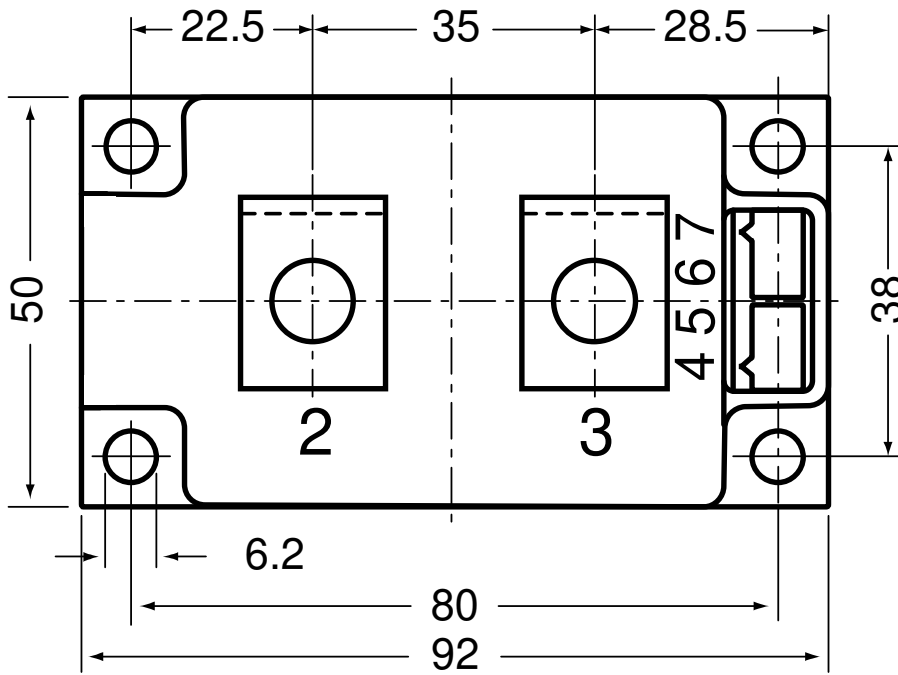
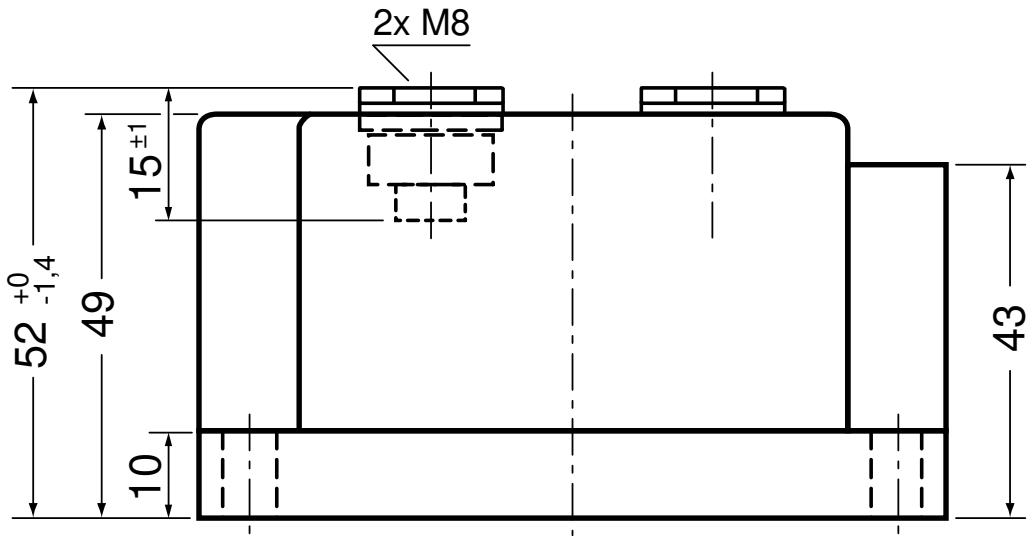


Rectifier

$V_{0\ max}$	threshold voltage	0.8	V
$R_{0\ max}$	slope resistance *	0.19	mΩ



Outlines Y1



**Rectifier**

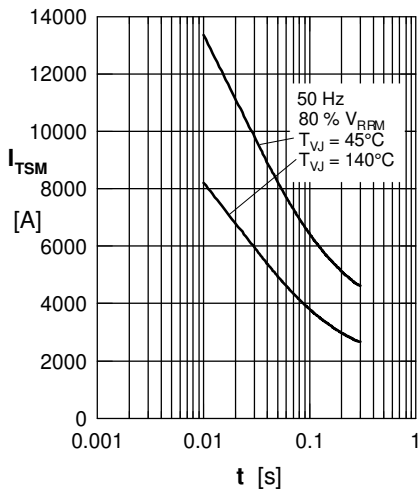


Fig. 1 Surge overload current  
 $I_{FSM}$ : Crest value,  $t$ : duration

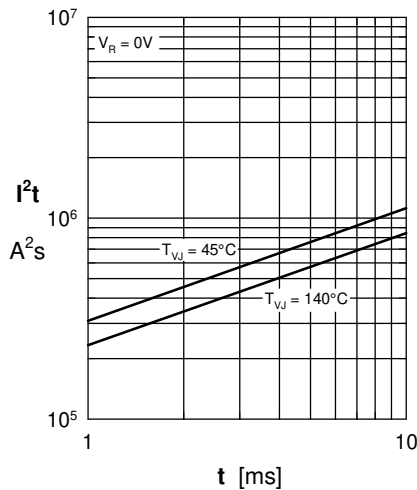


Fig. 2  $I^2t$  versus time (1-10 ms)

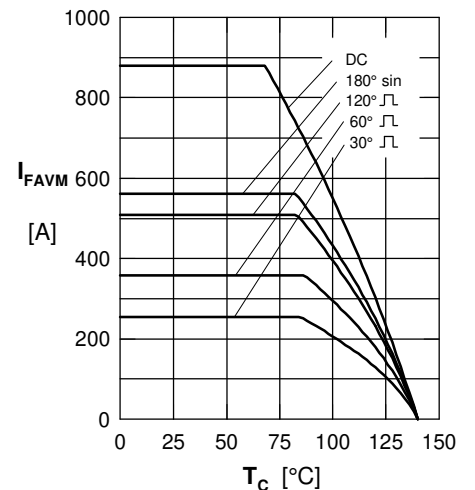


Fig. 3 Maximum forward current at case temperature

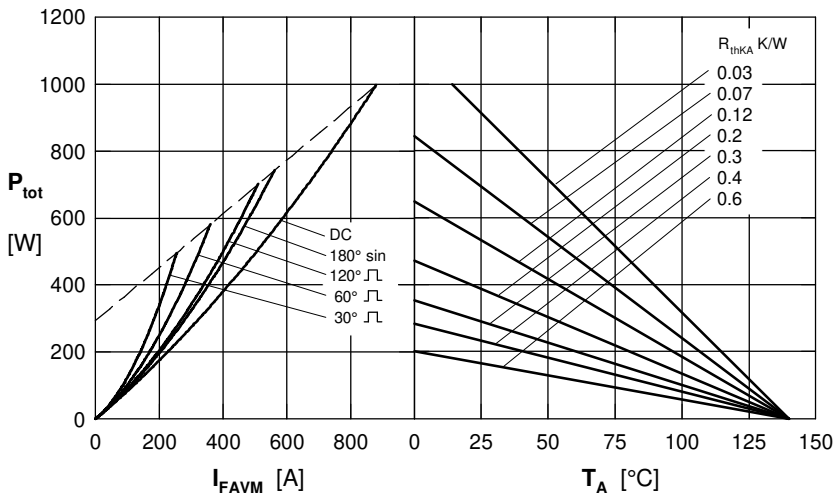


Fig. 4 Power dissipation vs. forward current and ambient temperature

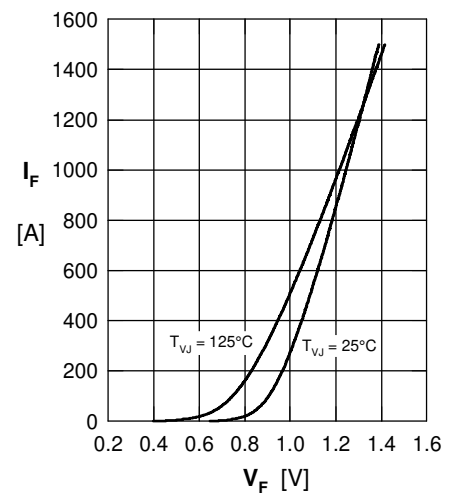


Fig. 5 Forward current  $I_F$  versus  $V_F$

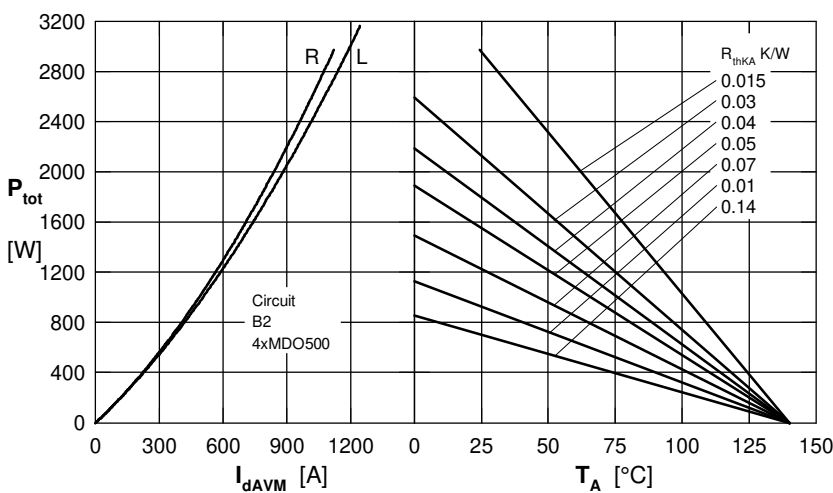


Fig. 6 Single phase rectifier bridge: Power dissipation vs. direct output current and ambient temperature. R = resistive load, L = inductive load

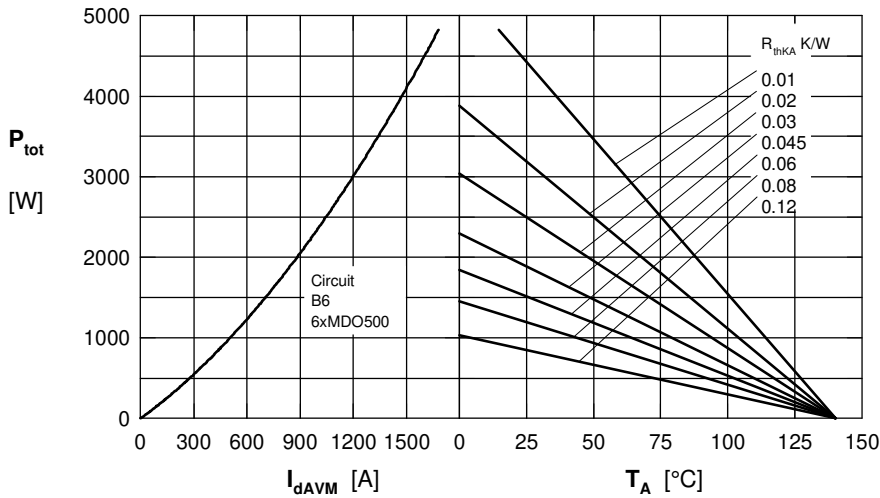
**Rectifier**


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

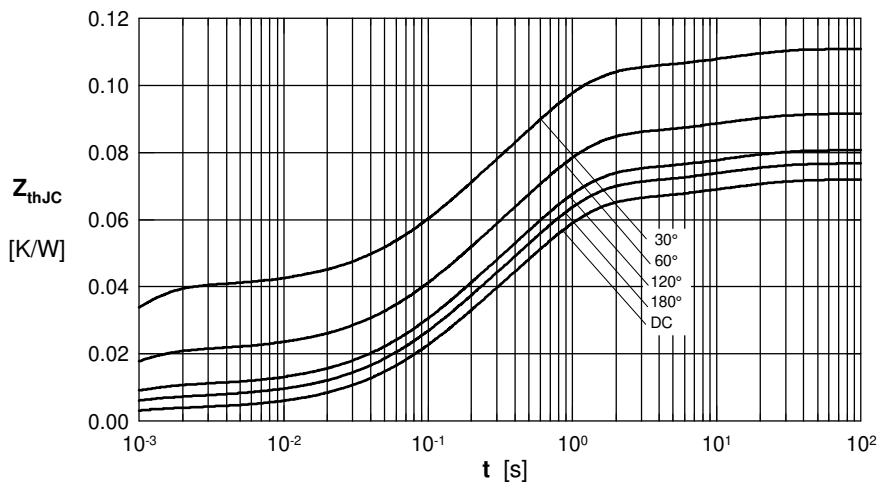


Fig. 7 Transient thermal impedance junction to case

$R_{thJC}$  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

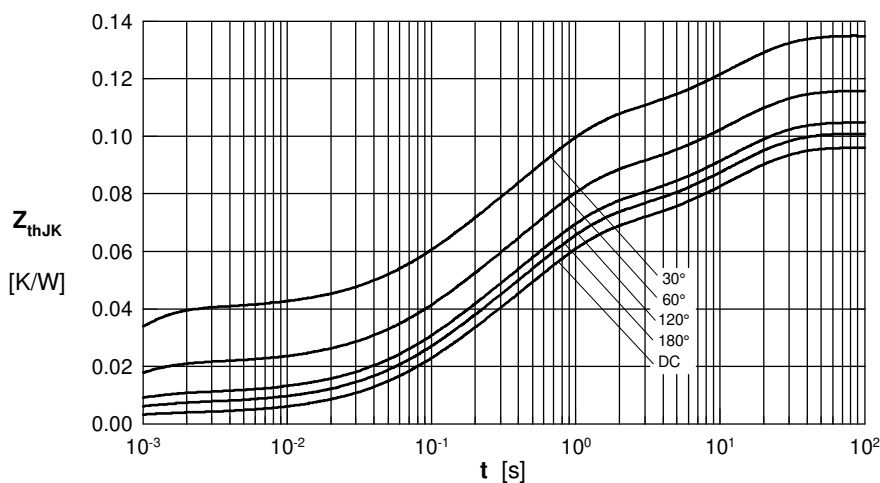


Fig. 8 Transient thermal impedance junction to heatsink

$R_{thJK}$  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