

# Standard Rectifier Module

$$V_{RRM} = 2 \times 1800 \text{ V}$$

$$I_{FAV} = 71 \text{ A}$$

$$V_F = 1.14 \text{ V}$$


Phase leg

Part number

**MDD56-18N1B**



Backside: isolated

 E72873



### Features / Advantages:

- Package with DCB ceramic
- Improved temperature and power cycling
- Planar passivated chips
- Very low forward voltage drop
- Very low leakage current

### 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: TO-240AA

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Height: 30 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

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Rectifier				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM}$	max. non-repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}C$			1900	V	
$V_{RRM}$	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}C$			1800	V	
$I_R$	reverse current	$V_R = 1800\text{ V}$	$T_{VJ} = 25^{\circ}C$		200	$\mu A$	
		$V_R = 1800\text{ V}$	$T_{VJ} = 150^{\circ}C$		10	mA	
$V_F$	forward voltage drop	$I_F = 100\text{ A}$	$T_{VJ} = 25^{\circ}C$		1.21	V	
		$I_F = 200\text{ A}$			1.48	V	
		$I_F = 100\text{ A}$	$T_{VJ} = 125^{\circ}C$		1.14	V	
		$I_F = 200\text{ A}$			1.45	V	
$I_{FAV}$	average forward current	$T_C = 100^{\circ}C$	$T_{VJ} = 150^{\circ}C$		71	A	
$I_{F(RMS)}$	RMS forward current	180° sine			150	A	
$V_{F0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0.80	V	
$r_F$	slope resistance				3	m $\Omega$	
$R_{thJC}$	thermal resistance junction to case				0.51	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.2		K/W	
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		245	W	
$I_{FSM}$	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		1.40	kA	
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		1.51	kA	
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		1.19	kA	
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		1.29	kA	
$I^2t$	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		9.80	kA <sup>2</sup> s	
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		9.49	kA <sup>2</sup> s	
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		7.08	kA <sup>2</sup> s	
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		6.87	kA <sup>2</sup> s	
$C_J$	junction capacitance	$V_R = 400\text{ V}; f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}C$		27	pF	



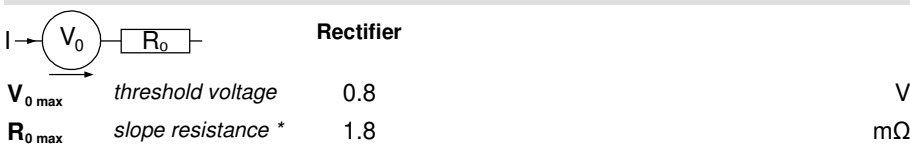
Package TO-240AA				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$I_{RMS}$	RMS current	per terminal			200	A	
$T_{VJ}$	virtual junction temperature		-40		150	°C	
$T_{op}$	operation temperature		-40		125	°C	
$T_{stg}$	storage temperature		-40		125	°C	
<b>Weight</b>					76	g	
$M_D$	mounting torque		2.5		4	Nm	
$M_T$	terminal torque		2.5		4	Nm	
$d_{Spp/App}$	creepage distance on surface   striking distance through air	terminal to terminal	13.0	9.7		mm	
$d_{Spb/Apb}$		terminal to backside	16.0	16.0		mm	
$V_{ISOL}$	isolation voltage	t = 1 second		4800		V	
		t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	4000		V	



Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDD56-18N1B	MDD56-18N1B	Box	36	454400

Similar Part	Package	Voltage class
MDD56-08N1B	TO-240AA	800
MDD56-12N1B	TO-240AA	1200
MDD56-14N1B	TO-240AA	1400
MDD56-16N1B	TO-240AA	1600

**Equivalent Circuits for Simulation** \* on die level  $T_{VJ} = 150^{\circ}C$





Outlines TO-240AA



General tolerance: DIN ISO 2768 class „c“





**Rectifier**

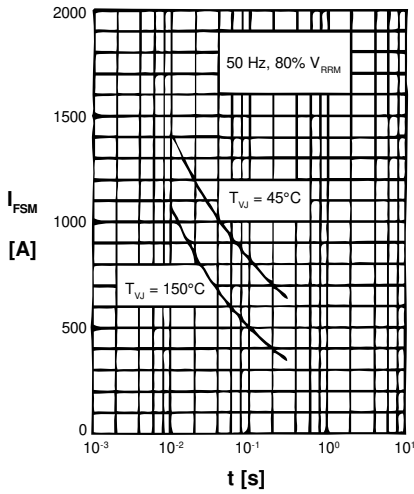


Fig. 1 Surge overload current  
 $I_{TSM}, I_{FSM}$ : Crest value,  $t$ : duration

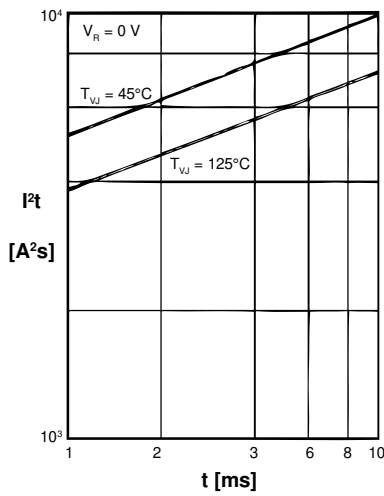


Fig. 2  $I^2t$  versus time (1-10 ms)

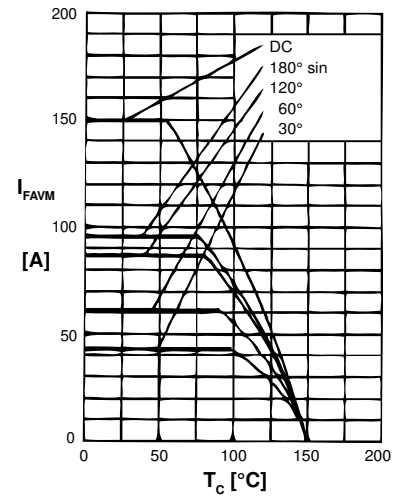


Fig. 3 Maximum forward current at case temperature

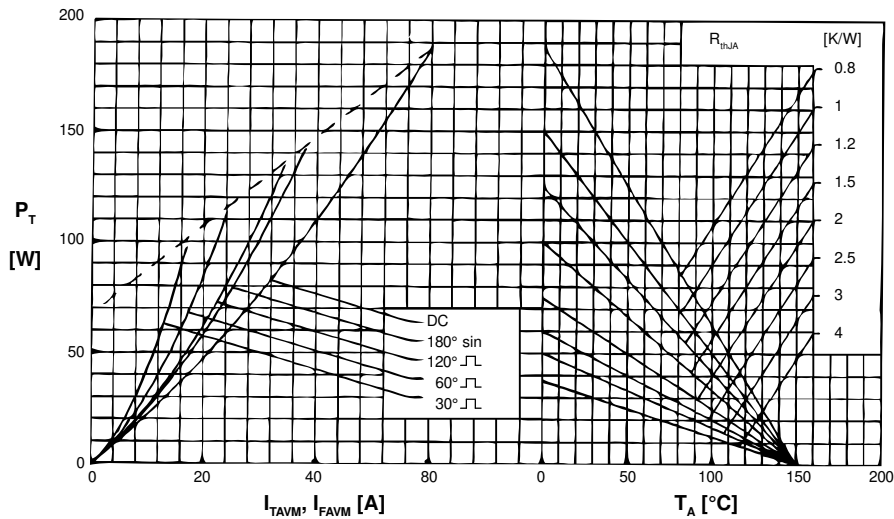


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per diode)

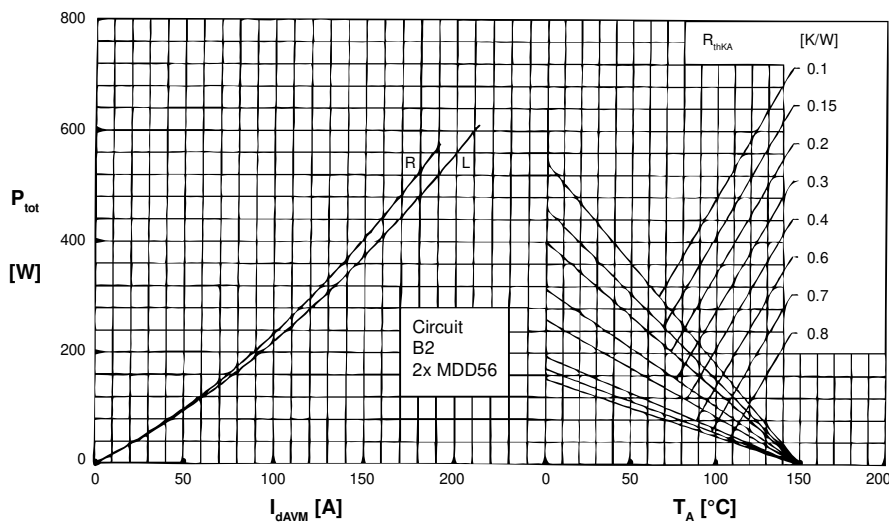


Fig. 6 Single phase rectifier bridge: Power dissipation versus direct output current and ambient temperature; R = resistive load, L = inductive load



**Rectifier**

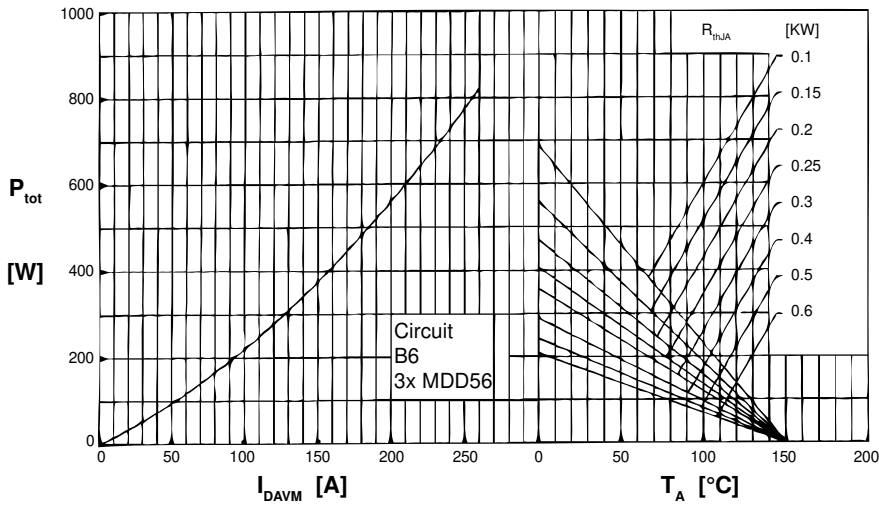


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

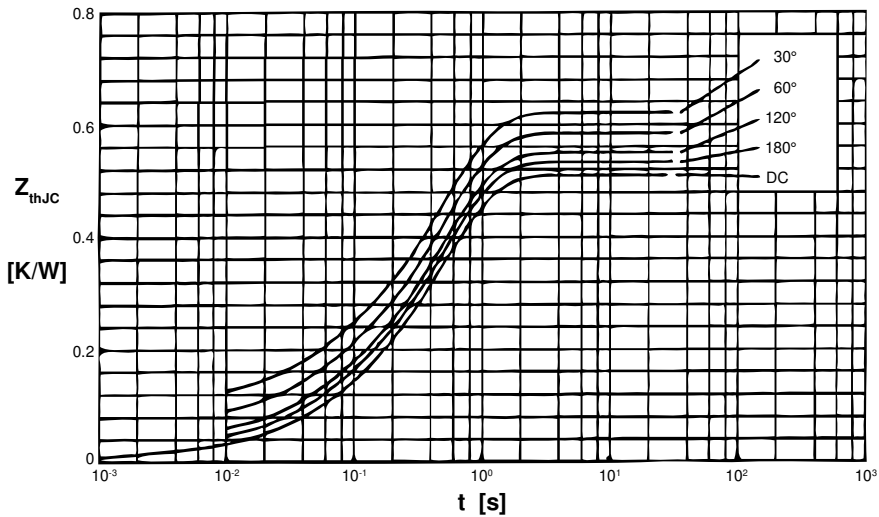


Fig. 7 Transient thermal impedance junction to case (per diode)

$R_{thJC}$  for various conduction angles d:

d	$R_{thJC}$ [K/W]
DC	0.51
180°	0.53
120°	0.55
60°	0.58
30°	0.62

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ [K/W]	$t_i$ [s]
1	0.013	0.0015
2	0.055	0.0450
3	0.442	0.4850

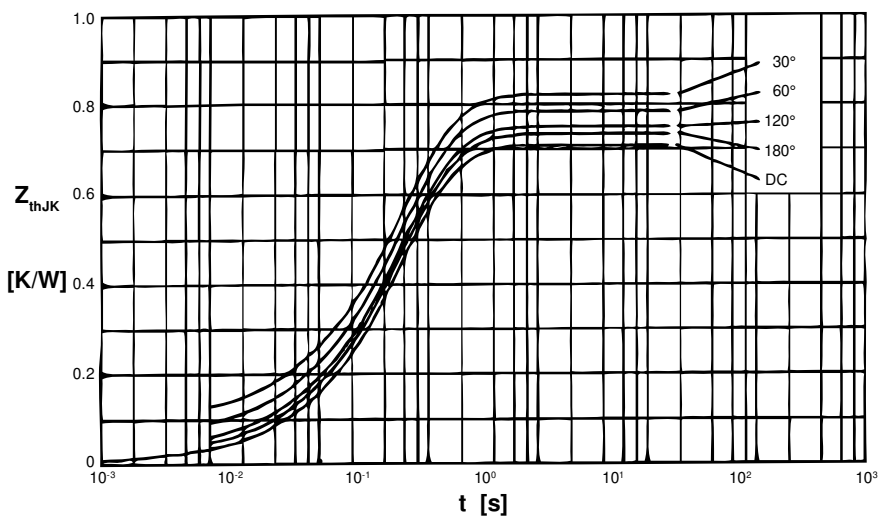


Fig. 8 Transient thermal impedance junction to heatsink (per thyristor)

$R_{thJK}$  for various conduction angles d:

d	$R_{thJK}$ [K/W]
DC	0.71
180°	0.73
120°	0.75
60°	0.78
30°	0.82

Constants for  $Z_{thJK}$  calculation:

i	$R_{thi}$ [K/W]	$t_i$ [s]
1	0.013	0.0015
2	0.055	0.0450
3	0.442	0.4850
4	0.200	1.2500

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