



Standard Rectifier Module

$$V_{RRM} = 2 \times 1200 \text{ V}$$

$$I_{FAV} = 59 \text{ A}$$

$$V_F = 1.26 \text{ V}$$

Phase leg

Part number

MDD44-12N1B



Backside: isolated



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

Disclaimer Notice

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Rectifier				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
V_{RSM}	max. non-repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}C$			1300	V	
V_{RRM}	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}C$			1200	V	
I_R	reverse current	$V_R = 1200 V$	$T_{VJ} = 25^{\circ}C$		100	μA	
		$V_R = 1200 V$	$T_{VJ} = 150^{\circ}C$		10	mA	
V_F	forward voltage drop	$I_F = 100 A$	$T_{VJ} = 25^{\circ}C$		1.30	V	
		$I_F = 200 A$			1.60	V	
		$I_F = 100 A$	$T_{VJ} = 125^{\circ}C$		1.26	V	
		$I_F = 200 A$			1.67	V	
I_{FAV}	average forward current	$T_C = 100^{\circ}C$	$T_{VJ} = 150^{\circ}C$		59	A	
$I_{F(RMS)}$	RMS forward current	180° sine			100	A	
V_{F0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0.80	V	
r_F	slope resistance				4.3	m Ω	
R_{thJC}	thermal resistance junction to case				0.59	K/W	
R_{thCH}	thermal resistance case to heatsink			0.2		K/W	
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		212	W	
I_{FSM}	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		1.15	kA	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		1.24	kA	
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		980	A	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		1.06	kA	
I^2t	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		6.62	kA ² s	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		6.40	kA ² s	
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		4.80	kA ² s	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		4.63	kA ² s	
C_J	junction capacitance	$V_R = 400 V; f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		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	
Weight					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	MDD44-12N1B	MDD44-12N1B	Box	36	458023

Similar Part	Package	Voltage class
MDD44-08N1B	TO-240AA	800
MDD44-14N1B	TO-240AA	1400
MDD44-16N1B	TO-240AA	1600
MDD44-18N1B	TO-240AA	1800

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 150^{\circ}\text{C}$

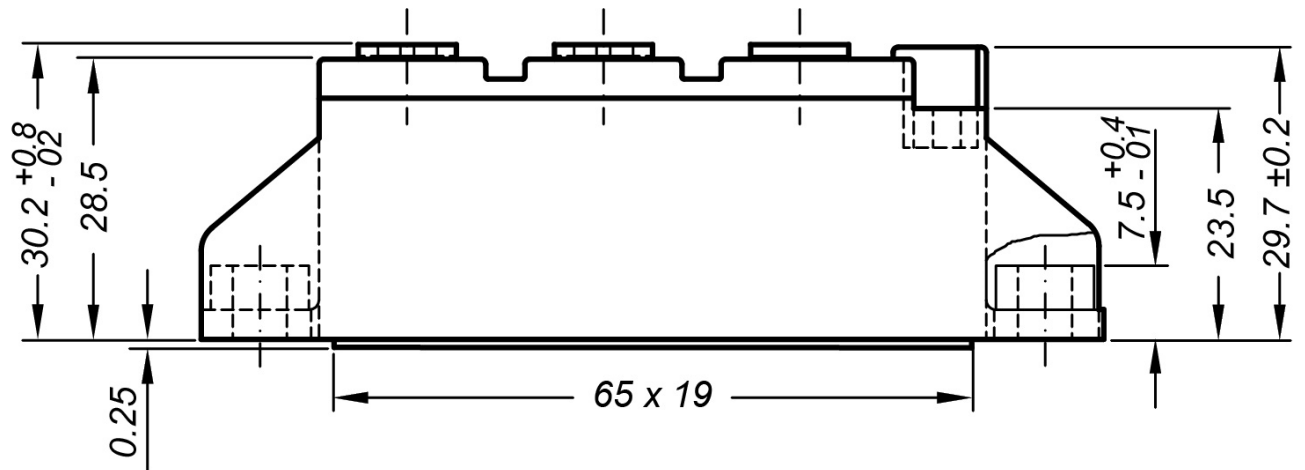


Rectifier

$V_{0\ max}$	threshold voltage	0.8	V
$R_{0\ max}$	slope resistance *	3.1	mΩ



Outlines TO-240AA



General tolerance: DIN ISO 2768 class „c“



Rectifier

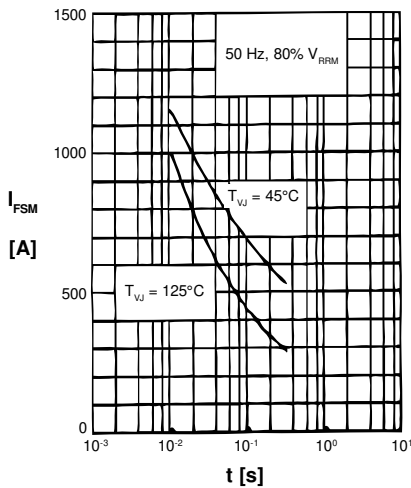


Fig. 1 Surge overload current
 I_{TSM} , I_{FSM} : Crest value, t : duration

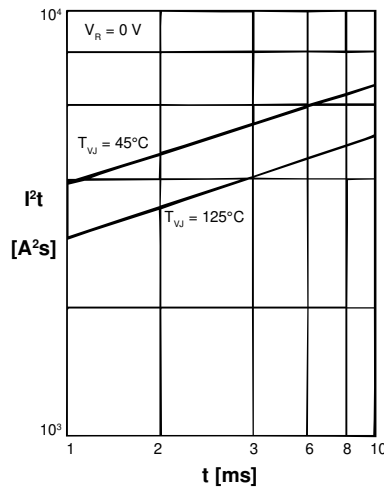


Fig. 2 I^2t versus time (1-10 ms)

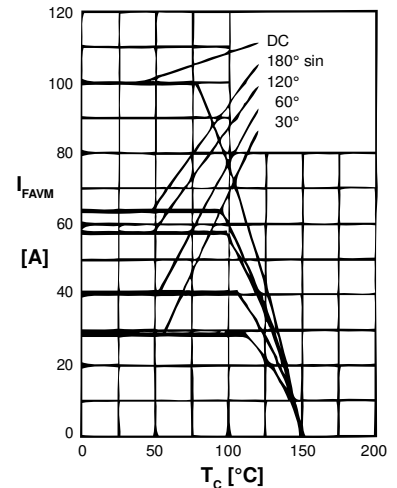


Fig. 3 Maximum forward current at case temperature

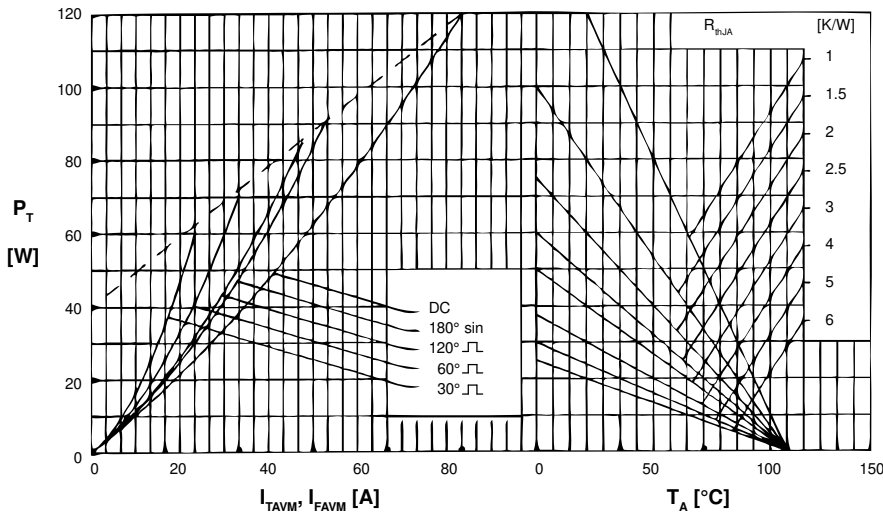


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per diode)

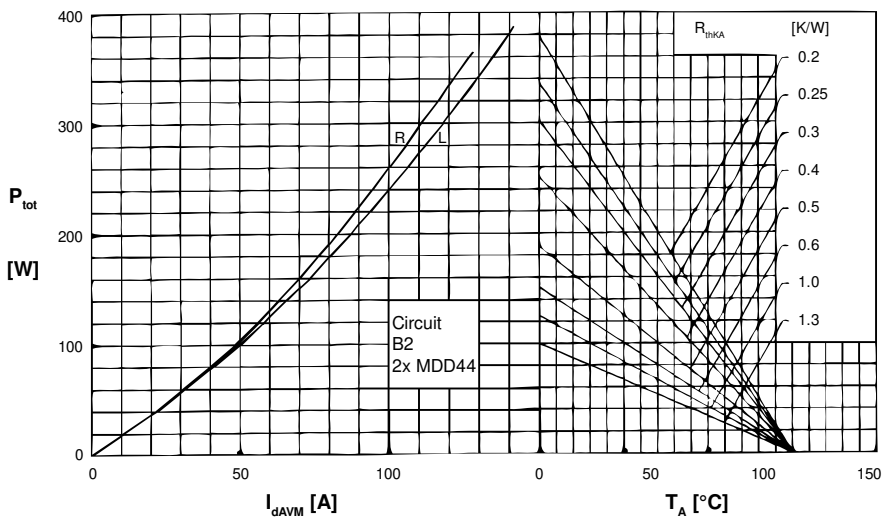


Fig. 6 Single phase rectifier bridge: Power dissipation versus direct output current and ambient temperature; R = resistive load, L = inductive load



Rectifier

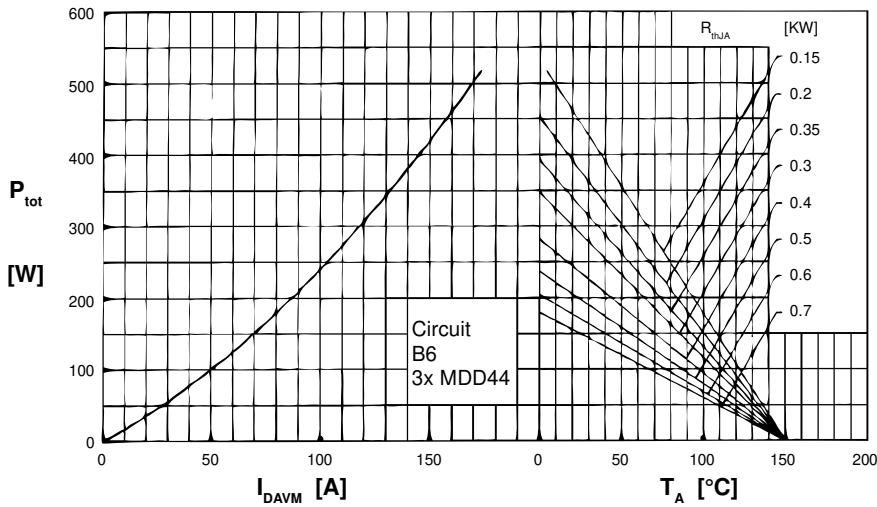


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

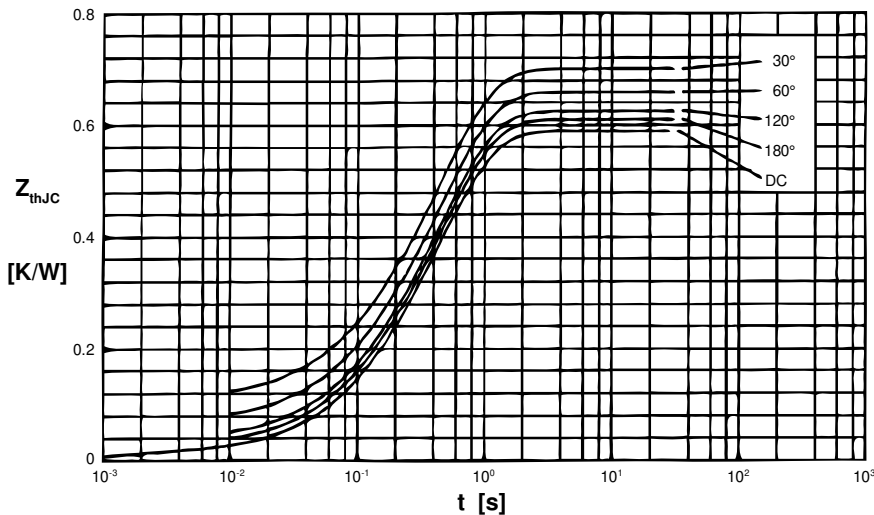


Fig. 7 Transient thermal impedance junction to case (per diode)

$R_{\theta JC}$ for various conduction angles d:

d	$R_{\theta JC}$ [K/W]
DC	0.59
180°	0.61
120°	0.63
60°	0.66
30°	0.70

Constants for $Z_{\theta JC}$ calculation:

i	$R_{\theta i}$ [K/W]	t_i [s]
1	0.012	0.0012
2	0.045	0.0950
3	0.533	0.4550

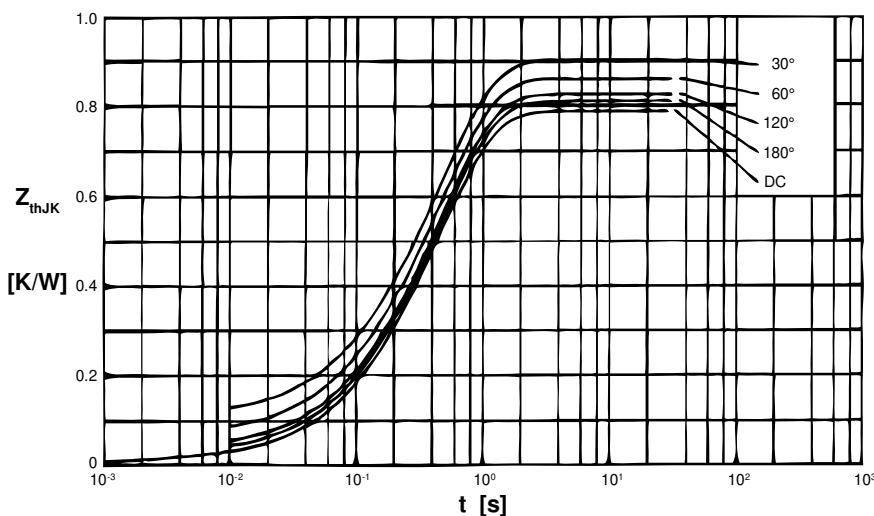


Fig. 8 Transient thermal impedance junction to heatsink (per thyristor)

$R_{\theta JK}$ for various conduction angles d:

d	$R_{\theta JK}$ [K/W]
DC	0.79
180°	0.81
120°	0.83
60°	0.86
30°	0.90

Constants for $Z_{\theta JK}$ calculation:

i	$R_{\theta i}$ [K/W]	t_i [s]
1	0.012	0.0012
2	0.045	0.0950
3	0.533	0.4550
4	0.200	0.4950