

Standard Rectifier Module

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

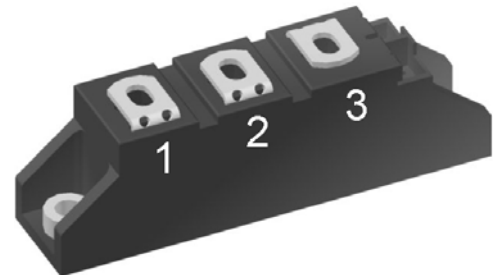
$$I_{FAV} = 71 \text{ A}$$

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

Phase leg

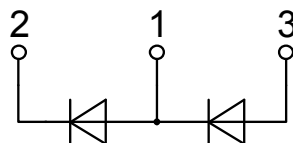
Part number

MDD56-12N1B



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:

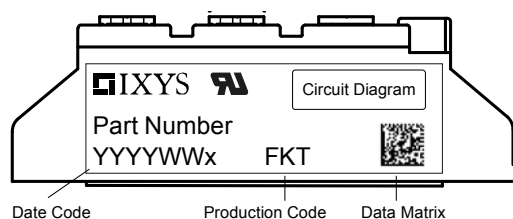
- Diode for main rectification
- For single and three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors

Package: TO-240AA

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RSM}	max. non-repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1300	V
V_{RRM}	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1200	V
I_R	reverse current	$V_R = 1200\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			200	μA
		$V_R = 1200\text{ V}$	$T_{VJ} = 150^{\circ}\text{C}$			10	mA
V_F	forward voltage drop	$I_F = 100\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.21	V
		$I_F = 200\text{ A}$				1.48	V
		$I_F = 100\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.14	V
		$I_F = 200\text{ A}$				1.45	V
I_{FAV}	average forward current	$T_C = 100^{\circ}\text{C}$	$T_{VJ} = 150^{\circ}\text{C}$			71	A
$I_{F(RMS)}$	RMS forward current	180° sine				150	A
V_{FO}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}\text{C}$			0.80	V
r_F	slope resistance					3	m Ω
R_{thJC}	thermal resistance junction to case					0.51	K/W
R_{thCH}	thermal resistance case to heatsink				0.20		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}\text{C}$			245	W
I_{FSM}	max. forward surge current	$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 45^{\circ}\text{C}$			1.40	kA
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			1.51	kA
		$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 150^{\circ}\text{C}$			1.19	kA
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			1.29	kA
I^2t	value for fusing	$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 45^{\circ}\text{C}$			9.80	kA ² s
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			9.49	kA ² s
		$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 150^{\circ}\text{C}$			7.08	kA ² s
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			6.87	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V; } f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}\text{C}$		27		pF

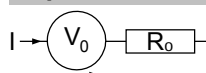
Package TO-240AA				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal				200	A
T_{VJ}	virtual junction temperature			-40		150	°C
T_{op}	operation temperature			-40		125	°C
T_{stg}	storage temperature			-40		125	°C
Weight					90		g
M_D	mounting torque			2.5		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	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	3600			V
		t = 1 minute		3000			V



Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDD56-12N1B	MDD56-12N1B	Box	6	458066

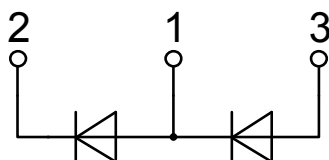
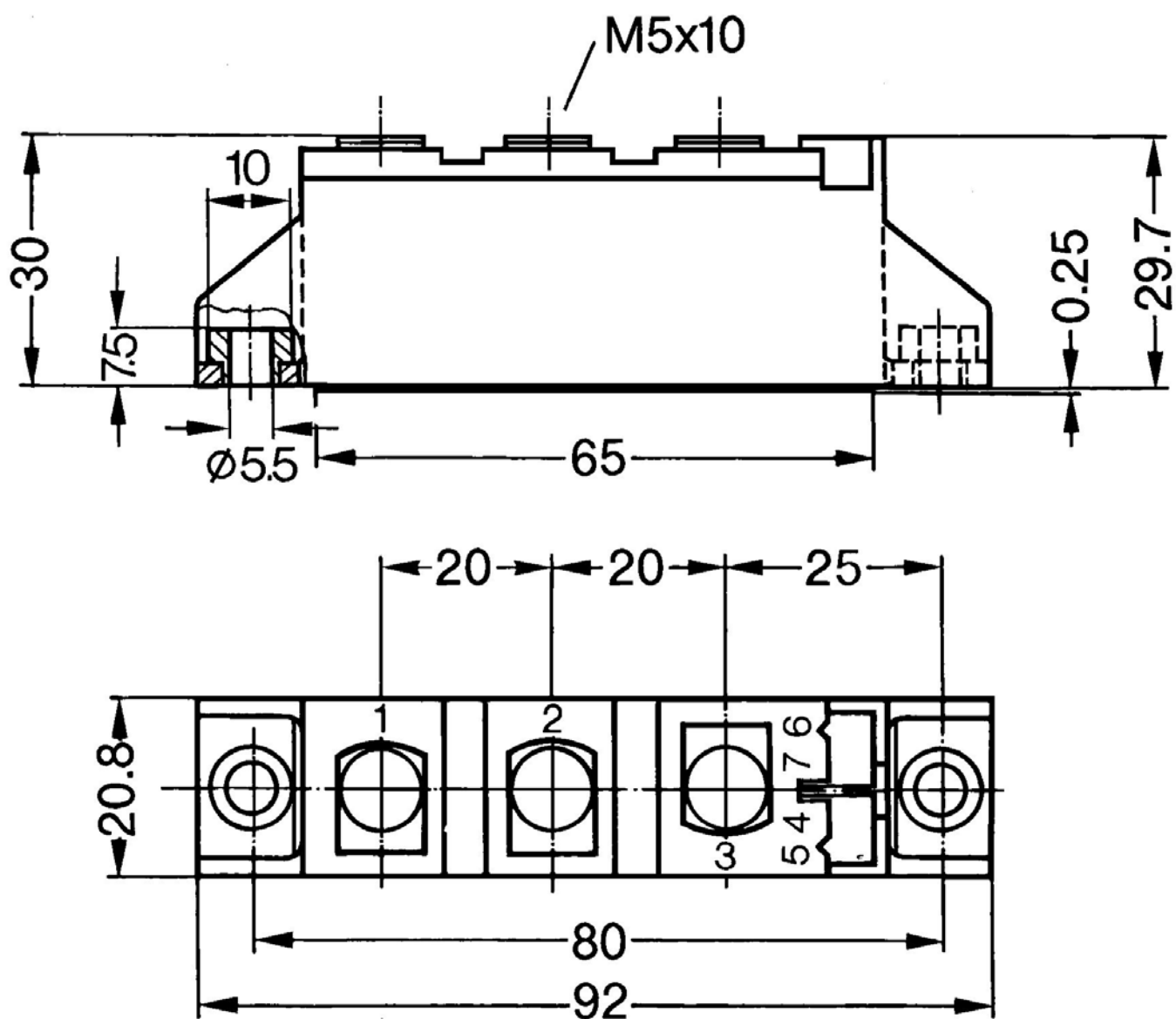
Equivalent Circuits for Simulation

* on die level

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

Rectifier

$V_{0\max}$	threshold voltage	0.8	V
$R_{0\max}$	slope resistance *	1.8	mΩ



Rectifier

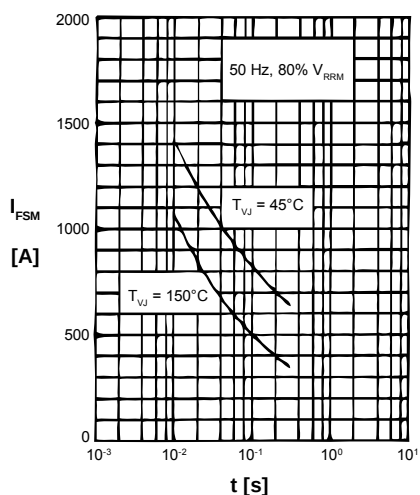


Fig. 1 Surge overload current
 I_{TSM}, I_{FSM} : Crest value, t : duration

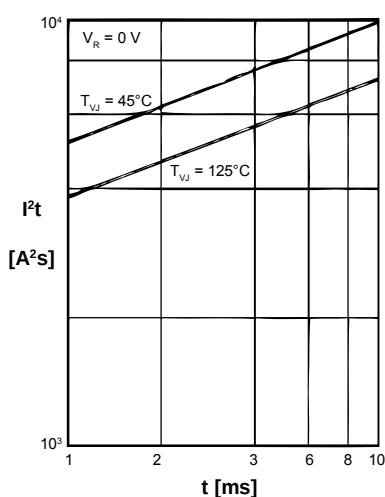


Fig. 2 I^2t versus time (1-10 ms)

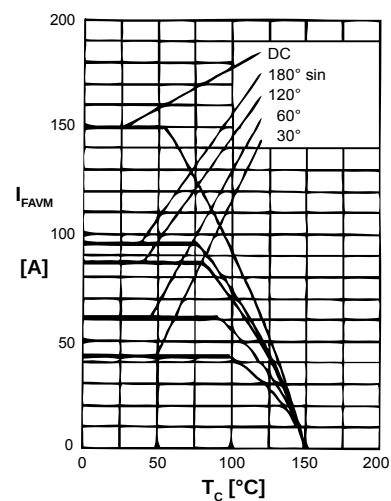


Fig. 3 Maximum forward current at case temperature

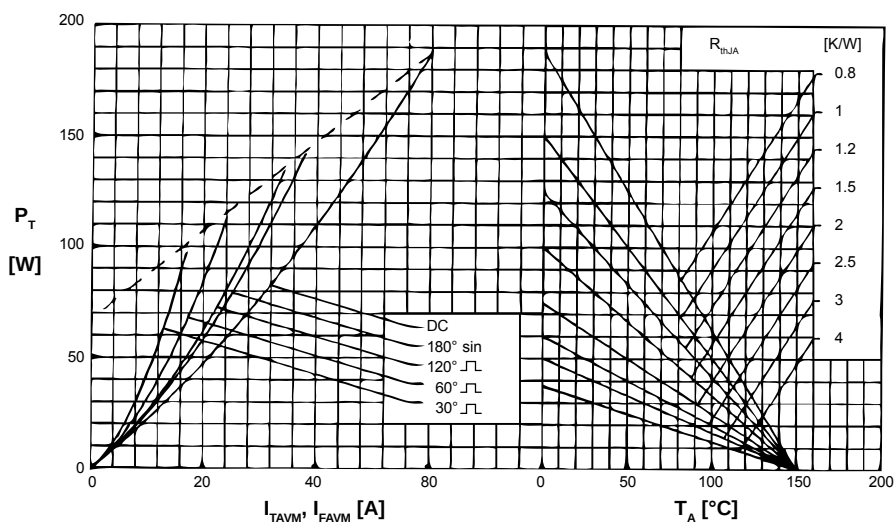


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per diode)

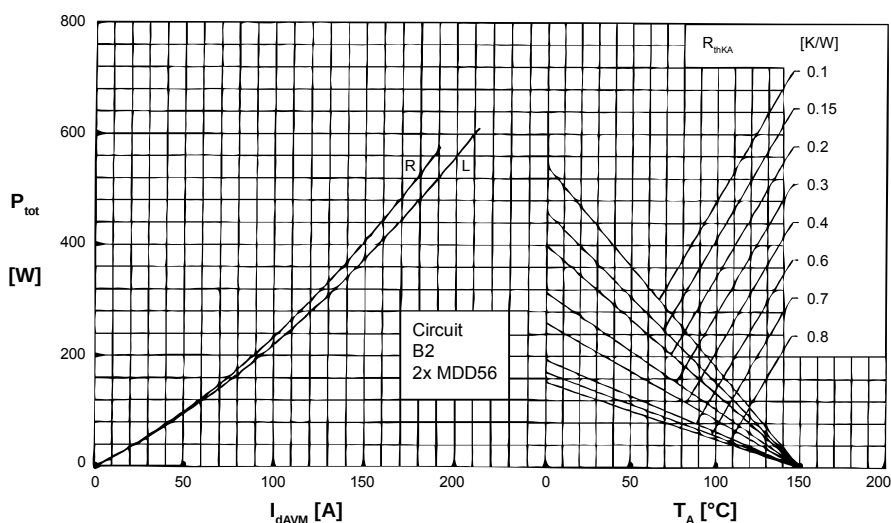


Fig. 6 Single phase rectifier bridge: Power dissipation versus direct output current and ambient temperature; R = resistive load, L = inductive load

Rectifier

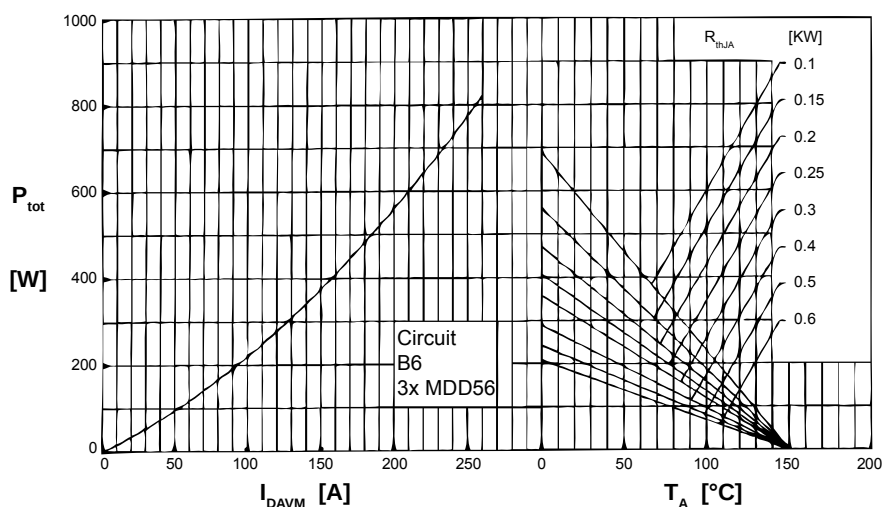


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

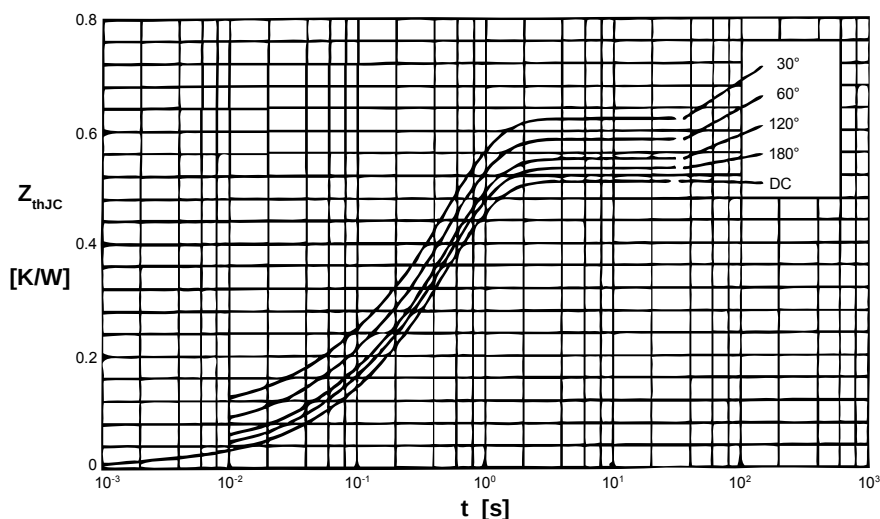


Fig. 7 Transient thermal impedance junction to case (per diode)

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

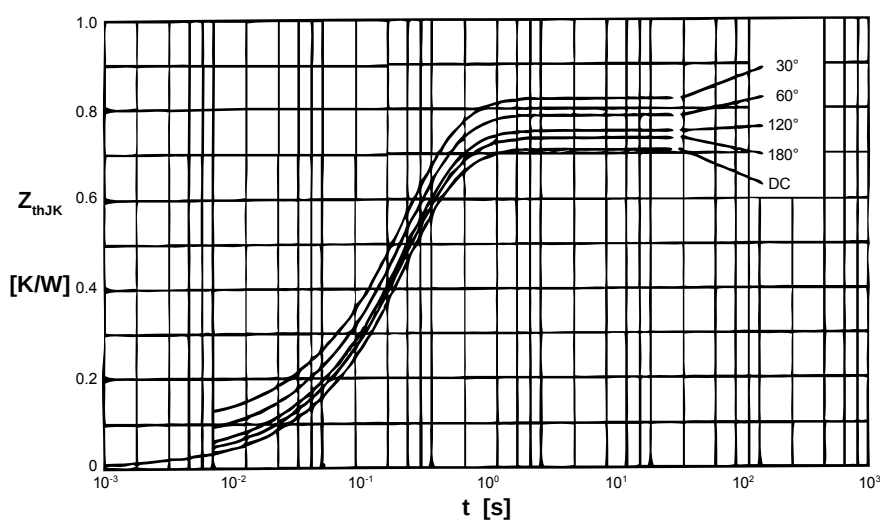


Fig. 8 Transient thermal impedance junction to heatsink (per thyristor)

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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Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype ameyasales1 ameyasales2

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com