

## Standard Rectifier Module

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

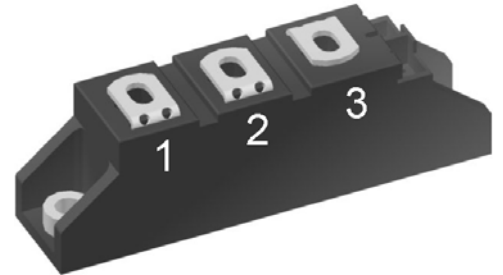
$$I_{FAV} = 59 \text{ A}$$

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

Phase leg

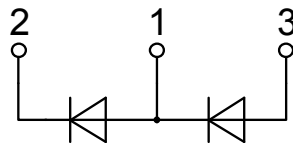
Part number

MDD44-12N1B



Backside: isolated

 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:

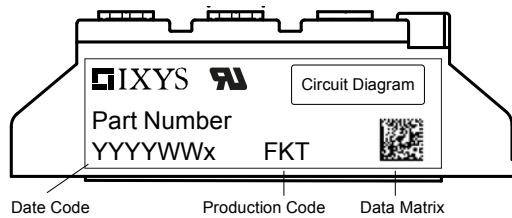
- Diode for main rectification
- For single and three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors

### 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	$T_{VJ} = 25^{\circ}C$			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	$\mu A$	
		$V_R = 1200 V$	$T_{VJ} = 150^{\circ}C$		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	
$V_{FO}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0.80	V	
$r_F$	slope resistance				4.3	m $\Omega$	
$R_{thJC}$	thermal resistance junction to case				0.59	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.20		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 <sup>2</sup> s	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		6.40	kA <sup>2</sup> s	
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		4.80	kA <sup>2</sup> s	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		4.63	kA <sup>2</sup> 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
<b>Weight</b>				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			3600	V
		t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA		3000	V

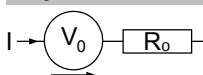


Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDD44-12N1B	MDD44-12N1B	Box	6	458023

### Equivalent Circuits for Simulation

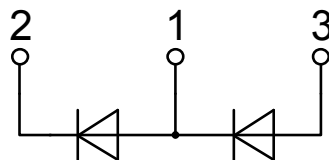
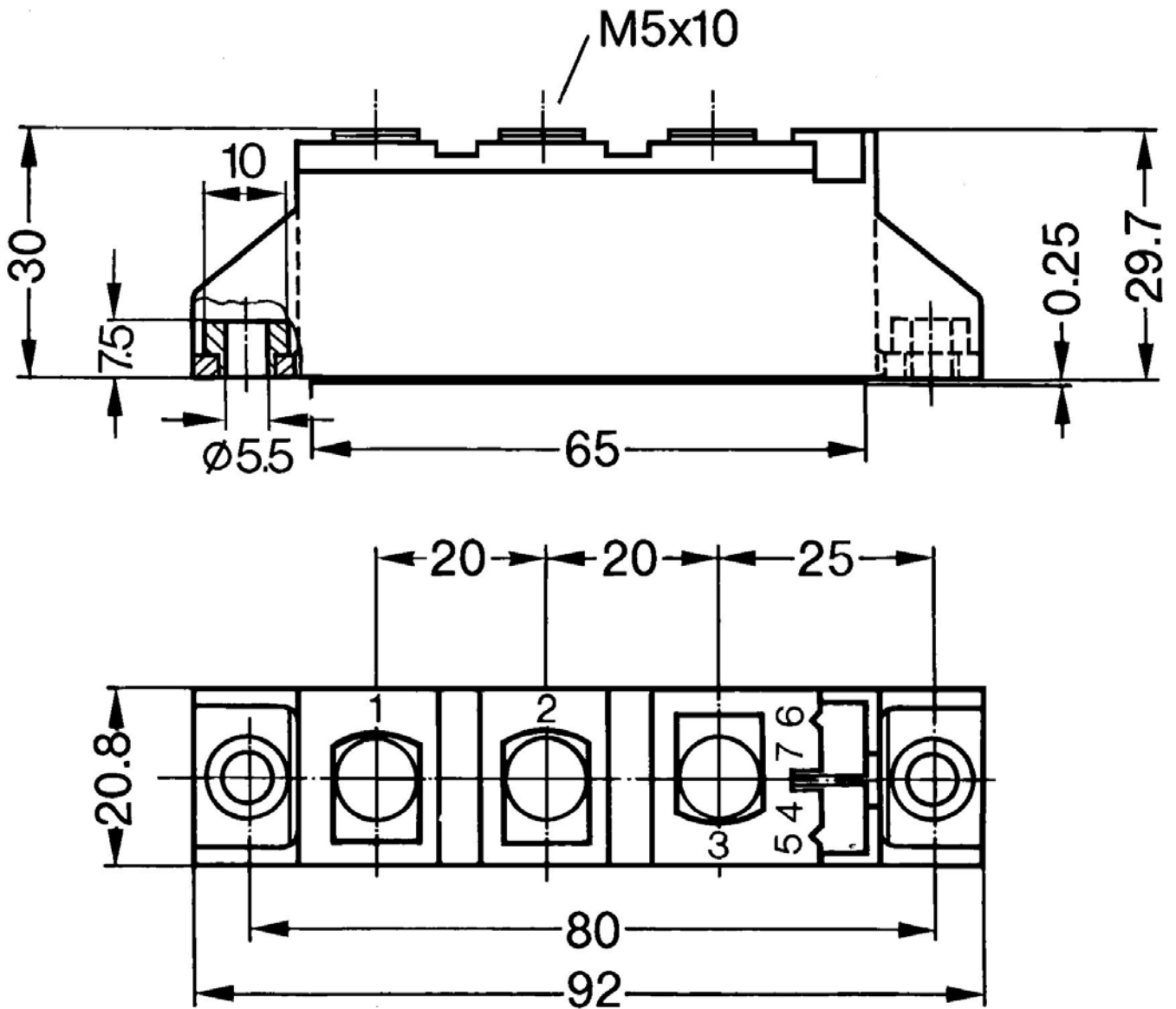
\* on die level

$T_{VJ} = 150$  °C



Rectifier

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



**Rectifier**

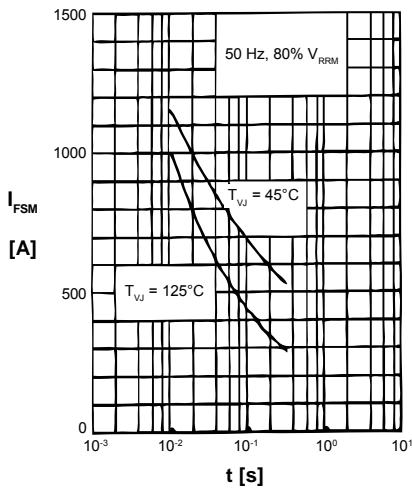


Fig. 1 Surge overload current  
 $I_{TSM}$ ,  $I_{FSM}$ : Crest value,  $t$ : duration

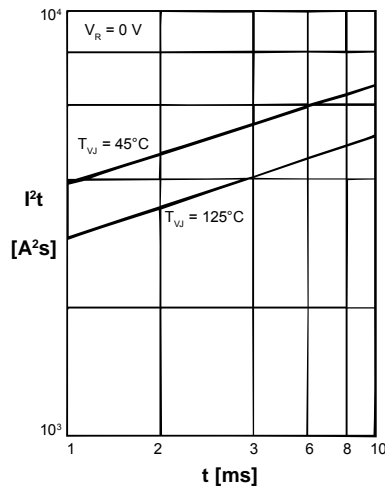


Fig. 2  $I^2t$  versus time (1-10 ms)

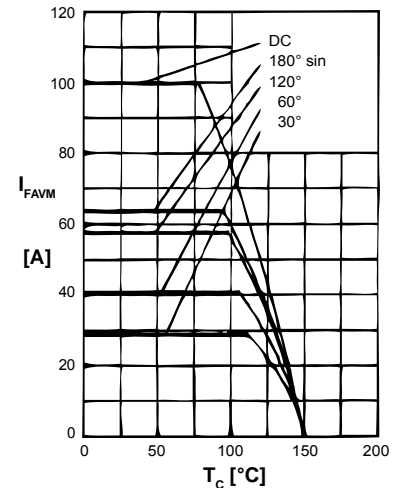


Fig. 3 Maximum forward current at case temperature

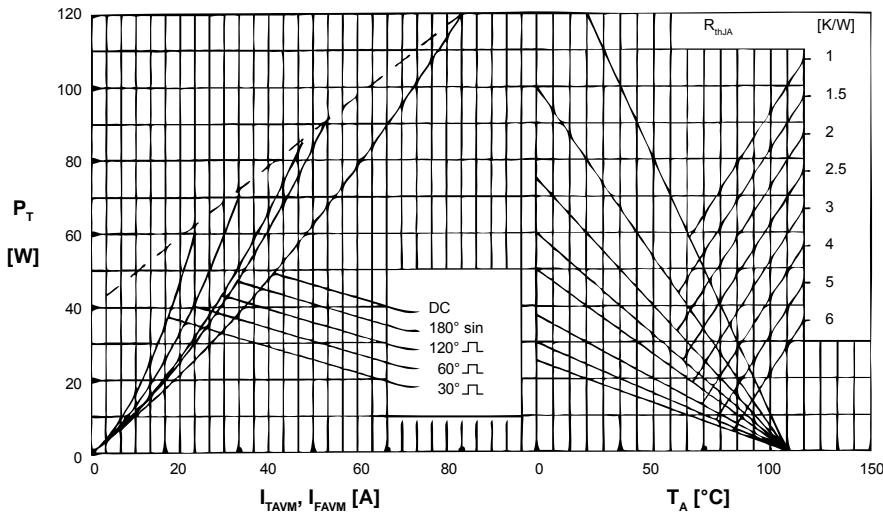


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per diode)

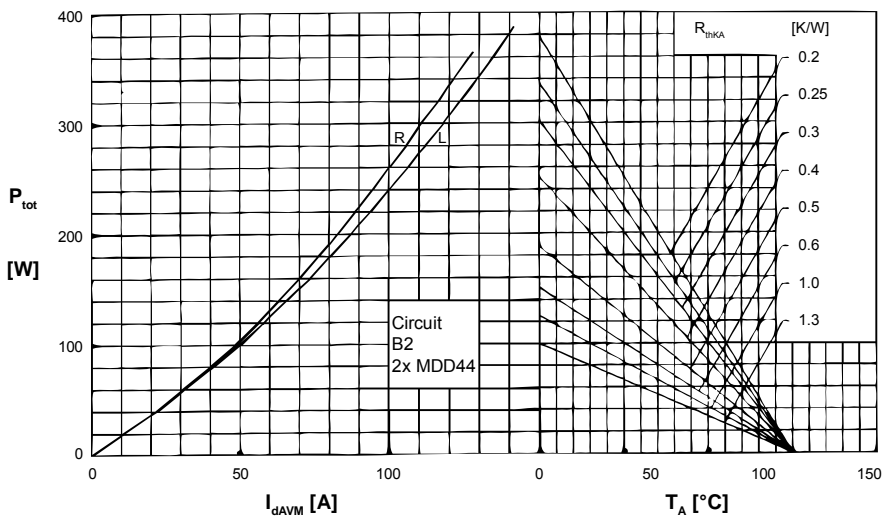


Fig. 6 Single phase rectifier bridge: Power dissipation versus direct output current and ambient temperature; R = resistive load, L = inductive load

## Rectifier

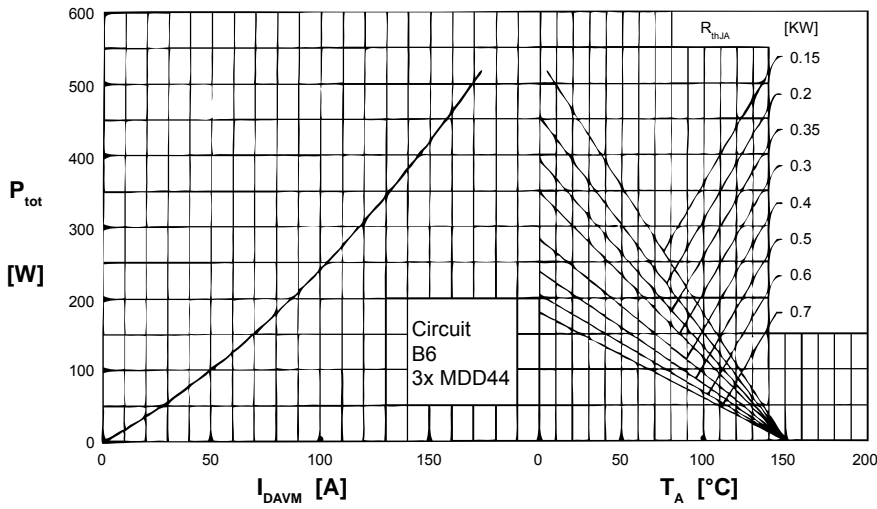


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

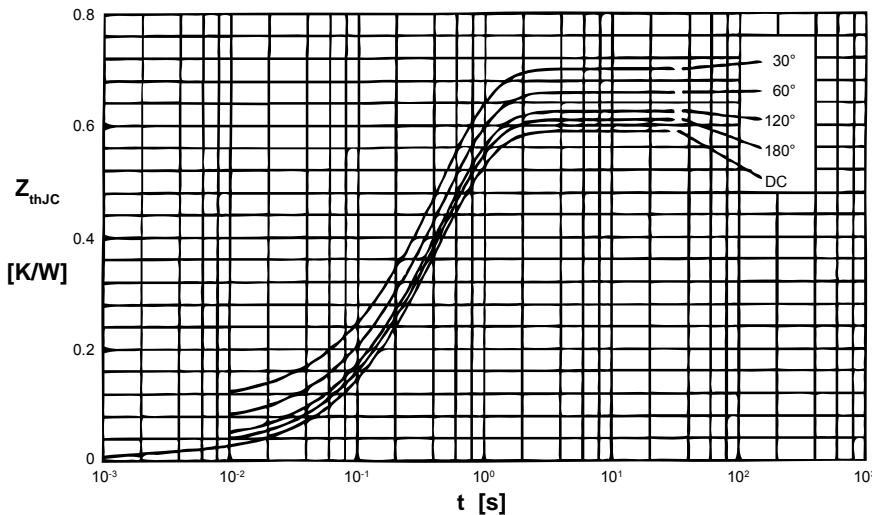


Fig. 7 Transient thermal impedance junction to case (per diode)

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

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

Constants for  $Z_{thJC}$  calculation:

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

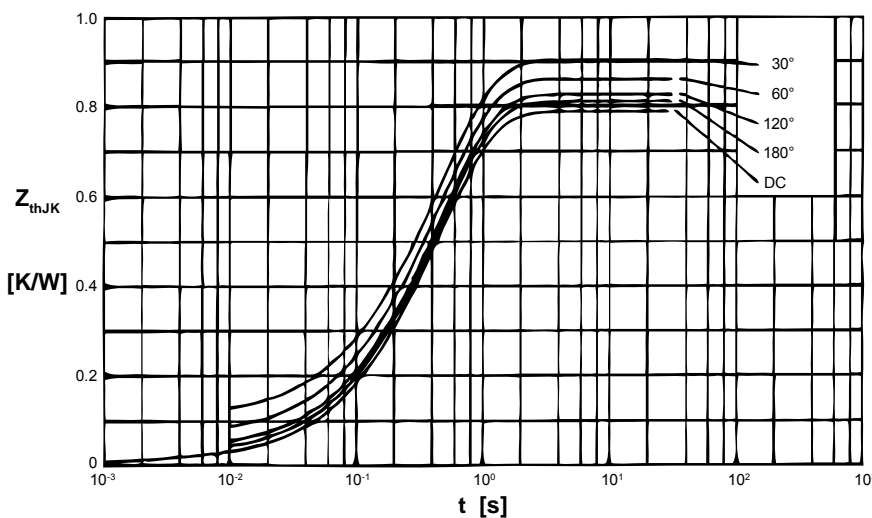


Fig. 8 Transient thermal impedance junction to heatsink (per thyristor)

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

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

Constants for  $Z_{thJK}$  calculation:

$i$	$R_{thi}$ [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

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