

# Standard Rectifier Module

$$V_{RRM} = 2 \times 1600V$$

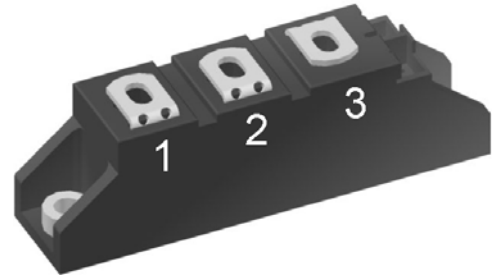
$$I_{FAV} = 120A$$

$$V_F = 1.13V$$

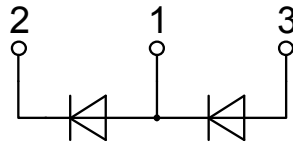
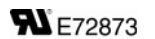
Phase leg

Part number

**MDD95-16N1B**



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:**

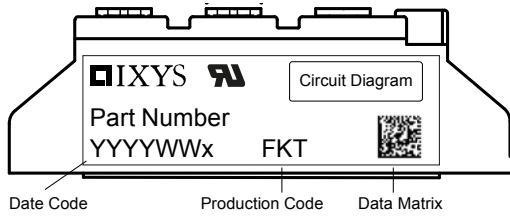
- Diode for main rectification
- For single and three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors

**Package: TO-240AA**

- Isolation Voltage: 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	$T_{VJ} = 25^{\circ}C$			1700	V	
$V_{RRM}$	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V	
$I_R$	reverse current	$V_R = 1600 V$			200	$\mu A$	
		$V_R = 1600 V$			15	mA	
$V_F$	forward voltage drop	$I_F = 150 A$			1.20	V	
		$I_F = 300 A$			1.43	V	
		$I_F = 150 A$	$T_{VJ} = 125^{\circ}C$			1.13	V
		$I_F = 300 A$	$T_{VJ} = 125^{\circ}C$			1.46	V
$I_{FAV}$	average forward current	$T_C = 100^{\circ}C$			120	A	
$I_{F(RMS)}$	RMS forward current	180° sine			180	A	
$V_{FO}$	threshold voltage	} for power loss calculation only			0.75	V	
$r_F$	slope resistance				1.95	m $\Omega$	
$R_{thJC}$	thermal resistance junction to case				0.26	K/W	
$R_{thCH}$	thermal resistance case to heatsink		0.20			K/W	
$P_{tot}$	total power dissipation				481	W	
$I_{FSM}$	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		2.80	kA	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		3.03	kA	
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150^{\circ}C$		2.38	kA	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		2.57	kA	
$I^2t$	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		39.2	kA <sup>2</sup> s	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		38.1	kA <sup>2</sup> s	
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150^{\circ}C$		28.3	kA <sup>2</sup> s	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		27.5	kA <sup>2</sup> s	
$C_J$	junction capacitance	$V_R = 400 V; f = 1 MHz$	$T_{VJ} = 25^{\circ}C$		116	pF	

Package TO-240AA				Ratings		
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			200	A
$T_{stg}$	storage temperature		-40		125	°C
$T_{VJ}$	virtual junction temperature		-40		150	°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
$d_{Spb/Appb}$		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	MDD95-16N1B	MDD95-16N1B	Box	6	453161

### Equivalent Circuits for Simulation

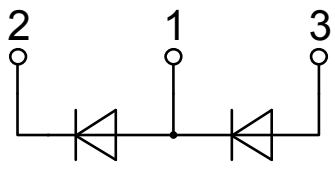
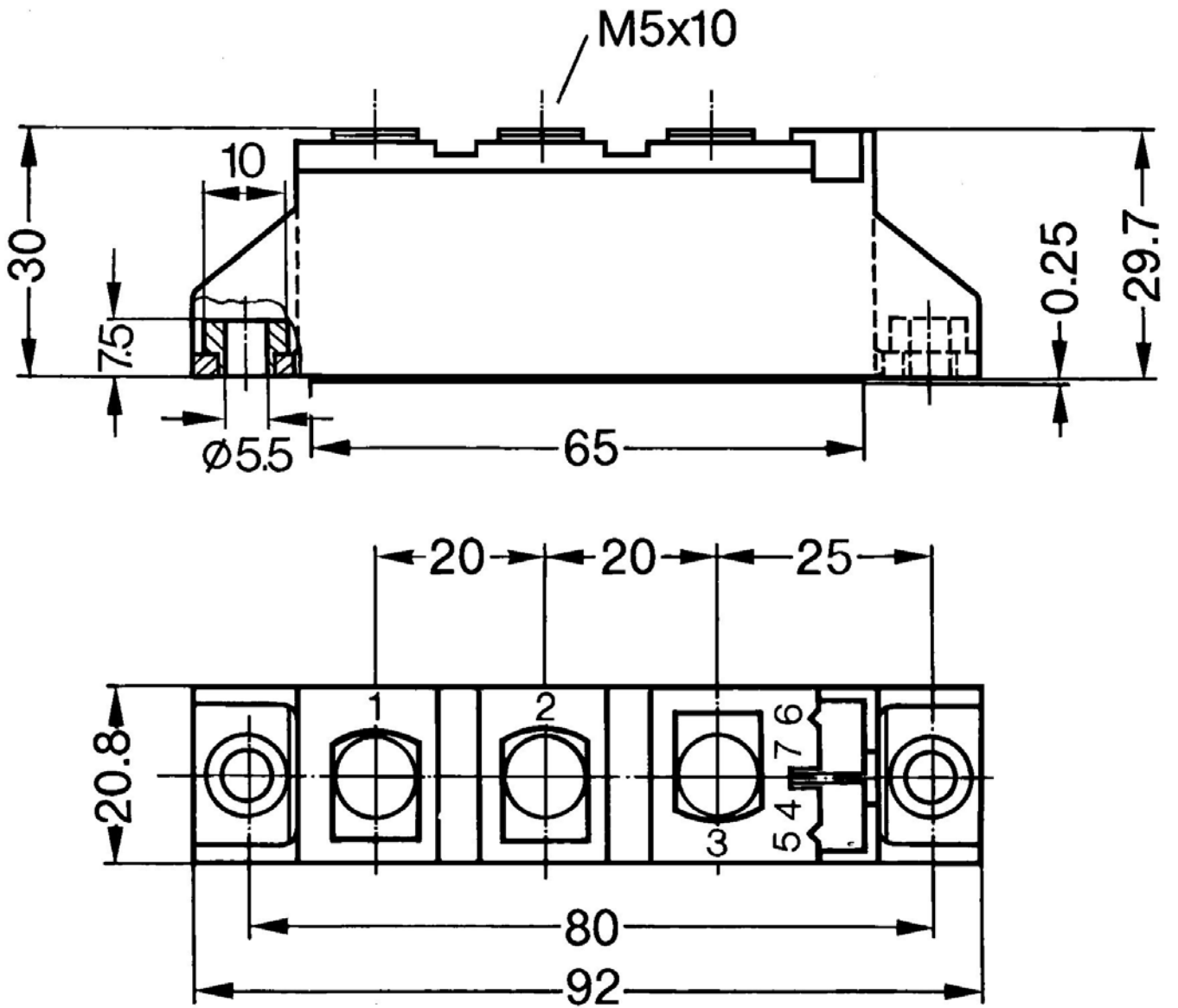
\* on die level

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



Rectifier

$V_{0\max}$	threshold voltage	0.75	V
$R_{0\max}$	slope resistance *	0.76	mΩ



Rectifier

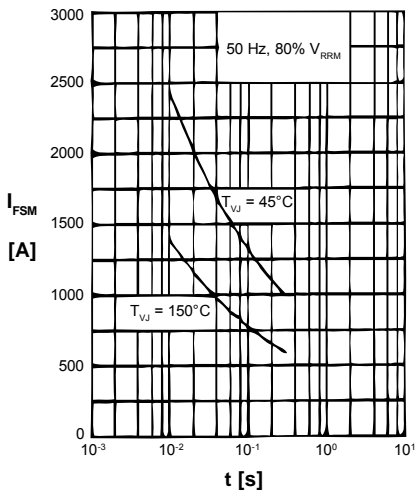


Fig. 1 Surge overload current  
 $I_{TSM}$ ,  $I_{FSM}$ : Crest value, t: duration

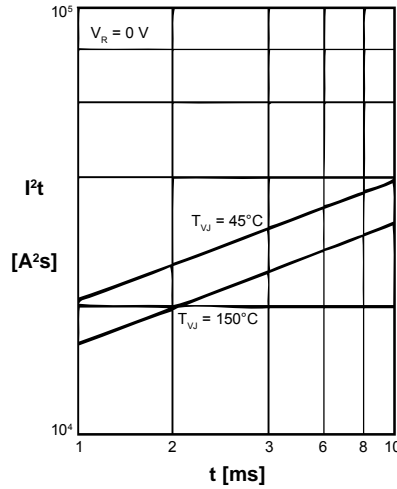


Fig. 2  $I^2t$  versus time (1-10 ms)

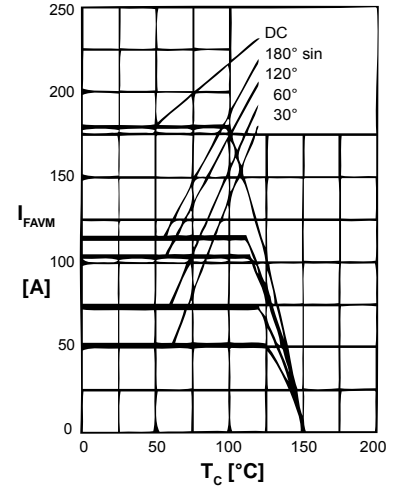


Fig. 3 Maximum forward current at case temperature

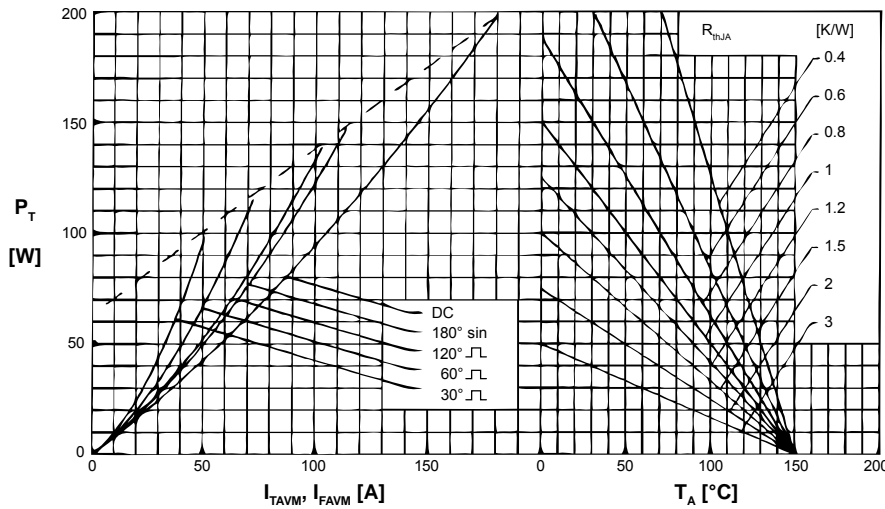


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per diode)

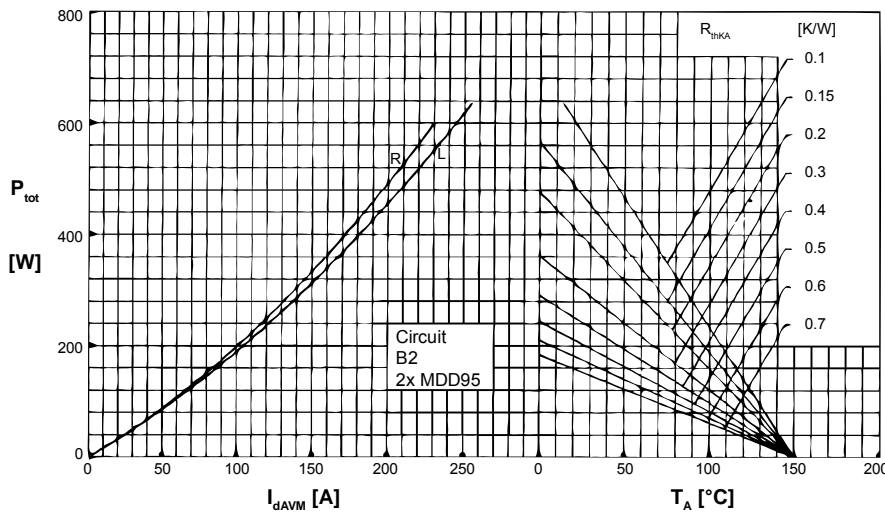


Fig. 6 Single phase rectifier bridge: Power dissipation versus direct output current and ambient temperature; R = resistive load, L = inductive load

## Rectifier

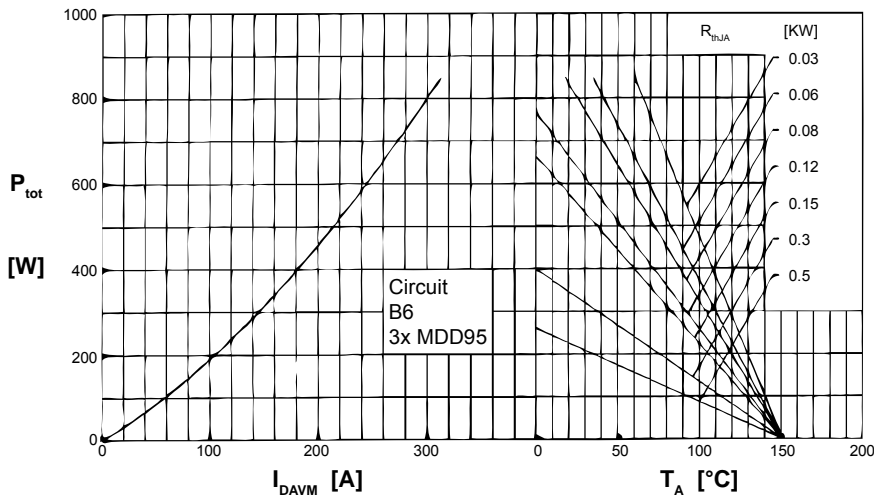


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

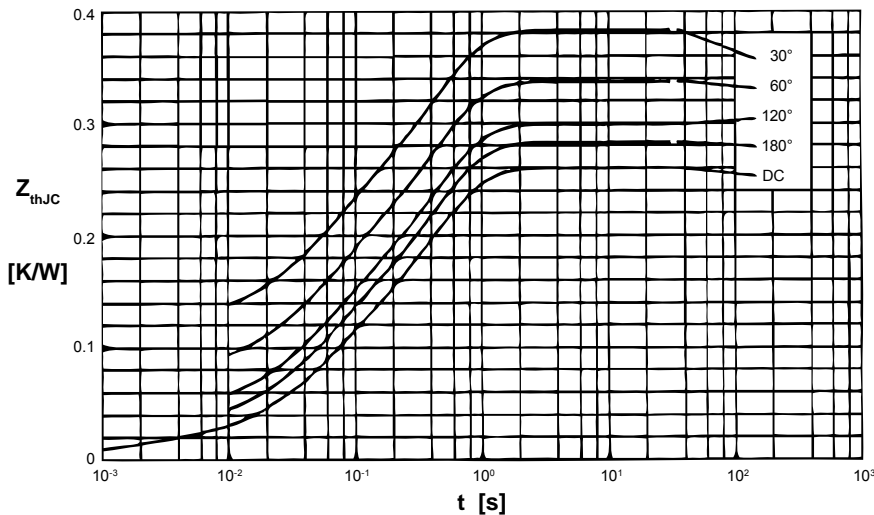


Fig. 7 Transient thermal impedance junction to case (per diode)

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

d	$R_{thJC}$ [KW]
DC	0.26
180°	0.28
120°	0.30
60°	0.34
30°	0.38

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ [KW]	$t_i$ [s]
1	0.013	0.0012
2	0.072	0.0470
3	0.175	0.3940

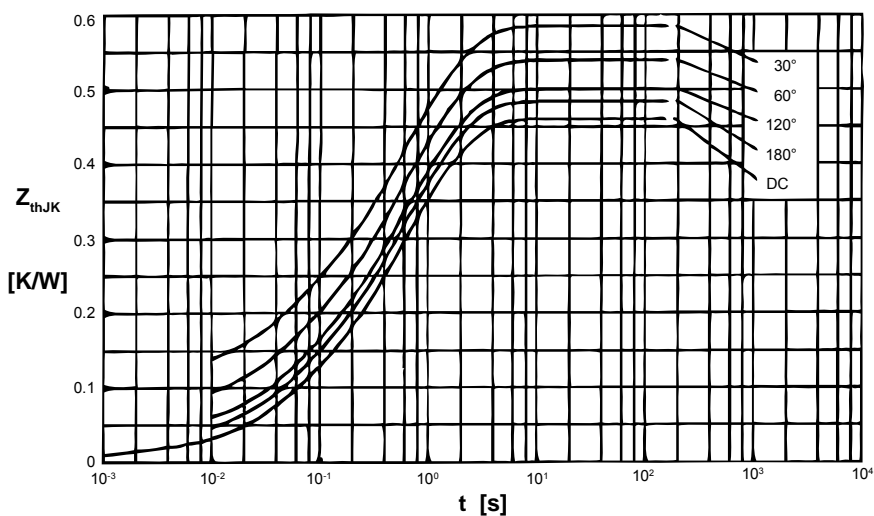


Fig. 8 Transient thermal impedance junction to heatsink (per thyristor)

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

d	$R_{thJK}$ [KW]
DC	0.46
180°	0.48
120°	0.50
60°	0.54
30°	0.58

Constants for  $Z_{thJK}$  calculation:

i	$R_{thi}$ [KW]	$t_i$ [s]
1	0.013	0.0012
2	0.072	0.0470
3	0.175	0.3940
4	0.200	1.3200