



# High Voltage Standard Rectifier Module

$V_{RRM} = 2 \times 2000 \text{ V}$

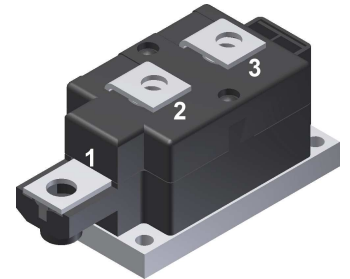
$I_{FAV} = 270 \text{ A}$

$V_F = 1.08 \text{ V}$

Phase leg

Part number

**MDD255-20N1**



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: Y1

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Height: 30 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

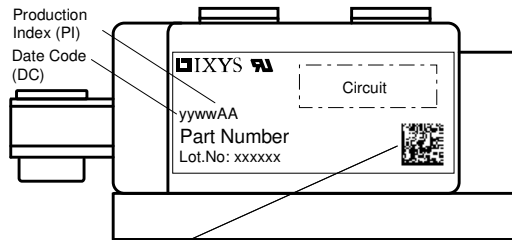
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Rectifier				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM}$	max. non-repetitive reverse blocking voltage				2100	V	
$V_{RRM}$	max. repetitive reverse blocking voltage				2000	V	
$I_R$	reverse current	$V_R = 2000\text{ V}$			500	$\mu\text{A}$	
		$V_R = 2000\text{ V}$			20	mA	
$V_F$	forward voltage drop	$I_F = 300\text{ A}$			1.19	V	
		$I_F = 600\text{ A}$			1.40	V	
		$I_F = 300\text{ A}$	$T_{VJ} = 125^\circ\text{C}$			1.08	V
		$I_F = 600\text{ A}$				1.35	V
$I_{FAV}$	average forward current	$T_C = 100^\circ\text{C}$			270	A	
$I_{F(RMS)}$	RMS forward current	180° sine			450	A	
$V_{F0}$	threshold voltage	} for power loss calculation only			0.80	V	
$r_F$	slope resistance				0.6	m $\Omega$	
$R_{thJC}$	thermal resistance junction to case				0.14	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.04		K/W	
$P_{tot}$	total power dissipation				890	W	
$I_{FSM}$	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^\circ\text{C}$		9.80	kA	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$		10.6	kA	
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150^\circ\text{C}$		8.33	kA	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$		9.00	kA	
$I^2t$	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^\circ\text{C}$		480.2	kA <sup>2</sup> s	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$		466.1	kA <sup>2</sup> s	
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150^\circ\text{C}$		346.9	kA <sup>2</sup> s	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$		336.6	kA <sup>2</sup> s	
$C_J$	junction capacitance	$V_R = 700\text{ V}; f = 1\text{ MHz}$	$T_{VJ} = 25^\circ\text{C}$		288	pF	



Package Y1				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$I_{RMS}$	RMS current	per terminal			600	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>					680	g	
$M_D$	mounting torque		4.5		7	Nm	
$M_T$	terminal torque		11		13	Nm	
$d_{Spp/App}$	creepage distance on surface   striking distance through air	terminal to terminal	16.0			mm	
$d_{Spb/Apb}$		terminal to backside	16.0			mm	
$V_{ISOL}$	isolation voltage	t = 1 second	3600			V	
		t = 1 minute	3000			V	



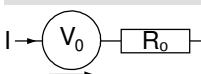
Data Matrix: part no. (1-19), DC + PI (20-25), lot.no.# (26-31), blank (32), serial no.# (33-36)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDD255-20N1	MDD255-20N1	Box	3	498815

Similar Part	Package	Voltage class
MDD255-12N1	Y1-CU	1200
MDD255-14N1	Y1-CU	1400
MDD255-16N1	Y1-CU	1600
MDD255-18N1	Y1-CU	1800

MDD255-22N1	Y1-CU	2200
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**Equivalent Circuits for Simulation** \* on die level  $T_{VJ} = 150^{\circ}C$

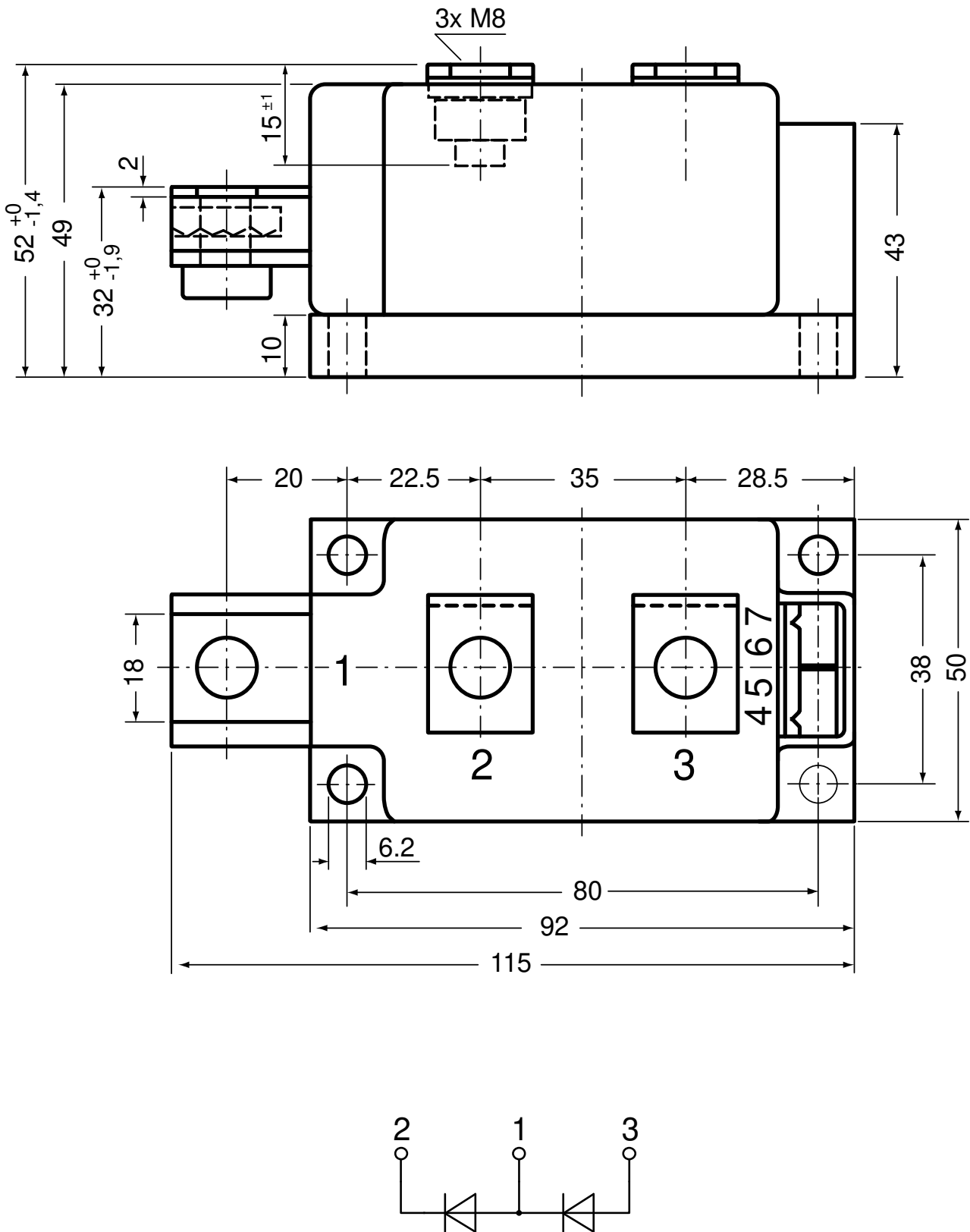


Rectifier

$V_{0\ max}$	threshold voltage	0.8	V
$R_{0\ max}$	slope resistance *	0.4	mΩ



Outlines Y1



**Rectifier**

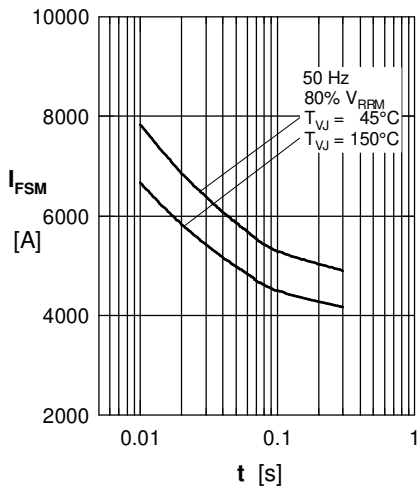


Fig. 1 Surge overload current  
 $I_{FSM}$ : Crest value,  $t$ : duration

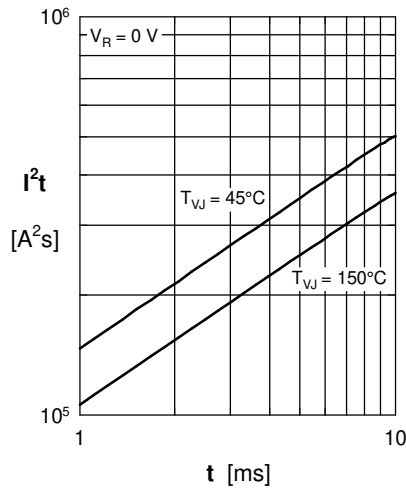


Fig. 2  $I^2t$  versus time (1-10 ms)

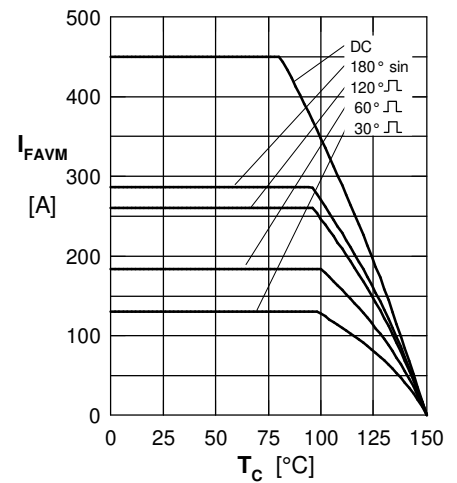


Fig. 3 Max. forward current  
at case temperature

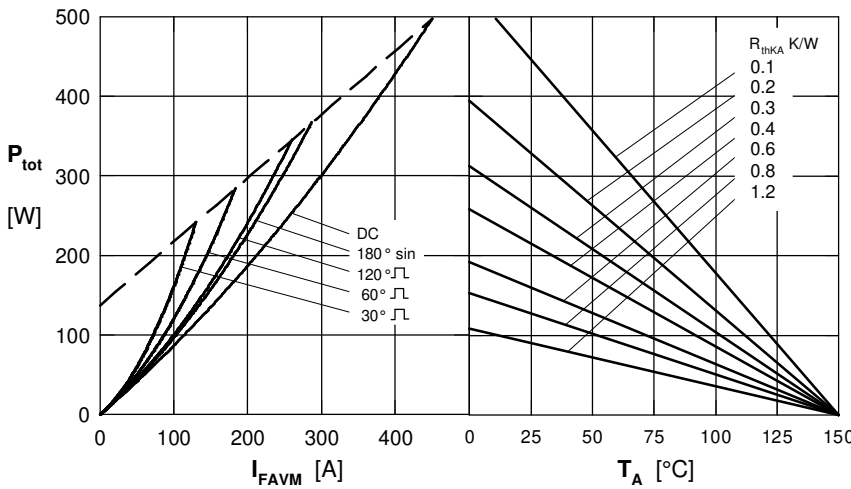


Fig. 4 Power dissipation vs. forward current & ambient temperature (per diode)

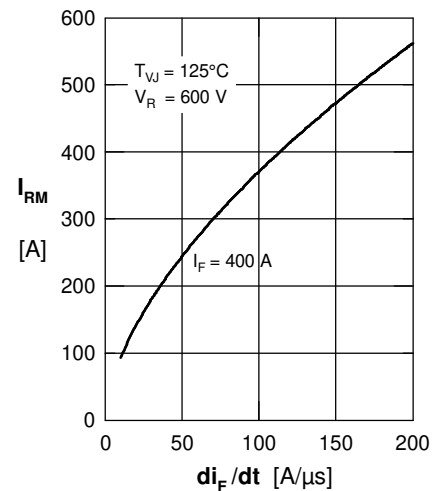


Fig. 5 Typ. peak reverse current  
 $I_{RM}$  versus  $-di_F/dt$

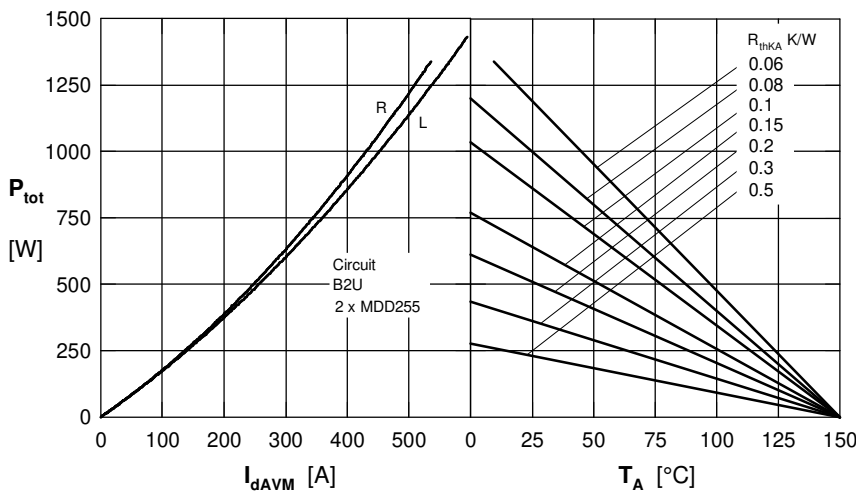


Fig. 6 Single phase rectifier bridge: Power dissipation vs. direct output current & ambient temperature. R = resistive load, L = inductive load

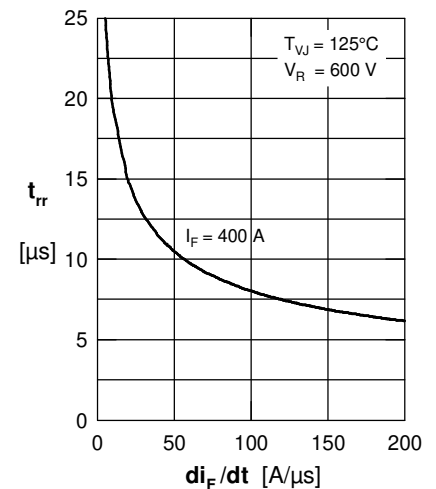


Fig. 7 Typ. recovery time  $t_{rr}$   
versus  $-di_F/dt$



**Rectifier**

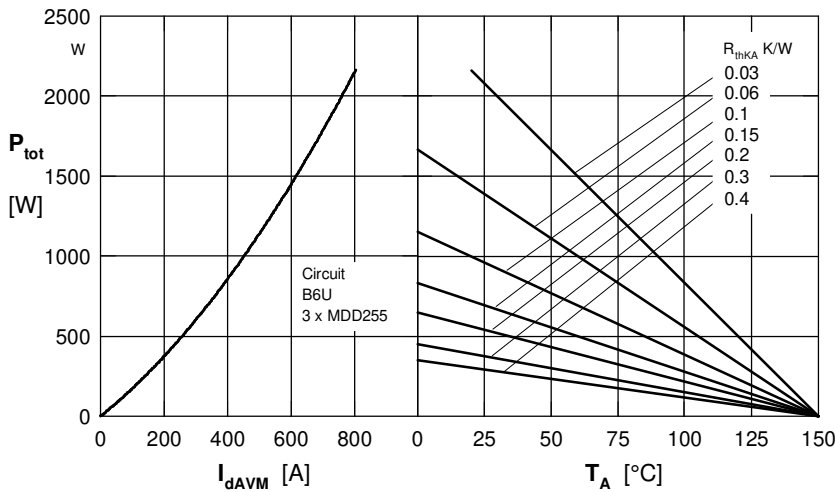


Fig. 8 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

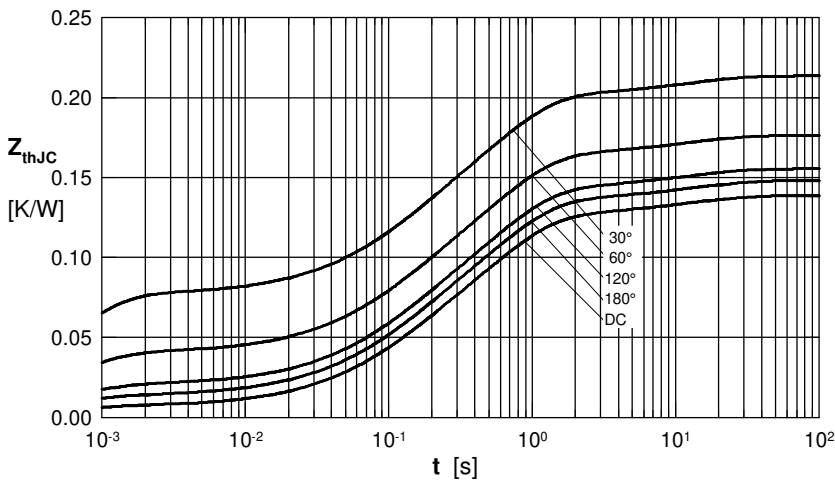


Fig. 9 Transient thermal impedance junction to case (per diode)

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

d	$R_{thJC}$ [K/W]
DC	0.139
180°	0.148
120°	0.156
60°	0.176
30°	0.214

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ [K/W]	$t_i$ [s]
1	0.0066	0.00054
2	0.0358	0.09800
3	0.0831	0.54000
4	0.0129	12.0000

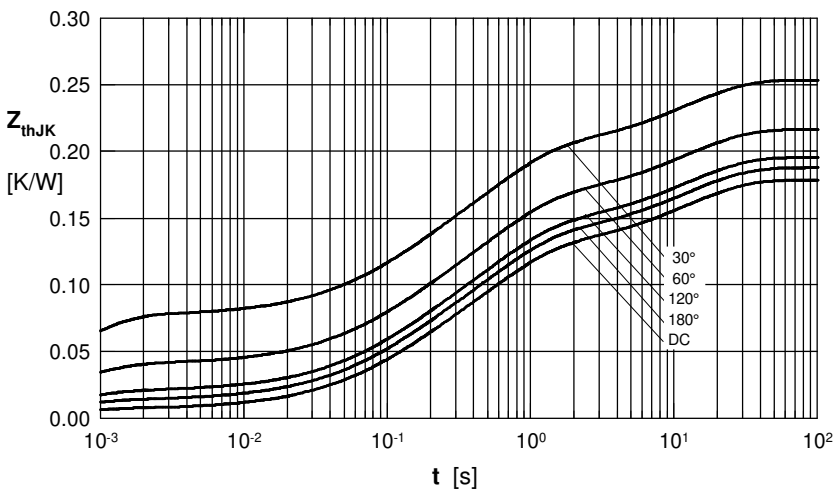


Fig. 10 Transient thermal impedance junction to heatsink (per diode)

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

d	$R_{thJK}$ [K/W]
DC	0.179
180°	0.188
120°	0.196
60°	0.216
30°	0.254

Constants for  $Z_{thJK}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.0066	0.00054
2	0.0358	0.09800
3	0.0831	0.54000
4	0.0129	12.0000
5	0.0400	12.0000