

# High Voltage Standard Rectifier Module

$$V_{RRM} = 2 \times 2200 \text{ V}$$

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

$$V_F = 1,08 \text{ V}$$

Phase leg

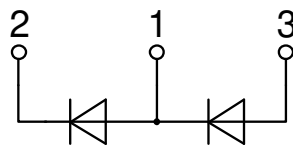
Part number

**MDD255-22N1**



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: 4800 V~
- Industry standard outline
- RoHS compliant
- Height: 30 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

## Disclaimer Notice

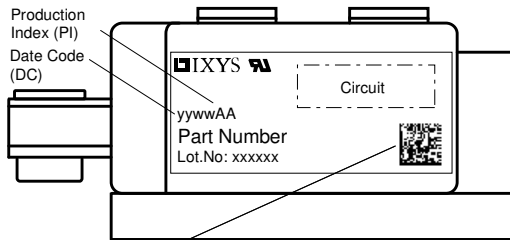
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Rectifier				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM}$	max. non-repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}C$			2300	V	
$V_{RRM}$	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}C$			2200	V	
$I_R$	reverse current	$V_R = 2200 V$	$T_{VJ} = 25^{\circ}C$		500	$\mu A$	
		$V_R = 2200 V$	$T_{VJ} = 150^{\circ}C$		20	mA	
$V_F$	forward voltage drop	$I_F = 300 A$	$T_{VJ} = 25^{\circ}C$		1,19	V	
		$I_F = 600 A$			1,40	V	
		$I_F = 300 A$	$T_{VJ} = 125^{\circ}C$		1,08	V	
		$I_F = 600 A$			1,35	V	
$I_{FAV}$	average forward current	$T_C = 100^{\circ}C$	$T_{VJ} = 150^{\circ}C$		270	A	
$I_{F(RMS)}$	RMS forward current	180° sine			450	A	
$V_{F0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0,80	V	
$r_F$	slope resistance				0,6	m $\Omega$	
$R_{thJC}$	thermal resistance junction to case				0,12	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0,04		K/W	
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		890	W	
$I_{FSM}$	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		9,80	kA	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		10,6	kA	
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150^{\circ}C$		8,33	kA	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		9,00	kA	
$I^2t$	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		480,2	kA <sup>2</sup> s	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		466,1	kA <sup>2</sup> s	
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150^{\circ}C$		346,9	kA <sup>2</sup> s	
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$		336,6	kA <sup>2</sup> s	
$C_J$	junction capacitance	$V_R = 700 V; f = 1 MHz$	$T_{VJ} = 25^{\circ}C$		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	4800			V
		t = 1 minute	4000			V



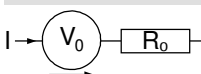
Data Matrix: part no. (1-19), DC + PI (20-25), lot.no.# (26-31), blank (32), serial no.# (33-36)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDD255-22N1	MDD255-22N1	Box	3	498807

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

MDD255-20N1	Y1-CU	2000
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**Equivalent Circuits for Simulation** \* on die level  $T_{VJ} = 150^{\circ}C$

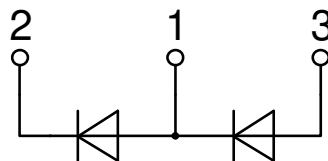
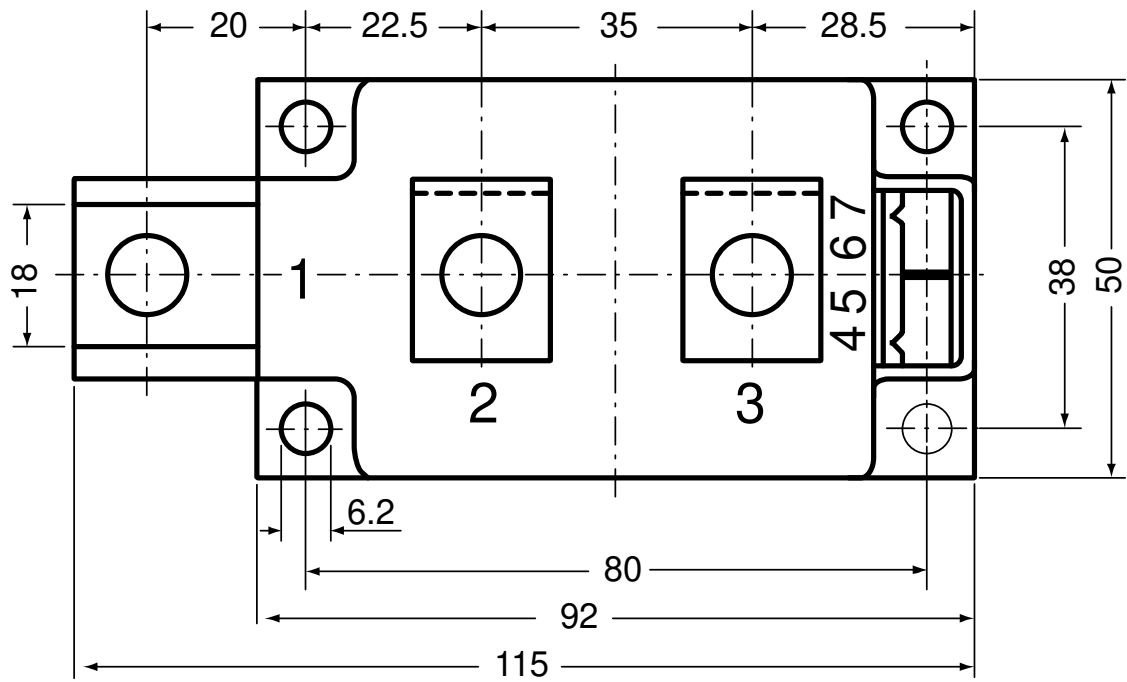
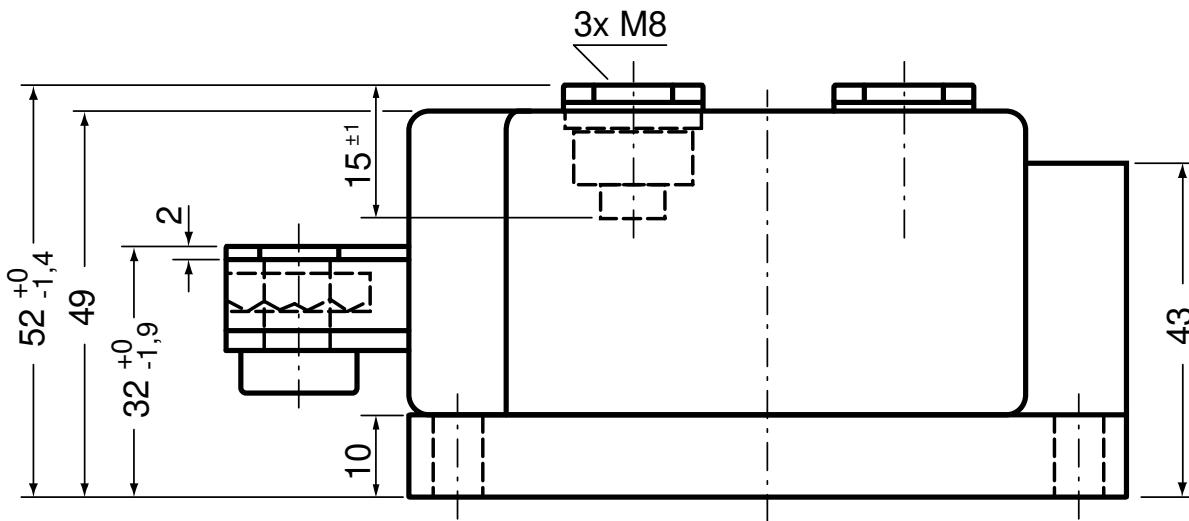


Rectifier

$V_{0\ max}$	threshold voltage	0,8	V
$R_{0\ max}$	slope resistance *	0,4	mΩ



Outlines Y1



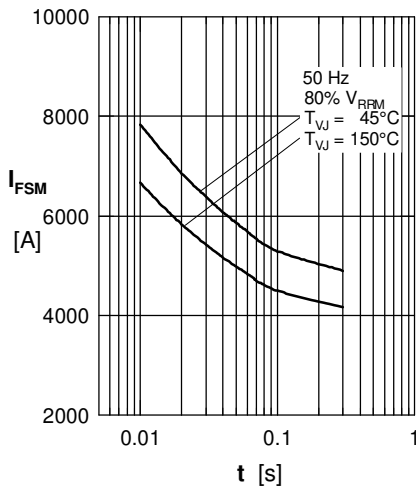
**Rectifier**


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

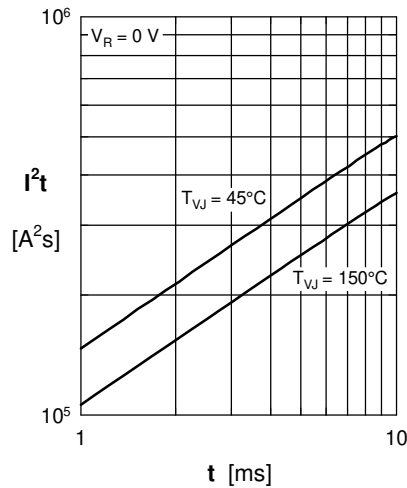


Fig. 2  $I^2t$  versus time (1-10 ms)

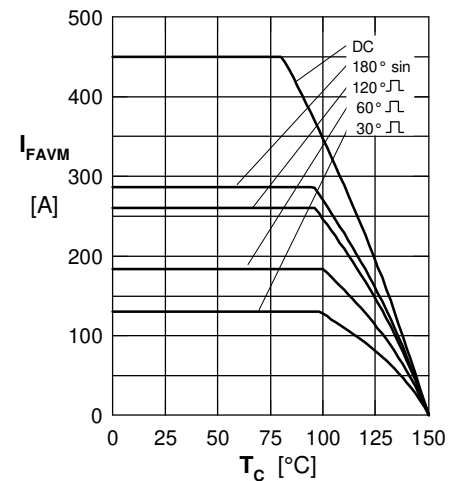


Fig. 3 Max. forward current  
 at case temperature

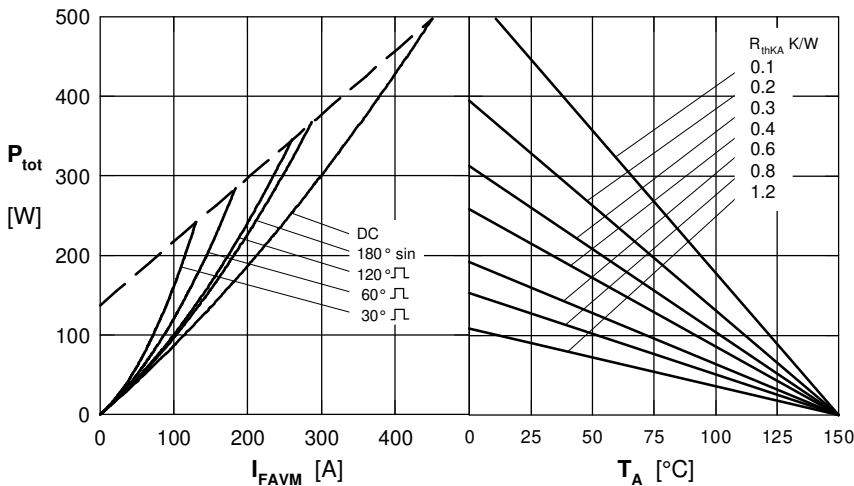


Fig. 4 Power dissipation vs. forward current & ambient temperature (per diode)

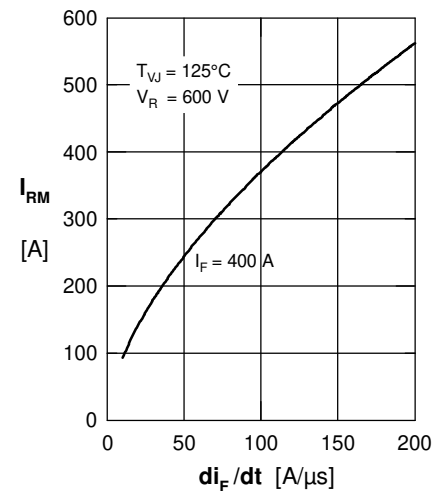


Fig. 5 Typ. peak reverse current  
 $I_{RM}$  versus  $-di_F/dt$

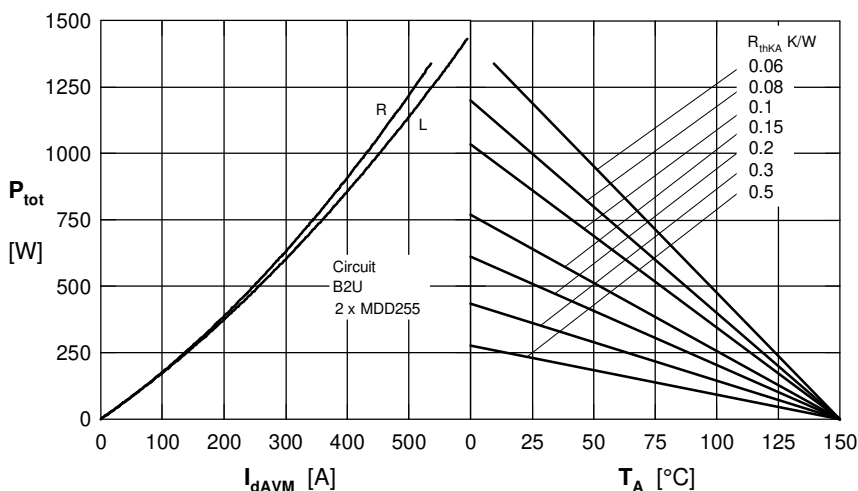


Fig. 6 Single phase rectifier bridge: Power dissipation vs. direct output current & ambient temperature. R = resistive load, L = inductive load

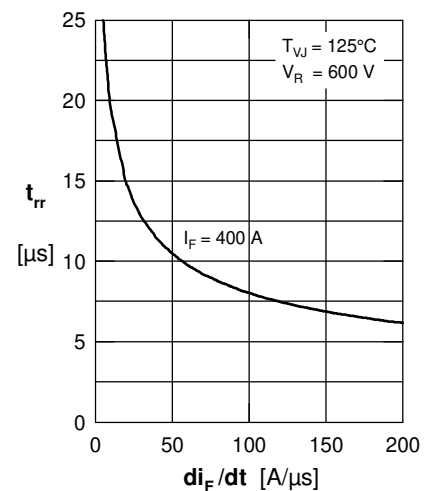


Fig. 7 Typ. recovery time  $t_{rr}$   
 versus  $-di_F/dt$



**Rectifier**

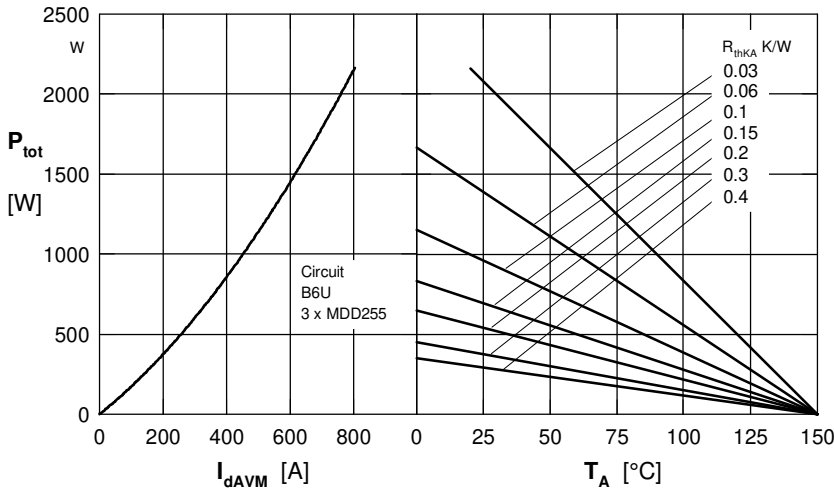


Fig. 8 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

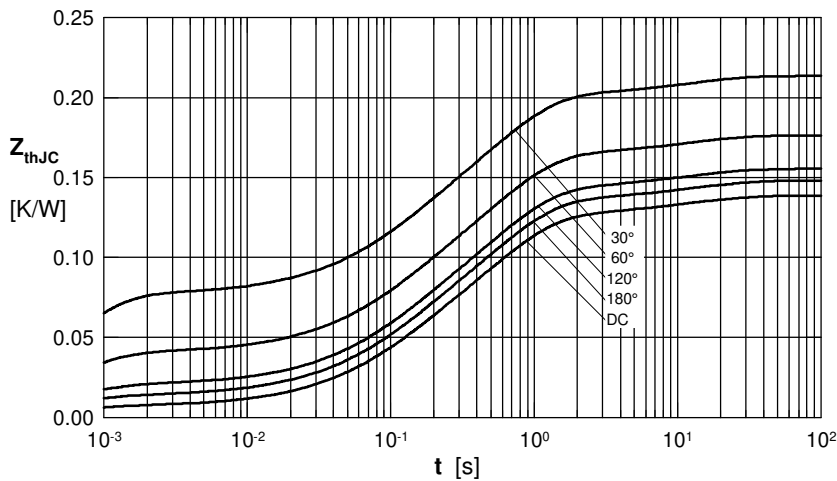


Fig. 9 Transient thermal impedance junction to case (per diode)

$R_{thJC}$  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

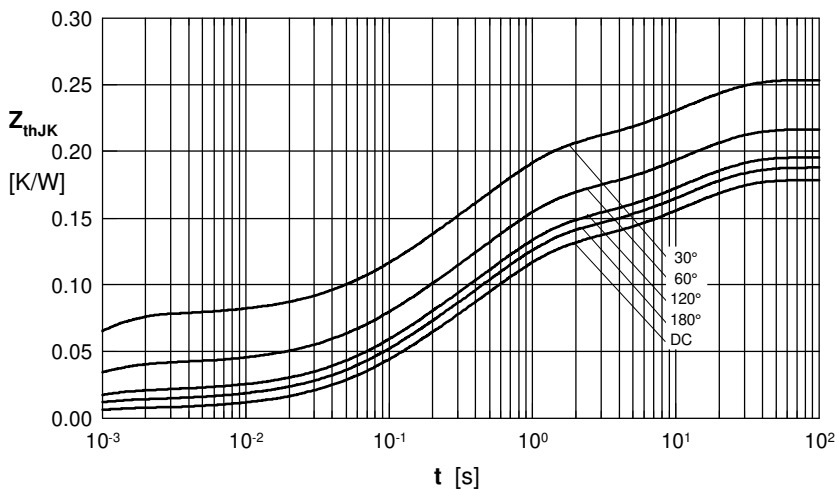


Fig. 10 Transient thermal impedance junction to heatsink (per diode)

$R_{thJK}$  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