

High Voltage Standard Rectifier Module

$$\begin{aligned} V_{RRM} &= 2 \times 2000 \text{ V} \\ I_{FAV} &= 270 \text{ A} \\ V_F &= 1,08 \text{ V} \end{aligned}$$

Phase leg

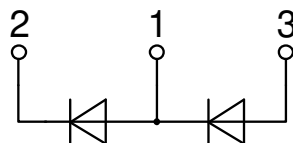
Part number

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: 4800 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		$T_{VJ} = 25^{\circ}\text{C}$			2100	V
V_{RRM}	max. repetitive reverse blocking voltage		$T_{VJ} = 25^{\circ}\text{C}$			2000	V
I_R	reverse current	$V_R = 2000\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			500	μA
		$V_R = 2000\text{ V}$	$T_{VJ} = 150^{\circ}\text{C}$			20	mA
V_F	forward voltage drop	$I_F = 300\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			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	$T_C = 100^{\circ}\text{C}$	$T_{VJ} = 150^{\circ}\text{C}$			270	A
$I_{F(RMS)}$	RMS forward current	180° sine				450	A
V_{F0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}\text{C}$			0,80	V
r_F	slope resistance					0,6	m Ω
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		$T_C = 25^{\circ}\text{C}$			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 ² s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$			466,1	kA ² s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150^{\circ}\text{C}$			346,9	kA ² s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\text{ V}$			336,6	kA ² 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
Weight				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	MDD255-20N1	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	$T_{VJ} = 150^{\circ}\text{C}$
		Rectifier	
$V_{0\ max}$	threshold voltage	0,8	V
$R_{0\ max}$	slope resistance *	0,4	mΩ

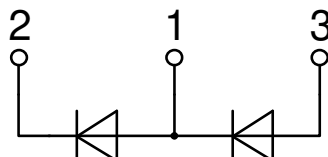
Technical drawing of a mechanical part, showing front and top views with dimensions.

Front View (Top):

- Overall width: 115
- Overall height: 43
- Top flange thickness: 10
- Distance from top flange to center of mounting holes: 15 ± 1
- Distance from top flange to center of mounting holes: 32 $^{+0}_{-1,9}$
- Distance from top flange to center of mounting holes: 49
- Distance from top flange to center of mounting holes: 52 $^{+0}_{-1,4}$
- Mounting holes: 3x M8

Top View (Bottom):

- Overall width: 115
- Overall height: 50
- Distance from left edge to center of mounting hole 1: 20
- Distance from center of mounting hole 1 to center of mounting hole 2: 22.5
- Distance from center of mounting hole 2 to center of mounting hole 3: 35
- Distance from center of mounting hole 3 to center of mounting hole 4: 28.5
- Distance from center of mounting hole 4 to right edge: 28.5
- Distance from left edge to center of mounting hole 1: 18
- Distance from center of mounting hole 1 to center of mounting hole 2: 6.2
- Distance from center of mounting hole 2 to center of mounting hole 3: 80
- Distance from center of mounting hole 3 to center of mounting hole 4: 92
- Distance from center of mounting hole 4 to right edge: 38
- Distance from center of mounting hole 1 to center of mounting hole 2: 1
- Distance from center of mounting hole 2 to center of mounting hole 3: 2
- Distance from center of mounting hole 3 to center of mounting hole 4: 3
- Distance from center of mounting hole 4 to right edge: 4
- Distance from center of mounting hole 1 to center of mounting hole 2: 5
- Distance from center of mounting hole 2 to center of mounting hole 3: 6
- Distance from center of mounting hole 3 to center of mounting hole 4: 7
- Distance from center of mounting hole 4 to right edge: 8



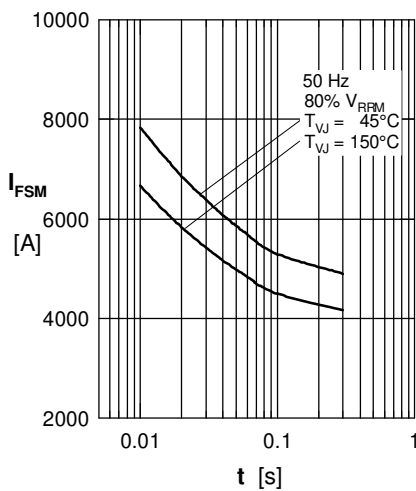
Rectifier


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

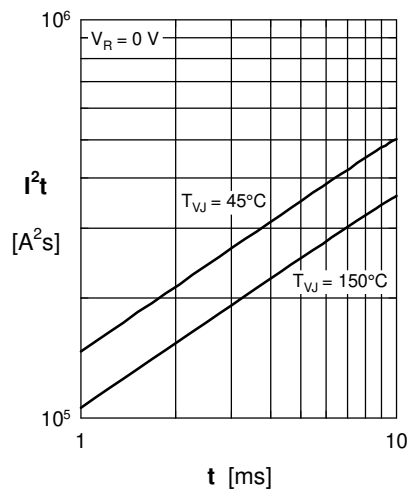


Fig. 2 I^2t versus time (1-10 ms)

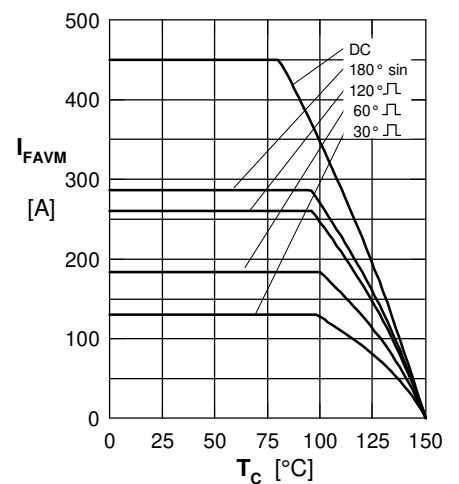


Fig. 3 Max. forward current
 at case temperature

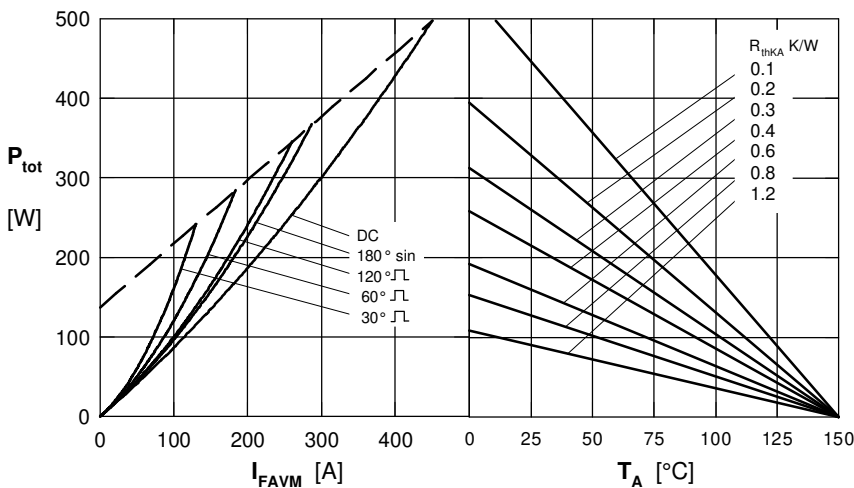


Fig. 4 Power dissipation vs. forward current & ambient temperature (per diode)

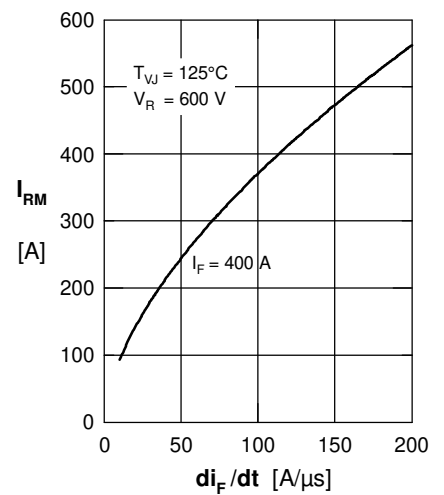


Fig. 5 Typ. peak reverse current
 I_{RM} versus $-di_F/dt$

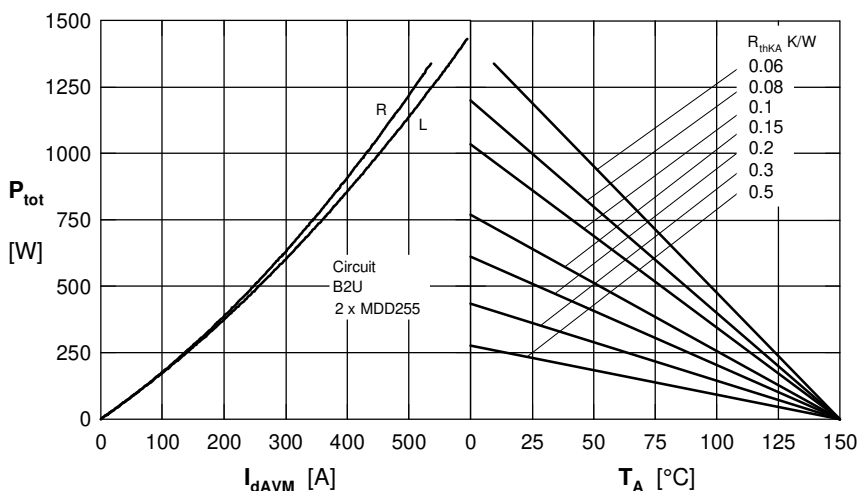


Fig. 6 Single phase rectifier bridge: Power dissipation vs. direct output current
 & ambient temperature. R = resistive load, L = inductive load

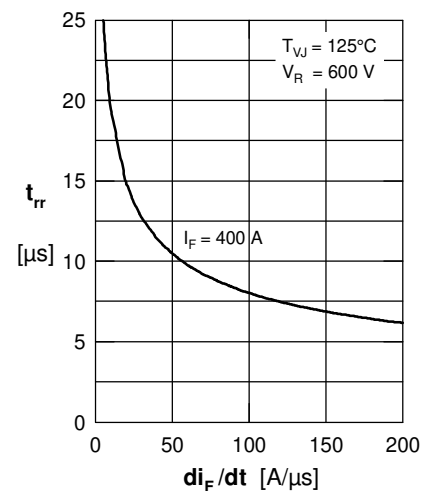


Fig. 7 Typ. recovery time t_{rr}
 versus $-di_F/dt$

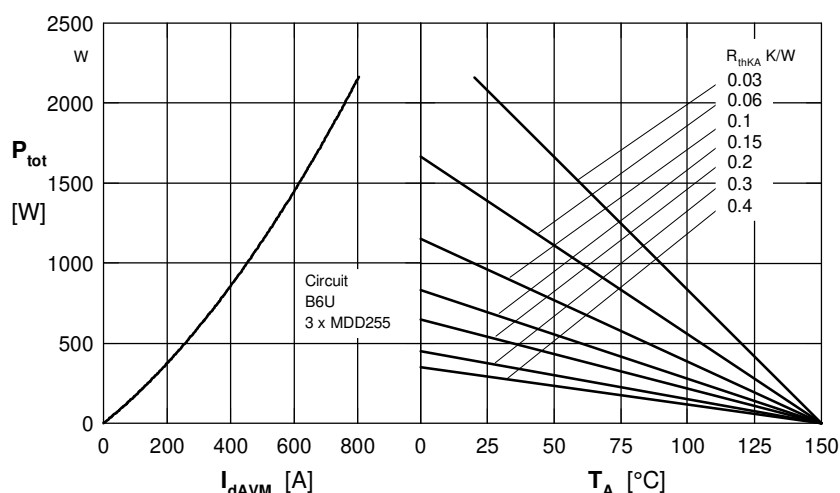
Rectifier


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

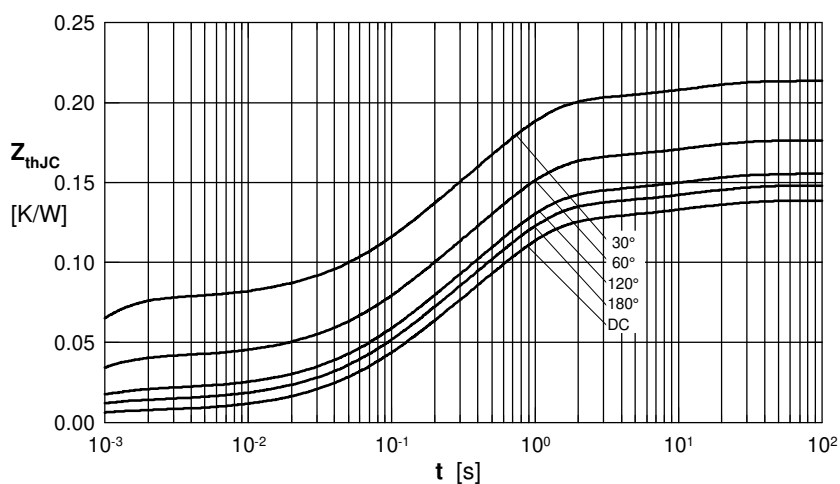


Fig. 9 Transient thermal impedance junction to case (per diode)

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

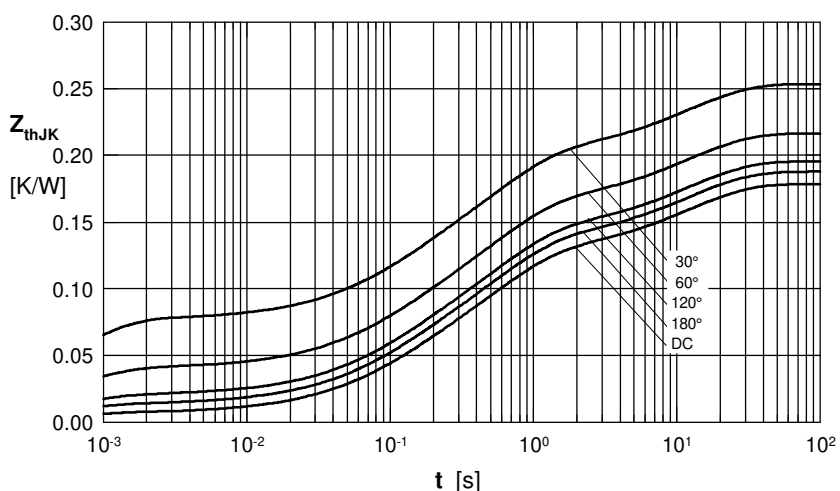


Fig. 10 Transient thermal impedance junction to heatsink (per diode)

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