



Standard Rectifier Module

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

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

$V_F = 1.08 \text{ V}$

Phase leg

Part number

MDD255-16N1



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

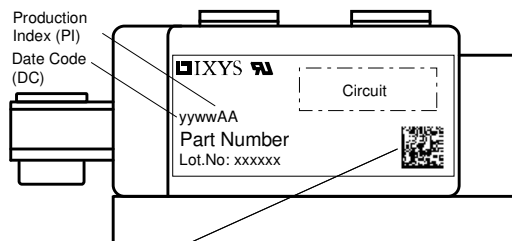
- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Height: 30 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

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Rectifier				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
V_{RSM}	max. non-repetitive reverse blocking voltage				1700	V	
V_{RRM}	max. repetitive reverse blocking voltage				1600	V	
I_R	reverse current	$V_R = 1600\text{ V}$			500	μA	
		$V_R = 1600\text{ V}$			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 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				890	W	
I_{FSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^\circ\text{C}$			9.80	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			10.6	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^\circ\text{C}$			8.33	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			9.00	kA
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^\circ\text{C}$			480.2	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			466.1	kA ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^\circ\text{C}$			346.9	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			336.6	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V}; f = 1\text{ MHz}$	$T_{VJ} = 25^\circ\text{C}$		381	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	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	MDD255-16N1	MDD255-16N1	Box	3	461881

Similar Part	Package	Voltage class
MDD255-12N1	Y1-CU	1200
MDD255-14N1	Y1-CU	1400
MDD255-18N1	Y1-CU	1800
MDD255-20N1	Y1-CU	2000

MDD255-22N1	Y1-CU	2200
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Equivalent Circuits for Simulation

* on die level

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

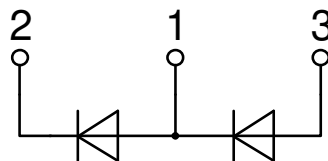
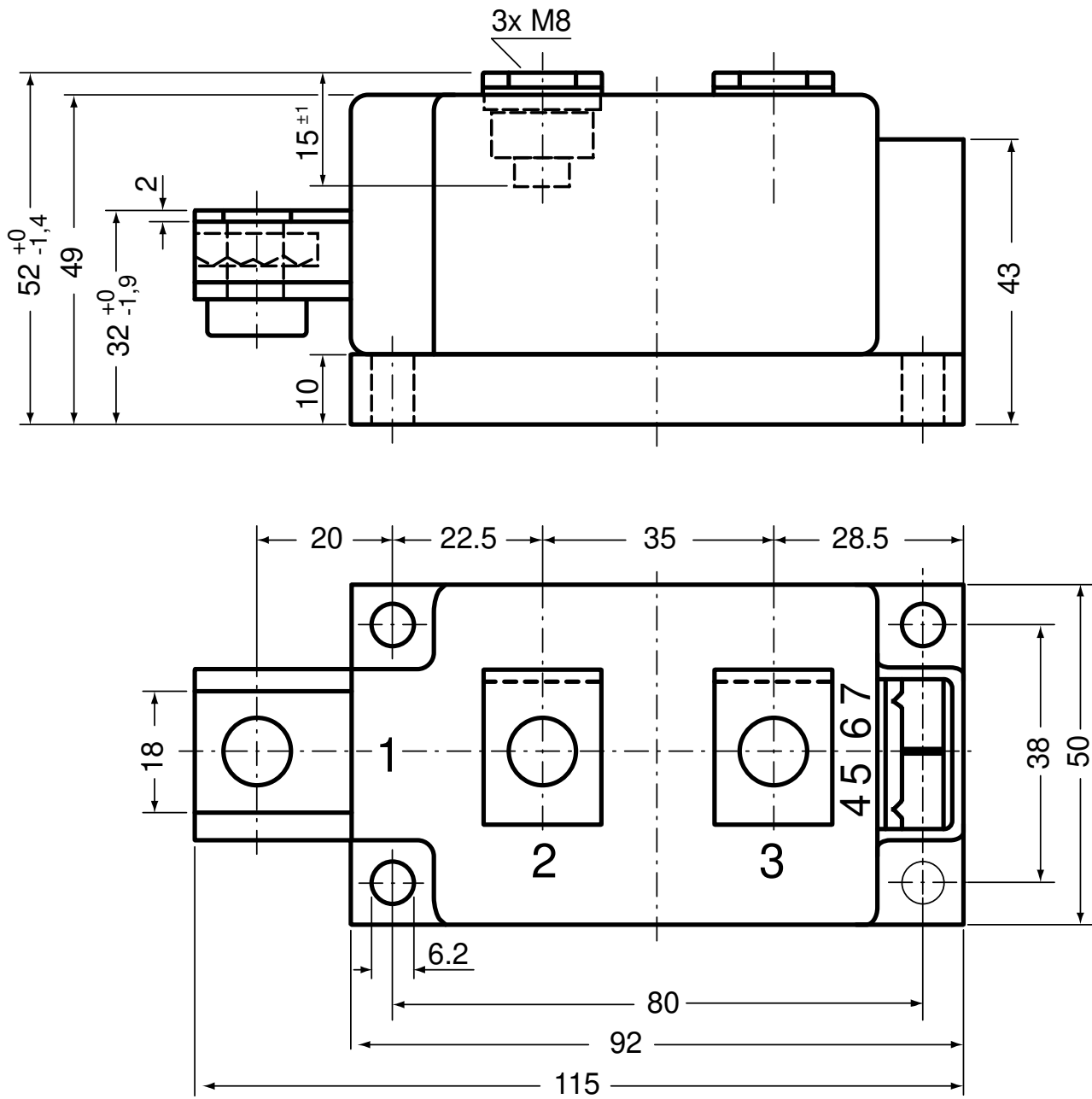


Rectifier

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



Outlines Y1





Rectifier

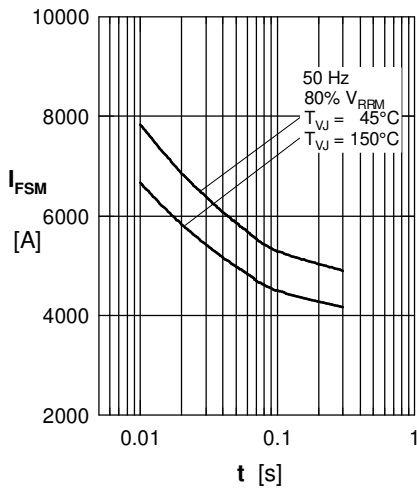


Fig. 1 Surge overload current
 I_{FSM} : Crest value, t: duration

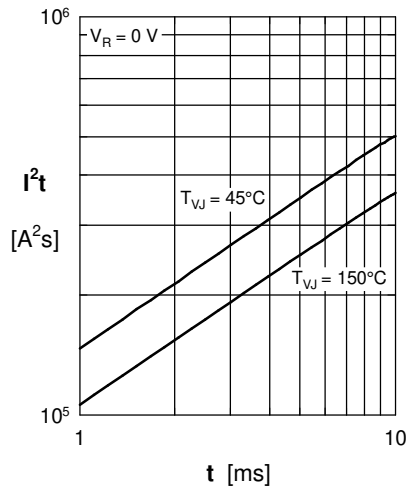


Fig. 2 I^2t versus time (1-10 ms)

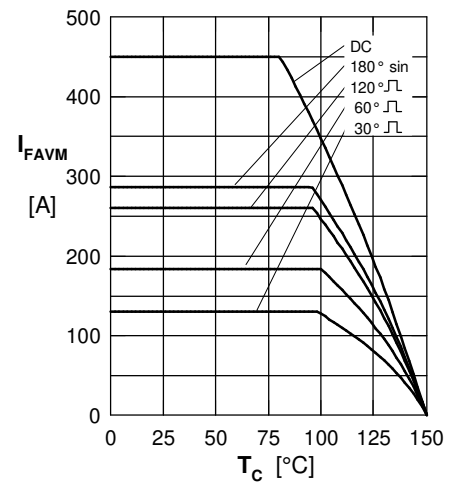


Fig. 3 Max. forward current at case temperature

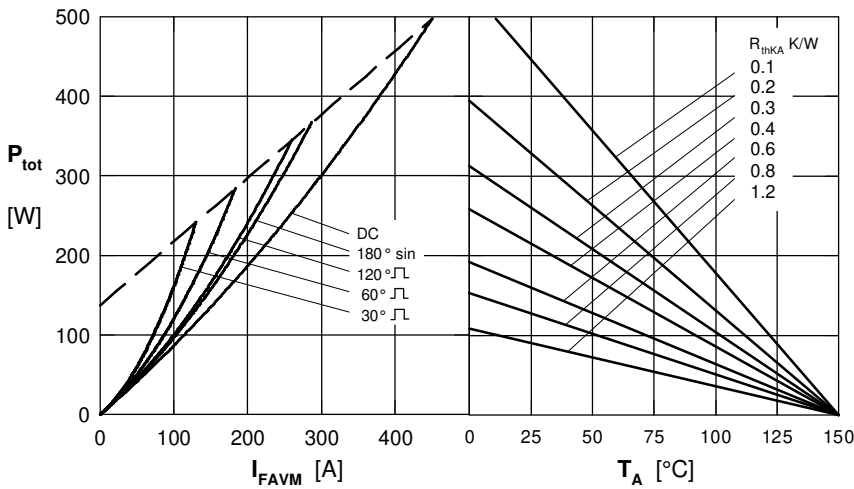


Fig. 4 Power dissipation vs. forward current & ambient temperature (per diode)

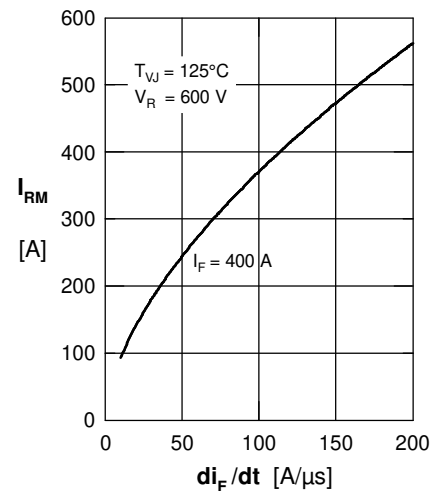


Fig. 5 Typ. peak reverse current I_{RM} versus $-di_F/dt$

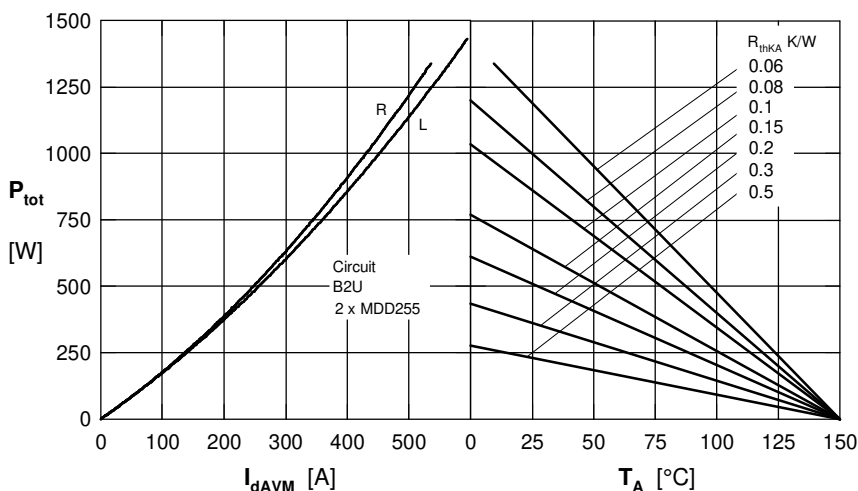


Fig. 6 Single phase rectifier bridge: Power dissipation vs. direct output current & ambient temperature. R = resistive load, L = inductive load

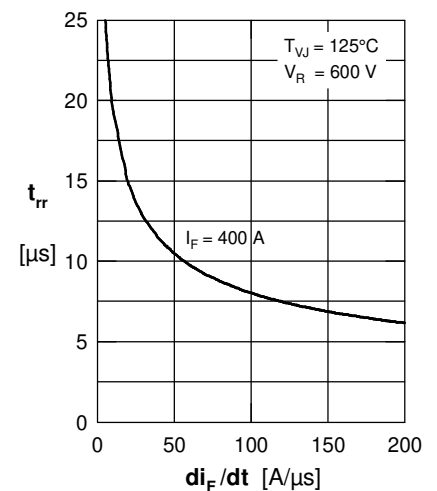


Fig. 7 Typ. recovery time t_{rr} versus $-di_F/dt$



Rectifier

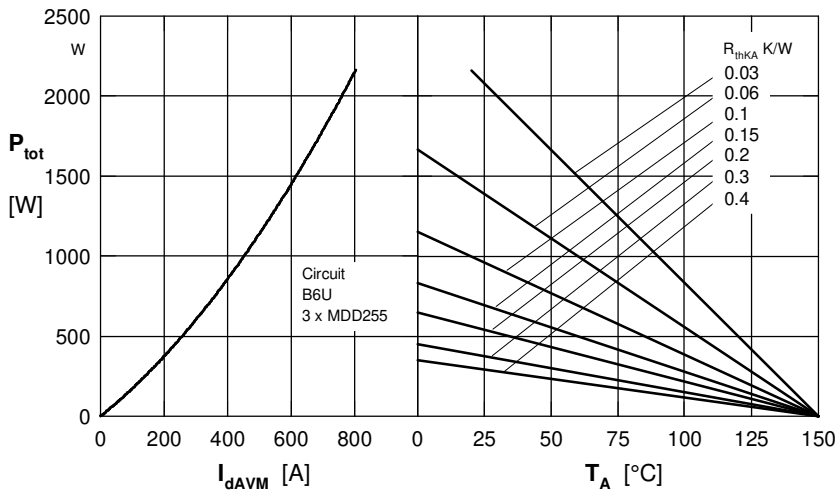


Fig. 8 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

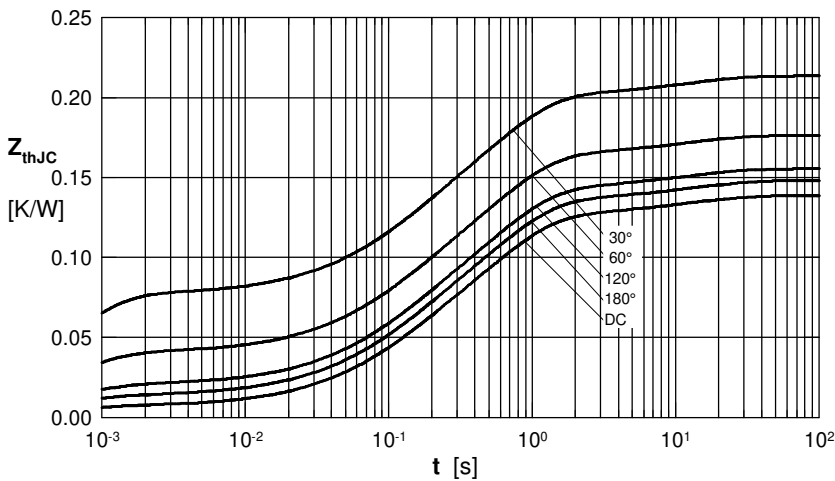


Fig. 9 Transient thermal impedance junction to case (per diode)

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

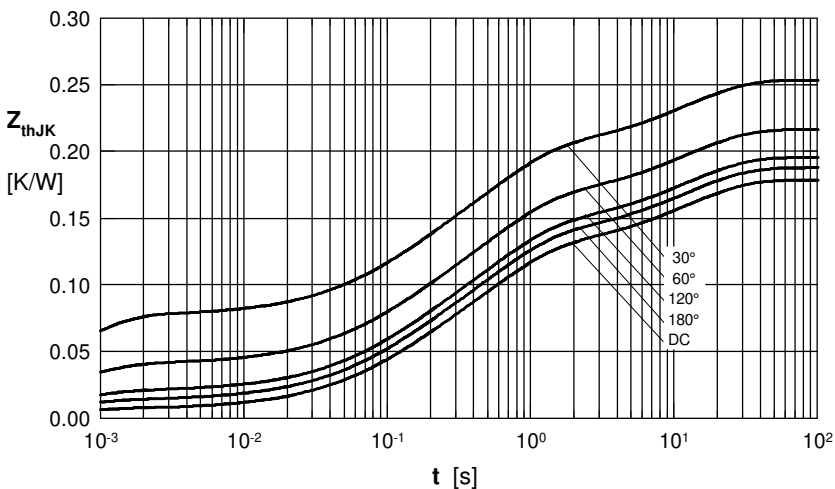


Fig. 10 Transient thermal impedance junction to heatsink (per diode)

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