

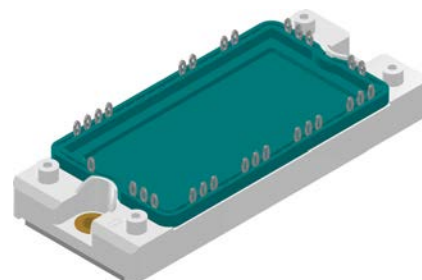
Standard Rectifier Module

3~ Rectifier	Brake Chopper
$V_{RRM} = 2200 \text{ V}$	$V_{CES} = 1200 \text{ V}$
$I_{DAV} = 210 \text{ A}$	$I_{C25} = 120 \text{ A}$
$I_{FSM} = 1000 \text{ A}$	$V_{CE(sat)} = 1,9 \text{ V}$

3~ Rectifier Bridge + Brake Unit + NTC

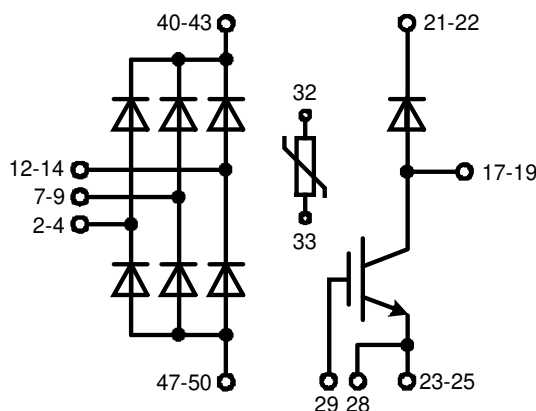
Part number

MDMA210UB1600PTED



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
- NTC

Applications:

- 3~ Rectifier with brake unit for drive inverters

Package: E2-Pack

- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- PressFit-Pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

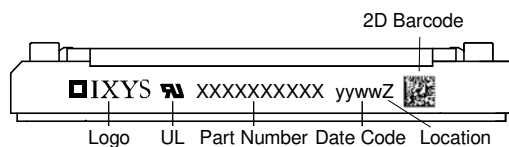
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Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RSM}	max. non-repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				2300	V
V_{RRM}	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				2200	V
I_R	reverse current	$V_R = 2200\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			100	μA
		$V_R = 2200\text{ V}$	$T_{VJ} = 150^{\circ}\text{C}$			2	mA
V_F	forward voltage drop	$I_F = 70\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1,23	V
		$I_F = 210\text{ A}$				1,75	V
		$I_F = 70\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1,19	V
		$I_F = 210\text{ A}$				1,67	V
I_{DAV}	bridge output current	$T_C = 85^{\circ}\text{C}$	$T_{VJ} = 150^{\circ}\text{C}$			210	A
		rectangular $d = \frac{1}{3}$					
V_{F0}	threshold voltage	} for power loss calculation only		$T_{VJ} = 150^{\circ}\text{C}$		0,82	V
r_F	slope resistance					5,2	m Ω
R_{thJC}	thermal resistance junction to case					0,5	K/W
R_{thCH}	thermal resistance case to heatsink				0,1		K/W
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$				250	W
I_{FSM}	max. forward surge current	$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 45^{\circ}\text{C}$			1,00	kA
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			1,08	kA
		$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 150^{\circ}\text{C}$			850	A
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			920	A
I^2t	value for fusing	$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 45^{\circ}\text{C}$			5,00	kA ² s
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			4,85	kA ² s
		$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 150^{\circ}\text{C}$			3,62	kA ² s
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			3,52	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V; } f = 1\text{ MHz}$			33		pF

Brake IGBT + Diode				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{CES}	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$				1200	V
V_{GES}	max. DC gate voltage					± 20	V
V_{GEM}	max. transient gate emitter voltage					± 30	V
I_{C25}	collector current	$T_C = 25^{\circ}\text{C}$				120	A
I_{C80}		$T_C = 80^{\circ}\text{C}$				84	A
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$				390	W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 77\text{ A}; V_{GE} = 15\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		1,9	2,2	V
			$T_{VJ} = 125^{\circ}\text{C}$		2,2		V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 3\text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	5,4	5,9	6,5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			0,2	mA
			$T_{VJ} = 125^{\circ}\text{C}$		0,6		mA
I_{GES}	gate emitter leakage current	$V_{GE} = \pm 20\text{ V}$				500	nA
$Q_{G(on)}$	total gate charge	$V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 77\text{ A}$			230		nC
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 77\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 10\text{ }\Omega$	$T_{VJ} = 125^{\circ}\text{C}$		70		ns
t_r	current rise time				40		ns
$t_{d(off)}$	turn-off delay time				250		ns
t_f	current fall time				100		ns
E_{on}	turn-on energy per pulse				6,8		mJ
E_{off}	turn-off energy per pulse				8,3		mJ
RBSOA	reverse bias safe operating area	$V_{GE} = \pm 15\text{ V}; R_G = 10\text{ }\Omega$	$T_{VJ} = 125^{\circ}\text{C}$				
I_{CM}		$V_{CEK} = 1200\text{ V}$				225	A
SCSOA	short circuit safe operating area	$V_{CEK} = 1200\text{ V}$					
t_{SC}	short circuit duration	$V_{CE} = 900\text{ V}; V_{GE} = \pm 15$	$T_{VJ} = 125^{\circ}\text{C}$			10	μs
I_{SC}	short circuit current	$R_G = 10\text{ }\Omega$; non-repetitive			300		A
R_{thJC}	thermal resistance junction to case					0,32	K/W
R_{thCH}	thermal resistance case to heatsink				0,10		K/W
Brake Diode							
V_{RRM}	max. repetitive reverse voltage		$T_{VJ} = 25^{\circ}\text{C}$			1200	V
I_{F25}	forward current		$T_C = 25^{\circ}\text{C}$			88	A
I_{F80}			$T_C = 80^{\circ}\text{C}$			59	A
V_F	forward voltage	$I_F = 60\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			2,20	V
			$T_{VJ} = 125^{\circ}\text{C}$		1,95		V
I_R	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$			0,1	mA
			$T_{VJ} = 125^{\circ}\text{C}$			1,2	mA
Q_{rr}	reverse recovery charge	$V_R = 600\text{ V}$ $-di_F/dt = 1200\text{ A}/\mu\text{s}$ $I_F = 60\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$		8		μC
I_{RM}	max. reverse recovery current				60		A
t_{rr}	reverse recovery time				350		ns
E_{rec}	reverse recovery energy				2,5		mJ
R_{thJC}	thermal resistance junction to case					0,6	K/W
R_{thCH}	thermal resistance case to heatsink				0,1		K/W

Package E2-Pack				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal				30	A
T_{VJ}	virtual junction temperature			-40		150	°C
T_{op}	operation temperature			-40		125	°C
T_{stg}	storage temperature			-40		125	°C
Weight					176		g
M_D	mounting torque			3		6	Nm
$d_{Spp/App}$	creepage distance on surface / striking distance through air	terminal to terminal		6,0			mm
$d_{Spb/Apb}$			terminal to backside	12,0			mm
V_{ISOL}	isolation voltage	t = 1 second	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	4300			V
		t = 1 minute		3600			V



Part description

M = Module
 D = Diode
 M = Standard Rectifier
 A = (up to 1800V)
 210 = Current Rating [A]
 UB = 3~ Rectifier Bridge + Brake Unit
 1600 = Reverse Voltage [V]
 PT = PressFit-Pin, Thermistor
 ED = E2-Pack
 - = Hyphen
 PC = Phase Change Material

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDMA210UB1600PTED	MDMA210UB1600PTED	Blister	28	516606
Alternative	MDMA210UB1600PTED-PC	MDMA210UB1600PTED	Blister	28	515409

Temperature Sensor NTC

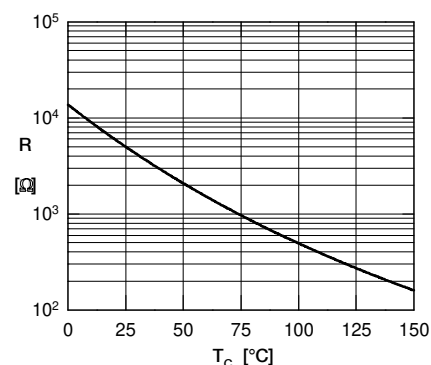
Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	resistance	$T_{VJ} = 25^\circ$	4,85	5	5,15	kΩ
$B_{25/50}$	temperature coefficient			3375		K

Equivalent Circuits for Simulation

* on die level

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

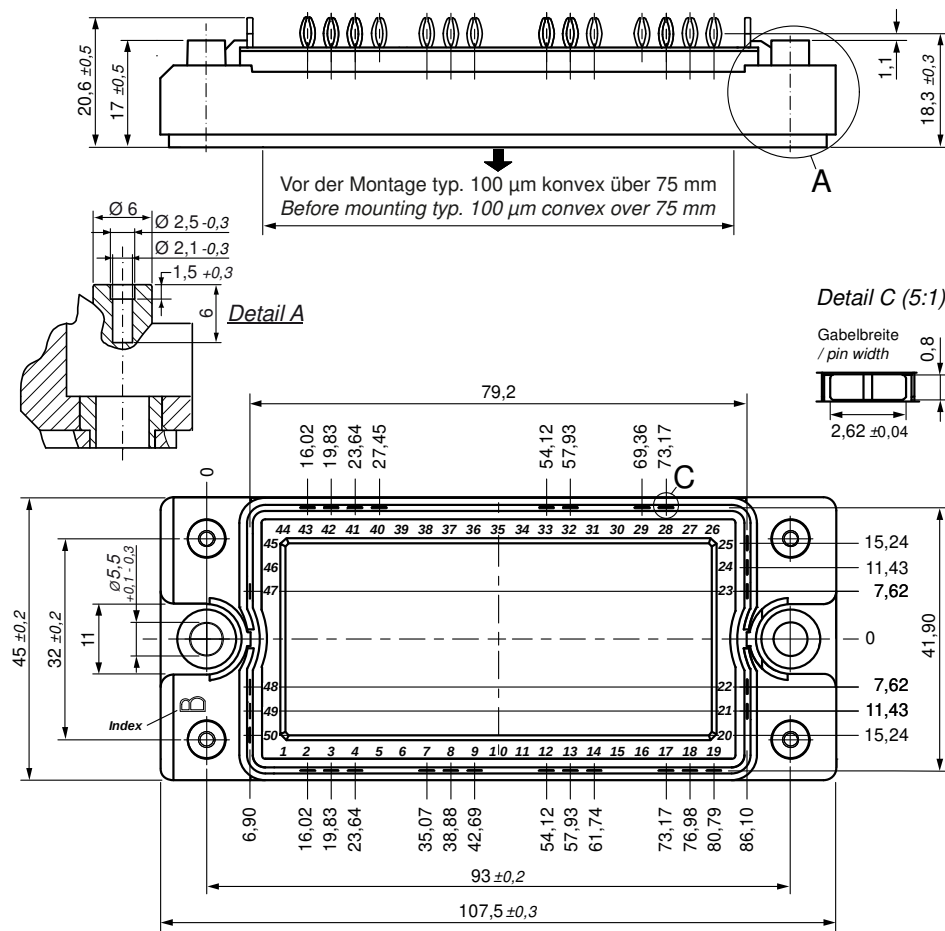
		Rectifier	Brake IGBT +	Brake Diode	
V_0	threshold voltage	0,82	1,1	1,22	V
R_0	slope resistance *	3,1	17,9	13	mΩ



Typ. NTC resistance vs. temperature



Outlines E2-Pack

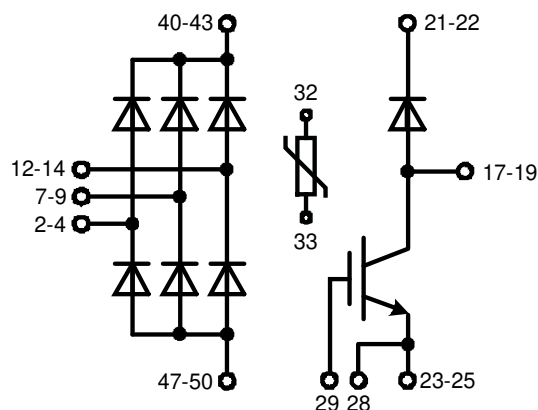


Bemerkung / Note:

- Nicht tolerierte Maße nach / Measure without tolerances according DIN ISO 2768-T1-m
- PCB-Lochmuster / PCB hole pattern: **see pin position**
- Toleranz Pin-Position und PCB-Lochmuster / Tolerance of pin position and PCB hole pattern: $\oplus 0.1$
- Bohrlochdurchmesser / Diameter of drill: **Ø 2.35 mm**
- Endlochdurchmesser / Diameter of plated holes: **Ø 2.14 - 2.29 mm** (Cu thickness in via typ. 50 µm)
- Beschichtung / Plating: **chem. Sn max. 15 µm**
- Einpresskraft / Insert Force: per terminal with a typ. insert speed of 7 mm/s: **typ. 90 N**
- Weitere Angaben / Further information: www.ixys.com **Application note IXAN0077**
- Montageanleitung / Mounting instruction: www.ixys.com **Application note IXAN0024**

Detail A: PCB-Montage / Mounting on PCB

- Empfohlene, selbstschneidende Schraube / Recommended, self-tapping screw: **EJOT PT®** (Größe / size: **K25**)
- Max. Schraubenlänge / Max. screw length: **PCB-Dicke / thickness + 6 mm** (max. Lochtiefe / hole depth)
- Empfohlenes Drehmoment / Recommended mounting torque: **1.5 Nm**



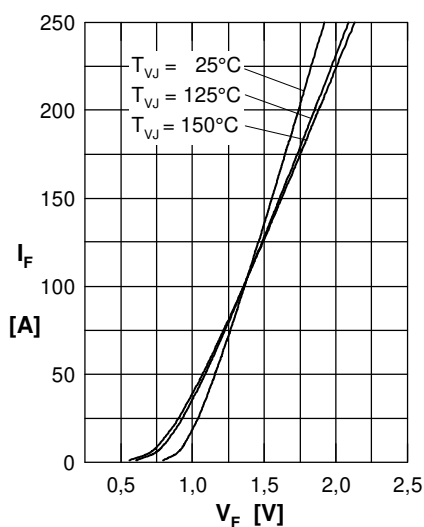
Rectifier


Fig. 1 Forward current versus voltage drop per diode

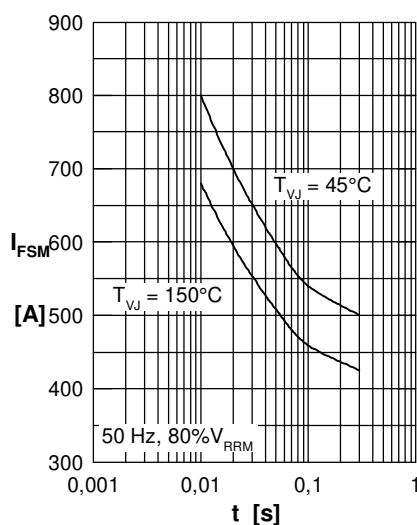


Fig. 2 Surge overload current vs. time per diode

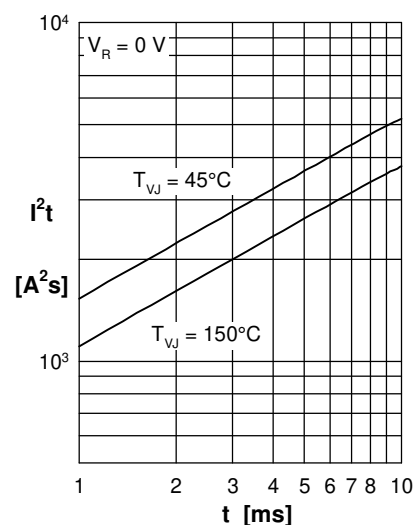
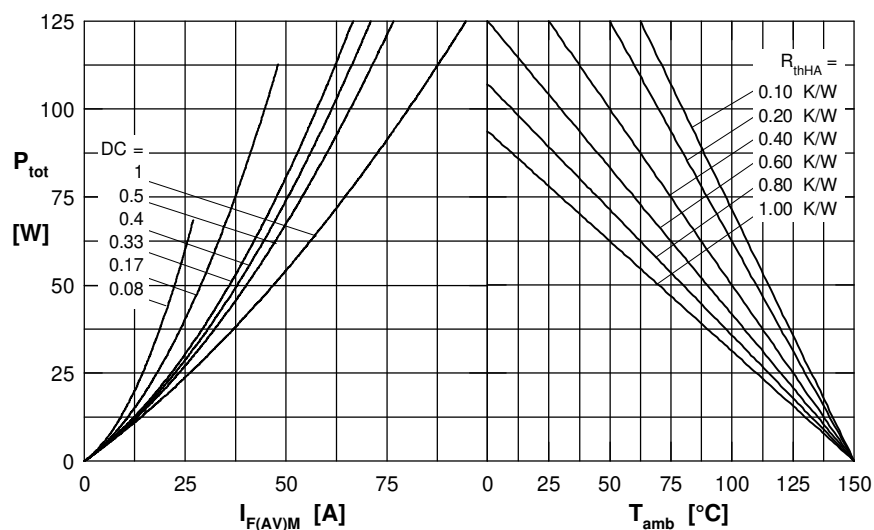

 Fig. 3 I^2t versus time per diode


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

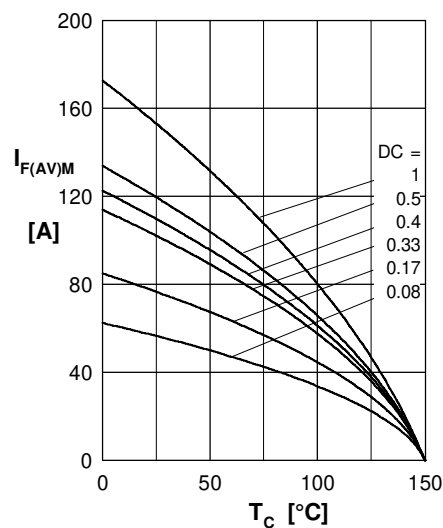


Fig. 5 Max. forward current vs. case temperature per diode

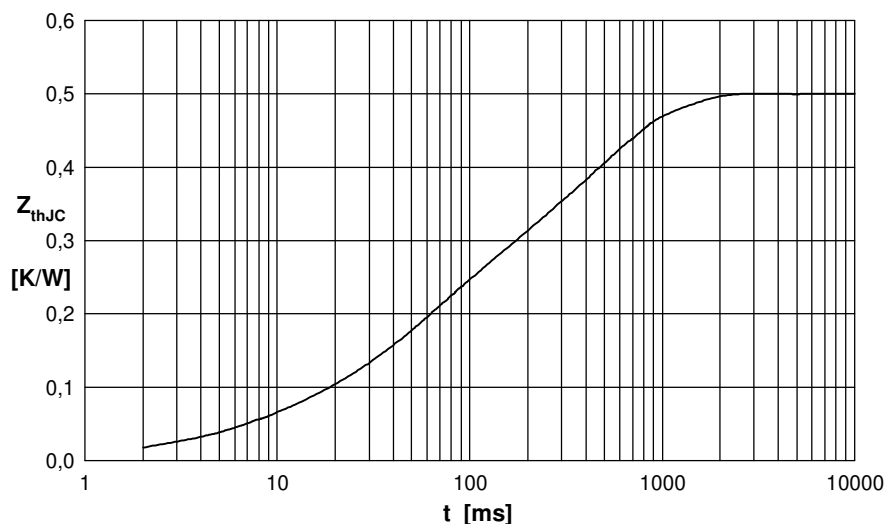


Fig. 6 Transient thermal impedance junction to case vs. time per diode

 Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.030	0.006
2	0.003	0.007
3	0.182	0.045
4	0.285	0.450