



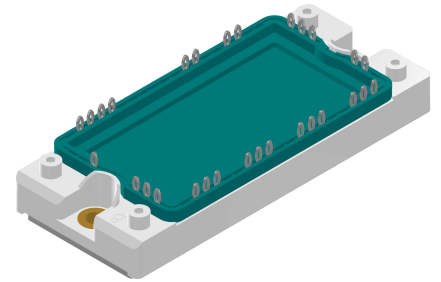
Standard Rectifier Module

3~ Rectifier	Brake Chopper
$V_{RRM} = 1600\text{ V}$	$V_{CES} = 1200\text{ V}$
$I_{DAV} = 360\text{ A}$	$I_{C25} = 250\text{ A}$
$I_{FSM} = 1900\text{ A}$	$V_{CE(sat)} = 1.7\text{ V}$

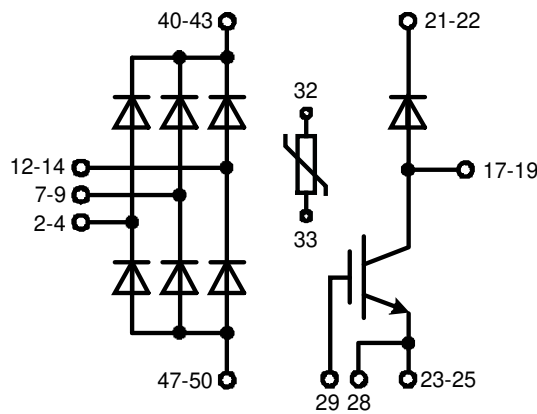
3~ Rectifier Bridge + Brake Unit + NTC

Part number

MDMA360UB1600PTED



Backside: isolated



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: 3600 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

Disclaimer Notice

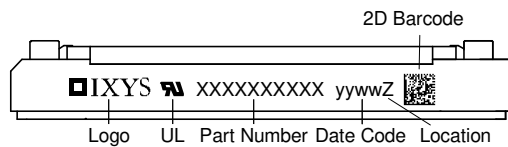
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Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RSM}	max. non-repetitive reverse blocking voltage					1700	V
V_{RRM}	max. repetitive reverse blocking voltage					1600	V
I_R	reverse current	$V_R = 1600$ V		$T_{VJ} = 25^\circ\text{C}$		100	μA
		$V_R = 1600$ V		$T_{VJ} = 150^\circ\text{C}$		3	mA
V_F	forward voltage drop	$I_F = 120$ A		$T_{VJ} = 25^\circ\text{C}$		1.25	V
		$I_F = 360$ A				1.80	V
		$I_F = 120$ A		$T_{VJ} = 125^\circ\text{C}$		1.23	V
		$I_F = 360$ A				1.98	V
I_{DAV}	bridge output current	$T_C = 85^\circ\text{C}$	rectangular	$T_{VJ} = 150^\circ\text{C}$		360	A
V_{FO}	threshold voltage	} for power loss calculation only		$T_{VJ} = 150^\circ\text{C}$		0.82	V
r_F	slope resistance					3.4	m Ω
R_{thJC}	thermal resistance junction to case					0.25	K/W
R_{thCH}	thermal resistance case to heatsink				0.1		K/W
P_{tot}	total power dissipation			$T_C = 25^\circ\text{C}$		500	W
I_{FSM}	max. forward surge current	$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 45^\circ\text{C}$		1.90	kA
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		2.05	kA
		$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 150^\circ\text{C}$		1.62	kA
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		1.75	kA
I^2t	value for fusing	$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 45^\circ\text{C}$		18.1	kA ² s
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		17.5	kA ² s
		$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 150^\circ\text{C}$		13.0	kA ² s
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		12.7	kA ² s
C_J	junction capacitance	$V_R = 400$ V; $f = 1$ MHz		$T_{VJ} = 25^\circ\text{C}$		73	pF

Brake IGBT + Diode				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
V_{CES}	collector emitter voltage				1200	V	
V_{GES}	max. DC gate voltage				± 20	V	
V_{GEM}	max. transient gate emitter voltage				± 30	V	
I_{C25}	collector current				250	A	
I_{C80}					175	A	
P_{tot}	total power dissipation				780	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 150 \text{ A}; V_{GE} = 15 \text{ V}$			1.7	V	
					1.9	V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 6 \text{ mA}; V_{GE} = V_{CE}$	6	6.8	7.5	V	
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}$			0.1	mA	
					1	mA	
I_{GES}	gate emitter leakage current	$V_{GE} = \pm 20 \text{ V}$			500	nA	
$Q_{G(on)}$	total gate charge	$V_{CE} = 600 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 150 \text{ A}$		510		nC	
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600 \text{ V}; I_C = 150 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 4.7 \Omega$			280	ns	
t_r	current rise time				80	ns	
$t_{d(off)}$	turn-off delay time				440	ns	
t_f	current fall time				230	ns	
E_{on}	turn-on energy per pulse				26	mJ	
E_{off}	turn-off energy per pulse				15	mJ	
RBSOA	reverse bias safe operating area	$V_{GE} = \pm 15 \text{ V}; R_G = 4.7 \Omega$					
I_{CM}		$V_{CEK} = 1200 \text{ V}$			400	A	
SCSOA	short circuit safe operating area	$V_{CEK} = 1200 \text{ V}$					
t_{SC}	short circuit duration	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15$			10	μs	
I_{SC}	short circuit current	$R_G = 4.7 \Omega$; non-repetitive		600		A	
R_{thJC}	thermal resistance junction to case				0.16	K/W	
R_{thCH}	thermal resistance case to heatsink				0.10	K/W	
Brake Diode							
V_{RRM}	max. repetitive reverse voltage				1200	V	
I_{F25}	forward current				135	A	
I_{F80}					90	A	
V_F	forward voltage	$I_F = 100 \text{ A}$			2.20	V	
					1.95	V	
I_R	reverse current	$V_R = V_{RRM}$			0.1	mA	
					1.2	mA	
Q_{rr}	reverse recovery charge	$V_R = 600 \text{ V}$ $-di_f/dt = 1600 \text{ A}/\mu\text{s}$ $I_F = 100 \text{ A}; V_{GE} = 0 \text{ V}$			12.5	μC	
I_{RM}	max. reverse recovery current				100	A	
t_{rr}	reverse recovery time				350	ns	
E_{rec}	reverse recovery energy				4	mJ	
R_{thJC}	thermal resistance junction to case				0.4	K/W	
R_{thCH}	thermal resistance case to heatsink				0.10	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	3600			V
		t = 1 minute	3000			V



Part description

- M = Module
- D = Diode
- M = Standard Rectifier
- A = (up to 1800V)
- 360 = 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	MDMA360UB1600PTED	MDMA360UB1600PTED	Blister	28	516620
Alternative	MDMA360UB1600PTED-PC	MDMA360UB1600PTED	Blister	28	515423

Temperature Sensor NTC

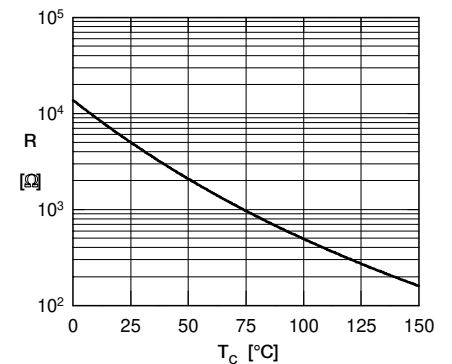
Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	resistance	$T_{VJ} = 25^\circ$	4.85	5	5.15	kΩ
$B_{25/50}$	temperature coefficient			3375		K

Equivalent Circuits for Simulation

* on die level

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

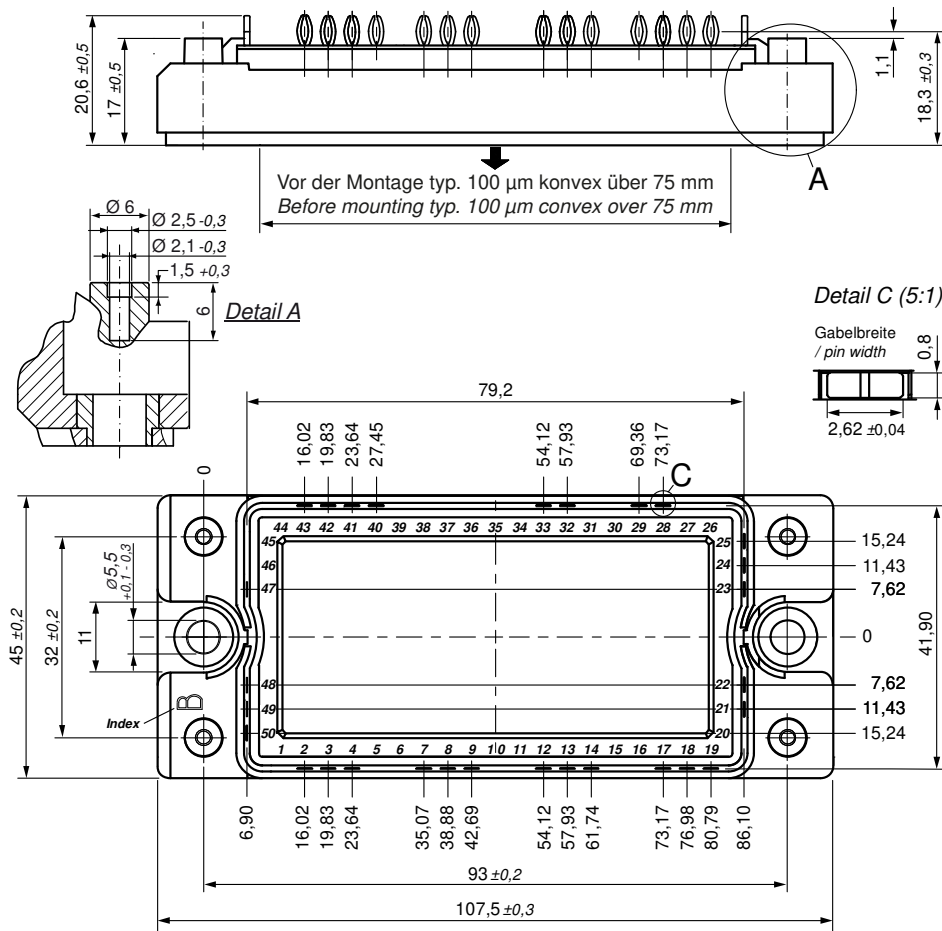
	Rectifier	Brake IGBT +	Brake Diode	
V_0	0.82	1.1	1.25	V
R_0	1.5	9.2	8.5	mΩ



Typ. NTC resistance vs. temperature



Outlines E2-Pack

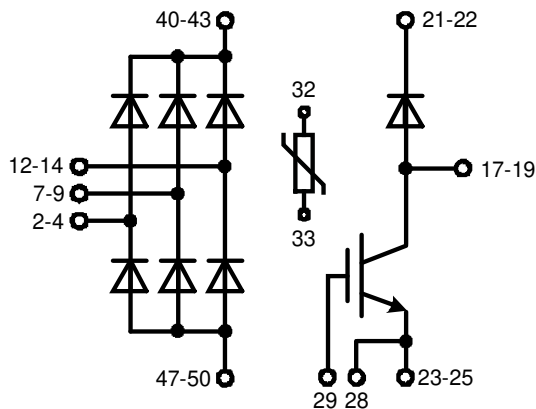


Bemerkung / Note:

- 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^L

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





Rectifier

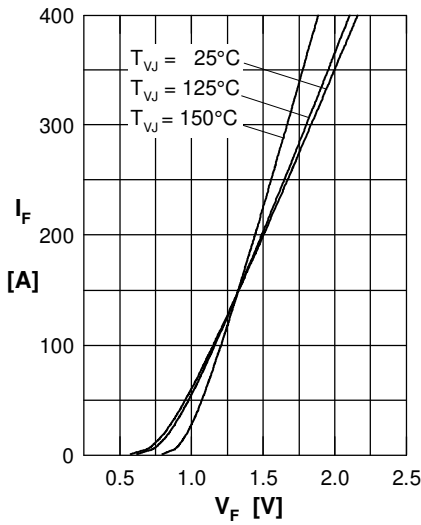


Fig. 1 Forward current versus voltage drop per diode

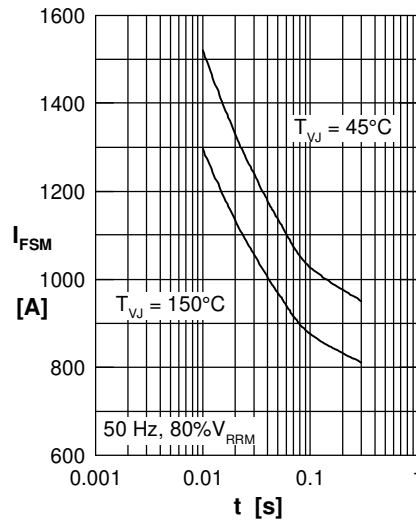


Fig. 2 Surge overload current vs. time per diode

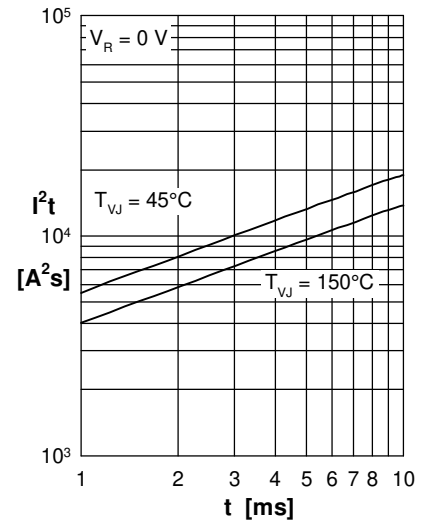


Fig. 3 I^2t versus time per diode

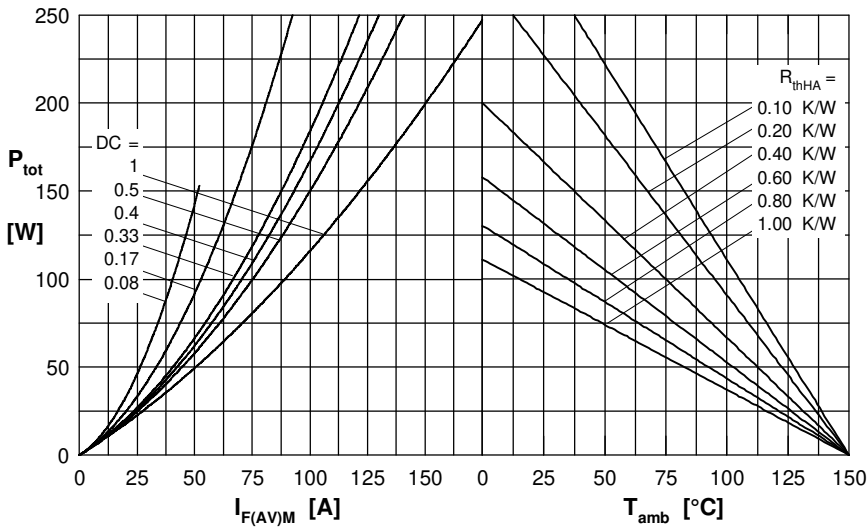


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

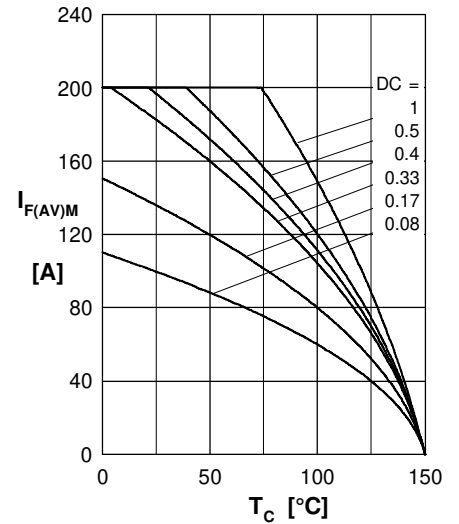


Fig. 5 Max. forward current vs. case temperature per diode

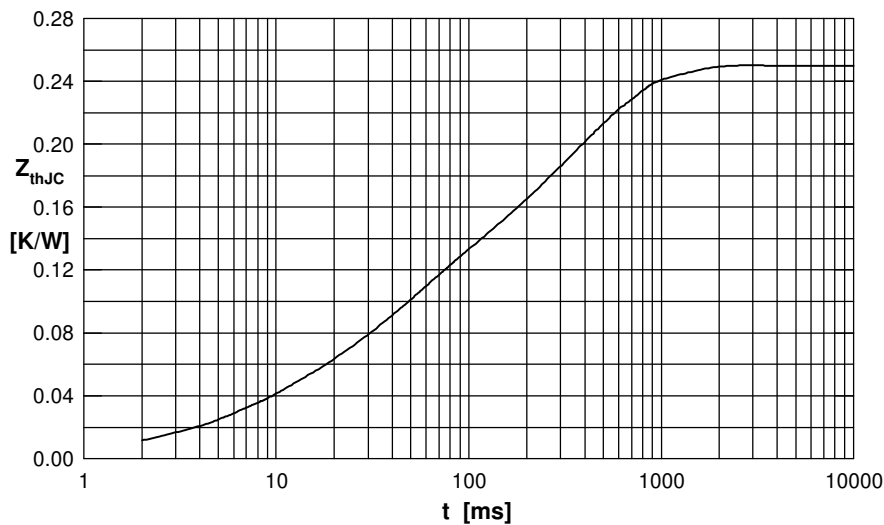


Fig. 6 Transient thermal impedance junction to case vs. time per diode

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.020	0.006
2	0.003	0.007
3	0.080	0.037
4	0.147	0.360