

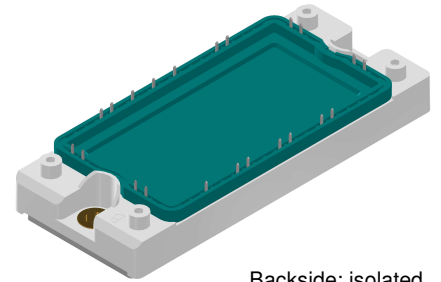
# Thyristor Module

<b>3~ Rectifier</b>
$V_{RRM} = 1800\text{ V}$
$I_{DAV} = 120\text{ A}$
$I_{FSM} = 500\text{ A}$

3~ Rectifier Bridge, half-controlled (high-side) + free wheeling Diode

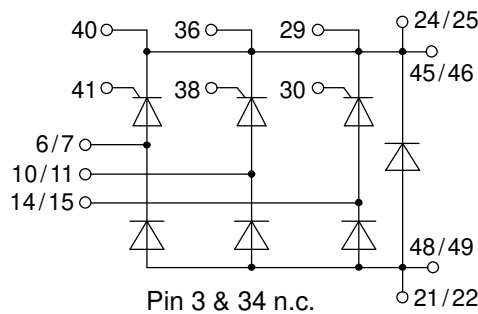
Part number

**MCMA120UJ1800ED**



Backside: isolated

E72873



### Features / Advantages:

- Thyristor/Standard Rectifier for line frequency
- Planar passivated chips
- Long-term stability
- Low forward voltage drop
- Leads suitable for PC board soldering
- Copper base plate with Direct Copper Bonded Al<sub>2</sub>O<sub>3</sub>-ceramic
- Improved temperature and power cycling

### 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: E2-Pack

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

### Terms and Conditions of Usage

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact your local sales office.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact your local sales office.

Should you intend to use the product in aviation, in health or life endangering or life support applications, please notify. For any such application we urgently recommend

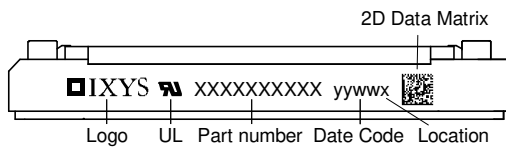
- to perform joint risk and quality assessments;

- the conclusion of quality agreements;

- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

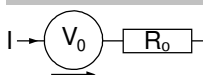
Rectifier				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1900	V	
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1800	V	
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1800 V$	$T_{VJ} = 25^{\circ}C$		50	$\mu A$	
		$V_{R/D} = 1800 V$	$T_{VJ} = 125^{\circ}C$		10	mA	
$V_T$	forward voltage drop	$I_T = 40 A$	$T_{VJ} = 25^{\circ}C$		1.33	V	
		$I_T = 120 A$			1.70	V	
		$I_T = 40 A$	$T_{VJ} = 125^{\circ}C$		1.36	V	
		$I_T = 120 A$			1.88	V	
$I_{DAV}$	bridge output current	$T_C = 80^{\circ}C$ rectangular $d = 1/3$	$T_{VJ} = 150^{\circ}C$		120	A	
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0.83	V	
$r_T$	slope resistance				13.6	m $\Omega$	
$R_{thJC}$	thermal resistance junction to case				0.65	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.10		K/W	
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		190	W	
$I_{TSM}$	max. forward surge current	$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		500	A	
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		540	A	
		$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 150^{\circ}C$		425	A	
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		460	A	
$I^2t$	value for fusing	$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		1.25	kA <sup>2</sup> s	
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		1.22	kA <sup>2</sup> s	
		$t = 10 ms$ ; (50 Hz), sine	$T_{VJ} = 150^{\circ}C$		905	A <sup>2</sup> s	
		$t = 8,3 ms$ ; (60 Hz), sine	$V_R = 0 V$		880	A <sup>2</sup> s	
$C_J$	junction capacitance	$V_R = 400 V$ $f = 1 MHz$	$T_{VJ} = 25^{\circ}C$		18	pF	
$P_{GM}$	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 150^{\circ}C$		10	W	
		$t_p = 300 \mu s$			5	W	
$P_{GAV}$	average gate power dissipation				0.5	W	
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 150^{\circ}C$ ; $f = 50 Hz$ repetitive, $I_T = 120 A$			100	A/ $\mu s$	
		$t_p = 200 \mu s$ ; $di_G/dt = 0.45 A/\mu s$ ; $I_G = 0.45 A$ ; $V = 2/3 V_{DRM}$ non-repet., $I_T = 40 A$			500	A/ $\mu s$	
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = 2/3 V_{DRM}$ $R_{GK} = \infty$ ; method 1 (linear voltage rise)	$T_{VJ} = 150^{\circ}C$		1000	V/ $\mu s$	
$V_{GT}$	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		1.4	V	
			$T_{VJ} = -40^{\circ}C$		1.6	V	
$I_{GT}$	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		70	mA	
			$T_{VJ} = -40^{\circ}C$		150	mA	
$V_{GD}$	gate non-trigger voltage	$V_D = 2/3 V_{DRM}$	$T_{VJ} = 150^{\circ}C$		0.2	V	
$I_{GD}$	gate non-trigger current				5	mA	
$I_L$	latching current	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		150	mA	
		$I_G = 0.45 A$ ; $di_G/dt = 0.45 A/\mu s$					
$I_H$	holding current	$V_D = 6 V$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		100	mA	
$t_{gd}$	gate controlled delay time	$V_D = 1/2 V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$	
		$I_G = 0.45 A$ ; $di_G/dt = 0.45 A/\mu s$					
$t_q$	turn-off time	$V_R = 100 V$ ; $I_T = 40 A$ ; $V = 2/3 V_{DRM}$ $di/dt = 10 A/\mu s$ $dv/dt = 20 V/\mu s$ $t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$		500	$\mu s$	

Package E2-Pack		Ratings				
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			100	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>				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
		50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA				


**Part description**

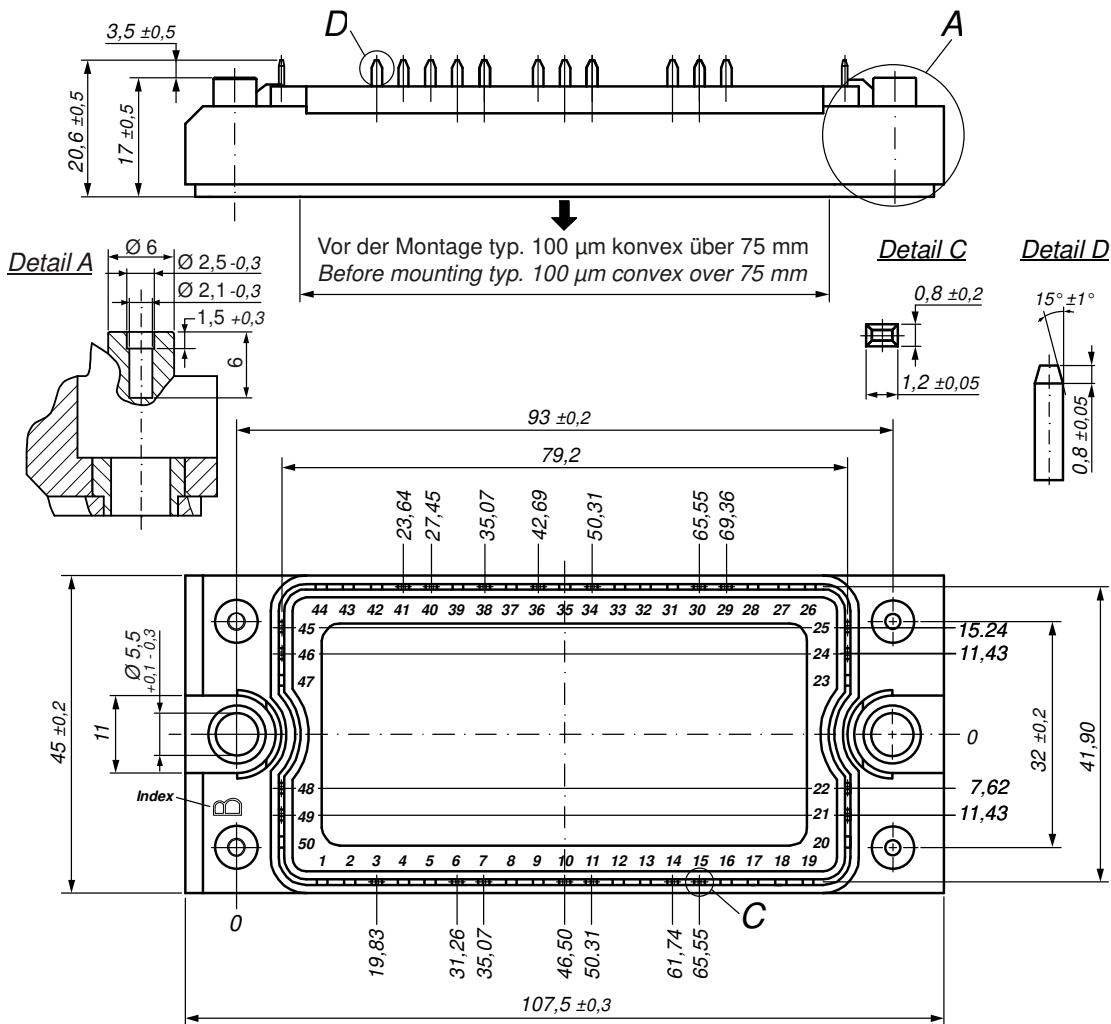
- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 120 = Current Rating [A]
- UJ = 3- Rectifier Bridge, half-controlled (high-side) + free wheeling Diode
- 1800 = Reverse Voltage [V]
- ED = E2-Pack

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA120UJ1800ED	MCMA120UJ1800ED	Box	6	510125

**Equivalent Circuits for Simulation**
*\* on die level*
 $T_{VJ} = 150\text{ °C}$ 

**Thyristor**

$V_{0\ max}$	threshold voltage	0.83	V
$R_{0\ max}$	slope resistance *	10.5	mΩ

## Outlines E2-Pack

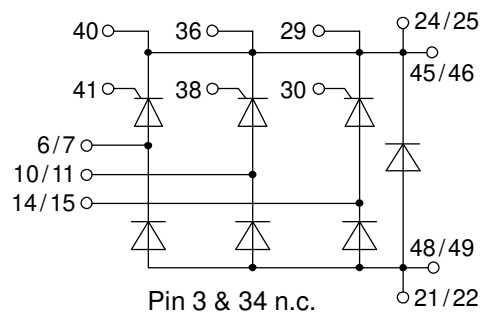


### Bemerkung / Note:

- Nichttolerierete 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:  $\oplus 0,1$*
- 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)*<sup>L</sup>
- Max. Schraubenlänge / *Max. screw length: PCB-Dicke / thickness + 6 mm (max. Lochtiefe / hole depth)*<sup>L</sup>
- Empfohlenes Drehmoment / *Recommended mounting torque: 1.5 Nm*



## Thyristor

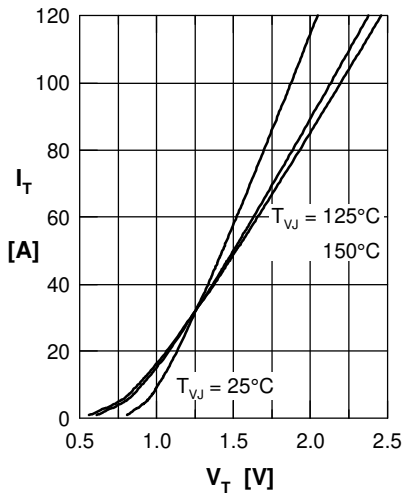


Fig. 1 Forward characteristics

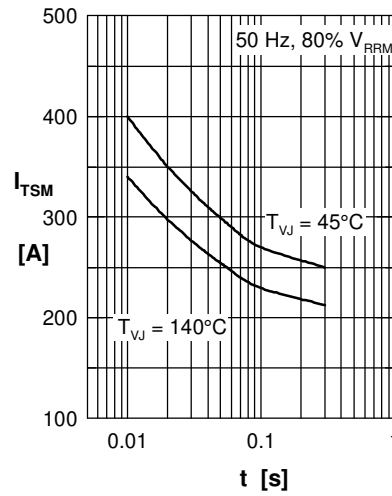


Fig. 2 Surge overload current  
 $I_{TSM}$ : crest value,  $t$ : duration

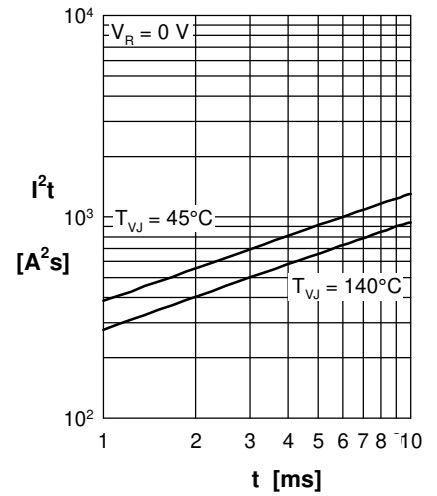


Fig. 3  $I^2t$  versus time (1-10 s)

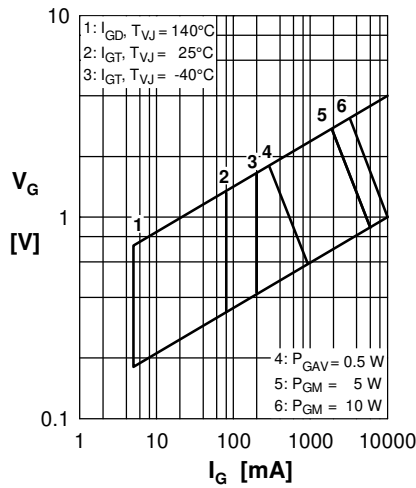


Fig. 4 Gate voltage & gate current

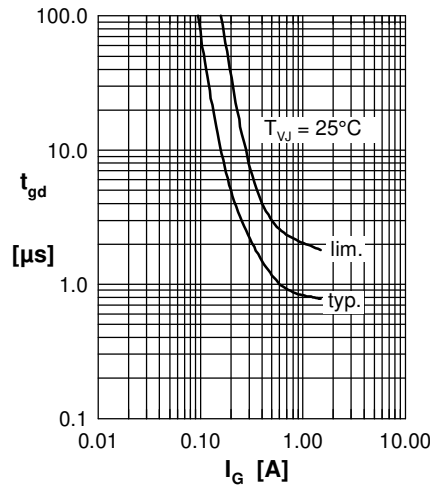


Fig. 5 Gate controlled delay time  $t_{gd}$

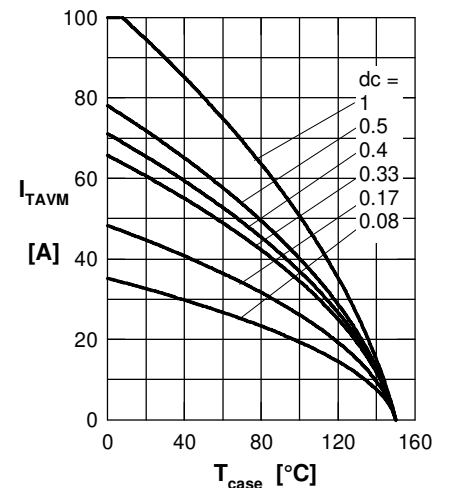


Fig. 6 Max. forward current at case temperature

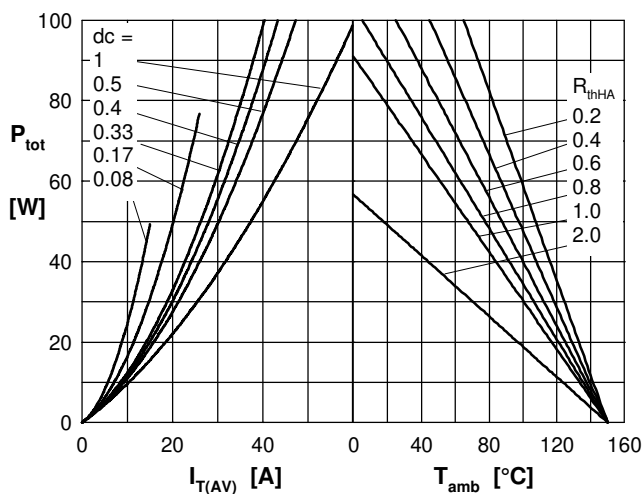


Fig. 7a Power dissipation versus direct output current  
Fig. 7b and ambient temperature

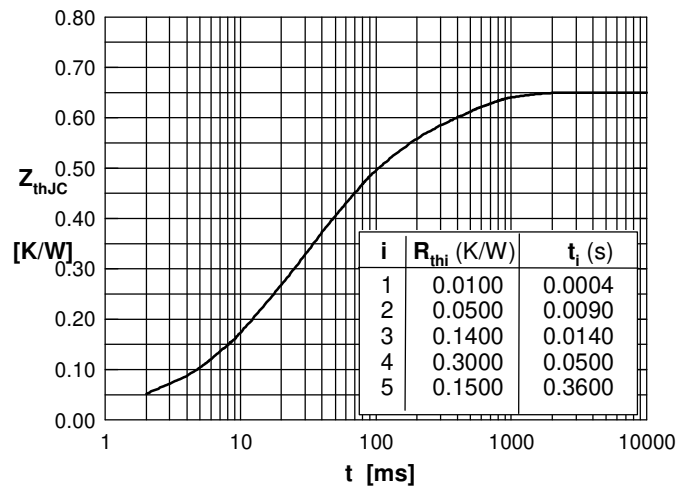


Fig. 8 Transient thermal impedance junction to case