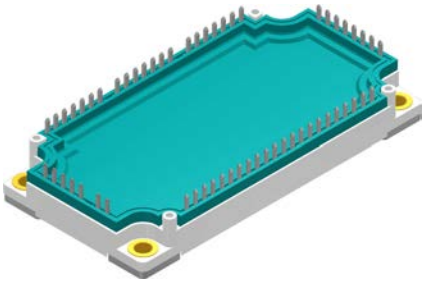
Thyristor Module

3~ Rectifier		
V_{RRM}	=	1600 V
I_{DAV}	=	450 A
I_{FSM}	=	2400 A

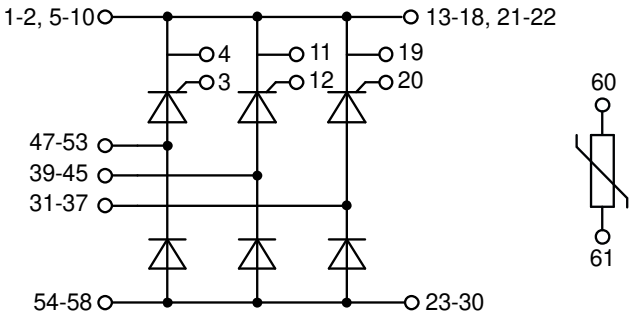
3~ Rectifier Bridge, half-controlled (high-side) + NTC

Part number

MCMA450UH1600TEH



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:

- 3~ half-controlled Rectifier for drive inverters

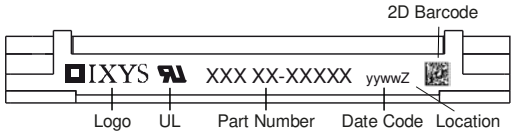
Package: E3-Pack

- Isolation Voltage: 4300 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

Rectifier

Symbol	Definition	Conditions		Ratings min.	typ.	max.	Unit
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1700	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1600	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 1600 V	T_{VJ} = 25°C			100	µA
		$V_{R/D}$ = 1600 V	T_{VJ} = 150°C			15	mA
V_T	*forward voltage drop*	I_T = 150 A	T_{VJ} = 25°C			1,34	V
		I_T = 450 A				2,10	V
		I_T = 150 A	T_{VJ} = 125°C			1,31	V
		I_T = 450 A				2,20	V
I_{DAV}	*bridge output current*	T_C = 90°C	T_{VJ} = 150°C			450	A
		rectangular d = 120°					
V_{T0}	*threshold voltage* } *for power loss calculation only*		T_{VJ} = 150°C			0,84	V
r_T	*slope resistance* }					3,1	mΩ
R_{thJC}	*thermal resistance junction to case*					0,17	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,08		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			735	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			2,40	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			2,59	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			2,04	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			2,21	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			28,8	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			27,9	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			20,8	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			20,2	kA²s
C_J	*junction capacitance*	V_R = 400V f = 1 MHz	T_{VJ} = 25°C		119		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 150°C			10	W
		t_P = 300 µs				5	W
P_{GAV}	*average gate power dissipation*					0,5	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 150°C; f = 50 Hz	repetitive, I_T = 450 A			150	A/µs
		t_P = 200 µs; di_G/dt = 0,45 A/µs;					
		I_G = 0,45A; V_D = ⅔ V_{DRM}	non-repet., I_T = 150 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 150°C			1000	V/µs
		R_{GK} = ∞; method 1 (linear voltage rise)					
V_{GT}	*gate trigger voltage*	V_D = 6 V	T_{VJ} = 25°C			1,5	V
			T_{VJ} = -40°C			1,6	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			150	mA
			T_{VJ} = -40°C			200	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 150°C			0,2	V
I_{GD}	*gate non-trigger current*					10	mA
I_L	*latching current*	t_p = 10 µs	T_{VJ} = 25°C			200	mA
		I_G = 0,45A; di_G/dt = 0,45 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			200	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 0,45A; di_G/dt = 0,45 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 150A; V_D = ⅔ V_{DRM}	T_{VJ} =125 °C		185		µs
		di/dt = 10 A/µs; dv/dt = 20 V/µs; t_p = 200 µs					

Package E3-Pack				Ratings			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal				50	A
T_{VJ}	*virtual junction temperature*			-40		150	°C
T_{op}	*operation temperature*			-40		125	°C
T_{stg}	*storage temperature*			-40		125	°C
Weight					270		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} ≤ 1 mA	4300			V
		t = 1 minute		3600			V



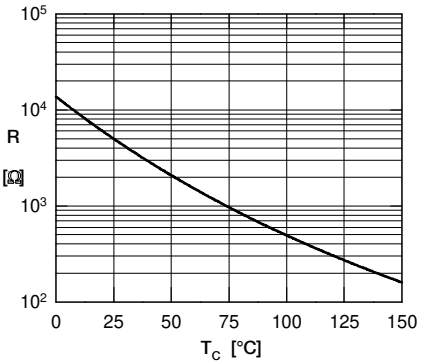
Part description

M = Module
C = Thyristor (SCR)
M = Thyristor
A = (up to 1800V)
450 = Current Rating [A]
UH = 3~ Rectifier Bridge, half-controlled (high-side)
1600 = Reverse Voltage [V]
T = Thermistor \ Temperature sensor
EH = E3-Pack

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA450UH1600TEH	MCMA450UH1600TEH	Box	5	521901

Temperature Sensor NTC

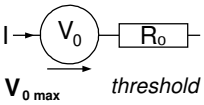
Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	*resistance*	T_{VJ} = 25°	4,85	5	5,15	kΩ
$B_{25/50}$	*temperature coefficient*			3375		K



Typ. NTC resistance vs. temperature

Equivalent Circuits for Simulation

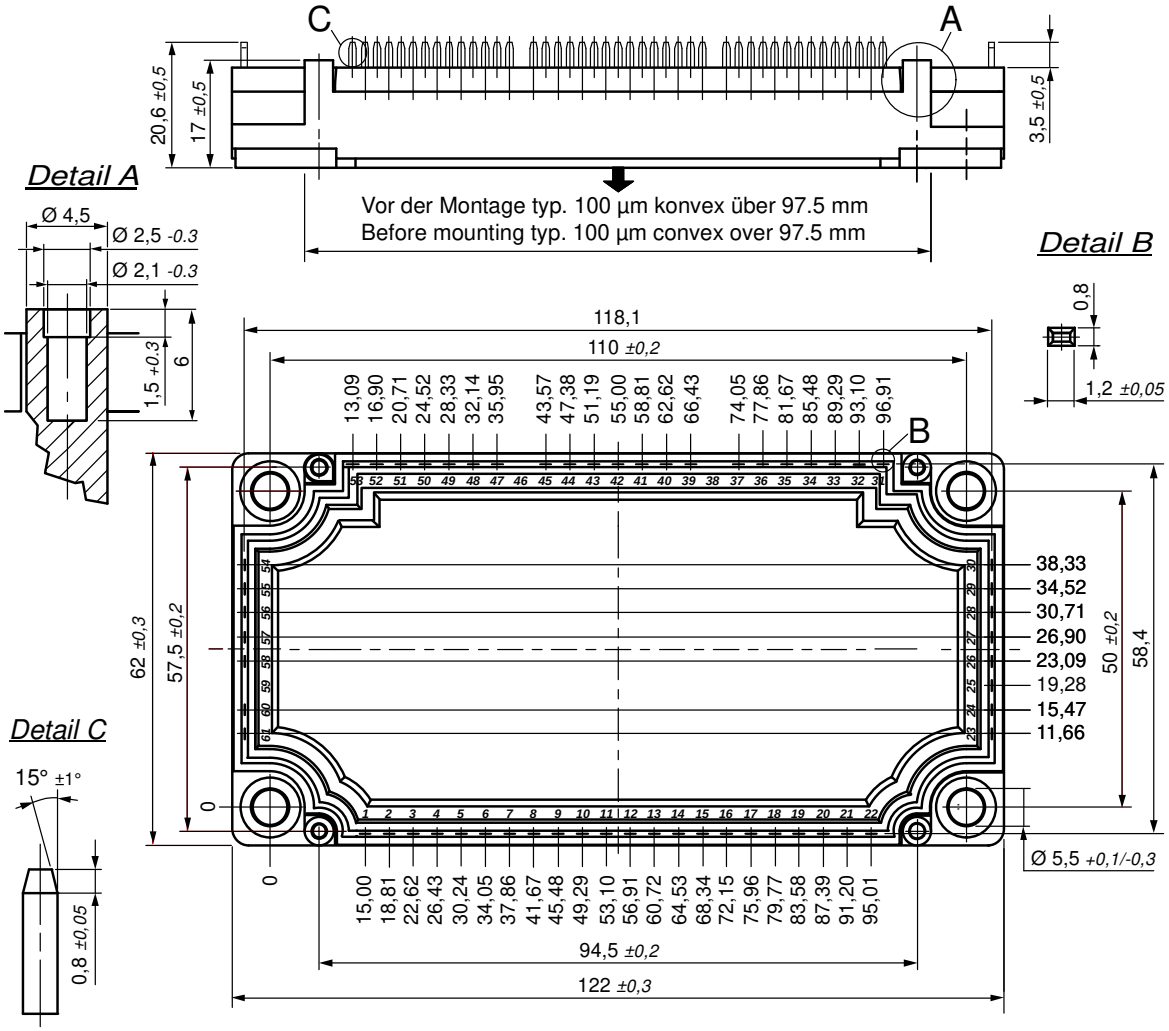
** on die level* T_{VJ} = 150°C



Thyristor

$V_{0\,max}$	*threshold voltage*	0,84	V
$R_{0\,max}$	*slope resistance **	1,65	mΩ

Outlines E3-Pack

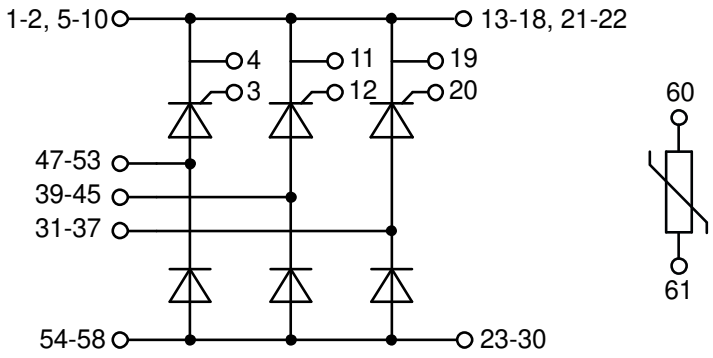


Bemerkung / ***Note:***

- Nichttolerierte 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:* ⌖ **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**)
- Max. Schraubenlänge / *Max. screw length:* **PCB-Dicke** / **thickness + 6 mm** (max. Lochtiefe / *hole depth*)
- Empfohlenes Drehmoment / *Recommended mounting torque:* **1.5 Nm**



Thyristor

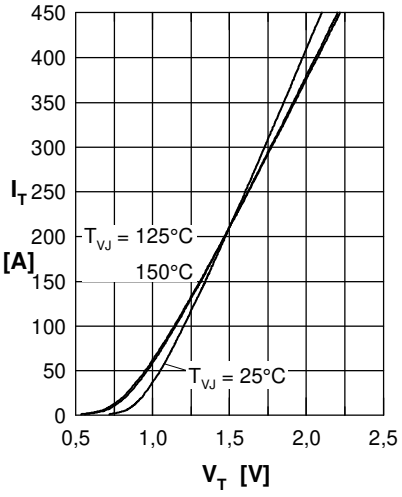


Fig. 1 Forward characteristics

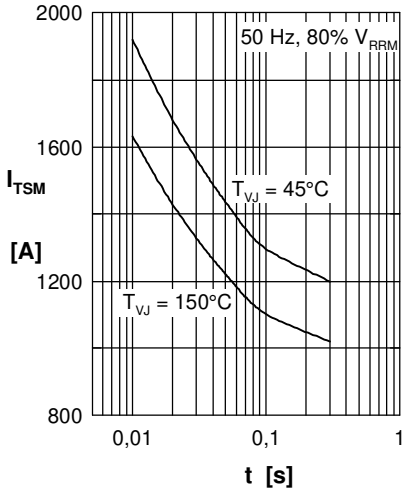


Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration

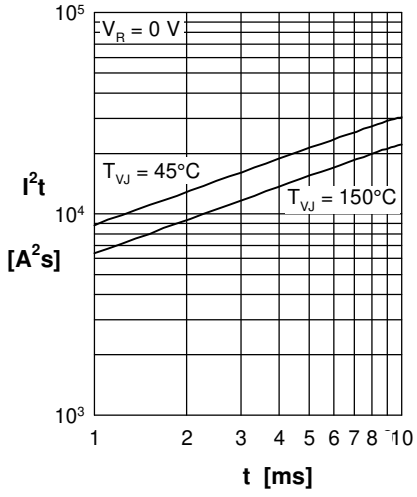


Fig. 3 I^2t versus time (1-10 s)

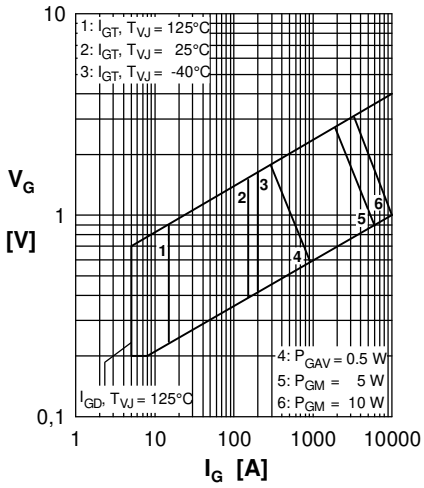


Fig. 4 Gate voltage & gate current

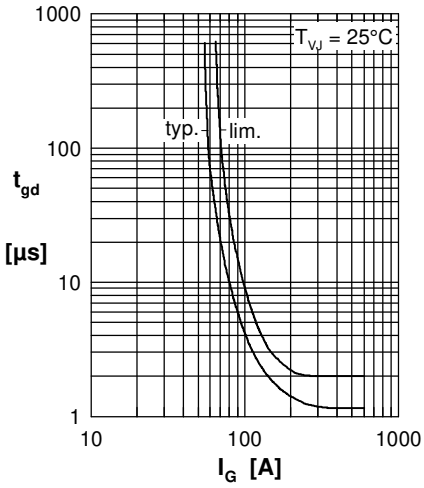


Fig. 5 Gate controlled delay time t_{gd}

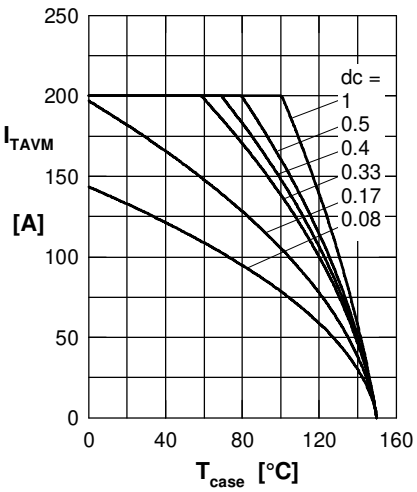


Fig. 6 Max. forward current at case temperature

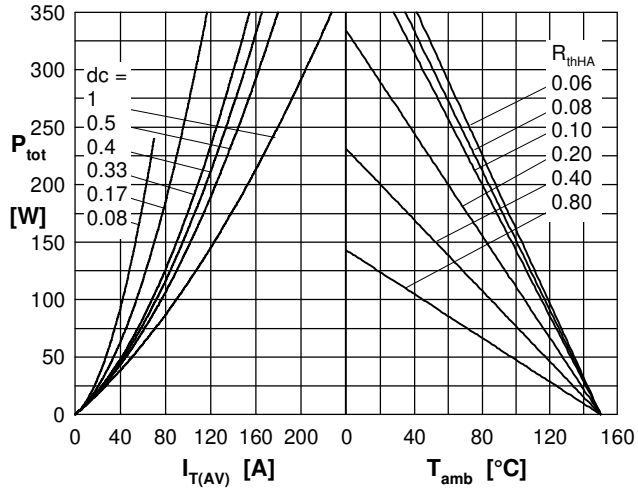
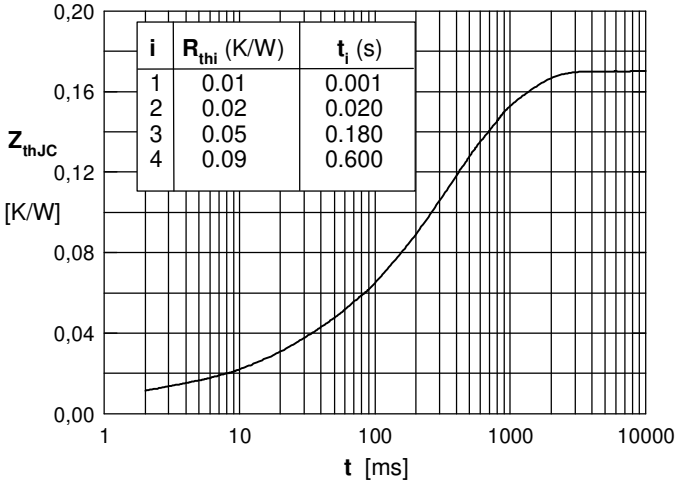


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature



i	R_{thi} (K/W)	t_i (s)
1	0.01	0.001
2	0.02	0.020
3	0.05	0.180
4	0.09	0.600

Fig. 8 Transient thermal impedance junction to case