

# Thyristor Module

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

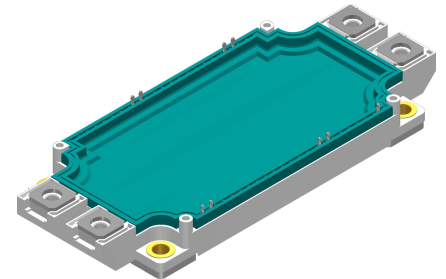
$$I_{TAV} = 150 \text{ A}$$

$$V_T = 1.35 \text{ V}$$

AC Controlling  
 2~ full-controlled

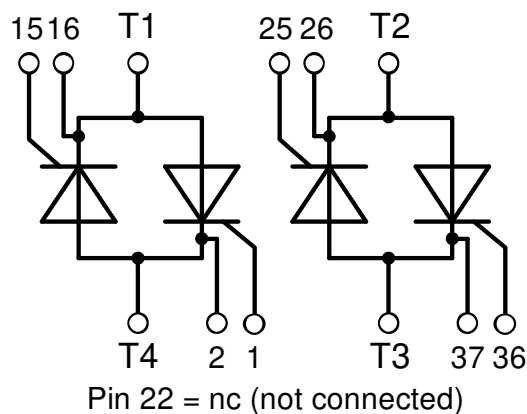
Part number

**MCMA300MC1600PSF**



Backside: isolated

 E72873



### Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al<sub>2</sub>O<sub>3</sub>-ceramic

### Applications:

- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

### Package: SimBus F

- 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

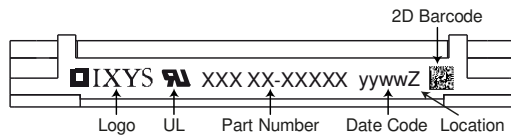
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Thyristor				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage			$T_{VJ} = 25^{\circ}C$		1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage			$T_{VJ} = 25^{\circ}C$		1600	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1600 V$		$T_{VJ} = 25^{\circ}C$		300	$\mu A$
		$V_{R/D} = 1600 V$		$T_{VJ} = 150^{\circ}C$		20	mA
$V_T$	forward voltage drop	$I_T = 150 A$		$T_{VJ} = 25^{\circ}C$		1.40	V
		$I_T = 300 A$				1.77	V
		$I_T = 150 A$		$T_{VJ} = 125^{\circ}C$		1.35	V
		$I_T = 300 A$				1.79	V
$I_{TAV}$	average forward current	$T_C = 100^{\circ}C$		$T_{VJ} = 150^{\circ}C$		150	A
$I_{RMS}$	RMS forward current per phase	sine 180°	d = 0.5			330	A
$V_{T0}$	threshold voltage	} for power loss calculation only		$T_{VJ} = 150^{\circ}C$		0.90	V
$r_T$	slope resistance					2.92	m $\Omega$
$R_{thJC}$	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			$T_C = 25^{\circ}C$		735	W
$I_{TSM}$	max. forward surge current	t = 10 ms; (50 Hz), sine		$T_{VJ} = 45^{\circ}C$		2.40	kA
		t = 8,3 ms; (60 Hz), sine		$V_R = 0 V$		2.59	kA
		t = 10 ms; (50 Hz), sine		$T_{VJ} = 150^{\circ}C$		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		$T_{VJ} = 45^{\circ}C$		28.8	kA <sup>2</sup> s
		t = 8,3 ms; (60 Hz), sine		$V_R = 0 V$		27.9	kA <sup>2</sup> s
		t = 10 ms; (50 Hz), sine		$T_{VJ} = 150^{\circ}C$		20.8	kA <sup>2</sup> s
		t = 8,3 ms; (60 Hz), sine		$V_R = 0 V$		20.2	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400 V$ f = 1 MHz		$T_{VJ} = 25^{\circ}C$	118		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, $I_T = 450 A$		150	A/ $\mu s$
		$t_p = 200 \mu s$ ; $di_G/dt = 0.45 A/\mu s$ ; $I_G = 0.45 A$ ; $V = \frac{2}{3} V_{DRM}$		non-repet., $I_T = 150 A$		500	A/ $\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$		$T_{VJ} = 150^{\circ}C$		1000	V/ $\mu s$
		$R_{GK} = \infty$ ; method 1 (linear voltage rise)					
$V_{GT}$	gate trigger voltage	$V_D = 6 V$		$T_{VJ} = 25^{\circ}C$		1.5	V
				$T_{VJ} = -40^{\circ}C$		1.6	V
$I_{GT}$	gate trigger current	$V_D = 6 V$		$T_{VJ} = 25^{\circ}C$		150	mA
				$T_{VJ} = -40^{\circ}C$		200	mA
$V_{GD}$	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$		$T_{VJ} = 150^{\circ}C$		0.2	V
$I_{GD}$	gate non-trigger current					10	mA
$I_L$	latching current	$t_p = 30 \mu s$		$T_{VJ} = 25^{\circ}C$		200	mA
		$I_G = 0.45 A$ ; $di_G/dt = 0.45 A/\mu s$					
$I_H$	holding current	$V_D = 6 V$ $R_{GK} = \infty$		$T_{VJ} = 25^{\circ}C$		200	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$		$T_{VJ} = 25^{\circ}C$		2	$\mu s$
		$I_G = 0.45 A$ ; $di_G/dt = 0.45 A/\mu s$					
$t_q$	turn-off time	$V_R = 100 V$ ; $I_T = 150 A$ ; $V = \frac{2}{3} V_{DRM}$		$T_{VJ} = 125^{\circ}C$	350		$\mu s$
		$di/dt = 10 A/\mu s$ $dv/dt = 20 V/\mu s$ $t_p = 200 \mu s$					

Package SimBus F		Ratings				
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			300	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>				350		g
$M_D$	mounting torque		3		6	Nm
$M_T$	terminal torque		3		6	Nm
$d_{Spp/App}$	creepage distance on surface   striking distance through air	terminal to terminal	13.3	10.0		mm
$d_{Spb/Apb}$		terminal to backside	10.2	10.2		mm
$V_{ISOL}$	isolation voltage	t = 1 second		4300		V
		t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	3600		V



### Part description

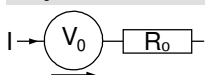
M = Module  
 C = Thyristor (SCR)  
 M = Thyristor  
 A = (up to 1800V)  
 300 = Current Rating [A]  
 MC = 2~ full-controlled  
 1600 = Reverse Voltage [V]  
 P = PressFit-Pin  
 SF = SimBus F

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA300MC1600PSF	MCMA300MC1600PSF	Blister	24	525675
Alternative	MCMA300MC1600PSF-PC	MCMA300MC1600PSF	Blister	24	

### Equivalent Circuits for Simulation

\* on die level

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

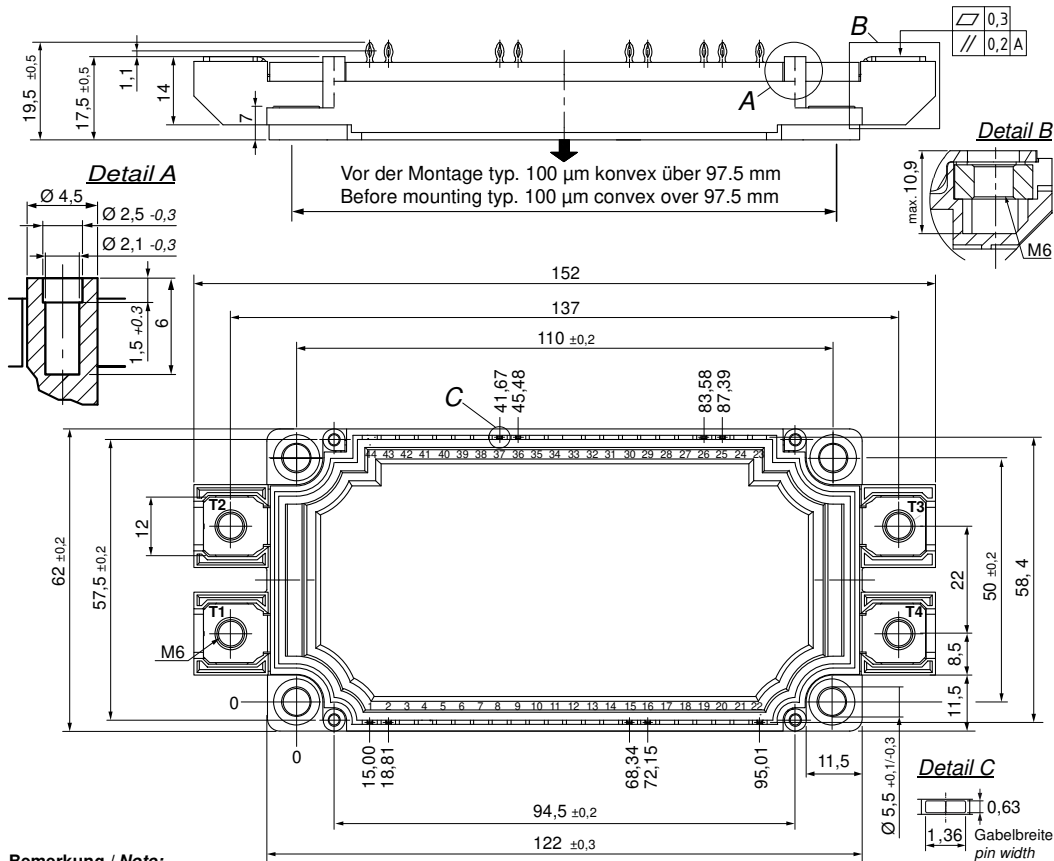


Thyristor

$V_{0\ max}$	threshold voltage	0.9	V
$R_{0\ max}$	slope resistance *	1.48	mΩ



**Outlines SimBus F**

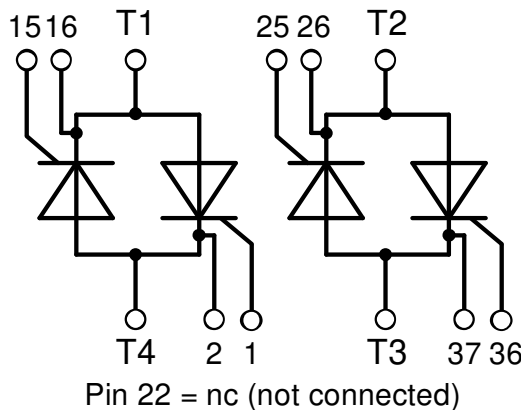


**Bemerkung / Note:**

- Nichttolerierete Maße nach / Measure w/o tolerances acc. 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:  $\varnothing 1,16$  mm
- Endlochdurchmesser / Diameter of plated holes:  $\varnothing 1,00 - 1,10$  mm (Cu thickness in via typ. 50  $\mu\text{m}$ )
- Beschichtung / Plating: chem. Sn max. 15  $\mu\text{m}$
- Einpresskraft / Insert Force: per terminal with a typ. insert speed of 1 mm/s: typ. 90 N
- Weitere Angaben / Further information: [www.ixys.com](http://www.ixys.com) Application note IXAN0077
- Montageanleitung / Mounting instruction: [www.ixys.com](http://www.ixys.com) Application note IXAN0024

**Detail A:** PCB-Montage / Mounting on PCB<sup>L</sup>

- 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

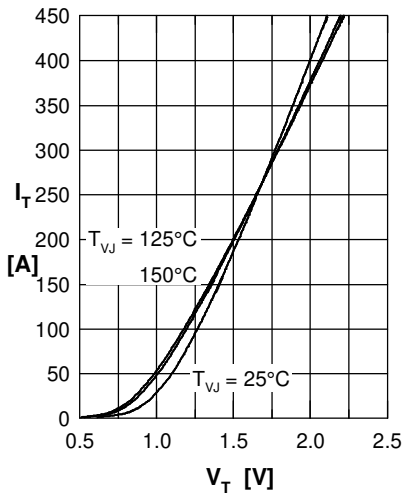


Fig. 1 Forward characteristics

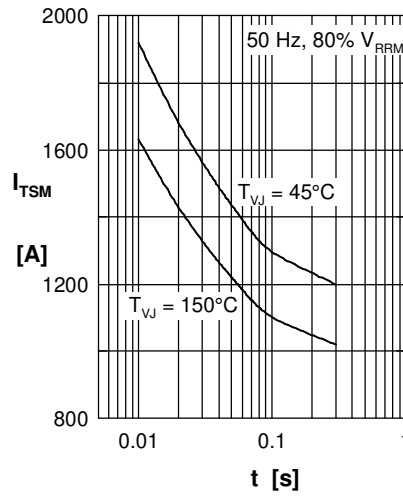


Fig. 2 Surge overload current  
 $I_{TSM}$ : crest value,  $t$ : duration

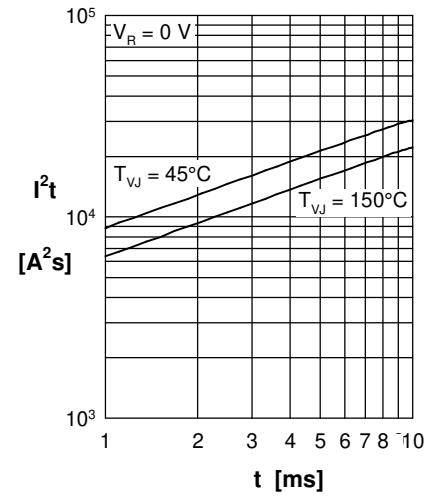


Fig. 3  $I^2t$  versus time (1-10 s)

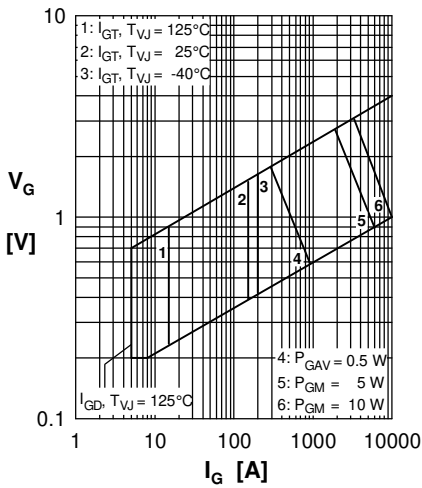


Fig. 4 Gate voltage & gate current

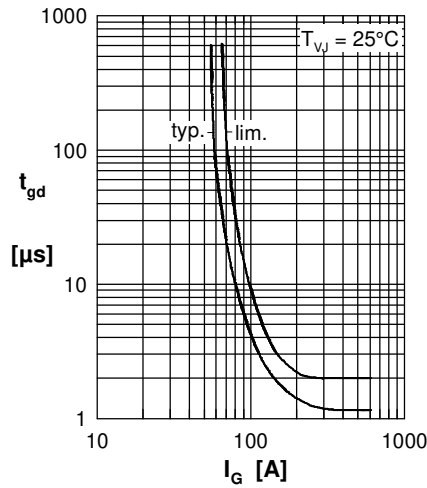


Fig. 5 Gate controlled delay time  $t_{gd}$

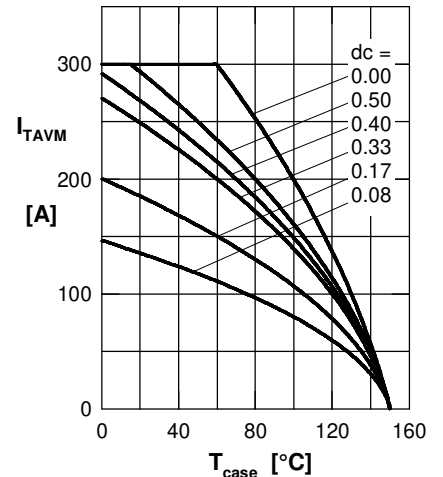


Fig. 6 Max. forward current at case temperature

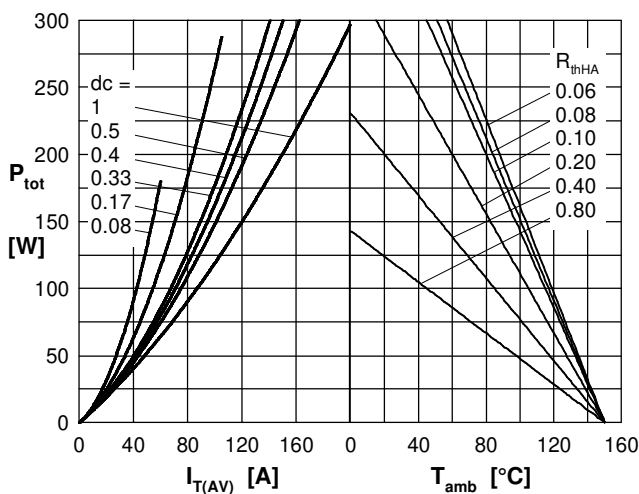


Fig. 7a Power dissipation versus direct output current  
 Fig. 7b and ambient temperature

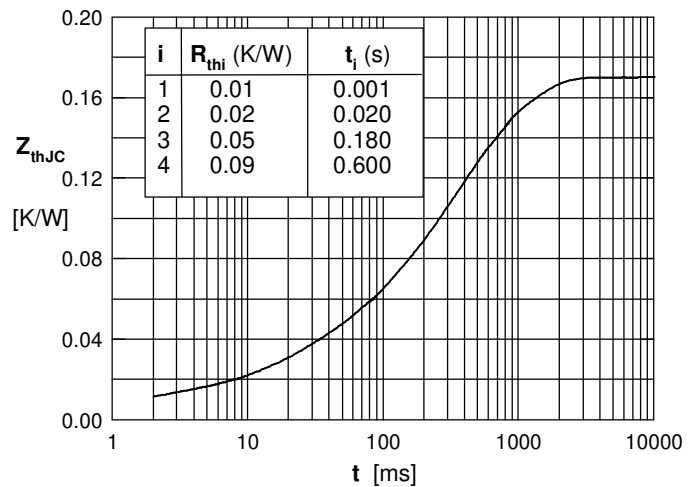


Fig. 8 Transient thermal impedance junction to case