

Thyristor \ Diode Module

$$V_{RRM} = 2 \times 1600 \text{ V}$$

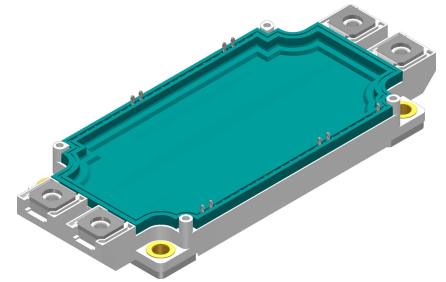
$$I_{TAV} = 400 \text{ A}$$

$$V_T = 1.28 \text{ V}$$

Phase leg + NTC

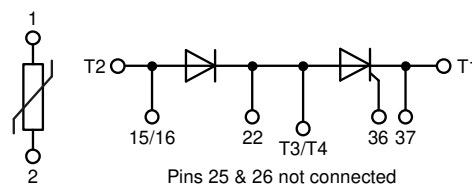
Part number

MCMA400PD1600PTSF



Backside: isolated

 E72873



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al₂O₃-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

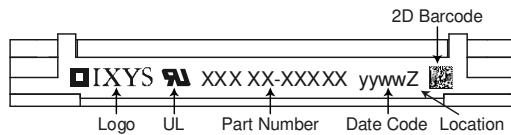
- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- PressFit-Pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

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Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage					1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage					1600	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1600$ V	$T_{VJ} = 25^{\circ}\text{C}$			300	μA
		$V_{R/D} = 1600$ V	$T_{VJ} = 140^{\circ}\text{C}$			20	mA
V_T	forward voltage drop	$I_T = 400$ A	$T_{VJ} = 25^{\circ}\text{C}$			1.31	V
		$I_T = 800$ A				1.70	V
		$I_T = 400$ A	$T_{VJ} = 125^{\circ}\text{C}$			1.28	V
		$I_T = 800$ A				1.74	V
I_{TAV}	average forward current	$T_C = 85^{\circ}\text{C}$	$T_{VJ} = 140^{\circ}\text{C}$			400	A
$I_{T(RMS)}$	RMS forward current	sine 180° $d = 0.5$				630	A
V_{T0}	threshold voltage	} for power loss calculation only		$T_{VJ} = 140^{\circ}\text{C}$		0.82	V
r_T	slope resistance					1.14	m Ω
R_{thJC}	thermal resistance junction to case					0.07	K/W
R_{thCH}	thermal resistance case to heatsink				0.04		K/W
P_{tot}	total power dissipation			$T_C = 25^{\circ}\text{C}$		1640	W
I_{TSM}	max. forward surge current	$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}\text{C}$			10.0	kA
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			10.8	kA
		$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 140^{\circ}\text{C}$			8.50	kA
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			9.18	kA
I^2t	value for fusing	$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}\text{C}$			500.0	kA ² s
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			485.2	kA ² s
		$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 140^{\circ}\text{C}$			361.3	kA ² s
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			350.6	kA ² s
C_J	junction capacitance	$V_R = 400$ V $f = 1$ MHz	$T_{VJ} = 25^{\circ}\text{C}$		482		pF
P_{GM}	max. gate power dissipation	$t_p = 30$ μs	$T_C = 140^{\circ}\text{C}$			120	W
		$t_p = 300$ μs				60	W
P_{GAV}	average gate power dissipation					20	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}\text{C}; f = 50$ Hz repetitive, $I_T = 1200$ A				100	A/ μs
		$t_p = 200$ $\mu\text{s}; di_G/dt = 0.45$ A/ $\mu\text{s}; I_G = 0.45$ A; $V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 400$ A				500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$T_{VJ} = 140^{\circ}\text{C}$			1000	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6$ V	$T_{VJ} = 25^{\circ}\text{C}$			2	V
			$T_{VJ} = -40^{\circ}\text{C}$			3	V
I_{GT}	gate trigger current	$V_D = 6$ V	$T_{VJ} = 25^{\circ}\text{C}$			150	mA
			$T_{VJ} = -40^{\circ}\text{C}$			220	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}\text{C}$			0.25	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	$t_p = 30$ μs	$T_{VJ} = 25^{\circ}\text{C}$			200	mA
		$I_G = 0.45$ A; $di_G/dt = 0.45$ A/ μs					
I_H	holding current	$V_D = 6$ V $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}\text{C}$			150	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}\text{C}$			2	μs
t_q	turn-off time	$I_G = 0.5$ A; $di_G/dt = 0.5$ A/ μs					
		$V_R = 100$ V; $I_T = 400$ A; $V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 125^{\circ}\text{C}$ $di/dt = 10$ A/ μs $dv/dt = 50$ V/ μs $t_p = 200$ μs			350		μs

Package SimBus F		Ratings				
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			tdb	A
T_{VJ}	virtual junction temperature		-40		140	°C
T_{op}	operation temperature		-40		125	°C
T_{stg}	storage temperature		-40		125	°C
Weight				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	3600			V


Part description

- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 400 = Current Rating [A]
- PD = Phase leg
- 1600 = Reverse Voltage [V]
- PT = PressFit-Pin, Thermistor
- SF = SimBus F
- = Hyphen
- PC = Phase Change Material

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA400PD1600PTSF	MCMA400PD1600PTSF	Blister	24	522726
Alternative	MCMA400PD1600PTSF-PC	MCMA400PD1600PTSF	Blister	24	522719

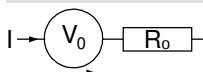
Similar Part	Package	Voltage class
MCMA280PD1600PTSF	SimBus F	1600
MCMA550PD1600PTSF	SimBus F	1600

Temperature Sensor NTC

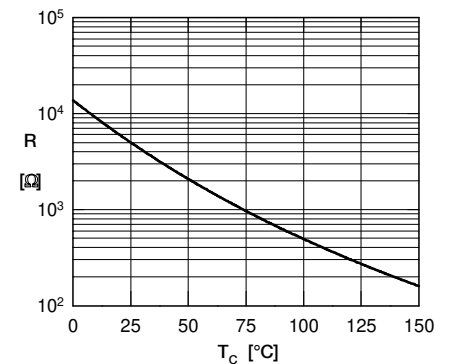
Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	resistance	$T_{VJ} = 25^\circ$	4.85	5	5.15	kΩ
$B_{25/50}$	temperature coefficient			3375		K

Equivalent Circuits for Simulation

* on die level

 $T_{VJ} = 140^\circ\text{C}$

Thyristor

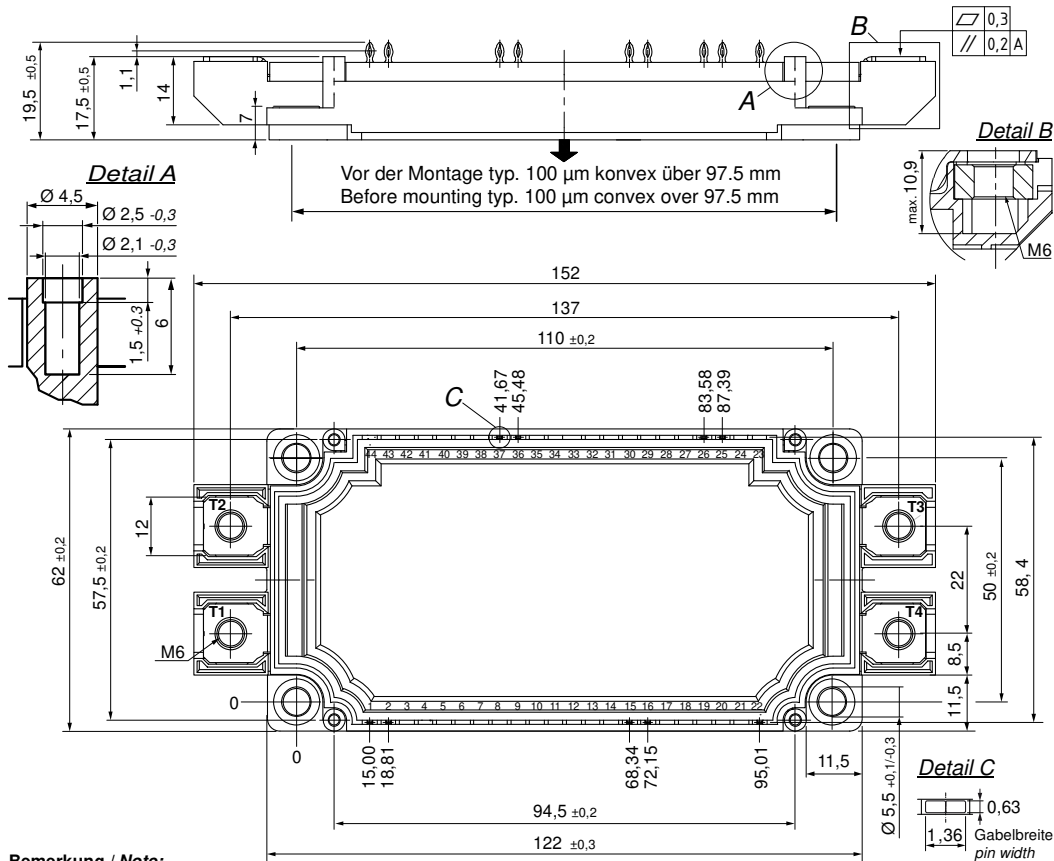
$V_{0\ max}$	threshold voltage	0.82				V
$R_{0\ max}$	slope resistance *	0.43				mΩ



Typ. NTC resistance vs. temperature



Outlines SimBus F

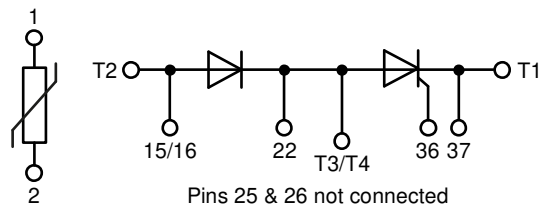


Bemerkung / Note:

- 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 μ m)
- Beschichtung / Plating: chem. Sn max. 15 μ 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 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**



Thyristor

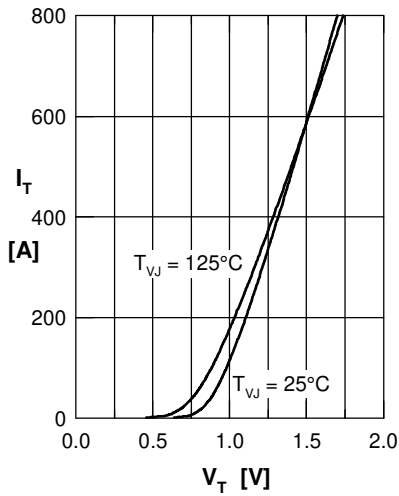


Fig. 1 Forward characteristics

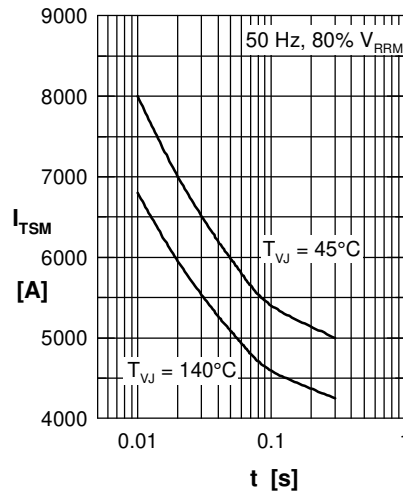


Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

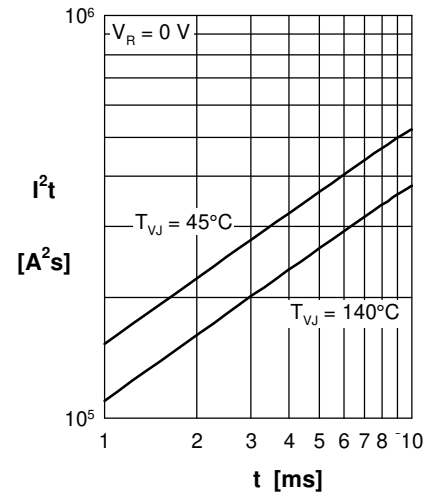


Fig. 3 I^2t versus time (1-10 s)

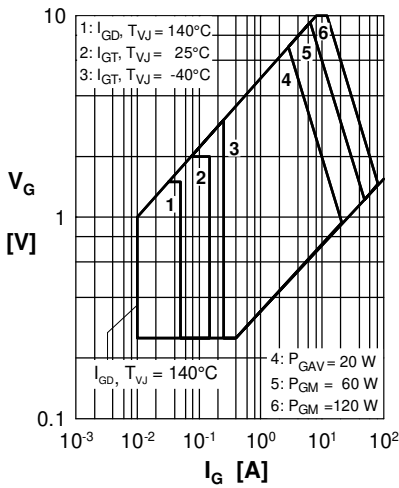


Fig. 4 Gate voltage & gate current

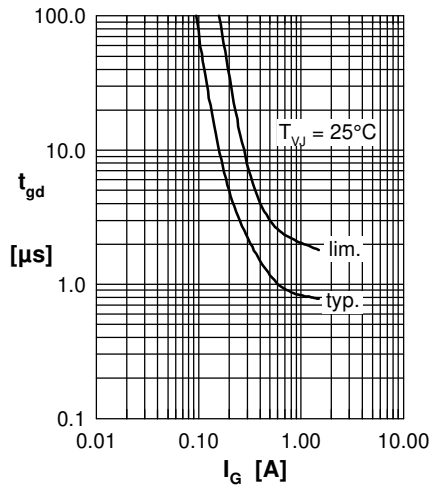


Fig. 5 Gate controlled delay time t_{gd}

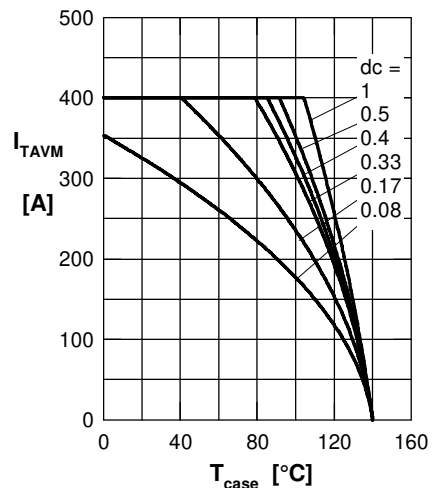


Fig. 6 Max. forward current at case temperature

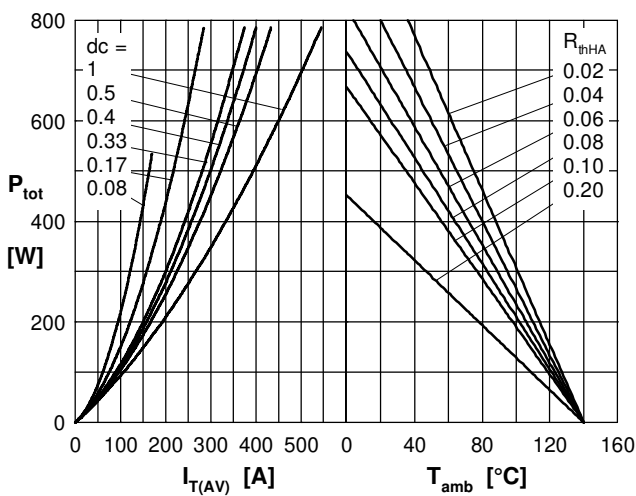


Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature

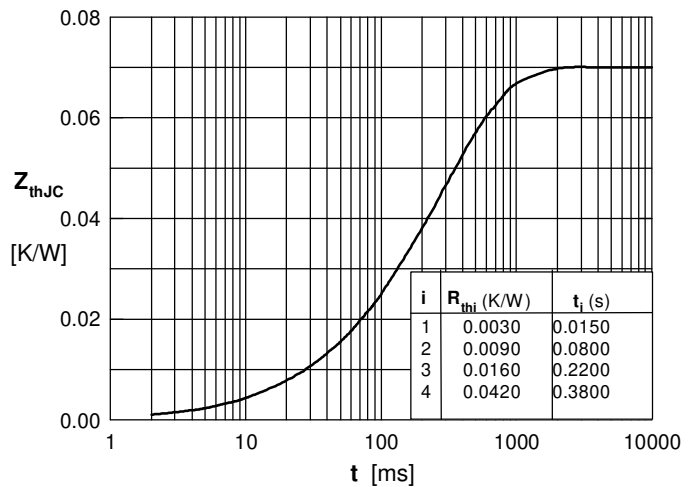


Fig. 8 Transient thermal impedance junction to case