

Thyristor \ Diode Module

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

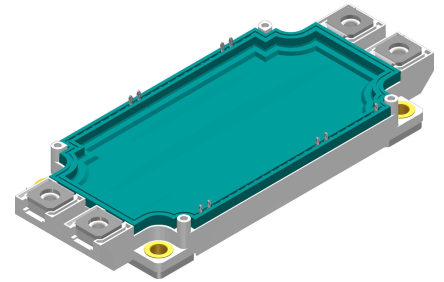
$$I_{TAV} = 400 \text{ A}$$

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


Phase leg + NTC

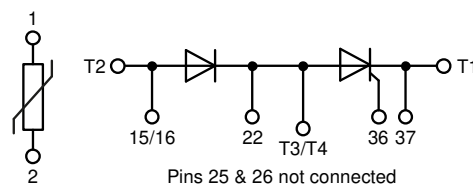
Part number

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

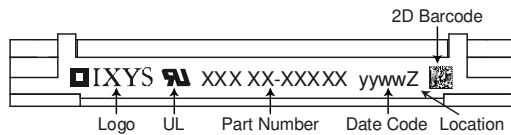
- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- PressFit-Pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

Disclaimer Notice

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.

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					0.82	V
r_T	slope resistance	} for power loss calculation only				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	$V_D = \frac{1}{2} V_{DRM}$ $I_G = 0.5$ A; $di_G/dt = 0.5$ A/ μs	$T_{VJ} = 25^{\circ}\text{C}$			2	μs
t_q	turn-off time	$V_R = 100$ V; $I_T = 400$ A; $V = \frac{2}{3} V_{DRM}$ $di/dt = 10$ A/ μs $dv/dt = 50$ V/ μs $t_p = 200$ μs	$T_{VJ} = 125^{\circ}\text{C}$		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

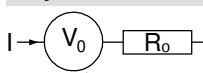
- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 400 = Current Rating [A]
- PD = Phase leg
- 1600 = Reverse Voltage [V]
- PT = PressFit-Pin, Thermistor
- SF = SimBus F
- = Hyphen
- PC = Phase Change Material

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

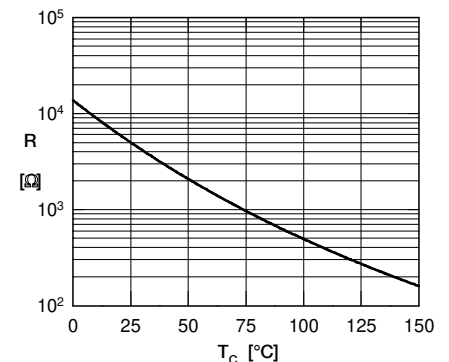
Similar Part	Package	Voltage class
MCMA280PD1600PTSF	SimBus F	1600
MCMA550PD1600PTSF	SimBus F	1600

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

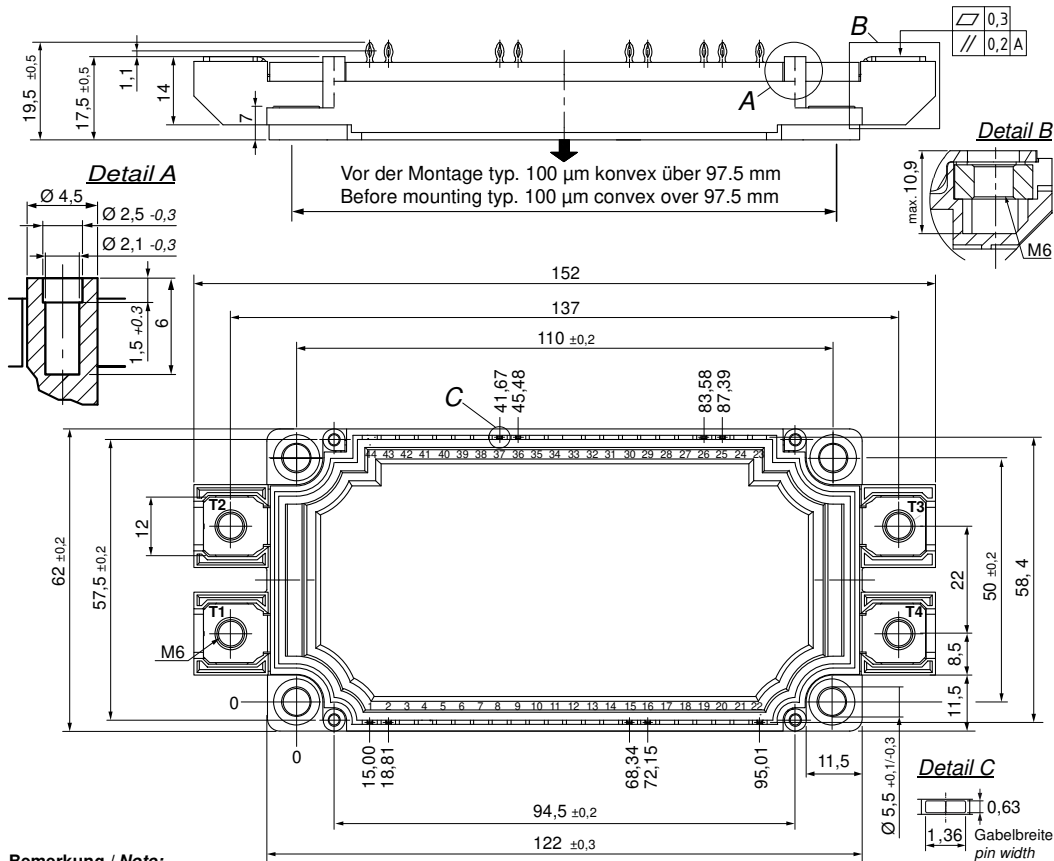
$V_{0\max}$	threshold voltage	0.82				V
$R_{0\max}$	slope resistance *	0.43				mΩ



Typ. NTC resistance vs. temperature



Outlines SimBus F

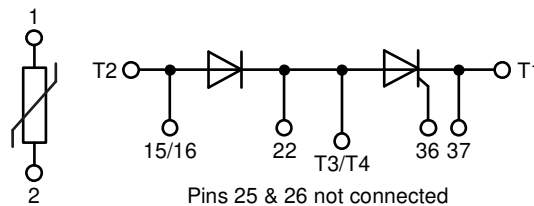


Bemerkung / Note:

- 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 μm)
- Beschichtung / Plating: chem. Sn max. 15 μm
- 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

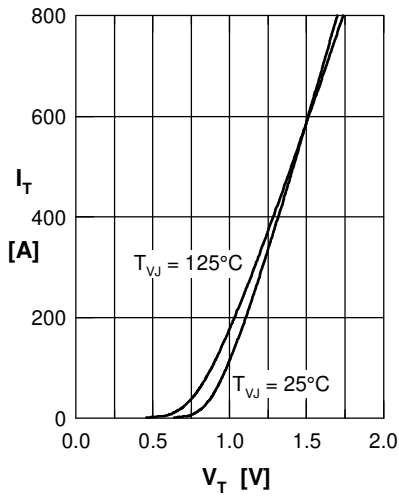


Fig. 1 Forward characteristics

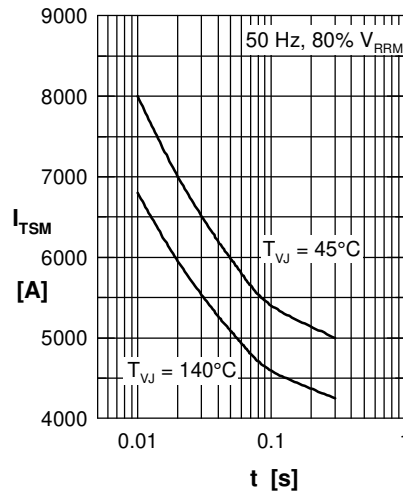


Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

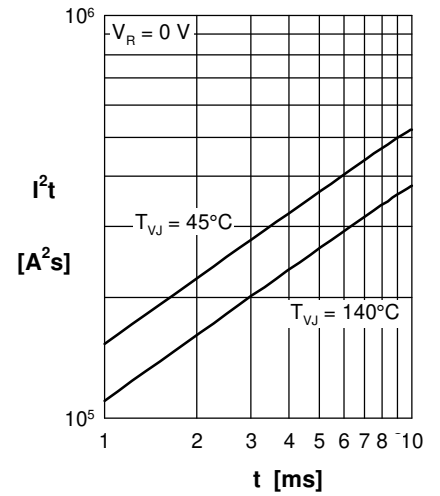


Fig. 3 I^2t versus time (1-10 s)

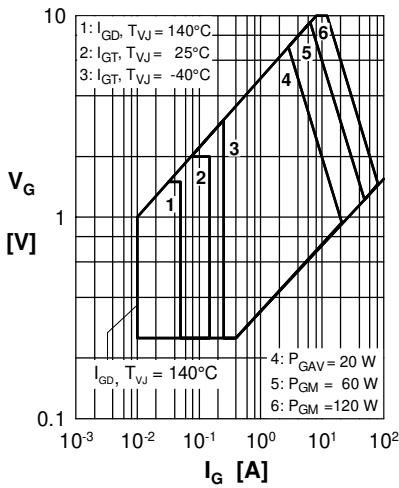


Fig. 4 Gate voltage & gate current

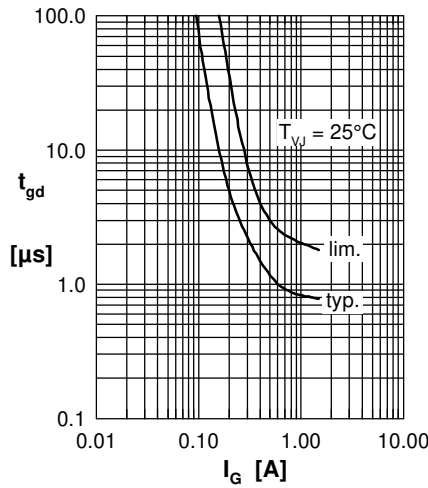


Fig. 5 Gate controlled delay time t_{gd}

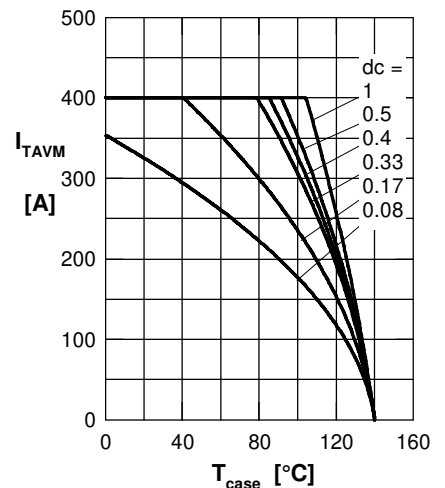


Fig. 6 Max. forward current at case temperature

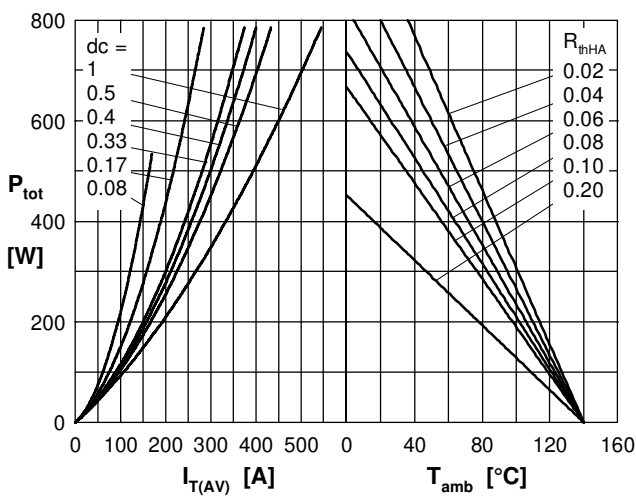


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature

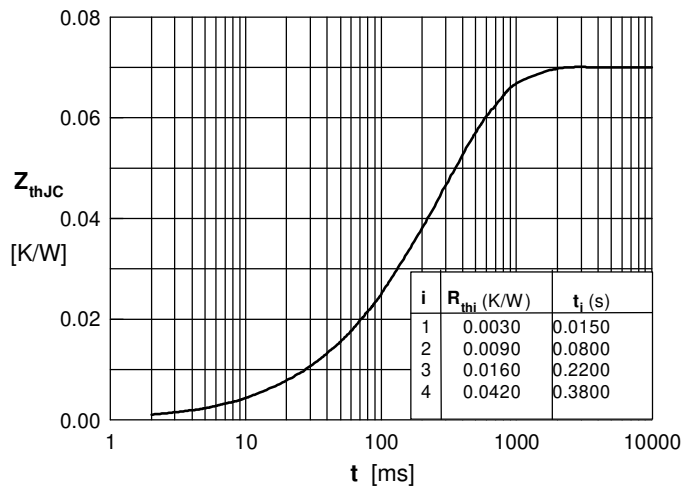


Fig. 8 Transient thermal impedance junction to case