

# Thyristor \ Diode Module

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

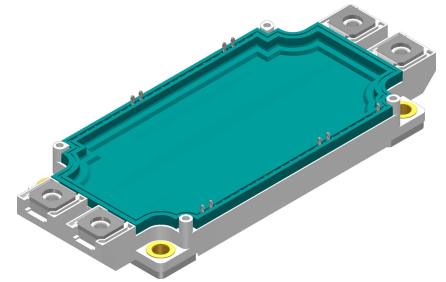
$$I_{TAV} = 550 \text{ A}$$

$$V_T = 1.27 \text{ V}$$

Phase leg + NTC

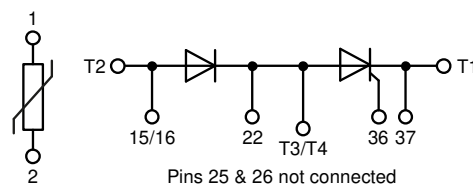
Part number

**MCMA550PD1600PTSF**



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

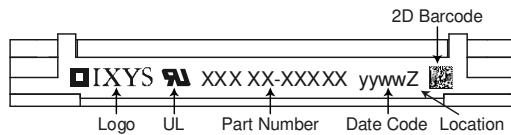
- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- PressFit-Pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

### 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](http://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	$T_{VJ} = 25^{\circ}\text{C}$			400	$\mu\text{A}$
		$V_{R/D} = 1600$ V	$T_{VJ} = 140^{\circ}\text{C}$			30	mA
$V_T$	forward voltage drop	$I_T = 550$ A	$T_{VJ} = 25^{\circ}\text{C}$			1.29	V
		$I_T = 1100$ A				1.66	V
		$I_T = 550$ A	$T_{VJ} = 125^{\circ}\text{C}$			1.27	V
		$I_T = 1100$ A				1.72	V
$I_{TAV}$	average forward current	$T_C = 85^{\circ}\text{C}$	$T_{VJ} = 140^{\circ}\text{C}$			550	A
$I_{T(RMS)}$	RMS forward current	sine $180^{\circ}$ $d = 0.5$				865	A
$V_{T0}$	threshold voltage	} for power loss calculation only		$T_{VJ} = 140^{\circ}\text{C}$		0.82	V
$r_T$	slope resistance					0.8	$\text{m}\Omega$
$R_{thJC}$	thermal resistance junction to case					0.05	K/W
$R_{thCH}$	thermal resistance case to heatsink				0.03		K/W
$P_{tot}$	total power dissipation			$T_C = 25^{\circ}\text{C}$		1150	W
$I_{TSM}$	max. forward surge current	$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}\text{C}$			13.0	kA
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			14.0	kA
		$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 140^{\circ}\text{C}$			11.1	kA
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			11.9	kA
$I^2t$	value for fusing	$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}\text{C}$			845.0	$\text{kA}^2\text{s}$
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			820.0	$\text{kA}^2\text{s}$
		$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 140^{\circ}\text{C}$			610.5	$\text{kA}^2\text{s}$
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			592.6	$\text{kA}^2\text{s}$
$C_J$	junction capacitance	$V_R = 400$ V $f = 1$ MHz	$T_{VJ} = 25^{\circ}\text{C}$		647		pF
$P_{GM}$	max. gate power dissipation	$t_p = 30$ $\mu\text{s}$	$T_C = 140^{\circ}\text{C}$			240	W
		$t_p = 300$ $\mu\text{s}$				120	W
$P_{GAV}$	average gate power dissipation					40	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}\text{C}; f = 50$ Hz      repetitive, $I_T = 1650$ A				100	$\text{A}/\mu\text{s}$
		$t_p = 200$ $\mu\text{s}; di_G/dt = 0.45$ $\text{A}/\mu\text{s}; I_G = 0.45$ A; $V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 550$ A				500	$\text{A}/\mu\text{s}$
$(dv/dt)_{cr}$	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	$\text{V}/\mu\text{s}$
$V_{GT}$	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	$T_{VJ} = 25^{\circ}\text{C}$			300	mA
			$T_{VJ} = -40^{\circ}\text{C}$			440	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					20	mA
$I_L$	latching current	$t_p = 30$ $\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$			400	mA
		$I_G = 0.45$ A; $di_G/dt = 0.45$ $\text{A}/\mu\text{s}$					
$I_H$	holding current	$V_D = 6$ V $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}\text{C}$			300	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$ $I_G = 0.5$ A; $di_G/dt = 0.5$ $\text{A}/\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$			2	$\mu\text{s}$
$t_q$	turn-off time	$V_R = 100$ V; $I_T = 550$ A; $V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 125^{\circ}\text{C}$			300		$\mu\text{s}$
							$di/dt = 10$ $\text{A}/\mu\text{s}$ $dv/dt = 50$ $\text{V}/\mu\text{s}$ $t_p = 200$ $\mu\text{s}$

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
<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	3600			V


**Part description**

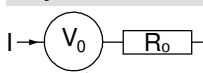
- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 550 = Current Rating [A]
- PD = Phase leg
- 1600 = Reverse Voltage [V]
- PT = PressFit-Pin, Thermistor
- SF = SimBus F
- = Hyphen
- PC = Phase Change Material

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA550PD1600PTSF	MCMA550PD1600PTSF	Blister	24	520868
Alternative	MCMA550PD1600PTSF-PC	MCMA550PD1600PTSF	Blister	24	

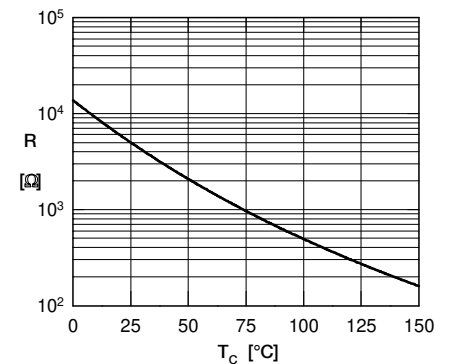
Similar Part	Package	Voltage class
MCMA280PD1600PTSF	SimBus F	1600
MCMA400PD1600PTSF	SimBus F	1600

**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

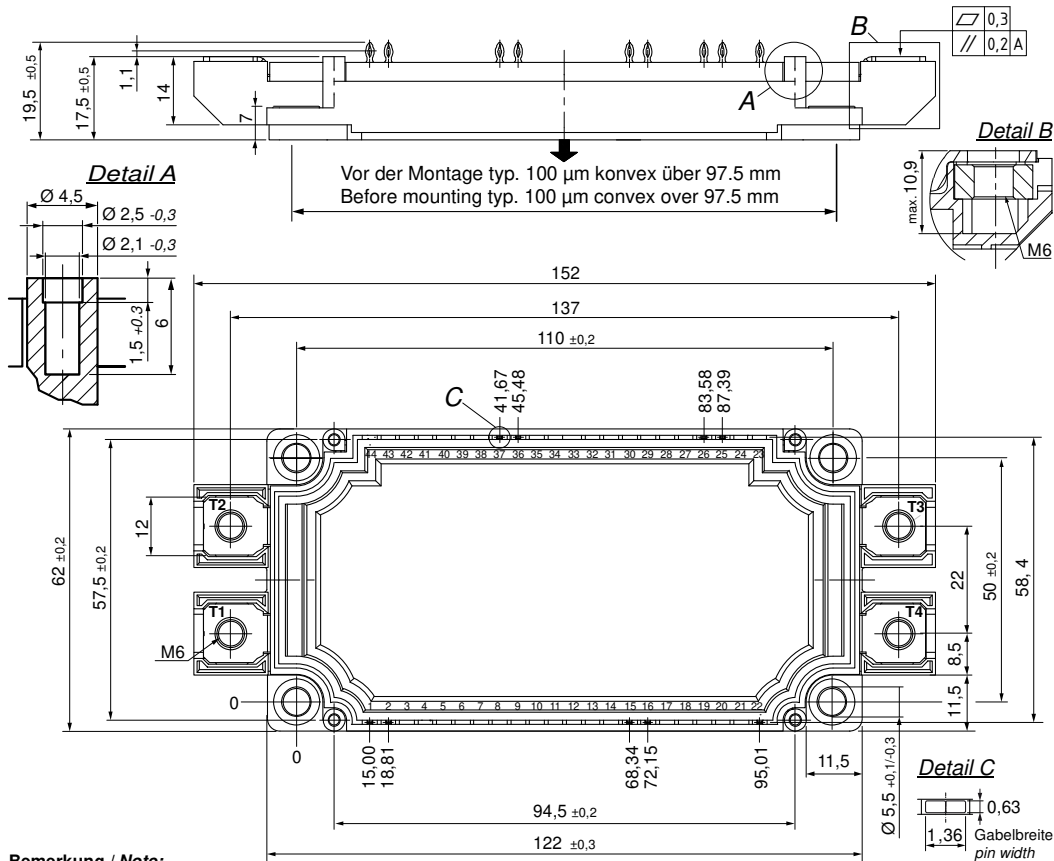
**Equivalent Circuits for Simulation**
*\* on die level*
 $T_{VJ} = 140^\circ\text{C}$ 

**Thyristor**

$V_{0\ max}$	threshold voltage	0.82				V
$R_{0\ max}$	slope resistance *	0.28				mΩ





**Outlines SimBus F**

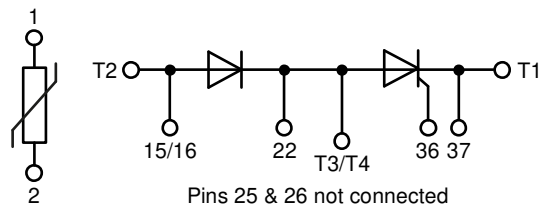


**Bemerkung / Note:**

- 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**



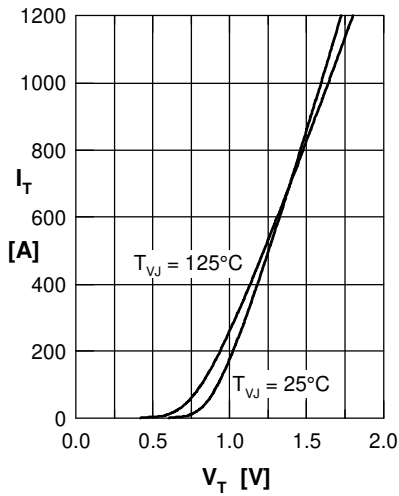
**Thyristor**


Fig. 1 Forward characteristics

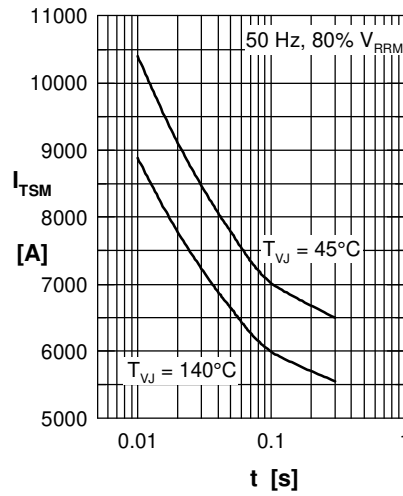
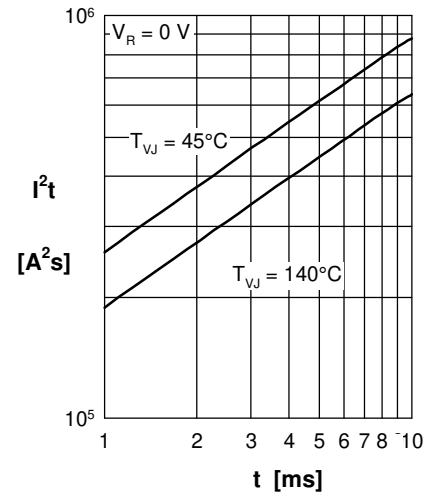
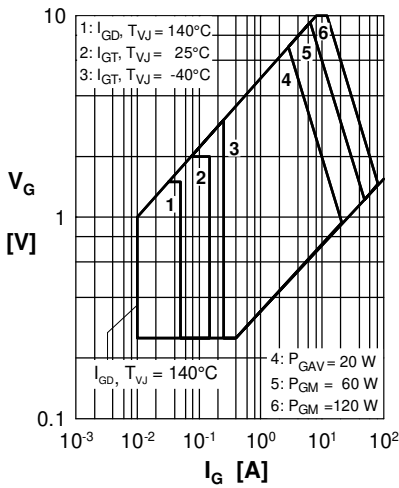

 Fig. 2 Surge overload current  
 $I_{TSM}$ : crest value,  $t$ : duration

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


Fig. 4 Gate voltage &amp; gate current

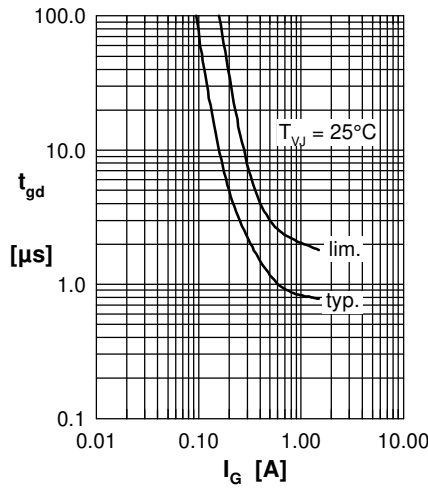
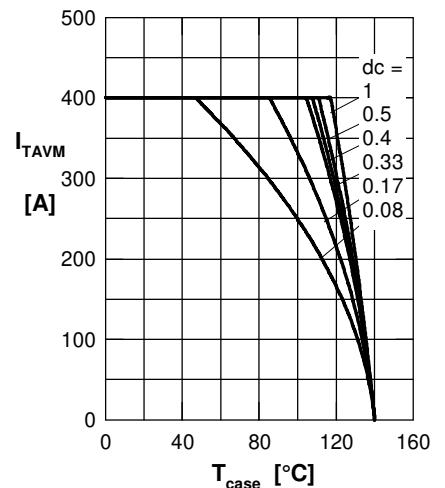

 Fig. 5 Gate controlled delay time  $t_{gd}$ 


Fig. 6 Max. forward current at case temperature

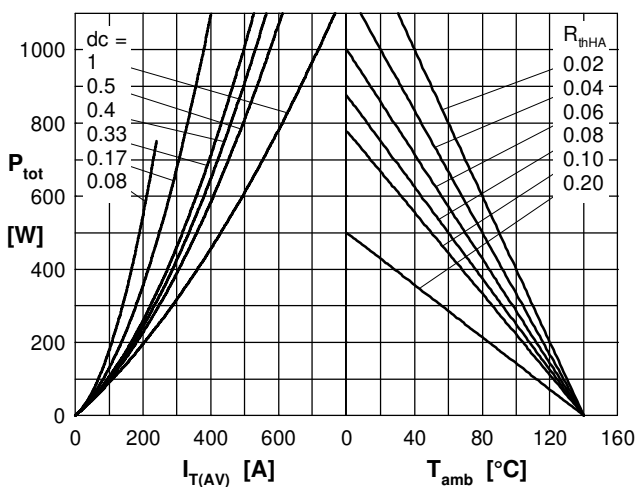
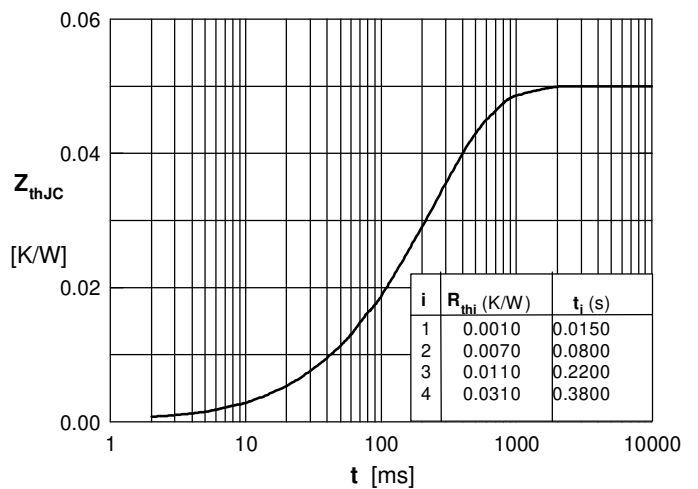

 Fig. 7a Power dissipation versus direct output current  
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case