

Thyristor \ Diode Module

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

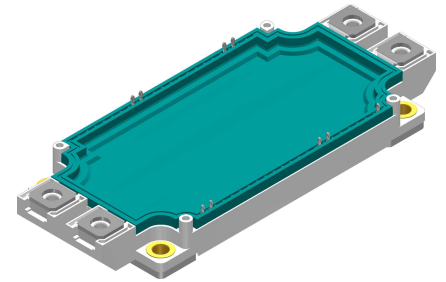
$$I_{TAV} = 550 \text{ A}$$

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

Phase leg + NTC

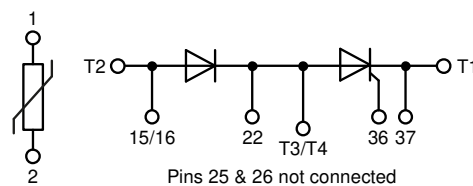
Part number

MCMA550PD1600PTSF



Backside: isolated

 E72873



Features / Advantages:

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

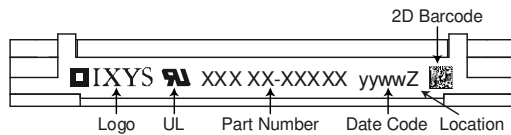
- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- PressFit-Pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

Disclaimer Notice

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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 | $T_{VJ} = 25^{\circ}\text{C}$ | | | 400 | μA |
| | | $V_{R/D} = 1600$ 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° $d = 0.5$ | | | | 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 | m Ω |
| 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 | kA ² s |
| | | $t = 8,3$ ms; (60 Hz), sine | $V_R = 0$ V | | | 820.0 | kA ² s |
| | | $t = 10$ ms; (50 Hz), sine | $T_{VJ} = 140^{\circ}\text{C}$ | | | 610.5 | kA ² s |
| | | $t = 8,3$ ms; (60 Hz), sine | $V_R = 0$ V | | | 592.6 | kA ² 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 | $t_p = 30$ μs | $T_C = 140^{\circ}\text{C}$ | | | 240 | W |
| | | $t_p = 300$ μs | | | | 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 | 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., $I_T = 550$ A | | | | 500 | A/ μs |
| $(dv/dt)_{cr}$ | critical rate of rise of voltage | $V = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 140^{\circ}\text{C}$ | | | 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 | $T_{VJ} = 25^{\circ}\text{C}$ | | | 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 | $t_p = 30$ μs | $T_{VJ} = 25^{\circ}\text{C}$ | | | 400 | mA |
| | | $I_G = 0.45$ A; $di_G/dt = 0.45$ A/ μs | | | | | |
| I_H | holding current | $V_D = 6$ V $R_{GK} = \infty$ | $T_{VJ} = 25^{\circ}\text{C}$ | | | 300 | 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 | $V_R = 100$ V; $I_T = 550$ A; $V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 125^{\circ}\text{C}$ | | | 300 | | μs |
| | | $di/dt = 10$ A/ μs $dv/dt = 50$ V/ μs $t_p = 200$ μs | | | | | |

| Package SimBus F | | Ratings | | | | |
|------------------|--|----------------------|------|------|------|------|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| I_{RMS} | RMS current | per terminal | | | tbd | 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

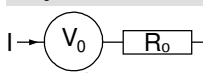
- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 550 = Current Rating [A]
- PD = Phase leg
- 1600 = Reverse Voltage [V]
- PT = PressFit-Pin, Thermistor
- SF = SimBus F
- = Hyphen
- PC = Phase Change Material

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

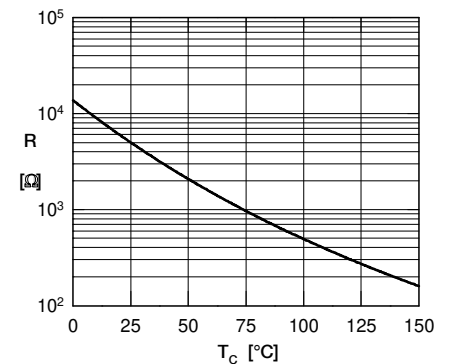
| Similar Part | Package | Voltage class |
|-------------------|----------|---------------|
| MCMA280PD1600PTSF | SimBus F | 1600 |
| MCMA400PD1600PTSF | SimBus F | 1600 |

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

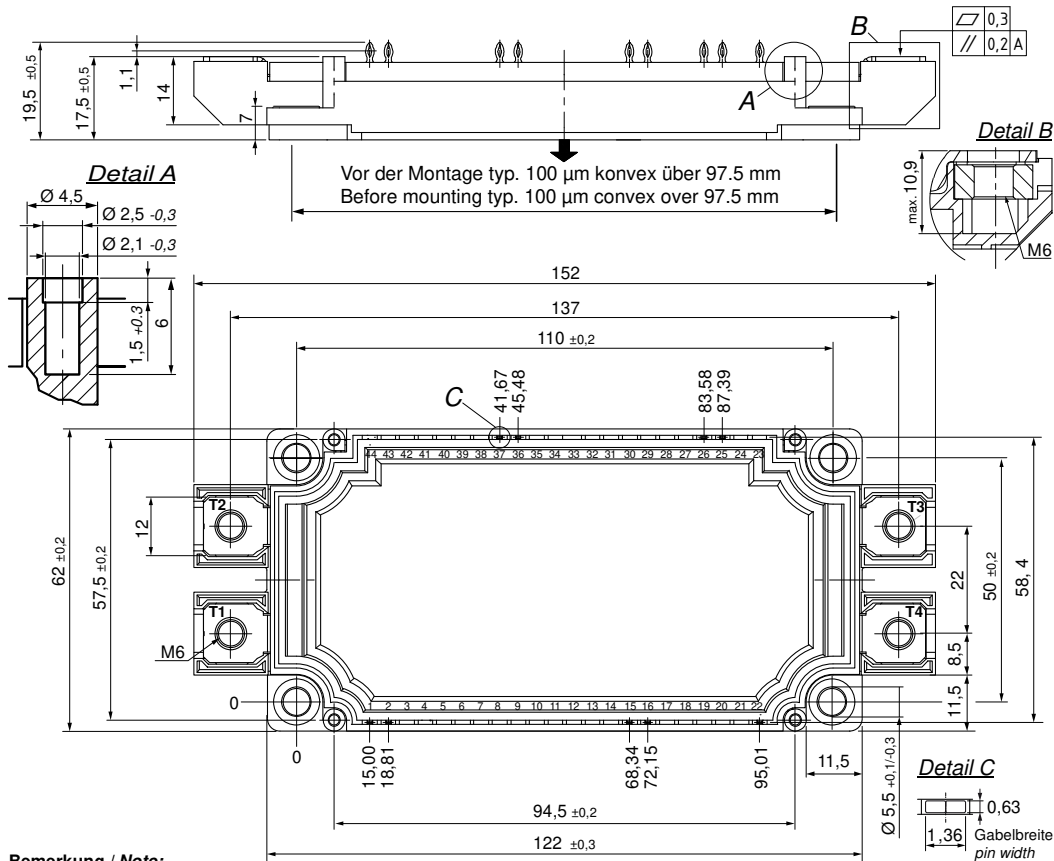
| | | | | | | |
|--------------|--------------------|------|--|--|--|----|
| $V_{0\ max}$ | threshold voltage | 0.82 | | | | V |
| $R_{0\ max}$ | slope resistance * | 0.28 | | | | mΩ |



Typ. NTC resistance vs. temperature



Outlines SimBus F

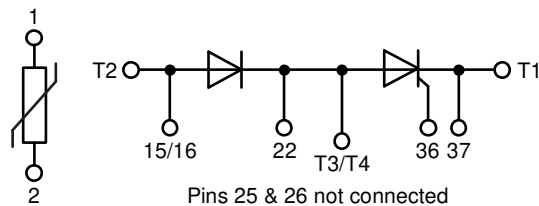


Bemerkung / Note:

- 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**



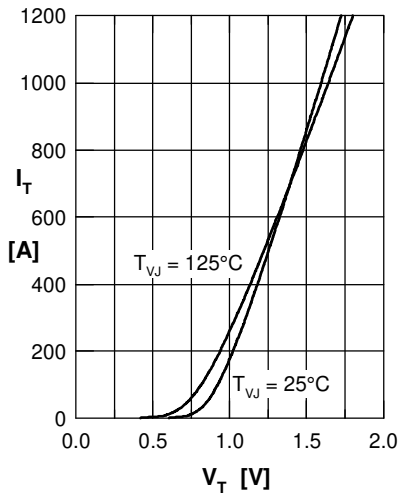
Thyristor


Fig. 1 Forward characteristics

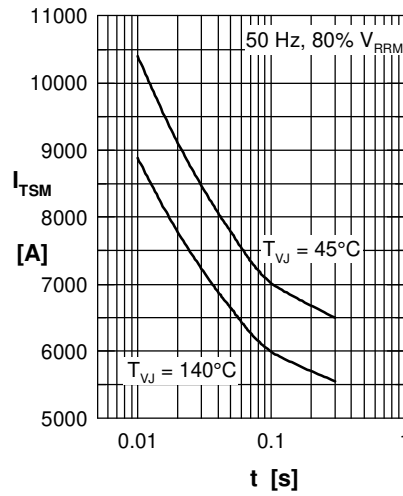
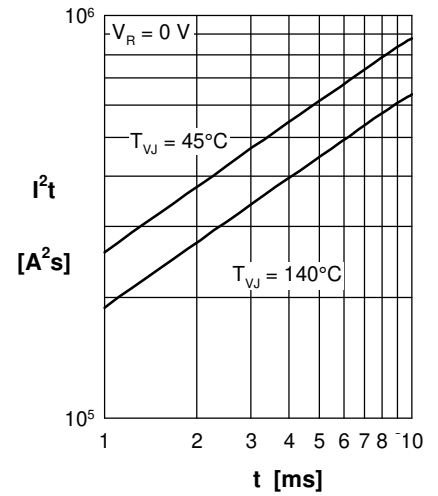
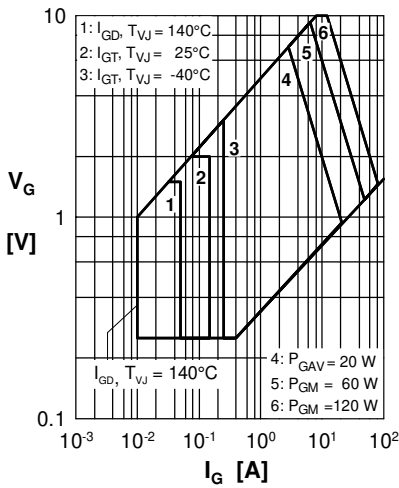

 Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

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


Fig. 4 Gate voltage & gate current

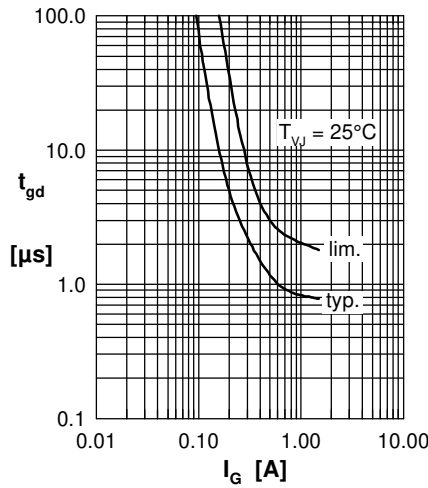
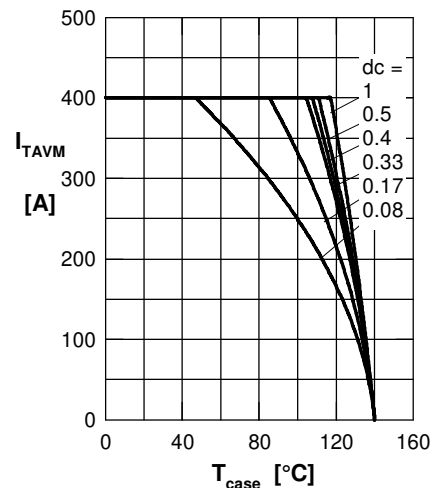

 Fig. 5 Gate controlled delay time t_{gd}


Fig. 6 Max. forward current at case temperature

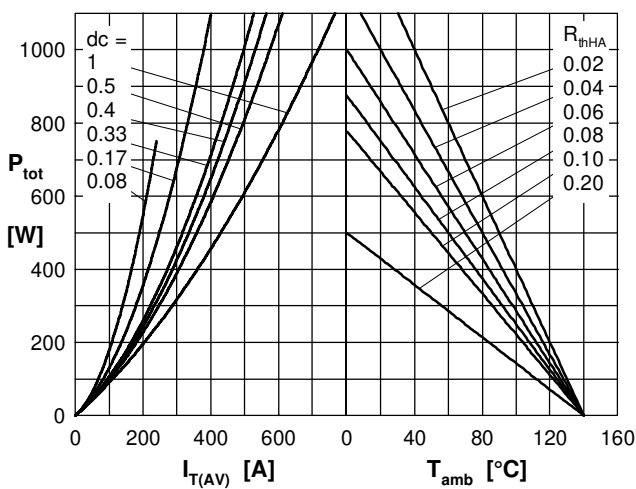
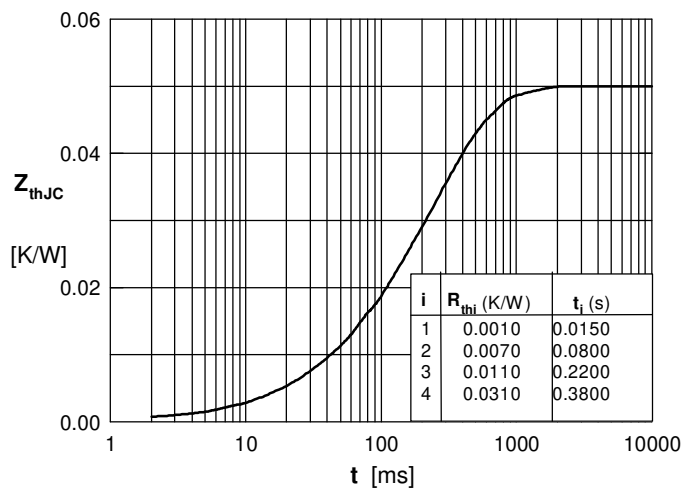

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case