

Thyristor

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

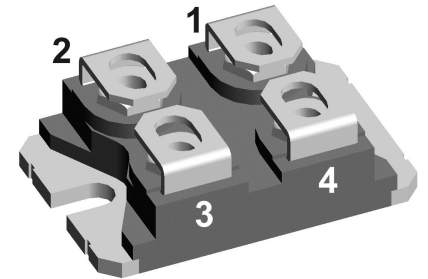
$$I_{TAV} = 57 \text{ A}$$

$$V_T = 1.2 \text{ V}$$


Single Thyristor

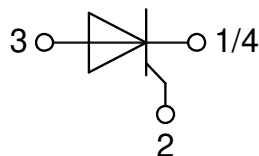
Part number

MCO50-16io1



Backside: isolated

 E72873



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability

Applications:

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

Package: SOT-227B (minibloc)

- Isolation Voltage: 3000 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Base plate: Copper internally DCB isolated
- Advanced power cycling

Disclaimer Notice

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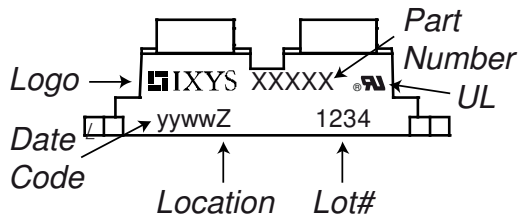
| Thyristor | | | Ratings | | | |
|----------------|--|--|--------------------------------|------|------|-------------------|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| $V_{RSM/DSM}$ | max. non-repetitive reverse/forward blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$ | | | 1700 | V |
| $V_{RRM/DRM}$ | max. repetitive reverse/forward blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$ | | | 1600 | V |
| I_{RD} | reverse current, drain current | $V_{R/D} = 1600\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 50 | μA |
| | | $V_{R/D} = 1600\text{ V}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 3 | mA |
| V_T | forward voltage drop | $I_T = 50\text{ A}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 1.27 | V |
| | | $I_T = 100\text{ A}$ | | | 1.53 | V |
| | | $I_T = 50\text{ A}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 1.20 | V |
| | | $I_T = 100\text{ A}$ | | | 1.50 | V |
| I_{TAV} | average forward current | $T_C = 80^{\circ}\text{C}$ | $T_{VJ} = 150^{\circ}\text{C}$ | | 57 | A |
| $I_{T(RMS)}$ | RMS forward current | 180° sine | | | 90 | A |
| V_{T0} | threshold voltage | } for power loss calculation only | $T_{VJ} = 150^{\circ}\text{C}$ | | 0.88 | V |
| r_T | slope resistance | | | | 6 | m Ω |
| R_{thJC} | thermal resistance junction to case | | | | 0.72 | K/W |
| R_{thCH} | thermal resistance case to heatsink | | | 0.2 | | K/W |
| P_{tot} | total power dissipation | | $T_C = 25^{\circ}\text{C}$ | | 170 | W |
| I_{TSM} | max. forward surge current | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}\text{C}$ | | 740 | A |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 800 | A |
| | | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 150^{\circ}\text{C}$ | | 630 | A |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 680 | A |
| I^2t | value for fusing | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}\text{C}$ | | 2.74 | kA ² s |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 2.66 | kA ² s |
| | | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 150^{\circ}\text{C}$ | | 1.99 | kA ² s |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 1.93 | kA ² s |
| C_J | junction capacitance | $V_R = 400\text{ V } f = 1\text{ MHz}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 32 | pF |
| P_{GM} | max. gate power dissipation | $t_p = 30\text{ }\mu\text{s}$ | $T_C = 150^{\circ}\text{C}$ | | 10 | W |
| | | $t_p = 300\text{ }\mu\text{s}$ | | | 1 | W |
| P_{GAV} | average gate power dissipation | | | | 0.5 | W |
| $(di/dt)_{cr}$ | critical rate of rise of current | $T_{VJ} = 150^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 150\text{ A}$ | | | 100 | A/ μs |
| | | $t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.3\text{ A}/\mu\text{s};$ $I_G = 0.3\text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 50\text{ A}$ | | | 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) | $T_{VJ} = 150^{\circ}\text{C}$ | | 1000 | V/ μs |
| V_{GT} | gate trigger voltage | $V_D = 6\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 1.4 | V |
| | | | $T_{VJ} = -40^{\circ}\text{C}$ | | 1.6 | V |
| I_{GT} | gate trigger current | $V_D = 6\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 80 | mA |
| | | | $T_{VJ} = -40^{\circ}\text{C}$ | | 200 | mA |
| V_{GD} | gate non-trigger voltage | $V_D = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 150^{\circ}\text{C}$ | | 0.2 | V |
| I_{GD} | gate non-trigger current | | | | 5 | mA |
| I_L | latching current | $t_p = 10\text{ }\mu\text{s}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 450 | mA |
| | | $I_G = 0.3\text{ A}; di_G/dt = 0.3\text{ A}/\mu\text{s}$ | | | | |
| I_H | holding current | $V_D = 6\text{ V } R_{GK} = \infty$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 100 | mA |
| t_{gd} | gate controlled delay time | $V_D = \frac{1}{2} V_{DRM}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 2 | μs |
| | | $I_G = 0.3\text{ A}; di_G/dt = 0.3\text{ A}/\mu\text{s}$ | | | | |
| t_q | turn-off time | $V_R = 100\text{ V}; I_T = 50\text{ A}; V = \frac{2}{3} V_{DRM}$ $di/dt = 10\text{ A}/\mu\text{s } dv/dt = 15\text{ V}/\mu\text{s } t_p = 200\text{ }\mu\text{s}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 150 | μs |



| Package SOT-227B (minibloc) | | Ratings | | | | |
|-----------------------------|--|----------------------------|-------------------------------------|------|------|------|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| I_{RMS} | RMS current | per terminal ¹⁾ | | | 150 | A |
| T_{VJ} | virtual junction temperature | | -40 | | 150 | °C |
| T_{op} | operation temperature | | -40 | | 125 | °C |
| T_{stg} | storage temperature | | -40 | | 150 | °C |
| Weight | | | | 30 | | g |
| M_D | mounting torque | | 1.1 | | 1.5 | Nm |
| M_T | terminal torque | | 1.1 | | 1.5 | Nm |
| $d_{Spp/App}$ | creepage distance on surface striking distance through air | terminal to terminal | 10.5 | 3.2 | | mm |
| $d_{Spb/Apb}$ | | terminal to backside | 8.6 | 6.8 | | mm |
| V_{ISOL} | isolation voltage | t = 1 second | | | 3000 | V |
| | | t = 1 minute | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA | | 2500 | V |

¹⁾ I_{RMS} is typically limited by the pin-to-chip resistance (1); or by the current capability of the chip (2). In case of (1) and a product with multiple pins for one chip-potential, the current capability can be increased by connecting the pins as one contact.

Product Marking

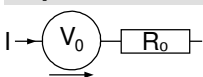


| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MCO50-16io1 | MCO50-16io1 | Tube | 10 | 500598 |

Equivalent Circuits for Simulation

* on die level

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

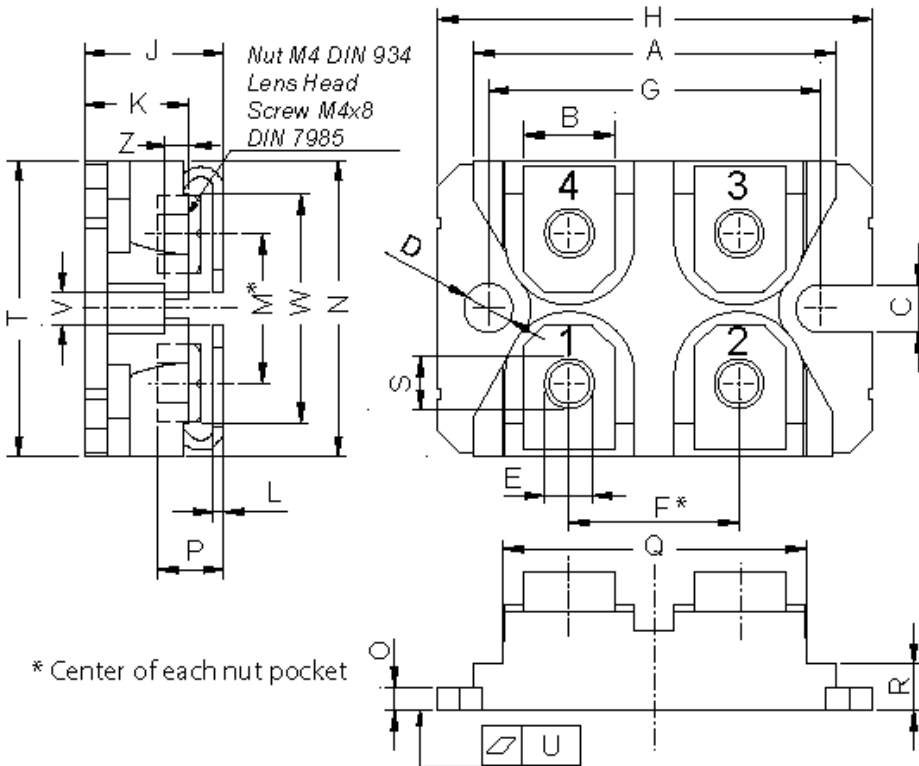


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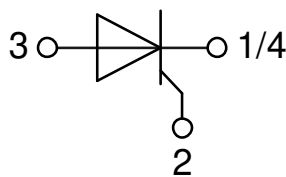
| | | | |
|--------------|--------------------|------|----|
| $V_{0\ max}$ | threshold voltage | 0.88 | V |
| $R_{0\ max}$ | slope resistance * | 4.1 | mΩ |



Outlines SOT-227B (minibloc)



| Dim. | Millimeter | | Inches | |
|------|------------|-------|--------|-------|
| | min | max | min | max |
| A | 31.50 | 31.88 | 1.240 | 1.255 |
| B | 7.80 | 8.20 | 0.307 | 0.323 |
| C | 4.09 | 4.29 | 0.161 | 0.169 |
| D | 4.09 | 4.29 | 0.161 | 0.169 |
| E | 4.09 | 4.29 | 0.161 | 0.169 |
| F | 14.91 | 15.11 | 0.587 | 0.595 |
| G | 30.12 | 30.30 | 1.186 | 1.193 |
| H | 37.80 | 38.23 | 1.488 | 1.505 |
| J | 11.68 | 12.22 | 0.460 | 0.481 |
| K | 8.92 | 9.60 | 0.351 | 0.378 |
| L | 0.74 | 0.84 | 0.029 | 0.033 |
| M | 12.50 | 13.10 | 0.492 | 0.516 |
| N | 25.15 | 25.42 | 0.990 | 1.001 |
| O | 1.95 | 2.13 | 0.077 | 0.084 |
| P | 4.95 | 6.20 | 0.195 | 0.244 |
| Q | 26.54 | 26.90 | 1.045 | 1.059 |
| R | 3.94 | 4.42 | 0.155 | 0.167 |
| S | 4.55 | 4.85 | 0.179 | 0.191 |
| T | 24.59 | 25.25 | 0.968 | 0.994 |
| U | -0.05 | 0.10 | -0.002 | 0.004 |
| V | 3.20 | 5.50 | 0.126 | 0.217 |
| W | 19.81 | 21.08 | 0.780 | 0.830 |
| Z | 2.50 | 2.70 | 0.098 | 0.106 |



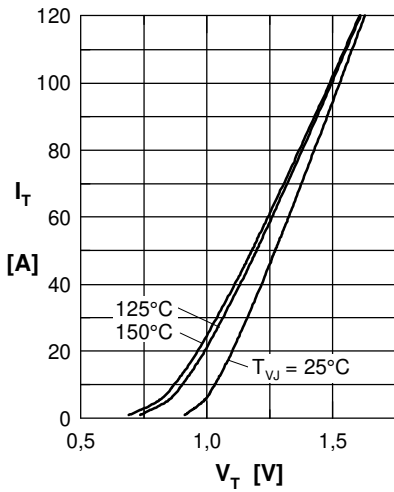
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Fig. 1 Forward characteristics

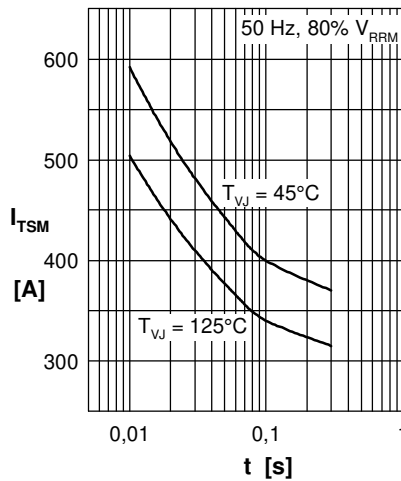


Fig. 2 Surge overload current

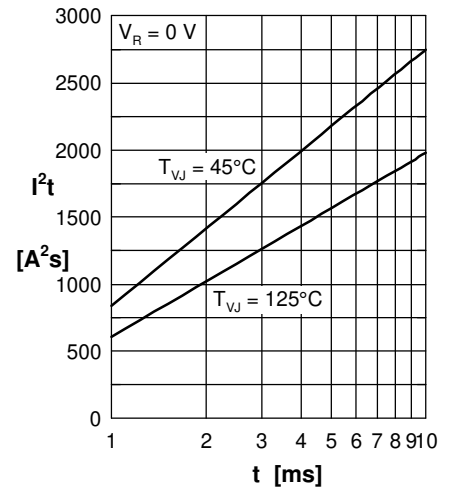
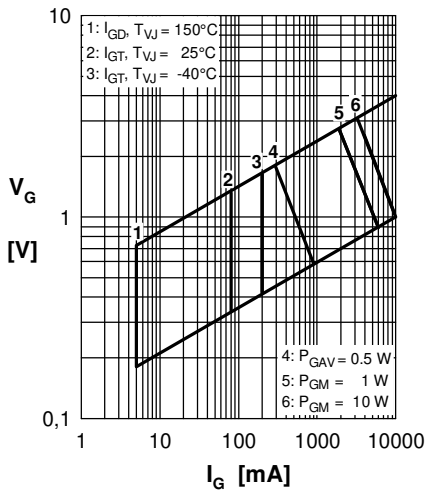

 Fig. 3 I^2t versus time (1-10 ms)


Fig. 4 Gate trigger characteristics

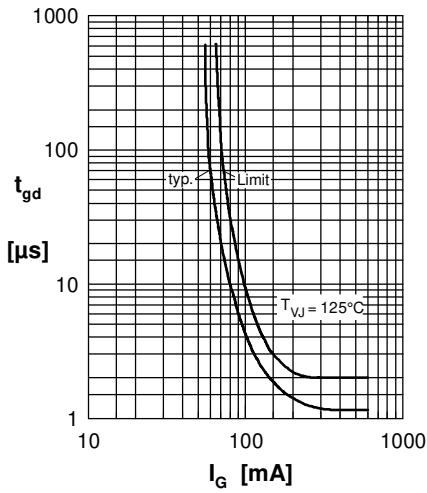


Fig. 5 Gate controlled delay time

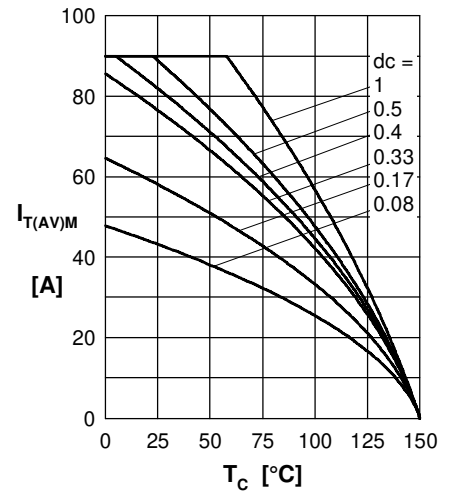


Fig. 6 Max. forward current at case temperature

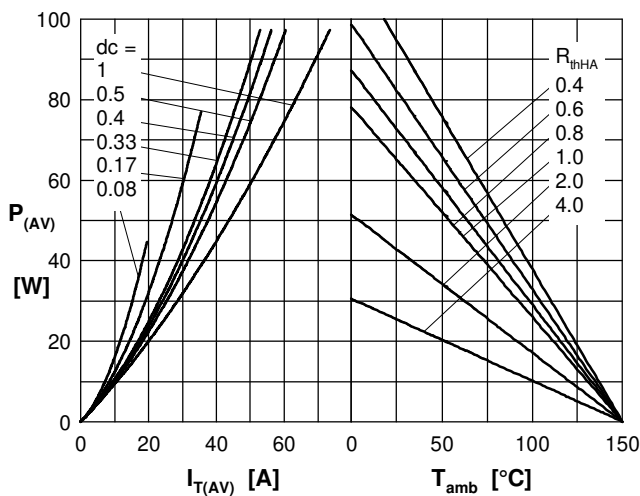
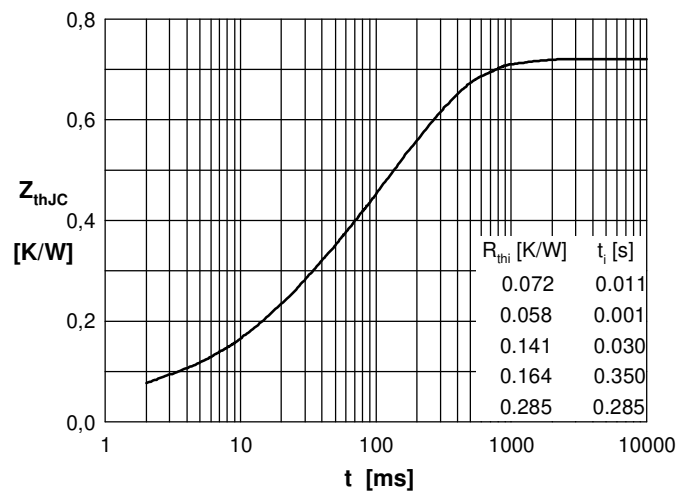

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case