

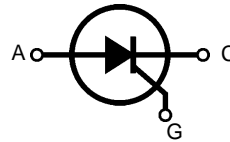
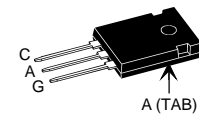
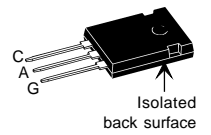
# Phase Control Thyristor

$$V_{RRM} = 800-1600 \text{ V}$$

$$I_{T(RMS)} = 75 \text{ A}$$

$$I_{T(AV)M} = 48 \text{ A}$$

| $V_{RSM}$ | $V_{RRM}$ | Type                     |
|-----------|-----------|--------------------------|
| $V_{DSM}$ | $V_{DRM}$ |                          |
| V         | V         |                          |
| 900       | 800       | CS 45-08io1              |
| 1300      | 1200      | CS 45-12io1              |
| 1700      | 1600      | CS 45-16io1 CS 45-16io1R |


**TO-247 AD**  
Version io1

**ISOPLUS 247™**  
Version io1R


\* Patent pending

C = Cathode, A = Anode, G = Gate

| Symbol         | Conditions  | Maximum Ratings                    |                       |
|----------------|---|------------------------------------|-----------------------|
| $I_{T(RMS)}$   | $T_{VJ} = T_{VJM}$                                  | 75                                 | A                     |
| $I_{T(AV)M}$   | $T_C = 75^\circ\text{C}; 180^\circ \text{ sine}$    | 48                                 | A                     |
| $I_{TSM}$      | $T_{VJ} = 45^\circ\text{C}$                         | $t = 10 \text{ ms (50 Hz), sine}$  | 520 A                 |
|                | $V_R = 0 \text{ V}$                                 | $t = 8.3 \text{ ms (60 Hz), sine}$ | 560 A                 |
|                | $T_{VJ} = T_{VJM}$                                  | $t = 10 \text{ ms (50 Hz), sine}$  | 460 A                 |
|                | $V_R = 0 \text{ V}$                                 | $t = 8.3 \text{ ms (60 Hz), sine}$ | 500 A                 |
| $I^2t$         | $T_{VJ} = 45^\circ\text{C}$                         | $t = 10 \text{ ms (50 Hz), sine}$  | 1350 A <sup>2</sup> s |
|                | $V_R = 0 \text{ V}$                                 | $t = 8.3 \text{ ms (60 Hz), sine}$ | 1300 A <sup>2</sup> s |
|                | $T_{VJ} = T_{VJM}$                                  | $t = 10 \text{ ms (50 Hz), sine}$  | 1050 A <sup>2</sup> s |
|                | $V_R = 0 \text{ V}$                                 | $t = 8.3 \text{ ms (60 Hz), sine}$ | 1030 A <sup>2</sup> s |
| $(di/dt)_{cr}$ | $T_{VJ} = T_{VJM}$                                  | repetitive, $I_T = 40 \text{ A}$   | 150 A/ $\mu\text{s}$  |
|                | $f = 50 \text{ Hz}, t_p = 200 \mu\text{s}$          |                                    |                       |
|                | $V_D = \frac{2}{3} V_{DRM}$                         | non repetitive, $I_T = I_{T(AV)M}$ | 500 A/ $\mu\text{s}$  |
|                | $I_G = 0.3 \text{ A}$                               |                                    |                       |
| $(dv/dt)_{cr}$ | $T_{VJ} = T_{VJM};$                                 | $V_{DR} = \frac{2}{3} V_{DRM}$     | 1000 V/ $\mu\text{s}$ |
|                | $R_{GK} = \infty;$ method 1 (linear voltage rise)   |                                    |                       |
| $P_{GM}$       | $T_{VJ} = T_{VJM}$                                  | $t_p = 30 \mu\text{s}$             | 10 W                  |
|                | $I_T = I_{T(AV)M}$                                  | $t_p = 300 \mu\text{s}$            | 5 W                   |
| $P_{G(AV)}$    |   |                                    | 0.5 W                 |
| $V_{RGM}$      |   |                                    | 10 V                  |
| $T_{VJ}$       |   | -40...+140                         | °C                    |
| $T_{VJM}$      |   | 140                                | °C                    |
| $T_{stg}$      |   | -40...+125                         | °C                    |
| $M_d$          | Version io1:  | mounting torque M3                 | 0.8...1.2 Nm          |
|                | Version io1R:                                       | mounting force with clip           | 20...120 N            |
| $F_C$          |   |                                    |                       |
| $V_{ISOL}^*$   | 50/60 Hz, RMS, $t = 1 \text{ minute, leads-to-tab}$ | 2500                               | V~                    |
| <b>Weight</b>  |   | 6                                  | g                     |

\* Version io1R only

 Data according to IEC 60747  
 IXYS reserves the right to change limits, test conditions and dimensions

## Features

- Thyristor for line frequency
- International standard package JEDEC TO-247
- Planar passivated chip
- Long-term stability of blocking currents and voltages
- Version AR isolated and UL registered E153432
- Epoxy meets UL 94V-0

## Applications

- Motor control
- Power converter
- AC power controller
- Switch-mode and resonant mode power supplies
- Light and temperature control

## Advantages

- Easy to mount with 1 screw (isolated mounting screw hole)
- Space and weight savings
- Simple mounting
- Improved temperature and power cycling

| Symbol     | Conditions   | Characteristic Values |                     |
|------------|--|-----------------------|---------------------|
| $I_R, I_D$ | $T_{VJ} = T_{VJM}; V_R = V_{RRM}; V_D = V_{DRM}$   | $\leq$                | 5 mA                |
| $V_T$      | $I_T = 80 \text{ A}; T_{VJ} = 25^\circ\text{C}$  | $\leq$                | 1.64 V              |
| $V_{T0}$   | For power-loss calculations only ( $T_{VJ} = 125^\circ\text{C}$ )  |                       | 0.85 V              |
| $r_T$      |  |                       | 11 mΩ               |
| $V_{GT}$   | $V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$   | $\leq$                | 1.5 V               |
|            | $T_{VJ} = -40^\circ\text{C}$   | $\leq$                | 1.6 V               |
| $I_{GT}$   | $V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$   | $\leq$                | 100 mA              |
|            | $T_{VJ} = -40^\circ\text{C}$   | $\leq$                | 200 mA              |
| $V_{GD}$   | $T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}$  | $\leq$                | 0.2 V               |
| $I_{GD}$   |  | $\leq$                | 10 mA               |
| $I_L$      | $T_{VJ} = 25^\circ\text{C}; t_p = 10 \mu\text{s}$<br>$I_G = 0.3 \text{ A}; di_G/dt = 0.3 \text{ A}/\mu\text{s}$      | $\leq$                | 150 mA              |
| $I_H$      | $T_{VJ} = 25^\circ\text{C}; V_D = 6 \text{ V}; R_{GK} = \infty$  | $\leq$                | 100 mA              |
| $t_{gd}$   | $T_{VJ} = 25^\circ\text{C}; V_D = \frac{1}{2} V_{DRM}$<br>$I_G = 0.3 \text{ A}; di_G/dt = 0.3 \text{ A}/\mu\text{s}$ | $\leq$                | 2 μs                |
| $R_{thJC}$ | DC current   |                       | 0.62 K/W            |
| $R_{thJH}$ | DC current   |                       | 0.82 K/W            |
| <b>a</b>   | Max. acceleration, 50 Hz   |                       | 50 m/s <sup>2</sup> |

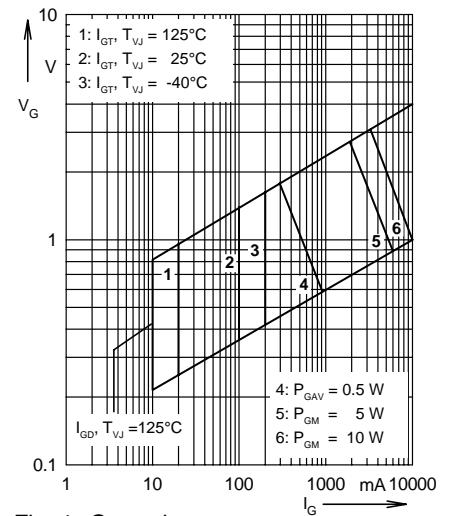


Fig. 1 Gate trigger range

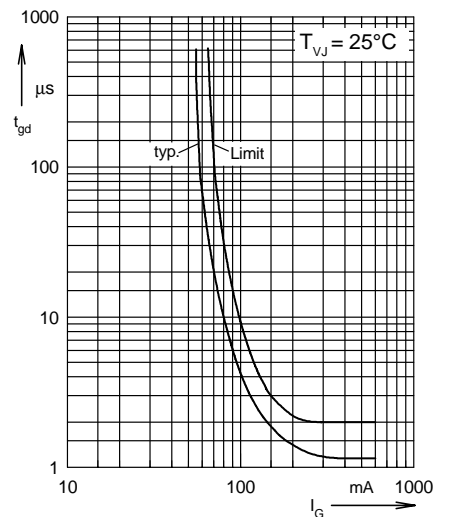


Fig. 2 Gate controlled delay time  $t_{gd}$

**TO-247 AD and ISOPLUS 247™**

| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 19.81      | 20.32 | 0.780  | 0.800 |
| B    | 20.80      | 21.46 | 0.819  | 0.845 |
| C    | 15.75      | 16.26 | 0.610  | 0.640 |
| D*   | 3.55       | 3.65  | 0.140  | 0.144 |
| E    | 4.32       | 5.49  | 0.170  | 0.216 |
| F    | 5.4        | 6.2   | 0.212  | 0.244 |
| G    | 1.65       | 2.13  | 0.065  | 0.084 |
| H    | -          | 4.5   | -      | 0.177 |
| J    | 1.0        | 1.4   | 0.040  | 0.055 |
| K    | 10.8       | 11.0  | 0.426  | 0.433 |
| L    | 4.7        | 5.3   | 0.185  | 0.209 |
| M    | 0.4        | 0.8   | 0.016  | 0.031 |
| N    | 1.5        | 2.49  | 0.087  | 0.102 |

\* ISOPLUS 247™ without hole

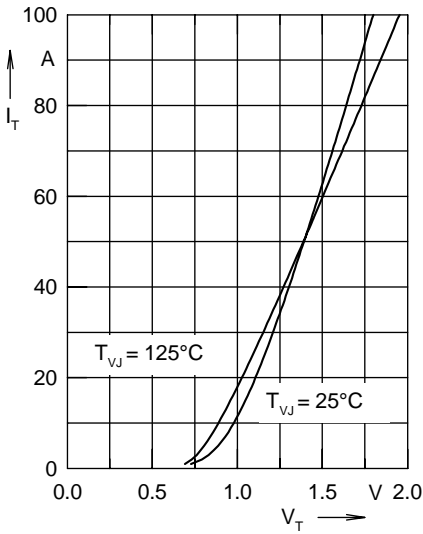


Fig. 3 Forward characteristics

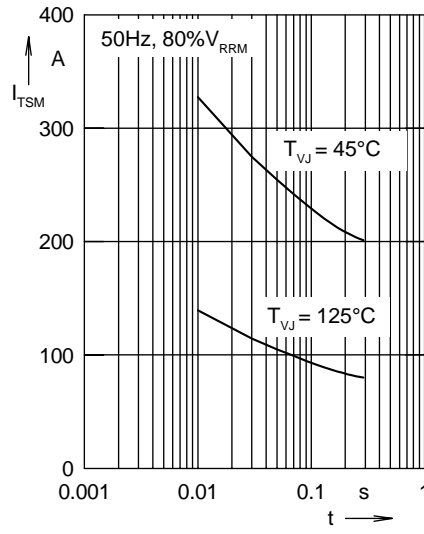


Fig. 4 Surge overload current  
 $I_{TSM}$ : crest value, t: duration

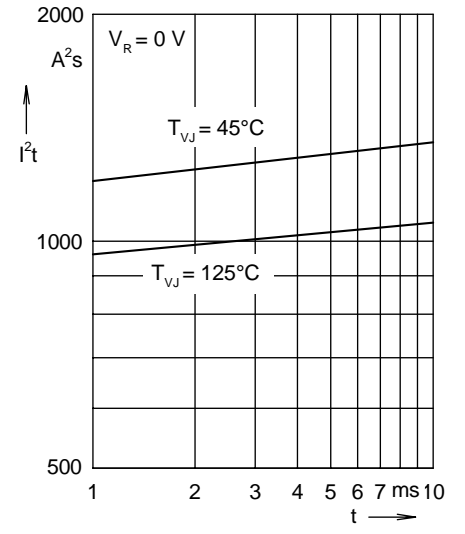


Fig. 5  $I^2t$  versus time (1-10 ms)

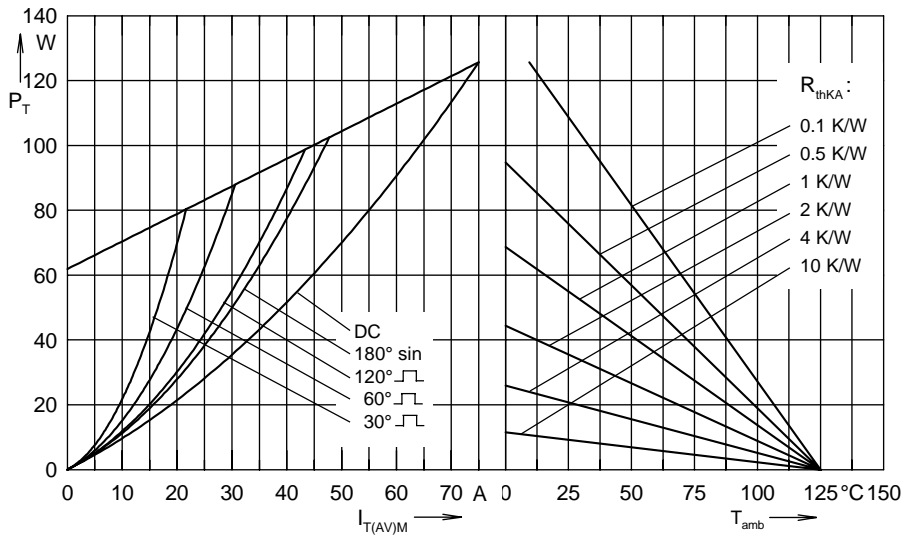


Fig. 6 Power dissipation versus forward current and ambient temperature

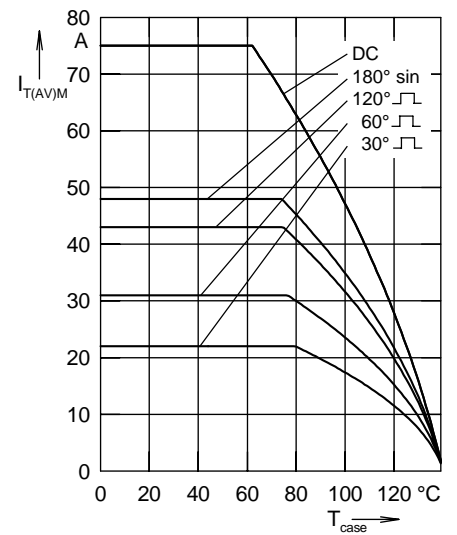


Fig. 7 Max. forward current at case temperature

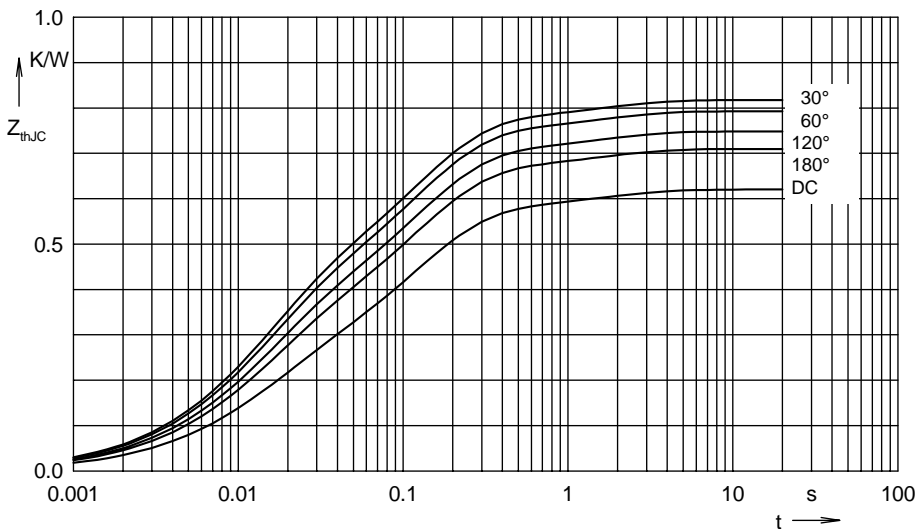


Fig. 8 Transient thermal impedance junction to case

$R_{thJC}$  for various conduction angles d:

| d    | $R_{thJC}$ (K/W) |
|------|------------------|
| DC   | 0.62             |
| 180° | 0.71             |
| 120° | 0.748            |
| 60°  | 0.793            |
| 30°  | 0.817            |

Constants for  $Z_{thJC}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.206           | 0.013     |
| 2 | 0.362           | 0.118     |
| 3 | 0.052           | 1.488     |

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