

### Power Modules - Thyristor/Thyristor

#### FEATURES

- High surge capability
- Qualified for industrial level
- Thick copper baseplate
- Easy mounting on heatsink
- International standard TO-240AA

#### TYPICAL APPLICATIONS

- Power supplies
- Machine tools control
- High power drives
- Welders
- Medium traction

| MAJOR RATINGS AND CHARACTERISTICS  |                   |             |                   |
|------------------------------------|-------------------|-------------|-------------------|
| PARAMETER                          | TEST CONDITIONS   | VALUES      | UNITS             |
| I <sub>T(AV)</sub>                 |                   | 90          | A                 |
|                                    | T <sub>Case</sub> | 85          | °C                |
| I <sub>T(RMS)</sub>                |                   | 200         | A                 |
|                                    | T <sub>Case</sub> | 85          | °C                |
| I <sub>TSM</sub>                   | 50 Hz             | 1730        | A                 |
|                                    | 60 Hz             | 1870        | A                 |
| I <sup>2</sup> t                   | 50 Hz             | 13.32       | kA <sup>2</sup> s |
|                                    | 60 Hz             | 14.52       | kA <sup>2</sup> s |
| V <sub>DRM</sub> /V <sub>RRM</sub> |                   | 200 to 1600 | V                 |
| t <sub>q</sub>                     | Typical           | 125         | µs                |
| T <sub>J</sub>                     |                   | -40 to 125  | °C                |

#### ELECTRICAL SPECIFICATIONS

| VOLTAGE RATINGS |              |   |  |  |
|-----------------|--------------|---|--|--|
| SERIES          | VOLTAGE CODE | V <sub>DRM</sub> /V <sub>RRM</sub> , MAX. RE-<br>PETITIVE PEAK AND<br>OFF-STATE VOLTAGE | V <sub>RSM</sub> , MAX. NON-<br>REPETITIVE PEAK<br>VOLTAGE (V) | I <sub>DRM</sub> /I <sub>RRM</sub> , MAX. at T <sub>J</sub><br>= T <sub>J(Max.)</sub> (mA) |
| TT90/...        | 02           | 200   | 300  | 20   |
| TT90/...        | 04           | 400   | 500  |  |
| TT90/...        | 06           | 600   | 700  |  |
| TT90/...        | 08           | 800   | 900  |  |
| TT90/...        | 10           | 1000  | 1100   |  |
| TT90/...        | 12           | 1200  | 1300   |  |
| TT90/...        | 14           | 1330  | 1500   |  |
| TT90/...        | 16           | 1520  | 1700   |  |

Revision: 03.07.2010

www.komkraft.com.br

### Power Modules - Thyristor/Thyristor

| MAXIMUM ALLOWABLE RATINGS |  |   |                          |  |                                  |
|---------------------------|--|---|--------------------------|--|----------------------------------|
| SYMBOL                    | DESCRIPTION  | TEST CONDITIONS   |                          | VALUE  | UNITS                            |
| $I_{T(AV)}$               | Maximum average on-state current at heatsink temperature | 180° conduction, half sine wave   |                          | 90   | A                                |
|                           |  |   |                          | 85   | °C                               |
| $I_{T(RMS)}$              | Maximum RMS on-state current                             | DC at 25°C heatsink temperature   |                          | 200  | A                                |
| $I_{TSM}$                 | Maximum peak, one-cycle non-repetitive surge current     | t = 10 ms   | 100% $V_{RRM}$ reapplied | Sinusoidal half wave, initial $T_j = T_j$ max. | kA                               |
|                           |  | t = 8.3 ms  |                          |  |                                  |
|                           |  | t = 10 ms   | No voltage reapplied     |  |                                  |
|                           |  | t = 8.3 ms  |                          |  |                                  |
| $I^2t$                    | Maximum $I^2t$   | t = 10 ms   | 100% $V_{RRM}$ reapplied |  | kA <sup>2</sup> s                |
|                           |  | t = 8.3 ms  |                          |  |                                  |
|                           |  | t = 10 ms   | No voltage reapplied     |  |                                  |
|                           |  | t = 8.3 ms  |                          |  |                                  |
| $I^2t^{1/2}$              | Maximum $I^2t^{1/2}$                                     | t = 0.1 to 10 ms, no voltage reapplied  |                          | 159.10   | kA <sup>2</sup> s <sup>1/2</sup> |
| $V_{T(TO)}$               | Low level threshold voltage                              | (16.7% $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$ ), $T_j = T_j$ max. |                          | 0.89   | V                                |
| $r_T$                     | Low level on-state slope resistance                      |   |                          | 2.42   | mΩ                               |
| $V_{TM}$                  | Maximum on-state voltage                                 | $I_{pk} = 283A$ , 50Hz half sine pulse, $T_j = T_j$ max.                            |                          | 1.63   | V                                |
| $I_H$                     | Maximum holding current                                  | $T_j = 25^\circ C$ , anode supply 12V resistive load                                |                          | 200  | mA                               |
| $I_L$                     | Typical latching current                                 |   |                          | 400  |                                  |

| SWITCHING |  |   |  |       |            |
|-----------|--|---|--|-------|------------|
| SYMBOL    | DESCRIPTION  | TEST CONDITIONS   |  | VALUE | UNITS      |
| dI/dt     | Maximum non-repetitive rate of rise of turned-on current | Gate drive 20 V, 20 Ω, $t_r \leq 1 \mu s$ , $T_j = T_j$ max., anode voltage $\leq 80\%$ $V_{DRM}$ |  | 150   | A/ $\mu s$ |
| $t_d$     | Typical delay time                                       | Gate current 1 A, $dI_g/dt = 1 A/\mu s$ , $V_d = 0.67\%$ $V_{DRM}$ , $T_j = 25^\circ C$           |  | 0.7   | $\mu s$    |
| $t_q$     | Typical turn-off time                                    |   |  | 125   |            |

| BLOCKING           |  |   |  |       |            |
|--------------------|--|---|--|-------|------------|
| SYMBOL             | DESCRIPTION  | TEST CONDITIONS                                   |  | VALUE | UNITS      |
| dV/dt              | Maximum critical rate of rise of off-state voltage | $T_j = T_j$ max. Linear to 80% rated $V_{DRM}$    |  | 500   | V/ $\mu s$ |
| $I_{RRM}, I_{DRM}$ | Maximum peak reverse and off-state leakage current | $T_j = T_j$ max., rated $V_{DRM}/V_{RRM}$ applied |  | 20    | mA         |

### Power Modules - Thyristor/Thyristor

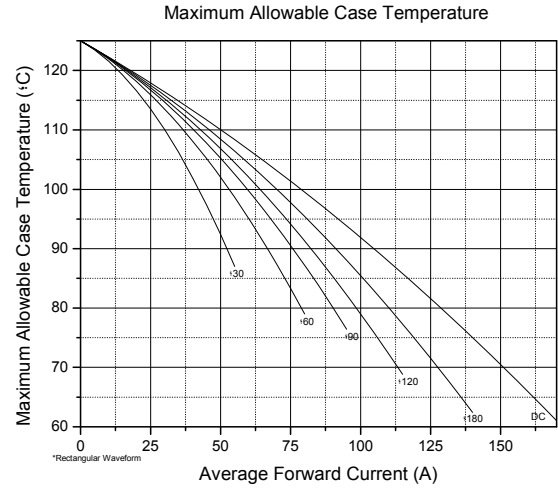
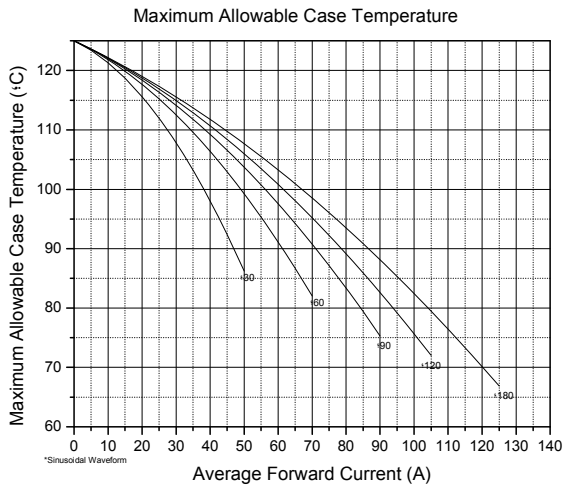
| TRIGGERING  |                                |   |  |       |      |       |
|-------------|--------------------------------|---|--|-------|------|-------|
| SYMBOL      | DESCRIPTION                    | TEST CONDITIONS                                     |  | VALUE |      | UNITS |
|             |                                |   |  | TYP.  | MAX. |       |
| $P_{GM}$    | Maximum peak gate power        | $T_J = T_J \text{ max.}, t_p \leq 5\text{ms}$       |  | 12    |      | W     |
| $P_{G(AV)}$ | Maximum average gate power     | $T_J = T_J \text{ max.}, f = 50\text{Hz}, d\% = 50$ |  | 3     |      |       |
| $I_{GM}$    | Maximum peak gate current      | $T_J = T_J \text{ max.}, t_p \leq 5\text{ms}$       |  | 1     |      | A     |
| $-V_{GM}$   | Maximum negative gate voltage  | $T_J = T_J \text{ max.}, t_p \leq 5\text{ms}$       |  | 2     |      | V     |
| $I_{GT}$    | DC gate current to trigger     | $T_J = -40^\circ\text{C}$                           | Maximum required gate trigger/current/voltage are the lowest values which will trigger all units, 12V anode to cathode applied                 | -     | 300  | mA    |
|             |                                | $T_J = 25^\circ\text{C}$                            |  | 80    | 150  |       |
| $V_{GT}$    | DC gate voltage to trigger     | $T_J = -40^\circ\text{C}$                           |  | -     | 4    | V     |
|             |                                | $T_J = 25^\circ\text{C}$                            |  | -     | 2    |       |
| $V_{GD}$    | DC gate voltage not to trigger | $T_J = T_J \text{ max.}$                            | Maximum gate current/voltage not to trigger is the maximum value which will not trigger any unit with rated $V_{DRM}$ anode to cathode applied | 0.25  |      | V     |

| THERMAL AND MECHANICAL SPECIFICATIONS |  |                                    |            |       |  |
|---------------------------------------|--|------------------------------------|------------|-------|--|
| SYMBOL                                | DESCRIPTION                                      | TEST CONDITIONS                    | VALUE      | UNITS |  |
| $T_J$                                 | Maximum operating junction temperature           | -                                  | -40 to 125 | °C    |  |
| $T_{Stg}$                             | Maximum storage temperature                      | -                                  | -40 to 150 |       |  |
| $R_{thJ-hs}$                          | Maximum thermal resistance, junction to heatsink | DC                                 | 0.145      | °C/W  |  |
|                                       |  | 180° sine wave                     | 0.155      |       |  |
|                                       |  | 120° rectangular wave              | 0.162      |       |  |
| $R_{thC-hs}$                          | Maximum thermal resistance, case to heat-sink    | Mtg. Surface smooth, flat, greased | 0.100      |       |  |
| -                                     | Mounting force, $\pm 10\%$                       | To terminal (To heatsink)          | 3(5)       | N.m   |  |
| -                                     | Approximate weight                               | -                                  | 110        | g     |  |
| -                                     | Case style                                       | -                                  | TO-240AA   | JEDEC |  |

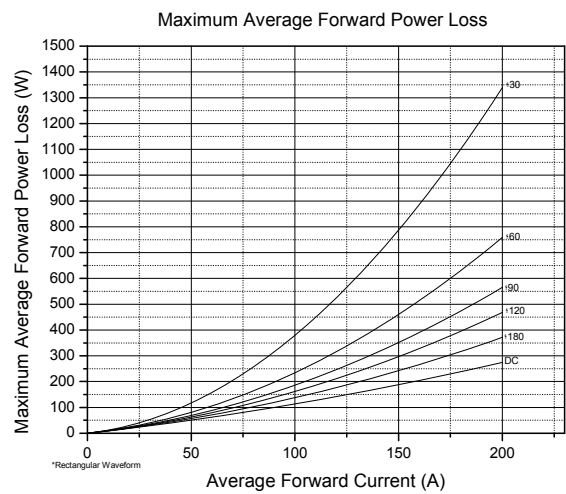
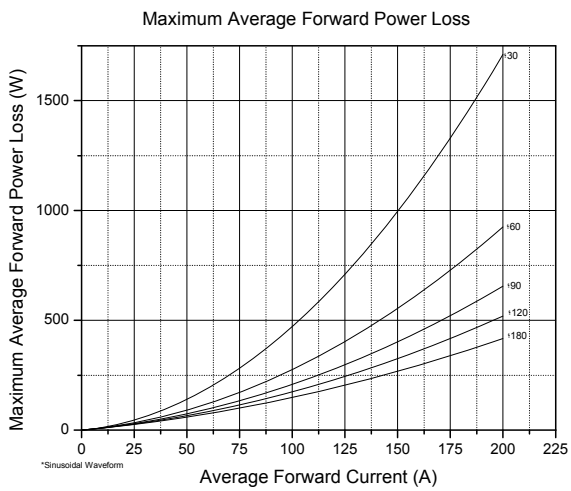
| CURRENT FORM FACTOR |                  |           |        |        |        |        |       |       |
|---------------------|------------------|-----------|--------|--------|--------|--------|-------|-------|
| FORM FACTOR         | CONDUCTION ANGLE | 15°       | 30°    | 45°    | 60°    | 90°    | 120°  | 180°  |
|                     |                  | Sine wave |        | 31.956 | 15.832 | 10.452 | 7.721 | 4.933 |
| Rectangular wave    |                  | 24.000    | 12.000 | 8.000  | 6.000  | 4.000  | 3.000 | 2.000 |

### Power Modules - Thyristor/Thyristor

#### CURRENT RATINGS CHARACTERISTICS

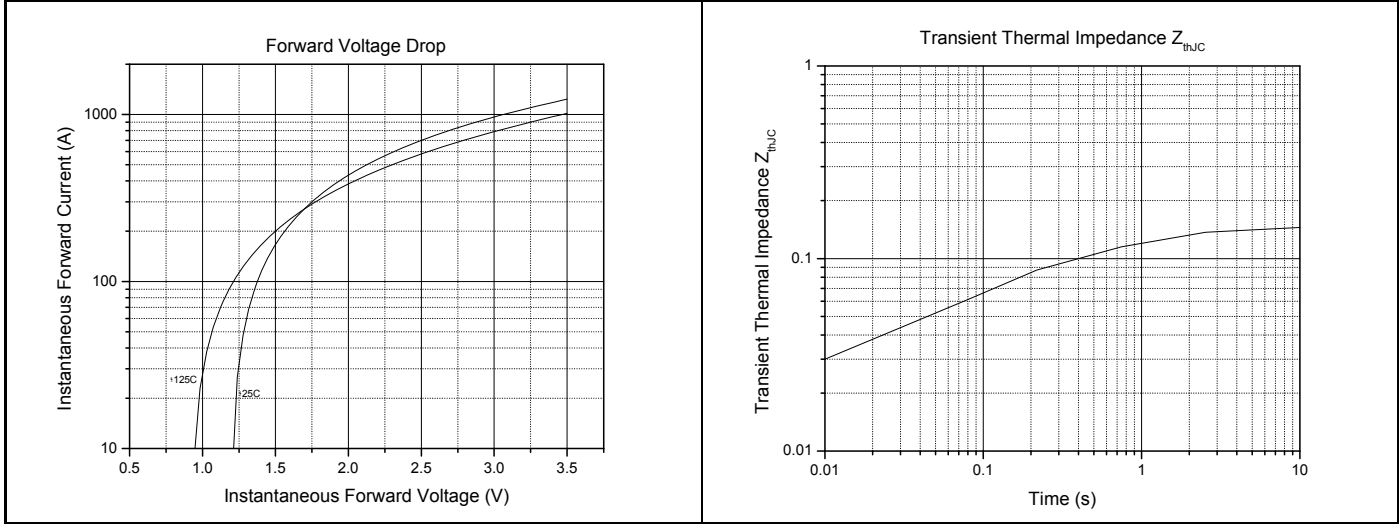


#### ON-STATE POWER LOSS CHARACTERISTICS

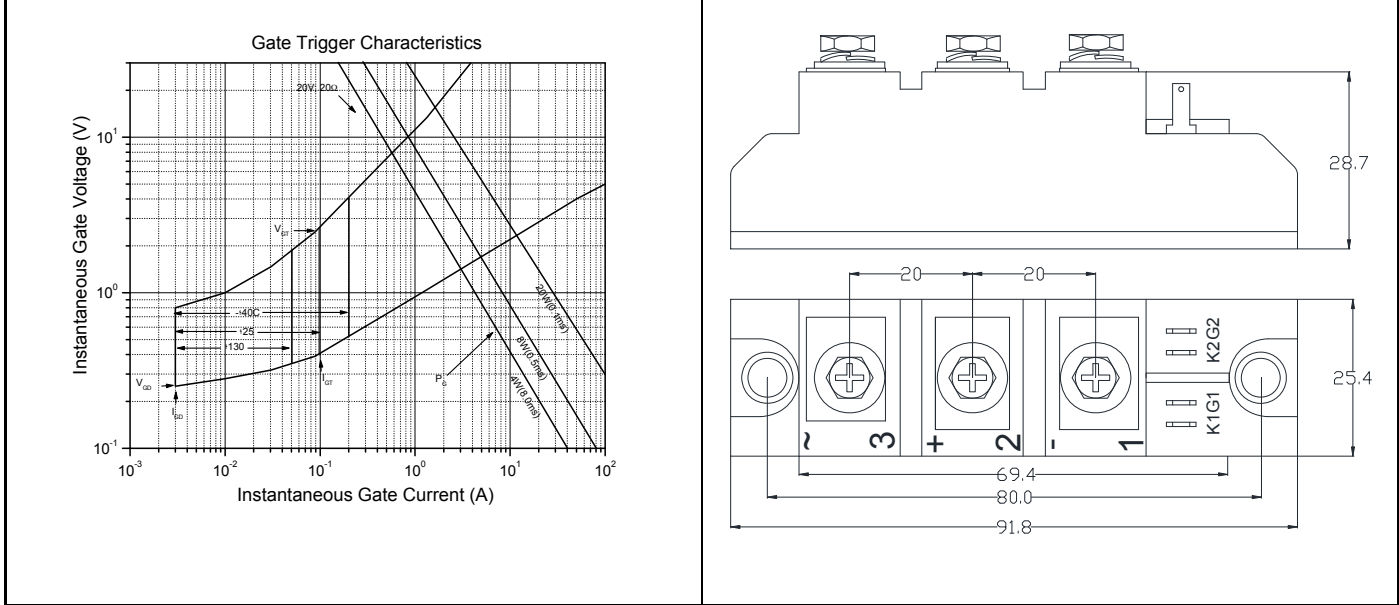


### Power Modules - Thyristor/Thyristor

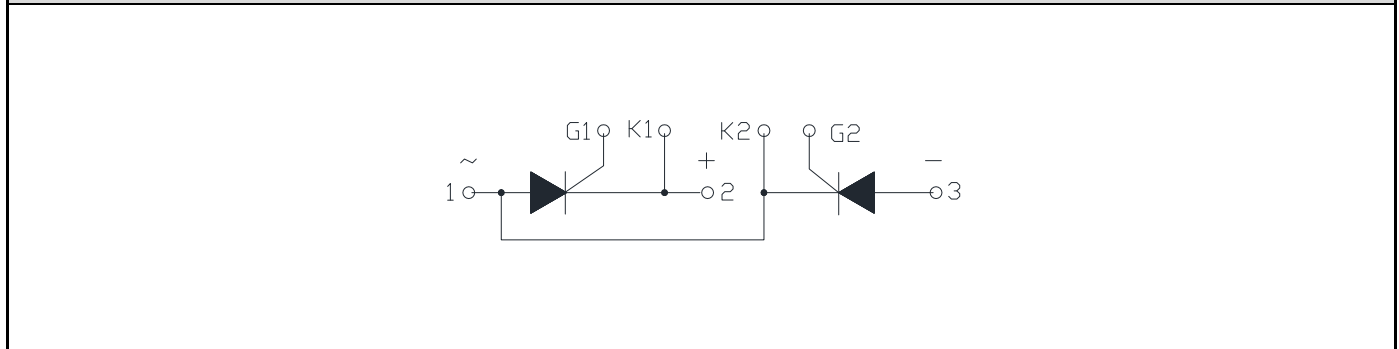
#### FORWARD VOLTAGE DROP / THERMAL IMPEDANCE CHARACTERISTICS



#### GATE TRIGGER / OUTLINE CHARACTERISTICS



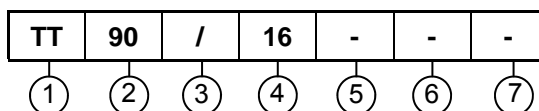
#### CIRCUIT CONFIGURATION



### Power Modules - Thyristor/Thyristor

**ORDERING INFORMATION**

Device code



- |   |  |
|---|--|
| 1 | <ul style="list-style-type: none"> <li>- N = Phase Control Thyristors</li> <li>- F = Fast Thyristors (inverter grade)</li> <li>- D = Normal Recovery Diodes</li> <li>- DF = Fast Recovery Diodes</li> <li>- DD = Module (diode-diode)</li> <li>- DT = Module (diode-thyristor)</li> <li>- TD = Module (thyristor-diode)</li> <li>- TT = Module (thyristor-thyristor)</li> <li>- P = Press-fit diode</li> </ul> |
| 2 | - Average Current Code   |
| 3 | - Essential Part Number  |
| 4 | - Voltage Code x 100 = $V_{RRM}$   |
| 5 | <ul style="list-style-type: none"> <li>- Turn-off time (fast thyristors only)</li> <li>- Reverse Recovery Time (fast diodes only)</li> </ul>   |
| 6 | <ul style="list-style-type: none"> <li>- M = Metric Thread</li> <li>- I = Inch Thread</li> </ul>   |
| 7 | <ul style="list-style-type: none"> <li>- None = Anode to stud (stud diodes only)</li> <li>- R = Cathode to stud (stud diodes only)</li> </ul>  |

#### Disclaimer

All product specifications and data are subject to change without notice.

Komkraft Ind.Com.de Componentes Eletrônicos Ltda., its affiliates, agents and employees, and all persons acting on its or their behalf (collectively, "Komkraft"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Komkraft disclaims any and all liability arising of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Komkraft's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

The products shown herein are not designed for use in medical, life-saving or life-sustaining applications unless otherwise expressly indicated.