

Medium Power Phase Control Thyristors (Power Modules), 50 A, 70 A, 90 A



D-55 (T-module)

FEATURES

- Electrically isolated base plate
- Types up to 1200 V_{RRM}
- 3500 V_{RMS} isolating voltage
- Simplified mechanical designs, rapid assembly
- High surge capability
- Large creepage distances
- UL E78996 approved
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT

DESCRIPTION

These series of T-modules are intended for general purpose applications such as battery chargers, welders and plating equipment, regulated power supplies and temperature and speed control circuits. The semiconductors are electrically isolated from the metal base, allowing common heatsinks and compact assemblies to be built.

| PRIMARY CHARACTERISTICS | |
|------------------------------------|-------------------------------|
| Package | D-55 (T-module) |
| Circuit configuration | Single SCR |
| I _{T(AV)} | 50 A, 70 A, 90 A |
| V _{DRM} /V _{RRM} | 100 V, 1200 V |
| V _{TM} | 1.55 V |
| I _{GT} | 120 mA |
| T _J | -40 °C to +125 °C |
| Type | Modules - thyristor, standard |

| MAJOR RATINGS AND CHARACTERISTICS | | | | | |
|-----------------------------------|-----------------|------------------|------------------|------------------|-------------------|
| SYMBOL | CHARACTERISTICS | VALUES T50RIA | VALUES T70RIA | VALUES T90RIA | UNITS |
| I _{T(AV)} | 70 °C | 50 | 70 | 90 | A |
| I _{T(RMS)} | | 80 | 110 | 141 | A |
| I _{TSM} | 50 Hz | 1310 | 1660 | 1780 | A |
| | 60 Hz | 1370 | 1740 | 1870 | |
| I ² t | 50 Hz | 8550 | 13 860 | 15 900 | A ² s |
| | 60 Hz | 7800 | 12 650 | 14 500 | |
| I ² √t | | 85 500 | 138 500 | 159 100 | A ² √s |
| V _{RRM} | Range | 100 to 1200 | 100 to 1200 | 100 to 1200 | V |
| T _J | | | -40 to +125 | | °C |

ELECTRICAL SPECIFICATIONS

| VOLTAGE RATINGS | | | | |
|-------------------------------------|--------------|--|---|---|
| TYPE NUMBER | VOLTAGE CODE | V _{RRM} /V _{DRM} , MAXIMUM REPETITIVE PEAK REVERSE AND PEAK OFF-STATE VOLTAGE V | V _{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V | I _{RRM} /I _{DRM} MAXIMUM AT T _J = 25 °C µA |
| VS-T50RIA VS-T70RIA VS-T90RIA | 10 | 100 | 150 | 100 |
| | 20 | 200 | 300 | |
| | 40 | 400 | 500 | |
| | 60 | 600 | 700 | |
| | 80 | 800 | 900 | |
| | 100 | 1000 | 1100 | |
| | 120 | 1200 | 1300 | |



| ON-STATE CONDUCTION | | | | | | | | |
|--|---------------|--|----------------------------|---|---------------|---------------|-------------------|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES T50RIA | VALUES T70RIA | VALUES T90RIA | UNITS | |
| Maximum average on-state current at case temperature | $I_{T(AV)}$ | 180° conduction, half sine wave | | 50 | 70 | 90 | A | |
| | | | | 70 | 70 | 70 | °C | |
| Maximum RMS on-state current | $I_{T(RMS)}$ | | | 80 | 110 | 141 | A | |
| Maximum peak, one-cycle on-state, non-repetitive surge current | I_{TSM} | t = 10 ms | No voltage reappplied | Sine half wave, initial $T_J = T_J$ maximum | 1310 | 1660 | 1780 | A |
| | | t = 8.3 ms | | | 1370 | 1740 | 1870 | |
| | | t = 10 ms | 100 % V_{RRM} reappplied | | 1100 | 1400 | 1500 | |
| | | t = 8.3 ms | | | 1150 | 1460 | 1570 | |
| Maximum I^2t for fusing | I^2t | t = 10 ms | No voltage reappplied | 8550 | 13 860 | 15 900 | A ² s | |
| | | t = 8.3 ms | | 7800 | 12 650 | 14 500 | | |
| | | t = 10 ms | 100 % V_{RRM} reappplied | 6050 | 9800 | 11 250 | | |
| | | t = 8.3 ms | | 5520 | 8950 | 10 270 | | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | t = 0.1 to 10 ms, no voltage reappplied | | 85 500 | 138 500 | 159 100 | A ² √s | |
| Low level value of threshold voltage | $V_{T(TO)1}$ | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, T_J maximum | | 0.97 | 0.77 | 0.78 | V | |
| High level value of threshold voltage | $V_{T(TO)2}$ | $(I > \pi \times I_{T(AV)})$, T_J maximum | | 1.13 | 0.88 | 0.88 | | |
| Low level value of on-state slope resistance | r_{t1} | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, T_J maximum | | 4.1 | 3.6 | 2.9 | mΩ | |
| High level value of on-state slope resistance | r_{t2} | $(I > \pi \times I_{T(AV)})$, T_J maximum | | 3.3 | 3.2 | 2.6 | | |
| Maximum on-state voltage drop | V_{TM} | $I_{TM} = \pi \times I_{T(AV)}$, $T_J = 25\text{ °C}$, $t_p = 400\text{ }\mu\text{s}$ square Average power = $V_{T(TO)} \times I_{T(AV)} + r_f \times (I_{T(RMS)})^2$ | | 1.60 | 1.55 | 1.55 | V | |
| Maximum forward voltage drop | V_{FM} | $I_{TM} = \pi \times I_{T(AV)}$, $T_J = 25\text{ °C}$, $t_p = 400\text{ }\mu\text{s}$ square Average power = $V_{T(TO)} \times I_{T(AV)} + r_f \times (I_{T(RMS)})^2$ | | 1.60 | 1.55 | 1.55 | V | |
| Maximum holding current | I_H | Anode supply = 6 V, initial $I_T = 30\text{ A}$, $T_J = 25\text{ °C}$ | | 200 | 200 | 200 | mA | |
| Maximum latching current | I_L | Anode supply = 6 V, resistive load = 10 Ω Gate pulse: 10 V, 100 μs, $T_J = 25\text{ °C}$ | | 400 | 400 | 400 | | |

| SWITCHING | | | | |
|-------------------------------|----------|---|--------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Typical turn-on time | t_{gd} | $T_J = 25\text{ °C}$, $V_d = 50\% V_{DRM}$, $I_{TM} = 50\text{ A}$ $I_g = 500\text{ mA}$, $t_r \leq 0.5$, $t_p \geq 6\text{ }\mu\text{s}$ | 0.9 | μs |
| Typical reverse recovery time | t_{rr} | $T_J = 125\text{ °C}$, $I_{TM} = 50\text{ A}$, $t_p = 300\text{ }\mu\text{s}$, $dI/dt = 10\text{ A}/\mu\text{s}$ | 3 | |
| Typical turn-off time | t_q | $T_J = T_J$ maximum, $I_{TM} = 50\text{ A}$, $t_p = 300\text{ }\mu\text{s}$, $dI/dt = 15\text{ A}/\mu\text{s}$, $V_R = 100\text{ V}$, linear to 80 % V_{DRM} | 110 | |

| BLOCKING | | | | |
|--|--------------------------|--|--------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum peak reverse and off-state leakage current | I_{RRM} , I_{DRM} | $T_J = T_J$ maximum | 15 | mA |
| RMS isolation voltage | V_{ISOL} | 50 Hz, circuit to base, all terminals shorted, $T_J = 25\text{ °C}$, $t = 1\text{ s}$ | 3500 | V |
| Critical rate of rise of off-state voltage | dV/dt | $T_J = T_J$ maximum, linear to 80 % rated V_{DRM} ⁽¹⁾ | 500 | V/μs |

Note

⁽¹⁾ Available with $dV/dt = 1000\text{ V}/\mu\text{s}$, to complete code add S90 i.e. T90RIA80S90



| TRIGGERING | | | | | | | |
|---|-------------|---|---------------------|---------------|---------------|------------|----|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES T50RIA | VALUES T70RIA | VALUES T90RIA | UNIT S | |
| Maximum peak gate power | P_{GM} | $T_J = T_J$ maximum, $t_p \leq 5$ ms | 10 | 12 | 12 | W | |
| Maximum average gate power | $P_{G(AV)}$ | $T_J = T_J$ maximum, $f = 50$ Hz | 2.5 | 3 | 3 | | |
| Maximum peak gate current | I_{GM} | $T_J = T_J$ maximum, $t_p \leq 5$ ms | 2.5 | 3 | 3 | A | |
| Maximum peak negative gate voltage | $-V_{GT}$ | | 10 | 10 | 10 | V | |
| Maximum required DC gate voltage to trigger | V_{GT} | Anode supply = 6 V, resistive load; $R_a = 1 \Omega$ | $T_J = -40$ °C | 4.0 | 4.0 | 4.0 | V |
| | | | $T_J = 25$ °C | 2.5 | 2.5 | 2.5 | |
| | | | $T_J = T_J$ maximum | 1.5 | 1.5 | 1.5 | |
| Maximum required DC gate current to trigger | I_{GT} | | $T_J = -40$ °C | 250 | 270 | 270 | mA |
| | | | $T_J = 25$ °C | 100 | 120 | 120 | |
| | | | $T_J = T_J$ maximum | 50 | 60 | 60 | |
| Maximum gate voltage that will not trigger | V_{GD} | $T_J = T_J$ maximum, rated V_{DRM} applied | 0.2 | 0.2 | 0.2 | V | |
| Maximum gate current that will not trigger | I_{GD} | | 5.0 | 6.0 | 6.0 | mA | |
| Maximum rate of rise of turned-on current | di/dt | $V_D = 0.67$ rated V_{DRM} , $I_{TM} = 2 \times$ rated di/dt $I_g = 400$ mA for T50RIA and $I_g = 500$ mA for T70RIA/T90RIA; $t_r < 0.5 \mu s$, $t_p \geq 6 \mu s$ For repetitive value use 40 % non-repetitive per JEDEC® STD. RS397, 5.2.2.6 | 200 | 200 | 200 | A/ μs | |
| | | | 180 | 180 | 180 | | |
| | | | 160 | 160 | 160 | | |
| | | | 150 | 150 | 150 | | |

| THERMAL AND MECHANICAL SPECIFICATIONS | | | | | | |
|---|------------|--|-------------------------------------|----------------|---------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES T50RIA | VALUES T70RIA | VALUES T90RIA | UNITS |
| Maximum junction operating temperature range | T_J | | -40 to +125 | | | °C |
| Maximum storage temperature range | T_{Stg} | | -40 to +150 | | | |
| Maximum thermal resistance, junction to case per junction | R_{thJC} | DC operation | 0.65 | 0.50 | 0.38 | K/W |
| Maximum thermal resistance, case to heatsink | R_{thCS} | Mounting surface, smooth, flat and greased | 0.2 | | | |
| Mounting torque, ± 10 % to heatsink terminals | | Non-lubricated threads | M3.5 mounting screws ⁽¹⁾ | 1.3 \pm 10 % | | Nm |
| | | | M5 screw terminals | 3 \pm 10 % | | |
| Approximate weight | | | 54 | | | g |
| Case style | | | D-55 (T-module) | | | |

Note

⁽¹⁾ A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound

| ΔR CONDUCTION PER JUNCTION | | | | | | | | | | | |
|------------------------------------|--|------|------|------|------|---|------|------|------|------|-------|
| DEVICES | SINUSOIDAL CONDUCTION AT T_J MAXIMUM | | | | | RECTANGULAR CONDUCTION AT T_J MAXIMUM | | | | | UNITS |
| | 180° | 120° | 90° | 60° | 30° | 180° | 120° | 90° | 60° | 30° | |
| T50RIA | 0.08 | 0.10 | 0.13 | 0.19 | 0.31 | 0.06 | 0.10 | 0.14 | 0.20 | 0.32 | K/W |
| T70RIA | 0.07 | 0.08 | 0.10 | 0.14 | 0.24 | 0.05 | 0.08 | 0.11 | 0.15 | 0.24 | |
| T90RIA | 0.05 | 0.06 | 0.08 | 0.12 | 0.20 | 0.04 | 0.06 | 0.09 | 0.12 | 0.20 | |

Note

• Table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC

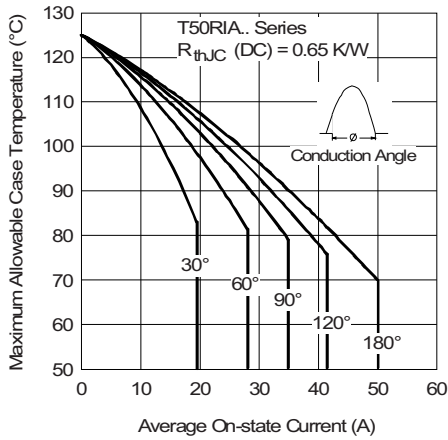


Fig. 1 - Current Ratings Characteristics

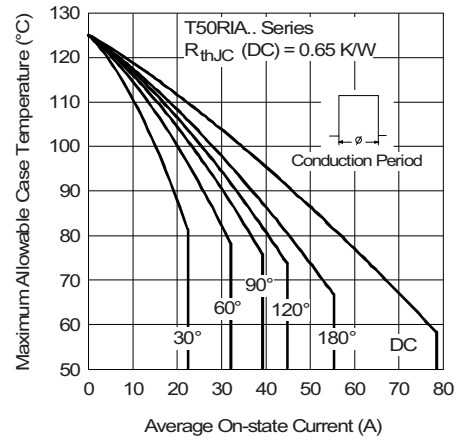


Fig. 2 - Current Ratings Characteristics

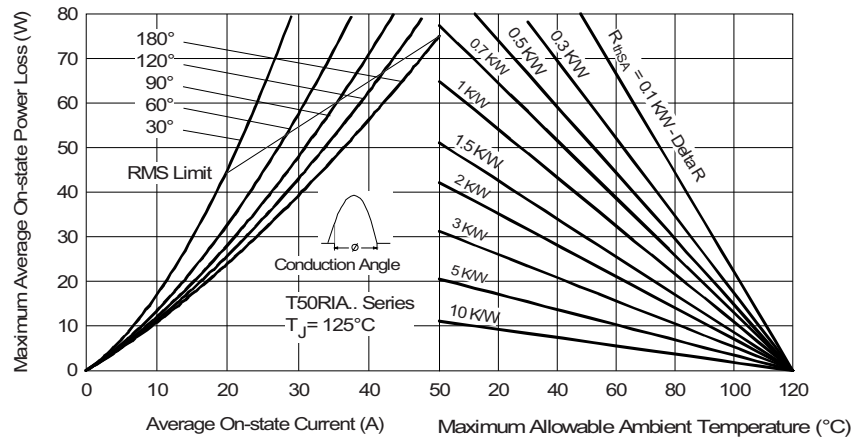


Fig. 3 - On-State Power Loss Characteristics

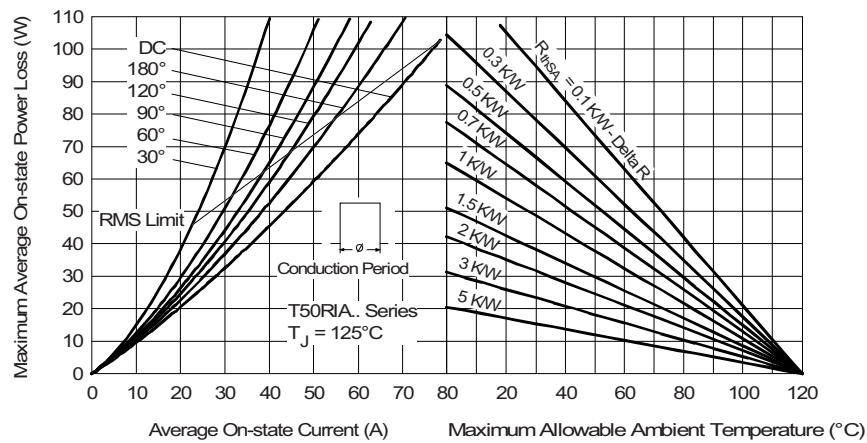


Fig. 4 - On-State Power Loss Characteristics

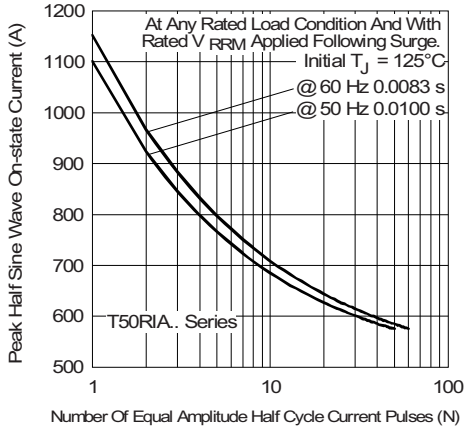


Fig. 5 - Maximum Non-Repetitive Surge Current

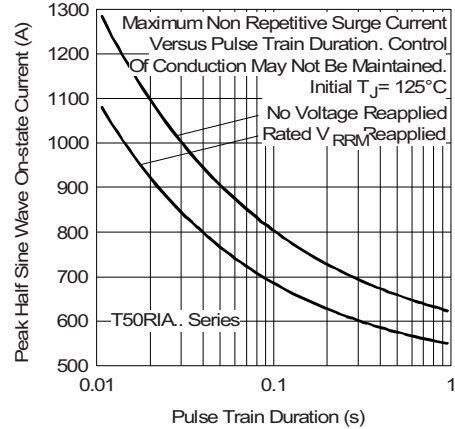


Fig. 6 - Maximum Non-Repetitive Surge Current

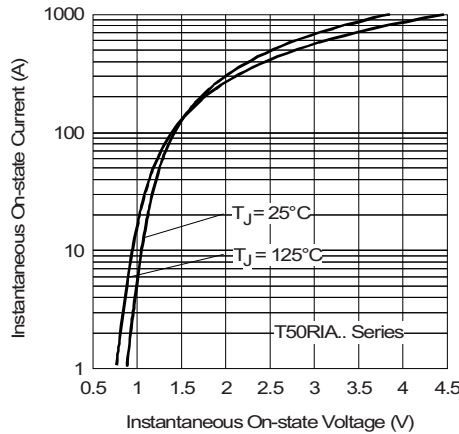


Fig. 7 - On-State Voltage Drop Characteristics

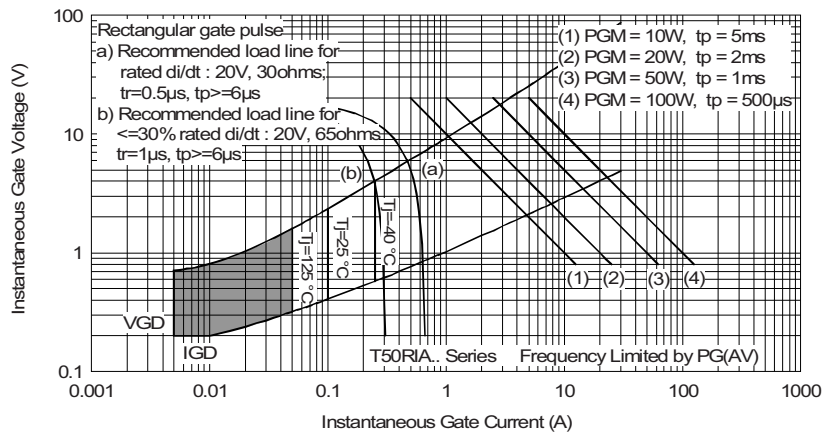


Fig. 8 - Gate Characteristics

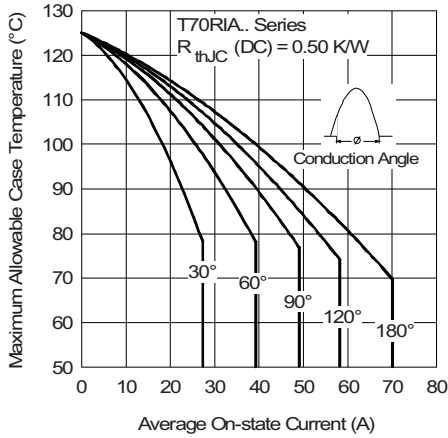


Fig. 9 - Current Ratings Characteristics

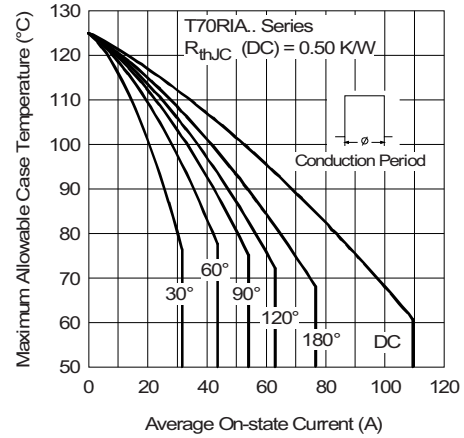


Fig. 10 - Current Ratings Characteristics

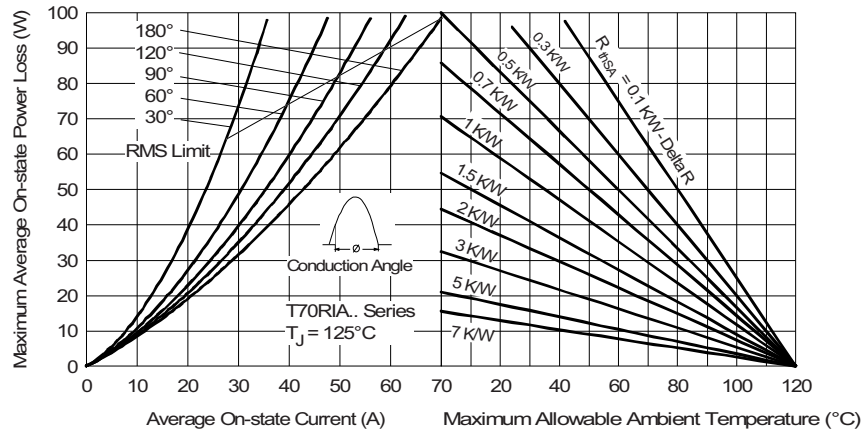


Fig. 11 - On-State Power Loss Characteristics

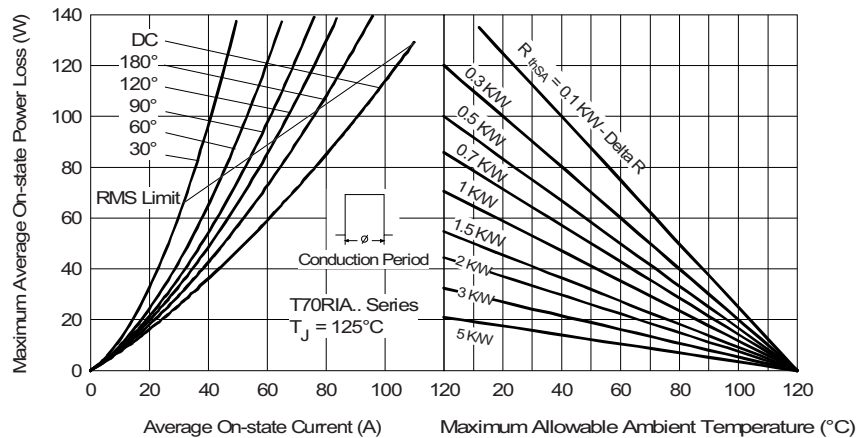


Fig. 12 - On-State Power Loss Characteristics

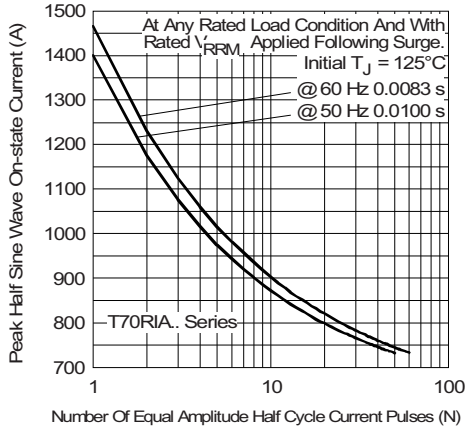


Fig. 13 - Maximum Non-Repetitive Surge Current

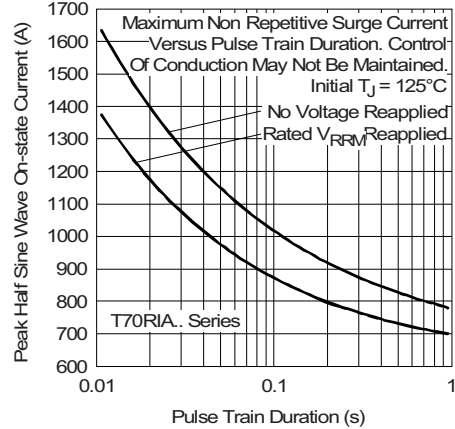


Fig. 14 - Maximum Non-Repetitive Surge Current

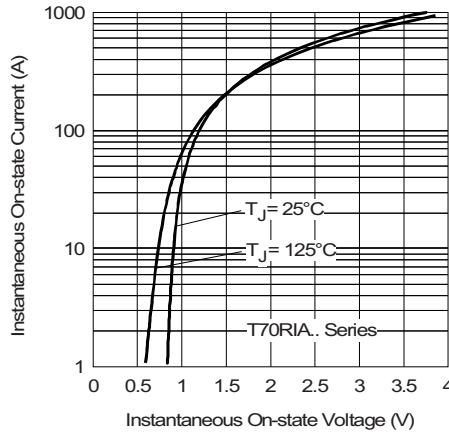


Fig. 15 - On-State Voltage Drop Characteristics

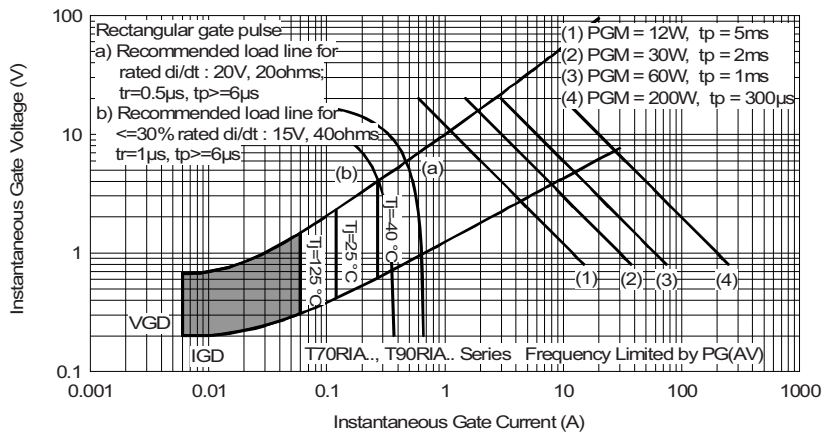


Fig. 16 - Gate Characteristics

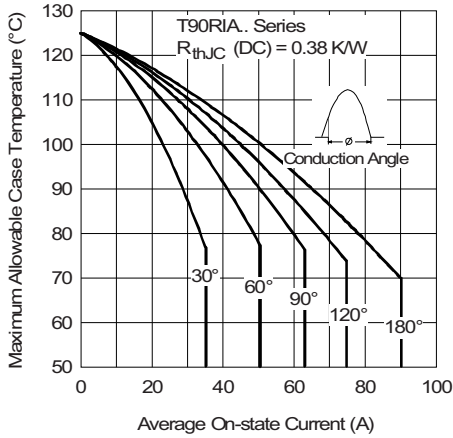


Fig. 17 - Current Ratings Characteristics

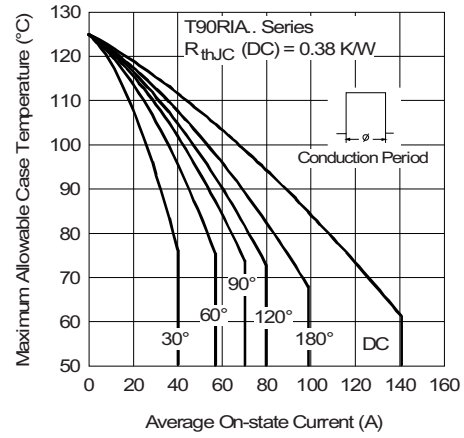


Fig. 18 - Current Ratings Characteristics

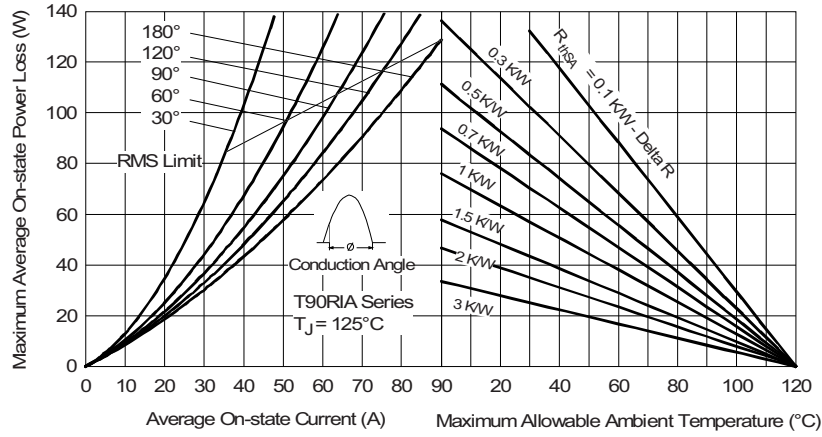


Fig. 19 - On-State Power Loss Characteristics

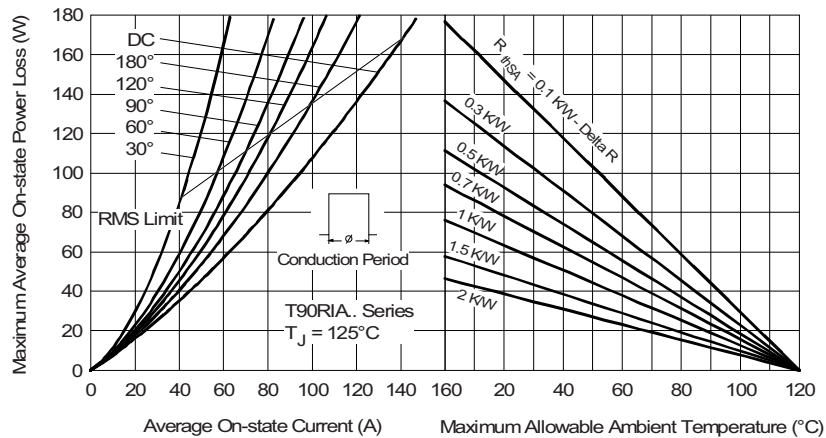


Fig. 20 - On-State Power Loss Characteristics

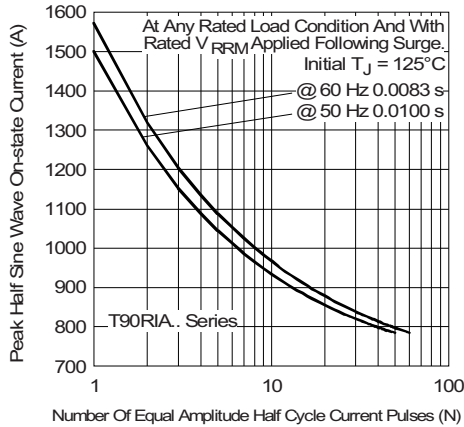


Fig. 21 - Maximum Non-Repetitive Surge Current

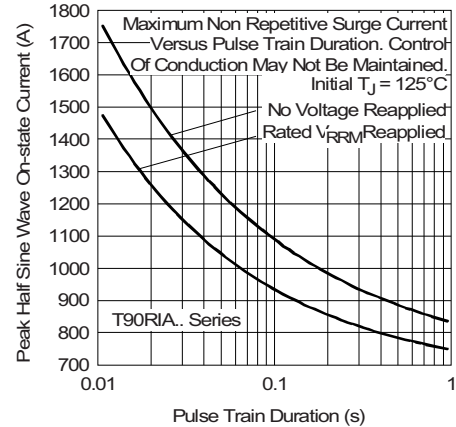


Fig. 22 - Maximum Non-Repetitive Surge Current

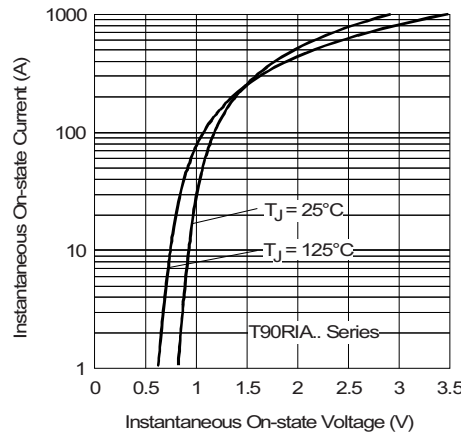


Fig. 23 - On-State Voltage Drop Characteristics

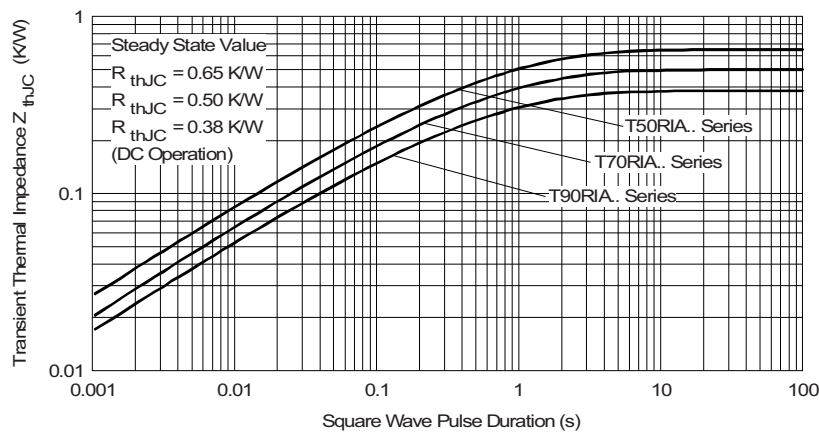
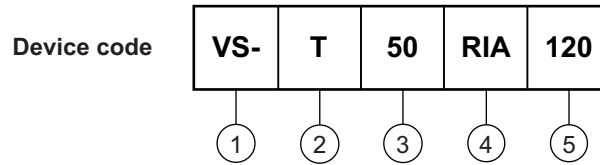


Fig. 24 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Module type
- 3** - Current rating
- 4** - Circuit configuration
- 5** - Voltage code x 10 = V_{RRM}

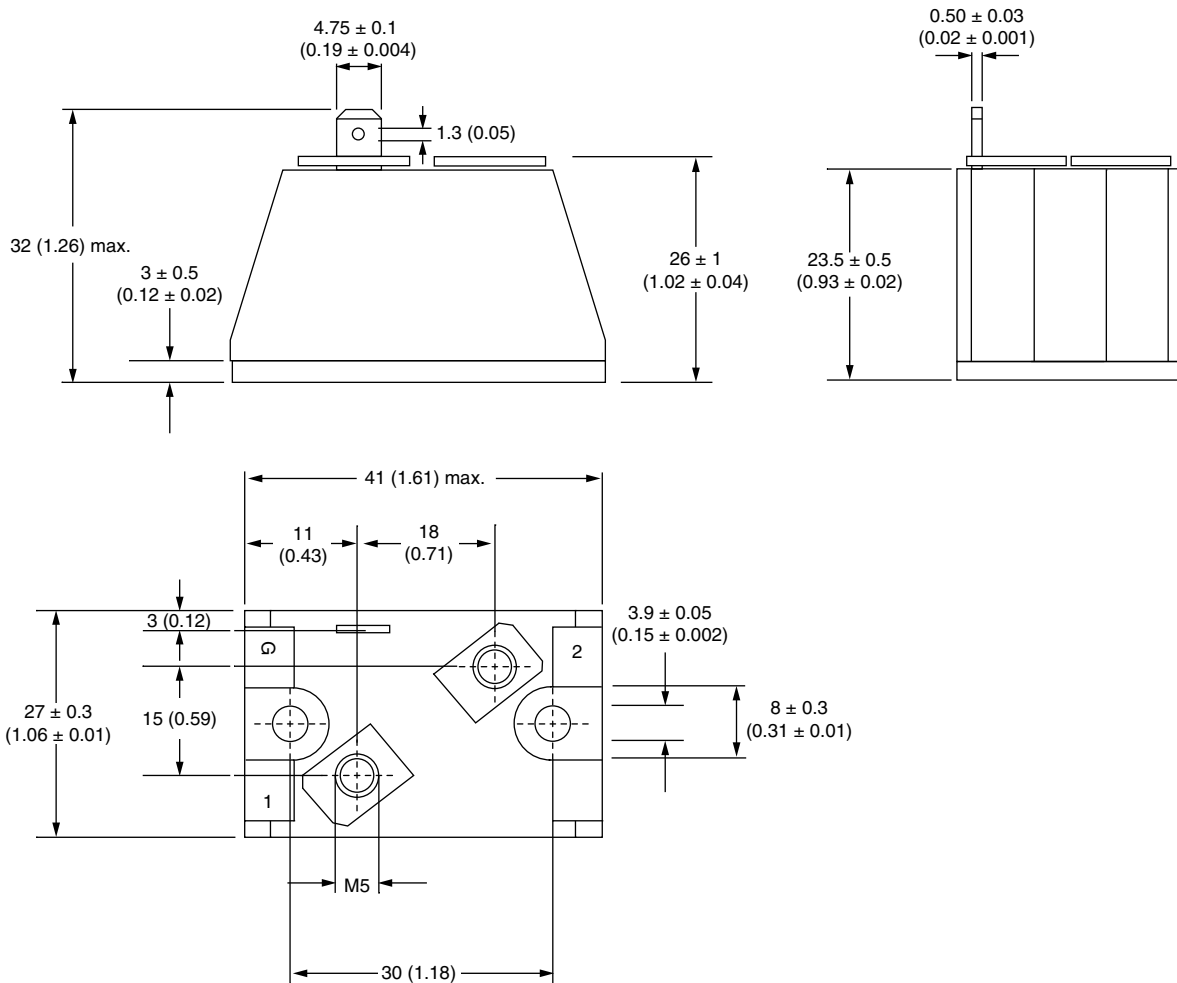
| CIRCUIT CONFIGURATION | |
|------------------------------|-----------------|
| CIRCUIT DESCRIPTION | CIRCUIT DRAWING |
| Single SCR | |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?95336 |



D-55 (T-Module) Thyristor Standard

DIMENSIONS in millimeters (inches)



Note

- 1 = anode
- 2 = cathode



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [SCR Modules](#) category:

Click to view products by [Vishay](#) manufacturer:

Other Similar products are found below :

[DT430N22KOF](#) [T1851N60TOH](#) [T420N12TOF](#) [T470N16TOF](#) [T901N36TOF](#) [TD140N18KOF](#) [TD162N16KOF-A](#) [TD330N16AOF](#)
[T300N14TOF](#) [T3710N06TOF](#) [VT](#) [T390N16TOF](#) [T460N24TOF](#) [T590N16TOF](#) [TD180N16KOF](#) [VSKE236/16PBF](#) [T1081N60TOH](#)
[TT61N08KOF](#) [TD251N18KOF](#) [TD430N22KOF](#) [TT162N08KOF](#) [T2001N34TOF](#) [T901N35TOF](#) [T1080N02TOF](#) [T360N22TOF](#)
[TD160N16SOF](#) [T420N18TOF](#) [T420N14TOF](#) [TD305N16KOF](#) [T740N26TOF](#) [T360N24TOF](#) [T430N16TOF](#) [T300N16TOF](#) [TD520N22KOF](#)
[TZ860N16KOF](#) [TT305N16KOF](#) [TT270N16KOF](#) [TD600N16KOF](#) [T740N22TOF](#) [T640N12TOF](#) [T470N12TOF](#) [T360N26TOF](#) [NTE5728](#)
[ETZ1100N16P70HPSA1](#) [T430N18TOF](#) [TD700N22KOFHPSA1](#) [T3441N52TOH](#) [T2851N48TOH](#) [TD820N16KOFHPSA1](#) [MCD501-16IO2](#)
[MCD501-18IO2](#)