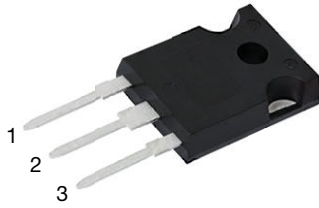
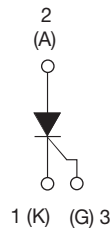


## Thyristor High Voltage, Phase Control SCR, 40 A


**TO-247AC 3L**

**FEATURES**

- Designed and qualified according to JEDEC®-JESD 47
- Low  $I_{GT}$  parts available
- 125 °C max. operating junction temperature
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
 COMPLIANT  
**HALOGEN**  
**FREE**  
 Available

**APPLICATIONS**

- Typical usage is in input rectification crowbar (soft start) and AC switch motor control, UPS, welding and battery charge

**DESCRIPTION**

The VS-40TPS... high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications. The glass passivation technology used has reliable operation up to 125 °C junction temperature.

| PRIMARY CHARACTERISTICS |                   |
|-------------------------|-------------------|
| $I_{T(AV)}$             | 35 A              |
| $V_{DRM}/V_{RRM}$       | 800 V, 1200 V     |
| $V_{TM}$                | 1.45 V            |
| $I_{GT}$                | 150 mA            |
| $T_J$                   | -40 °C to +125 °C |
| Package                 | TO-247AC 3L       |
| Circuit configuration   | Single SCR        |

| MAJOR RATINGS AND CHARACTERISTICS |                            |             |            |
|-----------------------------------|----------------------------|-------------|------------|
| PARAMETER                         | TEST CONDITIONS            | VALUES      | UNITS      |
| $I_{T(AV)}$                       | Sinusoidal waveform        | 35          | A          |
| $I_{RMS}$                         |                            | 55          |            |
| $V_{RRM}/V_{DRM}$                 |                            | 800 to 1200 | V          |
| $I_{TSM}$                         |                            | 600         | A          |
| $V_T$                             | 40 A, $T_J = 25\text{ °C}$ | 1.45        | V          |
| dV/dt                             |                            | 1000        | V/ $\mu$ s |
| dI/dt                             |                            | 100         | A/ $\mu$ s |
| $T_J$                             |                            | -40 to +125 | °C         |

| VOLTAGE RATINGS |  |  |                                      |
|-----------------|--|--|--------------------------------------|
| PART NUMBER     | $V_{RRM}/V_{DRM}$ ,<br>MAXIMUM REPETITIVE PEAK<br>AND OFF-STATE VOLTAGE<br>V | $V_{RSM}$ ,<br>MAXIMUM NON-REPETITIVE PEAK<br>REVERSE VOLTAGE<br>V | $I_{RRM}/I_{DRM}$<br>AT 125 °C<br>mA |
| VS-40TPS08A-M3  | 800  | 900  | 10                                   |
| VS-40TPS08-M3   | 800  | 900  |                                      |
| VS-40TPS12A-M3  | 1200   | 1300   |                                      |
| VS-40TPS12-M3   | 1200   | 1300   |                                      |



| ABSOLUTE MAXIMUM RATINGS                             |                   |   |                                       |        |                   |
|--|-------------------|---|---------------------------------------|--------|-------------------|
| PARAMETER  | SYMBOL            | TEST CONDITIONS   |                                       | VALUES | UNITS             |
| Maximum average on-state current                     | $I_{T(AV)}$       | $T_C = 79\text{ }^\circ\text{C}$ , 180° conduction half sine wave                                 |                                       | 35     | A                 |
| Maximum continuous RMS on-state current as AC switch | $I_{T(RMS)}$      |   |                                       | 55     |                   |
| Maximum peak, one-cycle non-repetitive surge current | $I_{TSM}$         | 10 ms sine pulse, rated $V_{RRM}$ applied   |                                       | 500    | A <sup>2</sup> s  |
|  |                   | 10 ms sine pulse, no voltage reapplied  |                                       | 600    |                   |
| Maximum $I^2t$ for fusing                            | $I^2t$            | 10 ms sine pulse, rated $V_{RRM}$ applied   |                                       | 1250   |                   |
|  |                   | 10 ms sine pulse, no voltage reapplied  |                                       | 1760   |                   |
| Maximum $I^2\sqrt{t}$ for fusing                     | $I^2\sqrt{t}$     | t = 0.1 ms to 10 ms, no voltage reapplied   |                                       | 17 600 | A <sup>2</sup> √s |
| Low level value of threshold voltage                 | $V_{T(TO)1}$      | $T_J = 125\text{ }^\circ\text{C}$   |                                       | 1.02   | V                 |
| High level value of threshold voltage                | $V_{T(TO)2}$      |   |                                       | 1.23   |                   |
| Low level value of on-state slope resistance         | $r_{t1}$          |   |                                       | 9.74   | mΩ                |
| High level value of on-state slope resistance        | $r_{t2}$          |   |                                       | 7.50   |                   |
| Maximum peak on-state voltage                        | $V_{TM}$          | 110 A, $T_J = 25\text{ }^\circ\text{C}$   |                                       | 1.85   | V                 |
| Maximum rate of rise of turned-on current            | di/dt             | $T_J = 25\text{ }^\circ\text{C}$  |                                       | 100    | A/μs              |
| Maximum holding current                              | $I_H$             | Anode supply = 6 V, resistive load, initial $T_J = 1\text{ A}$ , $I_T = 25\text{ }^\circ\text{C}$ |                                       | 200    | mA                |
| Maximum latching current                             | $I_L$             | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^\circ\text{C}$                              |                                       | 300    |                   |
| Maximum reverse and direct leakage current           | $I_{RRM}/I_{DRM}$ | $T_J = 25\text{ }^\circ\text{C}$  | $V_R = \text{Rated } V_{RRM}/V_{DRM}$ | 0.5    | mA                |
|  |                   | $T_J = 125\text{ }^\circ\text{C}$   |                                       | 10     |                   |
| Maximum rate of rise of off-state voltage 40TPS12A   | dV/dt             | $T_J = T_J$ maximum, linear to 80 % $V_{DRM}$ , $R_g - k = 100\text{ }^\circ\Omega$               |                                       | 500    | V/μs              |
| Maximum rate of rise of off-state voltage 40TPS12    |                   |   |                                       | 1000   |                   |

| TRIGGERING  |             |  |                                   |        |       |
|---|-------------|--|-----------------------------------|--------|-------|
| PARAMETER   | SYMBOL      | TEST CONDITIONS  |                                   | VALUES | UNITS |
| Maximum peak gate power                             | $P_{GM}$    |  |                                   | 10     | W     |
| Maximum average gate power                          | $P_{G(AV)}$ |  |                                   | 2.5    |       |
| Maximum peak gate current                           | $I_{GM}$    |  |                                   | 2.5    | A     |
| Maximum peak negative gate voltage                  | $-V_{GM}$   |  |                                   | 10     | V     |
| Maximum required DC gate voltage to trigger         | $V_{GT}$    | $T_J = -40\text{ }^\circ\text{C}$                                  | Anode supply = 6 V resistive load | 4.0    | V     |
|   |             | $T_J = 25\text{ }^\circ\text{C}$                                   |                                   | 2.5    |       |
|   |             | $T_J = 125\text{ }^\circ\text{C}$                                  |                                   | 1.7    |       |
| Maximum required DC gate current to trigger         | $I_{GT}$    | $T_J = -40\text{ }^\circ\text{C}$                                  | Anode supply = 6 V resistive load | 270    | mA    |
|   |             | $T_J = 25\text{ }^\circ\text{C}$                                   |                                   | 150    |       |
|   |             | $T_J = 125\text{ }^\circ\text{C}$                                  |                                   | 80     |       |
|   |             | $T_J = 25\text{ }^\circ\text{C}$ , for 40TPS..APbF and 40TPS..A-M3 |                                   | 40     |       |
| Maximum DC gate voltage not to trigger for 40TPS12  | $V_{GD}$    | $T_J = 125\text{ }^\circ\text{C}$ , $V_{DRM} = \text{rated value}$ |                                   | 0.25   | V     |
| Maximum DC gate current not to trigger for 40TPS12  | $I_{GD}$    |  |                                   | 6      | mA    |
| Maximum DC gate voltage not to trigger for 40TPS12A | $V_{GD}$    | $T_J = 125\text{ }^\circ\text{C}$ , $V_{DRM} = \text{rated value}$ |                                   | 0.15   | V     |
| Maximum DC gate current not to trigger for 40TPS12A | $I_{GD}$    |  |                                   | 1      | mA    |



| THERMAL AND MECHANICAL SPECIFICATIONS           |                |                                      |             |                        |
|---|----------------|--------------------------------------|-------------|------------------------|
| PARAMETER                                       | SYMBOL         | TEST CONDITIONS                      | VALUES      | UNITS                  |
| Maximum junction and storage temperature range  | $T_J, T_{Stg}$ |                                      | -40 to +125 | °C                     |
| Maximum thermal resistance, junction to case    | $R_{thJC}$     | DC operation                         | 0.6         | °C/W                   |
| Maximum thermal resistance, junction to ambient | $R_{thJA}$     |                                      | 40          |                        |
| Maximum thermal resistance, case to heatsink    | $R_{thCS}$     | Mounting surface, smooth and greased | 0.2         |                        |
| Approximate weight                              |                |                                      | 6           | g                      |
|   |                |                                      | 0.21        | oz.                    |
| Mounting torque                                 | minimum        |                                      | 6 (5)       | kgf · cm<br>(lbf · in) |
|   | maximum        |                                      | 12 (10)     |                        |
| Marking device                                  |                | Case style TO-247AC 3L               | 40TPS08A    |                        |
|   |                |                                      | 40TPS12A    |                        |
|   |                |                                      | 40TPS08     |                        |
|   |                |                                      | 40TPS12     |                        |

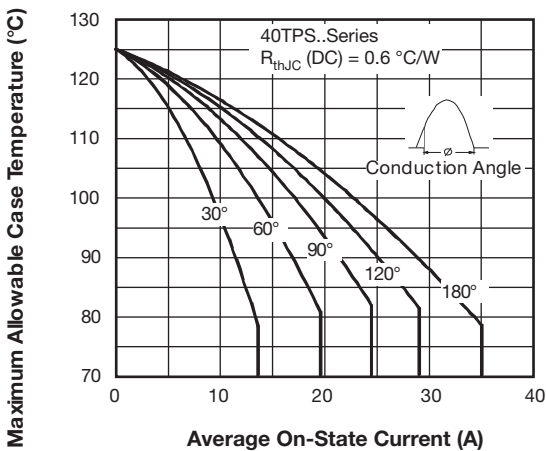


Fig. 1 - Current Rating Characteristics

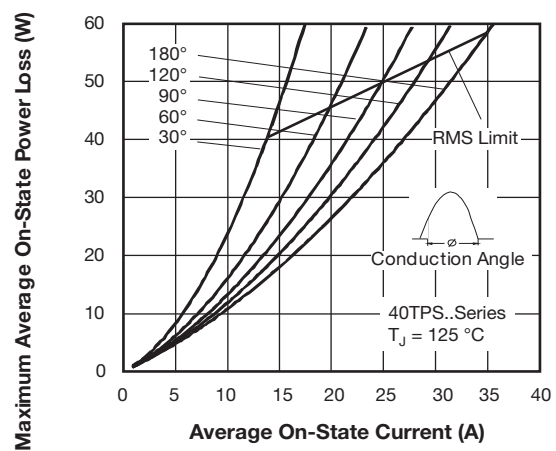


Fig. 3 - On-State Power Loss Characteristics

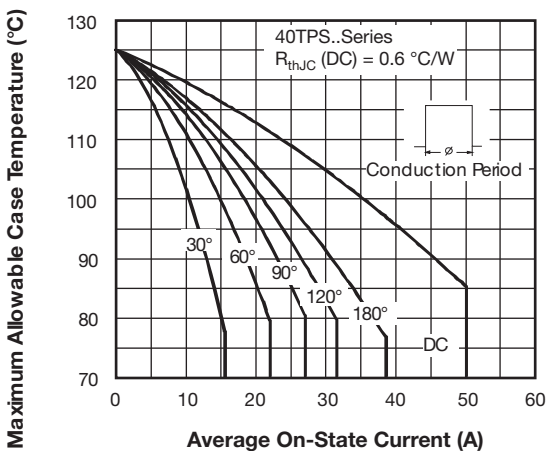


Fig. 2 - Current Rating Characteristics

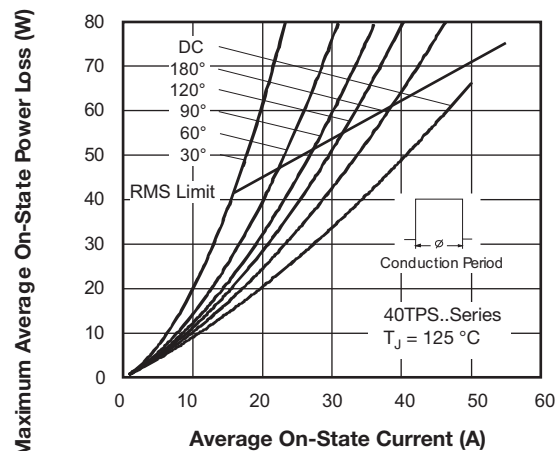


Fig. 4 - On-State Power Loss Characteristics

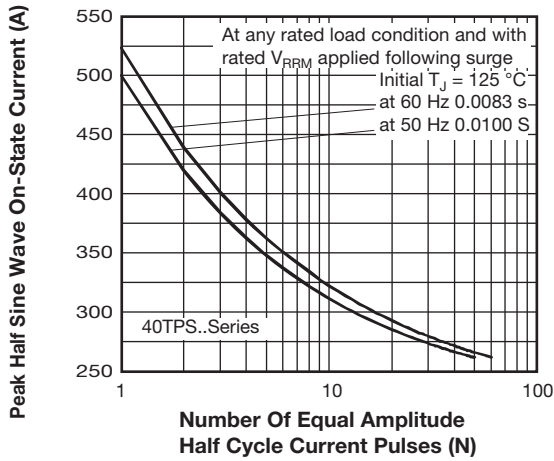


Fig. 5 - Maximum Non-Repetitive Surge Current

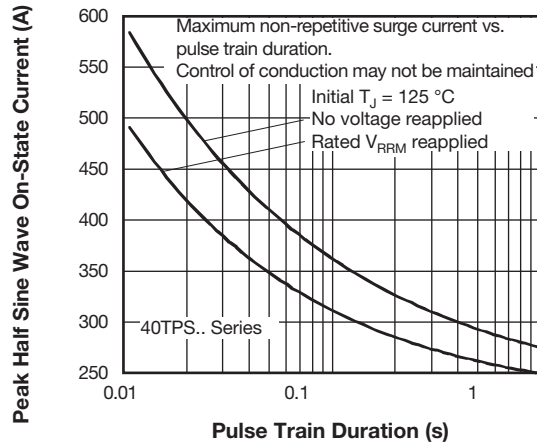


Fig. 6 - Maximum Non-Repetitive Surge Current

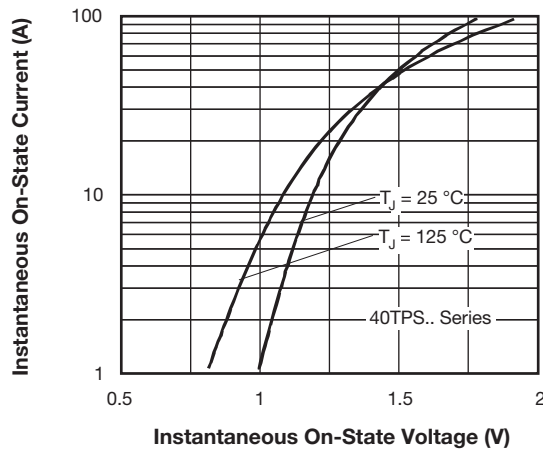


Fig. 7 - On-State Voltage Drop Characteristics

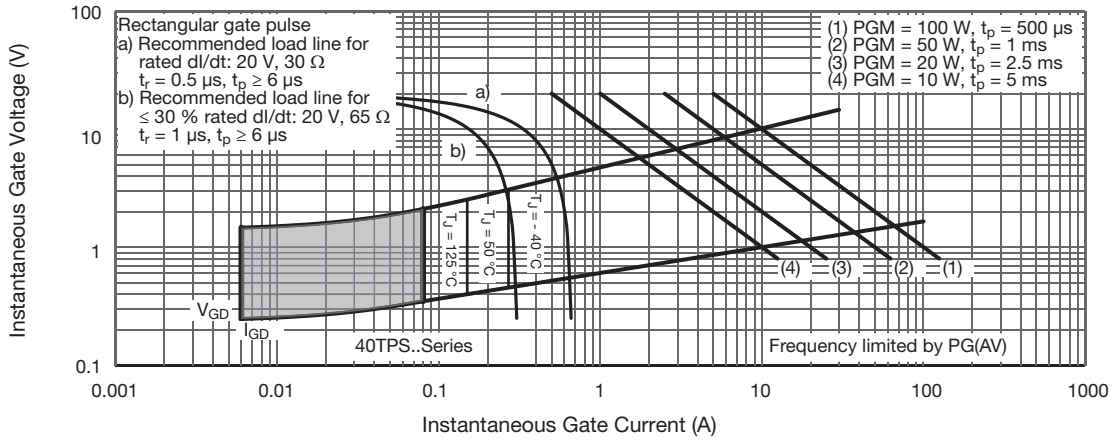


Fig. 8 - Gate Characteristics

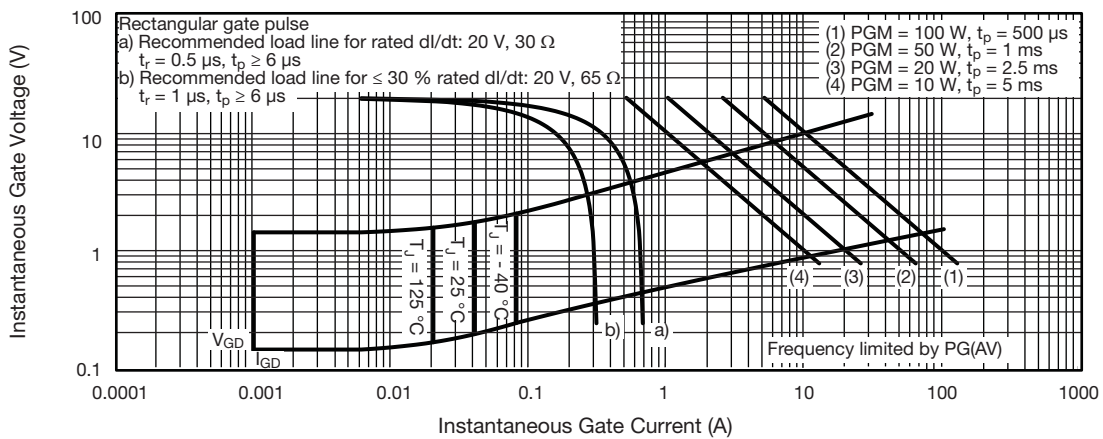


Fig. 9 - Gate Characteristics, 40TPS..A Series

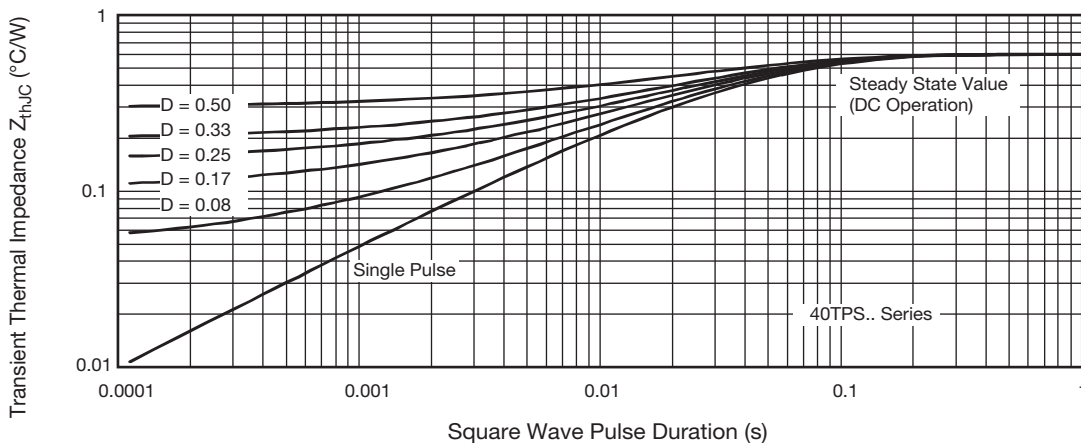
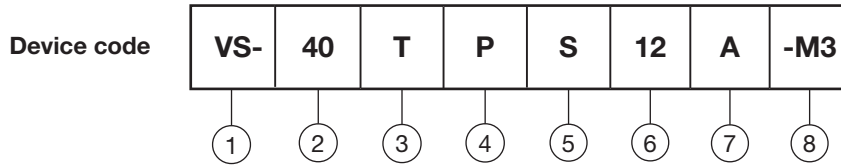


Fig. 10 - Thermal Impedance  $Z_{thJC}$  Characteristics



## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (40 = 40 A)
- 3** - Circuit configuration:  
T = thyristor
- 4** - Package:  
P = TO-247AC 3L
- 5** - Type of silicon:  
S = standard recovery rectifier
- 6** - Voltage ratings
 

|             |
|-------------|
| 08 = 800 V  |
| 12 = 1200 V |
- 7** -
  - A = low  $I_{GT}$  selection 40 mA maximum
  - None = standard  $I_{gt}$  selection
- 8** - Environmental digit:  
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| <b>ORDERING INFORMATION</b> (Example) |                  |                        |                          |
|---------------------------------------|------------------|------------------------|--------------------------|
| PREFERRED P/N                         | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION    |
| VS-40TPS08A-M3                        | 25               | 500                    | Antistatic plastic tubes |
| VS-40TPS08-M3                         | 25               | 500                    | Antistatic plastic tubes |
| VS-40TPS12A-M3                        | 25               | 500                    | Antistatic plastic tubes |
| VS-40TPS12-M3                         | 25               | 500                    | Antistatic plastic tubes |

| <b>LINKS TO RELATED DOCUMENTS</b> |  |
|-----------------------------------|--|
| Dimensions                        | <a href="http://www.vishay.com/doc?96138">www.vishay.com/doc?96138</a> |
| Part marking information          | <a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a> |





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