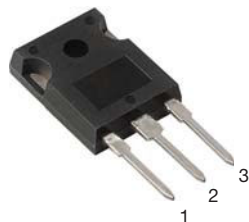
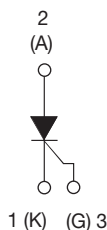




## Thyristor High Voltage, Phase Control SCR, 30 A



TO-247AC



## FEATURES

- Designed and qualified according to JEDEC-JESD47
- 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 in motor control, UPS, welding and battery charge

## DESCRIPTION

The VS-30TPS... 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.

## PRODUCT SUMMARY

|                   |                   |
|-------------------|-------------------|
| Package           | TO-247AC          |
| Diode variation   | Single SCR        |
| $I_{T(AV)}$       | 20 A              |
| $V_{DRM}/V_{RRM}$ | 800 V, 1200 V     |
| $V_{TM}$          | 1.3 V             |
| $I_{GT}$          | 45 mA             |
| $T_J$             | - 40 °C to 125 °C |

## MAJOR RATINGS AND CHARACTERISTICS

| PARAMETER         | TEST CONDITIONS            | VALUES      | UNITS |
|-------------------|----------------------------|-------------|-------|
| $I_{T(AV)}$       | Sinusoidal waveform        | 20          | A     |
| $I_{RMS}$         |                            | 30          |       |
| $V_{RRM}/V_{DRM}$ |                            | 800/1200    | V     |
| $I_{TSM}$         |                            | 300         | A     |
| $V_T$             | 20 A, $T_J = 25\text{ °C}$ | 1.3         | V     |
| dV/dt             |                            | 500         | V/μs  |
| dI/dt             |                            | 150         | A/μs  |
| $T_J$             |                            | - 40 to 125 | °C    |

## VOLTAGE RATINGS

| PART NUMBER                  | $V_{RRM}/V_{DRM}$ , MAXIMUM<br>REPETITIVE PEAK AND<br>OFF-STATE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM<br>NON-REPETITIVE PEAK<br>REVERSE VOLTAGE<br>V | $I_{RRM}/I_{DRM}$<br>AT 125 °C<br>mA |
|------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------|
| VS-30TPS08PbF, VS-30TPS08-M3 | 800                                                                          | 900                                                                | 10                                   |
| VS-30TPS12PbF, VS-30TPS12-M3 | 1200                                                                         | 1300                                                               |                                      |



| ABSOLUTE MAXIMUM RATINGS                             |                 |                                                                                                     |        |               |
|------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------|--------|---------------|
| PARAMETER                                            | SYMBOL          | TEST CONDITIONS                                                                                     | VALUES | UNITS         |
| Maximum average on-state current                     | $I_{T(AV)}$     | $T_C = 95\text{ }^{\circ}\text{C}$ , 180° conduction half sine wave                                 | 20     | A             |
| Maximum RMS on-state current                         | $I_{RMS}$       |                                                                                                     | 30     |               |
| Maximum peak, one-cycle non-repetitive surge current | $I_{TSM}$       | 10 ms sine pulse, rated $V_{RRM}$ applied                                                           | 250    |               |
|                                                      |                 | 10 ms sine pulse, no voltage reapplied                                                              | 300    |               |
| Maximum $I^2t$ for fusing                            | $I^2t$          | 10 ms sine pulse, rated $V_{RRM}$ applied                                                           | 310    | $A^2s$        |
|                                                      |                 | 10 ms sine pulse, no voltage reapplied                                                              | 442    |               |
| Maximum $I^2\sqrt{t}$ for fusing                     | $I^2\sqrt{t}$   | $t = 0.1$ to 10 ms, no voltage reapplied                                                            | 4420   | $A^2\sqrt{s}$ |
| Maximum on-state voltage drop                        | $V_{TM}$        | 20 A, $T_J = 25\text{ }^{\circ}\text{C}$                                                            | 1.3    | V             |
| On-state slope resistance                            | $r_t$           | $T_J = 125\text{ }^{\circ}\text{C}$                                                                 | 12     | $m\Omega$     |
| Threshold voltage                                    | $V_{T(To)}$     |                                                                                                     | 1.0    | V             |
| Maximum reverse and direct leakage current           | $I_{RM}/I_{DM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                                  | 0.5    | mA            |
|                                                      |                 | $T_J = 125\text{ }^{\circ}\text{C}$                                                                 | 10     |               |
| Maximum holding current                              | $I_H$           | $V_R = \text{Rated } V_{RRM}/V_{DRM}$                                                               |        |               |
| Maximum latching current                             | $I_L$           | Anode supply = 6 V, resistive load, initial $I_T = 1\text{ A}$ , $T_J = 25\text{ }^{\circ}\text{C}$ | 150    |               |
| Maximum rate of rise of off-state voltage            | $dV/dt$         | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$                              | 200    |               |
| Maximum rate of rise of turned-on current            | $dI/dt$         | $T_J = T_J$ maximum, linear to 80 % $V_{DRM}$ , $R_g-k = \text{Open}$                               | 500    | V/ $\mu s$    |
|                                                      |                 |                                                                                                     | 150    | A/ $\mu s$    |

| TRIGGERING                                  |             |                                                                         |        |       |
|---------------------------------------------|-------------|-------------------------------------------------------------------------|--------|-------|
| PARAMETER                                   | SYMBOL      | TEST CONDITIONS                                                         | VALUES | UNITS |
| Maximum peak gate power                     | $P_{GM}$    |                                                                         | 8.0    | W     |
| Maximum average gate power                  | $P_{G(AV)}$ |                                                                         | 2.0    |       |
| Maximum peak positive gate current          | $+I_{GM}$   |                                                                         | 1.5    | A     |
| Maximum peak negative gate voltage          | $-V_{GM}$   |                                                                         | 10     | V     |
| Maximum required DC gate current to trigger | $I_{GT}$    | Anode supply = 6 V, resistive load, $T_J = -10\text{ }^{\circ}\text{C}$ | 60     | mA    |
|                                             |             | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$  | 45     |       |
|                                             |             | Anode supply = 6 V, resistive load, $T_J = 125\text{ }^{\circ}\text{C}$ | 20     |       |
| Maximum required DC gate voltage to trigger | $V_{GT}$    | Anode supply = 6 V, resistive load, $T_J = -10\text{ }^{\circ}\text{C}$ | 2.5    | V     |
|                                             |             | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$  | 2.0    |       |
|                                             |             | Anode supply = 6 V, resistive load, $T_J = 125\text{ }^{\circ}\text{C}$ | 1.0    |       |
| Maximum DC gate voltage not to trigger      | $V_{GD}$    | $T_J = 125\text{ }^{\circ}\text{C}$ , $V_{DRM} = \text{Rated value}$    | 0.25   | mA    |
| Maximum DC gate current not to trigger      | $I_{GD}$    |                                                                         | 2.0    |       |

| SWITCHING                     |          |                                     |        |         |
|-------------------------------|----------|-------------------------------------|--------|---------|
| PARAMETER                     | SYMBOL   | TEST CONDITIONS                     | VALUES | UNITS   |
| Typical turn-on time          | $t_{gt}$ | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.9    | $\mu s$ |
| Typical reverse recovery time | $t_{rr}$ | $T_J = 125\text{ }^{\circ}\text{C}$ | 4      |         |
| Typical turn-off time         | $t_q$    |                                     | 110    |         |



| 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                         | 0.8         | °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   |
|                                                 | maximum        |                                      | 12 (10)     | (lbf · in) |
| Marking device                                  |                | Case style TO-247AC (JEDEC)          | 30TPS08     |            |
|                                                 |                |                                      | 30TPS12     |            |

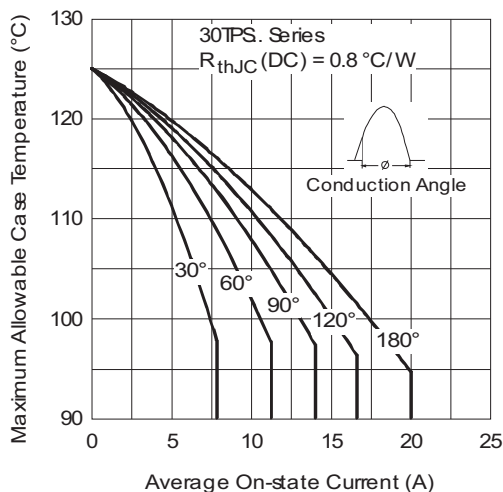


Fig. 1 - Current Rating Characteristics

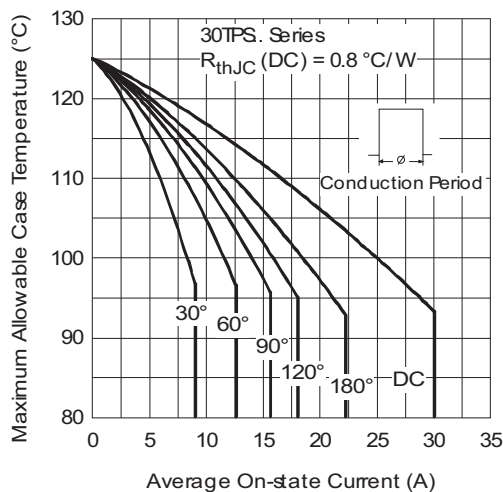


Fig. 2 - Current Rating Characteristics

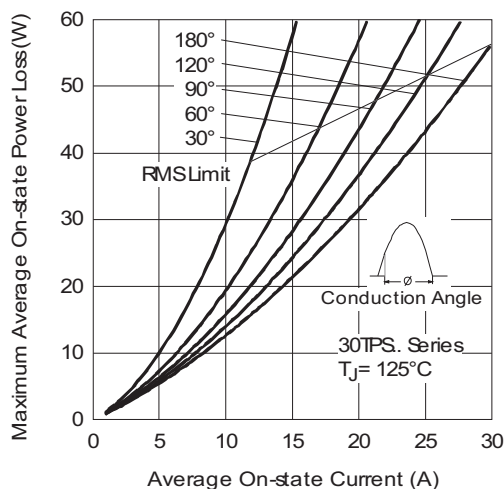


Fig. 3 - On-State Power Loss Characteristics

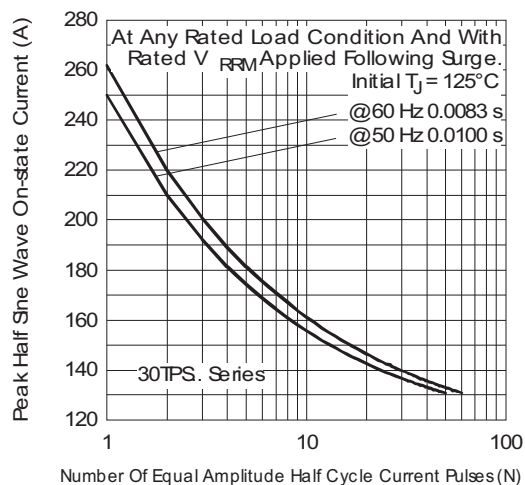


Fig. 5 - Maximum Non-Repetitive Surge Current

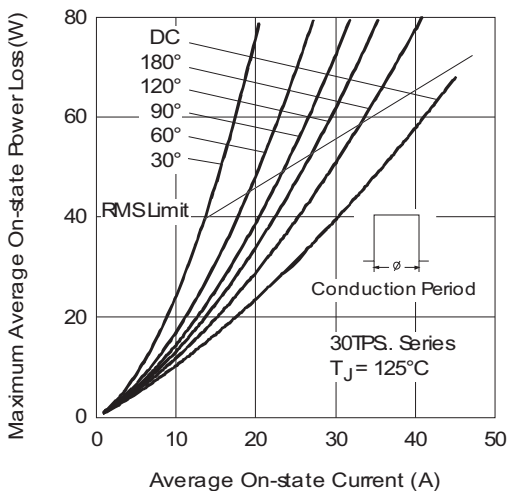


Fig. 4 - On-State Power Loss Characteristics

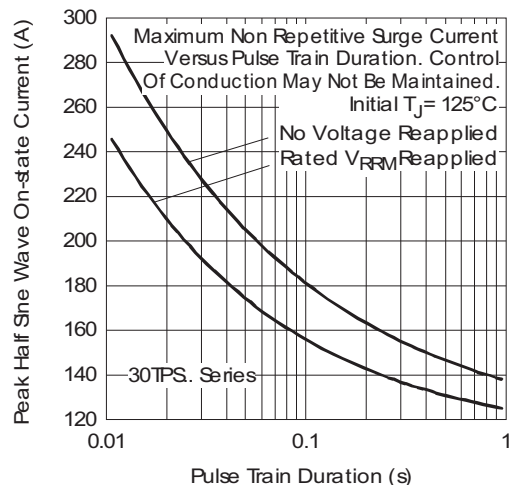


Fig. 6 - Maximum Non-Repetitive Surge Current

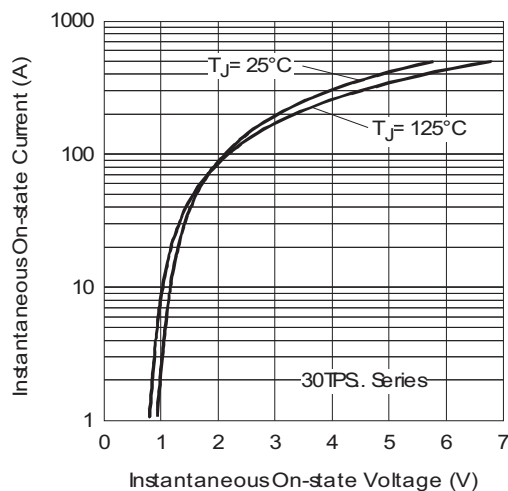


Fig. 7 - On-State Voltage Drop Characteristics

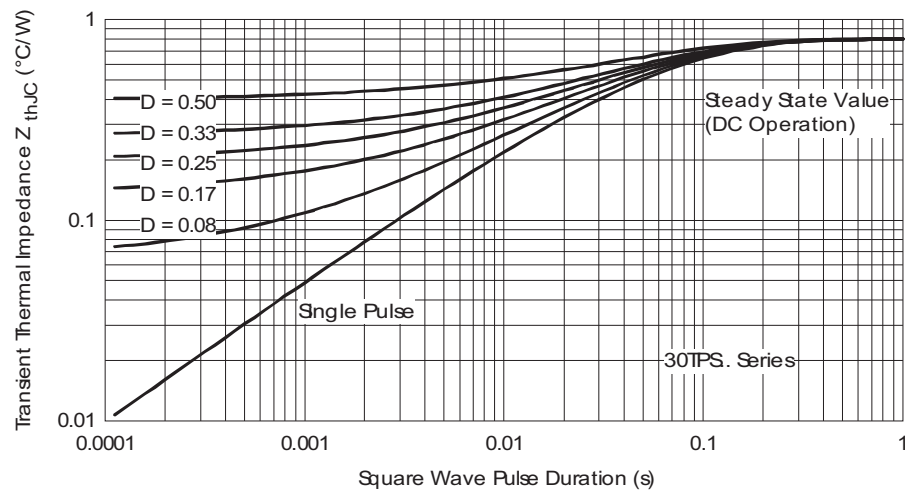


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

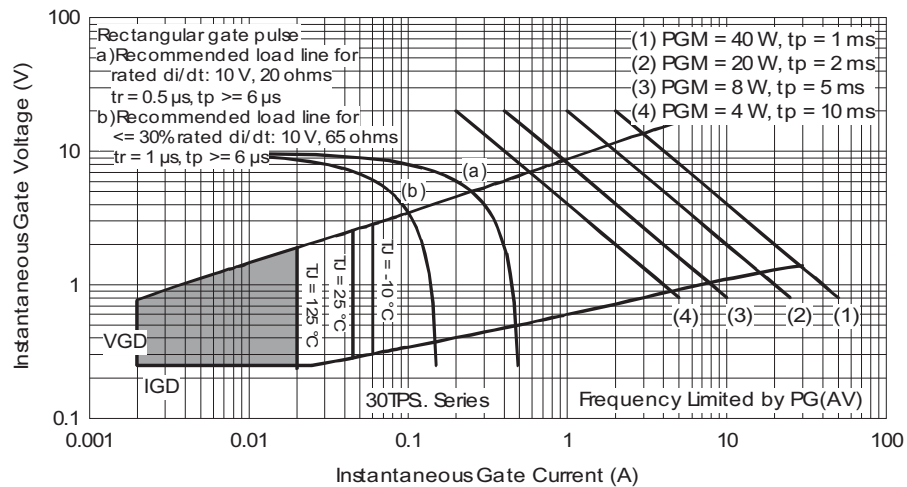


Fig. 9 - Gate Characteristics

**ORDERING INFORMATION TABLE**

|             |                                                                                                                                          |           |          |          |          |           |            |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|----------|----------|-----------|------------|
| Device code | <b>VS-</b>                                                                                                                               | <b>30</b> | <b>T</b> | <b>P</b> | <b>S</b> | <b>12</b> | <b>PbF</b> |
|             | 1                                                                                                                                        | 2         | 3        | 4        | 5        | 6         | 7          |
| <b>1</b>    | - Vishay Semiconductors product                                                                                                          |           |          |          |          |           |            |
| <b>2</b>    | - Current rating (30 = 30 A)                                                                                                             |           |          |          |          |           |            |
| <b>3</b>    | - Circuit configuration:<br>T = Thyristor                                                                                                |           |          |          |          |           |            |
| <b>4</b>    | - Package:<br>P = TO-247                                                                                                                 |           |          |          |          |           |            |
| <b>5</b>    | - Type of silicon:<br>S = Standard recovery rectifier                                                                                    |           |          |          |          |           |            |
| <b>6</b>    | - Voltage code x 100 = $V_{RRM}$                                                                                                         |           |          |          |          |           |            |
| <b>7</b>    | - Environmental digit:<br>PbF = Lead (Pb)-free and RoHS compliant<br>-M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free |           |          |          |          |           |            |

|                           |
|---------------------------|
| 08 = 800 V<br>12 = 1200 V |
|---------------------------|

| <b>ORDERING INFORMATION</b> (Example) |                  |                        |                          |
|---------------------------------------|------------------|------------------------|--------------------------|
| PREFERRED P/N                         | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION    |
| VS-30TPS08PbF                         | 25               | 500                    | Antistatic plastic tubes |
| VS-30TPS08-M3                         | 25               | 500                    | Antistatic plastic tubes |
| VS-30TPS12PbF                         | 25               | 500                    | Antistatic plastic tubes |
| VS-30TPS12-M3                         | 25               | 500                    | Antistatic plastic tubes |

| <b>LINKS TO RELATED DOCUMENTS</b> |                                                                                     |
|-----------------------------------|-------------------------------------------------------------------------------------|
| Dimensions                        | <a href="http://www.vishay.com/doc?95223">www.vishay.com/doc?95223</a>              |
| Part marking information          | TO-247AC PbF <a href="http://www.vishay.com/doc?95226">www.vishay.com/doc?95226</a> |
|                                   | TO-247AC -M3 <a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a> |



**DIMENSIONS** in millimeters and inches



### Lead assignments

#### Diodes

1. - Anode/open
2. - Cathode
3. - Anode

| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.65        | 5.31  | 0.183  | 0.209 |       |
| A1     | 2.21        | 2.59  | 0.087  | 0.102 |       |
| A2     | 1.50        | 2.49  | 0.059  | 0.098 |       |
| b      | 0.99        | 1.40  | 0.039  | 0.055 |       |
| b1     | 0.99        | 1.35  | 0.039  | 0.053 |       |
| b2     | 1.65        | 2.39  | 0.065  | 0.094 |       |
| b3     | 1.65        | 2.37  | 0.065  | 0.094 |       |
| b4     | 2.59        | 3.43  | 0.102  | 0.135 |       |
| b5     | 2.59        | 3.38  | 0.102  | 0.133 |       |
| c      | 0.38        | 0.86  | 0.015  | 0.034 |       |
| c1     | 0.38        | 0.76  | 0.015  | 0.030 |       |
| D      | 19.71       | 20.70 | 0.776  | 0.815 | 3     |
| D1     | 13.08       | -     | 0.515  | -     | 4     |

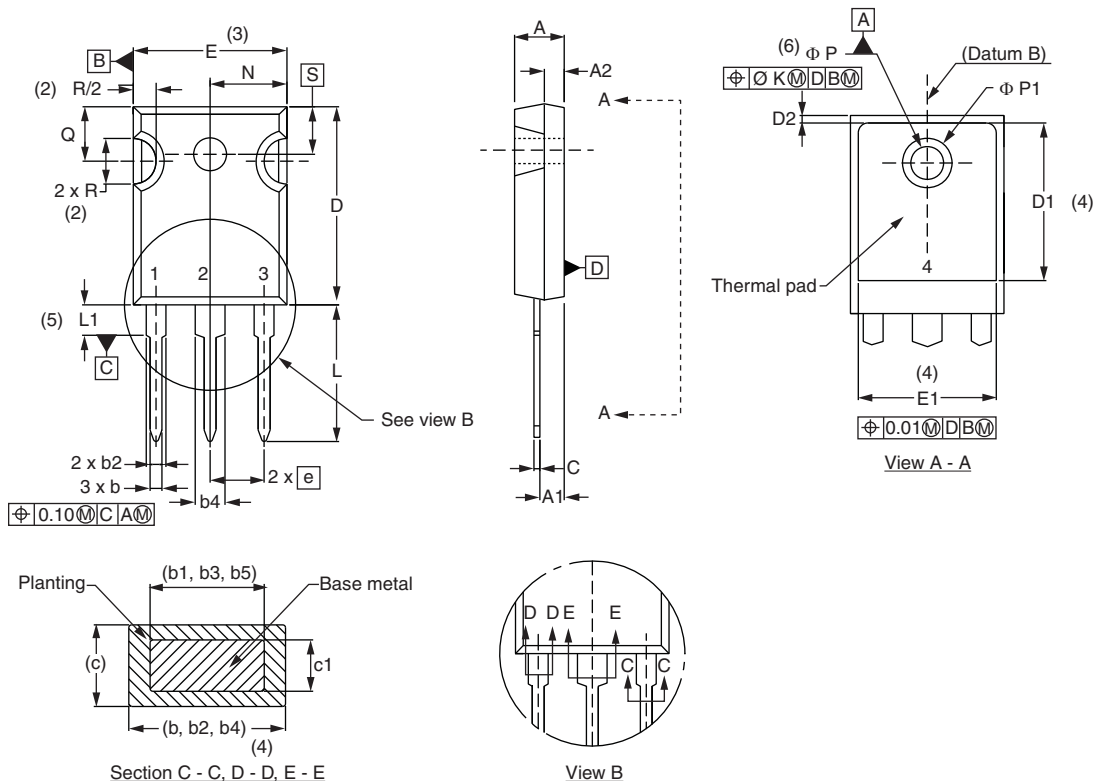
| SYMBOL    | MILLIMETERS |       | INCHES    |       | NOTES |
|-----------|-------------|-------|-----------|-------|-------|
|           | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D2        | 0.51        | 1.30  | 0.020     | 0.051 |       |
| E         | 15.29       | 15.87 | 0.602     | 0.625 | 3     |
| E1        | 13.72       | -     | 0.540     | -     |       |
| e         | 5.46 BSC    |       | 0.215 BSC |       |       |
| FK        | 2.54        |       | 0.010     |       |       |
| L         | 14.20       | 16.10 | 0.559     | 0.634 |       |
| L1        | 3.71        | 4.29  | 0.146     | 0.169 |       |
| N         | 7.62 BSC    |       | 0.3       |       |       |
| $\Phi P$  | 3.56        | 3.66  | 0.14      | 0.144 |       |
| $\Phi P1$ | -           | 6.98  | -         | 0.275 |       |
| Q         | 5.31        | 5.69  | 0.209     | 0.224 |       |
| R         | 4.52        | 5.49  | 1.78      | 0.216 |       |
| S         | 5.51 BSC    |       | 0.217 BSC |       |       |

### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6)  $\Phi P$  to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC outline TO-247 with exception of dimension c

### TO-247

**DIMENSIONS** in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.65        | 5.31  | 0.183  | 0.209 |       |
| A1     | 2.21        | 2.59  | 0.087  | 0.102 |       |
| A2     | 1.17        | 1.37  | 0.046  | 0.054 |       |
| b      | 0.99        | 1.40  | 0.039  | 0.055 |       |
| b1     | 0.99        | 1.35  | 0.039  | 0.053 |       |
| b2     | 1.65        | 2.39  | 0.065  | 0.094 |       |
| b3     | 1.65        | 2.33  | 0.065  | 0.092 |       |
| b4     | 2.59        | 3.43  | 0.102  | 0.135 |       |
| b5     | 2.59        | 3.38  | 0.102  | 0.133 |       |
| c      | 0.38        | 0.89  | 0.015  | 0.035 |       |
| c1     | 0.38        | 0.84  | 0.015  | 0.033 |       |
| D      | 19.71       | 20.70 | 0.776  | 0.815 | 3     |
| D1     | 13.08       | -     | 0.515  | -     | 4     |

| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D2     | 0.51        | 1.35  | 0.020     | 0.053 |       |
| E      | 15.29       | 15.87 | 0.602     | 0.625 | 3     |
| E1     | 13.46       | -     | 0.53      | -     |       |
| e      | 5.46 BSC    |       | 0.215 BSC |       |       |
| Ø K    | 0.254       |       | 0.010     |       |       |
| L      | 14.20       | 16.10 | 0.559     | 0.634 |       |
| L1     | 3.71        | 4.29  | 0.146     | 0.169 |       |
| N      | 7.62 BSC    |       | 0.3       |       |       |
| Ø P    | 3.56        | 3.66  | 0.14      | 0.144 |       |
| Ø P1   | -           | 7.39  | -         | 0.291 |       |
| Q      | 5.31        | 5.69  | 0.209     | 0.224 |       |
| R      | 4.52        | 5.49  | 0.178     | 0.216 |       |
| S      | 5.51 BSC    |       | 0.217 BSC |       |       |

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6) Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC® outline TO-247 with exception of dimension c and Q



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**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**