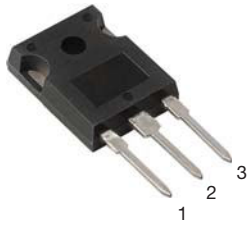
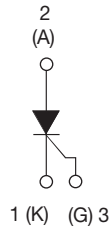


## Thyristor High Voltage, Phase Control SCR, 30 A



TO-247AC



### FEATURES

- High voltage (up to 1600 V)
- 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)



| PRODUCT SUMMARY   |                   |
|-------------------|-------------------|
| Package           | TO-247AC          |
| Diode variation   | Single SCR        |
| $I_{T(AV)}$       | 20 A              |
| $V_{DRM}/V_{RRM}$ | 1600 V            |
| $V_{TM}$          | 1.3 V             |
| $I_{GT}$          | 45 mA             |
| $T_J$             | - 40 °C to 125 °C |

### APPLICATIONS

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

### DESCRIPTION

The VS-30TPS16... 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.

| MAJOR RATINGS AND CHARACTERISTICS |                            |             |            |
|-----------------------------------|----------------------------|-------------|------------|
| PARAMETER                         | TEST CONDITIONS            | VALUES      | UNITS      |
| $I_{T(AV)}$                       | Sinusoidal waveform        | 20          | A          |
| $I_{RMS}$                         |                            | 30          |            |
| $V_{RRM}/V_{DRM}$                 |                            | 1600        | V          |
| $I_{TSM}$                         |                            | 300         | A          |
| $V_T$                             | 20 A, $T_J = 25\text{ °C}$ | 1.3         | V          |
| dV/dt                             |                            | 500         | V/ $\mu$ s |
| dI/dt                             |                            | 150         | A/ $\mu$ s |
| $T_J$                             |                            | - 40 to 125 | °C         |

| VOLTAGE RATINGS              |  |  |                                   |
|------------------------------|--|--|-----------------------------------|
| PART NUMBER                  | $V_{RRM}/V_{DRM}$ , MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE<br>V | $I_{RRM}/I_{DRM}$ AT 125 °C<br>mA |
| VS-30TPS16PbF, VS-30TPS16-M3 | 1600   | 1700   | 10                                |



| 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            | $I_{RM}/I_{DM}$ | $V_R = \text{Rated } V_{RRM}/V_{DRM}$   | $T_J = 25\text{ }^\circ\text{C}$  | 0.5           | mA |
|   |                 |   | $T_J = 125\text{ }^\circ\text{C}$ | 10            |    |
| Maximum holding current                               | $I_H$           | Anode supply = 6 V, resistive load, initial $I_T = 1$ A, $T_J = 25\text{ }^\circ\text{C}$ | 150                               |               |    |
| Maximum latching current                              | $I_L$           | Anode supply = 6 V, resistive load, $T_J = 25\text{ }^\circ\text{C}$                      | 200                               |               |    |
| Maximum rate of rise of off-state voltage             | $dV/dt$         | $T_J = T_J$ maximum, linear to 80 % $V_{DRM}$ , $R_g-k = \text{Open}$                     | 500                               | $V/\mu s$     |    |
| Maximum rate of rise of turned-on current             | $dI/dt$         |   | 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   |       |
| Maximum DC gate current not to trigger      | $I_{GD}$    |   | 2.0    | mA    |

| 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<br>(lbf · in) |
|   | maximum        |                                      | 12 (10)     |                        |
| Marking device                                  |                | Case style TO-247AC (JEDEC)          | 30TPS16     |                        |

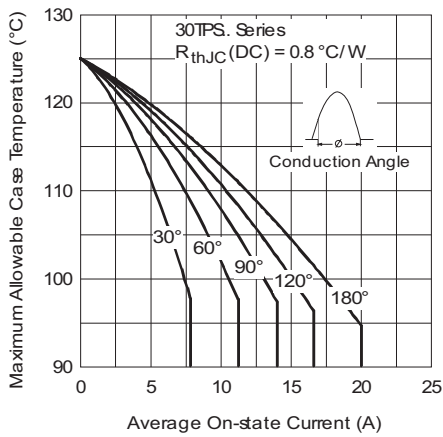


Fig. 1 - Current Rating Characteristics

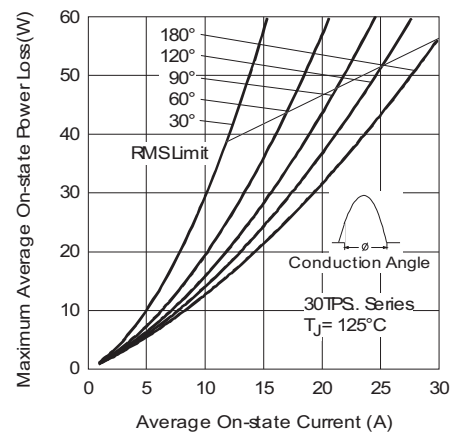


Fig. 3 - On-State Power Loss Characteristics

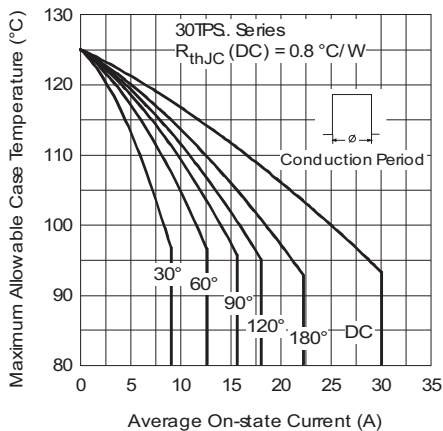


Fig. 2 - Current Rating Characteristics

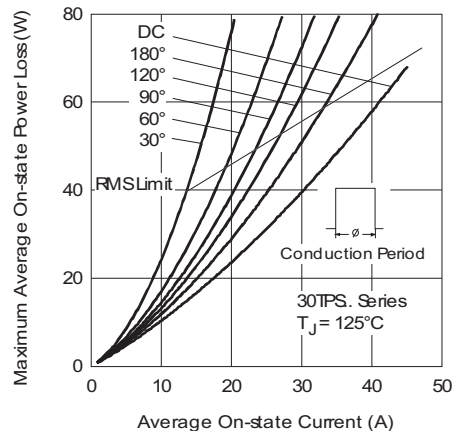


Fig. 4 - On-State Power Loss Characteristics

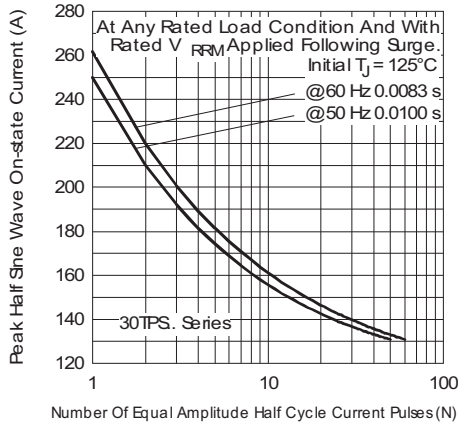


Fig. 5 - Maximum Non-Repetitive Surge Current

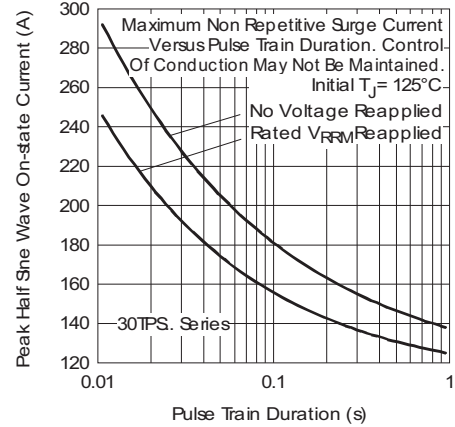


Fig. 6 - Maximum Non-Repetitive Surge Current

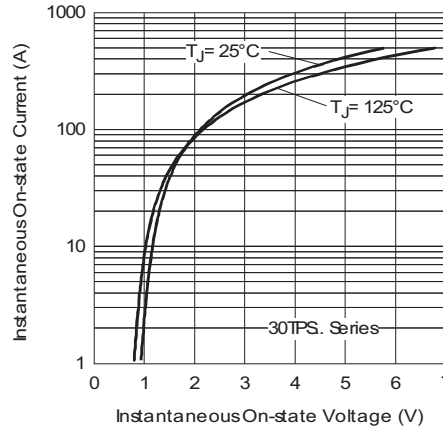


Fig. 7 - On-State Voltage Drop Characteristics

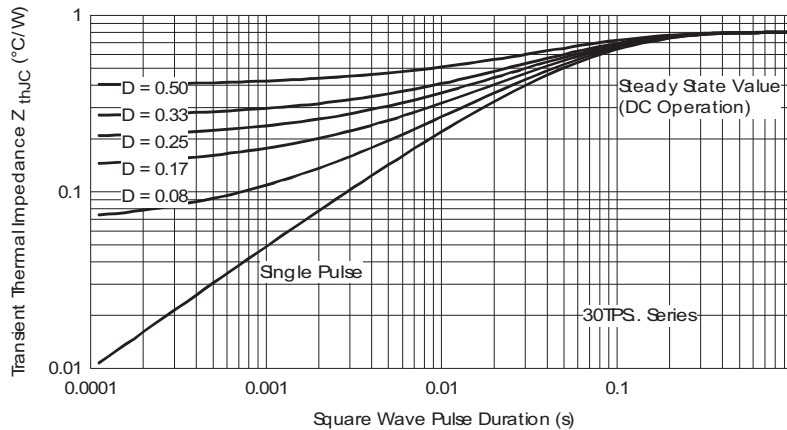


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

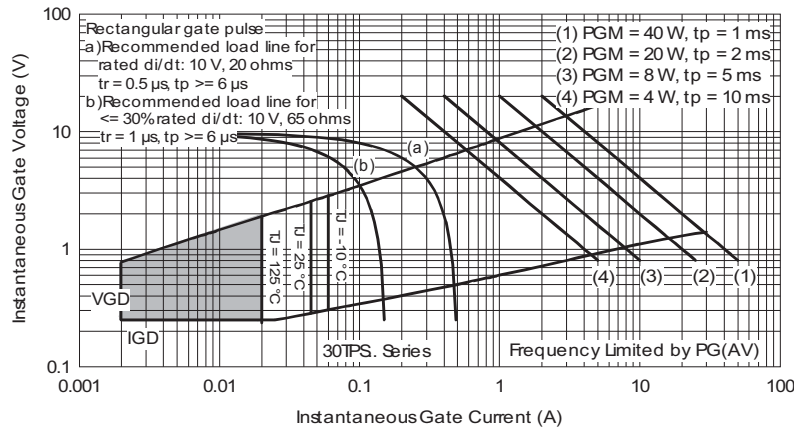


Fig. 9 - Gate Characteristics

**ORDERING INFORMATION TABLE**

|             |            |           |          |          |          |           |            |
|-------------|------------|-----------|----------|----------|----------|-----------|------------|
| Device code | <b>VS-</b> | <b>30</b> | <b>T</b> | <b>P</b> | <b>S</b> | <b>16</b> | <b>PbF</b> |
|             | ①          | ②         | ③        | ④        | ⑤        | ⑥         | ⑦          |

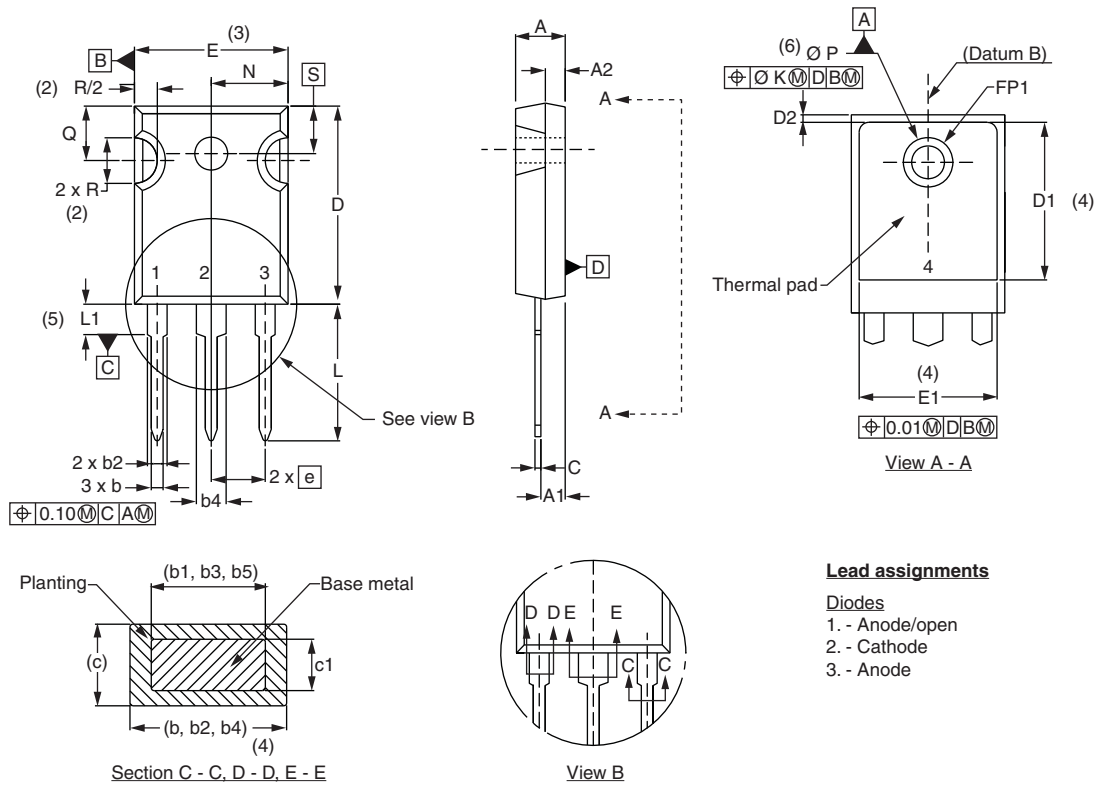
- 1** - Vishay Semiconductors product
- 2** - Current rating (30 = 30 A)
- 3** - Circuit configuration:  
T = Thyristor
- 4** - Package:  
P = TO-247
- 5** - Type of silicon:  
S = Standard recovery rectifier
- 6** - Voltage rating (16 = 1600 V)
- 7** - Environmental digit:  
PbF = Lead (Pb)-free and RoHS compliant  
-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-30TPS16PbF                         | 25               | 500                    | Antistatic plastic tubes |
| VS-30TPS16-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

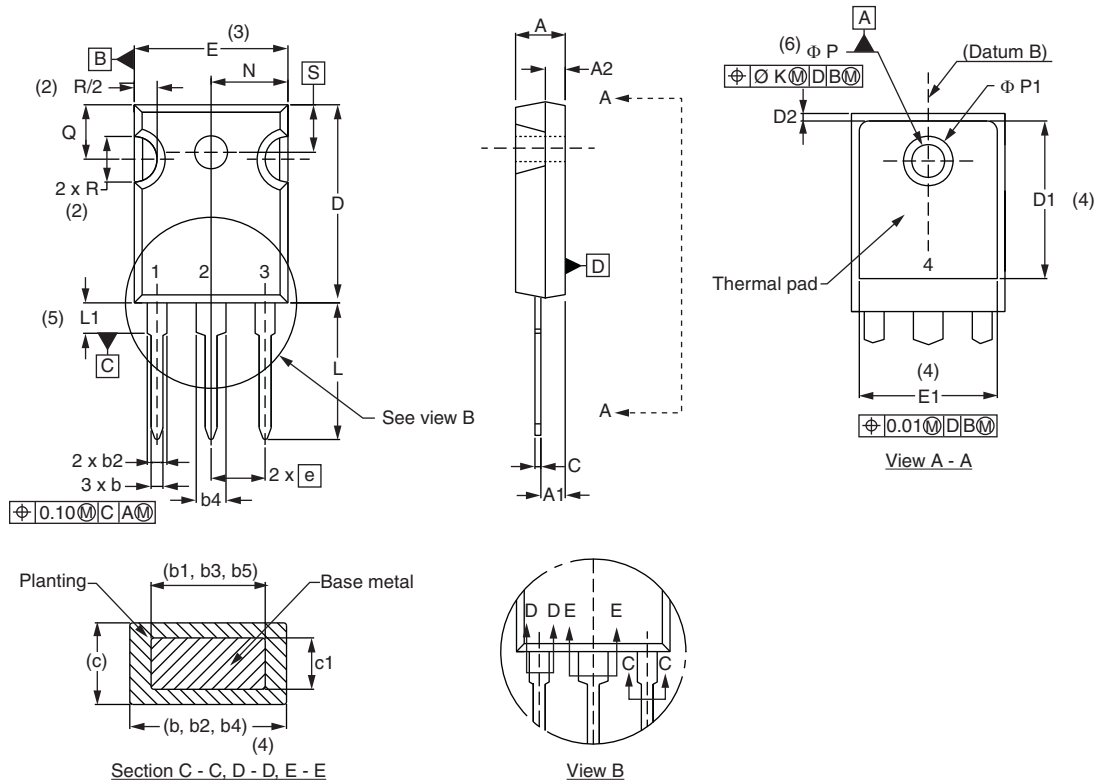
| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| A      | 4.65        | 5.31  | 0.183     | 0.209 |       |
| A1     | 2.21        | 2.59  | 0.087     | 0.102 |       |
| 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     |
| 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       |       |       |
| Ø P    | 3.56        | 3.66  | 0.14      | 0.144 |       |
| Ø 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) 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

## 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     |
| 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 |       |       |
| $\varnothing K$  | 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       |       |       |
| $\varnothing P$  | 3.56        | 3.66  | 0.14      | 0.144 |       |
| $\varnothing P1$ | -           | 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)  $\varnothing P$  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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