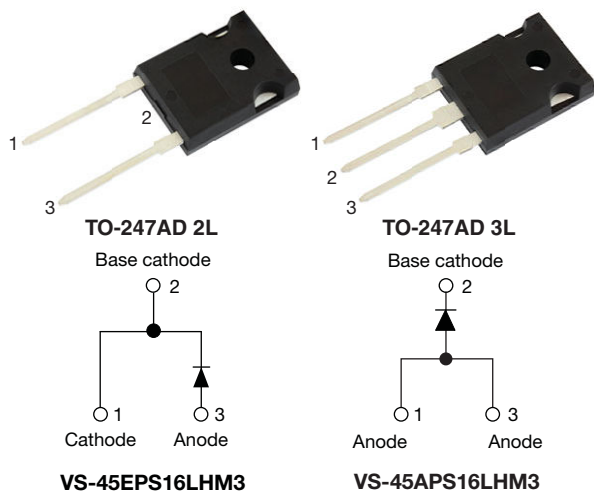


## High Voltage Input Rectifier Diode, 45 A



### FEATURES

- Very low forward voltage drop
- Glass passivated pellet chip junction
- AEC-Q101 qualified meets JESD 201 class 1A whisker test
- Flexible solution for reliable AC power rectification
- High surge, low  $V_F$  rugged blocking diode for DC charging stations
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### APPLICATIONS

- On-board and off-board EV / HEV battery chargers
- Renewable energy inverters

### DESCRIPTION

High voltage rectifiers optimized for very low forward voltage drop with moderate leakage.

These devices are intended for use in main rectification (single or three phase bridge).

### PRIMARY CHARACTERISTICS

|                       |                          |
|-----------------------|--------------------------|
| $I_{F(AV)}$           | 45 A                     |
| $V_R$                 | 1600 V                   |
| $V_F$ at $I_F$        | 1.16 V                   |
| $I_{FSM}$             | 500 A                    |
| $T_J$ max.            | 150 °C                   |
| Package               | TO-247AD 2L, TO-247AD 3L |
| Circuit configuration | Single                   |

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS     | VALUES      | UNITS |
|-------------|---------------------|-------------|-------|
| $I_{F(AV)}$ | Sinusoidal waveform | 45          | A     |
| $V_{RRM}$   |                     | 1600        | V     |
| $I_{FSM}$   |                     | 500         | A     |
| $V_F$       | 20 A, $T_J = 25$ °C | 1.0         | V     |
| $T_J$       |                     | -40 to +150 | °C    |

### VOLTAGE RATINGS

| PART NUMBER    | $V_{RRM}$ , MAXIMUM<br>PEAK REVERSE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM<br>NON-REPETITIVE PEAK REVERSE<br>VOLTAGE<br>V | $I_{RRM}$<br>AT 150 °C<br>mA |
|----------------|--------------------------------------------------|--------------------------------------------------------------------|------------------------------|
| VS-45EPS16LHM3 | 1600                                             | 1700                                                               | 1                            |
| VS-45APS16LHM3 | 1600                                             | 1700                                                               |                              |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                           | SYMBOL        | TEST CONDITIONS                                | VALUES | UNITS             |
|-----------------------------------------------------|---------------|------------------------------------------------|--------|-------------------|
| Maximum average forward current                     | $I_{F(AV)}$   | $T_C = 109$ °C, 180° conduction half sine wave | 45     | A                 |
| Maximum peak one cycle non-repetitive surge current | $I_{FSM}$     | 10 ms sine pulse, rated $V_{RRM}$ applied      | 420    |                   |
|                                                     |               | 10 ms sine pulse, no voltage reapplied         | 500    |                   |
| Maximum $I^2t$ for fusing                           | $I^2t$        | 10 ms sine pulse, rated $V_{RRM}$ applied      | 884    | A <sup>2</sup> s  |
|                                                     |               | 10 ms sine pulse, no voltage reapplied         | 1250   |                   |
| Maximum $I^2\sqrt{t}$ for fusing                    | $I^2\sqrt{t}$ | $t = 0.1$ ms to 10 ms, no voltage reapplied    | 12 500 | A <sup>2</sup> √s |


**ELECTRICAL SPECIFICATIONS**

| PARAMETER                       | SYMBOL      | TEST CONDITIONS                          | VALUES | UNITS            |
|---------------------------------|-------------|------------------------------------------|--------|------------------|
| Maximum forward voltage drop    | $V_{FM}$    | 45 A, $T_J = 25\text{ }^{\circ}\text{C}$ | 1.16   | V                |
| Forward slope resistance        | $r_t$       | $T_J = 150\text{ }^{\circ}\text{C}$      | 7.6    | $\text{m}\Omega$ |
| Threshold voltage               | $V_{F(TO)}$ |                                          | 0.72   | V                |
| Maximum reverse leakage current | $I_{RM}$    | $T_J = 25\text{ }^{\circ}\text{C}$       | 0.1    | mA               |
|                                 |             | $T_J = 150\text{ }^{\circ}\text{C}$      | 1.0    |                  |

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                       | SYMBOL                            | TEST CONDITIONS                       | VALUES      | UNITS                  |
|-------------------------------------------------|-----------------------------------|---------------------------------------|-------------|------------------------|
| Maximum junction and storage temperature range  | T <sub>J</sub> , T <sub>Stg</sub> |                                       | -40 to +150 | °C                     |
| Maximum thermal resistance, junction to case    | R <sub>thJC</sub>                 | DC operation                          | 0.40        | °C/W                   |
| Maximum thermal resistance, junction to ambient | R <sub>thJA</sub>                 |                                       | 40          |                        |
| Typical thermal resistance, case to heatsink    | R <sub>thCS</sub>                 | Mounting surface, smooth, and greased | 0.25        |                        |
| 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-247AD 2L                | 45EPS16LH   |                        |
|                                                 |                                   | Case style TO-247AD 3L                | 45APS16LH   |                        |

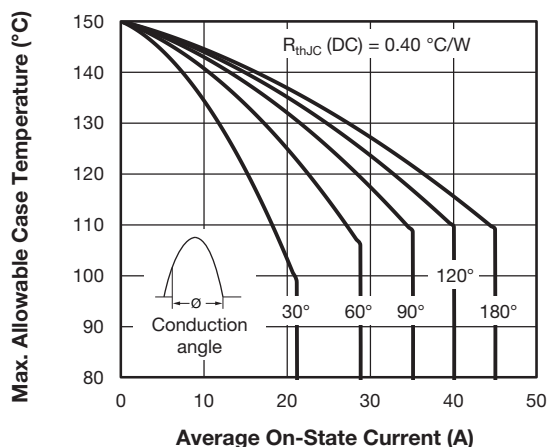


Fig. 1 - Current Rating Characteristics

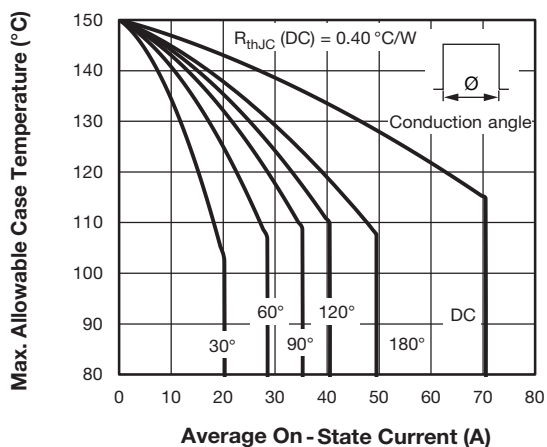


Fig. 2 - Current Rating Characteristics

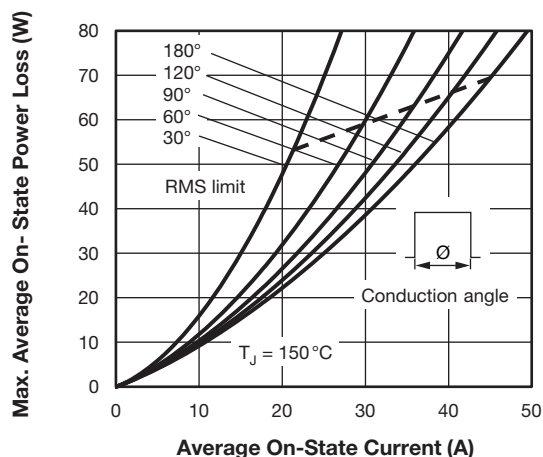


Fig. 3 - Forward Power Loss Characteristics

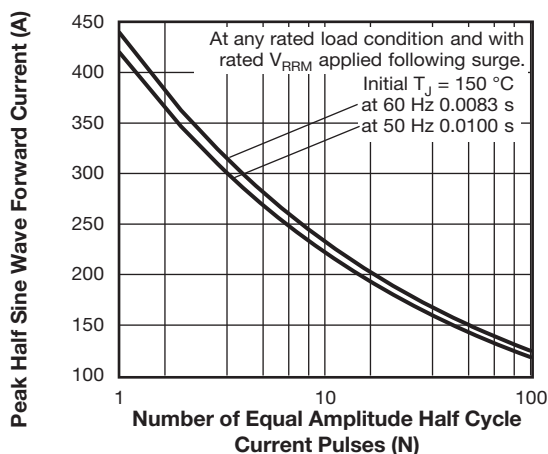


Fig. 5 - Maximum Non-Repetitive Surge Current

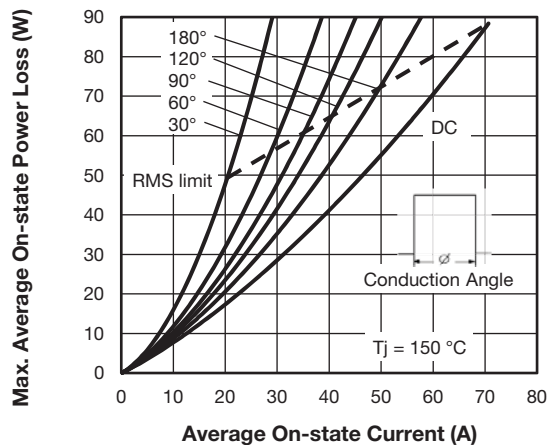


Fig. 4 - Forward Power Loss Characteristics

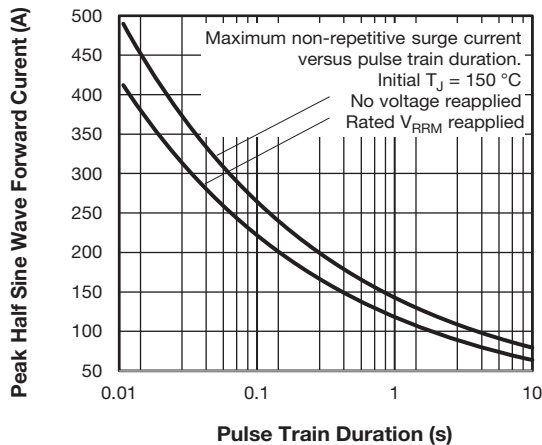


Fig. 6 - Maximum Non-Repetitive Surge Current

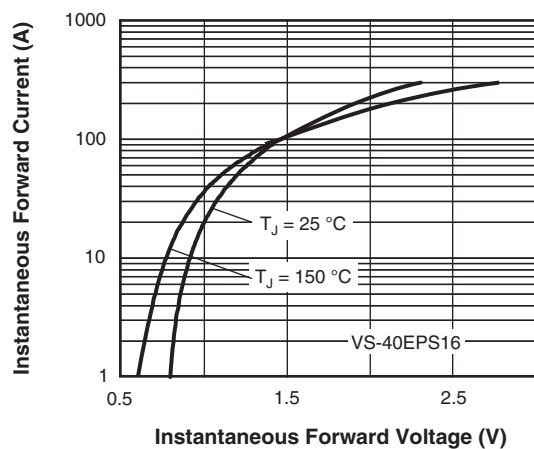
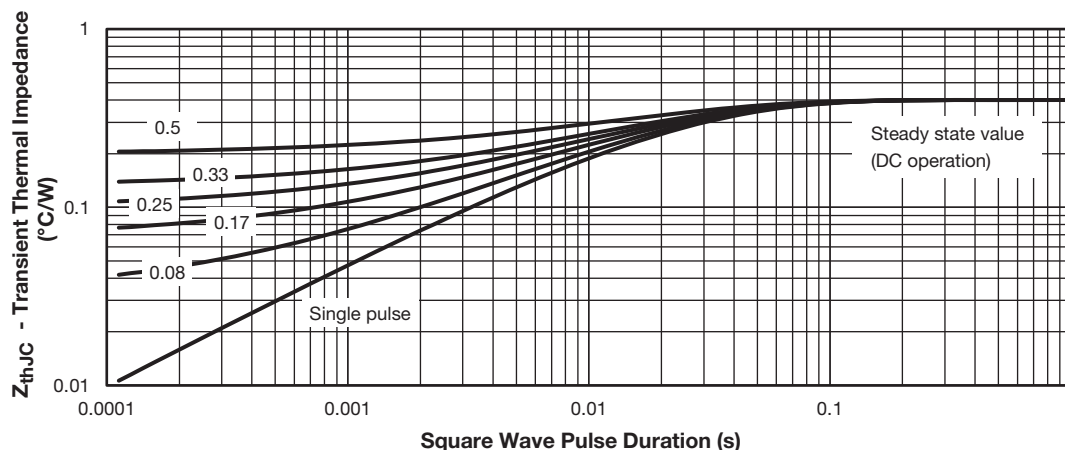


Fig. 7 - Forward Voltage Drop Characteristics


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

### ORDERING INFORMATION TABLE

| Device code | VS- | 45 | E | P | S | 16 | L | H | M3 |
|-------------|-----|----|---|---|---|----|---|---|----|
|             | 1   | 2  | 3 | 4 | 5 | 6  | 7 | 8 | 9  |

- 1** - Vishay Semiconductors product
- 2** - Current rating (45 = 45 A)
- 3** - Circuit configuration:  
E = single, 2 pins  
A = single, 3 pins
- 4** - Package:  
P = TO-247AD
- 5** - Type of silicon:  
S = standard recovery rectifier
- 6** - Voltage code x 100 =  $V_{RRM}$  ————— 16 = 1600 V
- 7** - L = long leads
- 8** - H = AEC-Q101 qualified
- 9** - Environmental digit:  
M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

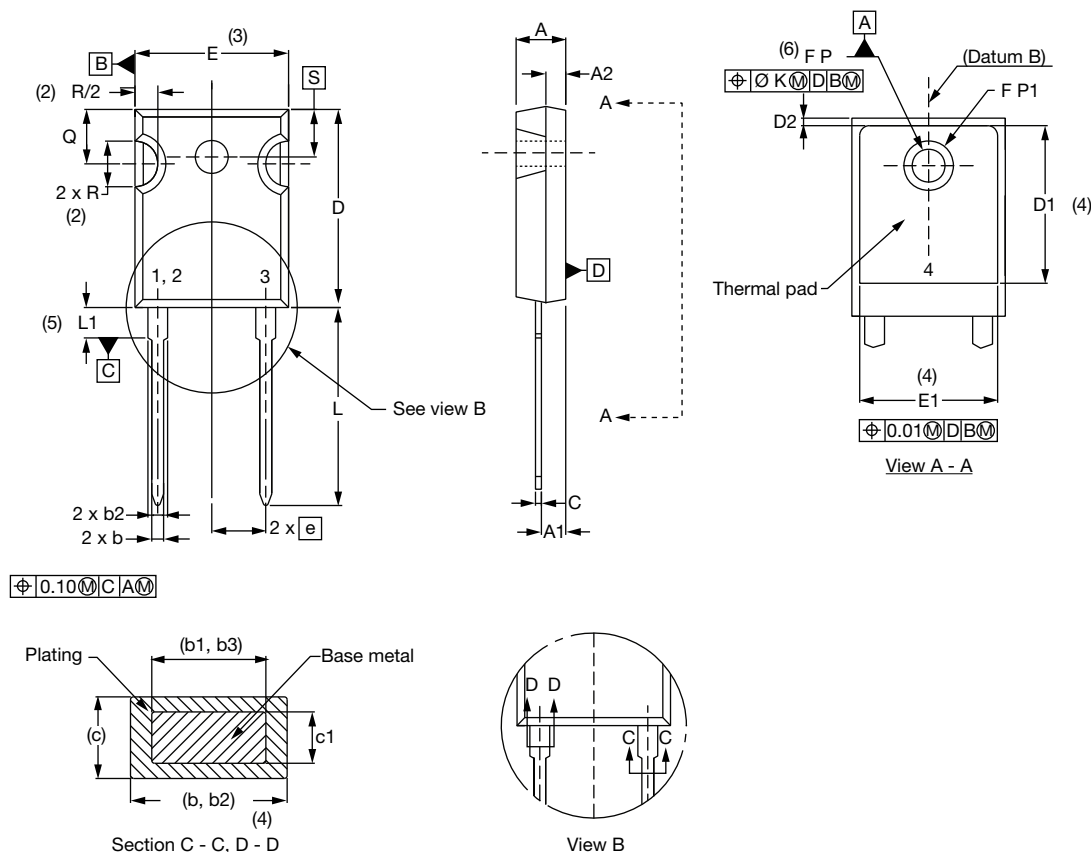
| ORDERING INFORMATION (Example) |                  |                        |                          |
|--------------------------------|------------------|------------------------|--------------------------|
| PREFERRED P/N                  | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION    |
| VS-45EPS16LHM3                 | 25               | 500                    | Antistatic plastic tubes |
| VS-45APS16LHM3                 | 25               | 500                    | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS |             |                                                                        |  |
|----------------------------|-------------|------------------------------------------------------------------------|--|
| Dimensions                 | TO-247AD 2L | <a href="http://www.vishay.com/doc?95536">www.vishay.com/doc?95536</a> |  |
|                            | TO-247AD 3L | <a href="http://www.vishay.com/doc?95626">www.vishay.com/doc?95626</a> |  |
| Part marking information   | TO-247AD 2L | <a href="http://www.vishay.com/doc?95648">www.vishay.com/doc?95648</a> |  |
|                            | TO-247AD 3L | <a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a> |  |



### TO-247AD 2L

**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     | 1.50        | 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        | 2.34  | 0.065  | 0.092 |       |
| 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 |       |

| SYMBOL           | MILLIMETERS |       | INCHES    |       | NOTES |
|------------------|-------------|-------|-----------|-------|-------|
|                  | MIN.        | MAX.  | MIN.      | MAX.  |       |
| 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                | 19.81       | 20.32 | 0.780     | 0.800 |       |
| L1               | 3.71        | 4.29  | 0.146     | 0.169 |       |
| $\varnothing P$  | 3.56        | 3.66  | 0.14      | 0.144 |       |
| $\varnothing P1$ | -           | 6.98  | -         | 0.275 |       |
| 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

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Contour of slot optional
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions D1 and E1
- Lead finish uncontrolled in L1
- $\varnothing P$  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")
- Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4



### TO-247AD 3L

**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     | 1.50        | 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        | 2.34  | 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        | 1.30  | 0.020     | 0.051 |       |
| E         | 15.29       | 15.87 | 0.602     | 0.625 | 3     |
| E1        | 13.46       | -     | 0.53      | -     |       |
| e         | 5.46 BSC    |       | 0.215 BSC |       |       |
| $\Phi K$  | 0.254       |       | 0.010     |       |       |
| L         | 19.81       | 20.32 | 0.780     | 0.800 |       |
| L1        | 3.71        | 4.29  | 0.146     | 0.169 |       |
| $\Phi P$  | 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  | 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
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- (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 A min., D, E min., Q min., S, and note 4



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