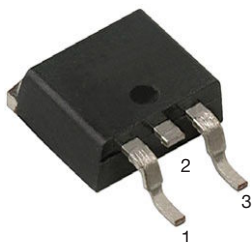
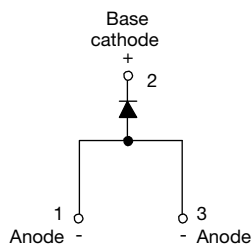


# Surface Mount Fast Soft Recovery Rectifier Diode, 10 A


**D<sup>2</sup>PAK (TO-263AB)**


## FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- 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

- Input rectification
- On-board and off-board EV / HEV battery chargers

## DESCRIPTION

The VS-10ETF12SLHM3 fast soft recovery rectifier series has been optimized for combined short reverse recovery time and low forward voltage drop.

The glass passivation ensures stable reliable operation in the most severe temperature and power cycling conditions.

## PRIMARY CHARACTERISTICS

|                       |                               |
|-----------------------|-------------------------------|
| $I_{F(AV)}$           | 10 A                          |
| $V_R$                 | 1200 V                        |
| $V_F$ at $I_F$        | 1.33 V                        |
| $I_{FSM}$             | 155 A                         |
| $t_{rr}$              | 80 ns                         |
| $T_J$ max.            | 150 °C                        |
| Package               | D <sup>2</sup> PAK (TO-263AB) |
| Circuit configuration | Single                        |
| Snap factor           | 0.6                           |

## MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS     | VALUES      | UNITS |
|-------------|---------------------|-------------|-------|
| $I_{F(AV)}$ | Sinusoidal waveform | 10          | A     |
| $V_{RRM}$   |                     | 1200        | V     |
| $I_{FSM}$   |                     | 155         | A     |
| $V_F$       | 10 A, $T_J = 25$ °C | 1.33        | V     |
| $t_{rr}$    | 1 A, 100 A/μs       | 80          | ns    |
| $T_J$       | Range               | -40 to +150 | °C    |

## VOLTAGE RATINGS

| PART NUMBER     | $V_{RRM}$ , MAXIMUM PEAK REVERSE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE<br>V | $I_{RRM}$ AT 150 °C<br>mA |
|-----------------|-----------------------------------------------|--------------------------------------------------------------|---------------------------|
| VS-10ETF12SLHM3 | 1200                                          | 1300                                                         | 4                         |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                           | SYMBOL        | TEST CONDITIONS                                | VALUES | UNITS             |
|-----------------------------------------------------|---------------|------------------------------------------------|--------|-------------------|
| Maximum average forward current                     | $I_{F(AV)}$   | $T_C = 125$ °C, 180° conduction half sine wave | 10     | A                 |
| Maximum peak one cycle non-repetitive surge current | $I_{FSM}$     | 10 ms sine pulse, rated $V_{RRM}$ applied      | 130    |                   |
|                                                     |               | 10 ms sine pulse, no voltage reapplied         | 155    |                   |
| Maximum $I^2t$ for fusing                           | $I^2t$        | 10 ms sine pulse, rated $V_{RRM}$ applied      | 85     | A <sup>2</sup> s  |
|                                                     |               | 10 ms sine pulse, no voltage reapplied         | 120    |                   |
| Maximum $I^2\sqrt{t}$ for fusing                    | $I^2\sqrt{t}$ | $t = 0.1$ ms to 10 ms, no voltage reapplied    | 1200   | A <sup>2</sup> √s |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                       | SYMBOL      | TEST CONDITIONS                          |                               | VALUES | UNITS            |
|---------------------------------|-------------|------------------------------------------|-------------------------------|--------|------------------|
| Maximum forward voltage drop    | $V_{FM}$    | 10 A, $T_J = 25\text{ }^{\circ}\text{C}$ |                               | 1.33   | V                |
| Forward slope resistance        | $r_t$       | $T_J = 150\text{ }^{\circ}\text{C}$      |                               | 22.9   | $\text{m}\Omega$ |
| Threshold voltage               | $V_{F(TO)}$ |                                          |                               | 0.96   | V                |
| Maximum reverse leakage current | $I_{RM}$    | $T_J = 25\text{ }^{\circ}\text{C}$       | $V_R = \text{rated } V_{RRM}$ | 0.1    | mA               |
|                                 |             | $T_J = 150\text{ }^{\circ}\text{C}$      |                               | 4      |                  |

**RECOVERY CHARACTERISTICS**

| PARAMETER                | SYMBOL   | TEST CONDITIONS                                                             | VALUES | UNITS         |  |
|--------------------------|----------|-----------------------------------------------------------------------------|--------|---------------|--|
| Reverse recovery time    | $t_{rr}$ | $I_F$ at 10 A <sub>pk</sub><br>25 A/ $\mu\text{s}$<br>25 $^{\circ}\text{C}$ | 310    | ns            |  |
| Reverse recovery current | $I_{rr}$ |                                                                             | 4.7    | A             |  |
| Reverse recovery charge  | $Q_{rr}$ |                                                                             | 1.05   | $\mu\text{C}$ |  |
| Typical snap factor      | S        |                                                                             | 0.6    |               |  |

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                                   | SYMBOL           | TEST CONDITIONS                          | VALUES      | UNITS                |
|-------------------------------------------------------------|------------------|------------------------------------------|-------------|----------------------|
| Maximum junction and storage temperature range              | $T_J, T_{Stg}$   |                                          | -40 to +150 | $^{\circ}\text{C}$   |
| Maximum thermal resistance, junction to case                | $R_{thJC}$       | DC operation                             | 1.5         | $^{\circ}\text{C/W}$ |
| Maximum thermal resistance, junction to ambient (PCB mount) | $R_{thJA}^{(1)}$ |                                          | 62          |                      |
| Approximate weight                                          |                  |                                          | 2           | g                    |
|                                                             |                  |                                          | 0.07        | oz.                  |
| Marking device                                              |                  | Case style D <sup>2</sup> PAK (TO-263AB) | 10ETF12SH   |                      |

**Note**

<sup>(1)</sup> When mounted on 1" square (650 mm<sup>2</sup>) PCB of FR-4 or G-10 material 4 oz. (140  $\mu\text{m}$ ) copper 40  $^{\circ}\text{C/W}$

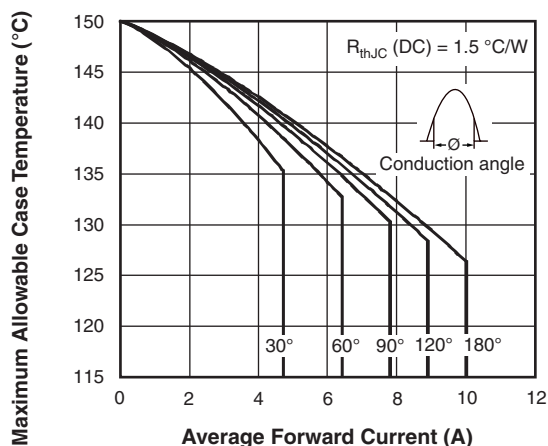


Fig. 1 - Current Rating Characteristics

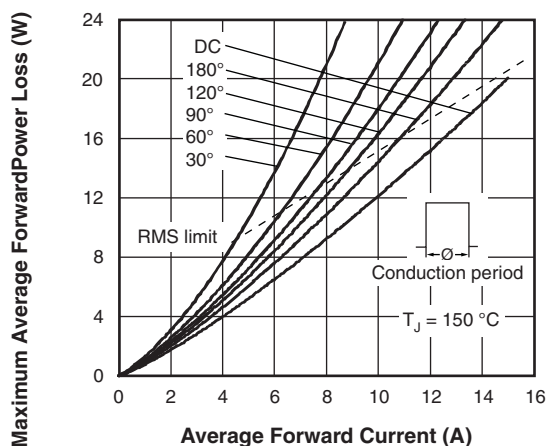


Fig. 4 - Forward Power Loss Characteristics

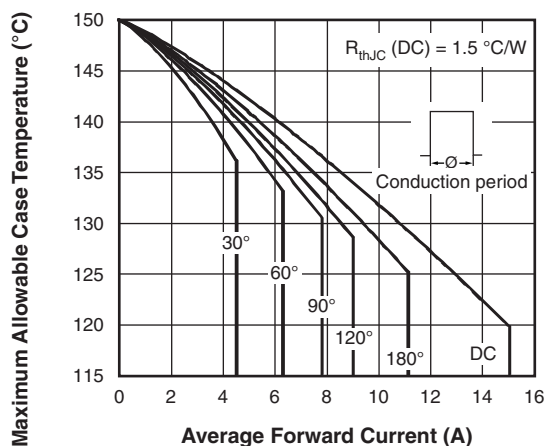


Fig. 2 - Current Rating Characteristics

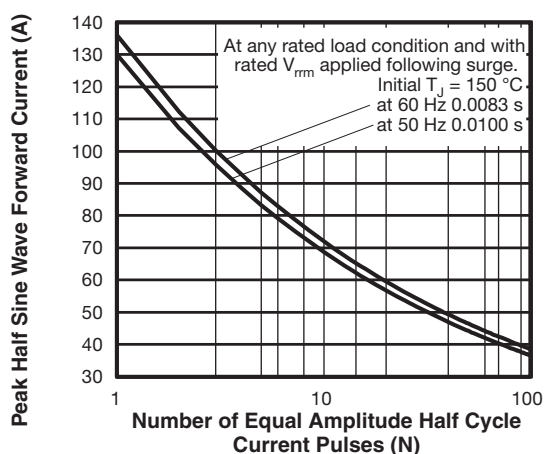


Fig. 5 - Maximum Non-Repetitive Surge Current

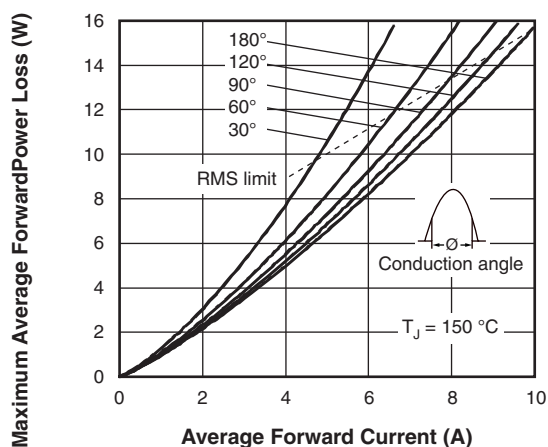


Fig. 3 - Forward Power Loss Characteristics

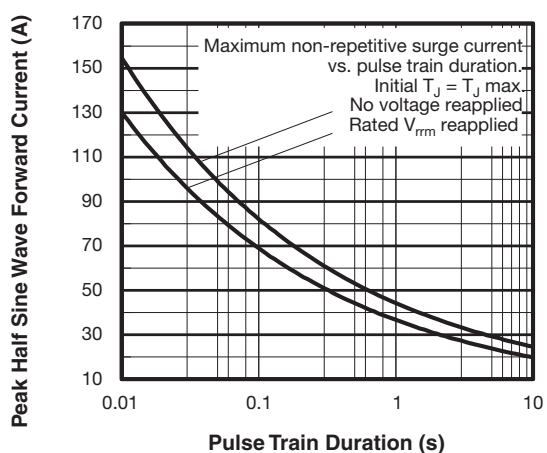


Fig. 6 - Maximum Non-Repetitive Surge Current

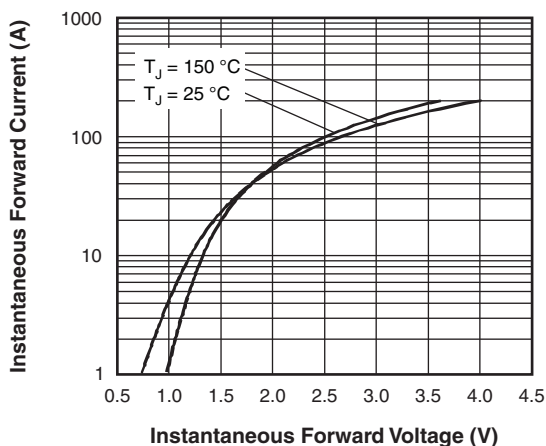


Fig. 7 - Forward Voltage Drop Characteristics

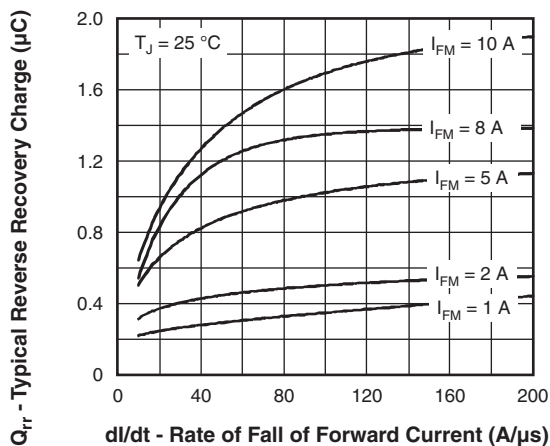


Fig. 10 - Recovery Charge Characteristics,  $T_J = 25\text{ }^{\circ}\text{C}$

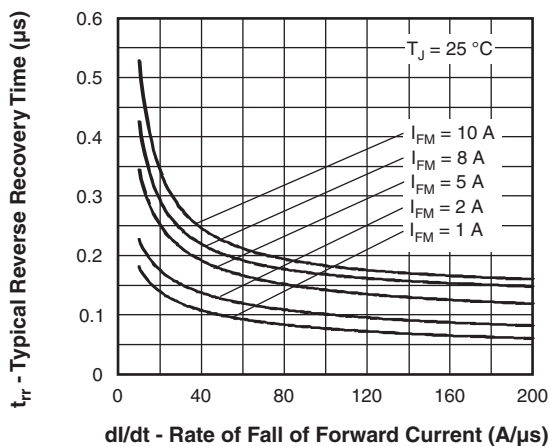


Fig. 8 - Recovery Time Characteristics,  $T_J = 25\text{ }^{\circ}\text{C}$

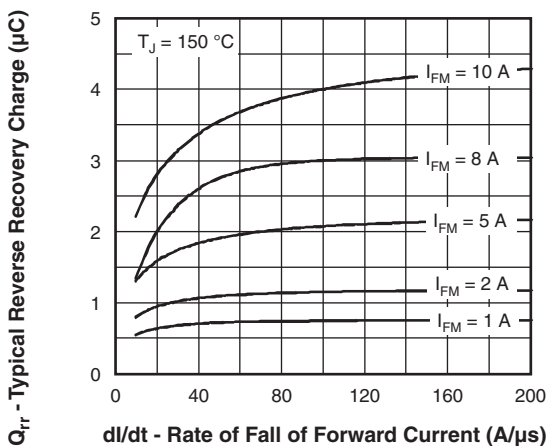


Fig. 11 - Recovery Charge Characteristics,  $T_J = 150\text{ }^{\circ}\text{C}$

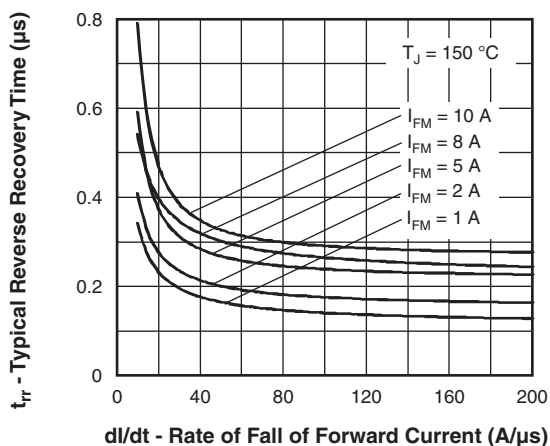


Fig. 9 - Recovery Time Characteristics,  $T_J = 150\text{ }^{\circ}\text{C}$

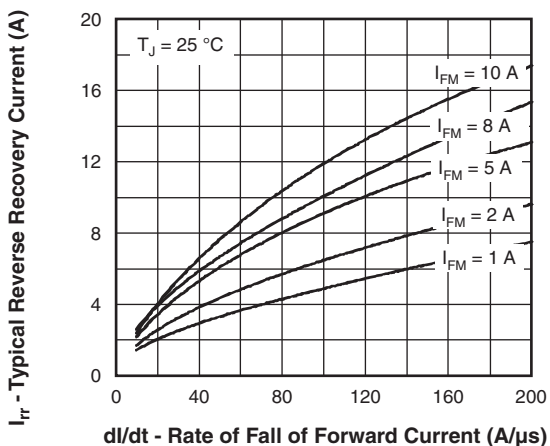


Fig. 12 - Recovery Current Characteristics,  $T_J = 25\text{ }^{\circ}\text{C}$

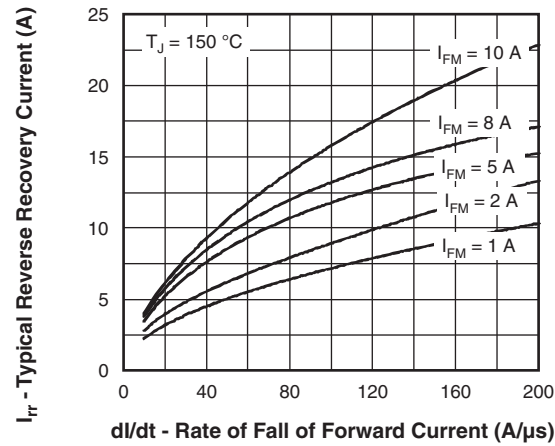


Fig. 13 - Recovery Current Characteristics,  $T_J = 150\text{ }^{\circ}\text{C}$

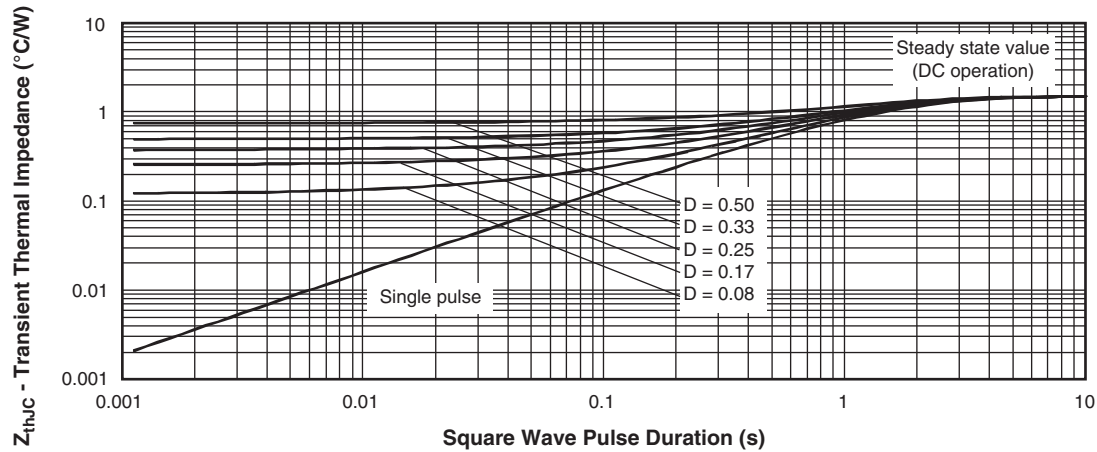


Fig. 14 - Thermal Impedance  $Z_{thJC}$  Characteristics

**ORDERING INFORMATION TABLE**

|             |     |    |   |   |   |    |   |   |   |    |
|-------------|-----|----|---|---|---|----|---|---|---|----|
| Device code | VS- | 10 | E | T | F | 12 | S | L | H | M3 |
|             | 1   | 2  | 3 | 4 | 5 | 6  | 7 | 8 | 9 | 10 |

- 1** - Vishay Semiconductors product
- 2** - Current rating (10 = 10 A)
- 3** - Circuit configuration:  
E = single
- 4** - Package:  
T = D<sup>2</sup>PAK (TO-263AB)
- 5** - Type of silicon:  
F = fast soft recovery rectifier
- 6** - Voltage code x 100 = V<sub>RRM</sub> — 12 = 1200 V
- 7** - S = surface mountable
- 8** - L = tape and reel (left oriented), for different orientation, contact factory
- 9** - H = AEC-Q101 qualified
- 10** - 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-10ETF12SLHM3                       | 800              | 800                    | 13" diameter reel     |

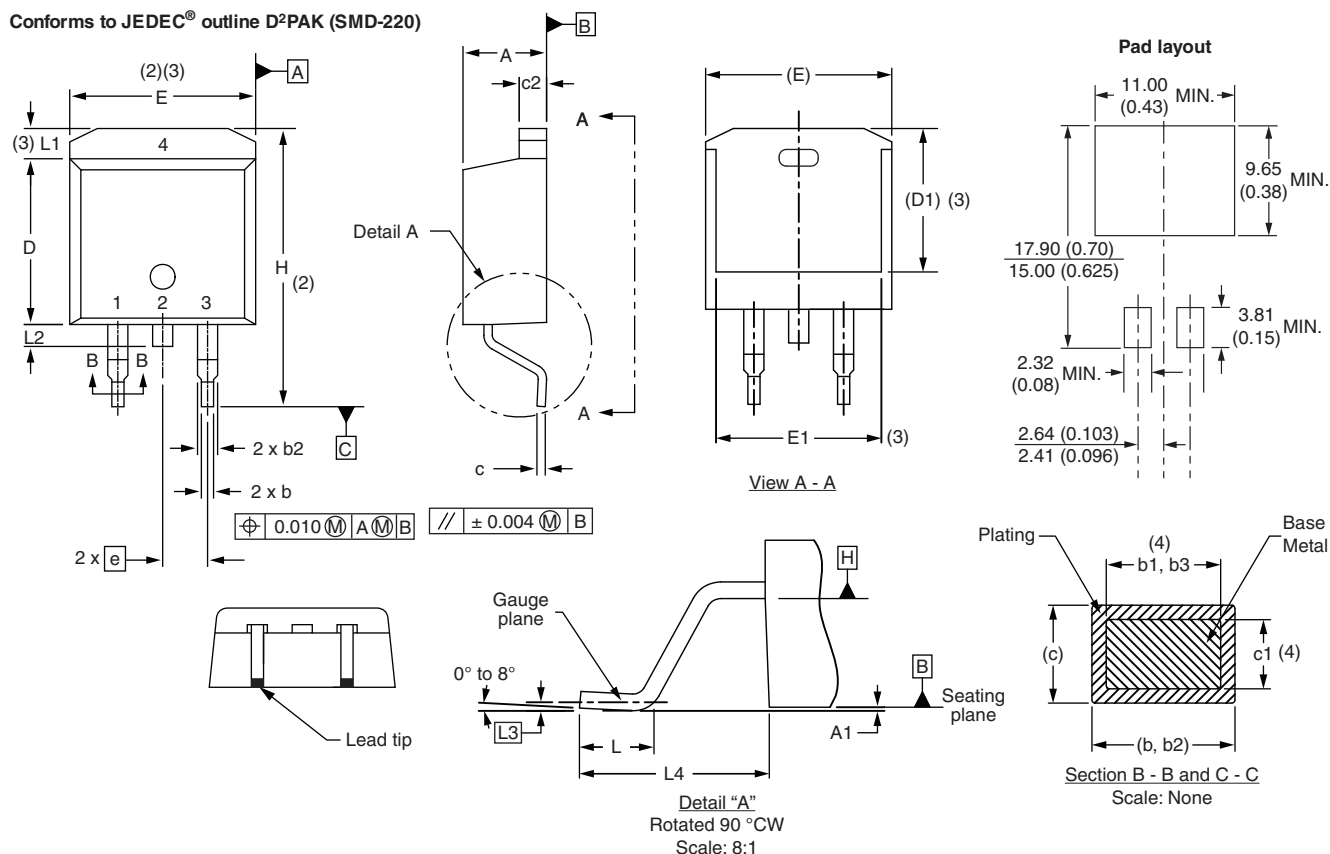
| <b>LINKS TO RELATED DOCUMENTS</b> |                                                                        |
|-----------------------------------|------------------------------------------------------------------------|
| Dimensions                        | <a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a> |
| Part marking information          | <a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a> |
| Packaging information             | <a href="http://www.vishay.com/doc?96317">www.vishay.com/doc?96317</a> |



## D<sup>2</sup>PAK

### DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (SMD-220)



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160  | 0.190 |       |
| A1     | 0.00        | 0.254 | 0.000  | 0.010 |       |
| b      | 0.51        | 0.99  | 0.020  | 0.039 |       |
| b1     | 0.51        | 0.89  | 0.020  | 0.035 | 4     |
| b2     | 1.14        | 1.78  | 0.045  | 0.070 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     |
| c      | 0.38        | 0.74  | 0.015  | 0.029 |       |
| c1     | 0.38        | 0.58  | 0.015  | 0.023 | 4     |
| c2     | 1.14        | 1.65  | 0.045  | 0.065 |       |
| D      | 8.51        | 9.65  | 0.335  | 0.380 | 2     |

| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| H      | 14.61       | 15.88 | 0.575     | 0.625 |       |
| L      | 1.78        | 2.79  | 0.070     | 0.110 |       |
| L1     | -           | 1.65  | -         | 0.066 | 3     |
| L2     | 1.27        | 1.78  | 0.050     | 0.070 |       |
| L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch
- (7) Outline conforms to JEDEC® outline TO-263AB



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