

# ANTREX Electronics

Electronic Components Sourcing Information

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## Product Reference Information

**Part Number:** VS-25TTS16S2LHM3  
**Manufacturer:** Vishay General Semiconductor - Diodes Division  
**Package:** TO-263AB (D2PAK)  
**Availability:** Please confirm with sales

### Product Page:

<https://antrexco.com/product/details/vishay-general-semiconductor-diodes-division-vs-25tts16s2lhm3.html>

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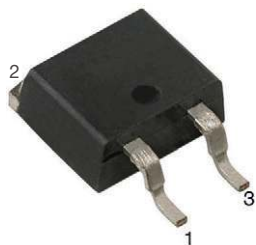
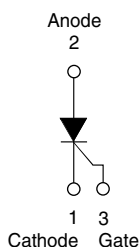
### Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

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# Thyristor Surface-Mount, Phase Control SCR, 16 A


**D²PAK 2L (TO-263AB 2L)**


## FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- AEC-Q101 qualified
- Meets JESD 201 class 2 whisker test
- Flexible solution for reliable AC power rectification
- Easy control peak current at charger power up to reduce passive / electromechanical components
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## LINKS TO ADDITIONAL RESOURCES



3D Models

## PRIMARY CHARACTERISTICS

|                       |                        |
|-----------------------|------------------------|
| $I_{T(AV)}$           | 16 A                   |
| $V_{DRM}/V_{RRM}$     | 1600 V                 |
| $V_{TM}$              | 1.25 V                 |
| $I_{GT}$              | 45 mA                  |
| $T_J$                 | -40 °C to +125 °C      |
| Package               | D²PAK 2L (TO-263AB 2L) |
| Circuit configuration | Single SCR             |

## APPLICATIONS

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

## DESCRIPTION

The VS-25TTS16S2L-M3 high voltage series of silicon controlled rectifiers is specifically designed for medium power switching and phase control applications.

## MECHANICAL DATA

**Case:** D²PAK 2L (TO-263AB 2L)

Molding compound meets UL 94 V-0 flammability rating

**Terminals:** matte tin plated leads, solderable per J-STD-002

## OUTPUT CURRENT IN TYPICAL APPLICATIONS

| APPLICATIONS                                                         | SINGLE-PHASE BRIDGE | THREE-PHASE BRIDGE | UNITS |
|----------------------------------------------------------------------|---------------------|--------------------|-------|
| NEMA FR-4 or G10 glass fabric-based epoxy with 4 oz. (140 µm) copper | 3.5                 | 5.5                | A     |
| Aluminum IMS, $R_{thCA} = 15$ °C/W                                   | 8.5                 | 13.5               |       |
| Aluminum IMS with heatsink, $R_{thCA} = 5$ °C/W                      | 16.5                | 25.0               |       |

### Note

- $T_A = 55$  °C,  $T_J = 125$  °C, footprint 300 mm²

## MAJOR RATINGS AND CHARACTERISTICS

| PARAMETER         | TEST CONDITIONS     | VALUES      | UNITS |
|-------------------|---------------------|-------------|-------|
| $I_{T(AV)}$       | Sinusoidal waveform | 16          | A     |
| $I_{RMS}$         |                     | 25          |       |
| $V_{RRM}/V_{DRM}$ |                     | 1600        | V     |
| $I_{TSM}$         |                     | 350         | A     |
| $V_T$             | 16 A, $T_J = 25$ °C | 1.25        | V     |
| dV/dt             |                     | 500         | V/µs  |
| dI/dt             |                     | 150         | A/µs  |
| $T_J$             |                     | -40 to +125 | °C    |

## VOLTAGE RATINGS

| PART NUMBER     | $V_{RRM}$ , MAXIMUM PEAK REVERSE VOLTAGE<br>V | $V_{DRM}$ , MAXIMUM PEAK DIRECT VOLTAGE<br>V | $I_{RRM}/I_{DRM}$ ,<br>AT 125 °C<br>mA |
|-----------------|-----------------------------------------------|----------------------------------------------|----------------------------------------|
| VS-25TT16S2LHM3 | 1600                                          | 1600                                         | 10                                     |

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER                                             | SYMBOL          | TEST CONDITIONS                                                                                     |                                       | VALUES |      | UNITS         |
|-------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------|---------------------------------------|--------|------|---------------|
|                                                       |                 |                                                                                                     |                                       | TYP.   | MAX. |               |
| Maximum average on-state current                      | $I_{T(AV)}$     | $T_C = 93\text{ }^{\circ}\text{C}$ , 180° conduction half sine wave                                 |                                       | 16     |      | A             |
| Maximum RMS on-state current                          | $I_{RMS}$       |                                                                                                     |                                       | 25     |      |               |
| Maximum peak, one-cycle, non-repetitive surge current | $I_{TSM}$       | 10 ms sine pulse, rated $V_{RRM}$ applied                                                           |                                       | 300    |      |               |
|                                                       |                 | 10 ms sine pulse, no voltage reapplied                                                              |                                       | 350    |      |               |
| Maximum $I^2t$ for fusing                             | $I^2t$          | 10 ms sine pulse, rated $V_{RRM}$ applied                                                           |                                       | 450    |      | $A^2s$        |
|                                                       |                 | 10 ms sine pulse, no voltage reapplied                                                              |                                       | 630    |      |               |
| Maximum $I^2\sqrt{t}$ for fusing                      | $I^2\sqrt{t}$   | $t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reapplied                                          |                                       | 6300   |      | $A^2\sqrt{s}$ |
| Maximum on-state voltage drop                         | $V_{TM}$        | 16 A, $T_J = 25\text{ }^{\circ}\text{C}$                                                            |                                       | 1.25   |      | V             |
| On-state slope resistance                             | $r_t$           | $T_J = 125\text{ }^{\circ}\text{C}$                                                                 |                                       | 12.0   |      | $m\Omega$     |
| Threshold voltage                                     | $V_{T(TO)}$     |                                                                                                     |                                       | 1.0    |      | V             |
| Maximum reverse and direct leakage current            | $I_{RM}/I_{DM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                                  | $V_R = \text{Rated } V_{RRM}/V_{DRM}$ | 0.5    |      | mA            |
|                                                       |                 | $T_J = 125\text{ }^{\circ}\text{C}$                                                                 |                                       | 10     |      |               |
| Holding current                                       | $I_H$           | Anode supply = 6 V, resistive load, initial $I_T = 1\text{ A}$ , $T_J = 25\text{ }^{\circ}\text{C}$ |                                       | -      | 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             | $dV/dt$         | $T_J = T_J\text{ max.}$ , 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 <sub>GM</sub>    |                                                              | 8.0    | W     |    |
| Maximum average gate power                  | P <sub>G(AV)</sub> |                                                              | 2.0    |       |    |
| Maximum peak positive gate current          | + I <sub>GM</sub>  |                                                              | 1.5    | A     |    |
| Maximum peak negative gate voltage          | - V <sub>GM</sub>  |                                                              | 10     | V     |    |
| Maximum required DC gate current to trigger | I <sub>GT</sub>    | Anode supply = 6 V, resistive load, T <sub>J</sub> = - 10 °C | 60     | mA    |    |
|                                             |                    | Anode supply = 6 V, resistive load, T <sub>J</sub> = 25 °C   | 45     |       |    |
|                                             |                    | Anode supply = 6 V, resistive load, T <sub>J</sub> = 125 °C  | 20     |       |    |
| Maximum required DC gate voltage to trigger | V <sub>GT</sub>    | Anode supply = 6 V, resistive load, T <sub>J</sub> = - 10 °C | 2.5    | V     |    |
|                                             |                    | Anode supply = 6 V, resistive load, T <sub>J</sub> = 25 °C   | 2.0    |       |    |
|                                             |                    | Anode supply = 6 V, resistive load, T <sub>J</sub> = 125 °C  | 1.0    |       |    |
| Maximum DC gate voltage not to trigger      | V <sub>GD</sub>    | T <sub>J</sub> = 125 °C, V <sub>DRM</sub> = Rated value      | 0.25   |       | mA |
| Maximum DC gate current not to trigger      | I <sub>GD</sub>    |                                                              | 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    |
| Soldering temperature                                       | $T_S$            | For 10 s (1.6 mm from case)                    | 260         |       |
| Maximum thermal resistance, junction to case                | $R_{thJC}$       | DC operation                                   | 1.1         | °C/W  |
| Typical thermal resistance, junction to ambient (PCB mount) | $R_{thJA}^{(1)}$ |                                                | 40          |       |
| Approximate weight                                          |                  |                                                | 2           | g     |
|                                                             |                  |                                                | 0.07        | oz.   |
| Marking device                                              |                  | Case style D <sup>2</sup> PAK 2L (TO-263AB 2L) | 25TTS16SH   |       |

### Note

(1) When mounted on 1" square (650 mm<sup>2</sup>) PCB of FR-4 or G-10 material 4 oz. (140 µm) copper 40 °C/W

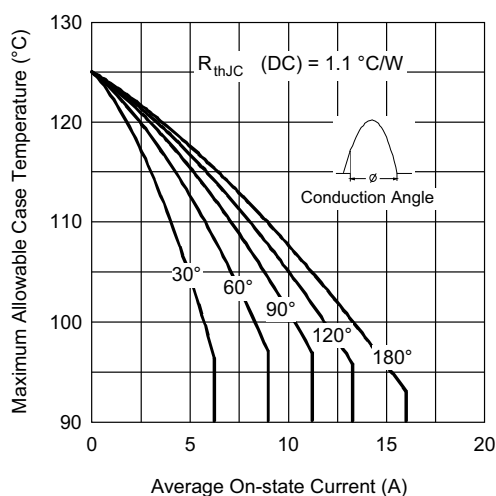


Fig. 1 - Current Rating Characteristics

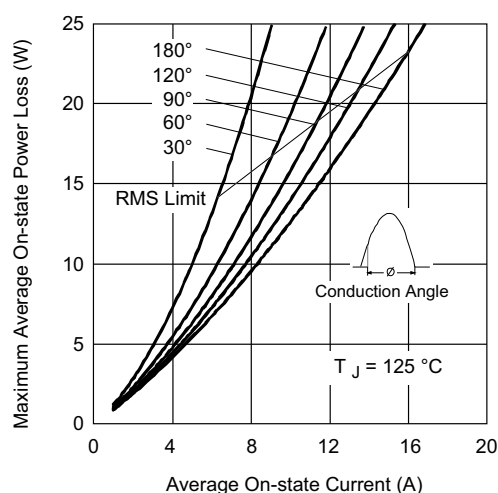


Fig. 3 - On-State Power Loss Characteristics

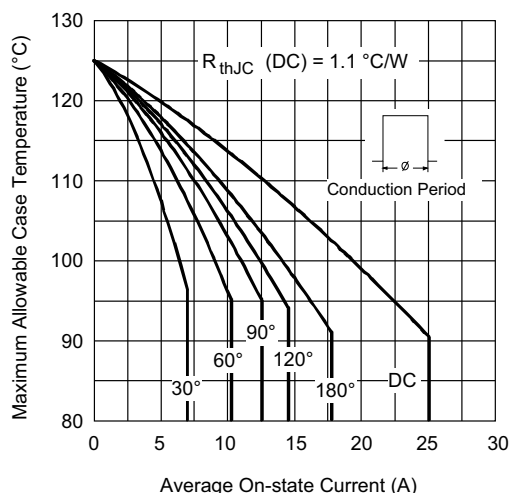


Fig. 2 - Current Rating Characteristics

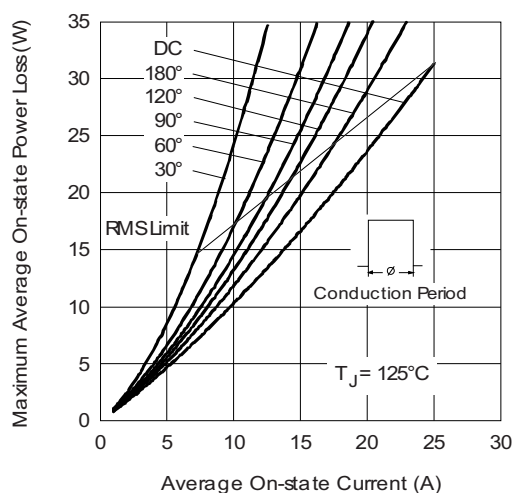


Fig. 4 - On-State Power Loss Characteristics

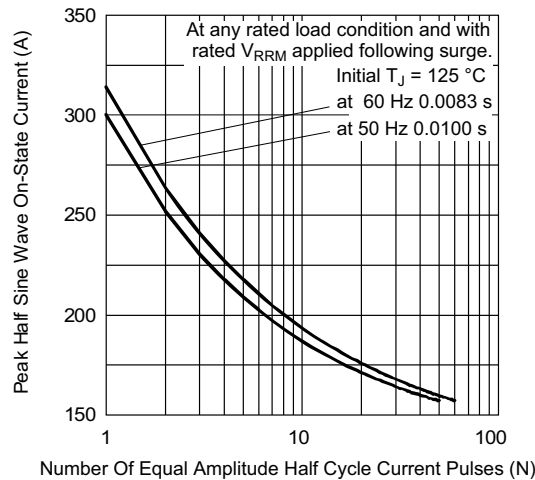


Fig. 5 - Maximum Non-Repetitive Surge Current

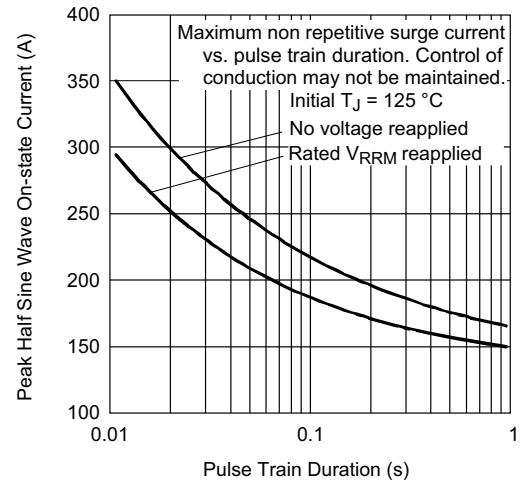


Fig. 6 - Maximum Non-Repetitive Surge Current

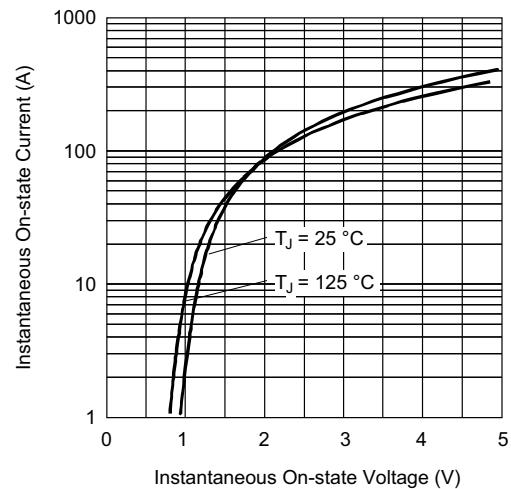
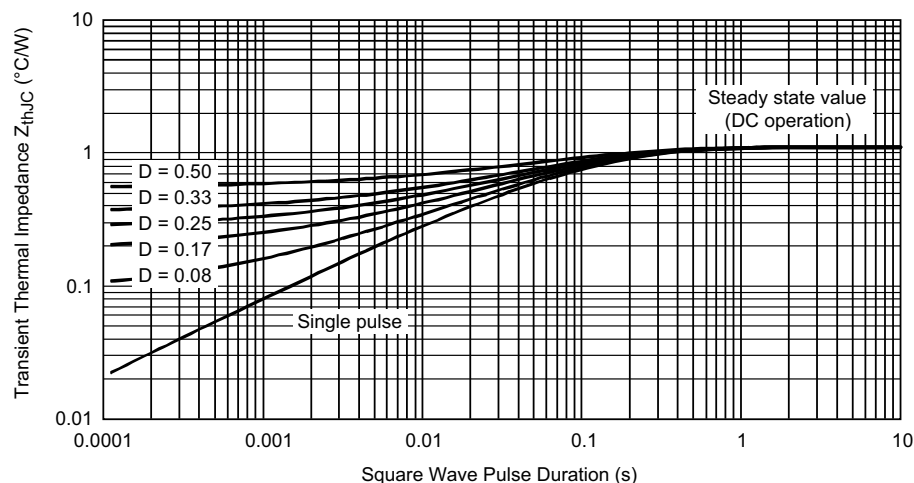


Fig. 7 - On-State Voltage Drop Characteristics


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

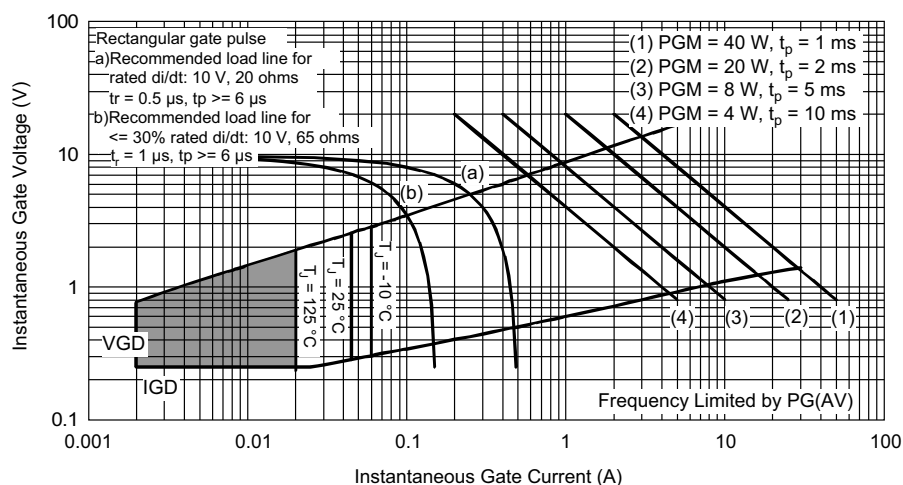


Fig. 9 - Gate Characteristics

## ORDERING INFORMATION TABLE

**Device code**

|            |           |          |          |          |           |          |          |          |          |           |
|------------|-----------|----------|----------|----------|-----------|----------|----------|----------|----------|-----------|
| <b>VS-</b> | <b>25</b> | <b>T</b> | <b>T</b> | <b>S</b> | <b>16</b> | <b>S</b> | <b>2</b> | <b>L</b> | <b>H</b> | <b>M3</b> |
| ①          | ②         | ③        | ④        | ⑤        | ⑥         | ⑦        | ⑧        | ⑨        | ⑩        | ⑪         |

- 1** - Vishay Semiconductors product
- 2** - Current rating (25 = 25 A)
- 3** - Circuit configuration:  
T = single thyristor
- 4** - Package:  
T = D<sup>2</sup>PAK (TO-263AB)
- 5** - Type of silicon:  
S = standard recovery rectifier
- 6** - Voltage rating: Voltage code x 100 = V<sub>RRM</sub> — **16 = 1600 V**
- 7** - S = surface mountable
- 8** - 2 = true 2 pin D<sup>2</sup>PAK
- 9** - L = tape and reel (left oriented), for different orientation contact factory
- 10** - H = AEC Q101 qualified
- 11** - Environmental digit:  
M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

### ORDERING INFORMATION (Example)

| PREFERRED P/N    | QUANTITY PER REEL | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
|------------------|-------------------|------------------------|-----------------------|
| VS-25TTS16S2LHM3 | 800               | 800                    | 13" diameter reel     |

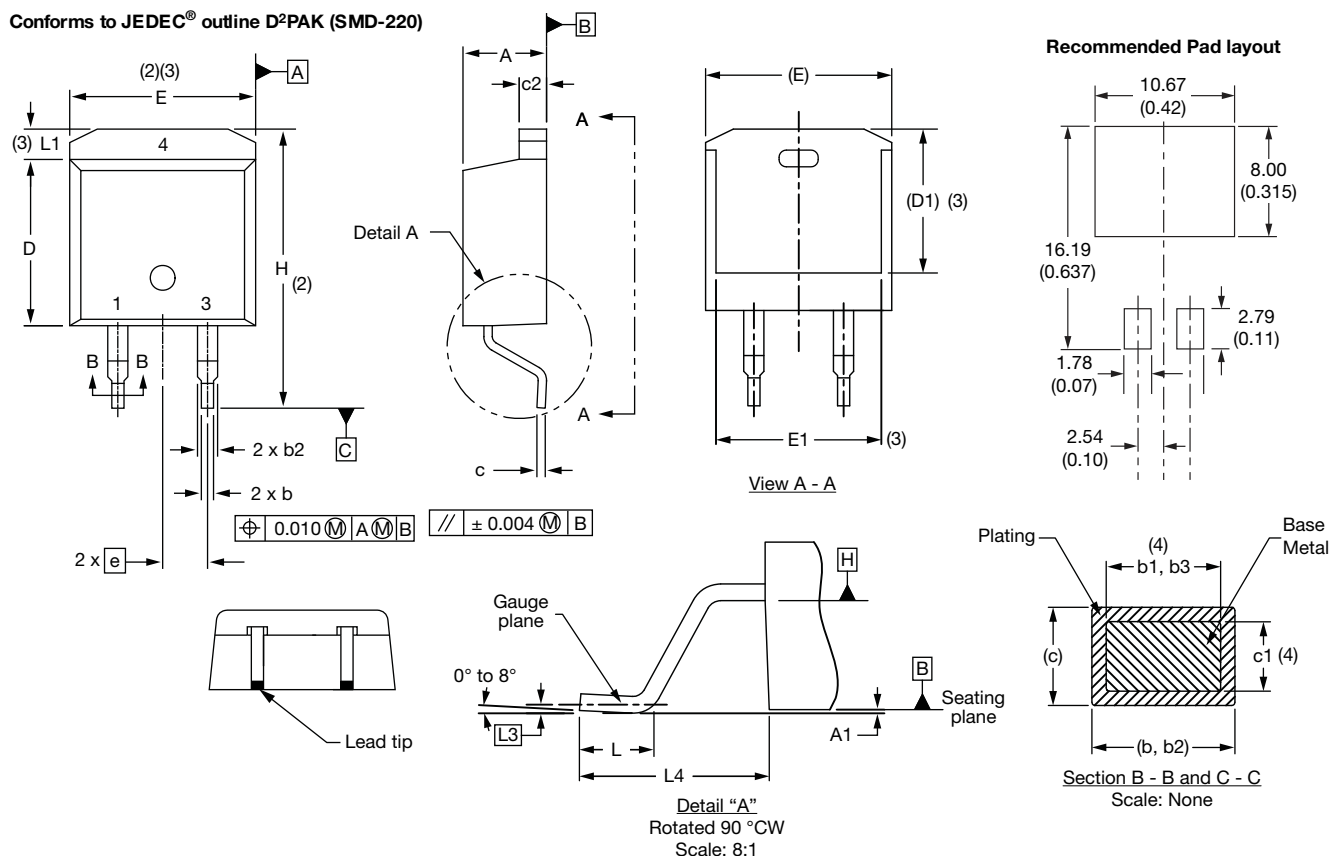
## LINKS TO RELATED DOCUMENTS

|                          |                                                                        |
|--------------------------|------------------------------------------------------------------------|
| Dimensions               | <a href="http://www.vishay.com/doc?96683">www.vishay.com/doc?96683</a> |
| Part marking information | <a href="http://www.vishay.com/doc?96693">www.vishay.com/doc?96693</a> |
| Packaging information    | <a href="http://www.vishay.com/doc?96317">www.vishay.com/doc?96317</a> |

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

#### 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     |
| L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |

#### Notes

- Dimensioning and tolerancing per ASME Y14.5 M-1994
- 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
- Thermal pad contour optional within dimension E, L1, D1 and E1
- Dimension b1 and c1 apply to base metal only
- Datum A and B to be determined at datum plane H
- Controlling dimension: inch
- Outline conforms to JEDEC® outline TO-263AB



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