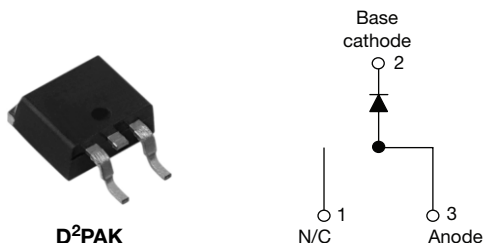


## Schottky Rectifier, 20 A



### FEATURES

- 125 °C  $T_J$  operation ( $V_R < 5$  V)
- Center tap module
- Optimized for OR-ing applications
- Ultralow forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Halogen-free according to IEC 61249-2-21 definition
- Compliant to RoHS directive 2002/95/EC
- AEC-Q101 qualified



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

### PRODUCT SUMMARY

|             |                  |
|-------------|------------------|
| $I_{F(AV)}$ | 20 A             |
| $V_R$       | 15 V             |
| $I_{RM}$    | 600 mA at 100 °C |

### DESCRIPTION

The Schottky rectifier module has been optimized for ultralow forward voltage drop specifically for the OR-ing of parallel power supplies. The proprietary barrier technology allows for reliable operation up to 125 °C junction temperature. Typical applications are in parallel switching power supplies, converters, reverse battery protection, and redundant power subsystems.

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS                  | VALUES      | UNITS |
|-------------|----------------------------------|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform             | 20          | A     |
| $V_{RRM}$   |                                  | 15          | V     |
| $I_{FSM}$   | $t_p = 5$ $\mu$ s sine           | 700         | A     |
| $V_F$       | 19 Apk, $T_J = 125$ °C (typical) | 0.25        | V     |
| $T_J$       | Range                            | - 55 to 125 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | TEST CONDITIONS | VS-STPS20L15GPbF | UNITS |
|--------------------------------------|-----------|-----------------|------------------|-------|
| Maximum DC reverse voltage           | $V_R$     | $T_J = 100$ °C  | 15               | V     |
| Maximum working peak reverse voltage | $V_{RWM}$ |                 |                  |       |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER  | SYMBOL      | TEST CONDITIONS   | VALUES | UNITS |
|--|-------------|---|--------|-------|
| Maximum average forward current<br>See fig. 5                        | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 85$ °C, rectangular waveform  | 20     | A     |
| Maximum peak one cycle<br>non-repetitive surge current<br>See fig. 7 | $I_{FSM}$   | 5 $\mu$ s sine or 3 $\mu$ s rect. pulse   | 700    |       |
|  |             | 10 ms sine or 6 ms rect. pulse  | 330    |       |
| Non-repetitive avalanche energy                                      | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 2$ A, $L = 6$ mH   | 10     | mJ    |
| Repetitive avalanche current   | $I_{AR}$    | Current decaying linearly to zero in 1 $\mu$ s<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical | 2      | A     |

| ELECTRICAL SPECIFICATIONS             |                                |  |                                       |        |      |       |  |
|---------------------------------------|--------------------------------|--|---------------------------------------|--------|------|-------|--|
| PARAMETER                             | SYMBOL                         | TEST CONDITIONS  |                                       | TYP.   | MAX. | UNITS |  |
| Forward voltage drop<br>See fig. 1    | V <sub>FM</sub> <sup>(1)</sup> | 19 A   | T <sub>J</sub> = 25 °C                | -      | 0.41 | V     |  |
|                                       |                                | 40 A   |                                       | -      | 0.52 |       |  |
|                                       |                                | 19 A   | T <sub>J</sub> = 125 °C               | 0.25   | 0.33 |       |  |
|                                       |                                | 40 A   |                                       | 0.37   | 0.50 |       |  |
| Reverse leakage current<br>See fig. 2 | I <sub>RM</sub> <sup>(1)</sup> | T <sub>J</sub> = 25 °C   | V <sub>R</sub> = Rated V <sub>R</sub> | -      | 10   | mA    |  |
|                                       |                                | T <sub>J</sub> = 100 °C  |                                       | -      | 600  |       |  |
| Threshold voltage                     | V <sub>F (TO)</sub>            | T <sub>J</sub> = T <sub>J</sub> maximum  |                                       | 0.182  |      | V     |  |
| Forward slope resistance              | r <sub>t</sub>                 |  |                                       | 7.6    |      | mΩ    |  |
| Maximum junction capacitance          | C <sub>T</sub>                 | V <sub>R</sub> = 5 V <sub>DC</sub> (test signal range 100 kHz to 1 MHz), 25 °C |                                       | -      | 2000 | pF    |  |
| Typical series inductance             | L <sub>S</sub>                 | Measured lead to lead 5 mm from package body                                   |                                       | 8      | -    | nH    |  |
| Maximum voltage rate of change        | dV/dt                          | Rated V <sub>R</sub>   |                                       | 10 000 |      | V/μs  |  |

**Note**(1) Pulse width < 300  $\mu$ s, duty cycle < 2 %

| THERMAL - MECHANICAL SPECIFICATIONS             |                   |   |             |                        |
|---|-------------------|---|-------------|------------------------|
| PARAMETER                                       | SYMBOL            | TEST CONDITIONS                                   | VALUES      | UNITS                  |
| Maximum junction temperature range              | T <sub>J</sub>    |   | - 55 to 125 | °C                     |
| Maximum storage temperature range               | T <sub>Stg</sub>  |   | - 55 to 150 |                        |
| Maximum thermal resistance, junction to case    | R <sub>thJC</sub> | DC operation<br>See fig. 4                        | 1.5         | °C/W                   |
| Typical thermal resistance, case to heatsink    | R <sub>thCS</sub> | Mounting surface, smooth and greased (for TO-220) | 0.50        |                        |
| Maximum thermal resistance, junction to ambient | R <sub>thJA</sub> | DC operation (for D <sup>2</sup> PAK)             | 40          |                        |
| Approximate weight                              |                   |   | 2           | g                      |
|   |                   |   | 0.07        | oz.                    |
| Mounting torque                                 | minimum           | Non-lubricated threads                            | 6 (5)       | kgf · cm<br>(lbf · in) |
|   | maximum           |   | 12 (10)     |                        |
| Marking device                                  |                   | Case style D <sup>2</sup> PAK                     | STPS20L15G  |                        |

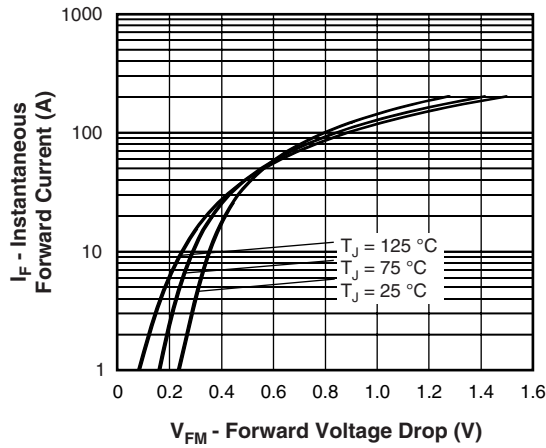


Fig. 1 - Maximum Forward Voltage Drop Characteristics

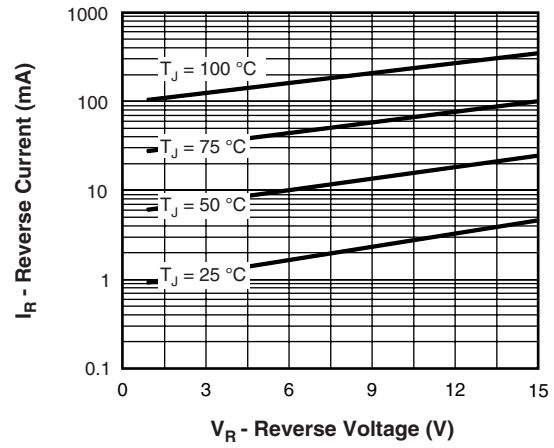


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

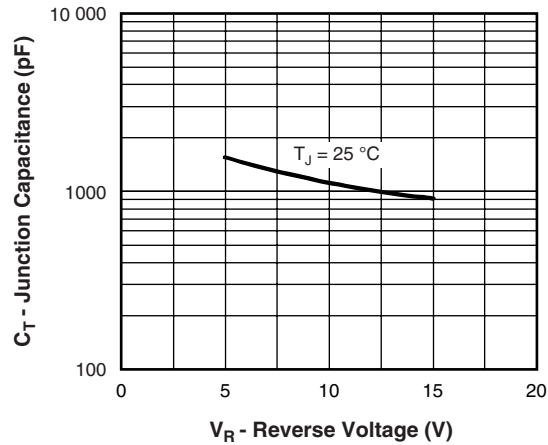


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

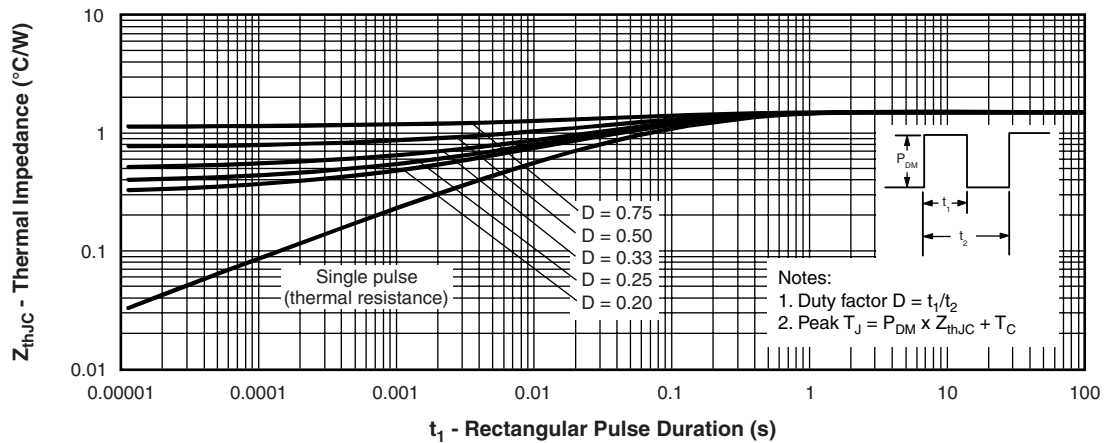


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

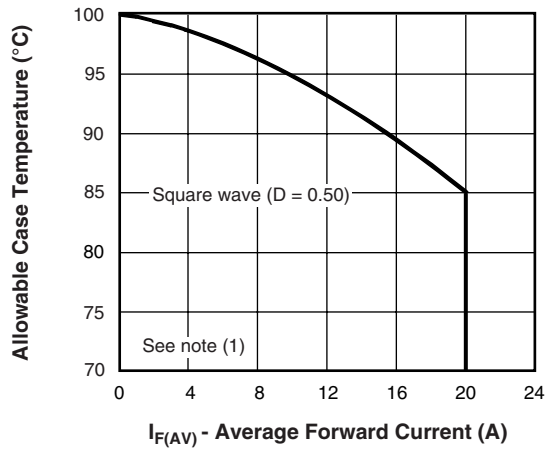


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

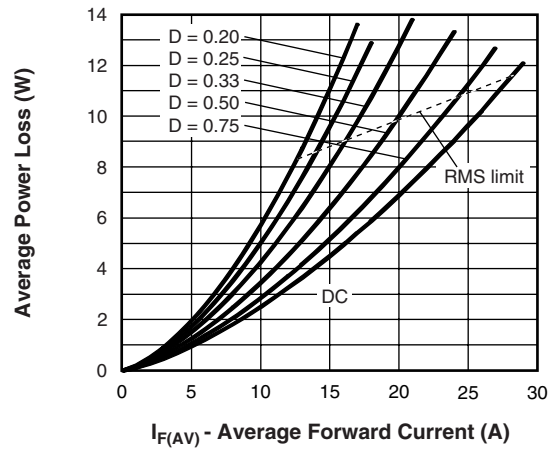


Fig. 6 - Forward Power Loss Characteristics

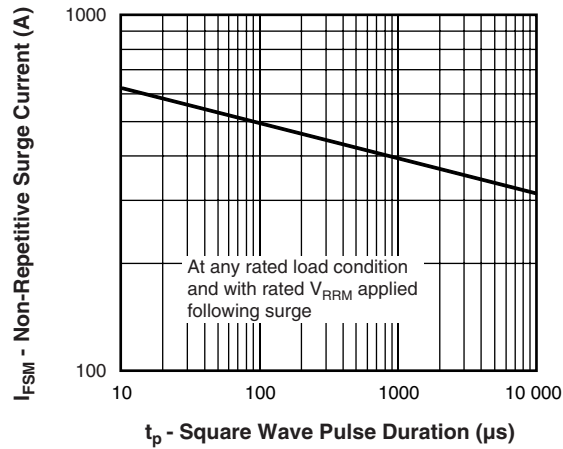


Fig. 7 - Maximum Non-Repetitive Surge Current

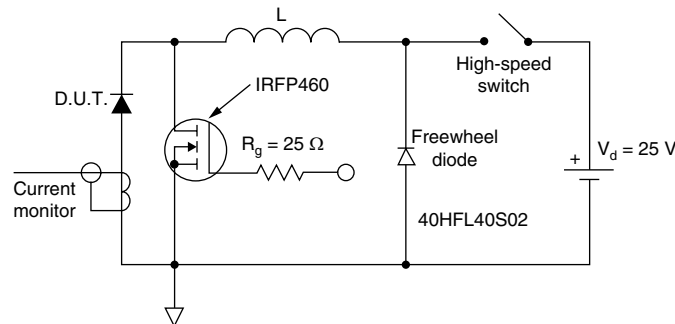


Fig. 8 - Unclamped Inductive Test Circuit

## Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1} = 80\%$  rated  $V_R$

**ORDERING INFORMATION TABLE**

|             |            |             |           |          |           |          |            |            |
|-------------|------------|-------------|-----------|----------|-----------|----------|------------|------------|
| Device code | <b>VS-</b> | <b>STPS</b> | <b>20</b> | <b>L</b> | <b>15</b> | <b>G</b> | <b>TRL</b> | <b>PbF</b> |
|             | 1          | 2           | 3         | 4        | 5         | 6        | 7          | 8          |

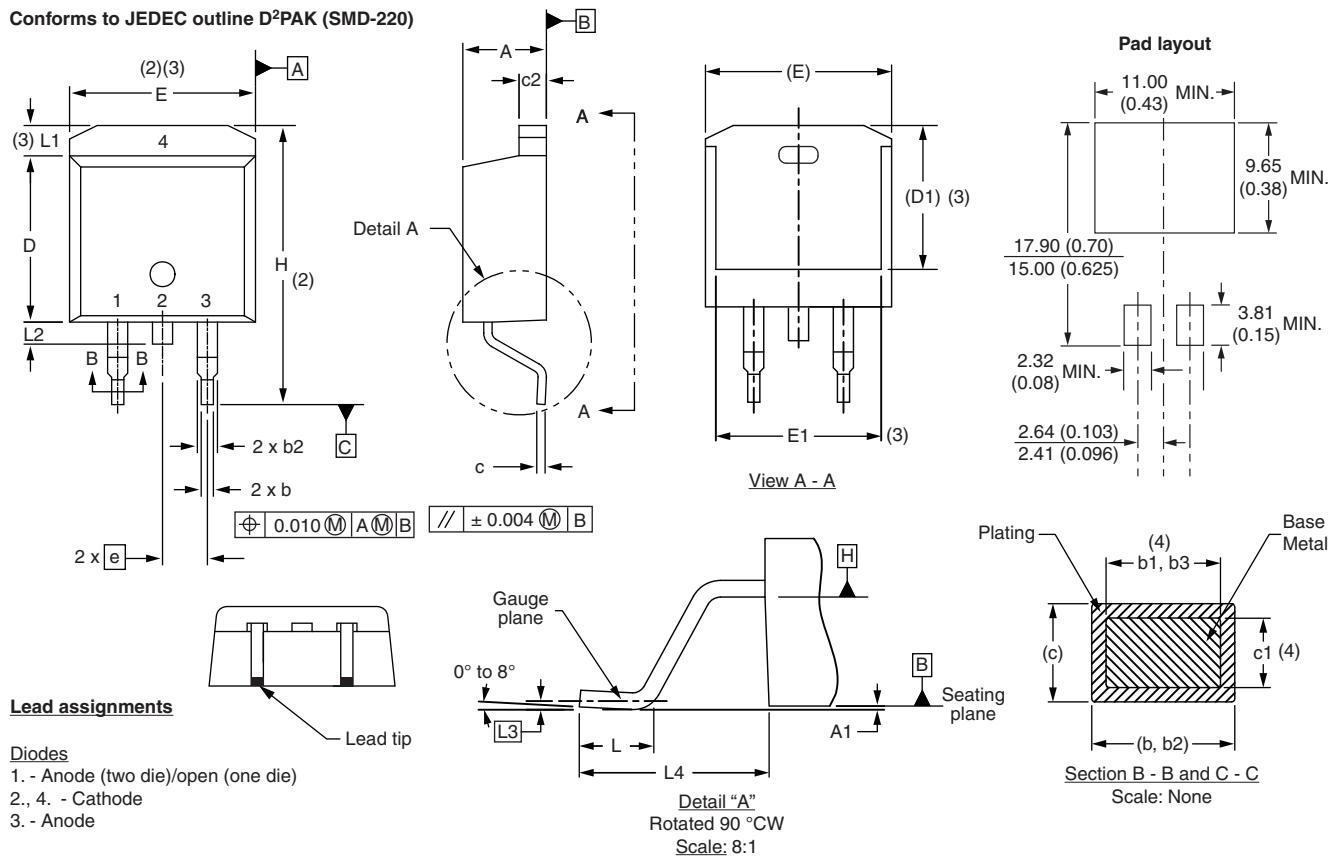
- |          |   |  |
|----------|---|--|
| <b>1</b> | - | HPP product suffix   |
| <b>2</b> | - | Essential part number  |
| <b>3</b> | - | Current rating (20 = 20 A)   |
| <b>4</b> | - | Low voltage  |
| <b>5</b> | - | Voltage rating (15 = 15 V)   |
| <b>6</b> | - | G = D <sup>2</sup> PAK package   |
| <b>7</b> | - | <ul style="list-style-type: none"><li>• None = Tube (50 pieces)</li><li>• TRL = Tape and reel (left oriented)</li><li>• TRR = Tape and reel (right oriented)</li></ul> |
| <b>8</b> | - | <ul style="list-style-type: none"><li>• PbF = Lead (Pb)-free (for D<sup>2</sup>PAK tube)</li><li>• P = Lead (Pb)-free (for D<sup>2</sup>PAK TRR and TRL)</li></ul>     |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| 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?95054">www.vishay.com/doc?95054</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</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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