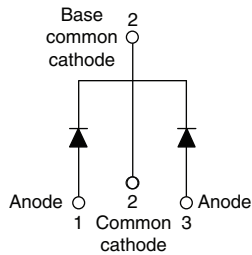


## High Performance Schottky Rectifier, 2 x 10 A


**TO-220AB 3L**


### FEATURES

- 175 °C  $T_J$  operation
- Low forward voltage drop
- High frequency operation
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Guard ring for enhanced ruggedness and long term reliability
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


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

### PRIMARY CHARACTERISTICS

|                       |                |
|-----------------------|----------------|
| $I_{F(AV)}$           | 2 x 10 A       |
| $V_R$                 | 150 V          |
| $V_F$ at $I_F$        | 0.66 V         |
| $I_{RM}$ max.         | 5 mA at 125 °C |
| $T_J$ max.            | 175 °C         |
| $E_{AS}$              | 2.45 mJ        |
| Package               | TO-220AB 3L    |
| Circuit configuration | Common cathode |

### DESCRIPTION

The center tap Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS                               | VALUES      | UNITS |
|-------------|---|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform                          | 20          | A     |
| $V_{RRM}$   |   | 150         | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                          | 1030        | A     |
| $V_F$       | 10 A <sub>pk</sub> , $T_J = 125$ °C (per leg) | 0.66        | V     |
| $T_J$       | Range   | -55 to +175 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-20CTQ150-M3 | UNITS |
|--------------------------------------|-----------|----------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 150            | V     |
| Maximum working peak reverse voltage | $V_{RWM}$ |                |       |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER   | SYMBOL      | TEST CONDITIONS   | VALUES | UNITS |
|---|-------------|---|--------|-------|
| Maximum average forward current, see fig. 5                             | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 154$ °C, rectangular waveform   | 10     | A     |
|   |             |   | 20     |       |
| Maximum peak one cycle non-repetitive surge current per leg, see fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse   | 1030   | A     |
|   |             | 10 ms sine or 6 ms rect. pulse  | 180    |       |
| Non-repetitive avalanche energy per leg                                 | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 0.7$ A, $L = 10$ mH  | 2.45   | mJ    |
| Repetitive avalanche current per leg                                    | $I_{AR}$    | Current decaying linearly to zero in 1 $\mu s$<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical | 0.7    | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER   | SYMBOL         | TEST CONDITIONS  | TYP.                              | MAX.   | UNITS            |               |
|---|----------------|--|-----------------------------------|--------|------------------|---------------|
| Maximum forward voltage drop per leg<br>See fig. 1    | $V_{FM}^{(1)}$ | 10 A   | $T_J = 25\text{ }^\circ\text{C}$  | 0.80   | 0.88             | V             |
|   |                | 20 A   |                                   | 0.90   | 1.0              |               |
|   |                | 10 A   | $T_J = 125\text{ }^\circ\text{C}$ | 0.63   | 0.66             |               |
|   |                | 20 A   |                                   | 0.73   | 0.77             |               |
| Maximum reverse leakage current per leg<br>See fig. 2 | $I_{RM}$       | $T_J = 25\text{ }^\circ\text{C}$   | $V_R = \text{Rated } V_R$         | 3.0    | 25               | $\mu\text{A}$ |
|   |                | $T_J = 125\text{ }^\circ\text{C}$  |                                   | 2.7    | 5.0              | mA            |
| Typical junction capacitance per leg                  | $C_T$          | $V_R = 5 V_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^\circ\text{C}$ | -                                 | 280    | pF               |               |
| Typical series inductance per leg                     | $L_S$          | Measured lead to lead 5 mm from package body                                     | -                                 | 8.0    | nH               |               |
| Maximum voltage rate of change                        | dV/dt          | Rated $V_R$  | -                                 | 10 000 | V/ $\mu\text{s}$ |               |

**Note**(1) Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER  | SYMBOL         | TEST CONDITIONS                       | VALUES      | UNITS                  |
|--|----------------|---------------------------------------|-------------|------------------------|
| Maximum junction and storage temperature range           | $T_J, T_{Stg}$ |                                       | - 55 to 175 | $^\circ\text{C}$       |
| Maximum thermal resistance, junction to case per leg     | $R_{thJC}$     | DC operation                          | 2.0         | $^\circ\text{C/W}$     |
| Maximum thermal resistance, junction to case per package |                |                                       | 1.0         |                        |
| Typical thermal resistance, case to heatsink             | $R_{thCS}$     | Mounting surface, smooth, and greased | 0.50        |                        |
| Approximate weight                                       |                |                                       | 2           | g                      |
|  |                |                                       | 0.07        | oz.                    |
| Mounting torque  |                |                                       | 6 (5)       | kgf · cm<br>(lbf · in) |
|  |                |                                       | 12 (10)     |                        |
| Marking device   |                | Case style 3L TO-220AB                | 20CTQ150    |                        |

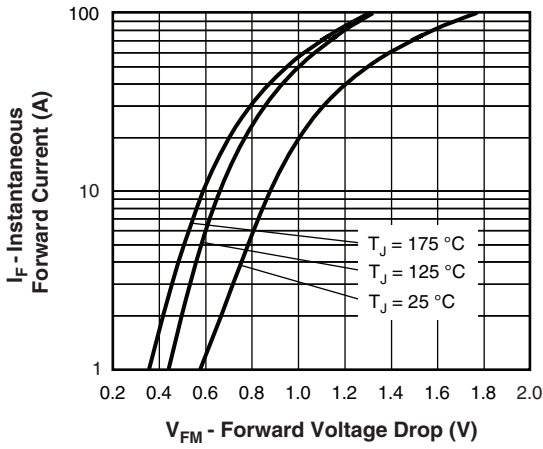


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

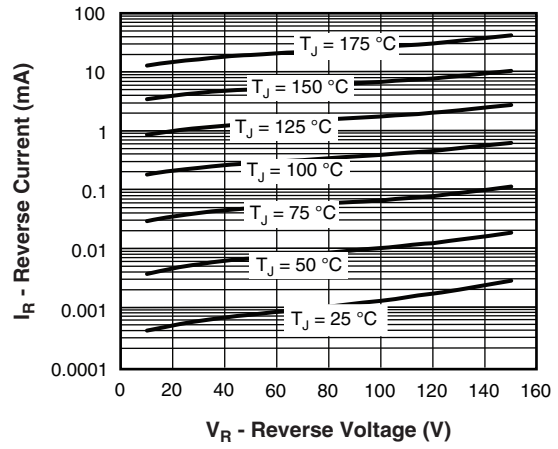


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

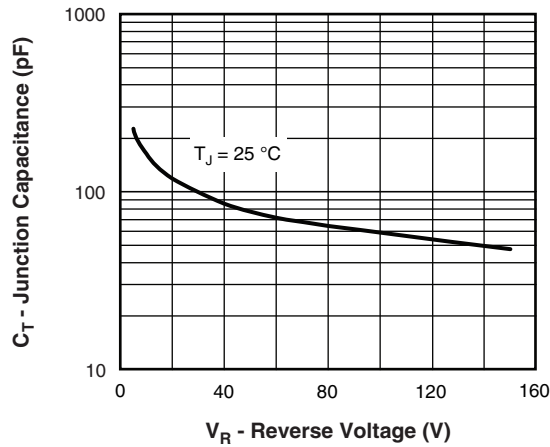


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

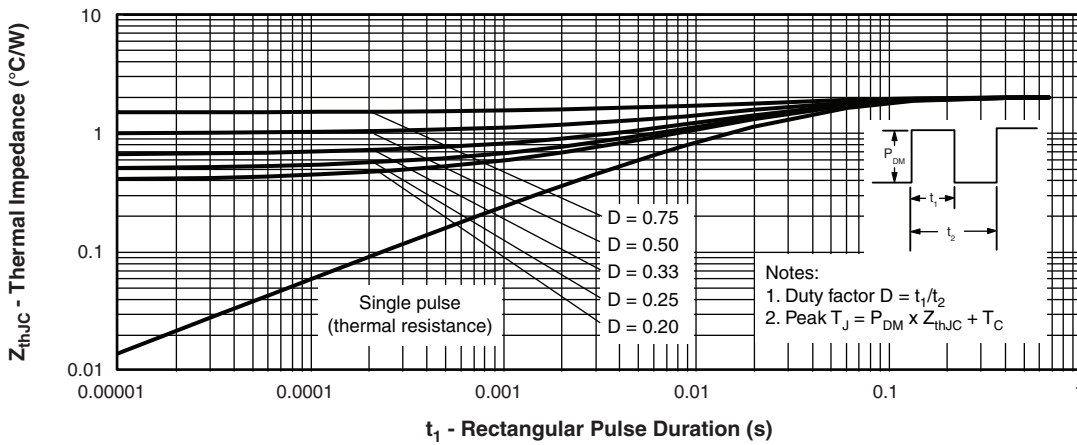


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

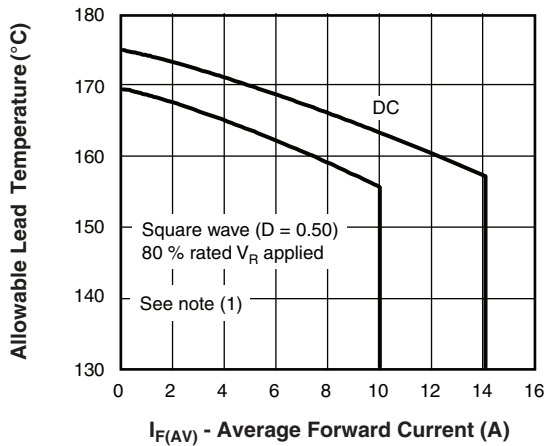


Fig. 5 - Maximum Average Forward Current vs. Allowable Lead Temperature

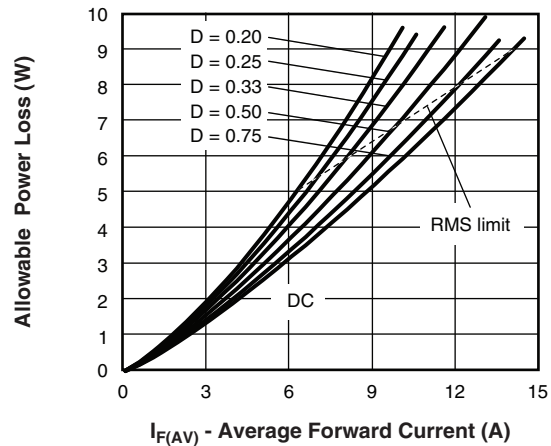


Fig. 6 - Maximum Average Forward Dissipation vs. Average Forward Current

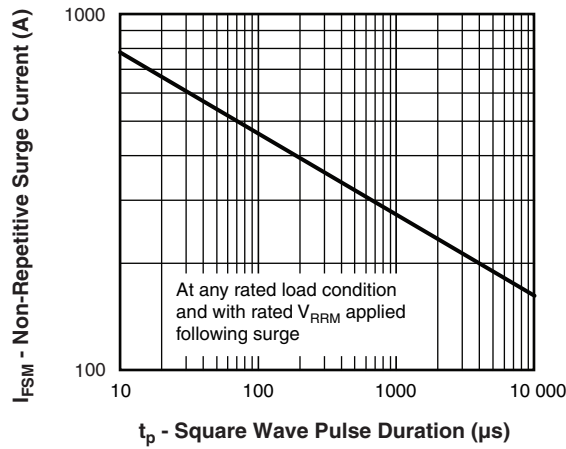


Fig. 7 - Maximum Peak Surge Forward Current vs. Pulse Duration

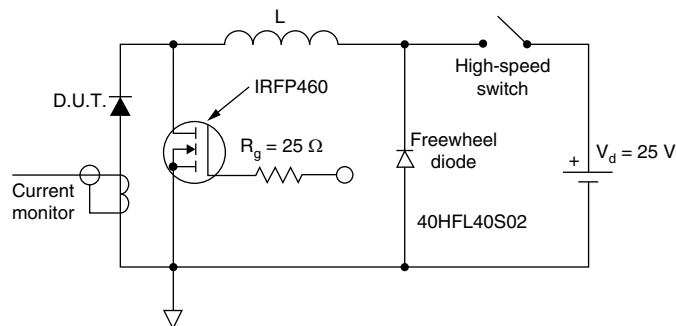


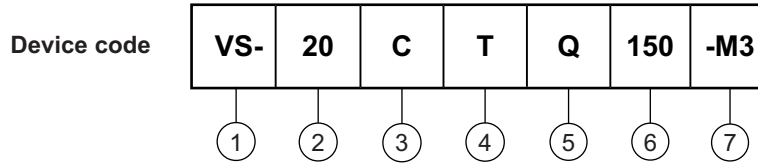
Fig. 8 - Unclamped Inductive Test Circuit

**Note**

- (1) Formula used:  $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$ ;  
 $Pd$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $Pd_{REV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1} = 80\%$  rated  $V_R$



**ORDERING INFORMATION TABLE**



- 1** - Vishay Semiconductors product
- 2** - Current rating (20 = 20 A)
- 3** - Circuit configuration:  
C = Common cathode
- 4** - Package:  
T = TO-220
- 5** - Schottky "Q" series
- 6** - Voltage ratings (150 = 150 A)
- 7** - Environmental digit  
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| <b>ORDERING INFORMATION</b> (Example) |                      |                              |
|---------------------------------------|----------------------|------------------------------|
| <b>PREFERRED P/N</b>                  | <b>BASE QUANTITY</b> | <b>PACKAGING DESCRIPTION</b> |
| VS-20CTQ150-M3                        | 50                   | Antistatic plastic tubes     |

| <b>LINKS TO RELATED DOCUMENTS</b> |  |
|-----------------------------------|--|
| Dimensions                        | <a href="http://www.vishay.com/doc?96154">www.vishay.com/doc?96154</a> |
| Part marking information          | <a href="http://www.vishay.com/doc?95028">www.vishay.com/doc?95028</a> |

### TO-220AB 3L

**DIMENSIONS** in millimeters and inches



Conforms to JEDEC® outline TO-220AB

| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.25        | 4.65  | 0.167  | 0.183 |       |
| A1     | 1.14        | 1.40  | 0.045  | 0.055 |       |
| A2     | 2.50        | 2.92  | 0.098  | 0.115 |       |
| b      | 0.69        | 1.01  | 0.027  | 0.040 |       |
| b1     | 0.38        | 0.97  | 0.015  | 0.038 | 4     |
| b2     | 1.20        | 1.73  | 0.047  | 0.068 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     |
| c      | 0.36        | 0.61  | 0.014  | 0.024 |       |
| c1     | 0.36        | 0.56  | 0.014  | 0.022 | 4     |
| D      | 14.85       | 15.35 | 0.585  | 0.604 | 3     |
| D1     | 8.38        | 9.02  | 0.330  | 0.355 |       |
| D2     | 11.68       | 13.30 | 0.460  | 0.524 | 6, 7  |
| E      | 10.11       | 10.51 | 0.398  | 0.414 | 3, 6  |
| E1     | 6.86        | 8.89  | 0.270  | 0.350 | 6     |
| e      | 2.41        | 2.67  | 0.095  | 0.105 |       |
| e1     | 4.88        | 5.28  | 0.192  | 0.208 |       |
| H1     | 6.09        | 6.48  | 0.240  | 0.255 | 6     |
| L      | 13.52       | 14.02 | 0.532  | 0.552 |       |
| L1     | 3.32        | 3.82  | 0.131  | 0.150 | 2     |
| Ø P    | 3.54        | 3.91  | 0.139  | 0.154 |       |
| Q      | 2.60        | 3.00  | 0.102  | 0.118 |       |

**Notes**

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1, 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) Dimension b1, b3, and c1 apply to base metal only
- (5) Controlling dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2, and E1
- (7) Outline conforms to JEDEC® TO-220, except D2



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