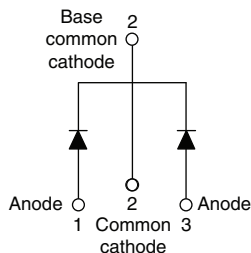




## Schottky Rectifier, 2 x 8 A



TO-220AB



## 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
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified according to JEDEC-JESD47
- Halogen-free according to IEC 61249-2-21 definition (-N3 only)



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

## PRODUCT SUMMARY

|                 |                   |
|-----------------|-------------------|
| Package         | TO-220AB          |
| $I_{F(AV)}$     | 2 x 8 A           |
| $V_R$           | 60 V, 80 V, 100 V |
| $V_F$ at $I_F$  | 0.58 V            |
| $I_{RM}$ max.   | 7 mA at 125 °C    |
| $T_J$ max.      | 175 °C            |
| Diode variation | Common cathode    |
| $E_{AS}$        | 7.5 mJ            |

## DESCRIPTION

This 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                         | 16          | A     |
| $V_{RRM}$   |                                              | 60 to 100   | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                         | 850         | A     |
| $V_F$       | 8 A <sub>pk</sub> , $T_J = 125$ °C (per leg) | 0.58        | V     |
| $T_J$       | Range                                        | - 55 to 175 | °C    |

## VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-16CTQ060PbF | VS-16CTQ060-N3 | VS-16CTQ080PbF | VS-16CTQ080-N3 | VS-16CTQ100PbF | VS-16CTQ100-N3 | UNITS |
|--------------------------------------|-----------|----------------|----------------|----------------|----------------|----------------|----------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 60             | 60             | 80             | 80             | 100            | 100            | 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 $T_C = 148$ °C, rectangular waveform | 8      | A     |
| per leg                                                                   |             |                                                         | 16     |       |
| Maximum peak one cycle non-repetitive surge current per leg<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse                 | 850    | A     |
|                                                                           |             | 10 ms sine or 6 ms rect. pulse                          | 275    |       |
| Non-repetitive avalanche energy per leg                                   | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 0.50$ A, $L = 60$ mH           | 7.50   | mJ    |

**ABSOLUTE MAXIMUM RATINGS**

|                                      |          |                                                                                                                     |      |   |
|--------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------|------|---|
| 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 | 0.50 | A |
|--------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------|------|---|

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                             | SYMBOL         | TEST CONDITIONS                                                                    | VALUES | UNITS      |
|-------------------------------------------------------|----------------|------------------------------------------------------------------------------------|--------|------------|
| Maximum forward voltage drop per leg<br>See fig. 1    | $V_{FM}^{(1)}$ | 8 A                                                                                | 0.72   | V          |
|                                                       |                | 16 A                                                                               | 0.88   |            |
|                                                       |                | 8 A                                                                                | 0.58   |            |
|                                                       |                | 16 A                                                                               | 0.69   |            |
| Maximum reverse leakage current per leg<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                 | 0.55   | mA         |
|                                                       |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                | 7.0    |            |
| Threshold voltage                                     | $V_{F(TO)}$    | $T_J = T_J$ maximum                                                                | 0.415  | V          |
| Forward slope resistance                              | $r_t$          |                                                                                    | 11.07  | m $\Omega$ |
| Maximum junction capacitance per leg                  | $C_T$          | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz) 25 $^{\circ}\text{C}$ | 500    | 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/ $\mu$ s |

**Note**

<sup>(1)</sup> Pulse width < 300  $\mu$ s, duty cycle < 2 %

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                               | SYMBOL                            | TEST CONDITIONS                      | VALUES      | UNITS                  |
|---------------------------------------------------------|-----------------------------------|--------------------------------------|-------------|------------------------|
| Maximum junction and storage temperature range          | T <sub>J</sub> , T <sub>Stg</sub> |                                      | - 55 to 175 | °C                     |
| Maximum thermal resistance, junction to case per leg    | R <sub>thJC</sub>                 | DC operation                         | 3.25        | °C/W                   |
| Maximum thermal resistance junction to case per package | R <sub>thJC</sub>                 |                                      | 1.63        |                        |
| Typical thermal resistance, case to heatsink            | R <sub>thCS</sub>                 | Mounting surface, smooth and greased | 0.50        |                        |
| Approximate weight                                      |                                   |                                      | 2           | g                      |
|                                                         |                                   |                                      | 0.07        | oz.                    |
| Mounting torque                                         | minimum                           |                                      | 6 (5)       | kgf · cm<br>(lbf · in) |
|                                                         | maximum                           |                                      | 12 (10)     |                        |
| Marking device                                          |                                   | Case style TO-220AB                  | 16CTQ060    |                        |
|                                                         |                                   |                                      | 16CTQ080    |                        |
|                                                         |                                   |                                      | 16CTQ100    |                        |

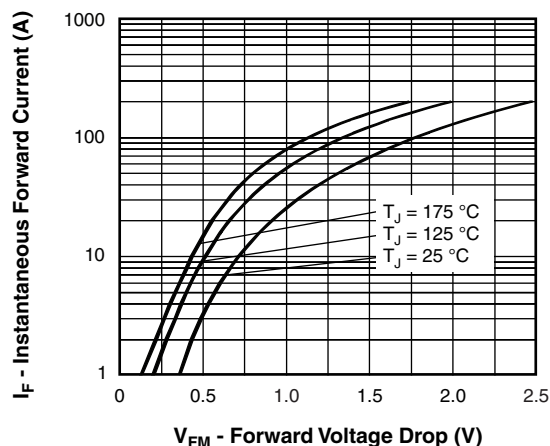


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

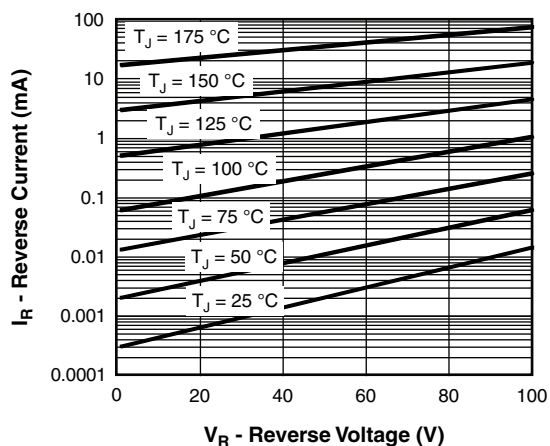


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

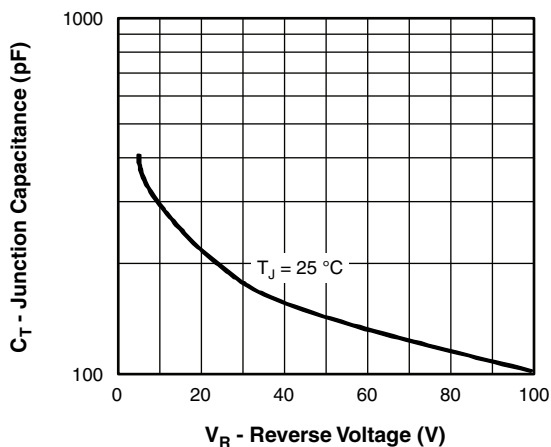


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

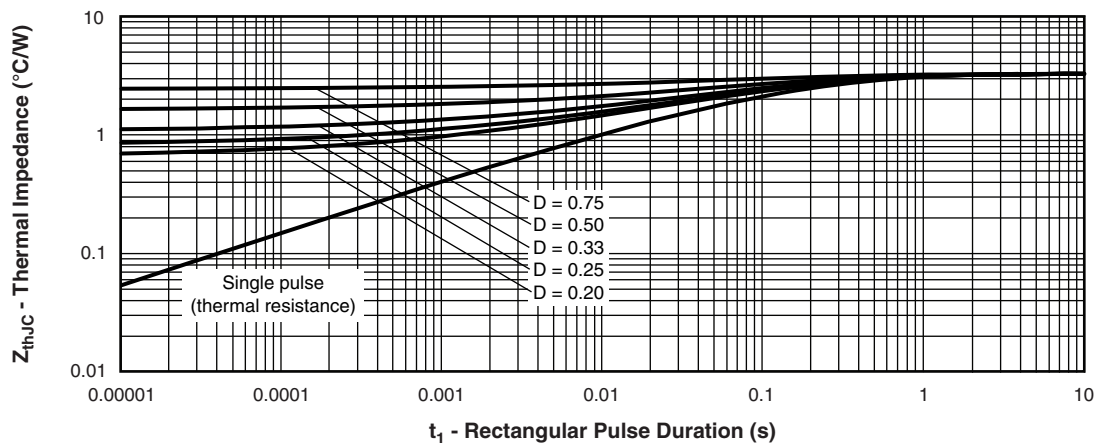


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

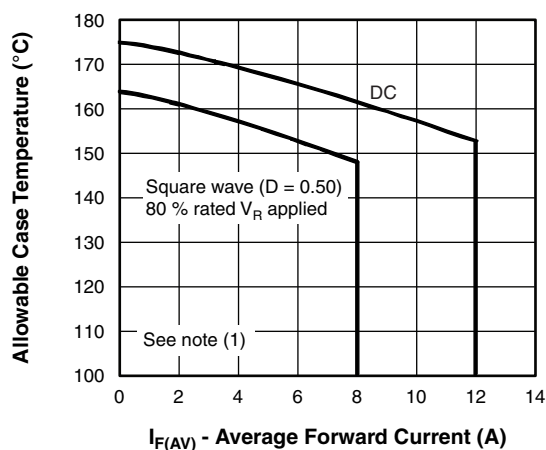


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

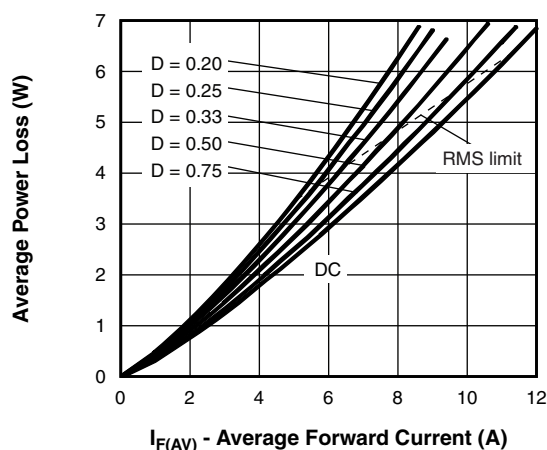


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

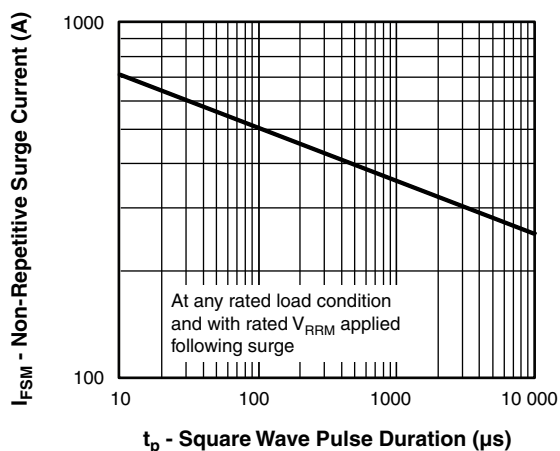


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)



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  $V_R$  applied

**ORDERING INFORMATION TABLE**

|             |            |           |          |          |          |            |            |
|-------------|------------|-----------|----------|----------|----------|------------|------------|
| Device code | <b>VS-</b> | <b>16</b> | <b>C</b> | <b>T</b> | <b>Q</b> | <b>100</b> | <b>PbF</b> |
|             | ①          | ②         | ③        | ④        | ⑤        | ⑥          | ⑦          |

- |          |   |                                                                  |             |
|----------|---|------------------------------------------------------------------|-------------|
| <b>1</b> | - | Vishay Semiconductors product                                    |             |
| <b>2</b> | - | Current rating (16 = 16 A)                                       |             |
| <b>3</b> | - | Circuit configuration                                            |             |
|          |   | C = Common cathode                                               |             |
| <b>4</b> | - | Package                                                          |             |
|          |   | T = TO-220                                                       |             |
| <b>5</b> | - | Schottky "Q" series                                              | 060 = 60 V  |
| <b>6</b> | - | Voltage rating                                                   | 080 = 80 V  |
|          |   |                                                                  | 100 = 100 V |
| <b>7</b> | - | Environmental digit                                              |             |
|          |   | • PbF = Lead (Pb)-free and RoHS compliant                        |             |
|          |   | • -N3 = Halogen-free, RoHS compliant, and totally lead (Pb)-free |             |

**ORDERING INFORMATION** (Example)

| PREFERRED P/N  | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
|----------------|------------------|------------------------|-------------------------|
| VS-16CTQ060PbF | 50               | 1000                   | Antistatic plastic tube |
| VS-16CTQ060-N3 | 50               | 1000                   | Antistatic plastic tube |
| VS-16CTQ080PbF | 50               | 1000                   | Antistatic plastic tube |
| VS-16CTQ080-N3 | 50               | 1000                   | Antistatic plastic tube |
| VS-16CTQ100PbF | 50               | 1000                   | Antistatic plastic tube |
| VS-16CTQ100-N3 | 50               | 1000                   | Antistatic plastic tube |

**LINKS TO RELATED DOCUMENTS**

|                          |              |                                                                        |
|--------------------------|--------------|------------------------------------------------------------------------|
| Dimensions               |              | <a href="http://www.vishay.com/doc?95222">www.vishay.com/doc?95222</a> |
| Part marking information | TO-220AB PbF | <a href="http://www.vishay.com/doc?95225">www.vishay.com/doc?95225</a> |
|                          | TO-220AB -N3 | <a href="http://www.vishay.com/doc?95028">www.vishay.com/doc?95028</a> |
| SPIICE model             |              | <a href="http://www.vishay.com/doc?95279">www.vishay.com/doc?95279</a> |

## TO-220AB

**DIMENSIONS** in millimeters and inches



| 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     | 2.56        | 2.92  | 0.101  | 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       | 15.25 | 0.585  | 0.600 | 3     |
| D1     | 8.38        | 9.02  | 0.330  | 0.355 |       |
| D2     | 11.68       | 12.88 | 0.460  | 0.507 | 6     |

| SYMBOL | MILLIMETERS |       | INCHES     |       | NOTES |
|--------|-------------|-------|------------|-------|-------|
|        | MIN.        | MAX.  | MIN.       | MAX.  |       |
| E      | 10.11       | 10.51 | 0.398      | 0.414 | 3, 6  |
| E1     | 6.86        | 8.89  | 0.270      | 0.350 | 6     |
| E2     | -           | 0.76  | -          | 0.030 | 7     |
| 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, 7  |
| L      | 13.52       | 14.02 | 0.532      | 0.552 |       |
| L1     | 3.32        | 3.82  | 0.131      | 0.150 | 2     |
| Ø P    | 3.54        | 3.73  | 0.139      | 0.147 |       |
| Q      | 2.60        | 3.00  | 0.102      | 0.118 |       |
| θ      | 90° to 93°  |       | 90° to 93° |       |       |

### 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) Dimensions E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, except A2 (maximum) and D2 (minimum) where dimensions are derived from the actual package outline



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