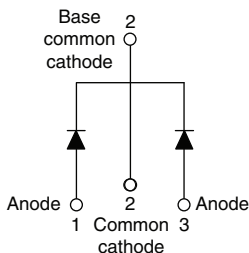




## Schottky Rectifier, 2 x 15 A



TO-220AB



## FEATURES

- 150 °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)



## PRODUCT SUMMARY

|                 |                  |
|-----------------|------------------|
| Package         | TO-220AB         |
| $I_{F(AV)}$     | 2 x 15 A         |
| $V_R$           | 25 V, 40 V, 45 V |
| $V_F$ at $I_F$  | 0.50 V           |
| $I_{RM}$ max.   | 70 mA at 125 °C  |
| $T_J$ max.      | 150 °C           |
| Diode variation | Common cathode   |
| $E_{AS}$        | 20 mJ            |

## DESCRIPTION

The VS-25CTQ... center tap Schottky rectifier series has been optimized for very low forward voltage drop, with moderate leakage. The proprietary barrier technology allows for reliable operation up to 150 °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                          | 30          | A     |
| $V_{RRM}$   | Range                                         | 35 to 45    | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                          | 990         | A     |
| $V_F$       | 15 A <sub>pk</sub> , $T_J = 125$ °C (per leg) | 0.50        | V     |
| $T_J$       | Range                                         | - 55 to 150 | °C    |

## VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-25CTQ035PbF | VS-25CTQ035-N3 | VS-25CTQ040PbF | VS-25CTQ040-N3 | VS-25CTQ045PbF | VS-25CTQ045-N3 | UNITS |
|--------------------------------------|-----------|----------------|----------------|----------------|----------------|----------------|----------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 35             | 35             | 40             | 40             | 45             | 45             | 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 $T_C = 102$ °C, rectangular waveform                                                             | 30     | A     |
| 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                                                                             | 990    | A     |
|                                                                           |             | 10 ms sine or 6 ms rect. pulse                                                                                      | 250    |       |
| Non-repetitive avalanche energy per leg                                   | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 3.0$ A, $L = 4.40$ mH                                                                      | 20     | 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 | 3      | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                             | SYMBOL                         | TEST CONDITIONS                                                               |                                       | VALUES | UNITS |
|-------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------|---------------------------------------|--------|-------|
| Maximum forward voltage drop per leg<br>See fig. 1    | V <sub>FM</sub> <sup>(1)</sup> | 15 A                                                                          | T <sub>J</sub> = 25 °C                | 0.56   | V     |
|                                                       |                                | 30 A                                                                          |                                       | 0.71   |       |
|                                                       |                                | 15 A                                                                          | T <sub>J</sub> = 125 °C               | 0.50   |       |
|                                                       |                                | 30 A                                                                          |                                       | 0.64   |       |
| Maximum reverse leakage current per leg<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> | 1.75   | mA    |
|                                                       |                                | T <sub>J</sub> = 125 °C                                                       |                                       | 70     |       |
| Maximum junction capacitance per leg                  | C <sub>T</sub>                 | V <sub>R</sub> = 5 V <sub>DC</sub> (test signal range 100 kHz to 1 MHz) 25 °C |                                       | 900    | pF    |
| Typical series inductance per leg                     | L <sub>S</sub>                 | Measured lead to lead 5 mm from package body                                  |                                       | 8.0    | 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 and storage temperature range           | T <sub>J</sub> , T <sub>Stg</sub> |                                      | - 55 to 150 | °C                     |
| Maximum thermal resistance, junction to case per leg     | R <sub>thJC</sub>                 | DC operation<br>See fig. 4           | 3.25        | °C/W                   |
| Maximum thermal resistance, junction to case per package |                                   | DC operation                         | 1.63        |                        |
| Typical thermal resistance, case to heatsink             | R <sub>thCS</sub>                 | Mounting surface, smooth and greased | 0.50        |                        |
| Approximate weight                                       |                                   |                                      | 2.0         | g                      |
|                                                          |                                   |                                      | 0.07        | oz.                    |
| Mounting torque                                          | minimum<br>maximum                |                                      | 6 (5)       | kgf · cm<br>(lbf · in) |
|                                                          |                                   |                                      | 12 (10)     |                        |
| Marking device                                           |                                   | Case style TO-220AB                  | 25CTQ035    |                        |
|                                                          |                                   |                                      | 25CTQ040    |                        |
|                                                          |                                   |                                      | 25CTQ045    |                        |

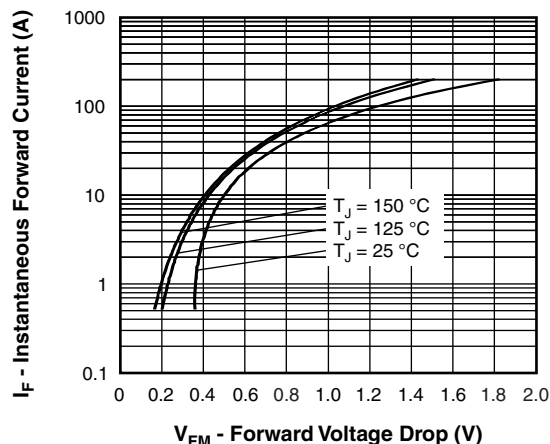


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

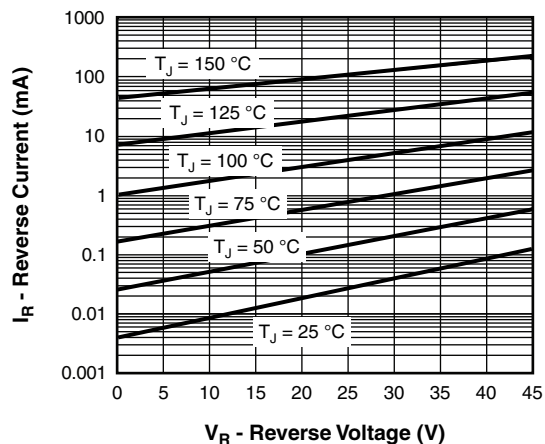


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

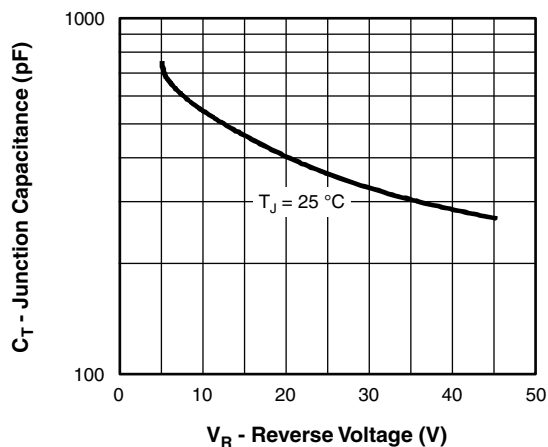


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

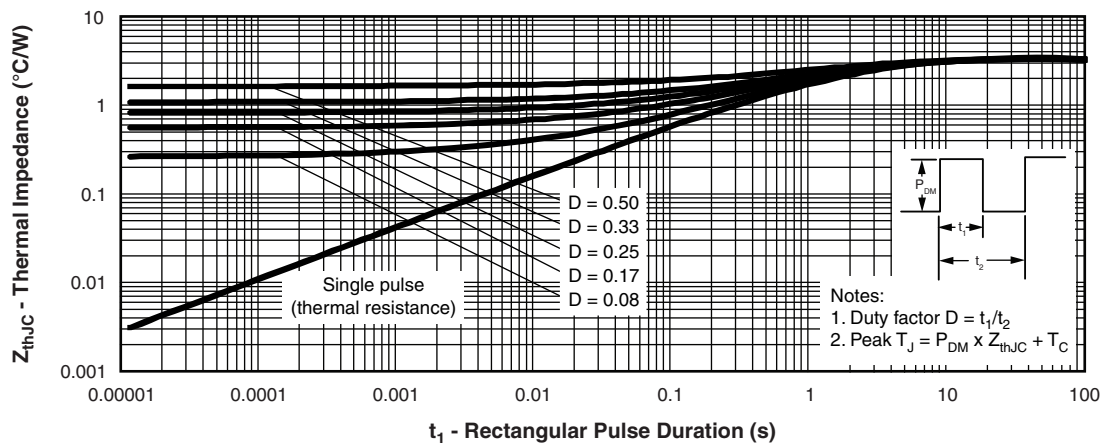


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

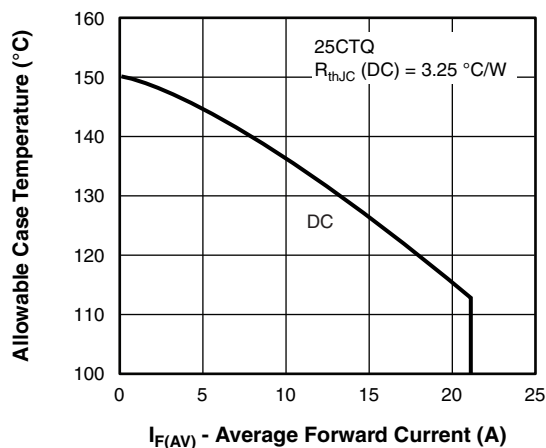


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

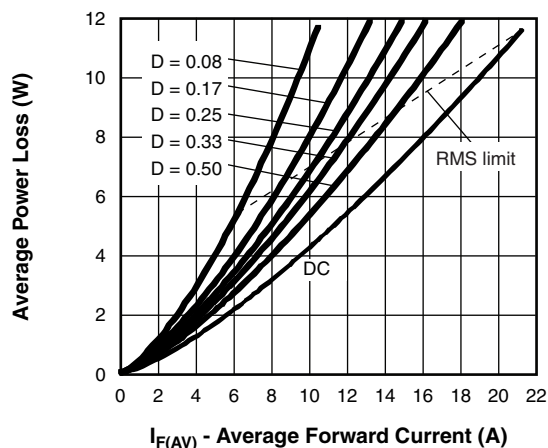


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

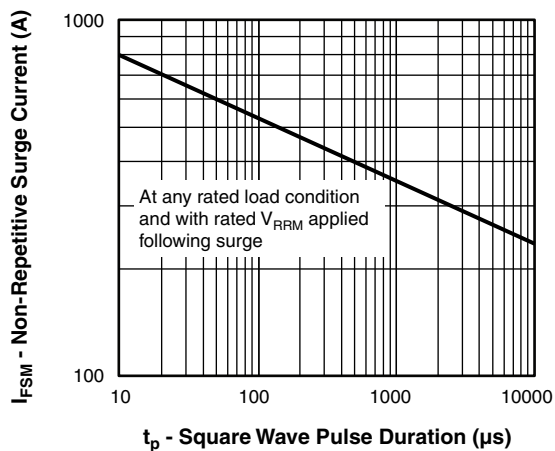


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

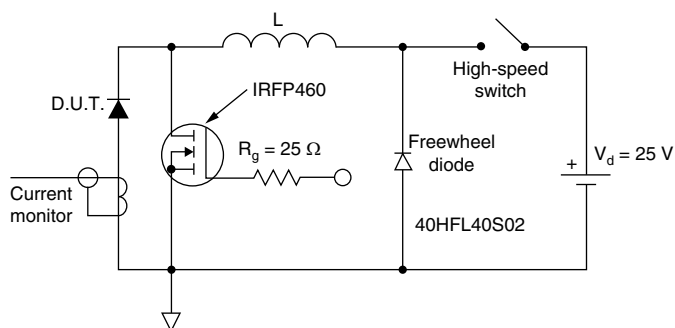


Fig. 8 - Unclamped Inductive Test Circuit

**ORDERING INFORMATION TABLE**

|             |                                                |           |          |          |          |                                        |                                                                                                               |
|-------------|------------------------------------------------|-----------|----------|----------|----------|----------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Device code | <b>VS-</b>                                     | <b>25</b> | <b>C</b> | <b>T</b> | <b>Q</b> | <b>045</b>                             | <b>PbF</b>                                                                                                    |
|             | ①                                              | ②         | ③        | ④        | ⑤        | ⑥                                      | ⑦                                                                                                             |
| ①           | - Vishay Semiconductors product                |           |          |          |          |                                        |                                                                                                               |
| ②           | - Current rating (25 = 25 A)                   |           |          |          |          |                                        |                                                                                                               |
| ③           | - Circuit configuration:<br>C = Common cathode |           |          |          |          |                                        |                                                                                                               |
| ④           | - Package:<br>T = TO-220                       |           |          |          |          |                                        |                                                                                                               |
| ⑤           | - Schottky "Q" series                          |           |          |          |          |                                        |                                                                                                               |
| ⑥           | - Voltage ratings                              |           |          |          |          |                                        |                                                                                                               |
| ⑦           | - Environmental digit                          |           |          |          |          |                                        |                                                                                                               |
|             |                                                |           |          |          |          | 035 = 35 V<br>040 = 40 V<br>045 = 45 V |                                                                                                               |
|             |                                                |           |          |          |          |                                        | • PbF = Lead (Pb)-free and RoHS compliant<br>• -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-25CTQ035PbF                 | 50               | 1000                   | Antistatic plastic tube |
| VS-25CTQ035-N3                 | 50               | 1000                   | Antistatic plastic tube |
| VS-25CTQ040PbF                 | 50               | 1000                   | Antistatic plastic tube |
| VS-25CTQ040-N3                 | 50               | 1000                   | Antistatic plastic tube |
| VS-25CTQ045PbF                 | 50               | 1000                   | Antistatic plastic tube |
| VS-25CTQ045-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?95285">www.vishay.com/doc?95285</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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