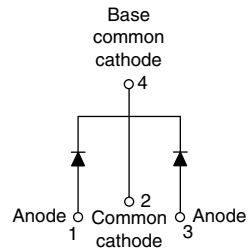


High Performance Schottky Rectifier, 2 x 6 A



FEATURES

- 175 °C T_J operation
- Center tap TO-220 package
- 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



RoHS
COMPLIANT
HALOGEN
FREE

PRIMARY CHARACTERISTICS

| | |
|-----------------------|------------------|
| $I_{F(AV)}$ | 2 x 6 A |
| V_R | 35 V, 40 V, 45 V |
| V_F at I_F | 0.53 V |
| I_{RM} max. | 7 mA at 125 °C |
| T_J max. | 175 °C |
| E_{AS} | 8 mJ |
| Package | TO-220AB 3L |
| Circuit configuration | Common cathode |

DESCRIPTION

The VS-12CTQ... 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 | 12 | A |
| V_{RRM} | Range | 35 to 45 | V |
| I_{FSM} | $t_p = 5 \mu s$ sine | 690 | A |
| V_F | 6 A $_{pk}$, $T_J = 125$ °C (per leg) | 0.53 | V |
| T_J | Range | -55 to +175 | °C |

VOLTAGE RATINGS

| PARAMETER | SYMBOL | VS-12CTQ035-M3 | VS-12CTQ040-M3 | VS-12CTQ045-M3 | UNITS |
|--------------------------------------|-----------|----------------|----------------|----------------|-------|
| Maximum DC reverse voltage | V_R | 35 | 40 | 45 | 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 $T_C = 160$ °C, rectangular waveform | 6 | A |
| per leg | | | 12 | |
| Maximum peak one cycle non-repetitive surge current per leg. See fig. 7 | I_{FSM} | 5 μs sine or 3 μs rect. pulse | 690 | A |
| | | 10 ms sine or 6 ms rect. pulse | | |
| Non-repetitive avalanche energy per leg | E_{AS} | $T_J = 25$ °C, $I_{AS} = 1.20$ A, $L = 11.10$ mH | 8 | mJ |
| Repetitive avalanche current per leg | I_{AR} | Current decaying linearly to zero in 1 μs Frequency limited by T_J maximum $V_A = 1.5 \times V_R$ typical | 1.20 | A |



| ELECTRICAL SPECIFICATIONS | | | | | |
|---|----------------|---|-----------------------------------|--------|------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Maximum forward voltage drop per leg See fig. 1 | $V_{FM}^{(1)}$ | 6 A | $T_J = 25\text{ }^\circ\text{C}$ | 0.60 | V |
| | | 12 A | | 0.73 | |
| | | 6 A | $T_J = 125\text{ }^\circ\text{C}$ | 0.53 | |
| | | 12 A | | 0.64 | |
| Maximum reverse leakage current per leg See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$ | $V_R = \text{Rated } V_R$ | 0.8 | mA |
| | | $T_J = 125\text{ }^\circ\text{C}$ | | 7.0 | |
| Threshold voltage | $V_{F(TO)}$ | $T_J = T_J \text{ maximum}$ | | 0.35 | V |
| Forward slope resistance | r_f | | | 18.23 | m Ω |
| Maximum junction capacitance per leg | C_T | $V_R = 5 V_{DC}$ (test signal range 100 kHz to 1 MHz) 25 °C | | 400 | 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/ μ s |

Note

(1) Pulse width < 300 μ 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 See fig. 4 | | 3.50 | $^\circ\text{C/W}$ |
| Maximum thermal resistance, junction to case per package | | DC operation | | 1.75 | |
| Typical thermal resistance, case to heatsink | R_{thCS} | Mounting surface, smooth and greased | | 0.50 | |
| Approximate weight | | | 2 | | g |
| | | | 0.07 | | oz. |
| Mounting torque | minimum | | | 6 (5) | kgf · cm (lbf · in) |
| | maximum | | | 12 (10) | |
| Marking device | Case style TO-220AB 3L | | 12CTQ035 | | |
| | | | 12CTQ040 | | |
| | | | 12CTQ045 | | |

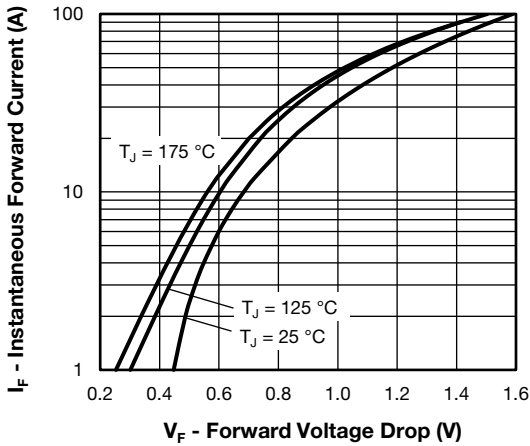


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

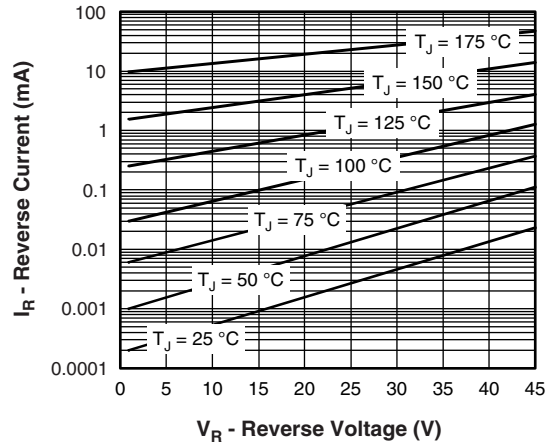


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

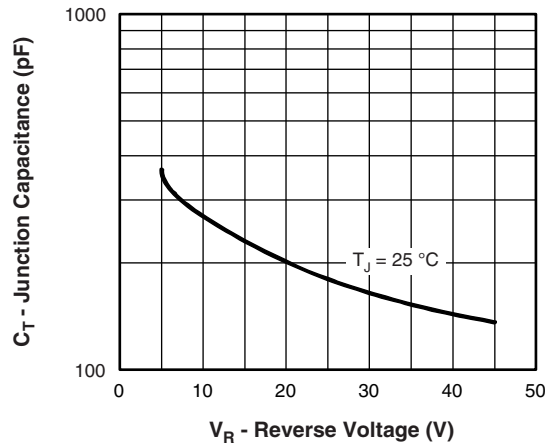


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

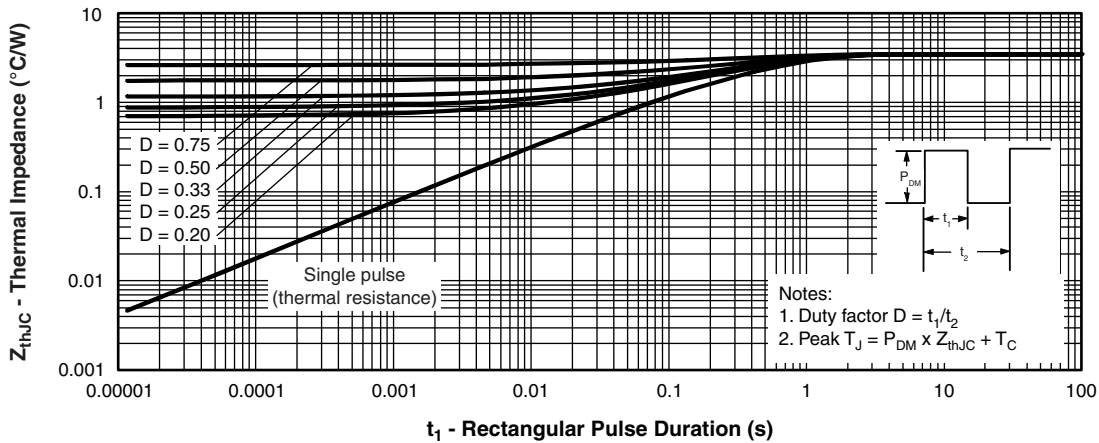


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

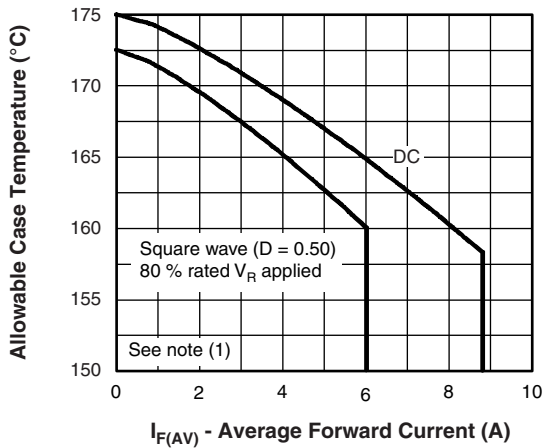


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

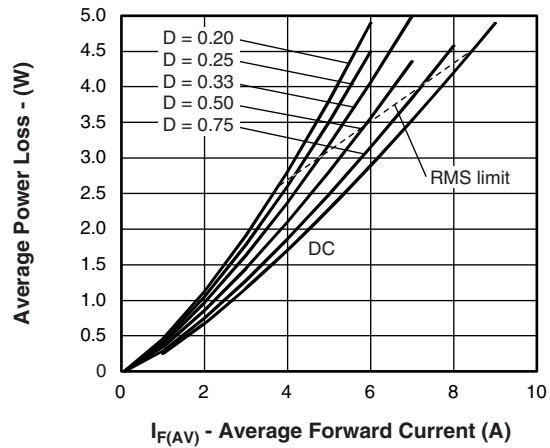


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

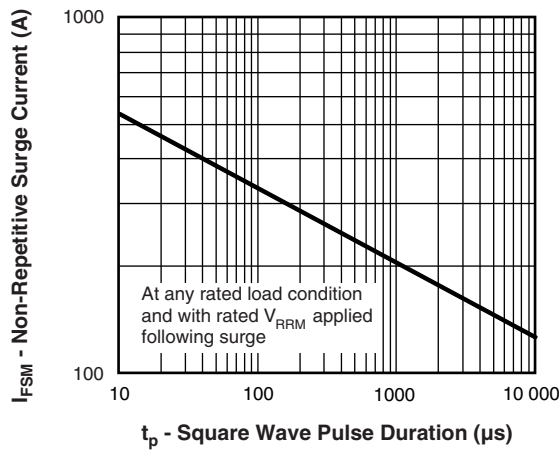


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

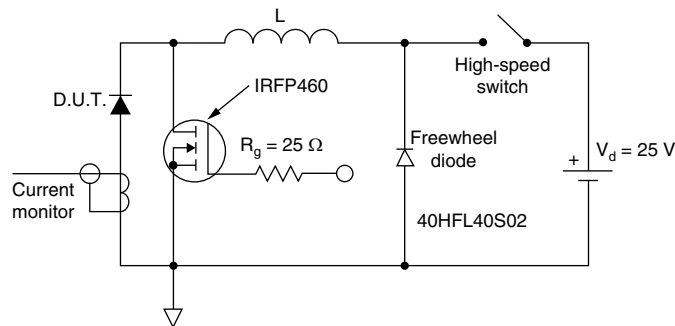


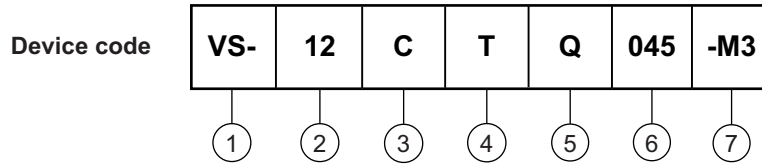
Fig. 8 - Unclamped Inductive Test Circuit

Note

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



ORDERING INFORMATION TABLE



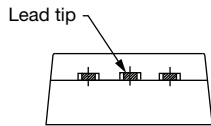
- 1** - Vishay Semiconductors product
 - 2** - Current rating (12 = 12 A)
 - 3** - Circuit configuration:
C = common cathode
 - 4** - Package:
T = TO-220
 - 5** - Schottky "Q" series
 - 6** - Voltage ratings
 - 7** - Environmental digit
- 035 = 35 V
 040 = 40 V
 045 = 45 V

| ORDERING INFORMATION (Example) | | |
|--------------------------------|---------------|--------------------------|
| PREFERRED P/N | BASE QUANTITY | PACKAGING DESCRIPTION |
| VS-12CTQ035-M3 | 50 | Antistatic plastic tubes |
| VS-12CTQ040-M3 | 50 | Antistatic plastic tubes |
| VS-12CTQ045-M3 | 50 | Antistatic plastic tubes |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?96154 |
| Part marking information | www.vishay.com/doc?95028 |
| SPICE model | www.vishay.com/doc?95629 |

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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