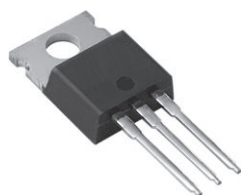
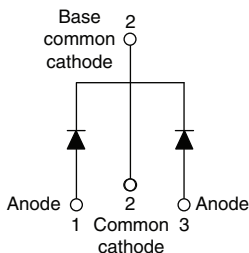


Schottky Rectifier, 2 x 20 A


TO-220AB


FEATURES

- 175 °C T_J operation
- Very 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 20 A |
| V_R | 150 V |
| V_F at I_F | 0.71 V |
| I_{RM} max. | 15 mA at 125 °C |
| T_J max. | 175 °C |
| Diode variation | Common cathode |
| E_{AS} | 1.0 mJ |

DESCRIPTION

The VS-40CTQ... center tap Schottky rectifier has been optimized for very low forward voltage drop, with moderate leakage. 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 | 40 | A |
| V_{RRM} | | 150 | V |
| I_{FSM} | $t_p = 5 \mu s$ sine | 1500 | A |
| V_F | 20 A _{pk} , $T_J = 125$ °C (per leg) | 0.71 | V |
| T_J | | - 55 to 175 | °C |

VOLTAGE RATINGS

| PARAMETER | SYMBOL | VS-40CTQ150PbF | VS-40CTQ150-N3 | UNITS |
|--------------------------------------|-----------|----------------|----------------|-------|
| Maximum DC reverse voltage | V_R | 150 | 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 $T_C = 140$ °C, rectangular waveform | 20 40 | A |
| Maximum peak one cycle non-repetitive surge current per leg See fig. 7 | I_{FSM} | 5 μs sine or 3 μs rect. pulse 10 ms sine or 6 ms rect. pulse | 1500 250 | |
| Non-repetitive avalanche energy per leg | E_{AS} | $T_J = 25$ °C, $I_{AS} = 1.5$ A, $L = 0.9$ mH | 1.0 | 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 | 1.5 | A |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|----------------|---|-------------------------------------|--------|------------------|
| Maximum forward voltage drop per leg See fig. 1 | $V_{FM}^{(1)}$ | 20 A | $T_J = 25\text{ }^{\circ}\text{C}$ | 0.93 | V |
| | | 40 A | | 1.16 | |
| | | 20 A | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.71 | |
| | | 40 A | | 0.85 | |
| Maximum reverse leakage current per leg See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$ | $V_R = \text{Rated } V_R$ | 50 | μA |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | | 15 | mA |
| Maximum junction capacitance per leg | C_T | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^{\circ}\text{C}$ | | 450 | 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/ μs |

Note(1) Pulse width < 300 μs , 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 | °C |
| Maximum thermal resistance, junction to case per leg | R _{thJC} | DC operation See fig. 4 | 1.5 | °C/W |
| Maximum thermal resistance, junction to case per package | | DC operation | 0.75 | |
| Typical thermal resistance, case to heatsink | R _{thCS} | Mounting surface, smooth and greased | 0.5 | |
| Approximate weight | | | 2 | g |
| | | | 0.07 | oz. |
| Mounting torque <div><div>minimum</div><div>maximum</div></div> | | Non-lubricated threads | 6 (5) | kgf · cm |
| | | | 12 (10) | (lbf · in) |
| Marking device | | Case style TO-220AB | 40CTQ150 | |

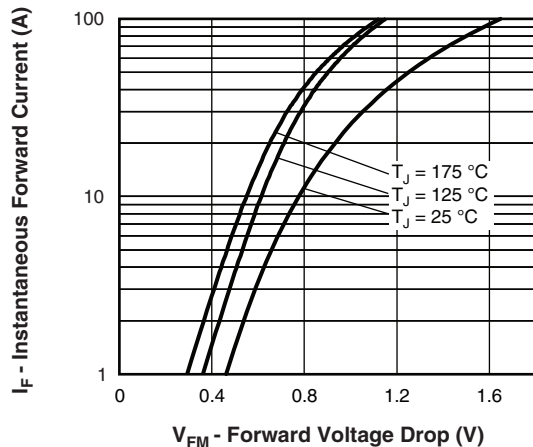


Fig. 1 - Maximum Forward Voltage Drop Characteristics

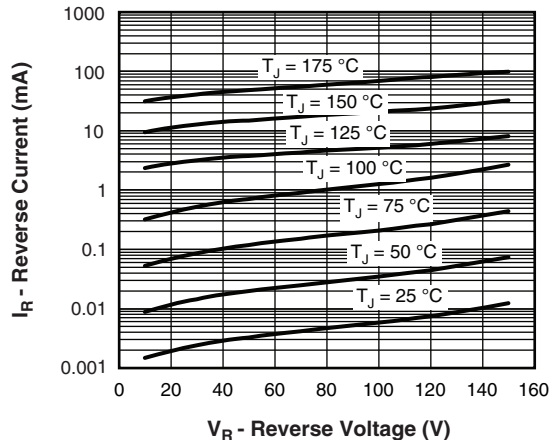


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

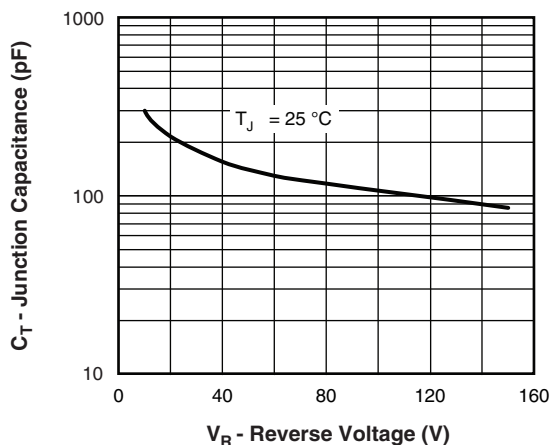
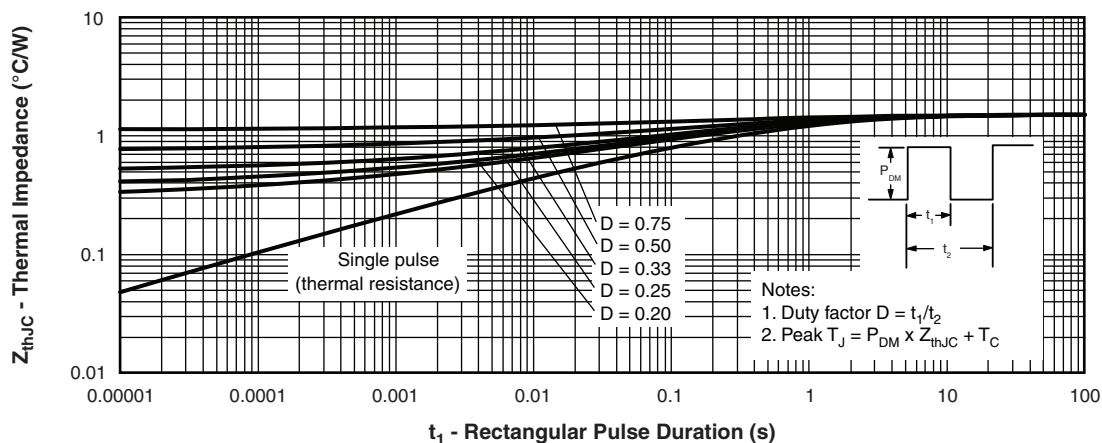


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

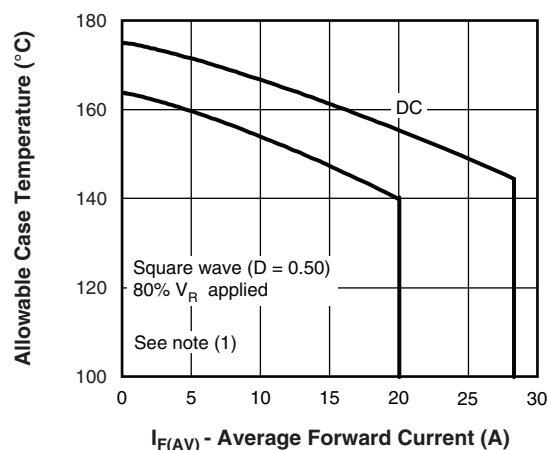


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

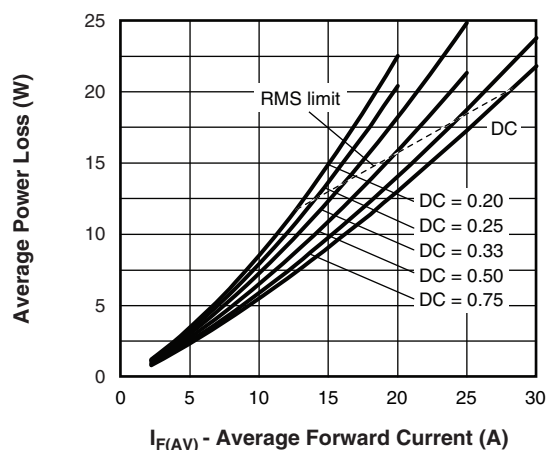


Fig. 6 - Forward Power Loss Characteristics

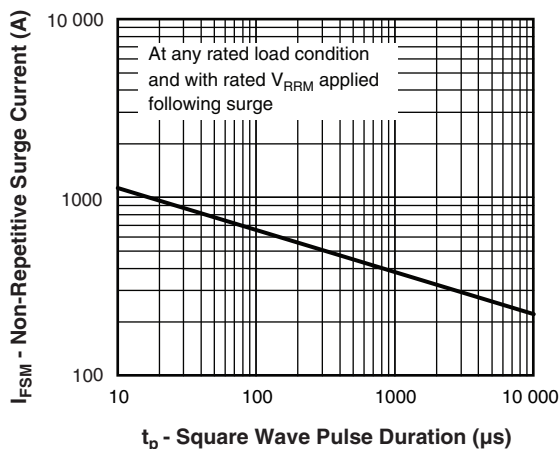


Fig. 7 - Maximum Non-Repetitive Surge Current

Note

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

**ORDERING INFORMATION TABLE**

| | | | | | | | |
|-------------|------------|-----------|----------|----------|----------|------------|------------|
| Device code | VS- | 40 | C | T | Q | 150 | PbF |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

- | | | |
|----------|---|--|
| 1 | - | Vishay Semiconductors product |
| 2 | - | Current rating (40 = 40 A) |
| 3 | - | Circuit configuration: C = Common cathode |
| 4 | - | Package: T = TO-220 |
| 5 | - | Schottky "Q" series |
| 6 | - | Voltage ratings (150 = 150 V) |
| 7 | - | Environmental digit |
- PbF = Lead (Pb)-free and RoHS compliant
 - -N3 = Halogen-free, RoHS compliant, and totally lead (Pb)-free

ORDERING INFORMATION (Example)

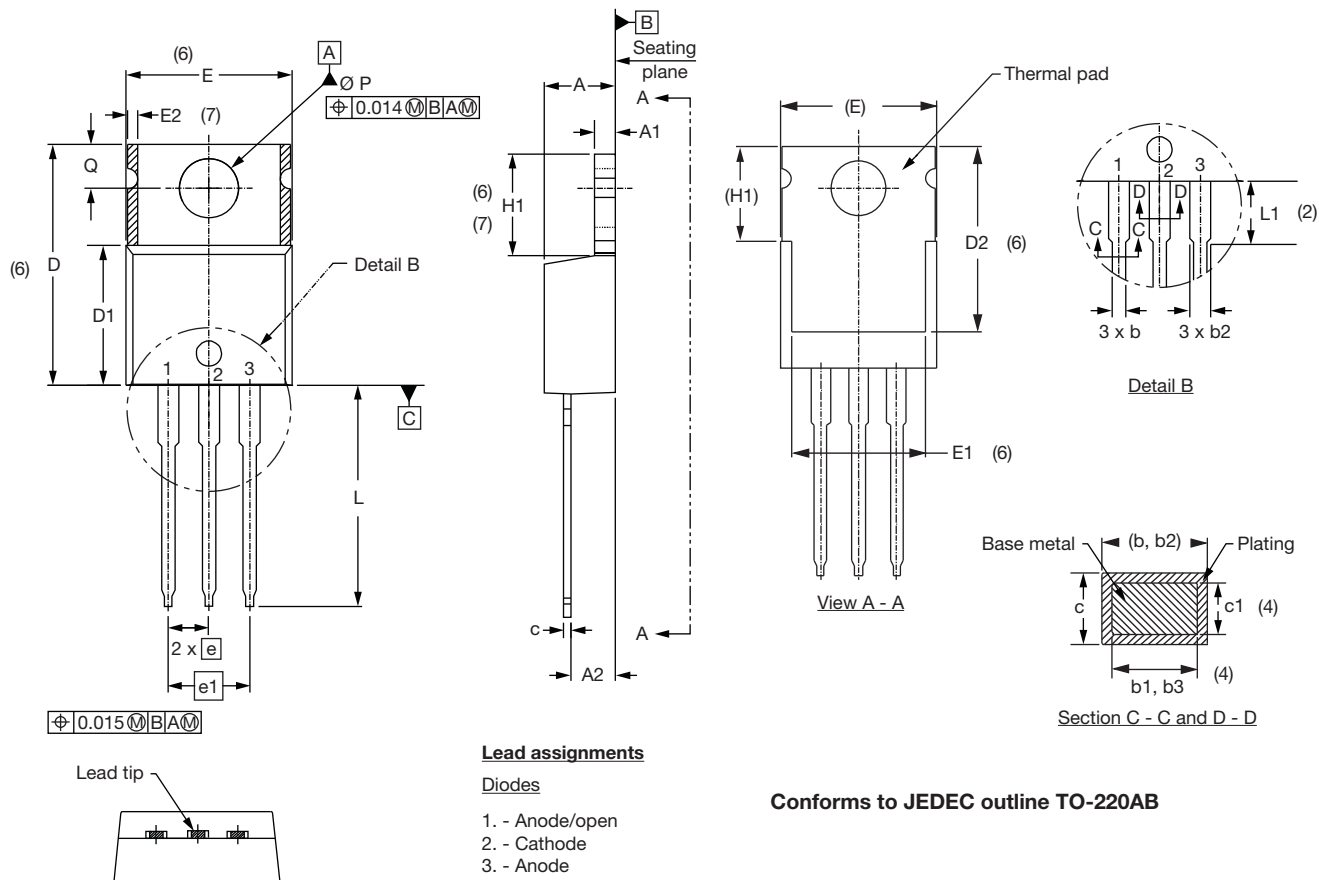
| PREFERRED P/N | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
|----------------|------------------|------------------------|-------------------------|
| VS-40CTQ150PbF | 50 | 1000 | Antistatic plastic tube |
| VS-40CTQ150-N3 | 50 | 1000 | Antistatic plastic tube |

LINKS TO RELATED DOCUMENTS

| | | |
|--------------------------|--------------|--|
| Dimensions | | www.vishay.com/doc?95222 |
| Part marking information | TO-220AB PbF | www.vishay.com/doc?95225 |
| | TO-220AB -N3 | www.vishay.com/doc?95028 |

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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