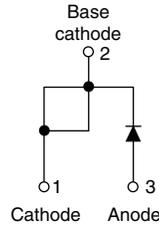


Schottky Rectifier, 20 A


TO-220AC


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-220AC |
| $I_{F(AV)}$ | 20 A |
| V_R | 35 V, 40 V, 45 V |
| V_F at I_F | 0.51 V |
| I_{RM} max. | 105 mA at 125 °C |
| T_J | 150 °C |
| Diode variation | Single die |
| E_{AS} | 27 mJ |

DESCRIPTION

The VS-20TQ... 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 | 20 | A |
| V_{RRM} | Range | 35 to 45 | V |
| I_{FSM} | $t_p = 5 \mu s$ sine | 1800 | A |
| V_F | 20 A_{pk} , $T_J = 125 \text{ }^\circ\text{C}$ | 0.51 | V |
| T_J | Range | - 55 to 150 | °C |

| VOLTAGE RATINGS | | | | | | | | |
|--------------------------------------|-----------|---------------|---------------|---------------|---------------|---------------|---------------|-------|
| PARAMETER | SYMBOL | VS-20TQ035PbF | VS-20TQ035-N3 | VS-20TQ040PbF | VS-20TQ040-N3 | VS-20TQ045PbF | VS-20TQ045-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 See fig. 5 | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 116 \text{ }^\circ\text{C}$, rectangular waveform | 20 | A |
| Maximum peak one cycle non-repetitive surge current See fig. 7 | I_{FSM} | 5 μs sine or 3 μs rect. pulse | 1800 | |
| | | 10 ms sine or 6 ms rect. pulse | 400 | |
| Non-repetitive avalanche energy | E_{AS} | $T_J = 25 \text{ }^\circ\text{C}$, $I_{AS} = 4 \text{ A}$, $L = 3.4 \text{ mH}$ | 27 | mJ |
| Repetitive avalanche current | I_{AR} | Current decaying linearly to zero in 1 μs Frequency limited by T_J maximum $V_A = 1.5 \times V_R$ typical | 4 | A |



| ELECTRICAL SPECIFICATIONS | | | | | |
|---|----------------|--|-----------------------------------|--------|------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Maximum forward voltage drop See fig. 1 | $V_{FM}^{(1)}$ | 20 A | $T_J = 25\text{ }^\circ\text{C}$ | 0.57 | V |
| | | 40 A | | 0.73 | |
| | | 20 A | $T_J = 125\text{ }^\circ\text{C}$ | 0.51 | |
| | | 40 A | | 0.67 | |
| Maximum reverse leakage current See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$ | $V_R = \text{Rated } V_R$ | 2.7 | mA |
| | | $T_J = 125\text{ }^\circ\text{C}$ | | 105 | |
| Maximum junction capacitance | C_T | $V_R = 5 V_{DC}$, (test signal range 100 kHz to 1 MHz) $25\text{ }^\circ\text{C}$ | | 1400 | pF |
| Typical series inductance | 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 150 | $^\circ\text{C}$ |
| Maximum thermal resistance, junction to case | R_{thJC} | DC operation See fig. 4 | | 1.50 | $^\circ\text{C/W}$ |
| 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-220AC | | 20TQ035 | |
| | | | | 20TQ040 | |
| | | | | 20TQ045 | |

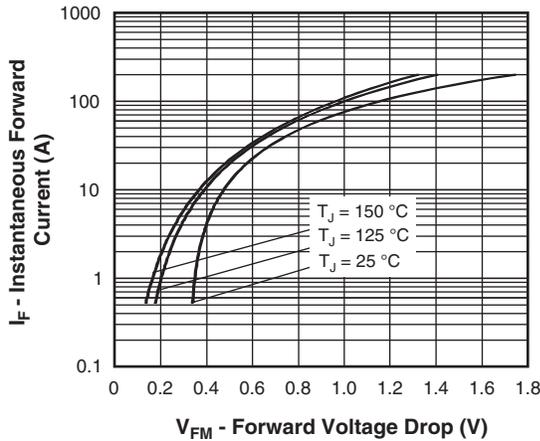


Fig. 1 - Maximum Forward Voltage Drop Characteristics

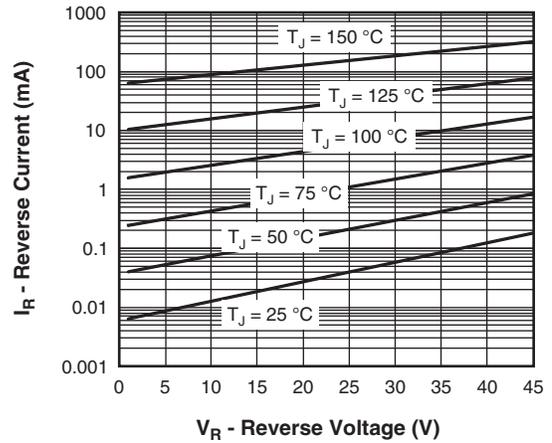


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

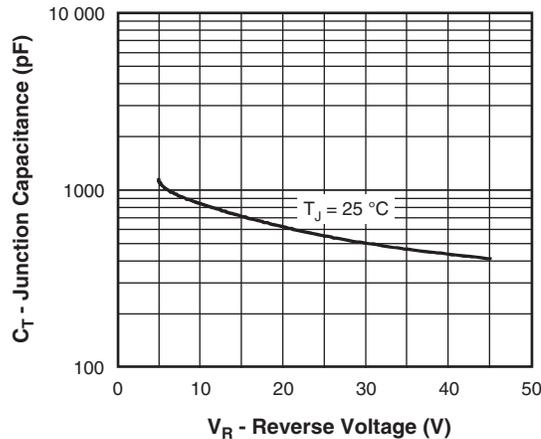


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

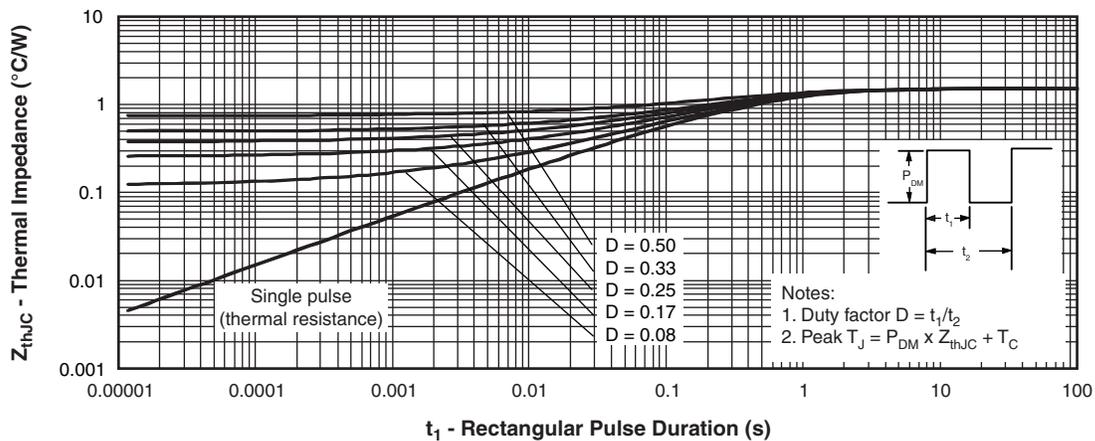


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

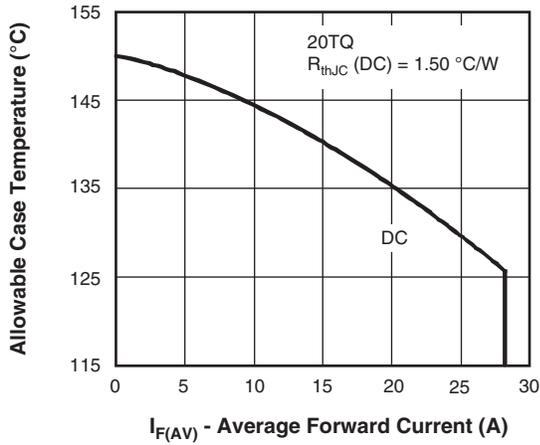


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

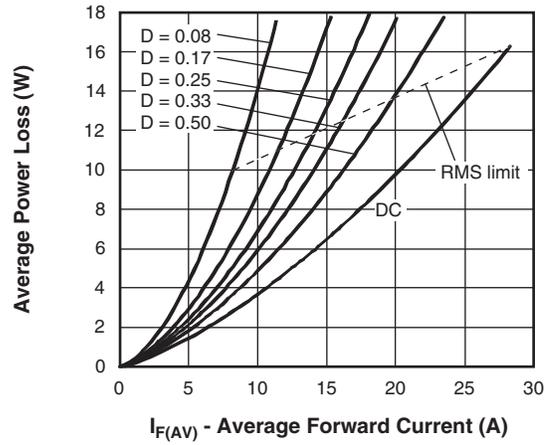


Fig. 6 - Forward Power Loss Characteristics

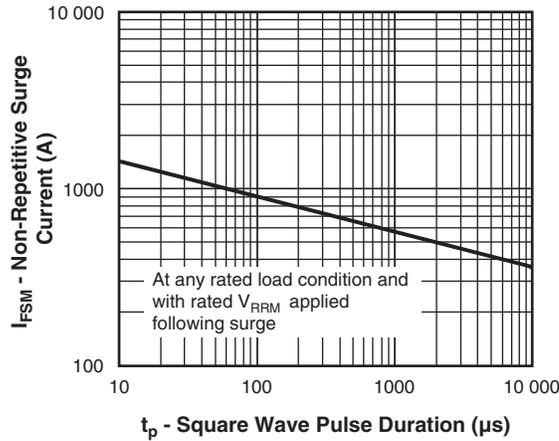


Fig. 7 - Maximum Non-Repetitive Surge Current

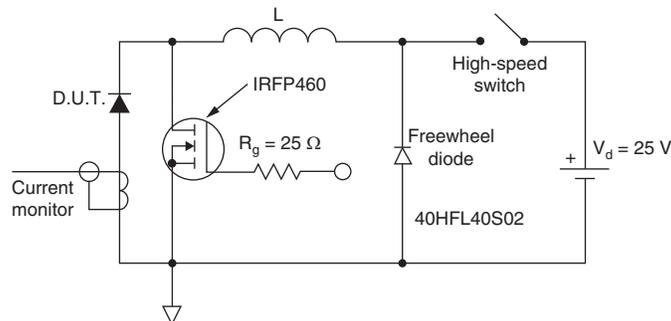
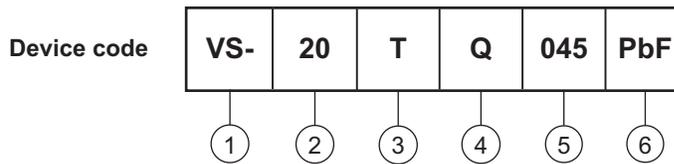


Fig. 8 - Unclamped Inductive Test Circuit



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (20 = 20 A)
- 3** - Package:
T = TO-220
- 4** - Schottky "Q" series
- 5** - Voltage ratings
- 6** - Environmental digit
 - PbF = Lead (Pb)-free and RoHS compliant
 - -N3 = Halogen-free, RoHS compliant, and totally lead (Pb)-free

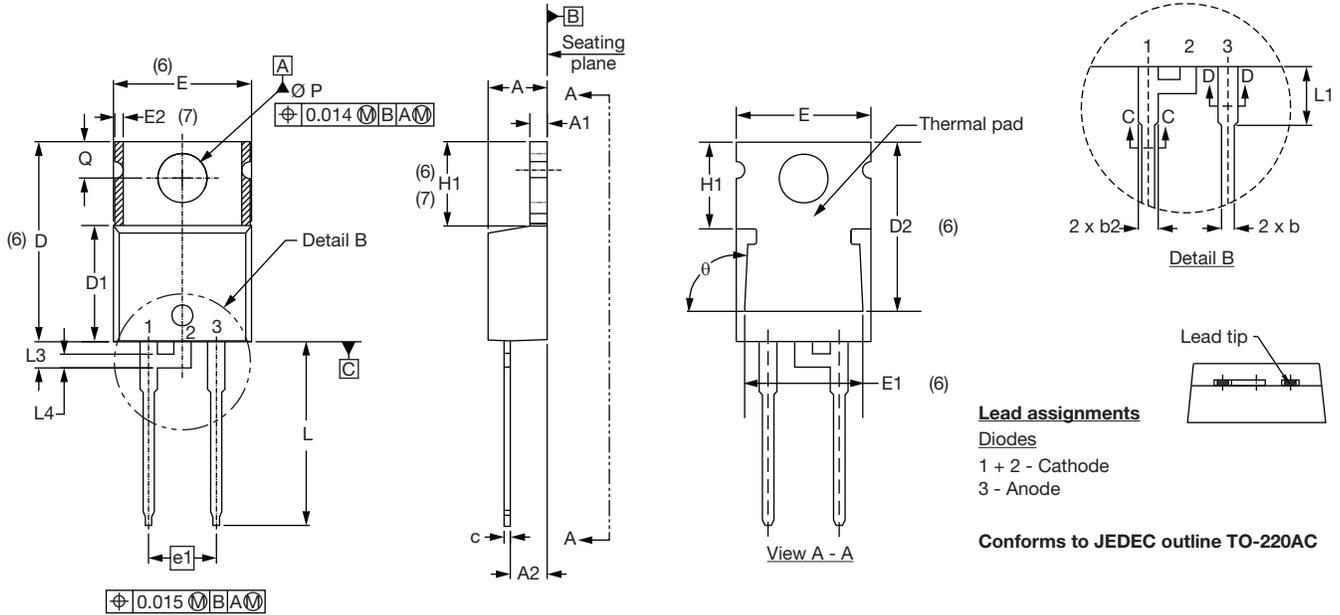
| |
|------------|
| 035 = 35 V |
| 040 = 40 V |
| 045 = 45 V |

| ORDERING INFORMATION (Example) | | | |
|--------------------------------|------------------|------------------------|-------------------------|
| PREFERRED P/N | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-20TQ035PbF | 50 | 1000 | Antistatic plastic tube |
| VS-20TQ035-N3 | 50 | 1000 | Antistatic plastic tube |
| VS-20TQ040PbF | 50 | 1000 | Antistatic plastic tube |
| VS-20TQ040-N3 | 50 | 1000 | Antistatic plastic tube |
| VS-20TQ045PbF | 50 | 1000 | Antistatic plastic tube |
| VS-20TQ045-N3 | 50 | 1000 | Antistatic plastic tube |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|---|
| Dimensions | www.vishay.com/doc?95221 |
| Part marking information | TO-220AC PbF www.vishay.com/doc?95224 |
| | TO-220AC -N3 www.vishay.com/doc?95068 |

TO-220AC

DIMENSIONS in millimeters and inches



| SYMBOL | MILLIMETERS | | INCHES | | NOTES | SYMBOL | MILLIMETERS | | INCHES | | NOTES |
|--------|-------------|-------|--------|-------|-------|--------|-------------|-------|------------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. | | | MIN. | MAX. | MIN. | MAX. | |
| A | 4.25 | 4.65 | 0.167 | 0.183 | | E1 | 6.86 | 8.89 | 0.270 | 0.350 | 6 |
| A1 | 1.14 | 1.40 | 0.045 | 0.055 | | E2 | - | 0.76 | - | 0.030 | 7 |
| A2 | 2.56 | 2.92 | 0.101 | 0.115 | | e | 2.41 | 2.67 | 0.095 | 0.105 | |
| b | 0.69 | 1.01 | 0.027 | 0.040 | | e1 | 4.88 | 5.28 | 0.192 | 0.208 | |
| b1 | 0.38 | 0.97 | 0.015 | 0.038 | 4 | H1 | 6.09 | 6.48 | 0.240 | 0.255 | 6, 7 |
| b2 | 1.20 | 1.73 | 0.047 | 0.068 | | L | 13.52 | 14.02 | 0.532 | 0.552 | |
| b3 | 1.14 | 1.73 | 0.045 | 0.068 | 4 | L1 | 3.32 | 3.82 | 0.131 | 0.150 | 2 |
| c | 0.36 | 0.61 | 0.014 | 0.024 | | L3 | 1.78 | 2.13 | 0.070 | 0.084 | |
| c1 | 0.36 | 0.56 | 0.014 | 0.022 | 4 | L4 | 0.76 | 1.27 | 0.030 | 0.050 | 2 |
| D | 14.85 | 15.25 | 0.585 | 0.600 | 3 | Ø P | 3.54 | 3.73 | 0.139 | 0.147 | |
| D1 | 8.38 | 9.02 | 0.330 | 0.355 | | Q | 2.60 | 3.00 | 0.102 | 0.118 | |
| D2 | 11.68 | 12.88 | 0.460 | 0.507 | 6 | θ | 90° to 93° | | 90° to 93° | | |
| E | 10.11 | 10.51 | 0.398 | 0.414 | 3, 6 | | | | | | |

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 dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, D2 (minimum) where dimensions are derived from the actual package outline



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