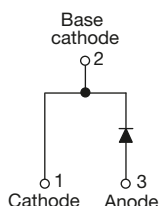




High Performance Schottky Rectifier, 20 A



TO-220AC 2L



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
- Meets JESD 201, class 1A whisker test
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

LINKS TO ADDITIONAL RESOURCES



3D Models

PRIMARY CHARACTERISTICS

| | |
|-----------------------|------------------|
| $I_{F(AV)}$ | 20 A |
| V_R | 35 V, 40 V, 45 V |
| V_F at I_F | 0.51 V |
| I_{RM} typ. | 105 mA at 125 °C |
| T_J max. | 150 °C |
| E_{AS} | 27 mJ |
| Package | TO-220AC 2L |
| Circuit configuration | Single |

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.

MECHANICAL DATA

Case: TO-220AC 2L

Molding compound meets UL 94-V0 flammability rating

Terminals: matte tin plated leads, solderable per J-STD-002

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} , $T_J = 125$ °C | 0.51 | V |
| T_J | Range | -55 to +150 | °C |

VOLTAGE RATINGS

| PARAMETER | SYMBOL | VS-20TQ035THN3 | VS-20TQ040THN3 | VS-20TQ045THN3 | 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 $T_C = 116$ °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 10 ms sine or 6 ms rect. pulse | 1800 400 | A |
| Non-repetitive avalanche energy | E_{AS} | $T_J = 25$ °C, $I_{AS} = 4$ A, $L = 3.4$ 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 | | 0.67 |
| | | 40 A | | | | |
| Maximum reverse leakage current | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$ | $V_R = \text{rated } V_R$ | 2.7 | mA | |
| | | $T_J = 125\text{ }^{\circ}\text{C}$ | | 150 | | |
| Typical reverse leakage current | $I_{RM}^{(1)}$ | $T_J = 125\text{ }^{\circ}\text{C}$ | $V_R = \text{rated } V_R$ | 105 | mA | |
| Maximum junction capacitance | C_T | $V_R = 5\text{ V}_{DC}$, (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/ 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 +150 | °C |
| Maximum thermal resistance, junction to case | R _{thJC} | DC operation See fig. 4 | 1.50 | °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 2L | 20TQ035TH | |
| | | | 20TQ040TH | |
| | | | 20TQ045TH | |

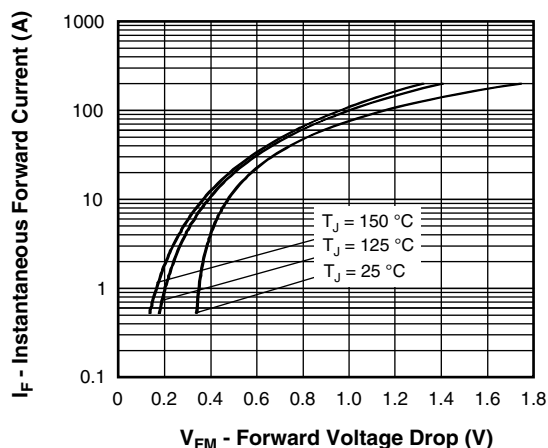


Fig. 1 - Maximum Forward Voltage Drop Characteristics

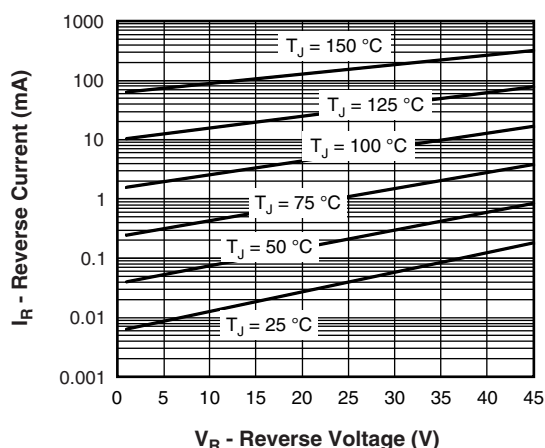


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

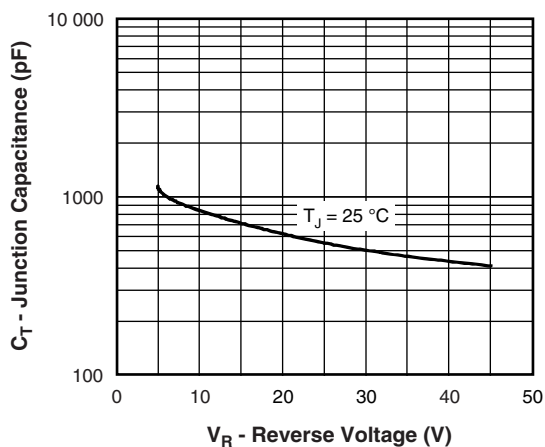


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

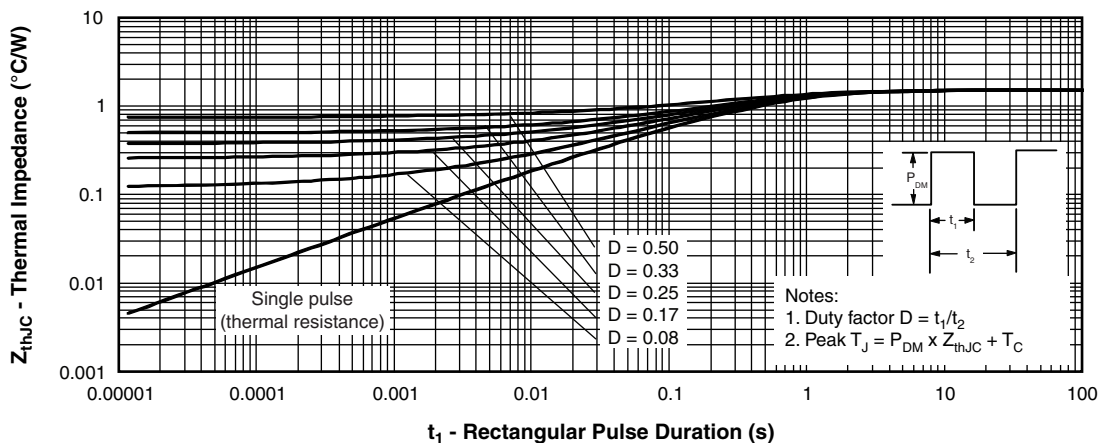


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

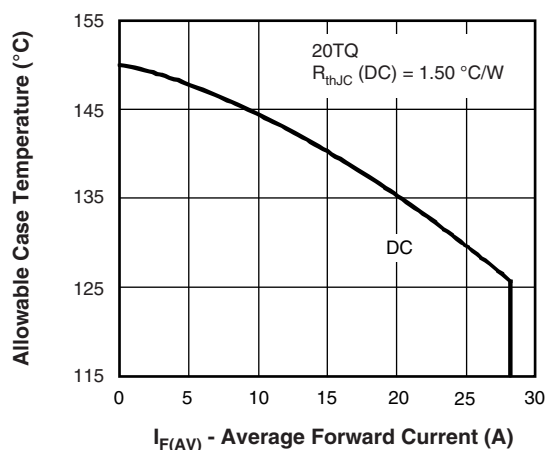


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

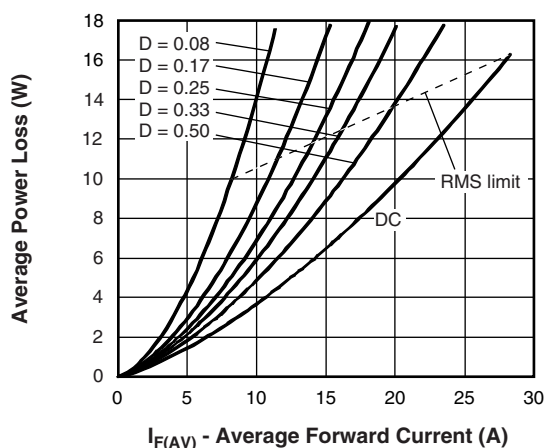


Fig. 6 - Forward Power Loss Characteristics

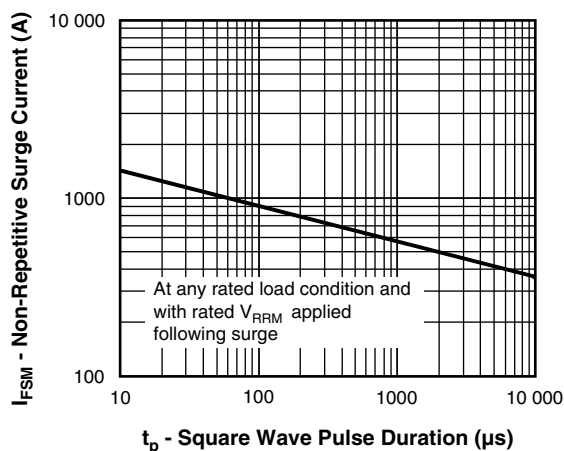


Fig. 7 - Maximum Non-Repetitive Surge Current

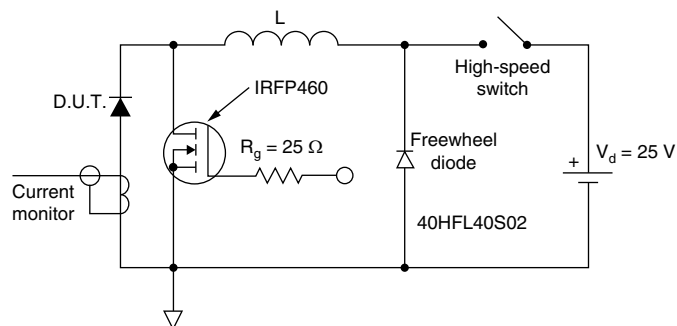


Fig. 8 - Unclamped Inductive Test Circuit



ORDERING INFORMATION TABLE

| | | | | | | | | |
|-------------|-----|----|---|---|-----|---|---|----|
| Device code | VS- | 20 | T | Q | 045 | T | H | N3 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

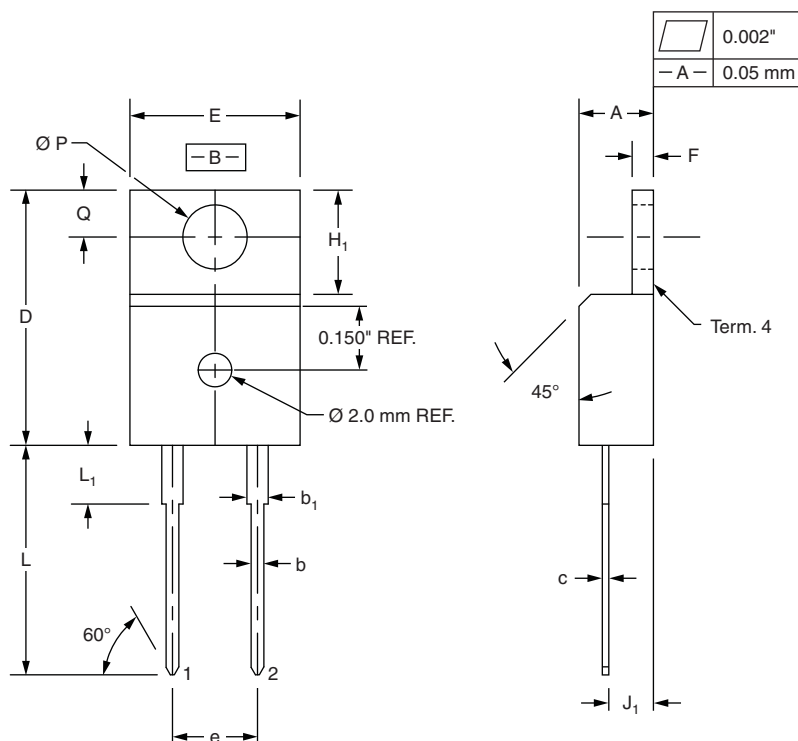
- | | | | |
|----------|---|---|--|
| 1 | - | Vishay Semiconductors product | |
| 2 | - | Current rating (20 = 20 A) | |
| 3 | - | Package: | |
| | | T = TO-220 | |
| 4 | - | Schottky "Q" series | |
| 5 | - | Voltage ratings | 035 = 35 V 040 = 40 V 045 = 45 V |
| 6 | - | • None = TO-220AB | |
| | - | • T = True 2 pin TO-220 | |
| 7 | - | H = AEC-Q101 qualified | |
| 8 | - | Environmental digit | |
| | | 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-20TQ035THN3 | 50 | 1000 | Antistatic plastic tube |
| VS-20TQ040THN3 | 50 | 1000 | Antistatic plastic tube |
| VS-20TQ045THN3 | 50 | 1000 | Antistatic plastic tube |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?95259 |
| Part marking information | www.vishay.com/doc?95391 |
| SPIICE model | www.vishay.com/doc?96917 |

True 2 Pin TO-220

DIMENSIONS in millimeters and inches



| SYMBOL | MILLIMETERS | | INCHES | |
|-------------------------------|-------------|-------|-----------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.32 | 4.57 | 0.170 | 0.180 |
| b | 0.71 | 0.91 | 0.028 | 0.036 |
| b ₁ | 1.15 | 1.39 | 0.045 | 0.055 |
| c | 0.36 | 0.53 | 0.014 | 0.021 |
| D | 14.99 | 15.49 | 0.590 | 0.610 |
| E | 10.04 | 10.41 | 0.395 | 0.410 |
| e | 5.08 BSC | | 0.200 BSC | |
| F | 1.22 | 1.37 | 0.048 | 0.054 |
| H ₁ | 5.97 | 6.47 | 0.235 | 0.255 |
| J ₁ | 2.54 | 2.79 | 0.100 | 0.110 |
| L | 13.47 | 13.97 | 0.530 | 0.550 |
| L ₁ ⁽¹⁾ | 3.31 | 3.81 | 0.130 | 0.150 |
| Ø P | 3.79 | 3.88 | 0.149 | 0.153 |
| Q | 2.60 | 2.84 | 0.102 | 0.112 |

Notes

⁽¹⁾ Lead dimension and finish uncontrolled in L₁

- These dimensions are within allowable dimensions of JEDEC TO-220AB rev. J outline dated 3-24-87
- Controlling dimension: Inch



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