

# ANTREX Electronics

## Electronic Components Sourcing Information

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### Product Reference Information

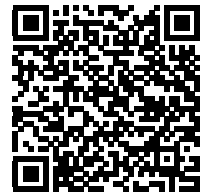
|                      |                                                |
|----------------------|------------------------------------------------|
| <b>Part Number:</b>  | VS-20TQ045-M3                                  |
| <b>Manufacturer:</b> | Vishay General Semiconductor - Diodes Division |
| <b>Package:</b>      | TO-220-2                                       |
| <b>Availability:</b> | Please confirm with sales                      |

#### Product Page:

<https://antrexco.com/product/details/vishay-general-semiconductor-diodes-division-vs-20tq045-m3.html>

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#### Note:

This PDF includes an ANTREX product reference cover page.

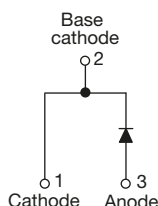
The original manufacturer datasheet follows from the next page.

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## High Performance Schottky Rectifier, 20 A



TO-220AC 2L



### FEATURES

- 150 °C T<sub>J</sub> 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
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT  
HALOGEN  
FREE

### LINKS TO ADDITIONAL RESOURCES



| PRIMARY CHARACTERISTICS          |                  |
|----------------------------------|------------------|
| I <sub>F(AV)</sub>               | 20 A             |
| V <sub>R</sub>                   | 35 V, 40 V, 45 V |
| V <sub>F</sub> at I <sub>F</sub> | 0.51 V           |
| I <sub>RM</sub> typ.             | 105 mA at 125 °C |
| T <sub>J</sub> max.              | 150 °C           |
| E <sub>AS</sub>                  | 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 <sub>F(AV)</sub>                | Rectangular waveform                         | 20          | A     |
| V <sub>RRM</sub>                  | Range                                        | 35 to 45    | V     |
| I <sub>FSM</sub>                  | t <sub>p</sub> = 5 µs sine                   | 1800        | A     |
| V <sub>F</sub>                    | 20 A <sub>pk</sub> , T <sub>J</sub> = 125 °C | 0.51        | V     |
| T <sub>J</sub>                    | Range                                        | -55 to +150 | °C    |

| VOLTAGE RATINGS                      |                  |               |               |               |       |
|--------------------------------------|------------------|---------------|---------------|---------------|-------|
| PARAMETER                            | SYMBOL           | VS-20TQ035-M3 | VS-20TQ040-M3 | VS-20TQ045-M3 | UNITS |
| Maximum DC reverse voltage           | V <sub>R</sub>   | 35            | 40            | 45            | V     |
| Maximum working peak reverse voltage | V <sub>RWM</sub> |               |               |               |       |

| ABSOLUTE MAXIMUM RATINGS                                             |                    |                                                                                                                                        |                                                                                  |        |       |
|----------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------|-------|
| PARAMETER                                                            | SYMBOL             | TEST CONDITIONS                                                                                                                        |                                                                                  | VALUES | UNITS |
| Maximum average forward current<br>See fig. 5                        | I <sub>F(AV)</sub> | 50 % duty cycle at T <sub>C</sub> = 116 °C, rectangular waveform                                                                       |                                                                                  | 20     | A     |
| Maximum peak one cycle<br>non-repetitive surge current<br>See fig. 7 | I <sub>FSM</sub>   | 5 μs sine or 3 μs rect. pulse                                                                                                          | Following any rated load<br>condition and with rated<br>V <sub>RRM</sub> applied | 1800   |       |
|                                                                      |                    | 10 ms sine or 6 ms rect. pulse                                                                                                         |                                                                                  | 400    |       |
| Non-repetitive avalanche energy                                      | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 4 A, L = 3.4 mH                                                                              |                                                                                  | 27     | mJ    |
| Repetitive avalanche current                                         | I <sub>AR</sub>    | Current decaying linearly to zero in 1 μs<br>Frequency limited by T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> typical |                                                                                  | 4      | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                  | SYMBOL         | TEST CONDITIONS                                                                             |                                     | VALUES | UNITS      |
|--------------------------------------------|----------------|---------------------------------------------------------------------------------------------|-------------------------------------|--------|------------|
| Maximum forward voltage drop<br>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            | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                          | $V_R = \text{Rated } V_R$           | 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/ $\mu$ s |

**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   | R <sub>thJC</sub>                 | DC operation<br>See fig. 4            | 1.50        | °C/W                   |
| Typical thermal resistance, case to heatsink   | R <sub>thCS</sub>                 | Mounting surface, smooth, and greased | 0.50        |                        |
| Approximate weight                             |                                   |                                       | 2           | g                      |
|                                                |                                   |                                       | 0.07        | oz.                    |
| Mounting torque                                | minimum                           |                                       | 6 (5)       | kgf · cm<br>(lbf · in) |
|                                                | maximum                           |                                       | 12 (10)     |                        |
| Marking device                                 |                                   | Case style TO-220AC 2L                | 20TQ035     |                        |
|                                                |                                   |                                       | 20TQ040     |                        |
|                                                |                                   |                                       | 20TQ045     |                        |

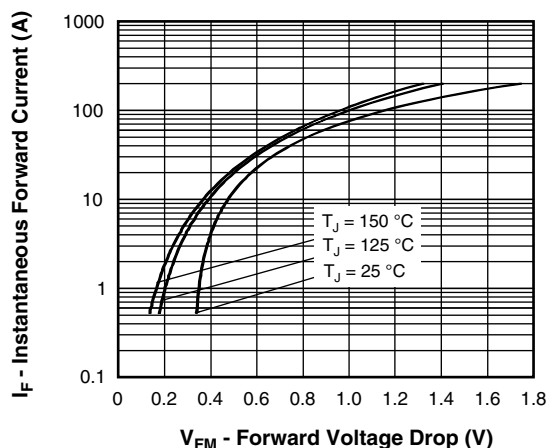


Fig. 1 - Maximum Forward Voltage Drop Characteristics

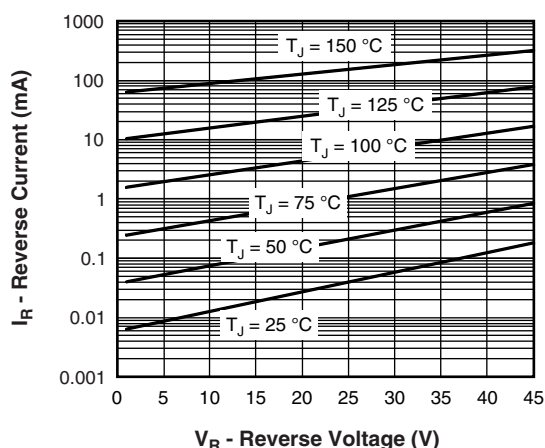


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

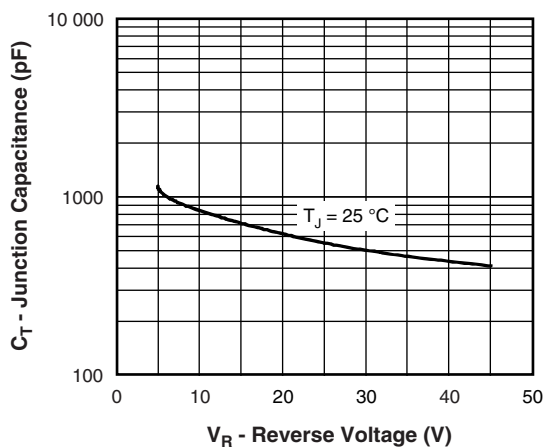
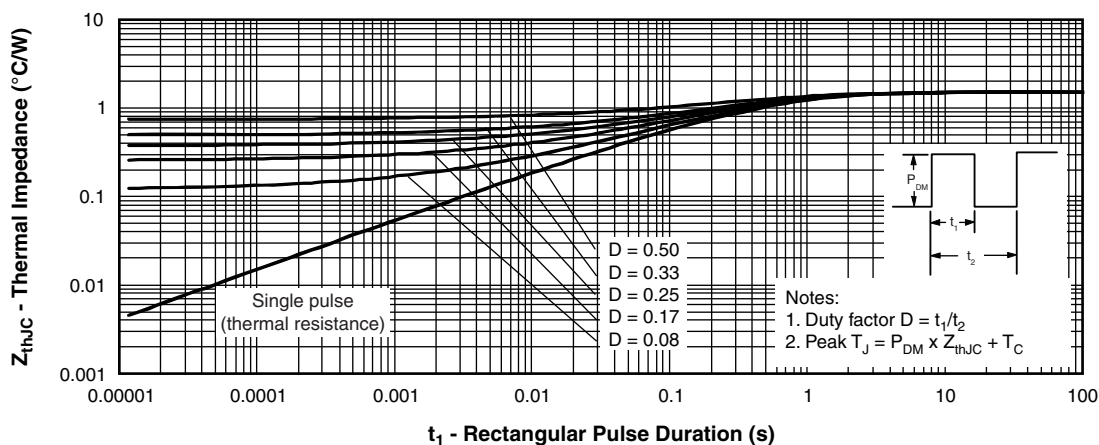


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

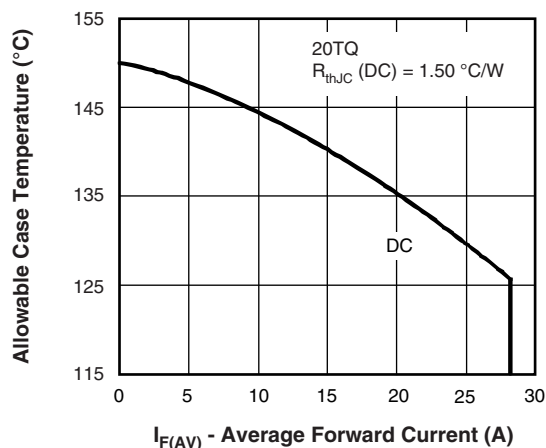


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

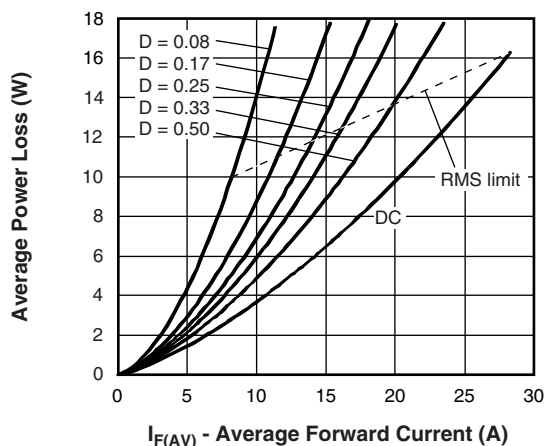


Fig. 6 - Forward Power Loss Characteristics

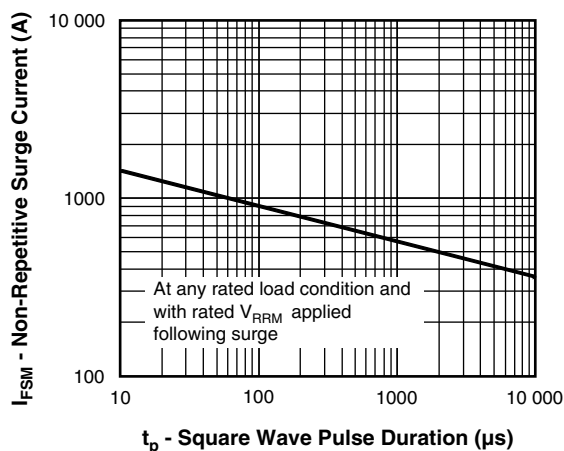


Fig. 7 - Maximum Non-Repetitive Surge Current

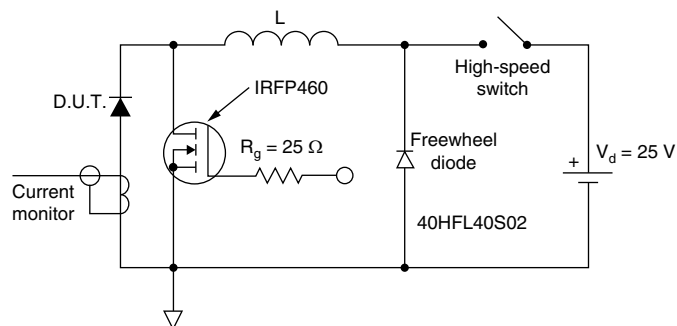


Fig. 8 - Unclamped Inductive Test Circuit



- 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

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

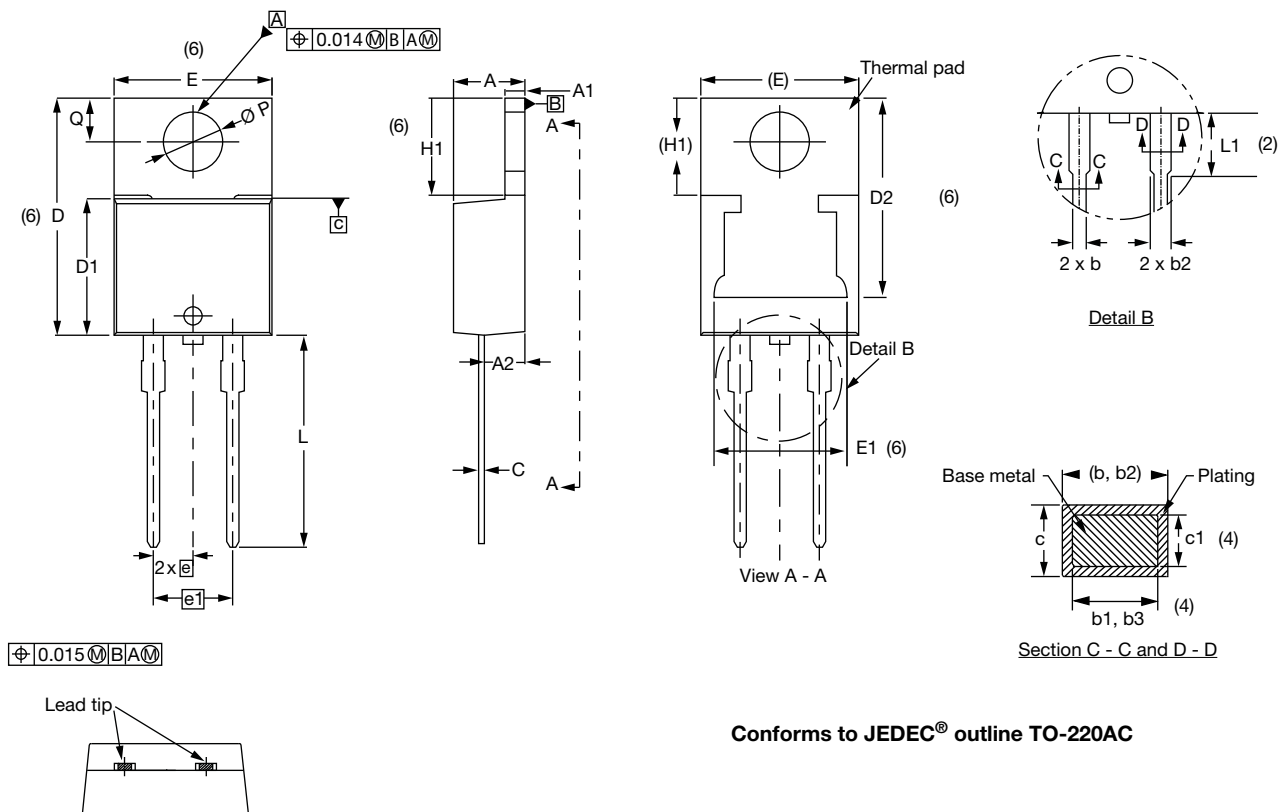
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?96156">www.vishay.com/doc?96156</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95391">www.vishay.com/doc?95391</a> |
| SPICE model                | <a href="http://www.vishay.com/doc?96917">www.vishay.com/doc?96917</a> |



### TO-220AC 2L

**DIMENSIONS** in millimeters and inches



Conforms to JEDEC® outline TO-220AC

| 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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