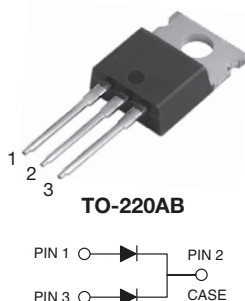


# Dual High Voltage TMBS® (Trench MOS Barrier Schottky) Rectifier

Ultra Low  $V_F = 0.34\text{ V}$  at  $I_F = 5.0\text{ A}$



## FEATURES

- Trench MOS Schottky technology
- Low forward voltage drop, low power losses
- High efficiency operation
- Solder bath temperature 275 °C maximum, 10 s per JESD 22-B106
- AEC-Q101 qualified available:
  - Automotive ordering code: base P/NHM3
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## TYPICAL APPLICATIONS

For use in high frequency DC/DC converters, switching power supplies, freewheeling diodes, OR-ing diode, and reverse battery protection in commercial, industrial, and automotive application.

## MECHANICAL DATA

**Case:** TO-220AB

Molding compound meets UL 94 V-0 flammability rating  
Base P/N-M3 - halogen-free, RoHS-compliant  
Base P/NHM3 - halogen-free, RoHS-compliant, and AEC-Q101 qualified

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

M3 suffix meets JESD 201 class 1A whisker test, HM3 suffix meets JESD 201 class 2 whisker test

**Mounting torque:** 10 in-lbs maximum

| PRIMARY CHARACTERISTICS                                |                |
|--------------------------------------------------------|----------------|
| $I_{F(AV)}$                                            | 2 x 20 A       |
| $V_{RRM}$                                              | 45 V           |
| $I_{FSM}$                                              | 250 A          |
| $V_F$ at $I_F = 20\text{ A}$ ( $T_J = 125\text{ °C}$ ) | 0.47 V         |
| $T_J$ max.                                             | 175 °C         |
| Package                                                | TO-220AB       |
| Circuit configuration                                  | Common cathode |

| MAXIMUM RATINGS ( $T_A = 25\text{ °C}$ unless otherwise noted)                     |             |             |      |
|------------------------------------------------------------------------------------|-------------|-------------|------|
| PARAMETER                                                                          | SYMBOL      | VX40M45C    | UNIT |
| Maximum repetitive peak reverse voltage                                            | $V_{RRM}$   | 45          | V    |
| Maximum average forward rectified current<br>(fig. 1)                              | $I_{F(AV)}$ | 40          | A    |
|                                                                                    |             | 20          |      |
| Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load | $I_{FSM}$   | 250         | A    |
| Operating junction temperature range                                               | $T_J$ (1)   | -40 to +175 | °C   |
| Storage temperature range                                                          | $T_{STG}$   | -40 to +175 |      |

### Note

(1) The heat generated must be less than the thermal conductivity from junction-to-ambient:  $dP_D/dT_J < 1/R_{\theta JA}$



| ELECTRICAL CHARACTERISTICS (T <sub>J</sub> = 25 °C unless otherwise noted) |                       |                         |                               |      |      |      |
|----------------------------------------------------------------------------|-----------------------|-------------------------|-------------------------------|------|------|------|
| PARAMETER                                                                  | TEST CONDITIONS       |                         | SYMBOL                        | TYP. | MAX. | UNIT |
| Instantaneous forward voltage per diode                                    | I <sub>F</sub> = 5 A  | T <sub>J</sub> = 25 °C  | V <sub>F</sub> <sup>(1)</sup> | 0.46 | -    | V    |
|                                                                            | I <sub>F</sub> = 10 A |                         |                               | 0.50 | -    |      |
|                                                                            | I <sub>F</sub> = 20 A |                         |                               | 0.55 | 0.60 |      |
|                                                                            | I <sub>F</sub> = 5 A  | T <sub>J</sub> = 125 °C |                               | 0.34 | -    |      |
|                                                                            | I <sub>F</sub> = 10 A |                         |                               | 0.39 | -    |      |
|                                                                            | I <sub>F</sub> = 20 A |                         |                               | 0.47 | 0.53 |      |
| Reverse current at rated V <sub>R</sub> per diode                          | V <sub>R</sub> = 45 V | T <sub>J</sub> = 25 °C  | I <sub>R</sub> <sup>(2)</sup> | -    | 0.25 | mA   |
|                                                                            |                       | T <sub>J</sub> = 125 °C |                               | 4.5  | 20   |      |
| Typical junction capacitance                                               | 4.0 V, 1 MHz          |                         | C <sub>J</sub>                | 3500 | -    | pF   |

**Notes**(1) Pulse test: 300  $\mu\text{s}$  pulse width, 1 % duty cycle(2) Pulse test: Pulse width  $\leq 5\text{ ms}$ 

| THERMAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted) |                       |          |                      |
|--------------------------------------------------------------------------------------|-----------------------|----------|----------------------|
| PARAMETER                                                                            | SYMBOL                | VX40M45C | UNIT                 |
| Typical thermal resistance per device                                                | $R_{\theta JC}^{(1)}$ | 1        | $^{\circ}\text{C/W}$ |

**Note**(1) Thermal resistance junction-to-case to follow JEDEC<sup>®</sup> 51-14 transient dual interface test method (TDIM)

| ORDERING INFORMATION (Example) |                 |              |               |               |
|--------------------------------|-----------------|--------------|---------------|---------------|
| PREFERRED P/N                  | UNIT WEIGHT (g) | PACKAGE CODE | BASE QUANTITY | DELIVERY MODE |
| VX40M45C-M3/P                  | 2.03            | P            | 50/tube       | Tube          |
| VX40M45CHM3/P <sup>(1)</sup>   | 2.03            | P            | 50/tube       | Tube          |

**Note**

(1) AEC-Q101 qualified

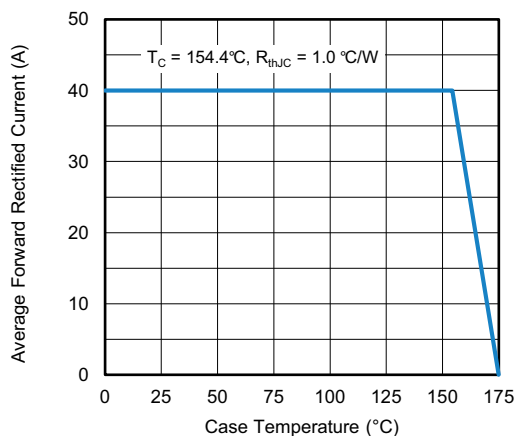
**RATINGS AND CHARACTERISTICS CURVES** ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)


Fig. 1 - Maximum Forward Current Derating Curve

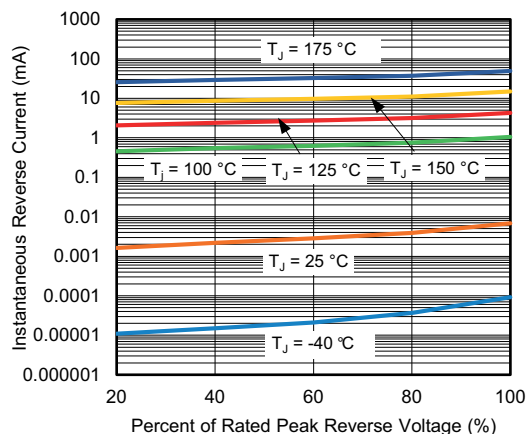


Fig. 4 - Typical Reverse Leakage Characteristics

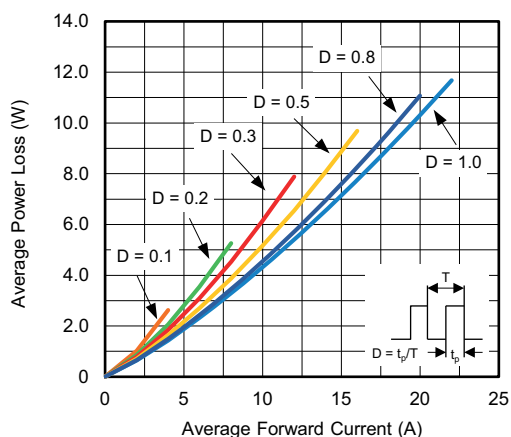


Fig. 2 - Average Power Loss Characteristics

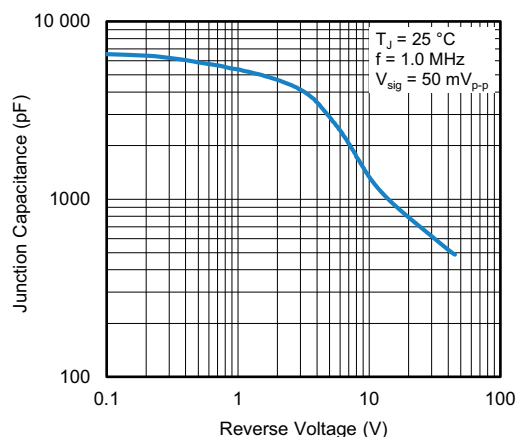


Fig. 5 - Typical Junction Capacitance

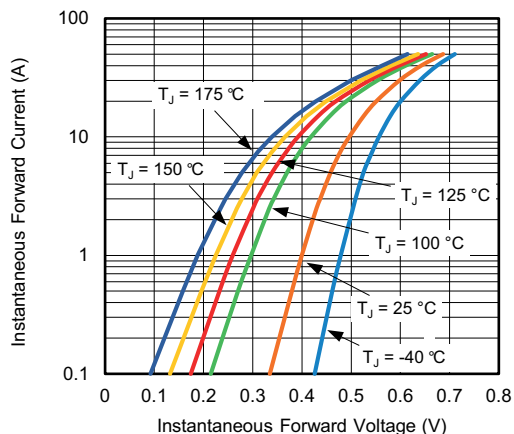


Fig. 3 - Typical Instantaneous Forward Characteristics

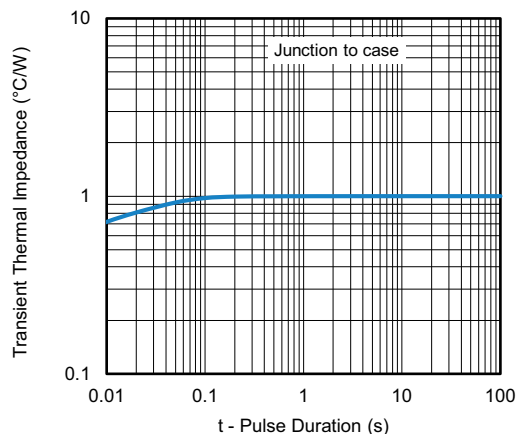
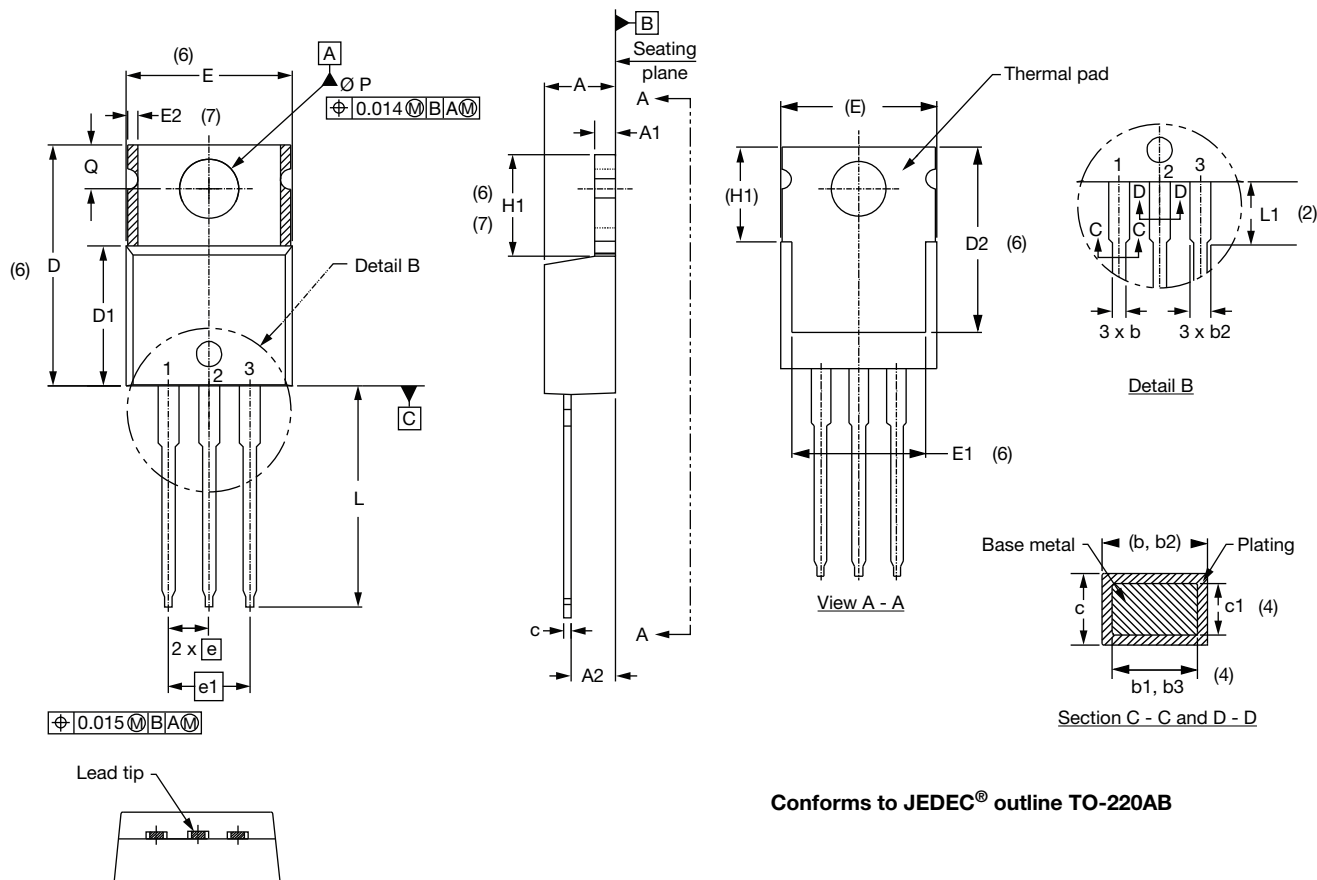


Fig. 6 - Typical Transient Thermal Impedance


**DIMENSIONS** in millimeters (inches) **TO-220AB**


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     | 2.56        | 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     |
| 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     | 5.84        | 6.86  | 0.230  | 0.270 | 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 |       |

**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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