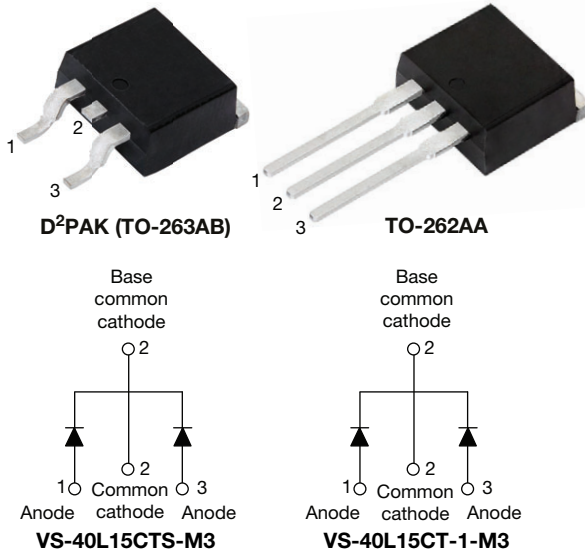


## High Performance Schottky Rectifier, 2 x 20 A



### FEATURES

- 125 °C  $T_J$  operation ( $V_R < 5\text{ V}$ )
- Center tap module
- Optimized for OR-ing applications
- Ultralow 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 MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- 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**

### DESCRIPTION

The center tap Schottky rectifier module has been optimized for ultralow forward voltage drop specifically for the OR-ing of parallel power supplies. The proprietary barrier technology allows for reliable operation up to 125 °C junction temperature. Typical applications are in parallel switching power supplies, converters, reverse battery protection, and redundant power subsystems.

### PRIMARY CHARACTERISTICS

|                       |   |
|-----------------------|---|
| $I_{F(AV)}$           | 2 x 20 A                                |
| $V_R$                 | 15 V                                    |
| $V_F$ at $I_F$        | 0.33 V                                  |
| $I_{RM}$ max.         | 600 mA at 100 °C                        |
| $T_J$ max.            | 125 °C                                  |
| $E_{AS}$              | 10 mJ                                   |
| Package               | D <sup>2</sup> PAK (TO-263AB), TO-262AA |
| Circuit configuration | Common cathode                          |

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS  | VALUES      | UNITS |
|-------------|--|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform                                   | 40          | A     |
| $V_{RRM}$   |  | 15          | V     |
| $I_{FSM}$   | $t_p = 5\ \mu\text{s}$ sine                            | 700         | A     |
| $V_F$       | 19 $A_{pk}$ , $T_J = 125\text{ °C}$ (per leg, typical) | 0.25        | V     |
| $T_J$       |  | -55 to +125 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | TEST CONDITIONS       | VS-40L15CTS-M3<br>VS-40L15CT-1-M3 | UNITS |
|--------------------------------------|-----------|-----------------------|-----------------------------------|-------|
| Maximum DC reverse voltage           | $V_R$     | $T_J = 100\text{ °C}$ | 15                                | 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 $T_C = 85\text{ }^\circ\text{C}$ , rectangular waveform  |   | 20     | A     |
|   |             |   |   | 40     |       |
| Maximum peak one cycle non-repetitive surge current per leg, see fig. 7 | $I_{FSM}$   | 5 $\mu\text{s}$ sine or 3 $\mu\text{s}$ rect. pulse   | Following any rated load condition and with rated $V_{RRM}$ applied | 700    |       |
|   |             | 10 ms sine or 6 ms rect. pulse  |   | 330    |       |
| Non-repetitive avalanche energy per leg                                 | $E_{AS}$    | $T_J = 25\text{ }^\circ\text{C}$ , $I_{AS} = 2\text{ A}$ , $L = 6\text{ mH}$  |   | 10     | mJ    |
| Repetitive avalanche current per leg                                    | $I_{AR}$    | Current decaying linearly to zero in 1 $\mu\text{s}$<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical |   | 2      | A     |

| ELECTRICAL SPECIFICATIONS                          |                |  |                                   |        |      |                  |
|--|----------------|--|-----------------------------------|--------|------|------------------|
| PARAMETER  | SYMBOL         | TEST CONDITIONS  |                                   | TYP.   | MAX. | UNITS            |
| Maximum forward voltage drop per leg<br>See fig. 1 | $V_{FM}^{(1)}$ | 19 A   | $T_J = 25\text{ }^\circ\text{C}$  | -      | 0.41 | V                |
|  |                | 40 A   |                                   | -      | 0.52 |                  |
|  |                | 19 A   | $T_J = 125\text{ }^\circ\text{C}$ | 0.25   | 0.33 |                  |
|  |                | 40 A   |                                   | 0.37   | 0.50 |                  |
| Reverse leakage current per leg<br>See fig. 2      | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$   | $V_R = \text{Rated } V_R$         | -      | 10   | mA               |
|  |                | $T_J = 100\text{ }^\circ\text{C}$  |                                   | -      | 600  |                  |
| Threshold voltage                                  | $V_{F(TO)}$    | $T_J = T_J$ maximum  |                                   | 0.182  |      | V                |
| Forward slope resistance                           | $r_t$          |  |                                   | 7.6    |      | m $\Omega$       |
| Maximum junction capacitance per leg               | $C_T$          | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^\circ\text{C}$ |                                   | -      | 2000 | pF               |
| Typical series inductance per leg                  | $L_S$          | Measured lead to lead 5 mm from package body   |                                   | 8      | -    | nH               |
| Maximum voltage rate of change                     | dV/dt          | Rated $V_R$  |                                   | 10 000 |      | V/ $\mu\text{s}$ |

**Note**

(1) Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %

| THERMAL - MECHANICAL SPECIFICATIONS                  |            |  |  |             |                        |
|--|------------|--|--|-------------|------------------------|
| PARAMETER  | SYMBOL     | TEST CONDITIONS                          |  | VALUES      | UNITS                  |
| Maximum junction temperature range                   | $T_J$      |  |  | -55 to +125 | $^\circ\text{C}$       |
| Maximum storage temperature range                    | $T_{Stg}$  |  |  | -55 to +150 |                        |
| Maximum thermal resistance, junction to case per leg | $R_{thJC}$ | DC operation<br>See fig. 4               |  | 1.5         | $^\circ\text{C/W}$     |
| Typical thermal resistance, case to heatsink         | $R_{thCS}$ | Mounting surface, smooth and greased     |  | 0.50        |                        |
| Maximum thermal resistance, junction to ambient      | $R_{thJA}$ | DC operation                             |  | 40          |                        |
| Approximate weight                                   |            |  |  | 2           | g                      |
|  |            |  |  | 0.07        | oz.                    |
| Mounting torque                                      | minimum    | Non-lubricated threads                   |  | 6 (5)       | kgf · cm<br>(lbf · in) |
|  | maximum    |  |  | 12 (10)     |                        |
| Marking device                                       |            | Case style D <sup>2</sup> PAK (TO-263AB) |  | 40L15CTS    |                        |
|  |            | Case style TO-262AA                      |  | 40L15CT-1   |                        |

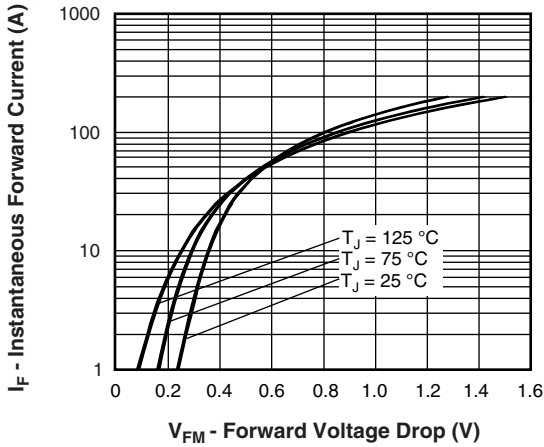


Fig. 1 - Maximum Forward Voltage Drop Characteristics

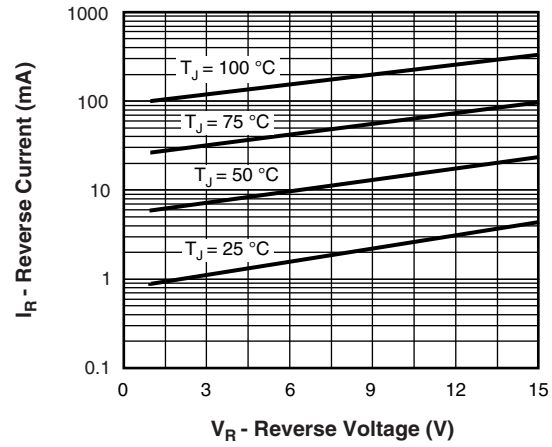


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

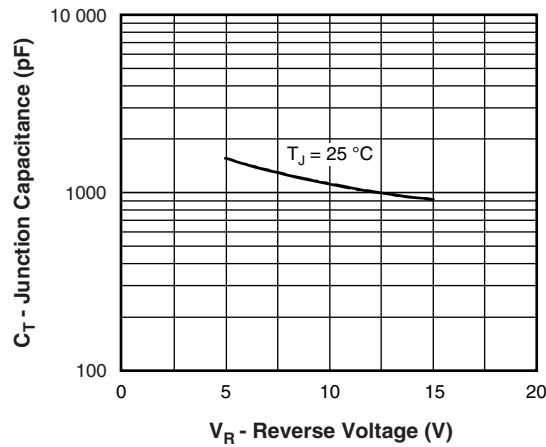


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

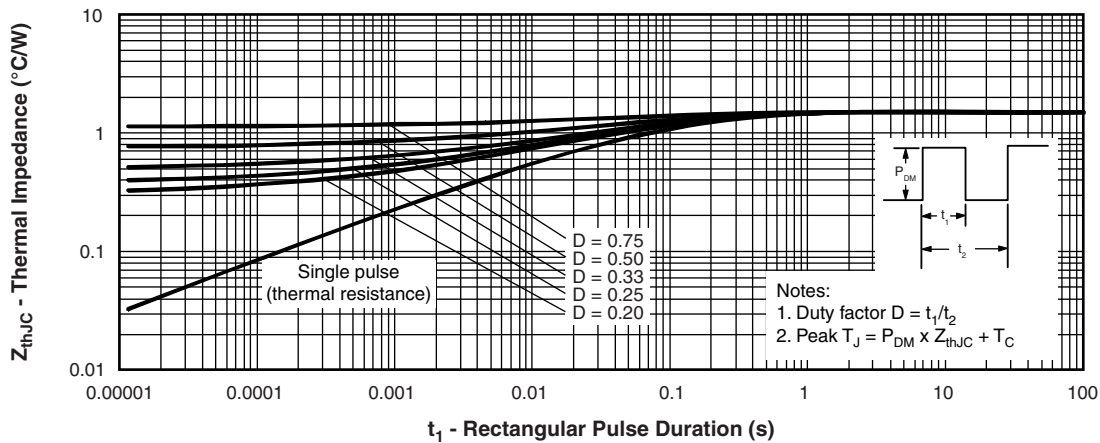


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

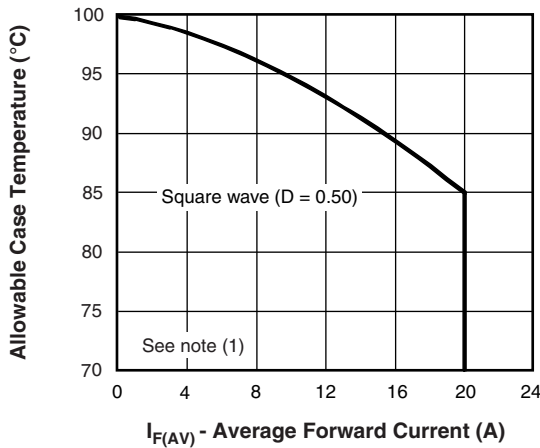


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

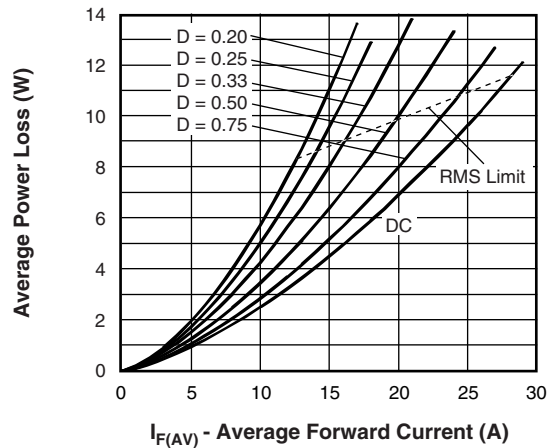


Fig. 6 - Forward Power Loss Characteristics

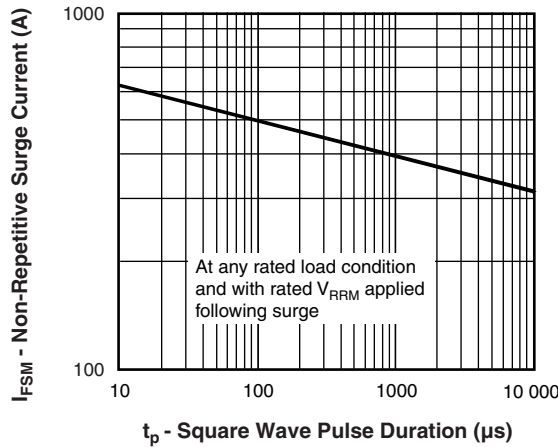


Fig. 7 - Maximum Non-Repetitive Surge Current

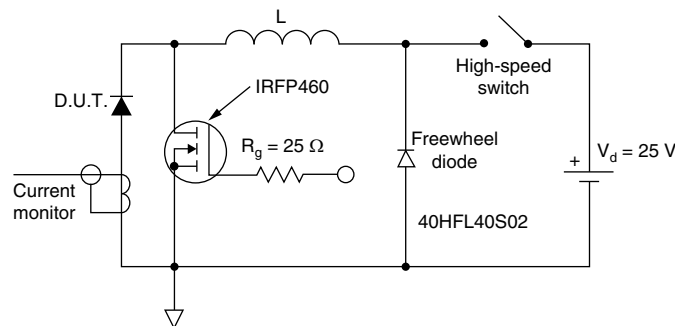


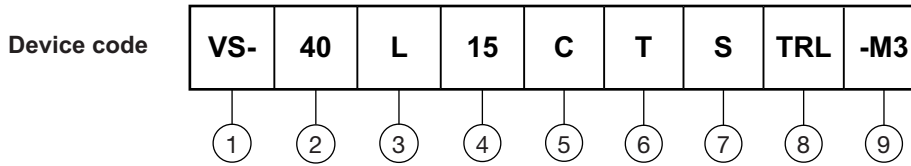
Fig. 8 - Unclamped Inductive Test Circuit

**Note**

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



## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (40 A)
- 3** - L = Schottky "L" series
- 4** - Voltage rating (15 V)
- 5** - C = common cathode
- 6** - T = TO-220
- 7** -
  - S = D<sup>2</sup>PAK (TO-263AB)
  - -1 = TO-262AA
- 8** -
  - None = tube
  - TRL = tape and reel (left oriented - for D<sup>2</sup>PAK (TO-263AB) only)
  - TRR = tape and reel (right oriented - for D<sup>2</sup>PAK (TO-263AB) only)
- 9** - -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

| ORDERING INFORMATION (Example) |               |                                    |
|--------------------------------|---------------|------------------------------------|
| PREFERRED P/N                  | BASE QUANTITY | PACKAGING DESCRIPTION              |
| VS-40L15CTS-M3                 | 50            | Antistatic plastic tubes           |
| VS-40L15CTSTRL-M3              | 800           | 13" diameter plastic tape and reel |
| VS-40L15CTSTRR-M3              | 800           | 13" diameter plastic tape and reel |
| VS-40L15CT-1-M3                | 50            | Antistatic plastic tubes           |

| LINKS TO RELATED DOCUMENTS |                               |  |
|----------------------------|-------------------------------|--|
| Dimensions                 | D <sup>2</sup> PAK (TO-263AB) | <a href="http://www.vishay.com/doc?96164">www.vishay.com/doc?96164</a> |
|                            | TO-262AA                      | <a href="http://www.vishay.com/doc?96165">www.vishay.com/doc?96165</a> |
| Part marking information   | D <sup>2</sup> PAK (TO-263AB) | <a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a> |
|                            | TO-262AA                      | <a href="http://www.vishay.com/doc?95443">www.vishay.com/doc?95443</a> |
| Packaging information      |                               | <a href="http://www.vishay.com/doc?96424">www.vishay.com/doc?96424</a> |
| SPICE model                |                               | <a href="http://www.vishay.com/doc?97118">www.vishay.com/doc?97118</a> |

### D<sup>2</sup>PAK

#### DIMENSIONS in millimeters and inches

Conforms to JEDEC<sup>®</sup> outline D<sup>2</sup>PAK (SMD-220)



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES | SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|--------|-------|-------|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160  | 0.190 |       | D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| A1     | 0.00        | 0.254 | 0.000  | 0.010 |       | E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| b      | 0.51        | 0.99  | 0.020  | 0.039 |       | E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| b1     | 0.51        | 0.89  | 0.020  | 0.035 | 4     | e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| b2     | 1.14        | 1.78  | 0.045  | 0.070 |       | H      | 14.61       | 15.88 | 0.575     | 0.625 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     | L      | 1.78        | 2.79  | 0.070     | 0.110 |       |
| c      | 0.38        | 0.74  | 0.015  | 0.029 |       | L1     | -           | 1.65  | -         | 0.066 | 3     |
| c1     | 0.38        | 0.58  | 0.015  | 0.023 | 4     | L2     | 1.27        | 1.78  | 0.050     | 0.070 |       |
| c2     | 1.14        | 1.65  | 0.045  | 0.065 |       | L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| D      | 8.51        | 9.65  | 0.335  | 0.380 | 2     | L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |

#### Notes

- Dimensioning and tolerancing per ASME Y14.5 M-1994
- Dimension D 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 outmost extremes of the plastic body
- Thermal pad contour optional within dimension E, L1, D1 and E1
- Dimension b1 and c1 apply to base metal only
- Datum A and B to be determined at datum plane H
- Controlling dimension: inch
- Outline conforms to JEDEC<sup>®</sup> outline TO-263AB

## TO-262

**DIMENSIONS** in millimeters and inches

Modified JEDEC® outline TO-262



$\oplus 0.010 \text{ M} \text{ A} \text{ M} \text{ B}$



**Lead assignments**

- Diodes**  
 1. - Anode (two die)/open (one die)  
 2., 4. - Cathode  
 3. - Anode



| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160     | 0.190 |       |
| A1     | 2.03        | 3.02  | 0.080     | 0.119 |       |
| b      | 0.51        | 0.99  | 0.020     | 0.039 |       |
| b1     | 0.51        | 0.89  | 0.020     | 0.035 | 4     |
| b2     | 1.14        | 1.78  | 0.045     | 0.070 |       |
| b3     | 1.14        | 1.73  | 0.045     | 0.068 | 4     |
| c      | 0.38        | 0.74  | 0.015     | 0.029 |       |
| c1     | 0.38        | 0.58  | 0.015     | 0.023 | 4     |
| c2     | 1.14        | 1.65  | 0.045     | 0.065 |       |
| D      | 8.51        | 9.65  | 0.335     | 0.380 | 2     |
| D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| L      | 13.46       | 14.10 | 0.530     | 0.555 |       |
| L1     | -           | 1.65  | -         | 0.065 | 3     |
| L2     | 3.36        | 3.71  | 0.132     | 0.146 |       |

**Notes**

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Dimension D 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Outline conform to JEDEC TO-262 except A1 (maximum), b (minimum), D1 (minimum) and L2 where dimensions derived the actual package outline



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