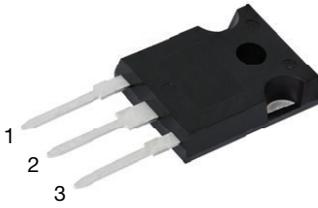
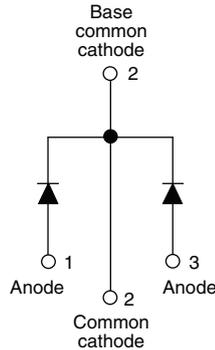


## High Performance Schottky Rectifier, 2 x 20 A


**TO-247AC 3L**


### FEATURES

- 150 °C  $T_J$  operation
- Very 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**

| PRIMARY CHARACTERISTICS |                 |
|-------------------------|-----------------|
| $I_{F(AV)}$             | 2 x 20 A        |
| $V_R$                   | 50 V to 60 V    |
| $V_F$ at $I_F$          | 0.49 V          |
| $I_{RM}$ typ.           | 96 mA at 125 °C |
| $T_J$ max.              | 150 °C          |
| $E_{AS}$                | 18 mJ           |
| Package                 | TO-247AC 3L     |
| Circuit configuration   | Common cathode  |

### DESCRIPTION

The VS-40CPQ... center tap Schottky rectifier 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                          | 40          | A     |
| $V_{RRM}$                         |   | 50/60       | V     |
| $I_{FSM}$                         | $t_p = 5 \mu s$ sine                          | 3200        | A     |
| $V_F$                             | 20 A <sub>pk</sub> , $T_J = 125$ °C (per leg) | 0.49        | V     |
| $T_J$                             |   | -55 to +150 | °C    |

| VOLTAGE RATINGS                      |           |                |                |       |
|--------------------------------------|-----------|----------------|----------------|-------|
| PARAMETER                            | SYMBOL    | VS-40CPQ050-N3 | VS-40CPQ060-N3 | UNITS |
| Maximum DC reverse voltage           | $V_R$     | 50             | 60             | V     |
| Maximum working peak reverse voltage | $V_{RWM}$ |                |                |       |

| ABSOLUTE MAXIMUM RATINGS   |             |   |        |       |
|--|-------------|---|--------|-------|
| PARAMETER  | SYMBOL      | TEST CONDITIONS   | VALUES | UNITS |
| Maximum average forward current<br>See fig. 5                                | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 120$ °C, rectangular waveform   | 40     | A     |
| Maximum peak one cycle<br>non-repetitive surge current per leg<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse   | 3200   |       |
|  |             | 10 ms sine or 6 ms rect. pulse  | 320    |       |
| Non-repetitive avalanche energy per leg                                      | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 2$ A, $L = 9.0$ mH   | 18     | mJ    |
| Repetitive avalanche current per leg   | $I_{AR}$    | Current decaying linearly to zero in 1 $\mu s$<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical | 2      | A     |



**ELECTRICAL SPECIFICATIONS**

| PARAMETER  | SYMBOL         | TEST CONDITIONS   | VALUES | UNITS            |
|--|----------------|---|--------|------------------|
| Maximum forward voltage drop per leg<br>See fig. 1 | $V_{FM}^{(1)}$ | 20 A  | 0.53   | V                |
|  |                | 40 A  |        |                  |
|  |                | 20 A  | 0.49   |                  |
|  |                | 40 A  |        |                  |
| Maximum reverse leakage current per leg            | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$  | 1.7    | mA               |
|  |                | $T_J = 125\text{ }^\circ\text{C}$   | 180    |                  |
| Typical reverse leakage current per leg            | $I_{RM}^{(1)}$ | $T_J = 125\text{ }^\circ\text{C}$   | 96     | mA               |
| Maximum junction capacitance per leg               | $C_T$          | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^\circ\text{C}$ | 1600   | pF               |
| Typical series inductance per leg                  | $L_S$          | Measured lead to lead 5 mm from package body  | 7.5    | 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 and storage temperature range           | $T_J, T_{Stg}$     |                                      | -55 to 150 | $^\circ\text{C}$       |
| Maximum thermal resistance, junction to case per leg     | $R_{thJC}$         | DC operation<br>See fig. 4           | 1.25       | $^\circ\text{C/W}$     |
| Maximum thermal resistance, junction to case per package |                    | DC operation                         | 0.63       |                        |
| Typical thermal resistance, case to heatsink             | $R_{thCS}$         | Mounting surface, smooth and greased | 0.24       |                        |
| Approximate weight                                       |                    |                                      | 6          | g                      |
|  |                    |                                      | 0.21       | oz.                    |
| Mounting torque  | minimum<br>maximum | Non-lubricated threads               | 6 (5)      | kgf · cm<br>(lbf · in) |
|  |                    |                                      | 12 (10)    |                        |
| Marking device   |                    | Case style TO-247AC 3L               | 40CPQ050   |                        |
|  |                    |                                      | 40CPQ060   |                        |

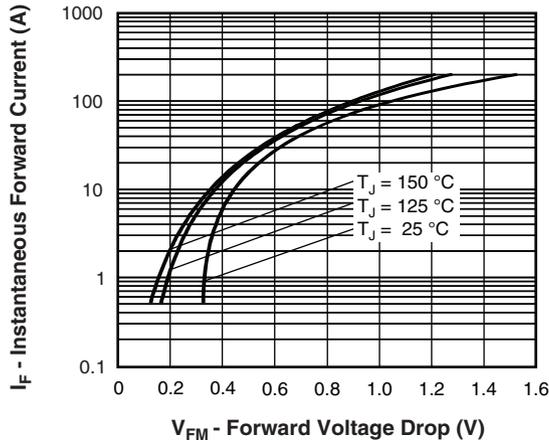


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

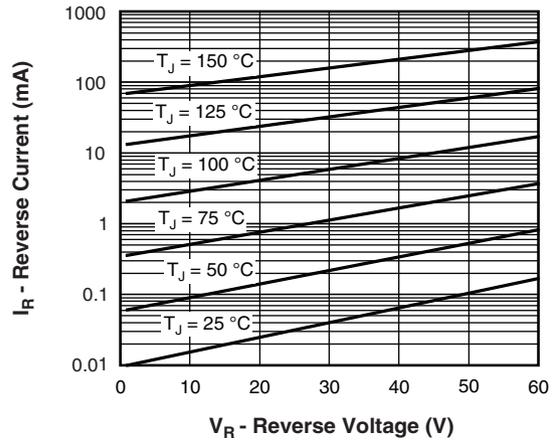


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

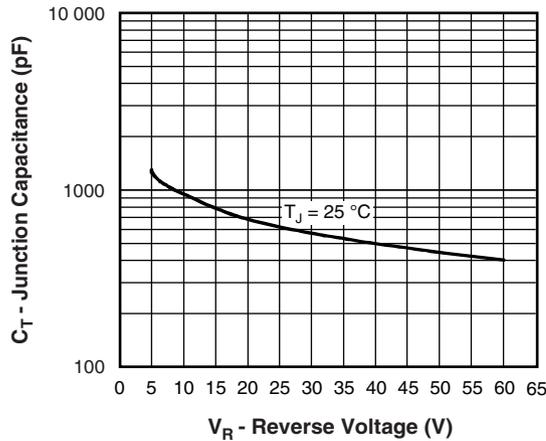


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

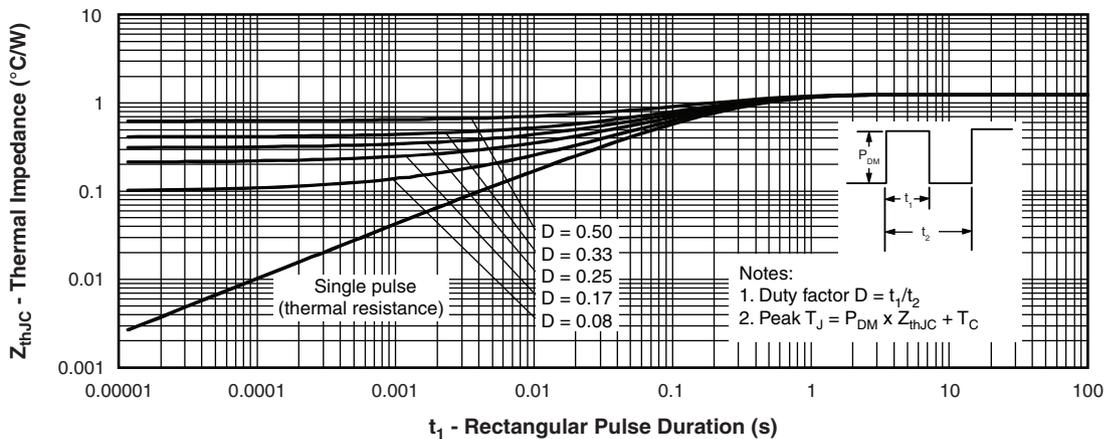


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

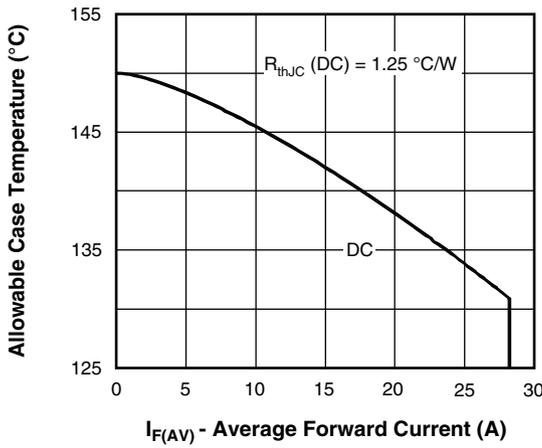


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

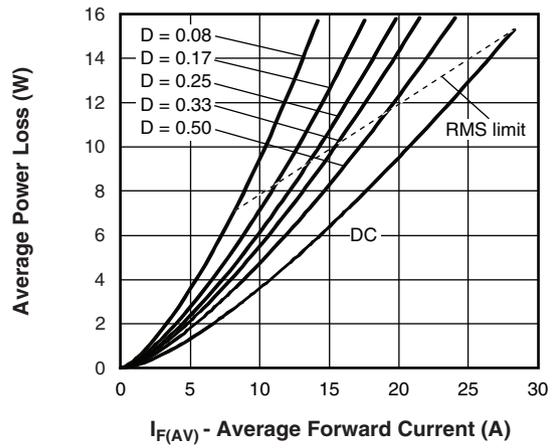


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

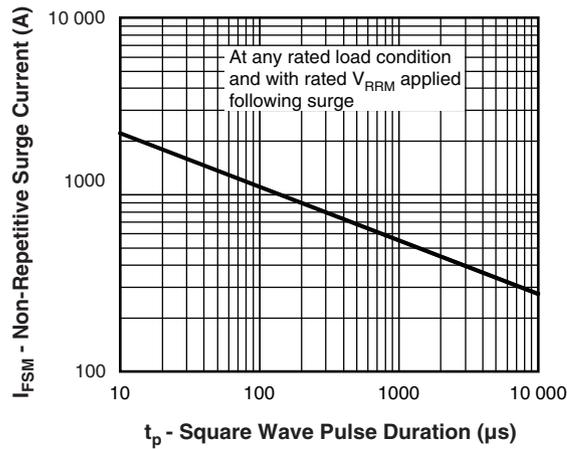


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

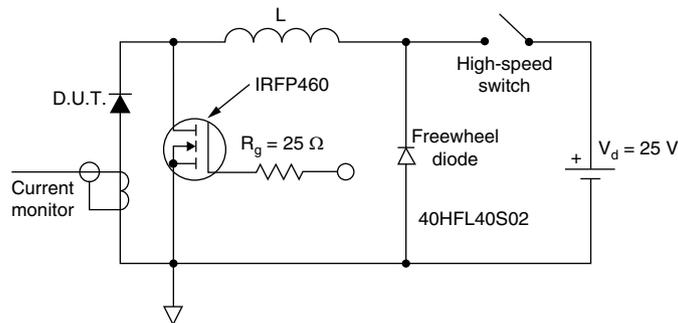
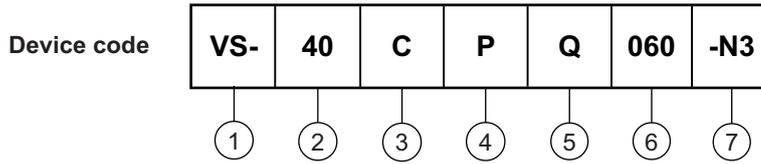


Fig. 8 - Unclamped Inductive Test Circuit



ORDERING INFORMATION TABLE



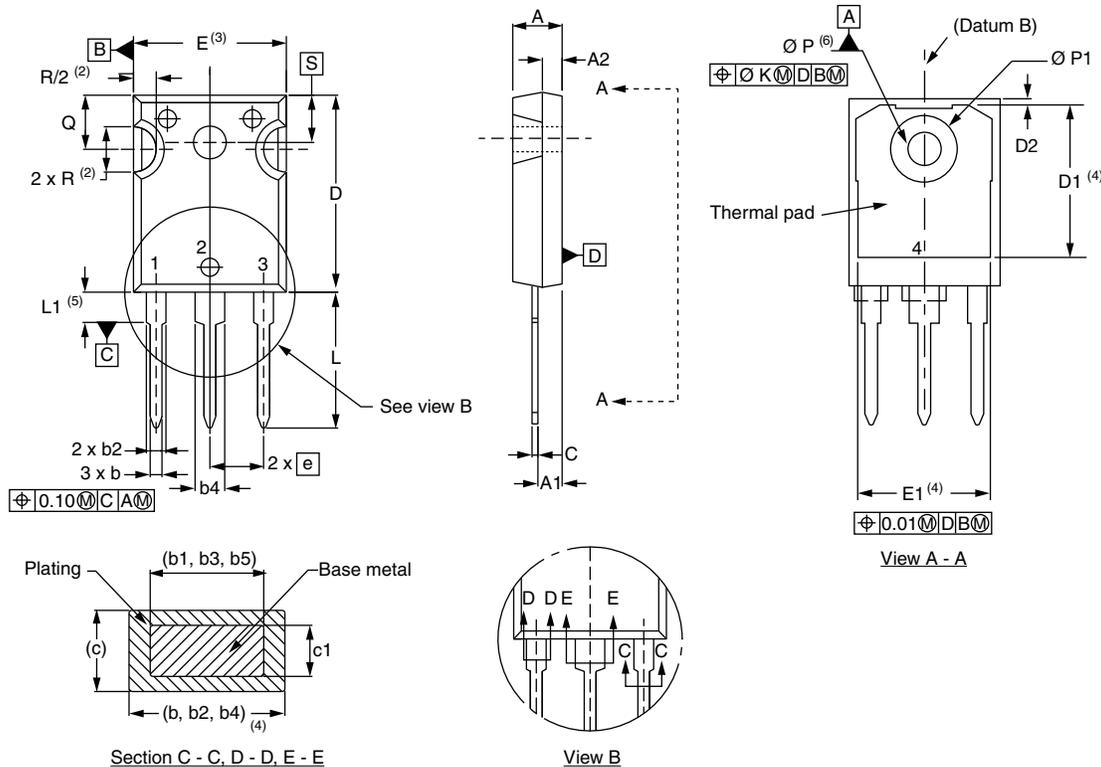
- 1** - Vishay Semiconductors product
- 2** - Current rating (40 = 40 A)
- 3** - Circuit configuration:  
C = common cathode
- 4** - Package:  
P = TO-247
- 5** - Schottky "Q" series
- 6** - Voltage code 050 = 50 V  
060 = 60 V
- 7** - Environmental digit  
-N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free

| ORDERING INFORMATION (Example) |                  |                        |                         |
|--------------------------------|------------------|------------------------|-------------------------|
| PREFERRED P/N                  | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
| VS-40CPQ050-N3                 | 25               | 500                    | Antistatic plastic tube |
| VS-40CPQ060-N3                 | 25               | 500                    | Antistatic plastic tube |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?96138">www.vishay.com/doc?96138</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a> |

### TO-247AC 3L

**DIMENSIONS** in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES | SYMBOL        | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|--------|-------|-------|---------------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |               | MIN.        | MAX.  | MIN.      | MAX.  |       |
| A      | 4.65        | 5.31  | 0.183  | 0.209 |       | D2            | 0.51        | 1.35  | 0.020     | 0.053 |       |
| A1     | 2.21        | 2.59  | 0.087  | 0.102 |       | E             | 15.29       | 15.87 | 0.602     | 0.625 | 3     |
| A2     | 1.17        | 1.37  | 0.046  | 0.054 |       | E1            | 13.46       | -     | 0.53      | -     |       |
| b      | 0.99        | 1.40  | 0.039  | 0.055 |       | e             | 5.46 BSC    |       | 0.215 BSC |       |       |
| b1     | 0.99        | 1.35  | 0.039  | 0.053 |       | $\text{Ø K}$  | 0.254       |       | 0.010     |       |       |
| b2     | 1.65        | 2.39  | 0.065  | 0.094 |       | L             | 14.20       | 16.10 | 0.559     | 0.634 |       |
| b3     | 1.65        | 2.34  | 0.065  | 0.092 |       | L1            | 3.71        | 4.29  | 0.146     | 0.169 |       |
| b4     | 2.59        | 3.43  | 0.102  | 0.135 |       | $\text{Ø P}$  | 3.56        | 3.66  | 0.14      | 0.144 |       |
| b5     | 2.59        | 3.38  | 0.102  | 0.133 |       | $\text{Ø P1}$ | -           | 7.39  | -         | 0.291 |       |
| c      | 0.38        | 0.89  | 0.015  | 0.035 |       | Q             | 5.31        | 5.69  | 0.209     | 0.224 |       |
| c1     | 0.38        | 0.84  | 0.015  | 0.033 |       | R             | 4.52        | 5.49  | 0.178     | 0.216 |       |
| D      | 19.71       | 20.70 | 0.776  | 0.815 | 3     | S             | 5.51 BSC    |       | 0.217 BSC |       |       |
| D1     | 13.08       | -     | 0.515  | -     | 4     |               |             |       |           |       |       |

**Notes**

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) 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 outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6)  $\text{Ø P}$  to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC® outline TO-247 with exception of dimension Q



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