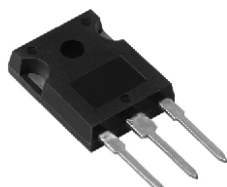
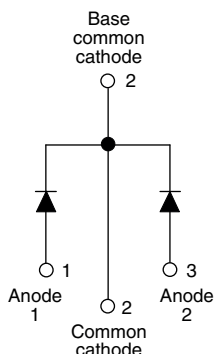


## Schottky Rectifier, 2 x 20 A


**TO-247AC**


### 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
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified according to JEDEC-JESD47
- Halogen-free according to IEC 61249-2-21 definition (-N3 only)



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

### PRODUCT SUMMARY

|                 |                 |
|-----------------|-----------------|
| Package         | TO-247AC        |
| $I_{F(AV)}$     | 2 x 20 A        |
| $V_R$           | 45 V            |
| $V_F$ at $I_F$  | 0.49 V          |
| $I_{RM}$ max.   | 80 mA at 100 °C |
| $T_J$ max.      | 150 °C          |
| Diode variation | Common cathode  |
| $E_{AS}$        | 20 mJ           |

### DESCRIPTION

The VS-STPS40L45CW... 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.

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS                           | VALUES      | UNITS |
|-------------|---|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform                      | 40          | A     |
| $V_{RRM}$   |   | 45          | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                      | 1240        | A     |
| $V_F$       | 20 Apk, $T_J = 125$ °C (per leg, typical) | 0.42        | V     |
| $T_J$       |   | - 55 to 150 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-STPS40L45CWPbF | VS-STPS40L45CW-N3 | UNITS |
|--------------------------------------|-----------|-------------------|-------------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 45                | 45                | V     |
| Maximum working peak reverse voltage | $V_{RWM}$ |                   |                   |       |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER   | SYMBOL      | TEST CONDITIONS   | VALUES | UNITS |
|---|-------------|---|--------|-------|
| Maximum average forward current<br>per device<br>See fig. 5               | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 122$ °C, rectangular waveform   | 40     | A     |
| per leg   |             |   | 20     |       |
| Maximum peak one cycle non-repetitive surge current per leg<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse   | 1240   |       |
|   |             | 10 ms sine or 6 ms rect. pulse  | 350    |       |
| Non-repetitive avalanche energy per leg                                   | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 3$ A, $L = 4.4$ mH   | 20     | 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 | 3      | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER  | SYMBOL         | TEST CONDITIONS  |                                     | TYP.   | MAX. | UNITS |
|--|----------------|--|-------------------------------------|--------|------|-------|
| Maximum forward voltage drop per leg<br>See fig. 1 | $V_{FM}^{(1)}$ | 20 A   | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.48   | 0.53 | V     |
|  |                | 40 A   |                                     | 0.61   | 0.69 |       |
|  |                | 20 A   | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.42   | 0.49 |       |
|  |                | 40 A   |                                     | 0.60   | 0.70 |       |
| Reverse leakage current per leg<br>See fig. 2      | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                 | $V_R = \text{Rated } V_R$           | -      | 1.5  | mA    |
|  |                | $T_J = 100\text{ }^{\circ}\text{C}$                                |                                     | 20     | 80   |       |
| Threshold voltage                                  | $V_{F(TO)}$    | $T_J = T_J \text{ maximum}$  |                                     | 0.27   |      | V     |
| Forward slope resistance                           | $r_t$          |  |                                     | 8.72   |      | mΩ    |
| Maximum junction capacitance per leg               | $C_T$          | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz) 25 °C |                                     | -      | 1500 | 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/μs  |

**Note**

<sup>(1)</sup> 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 <sub>J</sub> , T <sub>Stg</sub> |                                      | - 55 to 150 | °C                     |
| Maximum thermal resistance, junction to case per leg     | R <sub>thJC</sub>                 | DC operation<br>See fig. 4           | 1.6         | °C/W                   |
| Maximum thermal resistance, junction to case per package |                                   | DC operation                         | 0.8         |                        |
| Typical thermal resistance, case to heatsink             | R <sub>thCS</sub>                 | Mounting surface, smooth and greased | 0.24        |                        |
| Approximate weight                                       |                                   |                                      | 6           | g                      |
|  |                                   |                                      | 0.21        | oz.                    |
| Mounting torque  |                                   | Non-lubricated threads               | 6 (5)       | kgf · cm<br>(lbf · in) |
|  |                                   |                                      | 12 (10)     |                        |
| Marking device   |                                   | Case style TO-247AC (JEDEC)          | STPS40L45CW |                        |

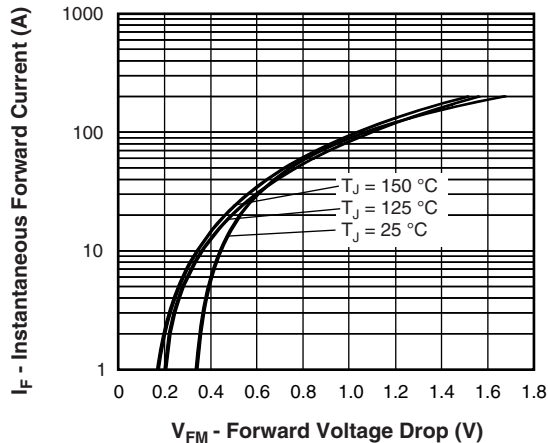


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

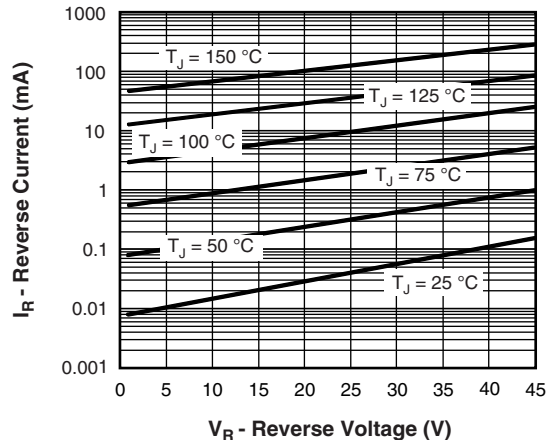


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

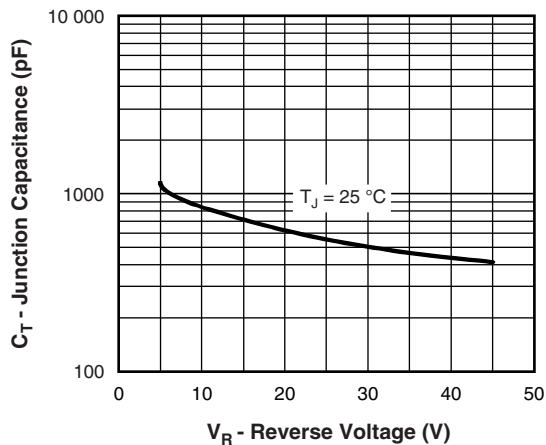


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

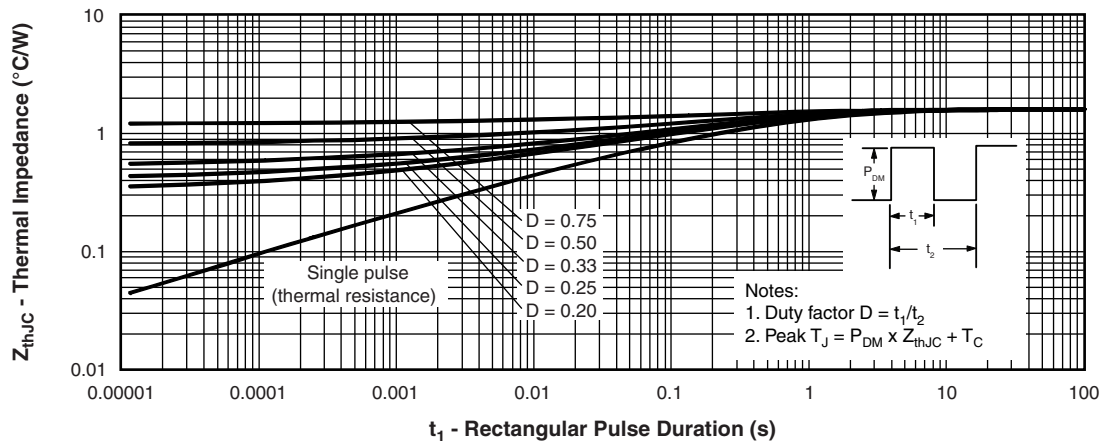


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

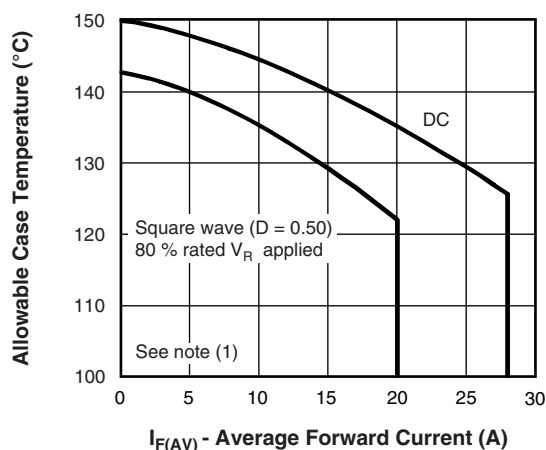


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

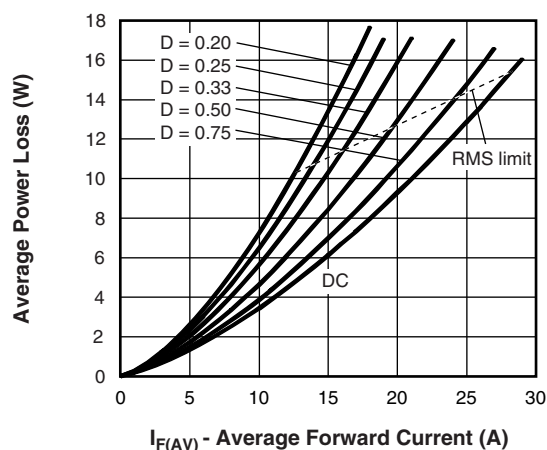


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

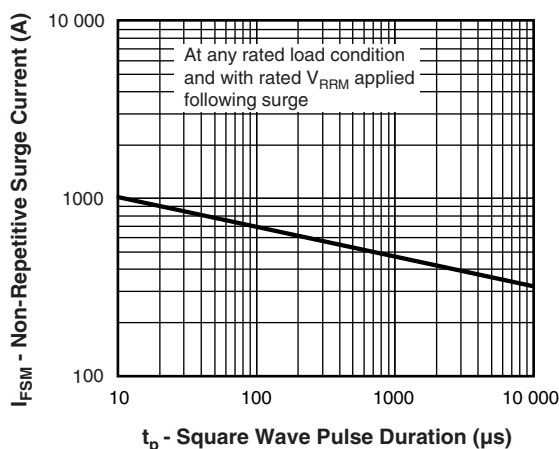


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

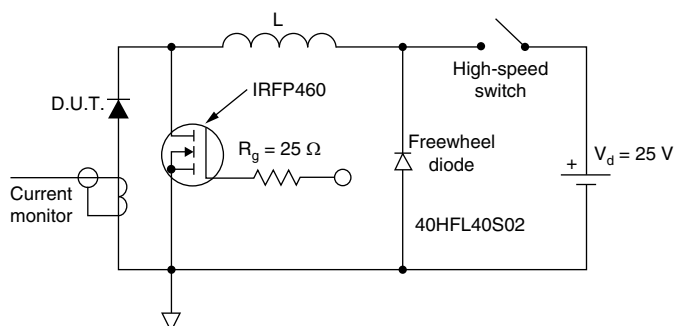


Fig. 8 - Unclamped Inductive Test Circuit

## 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**

|             |            |             |           |          |           |           |            |
|-------------|------------|-------------|-----------|----------|-----------|-----------|------------|
| Device code | <b>VS-</b> | <b>STPS</b> | <b>40</b> | <b>L</b> | <b>45</b> | <b>CW</b> | <b>PbF</b> |
|             | ①          | ②           | ③         | ④        | ⑤         | ⑥         | ⑦          |

- |          |   |  |
|----------|---|--|
| <b>1</b> | - | Vishay Semiconductors product  |
| <b>2</b> | - | Schottky STPS series   |
| <b>3</b> | - | Current ratings (40 = 40 A)  |
| <b>4</b> | - | L = Low forward voltage  |
| <b>5</b> | - | Voltage code (45 = 45 V)   |
| <b>6</b> | - | Package:<br>CW = TO-247  |
| <b>7</b> | - | Environmental digit <ul style="list-style-type: none"><li>• PbF = Lead (Pb)-free and RoHS compliant</li><li>• -N3 = Halogen-free, RoHS compliant, and totally lead (Pb)-free</li></ul> |

| <b>ORDERING INFORMATION</b> (Example) |                  |                        |                         |
|---------------------------------------|------------------|------------------------|-------------------------|
| PREFERRED P/N                         | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
| VS-STPS40L45CWPbF                     | 25               | 500                    | Antistatic plastic tube |
| VS-STPS40L45CW-N3                     | 25               | 500                    | Antistatic plastic tube |

| <b>LINKS TO RELATED DOCUMENTS</b> |              |  |
|-----------------------------------|--------------|--|
| Dimensions                        |              | <a href="http://www.vishay.com/doc?95223">www.vishay.com/doc?95223</a> |
| Part marking information          | TO-247AC PbF | <a href="http://www.vishay.com/doc?95226">www.vishay.com/doc?95226</a> |
|                                   | TO-247AC -N3 | <a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a> |



**DIMENSIONS** in millimeters and inches



### Lead assignments

#### Diodes

1. - Anode/open
2. - Cathode
3. - Anode

| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.65        | 5.31  | 0.183  | 0.209 |       |
| A1     | 2.21        | 2.59  | 0.087  | 0.102 |       |
| A2     | 1.50        | 2.49  | 0.059  | 0.098 |       |
| b      | 0.99        | 1.40  | 0.039  | 0.055 |       |
| b1     | 0.99        | 1.35  | 0.039  | 0.053 |       |
| b2     | 1.65        | 2.39  | 0.065  | 0.094 |       |
| b3     | 1.65        | 2.37  | 0.065  | 0.094 |       |
| b4     | 2.59        | 3.43  | 0.102  | 0.135 |       |
| b5     | 2.59        | 3.38  | 0.102  | 0.133 |       |
| c      | 0.38        | 0.86  | 0.015  | 0.034 |       |
| c1     | 0.38        | 0.76  | 0.015  | 0.030 |       |
| D      | 19.71       | 20.70 | 0.776  | 0.815 | 3     |
| D1     | 13.08       | -     | 0.515  | -     | 4     |

| SYMBOL    | MILLIMETERS |       | INCHES    |       | NOTES |
|-----------|-------------|-------|-----------|-------|-------|
|           | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D2        | 0.51        | 1.30  | 0.020     | 0.051 |       |
| E         | 15.29       | 15.87 | 0.602     | 0.625 | 3     |
| E1        | 13.72       | -     | 0.540     | -     |       |
| e         | 5.46 BSC    |       | 0.215 BSC |       |       |
| FK        | 2.54        |       | 0.010     |       |       |
| L         | 14.20       | 16.10 | 0.559     | 0.634 |       |
| L1        | 3.71        | 4.29  | 0.146     | 0.169 |       |
| N         | 7.62 BSC    |       | 0.3       |       |       |
| $\Phi P$  | 3.56        | 3.66  | 0.14      | 0.144 |       |
| $\Phi P1$ | -           | 6.98  | -         | 0.275 |       |
| Q         | 5.31        | 5.69  | 0.209     | 0.224 |       |
| R         | 4.52        | 5.49  | 1.78      | 0.216 |       |
| S         | 5.51 BSC    |       | 0.217 BSC |       |       |

### 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)  $\Phi P$  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 c



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