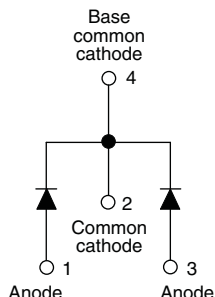


## Schottky Rectifier, 2 x 6 A



D-PAK (TO-252AA)



### FEATURES

- Low forward voltage drop
- Guard ring for enhanced ruggedness and long term reliability
- Popular D-PAK outline
- Center tap configuration
- Small foot print, surface mountable
- High frequency operation
- AEC-Q101 qualified
- Meets JESD 201 class 2 whisker test
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### PRODUCT SUMMARY

|                 |                  |
|-----------------|------------------|
| Package         | D-PAK (TO-252AA) |
| $I_{F(AV)}$     | 2 x 6 A          |
| $V_R$           | 40 V             |
| $V_F$ at $I_F$  | 0.48 V           |
| $I_{RM}$        | 40 mA at 125 °C  |
| $T_J$ max.      | 150 °C           |
| Diode variation | Common cathode   |
| $E_{AS}$        | 9 mJ             |

### DESCRIPTION

The VS-12CWQ04FNHM3 surface mount, center tap, Schottky rectifier series has been designed for applications requiring low forward drop and small foot prints on PC board. Typical applications are in disk drives, switching power supplies, converters, freewheeling diodes, battery charging, and reverse battery protection.

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS                              | VALUES      | UNITS |
|-------------|----------------------------------------------|-------------|-------|
| $I_{F(AV)}$ | Rectangular waveform                         | 12          | A     |
| $V_{RRM}$   |                                              | 40          | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                         | 550         | A     |
| $V_F$       | 6 A <sub>pk</sub> , $T_J = 125$ °C (per leg) | 0.48        | V     |
| $T_J$       | Range                                        | - 55 to 150 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-12CWQ04FNHM3 | UNITS |
|--------------------------------------|-----------|-----------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 40              | V     |
| Maximum working peak reverse voltage | $V_{RRM}$ |                 |       |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                                         | SYMBOL      | TEST CONDITIONS                                                                                                     | VALUES | UNITS |
|-------------------------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------|--------|-------|
| Maximum average forward current<br>per leg<br>See fig. 5          | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 134$ °C, rectangular waveform                                                             | 6      | A     |
| per device                                                        |             |                                                                                                                     | 12     |       |
| Maximum peak one cycle non-repetitive surge current<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse                                                                             | 550    | A     |
|                                                                   |             | 10 ms sine or 6 ms rect. pulse                                                                                      | 90     |       |
| Non-repetitive avalanche energy per leg                           | $E_{AS}$    | $T_J = 25$ °C, $I_{AS} = 1.5$ A, $L = 8$ mH                                                                         | 9      | 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 | 1.2    | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                             | SYMBOL         | TEST CONDITIONS                                                                            |                                     | VALUES | UNITS |
|-------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------|-------------------------------------|--------|-------|
| Maximum forward voltage drop per leg<br>See fig. 1    | $V_{FM}^{(1)}$ | 6 A                                                                                        | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.53   | V     |
|                                                       |                | 12 A                                                                                       |                                     | 0.68   |       |
|                                                       |                | 6 A                                                                                        | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.48   |       |
|                                                       |                | 12 A                                                                                       |                                     | 0.64   |       |
| Maximum reverse leakage current per leg<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                         | $V_R = \text{Rated } V_R$           | 3      | mA    |
|                                                       |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                        |                                     | 40     |       |
| Threshold voltage                                     | $V_{F(TO)}$    | $T_J = T_J \text{ maximum}$                                                                |                                     | 0.28   | V     |
| Forward slope resistance                              | $r_t$          |                                                                                            |                                     | 25.58  | mΩ    |
| Typical junction capacitance per leg                  | $C_T$          | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^{\circ}\text{C}$ |                                     | 405    | pF    |
| Typical series inductance per leg                     | $L_S$          | Measured lead to lead 5 mm from package body                                               |                                     | 5.0    | nH    |

**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                           | $T_J^{(1)}, T_{Stg}$ |                            | - 55 to 150 | $^{\circ}\text{C}$   |
| Maximum thermal resistance,<br>per leg<br>junction to case<br>per device | $R_{thJC}$           | DC operation<br>See fig. 4 | 3.0         | $^{\circ}\text{C/W}$ |
|                                                                          |                      |                            | 1.5         |                      |
| Approximate weight                                                       |                      |                            | 0.3         | g                    |
|                                                                          |                      |                            | 0.01        | oz.                  |
| Marking device                                                           |                      | Case style D-PAK           | 12CWQ04FNH  |                      |

**Note**(1)  $\frac{dP_{tot}}{dT_J} < \frac{1}{R_{thJA}}$  thermal runaway condition for a diode on its own heatsink

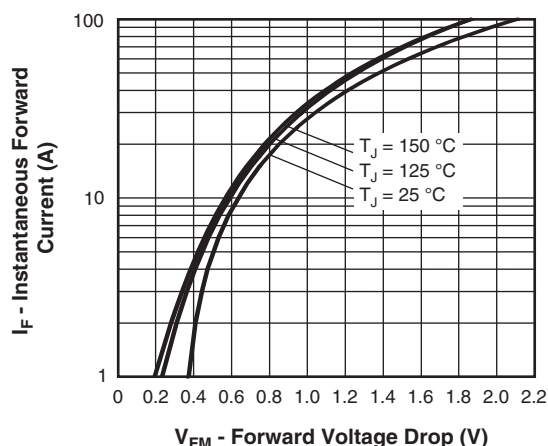


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

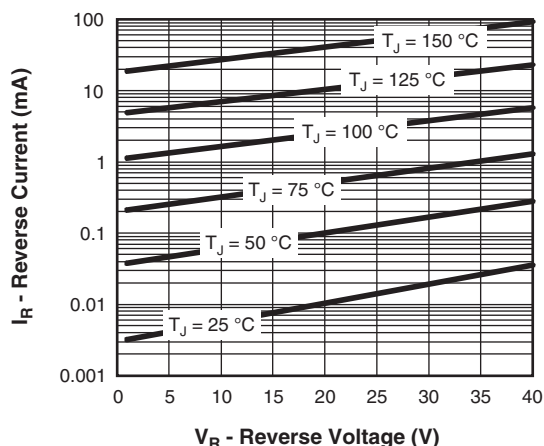


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

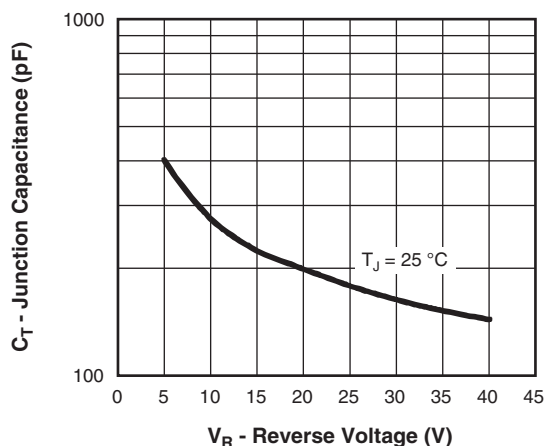


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

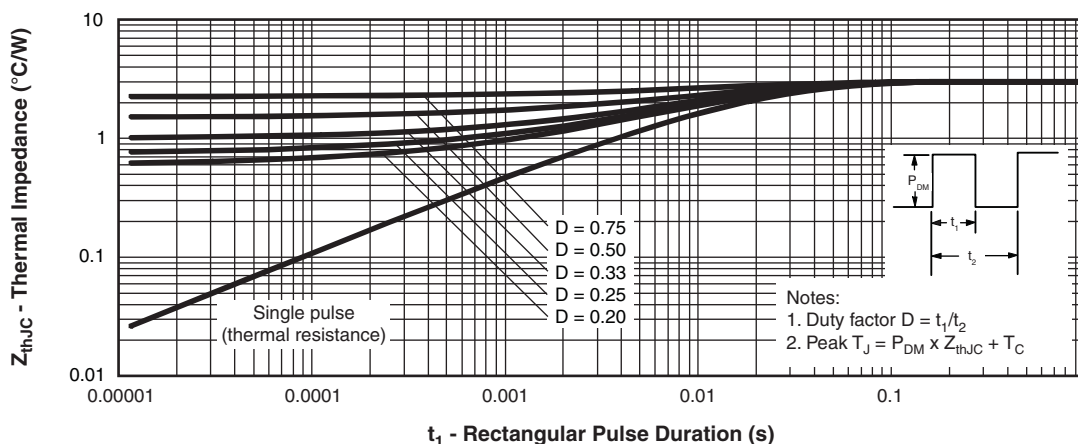


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

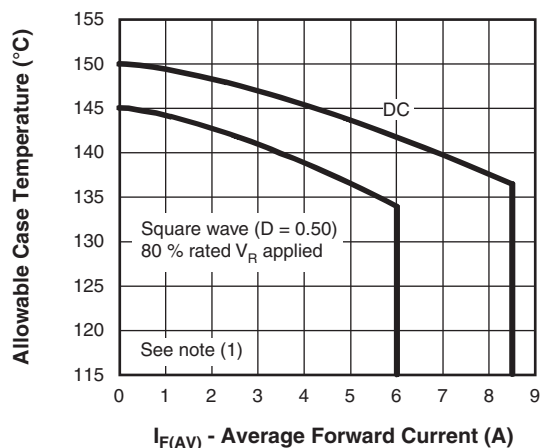


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

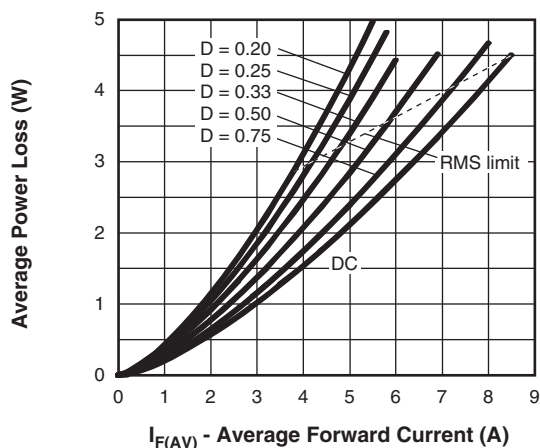


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

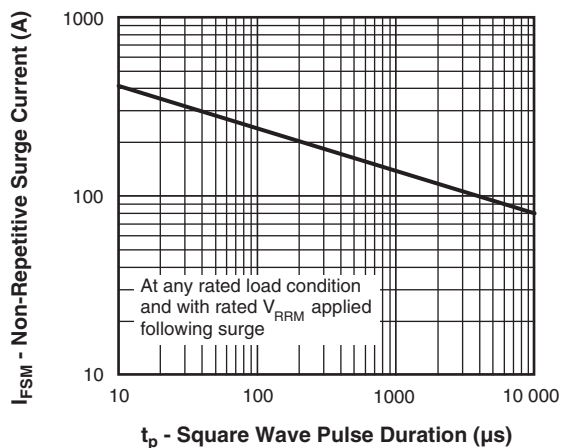


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

#### 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 | VS- | 12                                                                                                                       | C | W | Q | 04 | FN | TRL | H | M3 |
|-------------|-----|--------------------------------------------------------------------------------------------------------------------------|---|---|---|----|----|-----|---|----|
|             | 1   | 2                                                                                                                        | 3 | 4 | 5 | 6  | 7  | 8   | 9 | 10 |
| 1           | -   | Vishay Semiconductors product                                                                                            |   |   |   |    |    |     |   |    |
| 2           | -   | Current rating (12 A)                                                                                                    |   |   |   |    |    |     |   |    |
| 3           | -   | Center tap configuration                                                                                                 |   |   |   |    |    |     |   |    |
| 4           | -   | Package identifier:<br>W = D-PAK                                                                                         |   |   |   |    |    |     |   |    |
| 5           | -   | Schottky "Q" series                                                                                                      |   |   |   |    |    |     |   |    |
| 6           | -   | Voltage rating (04 = 40 V)                                                                                               |   |   |   |    |    |     |   |    |
| 7           | -   | FN = TO-252AA                                                                                                            |   |   |   |    |    |     |   |    |
| 8           | -   | • None = Tube<br>• TR = Tape and reel<br>• TRL = Tape and reel (left oriented)<br>• TRR = Tape and reel (right oriented) |   |   |   |    |    |     |   |    |
| 9           | -   | H = AEC-Q101 qualified                                                                                                   |   |   |   |    |    |     |   |    |
| 10          | -   | Environmental digit:<br>M3 = Halogen-free, RoHS-compliant, and terminations lead (Pb)-free                               |   |   |   |    |    |     |   |    |

| ORDERING INFORMATION (Example) |                  |                        |                         |
|--------------------------------|------------------|------------------------|-------------------------|
| PREFERRED P/N                  | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
| VS-12CWQ04FNHM3                | 75               | 3000                   | Antistatic plastic tube |
| VS-12CWQ04FNTRHM3              | 2000             | 2000                   | 13" diameter reel       |
| VS-12CWQ04FNTRRHM3             | 3000             | 3000                   | 13" diameter reel       |
| VS-12CWQ04FNTRLHM3             | 3000             | 3000                   | 13" diameter reel       |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95519">www.vishay.com/doc?95519</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95518">www.vishay.com/doc?95518</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95033">www.vishay.com/doc?95033</a> |



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