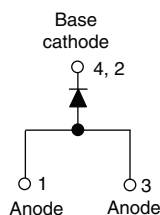


## Schottky Rectifier, 3.5 A


**D-PAK (TO-252AA)**


### FEATURES

- Low forward voltage drop
- Guard ring for enhanced ruggedness and long term reliability
- Halogen-free according to IEC 61249-2-21 definition
- Popular D-PAK outline
- Small foot print, surface mountable
- High frequency operation
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### PRODUCT SUMMARY

|                 |                      |
|-----------------|----------------------|
| Package         | D-PAK (TO-252AA)     |
| $I_{F(AV)}$     | 3.5 A                |
| $V_R$           | 40 V                 |
| $V_F$ at $I_F$  | See Electrical table |
| $I_{RM}$        | 24 mA at 125 °C      |
| $T_J$ max.      | 150 °C               |
| Diode variation | Single die           |
| $E_{AS}$        | 8 mJ                 |

### DESCRIPTION

The VS-30WQ04FN-M3 surface mount Schottky rectifier 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       | 3.5         | A     |
| $V_{RRM}$   |                            | 40          | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine       | 500         | A     |
| $V_F$       | 3 Apk, $T_J = 125^\circ C$ | 0.49        | V     |
| $T_J$       |                            | - 40 to 150 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-30WQ04FN-M3 | UNITS |
|--------------------------------------|-----------|----------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 40             | 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 $T_C = 135^\circ C$ , rectangular waveform   | 3.5    | A     |
| Maximum peak one cycle<br>non-repetitive surge current<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse   | 500    |       |
|  |             | 10 ms sine or 6 ms rect. pulse  | 80     |       |
| Non-repetitive avalanche energy                                      | $E_{AS}$    | $T_J = 25^\circ C$ , $I_{AS} = 1 A$ , $L = 16 mH$   | 8.0    | mJ    |
| Repetitive avalanche current   | $I_{AR}$    | Current decaying linearly to zero in 1 $\mu s$<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical | 1.0    | A     |

**ELECTRICAL SPECIFICATIONS**

| PARAMETER                                     | SYMBOL         | TEST CONDITIONS  |                                     | VALUES | UNITS |
|---|----------------|--|-------------------------------------|--------|-------|
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 3 A  | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.53   | V     |
|   |                | 6 A  |                                     | 0.67   |       |
|   |                | 3 A  | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.49   |       |
|   |                | 6 A  |                                     | 0.62   |       |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$   | $V_R = \text{Rated } V_R$           | 2      | mA    |
|   |                | $T_J = 125\text{ }^{\circ}\text{C}$  |                                     | 24     |       |
| Threshold voltage                             | $V_{F(TO)}$    | $T_J = T_J \text{ maximum}$  |                                     | 0.34   | V     |
| Forward slope resistance                      | $r_t$          |  |                                     | 37.33  | mΩ    |
| Typical junction capacitance                  | $C_T$          | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^{\circ}\text{C}$ |                                     | 189    | pF    |
| Typical series inductance                     | $L_S$          | Measured lead to lead 5 mm from package body   |                                     | 5.0    | nH    |
| Maximum voltage rate of change                | dV/dt          | Rated $V_R$  |                                     | 10 000 | V/μs  |

**Note**

<sup>(1)</sup> Pulse width < 300 μs, duty cycle < 2 %

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                                      | SYMBOL               | TEST CONDITIONS                        | VALUES      | UNITS |
|--|----------------------|--|-------------|-------|
| Maximum junction and storage temperature range | $T_J^{(1)}, T_{Stg}$ |  | - 40 to 150 | °C    |
| Maximum thermal resistance, junction to case   | $R_{thJC}$           | DC operation<br>See fig. 4             | 4.7         | °C/W  |
| Approximate weight                             |                      |  | 0.3         | g     |
|  |                      |  | 0.01        | oz.   |
| Marking device                                 |                      | Case style D-PAK (similar to TO-252AA) | 30WQ04FN    |       |

**Note**

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

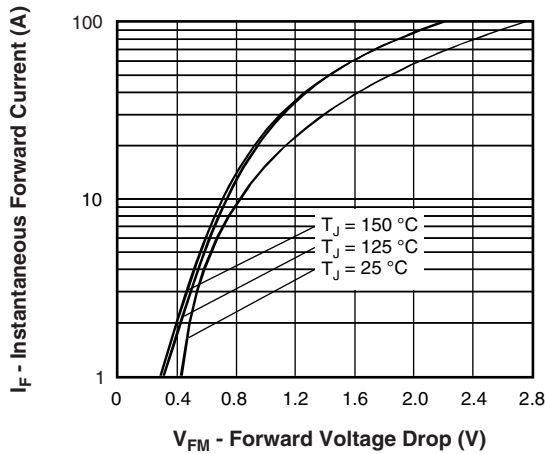


Fig. 1 - Maximum Forward Voltage Drop Characteristics

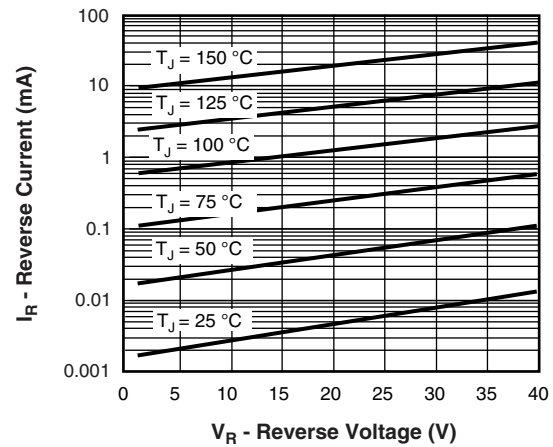


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

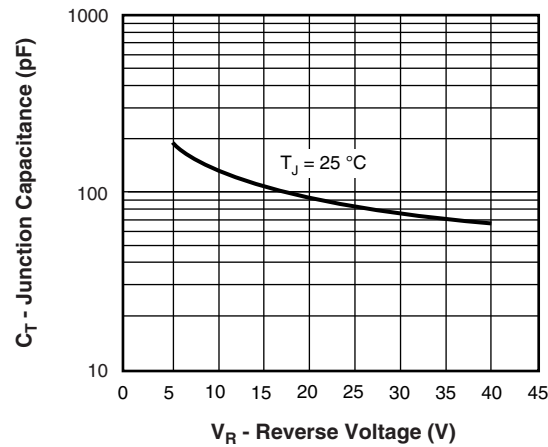
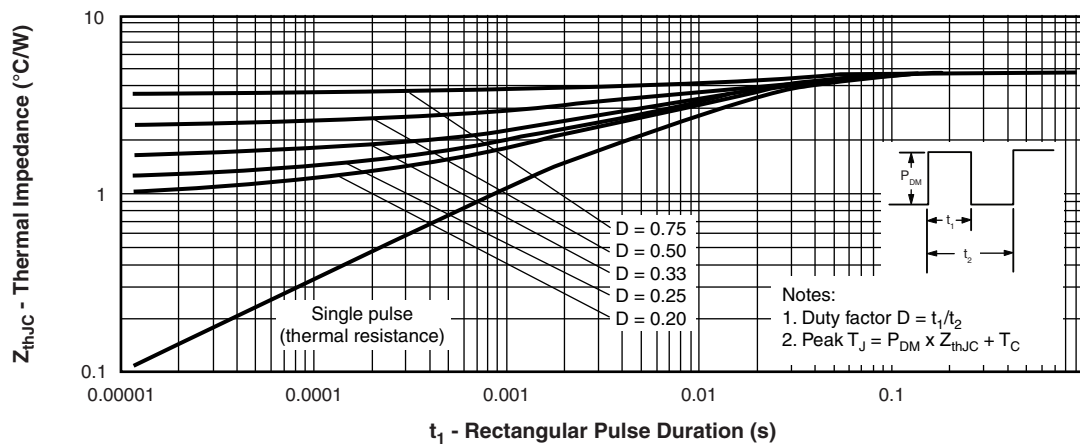


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

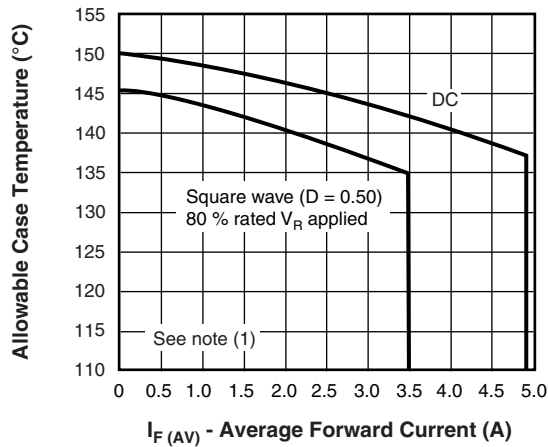


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

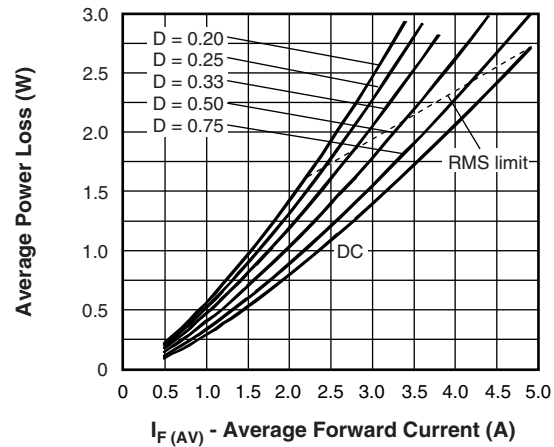


Fig. 6 - Forward Power Loss Characteristics

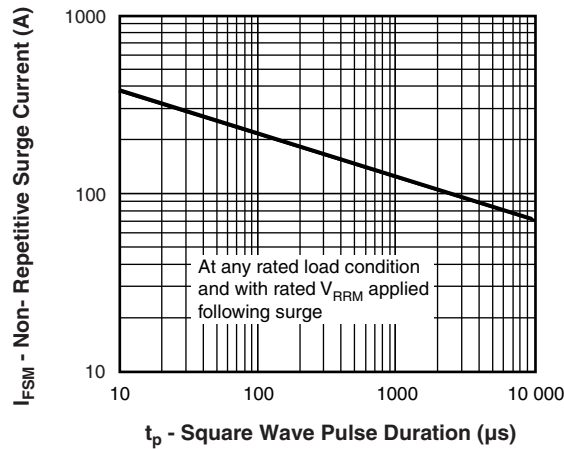


Fig. 7 - Maximum Non-Repetitive Surge Current

## 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>30</b> | <b>W</b> | <b>Q</b> | <b>04</b> | <b>FN</b> | <b>TRL</b> | <b>-M3</b> |
|             | 1          | 2         | 3        | 4        | 5         | 6         | 7          | 8          |

- 1** - Vishay Semiconductors product
- 2** - Current rating (3.5 A)
- 3** - Package identifier:  
W = D-PAK
- 4** - Schottky "Q" series
- 5** - Voltage rating (04 = 40 V)
- 6** - FN = TO-252AA (D-PAK)
- 7** -
  - None = Tube
  - TR = Tape and reel
  - TRL = Tape and reel (left oriented)
  - TRR = Tape and reel (right oriented)
- 8** - Environmental digit:  
-M3 = Halogen-free, RoHS compliant and terminations lead (Pb)-free

**ORDERING INFORMATION** (Example)

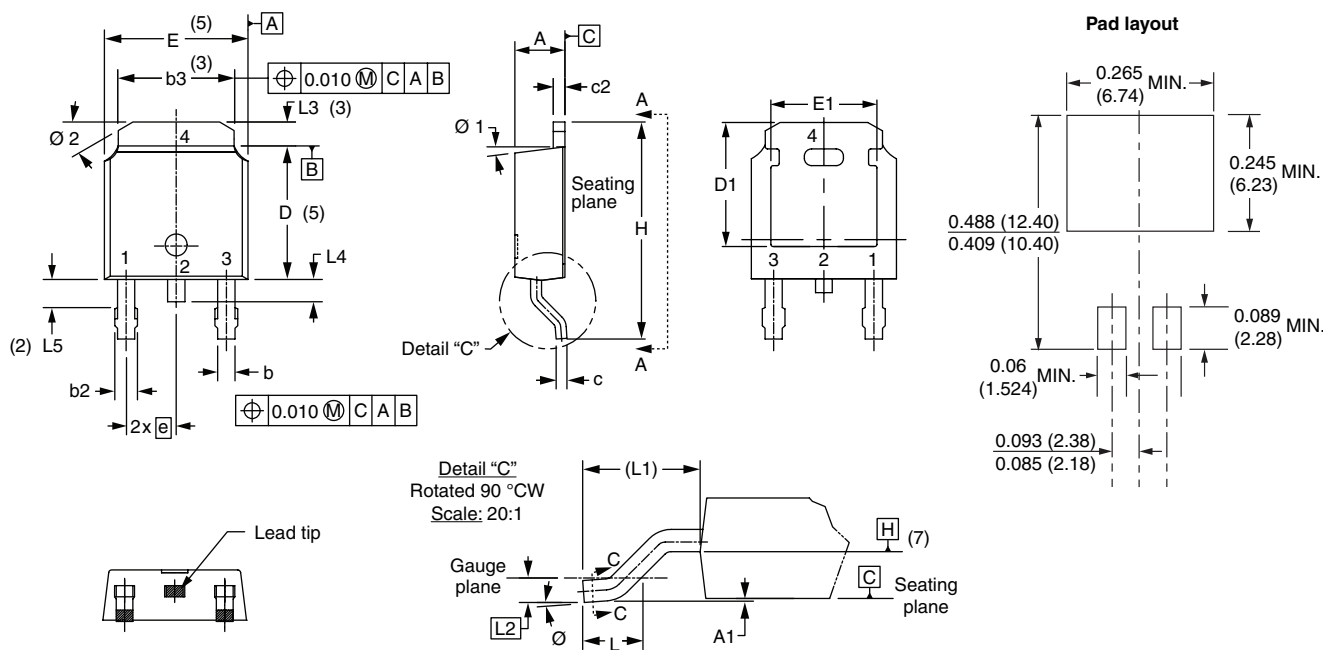
| PREFERRED P/N     | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION   |
|-------------------|------------------|------------------------|-------------------------|
| VS-30WQ04FN-M3    | 75               | 3000                   | Antistatic plastic tube |
| VS-30WQ04FNTR-M3  | 2000             | 2000                   | 13" diameter reel       |
| VS-30WQ04FNTRL-M3 | 3000             | 3000                   | 13" diameter reel       |
| VS-30WQ04FNTRR-M3 | 3000             | 3000                   | 13" diameter reel       |

**LINKS TO RELATED DOCUMENTS**

|                          |  |
|--------------------------|--|
| Dimensions               | <a href="http://www.vishay.com/doc?95016">www.vishay.com/doc?95016</a> |
| Part marking information | <a href="http://www.vishay.com/doc?95176">www.vishay.com/doc?95176</a> |
| Packaging information    | <a href="http://www.vishay.com/doc?95033">www.vishay.com/doc?95033</a> |
| SPICE model              | <a href="http://www.vishay.com/doc?95288">www.vishay.com/doc?95288</a> |

## D-PAK (TO-252AA)

### DIMENSIONS in millimeters and inches



| SYMBOL | MILLIMETERS |      | INCHES |       | NOTES |
|--------|-------------|------|--------|-------|-------|
|        | MIN.        | MAX. | MIN.   | MAX.  |       |
| A      | 2.18        | 2.39 | 0.086  | 0.094 |       |
| A1     | -           | 0.13 | -      | 0.005 |       |
| b      | 0.64        | 0.89 | 0.025  | 0.035 |       |
| b2     | 0.76        | 1.14 | 0.030  | 0.045 |       |
| b3     | 4.95        | 5.46 | 0.195  | 0.215 | 3     |
| c      | 0.46        | 0.61 | 0.018  | 0.024 |       |
| c2     | 0.46        | 0.89 | 0.018  | 0.035 |       |
| D      | 5.97        | 6.22 | 0.235  | 0.245 | 5     |
| D1     | 5.21        | -    | 0.205  | -     | 3     |
| E      | 6.35        | 6.73 | 0.250  | 0.265 | 5     |
| E1     | 4.32        | -    | 0.170  | -     | 3     |

| SYMBOL | MILLIMETERS |       | INCHES     |       | NOTES |
|--------|-------------|-------|------------|-------|-------|
|        | MIN.        | MAX.  | MIN.       | MAX.  |       |
| e      | 2.29 BSC    |       | 0.090 BSC  |       |       |
| H      | 9.40        | 10.41 | 0.370      | 0.410 |       |
| L      | 1.40        | 1.78  | 0.055      | 0.070 |       |
| L1     | 2.74 BSC    |       | 0.108 REF. |       |       |
| L2     | 0.51 BSC    |       | 0.020 BSC  |       |       |
| L3     | 0.89        | 1.27  | 0.035      | 0.050 | 3     |
| L4     | -           | 1.02  | -          | 0.040 |       |
| L5     | 1.14        | 1.52  | 0.045      | 0.060 | 2     |
| Ø      | 0°          | 10°   | 0°         | 10°   |       |
| Ø1     | 0°          | 15°   | 0°         | 15°   |       |
| Ø2     | 25°         | 35°   | 25°        | 35°   |       |

#### Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension uncontrolled in L5
- (3) Dimension D1, E1, L3 and b3 establish a minimum mounting surface for thermal pad
- (4) Section C - C dimension apply to the flat section of the lead between 0.13 and 0.25 mm (0.005 and 0.010") from the lead tip
- (5) 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
- (6) Dimension b1 and c1 applied to base metal only
- (7) Datum A and B to be determined at datum plane H
- (8) Outline conforms to JEDEC outline TO-252AA



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