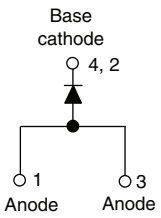
# High Performance Schottky Rectifier, 3.5 A

DPAK (TO-252AA)




## FEATURES

- Low forward voltage drop
- Guard ring for enhanced ruggedness and long term reliability
- Popular D-PAK outline
- 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

RoHS COMPLIANT
HALOGEN FREE

## DESCRIPTION

The VS-30WQ06FNHM3 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.

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 3.5 A |
| $V_R$ | 60 V |
| $V_F$ at $I_F$ | See Electrical table |
| $I_{RM}$ | 30 mA at 125 °C |
| $T_J$ max. | 150 °C |
| $E_{AS}$ | 6 mJ |
| Circuit configuration | Single |
| Package | DPAK (TO-252AA) |

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| $I_{F(AV)}$ | Rectangular waveform | 3.5 | A |
| $V_{RRM}$ | | 60 | V |
| $I_{FSM}$ | $t_p$ = 5 µs sine | 490 | A |
| $V_F$ | 3 $A_{pk}$, $T_J$ = 125 °C | 0.53 | V |
| $T_J$ | | -40 to +150 | °C |

| VOLTAGE RATINGS | | | |
|---|---|---|---|
| PARAMETER | SYMBOL | VS-30WQ06FNHM3 | UNITS |
| Maximum DC reverse voltage | $V_R$ | 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 $T_C$ = 133 °C, rectangular waveform | | 3.5 | A |
| Maximum peak one cycle non-repetitive surge current<br>See fig. 7 | $I_{FSM}$ | 5 µs sine or 3 µs rect. pulse | Following any rated load condition and with rated $V_{RRM}$ applied | 490 | |
| | | 10 ms sine or 6 ms rect. pulse | | 70 | |
| Non-repetitive avalanche energy | $E_{AS}$ | $T_J$ = 25 °C, $I_{AS}$ = 1 A, L = 12 mH | | 6.0 | mJ |
| Repetitive avalanche current | $I_{AR}$ | Current decaying linearly to zero in 1 µs<br>Frequency limited by $T_J$ maximum $V_A$ = 1.5 x $V_R$ 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 °C | 0.61 | V |
| | | 6 A | | 0.76 | |
| | | 3 A | $T_J$ = 125 °C | 0.53 | |
| | | 6 A | | 0.65 | |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}$ (1) | $T_J$ = 25 °C | $V_R$ = Rated $V_R$ | 2 | mA |
| | | $T_J$ = 125 °C | | 30 | |
| Threshold voltage | $V_{F(TO)}$ | $T_J$ = $T_J$ maximum | | 0.38 | V |
| Forward slope resistance | $r_t$ | | | 34.31 | mΩ |
| Typical junction capacitance | $C_T$ | $V_R$ = 5 $V_{DC}$ (test signal range 100 kHz to 1 MHz), 25 °C | | 145 | 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**

(1) 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 DPAK (TO-252AA) | 30WQ06FNH | |

**Note**

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

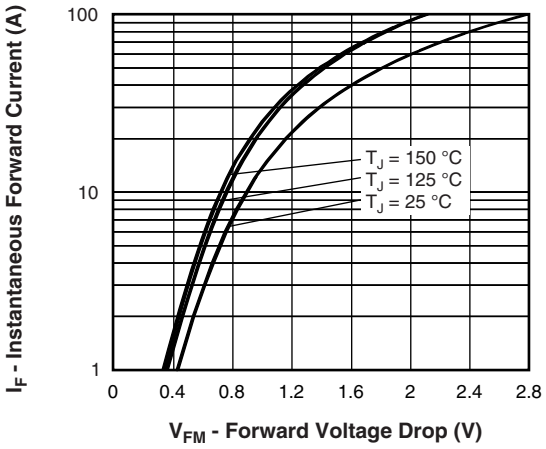



Fig. 1 - Maximum Forward Voltage Drop Characteristics

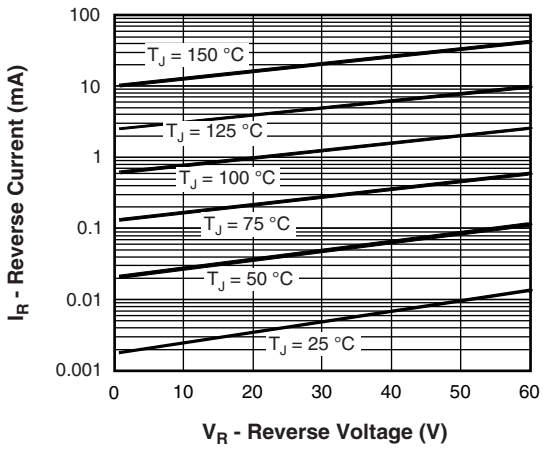



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

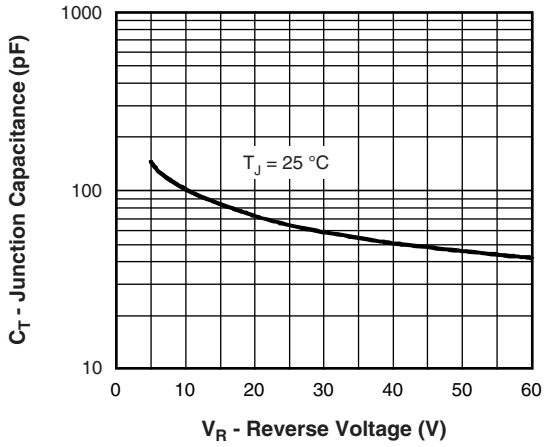



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

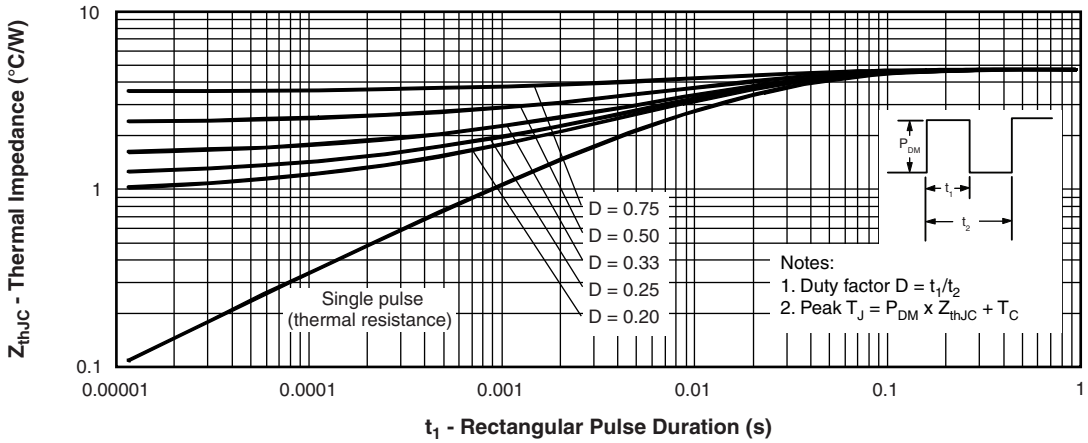



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

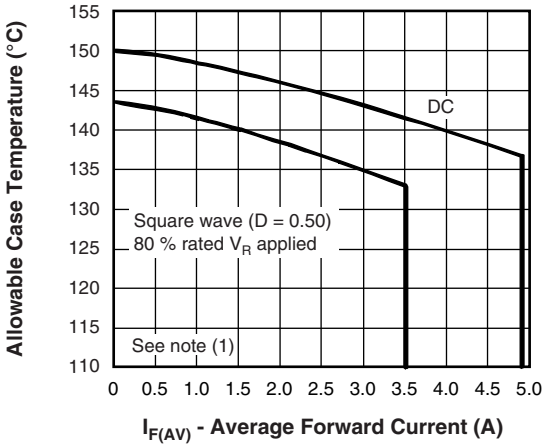



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

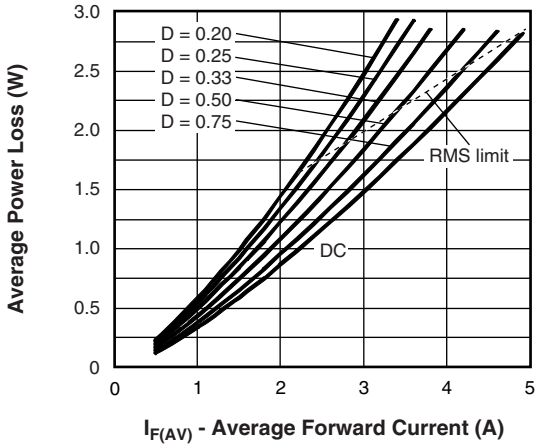



Fig. 6 - Forward Power Loss Characteristics

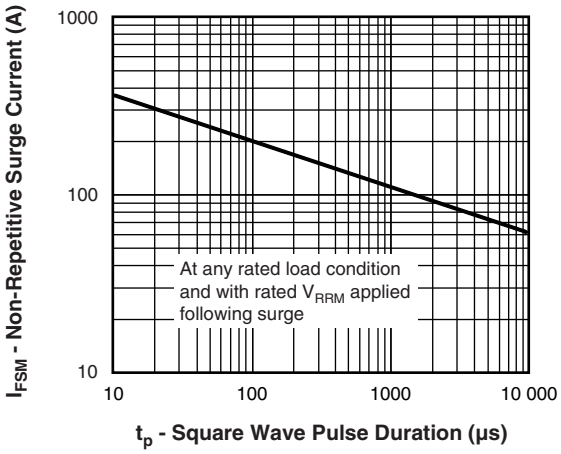


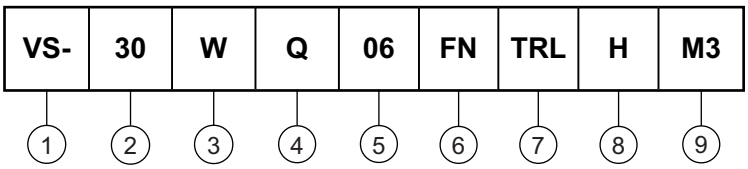

Fig. 7 - Maximum Non-Repetitive Surge Current

**Note**

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

## ORDERING INFORMATION TABLE

Device code




1 - Vishay Semiconductors product

2 - Current rating (3.5 A)

3 - Package identifier:
W = DPAK

4 - Schottky “Q” series

5 - Voltage rating (06 = 60 V)

6 - FN = DPAK (TO-252AA)

7 - • None = tube
• TR = tape and reel
• TRL = tape and reel (left oriented)
• TRR = tape and reel (right oriented)

8 - H = AEC-Q101 qualified

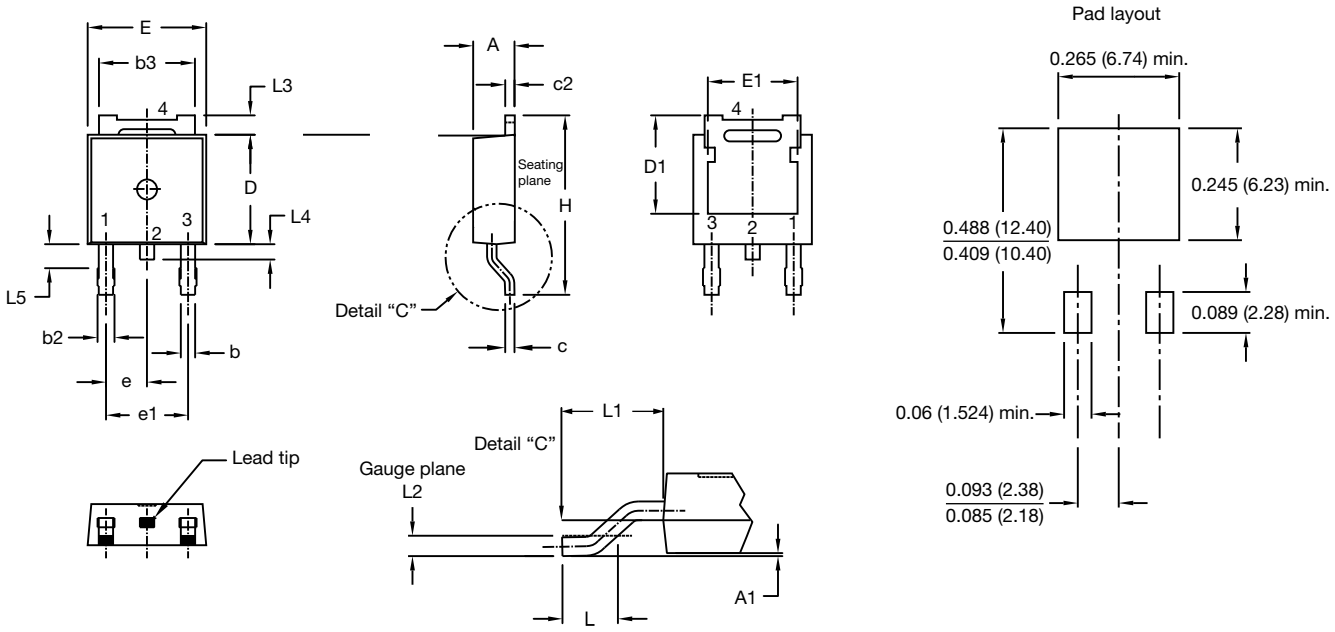
9 - Environmental digit:
M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **QUANTITY PER T/R** | **MINIMUM ORDER QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-30WQ06FNHM3 | 75 | 3000 | Antistatic plastic tube |
| VS-30WQ06FNTRHM3 | 2000 | 2000 | 13" diameter reel |
| VS-30WQ06FNTRRHM3 | 3000 | 3000 | 13" diameter reel |
| VS-30WQ06FNTRLHM3 | 3000 | 3000 | 13" diameter reel |

| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | www.vishay.com/doc?95519 |
| Part marking information | www.vishay.com/doc?95518 |
| Packaging information | www.vishay.com/doc?95033 |
| SPICE model | www.vishay.com/doc?95687 |

# DPAK (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 | 4.93 | - | 0.194 | - | 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 |

**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) Dimensions 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

(5) Outline conforms to JEDEC® outline TO-252AA, except for D1 dimension

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