



## Schottky Rectifier, 3.3 A



C-16



### FEATURES

- Low profile, axial leaded outline
- High frequency operation
- Very low forward voltage drop
- 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 for commercial level
- Halogen-free according to IEC 61249-2-21 definition (-M3 only)



| PRODUCT SUMMARY |                      |
|-----------------|----------------------|
| Package         | DO-201AD (C-16)      |
| $I_{F(AV)}$     | 3.3 A                |
| $V_R$           | 30 V, 40 V           |
| $V_F$ at $I_F$  | See Electrical table |
| $I_{RM}$ max.   | 20 mA at 125 °C      |
| $T_J$ max.      | 150 °C               |
| Diode variation | Single die           |
| $E_{AS}$        | 6.0 mJ               |

### DESCRIPTION

The VS-31DQ... axial leaded Schottky rectifier has been optimized for very low forward voltage drop, with moderate leakage. 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                     | 3.3         | A     |
| $V_{RRM}$                         |  | 30/40       | V     |
| $I_{FSM}$                         | $t_p = 5 \mu s$ sine                     | 450         | A     |
| $V_F$                             | 3 Apk, $T_J = 25 \text{ }^\circ\text{C}$ | 0.57        | V     |
| $T_J$                             |  | - 40 to 150 | °C    |

| VOLTAGE RATINGS                      |           |           |              |           |              |       |
|--------------------------------------|-----------|-----------|--------------|-----------|--------------|-------|
| PARAMETER                            | SYMBOL    | VS-31DQ03 | VS-31DQ03-M3 | VS-31DQ04 | VS-31DQ04-M3 | UNITS |
| Maximum DC reverse voltage           | $V_R$     | 30        | 30           | 40        | 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. 4                        | $I_{F(AV)}$ | 50 % duty cycle at $T_L = 117 \text{ }^\circ\text{C}$ , rectangular waveform  |   | 3.3    | A     |
| Maximum peak one cycle<br>non-repetitive surge current<br>See fig. 6 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse   | Following any rated load<br>condition and with rated<br>$V_{RRM}$ applied | 450    |       |
|  |             | 10 ms sine or 6 ms rect. pulse  |   | 90     |       |
| Non-repetitive avalanche energy                                      | $E_{AS}$    | $T_J = 25 \text{ }^\circ\text{C}$ , $I_{AS} = 1.0 \text{ A}$ , $L = 12 \text{ mH}$                                  |   | 6.0    | 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     |

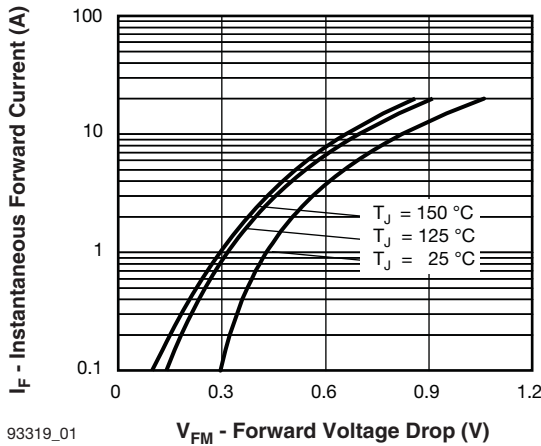


| <b>ELECTRICAL SPECIFICATIONS</b>              |                |  |                                   |        |                  |
|---|----------------|--|-----------------------------------|--------|------------------|
| PARAMETER                                     | SYMBOL         | TEST CONDITIONS  |                                   | VALUES | UNITS            |
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 3 A  | $T_J = 25\text{ }^\circ\text{C}$  | 0.57   | V                |
|   |                | 6 A  |                                   | 0.71   |                  |
|   |                | 3 A  | $T_J = 125\text{ }^\circ\text{C}$ | 0.51   |                  |
|   |                | 6 A  |                                   | 0.62   |                  |
| Maximum reverse leakage current<br>See fig. 4 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$   | $V_R = \text{Rated } V_R$         | 1      | mA               |
|   |                | $T_J = 125\text{ }^\circ\text{C}$  |                                   | 20     |                  |
| Typical junction capacitance                  | $C_T$          | $V_R = 5 V_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^\circ\text{C}$ |                                   | 190    | pF               |
| Typical series inductance                     | $L_S$          | Measured lead to lead 5 mm from package body                                     |                                   | 9.0    | nH               |
| Maximum voltage rate of charge                | dV/dt          | Rated $V_R$  |                                   | 10 000 | V/ $\mu\text{s}$ |

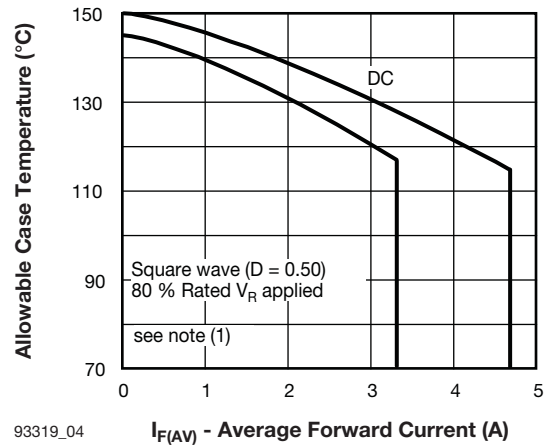
**Note**(1) Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %

| <b>THERMAL - MECHANICAL SPECIFICATIONS</b>      |                      |  |  |             |                    |
|---|----------------------|--|--|-------------|--------------------|
| PARAMETER                                       | SYMBOL               | TEST CONDITIONS  |  | VALUES      | UNITS              |
| Maximum junction and storage temperature range  | $T_J^{(1)}, T_{Stg}$ |  |  | - 40 to 150 | $^\circ\text{C}$   |
| Maximum thermal resistance, junction to ambient | $R_{thJA}$           | DC operation<br>Without cooling fin                                |  | 80          | $^\circ\text{C/W}$ |
| Typical thermal resistance, junction to lead    | $R_{thJL}$           | With fin 20 mm x 20 mm (0.79" x 0.79")<br>1.0 mm (0.04") thickness |  | 15          |                    |
| Approximate weight                              |                      |  |  | 1.2         | g                  |
|   |                      |  |  | 0.042       | oz.                |
| Marking device                                  |                      | Case style C-16  |  | 31DQ03      |                    |
|   |                      |  |  | 31DQ04      |                    |

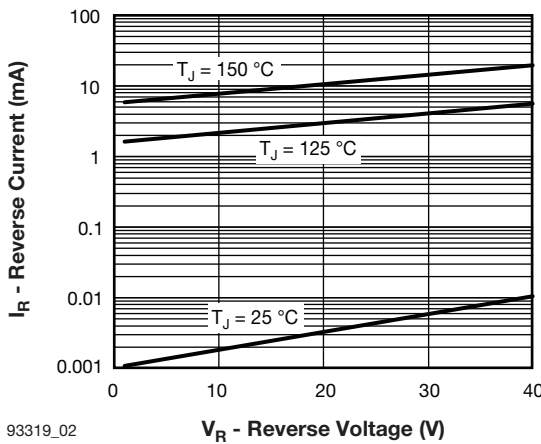
**Note**(1)  $\frac{dP_{tot}}{dT_J} < \frac{1}{R_{thJA}}$  thermal runaway condition for a diode on its own heatsink



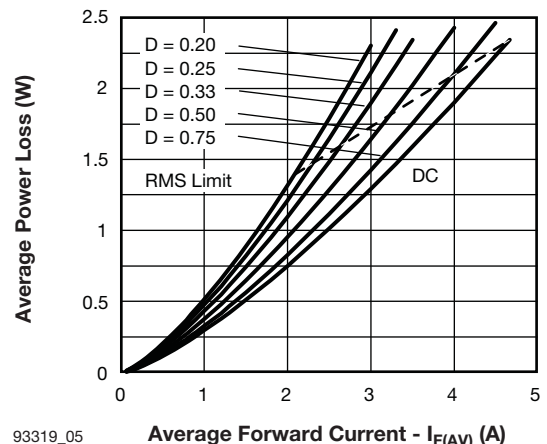
93319\_01 **V<sub>FM</sub> - Forward Voltage Drop (V)**  
Fig. 1 - Maximum Forward Voltage Drop Characteristics



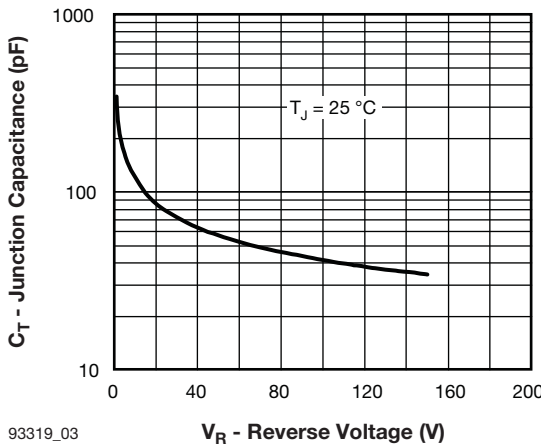
93319\_04 **I<sub>F(AV)</sub> - Average Forward Current (A)**  
Fig. 4 - Maximum Allowable Lead Temperature vs. Average Forward Current



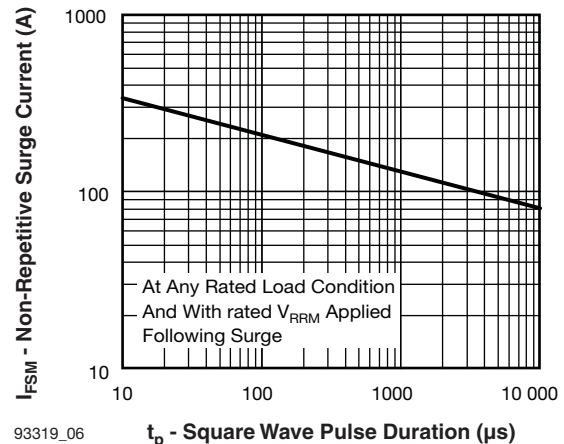
93319\_02 **V<sub>R</sub> - Reverse Voltage (V)**  
Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage



93319\_05 **Average Forward Current - I<sub>F(AV)</sub> (A)**  
Fig. 5 - Forward Power Loss Characteristics



93319\_03 **V<sub>R</sub> - Reverse Voltage (V)**  
Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage



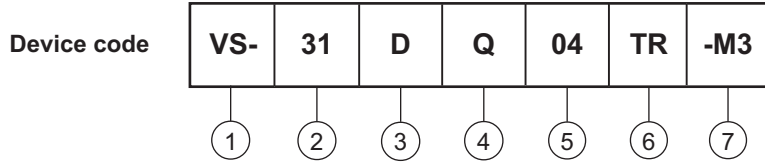
93319\_06 **t<sub>p</sub> - Square Wave Pulse Duration (μs)**  
Fig. 6 - Maximum Non-Repetitive Surge Current

**Note**

(2) 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



- 1** - Vishay Semiconductors product
- 2** - 31 = Current Rating 3.3 A
- 3** - D = DO-201 package
- 4** - Q = Schottky Q.. series
- 5** - 04 = Voltage ratings 03 = 30 V  
04 = 40 V
- 6** -
  - TR = Tape and reel package
  - None = Bulk package
- 7** - Environmental digit
  - None = Lead (Pb)-free and RoHS compliant
  - -M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free

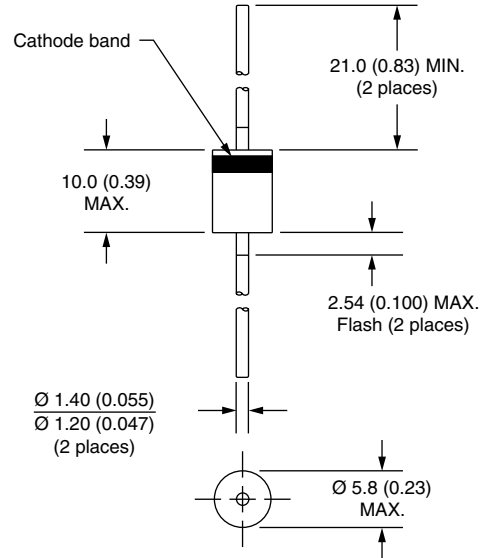
| ORDERING INFORMATION (Example) |                  |                        |                       |
|--------------------------------|------------------|------------------------|-----------------------|
| PREFERRED P/N                  | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-31DQ03                      | 500              | 500                    | Bulk                  |
| VS-31DQ03TR                    | 1200             | 1200                   | Tape and reel         |
| VS-31DQ03-M3                   | 500              | 500                    | Bulk                  |
| VS-31DQ03TR-M3                 | 1200             | 1200                   | Tape and reel         |
| VS-31DQ04                      | 500              | 500                    | Bulk                  |
| VS-31DQ04TR                    | 1200             | 1200                   | Tape and reel         |
| VS-31DQ04-M3                   | 500              | 500                    | Bulk                  |
| VS-31DQ04TR-M3                 | 1200             | 1200                   | Tape and reel         |

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?95242">www.vishay.com/doc?95242</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95304">www.vishay.com/doc?95304</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95338">www.vishay.com/doc?95338</a> |



## Axial DO-201AD (C-16)

**DIMENSIONS** in millimeters (inches)





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