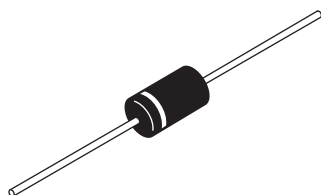




## Schottky Rectifier, 3.3 A



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)



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

## PRODUCT SUMMARY

|                 |                      |
|-----------------|----------------------|
| Package         | DO-201AD (C-16)      |
| $I_{F(AV)}$     | 3.3 A                |
| $V_R$           | 50 V, 60 V           |
| $V_F$ at $I_F$  | See Electrical table |
| $I_{RM}$ max.   | 15 mA at 125 °C      |
| $T_J$ max.      | 150 °C               |
| Diode variation | Single die           |
| $E_{AS}$        | 5.0 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     |
| $V_{RRM}$   |                           | 50/60       | V     |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine      | 340         | A     |
| $V_F$       | 3 Apk, $T_J = 25^\circ C$ | 0.62        | V     |
| $T_J$       |                           | - 40 to 150 | °C    |

## VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | VS-31DQ05 | VS-31DQ05-M3 | VS-31DQ06 | VS-31DQ06-M3 | UNITS |
|--------------------------------------|-----------|-----------|--------------|-----------|--------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 50        | 50           | 60        | 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. 4                     | $I_{F(AV)}$ | 50 % duty cycle at $T_L = 105^\circ C$ , rectangular waveform                                                       | 3.3    | A     |
| Maximum peak one cycle non-repetitive surge current<br>See fig. 6 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse                                                                             | 340    |       |
|                                                                   |             | 10 ms sine or 6 ms rect. pulse                                                                                      | 55     |       |
| Non-repetitive avalanche energy                                   | $E_{AS}$    | $T_J = 25^\circ C$ , $I_{AS} = 1$ A, $L = 10$ mH                                                                    | 5.0    | 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                                                                                       | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.62   | V     |
|                                               |                | 6 A                                                                                       |                                     | 0.78   |       |
|                                               |                | 3 A                                                                                       | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.54   |       |
|                                               |                | 6 A                                                                                       |                                     | 0.65   |       |
| Maximum reverse leakage current<br>See fig. 4 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                        | $V_R = \text{Rated } V_R$           | 2      | mA    |
|                                               |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                       |                                     | 15     |       |
| Typical junction capacitance                  | $C_T$          | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^{\circ}\text{C}$ |                                     | 160    | 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/μs  |

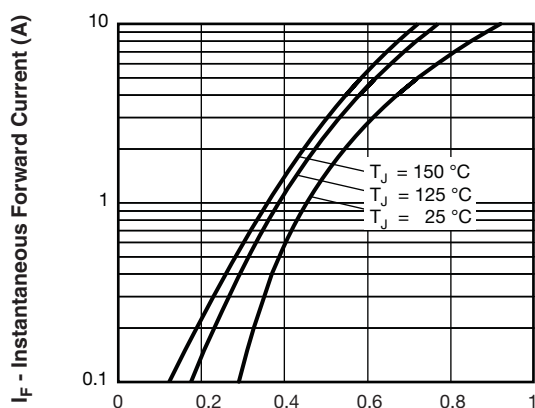
**Note**

(1) Pulse width < 300  $\mu$ s, 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 | $^{\circ}\text{C}$   |
| 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    | $R_{thJL}$           | DC operation                        | 15          |                      |
| Approximate weight                              |                      |                                     | 1.2         | g                    |
|                                                 |                      |                                     | 0.042       | oz.                  |
| Marking device                                  |                      | Case style C-16                     | 31DQ05      |                      |
|                                                 |                      |                                     | 31DQ06      |                      |

**Note**

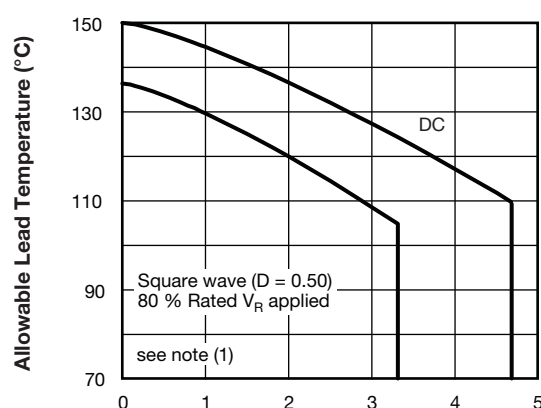
(1)  $\frac{dP_{tot}}{dT_J} < \frac{1}{R_{thJA}}$  thermal runaway condition for a diode on its own heatsink



93320\_01

$V_{FM}$  - Forward Voltage Drop (V)

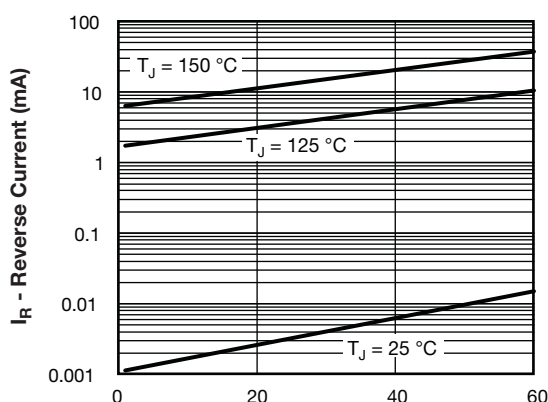
Fig. 1 - Maximum Forward Voltage Drop Characteristics



93320\_04

$I_{F(AV)}$  - Average Forward Current (A)

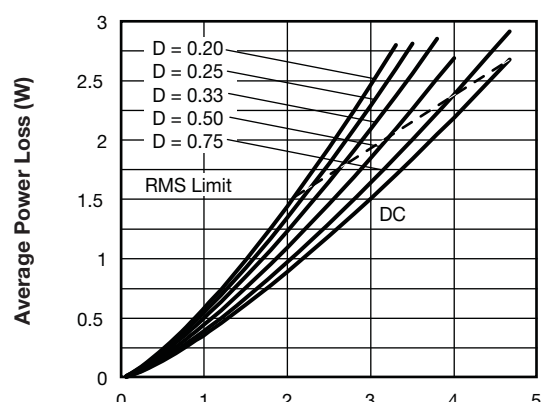
Fig. 4 - Maximum Allowable Lead Temperature vs. Average Forward Current



93320\_02

$V_R$  - Reverse Voltage (V)

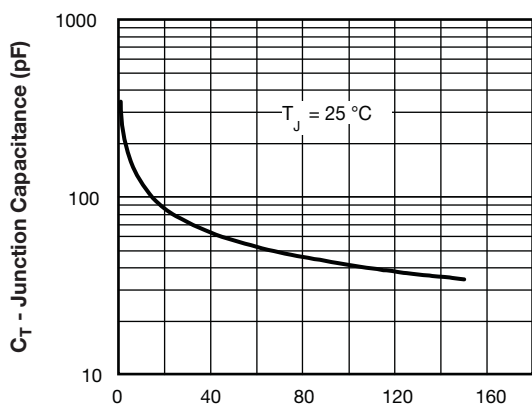
Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage



93320\_05

Average Forward Current -  $I_{F(AV)}$  (A)

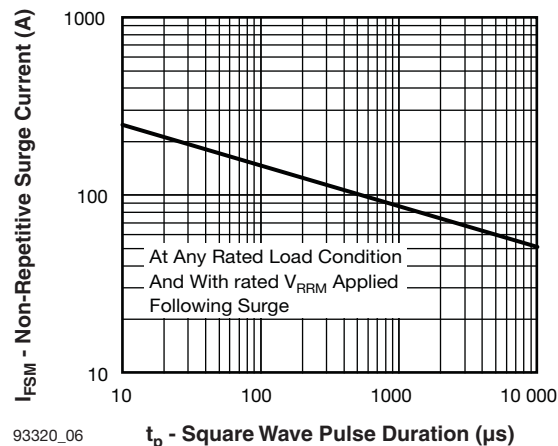
Fig. 5 - Forward Power Loss Characteristics



93320\_03

$V_R$  - Reverse Voltage (V)

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage



93320\_06

$t_p$  - Square Wave Pulse Duration ( $\mu$ s)

Fig. 6 - 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 | VS- | 31 | D | Q | 06 | TR | -M3 |
|             | 1   | 2  | 3 | 4 | 5  | 6  | 7   |

- 1** - Vishay Semiconductors product
- 2** - 31 = Current Rating, 3.3 A
- 3** - D = DO-201 package
- 4** - Q = Schottky Q.. series
- 5** - 06 = Voltage ratings 

05 = 50 V  
06 = 60 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

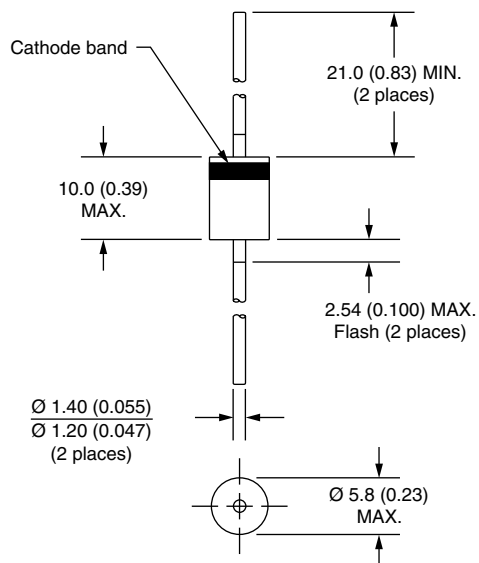
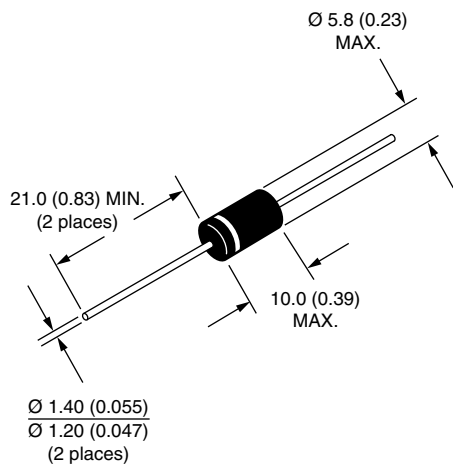
| ORDERING INFORMATION (Example) |                  |                        |                       |
|--------------------------------|------------------|------------------------|-----------------------|
| PREFERRED P/N                  | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-31DQ05                      | 500              | 500                    | Bulk                  |
| VS-31DQ05TR                    | 1200             | 1200                   | Tape and reel         |
| VS-31DQ05-M3                   | 500              | 500                    | Bulk                  |
| VS-31DQ05TR-M3                 | 1200             | 1200                   | Tape and reel         |
| VS-31DQ06                      | 500              | 500                    | Bulk                  |
| VS-31DQ06TR                    | 1200             | 1200                   | Tape and reel         |
| VS-31DQ06-M3                   | 500              | 500                    | Bulk                  |
| VS-31DQ06TR-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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