

## Schottky Rectifier, 9 A



DO-204AR



### FEATURES

- 150 °C T<sub>J</sub> operation
- Low forward voltage drop
- High frequency operation
- 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-204AR               |
| I <sub>F(AV)</sub>               | 9 A                    |
| V <sub>R</sub>                   | 30 V, 35 V, 40 V, 45 V |
| V <sub>F</sub> at I <sub>F</sub> | 0.42 V                 |
| I <sub>RM</sub> max.             | 70 mA at 125 °C        |
| T <sub>J</sub> max.              | 150 °C                 |
| Diode variation                  | Single die             |
| E <sub>AS</sub>                  | 12 mJ                  |

### DESCRIPTION

The VS-90SQ... axial leaded Schottky rectifier series has been optimized for very low forward voltage drop, with moderate leakage. The proprietary barrier technology allows for reliable operation up to 150 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL             | CHARACTERISTICS                | VALUES      | UNITS |
|--------------------|--------------------------------|-------------|-------|
| I <sub>F(AV)</sub> | Rectangular waveform           | 9           | A     |
| V <sub>RRM</sub>   | Range                          | 30 to 45    | V     |
| I <sub>FSM</sub>   | t <sub>p</sub> = 5 μs sine     | 2150        | A     |
| V <sub>F</sub>     | 9 Apk, T <sub>J</sub> = 125 °C | 0.42        | V     |
| T <sub>J</sub>     | Range                          | - 55 to 150 | °C    |

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL           | VS-90SQ030<br>VS-90SQ030-M3 | VS-90SQ035<br>VS-90SQ035-M3 | VS-90SQ040<br>VS-90SQ040-M3 | VS-90SQ045<br>VS-90SQ045-M3 | UNITS |
|--------------------------------------|------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-------|
| Maximum DC reverse voltage           | V <sub>R</sub>   | 30                          | 35                          | 40                          | 45                          | V     |
| Maximum working peak reverse voltage | V <sub>RWM</sub> |                             |                             |                             |                             |       |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                                            | SYMBOL             | TEST CONDITIONS                                                                                                                         | VALUES | UNITS |
|----------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------|-------|
| Maximum average forward current<br>See fig. 5                        | I <sub>F(AV)</sub> | 50 % duty cycle at T <sub>C</sub> = 69 °C, rectangular waveform                                                                         | 9      | A     |
| Maximum peak one cycle<br>non-repetitive surge current<br>See fig. 7 | I <sub>FSM</sub>   | 5 μs sine or 3 μs rect. pulse                                                                                                           | 2150   |       |
|                                                                      |                    | 10 ms sine or 6 ms rect. pulse                                                                                                          | 340    |       |
| Non-repetitive avalanche energy                                      | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 1.8 A, L = 7.4 mH                                                                             | 12     | mJ    |
| Repetitive avalanche current                                         | I <sub>AR</sub>    | Current decaying linearly to zero in 1 μs<br>Frequency limited by, T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> typical | 1.8    | A     |



| ELECTRICAL SPECIFICATIONS                     |                |                                                                                             |                                     |        |       |
|-----------------------------------------------|----------------|---------------------------------------------------------------------------------------------|-------------------------------------|--------|-------|
| PARAMETER                                     | SYMBOL         | TEST CONDITIONS                                                                             |                                     | VALUES | UNITS |
| Maximum forward voltage drop<br>See fig. 1    | $V_{FM}^{(1)}$ | 9 A                                                                                         | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.48   | V     |
|                                               |                | 18 A                                                                                        |                                     | 0.57   |       |
|                                               |                | 9 A                                                                                         | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.42   |       |
|                                               |                | 18 A                                                                                        |                                     | 0.52   |       |
| Maximum reverse leakage current<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                          | $V_R = \text{Rated } V_R$           | 1.75   | mA    |
|                                               |                | $T_J = 125\text{ }^{\circ}\text{C}$                                                         |                                     | 70     |       |
| Maximum junction capacitance                  | $C_T$          | $V_R = 5\text{ }V_{DC}$ , (test signal range 100 kHz to 1 MHz) $25\text{ }^{\circ}\text{C}$ |                                     | 900    | pF    |
| Typical series inductance                     | $L_S$          | Measured lead to lead 5 mm from body                                                        |                                     | 10.0   | nH    |
| Maximum voltage rate of change                | dV/dt          | Rated $V_R$                                                                                 |                                     | 10 000 | V/μs  |

**Note**
<sup>(1)</sup> Pulse width < 300  $\mu$ s, duty cycle < 2 %

| <b>THERMAL - MECHANICAL SPECIFICATIONS</b>     |                |                                              |             |                      |
|------------------------------------------------|----------------|----------------------------------------------|-------------|----------------------|
| PARAMETER                                      | SYMBOL         | TEST CONDITIONS                              | VALUES      | UNITS                |
| Maximum junction and storage temperature range | $T_J, T_{Stg}$ |                                              | - 55 to 150 | $^{\circ}\text{C}$   |
| Maximum thermal resistance, junction to lead   | $R_{thJL}$     | DC operation; see fig. 4<br>1/8" lead length | 8.0         | $^{\circ}\text{C/W}$ |
| Typical thermal resistance, junction to air    | $R_{thJA}$     |                                              | 44          |                      |
| Approximate weight                             |                |                                              | 1.4         | g                    |
|                                                |                |                                              | 0.049       | oz.                  |
| Marking device                                 |                | Case style DO-204AR (JEDEC)                  | 90SQ030     |                      |
|                                                |                |                                              | 90SQ035     |                      |
|                                                |                |                                              | 90SQ040     |                      |
|                                                |                |                                              | 90SQ045     |                      |

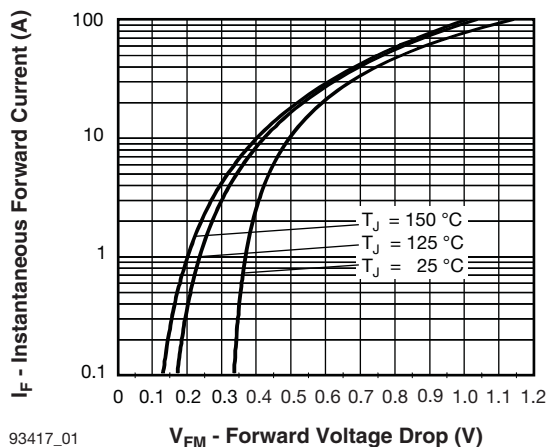


Fig. 1 - Maximum Forward Voltage Drop Characteristics

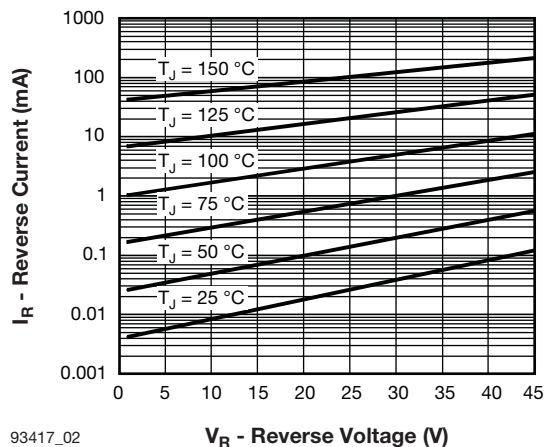


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

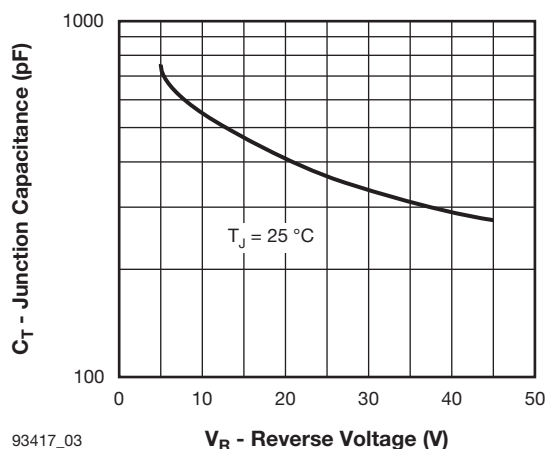
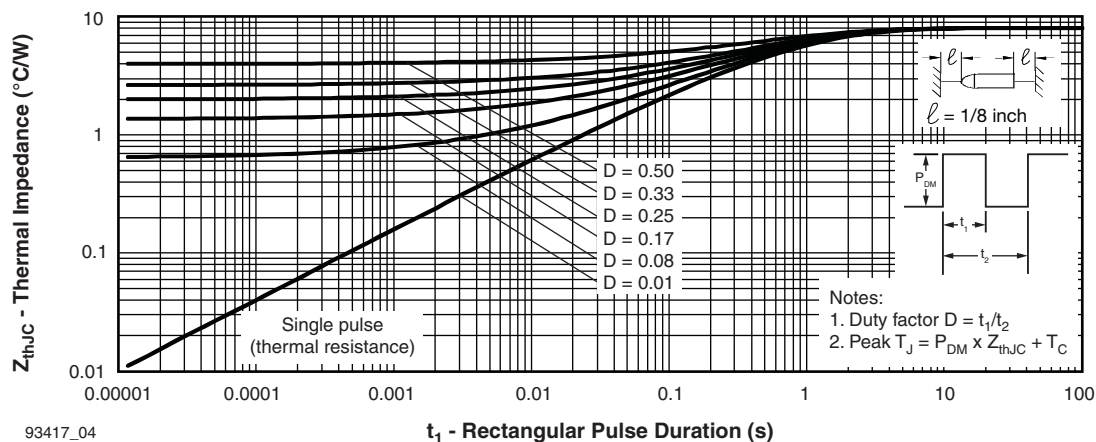


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

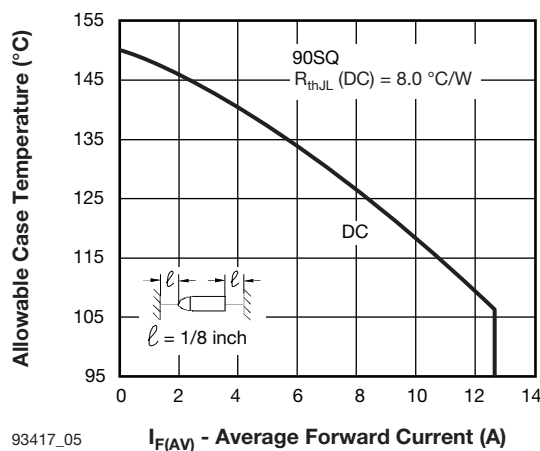


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

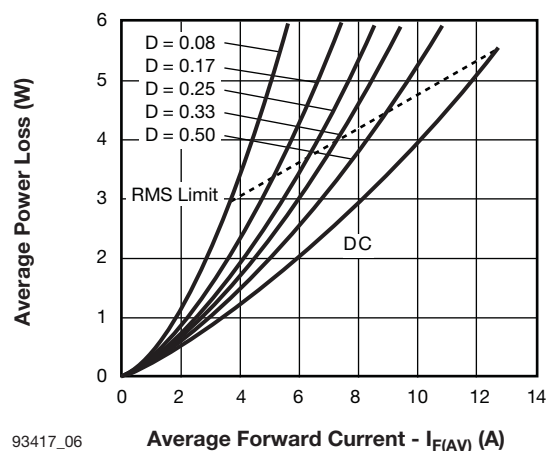


Fig. 6 - Forward Power Loss Characteristics

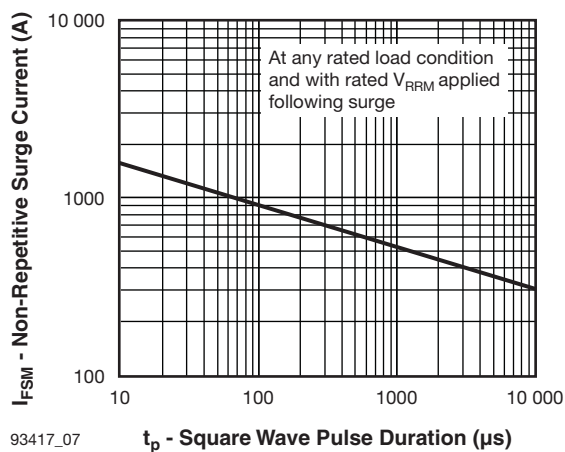


Fig. 7 - Maximum Non-Repetitive Surge Current

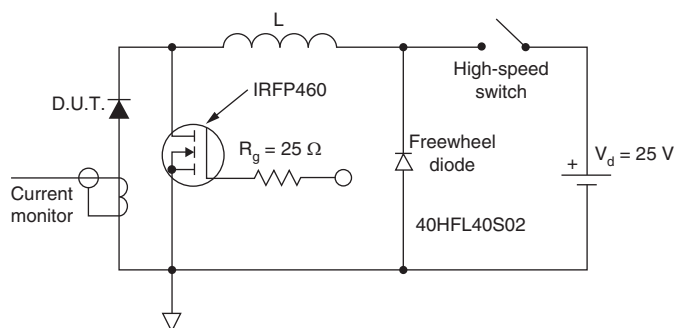


Fig. 8 - Unclamped Inductive Test Circuit

**ORDERING INFORMATION TABLE**

| Device code | VS-                                                                                                                                        | 90 | S | Q | 045 | TR | -M3 |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|-----|----|-----|
|             | 1                                                                                                                                          | 2  | 3 | 4 | 5   | 6  | 7   |
| 1           | Vishay Semiconductors product                                                                                                              |    |   |   |     |    |     |
| 2           | 90 = Current x 10                                                                                                                          |    |   |   |     |    |     |
| 3           | S = DO-204AR                                                                                                                               |    |   |   |     |    |     |
| 4           | Q = Schottky Q.. series                                                                                                                    |    |   |   |     |    |     |
| 5           | Voltage rating                                                                                                                             |    |   |   |     |    |     |
| 6           | • TR = Tape and reel package<br>• None = Bulk package                                                                                      |    |   |   |     |    |     |
| 7           | Environmental digit<br>• None = Lead (Pb)-free and RoHS compliant<br>• -M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free |    |   |   |     |    |     |

|            |
|------------|
| 030 = 30 V |
| 035 = 35 V |
| 040 = 40 V |
| 045 = 45 V |

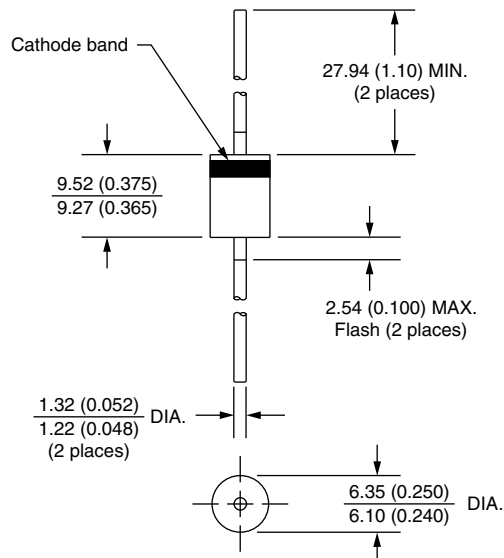
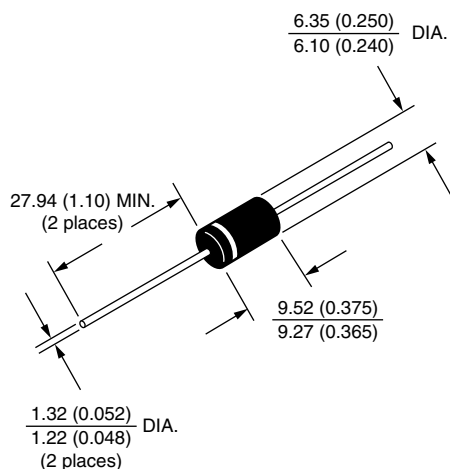
| ORDERING INFORMATION (Example) |                  |                        |                       |
|--------------------------------|------------------|------------------------|-----------------------|
| PREFERRED P/N                  | QUANTITY PER T/R | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-90SQ030                     | 300              | 300                    | Bulk                  |
| VS-90SQ030TR                   | 1500             | 1500                   | Tape and reel         |
| VS-90SQ030-M3                  | 300              | 300                    | Bulk                  |
| VS-90SQ030TR-M3                | 1500             | 1500                   | Tape and reel         |
| VS-90SQ035                     | 300              | 300                    | Bulk                  |
| VS-90SQ035TR                   | 1500             | 1500                   | Tape and reel         |
| VS-90SQ035-M3                  | 300              | 300                    | Bulk                  |
| VS-90SQ035TR-M3                | 1500             | 1500                   | Tape and reel         |
| VS-90SQ040                     | 300              | 300                    | Bulk                  |
| VS-90SQ040TR                   | 1500             | 1500                   | Tape and reel         |
| VS-90SQ040-M3                  | 300              | 300                    | Bulk                  |
| VS-90SQ040TR-M3                | 1500             | 1500                   | Tape and reel         |
| VS-90SQ045                     | 300              | 300                    | Bulk                  |
| VS-90SQ045TR                   | 1500             | 1500                   | Tape and reel         |
| VS-90SQ045-M3                  | 300              | 300                    | Bulk                  |
| VS-90SQ045TR-M3                | 1500             | 1500                   | Tape and reel         |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95243">www.vishay.com/doc?95243</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95325">www.vishay.com/doc?95325</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95332">www.vishay.com/doc?95332</a> |



## Axial DO-204AR

**DIMENSIONS** in millimeters (inches)





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