

## Standard Recovery Diodes, (Stud Version), 400 A



DO-9 (DO-205AB)

### FEATURES

- Wide current range
- High surge current capabilities
- Stud cathode and stud anode version
- Standard JEDEC® types
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### TYPICAL APPLICATIONS

- Converters
- Power supplies
- Machine tool controls
- High power drives

### PRIMARY CHARACTERISTICS

|                       |                 |
|-----------------------|-----------------|
| $I_{F(AV)}$           | 400 A           |
| Package               | DO-9 (DO-205AB) |
| Circuit configuration | Single          |

### MAJOR RATINGS AND CHARACTERISTICS

| PARAMETER    | TEST CONDITIONS | VALUES      | UNITS             |
|--------------|-----------------|-------------|-------------------|
| $I_{F(AV)}$  |                 | 400         | A                 |
|              | $T_C$           | 120         | °C                |
| $I_{F(RMS)}$ |                 | 630         | A                 |
| $I_{FSM}$    | 50 Hz           | 8250        | A                 |
|              | 60 Hz           | 8640        |                   |
| $I^2t$       | 50 Hz           | 340         | kA <sup>2</sup> s |
|              | 60 Hz           | 311         |                   |
| $V_{RRM}$    | Range           | 800 to 1600 | V                 |
| $T_J$        |                 | -40 to +200 | °C                |

### ELECTRICAL SPECIFICATIONS

#### VOLTAGE RATINGS

| TYPE NUMBER | VOLTAGE CODE | $V_{RRM}$ , MAXIMUM REPETITIVE<br>PEAK REVERSE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM NON-REPETITIVE<br>PEAK REVERSE VOLTAGE<br>V | $I_{RRM}$ MAXIMUM<br>AT $T_J = T_J$ MAXIMUM<br>mA |
|-------------|--------------|-------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------|
| VS-400U(R)  | 80           | 800                                                         | 900                                                             | 15                                                |
|             | 120          | 1200                                                        | 1300                                                            |                                                   |
|             | 160          | 1600                                                        | 1700                                                            |                                                   |



| FORWARD CONDUCTION                                            |                     |                                                                                                           |                                  |                                                                       |        |                    |
|---------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------|--------|--------------------|
| PARAMETER                                                     | SYMBOL              | TEST CONDITIONS                                                                                           |                                  |                                                                       | VALUES | UNITS              |
| Maximum average forward current at case temperature           | I <sub>F(AV)</sub>  | 180° conduction, half sine wave                                                                           |                                  |                                                                       | 400    | A                  |
|                                                               |                     |                                                                                                           |                                  |                                                                       | 120    | °C                 |
| Maximum RMS forward current                                   | I <sub>F(RMS)</sub> | DC at 110 °C case temperature                                                                             |                                  |                                                                       | 630    | A                  |
| Maximum peak, one cycle forward, non-repetitive surge current | I <sub>FSM</sub>    | t = 10 ms                                                                                                 | No voltage reapplied             | Sinusoidal half wave, initial T <sub>J</sub> = T <sub>J</sub> maximum | 8250   | A                  |
|                                                               |                     | t = 8.3 ms                                                                                                |                                  |                                                                       | 8640   |                    |
|                                                               |                     | t = 10 ms                                                                                                 | 100 % V <sub>RRM</sub> reapplied |                                                                       | 6940   |                    |
|                                                               |                     | t = 8.3 ms                                                                                                |                                  |                                                                       | 7270   |                    |
| Maximum I <sup>2</sup> t for fusing                           | I <sup>2</sup> t    | t = 10 ms                                                                                                 | No voltage reapplied             |                                                                       | 340    | kA <sup>2</sup> s  |
|                                                               |                     | t = 8.3 ms                                                                                                |                                  |                                                                       | 311    |                    |
|                                                               |                     | t = 10 ms                                                                                                 | 100 % V <sub>RRM</sub> reapplied |                                                                       | 241    |                    |
|                                                               |                     | t = 8.3 ms                                                                                                |                                  |                                                                       | 220    |                    |
| Maximum I <sup>2</sup> √t for fusing                          | I <sup>2</sup> √t   | t = 0.1 to 10 ms, no voltage reapplied                                                                    |                                  |                                                                       | 3400   | kA <sup>2</sup> √s |
| Low level value of threshold voltage                          | V <sub>F(TO)1</sub> | (16.7 % × π × I <sub>F(AV)</sub> < I < π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum  |                                  |                                                                       | 0.77   | V                  |
| High level value of threshold voltage                         | V <sub>F(TO)2</sub> | (I > π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum                                    |                                  |                                                                       | 0.85   |                    |
| Low level value of forward slope resistance                   | r <sub>f1</sub>     | (16.7 % × π × I <sub>F(AV)</sub> < I < π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum  |                                  |                                                                       | 0.49   | mΩ                 |
| High level value of forward slope resistance                  | r <sub>f2</sub>     | (I > π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum                                    |                                  |                                                                       | 0.49   |                    |
| Maximum forward voltage drop                                  | V <sub>FM</sub>     | I <sub>pk</sub> = 1500 A, T <sub>J</sub> = T <sub>J</sub> maximum, t <sub>p</sub> = 10 ms sinusoidal wave |                                  |                                                                       | 1.62   | V                  |

| THERMAL AND MECHANICAL SPECIFICATIONS                    |                |                                               |                 |       |
|----------------------------------------------------------|----------------|-----------------------------------------------|-----------------|-------|
| PARAMETER                                                | SYMBOL         | TEST CONDITIONS                               | VALUES          | UNITS |
| Maximum junction operating and storage temperature range | $T_J, T_{Stg}$ |                                               | -40 to 200      | °C    |
| Maximum thermal resistance, junction to case             | $R_{thJC}$     | DC operation                                  | 0.15            | K/W   |
| Maximum thermal resistance, case to heatsink             | $R_{thCS}$     | Mounting surface, smooth, flat and greased    | 0.04            |       |
| Maximum allowed mounting torque ± 10 %                   |                | Not lubricated threads                        | 27              | N · m |
| Approximate weight                                       |                |                                               | 250             | g     |
| Case style                                               |                | See dimensions - link at the end of datasheet | DO-9 (DO-205AB) |       |

| $\Delta R_{thJC}$ CONDUCTION |                       |                        |                     |       |
|------------------------------|-----------------------|------------------------|---------------------|-------|
| CONDUCTION ANGLE             | SINUSOIDAL CONDUCTION | RECTANGULAR CONDUCTION | TEST CONDITIONS     | UNITS |
| 180°                         | 0.020                 | 0.013                  | $T_J = T_J$ maximum | K/W   |
| 120°                         | 0.023                 | 0.023                  |                     |       |
| 90°                          | 0.029                 | 0.031                  |                     |       |
| 60°                          | 0.042                 | 0.044                  |                     |       |
| 30°                          | 0.073                 | 0.074                  |                     |       |

**Note**

- The table above shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC

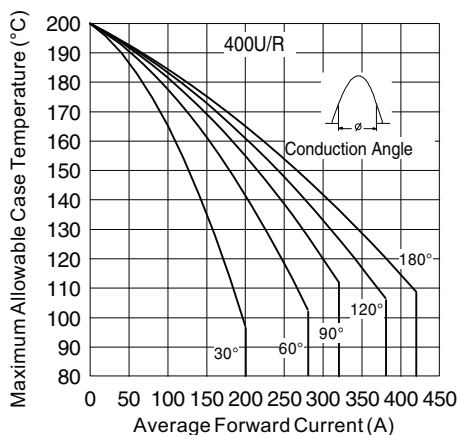


Fig. 1 - Current Ratings Characteristics

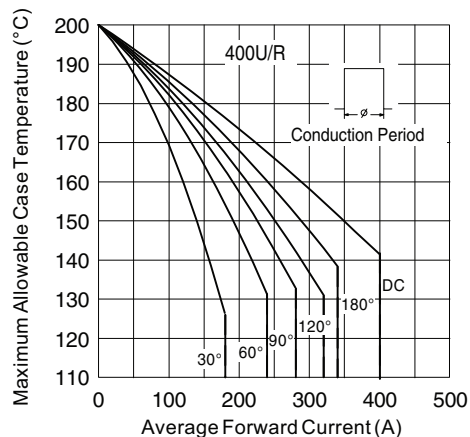


Fig. 2 - Current Ratings Characteristics

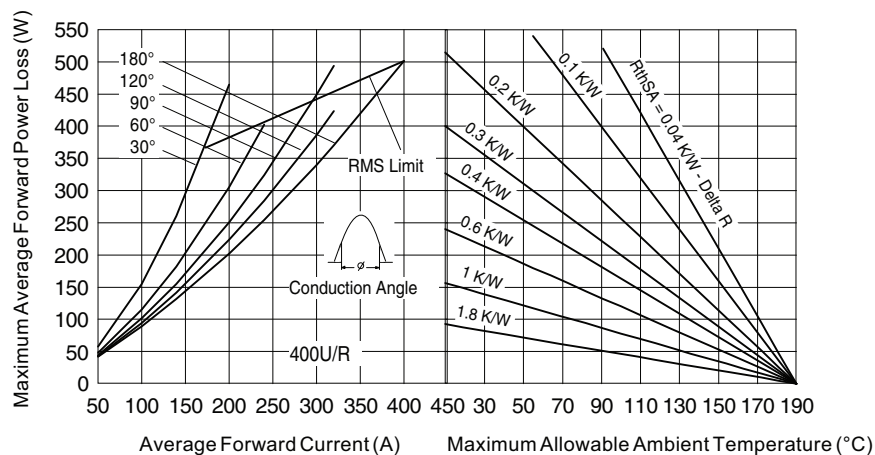


Fig. 3 - Forward Power Loss Characteristics

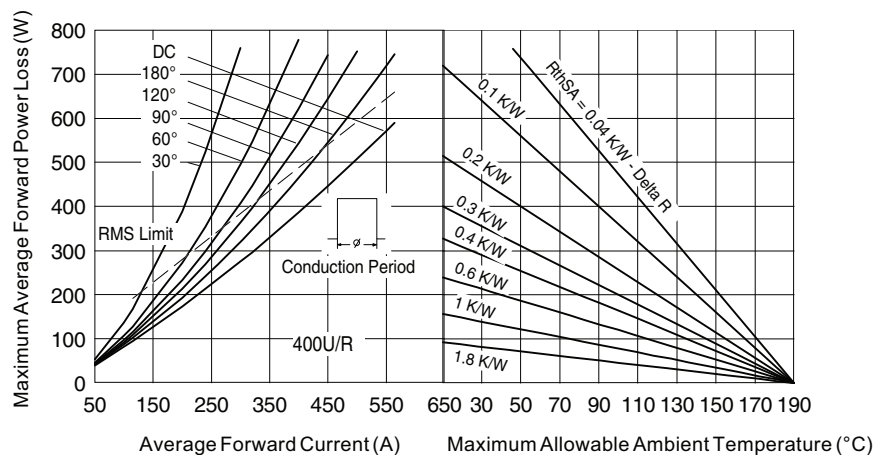


Fig. 4 - Forward Power Loss Characteristics

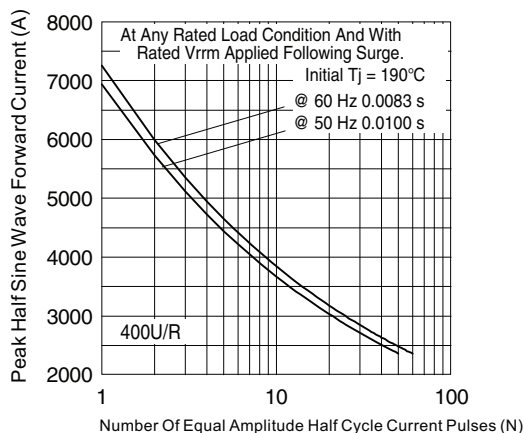


Fig. 5 - Maximum Non-Repetitive Surge Current

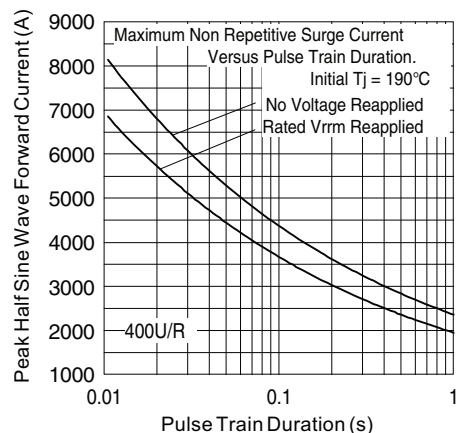


Fig. 6 - Maximum Non-Repetitive Surge Current

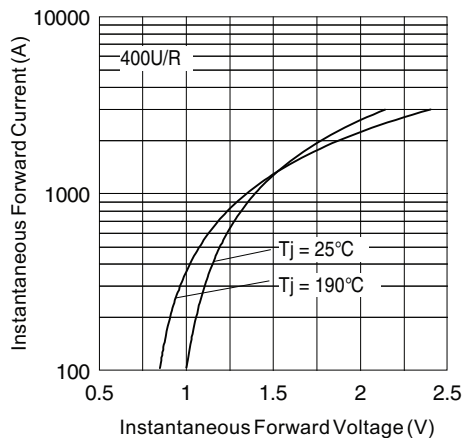
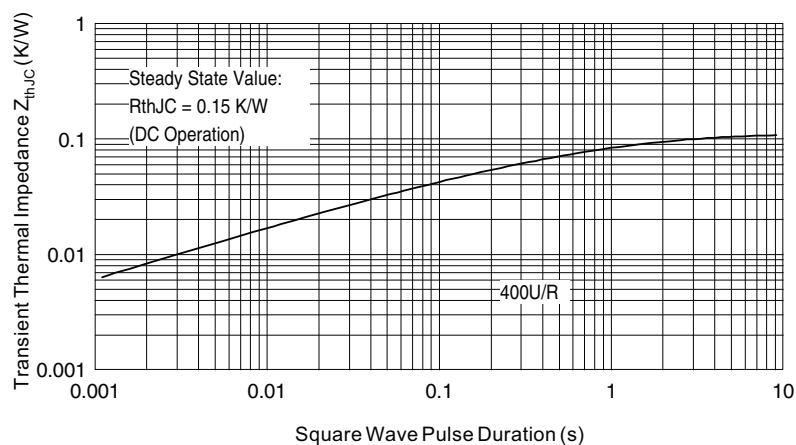


Fig. 7 - Forward Voltage Drop Characteristics


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic



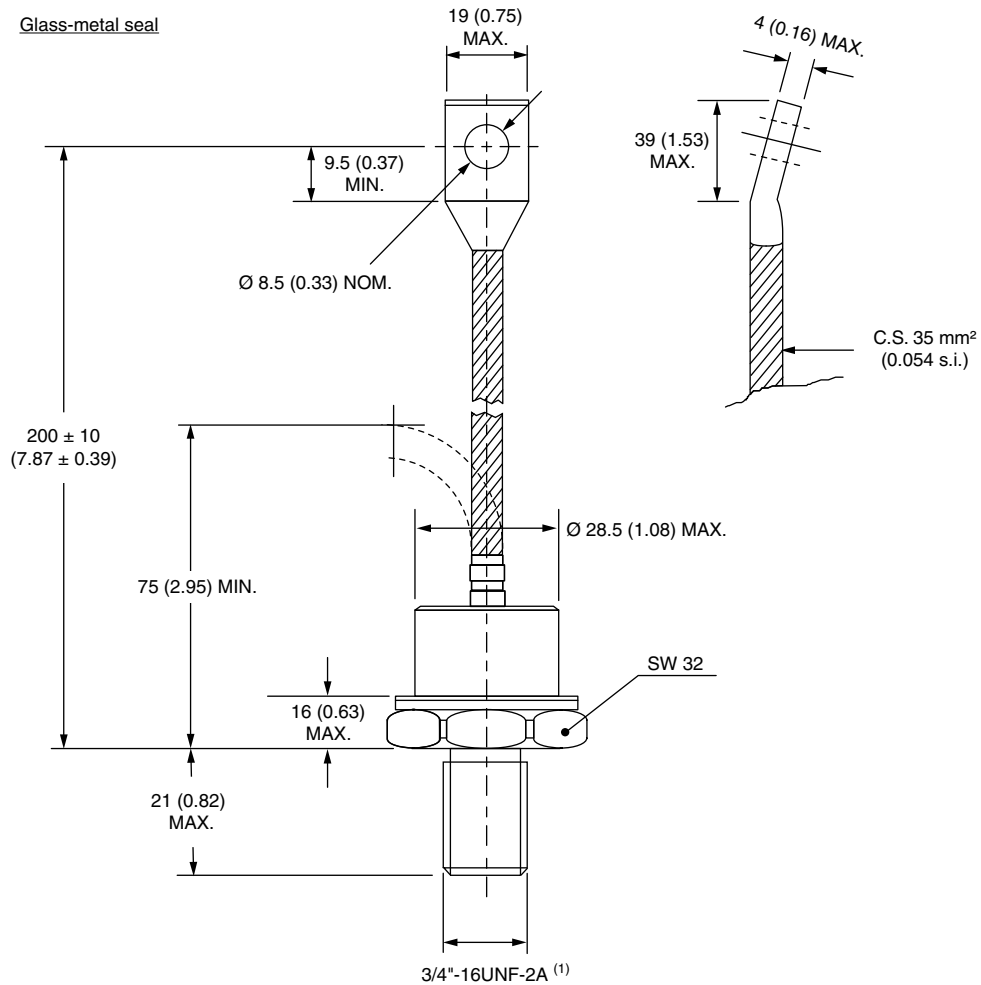
## ORDERING INFORMATION TABLE

|             |                                                                                                                                                     |    |   |   |   |     |   |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|---|-----|---|
| Device code | VS-                                                                                                                                                 | 40 | 0 | U | R | 160 | D |
|             | 1                                                                                                                                                   | 2  | 3 | 4 | 5 | 6   | 7 |
| 1           | - Vishay Semiconductors product                                                                                                                     |    |   |   |   |     |   |
| 2           | - 40 = essential part number                                                                                                                        |    |   |   |   |     |   |
| 3           | - 0 = standard recovery device                                                                                                                      |    |   |   |   |     |   |
| 4           | - U = stud normal polarity (cathode to stud)                                                                                                        |    |   |   |   |     |   |
| 5           | <ul style="list-style-type: none"><li>• None = stud normal polarity (cathode to stud)</li><li>• R = stud reverse polarity (anode to stud)</li></ul> |    |   |   |   |     |   |
| 6           | - Voltage code x 10 = $V_{RRM}$ (see Voltage Ratings table)                                                                                         |    |   |   |   |     |   |
| 7           | - Diffused diode                                                                                                                                    |    |   |   |   |     |   |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95339">www.vishay.com/doc?95339</a> |

## DO-205AB (DO-9) for 400U(R) Series

**DIMENSIONS** in millimeters (inches)



**Note**

- For metric device: M16 x 1.5 contact factory



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