

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



DO-9 (DO-205AB)

### FEATURES

- Wide current range
- High voltage ratings up to 2400 V
- High surge current capabilities
- Stud cathode and stud anode version
- Standard JEDEC® types
- Compression bonded encapsulations
- 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
- Medium traction applications

### PRIMARY CHARACTERISTICS

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

### MAJOR RATINGS AND CHARACTERISTICS

| PARAMETER    | TEST CONDITIONS | VALUES       | UNITS             |
|--------------|-----------------|--------------|-------------------|
| $I_{F(AV)}$  |                 | 480          | A                 |
|              | $T_C$           | 120          | °C                |
| $I_{F(RMS)}$ |                 | 630          | A                 |
| $I_{FSM}$    | 50 Hz           | 8250         |                   |
|              | 60 Hz           | 8640         |                   |
| $I^2t$       | 50 Hz           | 340          | kA <sup>2</sup> s |
|              | 60 Hz           | 311          |                   |
| $V_{RRM}$    | Range           | 1600 to 2400 | V                 |
| $T_J$        |                 | -40 to +190  | °C                |

### ELECTRICAL SPECIFICATIONS

#### VOLTAGE RATINGS

| TYPE NUMBER | VOLTAGE CODE | $V_{RRM}$ , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE<br>V | $I_{RRM}$ MAXIMUM AT $T_J = T_J$ MAXIMUM<br>mA |
|-------------|--------------|----------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------|
| VS-SD400N/R | 16           | 1600                                                     | 1700                                                         | 15                                             |
|             | 20           | 2000                                                     | 2100                                                         |                                                |
|             | 24           | 2400                                                     | 2500                                                         |                                                |



| 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                 |                   |
|                                                               |                     |                                                                                                              |                                  |                                                                          | 480    | A                  |                   |
|                                                               |                     |                                                                                                              |                                  |                                                                          | 100    | °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<br>T <sub>J</sub> = T <sub>J</sub> maximum | 8250   |                    |                   |
|                                                               |                     | 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 % x π x I <sub>F(AV)</sub> < I < π x I <sub>F(AV)</sub> ),<br>T <sub>J</sub> = T <sub>J</sub> maximum  |                                  |                                                                          | 0.80   | V                  |                   |
| High level value of threshold voltage                         | V <sub>F(TO)2</sub> | (I > π x 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 % x π x I <sub>F(AV)</sub> < I < π x I <sub>F(AV)</sub> ),<br>T <sub>J</sub> = T <sub>J</sub> maximum  |                                  |                                                                          | 0.55   | mW                 |                   |
| High level value of forward slope resistance                  | r <sub>f2</sub>     | (I > π x I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum                                       |                                  |                                                                          | 0.51   |                    |                   |
| Maximum forward voltage drop                                  | V <sub>FM</sub>     | I <sub>pk</sub> = 1500 A, T <sub>J</sub> = T <sub>J</sub> maximum,<br>t <sub>p</sub> = 10 ms sinusoidal wave |                                  |                                                                          | 1.62   | V                  |                   |

| THERMAL AND MECHANICAL SPECIFICATIONS        |            |                                               |                 |       |
|----------------------------------------------|------------|-----------------------------------------------|-----------------|-------|
| PARAMETER                                    | SYMBOL     | TEST CONDITIONS                               | VALUES          | UNITS |
| Maximum junction operating temperature range | $T_J$      |                                               | -40 to +190     | °C    |
| Maximum storage temperature range            | $T_{Stg}$  |                                               | -55 to +200     |       |
| Maximum thermal resistance, junction to case | $R_{thJC}$ | DC operation                                  | 0.11            | K/W   |
| Maximum thermal resistance, case to heatsink | $R_{thCS}$ | Mounting surface, smooth, flat and greased    | 0.04            |       |
| Maximum allowed mounting torque $\pm 10\%$   |            | Not-lubricated threads                        | 27              | Nm    |
| 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

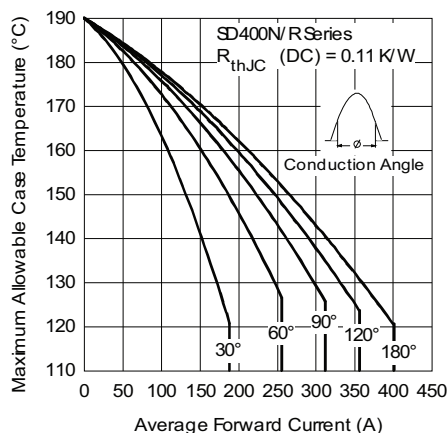


Fig. 1 - Current Ratings Characteristics

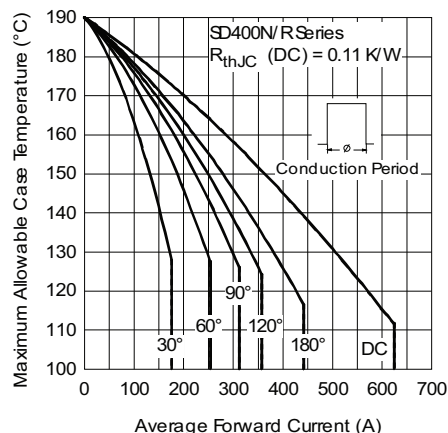


Fig. 2 - Current Ratings Characteristics

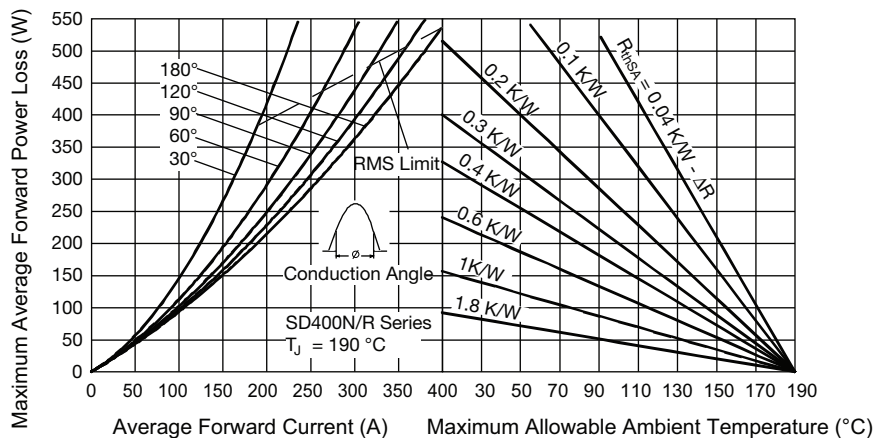


Fig. 3 - Forward Power Loss Characteristics

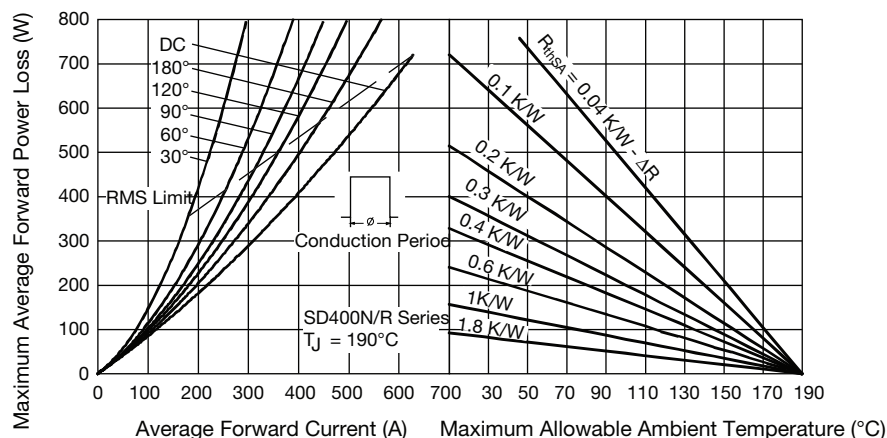


Fig. 4 - Forward Power Loss Characteristics

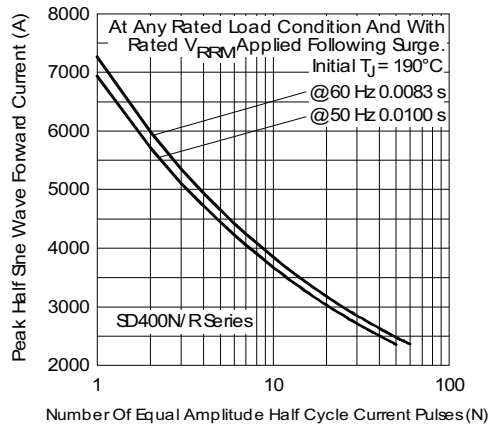


Fig. 5 - Maximum Non-Repetitive Surge Current

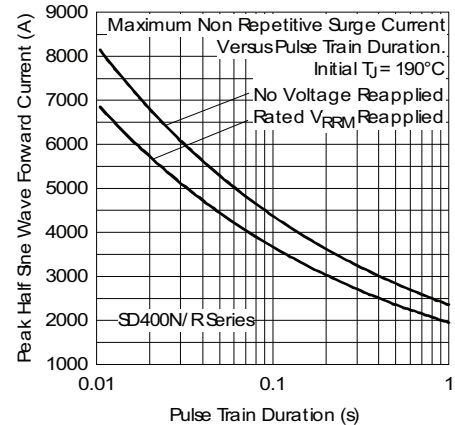


Fig. 6 - Maximum Non-Repetitive Surge Current

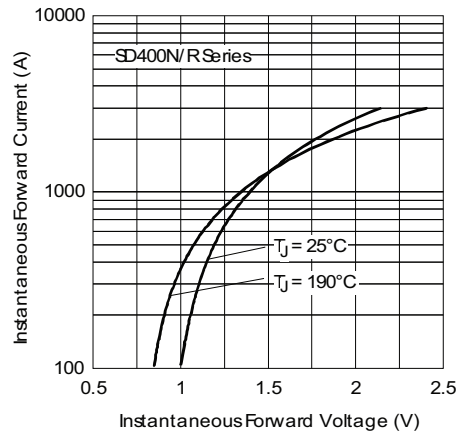
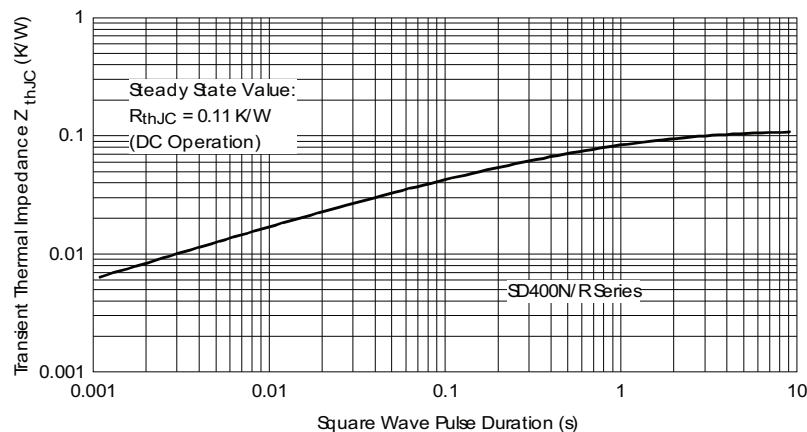


Fig. 7 - Forward Voltage Drop Characteristics


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



## ORDERING INFORMATION TABLE

|             |     |    |    |   |   |    |   |   |
|-------------|-----|----|----|---|---|----|---|---|
| Device code | VS- | SD | 40 | 0 | N | 24 | P | C |
|             | 1   | 2  | 3  | 4 | 5 | 6  | 7 | 8 |

- 1** - Vishay Semiconductors product
- 2** - Diode
- 3** - Essential part number
- 4** - 0 = standard recovery
- 5** -
  - N = stud normal polarity (cathode to stud)
  - R = stud reverse polarity (anode to stud)
- 6** - Voltage code x 100 =  $V_{RRM}$  (see Voltage Ratings table)
- 7** - P = stud base DO-9 (DO-205AB) 3/4" 16UNF-2A
- 8** - C = ceramic housing

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95301">www.vishay.com/doc?95301</a> |

**DIMENSIONS** in millimeters (inches)





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