



## Standard Recovery Diodes, (Stud Version), 85 A



DO-5 (DO-203AB)

### FEATURES

- High surge current capability
- Stud cathode and stud anode version
- Leaded version available
- Types up to 1600 V  $V_{RRM}$
- 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

- Battery chargers
- Converters
- Power supplies
- Machine tool controls
- Welding

### PRIMARY CHARACTERISTICS

|                       |                 |
|-----------------------|-----------------|
| $I_{F(AV)}$           | 85 A            |
| Package               | DO-5 (DO-203AB) |
| Circuit configuration | Single          |

### MAJOR RATINGS AND CHARACTERISTICS

| PARAMETER    | TEST CONDITIONS | 85HF(R)     |              | UNITS            |
|--------------|-----------------|-------------|--------------|------------------|
|              |                 | 10 to 120   | 140 to 160   |                  |
| $I_{F(AV)}$  |                 | 85          | 85           | A                |
|              | $T_C$           | 140         | 110          | °C               |
| $I_{F(RMS)}$ |                 | 133         | 133          | A                |
| $I_{FSM}$    | 50 Hz           | 1700        | 1700         | A                |
|              | 60 Hz           | 1800        | 1800         |                  |
| $I^2t$       | 50 Hz           | 14 500      | 14 500       | A <sup>2</sup> s |
|              | 60 Hz           | 13 500      | 13 500       |                  |
| $V_{RRM}$    | Range           | 100 to 1200 | 1400 to 1600 | V                |
| $T_J$        |                 | -65 to +180 | -65 to +150  | °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-85HF(R)<br>VS-86HF(R)<br>VS-87HF(R)<br>VS-88HF(R) | 10           | 100                                                         | 200                                                             | 9                                                 |
|                                                      | 20           | 200                                                         | 300                                                             |                                                   |
|                                                      | 40           | 400                                                         | 500                                                             |                                                   |
|                                                      | 60           | 600                                                         | 700                                                             |                                                   |
|                                                      | 80           | 800                                                         | 900                                                             |                                                   |
|                                                      | 100          | 1000                                                        | 1100                                                            |                                                   |
|                                                      | 120          | 1200                                                        | 1300                                                            |                                                   |
|                                                      | 140          | 1400                                                        | 1500                                                            | 4.5                                               |
|                                                      | 160          | 1600                                                        | 1700                                                            |                                                   |



| FORWARD CONDUCTION                                            |                     |                                                                                           |                                             |                                                                       |           |         |                   |
|---------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------|-----------|---------|-------------------|
| PARAMETER                                                     | SYMBOL              | TEST CONDITIONS                                                                           |                                             |                                                                       | 85HF(R)   |         | UNITS             |
|                                                               |                     |                                                                                           |                                             |                                                                       | 10 to 120 | 140/160 |                   |
| Maximum average forward current at case temperature           | I <sub>F(AV)</sub>  | 180° conduction, half sine wave                                                           |                                             |                                                                       | 85        |         | A                 |
|                                                               |                     |                                                                                           |                                             |                                                                       | 140       | 110     | °C                |
| Maximum RMS forward current                                   | I <sub>F(RMS)</sub> |                                                                                           |                                             |                                                                       | 133       |         | A                 |
| Maximum peak, one-cycle forward, non-repetitive surge current | I <sub>FSM</sub>    | t = 10 ms                                                                                 | No voltage reappplied                       | Sinusoidal half wave, initial T <sub>J</sub> = T <sub>J</sub> maximum | 1700      |         | A                 |
|                                                               |                     | t = 8.3 ms                                                                                |                                             |                                                                       | 1800      |         |                   |
|                                                               |                     | t = 10 ms                                                                                 | 100 % V <sub>R<sub>RM</sub></sub> reapplied |                                                                       | 1450      |         |                   |
|                                                               |                     | t = 8.3 ms                                                                                |                                             |                                                                       | 1500      |         |                   |
| Maximum I <sup>2</sup> t for fusing                           | I <sup>2</sup> t    | t = 10 ms                                                                                 | No voltage reappplied                       |                                                                       | 14 500    |         | A <sup>2</sup> s  |
|                                                               |                     | t = 8.3 ms                                                                                |                                             |                                                                       | 13 500    |         |                   |
|                                                               |                     | t = 10 ms                                                                                 | 100 % V <sub>R<sub>RM</sub></sub> reapplied |                                                                       | 10 500    |         |                   |
|                                                               |                     | t = 8.3 ms                                                                                |                                             |                                                                       | 9400      |         |                   |
| Maximum I <sup>2</sup> √t for fusing                          | I <sup>2</sup> √t   | t = 0.1 ms to 10 ms, no voltage reapplied                                                 |                                             |                                                                       | 145 000   |         | A <sup>2</sup> √s |
| Value of threshold voltage (up to 1200 V)                     | V <sub>F(TO)</sub>  | T <sub>J</sub> = T <sub>J</sub> maximum                                                   |                                             |                                                                       | 0.68      |         | V                 |
| Value of threshold voltage (for 1400 V, 1600 V)               |                     |                                                                                           |                                             |                                                                       | 0.69      |         |                   |
| Value of forward slope resistance (up to 1200 V)              | r <sub>f</sub>      | T <sub>J</sub> = T <sub>J</sub> maximum                                                   |                                             |                                                                       | 1.62      |         | mW                |
| Value of forward slope resistance (for 1400 V, 1600 V)        |                     |                                                                                           |                                             |                                                                       | 1.75      |         |                   |
| Maximum forward voltage drop                                  | V <sub>FM</sub>     | I <sub>pk</sub> = 267 A, T <sub>J</sub> = 25 °C, t <sub>p</sub> = 400 μs rectangular wave |                                             |                                                                       | 1.2       | 1.4     | V                 |

| THERMAL AND MECHANICAL SPECIFICATIONS                    |                                   |                                               |                 |             |                     |
|----------------------------------------------------------|-----------------------------------|-----------------------------------------------|-----------------|-------------|---------------------|
| PARAMETER                                                | SYMBOL                            | TEST CONDITIONS                               | 85HF(R)         |             | UNITS               |
|                                                          |                                   |                                               | 10 to 20        | 140 to 160  |                     |
| Maximum junction operating and storage temperature range | T <sub>J</sub> , T <sub>Stg</sub> |                                               | -65 to +180     | -65 to +150 | °C                  |
| Maximum thermal resistance, junction to case             | R <sub>thJC</sub>                 | DC operation                                  | 0.35            |             | K/W                 |
| Maximum thermal resistance, case to heatsink             | R <sub>thCS</sub>                 | Mounting surface, smooth, flat and greased    | 0.25            |             |                     |
| Maximum shock <sup>(1)</sup>                             |                                   |                                               | 1500            |             | g                   |
| Maximum constant vibration <sup>(1)</sup>                |                                   | 50 Hz                                         | 20              |             |                     |
| Maximum constant acceleration <sup>(1)</sup>             |                                   | Stud outwards                                 | 5000            |             |                     |
| Maximum allowable mounting torque<br>+ 0 %, - 10 %       |                                   | Not lubricated thread, tightening on nut      | 3.4 (30)        |             | N · m<br>(lbf · in) |
|                                                          |                                   | Lubricated thread, tightening on nut          | 2.3 (20)        |             |                     |
|                                                          |                                   | Not lubricated thread, tightening on hexagon  | 4.2 (37)        |             |                     |
|                                                          |                                   | Lubricated thread, tightening on hexagon      | 3.2 (28)        |             |                     |
| Approximate weight                                       |                                   | Unleaded device                               | 17              |             | g                   |
|                                                          |                                   |                                               | 0.6             |             | oz.                 |
| Case style                                               |                                   | See dimensions - link at the end of datasheet | DO-5 (DO-203AB) |             |                     |

## Notes

- <sup>(1)</sup> Available only for 88HF
- <sup>(2)</sup> Recommended for pass-through holes
- <sup>(3)</sup> Recommended for holed threaded heatsinks



| $\Delta R_{thJC}$ CONDUCTION |                       |                        |                             |       |
|------------------------------|-----------------------|------------------------|-----------------------------|-------|
| CONDUCTION ANGLE             | SINUSOIDAL CONDUCTION | RECTANGULAR CONDUCTION | TEST CONDITIONS             | UNITS |
| 180°                         | 0.10                  | 0.08                   | $T_J = T_J \text{ maximum}$ | K/W   |
| 120°                         | 0.11                  | 0.11                   |                             |       |
| 90°                          | 0.13                  | 0.13                   |                             |       |
| 60°                          | 0.17                  | 0.17                   |                             |       |
| 30°                          | 0.26                  | 0.26                   |                             |       |

## Note

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

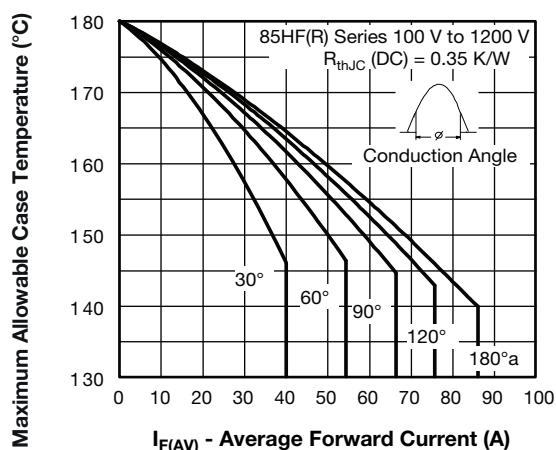


Fig. 1 - Current Ratings Characteristics

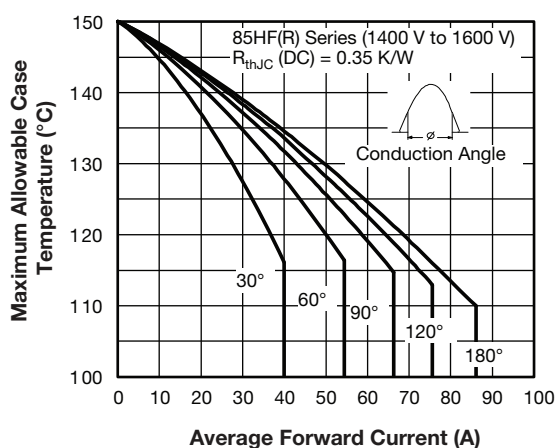


Fig. 3 - Current Ratings Characteristics

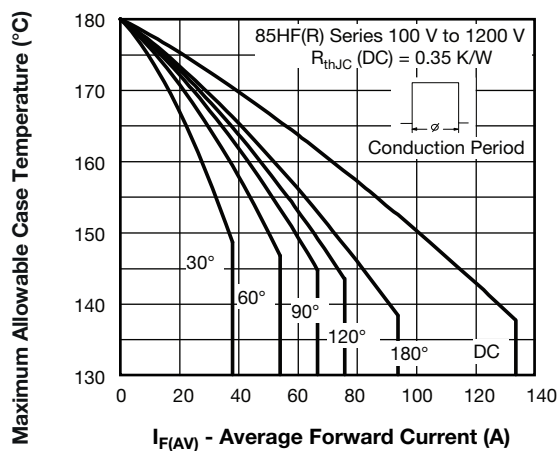


Fig. 2 - Current Ratings Characteristics

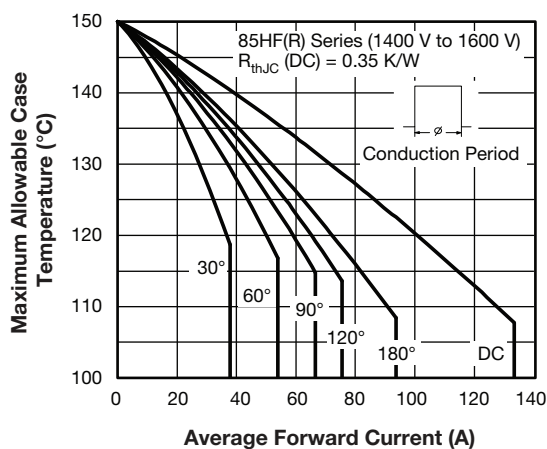


Fig. 4 - Current Ratings Characteristics



# VS-85HF(R), VS-86HF(R), VS-87HF(R), VS-88HF(R) Series

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Vishay Semiconductors

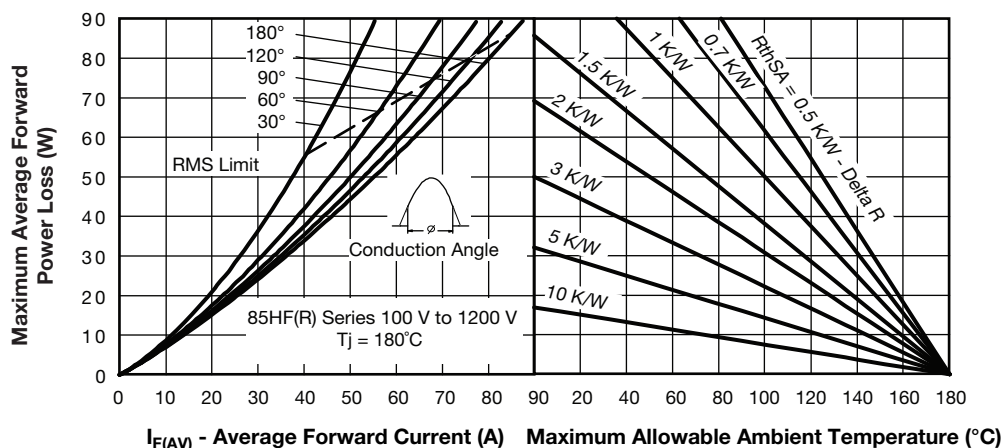


Fig. 5 - Forward Power Loss Characteristics

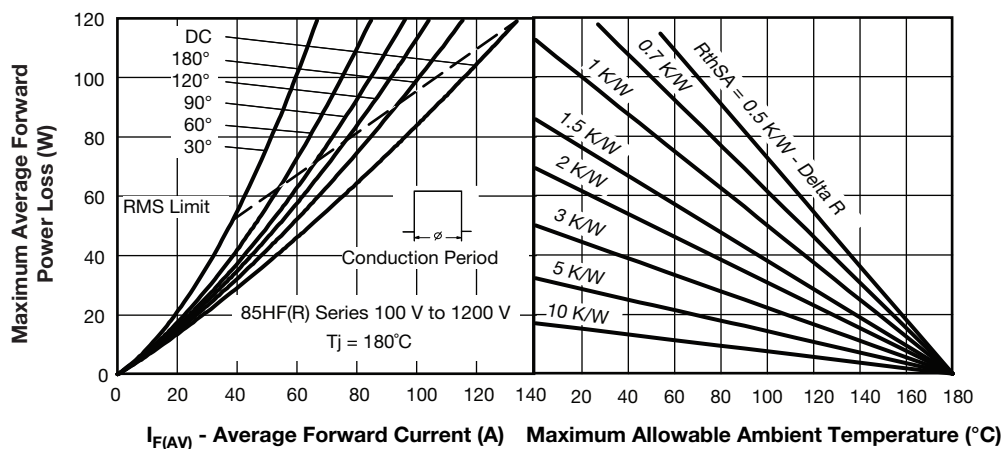


Fig. 6 - Forward Power Loss Characteristics

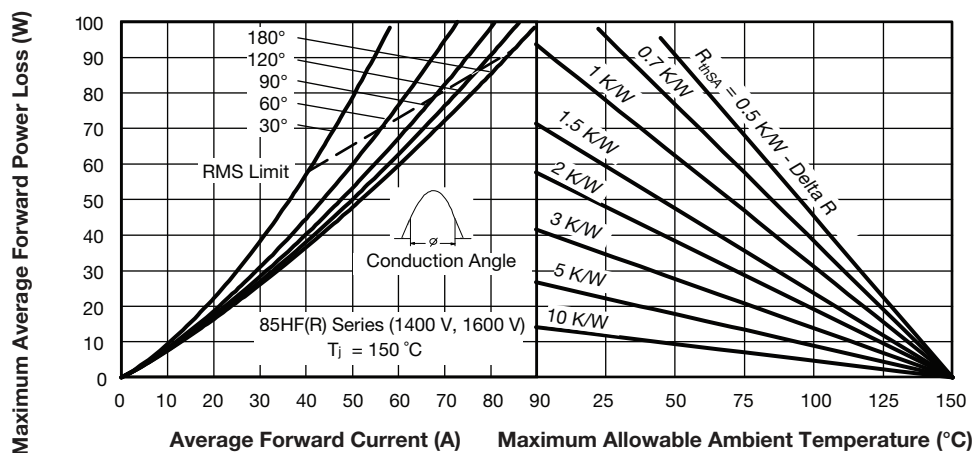


Fig. 7 - Forward Power Loss Characteristics

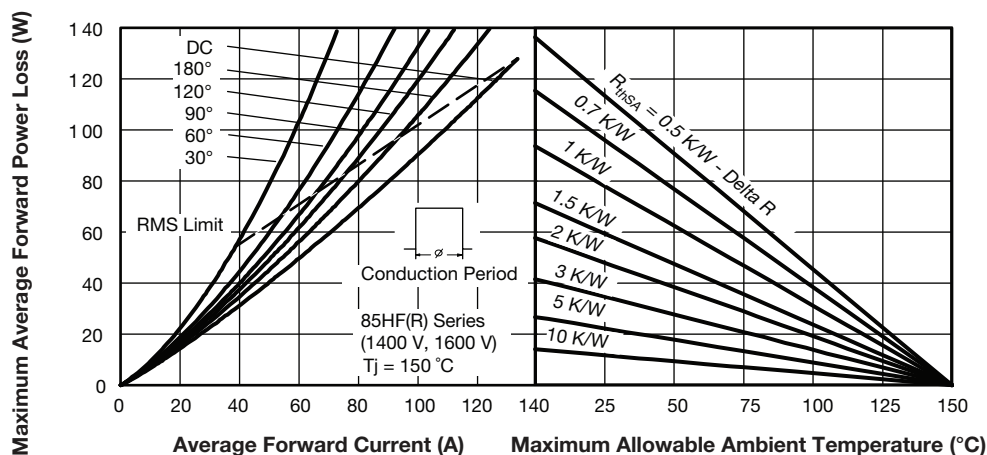


Fig. 8 - Forward Power Loss Characteristics

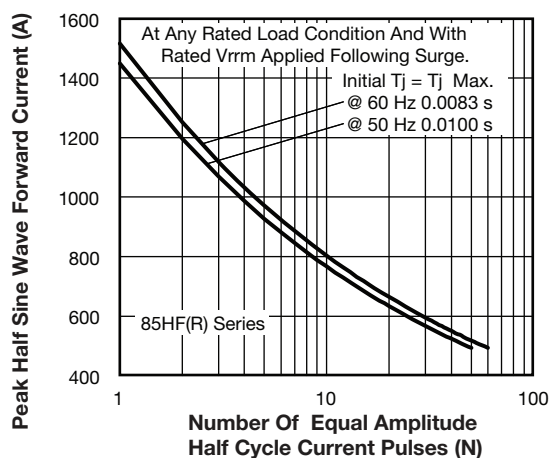


Fig. 9 - Maximum Non-Repetitive Surge Current

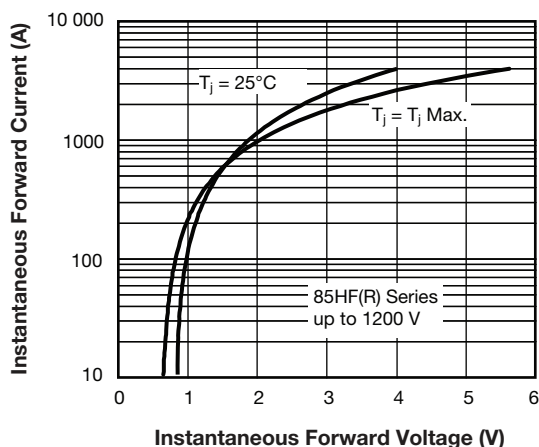


Fig. 11 - Forward Voltage Drop Characteristics

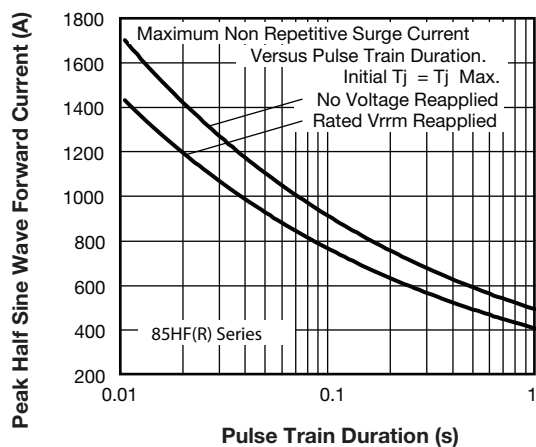


Fig. 10 - Maximum Non-Repetitive Surge Current

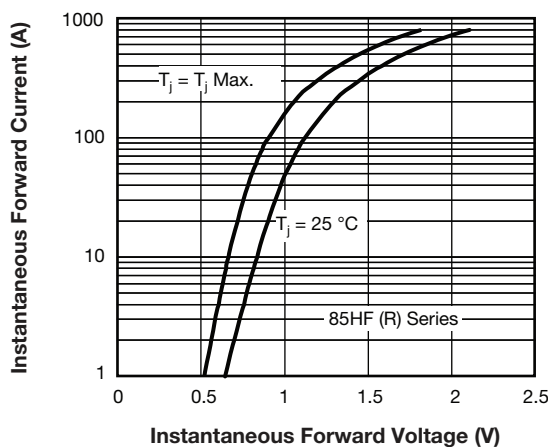


Fig. 12 - Forward Voltage Drop Characteristics (for 1400 V, 1600 V)

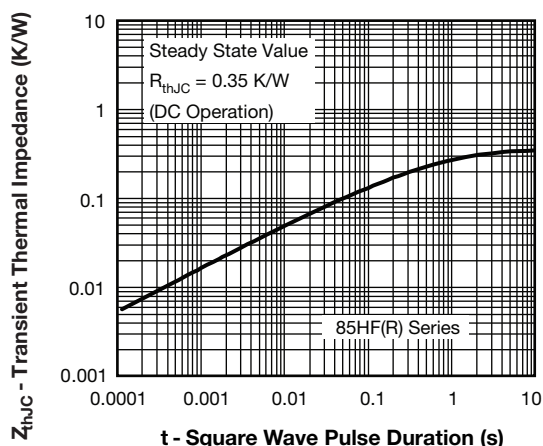


Fig. 13 - Thermal Impedance  $Z_{thJC}$  Characteristics

## ORDERING INFORMATION TABLE

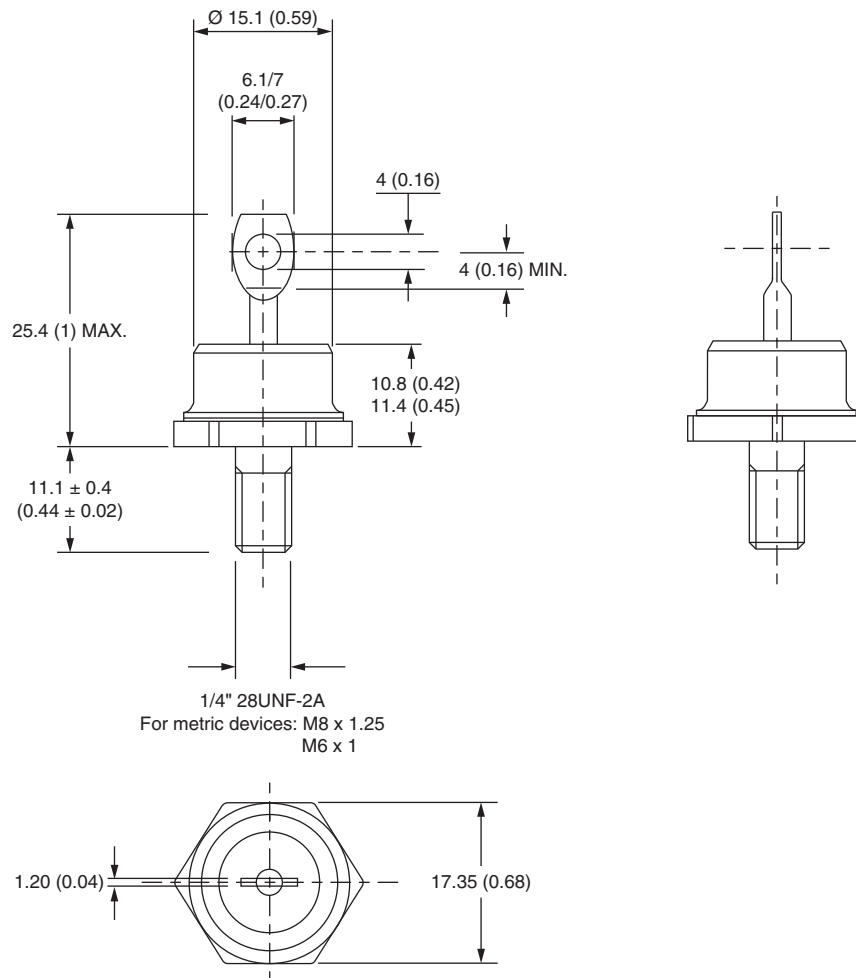
| Device code | VS-                                                                                                                                                                                       | 85 | HF | R | 160 | M |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|---|-----|---|
|             | ①                                                                                                                                                                                         | ②  | ③  | ④ | ⑤   | ⑥ |
| ①           | - Vishay Semiconductors product                                                                                                                                                           |    |    |   |     |   |
| ②           | - 85 = standard device<br>86 = not isolated lead<br>87 = isolated lead with silicone sleeve<br>(red = Reverse polarity)<br>(blue = Normal polarity)<br>88 = type for rotating application |    |    |   |     |   |
| ③           | - HF = standard diode                                                                                                                                                                     |    |    |   |     |   |
| ④           | - None = stud normal polarity (cathode to stud)<br>R = stud reverse polarity (anode to stud)                                                                                              |    |    |   |     |   |
| ⑤           | - Voltage code x 10 = $V_{RRM}$ (see Voltage Ratings table)                                                                                                                               |    |    |   |     |   |
| ⑥           | - None = stud base DO-5 (DO-203AB) 1/4" 28UNF-2A<br>M = stud base DO-5 (DO-203AB) M6 x 1 (not available for 88HF)<br>M8 = stud base DO-5 (DO-203AB) M8 x 1.25 (not available for 88HF)    |    |    |   |     |   |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95342">www.vishay.com/doc?95342</a> |



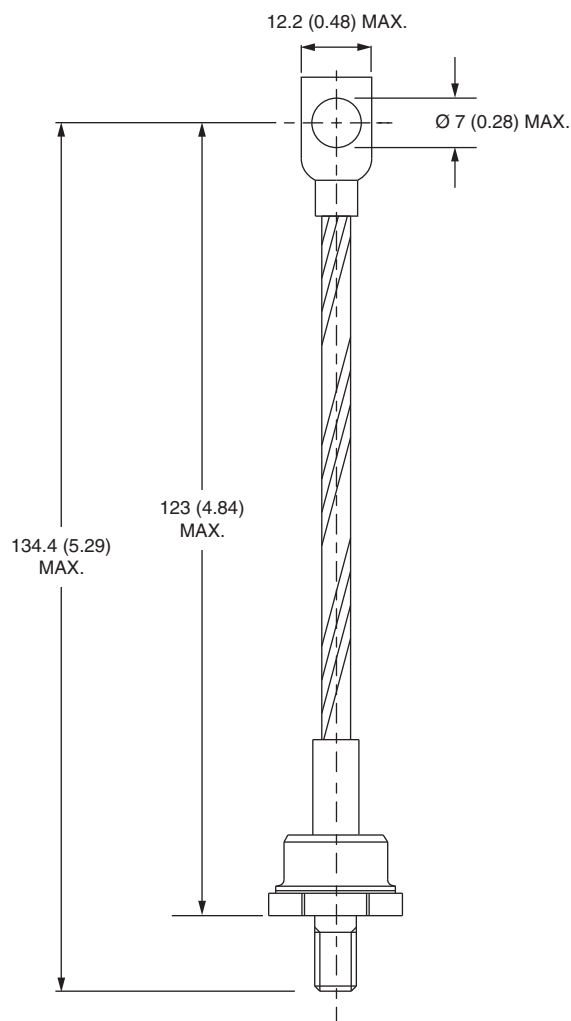
## DO-5 (DO-203AB) for 85HF(R), 86HF(R) and 88HF(R) Series

**DIMENSIONS FOR 85HF(R) SERIES** in millimeters (inches)

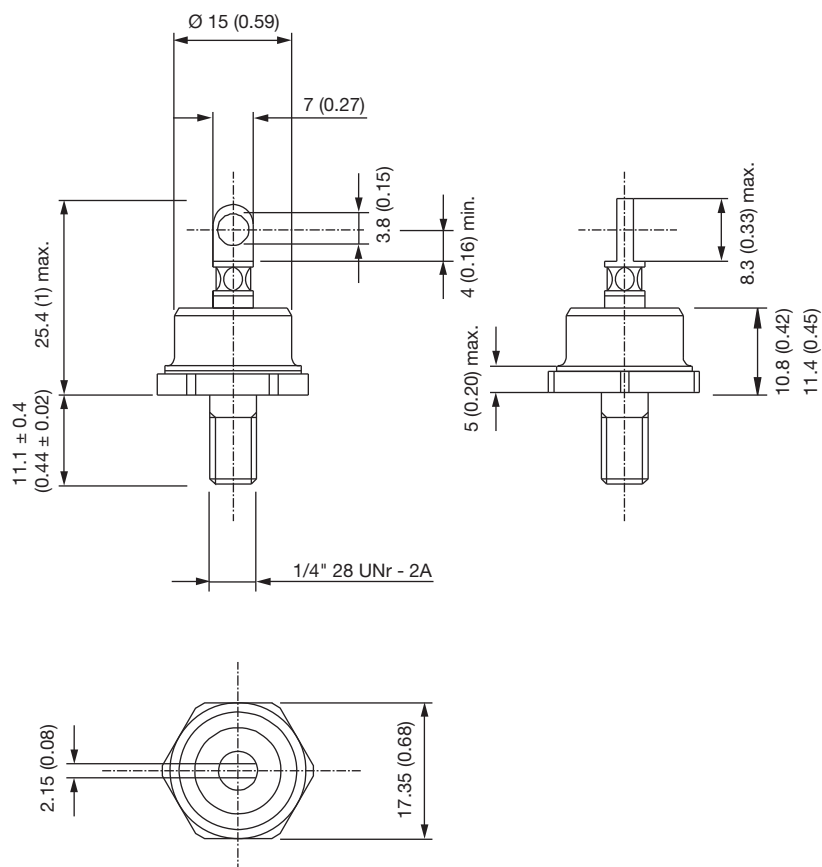




## DIMENSIONS FOR 86HF(R) SERIES in millimeters (inches)



### DIMENSIONS 88HF(R) SERIES in millimeters (inches)





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