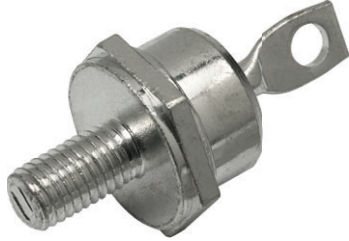




## Fast Recovery Diodes (Stud Version), 40 A, 70 A, 85 A



DO-203AB (DO-5)

### FEATURES

- Short reverse recovery time
- Low stored charge
- Wide current range
- Excellent surge capabilities
- Stud cathode and stud anode versions
- Types up to 100 V<sub>RRM</sub>
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

### TYPICAL APPLICATIONS

- DC power supplies
- Inverters
- Converters
- Choppers
- Ultrasonic systems
- Freewheeling diodes

| PRODUCT SUMMARY       |                  |
|-----------------------|------------------|
| I <sub>F(AV)</sub>    | 40 A, 70 A, 85 A |
| Package               | DO-203AB (DO-5)  |
| Circuit Configuration | Single diode     |

| MAJOR RATINGS AND CHARACTERISTICS |                        |                                    |                                    |                                    |                   |
|-----------------------------------|------------------------|------------------------------------|------------------------------------|------------------------------------|-------------------|
| PARAMETER                         | TEST CONDITIONS        | 40HFL                              | 70HFL                              | 85HFL                              | UNITS             |
| I <sub>F(AV)</sub>                |                        | 40                                 | 70                                 | 85                                 | A                 |
|                                   | T <sub>C</sub> maximum | 85                                 | 85                                 | 85                                 | °C                |
| I <sub>FSM</sub>                  | 50 Hz                  | 400                                | 700                                | 1100                               | A                 |
|                                   | 60 Hz                  | 420                                | 730                                | 1151                               |                   |
| I <sup>2</sup> t                  | 50 Hz                  | 800                                | 2450                               | 6050                               | A <sup>2</sup> s  |
|                                   | 60 Hz                  | 730                                | 2240                               | 5523                               |                   |
| I <sup>2</sup> √t                 |                        | 11 300                             | 34 650                             | 85 560                             | I <sup>2</sup> √s |
| V <sub>RRM</sub>                  | Range                  | 100 to 1000                        | 100 to 1000                        | 100 to 1000                        | V                 |
| t <sub>rr</sub>                   |                        | See Recovery Characteristics table | See Recovery Characteristics table | See Recovery Characteristics table | ns                |
| T <sub>J</sub>                    | Range                  | -40 to 125                         | -40 to 125                         | -40 to 125                         | °C                |



**ELECTRICAL SPECIFICATIONS**

| <b>VOLTAGE RATINGS</b>       |   |   |  |                         |
|------------------------------|---|---|--|-------------------------|
| TYPE NUMBER <sup>(1)</sup>   | V <sub>RRM</sub> , MAXIMUM PEAK REPETITIVE REVERSE VOLTAGE<br>T <sub>J</sub> = - 40 °C TO 125 °C<br>V | V <sub>RSM</sub> , MAXIMUM PEAK NON-REPETITIVE REVERSE VOLTAGE<br>T <sub>J</sub> = 25 °C TO 125 °C<br>V | I <sub>FM</sub> , MAXIMUM PEAK REVERSE CURRENT AT RATED V <sub>RRM</sub><br>mA |                         |
|                              |   |   | T <sub>J</sub> = 25 °C   | T <sub>J</sub> = 125 °C |
| VS-40HFL10S02, VS-40HFL10S05 | 100   | 150   | 0.1  | 10                      |
| VS-40HFL20S02, VS-40HFL20S05 | 200   | 300   |  |                         |
| VS-40HFL40S02, VS-40HFL40S05 | 400   | 500   |  |                         |
| VS-40HFL60S02, VS-40HFL60S05 | 600   | 700   |  |                         |
| VS-40HFL80S05                | 800   | 900   |  |                         |
| VS-40HFL100S05               | 1000  | 1100  |  |                         |
| VS-70HFL10S02, VS-70HFL10S05 | 100   | 150   | 0.1  | 15                      |
| VS-70HFL20S02, VS-70HFL20S05 | 200   | 300   |  |                         |
| VS-70HFL40S02, VS-70HFL40S05 | 400   | 500   |  |                         |
| VS-70HFL60S02, VS-70HFL60S05 | 600   | 700   |  |                         |
| VS-70HFL80S05                | 800   | 900   |  |                         |
| VS-70HFL100S05               | 1000  | 1100  |  |                         |
| VS-85HFL10S02, VS-85HFL10S05 | 100   | 150   | 0.1  | 20                      |
| VS-85HFL20S02, VS-85HFL20S05 | 200   | 300   |  |                         |
| VS-85HFL40S02, VS-85HFL40S05 | 400   | 500   |  |                         |
| VS-85HFL60S02, VS-85HFL60S05 | 600   | 700   |  |                         |
| VS-85HFL80S05                | 800   | 900   |  |                         |
| VS-85HFL100S05               | 1000  | 1100  |  |                         |

**Note**

<sup>(1)</sup> Types listed are cathode case, for anode case add "R" to code, i.e. 40HFLR20S02, 85HFLR100S05 etc.

| <b>FORWARD CONDUCTION</b>                                   |                     |  |   |        |        |        |                   |
|---|---------------------|--|---|--------|--------|--------|-------------------|
| PARAMETER   | SYMBOL              | TEST CONDITIONS  |   | 40HFL  | 70HFL  | 85HFL  | UNITS             |
| Maximum average forward current at maximum case temperature | I <sub>F(AV)</sub>  | 180° conduction, half sine wave                                  |   | 40     | 70     | 85     | A                 |
|   |                     |  |   | 75     |        |        | °C                |
| Maximum RMS forward current                                 | I <sub>F(RMS)</sub> |  |   | 63     | 110    | 134    | A                 |
| Maximum peak repetitive forward current                     | I <sub>FRM</sub>    | Sinusoidal half wave, 30° conduction                             |   | 220    | 380    | 470    | A                 |
| Maximum peak, one-cycle non-repetitive forward current      | I <sub>FSM</sub>    | t = 10 ms  | Sinusoidal half wave, 100 % V <sub>RRM</sub> reapplied, initial T <sub>J</sub> = T <sub>J</sub> maximum | 400    | 700    | 1100   | A                 |
|   |                     | t = 8.3 ms   |   | 420    | 730    | 1151   |                   |
|   |                     | t = 10 ms  | Sinusoidal half wave, no voltage reapplied, initial T <sub>J</sub> = T <sub>J</sub> maximum             | 475    | 830    | 1308   |                   |
|   |                     | t = 8.3 ms   |   | 500    | 870    | 1369   |                   |
| Maximum I <sup>2</sup> t for fusing                         | I <sup>2</sup> t    | t = 10 ms  | 100 % V <sub>RRM</sub> reapplied, initial T <sub>J</sub> = T <sub>J</sub> maximum                       | 800    | 2450   | 6050   | A <sup>2</sup> s  |
|   |                     | t = 8.3 ms   |   | 730    | 2240   | 5523   |                   |
|   |                     | t = 10 ms  | No voltage reapplied, initial T <sub>J</sub> = T <sub>J</sub> maximum                                   | 1130   | 3460   | 8556   |                   |
|   |                     | t = 8.3 ms   |   | 1030   | 3160   | 7810   |                   |
| Maximum I <sup>2</sup> √t for fusing <sup>(1)</sup>         | I <sup>2</sup> √t   | t = 0.1 ms to 10 ms, no voltage reapplied                        |   | 11 300 | 34 650 | 85 560 | A <sup>2</sup> √s |
| Maximum value of threshold voltage                          | V <sub>F(TO)</sub>  | T <sub>J</sub> = 125 °C  |   | 1.081  | 1.085  | 1.128  | V                 |
| Maximum value of forward slope resistance                   | r <sub>F</sub>      |  |   | 6.33   | 3.40   | 2.11   | mΩ                |
| Maximum forward voltage drop                                | V <sub>FM</sub>     | T <sub>J</sub> = 25 °C, I <sub>FM</sub> = π × I <sub>F(AV)</sub> |   | 1.95   | 1.85   | 1.75   | V                 |

**Note**

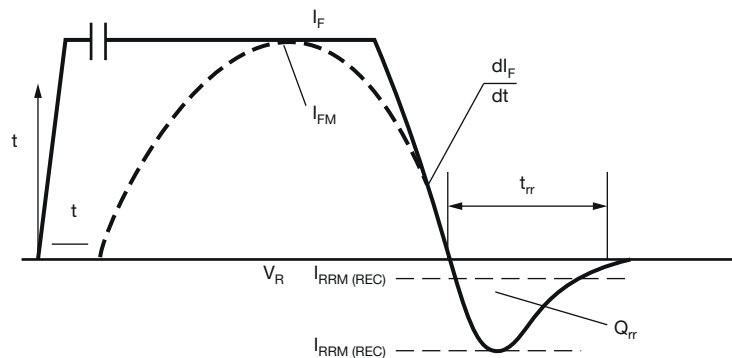
<sup>(1)</sup> I<sup>2</sup>t for time t<sub>x</sub> = I<sup>2</sup>√t × √t<sub>x</sub>

| RECOVERY CHARACTERISTICS         |          |   |          |      |          |      |          |      |       |
|----------------------------------|----------|---|----------|------|----------|------|----------|------|-------|
| PARAMETER                        | SYMBOL   | TEST CONDITIONS   | 40HFL... |      | 70HFL... |      | 85HFL... |      | UNITS |
|                                  |          |   | S02      | S05  | S02      | S05  | S02      | S05  |       |
| Typical reverse recovery time    | $t_{rr}$ | $T_J = 25\text{ }^\circ\text{C}$ , $I_F = 1\text{ A}$ to $V_R = 30\text{ V}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$     | 70       | 180  | 60       | 150  | 50       | 120  | ns    |
|                                  |          | $T_J = 25\text{ }^\circ\text{C}$ , $-di_F/dt = 25\text{ A}/\mu\text{s}$ , $I_{FM} = \pi \times \text{rated } I_{F(AV)}$ | 200      | 500  | 200      | 500  | 200      | 500  |       |
| Typical reverse recovered charge | $Q_{rr}$ | $T_J = 25\text{ }^\circ\text{C}$ , $I_F = 1\text{ A}$ to $V_R = 30\text{ V}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$     | 160      | 750  | 90       | 500  | 70       | 340  | nC    |
|                                  |          | $T_J = 25\text{ }^\circ\text{C}$ , $-di_F/dt = 25\text{ A}/\mu\text{s}$ , $I_{FM} = \pi \times \text{rated } I_{F(AV)}$ | 240      | 1300 | 240      | 1300 | 240      | 1300 |       |

| THERMAL AND MECHANICAL SPECIFICATIONS             |            |   |                 |       |       |                     |
|---|------------|---|-----------------|-------|-------|---------------------|
| PARAMETER   | SYMBOL     | TEST CONDITIONS   | 40HFL           | 70HFL | 85HFL | UNITS               |
| Junction operating temperature range              | $T_J$      |   | - 40 to 125     |       |       | °C                  |
| Storage temperature range                         | $T_{Stg}$  |   | - 40 to 150     |       |       |                     |
| Maximum thermal resistance, junction to case      | $R_{thJC}$ | DC operation  | 0.60            | 0.36  | 0.30  | K/W                 |
| Maximum thermal resistance, case to heatsink      | $R_{thCS}$ | Mounting surface, smooth, flat and greased                  | 0.25            |       |       |                     |
| Maximum allowable mounting torque (+ 0 %, - 10 %) |            | Not lubricated thread, tightening on nut <sup>(1)</sup>     | 3.4 (30)        |       |       | N · m<br>(lbf · in) |
|   |            | Lubricated thread, tightening on nut <sup>(1)</sup>         | 2.3 (20)        |       |       |                     |
|   |            | Not lubricated thread, tightening on hexagon <sup>(2)</sup> | 4.2 (37)        |       |       |                     |
|   |            | Lubricated thread, tightening on hexagon <sup>(2)</sup>     | 3.2 (28)        |       |       |                     |
| Approximate weight                                |            |   | 25              |       |       |                     |
|   |            |   | 0.88            |       |       |                     |
| Case style  |            | JEDEC   | DO-203AB (DO-5) |       |       |                     |

**Notes**

- (1) Recommended for pass-through holes
- (2) Recommended for holed threaded heatsinks



- $I_F$ ,  $I_{FM}$  - Peak forward current prior to commutation
- $-di_F/dt$  - Rate of fall forward current
- $I_{RRM} (REC)$  - Peak reverse recovery current
- $t_{rr}$  - Reverse recovery time
- $Q_{rr}$  - Reverse recovered charge

Fig. 1 - Reverse Recovery Time Test Waveform



Fig. 2 - Current Rating Nomogram (Sinusoidal Waveforms), 40HFL Series



Fig. 3 - Current Rating Nomogram (Rectangular Waveforms), 40HFL Series



Fig. 4 - Current Rating Nomogram (Sinusoidal Waveforms), 70HFL Series



Fig. 5 - Current Rating Nomogram (Rectangular Waveforms), 70HFL Series

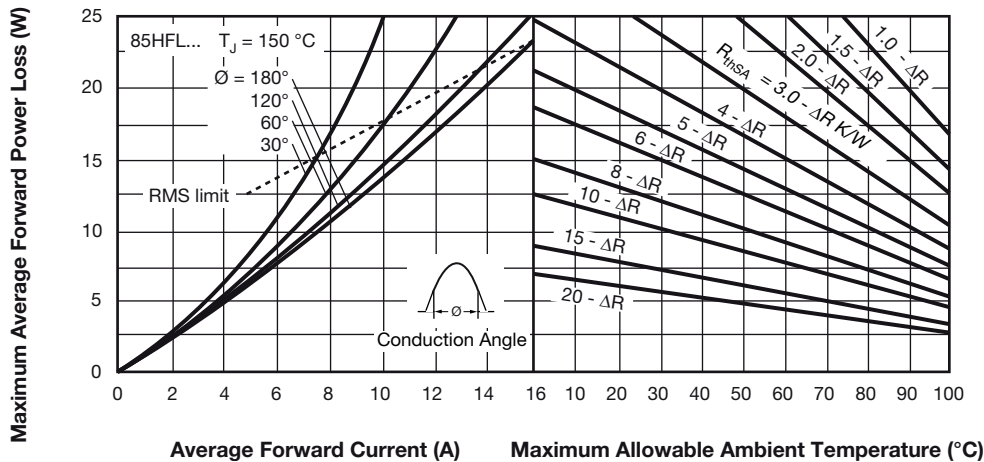


Fig. 6 - Current Rating Nomogram (Sinusoidal Waveforms), 85HFL Series

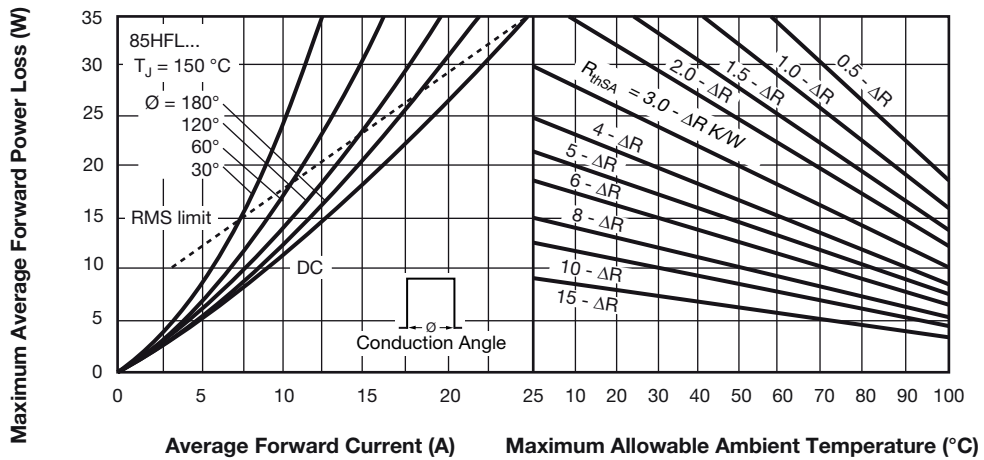


Fig. 7 - Current Rating Nomogram (Rectangular Waveforms), 85HFL Series



Fig. 8 - Maximum High Level Forward Power Loss vs. Average Forward Current, 40HFL Series

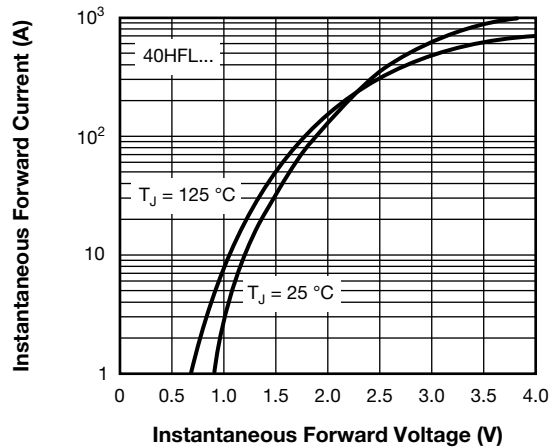


Fig. 11 - Maximum Forward Voltage vs. Forward Current, 40HFL Series



Fig. 9 - Maximum High Level Forward Power Loss vs. Average Forward Current, 70HFL Series

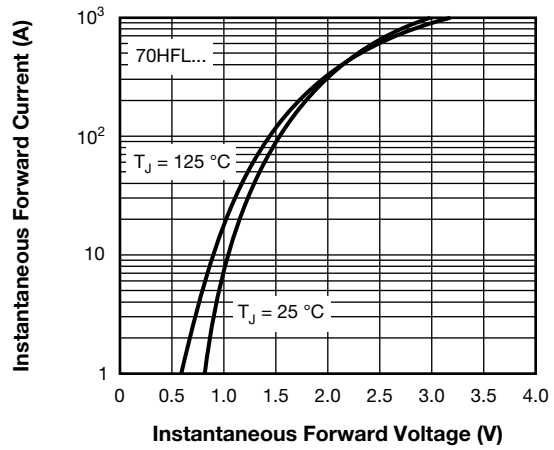


Fig. 12 - Maximum Forward Voltage vs. Forward Current, 70HFL Series



Fig. 10 - Maximum High Level Forward Power Loss vs. Average Forward Current, 85HFL Series

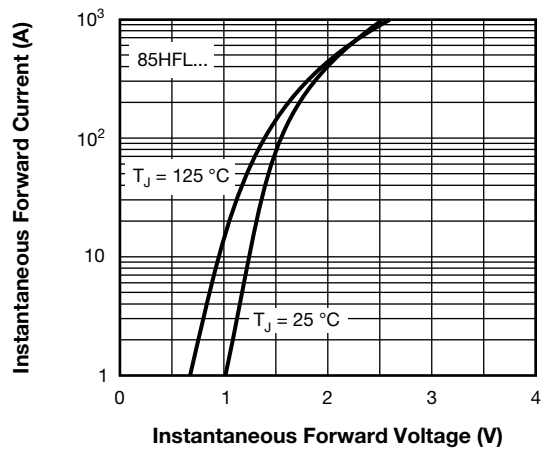


Fig. 13 - Maximum Forward Voltage vs. Forward Current, 85HFL Series

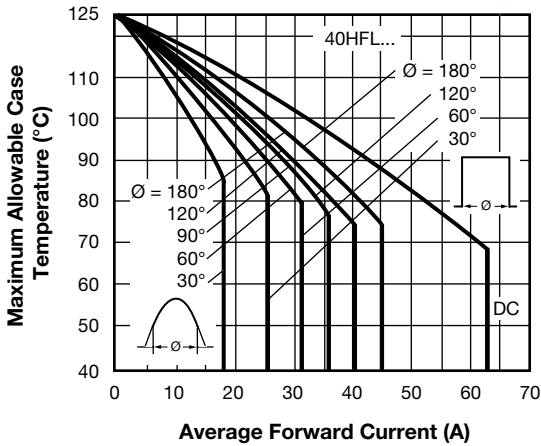


Fig. 14 - Average Forward Current vs. Maximum Allowable Case Temperature, 40HFL Series

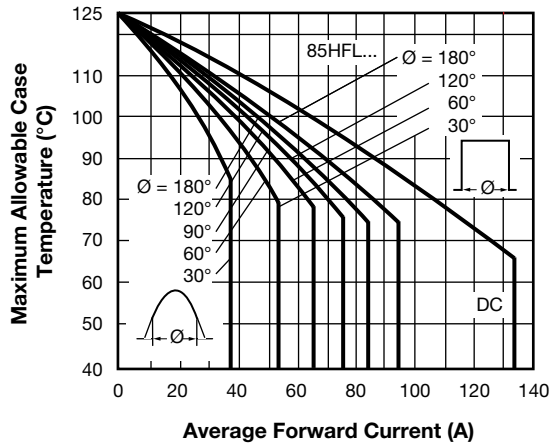


Fig. 16 - Average Forward Current vs. Maximum Allowable Case Temperature, 85HFL Series

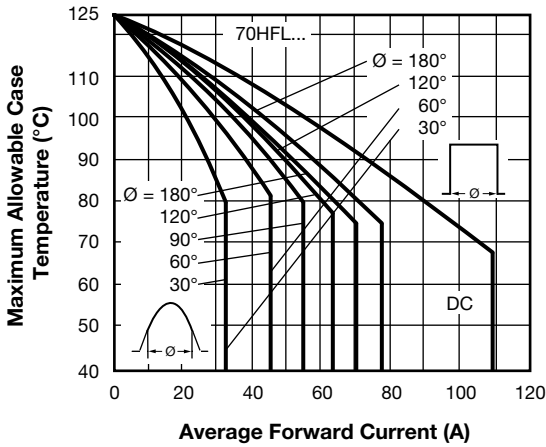


Fig. 15 - Average Forward Current vs. Maximum Allowable Case Temperature, 70HFL Series

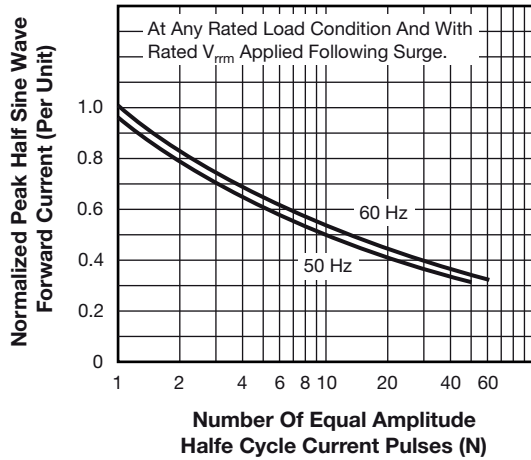


Fig. 17 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, All Series

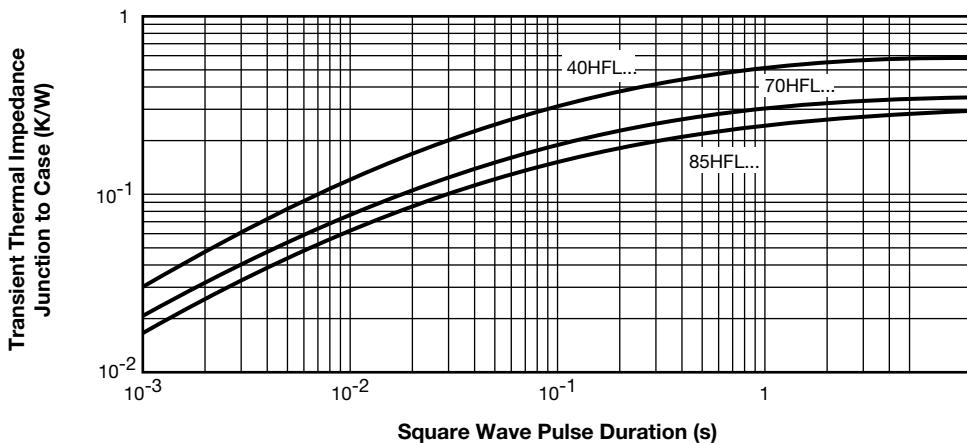


Fig. 18 - Maximum Transient Thermal Impedance, Junction to Case vs. Pulse Duration, All Series



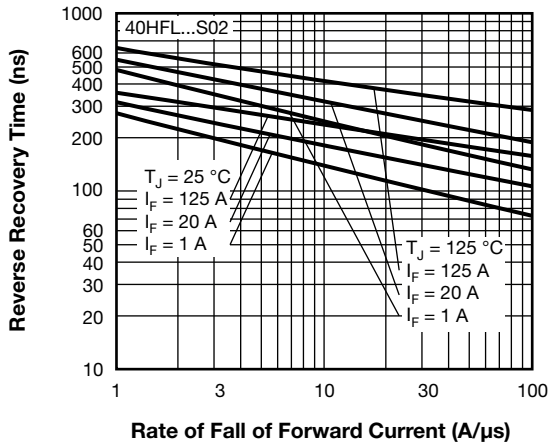


Fig. 19 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 40HFL...S02 Series

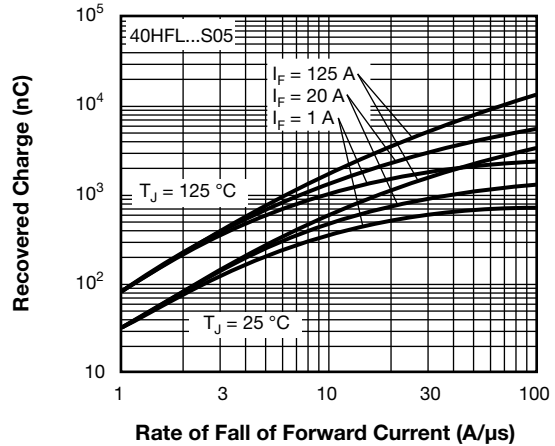


Fig. 22 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 40HFL...S05 Series

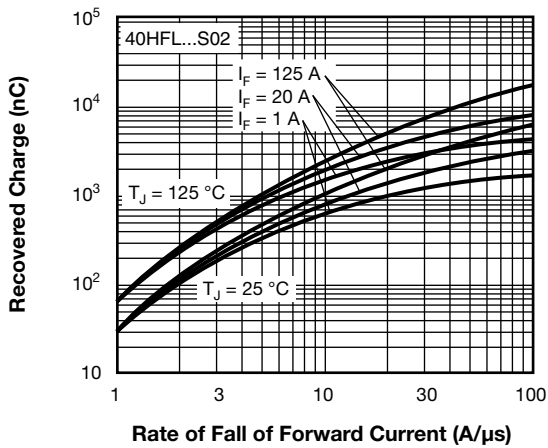


Fig. 20 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 40HFL...S02 Series

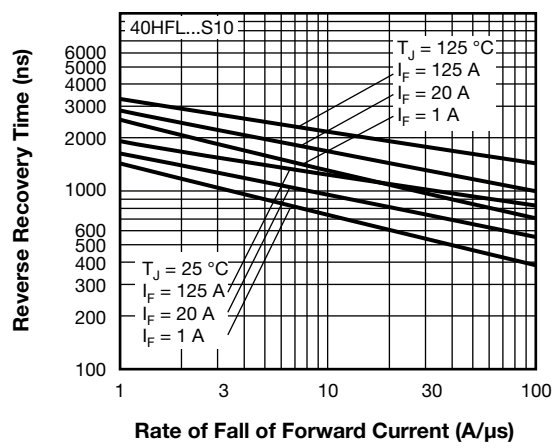


Fig. 23 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 40HFL...Series

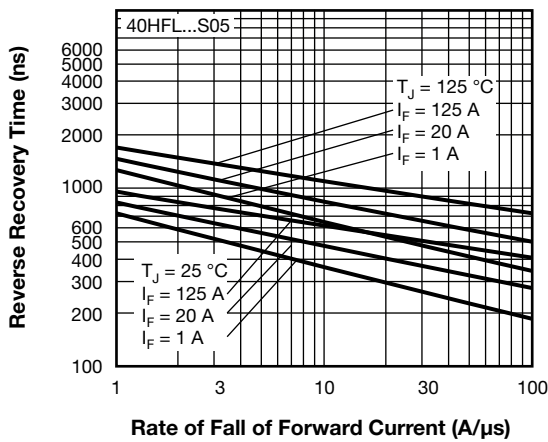


Fig. 21 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 40HFL...S05 Series

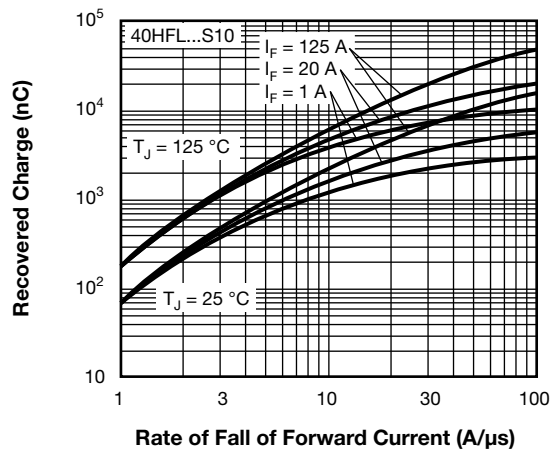


Fig. 24 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 40HFL...Series



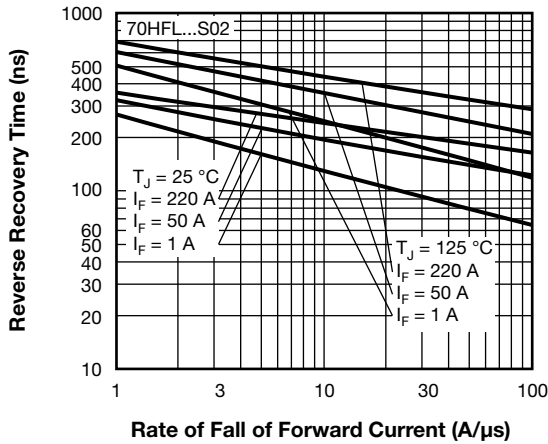


Fig. 25 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 70HFL...S02 Series

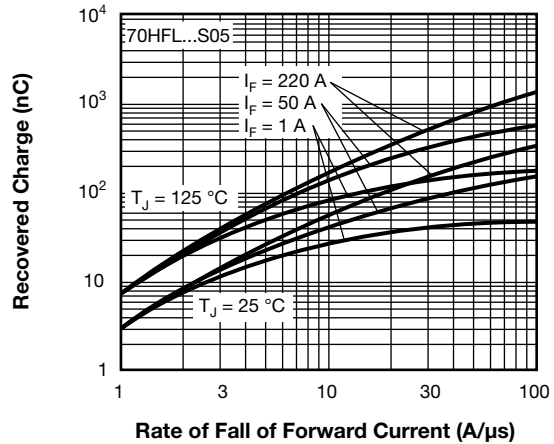


Fig. 28 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 70HFL...S05 Series

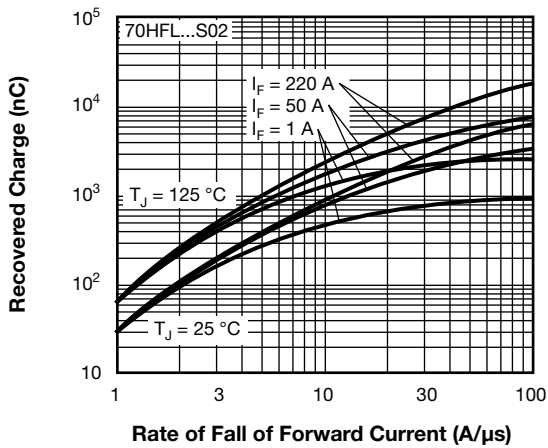


Fig. 26 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 70HFL...S02 Series

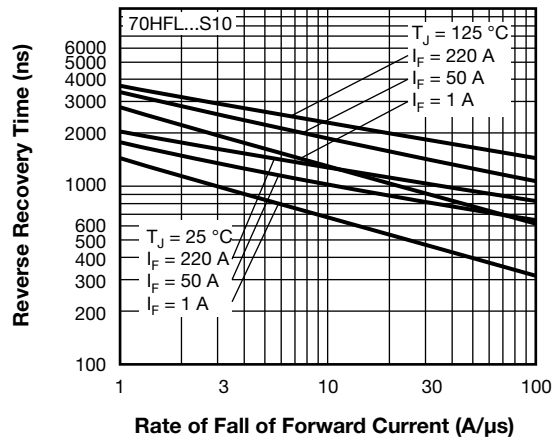


Fig. 29 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 70HFL... Series

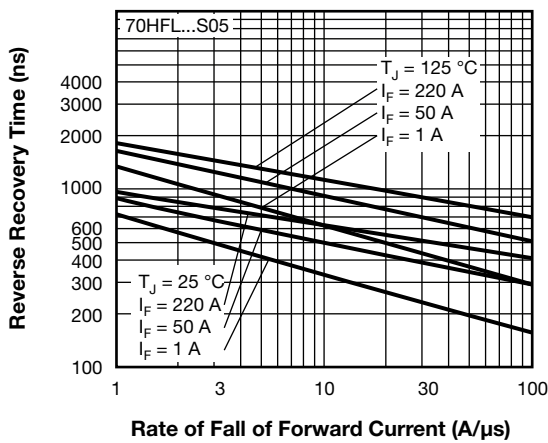


Fig. 27 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 70HFL...S05 Series

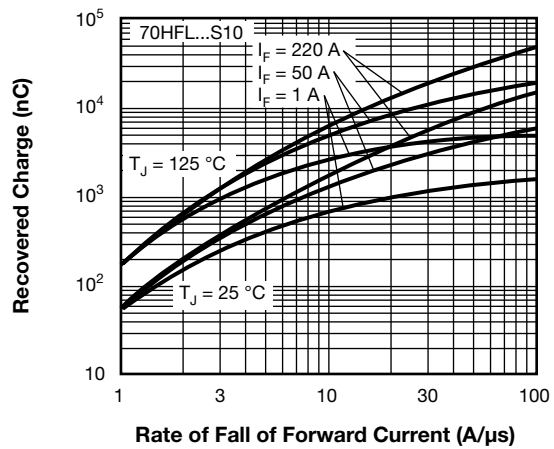
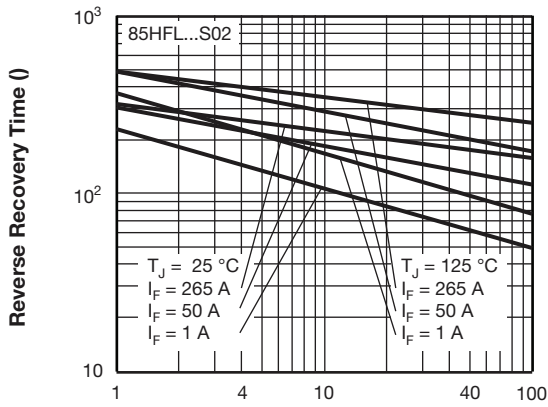
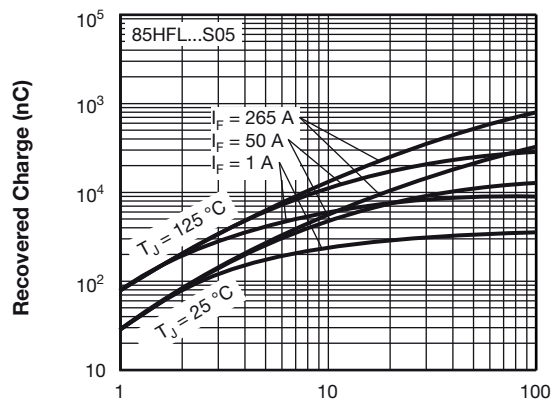


Fig. 30 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 70HFL... Series



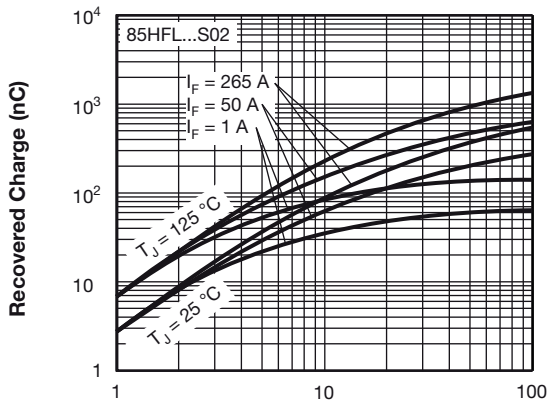
Rate of Fall of Forward Current (A/μs)

Fig. 31 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 85HFL...S02 Series



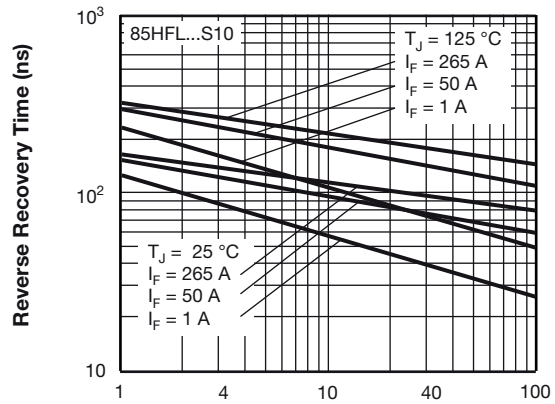
Rate of Fall of Forward Current (A/μs)

Fig. 34 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 85HFL...S05 Series



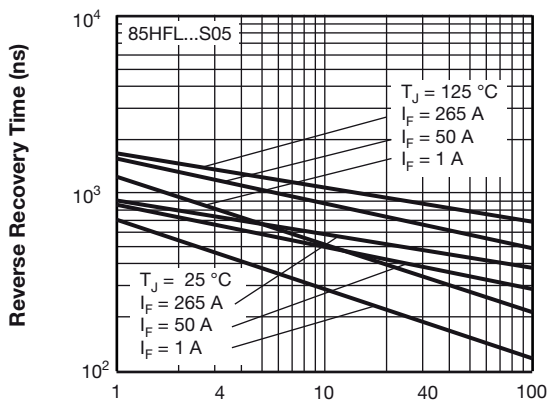
Rate of Fall of Forward Current (A/μs)

Fig. 32 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 85HFL...S02 Series



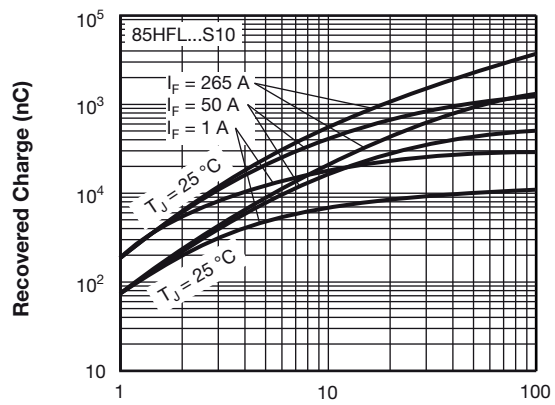
Rate of Fall of Forward Current (A/μs)

Fig. 35 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 85HFL... Series



Rate of Fall of Forward Current (A/μs)

Fig. 33 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 85HFL...S05 Series

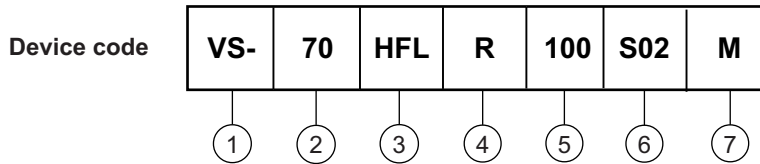


Rate of Fall of Forward Current (A/μs)

Fig. 36 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 85HFL... Series



## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** -
  - 70 = standard device (current rating: 40 = 40 A, 70 = 70 A, 85 = 85 A)
  - 71 = not isolated lead
  - 72, 87 = isolated lead with silicone sleeve  
(red = reverse polarity)  
(blue = normal polarity)
- 3** - HFL = fast recovery diode
- 4** -
  - None = stud normal polarity (cathode to stud)
  - R = stud reverse polarity (anode to stud)
- 5** - Voltage code x 10 =  $V_{RRM}$  (see "Voltage Ratings" table)
- 6** - Refer to "Recovery Characteristics" table
- 7** -
  - None = stud base DO-203AB (DO-5) 1/4" 28UNF-2A
  - M = stud base DO-203AB (DO-5) M6 x 1

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?95312">www.vishay.com/doc?95312</a> |

## DO-203AB (DO-5) for 40HFL, 70HFL and 85HFL

### DIMENSIONS FOR 40HFL/70HFL in millimeters (inches)



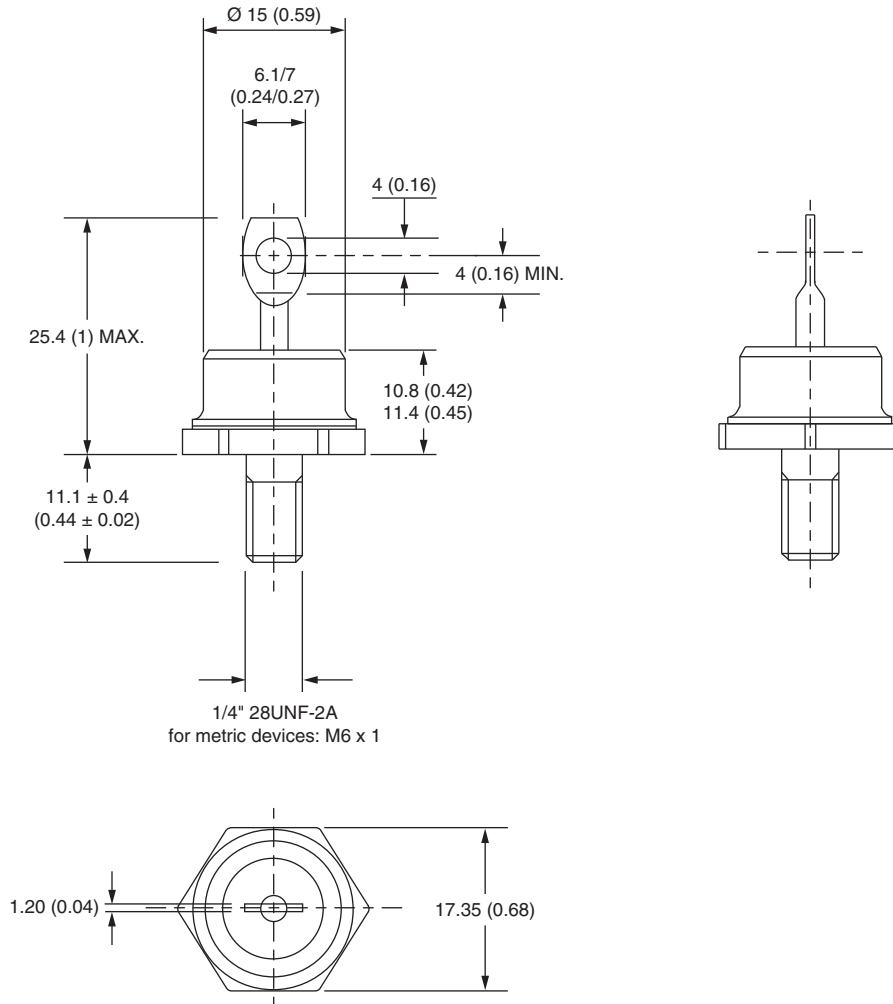
# Outline Dimensions

Vishay Semiconductors

DO-203AB (DO-5) for  
40HFL, 70HFL and 85HFL



## DIMENSIONS FOR 85HFL in millimeters (inches)





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