



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



DO-5 (DO-203AB)

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_{RRM}
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT

TYPICAL APPLICATIONS

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

| PRIMARY CHARACTERISTICS | |
|-------------------------|------------------|
| I _{F(AV)} | 40 A, 70 A, 85 A |
| Package | DO-5 (DO-203AB) |
| Circuit Configuration | Single |

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



ELECTRICAL SPECIFICATIONS

| VOLTAGE RATINGS | | | | |
|------------------------------|---|---|--|-------------------------|
| TYPE NUMBER ⁽¹⁾ | V _{RRM} , MAXIMUM PEAK REPETITIVE REVERSE VOLTAGE T _J = - 40 °C TO 125 °C V | V _{RSM} , MAXIMUM PEAK NON-REPETITIVE REVERSE VOLTAGE T _J = 25 °C TO 125 °C V | I _{FM} , MAXIMUM PEAK REVERSE CURRENT AT RATED V _{RRM} mA | |
| | | | T _J = 25 °C | T _J = 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

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

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

Note

⁽¹⁾ I²t for time t_x = I²√t x √t_x

| 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 ⁽¹⁾ | 3.4 (30) | | | N · m (lbf · in) |
| | | Lubricated thread, tightening on nut ⁽¹⁾ | 2.3 (20) | | | |
| | | Not lubricated thread, tightening on hexagon ⁽²⁾ | 4.2 (37) | | | |
| | | Lubricated thread, tightening on hexagon ⁽²⁾ | 3.2 (28) | | | |
| Approximate weight | | | 25 | | | |
| | | | 0.88 | | | |
| Case style | | JEDEC® | DO-5 (DO-203AB) | | | |

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

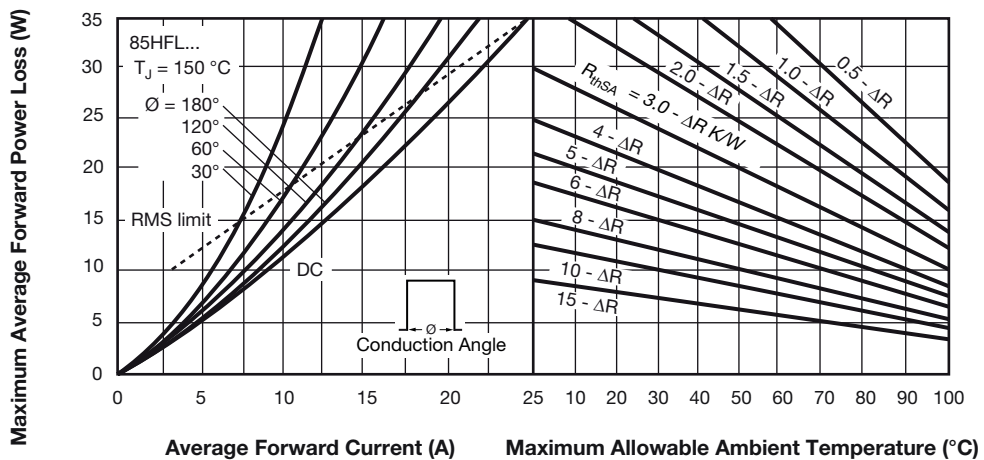


Fig. 7 - Current Rating Nomogram (Rectangular Waveforms), 85HFL Series



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

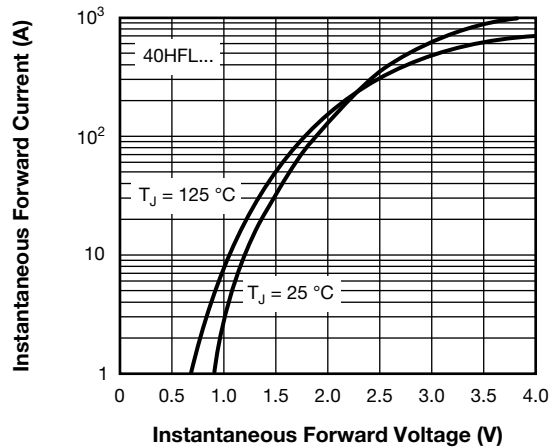


Fig. 11 - Maximum Forward Voltage vs. Forward Current, 40HFL Series



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

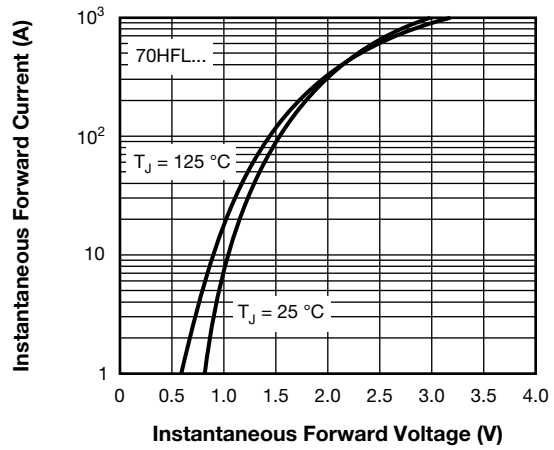


Fig. 12 - Maximum Forward Voltage vs. Forward Current, 70HFL Series



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

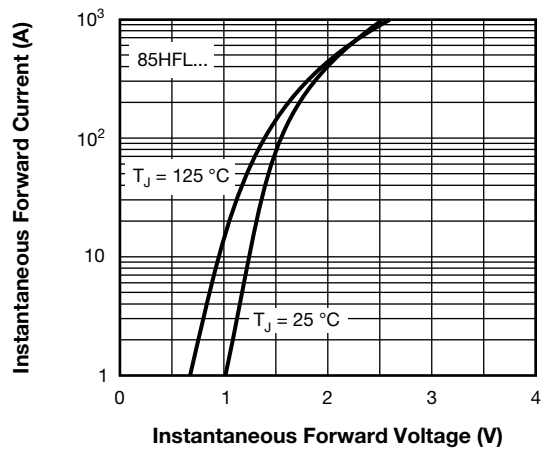


Fig. 13 - Maximum Forward Voltage vs. Forward Current, 85HFL Series

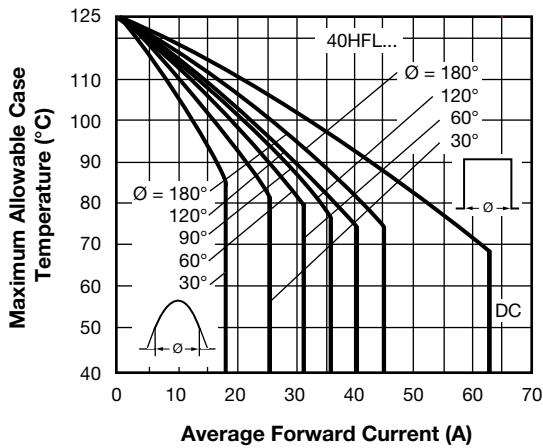


Fig. 14 - Average Forward Current vs. Maximum Allowable Case Temperature, 40HFL Series

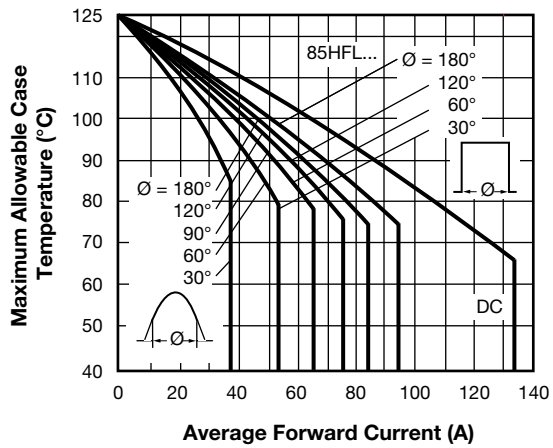


Fig. 16 - Average Forward Current vs. Maximum Allowable Case Temperature, 85HFL Series

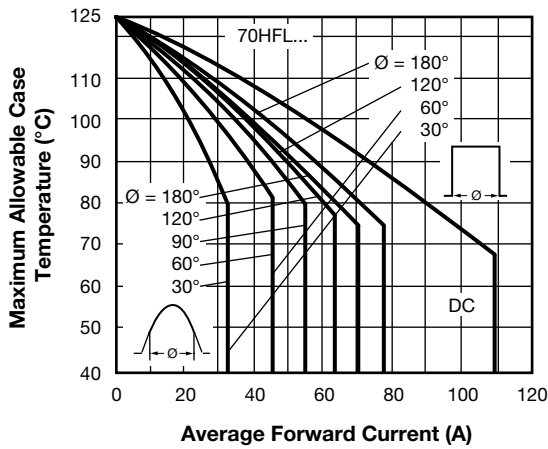


Fig. 15 - Average Forward Current vs. Maximum Allowable Case Temperature, 70HFL Series

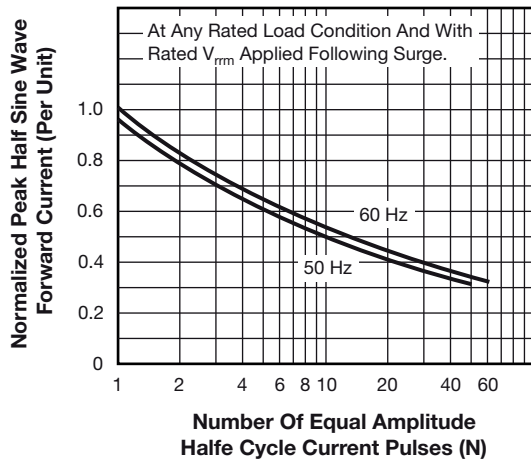


Fig. 17 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, All Series

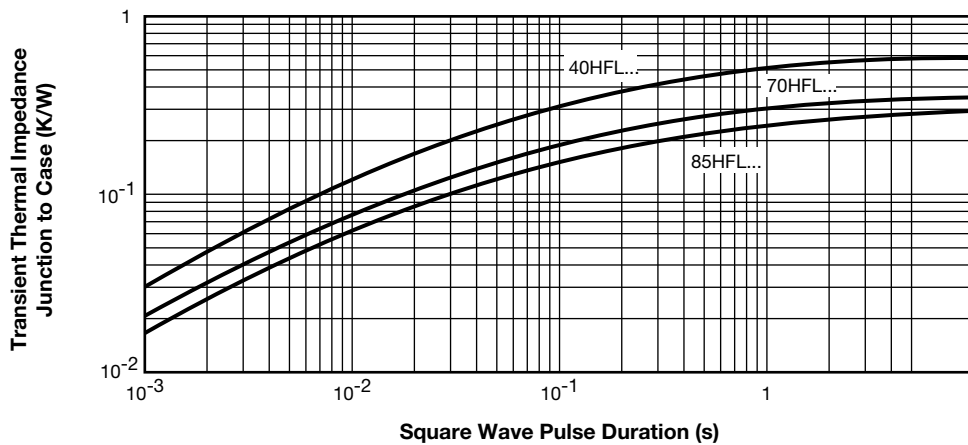


Fig. 18 - Maximum Transient Thermal Impedance, Junction to Case vs. Pulse Duration, All Series

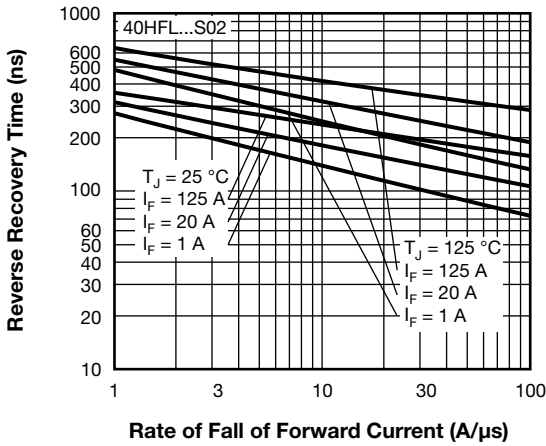


Fig. 19 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 40HFL...S02 Series

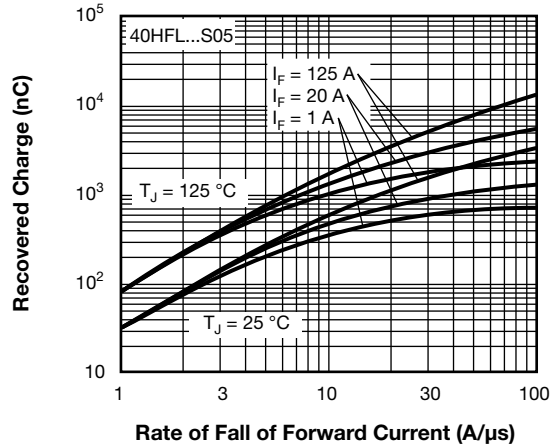


Fig. 22 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 40HFL...S05 Series

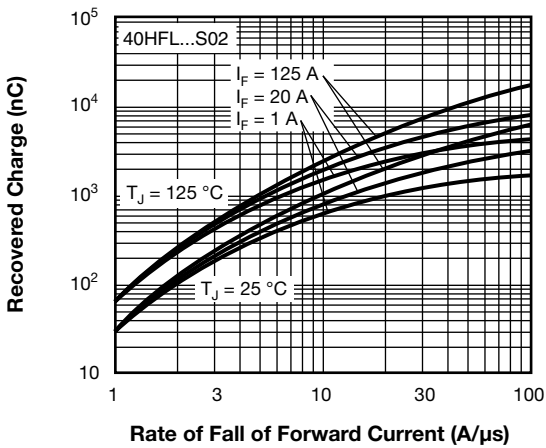


Fig. 20 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 40HFL...S02 Series

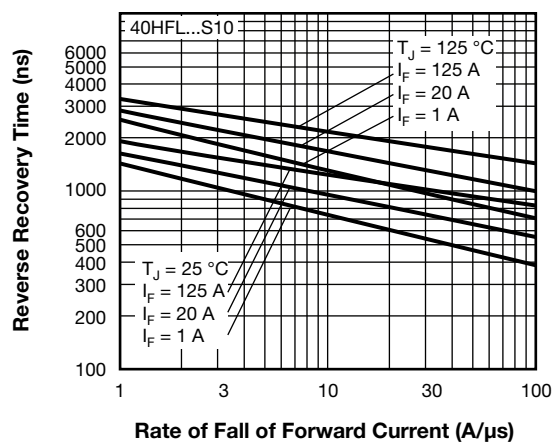


Fig. 23 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 40HFL...Series

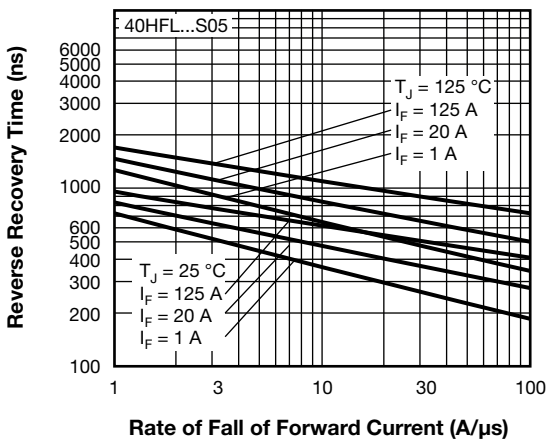


Fig. 21 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 40HFL...S05 Series

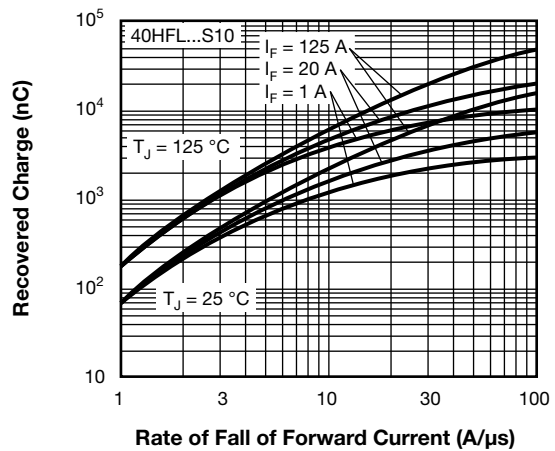


Fig. 24 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 40HFL...Series

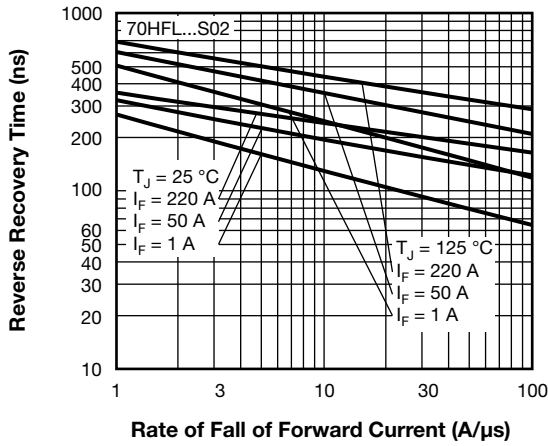


Fig. 25 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 70HFL...S02 Series

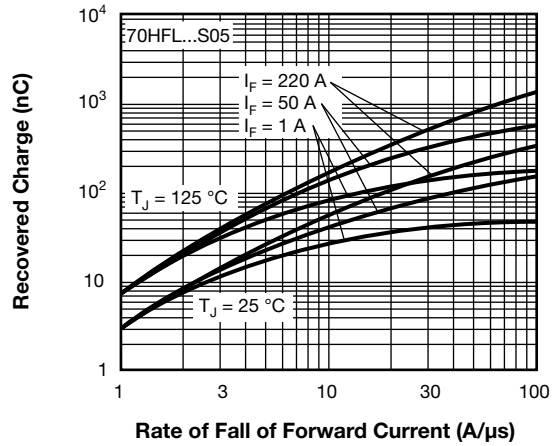


Fig. 28 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 70HFL...S05 Series

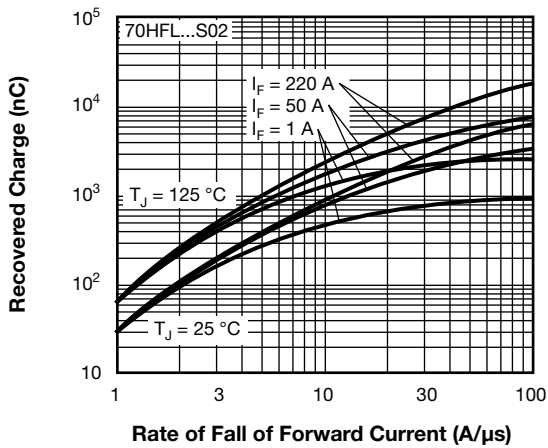


Fig. 26 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 70HFL...S02 Series

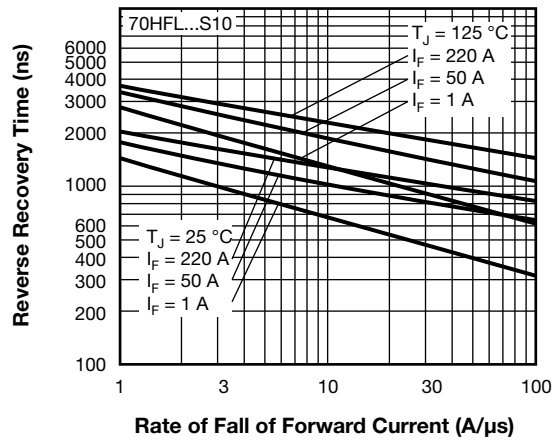


Fig. 29 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 70HFL... Series

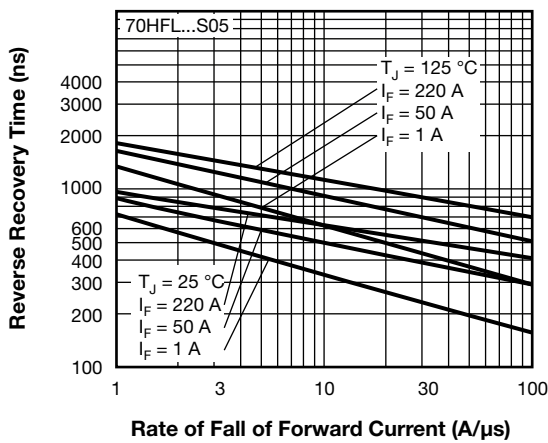


Fig. 27 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 70HFL...S05 Series

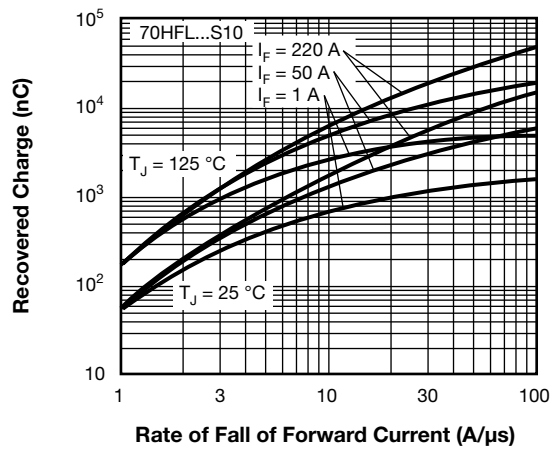
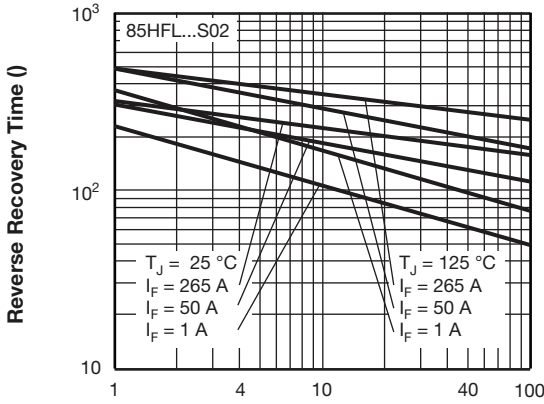
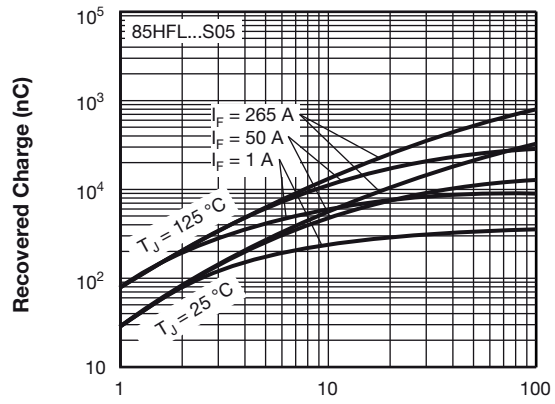


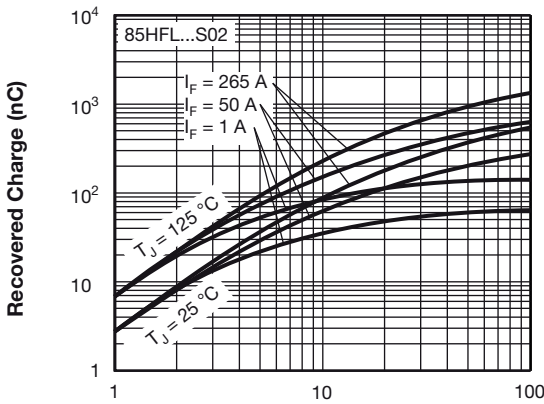
Fig. 30 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 70HFL... Series



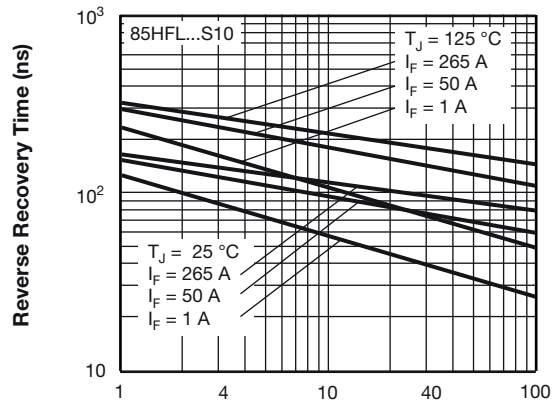
Rate of Fall of Forward Current (A/μs)
 Fig. 31 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 85HFL...S02 Series



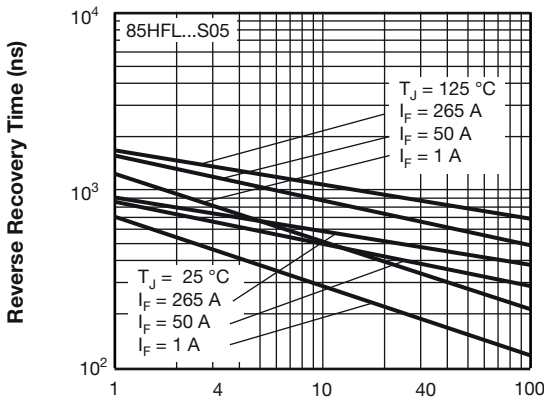
Rate of Fall of Forward Current (A/μs)
 Fig. 34 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 85HFL...S05 Series



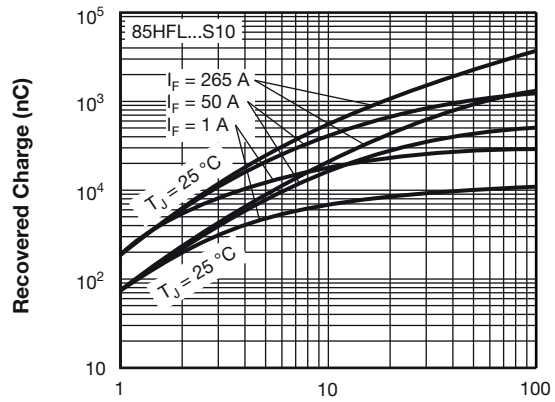
Rate of Fall of Forward Current (A/μs)
 Fig. 32 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 85HFL...S02 Series



Rate of Fall of Forward Current (A/μs)
 Fig. 35 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 85HFL... Series



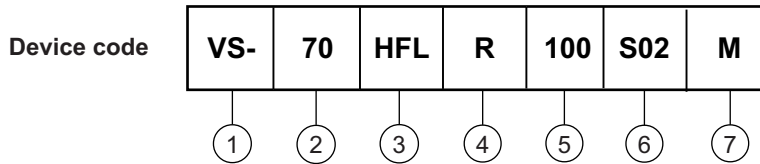
Rate of Fall of Forward Current (A/μs)
 Fig. 33 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 85HFL...S05 Series



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-5 (DO-203AB) 1/4" 28UNF-2A
 - M = stud base DO-5 (DO-203AB) M6 x 1

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?95312 |

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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