# 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 $V_{RRM}$
- Compliant to RoHS directive 2002/95/EC

RoHS COMPLIANT

## TYPICAL APPLICATIONS

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

| PRODUCT SUMMARY | |
|---|---|
| $I_{F(AV)}$ | 40 A/70 A/85 A |

| MAJOR RATINGS AND CHARACTERISTICS | | | | | |
|---|---|---|---|---|---|
| SYMBOL | CHARACTERISTICS | 40HFL | 70HFL | 85HFL | UNITS |
| $I_{F(AV)}$ | | 40 | 70 | 85 | A |
| | Maximum $T_C$ | 85 | 85 | 85 | °C |
| $I_{FSM}$ | 50 Hz | 400 | 700 | 1100 | A |
| | 60 Hz | 420 | 730 | 1151 | |
| $I^2t$ | 50 Hz | 800 | 2450 | 6050 | $A^2s$ |
| | 60 Hz | 730 | 2240 | 5523 | |
| $I^2\sqrt{t}$ | | 11 300 | 34 650 | 85 560 | $I^2\sqrt{s}$ |
| $V_{RRM}$ | Range | 100 to 1000 | | | V |
| $t_{rr}$ | | See Recovery Characteristics table | | | ns |
| $T_J$ | Range | - 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 |
| 40HFL10S02, 40HFL10S05, 40HFL10S10 | 100 | 150 | 0.1 | 10 |
| 40HFL20S02, 40HFL20S05, 40HFL20S10 | 200 | 300 | | |
| 40HFL40S02, 40HFL40S05, 40HFL40S10 | 400 | 500 | | |
| 40HFL60S02, 40HFL60S05, 40HFL60S10 | 600 | 700 | | |
| 40HFL80S05, 40HFL80S10 | 800 | 900 | | |
| 40HFL100S05, 40HFL100S10 | 1000 | 1100 | | |
| 70HFL10S02, 70HFL10S05, 70HFL10S10 | 100 | 150 | 0.1 | 15 |
| 70HFL20S02, 70HFL20S05, 70HFL20S10 | 200 | 300 | | |
| 70HFL40S02, 70HFL40S05, 70HFL40S10 | 400 | 500 | | |
| 70HFL60S02, 70HFL60S05, 70HFL60S10 | 600 | 700 | | |
| 70HFL80S05, 70HFL80S10 | 800 | 900 | | |
| 70HFL100S05, 70HFL100S10 | 1000 | 1100 | | |
| 85HFL10S02, 85HFL10S05, 85HFL10S10 | 100 | 150 | 0.1 | 20 |
| 85HFL20S02, 85HFL20S05, 85HFL20S10 | 200 | 300 | | |
| 85HFL40S02, 85HFL40S05, 85HFL40S10 | 400 | 500 | | |
| 85HFL60S02, 85HFL60S05, 85HFL60S10 | 600 | 700 | | |
| 85HFL80S05, 85HFL80S10 | 800 | 900 | | |
| 85HFL100S05, 85HFL100S10 | 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 $I^2t$ for fusing | $I^2t$ | t = 10 ms | 100 % $V_{RRM}$ reapplied, initial $T_J = T_J$ maximum | 800 | 2450 | 6050 | $A^2s$ |
| | | 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 $I^2\sqrt{t}$ for fusing (1) | $I^2\sqrt{t}$ | t = 0.1 ms to 10 ms, no voltage reapplied | | 11 300 | 34 650 | 85 560 | $A^2\sqrt{s}$ |
| 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, $I_{FM} = \pi \times I_{F(AV)}$ | | 1.95 | 1.85 | 1.75 | V |

**Note**

(1) $I^2t$ for time $t_x = I^2\sqrt{t} \bullet \sqrt{t_x}$

## RECOVERY CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITIONS | 40HFL... | | | 70HFL... | | | 85HFL... | | | UNITS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S02 | S05 | S10 | S02 | S05 | S10 | S02 | S05 | S10 | |
| Typical reverse recovery time | $t_{rr}$ | $T_J$ = 25 °C, $I_F$ = 1 A to $V_R$ = 30 V, - $dI_F/dt$ = 100 A/µs | 70 | 180 | 350 | 60 | 150 | 290 | 50 | 120 | 270 | ns |
| | | $T_J$ = 25 °C, - $dI_F/dt$ = 25 A/µs, $I_{FM} = \pi \times$ rated $I_{F(AV)}$ | 200 | 500 | 1000 | 200 | 500 | 1000 | 200 | 500 | 1000 | |
| Typical reverse recovered charge | $Q_{rr}$ | $T_J$ = 25 °C, $I_F$ = 1 A to $V_R$ = 30 V, - $dI_F/dt$ = 100 A/µs | 160 | 750 | 3100 | 90 | 500 | 1600 | 70 | 340 | 1350 | nC |
| | | $T_J$ = 25 °C, - $dI_F/dt$ = 25 A/µs, $I_{FM} = \pi \times$ rated $I_{F(AV)}$ | 240 | 1300 | 6000 | 240 | 1300 | 6000 | 240 | 1300 | 6000 | |

| 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, tighting on nut (1) | 3.4 (30) | | | N · m (lbf · in) |
| | | Lubricated thread, tighting on nut (1) | 2.3 (20) | | | |
| | | Not lubricated thread, tighting on hexagon (2) | 4.2 (37) | | | |
| | | Lubricated thread, tighting on hexagon (2) | 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

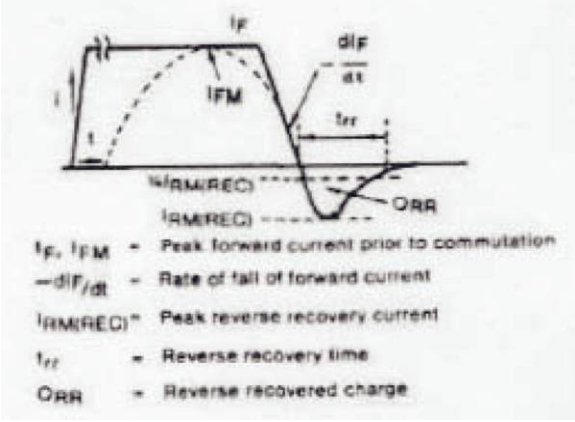



Fig. 1 - Reverse Recovery Time Test Waveform

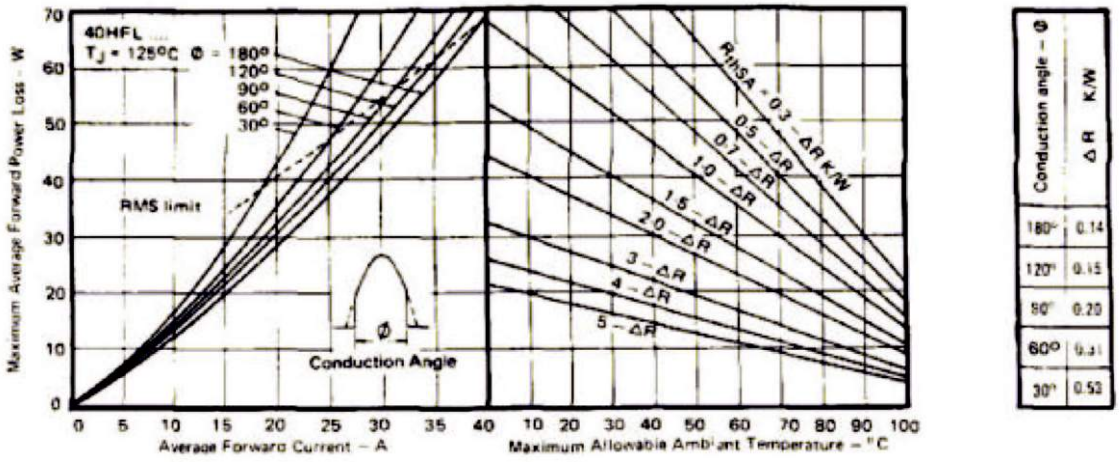



Fig. 2 - Current Rating Nomogram (Sinusoidal Waveforms), 40HFL Series

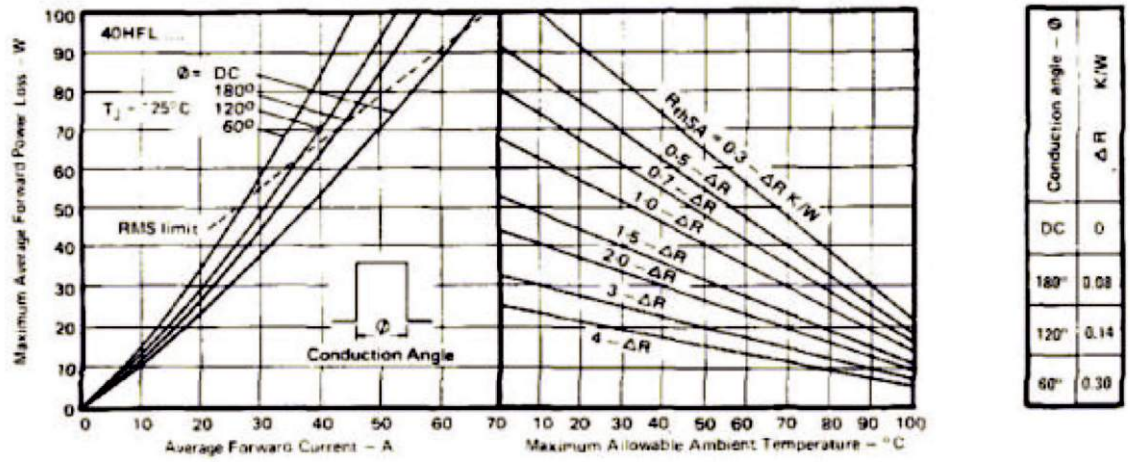



Fig. 3 - Current Rating Nomogram (Rectangular Waveforms), 40HFL Series

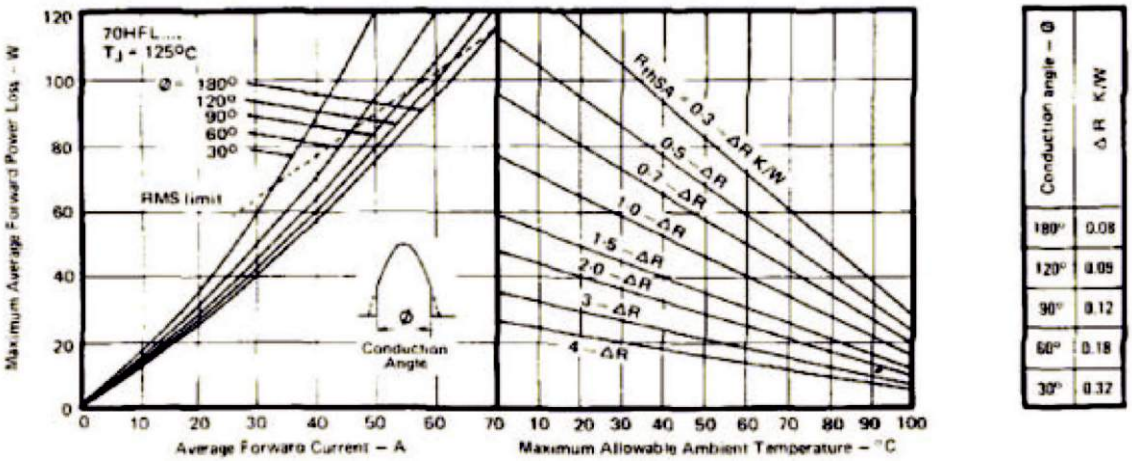



Fig. 4 - Current Rating Nomogram (Sinusoidal Waveforms), 70HFL Series

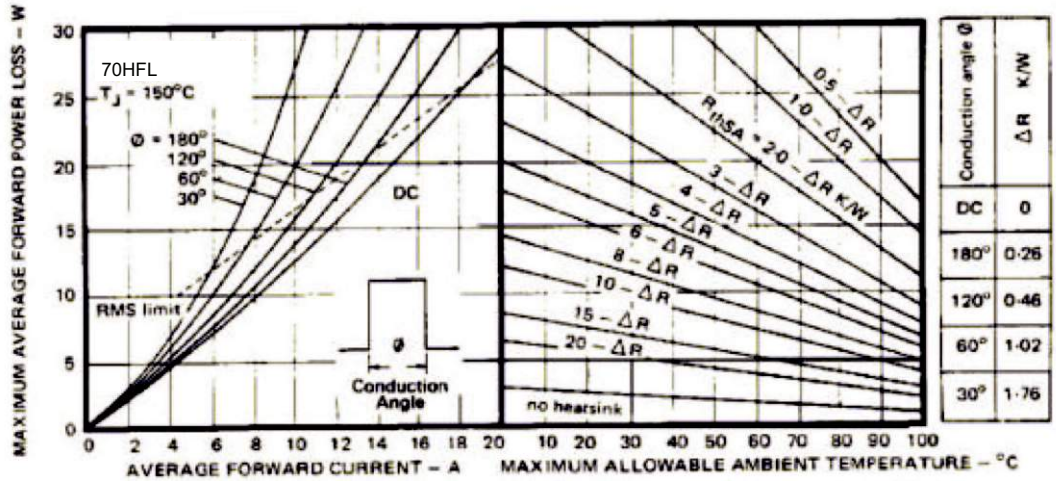



Fig. 5 - Current Rating Nomogram (Rectangular Waveforms), 70HFL Series

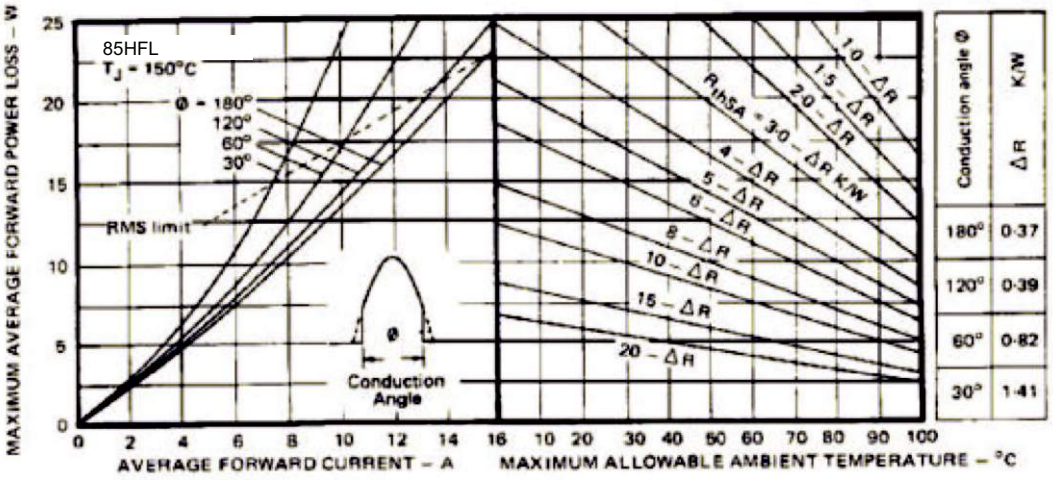



Fig. 6 - Current Rating Nomogram (Sinusoidal Waveforms), 85HFL Series

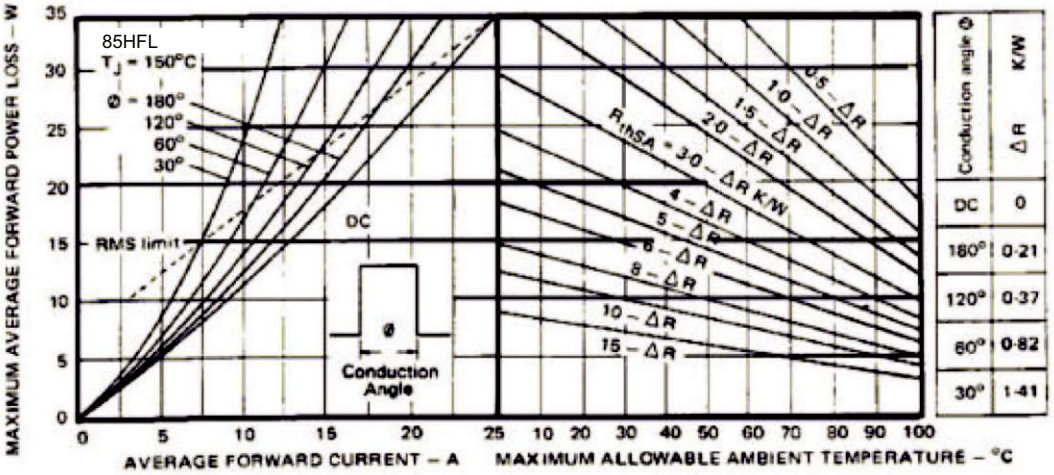



Fig. 7 - Current Rating Nomogram (Rectangular Waveforms), 85HFL Series

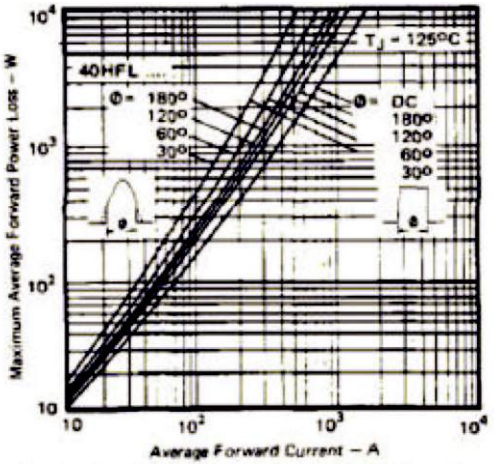



Fig. 8 - Maximum High Level Forward Power Loss vs.
Average Forward Current, 40HFL Series

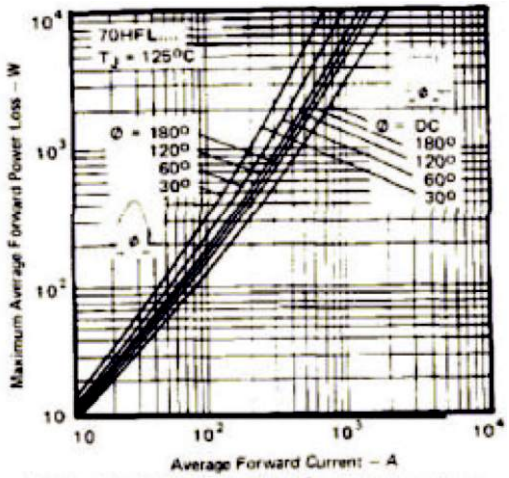



Fig. 9 - Maximum High Level Forward Power Loss vs.
Average Forward Current, 70HFL Series

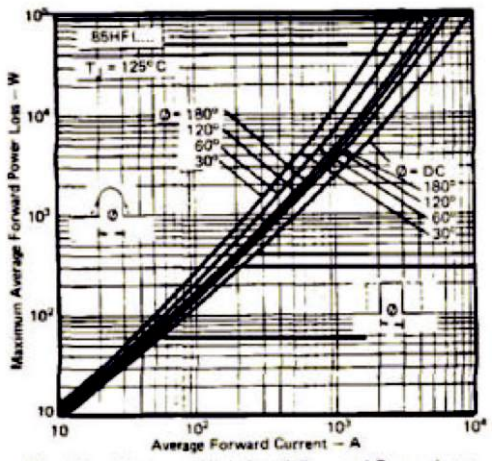



Fig. 10 - Maximum High Level Forward Power Loss vs. Average Forward Current, 85HFL Series

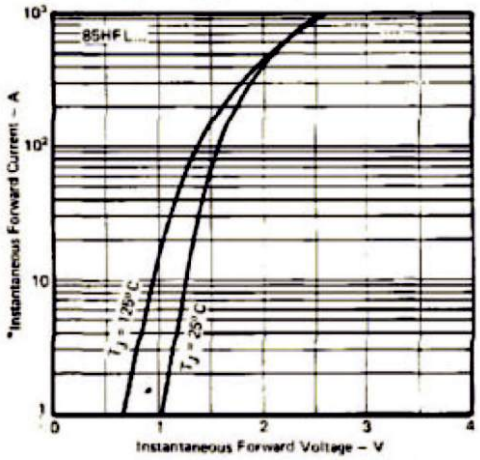



Fig. 13 - Maximum Forward Voltage vs. Forward Current, 85HFL Series

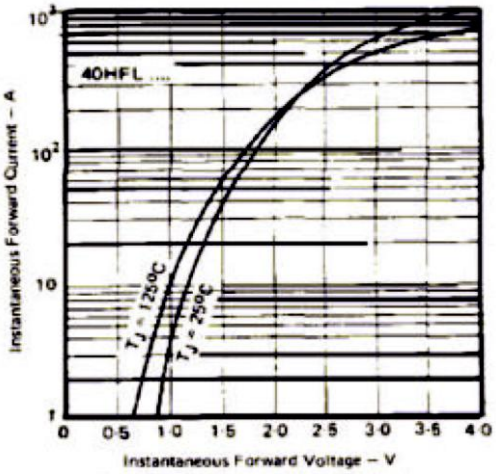



Fig. 11 - Maximum Forward Voltage vs. Forward Current, 40HFL Series

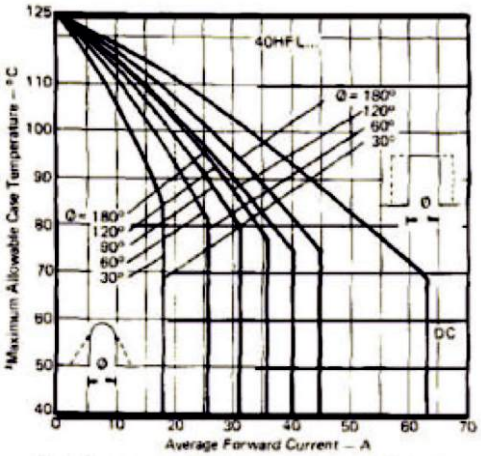



Fig. 14 - Average Forward Current vs. Maximum Allowable Case Temperature, 40HFL Series

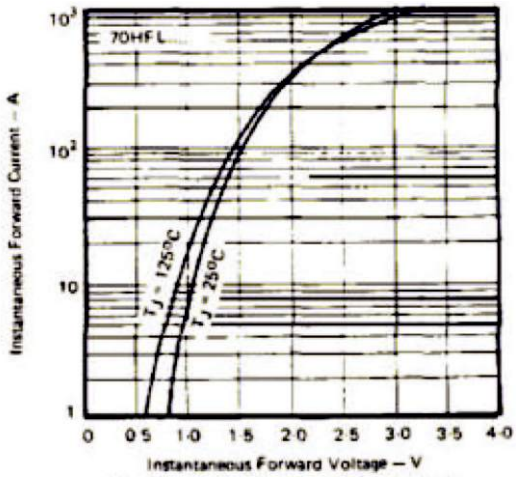



Fig. 12 - Maximum Forward Voltage vs. Forward Current, 70HFL Series

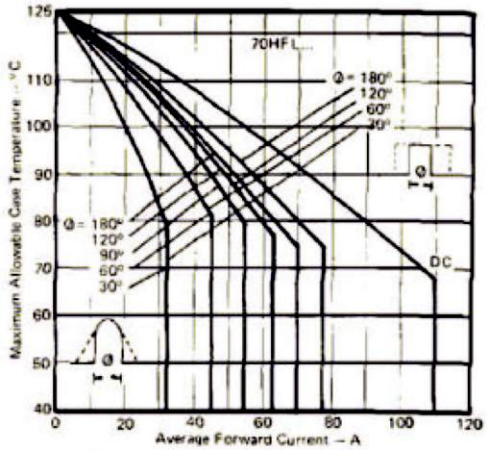



Fig. 15 - Average Forward Current vs. Maximum Allowable Case Temperature, 70HFL Series

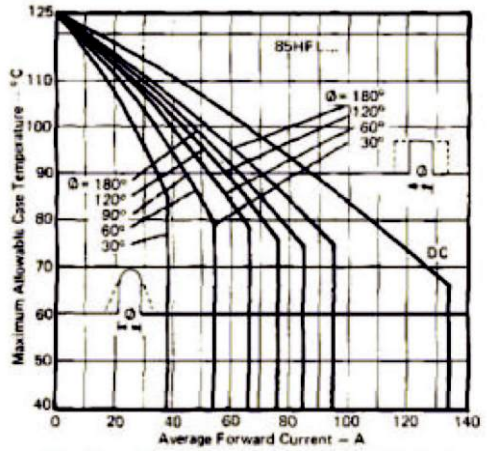



Fig. 16 - Average Forward Current vs. Maximum Allowable Case Temperature, 85HFL Series

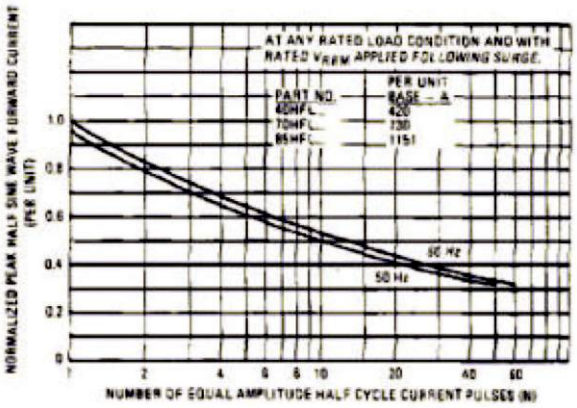



Fig. 17 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, All Series

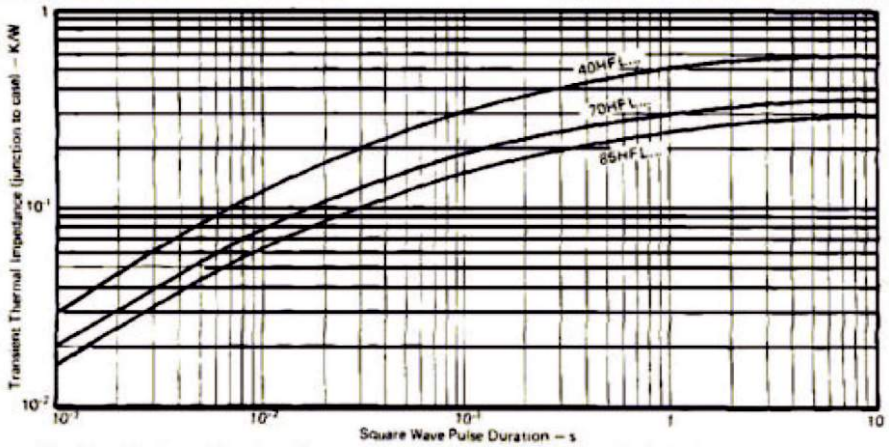



Fig. 18 - Maximum Transient Thermal Impedance, Junction to Case vs. Pulse Duration, All Series

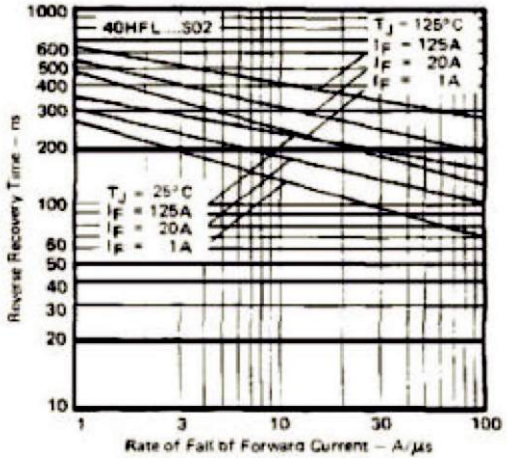



Fig. 19 - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, 40HFL...S02 Series

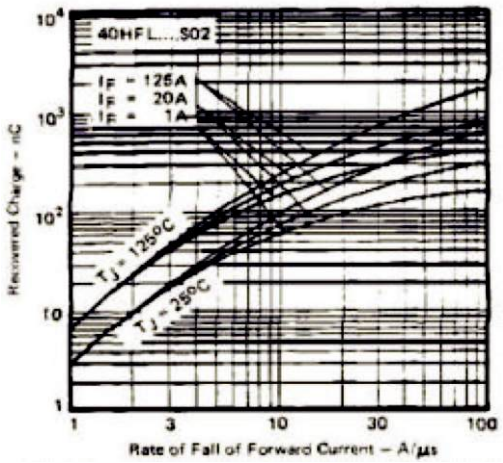



Fig. 20 - Typical Recovered Charge vs. Rate of Fall of Forward Current, 40HFL...S02 Series

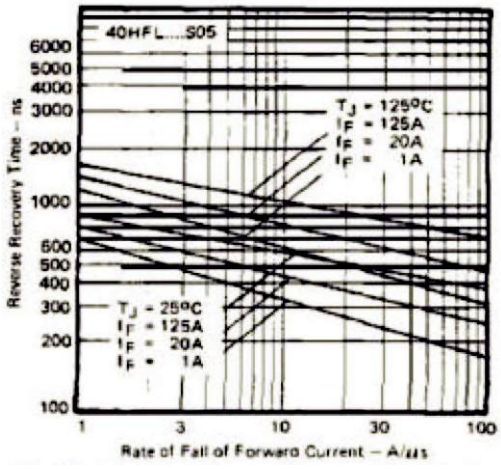



Fig. 21 - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, 40HFL...S05 Series

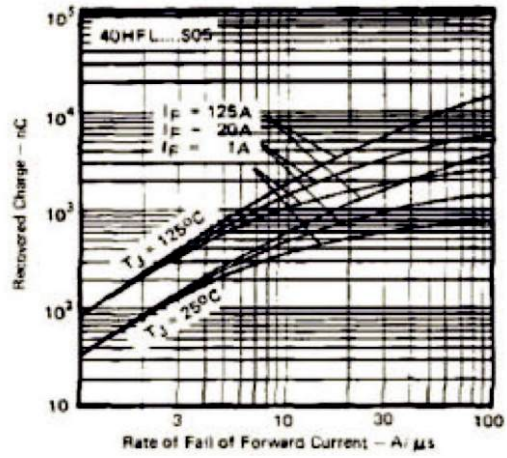



Fig. 22 - Typical Recovered Charge vs.
Rate of Fall of Forward Current, 40HFL...S05 Series

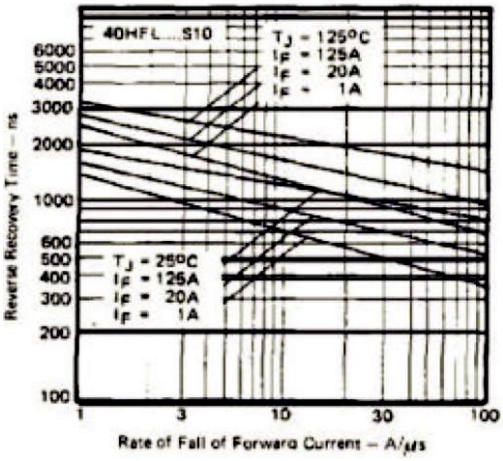



Fig. 23 - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, 40HFL...S10 Series

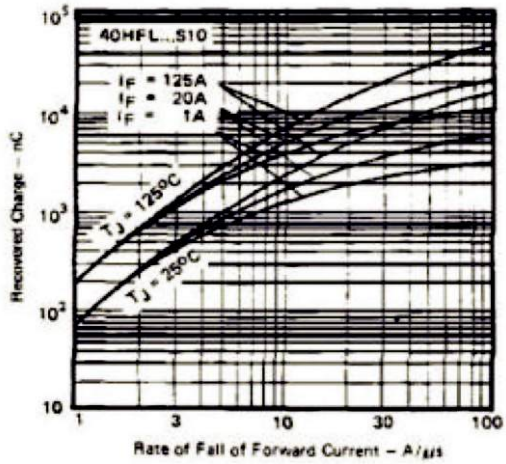



Fig. 24 - Typical Recovered Charge vs.
Rate of Fall of Forward Current, 40HFL...S10 Series

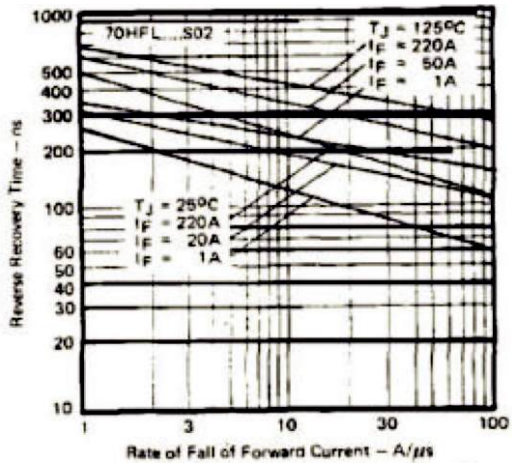



Fig. 25 - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, 70HFL...S02 Series

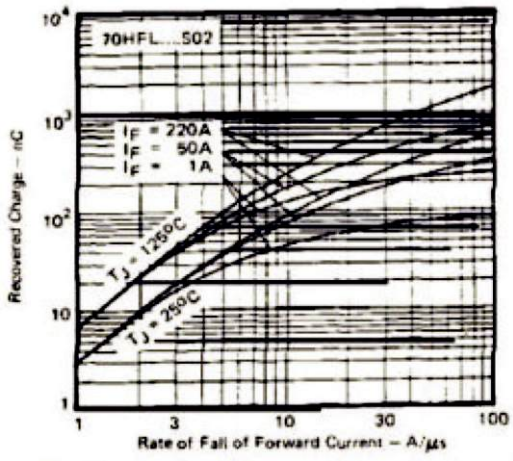



Fig. 26 - Typical Recovered Charge vs.
Rate of Fall of Forward Current, 70HFL...S02 Series

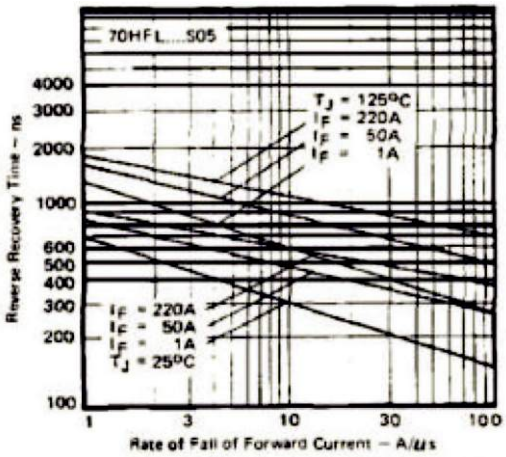



Fig. 27 - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, 70HFL...S05 Series

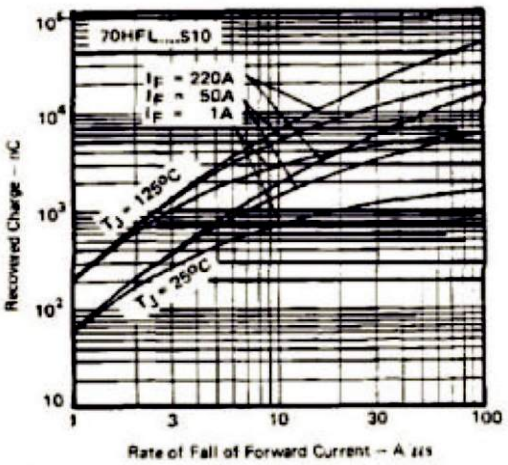



Fig. 30 - Typical Recovered Charge vs.
Rate of Fall of Forward Current, 70HFL...S10 Series

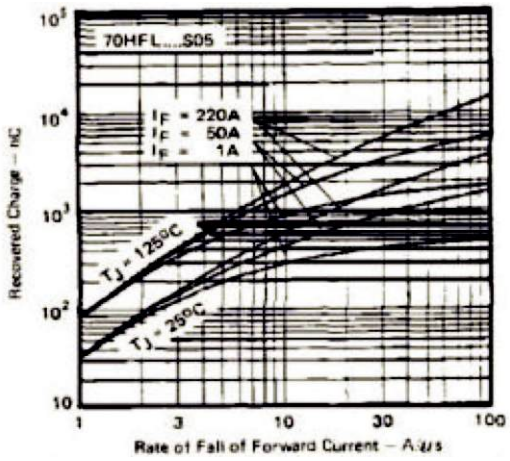



Fig. 28 - Typical Recovered Charge vs.
Rate of Fall of Forward Current, 70HFL...S05 Series

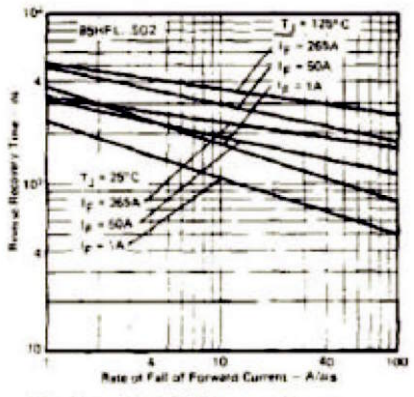



Fig. 31 - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, 85HFL...S02 Series

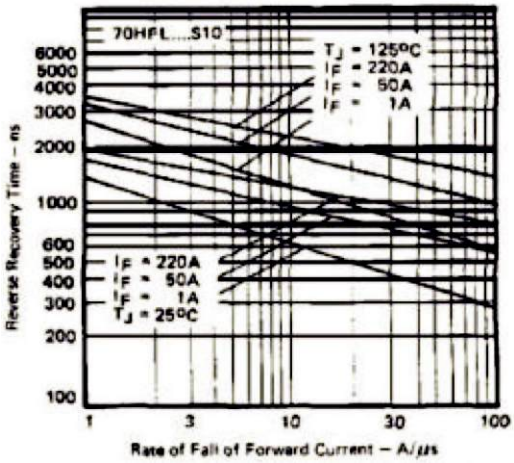



Fig. 29 - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, 70HFL...S10 Series

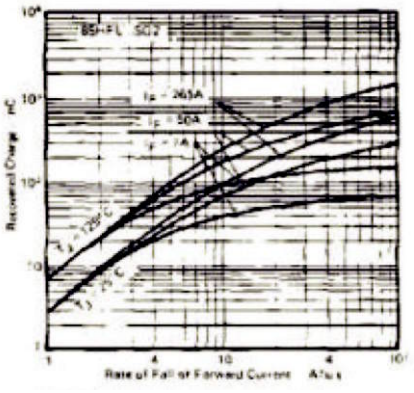



Fig. 32 - Typical Recovered Charge vs.
Rate of Fall of Forward Current, 85HFL...S02 Series

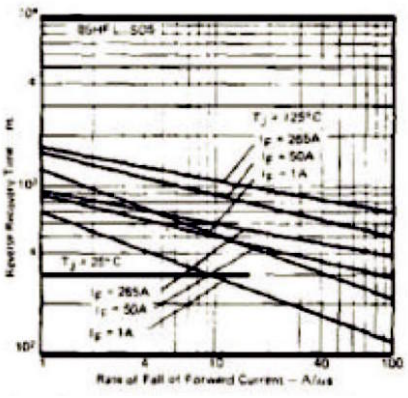


Fig. 33 - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, 85HFL...S05 Series

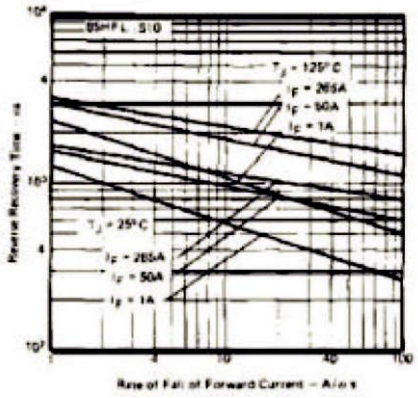


Fig. 35 - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, 85HFL...S10 Series

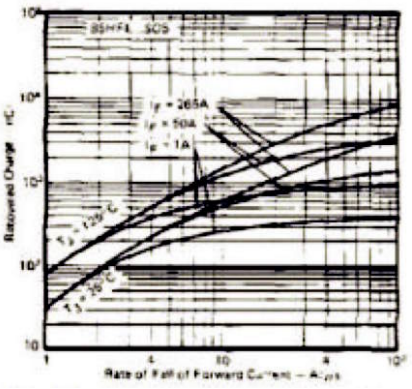


Fig. 34 - Typical Recovered Charge vs.
Rate of Fall of Forward Current, 85HFL...S05 Series

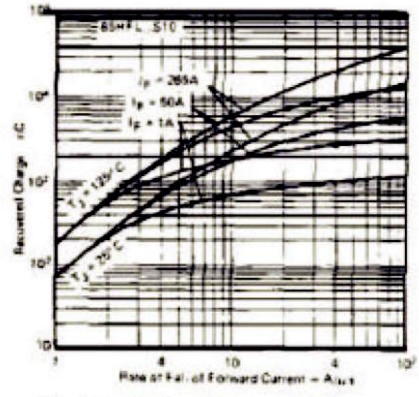
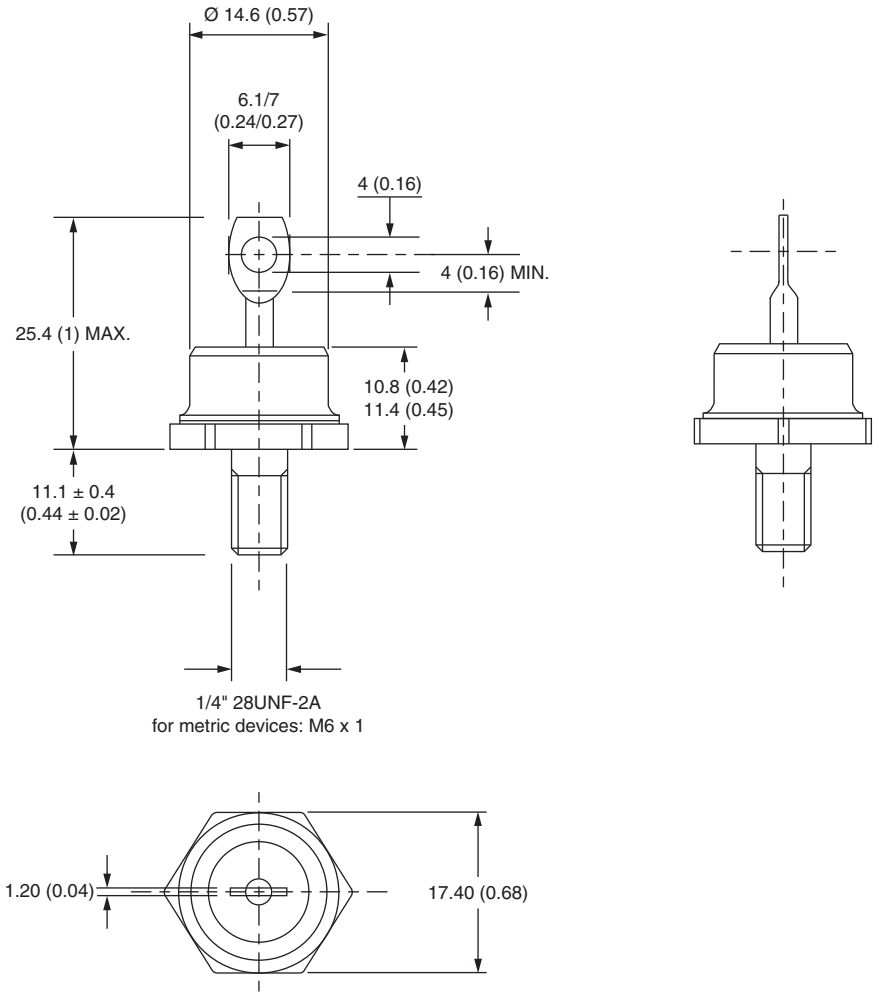


Fig. 36 - Typical Recovered Charge vs.
Rate of Fall of Forward Current, 85HFL...S10 Series

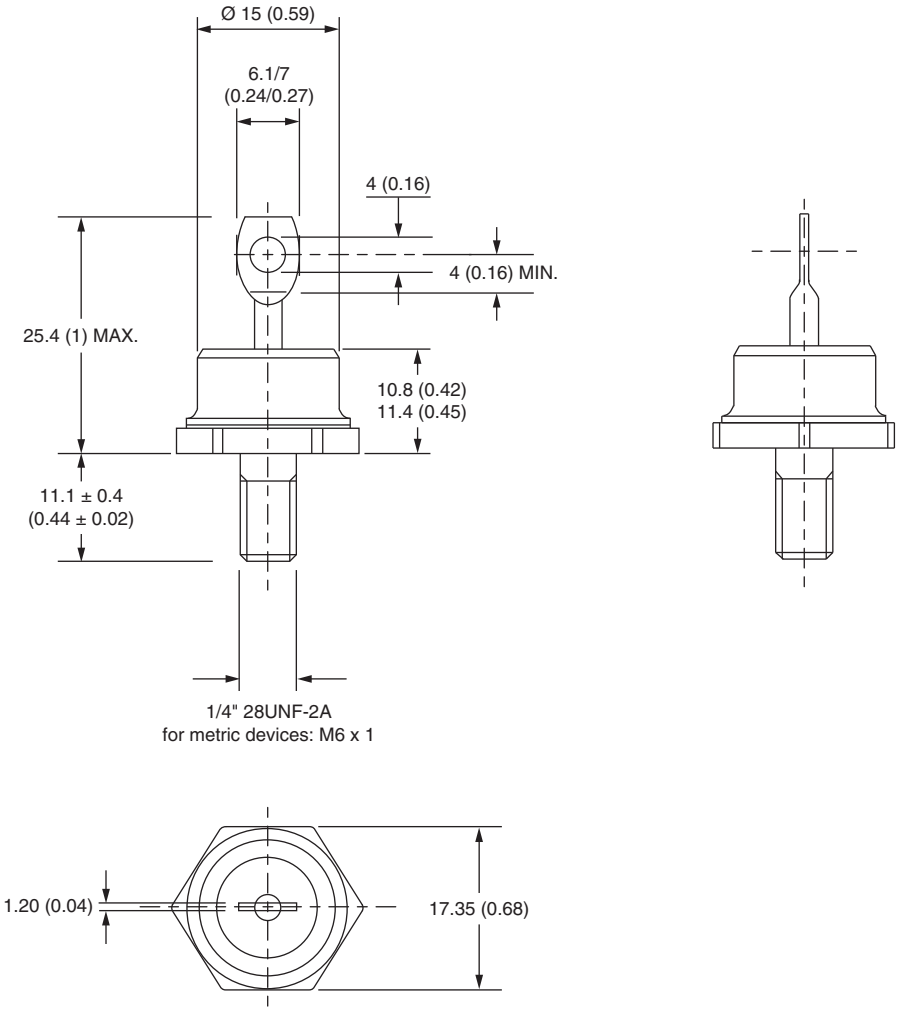
| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | www.vishay.com/doc?95312 |

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

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



**DIMENSIONS FOR 85HFL** in millimeters (inches)



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