

INTERNATIONAL RECTIFIER

1N3879, 1N3889, 6FL, 12FL, 16FL SERIES

6A, 12A and 16A Fast Recovery Rectifiers

Major Ratings and Characteristics

| | 1N3879 -1N3883 | 1N3889 -1N3893 | 6FL... | 12FL... | 16FL... | Unit | |
|---------------------|-------------------|-------------------|-----------|---------|---------|--------------|------------------|
| $I_F(AV)^{\dagger}$ | 6* | 12* | 6 | 12 | 16 | A | |
| I_{FSM} | 50Hz | 72 | 145 | 110 | 145 | 180 | A |
| | 60Hz | 75* | 150* | 115 | 150 | 190 | A |
| I^2t | 50Hz | 26 | 103 | 60 | 103 | 160 | A ² s |
| | 60Hz | 23 | 94 | 55 | 94 | 150 | A ² s |
| I_{RMS} | 363 | 1452 | 895 | 1452 | 2290 | A \sqrt{s} | |
| t_{rr} range | see table | | | | | ns | |
| V_{RRM} range | 50 - 400* | | 50 - 1000 | | | V | |
| T_J range | -65 to 150 | | | | | °C | |

*JEDEC registered values.

† At max. $T_C = 100^\circ\text{C}$.

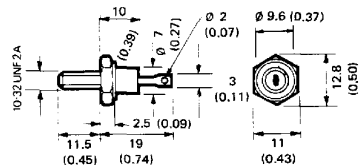
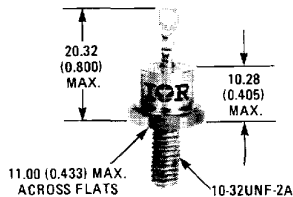
Description

This range of fast recovery diodes is designed for applications in DC power supplies, inverters, converters, choppers, ultrasonic systems and for use as free wheel diodes.

Features

- Short reverse recovery time
- Low stored charge
- Wide current range
- Excellent surge capabilities
- Standard JEDEC types
- Stud cathode and stud anode versions
- Types up to 1000V V_{RRM}
- Fully characterised reverse recovery conditions

CASE STYLE AND DIMENSIONS



Conforms to JEDEC: DO-203AA (DO-4)

IEC 191-2: A3U

BS 3934: SO-10A

DIN 41885: 101 C 2

All dimensions in millimetres (inches)

REVERSE VOLTAGE RATINGS

| Part Number | VRRM - Max. Repetitive Peak Reverse Voltage | | VRRM - Max. Non-Repetitive Peak Reverse Voltage | | IR - Max. Reverse Current At Rated VR | | |
|-------------|---|------------|---|------|---------------------------------------|------------------------|------------------------|
| | V | | V | | T _J = 25°C | T _J = 100°C | T _J = 150°C |
| | mA | | mA | | mA | | |
| 1N3879 | 50 | 75 | 0.015* | 1.0* | 3.0* | | |
| 1N3880 | 100 | 150 | 0.015* | 1.0* | 3.0* | | |
| 1N3881 | 200 | 250 | 0.015* | 1.0* | 3.0* | | |
| 1N3882 | 300 | 350 | 0.015* | 1.0* | 3.0* | | |
| 1N3883 | 400 | 450 | 0.015* | 1.0* | 3.0* | | |
| 1N3889 | 50 | 75 | 0.025* | 3.0* | 5.0* | | |
| 1N3890 | 100 | 150 | 0.025* | 3.0* | 5.0* | | |
| 1N3891 | 200 | 250 | 0.025* | 3.0* | 5.0* | | |
| 1N3892 | 300 | 350 | 0.025* | 3.0* | 5.0* | | |
| 1N3893 | 400 | 450 | 0.025* | 3.0* | 5.0* | | |
| **6FL6S02 | 6FL6S05 | 6FL6S10 | 50 | 75 | 0.050 | — | 6.0 |
| 6FL10S02 | 6FL10S05 | 6FL10S10 | 100 | 150 | 0.050 | — | 6.0 |
| 6FL20S02 | 6FL20S05 | 6FL20S10 | 200 | 275 | 0.050 | — | 6.0 |
| 6FL40S02 | 6FL40S05 | 6FL40S10 | 400 | 500 | 0.050 | — | 6.0 |
| 6FL60S02 | 6FL60S05 | 6FL60S10 | 600 | 725 | 0.050 | — | 6.0 |
| — | 6FL80S05 | 6FL80S10 | 800 | 950 | 0.050 | — | 6.0 |
| — | 6FL100S05 | 6FL100S10 | 1000 | 1250 | 0.050 | — | 6.0 |
| **12FL6S02 | 12FL6S05 | 12FL6S10 | 50 | 75 | 0.050 | — | 6.0 |
| 12FL10S02 | 12FL10S05 | 12FL10S10 | 100 | 150 | 0.050 | — | 6.0 |
| 12FL20S02 | 12FL20S05 | 12FL20S10 | 200 | 275 | 0.050 | — | 6.0 |
| 12FL40S02 | 12FL40S05 | 12FL40S10 | 400 | 500 | 0.050 | — | 6.0 |
| 12FL60S02 | 12FL60S05 | 12FL60S10 | 600 | 725 | 0.050 | — | 6.0 |
| — | 12FL80S05 | 12FL80S10 | 800 | 950 | 0.050 | — | 6.0 |
| — | 12FL100S05 | 12FL100S10 | 1000 | 1250 | 0.050 | — | 6.0 |
| **16FL6S02 | 16FL6S05 | 16FL6S10 | 50 | 75 | 0.050 | — | 6.0 |
| 16FL10S02 | 16FL10S05 | 16FL10S10 | 100 | 150 | 0.050 | — | 6.0 |
| 16FL20S02 | 16FL20S05 | 16FL20S10 | 200 | 275 | 0.050 | — | 6.0 |
| 16FL40S02 | 16FL40S05 | 16FL40S10 | 400 | 500 | 0.050 | — | 6.0 |
| 16FL60S02 | 16FL60S05 | 16FL60S10 | 600 | 725 | 0.050 | — | 6.0 |
| — | 16FL80S05 | 16FL80S10 | 800 | 950 | 0.050 | — | 6.0 |
| — | 16FL100S05 | 16FL100S10 | 1000 | 1250 | 0.050 | — | 6.0 |

REVERSE RECOVERY CHARACTERISTICS

| | 1N3879-1N3883 | 1N3889-1N3893 | 6FL... | | | 12FL... | | | 16FL... | | | Unit | Conditions |
|---|---------------|---------------|--------|------|------|---------|------|------|---------|------|------|------|--|
| | | | S02 | S05 | S10 | S02 | S05 | S10 | S02 | S05 | S10 | | |
| t _{rr} Max. reverse recovery time | 150 | 150 | 110 | 285 | 490 | 100 | 250 | 430 | 90 | 225 | 390 | ns | T _J = 25°C, I _F = 1A to V _R = 30V dI _F /dt = 100 A/μs |
| | 300* | 300* | 200 | 500 | 1000 | 200 | 500 | 1000 | 200 | 500 | 1000 | ns | T _J = 25°C, dI _F /dt = 25 A/μs |
| I _{RM(REC)} Max. peak reverse recovery current | 4* | 5* | — | — | — | — | — | — | — | — | — | — | I _{FM} = π × rated I _{F(AV)} |
| QRR Max. reverse recovered charge | 400 | 350 | 230 | 1700 | 5000 | 200 | 1300 | 3800 | 150 | 1100 | 3000 | nC | T _J = 25°C, I _F = 1A to V _R = 30V dI _F /dt = 100 A/μs |
| | 400 | 400 | 200 | 1200 | 5000 | 200 | 1200 | 5000 | 200 | 1200 | 5000 | nC | T _J = 25°C, dI _F /dt = 25 A/μs I _{FM} = π × rated I _{F(AV)} |

ELECTRICAL SPECIFICATIONS

| | 1N3879-1N3883 | 6FL... | 1N3889-1N3893 | 12FL... | 16FL... | Unit | Conditions |
|---|---------------|--------|---------------|---------|-------------------|---|------------|
| FORWARD CONDUCTION | | | | | | | |
| I _{F(AV)} Max. average forward current | 6* | 6 | 12* | 16 | A | 180° conduction, half sine wave, T _C = 100°C | |
| I _{F(RMS)} Max. r.m.s. forward current | 9.5 | 9.5 | 19 | 25 | A | | |
| I _{FSM} Max. peak one-cycle non-repetitive forward current | 72 | 110 | 145 | 180 | A | t = 10 ms With rated VRRM | |
| | 75* | 115 | 150* | 190 | | t = 8.3 ms | |
| | 85 | 130 | 170 | 215 | | t = 10 ms VRRM = 0 | |
| i ² _t Max. i ² for fusing | 90 | 135 | 160 | 245 | A ² s | t = 10 ms With rated VRRM | |
| | 26 | 80 | 103 | 160 | | t = 8.3 ms | |
| | 23 | 55 | 94 | 150 | | t = 10 ms VRRM = 0 | |
| Max. i ² for individual device fusing | 36 | 86 | 145 | 230 | A ² s | t = 10 ms | |
| | 33 | 76 | 130 | 210 | | t = 8.3 ms | |
| i ² √t Max. i ² √t for individual device fusing | 363 | 856 | 1452 | 2290 | i ² √s | t = 0.1 to 10 ms | |
| V _{FM} Max. peak forward voltage | 1.4* | 1.4 | 1.4* | 1.4 | V | T _J = 25°C, I _F = rated I _{F(AV)} (D.C.) | |
| | 1.5* | 1.5 | 1.5* | 1.5 | | T _C = 100°C, I _{FM} = π × rated I _{F(AV)} | |

* JEDEC registered value
 ** Suffix "S02" may be omitted, i.e., 12FL10 to imply 12FL10S02, 12FLR60 implies 12FLR60S02.

① I_{R(AV)} @ rated I_{F(AV)} and VRRM, and T_C = 100°C.

② I_{RM} @ rated VRRM and T_J = 150°C.

③ i²t for time t_x = 12√t * √x

④ Types listed are cathode to case; for anode-to-case include "R" in code, i.e., 1N3879R, 6FLR20S10, 16FLR40S02.

⑤ When these devices are ordered without a suffix, e.g., 40HFL, the order will be filled with devices that meet the S02 specification.

Thermal and mechanical specifications

| | 1N3879 -1N3863 6FL... | 1N3889 -1N3893 12FL... | 16FL... | Units | Conditions |
|------------|--|------------------------------|--------------|------------|--|
| T_J | Junction operating temperature range | | | -65 to 150 | °C |
| T_{stg} | Storage temperature range | | | -65 to 175 | °C |
| R_{thJC} | 2.5 | 2.0 | 1.6 | deg C/W | DC operation |
| R_{thCS} | Maximum thermal resistance, case to heatsink | | | 0.5 | deg C/W |
| T | Mounting torque ± 10% | to nut | 10.5 | lb.in | Mounting surface flat, smooth and greased. Lubricated threads (Non-lubricated threads) |
| | | | 0.12 | kgf.m | |
| | | 1.2 | Nm | | |
| | | to device | 11.5 (13.5) | lb.in | |
| | | | 0.13 (0.156) | kgf.m | |
| wt | Approximate weight | 7 | | g | |
| | | 0.25 | | oz | |
| Case style | | DO-203AA (DO-4) | | JEDEC | |

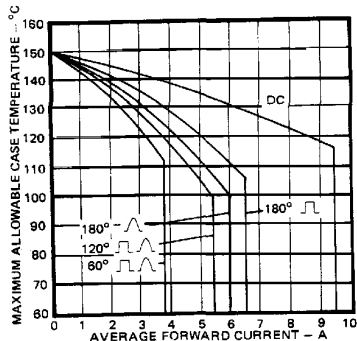


Fig. 1 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3879 and 6FL Series

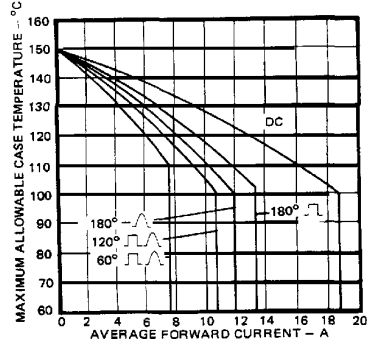


Fig. 2 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3889 and 12FL Series

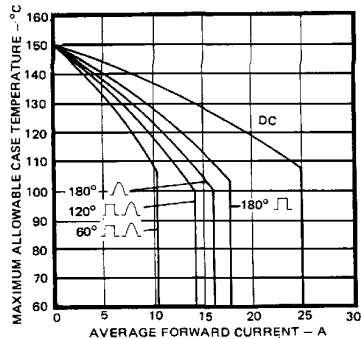
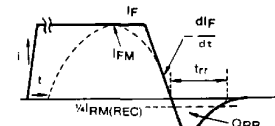
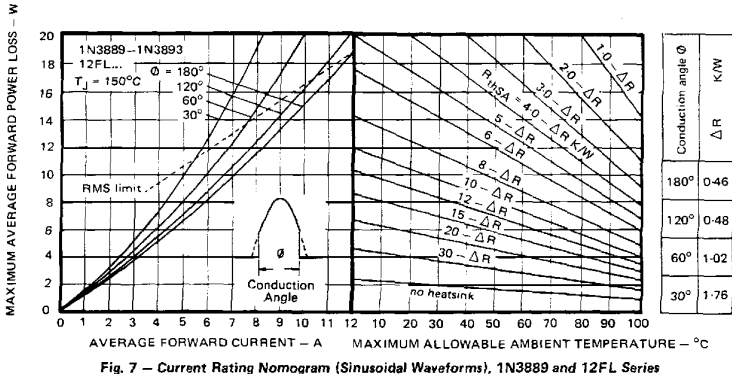
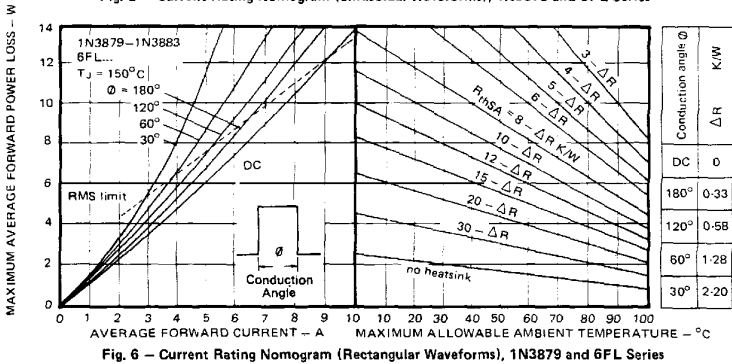
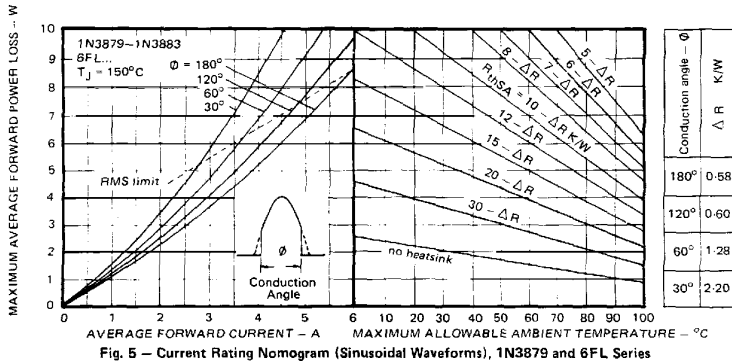


Fig. 3 - Average Forward Current Vs. Maximum Allowable Case Temperature, 16FL Series



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

Fig. 4 - Reverse Recovery Time Test Waveform



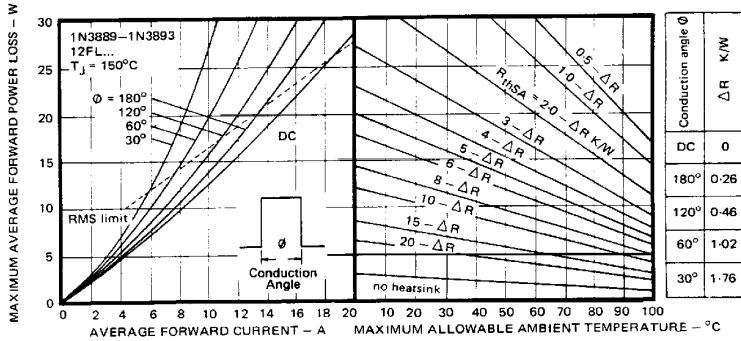


Fig. 8 – Current Rating Nomogram (Rectangular Waveforms), 1N3889 and 12FL Series

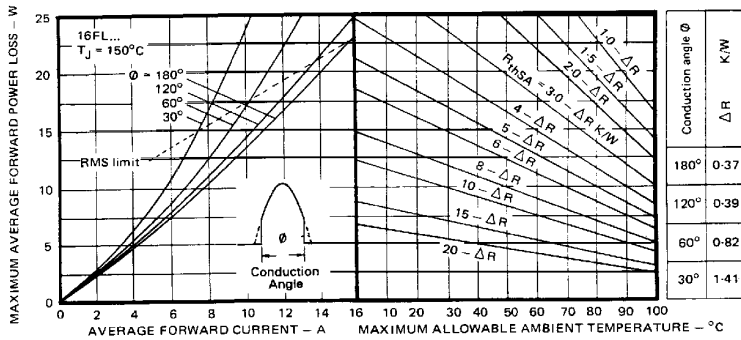


Fig. 9 – Current Rating Nomogram (Sinusoidal Waveforms), 16FL Series

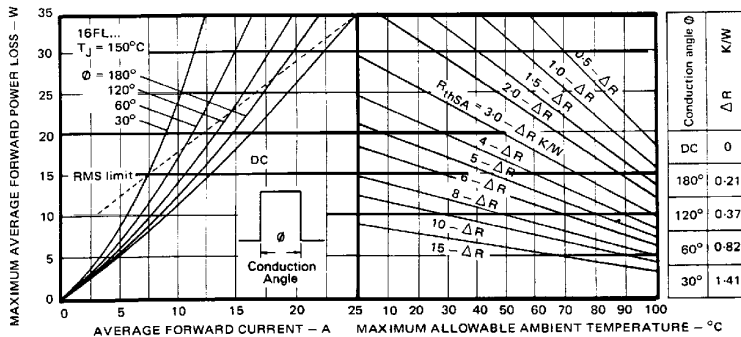


Fig. 10 – Current Rating Nomogram (Rectangular Waveforms), 16FL Series

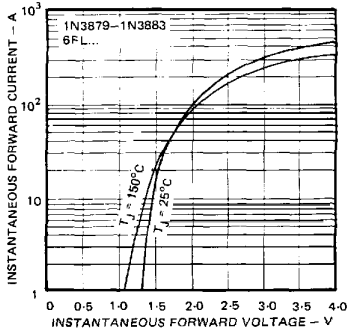


Fig. 11 – Maximum Forward Voltage Vs. Forward Current, 1N3879 and 6FL Series

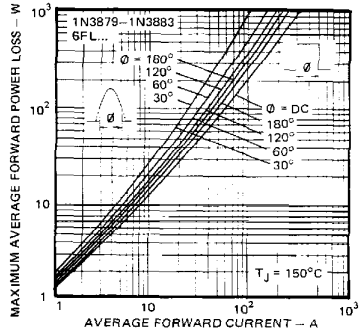


Fig. 12 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3879 and 6FL Series

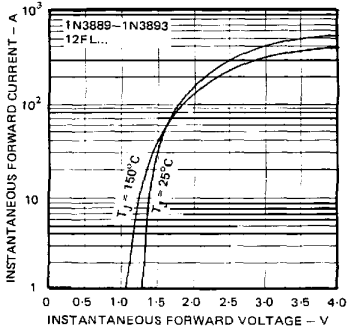


Fig. 13 – Maximum Forward Voltage Vs. Forward Current, 1N3889 and 12FL Series

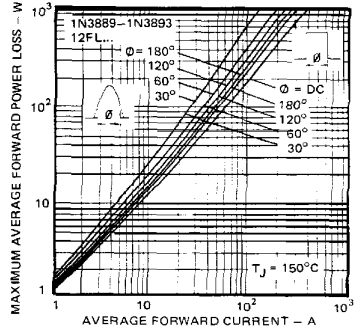


Fig. 14 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3889 and 12FL Series

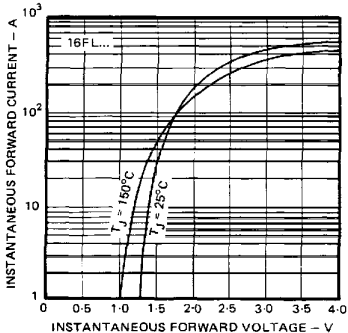


Fig. 15 – Maximum Forward Voltage Vs. Forward Current, 16FL Series

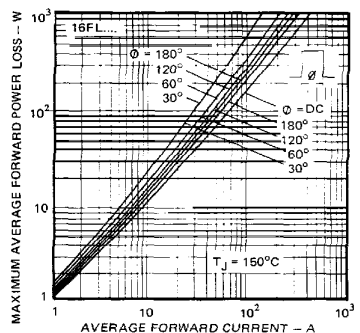


Fig. 16 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 16FL Series

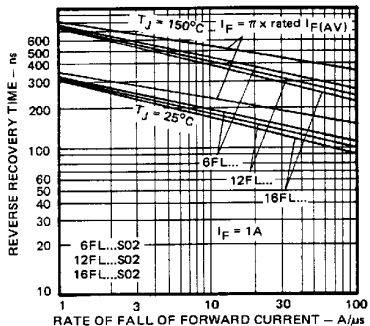


Fig. 17A — Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series __S02

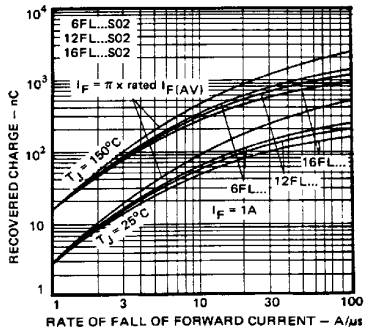


Fig. 17B — Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series __S02

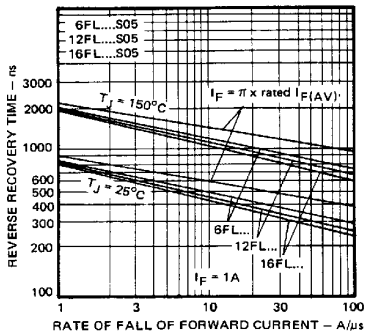


Fig. 18A — Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series __S05

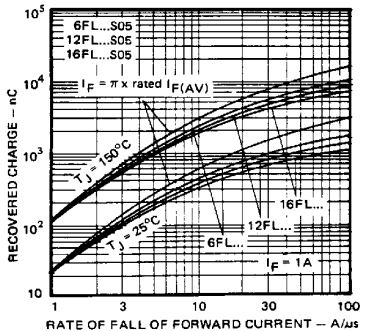


Fig. 18B — Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series __S05

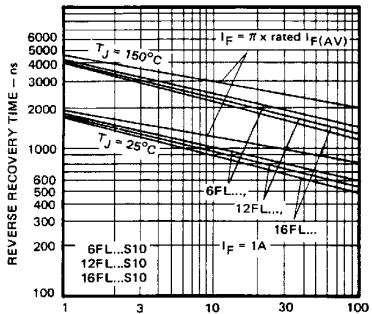


Fig. 19A — Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series __S10

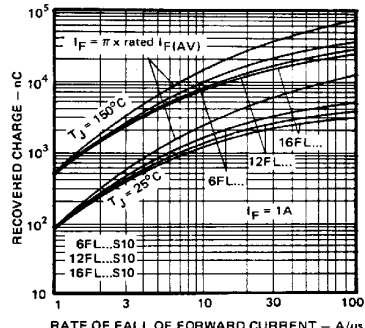


Fig. 19B — Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series __S10

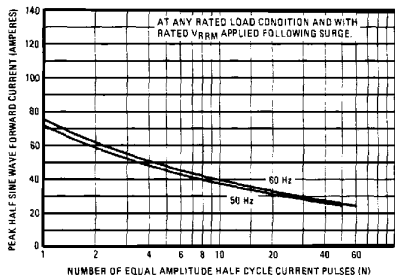


Fig. 20 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3879 Series

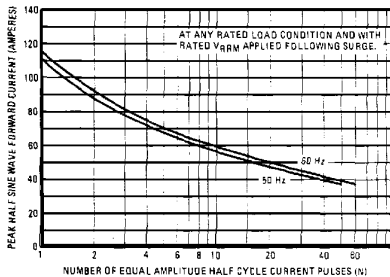


Fig. 21 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 6FL Series

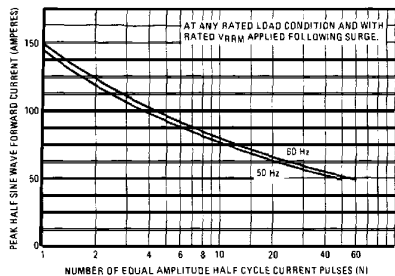


Fig. 22 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3889 and 12FL Series

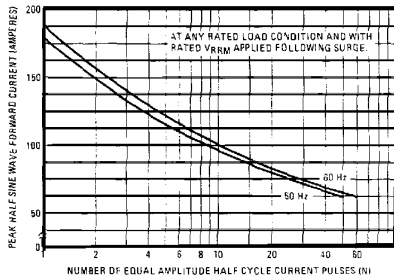


Fig. 23 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 16FL Series

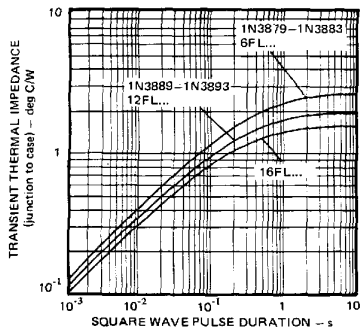


Fig. 24 – Maximum Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration, All Series.

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