

# 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 <sup>2</sup> s
	60Hz	23	94	55	94	150	A <sup>2</sup> 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.  $T_C = 100^\circ\text{C}$ .

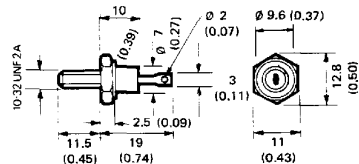
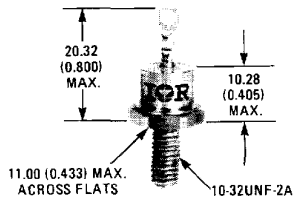
#### Description

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		I <sub>R</sub> - Max. Reverse Current At Rated V <sub>R</sub>		
	V		V		T <sub>J</sub> = 25°C	T <sub>J</sub> = 100°C	T <sub>J</sub> = 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

		6FL...			12FL...			16FL...			Unit	Conditions		
		S02	S05	S10	S02	S05	S10	S02	S05	S10				
t <sub>rr</sub>	Max. reverse recovery time	150	150	110	285	490	100	250	430	90	225	390	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 1A to V <sub>R</sub> = 30V dI <sub>F</sub> /dt = 100 A/μs
		300*	300*	200	500	1000	200	500	1000	200	500	1000	ns	T <sub>J</sub> = 25°C, dI <sub>F</sub> /dt = 25 A/μs
		4*	5*	—	—	—	—	—	—	—	—	—	—	ns
I <sub>RM</sub> (REC)	Max. peak reverse recovery current	4*	5*	—	—	—	—	—	—	—	—	—	ns	I <sub>FM</sub> = π × rated I <sub>F</sub> (AV)
Q <sub>RR</sub>	Max. reverse recovered charge	400	350	230	1700	5000	200	1300	3800	150	1100	3000	nC	T <sub>J</sub> = 25°C, I <sub>F</sub> = 1A to V <sub>R</sub> = 30V dI <sub>F</sub> /dt = 100 A/μs
		400	400	200	1200	5000	200	1200	5000	200	1200	5000	nC	T <sub>J</sub> = 25°C, dI <sub>F</sub> /dt = 25 A/μs I <sub>FM</sub> = π × rated I <sub>F</sub> (AV)

ELECTRICAL SPECIFICATIONS

	1N3879-1N3883	6FL...	1N3889-1N3893	12FL...	16FL...	Unit	Conditions						
FORWARD CONDUCTION													
I <sub>F</sub> (AV)	Max. average forward current							6*	9	12*	16	A	180° conduction, half sine wave, T <sub>C</sub> = 100°C
I <sub>F</sub> (RMS)	Max. r.m.s. forward current							9.5	9.5	19	25	A	
I <sub>FSM</sub>	Max. peak one-cycle non-repetitive forward current							72	110	145	180	A	t = 10 ms t = 8.3 ms With rated VRRM Sinusoidal half wave, initial T <sub>J</sub> = 150°C
								85	130	170	215		
								90	135	180	225		
i <sup>2</sup> <sub>t</sub>	Max. i <sup>2</sup> <sub>t</sub> for fusing							26	80	103	160	A <sup>2</sup> s	Initial T <sub>J</sub> = 150°C
	Max. i <sup>2</sup> <sub>t</sub> for individual device fusing							36	86	145	230		
								33	76	130	210		
i <sup>2</sup> √t	Max. i <sup>2</sup> √t for individual device fusing							363	856	1452	2290	i <sup>2</sup> √s	t = 0.1 to 10 ms
V <sub>FM</sub>	Max. peak forward voltage							1.4*	1.4	1.4*	1.4	V	T <sub>J</sub> = 25°C, I <sub>F</sub> = rated I <sub>F</sub> (AV) (D.C.)
								1.5*	1.5	1.5*	1.5		T <sub>C</sub> = 100°C, I <sub>FM</sub> = π × rated I <sub>F</sub> (AV)

\* JEDEC registered value

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

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

① I<sub>R</sub>(AV) @ rated I<sub>F</sub>(AV) and VRRM, and T<sub>C</sub> = 100°C.

② I<sub>RM</sub> @ rated VRRM and T<sub>J</sub> = 150°C.

③ i<sup>2</sup><sub>t</sub> for time t<sub>x</sub> = 12√t \* √x

④ 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 -1N3883 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	

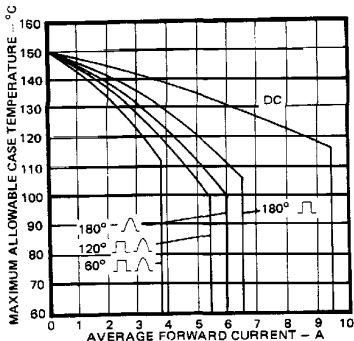


Fig. 1 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3879 and 6FL Series

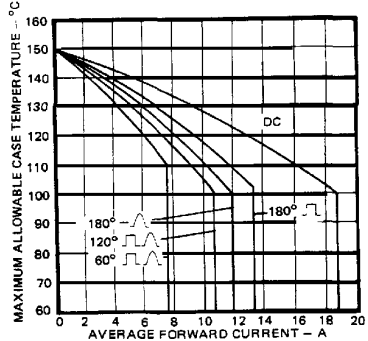


Fig. 2 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3889 and 12FL Series

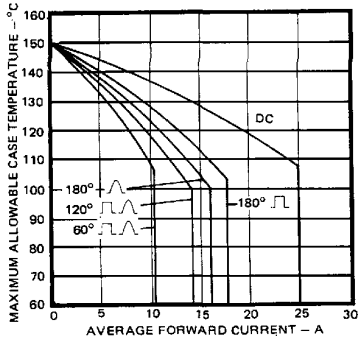
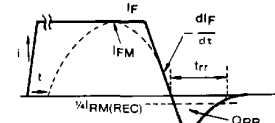
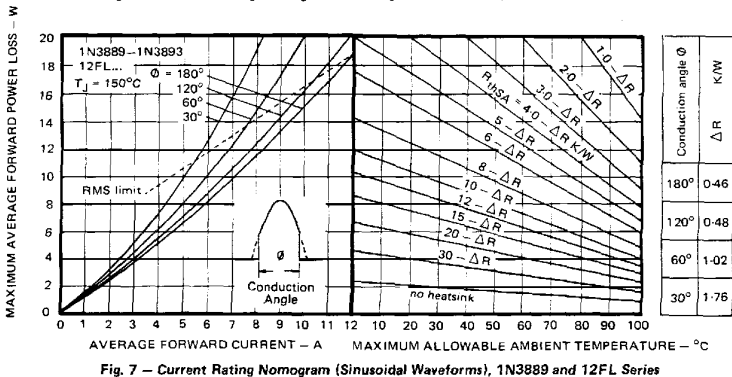
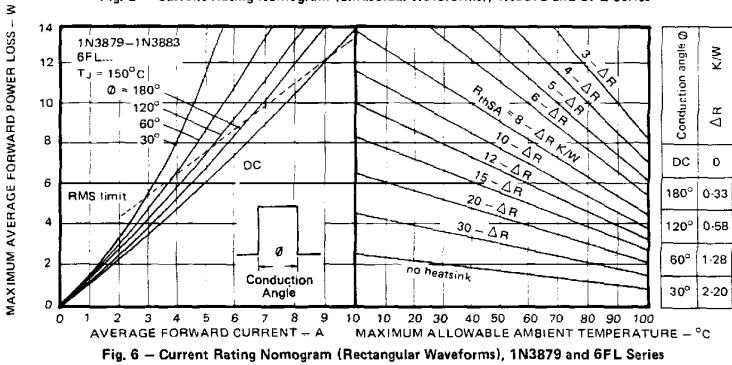
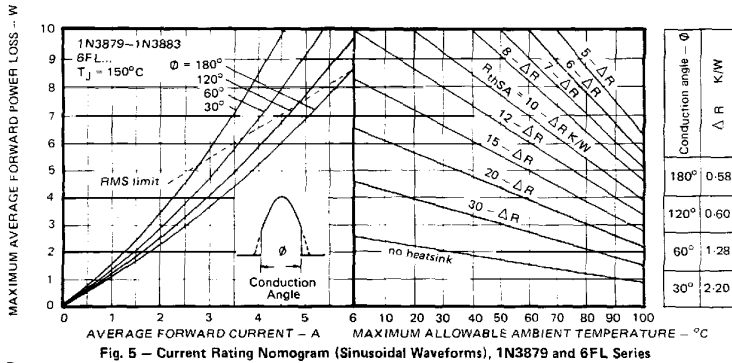


Fig. 3 - Average Forward Current Vs. Maximum Allowable Case Temperature, 16FL Series



- $I_F, I_{FM}$  = 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



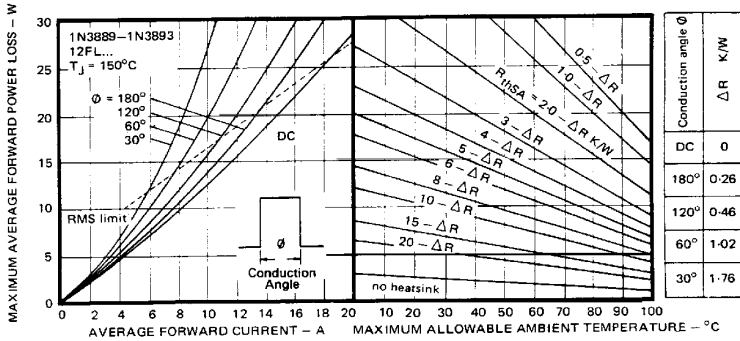


Fig. 8 – Current Rating Nomogram (Rectangular Waveforms), 1N3889 and 12FL Series

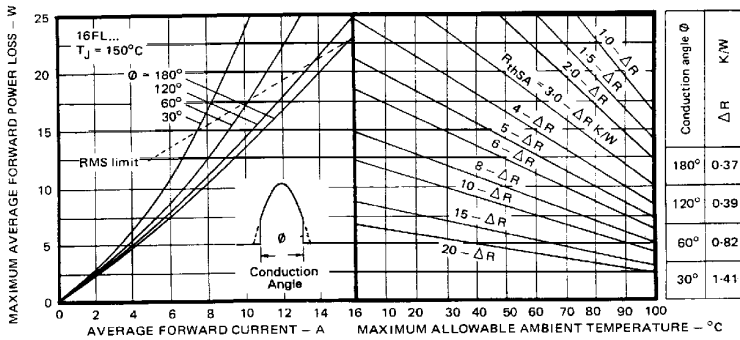


Fig. 9 – Current Rating Nomogram (Sinusoidal Waveforms), 16FL Series

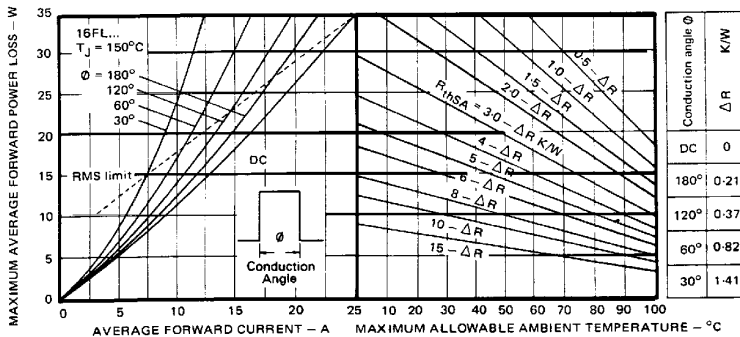


Fig. 10 – Current Rating Nomogram (Rectangular Waveforms), 16FL Series

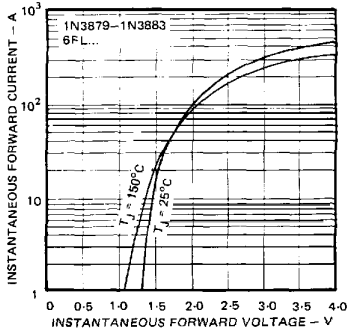


Fig. 11 – Maximum Forward Voltage Vs. Forward Current, 1N3879 and 6FL Series

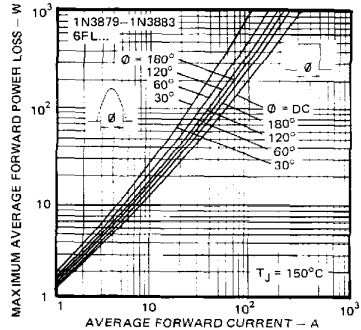


Fig. 12 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3879 and 6FL Series

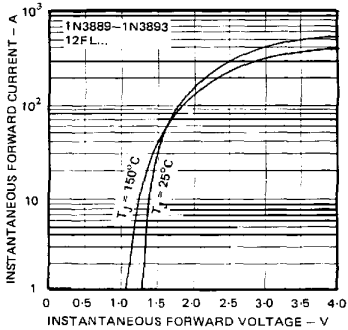


Fig. 13 – Maximum Forward Voltage Vs. Forward Current, 1N3889 and 12FL Series

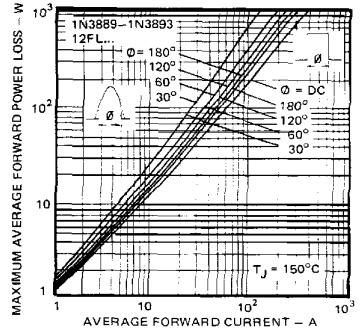


Fig. 14 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3889 and 12FL Series

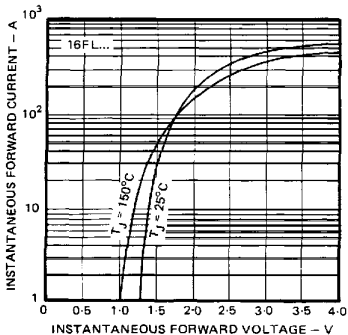


Fig. 15 – Maximum Forward Voltage Vs. Forward Current, 16FL Series

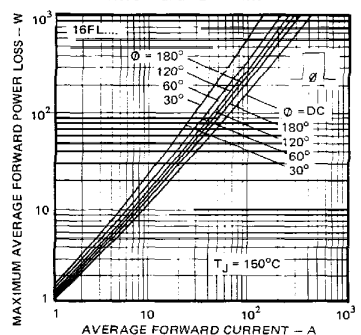


Fig. 16 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 16FL Series

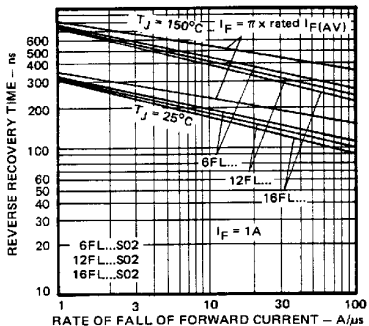


Fig. 17A — Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series \_\_S02

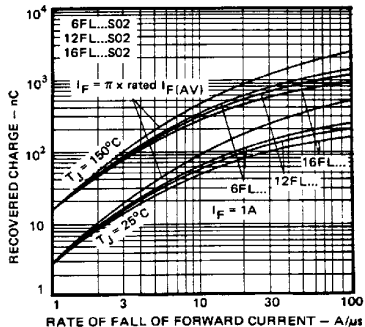


Fig. 17B — Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series \_\_S02

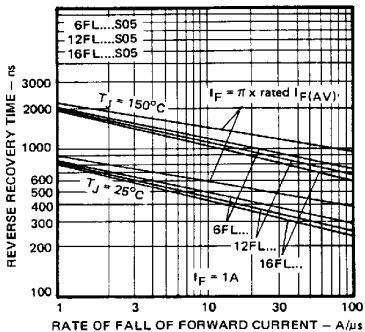


Fig. 18A — Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series \_\_S05

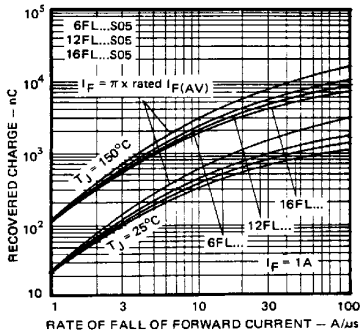


Fig. 18B — Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series \_\_S05

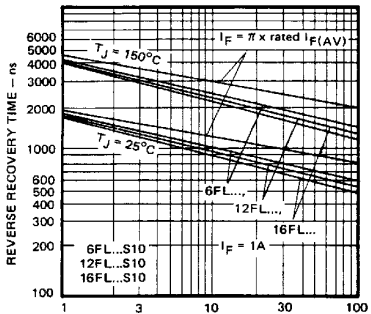


Fig. 19A — Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series \_\_S10

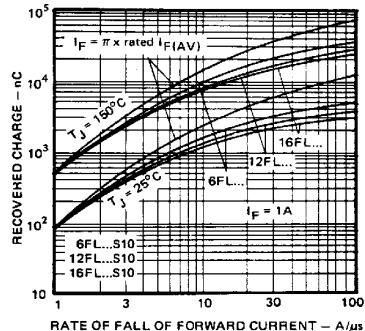


Fig. 19B — Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series \_\_S10

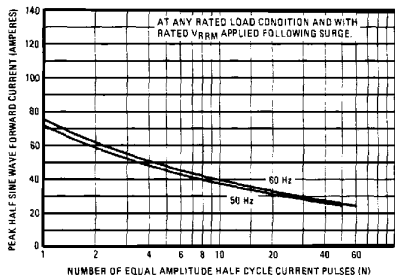


Fig. 20 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3879 Series

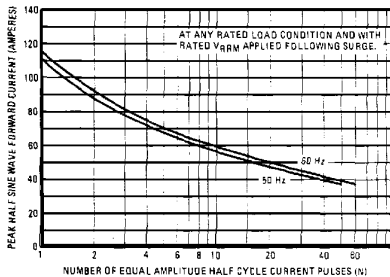


Fig. 21 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 6FL Series

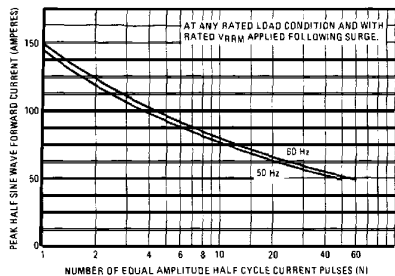


Fig. 22 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3889 and 12FL Series

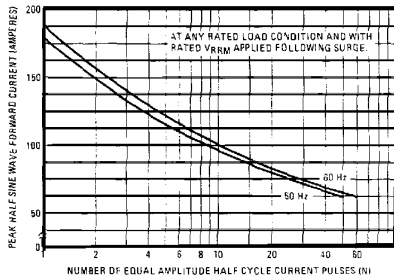


Fig. 23 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 16FL Series

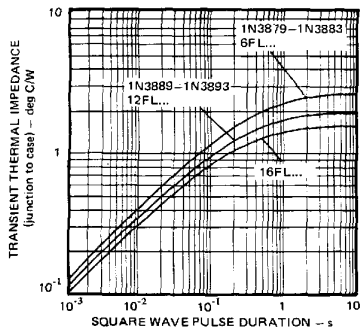


Fig. 24 – Maximum Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration, All Series.