Bulletin PD-2.030 revG 01/05

International
IOR Rectifier

1N3879(R), 1N3889(R)
6/ 12/ 16FL(R) SERIES

FAST RECOVERY DIODES

Stud Version

Major Ratings and Characteristics

Parameters		1N3879-1N3883	1N3889-1N3893	6FL	12FL	16FL	Units
$I_{F(AV)}$ @ T_C = 100°C		6 *	12 *	6	12	16	A
$I_{F(RMS)}$		9.5	19	9.5	19	25	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^2s
	@60Hz	23	94	55	94	150	A^2s
$I^2\sqrt{t}$		363	856	1452	1452	2290	$I^2\sqrt{s}$
V_{RRM}	range	50 to 400 *		50 to 1000			V
t_{rr}	range	see table					ns
T_J	range	- 65 to 150					°C

* JEDEC registred values.

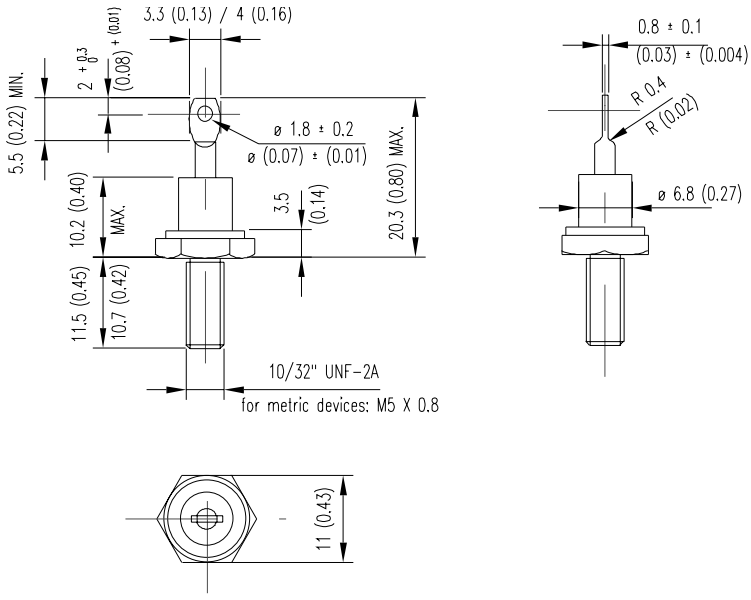
Description

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

Features

- Short reverse recovery time
- Low stored charge
- Wide current range
- Excellent surge capabilities
- Standard JEDEC types
- Stud cathode and stud anode versions
- Fully characterised reverse recovery conditions

case style
DO-203AA (DO-4)



ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{RRM} max. repetitive peak and off-state voltage V	V_{RSM}, maximum non-repetitive peak voltage V	I_{RRM} max. T_J = 25°C µA	I_{RRM} max. T_J = 100°C mA	I_{RRM} max. T_J = 150°C mA
1N3879.		50	75			
1N3880.		100	150			
1N3881.	-	200	250	15 *	1.0 *	3.0 *
1N3882.		300	350			
1N3883.		400	450			
1N3889.	-	50	75			
1N3890.	-	100	150			
1N3891.	-	200	250	25 *	3.0 *	5.0 *
1N3892.	-	300	350			
1N3893.	-	400	450			
	5	50	75			
	10	100	150			
6FL..	20	200	275			
12FL..	40	400	500	50	-	6.0
16FL..	60	600	725			
	80	800	950			
	100	1000	1250			

Forward Conduction

	Parameter	1N3879. 1N3883.	6FL..	1N3889. 1N3893. 12FL..	16FL..	Units	Conditions		
$I_{F(AV)}$	Max. average forward current @ TC = 100°C	6*	6	12 *	16	A	180° conduction, half sine wave. DC		
$I_{F(RMS)}$	Max. RMS current	9.5	9.5	19	25	A			
I_{FSM}	Max. peak, one-cycle non-repetitive forward current	85	130	170	215	A	t = 10ms	No voltage reapplied	Sinusoidal half wave Initial T_J = 150°C
		90	135	180	225		t = 8.3ms		
		72	110	145	180		t = 10ms	100% V_{RRM} reapplied	
		75 *	115	150 *	190		t = 8.3ms		
I^2t	Maximum I^2t for fusing	36	86	145	230	A^2s	t = 10ms	No voltage reapplied	
		33	78	130	210		t = 8.3ms		
		26	60	103	160		t = 10ms	100% V_{RRM} reapplied	
		23	55	94	150		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	363	856	1452	2290	$A^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
V_{FM}	Max. 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 x rated $I_{F(AV)}$		

* JEDEC registered value

Recovery Characteristics

Parameter		1N3879. 1N3883.	1N3889. 1N3893.	6FL.. 12FL.. 16FL.. S02	S05	Units	Conditions
t_{rr}	Max. reverse recovery time	150	150	…	…	ns	T_J = 25°C, I_F = 1A to V_R = 30V, dI_F/dt = 100A/µs
		300 *	300 *	200	500		T_J = 25°C, dI_F/dt = 25A/µs, I_{FM} = p x rated $I_{F(AV)}$
$I_{RM(REC)}$	Max. peak recovery current	4 *	5 *	...		---	I_{FM} = p x rated $I_{F(AV)}$
Q_{RR}	Max. reverse	400	350	…	…	nC	T_J = 25°C, I_F = 1A to V_R = 30V, dI_F/dt = 100A/µs
	recovered charge	400	400	...	...		T_J = 25°C, dI_F/dt = 25A/µs, I_{FM} = p x rated $I_{F(AV)}$

* JEDEC registered value

Thermal and Mechanical Specification

Parameter		1N3879. 1N3883. 6FL..	1N3889. 1N3893. 12FL..	16FL..	Units	Conditions
T_J	Max. junction operating temperature range	-65 to 150			°C	
T_{stg}	Max. storage temperature range	-65 to 175				
R_{thJC}	Max. thermal resistance, junction to case	2.5	2.0	1.6	C/W	DC operation
R_{thCS}	Max. thermal resistance, case to heatsink	0.5				Mounting surface, smooth, flat and greased
T	Allowable mounting torque	$1.5^{+0-10\%}$			Nm	Not lubricated threads
		13			lbf.in	
		$1.2^{+0-10\%}$			Nm	Lubricated threads
		10			lbf.in	
wt	Approximate weight	7 (0.25)			g (oz)	
	Case style	DO-203AA(DO-4)			JEDEC	

ΔR_{thJC} Conduction

(The following table shows the increment of thermal resistence R_{thJC} when devices operate at different conduction angles than DC)

	1N3879. 1N3883. 6FL..	1N3889. 1N3893. 12FL..	16FL..	1N3879. 1N3883. 6FL..	1N3889. 1N3893. 12FL..	16FL..		
Conduction angle	Sinusoidal conduction			Rectangular conduction			Units	Conditions
180°	0.58	0.46	0.37	0.33	0.26	0.21	K/W	T_J = 150°C
120°	0.60	0.48	0.39	0.58	0.46	0.37		
60°	1.28	1.02	0.82	1.28	1.02	0.82		
30°	2.20	1.76	1.41	2.20	1.76	1.41		

Ordering Information Table

Device Code

A	16	F	L	R	60	M	S02
1	2	3	4	5	6	7	8

1 - Omit = Standard or Fast Recovery Diode
A = Avalanche Diode

2 - Current Code $I_{(AVG)}$ = Exact Current Rating

3 - F = Diode

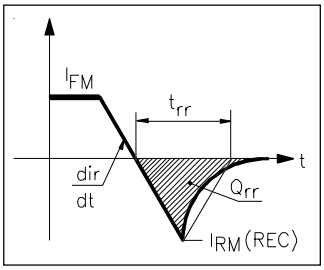
4 - Omit = Standard Recovery Diode
L = Only for Fast Diode

5 - Omit = Stud Forward Polarity
R = Stud Reverse Polarity

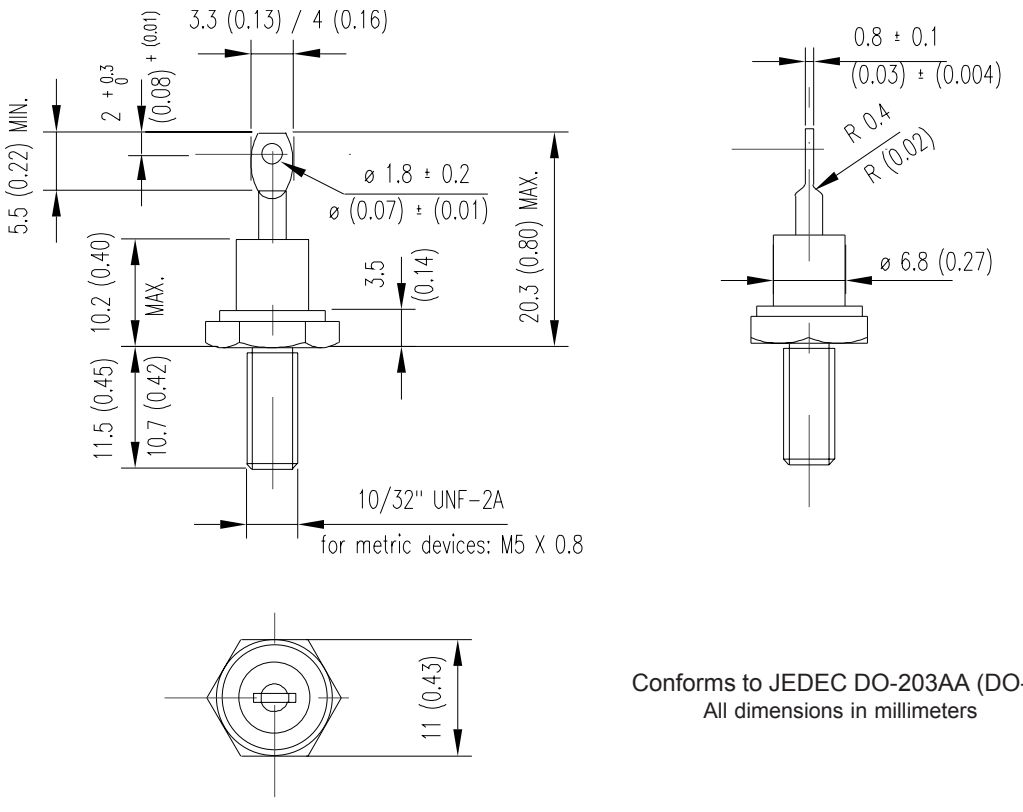
6 - Voltage code: Code x 10 = V_{RRM} (see Voltage Ratings table)

7 - Outlines:
Omit = Stud Base UNF Thread
M = Stud Base Metric Thread

8 - t_{rr} code only for Fast Diode (see Recovery Characteristics table)



Outline Table



Conforms to JEDEC DO-203AA (DO-4)
All dimensions in millimeters

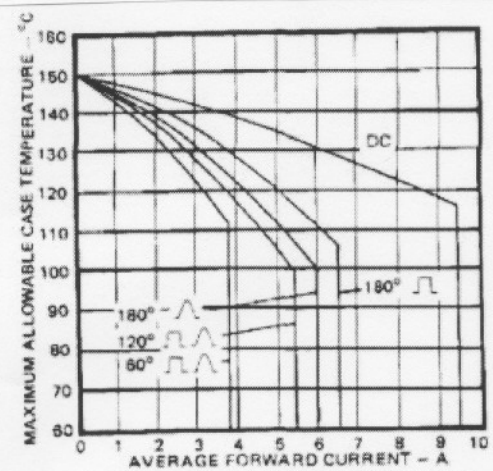


Fig. 1 – Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3879 and 6FL Series

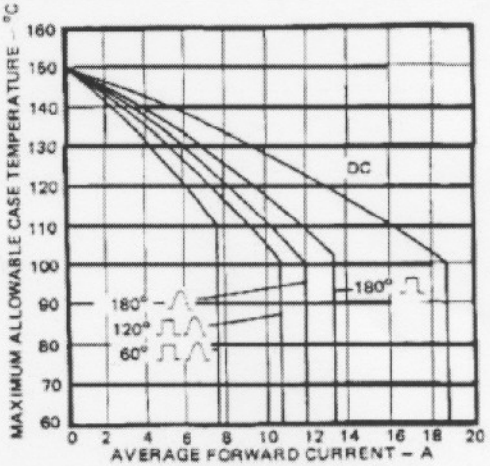


Fig. 2 – Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3889 and 12FL Series

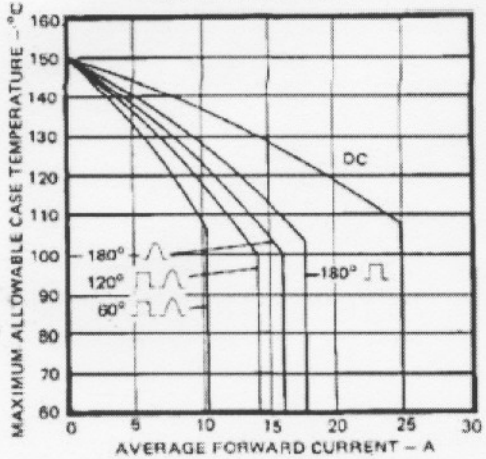
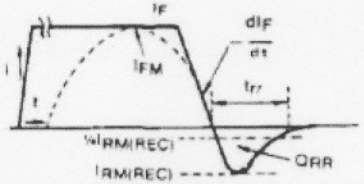


Fig. 3 – Average Forward Current Vs. Maximum Allowable Case Temperature, 16FL Series



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

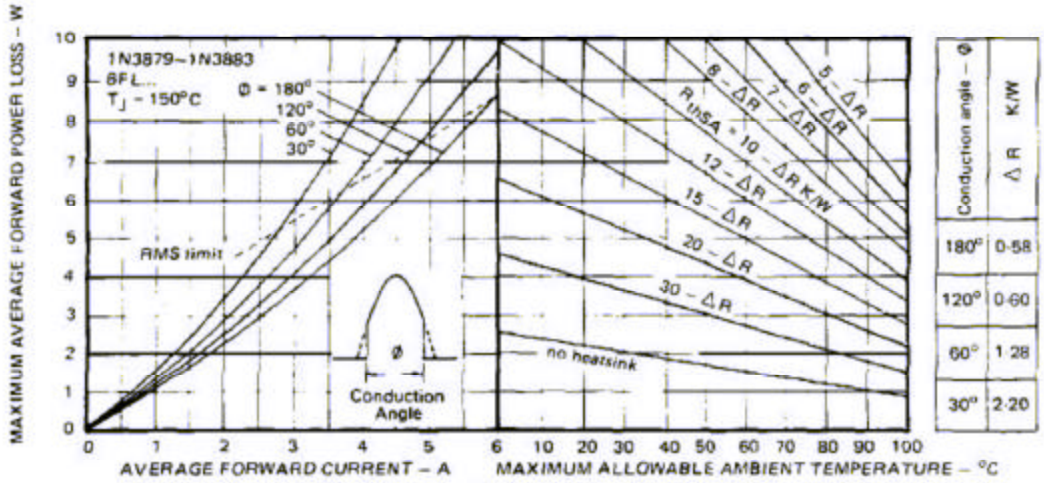


Fig. 5 – Current Rating Nomogram (Sinusoidal Waveforms), 1N3879 and 6FL Series

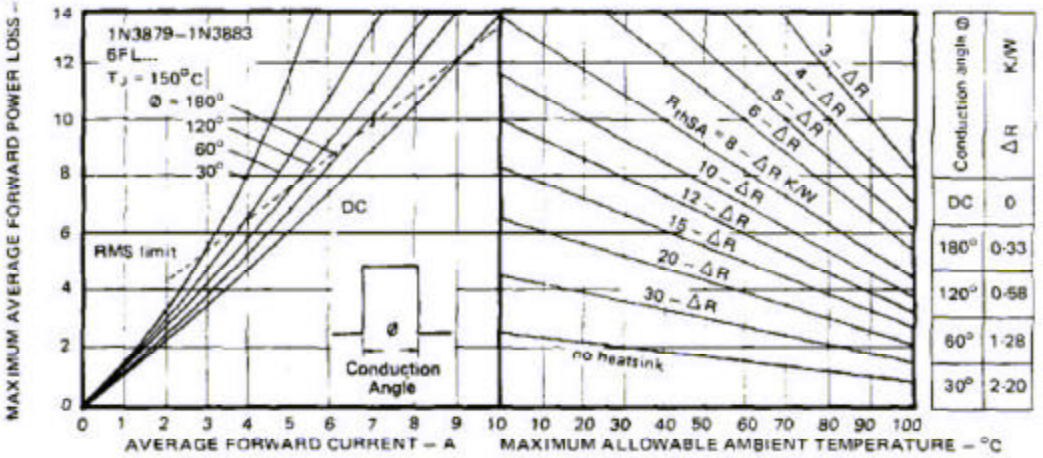


Fig. 6 – Current Rating Nomogram (Rectangular Waveforms), 1N3879 and 6FL Series

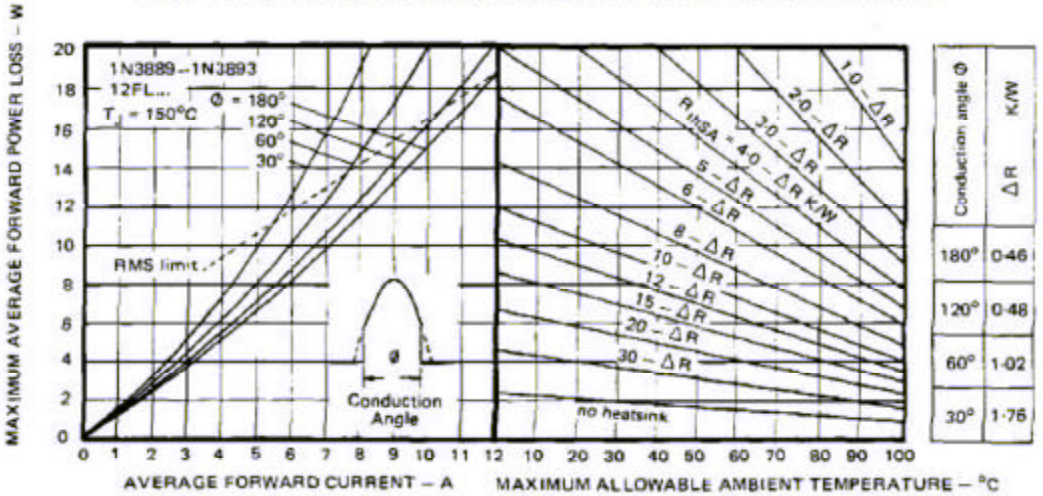
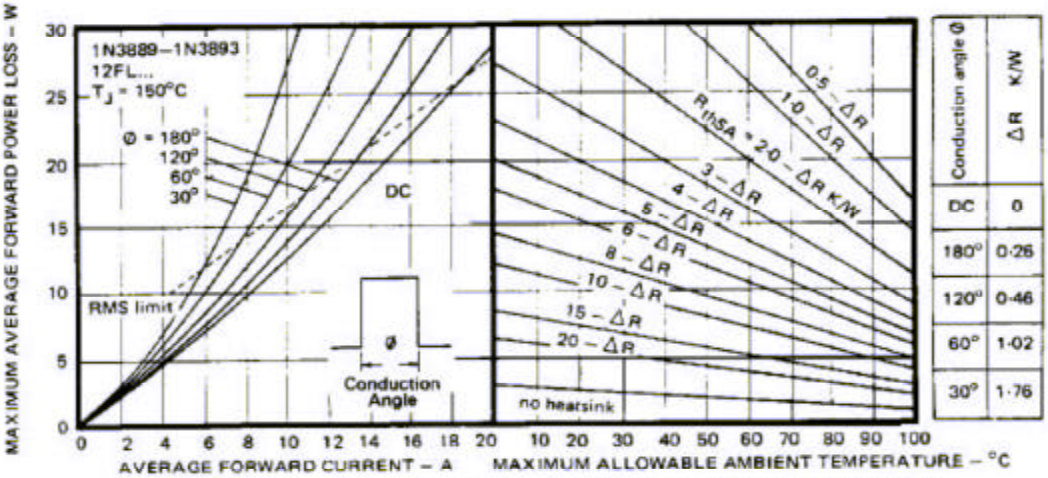
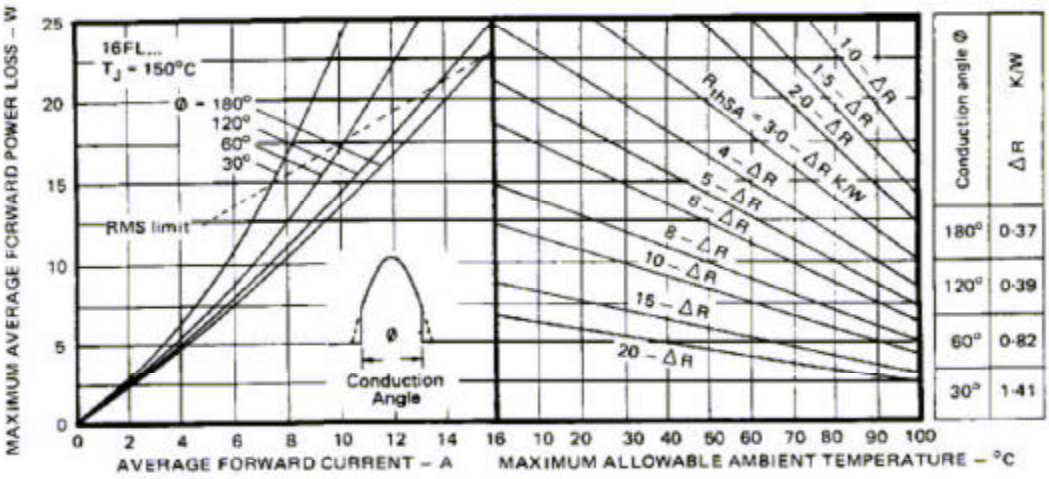


Fig. 7 – Current Rating Nomogram (Sinusoidal Waveforms), 1N3889 and 12FL Series



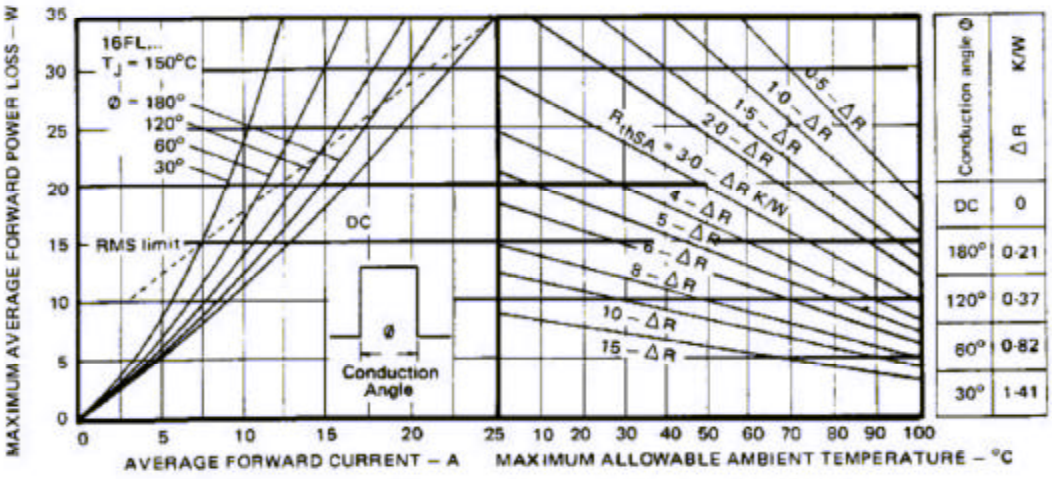
Conduction angle Ø	ΔR K/W
DC	0
180°	0·26
120°	0·46
60°	1·02
30°	1·76

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



Conduction angle Ø	ΔR K/W
180°	0·37
120°	0·39
60°	0·82
30°	1·41

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



Conduction angle Ø	ΔR K/W
DC	0
180°	0·21
120°	0·37
60°	0·82
30°	1·41

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

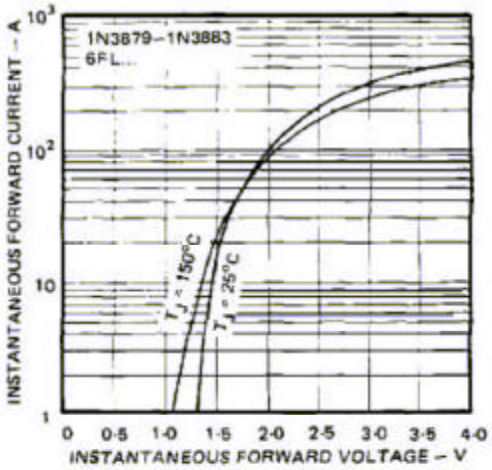


Fig. 11 – Maximum Forward Voltage Vs. Forward Current, 1N3879 and 6FL Series

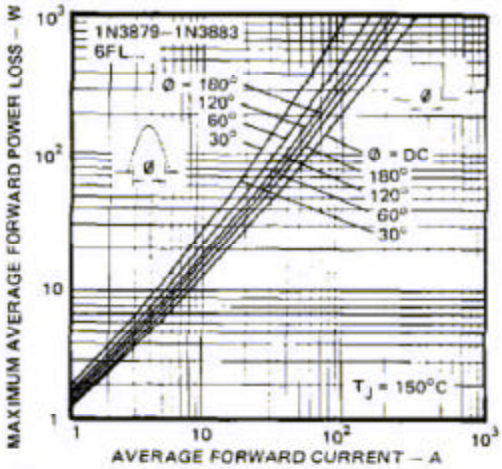


Fig. 12 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3879 and 6FL Series

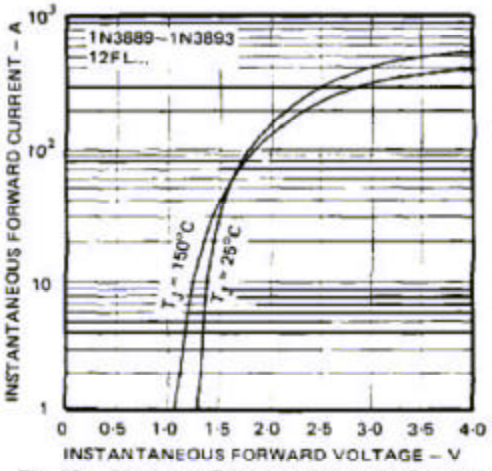


Fig. 13 – Maximum Forward Voltage Vs. Forward Current, 1N3889 and 12FL Series

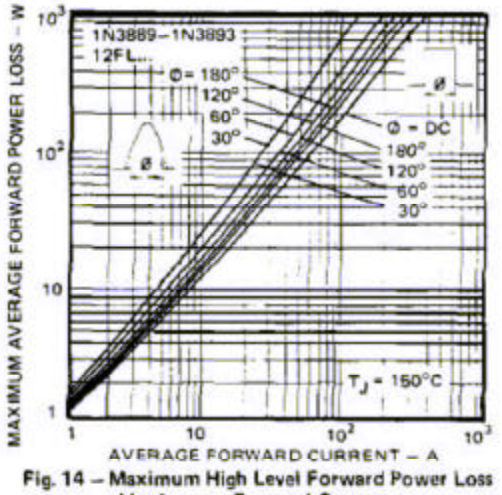


Fig. 14 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3889 and 12FL Series

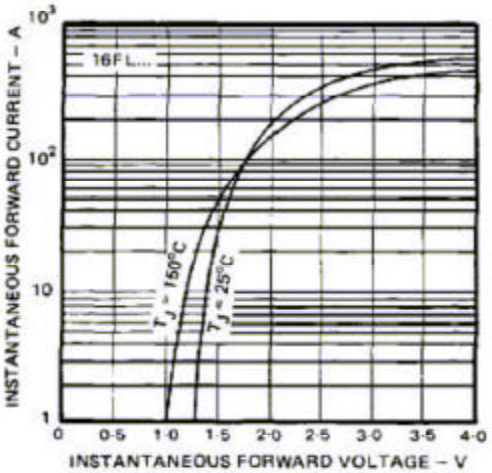


Fig. 15 – Maximum Forward Voltage Vs. Forward Current, 16FL Series

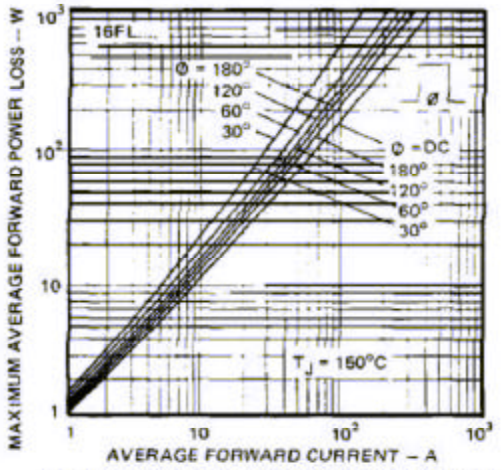


Fig. 16 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 16FL Series

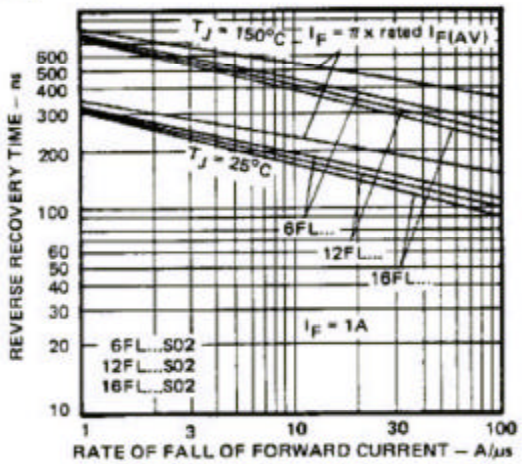


Fig. 17A – Typical Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series ___S02

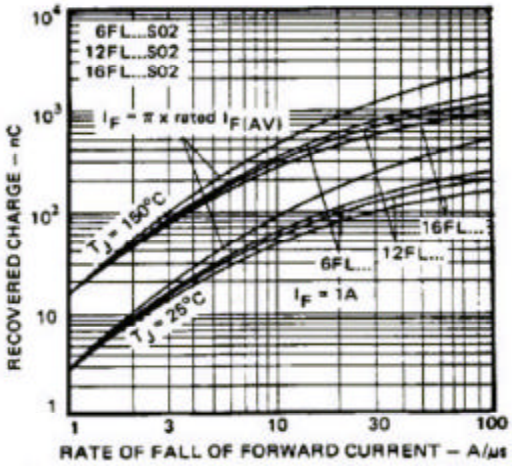


Fig. 17B – Typical Recovered Charge Vs. Rate of Fall of Forward Current, All Series ___S02

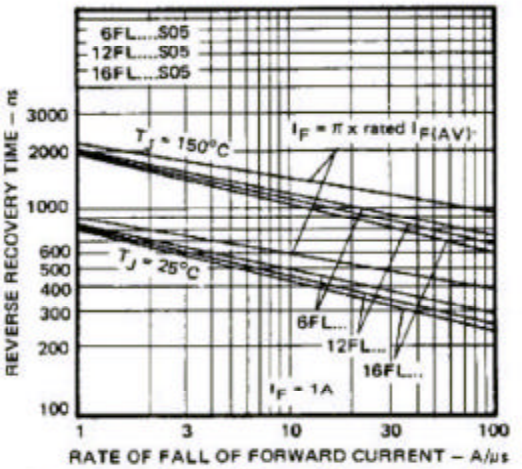


Fig. 18A – Typical Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series ___S05

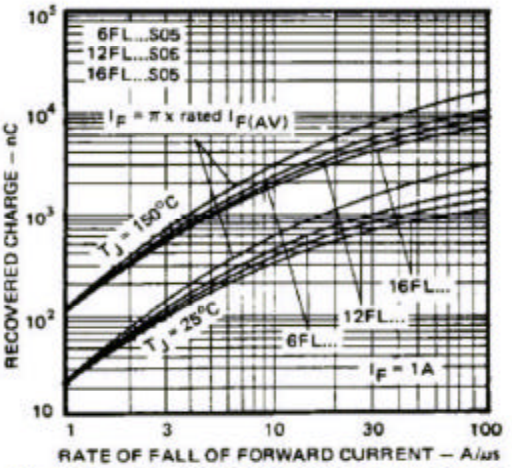


Fig. 18B – Typical Recovered Charge Vs. Rate of Fall of Forward Current, All Series ___S05

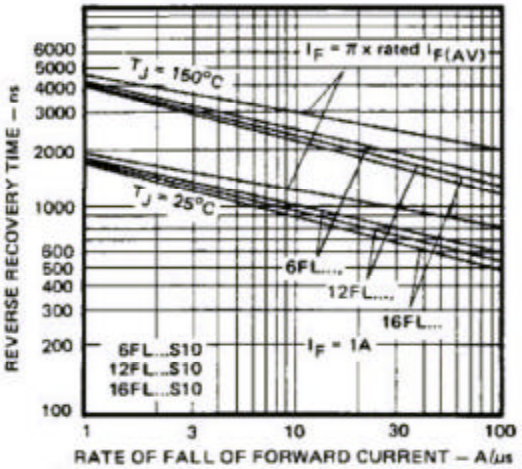


Fig. 19A – Typical Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series ___S10

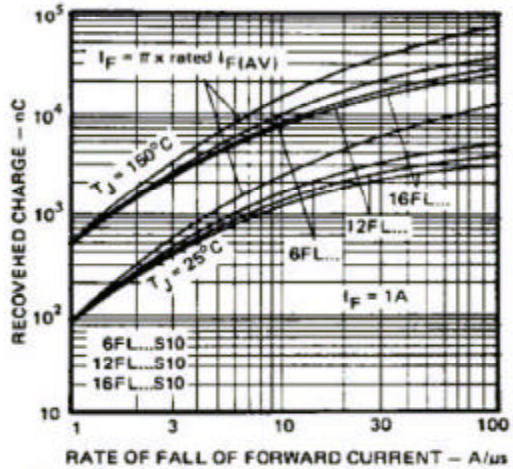


Fig. 19B – Typical Recovered Charge Vs. Rate of Fall of Forward Current, All Series ___S10

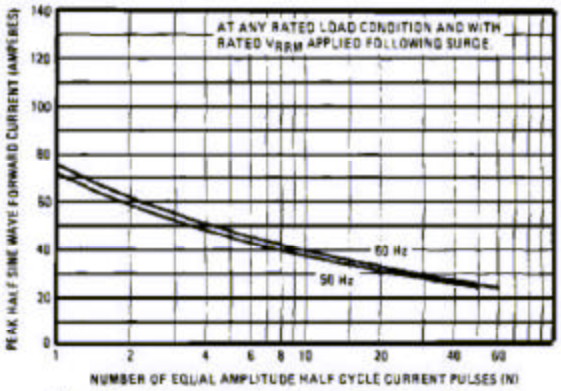


Fig. 20 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3879 Series

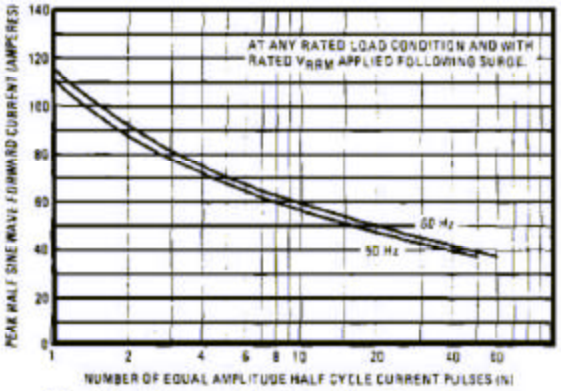


Fig. 21 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 6FL Series

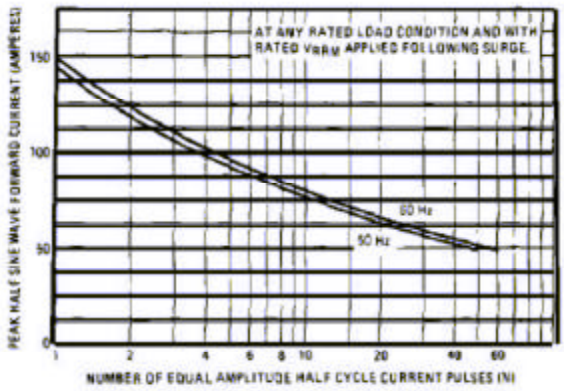


Fig. 22 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3889 and 12FL Series

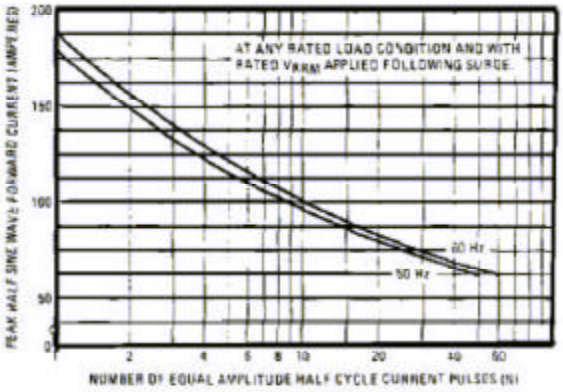


Fig. 23 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 16FL Series

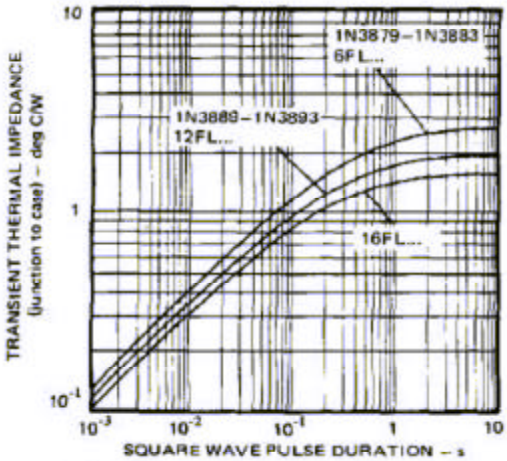


Fig. 24 – Maximum Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration, All Series.