

**Fast Recovery Diodes
(Stud Version), 6 A, 12 A, 16 A****DO-4 (DO-203AA)****FEATURES**

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

$I_{F(AV)}$	6 A, 12 A, 16 A
Package	DO-4 (DO-203AA)
Circuit configuration	Single

MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	6FL	12FL	16FL	UNITS
$I_{F(AV)}$		6	12	16	A
	T_C	100	100	100	°C
$I_{F(RMS)}$		9.5	19	25	A
I_{FSM}	50 Hz	110	145	180	A
	60 Hz	115	150	190	
I^2t	50 Hz	60	103	160	A ² s
	60 Hz	55	94	150	
$I^2\sqrt{t}$		1452	1452	2290	$I^2\sqrt{s}$
V_{RRM}	Range	50 to 1000	50 to 1000	50 to 1000	V
t_{rr}		See Recovery Characteristics table	See Recovery Characteristics table	See Recovery Characteristics table	ns
T_J	Range	-65 to +150	-65 to +150	-65 to +150	°C

ELECTRICAL SPECIFICATIONS**VOLTAGE RATINGS**

TYPE NUMBER	VOLTAGE CODE	V_{RRM} , MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	V_{RSM} , MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	I_{RRM} MAXIMUM AT $T_J = 25\text{ °C}$ μA	I_{RRM} MAXIMUM AT $T_J = 100\text{ °C}$ mA	I_{RRM} MAXIMUM AT $T_J = 150\text{ °C}$ mA
VS-6FL..., VS-12FL..., VS-16FL..	5	50	75	50	-	6.0
	10	100	150			
	20	200	275			
	40	400	500			
	60	600	725			
	80	800	950			
	100	1000	1250			

**FORWARD CONDUCTION**

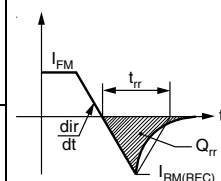
PARAMETER	SYMBOL	TEST CONDITIONS			6FL..	12FL..	16FL..	UNITS
Maximum average forward current at case temperature	I _{F(AV)}	180° conduction, half sine wave DC			6	12 ⁽¹⁾	16	A
					100	100	100	°C
Maximum RMS current	I _{F(RMS)}				9.5	19	25	A
Maximum peak, one-cycle non-repetitive forward current	I _{FSM}	t = 10 ms	No voltage	Sinusoidal half wave, initial T _J = 150 °C	130	170	215	
		t = 8.3 ms	reapplied		135	180	225	
		t = 10 ms	100 % V _{RRM} reapplied		110	145	180	
		t = 8.3 ms			115	150 ⁽¹⁾	190	
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage		86	145	230	
		t = 8.3 ms	reapplied		78	130	210	
		t = 10 ms	100 % V _{RRM} reapplied	60	103	160		
		t = 8.3 ms		55	94	150		
Maximum I ² √t for fusing	I ² √t	t = 0.1 ms to 10 ms, no voltage reapplied			856	1452	2290	A ² √s
Maximum forward voltage drop	V _{FM}	T _J = 25 °C; I _F = Rated I _{F(AV)} (DC)			1.4	1.4 ⁽¹⁾	1.4	V
		T _C = 100 °C; I _{FM} = π x rated I _{F(AV)}			1.5	1.5 ⁽¹⁾	1.5	

Note

(1) JEDEC® registered values

RECOVERY CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	6FL..			12FL..			16FL..			UNITS
			S02	S05	S10	S02	S05	S10	S02	S05	S10	
Maximum reverse recovery time	t_{rr}	$T_J = 25\text{ °C}, I_F = 1\text{ A to } V_R = 30\text{ V}, di_F/dt = 100\text{ A}/\mu s$	110	285	490	100	250	430	90	225	390	ns
		$T_J = 25\text{ °C}, di_F/dt = 25\text{ A}/\mu s, I_{FM} = \pi \times \text{rated } I_{F(AV)}$	200	500	1000	200	500	1000	200	500	1000	
Maximum peak recovery current	$I_{RM(REC)}$	$I_{FM} = \pi \times \text{rated } I_{F(AV)}$	-	-	-	-	-	-	-	-	-	-
Maximum reverse recovery charge	Q_{rr}	$T_J = 25\text{ °C}, I_F = 1\text{ A to } V_R = 30\text{ V}, di_F/dt = 100\text{ A}/\mu s$	230	1700	5000	200	1300	3800	150	1100	3000	nC
		$T_J = 25\text{ °C}, di_F/dt = 25\text{ A}/\mu s, I_{FM} = \pi \times \text{rated } I_{F(AV)}$	200	1200	5000	200	1200	5000	200	1200	5000	

**Note**

(1) JEDEC® registered values

THERMAL AND MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	6FL...	12FL...	16FL...	UNITS
Maximum junction operating temperature range	T _J		-65 to +150			°C
Maximum storage temperature range	T _{Stg}		-65 to +175			
Maximum thermal resistance, junction to case	R _{thJC}	DC operation	2.5	2.0	1.6	°C/W
Maximum thermal resistance, case to heatsink	R _{thCS}	Mounting surface, smooth, flat, and greased	0.5			
Allowable mounting torque		Not lubricated threads	1.5 + 0 - 10 % (13)			N · m (lbf · in)
		Lubricated threads	1.2 + 0 - 10 % (10)			
Approximate weight			7			g
			0.25			oz.
Case style		JEDEC®	DO-4 (DO-203AA)			



ΔR_{thJC} CONDUCTION								
CONDUCTION ANGLE	6FL..	12FL..	16FL..	6FL..	12FL..	16FL..	TEST CONDITIONS	UNITS
	SINUSOIDAL CONDUCTION			RECTANGULAR CONDUCTION				
180°	0.58	0.46	0.37	0.33	0.26	0.21	T _J = 150 °C	K/W
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		

Note

- The table above shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC

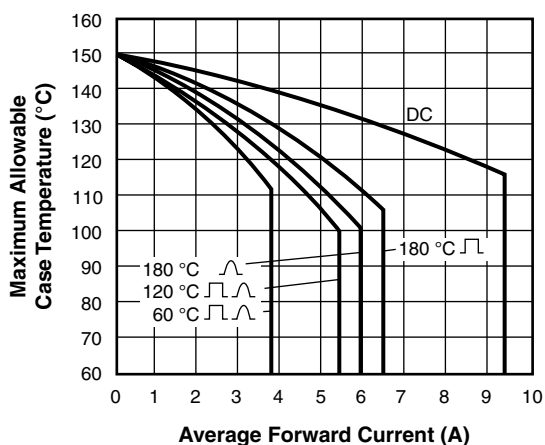


Fig. 1 - Average Forward Current vs. Maximum Allowable Case Temperature, 6FL Series

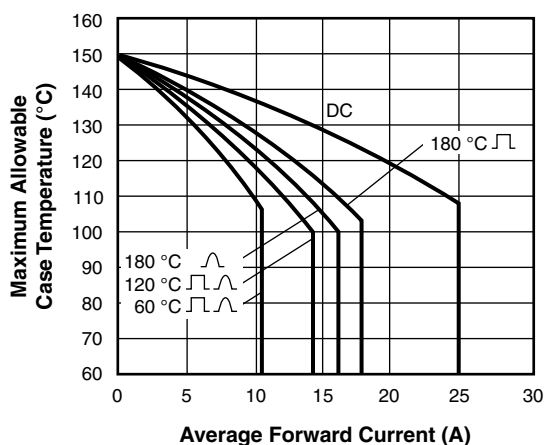


Fig. 3 - Average Forward Current vs. Maximum Allowable Case Temperature, 16FL Series

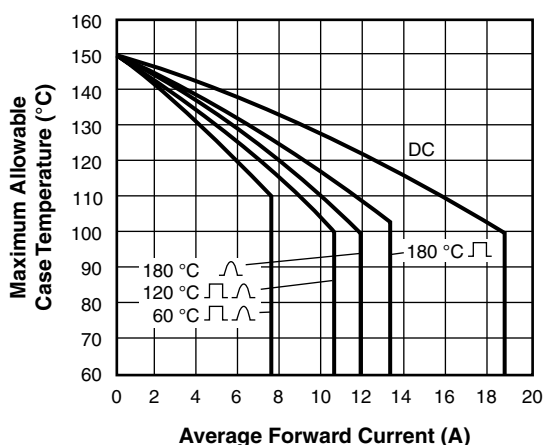


Fig. 2 - Average Forward Current vs. Maximum Allowable Case Temperature, 12FL Series

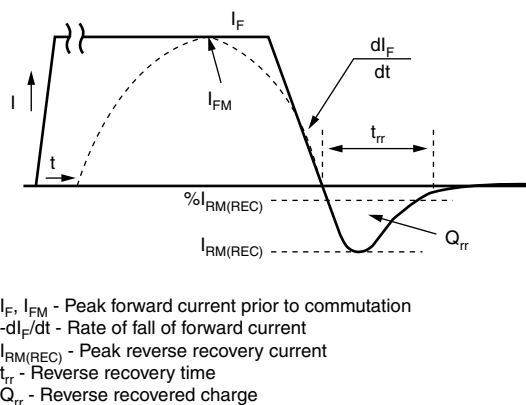


Fig. 4 - Reverse Recovery Time Test Waveform

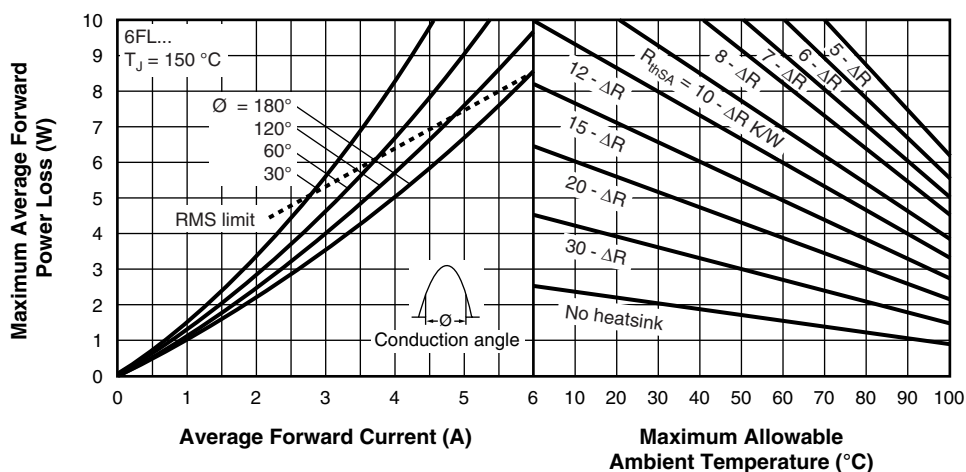


Fig. 5 - Current Rating Nomogram (Sinusoidal Waveforms), 6FL Series

Conduction angle - ϕ	ΔR - K/W
180°	0.58
120°	0.60
60°	1.28
30°	2.20

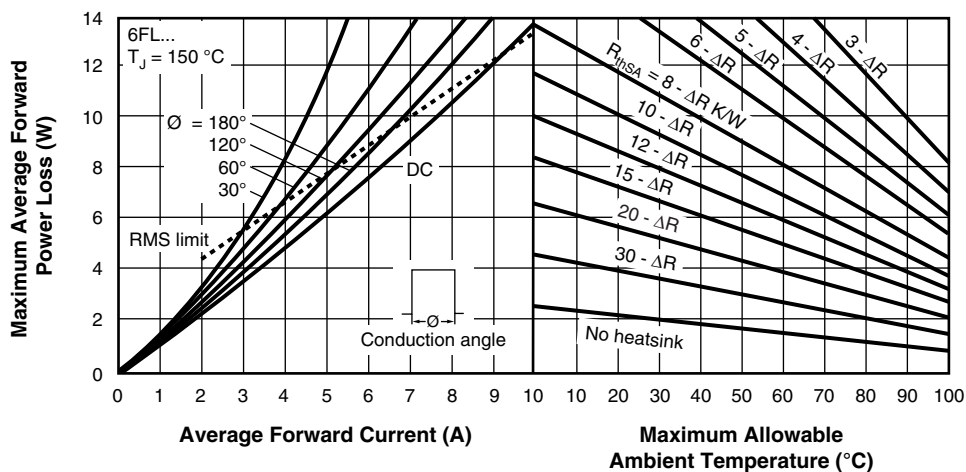


Fig. 6 - Current Rating Nomogram (Rectangular Waveforms), 6FL Series

Conduction angle - ϕ	ΔR - K/W
DC	0
180°	0.33
120°	0.58
60°	1.28
30°	2.20

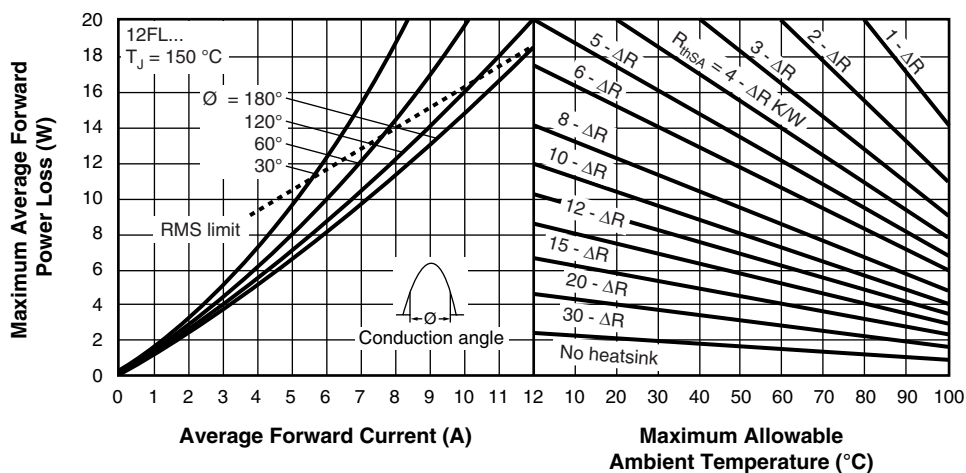
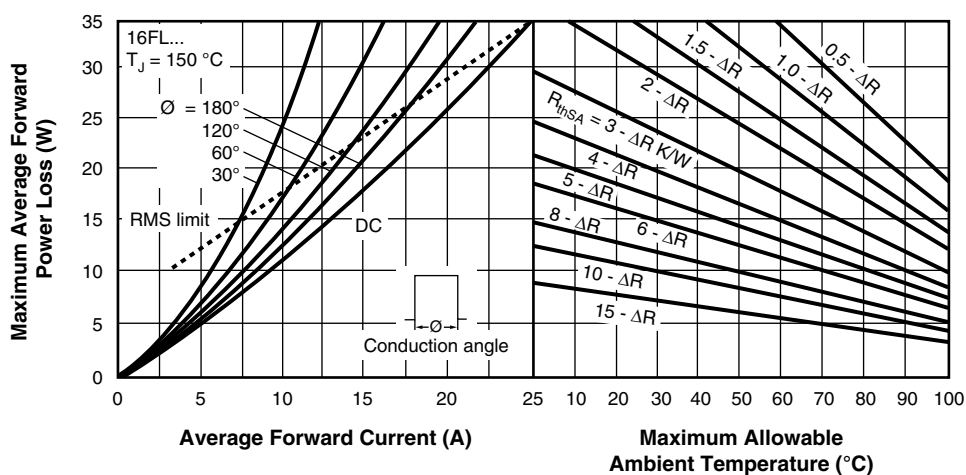
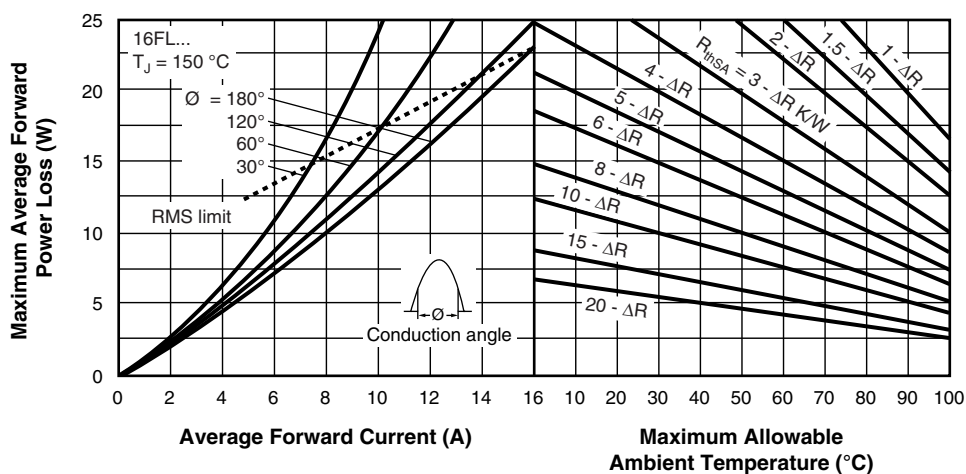
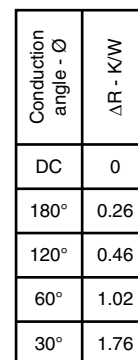


Fig. 7 - Current Rating Nomogram (Sinusoidal Waveforms), 12FL Series

Conduction angle - ϕ	ΔR - K/W
180°	0.46
120°	0.48
60°	1.02
30°	1.76



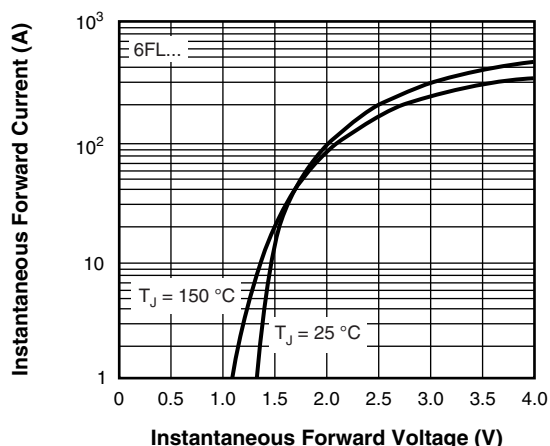


Fig. 11 - Maximum Forward Voltage vs. Forward Current, 6FL Series

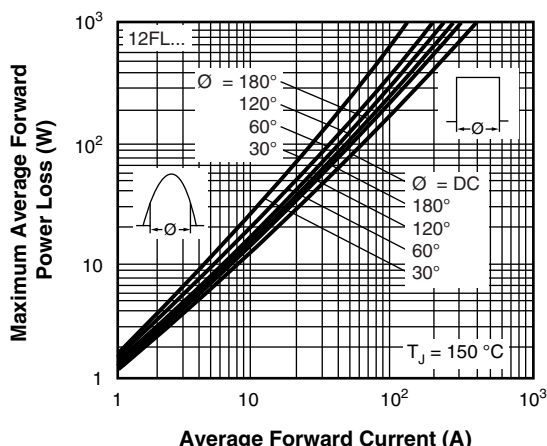


Fig. 14 - Maximum High Level Forward Power Loss vs. Average Forward Current, 12FL Series

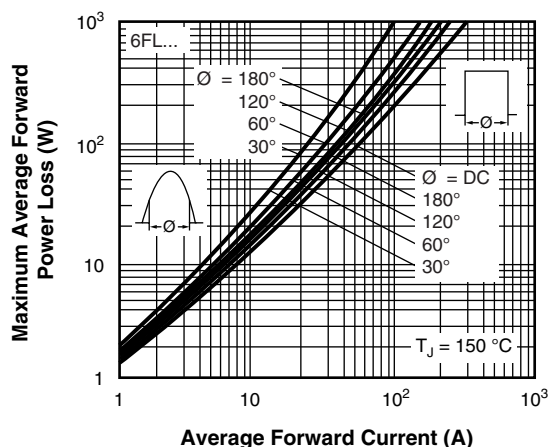


Fig. 12 - Maximum High Level Forward Power Loss vs. Average Forward Current, 6FL Series

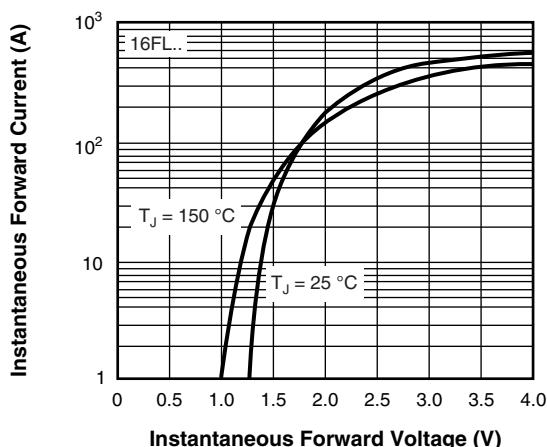


Fig. 15 - Maximum Forward Voltage vs. Forward Current, 16FL Series

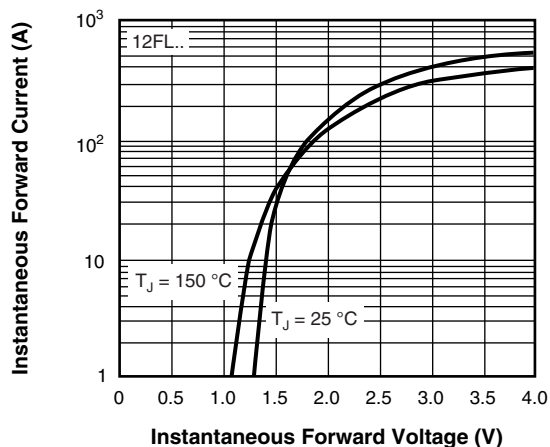


Fig. 13 - Maximum Forward Voltage vs. Forward Current, 12FL Series

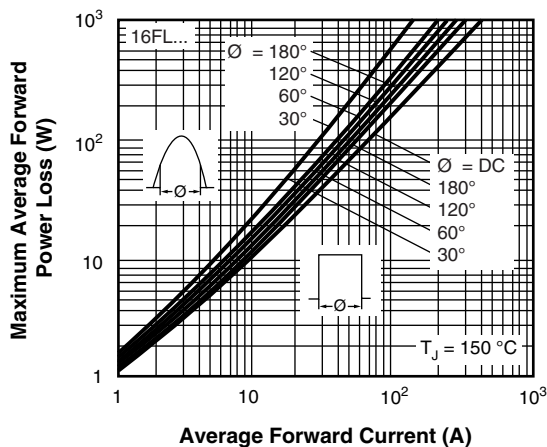


Fig. 16 - Maximum High Level Forward Power Loss vs. Average Forward Current, 16FL Series

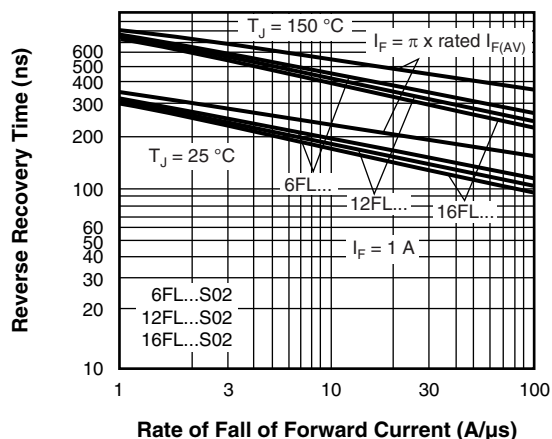


Fig. 17a - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, All Series...S02

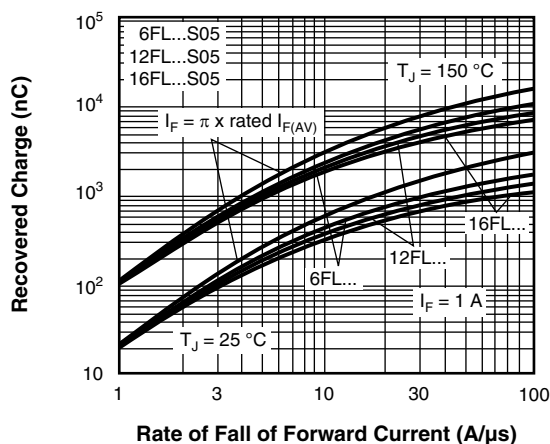


Fig. 18b - Typical Recovered Charge vs. Rate of Fall of Forward Current, All Series...S05

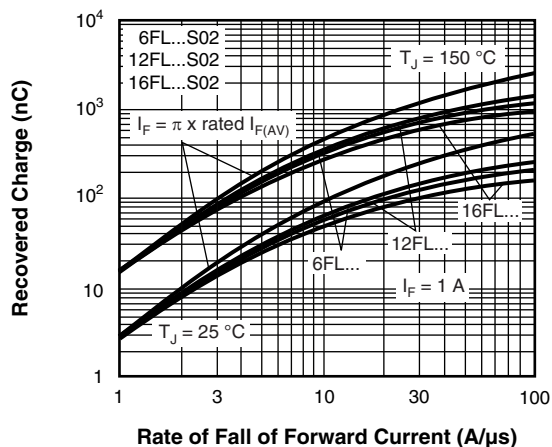


Fig. 17b - Typical Recovered Charge vs. Rate of Fall of Forward Current, All Series...S02

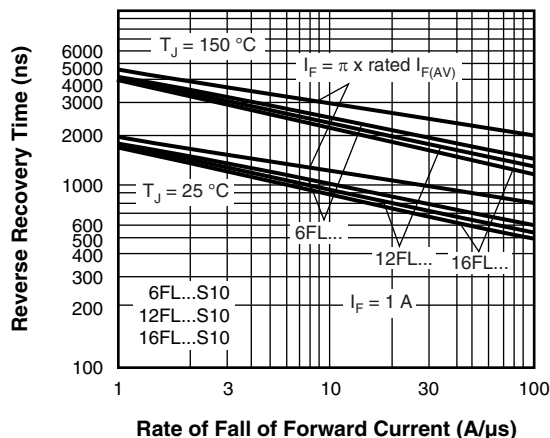


Fig. 19a - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, All Series...S10

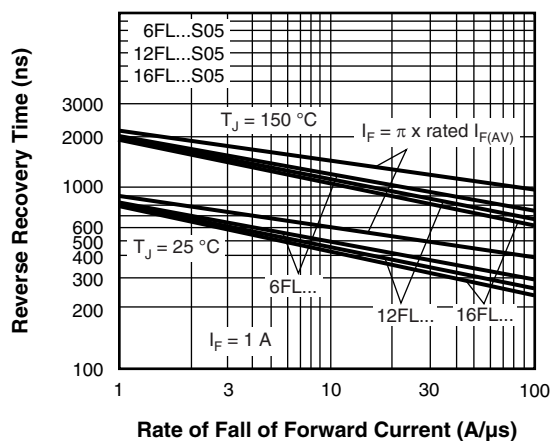


Fig. 18a - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, All Series...S05

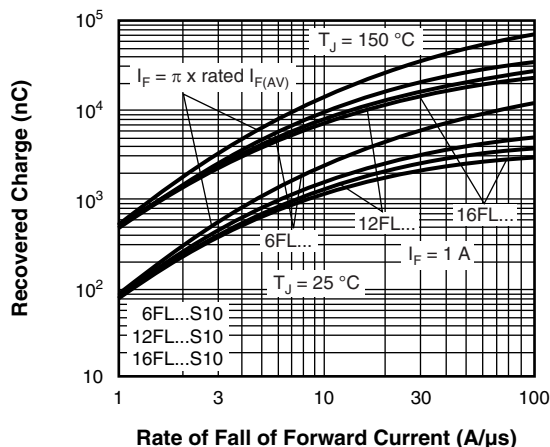


Fig. 19b - Typical Recovered Charge vs. Rate of Fall of Forward Current, All Series...S10

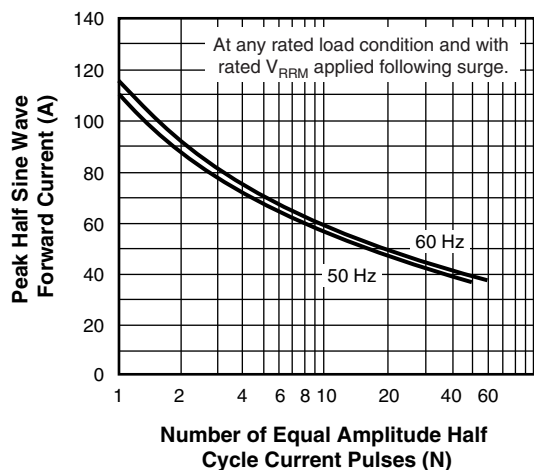


Fig. 20 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 6FL Series

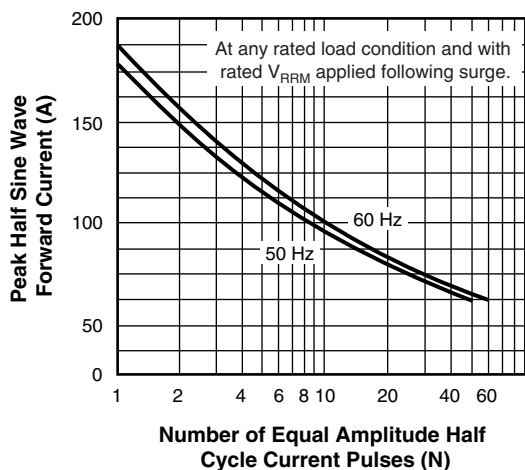


Fig. 22 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 16FL Series

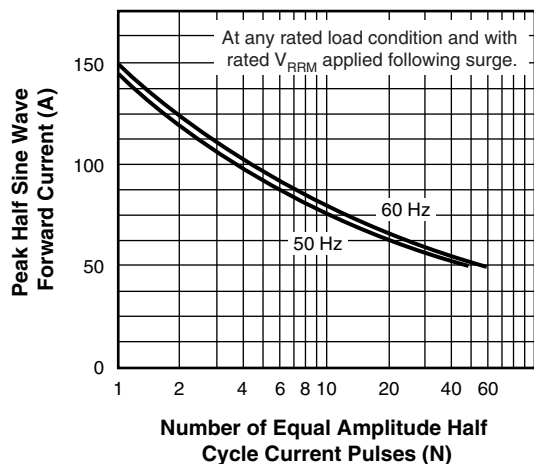


Fig. 21 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 12FL Series

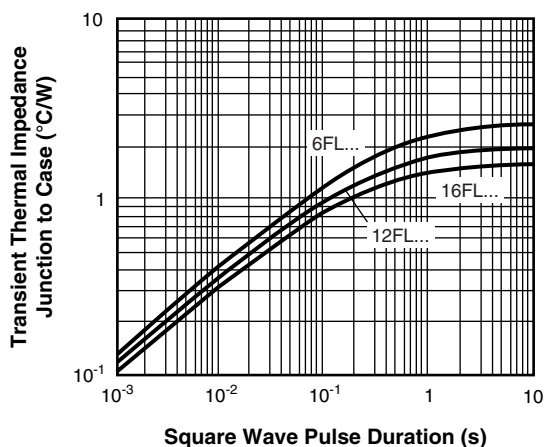


Fig. 23 - Maximum Transient Thermal Impedance, Junction to Case vs. Pulse Duration, All Series



ORDERING INFORMATION TABLE

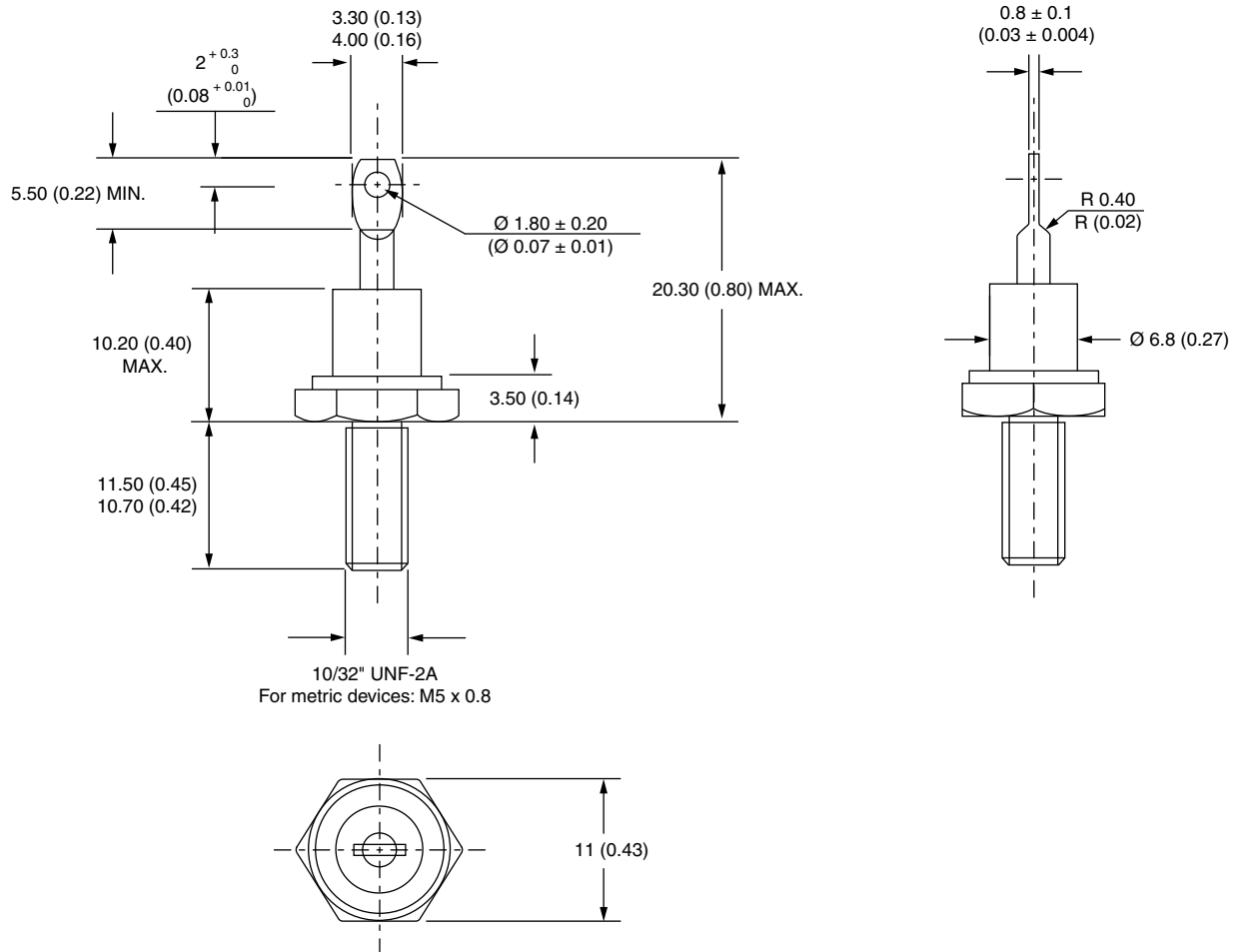
Device code	VS-	16	F	L	R	60	M	S02
	1	2	3	4	5	6	7	8

- | | | |
|----------|---|---|
| 1 | - | Vishay Semiconductors product |
| 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 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) |

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95311

DO-203AA (DO-4)

DIMENSIONS in millimeters (inches)





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