THE DATASHEET OF

VS-12FL60S02

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^2s
	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 °C µA	I_{RRM} MAXIMUM AT T_J = 100 °C mA	I_{RRM} MAXIMUM AT T_J = 150 °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

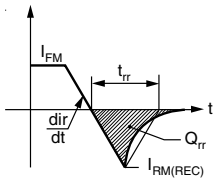
PARAMETER	SYMBOL	TEST CONDITIONS			6FL..	12FL..	16FL..	UNITS
Maximum average forward current at case temperature	$I_{F(AV)}$	180° conduction, half sine wave			6	12 (1)	16	A
		DC			100	100	100	°C
Maximum RMS current	$I_{F(RMS)}$				9.5	19	25	A
Maximum peak, one-cycle non-repetitive forward current	I_{FSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial T_J = 150 °C	130	170	215	
		t = 8.3 ms			135	180	225	
		t = 10 ms	100 % V_{RRM} reapplied		110	145	180	
		t = 8.3 ms			115	150 (1)	190	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		86	145	230	A^2s
		t = 8.3 ms			78	130	210	
		t = 10 ms	100 % V_{RRM} reapplied		60	103	160	
		t = 8.3 ms			55	94	150	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			856	1452	2290	$A^2\sqrt{s}$
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.., S02	6FL.., S05	6FL.., S10	12FL.., S02	12FL.., S05	12FL.., S10	16FL.., S02	16FL.., S05	16FL.., S10	UNITS
Maximum reverse recovery time	t_{rr}	T_J = 25 °C, I_F = 1 A to V_R = 30 V, dI_F/dt = 100 A/µs	110	285	490	100	250	430	90	225	390	ns
		T_J = 25 °C, dI_F/dt = 25 A/µs, I_{FM} = π x rated $I_{F(AV)}$	200	500	1000	200	500	1000	200	500	1000	
Maximum peak recovery current	$I_{RM(REC)}$	I_{FM} = π x rated $I_{F(AV)}$	-	-	-	-	-	-	-	-	-	-
Maximum reverse recovery charge	Q_{rr}	T_J = 25 °C, I_F = 1 A to V_R = 30 V, dI_F/dt = 100 A/µs	230	1700	5000	200	1300	3800	150	1100	3000	nC
		T_J = 25 °C, dI_F/dt = 25 A/µs, I_{FM} = π x 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

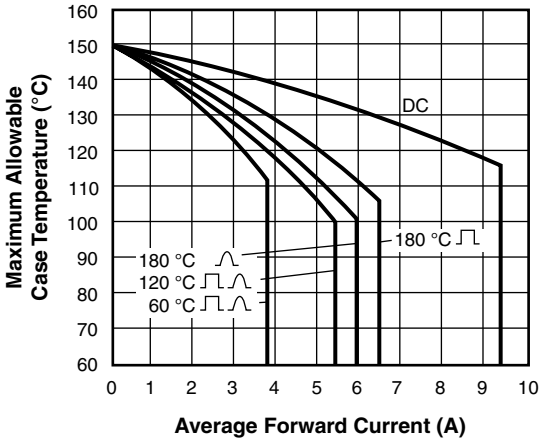


Fig. 1 - Average Forward Current vs.
Maximum Allowable Case Temperature, 6FL Series

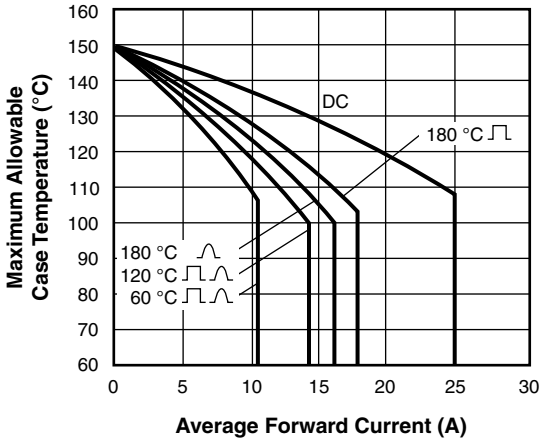


Fig. 3 - Average Forward Current vs.
Maximum Allowable Case Temperature, 16FL Series

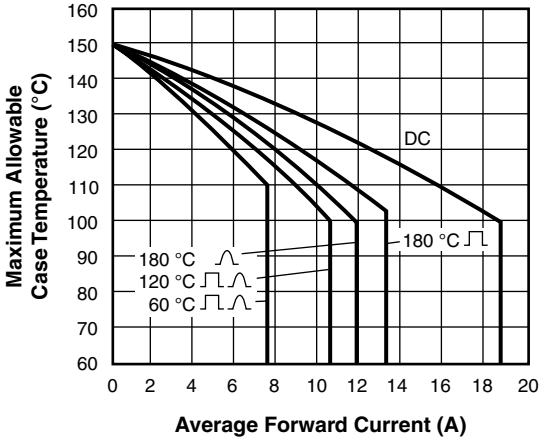
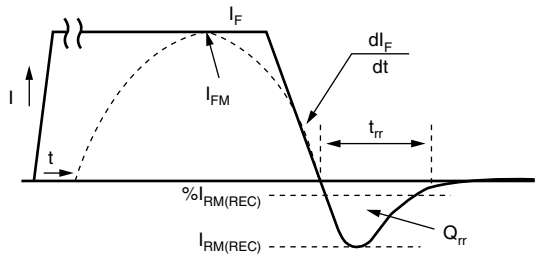
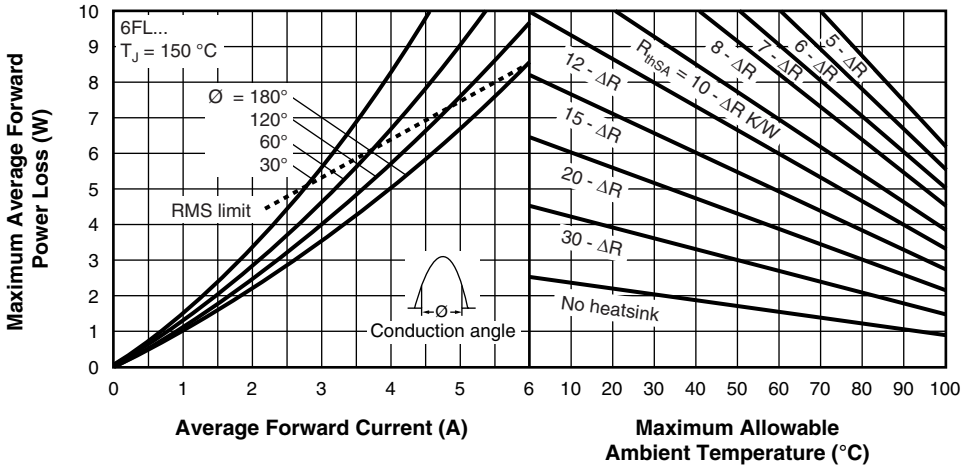


Fig. 2 - Average Forward Current vs.
Maximum Allowable Case Temperature, 12FL Series



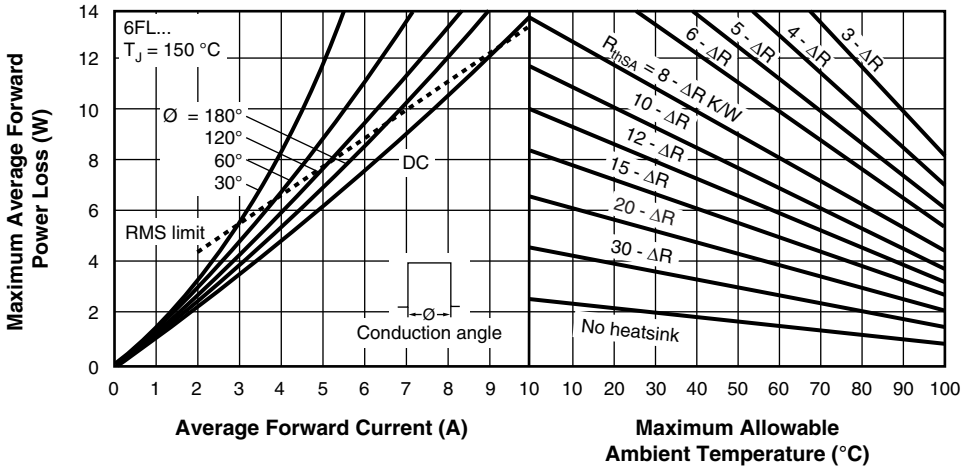
I_F, I_{FM} - Peak forward current prior to commutation
$-dI_F/dt$ - Rate of fall of forward current
$I_{RM(REC)}$ - Peak reverse recovery current
t_{rr} - Reverse recovery time
Q_{rr} - Reverse recovered charge

Fig. 4 - Reverse Recovery Time Test Waveform



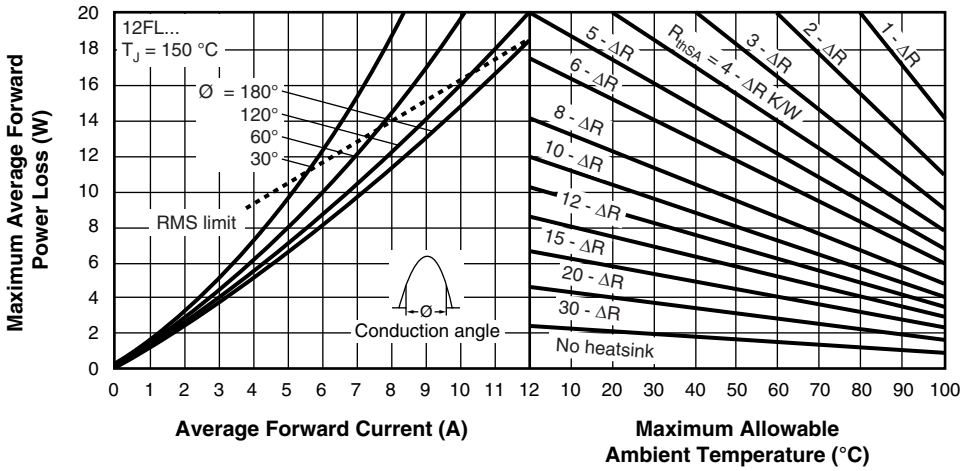
Conduction angle - Ø	ΔR - K/W
180°	0.58
120°	0.60
60°	1.28
30°	2.20

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



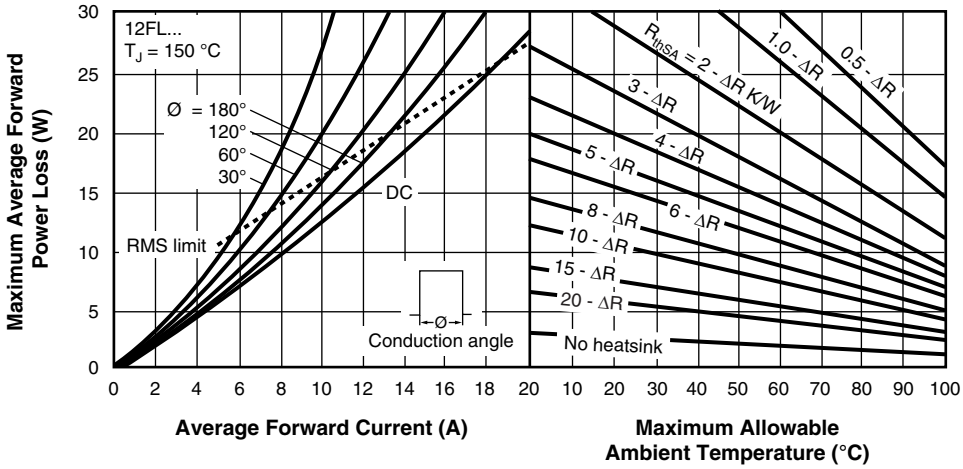
Conduction angle - Ø	ΔR - K/W
DC	0
180°	0.33
120°	0.58
60°	1.28
30°	2.20

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



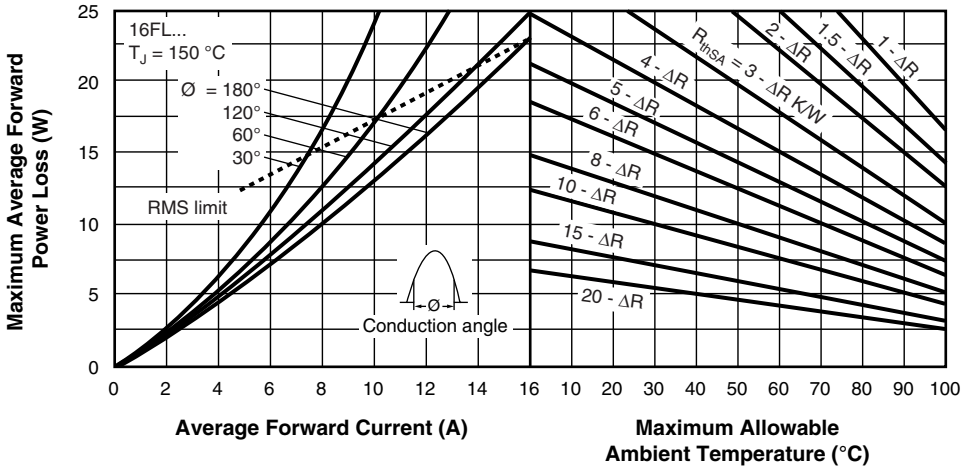
Conduction angle - Ø	ΔR - K/W
180°	0.46
120°	0.48
60°	1.02
30°	1.76

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



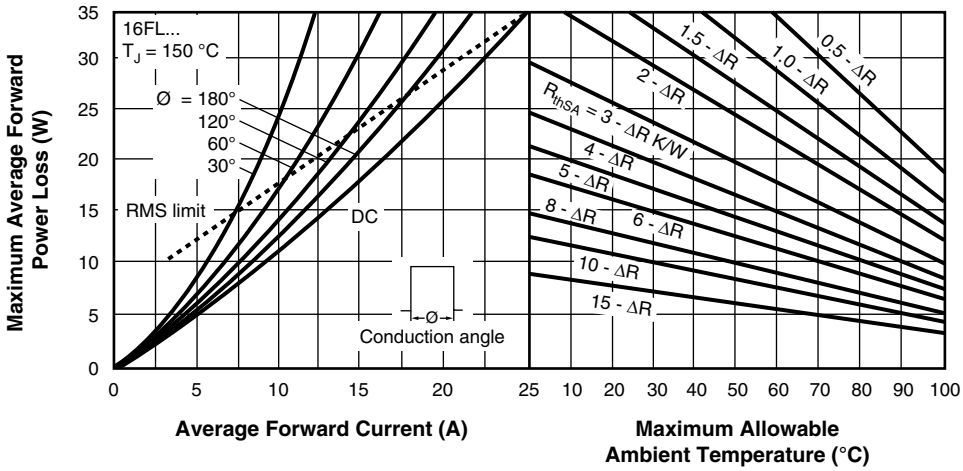
Conduction angle - Ø	ΔR - K/W
DC	0
180°	0.26
120°	0.46
60°	1.02
30°	1.76

Fig. 8 - Current Rating Nomogram (Rectangular Waveforms), 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

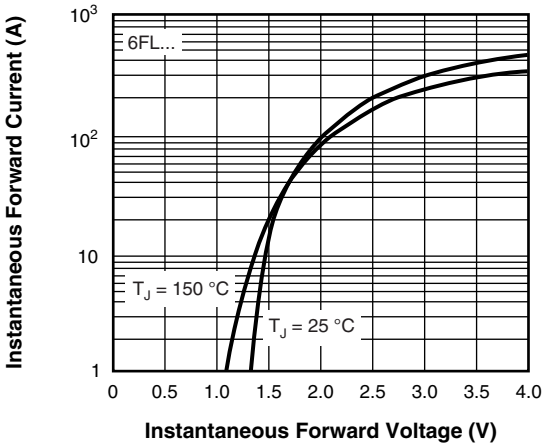


Fig. 11 - Maximum Forward Voltage vs. Forward Current, 6FL Series

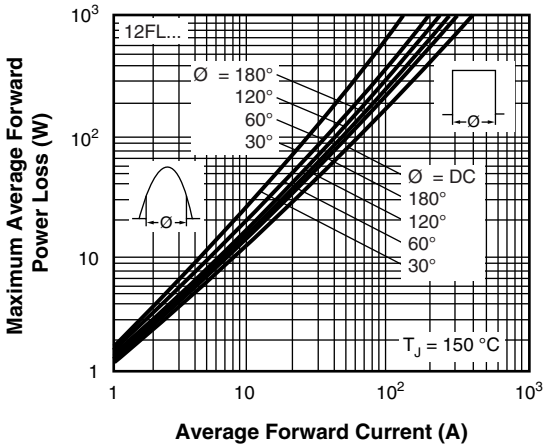


Fig. 14 - Maximum High Level Forward Power Loss vs. Average Forward Current, 12FL Series

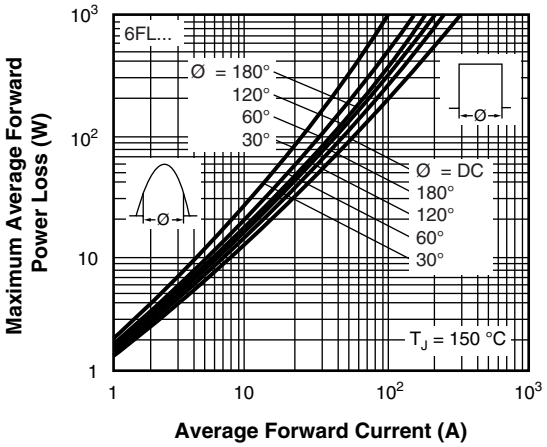


Fig. 12 - Maximum High Level Forward Power Loss vs. Average Forward Current, 6FL Series

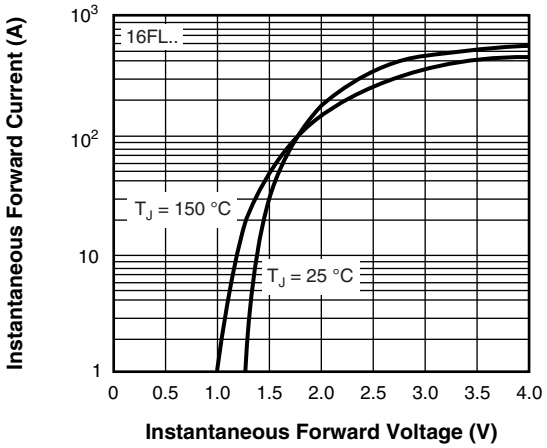


Fig. 15 - Maximum Forward Voltage vs. Forward Current, 16FL Series

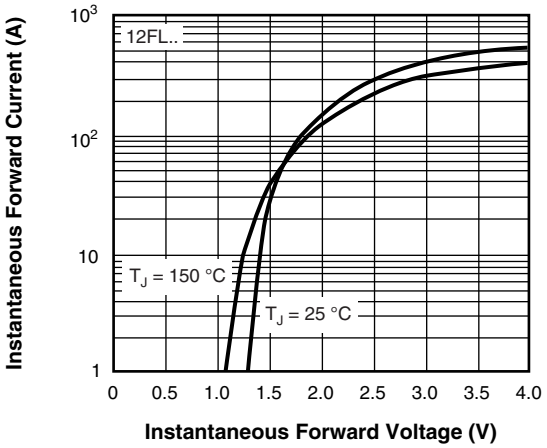


Fig. 13 - Maximum Forward Voltage vs. Forward Current, 12FL Series

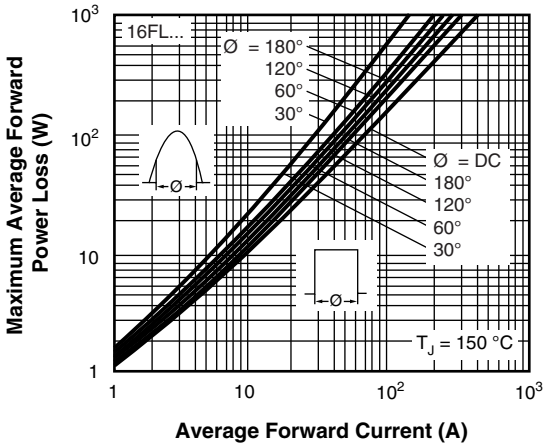


Fig. 16 - Maximum High Level Forward Power Loss vs. Average Forward Current, 16FL Series

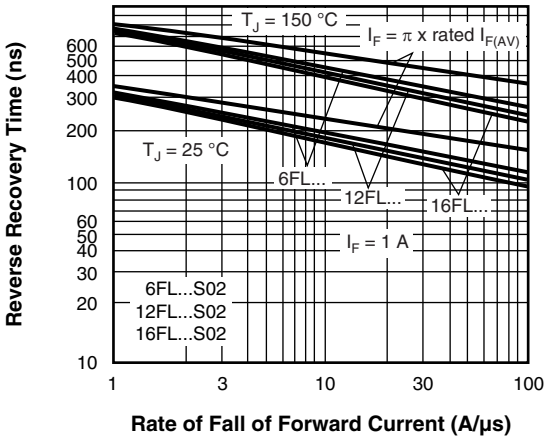


Fig.17a - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, All Series...S02

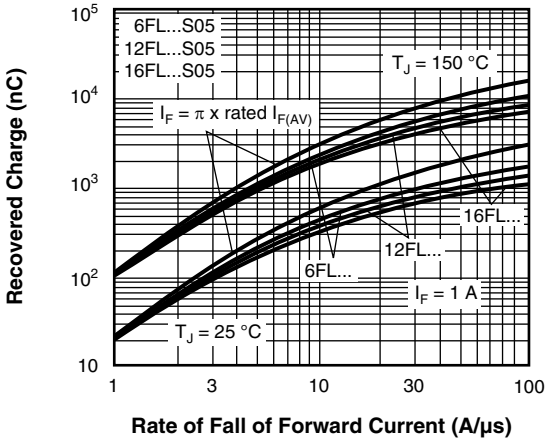


Fig. 18b - Typical Recovered Charge vs.
Rate of Fall of Forward Current, All Series...S05

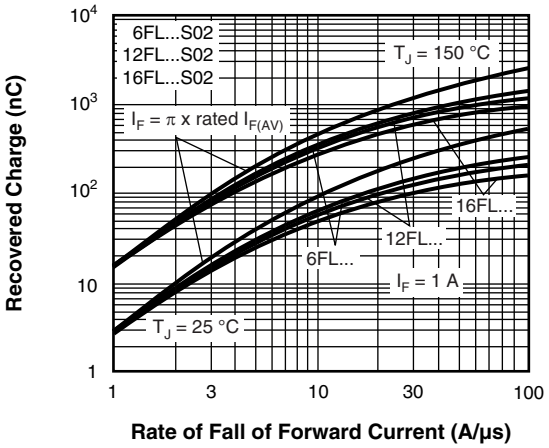


Fig. 17b - Typical Recovered Charge vs.
Rate of Fall of Forward Current, All Series...S02

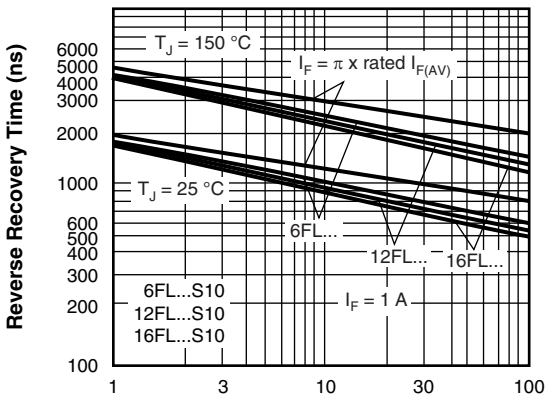


Fig. 19a - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, All Series...S10

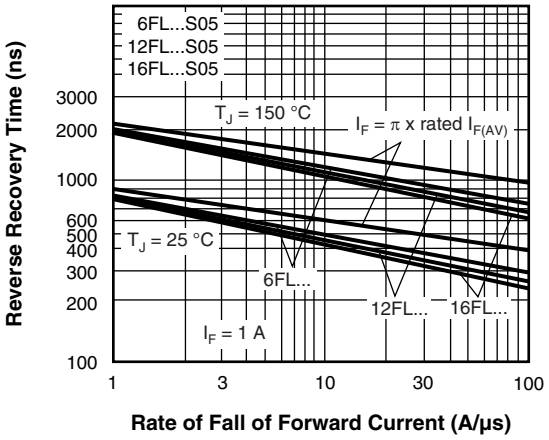


Fig. 18a - Typical Reverse Recovery Time vs.
Rate of Fall of Forward Current, All Series...S05

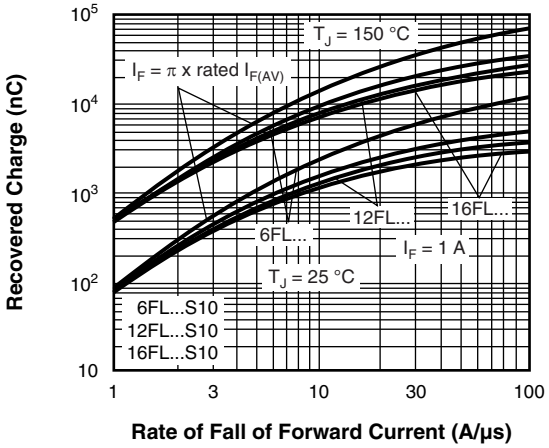


Fig. 19b - Typical Recovered Charge vs.
Rate of Fall of Forward Current, All Series...S10

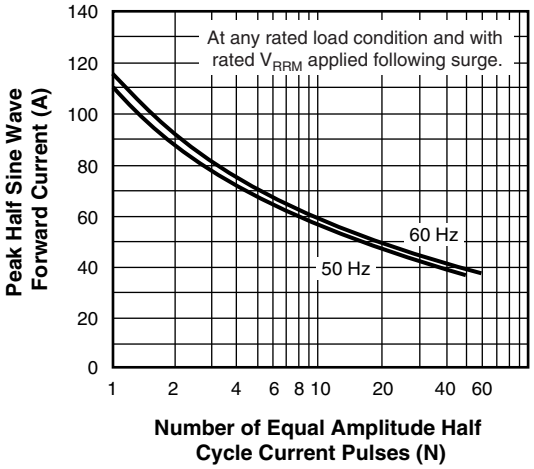


Fig. 20 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 6FL Series

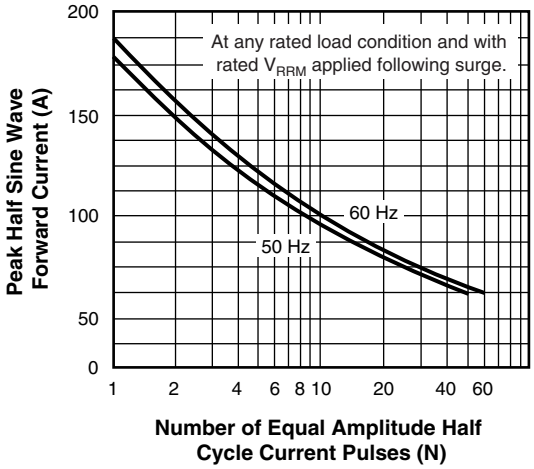


Fig. 22 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 16FL Series

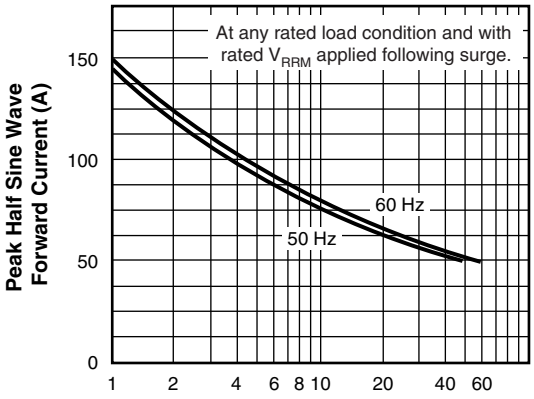


Fig. 21 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 12FL Series

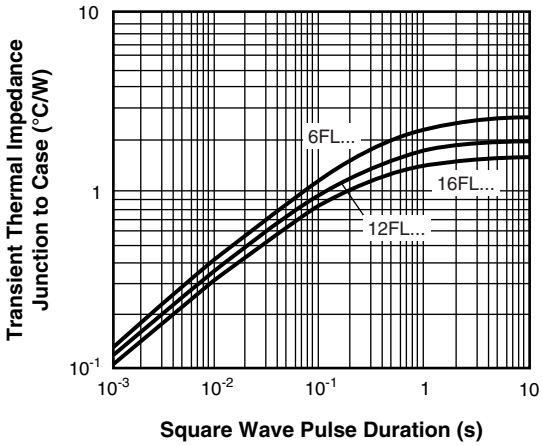
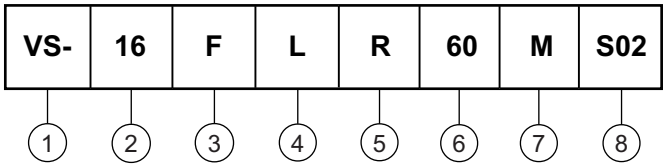


Fig. 23 - Maximum Transient Thermal Impedance, Junction to Case vs. Pulse Duration, All Series

ORDERING INFORMATION TABLE

Device code

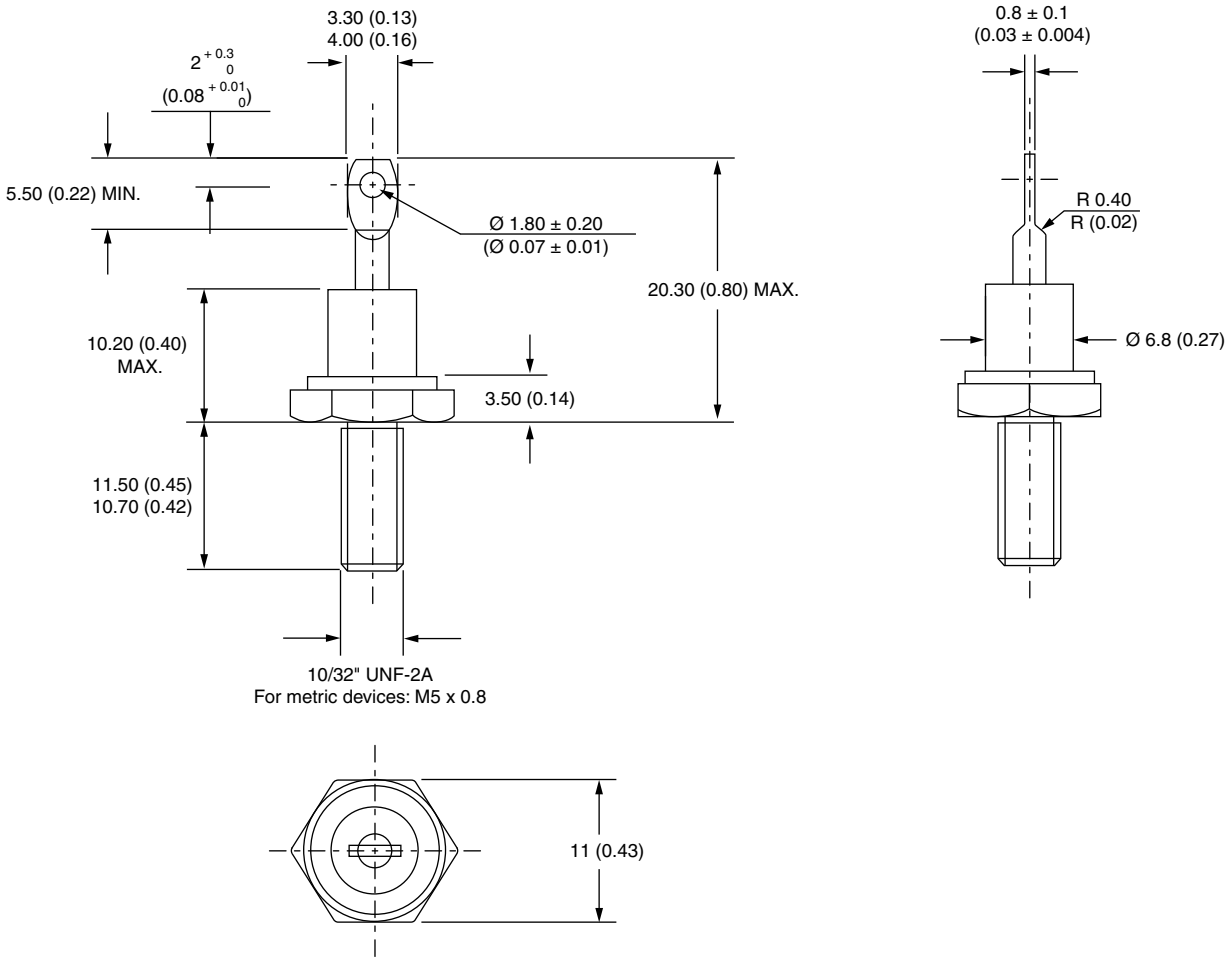


1 - Vishay Semiconductors product
2 - Current code $I_{(AVG)}$ = exact current rating
3 - F = diode
4 - Omit = standard recovery diode
L = only for fast diode
5 - Omit = stud forward polarity
R = stud reverse polarity
6 - Voltage code x 10 = V_{RRM} (see Voltage Ratings table)
7 - Outlines:
Omit = stud 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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- Excess Inventory Management