

## Fast Recovery Diodes (Stud Version), 6 A/12 A/16 A



DO-203AA (DO-4)

### 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
- Compliant to RoHS directive 2002/95/EC



**RoHS**  
COMPLIANT

### PRODUCT SUMMARY

$I_{F(AV)}$

6 A/12 A/16 A

### TYPICAL APPLICATIONS

- DC power supplies
- Inverters
- Converters
- Choppers
- Ultrasonic systems
- Freewheeling diodes

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	6FL..	12FL..	16FL..	UNITS
$I_{F(AV)}$	$T_C = 100\text{ }^\circ\text{C}$	6	12	16	A
$I_{F(RMS)}$		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 <sup>2</sup> s
	60 Hz	55	94	150	
$I^2\sqrt{t}$		1452	1452	2290	I <sup>2</sup> √s
$V_{RRM}$	Range	50 to 1000			V
$t_{rr}$		See Recovery Characteristics table			ns
$T_J$	Range	- 65 to 150			°C

# 6FL(R), 12FL(R), 16FL(R) Series



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## ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS						
TYPE NUMBER	VOLTAGE CODE	V <sub>RRM</sub> , MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	V <sub>RSM</sub> , MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	I <sub>RRM</sub> MAXIMUM AT T <sub>J</sub> = 25 °C μA	I <sub>RRM</sub> MAXIMUM AT T <sub>J</sub> = 100 °C mA	I <sub>RRM</sub> MAXIMUM AT T <sub>J</sub> = 150 °C mA
6FL.. 12FL.. 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 <sub>F(AV)</sub>	180° conduction, half sine wave DC			6	12 <sup>(1)</sup>	16	A
					100	100	100	°C
Maximum RMS current	I <sub>F(RMS)</sub>				9.5	19	25	A
Maximum peak, one-cycle non-repetitive forward current	I <sub>FSM</sub>	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial T <sub>J</sub> = 150 °C	130	170	215	
		t = 8.3 ms			135	180	225	
		t = 10 ms	100 % V <sub>RRM</sub> reapplied		110	145	180	
		t = 8.3 ms			115	150 <sup>(1)</sup>	190	
Maximum I <sup>2</sup> t for fusing	I <sup>2</sup> t	t = 10 ms	No voltage reapplied		86	145	230	A <sup>2</sup> s
		t = 8.3 ms			78	130	210	
		t = 10 ms	100 % V <sub>RRM</sub> reapplied		60	103	160	
		t = 8.3 ms			55	94	150	
Maximum I <sup>2</sup> √t for fusing	I <sup>2</sup> √t	t = 0.1 ms to 10 ms, no voltage reapplied			856	1452	2290	A <sup>2</sup> √s
Maximum forward voltage drop	V <sub>FM</sub>	T <sub>J</sub> = 25 °C; I <sub>F</sub> = Rated I <sub>F(AV)</sub> (DC)			1.4	1.4 <sup>(1)</sup>	1.4	V
		T <sub>C</sub> = 100 °C; I <sub>FM</sub> = π x rated I <sub>F(AV)</sub>			1.5	1.5 <sup>(1)</sup>	1.5	

### Note

(1) JEDEC registered values



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RECOVERY CHARACTERISTICS						
PARAMETER	SYMBOL	TEST CONDITIONS	6FL.. 12FL.. 16FL..		UNITS	
			S02	S05		
Maximum reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_F = 1\text{ A}$ to $V_R = 30\text{ V}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	-	-	ns	
		$T_J = 25\text{ }^\circ\text{C}$ , $di_F/dt = 25\text{ A}/\mu\text{s}$ , $I_{FM} = \pi \times \text{rated } I_{F(AV)}$	200	500		
Maximum peak recovery current	$I_{RM(REC)}$	$I_{FM} = \pi \times \text{rated } I_{F(AV)}$	-		-	
Maximum reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_F = 1\text{ A}$ to $V_R = 30\text{ V}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	-	-	nC	
		$T_J = 25\text{ }^\circ\text{C}$ , $di_F/dt = 25\text{ A}/\mu\text{s}$ , $I_{FM} = \pi \times \text{rated } I_{F(AV)}$	-	-		

**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			$^\circ\text{C}$
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	$^\circ\text{C}/\text{W}$
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-203AA (DO-4)			

# 6FL(R), 12FL(R), 16FL(R) Series



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$\Delta R_{thJC}$ 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	$T_J = 150^\circ\text{C}$	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

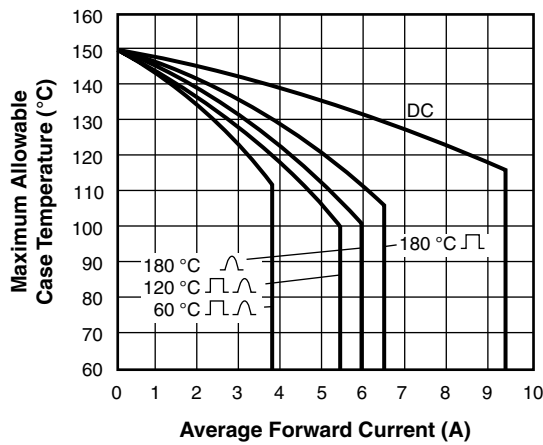


Fig. 1 - Average Forward Current vs. Maximum Allowable Case Temperature, 6FL Series

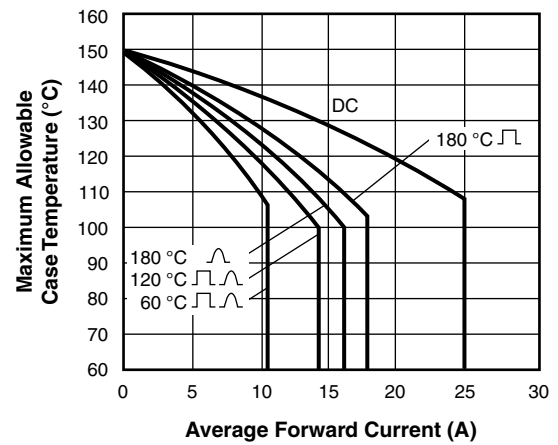


Fig. 3 - Average Forward Current vs. Maximum Allowable Case Temperature, 16FL Series

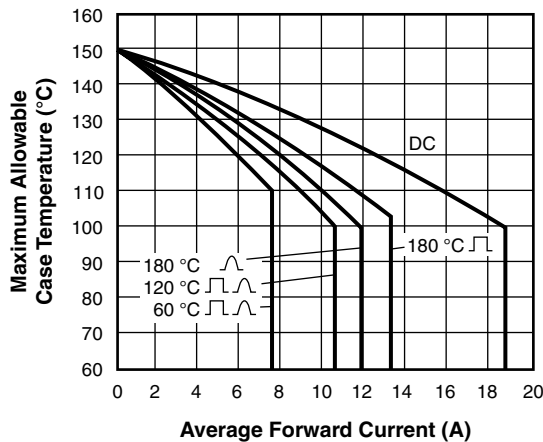
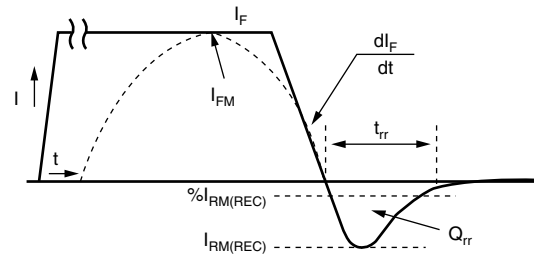


Fig. 2 - Average Forward Current vs. Maximum Allowable Case Temperature, 12FL Series



$I_F, I_{FM}$  - 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

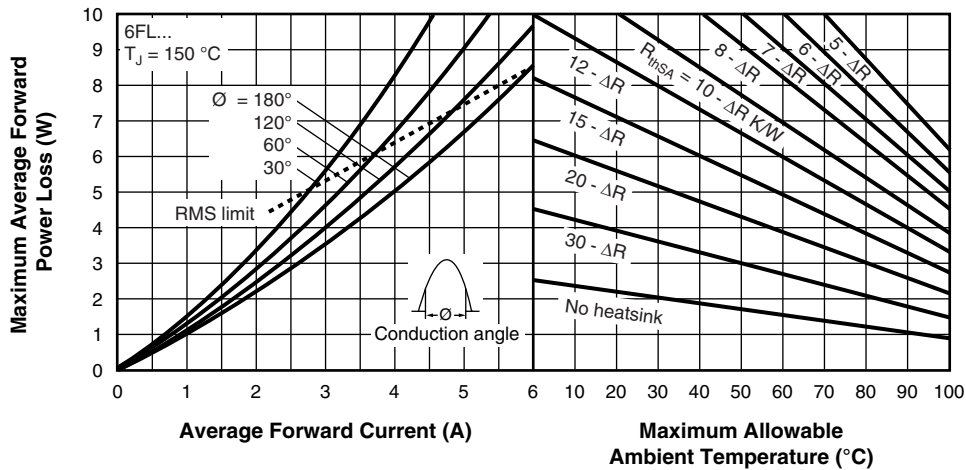
Fig. 4 - Reverse Recovery Time Test Waveform



# 6FL(R), 12FL(R), 16FL(R) Series

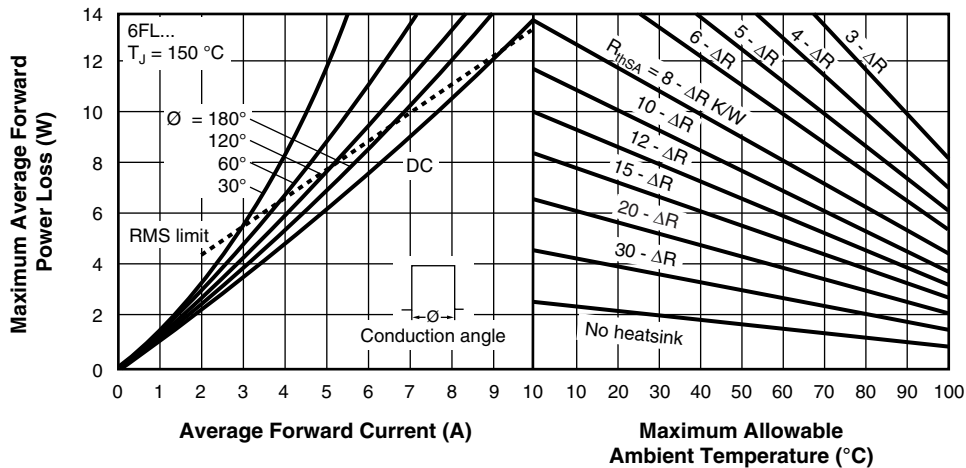
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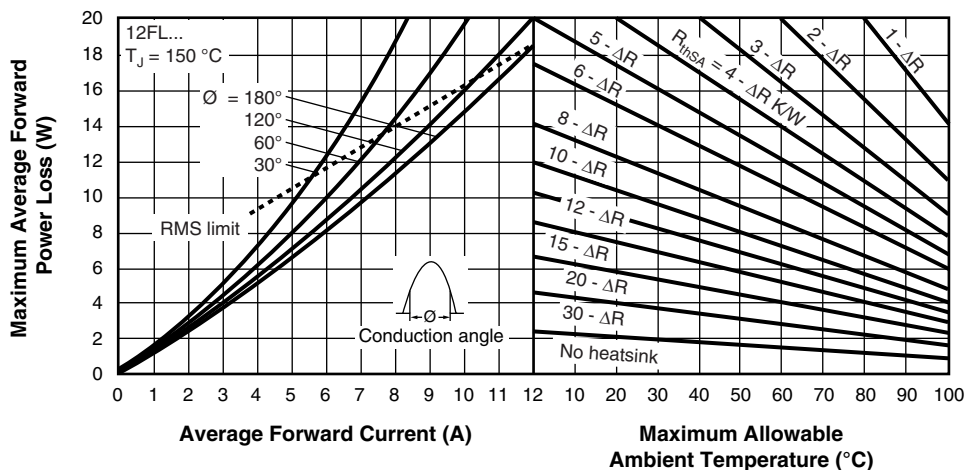
Conduction angle - $\phi$	$\Delta R$ - K/W
180°	0.58
120°	0.60
60°	1.28
30°	2.20

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



Conduction angle - $\phi$	$\Delta R$ - 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



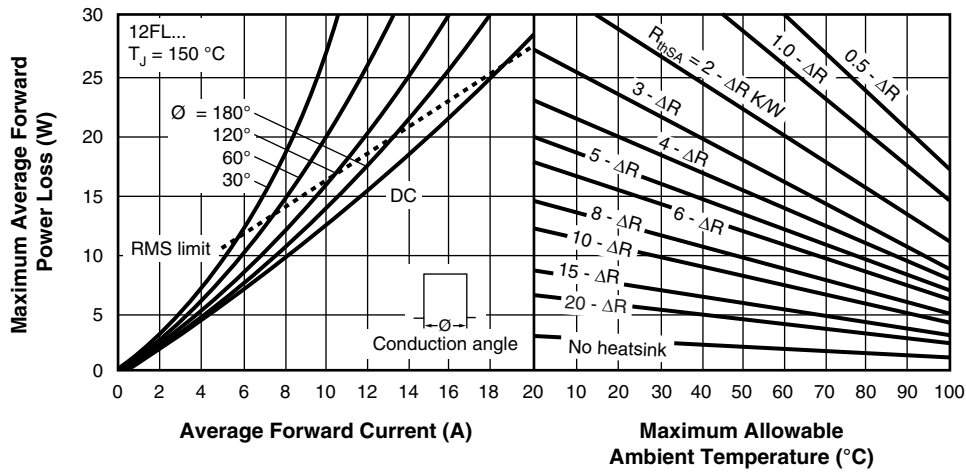
Conduction angle - $\phi$	$\Delta R$ - K/W
180°	0.46
120°	0.48
60°	1.02
30°	1.76

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

# 6FL(R), 12FL(R), 16FL(R) Series

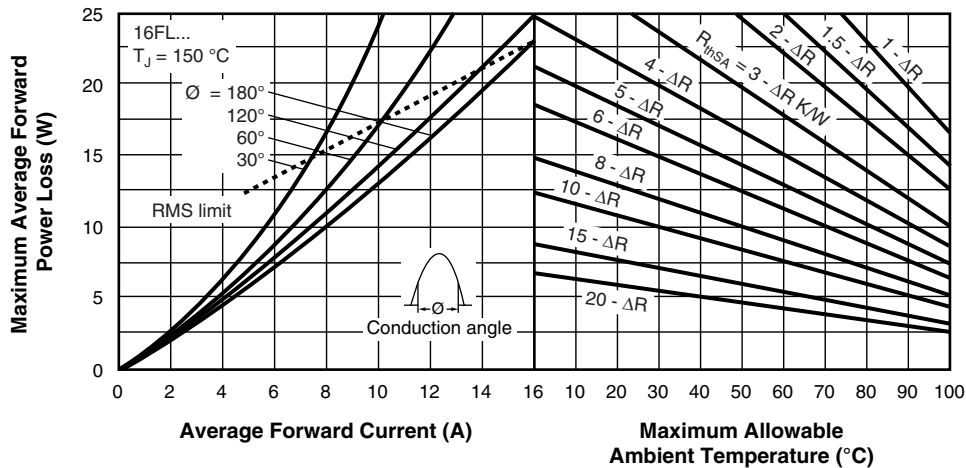
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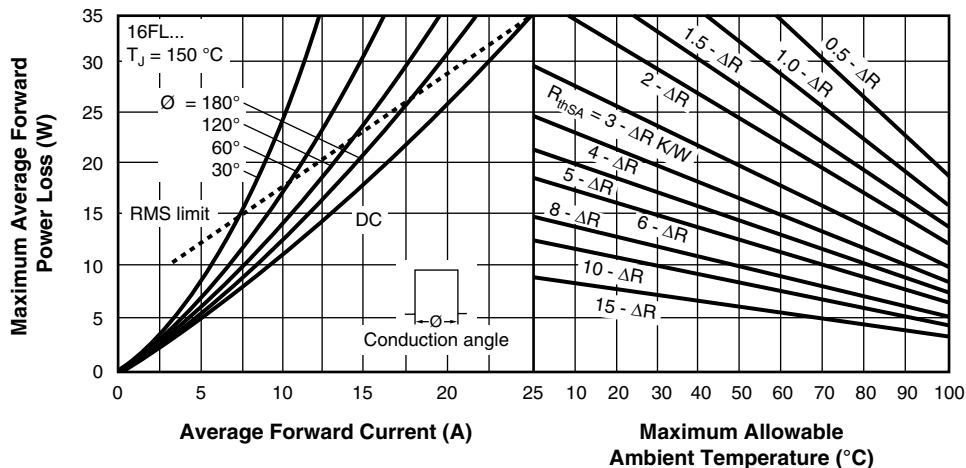
Conduction angle - $\phi$	$\Delta R$ - K/W
DC	0
180°	0.26
120°	0.46
60°	1.02
30°	1.76

Fig. 8 - Current Rating Nomogram (Rectangular Waveforms), 12FL Series



Conduction angle - $\phi$	$\Delta R$ - 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 - $\phi$	$\Delta R$ - 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

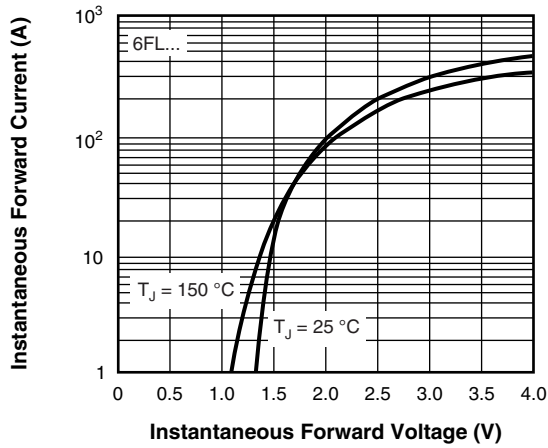


Fig. 11 - Maximum Forward Voltage vs. Forward Current, 6FL Series

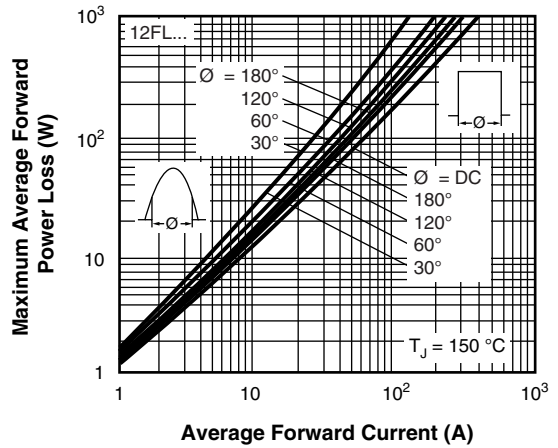


Fig. 14 - Maximum High Level Forward Power Loss vs. Average Forward Current, 12FL Series

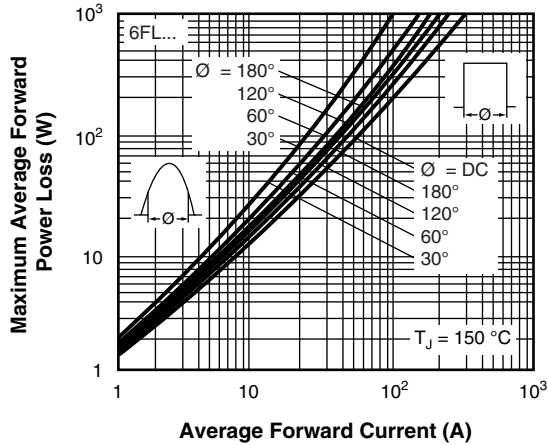


Fig. 12 - Maximum High Level Forward Power Loss vs. Average Forward Current, 6FL Series

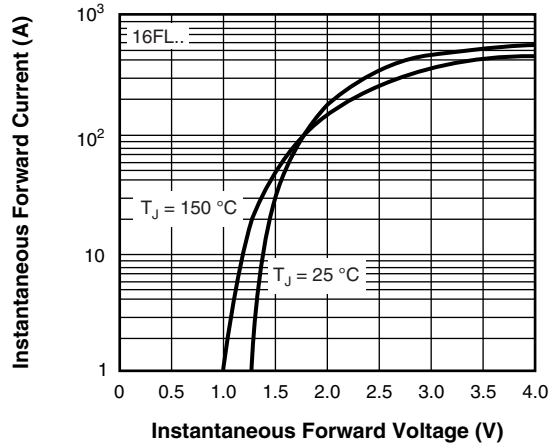


Fig. 15 - Maximum Forward Voltage vs. Forward Current, 16FL Series

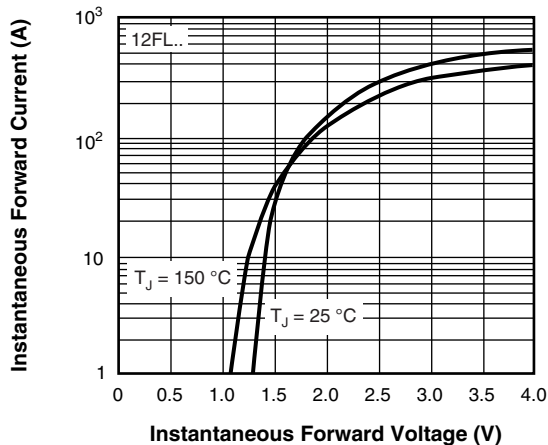


Fig. 13 - Maximum Forward Voltage vs. Forward Current, 12FL Series

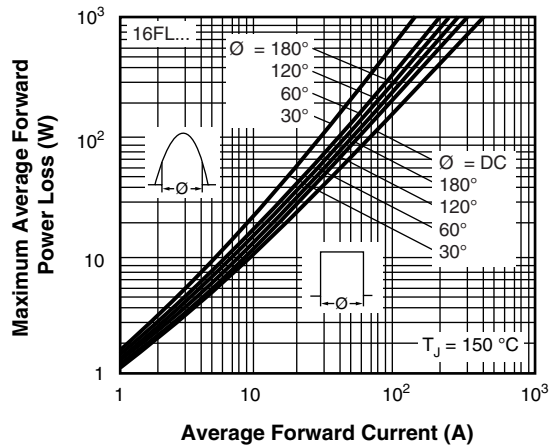


Fig. 16 - Maximum High Level Forward Power Loss vs. Average Forward Current, 16FL Series

# 6FL(R), 12FL(R), 16FL(R) Series



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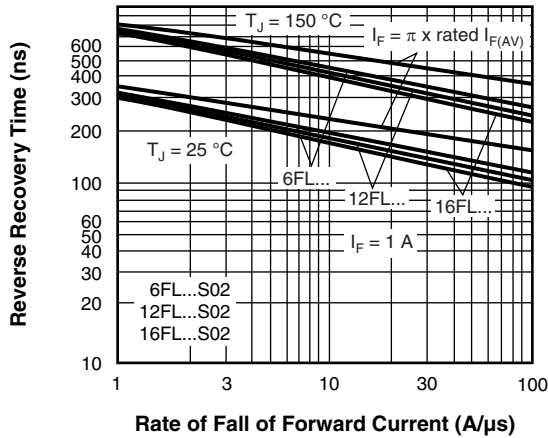


Fig. 17a - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, All Series ...S02

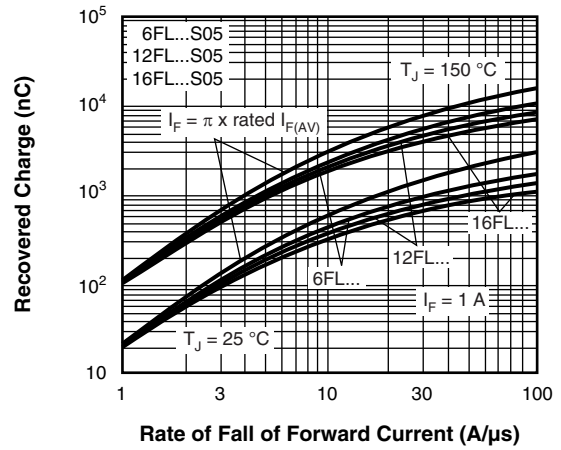


Fig. 18b - Typical Recovered Charge vs. Rate of Fall of Forward Current, All Series ...S05

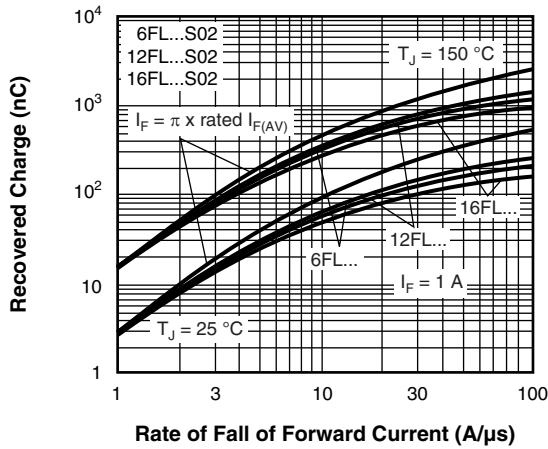


Fig. 17b - Typical Recovered Charge vs. Rate of Fall of Forward Current, All Series ...S02

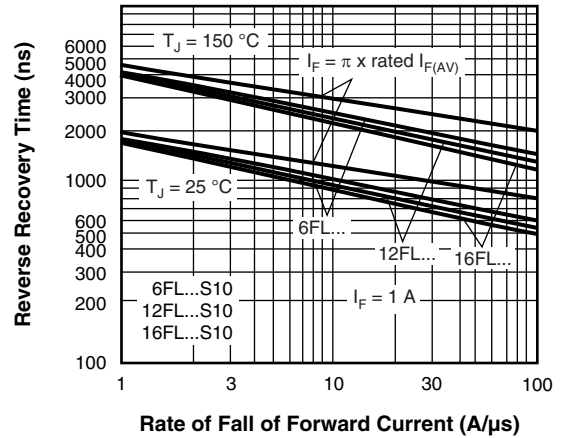


Fig. 19a - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, All Series ...S10

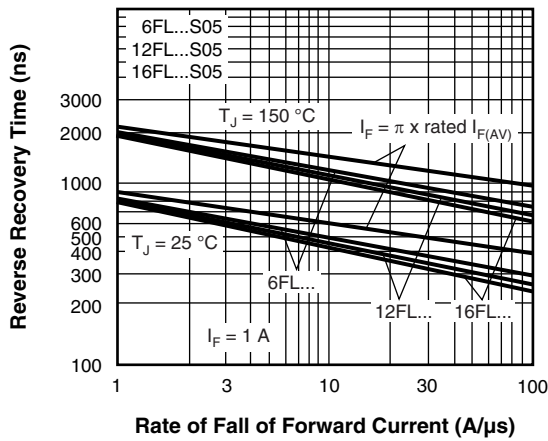


Fig. 18a - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, All Series ...S05

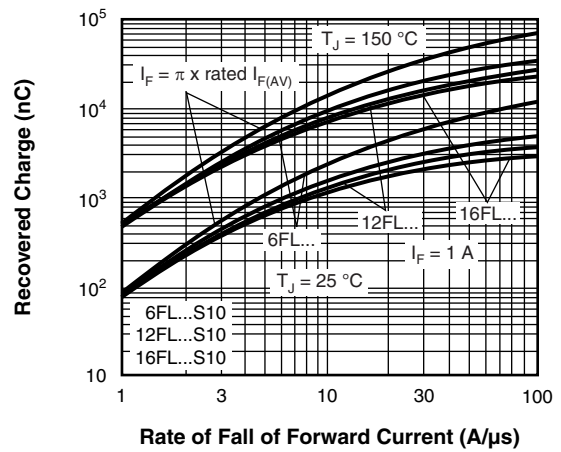


Fig. 19b - Typical Recovered Charge vs. Rate of Fall of Forward Current, All Series ...S10





# 6FL(R), 12FL(R), 16FL(R) Series

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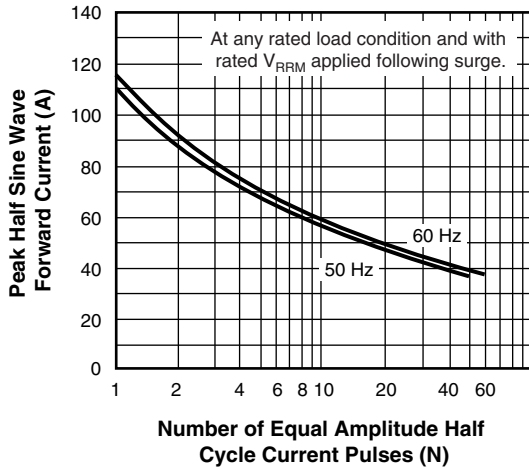


Fig. 20 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 6FL Series

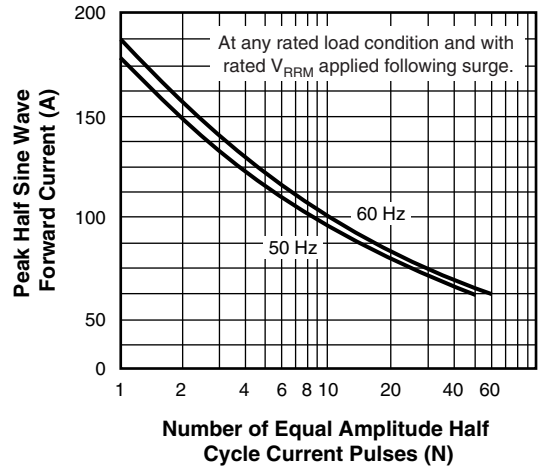


Fig. 22 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 16FL Series

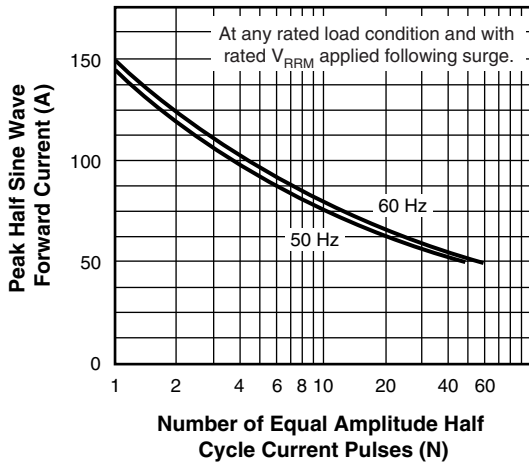


Fig. 21 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 12FL Series

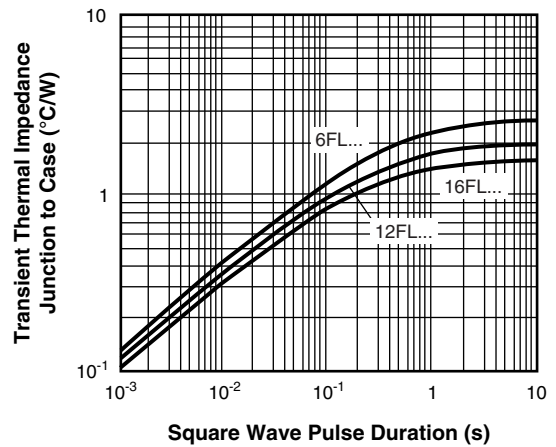


Fig. 23 - Maximum Transient Thermal Impedance, Junction to Case vs. Pulse Duration, All Series

# 6FL(R), 12FL(R), 16FL(R) Series



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## ORDERING INFORMATION TABLE

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

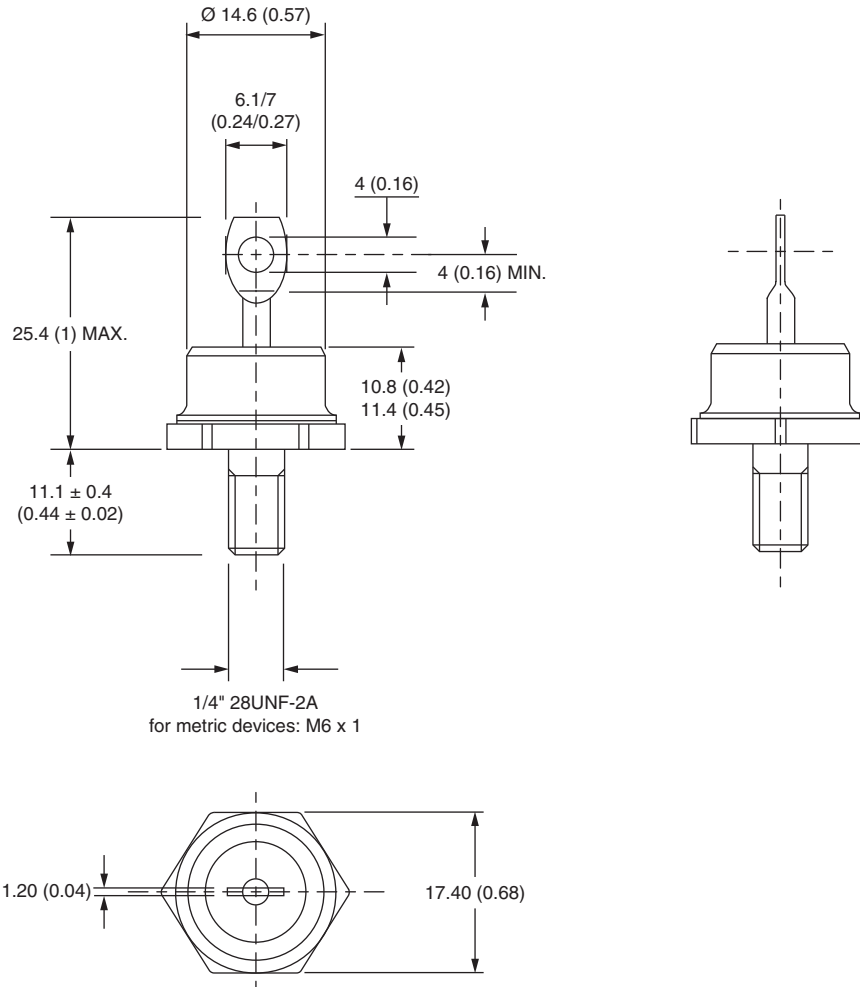
- 1** - Current code  $I_{(AVG)}$  = Exact current rating
- 2** - F = Diode
- 3** - Omit = Standard recovery diode  
L = Only for fast diode
- 4** - Omit = Stud forward polarity  
R = Stud reverse polarity
- 5** - Voltage code  $\times 10 = V_{RRM}$  (see Voltage Ratings table)
- 6** - Outlines:  
Omit = Stud base UNF thread  
M = Stud base metric thread
- 7** -  $t_{rr}$  code only for fast diode (see Recovery Characteristics table)

### LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?95311">www.vishay.com/doc?95311</a>
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## DO-203AB (DO-5) for 40HFL, 70HFL and 85HFL

### DIMENSIONS FOR 40HFL/70HFL in millimeters (inches)



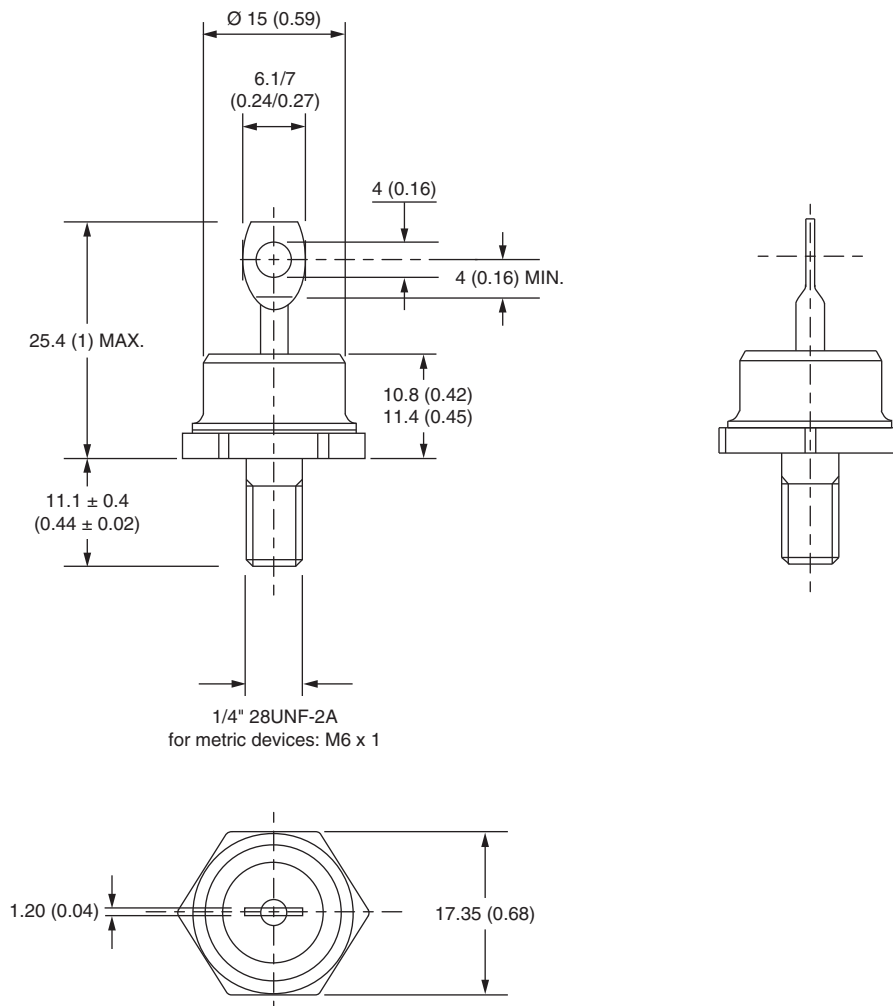
# Outline Dimensions

Vishay Semiconductors

DO-203AB (DO-5) for  
40HFL, 70HFL and 85HFL



## DIMENSIONS FOR 85HFL in millimeters (inches)





## Disclaimer

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## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**



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Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.