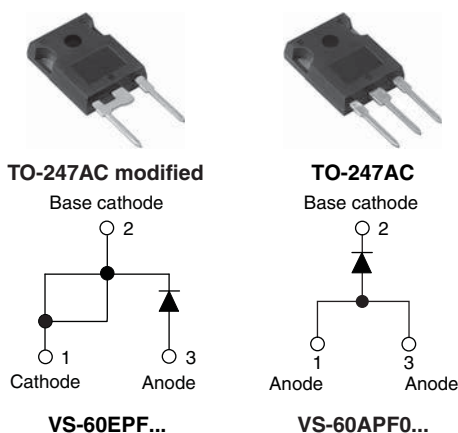


## Fast Soft Recovery Rectifier Diode, 60 A



### FEATURES

- 150 °C max. operating junction temperature
- Low forward voltage drop and short reverse recovery time
- Designed and qualified according to JEDEC-JESD47
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition (-M3 only)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### APPLICATIONS

These devices are intended for use in output rectification and freewheeling in inverters, choppers and converters as well as in input rectification where severe restrictions on conducted EMI should be met.

### DESCRIPTION

The VS-60EPF0... and VS-60APF0... soft recovery rectifier series has been optimized for combined short reverse recovery time and low forward voltage drop.

The glass passivation ensures stable reliable operation in the most severe temperature and power cycling conditions.

### PRODUCT SUMMARY

Package	TO-247AC modified (2 pins), TO-247AC
$I_{F(AV)}$	60 A
$V_R$	200 V, 400 V, 600 V
$V_F$ at $I_F$	1.3 V
$I_{FSM}$	830 A
$t_{rr}$	70 ns
$T_J$ max.	150 °C
Diode variation	Single die
Snap factor	0.5

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$V_{RRM}$		200 to 600	V
$I_{F(AV)}$	Sinusoidal waveform	60	A
$I_{FSM}$		830	
$t_{rr}$	1 A, 100 A/ $\mu$ s	70	ns
$V_F$	30 A, $T_J = 25$ °C	1.1	V
$T_J$		- 40 to 150	°C

### VOLTAGE RATINGS

PART NUMBER	$V_{RRM}$ , MAXIMUM PEAK REVERSE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}$ AT 150 °C mA
VS-60EPF02PbF, VS-60APF02PbF, VS-60EPF02-M3, VS-60APF02-M3	200	300	5
VS-60EPF04PbF, VS-60APF04PbF, VS-60EPF04-M3, VS-60APF04-M3	400	500	
VS-60EPF06PbF, VS-60APF06PbF, VS-60EPF06-M3, VS-60APF06-M3	600	700	

**ABSOLUTE MAXIMUM RATINGS**

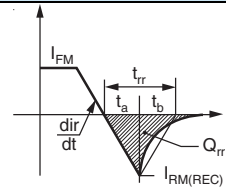
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	$T_C = 106\text{ }^{\circ}\text{C}$ , 180° conduction half sine wave	60	A
Maximum peak one cycle non-repetitive surge current	$I_{FSM}$	10 ms sine pulse, rated $V_{RRM}$ applied	700	
		10 ms sine pulse, no voltage reapplied	830	
Maximum $I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied	2450	$\text{A}^2\text{s}$
		10 ms sine pulse, no voltage reapplied	3460	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reapplied	34 600	$\text{A}^2\sqrt{\text{s}}$

**ELECTRICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum forward voltage drop	$V_{FM}$	60 A, $T_J = 25\text{ }^{\circ}\text{C}$	1.3	V
Forward slope resistance	$r_t$	$T_J = 150\text{ }^{\circ}\text{C}$	5.0	$\text{m}\Omega$
Threshold voltage	$V_{F(TO)}$		0.88	V
Maximum reverse leakage current	$I_{RM}$	$T_J = 25\text{ }^{\circ}\text{C}$	0.1	mA
		$T_J = 150\text{ }^{\circ}\text{C}$	5.0	

**RECOVERY CHARACTERISTICS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Reverse recovery time	$t_{rr}$	$I_F$ at 60 A <sub>pk</sub> 25 A/ $\mu\text{s}$ 25 $^{\circ}\text{C}$	180	ns
Reverse recovery current	$I_{rr}$		3.4	A
Reverse recovery charge	$Q_{rr}$		0.5	$\mu\text{C}$
Snap factor	S	Typical	0.5	

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		- 40 to 150	$^{\circ}\text{C}$
Maximum thermal resistance, junction to case	$R_{thJC}$	DC operation	0.4	$^{\circ}\text{C/W}$
Maximum thermal resistance, junction to ambient	$R_{thJA}$		40	
Typical thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth and greased	0.2	
Approximate weight			6	g
			0.21	oz.
Mounting torque	minimum		6 (5)	$\text{kgf} \cdot \text{cm}$ ( $\text{lbf} \cdot \text{in}$ )
	maximum		12 (10)	
Marking device		Case style TO-247AC modified	60EPF02	
			60EPF04	
			60EPF06	
		Case style TO-247AC	60APF02	
			60APF04	
			60APF06	

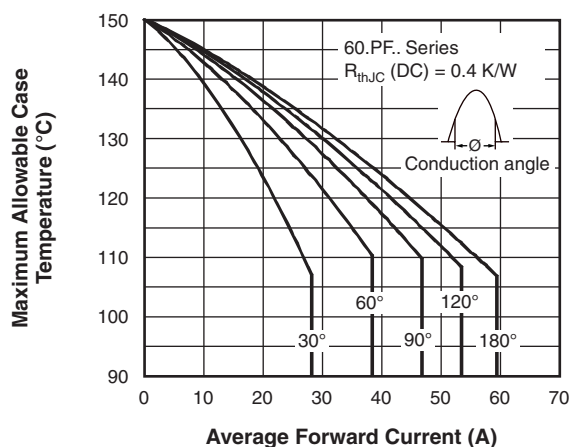


Fig. 1 - Current Rating Characteristics

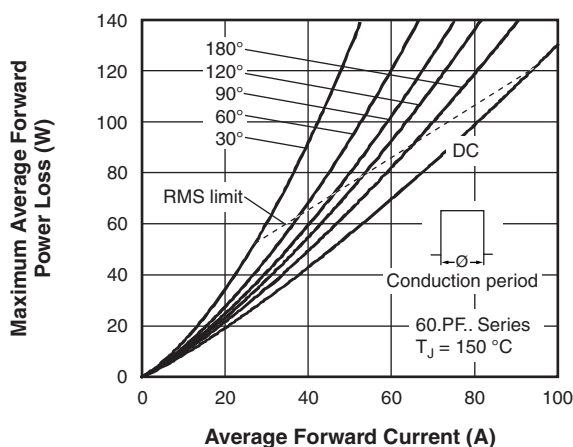


Fig. 4 - Forward Power Loss Characteristics

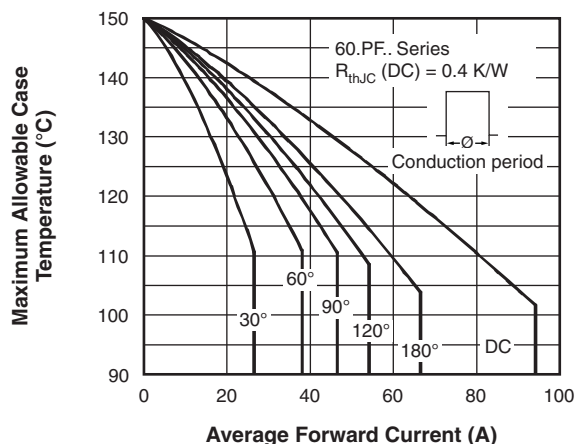


Fig. 2 - Current Rating Characteristics

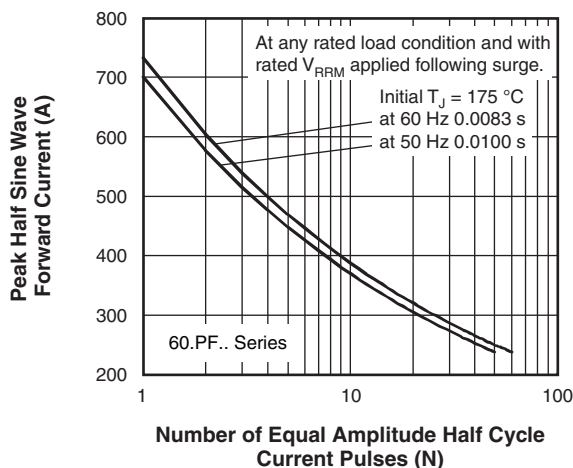


Fig. 5 - Maximum Non-Repetitive Surge Current

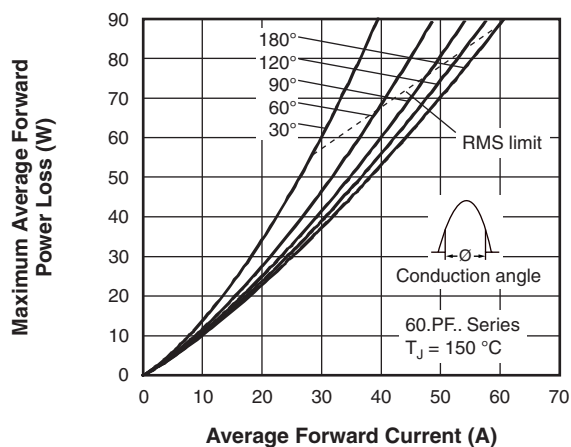


Fig. 3 - Forward Power Loss Characteristics

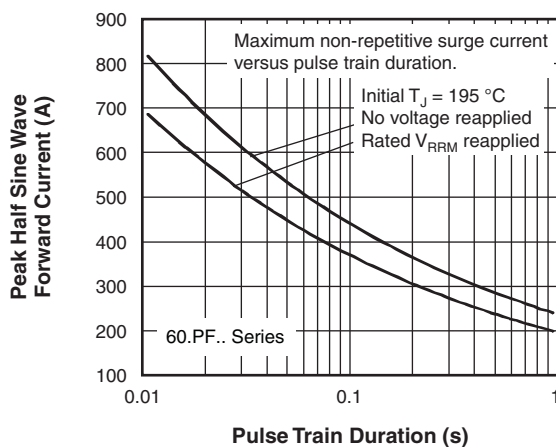


Fig. 6 - Maximum Non-Repetitive Surge Current

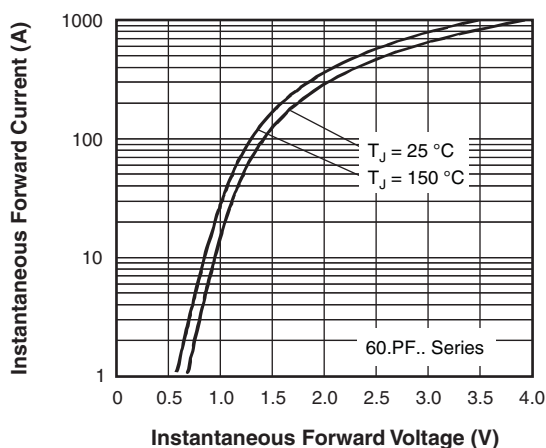
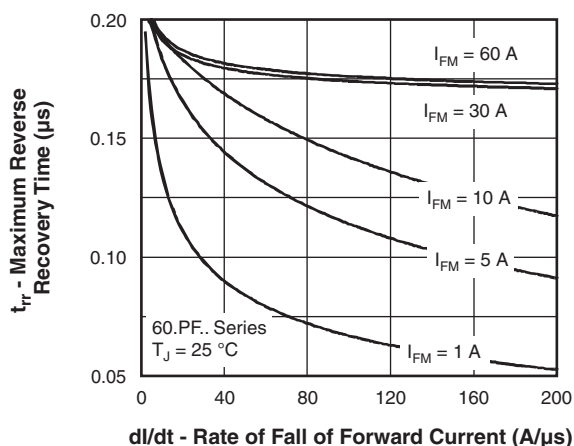
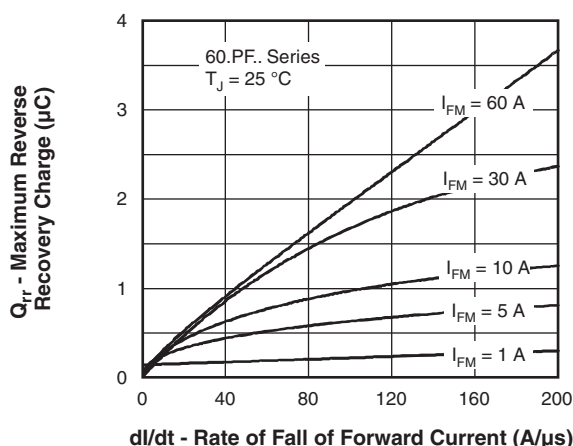
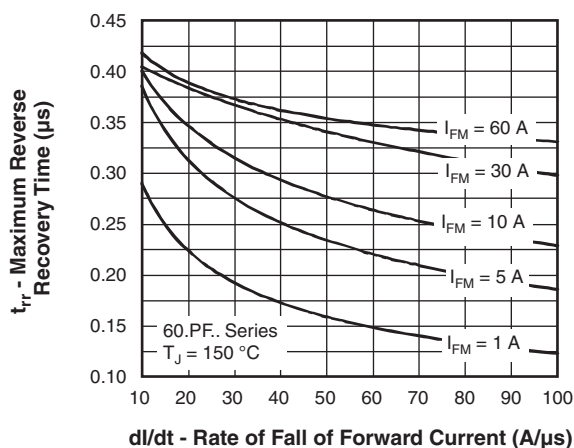
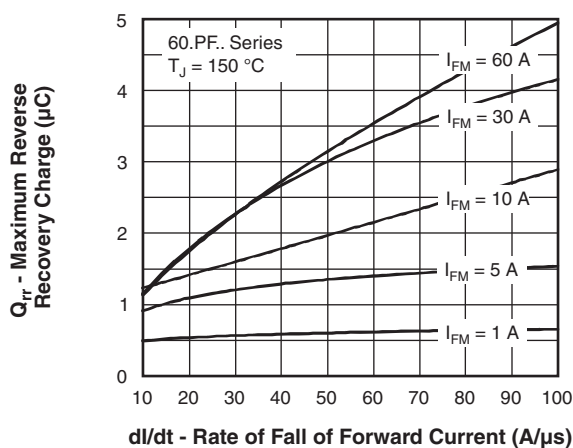


Fig. 7 - Forward Voltage Drop Characteristics


Fig. 8 - Recovery Time Characteristics,  $T_J = 25\text{ °C}$ 

Fig. 10 - Recovery Charge Characteristics,  $T_J = 25\text{ °C}$ 

Fig. 9 - Recovery Time Characteristics,  $T_J = 150\text{ °C}$ 

Fig. 11 - Recovery Charge Characteristics,  $T_J = 150\text{ °C}$

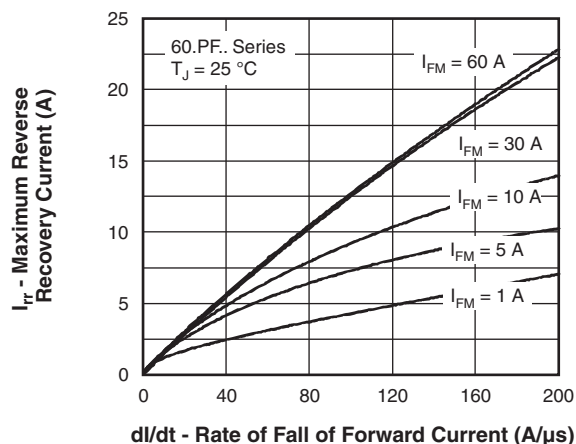


Fig. 12 - Recovery Current Characteristics,  $T_J = 25^\circ C$

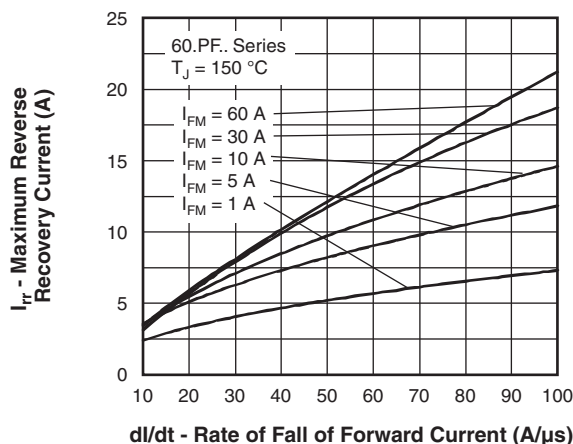


Fig. 13 - Recovery Current Characteristics,  $T_J = 150^\circ C$

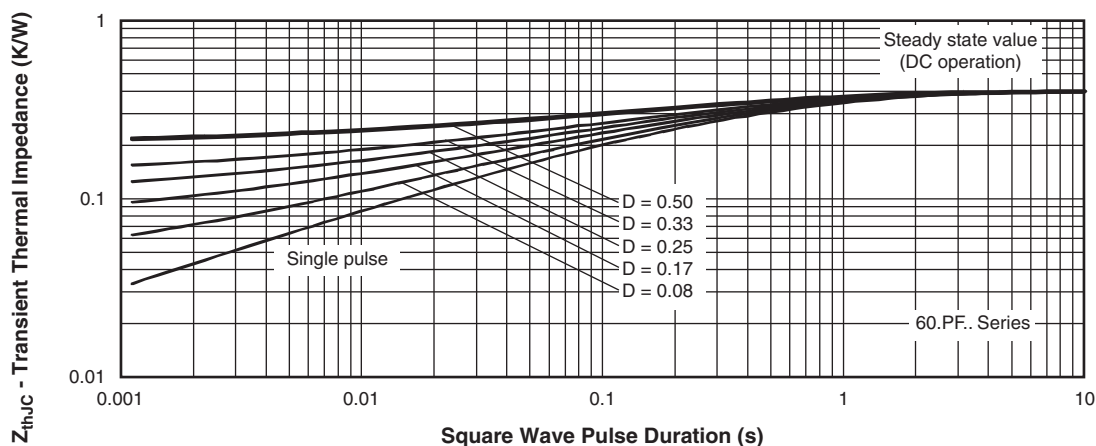


Fig. 14 - Thermal Impedance  $Z_{thJC}$  Characteristics

**ORDERING INFORMATION TABLE**

Device code	VS-	60	E	P	F	06	PbF
	1	2	3	4	5	6	7
<b>1</b>	- Vishay Semiconductors product						
<b>2</b>	- Current rating (60 = 60 A)						
<b>3</b>	- Circuit configuration: E = Single diode A = Single diode, 3 pins						
<b>4</b>	- Package: P = TO-247AC/TO-247AC modified						
<b>5</b>	- Type of silicon: F = Fast recovery						
<b>6</b>	- Voltage code x 100 = $V_{RRM}$						
<b>7</b>	- Environmental digit:						
							02 = 200 V 04 = 400 V 06 = 600 V
• PbF = Lead (Pb)-free and RoHS compliant							
• -M3 = Halogen-free, RoHS compliant and terminations lead (Pb)-free							

<b>ORDERING INFORMATION</b> (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-60EPF02PbF	25	500	Antistatic plastic tubes
VS-60EPF02-M3	25	500	Antistatic plastic tubes
VS-60APF02PbF	25	500	Antistatic plastic tubes
VS-60APF02-M3	25	500	Antistatic plastic tubes
VS-60EPF04PbF	25	500	Antistatic plastic tubes
VS-60EPF04-M3	25	500	Antistatic plastic tubes
VS-60APF04PbF	25	500	Antistatic plastic tubes
VS-60APF04-M3	25	500	Antistatic plastic tubes
VS-60EPF06PbF	25	500	Antistatic plastic tubes
VS-60EPF06-M3	25	500	Antistatic plastic tubes
VS-60APF06PbF	25	500	Antistatic plastic tubes
VS-60APF06-M3	25	500	Antistatic plastic tubes

<b>LINKS TO RELATED DOCUMENTS</b>		
Dimensions	TO-247AC modified	<a href="http://www.vishay.com/doc?95253">www.vishay.com/doc?95253</a>
	TO-247AC	<a href="http://www.vishay.com/doc?95223">www.vishay.com/doc?95223</a>
Part marking information	TO-247AC modified PbF	<a href="http://www.vishay.com/doc?95255">www.vishay.com/doc?95255</a>
	TO-247AC modified -M3	<a href="http://www.vishay.com/doc?95442">www.vishay.com/doc?95442</a>
	TO-247AC PbF	<a href="http://www.vishay.com/doc?95226">www.vishay.com/doc?95226</a>
	TO-247AC -M3	<a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a>
SPIICE model		<a href="http://www.vishay.com/doc?95275">www.vishay.com/doc?95275</a>



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