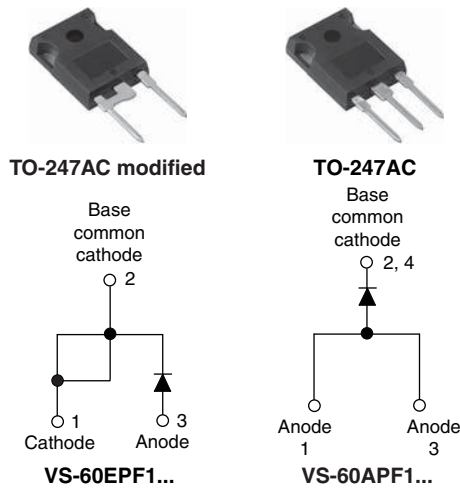


## Fast Soft Recovery Rectifier Diode, 60 A



### 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-60EPF1... and VS-60APF1... 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
$V_R$	1000 V, 1200 V
$V_F$ at $I_F$	1.4 V
$I_{FSM}$	700 A
$t_{rr}$	95 ns
$T_J$ max.	150 °C
Diode variation	Single die
Snap factor	0.6

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$V_{RRM}$		1000 to 1200	V
$I_{F(AV)}$	Sinusoidal waveform	60	A
$I_{FSM}$		700	
$t_{rr}$	1 A, - 100 A/ $\mu$ s	95	ns
$V_F$	30 A, $T_J = 25$ °C	1.2	V
$T_J$	Range	- 40 to 150	°C

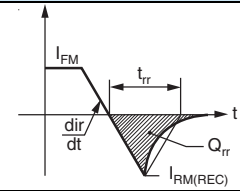
VOLTAGE RATINGS			
PART NUMBER	$V_{RRM}$ , MAXIMUM PEAK REVERSE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}$ AT 150 °C mA
VS-60EPF10PbF, VS-60APF10PbF VS-60EPF10-M3, VS-60APF10-M3	1000	1100	8
VS-60EPF12PbF, VS-60APF12PbF VS-60EPF12-M3, VS-60APF12-M3	1200	1300	



<b>ABSOLUTE MAXIMUM RATINGS</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	$T_C = 103\text{ }^\circ\text{C}$ , 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	$A^2s$
		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	$A^2\sqrt{s}$

<b>ELECTRICAL SPECIFICATIONS</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum forward voltage drop	$V_{FM}$	60 A, $T_J = 25\text{ }^\circ\text{C}$	1.4	V
Forward slope resistance	$r_t$	$T_J = 125\text{ }^\circ\text{C}$	4.6	$m\Omega$
Threshold voltage	$V_{F(TO)}$		0.9	V
Maximum reverse leakage current	$I_{RM}$	$T_J = 25\text{ }^\circ\text{C}$	0.1	mA
		$T_J = 150\text{ }^\circ\text{C}$	8	

<b>RECOVERY CHARACTERISTICS</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Reverse recovery time	$t_{rr}$	$I_F$ at 60 $A_{pk}$ 25 A/ $\mu s$ 25 °C	480	ns
Reverse recovery current	$I_{rr}$		8	A
Reverse recovery charge	$Q_{rr}$		2.7	$\mu C$
Snap factor	S		0.6	



<b>THERMAL - MECHANICAL SPECIFICATIONS</b>				
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	60EPF10	
			60EPF12	
		Case style TO-247AC	60APF10	
			60APF12	

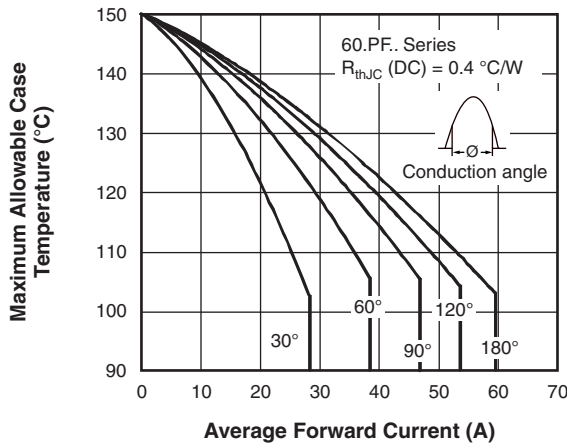


Fig. 1 - Current Rating Characteristics

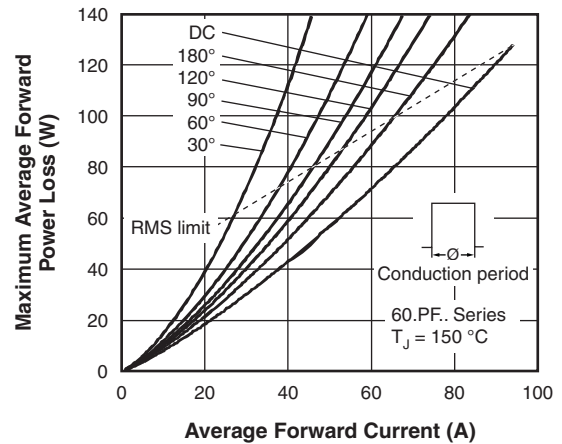


Fig. 4 - Forward Power Loss Characteristics

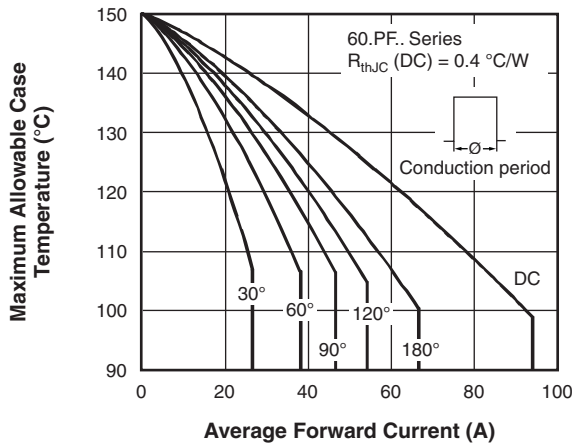


Fig. 2 - Current Rating Characteristics

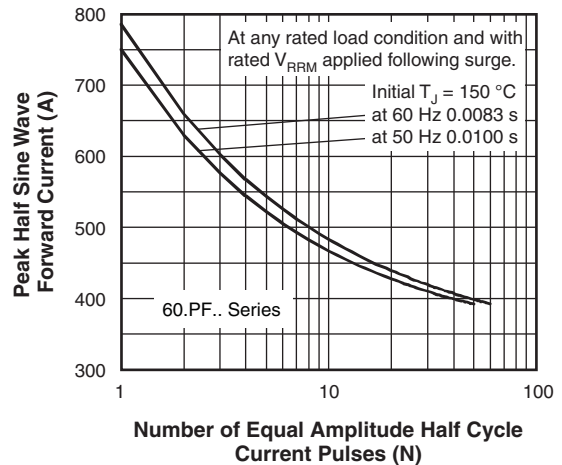


Fig. 5 - Maximum Non-Repetitive Surge Current

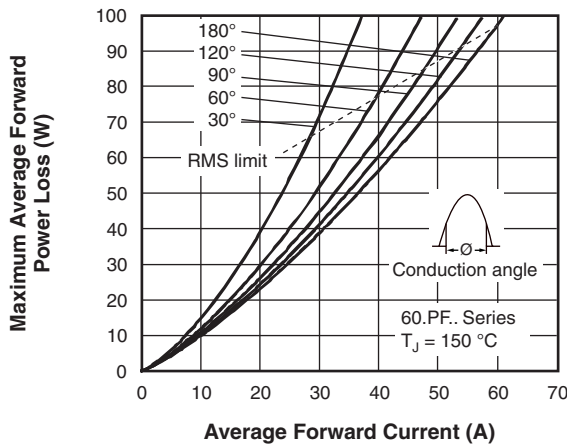


Fig. 3 - Forward Power Loss Characteristics

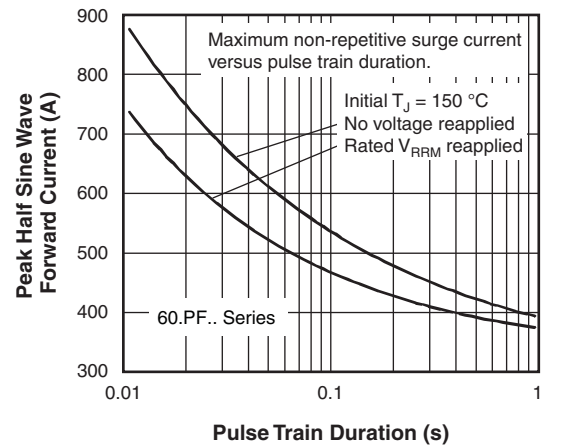


Fig. 6 - Maximum Non-Repetitive Surge Current

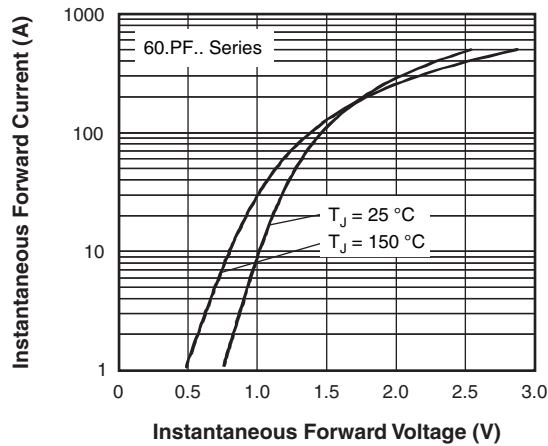


Fig. 7 - Forward Voltage Drop Characteristics

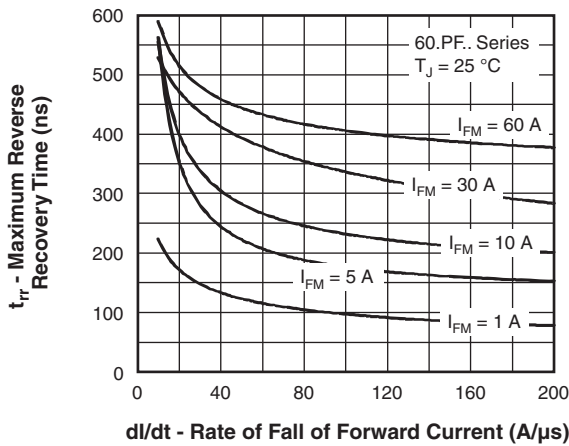


Fig. 8 - Recovery Time Characteristics,  $T_J = 25\text{ }^\circ\text{C}$

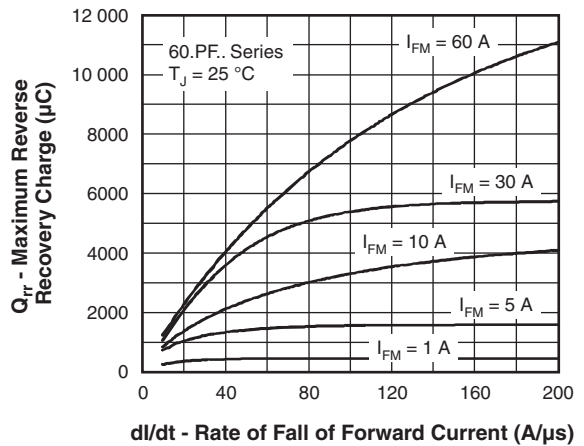


Fig. 10 - Recovery Charge Characteristics,  $T_J = 25\text{ }^\circ\text{C}$

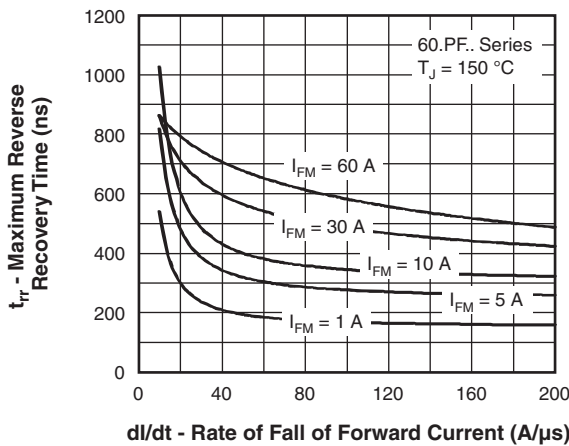


Fig. 9 - Recovery Time Characteristics,  $T_J = 150\text{ }^\circ\text{C}$

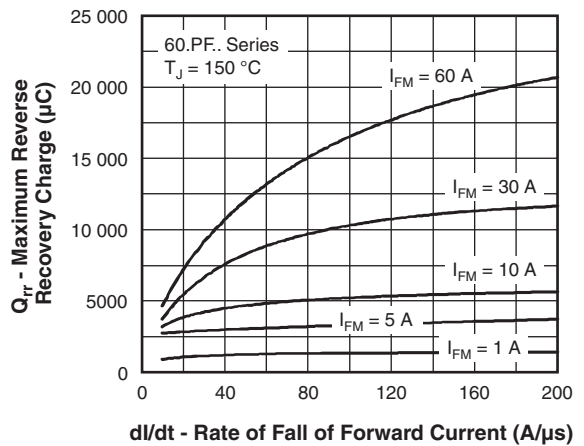


Fig. 11 - Recovery Charge Characteristics,  $T_J = 150\text{ }^\circ\text{C}$

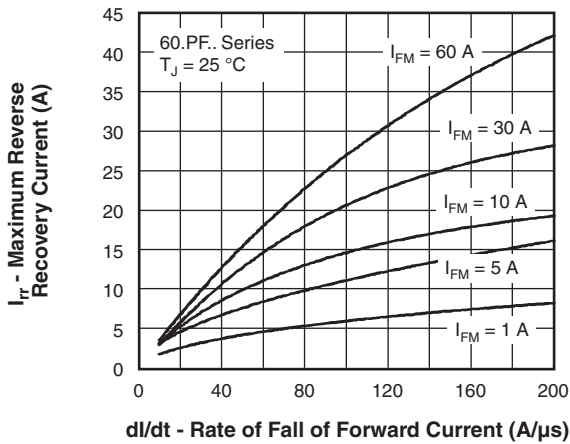


Fig. 12 - Recovery Current Characteristics,  $T_J = 25\text{ }^\circ\text{C}$

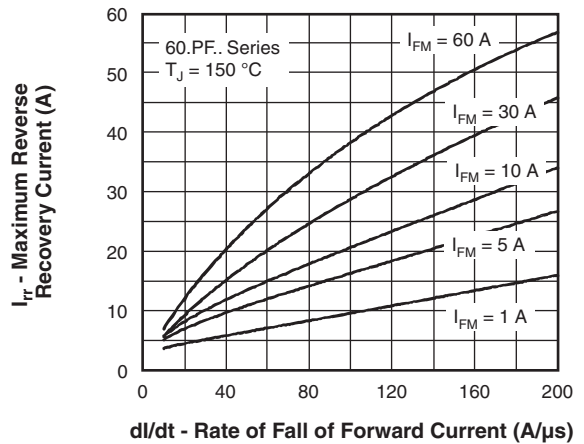


Fig. 13 - Recovery Current Characteristics,  $T_J = 150\text{ }^\circ\text{C}$

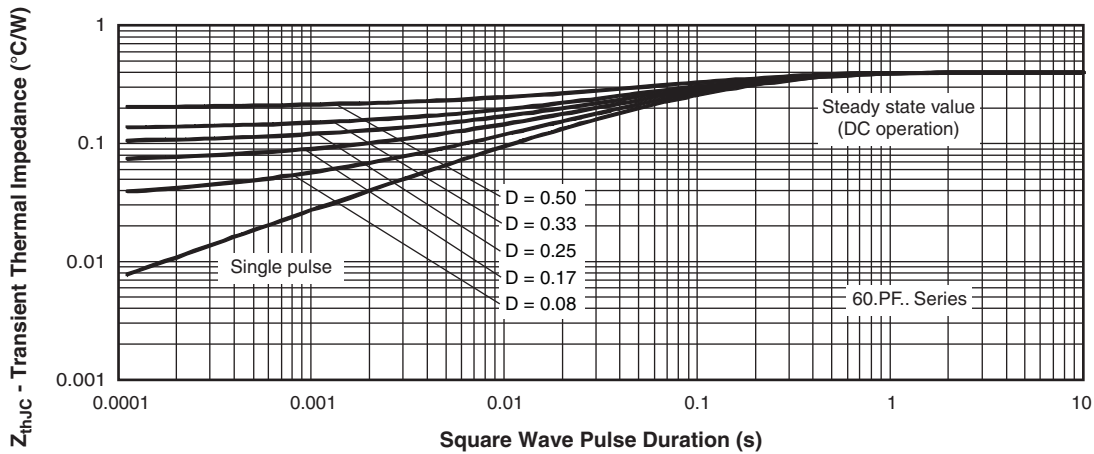
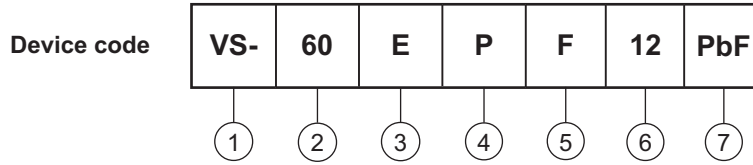


Fig. 14 - Thermal Impedance  $Z_{thJC}$  Characteristics



**ORDERING INFORMATION TABLE**



- 1** - Vishay Semiconductors product
- 2** - Current rating (60 = 60 A)
- 3** - Circuit configuration:  
E = Single diode  
A = Single diode, 3 pins
- 4** - Package:  
P = TO-247AC/TO-247AC modified
- 5** - Type of silicon:  
F = Fast recovery
- 6** - Voltage code x 100 =  $V_{RRM}$ 

10 = 1000 V
12 = 1200 V
- 7** - Environmental digit:
  - PbF = Lead (Pb)-free and RoHS compliant
  - -M3 = Halogen-free, RoHS compliant and terminations lead (Pb)-free

<b>ORDERING INFORMATION (Example)</b>			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-60EPF10PbF	25	500	Antistatic plastic tubes
VS-60EPF10-M3	25	500	Antistatic plastic tubes
VS-60APF10PbF	25	500	Antistatic plastic tubes
VS-60APF10-M3	25	500	Antistatic plastic tubes
VS-60EPF12PbF	25	500	Antistatic plastic tubes
VS-60EPF12-M3	25	500	Antistatic plastic tubes
VS-60APF12PbF	25	500	Antistatic plastic tubes
VS-60APF12-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>



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