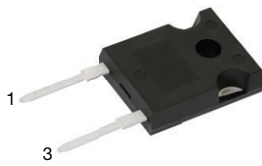
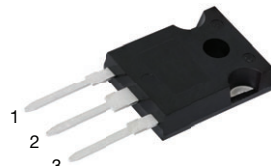
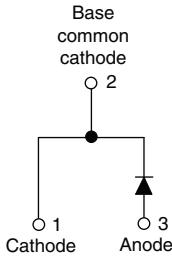
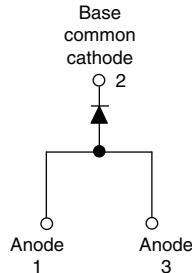


## Ultrafast Soft Recovery Diode, 60 A FRED Pt<sup>®</sup>



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


**TO-247AC 2L**

**TO-247AC 3L**

**VS-60EPU02-N3**

**VS-60APU02-N3**

### FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Output rectification
- Designed and qualified according to JEDEC<sup>®</sup>-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### BENEFITS

- Reduced RFI and EMI
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

### DESCRIPTION / APPLICATIONS

These diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems.

The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for HF welding, power converters and other applications where switching losses are not significant portion of the total losses.

### PRIMARY CHARACTERISTICS

$I_{F(AV)}$	60 A
$V_R$	200 V
$V_F$ at $I_F$	0.81 V
$t_{rr}$ typ.	See Recovery table
$T_J$ max.	175 °C
Package	TO-247AC 2L, TO-247AC 3L
Circuit configuration	Single

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	$V_R$		200	V
Continuous forward current	$I_{F(AV)}$	$T_C = 127\text{ °C}$	60	A
Single pulse forward current	$I_{FSM}$	$T_C = 25\text{ °C}, t_p = 10\text{ ms}$	800	
Maximum repetitive forward current	$I_{FRM}$	Square wave, 20 kHz	120	
Operating junction and storage temperatures	$T_J, T_{Stg}$		-55 to +175	°C

### ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 100\text{ }\mu\text{A}$	200	-	-	V
		$I_F = 60\text{ A}$	-	0.98	1.08	
Forward voltage	$V_F$	$I_F = 60\text{ A}, T_J = 175\text{ °C}$	-	0.81	0.88	
		$V_R = V_R$ rated	-	-	50	
Reverse leakage current	$I_R$	$T_J = 150\text{ °C}, V_R = V_R$ rated	-	-	2	mA
			-	87	-	pF
Junction capacitance	$C_T$	$V_R = 200\text{ V}$	-	87	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH



DYNAMIC RECOVERY CHARACTERISTICS (T <sub>C</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 1.0 A, dI <sub>F</sub> /dt = 200 A/μs, V <sub>R</sub> = 30 V	-	-	35	ns
		T <sub>J</sub> = 25 °C	-	28	-	
		T <sub>J</sub> = 125 °C	-	50	-	
Peak recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	-	4	-	A
		T <sub>J</sub> = 125 °C	-	8	-	
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25 °C	-	59	-	nC
		T <sub>J</sub> = 125 °C	-	220	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	R <sub>thJC</sub>		-	-	0.70	K/W
Thermal resistance, junction to ambient per leg	R <sub>thJA</sub>	Typical socket mount	-	-	40	°C/W
Thermal resistance, case to heatsink	R <sub>thCS</sub>	Mounting surface, flat, smooth, and greased	-	0.2	-	K/W
Weight			-	5.5	-	g
			-	0.2	-	oz.
Mounting torque			-	-	1.2	N · m
Marking device		Case style TO-247AC 2L	60EPU02			
		Case style TO-247AC 3L	60APU02			

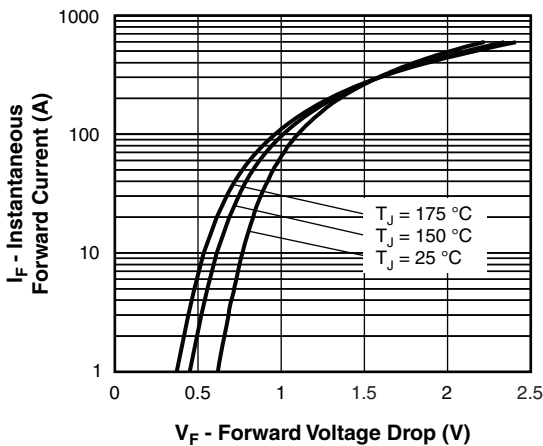


Fig. 1 - Typical Forward Voltage Drop Characteristics

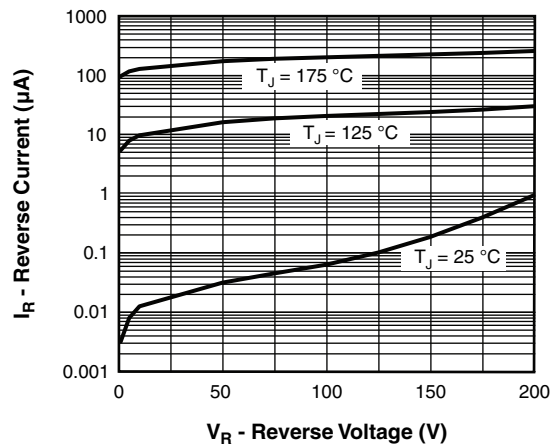


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

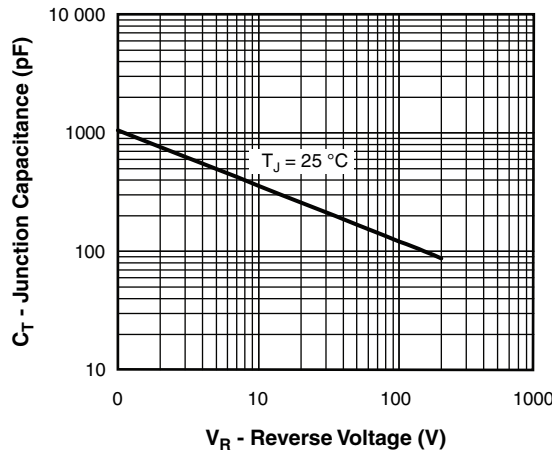


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

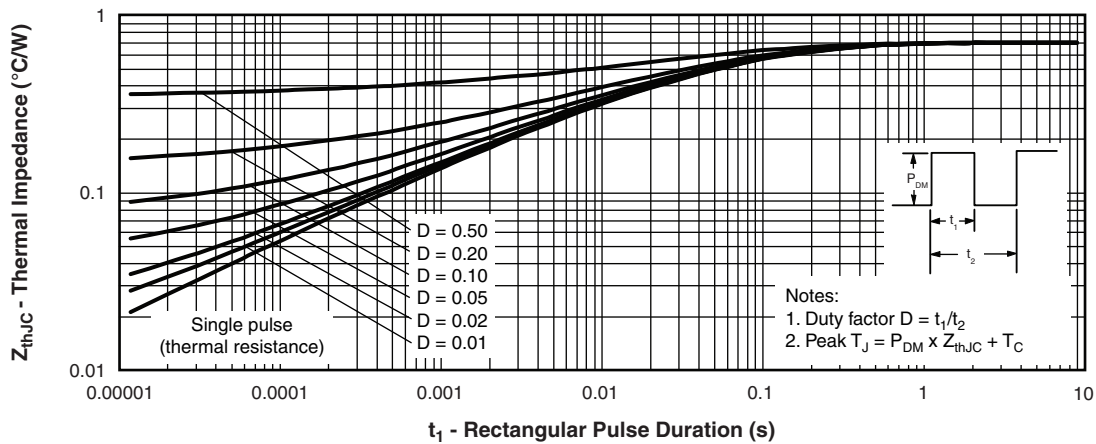


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

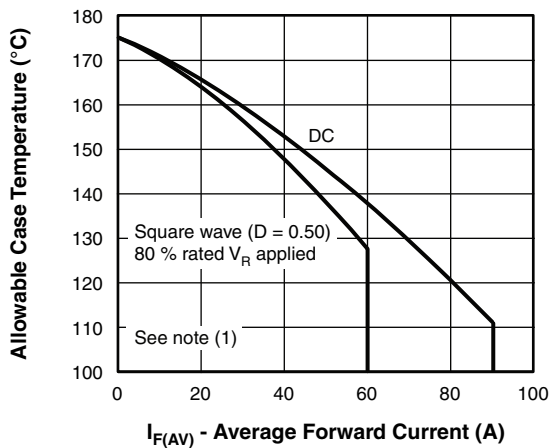


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

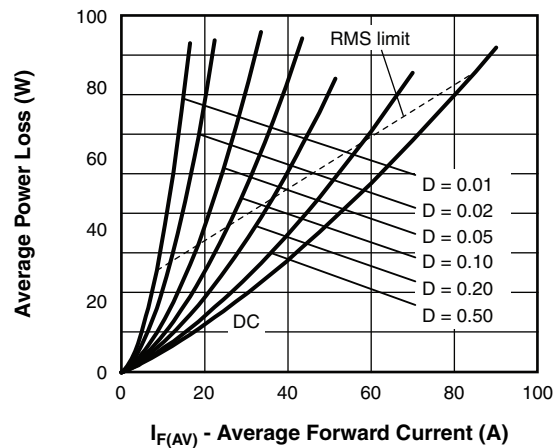


Fig. 6 - Forward Power Loss Characteristics

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1} = 80\%$  rated  $V_R$

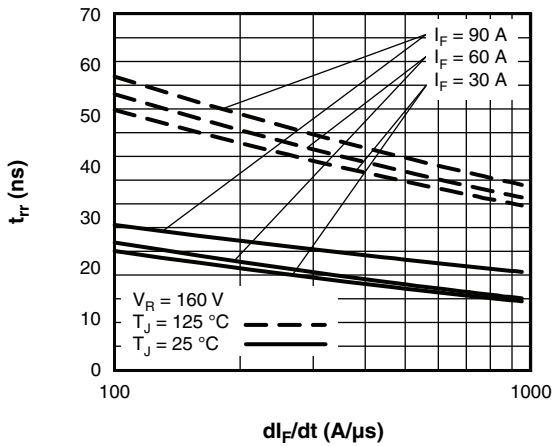


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

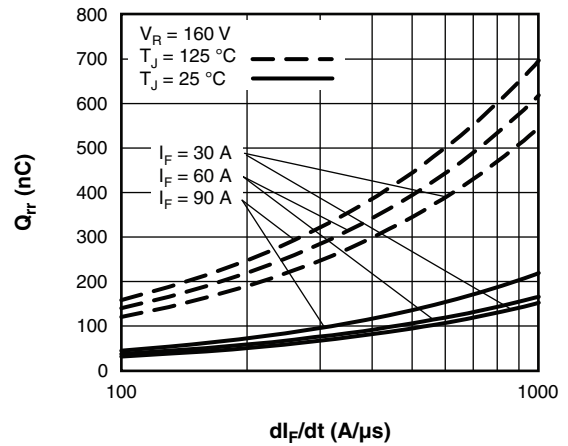


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$

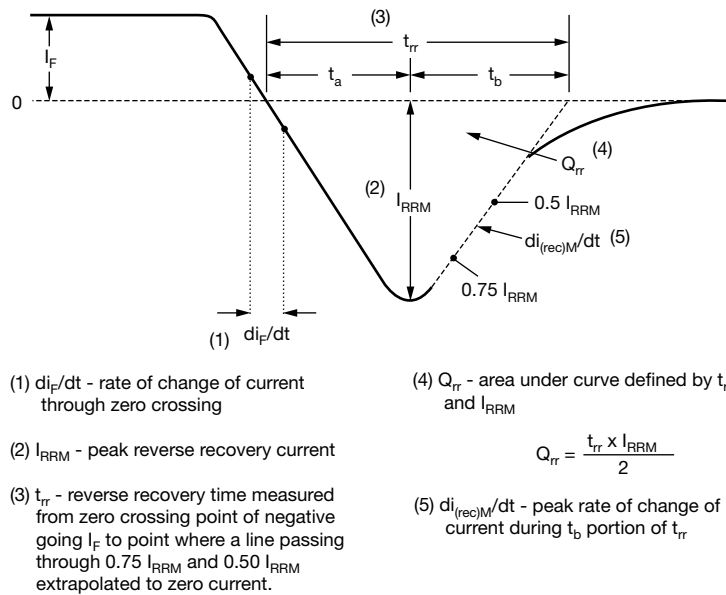
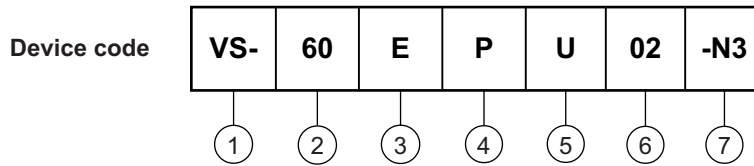


Fig. 9 - Reverse Recovery Waveform and Definitions



## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (60 = 60 A)
- 3** - Circuit configuration:
  - E = single diode, 2 pins
  - A = single diode, 3 pins
- 4** - Package:
  - P = TO-247AC
- 5** - Type of silicon:
  - U = ultrafast recovery
- 6** - Voltage rating (02 = 200 V)
- 7** - Environmental digit:
  - N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-60EPU02-N3	25	500	Antistatic plastic tube
VS-60APU02-N3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS			
Dimensions	TO-247AC 2L	<a href="http://www.vishay.com/doc?96144">www.vishay.com/doc?96144</a>	
	TO-247AC 3L	<a href="http://www.vishay.com/doc?96138">www.vishay.com/doc?96138</a>	
Part marking information	TO-247AC 2L -N3	<a href="http://www.vishay.com/doc?95648">www.vishay.com/doc?95648</a>	
	TO-247AC 3L -N3	<a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a>	
SPICE model		<a href="http://www.vishay.com/doc?96049">www.vishay.com/doc?96049</a>	



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