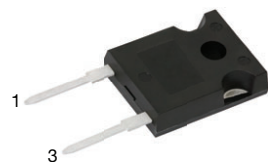
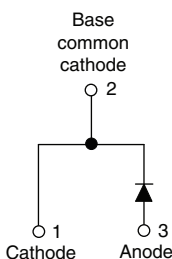
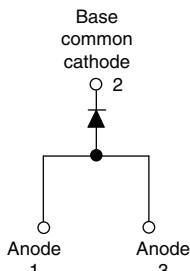


# Ultrafast Soft Recovery Diode, 60 A FRED Pt®


**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®-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.



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

## 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
Forward voltage	$V_F$	$I_F = 60\text{ A}$	-	0.98	1.08	
		$I_F = 60\text{ A}$ , $T_J = 175\text{ °C}$	-	0.81	0.88	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	50	$\mu\text{A}$
		$T_J = 150\text{ °C}$ , $V_R = V_R$ rated	-	-	2	mA
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** ( $T_C = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1.0\text{ A}$ , $dI_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	-	35	ns
		$T_J = 25\text{ }^{\circ}\text{C}$	-	28	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	50	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	4	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	8	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	59	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	220	-	

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	$R_{thJC}$		-	-	0.70	K/W
Thermal resistance, junction to ambient per leg	$R_{thJA}$	Typical socket mount	-	-	40	$^{\circ}\text{C}/\text{W}$
Thermal resistance, case to heatsink	$R_{thCS}$	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			

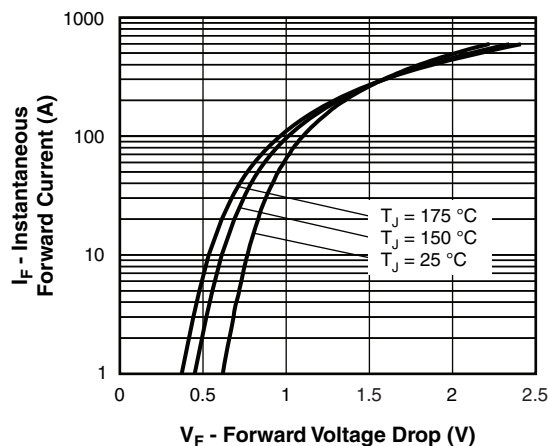


Fig. 1 - Typical Forward Voltage Drop Characteristics

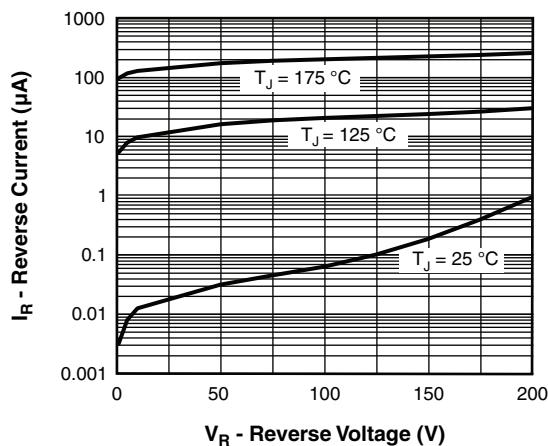


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

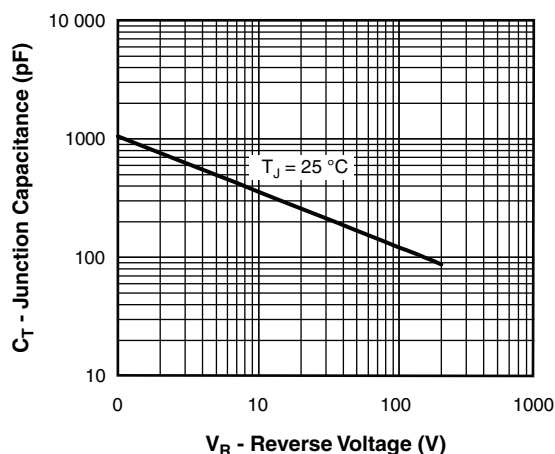


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

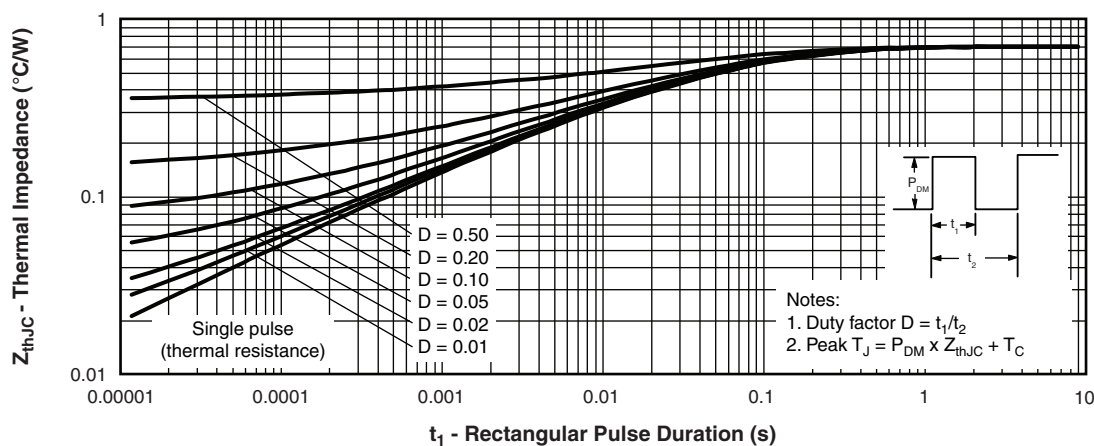
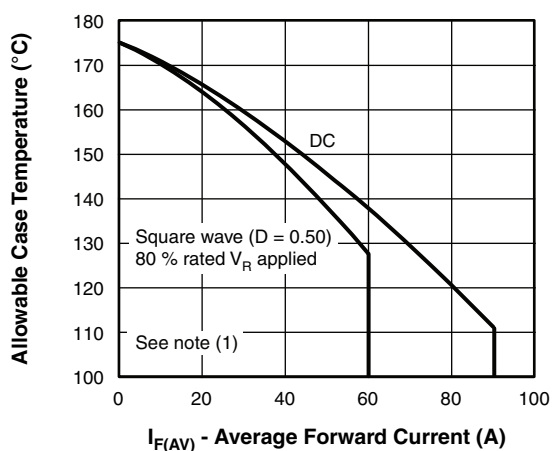

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics


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

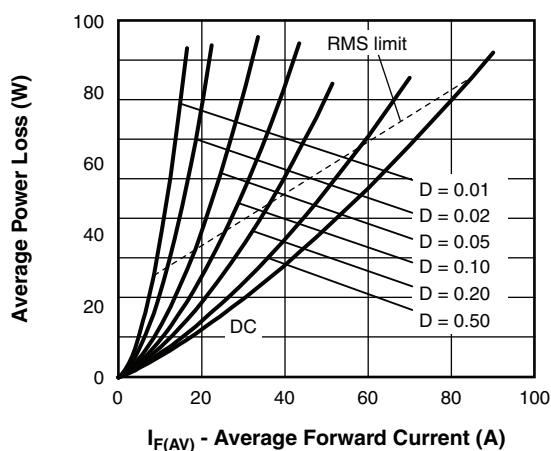


Fig. 6 - Forward Power Loss Characteristics

#### 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  $V_R$

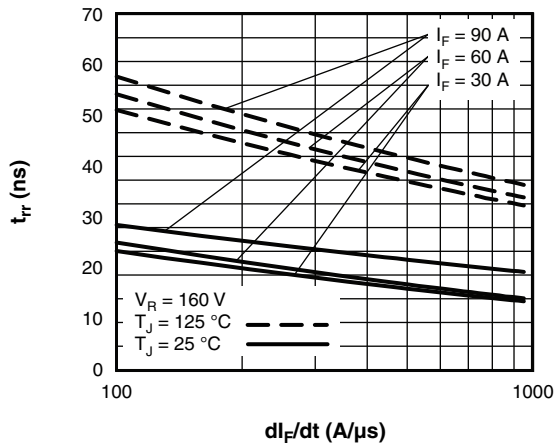
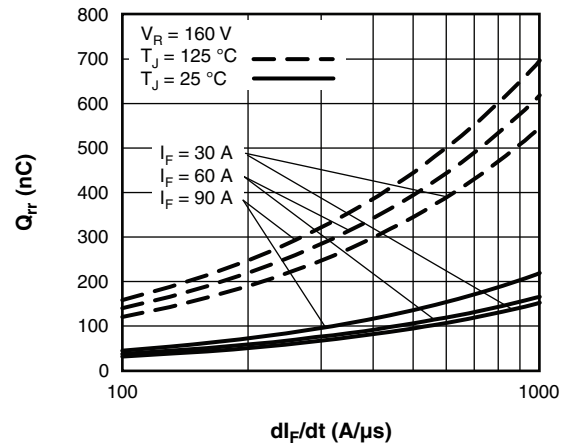
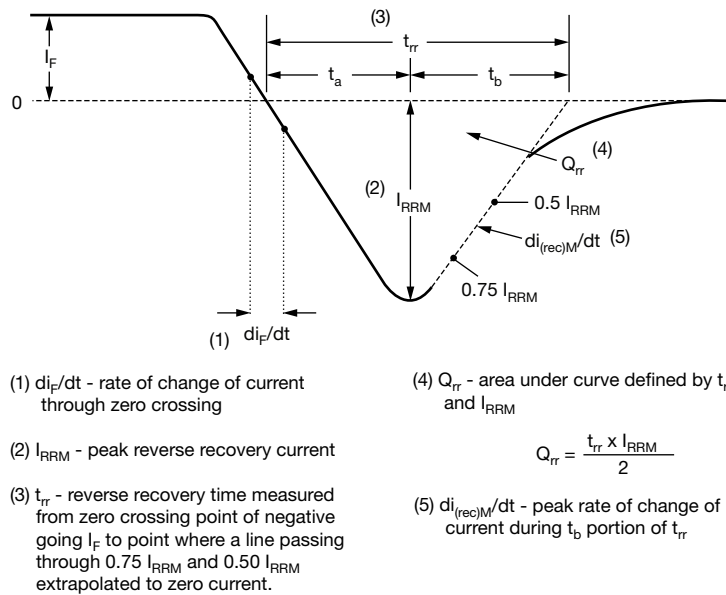

Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$ 

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


Fig. 9 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code	<b>VS-</b>	<b>60</b>	<b>E</b>	<b>P</b>	<b>U</b>	<b>02</b>	<b>-N3</b>
	1	2	3	4	5	6	7

- 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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