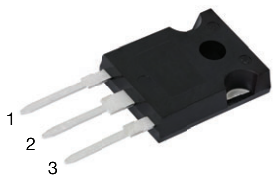
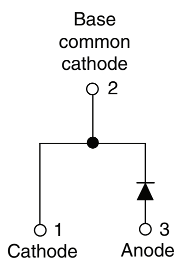
Ultrafast Soft Recovery Diode, 60 A FRED Pt®

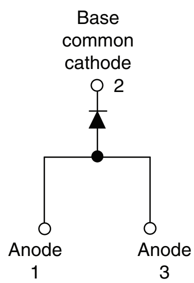
TO-247AC 2L



TO-247AC 3L



VS-60EPU04-N3



VS-60APU04-N3

FEATURES

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

Pb-free
RoHS COMPLIANT
HALOGEN FREE

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	400 V
V_F at I_F	0.87 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		400	V
Continuous forward current	$I_{F(AV)}$	T_C = 127 °C	60	A
Single pulse forward current	I_{FSM}	T_C = 25 °C, t_p = 10 ms	600	
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 °C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_R	I_R = 100 μA	400	-	-	V
Forward voltage	V_F	I_F = 60 A	-	1.05	1.25	
		I_F = 60 A, T_J = 175 °C	-	0.87	1.03	
		I_F = 60 A, T_J = 125 °C	-	0.93	1.10	
Reverse leakage current	I_R	V_R = V_R rated	-	-	50	μA
		T_J = 150 °C, V_R = V_R rated	-	-	2	mA
Junction capacitance	C_T	V_R = 400 V	-	50	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	3.5	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_C = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	I_F = 1 A, dI_F/dt = 200 A/μs, V_R = 30 V		-	50	60	ns
		T_J = 25 °C	I_F = 60 A dI_F/dt = 200 A/μs V_R = 200 V	-	85	-	
		T_J = 125 °C		-	145	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	8.8	-	A
		T_J = 125 °C		-	15.4	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	375	-	nC
		T_J = 125 °C		-	1120	-	

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	°C/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	-	2.4	N · m
			10	-	20	lbf · in
Marking device		Case style TO-247AC 2L	60EPU04			
		Case style TO-247AC 3L	60APU04			

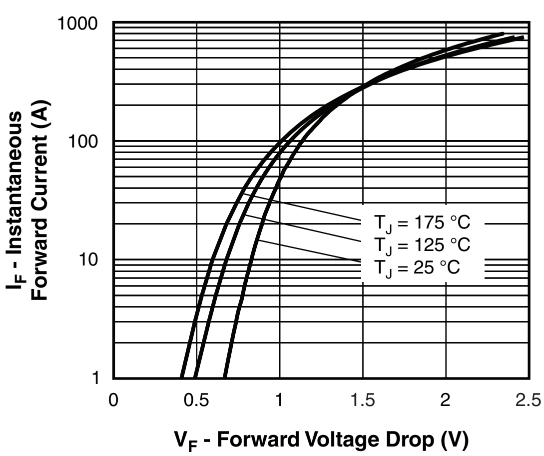


Fig. 1 - Typical Forward Voltage Drop Characteristics

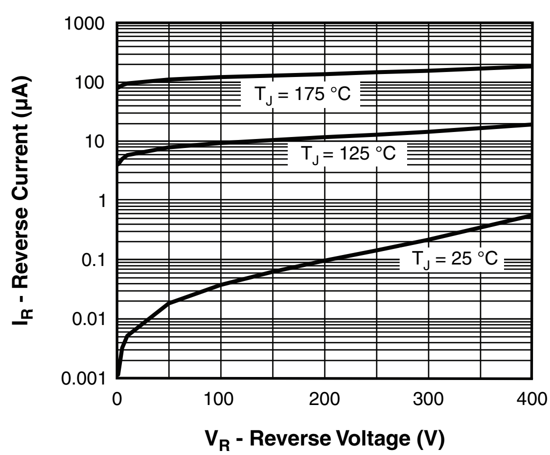


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

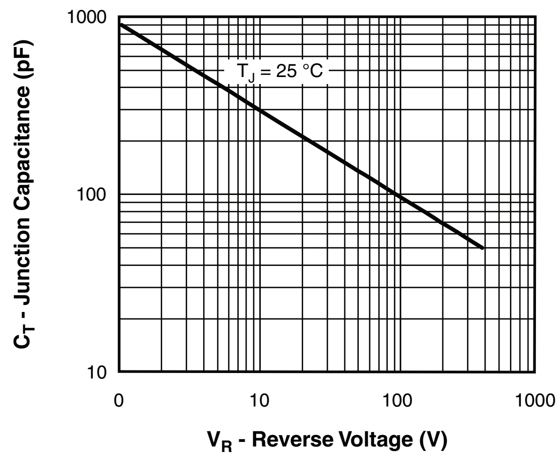


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

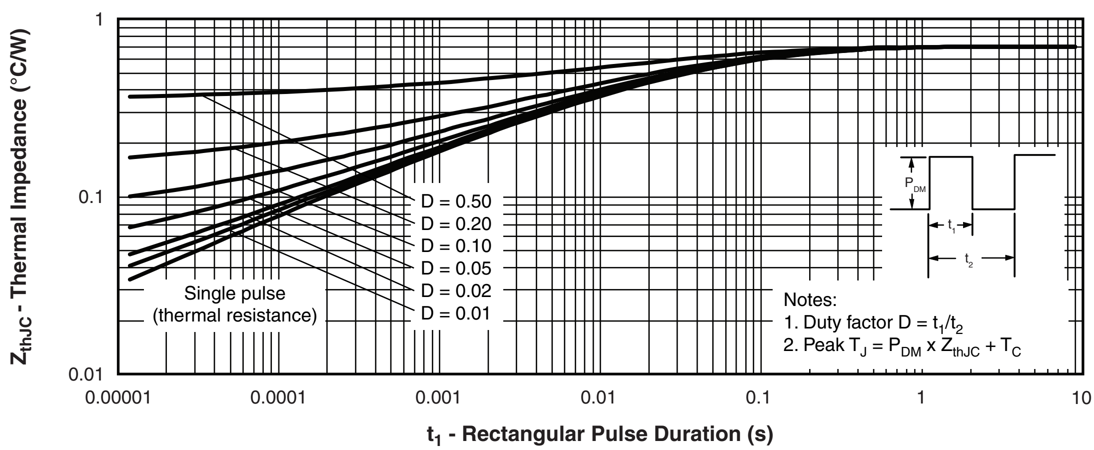


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

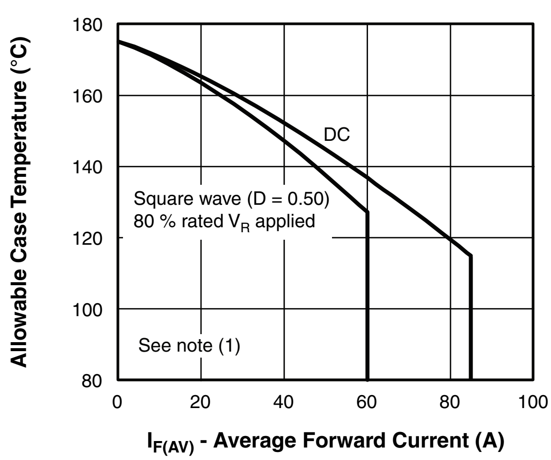


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

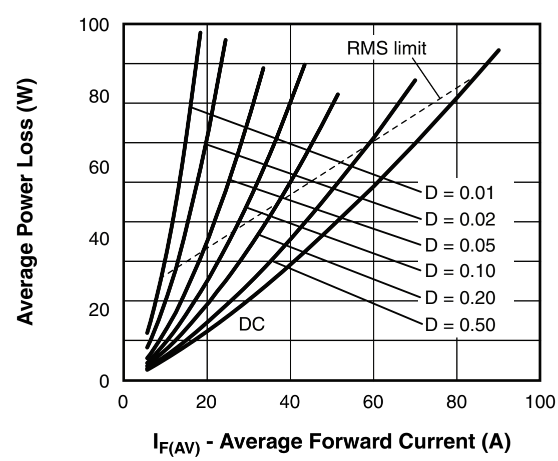


Fig. 6 - Forward Power Loss Characteristics

Note

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

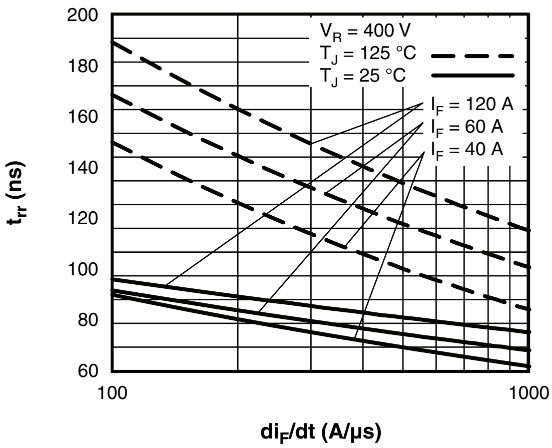


Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

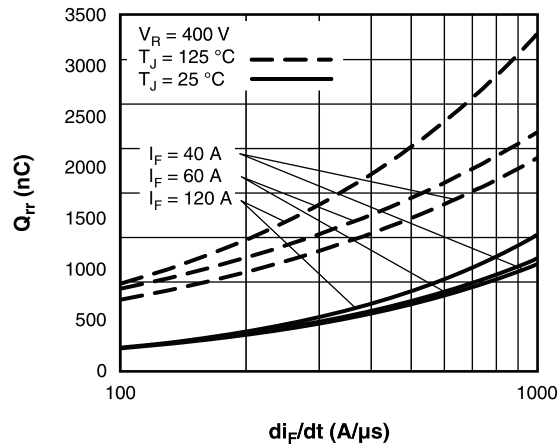
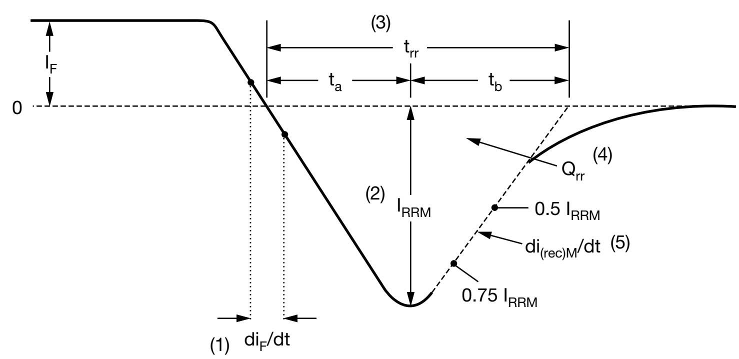


Fig. 8 - Typical Stored Charge vs. di_F/dt



(1) di_F/dt - rate of change of current through zero crossing

(2) I_{RRM} - peak reverse recovery current

(3) t_{rr} - reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current.

(4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(5) $di_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

Fig. 9 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code

VS-	60	E	P	U	04	-N3
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 (04 = 400 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-60EPU04-N3	25	500	Antistatic plastic tube
VS-60APU04-N3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-247AC 2L	www.vishay.com/doc?96144
	TO-247AC 3L	www.vishay.com/doc?96138
Part marking information	TO-247AC 2L	www.vishay.com/doc?95648
	TO-247AC 3L	www.vishay.com/doc?95007

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