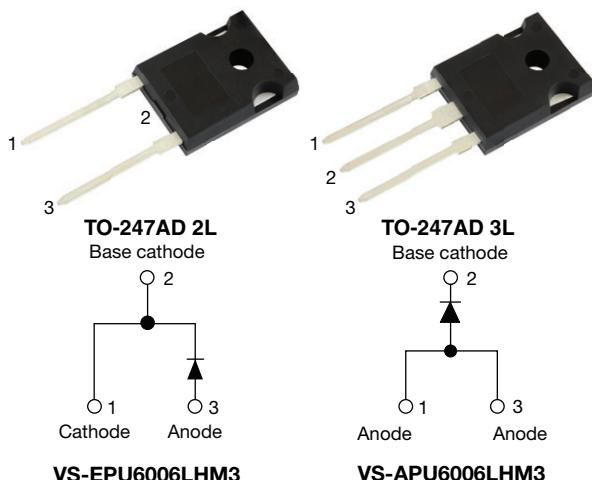


Ultrafast Soft Recovery Diode, 60 A FRED Pt®



FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- AEC-Q101 qualified meets JESD 201 class 1 whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

DESCRIPTION / APPLICATIONS

VS-EPU60... series are the state of the art ultrafast recovery rectifiers designed with optimized performance of forward voltage drop and ultrafast recovery time.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in the output rectification stage of SMPS, welding, UPS, DC/DC converters as well as freewheeling diodes in low voltage inverters and chopper motor drives.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	60 A
V_R	600 V
V_F at I_F	1.05 V
t_{rr} typ.	32 ns
T_J max.	175 °C
Package	TO-247AD 2L, TO-247AD 3L
Circuit configuration	Single

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS	
Repetitive peak reverse voltage	V_{RRM}		600	V	
Average rectified forward current in DC	$I_{F(AV)}$	$T_C = 116$ °C	60	A	
Single pulse forward current	I_{FSM}	$T_C = 25$ °C, $t_p = 8.3$ ms; half sine wave	600		
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	600	-	-	
Forward voltage	V_F	$I_F = 60$ A	-	1.2	1.5	V
		$I_F = 60$ A, $T_J = 125$ °C	-	1.1	1.3	
		$I_F = 60$ A, $T_J = 175$ °C	-	1.05	1.2	
Reverse leakage current	I_R	$V_R = V_R$ rated	-	0.2	30	µA
		$T_J = 150$ °C, $V_R = V_R$ rated	-	-	200	
Junction capacitance	C_T	$V_R = 600$ V	-	38	-	pF

DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	$I_F = 1 \text{ A}$, $dI_F/dt = 200 \text{ A}/\mu\text{s}$, $V_R = 30 \text{ V}$		-	32	-	ns
		$T_J = 25^\circ\text{C}$	$I_F = 60 \text{ A}$, $dI_F/dt = 200 \text{ A}/\mu\text{s}$, $V_R = 200 \text{ V}$	-	110	-	
		$T_J = 125^\circ\text{C}$		-	200	-	
Peak recovery current	I_{RRM}	$T_J = 25^\circ\text{C}$	$I_F = 60 \text{ A}$, $dI_F/dt = 200 \text{ A}/\mu\text{s}$, $V_R = 200 \text{ V}$	-	10	-	A
		$T_J = 125^\circ\text{C}$		-	19	-	
Reverse recovery charge	Q_{rr}	$T_J = 25^\circ\text{C}$	$I_F = 60 \text{ A}$, $dI_F/dt = 200 \text{ A}/\mu\text{s}$, $V_R = 200 \text{ V}$	-	530	-	nC
		$T_J = 125^\circ\text{C}$		-	1900	-	

THERMAL - MECHANICAL SPECIFICATIONS							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T_J, T_{Stg}			-55	-	175	$^\circ\text{C}$
Thermal resistance, junction to case	R_{thJC}			-	-	0.65	$^\circ\text{C}/\text{W}$
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount		-	-	70	
Thermal resistance, case to heat sink	R_{thCS}	Mounting surface, flat, smooth and greased		-	0.5	-	
Weight				-	6	-	g
				-	0.21	-	oz.
Mounting torque				6 (5)	-	1.2 (10)	kgf. cm (lbf · in)
Marking device		Case style: TO-247AD 2L		EPU6006LH			
		Case style: TO-247AD 3L		APU6006LH			

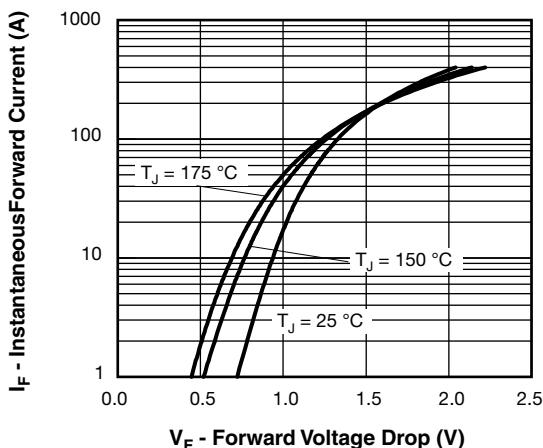


Fig. 1 - Typical Forward Voltage Drop Characteristics

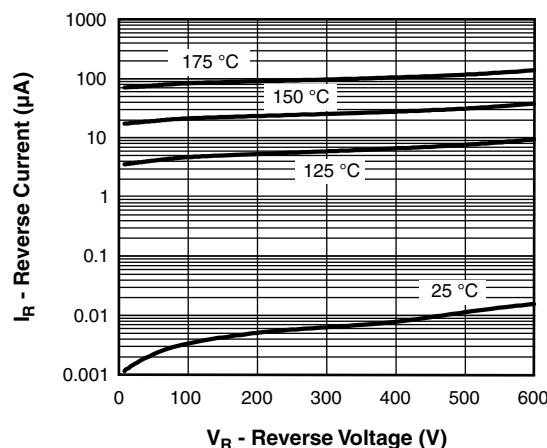


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

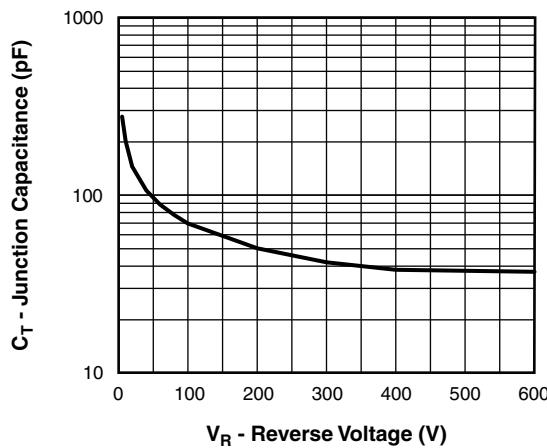


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

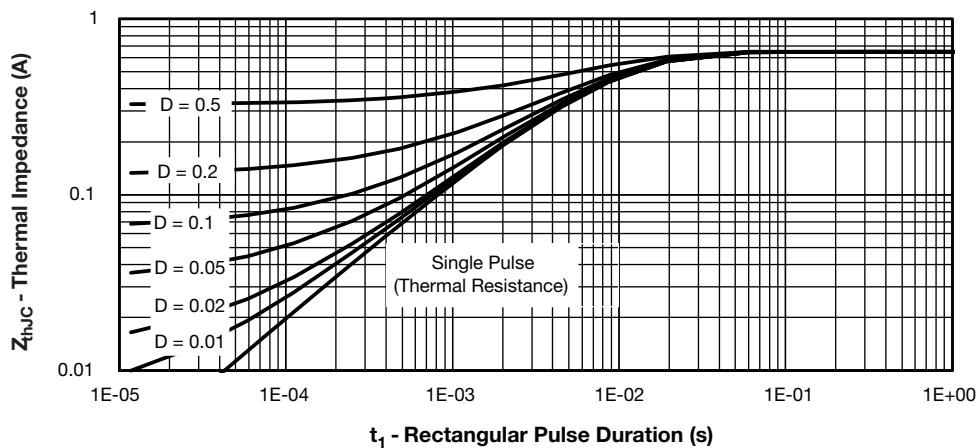


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

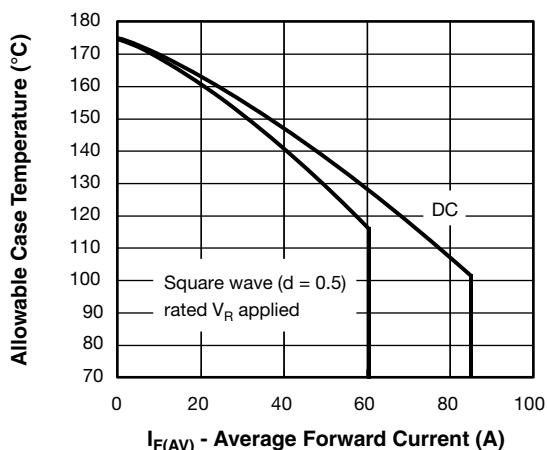


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

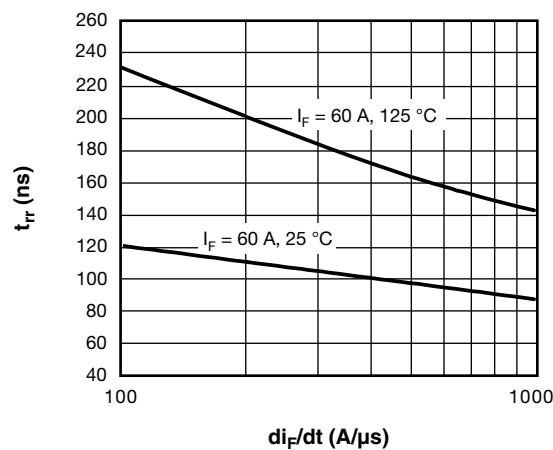


Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

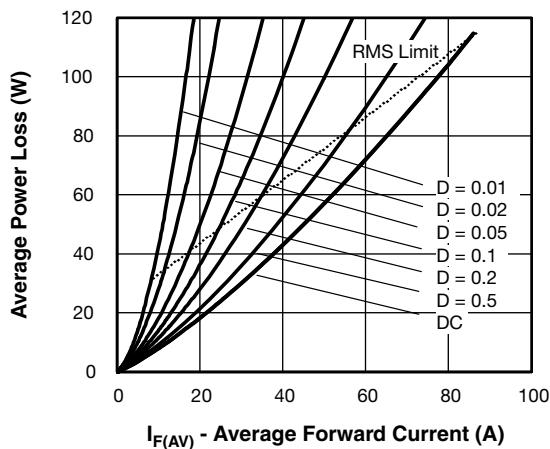


Fig. 6 - Forward Power Loss Characteristics

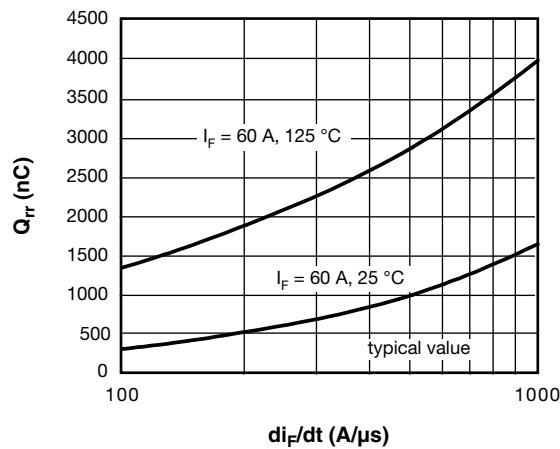
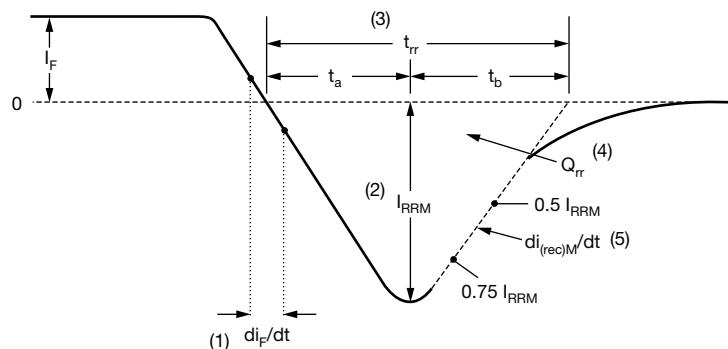


Fig. 8 - Typical Stored Charge vs. di_F/dt

Note

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



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

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

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

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

(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.

(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-	E	P	U	60	06	L	H	N3
	1	2	3	4	5	6	7	8	9

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration:
 - E = single diode 2 pins
 - A = single diode 3 pins
- 3** - P = TO-247
- 4** - U = ultrafast recovery time
- 5** - Current code (60 = 60 A)
- 6** - Voltage code (06 = 600 V)
- 7** - L = long lead
- 8** - H = AEC-Q101 qualified
- 9** - Environmental digit:
N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free

ORDERING INFORMATION (Example)

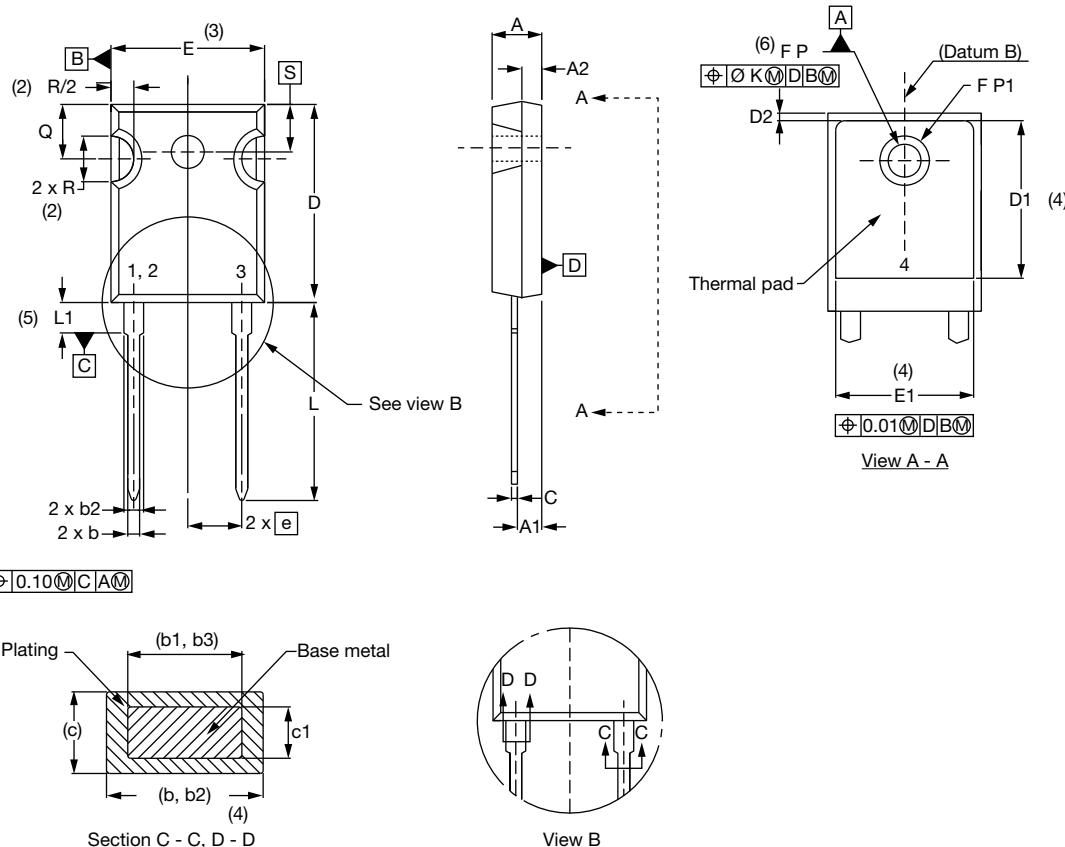
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-EPU6006LHN3	25	500	Antistatic plastic tube
VS-APU6006LHN3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS

Dimensions	TO-247AD 2L	www.vishay.com/doc?95536
	TO-247AD 3L	www.vishay.com/doc?95626
Part marking information	TO-247AD 2L	www.vishay.com/doc?95648
	TO-247AD 3L	www.vishay.com/doc?95007

TO-247AD 2L

DIMENSIONS in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES		SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.				MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209			E	15.29	15.87	0.602	0.625	3
A1	2.21	2.59	0.087	0.102			E1	13.46	-	0.53	-	
A2	1.50	2.49	0.059	0.098			e	5.46 BSC		0.215 BSC		
b	0.99	1.40	0.039	0.055			Ø K	0.254		0.010		
b1	0.99	1.35	0.039	0.053			L	19.81	20.32	0.780	0.800	
b2	1.65	2.39	0.065	0.094			L1	3.71	4.29	0.146	0.169	
b3	1.65	2.34	0.065	0.092			Ø P	3.56	3.66	0.14	0.144	
c	0.38	0.89	0.015	0.035			Ø P1	-	6.98	-	0.275	
c1	0.38	0.84	0.015	0.033			Q	5.31	5.69	0.209	0.224	
D	19.71	20.70	0.776	0.815	3		R	4.52	5.49	0.178	0.216	
D1	13.08	-	0.515	-	4		S	5.51 BSC		0.217 BSC		
D2	0.51	1.35	0.020	0.053								

Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6) Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4

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