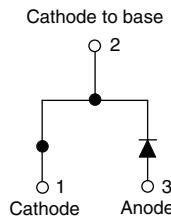


## Ultrafast Soft Recovery Diode, 60 A FRED Pt®



### FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Designed and qualified according to commercial qualification
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://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.

PRODUCT SUMMARY	
Package	TO-247AD 2L
$I_{F(AV)}$	60 A
$V_R$	600 V
$V_F$ at $I_F$	1.05 V
$t_{rr}$ typ.	32 ns
$T_J$ max.	175 °C
Diode variation	Single die

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	-	-	V
Forward voltage	$V_F$	$I_F = 60$ A	-	1.2	1.5	
		$I_F = 60$ 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	$I_{RRM}$	$T_J = 25^\circ\text{C}$		-	10	-	A
		$T_J = 125^\circ\text{C}$		-	19	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25^\circ\text{C}$		-	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	°C
Thermal resistance, junction to case	$R_{thJC}$			-	-	0.65	°C/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		EPU6006L			

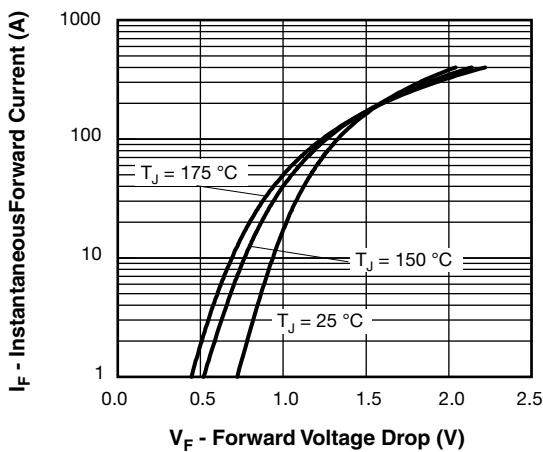


Fig. 1 - Typical Forward Voltage Drop Characteristics

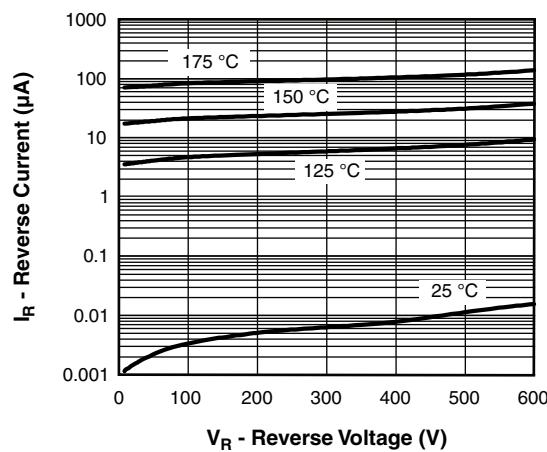


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

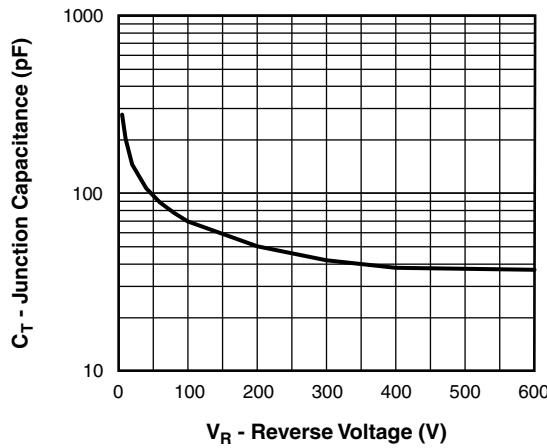


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

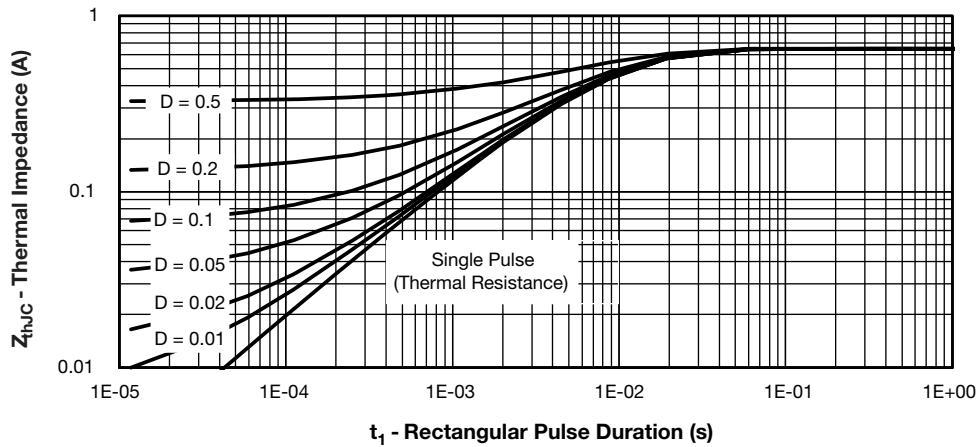


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

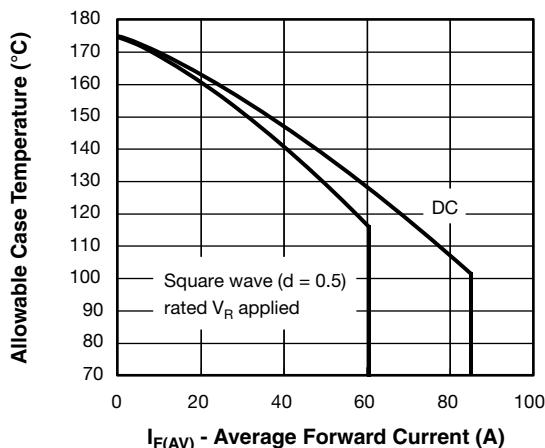


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

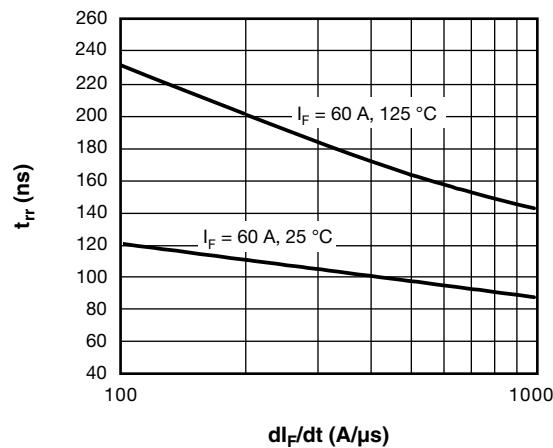


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

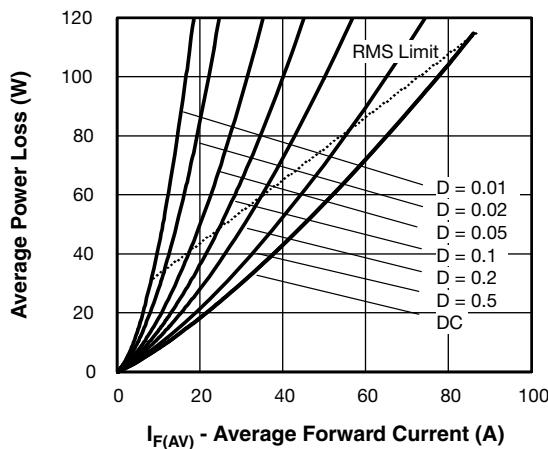


Fig. 6 - Forward Power Loss Characteristics

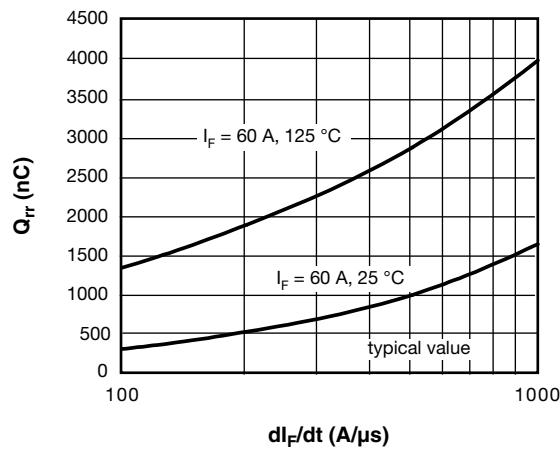


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$

#### 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  $V_R$

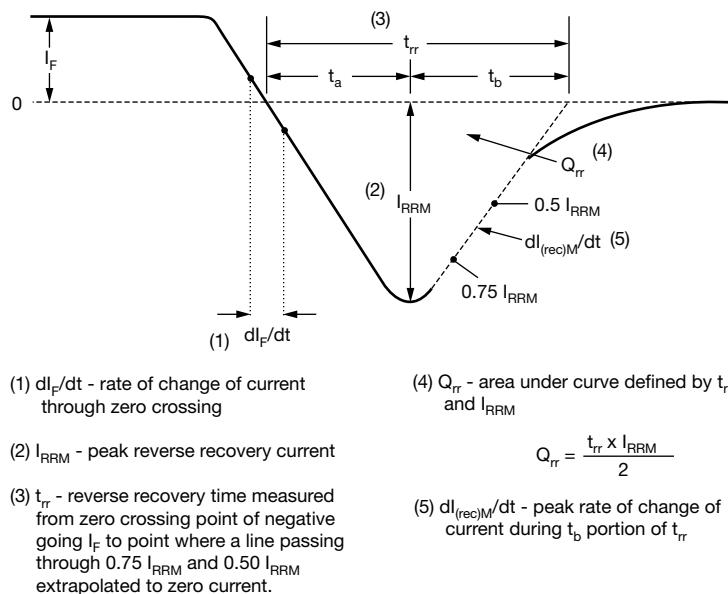


Fig. 9 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code	VS-	E	P	U	60	06	L	-N3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

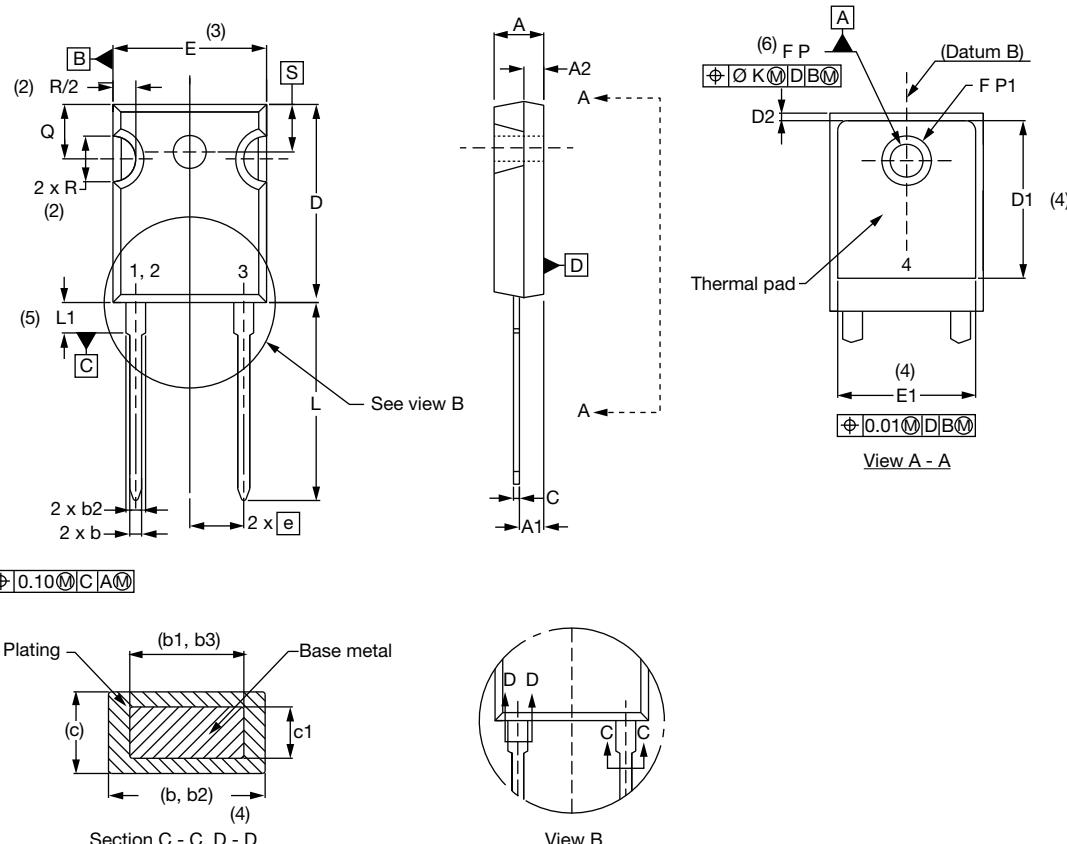
- 1** - Vishay Semiconductors product
- 2** - Circuit configuration:
  - E = single diode 2 pins
- 3** - P = TO-247
- 4** - U = ultrafast recovery time
- 5** - Current code (60 = 60 A)
- 6** - Voltage code (06 = 600 V)
- 7** - L = long lead
- 8** - Environmental digit:  
-N3 = halogen-free, RoHS-compliant,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

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-EPU6006L-N3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-247AD 2L	<a href="http://www.vishay.com/doc?95536">www.vishay.com/doc?95536</a>
Part marking information	TO-247AD 2L	<a href="http://www.vishay.com/doc?95648">www.vishay.com/doc?95648</a>

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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