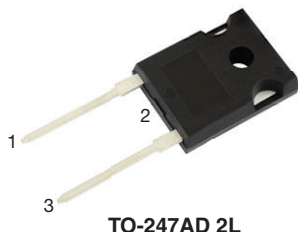
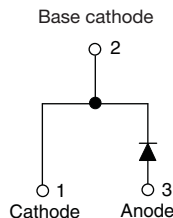


## Ultrafast Soft Recovery Diode, 60 A FRED Pt® Gen 4



TO-247AD 2L



### FEATURES

- Gen 4 FRED Pt® technology
- Low  $I_{RRM}$  and reverse recovery charge
- Very low forward voltage drop
- Polyimide passivated chip for high reliability standard
- 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](http://www.vishay.com/doc?99912)



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

### PRIMARY CHARACTERISTICS

$I_{F(AV)}$	60 A
$V_R$	600 V
$V_F$ at $I_F$	1.29 V
$t_{rr}$ typ.	see Recovery table
$T_J$ max.	175 °C
Package	TO-247AD 2L
Circuit configuration	Single

### DESCRIPTION

Gen 4 Fred technology, state of the art, ultralow  $V_F$ , soft switching optimized for Discontinuous (Critical) Mode (DCM) and IGBT F/W diode.

The minimized conduction loss, optimized stored charge and low recovery current minimized the switching losses and reduce over dissipation in the switching element and snubbers.

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 116$ °C	60	A
Non-repetitive peak surge current	$I_{FSM}$	$T_C = 25$ °C, $t_p = 8.3$ ms half sine wave	450	
Operating junction and storage temperature	$T_J, T_{Stg}$		-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	$V_{BR}, V_R$	$I_R = 100$ $\mu$ A	600	-	-	V
Forward voltage	$V_F$	$I_F = 30$ A	-	1.4	-	
		$I_F = 60$ A	-	1.46	1.7	
		$I_F = 30$ A, $T_J = 125$ °C	-	1.26	-	
		$I_F = 60$ A, $T_J = 125$ °C	-	1.33	-	
		$I_F = 30$ A, $T_J = 150$ °C	-	1.22	-	
		$I_F = 60$ A, $T_J = 150$ °C	-	1.29	-	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	50	$\mu$ A
		$T_J = 125$ °C, $V_R = V_R$ rated	-	-	500	
Junction capacitance	$C_T$	$V_R = 600$ V	-	30	-	pF

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	74	-	ns
		$T_J = 125\text{ }^{\circ}\text{C}$	-	105	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	31	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	50	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	1530	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	3520	-	

 $I_F = 60\text{ A}$   
 $di_F/dt = 1000\text{ A}/\mu\text{s}$   
 $V_R = 400\text{ V}$ **THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	$R_{thJC}$		-	-	0.6	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient	$R_{thJA}$	Typical socket mount	-	-	40	
Thermal resistance, case to heatsink	$R_{thCS}$		-	0.25	-	
Weight			-	6.0	-	g
			-	0.21	-	oz.
Mounting torque			6.0 (5)	-	12 (20)	kgf · cm (lbf · in)
Marking device		Case style TO-247AD 2L	E4PU6006L			

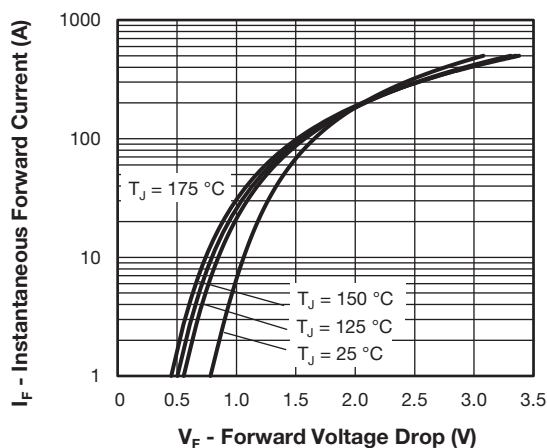


Fig. 1 - Typical Forward Voltage Drop Characteristics

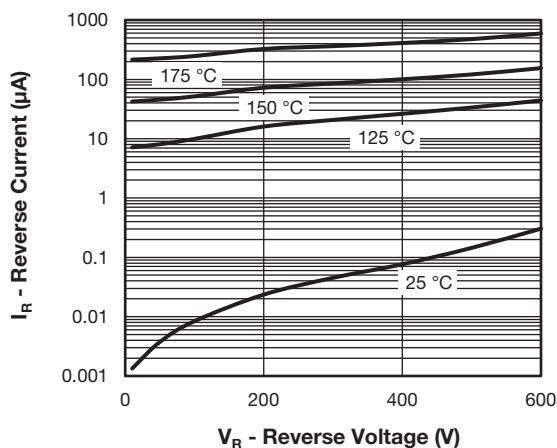


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

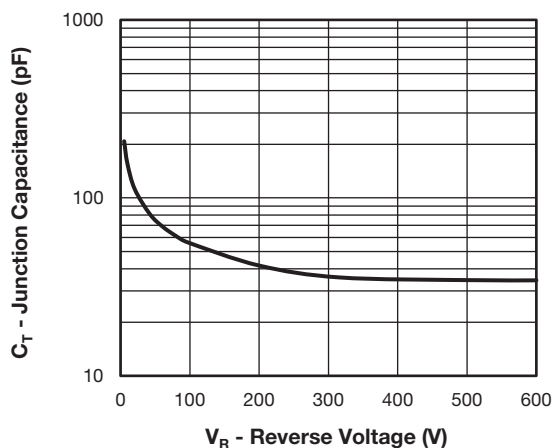


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

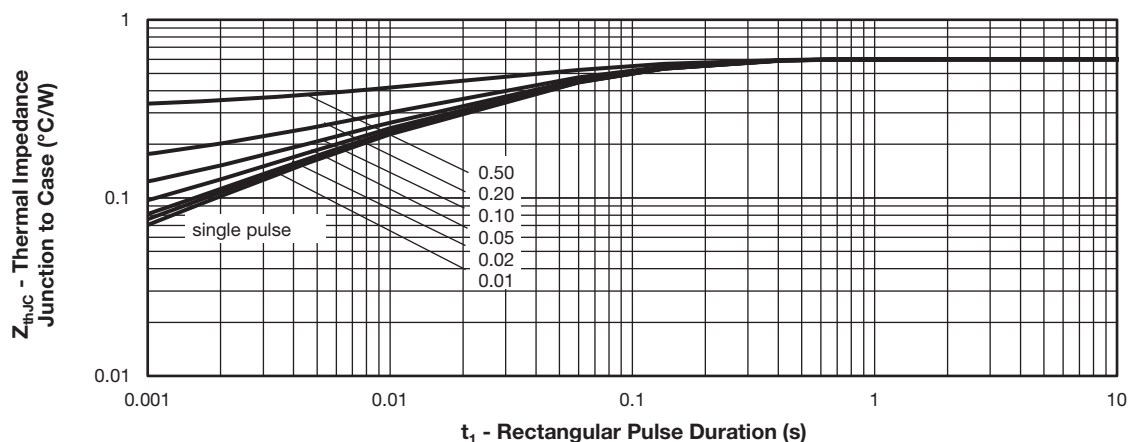
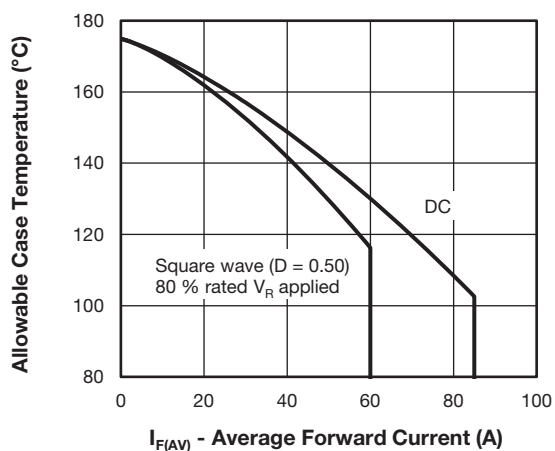

Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics


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

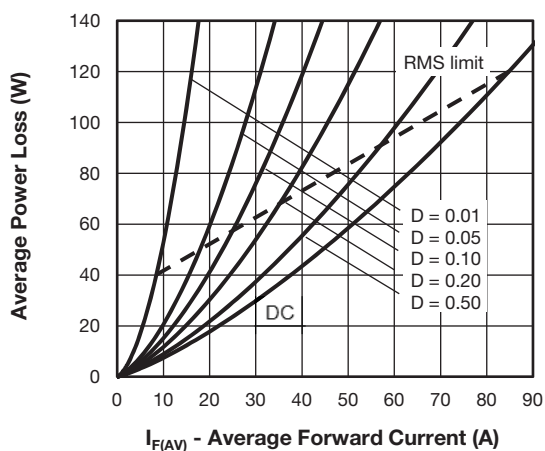


Fig. 6 - Forward Power Loss Characteristics

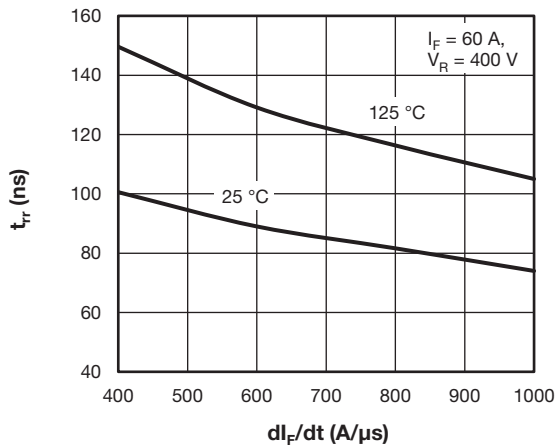


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

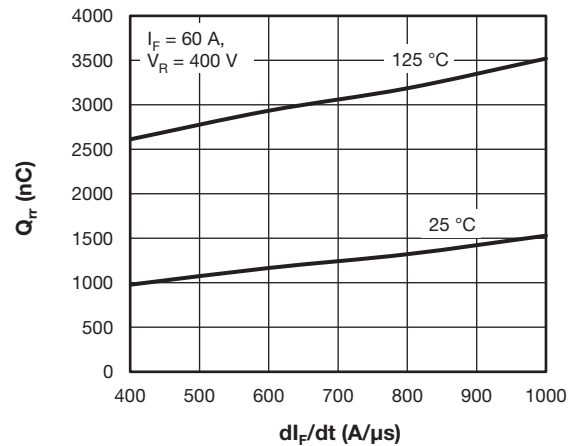


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$

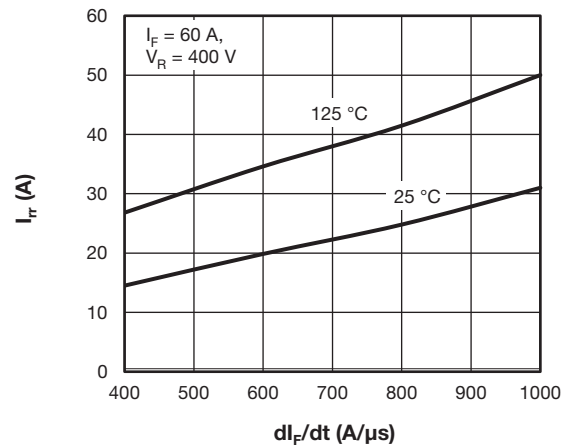


Fig. 9 - Typical Reverse Current vs.  $dI_F/dt$

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>E</b>	<b>4</b>	<b>P</b>	<b>U</b>	<b>60</b>	<b>06</b>	<b>L</b>	<b>-N3</b>
	①	②	③	④	⑤	⑥	⑦	⑧	⑨
	<b>1</b>	-	Vishay Semiconductors product						
	<b>2</b>	-	Circuit configuration:						
			E = single diode						
	<b>3</b>	-	FRED Gen 4						
	<b>4</b>	-	P = TO-247 package						
	<b>5</b>	-	Process type:						
			U = ultrafast recovery						
	<b>6</b>	-	Current rating (60 = 60 A)						
	<b>7</b>	-	Voltage rating (06 = 600 V)						
	<b>8</b>	-	L = long lead						
	<b>9</b>	-	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-E4PU6006L-N3	25	500	Antistatic plastic tube

**LINKS TO RELATED DOCUMENTS**

Dimensions	<a href="http://www.vishay.com/doc?95536">www.vishay.com/doc?95536</a>
Part marking information	<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
	MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.50	2.49	0.059	0.098	
b	0.99	1.40	0.039	0.055	
b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.34	0.065	0.092	
c	0.38	0.89	0.015	0.035	
c1	0.38	0.84	0.015	0.033	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4
D2	0.51	1.35	0.020	0.053	

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E	15.29	15.87	0.602	0.625	3
E1	13.46	-	0.53	-	
e	5.46 BSC		0.215 BSC		
$\phi K$	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
$\phi P$	3.56	3.66	0.14	0.144	
$\phi P1$	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	0.178	0.216	
S	5.51 BSC		0.217 BSC		

#### Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Contour of slot optional
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions D1 and E1
- Lead finish uncontrolled in L1
- $\phi P$  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")
- 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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