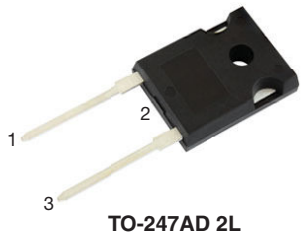
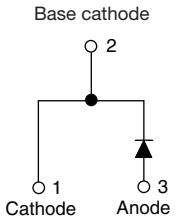
Ultrafast Soft Recovery Diode, 60 A FRED Pt® Gen 4



TO-247AD 2L



FEATURES

- Gen 4 FRED Pt® technology
- Low I_{RRM} and reverse recovery charge
- Very low forward voltage drop
- Polymide passivated chip for high reliability standard
- 175 °C operating junction temperature
- AEC-Q101 qualified, meets JESD 201 class 1A whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

HALOGEN FREE

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.

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

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 µA	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	µA
		T_J = 125 °C, V_R = V_R rated	-	-	500	
Junction capacitance	C_T	V_R = 600 V	-	30	-	pF

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DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	T_J = 25 °C	I_F = 60 A dI_F/dt = 1000 A/µs V_R = 400 V	-	74	-	ns
		T_J = 125 °C		-	105	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	31	-	A
		T_J = 125 °C		-	50	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	1530	-	nC
		T_J = 125 °C		-	3520	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	R_{thJC}		-	-	0.6	°C/W
Thermal resistance, case to heat sink	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	E4PU6006LH			

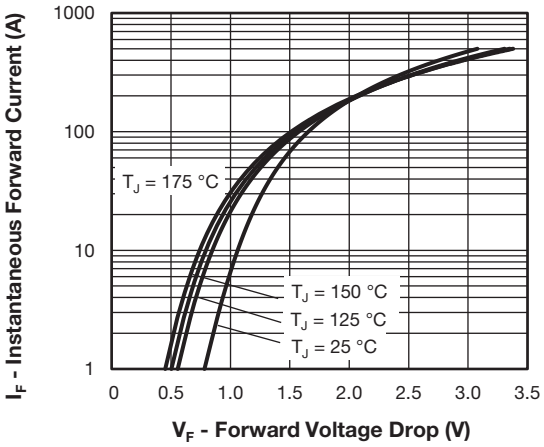

Fig. 1 - Typical Forward Voltage Drop Characteristics

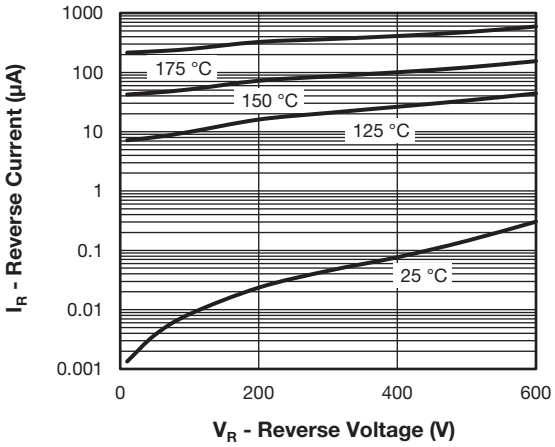

Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

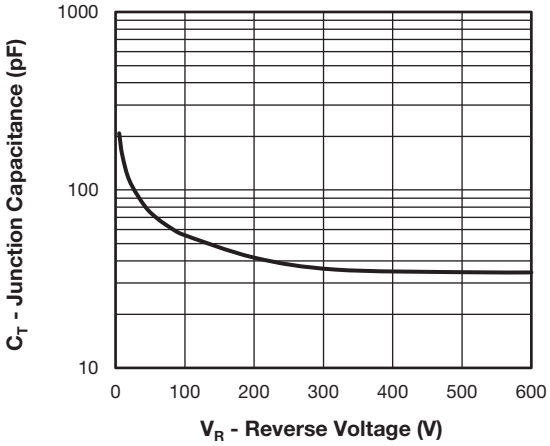

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

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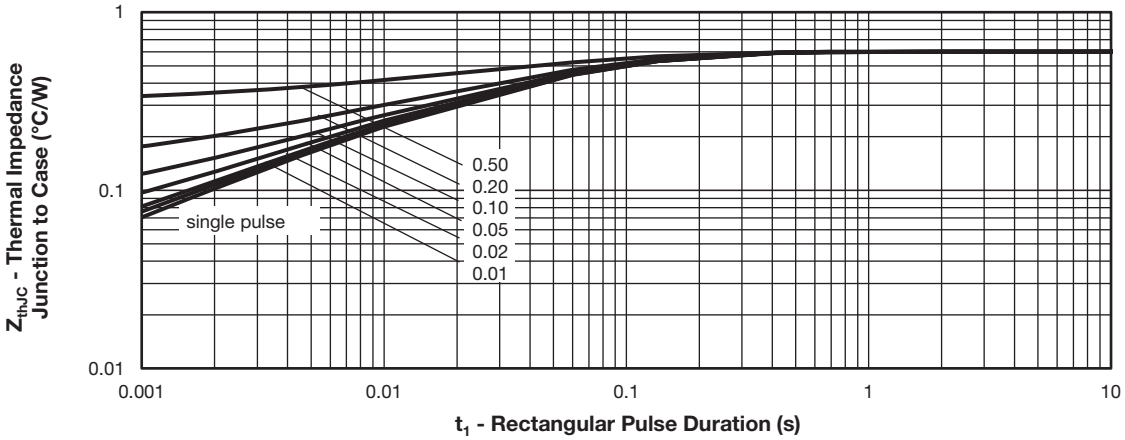

Fig. 4 - Max. Thermal Impedance Z_{thJC} Characteristics

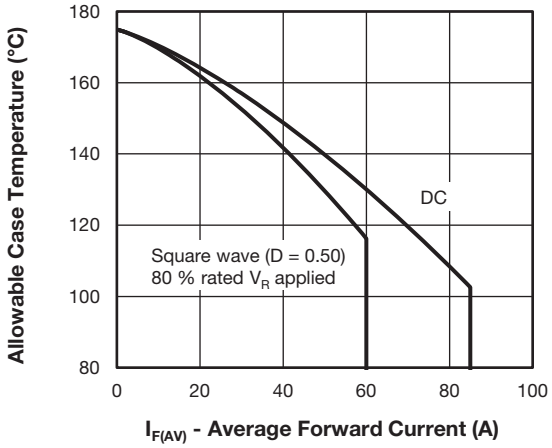

Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

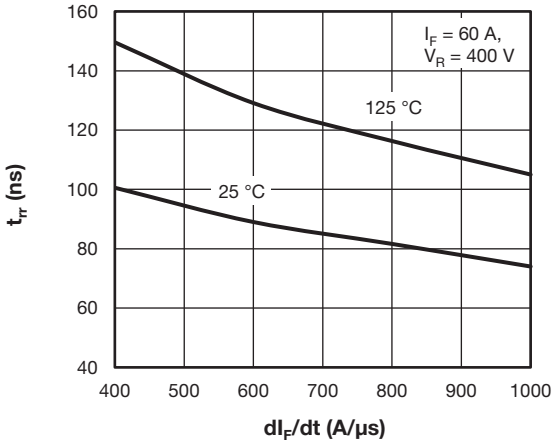

Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

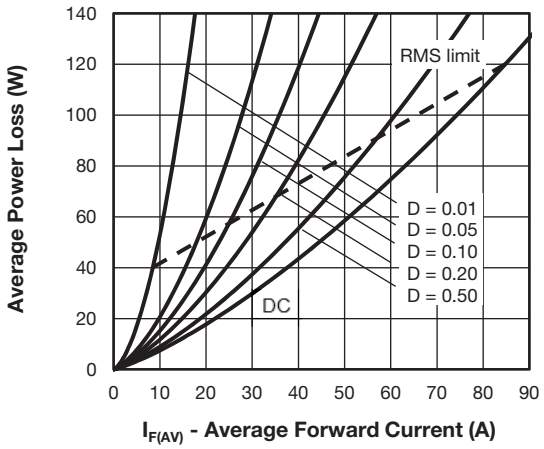

Fig. 6 - Forward Power Loss Characteristics

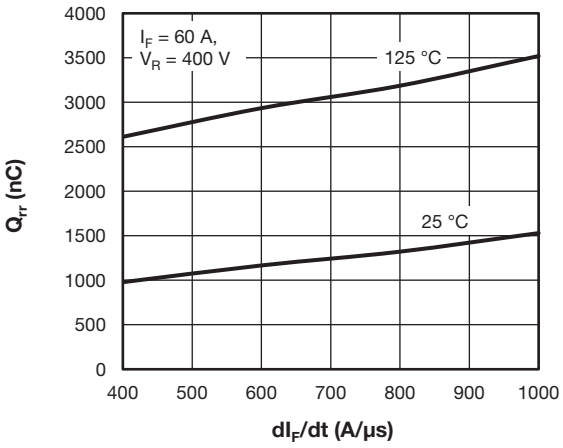

Fig. 8 - Typical Stored Charge vs. dI_F/dt

Note

(1) Formula used: $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$;
Pd = Forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}$/D) (see Fig.5)
P_{dREV} = Inverse power loss = $V_{R1} \times I_R$ (1 - D); I_R at V_R = rated V_R

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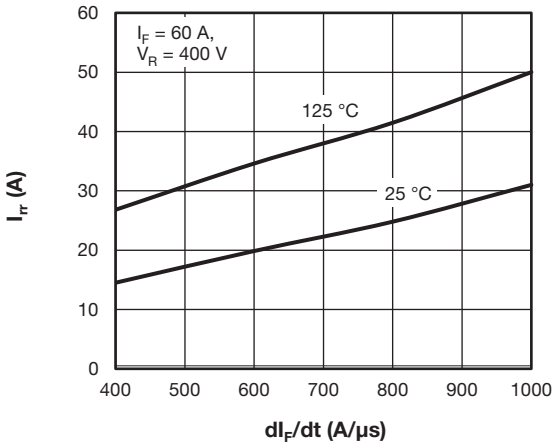

Fig. 9 - Typical Reverse Current vs. dI_F/dt

ORDERING INFORMATION TABLE

Device code

VS-	E	4	P	U	60	06	L	H	N3
1	2	3	4	5	6	7	8	9	10

1 - Vishay Semiconductors product

2 - Circuit configuration:
E = single diode

3 - FRED Gen 4

4 - P = TO-247 package

5 - Process type:
U = ultrafast recovery

6 - Current rating (60 = 60 A)

7 - Voltage rating (06 = 600 V)

8 - L = long lead

9 - H = AEC-Q101 qualified

10 - 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-E4PU6006LHN3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-247AD 2L	www.vishay.com/doc?95536
Part marking information	TO-247AD 2L	www.vishay.com/doc?95648

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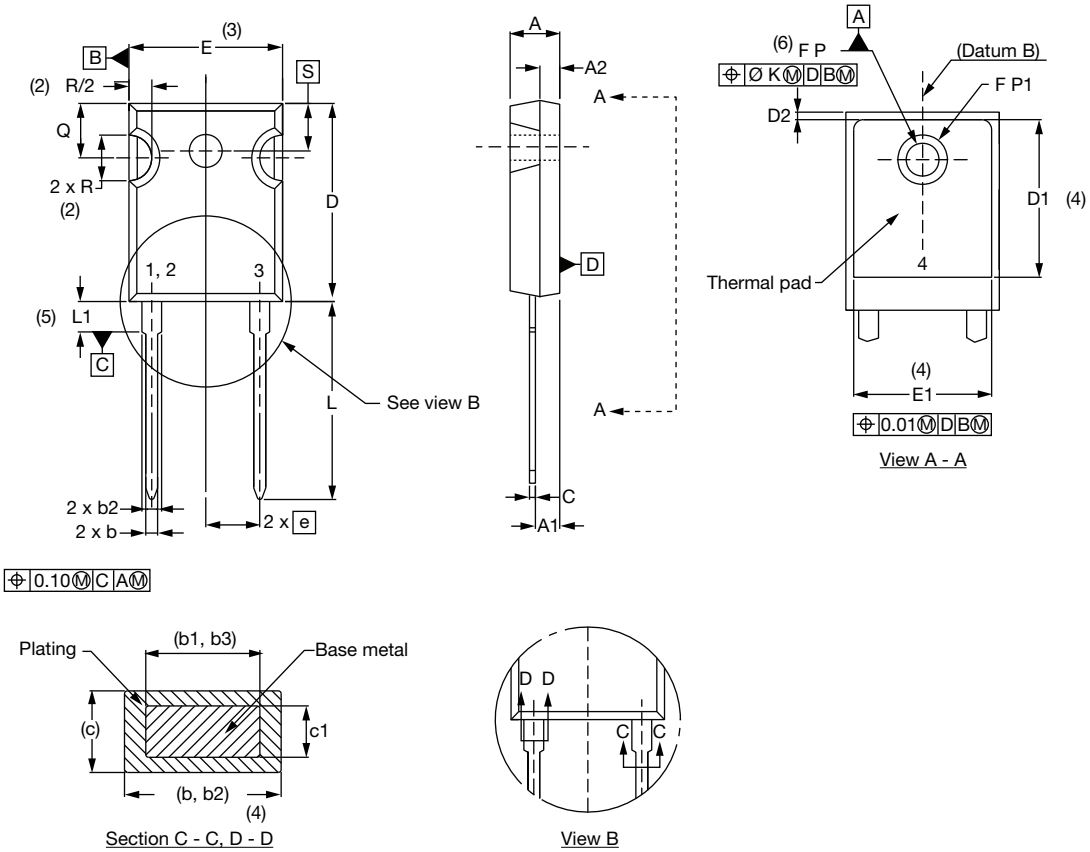
TO-247AD 2L

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		
Ø K	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
Ø P	3.56	3.66	0.14	0.144	
Ø 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

(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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