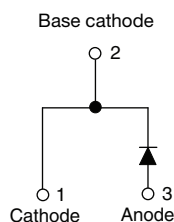
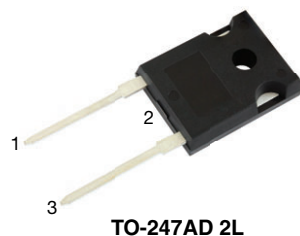


Ultrafast Rectifier, 50 A FRED Pt®



FEATURES

- Ultrafast and soft recovery
- Optimized forward voltage drop
- 175 °C maximum operating junction temperature
- Polyimide passivation
- Rugged design
- Good thermal performance
- AEC-Q101 qualified available
- Meets JESD 201 class 1 whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



PRODUCT SUMMARY

Package	TO-247AD 2L
$I_{F(AV)}$	50 A
V_R	1200 V
V_F at I_F at 125 °C	1.95 V
t_{rr}	57 ns
T_J max.	175 °C
Diode variation	Single die

DESCRIPTION / APPLICATIONS

Ultrafast recovery rectifiers designed with optimized performance of forward voltage drop, recovery time, and soft recovery. Polyimide passivated, planar structure, and the platinum doped life time control guarantee, ruggedness, reliability characteristics, and solid value proposition for efficiency and thermal performance.

These devices are intended for use in boost stage in the AC/DC section of SMPS, high frequency output rectification of battery charger, inverters for solar inverters, or as freewheeling diodes in motor drive.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage	V_{RRM}		1200	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 138\text{ °C}$, $D = 0.50$	50	A
Non-repetitive peak surge current	I_{FSM}	$T_C = 25\text{ °C}$, $t_p = 10\text{ ms}$, sine wave	400	
Repetitive peak forward current	I_{FRM}		100	
Operating junction and storage temperature	T_J , T_{Stg}		-55 to +175	°C

ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR} , V_R	$I_R = 500\text{ }\mu\text{A}$	1200	-	-	V
Forward voltage	V_F	$I_F = 50\text{ A}$	-	2.05	2.55	
		$I_F = 50\text{ A}$, $T_J = 125\text{ °C}$	-	1.95	2.37	
Reverse leakage current	I_R	$V_R = V_R$ rated	-	-	330	μA
		$T_J = 125\text{ °C}$, $V_R = V_R$ rated	-	-	580	
Junction capacitance	C_T	$V_R = 200\text{ V}$	-	55	-	pF
Series inductance	L_S	Measured to lead 5 mm from package body	-	8	-	nH

**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}	$I_F = 1.0\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	-	57	-	ns
		$T_J = 25\text{ }^{\circ}\text{C}$	-	262	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	473	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^{\circ}\text{C}$	-	9.8	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	17	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	-	1280	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	4056	-	

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	R_{thJC}		-	0.2	0.28	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	31	34	
Thermal resistance, case to heat sink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.22	0.32	
Weight			-	0.2	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Maximum junction and storage temperature range	T_J , T_{Stg}		-55	-	175	$^{\circ}\text{C}$
Marking device		Case style: TO-247AD 2L	50EPU12LH			

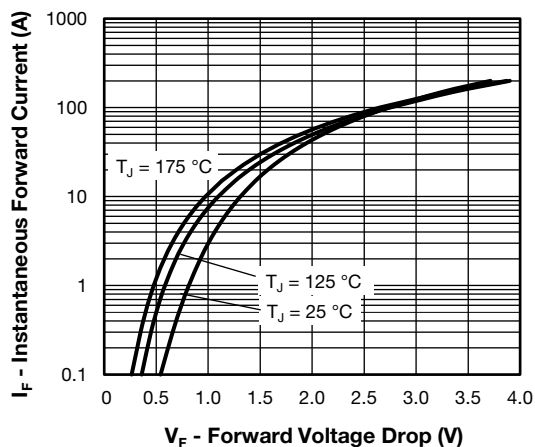


Fig. 1 - Typical Forward Voltage Drop Characteristics

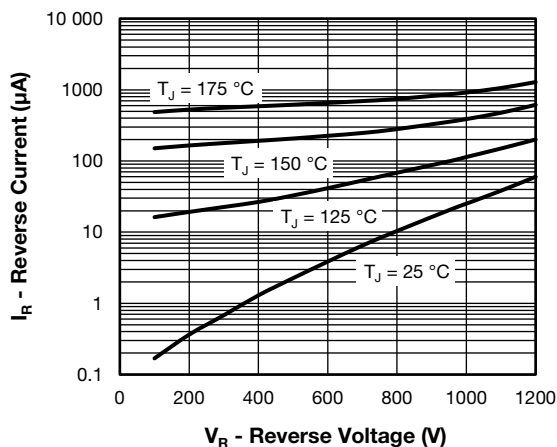


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

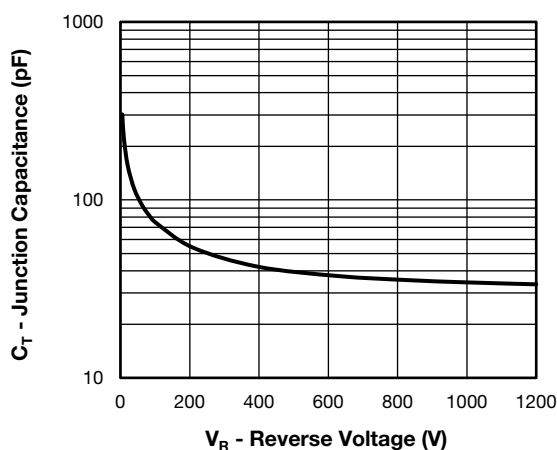


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

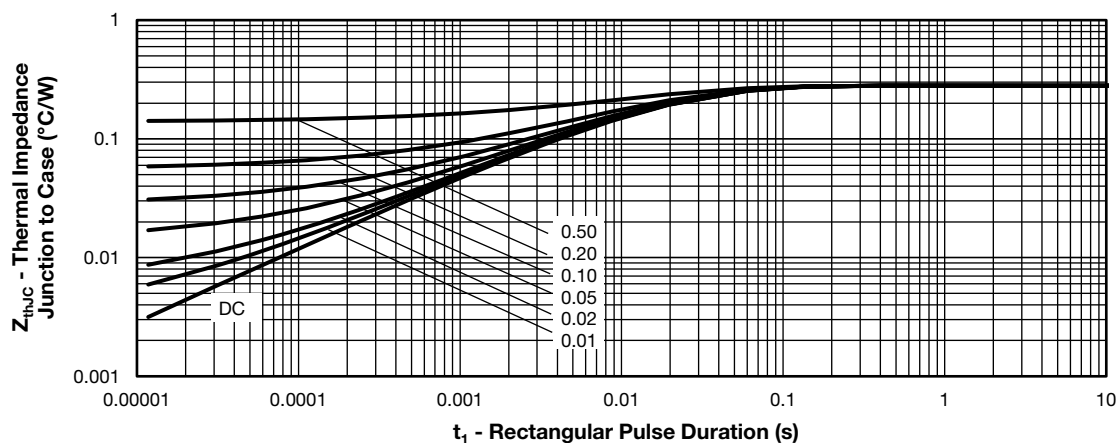
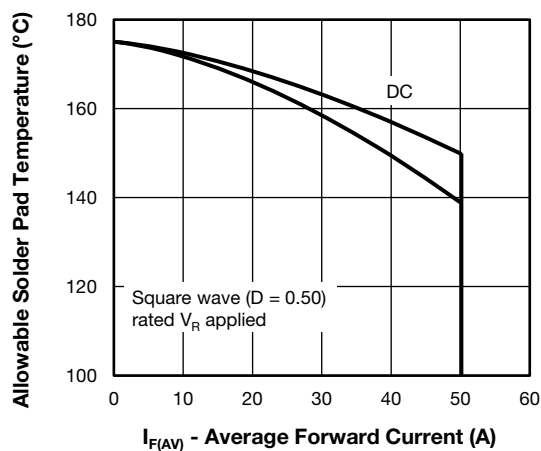

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics


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

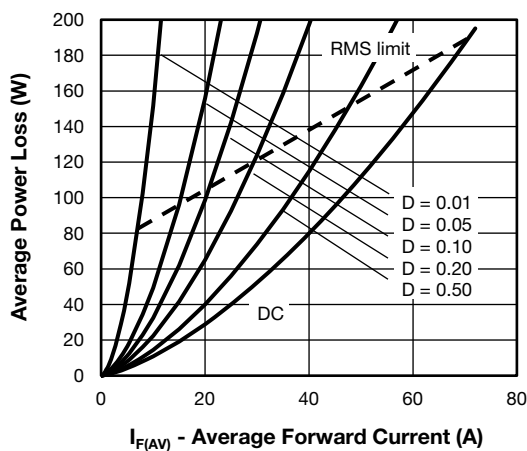
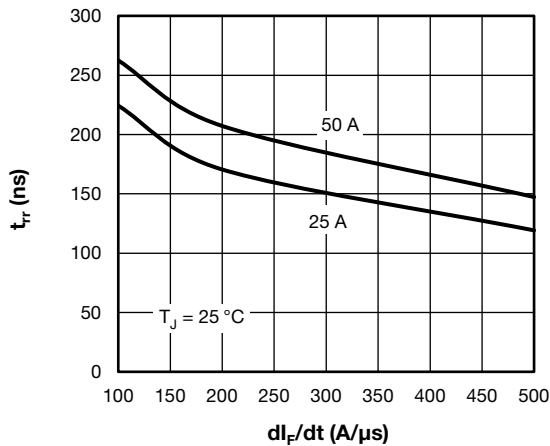
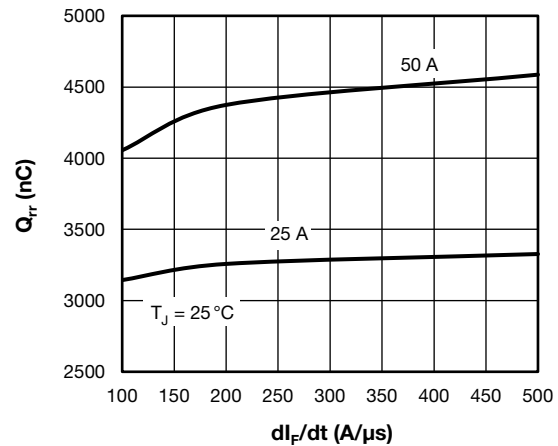
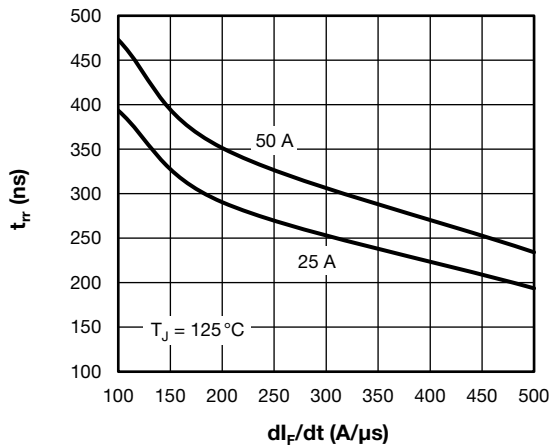
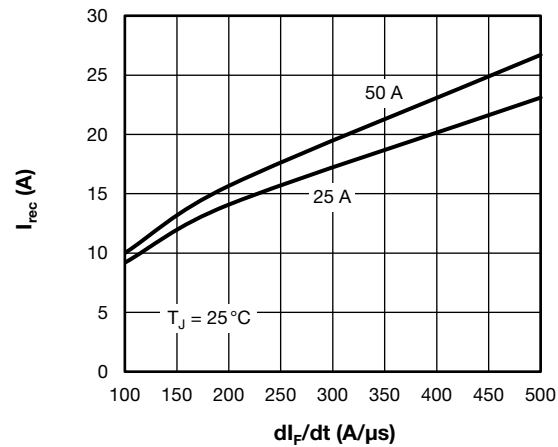
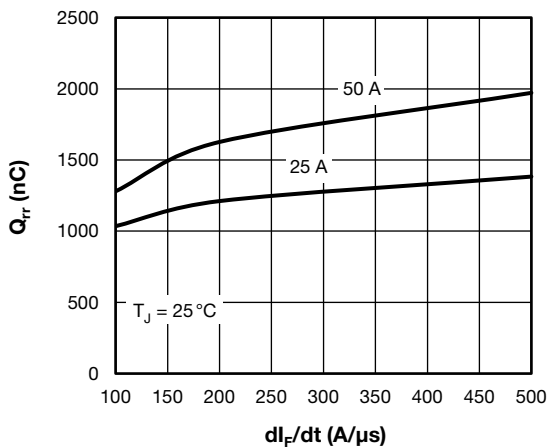
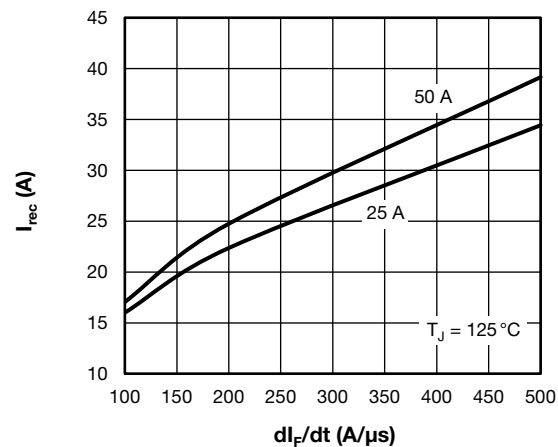
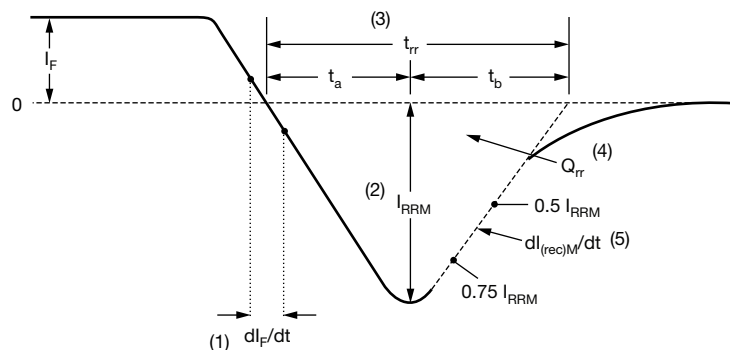


Fig. 6 - Forward Power Loss Characteristics


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

Fig. 10 - Typical Stored Charge vs. dI_F/dt

Fig. 8 - Typical Reverse Recovery Time vs. dI_F/dt

Fig. 11 - Typical Reverse Current vs. dI_F/dt

Fig. 9 - Typical Stored Charge vs. dI_F/dt

Fig. 12 - Typical Reverse Current 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. 13 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code	VS-	50	E	P	U	12	L	H	N3
	①	②	③	④	⑤	⑥	⑦	⑧	⑨

- 1** - Vishay Semiconductors product
- 2** - Current rating (50 = 50 A)
- 3** - Circuit configuration: E = single diode
- 4** - P = TO-247 package
- 5** - Process type:
U = ultrafast recovery
- 6** - Voltage rating (12 = 1200 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-50EPU12LHN3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95536
Part marking information	www.vishay.com/doc?95648



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		
ϕK	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
ϕP	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
- ϕP 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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