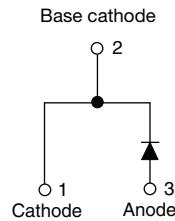
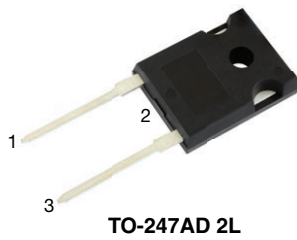


# Ultrafast Rectifier, 50 A FRED Pt®



## 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](http://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	$\mu\text{A}$
		$T_J = 125\text{ °C}$ , $V_R = V_R$ 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			

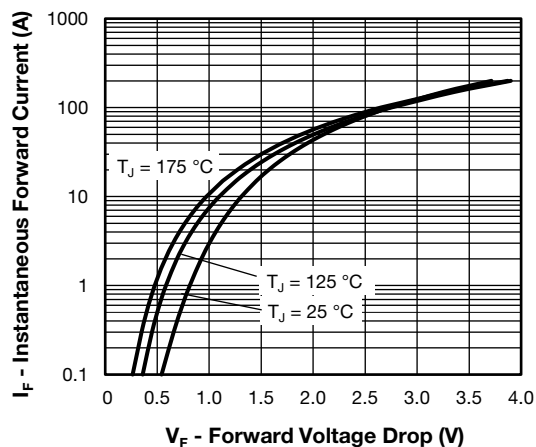


Fig. 1 - Typical Forward Voltage Drop Characteristics

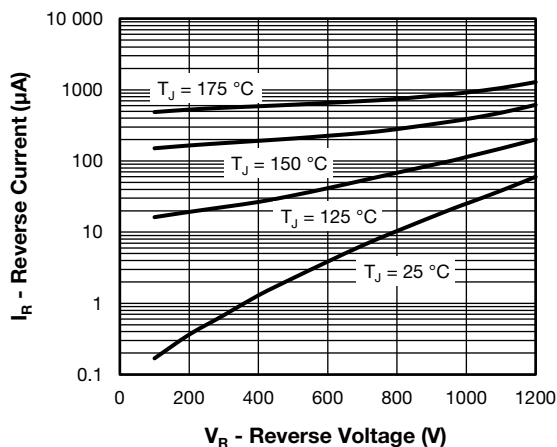


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

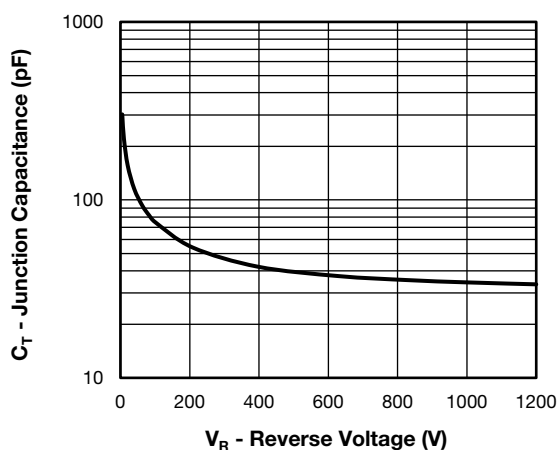


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

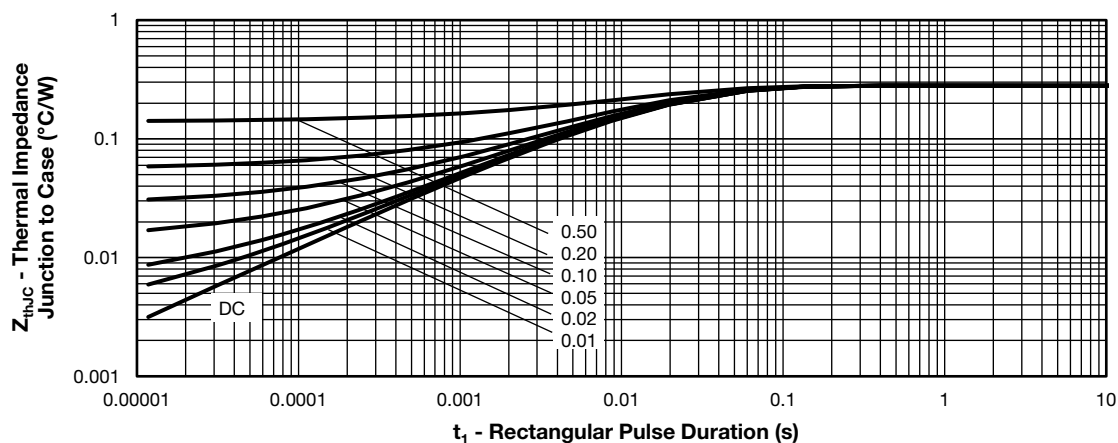
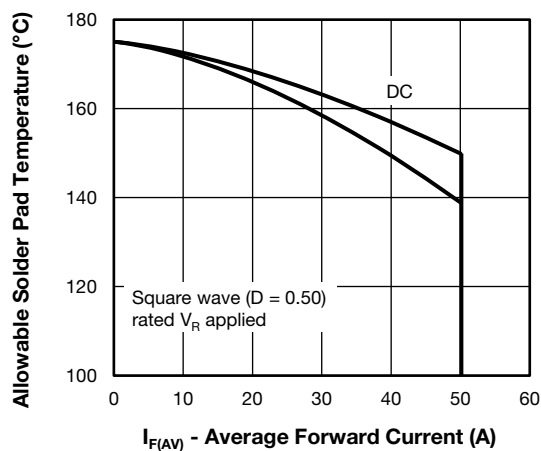

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics


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

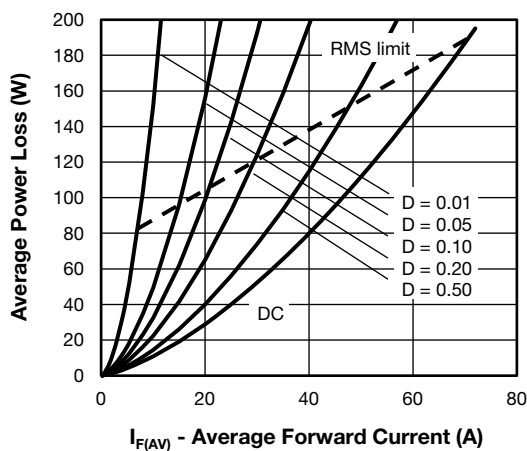
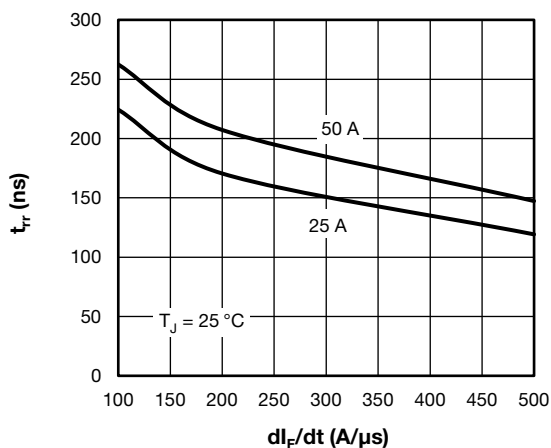
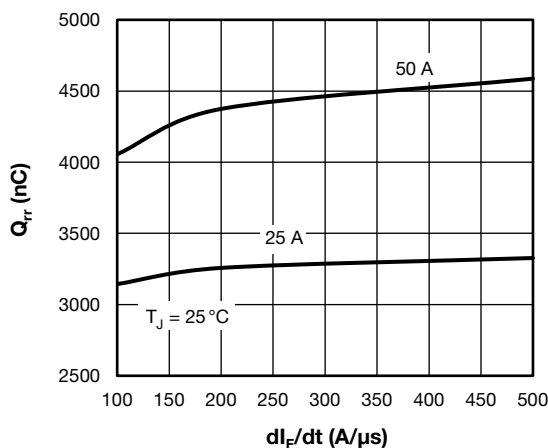
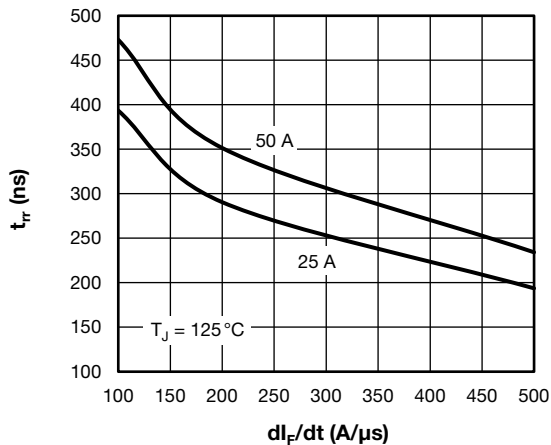
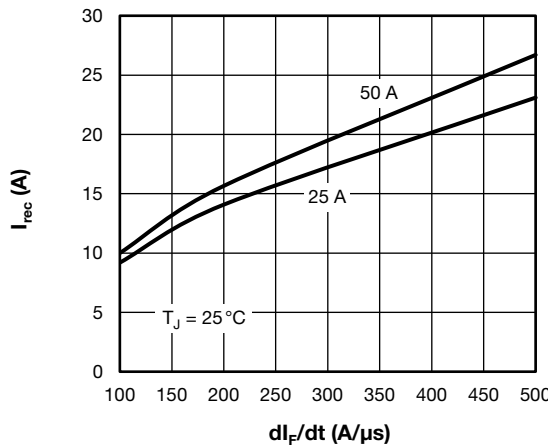
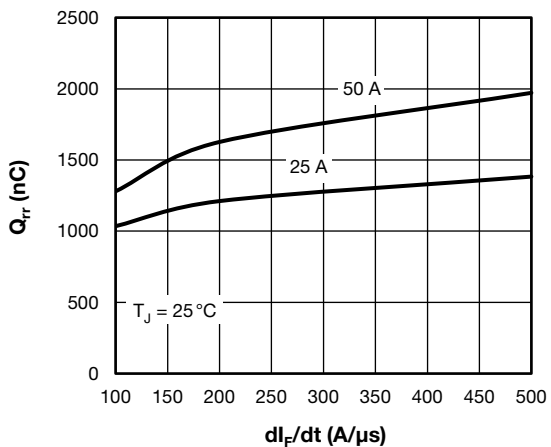
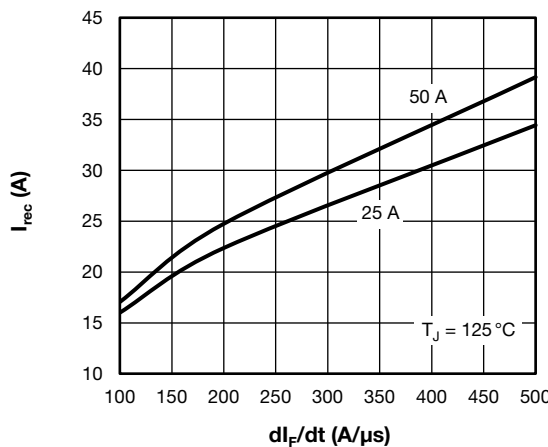


Fig. 6 - Forward Power Loss Characteristics


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.  $dI_F/dt$

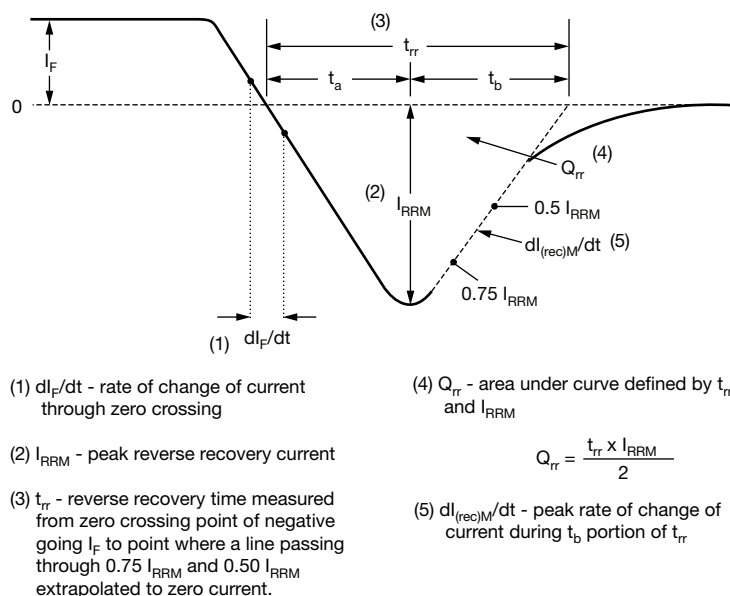


Fig. 13 - Reverse Recovery Waveform and Definitions

## 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	<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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