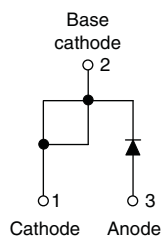


Ultrafast Rectifier, 8 A FRED Pt®


TO-220AC


FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Low leakage current
- AEC-Q101 qualified, meets JESD 201, class 2 whisker test
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT
HALOGEN
FREE

DESCRIPTION / APPLICATIONS

FRED Pt® series are the state of the art ultrafast recovery rectifiers specifically 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, UPS, DC/DC converters as well as freewheeling diode 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-220AC
$I_{F(AV)}$	8 A
V_R	400 V
V_F at I_F	0.94 V
t_{rr} typ.	See Recovery table
T_J max.	175 °C
Diode variation	Single die

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage	V_{RRM}		400	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 155\text{ °C}$	8	A
Non-repetitive peak surge current	I_{FSM}	$T_C = 25\text{ °C}$	100	
Repetitive peak forward current	I_{FRM}		16	
Operating junction and storage temperatures	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	$I_R = 100\text{ }\mu\text{A}$	400	-	-	V
Forward voltage	V_F	$I_F = 8\text{ A}$	-	1.19	1.3	
		$I_F = 8\text{ A}, T_J = 150\text{ °C}$	-	0.94	1.0	
Reverse leakage current	I_R	$V_R = V_R$ rated	-	0.2	10	μA
		$T_J = 150\text{ °C}, V_R = V_R$ rated	-	20	500	
Junction capacitance	C_T	$V_R = 400\text{ V}$	-	14	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8.0	-	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}	$I_F = 1.0\text{ A}$, $dI_F/dt = 50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	-	35	60	ns
		$T_J = 25\text{ }^{\circ}\text{C}$	-	43	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	67	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^{\circ}\text{C}$	-	2.8	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	6.3	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	-	60	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	210	-	

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	R_{thJC}		-	1.8	2	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	50	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-220AC	8ETU04H			

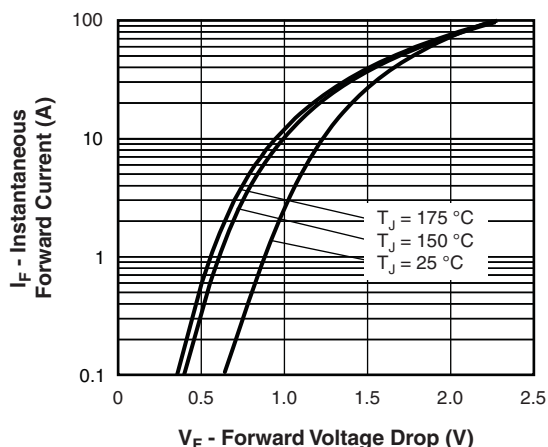


Fig. 1 - Typical Forward Voltage Drop Characteristics

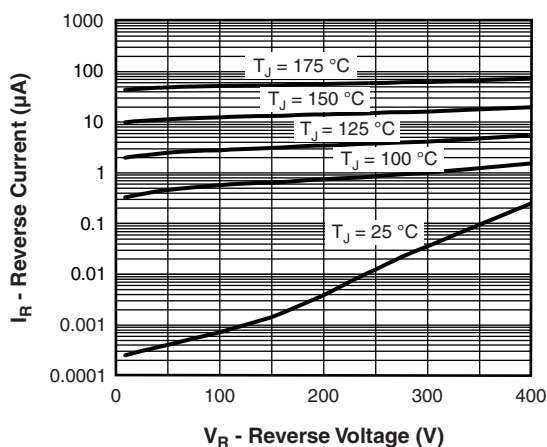


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

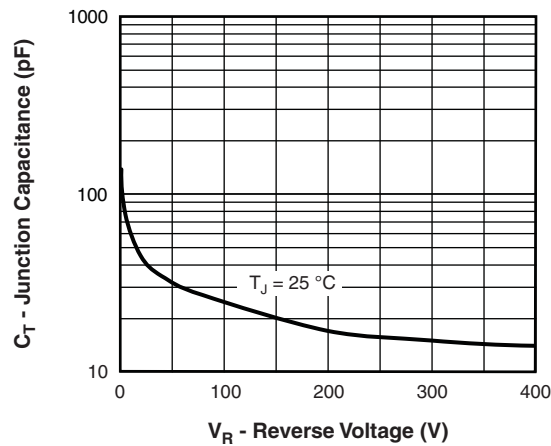


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

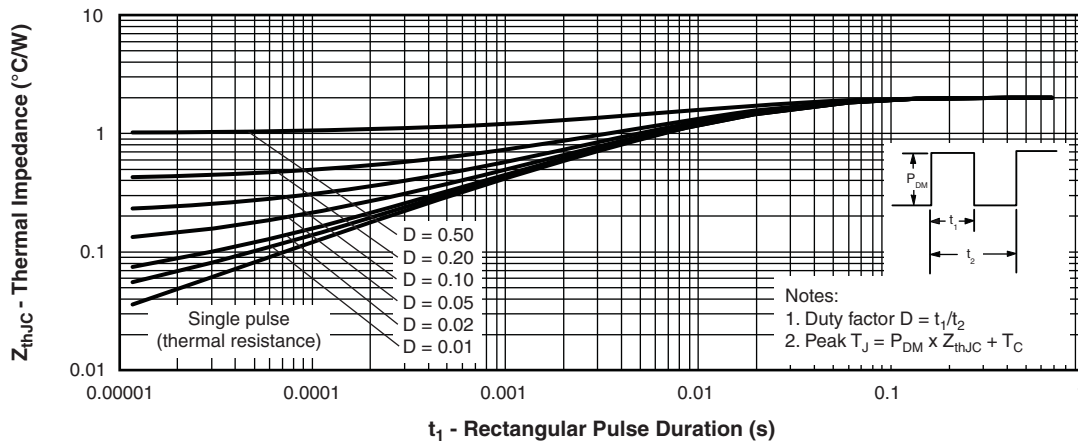
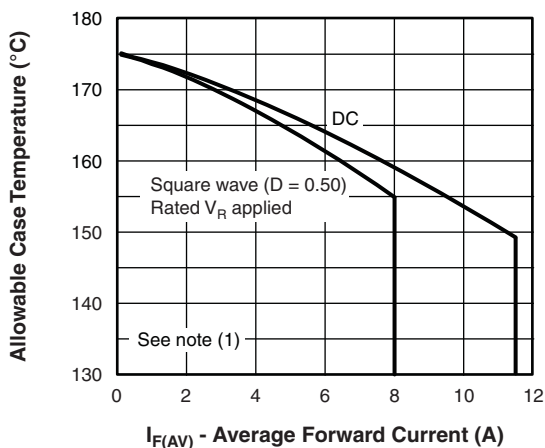

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics


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

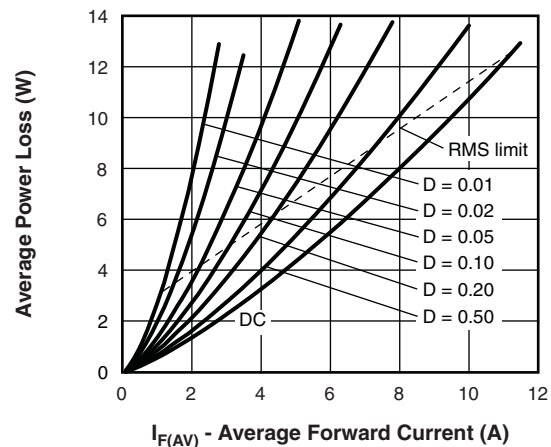


Fig. 6 - Forward Power Loss Characteristics

Note

- (1) Formula used: $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$
 P_d = Forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
 P_{dREV} = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = Rated V_R

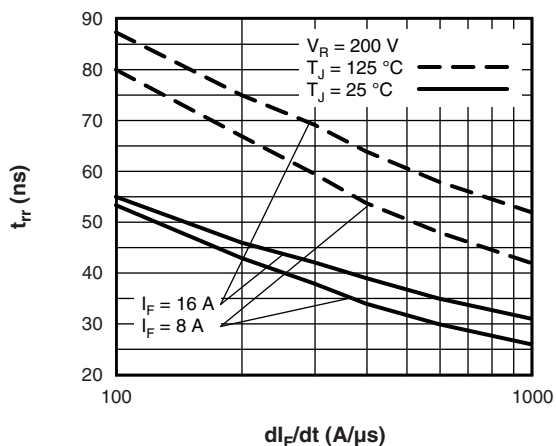
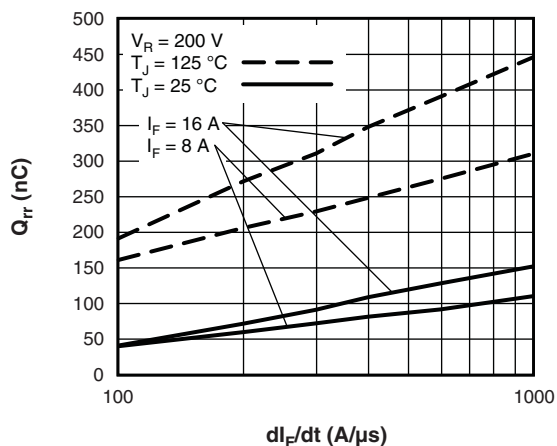
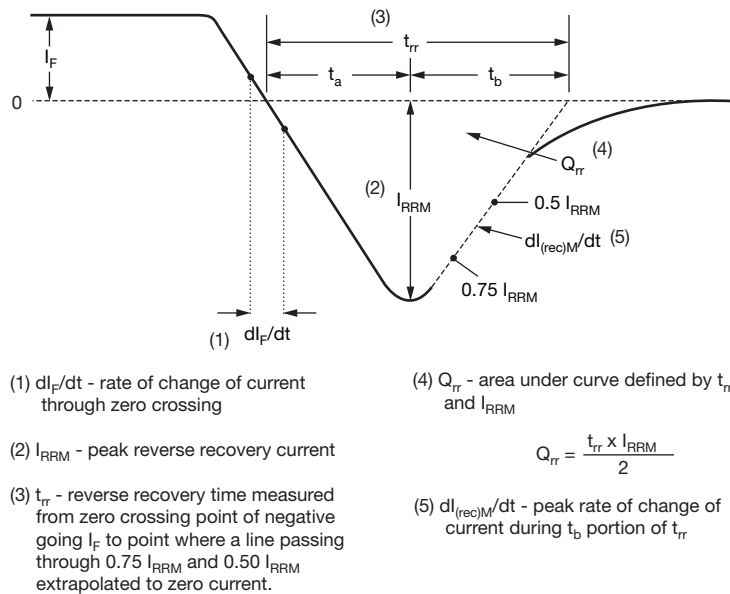

Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

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


Fig. 9 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

Device code	VS-	8	E	T	U	04	H	N3
	1	2	3	4	5	6	7	8

- 1** - Vishay Semiconductors product
- 2** - Current rating (8 = 8 A)
- 3** - E = single diode
- 4** - Package:
T = TO-220
- 5** - U = ultrafast recovery
- 6** - Voltage rating (04 = 400 V)
- 7** - H = AEC-Q101 qualified
- 8** - Environmental digit:
N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free

ORDERING INFORMATION (Example)

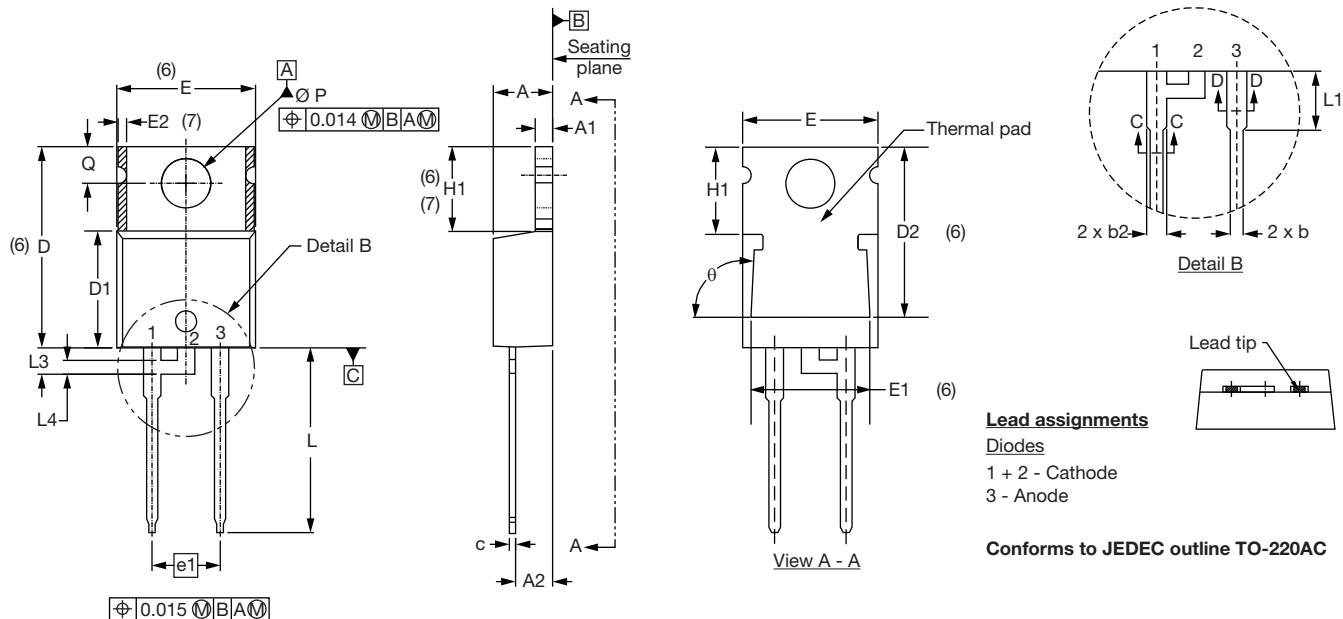
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-8ETU04HN3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS

Dimensions	www.vishay.com/doc?95221
Part marking information	www.vishay.com/doc?95068
SPICE model	www.vishay.com/doc?95441

TO-220AC

DIMENSIONS in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.56	2.92	0.101	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.97	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.14	1.73	0.045	0.068	4
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
D	14.85	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	
D2	11.68	12.88	0.460	0.507	6
E	10.11	10.51	0.398	0.414	3, 6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E1	6.86	8.89	0.270	0.350	6
E2	-	0.76	-	0.030	7
e	2.41	2.67	0.095	0.105	
e1	4.88	5.28	0.192	0.208	
H1	6.09	6.48	0.240	0.255	6, 7
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
L3	1.78	2.13	0.070	0.084	
L4	0.76	1.27	0.030	0.050	2
Ø P	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.118	
θ	90° to 93°		90° to 93°		

Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, D2 (minimum) where dimensions are derived from the actual package outline



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