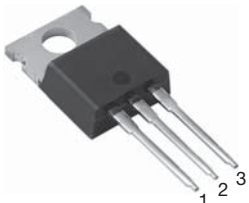
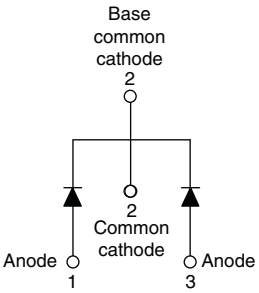
Ultrafast Rectifier, 16 A FRED Pt®



TO-220AB



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

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

PRODUCT SUMMARY	
Package	TO-220AB
$I_{F(AV)}$	2 x 8 A
V_R	400 V
V_F at I_F	1.3 V
t_{rr} (typ.)	24 ns
T_J max.	175 °C
Diode variation	Common cathode

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.

ABSOLUTE MAXIMUM RATINGS					
PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage		V_{RRM}		400	V
Average rectified forward current	per leg	$I_{F(AV)}$		8	A
	total device		T_C = 155 °C, rated V_R	16	
Non-repetitive peak surge current		I_{FSM}	T_C = 25 °C	100	
Peak repetitive forward current		I_{FRM}	T_C = 155 °C, rated V_R, square wave, 20 kHz	16	
Operating junction and storage temperatures		T_J, T_{Stg}		- 65 to 175	°C

ELECTRICAL SPECIFICATIONS PER LEG (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	400	-	-	V
Forward voltage	V_F	I_F = 8 A	-	1.19	1.3	
		I_F = 8 A, T_J = 150 °C	-	0.94	1.0	
Reverse leakage current	I_R	V_R = V_R rated	-	0.2	10	µA
		T_J = 150 °C, V_R = V_R rated	-	20	500	
Junction capacitance	C_T	V_R = 400 V	-	14	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8.0	-	nH

DYNAMIC RECOVERY CHARACTERISTICS PER LEG (T_J = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1.0 A, dI_F/dt = 50 A/µA, V_R = 30 V		-	35	-	ns
		I_F = 1.0 A, dI_F/dt = 100 A/µA, V_R = 30 V		-	24	-	
		T_J = 25 °C	I_F = 8 A dI_F/dt = 200 A/µs V_R = 200 V	-	43	-	
		T_J = 125 °C		-	67	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	2.8	-	A
		T_J = 125 °C		-	6.3	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	60	-	nC
		T_J = 125 °C		-	210	-	

THERMAL MECHANICAL SPECIFICATIONS							
PARAMETER		**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range		T_J, T_{Stg}		- 65	-	175	°C
Thermal resistance, junction to case	per leg	R_{thJC}		-	3.6	4	°C/W
	per device			-	1.8	2	
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-220AB	16CTU04H			

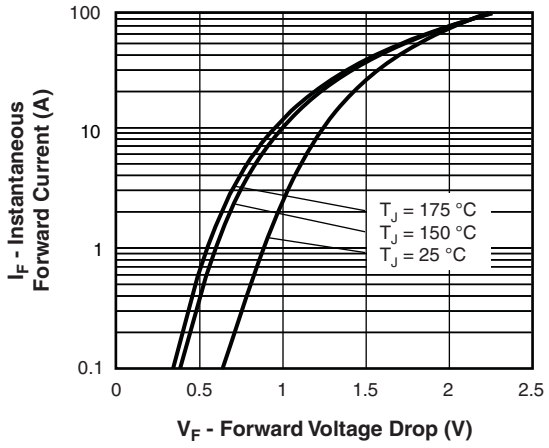


Fig. 1 - Typical Forward Voltage Drop Characteristics

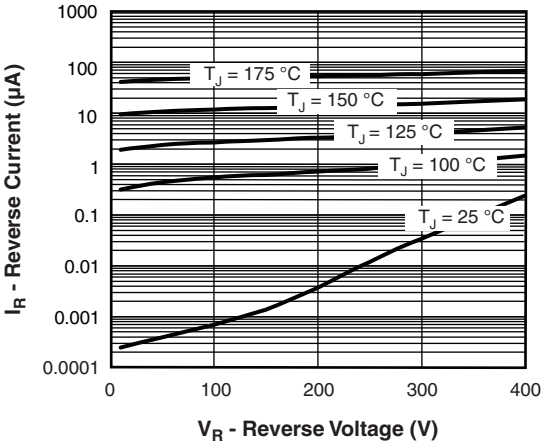


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

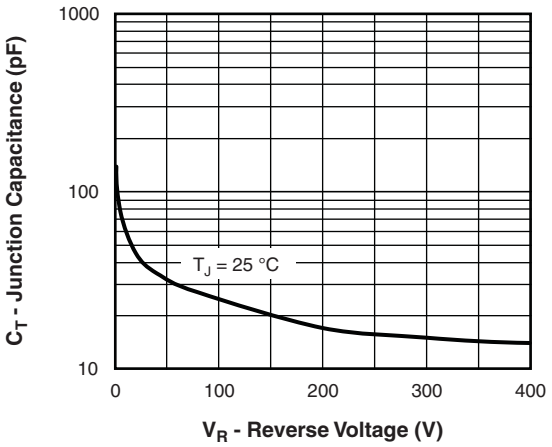


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

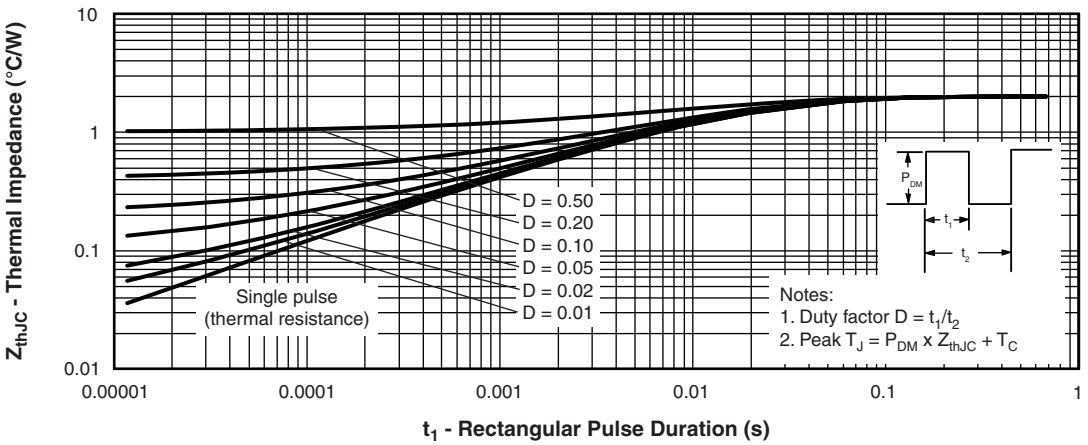


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

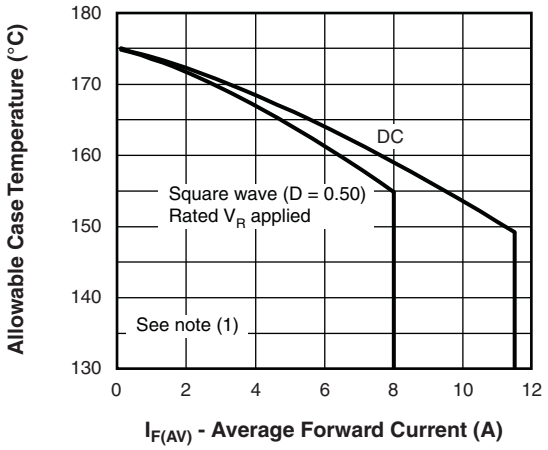


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

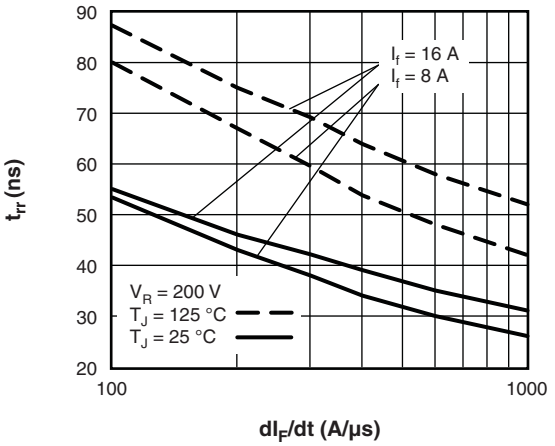


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

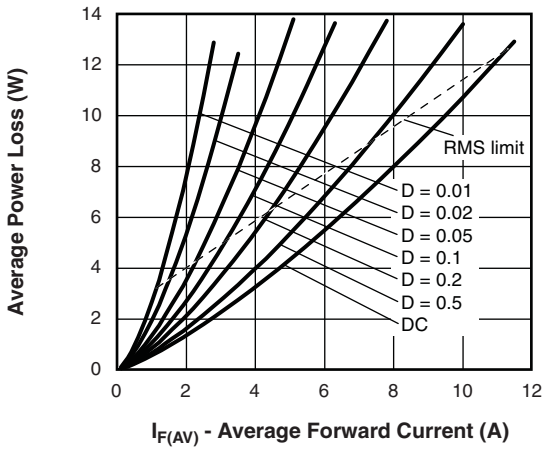


Fig. 6 - Forward Power Loss Characteristics

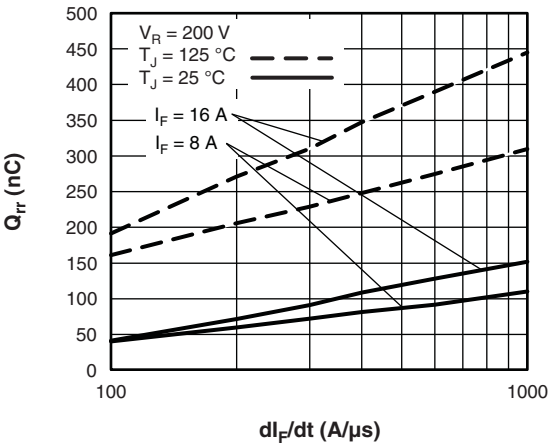
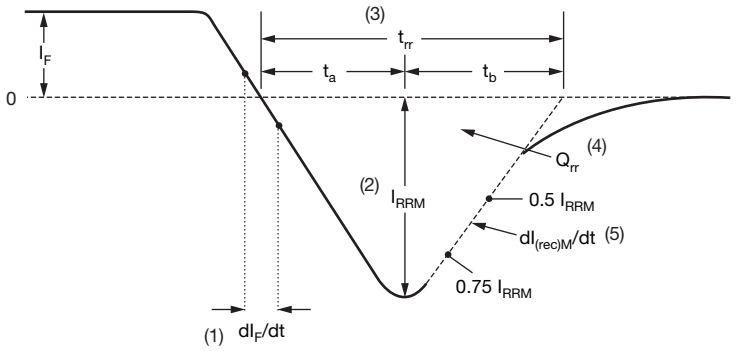


Fig. 8 - Typical Stored Charge vs. dI_F/dt

Note

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



(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. 1 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code	VS-	16	C	T	U	04	H	N3
	1	2	3	4	5	6	7	8

- 1 - Vishay Semiconductors product
- 2 - Current rating (16 = 16 A)
- 3 - Circuit configuration:
  C = Common cathode
- 4 - Package:
  T = TO-220
- 5 - 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-16CTU04HN3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95222
Part marking information	www.vishay.com/doc?95028

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