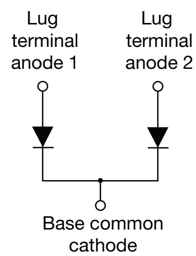
HEXFRED®
Ultrafast Soft Recovery Diode, 320 A

TO-244



FEATURES

- Very low Q_{rr} and t_{rr}
- UL approved file E222165
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS
COMPLIANT

BENEFITS

- Reduced RFI and EMI
- Reduced snubbing

DESCRIPTION

HEXFRED® diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems. An extensive characterization of the recovery behavior for different values of current, temperature and dI_F/dt simplifies the calculations of losses in the operating conditions. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for power converters, motors drives and other applications where switching losses are significant portion of the total losses.

PRODUCT SUMMARY	
$I_{F(AV)}$	320 A
V_R	400 V
$I_{F(DC)}$ at T_C	255 A at 85 °C
Package	TO-244 (TO-244AB)
Circuit	Two diodes common cathode

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	V_R		400	V
Continuous forward current	I_F	T_C = 25 °C	420	A
		T_C = 85 °C	255	
		T_C = 115 °C	160	
Single pulse forward current	I_{FSM}	Limited by junction temperature	1200	
Non-repetitive avalanche energy	E_{AS}	L = 100 µH, duty cycle limited by maximum T_J	1.4	mJ
Maximum power dissipation	P_D	T_C = 25 °C	625	W
		T_C = 100 °C	250	
Operating junction and storage temperature range	T_J, T_{Stg}		-55 to 150	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	V_{BR}	I_R = 100 µA		400	-	-	V
Maximum forward voltage	V_{FM}	I_F = 160 A	See fig. 1	-	1.10	1.35	
		I_F = 320 A		-	1.30	1.54	
		I_F = 160 A, T_J = 125 °C		-	1.00	1.20	
Maximum reverse leakage current	I_{RM}	T_J = 125 °C, V_R = 400 V	See fig. 2	-	0.9	3	mA
Junction capacitance	C_T	V_R = 200 V	See fig. 3	-	370	500	pF
Series inductance	L_S	From top of terminal hole to mounting plane		-	5.0	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time See fig. 5	t_{rr}	I_F = 1.0 A, dI_F/dt = 200 A/μs, V_R = 30 V		-	45	-	ns
		T_J = 25 °C	I_F = 160 A dI_F/dt = 200 A/μs V_R = 200 V	-	90	140	
		T_J = 125 °C		-	290	440	
Peak recovery current See fig. 6	I_{RRM}	T_J = 25 °C		-	8.7	20	A
		T_J = 125 °C		-	18	30	
Reverse recovery charge See fig. 7	Q_{rr}	T_J = 25 °C		-	420	1100	nC
		T_J = 125 °C		-	2600	7000	
Peak rate of recovery current See fig. 8	$dI_{(rec)M}/dt$	T_J = 25 °C		-	300	-	A/μs
		T_J = 125 °C		-	280	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range		T_J, T_{Stg}	-55	-	150	°C
Thermal resistance, junction to case	per leg	R_{thJC}	-	-	0.19	°C/W K/W
	per module		-	-	0.095	
Typical thermal resistance, case to heatsink		R_{thCS}	-	0.10	-	
Weight			-	68	-	g
			-	2.4	-	oz.
Mounting torque [(1)]			30 (3.4)	-	40 (4.6)	N · m (lbf · in)
	center hole		12 (1.4)	-	18 (2.1)	
Terminal torque			30 (3.4)	-	40 (4.6)	
Vertical pull			-	-	80	lbf · in
2" lever pull			-	-	35	

Note

(1) Mounting surface must be smooth, flat, free of burrs or other protrusions. Apply a thin even film or thermal grease to mounting surface. Gradually tighten each mounting bolt in 5 to 10 lbf · in steps until desired or maximum torque limits are reached.

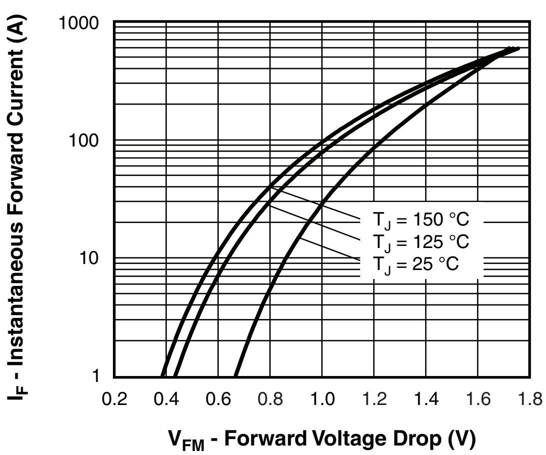


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

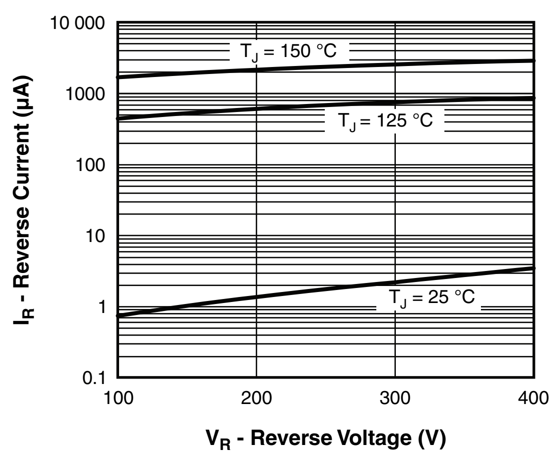


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

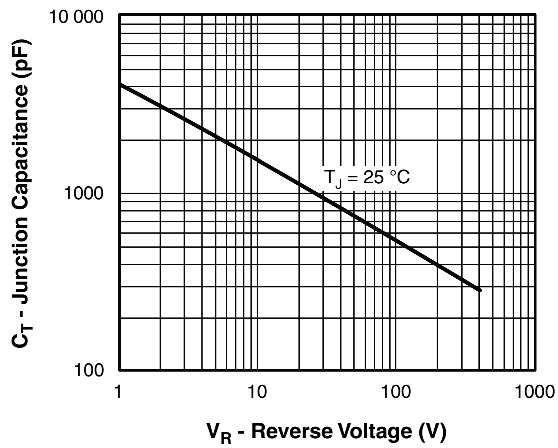


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

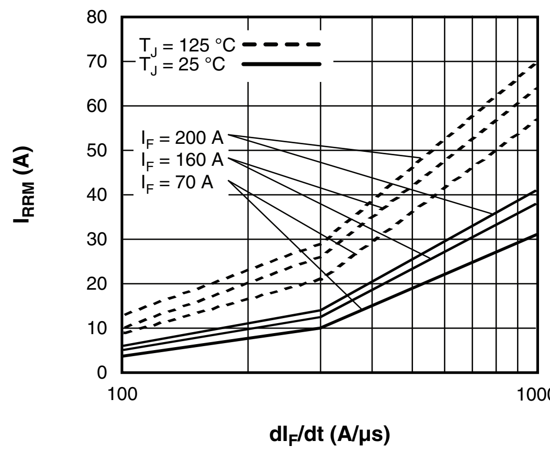


Fig. 6 - Typical Recovery Current vs. dI_F/dt (Per Leg)

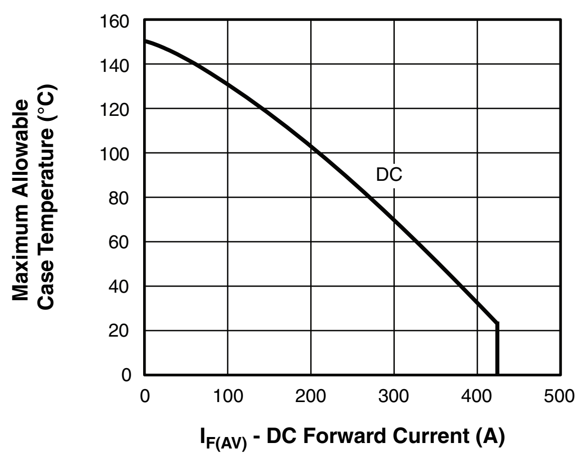


Fig. 4 - Maximum Allowable Case Temperature vs. DC Forward Current (Per Leg)

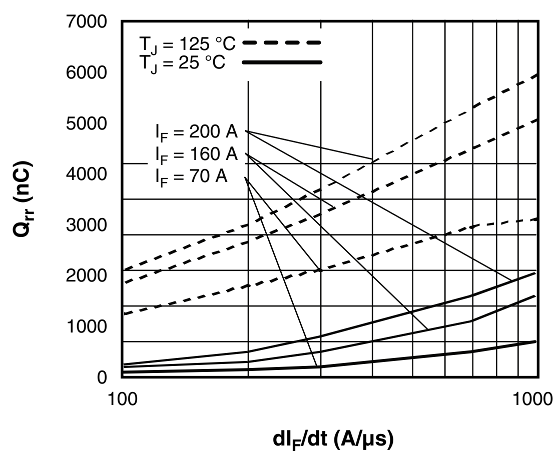


Fig. 7 - Typical Stored Charge vs. dI_F/dt (Per Leg)

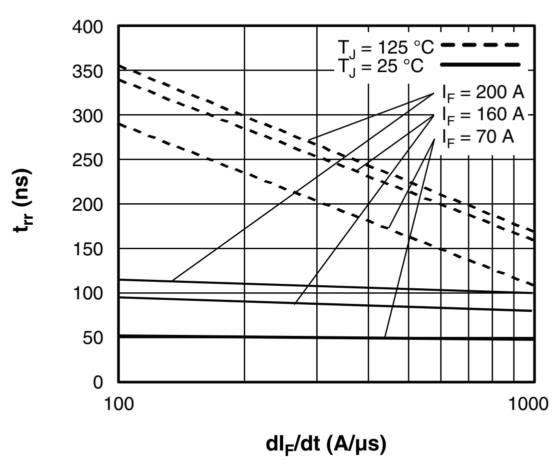


Fig. 5 - Typical Reverse Recovery Time vs. dI_F/dt (Per Leg)

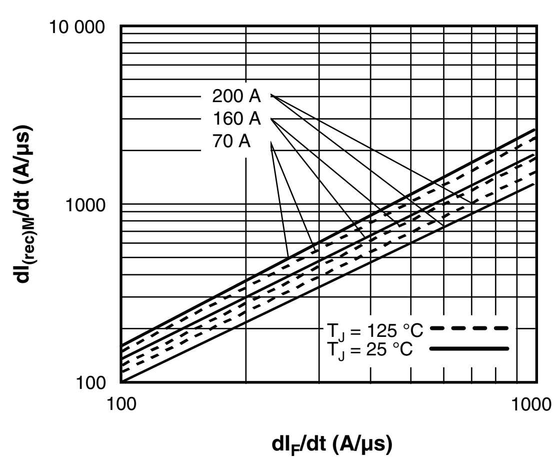


Fig. 8 - Typical $dI_{(rec)M}/dt$ vs. dI_F/dt (Per Leg)

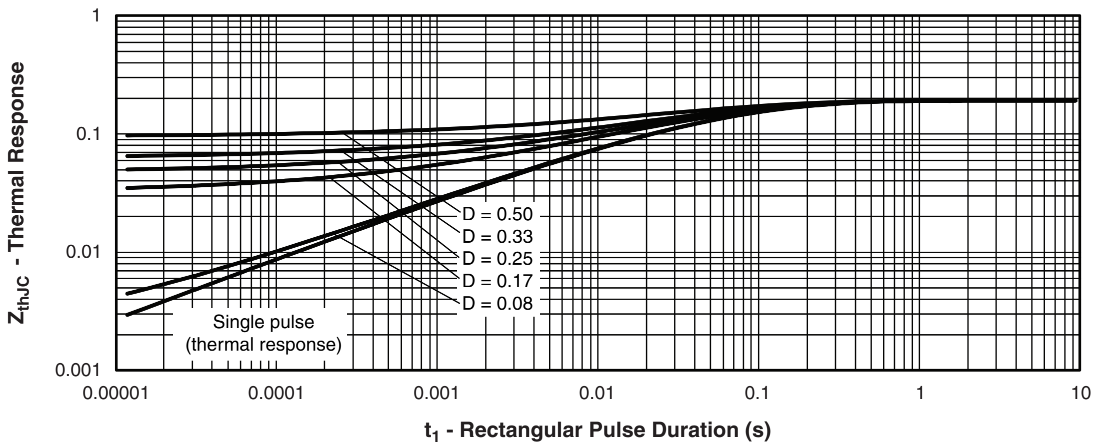


Fig. 9 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

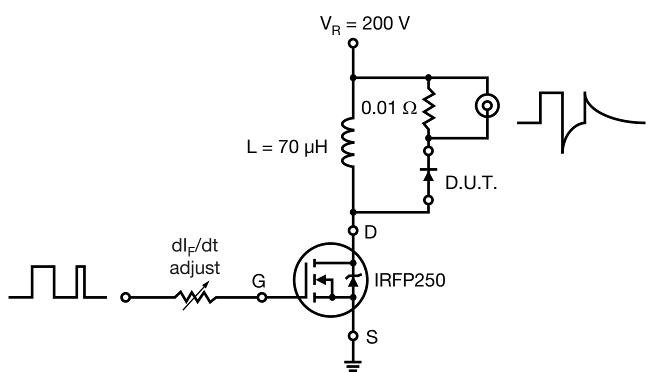
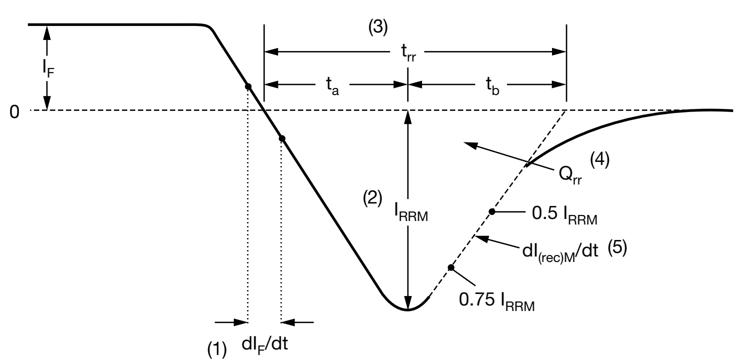


Fig. 10 - Reverse Recovery Parameter Test Circuit



(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. 11 - Reverse Recovery Waveform and Definitions

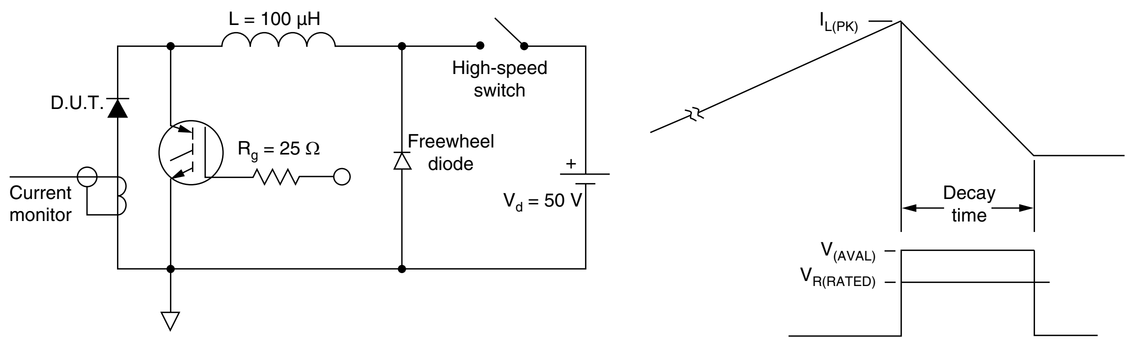


Fig. 12 - Avalanche Test Circuit and Waveforms

ORDERING INFORMATION TABLE

Device code	VS-	HFA	320	NJ	40	C	PbF
	1	2	3	4	5	6	7

1 - Vishay Semiconductors product

2 - HEXFRED® family, electron irradiated

3 - Average current rating

4 - NJ = TO-244

5 - Voltage rating (400 V)

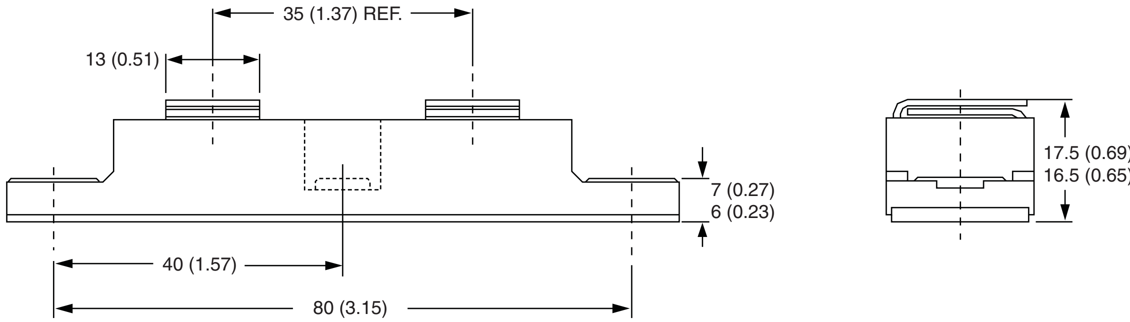
6 - C = Common cathode

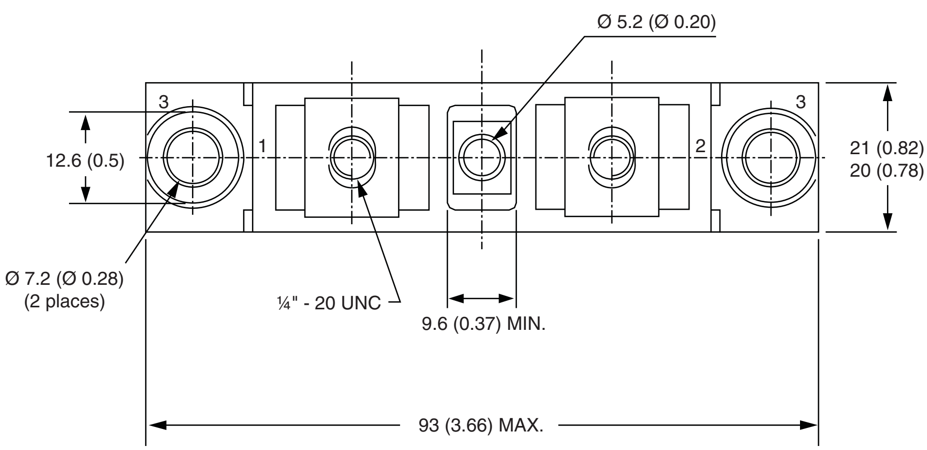
7 - Lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95021

TO-244

DIMENSIONS in millimeters (inches)





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