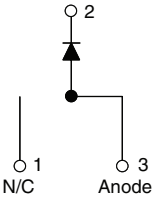
HEXFRED®
Ultrafast Soft Recovery Diode, 4 A



D-PAK



FEATURES

- Ultrafast recovery time
- Ultrasoft recovery
- Very low I_{RRM}
- Very low Q_{rr}
- Guaranteed avalanche
- Specified at operating temperature
- Lead (Pb)-free
- Designed and qualified for Q101 level

Pb Available

RoHS* COMPLIANT

BENEFITS

- Reduced RFI and EMI
- Reduced power loss in diode and switching transistor
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

PRODUCT SUMMARY	
V_R	600 V
V_F at 4 A at 25 °C	1.8 V
$I_{F(AV)}$	4 A
t_{rr} (typical)	17 ns
T_J (maximum)	150 °C

DESCRIPTION/APPLICATIONS

These diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for freewheeling, flyback, power converters, motor drives, and other applications where high speed and reduced switching losses are design requirements.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	V_{RRM}		600	V
Maximum continuous forward current	$I_{F(AV)}$	T_C = 100 °C	4	A
Single pulse forward current	I_{FSM}		25	
Repetitive peak forward current	I_{FRM}	T_C = 116 °C	16	
Maximum power dissipation	P_D	T_C = 100 °C	10	W
Operating junction and storage temperatures	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
Breakdown voltage, blocking voltage	V_{BR}, V_R	I_R = 100 µA	600	-	-	V
Forward voltage See fig. 1	V_F	I_F = 4 A	-	1.5	1.8	
		I_F = 8 A	-	1.8	2.2	
		I_F = 4 A, T_J = 125 °C	-	1.4	1.7	
Maximum reverse leakage current	I_R	V_R = V_R rated	-	0.17	3.0	µA
		T_J = 125 °C, V_R = 0.8 x V_R rated	-	44	300	
Junction capacitance	C_T	V_R = 200 V	-	4	8	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8.0	-	nH

* Pb containing terminations are not RoHS compliant, exemptions may apply

DYNAMIC RECOVERY CHARACTERISTICS (T_C = 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 = 200 A/µA, V_R = 30 V		-	17	-	ns
		T_J = 25 °C	I_F = 4 A dI_F/dt = 200 A/µs V_R = 200 V	-	28	42	
		T_J = 125 °C		-	38	57	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	2.9	5.2	A
		T_J = 125 °C		-	3.7	6.7	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	40	60	nC
		T_J = 125 °C		-	70	105	
Rate of fall of recovery current	$dI_{(rec)M}/dt$	T_J = 25 °C		-	280	-	A/µs
		T_J = 125 °C		-	235	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range	T_J, T_{Stg}		- 55	-	150	°C
Soldering temperature	T_S	10 s	-	-	240	°C/W
Thermal resistance, junction to case	R_{thJC}		-	-	5.0	
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	80	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style D-PAK	HFA04SD60S			

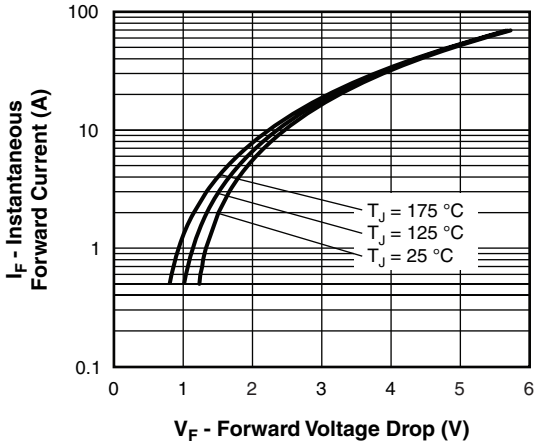


Fig. 1 - Typical Forward Voltage Drop Characteristics

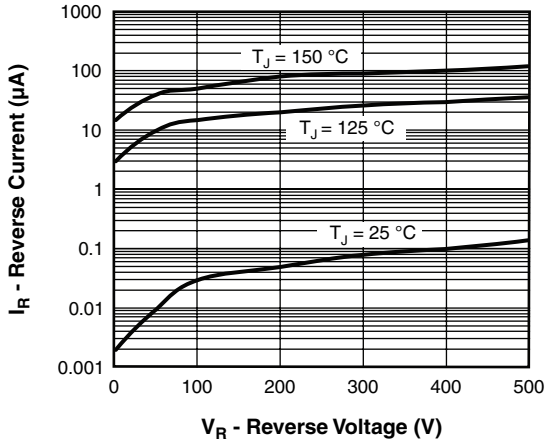


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

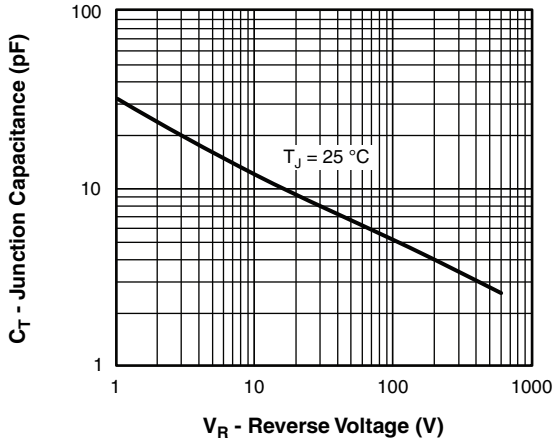


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

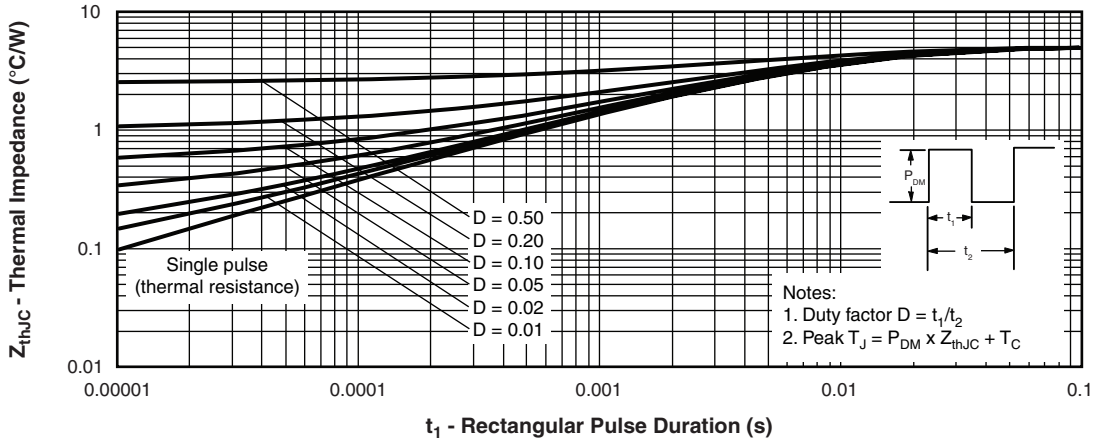


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

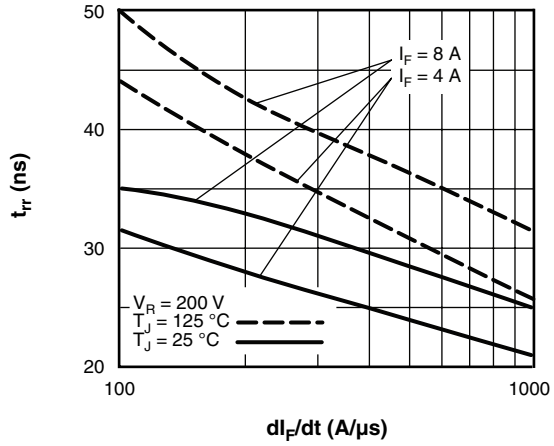


Fig. 5 - Typical Reverse Recovery Time vs. dI_F/dt

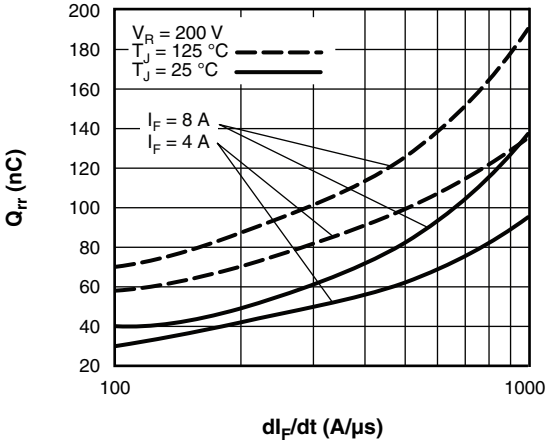


Fig. 7 - Typical Stored Charge vs. dI_F/dt

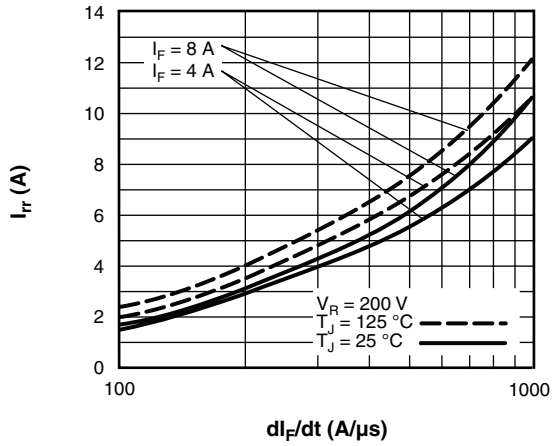


Fig. 6 - Typical Recovery Current vs. dI_F/dt

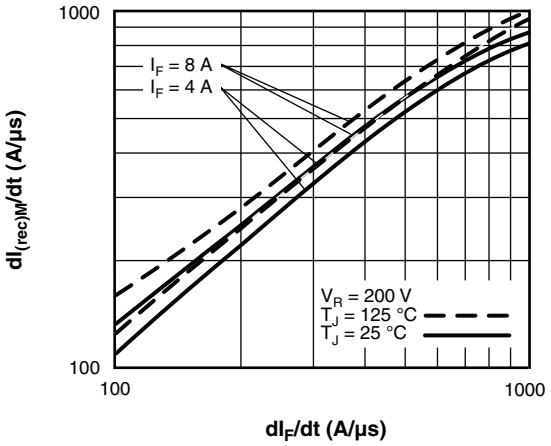


Fig. 8 - Typical $dI_{(rec)M}/dt$ vs. dI_F/dt

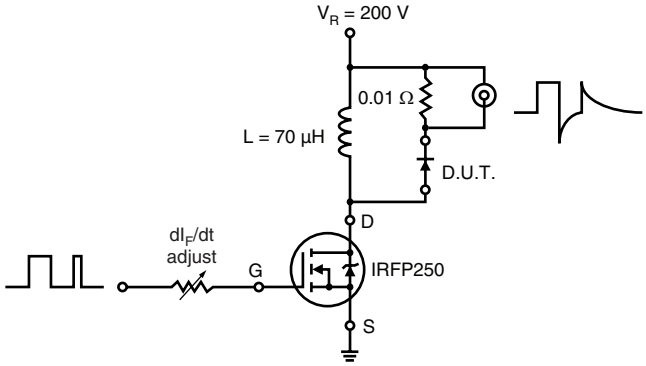
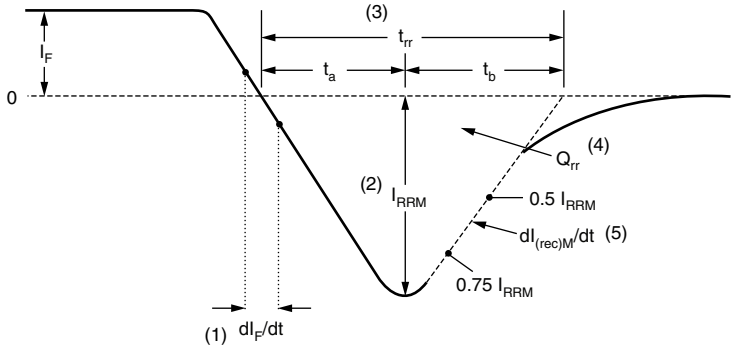


Fig. 9 - Reverse Recovery Parameter Test Circuit



(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. 10 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code

HFA	A	04	SD	60	S	PbF
1	2	3	4	5	6	7

1 - HEXFRED® family

2 - Electron irradiated

3 - Current rating (04 = 4 A)

4 - D-PAK

5 - Voltage rating (60 = 600 V)

6 - Suffix

S = D^2PAK/D-PAK
TR = Tape and reel
TRL = Tape and reel left
TRR = Tape and reel right

7 - • None = Standard production
• PbF = Lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	http://www.vishay.com/doc?95016
Part marking information	http://www.vishay.com/doc?95059
Packaging information	http://www.vishay.com/doc?95033

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