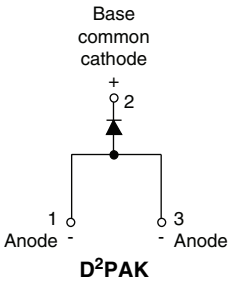
HEXFRED®
Ultrafast Soft Recovery Diode, 4 A



D²PAK

FEATURES

- Ultrafast recovery
- Ultrasoft recovery
- Very low I_{RRM}
- Very low Q_{rr}
- Specified at operating conditions
- Designed and qualified for industrial level

BENEFITS

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

DESCRIPTION

HFA04TB60S is a state of the art ultrafast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which result in performance which is unsurpassed by any rectifier previously available. With basic ratings of 600 V and 4 A continuous current, the HFA04TB60S is especially well suited for use as the companion diode for IGBTs and MOSFETs. In addition to ultrafast recovery time, the HEXFRED® product line features extremely low values of peak recovery current (I_{RRM}) and does not exhibit any tendency to “snap-off” during the t_b portion of recovery. The HEXFRED features combine to offer designers a rectifier with lower noise and significantly lower switching losses in both the diode and the switching transistor. These HEXFRED advantages can help to significantly reduce snubbing, component count and heatsink sizes. The HEXFRED HFA04TB60S is ideally suited for applications in power supplies and power conversion systems (such as inverters), motor drives, and many other similar applications where high speed, high efficiency is needed.

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
Q_{rr} at 125 °C	40 nC
$dI_{(rec)M}/dt$ at 125 °C	280 A/µs

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**UNITS**
Cathode to anode voltage	V_R		600	V
Maximum continuous forward current	I_F	T_C = 100 °C	4	A
Single pulse forward current	I_{FSM}		25	
Maximum repetitive forward current	I_{FRM}		16	
Maximum power dissipation	P_D	T_C = 25 °C	25	W
		T_C = 100 °C	10	
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		600	-	-	V
Maximum forward voltage	V_{FM}	I_F = 4.0 A	See fig. 1	-	1.5	1.8	
		I_F = 8.0 A		-	1.8	2.2	
		I_F = 4.0 A, T_J = 125 °C		-	1.4	1.7	
Maximum reverse leakage current	I_{RM}	V_R = V_R rated	See fig. 2	-	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	See fig. 3	-	4.0	8.0	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body		-	8.0	-	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, 6	t_{rr}	I_F = 1.0 A, dI_F/dt = 200 A/µs, V_R = 30 V		-	17	-	ns
	t_{rr1}	T_J = 25 °C	I_F = 4.0 A dI_F/dt = 200 A/µs V_R = 200 V	-	28	42	
	t_{rr2}	T_J = 125 °C		-	38	57	
Peak recovery current	I_{RRM1}	T_J = 25 °C		-	2.9	5.2	A
	I_{RRM2}	T_J = 125 °C		-	3.7	6.7	
Reverse recovery charge See fig. 7	Q_{rr1}	T_J = 25 °C		-	40	60	nC
	Q_{rr2}	T_J = 125 °C		-	70	105	
Peak rate of fall of recovery current during t_b See fig. 8	$dI_{(rec)M}/dt1$	T_J = 25 °C		-	280	-	A/µs
	$dI_{(rec)M}/dt2$	T_J = 125 °C		-	235	-	

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Lead temperature	T_{lead}	0.063" from case (1.6 mm) for 10 s	-	-	300	°C
Thermal resistance, junction to case	R_{thJC}		-	-	5.0	K/W
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	80	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Marking device		Case style D^2PAK	HFA04TB60S			

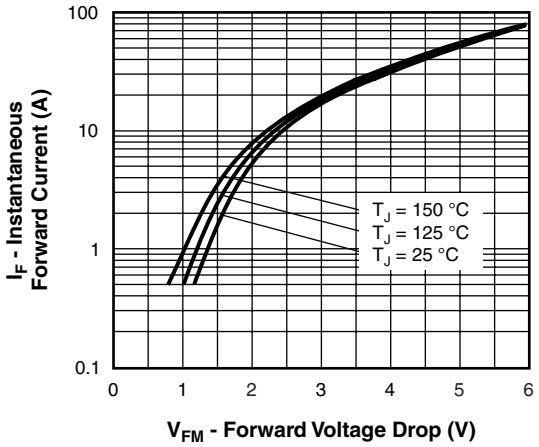


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

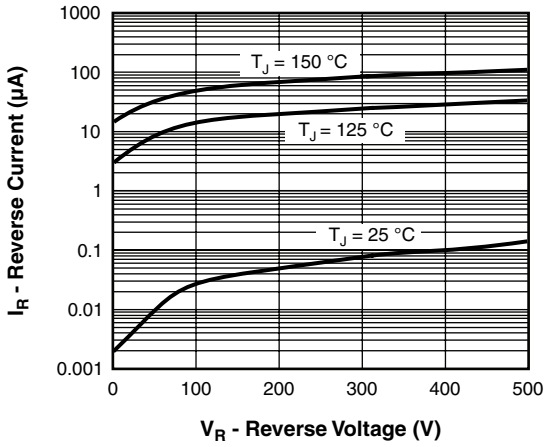


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

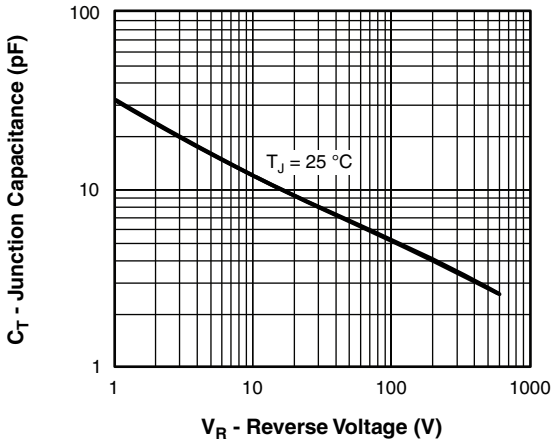


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

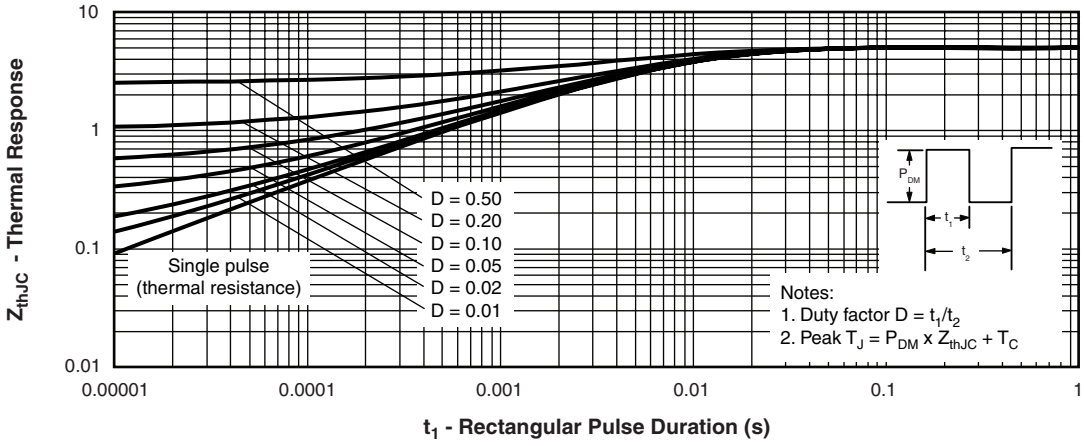


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

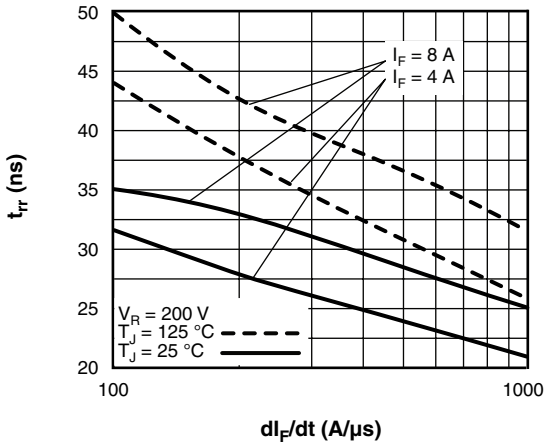


Fig. 5 - Typical Reverse Recovery Time vs. dI_F/dt

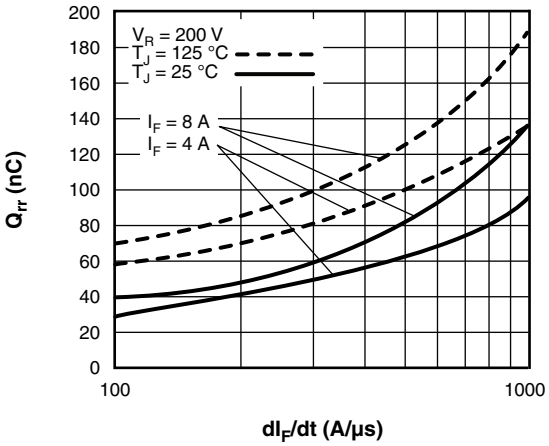


Fig. 7 - Typical Stored Charge vs. dI_F/dt

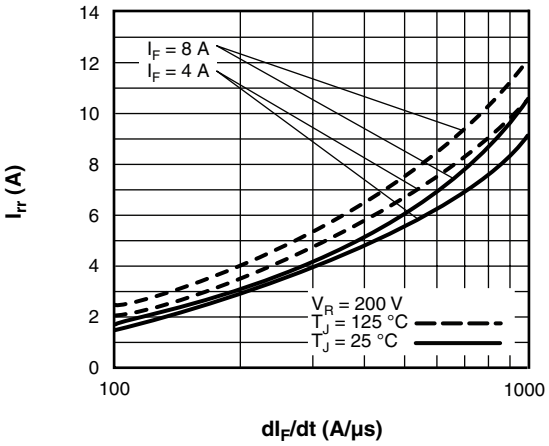


Fig. 6 - Typical Recovery Current vs. dI_F/dt

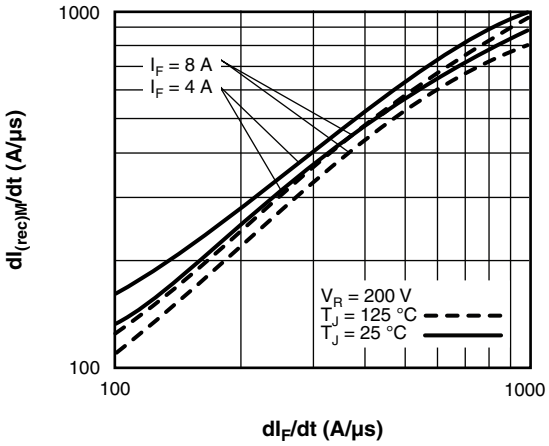


Fig. 8 - Typical $dI_{(rec)M}/dt$ vs. dI_F/dt

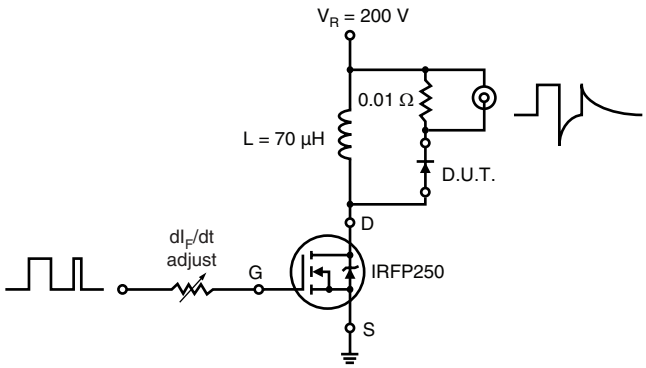
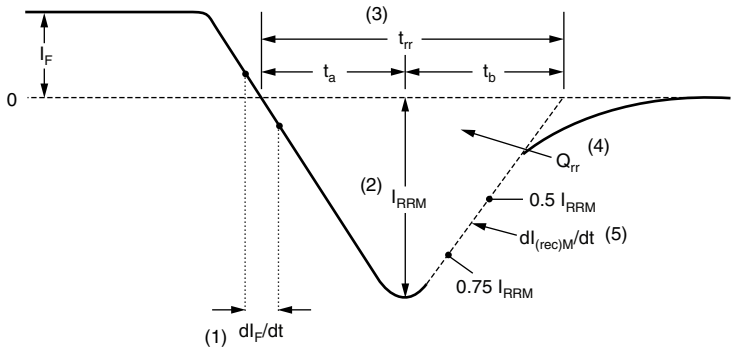


Fig. 9 - Reverse Recovery Parameter Test Circuit



(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}

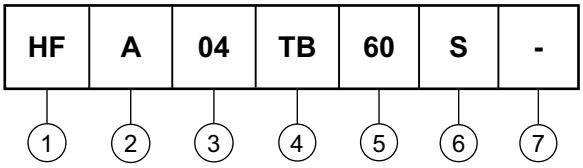
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(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



1 - HEXFRED® family

2 - Process designator: A = Subs. electron irradiated
B = Subs. platinum

3 - Current rating (04 = 4 A)

4 - Package outline (TB = TO-220, 2 leads)

5 - Voltage rating (60 = 600 V)

6 - Configuration (S = SMD)

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

LINKS TO RELATED DOCUMENTS	
Dimensions	http://www.vishay.com/doc?95046
Part marking information	http://www.vishay.com/doc?95054
Packaging information	http://www.vishay.com/doc?95032

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