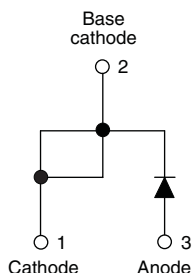


HEXFRED[®], Ultrafast Soft Recovery Diode, 6 A


TO-220AC

FEATURES

- Ultrafast and ultrasoft recovery
- Very low I_{RRM} and Q_{rr}
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified according to JEDEC-JESD47
- Halogen-free according to IEC 61249-2-21 definition (-N3 only)



RoHS
COMPLIANT
HALOGEN
FREE
Available

BENEFITS

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

DESCRIPTION

VS-HFA06TB120... 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 1200 V and 6 A continuous current, the VS-HFA06TB120... 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 VS-HFA06TB120... 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

Package	TO-220AC
$I_{F(AV)}$	6 A
V_R	1200 V
V_F at I_F	3.0 V
t_{rr} typ.	26 ns
T_J max.	150 °C
Diode variation	Single die

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	V_R		1200	V
Maximum continuous forward current	I_F	$T_C = 100\text{ °C}$	6	A
Single pulse forward current	I_{FSM}		80	
Maximum repetitive forward current	I_{FRM}		24	
Maximum power dissipation	P_D	$T_C = 25\text{ °C}$	62.5	W
		$T_C = 100\text{ °C}$	25	
Operating junction and storage temperature range	T_J, T_{Stg}		- 55 to + 150	°C



ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	V_{BR}	$I_R = 100\text{ }\mu\text{A}$	1200	-	-	V
Maximum forward voltage	V_{FM}	$I_F = 6.0\text{ A}$	-	2.7	3.0	
		$I_F = 12\text{ A}$	-	3.5	3.9	
		$I_F = 6.0\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$	-	2.4	2.8	
Maximum reverse leakage current	I_{RM}	$V_R = V_R\text{ rated}$	-	0.26	5.0	μA
		$T_J = 125\text{ }^{\circ}\text{C}, V_R = 0.8 \times V_R\text{ rated}$	-	110	500	
Junction capacitance	C_T	$V_R = 200\text{ V}$	-	9.0	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}	$I_F = 1.0\text{ A}, dI_F/dt = 200\text{ A}/\mu\text{s}, V_R = 30\text{ V}$	-	26	-	ns
	t_{rr1}	$T_J = 25\text{ }^{\circ}\text{C}$	-	53	80	
	t_{rr2}	$T_J = 125\text{ }^{\circ}\text{C}$	-	87	130	
Peak recovery current	I_{RRM1}	$T_J = 25\text{ }^{\circ}\text{C}$	-	4.4	8.0	A
	I_{RRM2}	$T_J = 125\text{ }^{\circ}\text{C}$	-	5.0	9.0	
Reverse recovery charge	Q_{rr1}	$T_J = 25\text{ }^{\circ}\text{C}$	-	116	320	nC
	Q_{rr2}	$T_J = 125\text{ }^{\circ}\text{C}$	-	233	585	
Peak rate of recovery current during t_b	$dI_{(rec)M}/dt1$	$T_J = 25\text{ }^{\circ}\text{C}$	-	180	-	A/ μs
	$dI_{(rec)M}/dt2$	$T_J = 125\text{ }^{\circ}\text{C}$	-	100	-	

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	$^{\circ}\text{C}$
Thermal resistance, junction to case	R_{thJC}		-	-	2.0	K/W
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	80	
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	HFA06TB120			

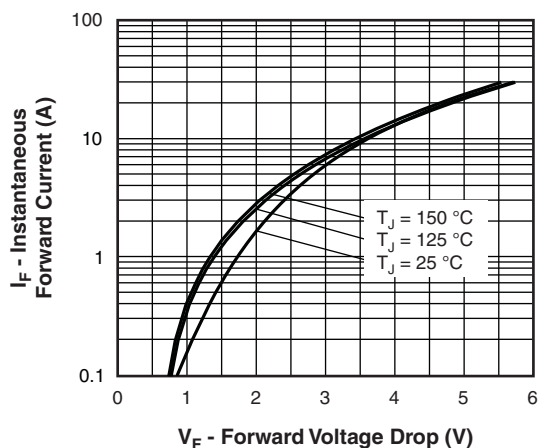


Fig. 1 - Typical Forward Voltage Drop Characteristics

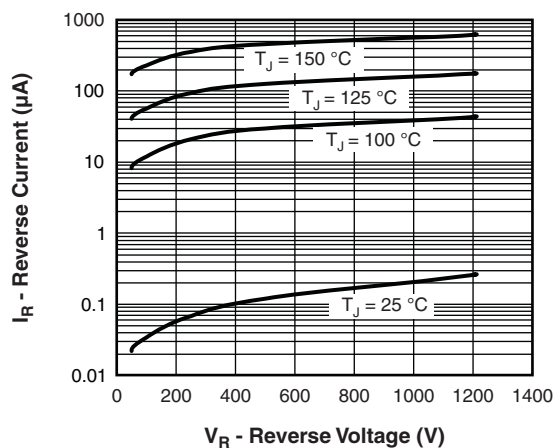


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

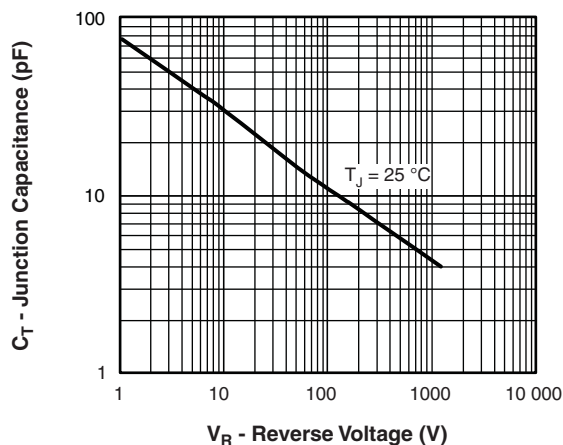
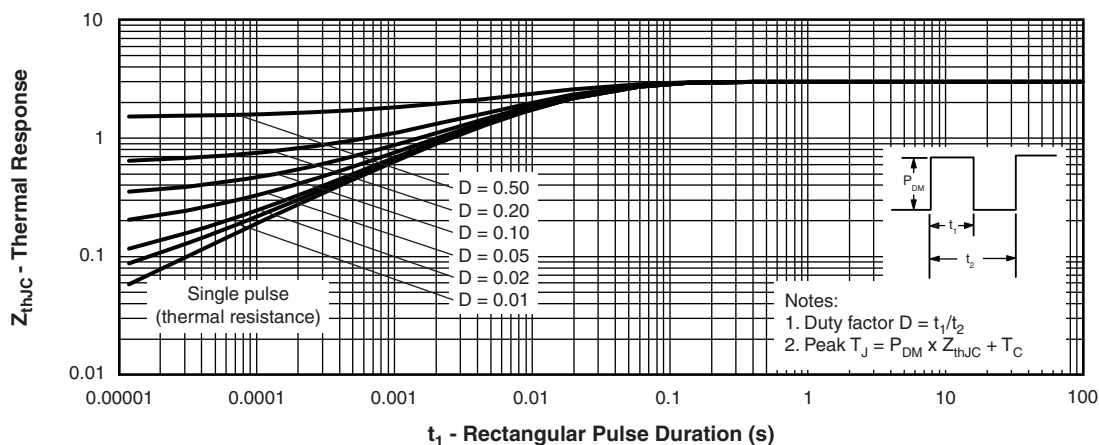
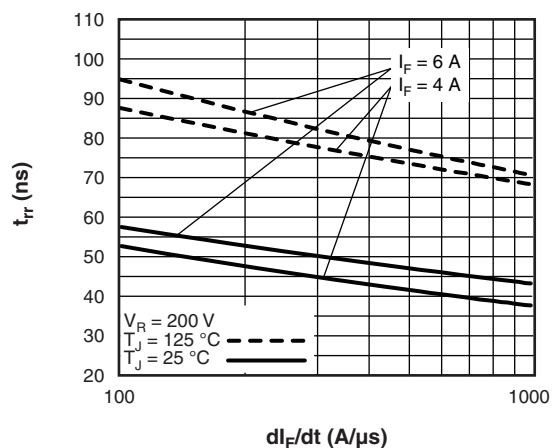
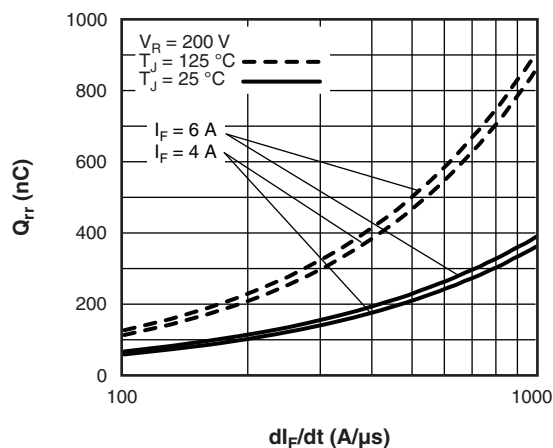
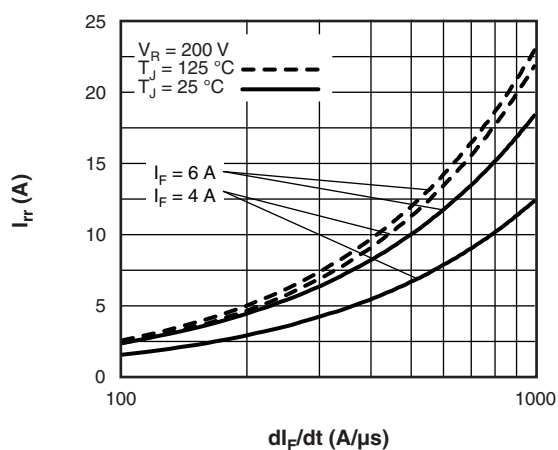
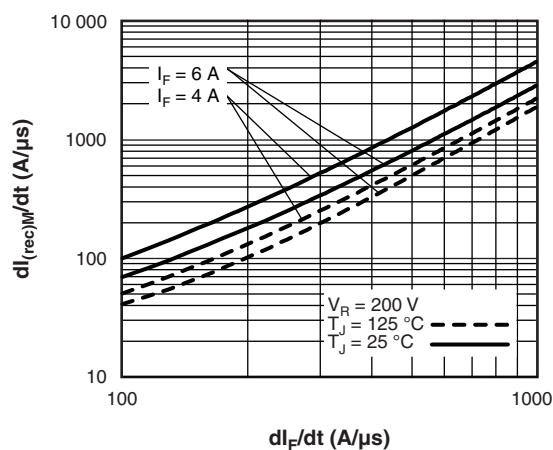


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

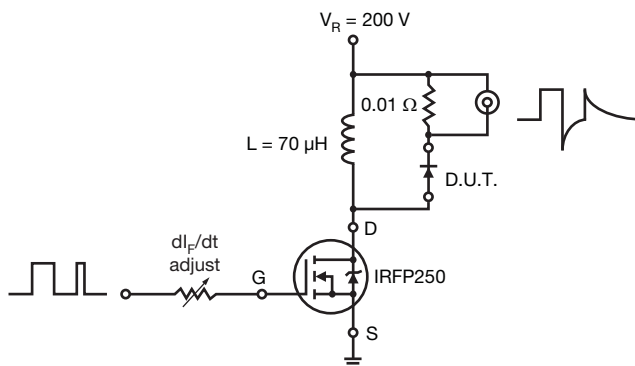


Fig. 9 - Reverse Recovery Parameter Test Circuit

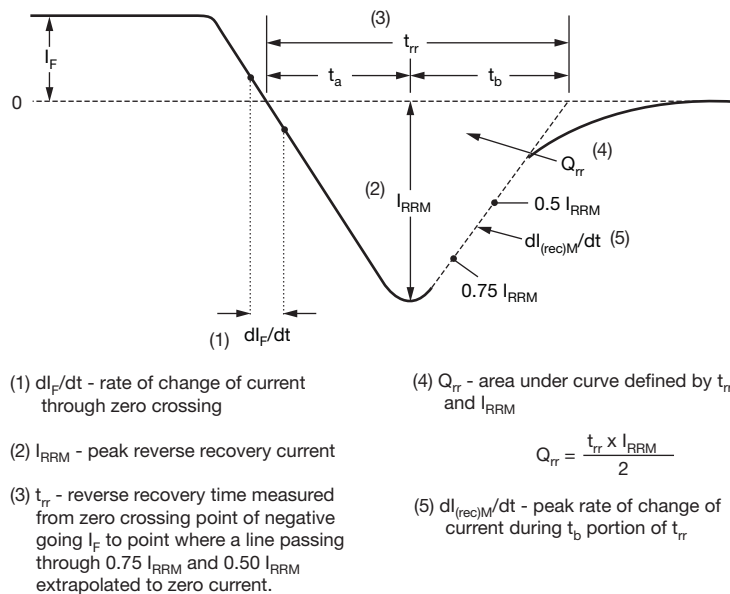


Fig. 10 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

Device code	VS-	HF	A	06	TB	120	PbF
	1	2	3	4	5	6	7

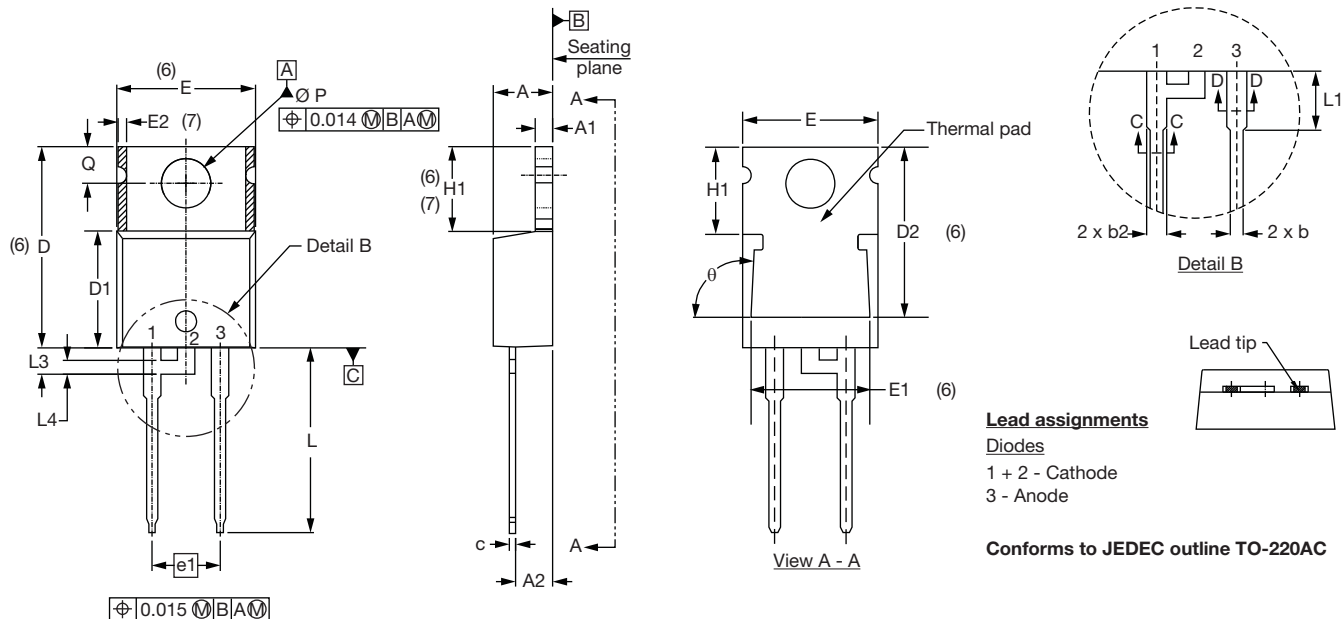
- | | | |
|----------|---|--|
| 1 | - | Vishay Semiconductors product |
| 2 | - | HEXFRED® family |
| 3 | - | Electron irradiated |
| 4 | - | Current rating (06 = 6 A) |
| 5 | - | Package:
TB = TO-220AC |
| 6 | - | Voltage rating (120 = 1200 V) |
| 7 | - | Environmental digit:
PbF = Lead (Pb)-free and RoHS compliant
-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-HFA06TB120PbF	50	1000	Antistatic plastic tube
VS-HFA06TB120-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions		www.vishay.com/doc?95221
Part marking information	TO-220ACPbF	www.vishay.com/doc?95224
	TO-220AC-N3	www.vishay.com/doc?95068

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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