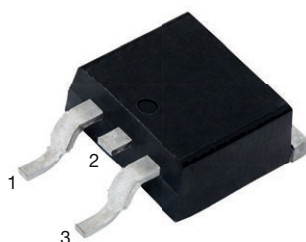
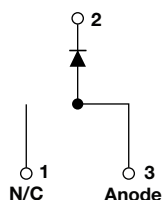


# HEXFRED® Ultrafast Soft Recovery Diode, 6 A


**D²PAK (TO-263AB)**


## FEATURES

- Ultrafast and ultrasoft recovery
- Very low  $I_{RRM}$  and  $Q_{rr}$
- Specified at operating conditions
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT  
**HALOGEN**  
**FREE**

## BENEFITS

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

## DESCRIPTION

VS-HFA06TB120S 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-HFA06TB120S 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-HFA06TB120S 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.

## PRIMARY CHARACTERISTICS

$I_{F(AV)}$	6 A
$V_R$	1200 V
$V_F$ at $I_F$	2.4 V
$t_{rr}$ (typ.)	26 ns
$T_J$ max.	150 °C
Package	D²PAK (TO-263AB)
Circuit configuration	Single

## 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	$\mu\text{A}$
		$T_J = 125\text{ }^{\circ}\text{C}$ , $V_R = 0.8 \times V_R\text{ rated}$	-	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 $t_b$	$dl_{(rec)M}/dt1$	$T_J = 25\text{ }^{\circ}\text{C}$	-	180	-	A/ $\mu\text{s}$
	$dl_{(rec)M}/dt2$	$T_J = 125\text{ }^{\circ}\text{C}$	-	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.
Marking device		Case style D <sup>2</sup> PAK (TO-263AB)	HFA06TB120S			

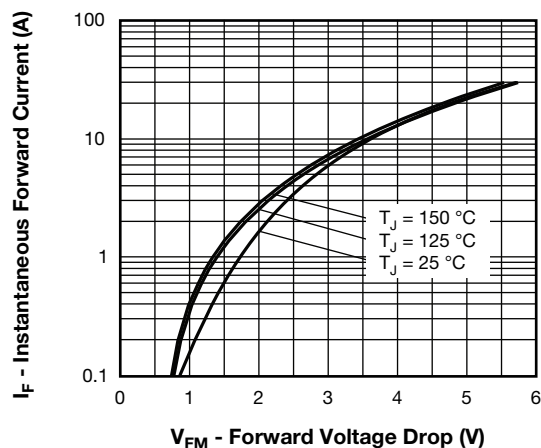


Fig. 1 - Typical Forward Voltage Drop Characteristics

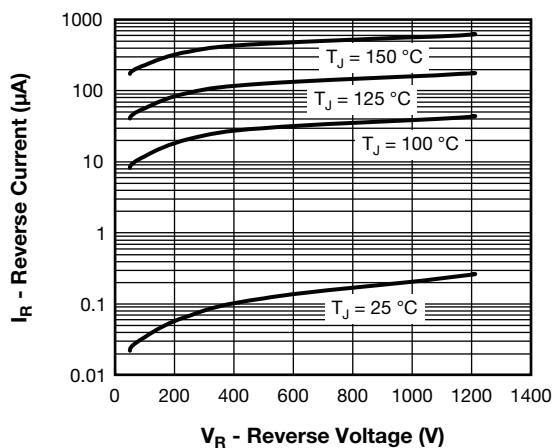


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

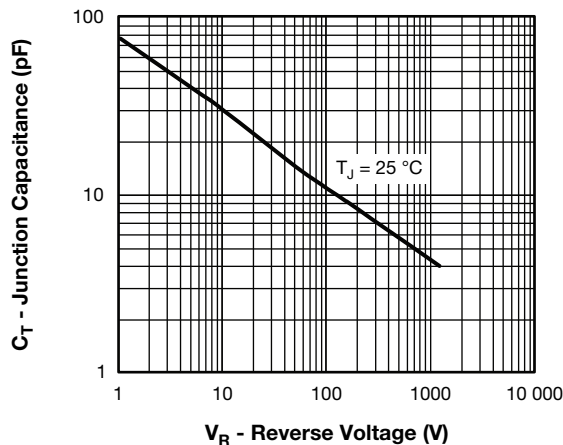
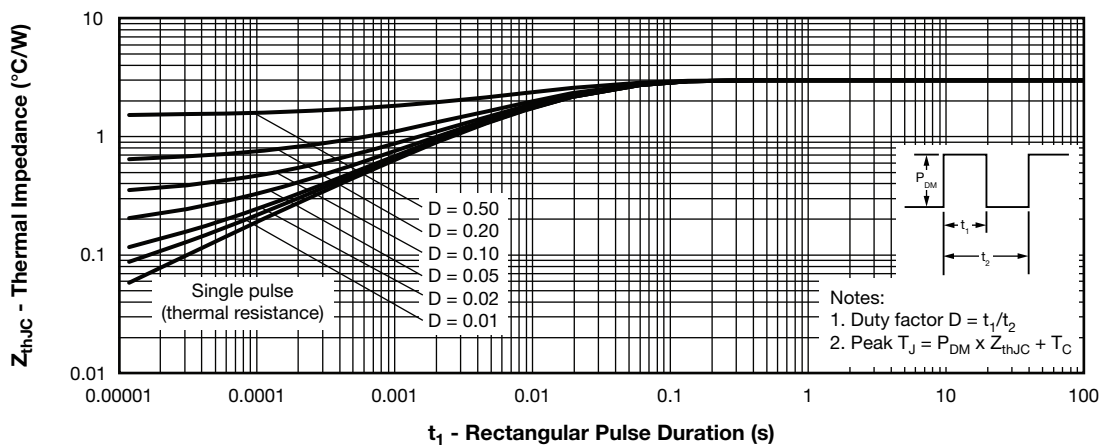
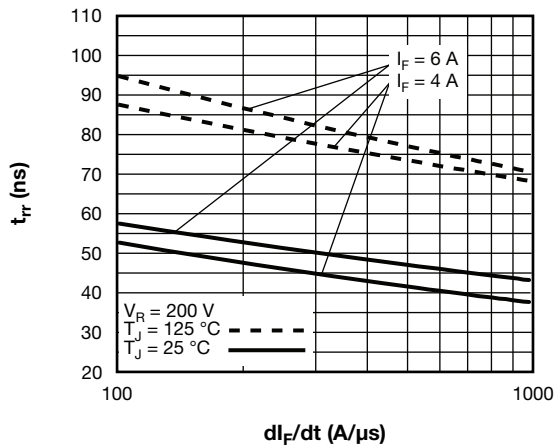
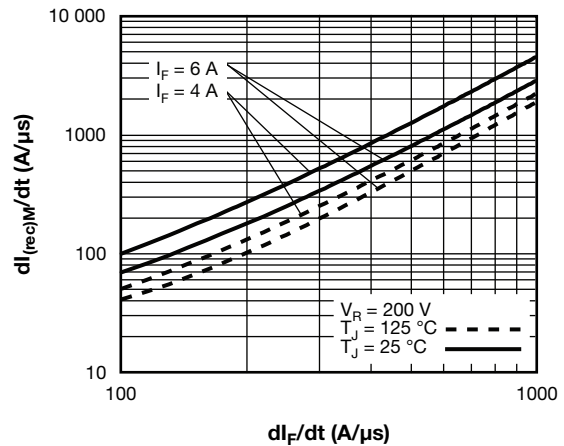
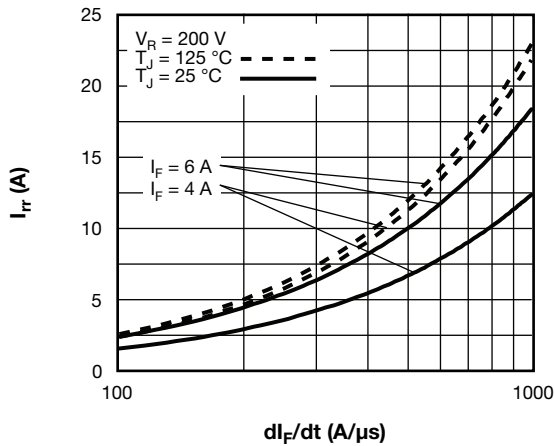
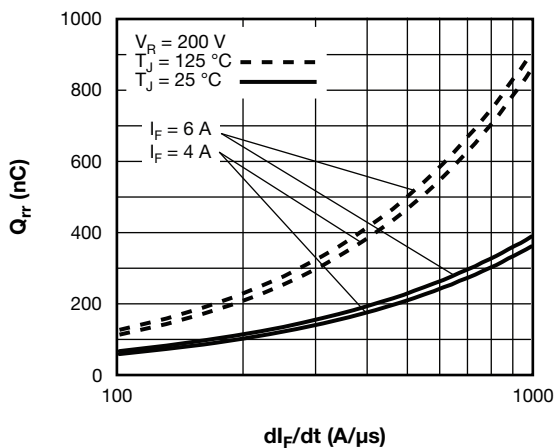


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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


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

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

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

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

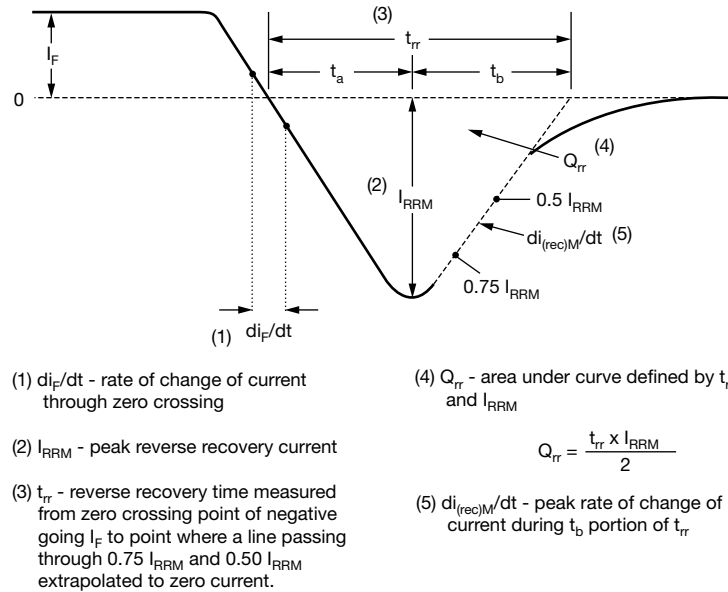


Fig. 9 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code	VS-	HF	A	06	TB	120	S	L	-M3
	1	2	3	4	5	6	7	8	9

- 1** - Vishay Semiconductors product
- 2** - HEXFRED® family
- 3** - Process designator: A = electron irradiated
- 4** - Current rating (06 = 6 A)
- 5** - Package outline (TB = TO-220, 2 leads)
- 6** - Voltage rating (120 = 1200 V)
- 7** - S = D<sup>2</sup>PAK (TO-263AB)
- 8** -
  - None = tube (50 pieces)
  - L = tape and reel (left oriented)
  - R = tape and reel (right oriented)
- 9** - Environmental digit:
  - M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free



## ORDERING INFORMATION (Example)

PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-HFA06TB120S-M3	50	Antistatic plastic tube
VS-HFA06TB120SR-M3	800	13" diameter reel
VS-HFA06TB120SL-M3	800	13" diameter reel

## LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?96164">www.vishay.com/doc?96164</a>
Part marking information	<a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a>
Packaging information	<a href="http://www.vishay.com/doc?96424">www.vishay.com/doc?96424</a>

### D<sup>2</sup>PAK

#### DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	0.00	0.254	0.000	0.010	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
e	2.54 BSC		0.100 BSC		
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.066	3
L2	1.27	1.78	0.050	0.070	
L3	0.25 BSC		0.010 BSC		
L4	4.78	5.28	0.188	0.208	

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) Dimension D 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inches
- (7) Outline conforms to JEDEC® outline TO-263AB



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