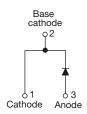


# HEXFRED® Ultrafast Soft Recovery Diode, 16 A





PRIMARY CHARACTERISTICS								
I <sub>F(AV)</sub>	16 A							
$V_{R}$	1200 V							
V <sub>F</sub> at I <sub>F</sub>	2.3 V							
t <sub>rr</sub> typ.	30 ns							
T <sub>J</sub> max.	150 °C							
Package	TO-220AC 2L							
Circuit configuration	Single							

#### **FEATURES**

- Ultrafast and ultrasoft recovery
- Very low I<sub>RBM</sub> and Q<sub>rr</sub>
- Designed and qualified according to JEDEC®-JESD 47



 Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912"><u>www.vishay.com/doc?99912</u></a>

#### **BENEFITS**

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

#### **DESCRIPTION**

VS-HFA16TB120... 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 16 A continuous current, the VS-HFA16TB120... 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<sub>RRM</sub>) and does not exhibit any tendency to "snap-off" during the t<sub>b</sub> 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-HFA16TB120... 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.

ABSOLUTE MAXIMUM RATINGS									
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS					
Cathode to anode voltage	$V_R$		1200	V					
Maximum continuous forward current	I <sub>F</sub>	T <sub>C</sub> = 100 °C	16						
Single pulse forward current	I <sub>FSM</sub>		190	Α					
Maximum repetitive forward current	I <sub>FRM</sub>		64						
Maximum nauga discination	Б	T <sub>C</sub> = 25 °C	151	10/					
Maximum power dissipation	$P_{D}$	T <sub>C</sub> = 100 °C	60	W					
Operating junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		-55 to +150	°C					



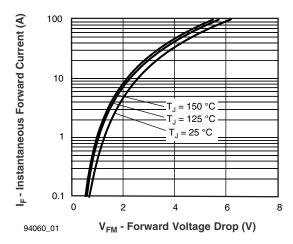


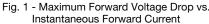
<b>ELECTRICAL SPECIFICATIONS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)									
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS			
Cathode to anode breakdown voltage	V <sub>BR</sub>	I <sub>R</sub> = 100 μA	1200	-	-				
Maximum forward voltage		I <sub>F</sub> = 16 A		-	2.5	3.0	V		
	$V_{FM}$	I <sub>F</sub> = 32 A	See fig. 1	-	3.2	3.93			
		I <sub>F</sub> = 16 A, T <sub>J</sub> = 125 °C		-	2.3	2.7			
Maximum reverse		$V_R = V_R$ rated	Cooffe 0	-	0.75	20			
leakage current	I <sub>RM</sub>	$T_J = 125$ °C, $V_R = 0.8 \times V_R$ rated	See fig. 2	-	375	2000	μA		
Junction capacitance	C <sub>T</sub>	V <sub>R</sub> = 200 V See fig. 3		-	27	40	pF		
Series inductance	L <sub>S</sub>	Measured lead to lead 5 mm from pa	-	8.0	-	nΗ			

<b>DYNAMIC RECOVERY CHARACTERISTICS</b> (T <sub>J</sub> = 25 °C unless otherwise specified)									
PARAMETER	SYMBOL	TEST CO	NDITIONS	MIN.	TYP.	MAX.	UNITS		
	t <sub>rr</sub>	$I_F = 1.0 \text{ A}, \text{ di}_F/\text{dt} = 200 \text{ A/}\mu\text{s}, \text{ V}_R = 30 \text{ V}$		-	30	-			
Reverse recovery time See fig. 5 and 10	t <sub>rr1</sub>	T <sub>J</sub> = 25 °C		-	90	135	ns		
coo ng. o ana 10	t <sub>rr2</sub>	T <sub>J</sub> = 125 °C		-	164	245			
Peak recovery current	I <sub>RRM1</sub>	T <sub>J</sub> = 25 °C	I <sub>F</sub> = 16 A di <sub>F</sub> /dt = 200 A/μs V <sub>R</sub> = 200 V	-	5.8	10	A nC A/μs		
See fig. 6	I <sub>RRM2</sub>	T <sub>J</sub> = 125 °C		-	8.3	15			
Reverse recovery charge	Q <sub>rr1</sub>	T <sub>J</sub> = 25 °C		-	260	675			
See fig. 7	Q <sub>rr2</sub>	T <sub>J</sub> = 125 °C		-	680	1838			
Peak rate of fall of recovery current during t <sub>b</sub> See fig. 8	di <sub>(rec)M</sub> /dt1	T <sub>J</sub> = 25 °C		-	120	-			
	di <sub>(rec)M</sub> /dt2	T <sub>J</sub> = 125 °C		-	76	-			

THERMAL - MECHANICAL SPECIFICATIONS									
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS			
Lead temperature	T <sub>lead</sub>	0.063" from case (1.6 mm) for 10 s	-	-	300	°C			
Thermal resistance, junction to case	R <sub>thJC</sub>		-	-	0.83				
Thermal resistance, junction to ambient RthJA Ty		Typical socket mount	ı	80	K/W				
Thermal resistance, case to heatsink	R <sub>thCS</sub>	Mounting surface, flat, smooth, and greased	-	0.50	-				
Weight			-	2.0	-	g			
vveignt			-	0.07	ī	OZ.			
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)			
Marking device		Case style 2L TO-220AC	HFA16TB120						







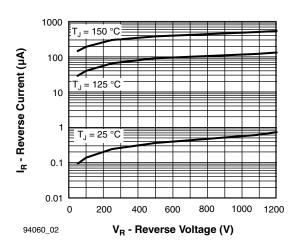


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

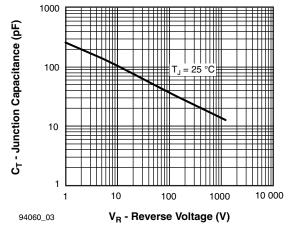


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

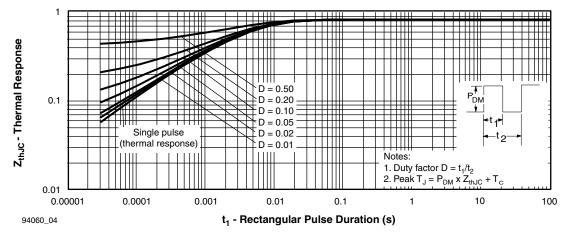


Fig. 4 - Maximum Thermal Impedance Z<sub>thJC</sub> Characteristics

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## Vishay Semiconductors

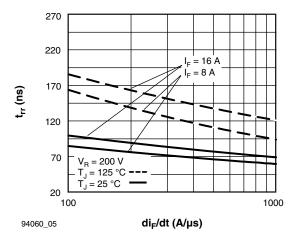


Fig. 5 - Typical Reverse Recovery Time vs. di<sub>F</sub>/dt (Per Leg)

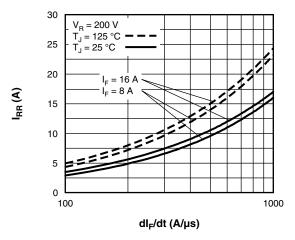


Fig. 6 - Typical Recovery Current vs. di<sub>F</sub>/dt (Per Leg

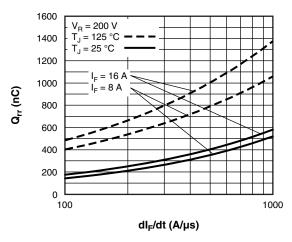


Fig. 7 - Typical Stored Charge vs. di<sub>F</sub>/dt (Per Leg)

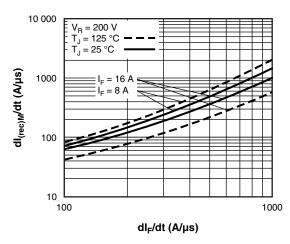
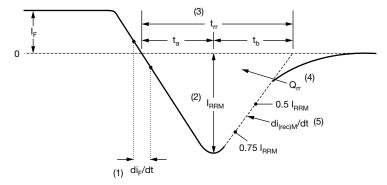


Fig. 8 - Typical di<sub>(rec)M</sub>/dt vs. di<sub>F</sub>/dt (Per Leg)



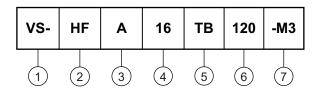
- di<sub>F</sub>/dt rate of change of current through zero crossing
- (2)  $I_{RRM}$  peak reverse recovery current
- (3) t<sub>rr</sub> reverse recovery time measured from zero crossing point of negative going I<sub>F</sub> to point where a line passing through 0.75 I<sub>RRM</sub> and 0.50 I<sub>RRM</sub> extrapolated to zero current.
- (4)  $\mathbf{Q}_{\rm rr}$  area under curve defined by  $\mathbf{t}_{\rm rr}$  and  $\mathbf{I}_{\rm RRM}$ 
  - $Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$
- (5)  $di_{(rec)M}/dt$  peak rate of change of current during  $t_{b}$  portion of  $t_{rr}$

Fig. 9 - Reverse Recovery Waveform and Definitions



#### **ORDERING INFORMATION TABLE**

Device code



1 - Vishay Semiconductors product

- HEXFRED® family

Electron irradiated

Current rating (16 = 16 A)

5 - Package:

TB = 2L TO-220AC

6 - Voltage rating (120 = 1200 V)

7 - Environmental digit:

-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

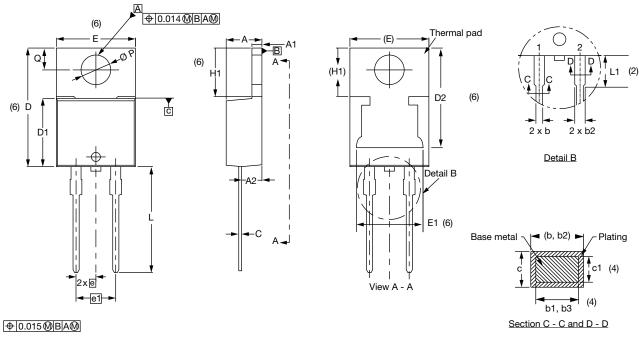
ORDERING INFORMATION (Example)								
PREFERRED P/N BASE QUANTITY PACKAGING DESCRIPTION								
VS-HFA16TB120-M3	50	Antistatic plastic tube						

LINKS TO RELATED DOCUMENTS							
Dimensions	www.vishay.com/doc?96156						
Part marking information	www.vishay.com/doc?95391						



### **TO-220AC 2L**

#### **DIMENSIONS** in millimeters and inches



Lead tip

Conforms to JEDEC® outline TO-220AC

SYMBOL	MILLIMETERS		INC	HES	NOTES	NOTES	SYMBOL	MILLIM	IETERS	INC	HES	NOTES
STMBOL	MIN.	MAX.	MIN.	MAX.	NOTES		STWIBOL	MIN.	MAX.	MIN.	MAX.	NOTES
Α	4.25	4.65	0.167	0.183			D2	11.68	13.30	0.460	0.524	6, 7
A1	1.14	1.40	0.045	0.055			E	10.11	10.51	0.398	0.414	3, 6
A2	2.50	2.92	0.098	0.115			E1	6.86	8.89	0.270	0.350	6
b	0.69	1.01	0.027	0.040			е	2.41	2.67	0.095	0.105	
b1	0.38	0.97	0.015	0.038	4		e1	4.88	5.28	0.192	0.208	
b2	1.20	1.73	0.047	0.068			H1	6.09	6.48	0.240	0.255	6
b3	1.14	1.73	0.045	0.068	4		L	13.52	14.02	0.532	0.552	
С	0.36	0.61	0.014	0.024			L1	3.32	3.82	0.131	0.150	2
c1	0.36	0.56	0.014	0.022	4		ØΡ	3.54	3.91	0.139	0.154	
D	14.85	15.35	0.585	0.604	3		Q	2.60	3.00	0.102	0.118	
D1	8.38	9.02	0.330	0.355							•	

#### 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 dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2, and E1
- (7) Outline conforms to JEDEC® TO-220, except D2



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