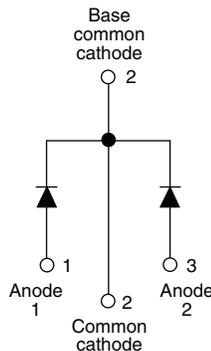


## HEXFRED® Ultrafast Soft Recovery Diode, 2 x 8 A


**TO-247AC**

**FEATURES**

- Ultrafast and ultrasoft recovery
- Very low  $I_{RRM}$  and  $Q_{rr}$
- Designed and qualified according to JEDEC®-JESD47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**BENEFITS**

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

**DESCRIPTION**

VS-HFA16PA120C... 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 8 A per leg continuous current, the VS-HFA16PA120C... 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-HFA16PA120C... 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-247AC
$I_{F(AV)}$	2 x 8 A
$V_R$	1200 V
$V_F$ at $I_F$	2.4 V
$t_{rr}$ typ.	28 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 <span style="float: right;">per leg per device</span>	$I_F$	$T_C = 100\text{ °C}$	8 16	A
Single pulse forward current	$I_{FSM}$		130	
Maximum repetitive forward current	$I_{FRM}$		32	
Maximum power dissipation	$P_D$	$T_C = 25\text{ °C}$ $T_C = 100\text{ °C}$	73.5 29	W
Operating junction and storage temperature range	$T_J, T_{Stg}$		-55 to +150	°C



<b>ELECTRICAL SPECIFICATIONS PER LEG</b> ( $T_J = 25\text{ }^\circ\text{C}$ 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	$V_{FM}$	$I_F = 8.0\text{ A}$	-	2.6	3.3	
		$I_F = 16\text{ A}$	-	3.4	4.3	
		$I_F = 8.0\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	2.4	3.1	
Maximum reverse leakage current	$I_{RM}$	$V_R = V_R\text{ rated}$	-	0.31	10	$\mu\text{A}$
		$T_J = 125\text{ }^\circ\text{C}, V_R = 0.8 \times V_R\text{ rated}$	-	135	1000	
Junction capacitance	$C_T$	$V_R = 200\text{ V}$	-	11	20	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package	-	8.0	-	nH

<b>DYNAMIC RECOVERY CHARACTERISTICS PER LEG</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1.0\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 30\text{ V}$	-	28	-	ns
	$t_{rr1}$	$T_J = 25\text{ }^\circ\text{C}$	-	63	95	
	$t_{rr2}$	$T_J = 125\text{ }^\circ\text{C}$	-	106	160	
Peak recovery current	$I_{RRM1}$	$T_J = 25\text{ }^\circ\text{C}$	-	4.5	8.0	A
	$I_{RRM2}$	$T_J = 125\text{ }^\circ\text{C}$	-	6.2	11	
Reverse recovery charge	$Q_{rr1}$	$T_J = 25\text{ }^\circ\text{C}$	-	140	380	nC
	$Q_{rr2}$	$T_J = 125\text{ }^\circ\text{C}$	-	335	880	
Peak rate of recovery current during $t_b$	$di_{(rec)M}/dt1$	$T_J = 25\text{ }^\circ\text{C}$	-	133	-	A/ $\mu\text{s}$
	$di_{(rec)M}/dt2$	$T_J = 125\text{ }^\circ\text{C}$	-	85	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
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	$R_{thJC}$		-	-	1.7	K/W
Thermal resistance, junction to ambient	$R_{thJA}$	Typical socket mount	-	-	40	
Thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, flat, smooth and greased	-	0.25	-	
Weight			-	6.0	-	g
			-	0.21	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-247AC (JEDEC)	HFA16PA120C			

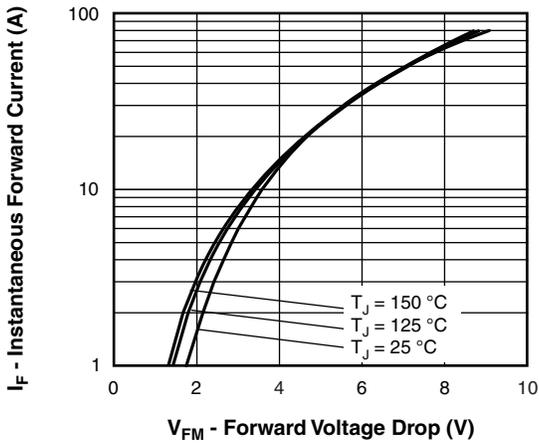


Fig. 1 - Maximum Forward Voltage Drop Characteristics

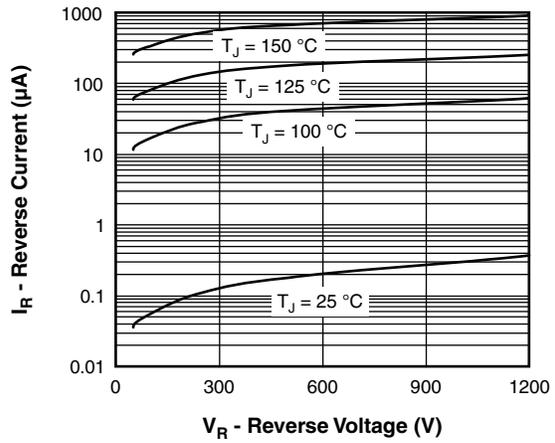


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

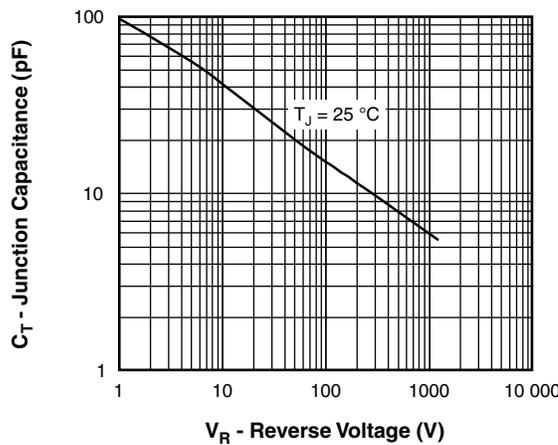


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

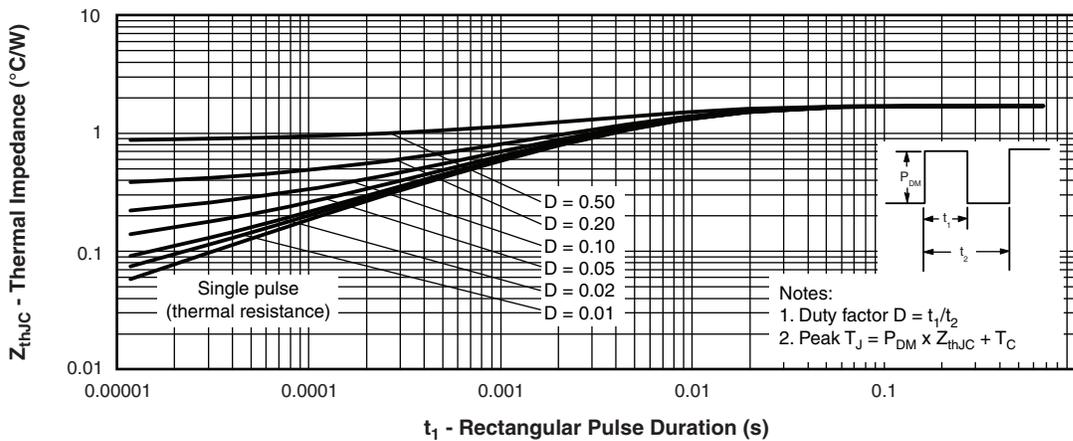


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

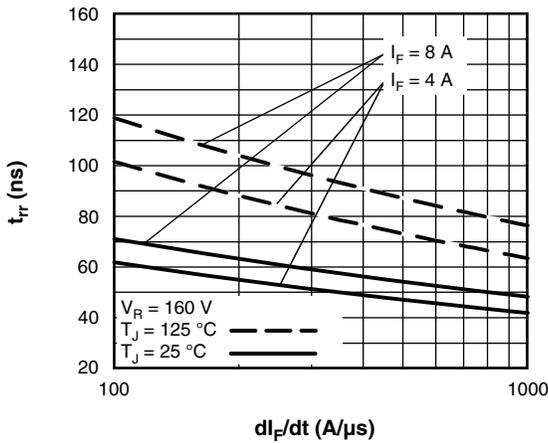


Fig. 5 - Typical Reverse Recovery Time vs.  $dI_F/dt$

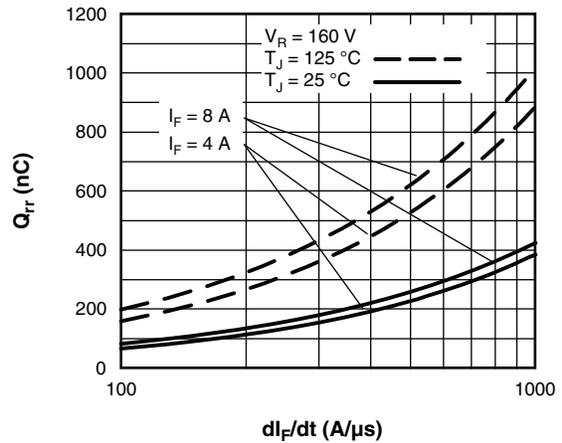


Fig. 7 - Typical Stored Charge vs.  $dI_F/dt$

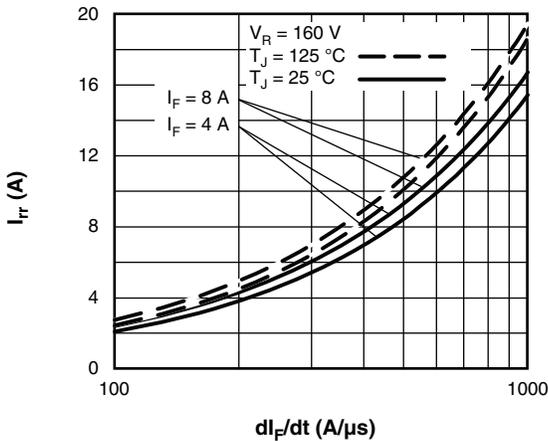


Fig. 6 - Typical Recovery Current vs.  $dI_F/dt$

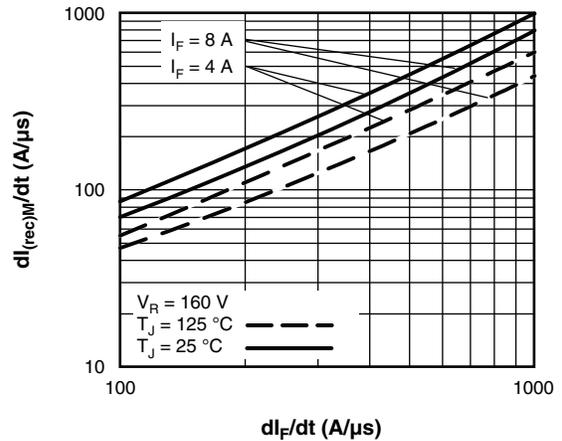


Fig. 8 - Typical  $dI_{(rec)M}/dt$  vs.  $dI_F/dt$

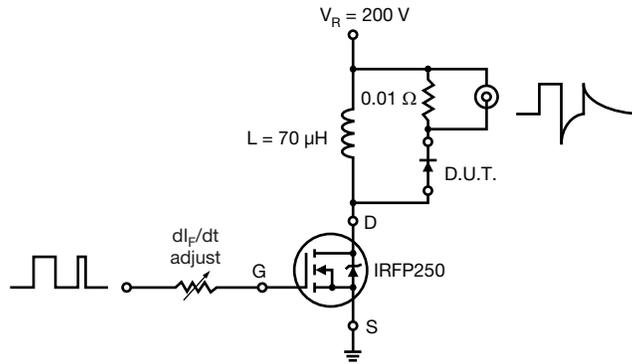
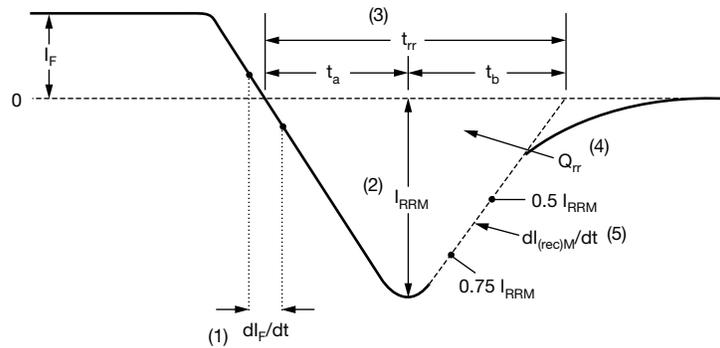


Fig. 9 - Reverse Recovery Parameter Test Circuit



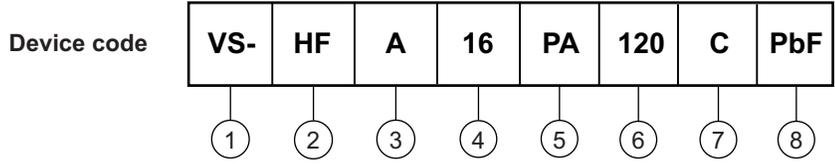
- (1)  $di_F/dt$  - rate of change of current through zero crossing
- (2)  $I_{RRM}$  - peak reverse recovery current
- (3)  $t_{rr}$  - reverse recovery time measured from zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.50 I_{RRM}$  extrapolated to zero current.
- (4)  $Q_{rr}$  - area under curve defined by  $t_{rr}$  and  $I_{RRM}$
- (5)  $dl_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

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

Fig. 10 - Reverse Recovery Waveform and Definitions



## ORDERING INFORMATION TABLE



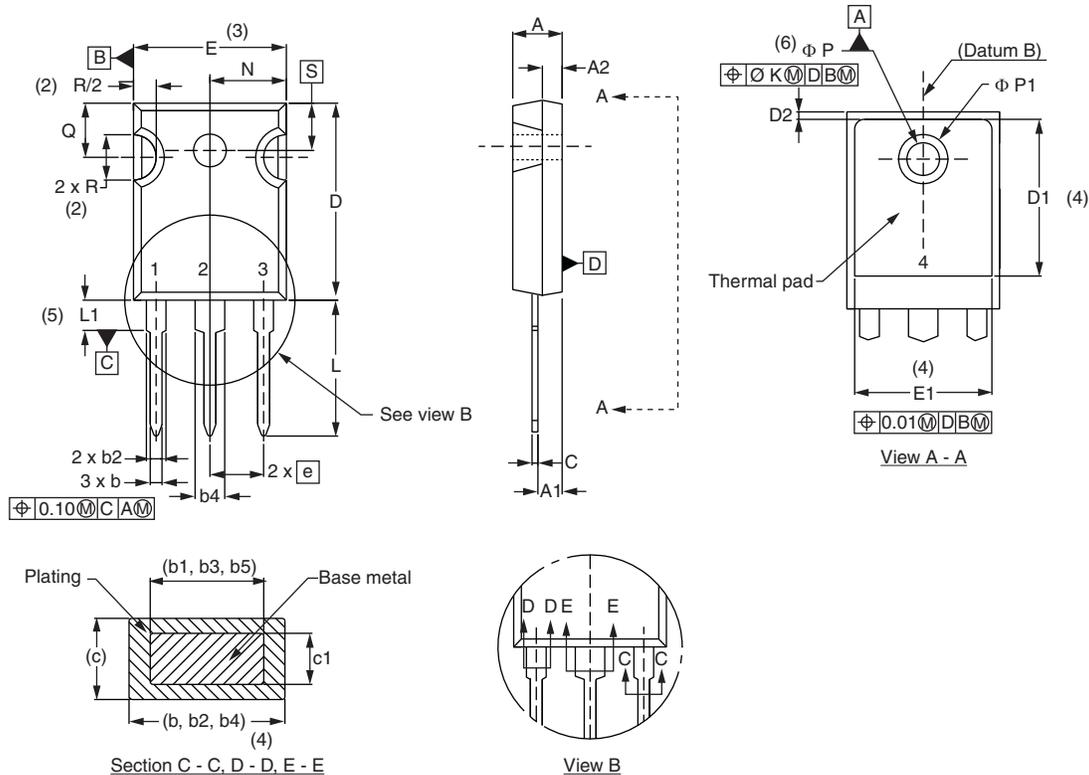
- 1** - Vishay Semiconductors product
- 2** - HEXFRED® family
- 3** - Electron irradiated
- 4** - Current rating (16 = 16 A)
- 5** - PA = TO-247AC
- 6** - Voltage rating: (120 = 1200 V)
- 7** - Circuit configuration  
C = Common cathode
- 7** - Environmental digit:  
PbF = lead (Pb)-free and RoHS-compliant  
-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-HFA16PA120CPbF	25	500	Antistatic plastic tube
VS-HFA16PA120C-N3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions		<a href="http://www.vishay.com/doc?95542">www.vishay.com/doc?95542</a>
Part marking information	TO-247ACPbF	<a href="http://www.vishay.com/doc?95226">www.vishay.com/doc?95226</a>
	TO-247AC-N3	<a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a>

### TO-247 - 50 mils L/F

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209		D2	0.51	1.35	0.020	0.053	
A1	2.21	2.59	0.087	0.102		E	15.29	15.87	0.602	0.625	3
A2	1.17	1.37	0.046	0.054		E1	13.46	-	0.53	-	
b	0.99	1.40	0.039	0.055		e	5.46 BSC		0.215 BSC		
b1	0.99	1.35	0.039	0.053		$\varnothing K$	0.254		0.010		
b2	1.65	2.39	0.065	0.094		L	14.20	16.10	0.559	0.634	
b3	1.65	2.34	0.065	0.092		L1	3.71	4.29	0.146	0.169	
b4	2.59	3.43	0.102	0.135		N	7.62 BSC		0.3		
b5	2.59	3.38	0.102	0.133		$\varnothing P$	3.56	3.66	0.14	0.144	
c	0.38	0.89	0.015	0.035		$\varnothing P1$	-	7.39	-	0.291	
c1	0.38	0.84	0.015	0.033		Q	5.31	5.69	0.209	0.224	
D	19.71	20.70	0.776	0.815	3	R	4.52	5.49	0.178	0.216	
D1	13.08	-	0.515	-	4	S	5.51 BSC		0.217 BSC		

**Notes**

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) 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 outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6)  $\varnothing P$  to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC® outline TO-247 with exception of dimension c and Q



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