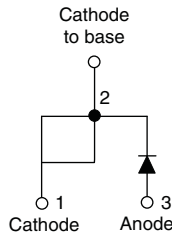


## HEXFRED® Ultrafast Soft Recovery Diode, 16 A


**TO-247AC modified**

**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-HFA16PB120... 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-HFA16PB120... 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-HFA16PB120... 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 modified (2 pins)
$I_{F(AV)}$	16 A
$V_R$	1200 V
$V_F$ at $I_F$	3.0 V
$t_{rr}$ typ.	30 ns
$T_J$ max.	150 °C
Diode variation	Single die

**ABSOLUTE MAXIMUM RATINGS**

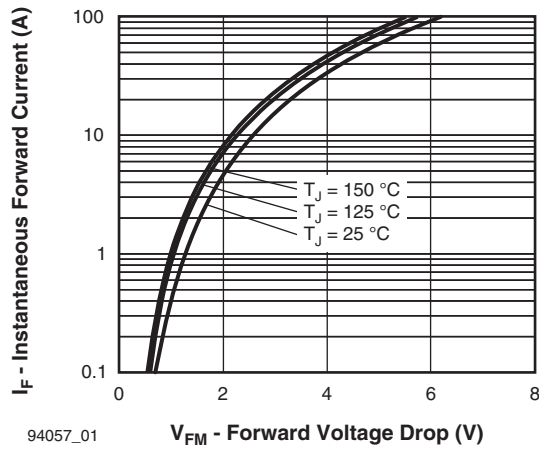
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	$V_R$		1200	V
Maximum continuous forward current	$I_F$	$T_C = 100\text{ °C}$	16	A
Single pulse forward current	$I_{FSM}$		190	
Maximum repetitive forward current	$I_{FRM}$		64	
Maximum power dissipation	$P_D$	$T_C = 25\text{ °C}$	151	W
		$T_C = 100\text{ °C}$	60	
Operating junction and storage temperature range	$T_J, T_{Stg}$		- 55 to + 150	°C



<b>ELECTRICAL SPECIFICATIONS</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	$V_{FM}$	$I_F = 16\text{ A}$	-	2.5	3.0	
		$I_F = 32\text{ A}$	-	3.2	3.93	
		$I_F = 16\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	2.3	2.7	
Maximum reverse leakage current	$I_{RM}$	$V_R = V_R$ rated	-	0.75	20	$\mu\text{A}$
		$T_J = 125\text{ }^\circ\text{C}, V_R = 0.8 \times V_R$ rated	-	375	2000	
Junction capacitance	$C_T$	$V_R = 200\text{ V}$	-	27	40	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH

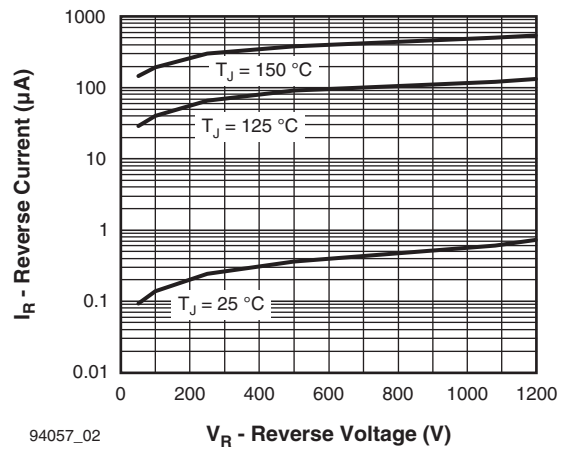
<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time See fig. 5, 10	$t_{rr}$	$I_F = 1.0\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 30\text{ V}$	-	30	-	ns
	$t_{rr1}$	$T_J = 25\text{ }^\circ\text{C}$	-	90	135	
	$t_{rr2}$	$T_J = 125\text{ }^\circ\text{C}$	-	164	245	
Peak recovery current See fig. 6	$I_{RRM1}$	$T_J = 25\text{ }^\circ\text{C}$	-	5.8	10	A
	$I_{RRM2}$	$T_J = 125\text{ }^\circ\text{C}$	-	8.3	15	
Reverse recovery charge See fig. 7	$Q_{rr1}$	$T_J = 25\text{ }^\circ\text{C}$	-	260	675	nC
	$Q_{rr2}$	$T_J = 125\text{ }^\circ\text{C}$	-	680	1838	
Peak rate of fall of recovery current during $t_b$ See fig. 8	$di_{(rec)M}/dt1$	$T_J = 25\text{ }^\circ\text{C}$	-	120	-	$\text{A}/\mu\text{s}$
	$di_{(rec)M}/dt2$	$T_J = 125\text{ }^\circ\text{C}$	-	76	-	

<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	$R_{thJC}$		-	-	0.83	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	-	0.50	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-247AC modified (JEDEC)	HFA16PB120			



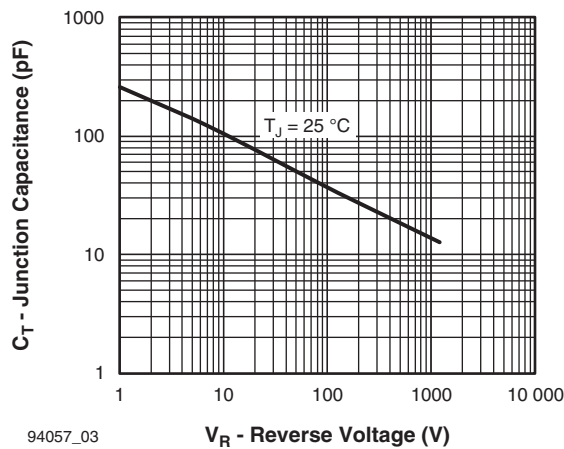
94057\_01 **V<sub>FM</sub> - Forward Voltage Drop (V)**

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



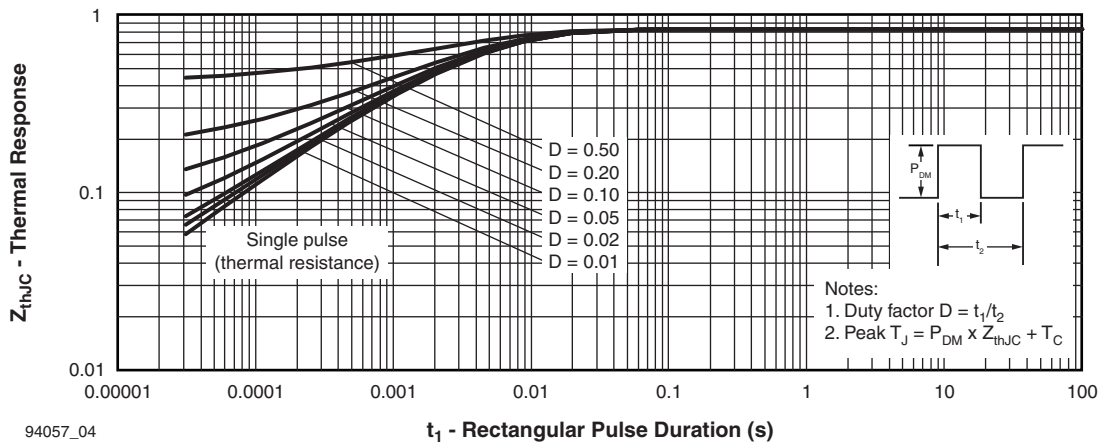
94057\_02 **V<sub>R</sub> - Reverse Voltage (V)**

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



94057\_03 **V<sub>R</sub> - Reverse Voltage (V)**

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage



94057\_04

**t<sub>1</sub> - Rectangular Pulse Duration (s)**

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

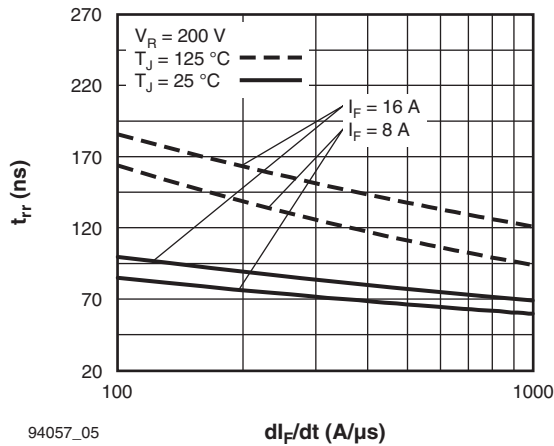


Fig. 5 - Typical Reverse Recovery Time vs.  $di_F/dt$  (Per Leg)

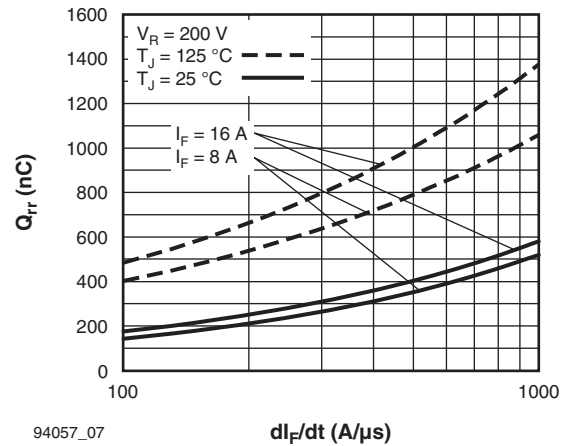


Fig. 7 - Typical Stored Charge vs.  $di_F/dt$  (Per Leg)

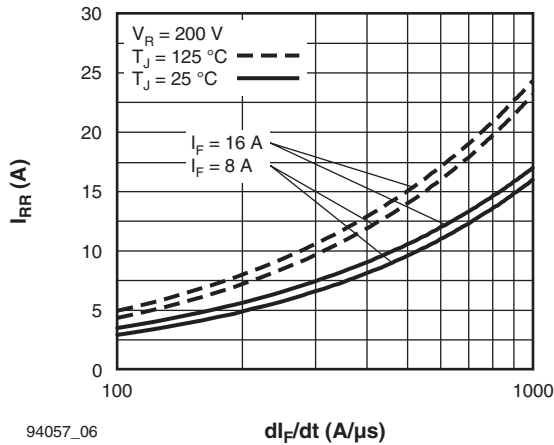


Fig. 6 - Typical Recovery Current vs.  $di_F/dt$  (Per Leg)

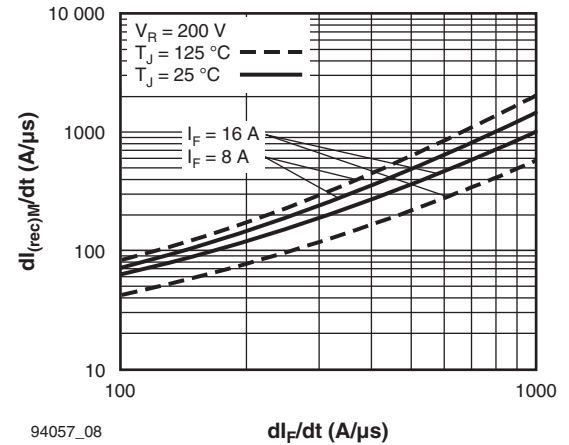


Fig. 8 - Typical  $di_{(rec)M}/dt$  vs.  $di_F/dt$  (Per Leg)

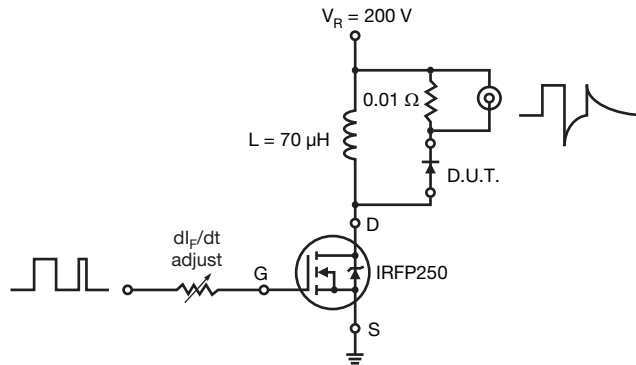


Fig. 9 - Reverse Recovery Parameter Test Circuit

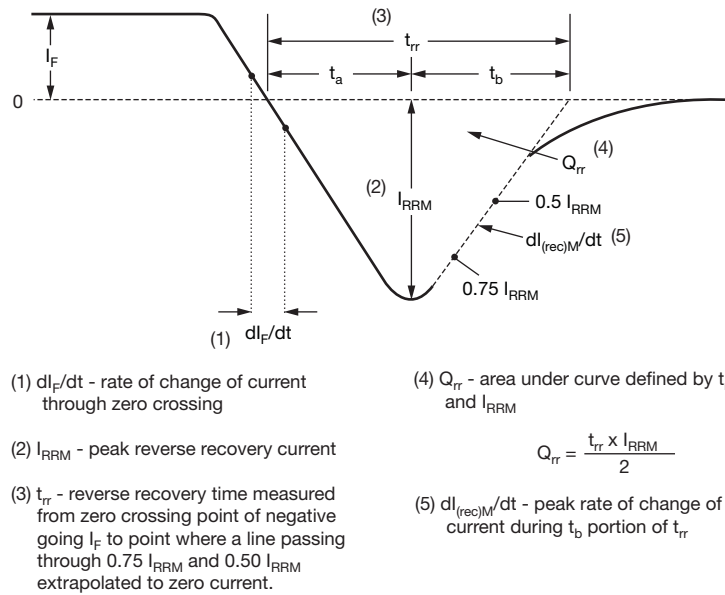
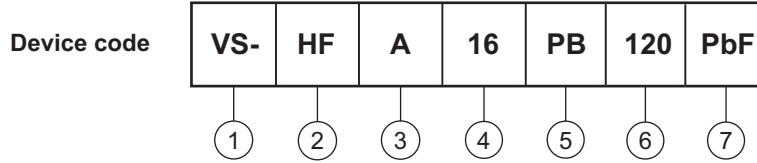


Fig. 10 - Reverse Recovery Waveform and Definitions



## ORDERING INFORMATION TABLE



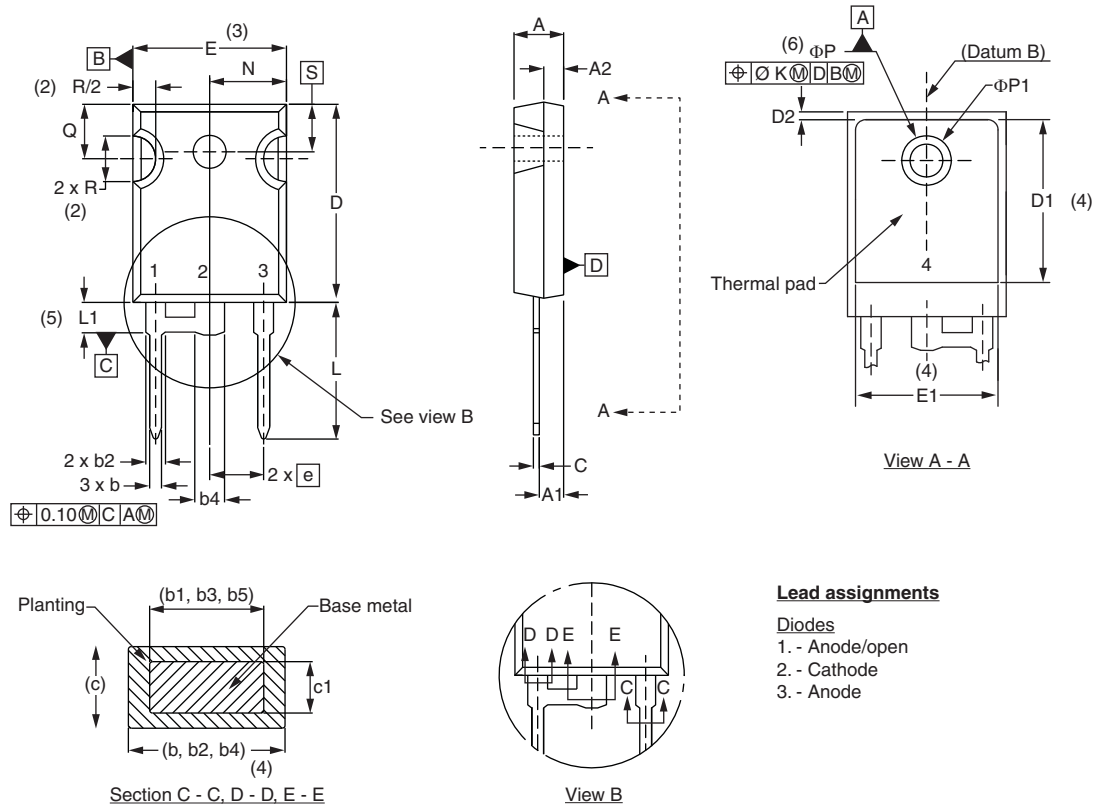
- 1** - Vishay Semiconductors product
  - 2** - HEXFRED® family
  - 3** - Electron irradiated
  - 4** - Current rating (16 = 16 A)
  - 5** - PB = TO-247AC modified
  - 6** - Voltage rating: (120 = 1200 V)
  - 7** - Environmental digit:
- PbF = Lead (Pb)-free and RoHS compliant  
 -N3 = Halogen-free, RoHS compliant and totally lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-HFA16PB120PbF	25	500	Antistatic plastic tube
VS-HFA16PB120-N3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95253">www.vishay.com/doc?95253</a>
Part marking information	TO-247AC modified PbF <a href="http://www.vishay.com/doc?95255">www.vishay.com/doc?95255</a>
	TO-247AC modified -N3 <a href="http://www.vishay.com/doc?95442">www.vishay.com/doc?95442</a>



**DIMENSIONS** in millimeters and inches



**Lead assignments**

- Diodes  
 1. - Anode/open  
 2. - Cathode  
 3. - Anode

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.50	2.49	0.059	0.098	
b	0.99	1.40	0.039	0.055	
b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.37	0.065	0.094	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
c	0.38	0.86	0.015	0.034	
c1	0.38	0.76	0.015	0.030	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4
D2	0.51	1.30	0.020	0.051	
E	15.29	15.87	0.602	0.625	3
E1	13.72	-	0.540	-	
e	5.46 BSC		0.215 BSC		
ΦK	2.54		0.010		
L	14.20	16.10	0.559	0.634	
L1	3.71	4.29	0.146	0.169	
N	7.62 BSC		0.3		
ΦP	3.56	3.66	0.14	0.144	
ΦP1	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	1.78	0.216	
S	5.51 BSC		0.217 BSC		

**Notes**

- (1) Dimensioning and tolerance 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) ΦP 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



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**





Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.