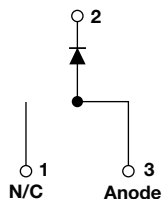


HEXFRED®

Ultrafast Soft Recovery Diode, 4 A


D²PAK

FEATURES

- Ultrafast recovery
- Ultrasoft recovery
- Very low I_{RRM}
- Very low Q_{rr}
- Specified at operating temperature
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Halogen-free according to IEC 61249-2-21 definition
- Compliant to RoHS directive 2002/95/EC
- AEC-Q101 qualified



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-HFA04TB60S 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 600 V and 4 A continuous current, the VS-HFA04TB60S 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-HFA04TB60S 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

V_R	600 V
V_F at 4 A at 25 °C	1.8 V
$I_{F(AV)}$	4 A
t_{rr} (typical)	17 ns
T_J (maximum)	150 °C
Q_{rr} at 125 °C	40 nC
$di_{(rec)M}/dt$ at 125 °C	280 A/μs

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	V_R		600	V
Maximum continuous forward current	I_F	$T_C = 100\text{ °C}$	4	A
Single pulse forward current	I_{FSM}		25	
Maximum repetitive forward current	I_{FRM}		16	
Maximum power dissipation	P_D	$T_C = 25\text{ °C}$	25	W
		$T_C = 100\text{ °C}$	10	
Operating junction and storage temperature range	T_J, T_{Stg}		- 55 to + 150	°C

ELECTRICAL SPECIFICATIONS (T _J = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	V _{BR}	I _R = 100 μA		600	-	-	V
Maximum forward voltage	V _{FM}	I _F = 4.0 A	See fig. 1	-	1.5	1.8	
		I _F = 8.0 A		-	1.8	2.2	
		I _F = 4.0 A, T _J = 125 °C		-	1.4	1.7	
Maximum reverse leakage current	I _{RM}	V _R = V _R rated	See fig. 2	-	0.17	3.0	μA
		T _J = 125 °C, V _R = 0.8 x V _R rated		-	44	300	
Junction capacitance	C _T	V _R = 200 V	See fig. 3	-	4.0	8.0	pF
Series inductance	L _S	Measured lead to lead 5 mm from package body		-	8.0	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time See fig. 5, 6	t _{rr}	I _F = 1.0 A, dI _F /dt = 200 A/μs, V _R = 30 V		-	17	-	ns
	t _{rr1}	T _J = 25 °C	I _F = 4.0 A dI _F /dt = 200 A/μs V _R = 200 V	-	28	42	
	t _{rr2}	T _J = 125 °C		-	38	57	
Peak recovery current	I _{RRM1}	T _J = 25 °C		-	2.9	5.2	A
	I _{RRM2}	T _J = 125 °C		-	3.7	6.7	
Reverse recovery charge See fig. 7	Q _{rr1}	T _J = 25 °C		-	40	60	nC
	Q _{rr2}	T _J = 125 °C		-	70	105	
Peak rate of fall of recovery current during t _b See fig. 8	di _{(rec)M} /dt1	T _J = 25 °C		-	280	-	A/μs
	di _{(rec)M} /dt2	T _J = 125 °C		-	235	-	

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	°C
Thermal resistance, junction to case	R _{thJC}		-	-	5.0	K/W
Thermal resistance, junction to ambient	R _{thJA}	Typical socket mount	-	-	80	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Marking device		Case style D ² PAK	HFA04TB60S			



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VS-HFA04TB60SPbF

Vishay High Power Products

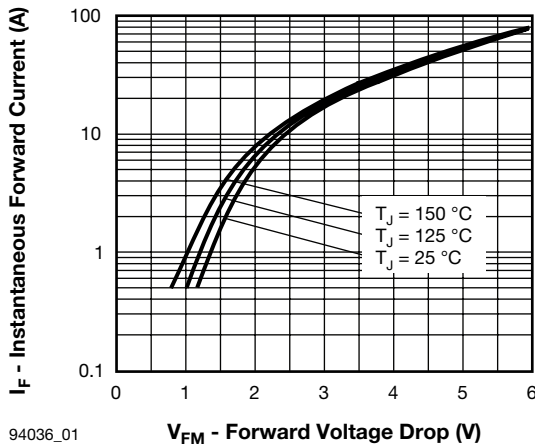


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

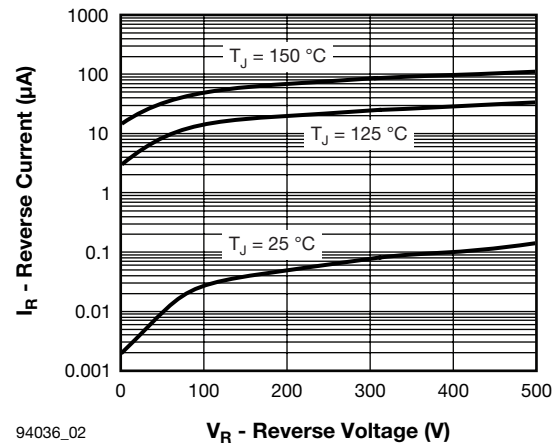


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

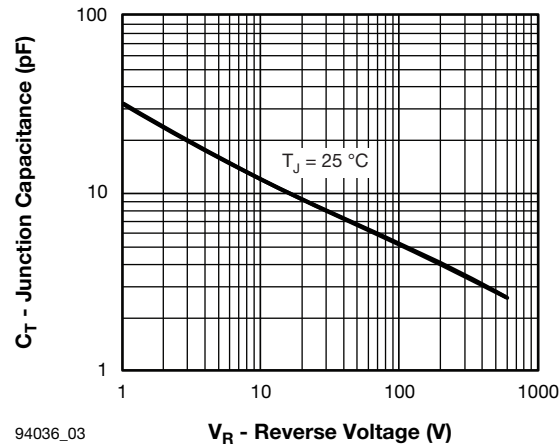


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

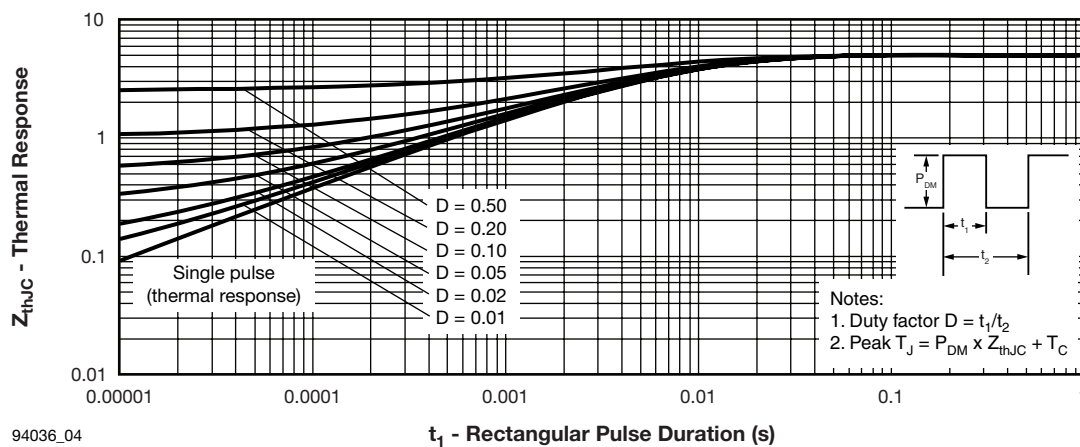


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

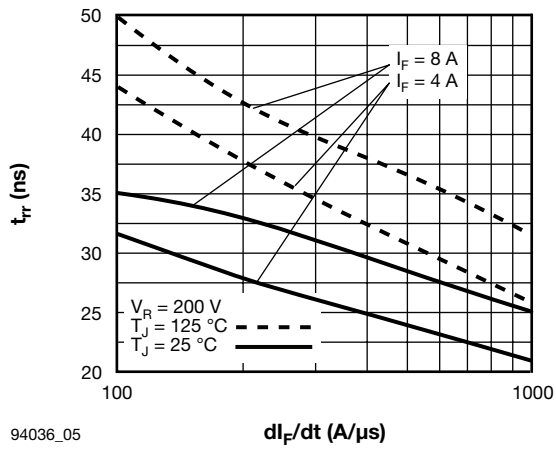


Fig. 5 - Typical Reverse Recovery Time vs. dI_F/dt

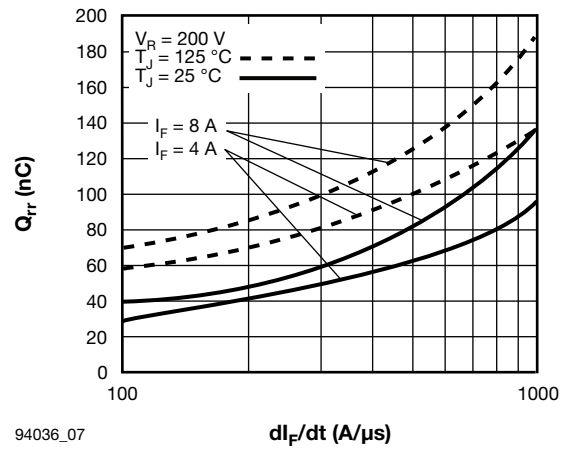


Fig. 7 - Typical Stored Charge vs. dI_F/dt

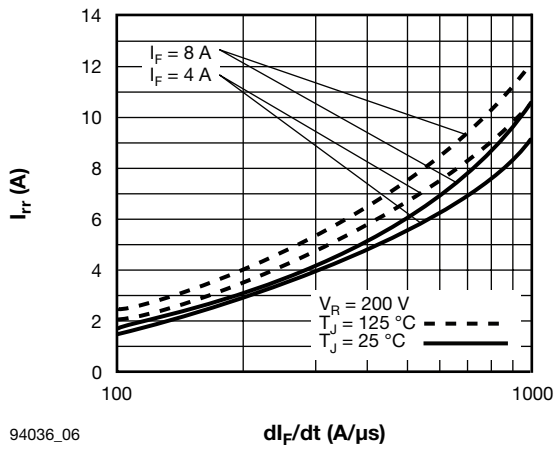


Fig. 6 - Typical Recovery Current vs. dI_F/dt

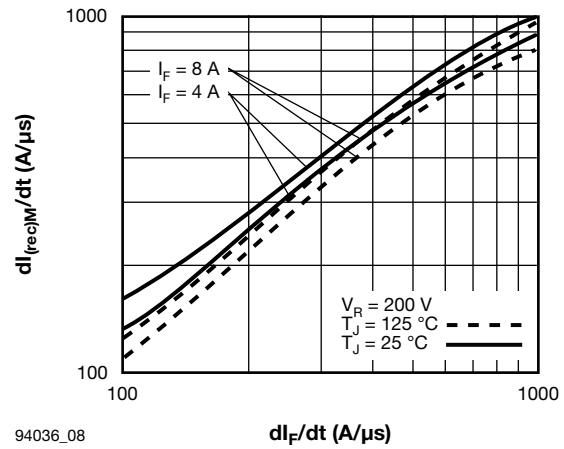


Fig. 8 - Typical dI_{recM}/dt vs. dI_F/dt

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Vishay High Power Products

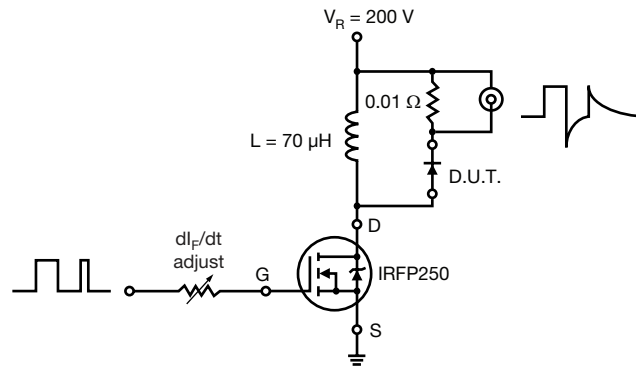


Fig. 9 - Reverse Recovery Parameter Test Circuit

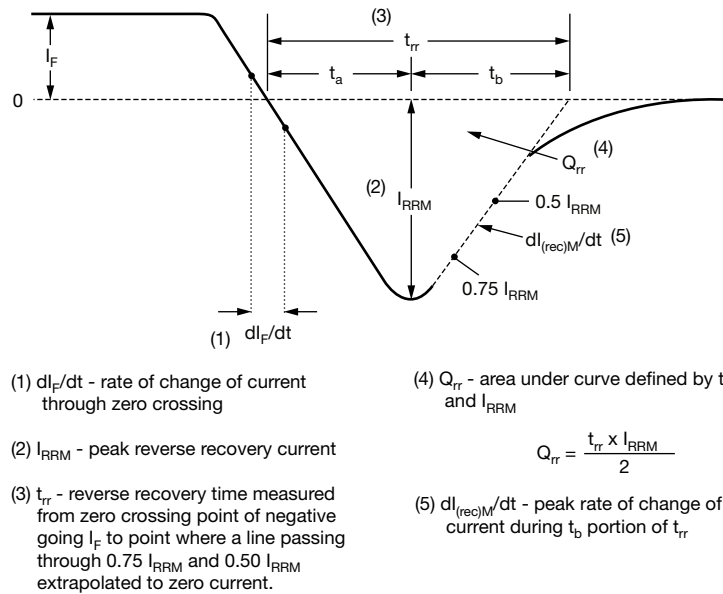


Fig. 10 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code	VS-	HF	A	04	TB	60	S	TRL	PbF
	1	2	3	4	5	6	7	8	9

- 1** - HPP product suffix
- 2** - HEXFRED® family
- 3** - Process designator: A = Electron irradiated
- 4** - Current rating (04 = 4 A)
- 5** - Package outline (TB = TO-220, 2 leads)
- 6** - Voltage rating (60 = 600 V)
- 7** - S = D²PAK
- 8** -
 - None = Tube (50 pieces)
 - TRL = Tape and reel (left oriented)
 - TRR = Tape and reel (right oriented)
- 9** - PbF = Lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95046
Part marking information	www.vishay.com/doc?95054
Packaging information	www.vishay.com/doc?95032



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