

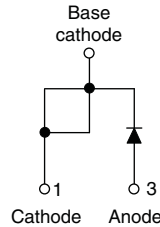


**THE DATASHEET OF  
VS-HFA25TB60HN3**



# HEXFRED®

## Ultrafast Soft Recovery Diode, 25 A


**TO-220AC**

**FEATURES**

- Ultrafast and ultrasoft recovery
- Very low  $I_{RRM}$  and  $Q_{rr}$
- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

 AUTOMOTIVE  
GRADE

**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-HFA25TB60... 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 25 A continuous current, the VS-HFA25TB60... 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-HFA25TB60... 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-220AC
$I_{F(AV)}$	25 A
$V_R$	600 V
$V_F$ at $I_F$	1.7 V
$t_{rr}$ typ.	23 ns
$T_J$ max.	150 °C
Diode variation	Single die

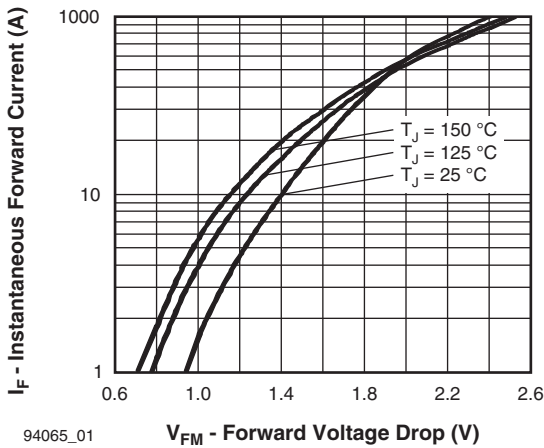
ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	$V_R$		600	V
Maximum continuous forward current	$I_F$	$T_C = 100\text{ °C}$	25	A
Single pulse forward current	$I_{FSM}$		225	
Maximum repetitive forward current	$I_{FRM}$		100	
Maximum power dissipation	$P_D$	$T_C = 25\text{ °C}$	125	W
		$T_C = 100\text{ °C}$	50	
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	$V_{BR}$	$I_R = 100\text{ }\mu\text{A}$	600	-	-	V
Maximum forward voltage	$V_{FM}$	$I_F = 25\text{ A}$	-	1.3	1.7	
		$I_F = 50\text{ A}$	-	1.5	2.0	
		$I_F = 25\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	1.3	1.7	
Maximum reverse leakage current	$I_{RM}$	$V_R = V_R$ rated	-	1.5	20	$\mu\text{A}$
		$T_J = 125\text{ }^\circ\text{C}, V_R = 0.8 \times V_R$ rated	-	600	2000	
Junction capacitance	$C_T$	$V_R = 200\text{ V}$	-	55	100	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH

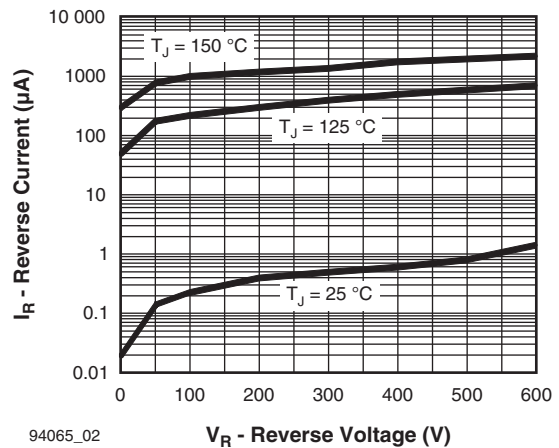
<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time See fig. 5, 6 and 16	$t_{rr}$	$I_F = 1.0\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 30\text{ V}$	-	23	-	ns
	$t_{rr1}$	$T_J = 25\text{ }^\circ\text{C}$	-	50	75	
	$t_{rr2}$	$T_J = 125\text{ }^\circ\text{C}$	-	105	160	
Peak recovery current See fig. 7 and 8	$I_{RRM1}$	$T_J = 25\text{ }^\circ\text{C}$	-	4.5	10	A
	$I_{RRM2}$	$T_J = 125\text{ }^\circ\text{C}$	-	8.0	15	
Reverse recovery charge See fig. 9 and 10	$Q_{rr1}$	$T_J = 25\text{ }^\circ\text{C}$	-	112	375	nC
	$Q_{rr2}$	$T_J = 125\text{ }^\circ\text{C}$	-	420	1200	
Peak rate of fall of recovery current during $t_b$ See fig. 11 and 12	$di_{(rec)M}/dt1$	$T_J = 25\text{ }^\circ\text{C}$	-	250	-	A/ $\mu\text{s}$
	$di_{(rec)M}/dt2$	$T_J = 125\text{ }^\circ\text{C}$	-	160	-	

<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	$R_{thJC}$		-	-	1.0	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.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-220AC	HFA25TB60H			



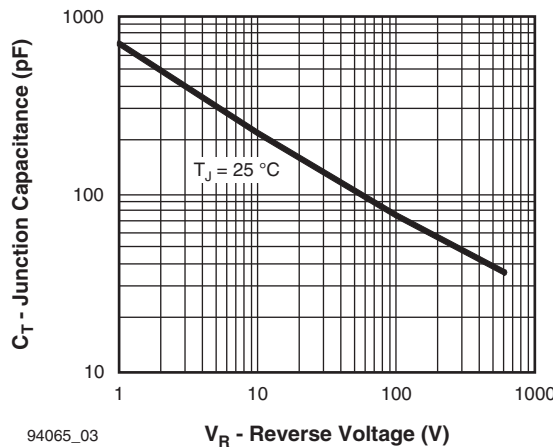
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Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current



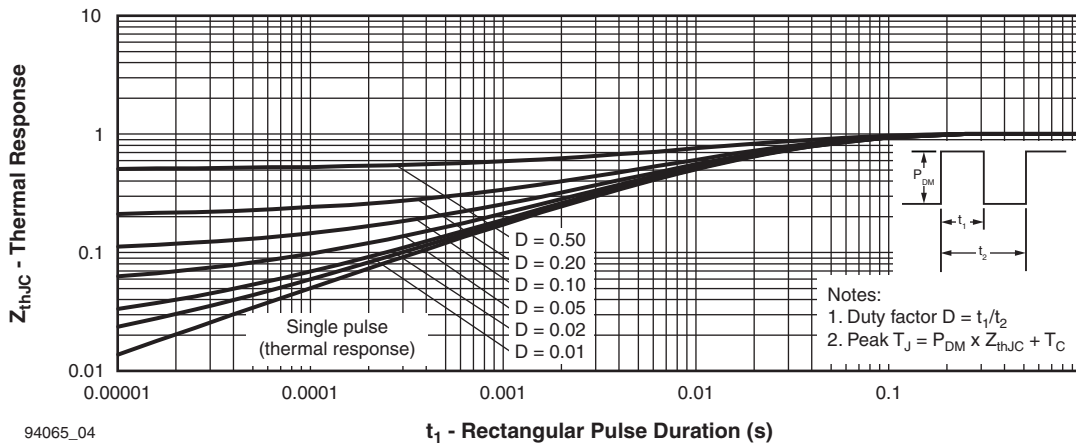
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Fig. 2 - Typical Reverse Current vs. Reverse Voltage



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Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage



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

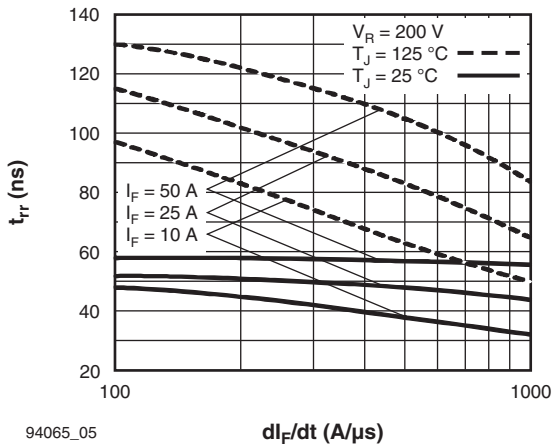


Fig. 5 - Typical Reverse Recovery Time vs.  $di_F/dt$

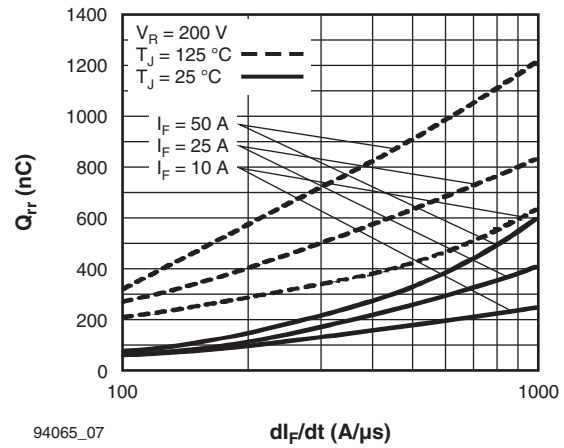


Fig. 7 - Typical Stored Charge vs.  $di_F/dt$

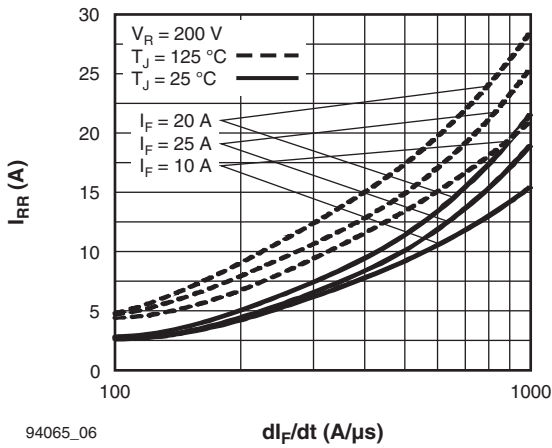


Fig. 6 - Typical Recovery Current vs.  $di_F/dt$

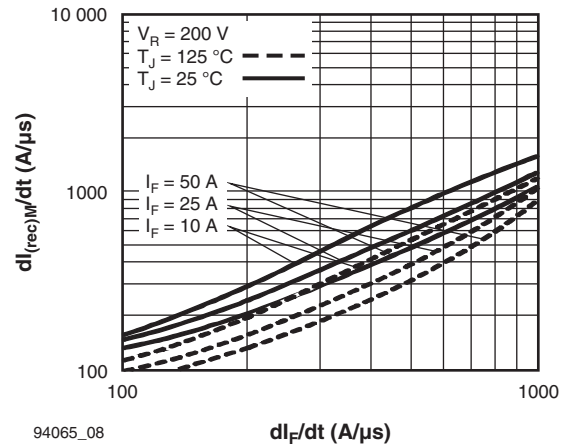


Fig. 8 - Typical  $di_{(rec)M}/dt$  vs.  $di_F/dt$

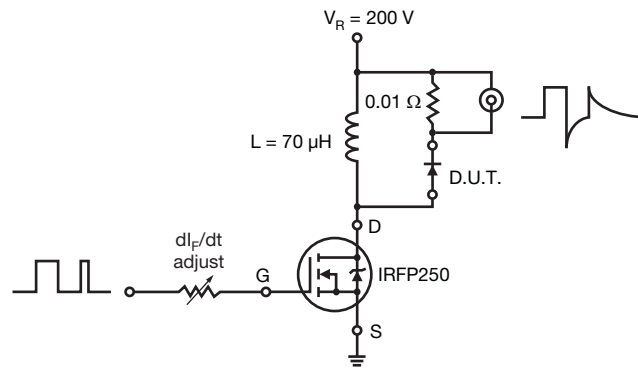
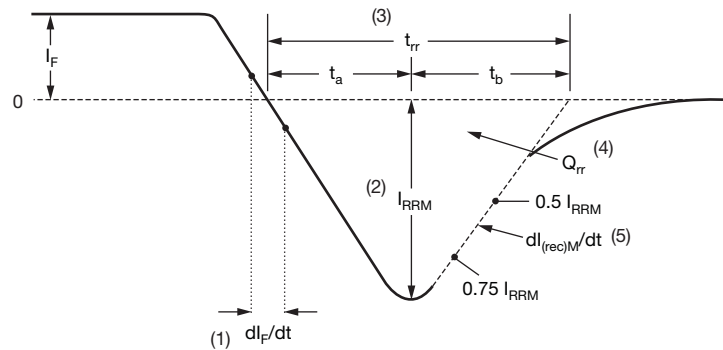


Fig. 9 - Reverse Recovery Parameter Test Circuit



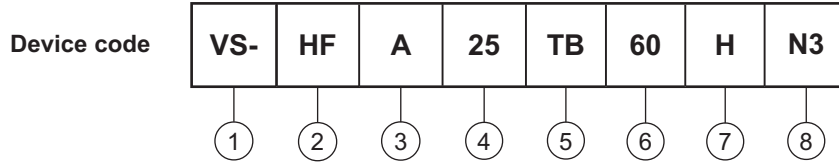
- (1)  $dl_F/dt$  - rate of change of current through zero crossing
- (2)  $I_{RRM}$  - peak reverse recovery current
- (3)  $t_{rr}$  - reverse recovery time measured from zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.50 I_{RRM}$  extrapolated 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 (25 = 25 A)
- 5** - Package:  
TB = TO-220AC
- 6** - Voltage rating (60 = 600 V)
- 7** - H = AEC-Q101 qualified
- 8** - Environmental digit:  
-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-HFA25TB60HN3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95221">www.vishay.com/doc?95221</a>
Part marking information	<a href="http://www.vishay.com/doc?95068">www.vishay.com/doc?95068</a>
SPIICE model	<a href="http://www.vishay.com/doc?95471">www.vishay.com/doc?95471</a>



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-  Alternative Solution
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