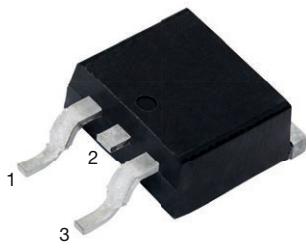
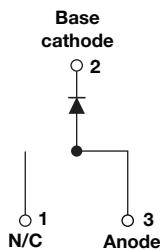


## HEXFRED®

### Ultrafast Soft Recovery Diode, 25 A


**D<sup>2</sup>PAK (TO-263AB)**


#### FEATURES

- Ultrafast and ultrasoft recovery
- Very low  $I_{RRM}$  and  $Q_{rr}$
- Specified at operating conditions
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**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-HFA25TB60S 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-HFA25TB60S 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-HFA25TB60S 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.

#### PRIMARY CHARACTERISTICS

$I_{F(AV)}$	25 A
$V_R$	600 V
$V_F$ at $I_F$	1.3 V
$t_{rr}$ (typ.)	23 ns
$T_J$ max.	150 °C
Package	D <sup>2</sup> PAK (TO-263AB)
Circuit configuration	Single

#### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	$V_R$		600	V
Maximum continuous forward current	$I_F$	$T_C = 100$ °C	25	A
Single pulse forward current	$I_{FSM}$		225	
Maximum repetitive forward current	$I_{FRM}$		100	W
Maximum power dissipation	$P_D$	$T_C = 25$ °C	125	
		$T_C = 100$ °C	50	
Operating junction and storage temperature range	$T_J, T_{Stg}$		-55 to +150	°C

**ELECTRICAL SPECIFICATIONS** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	$V_{BR}$	$I_R = 100 \mu\text{A}$		600	-	-	V
Maximum forward voltage	$V_{FM}$	$I_F = 25 \text{ A}$	See fig. 1	-	1.3	1.7	
		$I_F = 50 \text{ A}$		-	1.5	2.0	
		$I_F = 25 \text{ A}, T_J = 125^\circ\text{C}$		-	1.3	1.7	
Maximum reverse leakage current	$I_{RM}$	$V_R = V_R \text{ rated}$	See fig. 2	-	1.5	20	$\mu\text{A}$
		$T_J = 125^\circ\text{C}, V_R = 0.8 \times V_R \text{ rated}$		-	600	2000	
Junction capacitance	$C_T$	$V_R = 200 \text{ V}$	See fig. 3	-	55	100	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body		-	8.0	-	nH

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time See fig. 5	$t_{rr}$	$I_F = 1.0 \text{ A}, dI_F/dt = 200 \text{ A}/\mu\text{s}, V_R = 30 \text{ V}$		-	23	-	ns
	$t_{rr1}$	$T_J = 25^\circ\text{C}$		-	50	75	
	$t_{rr2}$	$T_J = 125^\circ\text{C}$		-	105	160	
Peak recovery current See fig. 6	$I_{RRM1}$	$T_J = 25^\circ\text{C}$	$I_F = 25 \text{ A}$ $dI_F/dt = 200 \text{ A}/\mu\text{s}$ $V_R = 200 \text{ V}$	-	4.5	10	A
	$I_{RRM2}$	$T_J = 125^\circ\text{C}$		-	8.0	15	
	$Q_{rr1}$	$T_J = 25^\circ\text{C}$		-	112	375	nC
Reverse recovery charge See fig. 7	$Q_{rr2}$	$T_J = 125^\circ\text{C}$		-	420	1200	
	$dI_{(rec)M}/dt1$	$T_J = 25^\circ\text{C}$		-	250	-	A/ $\mu\text{s}$
	$dI_{(rec)M}/dt2$	$T_J = 125^\circ\text{C}$		-	160	-	

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS	
Lead temperature	$T_{\text{lead}}$	0.063" from case (1.6 mm) for 10 s		-	-	300	$^\circ\text{C}$	
Thermal resistance, junction-to-case	$R_{\text{thJC}}$			-	-	1.0	K/W	
Thermal resistance, junction-to-ambient	$R_{\text{thJA}}$			-	-	80		
Weight		Typical socket mount		-	2.0	-	g	
				-	0.07	-		
Marking device		Case style D <sup>2</sup> PAK (TO-263AB)		HFA25TB60S				

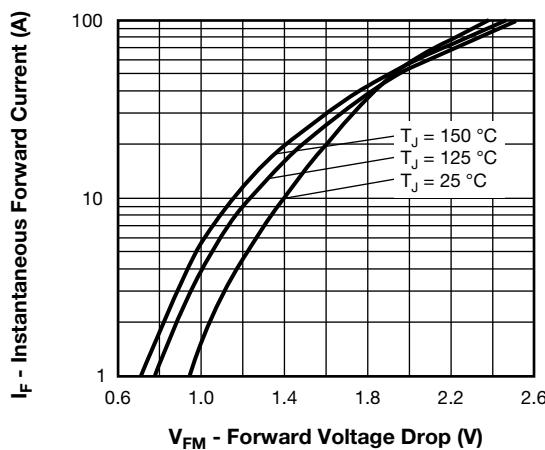


Fig. 1 - Maximum Forward Voltage Drop vs.  
Instantaneous Forward Current

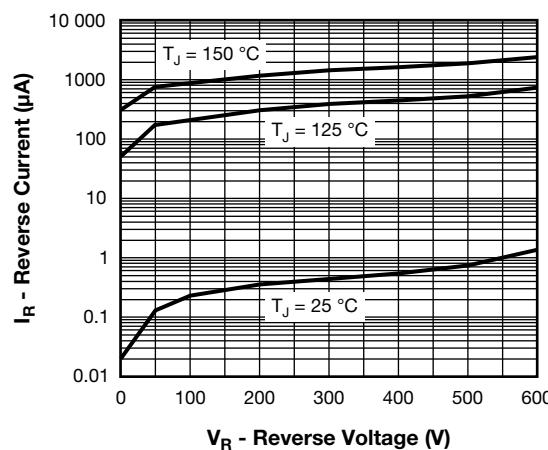


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

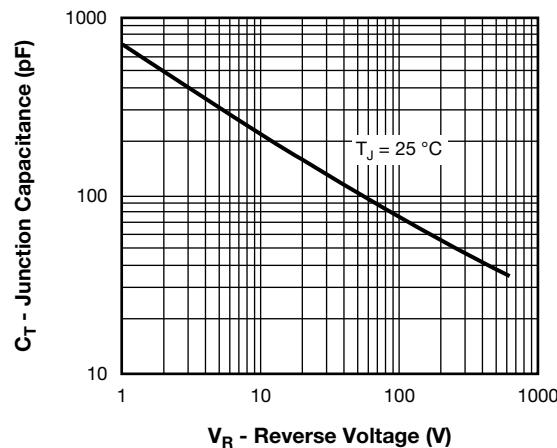


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

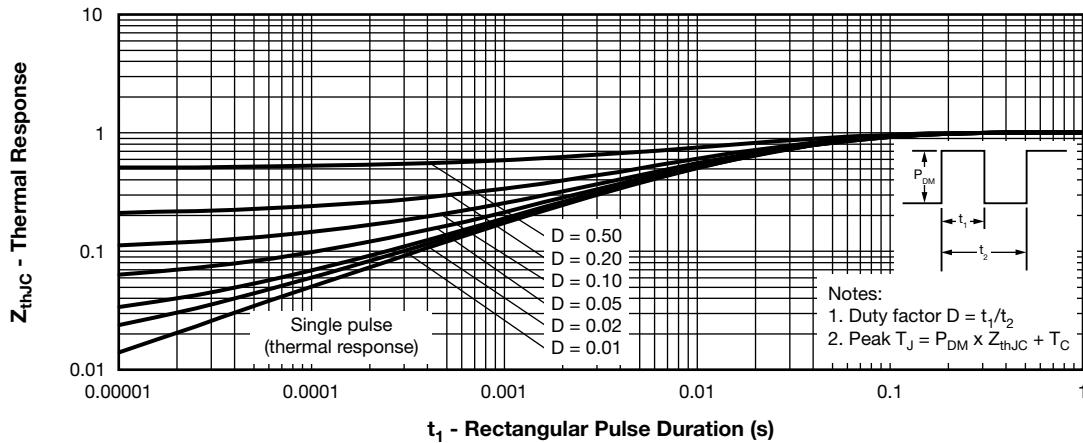


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

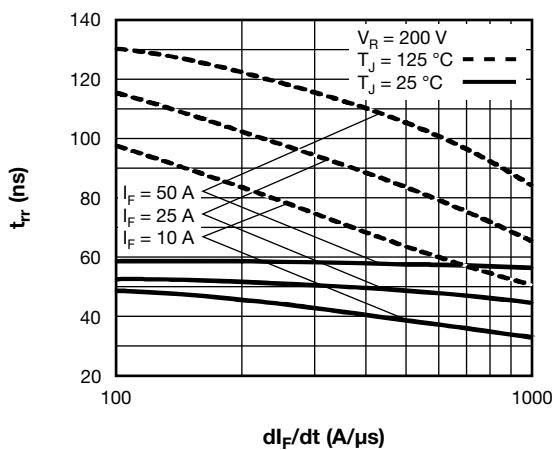


Fig. 5 - Typical Reverse Recovery Time vs.  $dI_F/dt$

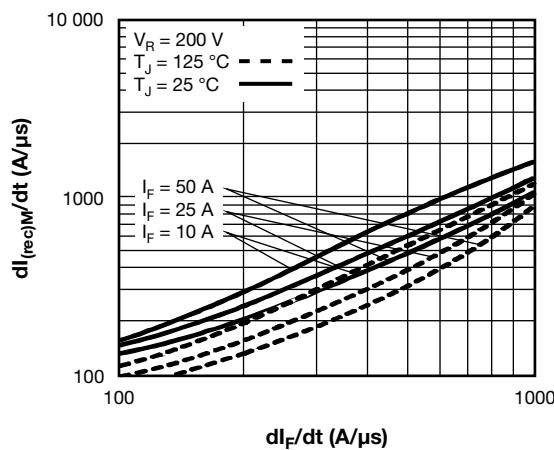


Fig. 8 - Typical  $dI_{(rec)M}/dt$  vs.  $dI_F/dt$

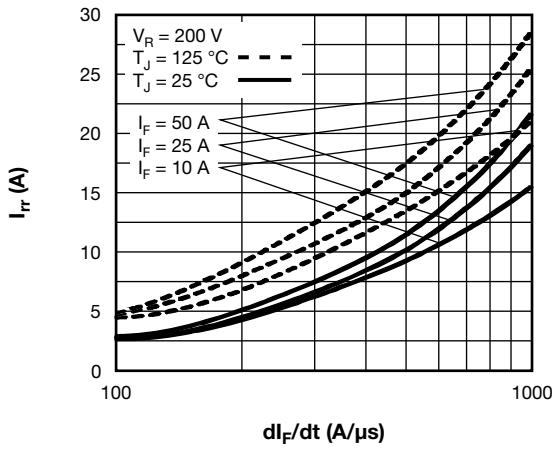


Fig. 6 - Typical Recovery Current vs.  $dI_F/dt$

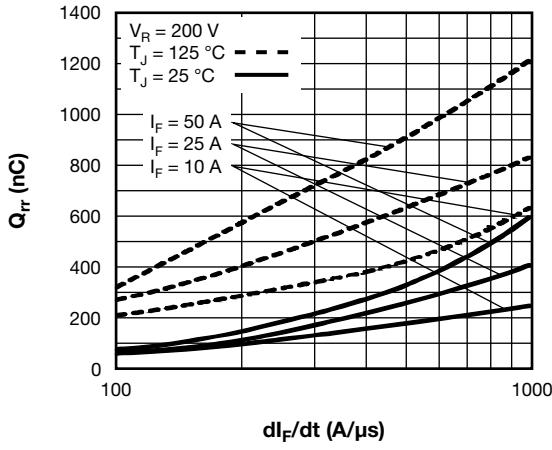


Fig. 7 - Typical Stored Charge vs.  $dI_F/dt$

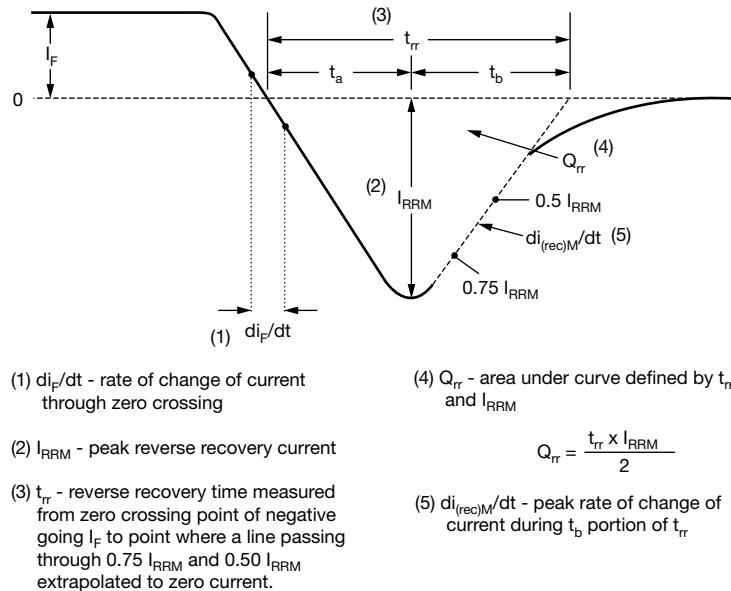


Fig. 9 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

Device code	VS-	HF	A	25	TB	60	S	L	-M3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

- 1** - Vishay Semiconductors product
- 2** - HEXFRED® family
- 3** - Process designator: A = electron irradiated
- 4** - Current rating (25 = 25 A)
- 5** - Package outline (TB = TO-220, 2 leads)
- 6** - Voltage rating (60 = 600 V)
- 7** - S = D<sup>2</sup>PAK (TO-263AB)
- 8**
  - None = tube
  - L = tape and reel (left oriented)
  - R = tape and reel (right oriented)
- 9** - Environmental digit:  
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

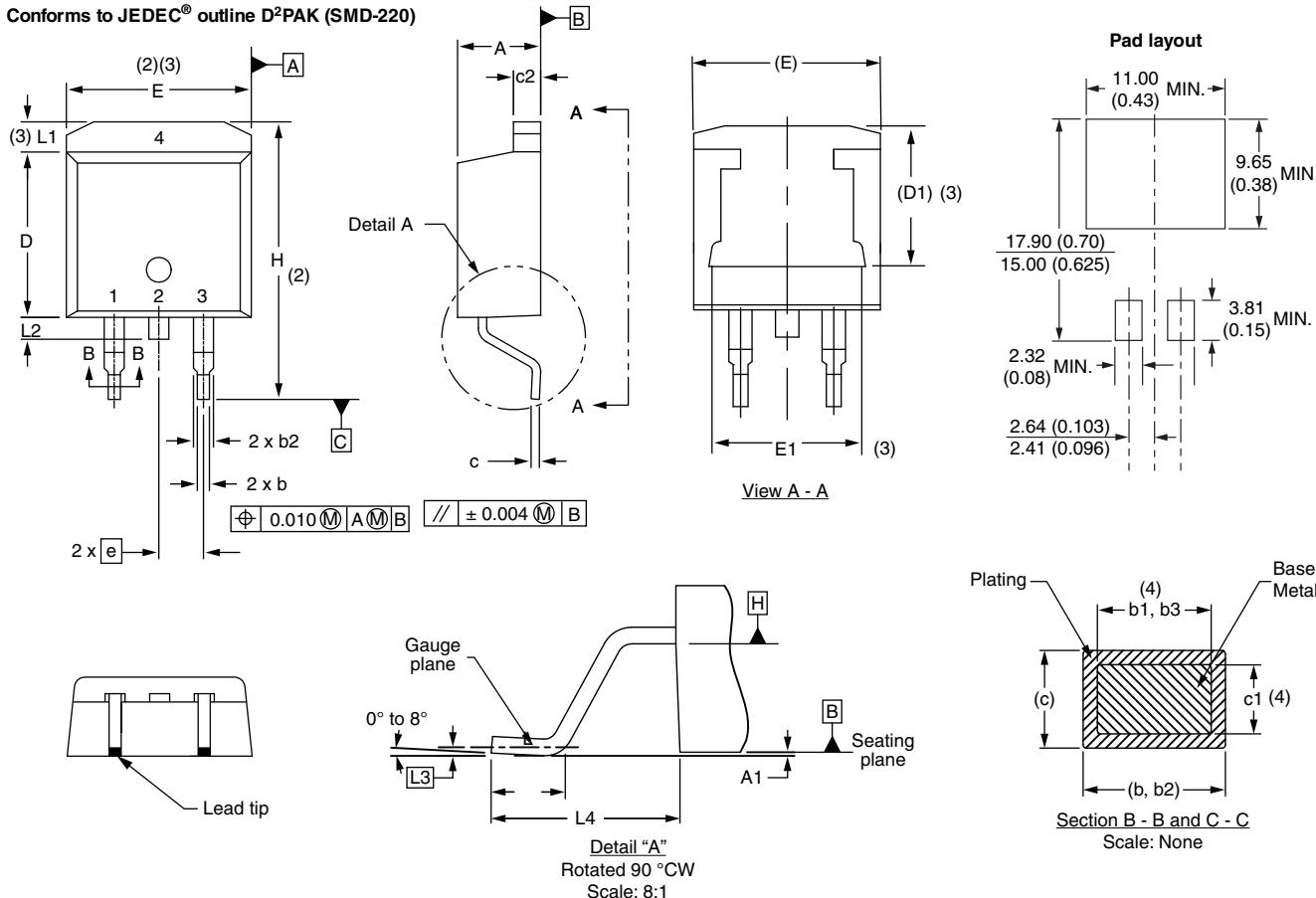
<b>ORDERING INFORMATION</b> (Example)		
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-HFA25TB60S-M3	50	Antistatic plastic tube
VS-HFA25TB60SR-M3	800	13" diameter reel
VS-HFA25TB60SL-M3	800	13" diameter reel

<b>LINKS TO RELATED DOCUMENTS</b>	
Dimensions	<a href="http://www.vishay.com/doc?96164">www.vishay.com/doc?96164</a>
Part marking information	<a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a>
Packaging information	<a href="http://www.vishay.com/doc?96424">www.vishay.com/doc?96424</a>

### D<sup>2</sup>PAK

**DIMENSIONS** in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES		SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.				MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190			D1	6.86	8.00	0.270	0.315	3
A1	0.00	0.254	0.000	0.010			E	9.65	10.67	0.380	0.420	2, 3
b	0.51	0.99	0.020	0.039			E1	7.90	8.80	0.311	0.346	3
b1	0.51	0.89	0.020	0.035	4		e	2.54 BSC		0.100 BSC		
b2	1.14	1.78	0.045	0.070			H	14.61	15.88	0.575	0.625	
b3	1.14	1.73	0.045	0.068	4		L	1.78	2.79	0.070	0.110	
c	0.38	0.74	0.015	0.029			L1	-	1.65	-	0.066	3
c1	0.38	0.58	0.015	0.023	4		L2	1.27	1.78	0.050	0.070	
c2	1.14	1.65	0.045	0.065			L3	0.25 BSC		0.010 BSC		
D	8.51	9.65	0.335	0.380	2		L4	4.78	5.28	0.188	0.208	

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inches
- (7) Outline conforms to JEDEC® outline TO-263AB

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