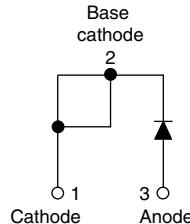


## Hyperfast Rectifier, 30 A FRED Pt®



### FEATURES

- Reduced  $Q_{rr}$  and soft recovery
- 175 °C  $T_J$  maximum
- For PFC CRM/CCM operation
- Fully isolated package ( $V_{INS} = 2500$  V<sub>RMS</sub>)
- UL E78996 approved
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
**HALOGEN FREE**  
Available

PRIMARY CHARACTERISTICS	
Package	TO-220 FullPAK
$I_{F(AV)}$	30 A
$V_R$	600 V
$V_F$ at $I_F$	1.34 V
$t_{rr}$ (typ.)	23 ns
$T_J$ max.	175 °C
Circuit configuration	Single

### DESCRIPTION / APPLICATIONS

State of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop, hyperfast recovery time and soft recovery.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in PFC boost stage in the AC/DC section of SMPS, inverters or as freewheeling diodes.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 37$ °C	30	A
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25$ °C	220	
Operating junction and storage temperatures	$T_J, T_{Stg}$		-65 to +175	°C

ELECTRICAL SPECIFICATIONS ( $T_J = 25$ °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 100$ µA	600	-	-	V
Forward voltage	$V_F$	$I_F = 30$ A	-	2.00	2.60	
		$I_F = 30$ A, $T_J = 150$ °C	-	1.34	1.75	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	0.3	50	µA
		$T_J = 150$ °C, $V_R = V_R$ rated	-	60	500	
Junction capacitance	$C_T$	$V_R = 600$ V	-	33	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8	-	nH

DYNAMIC RECOVERY CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1 \text{ A}$ , $dI_F/dt = 50 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$	-	28	35	ns
		$I_F = 1 \text{ A}$ , $dI_F/dt = 100 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$	-	23	30	
		$T_J = 25^\circ\text{C}$	-	31	-	
		$T_J = 125^\circ\text{C}$	-	77	-	
Peak recovery current	$I_{RRM}$	$T_J = 25^\circ\text{C}$	-	3.5	-	A
		$T_J = 125^\circ\text{C}$	-	7.7	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25^\circ\text{C}$	-	65	-	nC
		$T_J = 125^\circ\text{C}$	-	345	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-65	-	175	°C
Thermal resistance, junction-to-case per leg	$R_{thJC}$		-	-	2.85	°C/W
Thermal resistance, junction-to-ambient per leg	$R_{thJA}$	Typical socket mount	-	-	70	
Thermal resistance, case-to-heatsink	$R_{thCS}$	Mounting surface, flat, smooth and greased	-	0.2	-	kgf · cm (lbf · in)
Weight			-	2	-	
			-	0.07	-	oz.
Mounting torque			6 (5)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-220 FullPAK	30ETH06FP			

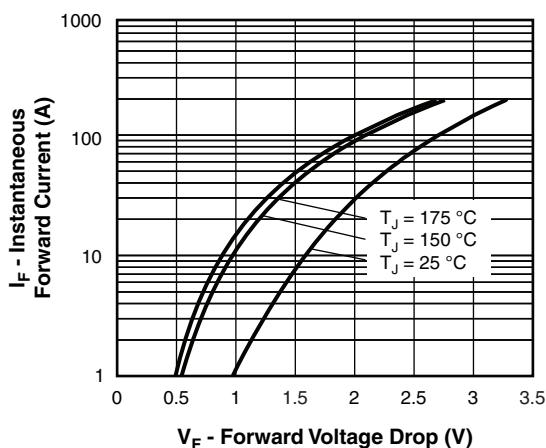


Fig. 1 - Typical Forward Voltage Drop Characteristics

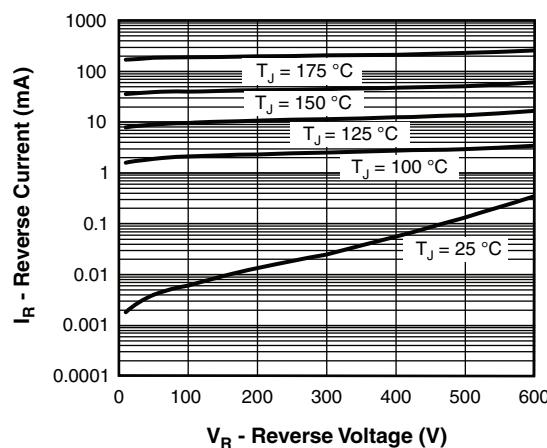


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

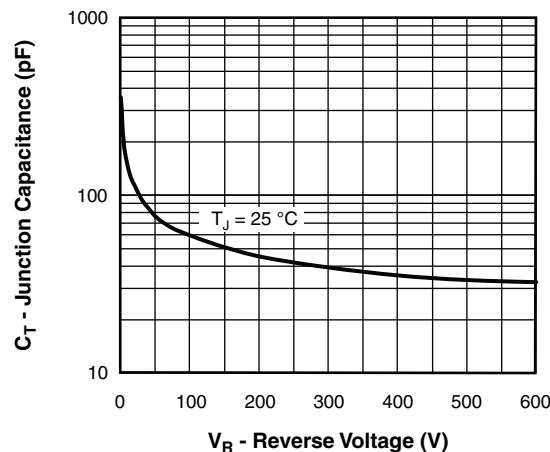


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

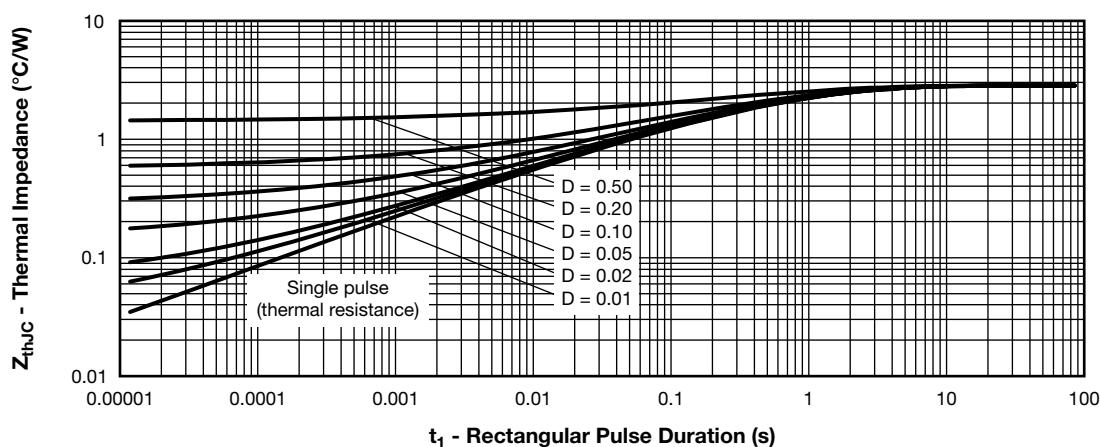


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

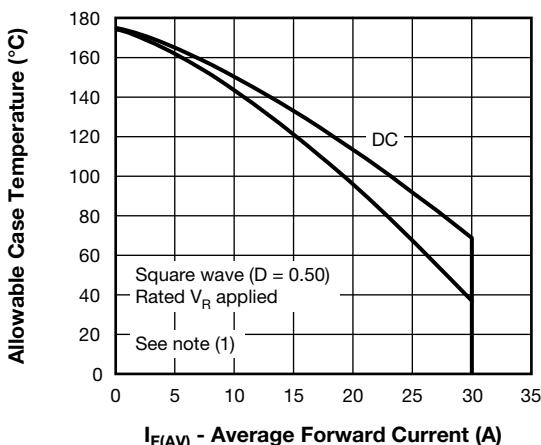


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

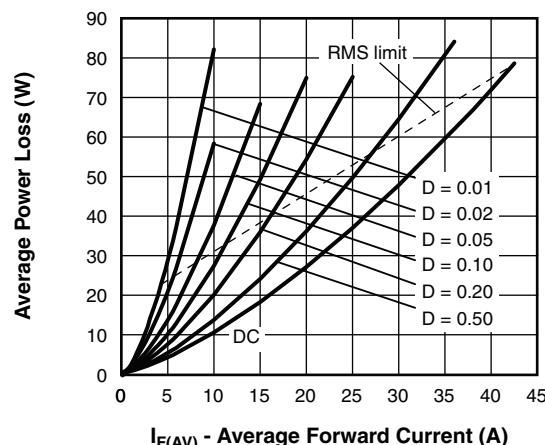


Fig. 6 - Forward Power Loss Characteristics

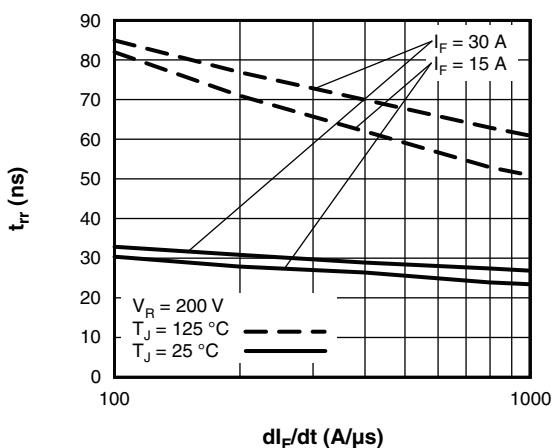


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

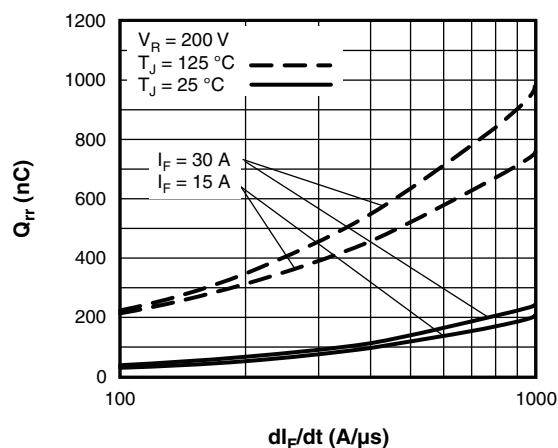
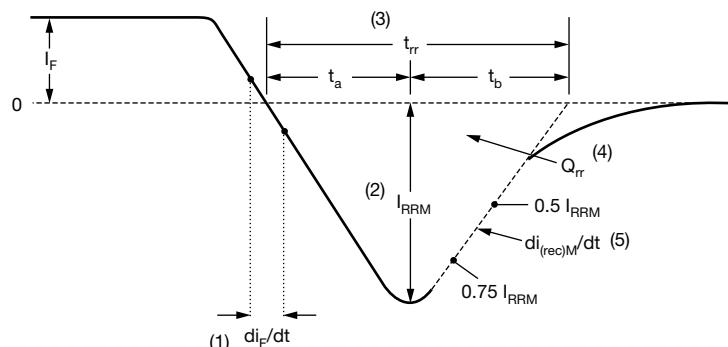


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$

#### Note

(1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = Rated  $V_R$



(1)  $dI_F/dt$  - rate of change of current through zero crossing

(4)  $Q_{rr}$  - area under curve defined by  $t_{rr}$  and  $I_{RRM}$

(2)  $I_{RRM}$  - peak reverse recovery current

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

(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.

(5)  $di_{recM}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

Fig. 9 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

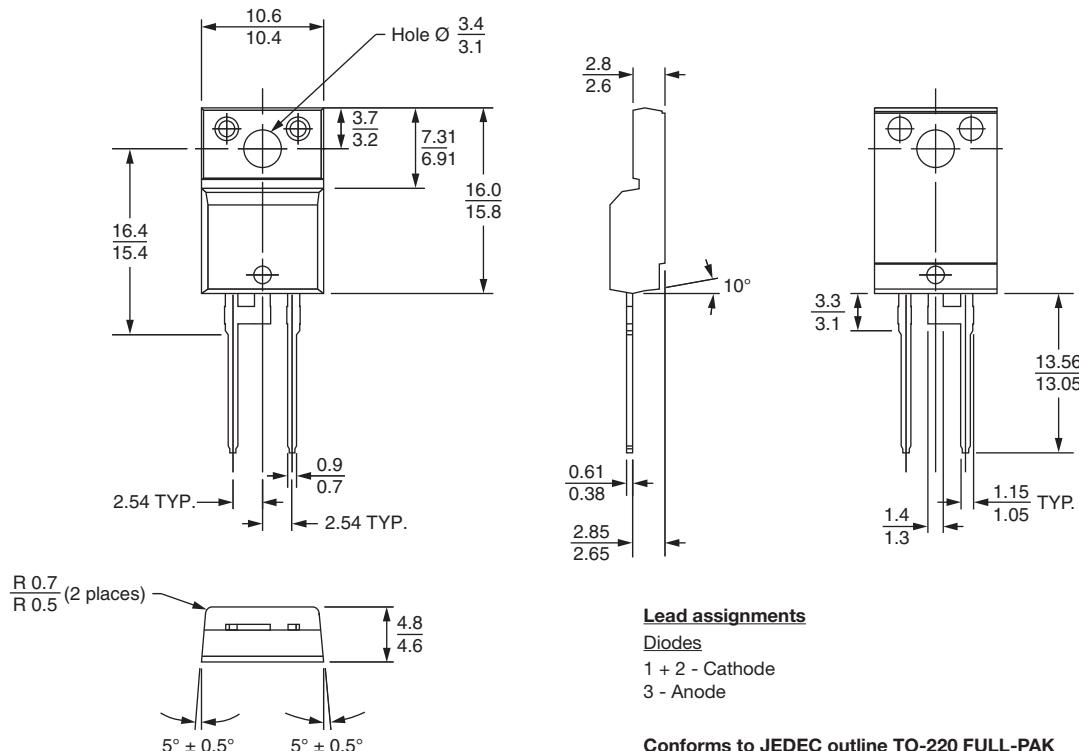
Device code	VS-	30	E	T	H	06	FP	-F3
	1	2	3	4	5	6	7	8

<b>1</b>	- Vishay Semiconductors product
<b>2</b>	- Current rating (30 A)
<b>3</b>	- E = single
<b>4</b>	- T = TO-220
<b>5</b>	- H = hyperfast recovery
<b>6</b>	- Voltage rating (06 = 600 V)
<b>7</b>	- TO-220 FullPAK
<b>8</b>	- Environmental digit: -F3 = RoHS-compliant and totally lead (Pb)-free -N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free

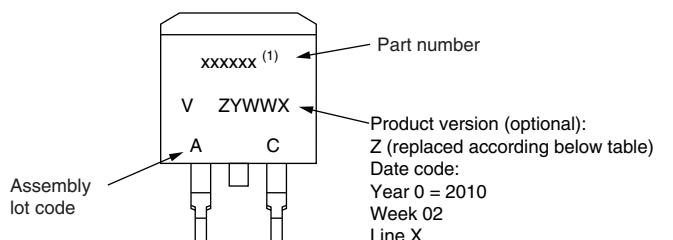
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-30ETH06FP-F3	50	1000	Antistatic plastic tube
VS-30ETH06FP-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95005">www.vishay.com/doc?95005</a>
Part marking information	<a href="http://www.vishay.com/doc?95440">www.vishay.com/doc?95440</a>
SPICE model	<a href="http://www.vishay.com/doc?96440">www.vishay.com/doc?96440</a>

### DIMENSIONS in millimeters



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



Example: This is a xxxxxx <sup>(1)</sup> with assembly lot code AC, assembled on WW 02, 2010

#### Note

(1) If part number contain "H" as last digit, product is AEC-Q101 qualified

ENVIRONMENTAL NAMING CODE (Z)	PRODUCT DEFINITION
A	Termination lead (Pb)-free
B	Totally lead (Pb)-free
E	RoHS-compliant and termination lead (Pb)-free
F	RoHS-compliant and totally lead (Pb)-free
M	Halogen-free, RoHS-compliant, and termination lead (Pb)-free
N	Halogen-free, RoHS-compliant, and totally lead (Pb)-free
G	Green

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