

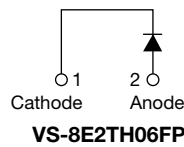
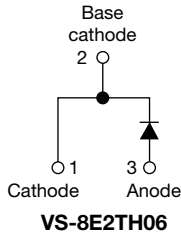
## Hyperfast Rectifier, 8 A FRED Pt®



2L TO-220AC



2L TO-220 FULL-PAK



### FEATURES

- Hyperfast recovery time, reduced  $Q_{rr}$  and soft recovery
- 175 °C maximum operating junction temperature
- For PFC CRM/CCM operation
- True 2 pin package
- Low forward voltage drop
- Low leakage current
- Fully isolated package ( $V_{INS} = 2500 V_{RMS}$ )
- Compliant to RoHS directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- Designed and qualified for industrial level



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

### DESCRIPTION/APPLICATIONS

State of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop and 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-to-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.

### PRODUCT SUMMARY

Package	2L TO-220AC, 2L TO-220 FP
$I_{F(AV)}$	8 A
$V_R$	600 V
$V_F$ at $I_F$	2.5 V
$t_{rr}$ (typ.)	17 ns
$T_J$ max.	175 °C
Diode variation	Single die

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 133\text{ °C}$	8	A
		$T_C = 78\text{ °C}$		
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25\text{ °C}$	70	
Peak repetitive forward current	$I_{FM}$		16	
Operating junction and storage temperatures	$T_J, T_{Stg}$		- 65 to 175	°C

### ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 100\ \mu A$	600	-	-	V
Forward voltage	$V_F$	$I_F = 8\text{ A}$	-	2.1	2.5	
		$I_F = 8\text{ A}, T_J = 150\text{ °C}$	-	1.6	1.9	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	0.2	35	$\mu A$
		$T_J = 150\text{ °C}, V_R = V_R$ rated	-	50	350	
Junction capacitance	$C_T$	$V_R = 600\text{ V}$	-	6	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8	-	nH

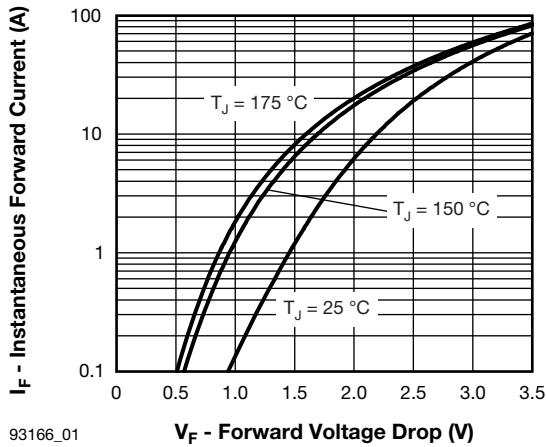
<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Reverse recovery time	$t_{rr}$	$I_F = 1.0\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	17	23	ns	
		$I_F = 8.0\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	22	25		
		$T_J = 25\text{ }^\circ\text{C}$	$I_F = 8\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 390\text{ V}$	-	22		-
		$T_J = 125\text{ }^\circ\text{C}$	$I_F = 8\text{ A}$ $di_F/dt = 600\text{ A}/\mu\text{s}$ $V_R = 390\text{ V}$	-	43		-
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 8\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 390\text{ V}$	-	3.1	-	A
		$T_J = 125\text{ }^\circ\text{C}$	$I_F = 8\text{ A}$ $di_F/dt = 600\text{ A}/\mu\text{s}$ $V_R = 390\text{ V}$	-	5.2	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 8\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 390\text{ V}$	-	32	-	nC
		$T_J = 125\text{ }^\circ\text{C}$	$I_F = 8\text{ A}$ $di_F/dt = 600\text{ A}/\mu\text{s}$ $V_R = 390\text{ V}$	-	120	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		- 65	-	175	$^\circ\text{C}$
Thermal resistance, junction to case	$R_{thJC}$	FULL-PAK	-	2	2.4	$^\circ\text{C}/\text{W}$
			-	5	5.5	
Thermal resistance, junction to ambient per leg	$R_{thJA}$	Typical socket mount	-	-	70	
Typical thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	2	-	g
			-	0.07	-	oz.
Mounting torque			6 (5)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-220	8E2TH06			
		Case style TO-220 FULL-PAK	8E2TH06FP			



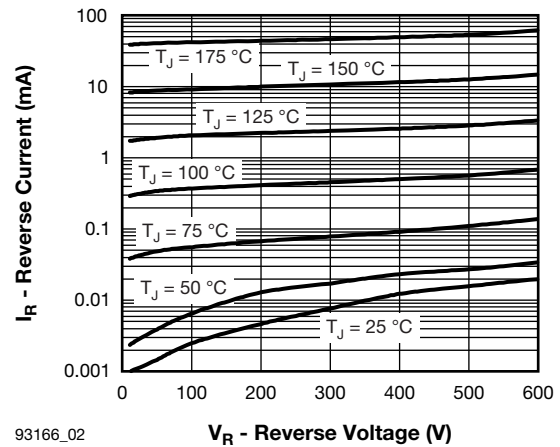
# VS-8E2TH06-E, VS-8E2TH06-M, VS-8E2TH06FP-E

Hyperfast Rectifier, 8 A FRED Pt® Vishay Semiconductors



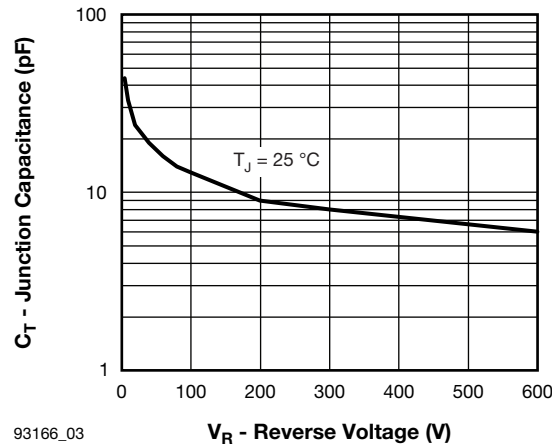
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Fig. 1 - Typical Forward Voltage Drop Characteristics



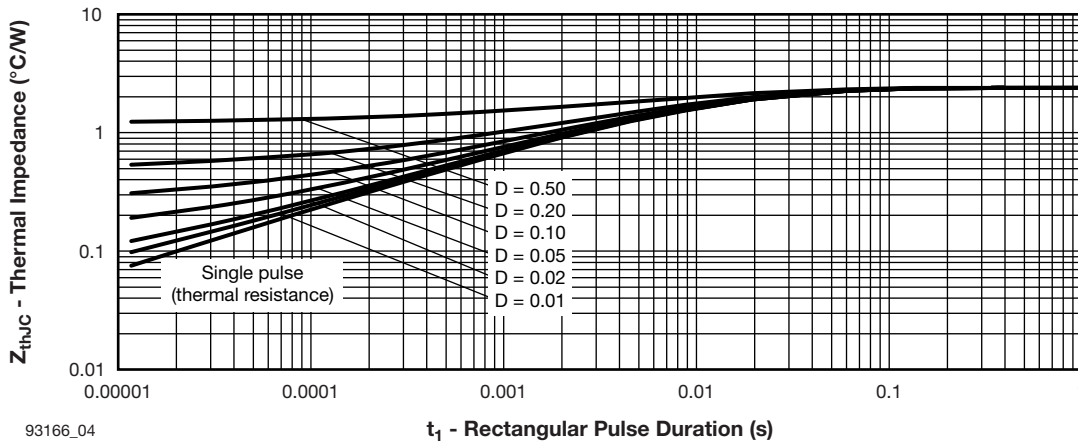
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Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage



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Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage



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Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (TO-220)

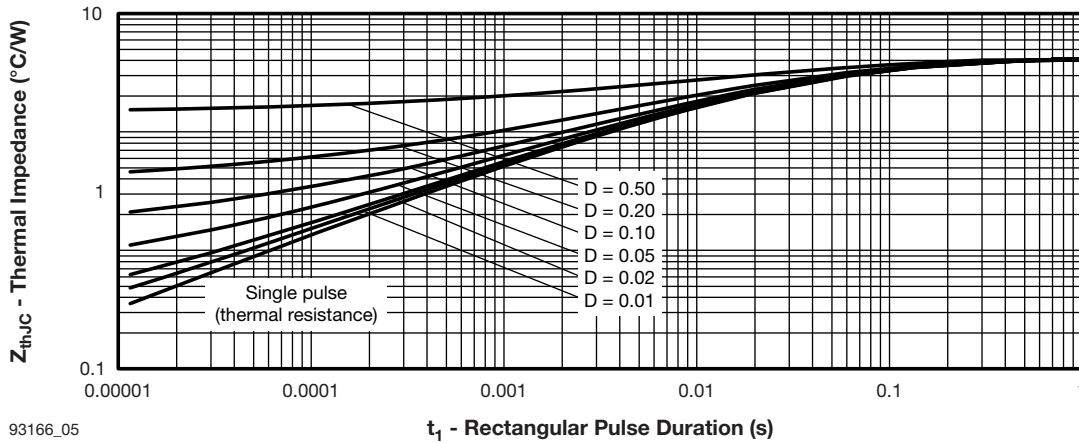


Fig. 5 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (FULL-PAK)

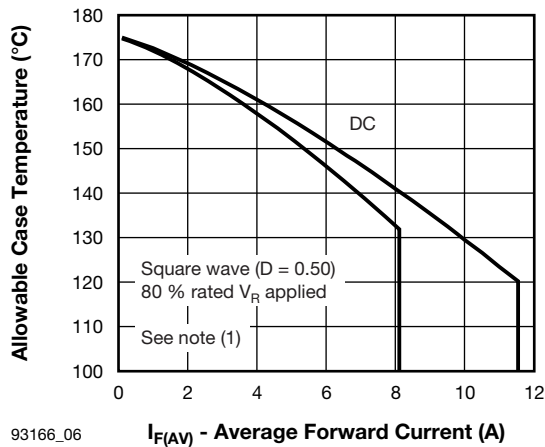


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current (TO-220)

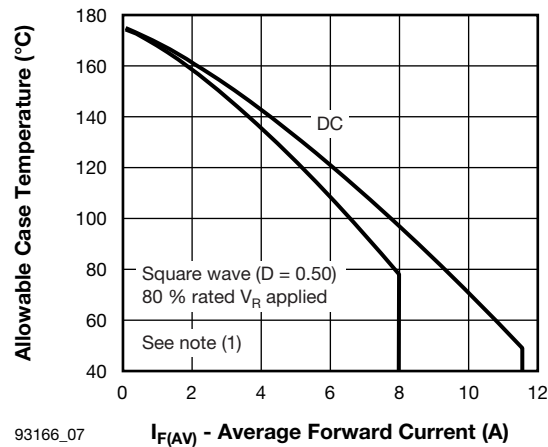


Fig. 7 - Maximum Allowable Case Temperature vs. Average Forward Current (FULL-PAK)

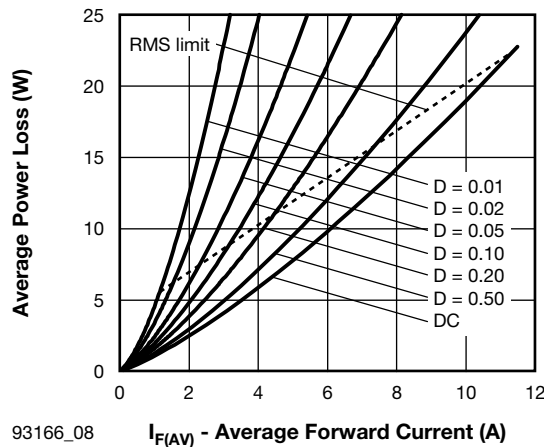
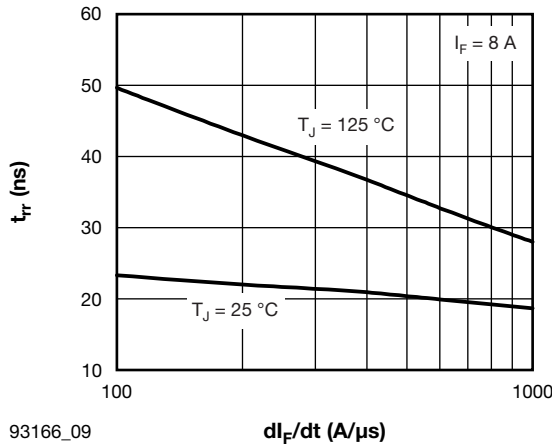


Fig. 8 - Forward Power Loss Characteristics

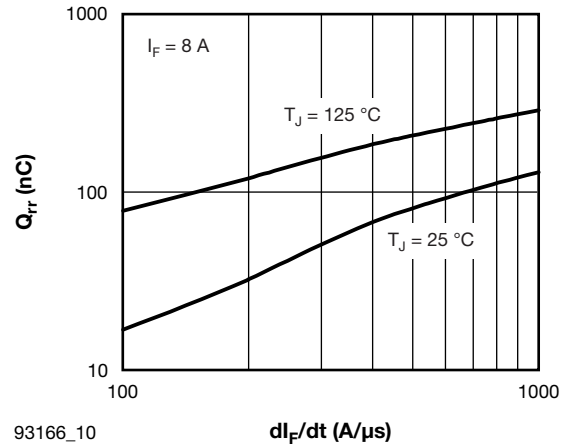
**Note**

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



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Fig. 9 - Typical Reverse Recovery Time vs.  $di_F/dt$



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Fig. 10 - Typical Stored Charge vs.  $di_F/dt$

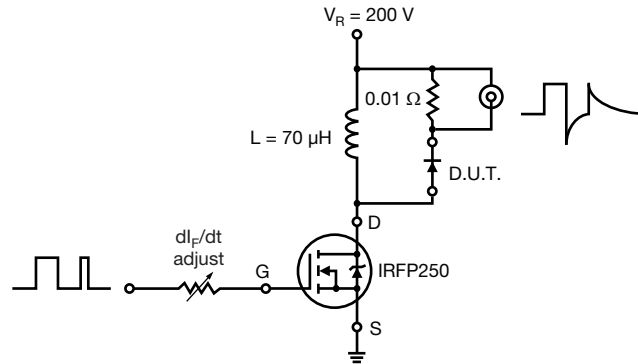
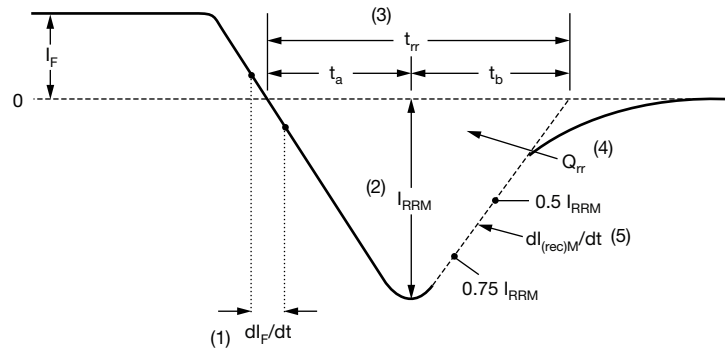


Fig. 11 - Reverse Recovery Parameter Test Circuit



(1)  $di_F/dt$  - 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  $0.5 I_{RRM}$  extrapolated to zero current.

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

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

(5)  $dI_{(rec)M}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

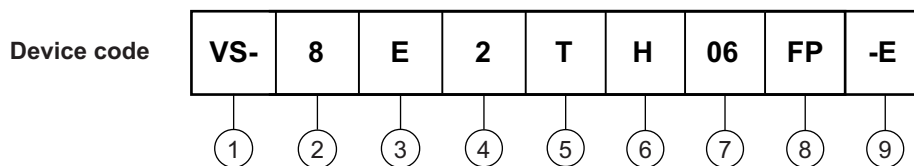
Fig. 12 - Reverse Recovery Waveform and Definitions

# VS-8E2TH06-E, VS-8E2TH06-M, VS-8E2TH06FP-E



Vishay Semiconductors Hyperfast Rectifier, 8 A FRED Pt®

## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product suffix
- 2** - Current rating (8 = 8 A)
- 3** - Circuit configuration:  
E = Single diode
- 4** - 2 = True 2 pin package
- 5** - T = TO-220
- 6** - H = Hyperfast recovery time
- 7** - Voltage code (06 = 600 V)
- 8** -
  - None = TO-220
  - FP = FULL-PAK
- 9** - Environmental digit:
  - -E = RoHS compliant and terminations lead (Pb)-free
  - -M = Halogen-free, RoHS compliant and terminations lead (Pb)-free

<b>ORDERING INFORMATION</b> (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-8E2TH06-E	50	1000	Antistatic plastic tubes
VS-8E2TH06-M	50	1000	Antistatic plastic tubes
VS-8E2TH06FP-E	50	1000	Antistatic plastic tubes

<b>LINKS TO RELATED DOCUMENTS</b>			
Dimensions	TO-220AC	<a href="http://www.vishay.com/doc?95259">www.vishay.com/doc?95259</a>	
	TO-220 FULL-PAK	<a href="http://www.vishay.com/doc?95260">www.vishay.com/doc?95260</a>	
Part marking information	TO-220AC	<a href="http://www.vishay.com/doc?95391">www.vishay.com/doc?95391</a>	
	TO-220 FULL-PAK	<a href="http://www.vishay.com/doc?95392">www.vishay.com/doc?95392</a>	
Packaging information		<a href="http://www.vishay.com/doc?95388">www.vishay.com/doc?95388</a>	



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