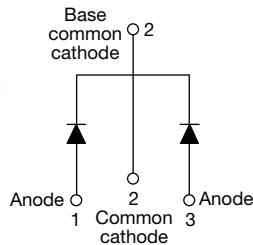


## Hyperfast Rectifier, 2 x 15 A FRED Pt® G5



### FEATURES

- Hyperfast and optimized  $Q_{rr}$
- Best in class forward voltage drop and switching losses trade off
- Optimized for high speed operation
- 175 °C maximum operating junction temperature
- Polyimide passivation
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS	
$I_{F(AV)}$ , per leg	15 A
$V_R$ , per leg	1200 V
$V_F$ at $I_F$ at 125 °C, per leg	1.7 V
$t_{rr}$	37 ns
$T_J$ max.	175 °C
Package	TO-220AB 3L
Circuit configuration	Common cathode

### DESCRIPTION / APPLICATIONS

Featuring a unique combination of low conduction and switching losses, this rectifier is the right choice for high frequency converters, both soft switched / resonant.

Specifically designed to improve efficiency of PFC and output rectification stages of EV / HEV battery charging stations, booster stage of solar inverters and UPS applications, these devices are perfectly matched to operate with MOSFETs or high speed IGBTs.

### MECHANICAL DATA

**Case:** TO-220AB 3L

Molding compound meets UL 94 V-0 flammability rating

**Terminals:** matte tin plated leads, solderable per J-STD-002

**Polarity:** as per marking device details

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Repetitive peak reverse voltage, per leg	$V_{RRM}$		1200	V	
Average rectified forward current, per leg	$I_{F(AV)}$	$T_C = 110$ °C, $D = 0.50$	15	A	
Repetitive forward current, per leg	$I_{FRM}$	$T_C = 110$ °C, $D = 0.50$ , 20 kHz	30		
Non-repetitive peak surge current, per leg	$I_{FSM}$	$T_C = 45$ °C, $t_p = 10$ ms, sine wave	125		
Operating junction and storage temperature	$T_J$ , $T_{Stg}$		-55 to +175	°C	

ELECTRICAL SPECIFICATIONS ( $T_J = 25$ °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage, per leg	$V_{BR}$ , $V_R$	$I_R = 100$ µA	1200	-	-	V
Forward voltage, per leg		$I_F = 15$ A		1.9	2.5	
		$I_F = 15$ A, $T_J = 125$ °C	-	1.7	-	
Reverse leakage current, per leg	$I_R$	$V_R = V_R$ rated	-	-	50	µA
		$T_J = 125$ °C, $V_R = V_R$ rated	-	-	500	
Junction capacitance, per leg	$C_T$	$V_R = 200$ V	-	10	-	pF
Series inductance, per leg	$L_S$	Measured 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, per leg	$t_{rr}$	$I_F = 1.0 \text{ A}$ , $dI_F/dt = 100 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$		-	37	50	ns
		$T_J = 25^\circ\text{C}$	$I_F = 10 \text{ A}$ , $dI_F/dt = 600 \text{ A}/\mu\text{s}$ , $V_R = 400 \text{ V}$	-	95	-	
		$T_J = 125^\circ\text{C}$		-	146	-	
Peak recovery current, per leg	$I_{RRM}$	$T_J = 25^\circ\text{C}$	$I_F = 15 \text{ A}$ , $dI_F/dt = 1000 \text{ A}/\mu\text{s}$ , $V_R = 800 \text{ V}$	-	14	-	A
		$T_J = 125^\circ\text{C}$		-	19	-	
		$T_J = 25^\circ\text{C}$		-	545	-	
Reverse recovery charge, per leg	$Q_{rr}$	$T_J = 125^\circ\text{C}$	$I_F = 15 \text{ A}$ , $dI_F/dt = 1000 \text{ A}/\mu\text{s}$ , $V_R = 800 \text{ V}$	-	1200	-	nC
		$T_J = 25^\circ\text{C}$		-	75.5	-	
		$T_J = 125^\circ\text{C}$		-	100	-	
Reverse recovery time, per leg	$t_{rr}$	$T_J = 25^\circ\text{C}$	$I_F = 15 \text{ A}$ , $dI_F/dt = 1000 \text{ A}/\mu\text{s}$ , $V_R = 800 \text{ V}$	-	23	-	A
		$T_J = 125^\circ\text{C}$		-	35	-	
		$T_J = 25^\circ\text{C}$		-	935	-	
Reverse recovery charge, per leg	$Q_{rr}$	$T_J = 125^\circ\text{C}$		-	1985	-	nC
		$T_J = 25^\circ\text{C}$		-	-	-	

THERMAL - MECHANICAL SPECIFICATIONS							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction-to-case, per leg	$R_{thJC}$			-	-	1.7	°C/W
Weight				-	2.0	-	g
Mounting torque				6.0 (5.0Z)	-	12 (10)	kgf · cm (lbf · in)
Maximum junction and storage temperature range	$T_J, T_{Stg}$			-55	-	175	°C
Marking device		Case style TO-220AB 3L		C5TH3012			

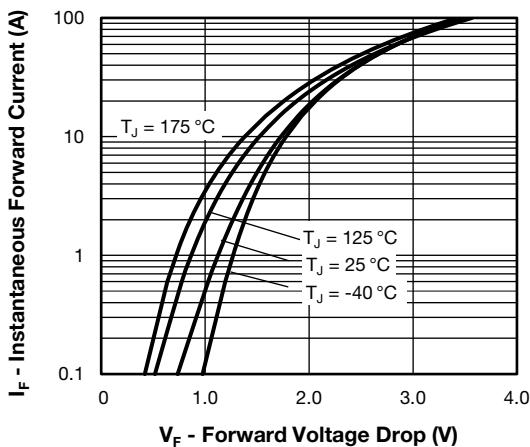


Fig. 1 - Forward Voltage Drop Characteristics, Per Leg

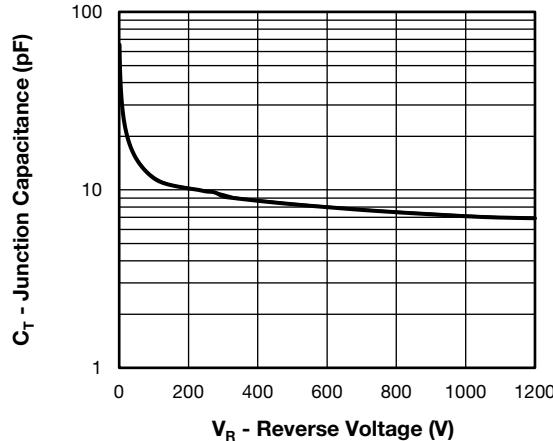


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, Per Leg

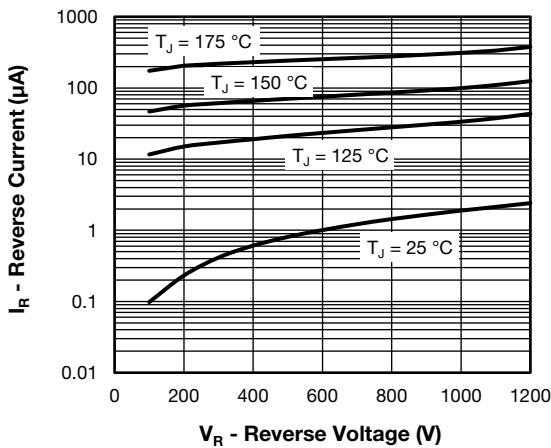


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage, Per Leg

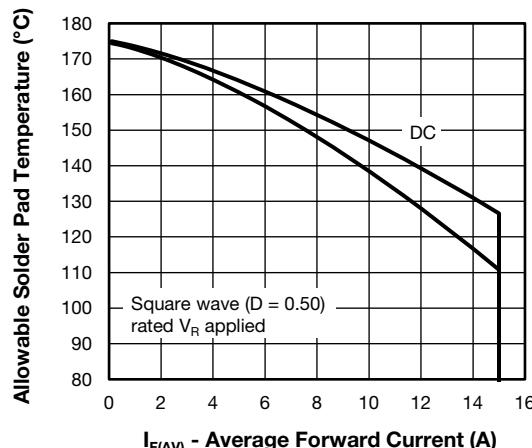


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current, Per Leg

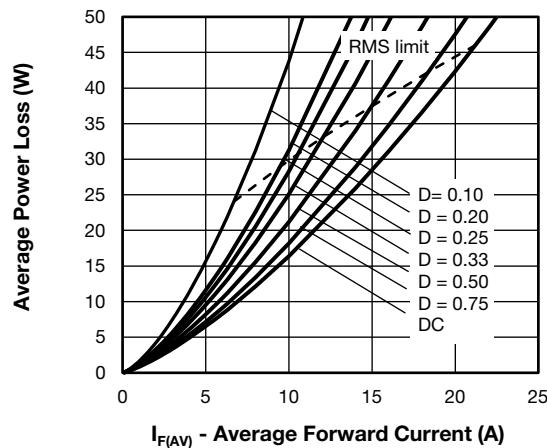


Fig. 5 - Forward Power Loss Characteristics, Per Leg

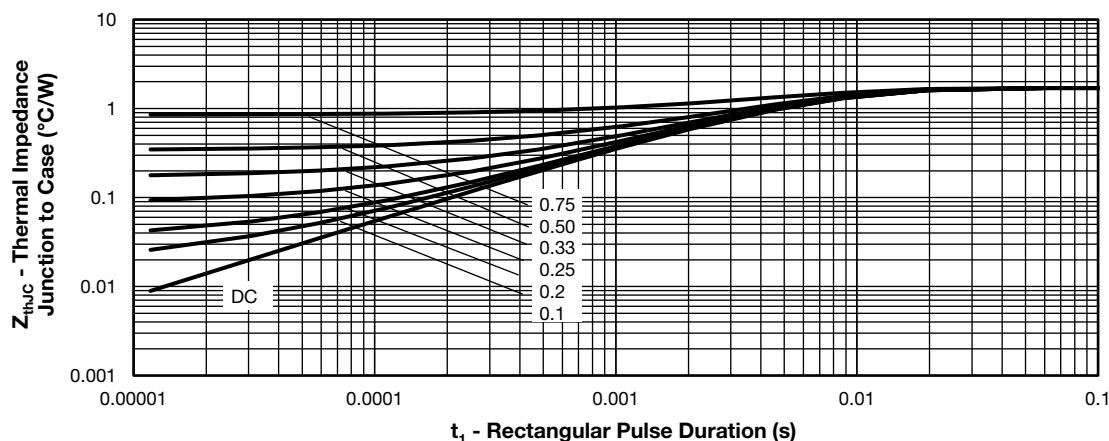


Fig. 6 - Transient Thermal Impedance, Junction to Case, Per Leg

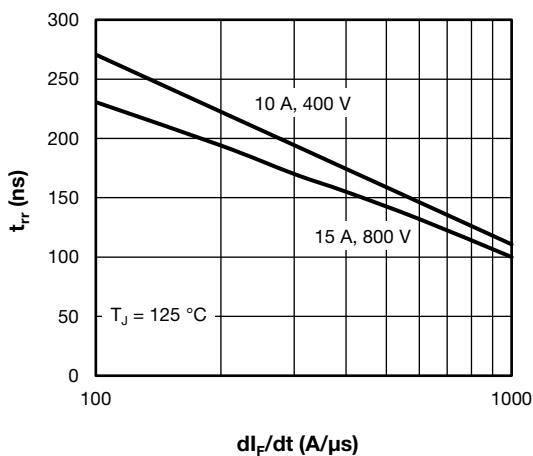


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$ , Per Leg

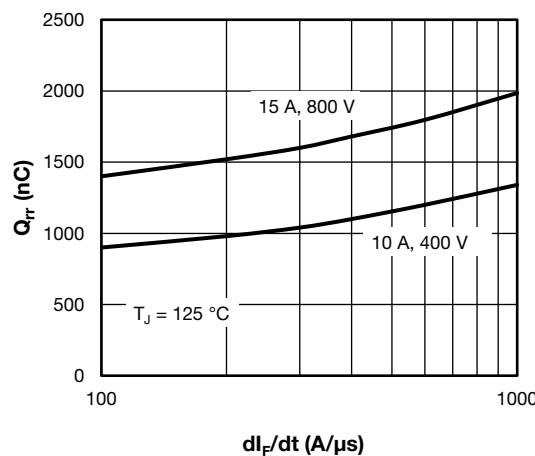


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$ , Per Leg

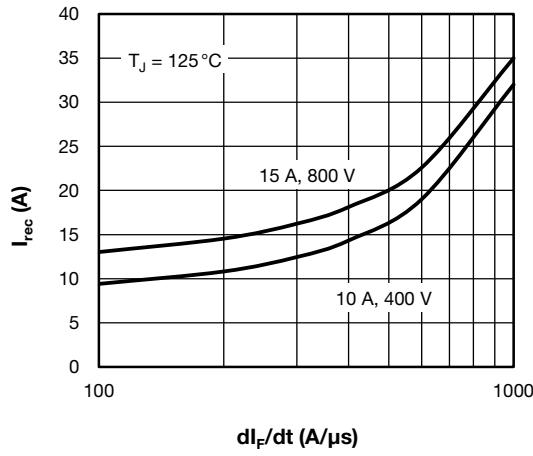


Fig. 9 - Typical Recovery Current vs.  $dI_F/dt$ , Per Leg

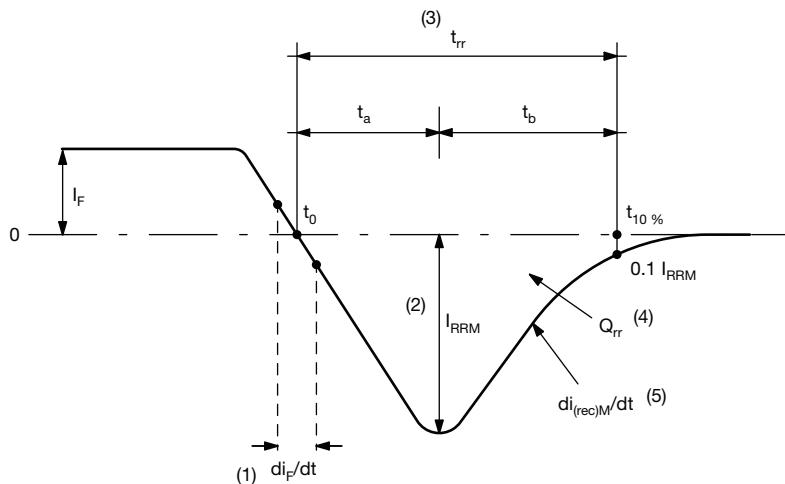


Fig. 10 - Reverse Recovery Waveform and Definitions

#### Notes

- (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  $t_0$ , crossing point of negative going  $I_F$ , to point  $t_{10\%}$ ,  $0.1 I_{RRM}$
- (4)  $Q_{rr}$  - area under curve defined by  $t_0$  and  $t_{10\%}$

$$Q_{rr} = \int_{t_0}^{t_{10\%}} I(t) dt$$

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

#### ORDERING INFORMATION TABLE

Device code	VS-	C	5	T	H	30	12	-M3
	1	2	3	4	5	6	7	8

1	- Vishay Semiconductors product
2	- C = common cathode
3	- 5 = FRED generation 5
4	- Package: T = TO-220AB 3L
5	- H = hyperfast recovery
6	- Current rating (30 = 30 A)
7	- Voltage rating (12 = 1200 V)
8	- Environmental digit: -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

#### ORDERING INFORMATION (Example)

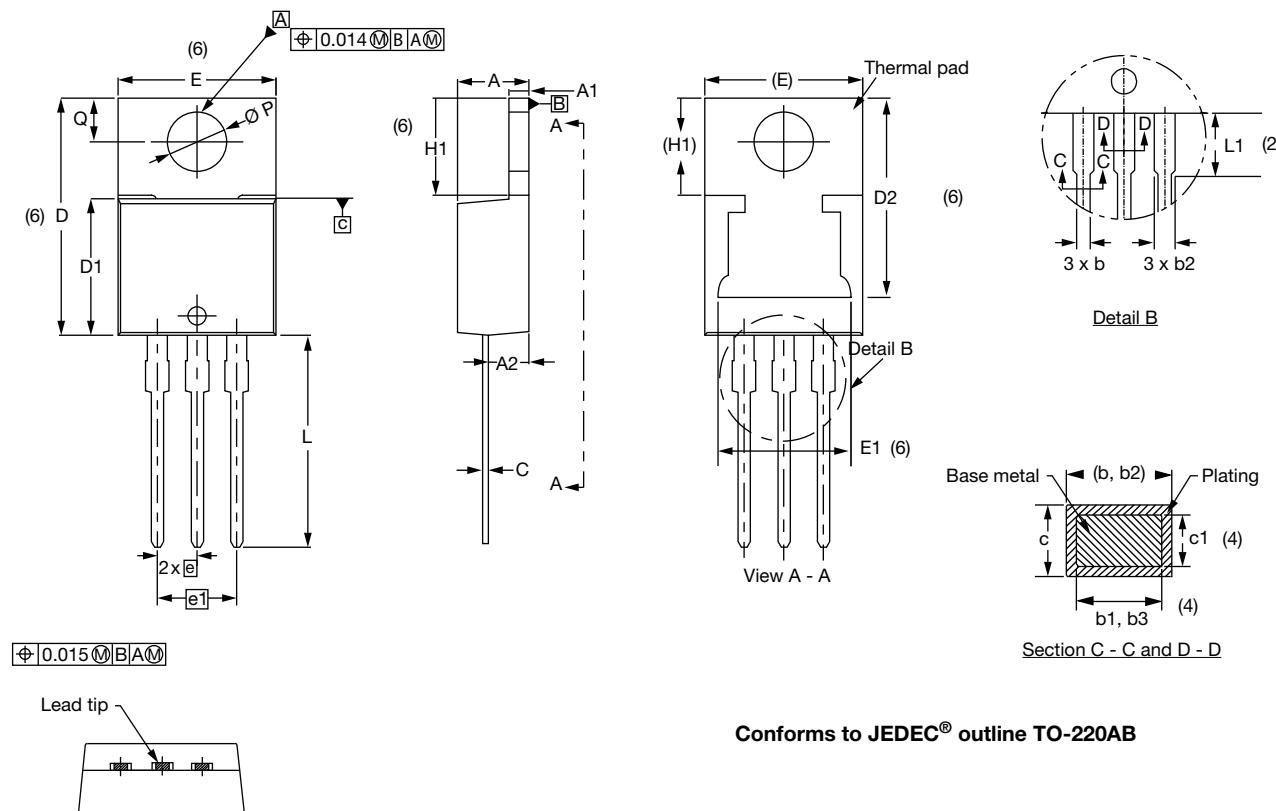
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-C5TH3012-M3	50	Antistatic plastic tubes

#### LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?96154">www.vishay.com/doc?96154</a>
Part marking information	<a href="http://www.vishay.com/doc?95028">www.vishay.com/doc?95028</a>

## TO-220AB 3L

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.50	2.92	0.098	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.97	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.14	1.73	0.045	0.068	4
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
D	14.85	15.35	0.585	0.604	3
D1	8.38	9.02	0.330	0.355	

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	11.68	13.30	0.460	0.524	6, 7
E	10.11	10.51	0.398	0.414	3, 6
E1	6.86	8.89	0.270	0.350	6
e	2.41	2.67	0.095	0.105	
e1	4.88	5.28	0.192	0.208	
H1	6.09	6.48	0.240	0.255	6
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
ØP	3.54	3.91	0.139	0.154	
Q	2.60	3.00	0.102	0.118	

**Notes**

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1, 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 outermost extremes of the plastic body
- (4) Dimension b1, b3, and c1 apply to base metal only
- (5) Controlling dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2, and E1
- (7) Outline conforms to JEDEC® TO-220, except D2

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