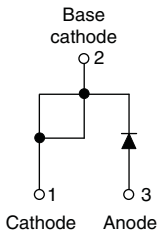
Hyperfast Rectifier, 15 A FRED Pt®



TO-220AC



FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Low leakage current
- Designed and qualified according to JEDEC-JESD47
- Material categorization:
  For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE Available

PRODUCT SUMMARY	
Package	TO-220AC
$I_{F(AV)}$	15 A
V_R	300 V
V_F at I_F	1.25 V
t_{rr} typ.	See Recovery table
T_J max.	175 °C
Diode variation	Single die

DESCRIPTION

300 V series are the state of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop and hyperfast recovery time.
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 the output rectification stage of SMPS, UPS, DC/DC converters as well as freewheeling diodes in low voltage inverters and chopper motor drives.
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**
Repetitive peak reverse voltage	V_{RRM}		300	V
Average rectified forward current	$I_{F(AV)}$	T_C = 142 °C	15	A
Non-repetitive peak surge current	I_{FSM}	T_J = 25 °C	140	
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	300	-	-	V
Forward voltage	V_F	I_F = 15 A	-	1.05	1.25	
		I_F = 15 A, T_J = 125 °C	-	0.85	1.00	
Reverse leakage current	I_R	V_R = V_R rated	-	0.05	40	µA
		T_J = 125 °C, V_R = V_R rated	-	12	400	
Junction capacitance	C_T	V_R = 300 V	-	45	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8	-	nH

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DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1.0 A, dI_F/dt = 50 A/μs, V_R = 30 V		-	-	40	ns
		T_J = 25 °C	I_F = 15 A dI_F/dt = - 200 A/μs V_R = 200 V	-	32	-	
		T_J = 125 °C		-	45	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	2.4	-	A
		T_J = 125 °C		-	6.1	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	38	-	nC
		T_J = 125 °C		-	137	-	

THERMAL - MECHANICAL SPECIFICATIONS (T_J = 25 °C unless otherwise noted)						
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	R_{thJC}		-	1.02	2.0	°C/W
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	70	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.2	-	
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	15ETH03			

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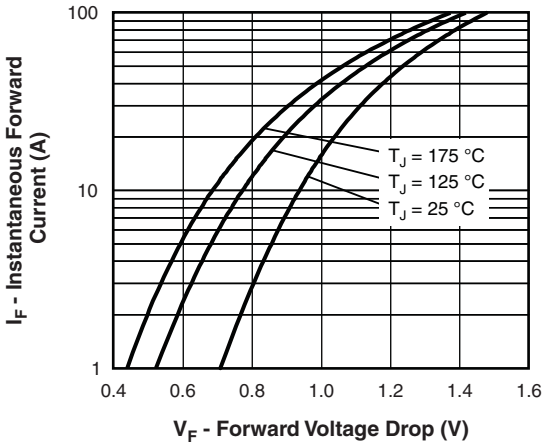


Fig. 1 - Typical Forward Voltage Drop Characteristics

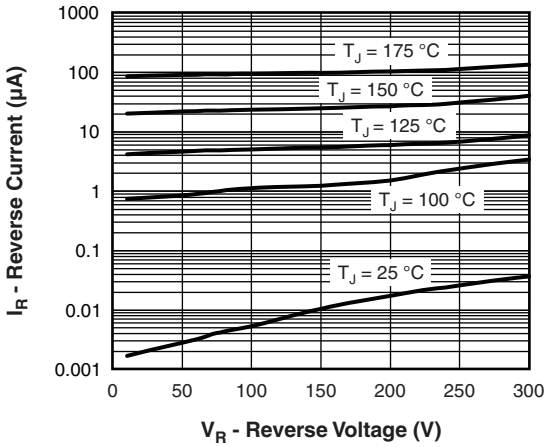


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

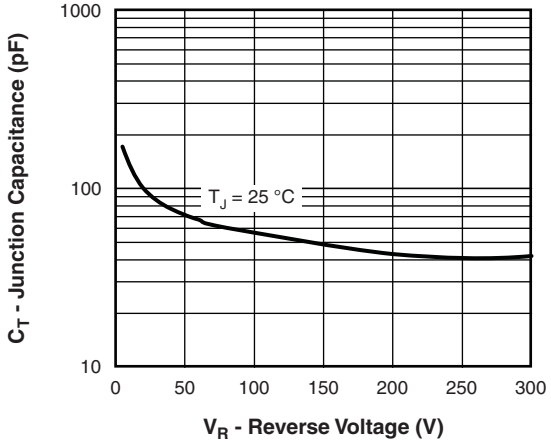


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

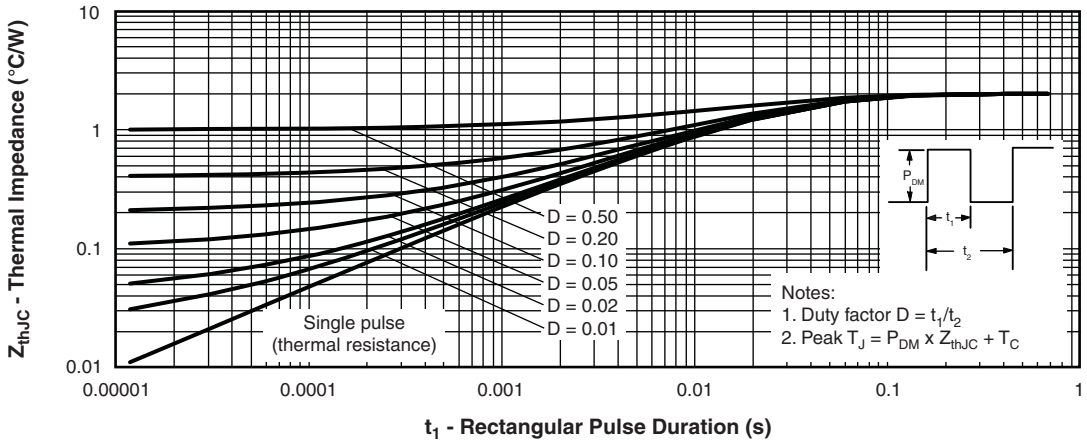


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

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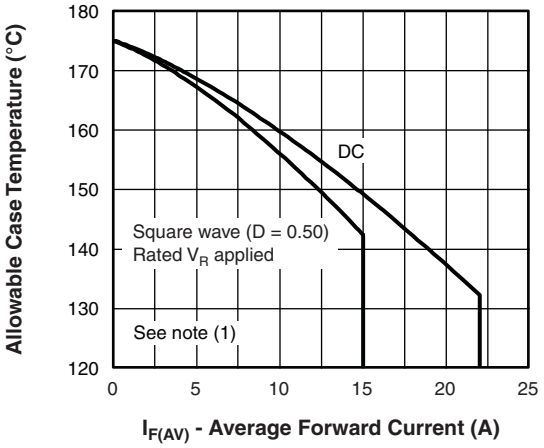


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

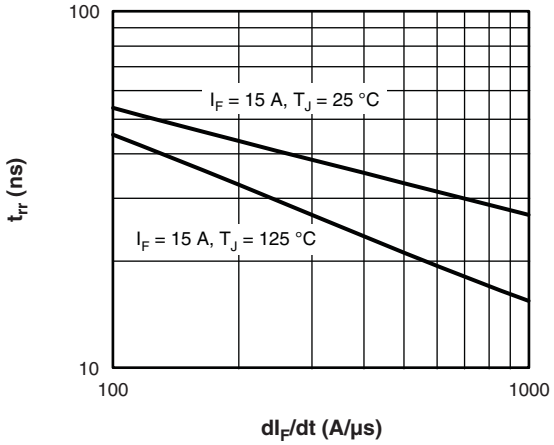


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

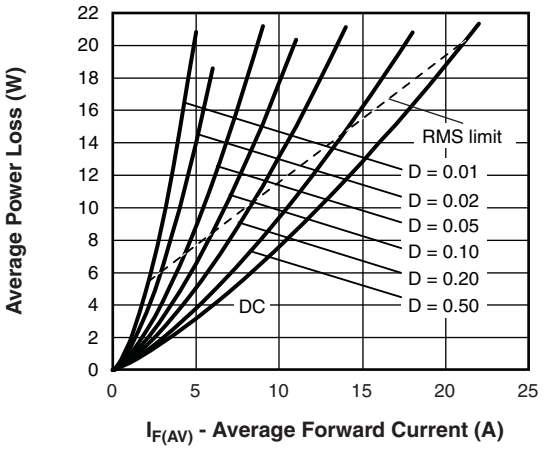


Fig. 6 - Forward Power Loss Characteristics

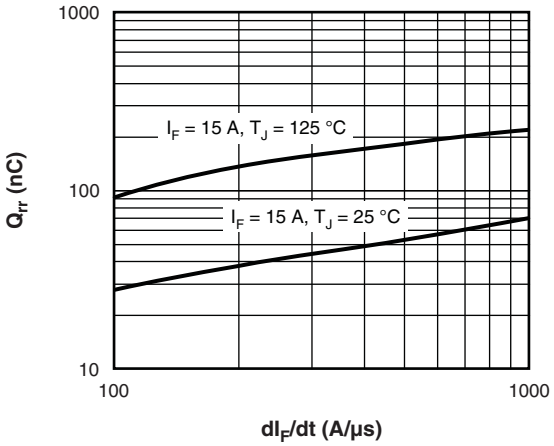


Fig. 8 - Typical Stored Charge vs. dI_F/dt

Note

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

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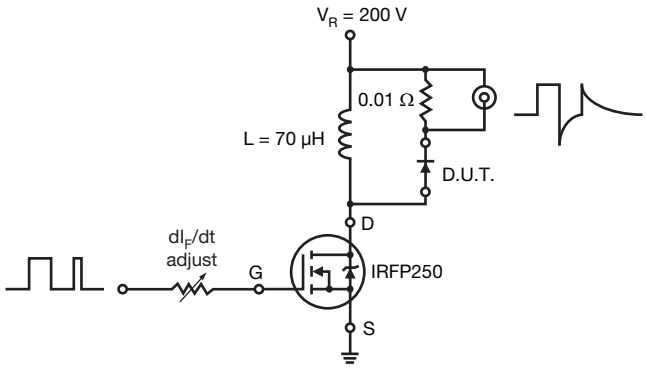
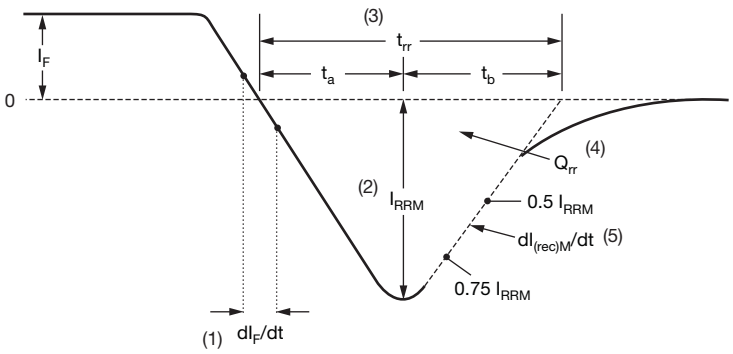


Fig. 9 - Reverse Recovery Parameter Test Circuit



(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 0.50 I_{RRM} extrapolated to zero current.

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

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

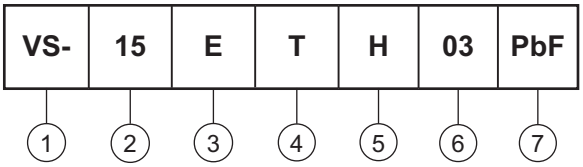
(5) $dI_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

Fig. 10 - Reverse Recovery Waveform and Definitions

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ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product
2 - Current rating (15 = 15 A)
3 - E = Single diode
4 - Package:
T = TO-220
5 - H = Hyperfast recovery
6 - Voltage rating (03 = 300 V)
7 - Environmental digit:
PbF = Lead (Pb)-free and RoHS compliant
-N3 = Halogen-free, RoHS compliant and totally lead (Pb)-free

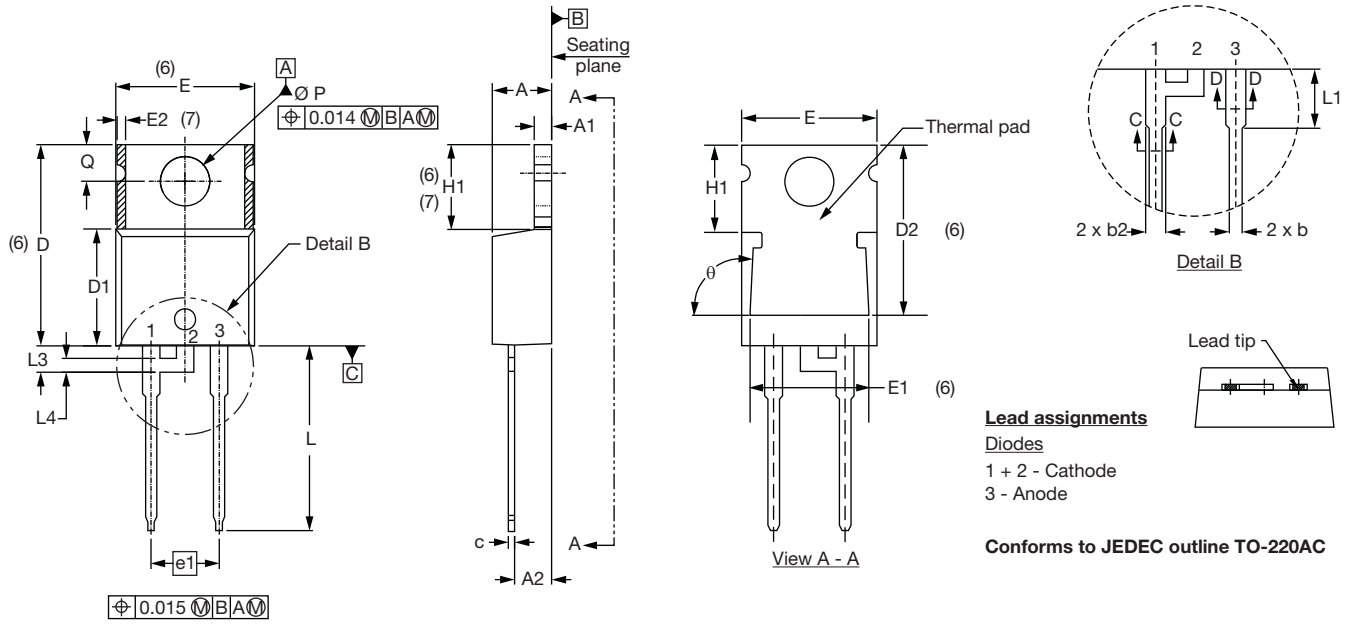
ORDERING INFORMATION (Example)			
PREFERRED P/N	**QUANTITY PER T/R**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-15ETH03PbF	50	1000	Antistatic plastic tube
VS-15ETH03-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions		www.vishay.com/doc?95221
Part marking information	TO-220ACPbF	www.vishay.com/doc?95224
	TO-220AC-N3	www.vishay.com/doc?95068

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TO-220AC

DIMENSIONS in millimeters and inches



Lead assignments
Diodes
1 + 2 - Cathode
3 - Anode

Conforms to JEDEC outline TO-220AC

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	2.56	2.92	0.101	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	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	
D2	11.68	12.88	0.460	0.507	6
E	10.11	10.51	0.398	0.414	3, 6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E1	6.86	8.89	0.270	0.350	6
E2	-	0.76	-	0.030	7
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, 7
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
L3	1.78	2.13	0.070	0.084	
L4	0.76	1.27	0.030	0.050	2
Ø P	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.118	
θ	90° to 93°		90° to 93°		

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 dimension: inches
(6) Thermal pad contour optional within dimensions E, H1, D2 and E1
(7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
(8) Outline conforms to JEDEC TO-220, D2 (minimum) where dimensions are derived from the actual package outline

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