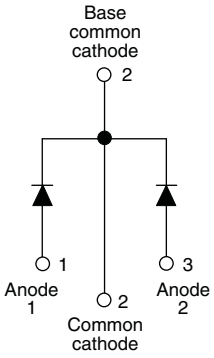
Ultrafast Rectifier, 2 x 15 A FRED Pt®

TO-247AC



FEATURES

- Ultrafast 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

DESCRIPTION/APPLICATIONS

300 V series are the state of the art ultrafast recovery rectifiers designed with optimized performance of forward voltage drop and ultrafast 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.

PRODUCT SUMMARY	
Package	TO-247AC
$I_{F(AV)}$	2 x 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	Common cathode

ABSOLUTE MAXIMUM RATINGS					
PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage		V_{RRM}		300	V
Average rectified forward current	per leg	$I_{F(AV)}$	T_C = 142 °C	15	A
	total device			30	
Non-repetitive peak surge current per leg		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						
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}		-	0.9	2.0	°C/W
Thermal resistance, junction to ambient per leg	R_{thJA}	Typical socket mount	-	-	40	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.4	-	
Weight			-	6.0	-	g
			-	0.21	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-247AC	30CPH03			

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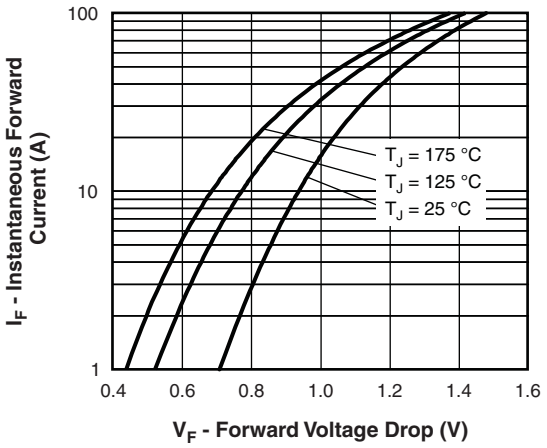

Fig. 1 - Typical Forward Voltage Drop Characteristics

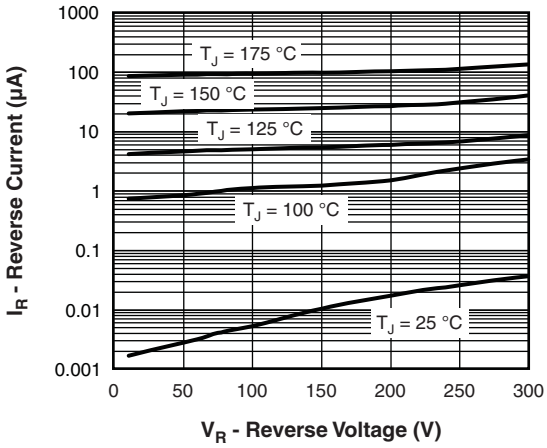

Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

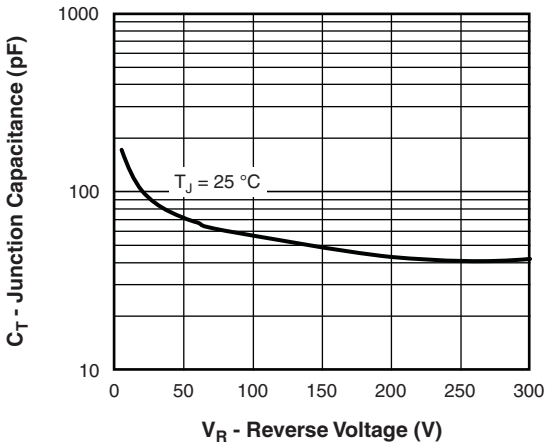

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

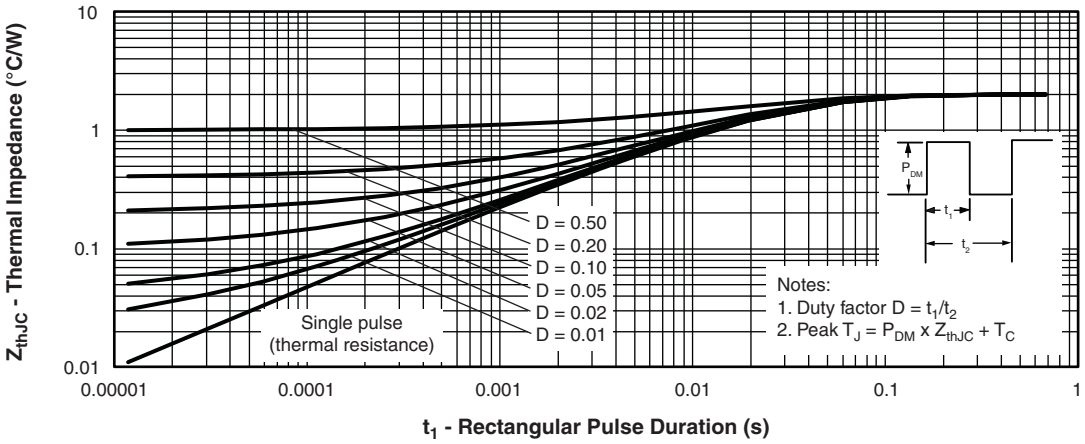

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

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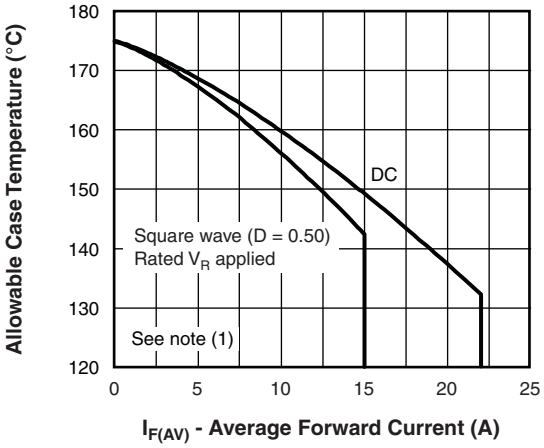

Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

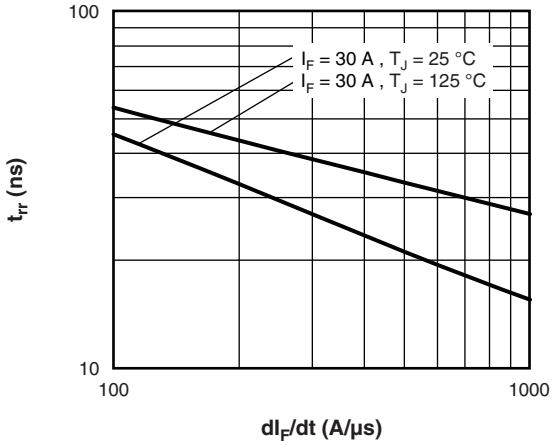

Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

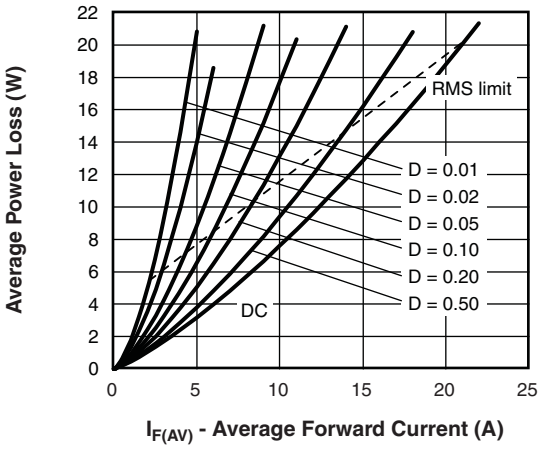

Fig. 6 - Forward Power Loss Characteristics

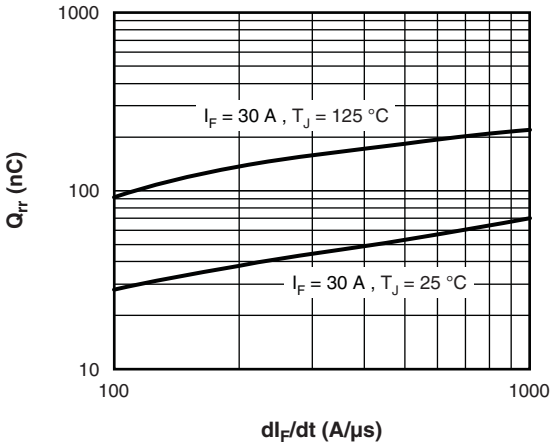

Fig. 8 - Typical Stored Charge vs. dI_F/dt

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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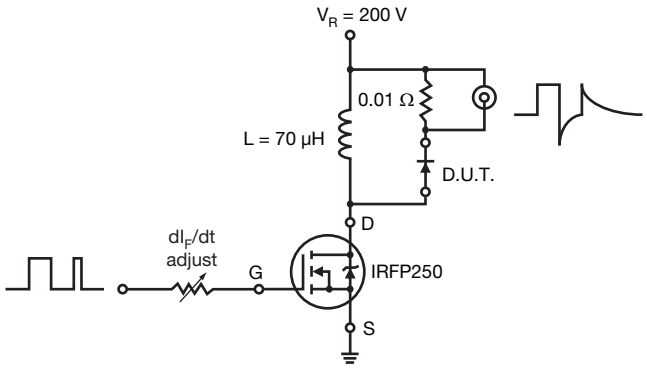
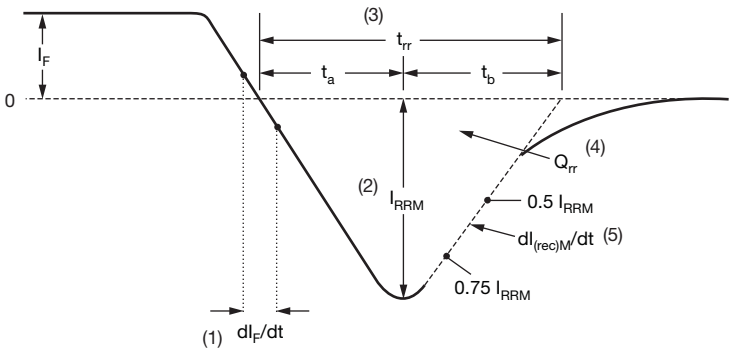


Fig. 9 - Reverse Recovery Parameter Test Circuit



(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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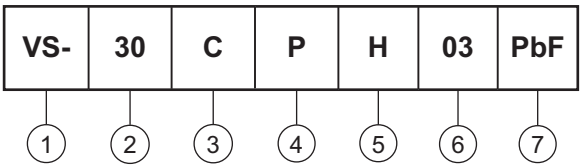
ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product
2 - Current rating (30 = 30 A)
3 - Circuit configuration: C = Common cathode
4 - Package:
P = TO-247
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-30CPH03PbF	25	500	Antistatic plastic tube
VS-30CPH03-N3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions		www.vishay.com/doc?95223
Part marking information	TO-247ACPbF	www.vishay.com/doc?95226
	TO-247AC-N3	www.vishay.com/doc?95007

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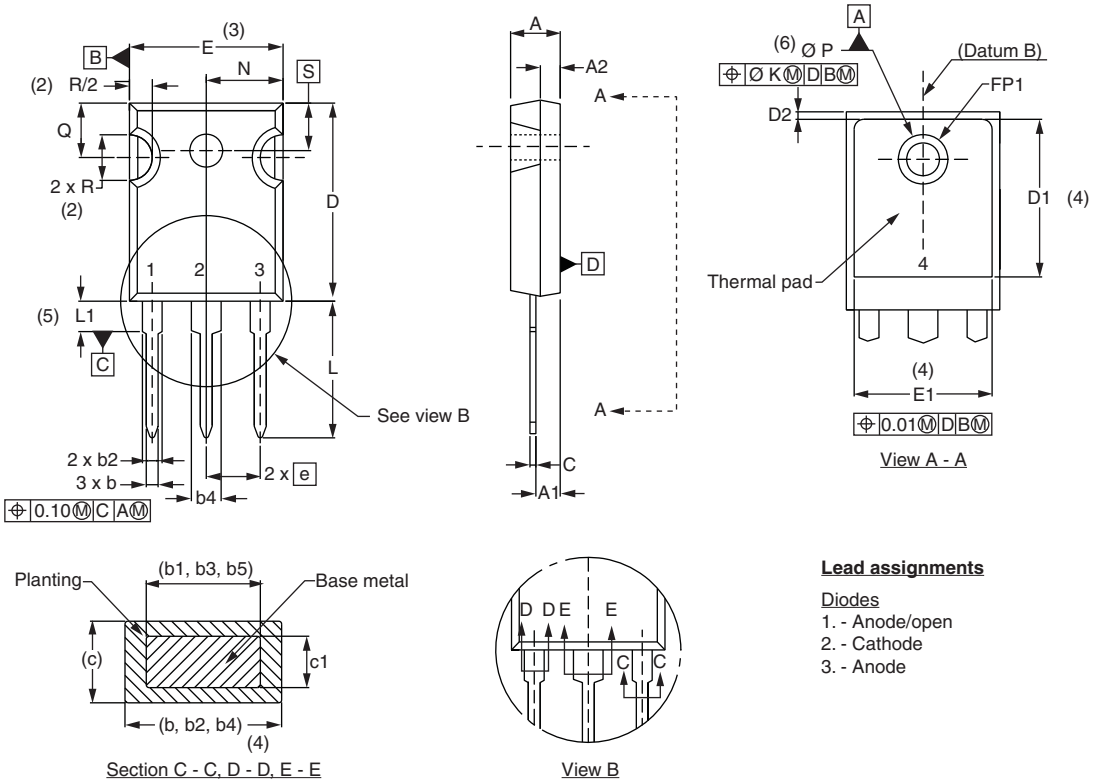
DIMENSIONS in millimeters and inches



Lead assignments

Diodes
1. - Anode/open
2. - Cathode
3. - Anode

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.50	2.49	0.059	0.098	
b	0.99	1.40	0.039	0.055	
b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.37	0.065	0.094	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
c	0.38	0.86	0.015	0.034	
c1	0.38	0.76	0.015	0.030	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	0.51	1.30	0.020	0.051	
E	15.29	15.87	0.602	0.625	3
E1	13.72	-	0.540	-	
e	5.46 BSC		0.215 BSC		
FK	2.54		0.010		
L	14.20	16.10	0.559	0.634	
L1	3.71	4.29	0.146	0.169	
N	7.62 BSC		0.3		
ΦP	3.56	3.66	0.14	0.144	
ΦP1	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	1.78	0.216	
S	5.51 BSC		0.217 BSC		

Notes

(1) Dimensioning and tolerancing per ASME Y14.5M-1994
(2) Contour of slot optional
(3) 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 outermost extremes of the plastic body
(4) Thermal pad contour optional with dimensions D1 and E1
(5) Lead finish uncontrolled in L1
(6) Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
(7) Outline conforms to JEDEC outline TO-247 with exception of dimension c

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Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

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