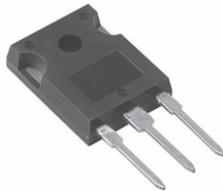
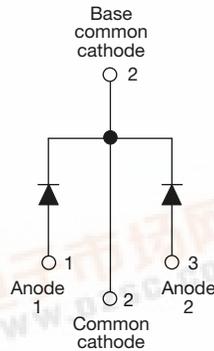


Ultrafast Rectifier, 2 x 30 A FRED Pt®



TO-247AC



FEATURES

- Low forward voltage drop
- 175 °C operating junction temperature
- Ultrafast recovery time
- Low leakage current
- Compliant to RoHS directive 2002/95/EC
- Designed and qualified for industrial level



RoHS COMPLIANT

DESCRIPTION/APPLICATIONS

VS-60CPU04-F3 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, welding, UPS, dc-to-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 30 A
V_R	400 V
V_F at I_F	1.30 V
t_{rr} (typical)	37 ns
T_J maximum	175 °C
Diode variation	Single die

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	V_{RRM}		400	V
Average rectified forward current	$I_{F(AV)}$	Rated V_R , $T_C = 134$ °C	30	A
per leg			60	
Non-repetitive peak surge current per leg	I_{FSM}	$T_J = 25$ °C	300	
Peak repetitive forward current per leg	I_{FM}	Rated V_R , square wave, 20 kHz, $T_C = 134$ °C	60	
Operating junction and storage temperatures	T_J, T_{Stg}		- 65 to 175	°C

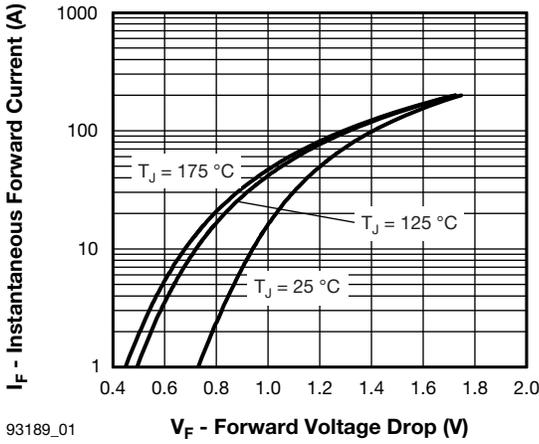
ELECTRICAL SPECIFICATIONS ($T_J = 25$ °C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_R	$I_R = 100$ μ A	400	-	-	V
Forward voltage	V_F	$I_F = 30$ A	-	1.10	1.30	
		$I_F = 30$ A, $T_J = 150$ °C	-	0.92	1.10	
		$I_F = 60$ A	-	1.25	1.6	
		$I_F = 60$ A, $T_J = 150$ °C	-	1.10	1.4	
Reverse leakage current	I_R	$V_R = V_R$ rated	-	-	10	μ A
		$T_J = 150$ °C, $V_R = V_R$ rated	-	-	100	
Junction capacitance	C_T	$V_R = 400$ V	-	40	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	12	-	nH



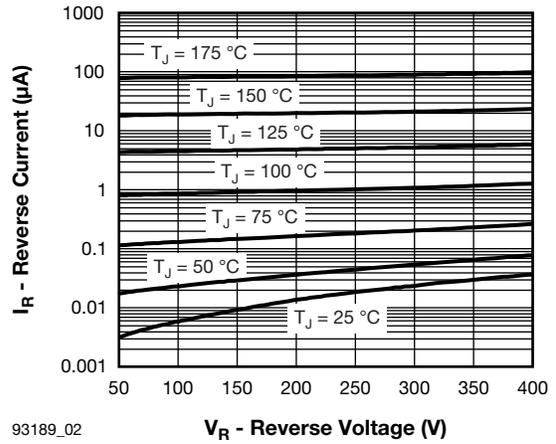
DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t _{rr}	I _F = 1.0 A, di _F /dt = 100 A/μs, V _R = 30 V	-	37	40	ns
		I _F = 1.0 A, di _F /dt = 50 A/μs, V _R = 30 V	-	46	-	
		T _J = 25 °C	-	65	-	
		T _J = 125 °C	-	119	-	
Peak recovery current	I _{RRM}	T _J = 25 °C	-	6.4	-	A
		T _J = 125 °C	-	14.7	-	
Reverse recovery charge	Q _{rr}	T _J = 25 °C	-	206	-	nC
		T _J = 125 °C	-	874	-	

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}		-	0.6	1.0	°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	-	0.5	-	
Weight			-	6	-	g
			-	0.21	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-247AC	60CPU04			



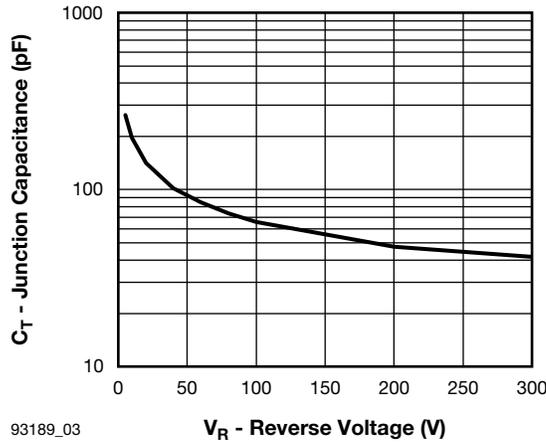
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Fig. 1 - Typical Forward Voltage Drop Characteristics



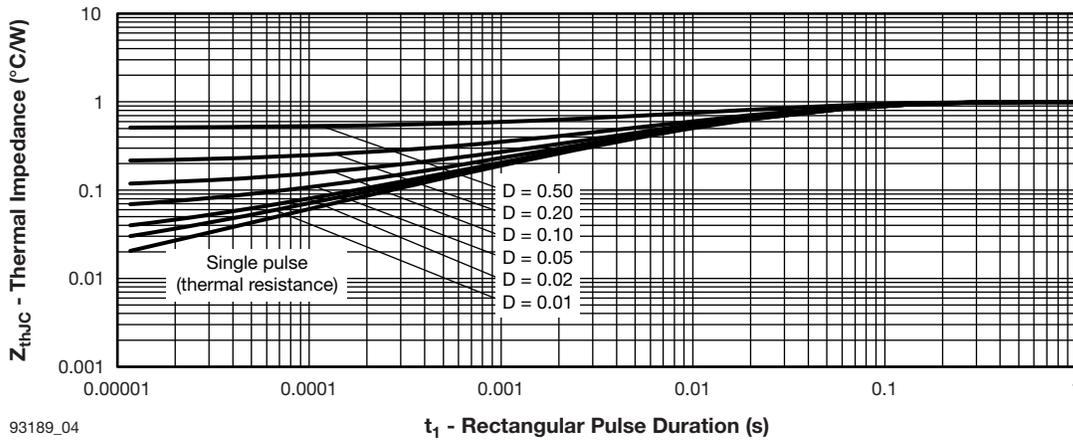
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Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage



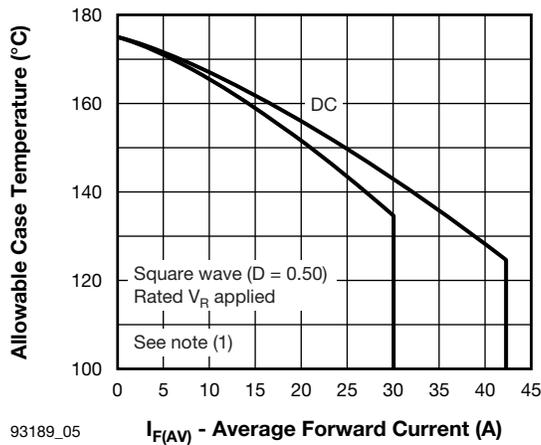
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Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

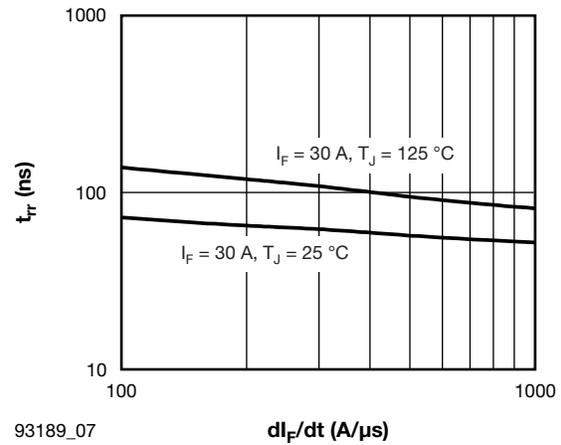


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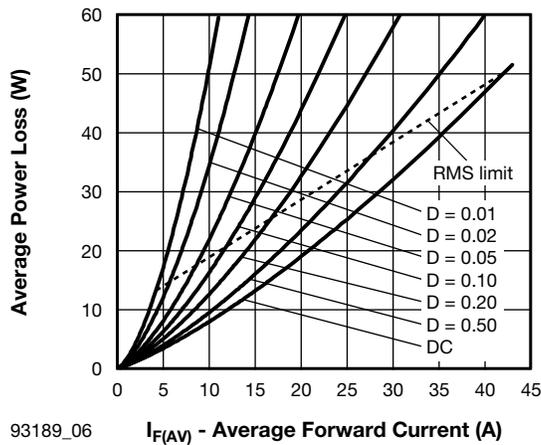
Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics



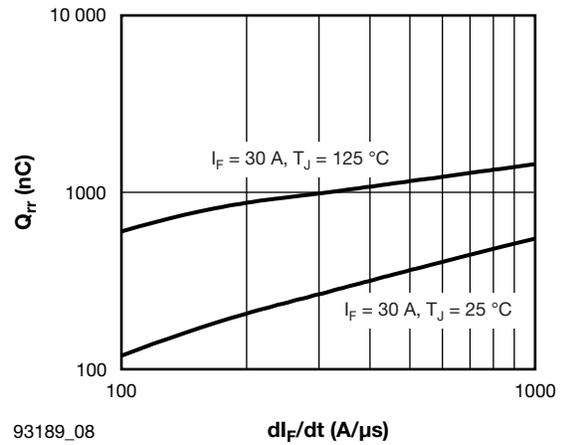
93189_05 **$I_{F(AV)}$ - Average Forward Current (A)**
Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current



93189_07 **di_F/dt (A/μs)**
Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt



93189_06 **$I_{F(AV)}$ - Average Forward Current (A)**
Fig. 6 - Forward Power Loss Characteristics



93189_08 **di_F/dt (A/μs)**
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

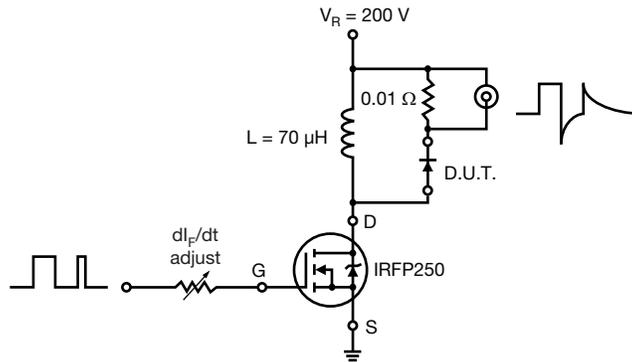
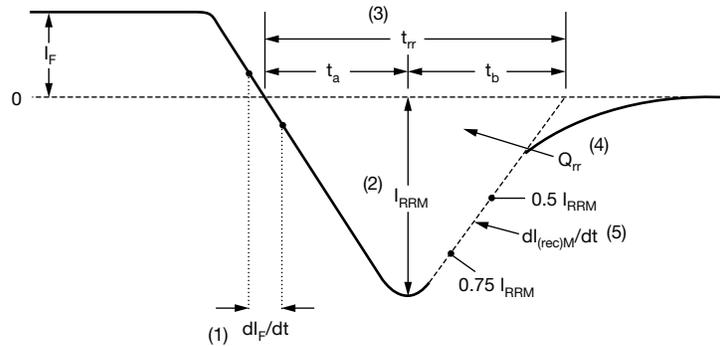


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

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

Fig. 10 - Reverse Recovery Waveform and Definitions

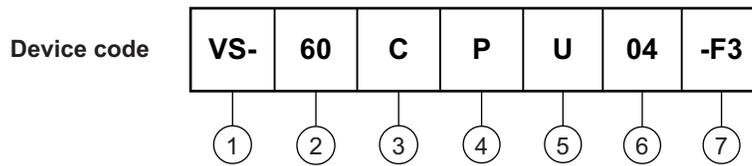
VS-60CPU04-F3



Vishay Semiconductors 世商

Ultrafast Rectifier,
2 x 30 A FRED Pt®

ORDERING INFORMATION TABLE



- 1** - HPP product suffix
- 2** - Current rating (60 = 60 A)
- 3** - Circuit configuration: C = Common cathode
- 4** - P = TO-247AC
- 5** - U = Ultrafast rectifier
- 6** - Voltage rating (04 = 400 V)
- 7** - Environmental digit:
-F3 = RoHS compliant and totally lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-60CPU04-F3	25	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95223
Part marking information	www.vishay.com/doc?95007
SPICE model	www.vishay.com/doc?95398

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