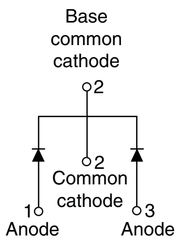
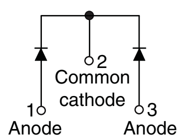
Hyperfast Rectifier, 2 x 10 A FRED Pt®

TO-220AB

TO-220 FULL-PAK



VS-20CTH03PbF
VS-20CTH03-N3



VS-20CTH03FPPbF
VS-20CTH03FP-N3

FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Low leakage current
- Fully isolated package (V_{INS} = 2500 V_{RMS})
- UL E78996 pending
- 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 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.

PRODUCT SUMMARY	
Package	TO-220AB, TO-220FP
$I_{F(AV)}$	2 x 10 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
Peak repetitive reverse voltage		V_{RRM}		300	V
Average rectified forward current	per diode	$I_{F(AV)}$	T_C = 160 °C	10	A
	(FULL-PAK) per diode		T_C = 135 °C		
	per device			20	
Non-repetitive peak surge current		I_{FSM}	T_J = 25 °C	120	
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 = 10 A	-	1.05	1.25	
		I_F = 10 A, T_J = 125 °C	-	0.85	0.95	
Reverse leakage current	I_R	V_R = V_R rated	-	-	20	µA
		T_J = 125 °C, V_R = V_R rated	-	6	200	
Junction capacitance	C_T	V_R = 300 V	-	30	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_C = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1 A, dI_F/dt = 50 A/µs, V_R = 30 V		-	-	35	ns
		I_F = 1 A, dI_F/dt = 100 A/µs, V_R = 30 V		-	-	30	
		T_J = 25 °C	I_F = 10 A dI_F/dt = 200 A/µs V_R = 200 V	-	31	-	
		T_J = 125 °C		-	42	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	2.4	-	A
		T_J = 125 °C		-	5.6	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	36	-	nC
		T_J = 125 °C		-	120	-	

THERMAL - MECHANICAL SPECIFICATIONS							
PARAMETER		**SYMBOL**	**TEST CONDTIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range		T_J, T_{Stg}		- 65	-	175	°C
Thermal resistance, junction to case	per diode	R_{thJC}	Mounting surface, flat, smooth and greased	-	-	1.5	°C/W
	(FULL-PAK) per diode			-	-	3.9	
Marking device			Case style TO-220AB	20CTH03			
			Case style TO-220 FULL-PAK	20CTH03FP			

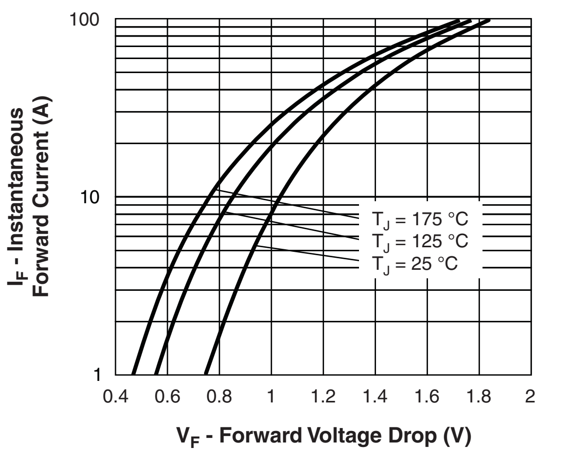


Fig. 1 - Typical Forward Voltage Drop Characteristics

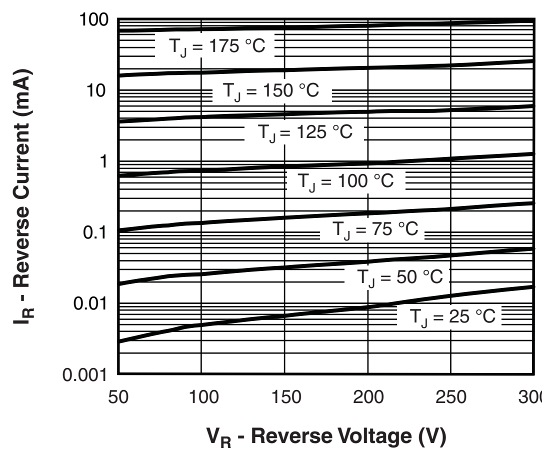


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

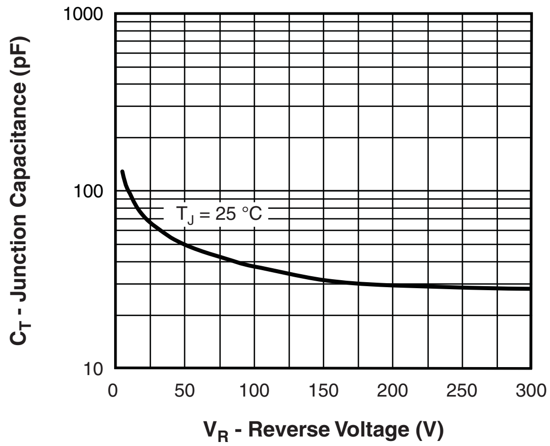


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

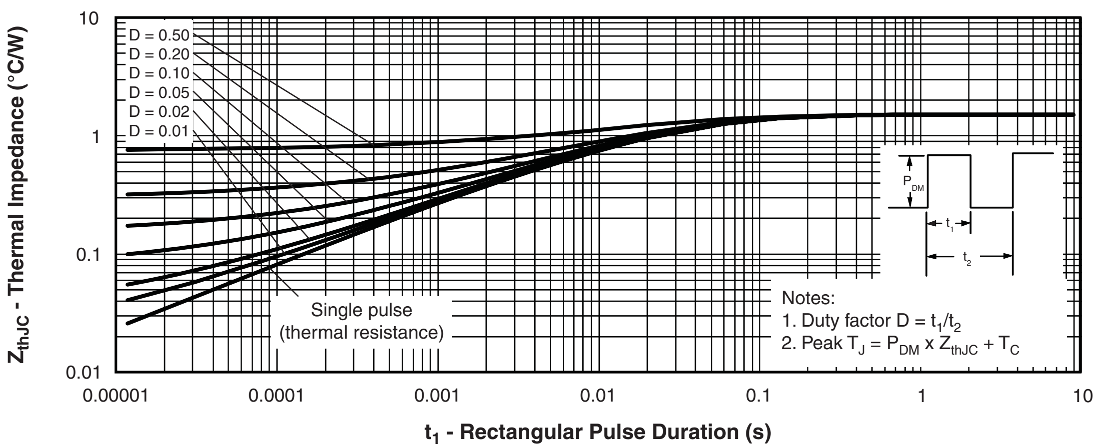


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

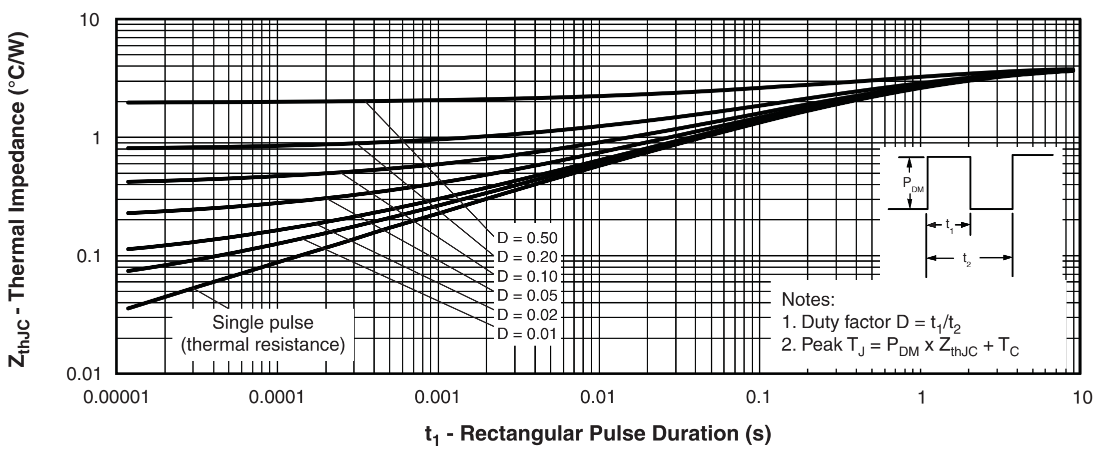


Fig. 5 - Maximum Thermal Impedance Z_{thJC} Characteristics (FULL-PAK)

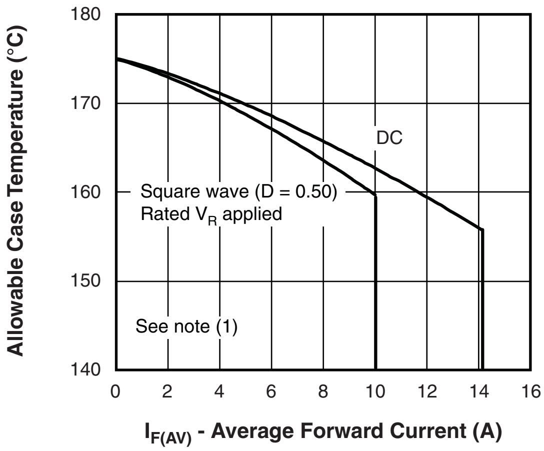


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

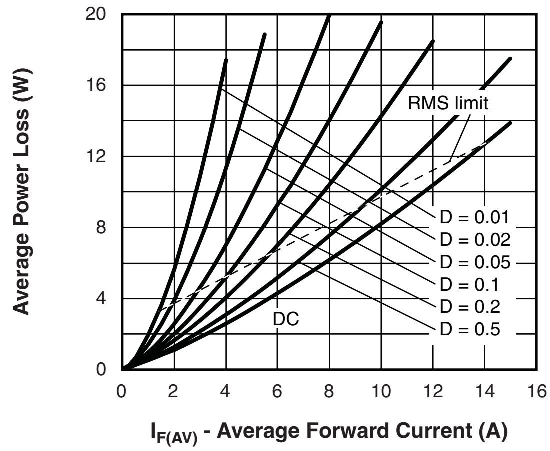


Fig. 8 - Forward Power Loss Characteristics

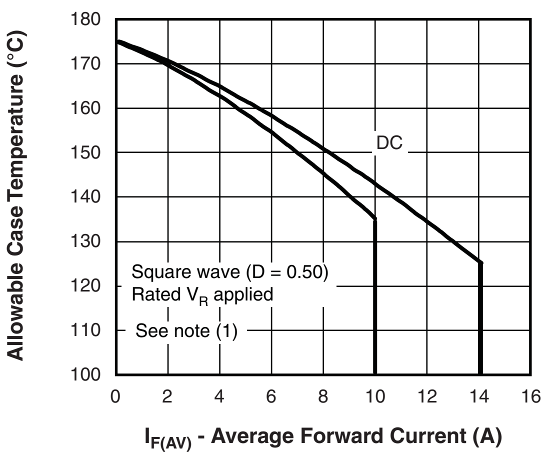


Fig. 7 - Maximum Allowable Case Temperature vs. Average Forward Current (FULL-PAK)

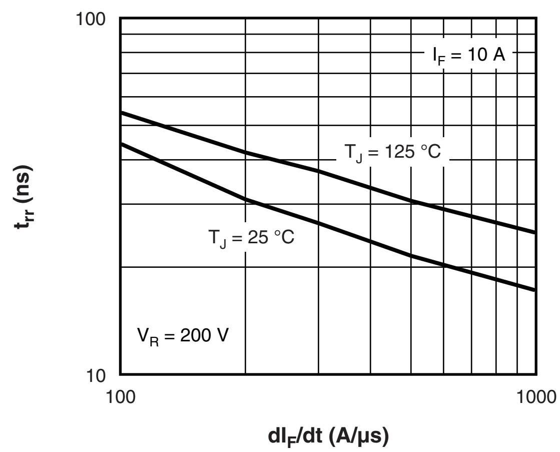


Fig. 9 - Typical Reverse Recovery Time vs. dI_F/dt

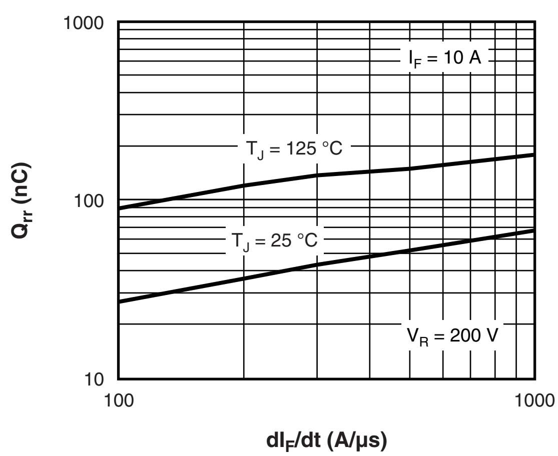


Fig. 10 - Typical Stored Charge vs. dI_F/dt

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. 8);
Pd_{REV} = Inverse power loss = $V_{R1} \times I_R$ (1 - D); I_R at V_{R1} = Rated V_R

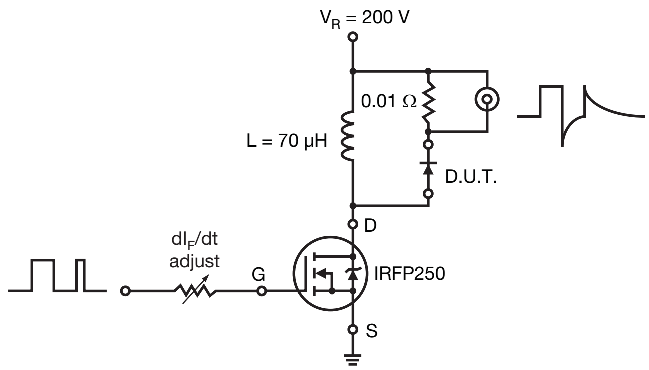
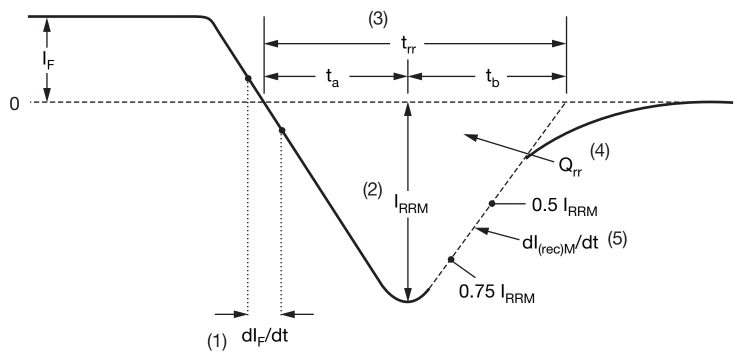


Fig. 11 - Reverse Recovery Parameter Test Circuit



(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 0.50 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. 12 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code	VS-	20	C	T	H	03	FP	PbF
	1	2	3	4	5	6	7	8

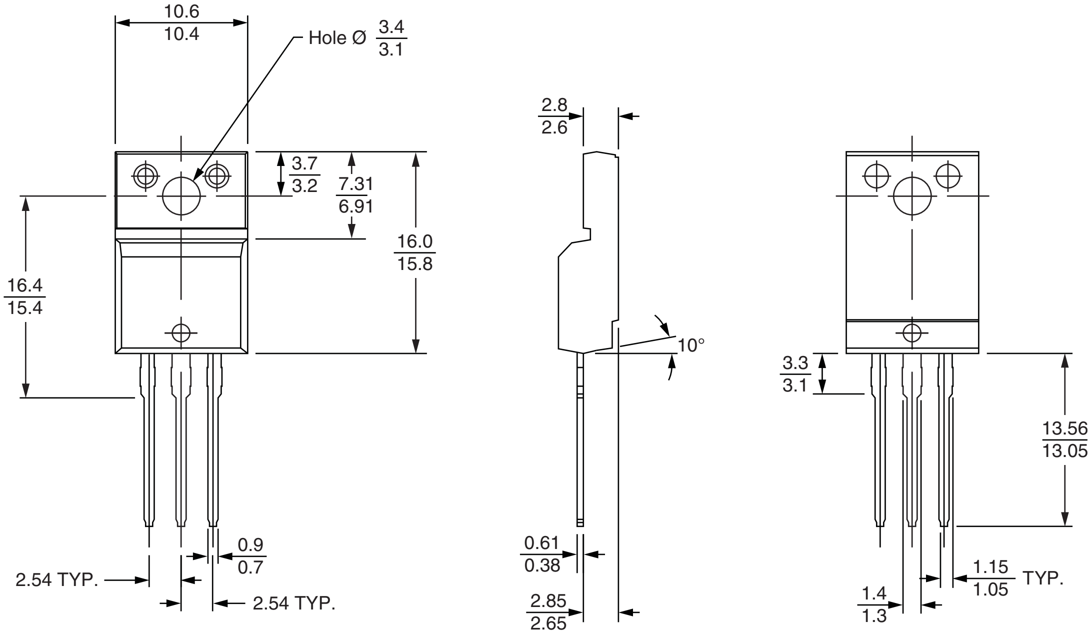
1 - Vishay Semiconductors product
2 - Current rating (20 = 20 A)
3 - C = Common cathode
4 - T = TO-220, D^2PAK
5 - H = Hyperfast recovery
6 - Voltage rating (03 = 300 V)
7 -
• None = TO-220AB
• FP = TO-220 FULL-PAK
8 - Environmental digit:
PbF = Lead (Pb)-free and RoHS compliant
-N3 = Halogen-free, RoHS compliant and totally lead (Pb)-free

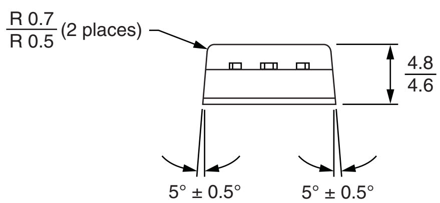
ORDERING INFORMATION (Example)

PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-20CTH03PbF	50	1000	Antistatic plastic tube
VS-20CTH03-N3	50	1000	Antistatic plastic tube
VS-20CTH03FPPbF	50	1000	Antistatic plastic tube
VS-20CTH03FP-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-220AB	www.vishay.com/doc?95222
	TO-220FP	www.vishay.com/doc?95072
Part marking information	TO-220ABPbF	www.vishay.com/doc?95225
	TO-220AB-N3	www.vishay.com/doc?95028
	TO-220FPPbF	www.vishay.com/doc?95069
	TO-220FP-N3	www.vishay.com/doc?95456

DIMENSIONS in millimeters





Lead assignments

Diodes

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

Conforms to JEDEC outline TO-220 FULL-PAK

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