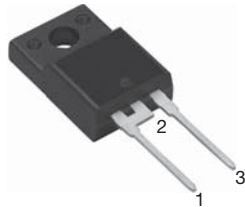
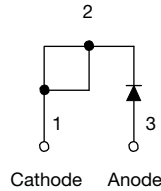


Fast Soft Recovery Rectifier Diode, 20 A


TO-220 FULL-PAK


FEATURES

- 150 °C max. operation junction temperature
- Designed and qualified according to JEDEC®-JESD47
- Fully isolated package ($V_{INS} = 2500 V_{RMS}$)
- UL E78996 approved
- Material categorization:
For definitions of compliance please see www.vishay.com/doc?99912



APPLICATIONS

These devices are intended for use in output rectification and freewheeling in inverters, choppers and converters as well as in input rectification where severe restrictions on conducted EMI should be met.

DESCRIPTION

The VS-20ETF...FP... fast soft recovery rectifier series has been optimized for combined short reverse recovery time and low forward voltage drop.

The glass passivation ensures stable reliable operation in the most severe temperature and power cycling conditions.

PRODUCT SUMMARY	
Package	TO-220FP
$I_{F(AV)}$	20 A
V_R	1000 V, 1200 V
V_F at I_F	1.31 V
I_{FSM}	320 A
t_{rr}	95 ns
T_J max.	150 °C
Diode variation	Single die
Snap factor	0.6

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
V_{RRM}		1000 to 1200	V
$I_{F(AV)}$	Sinusoidal waveform	20	A
I_{FSM}		320	
t_{rr}	1 A, 100 A/ μ s	95	ns
V_F	20 A, $T_J = 25$ °C	1.31	V
T_J	Range	-40 to 150	°C

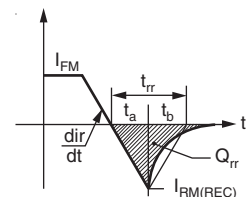
VOLTAGE RATINGS			
PART NUMBER	V_{RRM} , MAXIMUM PEAK REVERSE VOLTAGE V	V_{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM} AT 150 °C mA
VS-20ETF10FPPbF, VS-20ETF10FP-M3	1000	1100	6
VS-20ETF12FPPbF, VS-20ETF12FP-M3	1200	1300	

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	$T_C = 50$ °C, 180° conduction half sine wave	20	A
Maximum peak one cycle non-repetitive surge current	I_{FSM}	10 ms sine pulse, rated V_{RRM} applied	270	
		10 ms sine pulse, no voltage reapplied	320	
Maximum I^2t for fusing	I^2t	10 ms sine pulse, rated V_{RRM} applied	365	A^2s
		10 ms sine pulse, no voltage reapplied	515	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1$ ms to 10 ms, no voltage reapplied	5150	$A^2\sqrt{s}$



ELECTRICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop	V_{FM}	20 A, $T_J = 25\text{ }^\circ\text{C}$		1.31	V
Forward slope resistance	r_t	$T_J = 150\text{ }^\circ\text{C}$		11.88	m Ω
Threshold voltage	$V_{F(TO)}$			0.93	V
Maximum reverse leakage current	I_{RM}	$T_J = 25\text{ }^\circ\text{C}$	$V_R = \text{Rated } V_{RRM}$	0.1	mA
		$T_J = 150\text{ }^\circ\text{C}$		6	

RECOVERY CHARACTERISTICS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Reverse recovery time	t_{rr}	I_F at 20 Apk 25 A/ μ s 25 $^\circ\text{C}$	400	ns
Reverse recovery current	I_{rr}		6.1	A
Reverse recovery charge	Q_{rr}		1.7	μC
Snap factor	S		Typical	0.6



THERMAL - MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	T_J, T_{Stg}		-40 to 150	$^\circ\text{C}$
Maximum thermal resistance, junction to case	R_{thJC}	DC operation	2.5	$^\circ\text{C/W}$
Maximum thermal resistance, junction to ambient	R_{thJA}		62	
Typical thermal resistance, case to heatsink	R_{thCS}	Mounting surface, smooth and greased	0.5	
Approximate weight			2	g
			0.07	oz.
Mounting torque	minimum		6 (5)	kgf · cm (lbf · in)
	maximum		12 (10)	
Marking device		Case style TO-220 FULL-PAK	20ETF10FP 20ETF12FP	

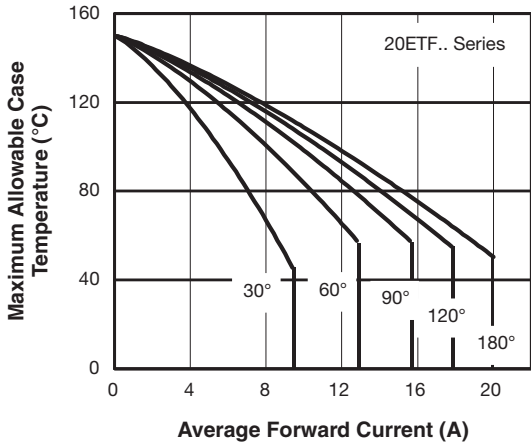


Fig. 1 - Current Rating Characteristics

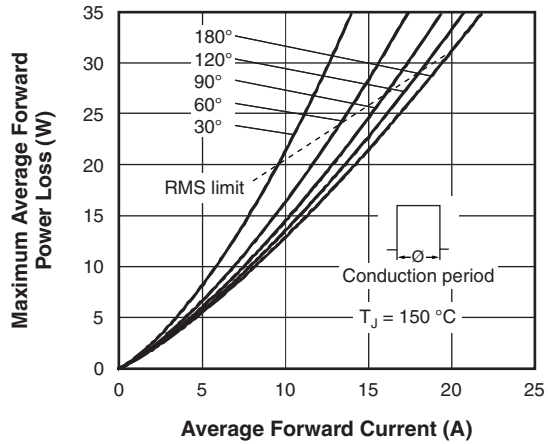


Fig. 4 - Forward Power Loss Characteristics

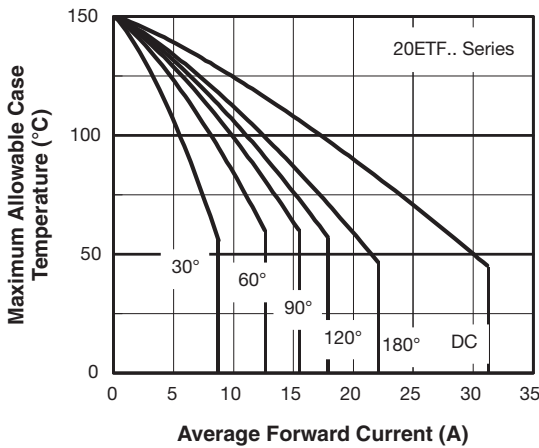


Fig. 2 - Current Rating Characteristics

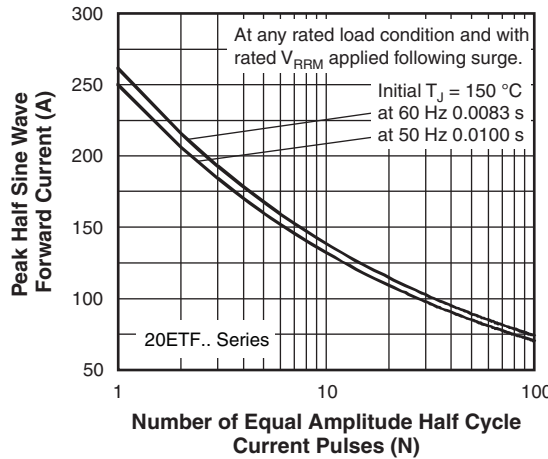


Fig. 5 - Maximum Non-Repetitive Surge Current

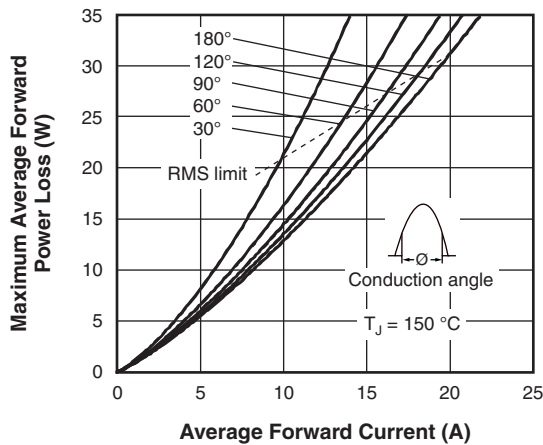


Fig. 3 - Forward Power Loss Characteristics

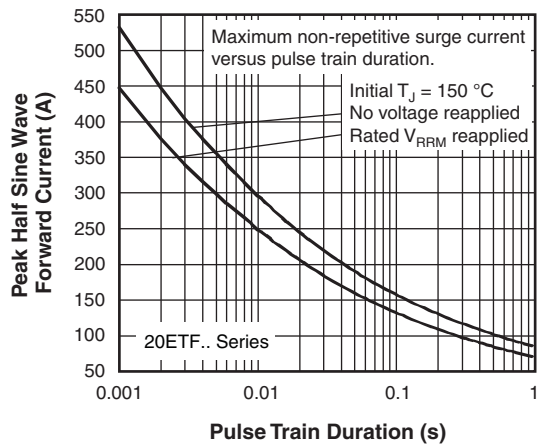


Fig. 6 - Maximum Non-Repetitive Surge Current

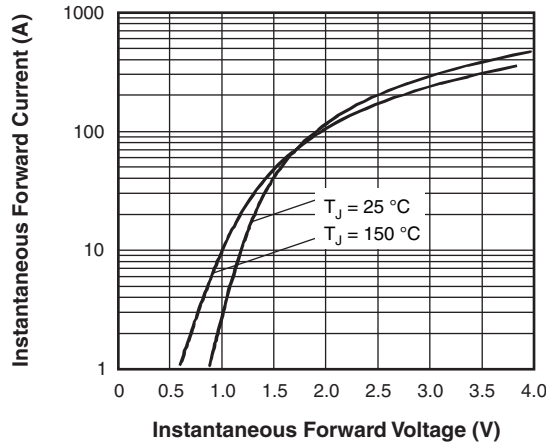


Fig. 7 - Forward Voltage Drop Characteristics

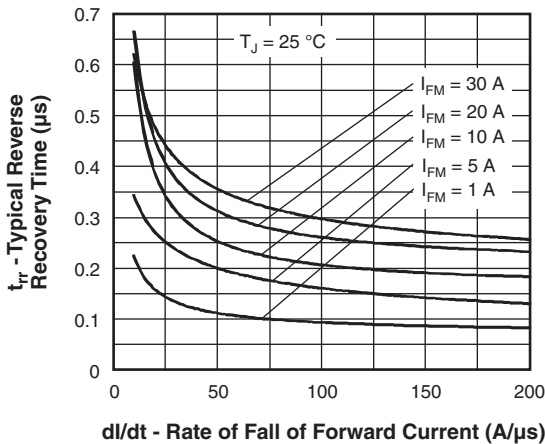


Fig. 8 - Recovery Time Characteristics, $T_J = 25\text{ }^\circ\text{C}$

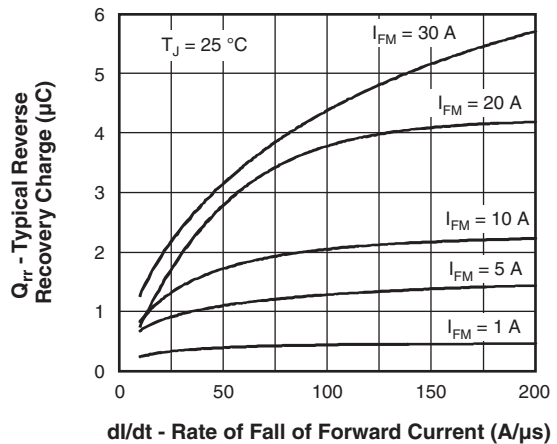


Fig. 10 - Recovery Charge Characteristics, $T_J = 25\text{ }^\circ\text{C}$

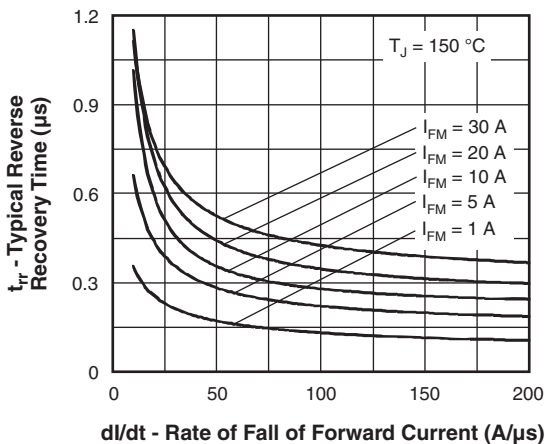


Fig. 9 - Recovery Time Characteristics, $T_J = 150\text{ }^\circ\text{C}$

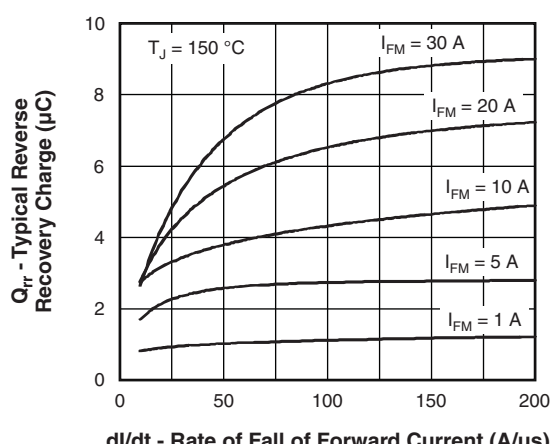


Fig. 11 - Recovery Charge Characteristics, $T_J = 150\text{ }^\circ\text{C}$

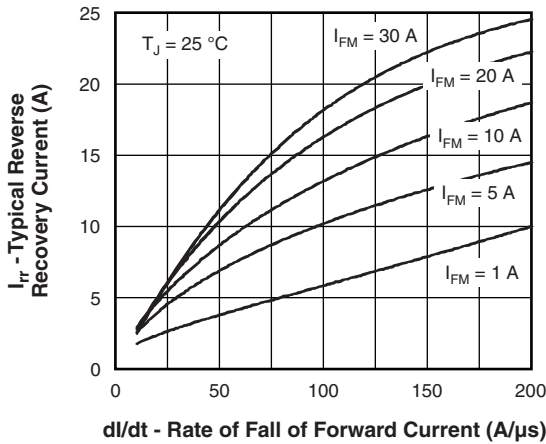


Fig. 12 - Recovery Current Characteristics, $T_J = 25\text{ }^\circ\text{C}$

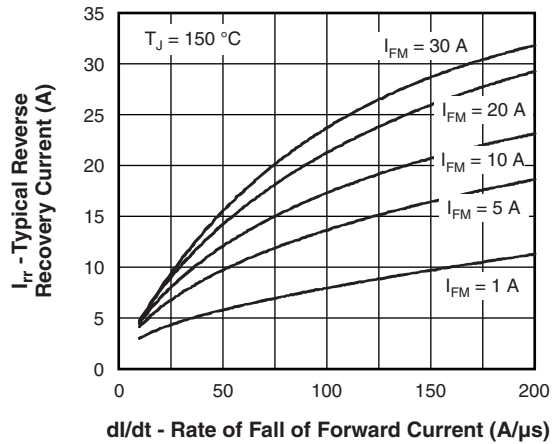


Fig. 13 - Recovery Current Characteristics, $T_J = 150\text{ }^\circ\text{C}$

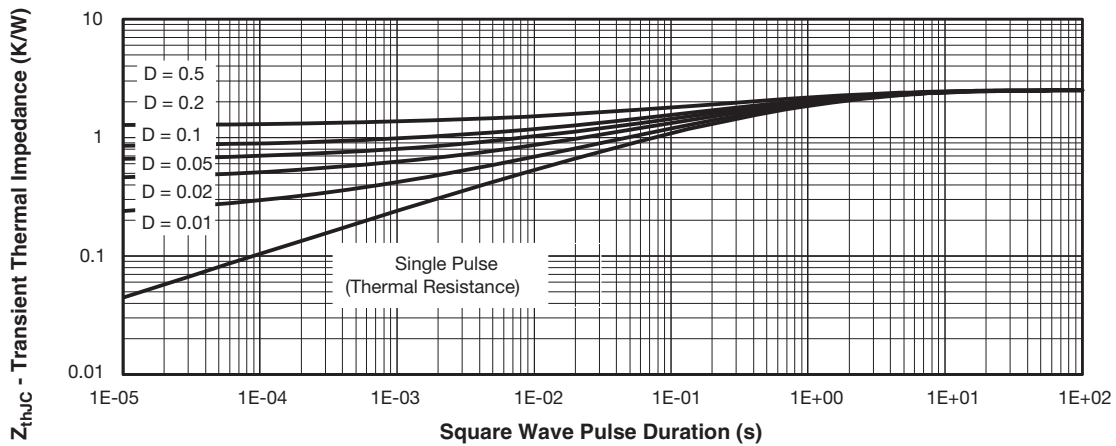
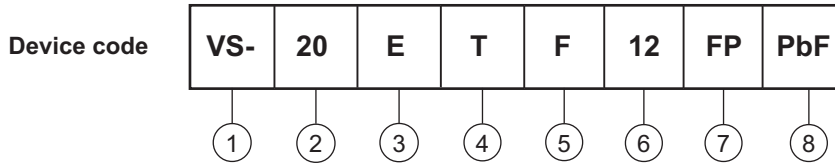


Fig. 14 - Thermal Impedance Z_{thJC} Characteristics



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (20 = 20 A)
- 3** - Circuit configuration:
E = Single diode
- 4** - Package:
T = TO-220
- 5** - Type of silicon:
F = Fast soft recovery rectifier
- 6** - Voltage code x 100 = V_{RRM}

10 = 1000 V
12 = 1200 V
- 7** - FULL-PAK
- 8** - Environmental digit:
 - PbF = Lead (Pb)-free and RoHS compliant
 - -M3 = Halogen-free, RoHS compliant and terminations lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-20ETF10FPPbF	50	1000	Antistatic plastic tubes
VS-20ETF10FP-M3	50	1000	Antistatic plastic tubes
VS-20ETF12FPPbF	50	1000	Antistatic plastic tubes
VS-20ETF12FP-M3	50	1000	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95005
Part marking information	TO-220 FP PbF www.vishay.com/doc?95009
	TO-220 FP -M3 www.vishay.com/doc?95440



DIMENSIONS in millimeters



Lead assignments

- Diodes**
1 + 2 - Cathode
3 - Anode

Conforms to JEDEC outline TO-220 FULL-PAK



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

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.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Vishay:

[20ETF10FP](#) [20ETF12FP](#) [VS-20ETF12PBF](#) [VS-20ETF10PBF](#) [VS-20ETF08PBF](#) [VS-20ETF12-M3](#) [VS-20ETF10STRRPBF](#) [VS-20ETF12FP-M3](#)