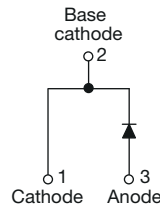


Fast Soft Recovery Rectifier Diode, 20 A



2L TO-220AC



FEATURES

- Glass passivated pellet chip junction
- 150 °C max operating junction temperature
- Low forward voltage drop and short reverse recovery time
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

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-20ETF0... 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.

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	20 A
V_R	200 V, 400 V, 600 V
V_F at I_F	1.3 V
I_{FSM}	300 A
t_{rr}	60 ns
T_J max.	150 °C
Snap factor	0.6
Package	2L TO-220AC
Circuit configuration	Single

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
V_{RRM}	Range	200 to 600	V
$I_{F(AV)}$	Sinusoidal waveform	20	A
I_{FSM}		300	
t_{rr}	1 A, 100 A/μs	60	ns
V_F	10 A, $T_J = 25$ °C	1.2	V
T_J	Range	-40 to +150	°C

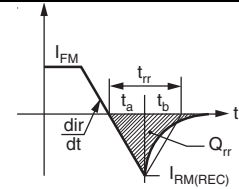
VOLTAGE RATINGS			
PART NUMBER	V_{RRM} , MAXIMUM PEAK REVERSE VOLTAGE V	V_{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM} AT 150 °C mA
VS-20ETF02-M3	200	300	5
VS-20ETF04-M3	400	500	
VS-20ETF06-M3	600	700	

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	$T_C = 97$ °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	250	
		10 ms sine pulse, no voltage reapplied	300	
Maximum I^2t for fusing	I^2t	10 ms sine pulse, rated V_{RRM} applied	316	A ² s
		10 ms sine pulse, no voltage reapplied	442	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1$ to 10 ms, no voltage reapplied	4420	A ² √s



ELECTRICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop	V_{FM}	20 A, $T_J = 25\text{ }^\circ\text{C}$		1.3	V
Forward slope resistance	r_t	$T_J = 150\text{ }^\circ\text{C}$		12.5	$m\Omega$
Threshold voltage	$V_{F(TO)}$			0.9	V
Maximum reverse leakage current	I_{RM}	$T_J = 25\text{ }^\circ\text{C}$	$V_R = \text{Rated } V_{RRM}$	0.1	mA
		$T_J = 150\text{ }^\circ\text{C}$		5.0	

RECOVERY CHARACTERISTICS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Reverse recovery time	t_{rr}	I_F at 20 A _{pk} 100 A/ μ s 25 $^\circ\text{C}$	160	ns
Reverse recovery current	I_{rr}		10	A
Reverse recovery charge	Q_{rr}		1.25	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	0.9	$^\circ\text{C/W}$
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)	$\text{kgf} \cdot \text{cm}$ $(\text{lbf} \cdot \text{in})$
	maximum		12 (10)	
Marking device		Case style 2L TO-220AC	20ETF02 20ETF04 20ETF06	

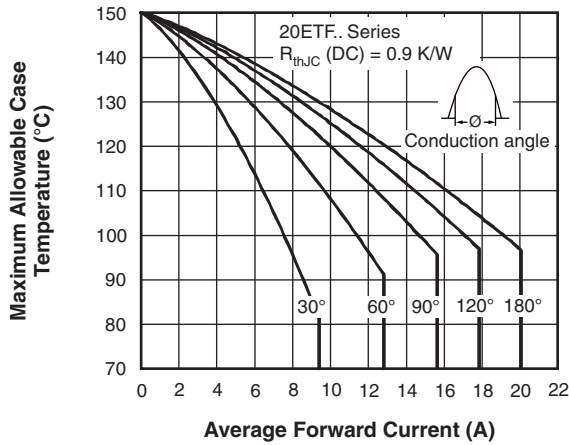


Fig. 1 - Current Rating Characteristics

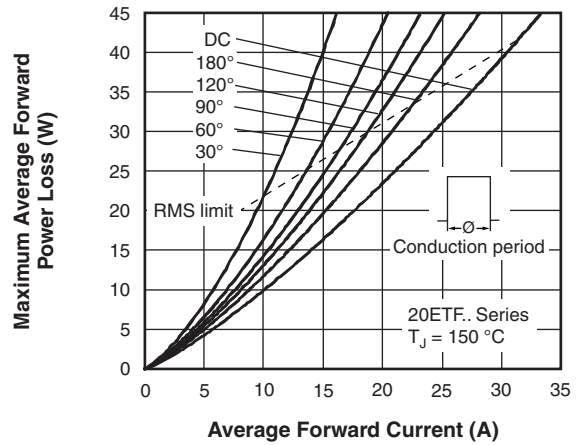


Fig. 4 - Forward Power Loss Characteristics

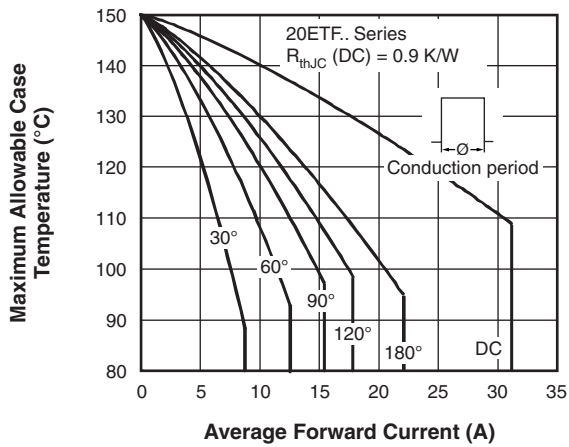


Fig. 2 - Current Rating Characteristics

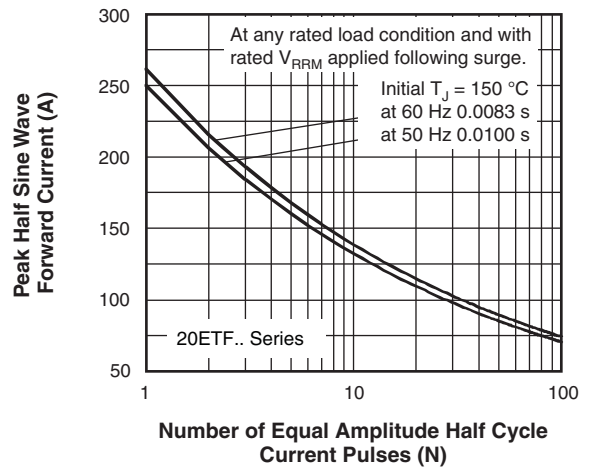


Fig. 5 - Maximum Non-Repetitive Surge Current

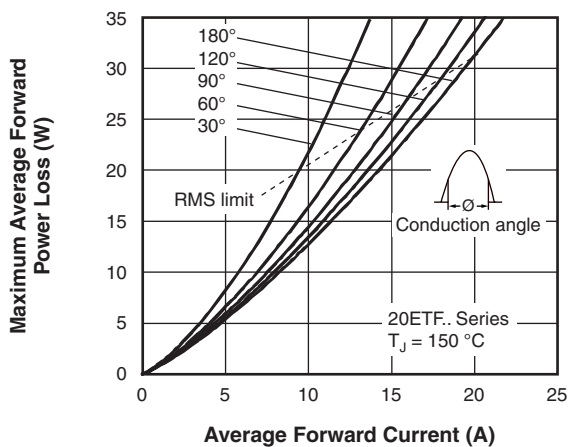


Fig. 3 - Forward Power Loss Characteristics

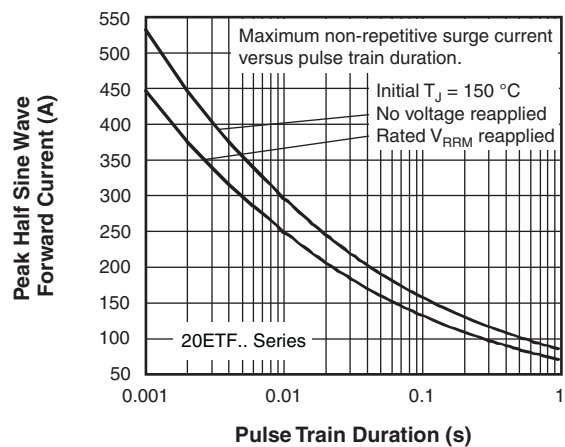


Fig. 6 - Maximum Non-Repetitive Surge Current

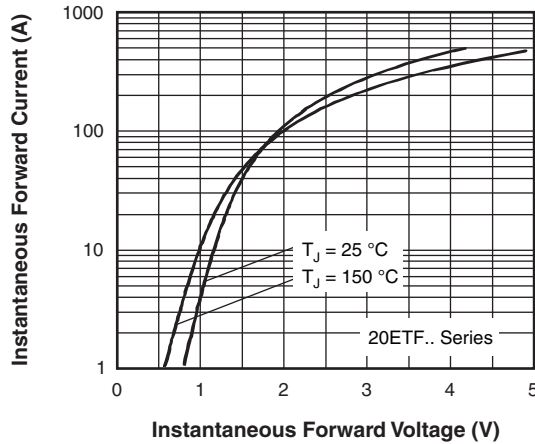


Fig. 7 - Forward Voltage Drop Characteristics

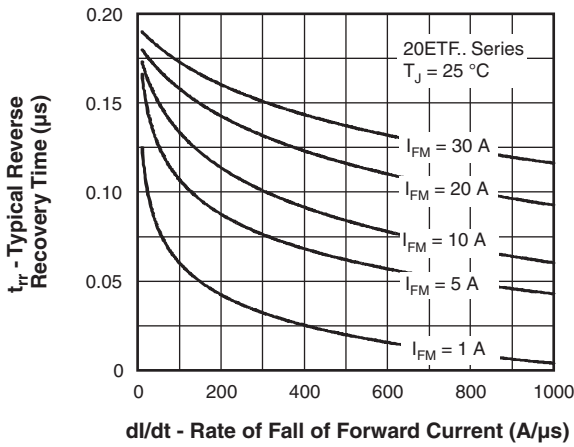


Fig. 8 - Recovery Time Characteristics, T_J = 25 °C

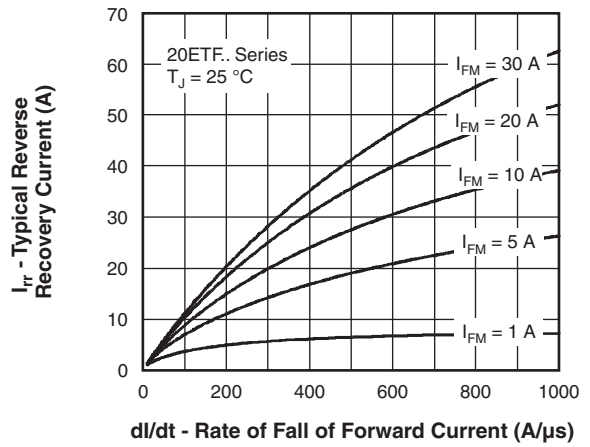


Fig. 10 - Recovery Charge Characteristics, T_J = 25 °C

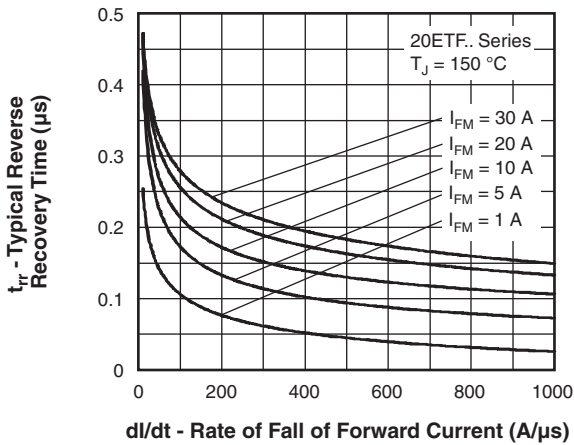


Fig. 9 - Recovery Time Characteristics, T_J = 150 °C

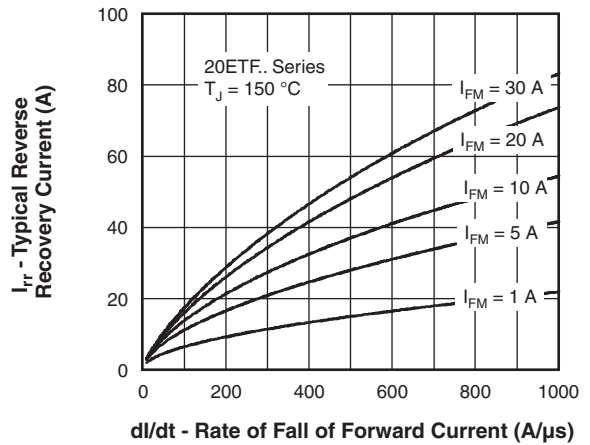


Fig. 11 - Recovery Charge Characteristics, T_J = 150 °C

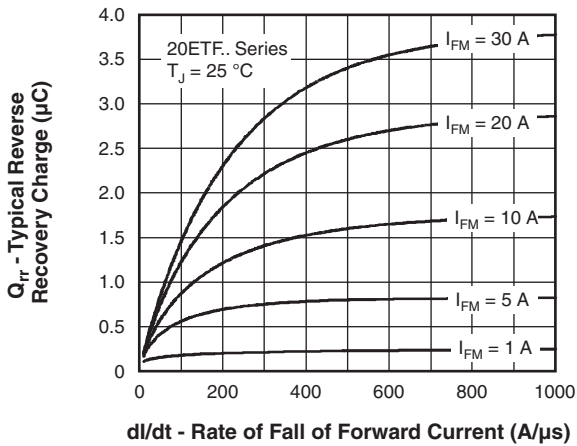


Fig. 12 - Recovery Current Characteristics, $T_J = 25\text{ }^\circ\text{C}$

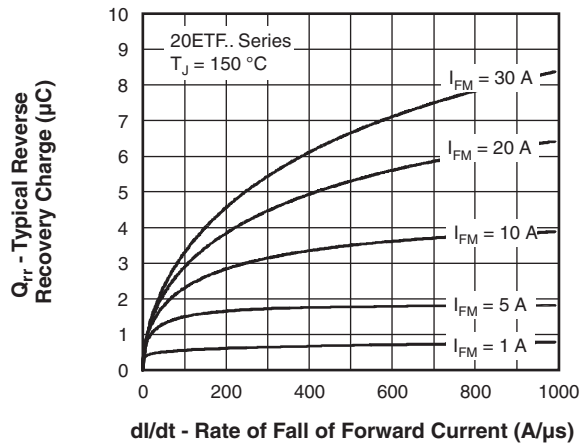


Fig. 13 - Recovery Current Characteristics, $T_J = 150\text{ }^\circ\text{C}$

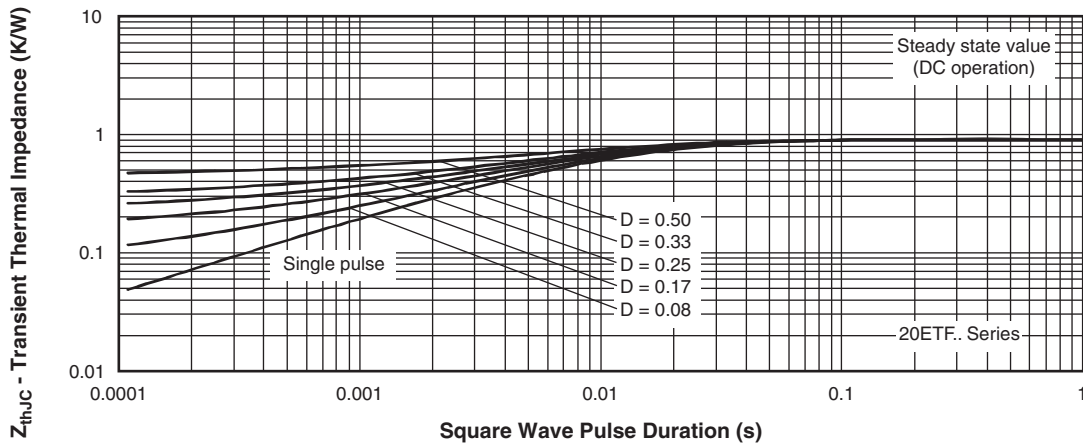
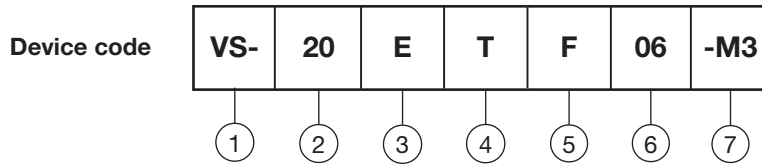


Fig. 14 - Thermal Impedance Z_{thJC} Characteristics



ORDERING INFORMATION TABLE



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

02 = 200 V
04 = 400 V
06 = 600 V
- 7** - Environmental digit
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

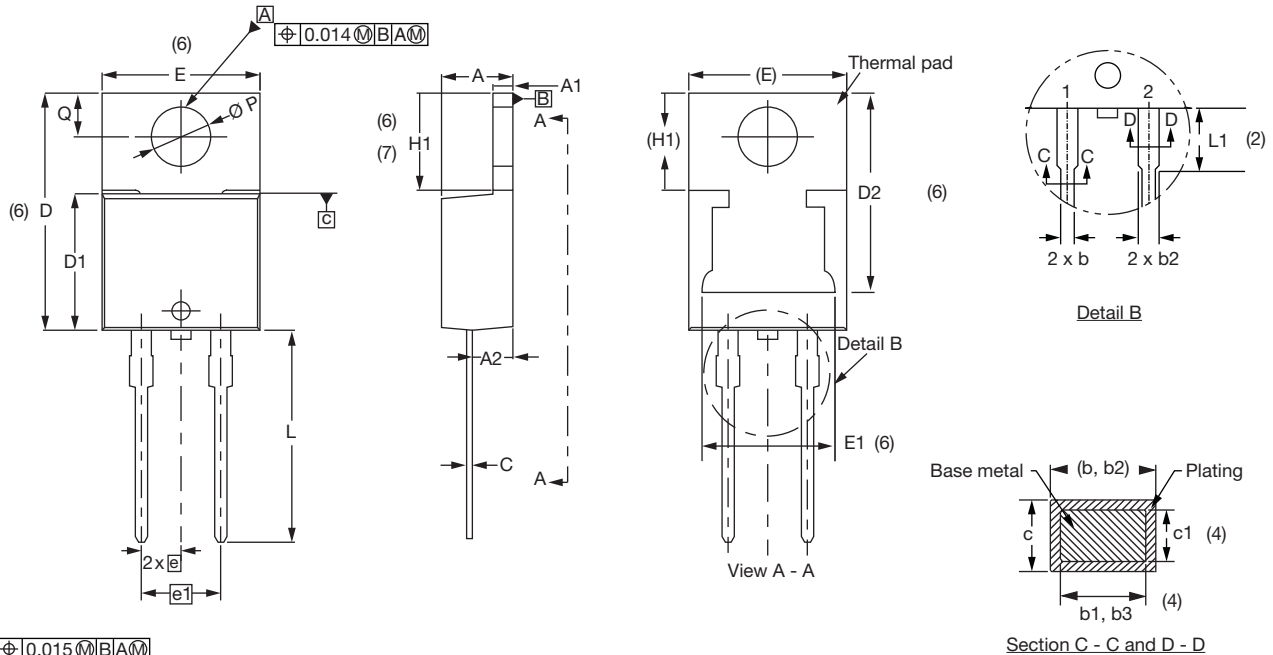
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-20ETF02-M3	50	1000	Antistatic plastic tube
VS-20ETF04-M3	50	1000	Antistatic plastic tube
VS-20ETF06-M3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?96156
Part marking information	www.vishay.com/doc?95391

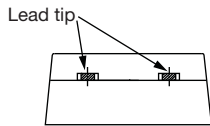


2L TO-220AC

DIMENSIONS in millimeters and inches



$\oplus 0.015 \text{ (M) B (A) (M)}$



Conforms to JEDEC® outline TO-220AC

SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183		D2	11.68	12.88	0.460	0.507	6
A1	1.14	1.40	0.045	0.055		E	10.11	10.51	0.398	0.414	3, 6
A2	2.50	2.92	0.098	0.115		E1	6.86	8.89	0.270	0.350	6
b	0.69	1.01	0.027	0.040		e	2.41	2.67	0.095	0.105	
b1	0.38	0.97	0.015	0.038	4	e1	4.88	5.28	0.192	0.208	
b2	1.20	1.73	0.047	0.068		H1	6.09	6.48	0.240	0.255	6, 7
b3	1.14	1.73	0.045	0.068	4	L	13.52	14.02	0.532	0.552	
c	0.36	0.61	0.014	0.024		L1	3.32	3.82	0.131	0.150	2
c1	0.36	0.56	0.014	0.022	4	$\varnothing P$	3.54	3.91	0.139	0.154	
D	14.85	15.35	0.585	0.604	3	Q	2.60	3.00	0.102	0.118	
D1	8.38	9.02	0.330	0.355							

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 dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2, and E1
- (7) Outline conforms to JEDEC® TO-220, except D2 (minimum)



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