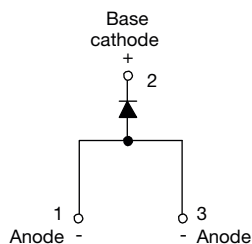


## Surface Mount Fast Soft Recovery Rectifier Diode, 10 A



### FEATURES

- Glass passivated pellet chip junction
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### APPLICATIONS

- Output rectification and freewheeling in inverters, choppers and converters
- Input rectifications where severe restrictions on conducted EMI should be met

### DESCRIPTION

The VS-10ETF..S-M3 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

$I_{F(AV)}$	10 A
$V_R$	1000 V, 1200 V
$V_F$ at $I_F$	1.33 V
$I_{FSM}$	155 A
$t_{rr}$	80 ns
$T_J$ max.	150 °C
Snap factor	0.6
Package	D²PAK (TO-263AB)
Circuit configuration	Single

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Sinusoidal waveform	10	A
$V_{RRM}$		1000, 1200	V
$I_{FSM}$		155	A
$V_F$	10 A, $T_J = 25$ °C	1.33	V
$t_{rr}$	1 A, 100 A/μs	80	ns
$T_J$	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-10ETF10S-M3	1000	1100	4
VS-10ETF12S-M3	1200	1300	

### ABSOLUTE MAXIMUM RATINGS

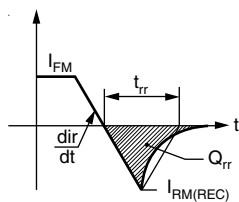
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	$T_C = 125$ °C, 180° conduction half sine wave	10	A
Maximum peak one cycle non-repetitive surge current	$I_{FSM}$	10 ms sine pulse, rated $V_{RRM}$ applied	130	
		10 ms sine pulse, no voltage reapplied	155	
Maximum $I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied	85	A²s
		10 ms sine pulse, no voltage reapplied	120	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1$ ms to 10 ms, no voltage reapplied	1200	A²√s

**ELECTRICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop	$V_{FM}$	10 A, $T_J = 25\text{ }^{\circ}\text{C}$		1.33	V
Forward slope resistance	$r_t$	$T_J = 150\text{ }^{\circ}\text{C}$		22.9	m $\Omega$
Threshold voltage	$V_{F(TO)}$			0.96	V
Maximum reverse leakage current	$I_{RM}$	$T_J = 25\text{ }^{\circ}\text{C}$	$V_R = \text{rated } V_{RRM}$	0.1	mA
		$T_J = 150\text{ }^{\circ}\text{C}$		4	

**RECOVERY CHARACTERISTICS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Reverse recovery time	$t_{rr}$	$I_F$ at 10 A <sub>pk</sub> 25 A/ $\mu$ s 25 $^{\circ}\text{C}$	310	ns
Reverse recovery current	$I_{rr}$		4.7	A
Reverse recovery charge	$Q_{rr}$		1.05	$\mu$ C
Typical snap factor	S		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	1.5	$^{\circ}\text{C/W}$
Maximum thermal resistance, junction to ambient (PCB mount)	$R_{thJA}^{(1)}$		62	
Approximate weight			2	g
			0.07	oz.
Marking device		Case style D <sup>2</sup> PAK (TO-263AB)	10ETF10S	
			10ETF12S	

**Note**

<sup>(1)</sup> When mounted on 1" square (650 mm<sup>2</sup>) PCB of FR-4 or G-10 material 4 oz. (140  $\mu$ m) copper 40  $^{\circ}\text{C/W}$ . For recommended footprint and soldering techniques refer to application note #AN-994

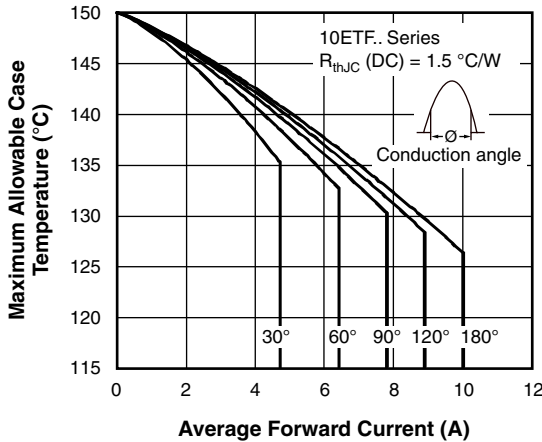


Fig. 1 - Current Rating Characteristics

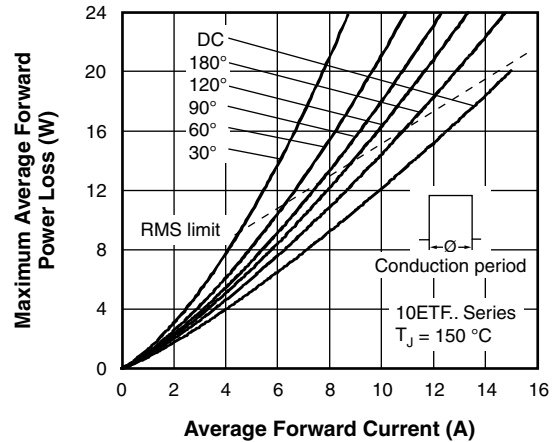


Fig. 4 - Forward Power Loss Characteristics

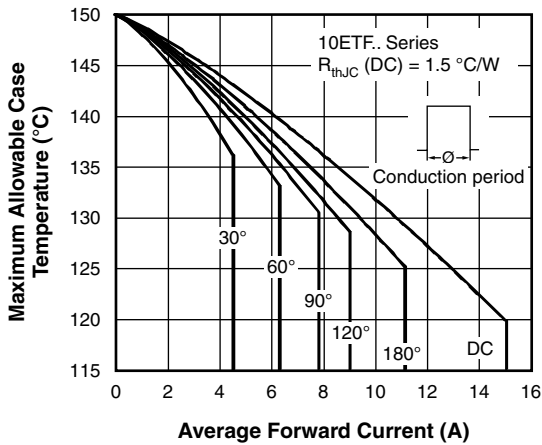


Fig. 2 - Current Rating Characteristics

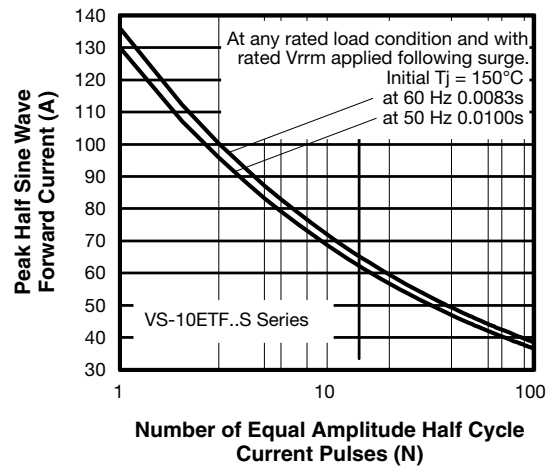


Fig. 5 - Maximum Non-Repetitive Surge Current

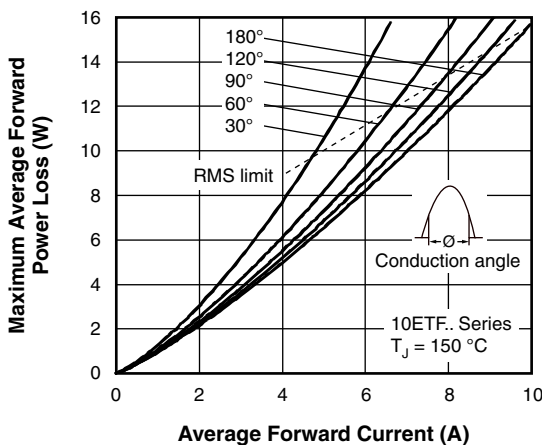


Fig. 3 - Forward Power Loss Characteristics

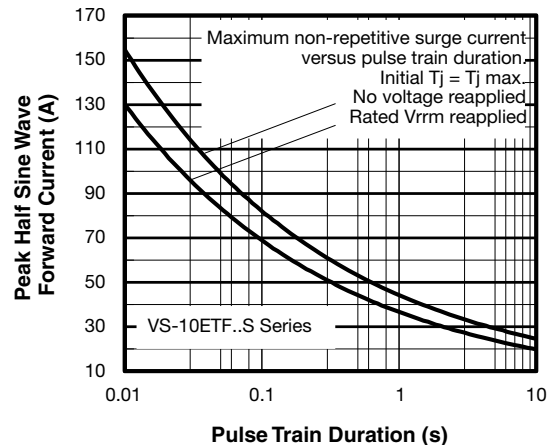


Fig. 6 - Maximum Non-Repetitive Surge Current

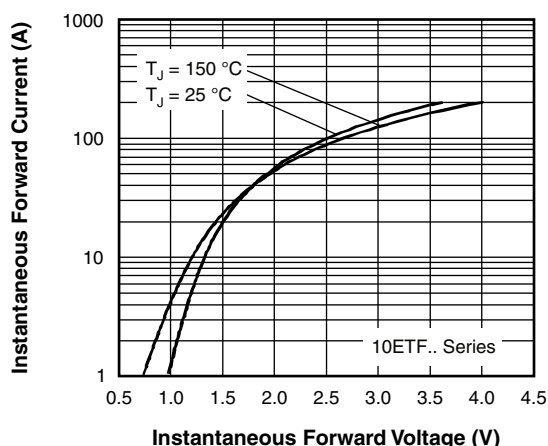
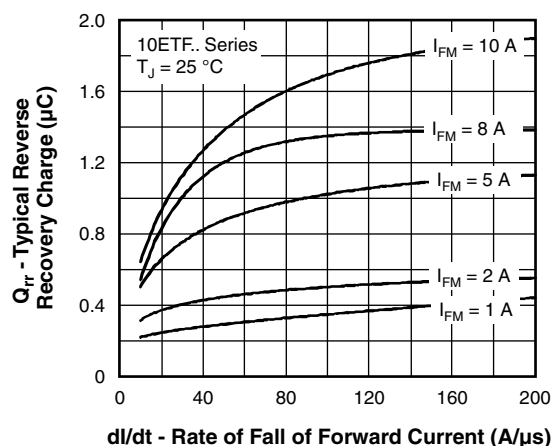
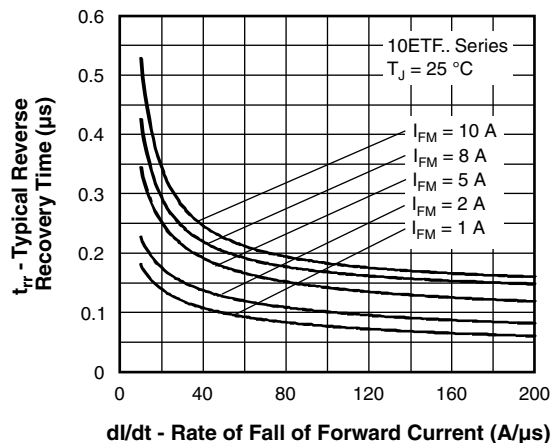
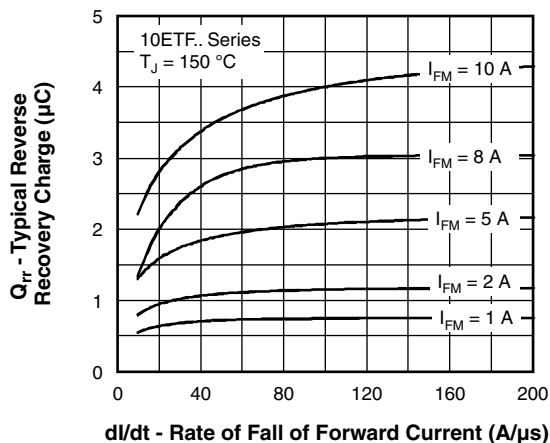
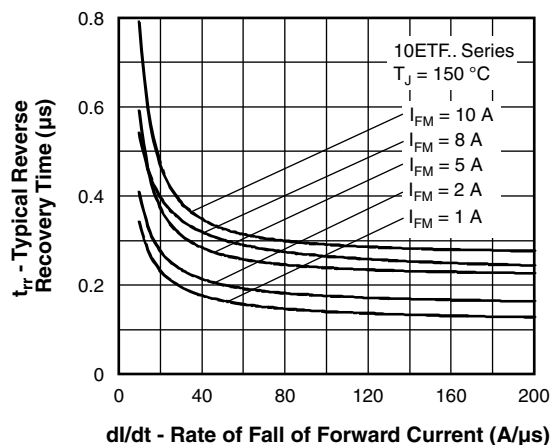
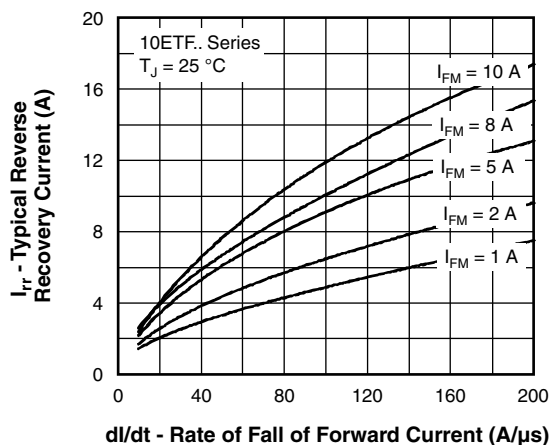


Fig. 7 - Forward Voltage Drop Characteristics


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

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

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

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

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

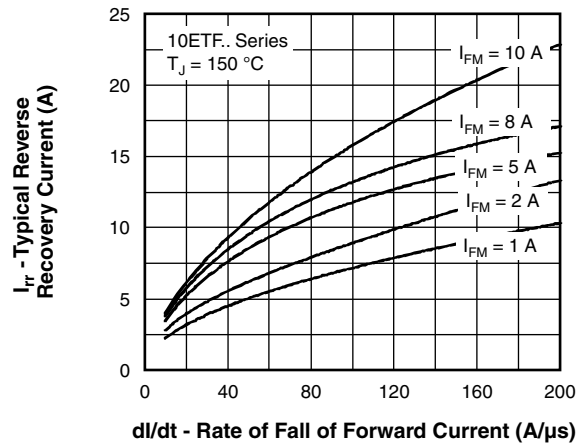


Fig. 13 - Recovery Current Characteristics,  $T_J = 150\text{ }^{\circ}\text{C}$

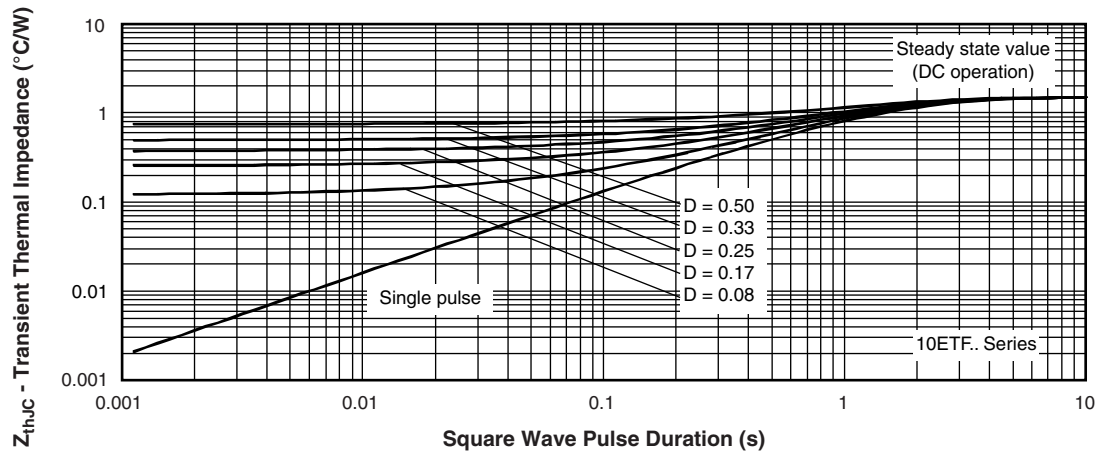


Fig. 14 - Thermal Impedance  $Z_{thJC}$  Characteristics

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>10</b>	<b>E</b>	<b>T</b>	<b>F</b>	<b>12</b>	<b>S</b>	<b>TRL</b>	<b>-M3</b>
	①	②	③	④	⑤	⑥	⑦	⑧	⑨

- |             |   |   |             |             |
|-------------|---|---|-------------|-------------|
| <b>1</b>    | - | Vishay Semiconductors product   |             |             |
| <b>2</b>    | - | Current rating (10 = 10 A)  |             |             |
| <b>3</b>    | - | Circuit configuration:<br>E = single  |             |             |
| <b>4</b>    | - | Package:<br>T = D <sup>2</sup> PAK (TO-263AB)   |             |             |
| <b>5</b>    | - | Type of silicon:<br>F = fast soft recovery rectifier  |             |             |
| <b>6</b>    | - | Voltage code x 100 = V <sub>RRM</sub> <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>10 = 1000 V</td></tr><tr><td>12 = 1200 V</td></tr></table> | 10 = 1000 V | 12 = 1200 V |
| 10 = 1000 V |   |   |             |             |
| 12 = 1200 V |   |   |             |             |
| <b>7</b>    | - | S = surface mountable   |             |             |
| <b>8</b>    | - | <ul style="list-style-type: none"><li>• None = tube</li><li>• TRR = tape and reel (right oriented)</li><li>• TRL = tape and reel (left oriented)</li></ul>                        |             |             |
| <b>9</b>    | - | -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free   |             |             |

**ORDERING INFORMATION (Example)**

PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-10ETF10S-M3	50	Antistatic plastic tubes
VS-10ETF10STRR-M3	800	13" diameter reel
VS-10ETF10STRL-M3	800	13" diameter reel
VS-10ETF12S-M3	50	Antistatic plastic tubes
VS-10ETF12STRR-M3	800	13" diameter reel
VS-10ETF12STRL-M3	800	13" diameter reel

**LINKS TO RELATED DOCUMENTS**

Dimensions	<a href="http://www.vishay.com/doc?96164">www.vishay.com/doc?96164</a>
Part marking information	<a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a>
Packaging information	<a href="http://www.vishay.com/doc?96424">www.vishay.com/doc?96424</a>

### D<sup>2</sup>PAK

#### DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	0.00	0.254	0.000	0.010	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
e	2.54 BSC		0.100 BSC		
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.066	3
L2	1.27	1.78	0.050	0.070	
L3	0.25 BSC		0.010 BSC		
L4	4.78	5.28	0.188	0.208	

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inches
- (7) Outline conforms to JEDEC® outline TO-263AB



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