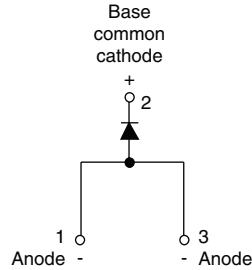


## Fast Soft Recovery Rectifier Diode, 10 A



D<sup>2</sup>PAK (SMD-220)



### FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Compliant to RoHS directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- Designed and qualified for industrial level



**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..SPbF 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

$V_F$ at 10 A	< 1.33 V
$t_{rr}$	80 ns
$V_{RRM}$	1000 V/1200 V

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Sinusoidal waveform	10	A
$V_{RRM}$		1000/1200	V
$I_{FSM}$		160	A
$V_F$	10 A, $T_J = 25\text{ °C}$	1.33	V
$t_{rr}$	1 A, 100 A/ $\mu$ s	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-10ETF10SPbF	1000	1100	4
VS-10ETF12SPbF	1200	1300	

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	$T_C = 125\text{ °C}$ , 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	160	
		10 ms sine pulse, no voltage reapplied	185	
Maximum $I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied	128	A <sup>2</sup> s
		10 ms sine pulse, no voltage reapplied	180	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reapplied	1800	A <sup>2</sup> $\sqrt{s}$

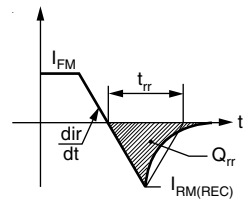
# VS-10ETF..SPbF Soft Recovery Series



Vishay High Power Products Fast Soft Recovery Rectifier Diode, 10 A

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 Apk 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	$\mu\text{C}$
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	
Soldering temperature	$T_S$		240	$^\circ\text{C}$
Approximate weight			2	g
			0.07	oz.
Marking device		Case style D <sup>2</sup> PAK (SMD-220)	10ETF10S	
			10ETF12S	

**Note**

(1) 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.



# VS-10ETF..SPbF Soft Recovery Series

Fast Soft Recovery Rectifier Diode, 10 A  
Vishay High Power Products

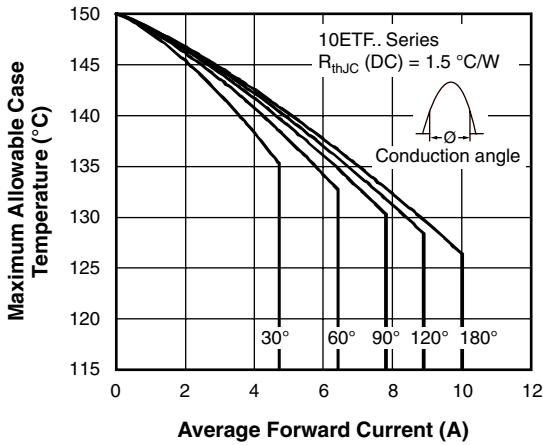


Fig. 1 - Current Rating Characteristics

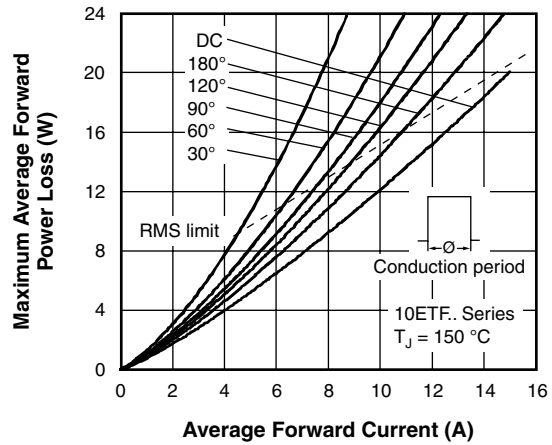


Fig. 4 - Forward Power Loss Characteristics

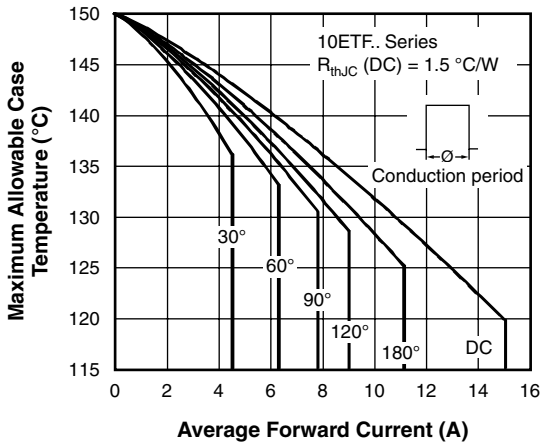


Fig. 2 - Current Rating Characteristics

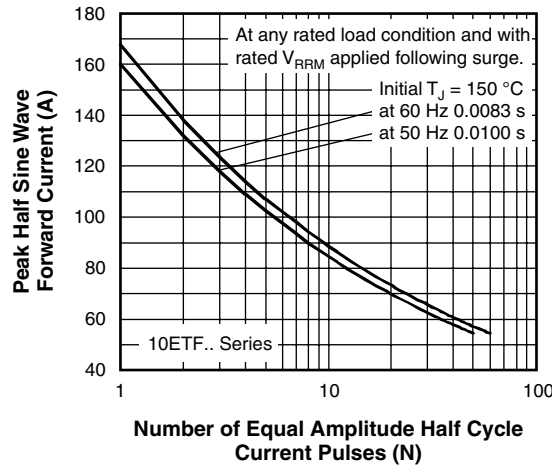


Fig. 5 - Maximum Non-Repetitive Surge Current

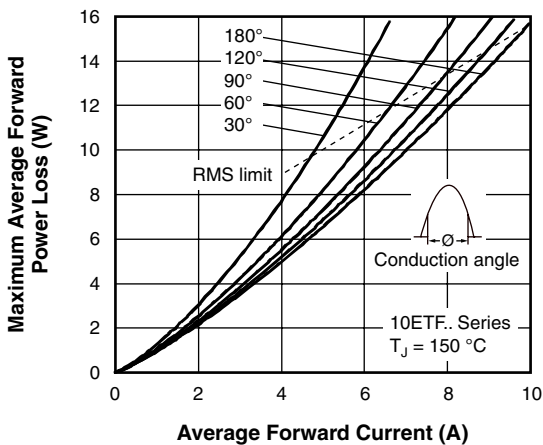


Fig. 3 - Forward Power Loss Characteristics

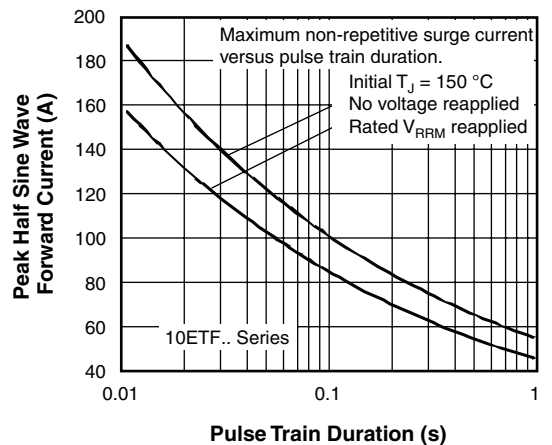


Fig. 6 - Maximum Non-Repetitive Surge Current

# VS-10ETF..SPbF Soft Recovery Series



Vishay High Power Products Fast Soft Recovery Rectifier Diode, 10 A

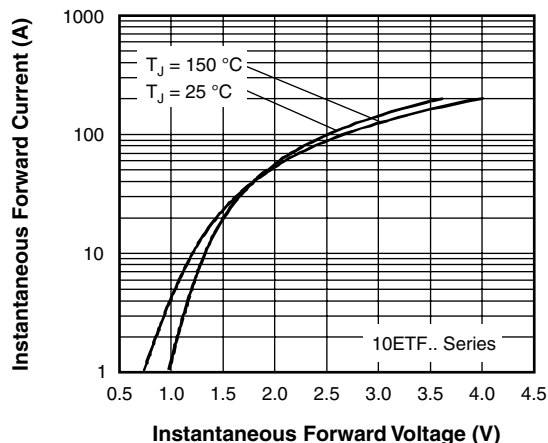


Fig. 7 - Forward Voltage Drop Characteristics

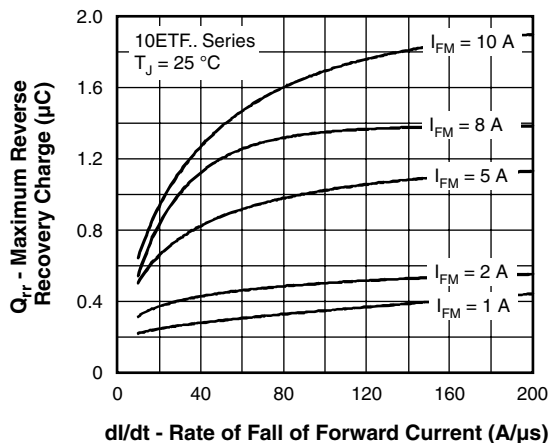


Fig. 10 - Recovery Charge Characteristics,  $T_J = 25\text{ }^\circ\text{C}$

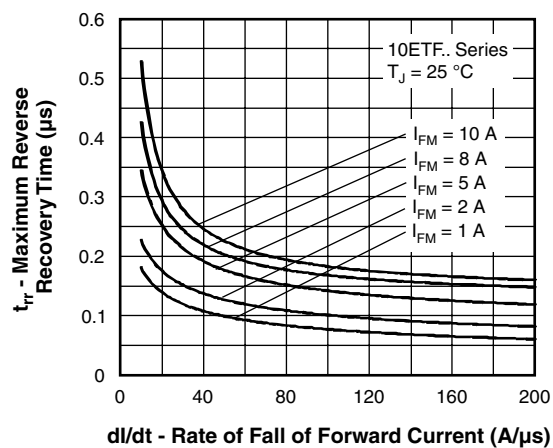


Fig. 8 - Recovery Time Characteristics,  $T_J = 25\text{ }^\circ\text{C}$

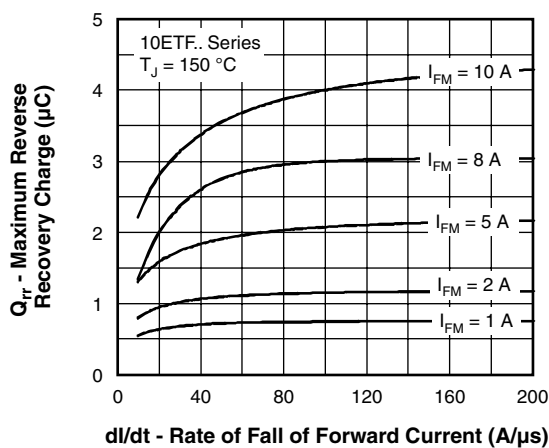


Fig. 11 - Recovery Charge Characteristics,  $T_J = 150\text{ }^\circ\text{C}$

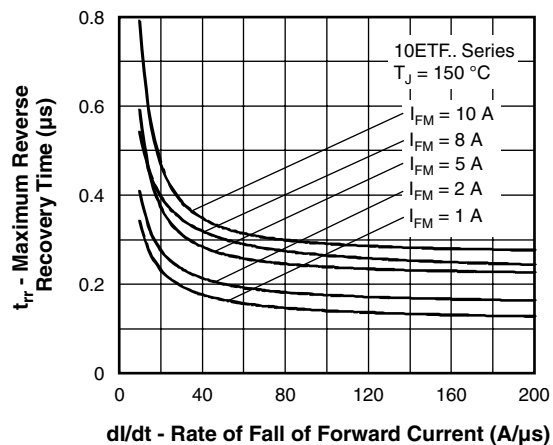


Fig. 9 - Recovery Time Characteristics,  $T_J = 150\text{ }^\circ\text{C}$

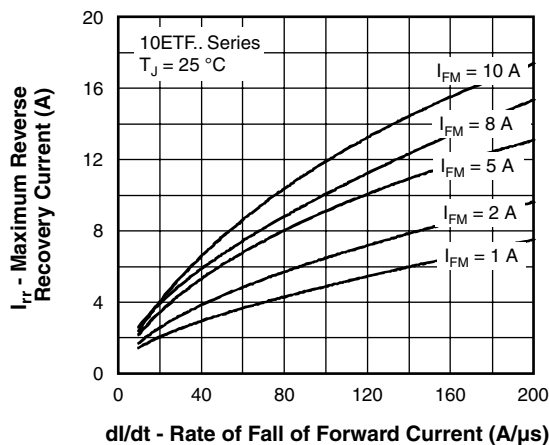


Fig. 12 - Recovery Current Characteristics,  $T_J = 25\text{ }^\circ\text{C}$



# VS-10ETF..SPbF Soft Recovery Series

Fast Soft Recovery Rectifier Diode, 10 A  
Vishay High Power Products

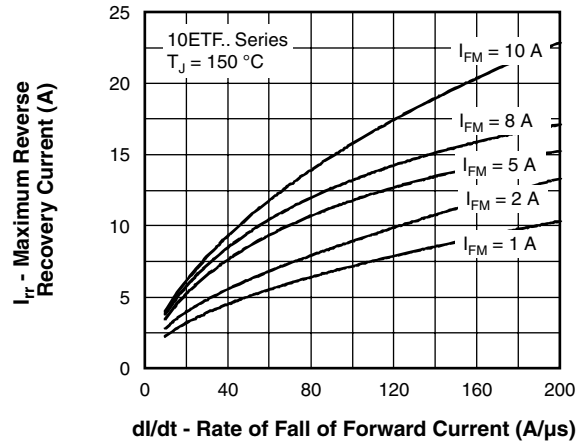


Fig. 13 - Recovery Current Characteristics,  $T_J = 150\text{ }^\circ\text{C}$

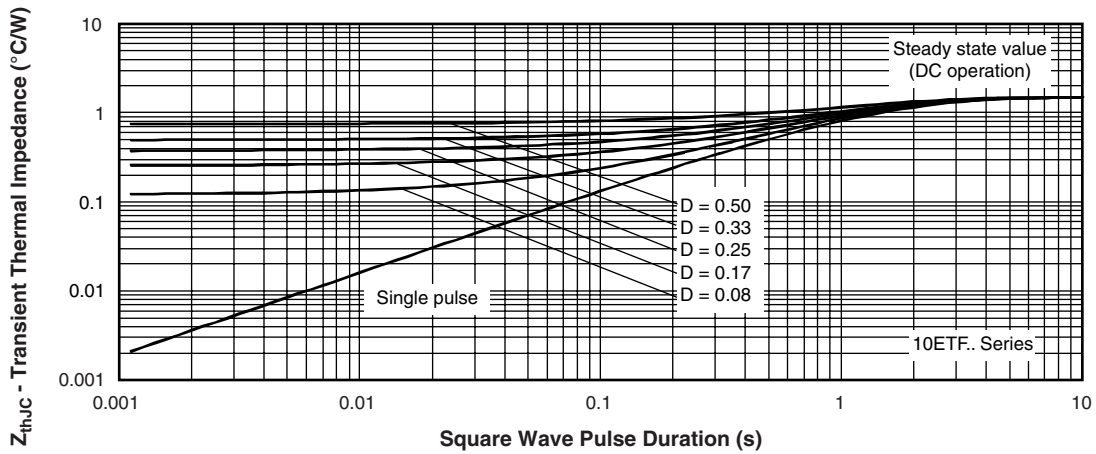


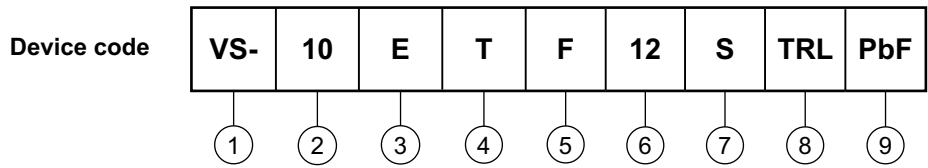
Fig. 14 - Thermal Impedance  $Z_{thJC}$  Characteristics

# VS-10ETF..SPbF Soft Recovery Series



Vishay High Power Products Fast Soft Recovery Rectifier Diode, 10 A

## ORDERING INFORMATION TABLE



- 1** - HPP product suffix
- 2** - Current rating (10 = 10 A)
- 3** - Circuit configuration:  
E = Single diode
- 4** - Package:  
T = D<sup>2</sup>PAK (TO-220AC)
- 5** - Type of silicon:  
F = Fast soft recovery rectifier
- 6** - Voltage code x 100 =  $V_{RRM}$ 

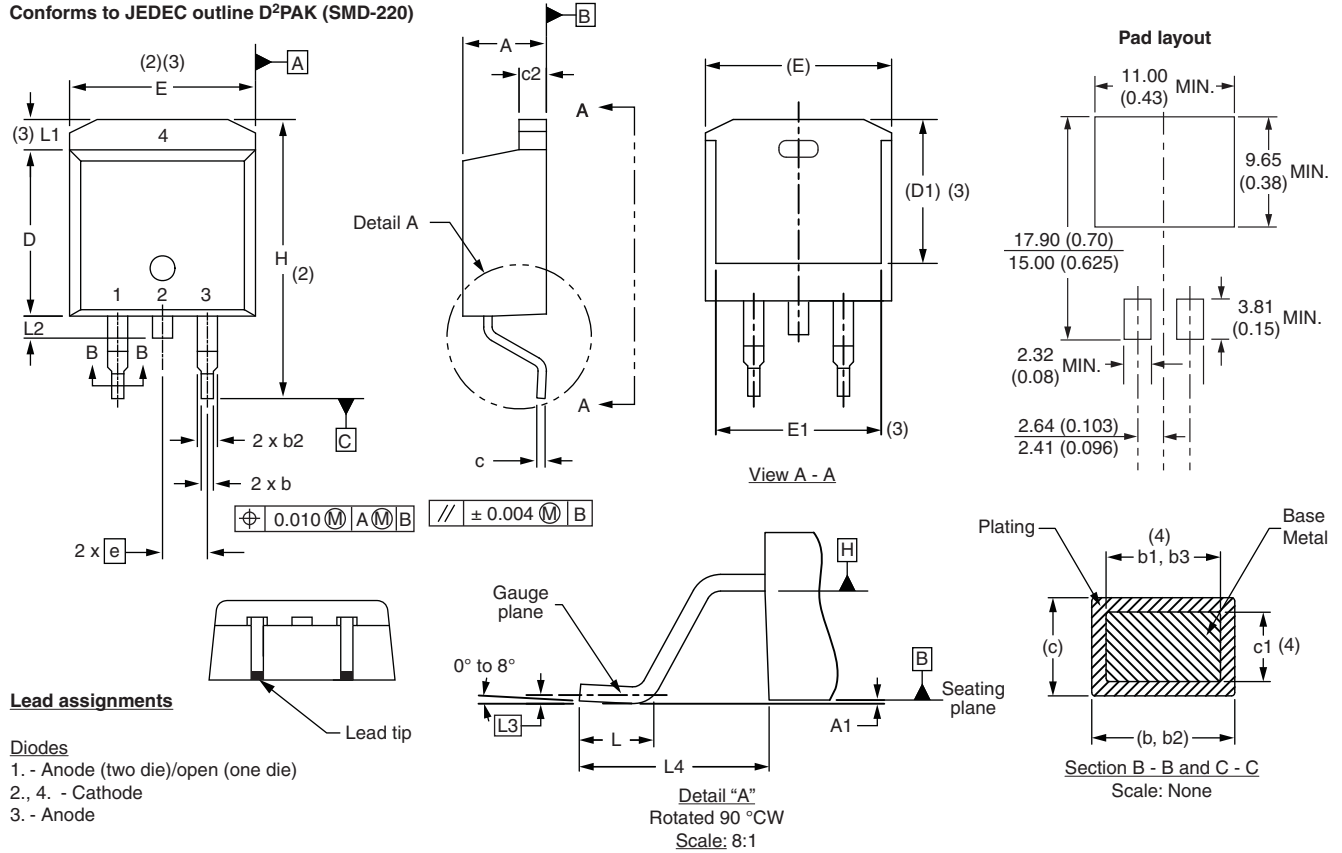
10 = 1000 V
12 = 1200 V
- 7** - S = Surface mountable
- 8** -
  - None = Tube
  - TRR = Tape and reel (right oriented)
  - TRL = Tape and reel (left oriented)
- 9** - PbF = Lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a>
Part marking information	<a href="http://www.vishay.com/doc?95054">www.vishay.com/doc?95054</a>
Packaging information	<a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</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	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190		D1	6.86	8.00	0.270	0.315	3
A1	0.00	0.254	0.000	0.010		E	9.65	10.67	0.380	0.420	2, 3
b	0.51	0.99	0.020	0.039		E1	7.90	8.80	0.311	0.346	3
b1	0.51	0.89	0.020	0.035	4	e	2.54 BSC		0.100 BSC		
b2	1.14	1.78	0.045	0.070		H	14.61	15.88	0.575	0.625	
b3	1.14	1.73	0.045	0.068	4	L	1.78	2.79	0.070	0.110	
c	0.38	0.74	0.015	0.029		L1	-	1.65	-	0.066	3
c1	0.38	0.58	0.015	0.023	4	L2	1.27	1.78	0.050	0.070	
c2	1.14	1.65	0.045	0.065		L3	0.25 BSC		0.010 BSC		
D	8.51	9.65	0.335	0.380	2	L4	4.78	5.28	0.188	0.208	

### Notes

- Dimensioning and tolerancing per ASME Y14.5 M-1994
- 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
- Thermal pad contour optional within dimension E, L1, D1 and E1
- Dimension b1 and c1 apply to base metal only
- Datum A and B to be determined at datum plane H
- Controlling dimension: inch
- Outline conforms to JEDEC outline TO-263AB



## 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 and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. 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.