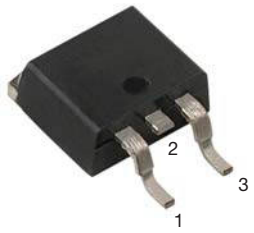
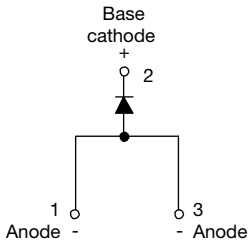
Surface Mount Fast Soft Recovery Rectifier Diode, 10 A



TO-263AB (D^2PAK)



FEATURES

- Glass passivated pellet chip junction
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb
e3
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.

PRODUCT SUMMARY	
Package	TO-263AB (D^2PAK)
$I_{F(AV)}$	10 A
V_R	200 V, 400 V, 600 V
V_F at I_F	1.2 V
I_{FSM}	140 A
t_{rr}	50 ns
T_J max.	150 °C
Diode variation	Single die
Snap factor	0.6

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
V_{RRM}		200 to 600	V
$I_{F(AV)}$	Sinusoidal waveform	10	A
I_{FSM}		140	
t_{rr}	1 A, 100 A/µs	50	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-10ETF02S-M3	200	300	2.5
VS-10ETF04S-M3	400	500	
VS-10ETF06S-M3	600	700	

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	T_C = 128 °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	115	
		10 ms sine pulse, no voltage reapplied	140	
Maximum I^2t for fusing	I^2t	10 ms sine pulse, rated V_{RRM} applied	66	A^2s
		10 ms sine pulse, no voltage reapplied	94	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied	940	$A^2\sqrt{s}$

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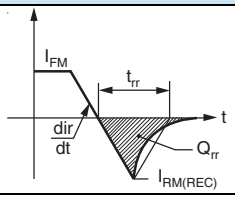
ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop	V_{FM}	10 A, T_J = 25 °C		1.2	V
Forward slope resistance	r_t	T_J = 150 °C		12.7	mΩ
Threshold voltage	$V_{F(TO)}$			1.25	V
Maximum reverse leakage current	I_{RM}	T_J = 25 °C	V_R = Rated V_{RRM}	0.1	mA
		T_J = 150 °C		2.5	

RECOVERY CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Reverse recovery time	t_{rr}	I_F at 10 A_{pk} 25 A/µs 25 °C	200	ns	
Reverse recovery current	I_{rr}		2.75	A	
Reverse recovery charge	Q_{rr}		0.32	µC	
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	°C
Maximum thermal resistance junction to case	R_{thJC}	DC operation	1.5	°C/W
Maximum thermal resistance junction to ambient (PCB mount)	R_{thJA} (1)		40	
Soldering temperature	T_S		260	°C
Approximate weight			2	g
			0.07	oz.
Marking device		Case style D^2PAK (SMD 220)	10ETF02S	
			10ETF04S	
			10ETF06S	

Note

(1) When mounted on 1" square (650 mm^2) PCB of FR-4 or G-10 material 4 oz. (140 µm) copper 40 °C/W.
For recommended footprint and soldering techniques refer to application note #AN-994.

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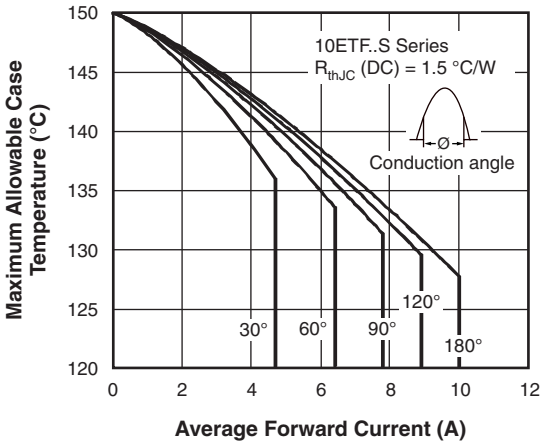

Fig. 1 - Current Rating Characteristics

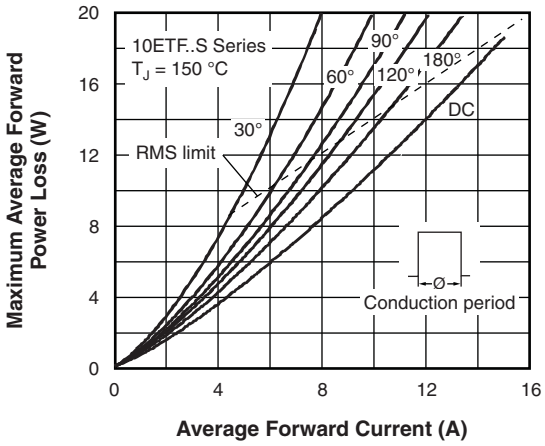

Fig. 4 - Forward Power Loss Characteristics

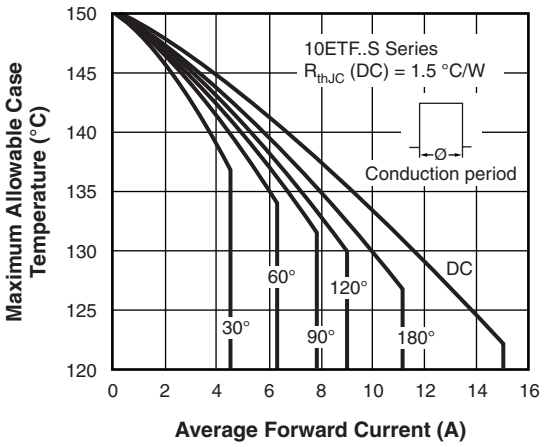

Fig. 2 - Current Rating Characteristics

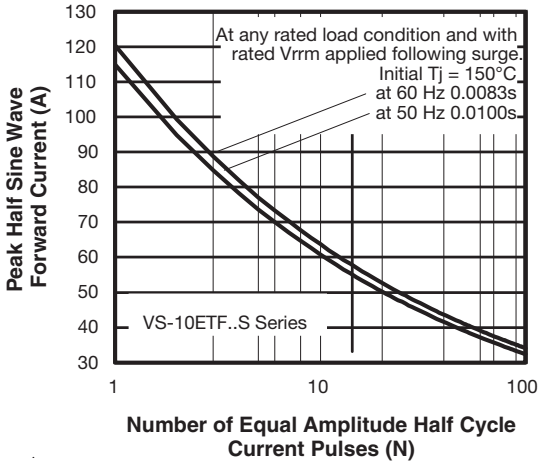

Fig. 5 - Maximum Non-Repetitive Surge Current

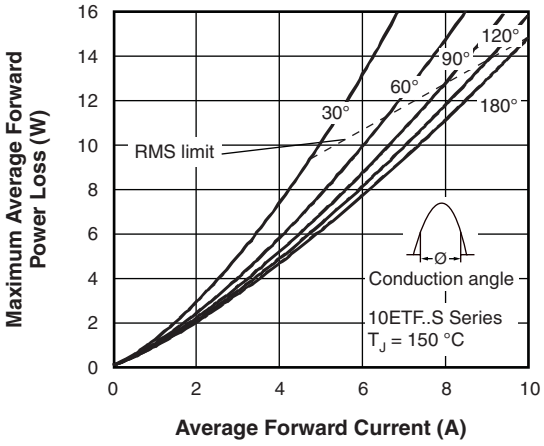

Fig. 3 - Forward Power Loss Characteristics

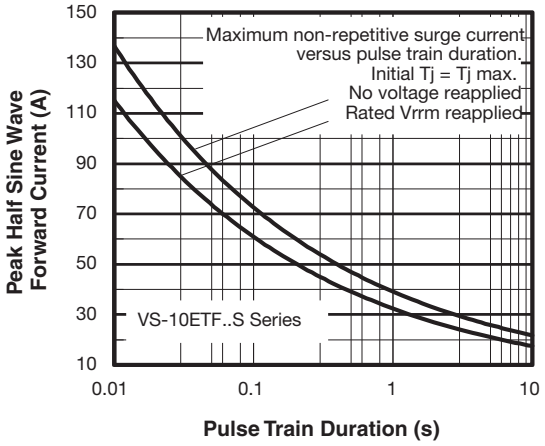

Fig. 6 - Maximum Non-Repetitive Surge Current

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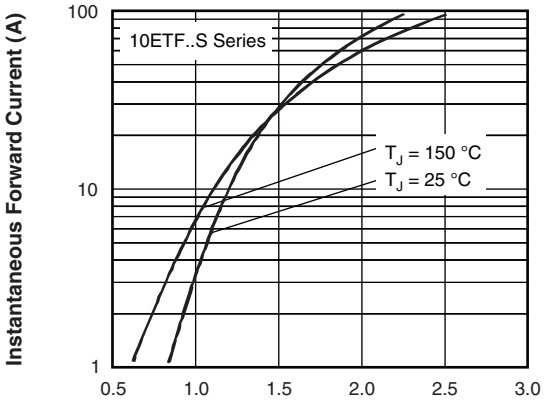

Fig. 7 - Forward Voltage Drop Characteristics

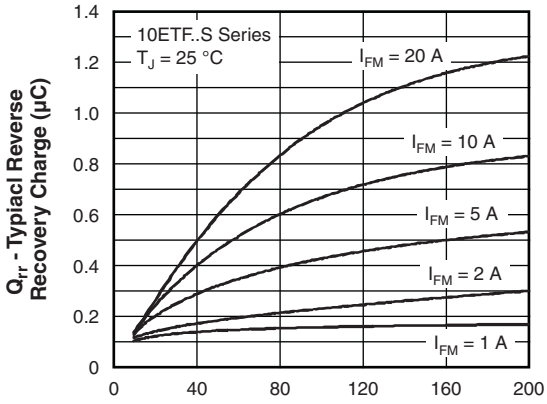

Fig. 10 - Recovery Charge Characteristics, T_J = 25 °C

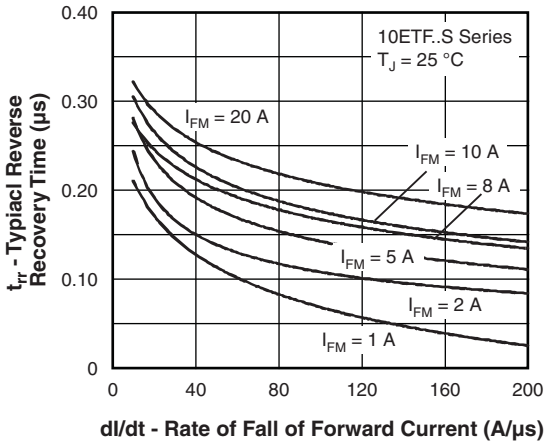

Fig. 8 - Recovery Time Characteristics, T_J = 25 °C

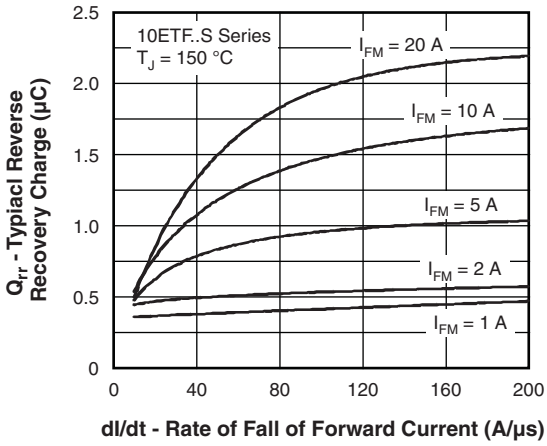

Fig. 11 - Recovery Charge Characteristics, T_J = 150 °C

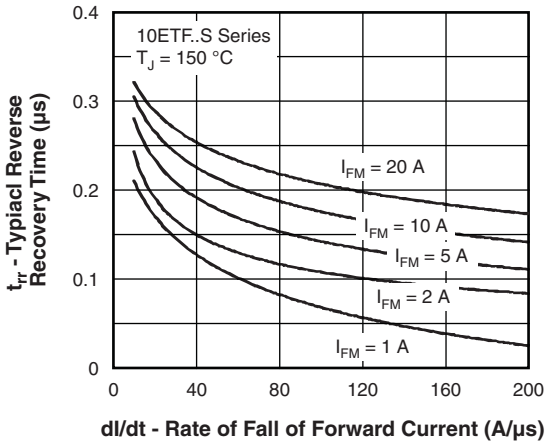

Fig. 9 - Recovery Time Characteristics, T_J = 150 °C

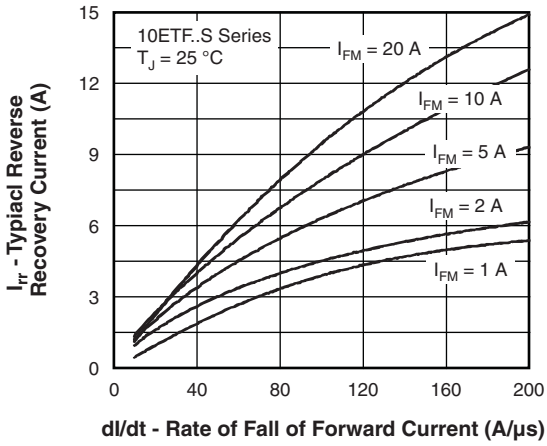

Fig. 12 - Recovery Current Characteristics, T_J = 25 °C

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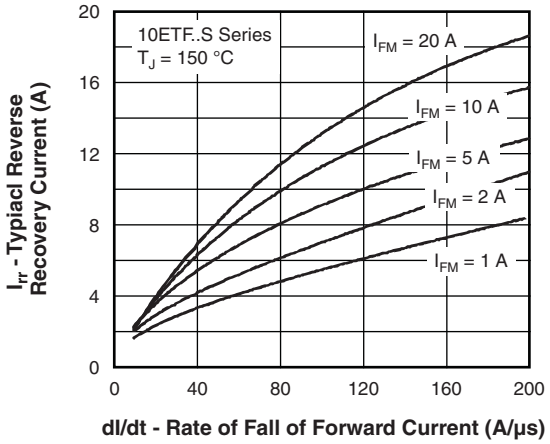

Fig. 13 - Recovery Current Characteristics, T_J = 150 °C

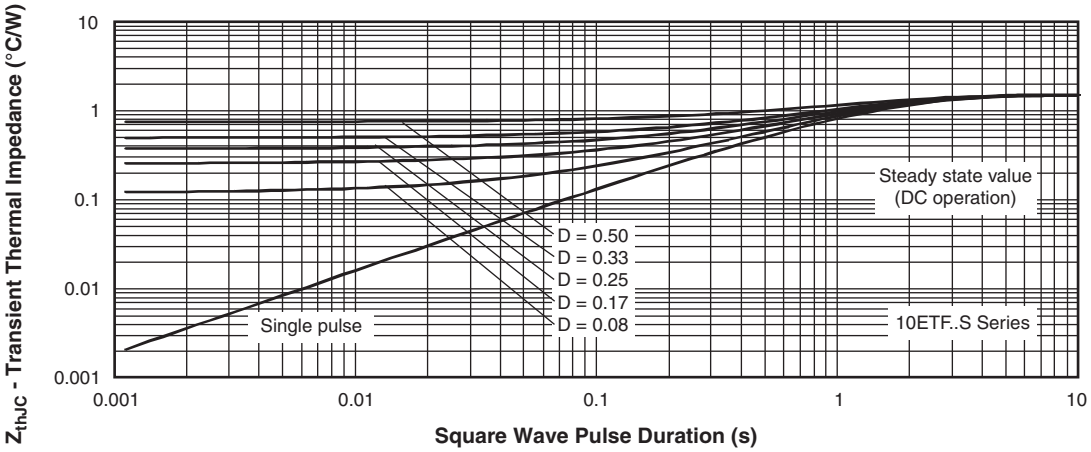

Fig. 14 - Thermal Impedance Z_{thJC} Characteristics

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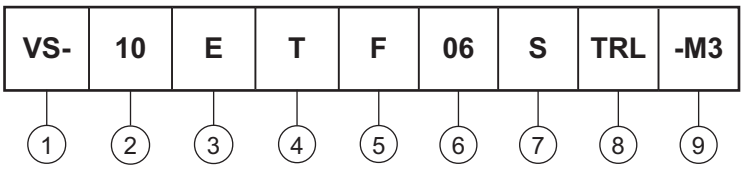
ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product

2 - Current rating (10 = 10 A)

3 - Circuit configuration:
E = single diode

4 - Package:
T = D^2PAK

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 - S = surface mountable

8 - • None = tube
• TRR = tape and reel (right oriented)
• TRL = tape and reel (left oriented)

9 - -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-10ETF02S-M3	50	1000	Antistatic plastic tubes
VS-10ETF02STRR-M3	800	800	13" diameter reel
VS-10ETF02STRL-M3	800	800	13" diameter reel
VS-10ETF04S-M3	50	1000	Antistatic plastic tubes
VS-10ETF04STRR-M3	800	800	13" diameter reel
VS-10ETF04STRL-M3	800	800	13" diameter reel
VS-10ETF06S-M3	50	1000	Antistatic plastic tubes
VS-10ETF06STRR-M3	800	800	13" diameter reel
VS-10ETF06STRL-M3	800	800	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95046
Part marking information	www.vishay.com/doc?95444
Packaging information	www.vishay.com/doc?95032

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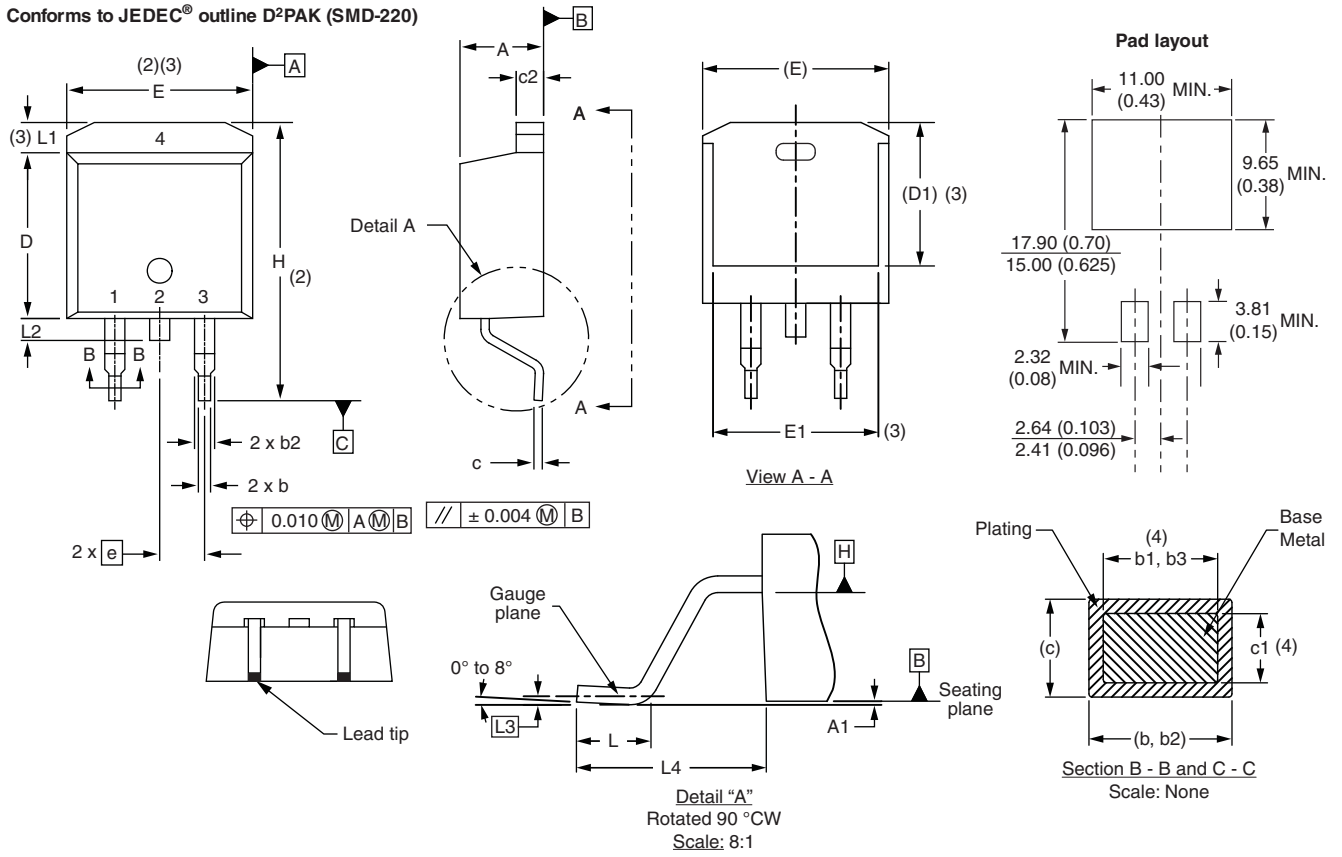
D²PAK

DIMENSIONS in millimeters and inches



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

(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: inch

(7) Outline conforms to JEDEC® outline TO-263AB

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