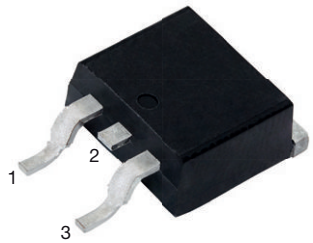
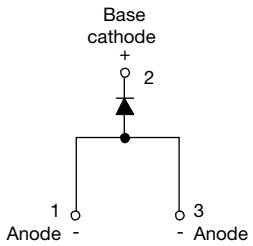
Surface Mount Fast Soft Recovery Rectifier Diode, 20 A



D²PAK (TO-263AB)



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

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-20ETF..S-M3 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	D²PAK (TO-263AB)
Circuit configuration	Single

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Sinusoidal waveform	20	A
V_{RRM}		200 to 600	V
I_{FSM}		300	A
V_F	10 A, T_J = 25 °C	1.2	V
t_{rr}	1 A, 100 A/µs	60	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-20ETF02S-M3	200	300	5
VS-20ETF04S-M3	400	500	
VS-20ETF06S-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^2s
		10 ms sine pulse, no voltage reapplied	442	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied	4420	$A^2\sqrt{s}$

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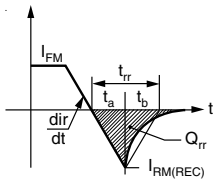
ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop	V_{FM}	20 A, T_J = 25 °C		1.30	V
		60 A, T_J = 25 °C		1.67	
Forward slope resistance	r_t			12.5	mΩ
Threshold voltage	$V_{F(TO)}$	T_J = 150 °C		0.9	V
Maximum reverse leakage current	I_{RM}	T_J = 25 °C	V_R = rated V_{RRM}	0.1	mA
		T_J = 150 °C		5.0	

RECOVERY CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Reverse recovery time	t_{rr}	I_F at 20 A_{pk} 100 A/µs 25 °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	°C
Maximum thermal resistance, junction to case	R_{thJC}	DC operation	0.9	°C/W
Maximum thermal resistance junction to ambient (PCB mount)	R_{thJA} (1)		40	
Approximate weight			2	g
			0.07	oz.
Marking device		Case style D^2PAK (TO-263AB)	20ETF02S	
			20ETF04S	
			20ETF06S	

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

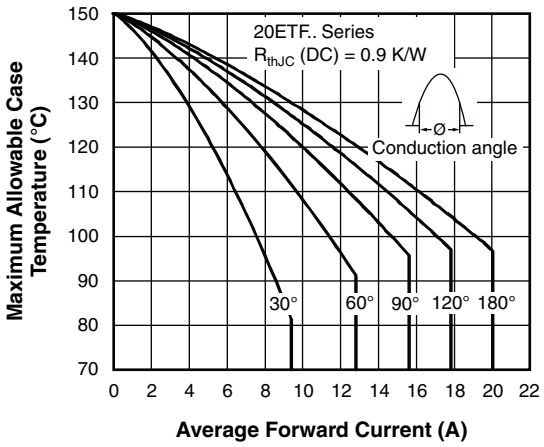


Fig. 1 - Current Rating Characteristics

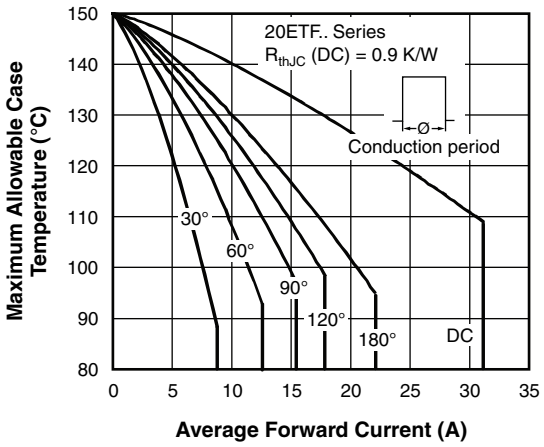


Fig. 2 - Current Rating Characteristics

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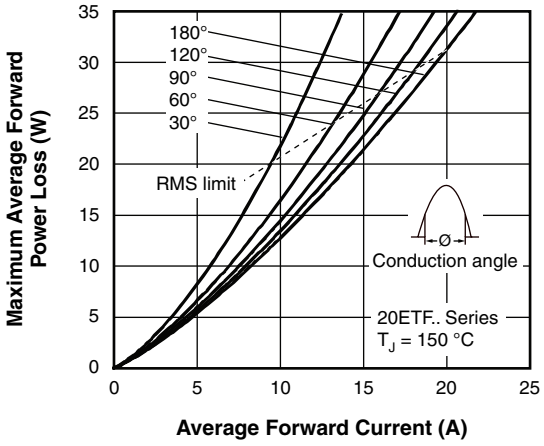

Fig. 3 - Forward Power Loss Characteristics

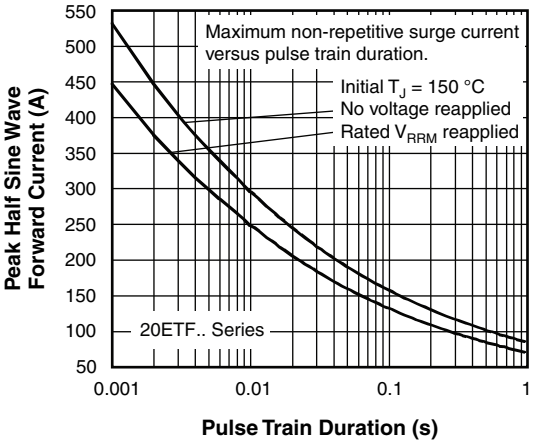

Fig. 6 - Maximum Non-Repetitive Surge Current

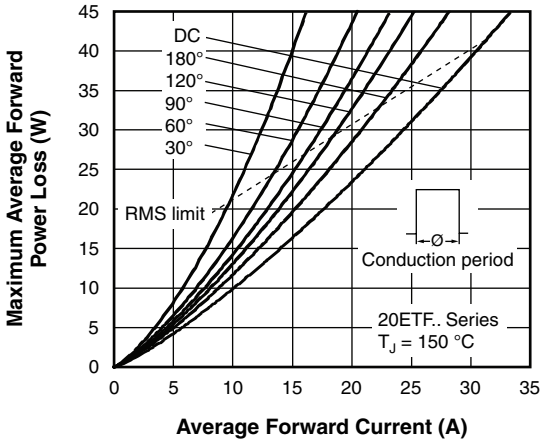

Fig. 4 - Forward Power Loss Characteristics

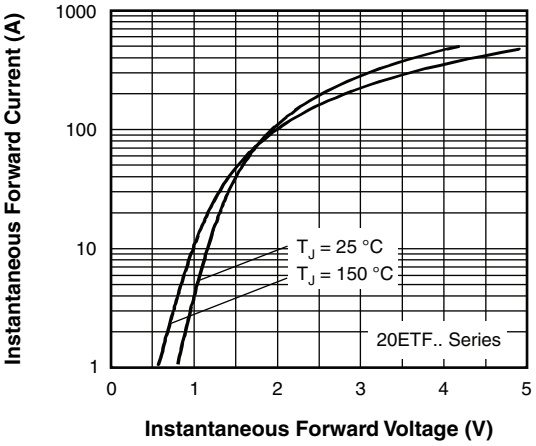

Fig. 7 - Forward Voltage Drop Characteristics

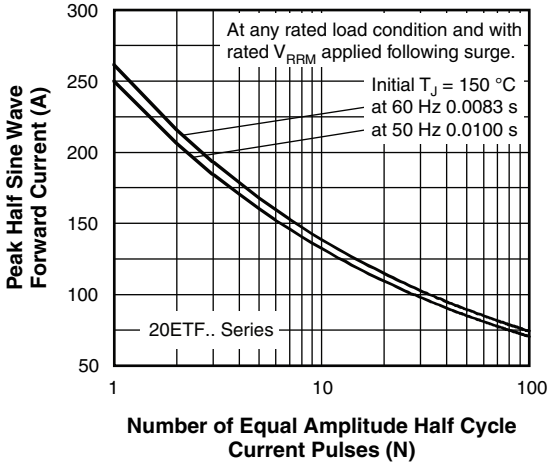

Fig. 5 - Maximum Non-Repetitive Surge Current

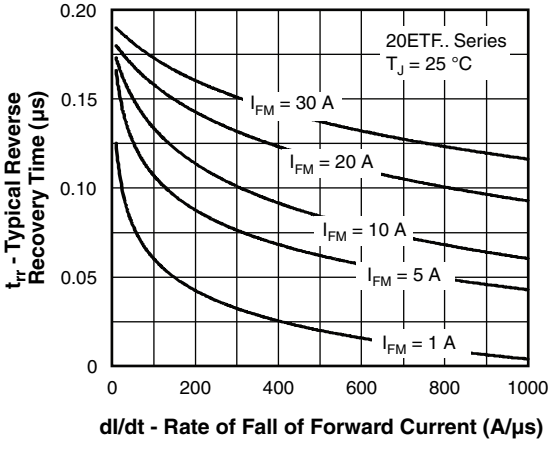

Fig. 8 - Recovery Time Characteristics, T_J = 25 °C

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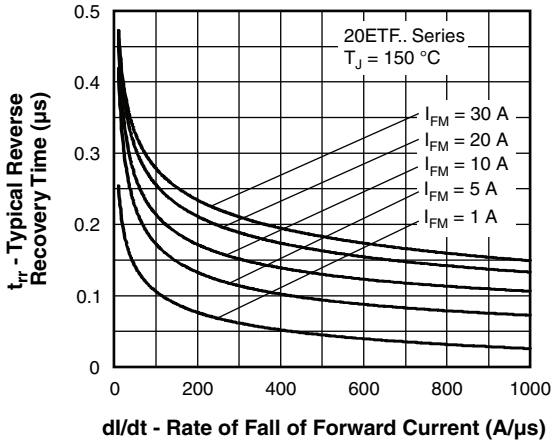

Fig. 9 - Recovery Time Characteristics, T_J = 150 °C

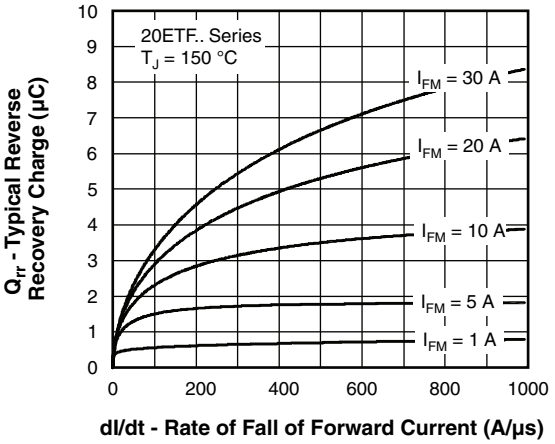

Fig. 11 - Recovery Charge Characteristics, T_J = 150 °C

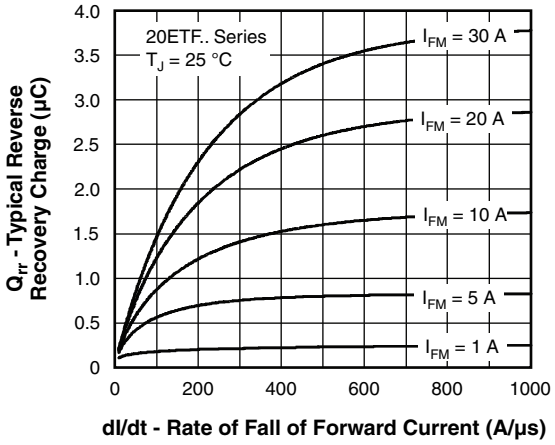

Fig. 10 - Recovery Charge Characteristics, T_J = 25 °C

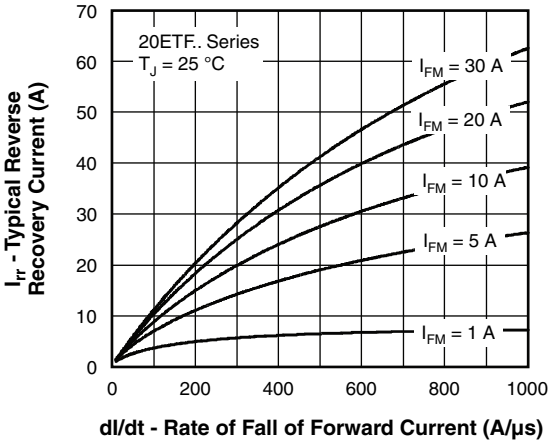

Fig. 12 - Recovery Current Characteristics, T_J = 25 °C

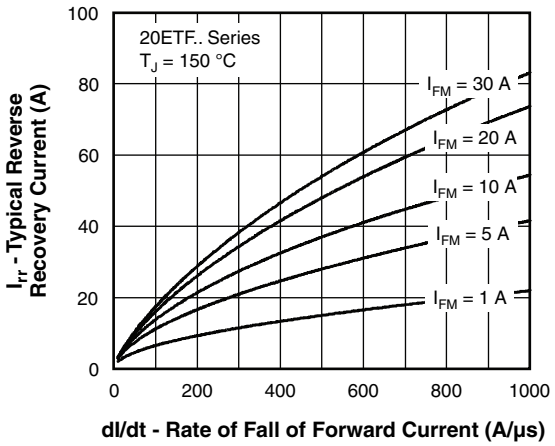

Fig. 13 - Recovery Current Characteristics, T_J = 150 °C

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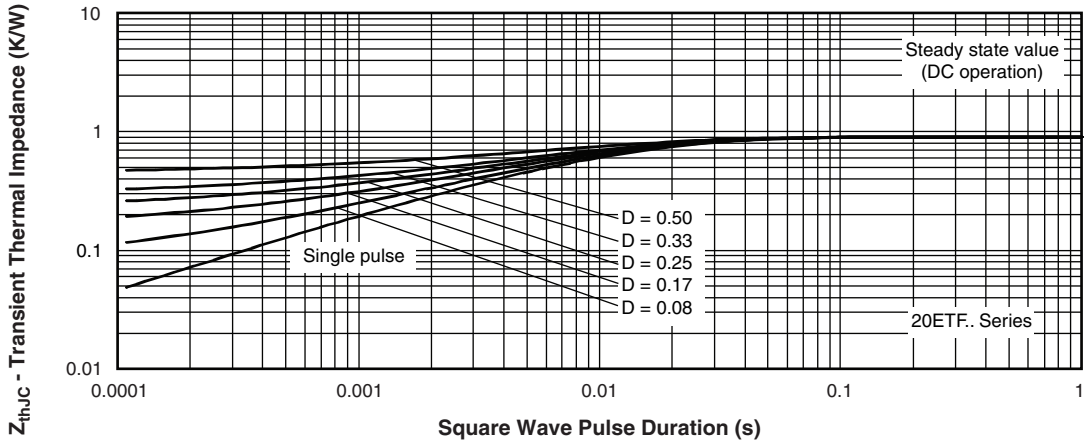

Fig. 14 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

Device code	VS-	20	E	T	F	06	S	TRL	-M3
	1	2	3	4	5	6	7	8	9

- 1 - Vishay Semiconductors product
- 2 - Current rating (20 = 20 A)
- 3 - Circuit configuration:
  E = single
- 4 - Package:
  T = D^2PAK (TO-263AB)
- 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

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ORDERING INFORMATION (Example)		
PREFERRED P/N	**BASE QUANTITY**	**PACKAGING DESCRIPTION**
VS-20ETF02S-M3	50	Antistatic plastic tubes
VS-20ETF02STRR-M3	800	13" diameter reel
VS-20ETF02STRL-M3	800	13" diameter reel
VS-20ETF04S-M3	50	Antistatic plastic tubes
VS-20ETF04STRR-M3	800	13" diameter reel
VS-20ETF04STRL-M3	800	13" diameter reel
VS-20ETF06S-M3	50	Antistatic plastic tubes
VS-20ETF06STRR-M3	800	13" diameter reel
VS-20ETF06STRL-M3	800	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?96164
Part marking information	www.vishay.com/doc?95444
Packaging information	www.vishay.com/doc?96424

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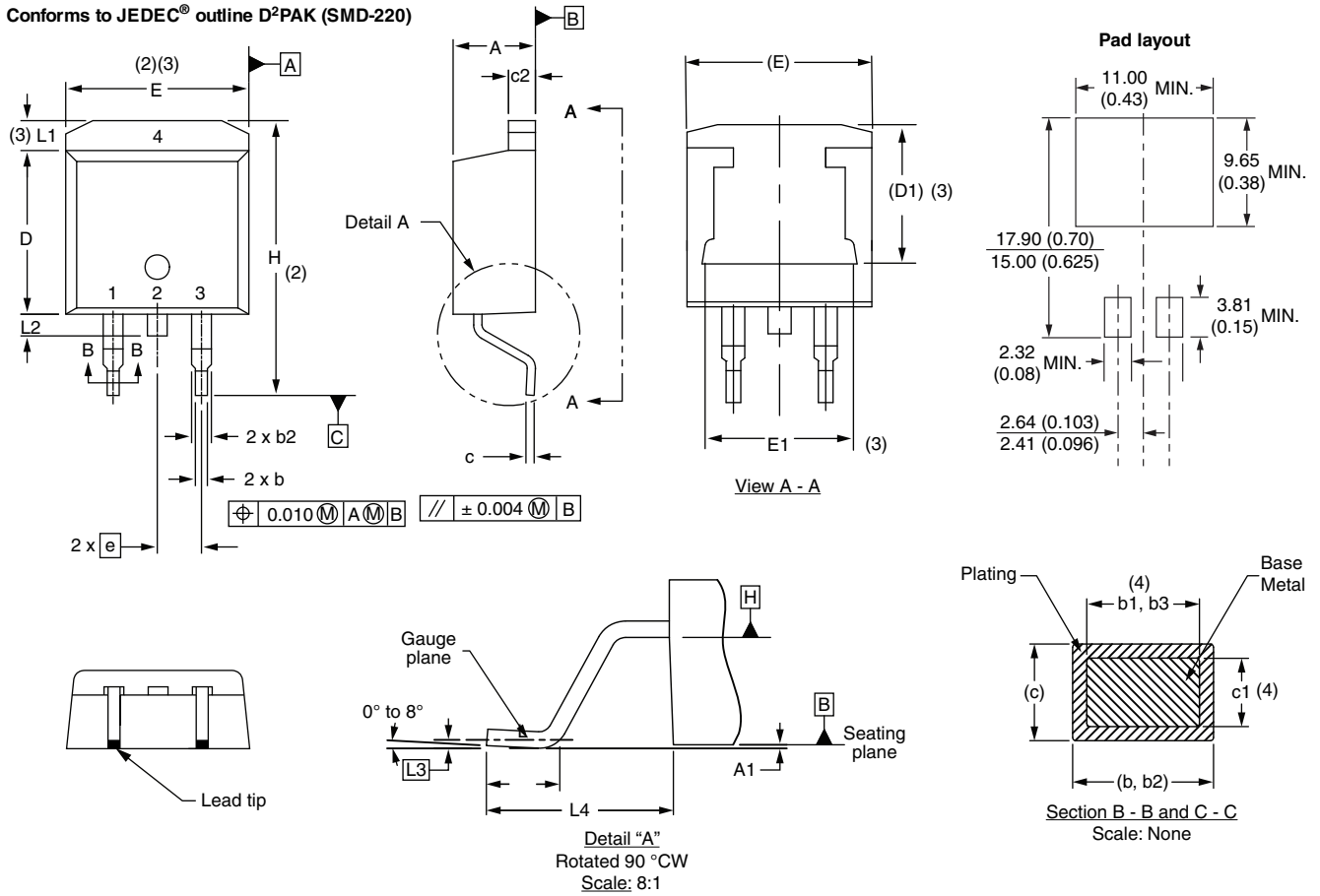
D^2PAK

DIMENSIONS in millimeters and inches



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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