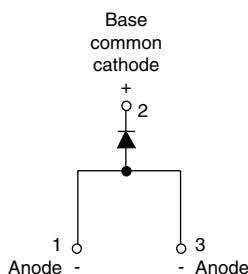


Surface Mount Fast Soft Recovery Rectifier Diode, 10 A


D²PAK (SMD-220)


FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Designed and qualified for industrial level
- 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-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

Package	TO-263AB (D ² PAK)
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-10ETF02SPbF	200	300	2.5
VS-10ETF04SPbF	400	500	
VS-10ETF06SPbF	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 ² t for fusing	I ² t	10 ms sine pulse, rated V _{RRM} applied	66	A ² s
		10 ms sine pulse, no voltage reapplied	94	
Maximum I ² √t for fusing	I ² √t	t = 0.1 ms to 10 ms, no voltage reapplied	940	A ² √s

**ELECTRICAL SPECIFICATIONS**

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

RECOVERY CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Reverse recovery time	t_{rr}	I_F at 10 A _{pk} 25 A/ μ s 25 $^{\circ}\text{C}$	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	$^{\circ}\text{C}$
Maximum thermal resistance junction to case	R_{thJC}	DC operation	1.5	$^{\circ}\text{C/W}$
Maximum thermal resistance junction to ambient (PCB mount)	$R_{thJA}^{(1)}$		40	
Soldering temperature	T_S		260	$^{\circ}\text{C}$
Approximate weight			2	g
			0.07	oz.
Marking device		Case style D ² PAK (SMD-220)	10ETF02S	
			10ETF04S	
			10ETF06S	

Note

- ⁽¹⁾ When mounted on 1" square (650 mm²) PCB of FR-4 or G-10 material 4 oz. (140 μ m) copper 40 $^{\circ}\text{C/W}$.
For recommended footprint and soldering techniques refer to application note #AN-994.

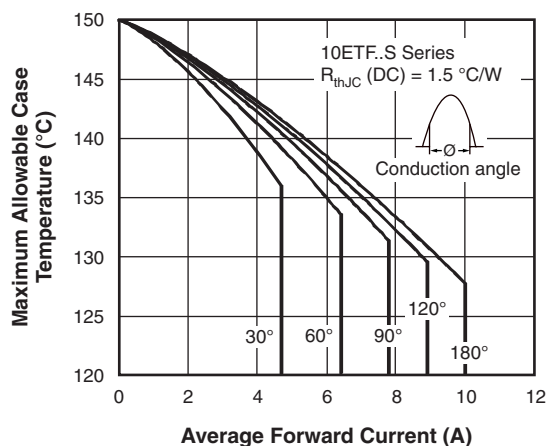


Fig. 1 - Current Rating Characteristics

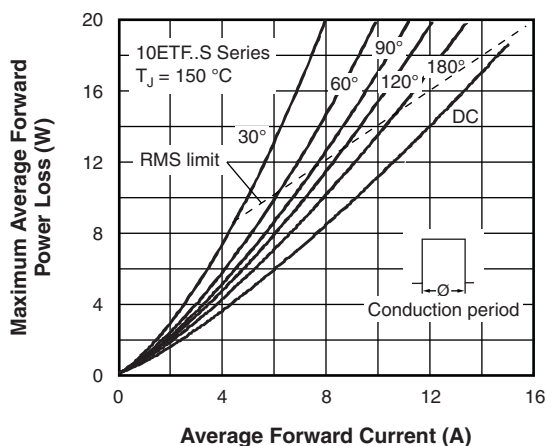


Fig. 4 - Forward Power Loss Characteristics

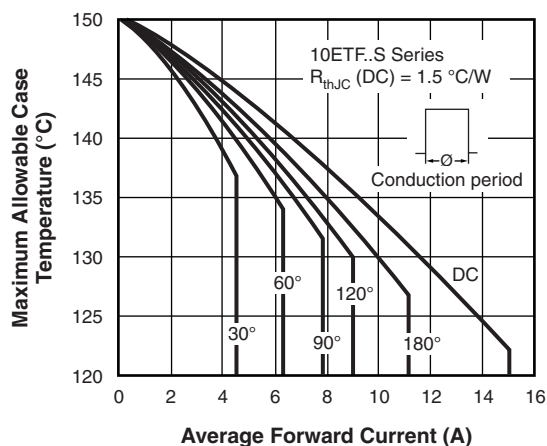


Fig. 2 - Current Rating Characteristics

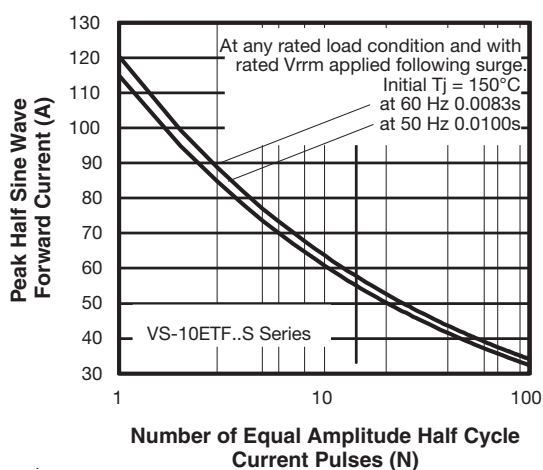


Fig. 5 - Maximum Non-Repetitive Surge Current

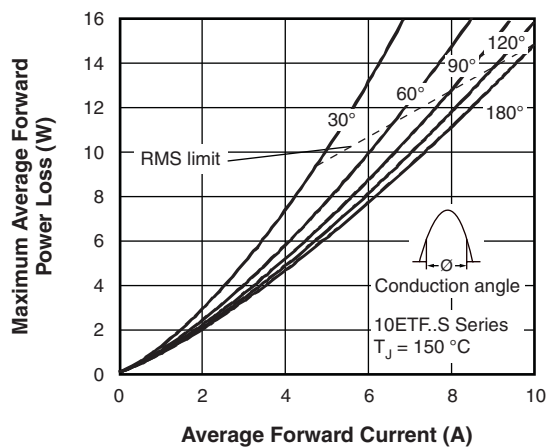


Fig. 3 - Forward Power Loss Characteristics

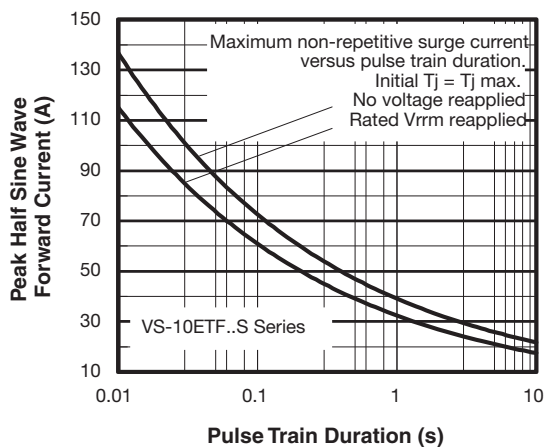


Fig. 6 - Maximum Non-Repetitive Surge Current

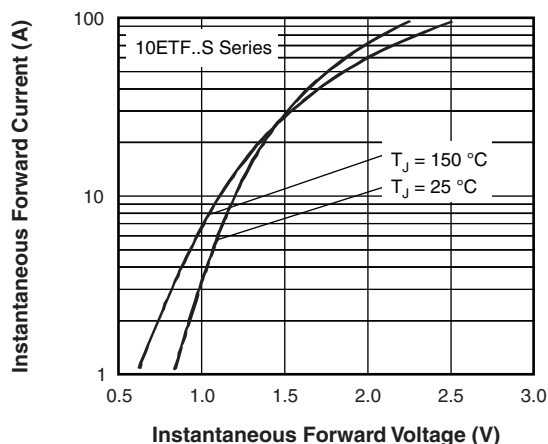


Fig. 7 - Forward Voltage Drop Characteristics

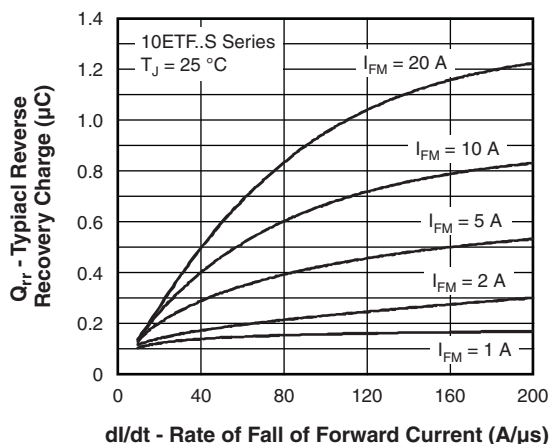


Fig. 10 - Recovery Charge Characteristics, $T_J = 25\text{ }^{\circ}\text{C}$

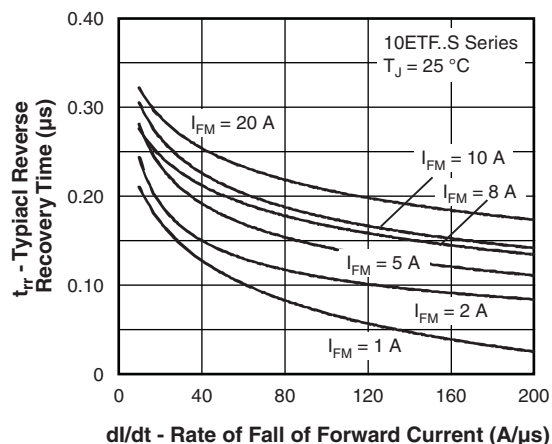


Fig. 8 - Recovery Time Characteristics, $T_J = 25\text{ }^{\circ}\text{C}$

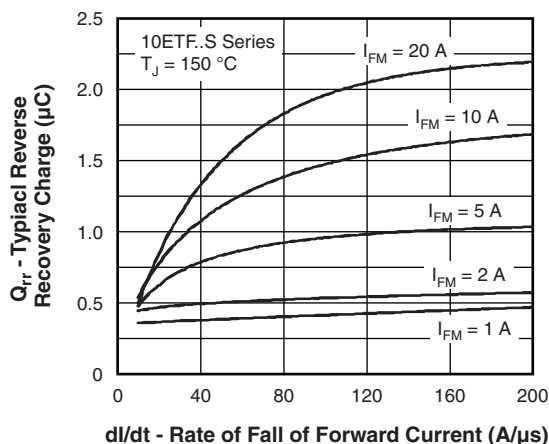


Fig. 11 - Recovery Charge Characteristics, $T_J = 150\text{ }^{\circ}\text{C}$

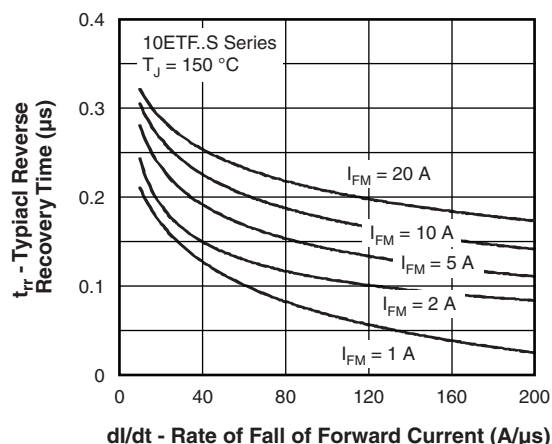


Fig. 9 - Recovery Time Characteristics, $T_J = 150\text{ }^{\circ}\text{C}$

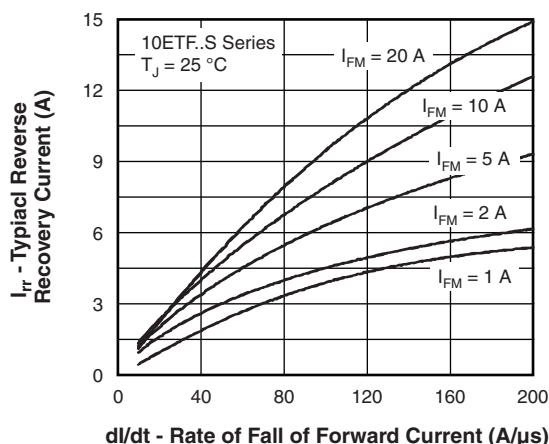
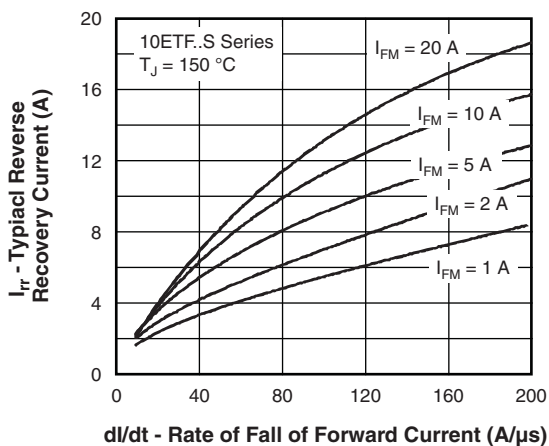
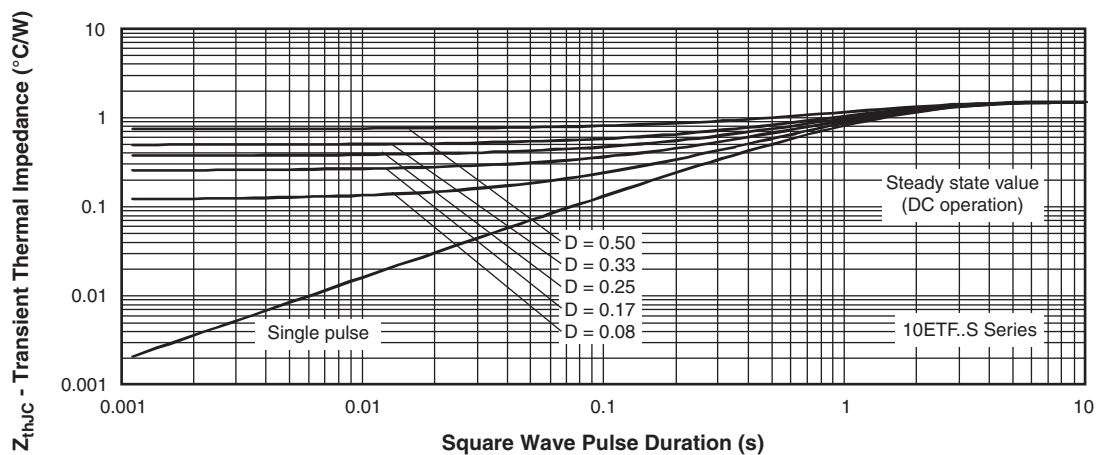


Fig. 12 - Recovery Current Characteristics, $T_J = 25\text{ }^{\circ}\text{C}$


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

Fig. 14 - Thermal Impedance Z_{thJC} Characteristics

**ORDERING INFORMATION TABLE**

Device code	VS-	10	E	T	F	06	S	TRL	PbF
	1	2	3	4	5	6	7	8	9

- 1** - Vishay Semiconductors product
- 2** - Current rating (10 = 10 A)
- 3** - Circuit configuration:
E = Single diode
- 4** - Package:
T = D²PAK (TO-220AC)
- 5** - Type of silicon:
F = Fast soft recovery rectifier
- 6** - Voltage code x 100 = V_{RRM}
- 7** - S = Surface mountable
- 8** -
 - None = Tube
 - TRR = Tape and reel (right oriented)
 - TRL = Tape and reel (left oriented)
- 9** - PbF = Lead (Pb)-free

02 = 200 V
04 = 400 V
06 = 600 V

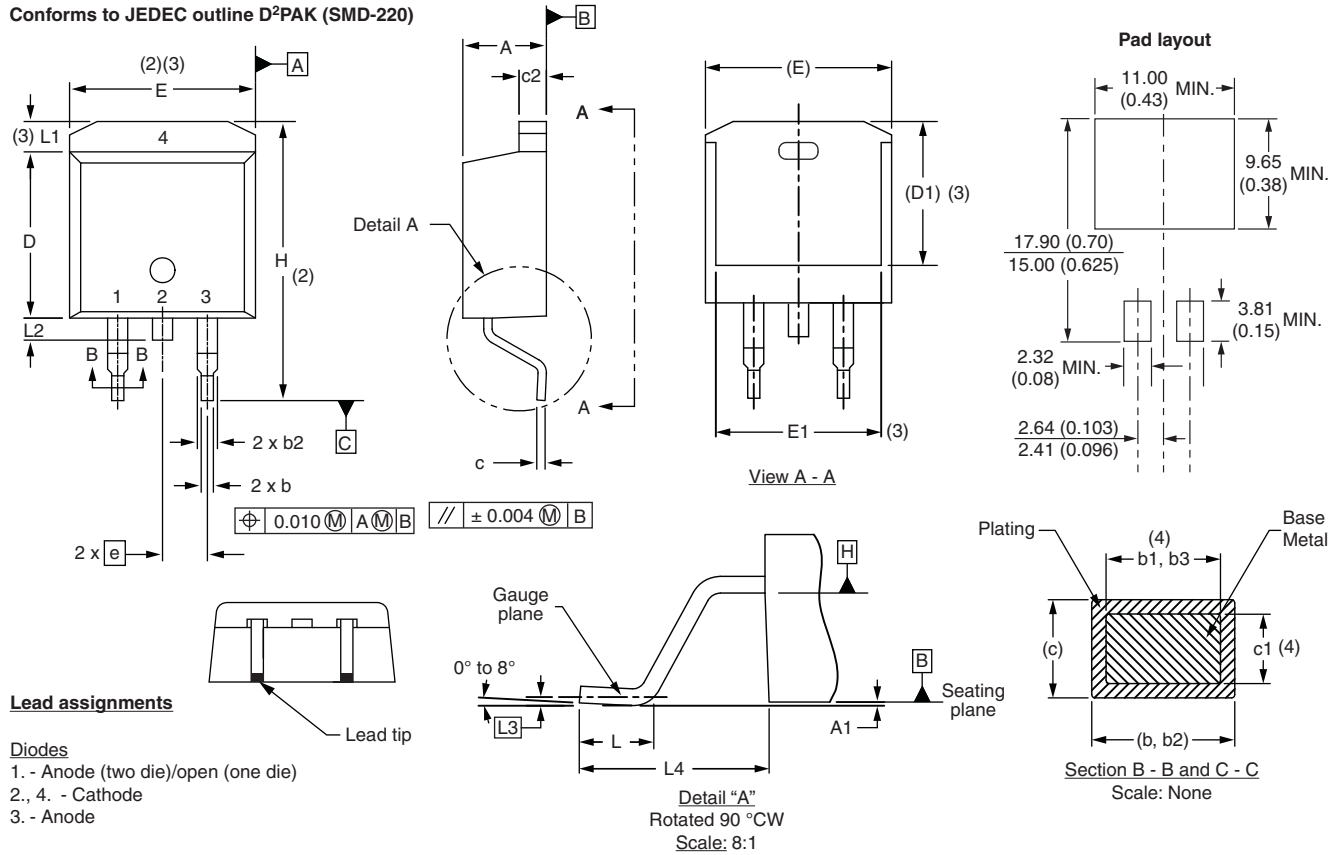
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-10ETF02SPbF	50	1000	Antistatic plastic tubes
VS-10ETF02STRRPbF	800	800	13" diameter reel
VS-10ETF02STRLPbF	800	800	13" diameter reel
VS-10ETF04SPbF	50	1000	Antistatic plastic tubes
VS-10ETF04STRRPbF	800	800	13" diameter reel
VS-10ETF04STRLPbF	800	800	13" diameter reel
VS-10ETF06SPbF	50	1000	Antistatic plastic tubes
VS-10ETF06STRRPbF	800	800	13" diameter reel
VS-10ETF06STRLPbF	800	800	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95046
Part marking information	www.vishay.com/doc?95054
Packaging information	www.vishay.com/doc?95032

D²PAK

DIMENSIONS in millimeters and inches

Conforms to JEDEC outline D²PAK (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: inch
- (7) Outline conforms to JEDEC outline TO-263AB



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