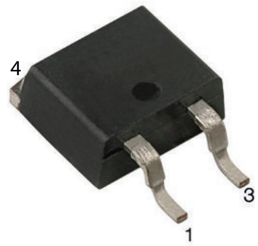
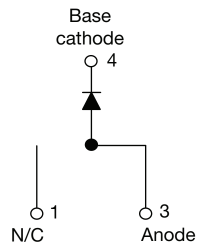
Hyperfast Rectifier, 20 A FRED Pt® G5



D²PAK 2L (TO-263AB 2L)



LINKS TO ADDITIONAL RESOURCES

3D Models

Application Notes

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	20 A
V_R	600 V
V_F at I_F at 125 °C	1.40 V
t_{rr} (typ.)	19 ns
T_J max.	175 °C
Package	D²PAK 2L (TO-263AB 2L)
Circuit configuration	Single

FEATURES

- Best in class forward voltage drop and switching losses trade off
- Optimized for high speed operation
- 175 °C maximum operating junction temperature
- Polyimide passivation
- 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

DESCRIPTION / APPLICATIONS

Featuring a unique combination of low conduction and switching losses, this rectifier is the right choice for soft switched and resonant converters, as well as medium frequency hard switching converters. This device is specifically designed to improve efficiency of high speed LLC output rectification stages of EV / HEV battery charging stations and high frequency stages of UPS applications

MECHANICAL DATA

Case: D²PAK 2L (TO-263AB 2L)
Molding compound meets UL 94 V-0 flammability rating

Terminals: matte tin plated leads, solderable per J-STD-002

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**UNITS**
Repetitive peak reverse voltage	V_{RRM}		600	V
Average rectified forward current	$I_{F(AV)}$	T_C = 107 °C, D = 0.50	20	A
Repetitive peak forward current	I_{FRM}	T_C = 107 °C, D = 0.50, f = 20 kHz	40	
Non-repetitive peak surge current	I_{FSM}	T_C = 25 °C, t_p = 10 ms, sine wave	185	
Operating junction and storage temperature	T_J, T_{Stg}		-55 to +175	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Breakdown voltage, blocking voltage	V_{BR}, V_R	I_R = 100 μA	600	-	-	V
Forward voltage	V_F	I_F = 20 A	-	1.7	2.31	
		I_F = 20 A, T_J = 125 °C	-	1.40	-	
Reverse leakage current	I_R	V_R = V_R rated	-	-	10	μA
		T_J = 125 °C, V_R = V_R rated	-	-	500	
Junction capacitance	C_T	V_R = 200 V	-	25	-	pF
Series inductance	L_S	Measured to lead 5 mm from package body	-	8	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1.0 A, dI_F/dt = 100 A/µs, V_R = 30 V		-	19	-	ns
		T_J = 25 °C	I_F = 12 A dI_F/dt = 1000 A/µs V_R = 400 V	-	33	-	
		T_J = 125 °C		-	43	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	12	-	A
		T_J = 125 °C		-	20	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	185	-	nC
		T_J = 125 °C		-	510	-	
Reverse recovery time	t_{rr}	T_J = 25 °C	I_F = 20 A dI_F/dt = 1000 A/µs V_R = 400 V	-	41	-	ns
		T_J = 125 °C		-	50	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	12	-	A
		T_J = 125 °C		-	19	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	240	-	nC
		T_J = 125 °C		-	640	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Thermal resistance, junction-to-case	R_{thJC}		-	-	1.72	°C/W
Weight			-	2.0	-	g
Maximum junction and storage temperature range	T_J, T_{Stg}		-55	-	175	°C
Marking device		Case style D^2PAK 2L (TO-263AB 2L)	E5TX2106S			

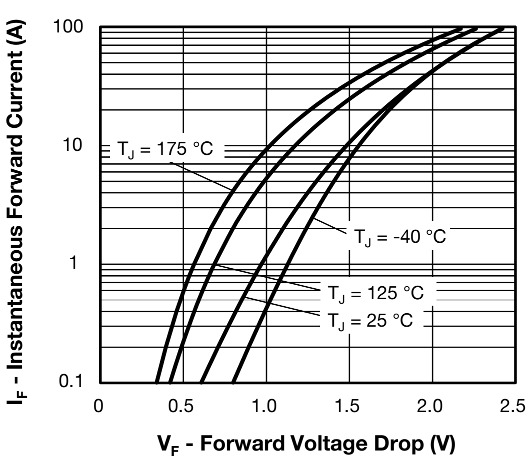


Fig. 1 - Forward Voltage Drop Characteristics

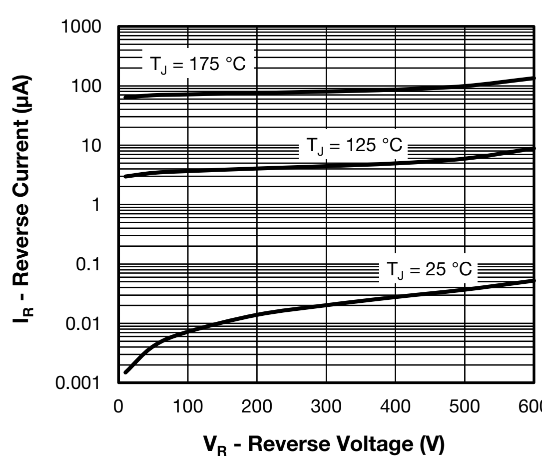


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

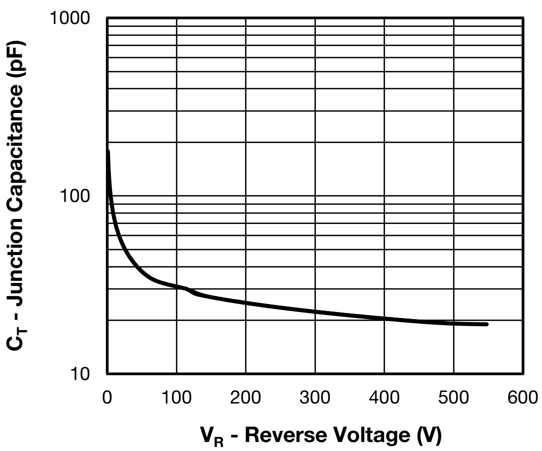


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

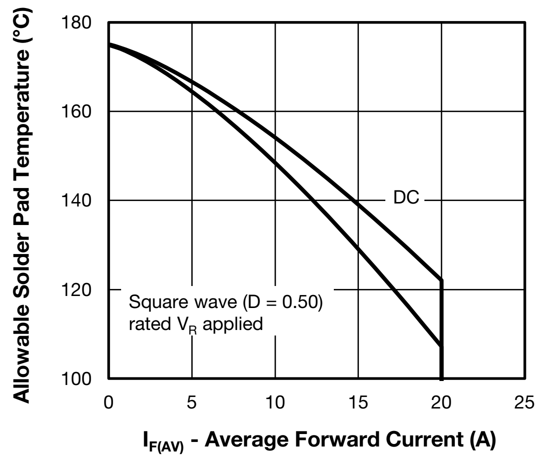


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

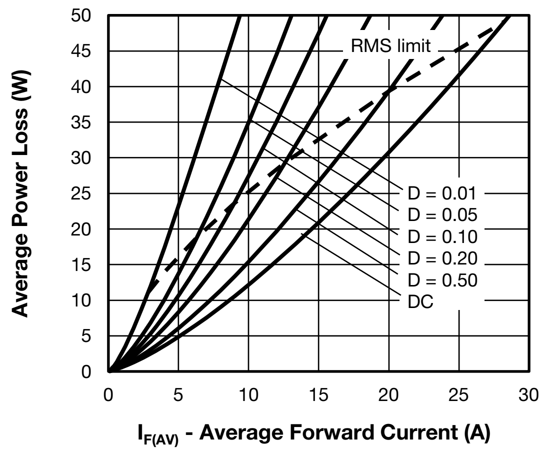


Fig. 5 - Forward Power Loss Characteristics

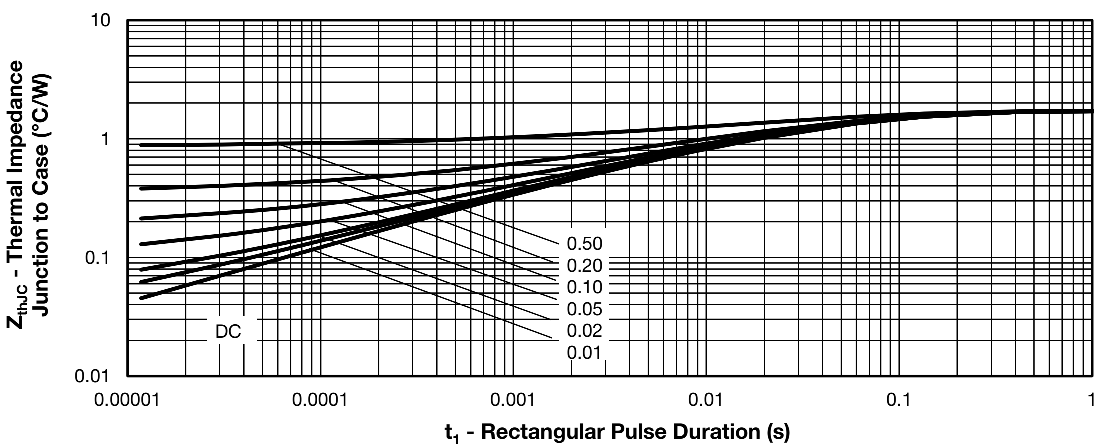


Fig. 6 - Transient Thermal Impedance, Junction to Case

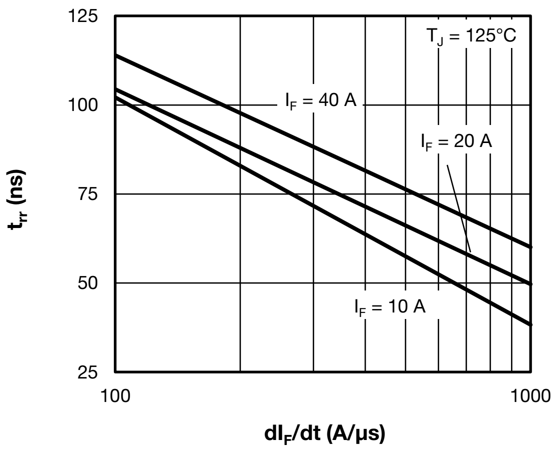


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

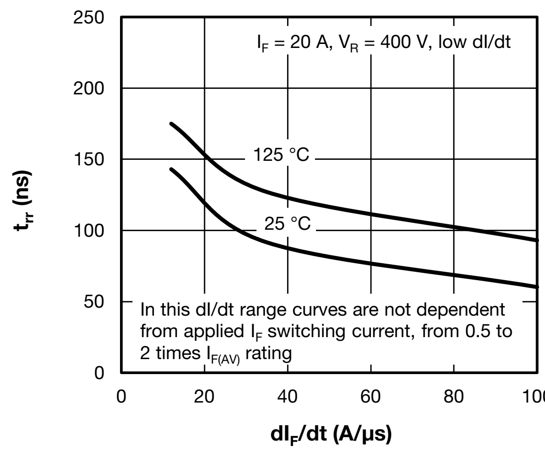


Fig. 10 - Typical Reverse Recovery Time vs. dI_F/dt

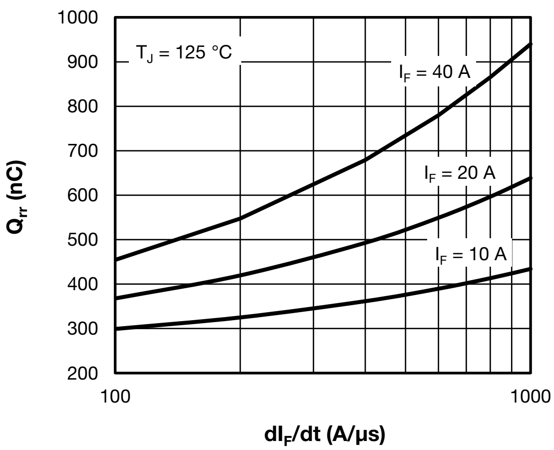


Fig. 8 - Typical Reverse Recovery Charge vs. dI_F/dt

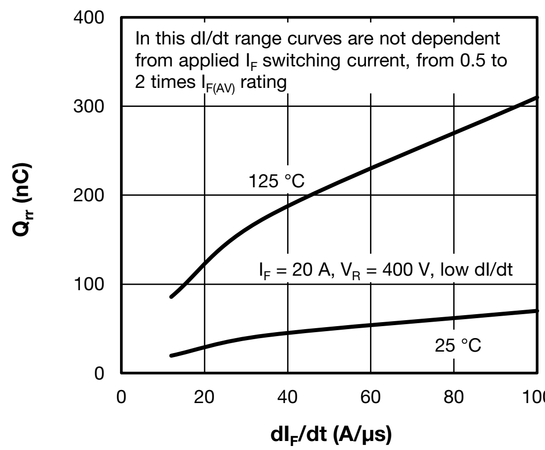


Fig. 11 - Typical Reverse Recovery Charge vs. dI_F/dt

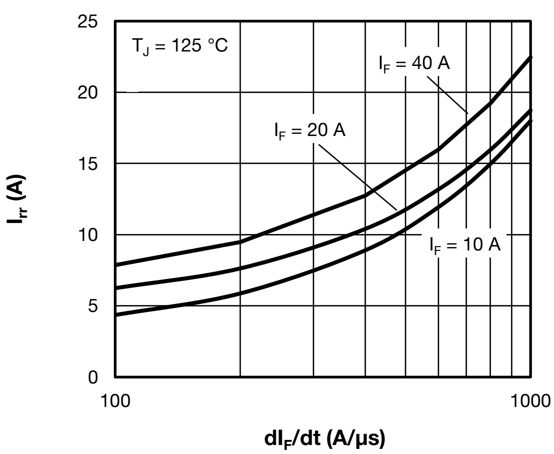


Fig. 9 - Typical Reverse Recovery Current vs. dI_F/dt

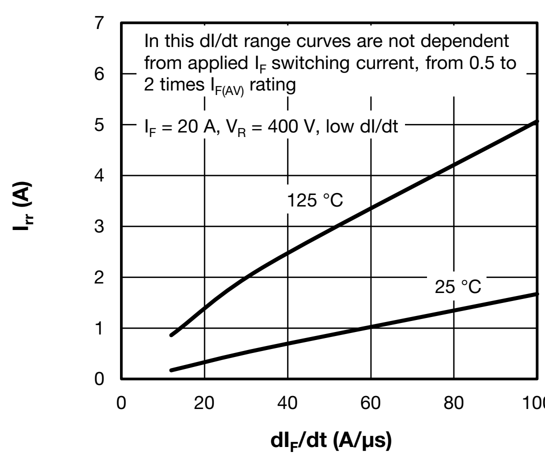


Fig. 12 - Typical Reverse Recovery Current vs. dI_F/dt

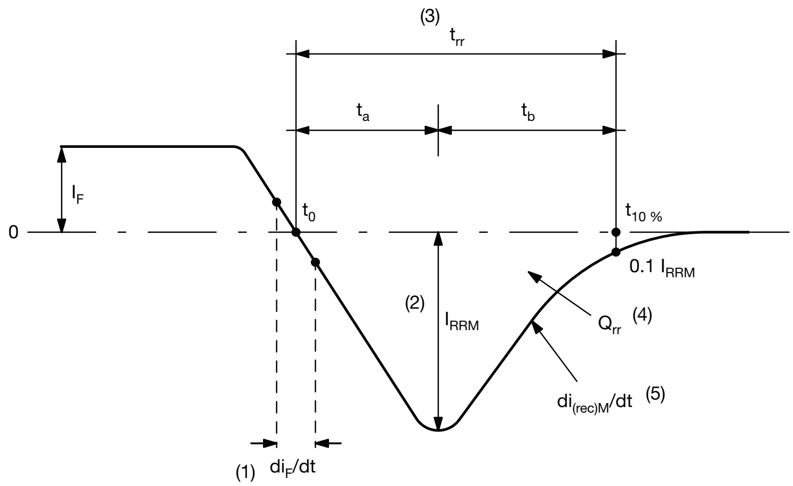


Fig. 13 - Reverse Recovery Waveform and Definitions

Notes

(1) di_F/dt - rate of change of current through zero crossing

(2) I_{RRM} - peak reverse recovery current

(3) t_{rr} - reverse recovery time measured from t_0, crossing point of negative going I_F, to point $t_{10\%}$, 0.1 I_{RRM}

(4) Q_{rr} - area under curve defined by t_0 and $t_{10\ \%}$

$$Q_{rr} = \int_{t_0}^{t_{10\ \%}} I(t)dt$$

(5) $di_{(rec)}M/dt$ - peak rate of change of current during t_b portion of t_{rr}

ORDERING INFORMATION TABLE

Device code	VS-	E	5	T	X	21	06	S2	L	-M3
	1	2	3	4	5	6	7	8	9	10

1 - Vishay Semiconductors product

2 - E = single diode

3 - 5 = FRED generation 5

4 - Package:
T = D^2PAK (TO-263) package

5 - X = hyperfast recovery

6 - Current rating (21 = 20 A)

7 - Voltage rating (06 = 600 V)

8 - S2 = true 2 pin D^2PAK

9 - None = tube (50 pieces)
• L = tape and reel (left oriented, for D^2PAK package)
If needed different orientation/packaging, please contact factory

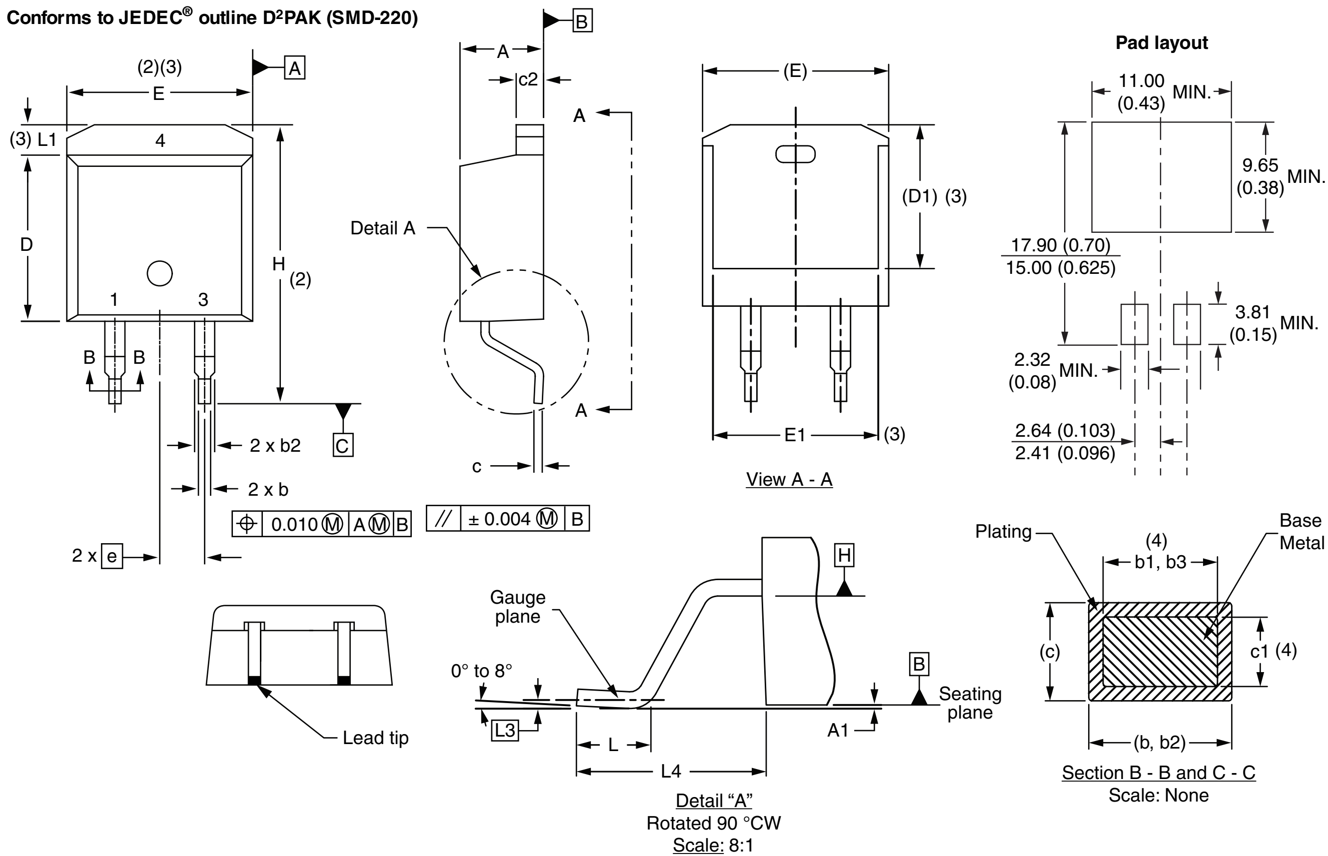
10 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

ORDERING INFORMATION (Example)		
PREFERRED P/N	**BASE QUANTITY**	**PACKAGING DESCRIPTION**
VS-E5TX2106S2L-M3	800	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?96683
Part marking information	www.vishay.com/doc?96693
Packaging information	www.vishay.com/doc?95032

D²PAK 2L (TO-263AB 2L)

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
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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