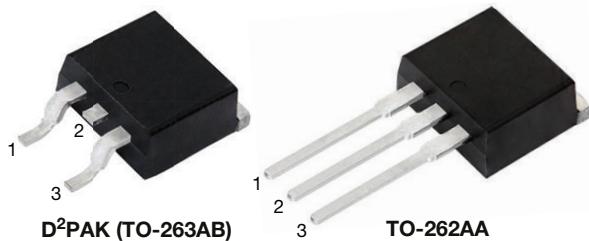
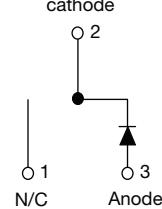
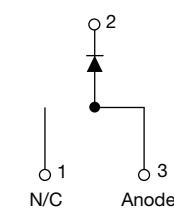


Hyperfast Rectifier, 15 A FRED Pt®


D²PAK (TO-263AB)
TO-262AA

Base cathode


VS-15ETH03S-M3

VS-15ETH03-1-M3

FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- Low leakage current
- 175 °C operating junction temperature
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT
HALOGEN
FREE

DESCRIPTION / APPLICATIONS

Vishay Semiconductors 300 V series are the state of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop and hyperfast recovery time.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in the output rectification stage of SMPS, UPS, DC/DC converters as well as freewheeling diodes in low voltage inverters and chopper motor drives.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

PRIMARY CHARACTERISTICS

$I_{F(AV)}$	15 A
V_R	300 V
V_F at I_F	0.85 V
t_{rr} (typ.)	40 ns
T_J max.	175 °C
Package	D ² PAK (TO-263AB), TO-262AA
Circuit configuration	Single

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Repetitive peak reverse voltage	V_{RRM}		300	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 142$ °C	15	A
Non-repetitive peak surge current	I_{FSM}	$T_J = 25$ °C	140	
Operating junction and storage temperatures	T_J, T_{Stg}		-65 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	300	-	-	V
Forward voltage	V_F	$I_F = 15$ A	-	1.05	1.25	
		$I_F = 15$ A, $T_J = 125$ °C	-	0.85	1.00	
Reverse leakage current	I_R	$V_R = V_R$ rated	-	0.05	40	µA
		$T_J = 125$ °C, $V_R = V_R$ rated	-	12	400	
Junction capacitance	C_T	$V_R = 300$ V	-	45	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8	-	nH

DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	$I_F = 1.0 \text{ A}$, $dI_F/dt = 50 \text{ A}/\mu\text{s}$, $V_R = 30 \text{ V}$		-	-	40	ns
		$T_J = 25^\circ\text{C}$	$I_F = 15 \text{ A}$, $dI_F/dt = -200 \text{ A}/\mu\text{s}$, $V_R = 200 \text{ V}$	-	32	-	
		$T_J = 125^\circ\text{C}$		-	45	-	
Peak recovery current	I_{RRM}	$T_J = 25^\circ\text{C}$	$I_F = 15 \text{ A}$, $dI_F/dt = -200 \text{ A}/\mu\text{s}$, $V_R = 200 \text{ V}$	-	2.4	-	A
		$T_J = 125^\circ\text{C}$		-	6.1	-	
Reverse recovery charge	Q_{rr}	$T_J = 25^\circ\text{C}$	$I_F = 15 \text{ A}$, $dI_F/dt = -200 \text{ A}/\mu\text{s}$, $V_R = 200 \text{ V}$	-	38	-	nC
		$T_J = 125^\circ\text{C}$		-	137	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T_J , T_{Stg}		-65	-	175	°C
Thermal resistance, junction to case per leg	R_{thJC}		-	1.02	2.0	°C/W
Thermal resistance, junction to ambient per leg	R_{thJA}	Typical socket mount	-	-	70	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth, and greased	-	0.2	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style D ² PAK (TO-263AB)	15ETH03S			
		Case style TO-262AA	15ETH03-1			

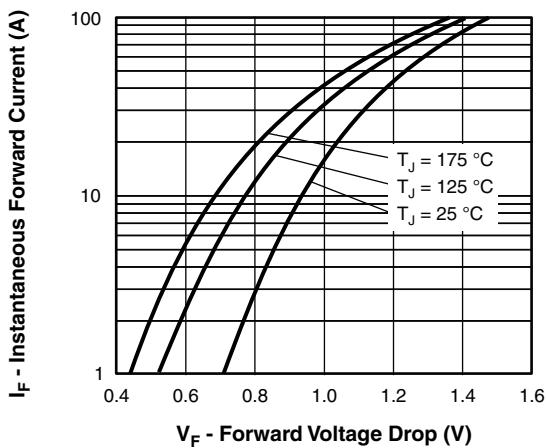


Fig. 1 - Typical Forward Voltage Drop Characteristics

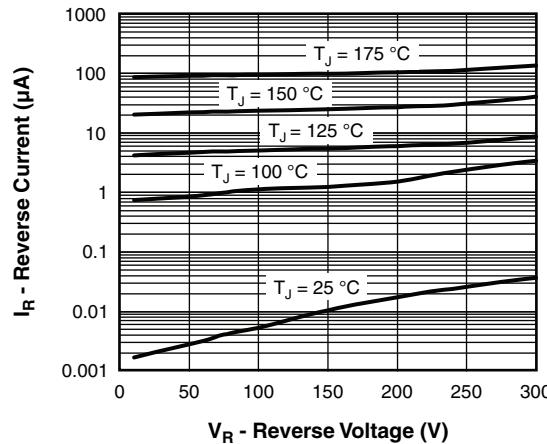


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

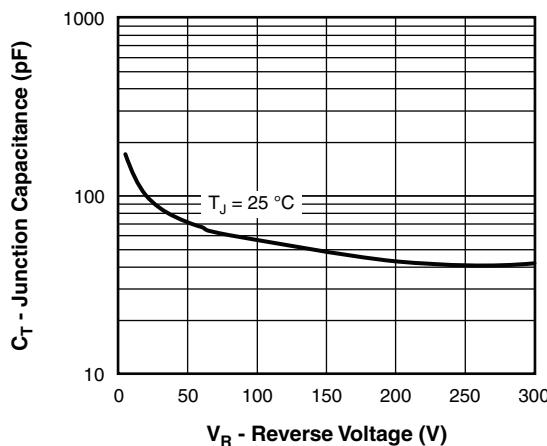


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

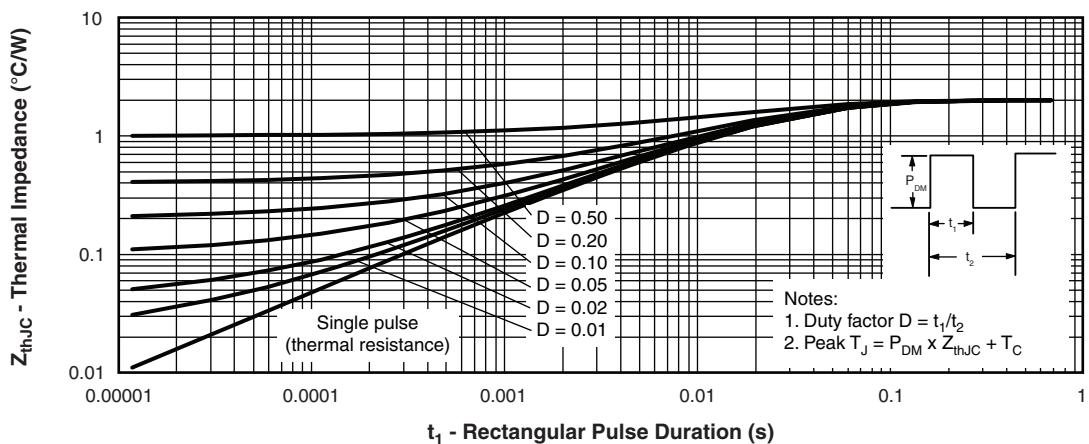


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

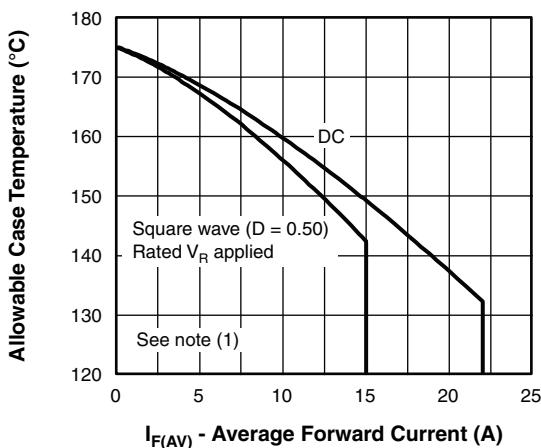


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

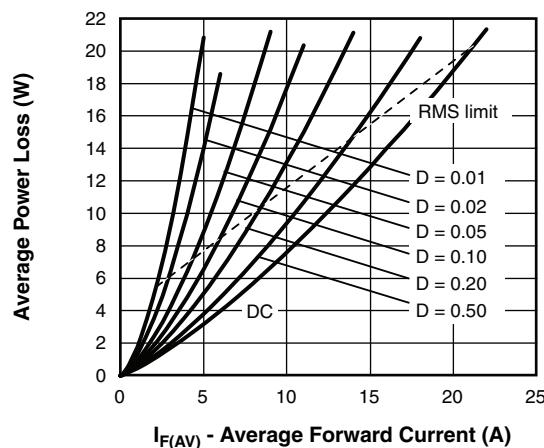


Fig. 6 - Forward Power Loss Characteristics

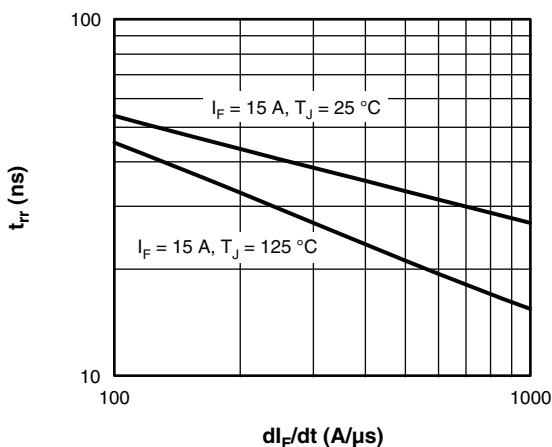


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

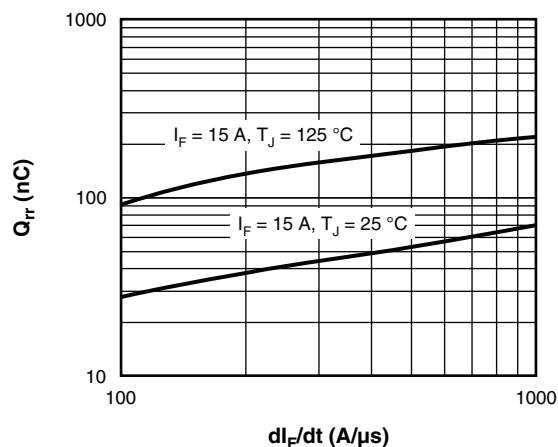
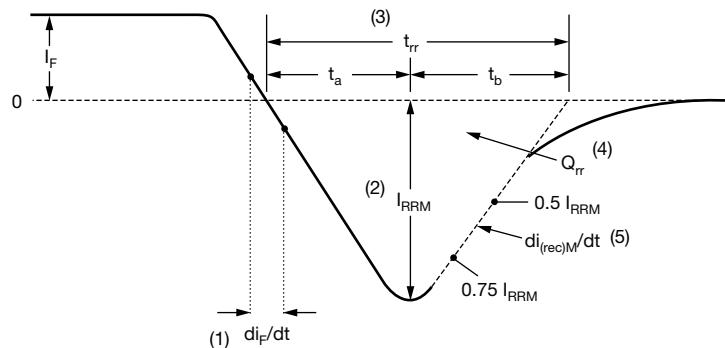


Fig. 8 - Typical Stored Charge vs. dI_F/dt

Note

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
 Pd = forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
 Pd_{REV} = inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = rated V_R

(2)



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

(4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}

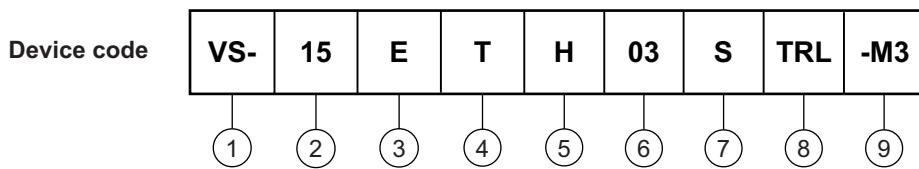
(2) I_{RRM} - peak reverse recovery current

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(3) t_{rr} - reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through $0.75 I_{RRM}$ and $0.50 I_{RRM}$ extrapolated to zero current.

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

Fig. 9 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE


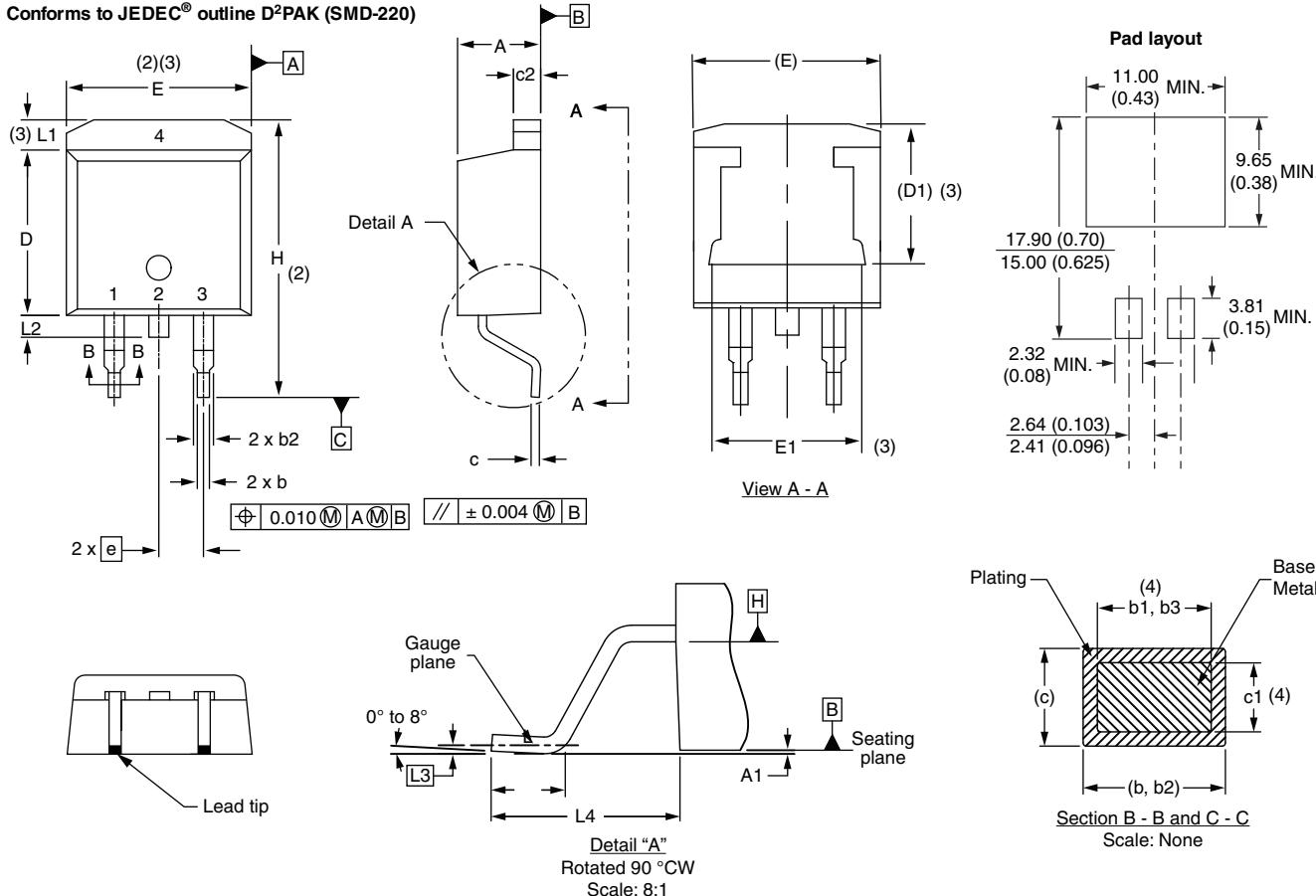
- 1** - Vishay Semiconductors product
- 2** - Current rating (15 A)
- 3** - E = single
- 4** - T = TO-220, D²PAK (TO-263AB)
- 5** - H = hyperfast rectifier
- 6** - Voltage rating (03 = 300 V)
- 7** - • S = D²PAK (TO-263AB)
• -1 = TO-262AA
- 8** - • None = tube (50 pieces)
• TRL = tape and reel (left oriented, for D²PAK (TO-263AB) package)
• TRR = tape and reel (right oriented, for D²PAK (TO-263AB) package)
- 9** - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

LINKS TO RELATED DOCUMENTS		
Dimensions	D ² PAK (TO-263AB)	www.vishay.com/doc?96164
	TO-262AA	www.vishay.com/doc?96165
Part marking information	D ² PAK (TO-263AB)	www.vishay.com/doc?95444
	TO-262AA	www.vishay.com/doc?95443
Packaging information		www.vishay.com/doc?96424
SPICE model		www.vishay.com/doc?96567

D²PAK

DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D²PAK (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	

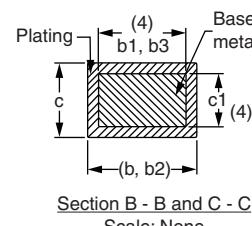
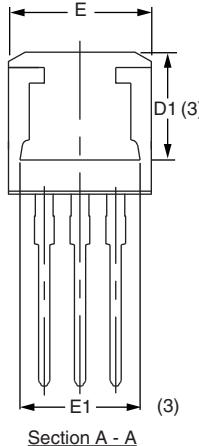
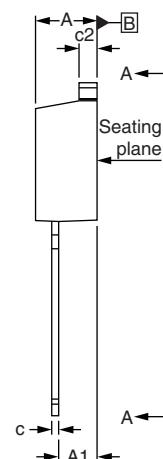
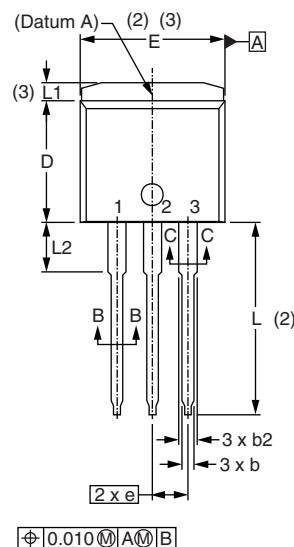
Notes

- (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

TO-262AA

DIMENSIONS in millimeters and inches

Modified JEDEC® outline TO-262


Lead assignments
Diodes

1. - Anode (two die/open one die)
- 2., 4. - Cathode
3. - Anode

Section B - B and C - C

Scale: None

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	2.03	3.02	0.080	0.119	
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
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		
L	13.46	14.10	0.530	0.555	
L1	-	1.65	-	0.065	3
L2	3.56	3.71	0.140	0.146	

Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-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) Controlling dimension: inches
- (6) Outline conform to JEDEC® TO-262 except A1 (max.), b (min., max.), b1 (min.), b2 (max.), c (min.), c1(min.), c2 (max.), D (min.), E (max.), L1 (max.), L2 (min., max.)

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