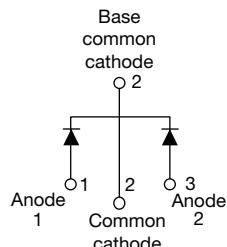
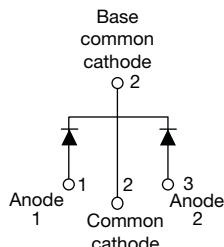


## Ultrafast Rectifier, 2 x 10 A FRED Pt®

**VS-MURB2020CTHM3**

**D<sup>2</sup>PAK**

**VS-MURB2020CT-1HM3**

**TO-262**


### FEATURES

- Ultrafast 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 260 °C
- AEC-Q101 qualified
- Meets JESD 201 class 1 whisker test
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### DESCRIPTION / APPLICATIONS

MUR.. series are the state of the art ultrafast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultrafast 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 diode 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.

PRODUCT SUMMARY	
Package	TO-263AB (D <sup>2</sup> PAK), TO-262AA
$I_{F(AV)}$	2 x 10 A
$V_R$	200 V
$V_F$ at $I_F$	0.85
$t_{rr}$ typ.	19 ns
$T_J$ max.	175 °C
Diode variation	Common cathode

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS	
Peak repetitive reverse voltage	$V_{RRM}$		200	V	
Average rectified forward current per leg	$I_{F(AV)}$		10	A	
		Rated $V_R$ , $T_C = 145$ °C	20		
Non-repetitive peak surge current per leg	$I_{FSM}$		100	A	
Peak repetitive forward current per leg	$I_{FM}$	Rated $V_R$ , square wave, 20 kHz, $T_C = 145$ °C	20		
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	200	-	-	V	
Forward voltage	$V_F$		-	-	0.85		
			-	-	1.15		
			-	-	1.05		
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	15	µA	
		$T_J = 150$ °C, $V_R = V_R$ rated	-	-	250		
Junction capacitance	$C_T$	$V_R = 200$ V	-	55	-	pF	
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH	

DYNAMIC RECOVERY CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1.0 \text{ A}$ , $dI_F/dt = 100 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$		-	19	-	ns
		$T_J = 25^\circ\text{C}$	$I_F = 10 \text{ A}$ $dI_F/dt = 200 \text{ A}/\mu\text{s}$ $V_R = 160 \text{ V}$	-	21	-	
		$T_J = 125^\circ\text{C}$		-	35	-	
Peak recovery current	$I_{RRM}$	$T_J = 25^\circ\text{C}$		-	1.9	-	A
		$T_J = 125^\circ\text{C}$		-	4.8	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25^\circ\text{C}$		-	25	-	nC
		$T_J = 125^\circ\text{C}$		-	78	-	

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	$R_{thJC}$			-	-	2.5	°C/W
Thermal resistance, junction to ambient per leg	$R_{thJA}$			-	-	50	
Thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, flat, smooth and greased		-	0.5	-	
Weight				-	2.0	-	g
				-	0.07	-	oz.
Mounting torque				6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style D <sup>2</sup> PAK		MURB2020CTH			
		Case style TO-262		MURB2020CT-1H			

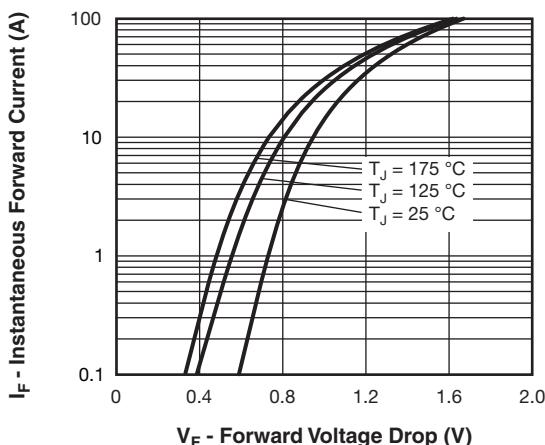


Fig. 1 - Typical Forward Voltage Drop Characteristics

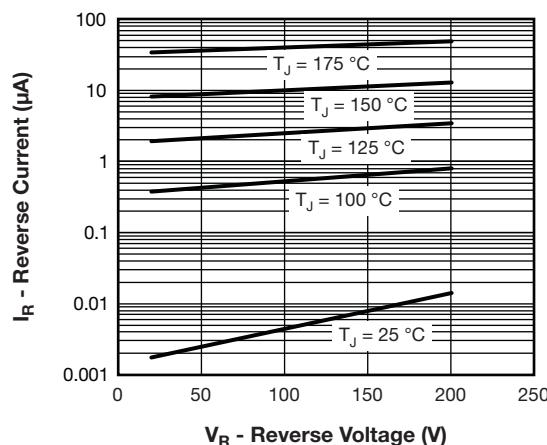


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

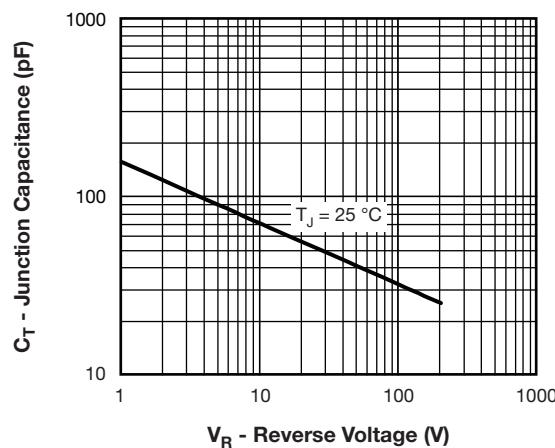


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

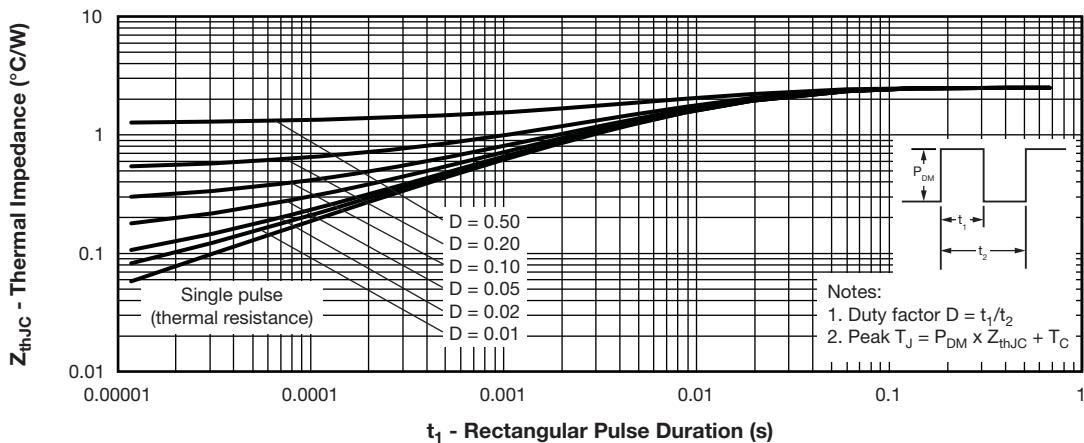


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

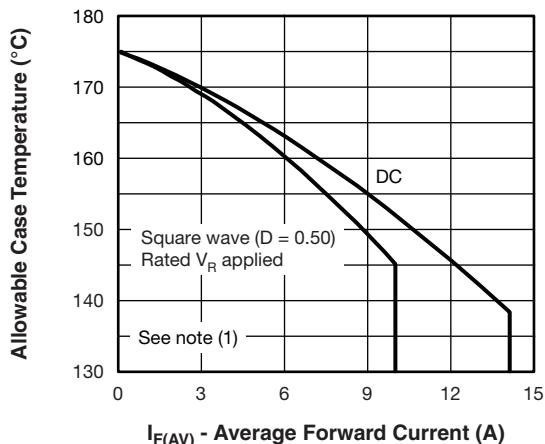


Fig. 5 - Maximum Allowable Case Temperature vs.  
Average Forward Current

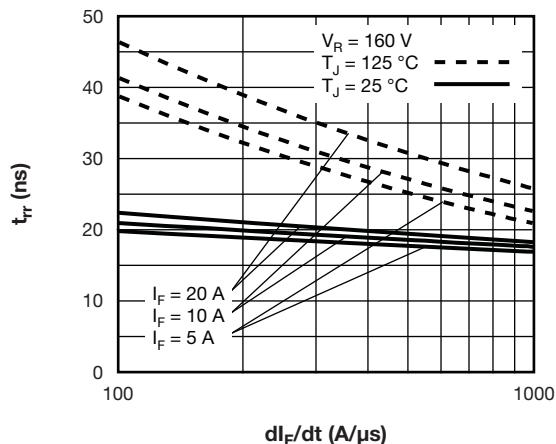


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

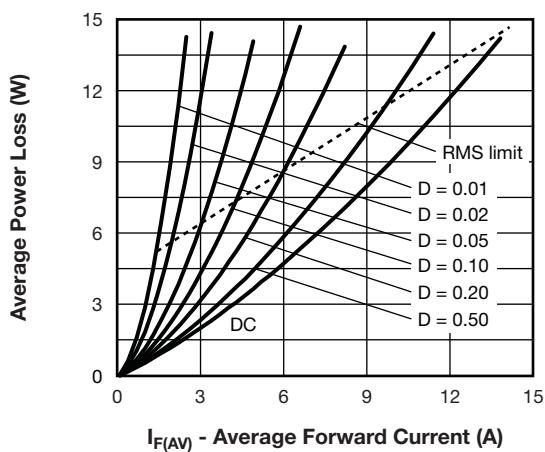


Fig. 6 - Forward Power Loss Characteristics

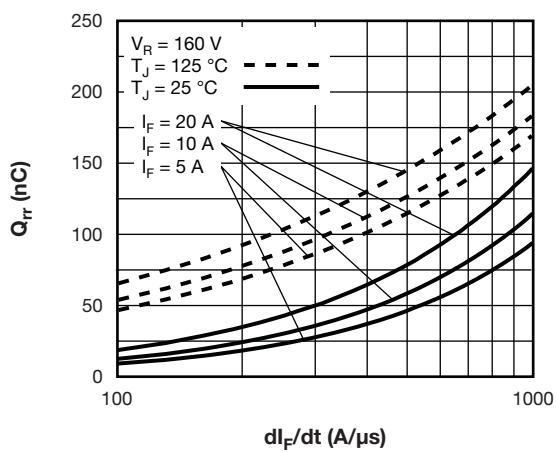
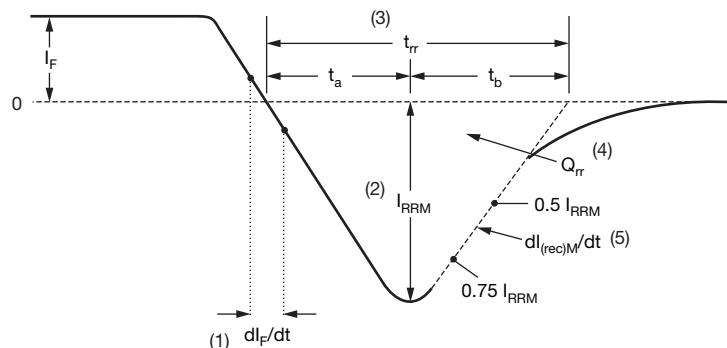


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$

### Note

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



(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 zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.5 I_{RRM}$  extrapolated to zero current.

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

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

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

Fig. 9 - Reverse Recovery Waveform and Definitions

### ORDERING INFORMATION TABLE

Device code	VS-	MUR	B	20	20	CT	-1	L	H	M3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

<b>1</b>	- Vishay Semiconductors product
<b>2</b>	- Ultrafast MUR series
<b>3</b>	- B = D <sup>2</sup> PAK/TO-262
<b>4</b>	- Current rating (20 = 20 A)
<b>5</b>	- Voltage rating (20 = 200 V)
<b>6</b>	- CT = Center tap (dual) TO-220/D <sup>2</sup> PAK/TO-262
<b>7</b>	<ul style="list-style-type: none"> <li>-1 = TO-262</li> <li>None = D<sup>2</sup>PAK</li> </ul>
<b>8</b>	<ul style="list-style-type: none"> <li>None</li> <li>L = Tape and reel (left oriented, for D<sup>2</sup>PAK package)</li> <li>R = Tape and reel (right oriented, for D<sup>2</sup>PAK package)</li> </ul>
<b>9</b>	- H = AEC-Q101 qualified
<b>10</b>	- M3 = Halogen-free, RoHS-compliant, and terminations lead (Pb)-free

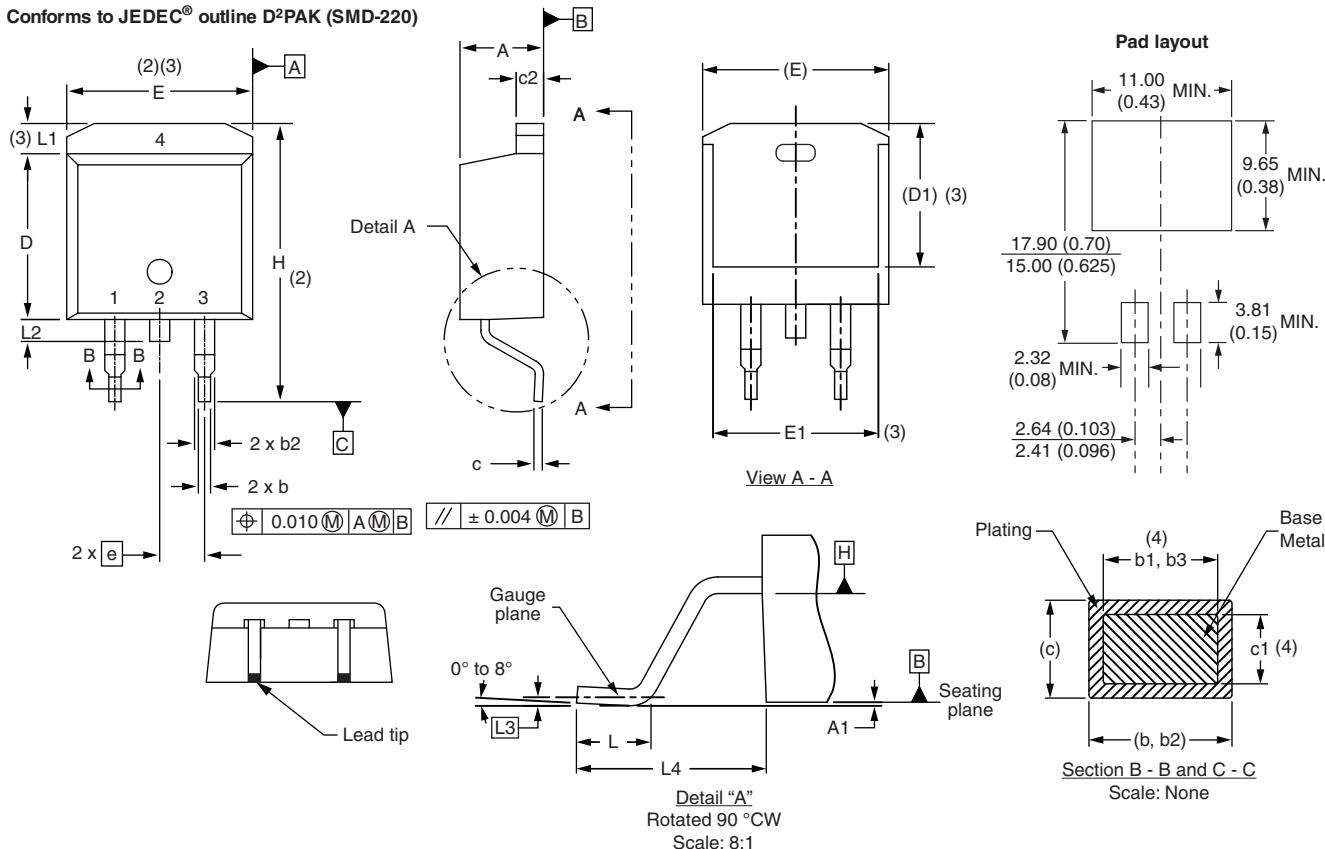


ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-MURB2020CTHM3	50	1000	Antistatic plastic tube
VS-MURB2020CT-1HM3	50	1000	Antistatic plastic tube
VS-MURB2020CTLHM3	800	800	13" diameter reel
VS-MURB2020CTRHM3	800	800	13" diameter reel

LINKS TO RELATED DOCUMENTS			
Dimensions	TO-263AB (D <sup>2</sup> PAK)	<a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a>	
	TO-262AA	<a href="http://www.vishay.com/doc?95419">www.vishay.com/doc?95419</a>	
Part marking information	TO-263AB (D <sup>2</sup> PAK)	<a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a>	
	TO-262AA	<a href="http://www.vishay.com/doc?95443">www.vishay.com/doc?95443</a>	
Packaging information	TO-263AB (D <sup>2</sup> PAK)	<a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a>	
SPICE model		<a href="http://www.vishay.com/doc?95622">www.vishay.com/doc?95622</a>	

# D<sup>2</sup>PAK

**DIMENSIONS** in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (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	

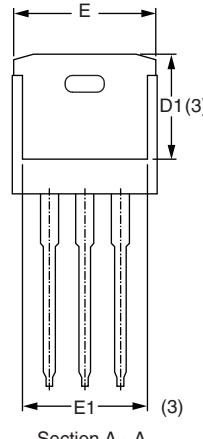
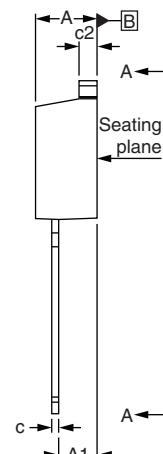
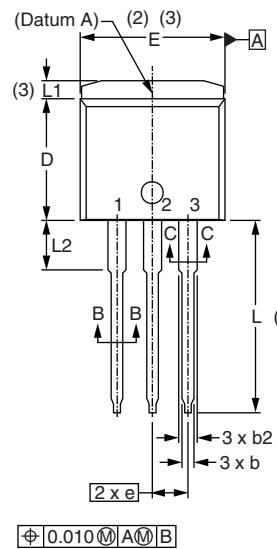
**Notes**

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

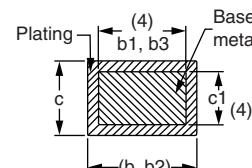
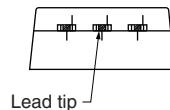
### TO-262

**DIMENSIONS** in millimeters and inches

Modified JEDEC® outline TO-262



Lead assignments



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	3.36	3.71	0.132	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 (maximum), b (minimum), D1 (minimum) and L2 where dimensions derived from the actual package outline

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