

# 100mA, 4μA Quiescent Current CMOS LDO Regulator

## General Description

The RT9169 series are 100mA ultra-low quiescent current CMOS low dropout (LDO) regulator designed for battery-powered equipments. The output voltages range from 1.2V to 5V with 0.1V per step.

The other features include 4μA ultra-low quiescent, low dropout voltage, high output accuracy, current limiting protection, and high ripple rejection ratio.

## Ordering Information

RT9169-□ □ □ □ □

Package Type

ZL : TO-92 (L-Type)

ZT : TO-92 (T-Type)

X : SOT-89

V : SOT-23-3

VL : SOT-23-3 (L-Type)

B : SOT-23-5

Operating Temperature Range

C : Commercial Standard

P : Pb Free with Commercial Standard

Output Voltage

12 : 1.2V

13 : 1.3V

:

49 : 4.9V

50 : 5.0V

Note :

RichTek Pb-free products are :

-RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.

-Suitable for use in SnPb or Pb-free soldering processes.

-100%matte tin (Sn) plating.

## Marking Information

For marking information, contact our sales representative directly or through a RichTek distributor located in your area, otherwise visit our website for detail.

## Features

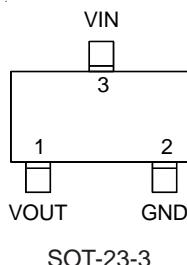
- Ultra-Low Quiescent Current: 4μA
- Low Dropout: 450mV at 100mA
- Wide Operating Voltage Ranges: 2V to 6V
- Current Limiting Protection
- Only 1μF Output Capacitor Required for Stability
- High Power Supply Rejection Ratio
- RoHS Compliant and 100% Lead (Pb)-Free

## Applications

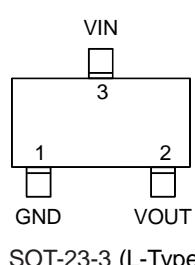
- Battery-Powered Equipment
- Palmtops, Notebook Computers
- Hand-held Instruments
- PCMCIA Cards

## Pin Configurations

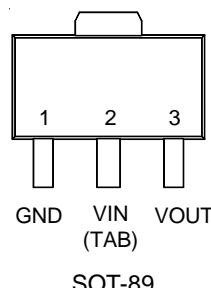
(TOP VIEW)



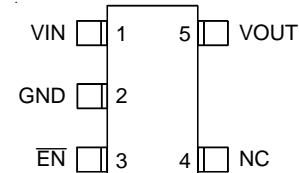
SOT-23-3



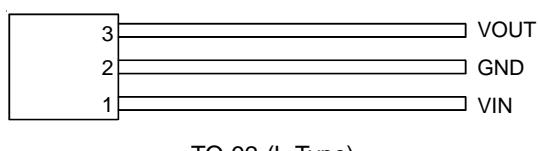
SOT-23-3 (L-Type)



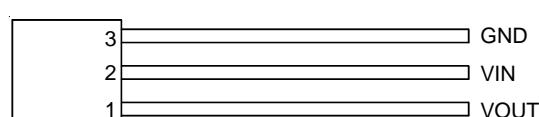
SOT-89



SOT-23-5

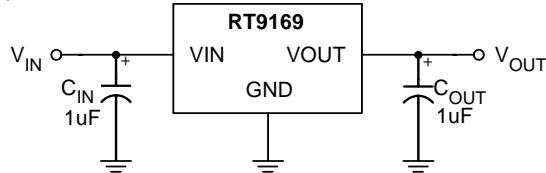


TO-92 (L-Type)



TO-92 (T-Type)

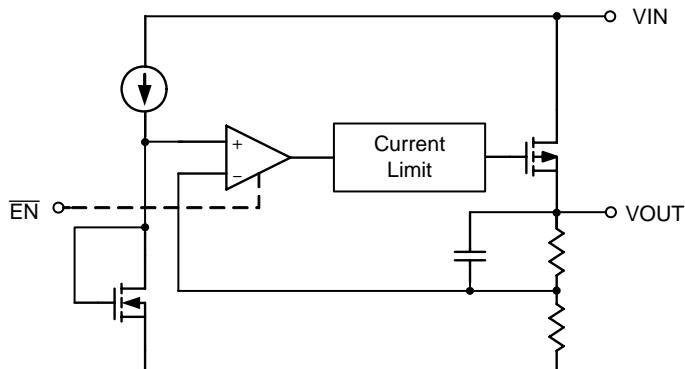
## Typical Application Circuit



## Functional Pin Description

Pin Name	Pin Function
VIN	Power Input
VOUT	Output Voltage
GND	Ground
EN	Chip Enable Control Input

## Function Block Diagram



## Absolute Maximum Ratings

- Input Voltage ----- 7V
- Power Dissipation, P<sub>D</sub> @ T<sub>A</sub> = 25°C  
 SOT-23-3 ----- 0.4W  
 SOT-23-5 ----- 0.4W  
 SOT-89 ----- 0.571W  
 TO-92 ----- 0.625W
- Operating Junction Temperature Range ----- -40°C to 125°C
- Storage Range ----- -65°C to 150°C
- Package Thermal Resistance (Note 1)  
 SOT-23-3, θ<sub>JA</sub> ----- 250°C/W  
 SOT-23-5, θ<sub>JA</sub> ----- 250°C/W  
 SOT-89, θ<sub>JA</sub> ----- 175°C/W  
 TO-92, θ<sub>JA</sub> ----- 160°C/W

## Electrical Characteristics

( $V_{IN} = 5.5V$ ,  $C_{IN} = 1\mu F$ ,  $C_{OUT} = 1\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise specified)

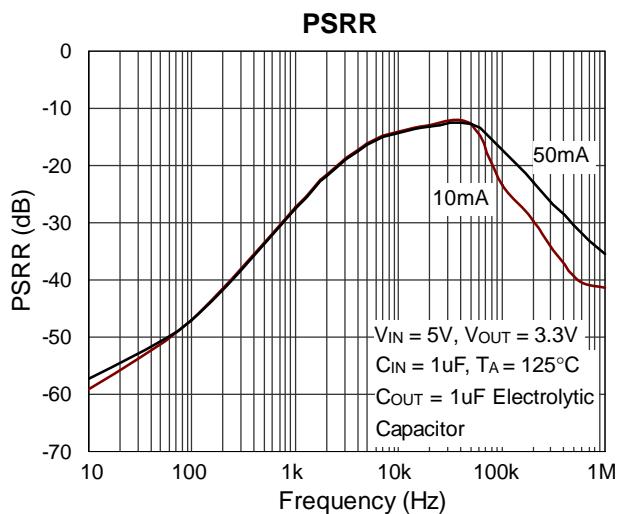
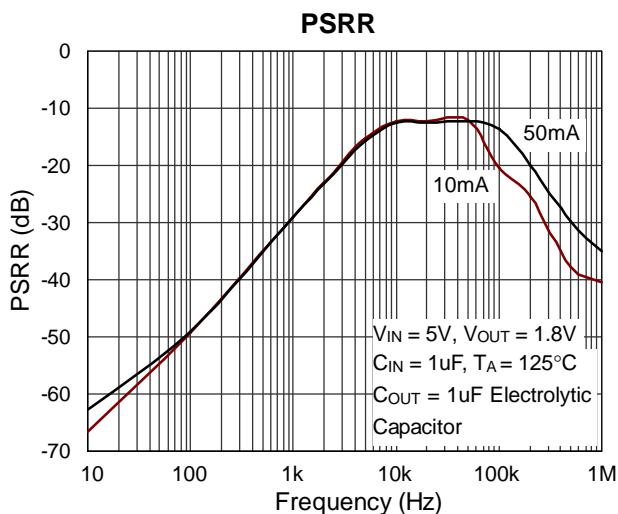
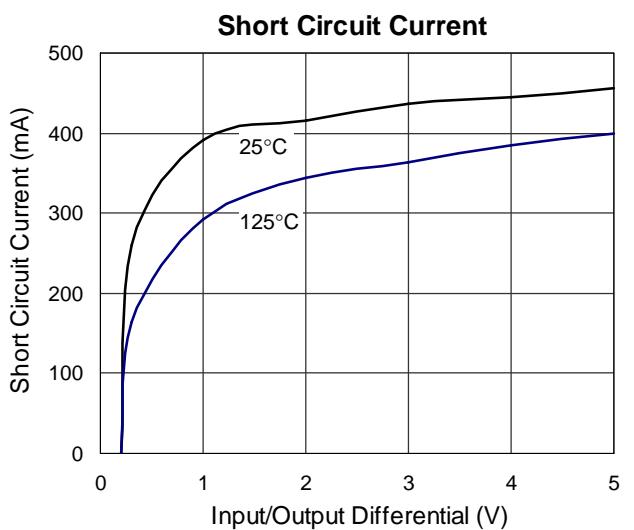
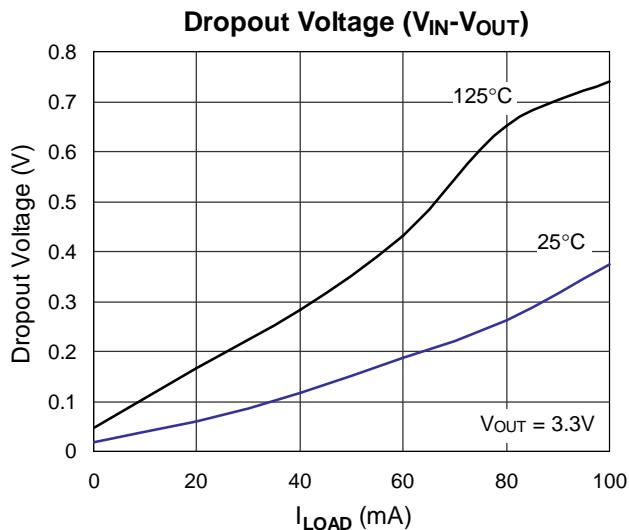
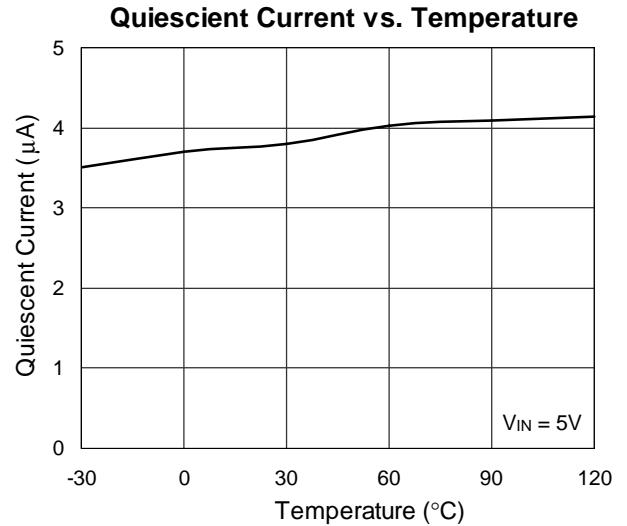
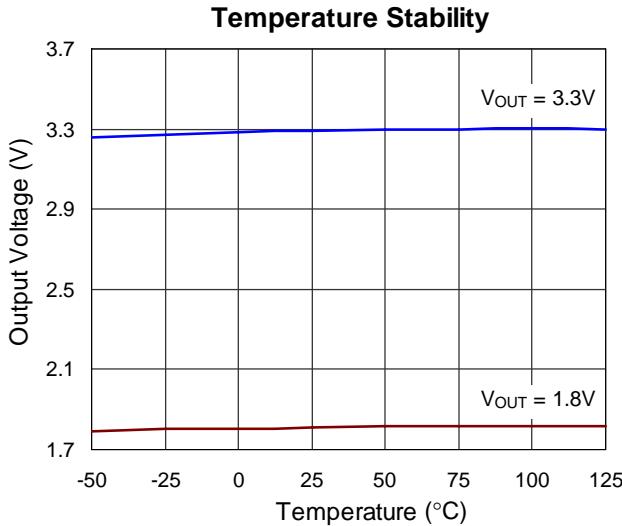
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Input Voltage Range	$V_{IN}$		2	--	6	V
Output Voltage Accuracy	$\Delta V_{OUT}$	$I_L = 1mA$	-2	--	+2	%
Maximum Output Current	$I_{MAX}$	$V_{IN} = V_{OUT} + 0.6V$ , $V_{IN} \geq 3.6V$	100	--	--	mA
Current Limit	$I_{LIM}$	$I_L = 100mA$	150	250	--	mA
GND Pin Current	$I_G$	No Load	--	4	7	$\mu A$
		$I_{OUT} = 100mA$		4	10	$\mu A$
Dropout Voltage	$V_{DROP}$	$I_{OUT} = 1mA$ , $V_{IN} \geq 3.6V$	--	4	10	mV
		$I_{OUT} = 50mA$ , $V_{IN} \geq 3.6V$	--	200	300	
		$I_{OUT} = 100mA$ , $V_{IN} \geq 3.6V$	--	450	600	
Line Regulation	$\Delta V_{LINE}$	$V_{IN} = (V_{OUT} + 0.3V)$ to 6V, $V_{IN} \geq 3.6V$ , $I_{OUT} = 1mA$	-0.2	--	+0.2	%/V
Load Regulation	$\Delta V_{LOAD}$	$I_{OUT} = 0mA$ to 100mA	--	0.01	0.04	%/mA
Output Noise	$e_{NO}$	$BW = 100Hz$ to 50kHz $C_{OUT} = 10\mu F$	--	250	--	$\mu V$
Ripple Rejection	PSRR	$F = 1kHz$ , $C_{OUT} = 1\mu F$	--	30	--	dB
Standby Current	RT9169-CB	$\overline{EN} = V_{IN}$	--	0.1	1	$\mu A$
EN Threshold			0.6	1	2	V
Thermal Shutdown Protection			125	--	--	$^\circ C$

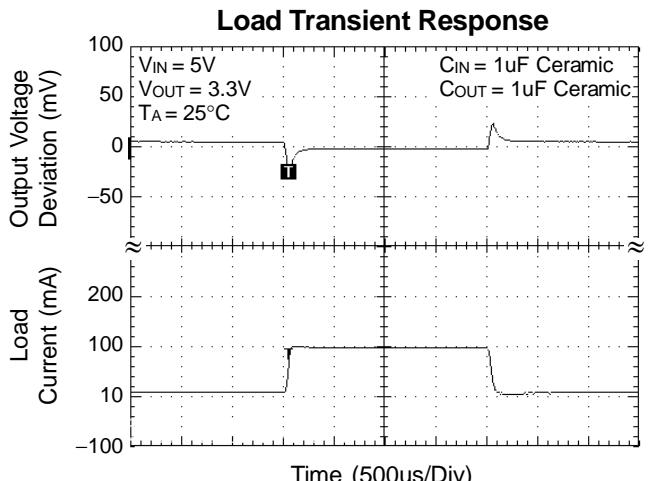
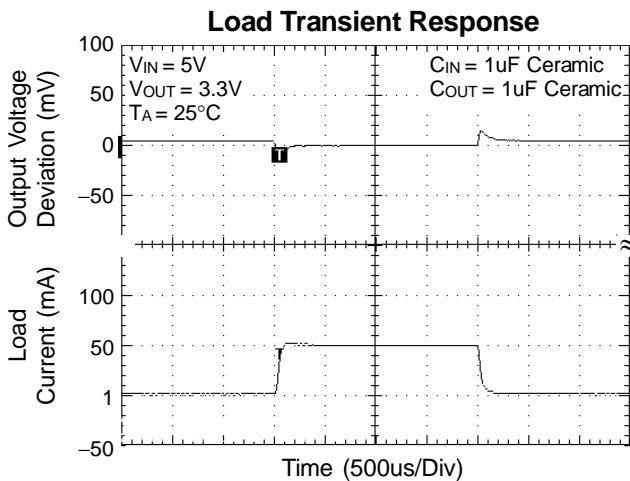
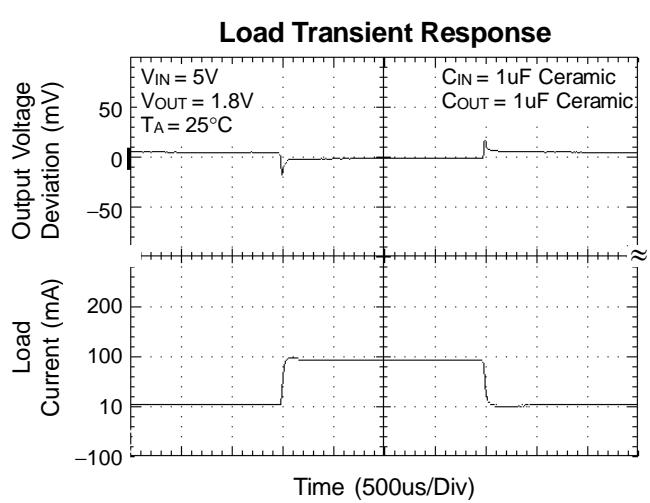
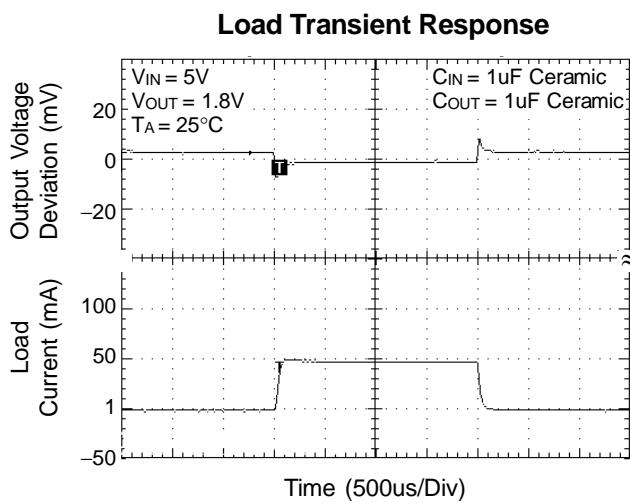
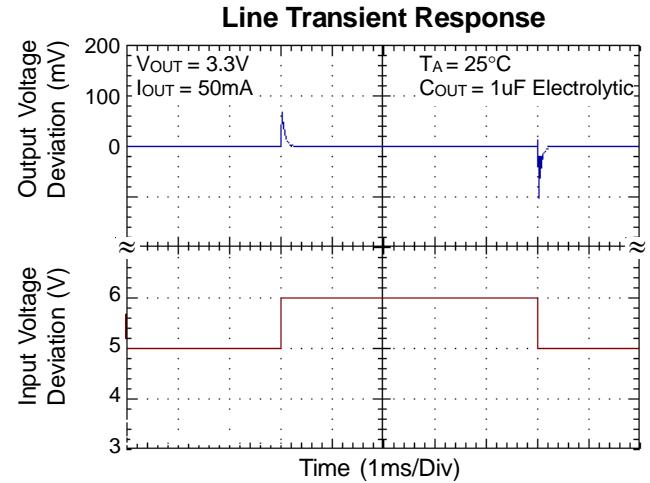
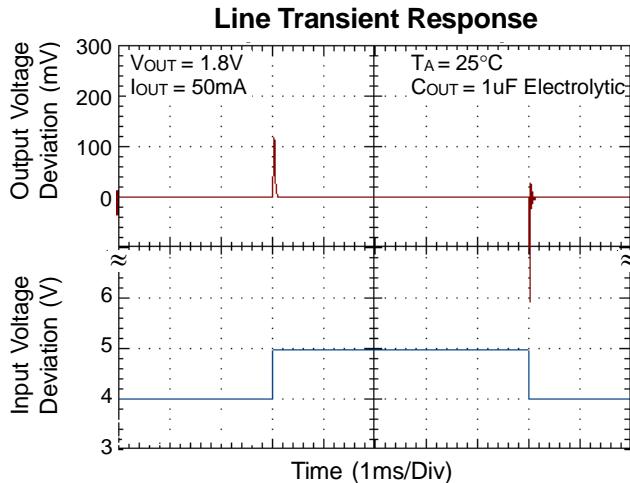
**Note 1.**  $\theta_{JA}$  is measured in the natural convection at  $T_A = 25^\circ C$  on a low effective thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

## Application Information

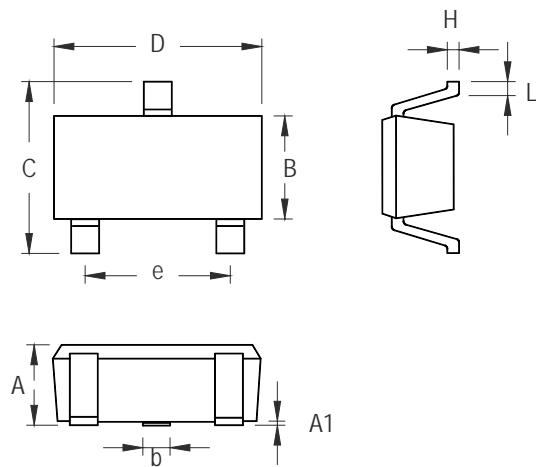
A  $1\mu F$  (or larger) capacitor is recommended between  $V_{OUT}$  and GND for stability. The part may oscillate without the capacitor. Any type of capacitor can be used, but not Aluminum electrolytes when operating below  $-25^\circ C$ . The capacitance may be increased without limit.

A  $1\mu F$  capacitor (or larger) should be placed between  $V_{IN}$  to GND.

**Typical Operating Characteristics**

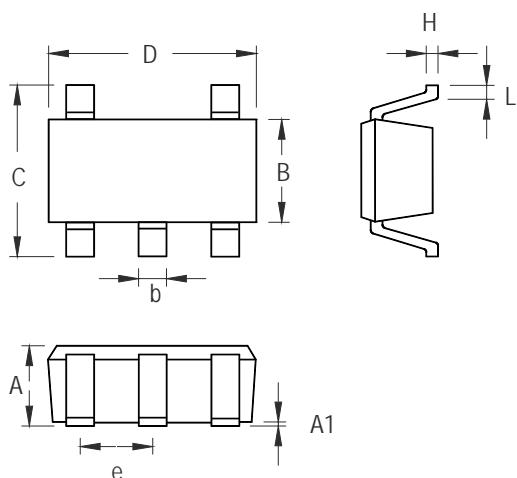


## Outline Dimension



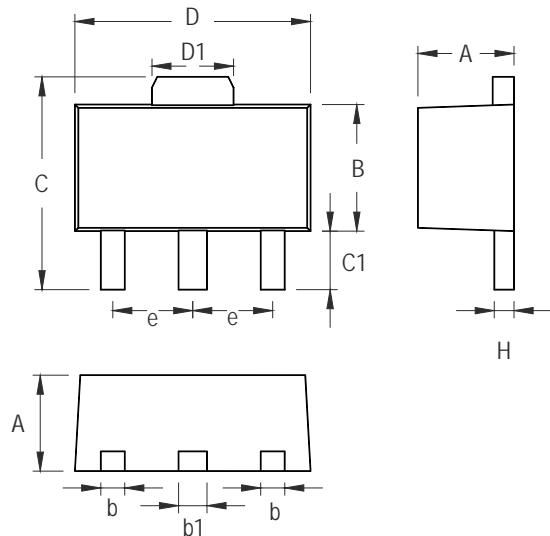
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.035	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.356	0.508	0.014	0.020
C	2.591	2.997	0.102	0.118
D	2.692	3.099	0.106	0.122
e	1.803	2.007	0.071	0.079
H	0.080	0.254	0.003	0.010
L	0.300	0.610	0.012	0.024

SOT-23-3 Surface Mount Package



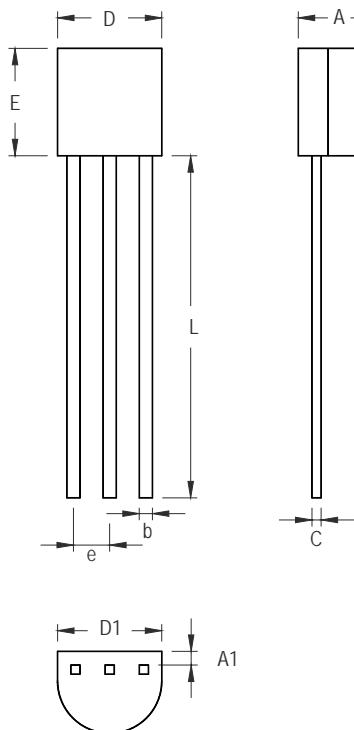
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.035	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.356	0.559	0.014	0.022
C	2.591	2.997	0.102	0.118
D	2.692	3.099	0.106	0.122
e	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
L	0.300	0.610	0.012	0.024

**SOT-23-5 Surface Mount Package**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.397	1.600	0.055	0.063
b	0.356	0.483	0.014	0.019
B	2.388	2.591	0.094	0.102
b1	0.406	0.533	0.016	0.021
C	3.937	4.242	0.155	0.167
C1	0.787	1.194	0.031	0.047
D	4.394	4.597	0.173	0.181
D1	1.397	1.753	0.055	0.069
e	1.448	1.549	0.057	0.061
H	0.356	0.432	0.014	0.017

3-Lead SOT-89 Surface Mount Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.175	4.191	0.125	0.165
A1	1.143	1.372	0.045	0.054
b	0.406	0.533	0.016	0.021
C	0.406	0.533	0.016	0.021
D	4.445	5.207	0.175	0.205
D1	3.429	5.029	0.135	0.198
E	4.318	5.334	0.170	0.210
e	1.143	1.397	0.045	0.055
L	12.700		0.500	

### 3-Lead TO-92 Plastic Package

#### RICHTEK TECHNOLOGY CORP.

Headquarter  
 5F, No. 20, Taiyuen Street, Chupei City  
 Hsinchu, Taiwan, R.O.C.  
 Tel: (8863)5526789 Fax: (8863)5526611

#### RICHTEK TECHNOLOGY CORP.

Taipei Office (Marketing)  
 8F-1, No. 137, Lane 235, Paochiao Road, Hsintien City  
 Taipei County, Taiwan, R.O.C.  
 Tel: (8862)89191466 Fax: (8862)89191465  
 Email: marketing@richtek.com