

300/500mA Low Dropout Linear Voltage Regulator

General Description

The RT9161/A is a 300/500mA fixed output voltage low dropout linear regulator. Typical ground current is approximately 110 μ A, from zero to maximum loading conditions. Wide range of available output voltage fits most of applications. Built-in output current-limiting most thermal-limiting provide maximal protection against any fault conditions.

For ease of application, the RT9161/A comes in the popular 3-pin SOT-23(300mA), SOT-89 (300mA), SOT-223 (500mA), or TO-92 packages.

Ordering Information

RT9161/A-□□□□□	
Package Type	
ZL : TO-92 (L-Type)	
ZT : TO-92 (T-Type)	
X : SOT-89	
G : SOT-223	
V : SOT-23	
Operating Temperature Range	
C : Commercial Standard	
P : Pb Free with Commercial Standard	
Output Voltage	
15 : 1.5V	
16 : 1.6V	
:	
49 : 4.9V	
50 : 5.0V	
500mA Output Current	
300mA Output Current	

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

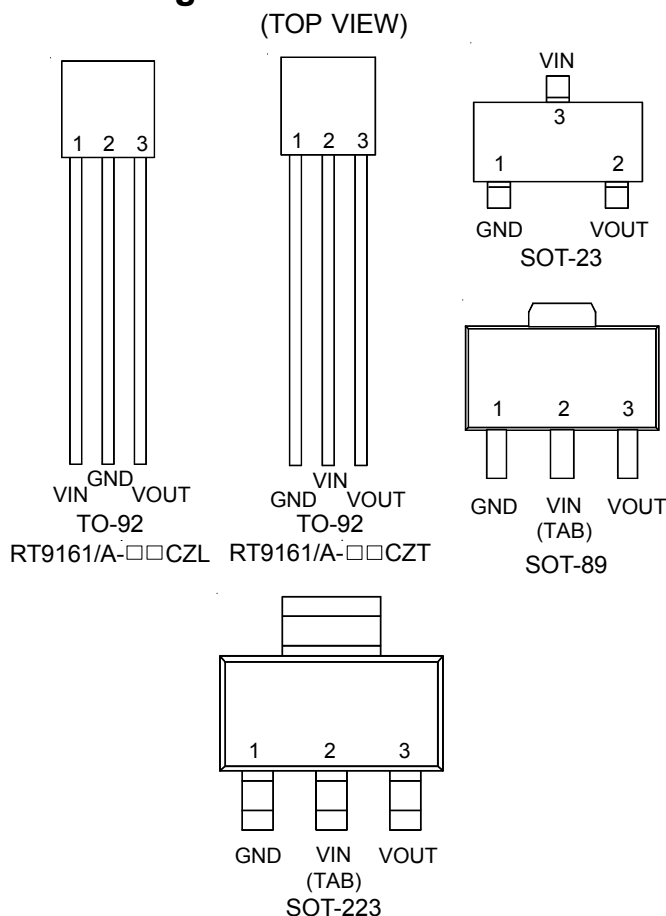
- Low Dropout Voltage of 200mV at Output Current 100mA, 450mV at Output Current 300mA, and 750mV at 500mA Output Current
- Guaranteed 300/500mA Output Current
- Internal 1.5 Ω P-MOSFET Draws No Base Current
- Low Ground Current 110 μ A
- 2% Accuracy Output Voltage
- Input Voltage Range up to 12V
- Extremely Tight Load Regulation
- Fast Transient Response
- Current-limiting and Thermal-limiting

Applications

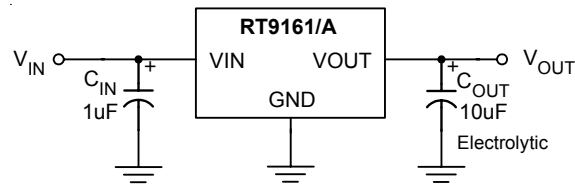
- Voltage Regulator for LAN Card, CD-ROM, and DVD
- Wireless Communication Systems
- Battery Powered Systems

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Pin Configurations



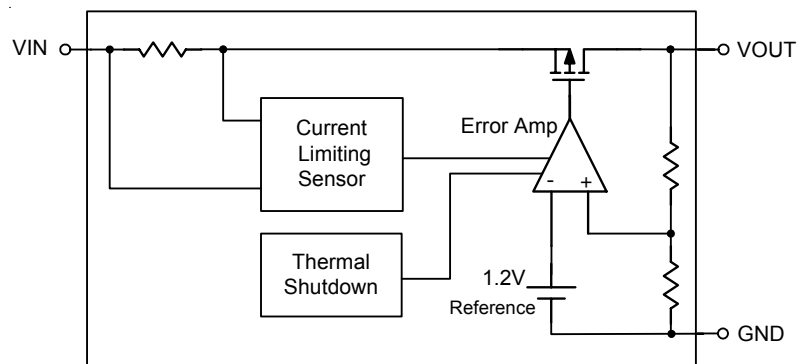
Typical Application Circuit



Functional Pin Description

Pin Name	Pin Function
VOUT	Output Voltage
GND	Ground
VIN	Power Input

Function Block Diagram



Absolute Maximum Ratings

- Input Voltage ----- -0.3 to 14V
- Operating Junction Temperature Range ----- -40°C to 125°C
- Storage Temperature Range ----- -65°C to 150°C
- Power Dissipation, P_D @ $T_A = 25^\circ\text{C}$
 - SOT-89 ----- 0.5W
 - TO-92 ----- 0.6W
 - SOT-23 ----- 0.15W
- Package Thermal Resistance
 - SOT-89, θ_{JC} ----- 100°C/W
 - SOT-89, θ_{JA} ----- 300°C/W
 - SOT-223, θ_{JC} ----- 15°C/W
 - SOT-223, θ_{JA} ----- 60°C/W
 - TO-92, θ_{JA} ----- 160°C/W
 - SOT-23, θ_{JA} ----- 250°C/W

Electrical Characteristics

($T_A = 25^\circ\text{C}$, $C_{IN} = 1\mu\text{F}$, $C_{OUT} = 10\mu\text{F}$, unless otherwise specified.)

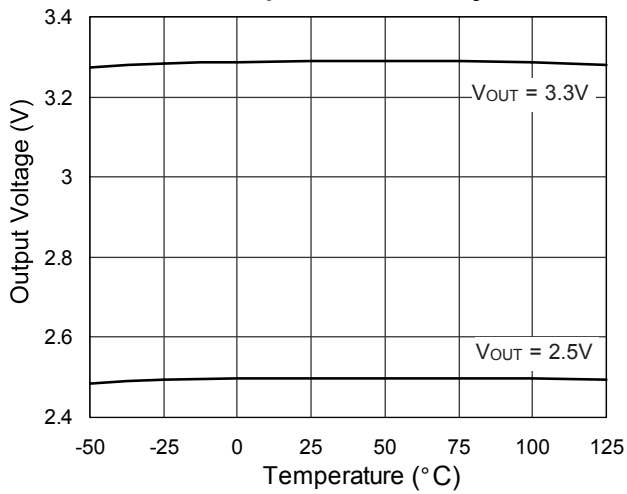
Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
Output Voltage Accuracy		ΔV_{OUT}	$I_L = 1\text{mA}$, $V_{IN} = 5\text{V}$	-2	--	+2	%
Output Voltage Temperature Coefficient				--	50	150	PPM/ $^\circ\text{C}$
Line Regulation		ΔV_{LINE}	$I_L = 1\text{mA}$, $V_{IN} = 4.5 \sim 12\text{V}$	--	2	3	% V_{OUT}
Load Regulation (1)		ΔV_{LOAD}	$I_L = 1\text{mA} \sim 300/500\text{mA}$, $V_{IN} = 5\text{V}$	--	1	30/50	mV
Current Limit (2)	RT9161	I_{LIMIT}	$V_{IN} = 5\text{V}$, $V_{OUT} = 0\text{V}$	350	580	--	mA
	RT9161A			500	900	--	
Dropout Voltage (3) (4)		V_{DROP}	$I_L = 300/500\text{mA}$	--	450/750	600/1000	mV
Standby Current		$I_{STANDBY}$	$I_L = 0$, $V_{IN} = 12\text{V}$	--	110	180	μA

Note:

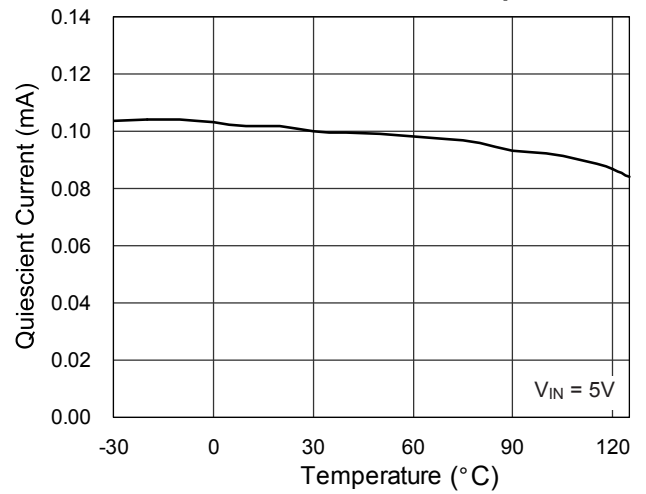
- (1) Regulation is measured at constant junction temperature, using pulsed ON time.
- (2) Current Limit is measured at constant junction temperature, using pulsed ON time.
- (3) Dropout is measured at constant junction temperature, using pulsed ON time, and the criterion is V_{OUT} inside target value $\pm 2\%$.
- (4) Dropout test is skipped at the condition of $V_{IN} < 3\text{V}$.

Typical Operating Characteristics

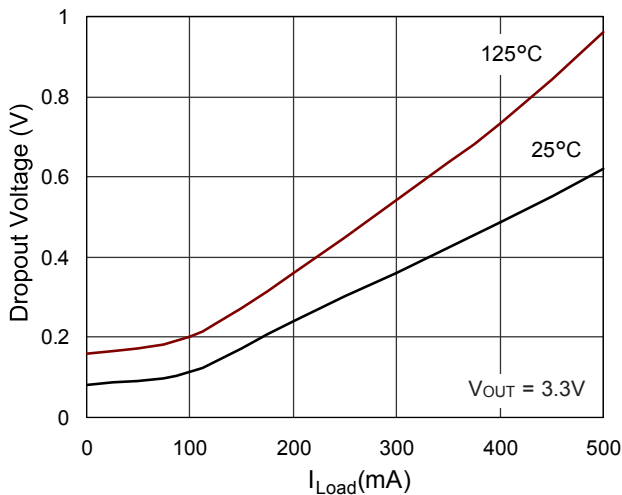
Temperature Stability



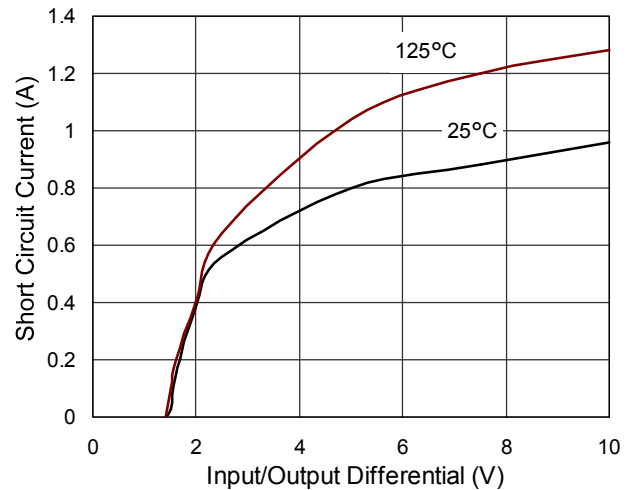
Quiescent Current vs. Temperature



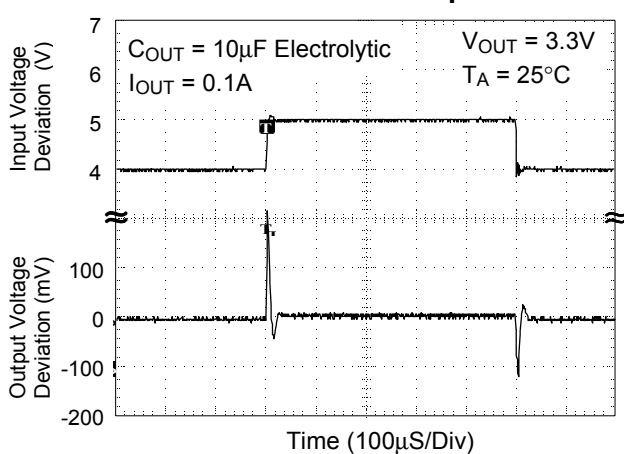
Dropout Voltage ($V_{IN} - V_{OUT}$)



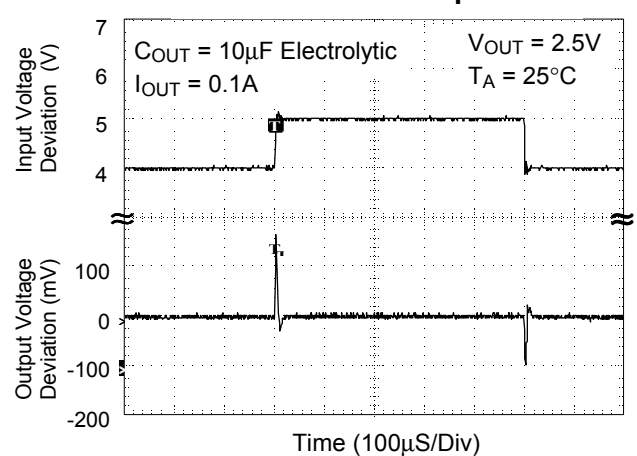
Short Circuit Current



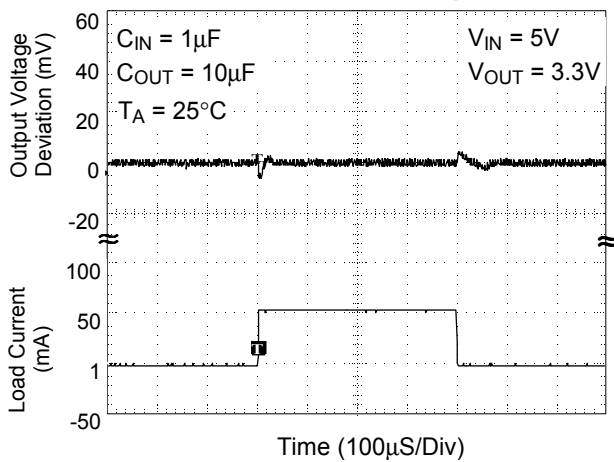
Line Transient Response



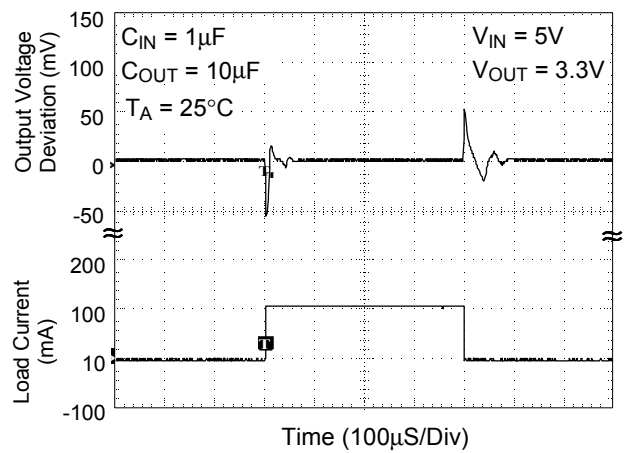
Line Transient Response



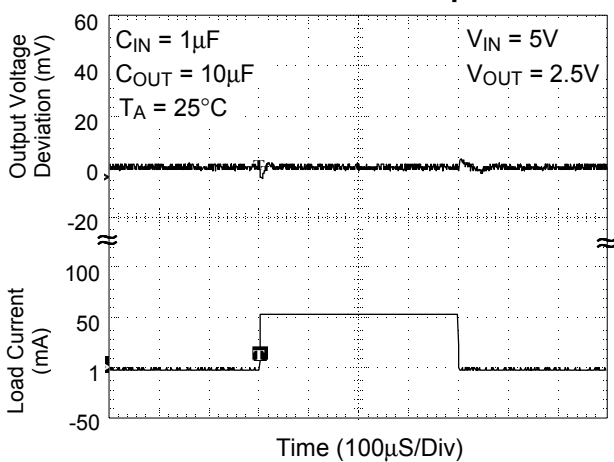
Load Transient Response



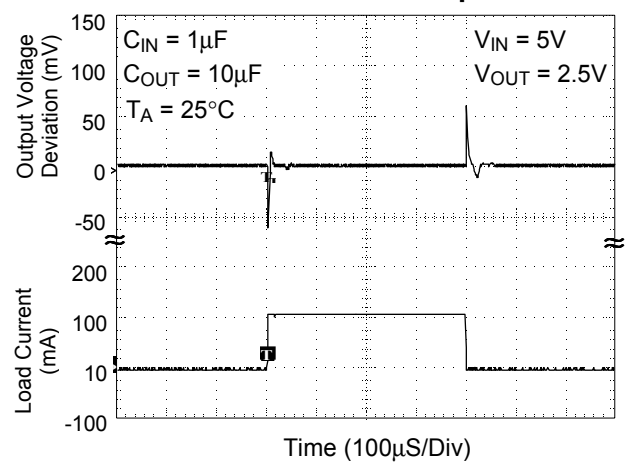
Load Transient Response



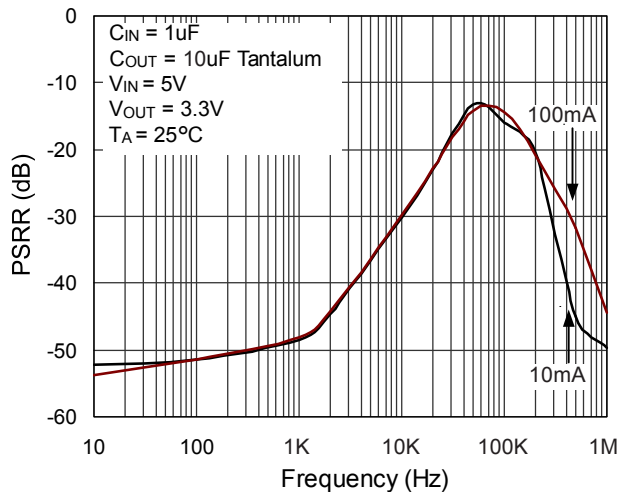
Load Transient Response



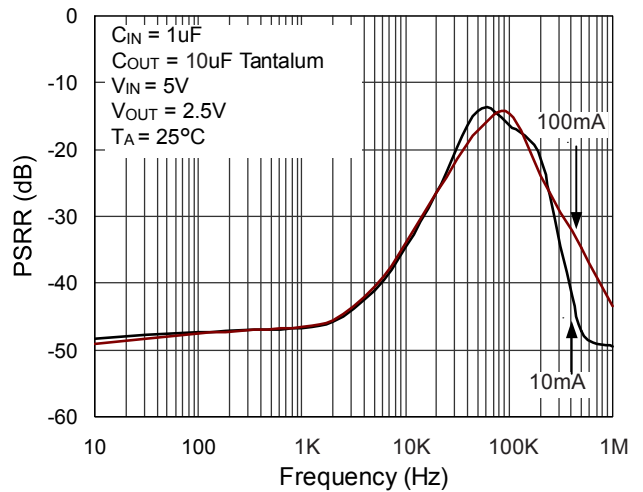
Load Transient Response



PSRR



PSRR



Application Information

A 10 μ F capacitor with 200m Ω or higher ESR, connecting between VOUT and GND pins, is recommended for stability. A capacitor with ESR smaller than 200 m Ω may cause VOUT oscillation as shown in Figure 1. Operating temperature should be well considered to ensure that the capacitance is no less than 10 μ F over the operating temperature range. Please take the notice that Aluminum electrolytic capacitors may cause VOUT oscillation when operating below -25 $^{\circ}$ C. The capacitance can be increased without limit for better transient response.

A 1 μ F or higher capacitor should be placed between VIN and GND to filter out input noise and ensure stable output voltage.

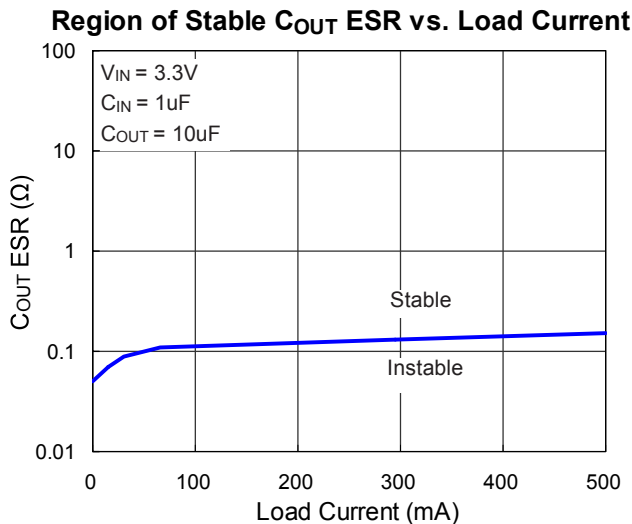
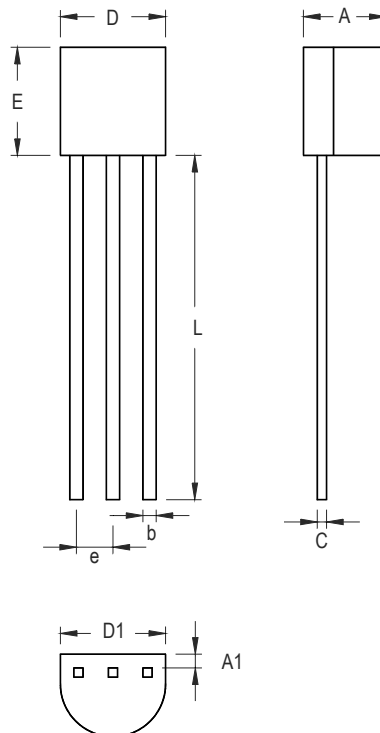


Figure 1

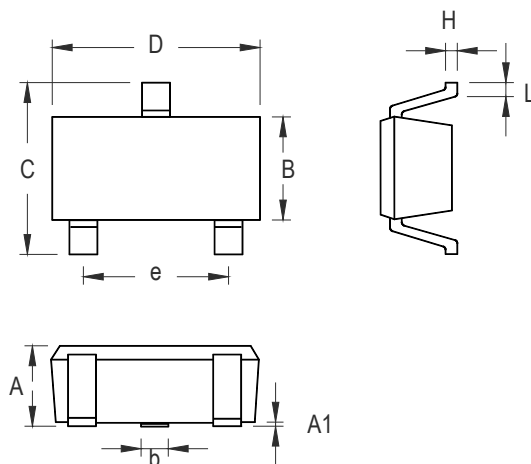
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Outline Dimension



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	--	0.135	--
E	4.318	5.334	0.170	0.210
e	1.143	1.397	0.045	0.055
L	12.700	--	0.500	--

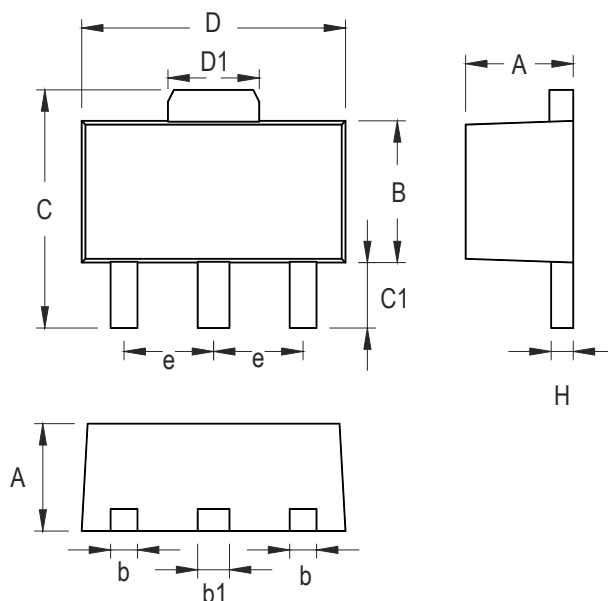
3-Lead TO-92 Plastic Package



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 Surface Mount Package

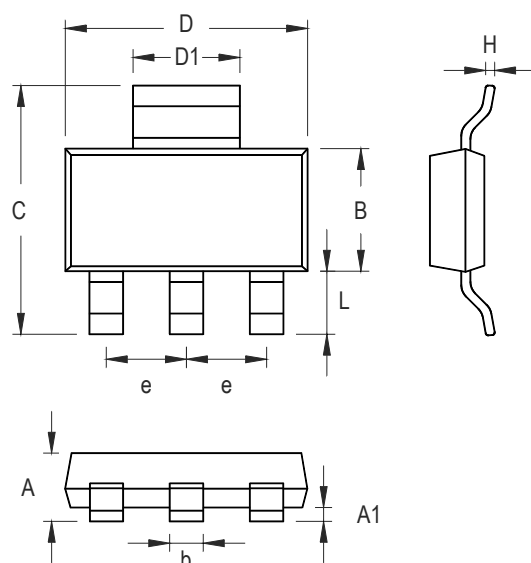
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Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.397	1.600	0.055	0.063
b	0.356	0.483	0.014	0.019
B	2.388	2.591	0.094	0.102
b1	0.406	0.533	0.016	0.021
C	--	4.242	--	0.167
C1	0.787	1.194	0.031	0.047
D	4.394	4.597	0.173	0.181
D1	1.397	1.753	0.055	0.069
e	1.448	1.549	0.057	0.061
H	0.355	0.432	0.014	0.017

3-Lead SOT-89 Surface Mount Package

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Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	--	1.803	--	0.071
A1	0.020	0.100	0.0008	0.0047
b	0.610	0.787	0.024	0.031
B	3.302	3.708	0.130	0.146
C	6.706	7.290	0.264	0.287
D	6.299	6.706	0.248	0.264
D1	2.896	3.150	0.114	0.124
e	2.261	2.362	0.089	0.093
H	0.229	0.330	0.009	0.013
L	0.914	--	0.036	--

3-Lead SOT-223 Surface Mount Package