

100mA, 4 μ A Quiescent Current CMOS LDO Regulator

General Description

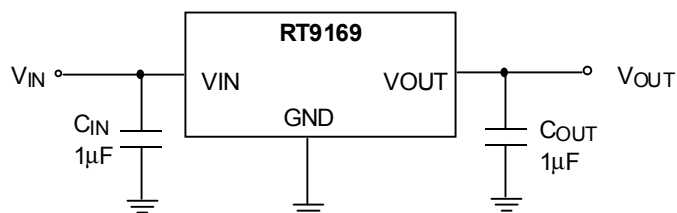
The RT9169 series are 100mA ultra-low quiescent current CMOS low dropout (LDO) regulator designed for battery-powered equipments. The output voltages range from 1.2V to 5V with 0.1V per step.

The other features include 4 μ A 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	
CB : SOT-25	
□□	Operating temperature range
C : Commercial standard	
□□	Output voltage
12 : 1.2V	
13 : 1.3V	
:	
49 : 4.9V	
50 : 5.0V	

Typical Application Circuit



Features

- **Ultra-Low Quiescent Current: 4 μ A**
- **Low Dropout: 450mV at 100mA**
- **Wide Operating Voltage Ranges: 2V~6V**
- **Current Limiting Protection**
- **Only 1 μ F Output Capacitor Required for Stability**
- **High Power Supply Rejection Ratio**

Applications

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

Pin Configurations

Part Number	Pin Configurations
RT9169-□□CZL (Plastic TO-92)	TOP VIEW 1. VIN 2. GND 3. VOUT
RT9169-□□CZT (Plastic TO-92)	TOP VIEW 1. VOUT 2. VIN 3. GND
RT9169-□□CX (Plastic SOT-89)	TOP VIEW 1. GND 2. VIN (TAB) 3. VOUT
RT9169-□□CV (Plastic SOT-23)	TOP VIEW 1. VOUT 2. GND 3. VIN
RT9169-□□CB (Plastic SOT-25)	TOP VIEW 1. VIN 2. GND 3. EN 4. NC 5. VOUT

Marking Information

Part Number	Marking
RT9169-12CX	B1
RT9169-13CX	B2
RT9169-14CX	B3
RT9169-15CX	B4
RT9169-16CX	B5
RT9169-17CX	B6
RT9169-18CX	B7
RT9169-19CX	B8
RT9169-20CX	B9
RT9169-21CX	BA
RT9169-22CX	BB
RT9169-23CX	BC
RT9169-24CX	BD
RT9169-25CX	BE
RT9169-26CX	BF
RT9169-27CX	BG
RT9169-28CX	BH
RT9169-29CX	BJ
RT9169-30CX	BK
RT9169-31CX	BL
RT9169-32CX	BM
RT9169-33CX	BN
RT9169-34CX	BP
RT9169-35CX	BQ
RT9169-36CX	BR
RT9169-37CX	BS
RT9169-38CX	BT
RT9169-39CX	BU
RT9169-40CX	BV
RT9169-41CX	BW
RT9169-42CX	BX
RT9169-43CX	BY
RT9169-44CX	BZ
RT9169-45CX	C1
RT9169-46CX	C2
RT9169-47CX	C3

Part Number	Marking
RT9169-48CX	C4
RT9169-49CX	C5
RT9169-50CX	C6
RT9169-12CZL	RTD1
RT9169-13CZL	RTD2
RT9169-14CZL	RTD3
RT9169-15CZL	RTD4
RT9169-16CZL	RTD5
RT9169-17CZL	RTD6
RT9169-18CZL	RTD7
RT9169-19CZL	RTD8
RT9169-20CZL	RTD9
RT9169-21CZL	RTDA
RT9169-22CZL	RTDB
RT9169-23CZL	RTDC
RT9169-24CZL	RTDD
RT9169-25CZL	RTDE
RT9169-26CZL	RTDF
RT9169-27CZL	RTDG
RT9169-28CZL	RTDH
RT9169-29CZL	RTDJ
RT9169-30CZL	RTDK
RT9169-31CZL	RTDL
RT9169-32CZL	RTDM
RT9169-33CZL	RTDN
RT9169-34CZL	RTDP
RT9169-35CZL	RTDQ
RT9169-36CZL	RTDR
RT9169-37CZL	RTDS
RT9169-38CZL	RTDT
RT9169-39CZL	RTDU
RT9169-40CZL	RTDV
RT9169-41CZL	RTDW
RT9169-42CZL	RTDX
RT9169-43CZL	RTDY
RT9169-44CZL	RTDZ

Part Number	Marking
RT9169-45CZL	RTC1
RT9169-46CZL	RTC2
RT9169-47CZL	RTC3
RT9169-48CZL	RTC4
RT9169-49CZL	RTC5
RT9169-50CZL	RTC6
RT9169-12CZT	RTE1
RT9169-13CZT	RTE2
RT9169-14CZT	RTE3
RT9169-15CZT	RTE4
RT9169-16CZT	RTE5
RT9169-17CZT	RTE6
RT9169-18CZT	RTE7
RT9169-19CZT	RTE8
RT9169-20CZT	RTE9
RT9169-21CZT	RTEA
RT9169-22CZT	RTEB
RT9169-23CZT	RTEC
RT9169-24CZT	RTED
RT9169-25CZT	RTEE
RT9169-26CZT	RTEF
RT9169-27CZT	RTEG
RT9169-28CZT	RTEH
RT9169-29CZT	RTEJ
RT9169-30CZT	RTEK
RT9169-31CZT	RTEL
RT9169-32CZT	RTEM
RT9169-33CZT	RTEN
RT9169-34CZT	RTEP
RT9169-35CZT	RTEQ
RT9169-36CZT	RTER
RT9169-37CZT	RTES
RT9169-38CZT	RTET
RT9169-39CZT	RTEU
RT9169-40CZT	RTEV
RT9169-41CZT	RTEW
RT9169-42CZT	RTEX

Part Number	Marking
RT9169-43CZT	RTEY
RT9169-44CZT	RTEZ
RT9169-45CZT	RTC7
RT9169-46CZT	RTC8
RT9169-47CZT	RTC9
RT9169-48CZT	RTCA
RT9169-49CZT	RTCB
RT9169-50CZT	RTCC
RT9169-12CV	B1
RT9169-13CV	B2
RT9169-14CV	B3
RT9169-15CV	B4
RT9169-16CV	B5
RT9169-17CV	B6
RT9169-18CV	B7
RT9169-19CV	B8
RT9169-20CV	B9
RT9169-21CV	BA
RT9169-22CV	BB
RT9169-23CV	BC
RT9169-24CV	BD
RT9169-25CV	BE
RT9169-26CV	BF
RT9169-27CV	BG
RT9169-28CV	BH
RT9169-29CV	BJ
RT9169-30CV	BK
RT9169-31CV	BL
RT9169-32CV	BM
RT9169-33CV	BN
RT9169-34CV	BQ
RT9169-35CV	BR
RT9169-36CV	BS
RT9169-37CV	BT
RT9169-38CV	BU
RT9169-39CV	BV
RT9169-40CV	BW

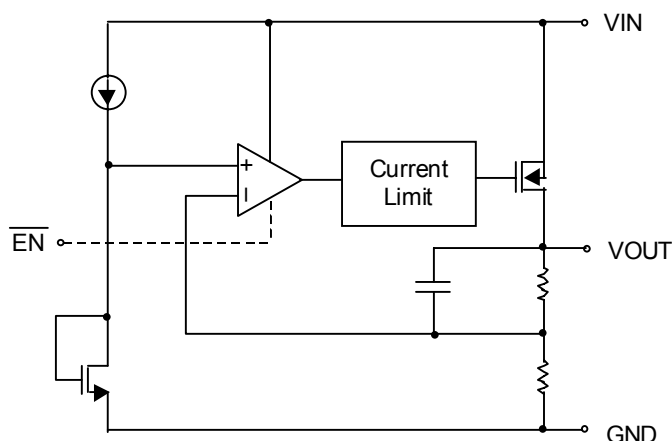
Part Number	Marking
RT9169-41CV	BX
RT9169-42CV	BY
RT9169-43CV	BZ
RT9169-44CV	CT
RT9169-45CV	CU
RT9169-46CV	CV

Part Number	Marking
RT9169-47CV	CW
RT9169-48CV	CX
RT9169-49CV	CY
RT9169-50CV	CZ
RT9169-25CB	C1
RT9169-28CB	C2

Pin Description

Pin Name	Pin Function
VIN	Power Input
VOUT	Output Voltage
GND	Ground
$\overline{\text{EN}}$	Chip Enable Control Input

Function Block Diagram



Absolute Maximum Ratings

- Input Voltage 7V
- Power Dissipation, P_D @ $T_A = 25^\circ\text{C}$
 - TO-92 0.6W
 - SOT-89 0.5W
 - SOT-23 0.25W
 - SOT-25 0.25W
- Operating Junction Temperature Range -40°C to 125°C
- Storage Range -65°C to 150°C
- Package Thermal Resistance
 - TO-92, θ_{JA} 160°C/W
 - SOT-89, θ_{JC} 100°C/W
 - SOT-89, θ_{JA} 300°C/W
 - SOT-23, θ_{JA} 250°C/W
 - SOT-25, θ_{JA} 250°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	ΔV_{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_{LIMIT}	$R_{LOAD} = 1\Omega$	--	250	--	mA
GND Pin Current	I_G	No Load	--	4	7	μA
		$I_{OUT} = 100mA$		4	10	μA
Dropout Voltage	V_{DROP}	$I_{OUT} = 1mA$, $V_{IN} \geq 3.6V$	--	4	--	mV
		$I_{OUT} = 50mA$, $V_{IN} \geq 3.6V$	--	200	--	
		$I_{OUT} = 100mA$, $V_{IN} \geq 3.6V$	--	450	--	
Line Regulation	ΔV_{LINE}	$V_{IN} = (V_{OUT} + 0.3V)$ to $6V$, $V_{IN} \geq 3.6V$, $I_{OUT} = 1mA$	-0.2	--	+0.2	%/V
Load Regulation	ΔV_{LOAD}	$I_{LOAD} = 0mA$ to $100mA$	--	0.01	0.04	%/mA
Output Noise	e_{NO}	$BW = 100Hz$ to $50KHz$ $C_{OUT} = 10\mu F$	--	250	--	μV
Ripple Rejection	PSRR	$F = 1KHz$, $C_{OUT} = 10\mu F$	--	50	--	DB
Standby Current	RT9169-CB	$\overline{EN} = V_{IN}$	--	0.1	1	μA
$\overline{EN}$ Threshold			0.6	1	2	V

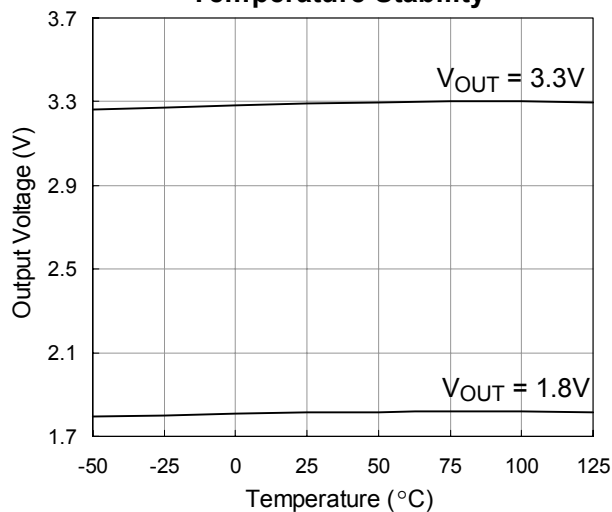
Application Information

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.

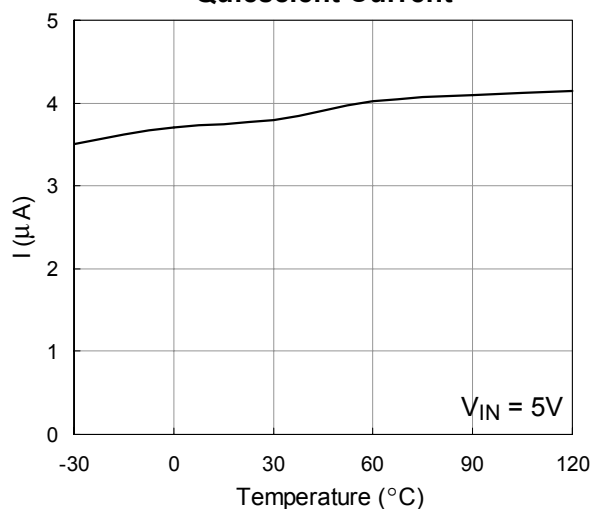
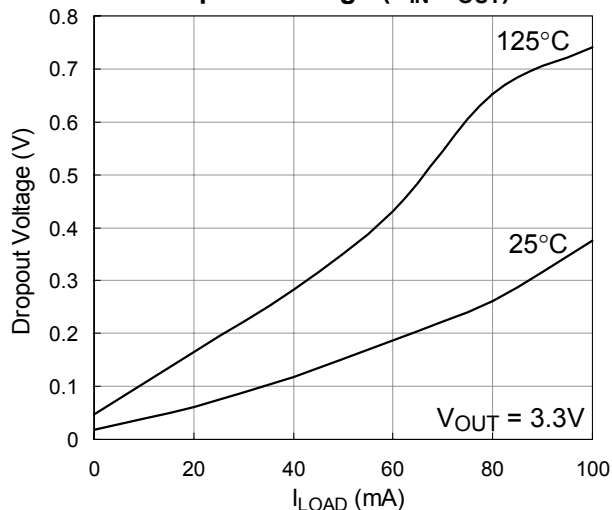
A $1\mu F$ capacitor (or larger) should be placed between V_{IN} to GND.

Typical Operating Characteristics

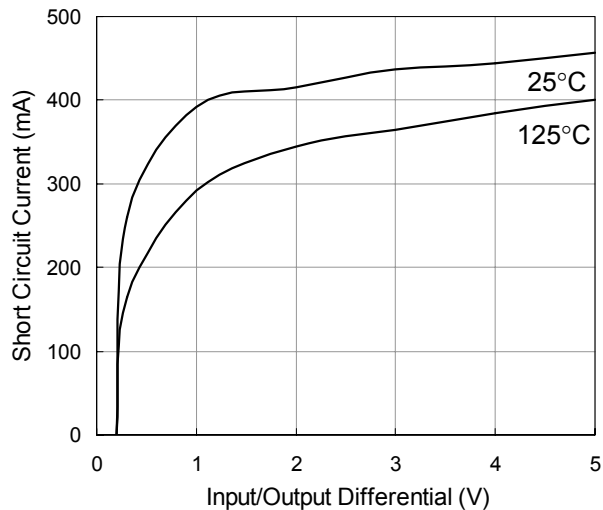
Temperature Stability



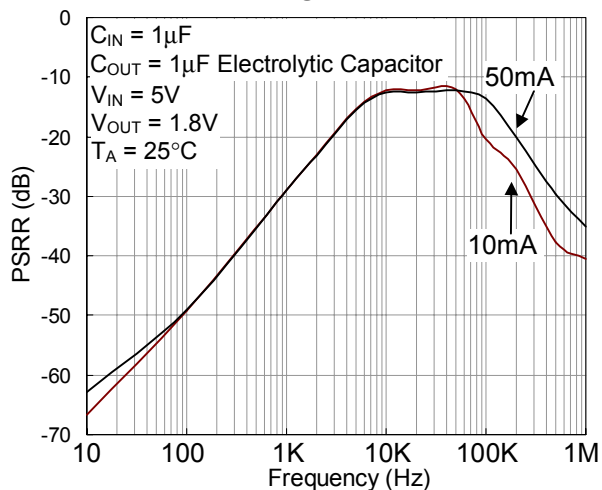
Quiescent Current

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

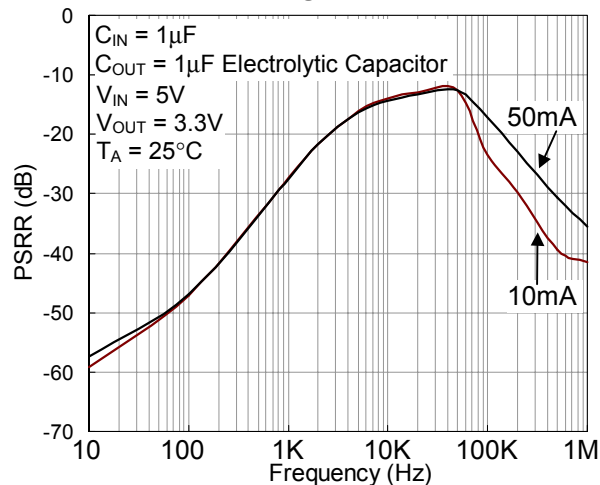
Short Circuit Current



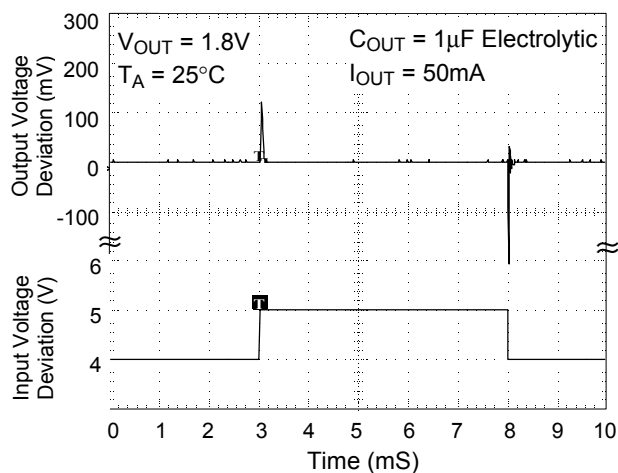
PSRR



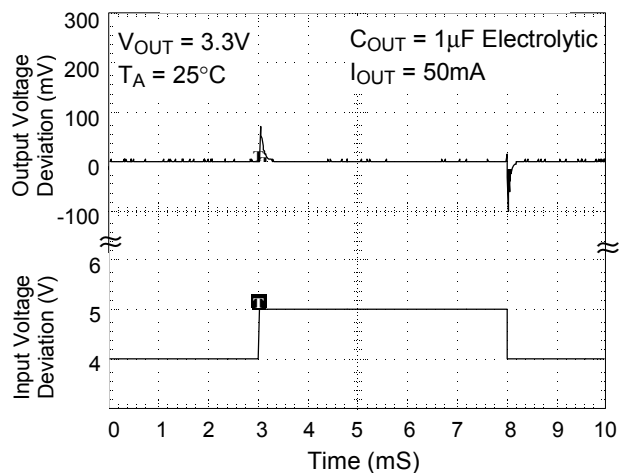
PSRR



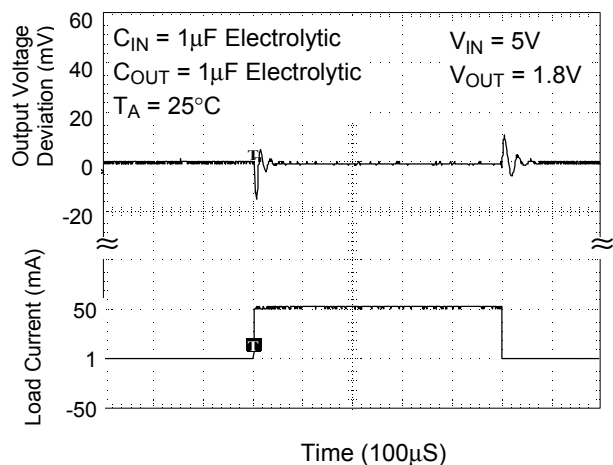
Line Transient Response



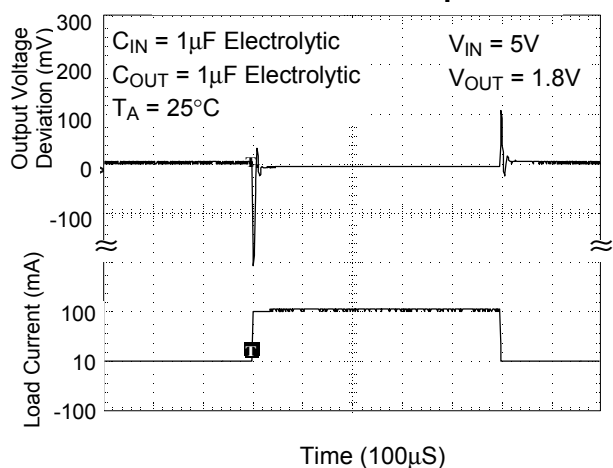
Line Transient Response



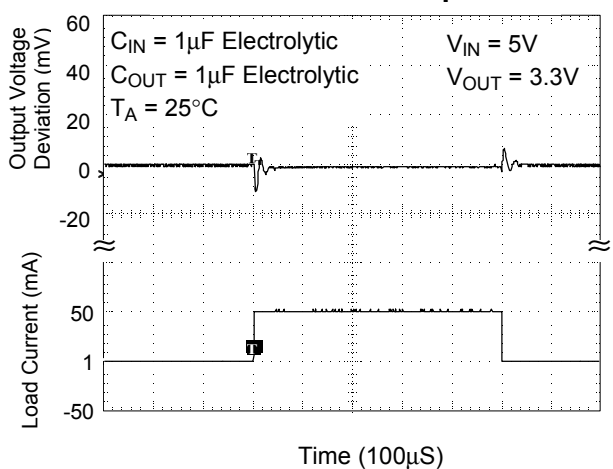
Load Transient Response



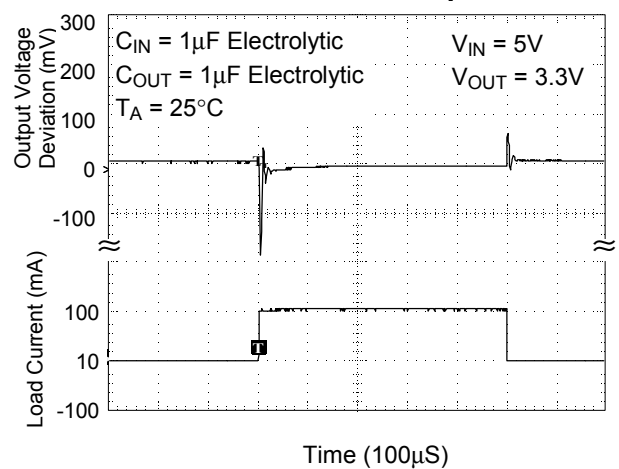
Load Transient Response



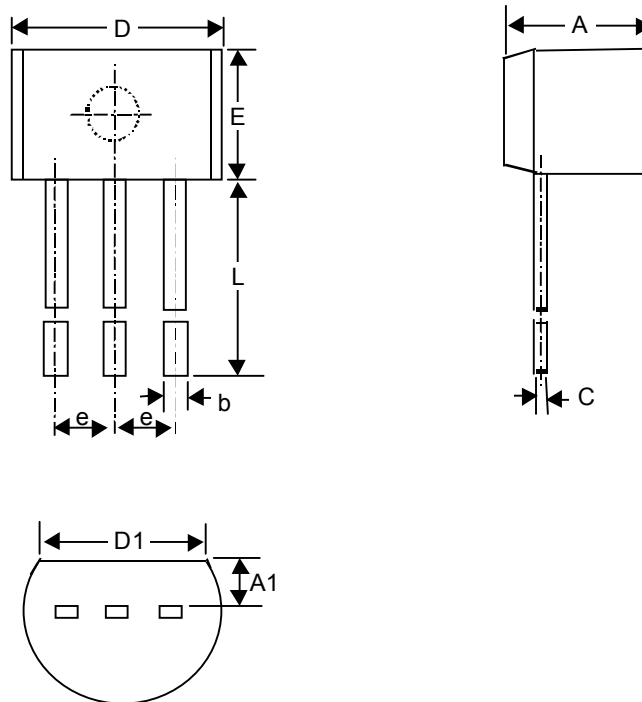
Load Transient Response



Load Transient Response

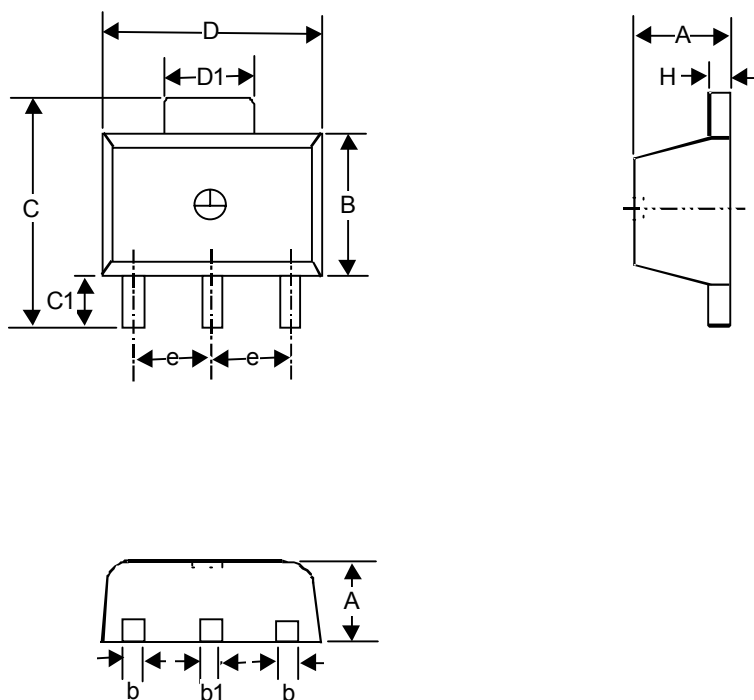


Package Information



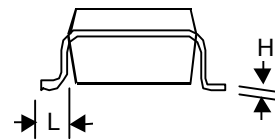
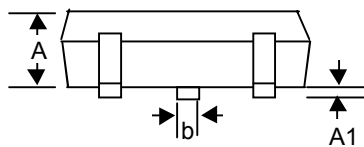
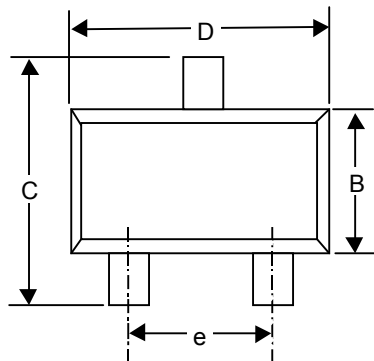
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.175	4.191	0.125	0.165
A1	1.143	1.372	0.045	0.054
b	0.406	0.533	0.016	0.021
C	0.406	0.533	0.016	0.021
D	4.445	5.207	0.175	0.205
D1	3.429	--	0.135	--
E	4.318	5.334	0.170	0.210
e	1.143	1.397	0.045	0.055
L	12.700	--	0.500	--

3-Lead TO-92 Package



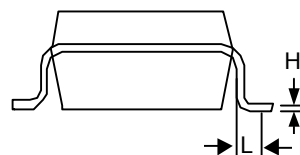
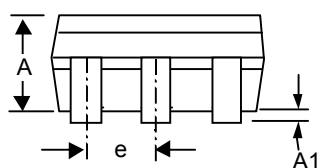
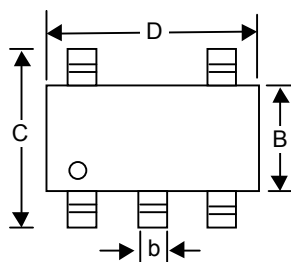
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.397	1.600	0.055	0.063
b	0.356	0.483	0.014	0.019
B	2.388	2.591	0.094	0.102
b1	0.406	0.533	0.016	0.021
C	--	4.242	--	0.167
C1	0.787	1.194	0.031	0.047
D	4.394	4.597	0.173	0.181
D1	1.397	1.753	0.055	0.069
e	1.448	1.549	0.057	0.061
H	0.381	0.432	0.015	0.017

3-Lead SOT-89 Surface Mount



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.035	0.051
A1	--	0.152	--	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	0.102	0.254	0.004	0.010
L	0.356	0.610	0.014	0.024

SOT-23 Plastic Surface Mount



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	0.102	0.254	0.004	0.010
L	0.356	0.610	0.014	0.024

SOT- 25 Surface Mount Package

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