

General Description

The LTP1117S is a low-dropout three-terminal regulator with 1.0A output current ability, and the dropout voltage is specified at typical 1.2V at 1.0A current load decreasing at lower load currents. The LTP1117S is optimized for low voltage where transient response and minimum input voltage are critical. It provides current limit and thermal shutdown protection solutions. Its circuit includes a trimmed band gap reference to assure output voltage accuracy to be within $\pm 1\%$. On-chip thermal shutdown provides protection against a combination of high current and ambient temperature that would create excessive junction temperature. The LTP1117S is available in 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, and 5.0V fixed-output voltage versions. The LTP1117S is available in the industry-standard SOT223-3L, SOT89-3L, TO252-2L packages.

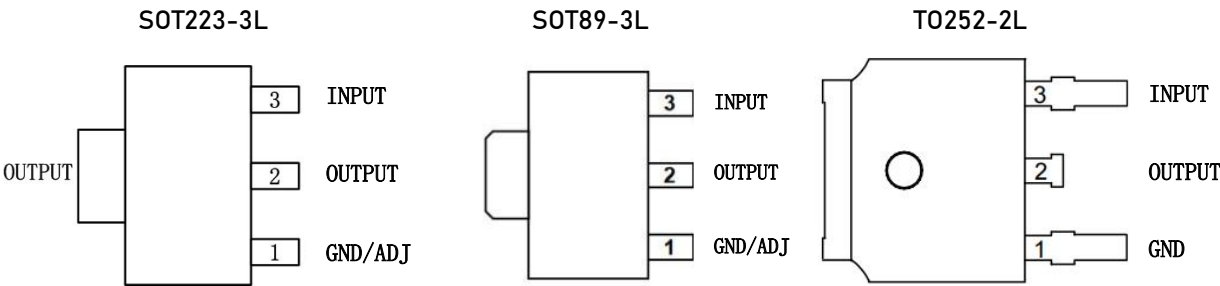
Features and Benefits

- Provides ADJ Version ($V_{REF} = 1.25V$) and Fixed Voltage 1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5.0V with Accuracy $\pm 1\%$
- Current Limit: 1.3A (Typ.)
- Dropout Voltage: 1.2V (Typ.) @ $I_{OUT} = 1A$
- Regulator Stable with Low ESR MLCC
- Excellent Line Regulation: 0.001%/V (Typ.) @ $I_{OUT} = 30mA$
- Excellent Load Regulation: 0.2%/A @ $I_{OUT} = 1A$
- Quiescent Current: 3.5mA
- Low Output Noise
- PSRR: 65dB
- OTSD Protection
- Operation Junction Temperature: $-40^{\circ}C$ to $+125^{\circ}C$
- Totally Lead-Free & Fully RoHS Compliant

Applications

- TVs and LCD Monitors
- PC Peripherals: Notebooks, Motherboards
- STB

Pin Description (Top View)



Pin Function

PackageNC	Symbol	Function
1	GND/ADJ	Ground Pin or Adjustable Pin
2	OUTPUT	Regulator Output Pin
3	INPUT	Supply Voltage Pin

Ordering Information

Package Type	Part Number	Quantity
T0252-2L	LTP1117S-33Z52	Tape and Reel, 2 500
	LTP1117S-50Z52	
SOT89-3L	LTP1117S-33XT4	Tape and Reel, 1 000
	LTP1117S-AXT4	
	LTP1117S-12T23	
	LTP1117S-15T23	
SOT223-3L	LTP1117S-18T23	Tape and Reel, 4 000
	LTP1117S-25T23	
	LTP1117S-33T23	
	LTP1117S-50T23	
	LTP1117S-AT23	

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage	V _{IN}	18	V
Lead Temperature (Soldering, 10sec)	T _{LEAD}	+260	°C
Operating Junction Temperature Range	T _J	+150	°C
Storage Temperature	T _{STG}	-55 to +150	°C

ESD Ratings

Parameter	Level	Unit
Human body model (HBM), per ANSI/ESDA/JEDEC JS-001	±4 000	V
Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002	±2 000	

Recommended Operating Conditions

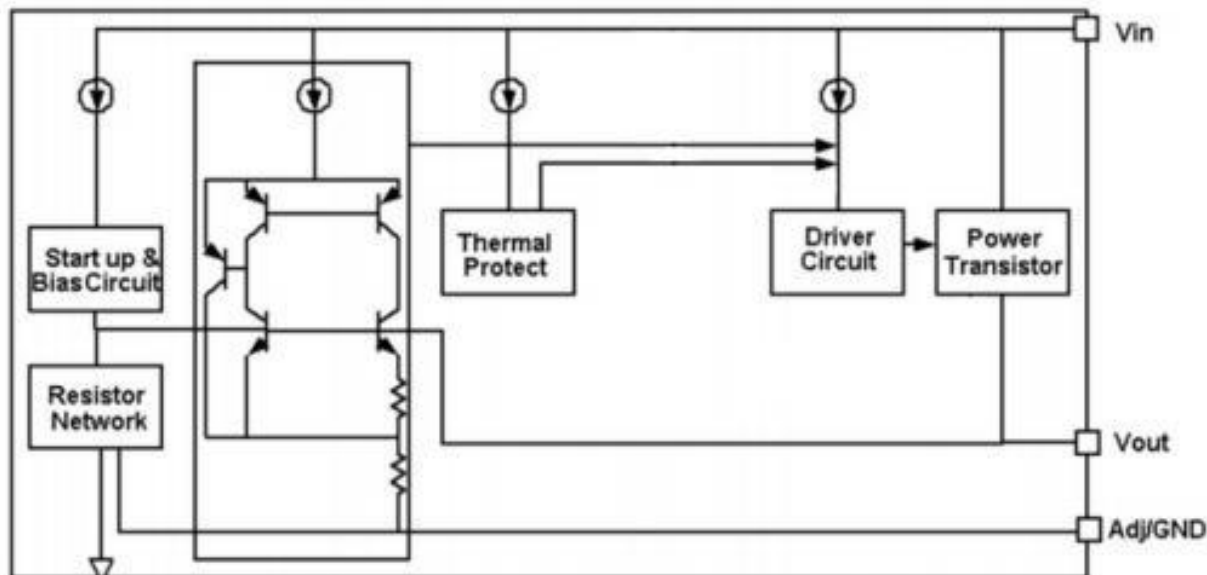
Symbol	Parameter	Min	Max	Unit
V _{IN}	Input Voltage		18	V
T _J	Operating Junction Temperature Range	-40	+125	°C

Electrical Characteristics

$V_{IN} = V_{OUT} + 1.5V$, $C_{IN} = 10\mu F$ (Ceramic), $C_{OUT} = 10\mu F$ (Ceramic), Typical $T_A = +25^\circ C$, Bold typeface applies over $-40^\circ C \leq T_J \leq +125^\circ C$ ranges, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input voltage	V_{IN}			15	18	V
Output Voltage	V_{OUT}	LTP1117S-33XT4/Z52/T23, $0 \leq I_{OUT} \leq 1A$, $V_{IN} = 4.8V$	3.267	3.3	3.333	V
		LTP1117S-50Z52/T23, $0 \leq I_{OUT} \leq 1A$, $V_{IN} = 6.5V$	4.95	5	5.05	
Dropout Voltage	V_{DROP}	$I_{OUT} = 100mA$		1.0	1.1	V
		$I_{OUT} = 1A$		1.2	1.3	
Maximum Output Current	$I_{OUT(MAX)}$	$1.5V \leq V_{IN} - V_{OUT}$	1.0	1.3		A
Load Regulation	V_{RLOAD}	$V_{IN} = V_{OUT} + 1.5V$, $1mA \leq I_{OUT} \leq 1A$		10	40	mV
Line Regulation	V_{RLINE}	$1.5V \leq V_{IN} - V_{OUT} \leq 10V$, $I_{OUT} = 10mA$		9	40	mV
Quiescent Current	I_Q	For Fixed Voltage Version, $I_{OUT} = 0mA$		3.5	6	mA
Peak Output Current	I_{PK}	$V_{IN} = 10V$, $T_J = +25^\circ C$		2.2		A
Power Supply Rejection Ratio	PSRR	Ripple 1.0 Vp-p, $V_{IN} = V_{OUT} + 2V$, $I_{OUT} = 10mA$		65		dB
Temperature adjustment rate	T_{AR}	$25^\circ C$, 30ms pulse		0.12		%/W
Output impedance	R_{OUT}			10		mΩ
Thermal Shutdown Temperature	T_{OTSD}			170		$^\circ C$
Thermal Shutdown Hysteresis	T_{HYOTSD}			20		$^\circ C$
Thermal Resistance	θ_{JC}	T0252-2L		16		$^\circ C/W$
		SOT89-3L		25		
		SOT223-3L		40		

Block Diagram



Detailed Description

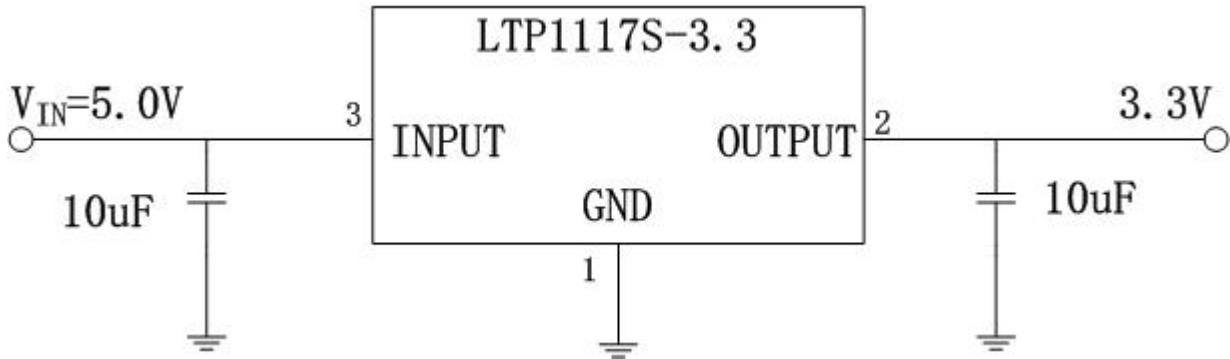
LTP1117S is a series of low dropout three-terminal regulators with a dropout of 1.1V at 1A load current. LTP1117S features a very low standby current 3.5mA. Other than a fixed version, $V_{out} = 1.2V, 1.5V, 1.8V, 2.5V, 2.85V, 3.3V,$ and 5V.

LTP1117S offers thermal shut down function, to assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within 2%. Other output voltage accuracy can be customized on demand, such as 1%.

LTP1117S is available in SOT223-3L, T0252-2L and SOT89-3L packages.

LTP1117S is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, bandgap, thermal shutdown, power transistors and its driver circuit and so on. The thermal shutdown modules can assure chip and its application system working safety when the temperature is larger than $170^{\circ}C$. The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The temperature coefficient is under 100 ppm/ $^{\circ}C$. And the accuracy of output voltage is guaranteed by trimming technique.

Typical Applications Circuit



Application circuit of LTP1117S

- 1) Recommend using 10uF tan capacitor as bypass capacitor for all application circuit.
- 2) Recommend using 10uF tan capacitor to assure circuit stability.

Thermal Considerations

We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by LTP1117S is very large. LTP1117S series uses SOT223-3L package type and its thermal resistance is about 20°C/W. And the copper area of application board can affect the total thermal resistance. If copper area is 5cm*5cm (two sides), the resistance is about 30°C/W. So the total thermal resistance is about 20°C/W + 30°C/W. We can decrease total thermal resistance by increasing copper area in application board. When there is no good heat dissipation copper are in PCB, the total thermal resistance will be as high as 120°C/W, then the power dissipation of LTP1117S could allow on itself is less than 1W. And furthermore, LTP1117S will work at junction temperature higher than 150°C under such condition and no lifetime is guaranteed.

Typical Performance Characteristics

$V_{IN} = V_{OUT} + 1.5V$, $C_{IN} = 10\mu F$ (Ceramic), $C_{OUT} = 10\mu F$ (Ceramic), Typical $T_A = +25^\circ C$.

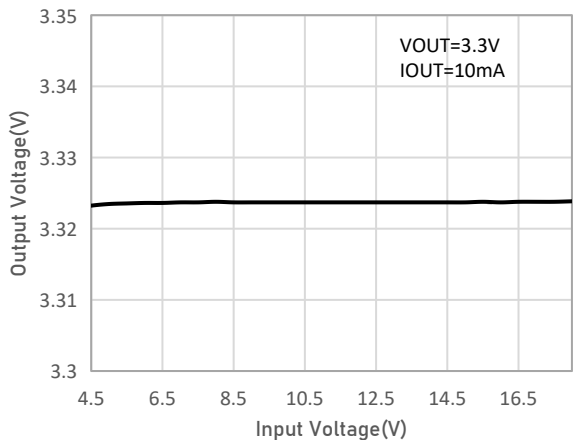


Figure 1. Output Voltage vs. Input Voltage

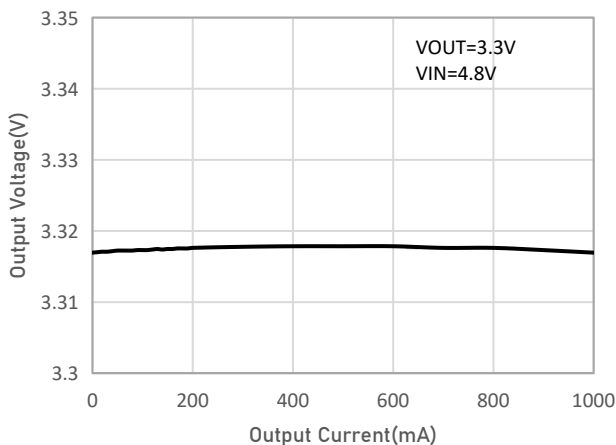


Figure 2. Output Voltage vs. Output Current

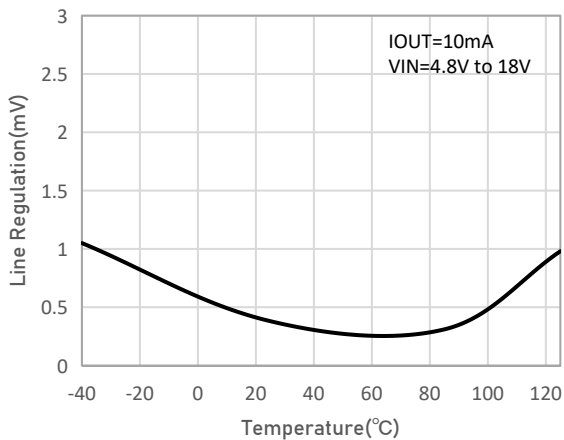


Figure 3. Line Regulation vs. Temperature

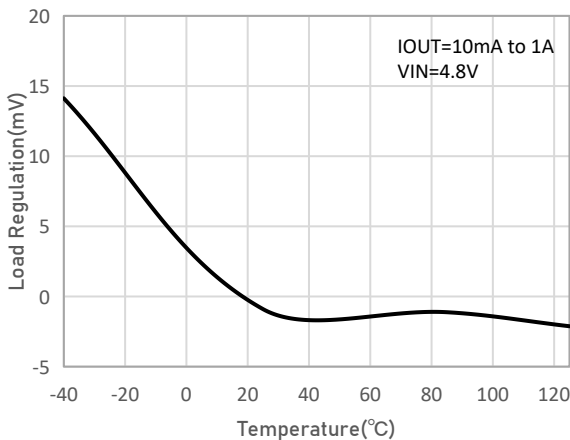


Figure 4. Load Regulation vs. Temperature

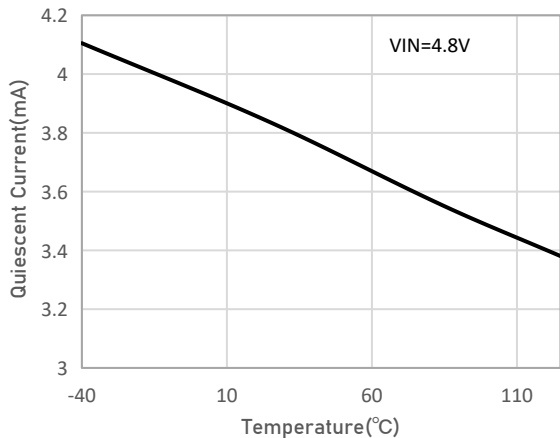


Figure 5. Quiescent Current vs. Temperature

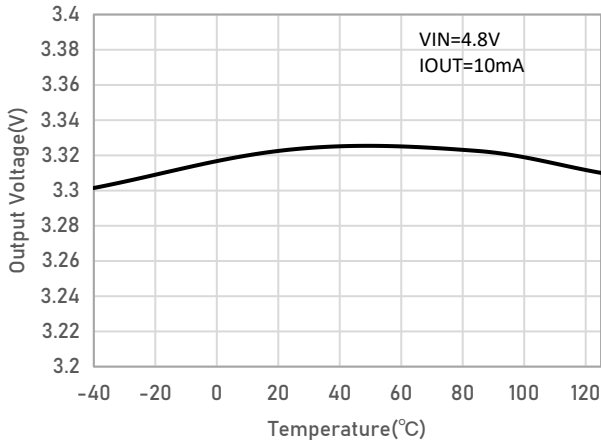


Figure 6. Output Voltage vs. Temperature

Typical Performance Characteristics (Cont.)

$V_{IN} = V_{OUT} + 1.5V$, $C_{IN} = 10\mu F$ (Ceramic), $C_{OUT} = 10\mu F$ (Ceramic), Typical $T_A = +25^\circ C$.

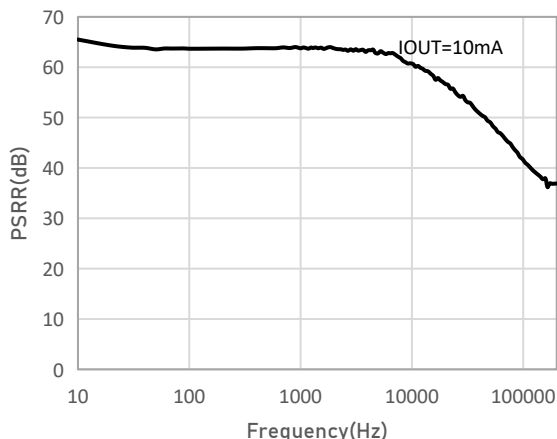


Figure 7. PSRR vs. Frequency

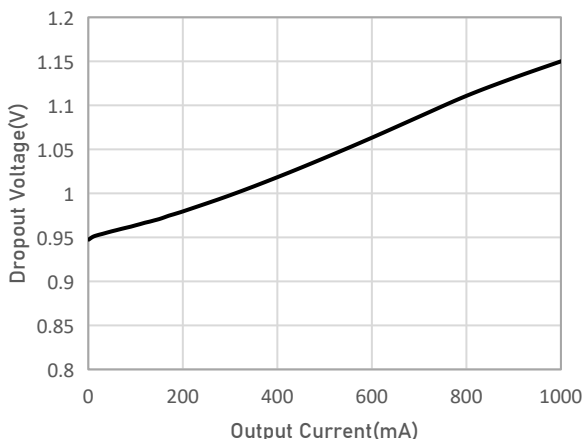


Figure 8. Dropout Voltage vs. Output Current

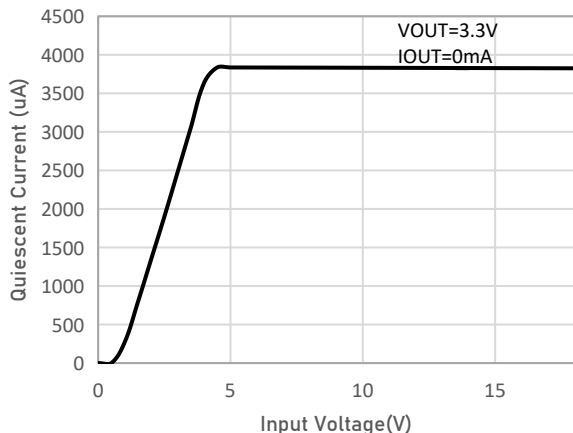


Figure 9. Quiescent Current vs. Input Voltage

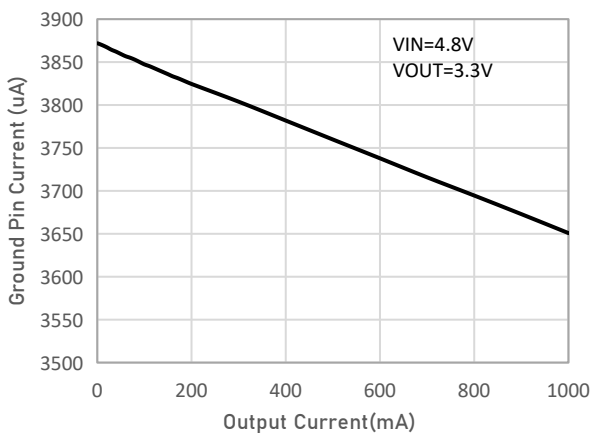


Figure 10. Ground Pin Current vs. Output Current

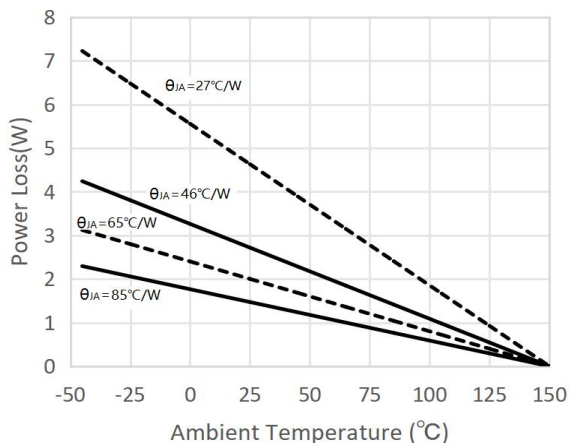


Figure 11. Power Loss VS Ambient Temperature

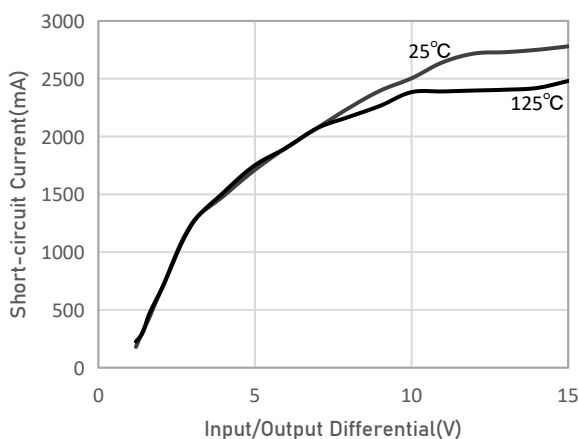


Figure 12. short-circuit current vs. Input/Output Differential

Typical Performance Characteristics (Cont.)

$V_{IN} = V_{OUT} + 1.5V$, $C_{IN} = 10\mu F$ (Ceramic), $C_{OUT} = 10\mu F$ (Ceramic), Typical $T_A = +25^\circ C$.

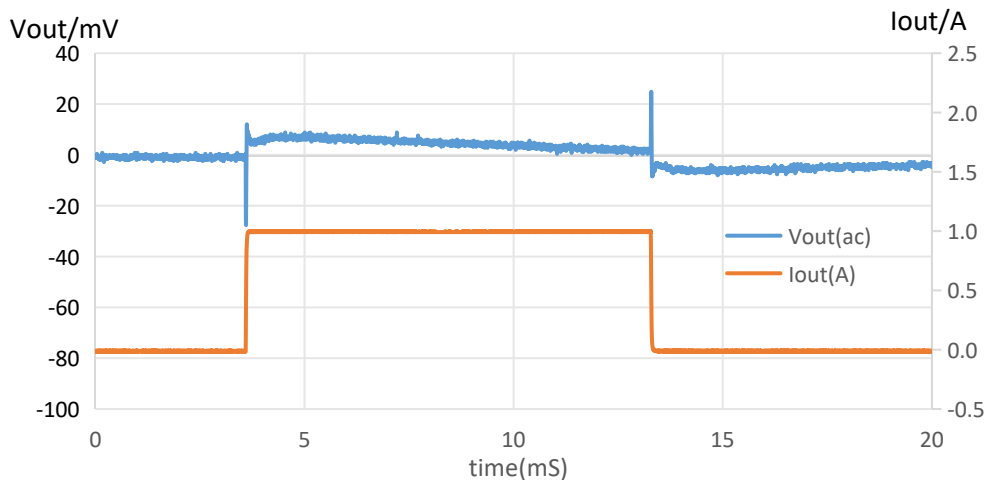


Figure 13. Line Transient Response
(LTP1117S-3.3V, $V_{IN}=5.3V$, $V_{OUT}=3.3V$, $C_{IN}=10\mu F$, $C_{OUT}=10\mu F$)

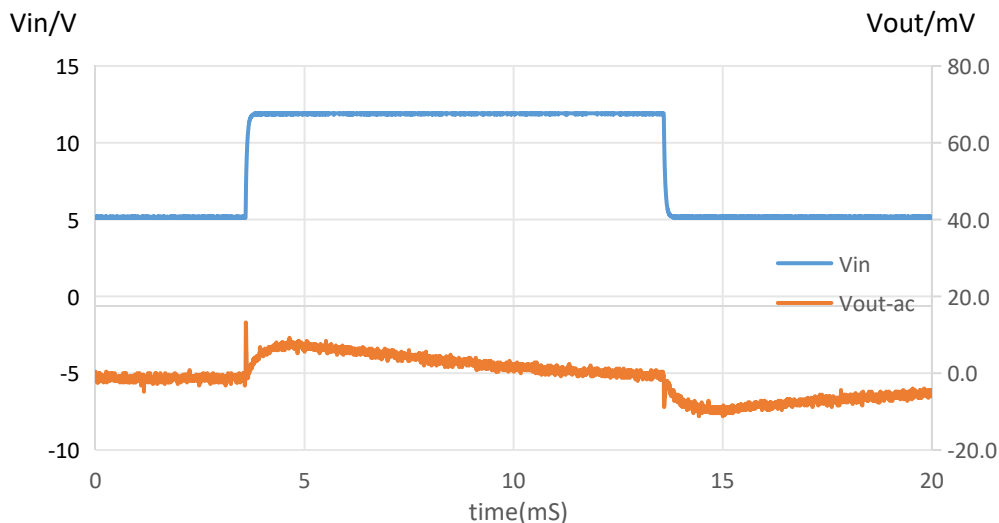
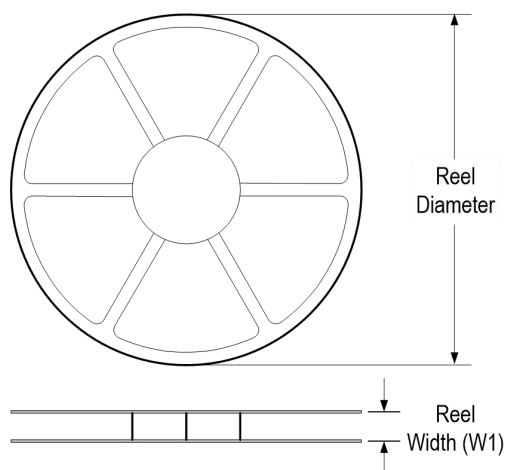


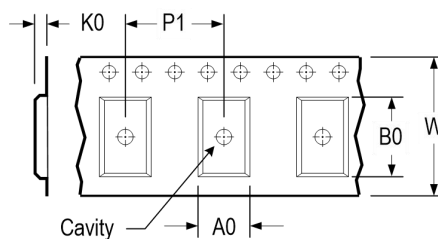
Figure 14. Load Transient Response
(LTP1117S-3.3V, $I_{OUT}=500mA$, $V_{OUT}=3.3V$, $C_{IN}=10\mu F$, $C_{OUT}=10\mu F$)

Tape and Reel Information

REEL DIMENSIONS

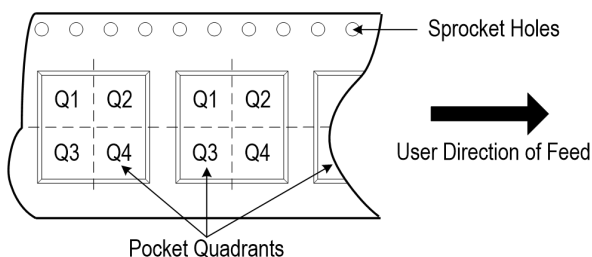


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



* All dimensions are nominal

Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin 1 Quadrant
LTP1117S-33Z52	T0252	2	2 500	330	16.5	6.8	10.4	2.5	8.0	16.0	Q2
LTP1117S-50Z52	T0252	2	2 500	330	16.5	6.8	10.4	2.5	8.0	16.0	Q2
LTP1117S-33XT4	SOT89	3	1 000	178	12.5	4.9	4.5	1.85	8.0	12.0	Q3
LTP1117S-AXT4	SOT89	3	1 000	178	12.5	4.9	4.5	1.85	8.0	12.0	Q3
LTP1117S-12T23	SOT223	3	4 000	330	12.5	7.0	7.5	1.88	8.0	12.0	Q3
LTP1117S-15T23	SOT223	3	4 000	330	12.5	7.0	7.5	1.88	8.0	12.0	Q3
LTP1117S-18T23	SOT223	3	4 000	330	12.5	7.0	7.5	1.88	8.0	12.0	Q3
LTP1117S-25T23	SOT223	3	4 000	330	12.5	7.0	7.5	1.88	8.0	12.0	Q3
LTP1117S-33T23	SOT223	3	4 000	330	12.5	7.0	7.5	1.88	8.0	12.0	Q3
LTP1117S-50T23	SOT223	3	4 000	330	12.5	7.0	7.5	1.88	8.0	12.0	Q3
LTP1117S-AT23	SOT223	3	4 000	330	12.5	7.0	7.5	1.88	8.0	12.0	Q3

CAUTION: These devices are sensitive to electrostatic discharge; follow proper IC Handling Procedures.

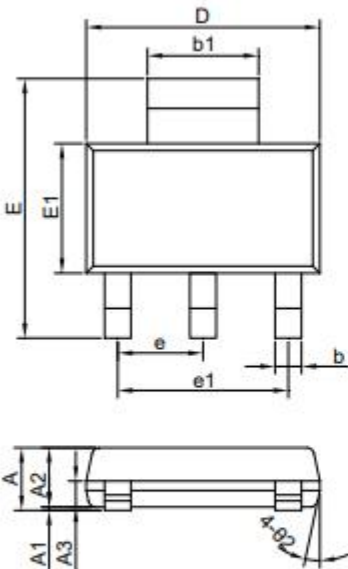
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Package Dimension

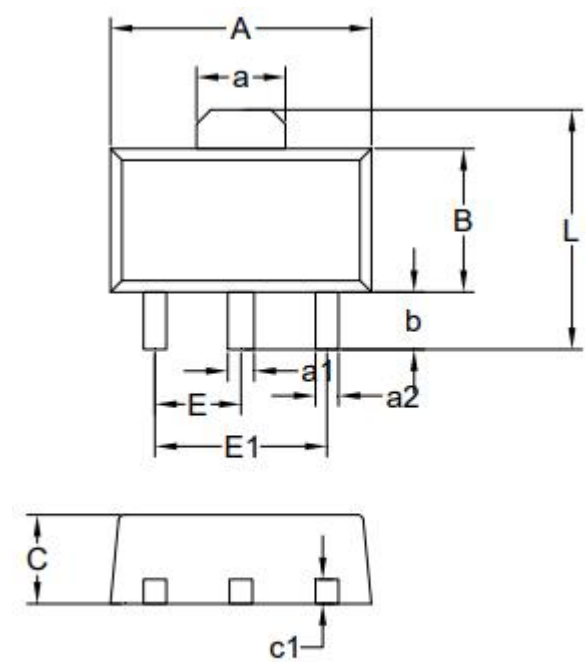
SOT223-3L



SYMBOL	Dimensions in Millimeters		
	MIN	NOM	MAX
A	1.55	-	1.80
A1	0.02	-	0.12
A2	1.45	1.60	1.75
A3	0.60	0.70	0.80
b	0.60	-	0.80
b1	2.90	-	3.10
c	0.24	-	0.32
D	6.20	6.30	6.50
E	6.70	7.00	7.30
E1	3.30	3.50	3.70
e	2.299REF		
e1	4.598REF		
L	0.90 MIN		
L2	0.30BSC		
θ	0°	-	10°
θ1	10°	12°	14°
θ2	10°	12°	14°

Package Dimension (Cont.)

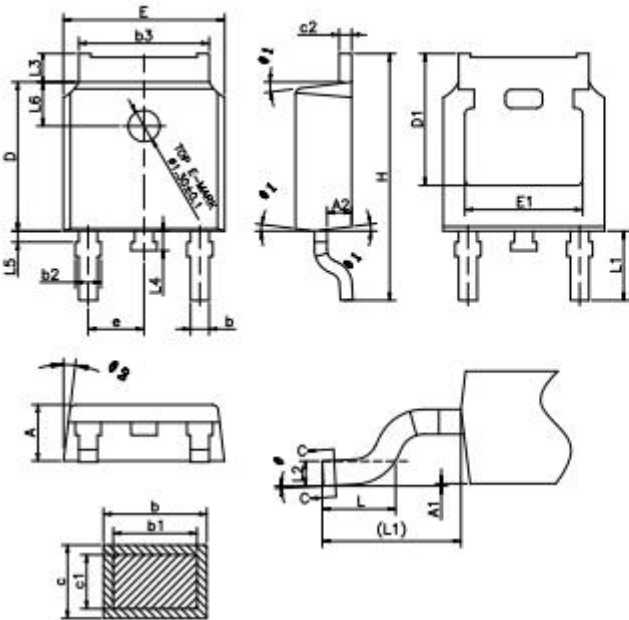
SOT89-3L



SYMBOL	Dimensions in Millimeters		
	MIN	NOM	MAX
A	4.40	-	4.70
B	2.35	-	2.65
L	3.87	-	4.48
a	1.45	-	1.80
E	1.00	-	2.00
E1	2.80	-	3.20
b	0.80	-	1.20
a1	0.36	-	0.56
a2	0.30	-	0.50
C	1.40	-	1.70
c1	0.35	-	0.50

Package Dimension (Cont.)

T0252-2L



SYMBOL	Dimensions in Millimeters		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.10
A2	0.90	1.01	1.10
b	0.72	-	0.85
b1	0.71	0.76	0.81
b2	0.72	-	0.90
b3	5.13	5.33	5.46
c	0.47	-	0.60
c1	0.46	0.51	0.56
c2	0.47	-	0.60
D	6.00	6.10	6.20
D1	5.25	-	-
E	6.50	6.60	6.70
E1	4.70	-	-
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.508 BSC		
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	0.15	-	0.75
L6	1.80 REF		
θ	0°	-	8°
θ1	5°	7°	9°
θ2	5°	7°	9°

Important Notice

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