

General Description

LTP1117C is a series of low dropout three-terminal regulators with a dropout of 1.1V at 1A load current. LTP1117C features a very low standby current 2mA compared to 5mA of competitor. Other than a fixed version, $V_{out} = 1.2V, 1.5V, 1.8V, 2.5V, 2.85V, 3.3V,$ and 5V, LTP1117C has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

It uses trimming technique to guarantee output voltage accuracy within 2%. LTP1117C is available in SOT223-3L, TO252-3L and SOT89-3L packages.

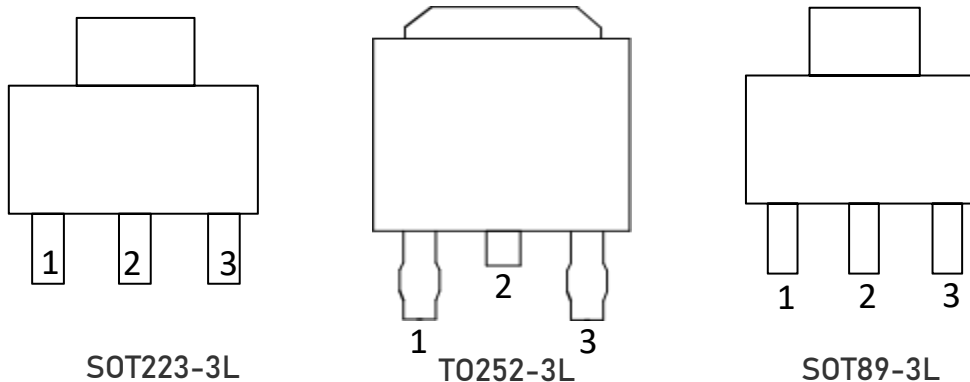
Features and Benefits

- Output current is 1A
- Range of operation input voltage: 18V
- Line regulation: 0.05%/V (typ.)
- Standby current: 2mA (typ.)
- Load regulation: 0.2%/A (typ.)(OUT:5V)
- Operation Temperature: $-40^{\circ}C \sim 105^{\circ}C$

Applications

- Power Management for Computer Mother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators for Switching Supplies

Pin Configuration (Top View)



Pin Description (SOT223-3L)

Pin no.	Symbol	Function
1	VSS/ADJ	VSS/ADJ pin
2	V_{OUT}	Output voltage pin
3	V_{IN}	Input voltage pin
4	V_{OUT}	Output voltage pin

Pin Description (T0252-3L)

Pin no.	Symbol	Function
1	VSS/ADJ	ASS/ADJ pin
2	V _{OUT}	Output voltage pin
3	V _{IN}	Input voltage pin

Pin Description (SOT89-3L)

Pin no.	Symbol	Function
1	VSS/ADJ	ASS/ADJ pin
2	V _{OUT}	Output voltage pin
3	V _{IN}	Input voltage pin

Selection Table

Type Number	Sympol	Output voltage	Package
LTP1117C	XX=12	1.2V	SOT89-3L
	XX=15	1.5V	
	XX=18	1.8V	
	XX=25	2.5V	SOT223-3L
	XX=285	2.85V	T0252-3L
	XX=33	3.3V	
	XX=50	5.0V	
	XX=A	adj	

Ordering Information

Type Number	Package Name	Package Quantity
LTP1117C-XXXT4	SOT89-3L	1 000 Tape&Reel
LTP1117C-XXT23	SOT223-3L	4 000 Tape&Reel
LTP1117C-XXZ52	T0252-3L	2 500 Tape&Reel

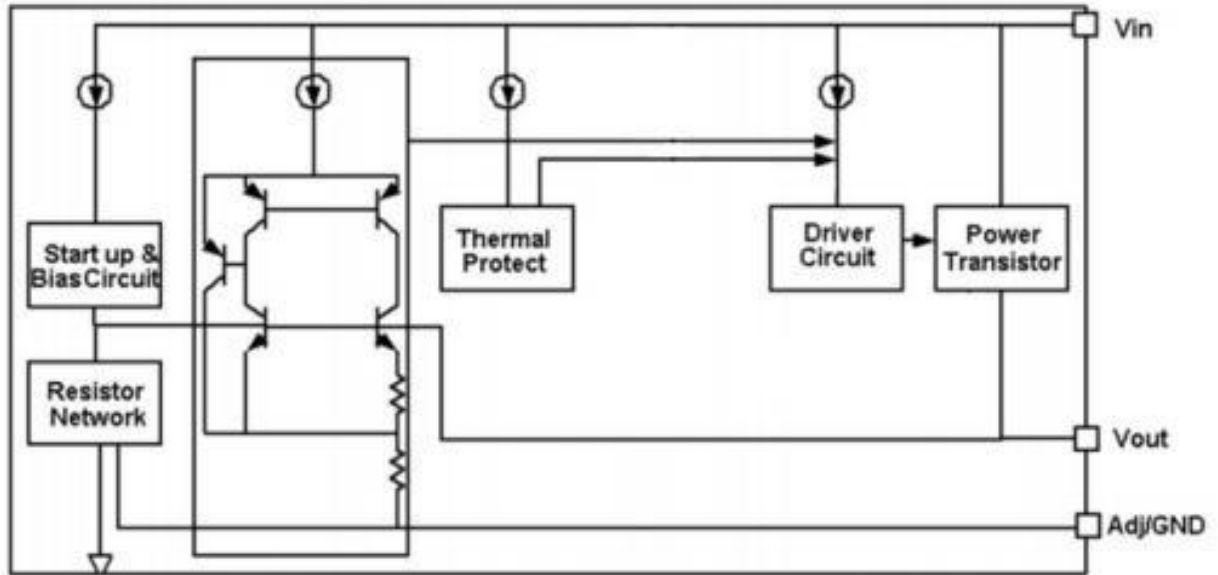
ESD Rating

Parameter	Item	Value	Unit
Electrostatic Discharge Voltage	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001	±2 000	V
	Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002	±2 000	

Absolute Maximum Ratings

Parameter	Rating	Unit
Input Supply Voltage: $V_{IN\ MAX}$	18	V
Junction Temperature: T_J	-55~+150	°C
Operation Temperature: T_{OPR}	-40~+105	°C
Storage Temperature: T_{STR}	-55~+150	°C
Soldering Temperature and Time	+260 (Recommended 10s)	°C

Block Diagram



Electrical Characteristics

 $T_A=25^{\circ}\text{C}$, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{in}	Input voltage			15	18	
V_{ref}	Reference voltage	LTP1117C-Adj $10\text{mA} \leq I_{out} \leq 1\text{A}$, $V_{in}=2.55\text{V}$	1.225	1.25	1.275	
V_{out}	Output voltage	LTP1117C-1.2V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=2.5\text{V}$	1.176	1.2	1.224	V
		LTP1117C-1.5V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=2.8\text{V}$	1.47	1.5	1.53	
		LTP1117C-1.8V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=3.1\text{V}$	1.764	1.8	1.836	
		LTP1117C-2.5V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=3.8\text{V}$	2.45	2.5	2.55	
		LTP1117C-2.85V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=4.15\text{V}$	2.793	2.85	2.907	
		LTP1117C-3.3V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=4.6\text{V}$	3.234	3.3	3.366	
		LTP1117C-5.0V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=6.3\text{V}$	4.9	5	5.1	
		LTP1117C-1.2V $I_{out}=10\text{mA}$, $2.5\text{V} \leq V_{in} \leq 10\text{V}$		4	19	
		LTP1117C-1.5V $I_{out}=10\text{mA}$, $2.8\text{V} \leq V_{in} \leq 10\text{V}$		5	26	
		LTP1117C-ADJ $I_{out}=10\text{mA}$, $2.55\text{V} \leq V_{in} \leq 12\text{V}$		5	24	
ΔV_{out}	Line Regulation	LTP1117C-1.8V $I_{out}=10\text{mA}$, $3.1\text{V} \leq V_{in} \leq 12\text{V}$		5	32	mV
		LTP1117C-2.5V $I_{out}=10\text{mA}$, $3.8\text{V} \leq V_{in} \leq 12\text{V}$		8	41	
		LTP1117C-2.85V $I_{out}=10\text{mA}$, $4.15\text{V} \leq V_{in} \leq 12\text{V}$		8	46	
		LTP1117C-3.3V $I_{out}=10\text{mA}$, $4.6\text{V} \leq V_{in} \leq 12\text{V}$		9	49	
		LTP1117C-5.0V $I_{out}=10\text{mA}$, $6.3\text{V} \leq V_{in} \leq 12\text{V}$		10	56	

Electrical Characteristics (continued)

 $T_A=25^\circ\text{C}$, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit			
ΔV_{out}	Load Regulation	LTP1117C-1.2V $V_{in}=2.5\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		10	40	mV			
		LTP1117C-1.5V $V_{in}=2.8\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		10	40				
		LTP1117C-ADJ $V_{in}=2.55\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		10	40				
		LTP1117C-1.8V $V_{in}=3.1\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		10	40				
		LTP1117C-2.5V $V_{in}=3.8\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		10	40				
		LTP1117C-2.85V $V_{in}=4.15\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		10	40				
		LTP1117C-3.3 $V_{in}=4.6\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		10	40				
		LTP1117C-5.0 $V_{in}=6.3\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		10	40				
		Vdrop	Dropout voltage	$I_{out}=100\text{mA}$			1.05	1.2	V
				$I_{out}=1\text{A}$			1.1	1.3	V
I_{min}	Minimum load current	LTP1117C-ADJ		2	10	mA			
I_q	Quiescent Current	LTP1117C-1.2V, $V_{in}=10\text{V}$		2	5				
		LTP1117C-1.5V, $V_{in}=10\text{V}$		2	5				
		LTP1117C-1.8V, $V_{in}=12\text{V}$		2	5				
		LTP1117C-2.5V, $V_{in}=12\text{V}$		2	5				
		LTP1117C-2.85V, $V_{in}=12\text{V}$		2	5				
		LTP1117C-3.3V, $V_{in}=12\text{V}$		2	5				
I_{adj}	Adjust pin current	LTP1117C-ADJ $V_{in}=5\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		55	120	μA			
		LTP1117C-ADJ $V_{in}=5\text{V}, 10\text{mA}\leq I_{out}\leq 1\text{A}$		0.2	10				
ΔV_{out}	Temperature coefficient	$V_{in}=4.5\text{V}, I_{out}=10\text{mA}$ $V_{OUT}=3.3\text{V}$ $20^\circ\text{C}\leq T_A\leq 120^\circ\text{C}$		30		mV			
θ_{JC}	Thermal resistance	SOT223-3L		20		$^\circ\text{C}/\text{W}$			
		TO252-3L		10					
		SOT89-3L		30					

Note1: All test are conducted under ambient temperature 25°C and within a short period of time 20ms

Note2: Load current smaller than minimum load current of LTP1117C-ADJ will lead to unstable or oscillation output.

Detailed Description

LTP1117C is a series of low dropout three-terminal regulators with a dropout of 1.1V at 1A load current. LTP1117C features a very low standby current 2mA compared to 5mA of

competitor. Other than a fixed version, $V_{out} = 1.2V, 1.5V, 1.8V, 2.5V, 2.85V, 3.3V,$ and 5V, LTP1117C has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

LTP1117C 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%.

LTP1117C is available in SOT223-3L, T0252-3L and SOT89-3L packages.

LTP1117C 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.

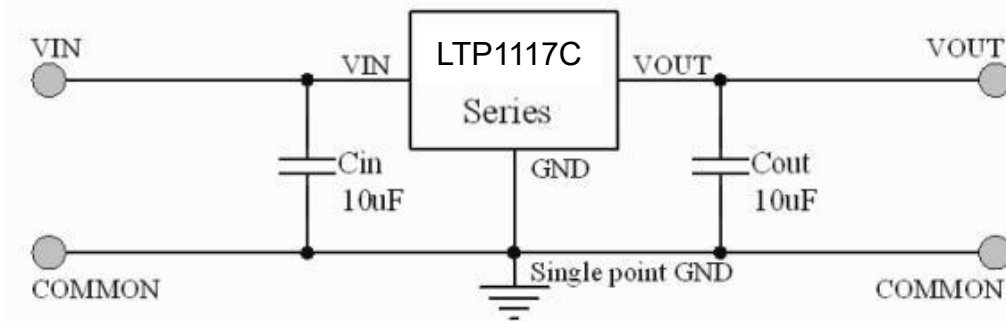
The thermal shutdown modules can assure chip and its application system working safety when the temperature is larger than 200°C.

The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The temperature coefficient is under 100 ppm/°C. And the accuracy of output voltage is guaranteed by trimming technique.

Typical Application

LTP1117C has an adjustable version and six fixed versions (1.2V, 1.5V, 1.8V, 2.5V, 2.85V, 3.3V and 5V)

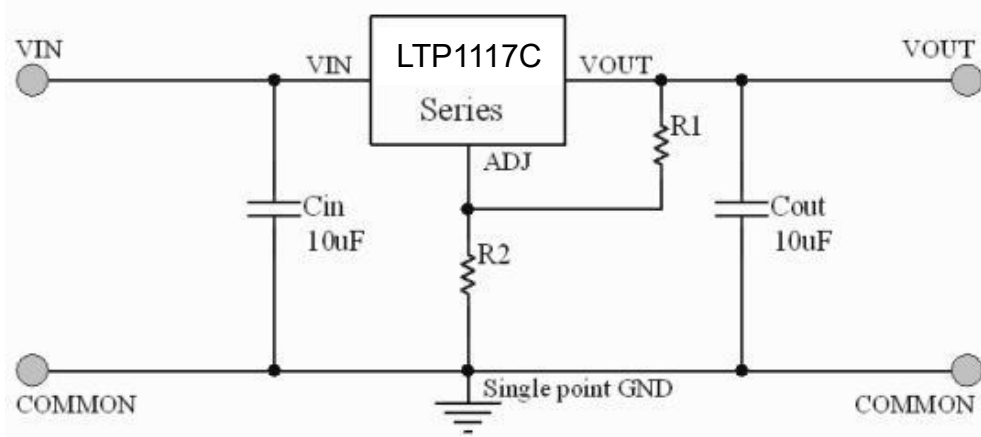
Fixed Output Voltage Version



Application circuit of LTP1117C fixed version

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

Adjustable Output Voltage Version



Application Circuit of LTP1117C-ADJ

The output voltage of adjustable version follows the equation: $V_{out} = 1.25 \times (1 + R2/R1) + I_{Adj} \times R2$. We can ignore I_{Adj} because I_{Adj} (about 50uA) is much less than the current of $R1$ (about 2-10mA).

1) To meet the minimum load current (>10mA) requirement, $R1$ is recommended to be 125ohm or lower. As LTP1117C-ADJ can keep itself stable at load current about 2mA, $R1$ is not allowed to be higher than 625ohm.

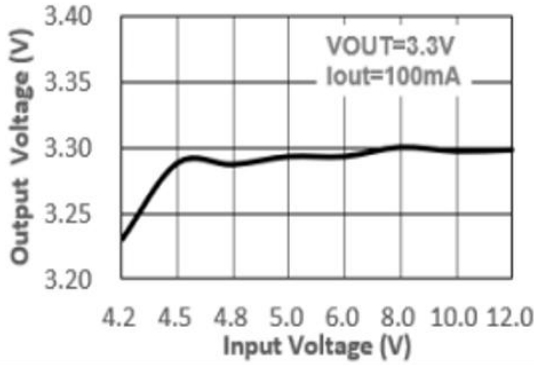
2) Using a bypass capacitor (CADJ) between the ADJ pin and ground can improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of CADJ should be less than $R1$ to prevent ripple from being amplified. As $R1$ is normally in the range of 100-500, the value of CADJ should satisfy this equation: $1/(2 \times \text{ripple} \times \text{CADJ}) < R1$.

Thermal Considerations

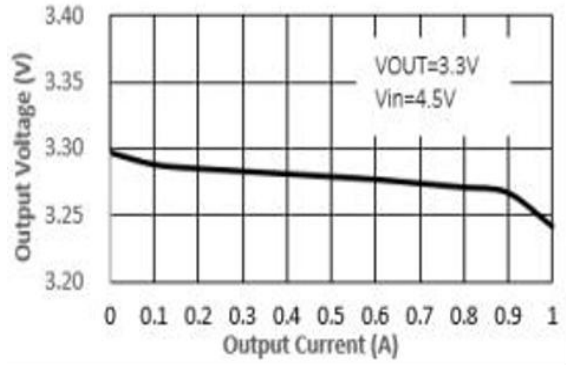
We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by LTP1117C is very large. LTP1117C series uses SOT223-3L package type and its thermal resistance is about 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 area in PCB, the total thermal resistance will be as high as 120°C/W, then the power dissipation of LTP1117C could allow on itself is less than 1W. And furthermore, LTP1117C will work at junction temperature higher than 150°C under such condition and no lifetime is guaranteed.

Typical Performance Characteristics

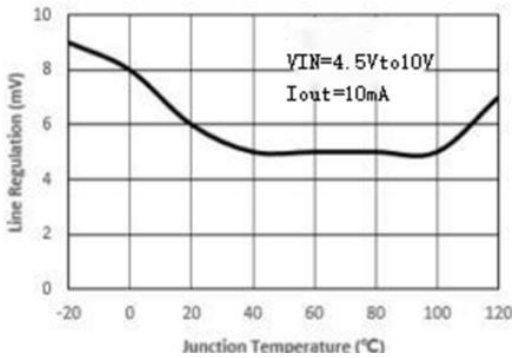
$T_A=25^{\circ}\text{C}$, unless otherwise noted



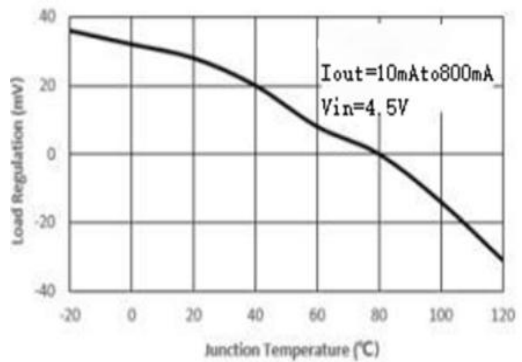
Output Voltage vs. Input Voltage ($V_{OUT}=3.3\text{V}$)



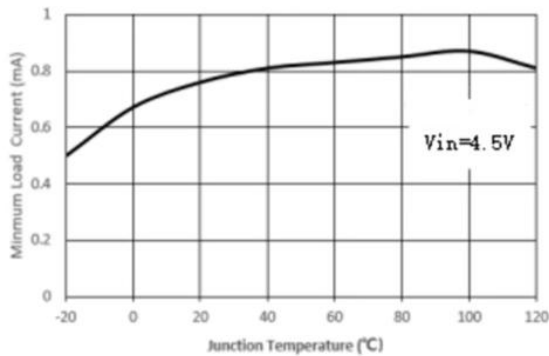
Output Voltage vs. Output Current ($V_{OUT}=3.3\text{V}$)



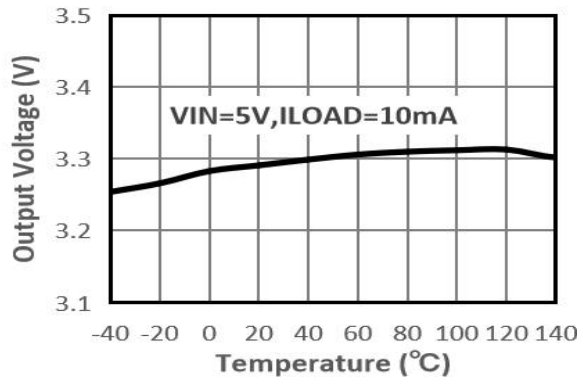
Line Regulation vs. Junction Temperature



Load Regulation vs. Junction Temperature



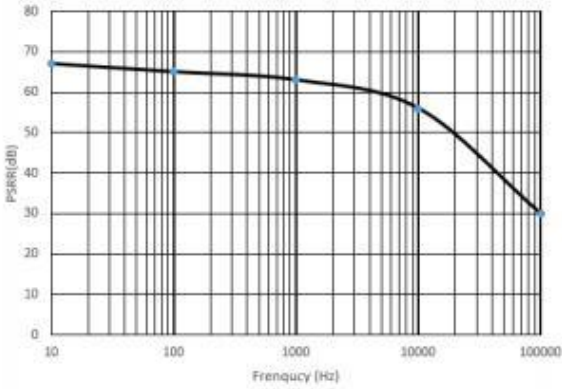
Minimum Load Current vs. Junction Temperature



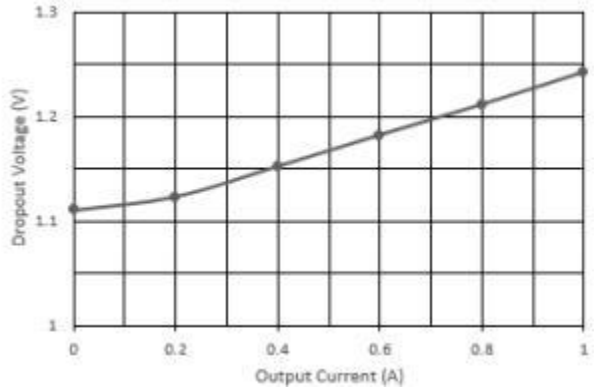
Output Voltage vs. Junction Temperature

Typical Performance Characteristics

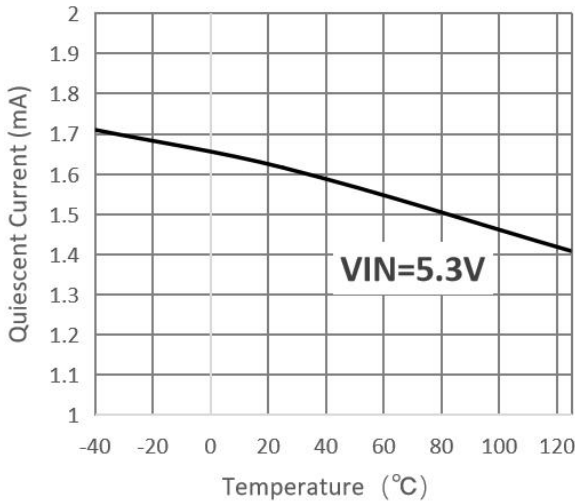
$T_A=25^{\circ}\text{C}$, unless otherwise noted



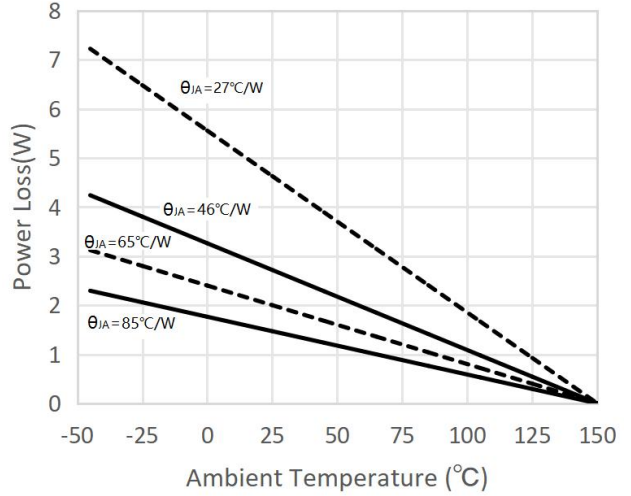
PSRR vs. Frequency



Dropout Voltage vs. Output Current



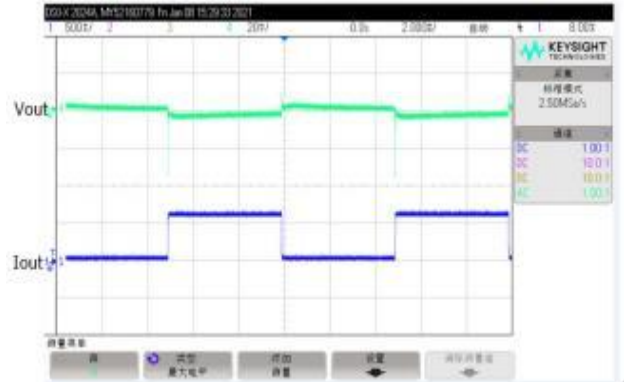
Quiescent Current vs. Temperature



Power Loss(W) VS Ambient Temperature(°C)



Line Transient Response

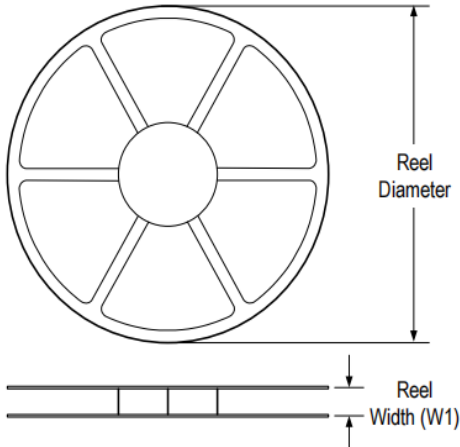


Load Transient Response

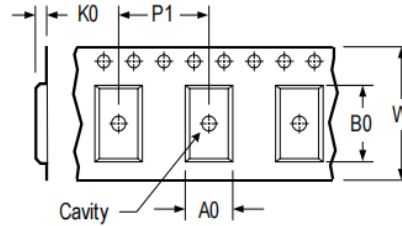
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Tape and Reel Information

REEL DIMENSIONS

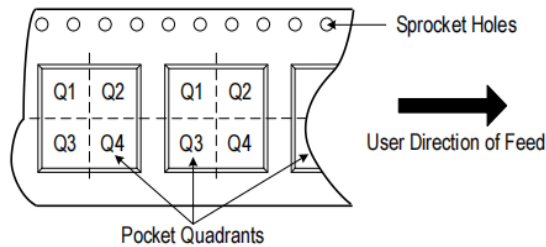


TAPE DIMENSIONS



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

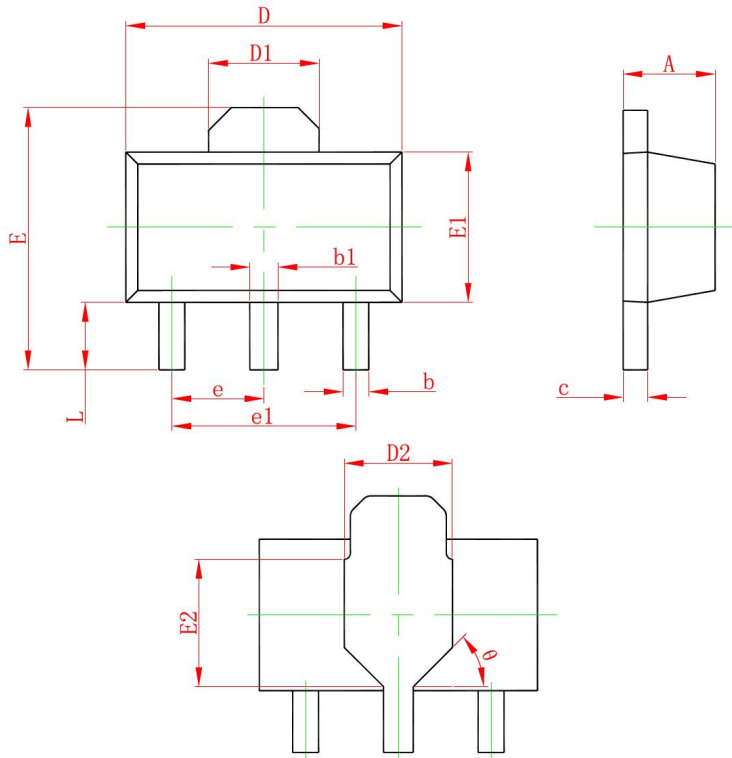


* All dimensions are nominal

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
LTP1117C-xxXT4	SOT89	3	1 000	178	12.0	4.9	4.5	1.85	8.0	12.0	Q3
LTP1117C-xxT23	SOT223	3	4 000	330	12.5	7.0	7.5	1.88	8.0	12.0	Q3
LTP1117C-xxZ52	TO252	3	2 500	330	16.5	6.8	10.4	2.5	8.0	16.0	Q2

Package Outlines

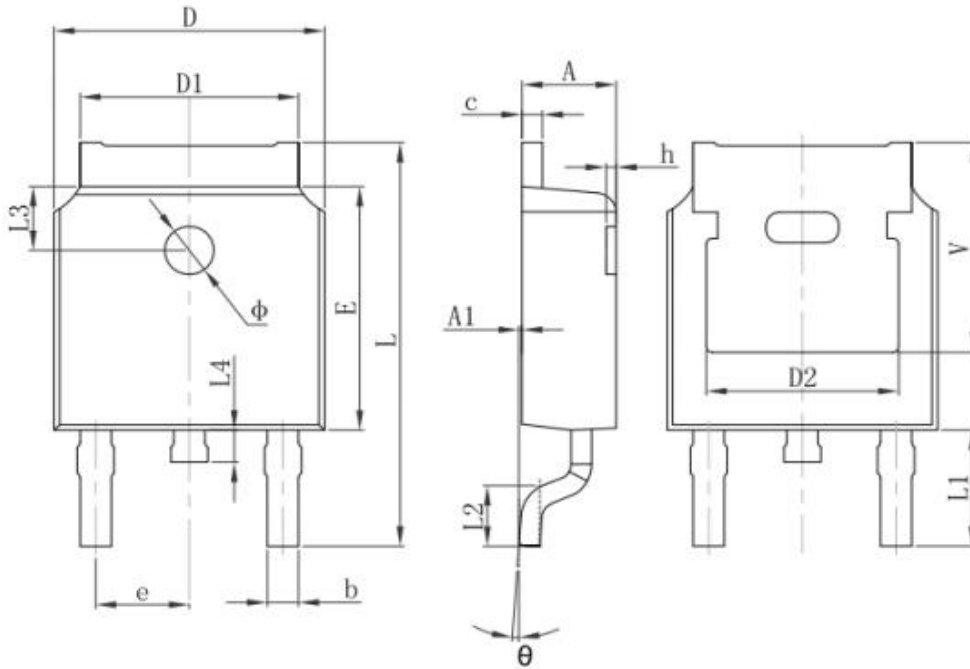
SOT89-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.380	0.580	0.015	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
D2	1.750 REF.		0.069 REF.	
E	3.940	4.250	0.155	0.167
E1	2.300	2.600	0.091	0.102
E2	1.900 REF.		0.075 REF.	
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047
θ	45°		45°	

Package Outlines

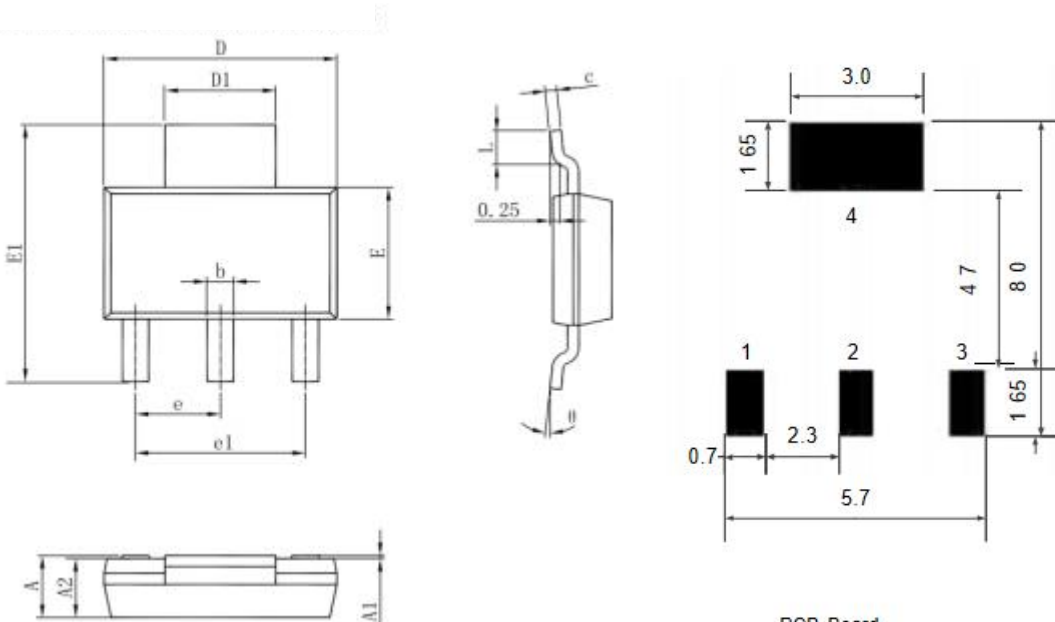
TO252-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	

Package Outlines

SOT223-3L



PCB Board

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.400	6.600	0.252	0.260
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
e	2.300(BSC)		0.091(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
θ	0°	10°	0°	10°

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