LTP1117C

1A Bipolar Linear Regulator

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, Vout = 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 SOT-223-3, TO-252 and SOT89-3 packages.

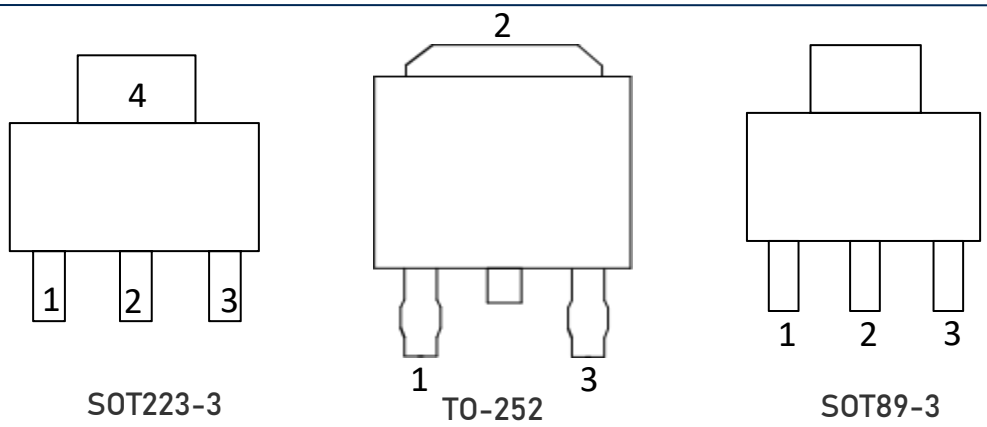
Features and Benefits

- 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℃~105℃

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）

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（TO252）

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）

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	Pakage
LTP1117C	XX=12	1.2V	SOT89-3
	XX=15	1.5V	
	XX=18	1.8V	SOT223-3
	XX=25	2.5V	
	XX=285	2.85V	
	XX=33	3.3V	TO-252
	XX=50	5.0V	
	XX=A	adj	

Ordering Information

Type Number	Package Name	Package Quantity
LTP1117C-XXXT4	SOT89-3L	1000 Tape&Reel
LTP1117C-XXT23	SOT223-3L	4000 Tape&Reel
LTP1117C-XXZ52	TO-252L	2500 Tape&Reel

ESD Rating

Parameter	Item	Value	Unit
Electrostatic Discharge Voltage	Human body model (HBM),) per ESDA/JEDEC JS-002-2014(1)	±2 000	V
	Charged device model (CDM), per ESDA/JEDEC JS-002-2014 (2)	±2 000	

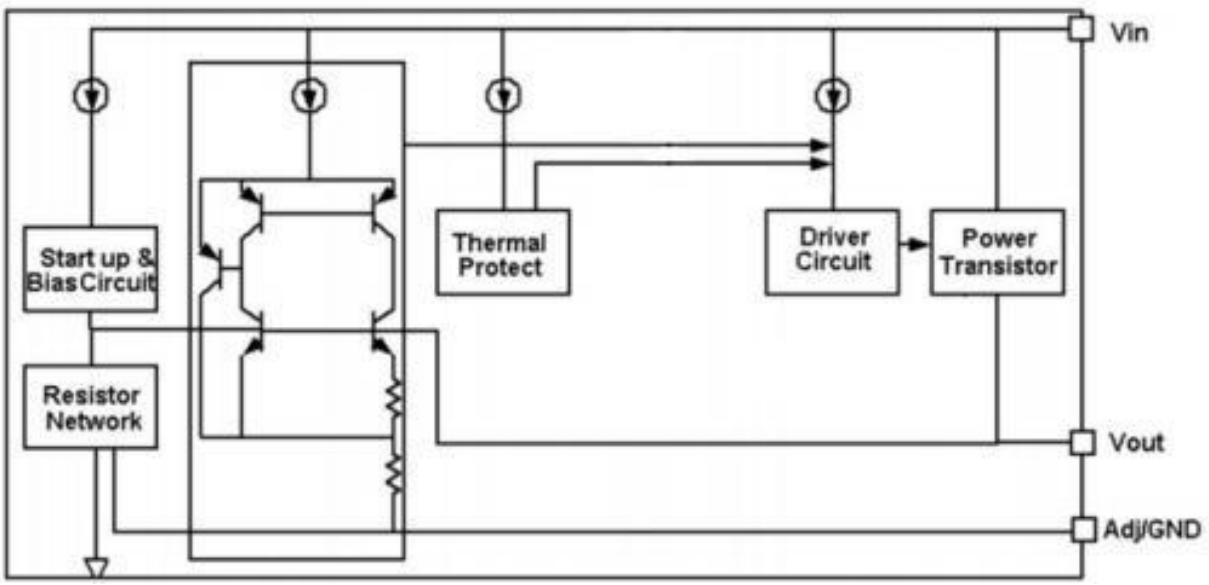
(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 500-V HBM is possible if necessary precautions are taken.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 250-V CDM is possible if necessary precautions are taken.

Absolute Maximum Ratings

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

Block Diagram



Electrical Characteristics

T_A=25℃, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Vin	Input voltage		--	15	18	V
Vref	Reference voltage	LTP1117C-Adj 10mA≤Iout≤1A , Vin=2.55V	1.225	1.25	1.275	V
Vout	Outout voltage	LTP1117C-1.2V 0≤Iout≤1A , Vin=2.5V	1.176	1.2	1.224	V
		LTP1117C-1.5V 0≤Iout≤1A , Vin=2.8V	1.47	1.5	1.53	V
		LTP1117C-1.8V 0≤Iout≤1A , Vin=3.1V	1.764	1.8	1.836	V
		LTP1117C-2.5V 0≤Iout≤1A , Vin=3.8V	2.45	2.5	2.55	V
		LTP1117C-2.85V 0≤Iout≤1A , Vin=4.15V	2.793	2.85	2.907	V
		LTP1117C-3.3V 0≤Iout≤1A , Vin=4.6V	3.234	3.3	3.366	V
		LTP1117C-5.0V 0≤Iout≤1A , Vin=6.3V	4.9	5	5.1	V
△Vout	Line Regulation	LTP1117C-1.2V Iout=10mA, 2.5V≤Vin≤10V		4	19	mV
		LTP1117C-1.5V Iout=10mA, 2.8V≤Vin≤10V		5	26	mV
		LTP1117C-ADJ Iout=10mA, 2.55V≤Vin≤12V		5	24	mV
		LTP1117C-1.8V Iout=10mA, 3.1V≤Vin≤12V		5	32	mV
		LTP1117C-2.5V Iout=10mA, 3.8V≤Vin≤12V		8	41	mV
		LTP1117C-2.85V Iout=10mA, 4.15V≤Vin≤12V		8	46	mV
		LTP1117C-3.3V Iout=10mA, 4.6V≤Vin≤12V		9	49	mV
		LTP1117C-5.0V Iout=10mA, 6.3V≤Vin≤12V		10	56	mV

Electrical Characteristics (continued)

T_A=25℃, unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
△Vout	Load Regulation	LTP1117C-1.2V Vin =2.5V, 10mA≤Iout≤1A		10	40	mV
		LTP1117C-1.5V Vin =2.8V, 10mA≤Iout≤1A		10	40	
		LTP1117C-ADJ Vin =2.55V, 10mA≤Iout≤1A		10	40	
		LTP1117C-1.8V Vin =3.1V, 10mA≤Iout≤1A		10	40	
		LTP1117C-2.5V Vin =2.8V, 10mA≤Iout≤1A		10	40	
		LTP1117C-2.85V Vin =4.15V, 10mA≤Iout≤1A		10	40	
		LTP1117C-3.3 Vin =4.6V, 10mA≤Iout≤1A		10	40	
		LTP1117C-5.0 Vin =6.3V, 10mA≤Iout≤1A		10	40	
Vdrop	Dropout voltage	Iout =100mA		1.05	1.2	V
		Iout=1A		1.1	1.3	V
Imin	Minimum load current	LTP1117C-ADJ		2	10	mA
Iq	Quiescent Current	LTP1117C-1.2V, Vin=10V		2	5	
		LTP1117C-1.5V, Vin=10V		2	5	
		LTP1117C-1.8V, Vin=12V		2	5	
		LTP1117C-2.5V, Vin=12V		2	5	
		LTP1117C-2.85V, Vin=12V		2	5	
		LTP1117C-3.3V, Vin=12V		2	5	
		LTP1117C-5.0V, Vin=12V		2	5	
Iadj	Adjust pin current	LTP1117C-ADJ Vin=5V,10mA≤Iout≤1A		55	120	uA
Ichange	Iadj change	LTP1117C-ADJ Vin=5V,10mA≤Iout≤1A		0.2	10	
△Vout	Temperature coefficient	Vin=4.5V, Iout=10mA VOUT=3.3V 20℃≤Ta≤120℃		30		mV
θ_{JC}	Thermal resistance	SOT-223		20		℃/W
		TO-252		10		
		SOT89-3		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, Vout = 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 SOT-223, TO-252 and SOT89 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.

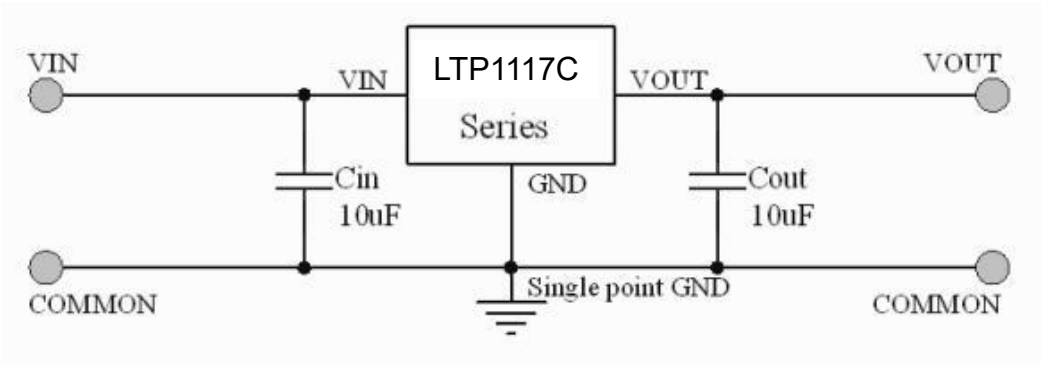
The thermal shutdown modules can assure chip and its application system working safety when the temperature is larger than 200°C.

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

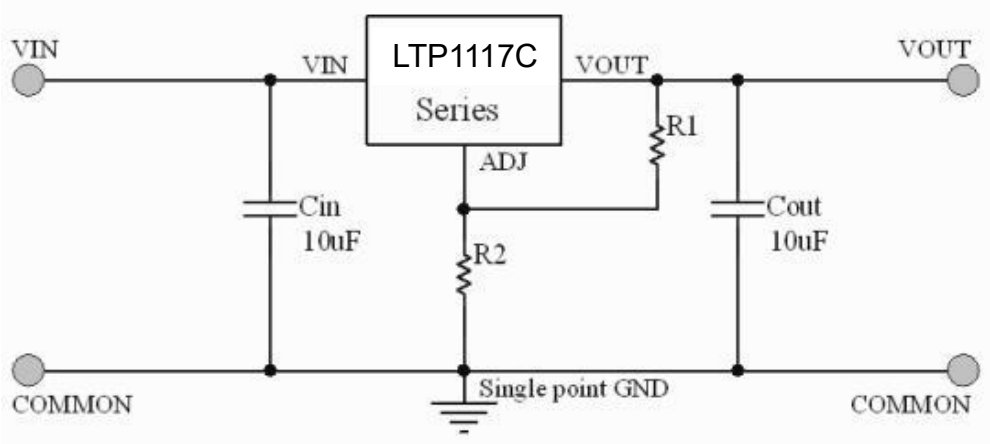


Application circuit of LTP1117C fixed version

1) Recommend using 10uF tan capacitor as bypass capacitor for all application circuit.

2) Recommend using 10uF tan capacitor to assure circuit stability.

Adjustable Output Voltage Version



Application Circuit of LTP1117C-ADJ

The output voltage of adjustable version follows the equation: Vout=1.25×(1+R2/R1)+IAdj×R2. We can ignore IAdj because IAdj (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.

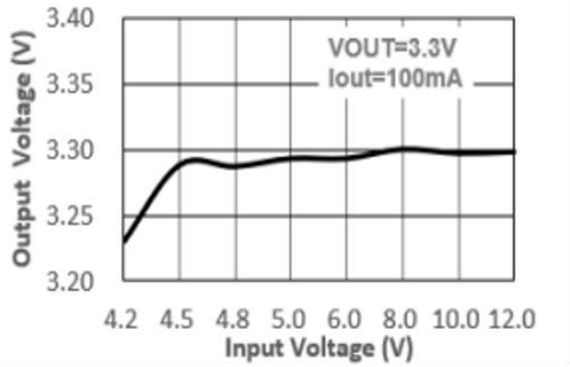
2) Using a bypass capacitor (CADJ) between the ADJ pin and ground can improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of CADJ should be less than R1 to prevent ripple from being amplified. As R1 is normally in the range of 00Ω~500Ω, the value of CADJ should satisfy this equation: 1/(2π×fripple ×CADJ)<R1.

Thermal Considerations

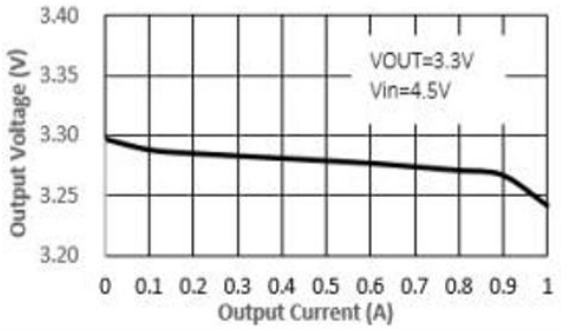
We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by LTP1117C is very large. LTP1117C series uses SOT- 223 package type and its thermal resistance is about 20°C/W. 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 LTP1117C could allow on itself is less than 1W. And furthermore, LTP1117C will work at junction temperature higher than 150℃ under such condition and no lifetime is guaranteed.

Typical Performance Characteristics

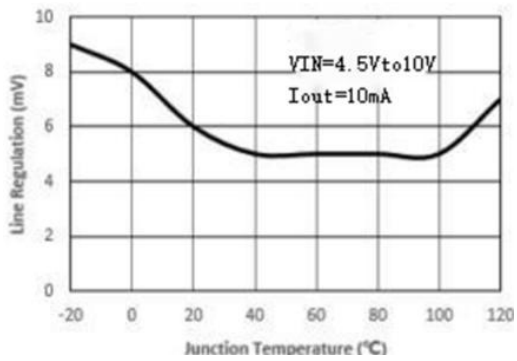
T_A=25℃, unless otherwise noted



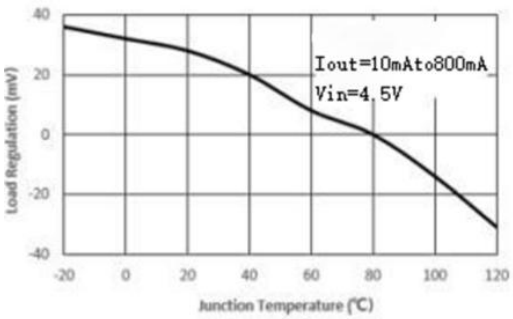
Output Voltage vs. Input Voltage (VOUT=3.3V)



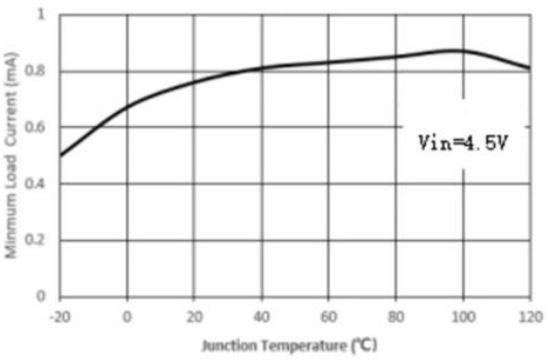
Output Voltage vs. Output Current (VOUT=3.3V)



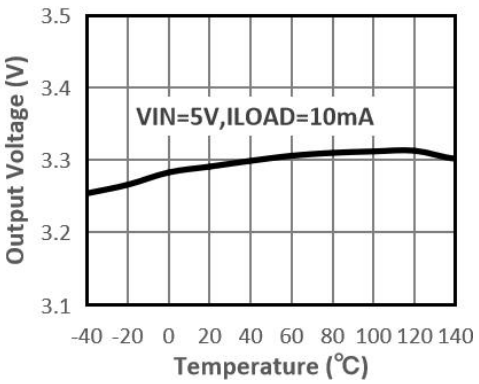
Line Regulation vs. Junction Temperature



Load Regulation vs. Junction Temperature



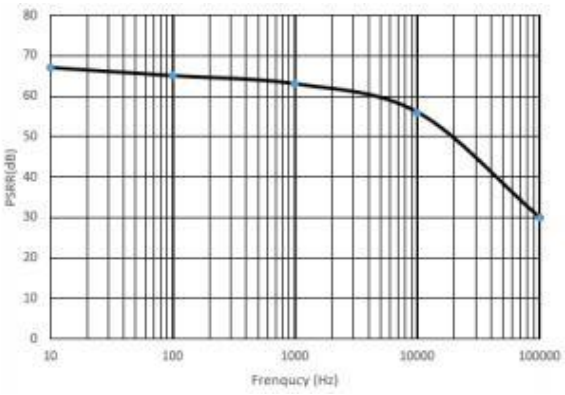
Minimum Load Current vs. Junction Temperature



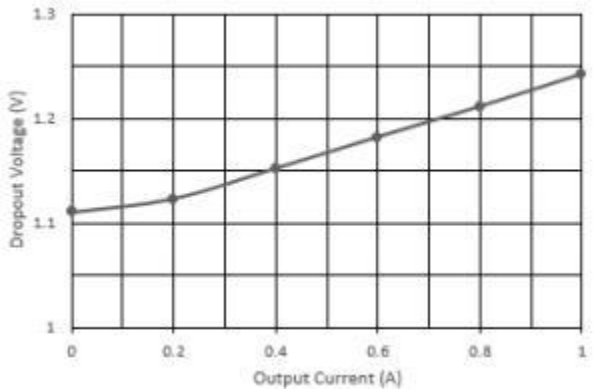
Output Voltage vs. Junction Temperature

Typical Performance Characteristics

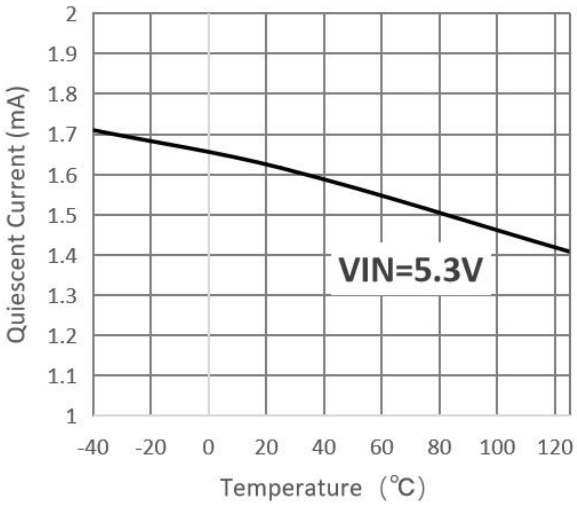
T_A=25℃, unless otherwise noted



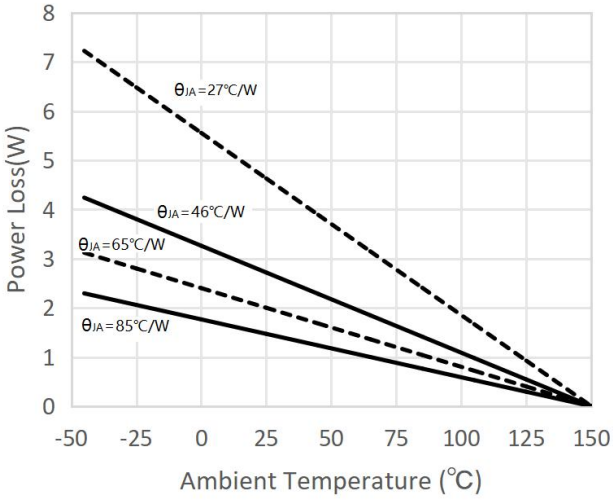
PSRR vs. Frequency



Dropout Voltage vs. Output Current



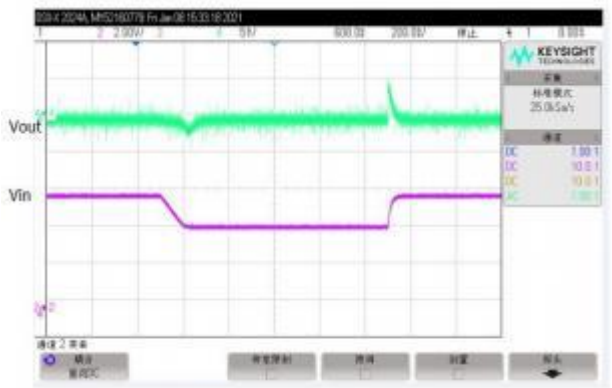
Quiescent Current vs. Temperature



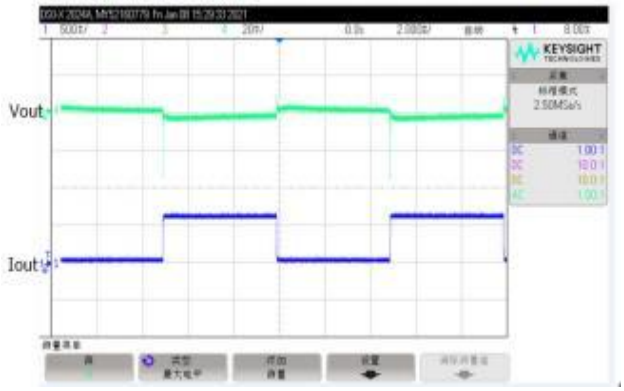
Power Loss(W) VS Ambient Temperature(℃)

Typical Performance Characteristics

T_A=25℃, unless otherwise noted



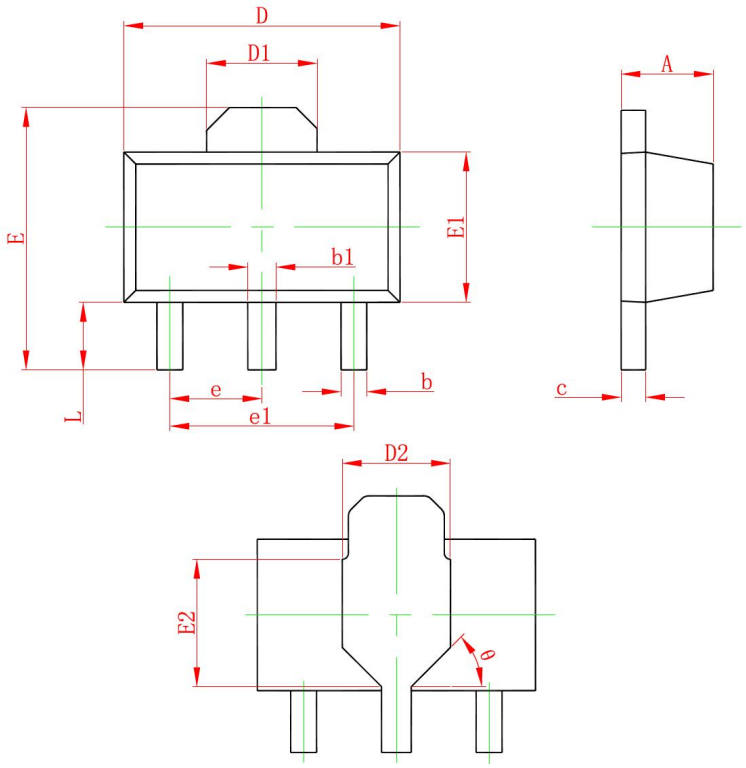
Line Transient Response



Load Transient Response

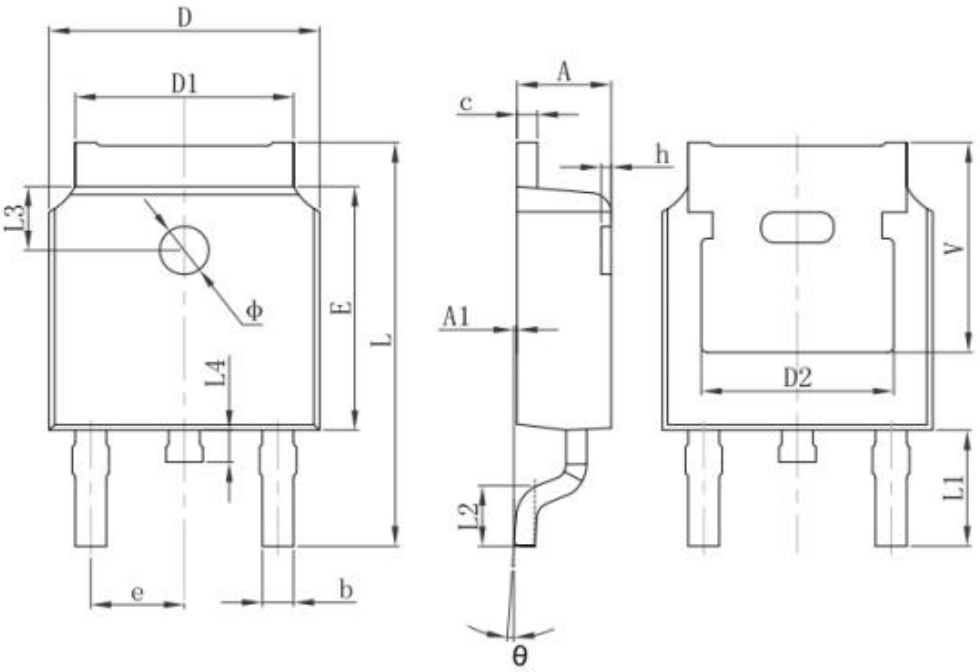
Package Outlines

3-pin SOT89 Outline Dimensions



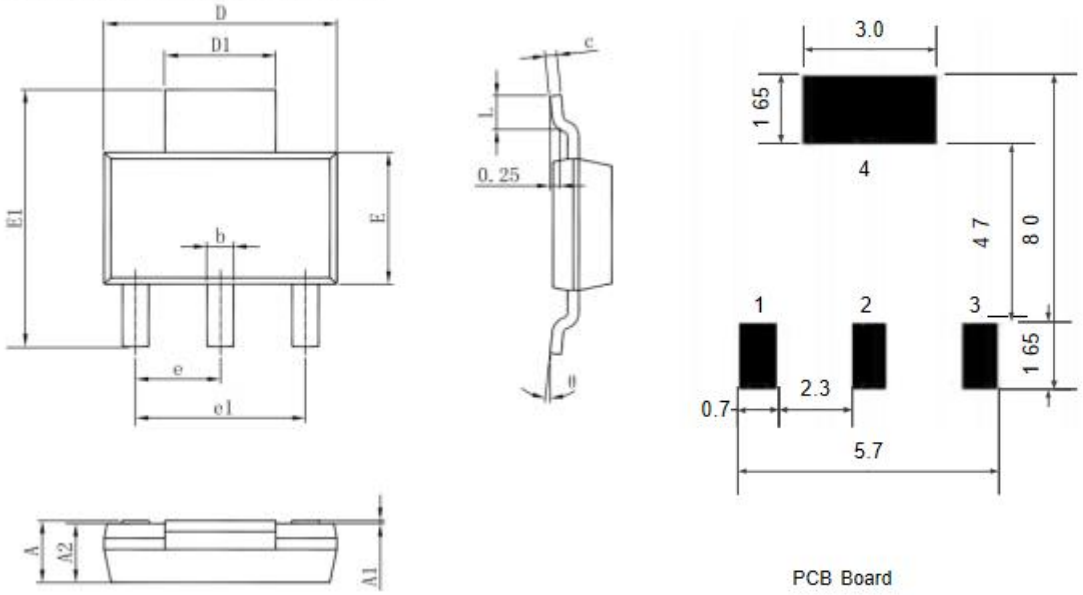
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.380	0.580	0.015	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
D2	1.750 REF.		0.069 REF.	
E	3.940	4.250	0.155	0.167
E1	2.300	2.600	0.091	0.102
E2	1.900REF.		0.075REF.	
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°	

TO-252-2L PACKAGE OUTLINE DIMENSIONS



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.	

SOT-223 PACKAGE OUTLINE DIMENSIONS



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°

Important Notice

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