High Ripple-rejection Low Dropout CMOS Voltage Regulator

■ General Description

The LN1250 Series is a positive voltage regulator with a low dropout voltage, high output voltage accuracy, and low current consumption developed based on CMOS technology.

A built-in low on-resistance transistor provides a low dropout voltage and large output current, and a built-in overcurrent protector prevents the load current from exceeding the current capacitance of the output transistor. Small SOT-89-3 package realize high-density mounting.

■ Applications

- Power supply for DVD and CD-ROM drives
- Power supply for battery-powered devices
- Power supply for personal communication devices
- Power supply for note PCs

■ Features

- Output voltage: 1.5 V to 5.5 V, selectable in 0.1 V steps.
- High-accuracy output voltage: ±2.0%
- Low dropout voltage: 150mV typ. (3.0V output product, I_{OUT} =100 mA)
- Low current consumption: during operation: 60μA(typ),120 μA (max)
- High peak current capability: 500mA output is possible (at $V_{IN} \geq V_{OUT(S)}$ +1.0 V)
- Built-in ON/OFF circuit: ensures long battery life.
- High ripple rejection: 60 dB typ. (at 1.0 kHz)
- Built-in overcurrent protector: overcurrent of output transistor can be restricted.
- Small package: SOT-89-3 and other required

■ Package

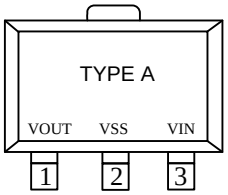
- SOT-89-3L

■ Ordering Information

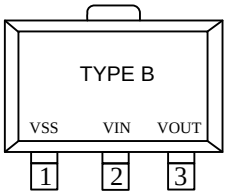
LN1250P ①②③④⑤

Designator	Symbol	Description
① ②	Integer	Output voltage： eg. ①=3，②=0 presents 3.0V
③	2	Accuracy：±2%
④	P	SOT89-3(B Type)
	R	SOT89-3(A Type)
	Q	SOT89-3(C Type)
⑤	R	Embossed Tape : standard Feed
	L	Embossed Tape : reverse Feed

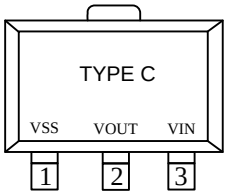
■ Pin Configuration



SOT-89-3L
(Top View)



SOT-89-3L
(Top View)

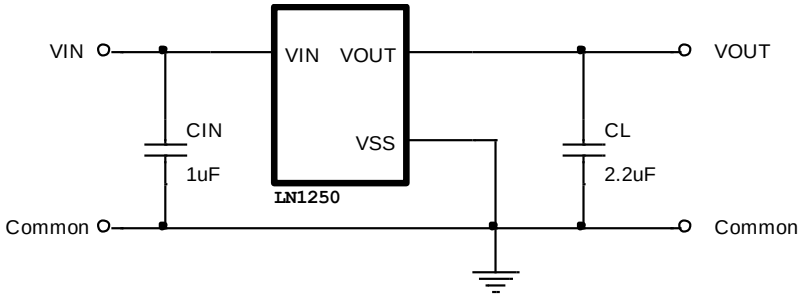


SOT-89-3L
(Top View)

■ Pin Assignment

Pin Number	Pin Name		
	A Type	B Type	C Type
1	VOUT	VSS	VSS
2	VSS	VIN	VOUT
3	VIN	VOUT	VIN

■ Typical Application Circuit



Caution: The above connection diagram and constant will not guarantee successful operation. Perform thorough evaluation using the actual application to set the constant.

■ Application Conditions

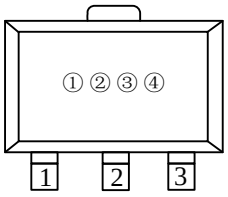
Input capacitor (CIN): 1.0μF or more

Output capacitor (CL): 2.2μF or more (tantalum capacitor)

Caution A general series regulator may oscillate, depending on the external components selected. Check that no oscillation occurs with the application using the above capacitor.

■ Marking Rule

- SOT-89-3L



SOT-89-3L
(Top View)

① Represents the product name

Symbol	Product Name
T	LN1250P◆◆◆◆◆

② Represents the range of output voltage

Voltage(V)	0.1～3.0	3.1～6.0	6.1～9.0
Symbol	A	B	C

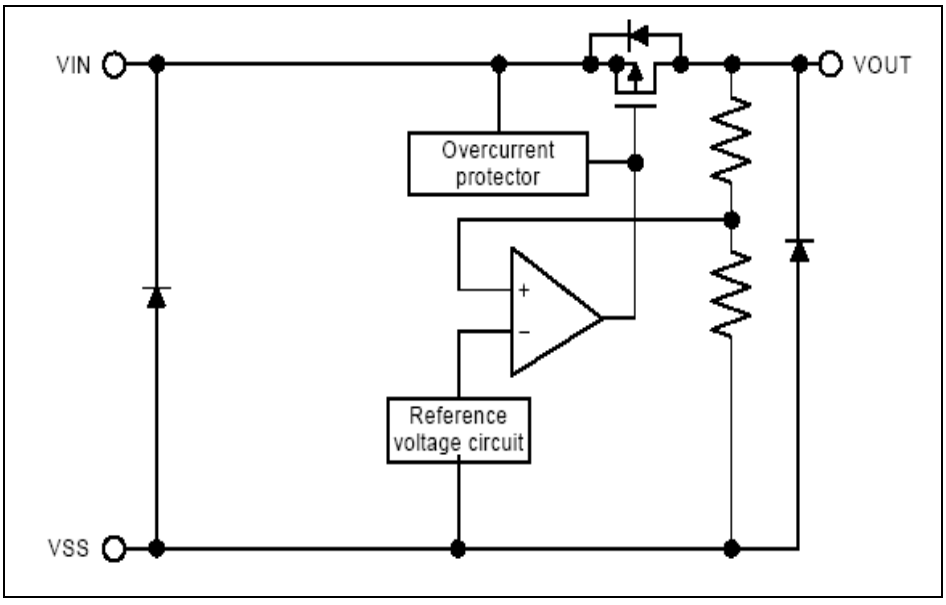
③ **Represents the Output Voltage**

Symbol	Output Voltage（V）			Symbol	Output Voltage（V）		
0	-	3.1	-	F	1.6	4.6	-
1	-	3.2	-	H	1.7	4.7	-
2	-	3.3	-	K	1.8	4.8	-
3	-	3.4	-	L	1.9	4.9	-
4	-	3.5	-	M	2	5.0	-
5	-	3.6	-	N	2.1	5.1	-
6	-	3.7	-	P	2.2	5.2	-
7	-	3.8	-	R	2.3	5.3	-
8	-	3.9	-	S	2.4	5.4	-
9	-	4	-	T	2.5	5.5	-
A	-	4.1	-	U	2.6	5.6	-
B	1.2	4.2	-	V	2.7	5.7	-
C	1.3	4.3	-	X	2.8	5.8	-
D	1.4	4.4	-	Y	2.9	5.9	-
E	1.5	4.5	-	Z	3	6.0	-

④ **Represents the assembly lot no.**

0~9, A~Z repeated (G, I, J, O, Q, W excepted)

■ Function Block Diagram



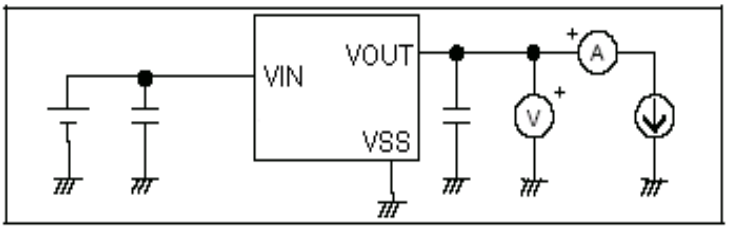
■ Absolute Maximum Ratings

Item	Symbol	Absolute Maximum Rating		Unit
Input voltage	V_{IN}	V_{SS}-0.3～V_{SS}+6		V
Output voltage	V_{OUT}	V_{SS}-0.3～V_{IN}+0.3		
Power dissipation	P_D	SOT-89-3	500	mW
Operating ambient temperature	Topr	-40～+85		°C
Storage temperature	Tstg	-40～+125		

Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

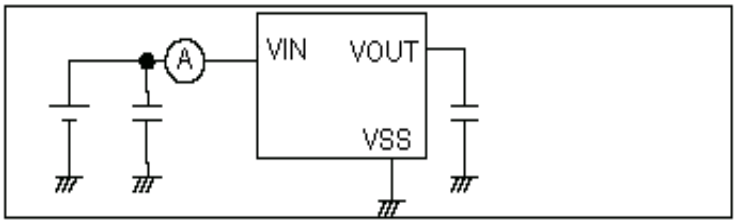
■ Test Circuits

1.



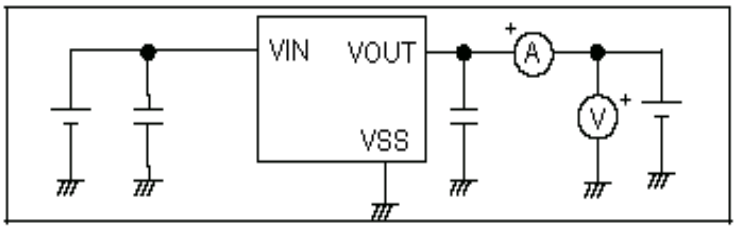
Circuit 1

2.



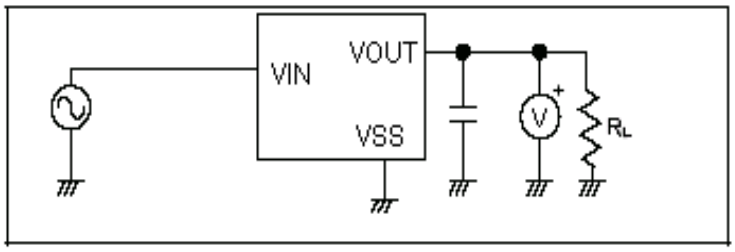
Circuit 2

3.



Circuit 3

4.



Circuit 4

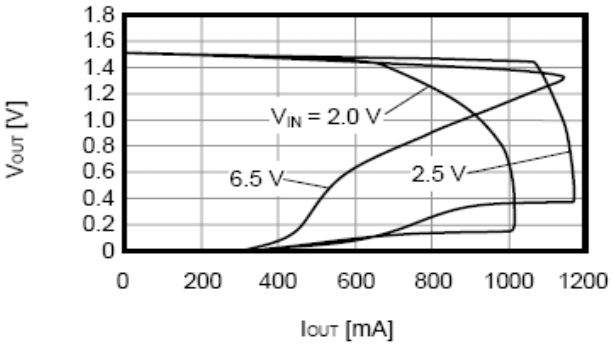
■ Electrical Characteristics

Item	Symbol	Condition		Min	Typ	Max	Unit	Test circuit
Output voltage	$V_{OUT(E)1}$	V_{IN} =$V_{OUT(S)}$+1.0 V, I_{OUT}=30 mA		$V_{OUT(S)}$ ×0.99	$V_{OUT(S)}$	$V_{OUT(S)}$ ×1.01	V	1
	$V_{OUT(E)2}$	V_{IN} =$V_{OUT(S)}$+1.0 V, I_{OUT}=80 mA		$V_{OUT(S)}$ ×0.98	$V_{OUT(S)}$	$V_{OUT(S)}$ ×1.02	V	
Outputcurrent*2	I_{OUT}	V_{IN}≥$V_{OUT(S)}$+1.0 V		500	—	—	mA	3
Dropout voltage	V_{drop}	I_{OUT}=100 mA	2.2 V ≤$V_{OUT(S)}$≤2.5 V	—	0.20	0.26	V	1
			2.6 V ≤$V_{OUT(S)}$≤3.3 V	—	0.15	0.22		
			3.4 V ≤$V_{OUT(S)}$≤5.5 V	—	0.12	0.18		
Line regulation	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}}$	$V_{OUT(S)}$+0.5 V ≤V_{IN}≤7 V I_{OUT}=80 mA		—	0.05	0.2	%/V	
Load regulation	ΔV_{OUT2}	V_{IN}=$V_{OUT(S)}$+1.0 V 1.0 mA ≤I_{OUT} ≤80 mA		—	20	40	mV	
temperature coefficient	$\frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}$	V_{IN}=$V_{OUT(S)}$+1.0 V, I_{OUT}=10 mA -40°C ≤ Ta ≤85°C		—	±100	—	ppm/℃	
Current consumption during operation	I_{SS1}	V_{IN}=$V_{OUT(S)}$+1.0 V,		—	60	120	μA	2
Input voltage	V_{IN}	——		2.0	—	7	V	—
Ripple rejection	|RR|	V_{IN}=$V_{OUT(S)}$+1.0 V，f=1.0 kHz Vrip=0.5 Vrms, I_{OUT}=80 mA		—	60	—	dB	4
Short-circuit current	I_{short}	V_{IN}=$V_{OUT(S)}$+1.0 V, ON/OFF pin ON,V_{OUT}=0 V		—	30	—	mA	3

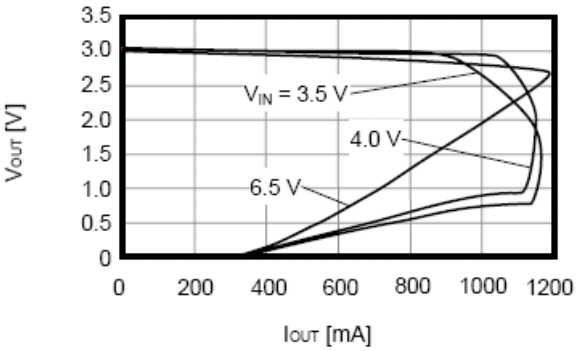
■ Typical Performance Characteristics

1、Output voltage VS. Output current (when load current increases)

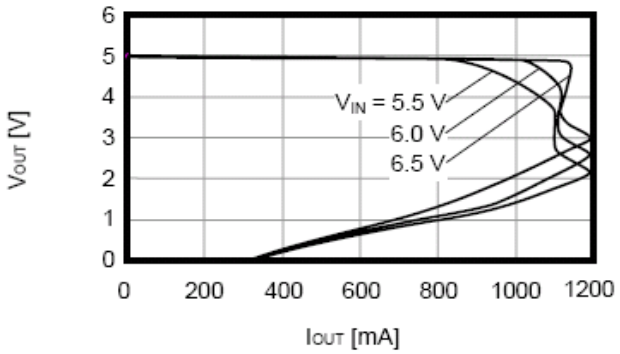
LN1250（1.5V）



LN1250（3.0V）



LN1250（5.0V）



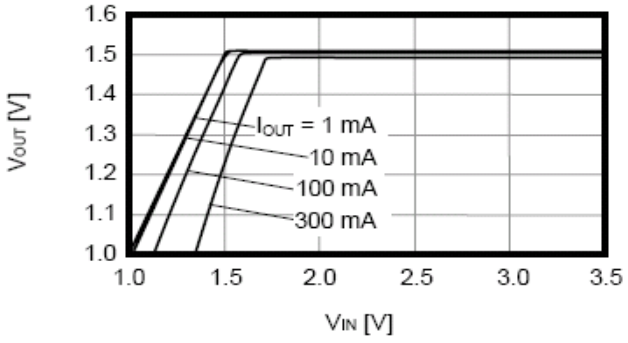
Remark： In determining the output current, attention should be paid to the following.

1) The minimum output current value and footnote *5 in the electrical characteristics

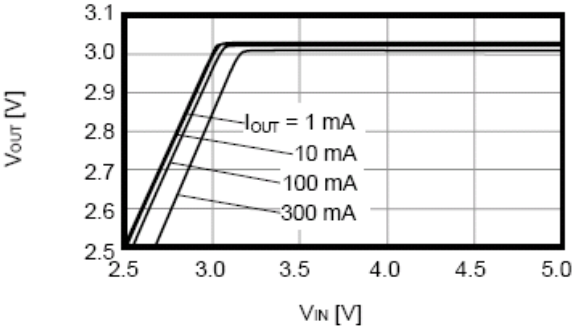
2) The package power dissipation

2、Output voltage VS. Input voltage

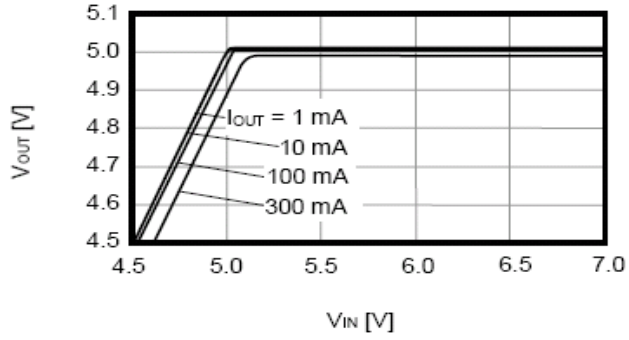
LN1250 （1.5V）



LN1250 （3.0V）

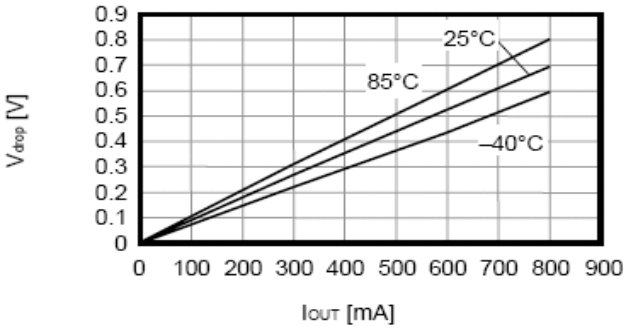


LN1250（5.0V）

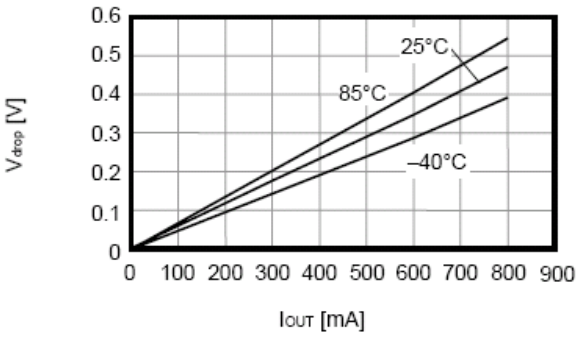


3、Dropout voltage vs. Output current

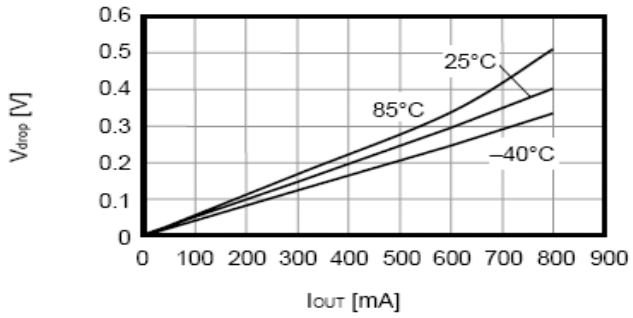
LN1250（1.5V）



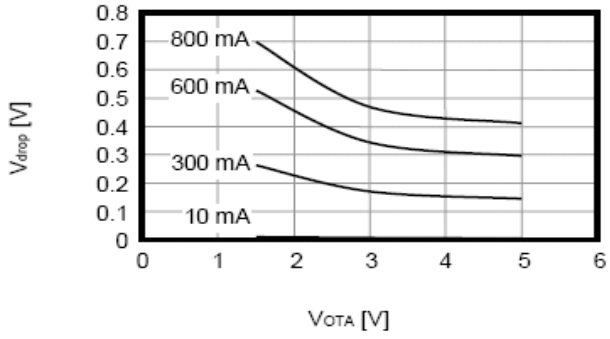
LN1250（3.0V）



LN1250（5.0V）

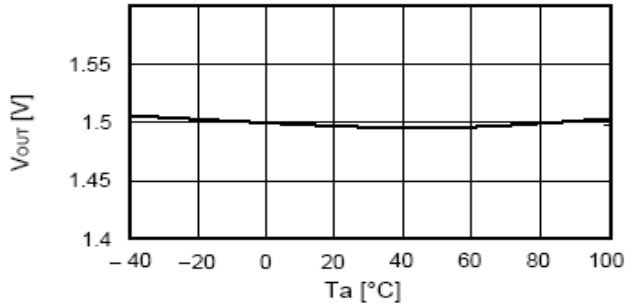


4、Dropout voltage VS. set output voltage

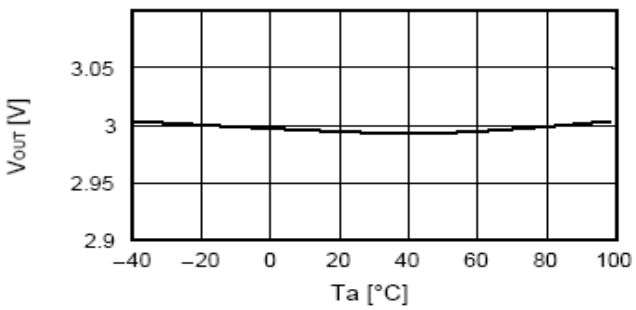


5、Output voltage VS. Ambient temperature

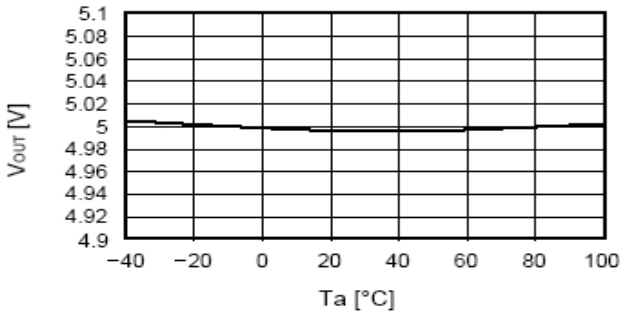
LN1250（1.5V）



LN1250（3.0V）

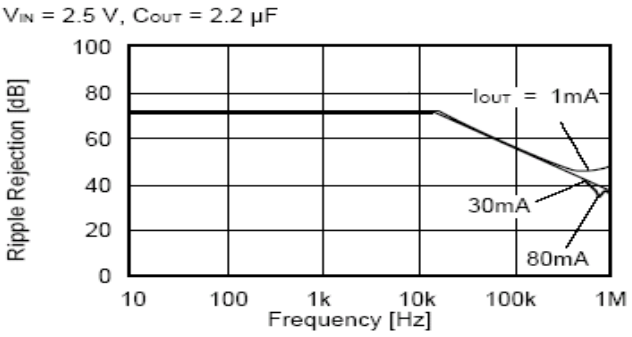


LN1250（5.0V）

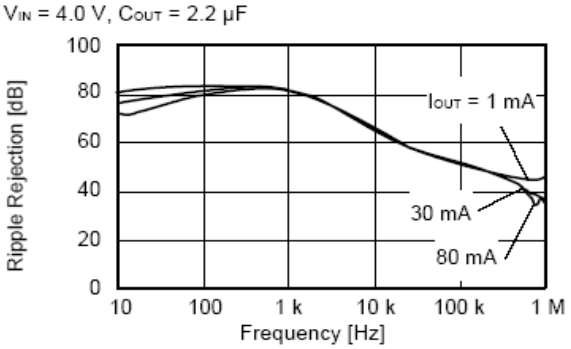


6、 Ripple rejection

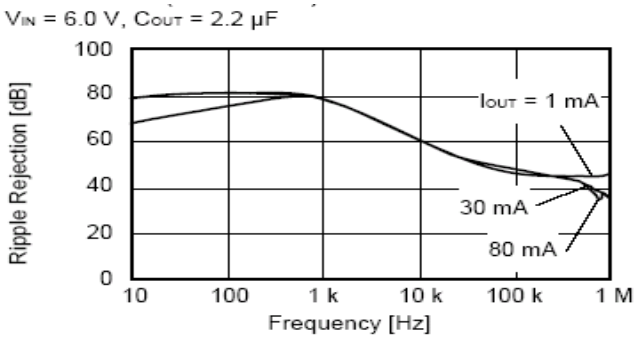
LN1250（1.5V）



LN1250（3.0V）

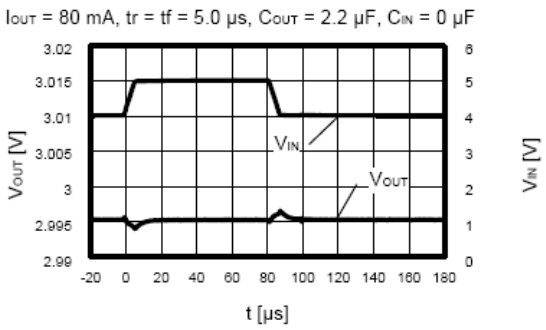


LN1250（5.0V）

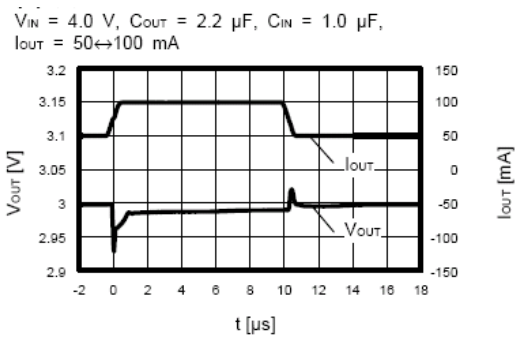


7、Transient response characteristics

Input transient response characteristics

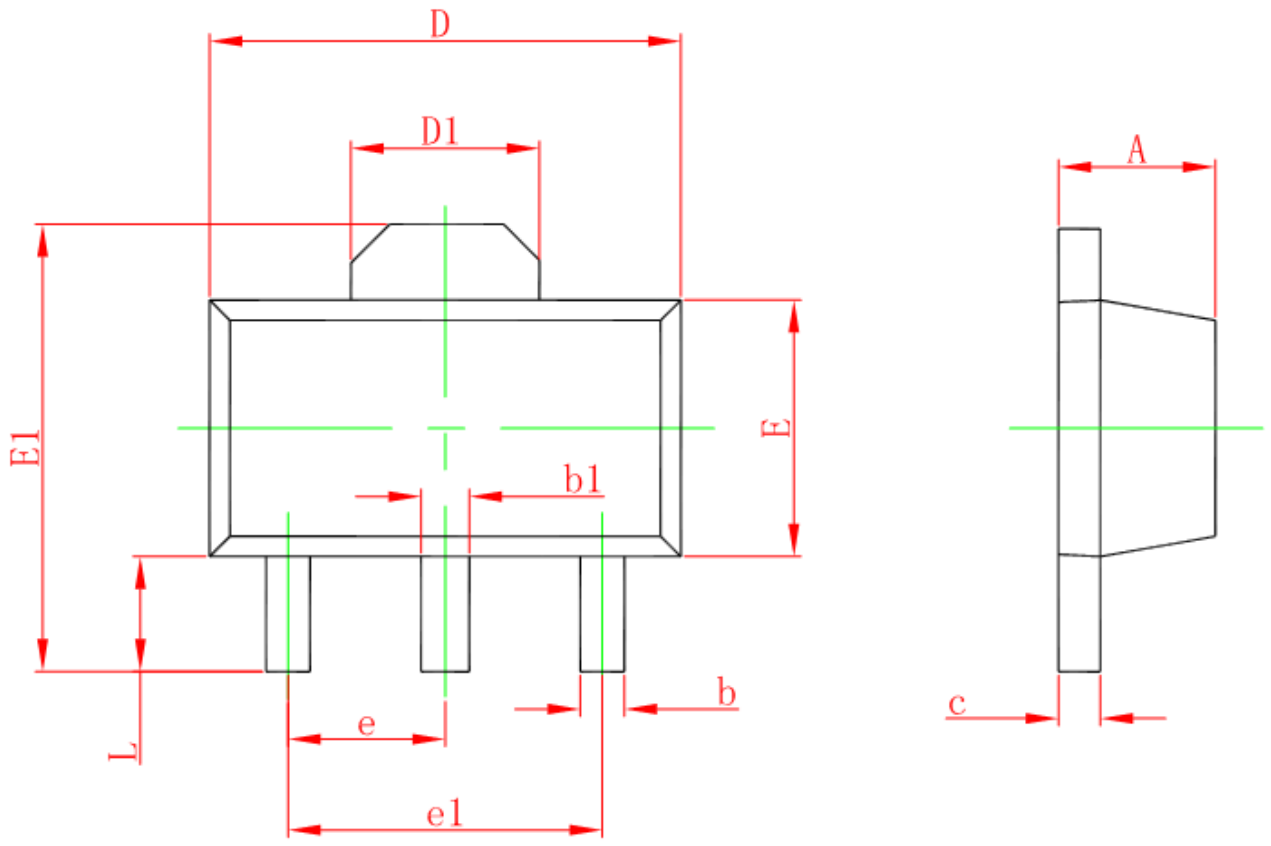


Load transient response characteristics



■ Package Information

- **SOT-89-3L**



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	0.400	0.580	0.016	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.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047