High Speed Low Dropout Middle Current Voltage Regulators

■ General Description

The LN5052 series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves high ripple rejection and low dropout and consists of a standard voltage source, an error correction, current limiter and a phase compensation circuit plus a driver transistor. Output voltage is selectable in 100mV increments within a range of 1.1V ~ 5.0V. The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series.

The current limiter's feedback circuit also operates as a short protect for the output current limiter and the output pin The CE function enables the output to be turned off, resulting in greatly reduced power consumption.

■ Package

- SOT-23-5L

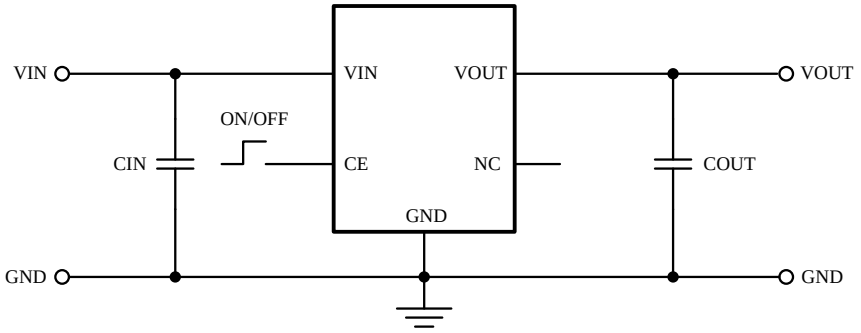
■ Features

- Output Voltage Range: 1.1V to 5.0V (selectable in 100mV steps)
- Highly Accurate: ± 2%
- Dropout Voltage: 100mV @ 100mA (3.0V type)
- High Ripple Rejection: 60dB (1 kHz)
- Low Power Consumption: 60μA (TYP.)
- Maximum Output Current : 500mA (V_{IN}≥V_{OUT}+1v)
- Standby Current : less than 1.0μA
- Internal protector: current limiter
- Internal discharge MOS

■ Applications

- Mobile phones
- Cordless phones
- Cameras, Video cameras
- Portable games
- Portable AV equipment
- Reference voltage
- Battery powered equipment

■ Typical Application Circuit



Caution: 1. The above connection diagram and constant will not guarantee successful operation. Perform thorough evaluation using the actual application to set the constant.

2. Input capacitor (CIN): 2.2μF or more, Output capacitor (COUT): 2.2μF or more

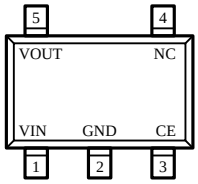
3. A general series regulator may oscillate, depending on the external components selected. Check that no oscillation occurs with the application using the above capacitor.

■ Ordering Information

LN5052BXXXMX-G

- Green material
- Device Orientation
  - R Standard Feed
  - L Reverse Feed
- Package
  - M SOT-23-5L
- Output Voltage Accuracy：
  - 2 ±2%
- Output VOltage:
  - 12 1.2V
  - 15 1.5V
  - 18 1.8V
  - 25 2.5V
  - 27 2.7V
  - 28 2.8V
  - 29 2.9V
  - 30 3.0V
  - 33 3.3V

■ Pin Configuration



SOT-23-5L
(TOP VIEW)

■ Pin Assignment

Pin Number SOT-23-5L	Pin Name	Function
1	VIN	Supply power
2	GND	Ground
3	CE	Enable pin
4	NC	NC
5	VOUT	Voltage output

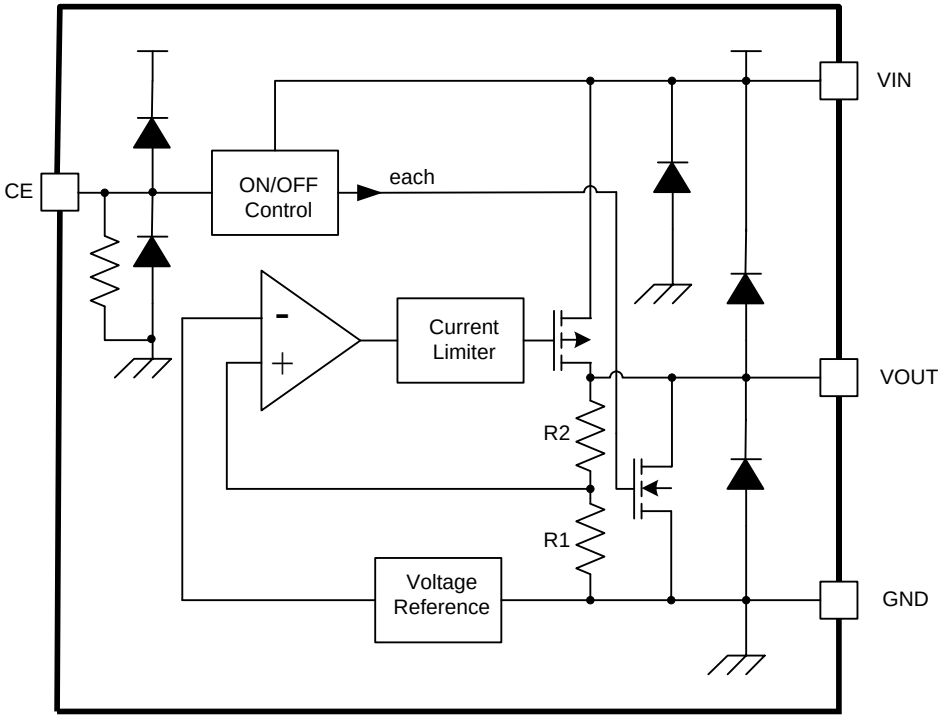
■ Marking Rule

Product Name	V_{OUT}(V)	Package	Mark	Output voltage accuracy
LN5052B122MR-G	1.2V	SOT23-5L	&3B④	±2%
LN5052B152MR-G	1.5V	SOT23-5L	&3E④	±2%
LN5052B182MR-G	1.8V	SOT23-5L	&3K④	±2%
LN5052B252MR-G	2.5V	SOT23-5L	&3T④	±2%
LN5052B272MR-G	2.7V	SOT23-5L	&3V④	±2%
LN5052B292MR-G	2.8V	SOT23-5L	&3X④	±2%
LN5052B282MR-G	2.9V	SOT23-5L	&3Y④	±2%
LN5052B302MR-G	3.0V	SOT23-5L	&3Z④	±2%
LN5052B332MR-G	3.3V	SOT23-5L	&42④	±2%
LN5052B362MR-G	3.6V	SOT23-5L	&3A④	±2%

④ **According to the product batch number**

Using the Numbers 0 to 9, letters a-z said LN5052 batch number

■ Function Block Diagram



■ Absolute Maximum Ratings

Parameter	Symbol	Maximum Rating		Unit
Input Voltage	V_{IN}	-0.3～+8		V
	$V_{ON/OFF}$	-0.3～V_{IN}+0.3		
Output Voltage	V_{OUT}	-0.3～V_{IN}+0.3		
Power Dissipation	P_D	SOT-23-5L	400	mW
Operating Ambient Temperature	Topr	-40～+85		℃
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.

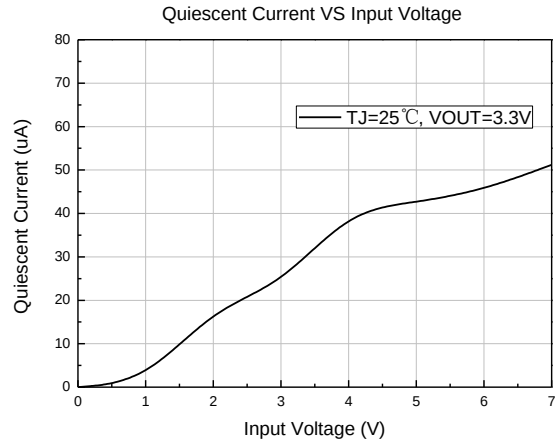
■ Electrical Characteristics

(TA=25℃ unless otherwise noted)

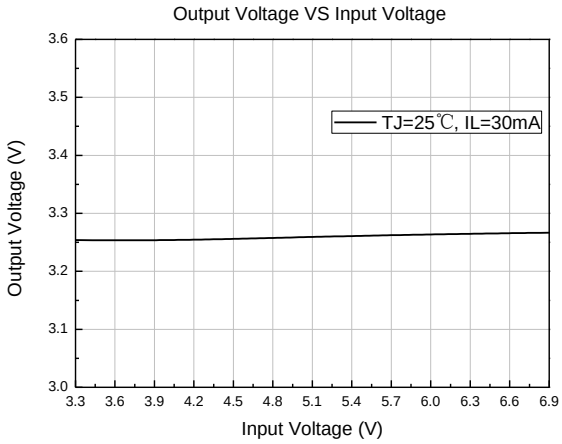
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Output Voltage	$V_{OUT(E)}$	V_{IN} =$V_{OUT(S)}$+1.0 V, I_{OUT}=30 mA	$V_{OUT(S)}$ ×0.98	$V_{OUT(S)}$	$V_{OUT(S)}$ ×1.02	V
Output Current	I_{OUT}	V_{IN}≥$V_{OUT(S)}$+1.0 V	500	-	-	mA
Dropout Voltage	V_{drop}	I_{OUT}=50 mA	-	0.05	0.10	V
		I_{OUT}=100 mA	-	0.1	0.15	
Line Regulations	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}}$	$V_{OUT(S)}$+0.5 V ≤V_{IN}≤7 V I_{OUT}=30 mA	-	0.10	0.20	%/V
Load Regulation	ΔV_{OUT2}	V_{IN}=$V_{OUT(S)}$+1.0 V 1.0 mA ≤I_{OUT} ≤100 mA	-	10	20	mV
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}$	V_{IN}=$V_{OUT(S)}$+1.0 V, I_{OUT}=10 mA -40°C ≤Ta ≤85°C	-	±100	-	ppm/℃
Supply Current	I_{SS1}	V_{IN}=$V_{OUT(S)}$+1.0 V	-	60		μA
Input Voltage	V_{IN}	-	2.0	-	7	V
Ripple-Rejection	|PSRR|	V_{IN}=$V_{OUT(S)}$+1.0 V，f=1 kHz Vrip=0.5 Vrms, I_{OUT}=50 mA	-	60	-	dB
CE “High” Voltage	V_{CEH}	-	1.6	-	-	V
CE “Low” Voltage	V_{CEL}	-	-	-	0.5	V
CE “High”Current （no resistor built in）	I_{CEH}	VIN=VCE=VOUT(T)+1.0V	-0.1	-	0.1	μA
CE “Low” Current （no resistor built in）	I_{CEL}	VIN= VOUT(T)+1.0V, VCE=VSS	-0.1	-	0.1	μA
Inrush Current	I_{RUSH}	V_{IN}= $V_{OUT(T)}$+1V, CL=47uF, V_{CE}=0→ $V_{OUT(T)}$+1V(Only when rising and within 1ms)	-	800	-	mA

■ Typical Performance Characteristics （3.3V output）

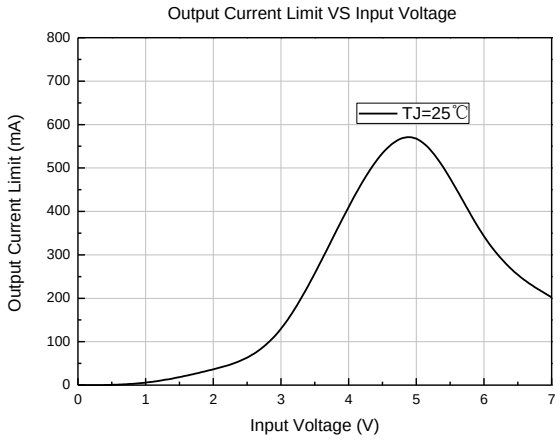
1. Quiescent Current VS Input Voltage



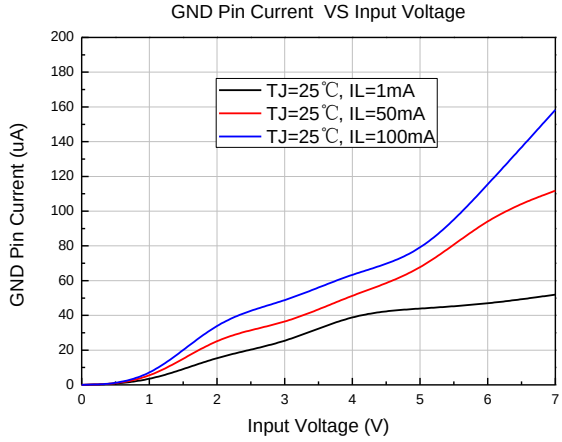
2. Output Voltage VS Input Voltage



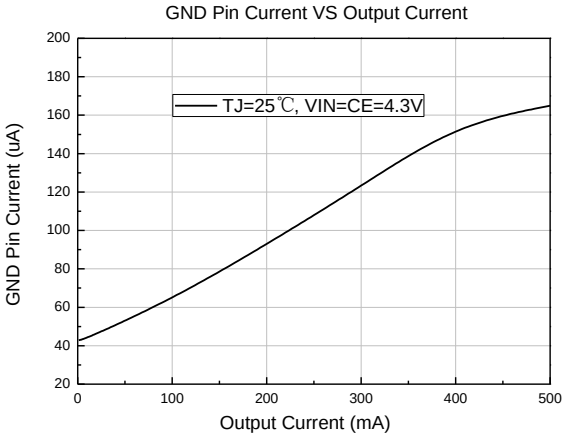
3. Output Current Limit VS Input Voltage



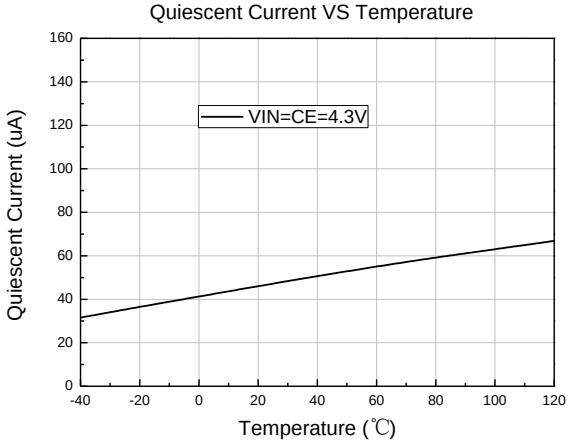
4. GND Pin Current VS Input Voltage



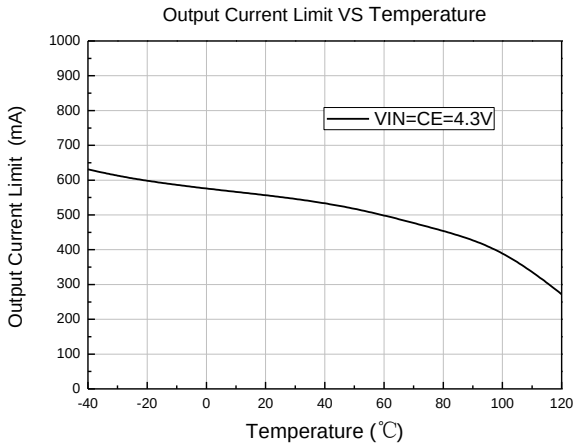
5. GND Pin Current VS Output Current



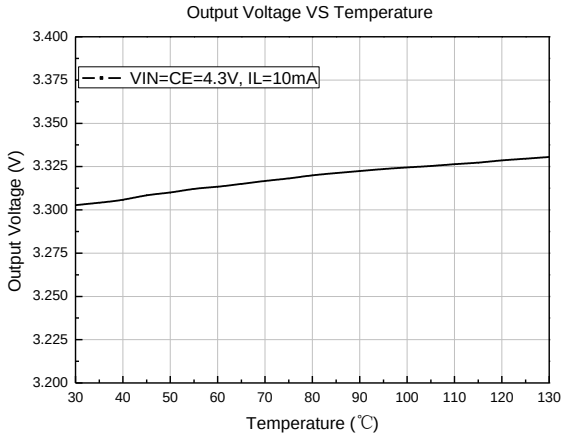
6. Quiescent Current VS Temperature



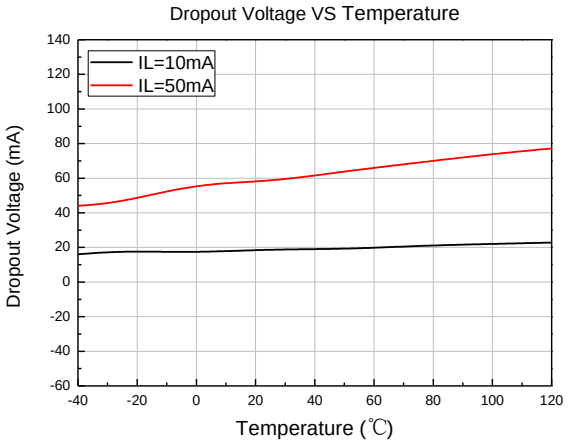
7. Output Current Limit VS Temperature



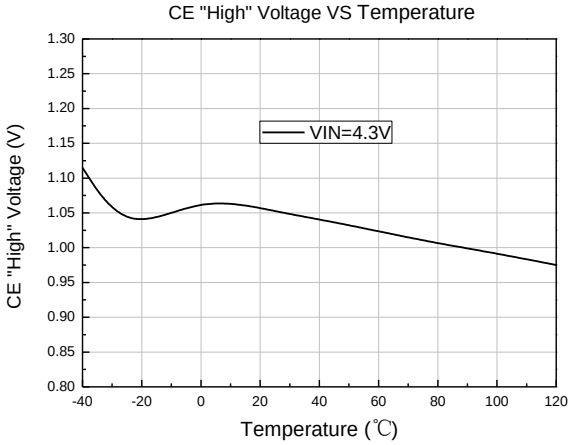
8. Output Voltage VS Temperature



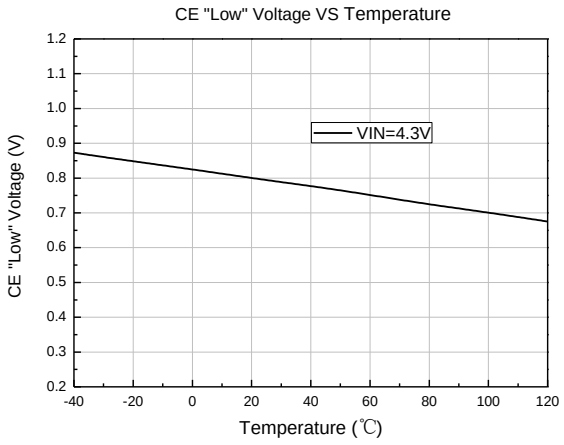
9. Dropout Voltage VS Temperature



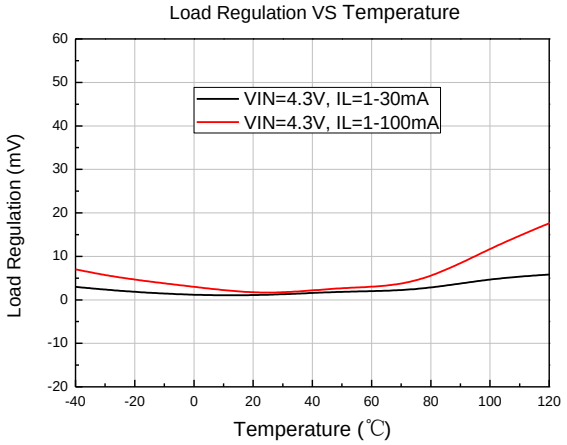
10. CE "High" Voltage VS Temperature



11. CE "Low" Voltage VS Temperature

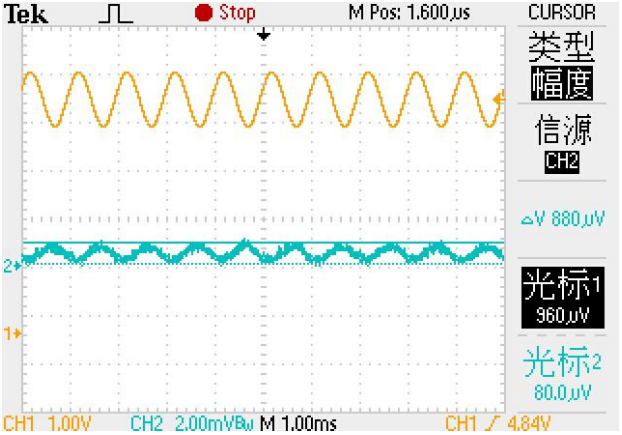


12. Load Regulation VS Temperature

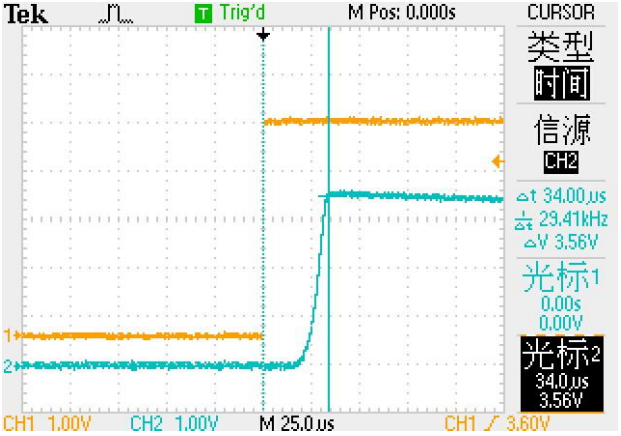


13. Input voltage transient response (IL=30mA)

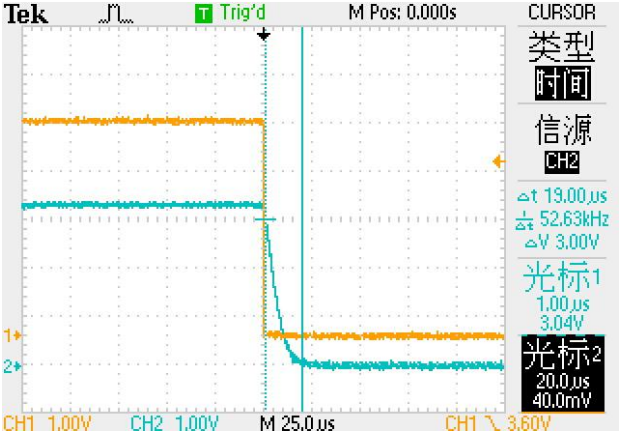
14. Ripple-Rejection (IL=50mA, Vpp=1V, F=1KHZ)



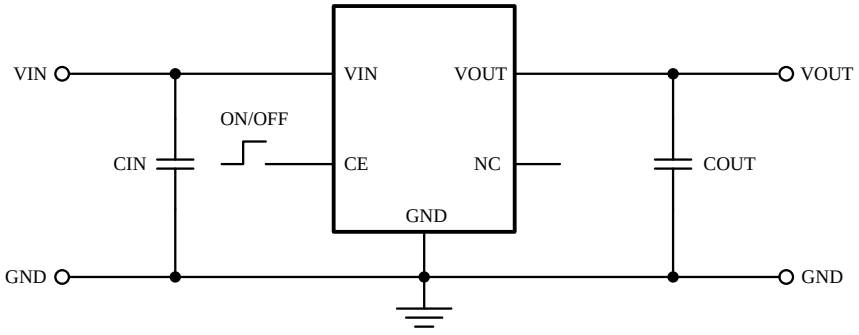
15. CE Opening Time



16. CE Turn-off Time



■ Application information



- **Setting the Input Capacitor and the Output Capacitor**

Input capacitors（CIN）and output capacitors(COUT) are recommended to use more than 2.2uF, which can ensure the stability of the system

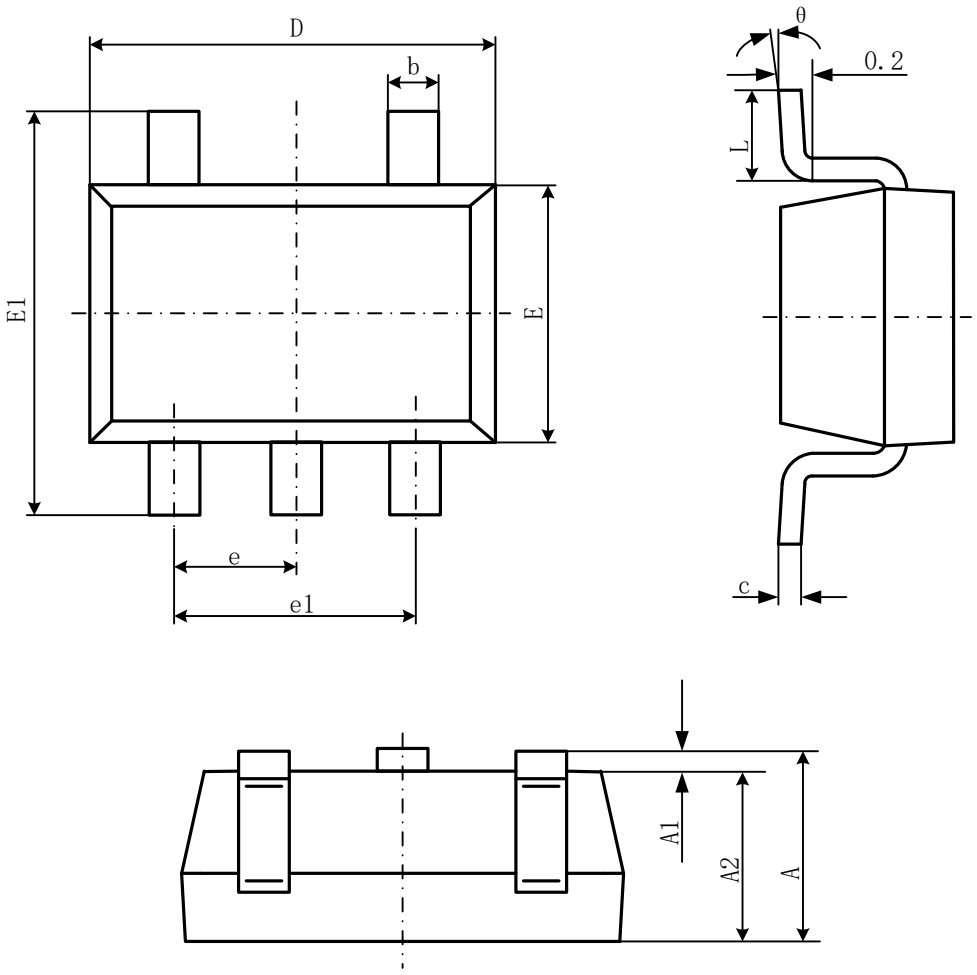
- **PCB Layout**

In order to get better use effect, the main points for attention of PCB layout are as follows:

- The input and output capacitors are as close as possible to the chip pins.
- The wiring of VIN and VOUT should be as thick as possible to reduce the wiring resistance and improve the load performance.
- The route from GND(pin) to GND uses a dedicated channel to prevent parasitic resistance from introducing into the change path, which results in incorrect feedback ratio and output error.

■ Package Information

- **SOT-23-5L**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°