

Features

- Low voltage drop: 0.17V@100mA
- High input voltage: 15V
- Low temperature coefficient
- Large Output Current: >0.5A
- Low Quiescent Current: 2.0uA
- Output voltage accuracy: tolerance $\pm 2\%$
- Built-in current limiter
- SOT89-3,SOT89-5,SOT23-3 and SOT23-5 packages

Applications

- Portable, Battery Powered Equipment
- Smoke detector and sensor
- Audio/Video Equipment
- Weighting Scales

General Description

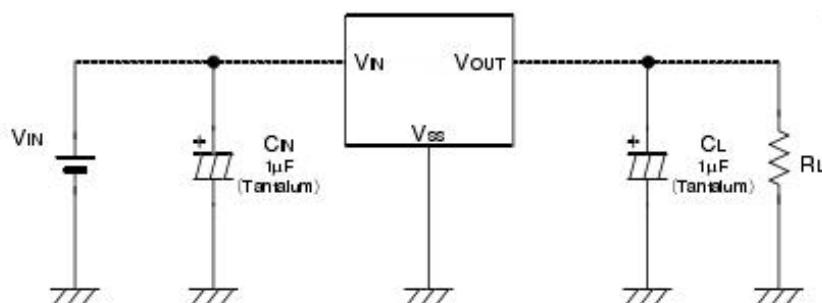
The HE62xx series is a group of positive voltage output, three-pin regulators, that provide a high current even when the input/output voltage differential is small. Low power consumption and high accuracy is achieved through CMOS and laser trimming technologies. The HE62xx consists of a high-precision voltage reference, an error amplification circuit, and a current limited output driver. Transient response to load variations have improved in comparison to the existing series. SOT89-3, SOT89-5,SOT23-3 and SOT23-5 packages are available.

Order Information

HE62①②③④⑤

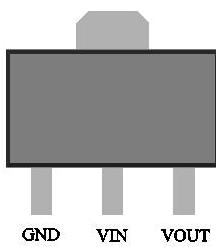
Designator	Symbol	Description
①②	Integer	Output Voltage(1.8~5.0V)
③	M	Standard
④	P	Package:SOT89-3
	PB	Package:SOT89B-3
	P5	Package:SOT89-5
	M	Package:SOT23-3
⑤	M5	Package:SOT23-5
	R	RoHS / Pb Free
	G	Halogen Free

Typical Application

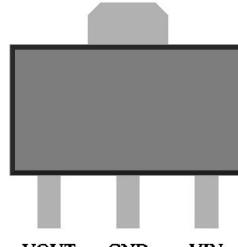


Pin Assignment

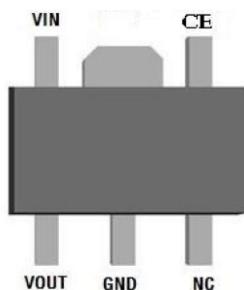
SOT89-3 (TOP view)



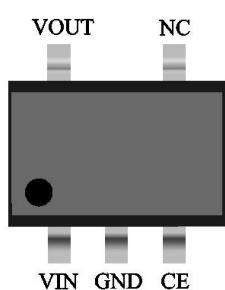
SOT89B-3 (TOP view)



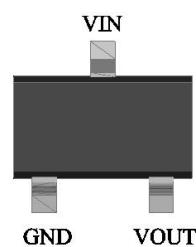
SOT89-5 (TOP view)



SOT23-5 (Top view)



SOT23-3 (Top view)



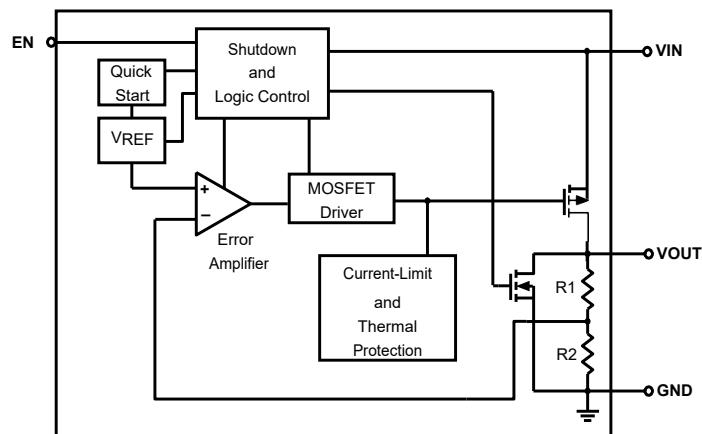
Selection Table

Part No.	Output Voltage	Package	Marking
HE6218MMR	1.8V	SOT23-3	Refer to Marking rule
HE6228MMR	2.8V	SOT23-3	
HE6230MMR	3.0V	SOT23-3	
HE6233MMR	3.3V	SOT23-3	
HE6236MMR	3.6V	SOT23-3	
HE6240MMR	4.0V	SOT23-3	
HE6244MMR	4.4V	SOT23-3	
HE6250MMR	5.0V	SOT23-3	
HE6230MM5R	3.0V	SOT23-5	
HE6233MM5R	3.3V	SOT23-5	
HE6236MM5R	3.6V	SOT23-5	
HE6240MM5R	4.0V	SOT23-5	
HE6244MM5R	4.4V	SOT23-5	
HE6250MM5R	5.0V	SOT23-5	

Selection Table

Part No.	Output Voltage	Package	Marking
HE6218MPR	1.8V	SOT89-3	Refer to Marking rule
HE6228MPR	2.8V	SOT89-3	
HE6230MPR	3.0V	SOT89-3	
HE6233MPR	3.3V	SOT89-3	
HE6236MPR	3.6V	SOT89-3	
HE6240MPR	4.0V	SOT89-3	
HE6244MPR	4.4V	SOT89-3	
HE6250MPR	5.0V	SOT89-3	
HE6230MPBR	3.0V	SOT89B-3	
HE6233MPBR	3.3V	SOT89B-3	
HE6250MPBR	5.0V	SOT89B-3	

Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply Input Voltage	V _{IN}	-0.3 ~ 18	V
EN to GND	V _{EN}	-0.3 ~ 18	V
Regulated Output Voltage	V _{OUT}	-0.3 ~ 6	V
Output Current	I _{OUT}	Internally limited	mA
Power Dissipation P _D @T _A =+25°C	SOT23-3	450	mW
	SOT23-5	500	
	SOT89-3	500	
	SOT89B-3, SOT89-5	700	
Thermal Resistance (Junction to air)	SOT23-3	275	°C /W
	SOT23-5	250	
	SOT89-3	130	
	SOT89B-3, SOT89-5	125	
Human Body Model (HBM)		4000	V
Charged Device Mode (CDM)		2000	V
Machine Mode (MM)		200	V
Storage Temperature Range	T _{STG}	-65 ~ +150	°C
Operating Junction Temperature	T _J	+150	°C
Lead Temperature (Soldering 10s)	T _{LEAD}	+260	°C

Note:

- 1、Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these conditions is not implied. Exposure to absolute-maximum-rated conditions for extended period may affect device reliability.
- 2、Ratings apply to ambient temperature at +25°C
- 3、The package thermal impedance is calculated in accordance to JESD 51-7.

Recommended Operating Conditions

Item	Min	Max	Unit
Operating Ambient Temperature	-40	+85	°C
Input voltage V _{IN}	2.5	18	V
Output Voltage	1.8	5.0	V

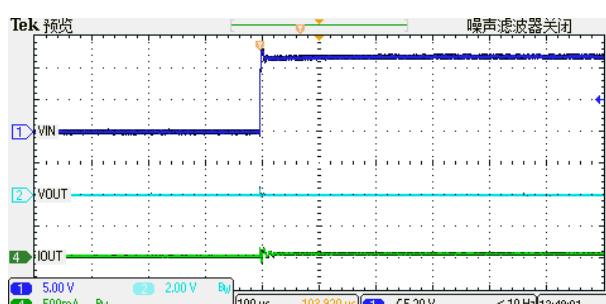
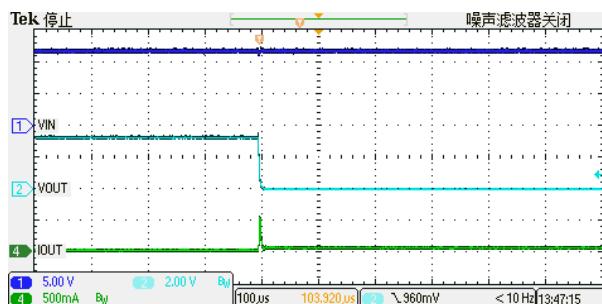
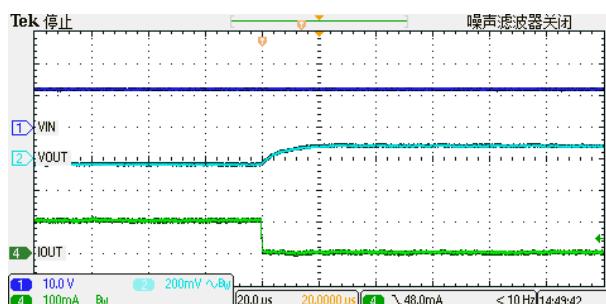
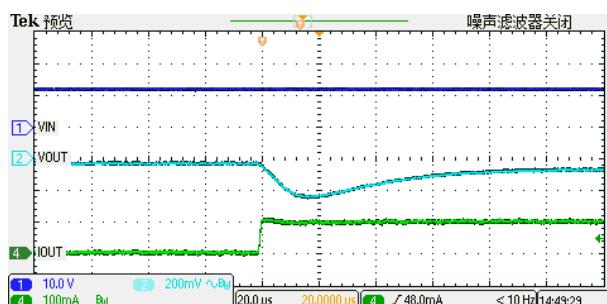
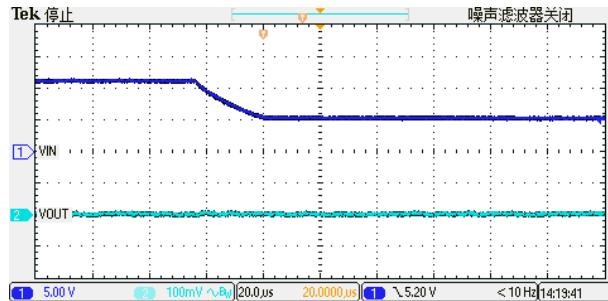
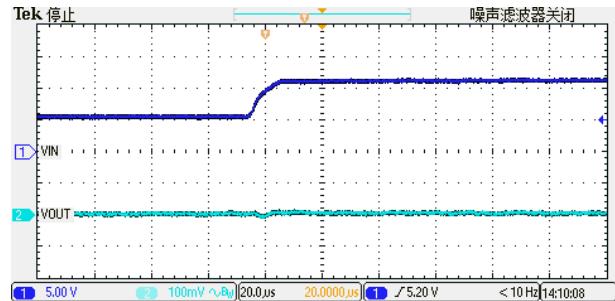
Electronic Characteristics

Test Conditions: $V_{IN} = V_{OUT} + 1V$, $C_{IN} = C_{OUT} = 1\mu F$, $TA = 25^\circ C$, unless otherwise specified

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Input Voltage	V_{IN}			2.5	—	18	V
Supply Current	I_Q	$V_{IN} = 12V$; $I_{LOAD} = 0mA$		—	2	—	μA
Stand-by Current	I_{SD}	$EN = 0V$; $V_{OUT} = 0V$		0	0.2	—	μA
Output Voltage	V_{OUT}	$V_{IN} = 12V$; $I_{LOAD} = 10mA$		$V_{OUT} * 0.99$	—	$V_{OUT} * 1.01$	V
Output Current	I_{OUT}	$V_{IN} = V_{OUT} + 1V$		500	—	—	mA
Dropout Voltage $V_{OUT} = 3.3V$	V_{DROP}	$I_{LOAD} = 100mA$		—	150	—	mV
		$I_{LOAD} = 300mA$		—	400	—	
		$I_{LOAD} = 500mA$		—	700	—	
Line Regulation	$\Delta V_{OUT} / \Delta V_{IN} * V_{OUT}$	$I_{LOAD} = 10mA$ $V_{OUT} + 1.0V \leq V_{IN} \leq 20V$		—	0.05	—	% / V
Load Regulation	ΔV_{OUT}	$V_{IN} = V_{OUT} + 1V$ $1mA \leq I_{LOAD} \leq 100mA$		—	5	20	mV
EN Threshold Voltage	V_{CEH}	CE "High" Voltage		1.5	—	—	V
	V_{CEL}	CE "Low" Voltage		—	—	0.4	V
EN PIN Current	I_{EN}			—	0	—	μA
Current Limit	I_{LIMIT}			—	—	750	mA
Short Current	I_{SHORT}	$V_{OUT} = GND$		—	100	—	mA
Output Noise Voltage	V_{ON}	$C_{OUT} = 1\mu F$; $I_{LOAD} = 10mA$ $BW = 10Hz \sim 100kHz$		—	50	—	μV_{RMS}
Power Supply Rejection Rate	PSRR	$V_{IN} = 4.3V$, $V_{OUT} = 3.3V$, $I_{LOAD} = 10mA$	$f = 100Hz$	—	85	—	dB
			$f = 1kHz$	—	70	—	dB
			$f = 10kHz$	—	50	—	dB
Thermal Shutdown Temperature	T_{SHDN}			—	160	—	$^\circ C$
Thermal Shutdown Hysteresis	ΔT_{SHD}			—	20	—	$^\circ C$

Note : All limits specified at room temperature ($TA = 25^\circ C$) unless otherwise specified. All room temperature limits are 100% production tested. All limits at temperature extremes are ensured through correlation using standard Statistical Quality Control (SQC) methods. All limits are used to calculate Average Outgoing Quality Level (AOQL).

Typical Performance Characteristics



Application Guideline

■ Input Capacitor

$A \geq 1\mu F$ ceramic capacitor is recommended to connect between VIN and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both VIN and GND.

■ Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is $\geq 1\mu F$, ceramic capacitor is recommended, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to VOUT and GND pins.

■ Dropout Voltage

The dropout voltage refers to the voltage difference between the VIN and VOUT pins while operating at specific output current. The dropout voltage V_{DROP} also can be expressed as the voltage drop on the pass-FET at specific output current (I_{RATED}) while the pass-FET is fully operating at ohmic region and the pass-FET can be characterized as an resistance $R_{DS(ON)}$. Thus the dropout voltage can be defined as ($V_{DROP} = V_{IN} - V_{OUT} = R_{DS(ON)} \times I_{RATED}$). For normal operation, the suggested LDO operating range is ($V_{IN} > V_{OUT} + V_{DROP}$) for good transient response and PSRR ability. Vice versa, while operating at the ohmic region will degrade the performance severely.

■ Thermal Application

For continuous operation, do not exceed the absolute maximum junction temperature. The maximum power dissipation depends on the thermal resistance of the IC package, PCB layout, rate of surrounding airflow, and difference between junction and ambient temperature. The maximum power dissipation can be calculated as below:

$T_A = 25^\circ C$, AISIS DEMO PCB,

The max $P_D = (T_j - T_A) / \theta_{JA}$.

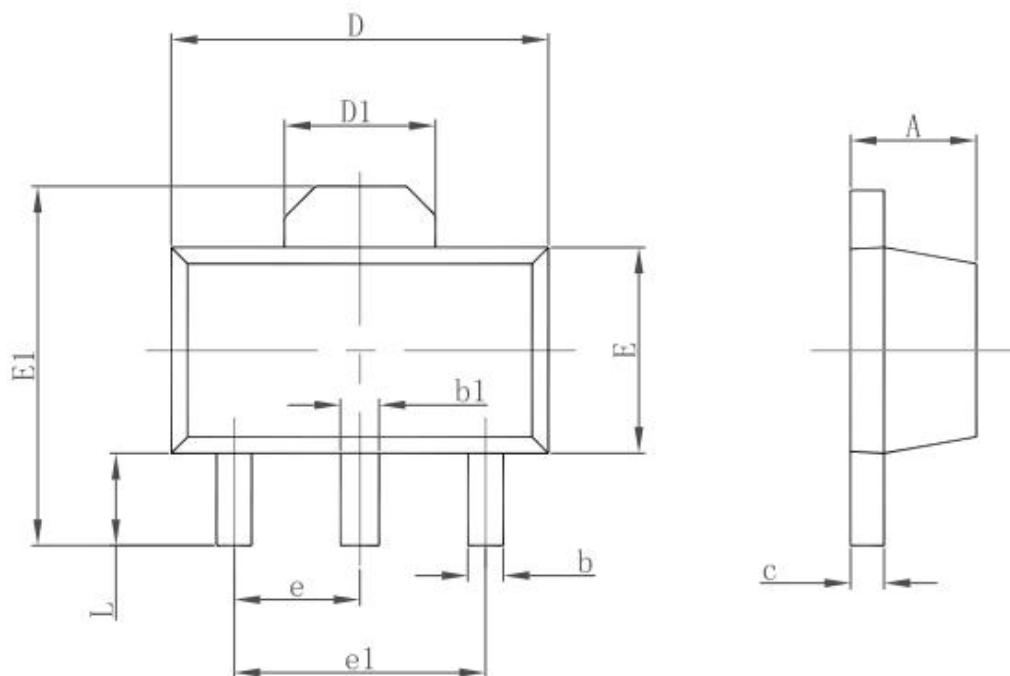
Power dissipation (P_D) is equal to the product of the output current and the voltage drop across the output pass element, as shown in the equation below:

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$$

■ Layout Consideration

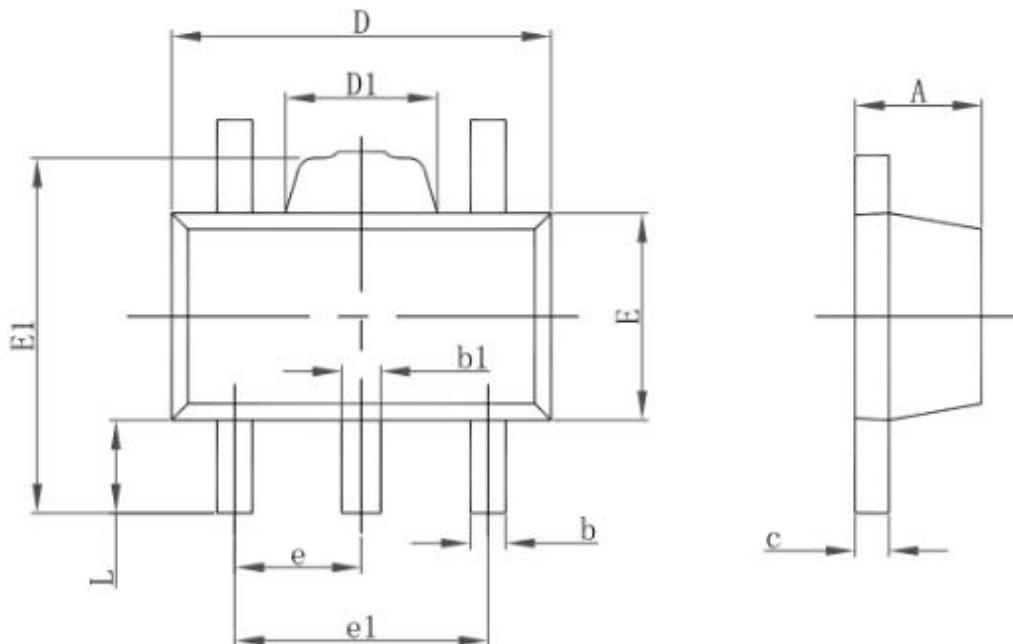
By placing input and output capacitors on the same side of the PCB as the LDO, and placing them as close as is practical to the package can achieve the best performance. The ground connections for input and output capacitors must be back to the HE62xx ground pin using as wide and as short of a copper trace as is practical. Connections using long trace lengths, narrow trace widths, and/or connections through via must be avoided. These add parasitic inductances and resistance that results in worse performance especially during transient conditions.

Package Information
3-pin SOT89 Outline Dimensions



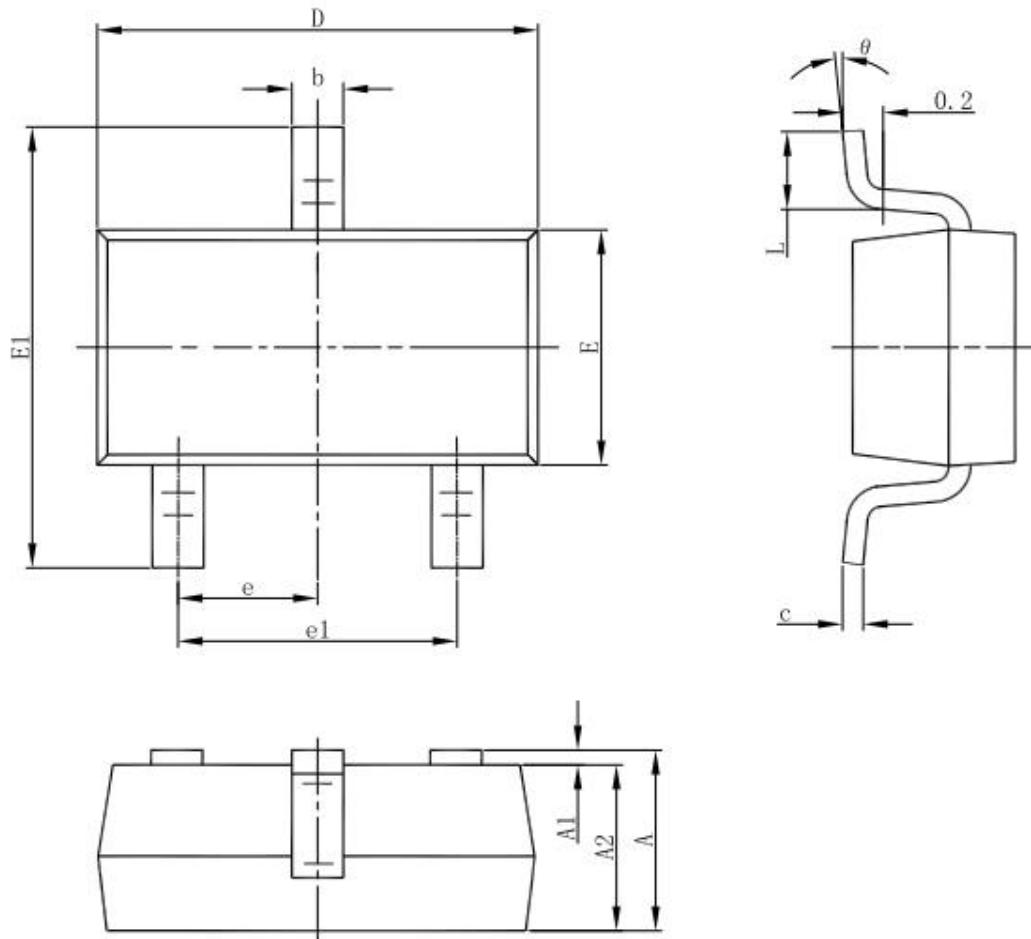
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047

SOT89-5 Outline Dimensions



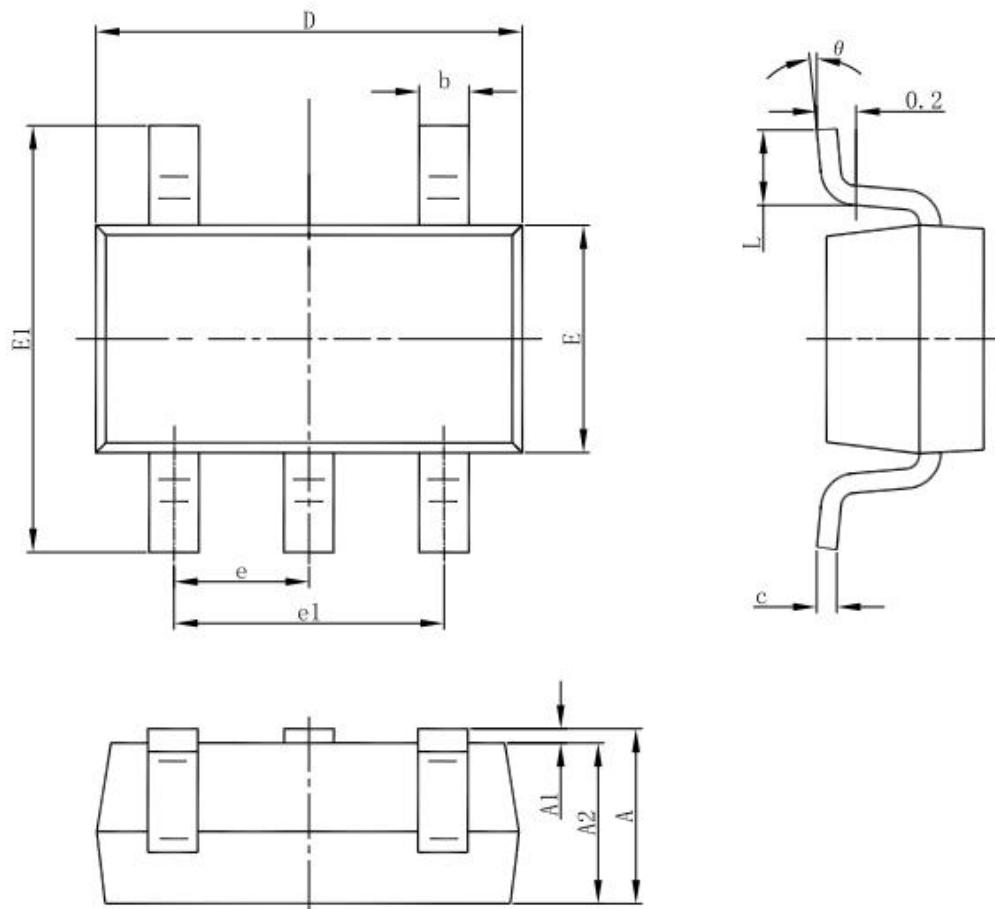
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.360	0.560	0.014	0.022
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.400	1.800	0.055	0.071
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500TYP.		0.060TYP.	
e1	2.900	3.100	0.114	0.122
L	0.900	1.100	0.035	0.043

3-pin SOT23-3 Outline Dimensions



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°

SOT23-5 Outline Dimensions



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°