1.1MHz Rail-To-Rail I/O CMOS Operational Amplifier

Description

The LN8541, LN8542, LN8544 (single channel, dual channel, four channel)are rail-to-rail input and output voltage feedback amplifier offering low cost. It has a wide input common-mode voltage range and output voltage swing, and takes the minimum operating supply voltage down to 2.1V and the maximum recommended supply voltage is 5.5V. All are specified over the extended –40°C to +125°C temperature range.

The series of LN854X provides 1.1MHz bandwidth at a low current consumption of 42μA per amplifier. Very low input bias currents of 0.5 pA, enable LN8541 to be used for integrators, photodiode amplifiers, and piezoelectric sensors. Rail-to-rail inputs and outputs are useful to designers buffering ASIC in single-supply systems.

Applications for these amplifiers include safety monitoring, portable equipment, battery and power supply control, and signal conditioning and interfacing for transducers in very low power systems.

Package

- SOP8/MSOP8
- TSSOP14
- SOT23-5L

Applications

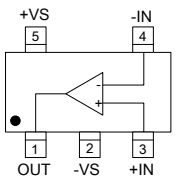
- ASIC input or output amplifiers
- Audio Output
- Handheld devices
- Mobile phones
- Notebook
- PCMCIA card
- Battery-powered devices

Features

- Low cost
- Rail-to-Rail input / output
- Unity-gain stable
- Slew rate: 0.52 (V/μs)
- Minimum power supply rejection ratio: 72dB
- Minimum common mode rejection ratio: 76dB
- Offset voltage: typically 0.8mV, 3.5mV maximum
- Gain bandwidth product: 1.1MHz
- Very low input bias current: 0.5pA
- Operating voltage range: 2.1V to 5.5V
- Input voltage range: 0.1V to +5.6 V (V_S = 5.5V)
- Quiescent current: 42μA (single)

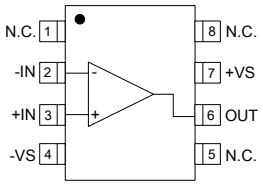
Pin Configuration

LN8541MR



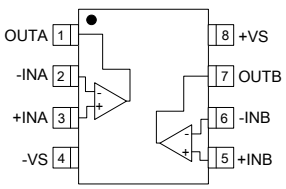
(SOT-23-5L)

LN8541SR/LN8541MMR



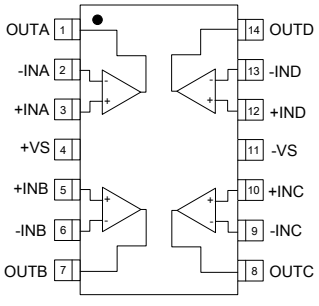
(SOP-8/MSOP-8)

LN8542SR/LN8542MMR



(SOP-8/MSOP-8)

LN8544SSR/LN8544TSR



(TSSOP-14)

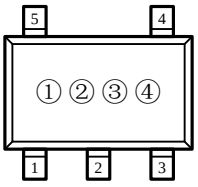
■ Ordering Information

LN854①②③-④

Designator	Symbol	Description
①	—	**Product name**
	1	LN8541
	2	LN8542
	4	LN8544
②	—	**Package**
	M	SOT23-5L
	S	SOP-8
	MM	MSOP-8
	TS	TSSOP-14
③	—	**Embossed Tape**
	R	Standard Feed
	L	Reverse Feed
④	G	Green epoxy molding compound

■ Marking Rule

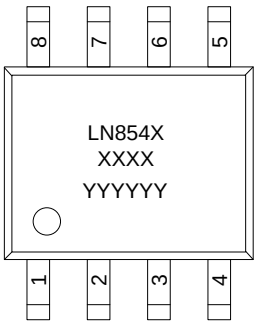
- SOT23-5L



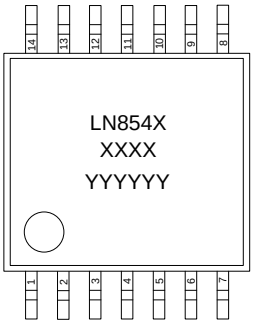
SOT23-5L
(TOP VIEW)

Designator	Symbol	Description
①②	41	Represent LN8541MR
③	Production definition	Indicates wafer version information
④	Production definition	Indicates the company's internal quality tracking information

- SOP8/MSOP8/TSSOP14



SOP8/MSOP8
(TOP VIEW)



TSSOP14
(TOP VIEW)

Designator	Symbol	Description
LN854X	LN5841/LN8542/LN8544	Represent LN8541/LN8542/LN8544
XXXX	Production definition	Indicates wafer version information
YYYYYY	Production definition	Indicates the company's internal quality tracking information

■ Absolute Maximum Ratings

Parameter	Symbol	Maximum Rating	Unit
Supply voltage	V_{DD}	7.5	V
Common-mode input voltage	V_{CM}	(-VS)-0.5 to (+VS)+0.5	V
Storage temperature	Tstg	-55—150	℃
Junction temperature	—	150	℃
ESD susceptibility	HBM	4000	V
	MM	400	V

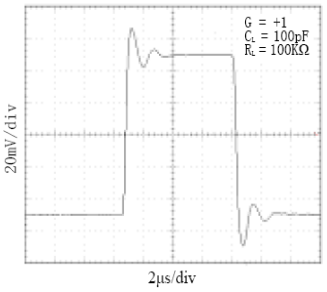
■ Electrical Specifications(TA=25℃ unless otherwise noted)

（The following parameters for the single channel parameters. Two channel and four channel can refer to it. V_S=+5V R_L=100KΩ $V_{OUT}=V_S/2$）

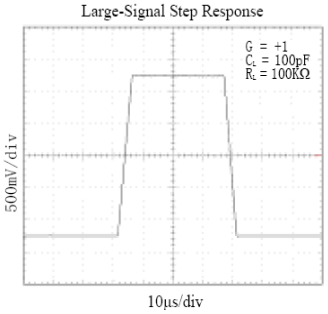
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
V_{OS}	Input offset voltage	-	-	±0.8	±5.4	mV
I_B	Input bias current	-	-	0.5	-	pA
I_{OS}	Input offset current	-	-	0.5	-	pA
V_{CM}	Common-Mode voltage range	VS＝5.5V	-0.1	-	5.6	V
CMRR	Common-Mode rejection ratio	VS＝5.5V ，VCM＝-0.1V－4V	72	88	-	dB
		VS＝5.5V ，VCM＝-0.1V－5.6V	57	78	-	dB
A_{OL}	Open-Loop voltage gain	RL=5K，VO=0.1V-4.9V	78	90	-	dB
		RL=100K，VO=0.035V-4.965V	82	94	-	dB
$\triangle V_{OS}/\triangle T$	Input offset voltage drift	-	-	2.7	-	μV/℃
V_{SW}	Output voltage swing from rail	RL=100K	-	0.008	-	V
I_{OUT}	Output current	-	18	23		mA
VDD	Operating voltage range	-	2.1	-	5.5	V
PSRR	Power supply rejection ratio	VS=+2.5V to +5.5V，VCM=(-VS)+0.5V	70	92	-	dB
I_Q	Quiescent current	IOUT=0	-	42	60	μA
GBP	Gain-bandwidth product	CL=100pF	-	1.1	-	MHz
SR	Slew rate	-	-	0.052	-	V/μs

■ Typical Operating Characteristics

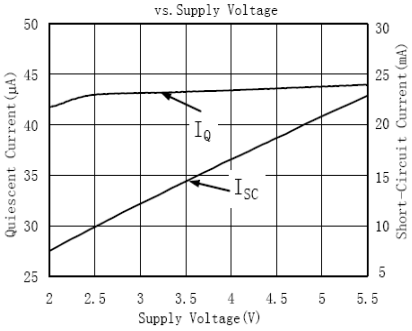
Small-Signal Step Response



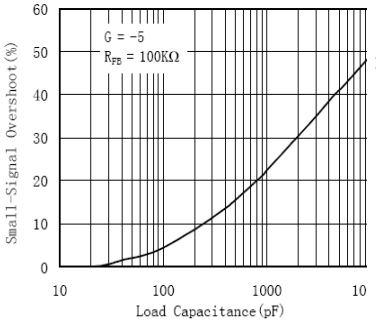
Large-Signal Step Response



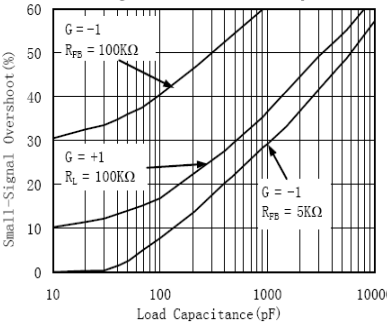
Quiescent And Short-Circuit Current vs. Supply Voltage



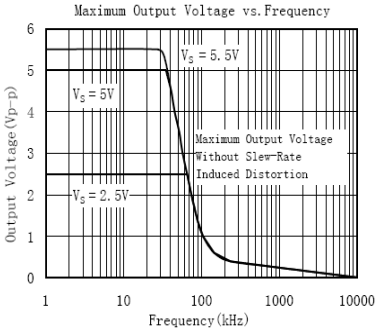
Small-Signal Overshoot vs. Load Capacitance



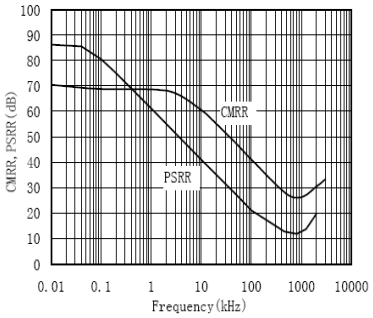
Small-Signal Overshoot vs. Load Capacitance



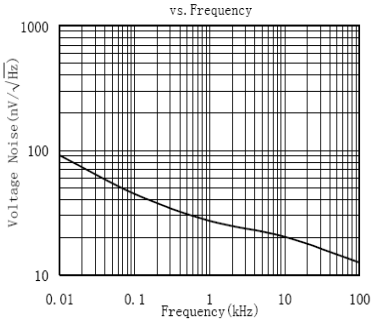
Maximum Output Voltage vs. Frequency



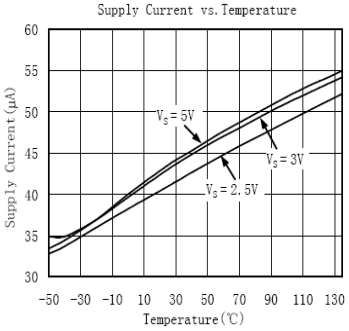
CMRR And PSRR vs. Frequency



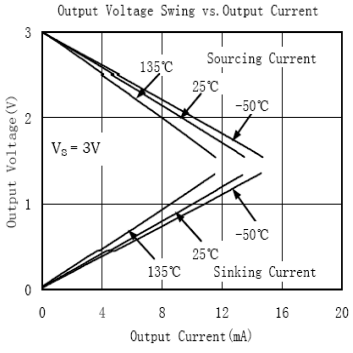
Input Voltage Noise Spectral Density vs. Frequency



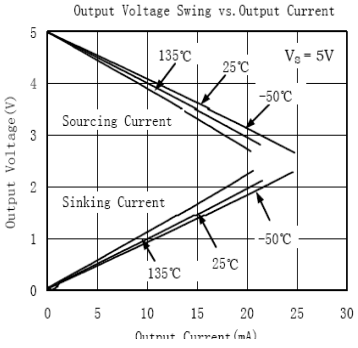
Supply Current vs. Temperature



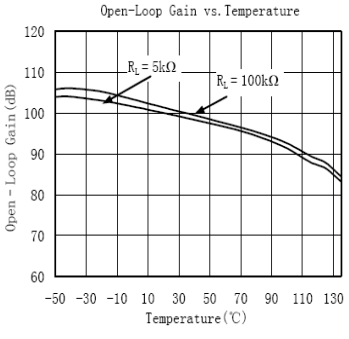
Output Voltage Swing vs. Output Current



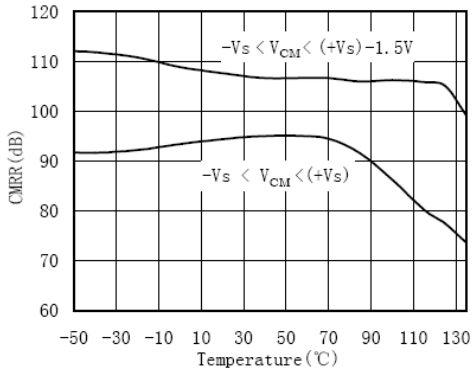
Output Voltage Swing vs. Output Current



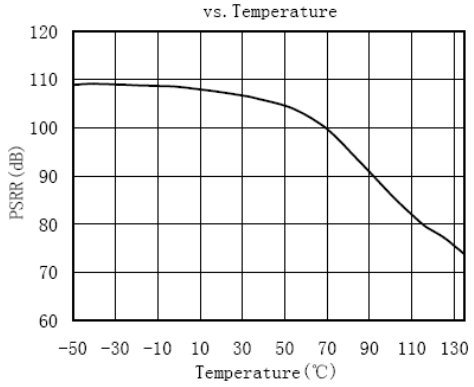
Open-Loop Gain vs. Temperature



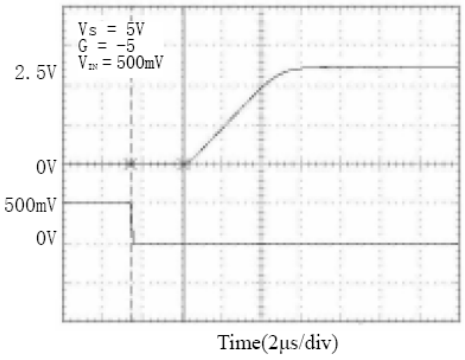
Common-Mode Rejection Ratio
vs. Temperature



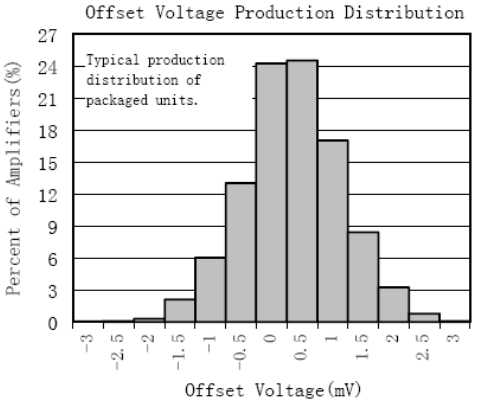
Power-Supply Rejection Ratio
vs. Temperature



Overload Recovery Time

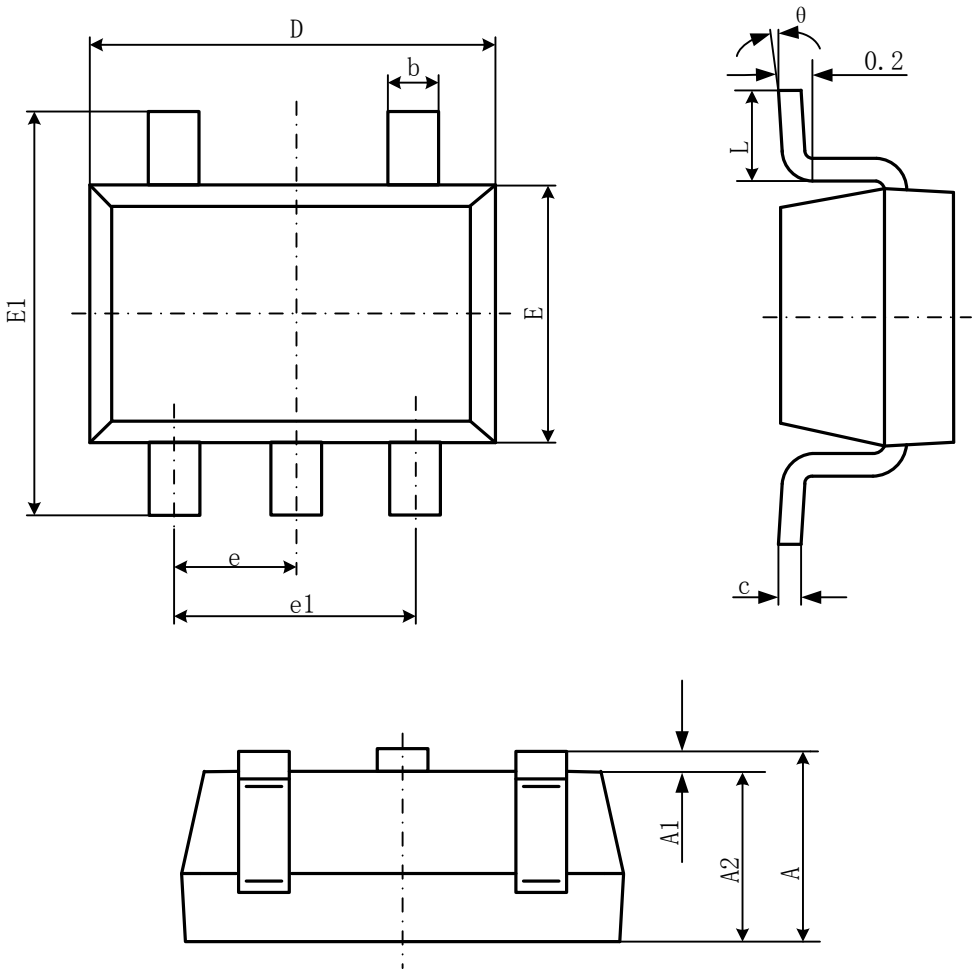


Offset Voltage Production Distribution



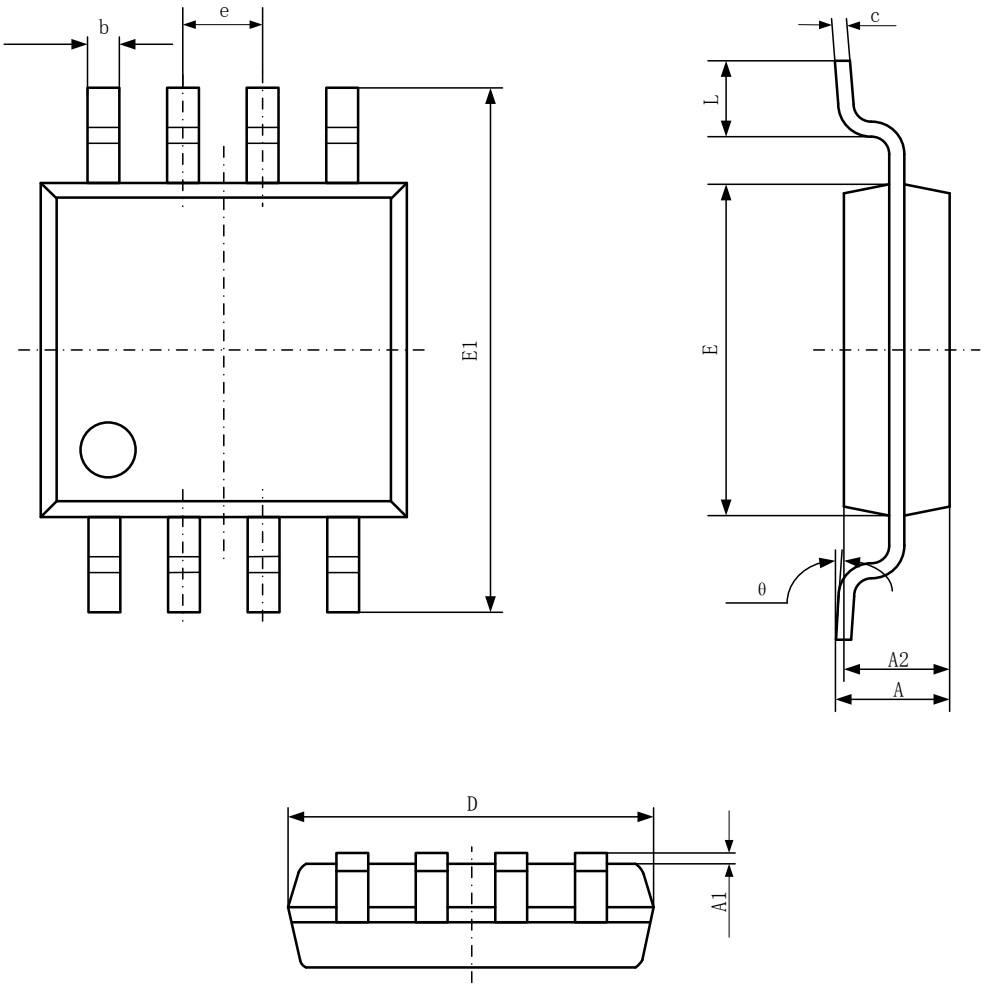
Package Information

- **SOT23-5L**



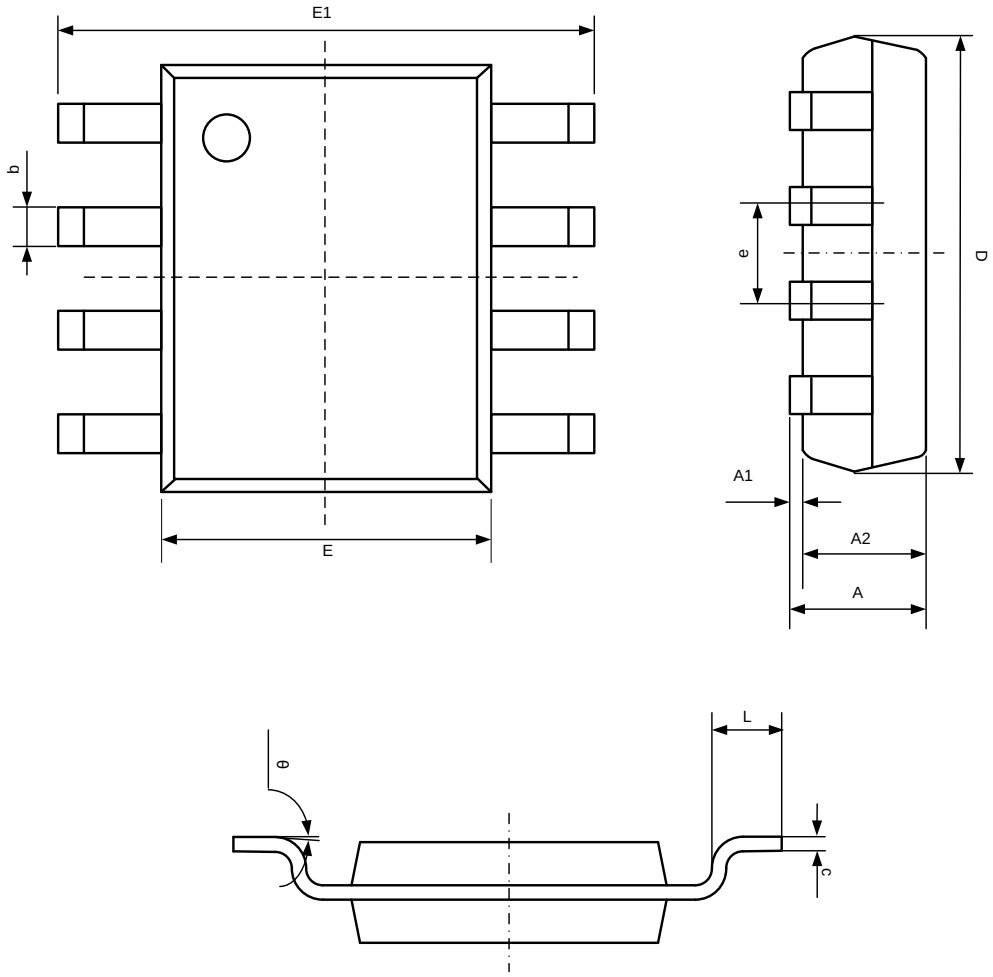
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

- **MSOP8**



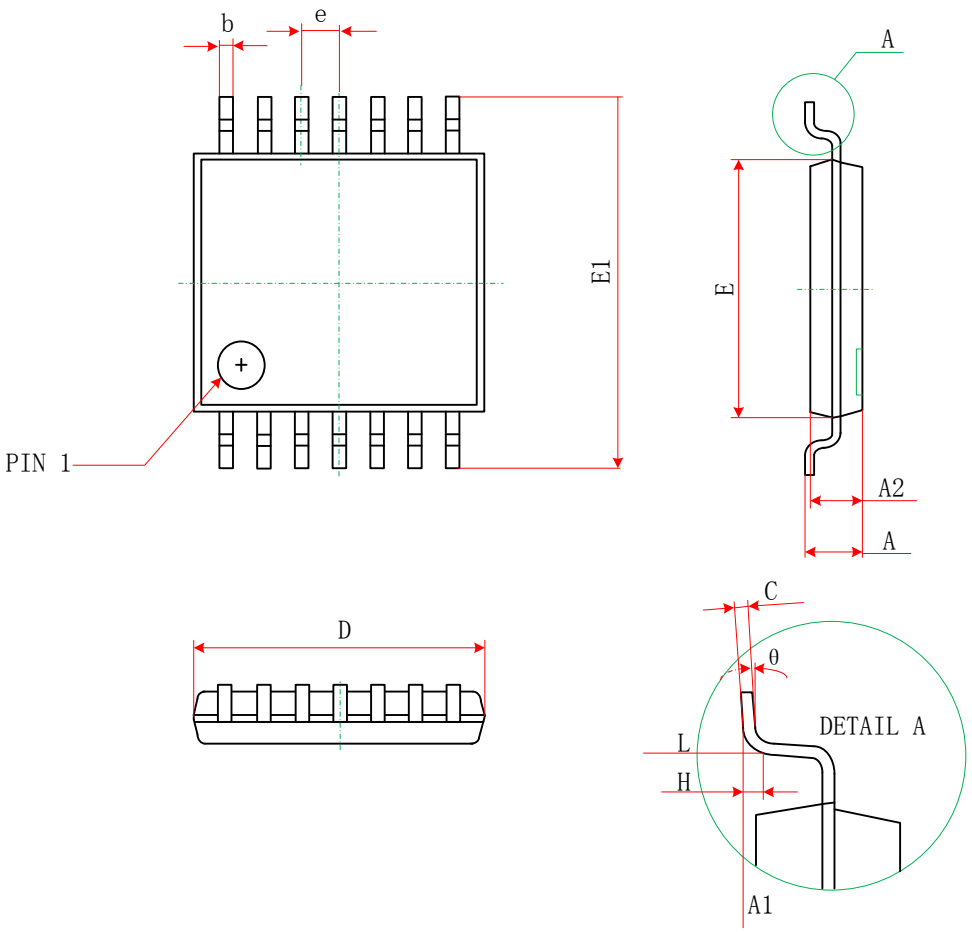
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	2.900	3.100	0.144	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

- **SOP8**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

- **TSSOP14**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
D	4.900	5.100	0.193	0.201
E	4.300	4.500	0.169	0.177
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
E1	6.250	6.550	0.246	0.258
A	1.200		0.047	
A2	0.800	1.000	0.031	0.039
A1	0.050	0.150	0.002	0.006
e	0.65(BSC)		0.026(BSC)	
L	0.500	0.700	0.020	0.028
H	0.25(TYP)		0.01(TYP)	
θ	1°	7°	1°	7°