

General Description

The LTA706x family of single- and dual-channel operational amplifiers represent a new generation of small package, low-power op-amps. Featuring rail-to-rail input and output (RRIO) swings, a wide bandwidth (13MHz) and very low noise (8.5nV/√Hz at 10kHz) makes this family very attractive for a variety of battery-powered applications that require a good balance between cost and performance, such as audio outputs, motor phase current sensing, photodiode amplification, barcode scanners and white goods.

The robust design of the LTA706x amplifiers provides ease-of-use to the circuit designer: unity gain stability with capacitive loads of up to 300pF, integrated RF/EMI rejection filter, no phase reversal in overdrive conditions and high electro-static discharge (ESD) protection. The LTA706x amplifiers are optimized for operation at voltages as low as +1.8V ($\pm 0.9V$) and up to +5.5V ($\pm 2.75V$) at the temperature range of $-40^{\circ}C$ to $+125^{\circ}C$.

The LTA7061 (single) is available in DFN0.8x0.8-4L (5 pins), SOT23-5L and SC70-5L packages. The LTA7062 (dual) is offered in SOIC-8L, MSOP-8L, DFN2x2-8L and TSSOP-8L packages.

Features and Benefits

- Low Input Offset Voltage: $\pm 1mV$
- Wide Unity-Gain Bandwidth: 13MHz
- Rail-to-Rail Input and Output
- Low Noise: 8.5nV/√Hz at 10kHz
- Internal RF/EMI Filter
- Single 1.8 V to 5.5 V Supply Voltage
- Extended Temperature Range: $-40^{\circ}C$ to $+125^{\circ}C$

Applications

- HEV/EV inverter and motor control
- Battery-Powered Instruments
- On-board (OBC) and wireless charger
- ADAS
- Motor Phase Current Sense
- Sensor Signal Conditioning

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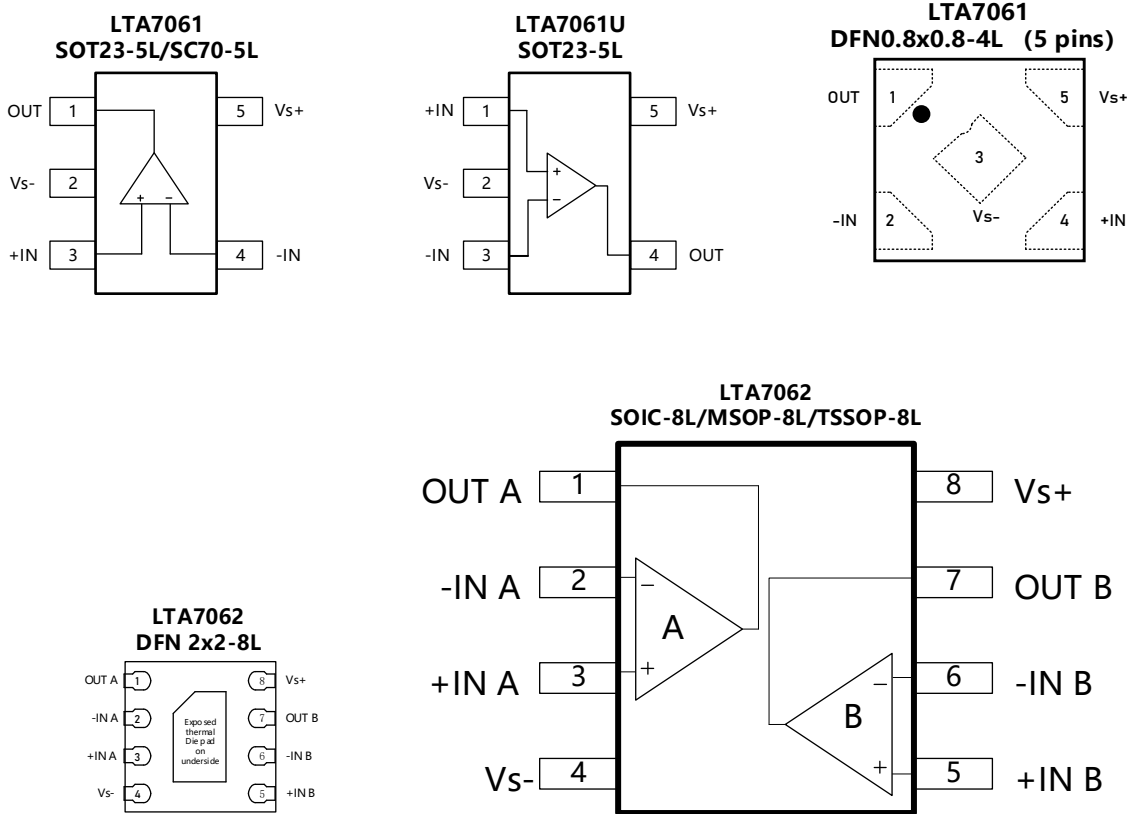
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Pin Configurations (Top View)



Pin Description

Symbol	Description
-IN	inverting input of the amplifier. The voltage range is from (Vs- - 0.1V) to (Vs+ + 0.1V).
+IN	Non-inverting input of the amplifier. This pin has the same voltage range as -IN.
Vs+	Positive power supply.
Vs-	Negative power supply.
OUT	Amplifier output.

Small Package, Precision, 13MHz, Low-Noise, RRIO, CMOS Amplifiers

Ordering Information

Type Number	Package Name	Package Quantity	Marking Code
LTA7061XF4/R20	DFN0.8x0.8-4L (5 pins)	Tape and Reel, 10 000	ZH
LTA7061XT5/R6	SOT23-5L	Tape and Reel, 3 000	ZH61
LTA7061UXT5/R6	SOT23-5L	Tape and Reel, 3 000	ZH61
LTA7061XC5/R6	SC70-5L	Tape and Reel, 3 000	ZH61
LTA7062XS8/R8	SOIC-8L	Tape and Reel, 4 000	ZH62
LTA7062XV8/R6	MSOP-8L	Tape and Reel, 3 000	ZH62
LTA7062XF8/R6	DFN2x2-8L	Tape and Reel, 3 000	ZH62
LTA7062XT8/R8	TSSOP-8L	Tape and Reel, 4 000	ZH62

Limiting Value -In accordance with the Absolute Maximum Rating System (IEC 60134).

Parameter	Absolute Maximum Rating
Supply Voltage, V_{S+} to V_{S-}	9V
Signal Input Terminals: Voltage	V_{S-} to V_{S+}
Output Short-Circuit	Continuous
Storage Temperature Range, T_{stg}	-40 °C to +150 °C
Junction Temperature, T_J	150 °C
Lead Temperature Range (Soldering 10 sec)	260 °C

ESD Ratings

Parameter	Item	Level	Unit
Electrostatic Discharge Voltage	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001	±4000	V
	Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002	±2000	

Small Package, Precision, 13MHz, Low-Noise, RRIO, CMOS Amplifiers

Electrical Characteristics

$V_S = 5.0\text{ V}$, $T_A = +25\text{ }^\circ\text{C}$, $V_{CM} = V_S/2$, $V_O = V_S/2$, and $R_L = 10\text{ k}\Omega$ connected to $V_S/2$, unless otherwise noted.

Boldface limits apply over the specified temperature range, $T_A = -40\text{ to }+125\text{ }^\circ\text{C}$.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OFFSET VOLTAGE						
Input offset voltage	V _{OS}	V _S = 5V	-3	±1	3	mV
		T _A = -40° C to 125° C, V _S = 5V	-4		4	
Offset voltage drift	V _{OS} TC	T _A = -40 to +125 °C		0.5		µV/°C
Power supply rejection ratio	PSRR	V _S = 1.8 to 5.5 V, V _{CM} =V _{S-}	70	87		dB
INPUT BIAS CURRENT						
Input bias current	I _B	V _S = 5V		10		pA
		T _A = -40° C to 125° C		800		
Input offset current	I _{OS}	V _S = 5V		10		pA
		T _A = -40° C to 125° C		800		
NOISE						
Input voltage noise	V _n	f = 0.1 to 10 Hz, V _S = 5V		6.9		µV _{P-P}
Input voltage noise density	e _n	f = 10 kHz, V _S = 5V		8.5		nV/ √ Hz
INPUT VOLTAGE						
Common-mode voltage range	V _{CM}		V _{S-} – 0.1		V _{S+} + 0.1	V
Common-mode rejection ratio	CMRR	V _{S-} -0.1V < V _{CM} < V _{S+} -1.5V, V _S = 5.5V	65	80		dB
OPEN-LOOP GAIN						
Open-loop voltage gain	A _{VOL}	V _S = 5.5V, V _{S-} +0.05V<V _O <V _{S+} - 0.05V, R _L = 10kΩ	90	98		dB
		V _S = 1.8V, V _{S-} +0.04V<V _O <V _{S+} - 0.04V, R _L = 10kΩ	78	87		
FREQUENCY RESPONSE						
Gain bandwidth product	GBW	V _S = 5V		13		MHz
Phase margin	PM	AV = 1, V _S = 5V		80		°
Gain margin	GM	AV = 1, V _S = 5V		8		dB
Slew Rate	SR	V _S = 5V		10		V/µs
Total harmonic distortion	THD	V _S = 5V, V _{CM} = 2.5V, G = +1, f = 1kHz, V _O = 1V _{RMS}		105		dB
Settling time	t _s	To 1%, V _S = 5V, G = +1, 2V step, C _L =100pf		0.38		µs

Small Package, Precision, 13MHz, Low-Noise, RRIO, CMOS Amplifiers

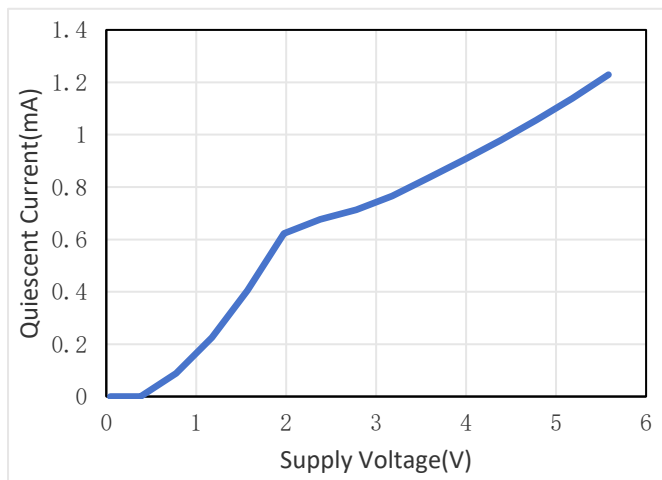
Electrical Characteristics (Cont.)

$V_S = 5.0\text{ V}$, $T_A = +25\text{ }^\circ\text{C}$, $V_{CM} = V_S/2$, $V_O = V_S/2$, and $R_L = 10\text{ k}\Omega$ connected to $V_S/2$, unless otherwise noted.

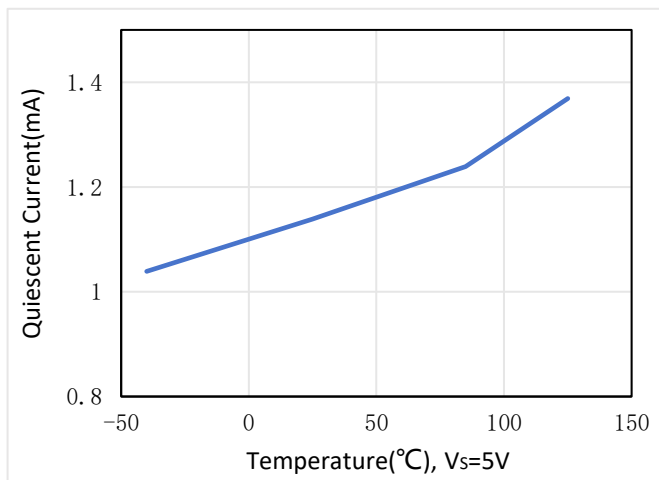
Boldface limits apply over the specified temperature range, $T_A = -40$ to $+125\text{ }^\circ\text{C}$.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OUTPUT						
High output voltage swing	V _{OH}	R _L = 10 kΩ	10	15		mV
		R _L = 2 kΩ	45	50		
Low output voltage swing	V _{OL}	R _L = 10 kΩ		7	10	
		R _L = 2 kΩ		35	40	
Short- circuit current	I _{sink}	V _S = 5.5V		-80		mA
	I _{source}	V _S = 5.5V		85		
POWER SUPPLY						
Operating supply voltage	V _S		1.8		5.5	V
Quiescent current (per amplifier)	I _Q	V _S = 1.8 V		0.7	0.9	mA
		V _S = 5.5 V		1.3	1.8	
THERMAL CHARACTERISTICS						
Operating temperature range	T _A		-40		+125	°C
Package Thermal Resistance	θ _{JA}	DFN0.8x0.8-4L (5 pins)		250		°C /W
		SC70-5L		333		
		SOT23-5L		190		
		DFN2x2-8L		94		
		TSSOP-8L		160		
		SOIC-8L		125		
		MSOP-8L		201		

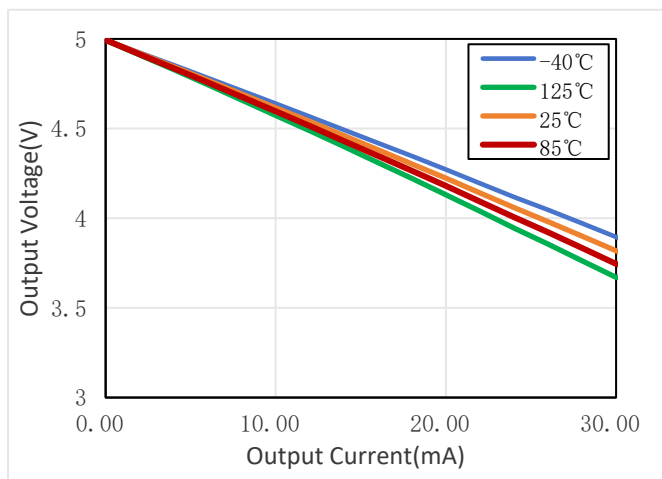
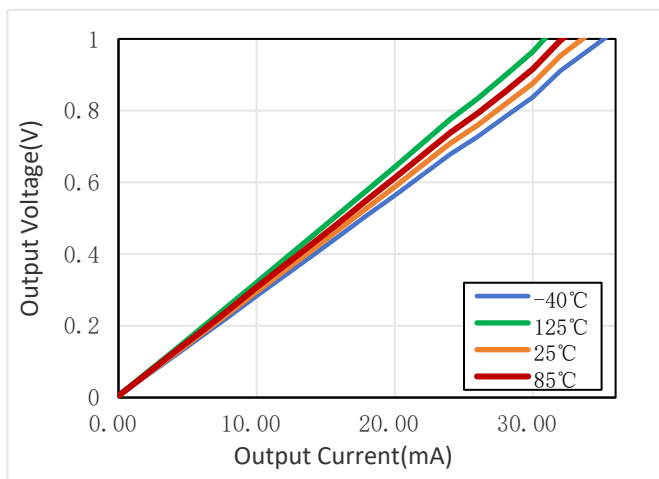
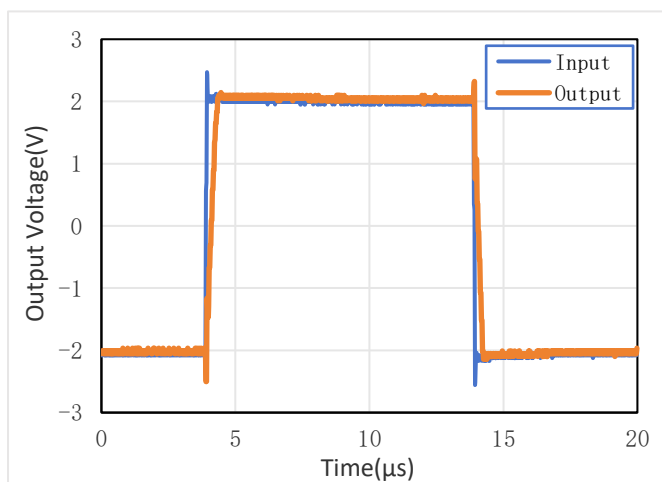
Typical Characteristics



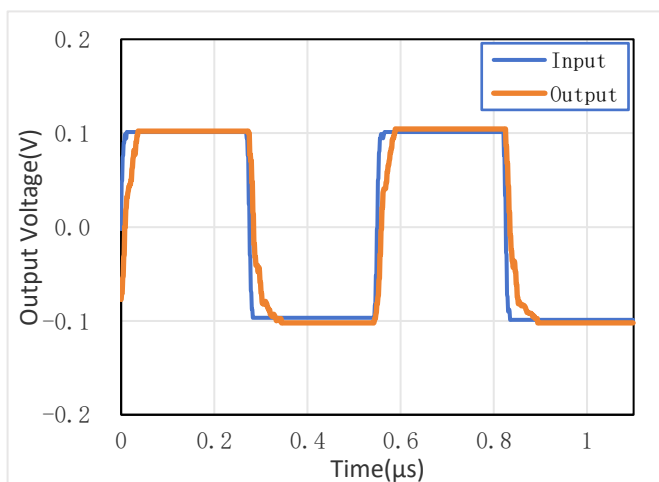
Quiescent Current as a function of Supply Voltage



Quiescent Current as a function of Temperature

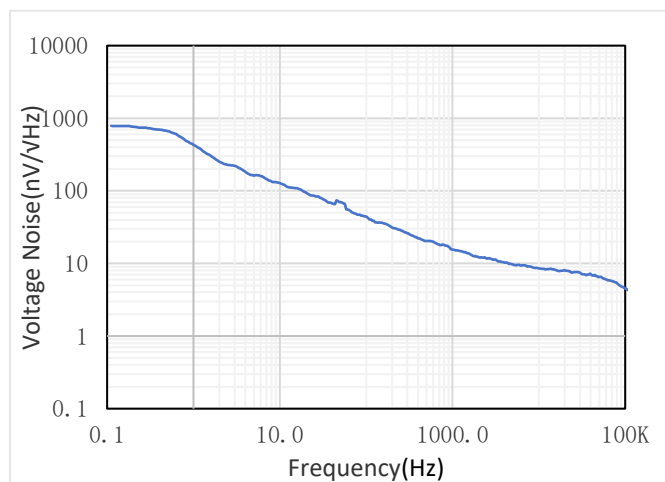
Output Voltage Swing as a function of Output Current
(Sourcing, $V_s = 5V$)Output Voltage Swing as a function of Output Current
(Sinking, $V_s = 5V$)

Large-Signal Step Response

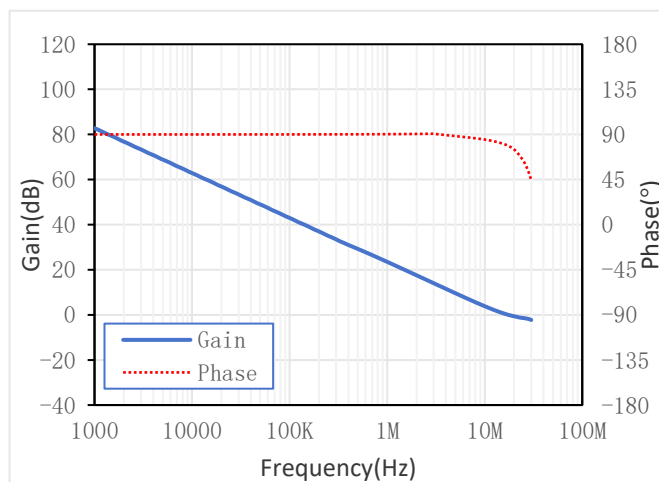


Small-Signal Step Response

Typical Characteristics (Cont.)

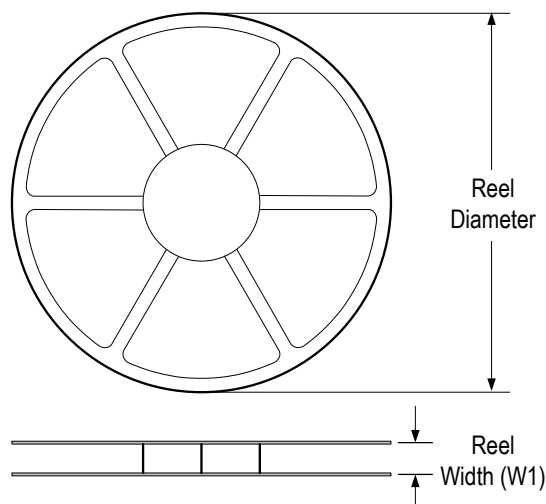


Voltage Noise Density vs. Frequency

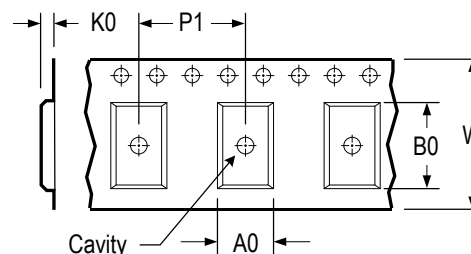
Open-Loop Gain and Phase vs. Frequency ($V_S = 3.3V$)

Tape and Reel Information

REEL DIMENSIONS

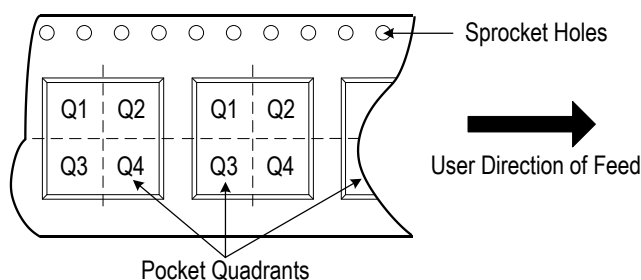


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

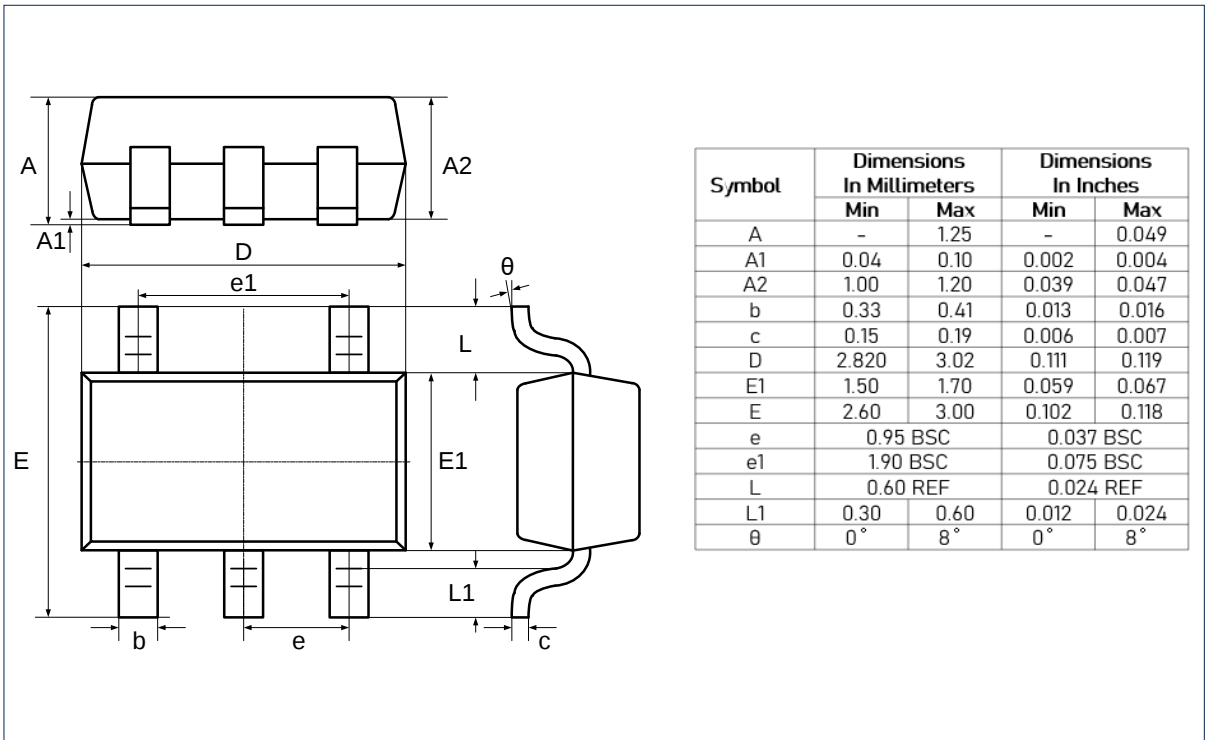


* All dimensions are nominal.

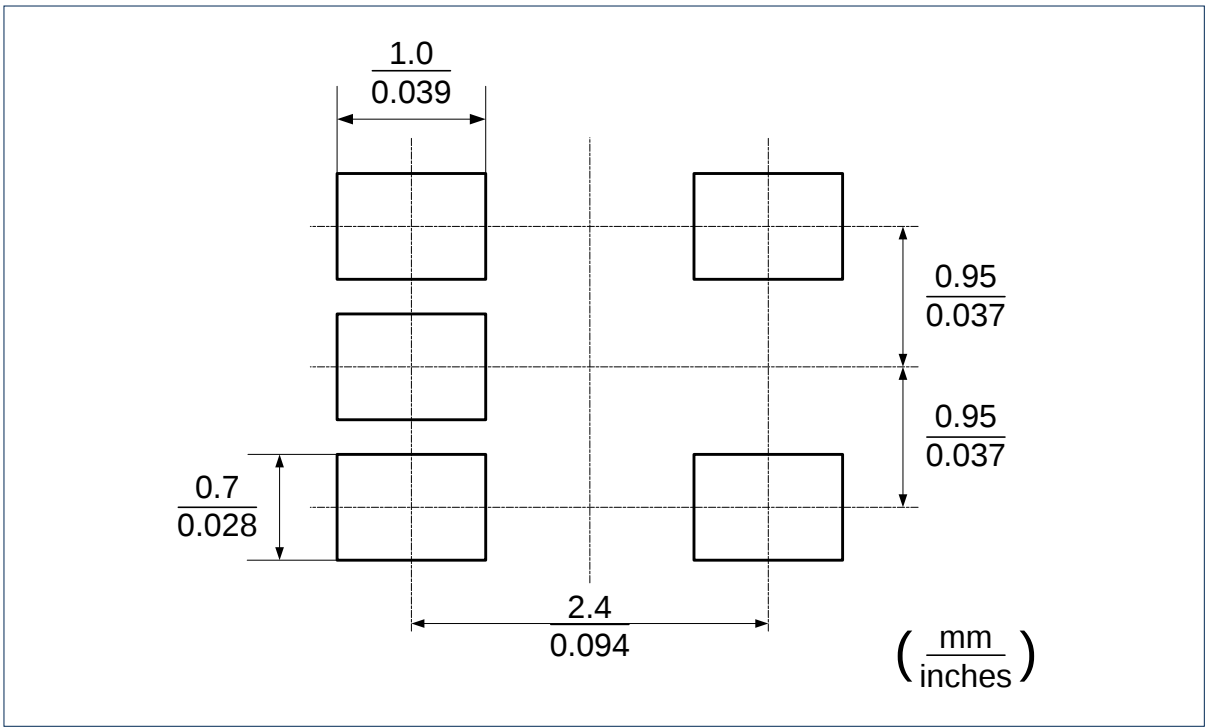
Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin 1 Quadrant
LTA7061XF4/R20	DFN0.8x0.8	5	10 000	178	9.5	1.0	1.0	0.5	2.0	8.0	Q3
LTA7061XT5/R6	SOT23	5	3 000	178	9.5	3.3	3.2	1.5	4.0	8.0	Q3
LTA7061UXT5/R6	SOT23	5	3 000	178	9.5	3.3	3.2	1.5	4.0	8.0	Q3
LTA7061XC5/R6	SC70	5	3 000	178	9.5	3.3	3.2	1.5	4.0	8.0	Q3
LTA7062XS8/R8	SOIC	8	4 000	330	12.5	6.6	5.3	2.0	8.0	12.0	Q1
LTA7062XV8/R6	MSOP	8	3 000	330	12.5	5.0	3.5	2.0	8.0	12.0	Q1
LTA7062XF8/R6	DFN2x2	8	3 000	178	9.5	2.25	2.25	1.0	4.0	8.0	Q1
LTA7062XT8/R8	TSSOP	8	4 000	330	12.5	6.5	4.0	1.2	8.0	12.0	Q1

Package Outlines

DIMENSIONS, SOT23-5L

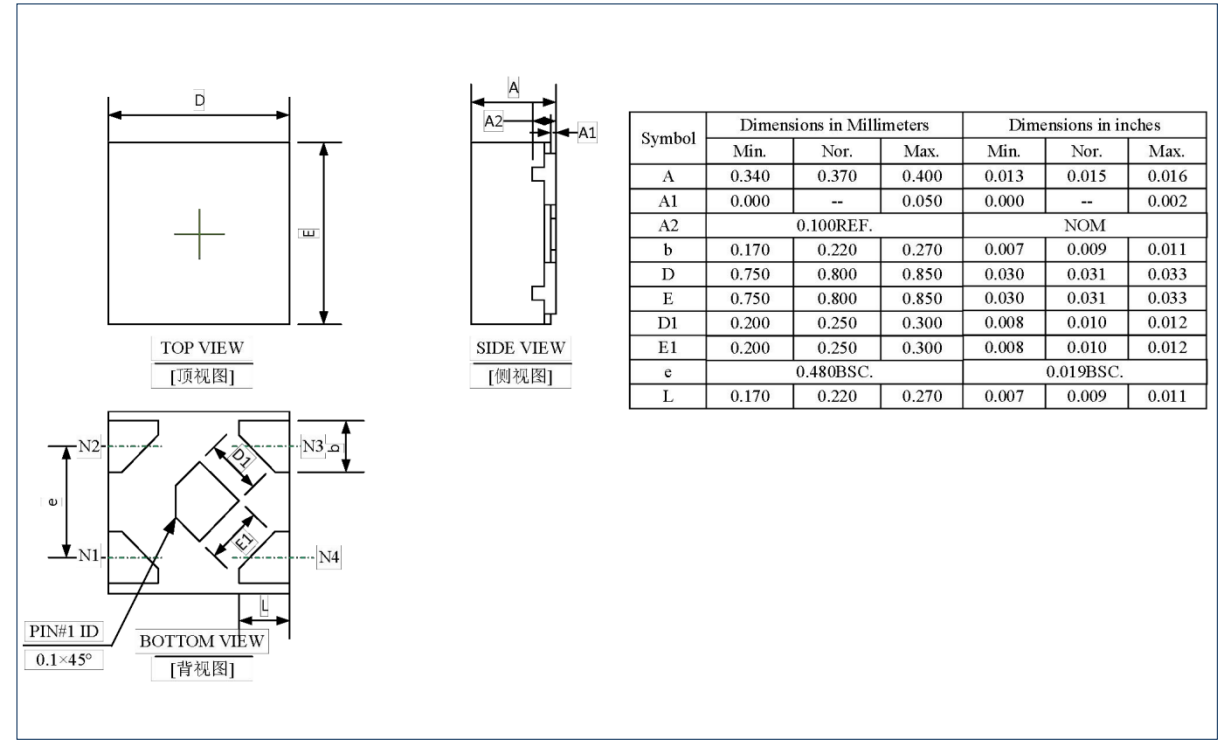


RECOMMENDED SOLDERING FOOTPRINT, SOT23-5L



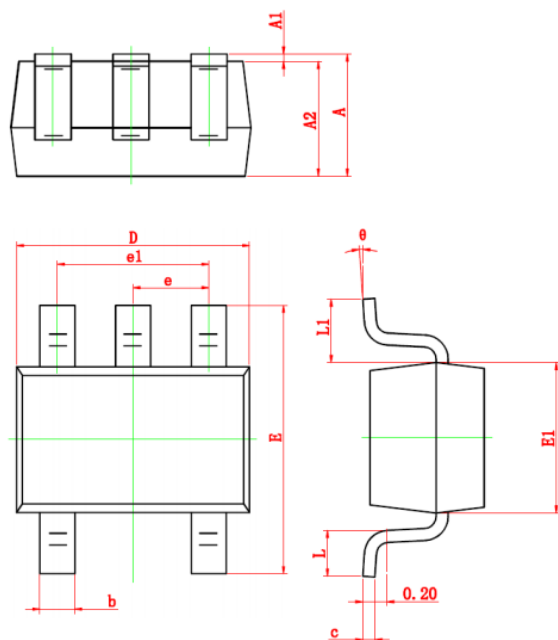
Package Outlines (Cont.)

DIMENSIONS, DFN0.8x0.8-4L (5 pins)



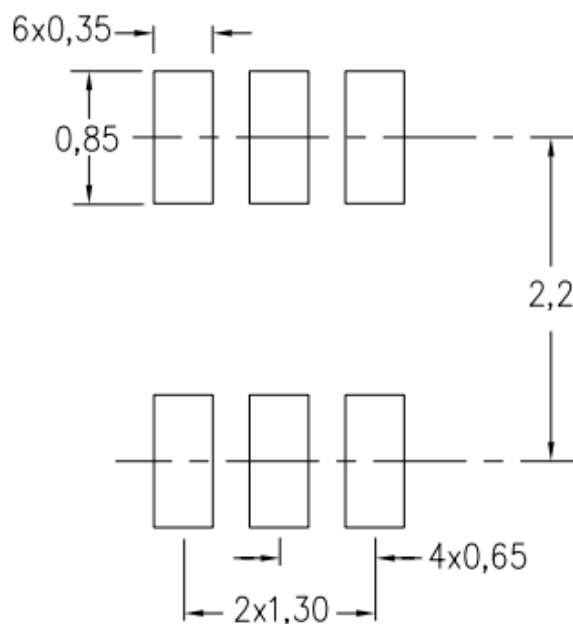
Package Outlines (Cont.)

DIMENSIONS, SC70-5L



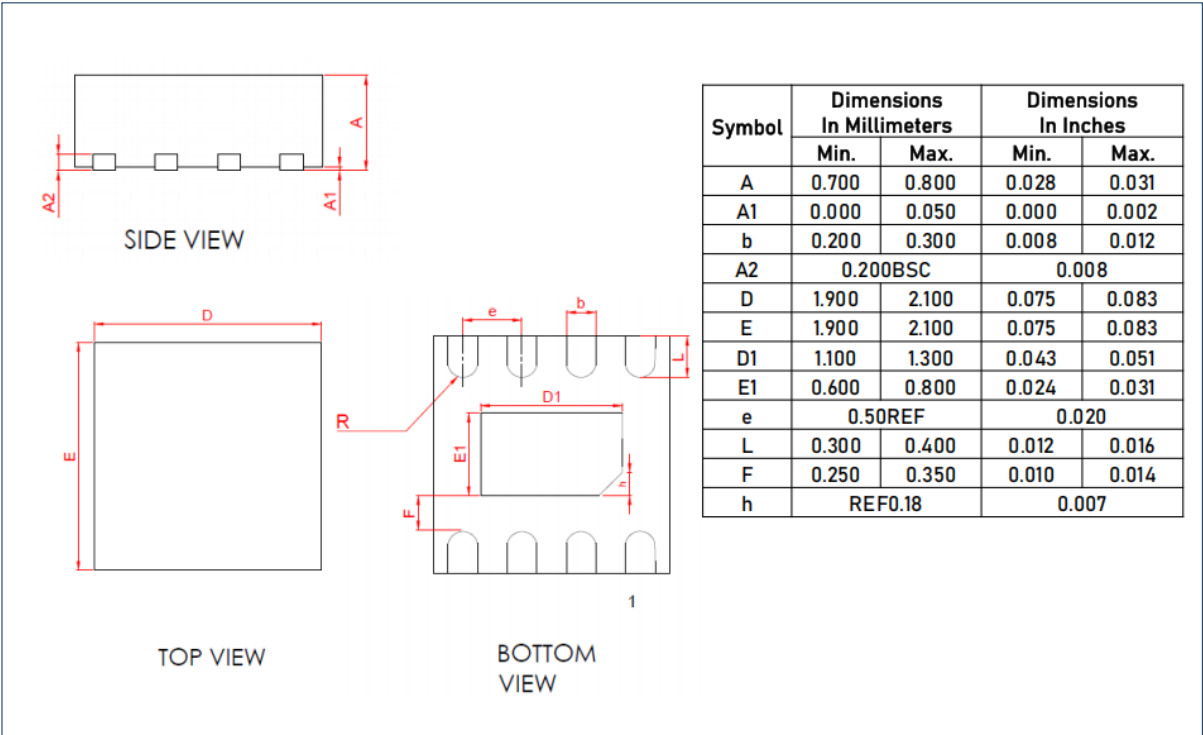
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.110	0.175	0.004	0.007
D	2.000	2.200	0.079	0.087
E	2.150	2.450	0.085	0.096
E1	1.150	1.350	0.045	0.053
e	0.650TYP		0.026REF	
e1	1.200	1.400	0.047	0.055
L	0.260	0.460	0.010	0.018
L1	0.525REF		0.021REF	
theta	0°	8°	0°	8°

RECOMMENDED SOLDERING FOOTPRINT, SC70-5L

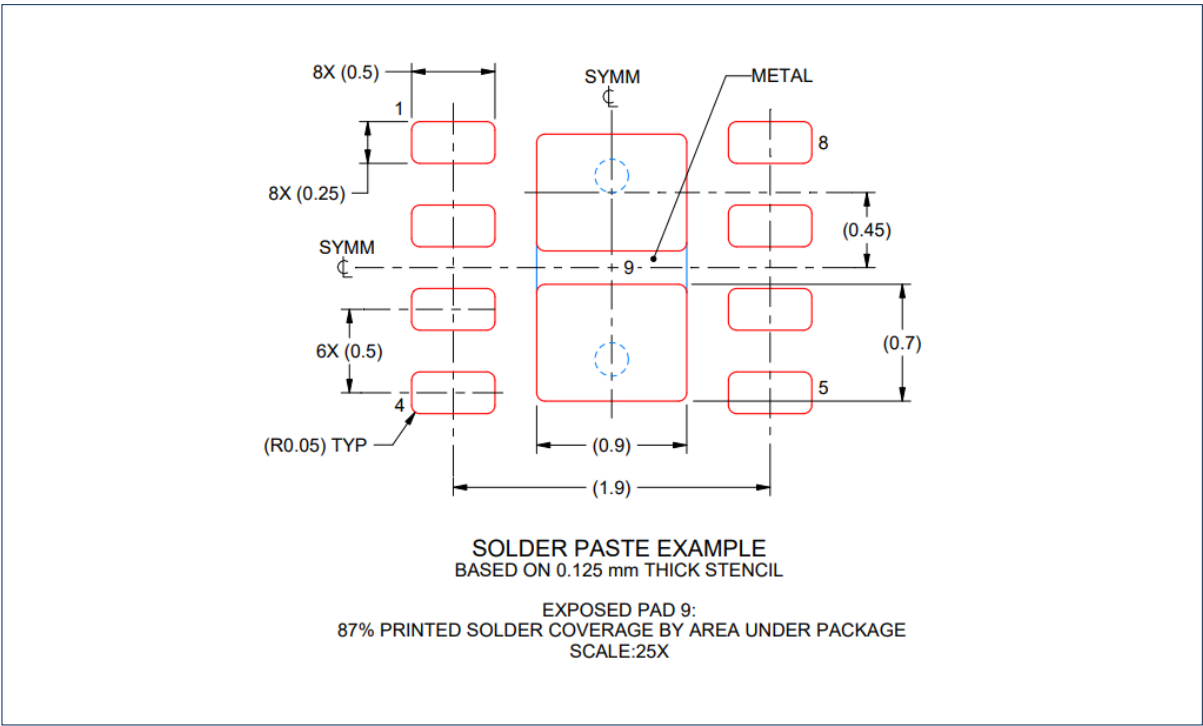


Package Outlines (Cont.)

DIMENSIONS, DFN2x2-8L

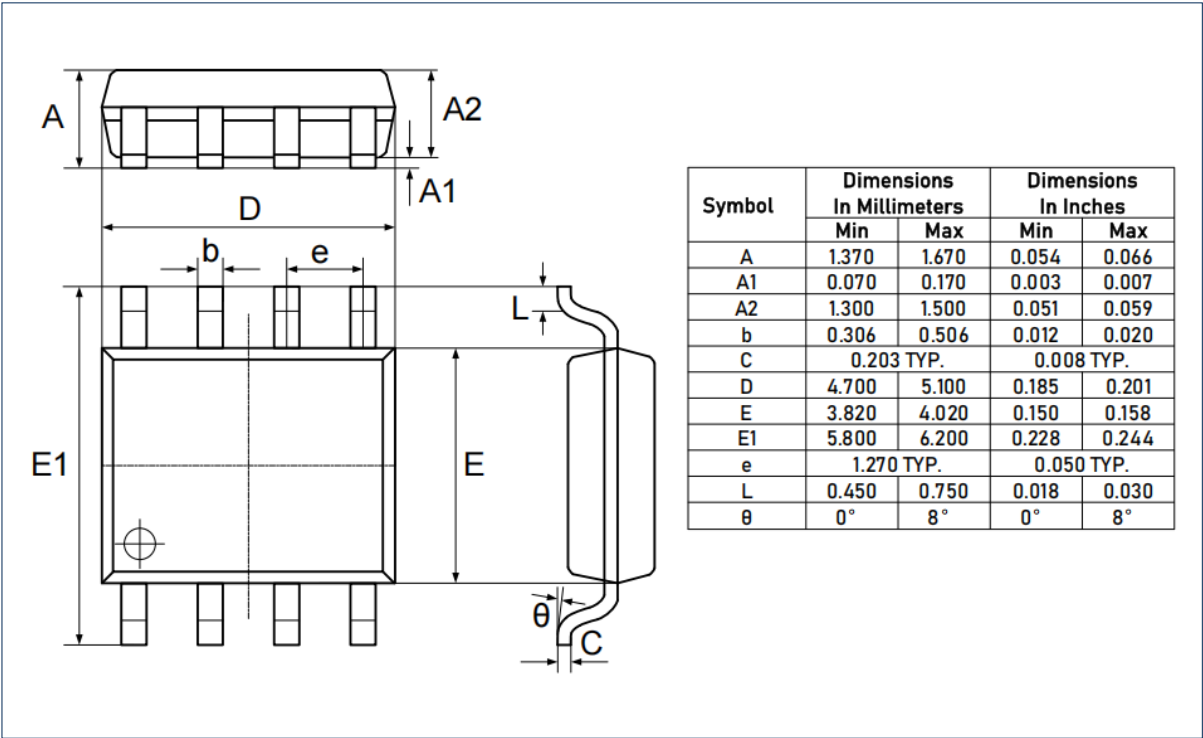


RECOMMENDED SOLDERING FOOTPRINT, DFN2x2-8L

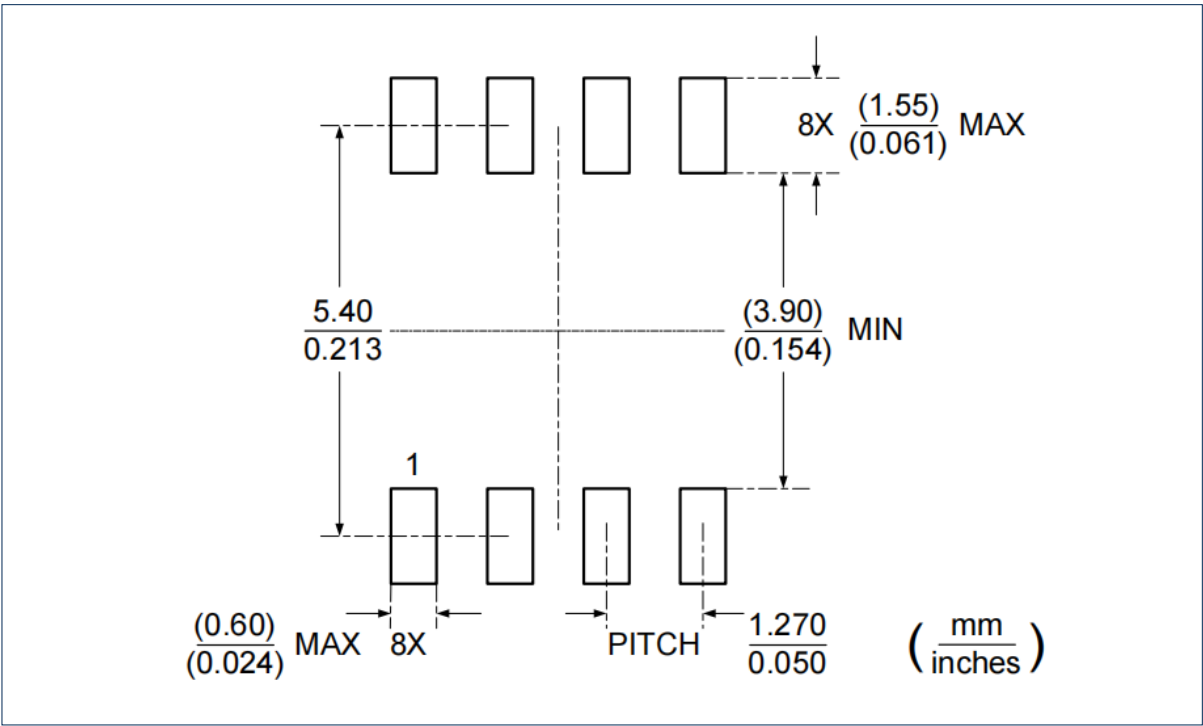


Package Outlines (Cont.)

DIMENSIONS, SOIC-8L

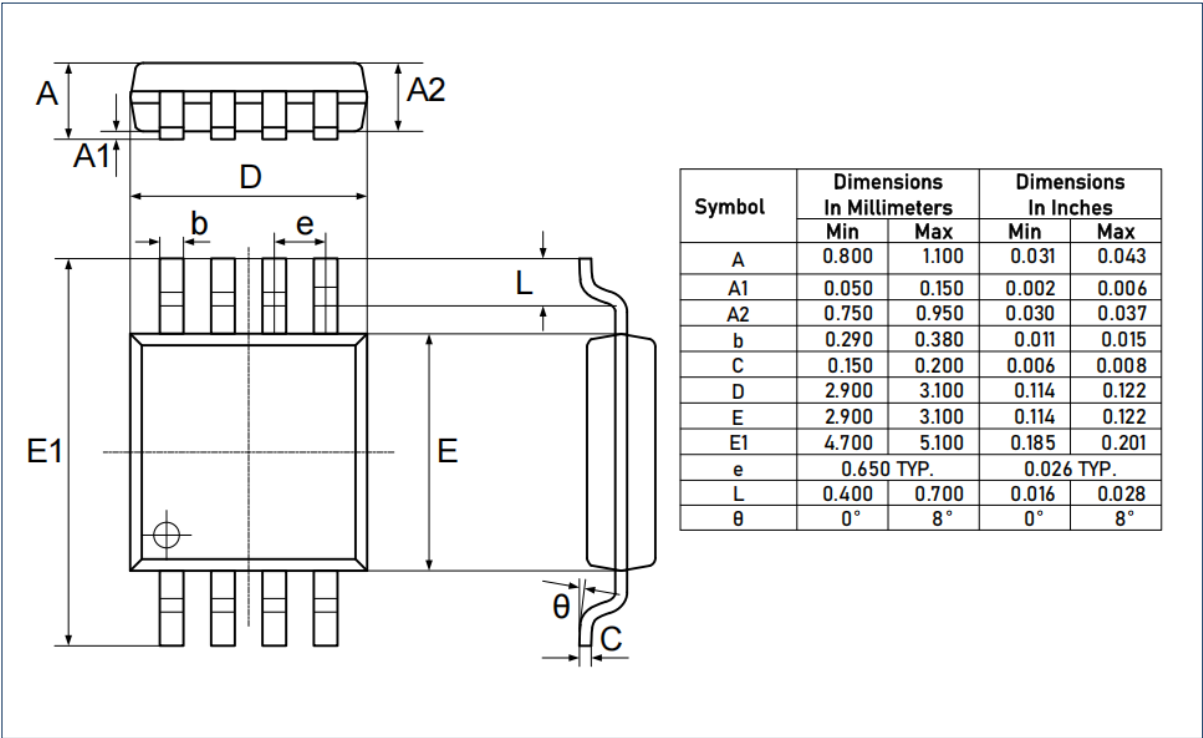


RECOMMENDED SOLDERING FOOTPRINT, SOIC-8L

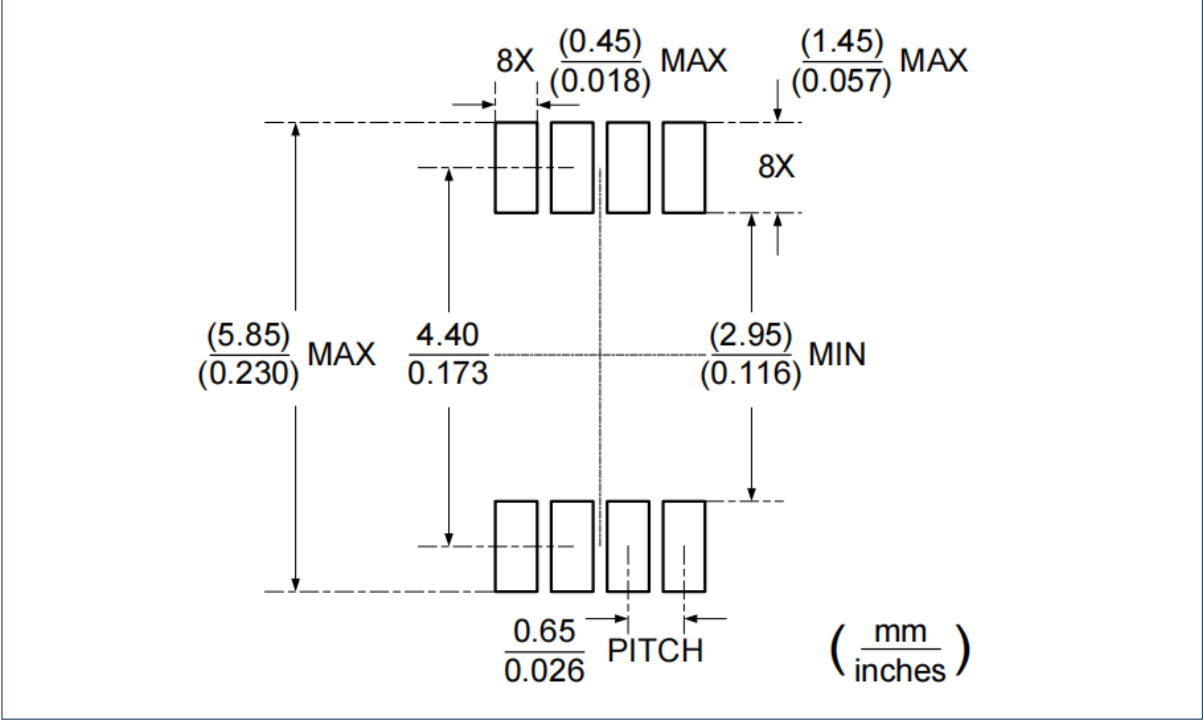


Package Outlines (Cont.)

DIMENSIONS, MSOP-8L

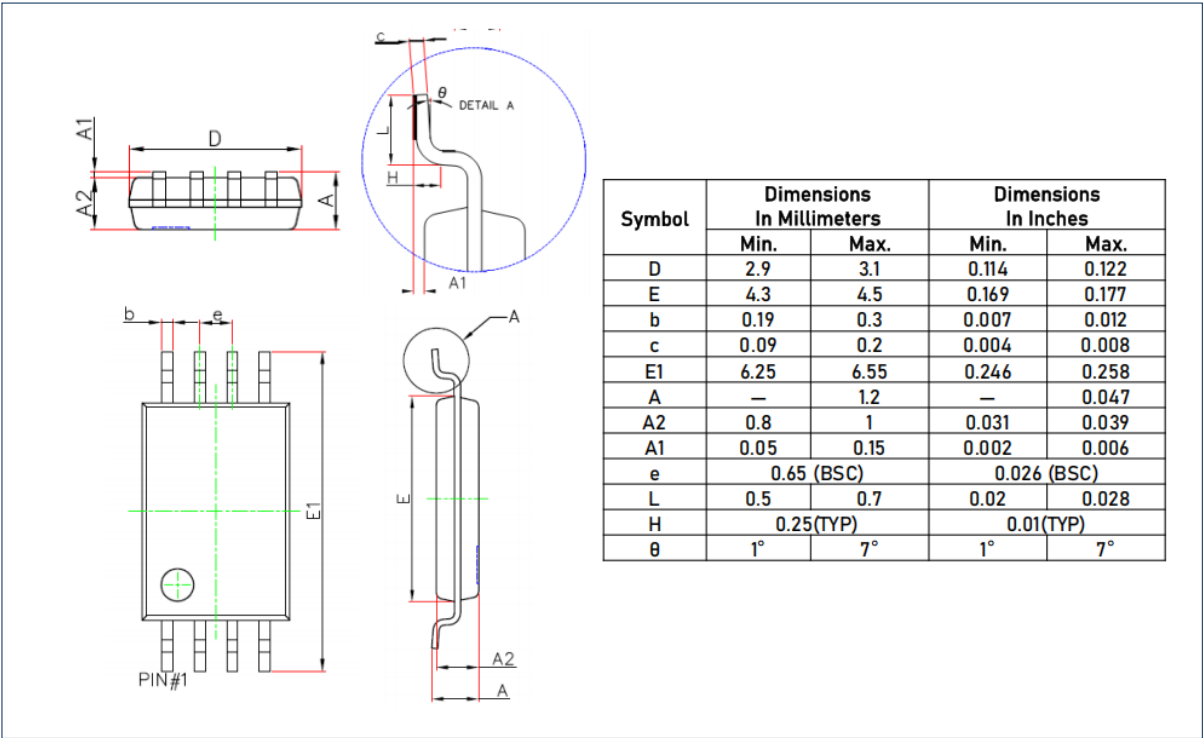


RECOMMENDED SOLDERING FOOTPRINT, MSOP-8L

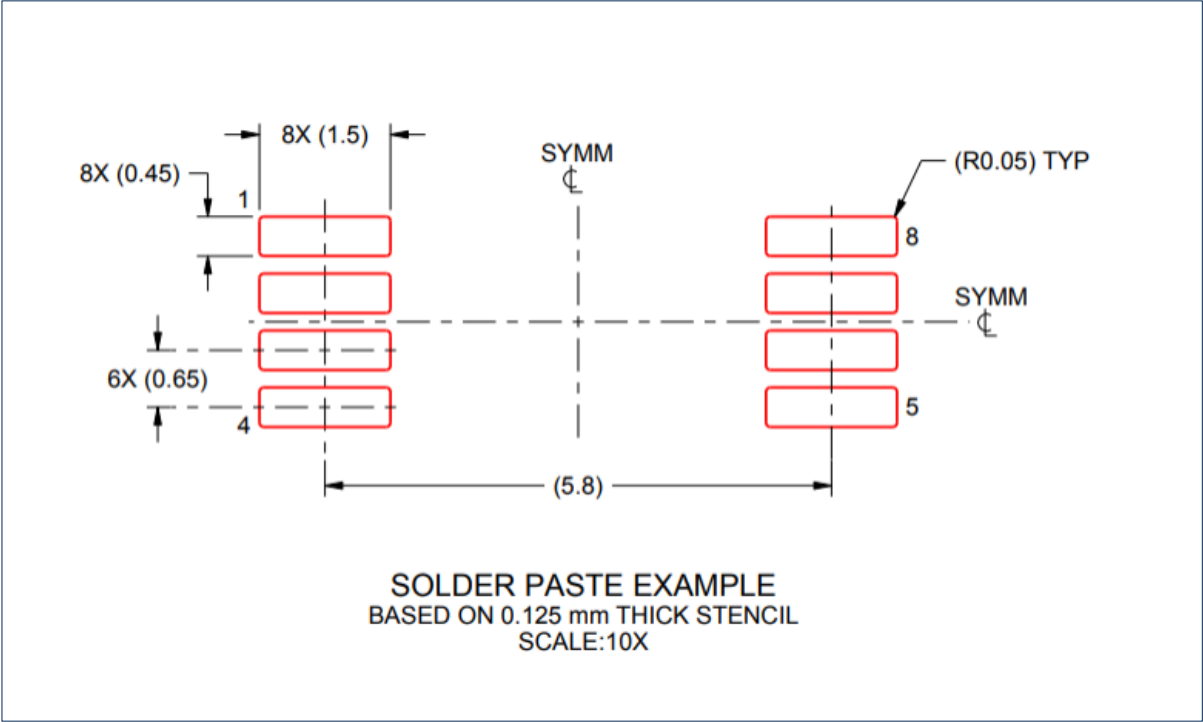


Package Outlines (Cont.)

DIMENSIONS, TSSOP-8L



RECOMMENDED SOLDERING FOOTPRINT, TSSOP-8L



Small Package, Precision, 13MHz, Low-Noise, RRIO, CMOS Amplifiers

Important Notice

Linearin is a global fabless semiconductor company specializing in advanced high-performance high-quality analog/mixed-signal IC products and sensor solutions. The company is devoted to the innovation of high performance, analog-intensive sensor front-end products and modular sensor solutions, applied in multi-market of medical & wearable devices, smart home, sensing of IoT, intelligent industrial & smart factory (industrial 4.0), and automotives. Linearin's product families include widely-used standard catalog products, solution-based application specific standard products (ASSPs) and sensor modules that help customers achieve faster time-to-market products. Go to <http://www.linearin.com> for a complete list of Linearin product families.

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