LTA808xE
48 V, 10 MHz, Low Noise, Precision Operational Amplifiers

General Description

The LTA8081E, LTA8082E and LTA8084E (LTA808xE) are a family of low power, 48 V wide supply voltage, rail-to-rail output, precision operational amplifiers capable of operating on supplies ranging from +4.5 V (±2.25 V) to +48 V (±24 V). This new generation of high-voltage CMOS operational amplifiers, in conjunction with the LTA809xE, provide a family of bandwidth, noise, and power options to meet the needs of a wide variety of applications. The LTA808xE devices offer outstanding dc precision and ac performance, including low offset (±75 µV typically), low offset drift (±1.5 µV/°C typically), 10 MHz bandwidth, and 8 nV/√Hz input voltage noise density at 10 kHz. Unique features such as differential input-voltage range to the negative supply rail, high output current (±45 mA), high capacitive load drive of up to 1 nF, and high slew rate (6 V/µs) make the LTA808xE high-performance operational amplifiers for high-voltage industrial applications.

The robust design of the LTA808xE family provides ease-of-use to the circuit designer: integrated RF/EMI rejection filter, no phase reversal in overdrive conditions, and high electro-static discharge (ESD) protection. The LTA808xE are optimized for operation at voltages from +4.5 V (±2.25 V) to +48V (±24 V) over the extended temperature range of −40 °C to +125 °C.

Features and Benefits

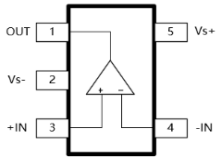
- Wide Supply: ±2.25 V to ±24 V, 4.5 V to 48 V
- Low Offset Voltage: ±75 µV Typically
- Low Offset Voltage Drift: ±1.5 µV/°C
- High Common-Mode Rejection: 113 dB
- Gain Bandwidth: 10 MHz
- Slew Rate: 6 V/µs
- Low Noise: 8 nV/√Hz at 10 kHz
- Low Bias Current: ±10 pA
- Rail-to-Rail Output

Applications

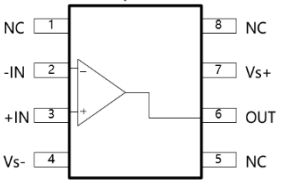
- Tracking Amplifier in Power Modules
- Merchant Power Supplies
- High-Side and Low-Side Current Sensing
- High Precision Comparator
- Battery-Powered Instruments
- Test and Measurement Equipment
- Multiplexed Data-Acquisition Systems
- Programmable Logic Controllers

Pin Configuration (Top View)

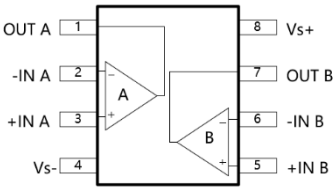
LTA8081E
SOT23-5L



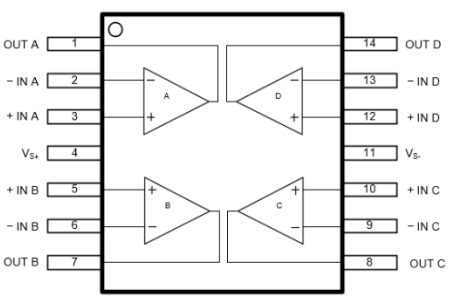
LTA8081E
ESOP-8L/EMSOP-8L



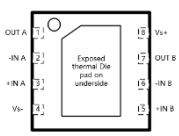
LTA8082E
ESOP-8L/EMSOP-8L



LTA8084E
SOIC-14L/ETSSOP-14L



LTA8082E
DFN 3×3-8L



Pin Description

Symbol	Description
-IN	Inverting input of the amplifier. The voltage range is from V_{S-} to V_{S+} – 1.5 V.
+IN	Non-inverting input of the amplifier. This pin has the same voltage range as -IN.
V_{S+}	Positive power supply. The voltage is from 4.5 V to 48 V. Split supplies are possible as long as the voltage between V_{S+} and V_{S-} is from 4.5 V to 48 V.
V_{S-}	Negative power supply. It is normally tied to ground. It can also be tied to a voltage other than ground as long as the voltage between V_{S+} and V_{S-} is from 4.5 V to 48 V.
OUT	Amplifier output.
NC	No connection.

Ordering Information

Type Number	Package Name	Package Quantity	Eco Class	Marking Code
LTA8081EXT5/R6	SOT23-5L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	H81
LTA8081EXS8/R8	ESOP-8L	Tape and Reel, 4 000	Green (RoHS & no Sb/Br)	HV81E
LTA8081EXV8/R6	EMSOP-8L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	HV81E
LTA8082EXS8/R8	ESOP-8L	Tape and Reel, 4 000	Green (RoHS & no Sb/Br)	HV82E
LTA8082EXV8/R6	EMSOP-8L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	HV82E
LTA8082EXF8/R10	DFN3x3-8L	Tape and Reel, 5 000	Green (RoHS & no Sb/Br)	HV82E
LTA8084EXS14/R5	SOIC-14L	Tape and Reel, 2 500	Green (RoHS & no Sb/Br)	HV84E
LTA8084EXT14/R6	ETSSOP-14L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	HV84E

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

Parameter	Absolute Maximum Rating
Supply Voltage, V_{S+} to V_{S-}	60 V
Signal Input Terminals: Voltage, Current	V_{S-} -0.3 V to V_{S+} +0.3 V, ±10 mA
Output Short-Circuit	Continuous
Storage Temperature Range, T_{stg}	-65°C to +150°C
Junction Temperature, T_J	150 °C
Lead Temperature Range (Soldering 10 sec)	260 °C

ESD Rating

Parameter	Item	Value	Unit
Electrostatic Discharge Voltage	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001	2 000	V
	Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002	2 000	

Electrical Characteristics

V_S = 4.5 V to 48 V, T_A = +25 °C, V_{CM} = V_{OUT} = V_S /2, and R_L = 10 kΩ connected to V_S /2, unless otherwise noted.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OFFSET VOLTAGE						
Input Offset Voltage	V_{OS}	V_S= 48 V		±75	±350	µV
Offset voltage drift	V_{OS} TC	T_A=-40 to +125°C		±1.5		µV/°C
Power supply rejection ratio	PSRR	V_S = 4.5 to 48 V, V_{CM} = 0.1 V	91	118		dB
		T_A=-40 to +125°C		90		
INPUT BIAS CURRENT						
Input bias current	I_B			10		pA
		T_A=-40 to +85°C		150		
		T_A=-40 to +125°C		600		
Input offset current	I_{OS}			5		pA
POWER SUPPLY						
Quiescent current (per amplifier)	I_Q	Vs=4.5V		2.1		mA
		Vs=48V		3.1		
NOISE						
Input voltage noise	V_n	f = 0.1 to 10 Hz		4		μV_{P-P}
Input current noise density	I_n	f = 1 kHz		5		fA/√Hz
Input voltage noise density	e_n	f = 1 kHz		10		nV/√Hz
		f = 10 kHz		8		
INPUT VOLTAGE						
Common-mode voltage range	V_{CM}		V_{S-}		V_{S+}-1.5	V
Common-mode rejection ratio	CMRR	V_S = 48 V, V_{CM} = 0 to 46 V	86	113		dB
		V_{CM} = 0.1 to 38 V, T_A = -40 to +125 °C		103		
		V_S = 4.5 V, V_{CM} = 0 to 2.5 V	66	93		
		V_{CM} = 0.1 to 2 V, T_A = -40 to +125 °C		84		
INPUT IMPEDANCE						
Input capacitance	C_{IN}	Differential		2		pF
		Common mode		3.5		
OPEN-LOOP GAIN						
Open-loop voltage gain	A_{VOL}	V_S = 48 V, V_O = 0.1 to 39.9 V	115	120		dB
		TA = -40 to +125 °C		110		
		V_S = 4.5 V, V_O = 0.1 to 4.4 V	100	115		
		T_A = -40 to +125°C		100		

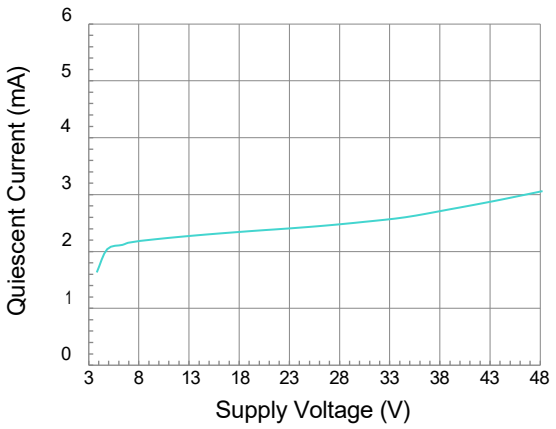
Electrical Characteristics (Cont.)

V_S = 4.5 V to 48 V, T_A = +25 °C, V_{CM} = V_{OUT} = V_S /2, and R_L = 10 kΩ connected to V_S /2, unless otherwise noted.

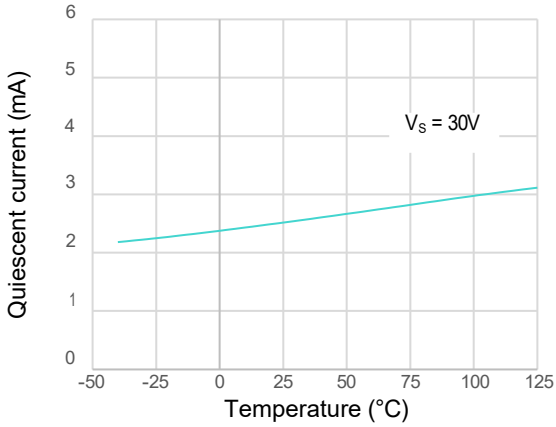
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
FREQUENCY RESPONSE						
Gain bandwidth product	GBW			10		MHz
Slew rate	SR	V_S = 30 V, G = +1, 8 V step		6		V/µs
Total harmonic distortion + noise	THD+N	G = +1, f = 1 kHz, V_O = 3 V_{RMS}		0.0002		%
Settling time	t_S	To 0.1%, V_S = 40 V, G = +1, 5 V step		2		µs
		To 0.01%, V_S = 40 V, G = +1, 5 V step		3.5		
Overload recovery time	t_{OR}	V_{IN} × Gain > V_S		0.6		µs
THERMAL CHARACTERISTICS						
Operating temperature range	T_A		-40		125	°C
Package Thermal Resistance	θ_{JA}	SOT23-5L		190		°C/W
		ESOP-8L		50		
		EMSOP-8L		60		
		DFN3x3-8L		94		
		SOIC-14L		115		
		ETSSOP-14L		55		

Typical Performance Characteristics

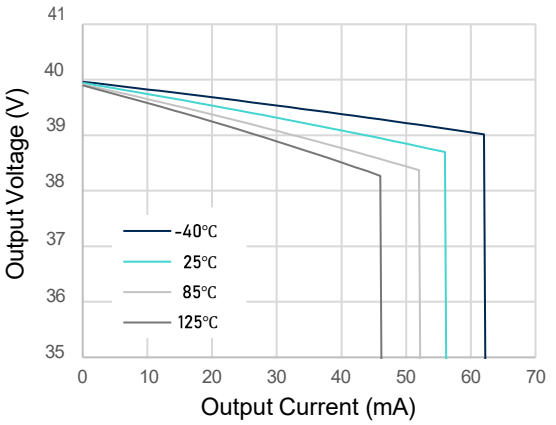
At T_A = +25 °C, V_{CM} = V_S /2, and R_L = 10 kΩ connected to V_S /2, unless otherwise noted.



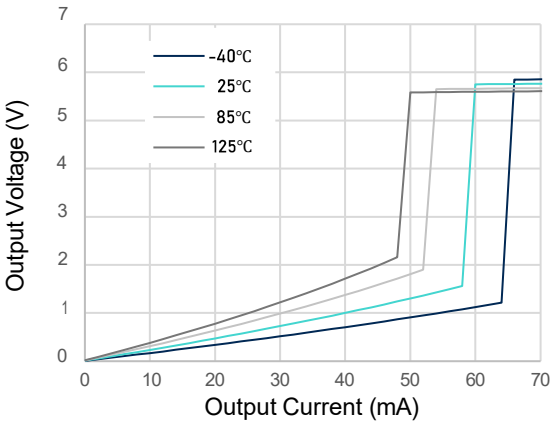
Quiescent Current as a function of Supply Voltage



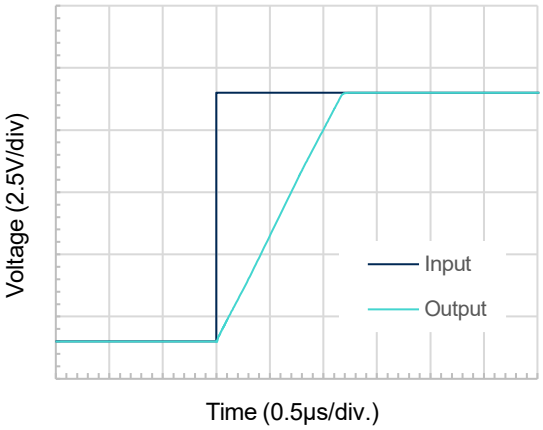
Quiescent Current as a function of Temperature



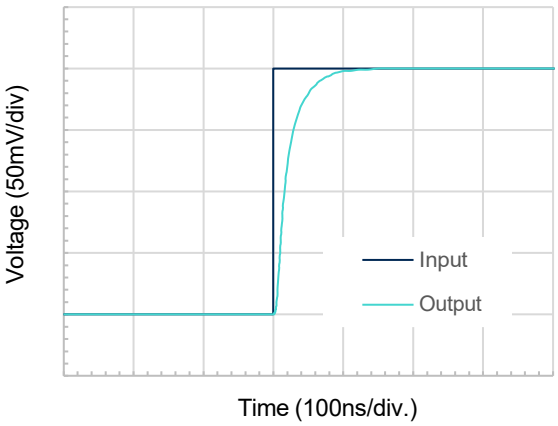
Output Voltage Swing as a function of Output Current (Sourcing, V_S = 40 V)



Output Voltage Swing as a function of Output Current (Sinking, V_S = 40 V)



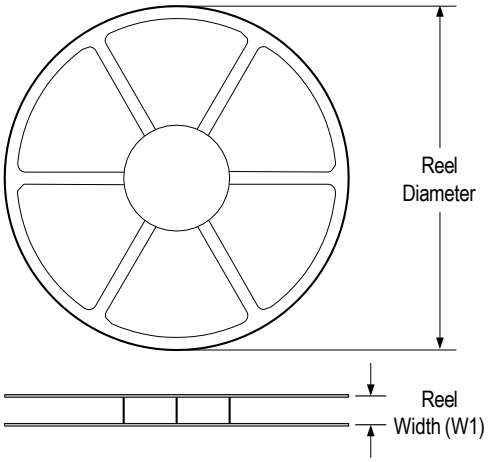
Large-Signal Step Response (Rising)



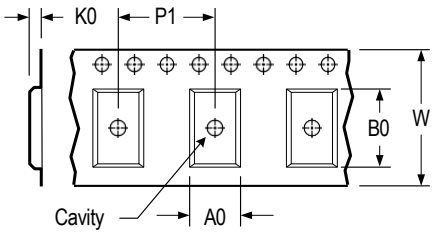
Small-Signal Step Response (Rising)

Tape and Reel Information

REEL DIMENSIONS

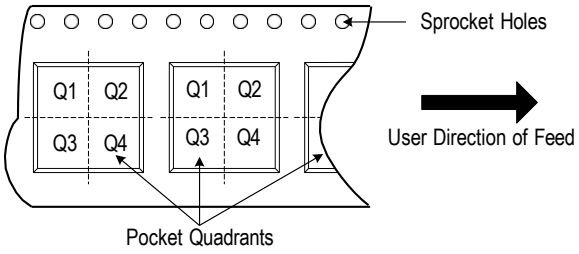


TAPE DIMENSIONS



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 ORIETATION IN TAPE

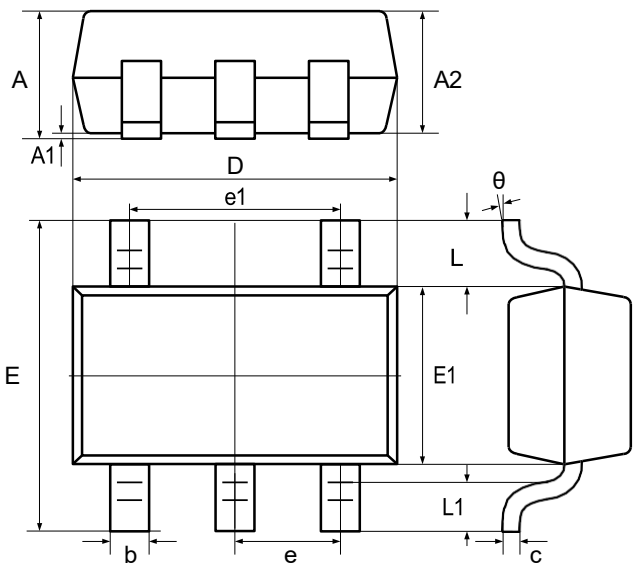


* All dimensions are nominal.

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
LTA8081EXT5/R6	SOT23	5	3 000	178	9.5	3.3	3.2	1.5	4.0	8.0	Q3
LTA8081EXS8/R8	ESOP	8	4 000	330	12.5	6.6	5.3	2.0	8.0	12.0	Q1
LTA8081EXV8/R6	EMSOP	8	3 000	330	12.5	5.0	3.5	2.0	8.0	12.0	Q1
LTA8082EXS8/R8	ESOP	8	4 000	330	12.5	6.6	5.3	2.0	8.0	12.0	Q1
LTA8082EXV8/R6	EMSOP	8	3 000	330	12.5	5.0	3.5	2.0	8.0	12.0	Q1
LTA8082EXF8/R10	DFN3×3	8	5 000	330	12.5	3.3	3.3	1.1	8.0	12.0	Q1
LTA8084EXS14/R5	SOIC	14	2 500	330	12.5	6.5	9.5	2.0	8.0	16.0	Q1
LTA8084EXT14/R6	ETSSOP	14	3 000	330	12.5	6.9	5.5	1.3	8.0	16.0	Q1

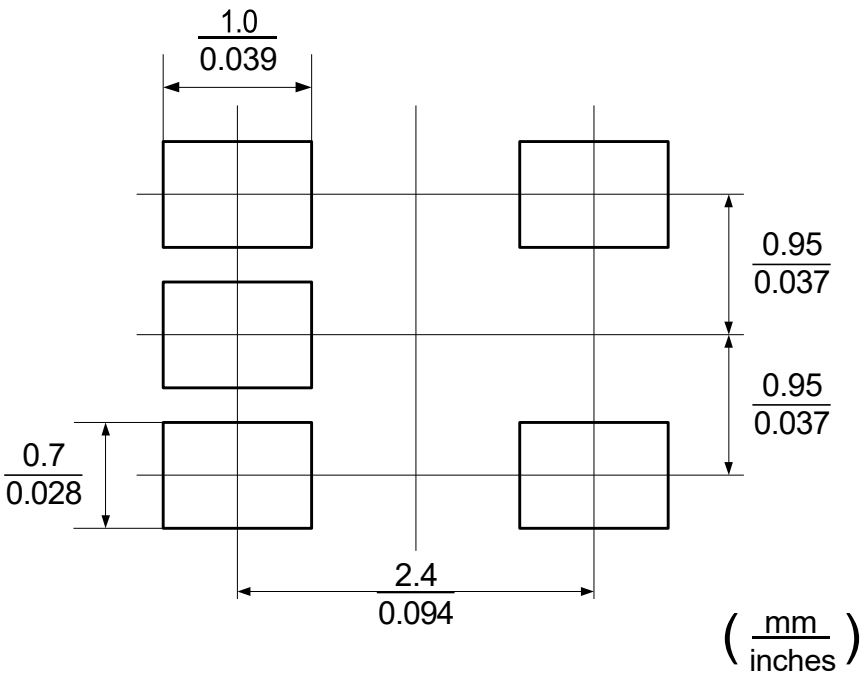
Package Outlines

DIMENSIONS, SOT23-5L



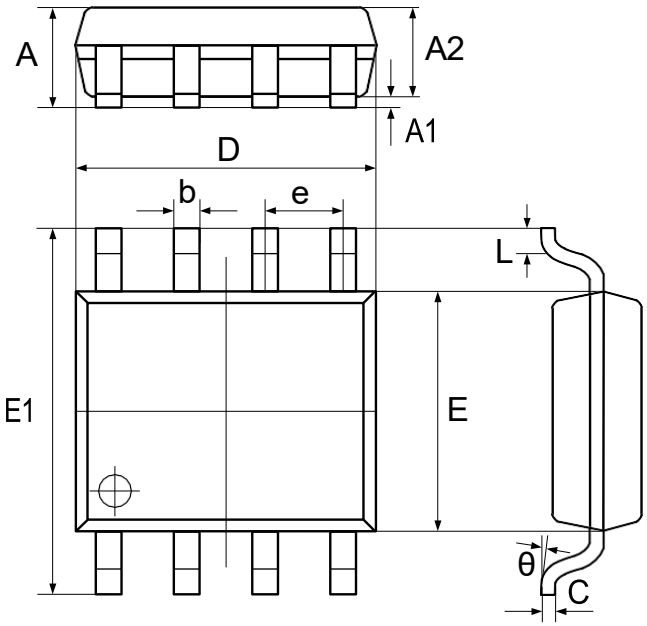
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	–	1.25	–	0.049
A1	0.04	0.10	0.002	0.004
A2	1.00	1.20	0.039	0.047
b	0.33	0.41	0.013	0.016
c	0.15	0.19	0.006	0.007
D	2.820	3.02	0.111	0.119
E1	1.50	1.70	0.059	0.067
E	2.60	3.00	0.102	0.118
e	0.95 BSC		0.037 BSC	
e1	1.90 BSC		0.075 BSC	
L	0.60 REF		0.024 REF	
L1	0.30	0.60	0.012	0.024
θ	0°	8°	0°	8°

RECOMMENDED SOLDERING FOOTPRINT, SOT23-5L



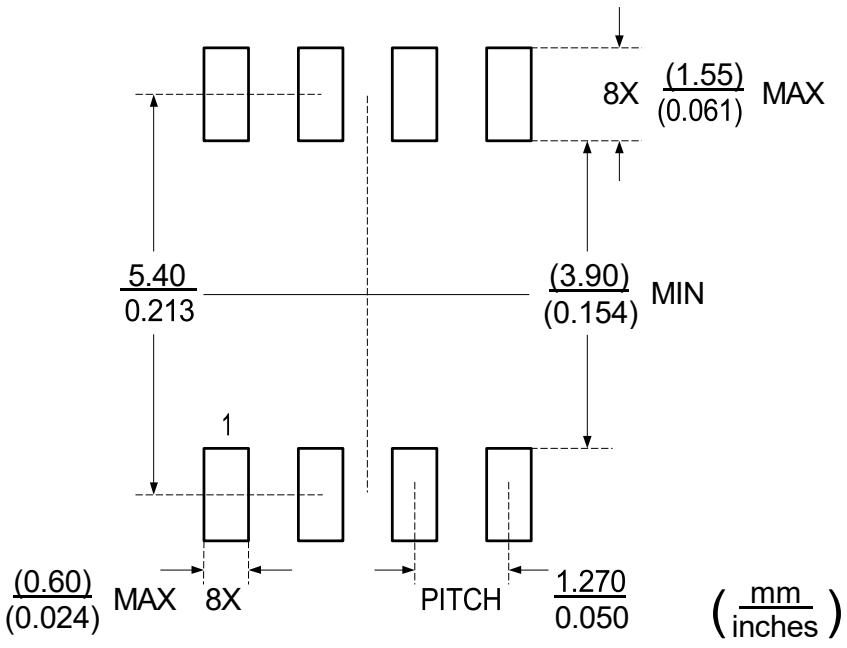
Package Outlines (continued)

DIMENSIONS, ESOP-8L



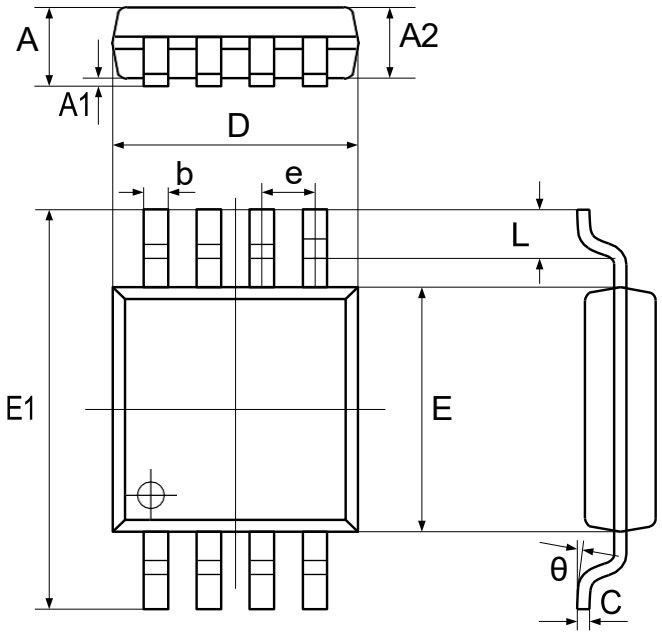
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.370	1.670	0.054	0.066
A1	0.070	0.170	0.003	0.007
A2	1.300	1.500	0.051	0.059
b	0.306	0.506	0.012	0.020
C	0.203 TYP.		0.008 TYP.	
D	4.700	5.100	0.185	0.201
E	3.820	4.020	0.150	0.158
E1	5.800	6.200	0.228	0.244
e	1.270 TYP.		0.050 TYP.	
L	0.450	0.750	0.018	0.030
θ	0°	8°	0°	8°

RECOMMENDED SOLDERING FOOTPRINT, ESOP-8L



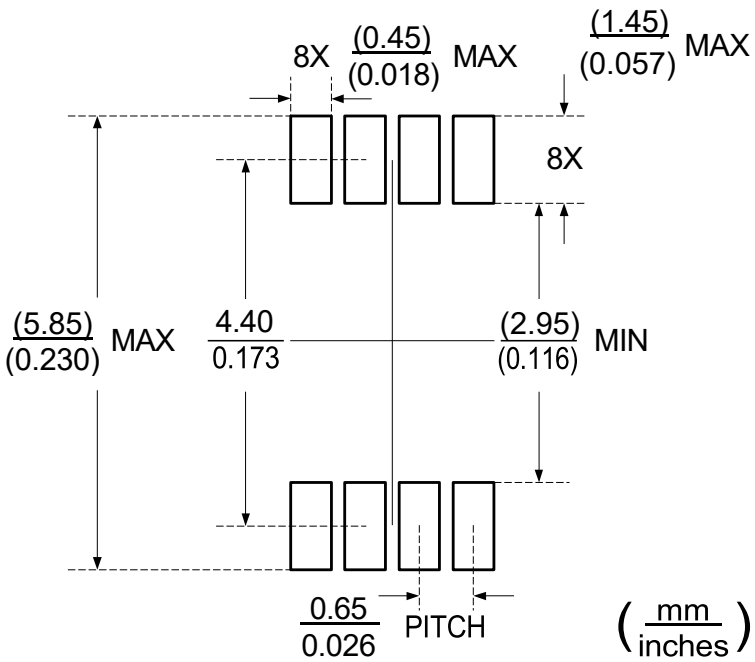
Package Outlines (continued)

DIMENSIONS, EMSOP-8L



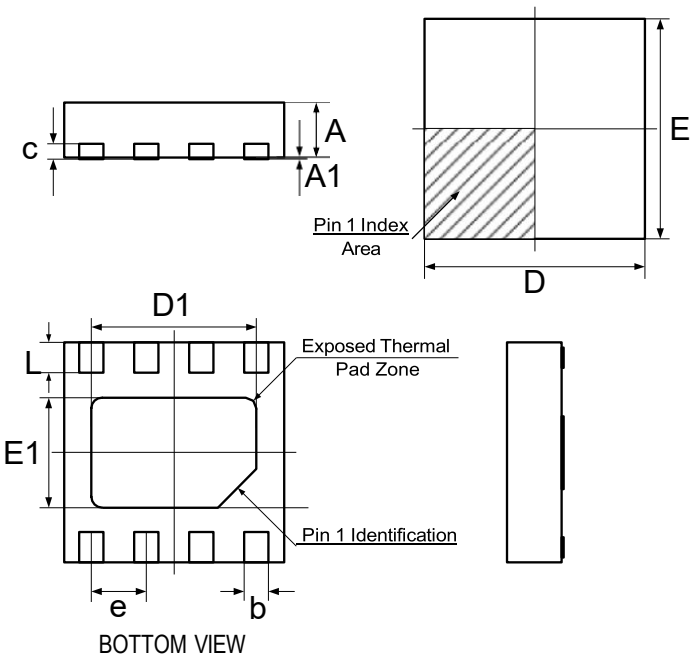
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.031	0.043
A1	0.050	0.150	0.002	0.006
A2	0.750	0.950	0.030	0.037
b	0.290	0.380	0.011	0.015
C	0.150	0.200	0.006	0.008
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
e	0.650 TYP.		0.026 TYP.	
L	0.400	0.700	0.016	0.028
θ	0°	8°	0°	8°

RECOMMENDED SOLDERING FOOTPRINT, EMSOP-8L



Package Outlines (continued)

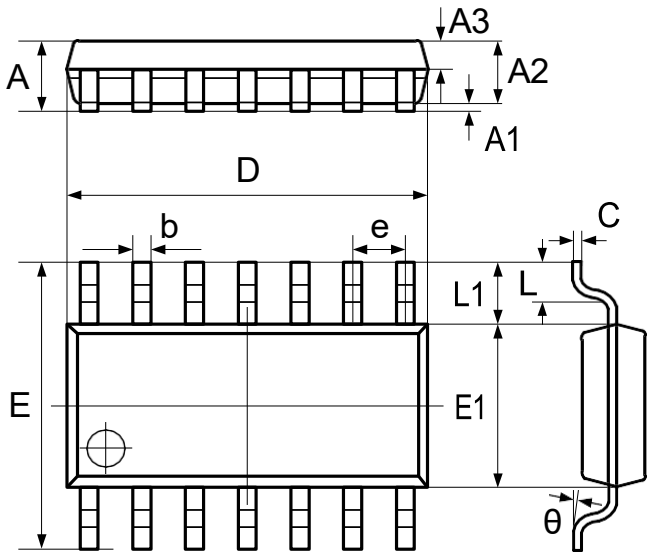
DIMENSIONS, DFN3x3-8L



Symbol	Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
A1	-	0.02	0.05
b	0.255	0.28	0.305
c	0.19	0.21	0.23
D	2.90	3.00	3.10
D1	2.25	2.30	2.35
E	2.90	3.00	3.10
E1	1.45	1.50	1.55
e	0.625	0.65	0.675
L	0.25	0.30	0.35

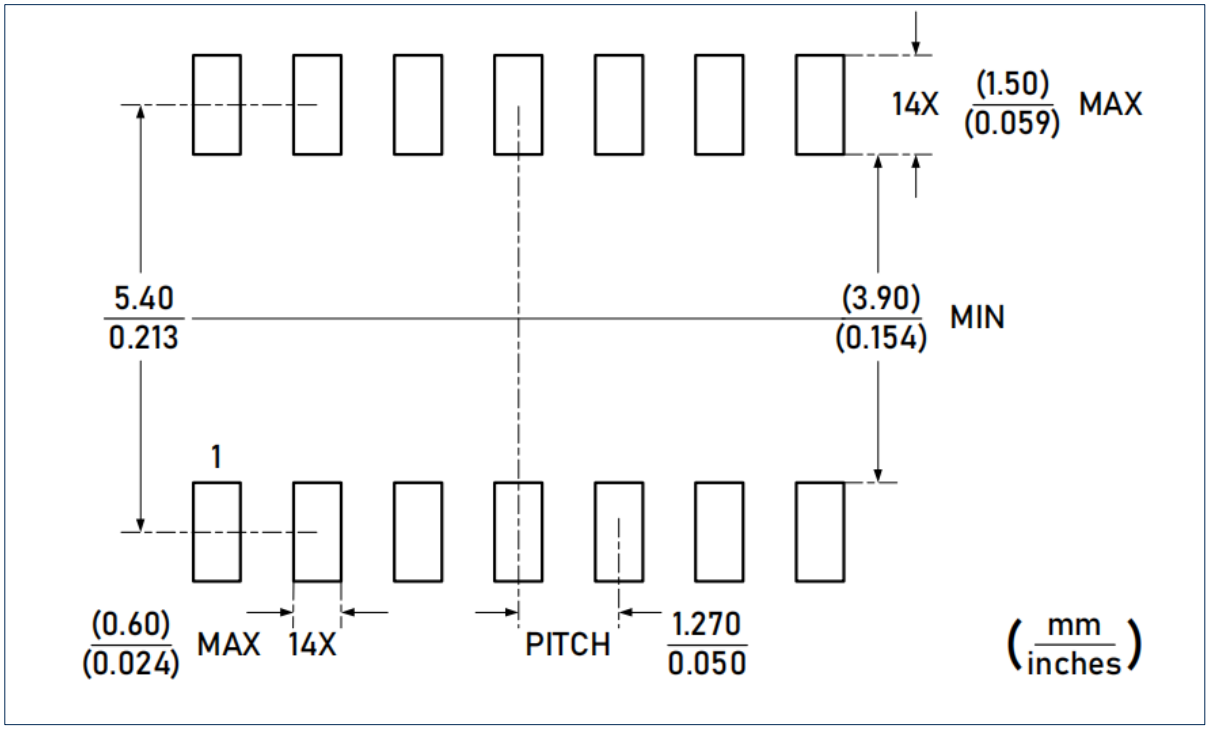
Package Outlines (continued)

DIMENSIONS, SOIC-14L



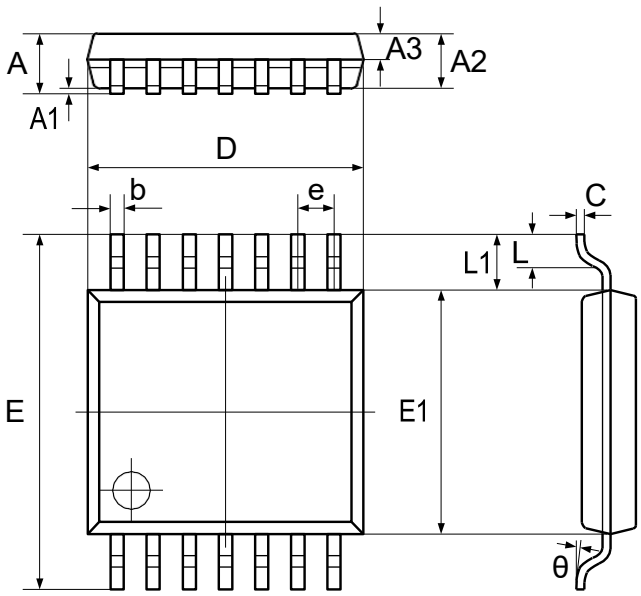
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.450	1.850	0.057	0.073
A1	0.100	0.300	0.004	0.012
A2	1.350	1.550	0.053	0.061
A3	0.550	0.750	0.022	0.030
b	0.406 TYP.		0.016 TYP.	
C	0.203 TYP.		0.008 TYP.	
D	8.630	8.830	0.340	0.348
E	5.840	6.240	0.230	0.246
E1	3.850	4.050	0.152	0.159
e	1.270 TYP.		0.050 TYP.	
L1	1.040 REF.		0.041 REF.	
L	0.350	0.750	0.014	0.030
θ	2°	8°	2°	8°

RECOMMENDED SOLDERING FOOTPRINT, SOIC-14L



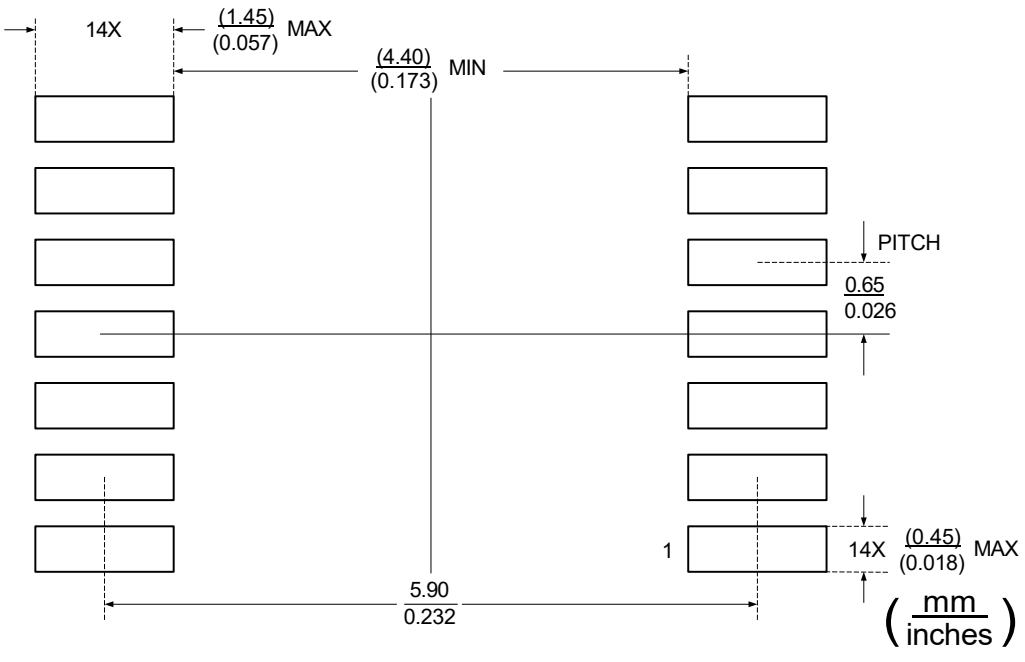
Package Outlines (continued)

DIMENSIONS, ETSSOP-14L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	-	1.200	-	0.047
A1	0.050	0.150	0.002	0.006
A2	0.900	1.050	0.035	0.041
A3	0.390	0.490	0.015	0.019
b	0.200	0.290	0.008	0.011
C	0.130	0.180	0.005	0.007
D	4.860	5.060	0.191	0.199
E	6.200	6.600	0.244	0.260
E1	4.300	4.500	0.169	0.177
e	0.650 TYP.		0.026 TYP.	
L1	1.000 REF.		0.039 REF.	
L	0.450	0.750	0.018	0.030
θ	0°	8°	0°	8°

RECOMMENDED SOLDERING FOOTPRINT, ETSSOP-14L



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 (industry 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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