LTA6381, LTA6382, LTA6384

36V, 12MHz High Supply Voltage Amplifier

General Description

The LTA6381, LTA6382 and LTA6384 are a family of micro-power, 36V wide supply voltage, rail-to-rail input and output operational amplifiers capable of operating on supplies ranging from +4V to +36V. LTA6381/LTA6382/LTA6384 offer outstanding dc precision and ac performance, including low offset (1.5mV typically), low offset drift (5 μV/°C typically), 12MHz bandwidth, Unique features such as differential input-voltage range to the negative supply rail, Short-circuit current (35mA), high capacitive load drive of up to 1nF, and high slew rate (20V/μs) make the LTA6381/LTA6382/LTA6384 high-performance operational amplifiers for high-voltage industrial applications.

The robust design of the LTA6381/LTA6382/LTA6384 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 LTA6381/LTA6382/LTA6384 are optimized for operation at voltages from +4V (±2V) to +36V (±18V) over the extended temperature range of −40 °C to +125 °C.

Features and Benefits

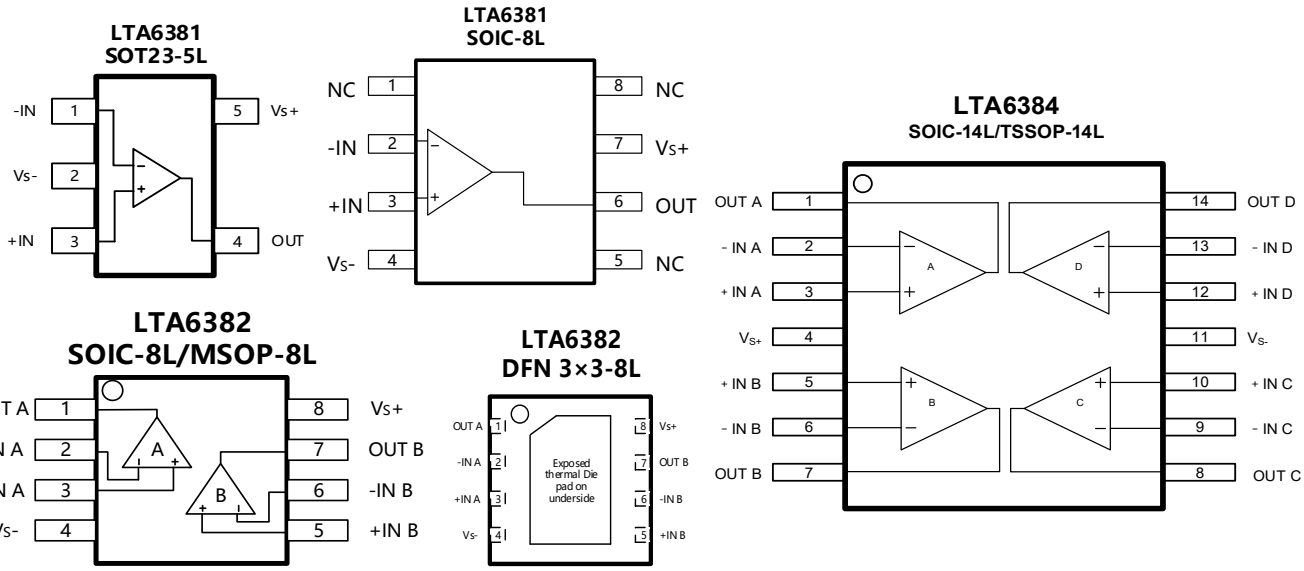
- Supply Voltage: 4V to 36V
- Offset Voltage: 5mV
- Differential Input Voltage Range to Supply Rail, can Work as Comparator
- Rail-to-Rail Input and Output
- Bandwidth: 12MHz
- Slew Rate: 20V/μs
- Operation Temperature Range: -40°C to 125°C

Applications

- Instrumentation
- Sensor Interface
- Motor Control
- Industrial Control
- Audio

Table of Content

Pin Configuration (Top View)



Pin Description

PIN Name	Description
OUT	Output.
-IN	Inverting input.
+IN	Non-inverting input.
V_{S-}	Negative power supply.
V_{S+}	Positive power supply.
NC	No connection.

Ordering Information[1]

Part Number	Package Type	Package Quantity	ECO Class[2]	Mark Code[3]
LTA6381XT5/R6	SOT23-5L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	F81
LTA6381XS8/R8	SOIC-8L	Tape and Reel, 4 000	Green (RoHS & no Sb/Br)	F6381
LTA6382XS8/R8	SOIC-8L	Tape and Reel, 4 000	Green (RoHS & no Sb/Br)	F6382
LTA6382XV8/R6	MSOP-8L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	F6382
LTA6382XF8/R6	DFN3×3-8L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	F6382
LTA6384XS14/R5	SOIC-14L	Tape and Reel, 2 500	Green (RoHS & no Sb/Br)	F6384
LTA6384XT14/R6	TSSOP-14L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	F6384

(1) Please contact to your Linearin representative for the latest availability information and product content details.

(2) Eco Class - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & Halogen Free).

(3) There may be multiple device markings, a varied marking character of "x" , or additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

Limiting Value

In accordance with the Absolute Maximum Ratin System (IEC60134).

Parameter	Absolute Maximum Rating
Supply Voltage, V_{S+} to V_{S-}	36 V
Signal Input Terminals: Voltage	V_{S-} – 0.5 V to V_{S+} + 0.5 V
Signal Input Terminals: Current	± 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 Ratings

Parameter	Level	UNIT
Human body model (HBM), per ANSI/ESDA/JEDEC JS-001	±3 000	V
Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002	±1 500	V

Thermal Information

Thermal Metric		Package	Level	Unit
θ_{JA}	Package Thermal Resistance	SOT23-5L	190	℃/W
		SOIC-8L	125	
		MSOP-8L	201	
		DFN3×3-8L	94	
		SOIC-14L	115	
		TSSOP-14L	112	

Electrical Characteristics

V_S = 36 V, T_A = + 25 °C, V_{CM} = V_S/2, V_O = V_S /2, and R_L = 10 kΩ connected to V_S/2, unless otherwise noted.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
POWER SUPPLY						
Supply Voltage Range	V_S		4		36	V
Quiescent Current per Amplifier	I_Q	V_S= 36V	1.65	2.30	3.30	mA
		V_S= 5V	1.40	1.35	2.40	
Power supply rejection ratio	PSRR	V_S = 4 to 36V， T_A=25℃	95	100		dB
		V_S = 4 to 36V， T_A=-40~125℃	90	98		
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{OS}	T_A=25℃	-4.5		4.5	mV
		T_A=-40~125℃		±1.5	5	
Input Offset Voltage Drift	dV_{OS}/dT			5		μV/℃
Input Bias Current	I_B	T_A=25℃		9		pA
		T_A=85℃		100		
		T_A=125℃		1400		
Input Offset Current	I_{OS}	T_A=25℃		9		pA
Input Capacitance	C_{IN}			3.5		pF
Open-loop Voltage Gain	A_V	V_s=36V, T_A=-40~125℃	90	100		dB
Common-mode voltage range	V_{CM}		V_{S-}-0.1		V_{S+}-1.5	V
Common-mode rejection ratio	CMRR	V_{cm} = 0V~34V, T_A=25℃	90	105		dB
		V_{cm} = 0V~34V, T_A=-40~125℃	92	100		
		V_{cm} = 0V~30V, T_A=25℃	86	110		
		V_{cm} = 0V~30V, T_A=-40~125℃	100	105		
OUTPUT CHARACTERISTICS						
Output Swing from Positive Rail	V_{OH}	R_L = 10 kΩ to V_S/2		230	290	mV
		R_L = 2 kΩ to V_S/2		1000	1300	
Output Swing from Negative Rail	V_{OL}	R_L = 10 kΩ to V_S/2		130	150	mV
		R_L = 2 kΩ to V_S/2		600	900	
Output Short-Circuit Current	Source			28		mA
	Sink			35		
Capacitive Load Drive				200		pF
AC SPECIFICATIONS						
Gain-Bandwidth Product	GBW			12		MHz
Slew Rate	SR			20		V/μs
Phase Margin	PM			68		deg

Electrical Characteristics(Cont.)

V_S = 36 V, T_A = + 25 °C, V_{CM} = V_S/2, V_O = V_S /2, and R_L = 10 kΩ connected to V_S/2, unless otherwise noted.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
NOISE PERFORMANCE						
Input Voltage Noise	E_N	f = 0.1 Hz to 10Hz		30		μV_{pp}
Input Voltage Noise Density	e_N	f = 1 kHz		50		nV/√Hz
		f = 10 kHz		23		nV/√Hz
Total Harmonic Distortion and Noise	THD+N	f = 1 kHz， G=1， R_L= 10kΩ， V_{out}=3V_{RMS}		0.0001		%

Typical Characteristics

At T_A = 25℃, V_S = 36 V, V_{CM} = V_S / 2 and R_L = 10 kΩ connected to V_S / 2, unless otherwise noted.

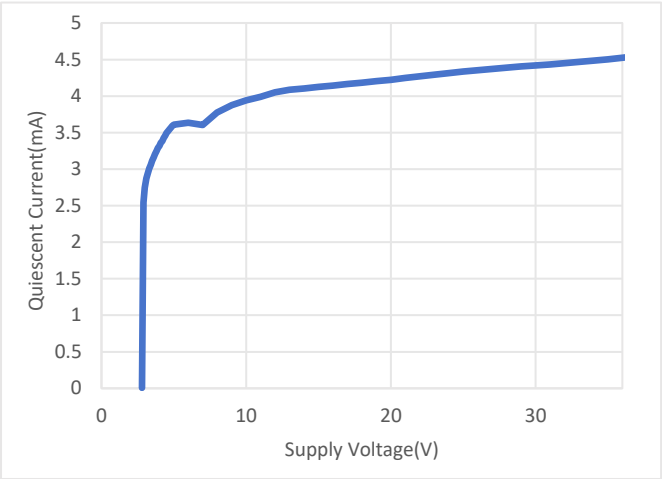


Figure 1. LTA6382 Quiescent Current vs Supply

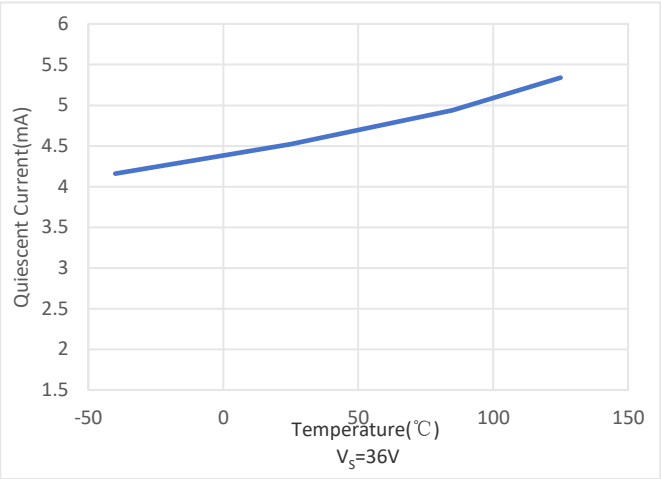


Figure 2. LTA6382 Quiescent Current vs Temperature

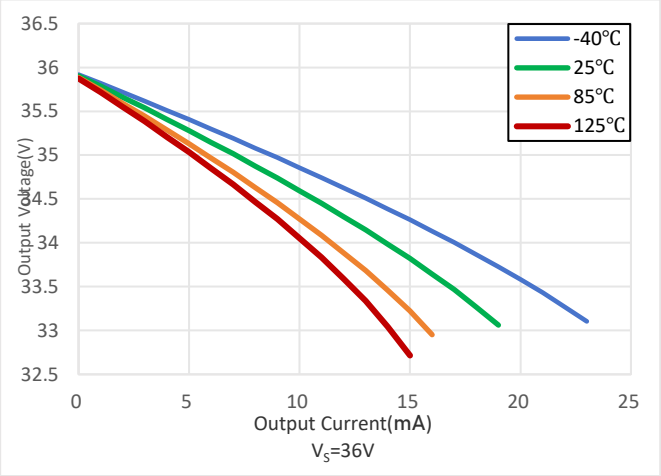


Figure 3. Output Voltage Swing as a function of Output Current (Sourcing, V_S = 36 V)

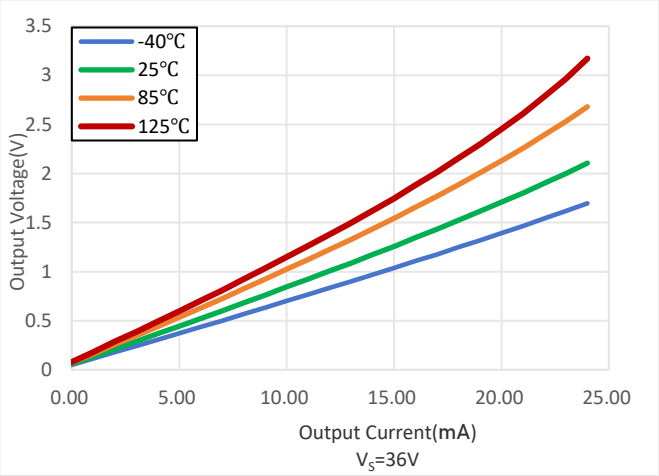


Figure 4. Output Voltage Swing as a function of Output Current (Sinking, V_S = 36 V)

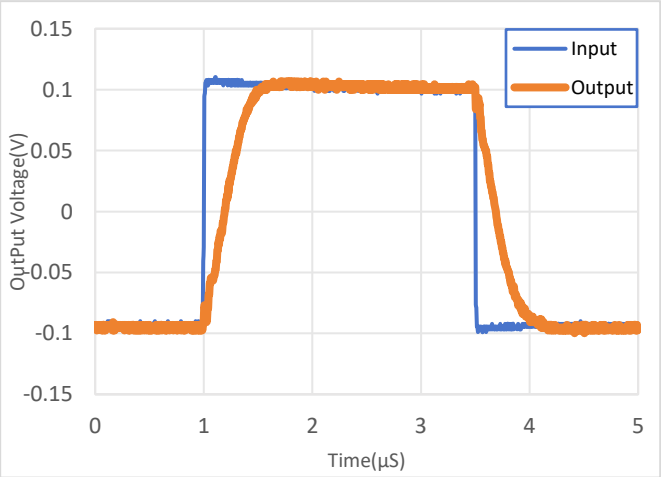


Figure 5. Small-Signal Step Response

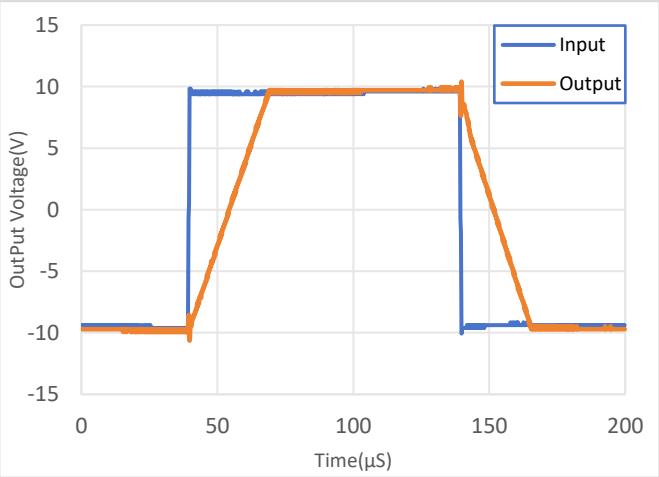


Figure 6. Large-Signal Step Response

Typical Characteristics(Cont.)

At T_A = 25℃, V_S = 36 V, V_{CM} = V_S / 2 and R_L = 10 kΩ connected to V_S / 2, unless otherwise noted.

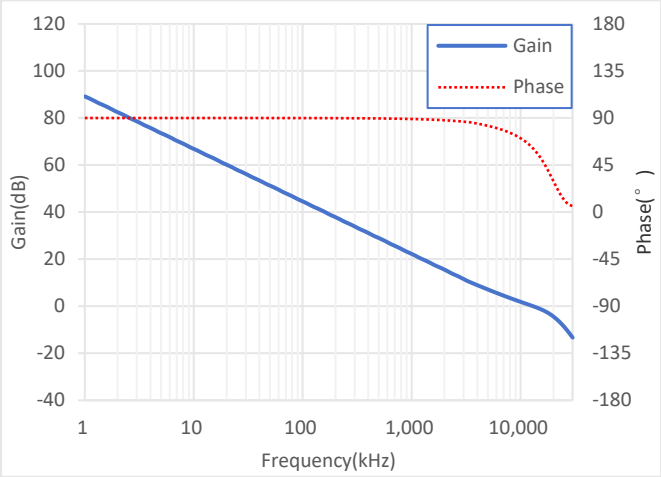


Figure 7. Open Loop Gain and Phase vs Frequency

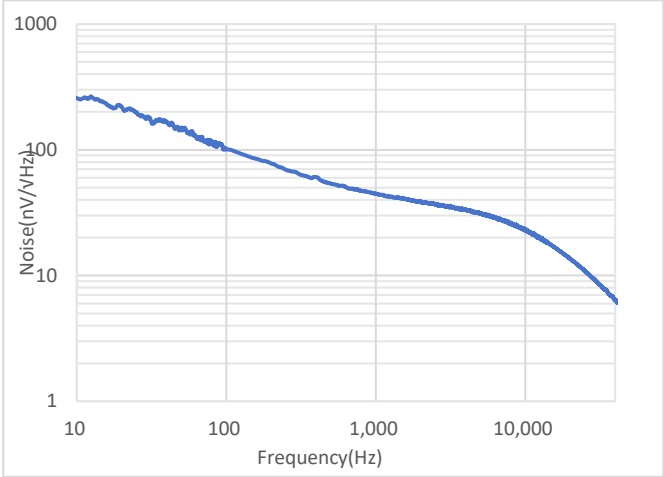
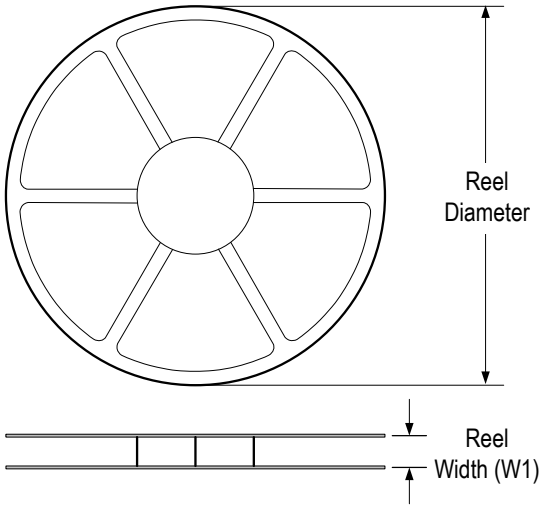


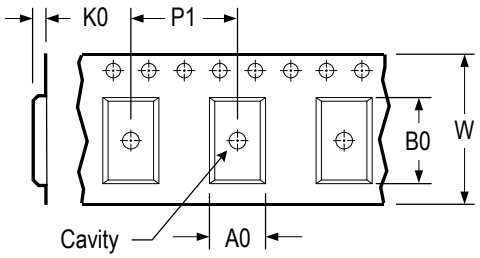
Figure 8. Voltage Noise Density vs. Frequency

Tape and Reel Information

REEL DIMENSIONS

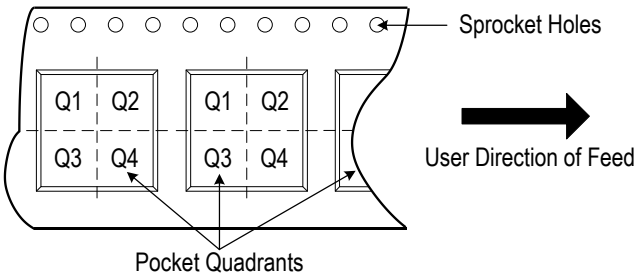


TAPE DIMENSIONS



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

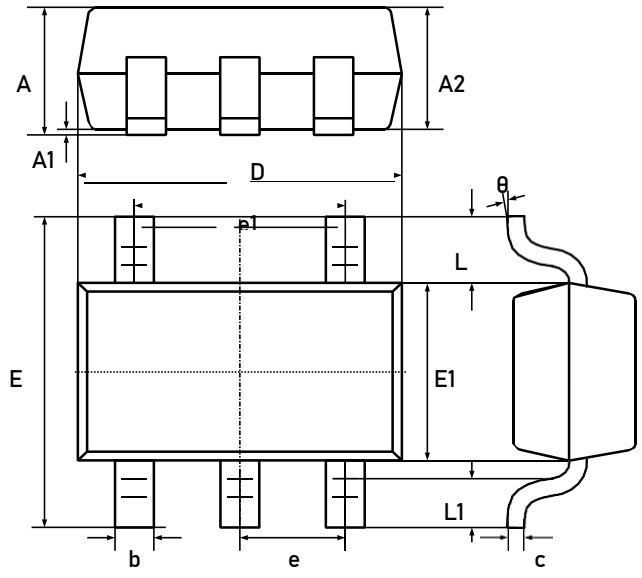


* All dimensions are nominal

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
LTA6381XT5/R6	SOT23	5	3 000	178	9.0	3.3	3.2	1.5	4.0	8.0	Q3
LTA6381XS8/R8	SOIC	8	4 000	330	12.5	6.6	5.3	2.0	8.0	12.0	Q1
LTA6382XS8/R8	SOIC	8	4 000	330	12.5	6.6	5.3	2.0	8.0	12.0	Q1
LTA6382XV8/R6	MSOP	8	3 000	330	12.5	5.0	3.5	2.0	8.0	12.0	Q1
LTA6382XF8/R6	DFN3×3	8	3 000	330	12.5	3.3	3.3	1.1	8.0	12.0	Q1
LTA6384XS14/R5	SOIC	14	2 500	330	12.5	6.5	9.5	2.0	8.0	16.0	Q1
LTA6384XT14/R6	TSSOP	14	3 000	330	12.5	6.9	5.5	1.2	8.0	16.0	Q1

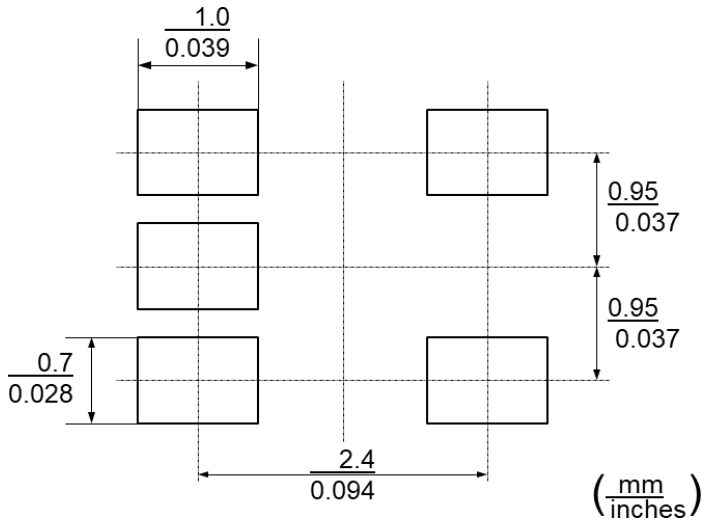
Package Outlines

DIMENSIONS, SOT23-5L



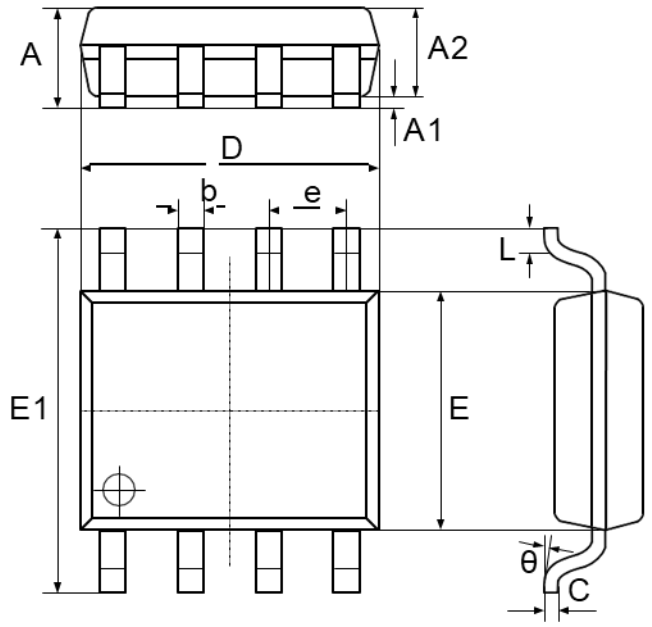
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	-	1.25	-	0.049
A1	0.04	0.10	0.002	0.004
A2	1.00	1.20	0.039	0.047
b	0.33	0.41	0.013	0.016
c	0.15	0.19	0.006	0.007
D	2.820	3.02	0.111	0.119
E1	1.50	1.70	0.059	0.067
E	2.60	3.00	0.102	0.118
e	0.95 BSC		0.037 BSC	
e1	1.90 BSC		0.075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



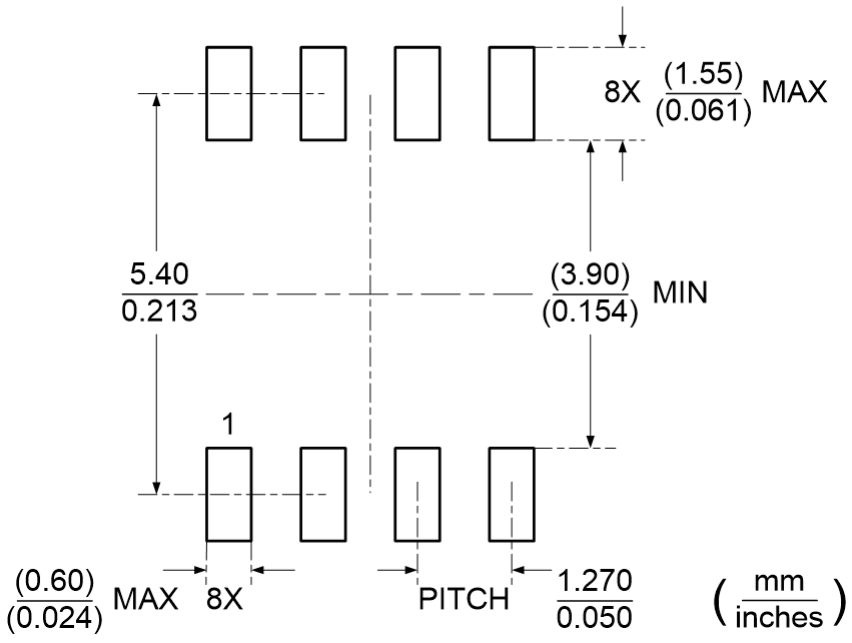
Package Outlines(Cont.)

DIMENSIONS, SOIC-8L



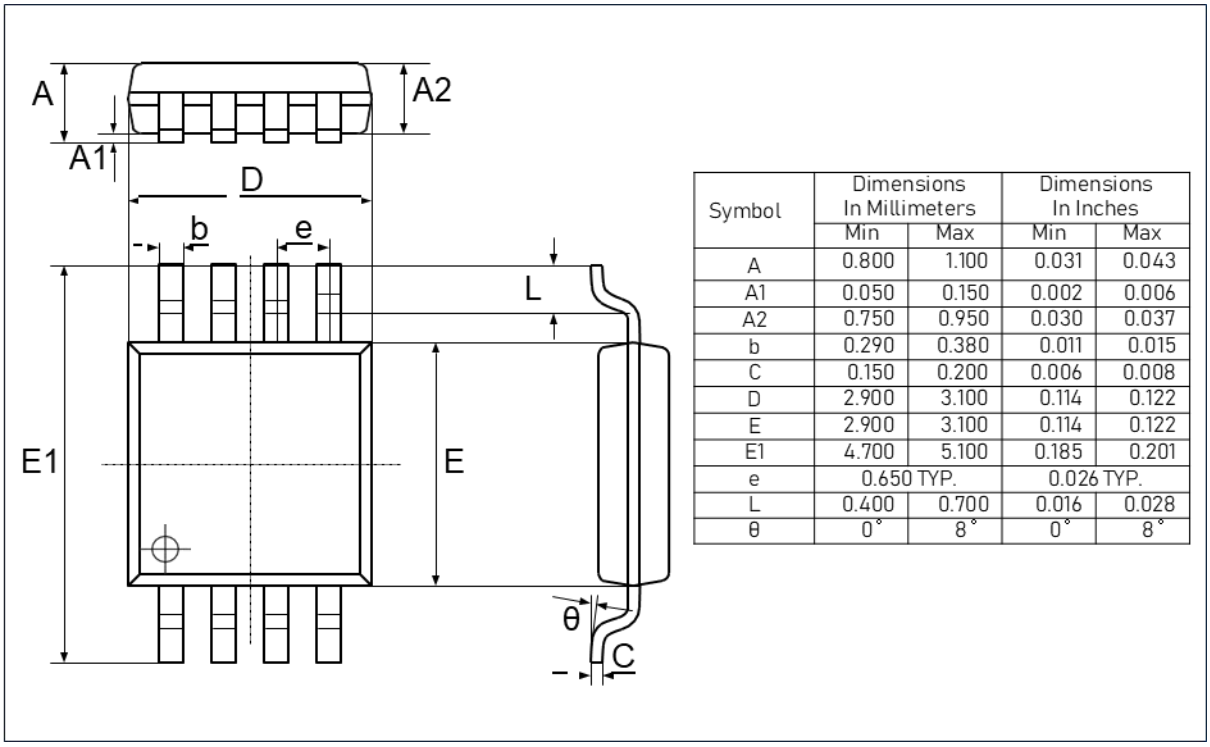
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.370	1.670	0.054	0.066
A1	0.070	0.170	0.003	0.007
A2	1.300	1.500	0.051	0.059
b	0.306	0.506	0.012	0.020
C	0.203 TYP.		0.008 TYP.	
D	4.700	5.100	0.185	0.201
E	3.820	4.020	0.150	0.158
E1	5.800	6.200	0.228	0.244
e	1.270 TYP.		0.050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

RECOMMENDED SOLDERING FOOTPRINT, SOIC-8L



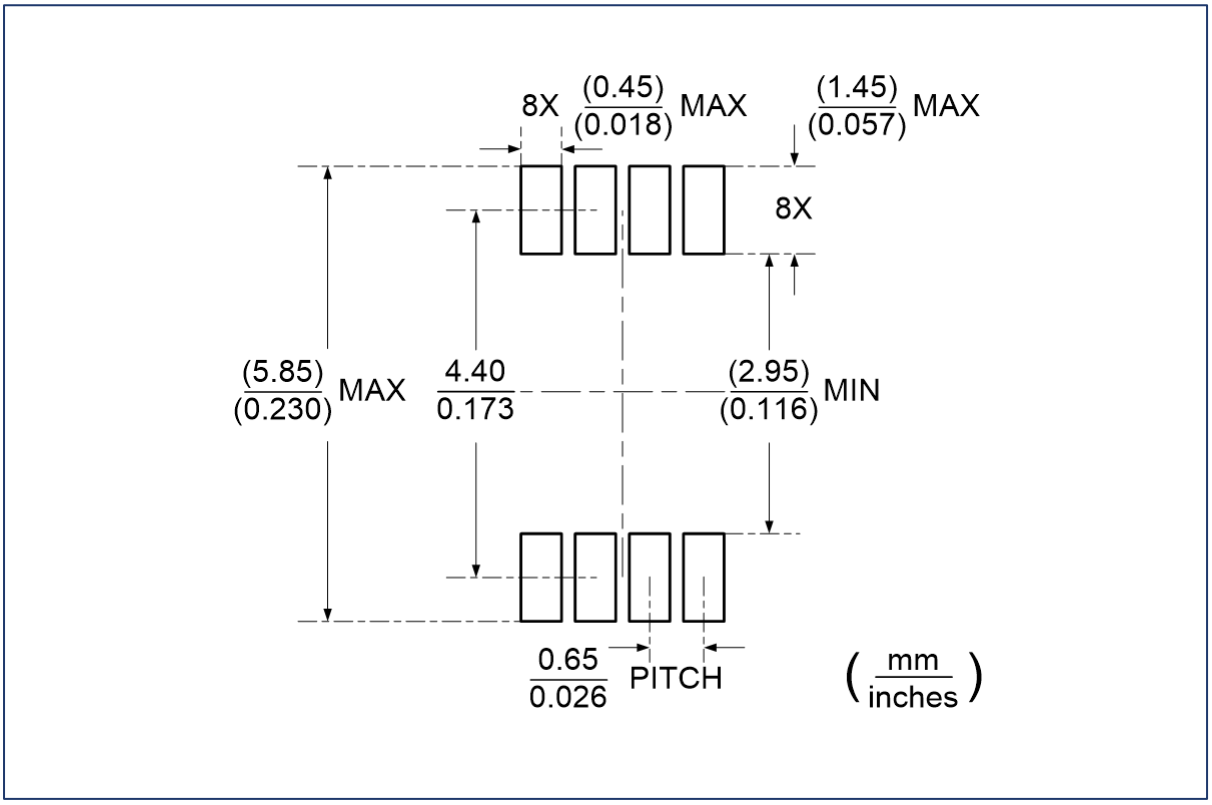
Package Outlines(Cont.)

DIMENSIONS, MSOP-8L



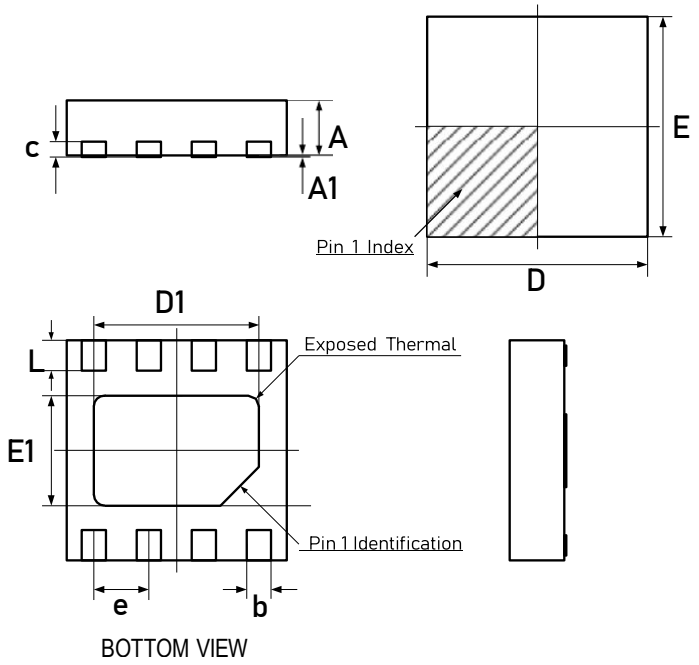
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.031	0.043
A1	0.050	0.150	0.002	0.006
A2	0.750	0.950	0.030	0.037
b	0.290	0.380	0.011	0.015
C	0.150	0.200	0.006	0.008
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
e	0.650 TYP.		0.026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

RECOMMENDED SOLDERING FOOTPRINT, MSOP-8L



Package Outlines(Cont.)

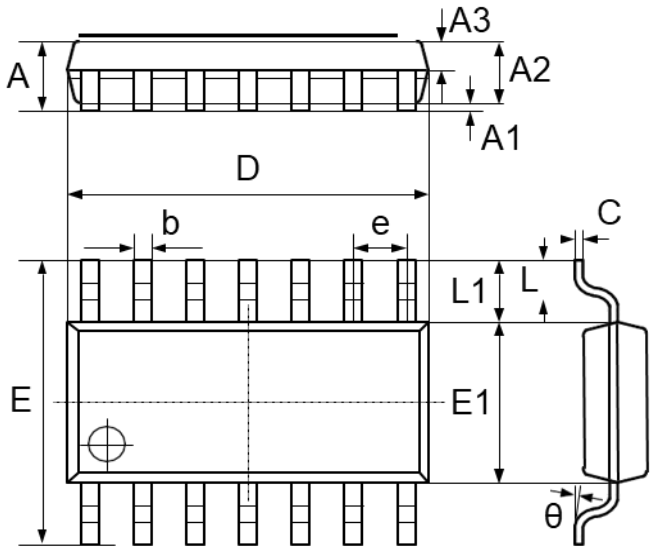
DIMENSIONS, DFN3x3-8L



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

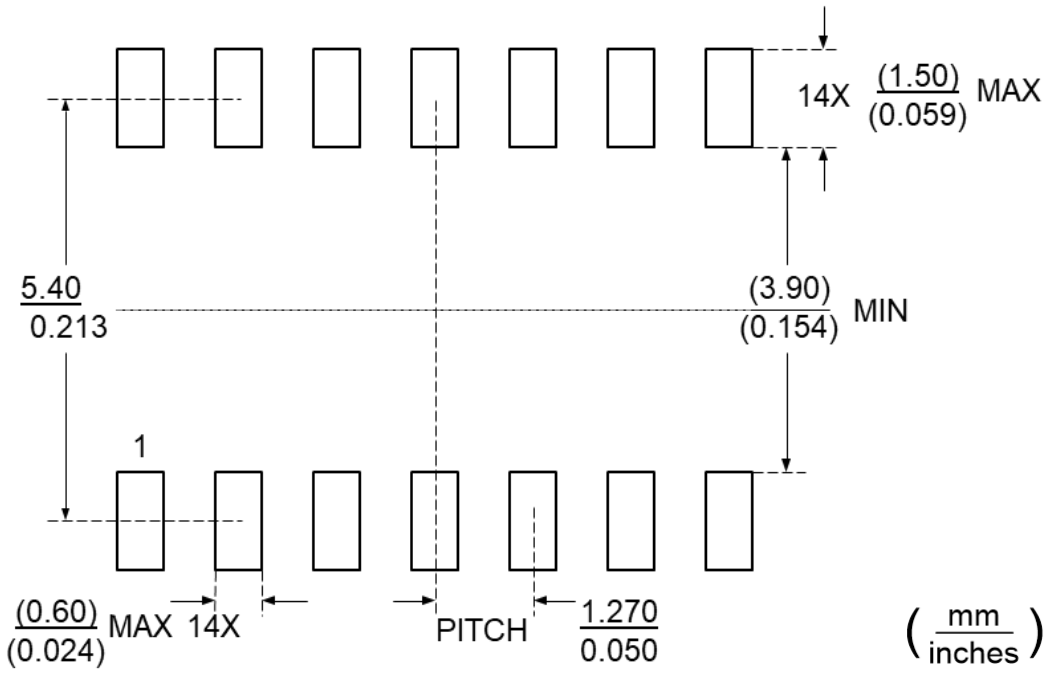
Package Outlines(Cont.)

DIMENSIONS, SOIC-14L



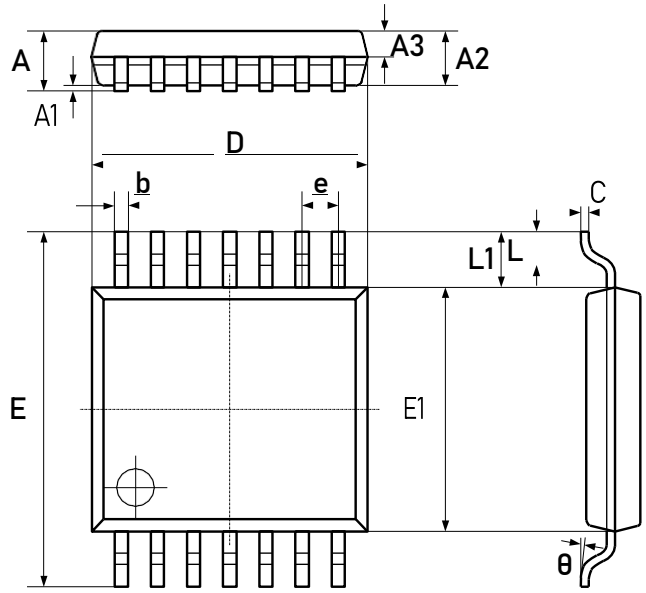
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.450	1.850	0.057	0.073
A1	0.100	0.300	0.004	0.012
A2	1.350	1.550	0.053	0.061
A3	0.550	0.750	0.022	0.030
b	0.406 TYP.		0.016 TYP.	
C	0.203 TYP.		0.008 TYP.	
D	8.630	8.830	0.340	0.348
E	5.840	6.240	0.230	0.246
E1	3.850	4.050	0.152	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



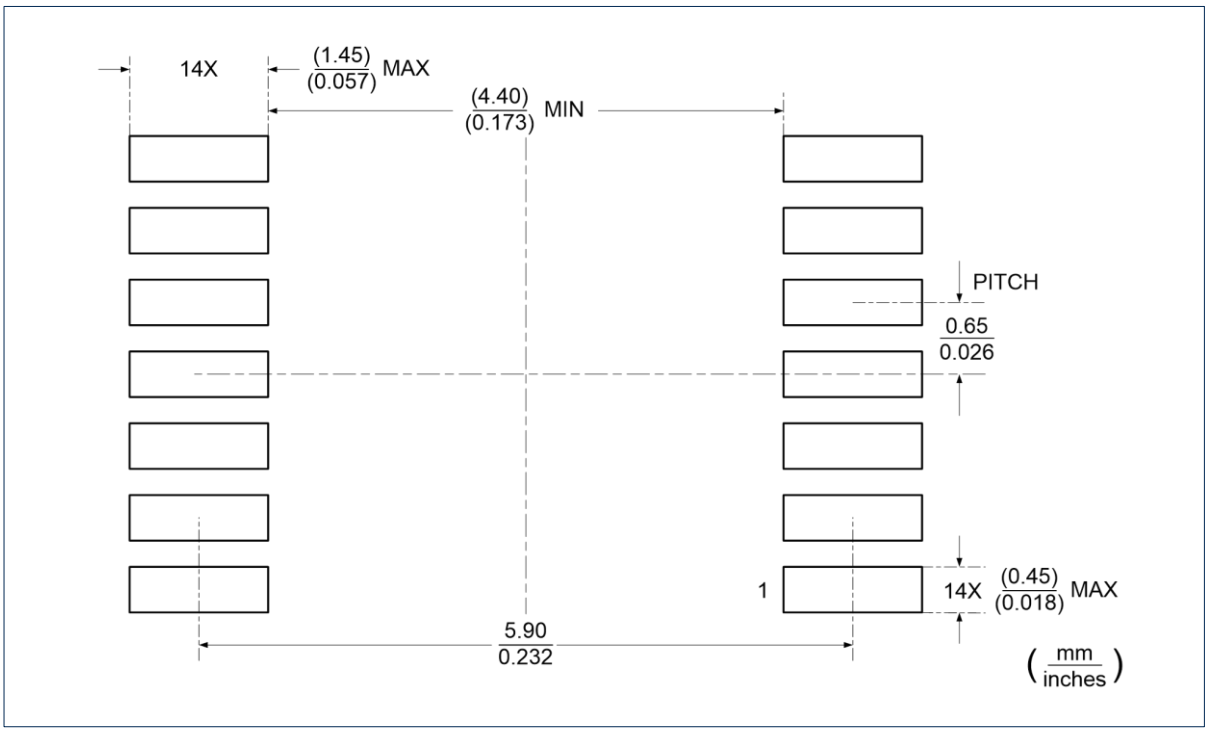
Package Outlines(Cont.)

DIMENSIONS, TSSOP-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, TSSOP-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.

For additional product information, or full datasheet, please contact with the Linearin's Sales Department or Representatives.