LTA77

New Generation High Precision Operational Amplifier

General Description

The LTA77 is a 44-V micro-power alternative to the industry-standard OP77/OP07 precision amplifiers. The LTA77 offer outstanding dc precision and ac performance, including 25 µV ultralow offset, below 0.3 µV/°C drift over temperature, 0.5 μV_{P-P} input voltage noise and 0.9 MHz bandwidth. External offset trimming is not required in the majority of circuits.

A PSRR of 3 µV/V (110 dB) and CMRR of 1.0 µV/V (120 dB) maximum virtually eliminate errors caused by power supply drifts and common-mode signals. This combination of outstanding characteristics makes the LTA77 ideally suited for high resolution instrumentation and other tight error budget systems.

The robust design of the LTA77 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 LTA77 is optimized for operation at voltages from +6 V (±3 V) to +44 V (±22 V) over the extended temperature range of −40 °C to +125 °C.

Features and Benefits

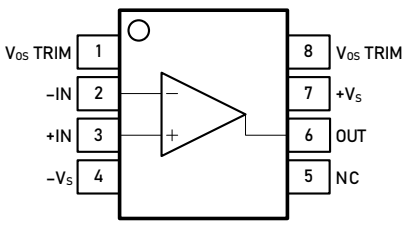
- Offset Voltage: 25 µV Maximum (LTA77E)
- Offset Voltage Drift: 0.3 µV/°C Maximum (LTA77E)
- 0.1 to 10 Hz Noise: 0.5 μV_{P-P}
- High Common-Mode Rejection: 0.1 µV/V (140 dB)
- Wide Supply: ±3 V to ±22 V, 6 V to 44 V
- Wide Bandwidth: 0.9 MHz
- High Slew Rate: 0.48 V/µs
- Low Quiescent Current: 1 mA per Amplifier
- EMI/RFI Filtered Inputs

Applications

- Replaces OP07/OP77/OP97/OP177 with Improved Performance
- High-Side and Low-Side Current Sensing
- Multiplexed Data-Acquisition Systems
- Test and Measurement Equipment
- High-Resolution ADC Driver Amplifiers
- SAR ADC Reference Buffers
- Programmable Logic Controllers
- High Precision Comparator

Pin Configuration (Top View)

LTA77
SOIC-8L



Pin Description

Symbol	Description
–IN	Inverting input of the amplifier. The voltage range is from V_{S-} to V_{S+} .
+IN	Non-inverting input of the amplifier. This pin has the same voltage range as –IN.
OUT	Amplifier output.
V_{OS} TRIM	External input offset voltage adjustment
$+V_S$	Positive power supply. The voltage is from 6 V to 44 V. Split supplies are possible as long as the voltage between V_{S+} and V_{S-} is from 6 V to 44 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 6 V to 44 V.
NC	No connection.

Ordering Information (1)

Type Number	Package Name	Package Quantity	Eco Class (2)	Marking Code
LTA77EXS8/R8	SOIC-8L	Tape and Reel, 4 000	Green (RoHS & no Sb/Br)	ZT-77
LTA77FXS8/R8	SOIC-8L	Tape and Reel, 4 000	Green (RoHS & no Sb/Br)	ZT-77

(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).

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

Parameter	Absolute Maximum Rating
Supply Voltage, V_{S+} to V_{S-}	44 V
Signal Input Terminals: Voltage, Current	V_{S-} to V_{S+}, ±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 MIL-STD-883J / Method 3015.9 (1)	2 000	V
	Charged device model (CDM), per ESDA/JEDEC JS-002-2014 (2)	2 000	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 500-V HBM is possible if necessary precautions are taken.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 250-V CDM is possible if necessary precautions are taken.

Electrical Characteristics

V_S = ±15 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.
Boldface limits apply over the specified temperature range, T_A = −40 °C to +125 °C.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OFFSET VOLTAGE						
Input offset voltage	V_{OS}	LTA77E		±10	±25	µV
		LTA77F		±20	±60	
Offset voltage drift	V_{OS} TC	LTA77E, T_A = −40 to +125 °C			±0.3	µV/°C
		LTA77F, T_A = −40 to +125 °C			±0.6	
Long-term stability (1)	V_{OS} TC	LTA77E		±0.3		µV/Mo
		LTA77F		±0.4		
Power supply rejection ratio	PSRR	LTA77E, V_S = ±3 to ±18 V		0.7	3	µV/V
		LTA77F, V_S = ±3 to ±18 V		0.7	5	
INPUT BIAS CURRENT						
Input bias current	I_B	LTA77E			2	nA
		LTA77F			2.8	
Input offset current	I_{OS}			0.2		nA
NOISE						
Input voltage noise	V_n	f = 0.1 to 10 Hz		0.5		$µV_{P-P}$
Input current noise	I_n	f = 0.1 to 10 Hz		10		pA_{P-P}
INPUT VOLTAGE						
Common-mode voltage range	V_{CM}		±13	±14		V
Common-mode rejection ratio	CMRR	LTA77E, V_{CM} = ±13 V		0.1	1.0	µV/V
		LTA77F, V_{CM} = ±13 V		0.1	1.6	
INPUT IMPEDANCE						
Input capacitance	C_{IN}	Differential		2.0		pF
		Common mode		3.5		
OPEN-LOOP GAIN						
Open-loop voltage gain	A_{VOL}	LTA77E, R_L ≥ 2 kΩ, V_O = ±10 V	5,000	12,000		V/mV
		LTA77F, R_L ≥ 2 kΩ, V_O = ±10 V	2,000	6,000		
FREQUENCY RESPONSE						
Gain bandwidth product	GBW			0.9		MHz
Slew rate	SR	G = +1, C_L = 100 pF, V_O = 1.5 to 3.5 V		0.5		V/µs
OUTPUT						
Output voltage swing	V_D	R_L = 10 kΩ		±14	±14.9	V
		R_L = 1 kΩ		±13.5	±14.5	
Short-circuit current	I_{SC}				±22	mA
Offset adjustment range					±1.5	mV

(1) Long-term input offset voltage stability refers to the averaged trend line of V_{OS} vs. time over extended periods after the first 30 days of operation.

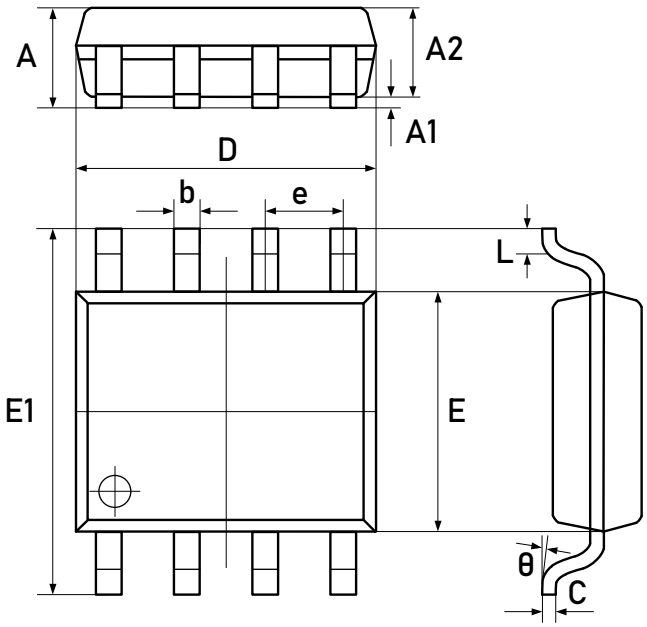
Electrical Characteristics (continued)

V_S = ±15 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. Boldface limits apply over the specified temperature range, T_A = −40 °C to +125 °C.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
POWER SUPPLY						
Operating supply voltage	V_S	T_A = −40 to +125 °C	6		44	V
Quiescent current (per amplifier)	I_Q	V_S = ±15 V, no load		0.22	0.31	mA
		V_S = ±3 V, no load		0.21	0.3	
THERMAL CHARACTERISTICS						
Operating temperature range	T_A		−40		+125	°C
Package Thermal Resistance	θ_{JA}	SOIC-8L		125		°C/W

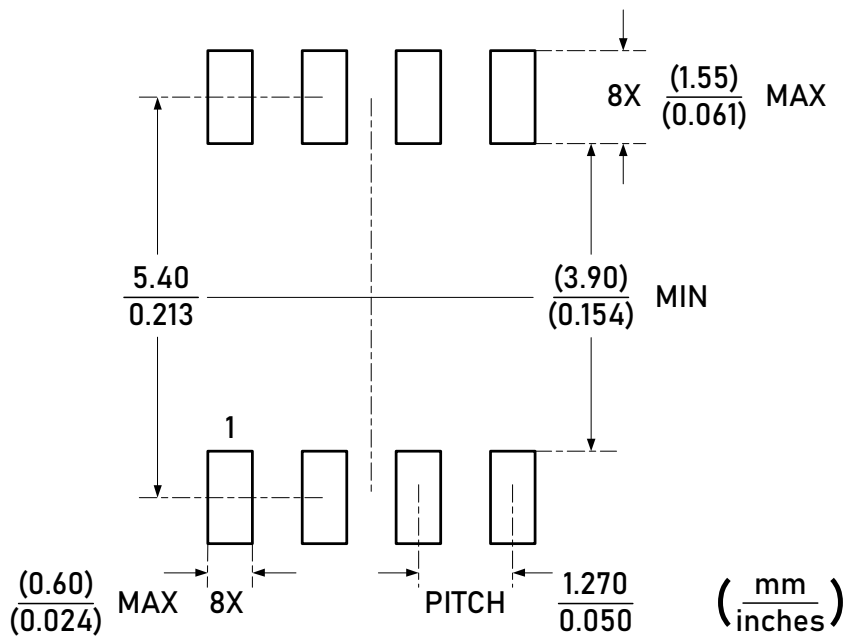
Package Outlines (continued)

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



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 (industrie 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.