LTA8373

48V, 4MHz, Low Noise, Rail-to-Rail Output Operational Amplifier

General Description

The LTA8373 is a low power, 48 V wide supply voltage, low noise, rail-to-rail output 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 LTA829x, LTA828x and LTA826x, provide a family of bandwidth, noise, and power options to meet the needs of a wide variety of applications. The LTA8373 offer outstanding dc precision and ac performance, including low offset (±2.5 mV maximum), low offset drift (±2 µV/°C typically), 4 MHz bandwidth, and 15 nV/√Hz input voltage noise density at 1 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 (2.7 V/µs) make the LTA8373 high-performance operational amplifiers for high-voltage industrial applications.

The robust design of the LTA8373 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 LTA8373 is optimized for operation at voltages from +4.5 V (±2.25 V) to +48 V (±24 V) over the extended temperature range of −40 °C to +125 °C.

Features and Benefits

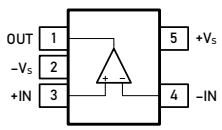
- Wide Supply: ±2.25 V to ±24 V, 4.5 V to 48 V
- Low Offset Voltage: ±2.5 mV Maximum
- Low Offset Voltage Drift: ±2 µV/°C
- High Common-Mode Rejection: 110 dB
- Gain Bandwidth: 4 MHz
- Slew Rate: 2.7 V/µs
- Low Noise: 12 nV/√Hz at 10 kHz
- Low Bias Current: ±10 pA
- Rail-to-Rail Output

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)

LTA8373
SOT23-5L



Pin Description

Symbol	Description
–IN	Inverting input of the amplifier. The voltage range is from V_{S-} to V_{S+} – 1.5V.
+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 4.5V to 48V. Split supplies are possible as long as the voltage between V_{S+} and V_{S-} is from 4.5V to 48V.
$-V_S$	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 4.5V to 48V.
OUT	Amplifier output.

Ordering Information (1)

Type Number	Package Name	Package Quantity	Eco Class (2)	Marking Code (3)
LTA8373XT5/R6	SOT23-5L	Tape and Reel, 3 000	Green (RoHS & no Sb/Br)	H71

(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 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 to +150 ℃
Junction Temperature, T_J	150 ℃
Lead Temperature Range (Soldering 10 sec)	260 ℃

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
OFFSET VOLTAGE						
V_{OS}	Input offset voltage			±0.5	±2.5	mV
V_{OS} TC	Offset voltage drift	T_A = −40 to +125 °C		±2		µV/°C
PSRR	Power supply rejection ratio	V_S = 4.5 to 48 V, V_{CM} = 0.1 V		5		µV/V
		T_A = −40 to +125 °C		10		
INPUT BIAS CURRENT						
I_B	Input bias current			10		pA
		T_A = +85 °C		150		
		T_A = +125 °C		600		
I_{OS}	Input offset current			5		pA
NOISE						
V_n	Input voltage noise	f = 0.1 to 10 Hz		4.6		μV_{P-P}
e_n	Input voltage noise density	f = 1 kHz		15		nV/√Hz
		f = 10 kHz		12		
I_n	Input current noise density	f = 1 kHz		5		fA/√Hz
INPUT VOLTAGE						
V_{CM}	Common-mode voltage range		$-V_S$		$+V_S$−1.5	V
CMRR	Common-mode rejection ratio	V_S = 40 V, V_{CM} = 0 to 38 V		110		dB
		V_{CM} = 0.1 to 38 V, T_A = −40 to +125 °C		100		
		V_S = 5.0 V, V_{CM} = 0 to 3 V		93		
		V_{CM} = 0.1 to 3 V, T_A = −40 to +125 °C		82		
INPUT IMPEDANCE						
C_{IN}	Input capacitance	Differential		2.0		pF
		Common mode		3.5		
OPEN-LOOP GAIN						
A_{VOL}	Open-loop voltage gain	V_S = 40 V, V_O = 0.1 to 39.9 V		126		dB
		T_A = −40 to +125 °C		118		
		V_S = 5 V, V_O = 0.1 to 4.9 V		116		
		T_A = −40 to +125 °C		108		
FREQUENCY RESPONSE						
GBW	Gain bandwidth product			4		MHz
SR	Slew rate	V_S = 40 V, G = +1, 10 V step		2.7		V/µs
THD+N	Total harmonic distortion + noise	G = +1, f = 1 kHz, V_O = 3 V_{RMS}		0.0003		%
t_S	Settling time	To 0.1%, V_S = 40 V, G = +1, 5 V step		3.6		µs
		To 0.01%, V_S = 40 V, G = +1, 5 V step		7		
t_{OR}	Overload recovery time	V_{IN} × Gain > V_S		1.2		µs

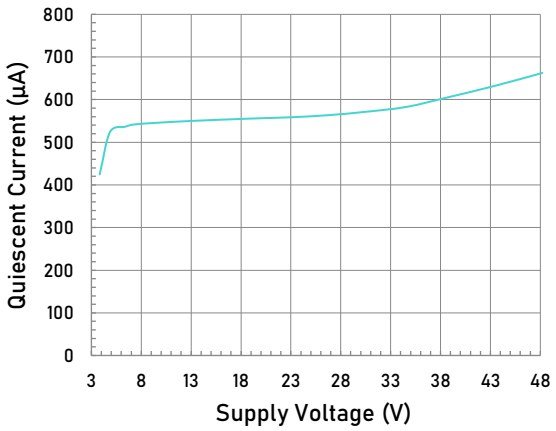
Electrical Characteristics (continued)

V_S = 4 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. Boldface limits apply over the specified temperature range, T_A = −40 °C to +125 °C.

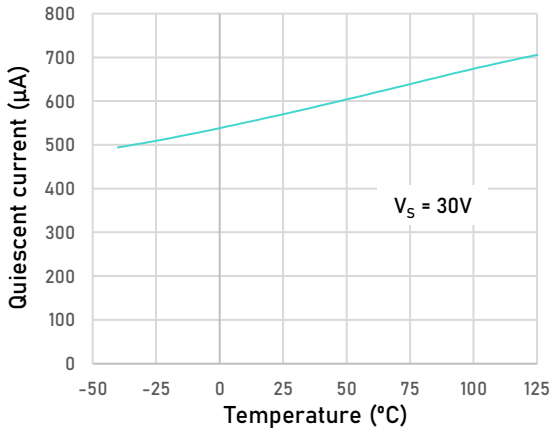
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
OUTPUT						
V_{OH}	High output voltage swing	V_S = ±20 V, R_L = 10 kΩ		$+V_S$−95		mV
		V_S = ±20 V, R_L = 2 kΩ		$+V_S$−260		
V_{OL}	Low output voltage swing	V_S = ±20 V, R_L = 10 kΩ		$-V_S$+60		mV
		V_S = ±20 V, R_L = 2 kΩ		$-V_S$+245		
I_{SC}	Short-circuit current			±45		mA
POWER SUPPLY						
V_S	Operating supply voltage	T_A = −40 to +125 °C	4.5		48	V
I_Q	Quiescent current (per amplifier)	V_S = 5 V		535		µA
		V_S = 40 V		620		
THERMAL CHARACTERISTICS						
T_A	Operating temperature range		−40		+125	°C
θ_{JA}	Package Thermal Resistance	SOT23-5L		190		°C/W

Typical Performance Characteristics

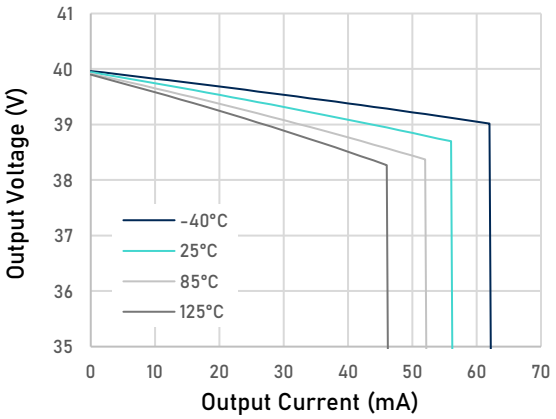
At T_A = +25 °C, V_{CM} = V_S /2, and R_L = 10 kΩ connected to V_S /2, unless otherwise noted.



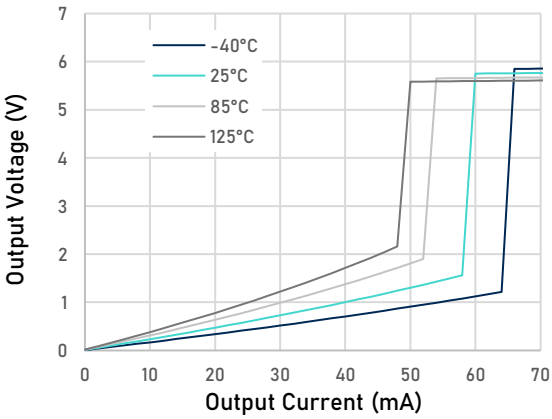
Quiescent Current as a function of Supply Voltage



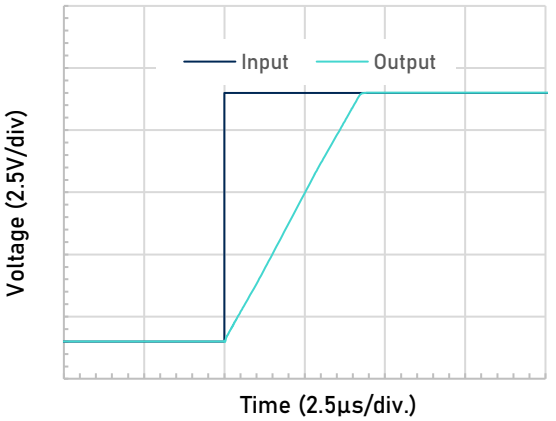
Quiescent Current as a function of Temperature



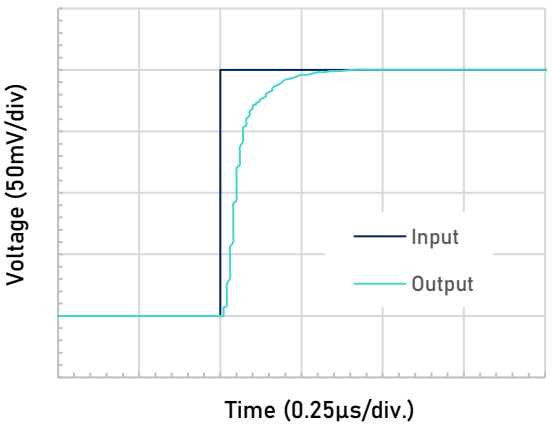
Output Voltage Swing as a function of Output Current (Sourcing, V_S = 40 V)



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



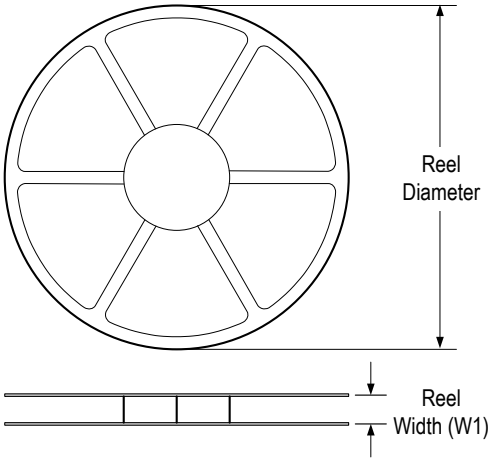
Large-Signal Step Response(Failing)



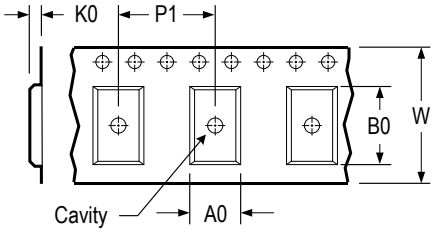
Small-Signal Step Response

Tape and Reel Information

REEL DIMENSIONS

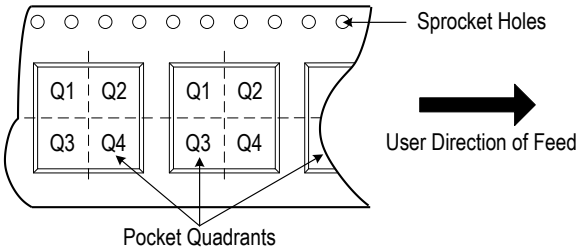


TAPE DIMENSIONS



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

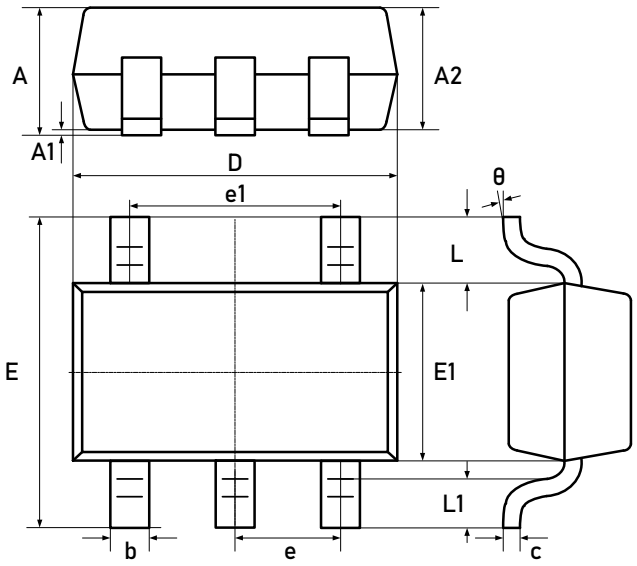


* All dimensions are nominal

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
LTA8373XT5/R6	SOT23	5	3 000	178	9.0	3.3	3.2	1.5	4.0	8.0	Q3

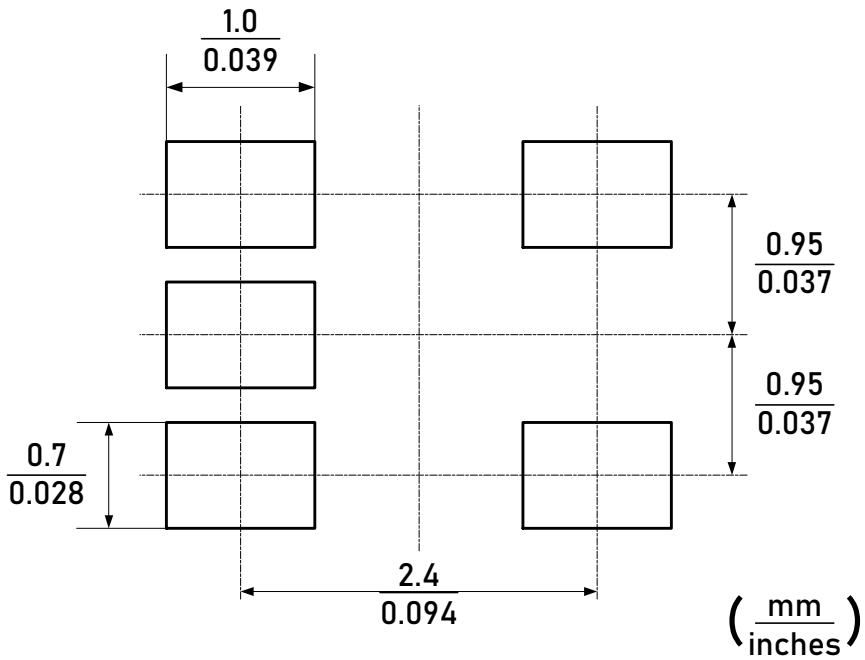
Package Outlines

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



Important Notice

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