General Description

The LTA2904H is a dual-channel industry-standard operational amplifier with supply voltage up to +40 V. The LTA2904H offers outstanding dc precision and ac performance, including low offset (±0.8 mV typically), low offset drift (±7 µV/°C typically), 1.1 MHz bandwidth, and 40 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 (±30 mA), high capacitive load drive of up to 0.1 nF, and high slew rate (0.5 V/µs) make the LTA2904H a high-performance operational amplifiers for high-voltage industrial applications.

The robust design of the LTA2904H provides ease-of-use to the circuit designer: integrated RF/EMI rejection filter and high electro-static discharge (ESD) protection (2000V for HBM). The LTA2904H is optimized for operation at voltages from +4.5 V (±2.25 V) to +40 V (±20 V) over the extended temperature range of –40 °C to +125 °C.

Features and Benefits

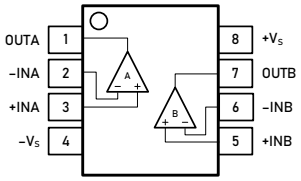
- Wide Supply: ±2.25 V to ±20 V, 4.5 V to 40 V
- Low Offset Voltage: ±0.8 mV Typically
- Low Offset Voltage Drift: ±7 µV/°C
- High Common-Mode Rejection: 80 dB
- Gain Bandwidth: 1.1 MHz
- Slew Rate: 0.5 V/µs
- Low Noise: 40 nV/√Hz at 1 kHz
- Low Quiescent Current: 300 µA per amplifier
- Low Bias Current: ±10 nA

Applications

- Merchant network and server power supply units
- Power Delivery: UPS, Server, and Merchant Network Power
- Programmable Logic Controllers
- Multi-function printers
- Power supplies and mobile chargers
- Motor control: AC induction, brushed DC, Brushless DC, high-voltage, low-voltage,permanent magnet, and stepper motor
- Desktop PC and motherboard
- Indoor and outdoor air conditioners
- Washers, dryers, and refrigerators
- AC inverters, string inverters, central inverters, an voltage frequency drives
- Electronic point-of-sale systems

Pin Configuration (Top View)

LTA2904H
SOIC-8L



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Pin Description

Symbol	Description
–IN	Inverting input of the amplifier. The voltage range is from V_{S-} to V_{S+} – 2 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 40 V. Split supplies are possible as long as the voltage between V_{S+} and V_{S-} is from 4.5 V to 40 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 40 V.
OUT	Amplifier output.
NC	No connection

Ordering Information (1)

Type Number	Package Name	Package Quantity	Eco Class (2)	Marking Code (3)
LTA2904HXS8/R8	SOIC-8L	Tape and Reel, 4 000	Green (RoHS & no Sb/Br)	HV2904

(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)	1 500	

(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.

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Electrical Characteristics

V_S = 4.5 V to 40 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.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OFFSET VOLTAGE						
Input offset voltage	V_{OS}			±0.8	±3	mV
Offset voltage drift	V_{OS} TC	T_A = −40 to +125 °C		±7		µV/°C
Power supply rejection ratio	PSRR	V_S = 4.5 to 40 V, V_{CM} = 0.1 V		5		µV/V
		T_A = −40 to +125 °C		10		
INPUT BIAS CURRENT						
Input bias current	I_B			10		nA
		T_A = −40 to +85 °C		90		
		T_A = −40 to +125 °C		250		
Input offset current	I_{OS}			5		nA
NOISE						
Input voltage noise	V_n	f = 0.1 to 10 Hz		5		μV_{P-P}
Input voltage noise density	e_n	f = 1 kHz		40		nV/√Hz
Input current noise density	I_n	f = 1 kHz		5		fA/√Hz
INPUT VOLTAGE						
Common-mode voltage range	V_{CM}		$-V_S$		$+V_S-2$	V
Common-mode rejection ratio	CMRR	V_{CM} = 0.1 to 38 V, T_A = −40 to +125 °C		80		dB
INPUT IMPEDANCE						
Input capacitance	C_{IN}	Differential		2		pF
		Common mode		3.5		
OPEN-LOOP GAIN						
Open-loop voltage gain	A_{VOL}	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						
Gain bandwidth product	GBW			1.1		MHz
Slew rate	SR	V_S = 40 V, G = +1, 10 V step		0.5		V/µs
Total harmonic distortion + noise	THD+N	G = +1, f = 1 kHz, V_O = 3 V_{RMS}		0.001		%
Settling time	t_S	To 0.1%, V_S = 40 V, G = +1, 5 V step		16		µs
		To 0.01%, V_S = 40 V, G = +1, 5 V step		22		
Overload recovery time	t_{OR}	V_{IN} × Gain > V_S		10		µs

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Electrical Characteristics (continued)

V_S = 4.5 V to 40 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.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OUTPUT						
High output voltage swing	V_{OH}	V_S = ±20 V, R_L = 10 kΩ		$+V_S$−1		V
		V_S = ±20 V, R_L = 2 kΩ		$+V_S$−1.2		
Low output voltage swing	V_{OL}	V_S = ±20 V, R_L = 10 kΩ		$-V_S$+60		mV
		V_S = ±20 V, R_L = 2 kΩ		$-V_S$+250		
Short-circuit current	I_{SC}			±45		mA
POWER SUPPLY						
Operating supply voltage	V_S	T_A = −40 to +125 °C	4.5		40	V
Quiescent current (per amplifier)	I_Q	V_S = 5 V		280		µA
		V_S = 40 V		300		
THERMAL CHARACTERISTICS						
Operating temperature range	T_A		−40		+125	°C
Package Thermal Resistance	θ_{JA}	SOIC-8L		125		°C/W

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