National Semiconductor

LH2110/LH2210/LH2310 Dual Voltage Follower

General Description

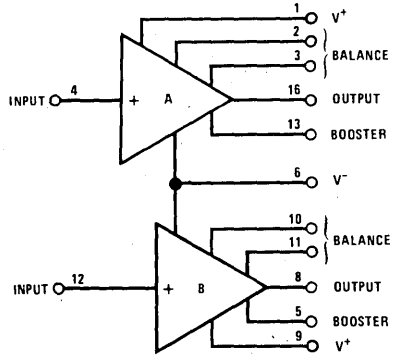
The LH2110 series of dual voltage followers are two LM110 type followers in a single hermetic package. Featuring all the same performance characteristics of the single, these duals offer in addition closer thermal tracking, lower weight, reduced insertion cost and smaller size than two singles. For additional information, see the LM110 data sheet and National's Linear Application Notebook.

The LH2110 is specified for operation over the −55°C to +125°C military temperature range. The LH2210 is specified for operation over the −25°C to +85°C temperature range. The LH2310 is specified for operation over the 0°C to +70°C temperature range.

Features

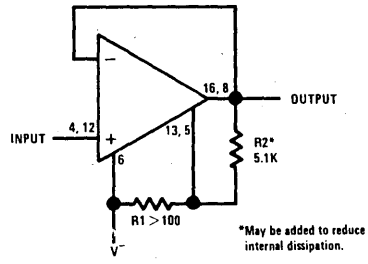
- Low input current — 1 nA
- High input resistance — 10^{10} ohms
- High slew rate — 30V/μs
- Wide bandwidth — 20 MHz
- Wide operating supply range — ±5V to ±18V
- Output short circuit proof

Connection Diagram

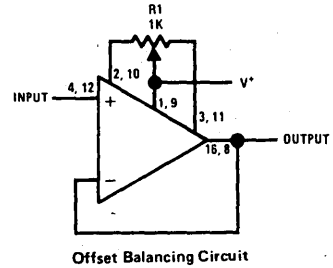


Order Number LH2110D, LH2210D or LH2310D, See Package D16C
Order Number LH2110F, LH2210F or LH2310F, See Package F16B
Order Number LH2110J, LH2210J or LH2310J, See Package J16A

Auxiliary Circuits



Increasing Negative Swing Under Load



Offset Balancing Circuit

Absolute Maximum Ratings

Supply Voltage	±18V
Power Dissipation (Note 1)	500 mW
Input Voltage (Note 2)	±15V
Output Short Circuit Duration (Note 3)	Continuous
Operating Temperature Range LH2110	−55°C to 125°C
LH2210	−25°C to 85°C
LH2310	0°C to 70°C
Storage Temperature Range	−65°C to 150°C
Lead Temperature (Soldering, 10 sec)	300°C

Electrical Characteristics Each Side (Note 4)

PARAMETER	CONDITIONS	LIMITS			UNITS
		LH2110	LH2210	LH2310	
Input Offset Voltage	$T_A = 25°C$	4.0	4.0	7.5	mV Max
Input Bias Current	$T_A = 25°C$	3.0	3.0	7.0	nA Max
Input Resistance	$T_A = 25°C$	10^{10}	10^{10}	10^{10}	Ω Min
Input Capacitance		1.5	1.5	1.5	pF Typ
Large Signal Voltage Gain	$T_A = 25°C$, $V_S = ±15V$ $V_{OUT} = ±10V$, $R_L = 8\ kΩ$	.999	.999	.999	V/V Min
Output Resistance	$T_A = 25°C$	2.5	2.5	2.5	Ω Max
Supply Current (Each Amplifier)	$T_A = 25°C$	5.5	5.5	5.5	mA Max
Input Offset Voltage		6.0	6.0	10	mV Max
Offset Voltage	$-55°C \leq T_A \leq 85°C$	6	6	10	μV/°C Typ
Temperature Drift	$T_A = 125°C$	12	12	–	μV/°C Typ
Input Bias Current		10	10	10	nA Max
Large Signal Voltage Gain	$V_S = ±15V$, $V_{OUT} = ±10V$ $R_L = 10\ kΩ$	.999	.999	.999	V/V Min
Output Voltage Swing (Note 5)	$V_S = ±15V$, $R_L = 10\ kΩ$	±10	±10	±10	V Min
Supply Current (Each Amplifier)	$T_A = 125°C$	4.0	4.0	–	mA Max
Supply Voltage Rejection Ratio	$±5V \leq V_S \leq ±18V$	70	70	70	dB Min

Note 1: The maximum junction temperature of the LH2110 is 150°C, while that of the LH2210 is 100°C and that of the LH2310 is 85°C. For operating devices in the flat package at elevated temperatures, the derating is based on a thermal resistance of 185°C/W when mounted on a 1/16-inch-thick epoxy glass board with 0.03-inch-wide, 2-ounce copper conductors. The thermal resistance of the dual-in-line package is 100°C/W, junction to ambient.

Note 2: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

Note 3: Continuous short circuit is allowed for case temperatures to 125°C and ambient temperatures to 70°C. It is necessary to insert a resistor greater than 2 kΩ in series with the input when the amplifier is driven from low impedance sources to prevent damage when the output is shorted.

Note 4: These specifications apply for $±5V \leq V_S \leq ±18V$ and $-55°C \leq T_A \leq 125°C$, unless otherwise specified. With the LM210, however, all temperature specifications are limited to $-25°C \leq T_A \leq 85°C$, and for the LH2310, all temperature specifications are limited to $0°C \leq T_A \leq 70°C$.

Note 5: Increased output swing under load can be obtained by connecting an external resistor between the booster and V^- terminals.