National Semiconductor

LH24250/LH24250C Dual Programmable Micropower Op Amp

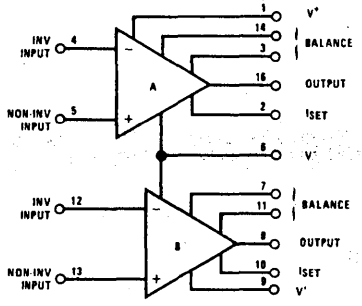
General Description

The LH24250/LH24250C series of dual programmable micropower operational amplifiers are two LM4250 type op amps in a single hermetic package. Featuring all the same performance characteristics of the LM4250, the LH24250/LH24250C duals also offer closer thermal tracking, lower weight, reduced insertion cost and smaller size than two single devices. For additional information, see the LM4250 data sheet and National's Linear Application Handbook.

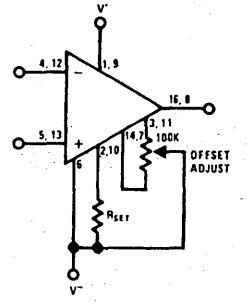
Features

- ±1V to ±18V power supply operation
- Standby power consumption as low as 20 μW
- Offset current programmable from less than 0.5 nA to 30 nA
- Programmable slew rate
- May be shut-down using standard open collector TTL
- Internally compensated and short circuit proof

Connection Diagram and Auxiliary Circuit



Offset Null Circuit



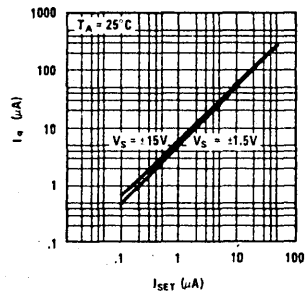
Ordering Information
Order Number LH24250D or LH24250CD, See Package D16C
LH24250F or LH24250CF, See Package F16B
LH24250J or LH24250CJ, See Package J16A

Typical Quiescent Current Setting Resistor

Set Current Setting Resistor to V−

	I_{SET}				
V_S	0.1 μA	0.5 μA	1.0 μA	5 μA	10 μA
±1.5V	25.6 MΩ	5.04 MΩ	2.5 MΩ	492 kΩ	244 kΩ
±3.0V	55.6 MΩ	11.0 MΩ	5.5 MΩ	1.09 MΩ	544 kΩ
±6.0V	116 MΩ	23.0 MΩ	11.5 MΩ	2.29 MΩ	1.14 MΩ
±9.0V	176 MΩ	35.0 MΩ	17.5 MΩ	3.49 MΩ	1.74 MΩ
±12.0V	236 MΩ	47.0 MΩ	23.5 MΩ	4.69 MΩ	2.34 MΩ
±15.0V	296 MΩ	59.0 MΩ	29.5 MΩ	5.89 MΩ	2.94 MΩ

Quiescent Current (I_Q) vs I_{SET}



Absolute Maximum Ratings

Supply Voltage	±18V	Output Short-Circuit Duration	Continuous
Power Dissipation (Note 1)	500mW	Operating Temperature Range LH24250	−55°C to 125°C
Differential Input Voltage	±15V	LH24250C	0°C to 70°C
Input Voltage (Note 2)	±15V	Storage Temperature Range	−65°C to 150°C
I_{SET} Current	150μA	Lead Temperature (Soldering, 10 sec)	300°C

Electrical Characteristics

LH24250, each amplifier (−55°C ≤ T_A ≤ 125°C unless otherwise specified)

Parameters	Conditions	$V_S = \pm 1.5V$				Units
		$I_{SET} = 1\mu A$		$I_{SET} = 10\mu A$		
		Min.	Max.	Min.	Max.	
V_{OS}	$T_A = 25°C$, $R_S \leq 100k\Omega$		3		5	mV
I_{OS}	$T_A = 25°C$		3		10	nA
I_{bias}	$T_A = 25°C$		7.5		50	nA
Large Signal Voltage Gain	$T_A = 25°C$, $R_L = 100k\Omega$	40				k
	$V_O = \pm 0.6V$, $R_L = 10k\Omega$			50		k
Supply Current	$T_A = 25°C$		7.5		80	μA
Power Consumption	$T_A = 25°C$		23		240	μW
V_{OS}	$R_S \leq 10k\Omega$		4		6	mV
I_{OS}	$T_A = 25°C$		5		10	nA
	$T_A = 25°C$		3		10	nA
I_{bias}			7.5		50	nA
Input Voltage Range		±0.7		±0.7		V
Large Signal Voltage Gain	$V_O = \pm 0.6V$, $R_L = 100k\Omega$	30				k
	$R_L = 10k\Omega$			30		k
Output Voltage Swing	$R_L = 100k\Omega$	±0.6				V
	$R_L = 10k\Omega$			±0.6	V	
Common Mode Rejection Ratio	$R_S \leq 10k\Omega$	70		70		dB
Supply Voltage Rejection Ration	$R_S \leq 10k\Omega$	76		76		dB
Supply Current			8		90	μA
Power Consumption			24		270	μW

Parameters	Conditions	$V_S = \pm 15V$				Units
		$I_{SET} = 1\mu A$		$I_{SET} = 10\mu A$		
		Min.	Max.	Min.	Max.	
V_{OS}	$T_A = 25°C$, $R_S \leq 10k\Omega$		3		5	mV
I_{OS}	$T_A = 25°C$		3		10	na
I_{bias}	$T_A = 25°C$		7.5		50	nA
Large Signal Voltage Gain	$T_A = 25°C$, $R_L = 100k\Omega$	100				k
	$V_O = \pm 10V$, $R_L = 10k\Omega$			100		k
Supply Current	$T_A = 25°C$		10		90	μA
Power Consumption	$T_A = 25°C$		300		2.7	μW/mW
V_{OS}	$R_S \leq 10k\Omega$		4		6	mV
I_{OS}	$T_A = 25°C$		25		25	nA
	$T_A = 25°C$		3		10	nA
I_{bias}			7.5		50	nA
Input Voltage Range		±13.5		±13.5		V
Large Signal Voltage Gain	$V_O = \pm 15V$, $R_L = 100\Omega$	50				k
	$R_L = 10k\Omega$			50		k
Output Voltage Swing	$R_L = 100k\Omega$	±12				V
	$R_L = 10k\Omega$			±12		V
Common Mode Rejection Ratio	$R_S \leq 10k\Omega$	70		70		dB
Supply Voltage Rejection ratio	$R_S \leq 10k\Omega$	76		76		dB
Supply Current		11		100		μA
Power Consumption			330		3	μW/mW

Note 1: The maximum junction temperature of the LH24250 is 150°C, while that of the LH24250C is 100°C. The thermal resistance of the dual-in-line package is 100°C/W junction to ambient. For the flat package, the derating is based on a thermal resistance of 185°C/W when mounted on a 1/16 inch thick epoxy glass board with ten, 0.03 inch wide, 2 ounce copper conductors.

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

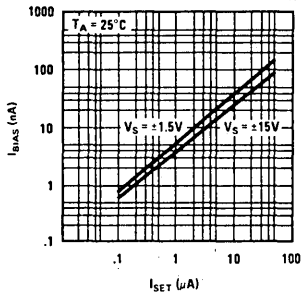
Electrical Characteristics LH24250C, each amplifier (0°C ≤ T_A ≤ 70°C unless otherwise specified)

Parameters	Conditions	$V_S = \pm 1.5V$				Units
		$I_{SET} = 1\mu A$		$I_{SET} = 10\mu A$		
		Min.	Max.	Min.	Max.	
V_{OS}	$T_A = 25°C$, $R_S \leq 100k\Omega$		5		6	mV
I_{OS}	$T_A = 25°C$		6		20	nA
I_{bias}	$T_A = 25°C$		10		75	nA
Large Signal Voltage Gain	$T_A = 25°C$, $R_L = 100k\Omega$	25				k
	$V_O = \pm 0.6V$, $R_L = 10k\Omega$			25		k
Supply Current	$T_A = 25°C$		8		90	μA
Power Consumption	$T_A = 25°C$		24		270	μW
V_{OS}	$R_S \leq 10k\Omega$		6.5		7.5	mV
I_{OS}			8		25	nA
I_{bias}			10		80	nA
Input Voltage Range		±0.6		±0.6		V
Large Signal Voltage Gain	$V_O = \pm 0.6V$, $R_L = 100k\Omega$	25				k
	$R_L = 10k\Omega$			25		k
Output Voltage Swing	$R_L = 100k\Omega$	±0.6				V
	$R_L = 10k\Omega$			±0.6	V	
Common Mode Rejection Ratio	$R_S \leq 10k\Omega$	70		70	dB	
Supply Voltage Rejection Ration	$R_S \leq 10k\Omega$	74		74	dB	
Supply Current			8		90	μA
Power Consumption			24		270	μW

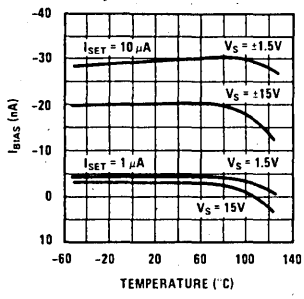
Parameters	Conditions	$V_S = \pm 15V$				Units
		$I_{SET} = 1\mu A$		$I_{SET} = 10\mu A$		
		Min.	Max.	Min.	Max.	
V_{OS}	$T_A = 25°C$, $R_S \leq 10k\Omega$		5		6	mV
I_{OS}	$T_A = 25°C$		6		20	na
I_{bias}	$T_A = 25°C$		10		75	nA
Large Signal Voltage Gain	$T_A = 25°C$, $R_L = 100k\Omega$	60				k
	$V_O = \pm 10V$, $R_L = 10k\Omega$			60		k
Supply Current	$T_A = 25°C$		11		100	μA
Power Consumption	$T_A = 25°C$		330		3	μW/mW
V_{OS}	$R_S \leq 10k\Omega$		6.5		7.5	mV
I_{OS}	$R_S \leq 10k\Omega$		8		25	nA
I_{bias}			10		80	nA
Input Voltage Range		±13.5		±13.5		V
Large Signal Voltage Gain	$V_O = \pm 15V$, $R_L = 100\Omega$	50				k
	$R_L = 10k\Omega$			50		k
Output Voltage Swing	$R_L = 100k\Omega$	±12				V
	$R_L = 10k\Omega$			±12		V
Common Mode Rejection Ratio	$R_S \leq 10k\Omega$	70		70		dB
Supply Voltage Rejection ratio	$R_S \leq 10k\Omega$	74		74		dB
Supply Current		11		100		μA
Power Consumption			300		3	μW/mW

Typical Performance Charateristics

Input Bias Current vs I_{SET}



Input Bias Current vs Temperature



Quiescent Current (I_q) vs Temperature