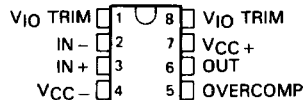


LT1012M, LT1012C HIGH-PERFORMANCE, LOW-NOISE OPERATIONAL AMPLIFIERS

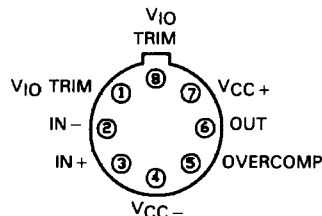
D3186, MARCH 1989

- Internally Compensated
- Input Offset Voltage:
LT1012M . . . 35 μV Max
LT1012C . . . 50 μV Max
- Input Bias Current (LT1012M):
100 pA Max at 25°C
600 pA Max from -55°C to 125°C
- αV_{IO} . . . 1.5 $\mu\text{V}/^\circ\text{C}$ Max
- Typical Peak-To-Peak Noise Voltage . . .
0.5 μV at $f = 0.1$ Hz to 10 Hz
- Low Supply Current . . . 600 μA Max
- CMRR . . . 114 dB Min (LT1012M)
- k_{SVR} . . . 114 dB Min (LT1012M)
- 5-mA Load Current with Voltage Gain of
200,000 Min (LT1012M)

P PACKAGE
(TOP VIEW)



L PACKAGE
(TOP VIEW)



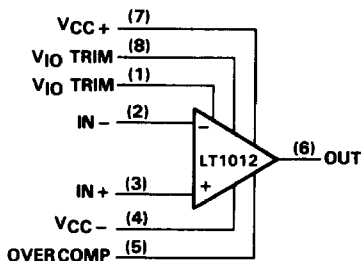
Pin 4 (L package) is in electrical contact with the case.

description

The LT1012 is an internally compensated operational amplifier that can be used in practically all precision applications. The LT1012 combines picoampere bias currents (maintained over the full temperature range), microvolt offset voltage, low offset voltage temperature coefficient and long-term drift, low voltage and current noise, and low power dissipation. High common-mode and supply voltage rejection ratios, low warm-up drift, and the capability to deliver 5-mA load current with a voltage gain of 200,000 complete the LT1012's precision specifications.

The LT1012M is characterized for operation over the full military temperature range of -55°C to 125°C. The LT1012C is characterized for operation from 0°C to 70°C.

symbol



AVAILABLE OPTIONS

T _A	V _{IO} MAX at 25°C	PACKAGE	
		METAL CAN (L)	PLASTIC DIP (P)
0°C to 70°C	50 μV	LT1012CL	LT1012CP
-55°C to 125°C	35 μV	LT1012ML	-

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Operational Amplifiers

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

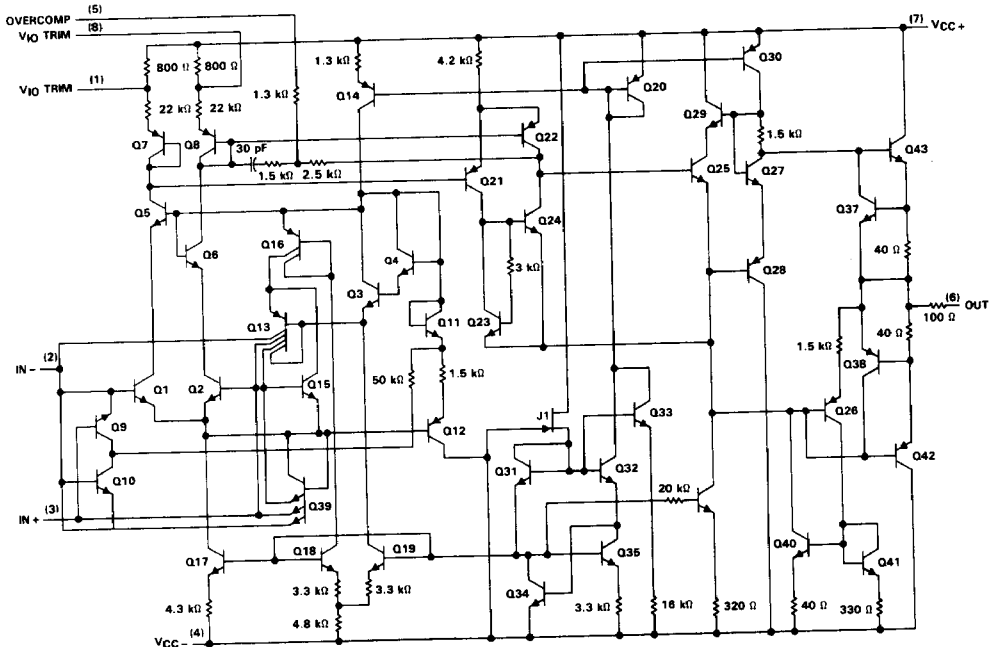
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LT1012M, LT1012C HIGH-PERFORMANCE, LOW-NOISE OPERATIONAL AMPLIFIERS

schematic



All resistor values shown are nominal

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, VCC+ (see Note 1)	+20 V
Supply voltage, VCC- (see Note 1)	-20 V
Input voltage	VCC±
Differential input current (see Note 2)	±10 mA
Duration of output short-circuit at or below 25°C	unlimited
Operating free-air temperature range: LT1012M	-55°C to 125°C
LT1012C	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: L package	300°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: P package	260°C

- NOTES: 1. All voltage values, unless otherwise noted, are with respect to the midpoint between VCC+ and VCC-.
2. Differential input voltages greater than 1 V cause excessive current to flow through the input protection diodes unless limiting resistance is used.

LT1012M, LT1012C HIGH-PERFORMANCE, LOW-NOISE OPERATIONAL AMPLIFIERS

electrical characteristics, $V_{CC\pm} = \pm 15\text{ V}$, $V_{IC} = 0$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T _A [†]	LT1012M			LT1012C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V _{IO} Input offset voltage	V _{CC±} = ±15 V, V _{IC} = 0	25°C	8	35		10	50	μV	
		Full range			180		120		
	V _{CC±} = ±15 V, V _{IC} = ±13.5 V	25°C	20	90		25	120		
		Full range			250		200		
V _{CC±} = ±2 V to ±20 V	25°C	20	90		25	120			
	Full range			250		200			
α _{VIO} Average temperature coefficient of input offset voltage		Full range	0.2	1.5		0.2	1.5	μV/°C	
Long-term drift of input offset voltage		25°C	0.3			0.3		μV/mo	
I _{IO} Input offset current	V _{CC±} = ±15 V, V _{IC} = 0	25°C	15	100		20	150	pA	
		Full range			250		230		
	V _{CC±} = ±15 V, V _{IC} = ±13.5 V	25°C	25	150		30	200		
		Full range			350		300		
	V _{CC±} = ±2 V to ±20 V	25°C	25	150		30	200		
V _{CC±} = ±2.5 V to ±20 V	Full range			350		300			
α _{IIO} Average temperature coefficient of input offset current		Full range	0.3	2.5		0.3	2.5	pA/°C	
I _{IB} Input bias current	V _{CC±} = ±15 V, V _{IC} = 0	25°C	±25	±100		±30	±150	pA	
		Full range			±600		±230		
	V _{CC±} = ±15 V, V _{IC} = ±13.5 V	25°C	±35	±150		±40	±200		
		Full range			±800		±300		
V _{CC±} = ±2 V to ±20 V	25°C	±35	±150		±40	±200			
	Full range			±800		±300			
α _{IIB} Average temperature coefficient of input bias current		Full range	0.6	6		0.3	2.5	pA/°C	
V _{ICR} Common-mode input voltage range		25°C	±13.5	±14		±13.5	±14	V	
		Full range	±13.5			±13.5			
V _{OM} Maximum peak output voltage swing	R _L = 10 kΩ	25°C	±13	±14		±13	±14	V	
		Full range	±13			±13			
A _{VD} Large-signal differential voltage amplification	V _O = ±12 V, R _L ≥ 10 kΩ	25°C	300	2000		200	2000	V/mV	
		Full range	100			100			
	V _O = ±10 V, R _L ≥ 2 kΩ	25°C	200	1000		120	1000		
		Full range	100			100			
CMRR Common-mode rejection ratio	V _{IC} = ±13.5 V	25°C	114	132		110	132	dB	
		Full range	108			108			
K _{SVR} Supply-voltage rejection ratio (ΔV _{CC±} /ΔV _{IO})	V _{CC±} = ±2 V to ±20 V	25°C	114	132		110	132	dB	
	V _{CC±} = ±2.5 V to ±20 V	Full range	108			108			
I _{CC} Supply current	V _{CC±} = ±15 V, V _{IC} = ±13.5 V	25°C	380	600		380	600	μA	
		Full range			800		800		
	V _{CC±} = ±2 V to ±20 V	25°C	380	600		380	600		
		Full range			800		800		

[†] Full range is -55°C to 125°C for the LT1012M and 0°C to 70°C for the LT1012C.

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Operational Amplifiers

LT1012M, LT1012C HIGH-PERFORMANCE, LOW-NOISE OPERATIONAL AMPLIFIERS

operating characteristics at $T_A = 25^\circ\text{C}$, $V_{CC\pm} = \pm 15\text{ V}$

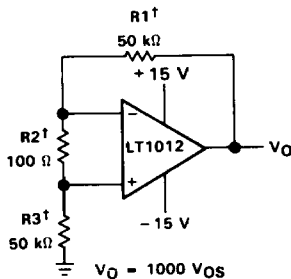
PARAMETER	TEST CONDITIONS	LT1012M			LT1012C			UNIT	
		MIN	TYP	MAX	MIN	TYP	MAX		
SR	Slew rate at unity gain	0.1	0.2		0.1	0.2		V/ μs	
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10 Hz			0.5	0.65		μV	
V_n	Equivalent input noise voltage	f = 10 Hz, See Note 3			17	30	17	30	nV/ $\sqrt{\text{Hz}}$
		f = 1 kHz			14	22	14	22	
I_n	Equivalent input noise current	f = 10 Hz			20	20		fA/ $\sqrt{\text{Hz}}$	

NOTE 3: This parameter is tested on a sample basis. For other test requirements, please contact the factory. This statement has no bearing on testing or nontesting of other parameters.

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Operational Amplifiers

PARAMETER MEASUREMENT INFORMATION



† Resistors must have low thermoelectric potential.
This circuit is also used as the burn-in configuration for the LT1012, with supply voltages increased to $\pm 20\text{ V}$, $R_1 = R_3 = 20\text{ k}\Omega$, $R_2 = 200\ \Omega$, $A_V = 100$.

FIGURE 1. TEST CIRCUIT FOR OFFSET VOLTAGE AND ITS TEMPERATURE COEFFICIENT