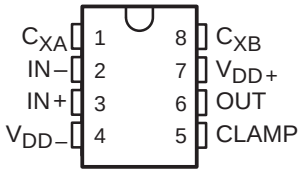
SLOS089A – D3238, MAY 1988–REVISED JULY 1991

- **Input Offset Voltage . . . 5 μV Max at 25°C**
- **Temperature Coefficient of Input Offset Voltage . . . 0.001 μV/°C Typ**
- **Long-Term Drift of Input Offset Voltage 100 nV/mo Typ**
- **Maximum Input Bias Current . . . 30 pA at 25°C**
- **Minimum Differential Voltage Amplification Over Full Temperature Range . . . 120 dB**
- **Minimum Common-Mode Rejection Ratio Over Full Temperature Range . . . 120 dB**
- **Minimum Supply Voltage Rejection Ratio Over Full Temperature Range . . . 120 dB**
- **Single-Supply Operation from 4.75 V to 16 V (Input Voltage Range Extends to Ground)**
- **External Capacitors Can Be Returned to V_{CC-} with No Noise Degradation**

D OR P PACKAGE
(T0P VIEW)



AVAILABLE OPTIONS

T_A	V_{IO} MAX at 25°C	PACKAGE	
		SMALL OUTLINE (D)	PLASTIC DIP (P)
–40°C to 85°C	5 μV	LTC1052CD	LTC1052CP
–55°C to 125°C	5 μV	LTC1052MD	LTC1052MP

The D package is available taped and reeled. Add the suffix R, (e.g., LTC1052CDR).

description

The LTC1052 is a low-noise chopper-stabilized operational amplifier manufactured using CMOS silicon-gate technology. The device is well-suited for applications such as thermocouple amplifiers, strain-gauge amplifiers, low-level signal processing, and medical instrumentation.

Chopper stabilization constantly corrects input offset voltage errors, including both errors in the initial input offset voltage and errors in input offset voltage due to time, temperature, and common-mode input voltage. The chopper circuitry is internal and completely transparent to the user. Only two external capacitors are required to alternately sample and hold the offset correction voltage and the amplified input signal.

Low-frequency (1/f) noise is also improved by the chopping technique. Instead of noise increasing continuously at a rate of 3 dB/octave, the internal chopping causes noise to decrease at low frequencies. Picoampere input currents further enhance the performance of this device.

The C-suffix devices are characterized for operation from –40°C to 85°C. The M-suffix devices are characterized for operation over the full military temperature range of –55°C to 125°C.

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

Supply voltage, V_{DD+} (see Notes 1 and 2) . . . . . 8 V
Supply voltage, V_{DD-} (see Notes 1 and 2) . . . . . –8 V
Input voltage range, V_I (any input, see Note 1) . . . . . ±16 V
Duration of short-circuit current at (or below) 25°C (see Note 2) . . . . . unlimited
Operating free-air temperature, T_A: C-suffix . . . . . –40°C to 85°C
M-suffix . . . . . –55°C to 125°C
Storage temperature range . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C

NOTES: 1. All voltage values, except differential voltages, are with respect to the midpoint between V_{DD+} and V_{DD-}.
2. Connecting any terminal to voltages greater than V_{DD+} or less than V_{DD-} may cause destructive latch-up. No sources operating from external supplies should be applied prior to device power up.
3. The output may be shorted to either supply.

electrical characteristics at specified free-air temperature, $V_{DD\pm}$ = ±5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	LTC1052C			LTC1052M			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IO}	Input offset voltage	V_{IC} = 0, R_S = 50 Ω	25°C		0.5	5		0.5	5	µV
α_{VIO}	Temperature coefficient of input offset voltage		Full range		0.01	0.05		0.01	0.05	µV/°C
	Long-term drift of input offset voltage		25°C		100			100		nV/mo
I_{IO}	Input offset current		25°C		5	30		5	30	pA
			Full range			350			2000	
I_{IB}	Input bias current		25°C		1	30		1	30	pA
			Full range			175			1000	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	Full range	–5 to 2.7			–5 to 2.7			V
V_{OM}	Maximum peak output voltage swing	R_L = 100 kΩ, See Note 4	25°C		4.95			4.95		V
		R_L = 10 kΩ, See Note 4	Full range	4.7			4.7			
A_{VD}	Large-signal differential voltage amplification	V_O = ±4 V, R_L = 10 kΩ	25°C	120	150		120	150		dB
			Full range	120			120			
f_{ch}	Internal chopping frequency		25°C		330			330		Hz
	On-state clamp current	R_L = 100 kΩ	25°C		100			100		µA
			Full range	25			25			
	Off-state clamp current	V_O = –4 V to 4 V	25°C		10	100		10	100	pA
			Full range			1			2	nA
CMRR	Common-mode rejection ratio	V_O = 0, V_{IC} = V_{ICR} min, R_S = 50 Ω	25°C	120	140		120	140		dB
			Full range	120			120			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm}$ = 2.375 V to ±8 V, V_O = 0, R_S = 50 Ω	25°C	120	150		120	150		dB
			Full range	120			120			
I_{DD}	Supply current	V_O = 0, No load	25°C		1.7	2		1.7	2	mA
			Full range			3			3	

† Full range is –40°C to 85°C for the LTC1052C and –55°C to 125°C for the LTC1052M.
‡ All typical values are at T_A = 25°C.
NOTE 4: Output clamp is not connected.

operating characteristics, $V_{DD\pm}$ = ±5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
SR	Slew rate	R_L = 10 kΩ, C_L = 50 pF		4		V/μs
V_{NPP}	Peak-to-peak equivalent input noise voltage	R_S = 100 kΩ to 10 Hz		1.5		μV
		R_S = 100 kΩ to 1 Hz		0.5		
I_n	Input noise current (see Note 5)	f = 10 Hz		0.6		fA/√Hz
GBP	Gain bandwidth product			1.2		MHz

NOTE 5: Equivalent input noise current is calculated as follows: $I_n = (2q \times I_{IB})^{1/2}$, where $q = 1.6 \times 10^{-19}$.

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