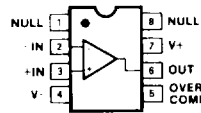


### FEATURES

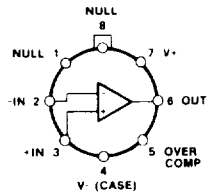
- Low Supply Current: 600  $\mu$ A max
- OP07 Type Performance
  - Offset Voltage: 20  $\mu$ V max
  - Offset Voltage Drift: 0.6  $\mu$ V/ $^{\circ}$ C max
- Very Low Bias Current
  - +25 $^{\circ}$ C: 100 pA max
  - 55 $^{\circ}$ C to +125 $^{\circ}$ C: 250 pA max
- High Common-Mode Rejection: 114 dB min
- Extended Industrial Temperature Range: -40 $^{\circ}$ C to +85 $^{\circ}$ C
- Available in Die Form

### PIN CONNECTIONS

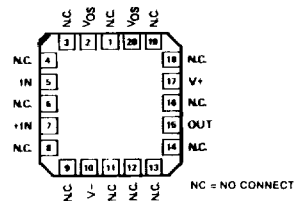
- Epoxy Mini-DIP (P Suffix)
- 8-Pin Hermetic DIP (Z Suffix)
- 8-Pin SO (S Suffix)



- TO-99 (J Suffix)



- OP97ARC/883 LCC (RC Suffix)



### GENERAL DESCRIPTION

The OP97 is a low power alternative to the industry-standard OP07 precision amplifier. The OP97 maintains the standards of performance set by the OP07 while utilizing only 600  $\mu$ A supply current, less than 1/6 that of an OP07. Offset voltage is an ultra-low 25  $\mu$ V, and drift over temperature is below 0.6  $\mu$ V/ $^{\circ}$ C. External offset trimming is not required in the majority of circuits.

Improvements have been made over OP07 specifications in several areas. Notable is bias current, which remains below 250 pA over the full military temperature range. The OP97 is ideal for use in precision long-term integrators or sample-and-hold circuits that must operate at elevated temperatures.

Common-mode rejection and power-supply rejection are also improved with the OP97, at 114 dB minimum over wider ranges of common-mode or supply voltage. Outstanding PSR, a supply range specified from  $\pm 2.25$  V to  $\pm 20$  V and the OP97's minimal power requirements combine to make the OP97 a preferred device for portable and battery-powered instruments.

The OP97 conforms to the OP07 pinout, with the null potentiometer connected between Pins 1 and 8 with the wiper to V+. The OP97 will upgrade circuit designs using 725, OP05, OP07, OP12 and 1012-type amplifiers. It may replace 741-type amplifiers in circuits without nulling or where the nulling circuitry has been removed.

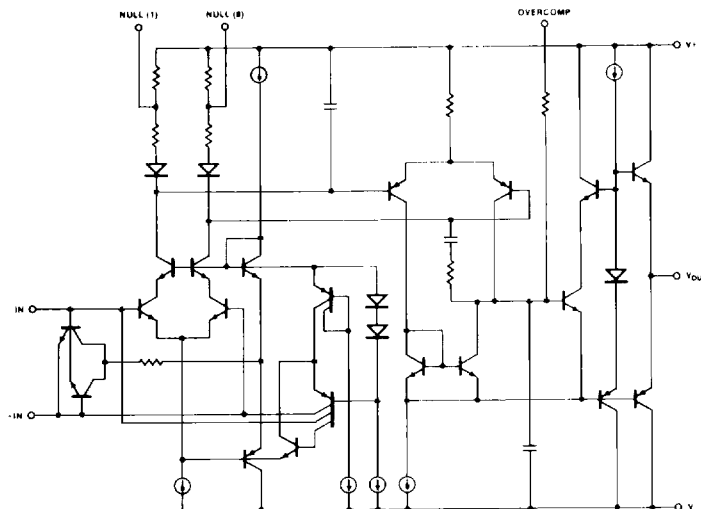


Figure 1. Simplified Schematic

To obtain the most recent version or complete data sheet, call our fax retrieval system at 1-800-446-6212 or visit our World Wide Web site at <http://www.analog.com>.

# OP97—SPECIFICATIONS

## ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 15$ V, $V_{CM} = 0$ V, $T_A = +25^\circ\text{C}$ , unless otherwise noted.)

Parameter	Symbol	Conditions	OP97A/E			OP97F			Units
			Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	$V_{OS}$			10	25		30	75	$\mu\text{V}$
Long-Term Offset Voltage Stability	$\Delta V_{OS}/\text{Time}$			0.3			0.3		$\mu\text{V}/\text{Month}$
Input Offset Current	$I_{OS}$			30	100		30	150	pA
Input Bias Current	$I_B$			$\pm 30$	$\pm 100$		$\pm 30$	$\pm 150$	pA
Input Noise Voltage	$e_n$ p-p	0.1 Hz to 10 Hz		0.5			0.5		$\mu\text{V}$ p-p
Input Noise Voltage Density	$e_n$	$f_0 = 10$ Hz <sup>1</sup>		17	30		17	30	$\text{nV}/\sqrt{\text{Hz}}$
		$f_0 = 1000$ Hz <sup>1</sup>		14	22		14	22	$\text{nV}/\sqrt{\text{Hz}}$
Input Noise Current Density	$i_n$	$f_0 = 10$ Hz		20			20		$\text{fA}/\sqrt{\text{Hz}}$
Large-Signal Voltage Gain	$A_{VO}$	$V_O = \pm 10$ V, $R_L = 2$ k $\Omega$	300	2000		200	2000		V/mV
Common-Mode Rejection	CMR	$V_{CM} = \pm 13.5$ V	114	132		110	132		dB
Power-Supply Rejection	PSR	$V_S = \pm 2$ V to $\pm 20$ V	114	132		110	132		dB
Input Voltage Range	IVR	(Note 1)	$\pm 13.5$	$\pm 14.0$		$\pm 13.5$	$\pm 14.0$		V
Output Voltage Swing	$V_o$	$R_L = 10$ k $\Omega$	$\pm 13$	$\pm 14$		$\pm 13$	$\pm 14$		V
Slew Rate	SR		0.1	0.2		0.1	0.2		V/ $\mu\text{s}$

Specifications subject to change without notice.

### ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

Supply Voltage	$\pm 20$ V
Input Voltage <sup>2</sup>	$\pm 20$ V
Differential Input Voltage <sup>3</sup>	$\pm 1$ V
Differential Input Current <sup>3</sup>	$\pm 10$ mA
Output Short-Circuit Duration	Indefinite
Operating Temperature Range	
OP97A (J, Z, RC)	$-55^\circ\text{C}$ to $+125^\circ\text{C}$
OP97E, F (J, P, Z, S)	$40^\circ\text{C}$ to $+85^\circ\text{C}$
Storage Temperature Range	$65^\circ\text{C}$ to $+150^\circ\text{C}$
Junction Temperature Range	$65^\circ\text{C}$ to $+150^\circ\text{C}$
Lead Temperature (Soldering, 60 sec)	$+300^\circ\text{C}$

Package Type	$\theta_{JA}$ <sup>4</sup>	$\theta_{JC}$	Units
TO-99 (J)	150	18	$^\circ\text{C}/\text{W}$
8-Pin Hermetic DIP (Z)	148	16	$^\circ\text{C}/\text{W}$
8-Pin Plastic DIP (P)	103	43	$^\circ\text{C}/\text{W}$
8-Pin SO (S)	158	43	$^\circ\text{C}/\text{W}$
20-Contact LCC (RC)	98	98	$^\circ\text{C}/\text{W}$

### NOTES

<sup>1</sup>Absolute maximum ratings apply to both DICE and packaged parts, unless otherwise noted.

<sup>2</sup>For supply voltages less than  $\pm 20$  V, the absolute maximum input voltage is equal to the supply voltage.

<sup>3</sup>The OP97's inputs are protected by back-to-back diodes. Current-limiting resistors are not used in order to achieve low noise. Differential input voltages greater than 1 V will cause excessive current to flow through the input protection diodes unless limiting resistance is used.

<sup>4</sup> $\theta_{JA}$  is specified for worst case mounting conditions, i.e.,  $\theta_{JA}$  is specified for device in socket for TO, cerdip, and P-DIP packages;  $\theta_{JA}$  is specified for device soldered to printed circuit board for SO package.

### ORDERING GUIDE

Model	Temperature Range	Package Option <sup>1</sup>
OP97AZ	$-55^\circ\text{C}$ to $+125^\circ\text{C}$	8-Pin Cerdip
OP97ARC/883 <sup>2</sup>	$-55^\circ\text{C}$ to $+125^\circ\text{C}$	20-Contact LCC
OP97EJ	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	TO-99
OP97EZ	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	8-Pin Cerdip
OP97EP	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	8-Pin Plastic DIP
OP97FJ	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	TO-99
OP97FZ	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	8-Pin Cerdip
OP97FP	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	8-Pin Plastic DIP
OP97FS	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	8-Pin SOIC
OP97FS-REEL	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	8-Pin SOIC
OP97FS-REEL7	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	8-Pin SOIC

### NOTES

<sup>1</sup>For outline information see Package Information section.

<sup>2</sup>For devices processed in total compliance to MIL-STD-883, add #883 after part number. Consult factory for #883 datasheet.