

**GENERAL DESCRIPTION**

The LM101A/LM201A and LM301A are general purpose, high performance operational amplifiers fabricated monolithically on a silicon chip by the planar epitaxial process. The units may be fully compensated with the addition of a 30pF capacitor stabilizing the circuit for all feedback configurations including capacitive loads.

The device may be operated as a comparator with a differential input as high as  $\pm 30V$ . Used as a comparator the output can be clamped at any desired level to make it compatible with logic circuits.

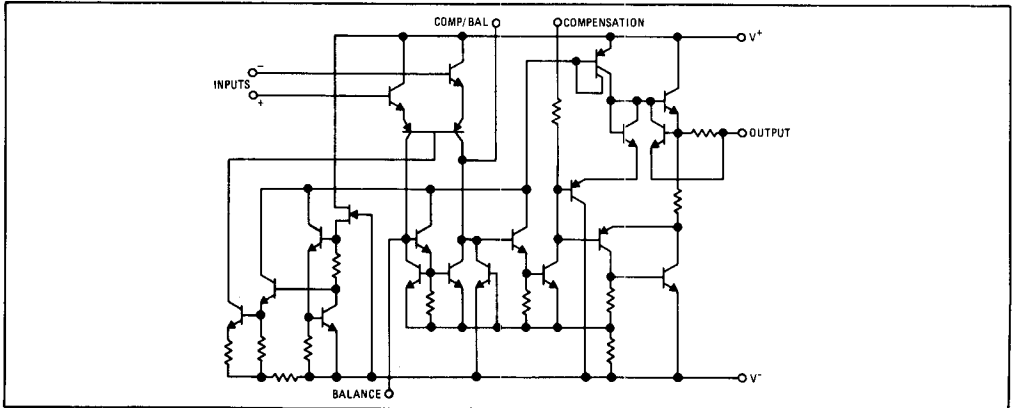
The LM101A operational amplifier will operate over the full military temperature range from  $-55^{\circ}C$  to  $+125^{\circ}C$ . The commercial version, the LM301A operates over a temperature range from  $0^{\circ}C$  to  $+70^{\circ}C$ .

The LM201A is the same as the LM101A except its performance is guaranteed from  $-25^{\circ}C$  to  $+85^{\circ}C$ .

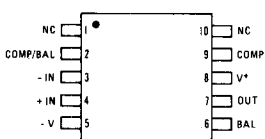
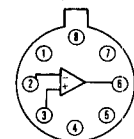
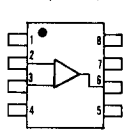
**DESIGN FEATURES**

- Offset Voltage 3mV Maximum Over Temperature
- Input Current 100nA Maximum Over Temperature
- Offset Current 20nA Maximum Over Temperature
- Offsets Guaranteed Over Entire Common-Mode Range and Supply Voltage Range
- Frequency Compensation 30pF
- Supply Voltage  $\pm 5V$  to  $\pm 20V$

**SCHEMATIC DIAGRAM**



**CONNECTION INFORMATION**

<p><b>CQ Flatpak</b> (Top View)</p>  <p>Order Part No.: LM101AF</p>	<p><b>TE</b> <b>Metal Can Package</b> (Top View)</p>  <p>Order Part Nos.: LM101AH, LM201AH*, LM301AH</p>	<p><b>DE and NB</b> <b>Dual In-line Package</b> (Top View)</p>  <p>Order Part Nos.: LM101ADE, LM201ADE, LM301ADE, LM301AN</p>	<table border="0"> <thead> <tr> <th>PIN</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr><td>1</td><td>COMP/BAL</td></tr> <tr><td>2</td><td>-INPUT</td></tr> <tr><td>3</td><td>+INPUT</td></tr> <tr><td>4</td><td>V<sup>-</sup></td></tr> <tr><td>5</td><td>BAL</td></tr> <tr><td>6</td><td>OUTPUT</td></tr> <tr><td>7</td><td>V<sup>+</sup></td></tr> <tr><td>8</td><td>COMP</td></tr> </tbody> </table>	PIN	FUNCTION	1	COMP/BAL	2	-INPUT	3	+INPUT	4	V <sup>-</sup>	5	BAL	6	OUTPUT	7	V <sup>+</sup>	8	COMP
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NOTE: THE LM101A/301A IS AVAILABLE ON SPECIAL ORDER IN THE DC (14-PIN) CERAMIC DIP PACKAGE.

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage	101A, 201A: $\pm 22V$ 301A: $\pm 18V$	Operating Temperature Range	
Power Dissipation (Note 1)	500mW	LM101A	$-55^{\circ}C$ to $+125^{\circ}C$
Differential Input Voltage	$\pm 30V$	LM201A	$-25^{\circ}C$ to $+85^{\circ}C$
Input Voltage (Note 2)	$\pm 15V$	LM301A	$0^{\circ}C$ to $+70^{\circ}C$
Output Short-Circuit Duration (Note 3)	Indefinite	Storage Temperature Range	$-65^{\circ}C$ to $+150^{\circ}C$
		Lead Temperature (Soldering, 60s)	$300^{\circ}C$

## ELECTRICAL CHARACTERISTICS LM101A, LM201A: $\pm 5V \leq V_S \leq \pm 20V$ ; LM301A: $\pm 5 \leq V_S \leq \pm 15V$ (Note 4)

PARAMETER	CONDITIONS	LM101A, LM201A			LM301A			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	$T_A = 25^{\circ}C, R_S \leq 50 k\Omega$		0.7	2.0		2.0	7.5	mV
Input Offset Current	$T_A = 25^{\circ}C$		1.5	10		3	50	nA
Input Bias Current	$T_A = 25^{\circ}C$		30	75		70	250	nA
Input Resistance	$T_A = 25^{\circ}C$	1.5	4		0.5	2		M $\Omega$
Supply Current	$T_A = 25^{\circ}C, V_S = \pm 20V$		1.8	3.0		1.8	3.0	mA
Large Signal Voltage Gain	$T_A = 25^{\circ}C, V_S = \pm 15V$ $V_{OUT} = \pm 10V, R_L \geq 2 k\Omega$	50	160		25	160		V/mV
Input Offset Voltage	$R_S \leq 50 k\Omega$			3.0			10	mV
Average Temperature Coefficient of Input Offset Voltage			3.0	15		6.0	30	$\mu V/^{\circ}C$
Input Offset Current				20			70	nA
Average Temperature Coefficient of Input Offset Current	$25^{\circ}C \leq T_A \leq 125^{\circ}C$ $25^{\circ}C \leq T_A \leq 70^{\circ}C$ $-55^{\circ}C \leq T_A \leq 25^{\circ}C$ $0^{\circ}C \leq T_A \leq 25^{\circ}C$		0.01	0.1		0.01	0.3	nA/ $^{\circ}C$ nA/ $^{\circ}C$ nA/ $^{\circ}C$ nA/ $^{\circ}C$
Input Bias Current				100			300	nA
Supply Current	$T_A = +125^{\circ}C, V_S = \pm 20V$		1.2	2.5				mA
Large Signal Voltage Gain	$V_S = \pm 15V, V_{OUT} = \pm 10V$ $R_L \geq 2 k\Omega$	25			15			V/mV
Output Voltage Swing	$V_S = \pm 15V, R_L = 10 k\Omega$ $R_L = 2 k\Omega$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$		$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$		V V
Input Voltage Range	LM101A: $V_S = \pm 20V$ ; LM301A: $V_S = \pm 15V$	$\pm 15$			$\pm 12$			V
Common Mode Rejection Ratio	$R_S \leq 50 k\Omega$	80	96		70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 50 k\Omega$	80	96		70	96		dB

### NOTES:

- For operating at elevated temperatures, the device must be derated based on  $+150^{\circ}C$  for LM101A,  $+100^{\circ}C$  for LM201A and LM301A, maximum junction temperature and a thermal resistance of 150 $^{\circ}C/W$  junction to ambient or 45 $^{\circ}C/W$  junction to case.
- For supply voltages less than  $\pm 15V$ , the absolute maximum input voltage is equal to the supply voltage.
- Continuous short-circuit is allowed for case temperatures to  $+125^{\circ}C$  and ambient temperatures to  $+75^{\circ}C$  for LM101A, case temperatures to  $+70^{\circ}C$  and ambient temperatures to  $+55^{\circ}C$  for LM301A.
- Specifications apply for temperature ranges: LM101A:  $-55^{\circ}C$  to  $+125^{\circ}C$ ; LM201A:  $-25^{\circ}C$  to  $+85^{\circ}C$ ; LM301A:  $0^{\circ}C$  to  $+70^{\circ}C$  unless otherwise specified.