

# LM301A LM201A

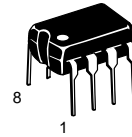
## Operational Amplifiers

A general purpose operational amplifier that allows the user to choose the compensation capacitor best suited to his needs. With proper compensation, summing amplifier slew rates to 10 V/μs can be obtained.

- Low Input Offset Current: 20 nA Maximum Over Temperature Range
- External Frequency Compensation for Flexibility
- Class AB Output Provides Excellent Linearity
- Output Short Circuit Protection
- Guaranteed Drift Characteristics

### OPERATIONAL AMPLIFIERS

#### SEMICONDUCTOR TECHNICAL DATA

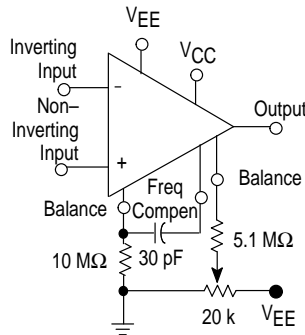


**N SUFFIX**  
PLASTIC PACKAGE  
CASE 626

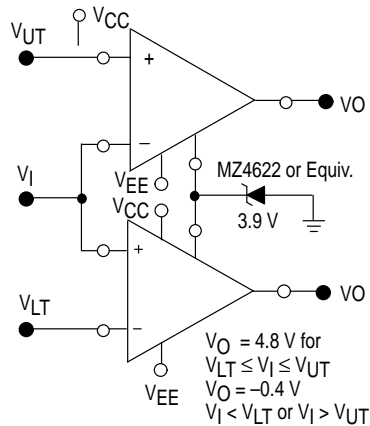


**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO-8)

**Figure 1. Standard Compensation and Offset Balancing Circuit**



**Figure 2. Double-Ended Limit Detector**

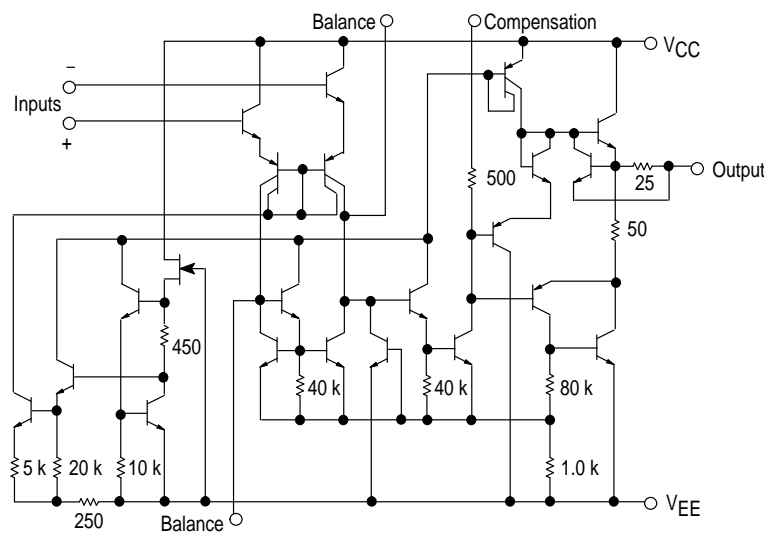


(Pins Not Shown Are Not Connected)

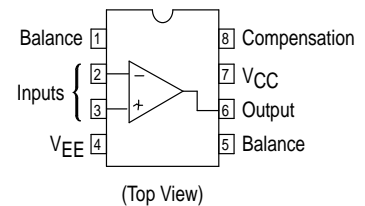
$$V_O = 4.8 \text{ V for } V_{LT} \leq V_I \leq V_{UT}$$

$$V_O = -0.4 \text{ V for } V_I < V_{LT} \text{ or } V_I > V_{UT}$$

**Figure 3. Representative Circuit Schematic**



### PIN CONNECTIONS



### ORDERING INFORMATION

Device	Operating Temperature Range	Package
LM301AD LM301AN	$T_A = 0^\circ \text{ to } +70^\circ \text{C}$	SO-8 Plastic DIP
LM201AD LM201AN	$T_A = -25^\circ \text{ to } +85^\circ \text{C}$	SO-8 Plastic DIP

# LM301A LM201A

## MAXIMUM RATINGS

Rating	Symbol	Value		Unit
		LM201A	LM301A	
Power Supply Voltage	$V_{CC}, V_{EE}$	$\pm 22$	$\pm 18$	Vdc
Input Differential Voltage	$V_{ID}$	$\longleftrightarrow \pm 30 \longrightarrow$		V
Input Common Mode Range (Note 1)	$V_{ICR}$	$\longleftrightarrow \pm 15 \longrightarrow$		V
Output Short Circuit Duration	$t_{SC}$	$\longleftrightarrow$ Continuous $\longrightarrow$		
Power Dissipation (Package Limitation) Plastic Dual-In-Line Package (LM201A/ Derate above $T_A = +25^\circ\text{C}$ 301A)	$P_D$	625 5.0	625 5.0	mW mW/ $^\circ\text{C}$
Operating Ambient Temperature Range	$T_A$	-25 to +85	0 to +70	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	$\longleftrightarrow -65$ to $+150 \longrightarrow$		$^\circ\text{C}$

**NOTE:** 1. For supply voltages less than  $\pm 15$  V, the absolute maximum input voltage is equal to the supply voltage.

**ELECTRICAL CHARACTERISTICS** ( $T_A = +25^\circ\text{C}$ , unless otherwise noted.) Unless otherwise specified, these specifications apply for supply voltages from  $\pm 5.0$  V to  $\pm 20$  V for the LM201A, and from  $\pm 5.0$  V to  $\pm 15$  V for the LM301A.

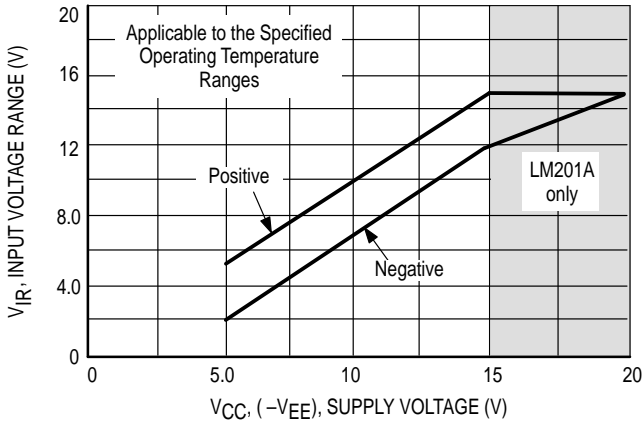
Characteristic	Symbol	LM201A			LM301A			Unit
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage ( $R_S \leq 50$ k $\Omega$ )	$V_{IO}$	-	0.7	2.0	-	2.0	7.5	mV
Input Offset Current	$I_{IO}$	-	1.5	10	-	3.0	50	nA
Input Bias Current	$I_{IB}$	-	30	75	-	70	250	nA
Input Resistance	$r_i$	1.5	4.0	-	0.5	2.0	-	M $\Omega$
Supply Current $V_{CC}/V_{EE} = \pm 20$ V $V_{CC}/V_{EE} = \pm 15$ V	$I_{CC}, I_{EE}$	-	1.8	3.0	-	-	-	mA
		-	-	-	-	1.8	3.0	
Large Signal Voltage Gain ( $V_{CC}/V_{EE} = \pm 15$ V, $V_O = \pm 10$ V, $R_L > 2.0$ k $\Omega$ )	$A_V$	50	160	-	25	160	-	V/mV

The following specifications apply over the operating temperature range.

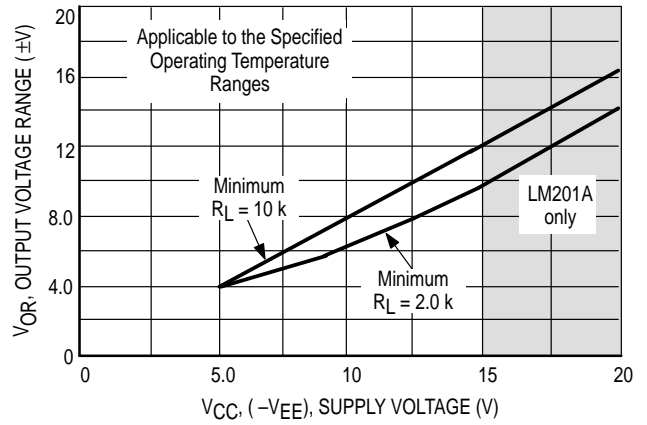
Input Offset Voltage ( $R_S \leq 50$ k $\Omega$ )	$V_{IO}$	-	-	3.0	-	-	10	mV
Input Offset Current	$I_{IO}$	-	-	20	-	-	70	nA
Avg Temperature Coefficient of Input Offset Voltage $T_A(\text{min}) \leq T_A \leq T_A(\text{max})$	$\Delta V_{IO}/\Delta T$	-	3.0	15	-	6.0	30	$\mu\text{V}/^\circ\text{C}$
Avg Temperature Coefficient of Input Offset Current $+25^\circ\text{C} \leq T_A \leq T_A(\text{max})$ $T_A(\text{min}) \leq T_A \leq 25^\circ\text{C}$	$\Delta I_{IO}/\Delta T$	-	0.01 0.02	0.1 0.2	-	0.01 0.02	0.3 0.6	nA/ $^\circ\text{C}$
Input Bias Current	$I_{IB}$	-	-	100	-	-	300	nA
Large Signal Voltage Gain ( $V_{CC}/V_{EE} = \pm 15$ V, $V_O = \pm 10$ V, $R_L > 2.0$ k $\Omega$ )	$A_{VOL}$	25	-	-	15	-	-	V/mV
Input Voltage Range $V_{CC}/V_{EE} = \pm 20$ V $V_{CC}/V_{EE} = \pm 15$ V	$V_{ICR}$	-15 -	- -	+15 -	- -12	- -	- +12	V
Common Mode Rejection ( $R_S \leq 50$ k $\Omega$ )	CMR	80	96	-	70	90	-	dB
Supply Voltage Rejection ( $R_S \leq 50$ k $\Omega$ )	PSR	80	96	-	70	96	-	dB
Output Voltage Swing ( $V_{CC}/V_{EE} = \pm 15$ V, $R_L = \pm 10$ k $\Omega$ , $R_L > 2.0$ k $\Omega$ )	$V_O$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	- -	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	- -	V
Supply Currents ( $T_A = T_A(\text{max})$ , $V_{CC}/V_{EE} = \pm 20$ V)	$I_{CC}, I_{EE}$	-	1.2	2.5	-	-	-	mA

# LM301A LM201A

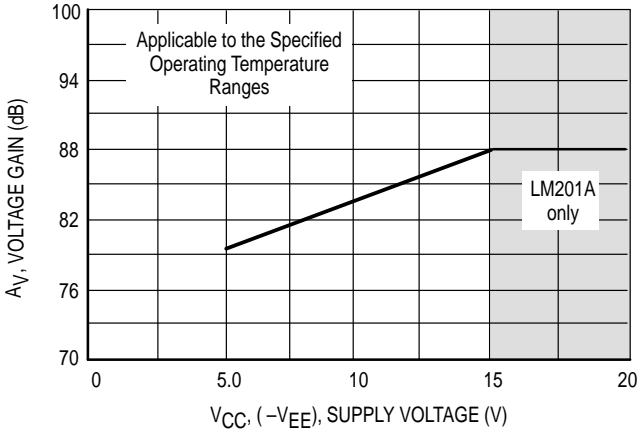
**Figure 4. Minimum Input Voltage Range**



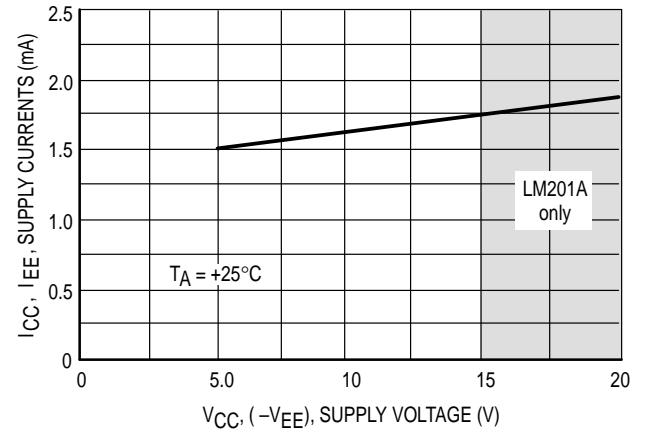
**Figure 5. Minimum Output Voltage Swing**



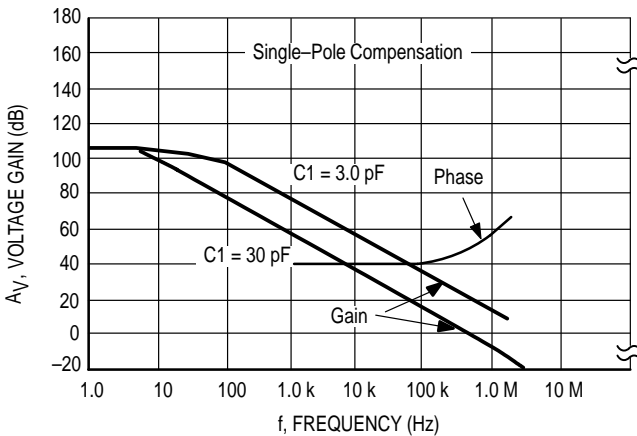
**Figure 6. Minimum Voltage Gain**



**Figure 7. Typical Supply Currents**



**Figure 8. Open Loop Frequency Response**



**Figure 9. Large Signal Frequency Response**

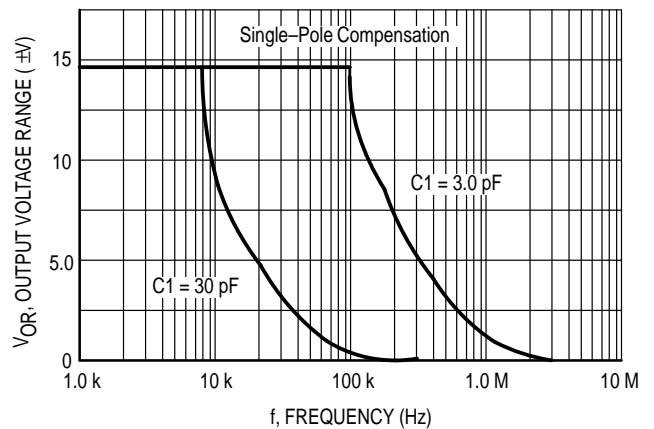


Figure 10. Voltage Follower Pulse Response

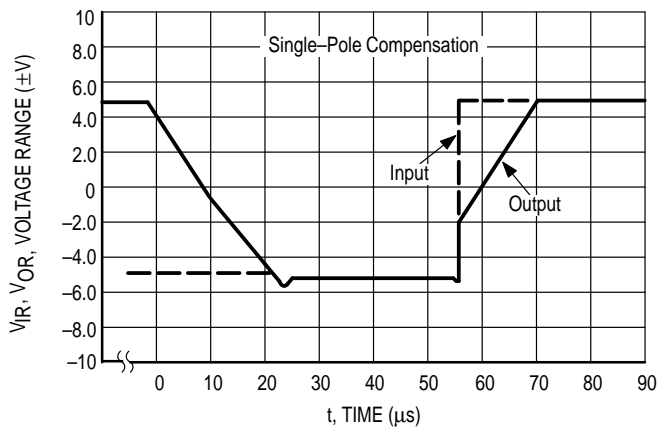


Figure 11. Open Loop Frequency Response

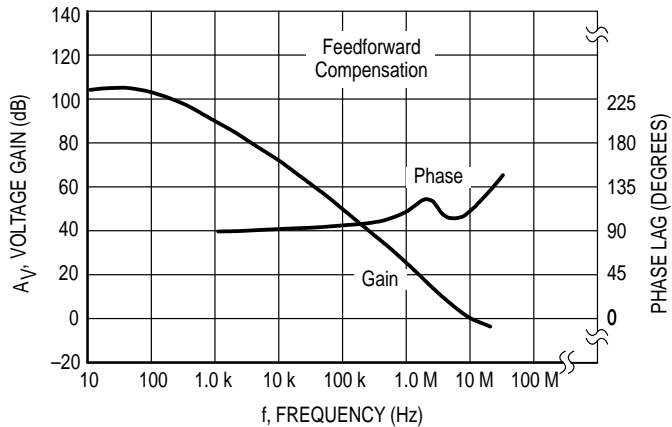


Figure 12. Large Signal Frequency Response

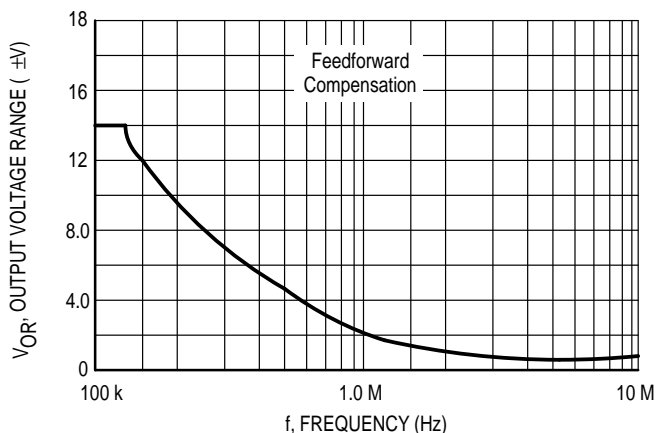


Figure 13. Inverter Pulse Response

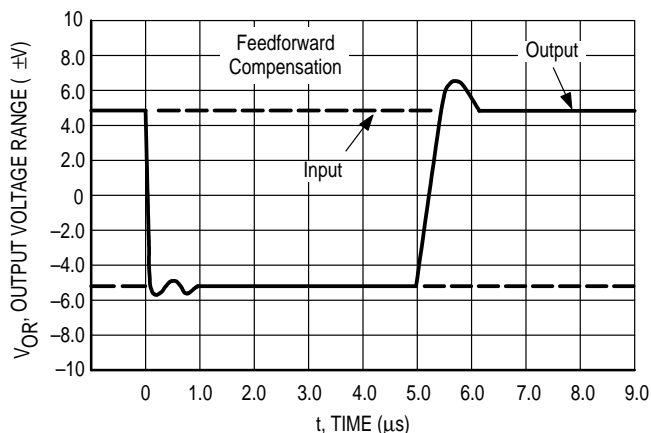


Figure 14. Single-Pole Compensation

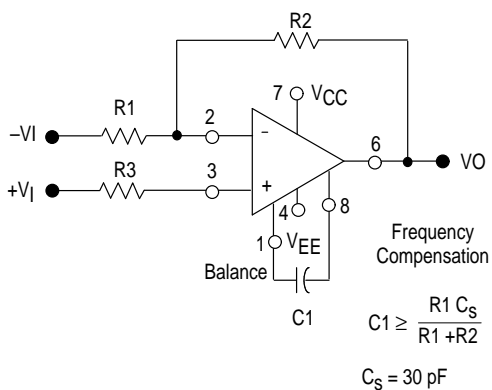
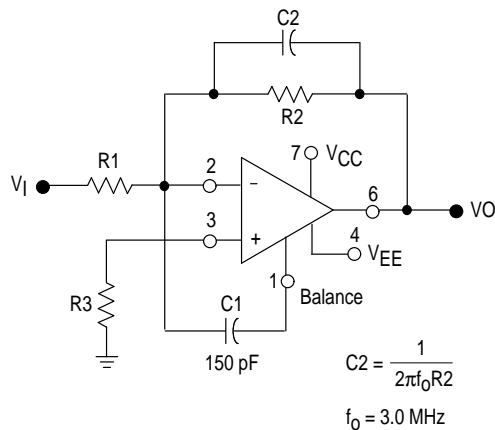


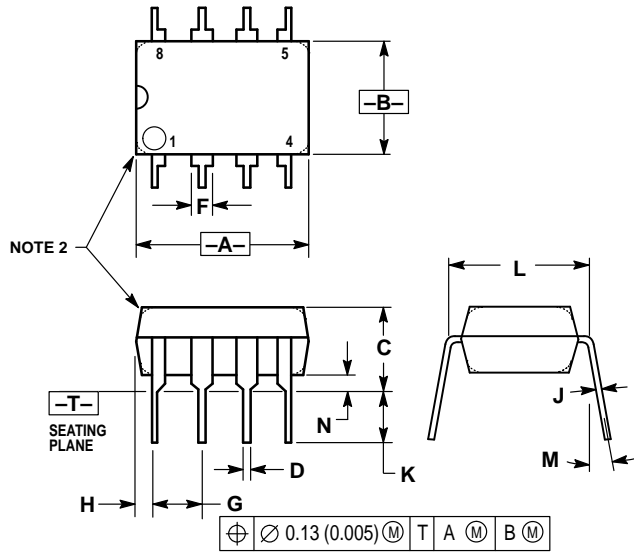
Figure 15. Feedforward Compensation



# LM301A LM201A

## OUTLINE DIMENSIONS

**N SUFFIX**  
 PLASTIC PACKAGE  
 CASE 626-05  
 (LM201A and LM301A)  
 ISSUE K

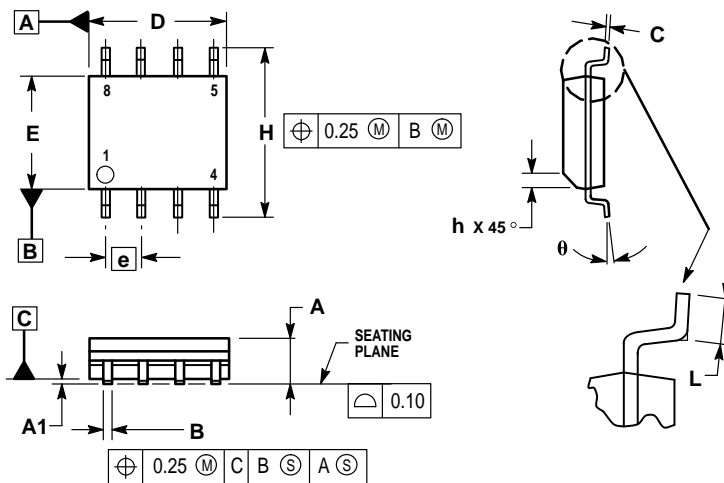


**NOTES:**

1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	—	10°	—	10°
N	0.76	1.01	0.030	0.040

**D SUFFIX**  
 PLASTIC PACKAGE  
 CASE 751-05  
 (SO-8)  
 ISSUE R



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE MOLD PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.35	0.49
C	0.18	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.25
$\theta$	0°	7°

# LM301A LM201A

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LM301A/D

