MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

LM101A
LM201A
LM301A

2

OPERATIONAL AMPLIFIER

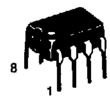
SILICON MONOLITHIC INTEGRATED CIRCUIT

Operational Amplifier

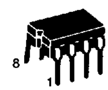
A general purpose operational amplifier that allows the user to choose the compensation capacitor best suited to his needs. With proper compensation, summing amplifier slew rates to 10 V/μs can be obtained.

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

N SUFFIX
PLASTIC PACKAGE
CASE 626
(LM201A and LM301A)



J SUFFIX
CERAMIC PACKAGE
CASE 693



D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO-8)

Figure 1. Standard Compensation and Offset Balancing Circuit

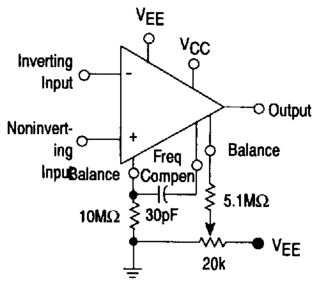
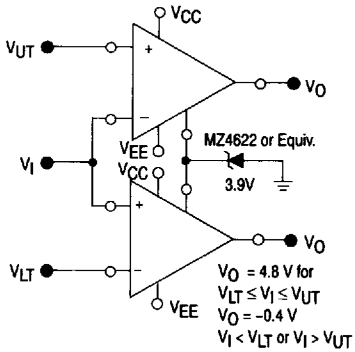
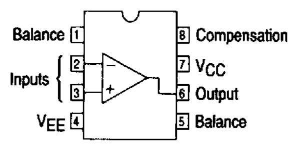


Figure 2. Double-Ended Limit Detctor



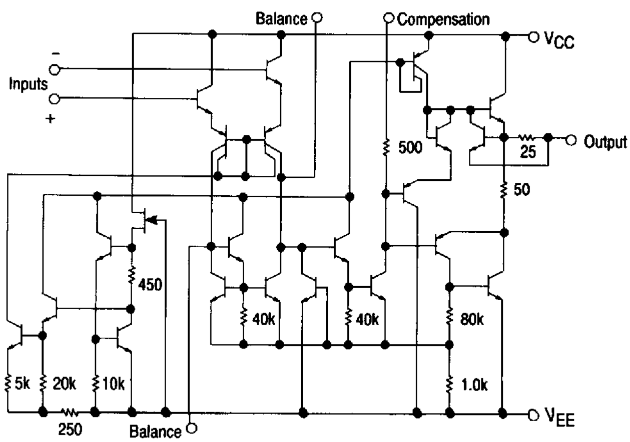
(Pins Not Shown Are Not Connected)

PIN CONNECTIONS



(Top View)

Figure 3. Representative Circuit Schematic



ORDERING INFORMATION

Device	Temperature Range	Package
LM101AJ	−55° to +125°C	Ceramic DIP
LM201AD LM201AN LM201AJ	−25° to +85°C	S0-8 Plastic DIP Ceramic DIP
LM301AD LM301AN LM301AJ	0° to +70°C	S0-8 Plastic DIP Ceramic DIP

LM101A, LM201A, LM301A

MAXIMUM RATINGS

Rating	Symbol	VALUE LM101A	LM201A	LM301A	Unit
Power Supply Voltage	V_{CC}, V_{EE}	±22	±22	±18	Vdc
Input Differential Voltage	V_{ID}	← ±30 →			V
Input Common Mode Range (Note 1)	V_{ICR}	← ±15 →			V
Output Short Circuit Duration	t_{SC}	← Continuous →			
Power Dissipation (Package Limitation)	P_D				
Plastic Dual-In-Line Package (LM201A/		—	625	625	mW
Derate above T_A = +25°C 301A)		—	5.0	5.0	mW/°C
Ceramic Package (LM101A)		← 750 →			mW
Derate above 25°C		← 6.6 →			mW/°C
Operating Ambient Temperature Range	T_A	–55 to +125	–25 to +85	0 to +70	°C
Storage Temperature Range	T_{stg}	← –65 to +150 →			°C

Note: 1. For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.

ELECTRICAL CHARACTERISTICS (T_A = +25°C, unless otherwise noted.) Unless otherwise specified, these specifications apply for supply voltages from ±5.0 V to ±20 V for the LM101A and LM201A, and from ±5.0 V to ±15 V for the LM301A.

Characteristics	Symbol	LM101A LM201A Min	Typ	Max	LM301A Min	Typ	Max	Unit
Input Offset Voltage (R_S ≤ 50 kΩ)	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	—	MΩ
Supply Current	I_{CC}, I_{EE}							mA
V_{CC}/V_{EE} = ±20 V		—	1.8	3.0	—	—	—	
V_{CC}/V_{EE} = ±15 V		—	—	—	—	1.8	3.0	
Large Signal Voltage Gain (V_{CC}/V_{EE} = ±15 V, V_O = ±10 V, R_L > 2.0 kΩ)	A_V	50	160	—	25	160	—	V/mV
The following specifications apply over the operating temperature range.								
Input Offset Voltage (R_S ≤ 50 kΩ)	V_{IO}	—	—	3.0	—	—	10	mV
Input Offset Current	I_{IO}	—	—	20	—	—	70	nA
Avg Temperature Coefficient of Input Offset Voltage $T_A(min) \le T_A \le T_A(max)$	$\Delta V_{IO}/\Delta T$	—	3.0	15	—	6.0	30	µV/°C
Avg Temperature Coefficient of Input Offset Current	$\Delta I_{IO}/\Delta T$							nA/°C
$+25°C \le T_A \le T_A(max)$		—	0.01	0.1	—	0.01	0.3	
$T_A(min) \le T_A \le 25°C$		—	0.02	0.2	—	0.02	0.6	
Input Bias Current	I_{IB}	—	—	100	—	—	300	nA
Large Signal Voltage Gain (V_{CC}/V_{EE} = ±15 V, V_O = ±10V, R_L > 2.0 kΩ)	A_{VOL}	25	—	—	15	—	—	V/mV
Input Voltage Range	V_{ICR}							V
V_{CC}/V_{EE} = ±20 V		–15	—	+15	—	—	—	
V_{CC}/V_{EE} = ±15 V		—	—	—	–12	—	+12	
Common Mode Rejection (R_S ≤ 50 kΩ)	CMR	80	96	—	70	90	—	dB
Supply Voltage Rejection (R_S ≤ 50 kΩ)	PSR	80	96	—	70	96	—	dB
Output Voltage Swing (V_{CC}/V_{EE} = ±15 V, R_L = ±10 kΩ, R_L > 2.0 kΩ)	V_O	±12 ±10	±14 ±13	— —	±12 ±10	±14 ±13	— —	V
Supply Currents ($T_A = T_A(max)$, V_{CC}/V_{EE} = ±20 V)	I_{CC}, I_{EE}	—	1.2	2.5	—	—	—	mA

LM101A, LM201A, LM301A

Figure 4. Minimum Input Voltage Range

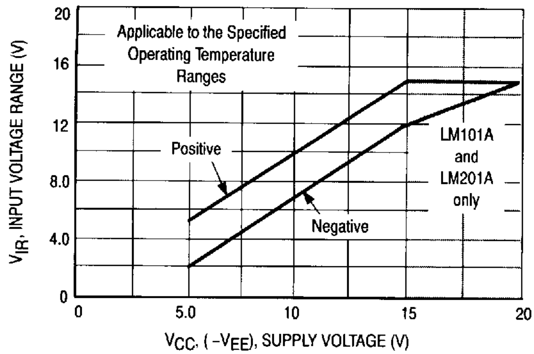


Figure 5. Minimum Output Voltage Swing

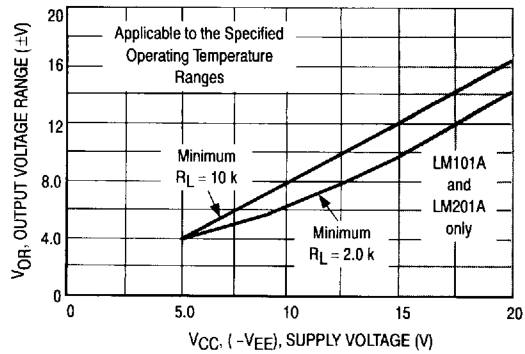


Figure 6. Minimum Voltage Gain

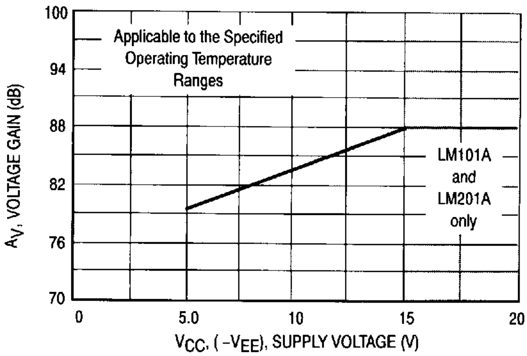


Figure 7. Typical Supply Currents

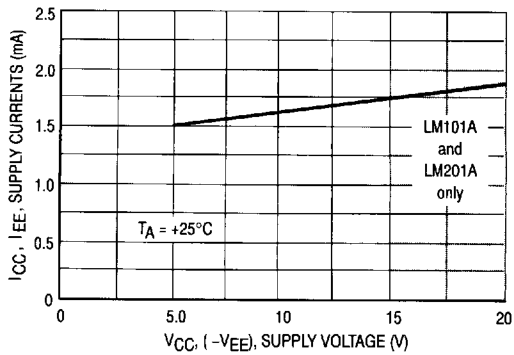


Figure 8. Open-Loop Frequency Response

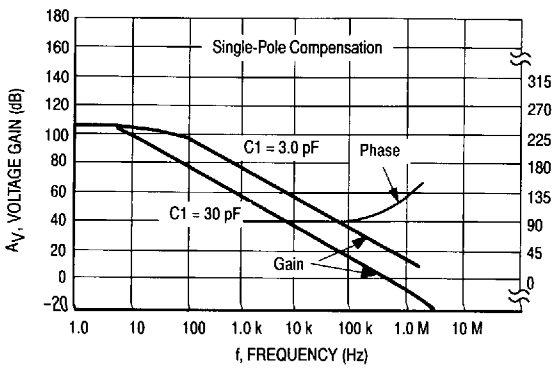


Figure 9. Large Signal Frequency Response

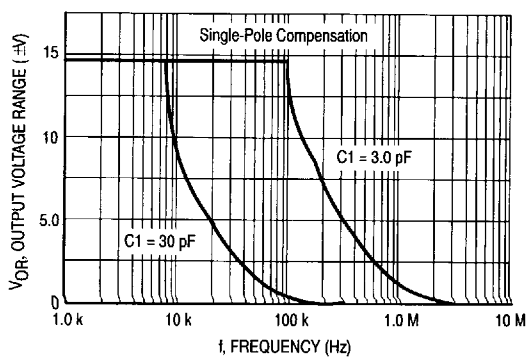


Figure 10. Voltage Follower Pulse Response

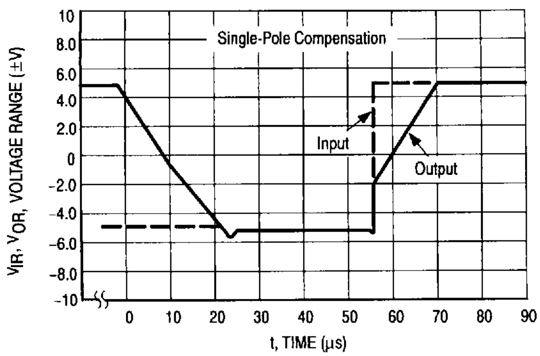


Figure 11. Open-Loop Frequency Response

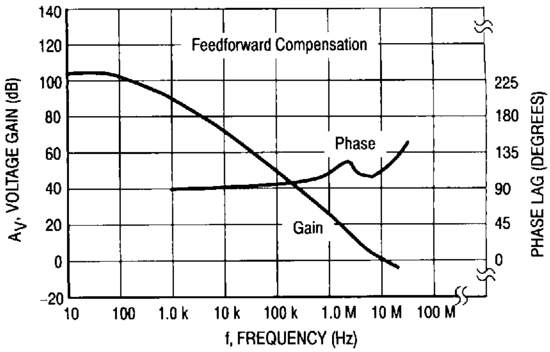


Figure 12. Large Signal Frequency Response

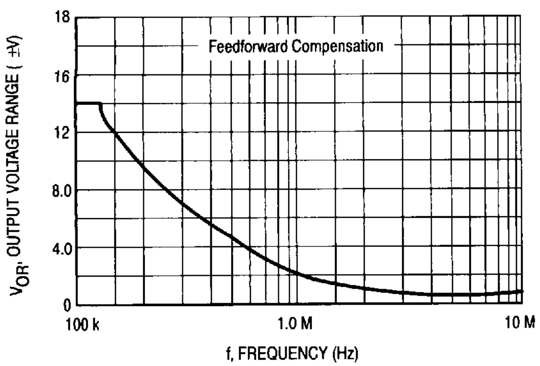


Figure 13. Inverter Pulse Response

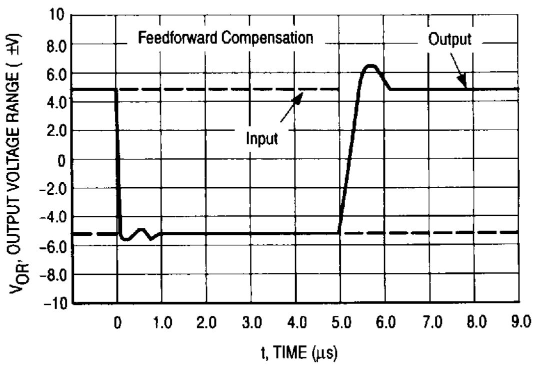
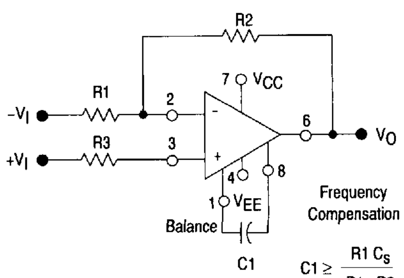


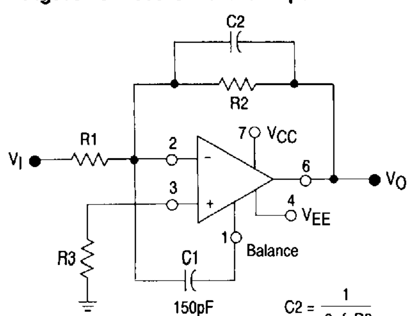
Figure 14. Single-Pole Compensation



$$C1 \geq \frac{R1\, C_S}{R1 + R2}$$

C_S = 30 pF

Figure 15. Feedforward Compensation



$$C2 = \frac{1}{2\pi f_O R2}$$

f_O = 3.0 MHz