# LM101A
# LM201A
# LM301A

**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**

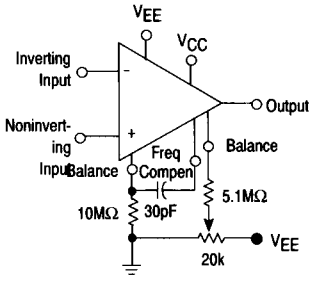
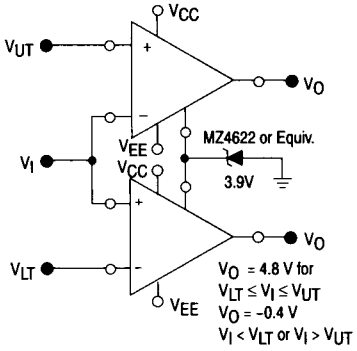
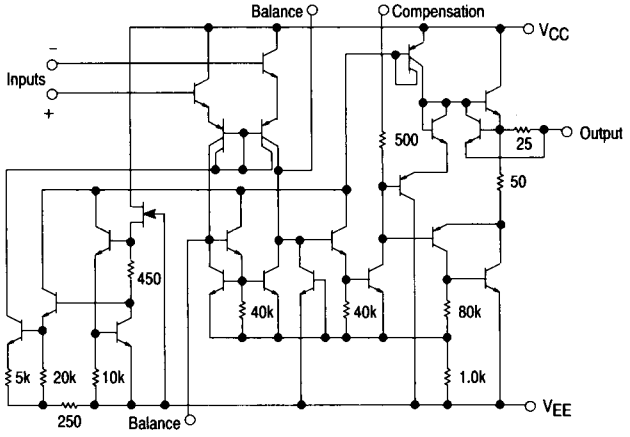



**Figure 2. Double-Ended Limit Detctor**

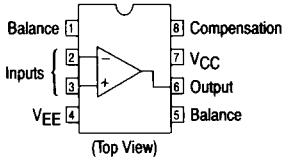



(Pins Not Shown Are Not Connected)

**Figure 3. Representative Circuit Schematic**




**PIN CONNECTIONS**




(Top View)

**ORDERING INFORMATION**

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

**MAXIMUM RATINGS**

| Rating | Symbol | VALUE LM101A | VALUE LM201A | VALUE 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 ≤ $T_A$ ≤ $T_A$ (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 | ±14 | — | ±12 | ±14 | — | V |
| | | ±10 | ±13 | — | ±10 | ±13 | — | |
| Supply Currents ($T_A$ = $T_A$(max), $V_{CC}/V_{EE}$ = ±20 V) | $I_{CC}$,$I_{EE}$ | — | 1.2 | 2.5 | — | — | — | mA |

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**Figure 4. Minimum Input Voltage Range**

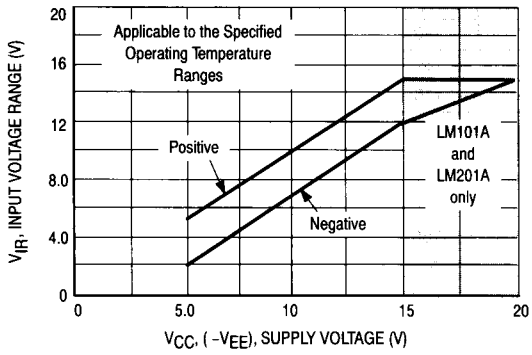


**Figure 5. Minimum Output Voltage Swing**

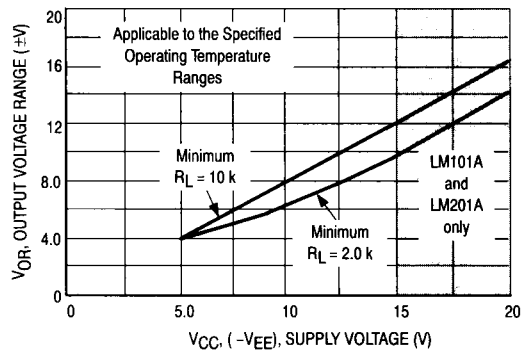


**Figure 6. Minimum Voltage Gain**

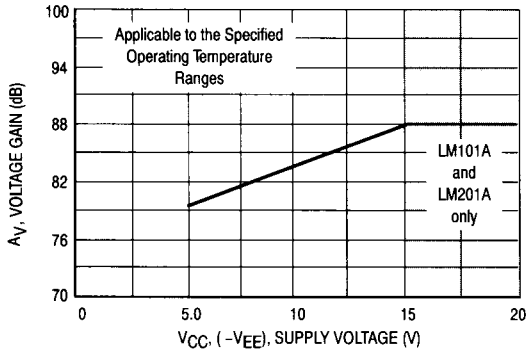


**Figure 7. Typical Supply Currents**

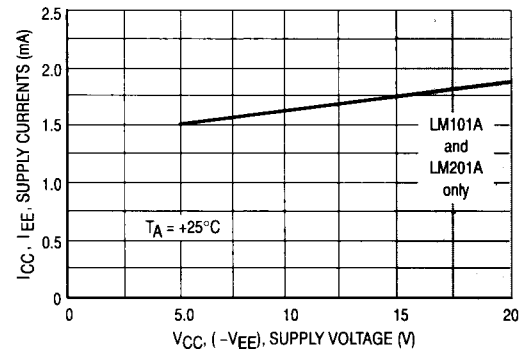


**Figure 8. Open-Loop Frequency Response**

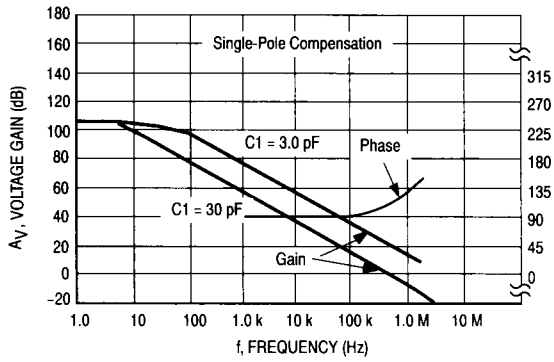


**Figure 9. Large Signal Frequency Response**

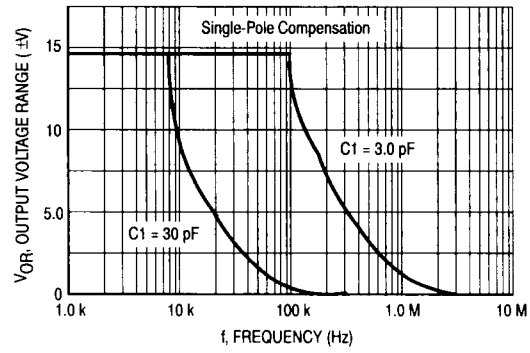

**Figure 10. Voltage Follower Pulse Response**

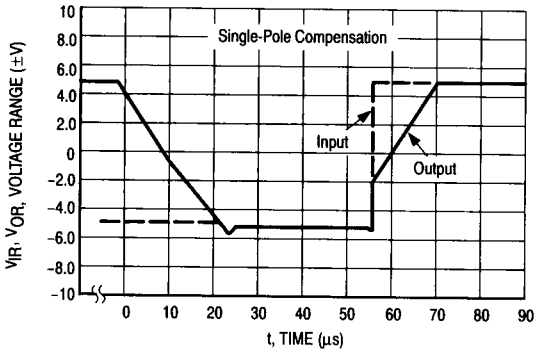


**Figure 11. Open-Loop Frequency Response**

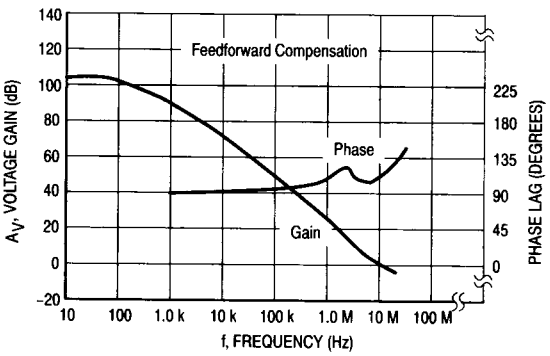


**Figure 12. Large Signal Frequency Response**

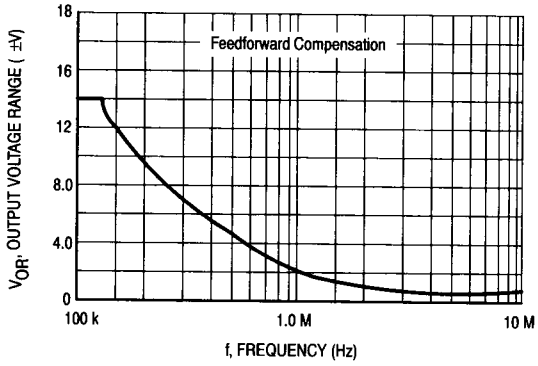


**Figure 13. Inverter Pulse Response**

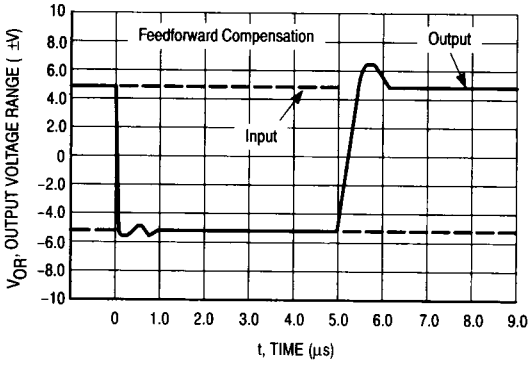


**Figure 14. Single-Pole Compensation**

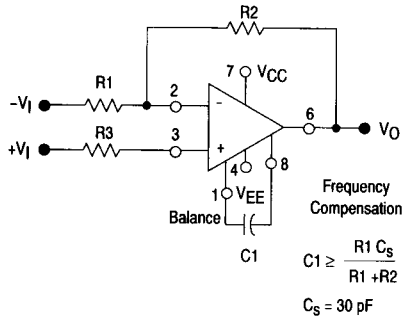


**Figure 15. Feedforward Compensation**