# LM741

## Single Operational Amplifier

### Features

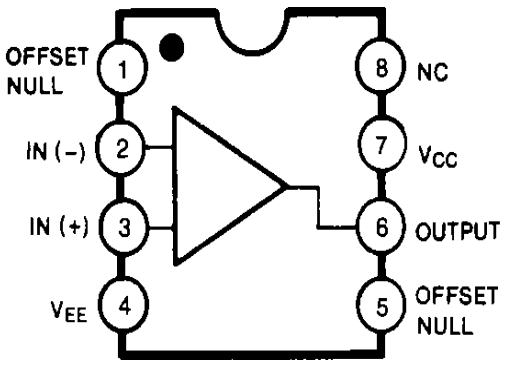
- Short circuit protection
- Excellent temperature stability
- Internal frequency compensation
- High Input voltage range
- Null of offset

### Description

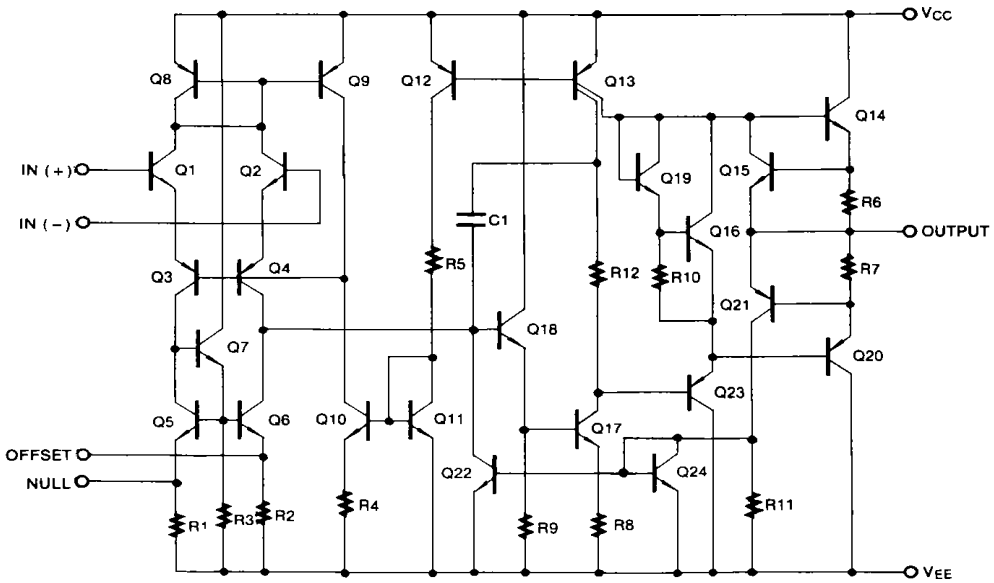
The LM741 series are general purpose operational amplifiers. It is intended for a wide range of analog applications. The high gain and wide range of operating voltage provide superior performance in intergrator, summing amplifier, and general feedback applications.

8-DIP


### Internal Block Diagram



## Schematic Diagram




## Absolute Maximum Ratings ($T_A$ = 25°C)

| Parameter | Symbol | LM741 | Unit |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | ±18 | V |
| Differential Input Voltage | $V_{I(DIFF)}$ | 30 | V |
| Input Voltage | $V_I$ | ±15 | V |
| Output Short Circuit Duration | - | Indefinite | - |
| Power Dissipation | $P_D$ | 500 | mW |
| Operating Temperature Range | $T_{OPR}$ | 0 ~ + 70 | °C |
| Storage Temperature Range | $T_{STG}$ | -65 ~ + 150 | °C |

## Electrical Characteristics

($V_{CC}$ = 15V, $V_{EE}$ = - 15V. $T_A$ = 25 °C, unless otherwise specified)

| Parameter | | Symbol | Conditions | | LM741 | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | | | Min. | Typ. | Max. | |
| Input Offset Voltage | | $V_{IO}$ | $R_S$≤10KΩ | | - | 2.0 | 6.0 | mV |
| | | | $R_S$≤50Ω | | - | - | - | |
| Input Offset Voltage Adjustment Range | | $V_{IO(R)}$ | $V_{CC}$ = ±20V | | - | ±15 | - | mV |
| Input Offset Current | | $I_{IO}$ | - | | - | 20 | 200 | nA |
| Input Bias Current | | $I_{BIAS}$ | - | | - | 80 | 500 | nA |
| Input Resistance | | $R_I$ | $V_{CC}$ =±20V | | 0.3 | 2.0 | - | MΩ |
| Input Voltage Range | | $V_{I(R)}$ | - | | ±12 | ±13 | - | V |
| Large Signal Voltage Gain | | $G_V$ | $R_L$≥2KΩ | $V_{CC}$ =±20V, $V_{O(P-P)}$ =±15V | - | - | - | V/mV |
| | | | | $V_{CC}$ =±15V, $V_{O(P-P)}$ =±10V | 20 | 200 | - | |
| Output Short Circuit Current | | $I_{SC}$ | - | | - | 25 | - | mA |
| Output Voltage Swing | | $V_{O(P-P)}$ | $V_{CC}$ = ±20V | $R_L$≥10KΩ | - | - | - | V |
| | | | | $R_L$≥10KΩ | - | - | - | |
| | | | $V_{CC}$ = ±15V | $R_L$≥10KΩ | ±12 | ±14 | - | |
| | | | | $R_L$≥10KΩ | ±10 | ±13 | - | |
| Common Mode Rejection Ratio | | CMRR | $R_S$≤10KΩ, $V_{CM}$ = ±12V | | 70 | 90 | - | dB |
| | | | $R_S$≤50Ω, $V_{CM}$ = ±12V | | - | - | - | |
| Power Supply Rejection Ratio | | PSRR | $V_{CC}$ = ±15V to $V_{CC}$ = ±15V $R_S$≤50Ω | | - | - | - | dB |
| | | | $V_{CC}$ = ±15V to $V_{CC}$ = ±15V $R_S$≤10KΩ | | 77 | 96 | - | |
| Transient Response | Rise Time | $t_R$ | Unity Gain | | - | 0.3 | - | µs |
| | Overshoot | OS | | | - | 10 | - | % |
| Bandwidth | | BW | - | | - | - | - | MHz |
| Slew Rate | | SR | Unity Gain | | - | 0.5 | - | V/µs |
| Supply Current | | $I_{CC}$ | $R_L$= ∞Ω | | - | 1.5 | 2.8 | mA |
| Power Consumption | | $P_C$ | $V_{CC}$ = ±20V | | - | - | - | mW |
| | | | $V_{CC}$ = ±15V | | - | 50 | 85 | |

## Electrical Characteristics

( 0°C ≤$T_A$≤70 °C $V_{CC}$ = ±15V, unless otherwise specified)

| Parameter | Symbol | Conditions | | LM741 | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Input Offset Voltage | $V_{IO}$ | $R_S$≤50Ω | | - | - | - | mV |
| | | $R_S$≤10KΩ | | - | - | 7.5 | |
| Input Offset Voltage Drift | $\Delta V_{IO}/\Delta T$ | - | | - | - | | µV/ °C |
| Input Offset Current | $I_{IO}$ | - | | - | - | 300 | nA |
| Input Offset Current Drift | $\Delta I_{IO}/\Delta T$ | - | | - | - | | nA/ °C |
| Input Bias Current | $I_{BIAS}$ | - | | - | - | 0.8 | µA |
| Input Resistance | $R_I$ | $V_{CC}$ = ±20V | | - | - | - | MΩ |
| Input Voltage Range | $V_{I(R)}$ | - | | ±12 | ±13 | - | V |
| Output Voltage Swing | $V_{O(P-P)}$ | $V_{CC}$ =±20V | $R_S$≥10KΩ | - | - | - | V |
| | | | $R_S$≥2KΩ | - | - | - | |
| | | $V_{CC}$ =±15V | $R_S$≥10KΩ | ±12 | ±14 | - | |
| | | | $R_S$≥2KΩ | ±10 | ±13 | - | |
| Output Short Circuit Current | $I_{SC}$ | - | | 10 | - | 40 | mA |
| Common Mode Rejection Ratio | CMRR | $R_S$≤10KΩ, $V_{CM}$ = ±12V | | 70 | 90 | - | dB |
| | | $R_S$≤50Ω, $V_{CM}$ = ±12V | | - | - | - | |
| Power Supply Rejection Ratio | PSRR | $V_{CC}$ = ±20V to ±5V | $R_S$≤50Ω | - | - | - | dB |
| | | | $R_S$≤10KΩ | 77 | 96 | - | |
| Large Signal Voltage Gain | $G_V$ | $R_S$≥2KΩ | $V_{CC}$ = ±20V, $V_{O(P-P)}$ = ±15V | - | - | - | V/mV |
| | | | $V_{CC}$ = ±15V, $V_{O(P.P)}$ = ±10V | 15 | - | - | |
| | | | $V_{CC}$ = ±15V, $V_{O(P-P)}$ = ±2V | - | - | - | |

## Typical Performance Characteristics

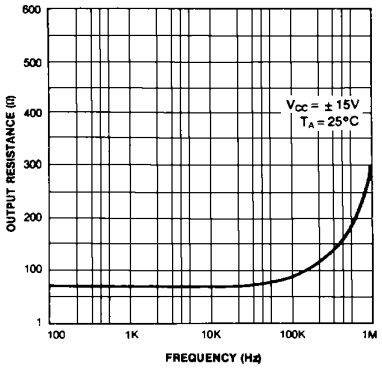



**Figure 1. Output Resistance vs Frequency**

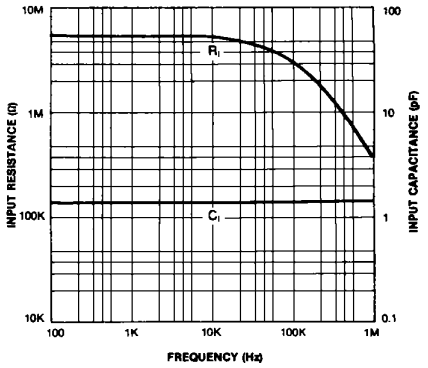



**Figure 2. Input Resistance and Input Capacitance vs Frequency**

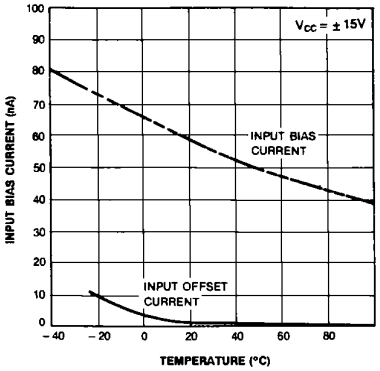



**Figure 3. Input Bias Current vs Ambient Temperature**

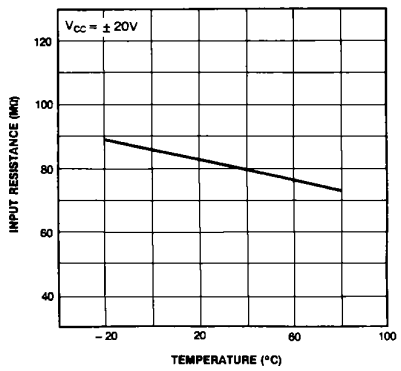



**Figure 4. Power Comsumption vs Ambient Temperature**

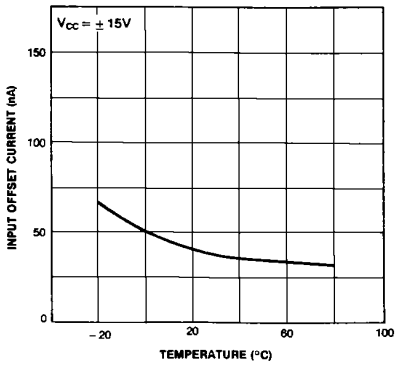



**Figure 5. Input Offset Current vs Ambient Temperature**

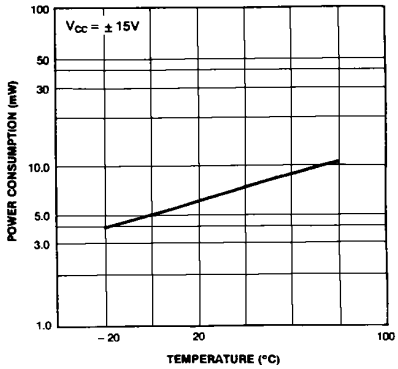



**Figure 6. Input Resistance vs Ambient Temperature**

## Typical Performance Characteristics (continued)

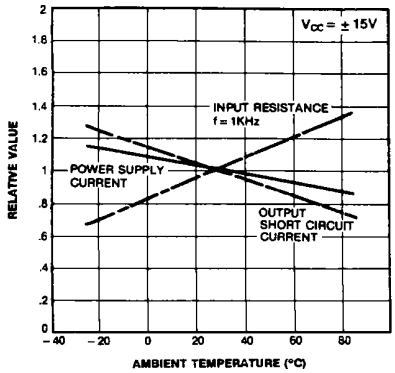



**Figure 7. Normalized DC Parameters vs Ambient Temperature**

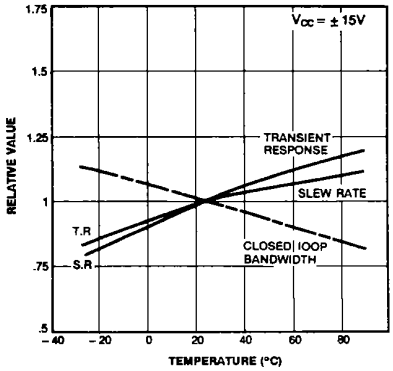



**Figure 8. Frequency Characteristics vs Ambient Temperature**

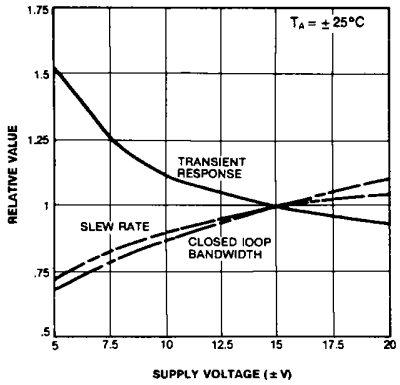



**Figure 9. Frequency Characteristics vs Supply Voltage**

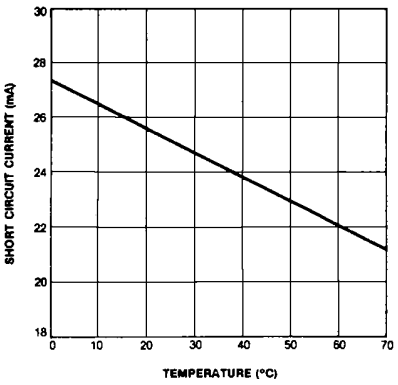



**Figure 10. Output Short Circuit Current vs Ambient Temperature**

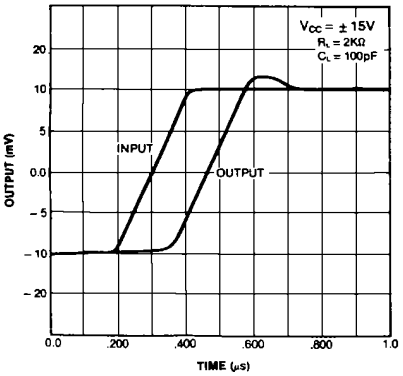



**Figure 11. Transient Response**

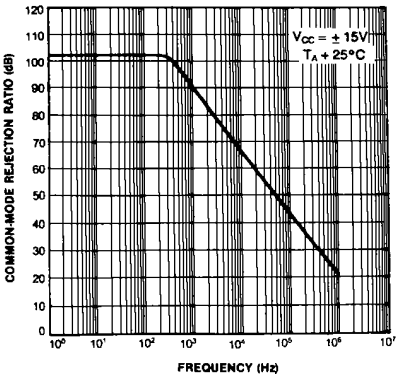



**Figure 12. Common-Mode Rejection Ratio vs Frequency**

## Typical Performance Characteristics (continued)

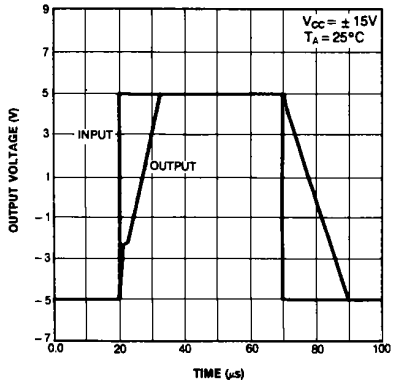



**Figure 13. Voltage Follower Large Signal Pulse Response**

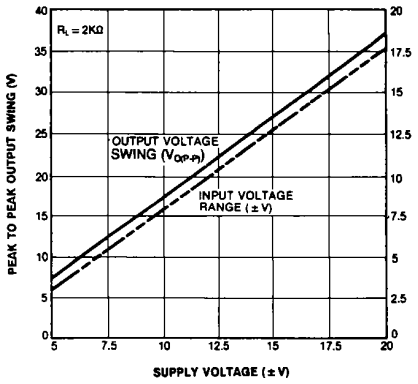
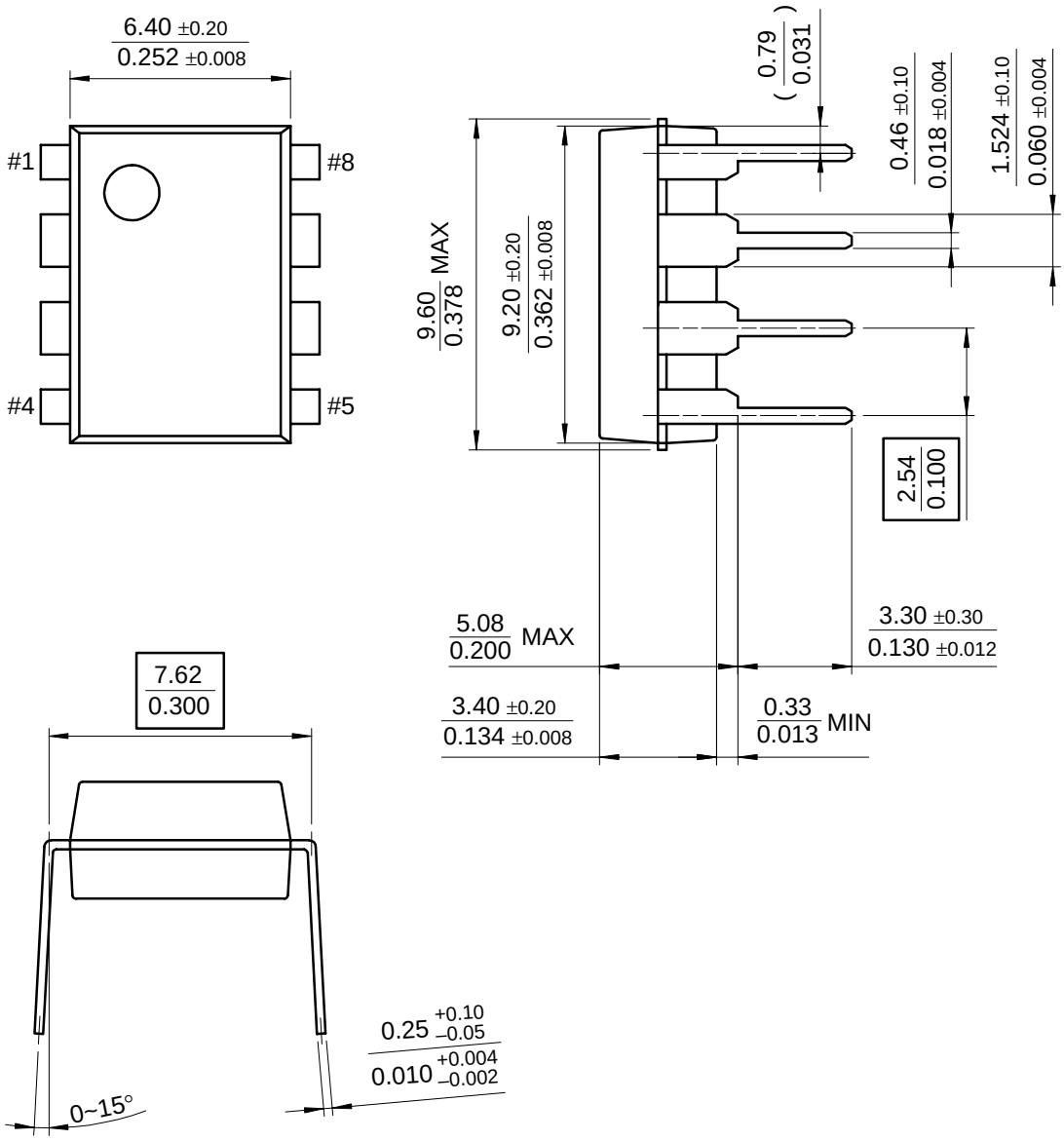



**Figure 14. Output Swing and Input Range vs Supply Voltage**

## Mechanical Dimensions

### Package

# 8-DIP



## Ordering Information

| Product Number | Package | Operating Temperature |
|---|---|---|
| LM741CN | 8 DIP | 0 ~ + 70°C |

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



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