# LM741

## Single Operational Amplifier

### Features

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

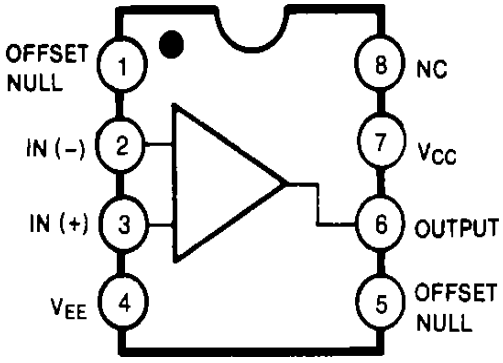
### Description

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.

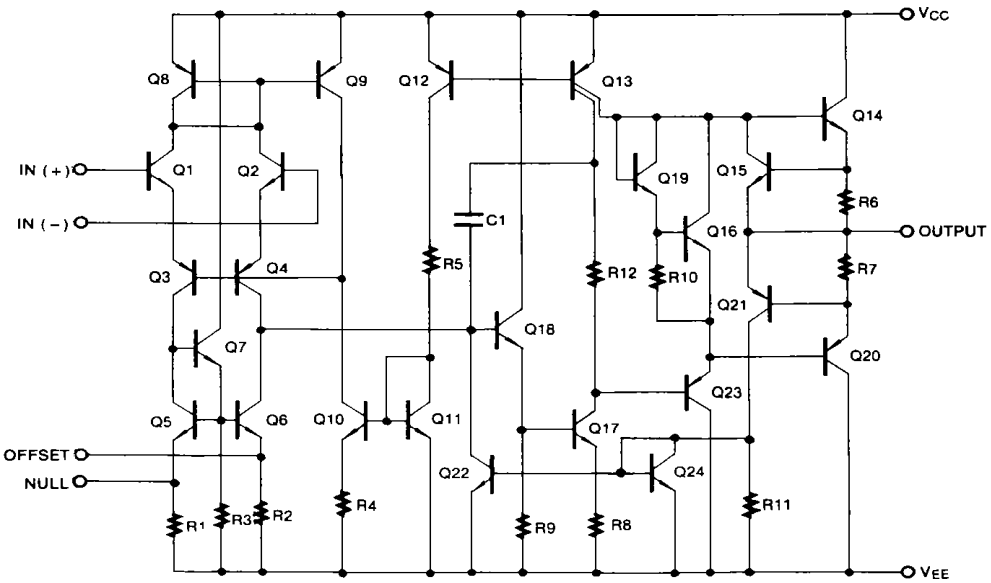
**8-DIP**


**8-SOP**


### Internal Block Diagram



## Schematic Diagram




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

| Parameter | Symbol | Value | 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<br>LM741C<br>LM741I | $T_{OPR}$ | <br>0 ~ + 70<br>-40 ~ +85 | °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 | | LM741C/LM741I | | | 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 (Note1) | | $R_I$ | $V_{CC}$ =±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 |
| | | | | $R_L$≥2KΩ | - | - | - | |
| | | | $V_{CC}$ = ±15V | $R_L$≥10KΩ | ±12 | ±14 | - | |
| | | | | $R_L$≥2KΩ | ±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 | |

Note:
1. Guaranteed by design.

## Electrical Characteristics

( 0°C ≤$T_A$≤70 °C $V_{CC}$ = ±15V, unless otherwise specified)
The following specification apply over the range of 0°C ≤ $T_A$ ≤ +70 °C for the LM741C; and the -40°C ≤ $T_A$ ≤ +85 °C for the LM741I

| Parameter | Symbol | Conditions | | LM741C/LM741I | | | 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 (Note1) | $R_I$ | $V_{CC}$ = ±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 | - | - | - | |

Note :
1. Guaranteed by design.

# Typical Performance Characteristics

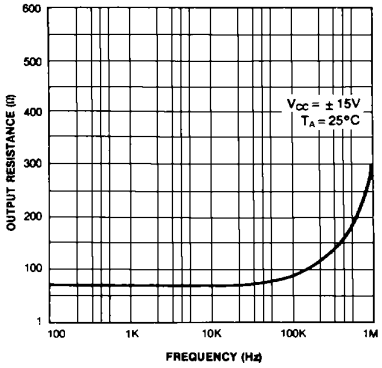



**Figure 1. Output Resistance vs Frequency**

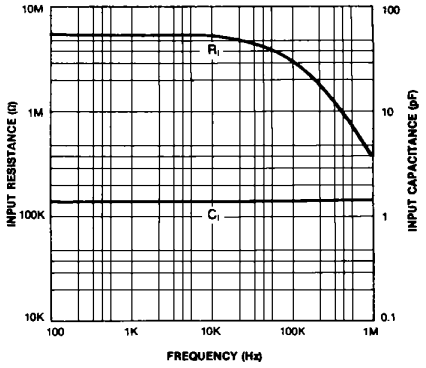



**Figure 2. Input Resistance and Input Capacitance vs Frequency**

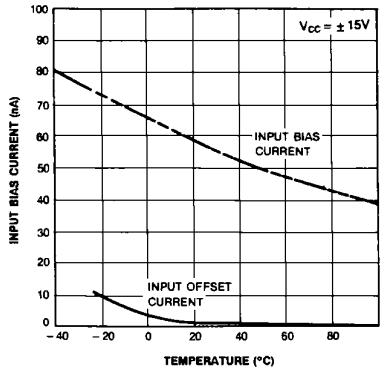



**Figure 3. Input Bias Current vs Ambient Temperature**

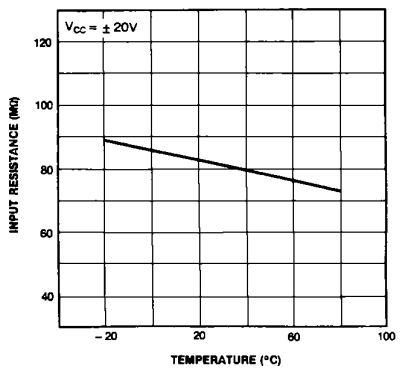



**Figure 4. Power Consumption vs Ambient Temperature**

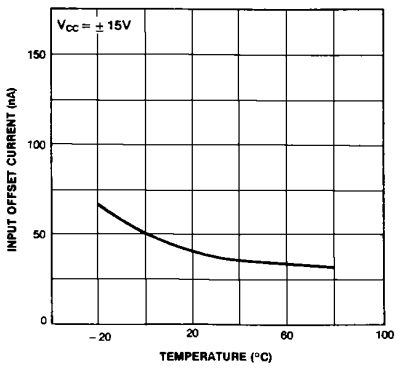



**Figure 5. Input Offset Current vs Ambient Temperature**

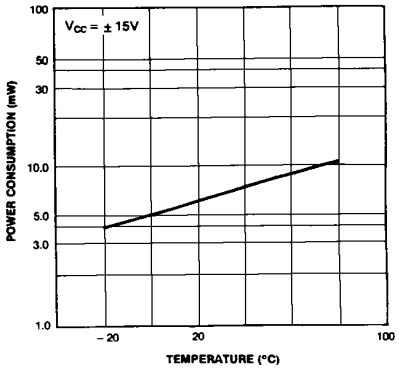



**Figure 6. Input Resistance vs Ambient Temperature**

## Typical Performance Characteristics (continued)

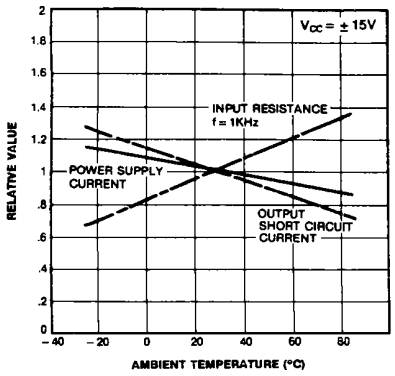



**Figure 7. Normalized DC Parameters vs Ambient Temperature**

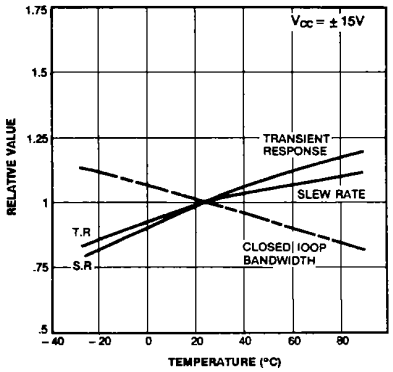



**Figure 8. Frequency Characteristics vs Ambient Temperature**

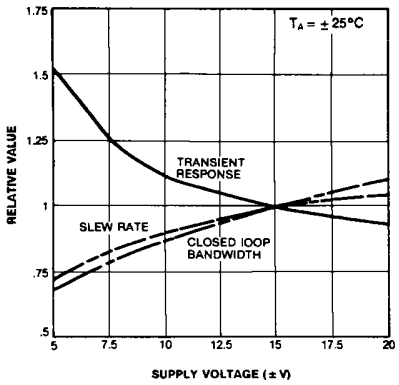



**Figure 9. Frequency Characteristics vs Supply Voltage**

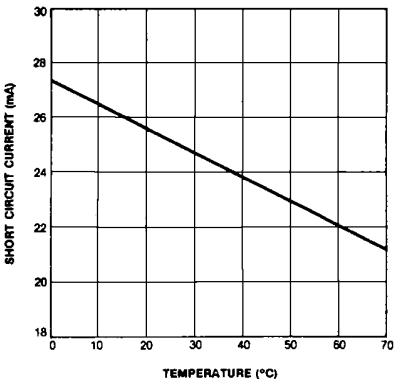



**Figure 10. Output Short Circuit Current vs Ambient Temperature**

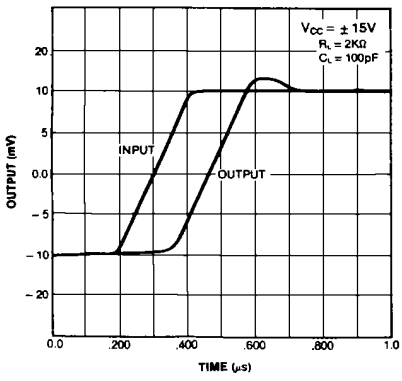



**Figure 11. Transient Response**

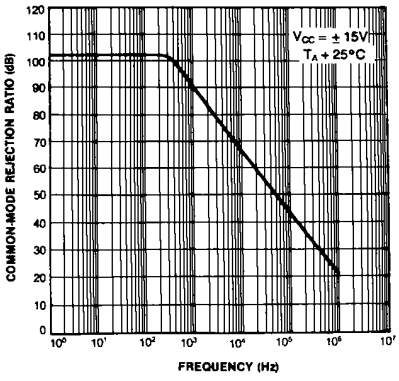



**Figure 12. Common-Mode Rejection Ratio vs Frequency**

## Typical Performance Characteristics (continued)

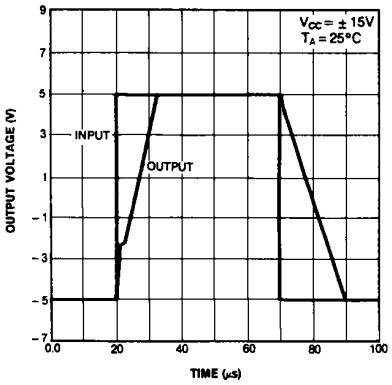



**Figure 13. Voltage Follower Large Signal Pulse Response**

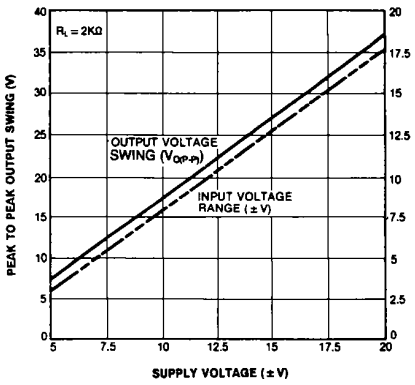
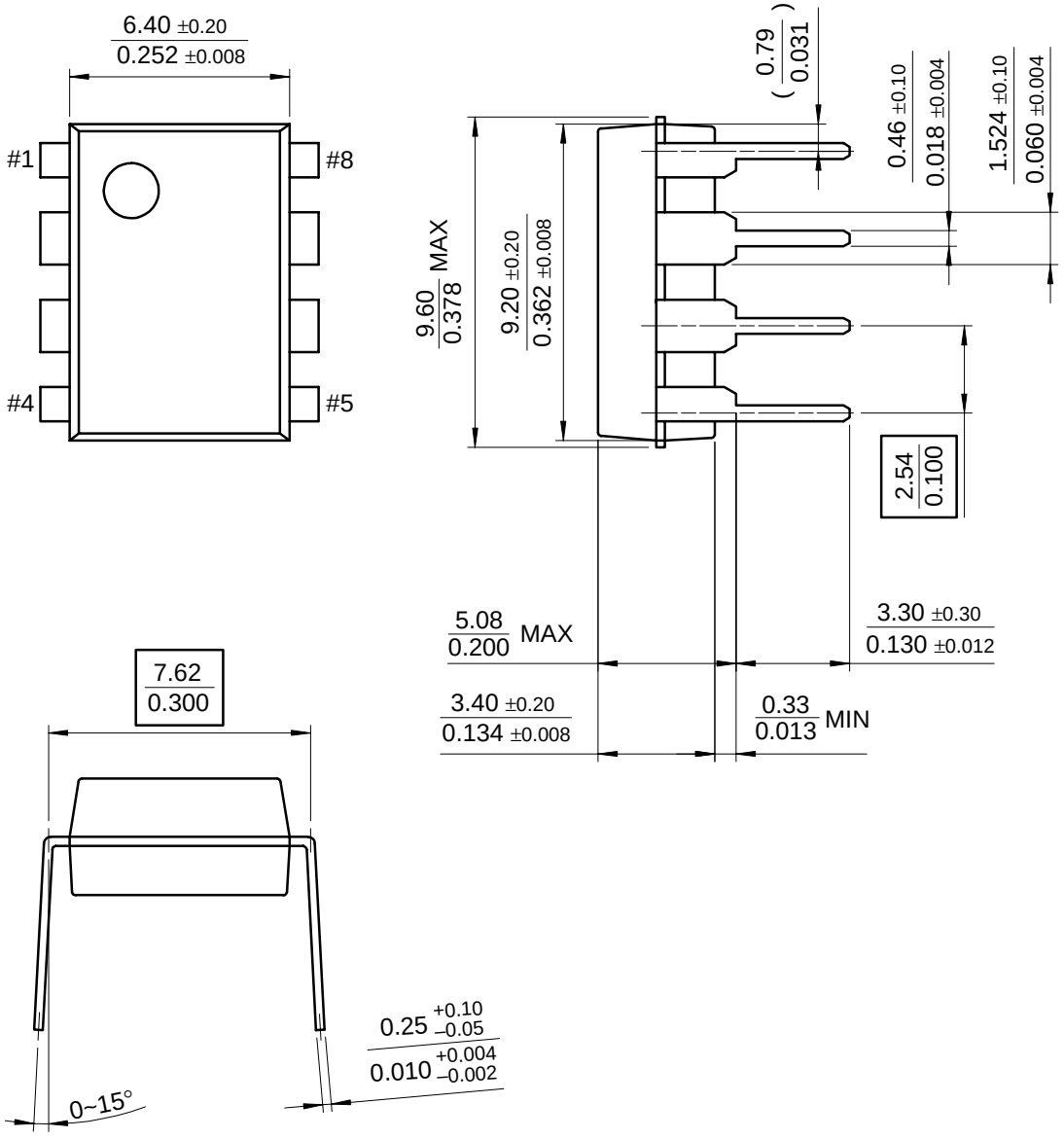



**Figure 14. Output Swing and Input Range vs Supply Voltage**

# Mechanical Dimensions

## Package

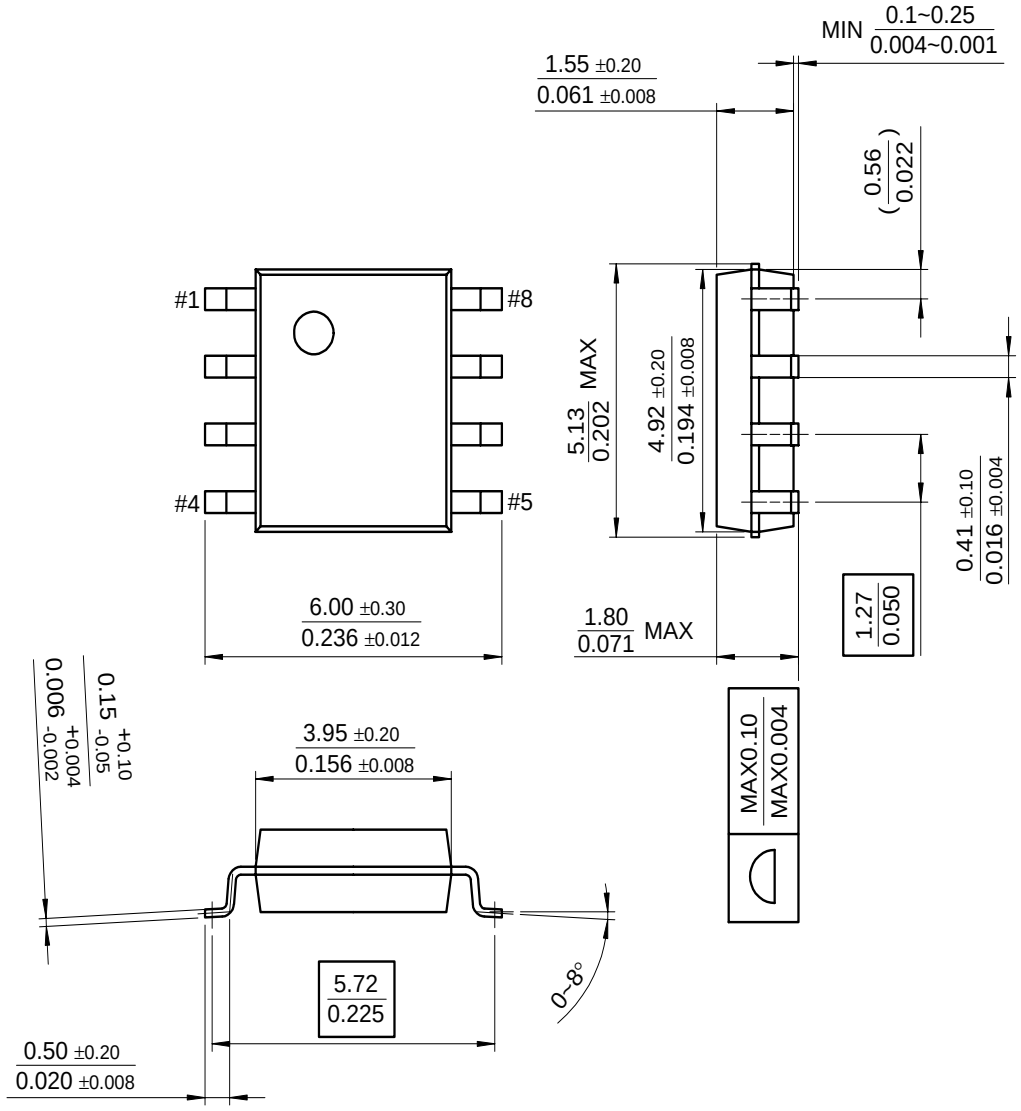
### 8-DIP



## Mechanical Dimensions (Continued)

### Package

# 8-SOP



## Ordering Information

| Product Number | Package | Operating Temperature |
|---|---|---|
| LM741CN | 8-DIP | 0 ~ + 70°C |
| LM741CM | 8-SOP | |
| LM741IN | 8-DIP | -40 ~ + 85°C |