

## HG741 Operational Amplifier

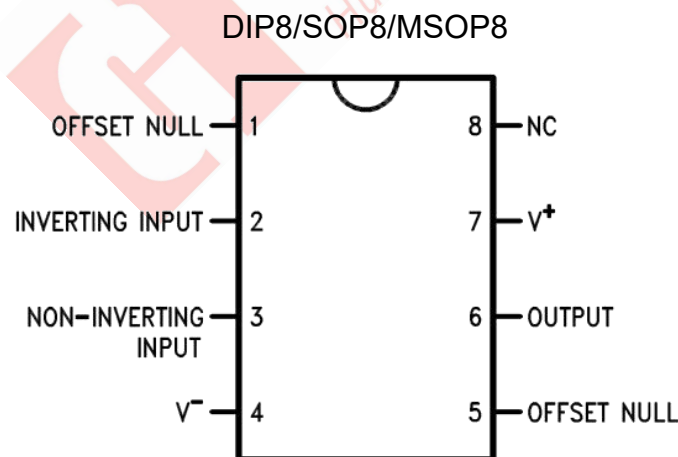
### General Description

The HG741 series are general purpose operational amplifiers which feature improved performance over industry standards like the HG709. They are a direct, plug-in replacement for the 709C, HG201, MC1439 and 748 in most applications. The amplifiers offer many features which make their application nearly foolproof: overload protection on the input and output, no latch-up when the common mode range is exceeded, as well as freedom from oscillations.

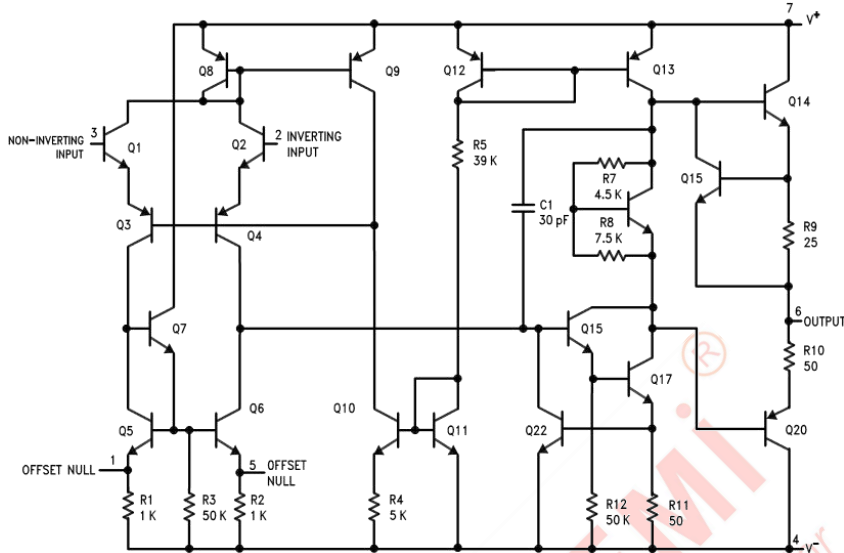
### Ordering Information

| DEVICE      | Package Type | MARKING | Packing | Packing Qty  |
|-------------|--------------|---------|---------|--------------|
| HG741N      | DIP8         | HG741   | TUBE    | 2000pcs/Box  |
| HG741AN     | DIP8         | HG741A  | TUBE    | 2000pcs/Box  |
| HG741M/TR   | SOP8         | HG741   | REEL    | 2500pcs/Reel |
| HG741AM/TR  | SOP8         | HG741A  | REEL    | 2500pcs/Reel |
| HG741MM/TR  | MSOP8        | HG741   | REEL    | 3000pcs/Reel |
| HG741AMM/TR | MSOP8        | HG741A  | REEL    | 3000pcs/Reel |

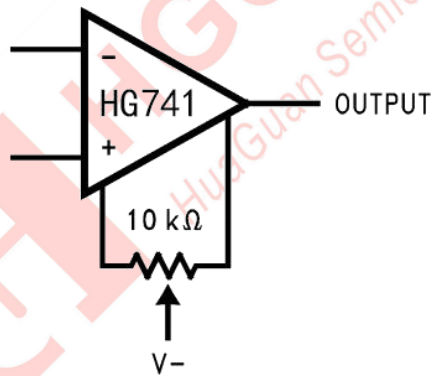
### Connection Diagram



**Schematic Diagram**



**Offset Nulling Circuit**



**Absolute Maximum Ratings**

| CONDITION                    |                            | LIMITS     | Units |
|------------------------------|----------------------------|------------|-------|
| Supply Voltage               |                            | ±22        | V     |
| Power Dissipation(Note2)     |                            | 500        | mW    |
| Differential Input Voltage   |                            | ±30        | V     |
| Input Voltage(Note3)         |                            | ±15        | V     |
| Output Sort Circuit Duration |                            | Continuous |       |
| Operating Temperature Range  | HG741A                     | -40 ~ +85  | °C    |
|                              | HG741                      | 0 ~ +70    | °C    |
| Junction Temperature         | HG741A                     | 150        | °C    |
|                              | HG741                      | 100        | °C    |
| Soldering Information        | N-Package(10 seconds)      | 260        | °C    |
|                              | J-or H-Package(10 seconds) | 300        | °C    |
| M-Package                    | Vapor Phase(60 seconds)    | 215        | °C    |
|                              | Infrared(15 seconds)       | 215        | °C    |
| Storage Temperature Range    |                            | -65 ~ +150 | °C    |
| ESD Tolerance(Note7)         |                            | 400        | V     |

**Electrical Characteristics**

| Parameter                             | Conditions   | HG741A     |     |       | HG741      |            |     | Units        |
|---------------------------------------|--|------------|-----|-------|------------|------------|-----|--------------|
|                                       |  | Min        | Typ | Max   | Min        | Typ        | Max |              |
| Input Offset Voltage                  | TA=25°C<br>Rs≤10KΩ<br>Rs≤50Ω                                     |            | 0.8 | 3.0   |            | 2.0        | 6.0 | mW<br>mW     |
|                                       | TAMIN≤TA≤TAMAX<br>Rs≤50Ω<br>Rs≤10KΩ                              |            |     | 4.0   |            |            | 7.5 | mW<br>mW     |
|                                       |  |            |     | 15    |            |            |     | μV/°C        |
| Average Input Offset Voltage Drift    |  |            |     | 15    |            |            |     | μV/°C        |
| Input Offset Voltage Adjustment Range | TA=25°C, Vs=±20V   | ±10        |     |       |            | ±15        |     | mW           |
| Input Offset Current                  | TA=25°C  |            | 3.0 | 30    |            | 20         | 200 | nA           |
|                                       | TAMIN≤TA≤TAMAX   |            |     | 70    |            |            | 300 | nA           |
| Average Input Offset Current Drift    |  |            |     | 0.5   |            |            |     | nA/°C        |
| Input Bias Current                    | TA=25°C  |            | 30  | 80    |            | 80         | 500 | nA           |
|                                       | TAMIN≤TA≤TAMAX   |            |     | 0.210 |            |            | 0.8 | μA           |
| Input Resistance                      | TA=25°C, Vs=±20V   | 1.0        | 6.0 |       | 0.3        | 2.0        |     | MΩ           |
|                                       | TAMIN≤TA≤TAMAX, Vs=±20V  | 0.5        |     |       |            |            |     | MΩ           |
| Input Voltage Range                   | TA=25°C  |            |     |       | ±12        | ±13        |     | V            |
|                                       | TAMIN≤TA≤TAMAX   |            |     |       |            |            |     | V            |
| Large Signal Voltage Gain             | TA=25°C, RL≥2KΩ<br>Vs=±20V, Vo=±15V<br>Vs=±15V, Vo=±10V          | 50         |     |       | 20         | 200        |     | V/mW<br>V/mW |
|                                       | TAMIN≤TA≤TAMAX<br>RL≥2KΩ<br>Vs=±20V, Vo=±15V<br>Vs=±15V, Vo=±10V | 32         |     |       | 15         |            |     | V/mW<br>V/mW |
|                                       | Vs=±5V, Vo=±2V   | 10         |     |       |            |            |     | V/mW         |
|                                       |  |            |     |       |            |            |     |              |
| Output Voltage Swing                  | Vs=±20V<br>RL≥10KΩ<br>RL≥2KΩ                                     | ±16<br>±15 |     |       |            |            |     | V<br>V       |
|                                       | Vs=±15V<br>RL≥10KΩ<br>RL≥2KΩ                                     |            |     |       | ±12<br>±10 | ±14<br>±13 |     | V<br>V       |
|                                       |  |            |     |       |            |            |     |              |
|                                       |  |            |     |       |            |            |     |              |
| Output Short Circuit Current          | TA=25°C  | 10         | 25  | 35    |            | 25         |     | mA           |
|                                       | TAMIN≤TA≤TAMAX   | 10         |     | 40    |            |            |     | mA           |
| Common-Mode Rejection Ratio           | TAMIN≤TA≤TAMAX<br>Rs≤10KΩ, VCM=±12V                              |            |     | 0.5   | 70         | 90         |     | dB           |
|                                       | Rs≤50Ω, VCM=±12V   | 80         | 95  |       |            |            |     | dB           |
|                                       |  |            |     |       |            |            |     |              |
| Supply Voltage Rejection Ratio        | TAMIN≤TA≤TAMAX<br>Vs=±20V to Vs=±5V<br>Rs≤50Ω<br>Rs≤10KΩ         | 86         | 96  |       |            |            |     | dB           |
|                                       |  |            |     |       | 77         | 96         |     | dB           |
|                                       |  |            |     |       |            |            |     |              |

|  |                               |           |             |           |  |          |     |          |
|--|-------------------------------|-----------|-------------|-----------|--|----------|-----|----------|
| Transient Response Rise Time Overshoot | TA=25°C,Unity Gain            |           | 0.25<br>6.0 | 0.8<br>20 |  | 0.3<br>5 |     | μs       |
| Bandwidth(Note5)                       | TA=25°C                       | 0.43<br>7 | 1.5         |           |  |          |     | MHz      |
| Slew Rate                              | TA=25°C,Unity Gain            | 0.3       | 0.7         |           |  | 0.5      |     | V/μs     |
| Supply Current                         | TA=25°C                       |           |             |           |  | 1.7      | 2.8 | mA       |
| Power Consumption                      | TA=25°C<br>VS=±20V<br>VS=±15V |           | 80          | 150       |  | 50       | 85  | mw<br>mw |

**Note 1:**“Absolute Maximum Ratings”indicate limits beyond which damage to the device may occur.Operating Ratings indicate conditions for which the device is functional,but do not guarantee specific performance limits.

**Note 2:** For operation at elevated temperatures, these devices must be derated based on thermal resistance, and T<sub>J</sub> max. (listed under “Absolute Maximum Ratings”). T<sub>J</sub> = T<sub>A</sub> +(θ<sub>J,A</sub> P<sub>D</sub>).

| Thermal Resistance                     | DIP(B)  | SOP-8(M) |
|--|---------|----------|
| θ <sub>J,A</sub> (Junction to Ambient) | 100°C/W | 195°C/W  |
| θ <sub>J,C</sub> (Junction to Case)    | N/A     | N/A      |

Note 3: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

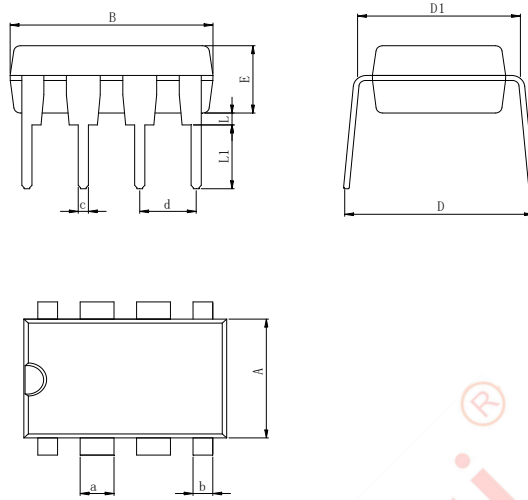
Note 4: Unless otherwise specified, these specifications apply for VS = ±15V, -40°C ≤ TA ≤ +85°C (HG741A). For the HG741, these specifications are limited to 0°C ≤ TA ≤ +70°C.

Note 5: Calculated value from: BW (MHz) = 0.35/Rise Time(μs).

Note 6: Human body model, 1.5 kΩ in series with 100 pF.

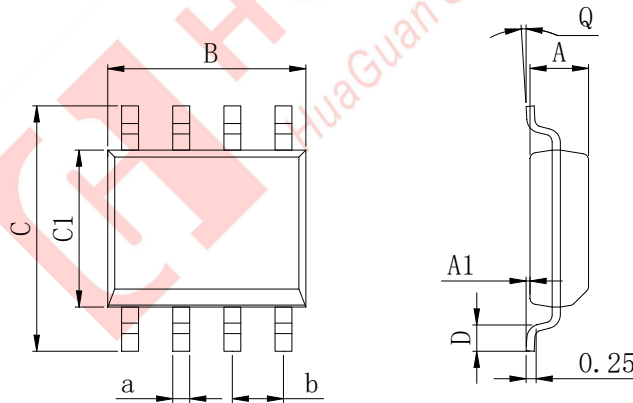
## Physical Dimensions

### DIP-8L



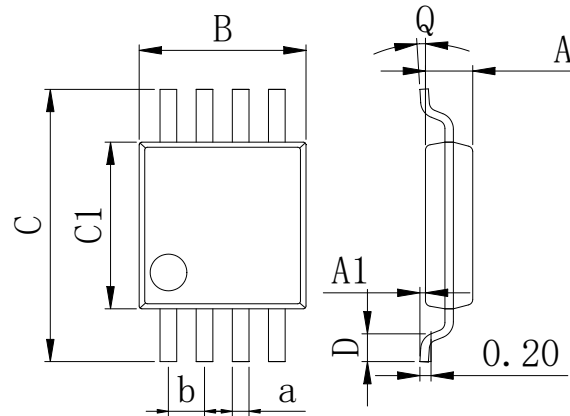
| Dimensions In Millimeters(DIP8L) |      |      |      |      |      |      |      |      |      |      |          |
|----------------------------------|------|------|------|------|------|------|------|------|------|------|----------|
| Symbol:                          | A    | B    | D    | D1   | E    | L    | L1   | a    | b    | c    | d        |
| Min:                             | 6.10 | 9.00 | 8.40 | 7.42 | 3.10 | 0.50 | 3.00 | 1.50 | 0.85 | 0.40 | 2.54 BSC |
| Max:                             | 6.68 | 9.50 | 9.00 | 7.82 | 3.55 | 0.70 | 3.60 | 1.55 | 0.90 | 0.50 |          |

### SOP-8L 150mil



| Dimensions In Millimeters(SOP8) |      |      |      |      |      |      |    |      |          |
|---------------------------------|------|------|------|------|------|------|----|------|----------|
| Symbol:                         | A    | A1   | B    | C    | C1   | D    | Q  | a    | b        |
| Min:                            | 1.35 | 0.05 | 4.90 | 5.80 | 3.80 | 0.40 | 0° | 0.35 | 1.27 BSC |
| Max:                            | 1.55 | 0.20 | 5.10 | 6.20 | 4.00 | 0.80 | 8° | 0.45 |          |

MSOP8



| Dimensions In Millimeters(MSOP8L) |      |      |      |      |      |      |    |      |          |
|-----------------------------------|------|------|------|------|------|------|----|------|----------|
| Symbol:                           | A    | A1   | B    | C    | C1   | D    | Q  | a    | b        |
| Min:                              | 0.80 | 0.05 | 2.90 | 4.75 | 2.90 | 0.35 | 0° | 0.25 | 0.65 BSC |
| Max:                              | 0.90 | 0.20 | 3.10 | 5.05 | 3.10 | 0.75 | 8° | 0.35 |          |

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