

**0.9MHz Single and Dual, High Gain  
Operational Amplifiers for Military,  
Industrial and Commercial Applications**

The CA1458, CA1558 (dual types); CA741C, CA741 (single types); high-gain operational amplifiers for use in military, industrial, and commercial applications.

These monolithic silicon integrated circuit devices provide output short circuit protection and latch-free operation. These types also feature wide common mode and differential mode signal ranges and have low offset voltage nulling capability when used with an appropriately valued potentiometer. A 10kΩ potentiometer is used for offset nulling types CA741C, CA741 (see Figure 1). Types CA1458, CA1558 have no specific terminals for offset nulling. Each type consists of a differential input amplifier that effectively drives a gain and level shifting stage having a complementary emitter follower output.

The manufacturing process make it possible to produce IC operational amplifiers with low burst "popcorn" noise characteristics.

Technical Data on LM Branded types is identical to the corresponding CA Branded types.

**Features**

- Input Bias Current ..... 500nA (Max)
- Input Offset Current ..... 200nA (Max)

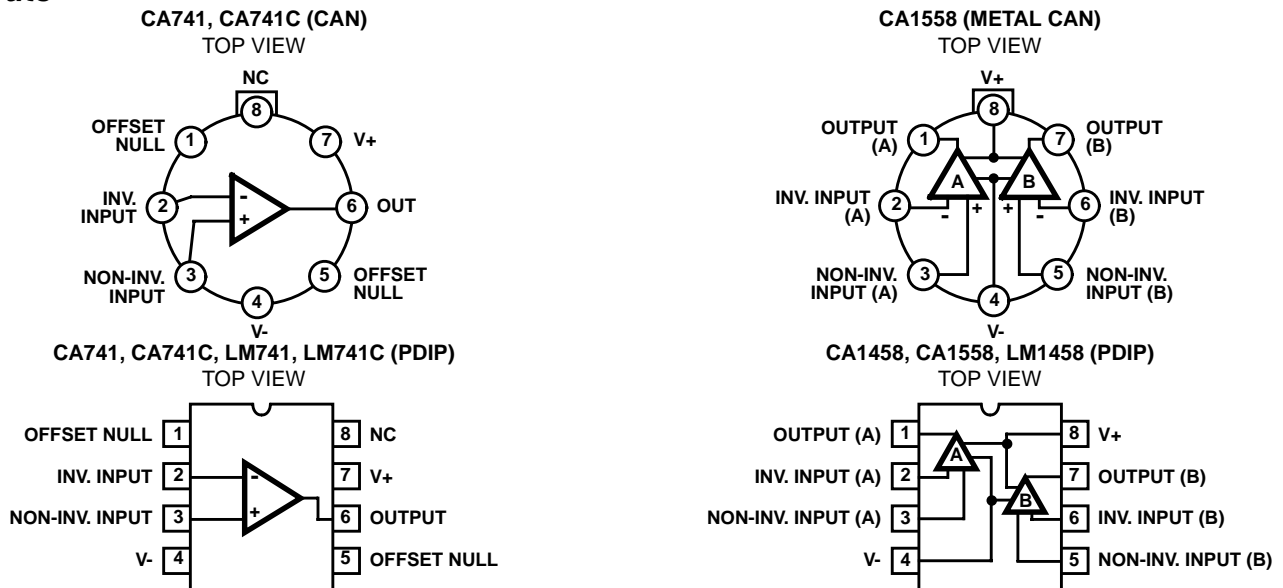
**Applications**

- Comparator
- Multivibrator
- DC Amplifier
- Summing Amplifier
- Integrator or Differentiator
- Narrow Band or Band Pass Filter

**Ordering Information**

| PART NUMBER | TEMP. RANGE (°C) | PACKAGE         | PKG. NO. |
|-------------|------------------|-----------------|----------|
| CA0741E     | -55 to 125       | 8 Ld PDIP       | E8.3     |
| CA0741CE    | 0 to 70          | 8 Ld PDIP       | E8.3     |
| CA1458E     | 0 to 70          | 8 Ld PDIP       | E8.3     |
| CA1558E     | -55 to 125       | 8 Ld PDIP       | E8.3     |
| CA0741T     | -55 to 125       | 8 Pin Metal Can | T8.C     |
| CA0741CT    | 0 to 70          | 8 Pin Metal Can | T8.C     |
| CA1558T     | -55 to 125       | 8 Pin Metal Can | T8.C     |
| LM741N      | -55 to 125       | 8 Ld PDIP       | E8.3     |
| LM741CN     | 0 to 70          | 8 Ld PDIP       | E8.3     |
| LM1458N     | 0 to 70          | 8 Ld PDIP       | E8.3     |

**Pinouts**



# CA741, CA741C, CA1458, CA1558, LM741, LM741C, LM1458

## Absolute Maximum Ratings

|  |                  |
|--|------------------|
| Supply Voltage   |                  |
| CA741C, CA1458, LM741C, LM1458 (Note 1)                | 36V              |
| CA741, CA1558, LM741 (Note 1)                          | 44V              |
| Differential Input Voltage                             | 30V              |
| Input Voltage  | $\pm V_{SUPPLY}$ |
| Offset Terminal to V- Terminal Voltage (CA741C, CA741) | $\pm 0.5V$       |
| Output Short Circuit Duration                          | Indefinite       |

## Thermal Information

|  |                      |                      |
|--|----------------------|----------------------|
| Thermal Resistance (Typical, Note 3)           | $\theta_{JA}$ (°C/W) | $\theta_{JC}$ (°C/W) |
| PDIP Package                                   | 130                  | N/A                  |
| Can Package                                    | 155                  | 67                   |
| Maximum Junction Temperature (Can Package)     | 175°C                |                      |
| Maximum Junction Temperature (Plastic Package) | 150°C                |                      |
| Maximum Storage Temperature Range              | -65°C to 150°C       |                      |
| Maximum Lead Temperature (Soldering 10s)       | 300°C                |                      |

## Operating Conditions

|   |                |
|---|----------------|
| Temperature Range                       |                |
| CA741, CA1558, LM741                    | -55°C to 125°C |
| CA741C, CA1458, LM741C, LM1458 (Note 2) | 0°C to 70°C    |

*CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.*

### NOTES:

1. Values apply for each section of the dual amplifiers.
2. All types in any package style can be operated over the temperature range of -55°C to 125°C, although the published limits for certain electrical specification apply only over the temperature range of 0°C to 70°C.
3.  $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

## Electrical Specifications Typical Values Intended Only for Design Guidance, $V_{SUPPLY} = \pm 15V$

| PARAMETER                       | SYMBOL | TEST CONDITIONS  | TYPICAL VALUE (ALL TYPES) | UNITS      |
|---------------------------------|--------|--|---------------------------|------------|
| Input Capacitance               | $C_I$  |  | 1.4                       | pF         |
| Offset Voltage Adjustment Range |        |  | $\pm 15$                  | mV         |
| Output Resistance               | $R_O$  |  | 75                        | $\Omega$   |
| Output Short Circuit Current    |        |  | 25                        | mA         |
| Transient Response              |        | Unity Gain, $V_I = 20mV$ , $R_L = 2k\Omega$ , $C_L \leq 100pF$ |                           |            |
| Rise Time                       | $t_r$  |  | 0.3                       | $\mu s$    |
| Overshoot                       | O.S.   |  | 5.0                       | %          |
| Slew Rate (Closed Loop)         | SR     | $R_L \geq 2k\Omega$  | 0.5                       | V/ $\mu s$ |
| Gain Bandwidth Product          | GBWP   | $R_L = 12k\Omega$  | 0.9                       | MHz        |

## Electrical Specifications For Equipment Design, $V_{SUPPLY} = \pm 15V$

| PARAMETER                       | TEST CONDITIONS      | TEMP (°C) | (NOTE 4)<br>CA741, CA1558, LM741 |          |     | (NOTE 4)<br>CA741C, CA1458, LM741C,<br>LM1458 |          |     | UNITS      |
|---------------------------------|----------------------|-----------|----------------------------------|----------|-----|---|----------|-----|------------|
|                                 |                      |           | MIN                              | TYP      | MAX | MIN   | TYP      | MAX |            |
| Input Offset Voltage            | $R_S \leq 10k\Omega$ | 25        | -                                | 1        | 5   | -   | 2        | 6   | mV         |
|                                 |                      | Full      | -                                | 1        | 6   | -   | -        | 7.5 | mV         |
| Input Common Mode Voltage Range |                      | 25        | -                                | -        | -   | $\pm 12$                                      | $\pm 13$ | -   | V          |
|                                 |                      | Full      | $\pm 12$                         | $\pm 13$ | -   | -   | -        | -   | V          |
| Common Mode Rejection Ratio     | $R_S \leq 10k\Omega$ | 25        | -                                | -        | -   | 70  | 90       | -   | dB         |
|                                 |                      | Full      | 70                               | 90       | -   | -   | -        | -   | dB         |
| Power Supply Rejection Ratio    | $R_S \leq 10k\Omega$ | 25        | -                                | -        | -   | -   | 30       | 150 | $\mu V/V$  |
|                                 |                      | Full      | -                                | 30       | 150 | -   | -        | -   | $\mu V/V$  |
| Input Resistance                |                      | 25        | 0.3                              | 2        | -   | 0.3   | 2        | -   | M $\Omega$ |

# CA741, CA741C, CA1458, CA1558, LM741, LM741C, LM1458

## Electrical Specifications For Equipment Design, $V_{SUPPLY} = \pm 15V$ (Continued)

| PARAMETER                 | TEST CONDITIONS                       | TEMP (°C) | (NOTE 4)<br>CA741, CA1558, LM741 |          |      | (NOTE 4)<br>CA741C, CA1458, LM741C,<br>LM1458 |          |     | UNITS |
|---------------------------|---------------------------------------|-----------|----------------------------------|----------|------|---|----------|-----|-------|
|                           |                                       |           | MIN                              | TYP      | MAX  | MIN   | TYP      | MAX |       |
| Input Bias Current        |                                       | 25        | -                                | 80       | 500  | -   | 80       | 500 | nA    |
|                           |                                       | Full      | -                                | -        | -    | -   | -        | 800 | nA    |
|                           |                                       | -55       | -                                | 300      | 1500 | -   | -        | -   | nA    |
|                           |                                       | 125       | -                                | 30       | 500  | -   | -        | -   | nA    |
| Input Offset Current      |                                       | 25        | -                                | 20       | 200  | -   | 20       | 200 | nA    |
|                           |                                       | Full      | -                                | -        | -    | -   | -        | 300 | nA    |
|                           |                                       | -55       | -                                | 85       | 500  | -   | -        | -   | nA    |
|                           |                                       | 125       | -                                | 7        | 200  | -   | -        | -   | nA    |
| Large Signal Voltage Gain | $R_L \geq 2k\Omega$ , $V_O = \pm 10V$ | 25        | 50,000                           | 200,000  | -    | 20,000  | 200,000  | -   | V/V   |
|                           |                                       | Full      | 25,000                           | -        | -    | 15,000  | -        | -   | -     |
| Output Voltage Swing      | $R_L \geq 10k\Omega$                  | 25        | -                                | -        | -    | $\pm 12$                                      | $\pm 14$ | -   | V     |
|                           |                                       | Full      | $\pm 12$                         | $\pm 14$ | -    | -   | -        | -   | V     |
|                           | $R_L \geq 2k\Omega$                   | 25        | -                                | -        | -    | $\pm 10$                                      | $\pm 13$ | -   | V     |
|                           |                                       | Full      | $\pm 10$                         | $\pm 13$ | -    | $\pm 10$                                      | $\pm 13$ | -   | V     |
| Supply Current            |                                       | 25        | -                                | 1.7      | 2.8  | -   | 1.7      | 2.8 | mA    |
|                           |                                       | -55       | -                                | 2        | 3.3  | -   | -        | -   | mA    |
|                           |                                       | 125       | -                                | 1.5      | 2.5  | -   | -        | -   | mA    |
| Device Power Dissipation  |                                       | 25        | -                                | 50       | 85   | -   | 50       | 85  | mW    |
|                           |                                       | -55       | -                                | 60       | 100  | -   | -        | -   | mW    |
|                           |                                       | 125       | -                                | 45       | 75   | -   | -        | -   | mW    |

NOTE:

4. Values apply for each section of the dual amplifiers.

## Test Circuits

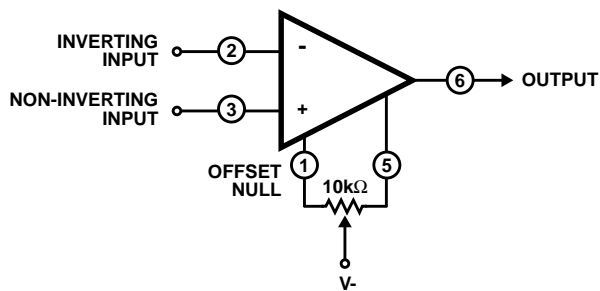


FIGURE 1. OFFSET VOLTAGE NULL CIRCUIT FOR CA741C, CA741, LM741C, AND LM741

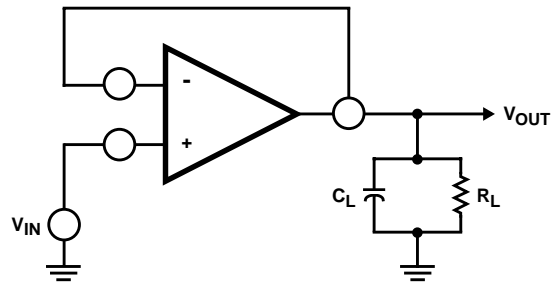
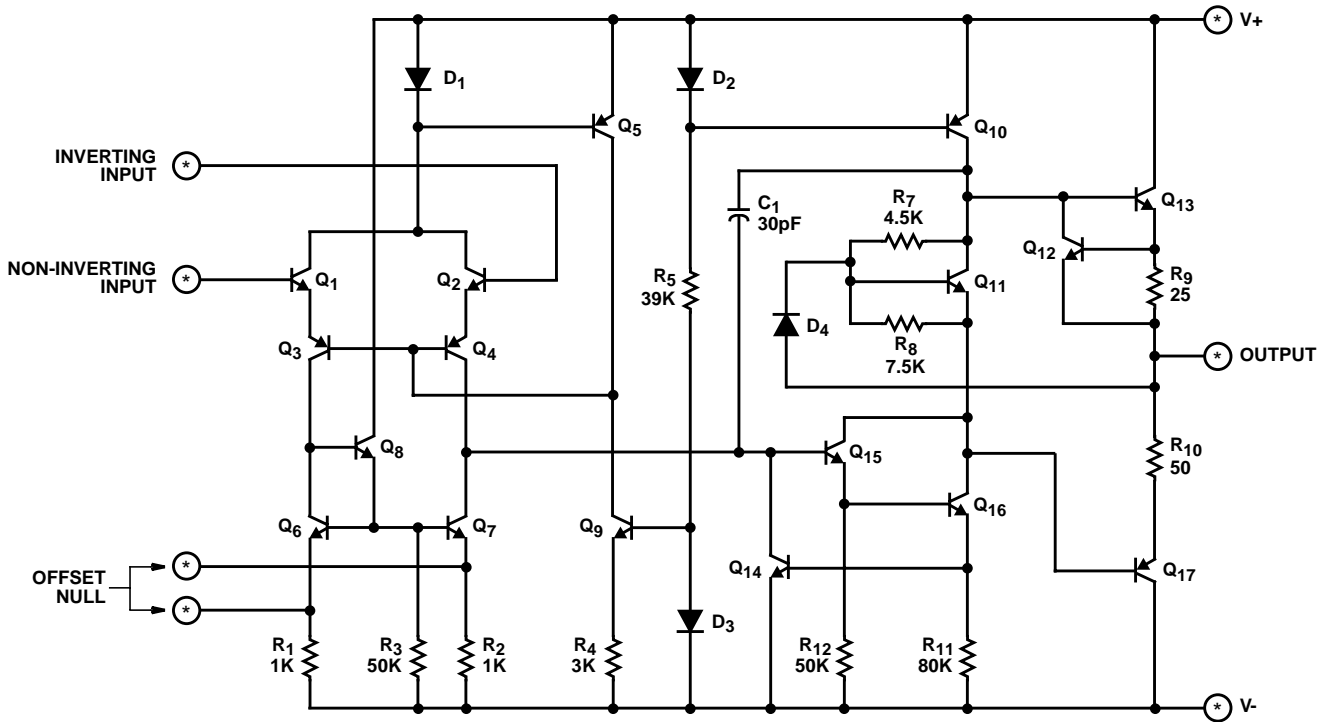


FIGURE 2. TRANSIENT RESPONSE TEST CIRCUIT FOR ALL TYPES

**Schematic Diagram** (Notes 5, 6)

CA741C, CA741, LM741C, LM741 AND FOR EACH AMPLIFIER OF THE CA1458, CA1558, AND LM1458



NOTES:

- 5. See Pinouts for Terminal Numbers of Respective Types.
- 6. All Resistance Values are in Ohms.

**Typical Performance Curves**

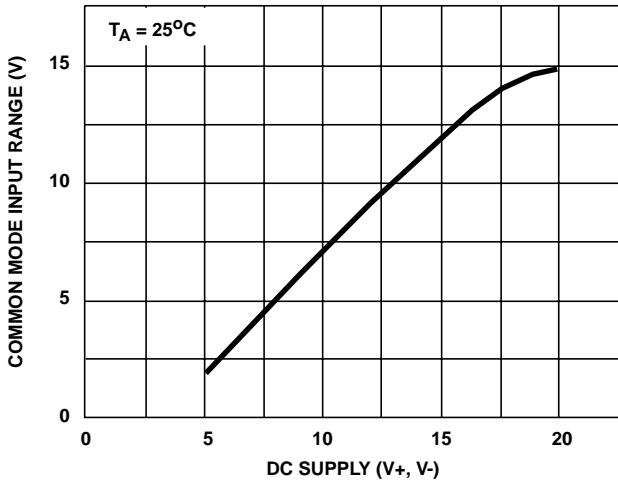


FIGURE 3. COMMON MODE INPUT VOLTAGE RANGE vs SUPPLY VOLTAGE FOR ALL TYPES

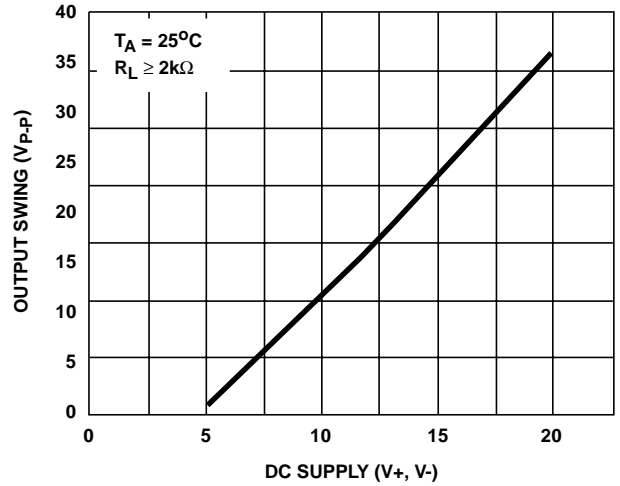


FIGURE 4. OUTPUT VOLTAGE vs SUPPLY VOLTAGE FOR ALL TYPES

Typical Performance Curves (Continued)

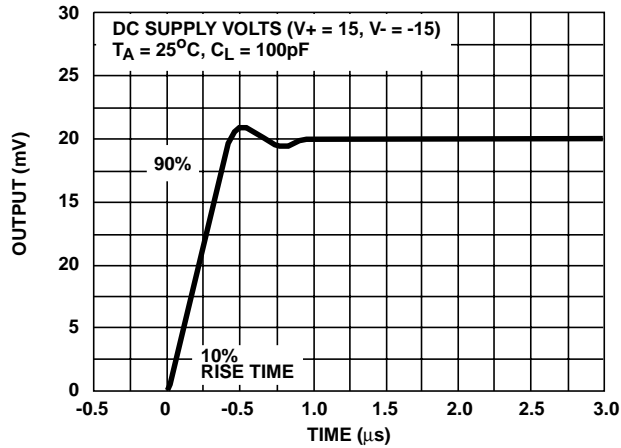
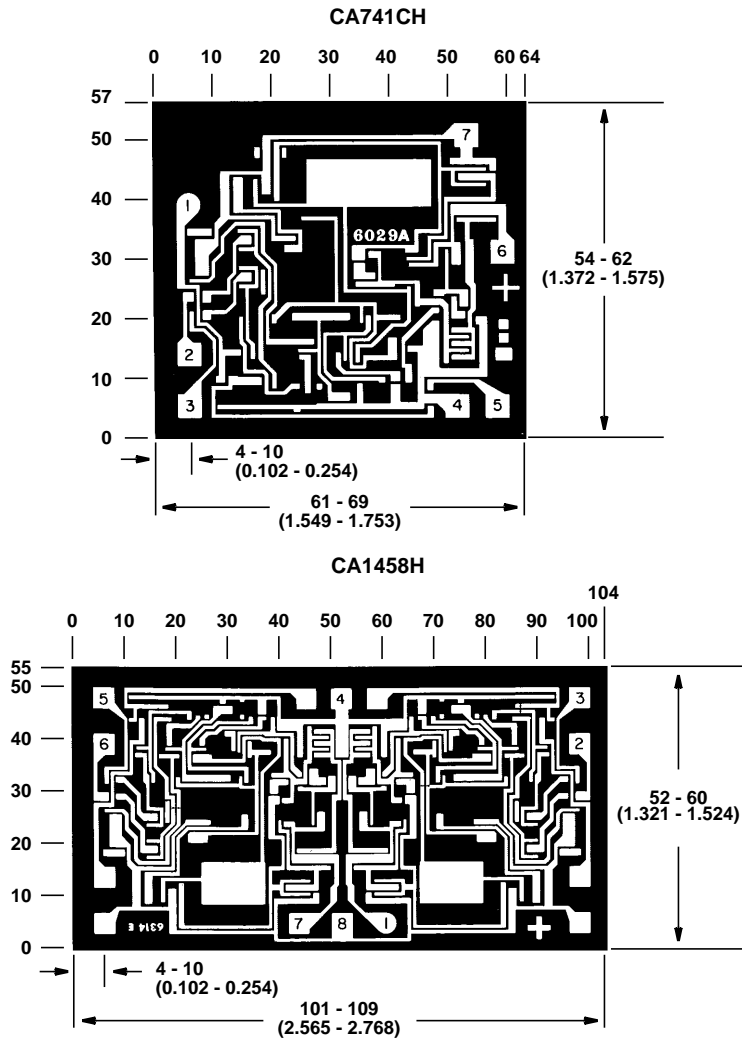


FIGURE 5. TRANSIENT RESPONSE FOR CA741C AND CA741

Metallization Mask Layout



NOTE: Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils ( $10^{-3}$  inch).

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