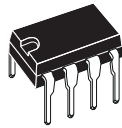


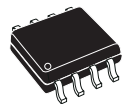
## General-purpose single operational amplifier

Datasheet - production data

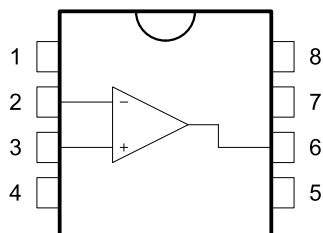
**N**  
**DIP8**  
(plastic package)



**D**  
**S08**  
(plastic micropackage)



**Pin connections**  
(top view)



- 1 - Offset null 1
- 2 - Inverting input
- 3 - Non-inverting input
- 4 -  $V_{CC}^-$
- 5 - Offset null 2
- 6 - Output
- 7 -  $V_{CC}^+$
- 8 - N.C.

### Features

- Large input voltage range
- No latch-up
- High gain
- Short-circuit protection
- No frequency compensation required
- Same pin configuration as the UA709

### Applications

- Summing amplifiers
- Voltage followers
- Integrators
- Active filters
- Function generators

### Description

The UA741 is a high performance monolithic operational amplifier constructed on a single silicon chip. It is intended for a wide range of analog applications.

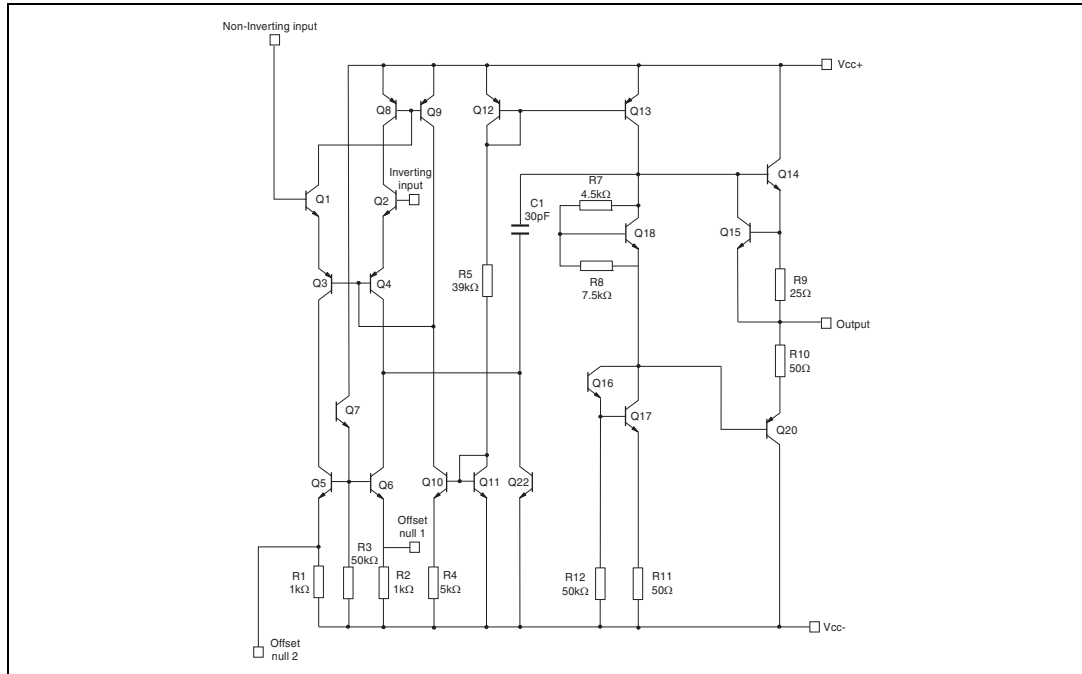
The high gain and wide range of operating voltages provide superior performances in integrators, summing amplifiers and general feedback applications. The internal compensation network (6 dB/octave) ensures stability in closed-loop circuits.

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# 1 Schematic diagram

Figure 1. Schematic diagram



## 2 Absolute maximum ratings and operating conditions

**Table 1. Absolute maximum ratings**

| Symbol     | Parameter                                | Value       | Unit                        |
|------------|--|-------------|-----------------------------|
| $V_{CC}$   | Supply voltage                           | $\pm 22$    | V                           |
| $V_{id}$   | Differential input voltage               | $\pm 30$    |                             |
| $V_i$      | Input voltage                            | $\pm 15$    |                             |
|            | Output short-circuit duration            | Infinite    |                             |
| $R_{thja}$ | Thermal resistance junction to ambient   |             | $^{\circ}\text{C}/\text{W}$ |
|            | DIP8                                     | 85          |                             |
|            | SO8                                      | 125         |                             |
| $R_{thjc}$ | Thermal resistance junction to case      |             |                             |
|            | DIP8                                     | 41          |                             |
|            | SO8                                      | 40          |                             |
| ESD        | HBM: human body model <sup>(1)</sup>     |             | V                           |
|            | DIP package                              | 500         |                             |
|            | SO package                               | 400         |                             |
|            | MM: machine model <sup>(2)</sup>         | 100         |                             |
|            | CDM: charged device model <sup>(3)</sup> | 1.5         | kV                          |
| $T_{stg}$  | Storage temperature range                | -65 to +150 | $^{\circ}\text{C}$          |

- Human body model: a 100 pF capacitor is charged to the specified voltage, then discharged through a 1.5k $\Omega$  resistor between two pins of the device. This is done for all couples of connected pin combinations while the other pins are floating.
- Machine model: a 200 pF capacitor is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5  $\Omega$ ). This is done for all couples of connected pin combinations while the other pins are floating.
- Charged device model: all pins and the package are charged together to the specified voltage and then discharged directly to the ground through only one pin. This is done for all pins.

**Table 2. Operating conditions**

| Symbol     | Parameter                            | UA741I      | UA741C   | Unit               |
|------------|--------------------------------------|-------------|----------|--------------------|
| $V_{CC}$   | Supply voltage                       | 5 to 40     |          | V                  |
| $V_{icm}$  | Common mode input voltage range      | $\pm 12$    |          |                    |
| $T_{oper}$ | Operating free air temperature range | -40 to +105 | 0 to +70 | $^{\circ}\text{C}$ |

### 3 Electrical characteristics

**Table 3. Electrical characteristics at  $V_{CC} = \pm 15\text{ V}$ ,  $T_{amb} = 25\text{ °C}$   
(unless otherwise specified)**

| Symbol        | Parameter  | Min.   | Typ.     | Max.       | Unit       |
|---------------|--|--|----------|------------|------------|
| $V_{io}$      | Input offset voltage ( $R_s \leq 10\text{ k}\Omega$ )<br>$T_{amb} = +25\text{ °C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$                            |  | 1        | 5<br>6     | mV         |
| $I_{io}$      | Input offset current<br>$T_{amb} = +25\text{ °C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$   |  | 2        | 30<br>70   | nA         |
| $I_{ib}$      | Input bias current<br>$T_{amb} = +25\text{ °C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$   |  | 10       | 100<br>200 |            |
| $A_{vd}$      | Large signal voltage gain ( $V_o = \pm 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ )<br>$T_{amb} = +25\text{ °C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$ | 50<br>25   | 200      |            | V/mV       |
| SVR           | Supply voltage rejection ratio ( $R_s \leq 10\text{ k}\Omega$ )<br>$T_{amb} = +25\text{ °C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$                  | 77<br>77   | 90       |            | dB         |
| $I_{CC}$      | Supply current, no load<br>$T_{amb} = +25\text{ °C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$  |  | 1.7      | 2.8<br>3.3 | mA         |
| $V_{icm}$     | Input common mode voltage range<br>$T_{amb} = +25\text{ °C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$  | $\pm 12$<br>$\pm 12$   |          |            | V          |
| CMR           | Common mode rejection ratio ( $R_S \leq 10\text{ k}\Omega$ )<br>$T_{amb} = +25\text{ °C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$                     | 70<br>70   | 90       |            | dB         |
| $I_{OS}$      | Output short circuit current   | 10   | 25       | 40         | mA         |
| $\pm V_{opp}$ | Output voltage swing<br>$T_{amb} = +25\text{ °C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$   | $R_L = 10\text{ k}\Omega$<br>12<br>$R_L = 2\text{ k}\Omega$<br>10<br>$R_L = 10\text{ k}\Omega$<br>12<br>$R_L = 2\text{ k}\Omega$<br>10 | 14<br>13 |            | V          |
| SR            | Slew rate<br>$V_i = \pm 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 100\text{ pF}$ , unity gain   | 0.25   | 0.5      |            | V/ $\mu$ s |
| $t_r$         | Rise time<br>$V_i = \pm 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 100\text{ pF}$ , unity gain  |  | 0.3      |            | $\mu$ s    |
| $K_{ov}$      | Overshoot<br>$V_i = 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 100\text{ pF}$ , unity gain  |  | 5        |            | %          |
| $R_i$         | Input resistance   | 0.3  | 2        |            | M $\Omega$ |

**Table 3. Electrical characteristics at  $V_{CC} = \pm 15\text{ V}$ ,  $T_{amb} = 25\text{ °C}$   
(unless otherwise specified) (continued)**

| Symbol   | Parameter  | Min. | Typ. | Max. | Unit                                 |
|----------|--|------|------|------|--------------------------------------|
| GBP      | Gain bandwidth product<br>$V_i = 10\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 100\text{ pF}$ , $f = 100\text{ kHz}$   | 0.7  | 1    |      | MHz                                  |
| THD      | Total harmonic distortion<br>$f = 1\text{ kHz}$ , $A_v = 20\text{ dB}$ , $R_L = 2\text{ k}\Omega$ , $V_o = 2\text{ V}_{pp}$ , $C_L = 100\text{ pF}$ ,<br>$T_{amb} = +25\text{ °C}$ |      | 0.06 |      | %                                    |
| $e_n$    | Equivalent input noise voltage<br>$f = 1\text{ kHz}$ , $R_s = 100\text{ }\Omega$   |      | 23   |      | $\frac{\text{nV}}{\sqrt{\text{Hz}}}$ |
| $\phi_m$ | Phase margin   |      | 50   |      | Degree                               |

## 4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

### 4.1 DIP8 package information

Figure 2. DIP8 package mechanical drawing

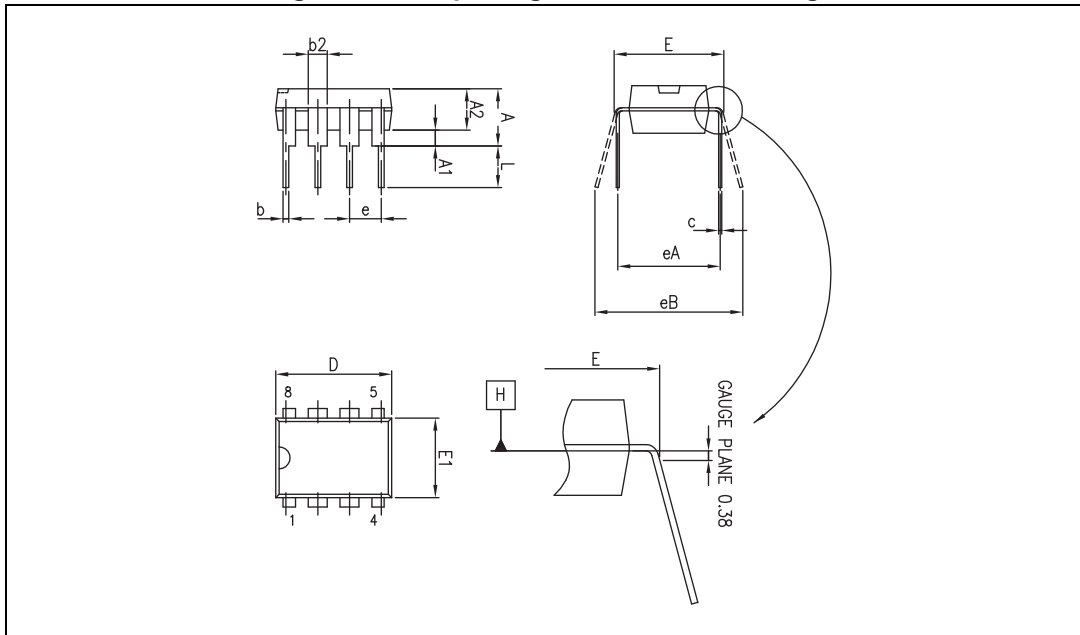


Table 4. DIP8 package mechanical data

| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    |             |      | 5.33  |        |       | 0.210 |
| A1   | 0.38        |      |       | 0.015  |       |       |
| A2   | 2.92        | 3.30 | 4.95  | 0.115  | 0.130 | 0.195 |
| b    | 0.36        | 0.46 | 0.56  | 0.014  | 0.018 | 0.022 |
| b2   | 1.14        | 1.52 | 1.78  | 0.045  | 0.060 | 0.070 |
| c    | 0.20        | 0.25 | 0.36  | 0.008  | 0.010 | 0.014 |
| D    | 9.02        | 9.27 | 10.16 | 0.355  | 0.365 | 0.400 |
| E    | 7.62        | 7.87 | 8.26  | 0.300  | 0.310 | 0.325 |
| E1   | 6.10        | 6.35 | 7.11  | 0.240  | 0.250 | 0.280 |
| e    |             | 2.54 |       |        | 0.100 |       |
| eA   |             | 7.62 |       |        | 0.300 |       |
| eB   |             |      | 10.92 |        |       | 0.430 |
| L    | 2.92        | 3.30 | 3.81  | 0.115  | 0.130 | 0.150 |



## 4.2 SO8 package information

Figure 3. SO8 package mechanical drawing

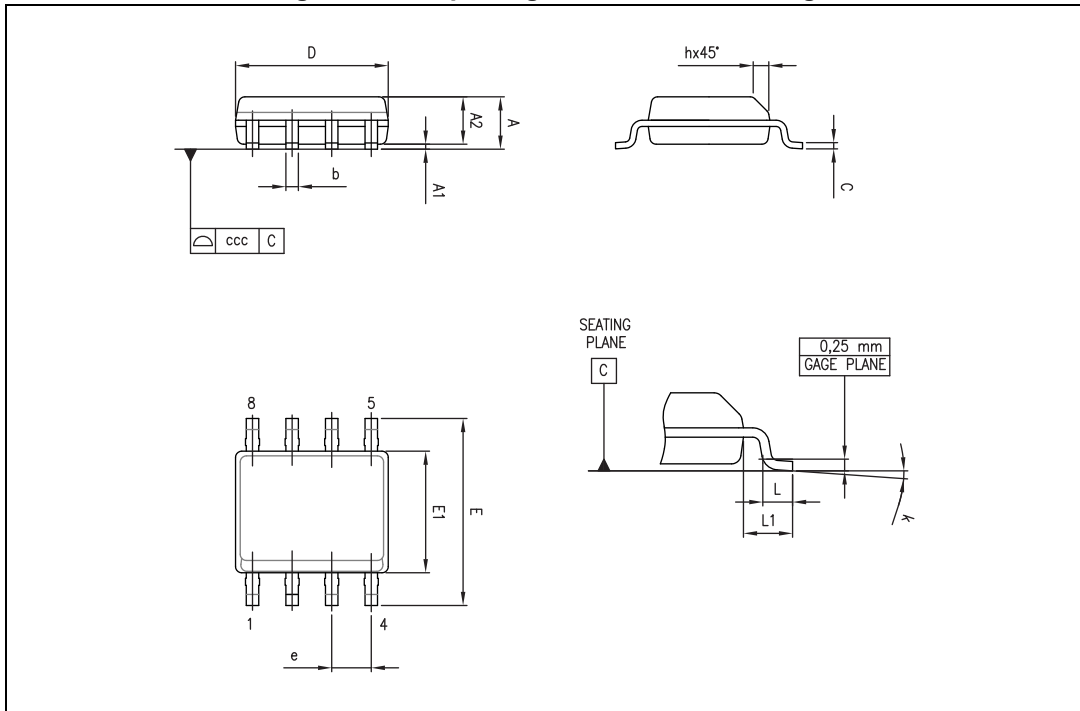


Table 5. SO8 package mechanical data

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    |             |      | 1.75 |        |       | 0.069 |
| A1   | 0.10        |      | 0.25 | 0.004  |       | 0.010 |
| A2   | 1.25        |      |      | 0.049  |       |       |
| b    | 0.28        |      | 0.48 | 0.011  |       | 0.019 |
| c    | 0.17        |      | 0.23 | 0.007  |       | 0.010 |
| D    | 4.80        | 4.90 | 5.00 | 0.189  | 0.193 | 0.197 |
| E    | 5.80        | 6.00 | 6.20 | 0.228  | 0.236 | 0.244 |
| E1   | 3.80        | 3.90 | 4.00 | 0.150  | 0.154 | 0.157 |
| e    |             | 1.27 |      |        | 0.050 |       |
| h    | 0.25        |      | 0.50 | 0.010  |       | 0.020 |
| L    | 0.40        |      | 1.27 | 0.016  |       | 0.050 |
| L1   |             | 1.04 |      |        | 0.040 |       |
| k    | 0           |      | 8 °  | 1 °    |       | 8 °   |
| ccc  |             |      | 0.10 |        |       | 0.004 |

## 5 Ordering information

Table 6. Order codes

| Order code  | Temperature range | Package | Packing             | Marking |
|-------------|-------------------|---------|---------------------|---------|
| UA741CN     | 0° C, +70° C      | DIP8    | Tube                | UA741CN |
| UA741CD/CDT |                   | SO-8    | Tube or tape & reel | 741C    |
| UA741IN     | -40° C, +105° C   | DIP8    | Tube                | UA741IN |
| UA741ID/IDT |                   | SO-8    | Tube or tape & reel | 741I    |

## 6 Revision history

Table 7. Document revision history

| Date        | Revision | Changes   |
|-------------|----------|---|
| 01-Nov-2001 | 1        | Initial release.  |
| 25-May-2009 | 2        | Document reformatted.<br>Added ESD values and thermal resistances in <a href="#">Table 1: Absolute maximum ratings</a> .<br>Added <a href="#">Table 2: Operating conditions</a> .<br>Removed UA741M information and order code in <a href="#">Table 6</a> . |
| 02-Sep-2013 | 3        | <a href="#">Table 6: Order codes</a> : updated marking for order codes UA741CD/CDT and UA741ID/IDT.   |

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