

# 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	±22	V
$V_{id}$	Differential input voltage	±30	
$V_i$	Input voltage	±15	
	Output short-circuit duration	Infinite	
$R_{thja}$	Thermal resistance junction to ambient		°C/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	°C

- Human body model: a 100 pF capacitor is charged to the specified voltage, then discharged through a 1.5kΩ 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 Ω). 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	±12		
$T_{oper}$	Operating free air temperature range	-40 to +105	0 to +70	°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 ( $R_s \leq 10\text{ k}\Omega$ ) $T_{amb} = +25\text{ °C}$ $T_{min} \leq T_{amb} \leq T_{max}$		1	5 6	mV
$I_{io}$	Input offset current $T_{amb} = +25\text{ °C}$ $T_{min} \leq T_{amb} \leq T_{max}$		2	30 70	nA
$I_{ib}$	Input bias current $T_{amb} = +25\text{ °C}$ $T_{min} \leq T_{amb} \leq T_{max}$		10	100 200	
$A_{vd}$	Large signal voltage gain ( $V_o = \pm 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ ) $T_{amb} = +25\text{ °C}$ $T_{min} \leq T_{amb} \leq T_{max}$	50 25	200		V/mV
SVR	Supply voltage rejection ratio ( $R_s \leq 10\text{ k}\Omega$ ) $T_{amb} = +25\text{ °C}$ $T_{min} \leq T_{amb} \leq T_{max}$	77 77	90		dB
$I_{CC}$	Supply current, no load $T_{amb} = +25\text{ °C}$ $T_{min} \leq T_{amb} \leq T_{max}$		1.7	2.8 3.3	mA
$V_{icm}$	Input common mode voltage range $T_{amb} = +25\text{ °C}$ $T_{min} \leq T_{amb} \leq T_{max}$	$\pm 12$ $\pm 12$			V
CMR	Common mode rejection ratio ( $R_s \leq 10\text{ k}\Omega$ ) $T_{amb} = +25\text{ °C}$ $T_{min} \leq T_{amb} \leq T_{max}$	70 70	90		dB
$I_{OS}$	Output short circuit current	10	25	40	mA
$\pm V_{opp}$	Output voltage swing $T_{amb} = +25\text{ °C}$ $T_{min} \leq T_{amb} \leq T_{max}$				V
	$R_L = 10\text{ k}\Omega$ $R_L = 2\text{ k}\Omega$ $R_L = 10\text{ k}\Omega$ $R_L = 2\text{ k}\Omega$	12 10 12 10	14 13		
SR	Slew rate $V_i = \pm 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 100\text{ pF}$ , unity gain	0.25	0.5		V/ $\mu$ s
$t_r$	Rise time $V_i = \pm 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 100\text{ pF}$ , unity gain		0.3		$\mu$ s
$K_{ov}$	Overshoot $V_i = 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 100\text{ pF}$ , 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 $V_i = 10\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 100\text{ pF}$ , $f = 100\text{ kHz}$	0.7	1		MHz
THD	Total harmonic distortion $f = 1\text{ kHz}$ , $A_v = 20\text{ dB}$ , $R_L = 2\text{ k}\Omega$ , $V_o = 2\text{ V}_{pp}$ , $C_L = 100\text{ pF}$ , $T_{amb} = +25\text{ °C}$		0.06		%
$e_n$	Equivalent input noise voltage $f = 1\text{ kHz}$ , $R_s = 100\text{ }\Omega$		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

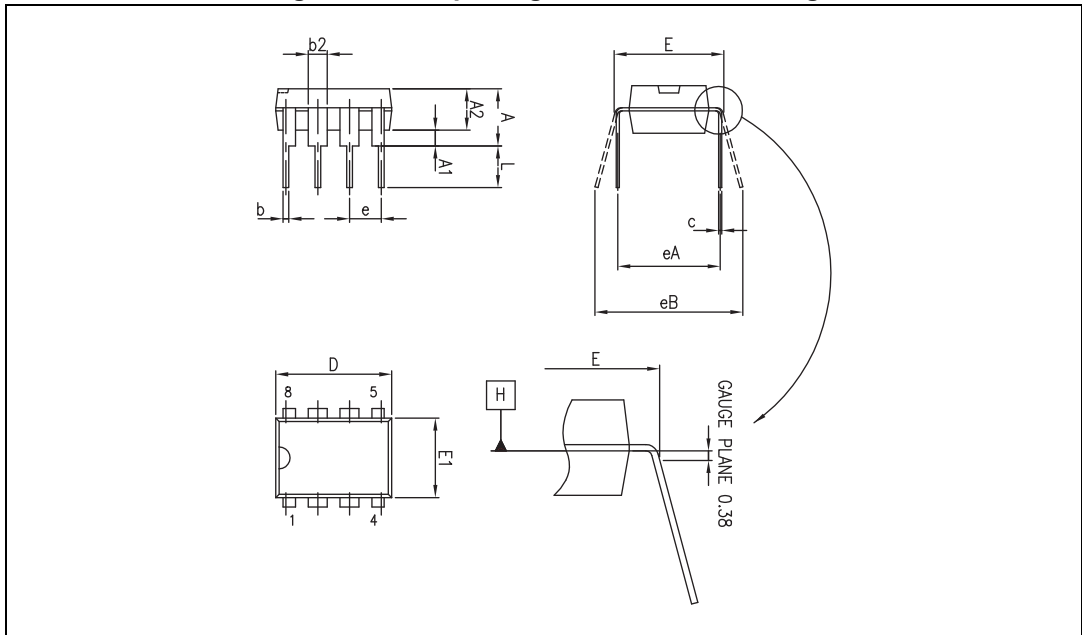


Table 4. DIP8 package mechanical data

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. Added ESD values and thermal resistances in <a href="#">Table 1: Absolute maximum ratings</a> . Added <a href="#">Table 2: Operating conditions</a> . 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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