

#### General-purpose single operational amplifier

#### **Features**

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

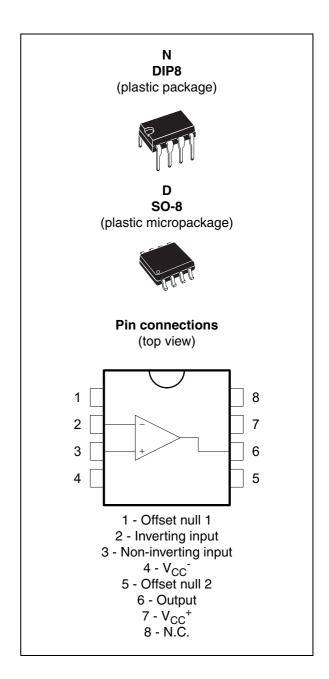
#### **Applications**

- 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.

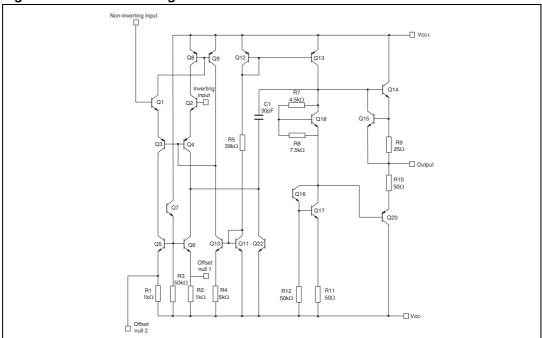
The high gain and wide range of operating voltages provide superior performances in integrator, summing amplifier and general feedback applications. The internal compensation network (6 dB/octave) ensures stability in closed-loop circuits.



Schematic diagram UA741

# 1 Schematic diagram

Figure 1. Schematic diagram



#### 2 Absolute maximum ratings and operating conditions

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply voltage	±22	V
V <sub>id</sub>	Differential input voltage	±30	V
V <sub>i</sub>	Input voltage	±15	V
	Output short-circuit duration	Infinite	
R <sub>thja</sub>	Thermal resistance junction to ambient SO-8 DIP8	125 85	°C/W
R <sub>thjc</sub>	Thermal resistance junction to case SO-8 DIP8	40 41	°C/W
ESD	HBM: human body model <sup>(1)</sup> DIP package SO package	500 400	V
_	MM: machine model <sup>(2)</sup>	100	V
	CDM: charged device model <sup>(3)</sup>	1.5	kV
T <sub>stg</sub>	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.

Table 2. Operating conditions

Symbol	Parameter	UA741I	UA741C	Unit
V <sub>CC</sub>	Supply voltage	5 to 40		V
V <sub>icm</sub>	Common mode input voltage range	±	12	V
T <sub>oper</sub>	Operating free air temperature range	-40 to +105	0 to +70	°C



<sup>2.</sup> 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.

Electrical characteristics UA741

#### 3 Electrical characteristics

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

Symbol	Parameter	Min.	Тур.	Max.	Unit
V <sub>io</sub>	Input offset voltage ( $R_s \le 10 \text{ k}\Omega$ ) $T_{amb} = +25^{\circ} \text{ C}$ $T_{min} \le T_{amb} \le T_{max}$		1	5 6	mV
l <sub>io</sub>	Input offset current $T_{amb} = +25^{\circ} C$ $T_{min} \leq T_{amb} \leq T_{max}$		2	30 70	nA
l <sub>ib</sub>	Input bias current $T_{amb} = +25^{\circ} C$ $T_{min} \leq T_{amb} \leq T_{max}$		10	100 200	nA
A <sub>vd</sub>	Large signal voltage gain ( $V_0 = \pm 10 \text{ V}$ , $R_L = 2 \text{ k}\Omega$ ) $T_{amb} = +25^{\circ} \text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$	50 25	200		V/mV
SVR	Supply voltage rejection ratio ( $R_s \le 10 \text{ k}\Omega$ ) $T_{amb} = +25^{\circ} \text{ C}$ $T_{min} \le T_{amb} \le T_{max}$	77 77	90		dB
I <sub>CC</sub>	Supply current, no load $T_{amb} = +25^{\circ} C$ $T_{min} \leq T_{amb} \leq T_{max}$		1.7	2.8 3.3	mA
V <sub>icm</sub>	Input common mode voltage range $T_{amb} = +25^{\circ} \text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$	±12 ±12			V
CMR	Common mode rejection ratio (R <sub>S</sub> $\leq$ 10 k $\Omega$ ) $T_{amb} = +25^{\circ} C$ $T_{min} \leq T_{amb} \leq T_{max}$	70 70	90		dB
los	Output short circuit current	10	25	40	mA
±V <sub>opp</sub>	$\begin{array}{ll} \text{Output voltage swing} \\ T_{amb} = +25^{\circ} \text{ C} & R_{L} = 10 \text{ k}\Omega \\ R_{L} = 2 \text{ k}\Omega \\ T_{min} \leq T_{amb} \leq T_{max} & R_{L} = 10 \text{ k}\Omega \\ R_{L} = 2 \text{ k}\Omega \end{array}$	12 10 12 10	14 13		V
SR	Slew rate $V_i = \pm 10 \text{ V}, \text{ R}_L = 2 \text{ k}\Omega, \text{ C}_L = 100 \text{ pF, unity gain}$	0.25	0.5		V/μs
t <sub>r</sub>	Rise time $V_i = \pm 20 \text{ mV}, \ R_L = 2 \text{ k}\Omega, \ C_L = 100 \text{ pF, unity gain}$		0.3		μs
K <sub>ov</sub>	Overshoot $V_i = 20 \text{ mV}, R_L = 2 \text{ k}\Omega, C_L = 100 \text{ pF, unity gain}$		5		%
R <sub>i</sub>	Input resistance	0.3	2		MΩ

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

Symbol	Parameter	Min.	Тур.	Max.	Unit
GBP	Gain bandwidth product $V_i$ = 10 mV, $R_L$ = 2 k $\Omega$ $C_L$ = 100 pF, f =100 kHz	0.7	1		MHz
THD	Total harmonic distortion $f=1\text{ kHz, }A_{v}=20\text{ dB, }R_{L}=2\text{ k}\Omega,V_{o}=2V_{pp},C_{L}=100\text{ pF,}\\ T_{amb}=+25^{\circ}\text{ C}$		0.06		%
e <sub>n</sub>	Equivalent input noise voltage f = 1 kHz, $R_s$ = 100 $\Omega$		23		$\frac{\text{nV}}{\sqrt{\text{Hz}}}$
Øm	Phase margin		50		Degree

Package information UA741

### 4 Package information

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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: <a href="https://www.st.com">www.st.com</a>. ECOPACK<sup>®</sup> is an ST trademark.

UA741 Package information

#### 4.1 DIP8 package information

Figure 2. DIP8 package mechanical drawing

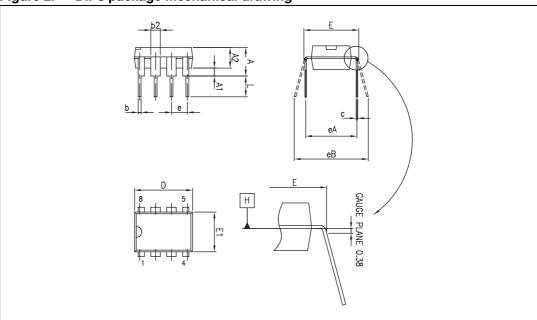


Table 4. DIP8 package mechanical data

	Dimensions					
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α			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
С	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
е		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

Package information UA741

#### 4.2 SO-8 package information

Figure 3. SO-8 package mechanical drawing

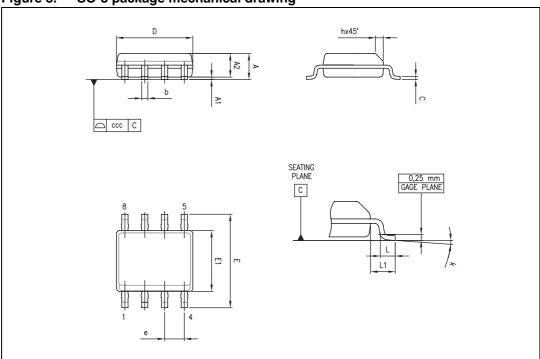


Table 5. SO-8 package mechanical data

	Dimensions					
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α			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
С	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
е		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°	<b>1</b> °		8°
CCC			0.10			0.004

# 5 Ordering information

Table 6. Order codes

Order code	Temperature range	Package	Packing	Marking
UA741CN		DIP8	Tube	UA741CN
UA741CD/CDT	0° C, +70° C	SO-8	Tube or tape & reel	UA741C
UA741IN		DIP8	Tube	UA741IN
UA741ID/IDT	-40° C, +105° C	SO-8	Tube or tape & reel	UA741I

Revision history UA741

# 6 Revision history

Table 7. Document revision history

Date	Revision	Changes			
01-Nov-2001	1	nitial release.			
25-May-2009	2	Document reformatted.  Added ESD values and thermal resistances in <i>Table 1: Absolute maximum ratings</i> .  Added <i>Table 2: Operating conditions</i> .  Removed UA741M information and order code in <i>Table 6</i> .			

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