UA741

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

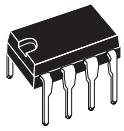
- Summing amplifiers
- Voltage followers
- Integrators
- Active filters
- Function generators

Description

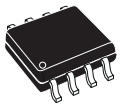
The UA741 is a high performance monolithic operational amplifier constructed on a single silicon chip. It is intended for a wide range of analog applications.

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.

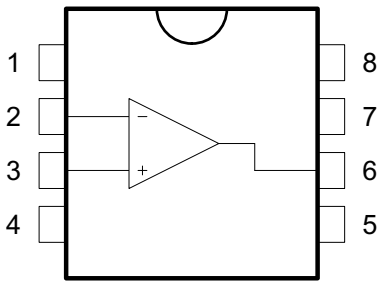
N
DIP8
(plastic package)



D
SO-8
(plastic micropackage)



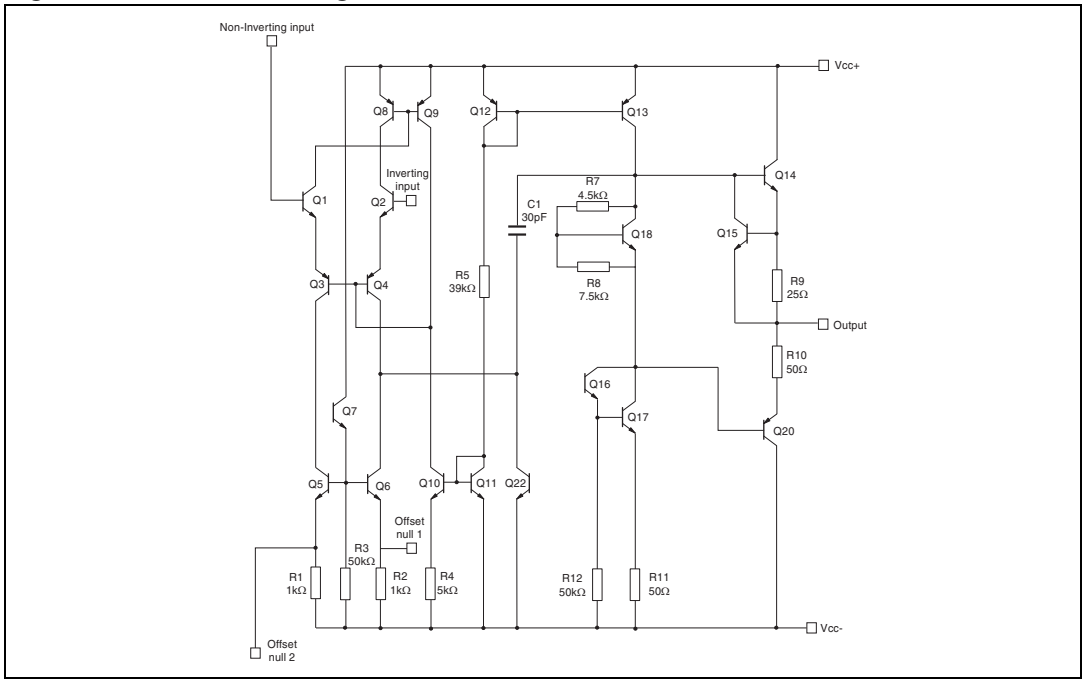
Pin connections
(top view)



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.

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
V_i	Input voltage	±15	V
	Output short-circuit duration	Infinite	
R_{thja}	Thermal resistance junction to ambient SO-8 DIP8	 125 85	°C/W
R_{thjc}	Thermal resistance junction to case SO-8 DIP8	 40 41	°C/W
ESD	HBM: human body model(1) DIP package SO package	 500 400	V
	MM: machine model(2)	100	V
	CDM: charged device model(3)	1.5	kV
T_{stg}	Storage temperature range	-65 to +150	°C

1. 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.
2. 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.
3. 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		V
T_{oper}	Operating free air temperature range	-40 to +105	0 to +70	°C

3 Electrical characteristics

Table 3. Electrical characteristics at V_{CC} = ±15 V, T_{amb} = +25° C (unless otherwise specified)

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

Table 3. Electrical characteristics at V_{CC} = ±15 V, T_{amb} = +25° C (unless otherwise specified) (continued)

Symbol	Parameter	Min.	Typ.	Max.	Unit
GBP	Gain bandwidth product V_i = 10 mV, R_L = 2 kΩ, C_L = 100 pF, f =100 kHz	0.7	1		MHz
THD	Total harmonic distortion f = 1 kHz, A_V = 20 dB, R_L = 2 kΩ, V_o = 2 V_{pp}, C_L = 100 pF, T_{amb} = +25° C		0.06		%
e_n	Equivalent input noise voltage f = 1 kHz, R_s = 100 Ω		23		$\frac{nV}{\sqrt{Hz}}$
∅m	Phase margin		50		Degree

4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*.
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4.1 DIP8 package information

Figure 2. DIP8 package mechanical drawing

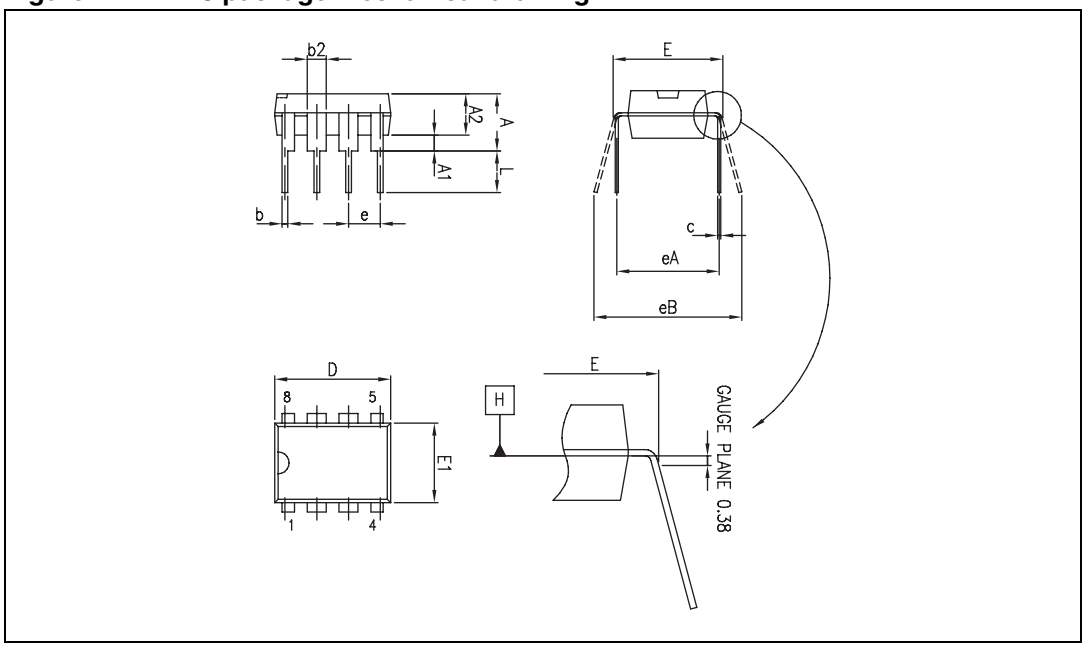

Table 4. DIP8 package mechanical data

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 SO-8 package information

Figure 3. SO-8 package mechanical drawing

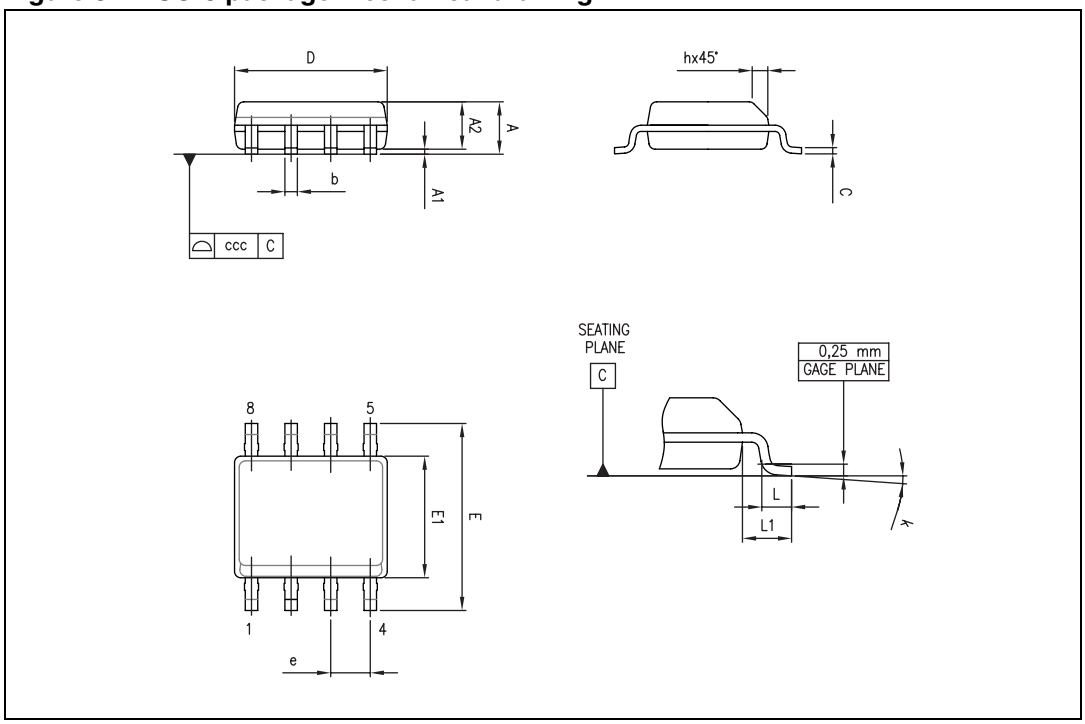

Table 5. SO-8 package mechanical data

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	UA741C
UA741IN	-40° C, +105° C	DIP8	Tube	UA741IN
UA741ID/IDT		SO-8	Tube or tape & reel	UA741I

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 *Table 1: Absolute maximum ratings*. Added *Table 2: Operating conditions*. Removed UA741M information and order code in *Table 6*.

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