

## 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

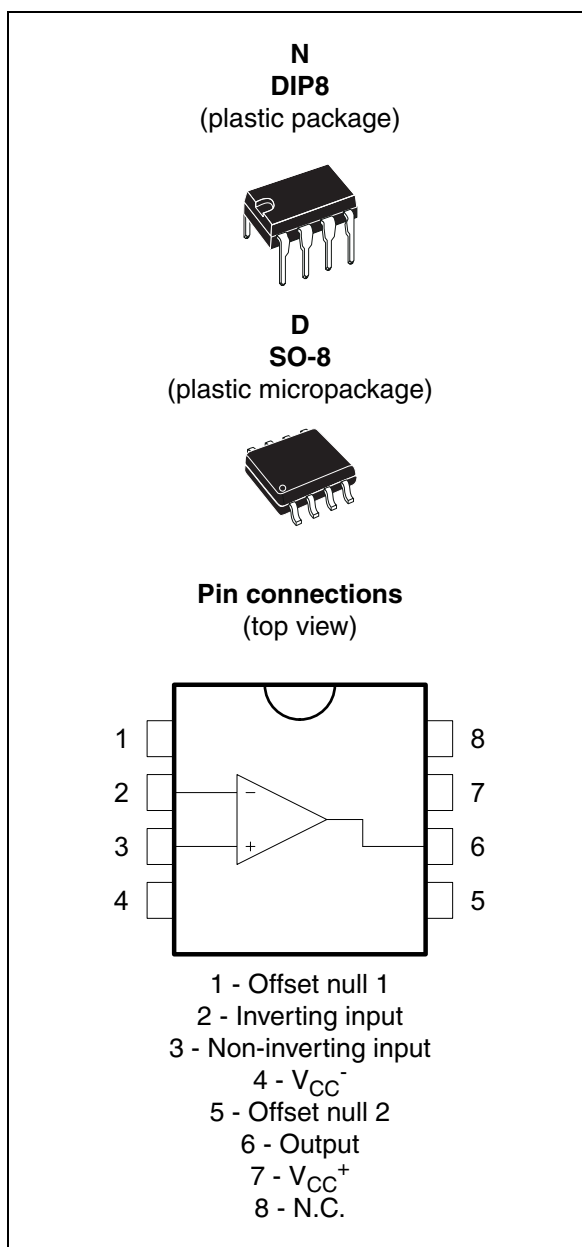
### Applications

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

### Description

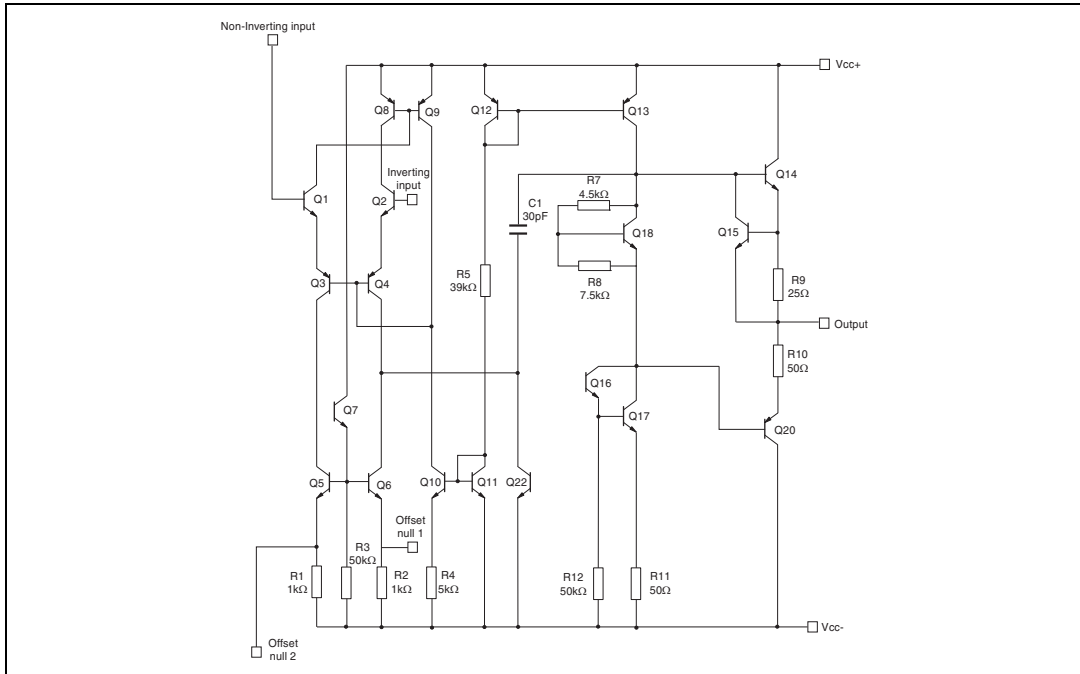
The UA741 is a high performance monolithic operational amplifier constructed on a single silicon chip. It is intended for a wide range of analog applications.

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.



# 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
$V_i$	Input voltage	$\pm 15$	V
	Output short-circuit duration	Infinite	
$R_{thja}$	Thermal resistance junction to ambient		
	SO-8	125	$^{\circ}\text{C}/\text{W}$
	DIP8	85	
$R_{thjc}$	Thermal resistance junction to case		
	SO-8	40	$^{\circ}\text{C}/\text{W}$
	DIP8	41	
ESD	HBM: human body model <sup>(1)</sup>		
	DIP package	500	V
	SO package	400	
	MM: machine model <sup>(2)</sup>	100	V
	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	$\pm 12$		V
$T_{oper}$	Operating free air temperature range	-40 to +105	0 to +70	$^{\circ}\text{C}$

### 3 Electrical characteristics

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{io}$	Input offset voltage ( $R_s \leq 10\text{ k}\Omega$ ) $T_{amb} = +25^\circ\text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$		1	5 6	mV
$I_{io}$	Input offset current $T_{amb} = +25^\circ\text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$		2	30 70	nA
$I_{ib}$	Input bias current $T_{amb} = +25^\circ\text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$		10	100 200	nA
$A_{vd}$	Large signal voltage gain ( $V_o = \pm 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ ) $T_{amb} = +25^\circ\text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$	50 25	200		V/mV
SVR	Supply voltage rejection ratio ( $R_s \leq 10\text{ k}\Omega$ ) $T_{amb} = +25^\circ\text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$	77 77	90		dB
$I_{CC}$	Supply current, no load $T_{amb} = +25^\circ\text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$		1.7	2.8 3.3	mA
$V_{icm}$	Input common mode voltage range $T_{amb} = +25^\circ\text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$	$\pm 12$ $\pm 12$			V
CMR	Common mode rejection ratio ( $R_S \leq 10\text{ k}\Omega$ ) $T_{amb} = +25^\circ\text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$	70 70	90		dB
$I_{OS}$	Output short circuit current	10	25	40	mA
$\pm V_{opp}$	Output voltage swing $T_{amb} = +25^\circ\text{ C}$ $T_{min} \leq T_{amb} \leq T_{max}$	$R_L = 10\text{ k}\Omega$ 12 $R_L = 2\text{ k}\Omega$ 10 $R_L = 10\text{ k}\Omega$ 12 $R_L = 2\text{ k}\Omega$ 10	14 13		V
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/ $\mu\text{s}$
$t_r$	Rise time $V_i = \pm 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 100\text{ pF}$ , unity gain		0.3		$\mu\text{s}$
$K_{ov}$	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  $V_{CC} = \pm 15\text{ V}$ ,  $T_{amb} = +25^\circ\text{ C}$   
(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 $f = 1\text{ kHz}$ , $A_v = 20\text{ dB}$ , $R_L = 2\text{ k}\Omega$ , $V_o = 2\text{ V}_{pp}$ , $C_L = 100\text{ pF}$ , $T_{amb} = +25^\circ\text{ C}$		0.06		%
$e_n$	Equivalent input noise voltage $f = 1\text{ kHz}$ , $R_s = 100\ \Omega$		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

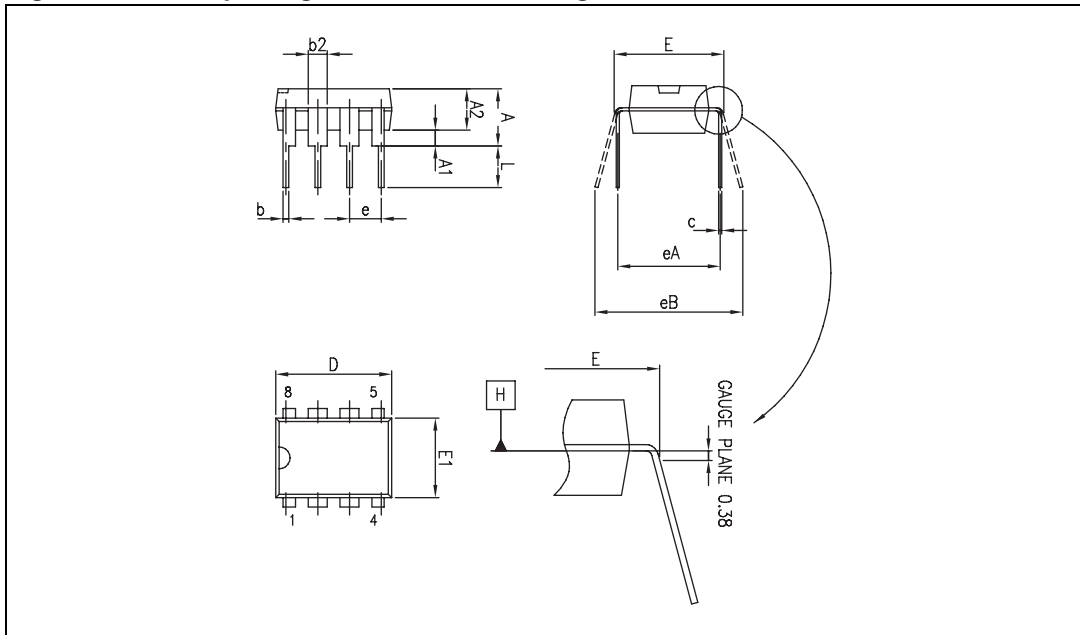


Table 4. DIP8 package mechanical data

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 SO-8 package information

Figure 3. SO-8 package mechanical drawing

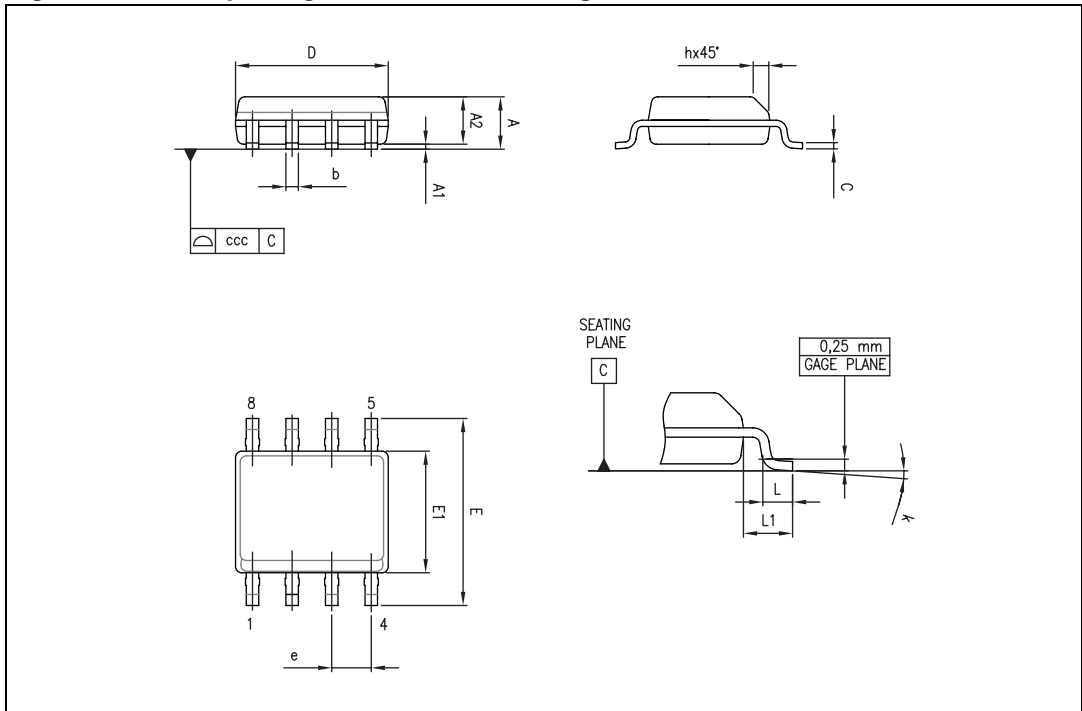


Table 5. SO-8 package mechanical data

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 <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> .

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2009 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)