



7929237 0023607 6 T-79-05-10  
**SGS-THOMSON**  
 MICROELECTRONICS

**UA741**

S G S-THOMSON

30E D

## GENERAL-PURPOSE SINGLE OP-AMPS

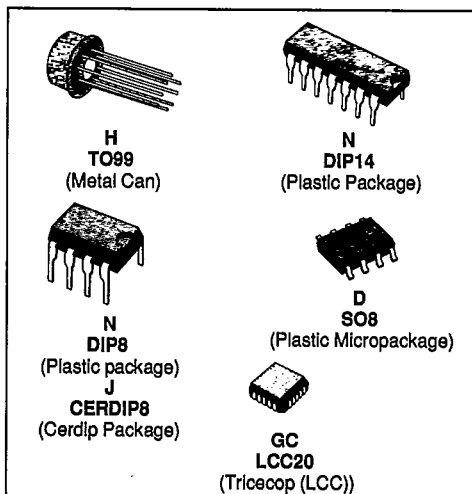
- LARGE INPUT VOLTAGE RANGE
- NO LATCH-UP
- HIGH GAIN
- SHORT-CIRCUIT PROTECTION
- NO FREQUENCY COMPENSATION REQUIRED
- SAME PIN CONFIGURATION AS THE UA709

### DESCRIPTION

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

- Summing amplifier
- Voltage follower
- Integrator
- Active filter
- Function generator.

The high gain and wide range of operating voltages provides superior performance integrator, summing amplifier, and general feedback applications. the internal compensation network (6 dB/octave) insures stability in closed loop applications.



### ORDER CODES

Part Number	Temperature Range	Package					
		H	J	GC	N	14	D
UA741C/E	0 °C to + 70 °C	•	•		•	•	•
UA741I	-40 °C to + 105 °C	•			•	•	
UA741M/A	-55 °C to + 125 °C	•	•	•			

**Note :** Hi-Rel Versions Available  
**Examples :** UA741CN, UA741IH

### PIN CONNECTIONS (top views)

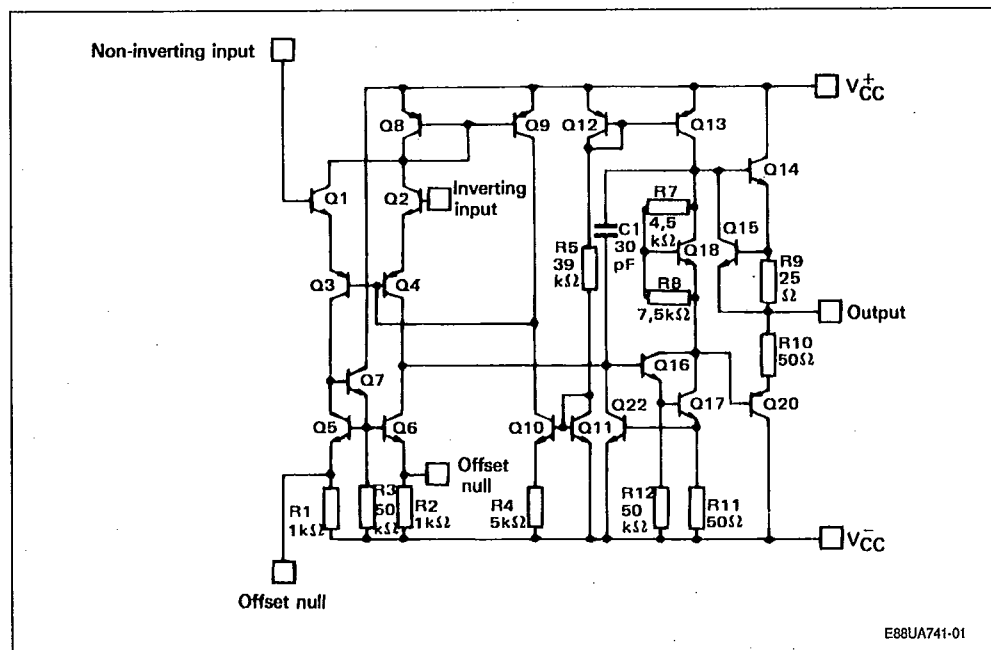
DIP8/CERDIP8 SO8	TO99	LCC20	DIP14
<ul style="list-style-type: none"> <li>1 - Offset null</li> <li>2 - Inverting Input</li> <li>3 - Non-Inverting Input</li> <li>4 - V<sub>cc</sub></li> <li>5 - Offset null</li> <li>6 - Output</li> <li>7 - V<sub>cc</sub></li> <li>8 - NC</li> </ul>	<ul style="list-style-type: none"> <li>1 - NC</li> <li>2 - Offset null</li> <li>3 - NC</li> <li>4 - NC</li> <li>5 - Inverting Input</li> <li>6 - NC</li> <li>7 - Non-inverting input</li> <li>8 - NC</li> <li>9 - NC</li> </ul>	<ul style="list-style-type: none"> <li>11 - NC</li> <li>12 - Offset null</li> <li>13 - NC</li> <li>14 - NC</li> <li>15 - Output</li> <li>16 - NC</li> <li>17 - V<sub>cc</sub></li> <li>18 - NC</li> <li>19 - NC</li> <li>20 - NC</li> </ul>	<ul style="list-style-type: none"> <li>4 - Inverting Input</li> <li>5 - Non-Inverting Input</li> <li>6 - V<sub>cc</sub></li> <li>7 - NC</li> <li>8 - NC</li> <li>9 - Offset null</li> <li>10 - Output</li> <li>11 - V<sub>cc</sub></li> <li>12 - NC</li> <li>13 - NC</li> <li>14 - NC</li> </ul>

## ABSOLUTE MAXIMUM RATINGS S G S-THOMSON

30E D

Symbol	Parameter	Value			Unit
		UA741M, A	UA741I	UA741C, E	
$V_{CC}$	Supply Voltage	$\pm 22$	$\pm 22$	$\pm 22$	V
$V_I$	Input Voltage	$\pm 15$	$\pm 15$	$\pm 15$	V
$V_{id}$	Differential Input Voltage	$\pm 30$	$\pm 30$	$\pm 30$	V
$P_{tot}$	Power Dissipation	500	500	500	mW
	Output Short-circuit Duration	Infinite			
$T_{oper}$	Operating Free-air Temperature Range	-55 to +125	-40 to +105	0 to +70	°C
$T_{stg}$	Storage Temperature Range	-65 to 150	-65 to 150	-65 to 150	°C

## SCHEMATIC DIAGRAM



Case	Offset Null	Inverting Input	Non-Inverting Input	$V_{CC}$	$V_{EE}$	Output	N.C.
TO99/DIP8/CERDIP8/SO8	1, 5	2	3	4	7	6	8
DIP14	3, 9	4	5	6	11	10	*
LCC20	2, 12	5	7	10	17	15	*

\* TO116, LCC20 : Other pins are not connected.

## ELECTRICAL CHARACTERISTICS S G S-THOMSON

30E D

UA741M/A :  $-55^{\circ}\text{C} \leq T_{\text{amb}} \leq +125^{\circ}\text{C}$ ,  $V_{\text{CC}} = \pm 15\text{ V}$ UA741I :  $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq +105^{\circ}\text{C}$ ,  $V_{\text{CC}} = \pm 15\text{ V}$ UA741C/E :  $0^{\circ}\text{C} \leq T_{\text{amb}} \leq +70^{\circ}\text{C}$ ,  $V_{\text{CC}} = \pm 15\text{ V}$ 

(unless otherwise specified)

T-79-05-10

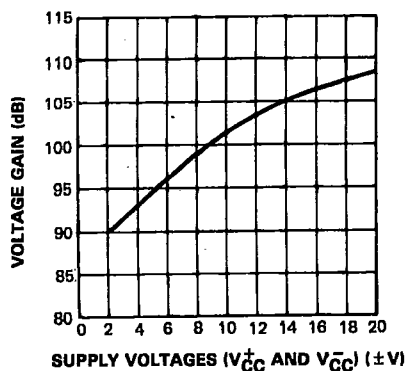
Symbol	Parameter	UA741C, E, I, M, A			Unit
		Min.	Typ.	Max.	
$V_{\text{IO}}$	Input Offset Voltage $R_S \leq 10\text{ k}\Omega$ $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$ UA741E, A $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$		1  1	5 6 2 4	mV
$I_{\text{IO}}$	Input Offset Current $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$		2	20 40	nA
$I_{\text{IB}}$	Input Bias Current $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$		10	100 200	nA
$A_{\text{VD}}$	Large Signal Voltage Gain ( $V_O = \pm 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ ) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$	50 25	200		V/mV
SVR	Supply Voltage Rejection Ratio ( $R_S \leq 10\text{ k}\Omega$ ) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$	77 77	90		dB
$I_{\text{CC}}$	Supply Current, no Load $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$		1.7	2.8 3.3	mA
$V_{\text{I}}$	Input Voltage Range $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$	- 12 - 12		+ 12 + 12	V
CMR	Common Mode Rejection Ratio ( $R_S \leq 10\text{ k}\Omega$ ) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$	70 70	90		dB
$I_{\text{OS}}$	Output Short-circuit Current $T_{\text{amb}} = 25^{\circ}\text{C}$	10	25	40	mA
$\pm V_{\text{OPP}}$	Output Voltage Swing $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$ $R_L = 10\text{ k}\Omega$ $R_L = 2\text{ k}\Omega$ $R_L = 10\text{ k}\Omega$ $R_L = 2\text{ k}\Omega$	12 10 12 10	14 13		V
$S_{\text{VO}}$	Slew-rate ( $V_{\text{I}} = \pm 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ , $T_{\text{amb}} = 25^{\circ}\text{C}$ , unity gain)	0.25	0.5		V/ $\mu\text{s}$
$t_r$	Rise Time ( $V_{\text{I}} = \pm 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ , $T_{\text{amb}} = 25^{\circ}\text{C}$ , unity gain)		0.3		$\mu\text{s}$
$K_{\text{OV}}$	Overshoot ( $V_{\text{I}} = \pm 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ , $T_{\text{amb}} = 25^{\circ}\text{C}$ , unity gain)		5		%
$R_{\text{I}}$	Input Resistance, $T_{\text{amb}} = 25^{\circ}\text{C}$	0.3	2		$\text{m}\Omega$

## ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	UA741C, E, I, M, A			Unit
		Min.	Typ.	Max.	
GPB	Gain Bandwidth Product ( $V_i = 10$ mV, $R_L = 2$ k $\Omega$ , $C_L \leq 100$ pF $f = 100$ kHz, $T_{amb} = 25$ °C)	0.7	1	1.6	MHz
THD	Total Harmonic Distortion ( $f = 1$ kHz, $A_v = 20$ dB, $R_L = 2$ k $\Omega$ , $V_O = 2$ V <sub>pp</sub> $C_L \leq 100$ pF, $T_{amb} = 25$ °C)		0.06		%
$V_N$	Equivalent Input Noise Voltage ( $f = 1$ kHz, $R_G = 100$ $\Omega$ )		23		nV/ $\sqrt{Hz}$
	Phase Margin		50		Degrees

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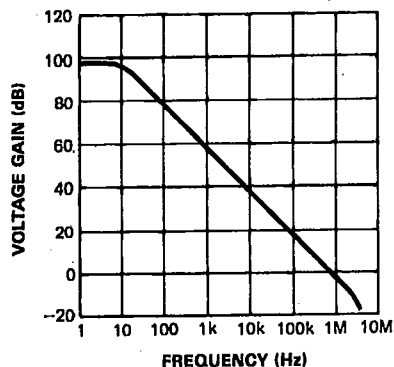
OPEN LOOP VOLTAGE GAIN (Typ.)



E88UA741-02

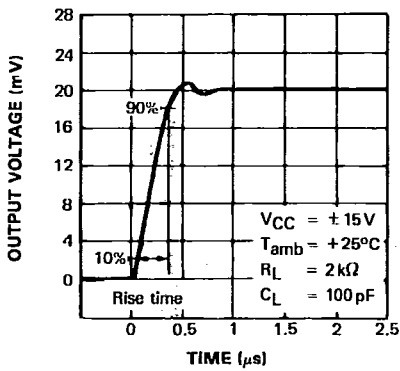
## 30E D

OPEN LOOP FREQUENCY RESPONSE (Typ.)



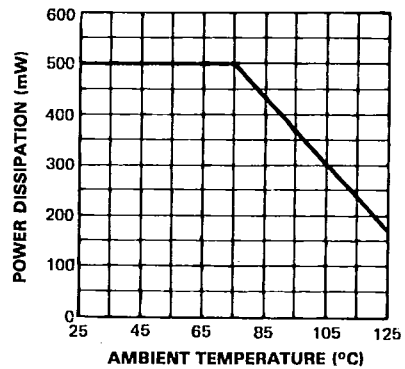
E88UA741-03

TRANSIENT RESPONSE (Typ.)



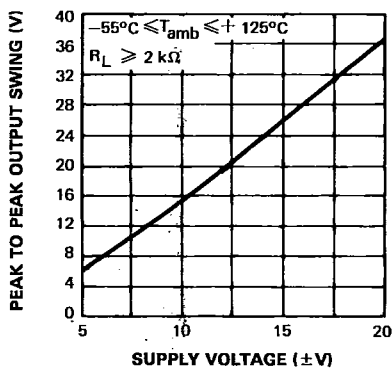
E88UA741-04

ABSOLUTE MAXIMUM POWER DISSIPATION



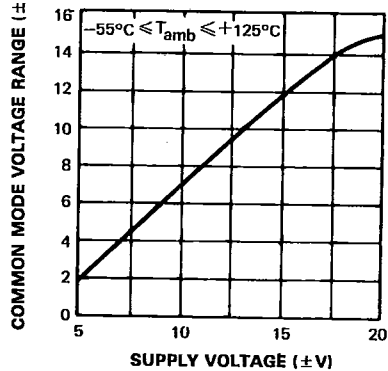
E88UA741-05

OUTPUT VOLTAGE SWING



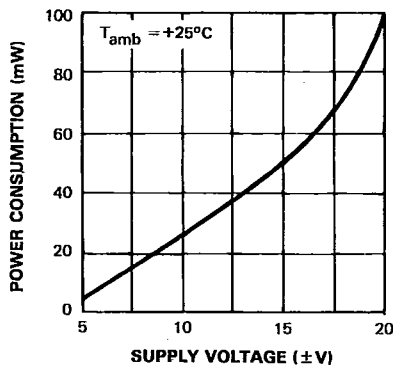
E88UA741-06

INPUT COMMON MODE VOLTAGE RANGE



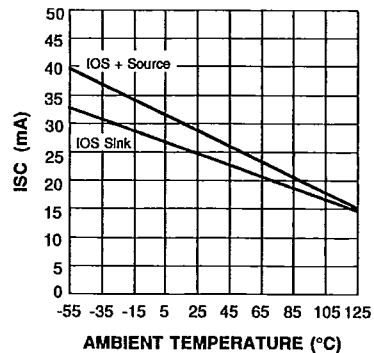
E88UA741-07

POWER CONSUMPTION



E88UA741-08

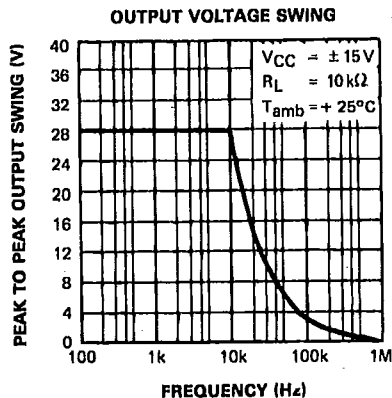
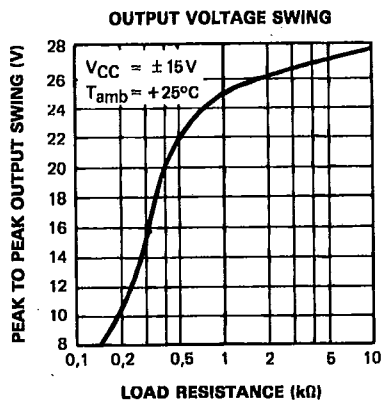
OUTPUT CURRENT vs AMBIENT TEMPERATURE



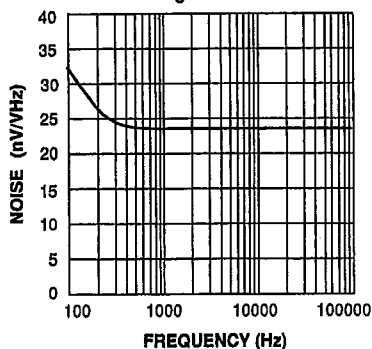
E88UA741-09

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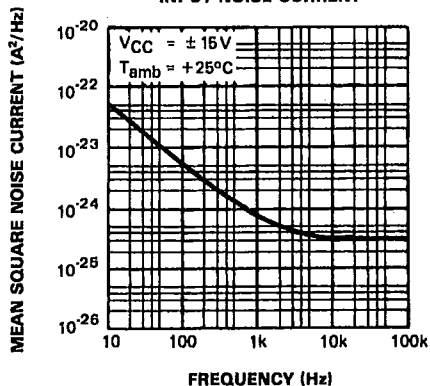


E88UA741-10  
**EQUIVALENT INPUT NOISE vs FREQUENCY**  
 $R_g = 100 \Omega$



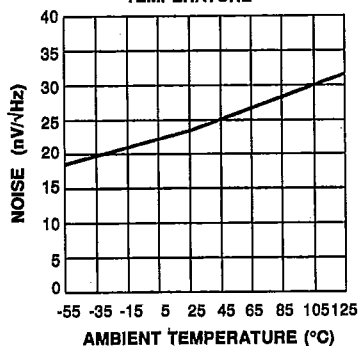
E88UA741-12

E88UA741-11  
**INPUT NOISE CURRENT**



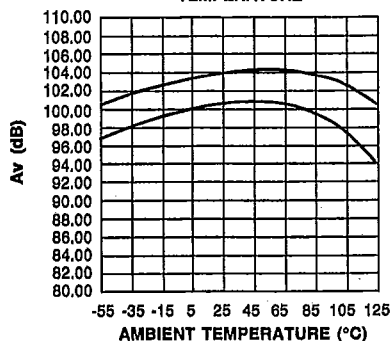
E88UA741-13

**EQUIVALENT INPUT NOISE vs AMBIENT TEMPERATURE**



E88UA741-14

**LARGE SIGNAL VOLTAGE GAIN vs AMBIENT TEMPERATURE**

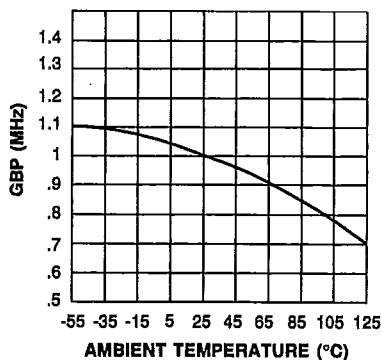


E88UA741-15

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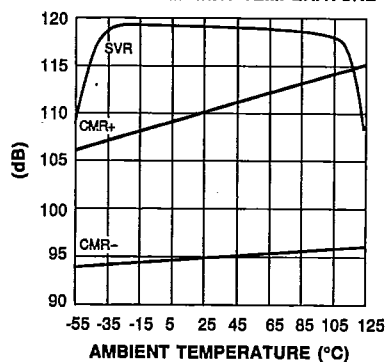
30E D

GAIN BANDWIDTH PRODUCT vs AMBIENT TEMPERATURE



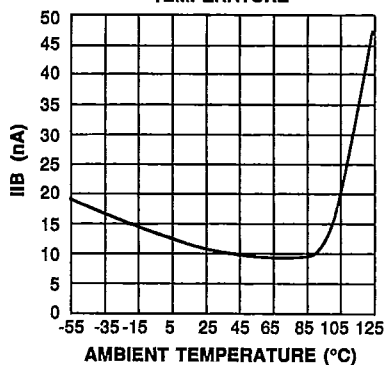
E88UA741-16

POWER SUPPLY &amp; COMMON MODE REJECTION RATIO vs AMBIENT TEMPERATURE



E88UA741-17

INPUT BIAS CURRENT vs AMBIENT TEMPERATURE

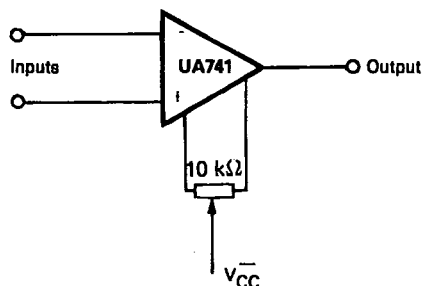


E88UA741-18

## MEASUREMENT DIAGRAMS

## VOLTAGE OFFSET NULL CIRCUIT

TO99 - DIP8 - Cerdip8

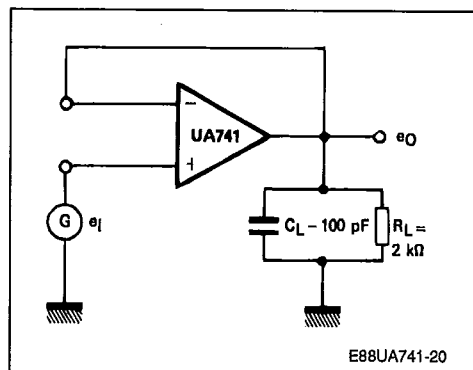


E88UA741-19

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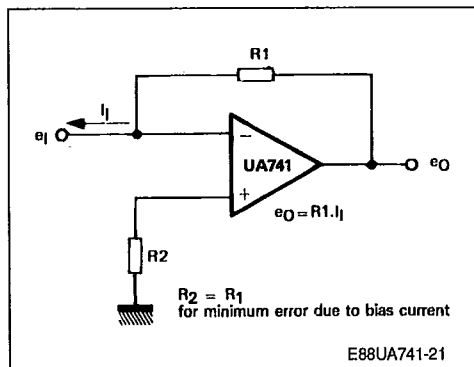
## TRANSIENT RESPONSE TEST CIRCUIT



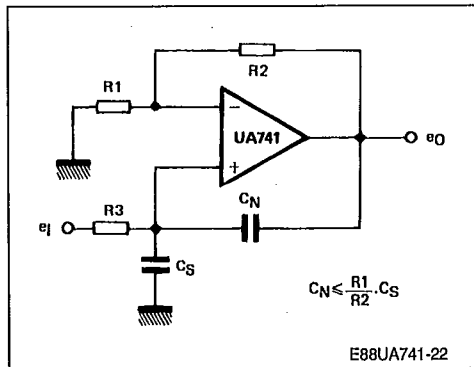
E88UA741-20

# MEASUREMENT DIAGRAMS (continued)

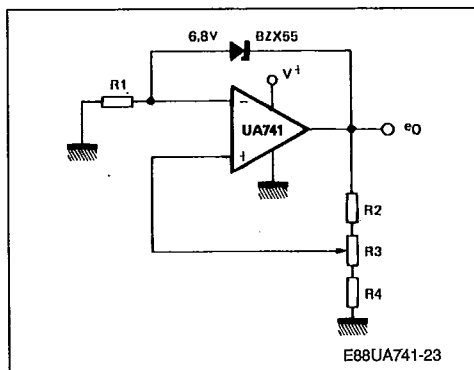
## CURRENT TO VOLTAGE CONVERTER



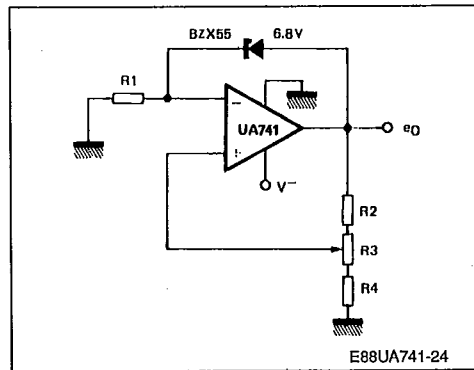
## NEUTRALIZING INPUT CAPACITANCE TO OPTIMIZE RESPONSE TIME



## POSITIVE VOLTAGE REFERENCE



## NEGATIVE VOLTAGE REFERENCE



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30E D

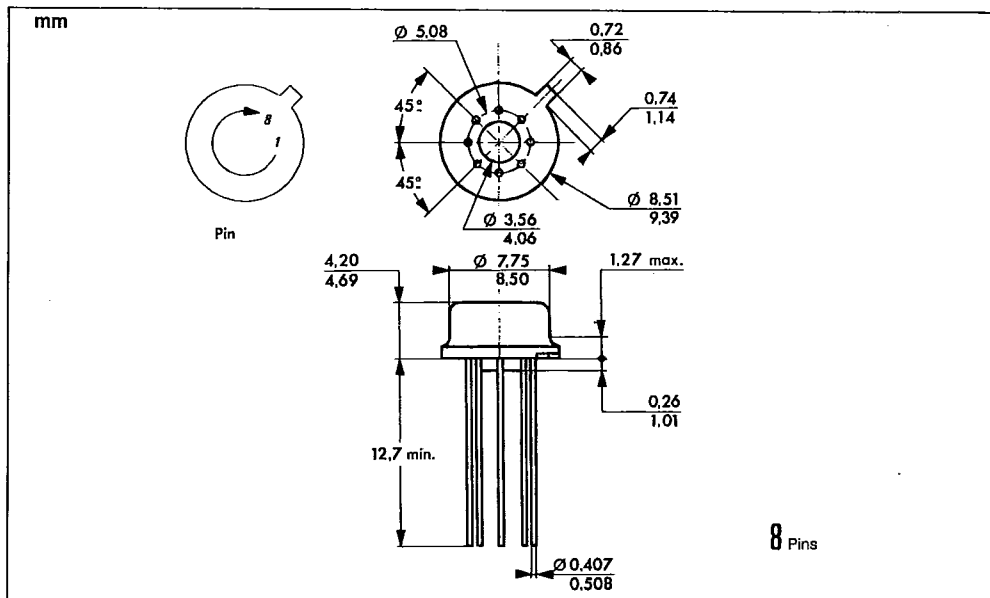


## PACKAGE MECHANICAL DATA

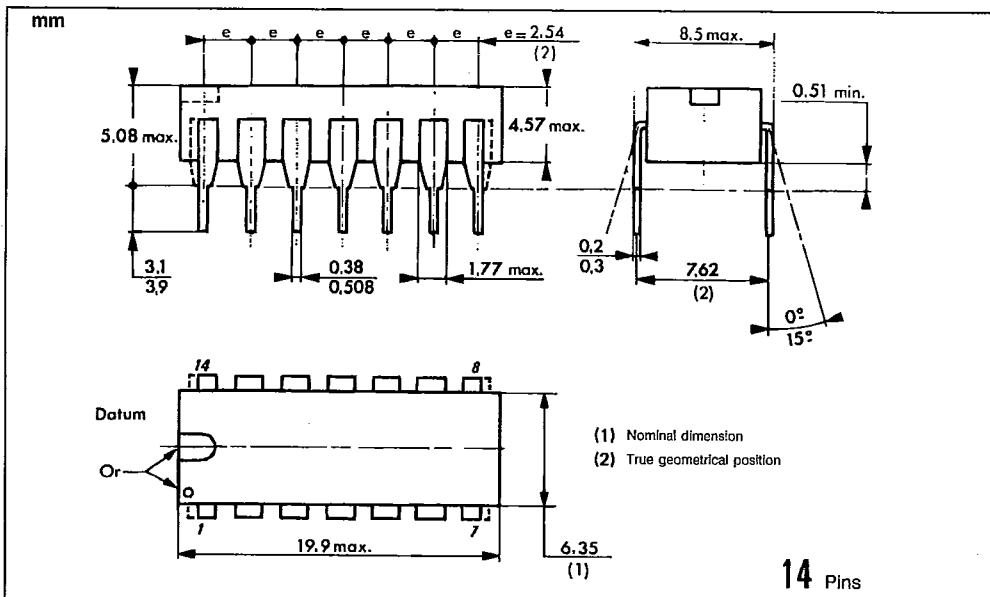
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30E D

8 PINS - TO99 - METAL CAN



14 PINS - PLASTIC DIP



## 30E D



**20 PINS**

T-79-05-10

## PACKAGE MECHANICAL DATA (continued)

8 PINS - PLASTIC MICROPACKAGE (SO) S G S-THOMSON

30E D

