



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

**UA741**

S G S-THOMSON

30E D

## GENERAL-PURPOSE SINGLE OP-AMPS

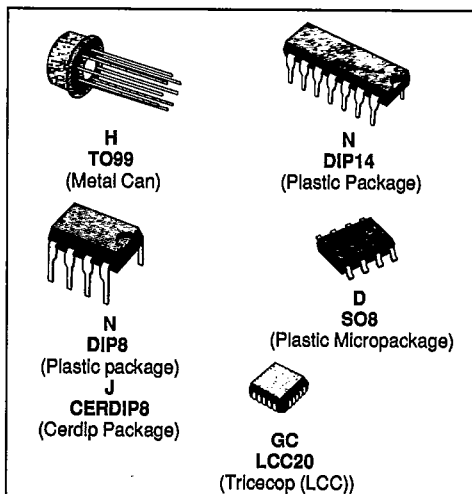
- LARGE INPUT VOLTAGE RANGE
- NO LATCH-UP
- HIGH GAIN
- SHORT-CIRCUIT PROTECTION
- NO FREQUENCY COMPENSATION REQUIRED
- SAME PIN CONFIGURATION AS THE UA709

### 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.

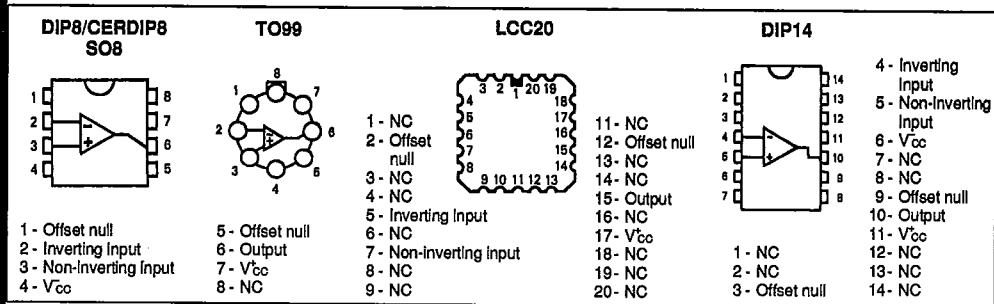


### ORDER CODES

| 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)

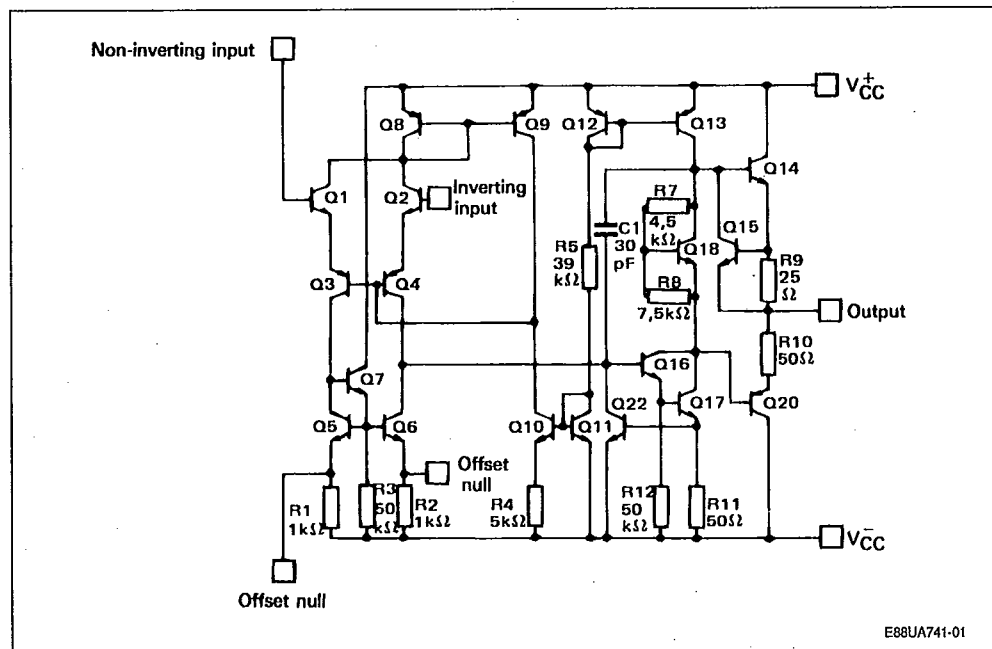


## ABSOLUTE MAXIMUM RATINGS S G S-THOMSON

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

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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

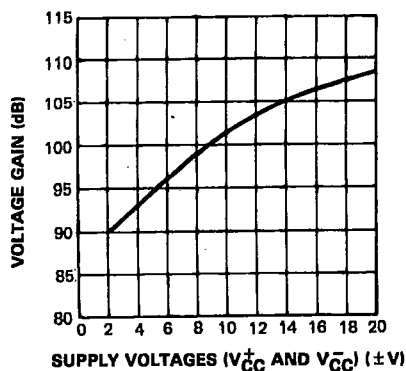
| Symbol               | Parameter                                                                                                                                                                                                                                                                | UA741C, E, I, M, A   |            |                  | Unit             |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------|------------------|------------------|
|                      |                                                                                                                                                                                                                                                                          | Min.                 | Typ.       | Max.             |                  |
| $V_{\text{IO}}$      | Input Offset Voltage $R_S \leq 10\text{ k}\Omega$<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$<br>UA741E, A<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$ |                      | 1<br><br>1 | 5<br>6<br>2<br>4 | mV               |
| $I_{\text{IO}}$      | Input Offset Current<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$                                                                                                                                                |                      | 2          | 20<br>40         | nA               |
| $I_{\text{IB}}$      | Input Bias Current<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$                                                                                                                                                  |                      | 10         | 100<br>200       | nA               |
| $A_{\text{VD}}$      | Large Signal Voltage Gain<br>( $V_O = \pm 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ )<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$                                                                                 | 50<br>25             | 200        |                  | V/mV             |
| SVR                  | Supply Voltage Rejection Ratio<br>( $R_S \leq 10\text{ k}\Omega$ )<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$                                                                                                  | 77<br>77             | 90         |                  | dB               |
| $I_{\text{CC}}$      | Supply Current, no Load<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$                                                                                                                                             |                      | 1.7        | 2.8<br>3.3       | mA               |
| $V_{\text{I}}$       | Input Voltage Range<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$                                                                                                                                                 | - 12<br>- 12         |            | + 12<br>+ 12     | V                |
| CMR                  | Common Mode Rejection Ratio<br>( $R_S \leq 10\text{ k}\Omega$ )<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$                                                                                                     | 70<br>70             | 90         |                  | dB               |
| $I_{\text{OS}}$      | Output Short-circuit Current<br>$T_{\text{amb}} = 25^{\circ}\text{C}$                                                                                                                                                                                                    | 10                   | 25         | 40               | mA               |
| $\pm V_{\text{OPP}}$ | Output Voltage Swing<br>$T_{\text{amb}} = 25^{\circ}\text{C}$<br>$T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$<br>$R_L = 10\text{ k}\Omega$<br>$R_L = 2\text{ k}\Omega$<br>$R_L = 10\text{ k}\Omega$<br>$R_L = 2\text{ k}\Omega$                              | 12<br>10<br>12<br>10 | 14<br>13   |                  | V                |
| $S_{\text{VO}}$      | Slew-rate ( $V_{\text{I}} = \pm 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ ,<br>$T_{\text{amb}} = 25^{\circ}\text{C}$ , unity gain)                                                                                                              | 0.25                 | 0.5        |                  | V/ $\mu\text{s}$ |
| $t_r$                | Rise Time<br>( $V_{\text{I}} = \pm 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ ,<br>$T_{\text{amb}} = 25^{\circ}\text{C}$ , unity gain)                                                                                                          |                      | 0.3        |                  | $\mu\text{s}$    |
| $K_{\text{OV}}$      | Overshoot ( $V_{\text{I}} = \pm 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ ,<br>$T_{\text{amb}} = 25^{\circ}\text{C}$ , 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<br>( $V_i = 10$ mV, $R_L = 2$ k $\Omega$ , $C_L \leq 100$ pF $f = 100$ kHz,<br>$T_{amb} = 25$ °C)                             | 0.7                | 1    | 1.6  | MHz             |
| THD    | Total Harmonic Distortion<br>( $f = 1$ kHz, $A_v = 20$ dB, $R_L = 2$ k $\Omega$ , $V_O = 2$ V <sub>pp</sub><br>$C_L \leq 100$ pF, $T_{amb} = 25$ °C) |                    | 0.06 |      | %               |
| $V_N$  | Equivalent Input Noise Voltage<br>( $f = 1$ kHz, $R_G = 100$ $\Omega$ )                                                                              |                    | 23   |      | nV/ $\sqrt{Hz}$ |
|        | Phase Margin                                                                                                                                         |                    | 50   |      | Degrees         |

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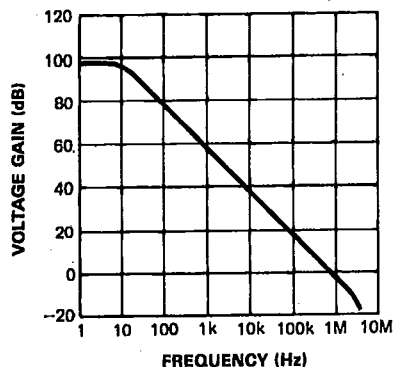
OPEN LOOP VOLTAGE GAIN (Typ.)



E88UA741-02

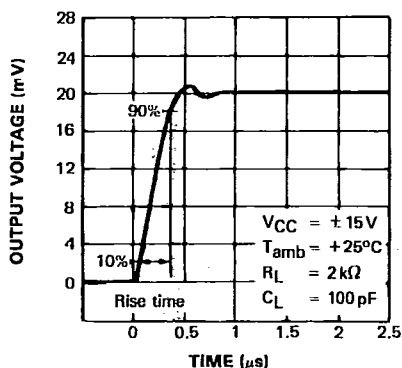
## 30E D

OPEN LOOP FREQUENCY RESPONSE (Typ.)



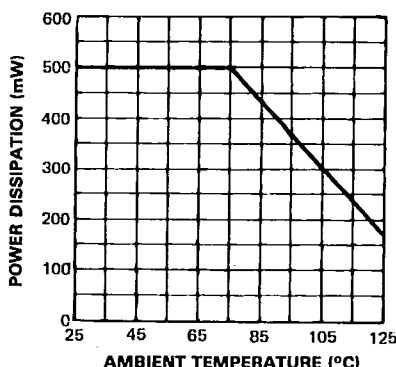
E88UA741-03

TRANSIENT RESPONSE (Typ.)



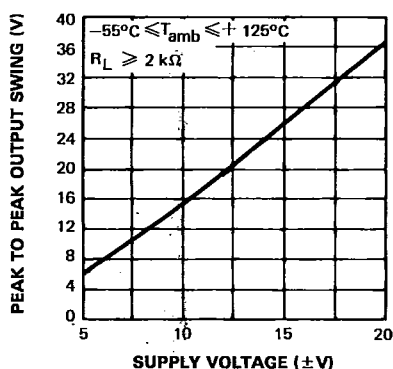
E88UA741-04

ABSOLUTE MAXIMUM POWER DISSIPATION



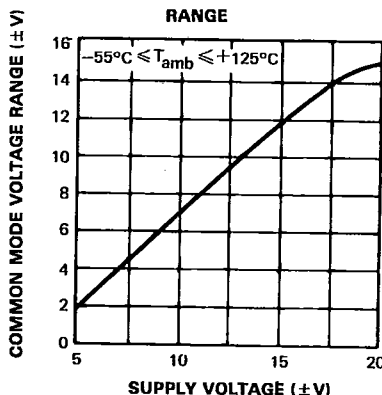
E88UA741-05

OUTPUT VOLTAGE SWING



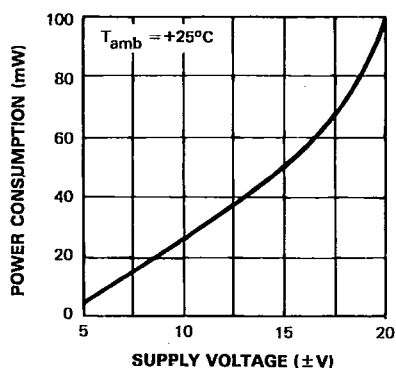
E88UA741-06

INPUT COMMON MODE VOLTAGE RANGE



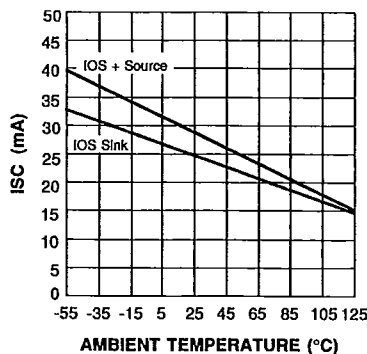
E88UA741-07

POWER CONSUMPTION



E88UA741-08

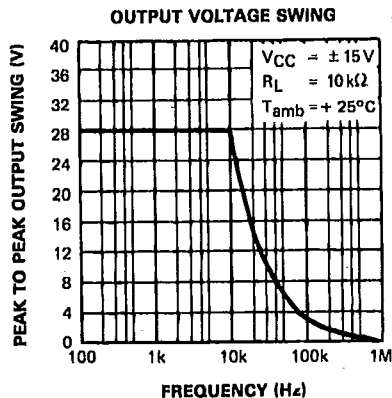
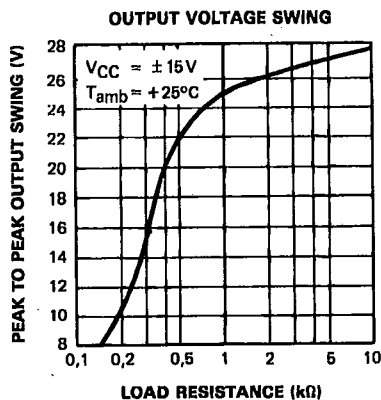
OUTPUT CURRENT vs AMBIENT TEMPERATURE



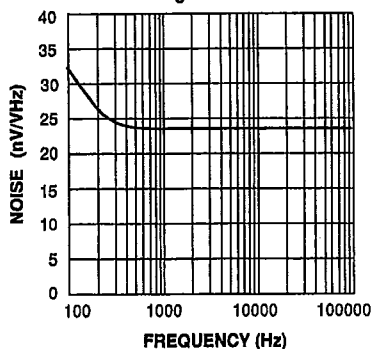
E88UA741-09

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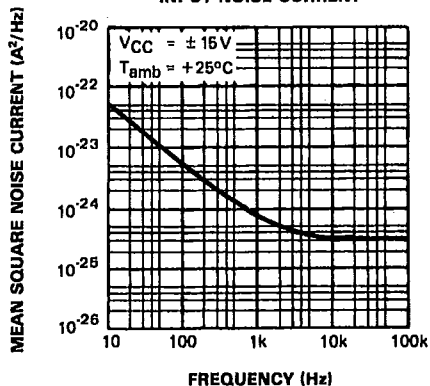


E88UA741-10  
**EQUIVALENT INPUT NOISE vs FREQUENCY**  
 $R_g = 100 \Omega$



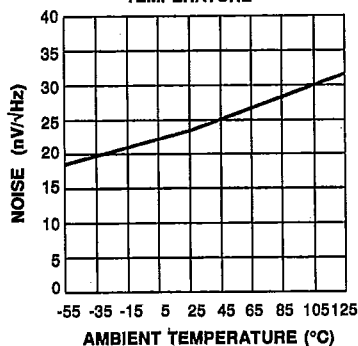
E88UA741-12

E88UA741-11  
**INPUT NOISE CURRENT**



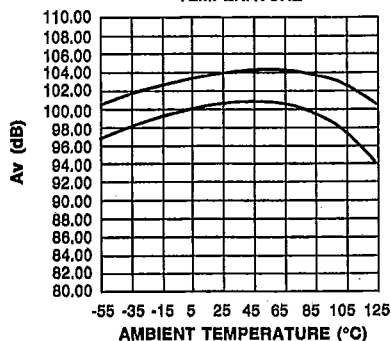
E88UA741-13

**EQUIVALENT INPUT NOISE vs AMBIENT TEMPERATURE**



E88UA741-14

**LARGE SIGNAL VOLTAGE GAIN vs AMBIENT TEMPERATURE**

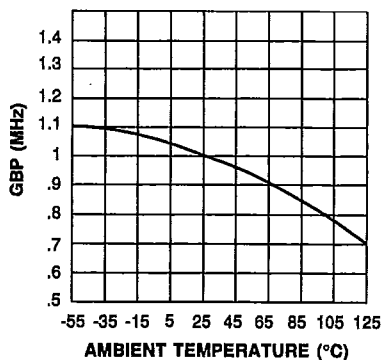


E88UA741-15

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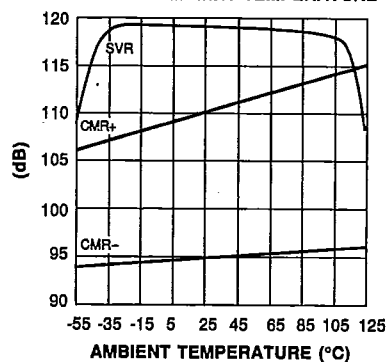
30E D

GAIN BANDWIDTH PRODUCT vs AMBIENT TEMPERATURE



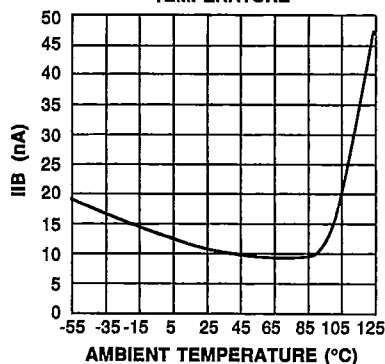
E88UA741-16

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



E88UA741-17

INPUT BIAS CURRENT vs AMBIENT TEMPERATURE

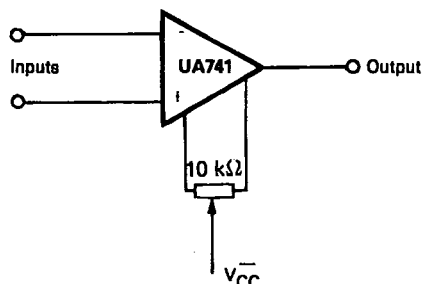


E88UA741-18

## MEASUREMENT DIAGRAMS

## VOLTAGE OFFSET NULL CIRCUIT

TO99 - DIP8 - CerdIP8

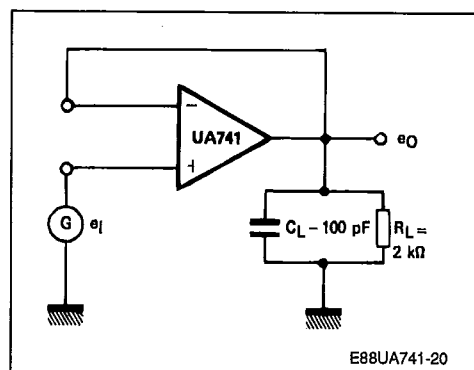


E88UA741-19

S G S-THOMSON

30E D

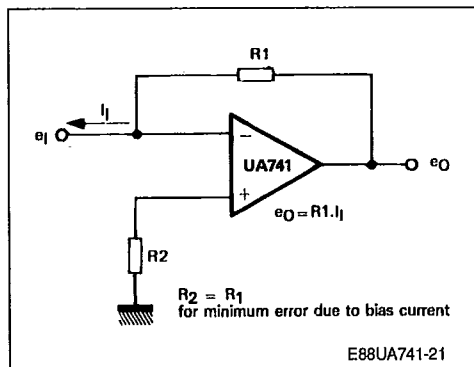
## TRANSIENT RESPONSE TEST CIRCUIT



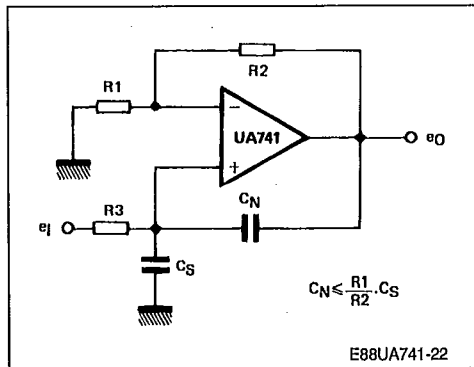
E88UA741-20

# MEASUREMENT DIAGRAMS (continued)

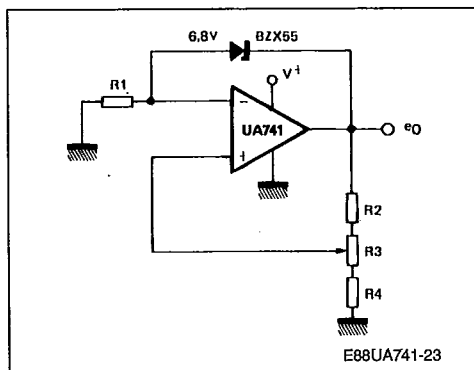
## CURRENT TO VOLTAGE CONVERTER



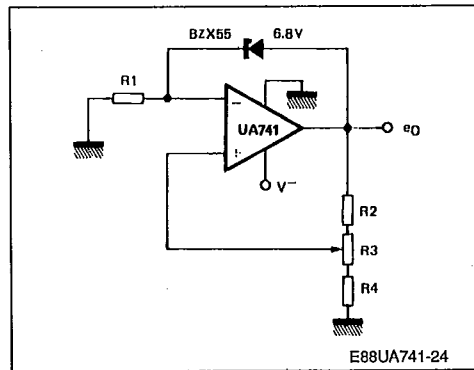
## NEUTRALIZING INPUT CAPACITANCE TO OPTIMIZE RESPONSE TIME



## POSITIVE VOLTAGE REFERENCE



## NEGATIVE VOLTAGE REFERENCE



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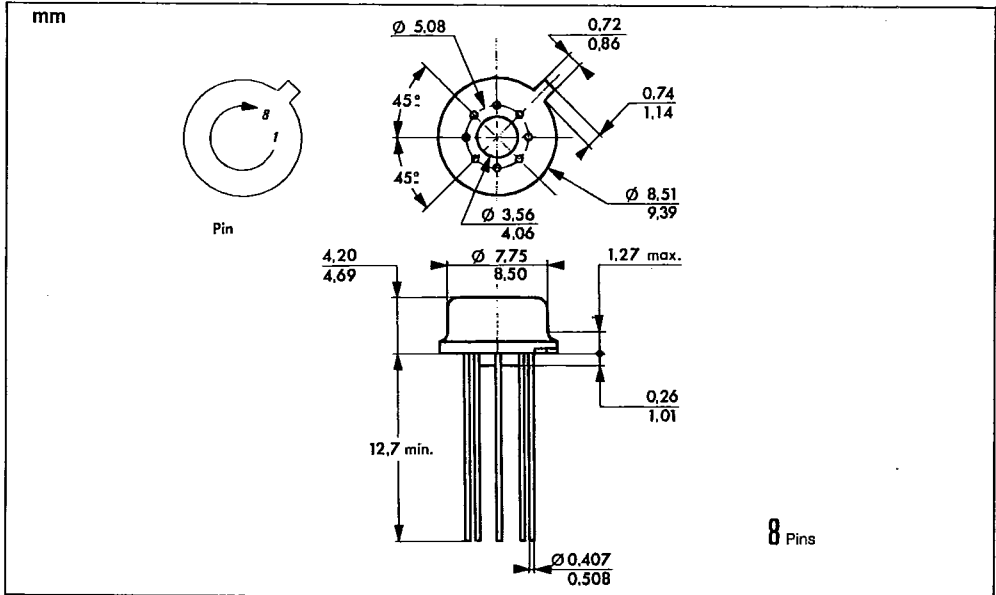
30E D

## PACKAGE MECHANICAL DATA

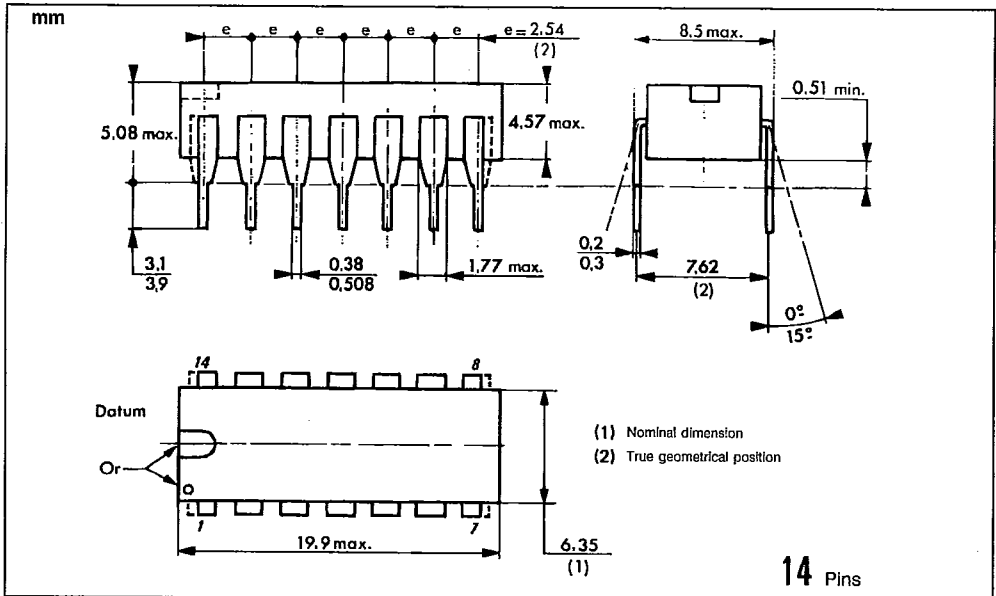
S G S-THOMSON

30E D

8 PINS - TO99 - METAL CAN



14 PINS - PLASTIC DIP



8 PINS - PLASTIC DIP OR Cerdip S G S-THOMSON

30E D



**20 PINS**

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## PACKAGE MECHANICAL DATA (continued)

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

30E D

