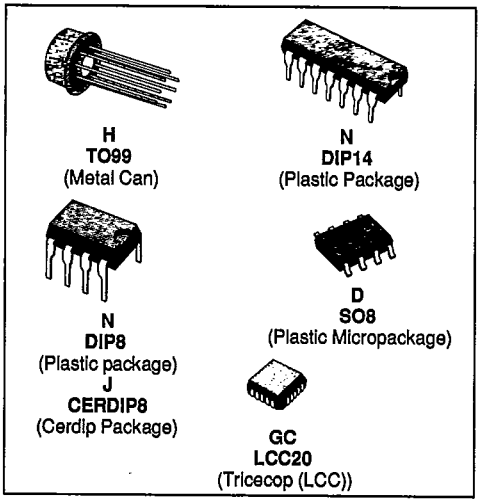
SGS-THOMSON MICROELECTRONICS

UA741

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



H
TO99
(Metal Can)

N
DIP14
(Plastic Package)

N
DIP8
(Plastic package)

J
CERDIP8
(Cerdip Package)

D
SO8
(Plastic Micropackage)

GC
LCC20
(Tricecop (LCC))

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.

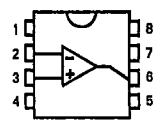
ORDER CODES

Part Number	Temperature Range	Package					
		H	J	GC	N	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

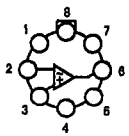
PIN CONNECTIONS (top views)

DIP8/CERDIP8
SO8



1 - Offset null
2 - Inverting Input
3 - Non-Inverting Input
4 - V_{cc}^-

TO99

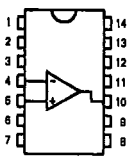


5 - Offset null
6 - Output
7 - V_{cc}^+
8 - NC

LCC20

1 - NC
2 - Offset null
3 - NC
4 - NC
5 - Inverting Input
6 - NC
7 - Non-Inverting Input
8 - NC
9 - NC
11 - NC
12 - Offset null
13 - NC
14 - NC
15 - Output
16 - NC
17 - V_{cc}^+
18 - NC
19 - NC
20 - NC

DIP14

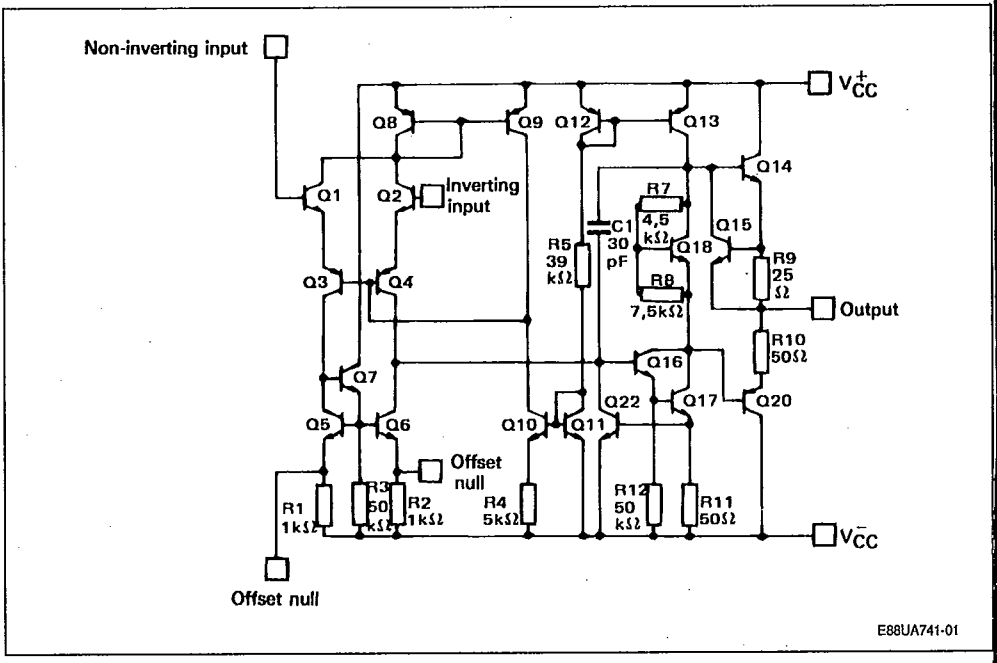


1 - NC
2 - NC
3 - Offset null
4 - Inverting Input
5 - Non-Inverting Input
6 - V_{cc}^+
7 - NC
8 - NC
9 - Offset null
10 - Output
11 - V_{cc}^-
12 - NC
13 - NC
14 - NC

ABSOLUTE MAXIMUM RATINGS S G S-THOMSON 30E D

Symbol	Parameter	Value			Unit
		UA741M, A	UA741I	UA741C, E	
V_{CC}	Supply Voltage	± 22	± 22	± 22	V
V_i	Input Voltage	± 15	± 15	± 15	V
V_{id}	Differential Input Voltage	± 30	± 30	± 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_{CC}^+	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.

S G S-THOMSON 30E D

ELECTRICAL CHARACTERISTICS

T-79-05-10

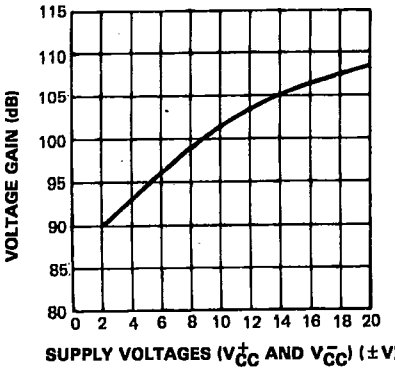
UA741M/A : $-55\ °C \le T_{amb} \le +125\ °C$, $V_{CC} = \pm 15\ V$
UA741I : $-40\ °C \le T_{amb} \le +105\ °C$, $V_{CC} = \pm 15\ V$
UA741C/E : $0\ °C \le T_{amb} \le +70\ °C$, $V_{CC} = \pm 15\ V$
(unless otherwise specified)

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

ELECTRICAL CHARACTERISTICS (continued)

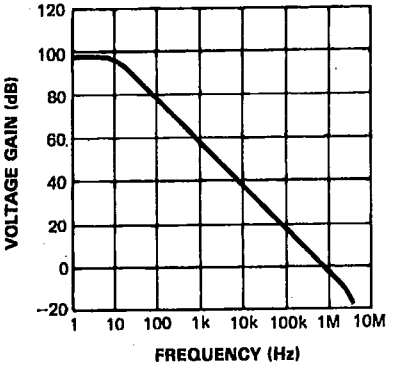
Symbol	Parameter	UA741C, E, I, M, A			Unit
		Min.	Typ.	Max.	
GPB	Gain Bandwidth Product (V_I = 10 mV, R_L = 2 kΩ, C_L ≤ 100 pF f = 100 kHz, T_{amb} = 25 °C)	0.7	1	1.6	MHz
THD	Total Harmonic Distortion (f = 1 kHz, A_V = 20 dB, R_L 2 kΩ, V_O = 2 V_{pp} C_L ≤ 100 pF, T_{amb} = 25 °C)		0.06		%
V_N	Equivalent Input Noise Voltage (f = 1 kHz, R_G = 100 Ω)		23		nV/√Hz
	Phase Margin		50		Degrees

OPEN LOOP VOLTAGE GAIN (Typ.)



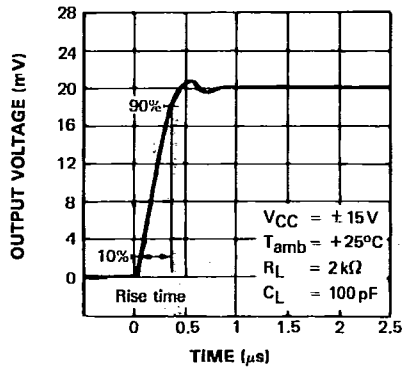
E88UA741-02

OPEN LOOP FREQUENCY RESPONSE (Typ.)



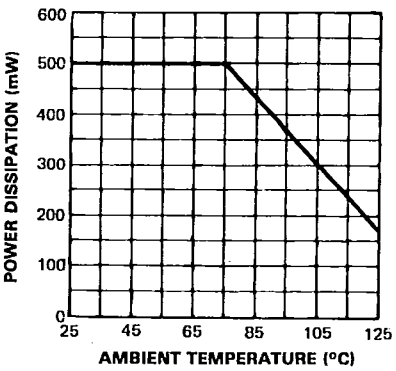
E88UA741-03

TRANSIENT RESPONSE (Typ.)



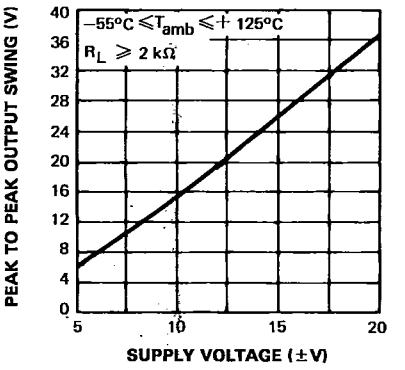
E88UA741-04

ABSOLUTE MAXIMUM POWER DISSIPATION



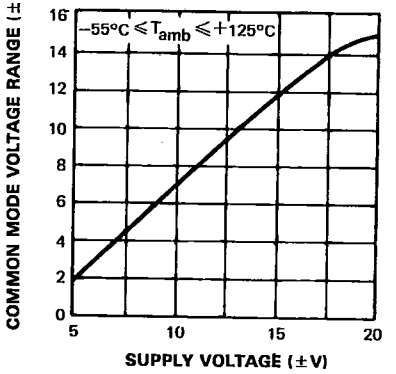
E88UA741-05

OUTPUT VOLTAGE SWING



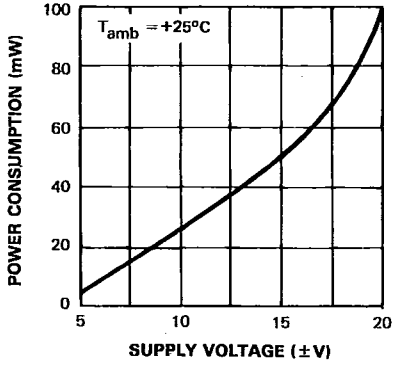
E88UA741-06

INPUT COMMON MODE VOLTAGE RANGE



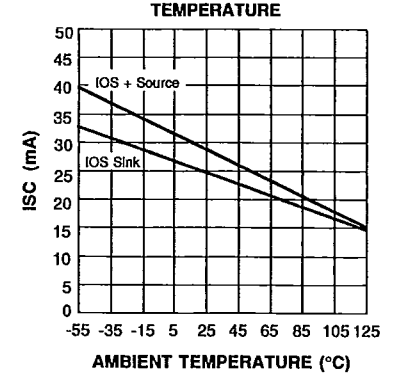
E88UA741-07

POWER CONSUMPTION



E88UA741-08

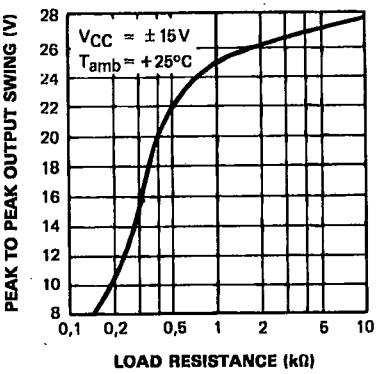
OUTPUT CURRENT vs AMBIENT TEMPERATURE



E88UA741-09

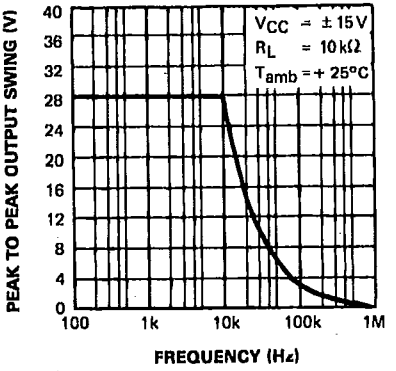
S G S-THOMSON 30E D

OUTPUT VOLTAGE SWING



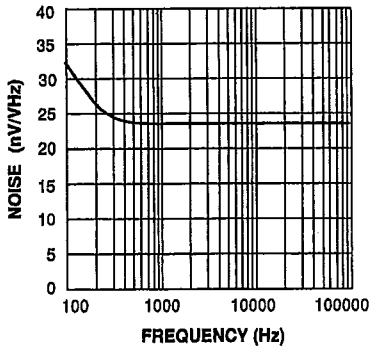
E88UA741-10

OUTPUT VOLTAGE SWING



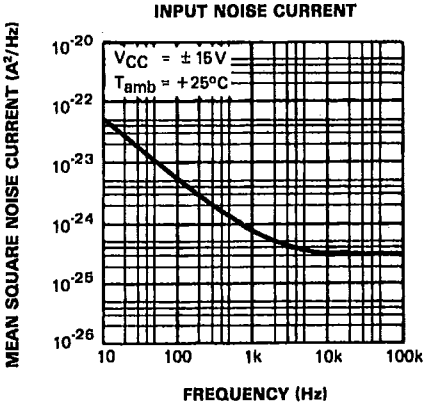
E88UA741-11

EQUIVALENT INPUT NOISE vs FREQUENCY
Rg = 100 Ω



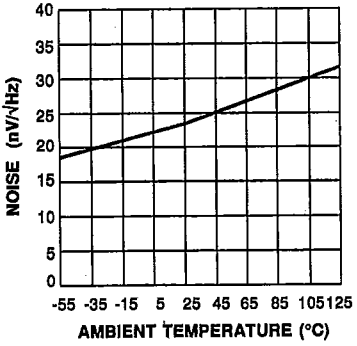
E88UA741-12

INPUT NOISE CURRENT



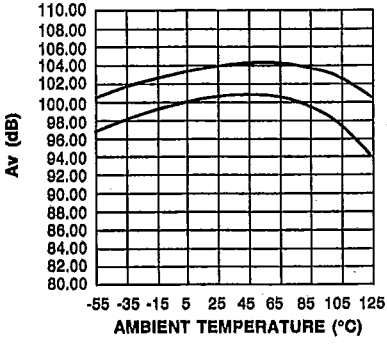
E88UA741-13

EQUIVALENT INPUT NOISE vs AMBIENT TEMPERATURE



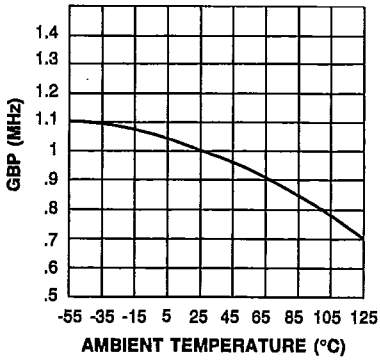
E88UA741-14

LARGE SIGNAL VOLTAGE GAIN vs AMBIENT TEMPERATURE



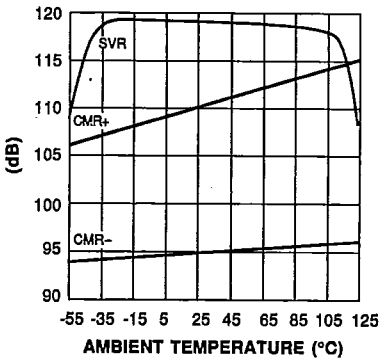
E88UA741-15

GAIN BANDWIDTH PRODUCT vs AMBIENT TEMPERATURE



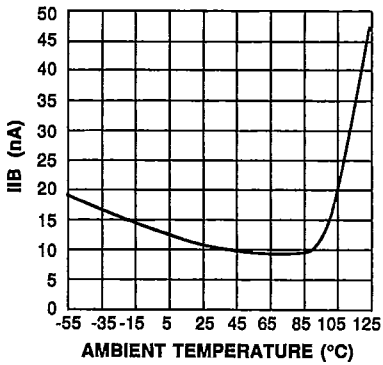
E88UA741-16

POWER SUPPLY & COMMON MODE REJECTION RATIO vs AMBIENT TEMPERATURE



E88UA741-17

INPUT BIAS CURRENT vs AMBIENT TEMPERATURE



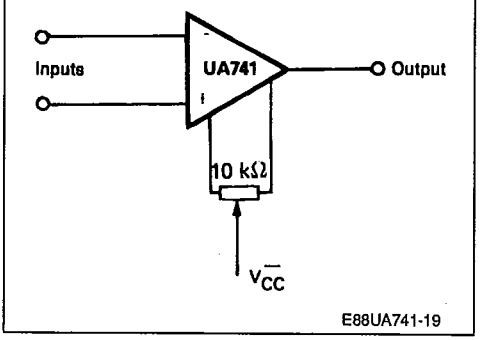
E88UA741-18

MEASUREMENT DIAGRAMS

S G S-THOMSON 30E D

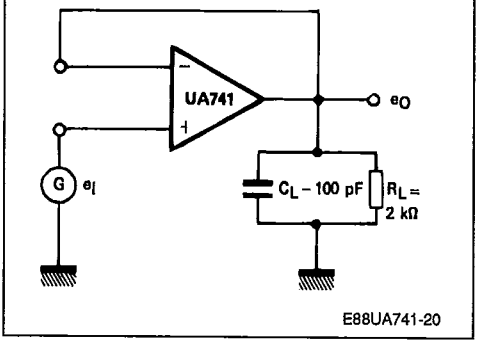
VOLTAGE OFFSET NULL CIRCUIT

TO99 – DIP8 – CERDIP8



E88UA741-19

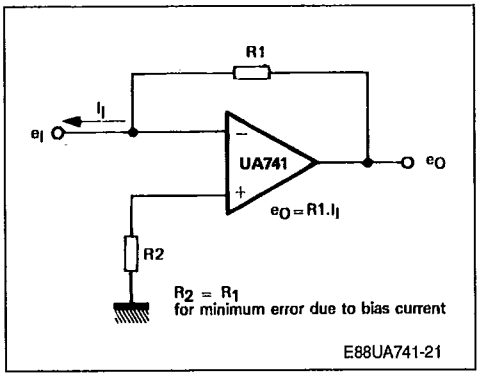
TRANSIENT RESPONSE TEST CIRCUIT



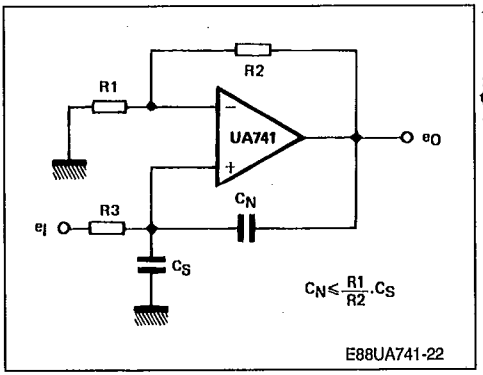
E88UA741-20

MEASUREMENT DIAGRAMS (continued)

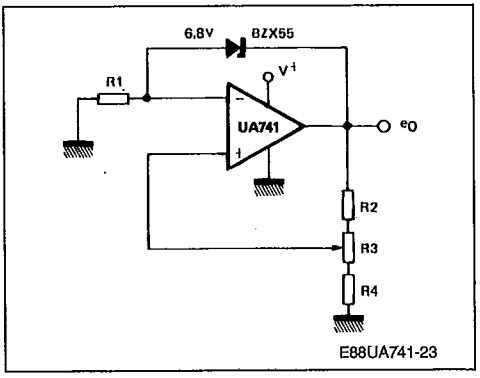
CURRENT TO VOLTAGE CONVERTER



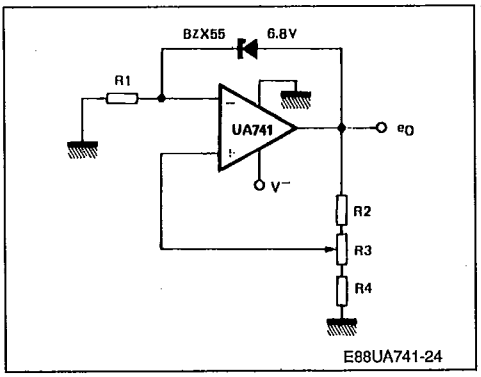
NEUTRALIZING INPUT CAPACITANCE TO OPTIMIZE RESPONSE TIME



POSITIVE VOLTAGE REFERENCE



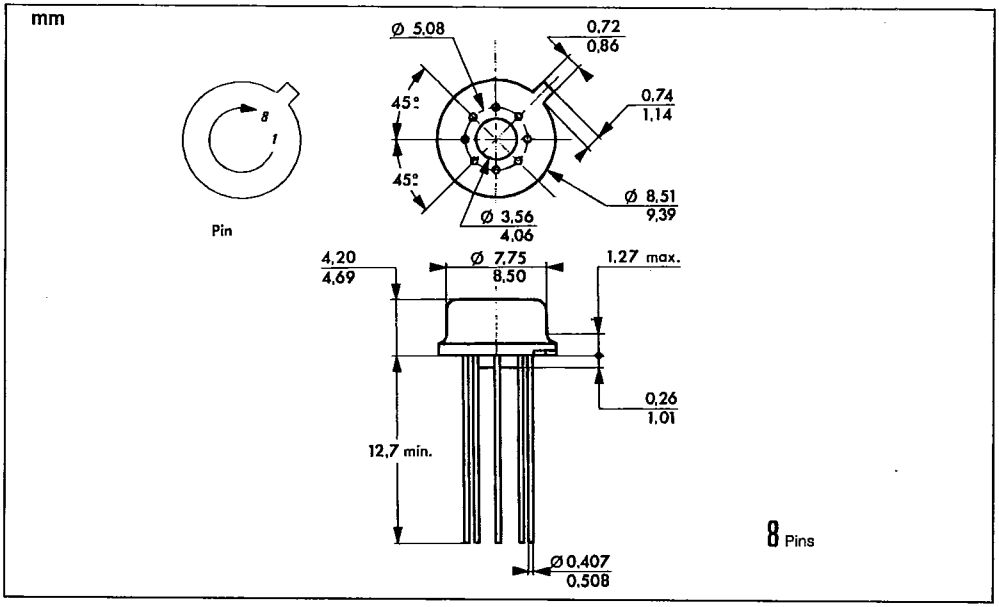
NEGATIVE VOLTAGE REFERENCE



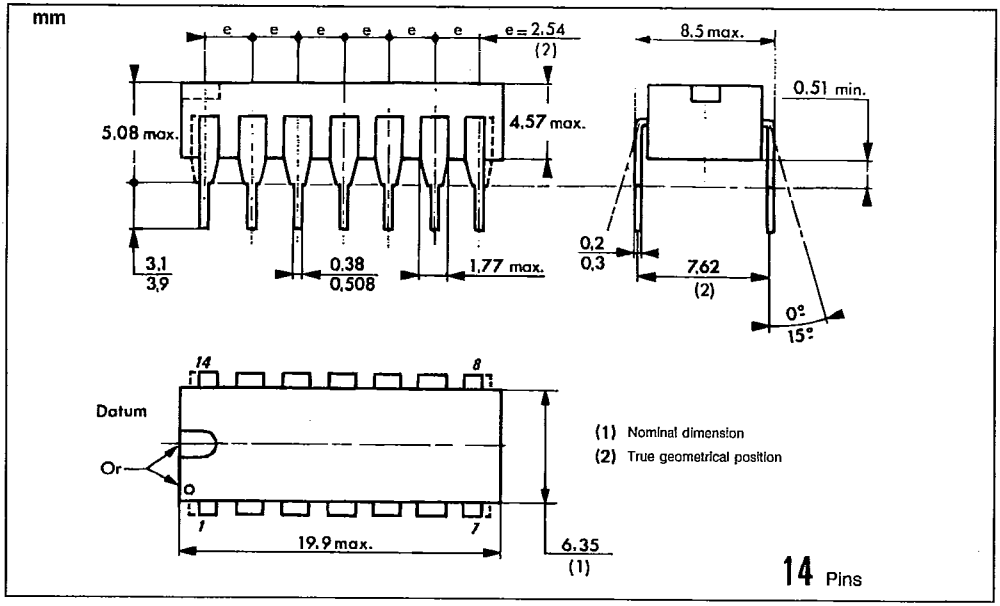
S G S-THOMSON 30E D

PACKAGE MECHANICAL DATA

8 PINS – TO99 – METAL CAN

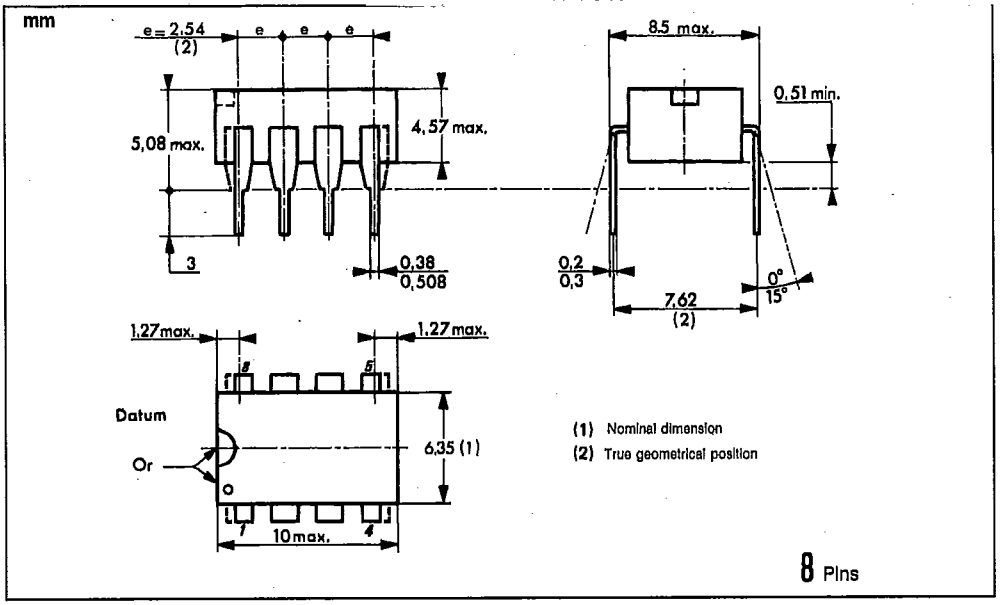


14 PINS – PLASTIC DIP

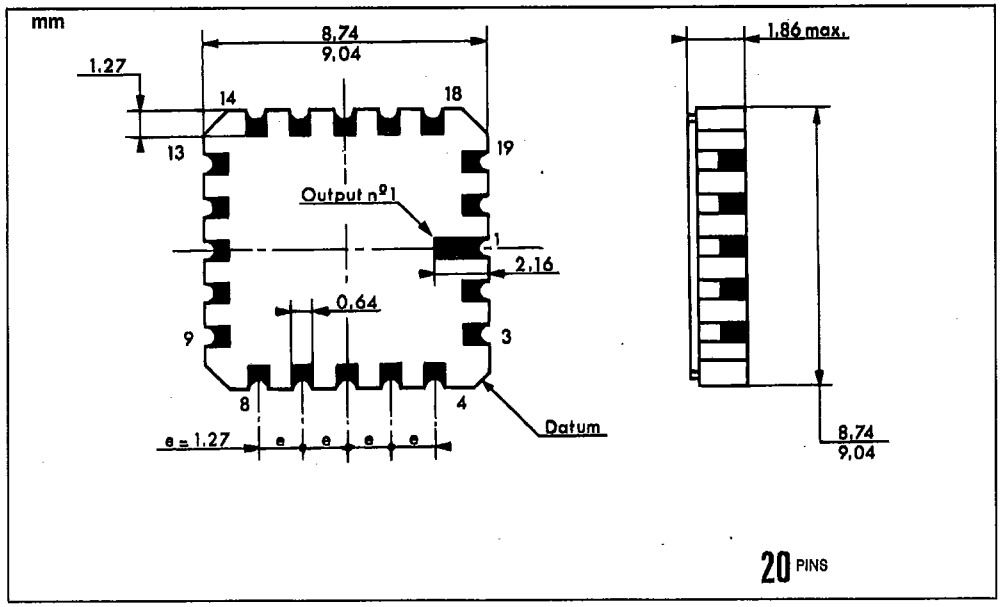


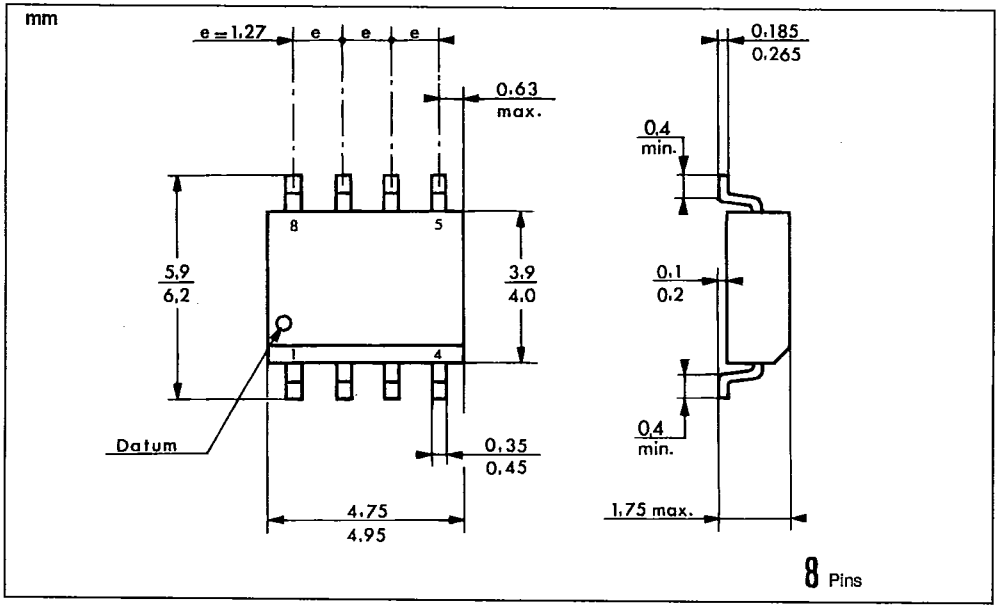
PACKAGE MECHANICAL DATA (continued)

8 PINS – PLASTIC DIP OR CERDIP S G S-THOMSON 30E D



20 PINS – TRICECOP (LCC)



PACKAGE MECHANICAL DATA (continued)

8 PINS – PLASTIC MICROPACKAGE (SO) S G S-THOMSON 30E D