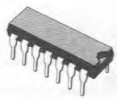
SGS-THOMSON MICROELECTRONICS

TL084
TL084A-TL084B

J–FET INPUT QUAD OP-AMPs

- LOW POWER CONSUMPTION
- WIDE COMMON-MODE AND DIFFERENTIAL VOLTAGE RANGE
- LOW INPUT BIAS AND OFFSET CURRENT
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J–FET INPUT STAGE
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE : 13 V/µs (typ)



N
DIP14
(Plastic package)

GC
LCC20
(Tricecop (LCC))

J
CERDIP14
(Cerdip package)

D
SO14
(Plastic micropackage)

ORDER CODES

Part Number	Temperature Range	Package			
		N	J	D	GC
TL084M	– 55 °C to + 125 °C		•		•
TL084I	– 40 °C to + 105 °C	•		•	
TL084C	0 °C to + 70 °C	•		•	
TL084AC	0 °C to + 70 °C	•		•	
TL084BC	0 °C to + 70 °C	•		•	

Note : Hi-Rel Versions Available
Examples : TL084MGC, TL084CN, TL084CD

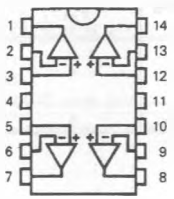
DESCRIPTION

The TL084, TL084A and TL084B are high speed J–FET input quad operational amplifiers incorporating well matched, high voltage J–FET and bipolar transistors in a monolithic integrated circuit.

The devices feature high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient.

PIN CONNECTIONS (Top views)

DIP14
CERDIP14
SO14



1 - Output 1
2 - Inverting input 1
3 - Non-inverting input 1
4 - V_{CC}^-
5 - Non-inverting input 2
6 - Inverting input 2
7 - Output 2
8 - Output 3
9 - Inverting input 3
10 - Non-inverting input 3
11 - V_{CC}^+
12 - Non-inverting input 4
13 - Inverting input 4
14 - Output 4

LCC20

1 - NC
2 - Output 1
3 - Inverting input 1
4 - Non-inverting input 1
5 - NC
6 - V_{CC}^-
7 - NC
8 - Non-inverting input 2
9 - Inverting input 2
10 - Output 2
11 - NC
12 - Output 3
13 - Inverting input 3
14 - Non-inverting input 3
15 - NC
16 - V_{CC}^+
17 - NC
18 - Non-inverting input 4
19 - Inverting input 4
20 - Output 4

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage (note 1)	± 18	V
V_i	Input Voltage (note 3)	± 15	V
V_{ID}	Differential Input Voltage (note 2)	± 30	V
P_{tot}	Power Dissipation	680	mW
	Output Short-circuit Duration (note 4)	Indefinite	
T_{oper}	Operating Free-air Temperature Range TL084C, AC, BC TL084I, BI TL084M	 0 to 70 – 40 to 105 – 55 to 125	°C
T_{stg}	Storage Temperature Range	– 65 to 150	°C

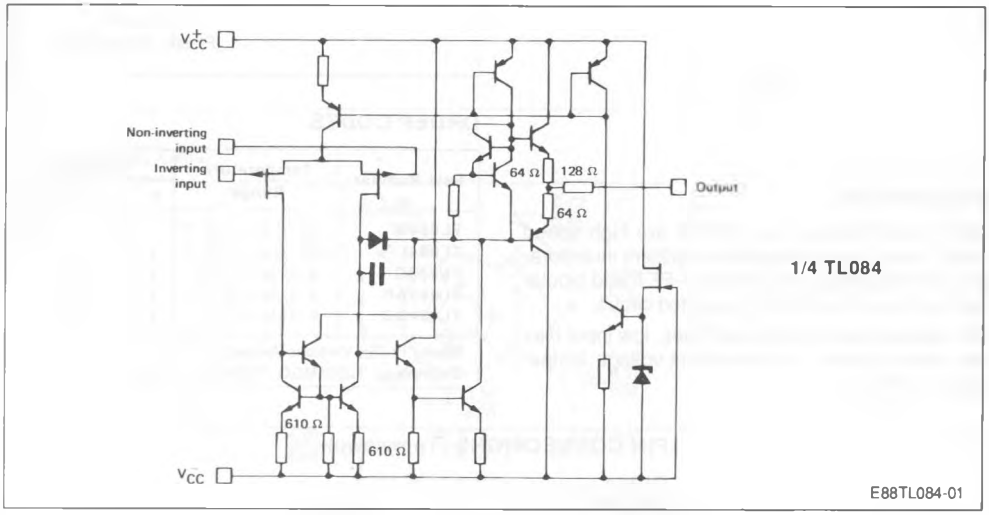
Notes 1. All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V_{CC}^- and V_{CC}^+.

2. Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.

3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.

4. The output may be shorted to ground or to either supply. Temperature and /or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

SCHEMATIC (each amplifier)



Case	Outputs	Inverting Inputs	Non-inverting Inputs	V_{CC}^-	V_{CC}^+	N.C.
DIP14 CERDIP14 SO14	1, 7, 14, 8	2, 6, 13, 9	3, 5, 12, 10	4	11	
LCC20	2, 10, 12, 20	3, 9, 13, 19	4, 8, 14, 18	6	16	*

* LCC20 : Other pins are not connected.

ELECTRICAL CHARACTERISTICS

$V_{CC} = \pm 15$ V (unless otherwise specified)
TL084M : $-55\ ^\circ C \le T_{amb} \le +125\ ^\circ C$
TL084I, BI : $-40\ ^\circ C \le T_{amb} \le +105\ ^\circ C$
TL084C, AC, BC: $0\ ^\circ C \le T_{amb} \le +70\ ^\circ C$

Symbol	Parameter	TL084M, I, BI TL084BC, AC			TL084C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage T_{amb} = 25 °C (Rs ≤ 10 kΩ) TL084BI, BC $T_{min} \le T_{amb} \le T_{max}$ TL084BI, BC		3 1	5 3 9 5		3	8 13	mV
DV_{io}	Input Offset Voltage Drift		10			10		µV/°C
I_{io}	Input Offset Current * T_{amb} = 25 °C $T_{min} \le T_{amb} \le T_{max}$		5	50 4		5	50 4	pA nA
I_{ib}	Input Bias Current * T_{amb} = 25 °C $T_{min} \le T_{amb} \le T_{max}$		30	200 20		30	200 20	pA nA
A_{vd}	Large Signal Voltage Gain (R_L > 2 kΩ, V_o = ± 10 V) T_{amb} = 25 °C $T_{min} \le T_{amb} \le T_{max}$	50 25	200		50 25	200		V/mV
SVR	Supply Voltage Rejection Ratio (R_S < 10 kΩ) T_{amb} = 25 °C $T_{min} \le T_{amb} \le T_{max}$	80 80	86		80 80	86		dB
I_{cc}	Supply Current, per Amp, no Load T_{amb} = 25 °C $T_{min} \le T_{amb} \le T_{max}$		1.4	2.5 2.5		1.4	2.5 2.5	mA
V_i	Input Voltage Range	− 11		+ 11	− 11		+ 11	V
CMR	Common Mode Rejection Ratio (R_S ≤ 10 kΩ) T_{amb} = 25 °C $T_{min} \le T_{amb} \le T_{max}$	80 80	86		70 70	86		dB
I_{os}	Output Short-circuit Current T_{amb} = 25 °C $T_{min} \le T_{amb} \le T_{max}$	10 10	40	60 60	10 10	40	60 60	mA
± V_{opp}	Output Voltage Swing T_{amb} = 25 °C $R_L \ge 2$ kΩ $R_L \ge 10$ kΩ $T_{min} \le T_{amb} \le T_{max}$ $R_L \ge 2$ kΩ $R_L \ge 10$ kΩ	11 12 11 12	12 13.5		11 12 11 12	12 13.5		V
S_{vo}	Slew-rate (V_i = 10 V, R_L = 2 kΩ C_L ≤ 100 pF, T_{amb} = 25 °C, unity gain)	12	16		8	16		V/µs
t_r	Rise Time (V_i = 20 mV, R_L = 2 kΩ C_L = 100 pF, T_{amb} = 25 °C, unity gain)		0.1			0.1		µs

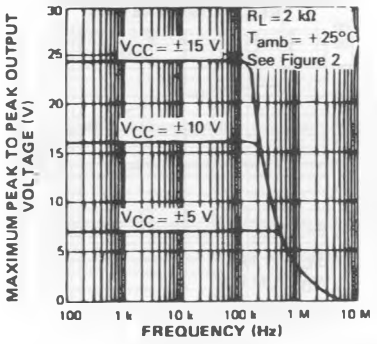
* The input bias currents are junction leakage currents wich approximatevely double for every 10 °C increase in the junction temperature.

ELECTRICAL CHARACTERISTICS

Symbol	Parameter	TL084M, I, BI TL084BC, AC			TL084C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
K_{ov}	Overshoot (V_i = 20 mV, R_L = 2 kΩ C_L < 100 pF, T_{amb} = 25 °C, unity gain)		10			10		%
GBP	Gain Bandwidth Product (f = 100 kHz, T_{amb} = 25 °C V_{in} = 10 mV, R_L = 2 kΩ, C_L = 100 pF) TL084BI, BC	2.5 3.3	4.0 4.0	5.0 5.0	2.5	4.0	5.0	MHz
R_i	Input Resistance (T_{amb} = 25 °C)		10^{12}			10^{12}		Ω
THD	Total Harmonic Distortion (f = 1 kHz, A_v = 20 dB, R_L = 2 kΩ C_L < 100 pF, T_{amb} = 25 °C, V_o = 2 V_{pp})		0.01			0.01		%
V_n	Equivalent Input Noise Voltage (f = 1 kHz, R_g = 100 Ω)		15			15		nV/√Hz
Øm	Phase Margin		45			45		Degrees
V_{O1}/V_{O2}	Channel Separation A_{vd} = 100, T_{amb} = 25 °C		120			120		dB

TYPICAL CHARACTERISTICS

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



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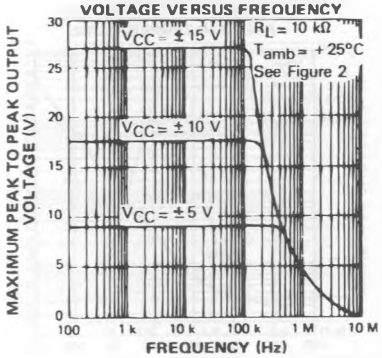
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



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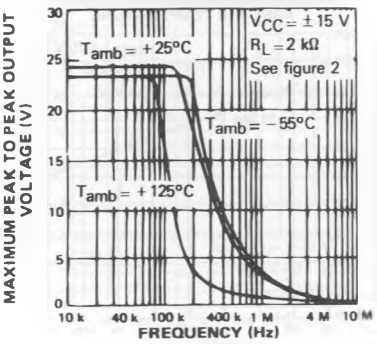
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



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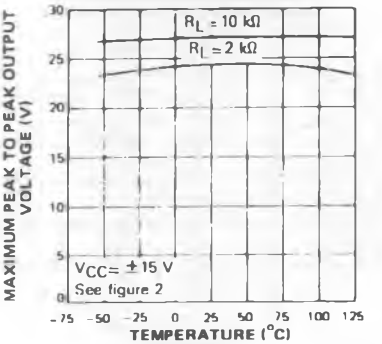
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREE-AIR TEMP.



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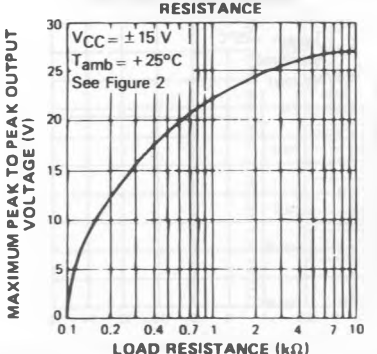
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE



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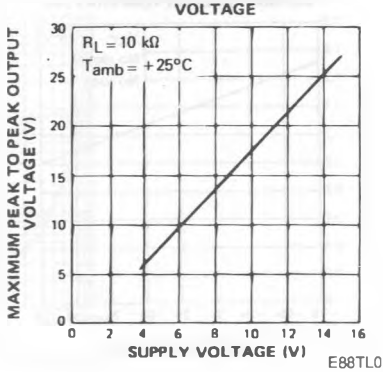
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE



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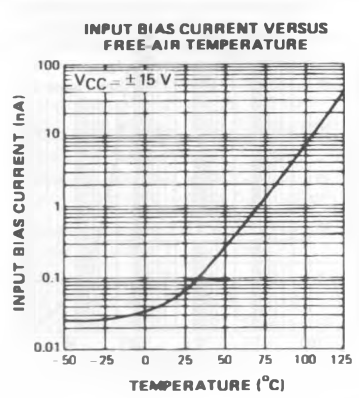
TYPICAL CHARACTERISTICS (continued)



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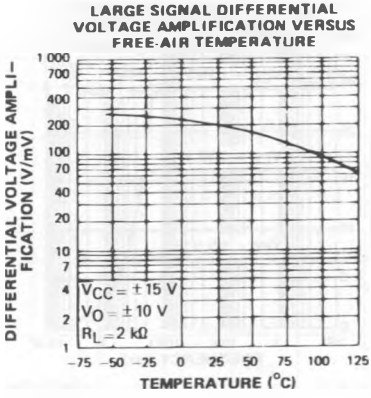

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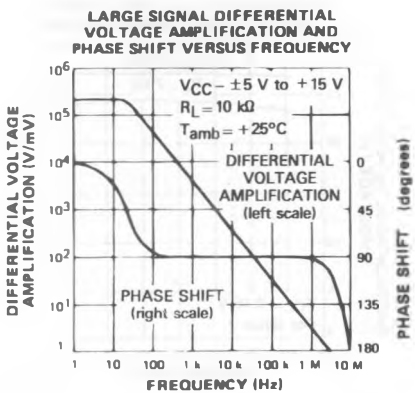

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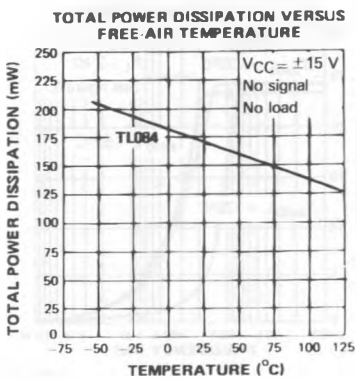

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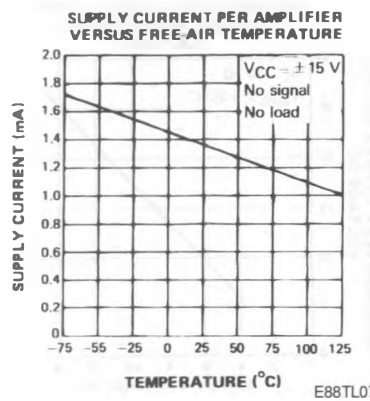

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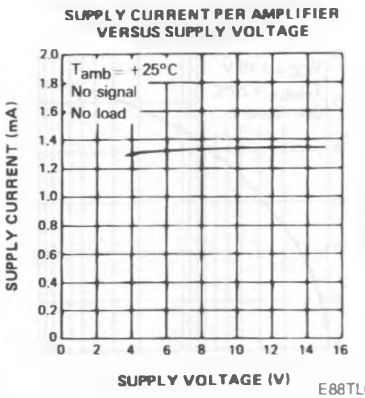

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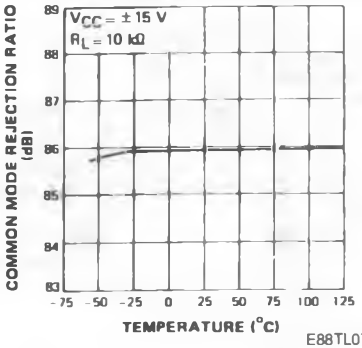
TYPICAL CHARACTERISTICS (continued)

COMMON MODE REJECTION RATIO VERSUS FREE-AIR TEMPERATURE



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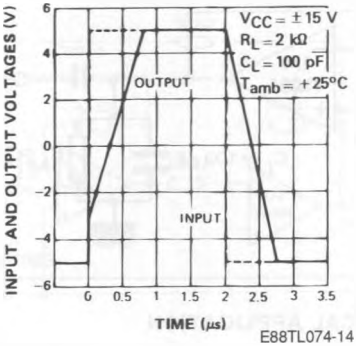
VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



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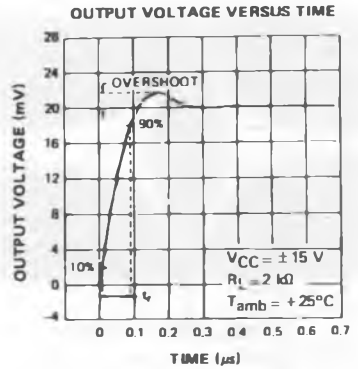
OUTPUT VOLTAGE VERSUS TIME



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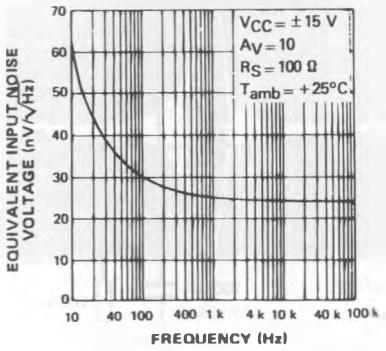
EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



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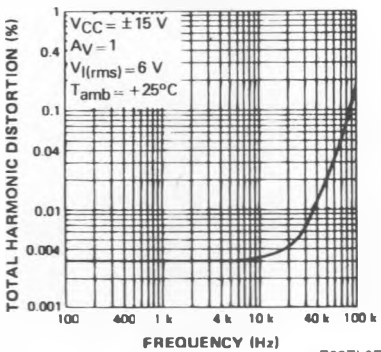
TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



E88TL074-17

PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage follower.

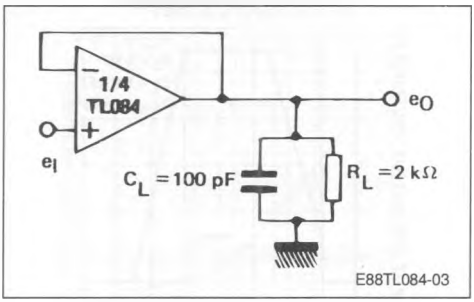
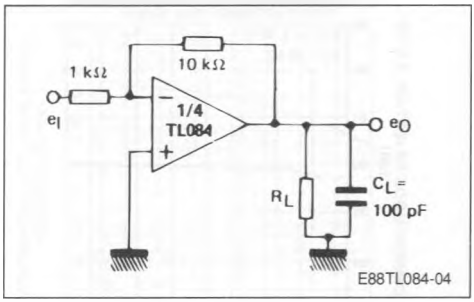


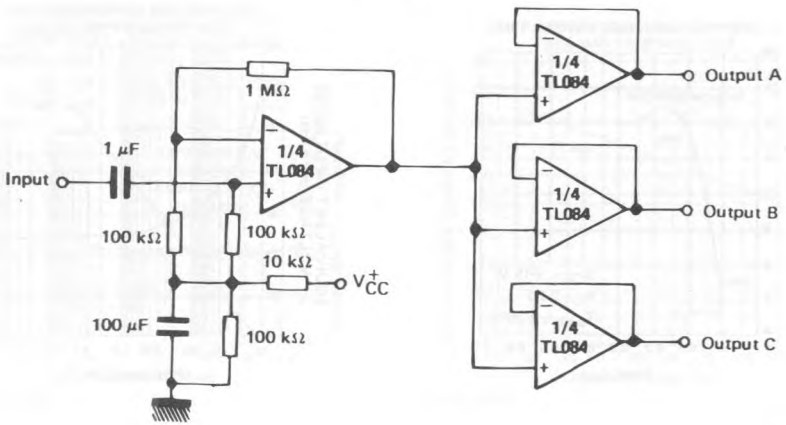
Figure 2 : Gain-of-10 inverting amplifier.



TYPICAL APPLICATION

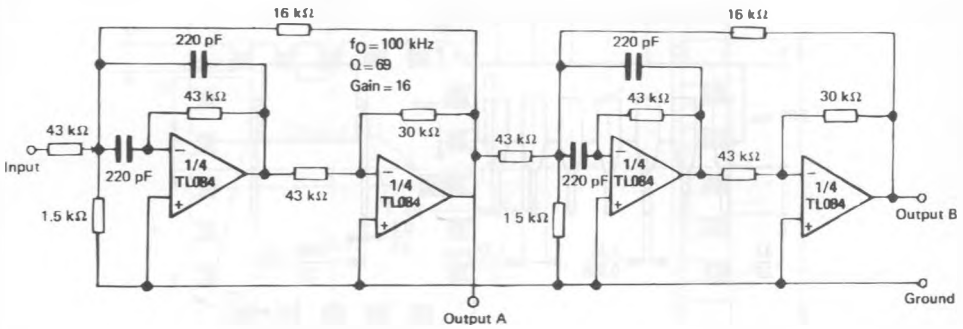
AUDIO DISTRIBUTION AMPLIFIER

f_O = 100 kHz



TYPICAL APPLICATION (continued)

POSITIVE FEEDBACK BANDPASS FILTER



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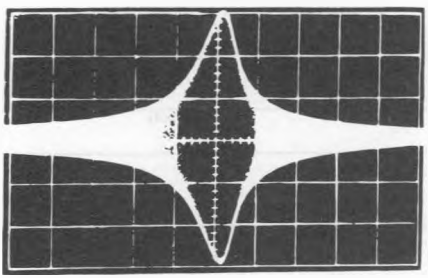
OUTPUT A



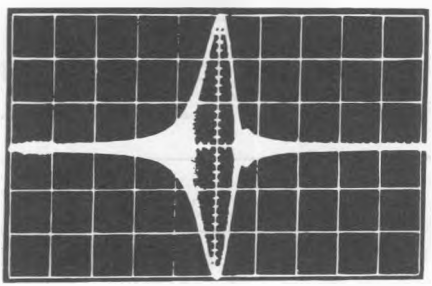
E88TL074-23

2 kHz /div

SECOND ORDER BANDPASS FILTER

f_O = 100 kHz; Q = 30; Gain = 4

OUTPUT B



E88TL074-22

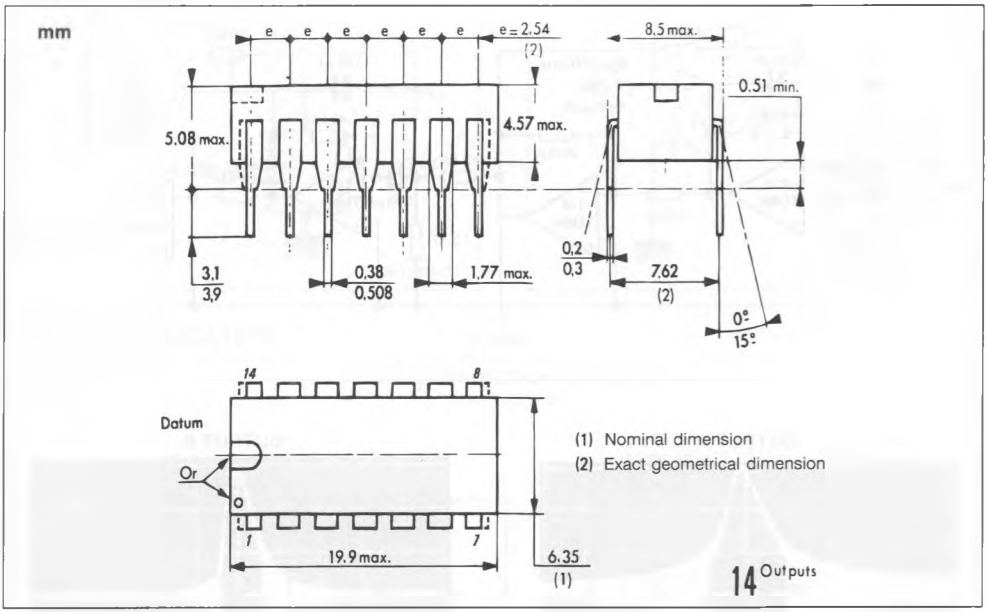
2 kHz /div

CASCADED BANDPASS FILTER

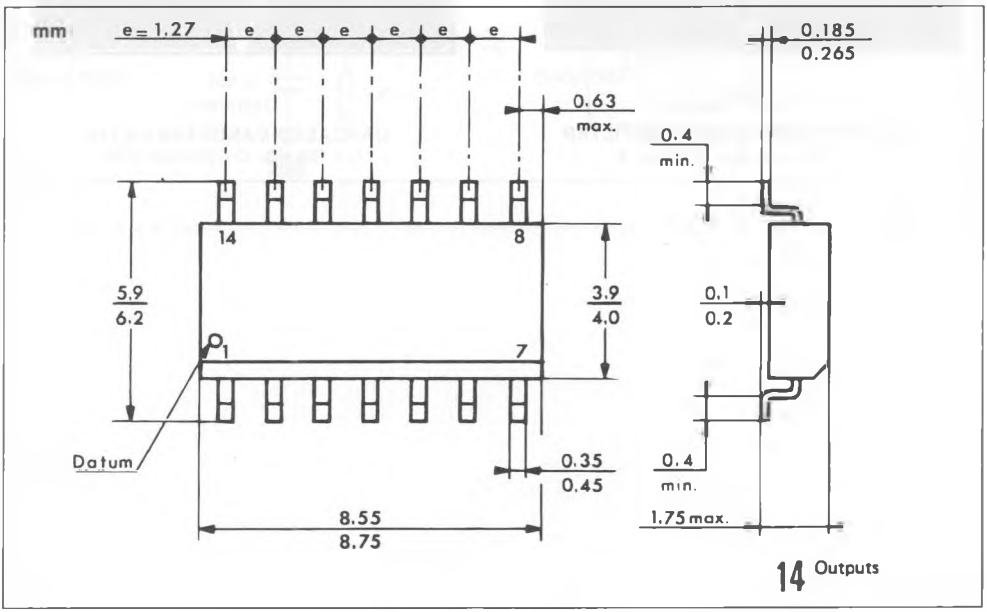
f_O = 100 kHz; Q = 69; Gain = 16

PACKAGE MECHANICAL DATA

14 PINS – PLASTIC DIP OR CERDIP



14 PINS – PLASTIC MICROPACKAGE (SO)



20 PINS – TRICECOP (LCC)