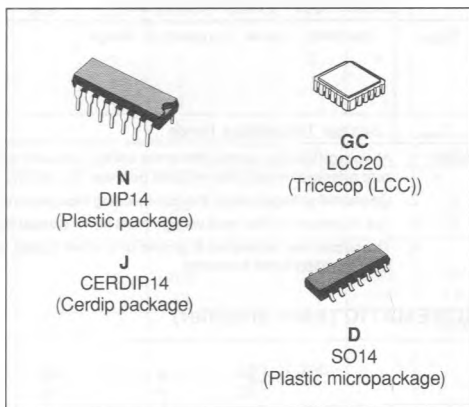


J-FET INPUT QUAD OP-AMPS

- 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/ μ s (typ)



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.

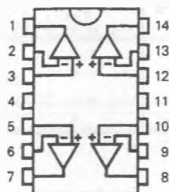
ORDER CODES

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

PIN CONNECTIONS (Top views)

**DIP14
CERDIP14
SO14**



LCC20



- 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

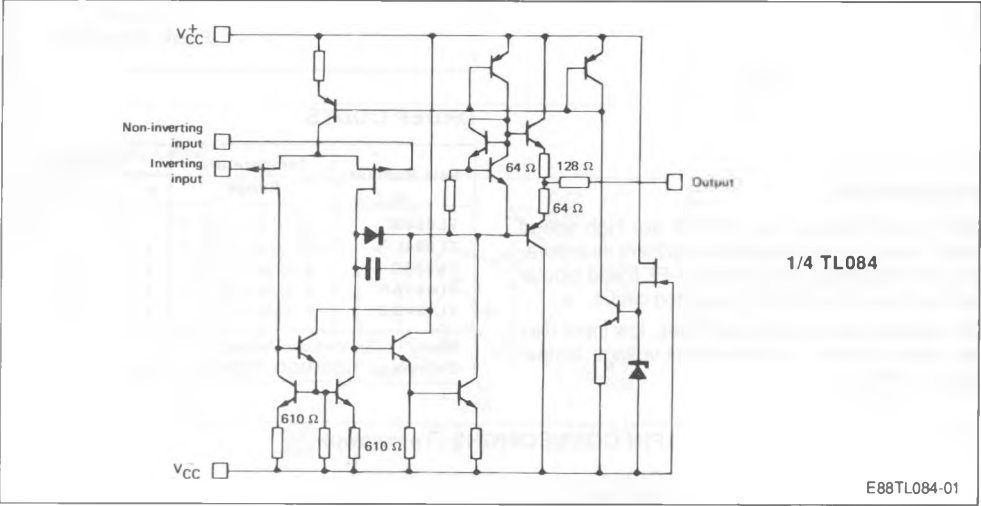
- 1 - NC
- 2 - Output 1
- 3 - Inverting input 1
- 4 - Non-inverting input 1
- 5 - NC
- 6 - V_{cc}
- 7 - NC
- 8 - Non-inverting input 2
- 9 - Inverting input 2
- 10 - Output 2
- 11 - NC
- 12 - Output 3
- 13 - Inverting input 3
- 14 - Non-inverting input 3
- 15 - NC
- 16 - V_{cc}
- 17 - NC
- 18 - Non-inverting 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	$^{\circ}\text{C}$
T_{sig}	Storage Temperature Range	- 65 to 150	$^{\circ}\text{C}$

- 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

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

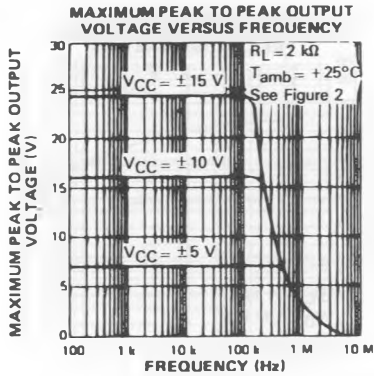
Symbol	Parameter	TL084M, I, BI TL084BC, AC			TL084C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage $T_{amb} = 25\text{ }^{\circ}\text{C}$ ($R_S \leq 10\text{ k}\Omega$) TL084BI, BC $T_{min} \leq T_{amb} \leq T_{max}$ TL084BI, BC		3 1	5 3 9 5		3	8 13	mV
DV_{io}	Input Offset Voltage Drift		10			10		$\mu\text{V}/^{\circ}\text{C}$
I_{io}	Input Offset Current * $T_{amb} = 25\text{ }^{\circ}\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$		5	50 4		5	50 4	μA nA
I_{ib}	Input Bias Current * $T_{amb} = 25\text{ }^{\circ}\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$		30	200 20		30	200 20	μA nA
A_{vd}	Large Signal Voltage Gain ($R_L > 2\text{ k}\Omega$, $V_o = \pm 10\text{ V}$) $T_{amb} = 25\text{ }^{\circ}\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$	50 25	200		50 25	200		V/mV
SVR	Supply Voltage Rejection Ratio ($R_S < 10\text{ k}\Omega$) $T_{amb} = 25\text{ }^{\circ}\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$	80 80	86		80 80	86		dB
I_{sc}	Supply Current, per Amp. no Load $T_{amb} = 25\text{ }^{\circ}\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$		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 ($R_S \leq 10\text{ k}\Omega$) $T_{amb} = 25\text{ }^{\circ}\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$	80 80	86		70 70	86		dB
I_{os}	Output Short-circuit Current $T_{amb} = 25\text{ }^{\circ}\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$	10 10	40	60 60	10 10	40	60 60	mA
$\pm V_{opp}$	Output Voltage Swing $T_{amb} = 25\text{ }^{\circ}\text{C}$ $R_L \geq 2\text{ k}\Omega$ $R_L \geq 10\text{ k}\Omega$ $T_{min} \leq T_{amb} \leq T_{max}$ $R_L \geq 2\text{ k}\Omega$ $R_L \geq 10\text{ k}\Omega$	11 12 11 12	12 13.5		11 12 11 12	12 13.5		V
S_{vo}	Slew-rate ($V_i = 10\text{ V}$, $R_L = 2\text{ k}\Omega$ $C_L \leq 100\text{ pF}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$, unity gain)	12	16		8	16		V/ μs
t_r	Rise Time ($V_i = 20\text{ mV}$, $R_L = 2\text{ k}\Omega$ $C_L = 100\text{ pF}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$, unity gain)		0.1			0.1		μs

* The input bias currents are junction leakage currents which approximately double for every $10\text{ }^{\circ}\text{C}$ increase in the junction temperature.

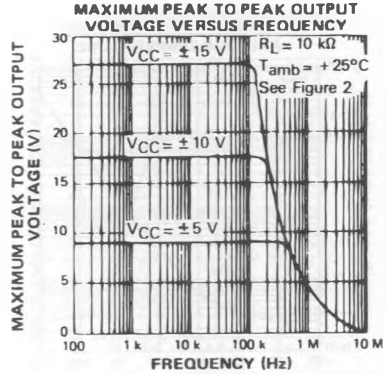
ELECTRICAL CHARACTERISTICS

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
∅m	Phase Margin		45			45		Degrees
V _{O1} /V _{O2}	Channel Separation A _{vd} = 100, T _{amb} = 25 °C		120			120		dB

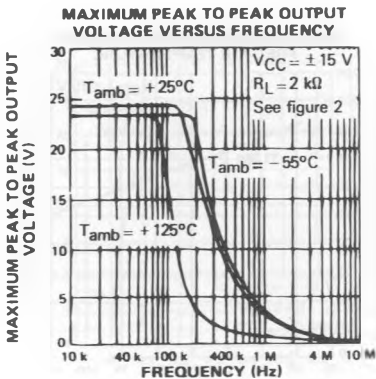
TYPICAL CHARACTERISTICS



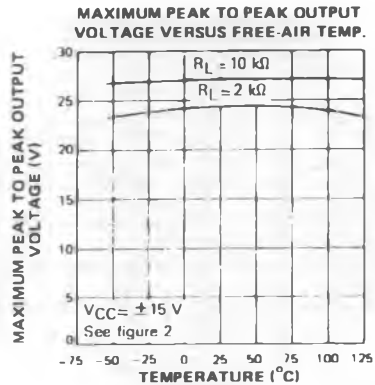
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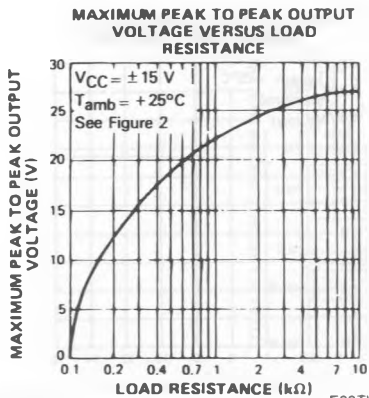
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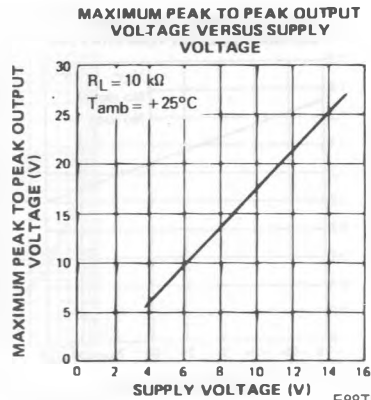
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E88TL074-05

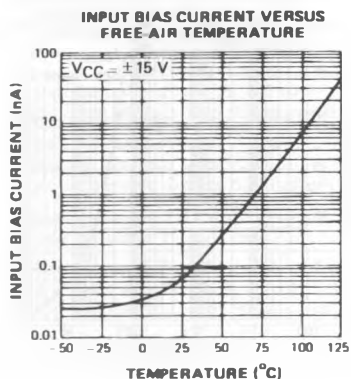


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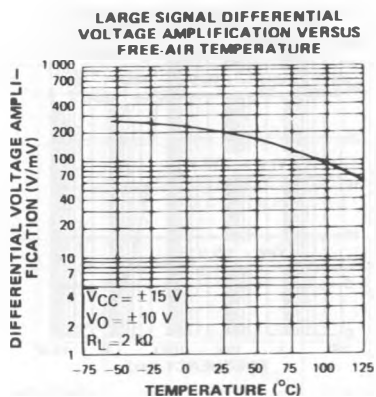


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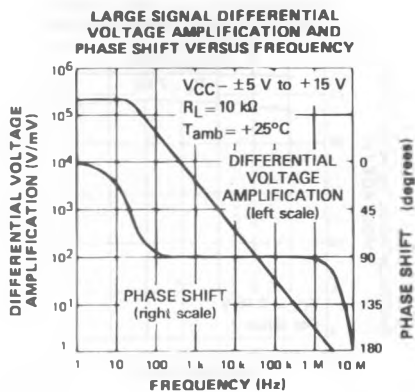
TYPICAL CHARACTERISTICS (continued)



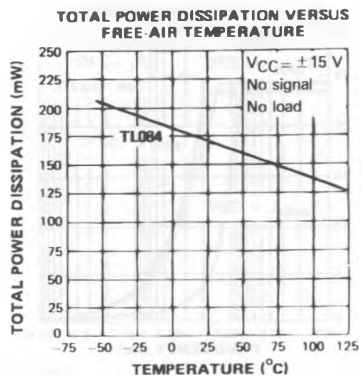
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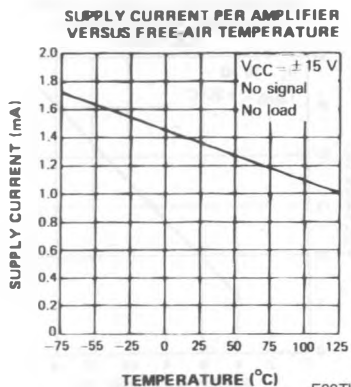
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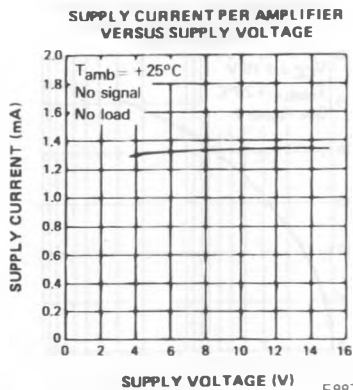
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E88TL074-11

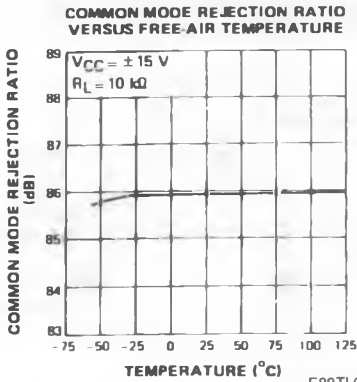


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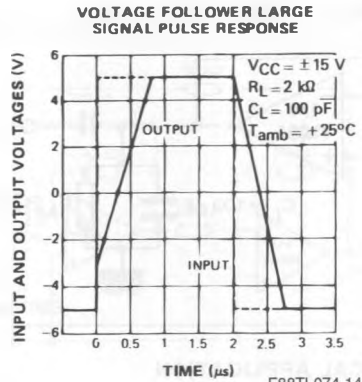


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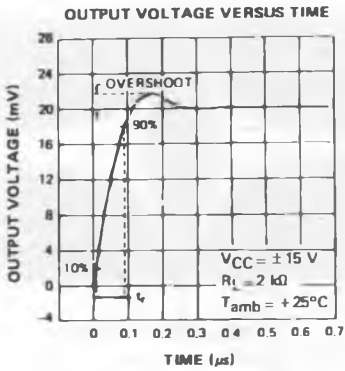
TYPICAL CHARACTERISTICS (continued)



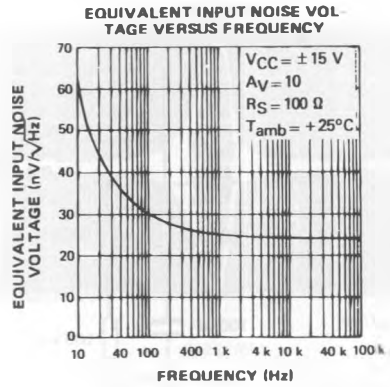
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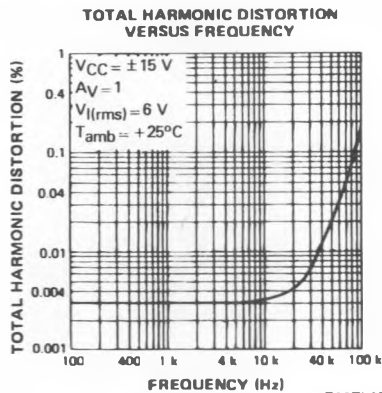
E88TL074-14



E88TL074-15



E88TL074-16



E88TL074-17

PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage follower.

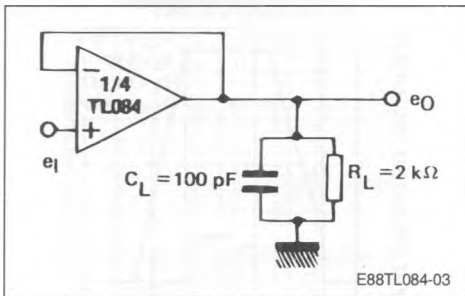
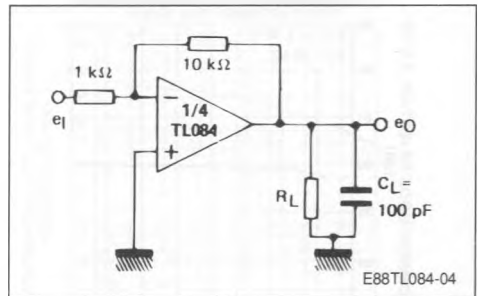
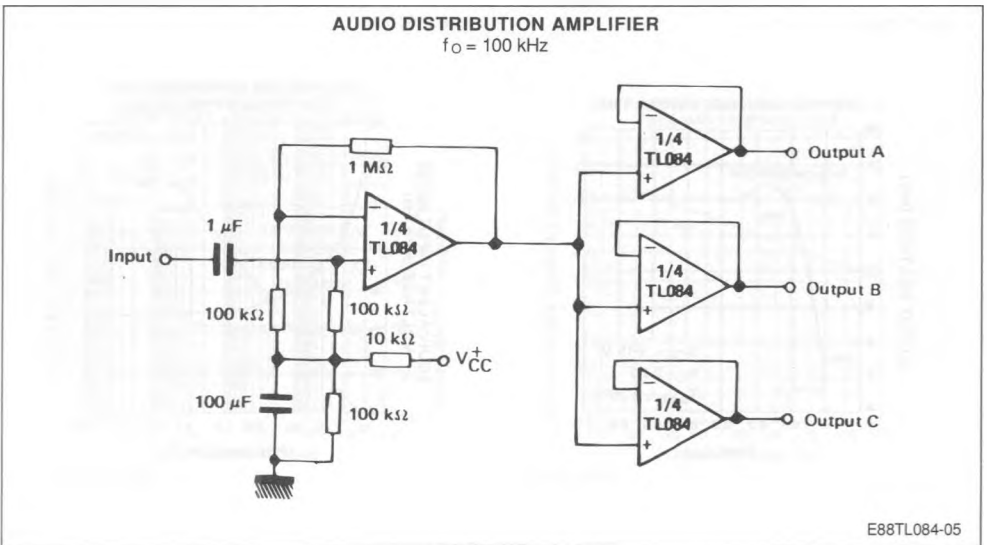


Figure 2 : Gain-of-10 inverting amplifier.

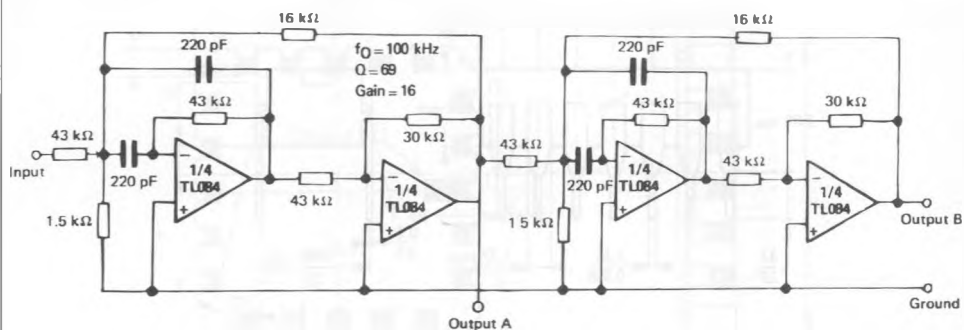


TYPICAL APPLICATION



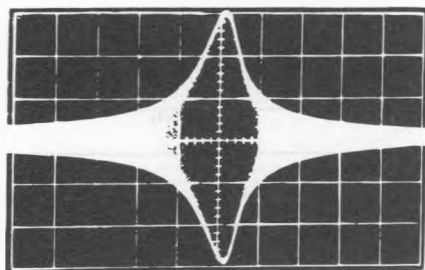
TYPICAL APPLICATION (continued)

POSITIVE FEEDBACK BANDPASS FILTER



E88TL074-21

OUTPUT A



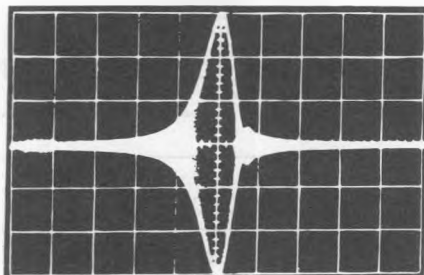
E88TL074-23

2 kHz /div

SECOND ORDER BANDPASS FILTER

$f_0 = 100 \text{ kHz}$; $Q = 30$; Gain = 4

OUTPUT B



E88TL074-22

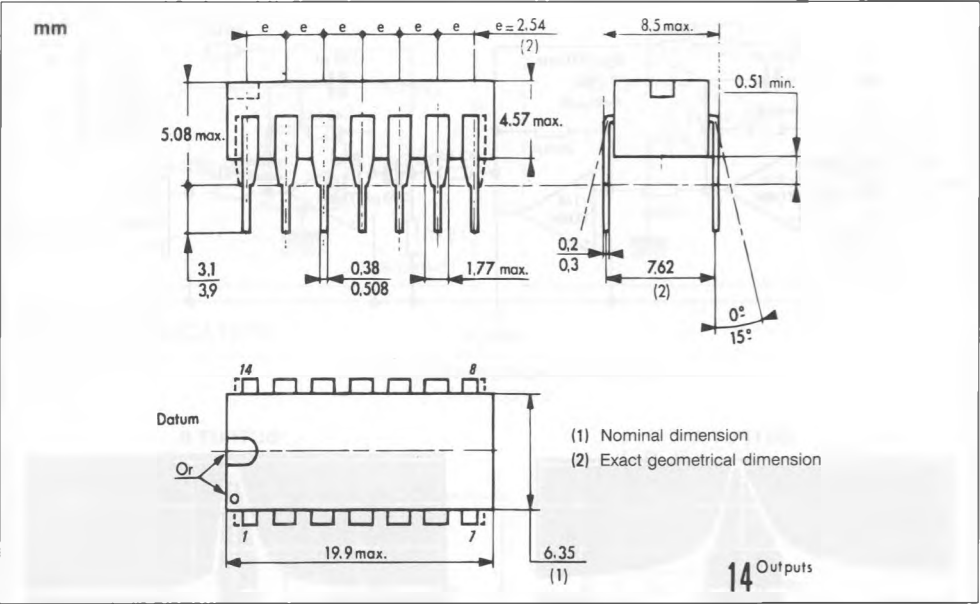
2 kHz /div

CASCADED BANDPASS FILTER

$f_0 = 100 \text{ kHz}$; $Q = 69$; Gain = 16

PACKAGE MECHANICAL DATA

14 PINS – PLASTIC DIP OR Cerdip



14 PINS – PLASTIC MICROPACKAGE (SO)

