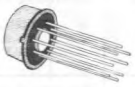
SGS-THOMSON MICROELECTRONICS

TL071
TL071A-TL071B

LOW NOISE J-FET INPUT SINGLE OP-AMPs

- LOW POWER CONSUMPTION
- WIDE COMMON-MODE AND DIFFERENTIAL VOLTAGE RANGE
- LOW INPUT BIAS AND OFFSET CURRENT
- LOW NOISE V_n = 18 nV/√Hz (typ)
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J-FET INPUT STAGE
- LOW HARMONIC DISTORTION : 0.01 % (typ)
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE : 13 V/µs (typ)

N
DIP8
(Plastic package)



H
TO-99
(Metal can)

D
SO8
(Plastic micropackage)

GC
LCC20
(Tricecop - LCC)

ORDER CODES

Part Number	Temperature Range	Package			
		N	H	D	GC
TL071M	– 55 °C to + 125 °C		•		•
TL071I	– 40 °C to + 105 °C	•		•	
TL071C	0 °C to + 70 °C	•		•	
TL071AC	0 °C to + 70 °C	•		•	
TL071BC	0 °C to + 70 °C	•		•	

Note : Hi-Rel Versions Available
Examples : TL071 MH. TL071 CN

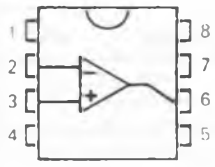
DESCRIPTION

The TL071, TL071A and TL071B are high speed J–FET input single operational amplifiers incorporating well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit.

The devices feature high slew rate, low input bias and, offset current, and low voltage temperature coefficient.

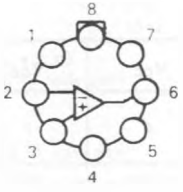
PIN CONNECTIONS (Top views)

DIP8
SO8



1 - Offset null
2 - Inverting input
3 - Non-inverting input
4 - V_{cc}

TO-99



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
10 - V_{cc}
11 - NC
12 - Offset null
13 - NC
14 - NC
15 - Output
16 - NC
17 - V_{cc}
18 - NC
19 - NC
20 - NC

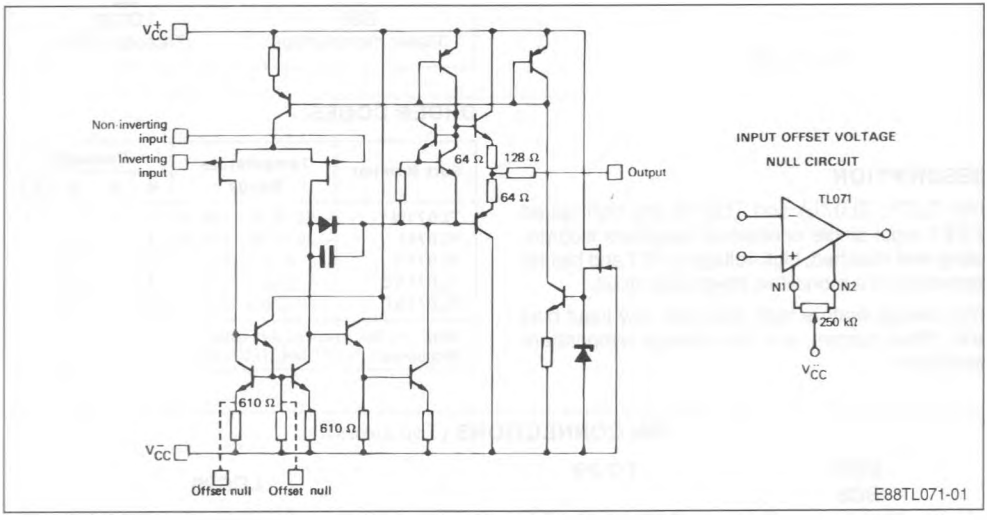
MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage (note 1)	± 18	V
V_i	Input Voltage (note 3)	± 15	V
V_{ID}	Diff. Input Voltage (note 2)	± 30	V
P_{tot}	Power Dissipation	680	mW
	Ouput Short-circuit Duration (note 4)	Indefinite	
T_{oper}	Operating Free-air Temperature Range TL071C, AC, BC TL071I, BI TL071M	 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 DIAGRAM



Case	Balance	Inverting Input	Non-inverting Input	V_{CC}^-	V_{CC}^+	Output	N.C.
DIP8 SO8 TO-99	1, 5	2	3	4	7	6	8
LCC20	2, 12	5	7	10	17	15	*

* **LCC20** : Other pins are not connected.

ELECTRICAL CHARACTERISTICS

V_{CC} = ± 15 V (unless otherwise specified)
TL071M : − 55 °C ≤ T_{amb} ≤ + 125 °C
TL071I, BI : − 40 °C ≤ T_{amb} ≤ + 105 °C
TL071C, AC, BC: 0 °C ≤ T_{amb} ≤ + 70 °C

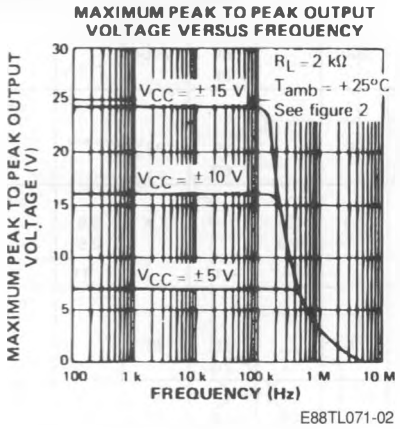
Symbol	Parameter	TL071M, I, BI TL071BC, AC			TL071C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{IO}	Input Offset Voltage T_{amb} = 25 °C (Rs ≤ 10 kΩ) TL071BI, BC $T_{min} \le T_{amb} \le T_{max}$ TL071BI, BC		 3 1 	 5 3 9 5		 3 	 8 13	mV
αV_{IO}	Input Offset Voltage Drift		10			10		µV/°C
I_{IO}	Input 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 $T_{min} \le T_{amb} \le T_{max}$		20	200 20		20	200 20	pA nA
A_{VD}	Large Signal Voltage Gain ($R_L \ge 2$ 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 ($R_S \le 10$ kΩ) T_{amb} = 25 °C $T_{min} \le T_{amb} \le T_{max}$	 80 80	 86 	 	 80 80	 86 	 	dB
I_{CC}	Supply Current, 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 ($R_S \le 10$ 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 $C_L \le 100$ 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 (continued)

Symbol	Parameter	TL071M, I, BI TL071BC, AC			TL071C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
K_{OV}	Overshoot (V_I = 20 mV, R_L = 2 kΩ $C_L \leq 100$ 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) TL071BI, 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 $C_L \leq 100$ 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

TYPICAL CHARACTERISTICS



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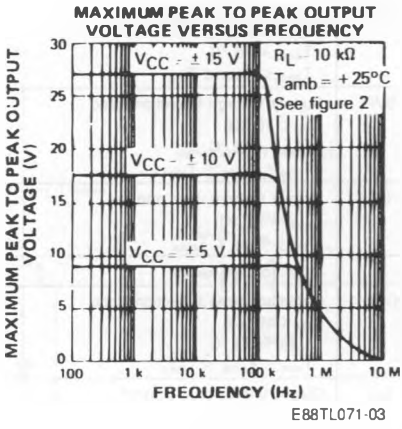

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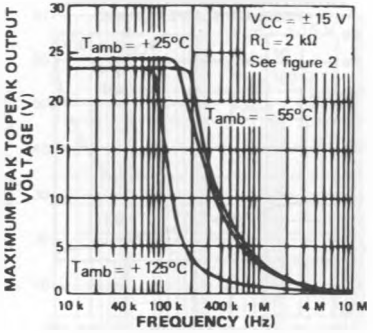
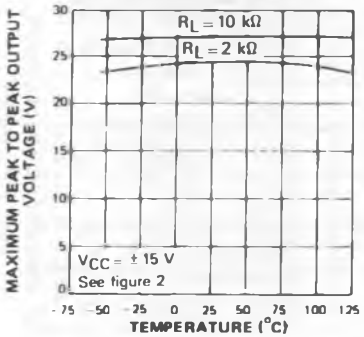
TYPICAL CHARACTERISTICS (continued)

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



E88TL071-04

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



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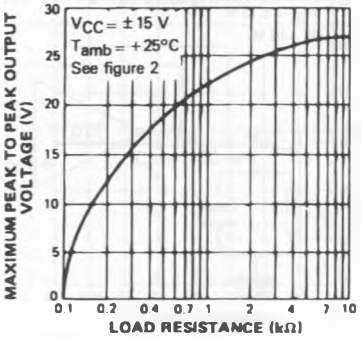
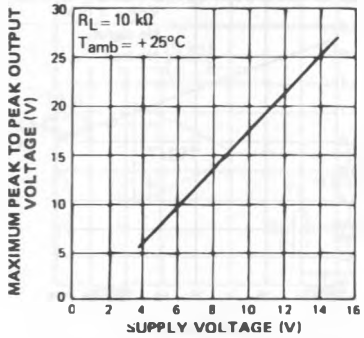
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE



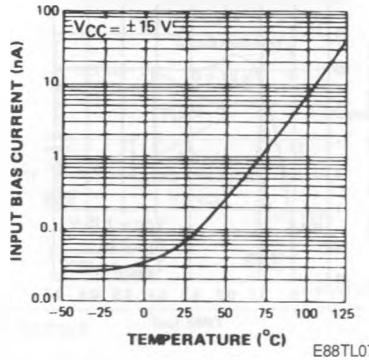
E88TL071-06

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE



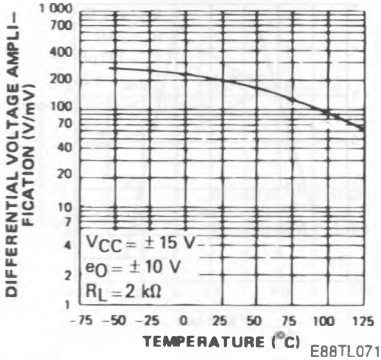
E88TL071-07

INPUT BIAS CURRENT VERSUS FREE-AIR TEMPERATURE



E88TL071-08

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE-AIR TEMPERATURE



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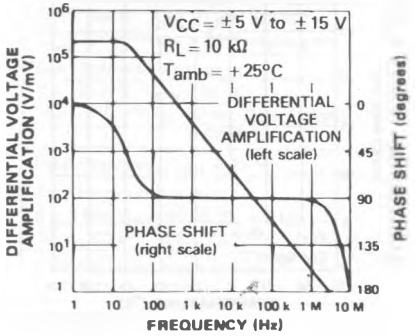
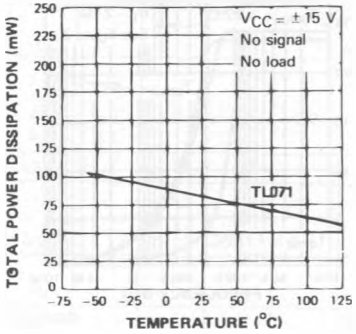
TYPICAL CHARACTERISTICS (continued)

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY



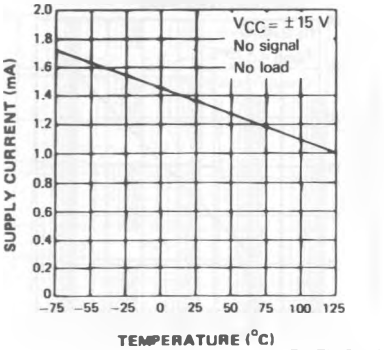
E88TL071-10

TOTAL POWER DISSIPATION VERSUS FREE-AIR TEMPERATURE



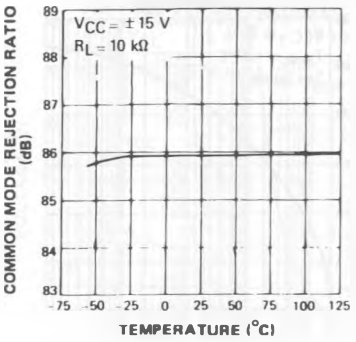
E88TL071-11

SUPPLY CURRENT PER AMPLIFIER VERSUS FREE-AIR TEMPERATURE



E88TL071-12

COMMON MODE REJECTION RATIO VERSUS FREE-AIR TEMPERATURE



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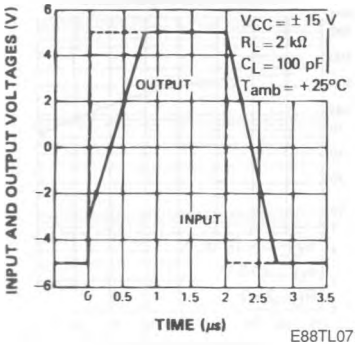
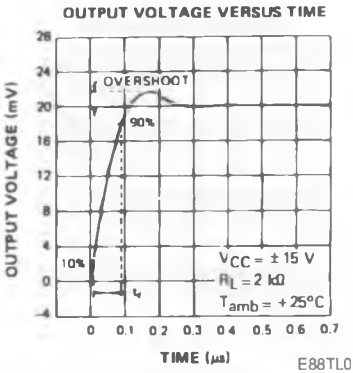
VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



E88TL071-14

OUTPUT VOLTAGE VERSUS TIME



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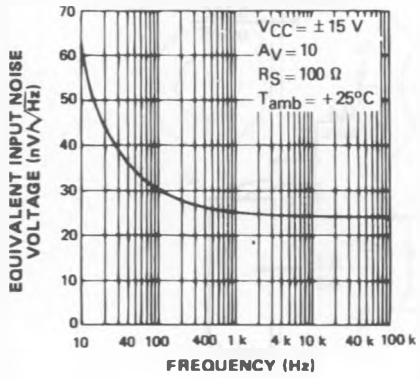
TYPICAL CHARACTERISTICS (continued)

EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



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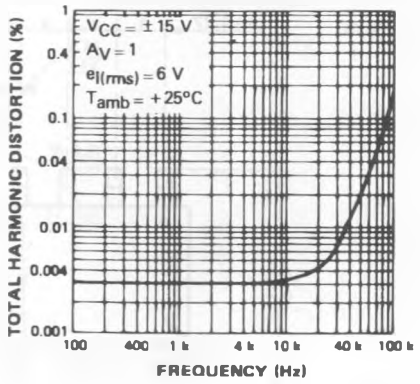
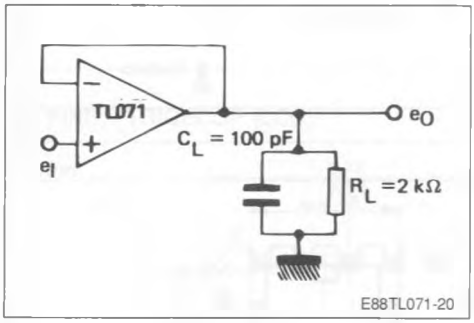
TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



E88TL071-17

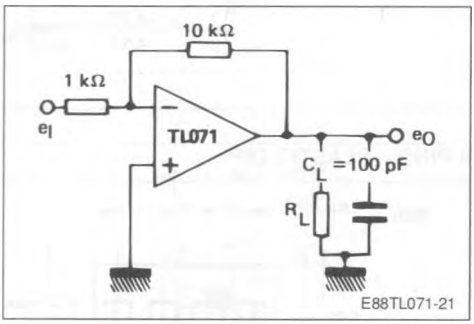
PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage follower.



E88TL071-20

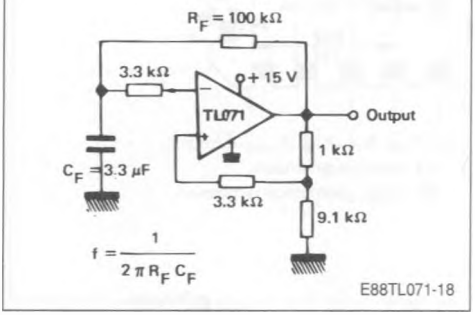
Figure 2 : Gain-of-10 inverting amplifier.



E88TL071-21

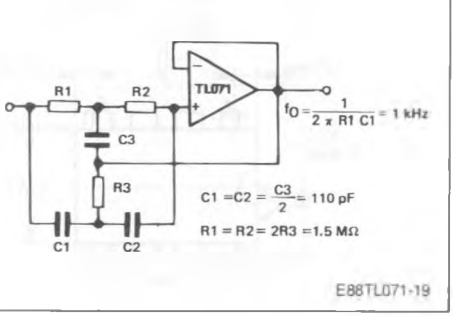
TYPICAL APPLICATIONS

(0.5 Hz) SQUARE WAVE OSCILLATOR



E88TL071-18

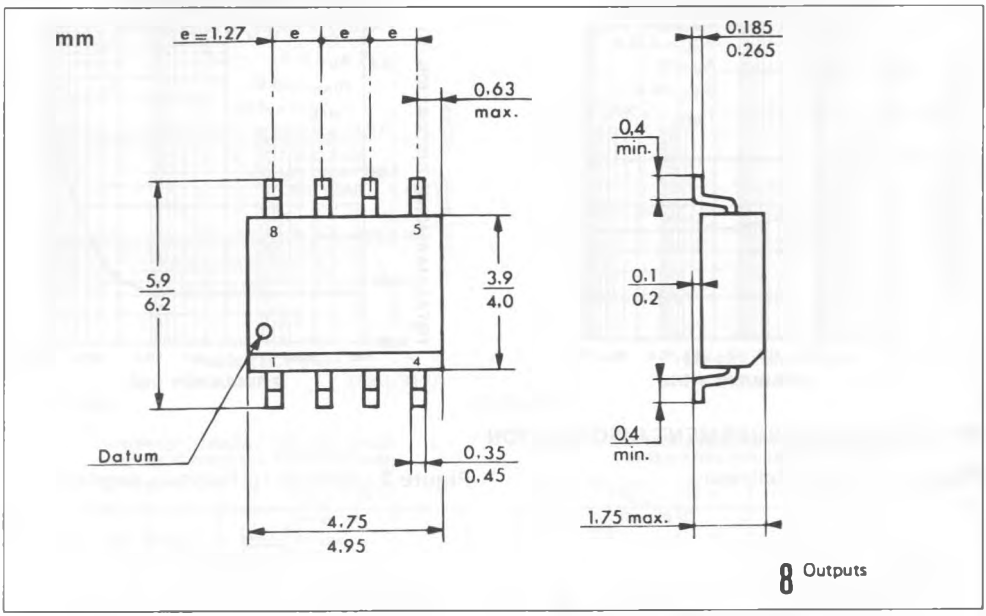
HIGH Q NOTCH FILTER



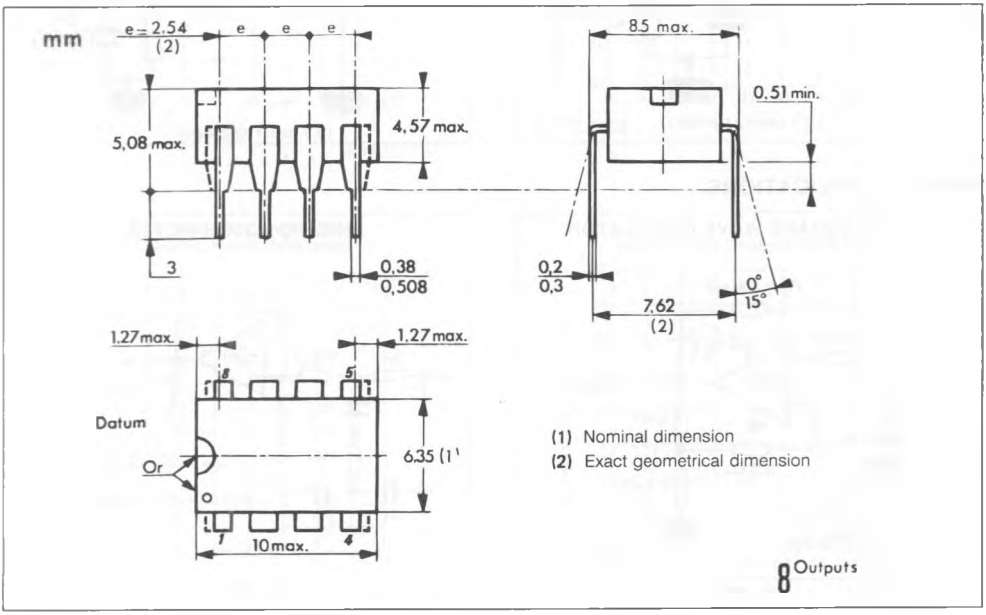
E88TL071-19

PACKAGE MECHANICAL DATA

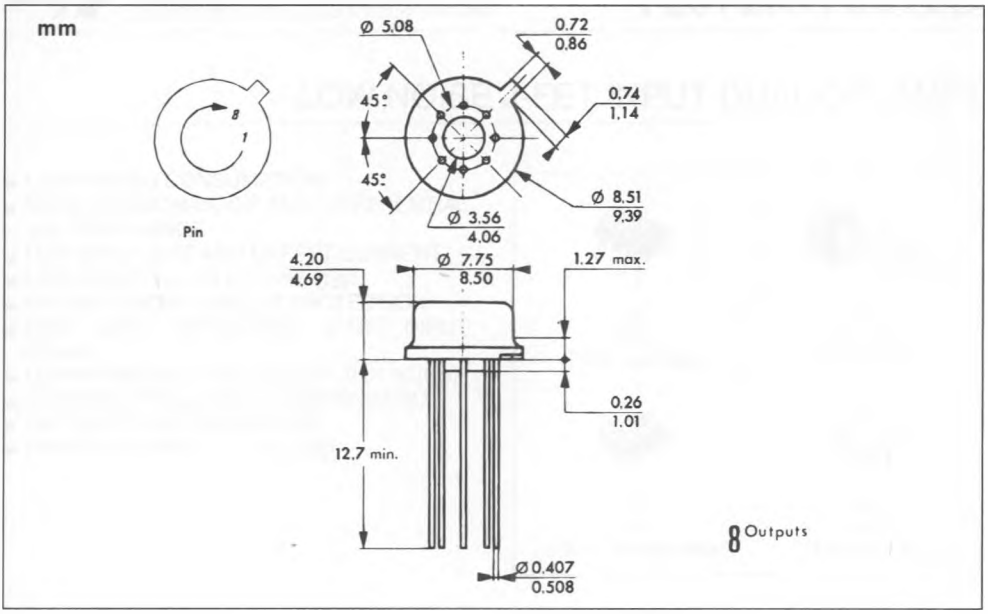
8 PINS – PLASTIC MICROPACKAGE (SO)



8 PINS – PLASTIC DIP



TO-99 – METAL CAN



20 PINS – TRICECOP (LCC)