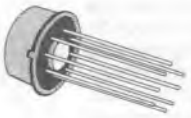
SGS-THOMSON MICROELECTRONICS

MC33001/A/B
MC34001/A/B
MC35001/A/B

J–FET INPUT SINGLE 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
DIP8
(Plastic package)



H
TO99
(Metal can)

GC
LCC20
(Tricecop (LCC))

D
SO8
(Plastic micropackage)

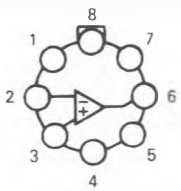
DESCRIPTION

These circuits 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 rates, low input bias and offset current, and low offset voltage temperature coefficient.

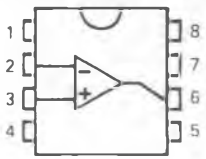
PIN CONNECTIONS (Top views)

TO99



1 - Balance
2 - Inverting input
3 - Non-inverting input
4 - V_{CC}^-
5 - Balance
6 - Output
7 - V_{CC}^+
8 - NC

DIP
SO8



LCC20

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

ORDER CODES

Part Number	Temperature	Package
MC35001GC	– 55 °C to + 125 °C	LCC
MC35001AGC	– 55 °C to + 125 °C	LCC
MC35001BGC	– 55 °C to + 125 °C	LCC
MC35001H	– 55 °C to + 125 °C	METAL CAN
MC35001AH	– 55 °C to + 125 °C	METAL CAN
MC35001BH	– 55 °C to + 125 °C	METAL CAN
MC33001N	– 40 °C to + 105 °C	DIP8
MC33001AN	– 40 °C to + 105 °C	DIP8
MC33001BN	– 40 °C to + 105 °C	DIP8
MC33001D	– 40 °C to + 105 °C	SO8
MC33001AD	– 40 °C to + 105 °C	SO8
MC33001BD	– 40 °C to + 105 °C	SO8
MC34001N	0 °C to + 70 °C	DIP8
MC34001AN	0 °C to + 70 °C	DIP8
MC34001BN	0 °C to + 70 °C	DIP8
MC34001D	0 °C to + 70 °C	SO8
MC34001AD	0 °C to + 70 °C	SO8
MC34001BD	0 °C to + 70 °C	SO8

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage (note 1)	± 18	V
V_i	Input Voltage (note 3)	± 15	V
V_{CC}	Diff. Input Voltage (note 2)	± 30	V
P_{tot}	Power Dissipation	680	mW
	Output Short-circuit Duration (note 4)	Infinite	
T_{oper}	Operating Free Air Temperature Range MC34001, A, B MC33001, A, B MC35001, A, B	 0 to 70 – 40 to 105 – 55 to 125	°C
T_{stg}	Storage Temperature Range	– 65 to 150	°C

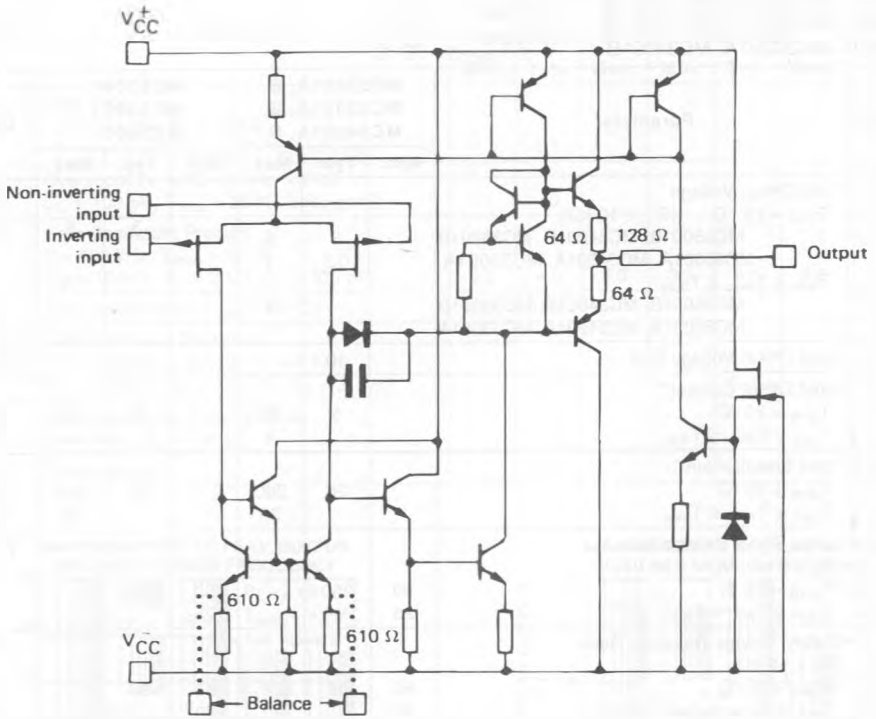
Notes : 1. All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V_{CC}^+ and V_{CC}^-.

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

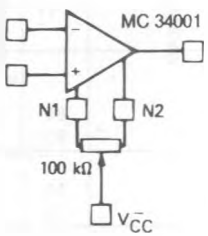
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.

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



INPUT OFFSET VOLTAGE NULL CIRCUITS



E88MC34001-01

Case	Balance	Inverting Input	Non-inverting Input	Output	V_{CC}^+	V_{CC}^-	N.C.
DIP8 SO8 TO99	1, 5	2	3	6	7	4	8
LCC20	2, 12	5	7	15	17	10	*

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

ELECTRICAL CHARACTERISTICS

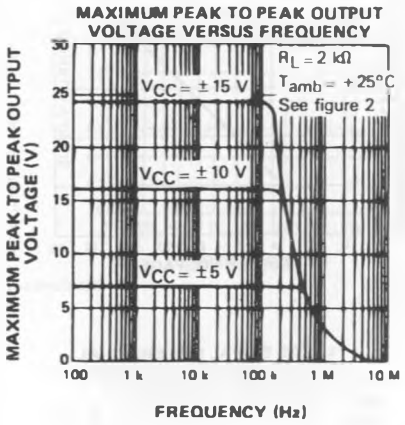
V_{CC} = ± 15 V (unless otherwise specified)
MC35001, MC35001A, MC35001B $-55 \le T_{amb} \le +125$ °C
MC33001, MC33001A, MC33001B $-40 \le T_{amb} \le +105$ °C
MC34001, MC34001A, MC34001B $0 \le T_{amb} \le +70$ °C

Symbol	Parameter	MC35001A, B MC33001A, B MC34001A, B			MC35001 MC33001 MC34001			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{IO}	Input Offset Voltage T_{amb} = 25 °C (R_S < 10 kΩ) MC35001B, MC34001B, MC33001B MC35001A, MC34001A, MC33001A $T_{min} \le T_{amb} \le T_{max}$ MC35001B, MC34001B, MC33001B MC35001A, MC34001A, MC33001A		 3 0.2 	 5 1 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 $T_{min} \le T_{amb} \le T_{max}$		20	200 20		20	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, 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 T_{amb} = 25 °C $T_{min} \le T_{amb} \le T_{max}$	− 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) $C_L \le$ 100 pF, T_{amb} = 25 °C, unity gain	12	16		12	16		V/µs

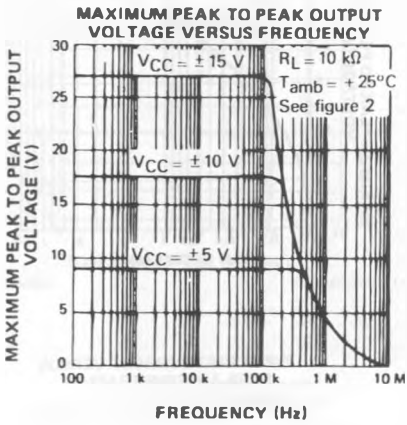
* The input bias currents are junction leakage currents wich approximatively double for every 10 °C increase in the junction temperature.

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	MC34001A, B MC33001A, B MC35001A, B			MC34001 MC33001 MC35001			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
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
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)	3.3	4.0	5.0	3.3	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

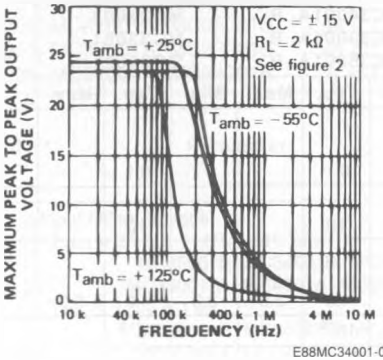


E88MC34001-02



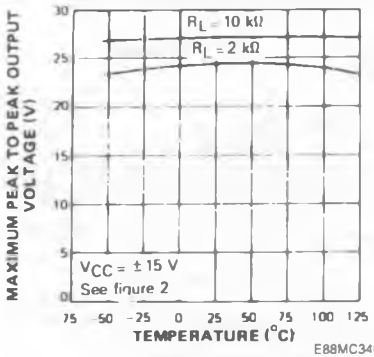
E88MC34001-03

MAXIMUM PEAK TO PEAK OUPUT VOLTAGE VERSUS FREE-AIR TEMP



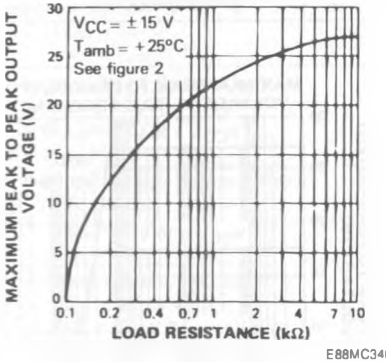
E88MC34001-04

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



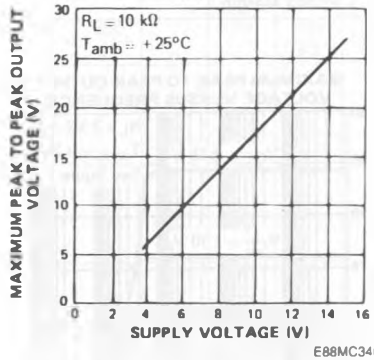
E88MC34001-05

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE



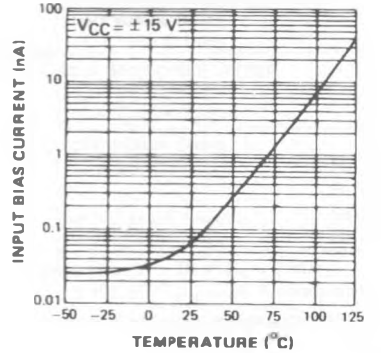
E88MC34001-06

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE



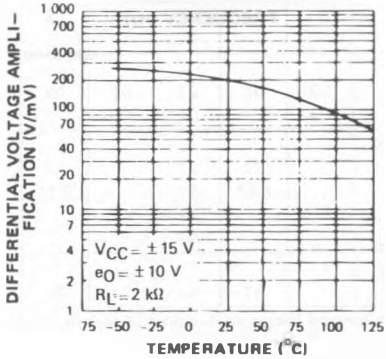
E88MC34001-07

INPUT BIAS CURRENT VERSUS FREE-AIR TEMPERATURE



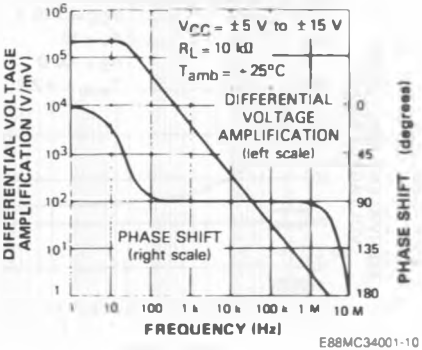
E88MC34001-08

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE-AIR TEMPERATURE



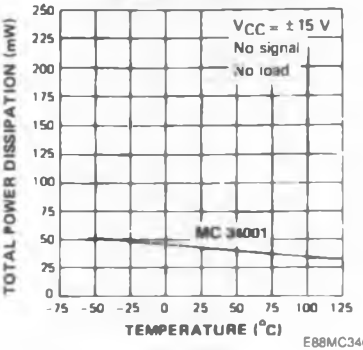
E88MC34001-09

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY



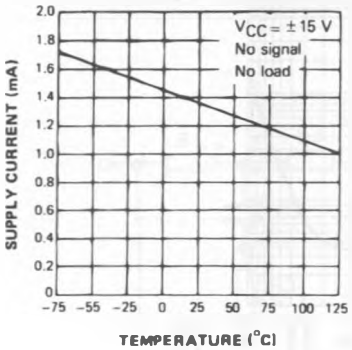
E88MC34001-10

TOTAL POWER DISSIPATION VERSUS FREE-AIR TEMPERATURE



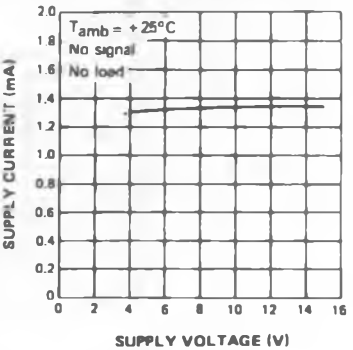
E88MC34001-11

SUPPLY CURRENT PER AMPLIFIER VERSUS FREE-AIR TEMPERATURE



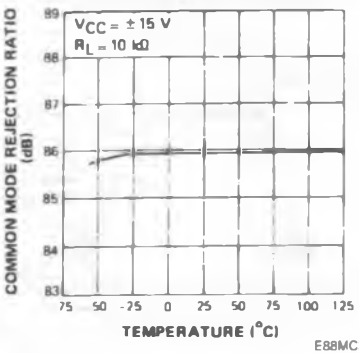
E88MC34001-12

SUPPLY CURRENT PER AMPLIFIER VERSUS SUPPLY VOLTAGE



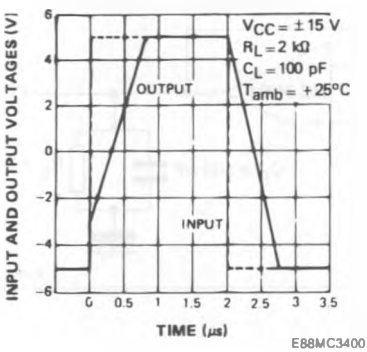
E88MC34001-13

COMMON MODE REJECTION RATIO VERSUS FREE-AIR TEMPERATURE



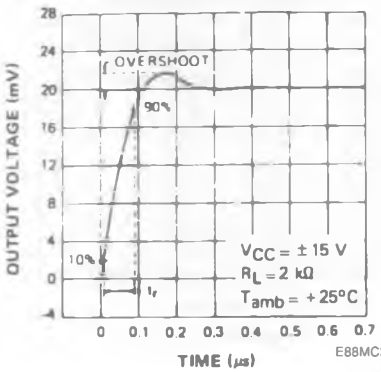
E88MC34001-14

VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



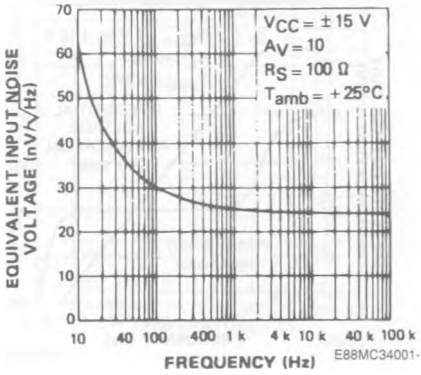
E88MC34001-15

OUTPUT VOLTAGE VERSUS TIME



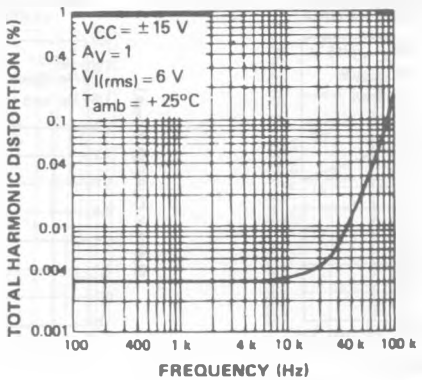
E88MC34001-16

EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



E88MC34001-17

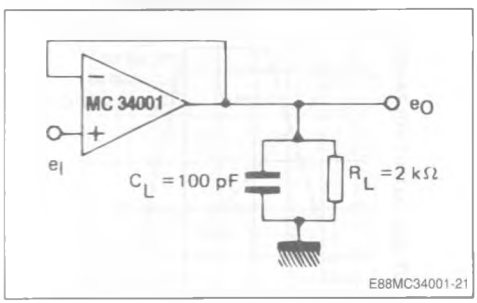
TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



E88MC34001-18

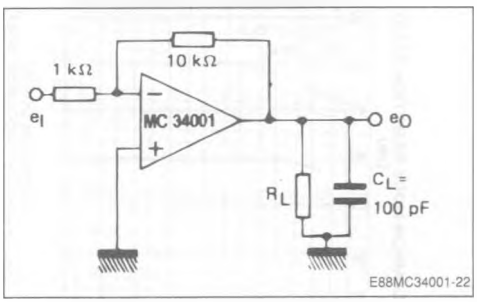
PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower.



E88MC34001-21

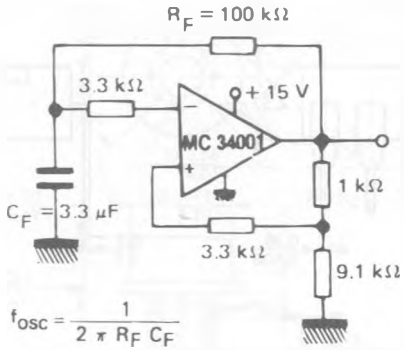
Figure 2 : Gain-of-10 Inverting Amplifier.



E88MC34001-22

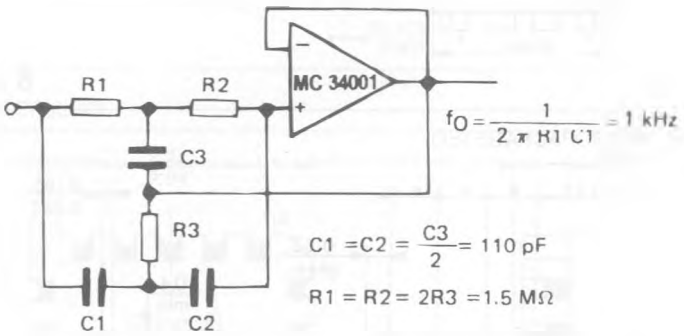
TYPICAL APPLICATIONS

(0.5 Hz) SQUARE WAVE OSCILLATOR



E88MC34001-19

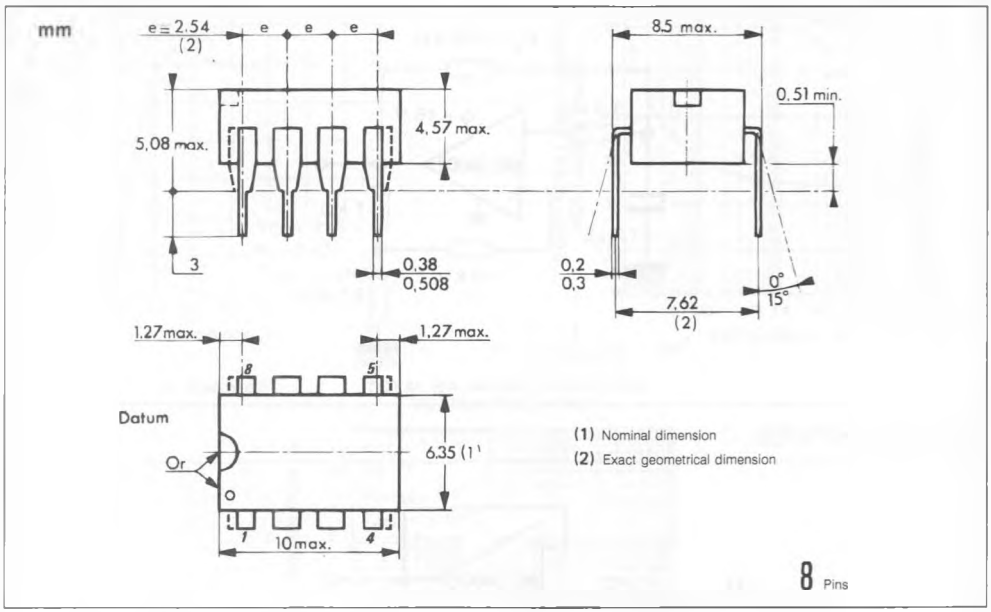
HIGH Q NOTCH FILTER



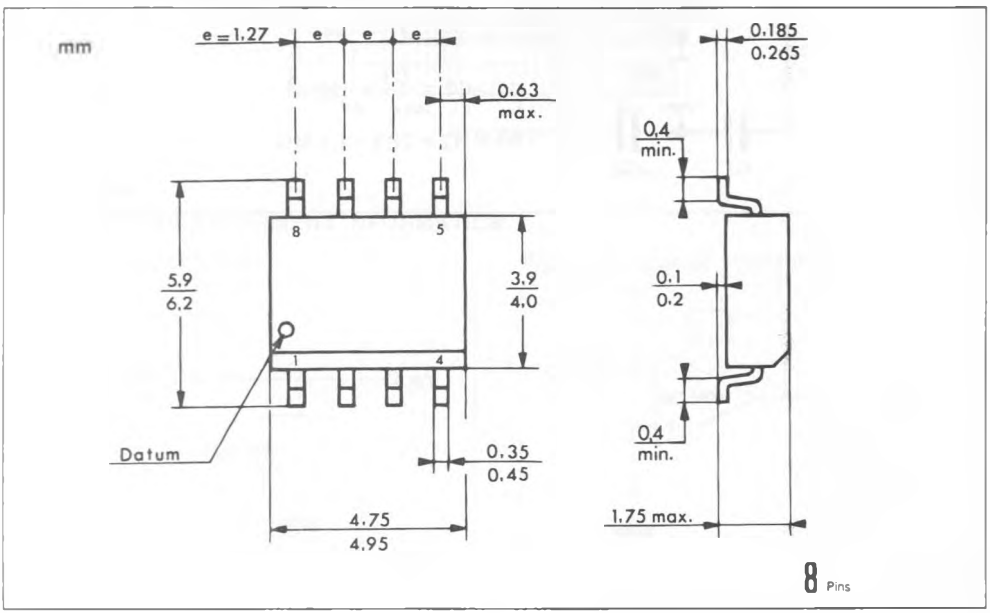
E88MC34001-20

PACKAGE MECHANICAL DATA

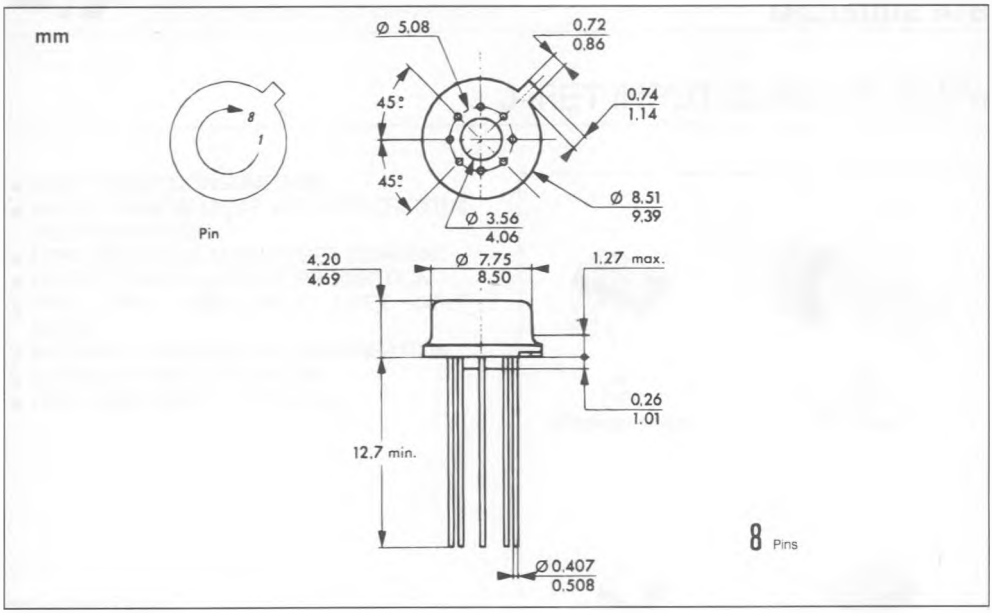
8 PINS – PLASTIC DIP



8 PINS – PLASTIC MICROPACKAGE (SO)



TO99 – METAL CAN



20 PINS – TRICECOP (LCC)