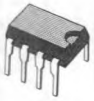
SGS-THOMSON
MICROELECTRONICS

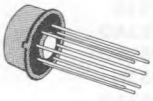
LF153/A/B
LF253/A/B
LF353/A/B

J–FET INPUT DUAL 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)

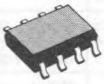


N
DIP8
(Plastic package)



H
TO99
(Metal can)

GC
LCC20
(Tricecop LCC)



D
SO8
(Plastic micropackage)

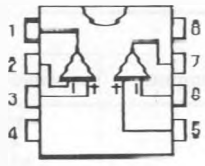
DESCRIPTION

The LF353 - 353A - 353B are high speed J–FET input dual 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.

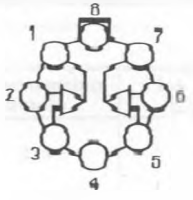
PIN CONNECTIONS (Top views)

DIP8
SO8



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 - V_{cc}^+

TO99



LCC20

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

ORDER CODES

Part Number	Temperature	Package
LF153GC	– 55 °C to + 125 °C	LCC
LF153AGC	– 55 °C to + 125 °C	LCC
LF153BGC	– 55 °C to + 125 °C	LCC
LF153H	– 55 °C to + 125 °C	METAL CAN
LF153AH	– 55 °C to + 125 °C	METAL CAN
LF153BH	– 55 °C to + 125 °C	METAL CAN
LF253N	– 40 °C to + 105 °C	DIP8
LF253AN	– 40 °C to + 105 °C	DIP8
LF253BN	– 40 °C to + 105 °C	DIP8
LF253D	– 40 °C to + 105 °C	SO8
LF253AD	– 40 °C to + 105 °C	SO8
LF253BD	– 40 °C to + 105 °C	SO8
LF353N	0 °C to + 70 °C	DIP8
LF353AN	0 °C to + 70 °C	DIP8
LF353BN	0 °C to + 70 °C	DIP8
LF353D	0 °C to + 70 °C	SO8
LF353AD	0 °C to + 70 °C	SO8
LF353BD	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		°C
	LF353, A, B	0 to 70	
	LF253, A, B	– 40 to 105	
	LF153, A, B	– 55 to 125	
T_{stg}	Storage Temperature Range	– 65 to 150	°C

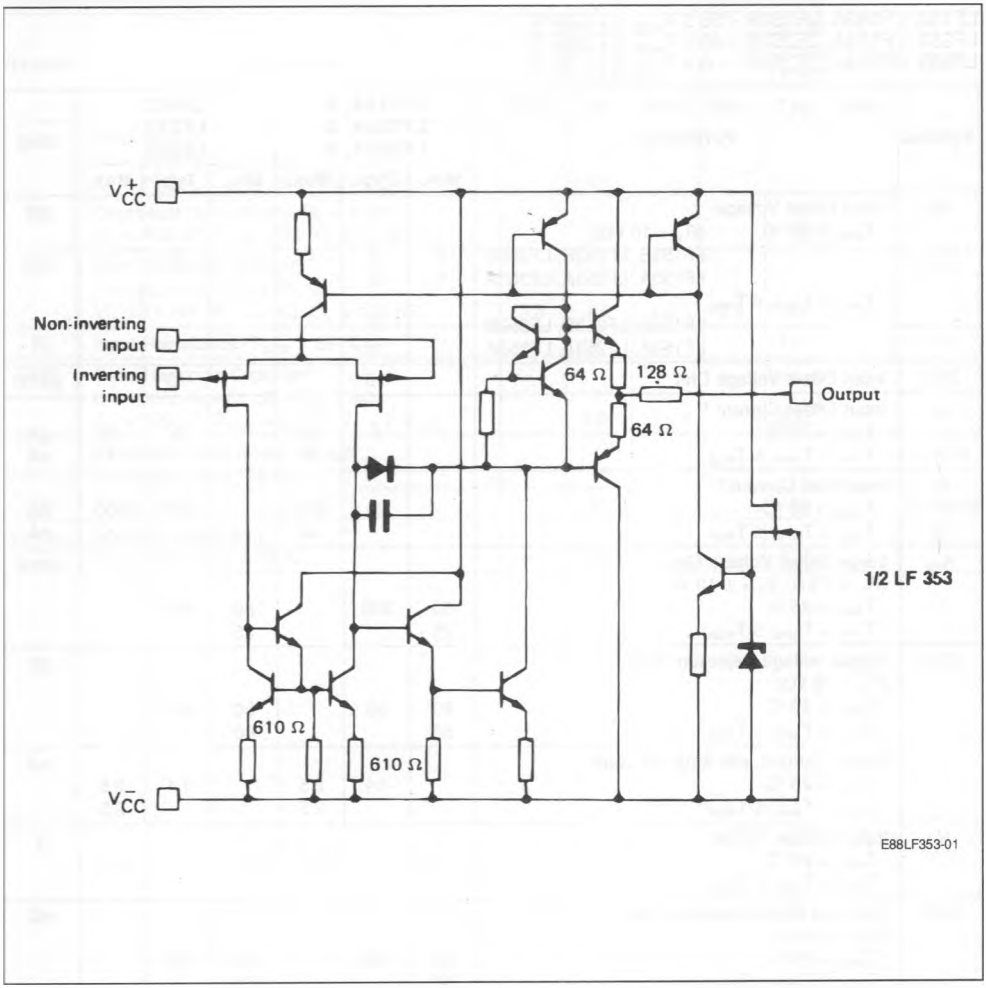
Notes : 1. All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V_{CC}^- and V_{CC}^+.

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	Outputs	Non-inverting Inputs	Inverting Inputs	V_{CC}^+	V_{CC}^-	N.C.
DIP8 SO8 TO99	1, 7	3, 5	2, 6	4	8	
LCC20	2, 17	7, 12	5, 15	10	20	*

* LCC20 : Other pins are not connected.

ELECTRICAL CHARACTERISTICS

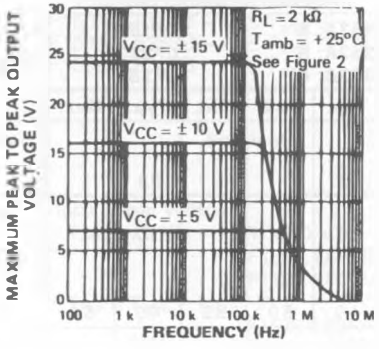
Vcc = ± 15 V (unless otherwise specified)
LF153, LF153A, LF153B – 55 ≤ T_{amb} ≤ + 125 °C
LF253, LF153A, LF253B – 40 ≤ T_{amb} ≤ + 105 °C
LF353, LF153A, LF353B 0 ≤ T_{amb} ≤ + 70 °C

Symbol	Parameter	LF153A, B LF253A, B LF353A, B			LF153 LF253 LF353			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage							mV
	T_{amb} = 25 °C (R_s < 10 kΩ)							
	LF153B, LF253B, LF353B	3	5			3	8	
	LF153A, LF253A, LF353A	1	2					
	$T_{min} \le T_{amb} \le T_{max}$							
	LF153B, LF253B, LF353B		9				13	
	LF153A, LF253A, LF353A		5					
DV_{io}	Input Offset Voltage Drift		10			10		µV/°C
I_{io}	Input Offset Current *							
	T_{amb} = 25 °C		5	50		5	50	pA
	$T_{min} \le T_{amb} \le T_{max}$			4			4	nA
I_{ib}	Input Bias Current *							
	T_{amb} = 25 °C		20	200		20	200	pA
	$T_{min} \le T_{amb} \le T_{max}$			20			20	nA
A_{vd}	Large Signal Voltage Gain (R_L > 2 kΩ, V_o = ± 10 V)							V/mV
	T_{amb} = 25 °C	50	200		50	200		
	$T_{min} \le T_{amb} \le T_{max}$	25			25			
SVR	Supply voltage Rejection Ratio (R_s < 10 kΩ)							dB
	T_{amb} = 25 °C	80	86		80	86		
	$T_{min} \le T_{amb} \le T_{max}$	80			80			
I_{cc}	Supply Current, per Amp, no Load							mA
	T_{amb} = 25 °C		1.4	2.5		1.4	2.5	
	$T_{min} \le T_{amb} \le T_{max}$			2.5			2.5	
V_i	Input Voltage Range							V
	T_{amb} = 25 °C	– 11		+ 11	– 11		+ 11	
	$T_{min} \le T_{amb} \le T_{max}$							
CMR	Common Mode Rejection Ratio (R_s < 10 kΩ)							dB
	T_{amb} = 25 °C	80	86		70	86		
	$T_{min} \le T_{amb} \le T_{max}$	80			70			
I_{os}	Output Short-circuit Current							mA
	T_{amb} = 25 °C	10	40	60	10	40	60	
	$T_{min} \le T_{amb} \le T_{max}$	10		60	10		60	
± V_{opp}	Output Voltage Swing							V
	T_{amb} = 25 °C $R_L \ge$ 2 kΩ	11	12		11	12		
	$R_L \ge$ 10 kΩ	12	13.5		12	13.5		
	$T_{min} \le T_{amb} \le T_{max}$ $R_L \ge$ 2 kΩ	11			11			
	$R_L \ge$ 10 kΩ	12			12			
S_{vo}	Slew-rate (V_i = 10 V, R_L = 2 kΩ)							V/µs
	$C_L \le$ 100 pF, T_{amb} = 25 °C, unity gain)	12	16		12	16		

ELECTRICAL CHARACTERISTICS (continued)

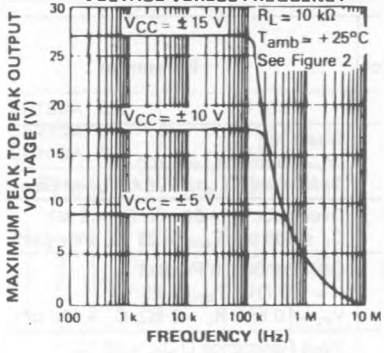
Symbol	Parameter	LF153A, B LF253A, B LF353A, B			LF153 LF253 LF353			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
t_r	Rise Time (V_I = 20 mV, R_L = 2 kΩ) C_L = 100pF, T_{amb} = 25 °C, unity Gain		0.1			0.1		µs
K_{ov}	Overshoot (V_i = 20 mV, R_L = 2 kΩ $C_L \leq$ 100 pF, T_{amb} = 25 °C, unity gain)		10			10		%
GBP	Gain Bandwidth Product (f = 100 kHz, T_{amb} = 25 °C V_{in} = 10 mV, R_L = 2 kΩ, C_L = 100 pF)	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
V_{o1}/V_{o2}	Channel Separation A_{vd} = 100, T_{amb} = 25 °C		120			120		dB

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



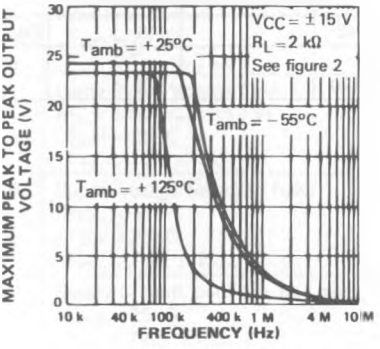
E88LF353-02

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



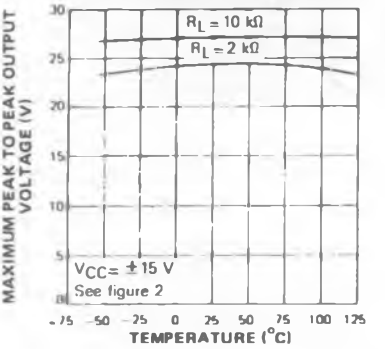
E88LF353-03

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



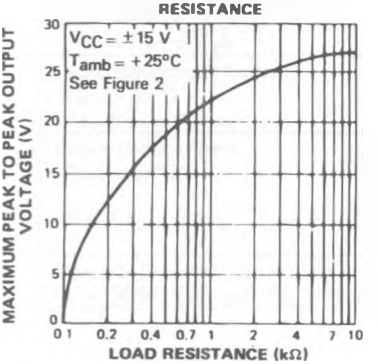
E88LF353-04

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



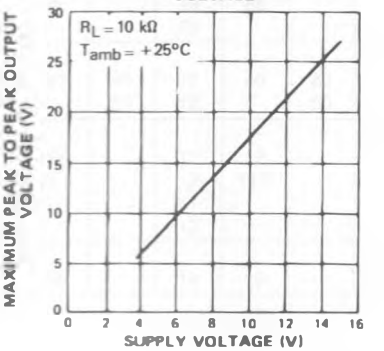
E88LF353-05

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE



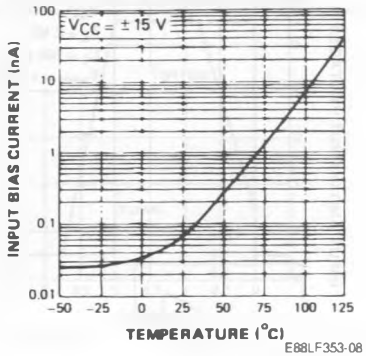
E88LF353-06

MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE



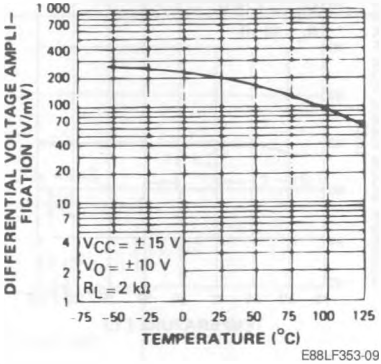
E88LF353-07

INPUT BIAS CURRENT VERSUS FREE-AIR TEMPERATURE



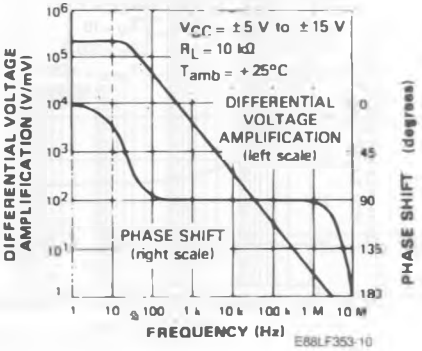
E88LF353-08

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE-AIR TEMPERATURE



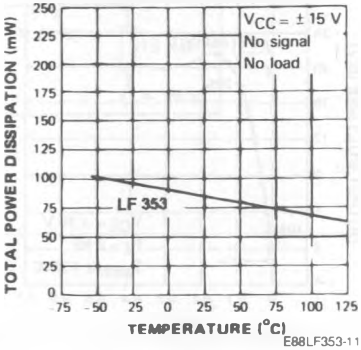
E88LF353-09

LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY



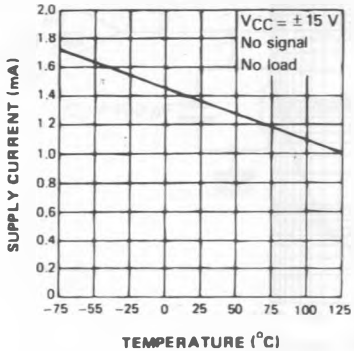
E88LF353-10

TOTAL POWER DISSIPATION VERSUS FREE-AIR TEMPERATURE



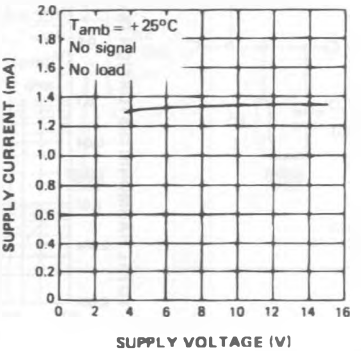
E88LF353-11

SUPPLY CURRENT PER AMPLIFIER VERSUS FREE-AIR TEMPERATURE



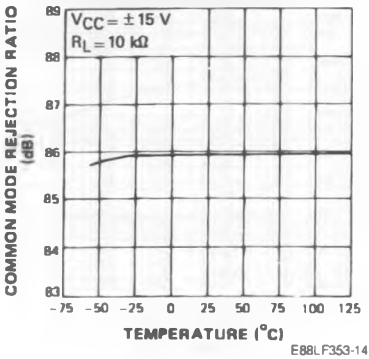
E88LF353-12

SUPPLY CURRENT PER AMPLIFIER VERSUS SUPPLY VOLTAGE



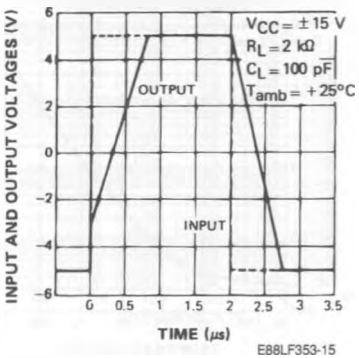
E88LF353-13

COMMON MODE REJECTION RATIO VERSUS FREE-AIR TEMPERATURE



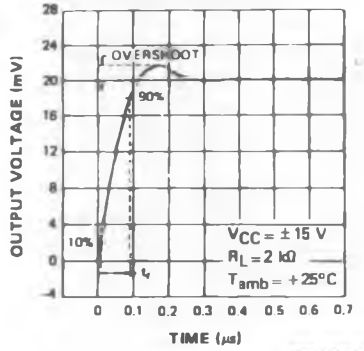
E88LF353-14

VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



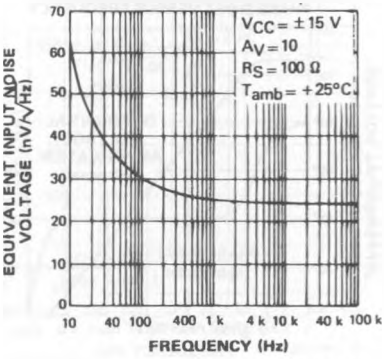
E88LF353-15

OUTPUT VOLTAGE VERSUS TIME



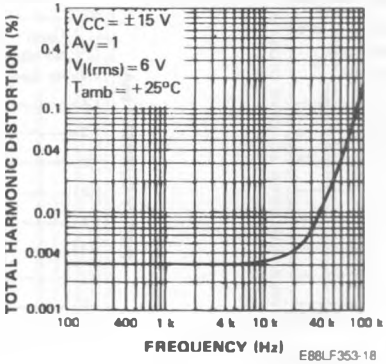
E88LF353-16

EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



E88LF353-17

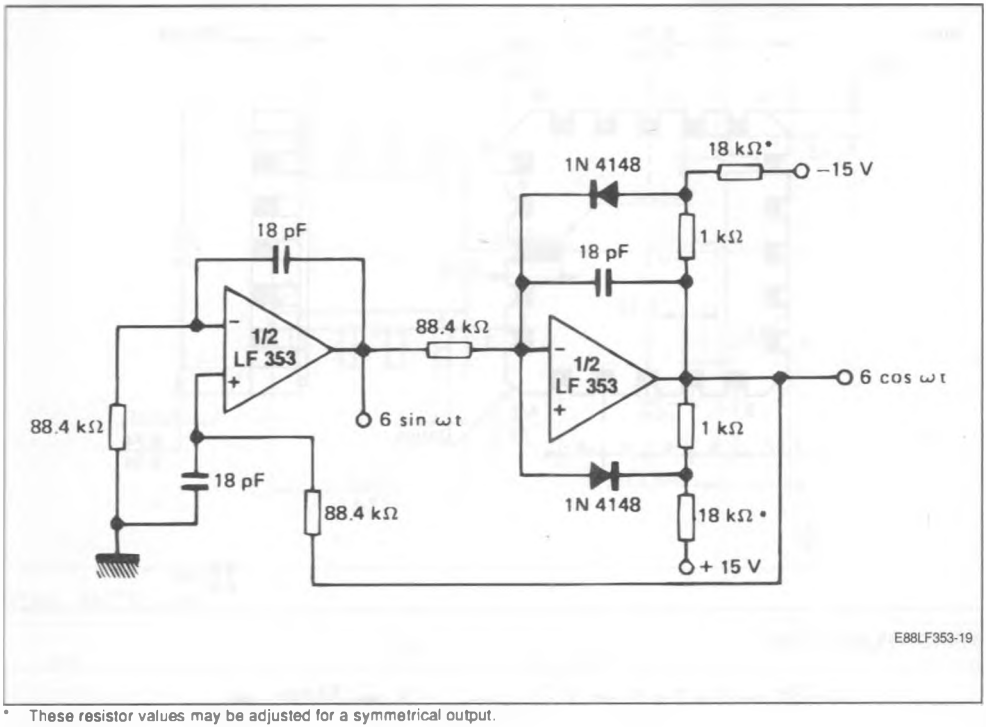
TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



E88LF353-18

TYPICAL APPLICATION

QUADRATURE OSCILLATOR



* These resistor values may be adjusted for a symmetrical output.

PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower.

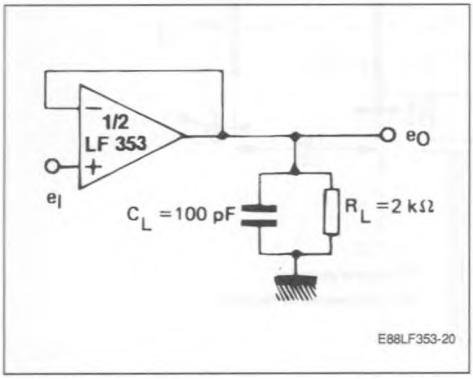
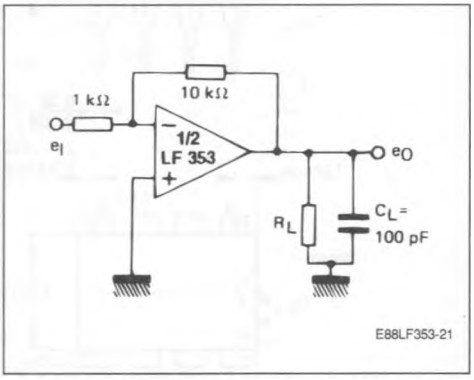
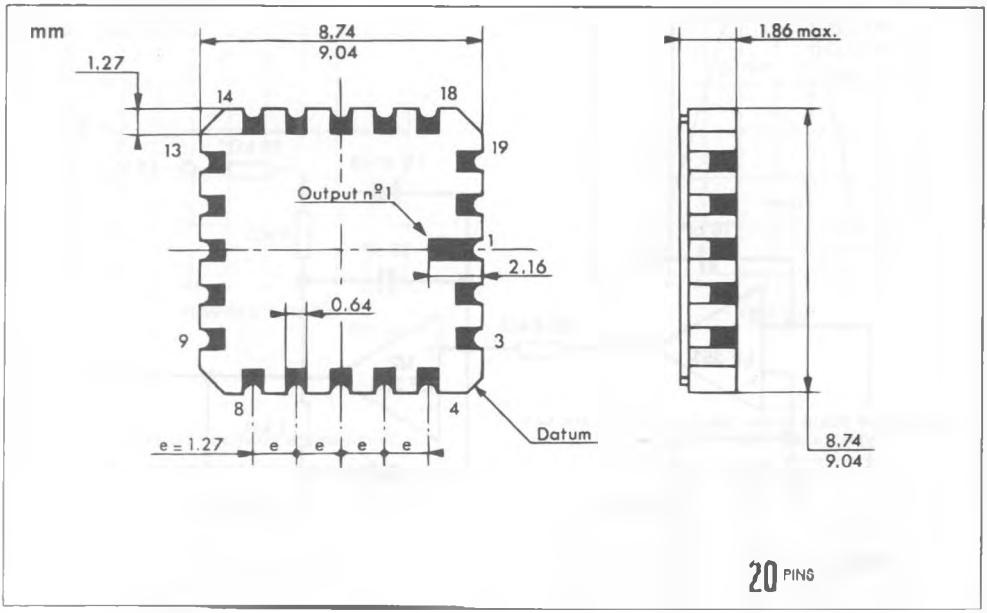


Figure 2 : Gain-of-10 Inverting Amplifier.

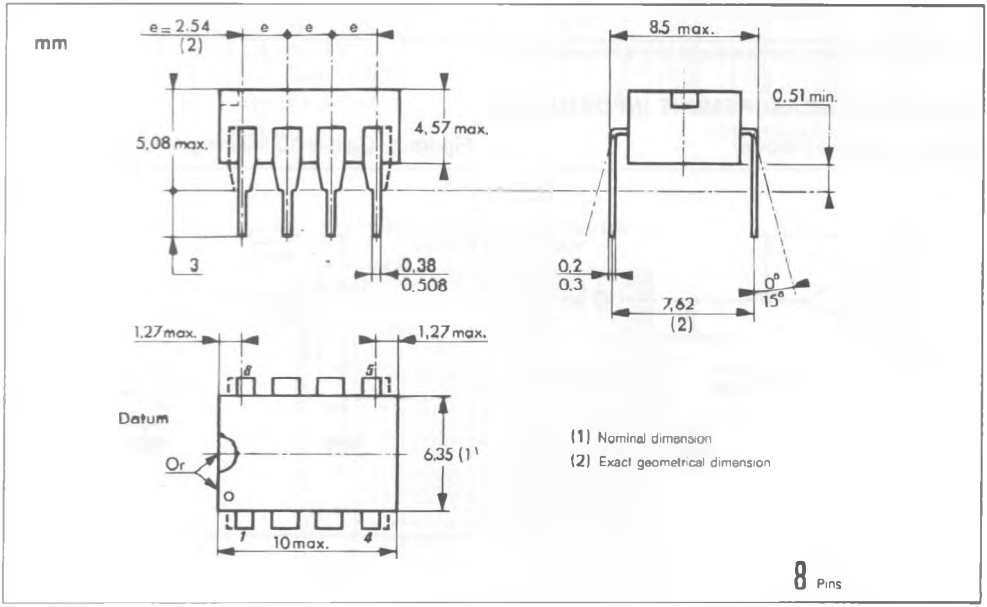


PACKAGE MECHANICAL DATA

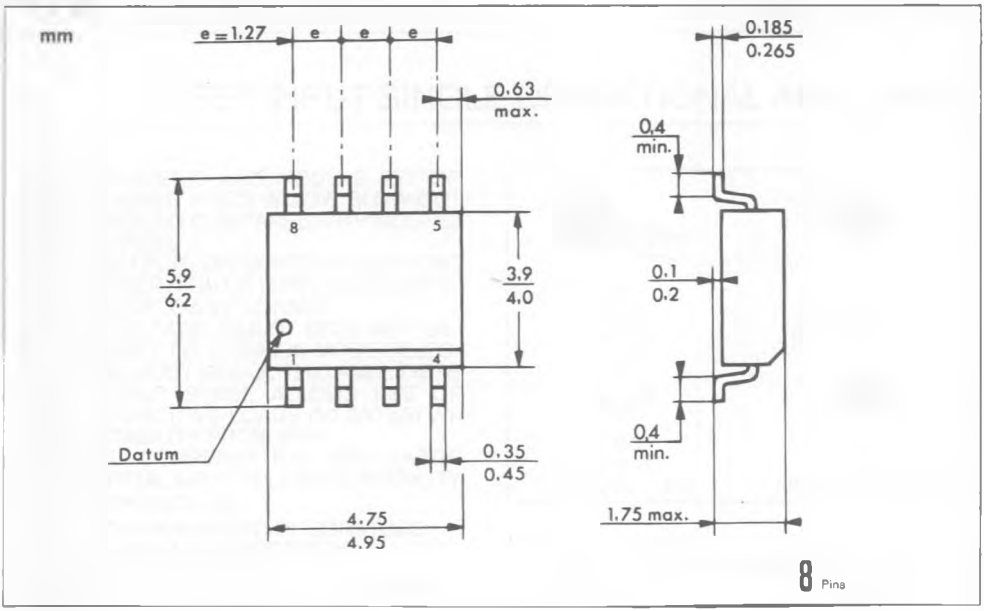
20 PINS – TRICECOP (LCC)



8 PINS – PLASTIC DIP



8 PINS – PLASTIC MICROPACKAGE (SO)



TO99 – METAL CAN