SGS-THOMSON MICROELECTRONICS

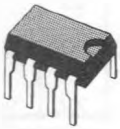
LM101A-LM201A LM301A

SINGLE OPERATIONAL AMPLIFIERS

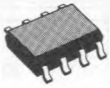
	LM101A LM201A	LM301A
▪ INPUT OFFSET VOLTAGE	0.2 mV	2 mV
▪ INPUT BIAS CURRENT	25 nA	70 nA
▪ INPUT OFFSET CURRENT	1.5 nA	2 nA
▪ SLEW RATE AS INVERTING AMPLIFIER	10 V/µs	10 V/µs

H
TO99
(Metal Can)

GC
LCC20
(Tricecop (LCC))



N
DIP8
(Plastic Package)
J
CERDIP8
(Cerdip Package)



D
SO8
(Plastic Micropackage)

DESCRIPTION

The LM101A is a general-purpose operational amplifier. This amplifier offers many features : supply voltages from ± 5 V to ±20 V, low current drain, overload protection on the input and output, no latch-up when the common-mode range is exceeded, freedom from oscillations and compensation with a single 30 pF capacitor. It has advantages over internally compensated amplifiers in that the compensation can be tailored to the particular application : slew rates of 10 V/µs and bandwidths of 3.5 MHz can be easily achieved. In addition, the circuit can be used as a comparator with differential inputs up to ± 30 V. The output can be clamped at any desired level to make it compatible with logic circuits.

ORDER CODES

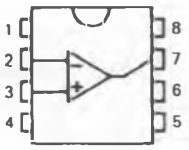
Part Number	Temperature Range	Package H	N	J	GC	D
LM101A	– 55 to + 125 °C	•		•	•	
LM201A	– 40 to + 105 °C	•	•	•		
LM301A	0 to + 70 °C	•	•	•		•

Note : Hi-Rel Versions Available
Examples : LM101AH, LM201AN

PIN CONNECTIONS (top views)

1 - Balance compensation 1
2 - Inverting input
3 - Non-inverting input
4 - V_{cc}

DIP8/CERDIP8
SO8



5 - Balance
6 - Output
7 - V_{cc}
8 - Compensation 2

1 - NC
2 - Balance compensation 1
3 - NC
4 - NC
5 - Inverting input
6 - NC
7 - Non-inverting input
8 - NC
9 - NC
10 - V_{cc}

LCC20

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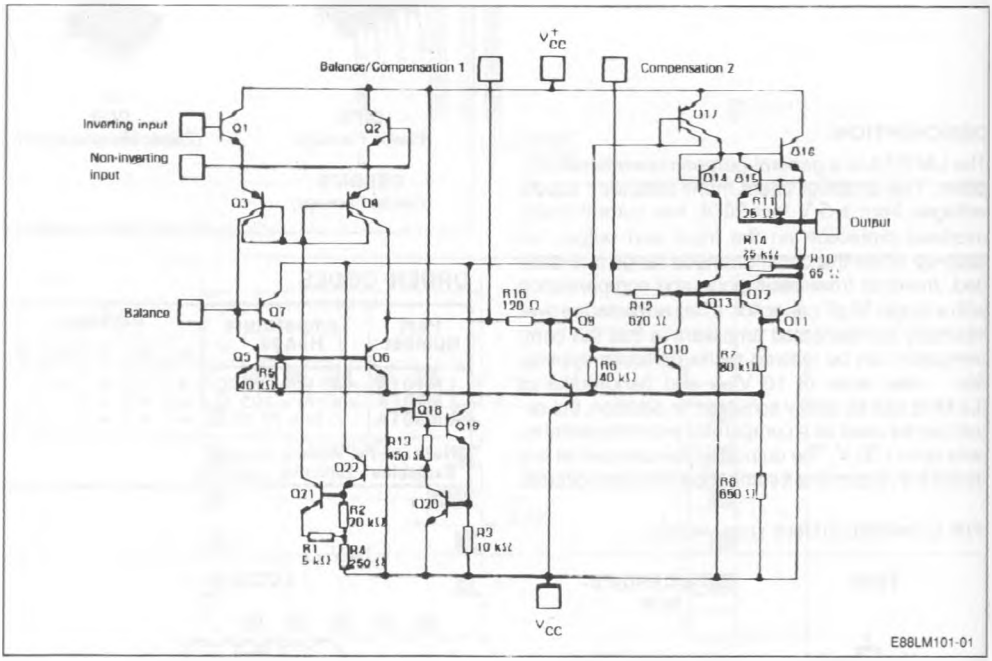
11 - NC
12 - Balance
13 - NC
14 - NC
15 - Output
16 - NC
17 - V_{cc}
18 - NC
19 - NC
20 - Compensation 2

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Value			Unit
			LM101A	LM201A	LM301A	
V_{CC}	Supply Voltage		± 22	± 22	± 22	V
V_{ID}	Differential Input Voltage		± 30	± 30	± 30	V
V_I	Input Voltage		± 15	± 15	± 15	V
	Output Short-circuit Duration		Indefinite for T_{amb} = + 70 °C		Indefinite for T_{amb} = +55 °C	
P_{tot}	Power Dissipation	N.J.H. Suffix GC Suffix D Suffix	500 665	500 300	500 300	mW
T_{oper}	Operating Free-air Temperature Range		– 55 to + 125	– 40 to + 105	0 to + 70	°C
T_{stg}	Storage Temperature Range		– 65 to + 150	– 65 to + 150	– 65 to + 150	°C

SCHEMATIC DIAGRAM



Case	Balance/ Comp. 1	Inverting Input	Non-inverting Input	V_{CC}^-	V_{CC}^+	Output	Balance	Comp. 2
TO99	1	2	3	4	7	6	5	8
DIP8 CERDIP8 SO8	1	2	3	4	7	6	5	8
LCC20*	2	5	7	10	17	15	12	20

* LCC20 : Other pins not connected

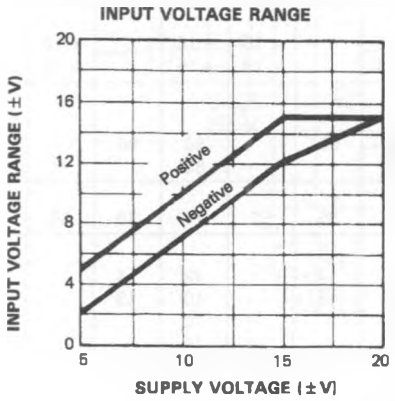
ELECTRICAL CHARACTERISTICS

LM301A : 0 °C < T_{amb} < + 70 °C, ± 5 V ≤ V_{CC} ≤ ± 20 V, C1 = 30 pF
LM201A : − 40 °C < T_{amb} < + 105 °C, ± 5 V ≤ V_{CC} ≤ ± 20 V, C1 = 30 pF
LM101A : − 55 °C < T_{amb} < + 125 °C, ± 5 V ≤ V_{CC} ≤ ± 20 V, C1 = 30 pF
* => V_{CC} = ± 15 V
(unless otherwise specified)

Symbol	Parameter	LM101A/LM201A			LM301A			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{IO}	Input Offset Voltage (R_S ≤ 10 kΩ) T_{amb} = 25 °C T_{min} ≤ T_{amb} ≤ T_{max}		0.2	1 3		2	5 6	mV
I_{IB}	Input Bias Current T_{amb} = 25 °C T_{min} ≤ T_{amb} ≤ T_{max}		25	75 100		70	100 200	nA
I_{IO}	Input Offset Current T_{amb} = 25 °C T_{min} ≤ T_{amb} ≤ T_{max}		1.5	10 20		2	20 40	nA
A_{VD}	Large Signal Voltage Gain * (V_O = ± 10 V, R_L = 2 kΩ) T_{amb} = 25 °C T_{min} ≤ T_{amb} ≤ T_{max}	50 25	100		50 25	100		V/mV
SVR	Supply Voltage Rejection Ratio (R_S ≤ 10 kΩ) T_{amb} = 25 °C T_{min} ≤ T_{amb} ≤ T_{max}	80 80	96		80 80	96		dB
I_{CC}	Supply Current no Load T_{amb} = 25 °C T_{min} ≤ T_{amb} ≤ T_{max}		1.8	3 3		1.8	3 3	mA
V_I	Input Voltage Range (V_{CC} = ± 20 V) T_{amb} = 25 °C T_{min} ≤ T_{amb} ≤ T_{max}	+ 15 − 15		+ 15 + 15	− 15 − 15		+ 15 + 15	V
CMR	Common Mode Rejection Ratio (R_S ≤ 10 kΩ) T_{amb} = 25 °C T_{min} ≤ T_{amb} ≤ T_{max}	80 80	96		80 80	96		dB
I_{OS}	Output Short-circuit Current * T_{amb} = 25 °C	10	30	50	10	30	50	mA
± V_{OPP}	Output Voltage Swing * T_{amb} = 25 °C R_L = 10 kΩ R_L = 2 kΩ T_{min} ≤ T_{amb} ≤ T_{max} R_L = 10 kΩ R_L = 2 kΩ	12 10 12 10	14 13		12 10 12 10	14 13		V

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	LM101A/LM201A			LM301A			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
S_{VO}	Slew Rate (V_I = ± 10 V, R_L = 2 kΩ, C_L < 100 pF, T_{amb} = 25 °C, unity gain) * (note 1)	0.25	0.5		0.25	0.5		V/µs
t_r	Rise Time (V_I = ± 20 mV, R_L = 2 kΩ, C_L ≤ 100 pF, T_{amb} = 25 °C, unity gain) *		0.3			0.3		µs
K_{OV}	Overshoot (V_I = 20 mV, R_L = 2 kΩ, C_L ≤ 100 pF T_{amb} = 25 °C, unity gain)		5			5		%
Z_i	Input Impedance, T_{amb} = 25 °C *	1.5	4		1.5	4		MΩ
R_O	Output Resistance, T_{amb} = 25 °C *		75			75		Ω
GBP	Gain Bandwidth Product * (V_I = 10 mV, R_L = 2 KΩ, C_L ≤ 100 pF, f = 100 kHz, T_{amb} = 25 °C)	0.5	1	1.6	0.5	1	1.6	MHz
THD	Total Harmonic Distortion * (f = 1 kHz, A_V = 20 dB, R_L = 2 kΩ, V_O = 2 V_{PP} C_L ≤ 100 pF, T_{amb} = 25 °C)		0.015			0.015		%
V_n	Equivalent Input Noise Voltage (f = 1 kHz, R_g = 100 Ω) *		25			25		nV/√Hz
DV_{IO}	Input Offset Voltage Drift T_{min} ≤ T_{amb} ≤ T_{max}		3	15		6	30	µV/°C
DI_{IO}	Input Offset Current Drift 25 °C ≤ T_{amb} ≤ T_{max} T_{min} ≤ T_{amb} ≤ 25 °C		10 20	100 200		10 20	100 200	pA/°C



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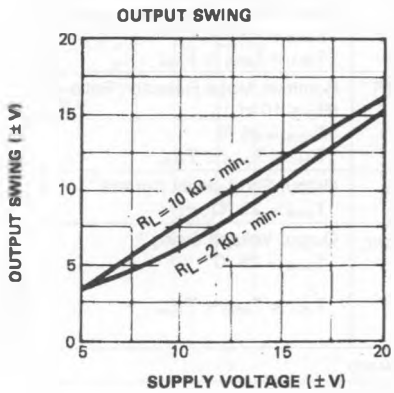
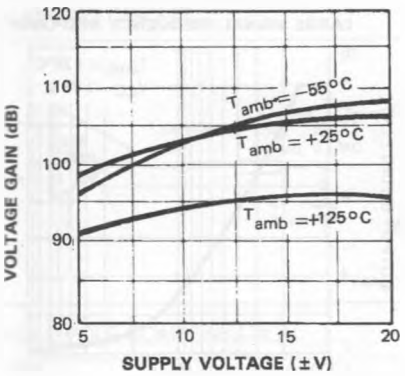


E88LM101-03

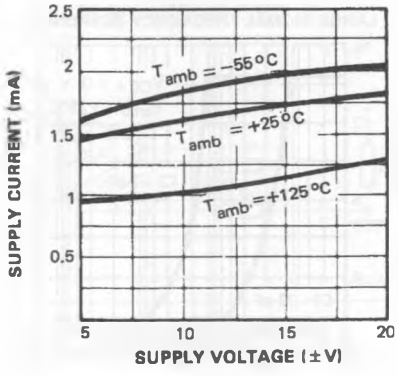
Note : 1. May be improved up to 10V/µs in inverting amplifier configuration (see basic diagram).

VOLTAGE GAIN



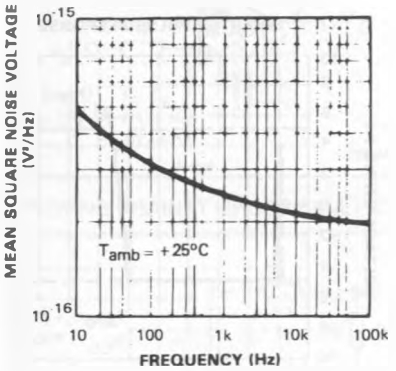
E88LM101-04

SUPPLY CURRENT



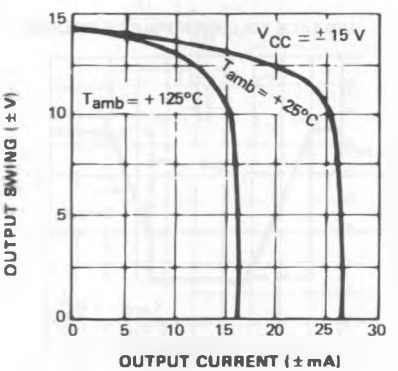
E88LM101-05

INPUT NOISE VOLTAGE



E88LM101-06

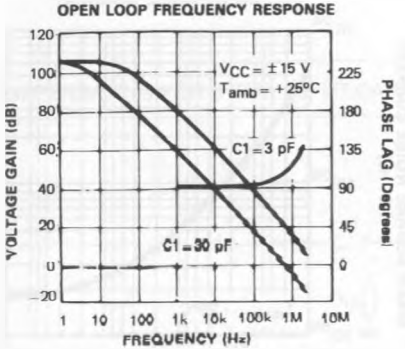
CURRENT LIMITING



E88LM101-07

SINGLE POLE COMPENSATION

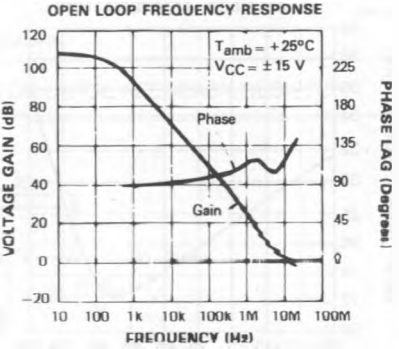
OPEN LOOP FREQUENCY RESPONSE



E88LM101-08

FEED FORWARD COMPENSATION

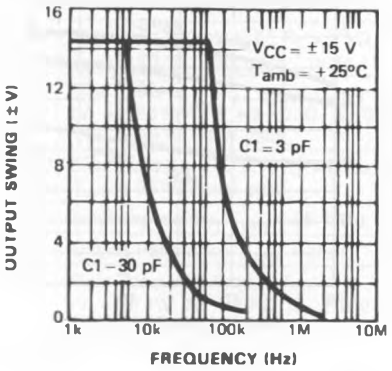
OPEN LOOP FREQUENCY RESPONSE



E88LM101-09

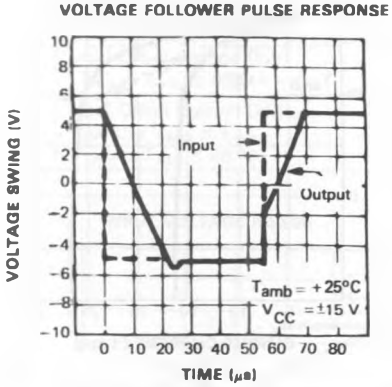
SINGLE POLE COMPENSATION

LARGE SIGNAL FREQUENCY RESPONSE



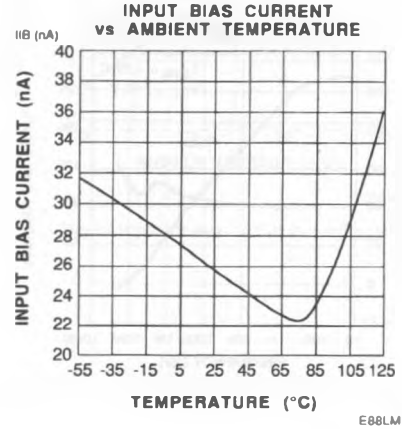
E88LM101-10

VOLTAGE FOLLOWER PULSE RESPONSE



E88LM101-12

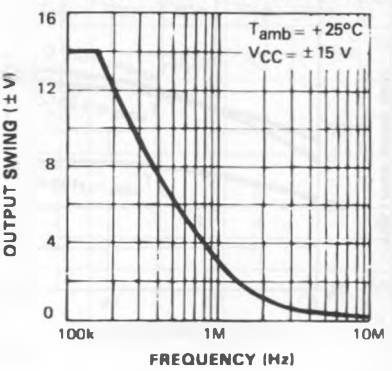
INPUT BIAS CURRENT vs AMBIENT TEMPERATURE



E88LM101-14

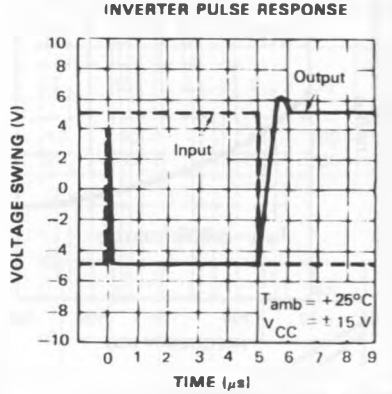
FEED FORWARD COMPENSATION

LARGE SIGNAL FREQUENCY RESPONSE



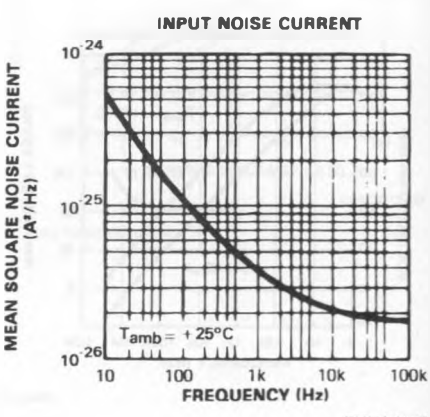
E88LM101-11

INVERTER PULSE RESPONSE



E88LM101-13

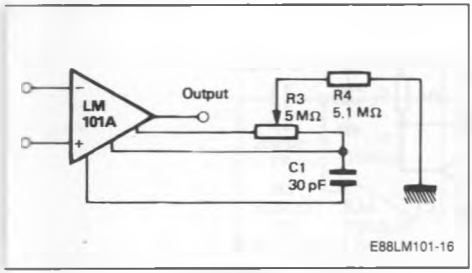
INPUT NOISE CURRENT



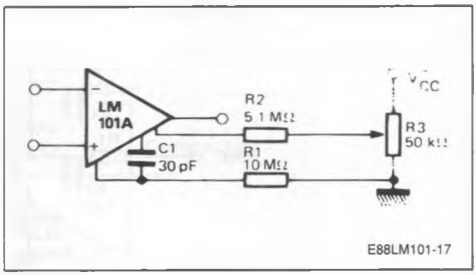
E88LM101-15

BASIC DIAGRAMS

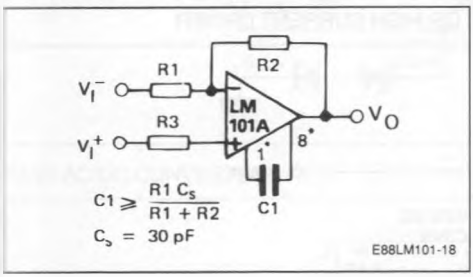
BALANCING CIRCUIT



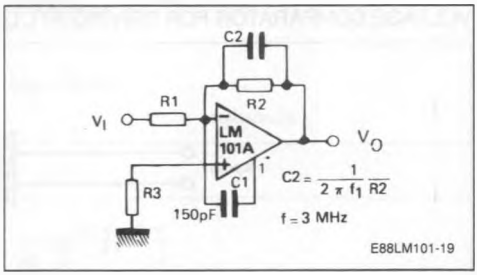
ALTERNATE BALANCING CIRCUIT



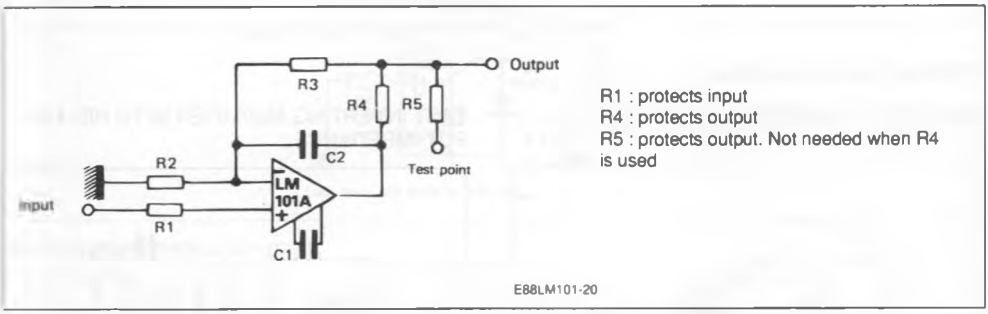
SINGLE POLE COMPENSATION



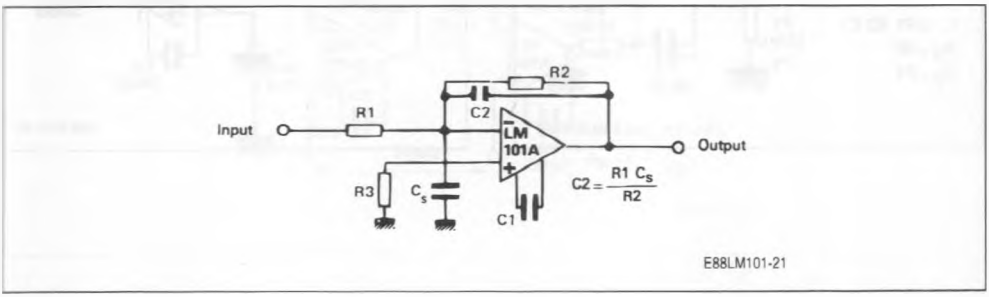
FEEDFORWARD COMPENSATION



PROTECTING AGAINST GROSS FAULT CONDITIONS

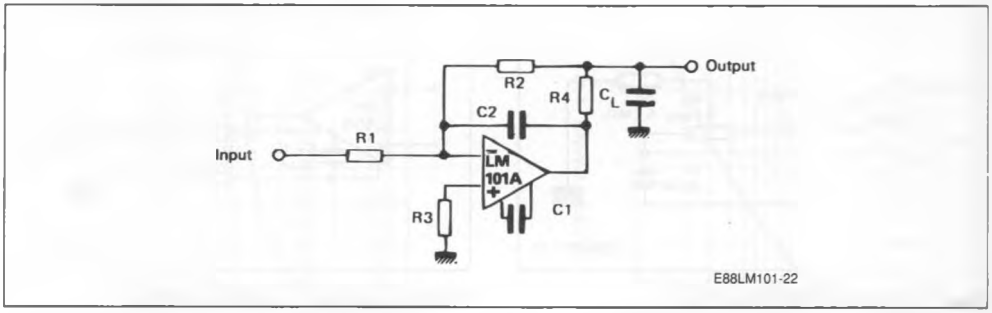


COMPENSATING FOR STRAY INPUT CAPACITANCES OR LARGE FEEDBACK RESISTOR

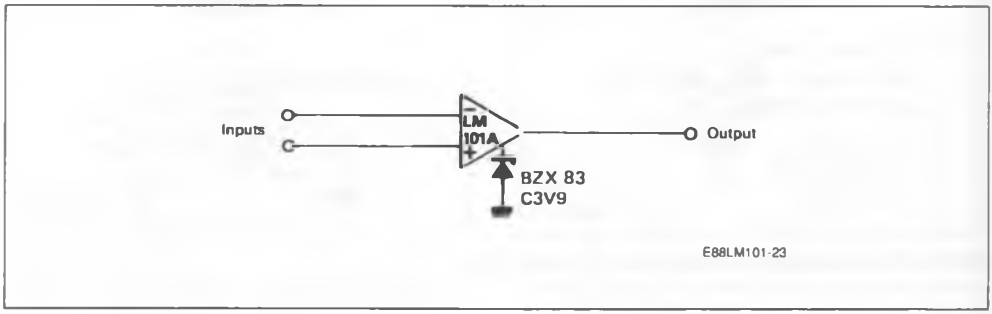


BASIC DIAGRAMS (continued)

ISOLATING LARGE CAPACITIVE LOADS

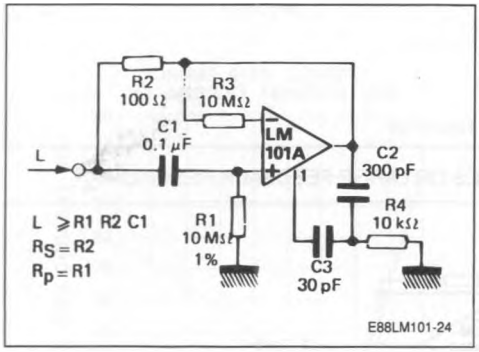


VOLTAGE COMPARATOR FOR DRIVING RTL LOGIC OR HIGH CURRENT DRIVER

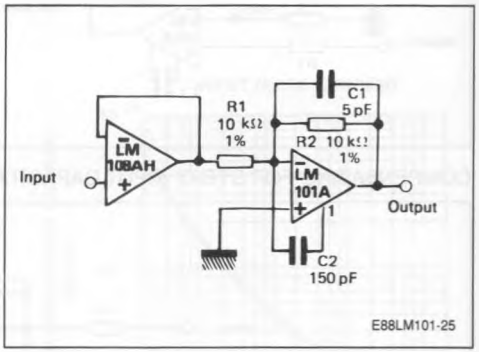


TYPICAL APPLICATIONS

SIMULATED INDUCTOR

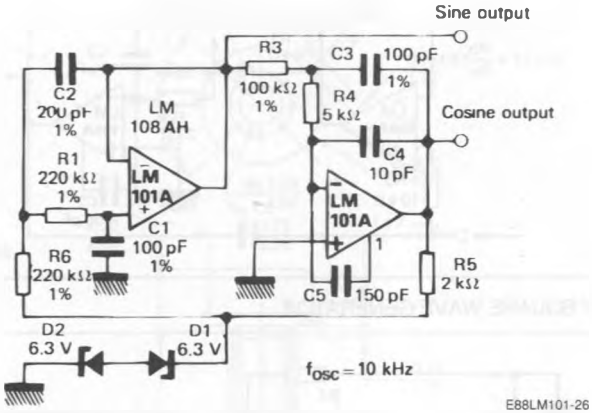


FAST INVERTING AMPLIFIER WITH HIGH INPUT IMPEDANCE

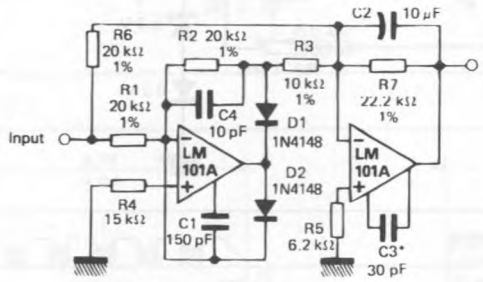


TYPICAL APPLICATIONS (continued)

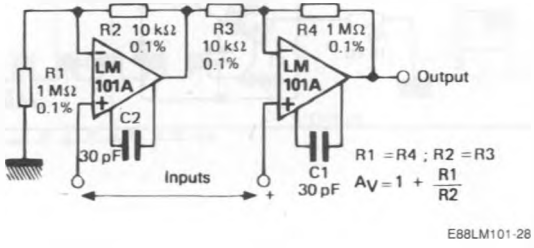
SINE WAVE OSCILLATOR



FAST AC/DC CONVERTER

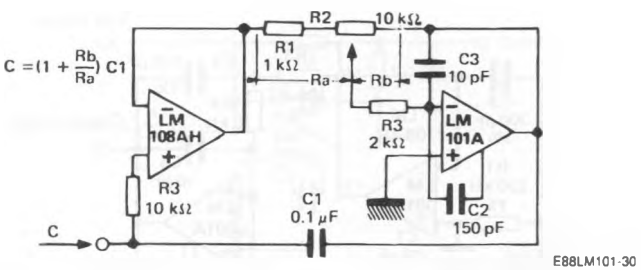


INSTRUMENTATION AMPLIFIER

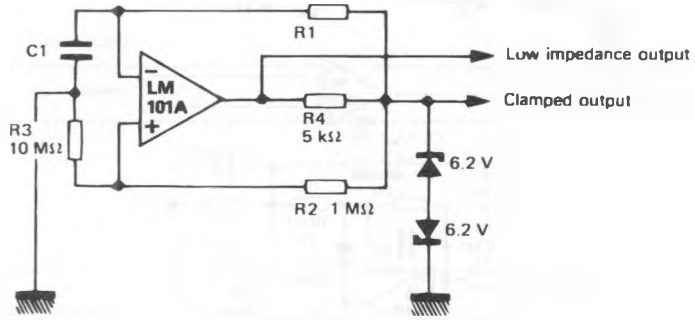


TYPICAL APPLICATIONS (continued)

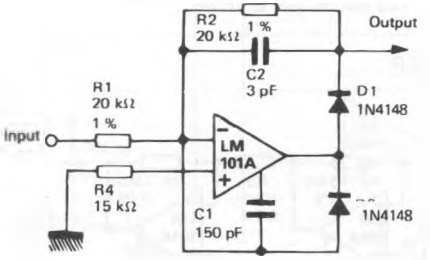
VARIABLE CAPACITANCE MULTIPLIER



LOW FREQUENCY SQUARE WAVE GENERATOR

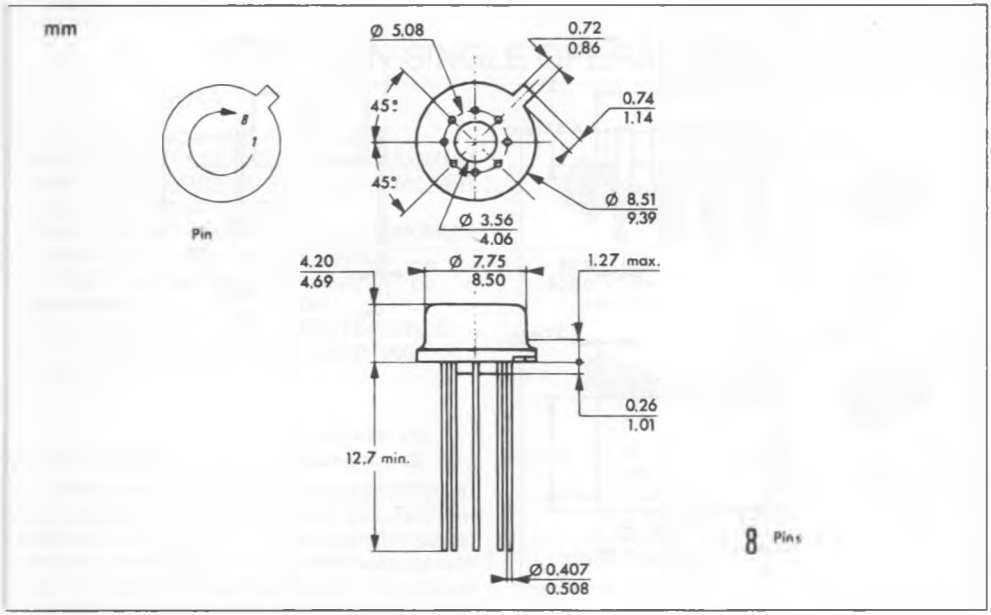


FAST HALF WAVE RECTIFIER

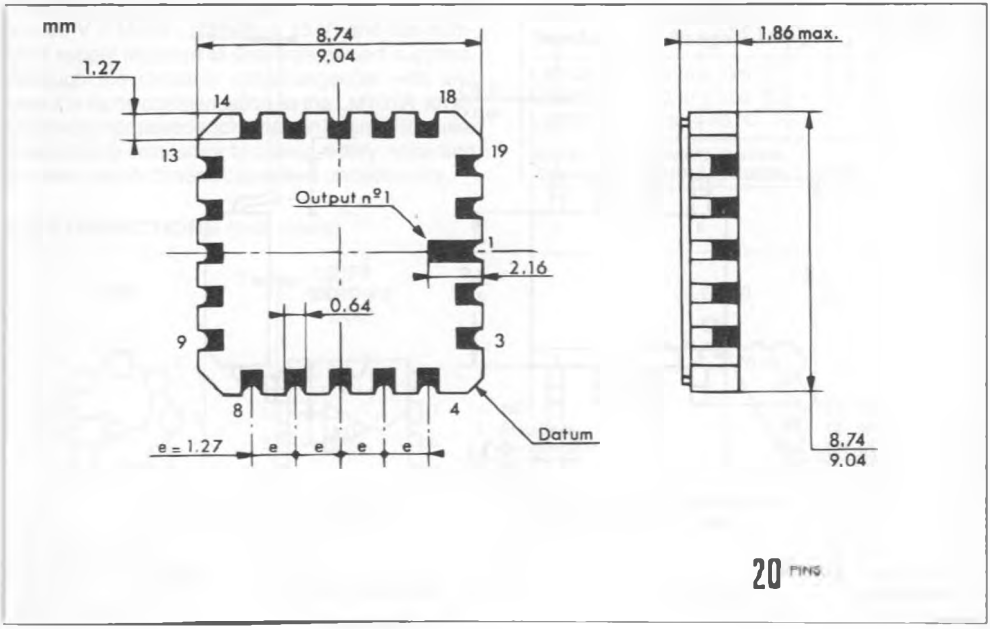


PACKAGE MECHANICAL DATA

8 PINS – METAL CAN TO99

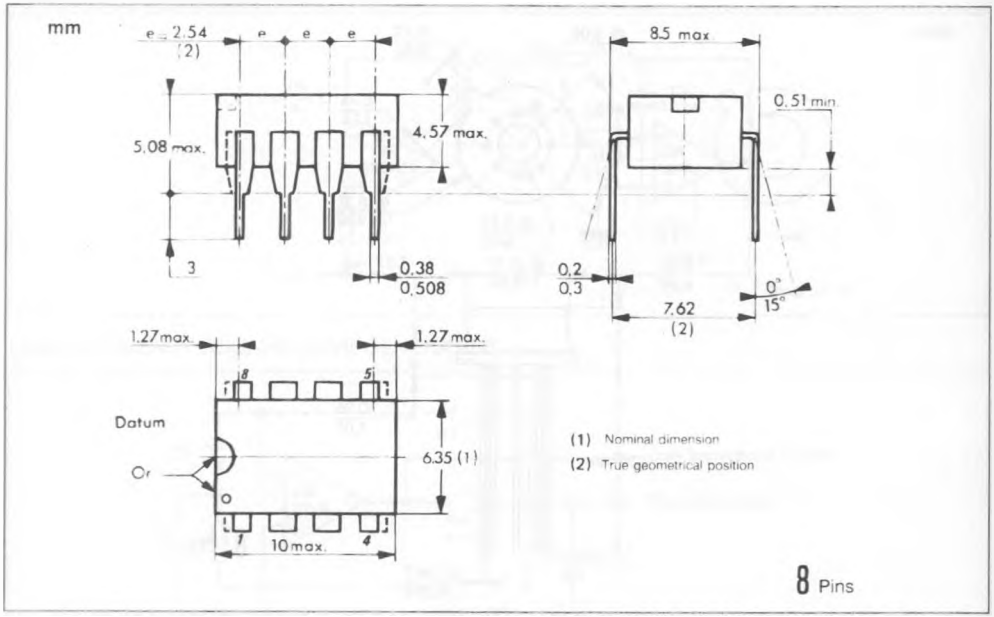


20 PINS – TRICECOP (LCC)



PACKAGE MECHANICAL DATA (continued)

8 PINS – PLASTIC DIP OR CERDIP



8 PINS – PLASTIC MICROPACKAGE (SO)