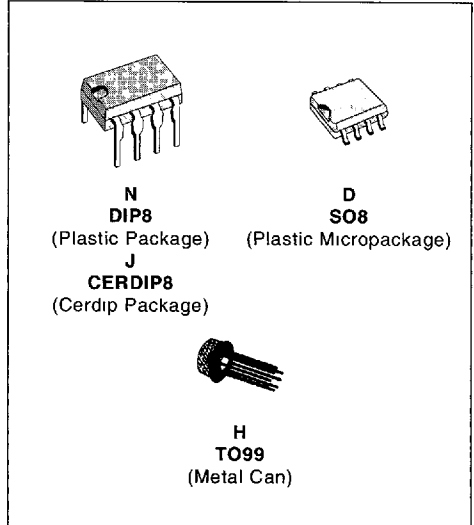


## SINGLE OPERATIONAL AMPLIFIERS

	LM101A LM201A	LM301A
■ INPUT OFFSET VOLTAGE	0.7mV	2mV
■ INPUT BIAS CURRENT	25nA	70nA
■ INPUT OFFSET CURRENT	1.5nA	2nA
■ SLEW RATE AS INVERTING AMPLIFIER	10V/μs	10V/μs



### DESCRIPTION

The LM101A is a general-purpose operational amplifier. This amplifier offers many features : supply voltages from  $\pm 5$  V to  $\pm 22$  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 30pF 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 3.5MHz can be easily achieved.

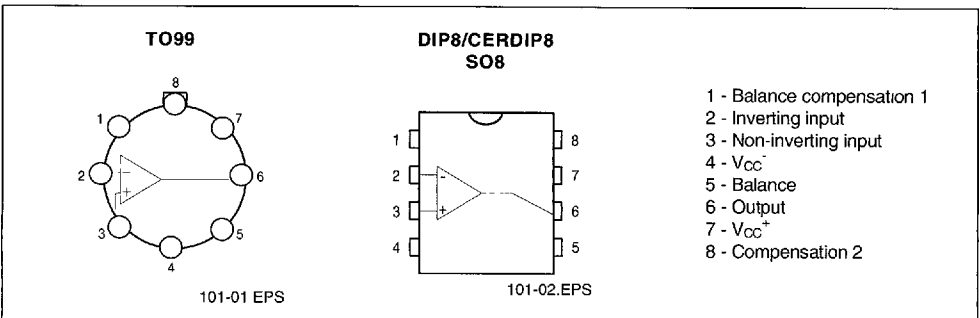
### ORDER CODES

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

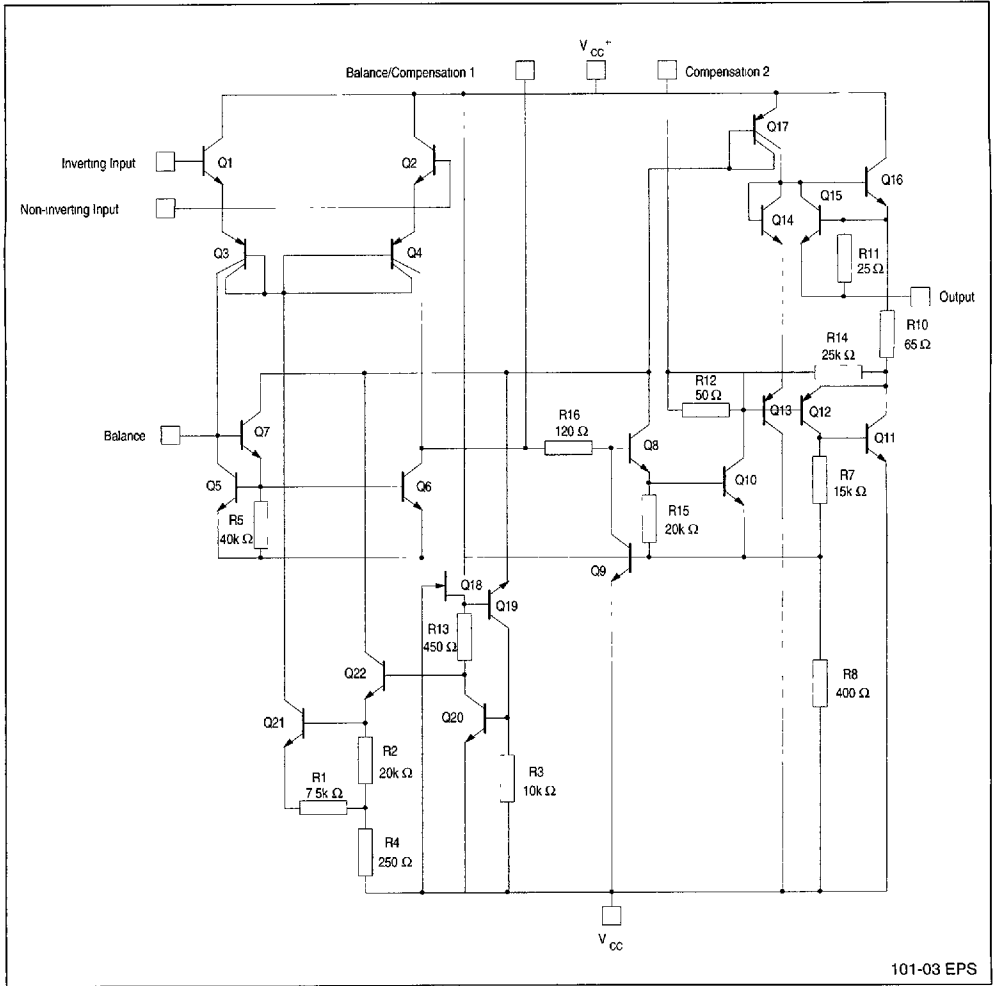
**Examples :** LM101AH, LM201AN

101-01.TBL

### PIN CONNECTIONS (top views)



**SCHEMATIC DIAGRAM**



101-03 EPS

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	LM101A	LM201A	LM301A	Unit
V <sub>CC</sub>	Supply Voltage	±22	±22	±22	V
V <sub>id</sub>	Differential Input Voltage	±30	±30	±30	V
V <sub>i</sub>	Input Voltage	±15	±15	±15	V
	Output Short-circuit Duration	Infinite			
P <sub>tot</sub>	Power Dissipation N.J.H. Suffix D Suffix	500 300			mW
T <sub>oper</sub>	Operating Free-air Temperature Range	-55 to +125	-40 to +105	0 to +70	°C
T <sub>stg</sub>	Storage Temperature Range	-65 to +150	-65 to +150	-65 to +150	°C

101-02.TBL

## ELECTRICAL CHARACTERISTICS

<b>LM301A</b>	$0^{\circ}\text{C} < T_{\text{amb}} < +70^{\circ}\text{C}$	$\pm 5\text{V} \leq V_{\text{CC}} \leq \pm 20\text{V}$	$C_1 = 30\text{pF}$
<b>LM201A</b>	$-40^{\circ}\text{C} < T_{\text{amb}} < +105^{\circ}\text{C}$	$\pm 5\text{V} \leq V_{\text{CC}} \leq \pm 20\text{V}$	$C_1 = 30\text{pF}$
<b>LM101A</b>	$-55^{\circ}\text{C} < T_{\text{amb}} < +125^{\circ}\text{C}$	$\pm 5\text{V} \leq V_{\text{CC}} \leq \pm 20\text{V}$	$C_1 = 30\text{pF}$

\*  $\Rightarrow V_{\text{CC}} = \pm 15\text{V}$ ,  $T_{\text{amb}} = 25^{\circ}\text{C}$  (unless otherwise specified)

Symbol	Parameter	LM101A - LM201A			LM301A			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$V_{\text{io}}$	Input Offset Voltage ( $R_{\text{S}} \leq 10\text{k}\Omega$ ) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$		0.7	2 3		2	7.5 10	mV
$I_{\text{b}}$	Input Bias Current $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$		25	75 100		70	250 300	nA
$I_{\text{io}}$	Input Offset Current $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$		1.5	10 20		2	50 70	nA
$A_{\text{vd}}$	Large Signal Voltage Gain * ( $V_{\text{O}} = \pm 10\text{V}$ , $R_{\text{L}} = 2\text{k}\Omega$ ) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$	50 25	100		25 15	100		V/mV
$\text{SVR}$	Supply Voltage Rejection Ratio ( $R_{\text{S}} \leq 10\text{k}\Omega$ ) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$	80 80	96		70 70	96		dB
$I_{\text{CC}}$	Supply Current no Load $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$		1.8	3 3		1.8	3 3	mA
$V_{\text{cm}}$	Input Common Mode Voltage Range ( $V_{\text{CC}} = \pm 20\text{V}$ ) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$	$\pm 15$ $\pm 15$			$\pm 15$ $\pm 15$			V
$\text{CMR}$	Common Mode Rejection Ratio ( $R_{\text{S}} \leq 10\text{k}\Omega$ ) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$	80 80	96		70 70	96		dB
$I_{\text{OS}}$	Output Short-circuit Current * $T_{\text{amb}} = 25^{\circ}\text{C}$	10	30	50	10	30	50	mA
$\pm V_{\text{OPP}}$	Output Voltage Swing * $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min}} \leq T_{\text{amb}} \leq T_{\text{max}}$		$R_{\text{L}} = 10\text{k}\Omega$ 12 $R_{\text{L}} = 2\text{k}\Omega$ 10 $R_{\text{L}} = 10\text{k}\Omega$ 12 $R_{\text{L}} = 2\text{k}\Omega$ 10	14 13		12 14 10 13		V

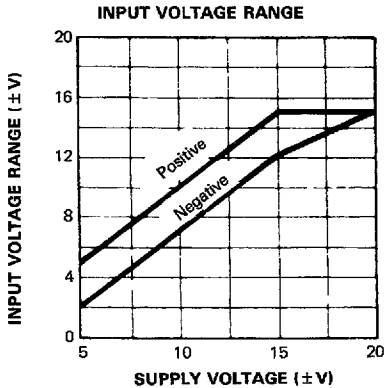
101-03 TBL

ELECTRICAL CHARACTERISTICS (continued)

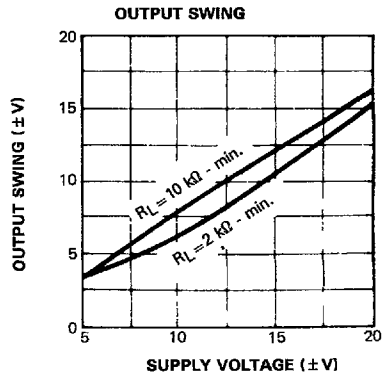
Symbol	Parameter	LM101A - LM201A			LM301A			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
SR	Slew Rate ( $V_I = \pm 10V$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , $T_{amb} = 25^\circ C$ , unity gain) - (note 1) *	0.25	0.5		0.25	0.5		V/ $\mu s$
$t_r$	Rise Time ( $V_I = \pm 20 \mu V$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , $T_{amb} = 25^\circ C$ , unity gain) *		0.3			0.3		$\mu s$
$K_{ov}$	Overshoot ( $V_I = 20 mV$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , $T_{amb} = 25^\circ C$ , unity gain)		5			5		%
$Z_i$	Input Impedance *	1.5	4		1.5	4		M $\Omega$
$R_o$	Output Resistance *		75			75		$\Omega$
GBP	Gain Bandwidth Product * ( $V_I = 10mV$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , $f = 100kHz$ , $T_{amb} = 25^\circ C$ )	0.5	1		0.5	1		MHz
THD	Total Harmonic Distortion ( $f = 1kHz$ , $A_v = 20dB$ , $R_L = 2k\Omega$ , $V_O = 2V_{pp}$ , $C_L = 100pF$ , $T_{amb} = 25^\circ C$ )		0.015			0.015		%
$e_n$	Equivalent Input Noise Voltage ( $f = 1kHz$ , $R_s = 100\Omega$ )		25			25		$\frac{nV}{\sqrt{Hz}}$
$DV_{io}$	Input Offset Voltage Drift $T_{min} \leq T_{amb} \leq T_{max}$ .		3	15		6	30	$\mu V/^\circ C$
$DI_{io}$	Input Offset Current Drift $25^\circ C \leq T_{amb} \leq T_{max}$ $T_{min} \leq T_{amb} \leq 25^\circ C$		10 20	100 200		10 20	300 600	$pA/^\circ C$

101-04 TBL

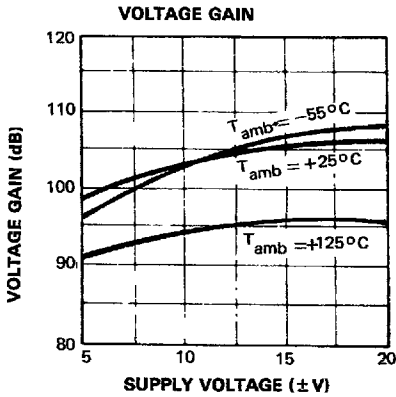
Note :1 May be improved up to 10V/ $\mu s$  in inverting amplifier configuration (see basic diagram)



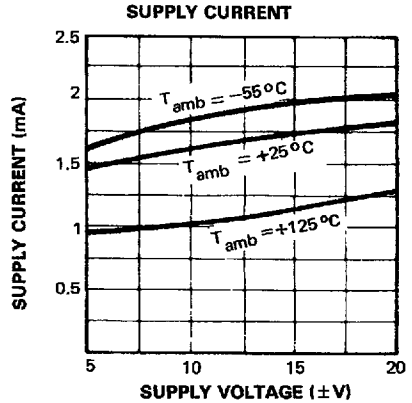
101-04.EPS



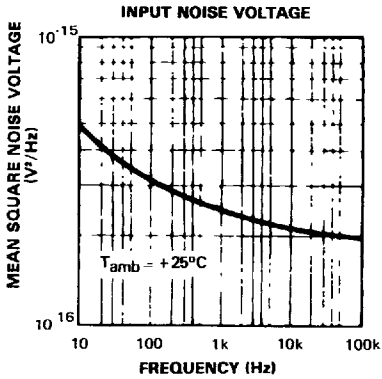
101-05 EPS



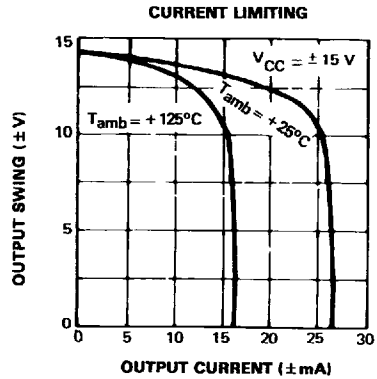
101-06.EPS



101-07.EPS



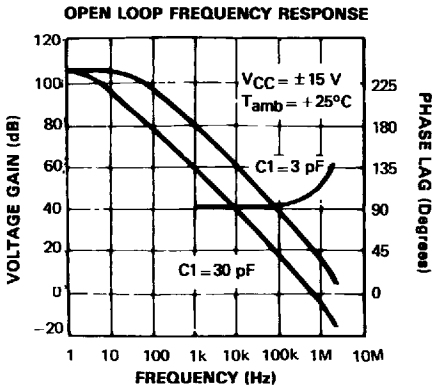
101-08.EPS



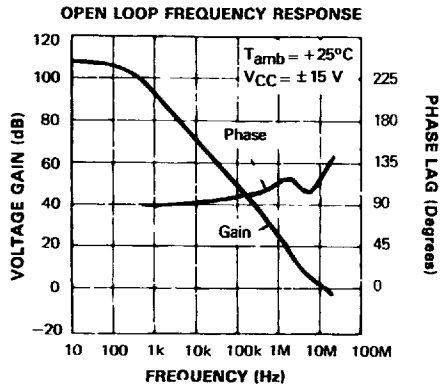
101-09.EPS

## SINGLE POLE COMPENSATION

## FEED FORWARD COMPENSATION



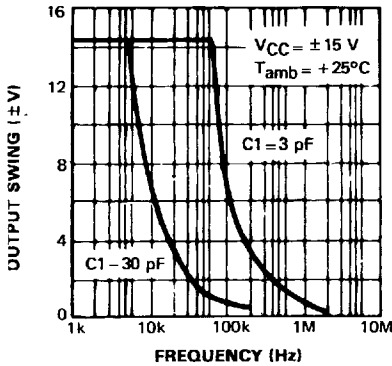
101-10.EPS



101-11.EPS

SINGLE POLE COMPENSATION

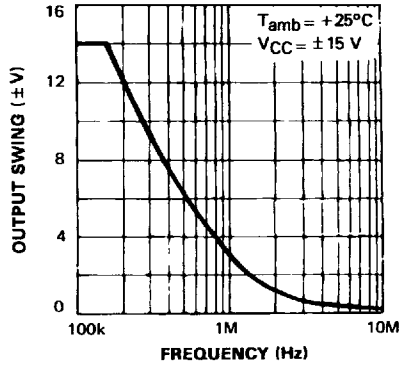
LARGE SIGNAL FREQUENCY RESPONSE



101-12.EPS

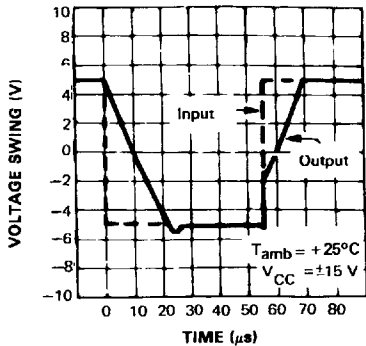
FEED FORWARD COMPENSATION

LARGE SIGNAL FREQUENCY RESPONSE



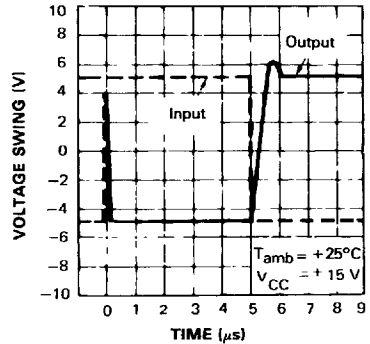
101-13.EPS

VOLTAGE FOLLOWER PULSE RESPONSE



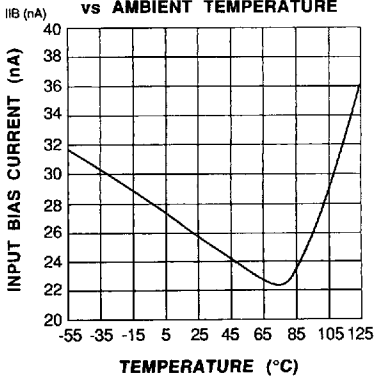
101-14.EPS

INVERTER PULSE RESPONSE



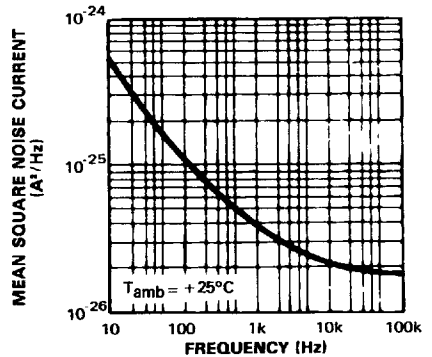
101-15.EPS

INPUT BIAS CURRENT vs AMBIENT TEMPERATURE



101-16.EPS

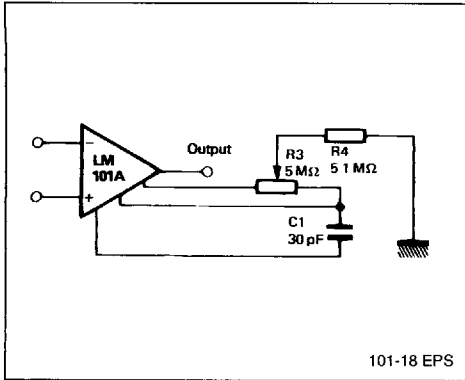
INPUT NOISE CURRENT



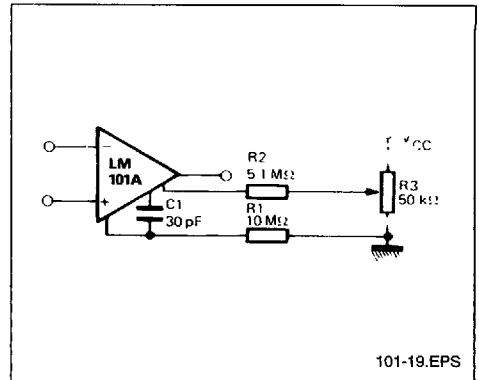
101-17.EPS

**BASIC DIAGRAM**

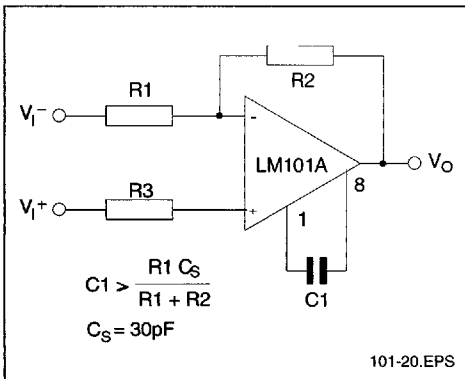
**BALANCING CIRCUIT**



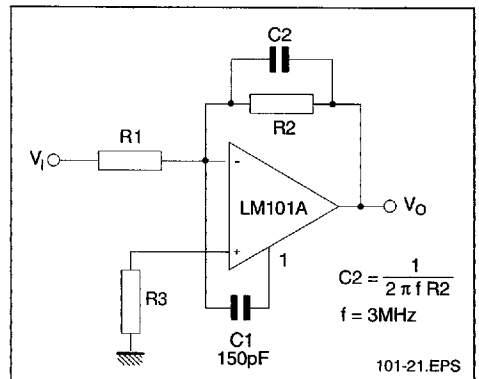
**ALTERNATE BALANCING CIRCUIT**



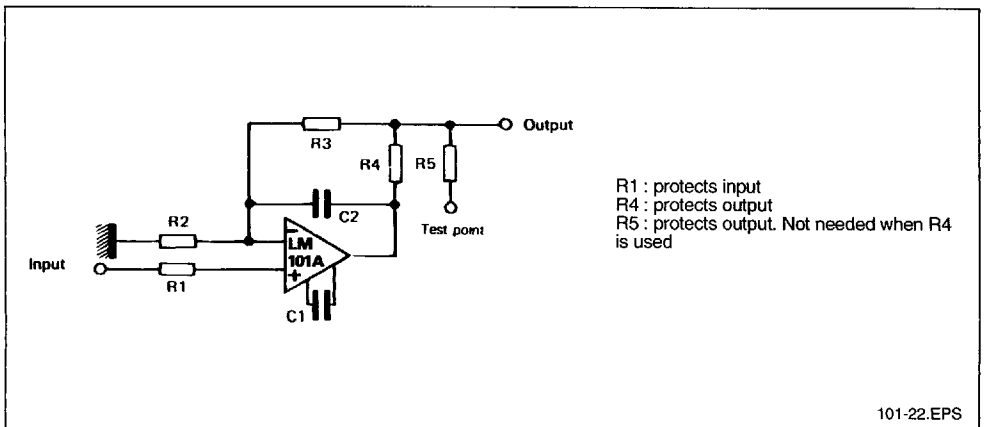
**SINGLE POLE COMPENSATION**



**FEEDFORWARD COMPENSATION**

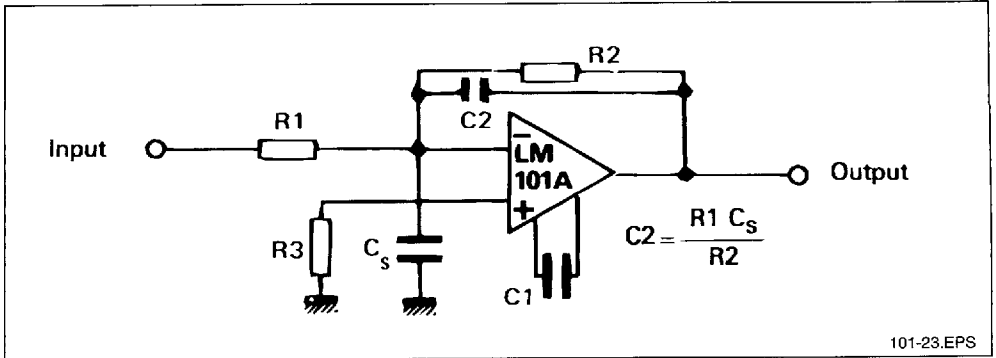


**PROTECTING AGAINST GROSS FAULT CONDITIONS**

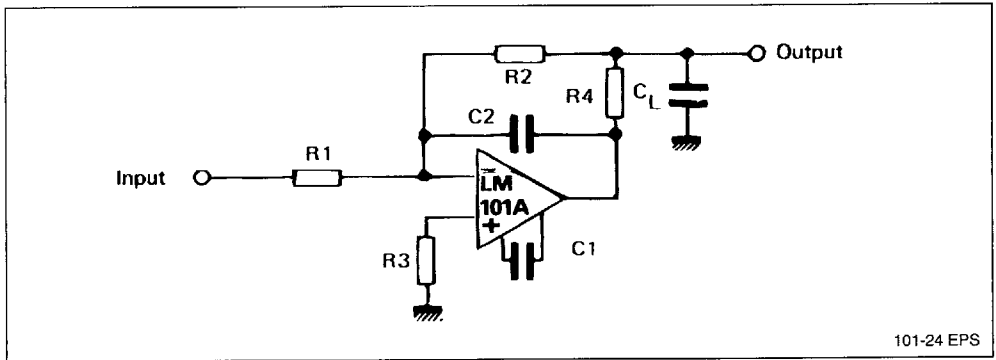


**BASIC DIAGRAM** (continued)

COMPENSATING FOR STRAY INPUT CAPACITANCES OR LARGE FEEDBACK RESISTOR

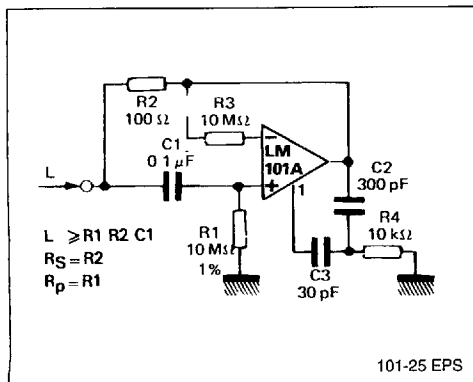


ISOLATING LARGE CAPACITIVE LOADS

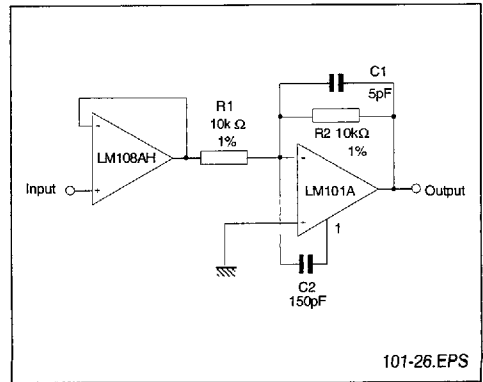


**TYPICAL APPLICATIONS**

SIMULATED INDUCTOR



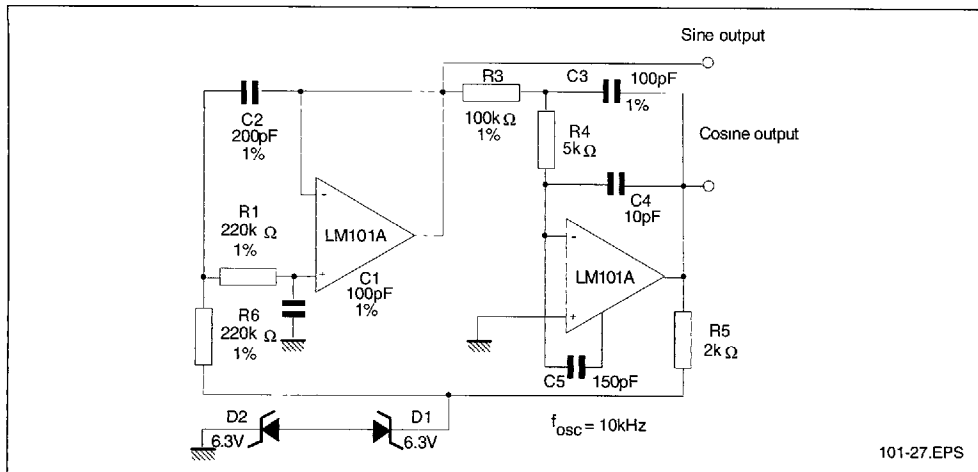
FAST AMPLIFIER WITH HIGH INPUT IMPEDANCE



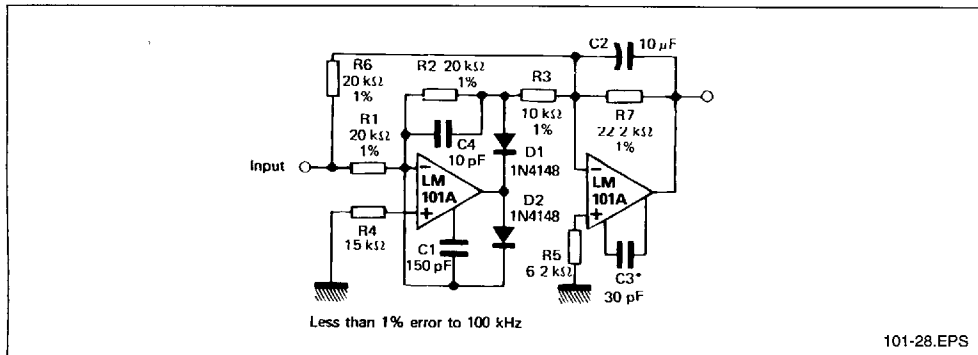


TYPICAL APPLICATIONS (continued)

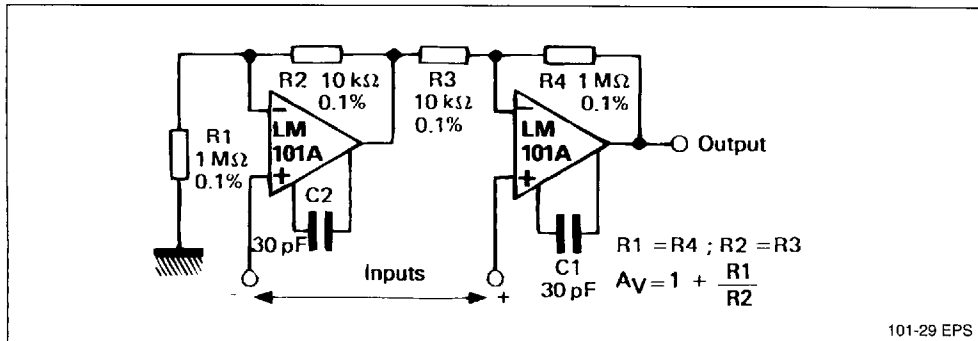
SINE WAVE OSCILLATOR



FAST AC/DC CONVERTER

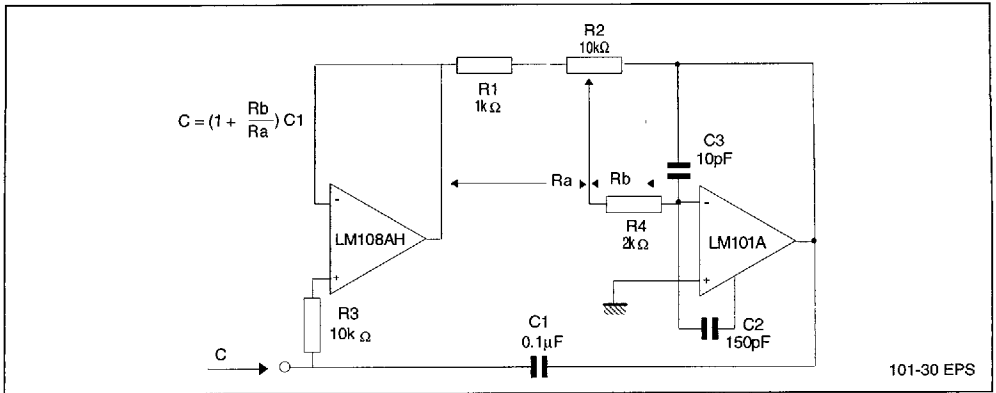


INSTRUMENTATION AMPLIFIER

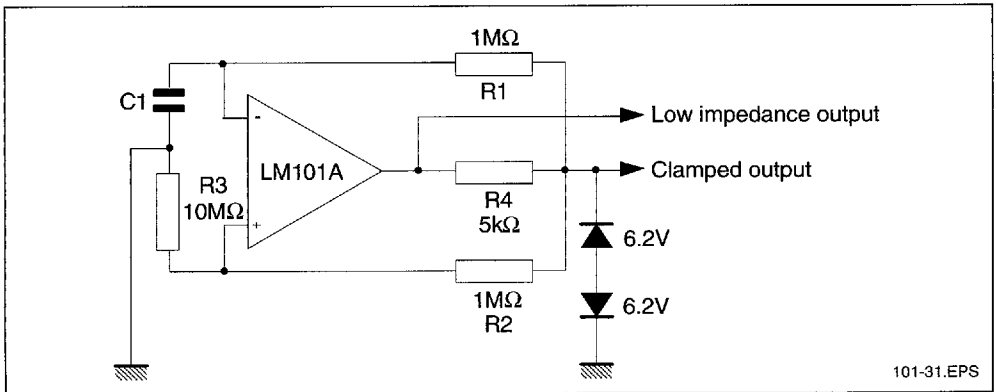


TYPICAL APPLICATIONS (continued)

VARIABLE CAPACITANCE MULTIPLIER



LOW FREQUENCY SQUARE WAVE GENERATOR



FAST HALF WAVE RECTIFIER

