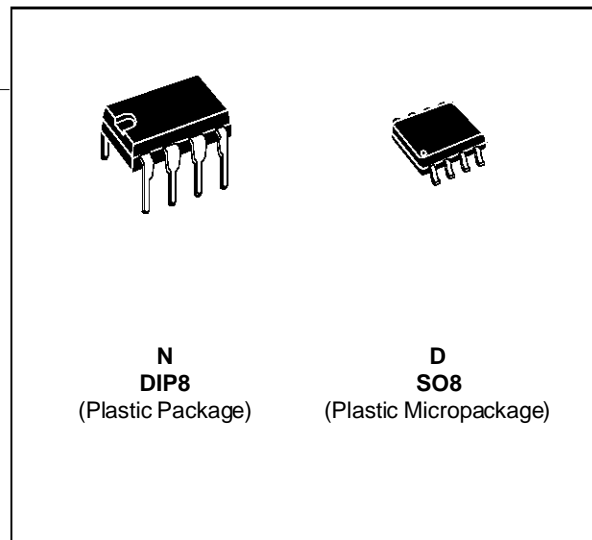


## SINGLE OPERATIONAL AMPLIFIER

	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

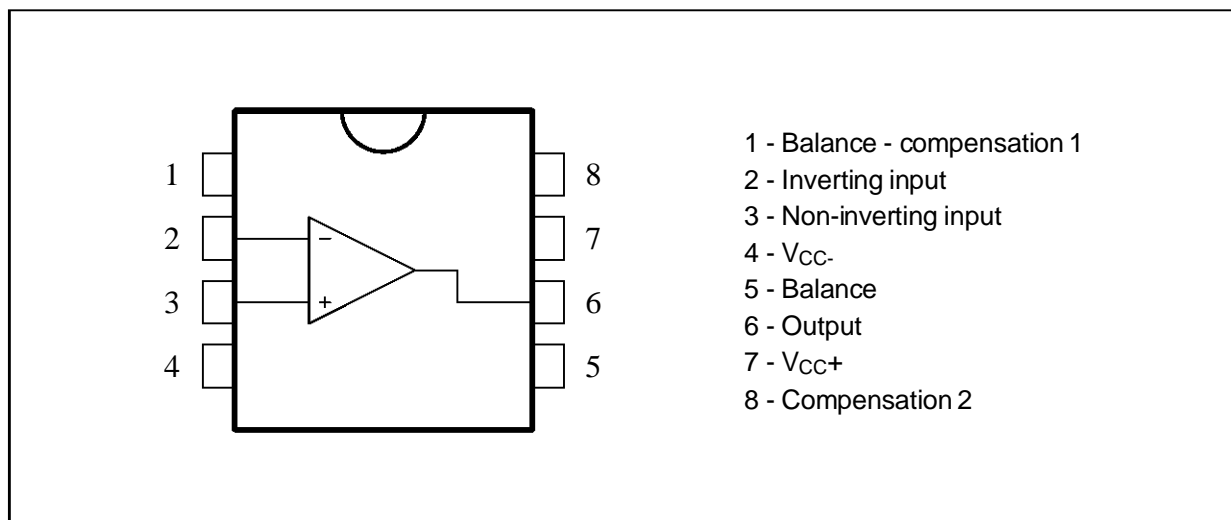
The LM101A is a general-purpose operational amplifier which offers many features : supply voltages from  $\pm 5V$  to  $\pm 22V$ , low current drain, overload protection on the input and output, no latch-up when the common-mode range is exceeded, free from oscillations and compensation with a single 30pF capacitor. It has advantages over internally compensated amplifiers in that the compensation can be tailored to the particular application : slew rate of 10V/μs and bandwidth of 3.5MHz can be easily achieved.

### ORDER CODES

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

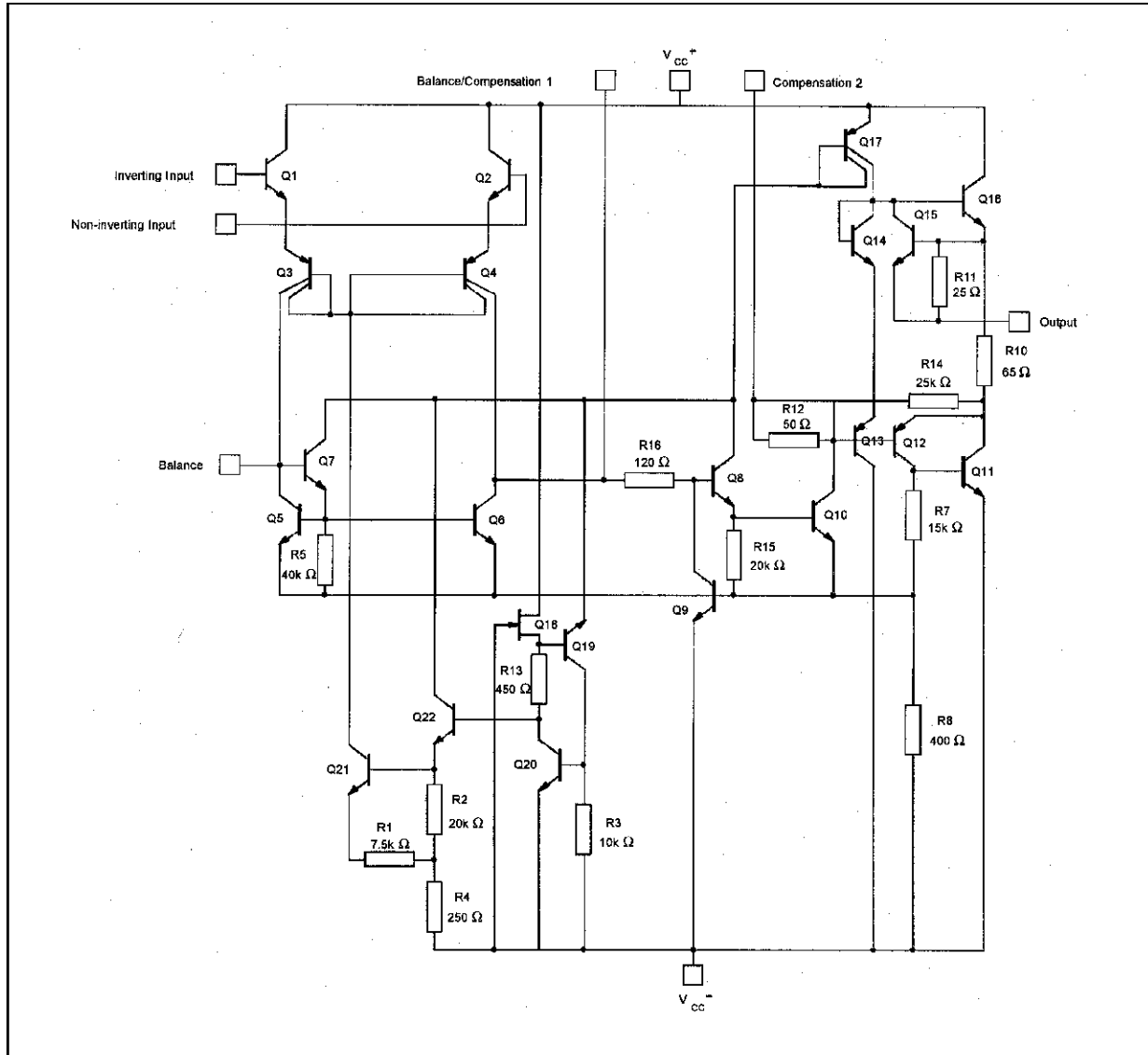
**Example :** LM201AN

### PIN CONNECTIONS (top view)



# LM101A - LM201A - LM301A

## SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	LM101A	LM201A	LM301A	Unit
$V_{cc}$	Supply Voltage		$\pm 22$		V
$V_{id}$	Differential Input Voltage		$\pm 30$		V
$V_i$	Input Voltage		$\pm 15$		V
$P_{tot}$	Power Dissipation		500		mW
			300		
	Output Short-circuit Duration		Infinite		
$T_{oper}$	Operating Free Air Temperature Range	-55 to +125	-40 to +105	0 to +70	$^{\circ}\text{C}$
$T_{stg}$	Storage Temperature Range	-65 to +150	-65 to +150	-65 to +150	$^{\circ}\text{C}$

**ELECTRICAL CHARACTERISTICS**

**LM301A**     $0^{\circ}\text{C} < T_{\text{amb}} < +70^{\circ}\text{C}$      $\pm 5\text{V} \leq V_{\text{CC}} \leq \pm 20\text{V}$      $C1 = 30\text{pF}$   
**LM201A**     $-40^{\circ}\text{C} < T_{\text{amb}} < +105^{\circ}\text{C}$      $\pm 5\text{V} \leq V_{\text{CC}} \leq \pm 20\text{V}$      $C1 = 30\text{pF}$   
**LM101A**     $-55^{\circ}\text{C} < T_{\text{amb}} < +125^{\circ}\text{C}$      $\pm 5\text{V} \leq V_{\text{CC}} \leq \pm 20\text{V}$      $C1 = 30\text{pF}$

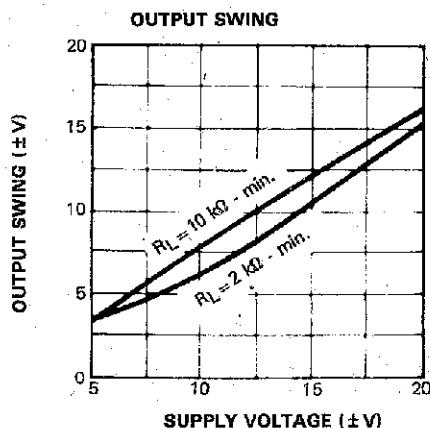
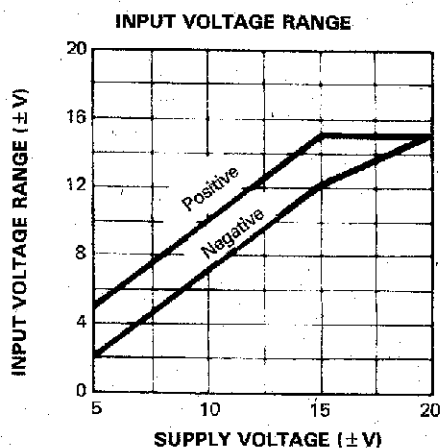
Symbol	Parameter	LM101A - LM201A			LM301A			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$V_{io}$	Input Offset Voltage ( $R_S \leq 10\text{k}\Omega$ ) $T_{\text{amb}} = +25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$		0.7	2 3		2	7.5 10	mV
$DV_{io}$	Input Offset Voltage Drift $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$		3	15		6	30	$\mu\text{V}/^{\circ}\text{C}$
$I_{ib}$	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
$I_{io}$	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
$DI_{io}$	Input Offset Current Drift $25^{\circ}\text{C} \leq T_{\text{amb}} \leq T_{\text{max.}}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$		10 20	100 200		10 20	300 600	$\text{pA}/^{\circ}\text{C}$
$A_{vd}$	Large Signal Voltage Gain * ( $V_O \leq 10\text{V}$ , $R_L = 2\text{k}\Omega$ ) $T_{\text{amb}} = +25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$	50 25	100		25 15	100		V/mV
SVR	Supply Voltage Rejection Ratio ( $R_S \leq 10\text{k}\Omega$ ) $T_{\text{amb}} = +25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$	80 80	96		70 70	96		dB
$I_{CC}$	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
$V_{icm}$	Input Common Mode Voltage Range ( $V_{CC} = \pm 20\text{V}$ ) $T_{\text{amb}} = +25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$	$\pm 15$ $\pm 15$			$\pm 15$ $\pm 15$			V
CMR	Common-mode Rejection Ratio ( $R_S \leq 10\text{k}\Omega$ ) $T_{\text{amb}} = +25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$	80 80	96		70 70	96		dB
$I_{OS}$	Output Short-circuit Current * $T_{\text{amb}} = +25^{\circ}\text{C}$	10	30	50	10	30	50	mA
$\pm V_{OPP}$	Output Voltage Swing * $T_{\text{amb}} = +25^{\circ}\text{C}$ $R_L = 10\text{k}\Omega$ $R_L = 2\text{k}\Omega$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ $R_L = 10\text{k}\Omega$ $R_L = 2\text{k}\Omega$	12 10 12 10	14 13		12 10 12 10	14 13		V

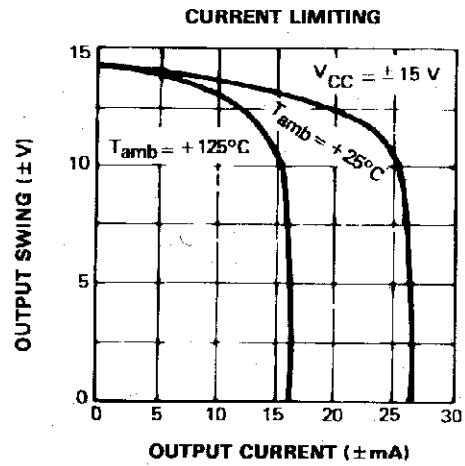
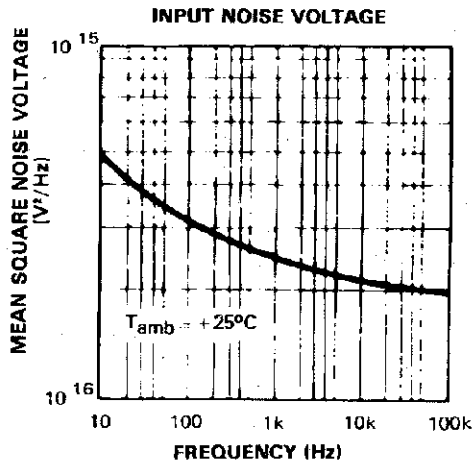
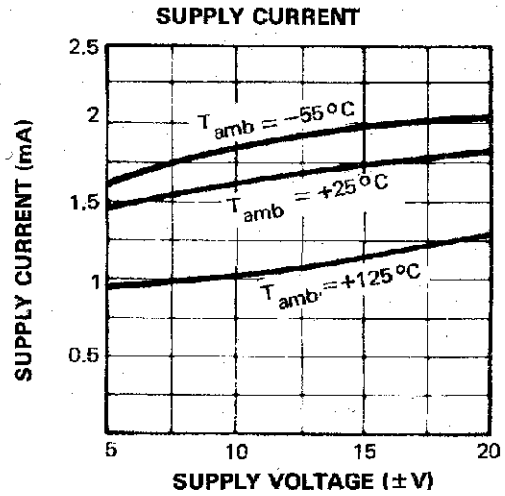
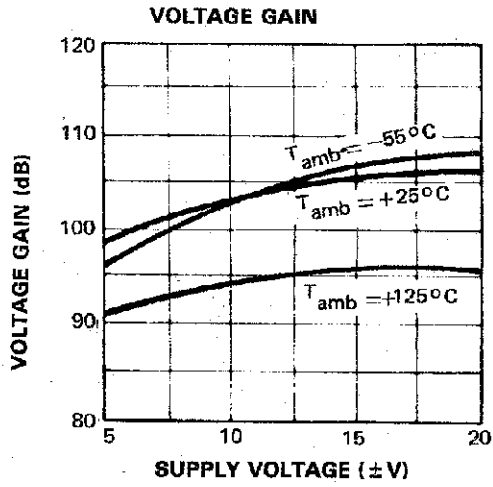
# LM101A - LM201A - LM301A

## ELECTRICAL CHARACTERISTICS (continued)

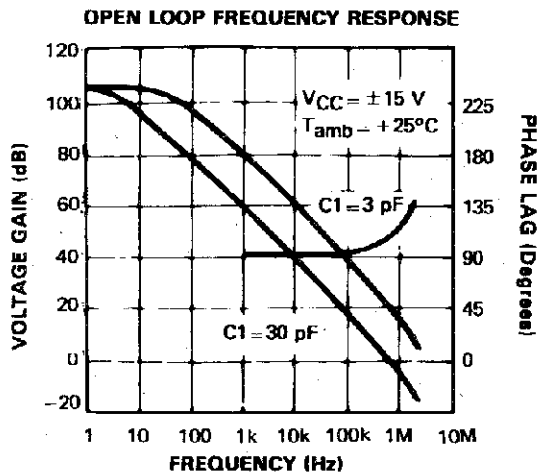
Symbol	Parameter	LM101A - LM201A			LM301A			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
SR	Slew Rate ( $V_i = \pm 10V$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , $T_{amb} = 25^\circ C$ , unity gain) - (note 1) *	0.25	0.5		0.25	0.5		V/ $\mu s$
$t_r$	Rise Time ( $V_i = \pm 20\mu V$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , $T_{amb} = 25^\circ C$ , unity gain) *		0.3			0.3		$\mu s$
Kov	Overshoot ( $V_i = 20mV$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , $T_{amb} = 25^\circ C$ , 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		$\frac{nV}{\sqrt{Hz}}$

Notes : 1. May be improved up to 10V/ $\mu s$  in inverting amplifier configuration  
 \* =>  $V_{CC} = \pm 15V$   $T_{amb} = +25^\circ C$  (unless otherwise specified)

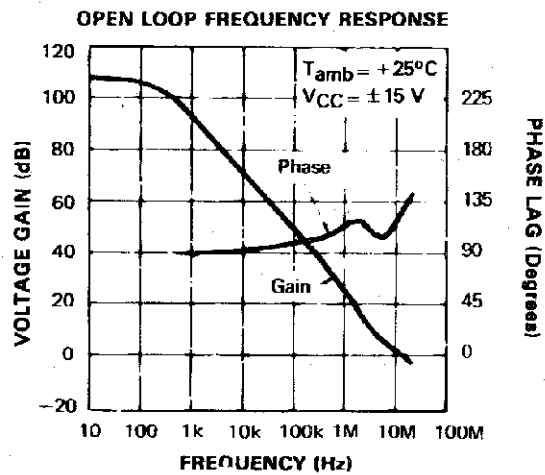




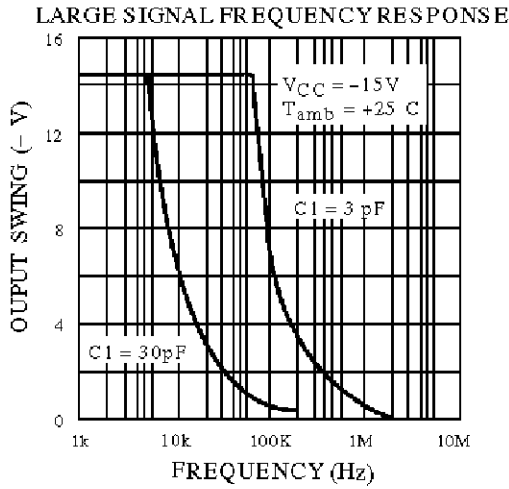
## SINGLE POLE COMPENSATION



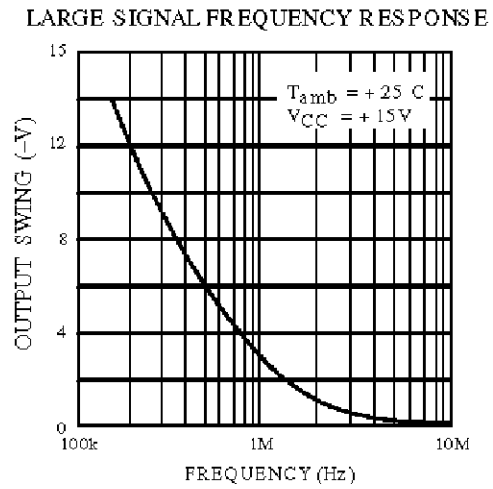
## FEED FORWARD COMPENSATION



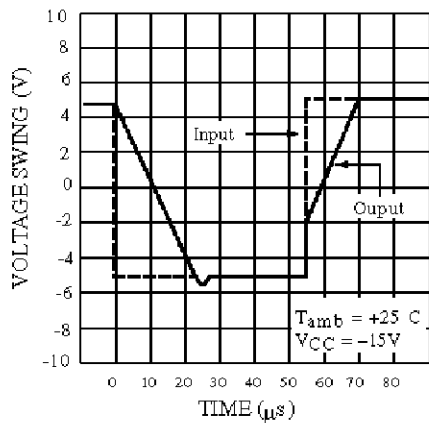
SINGLE POLE COMPENSATION



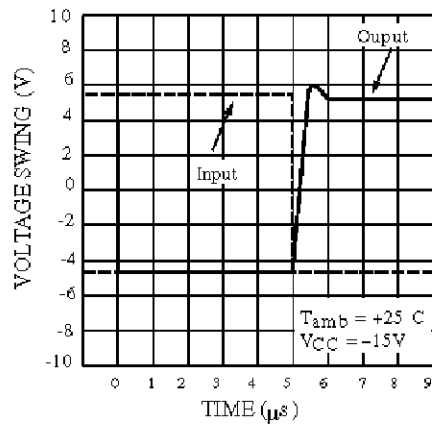
FEED FORWARD COMPENSATION



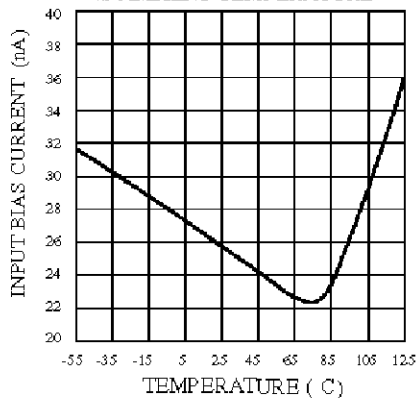
VOLTAGE FOLLOWER PULSE RESPONSE



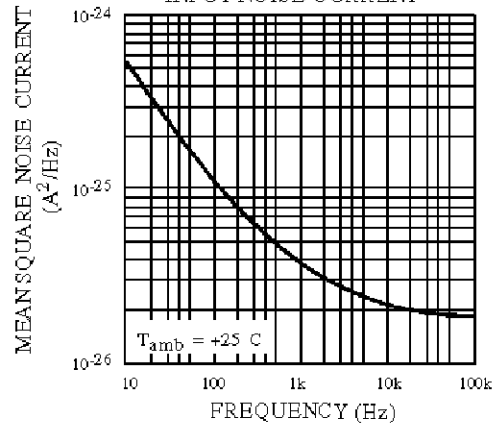
INVERTER PULSE RESPONSE



INPUT BIAS CURRENT vs AMBIENT TEMPERATURE

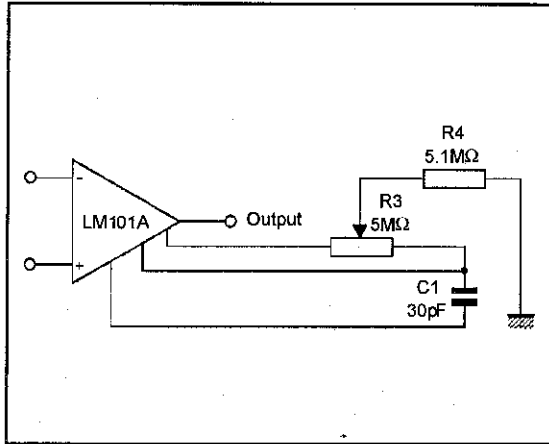


INPUT NOISE CURRENT

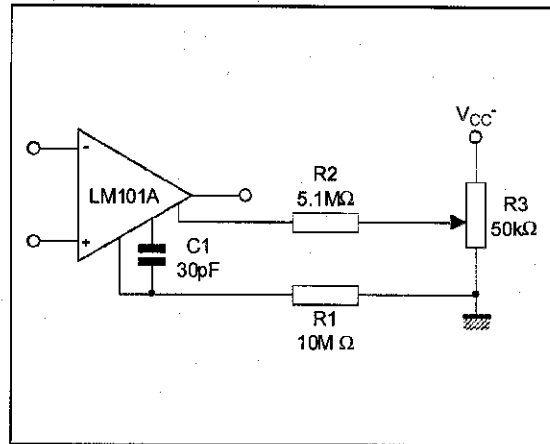


**BASIC DIAGRAM**

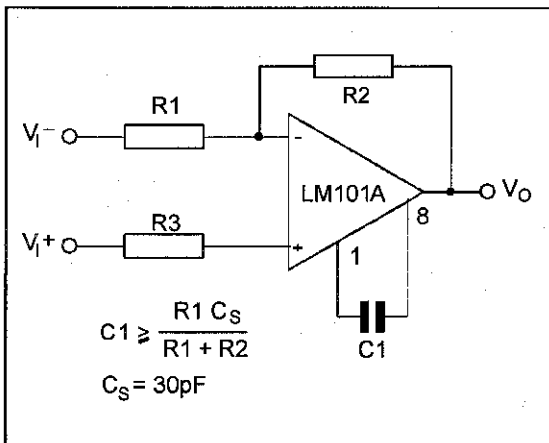
**BALANCING CIRCUIT**



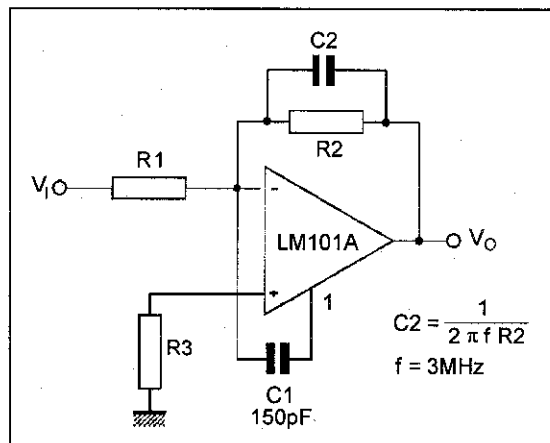
**ALTERNATE BALANCING CIRCUIT**



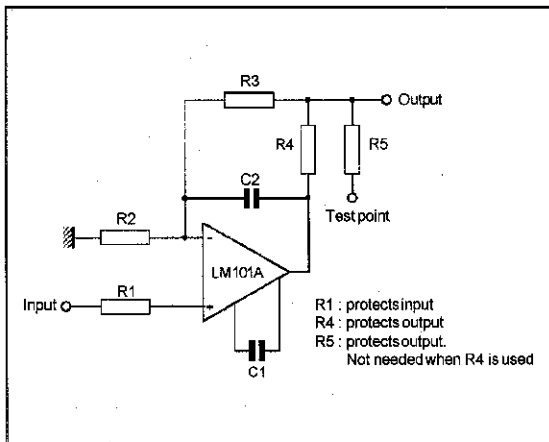
**SINGLE POLE COMPENSATION**



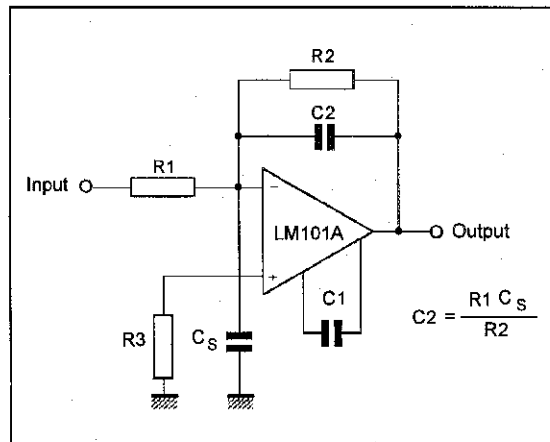
**FEEDFORWARD COMPENSATION**



**PROTECTING AGAINST GROSS FAULT CONDITIONS**

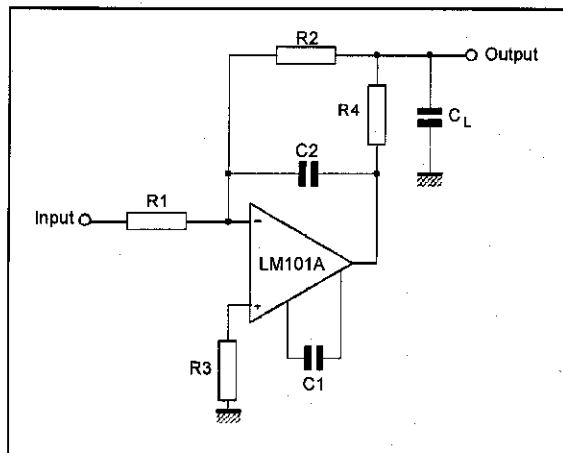


**COMPENSATING FOR STRAY INPUT CAPACITANCES OR LARGE FEEDBACK RESISTOR**



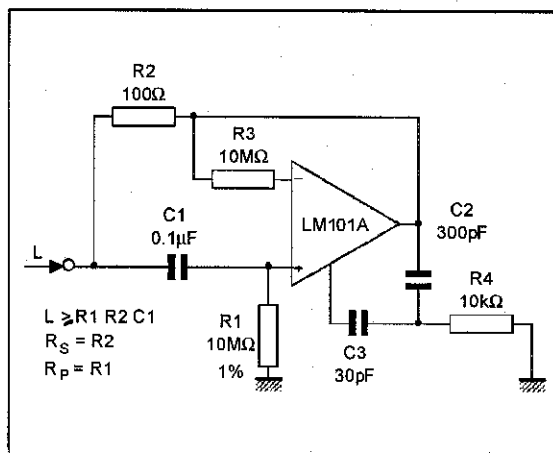
**BASIC DIAGRAM (continued)**

**ISOLATING LARGE CAPACITIVE LOAD**

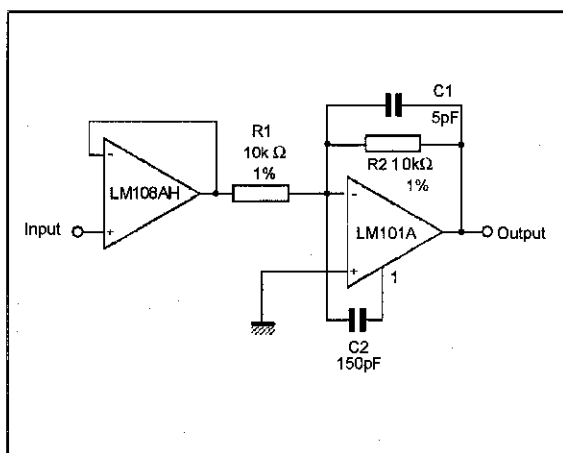


**TYPICAL APPLICATIONS**

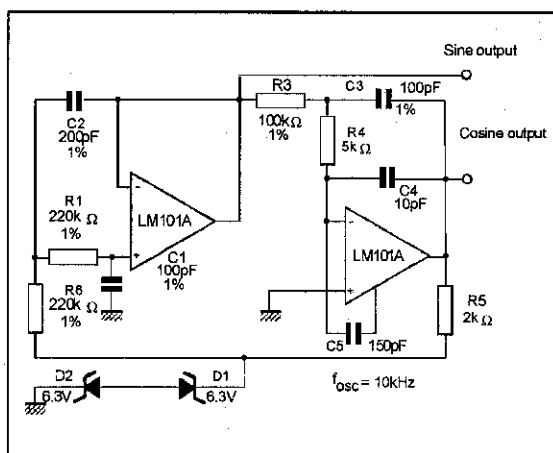
**SIMULATED INDUCTOR**



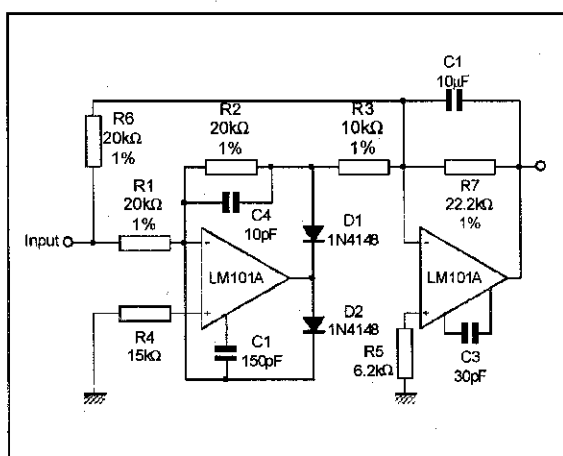
**FAST AMPLIFIER WITH HIGH INPUT IMPEDANCE**



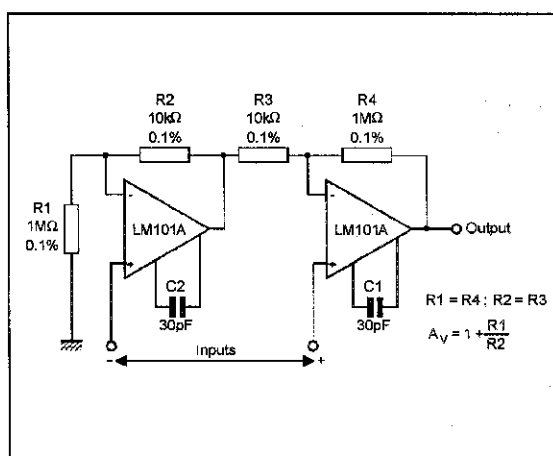
**SINE WAVE OSCILLATOR**



**FAST AC/DC CONVERTER**



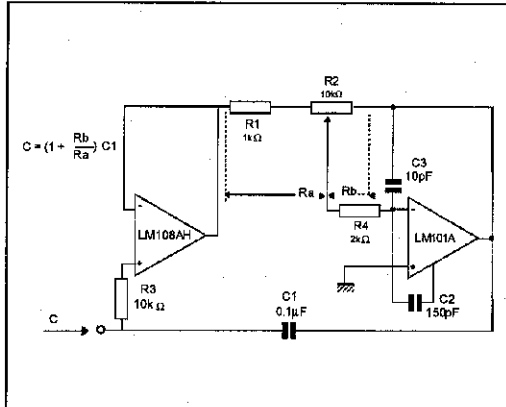
**INSTRUMENTATION AMPLIFIER**



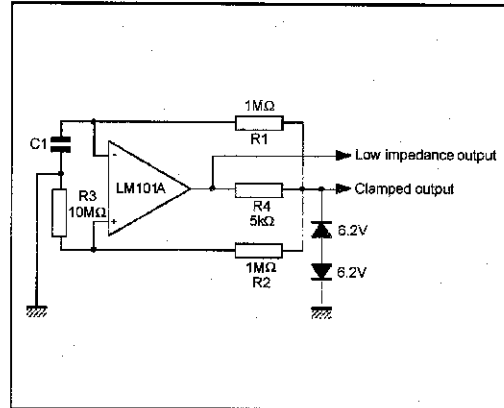


TYPICAL APPLICATIONS (continued)

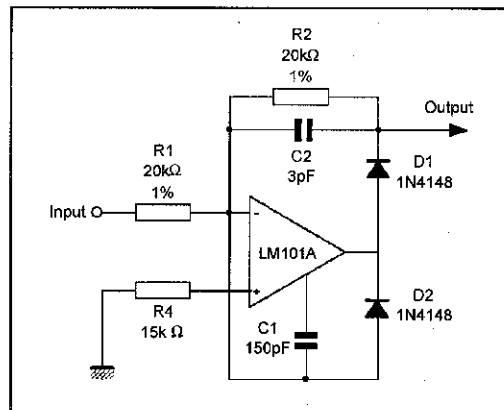
VARIABLE CAPACITANCE MULTIPLIER



LOW FREQUENCY SQUARE WAVE GENERATOR

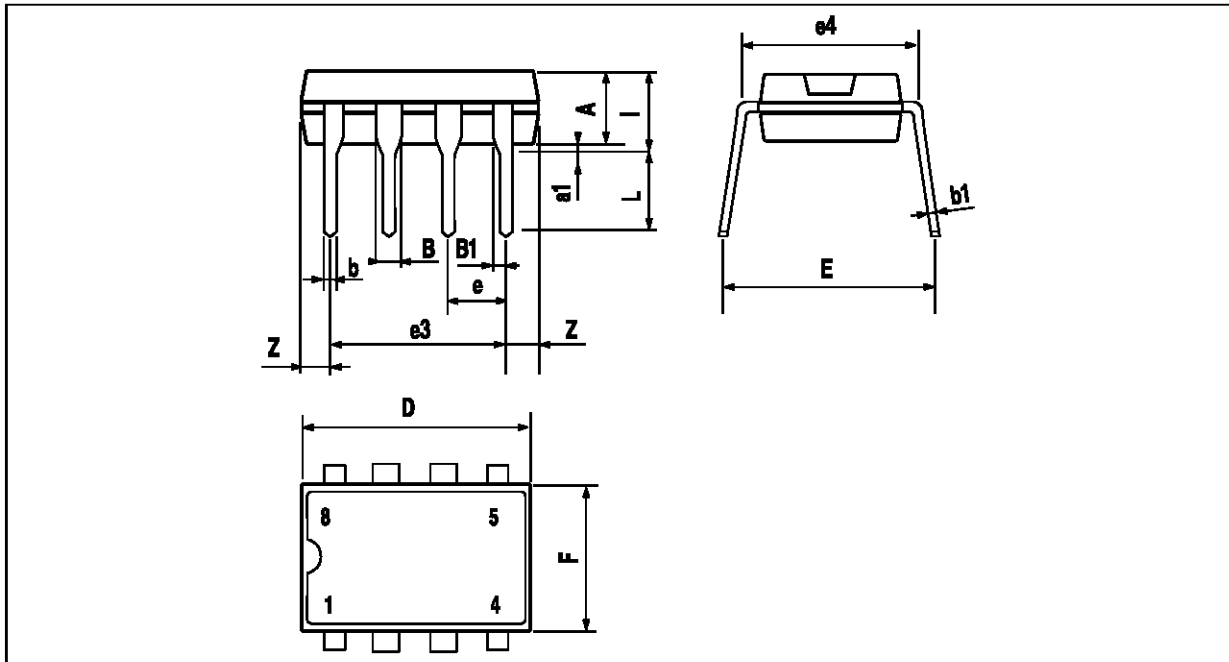


FAST HALF WAVE RECTIFIER



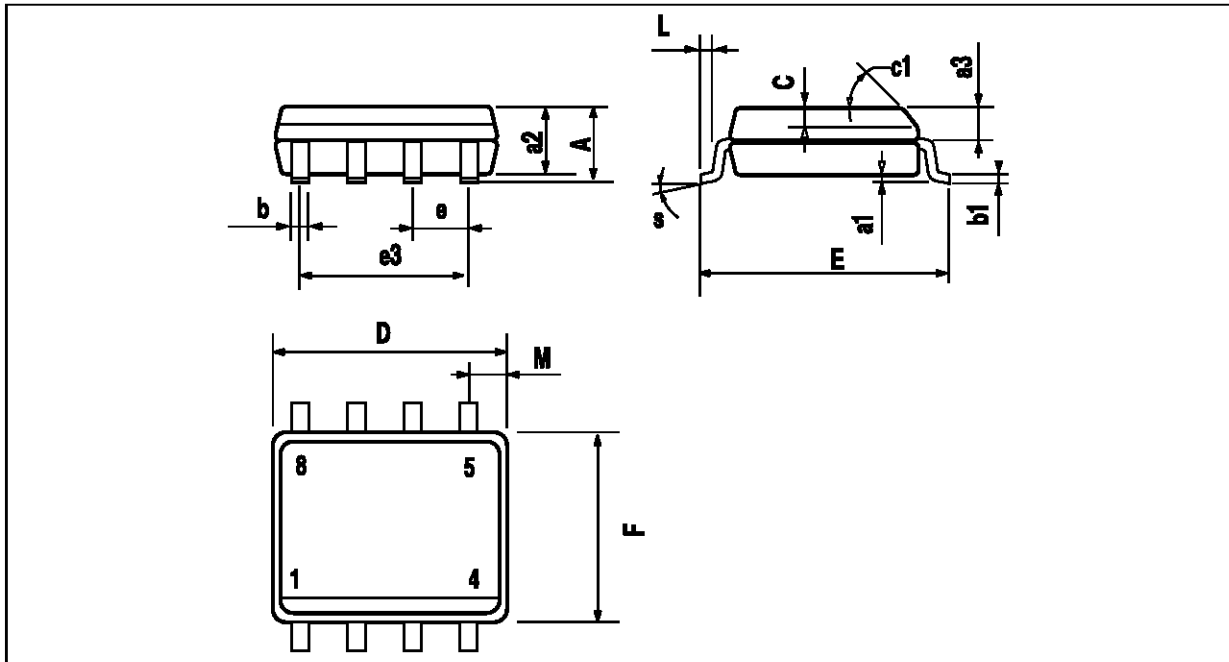
**LM101A - LM201A - LM301A**

**PACKAGE MECHANICAL DATA**  
8 PINS - PLASTIC DIP



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

**PACKAGE MECHANICAL DATA**  
8 PINS - PLASTIC MICROPACKAGE (SO)



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

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