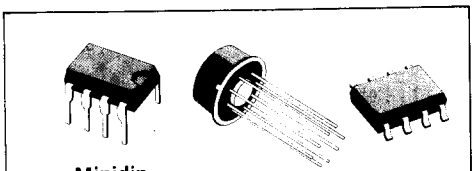
OPERATIONAL AMPLIFIERS

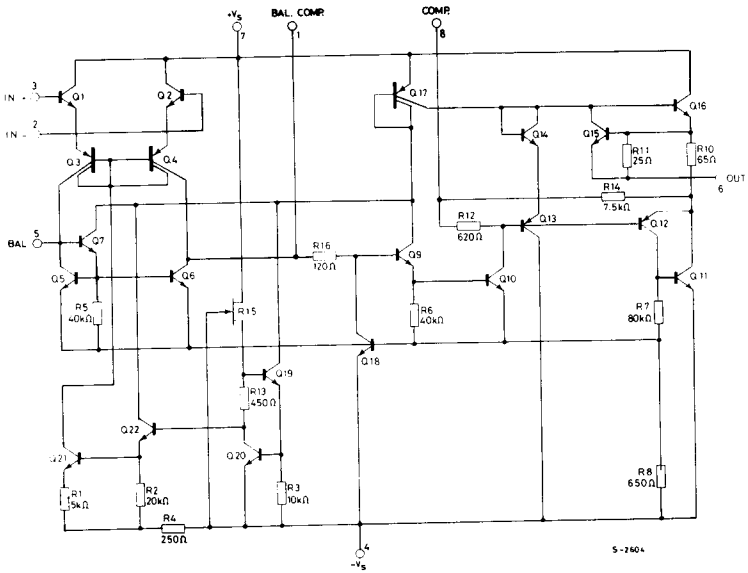
- GUARANTED DRIFT CHARACTERISTICS
- SLEW RATE OF 10V/μs AS SUMMING AMPLIFIER ($G_V \geqslant 10$)
- UNITY GAIN PHASE COMPENSATION WITH A 30pF CAPACITOR
- 3mV MAX OFFSET VOLTAGE OVER TEMPERATURE RANGE
- 100nA MAX INPUT BIAS CURRENT OVER TEMPERATURE RANGE

The LM101 series consists of high performance operational amplifiers, intended for a wide range of analog applications, where tailoring of frequency characteristics is desirable. The LM101 series is short circuit protected and has the same pin configuration as the LM741 and LM748. Absence of latch-up and high common mode voltage range make the LM101 series ideal for use as voltage followers. In addition, the LM101 series provides better accuracy and lower noise in high impedance circuitry: the low input current also makes it particularly well suited for long interval integrators, timers, sample and hold circuits and low frequency generators.



Minidip (Plastic and Ceramic) **TO-99** **SO-8**

SCHEMATIC DIAGRAM



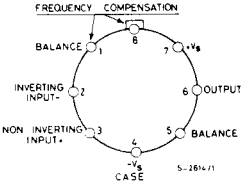
ABSOLUTE MAXIMUM RATINGS

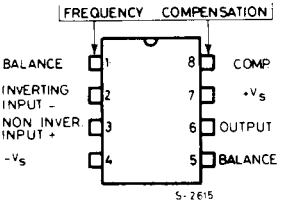
V_s	Supply voltage for **LM101A/201A**	± 22	V
	for **LM301A**	± 18	V
V_i (1)	Input voltage	± 15	V
ΔV_i	Differential input voltage	± 30	V
T_{op}	Operating temperature for **LM101A**	-55 to 125	°C
	for **LM201A**	-25 to 85	°C
	for **LM301A**	0 to 70	°C
	Output short circuit duration (2)	indefinite	
T_j	Junction temperature	150	°C
T_{stg}	Storage temperature	-65 to 150	°C

(1) For supply voltage less than ± 15V, input voltage is equat to the supply voltage
(2) The short circuit duration is limited by thermal dissipation

CONNECTION DIAGRAM AND ORDERING NUMBERS

(top view)





Temperature range	Ceramic Minidip	Plastic Minidip	SO-8	TO-99
Commercial 0 to 70°C	LM301AJ	LM301AN	LM301AD	LM301AH
Industrial -25 to 85°C	LM201AJ	–	LM201AD	LM201AH
Military -55 to 125°C	LM101AJ	–	–	LM101AH

THERMAL DATA

			Plastic Minidip	Ceramic Minidip	TO-99	SO-8
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	120°C/W	150°C/W	155°C/W	200°C/W

ELECTRICAL CHARACTERISTICS

Parameter		Test conditions	LM101A/201A			LM301A			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{os}	Input offset voltage	$R_g \leq 10K\Omega$			3			10	mV
		$R_g \leq 10K\Omega$ $T_{amb}= 25°C$		0.7	2		2	7.5	mV
$\frac{\Delta V_{os}}{\Delta T}$	Average temperat. coefficient of input offset voltage	$R_g \leq 10K\Omega$ $R_g \leq 50\Omega$		3	15		6	30	$\mu V/°C$
I_{os}	Input offset current	$T_{amb}= 25°C$ $T_{amb}= T_{max}$ $T_{amb}= T_{min}$			20			70	nA
		$T_{amb} = 25°C$		1.5	10		3	50	
$\frac{\Delta I_{os}}{\Delta T}$	Average temperat. coefficient of input offset current	$T_{amb}= 25°C$ to T_{max} $T_{amb}= T_{min}$ to $25°C$		0.01 0.02	0.1 0.2		0.01 0.02	0.3 0.6	nA/°C nA/°C
I_b	Input bias current	$T_{amb}= 25°C$		30	0.1 75		70	0.3 250	μA nA
R_i	Input voltage range	$T_{amb}= 25°C$	1.5	4		0.5	2		MΩ
V_I	Input voltage range	$V_s = \pm 20V$ $V_s = \pm 15V$	± 15			± 12			V V
G_v	Large signal voltage gain	$V_s= \pm 15V$ $V_o= \pm 10V$ $R_L \geq 2K\Omega$	88			83			dB
		$V_s= \pm 15V$ $V_o= \pm 10V$ $R_L \geq 2K\Omega$ $T_{amb}= 25°C$	94	104		86	104		dB
CMR	Common mode rejection	$R_g \leq 10K\Omega$	80	96		70	90		dB
SVR	Supply voltage rejection	$R_g \leq 10K\Omega$	80	96		70	96		dB
V_o	Output voltage swing	$V_s= \pm 15V$ $R_L= 10K\Omega$ $R_L = 2K\Omega$	± 12 ± 10	± 14 ± 13		± 12 ± 10	± 14 ± 13		V V
I_s	Supply current	$V_s = \pm 20V$ $T_{amb}= T_{max}$		1.2	2.5				mA
		$T_{amb}= 25°C$ $V_s= \pm 20V$ $V_s= \pm 15V$		1.8	3		1.8	3	

These specifications, unless otherwise specified, apply for $C_1= 30$ pF, $V_s= \pm 5$ to $\pm 20V$ and $T_{amb}= -55$ to $125°C$ (LM101A), $T_{amb} = -25$ to $85°C$ (LM201A), $V_s = \pm 5$ to $\pm 15V$ and $T_{amb} = 0$ to $70°C$ (LM301A)

Guaranteed characteristics (LM101A/201A)

Fig. 1 - Input voltage range vs. supply voltage

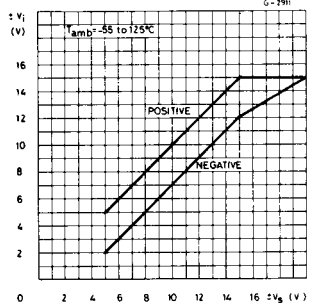


Fig. 2 - Output voltage swing vs. supply voltage

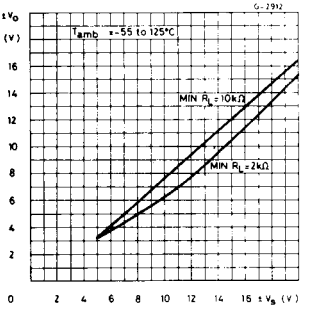
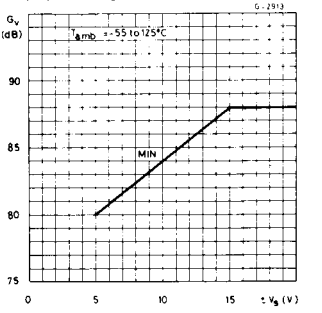


Fig. 3 - Voltage gain vs. supply voltage



Guaranteed characteristics (LM301A)

Fig. 4 - Input voltage range vs. supply voltage

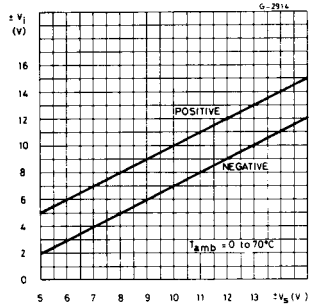


Fig. 5 - Output voltage swing vs. supply votage

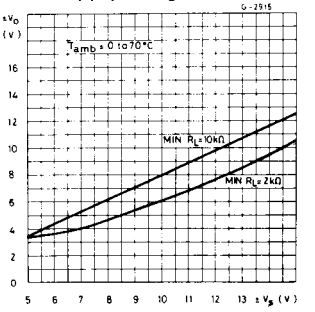


Fig. 6 - Voltage gain vs. supply voltage

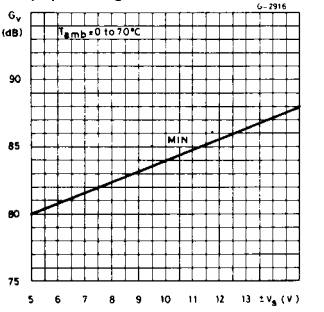


Fig. 7 - Input bias current vs. ambient temperature (for LM101A/201A/301A)

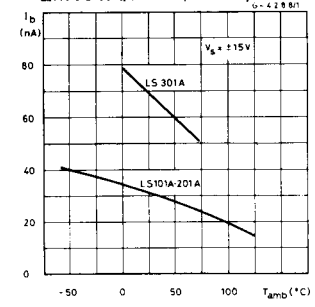


Fig. 8 - Input offset current vs. ambient temperature (for LM101A/201A/301A)

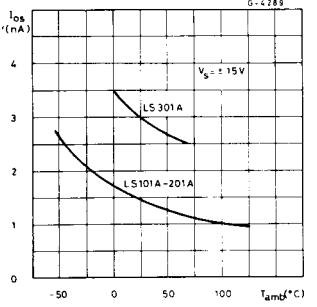


Fig. 9 - Supply current vs. supply voltage

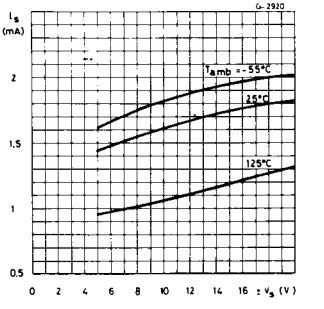


Fig. 10 - Output voltage swing vs. output current

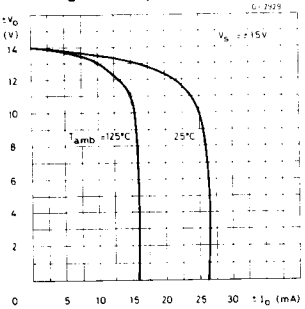


Fig. 11 - Input noise voltage vs. frequency

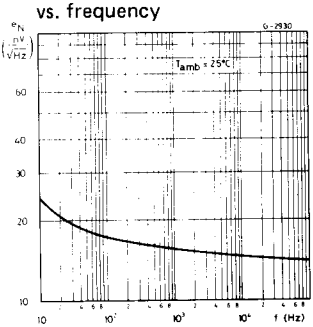
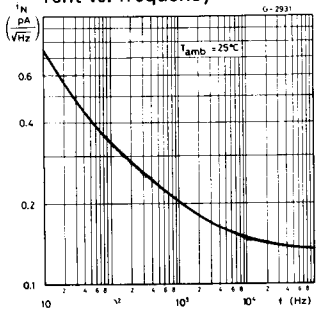


Fig. 12 - Input noise current vs. frequency



OPERATIONAL AMPLIFIER COMPENSATION

SINGLE POLE

Fig. 13

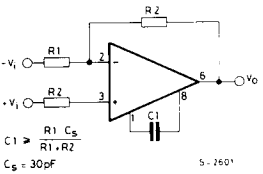


Fig. 14 - Open loop frequency

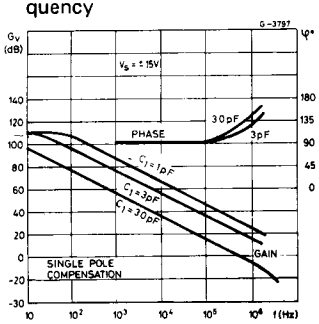
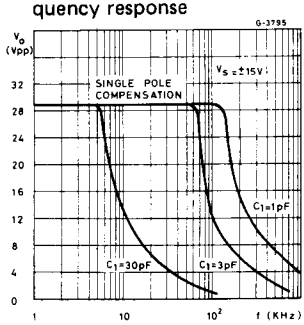


Fig. 15 - Large signal frequency response



TWO POLE

Fig 16

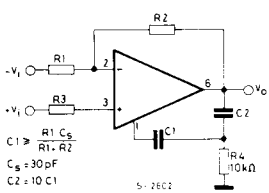


Fig. 17 - Open loop frequency response

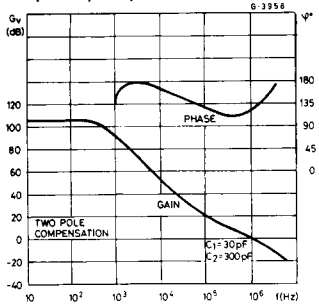
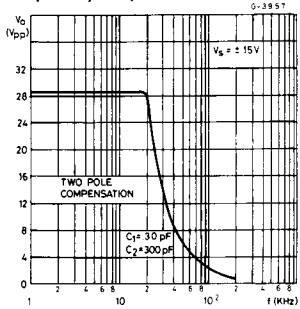


Fig. 18 - Large signal frequency response



FEED FORWARD

Fig. 19

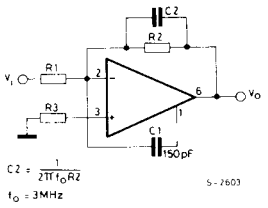


Fig. 20 - Open loop frequency response

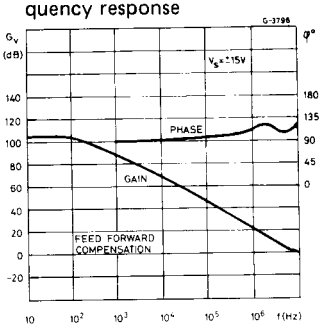


Fig. 21 - Large signal frequency response

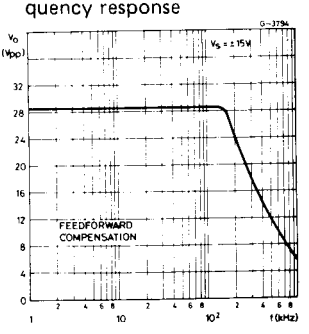


Fig. 22 - Single pole compensation pulse response

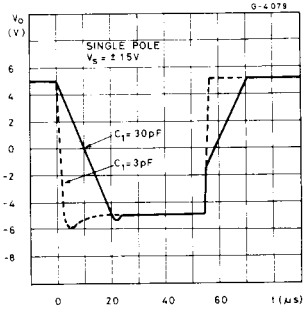


Fig. 23 - Two pole compensation pulse response

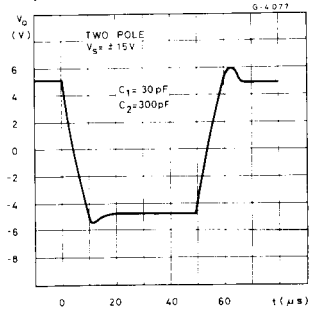
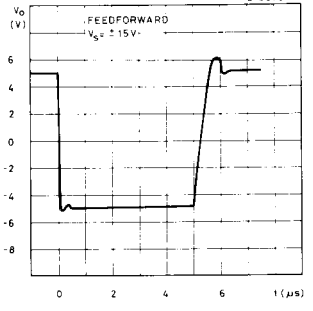


Fig. 24 - Feed forward pulse response



TYPICAL APPLICATIONS

Fig. 25 - Inverting amplifier with balancing circuit

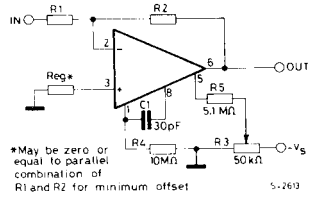
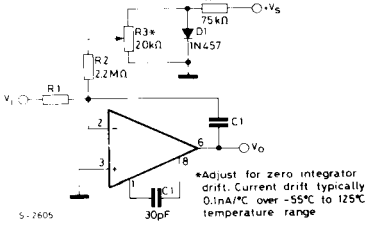


Fig. 26 - Integrator with bias current compensation



TYPICAL APPLICATIONS (continued)

Fig. 27 - Standard compensation and offset balancing circuit

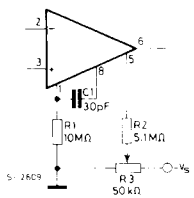


Fig. 28 - Compensation for stray input capacitances or large feedback resistor

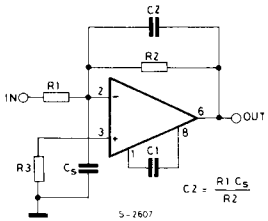


Fig. 29 - Protecting against gross fault conditions

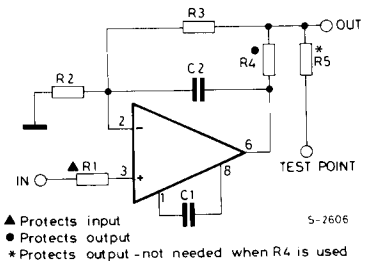


Fig . 30 - Bilateral current source

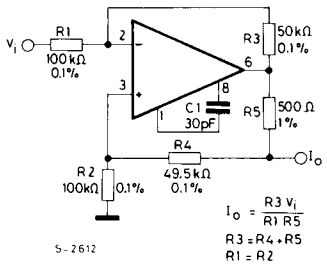


Fig. 31 - Power operational amplifier (G_v = 40dB)

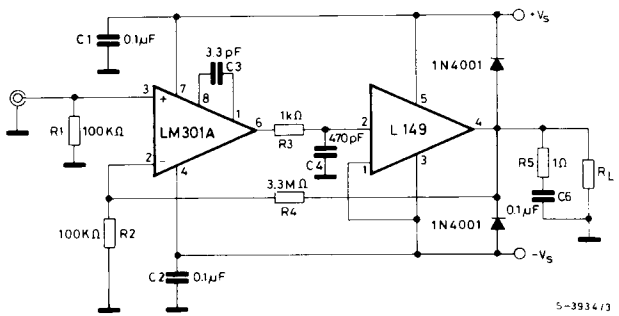


Fig. 32 - Fast AC/DC converter with feedforward compensation

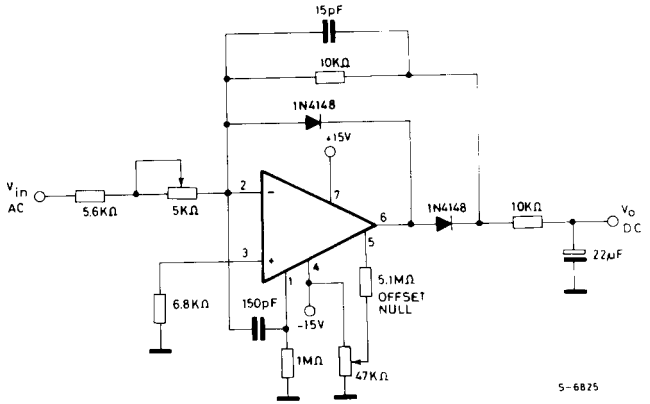
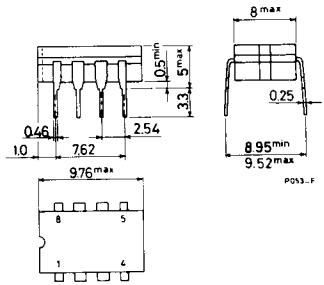


Fig. 33 - DC output voltage (mV) vs. frequncy and AC input voltage of the circuit of fig. 32

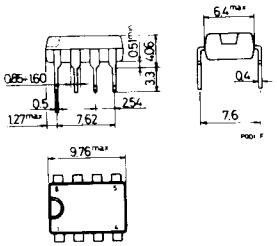
V_i (mV)	Frequency (Hz)			
	40Hz	1K	10K	20K
4	4	3.8	3.6	3.5
12	12	12	11.8	11.7
40	40	40	39.8	39.6
120	120	120	120	119.5
400	400	400	396	395
1200	1200	1200	1200	1190

MECHANICAL DATA (Dimensions in mm)

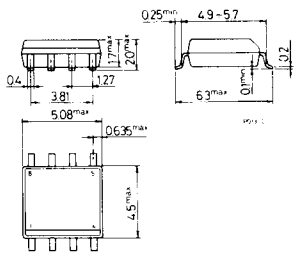
Minidip (ceramic)



Minidip (plastic)



SO-8 (Micropackage)



TO-99