LM101/A/201/A/301/A, LH2101A/2201A/2301A-F,N,N-14,T

DESCRIPTION

The LM101, LM201, LM101A, LM201A, and LM301A are high performance operational amplifiers featuring high gain, short circuit protection, simplified compensation and excellent temperature stability.

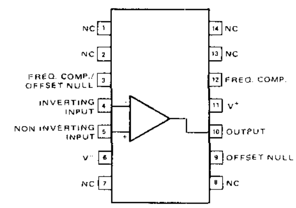
The LH2101A, LH2201A, LH2301A are dual amplifier using two LM101A type devices in the same hermetic package. All electrical specifications are the same as the single amplifiers.

FEATURES

- **Short circuit protection**
- **Offset voltage null capability**
- **Large common-mode and differential voltage ranges**
- **Low power consumption**
- **No latch up**
- **LM101, LM101A Mil std 883A,B,C available**
- **LM101A Mil std 38510 (JAN) planned, Mil std M38510 processing available**

PIN CONFIGURATIONS

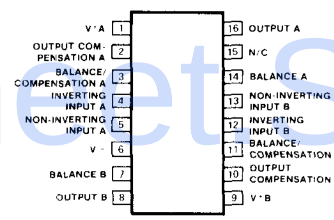
F,N-14 PACKAGE



ORDER PART NO.

LM101N-14	LM101AF
LM201N-14	LM201AF
LM101AN-14	LM301AF
LM201AN-14	LM101F
LM301AN-14	LM201F

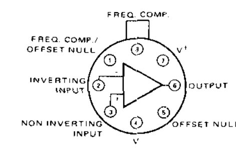
F PACKAGE



ORDER PART NO.

LH2101AF
LH2201AF
LH2301AF

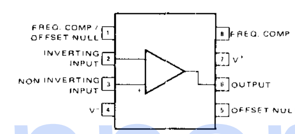
T PACKAGE



ORDER PART NO.

LM101T
LM201T
LM101AT
LM201AT
LM301AT

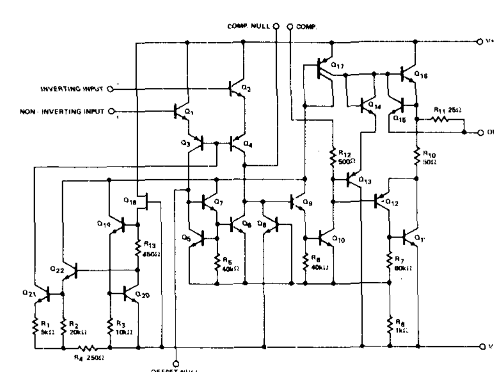
N PACKAGE



ORDER PART NO.

LM101N
LM201N
LM101AN
LM201AN
LM301AN

EQUIVALENT SCHEMATIC



ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Supply Voltage		
LH2101A, LH2201A, LM101, LM201, LM101A, LM201A	±22	V
LM301A, LH2301A	±18	
Power dissipation[1]	500	mW
Differential input voltage	±30	V
Input voltage[2]	±15	V
Output short circuit duration	Indefinite	
Operating temperature range		
LM101, LM101A, LH2101A	-55 to +125	°C
LM201A, LH2201A	-25 to +85	°C
LM201, LM301A, LH2301A	0 to +70	°C
Storage temperature range	-65 to +150	°C
Lead temperature (soldering 60sec)	300	°C

NOTES

1. Absolute maximum rating holds for all packages. The maximum junction temperature is 150°C for the LM101 and 100°C for the LM201. For operation at elevated temperatures, derate according to appropriate thermal resistances given under package information.
2. For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

DC ELECTRICAL CHARACTERISTICS $T_A = 25°C$, $\pm5V \leq V_S \leq +20V$ unless otherwise specified.*

PARAMETER		TEST CONDITIONS	LM101			LM201			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage	$R_S \leq 10k\Omega$, $C_1 = 30pF$		1.0	5.0		2.0	7.5	mV
		Over temp.			6.0			10	mV
V_{OS}	Drift	$R_S \leq 50\Omega$, $C_1 = 30pF$		3.0			6		μV/°C
		$R_S \leq 10k\Omega$		6.0			10		μV/°C
I_{OS}	Offset current	$C_1 = 30pF$		40	200		100	500	nA
		T_A = high, $C_1 = 30pF$		10	200				nA
		T_A = low		100	500				nA
		Over temp.							nA
		$T_A = +70°C$					50	400	nA
		$T_A = 0°C$					150	750	nA
I_{BIAS}	Input current	$C_1 = 30pF$		120	500		250	1500	nA
		$T_A = -55°C$, $C_1 = 30pF$		280	1500				nA
		$T_A = 0°C$					320	2000	nA
V_{CM}	Common mode voltage range	Over temp., $V_S = \pm15V$, $C_1 = 30pF$	±12			±12			V
CMRR	Common mode rejection ratio	$R_S \leq 10k\Omega$, $C_1 = 30pF$, over temp.	70	90		65	90		dB
R_{IN}	Input resistance	$C_1 = 30pF$	0.3	0.8		0.1	0.4		MΩ
A_{VOL}	Large signal voltage gain	$R_L \geq 2k\Omega$, V_{OUT} ±10V, $V_S = \pm15V$	50	160		20	150		V/mV
		Over temp.	25			15			V/mV
	Supply current	$V_S = \pm20V$		1.8	3.0		1.8	3.0	mA

*NOTE

Unless otherwise specified, all specifications for LM301A are $\pm5V \leq V_S \leq \pm15V$.

DC ELECTRICAL CHARACTERISTICS (Cont'd) $T_A = 25°C$, $\pm5V \le V_S \le +20V$ unless otherwise specified.*

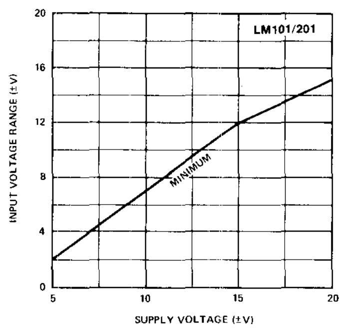
PARAMETER		TEST CONDITIONS	LM101A/LM201A/ LH2101A/LH2201A			LM301A/LH2301A			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage	$R_S \le 50k\Omega$, $C_1 = 30pF$ Over temp.		0.7	2.0 3.0		2.0	7.5 10	mV mV
V_{OS}	Drift	$R_S = 0\Omega$, over temp.		3.0	1.5		6.0	30	μV/°C
I_{OS}	Offset current	$C_1 = 30pF$ Over temp.		1.5	10 20		3	50 70	nA nA
I_{OS}	Drift	$+25°C \le T_A \le T_{MAX}$, $C_1 = 30pF$ $T_{MIN} \le T_A \le +25°C$		0.01 0.02	0.1 0.2		0.01 0.02	0.3 0.6	nA/°C nA/°C
I_{BIAS}	Input current	$C_1 = 30pF$ Over temp.		30	75 100		70	250 300	nA nA
V_{CM}	Common mode voltage range	Over temp., $V_S = \pm15V$, $C_1 = 30pF$ $V_S = \pm20$	 ±15			±12			V V
CMRR	Common mode rejection ratio	$R_S \le 50k\Omega$, $C_1 = 30pF$, over temp.	80	96		70	90		dB
R_{IN}	Input resistance	$C_1 = 30pF$	1.5	4		0.5	2		MΩ
A_{VOL}	Large signal voltage gain	$R_L \ge 2k\Omega$, V_{OUT} ±10V, $V_S = \pm15V$ Over temp.	50 25	160		25 15	160		V/mV V/mV
	Supply current	$V_S = \pm20V$ $V_S = \pm15V$		1.8	3.0		 1.8	 3.0	mA mA

*NOTE

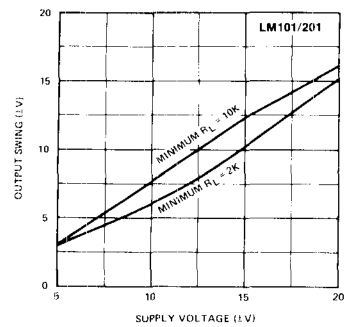
Unless otherwise specified, all specifications for LM301A are $\pm5V \le V_S \le \pm15V$.

TYPCIAL PERFORMANCE CHARACTERISTICS

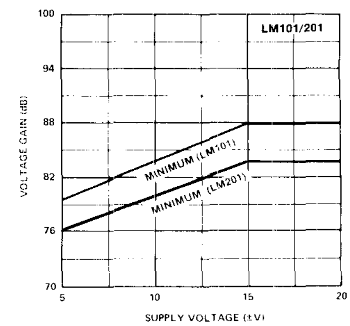
INPUT VOLTAGE RANGE vs SUPPLY VOLTAGE



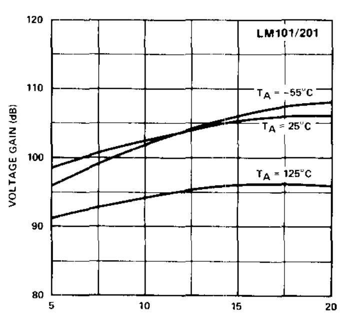
OUTPUT SWING vs SUPPLY VOLTAGE



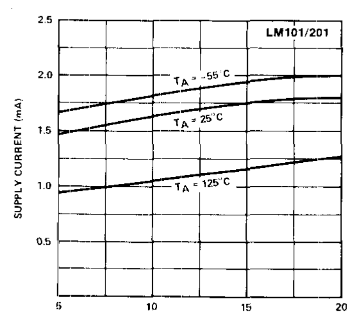
VOLTAGE GAIN vs SUPPLY VOLTAGE



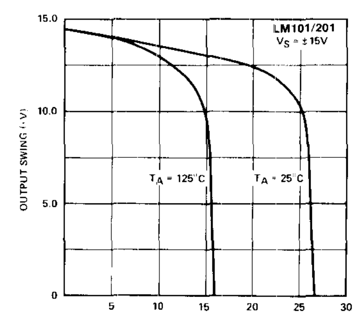
VOLTAGE GAIN



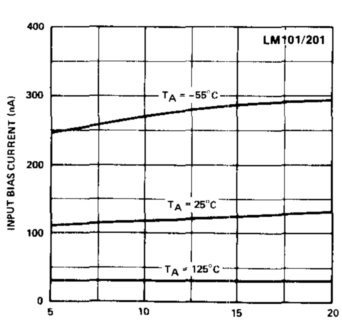
SUPPLY CURRENT



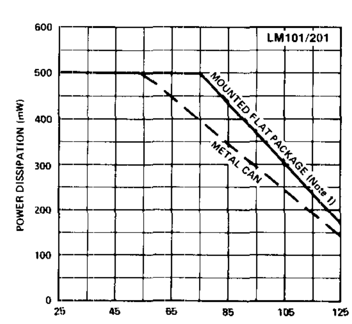
CURRENT LIMITING



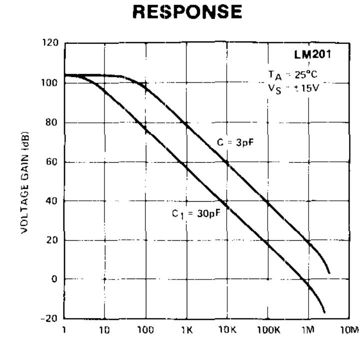
INPUT CURRENT



MAXIMUM POWER DISSIPATION

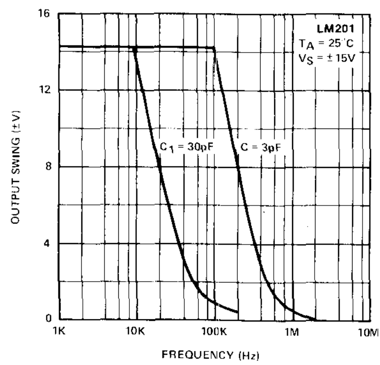


OPEN LOOP FREQUENCY RESPONSE

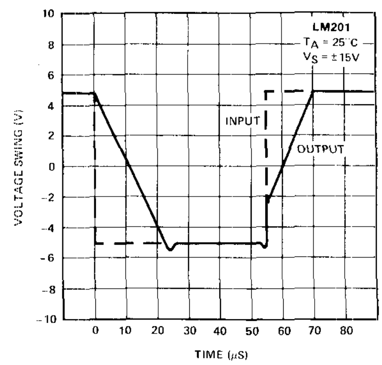


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

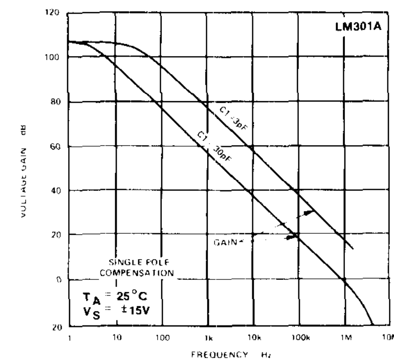
LARGE SIGNAL FREQUENCY RESPONSE



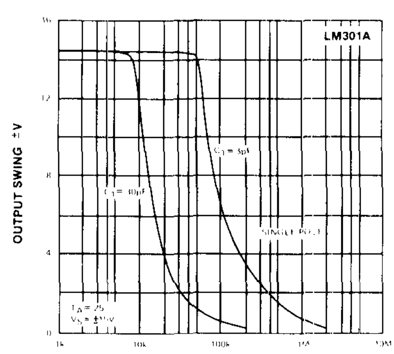
VOLTAGE FOLLOWER PULSE RESPONSE



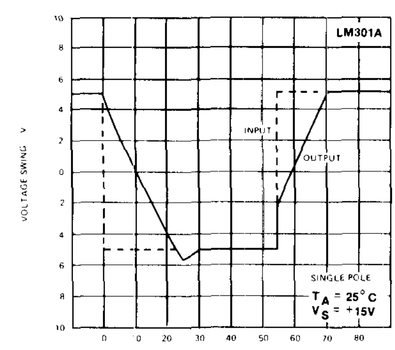
OPEN LOOP FREQUENCY RESPONSE



LARGE SIGNAL FREQUENCY RESPONSE

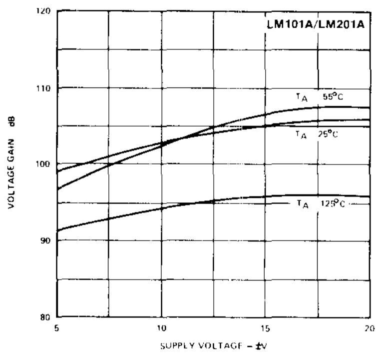


VOLTAGE FOLLOWER PULSE RESPONSE

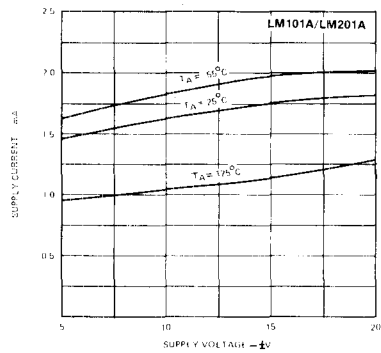


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

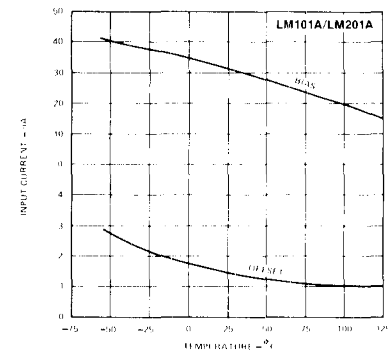
VOLTAGE GAIN



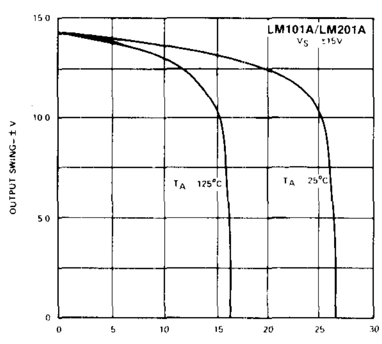
SUPPLY CURRENT



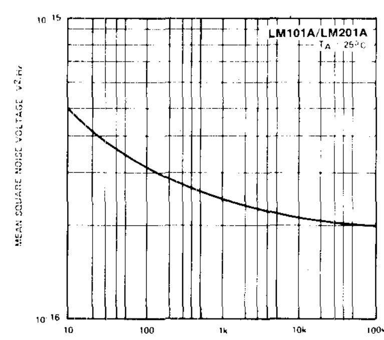
INPUT CURRENT



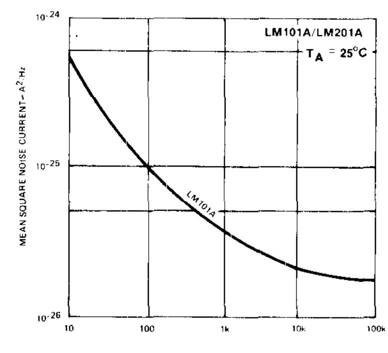
CURRENT LIMITING



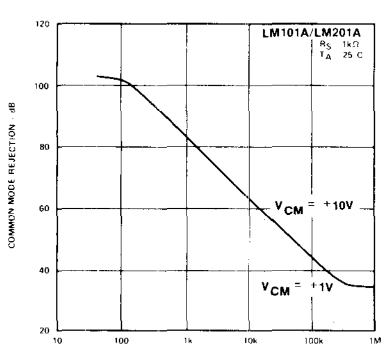
INPUT NOISE VOLTAGE



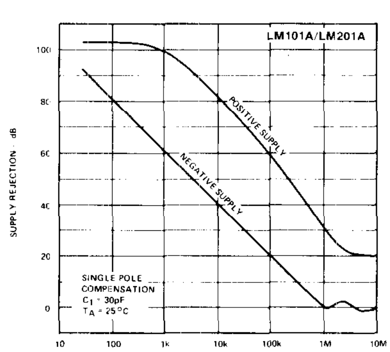
INPUT NOISE CURRENT



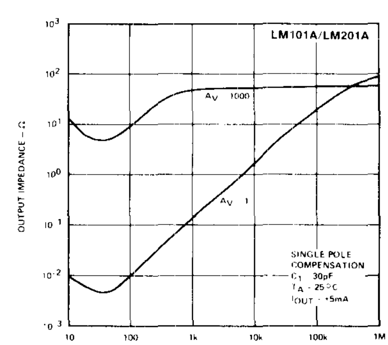
COMMON MODE REJECTION



POWER SUPPLY REJECTION

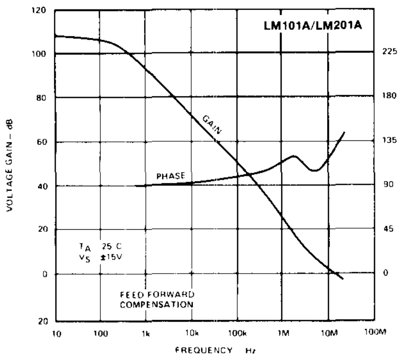


CLOSED LOOP OUTPUT IMPEDANCE

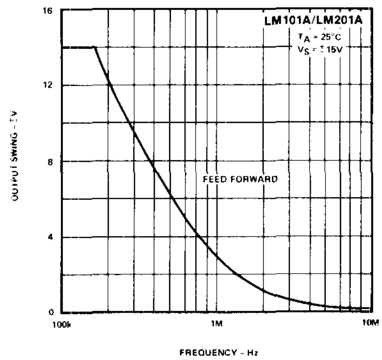


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

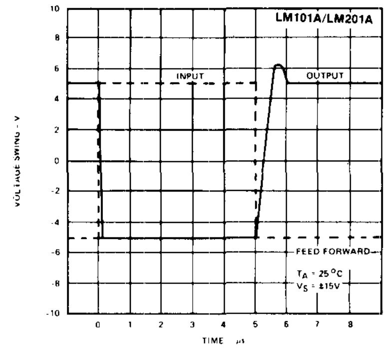
OPEN LOOP FREQUENCY RESPONSE



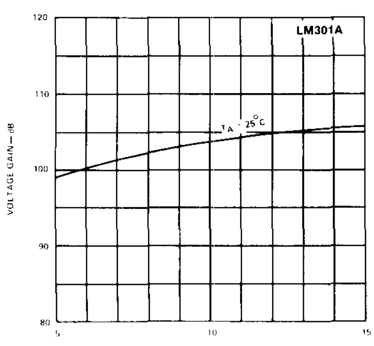
LARGE SIGNAL FREQUENCY RESPONSE



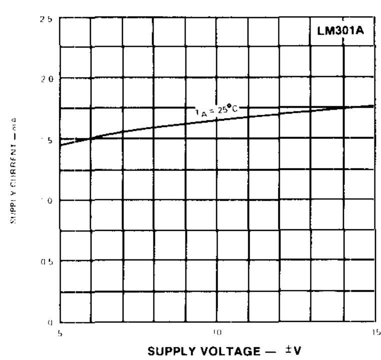
INVERTER PULSE RESPONSE



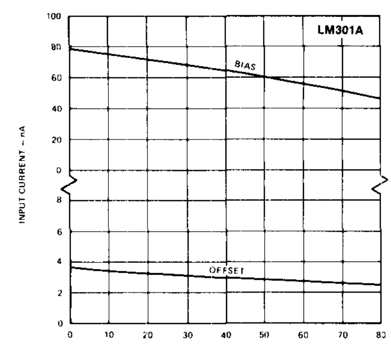
VOLTAGE GAIN



SUPPLY CURRENT



INPUT CURRENT



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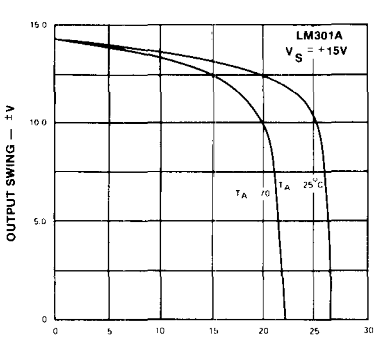
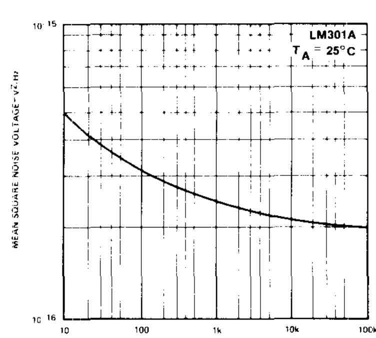
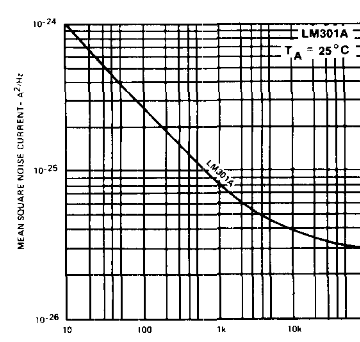


INPUT NOISE VOLTAGE

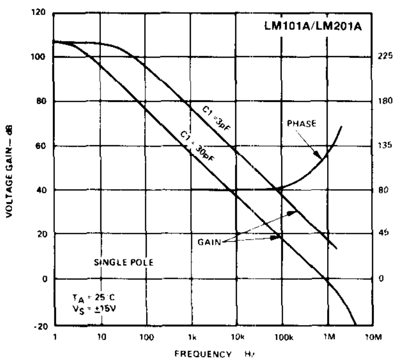


INPUT NOISE CURRENT

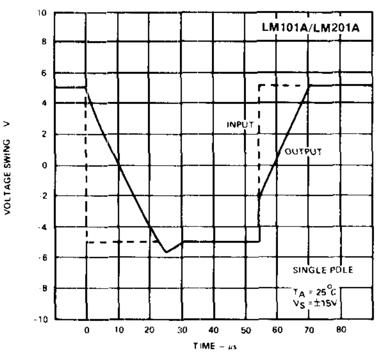


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

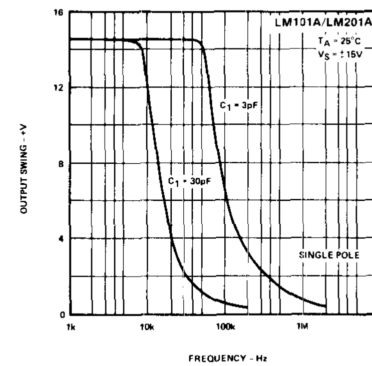
OPEN LOOP FREQUENCY RESPONSE



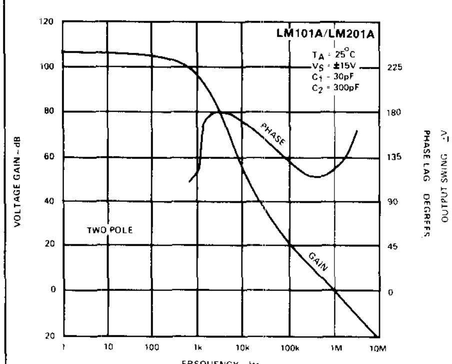
VOLTAGE FOLLOWER PULSE RESPONSE



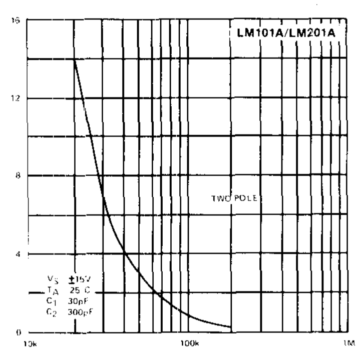
LARGE SIGNAL FREQUENCY RESPONSE



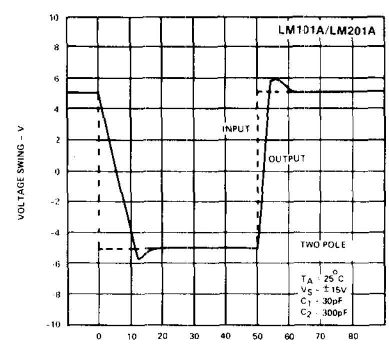
OPEN LOOP FREQUENCY RESPONSE



LARGE SIGNAL FREQUENCY RESPONSE

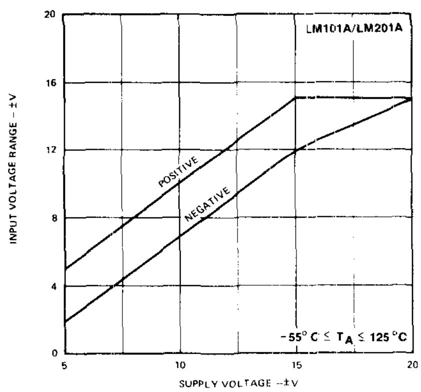


VOLTAGE FOLLOWER PULSE RESPONSE

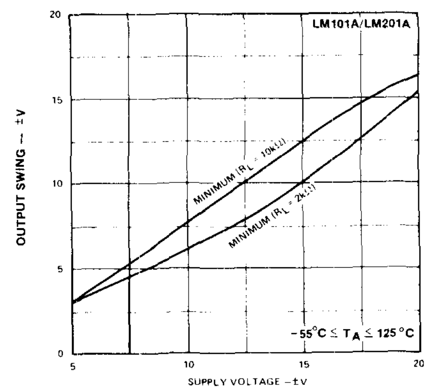


GUARANTEED PERFORMANCE CHARACTERISTICS

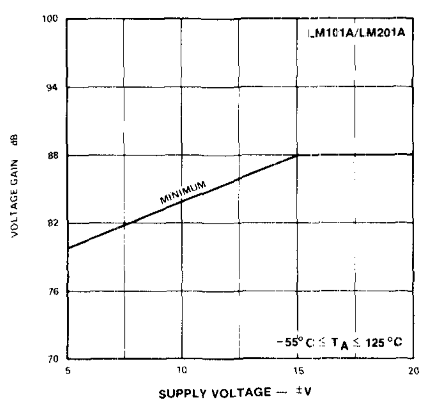
INPUT VOLTAGE RANGE



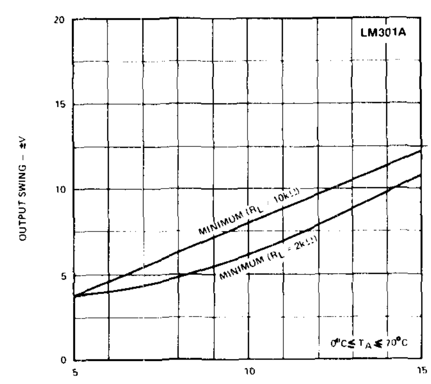
OUTPUT SWING



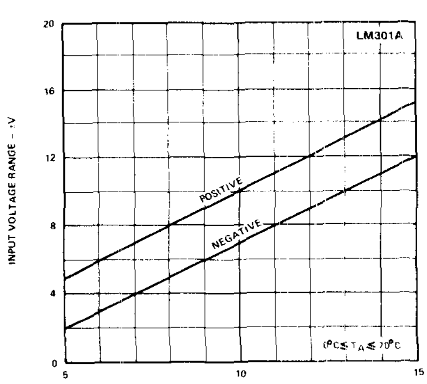
VOLTAGE GAIN



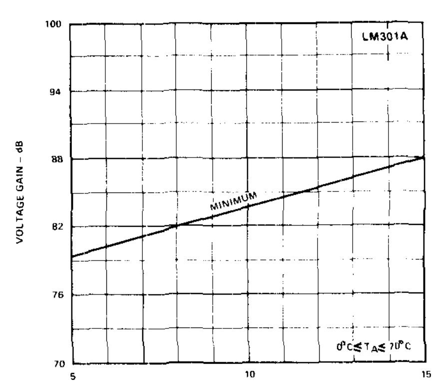
OUTPUT SWING



INPUT VOLTAGE RANGE



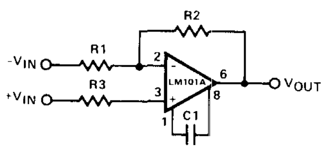
VOLTAGE GAIN



LM101/A/201/A/301/A, LH2101A/2201A/2301A-F,N,N-14,T

COMPENSATION CIRCUITS

SINGLE POLE COMPENSATION

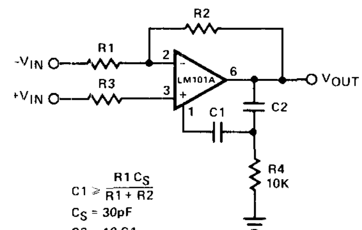


$C1 \geq \frac{R1\,C_S}{R1+R2}$

$C_S = 30pF$

NOTE: Pin connections shown are for T package.

TWO POLE COMPENSATION

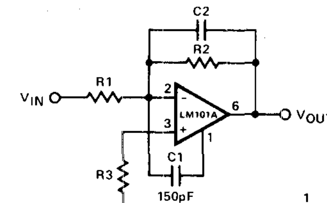


$C1 \geq \frac{R1\,C_S}{R1+R2}$

$C_S = 30pF$

$C2 = 10\,C1$

FEED FORWARD COMPENSATION

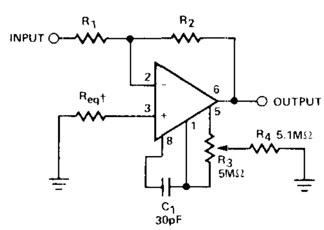


$C2 = \frac{1}{2\pi f_o R2}$

$f_o = 3\,MHz$

TYPICAL APPLICATIONS

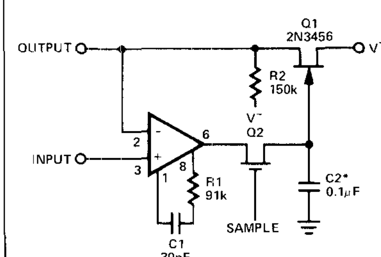
INVERTING AMPLIFIER WITH BALANCING CIRCUIT



†May be zero or equal to parallel combination of R_1 and R_2 for minimum offset.

NOTE: Pin numbers shown refer to T or N package only.

LOW DRIFT SAMPLE AND HOLD



*Polycarbonate Dielectric Capacitor

NOTE: Pin numbers shown refer to T or N package only.