



LM101A/LM301A
LM107/LM307

Operational Amplifiers

FEATURES

- 30 Volt Differential Input Range
- 75 nA Input Bias Current
- Wide Common Mode Voltage Range

APPLICATIONS

- Signal Conditioning Amplifiers
- Voltage Followers
- Comparators

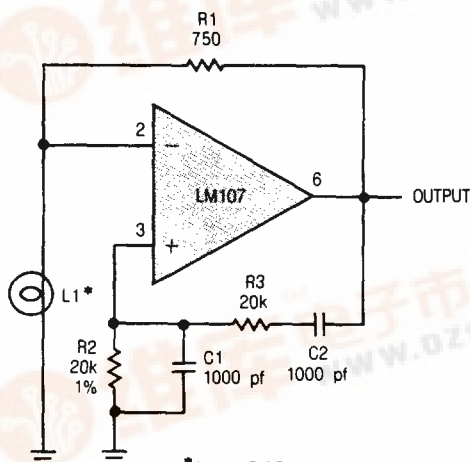
DESCRIPTION

The LM101A and LM107 are general purpose operational amplifiers, featuring low bias current and the ability to operate with high input differential voltages up to 30 Volts. Unlike many FET input amplifiers, the output of the LM101A/107 does not reverse if the common mode range is exceeded, making them particularly useful in comparator and oscillator circuits.

The LM101A uses external compensation, allowing the frequency response and slew rate to be optimized for the application. The LM107 is identical to the LM101A with the exception that the compensation capacitor is internal. Linear's LM101A and LM107 include improved design and processing techniques resulting in superior long term stability and reliability over previous devices. The curve of bias current versus differential input voltage indicates that a minimal change in input current occurs over a wide range of input signal, which is important in many applications.

2

Wein Bridge Sine Wave Oscillator



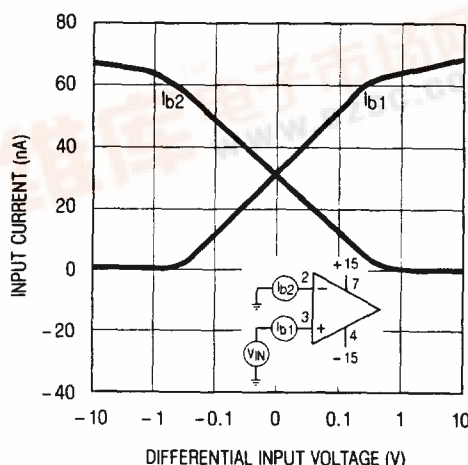
* L1 — ELDEMA 1869

R1 = R2

C1 = C2

$$f = \frac{1}{2\pi R2 C1}$$

Bias Current vs Differential Input Voltage



LM101A/LM301A LM107/LM307

ABSOLUTE MAXIMUM RATINGS

Supply Voltage

LM101A/LM107	± 22 Volts
LM301A/LM307	± 18 Volts

Differential Input Voltage ± 30 Volts

Input Voltage, Note 2 ± 15 Volts

Output Short Circuit Duration, Note 3..... Indefinite

Operating Temperature Range

LM101A/LM107	−55°C to 125°C
LM301A/LM307	0°C to 70°C

Maximum Junction Temperature

LM101A/LM107	150°C
LM301A/LM307	100°C

Storage Temperature Range

All Devices..... −65°C to 150°C

Lead Temperature (Soldering, 10 sec.)..... 300°C

PACKAGE/ORDER INFORMATION

TOP VIEW	ORDER PART NUMBER	
	LM101AH	
	LM301AH	
	LM107H	
	LM307H	
TOP VIEW		
	LM101AJ8	
	LM301AJ8	
	LM107J8	
	LM307J8	

ELECTRICAL CHARACTERISTICS (Note 1)

SYMBOL	PARAMETER	CONDITIONS		LM101A/LM107			LM301A/LM307			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage	$R_S \leq 50K\Omega$, $T_A = 25^\circ C$ $R_S \leq 50K\Omega$	●		0.7	2.0 3.0		2.0	7.5 10	mV mV
$\frac{\Delta V_{OS}}{\Delta Temp}$	Average Temperature Coefficient of Input Offset Voltage	$R_S \leq 50K\Omega$	●		3.0	15		6.0	30	$\mu V/^\circ C$
I_{OS}	Input Offset Current	$T_A = 25^\circ C$	●		1.5	10 20		3.0	50 70	nA nA
$\frac{\Delta I_{OS}}{\Delta Temp}$	Average Temperature Coefficient of Input Offset Current	$25^\circ C \leq T_A \leq T_{MAX}$ $T_{MIN} \leq T_A \leq 25^\circ C$			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	$T_A = 25^\circ C$	●		30	75 100		70	250 300	nA nA
A_{VOL}	Large Signal Voltage Gain	$T_A = 25^\circ C$, $V_S \pm 15V$, $V_{OUT} = \pm 10V$, $R_L \geq 2K\Omega$ $V_S = \pm 15V$, $V_{OUT} = \pm 10V$, $R_L \geq 2K\Omega$	●	50 25	160		25 15	160		V/mV V/mV
CMRR	Common Mode Rejection Ratio	$R_S \leq 50K\Omega$	●	80	96		70	90		dB
PSRR	Power Supply Rejection Ratio	$R_S \leq 50K\Omega$	●	80	96		70	96		dB
	Input Voltage Range	$V_S = \pm 20V$ $V_S = \pm 15V$	●	± 15						V
			●		+ 15 − 13		± 12	+ 15 − 13		V V
V_{OUT}	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
R_{IN}	Input Resistance	$T_A = 25^\circ C$		1.5	4.0		0.5	2.0		MΩ
I_S	Supply Current	$T_A = 25^\circ C$, $V_S = \pm 20V$ $T_A = 125^\circ C$, $V_S = \pm 20V$	●		1.8 1.2	3.0 2.5		1.8	3.0	mA mA

The ● denotes the specifications which apply over the full operating temperature range.

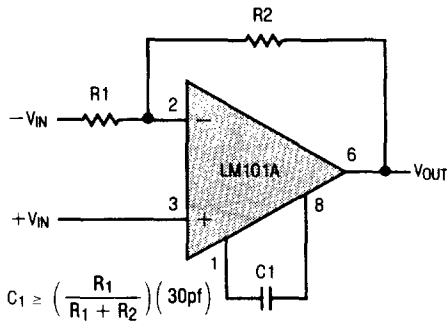
Note 1: Unless otherwise noted; all measurements are made with unity gain compensation ($C_1 = 30pF$ for the LM101A/301A); these specifications apply for $\pm 5V \leq V_S \leq \pm 20V$ for the LM101A/LM107; and $\pm 5V \leq V_S \leq \pm 15V$ for the LM301A/LM307.

Note 2: For supply voltages less than ± 15 Volts, the maximum input voltage is equal to the supply voltage.

Note 3: The output may be shorted to ground or either power supply indefinitely, provided the case temperature is below 125°C for the LM101A/107 and below 70°C for the LM301A/307.

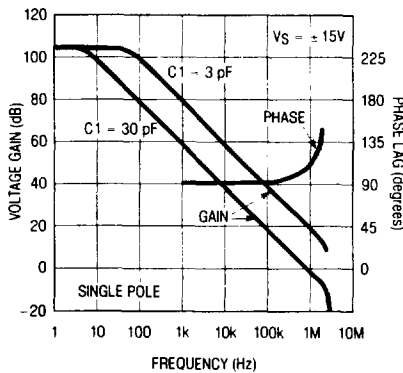
TYPICAL PERFORMANCE CHARACTERISTICS (LM101A)

Single Pole Compensation

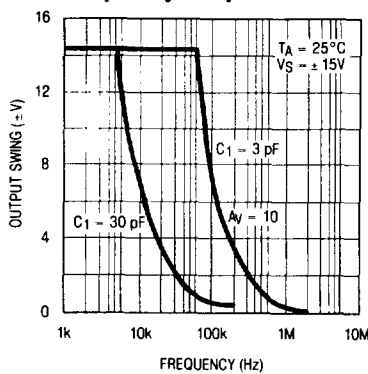


$C_1 = 30 \text{ pF}$ for unity gain stability. At gains above 1 frequency response can be maximized by decreasing C_1 .

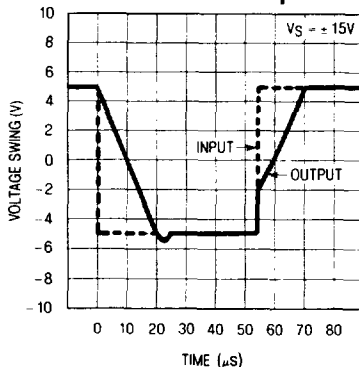
Open Loop Frequency Response



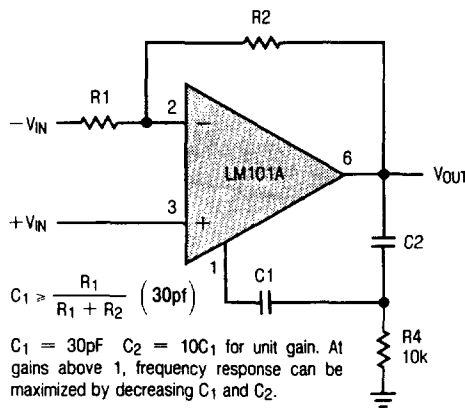
Single Pole Large Signal Frequency Response



Single Pole Voltage Follower Pulse Response

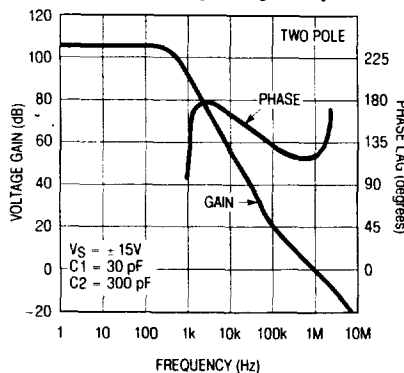


Two Pole Compensation

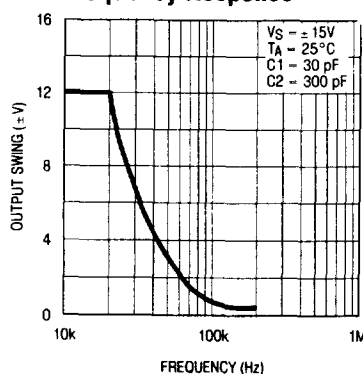


$C_1 = 30 \text{ pF}$ $C_2 = 10 \text{ C}_1$ for unit gain. At gains above 1, frequency response can be maximized by decreasing C_1 and C_2 .

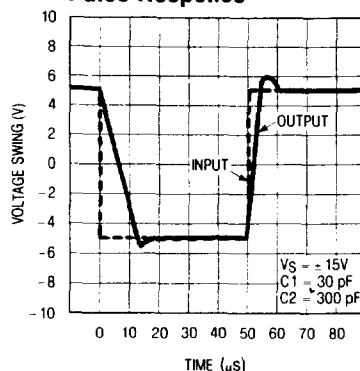
Open Loop Frequency Response



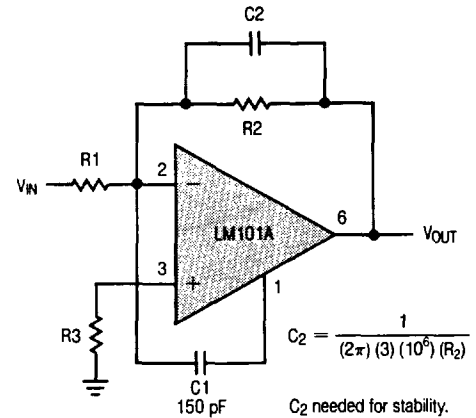
2 Pole Large Signal Frequency Response



2 Pole Voltage Follower Pulse Response

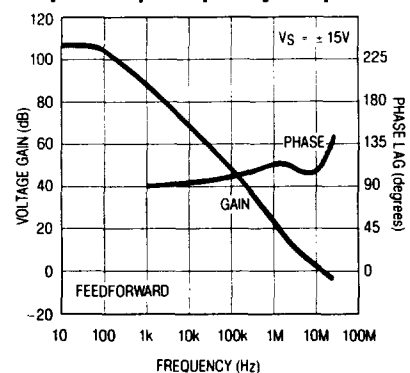


Feedforward Compensation

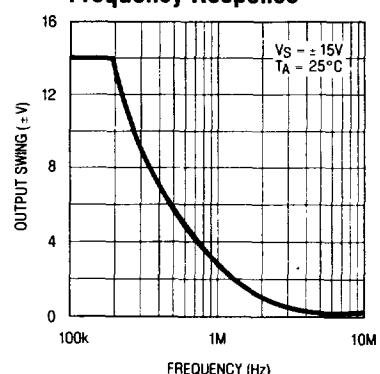


C_2 needed for stability.

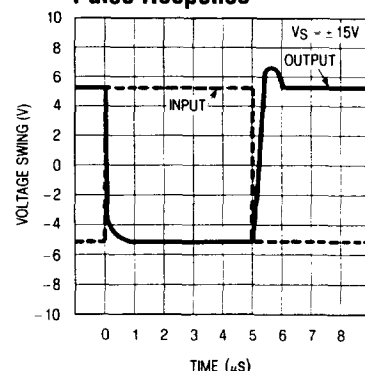
Open Loop Frequency Response



Feedforward Large Signal Frequency Response



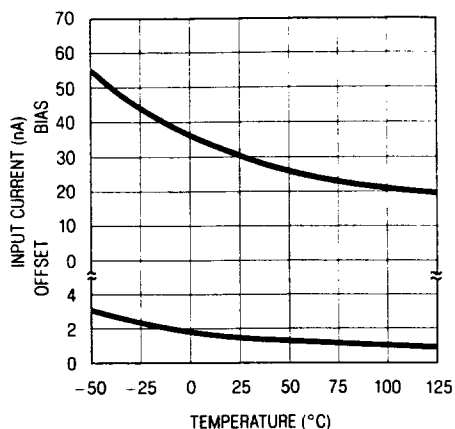
Feedforward Inverter Pulse Response



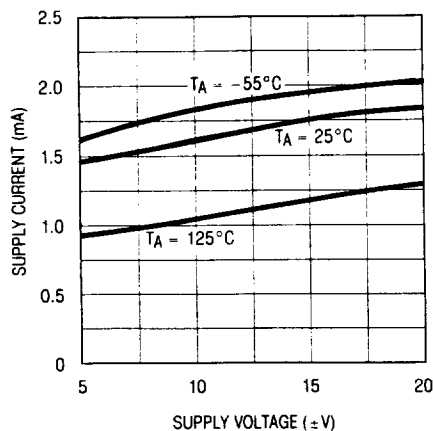
LM101A/LM301A LM107/LM307

TYPICAL PERFORMANCE CHARACTERISTICS (LM101A/LM107)

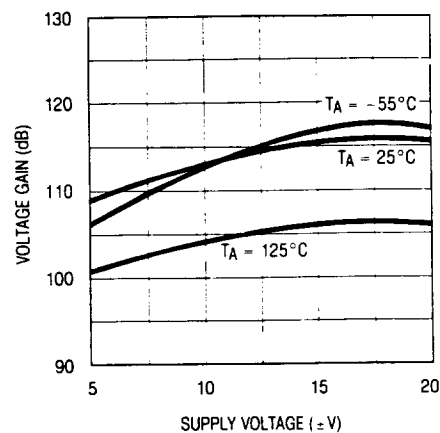
Input Current



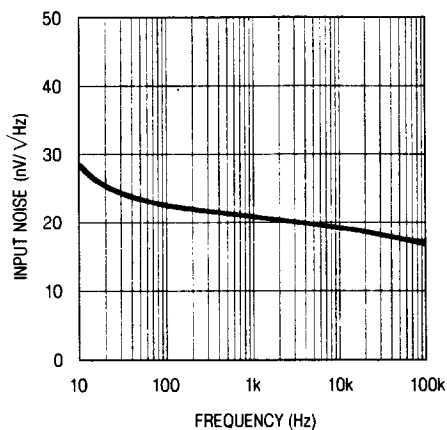
Supply Current



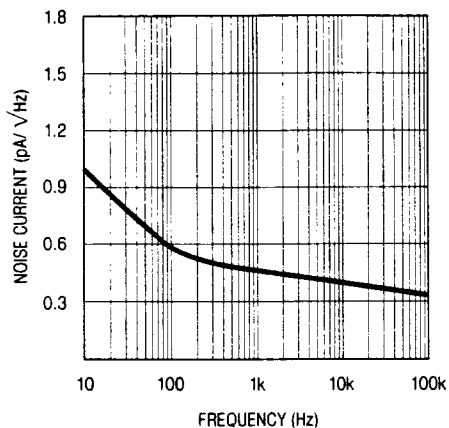
Voltage Gain



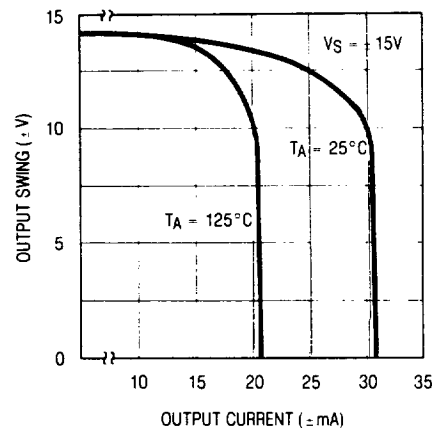
Input Noise Voltage



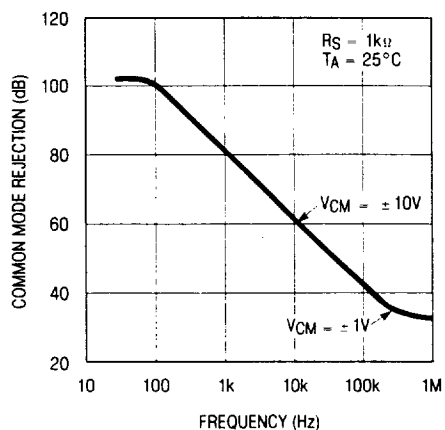
Input Noise Current



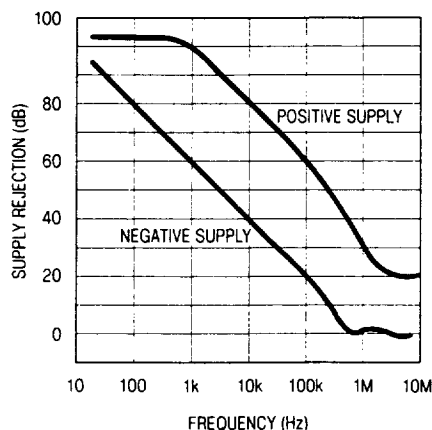
Current Limiting



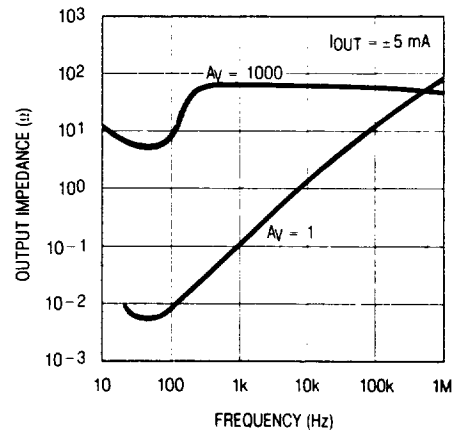
Common Mode Rejection



Power Supply Rejection



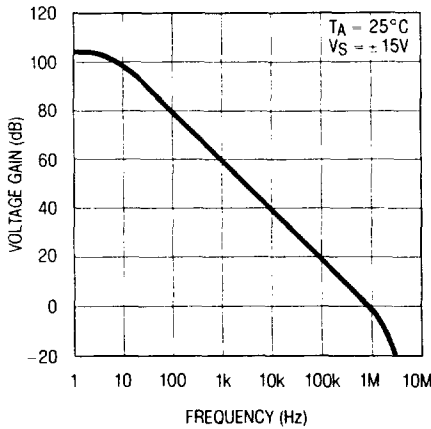
Closed Loop Output Impedance



LM101A/LM301A LM107/LM307

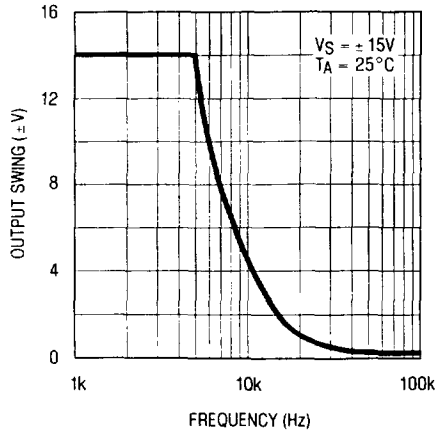
LM107

Open Loop Frequency Response



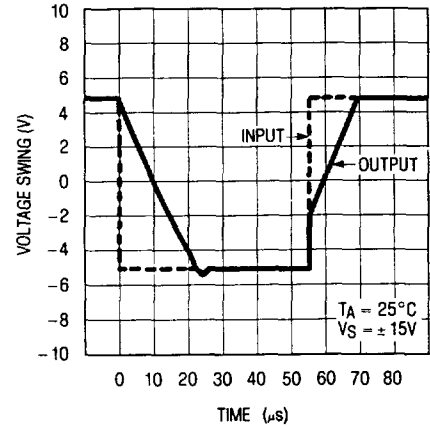
LM107

Large Signal Frequency Response



LM107

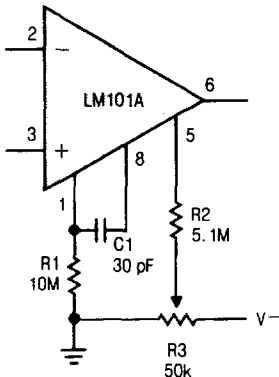
Voltage Follower Pulse Response



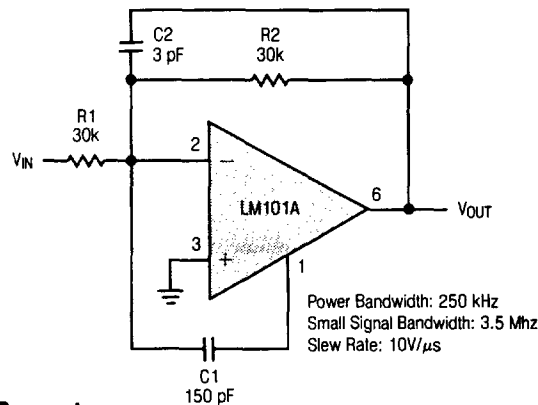
TYPICAL APPLICATIONS

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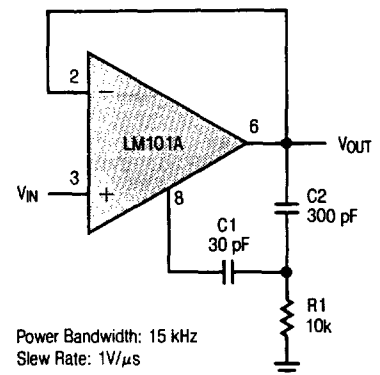
Standard Compensation and Offset Balancing Circuit



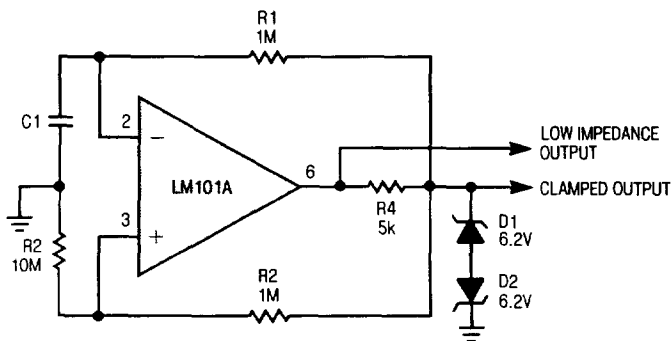
Fast Summing Amplifier



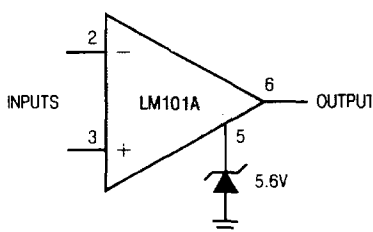
Fast Voltage Follower



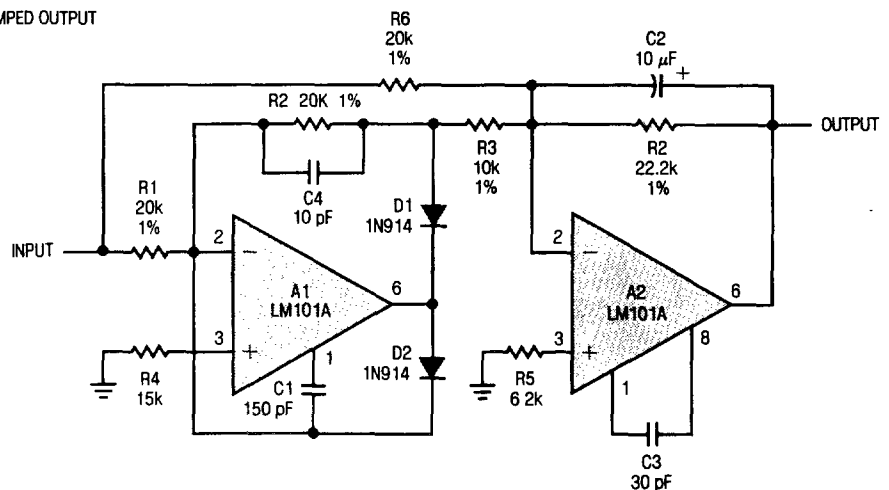
Low Frequency Square Wave Generator



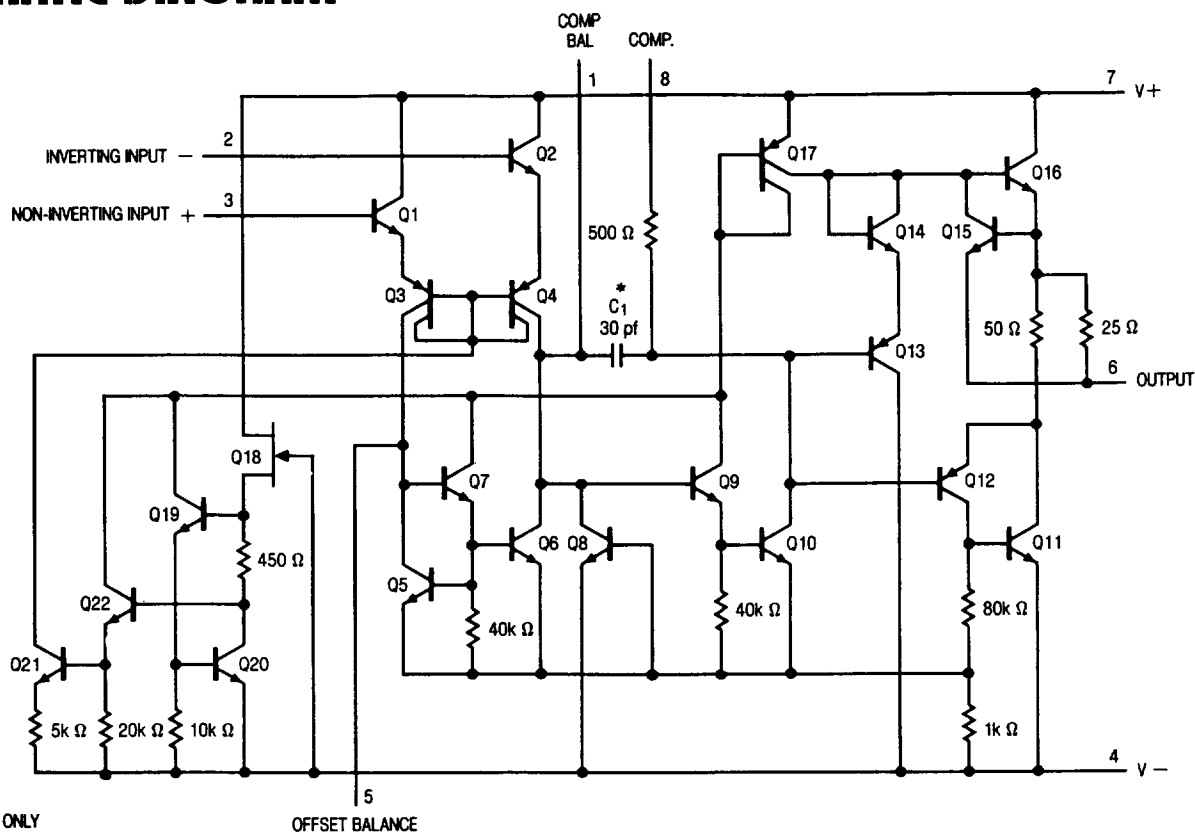
Voltage Comparator with Clamp



Precision Rectifier



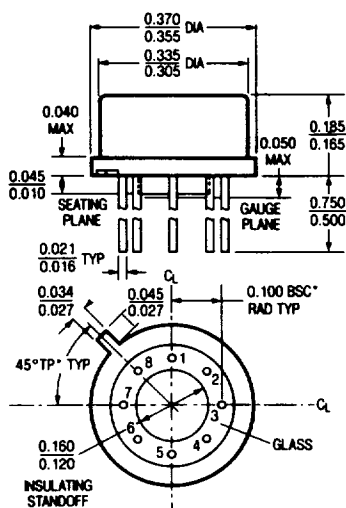
SCHEMATIC DIAGRAM



* C1 FOR LM107 ONLY
FOR LM107, THERE ARE NO INTERNAL
CONNECTIONS TO PINS 1, 5 AND 8

PACKAGE DESCRIPTION

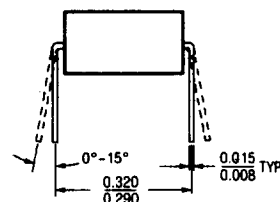
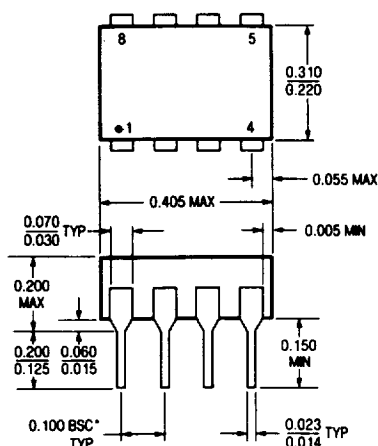
H Package Metal Can



NOTE: DIMENSIONS IN INCHES

T_{jmax}	Θ_{ja}	Θ_{jc}
150°C	150°C/W	45°C/W

J8 Package
8 Lead Hermetic Dip



NOTE: DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED.

*LEADS WITHIN 0.007 OF TRUE POSITION (TP) AT GAUGE PLANE

T_{jmax} 150°C	Θ_{ja} 100°C/W
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