OBSOLETE:
FOR INFORMATION PURPOSES ONLY
Contact Linear Technology for Potential Replacement

FEATURES

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

APPLICATIONS

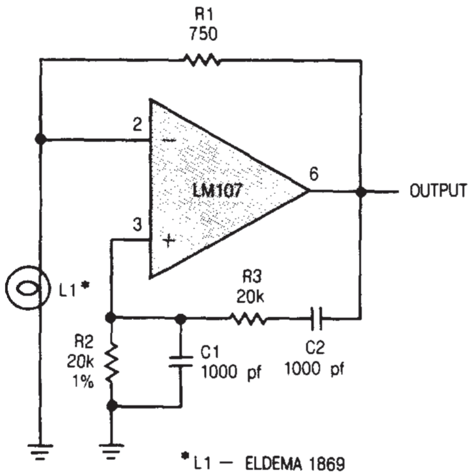
- Signal Conditioning Amplifiers
- Voltage Followers
- Comparators

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.

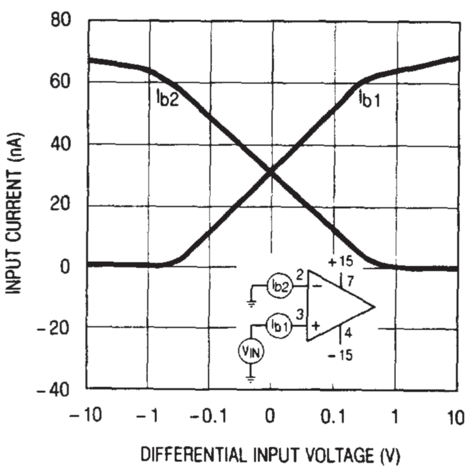
The LM101A uses external compensation, allowing the frequency response and slew rate to be optimized for the application. The LM107 is identical to the LM101A with the exception that the compensation capacitor is internal. Linear's LM101A and LM107 include improved design and processing techniques resulting 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.

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



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

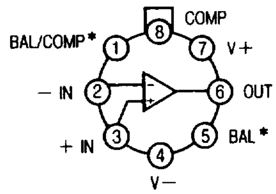
Maximum Junction Temperature
- LM101A/LM107 .... 150°C
- LM301A/LM307 .... 100°C

Storage Temperature Range
- All Devices................. −65°C to 150°C

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

PACKAGE/ORDER INFORMATION

TOP VIEW

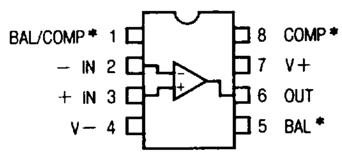


METAL CAN H PACKAGE
*PINS 1, 5, 8 NO CONNECTION ON LM107/307

ORDER PART NUMBER

LM101AH
LM301AH
LM107H
LM307H

TOP VIEW



J8 PACKAGE
HERMETIC DIP
*PINS 1, 5, 8 NO CONNECTION ON LM107/307

LM101AJ8
LM301AJ8
LM107J8
LM307J8

ELECTRICAL CHARACTERISTICS (Note 1)

SYMBOL	PARAMETER	CONDITIONS		LM101A/LM107 MIN	TYP	MAX	LM301A/LM307 MIN	TYP	MAX	UNITS
V_{OS}	Input Offset Voltage	$R_S \leq 50K\Omega$, $T_A = 25°C$			0.7	2.0		2.0	7.5	mV
		$R_S \leq 50K\Omega$	●			3.0			10	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	μV/°C
I_{OS}	Input Offset Current	$T_A = 25°C$			1.5	10		3.0	50	nA
			●			20			70	nA
$\frac{\Delta I_{OS}}{\Delta Temp}$	Average Temperature Coefficient of Input Offset Current	$25°C \leq T_A \leq T_{MAX}$			0.01	0.1		0.01	0.3	nA/°C
		$T_{MIN} \leq T_A \leq 25°C$			0.02	0.2		0.02	0.6	nA/°C
I_B	Input Bias Current	$T_A = 25°C$			30	75		70	250	nA
			●			100			300	nA
A_{VOL}	Large Signal Voltage Gain	$T_A = 25°C$, V_S ±15V, V_{OUT} = ±10V, $R_L \geq 2K\Omega$		50	160		25	160		V/mV
		V_S = ±15V, V_{OUT} = ±10V, $R_L \geq 2K\Omega$	●	25			15			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 = ±20V	●	±15						V
		V_S = ±15V	●		+15		±12	+15		V
					−13			−13		V
V_{OUT}	Output Voltage Swing	V_S = ±15V R_L = 10KΩ	●	±12	±14		±12	±14		V
		R_L = 2KΩ	●	±10	±13		±10	±13		V
R_{IN}	Input Resistance	$T_A = 25°C$		1.5	4.0		0.5	2.0		MΩ
I_S	Supply Current	$T_A = 25°C$, V_S = ±20V			1.8	3.0		1.8	3.0	mA
		$T_A = 125°C$, V_S = ±20V	●		1.2	2.5				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.

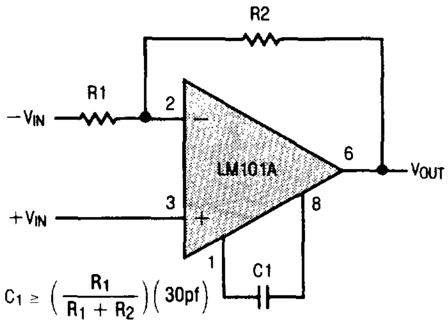
Note 2: For supply voltages less than ±15 Volts, the maximum input voltage is equal to the supply voltage.

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)

2

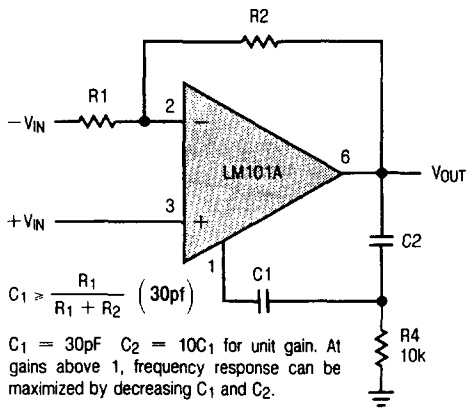
Single Pole Compensation



$C_1 \geq \left(\frac{R_1}{R_1 + R_2}\right)(30pf)$

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

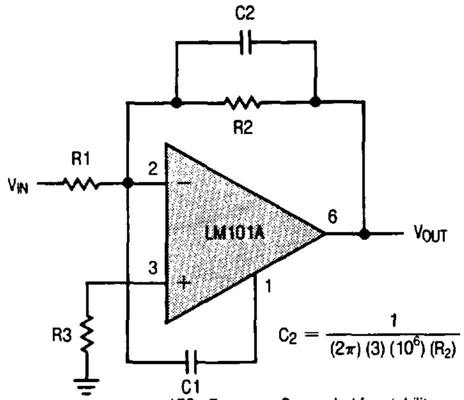
Two Pole Compensation



$C_1 \geq \frac{R_1}{R_1 + R_2}\ (30pf)$

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

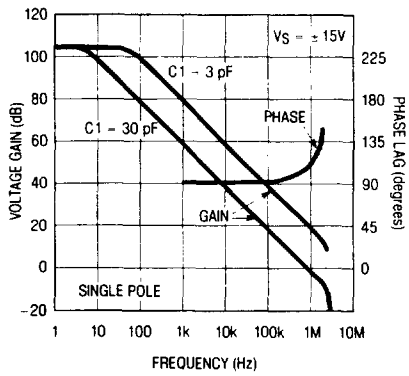
Feedforward Compensation



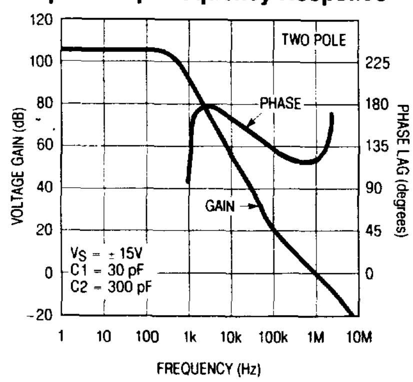
$C_2 = \frac{1}{(2\pi)(3)(10^6)(R_2)}$

C_2 needed for stability.

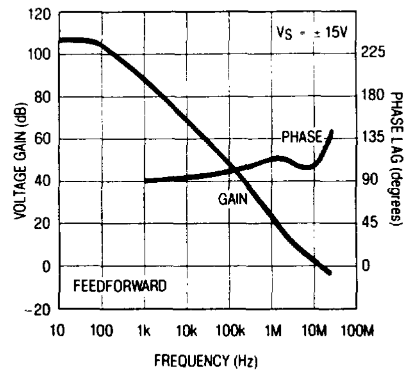
Open Loop Frequency Response



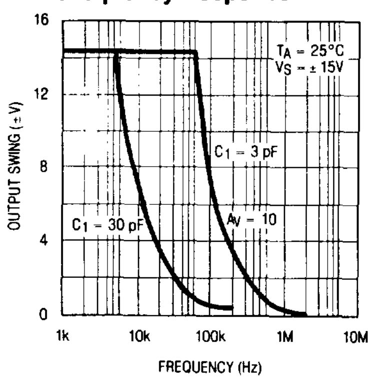
Open Loop Frequency Response



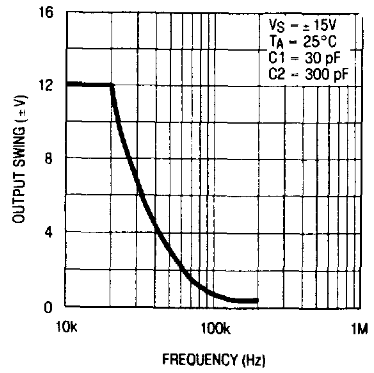
Open Loop Frequency Response



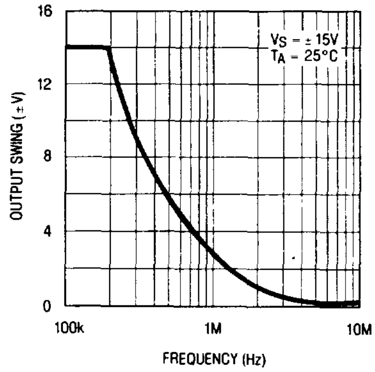
Single Pole Large Signal Frequency Response



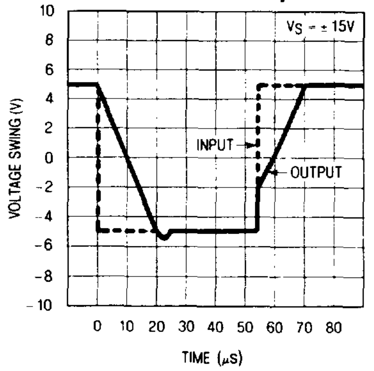
2 Pole Large Signal Frequency Response



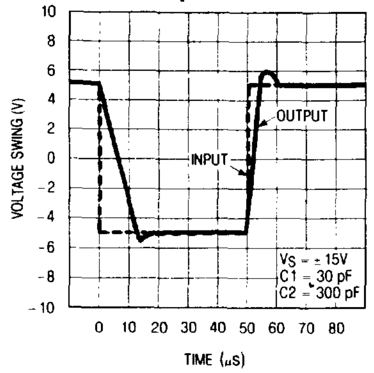
Feedforward Large Signal Frequency Response



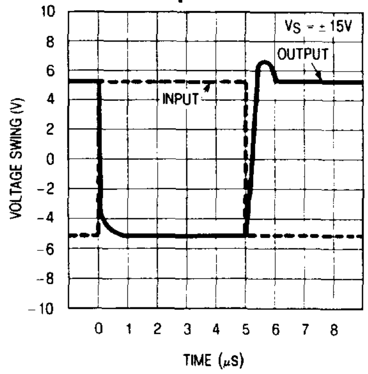
Single Pole Voltage Follower Pulse Response



2 Pole Voltage Follower Pulse Response

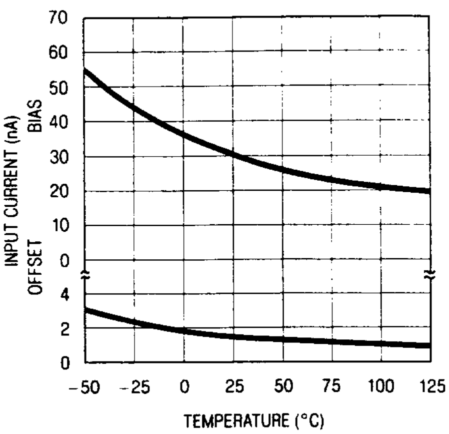


Feedforward Inverter Pulse Response

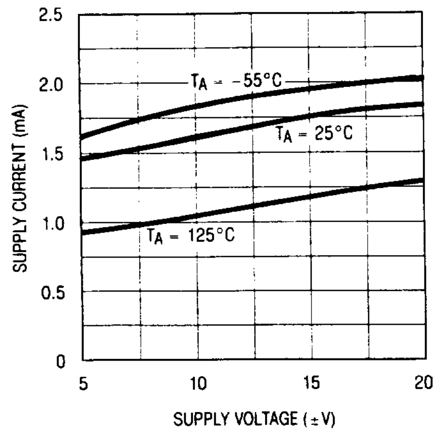


TYPICAL PERFORMANCE CHARACTERISTICS (LM101A/LM107)

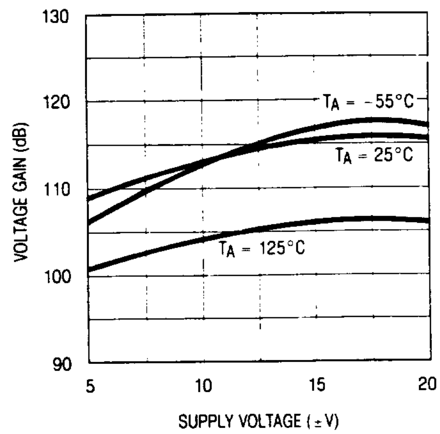
Input Current



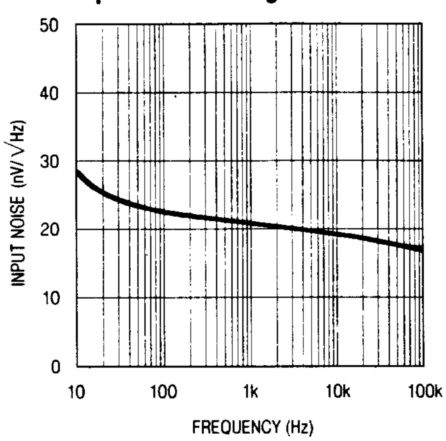
Supply Current



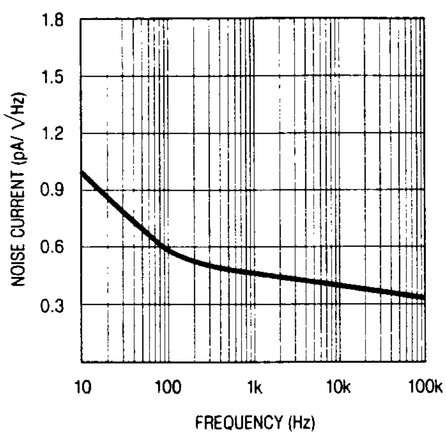
Voltage Gain



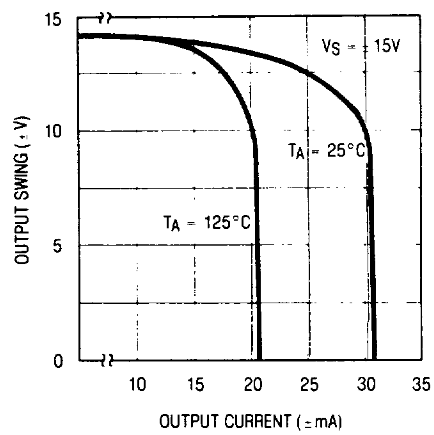
Input Noise Voltage



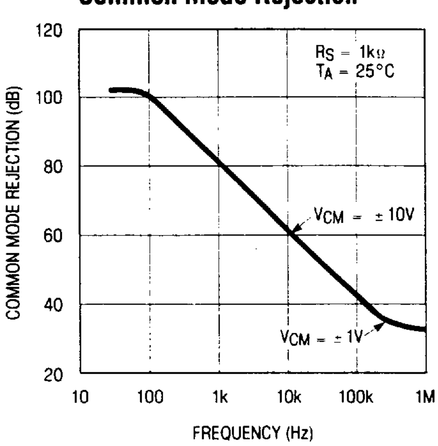
Input Noise Current



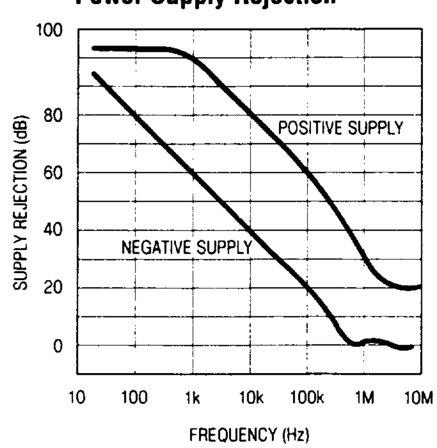
Current Limiting



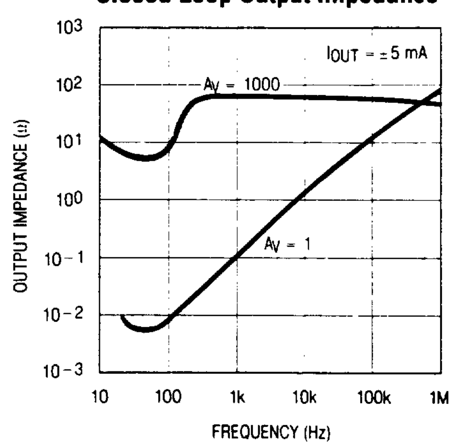
Common Mode Rejection



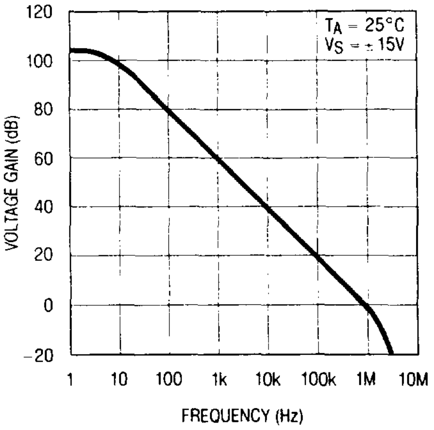
Power Supply Rejection



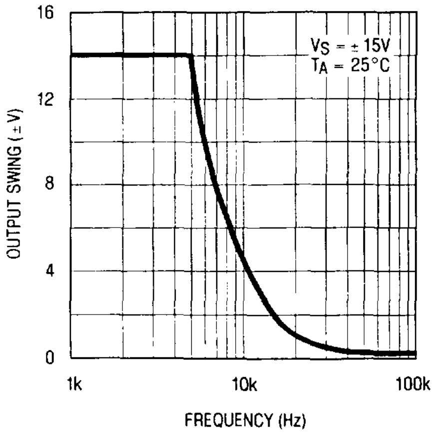
Closed Loop Output Impedance



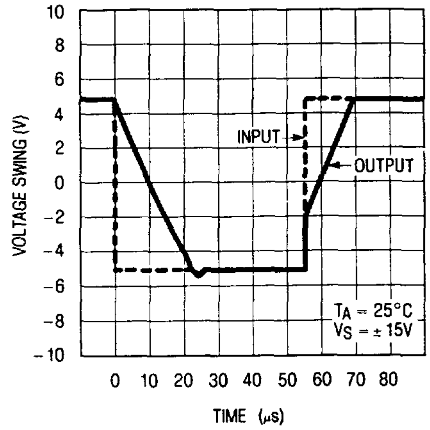
LM107
Open Loop Frequency Response



LM107
Large Signal Frequency Response



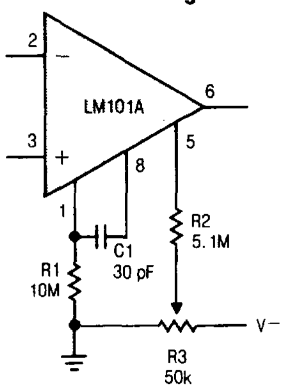
LM107
Voltage Follower Pulse Response



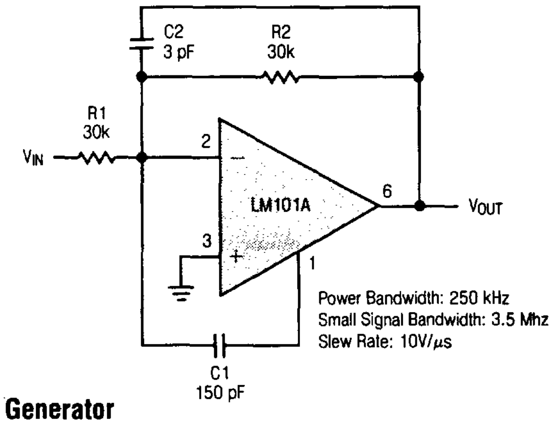
2

TYPICAL APPLICATIONS

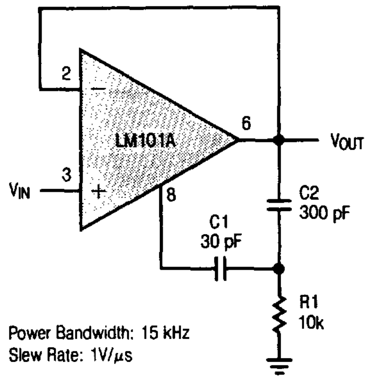
Standard Compensation and Offset Balancing Circuit



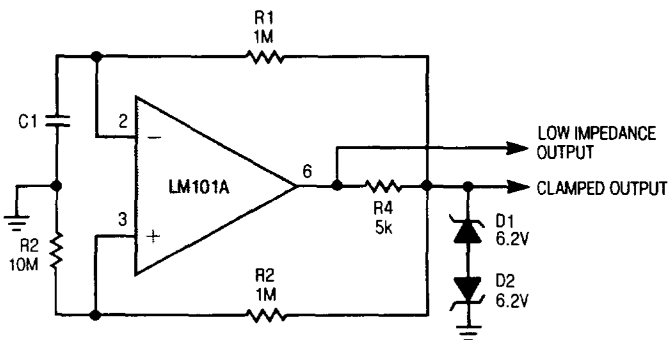
Fast Summing Amplifier



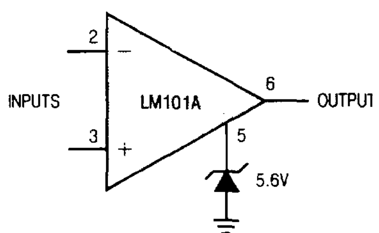
Fast Voltage Follower



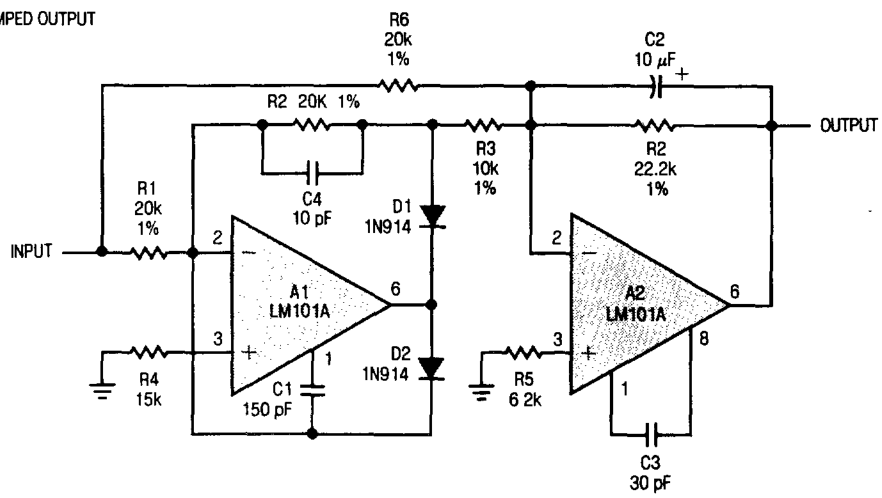
Low Frequency Square Wave Generator



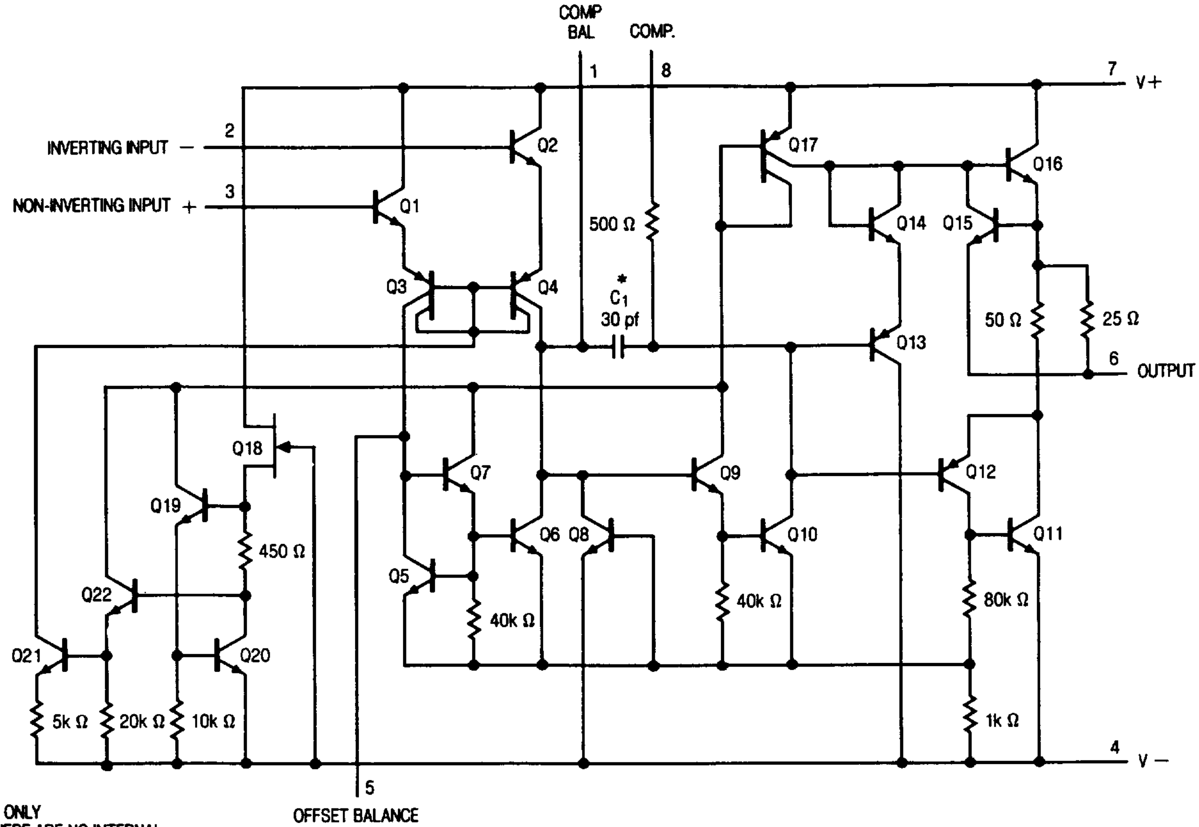
Voltage Comparator with Clamp



Precision Rectifier



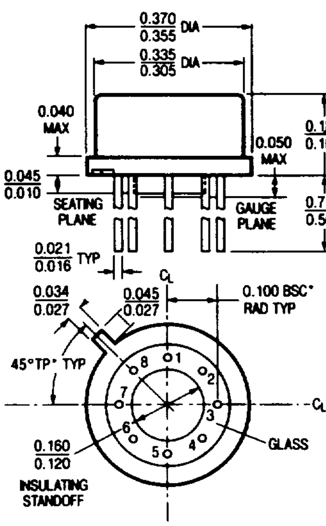
SCHEMATIC DIAGRAM



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

PACKAGE DESCRIPTION

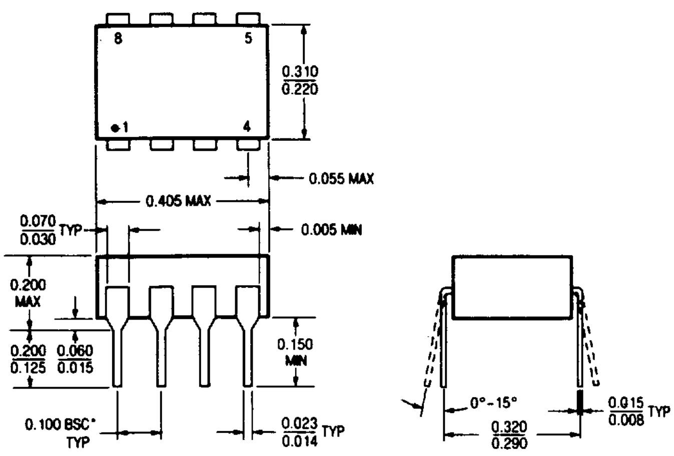
H Package
Metal Can



NOTE: DIMENSIONS IN INCHES

$T_j$max	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

$T_j$max	Θ_{ja}
150°C	100°C/W