Am101/201/301

Operational Amplifiers

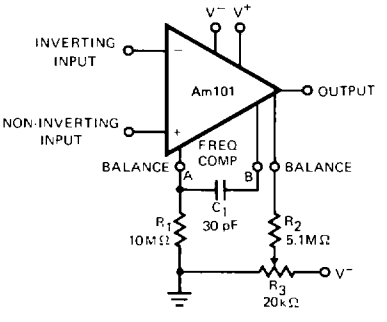
Description: The Am101/201/301 monolithic operational amplifiers are functionally, electrically and pin-for-pin equivalent to the National LM101, and LM201. They are available in the hermetic TO-99 metal can, dual-in-line packages, and flat packages.

Distinctive Characteristics: 100% reliability assurance testing including high-temperature bake, temperature cycling, centrifuge and fine leak hermeticity testing in compliance with MIL STD 883 Class B.
Electrically tested and optically inspected dice for the assemblers of hybrid products.

FUNCTIONAL DESCRIPTION

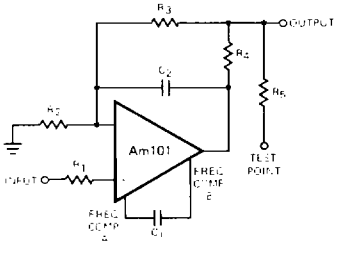
The Am101/201/301 are differential input, class AB output operational amplifiers. The inputs and outputs are protected against overload and the amplifiers may be frequency compensated with an external 30pF capacitor.

FUNCTIONAL DIAGRAM



LIC-635

APPLICATIONS



LIC-636

INPUT/OUTPUT OVERLOAD PROTECTION

If an input is driven from a low-impedance source, a series resistor, R_1 should be used to limit the peak instantaneous output current of the source to less than 100 mA. A large capacitor (> 0.1 µF) is equivalent to a low source impedance and should be protected against by an isolation resistor.

The amplifier output is protected against damage from shorts to ground or to the power supplies by device design. Protection of the output from voltages exceeding the specified operating power supplies can be obtained by isolating the output via limiting resistors R_4 or R_5.

The power supplies must never become reversed, even under transient conditions. Reverse voltages as low as 1 volt can cause damage through excessive current. This hazard can be reduced by using clamp diodes of high peak current rating connected to the device supply lines.

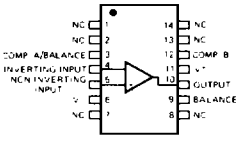
ORDERING INFORMATION

Part Number	Package Type	Temperature Range	Order Number
Am301	DIP	0°C to +70°C	LM301D
	Metal Can	0°C to +70°C	LM301H
	Dice	0°C to +70°C	LD301
Am201	DIP	−25°C to +80°C	LM201D
	Metal Can	−25°C to +80°C	LM201H
Am101	DIP	−55°C to +125°C	LM101D
	Metal Can	−55°C to +125°C	LM101H
	Dice	−55°C to +125°C	LD101

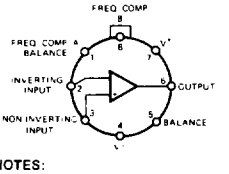
CONNECTION DIAGRAMS

Top Views

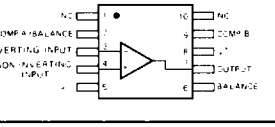
Dual-In-Line



Metal Can



Flat Package



NOTES:

(1) On Metal Can, pin 4 is connected to case.

(2) On DIP, pin 6 is connected to bottom of package.

(3) On Flat Package, pin 5 is connected to bottom of package.

LIC-637

MAXIMUM RATINGS

Supply Voltage	±22V
Internal Power Dissipation (Note 1)	500 mW
Differential Input Voltage	±30V
Input Voltage (Note 2)	±15V
Output Short-Circuit Duration	Indefinite
Operating Temperature Range	
Am101	−55°C to +125°C
Am201	−25°C to +85°C
Am301	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 60 sec.)	300°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified) (Note 3)

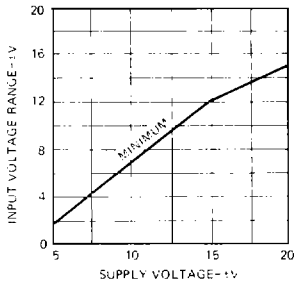
Parameter (see definitions)	Conditions	Am301 Min	Am301 Typ	Am301 Max	Am101 Am201 Min	Am101 Am201 Typ	Am101 Am201 Max	Units
Input Offset Voltage	$R_S \leq 10\ k\Omega$		2.0	7.5		1.0	5.0	mV
Input Offset Current			100	500		40	200	nA
Input Bias Current			250	1500		120	500	nA
Input Resistance		0.1	0.4		0.3	0.8		MΩ
Supply Current	$V_S = \pm 20V$		1.8	3.0		1.8	3.0	mA
Large Signal Voltage Gain	$V_S = \pm 15V, V_{OUT} = \pm 10V,$ $R_L > 2\ k\Omega$	20	150		50	160		V/mV
The Following Specifications Apply Over The Operating Temperature Ranges								
Input Offset Voltage	$R_S \leq 10\ k\Omega$			10			6.0	mV
Input Offset Current	$T_A = T_{A(min)}$		150	750		100	500	nA
	$T_A = T_{A(max)}$		50	400		10	200	nA
Input Bias Current	$T_A = T_{A(min)}$		0.32	2		0.28	1.5	μA
Large Signal Voltage Gain	$V_S = \pm 15\ V, V_{OUT} = \pm 10\ V,$ $R_L > 2\ k\Omega$	15			25			V/mV
Input Voltage Range	$V_S = \pm 15\ V$	±12			±12			V
Common Mode Rejection Ratio	$R_S \leq 10\ k\Omega$	65	90		70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10\ k\Omega$	70	90		70	90		dB
Output Voltage Swing	$V_S = \pm 15\ V, R_L = 10\ k\Omega,$	±12	±14		±12	±14		V
	$R_L = 2\ k\Omega$	±10	±13		±10	±13		V
Supply Current	$T_A = +125°C\ V_S = \pm 20\ V$					1.2	2.5	mA

Notes: 1. Derate Metal Can package at 6.8 mW/°C for operation at ambient temperatures above 75°C and the Dual-In-Line package at 9 mW/°C for operation at ambient temperatures above 95°C.
2. For supply voltages less than ±15 V, the maximum input voltage is equal to the supply voltage.
3. Unless otherwise specified, these specifications apply for supply voltages from ±5 V to ±20 V and C_1 = 30 pF.

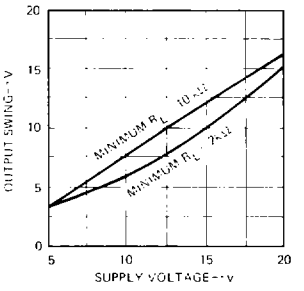
GUARANTEED PERFORMANCE CURVES

(Curves apply over the Operating Temperature Ranges)

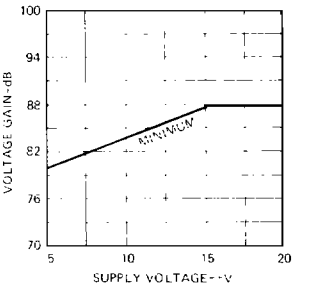
Input Voltage Range



Output Swing



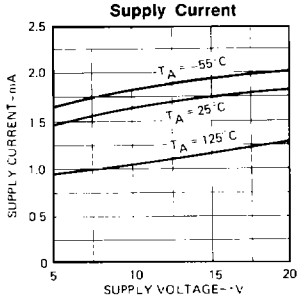
Voltage Gain



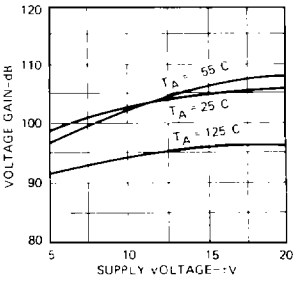
LIC-638

PERFORMANCE CURVES

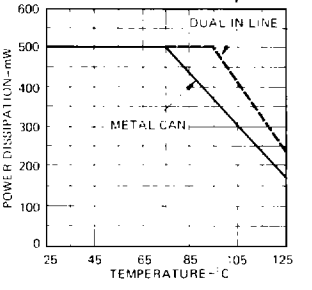
Supply Current



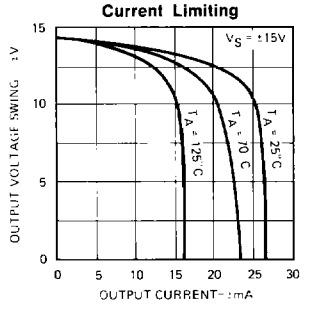
Voltage Gain



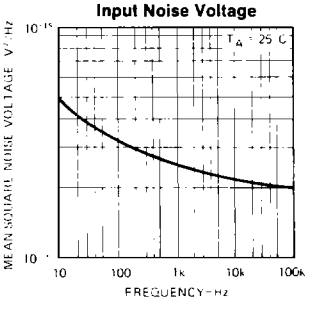
Maximum Power Dissipation



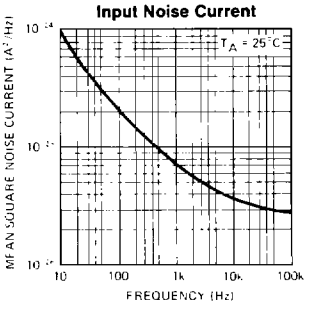
Current Limiting



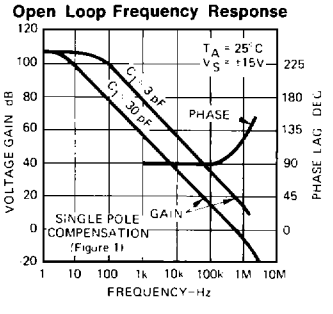
Input Noise Voltage



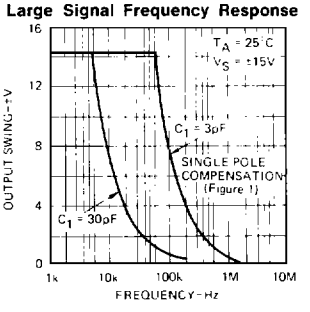
Input Noise Current



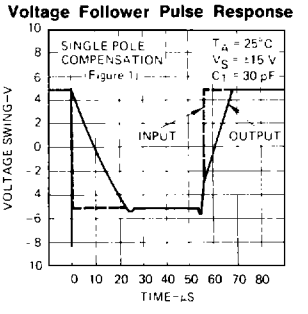
Open Loop Frequency Response



Large Signal Frequency Response



Voltage Follower Pulse Response

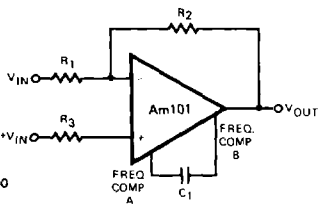


LIC-639

6

FREQUENCY COMPENSATION CIRCUITS

Single Pole Compensation

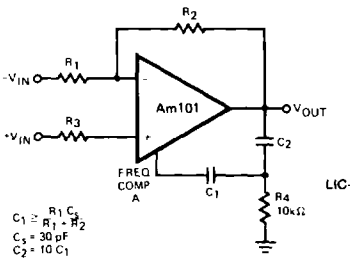


LIC-640

$C_1 \geq \frac{R_1 C_S}{R_1 + R_2}$

$C_S = 30\ pF$

Two Pole Compensation



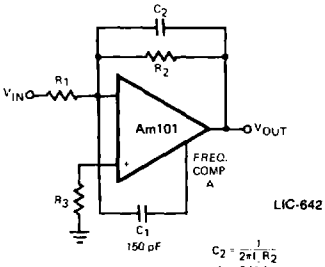
LIC-641

$C_1 \geq \frac{R_1 C_S}{R_1 + R_2}$

$C_S = 30\ pF$

$C_2 = 10\,C_1$

Feedforward Compensation



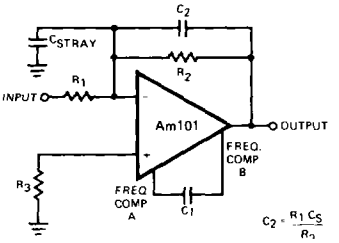
LIC-642

$C_2 = \frac{1}{2\pi f_t R_2}$

$f_t = 3\ MHz$

Power supplies should be bypassed to ground at one point, minimum, on each card. More bypass points should be considered for five or more amplifiers on a single card. For applications using feed-forward compensation, the power supply leads of each amplifier should be bypassed with low inductance capacitors.

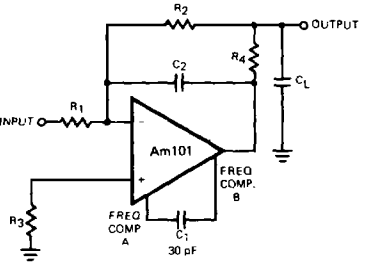
Compensating for Stray Input Capacitance/Large Feedback Resistance



LIC-643

$C_2 = \frac{R_1 C_S}{R_2}$

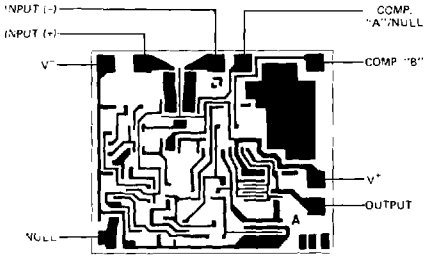
Isolating Large Capacitive Loads



LIC-644

The values given for the frequency compensation capacitor guarantee stability only for source resistances less than 10kΩ, stray capacitances on the summing junction less than 5pF and capacitive loads smaller than 100pF. If any of these conditions is not met, it is necessary to use a larger compensation capacitor. Alternately, lead capacitors can be used in the feedback network to negate the effect of stray capacitance and large feedback resistors, or an RC network can be added to isolate capacitive loads.

Metallization and Pad Layout



49 x 56 Mils