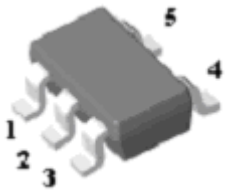
DESCRIPTION

The LM321 brings performance and economy to low power systems. With a high unity gain frequency and a guaranteed 0.4V/μs slew rate, the quiescent current is only 430μA/amplifier (5V). The input common mode range includes ground and therefore the device is able to operate in single supply applications as well as in dual supply applications. It is also capable of comfortably driving large capacitive loads.



SOT-23-5L

The LM321 is available in the SOT-23-5L package. Overall the LM321 is a low power, wide supply range performance op amp that can be designed into a wide range of applications at an economical price without sacrificing valuable board space.

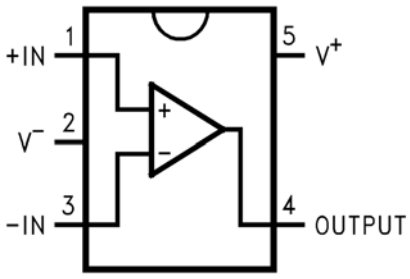
FEATURES

- Gain-Bandwidth product: 1MHz
- Low supply current: 430μA
- Low input bias current: 45nA
- Wide supply voltage range: +3V to +32V

APPLICATIONS

- Chargers
- Power supplies
- Industrial: controls, instruments
- Desktops
- Communications infrastructure

BLOCK DIAGRAM



MARKING INFORMATION



ABSOLUTE MAXIMUM RATINGS (Note 1)

Characteristic	Value	Unit
Supply Voltage,(V^+ - V^-)	32	V
Input Voltage	-0.3~+32	V
Output Short Circuit to GND $V^+ \leqslant$ 15V anf Ta=25℃ Note2	Continuous	
Junction Temperature (Note3)	150	℃
Thermal Resistance to Ambient (θ_{JA})	265	℃
Operating Temperature Range	-40~+85	℃
Storage Temperature Range	-65~+150	℃

ELECTRICAL CHARACTERISTICS (Unless otherwise specified: V^+=5.0V)

Parameter	Test Conditions		Min.	Typ.	Max.	Unit
Input Offset Voltage	Ta=25℃ (Note 4)			2	5	mV
Input Bias Current	Ta=25℃, $I_{IN(+)}$ or $I_{IN(-)}$, V_{CM}=0V (Note 5)			45	150	nA
Input Offset Current	Ta=25℃, $I_{IN(+)}$ - $I_{IN(-)}$, V_{CM}=0V			3	30	nA
Input Common-Mode Voltage Range	Ta=25℃, V^+=30V (Note 6)		0		V^+-1.5	V
Supply Current	Over Full Temperature Range, R_L=∞ on all Op Amps	V^+=30V		0.66	2	mA
		V^+=5V		0.43	1.2	
Large Signal Voltage Gain	V^+=15V, Ta=25℃, R_L≥2kΩ (For Vo=1~11V)		50	100		V/mV
Common-Mode Rejection Ratio	DC, Ta=25℃, V_{CM}=0~V^+-1.5V		70	90		dB
Power Supply Rejection Ratio	DC, Ta=25℃, V^+=5~30V		75	100		dB
Amplifier-to-Amplifier Coupling	Ta=25℃, f=1~20kHz (Input Referred) (Note 7)			-120		dB

Output Current	Source	$V_{IN(+)}$=1V,$V_{IN(-)}$=0V,V^+=15V,Vo=2V, Ta=25℃		20	40		mA
	Sink	$V_{IN(-)}$=1V,$V_{IN(+)}$=0V,V^+=15V,Vo=2V, Ta=25℃		10	20		mA
		$V_{IN(-)}$=1V,$V_{IN(+)}$=0V,V^+=15V, Vo=200mV,Ta=25℃		12	50		?A
Short Circuit to Ground		V^+=15V， Ta=25℃ （Note 2）			40	85	mA
Output Voltage Swing	V_{OH}	V^+=30V	R_L=2k?	26			V
			R_L=10k?	27	28		V
	V_{OL}	V^+=5V， R_L=10k?			5	20	mV

Note 1 Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not guaranteed. For guaranteed specifications and the test conditions, see the Electrical Characteristics.

Note 2: Short circuits from the output to V^+ can cause excessive heating and eventual destruction. When considering short circuits to ground, the maximum output current is approximately 40mA independent of the magnitude of V^+. At values of supply voltage in excess of +15V, continuous short-circuits can exceed the power dissipation ratings and cause eventual destruction. Destructive dissipation can result from simultaneous shorts on all amplifiers.

Note 3: The maximum power dissipation is a function of $T_{J(MAX)}$, θ_{JA} , and Ta. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} - Ta)/\theta_{JA}$. All numbers apply for packages soldered directly onto a PC board.

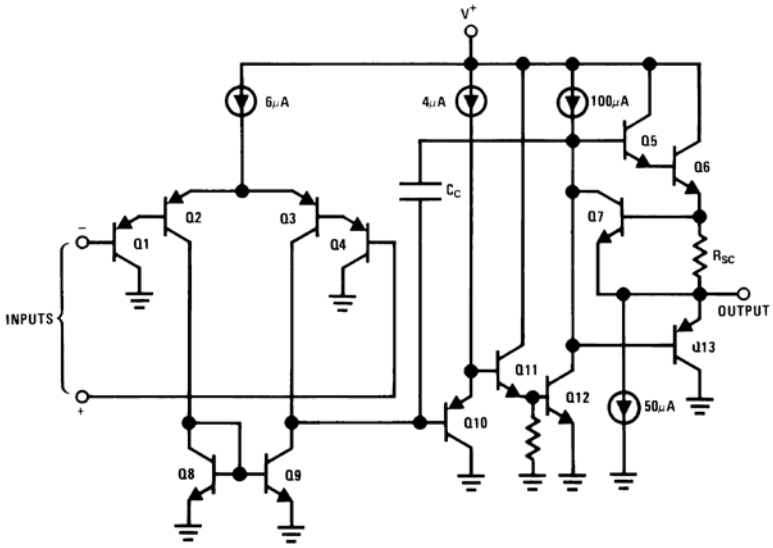
Note 4: Vo=1.4V, Rs = 0? with V^+ from 5V to 30V; and over the full input common-mode range (0V to V^+ -1.5V) at 25°C

Note 5: The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.

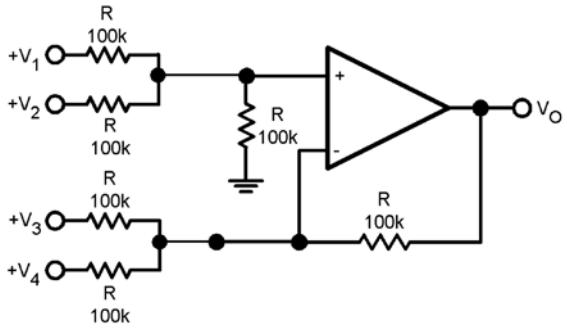
Note 6: The input common-mode voltage of either input signal voltage should not be allowed to go negative by more than 0.3V (at 25°C). The upper end of them common-mode voltage range is V^+ -1.5V (at 25°C), but either or both inputs can go to +32V without damage, independent of the magnitude of V^+.

Note 7: Due to proximity of external components, insure that coupling is not originating via stray capacitance between these external parts. This typically can be detected as this type of capacitance increases at higher frequencies.

SIMPLIFIED SCHEMATIC



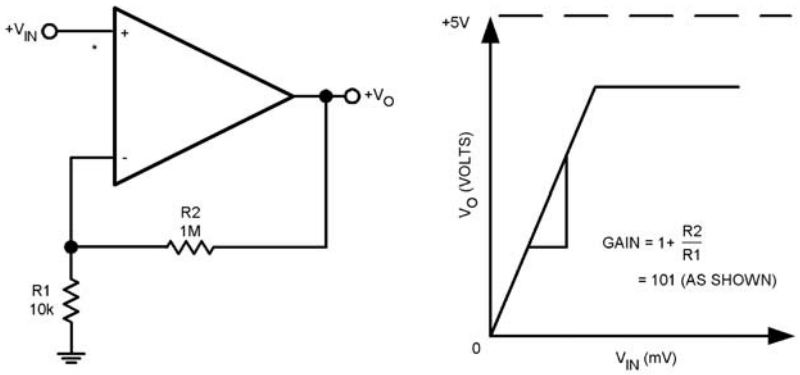
APPLICATION CIRCUIT



DC Summing Amplifier
($V_{IN's} \geq 0\ V_{DC}$ and $V_O \geq V_{DC}$)

Where: $V_0 = V_1 + V_2 - V_3 - V_4$, $(V_1 + V_2) \geq (V_3 + V_4)$ to keep $V_O > 0\ V_{DC}$

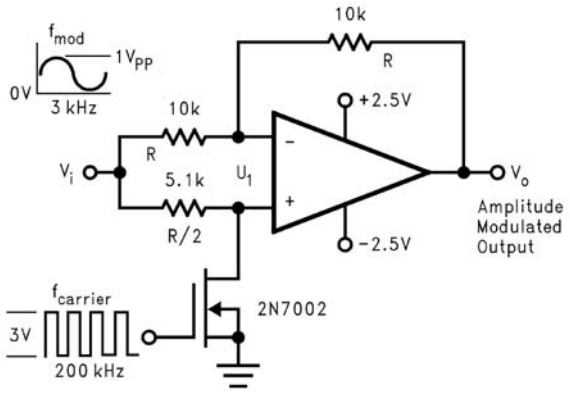
Non-Inverting DC Gain (0V Input = 0V Output)



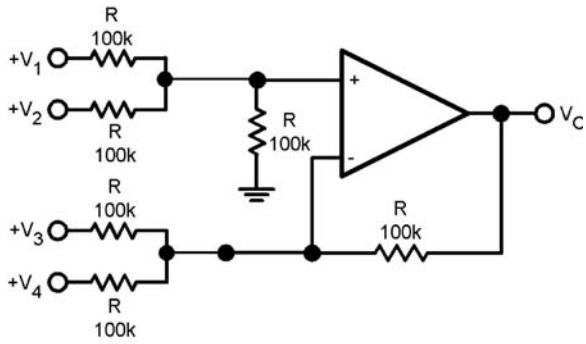
* R NOT NEEDED DUE TO TEMPERATURE INDEPENDENT I_{IN}

TYPICAL APPLICATIONS

Amplitude Modulator Circuit

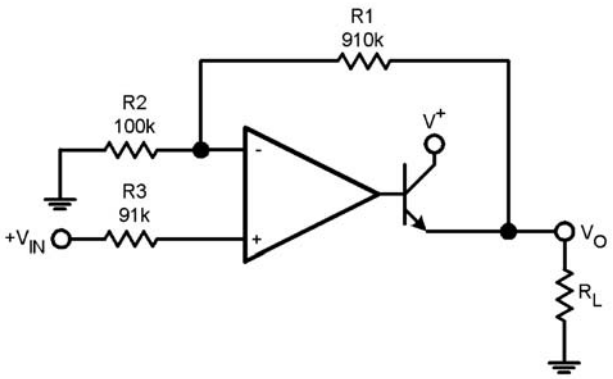


DC Summing Amplifier
($V_{IN's} \geq 0\ V_{DC}$ and $V_O \geq V_{DC}$)



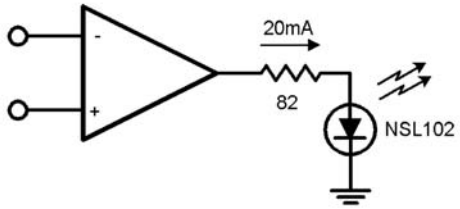
Where: $V_0 = V_1 + V_2 - V_3 - V_4$, $(V_1 + V_2) \geq (V_3 + V_4)$ to keep $V_O > 0\ V_{DC}$

Power Amplifier

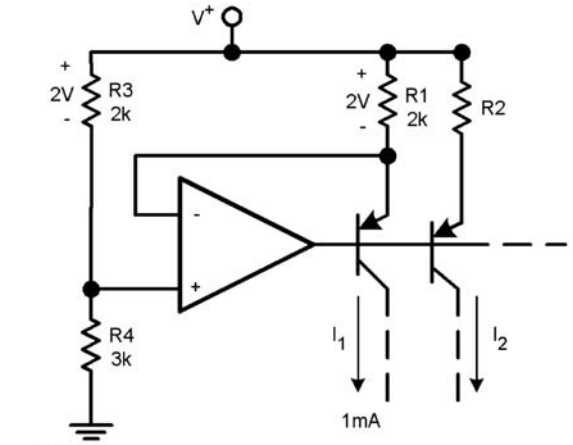


$V_0 = 0\ V_{DC}$ for $V_{IN} = 0\ V_{DC}$, $A_V = 10$

LED Driver

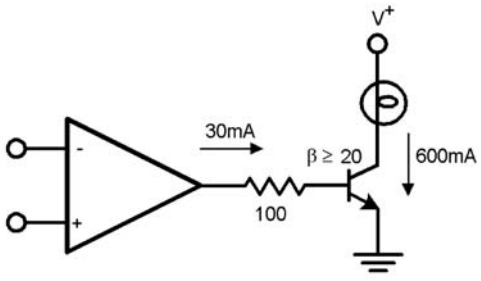


Fixed Current Sources



$$I_2 = \left[\frac{R1}{R2}\right] I_1$$

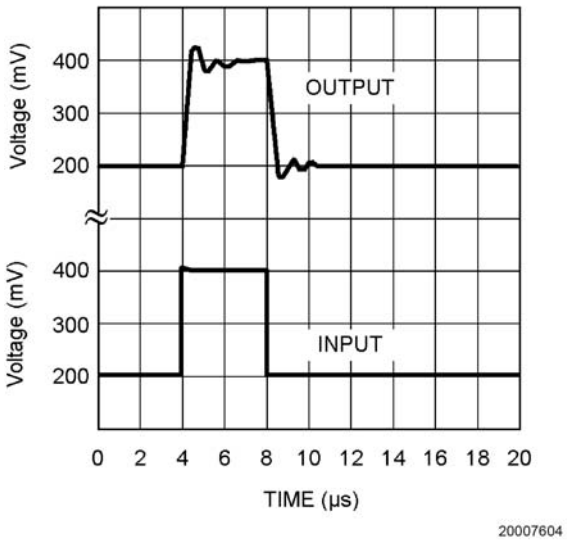
Lamp Driver



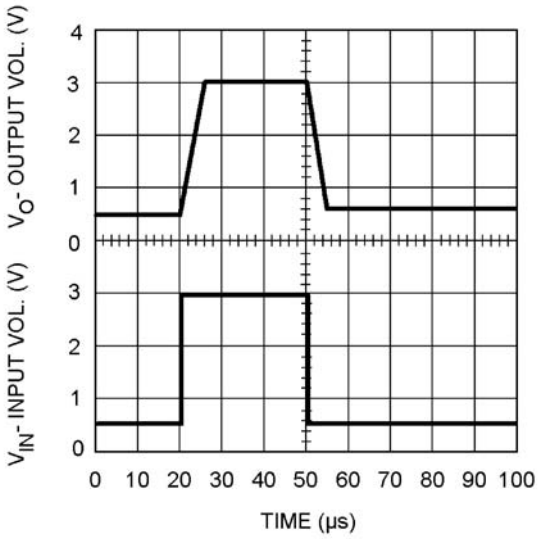
CHARACTURISTIC CURVES

(Unless otherwise specified: Vs=+5V, single supply,Ta=25℃)

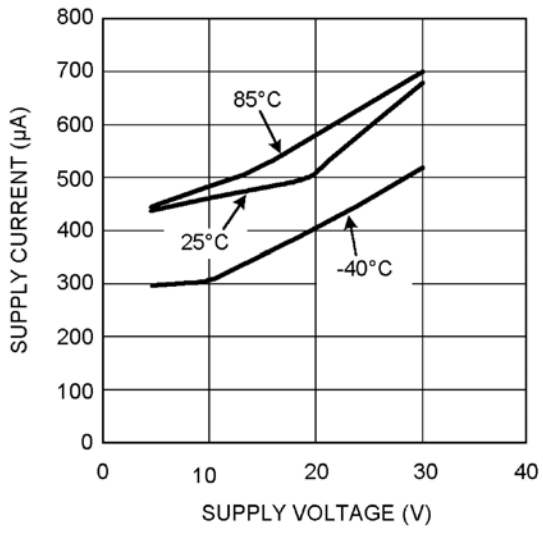
Small Signal Pulse Response



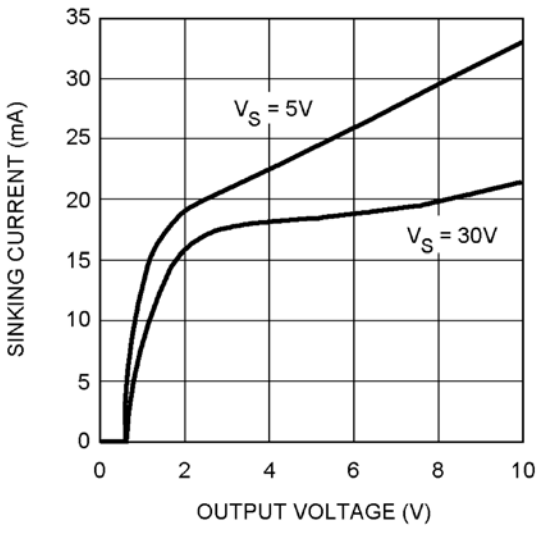
Large Signal Pulse Response



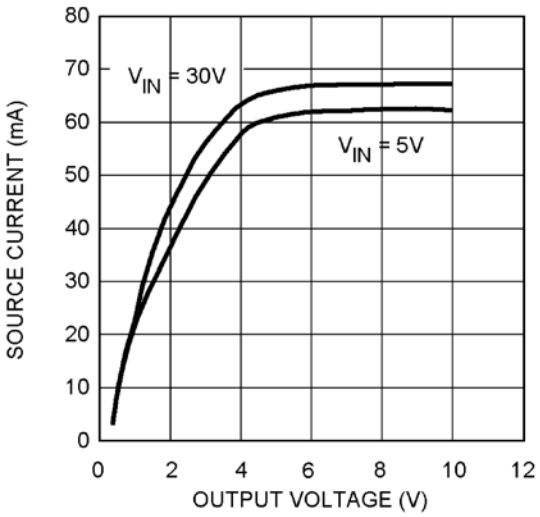
Supply Current vs. Supply Voltage



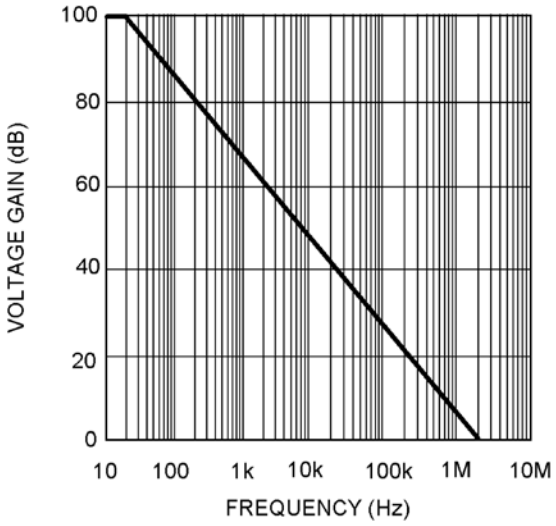
Sinking Current vs. Output Voltage



Source Current vs. Output Voltage



Open Loop Frequency Response



OUTLINE DRAWING

SOT-23-5L Unit:mm

