

Low Power Single Operational Amplifier

Features

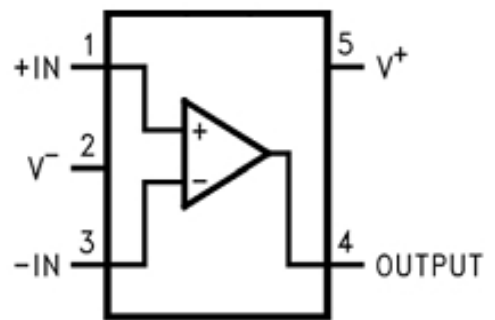
- Gain-Bandwidth product 1.0MHz
- Low supply current 100 μ A
- Low input bias current 45nA
- Wide supply voltage range +3V to +32V

Package



SOT23-5L

Pin Configurations



Function Block

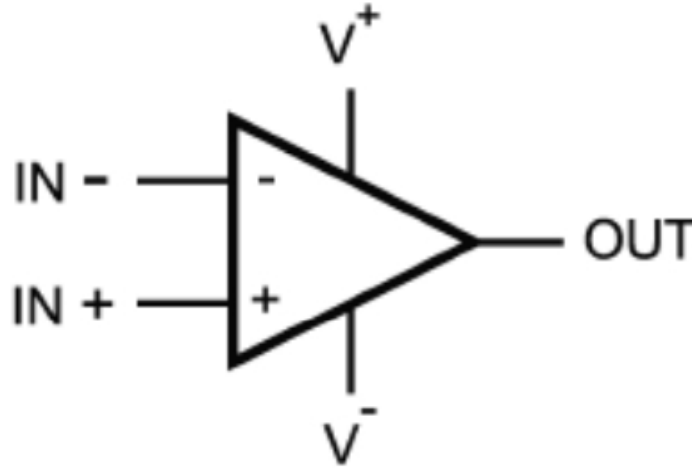


Figure1 Function Block Diagram of LM321

Absolute Maximum Ratings*1

Parameter Name	Value	Unit
Supply Voltage	32	V
Input Voltage	-0.3~+32	V
Output Short Circuit to GND $V^+ \leq 15V$ and $T_a=25^\circ C$ *2	Continuous	
Junction Temperature *3	150	$^\circ C$
Thermal Resistance to Ambient (θ_{JA})	265	$^\circ C/W$
Operating Temperature Range	-40~+85	$^\circ C$
Storage Temperature Range	-65~+150	$^\circ C$

Electrical Characteristics

(TA = 25°C, unless otherwise noted, V+ = 5V)

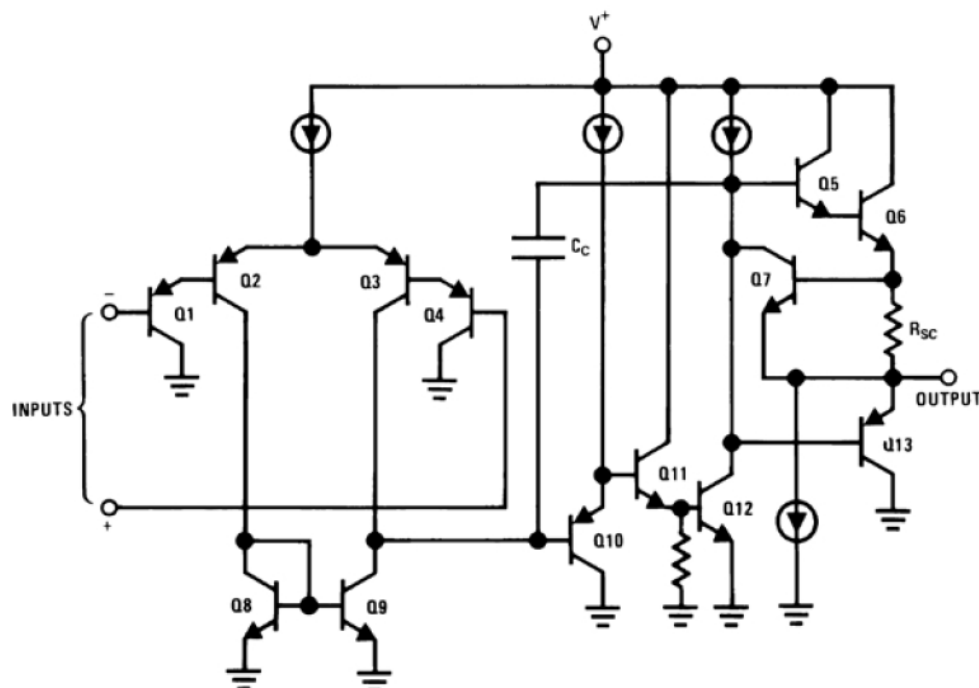
Parameter Name		Test Conditions		Min	Typ	Max	Unit
Input Offset Voltage		Ta=25°C*4			0.26	2.5	mV
Input Bias Current		Ta=25°C, I _{IN(+)} or I _{IN(-)} , V _{CM} =0V*5			45	150	nA
Input Offset Current		Ta=25°C, I _{IN(+)} - I _{IN(-)} , V _{CM} =0V			3	30	nA
Input Common-Mode Voltage Range		Ta=25°C, V ⁺ =30V*6		0		V ⁺ -1.5	V
Supply Current		Over Full Temperature Range, R _L =∞ on all Op Amps	V ⁺ =30V		160	500	μA
			V ⁺ =5V		100	300	
Large Signal Voltage Gain		Ta=25°C, V ⁺ =15V, R _L ≥ 2kΩ (for V _O =1~11V)		50	100		V/mV
Common-Mode Rejection Ratio		DC, Ta=25°C, V _{CM} =0~V ⁺ -1.5V		70	90		dB
Power Supply Rejection Ratio		DC, Ta=25°C, V ⁺ =5~30V		75	100		dB
Amplifier-to-Amplifier Coupling		Ta=25°C, f=1~20kHz(input referred)*7			120		dB
Output Current	Source	V _{IN(+)} =1V, V _{IN(-)} =0V, V ⁺ =15V, V _O =2V, Ta=25°C		20	40		mA
	Sink	V _{IN(-)} =1V, V _{IN(+)} =0V, V ⁺ =15V, V _O =2V, Ta=25°C		10	15		mA
		V _{IN(-)} =1V, V _{IN(+)} =0V, V ⁺ =15V, V _O =200mV, Ta=25°C		12	50		μA
Short Circuit to Ground		Ta=25°C, V ⁺ =15V*2			40	85	mA
Output Voltage Swing	V _{OH}	V ⁺ =27V	R _L =2kΩ	21	25		V
			R _L =10kΩ	22	24		V
	V _{OL}	V ⁺ =5V, R _L =10kΩ			5	20	mV

* 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.

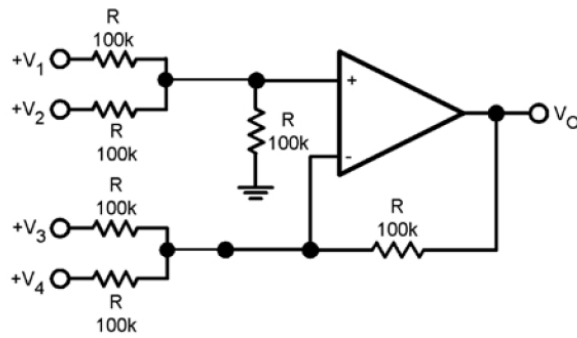
* 2: Short circuits from the output to V+ can cause excessive heating and eventual destruction. When considering short circuits to ground, the maximum output current is approximately 40mA independent of the magnitude of V+. At values of supply voltage in excess of +15V, continuous short-circuits can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

* 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 $P_D = (T_{J(MAX)} - T_a) / \theta_{JA}$. All numbers apply for packages soldered directly onto a PC board.

***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.



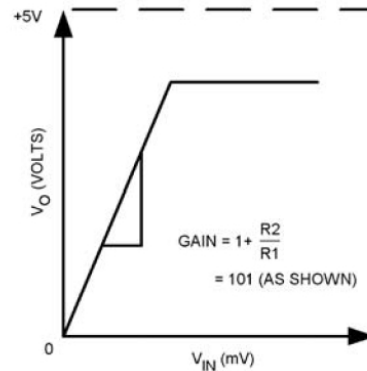
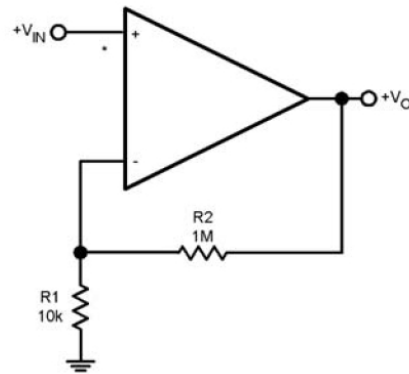
Typical Application Circuit



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

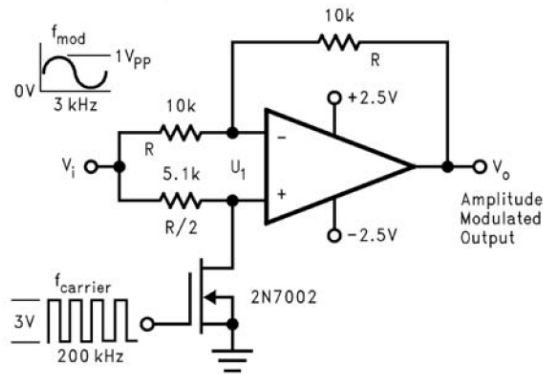
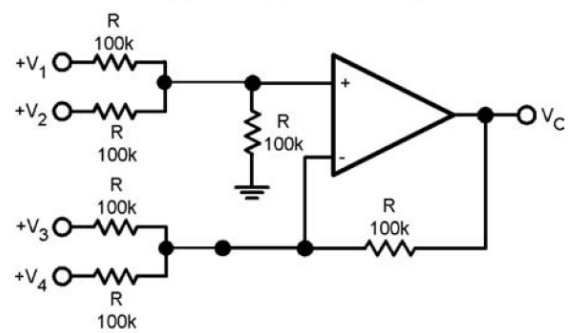
Where: $V_O = V_1 + V_2 - V_3 - V_4$, ($V_1 + V_2 \geq V_3 + V_4$) to keep $V_O > 0$ V_{DC}

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



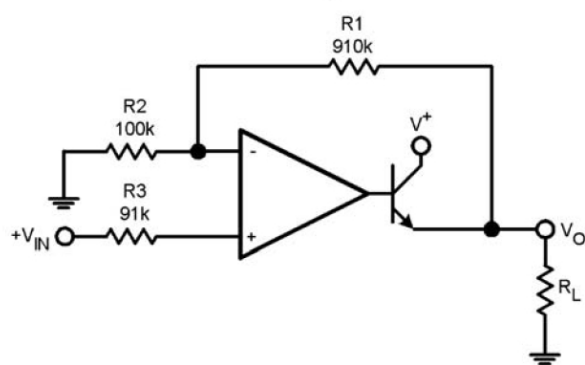
* R NOT NEEDED DUE TO TEMPERATURE INDEPENDENT I_{IN}

Amplitude Modulator Circuit


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


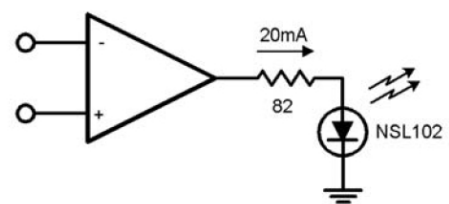
Where: $V_O = V_1 + V_2 - V_3 - V_4$, $(V_1 + V_2) \geq (V_3 + V_4)$ to keep $V_O > 0$ V_{DC}

Power Amplifier

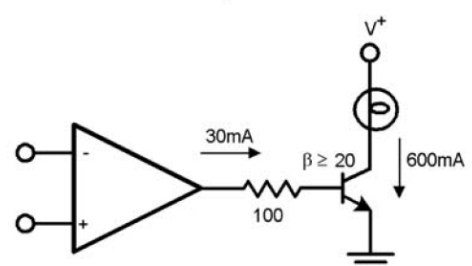


$V_O = 0$ V_{DC} for $V_{IN} = 0$ V_{DC} , $A_V = 10$

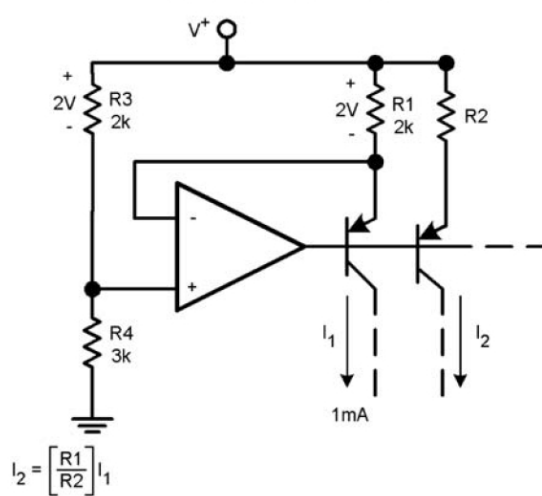
LED Driver



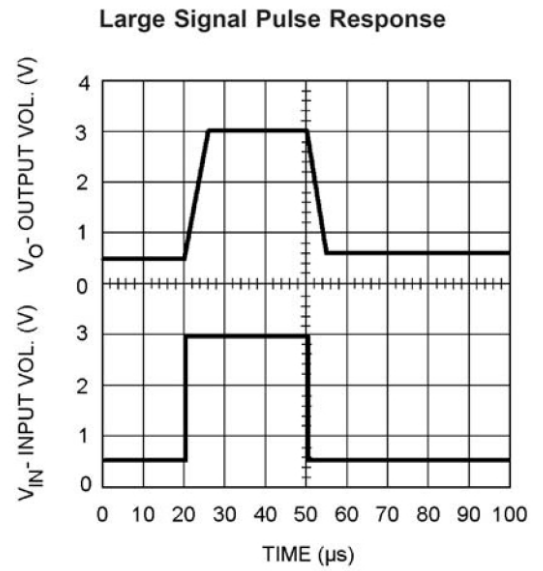
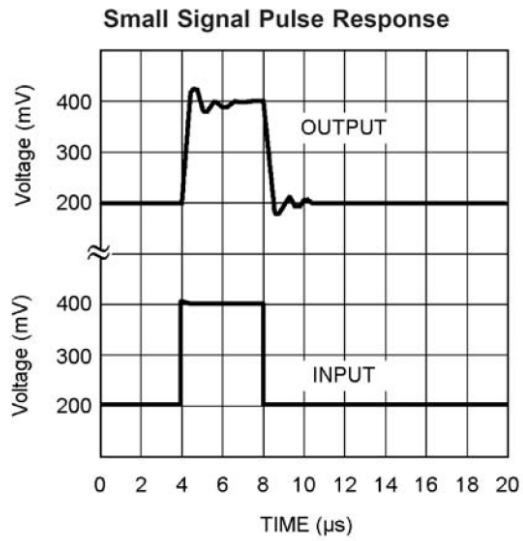
Lamp Driver



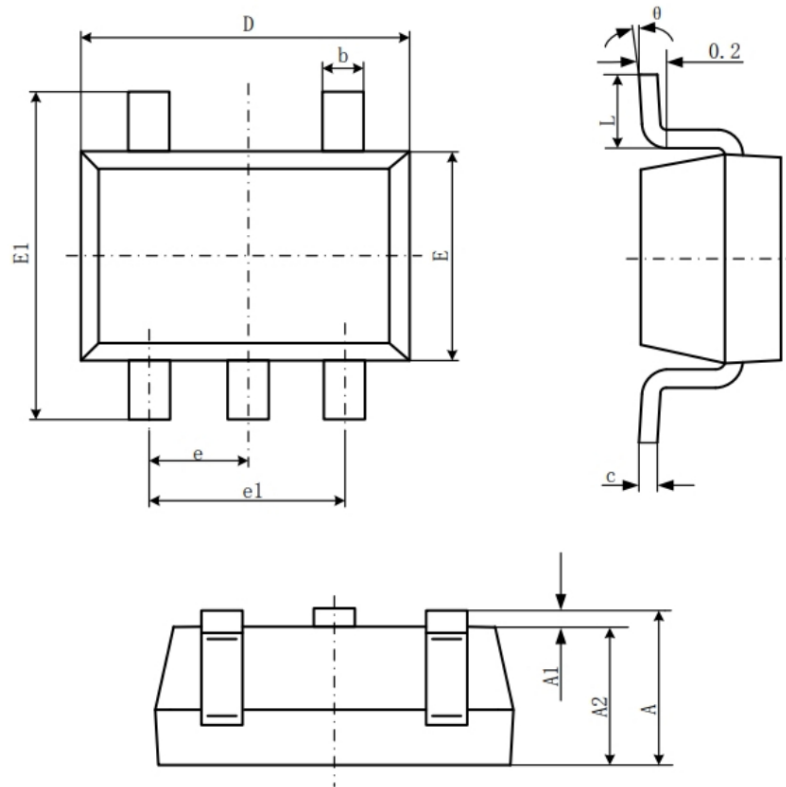
Fixed Current Sources



Characteristics Curves



SOT23-5 Package Outline Dimensions



编号	尺寸(mm)	
	Min	Max
A	1.050	1.250
A1	0.000	0.100
A2	1.050	1.150
b	0.300	0.500
c	0.100	0.200
D	2.820	3.020
E	1.500	1.700
E1	2.650	2.950
e	0.950(BSC)	
e1	1.800	2.000
L	0.300	0.600
θ	0°	8°