LM321 Low Power Single Operational Amplifier

1. General Description

1.1 Description

The LM321 brings performance and economy to low power systems. The quiescent current is only 400-μA/amplifier (5 V). 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.

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

1.2 Features

- (VS = 5 V, TA = 25°C. Typical values unless specified.)
- Wide Supply Voltage Range 3 V to 32 V
- Gain-Bandwidth Product 4 MHz
- Low Supply Current 400 μA
- Low Input Bias Current 30 nA
- Stable With High Capacitive Loads

1.3 Device Information

PART NUMBER	PACKAGE
LM321	SOT23-5

2. Connection Diagrams and Pin Description

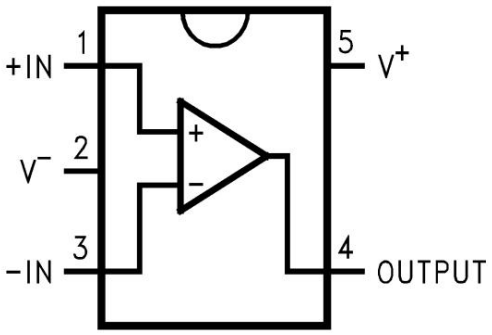


Figure 2.1: Top View

PIN No.	NAME	I/O	FUNCTION
1	IN+	I	Positive Input
2	V-	-	Negative (lowest) supply or ground (for single-supply operation)
3	1IN-	I	Negative Input
4	2OUT	O	Output
5	V+	-	Positive (highest) supply

3. Schematic Diagram

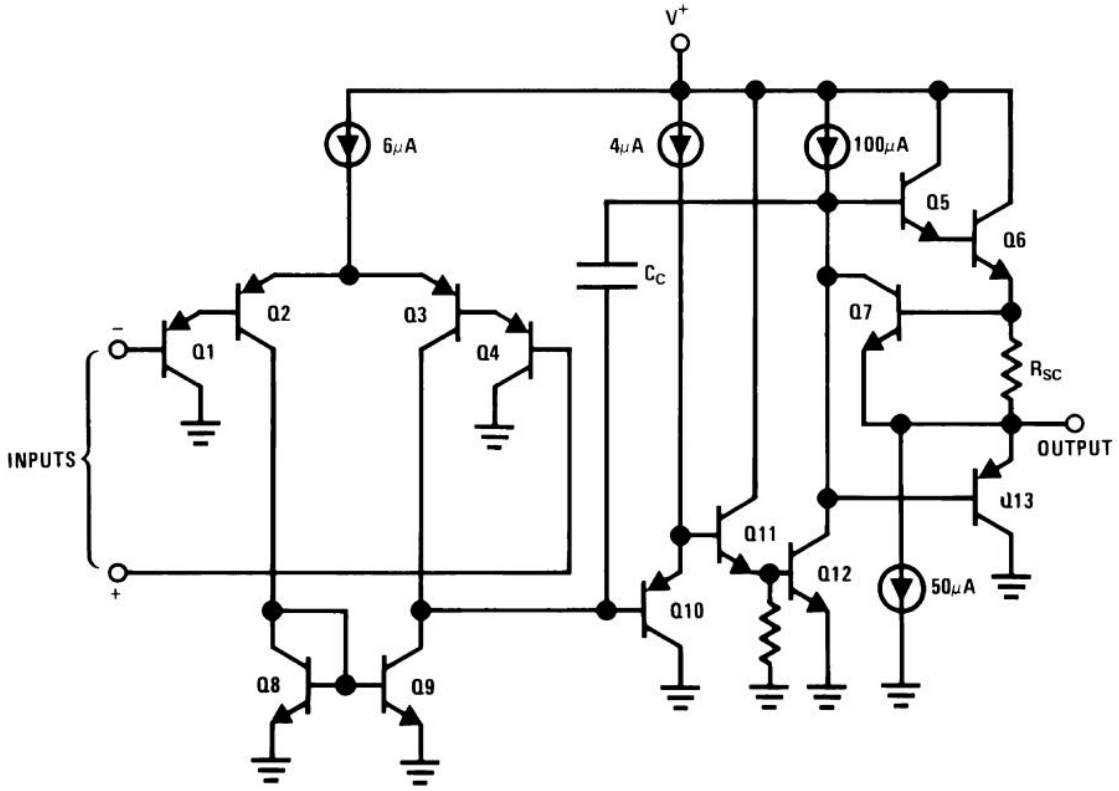


Figure 3.1：LM321 Functional Block Diagram

4. Specifications

4.1 Absolute Maximum Ratings

(Ta=25℃,unless otherwise specified)

Symbol	Parameter	MIN	MAX	Unit
V_{ID}	Differential Input Voltage	-32	32	V
V_S	Supply Voltage (V+ - V-)		32	V
V_I	Input Voltage	-0.3	32	V
I_O	Output Short Circuit to GND, V + ≤ 15 V and TA = 25°C(1)	Unlimited		
T_J	Junction Temperature	-	150	℃
Tstg	Storage temperature	-65	150	℃

Absolute maximum ratings are those values beyond which the device could be permanently damaged,These are stress ratings only,which do not imply functional operation of the device at these or any other conditions beyond those indicated under normal operating conditions.

(1) .Short circuits from the output V+ can cause excessive heating and eventual destruction. When considering short circuits to ground, at values of supply voltage in excess of +15V, continuous short circuits can exceed the power dissipation ratings and cause eventual destruction.

4.2 Recommended Operating Conditions

(T_a=25℃,unless otherwise specified)

Symbol	Parameter	MIN	TYP	MAX	Unit
V_{CC}	Supply Voltage	3	-	30	V
T_{OP}	Operating Temperature	-40	-	85	℃

4.3 Electrical Characteristics

Unless otherwise specified, all limits specified for at TA = 25°C; V+ = 5 V, V− = 0 V, VO = 1.4 V

Symbol	Parameter	Test Condition		MIN	TYP	MAX	Unit
I_{CC}	Quiescent current per amplifier	V+ = 5 V,no load		--	400	1.2	mA
		V+ = 30V,no load		--	500	2	mA
I_B	Input Bias Current	V_O=1.4V		--	30	200	nA
V_{IO}	Input Offset Voltage	V_S=5V to 30V V_O=1.4V,Vcm=0		--	0.5	6	mV
I_{IO}	Input Offset Current	V_O=1.4V		--	10	50	nA
V_{ICR}	Common-Mode Voltage Range			V-	-	V+ -1.5	V
A_{VD}	Open-loop voltage gain	V+=15V, V_O=1.4V to 11.4V, R_L =2kΩ		--	100	--	V/mV
GBW	Gain bandwidth product	V_S=30V		--	4	--	MHZ
V_{OH}	Output voltage-high	V+ = 30 V; RL = 2 kΩ		26	--	--	V
		V+ = 30 V; RL = 10 kΩ		27	28.5	--	
V_{OL}	Output voltage-low	V+ = 5 V; RL =10 kΩ		--	5	20	mV
I_O	Output current	Source	V+ = 15 V; V_O = 2V; V_{ID}= 1 V	20	40	--	mA
		Sink	V+ = 15 V; V_O =2V; V_{ID}= -1 V	--	11	--	
			V+ = 15 V; V_O =0.2V; V_{ID}= -1 V	12	130	--	uA
CMRR	Common-Mode Rejection Ratio	R_S ≤ 10kΩ		--	85	--	dB
PSRR	Supply-Voltage Rejection Ratio	V+ = 5 V to 30 V		--	100	--	dB
Ishort	Output short circuit to Grand(1)	V+ = 15 V		--	40	85	mA

(1). 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.

5. Application information

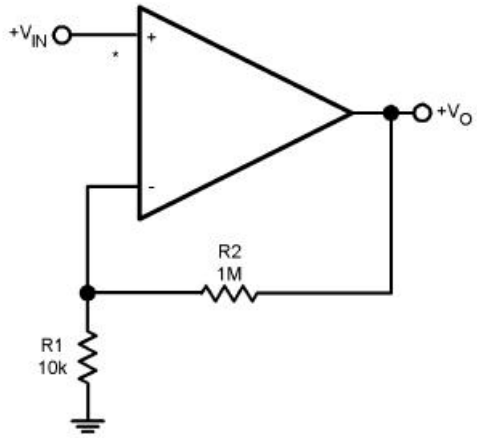
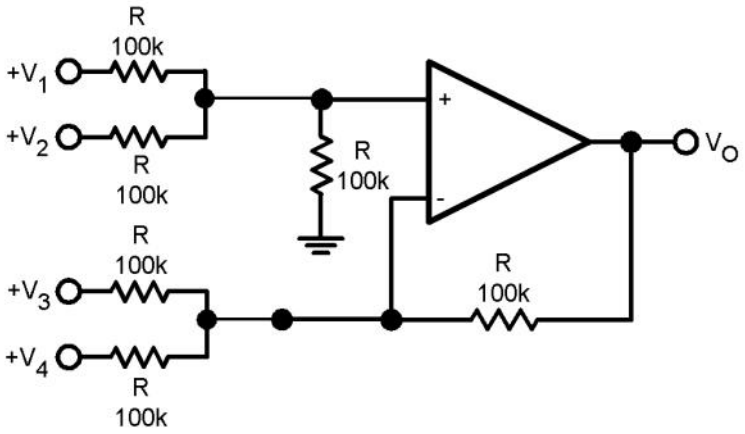


Figure 5.1 Non-Inverting Dc Gain Schematic (0-V Input = 0-V Output)



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

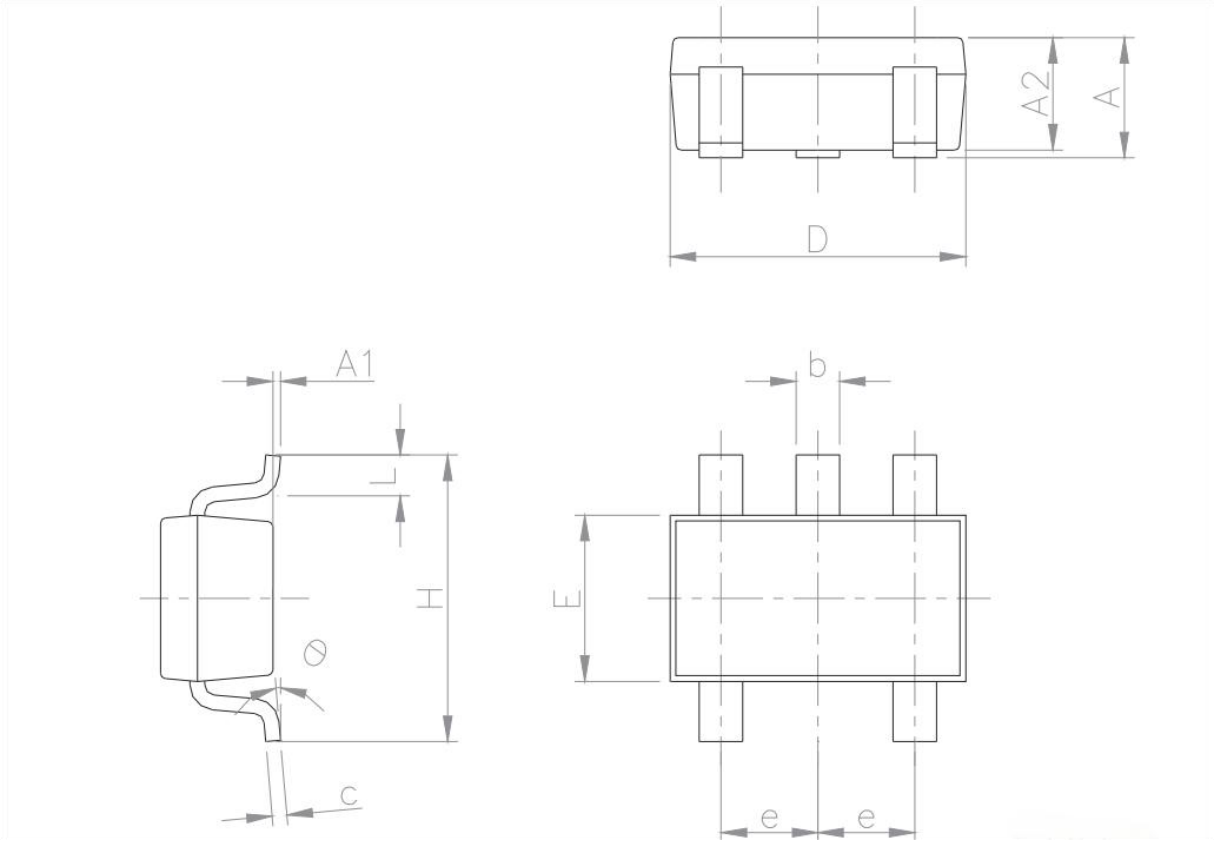
Figure 5.2 DC Summing Amplifier Schematic($V_{IN's} \geq 0\ V_{DC}$ and $V_O \geq V_{DC}$)

6. Ordering Information

Orderable Device	Package Type	Pins	Packing	Package Qty
LM321LT05ABRCQ	SOT23	5	Tape & Reel	3000

7. Package Information

7.1 SOT23-5



Symbol	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90	-	1.45	0.035	-	0.057
A1	-	-	0.15	-	-	0.006
A2	0.90	-	1.30	0.035	-	0.051
b	0.35	-	0.50	0.014	-	0.020
c	0.09	-	0.20	0.004	-	0.008
D	2.80	-	3.05	0.110	-	0.120
E	1.50	-	1.75	0.059	-	0.069
e	-	0.95	-	-	0.037	-
H	2.60	-	3.00	0.102	-	0.118
L	0.10	-	0.60	0.004	-	0.024
θ	0 degrees	-	10 degrees	-	-	-