



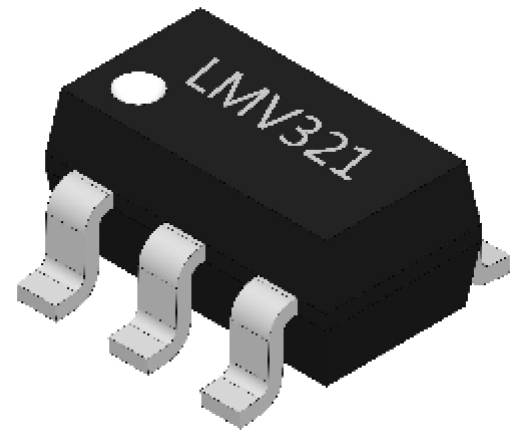
THE DATASHEET OF LMV321



Low-power Consumption Single Operation Amplifier

Function description

- LMV321 is a low-power consumption system with good performance and economy. It has high unit gain frequency and the designated conversion rate of $0.4\text{V}/\mu\text{s}$, and the quiescent current is only $430\ \mu\text{A}$ / amplifier (5V). The input common-mode scope includes grounding; for this reason, the device can work in both single power supply applications and dual power supply applications. In addition, the device can drive large capacitive loads comfortably.
- SOT-23 package is adopted for LMV321. Generally speaking, LMV321 is an operational amplifier with low power consumption and wide power supply ranges, which can be designed for various applications with favorable price at the



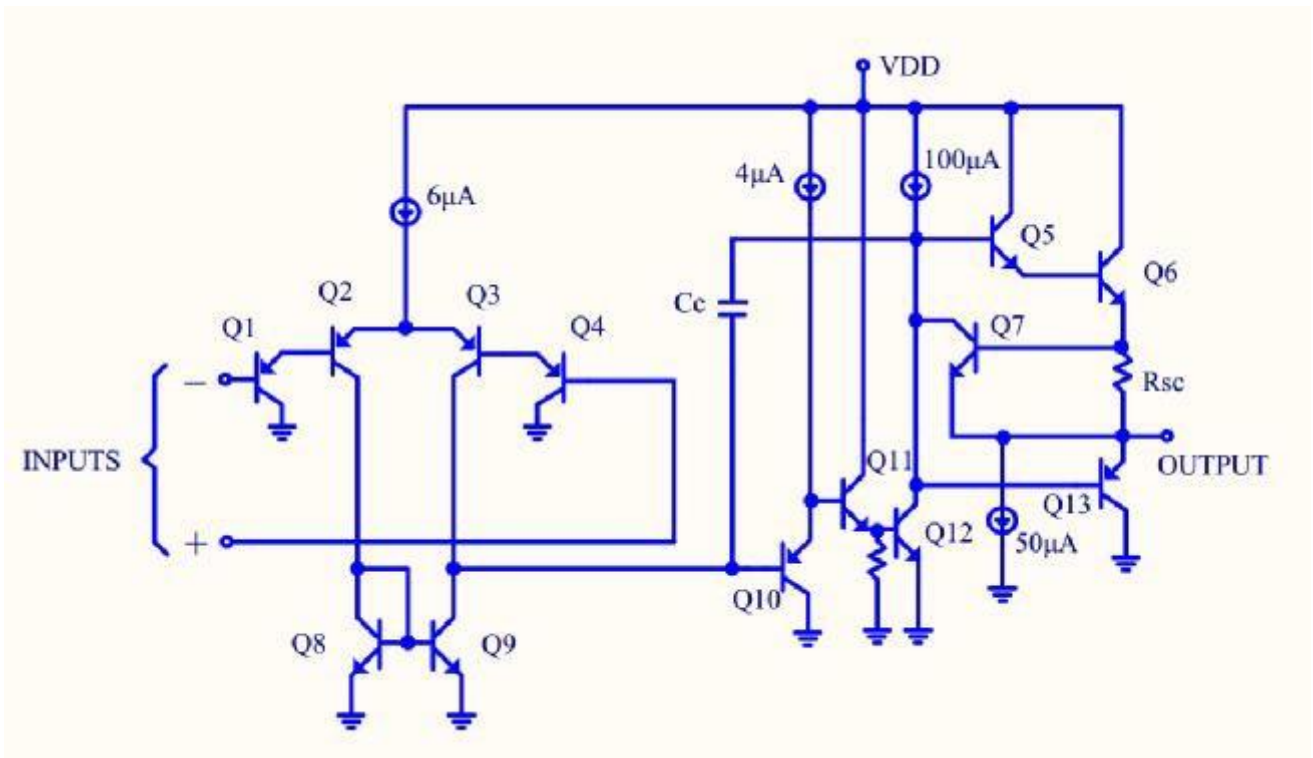
SOT-23-5

Main characteristics of chip functions:

- $V_{CC} = 5\text{V}$, $T_A = 25^\circ\text{C}$. Typical value, unless otherwise specified
- Gain bandwidth product: 1MHZ
- Low Supply current $430\ \mu\text{A}$
- Low input bias current 45nA
- Volt Current Condenser Input $+3\text{V}$ to 5.5V
- Stable unit gains
- Stable high capacitor loads

Applications

- Charger
- Power adapter
- Sensor interface
- Piezoelectric sensor amplifier
- Medical instruments
- Audio output
- Mobile communication portable system

Simplified schematic diagram:

Absolute Max. rated value:

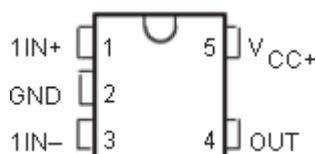
Low Input Voltage	±Supply voltage
Input current ($V_{IN} < -0.3V$) ⁽²⁾	50mA
Supply voltage ($V+ - V-$)	5.5 V
Input Voltage	-0.3V to +5V
Output short circuit to GND	continuous
$V+ \leq 15V$ and $T_A = 25^\circ C$ ⁽³⁾	
Storage Temperature Range	-65°C to 150°C
Junction temperature ⁽⁴⁾	150°C
Installation temperature	60°C
Lead temperature (welding, 10 seconds)	215°C
Infrared (10 seconds)	
Thermal resistance to the environment (θ_{JA})	265°C/W
ESD tolerance ⁽⁵⁾	300 V

- (1) The absolute maximum rated value indicates the limits of the ranges of the device, and damages may be caused if the limits are exceeded. The operating rated value indicates the conditions for normal working of the device; in which conditions, it is difficult to ensure specific performances. Please refer to electrical characteristics for the specifications and the testing conditions to be ensured.
- (2) The input current exists only when any voltage of the input lead is negative. That is because the base junction of the collector of the input PNP crystal valve changes forward bias, so as to work as the input diode clamping. In addition to this function as a diode, there are horizontal NPN crystal valve parasitism actions in the IC chip. The crystal valve action can make the output voltage of the operational amplifier achieve V+ voltage level (or grounded as a big overload) within the time period of negative input driving. It is not destructive; when the negative input voltage returns to higher than -0.36V (at 25°C) again, the normal output state is established again.
- (3) The output V+ short circuit may lead to overheating and ultimate destruction. When grounded short circuit is taken into consideration, the maximum output current is about 40mA, irrelevant to the value of V+. When the voltage of the power supply is higher than 5.5V, continuous short circuit may exceed the rated power, which may lead to ultimate destruction.
- (4) The maximum power consumption is the TJ (the maximum value), θ_{JA} and TA of a function. The maximum power consumption at any environment temperature $PD = (TJ(\text{max.}) - TA)/\theta_{JA}$. All the digits are applicable to direct welding to the PCB board.
- (5) Human body model, 1.5k Ω in series of 100pF.

Operating ranges:

Temperature ranges	-40°C to 85°C
Power voltage	3V to 5.5V

Diagram of pin position:



Pin	Symbol	Description
1	IN+	Same power supply
2	GND	Negative power supply
3	IN-	Reverse input end
4	OUT	Output end
5	VCC+	Input supply current

Electrical specifications

Unless otherwise specified, all the limits are designated as TA = 25°C; V+ = 5V, V- = 0V, VO = 1.4V.

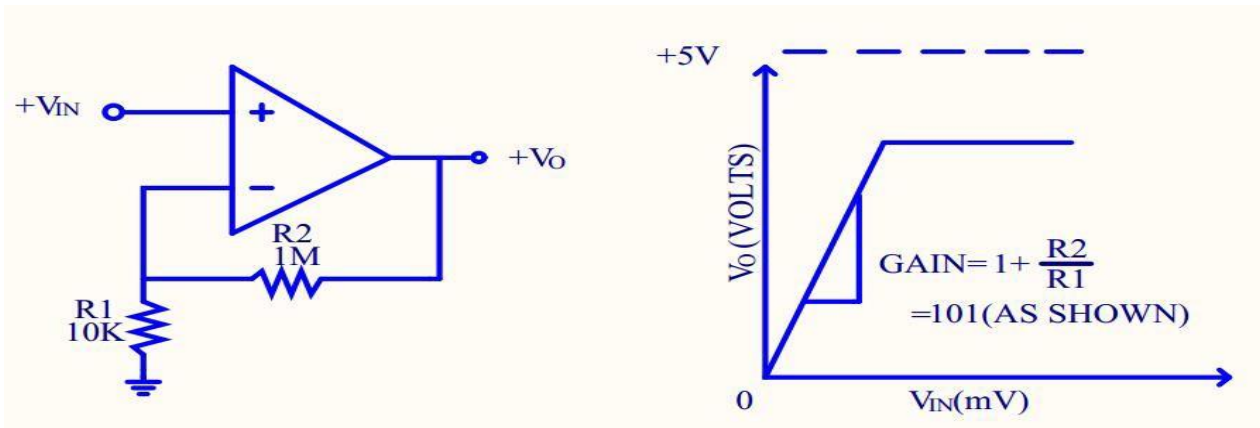
Symbol	Parameters	Conditions	Min	Typical value	Max(Unit
V _{OS}	Input offset voltage			3	7 9	mV
I _{OS}	Input offset Current			5	50 150	nA
I _B	Bias current ⁽⁴⁾			45	250 500	nA
V _{CM}	Common-mode input voltage ranges	V ₊ = 3V ⁽⁵⁾ For CMRR > = 50dB	0		V ₊ -1.5 V ₊ -2	V
A _v	Large signal voltage gain	(V ⁺ = 5V, R _L = 2kΩ V _O = 2.4V to 4.4V)	25 15	100		V/mV
PSRR	Volt Current Condenser	R _S ≤ 10kΩ, V ₊ ≤ 3V to 5.5V	65	100		dB
CMRR	Common mode rejection ratio	R _S ≤ 10kΩ	65	85		dB
V _O	Output voltage	V _{OH}	V ⁺ = 3V, R _L = 2kΩ	2.6		V
			V ⁺ = 3V, R _L = 10kΩ	2.7	2.8	
		V _{OL}	V ⁺ = 5V, R _L = 10kΩ		5	20
I _S	Supply current, No load	V ₊ = 5V		0.430 0.7	1.15 1.2	mA
		V ₊ = 3V		0.660 1.5	2.85 3	
I _{SOURCE}	Output current	V _{ID} = +1V, V ₊ = 5V, V _O = 2V	20 10	40 20		mA
I _{SINK}	Output Sinking current	V _{ID} = -1V V ⁺ = 5V, V _O = 2V	10 5	20 8		mA
		V _{ID} = -1V V ⁺ = 5V, V _O = 0.2V	12	100		μA
I _O	Output short circuit to ground (6)	V ₊ = 5V		40	85	mA

SR	Slew rate	$V^+ = 5V, R_L = 2k\Omega,$ $V_{IN} = 0.5 \text{ to } 3V$ $C_L = 100pF, \text{ Unity Gain}$		0.4		V/ μ s
GBW	Gain bandwidth product	$V^+ = 5V, f = 100kHz,$ $V_{IN} = 10mV, R_L = 2K\Omega$ $C_L = 100pF$		1		MHz
ϕ_m	Phase margin			60		deg
THD	Total harmonic distortion	$f = 1kHz, A_v = 20dB$ $R_L = 2k\Omega, V_o = 2V_{pp}$ $C_L = 100pF, V^+ = 3V$		0.015		%
e_n	Voltage noise density	$f = 1kHz, R_s = 100\Omega$ $V^+ = 5V$		40		nV/ \sqrt{Hz}

- (1) All the limiting values are tested by experiments and determined based on statistical analysis.
- (2) The typical values indicate the most likely parameters.
- (3) $V_O = 1.4V, R_S = 0\Omega$ V^+ , from 3V to 5V; however, the whole input common mode scope (0V to $V^+ + 1.5V$) is at 25°C.
- (4) Since the PNP input level and the input current direction exceed the IC. the current is basically constant, independent from the output state; for this reason, there is no change in loading in the input line.
- (5) The unloading of the input common mode voltage or the input signal voltage shall be no more than 0.3V (at 25°C. The upper limit of the common mode voltage is $V^+ - 1.5V$ at 25°C. however, one or two inputs can achieve 5V, which will not lead to damage.
- (6) The short circuit of the output V^+ may lead to overheating or ultimate destruction. Since the maximum output current of the grounded short circuit is about 40ma. with the supply voltage of more than 5V, continuous short circuit may exceed the rated power consumption, which may lead to ultimate destruction.

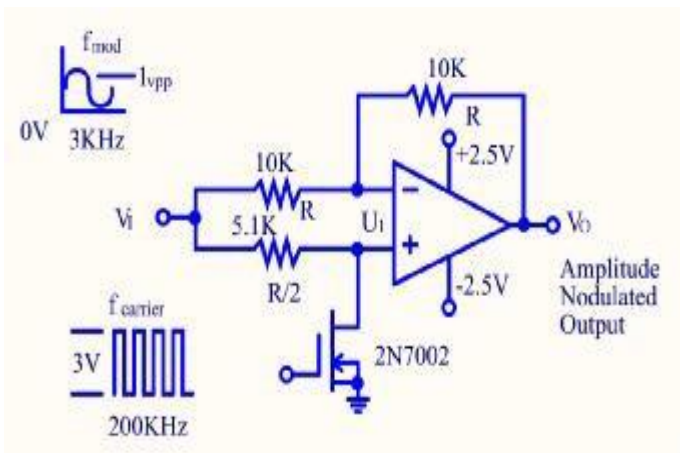
Typical working characteristics:

Same-phase DC gains (0V input = 0V output)

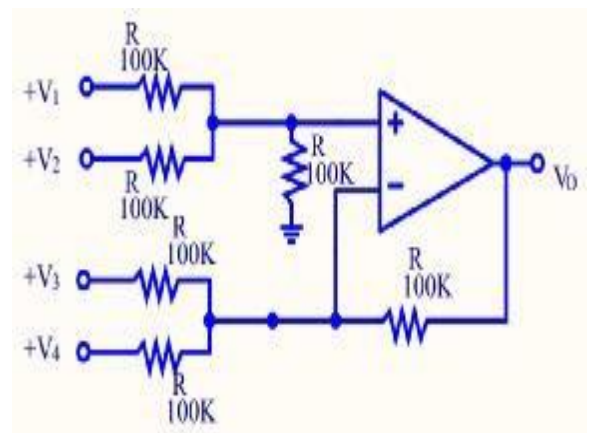


Amplification modulator circuit

DC additive amplifier (V)

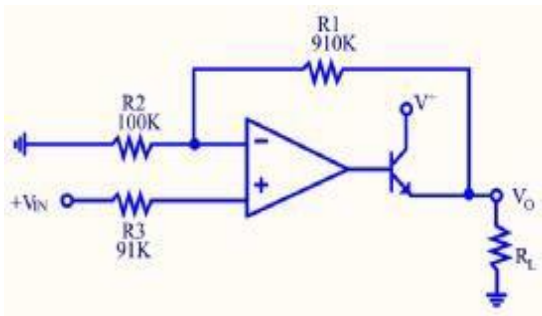


(I_N 's ≥ 0 VDC and $V_O \geq V_{DC}$)



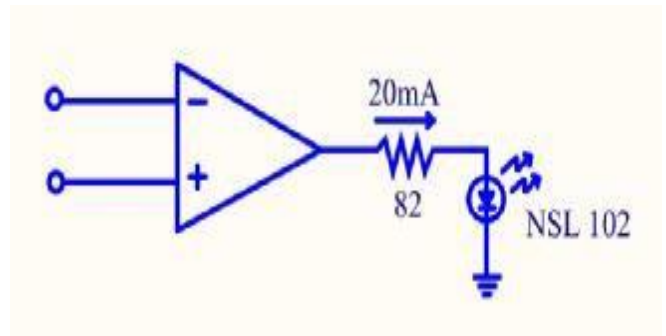
Where: $V_0 = V_1 + V_2 - V_3 - V_4$, $(V_1+V_2) \geq (V_3+V_4)$ to keep $V_O > 0V_{DC}$

Power amplifier

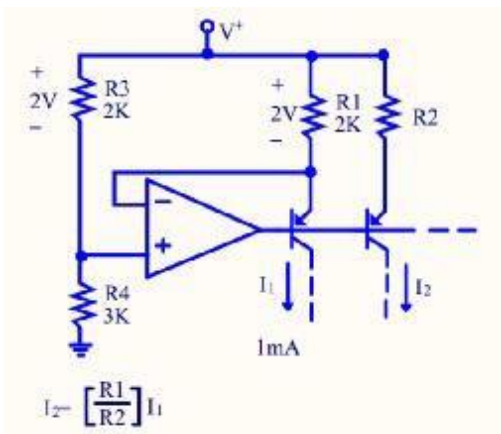


$V_0 = 0$ VDC for $V_{IN} = 0$ VDC, $A_V = 10$

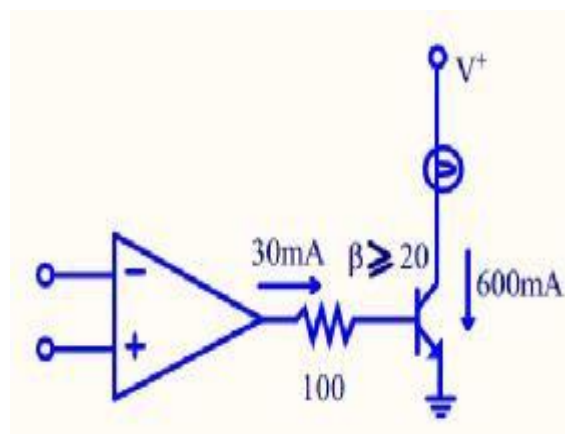
LED driver



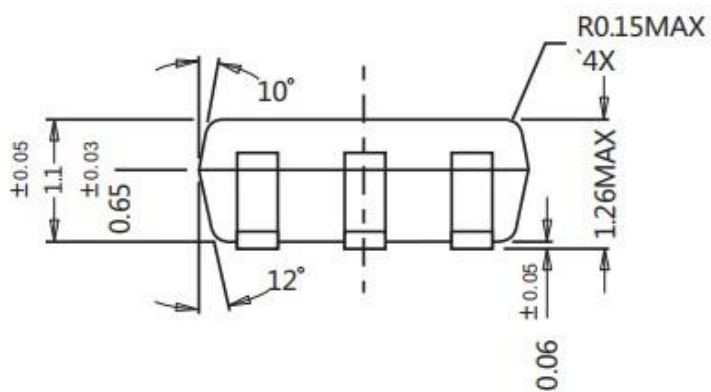
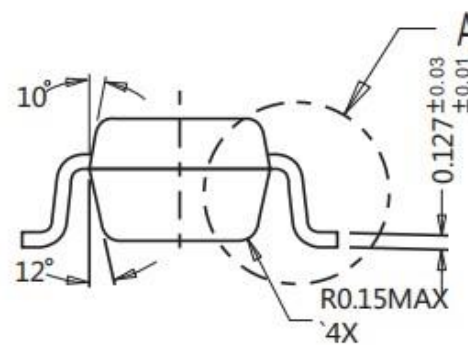
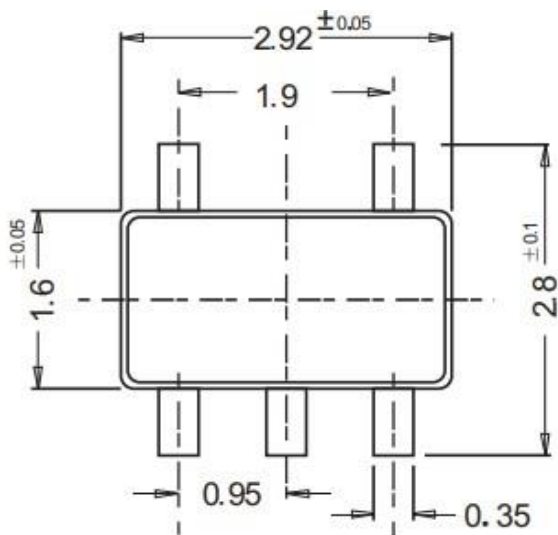
Fixed current supply



Lamp driving



package dimension SOT-23-5



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