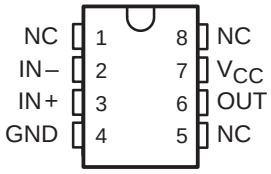
SLOS085 – D2343, APRIL 1977 – REVISED OCTOBER 1990

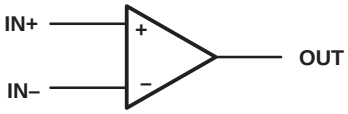
- **Wide Range of Single Supply Voltages . . . 3 V to 30 V or Dual Supplies**
- **Low Supply Current Independent of Supply Voltage . . . 0.8 mA Typ**
- **Common-Mode Input Voltage Range Includes Ground Allowing Direct Sensing Near Ground**
- **Low Input Bias and Offset Parameters**
  - **Input Offset Voltage . . . 2 mV Typ**
  - **Input Offset Current . . . 3 nA Typ (TL321I)**
  - **Input Bias Current . . . 45 nA Typ**
- **Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage . . . ±32 V**
- **Open-Loop Differential Voltage Amplification . . . 100 V/mV Typ**
- **Internal Frequency Compensation**

TTL321C, TL321I . . . D OR P PACKAGE
(TOP VIEW)



NC – No internal connection

symbol



AVAILABLE OPTIONS

T_A	V_{IO} MAX at 25°C	PACKAGE	
		SMALL OUTLINE (D)	PLASTIC DIP (P)
0°C to 70°C	7 mV	TL321CD	TL321CP
–25°C to 85°C	5 mV	TL321ID	TL321IP

The D packages are available taped and reeled. Add the suffix R to the device type, (e.g., TL321CDR).

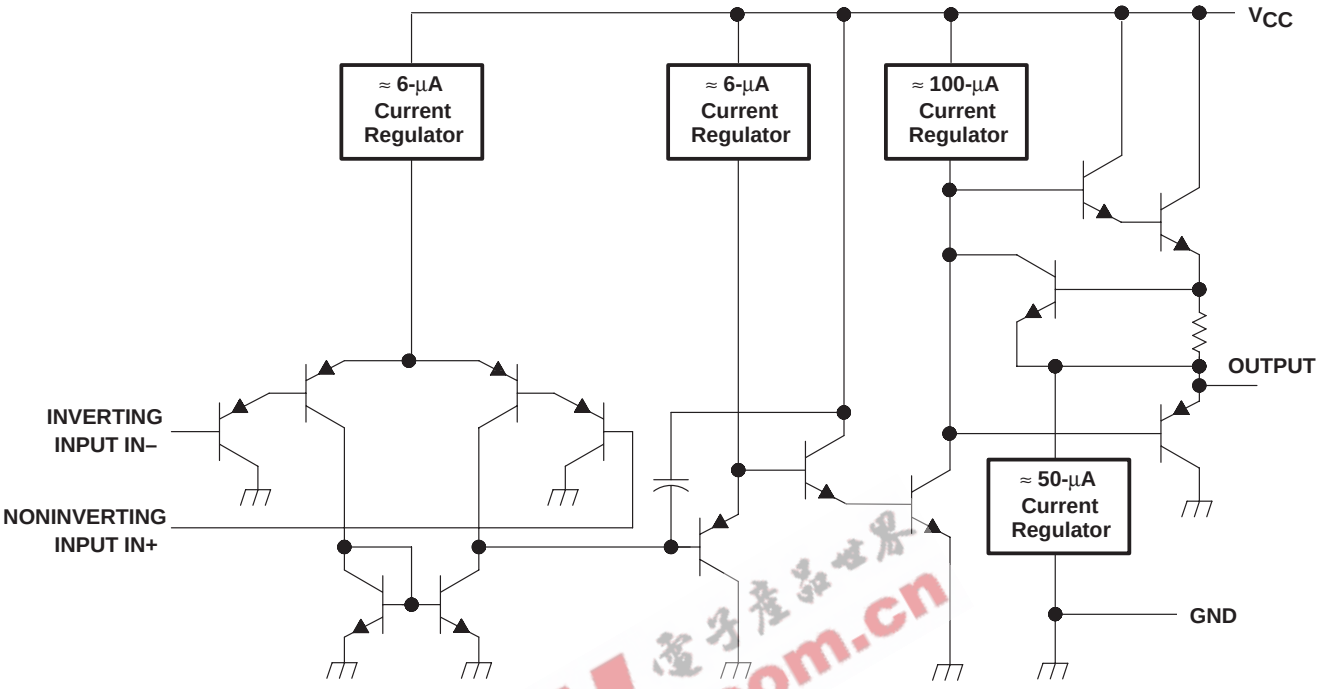
description

The TL321 is a high-gain, frequency-compensated operational amplifier that is designed specifically to operate from a single supply over a wide range of voltages. Operation from split supplies is also possible as long as the difference between the two supplies is 3 V to 30 V and pin 7 is at least 1.5 V more positive than the input common-mode voltage. The low supply current is independent of the magnitude of the supply voltage.

Applications include transducer amplifiers, dc amplification blocks, and all the conventional operational amplifier circuits that now can be more easily implemented in single-supply-voltage systems. For example, the TL321 can be operated directly off of the standard 5-V supply that is used in digital systems and will easily provide the required interface electronics without requiring additional ±15-V supplies.

The TL321C is characterized for operation from 0°C to 70°C. The TL321I is characterized for operation from –25 °C to 85°C.

schematic



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1) . . . . . 32 V
Differential input voltage (see Note 2) . . . . . ±32 V
Input voltage range (either input) . . . . . –0.3 V to 32 V
Duration of output short circuit to ground at (or below) 25°C free-air temperature
(V_{CC} ≤ 15 V) (see Note 3) . . . . . Unlimited
Continuous total dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range: TL321C . . . . . 0°C to 70°C
TL321I . . . . . –25°C to 85°C
Storage temperature range . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C

NOTES: 1. All voltage values, except differential voltages, are with respect to the network ground terminal.
2. Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.
3. Short circuits from the output to V_{CC} can cause excessive heating and eventual destruction.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR	DERATE ABOVE T_A	$T_A = 70°C$ POWER RATING	$T_A = 85°C$ POWER RATING
D	680 mW	5.8 mW/°C	33°C	464 mW	377 mW
P	680 mW	8.0 mW/°C	65°C	640 mW	520 mW

recommended operating conditions

	MIN	NOM	MAX	UNIT
Single supply voltage, V_{CC}	5		30	V
Dual supply voltage, V_{CC+}	2.5		15	V
Dual supply voltage, $V_{CC–}$	–2.5		–15	V

electrical characteristics at specified free-air temperature, V_{CC} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		TL321C			TL321I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$V_{IC} = V_{ICR}$ min, V_{CC} = 5 V to 30 V, V_O = 1.4 V, R_S = 50 kΩ	25°C		2	7		2	5	mV
			Full range			9			7	
I_{IO}	Input offset current	V_O = 1.4 V	25°C		5	50		3	30	nA
			Full range			150			100	
I_{IB}	Input bias current	V_O = 1.4 V	25°C		−45	−250		−45	−150	nA
			Full range			−500			−300	
V_{ICR}	Common-mode input voltage range	V_{CC} = 5 V to 30 V	25°C	0 to V_{CC}−1.5			0 to V_{CC}−1.5			V
			Full range	0 to V_{CC}−1.5			0 to V_{CC}−1.5			
V_{OH}	High-level output voltage	V_{CC} = 30 V, R_L = 2 kΩ	Full range	26			26			V
		V_{CC} = 30 V, R_L ≥ 10 kΩ	Full range	27	28		27	28		
		R_L ≥ 2 kΩ	25°C	3.5			3.5			
V_{OL}	Low-level output voltage	R_L ≥ 10 kΩ	Full range		5	20		5	20	mV
A_{VD}	Large-signal differential voltage amplification	V_{CC} = 15 V, V_O = 1 V to 11 V, R_L = 2 kΩ	25°C	25	100		50	100		V/mV
			Full range	15			25			
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$ min, R_S = 50 kΩ	25°C	65	85		70	85		dB
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	V_{CC} = 5 V to 30 V, R_S = 50 kΩ	25°C	65	100		65	100		dB
I_O	Output current	Source: V_{CC} = 15 V, V_{ID} = 1 V, V_O = 0	25°C	−20	−40		−25	−40		mA
			Full range	−10	−20		−10	−20		
		Sink: V_{CC} = 15 V, V_{ID} = −1 V, V_O = 15 V	25°C	10	20		10	20		
			Full range	5	8		5	8		
		V_{ID} = −1 V, V_O = 200 V	25°C	12	50		12	50		µA
I_{CC}	Supply current	No load, V_O = 15 V, V_{CC} = 30 V	Full range			2			2	mA
		No load, V_O = 2.5 V, V_{CC} = 5 V	Full range			1		0.4	1	

† All characteristics are measured under open-loop conditions with zero common-mode voltage unless otherwise specified. Full range is 0°C to 70°C for TL321C and −25°C to 85°C for TL321I.

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