TPV321L Series

General Purpose, 1MHz, Micro-Power CMOS Op-Amps

Features

- General Purpose, Low Cost
- Gain Bandwidth Product: 1MHz
- Low Supply Current：28μA (VS=5V)
- Input Offset Voltage：1mV (Typical)
- Slew rate: 1V/μs (VS=5V)
- Input Bias Current: 5pA
- Rail-to-Rail Input and Output
- No Phase Reversal for Overdriven Inputs
- Supply Voltage Range: 1.5V to 5.5V
- Operating Temperature: -45°C ~ +85°C
- Type Package:
  SOT23-5 (TPV321LS5)
  SOT353 (TPV321LC5)

Applications

- Audio Output
- Battery and Power Supply Control
- Smoke/Gas/Environment Sensors
- Medical Equipment
- Portable Instruments and Mobile Device
- Active Filters
- Piezo Electrical Transducer Amplifier
- Sensor Interface
- ASIC Input or Output Amplifier

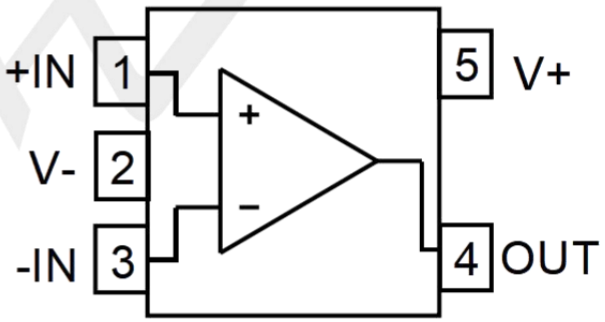
General Description

The are general purpose, low offset, high frequency response and low power operational amplifiers. With an excellent bandwidth of 1MHz, a slew rate of 1V/μs, and a quiescent current of 28μA per amplifier at 5V, the family can be designed into a wide range of applications.

The op-amps are designed to provide optimal performance in low voltage and low power systems. The input common-mode voltage range includes ground, and the maximum input offset voltage are 3mV. These parts provide rail-to-rail output swing into heavy loads.

The families of operational amplifiers are specified at the full temperature range of -40°C to +85°C under single or dual power supplies of 1.5V to 5.5V.

Pinout (top view)



Pin Configurations

Pin Number	Pin Name	Pin Function
1	+IN	In-phase input
2	V-	Chip Supply Voltage(Negative)/GND
3	-IN	Reverse input
4	OUT	Output
5	V+	Chip Supply Voltage(Positive)/VDD

Absolute Maximum Ratings

(@TA = +25°C, unless otherwise specified.)

Condition		Rating		UNIT
VDD to GND	Power Supply Voltage	-0.5	+6V	V
IN+ or IN-	Analog Input Voltage	GND-0.5V	VDD+0.5V	V
Current	Signal Input Terminals Current	-10	+10	mA
	Signal output Terminals Current	-200	+200	mA
	Output Short-Circuit	Continuous		mA
Temperature	Operating Temperature Range	-45	+85	°C
	Junction Temperature , TJ	-40	+150	
	Storage, Tstg	-65	+150	
	Lead Temperature (Soldering, 10 sec.)	260		

(1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

(2) Input terminals are diode clamped to the power-supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current limited to 10mA or less.

(3) Output terminals are diode-clamped to the power-supply rails. Output signals that can swing more than 0.5V beyond the supply rails should be current-limited to ±200mA or less.

(4) Short-circuit to ground, one amplifier per package.

ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-Body Model (HBM)	±2000	V
		Charged-Device Model (CDM)	±500	V
		Machine Model	100	V

Recommended Operating Conditions

		MIN	MAX	UNIT
Supply voltage， Vs= (V+) - (V-)	Single-supply	1.5	5.5	V
	Dual-supply	±0.75	±2.75	V

Electrical Characteristics

(At T_A = 25°C, VS=5V,V_{CM}=V_{OUT}= V_S /2, unless otherwise noted.)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNIT
OFFSET VOLTAGE						
V_{OS}	Input Offset Voltage		-3	±1	3	mV
dV_{OS}/dT	Input Offset Voltage Average Drift	T_A = -40°C to 85°C	--	1.8	--	µV/°C
INPUT CURRENT						
I_B	Input Bias Current		--	5	--	pA
I_{OS}	Input Offset Current		--	1	--	pA
NOISE						
V_N	Input Voltage Noise	f=0.1Hz to 10Hz	--	20	--	μV_{PP}
e_n	Input Voltage Noise Density	f=1kHz	--	65	--	nV/√Hz
INPUT VOLTAGE						
V_{CM}	Common-Mode Voltage Range		V_{S-}	--	V_{S+}-0.5	V
CMRR	Common-Mode Rejection Ratio	V_{CM}=0.1V to 4V	70	80	--	dB
FREQUENCY RESPONSE						
GBW	Gain-Bandwidth Product		--	1	--	MHz
SR	Slew Rate	G = +1, V_{IN}=2V Step	--	1	--	V/µs
t_S	Settling Time to 0.1%	G = +1, V_{IN}=2V Step	--	2.5	--	µs

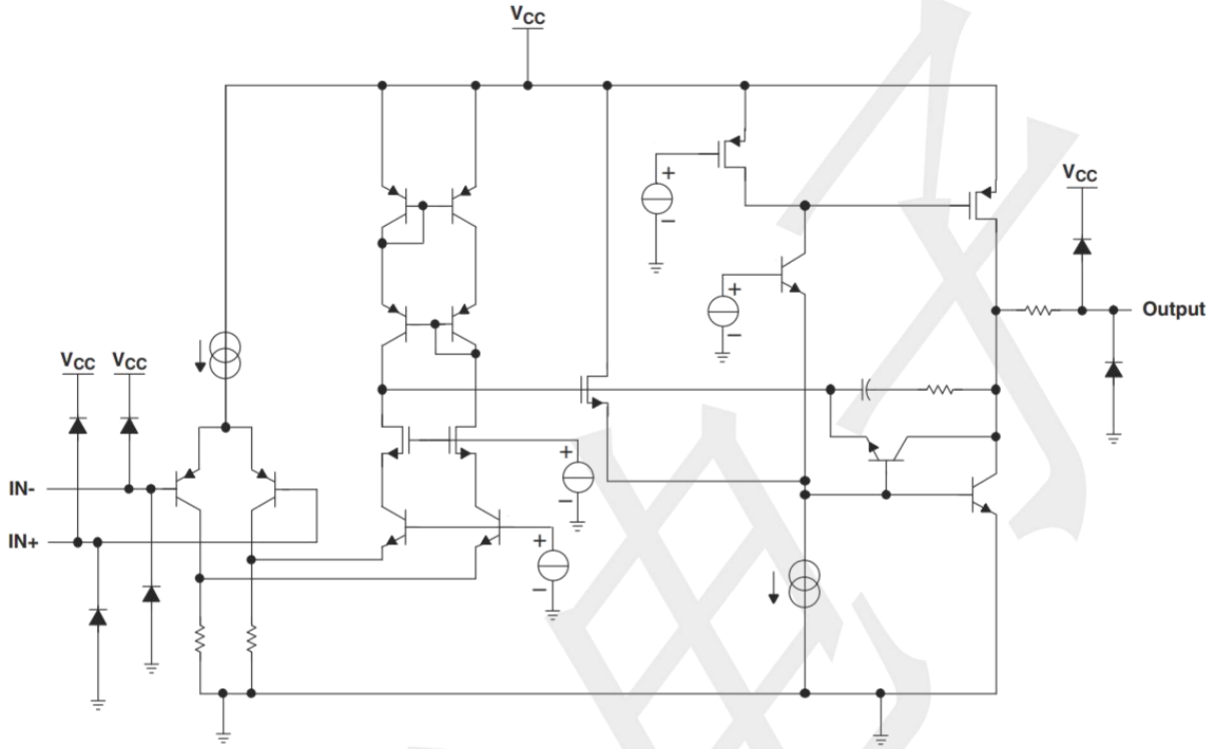
Electrical Characteristics

(At T_A = 25°C, VS=5V,V_{CM}=V_{OUT}= V_S /2, unless otherwise noted.)

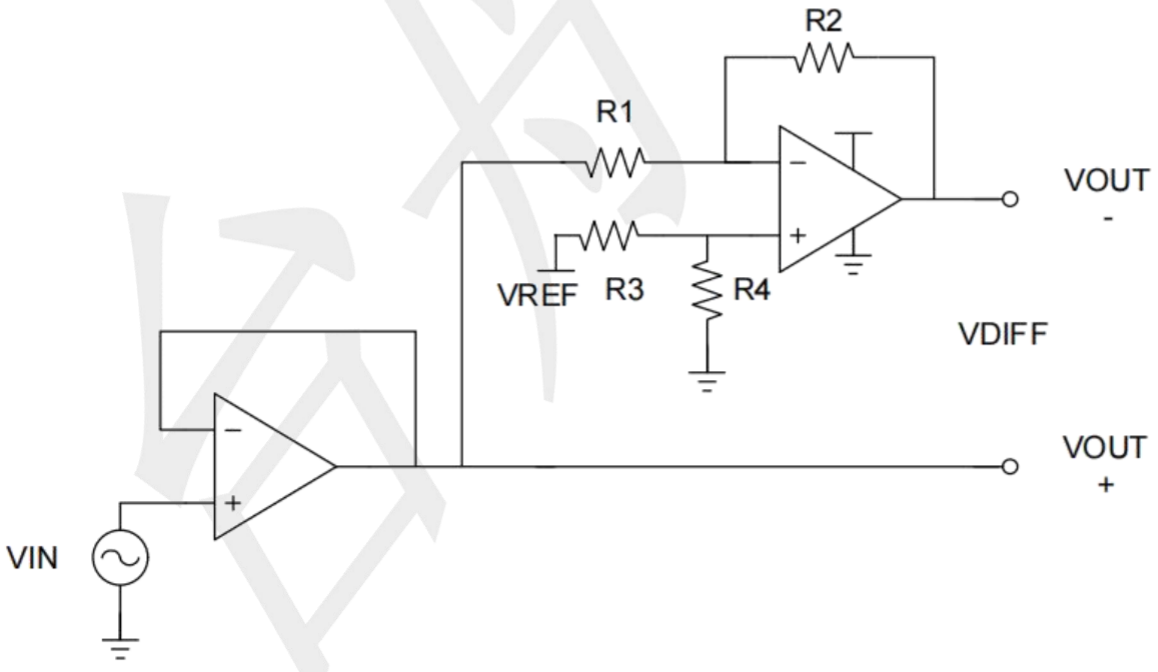
PARAMETER		CONDITIONS	MIN	TYP	MAX	UNIT
OUTPUT						
A_V	Open-Loop Voltage Gain	V_{OUT}=0.1V to 4.9V R_L=100kΩ	80	100	--	dB
V_{OH}	High output voltage swing	R_L=100kΩ	--	--	5	mV
V_{OL}	Low output voltage swing	R_L=100kΩ	--	--	5	mV
I_{SC}	Output Short-Circuit Current	Source current	--	45	--	mA
		Sink current	--	70	--	mA
C_L(1)	Capacitive Load Drive	G = +1, V_{IN}=0.2V Step	--	--	1000	pF
POWER SUPPLY						
PSRR	Power-Supply Rejection Ratio	V_S=1.5V to 5.5V	80	90	--	dB
V_S	Operating Voltage Range		1.5	--	5.5	V
I_Q	Quiescent Current/Amplifier	I_O=0A	--	28	40	μA

(1) Capacitive load drive means that above a given maximum value, the output waveform will oscillate under the step response.

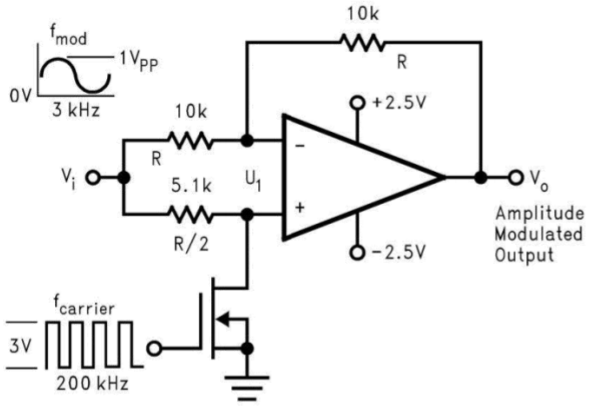
BLOCK DIAGRAM



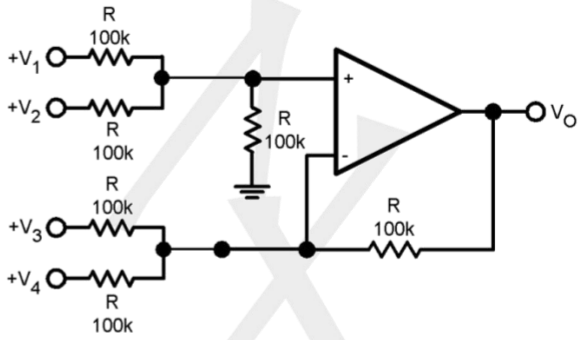
TYPICAL APPLICATION



Typical Application Circuit



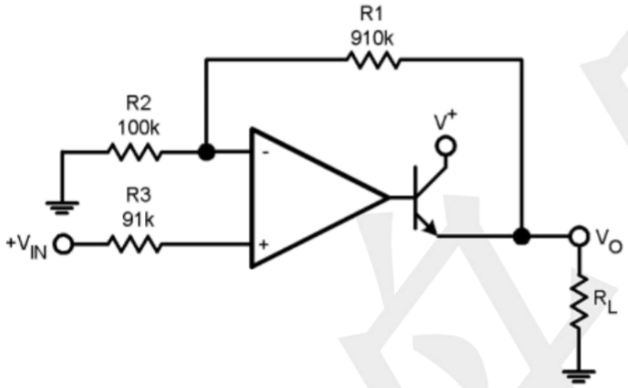
Amplitude modulator circuit



Note：$V_O=V_1+V_2-V_3-V_4,(V_1+V_2) \geq (V_3+V_4)$ for $V_O \geq 0V_{DC}$

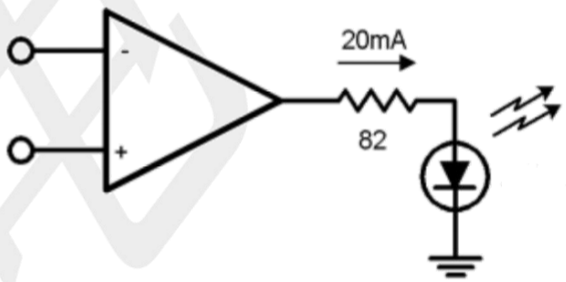
DC adder amplifier

(V_{IN}'s$\geq 0V_{DC}$,$V_O \geq V_{DC}$)

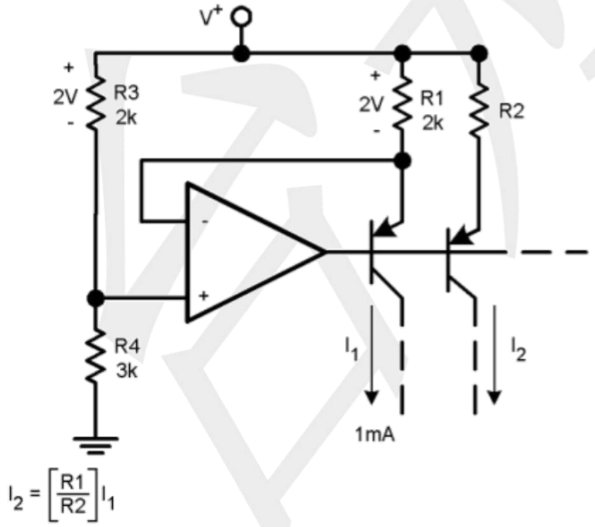


$V_O=0V_{DC}$ for $V_{IN}=0V_{DC}$, $A_V=10$

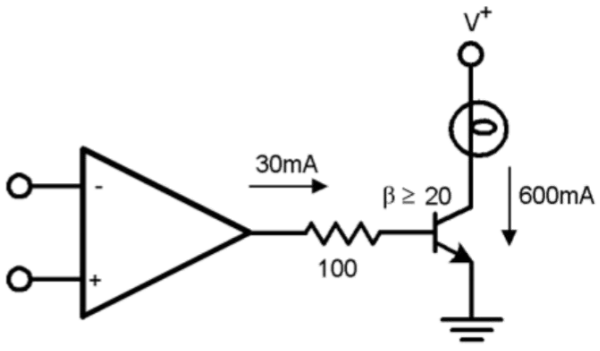
Power Amplifier



LED Driver



Fixed current source



Lamp Driver

Typical Performance Characteristics (@TA = +25°C, unless otherwise specified.)

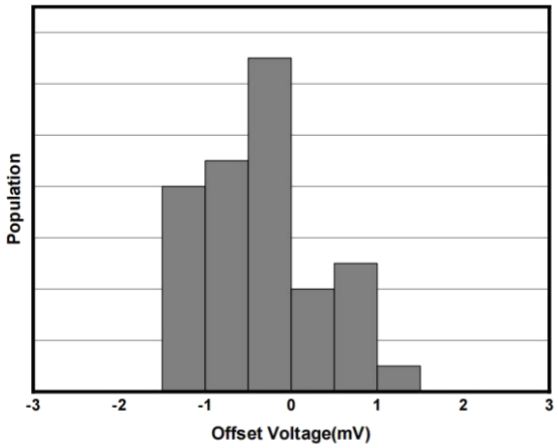


Figure 2. Offset Voltage Production Distribution

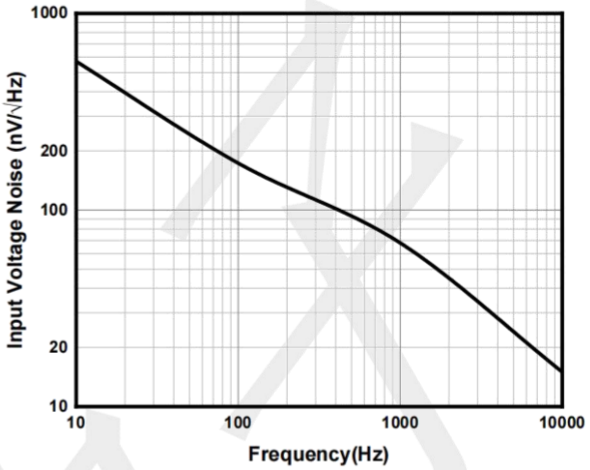


Figure 3. Input Voltage Noise Spectral Density

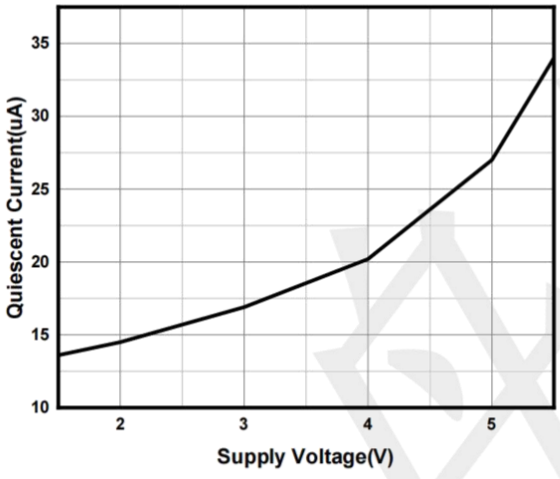


Figure 4. Quiescent Current vs Supply Voltage

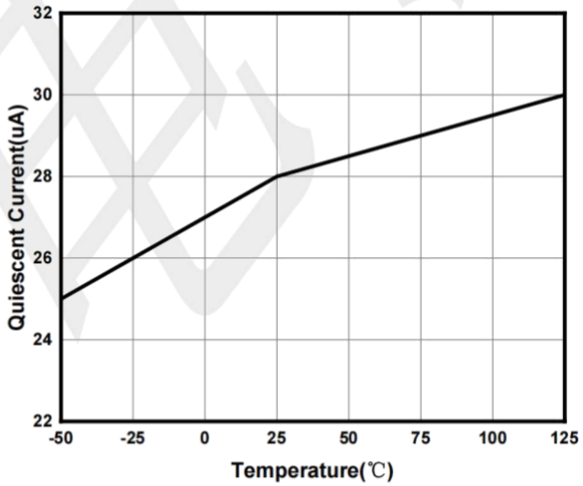


Figure 5. Quiescent Current vs Temperature

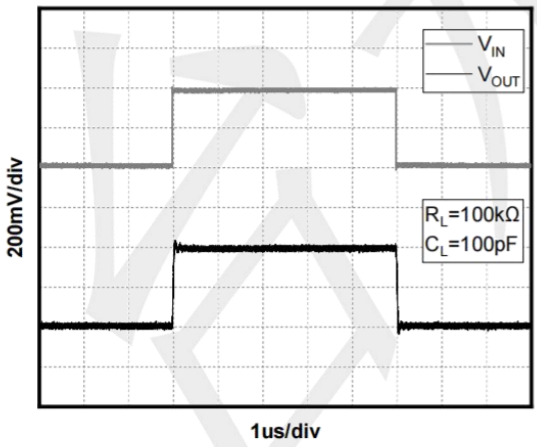


Figure 6. Small-Signal Step Response(V_S=5)

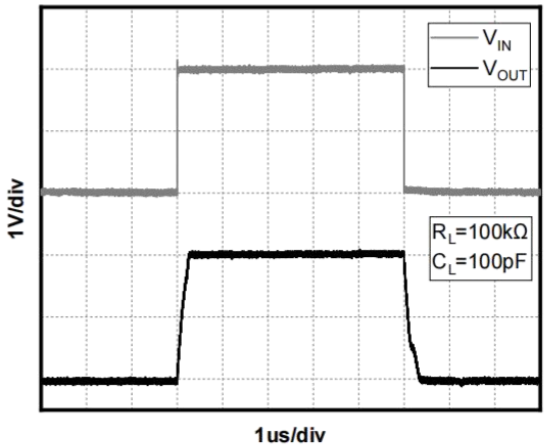


Figure 7. Large-Signal Step Response(V_S=5V)

Typical Performance Characteristics (@TA = +25°C, unless otherwise specified.)

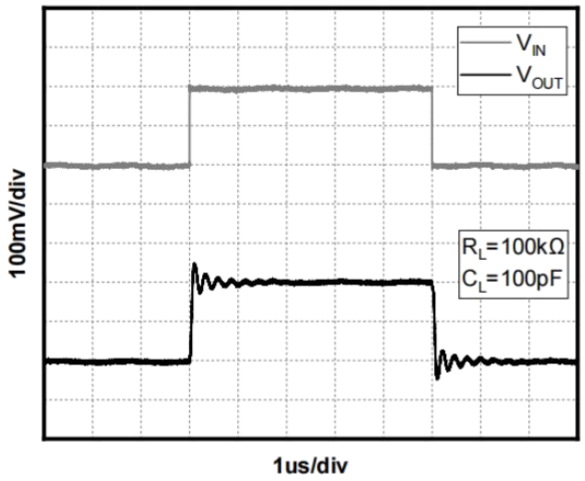


Figure 8. Small-Signal Step Response(V_S=1.5V)

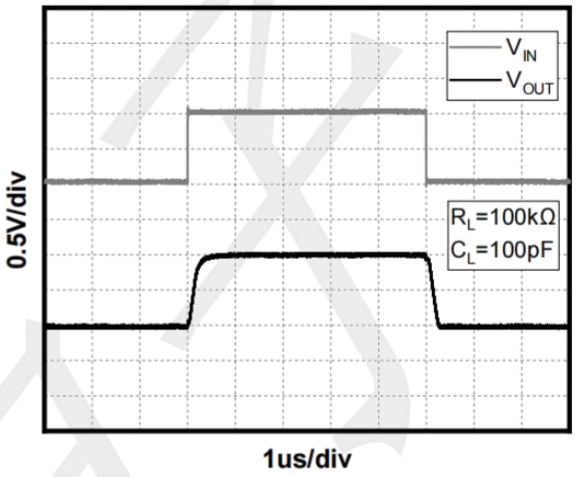


Figure 9.Large-Signal Step Response(V_S=1.5V)

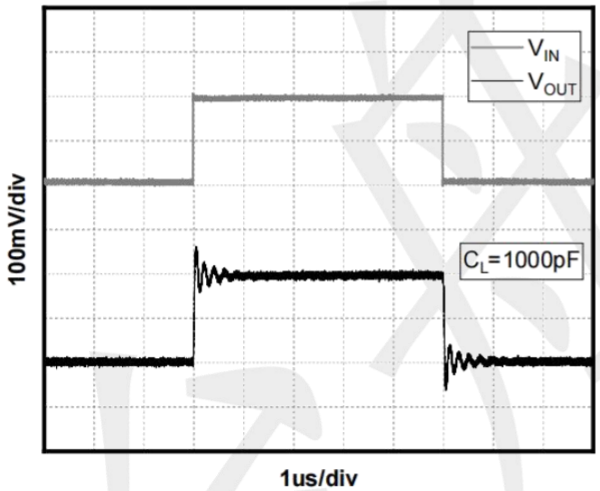


Figure 10. Capacitive Load Drive(C_L=1000pF)

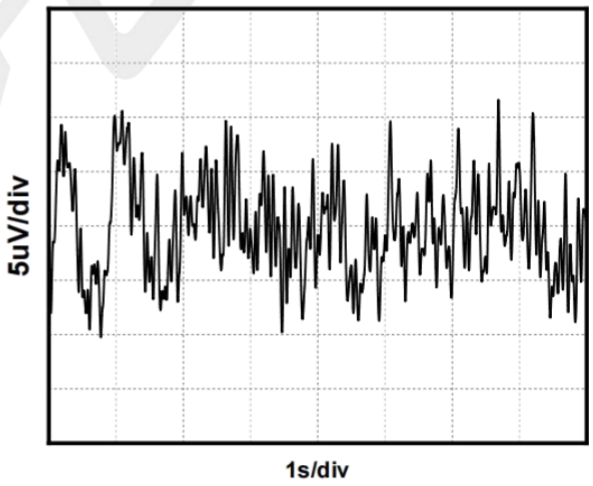
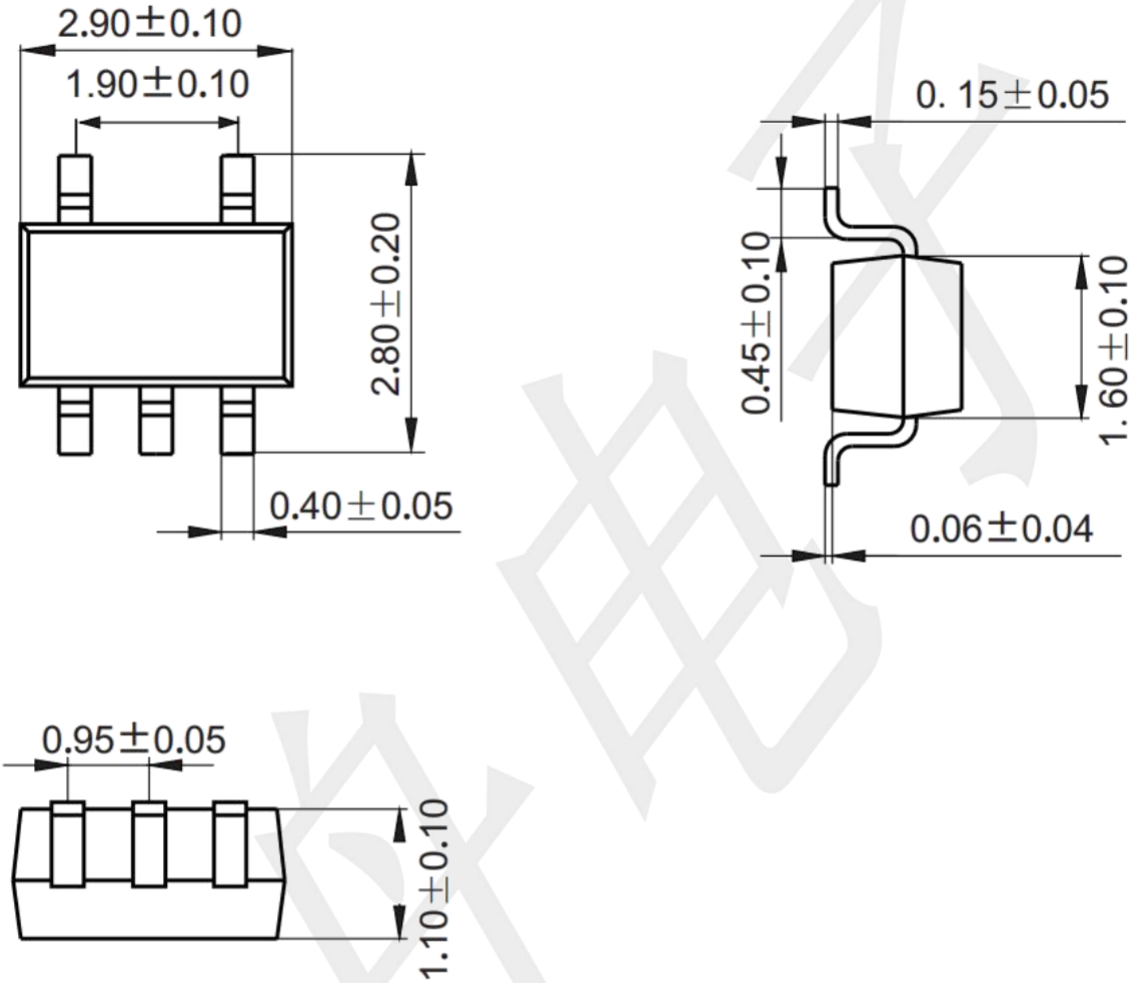


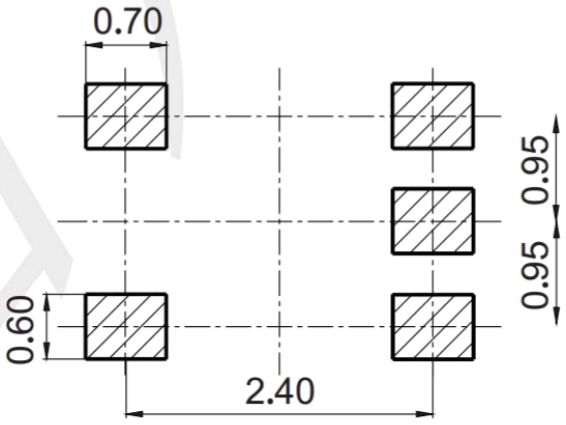
Figure 11. 0.1Hz to 10Hz Noise

Package information (Unit: mm)

SOT23-5

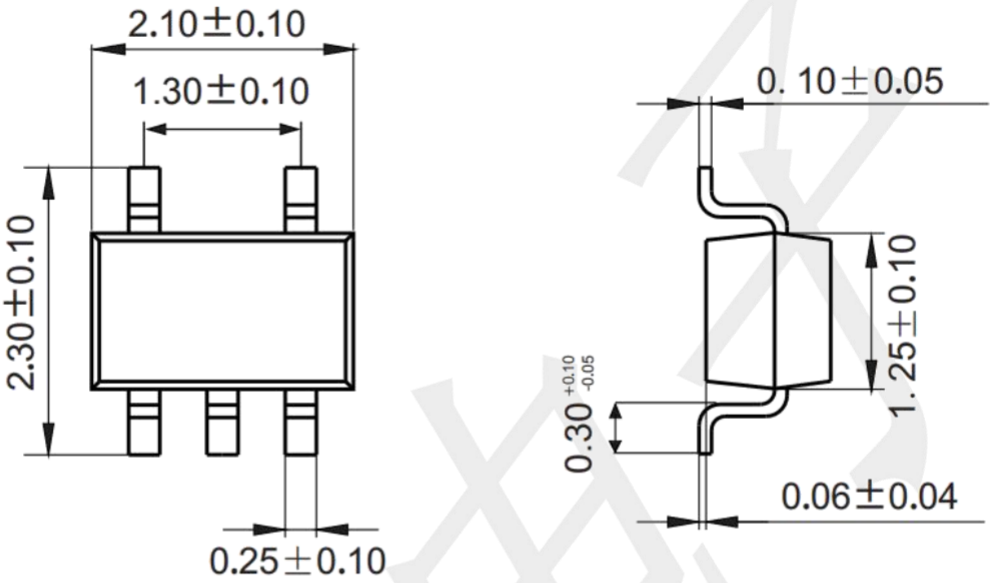


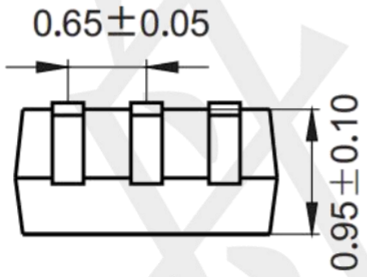
Mounting Pad Layout (Unit: mm)



Package information (Unit: mm)

SOT353





Mounting Pad Layout (unit: mm)