OPA336NA-TP

CMOS Operational Amplifier Zero Drift

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Features

- General Purpose, Low Cost
- Gain Bandwidth Product: 200KHz
- Low Quiescent Current: 21μA/Amplifier
- 0.01Hz-10Hz Noise： 1.5μVPP
- Zero Drift： 0.01μV/°C （Typ）
- Input Bias Current: 20pA
- Unity Gain Stable
- Rail-to-Rail Input and Output
- Single or Dual Supply Operation
- Supply Voltage Range: 1.8V to 5.5V
- Operating Temperature: -50°C ~ +125°C
- Type Package:SOT23-5

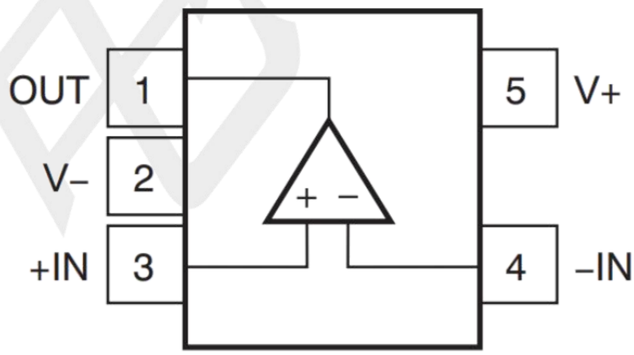
Applications

- Temperature Sensors
- Battery-Powered Instruments
- Smoke/Gas/Environment Sensors
- Medical Equipment
- Portable Instruments and Mobile Device
- Active Filters
- Piezo Electrical Transducer Amplifier
- Sensor Interface
- Handheld Test Equipment

General Description

The OPA336N of CMOS operational amplifiers use a proprietary auto-calibration technique to simultaneously provide very low offset voltage (±10uV, maximum) and near-zero drift over time and temperature. These miniature, high-precision, low quiescent current (21uA) amplifiers offer high impedance inputs that have a common-mode range 100 mV beyond the rails, and rail-to-rail output that swings within 50 mV of the rails. Single or dual supplies as low as 1.8 V (±0.9 V) and up to 5.5 V (+2.75 V) can be used. These devices are optimized for low voltage, single-supply operation.

Pinout (top view)



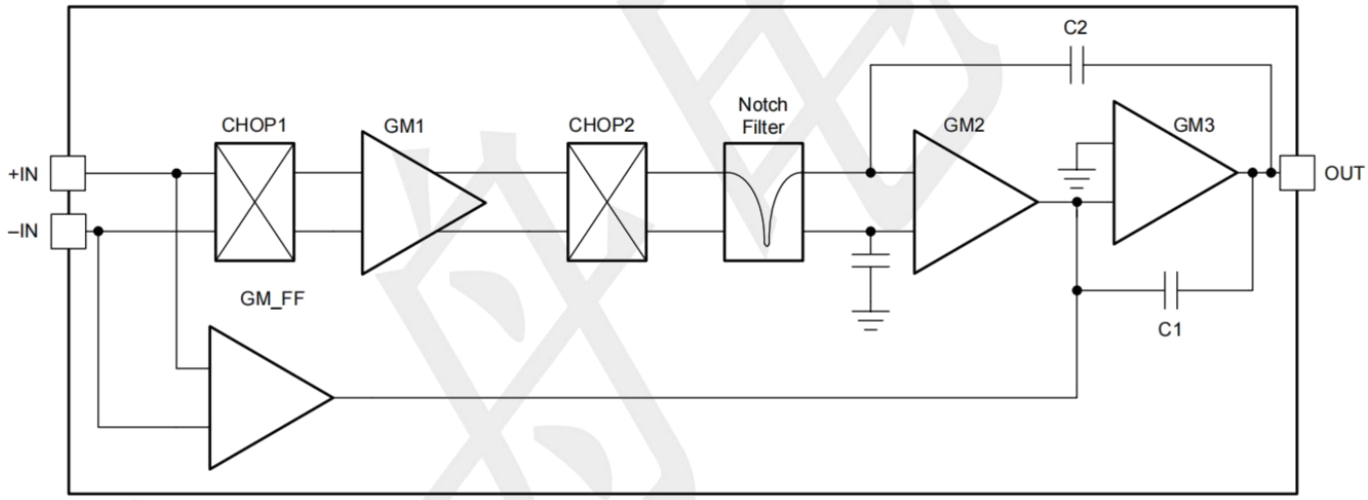
Pin Configurations

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

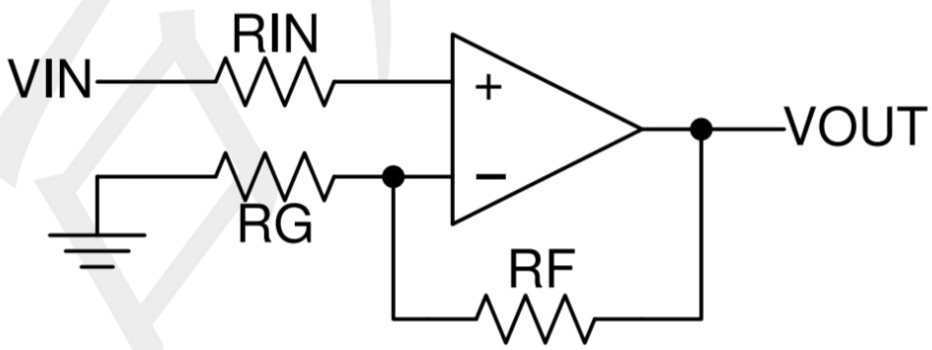
Absolute Maximum Ratings (@TA = +25°C, unless otherwise specified.)

Condition		Rating		UNIT
VDD to GND	Power Supply Voltage	7V		**V**
IN+ or IN-	Signal Input Terminals Voltage	GND-0.3V~VDD+0.3V		**V**
IN+ or IN-	Signal Input Terminals Current	-1mA ~ +1mA		**mA**
OUT to GND	Output Short-Circuit	Continuous		**mA**
TJ	Junction Temperature	150		**°C**
LT	Lead Temperature (Soldering, 10 sec.)	260		**°C**
T_A	Operating Temperature Range	-55	150	**°C**
Tstg	Storage Temperature Range	-65	150	**°C**
$V_{(ESD)}$	Human body model (HBM)	±4000		**V**
$V_{(ESD)}$	Charged-device model (CDM)	±1000		**V**

BLOCK DIAGRAM



Power Supply Bypassing



Electrical Characteristics

(At TA = +25℃,VS = +5V, VIN = 0V, unless otherwise noted.)

PARAMETER	SYMBOL	TEST Conditions	MIN	TYP	MAX	UNIT
Supply-Voltage Range	V_{DD}	Single-supply	1.8	--	5.5	V
		Dual-supply	±0.9	--	±2.75	V
Quiescent Current/Amplifier	I_Q	V_{DD} = 5V	--	21	35	uA
Input Offset Voltage	V_{OS}		--	±8	±50	uV
Input Offset Voltage Tempco	dV_{OS}/dT	T_A = -55°C to 125°C	--	0.01	--	μV/°C
Input Bias Current	I_B	(2)	--	1	20	PA
Input Bias Current	I_B	T_A = -55°C to 125°C	--	--	180	PA
Input Offset Current	I_{OS}	(2)	--	1	20	PA
Common-Mode Voltage Range	V_{CM}		GND-0.1	--	VDD+0.1	V
Common-Mode Rejection Ratio	CMRR	ΔV_{IN}=1V	130	135	--	dB
Power-Supply Rejection Ratio	PSRR	ΔV_S=1V	--	135	--	dB
Open-Loop Voltage Gain	A_V	ΔV_{OUT}=1V	140	150	--	dB
Output Swing from Positive Rail	$V_{OUT-SWING}$	R_L=10kΩ	--	13	--	mV
Output Swing from Negative Rail		R_L=10kΩ	--	17	--	mV
Capacitive Load Drive	C_L (3)	G = +1 , V_{IN}=4V Step	--	--	1	nF
Output Short-Circuit Current	I_{SC}	Sinking or Sourcing	--	21	--	mA
Gain Bandwidth Product	GBW		--	200	--	KHz
Slew Rate	SR	G = +1 , V_{IN}=4V Step	--	0.1	--	V/μs
Input Voltage Noise	V_N	f=0.1Hz to 10Hz	--	2	--	μV_{PP}
Input Voltage Noise PSD		f=1kHz	--	45	--	nV/√Hz
Specified temperature			-50	--	125	°C

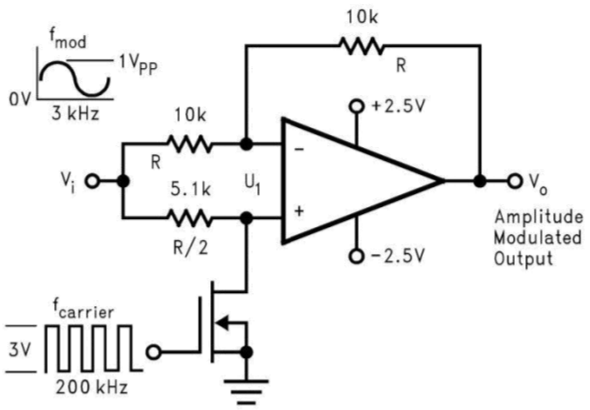
Notes:

1: All devices are 100% production tested at T_A = +25°C;range is guaranteed by design, not production tested.

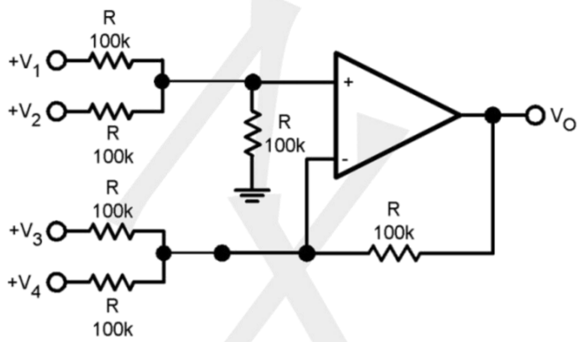
2: Parameter is guaranteed by design.

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

Typical Application Circuit



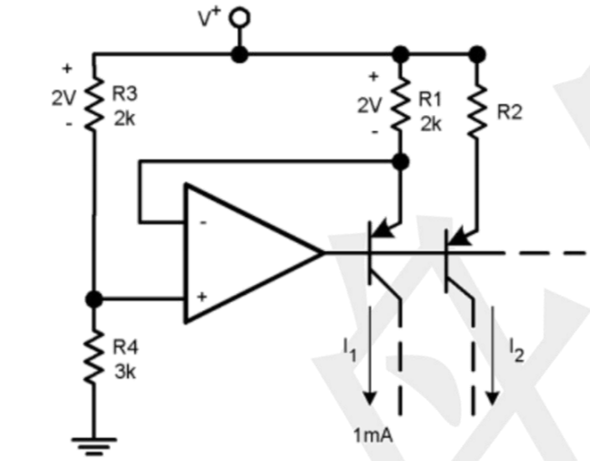
Amplitude modulator circuit



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

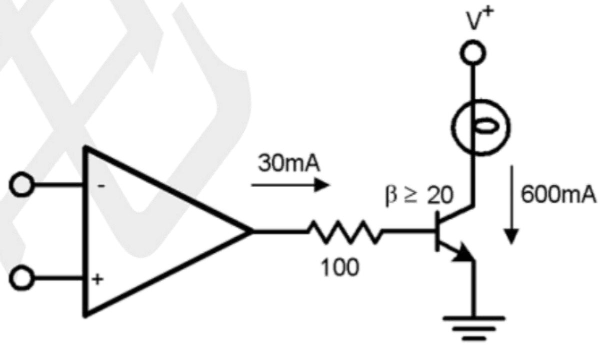
DC adder amplifier

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



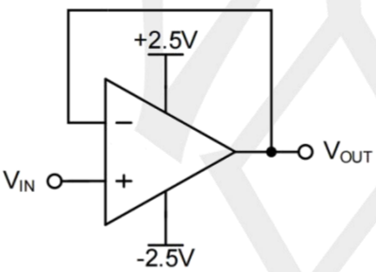
$I_2 = \left[\frac{R1}{R2}\right] I_1$

Fixed current source



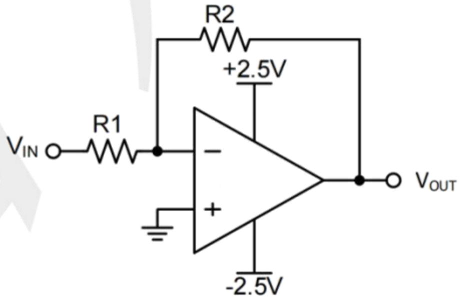
Lamp Driver

$V_{OUT}=V_{IN}$



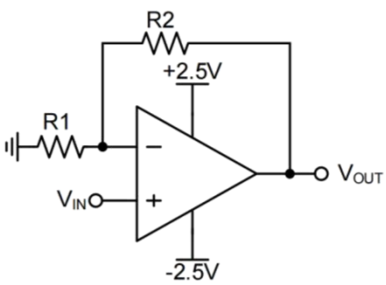
Voltage Follower

$V_{OUT}=-\frac{R2}{R1}V_{IN}$



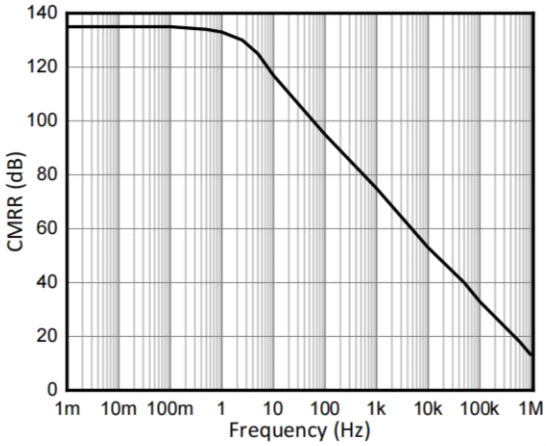
Inverting Proportional Amplifier

$V_{OUT}=(1+\frac{R2}{R1})V_{IN}$

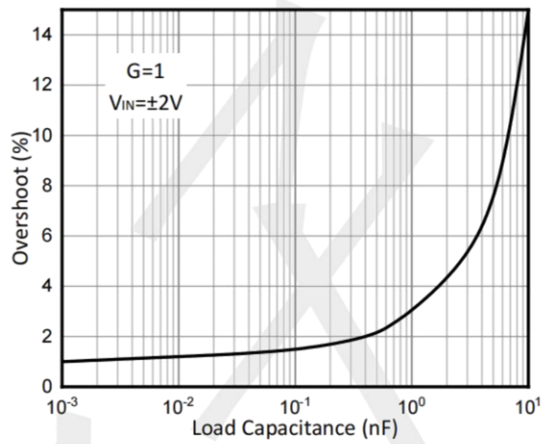


Noninverting Proportional Amplifier

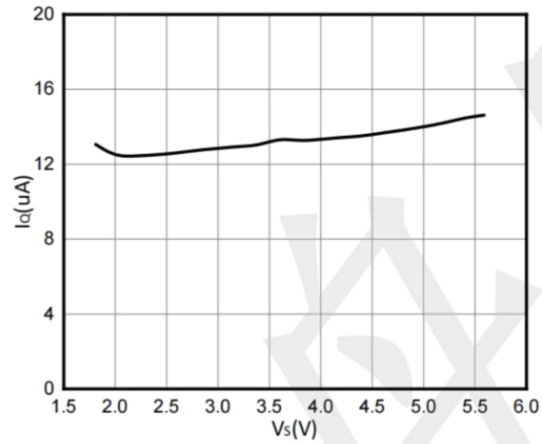
Typical Performance Characteristics (@TA = +25°C, unless otherwise specified.)



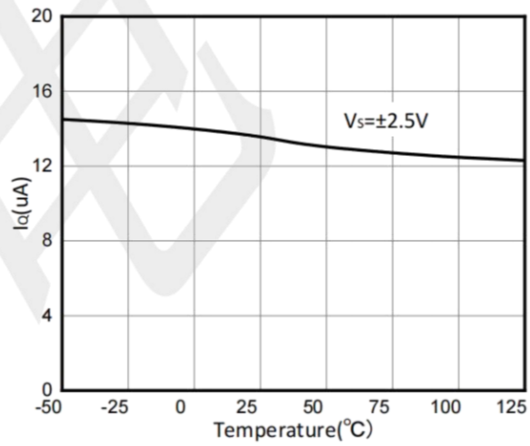
CMRR vs Frequency



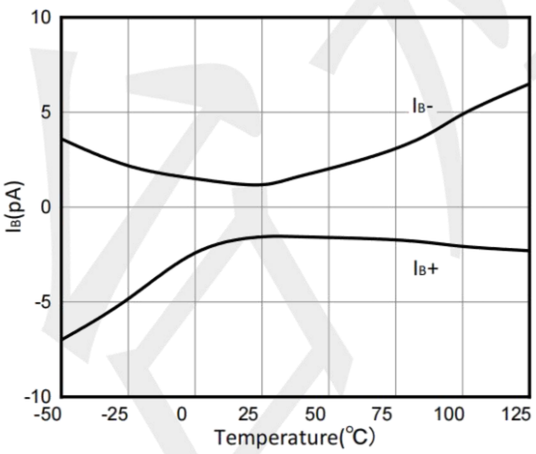
Large-Signal Overshoot vs Load Capacitance



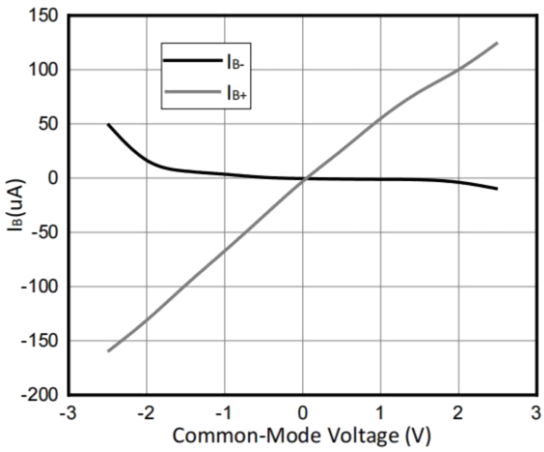
Quiescent Current vs Supply Voltage



Quiescent Current vs Temperature



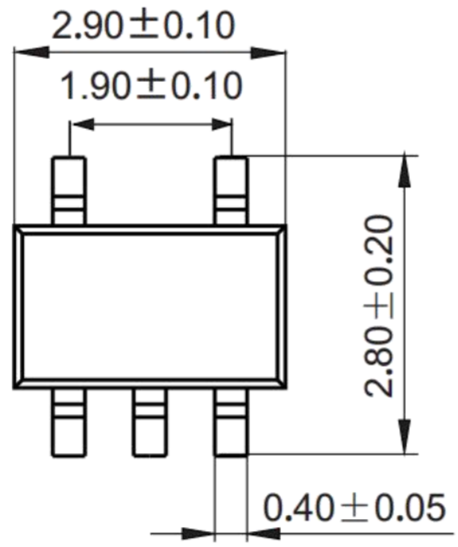
Input Bias Current vs Temperature

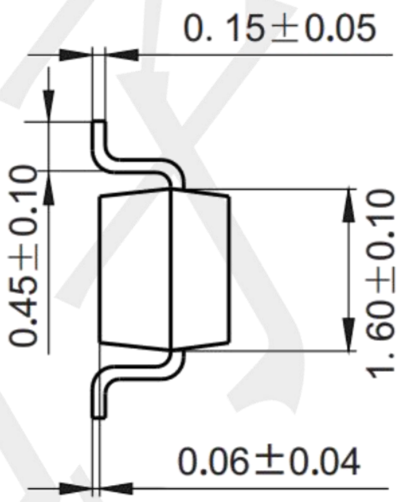


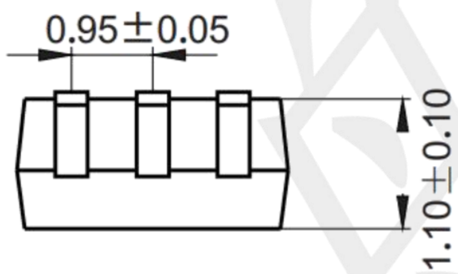
Input Bias Current vs Common-Mode Voltage

Package informantion (Unit: mm)

SOT23-5







Mounting Pad Layout (Unit: mm)