TPSGM8551XN5G

Ultra Low Noise Rail-to-Rail I/O CMOS Precision OPERATIONAL AMPLIFIERS

Features

- General Purpose, Low Cost
- Gain Bandwidth Product: 6MHz
- Input Offset Voltage：2μV (Typ)
- Ultra Low Noise：6nV/√Hz at 1kHz
- Zero Drift：0.03μV/°C（Typ）
- Input Bias Current: 500pA
- Rail-to-Rail Input and Output
- Single or Dual Supply Operation
- Supply Voltage Range: 2V to 5.5V
- Operating Temperature: -50°C ~ +125°C
- Type Package:SOT23-5

Applications

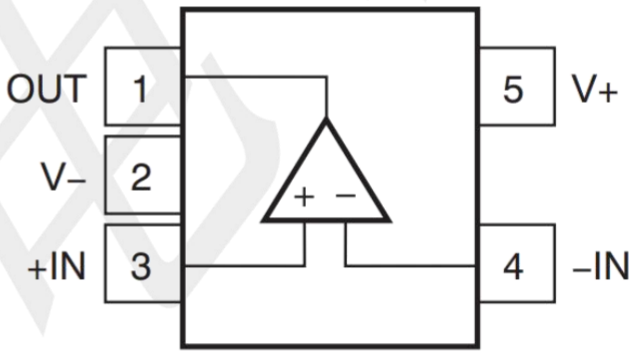
- Temperature Sensors
- Battery-Powered Instruments
- Smoke/Gas/Environment Sensors
- Medical Equipment
- Portable Instruments and Mobile Device
- Active Filters
- Piezo Electrical Transducer Amplifier
- Sensor Interface
- Handheld Test Equipment

General Description

The TPSGM8551 family represents a new generation of low-noise operational amplifiers,offering outstanding dc precision and ac performance. Rail-to-Rail input and output,low offset (2μV),low noise (6nV/√Hz),quiescent current of 600 μA, and a 6-MHz bandwidth make this part very attractive for a variety of precision and portable applications.

In addition, this device has a reasonably wide supply range (2V to 5.5V) with excellent PSRR, making it attractive for applications that run directly from batteries without regulation.

Pinout (top view)



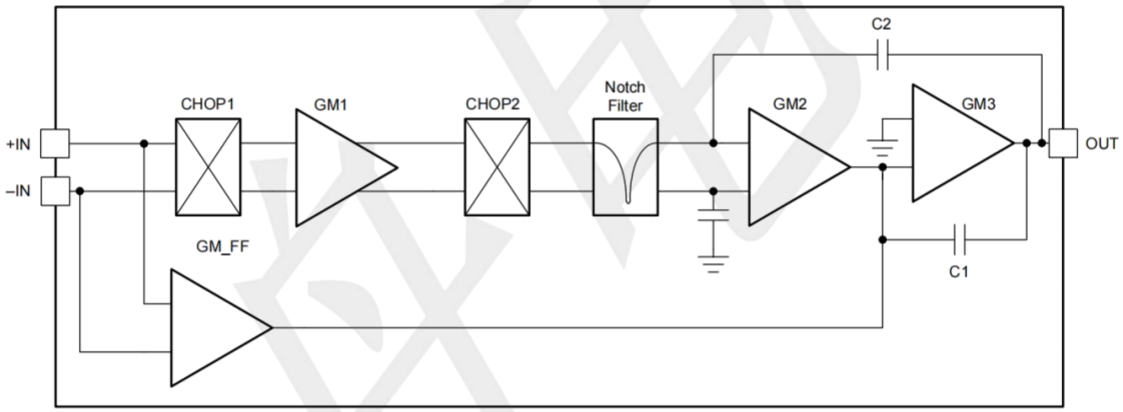
Pin Configurations

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	6V		V
IN+ or IN-	Signal Input Terminals Voltage	GND-0.5V~VDD+0.5V		V
IN+ or IN-	Signal Input Terminals Current	-10~ +10		mA
OUT to GND	Output Short-Circuit	Continuous		mA
TJ	Junction Temperature	150		°C
LT	Lead Temperature (Soldering, 10 sec.)	260		°C
TA	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)	±500		V

BLOCK DIAGRAM



Power Supply Bypassing

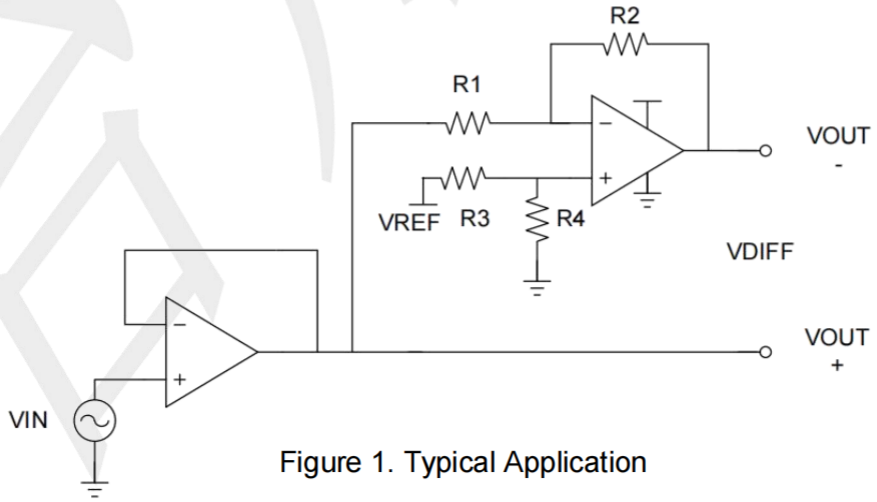


Figure 1. Typical Application

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	2	--	5.5	V
		Dual-supply	±1	--	±2.75	V
Quiescent Current/Amplifier	I_Q	I_O = 0A	--	600	700	uA
Input Offset Voltage	V_{OS}		--	2	10	uV
Input Offset Voltage Tempco	dV_{OS}/dT	T_A = -55°C to 125°C	--	0.03	--	μV/°C
Input Bias Current	I_B	(2)	--	500	--	PA
Input Offset Current	I_{OS}	(2)	--	50	--	PA
Common-Mode Voltage Range	V_{CM}		GND-0.1	--	VDD+0.1	V
Common-Mode Rejection Ratio	CMRR	V_{CM}=0.1V to 4V	110	130	--	dB
Power-Supply Rejection Ratio	PSRR	V_S=1.5V to 5.5V	110	130	--	dB
Open-Loop Voltage Gain	A_V	V_{OUT}=0.1V to 4.9V, R_L=10kΩ	135	150	--	dB
High output voltage swing	V_{OH}	R_L=10kΩ	--	10	20	mV
		R_L=2kΩ	--	50	60	mV
Low output voltage swing	V_{OL}	R_L=10kΩ	--	10	20	mV
		R_L=2kΩ	--	35	45	mV
Capacitive Load Drive	$C_{L\,(3)}$	G = +1 , V_{IN}=2V Step	--	--	560	pF
Output Short-Circuit Current	I_{SC}	Source current	--	30	--	mA
		Sink current	--	65	--	mA
Gain Bandwidth Product	GBW	C_L=100pF	--	6	--	MHz
Slew Rate	SR	G = +1 , V_{IN}=4V Step	--	5	--	V/μs
Settling Time to 0.1%	ts	G = +1 , V_{IN}=4V Step	--	0.7	--	μs
Total Harmonic Distortion +Noise	THD+N	G=1,V_O=1V_{RMS}, f=1kHz, R_L=10kΩ	--	0.0004	--	%
Input Voltage Noise	V_N	f=0.1Hz to 10Hz	--	0.3	--	μV_{PP}
Input Voltage Noise PSD	en	f=1kHz	--	6	--	**nV/√Hz**
Specified temperature			-50	--	125	**°C**

Notes:

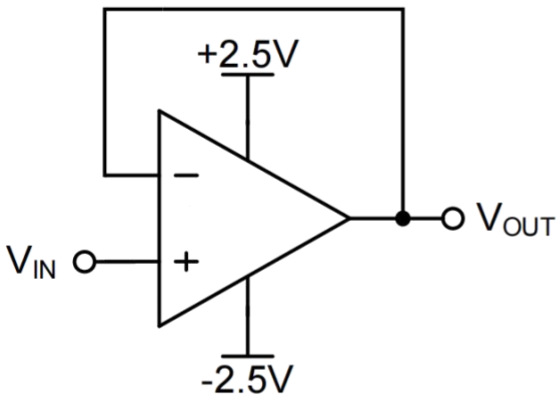
1: All devices are 100% production tested at T_A = +25°C;range is guaranteed by design, not production tested.

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.

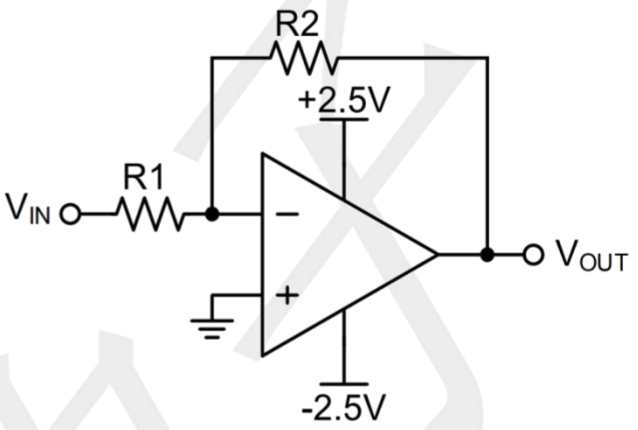
Typical Application Circuit

$V_{OUT}=V_{IN}$



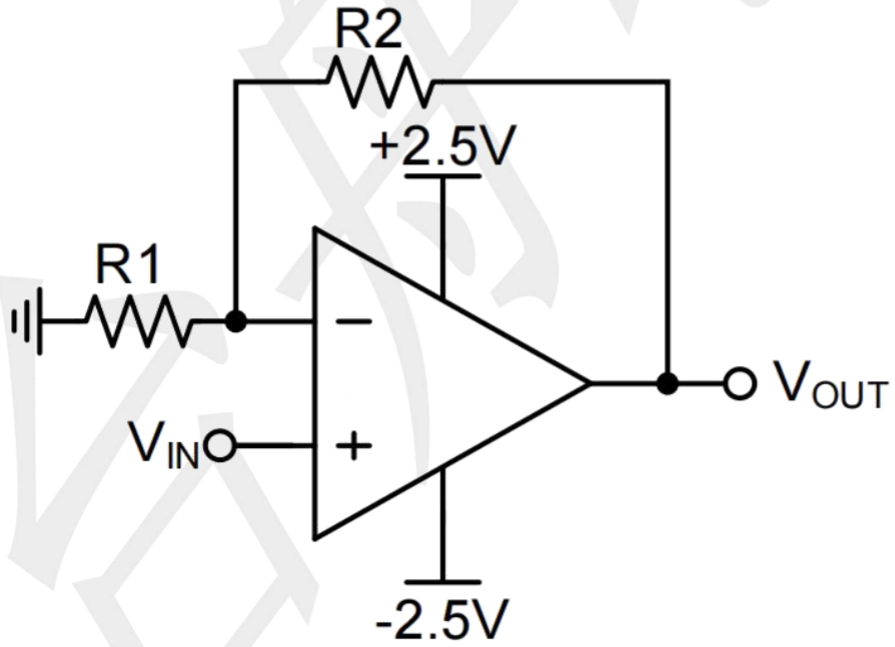
Voltage Follower

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



Inverting Proportional Amplifier

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



Noninverting Proportional Amplifier

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

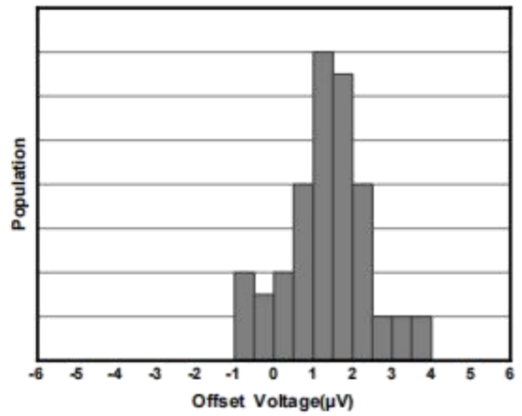


Figure 2. Offset Voltage Production Distribution

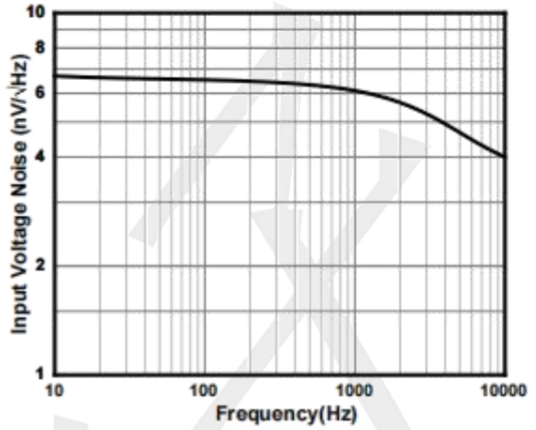


Figure 3. Input Voltage Noise Spectral Density

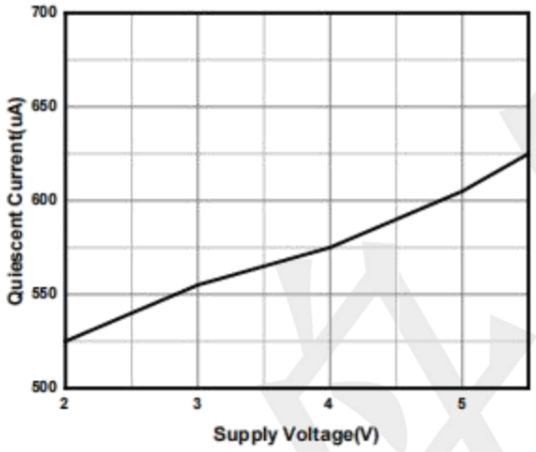


Figure 4. Quiescent Current vs Supply Voltage

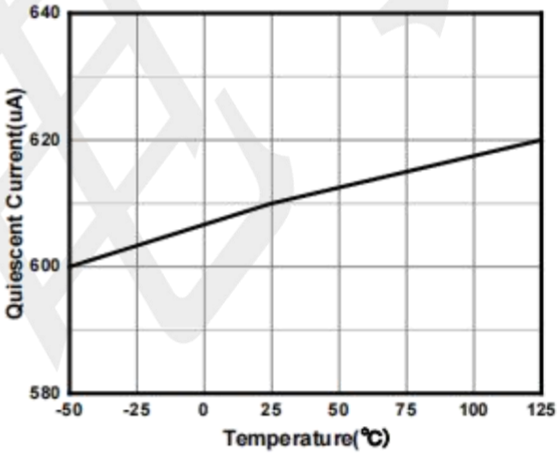


Figure 5. Quiescent Current vs Temperature

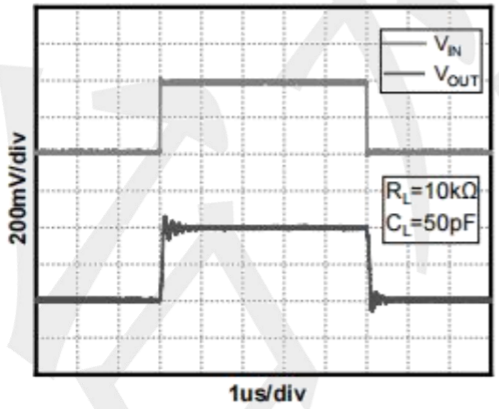


Figure 6. Small-Signal Step Response(V_S=5V)

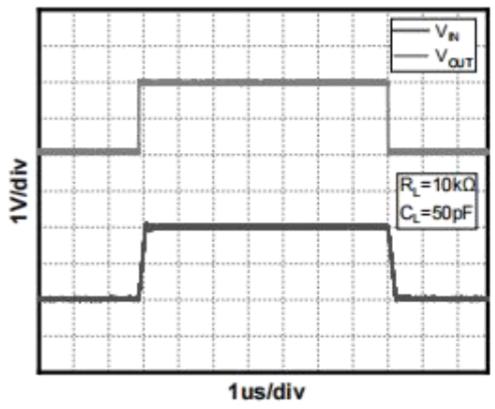
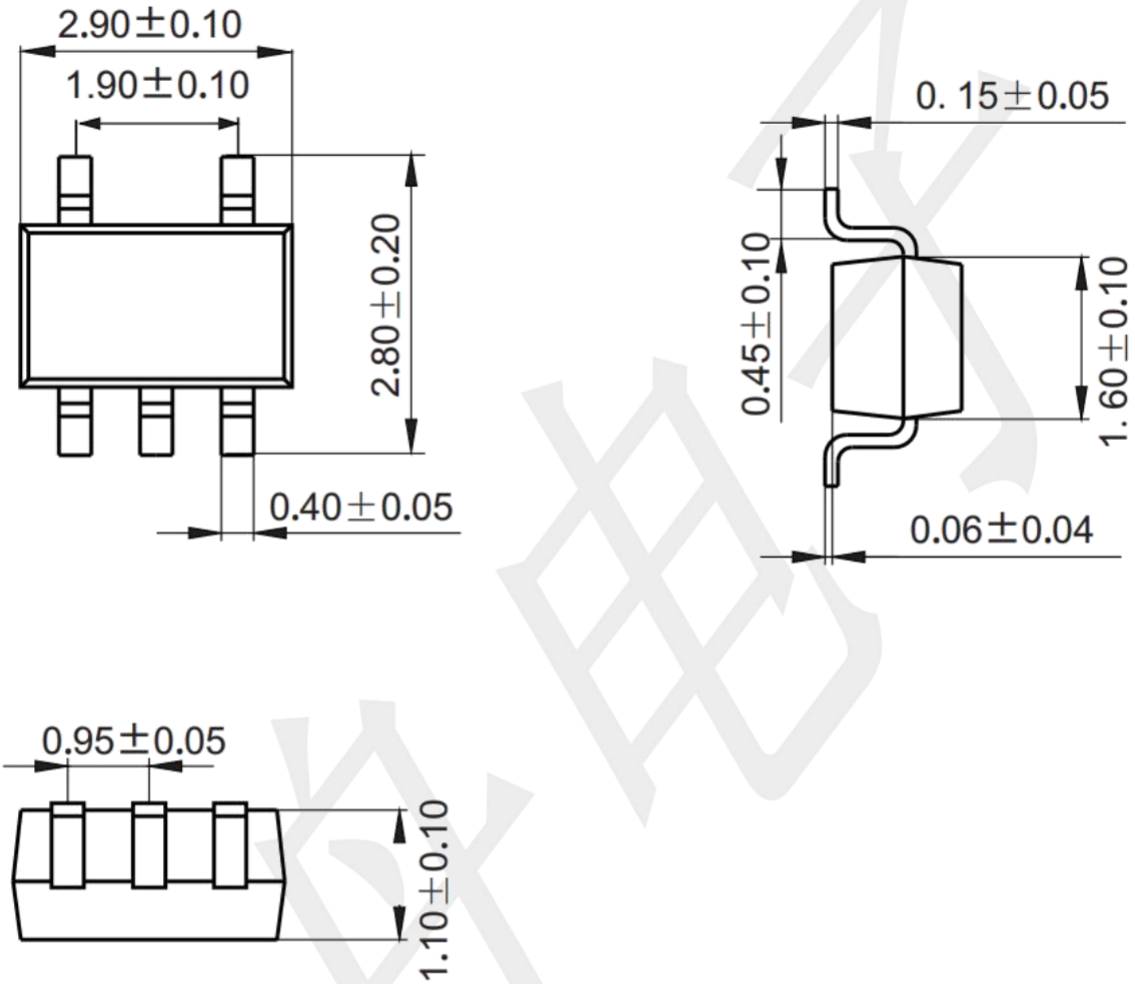


Figure 7. Large-Signal Step Response(V_S=5V)

Package information (Unit: mm)

SOT23-5



Mounting Pad Layout (Unit: mm)