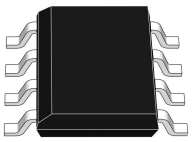


TSV912A

SO-8 CMOS Rail-to-Rail Input/Output Operational Amplifiers

SO-8 CMOS 轨到轨输入/输出运算放大器

1. Description 描述

This operational amplifier offer low voltage operation and rail-to-rail input and output, as well as an excellent speed/power consumption ratio.

这款运算放大器支持低压工作，拥有轨到轨输入输出能力，同时兼具出色的速度功耗比。

2. Features 特性

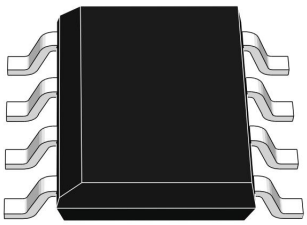
Feature 特性	Description 描述
Single-Supply Operation 单电源供电工作模式	$+2.1V$~$+5.5V$
Gain-Bandwidth Product 增益带宽积	$6MHz$ (Typ.)
Low Input Bias Current 低输入偏置电流	$1pA$ (Typ.)
Applications 应用	• Sensors 传感器 • Active Filters 有源滤波器 • Laptops and PDAs 笔记本电脑 • Audio 音频设备 • Handheld Test Equipment 手持测试设备 • Battery-Powered Instrumentation 电池供电仪器 • A/D Converters 模数转换器（ADC）
Environmental Compliance 环保合规	Totally Lead-Free & Fully RoHS Compliant. 完全无铅和符合 RoHS 标准[1] Halogen and Antimony Free, "Green" Device. 无卤素和无锑，“绿色”器件[2]
Automotive Compliance 汽车合规	Qualified according to AEC-Q101 and recommended for use in automotive applications. 通过了 AEC-Q101 认证，推荐用于汽车电子应用场景。

[1] No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
无铅，完全符合欧盟标准 2002/95/EC（RoHS），2011/65/EU （RoHS 2）和 2015/863/EU （RoHS 3）。

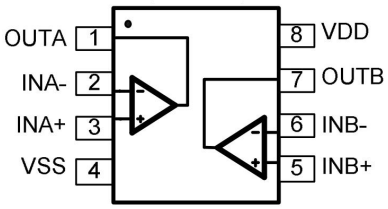
[2] Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
无卤素和无锑的“绿色”产品指溴含量<900ppm，氯含量<900ppm（溴+氯总含量<1500ppm）和锑化合物含量<1000ppm。

3. Mechanical Data 封装数据

Feature 特性	Description 描述
Package 封装	SO-8
Moisture Sensitivity Level 湿敏感度等级	J-STD-020 MSL1
Material 材料	Molded Plastic, “Green” Molding Compound; UL Flammability Classification Rating 94V-0. 模塑塑料封装，“绿色”成型复合材料；UL 可燃性等级 94V-0。
Dimensions 尺寸	$1.27mm$ pitch; $4.9mm \times 3.9mm \times 1.75mm$ body 相邻引脚中心距为 $1.27mm$，封装本体（不含引脚）尺寸为 $4.9mm \times 3.9mm \times 1.75mm$
Terminals Compliance 引脚合规	8 terminals, Tin Plated Leads, Solderable per MILSTD-202, Method 208 e3 8 个镀锡引脚, 可焊性符合 MIL-STD-202 标准中 208 方法 e3 条款的要求
Weight 重量	0.08 grams (Approximate) 约 0.08 克
Polarity 极性	See Diagrams Below 极性见下图



SO-8 Top View



Top View Pin-Out

4. Ordering Information 订购信息

Part Number	Compliance	Package	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
TSV912A	Automotive	SO-8	13	12	2500

5. Marking Information 丝印信息

Part Number	Marking Code
TSV912A	V912A

6. Absolute Maximum Ratings(T_a =+ 25℃) 绝对最大额定值

Characteristic 特性	Symbol 符号	Min Value 最小值	Max Value 最大值	Unit 单位
Power Supply Voltage(V_{DD} to V_{SS}) 电源电压（V_{DD}到V_{SS}）	V_{DD}-V_{SS}	-0.5	+7.5	V
Analog Input Voltage(IN+ or IN-) 模拟输入引脚电压	V_{IN+} ,V_{IN-}	V_{SS}-0.5	V_{DD}+0.5	V
PDB Input Voltage 电源关断输入电压	V_{PDB}	V_{SS}-0.5	+7	V

7. Thermal Characteristics(T_a =+ 25℃) 热特性

Characteristic 特性	Symbol 符号	Value 值	Unit 单位
Thermal Resistance From Junction To Ambient 结到环境的热阻	$R_{\theta JA}$	125	℃/W
Operating Temperature Range 运行温度	T_{op}	-40 ~ +125	℃
Maximum Junction Temperature 最大结温	$T_{J(max)}$	+160	℃
Storage Temperature 储藏温度	T_{stg}	-55 ~ +150	℃
Lead Temperature (soldering, 10sec) 引脚温度（焊接 10s）	T_L	+260	℃

8. ESD Ratings ESD 评级

Characteristic 特性	JEDEC Class JEDEC 等级	Value 值	Unit 单位
Electrostatic Discharge-Human Body Model（ESD HBM） 人体放电模型	3B	8000	V
Electrostatic Discharge-Machine Model（ESD MM） 带电器件模型	C	400	V

9. Electrical Characteristics(T_a =+ 25℃) 电特性

(At $V_S = 5V, T_A$ =+ 25℃, $V_{CM} = V_S/2$, $R_L = 600\Omega$, *unless otherwise noted.)*

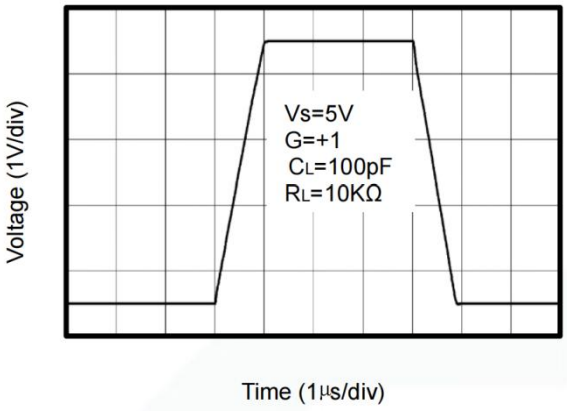
Characteristic 特性	Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Conditions 条件
Input Offset Voltage 输入失调电压	V_{IO}	-	0.8	3.5	mV	
Input Bias Current 输入偏置电流	I_{IB}	-	1	-	pA	
Input Offset Current 输入失调电流	I_{OS}	-	1	-	pA	
Input Common Mode Voltage Range 输入共模电压范围	V_{CM}	-	-0.1~ +5.6	-	V	$V_S = 5.5V$
Common Mode Rejection Ratio 共模抑制比	$CMRR$	73	90	-	dB	$V_S = 5.5V$, $V_{CM} = -0.1V\ to\ 4V$
		-	83	-	dB	$V_S = 5.5V$, $V_{CM} = -0.1V\ to\ 5.6V$
Open-Loop Voltage Gain 开环电压增益	A_{OL}	90	97	-	dB	$R_L = 600\Omega$, $V_O = 0.15V\ to\ 4.85V$
		-	108	-	dB	$R_L = 10k\Omega$, $V_O = 0.05V\ to\ 4.95V$
Input Offset Voltage Drift 输入失调电压温漂	$\Delta V_{OS}/\Delta_T$	-	2.4	-	μV/℃	
Output Voltage Swing from Rail 轨到轨输出电压摆幅	V_{OUT_SWING}	-	0.1	-	V	$R_L = 600\Omega$
		-	0.015	-	V	$R_L = 10k\Omega$
Output Current 输出电流	I_{OUT}	49	53	-	mA	
Closed-Loop Output Impedance 闭环输出阻抗	$Z_{OUT(CL)}$	-	3	-	Ω	$f = 200kHz, G = 1$
Turn-ON Time 开启时间	t_{on}	-	4	-	μs	
Turn-OFF Time 关断时间	t_{off}	-	1.2	-	μs	
Operating Voltage Range 工作电压范围	V_S	2.1	-	5.5	V	
Power Supply Rejection Ratio 电源抑制比	$PSRR$	74	91	-	dB	V_S =+ $2.5V\ to\ +5.5V$ $V_{CM} = (-V_S) + 0.5V$
Quiescent Current/Amplifier 静态工作电流/单路放大器	I_Q	-	470	650	μA	$I_{OUT} = 0$

Characteristic 特性	Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Conditions 条件
Gain-Bandwidth Product 增益带宽积	GBP	-	6	-	MHz	$R_L = 10k\Omega$, $C_L = 100pF$
Phase Margin 相位裕度	φm	-	53	-	Degrees	$R_L = 10k\Omega$, $C_L = 100pF$
Full Power Bandwidth 全功率带宽	BWP	-	250	-	kHz	<1% distortion, $R_L = 600\Omega$
Slew Rate 压摆率	SR	-	4.2	-	V/μs	$G = +1,2V\ Step$, $R_L = 10k\Omega$
Settling Time to 0.1% 0.1%精度建立时间	t_S	-	0.4	-	μs	$G = +1,2V\ Step$, $R_L = 600\Omega$
Overload Recovery Time 过载恢复时间	t_{OR}	-	2.5	-	μs	$V_{IN} \cdot Gain = VS$, $R_L = 600\Omega$
Voltage Noise Density 电压噪声密度	e_n	-	13	-	$nV/\sqrt{Hz}$	$f = 1kHz$
		-	9.5	-	$nV/\sqrt{Hz}$	$f = 10kHz$

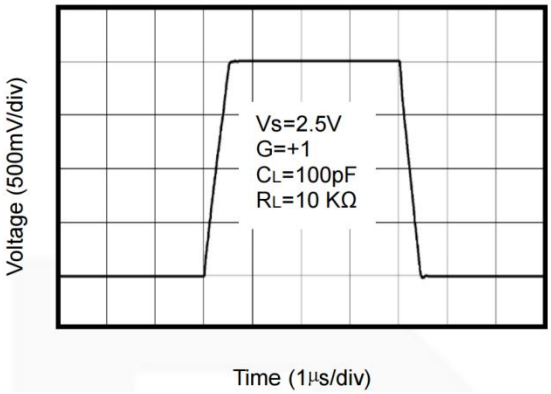
10. Typical Electrical Characteristics Curve 典型电特性曲线

(At $V_S = 5V, T_A = +25℃, V_{CM} = V_S/2, R_L = 600\Omega$, *unless otherwise noted.)*

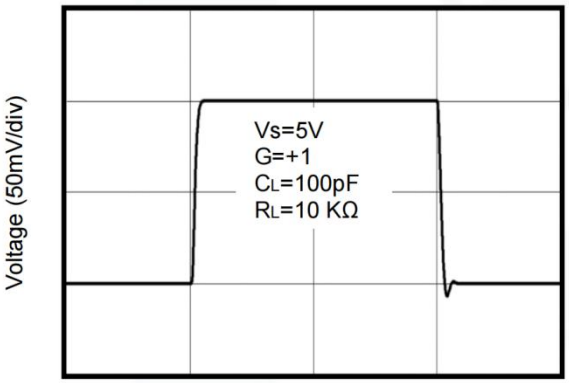
Large-Signal Step Response



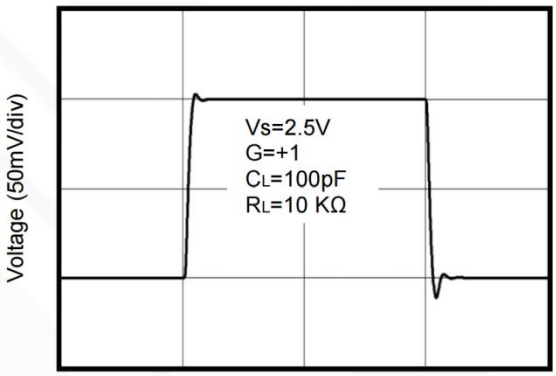
Large-Signal Step Response



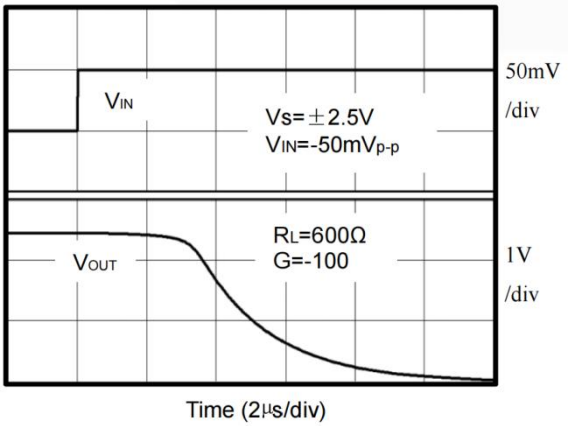
Small-Signal Step Response



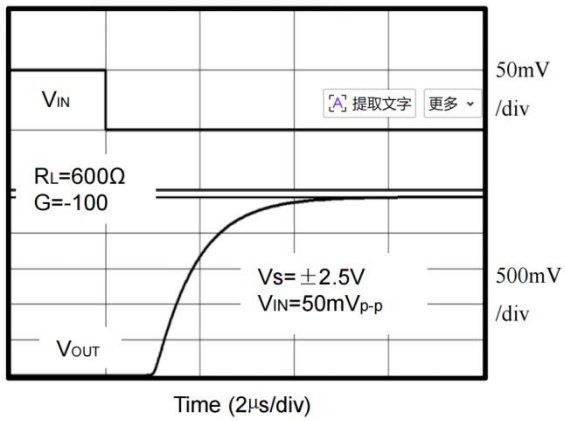
Small-Signal Step Response



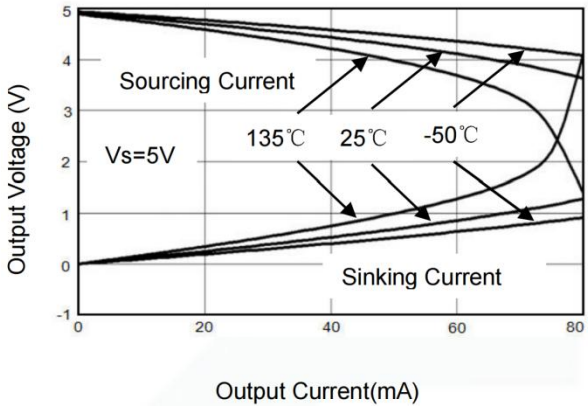
Positive Overload Recovery



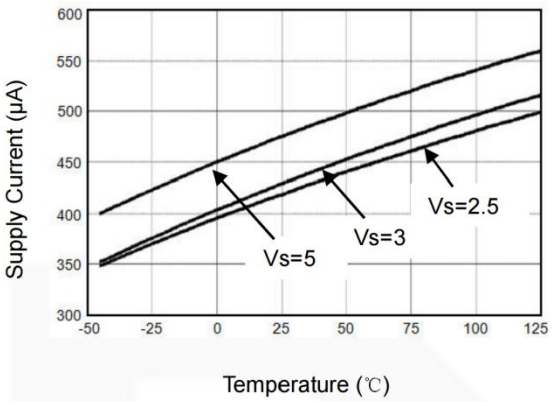
Negative Overload Recovery



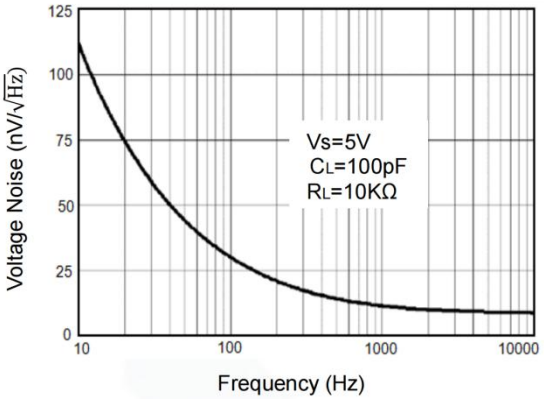
Output Voltage Swing vs.Output Current



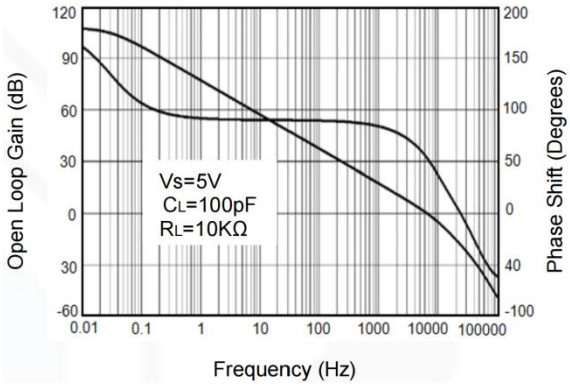
Supply Current vs. Temperature



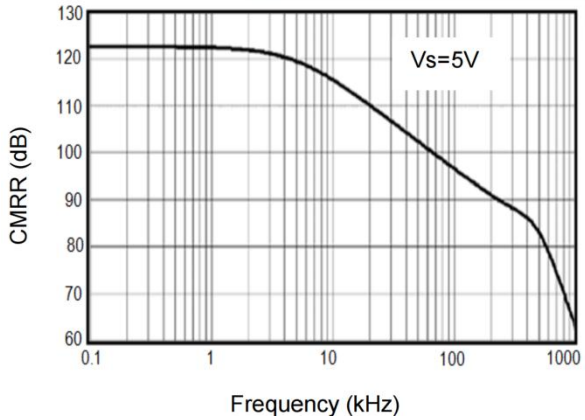
Input Voltage Noise Spectral Density vs. Frequency



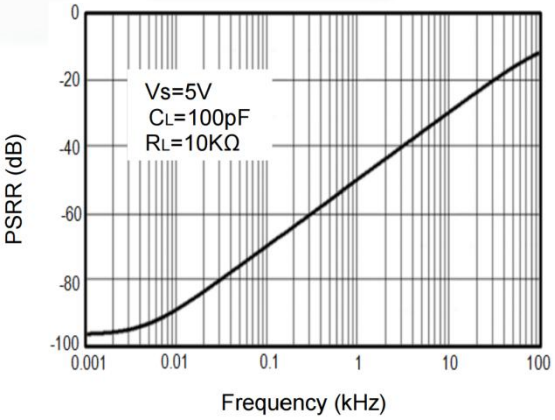
Open Loop Gain, Phase Shift vs. Frequency



CMRR vs. Frequency

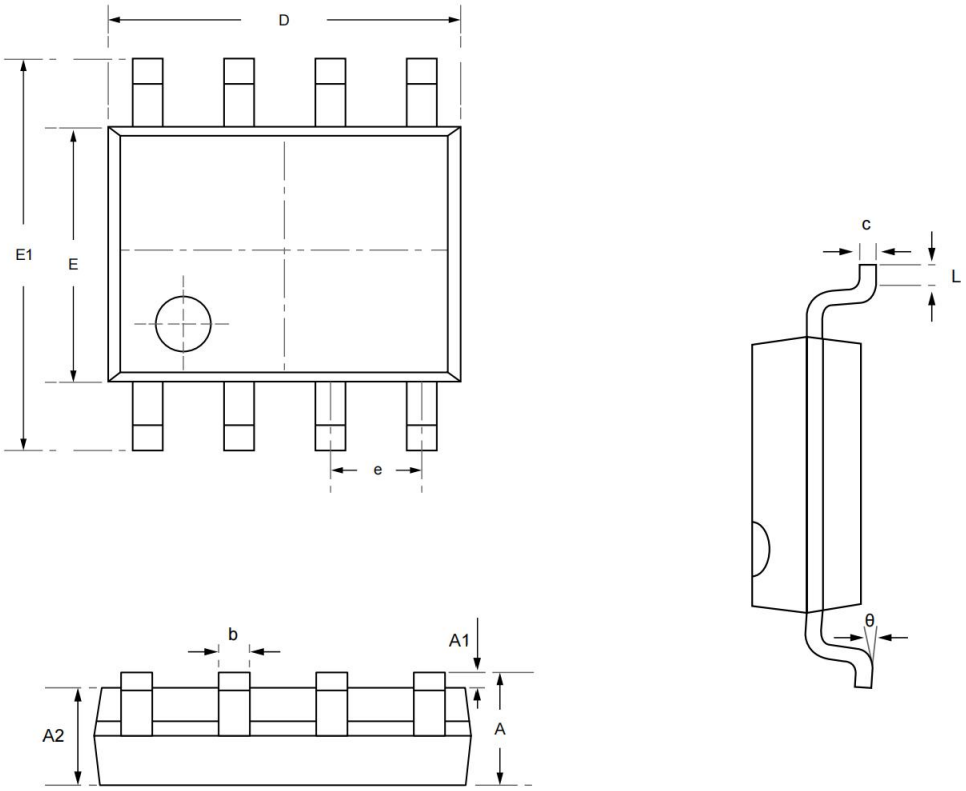


PSRR vs. Frequency



11. Package Outline Dimensions 封装外形尺寸

SO-8



Symbol 符号	Millimeters 毫米	
	Min.最小值	Max.最大值
A	1.35	1.75
A1	0.10	0.25
A2	1.25	1.55
b	0.28	0.48
c	0.17	0.25
D	4.80	5.00
E	3.80	4.00
E1	5.80	6.20
e	1.27(Typ.)	-
L	0.40	1.27
θ	0°	8°

12. Suggested Pad Layout 推荐焊盘布局

SO-8

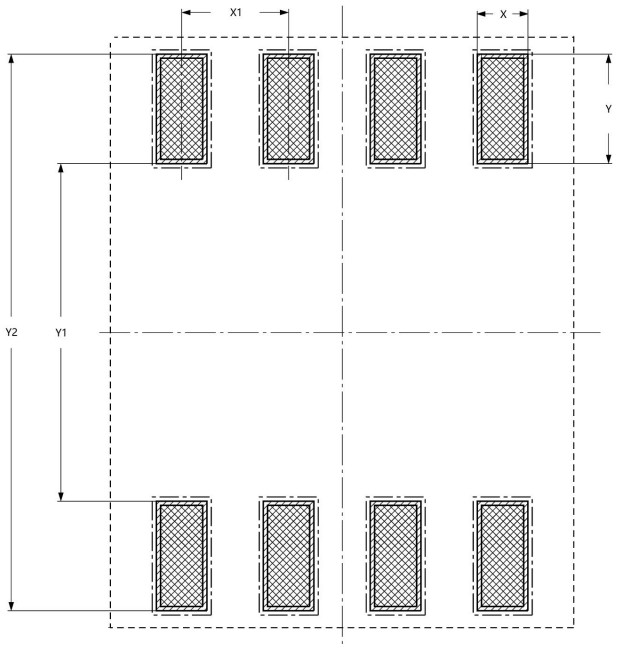


Fig. Soldering footprint for SO-8

图 SO-8 的引脚焊接

Dimensions 尺寸	Millimeters 毫米
X	0.60
X1	1.27
Y	1.30
Y1	4.00
Y2	6.60

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Contents 目录

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