



SGM8924

9MHz, Dual Rail-to-Rail Output Operational Amplifier with Shutdown

GENERAL DESCRIPTION

The SGM8924 is a dual operational amplifier designed for 5V operation. The device can operate from 3V to 5.5V single supply. It provides a wide input common mode voltage range and rail-to-rail output voltage swing.

The SGM8924 offers excellent overall performance. It features low offset, low noise and low distortion. Meanwhile, low impedance load can be used due to the characteristics of high output drive capability. The device works well in low voltage or battery-powered audio systems requiring high quality.

The SGM8924 is offered in a Green MSOP-10 package. It is specified over the extended -40°C to $+85^{\circ}\text{C}$ temperature range.

FEATURES

- **Low Offset Voltage: 1mV (MAX, SGM8924A)**
- **Low Input Voltage Noise: $6\text{nV}/\sqrt{\text{Hz}}$**
- **Low Distortion**
- **High Output Voltage Swing: 4.75V (with 150mA Output Current)**
- **Low Output Voltage Swing: 0.3V (with 150mA Output Current)**
- **Gain-Bandwidth Product: 9MHz**
- **Slew Rate: $5.13\text{V}/\mu\text{s}$**
- **Thermal Shutdown Protection Circuitry**
- **Rail-to-Rail Output**
- **Supply Voltage Range: 3V to 5.5V**
- **Low Supply Current: 5.5mA/Amplifier (TYP)**
- **-40°C to $+85^{\circ}\text{C}$ Operating Temperature Range**
- **Available in a Green MSOP-10 Package**

APPLICATIONS

Data Acquisition
Process Control
Active Filter
Test Equipment
Mobile Phone
Audio Processing
Video Processing
Headphone Amplifier
Portable Equipment
Broadband Communication
A-to-D Driver
D-to-A Driver

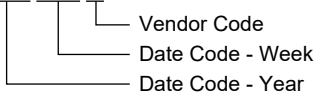
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8924	MSOP-10	-40°C to +85°C	SGM8924YMS10G/TR	SGM8924 YMS10 XXXXX	Tape and Reel, 3000
SGM8924A	MSOP-10	-40°C to +85°C	SGM8924AYMS10G/TR	SGM8924 YMS10 XXXXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

XXXXX



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, +Vs to -Vs.....	6V
Input Common Mode Voltage Range.....	-0.1V to 3.8V
Junction Temperature	+150°C
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility	
HBM.....	8000V
MM.....	400V

performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range	-40°C to +85°C
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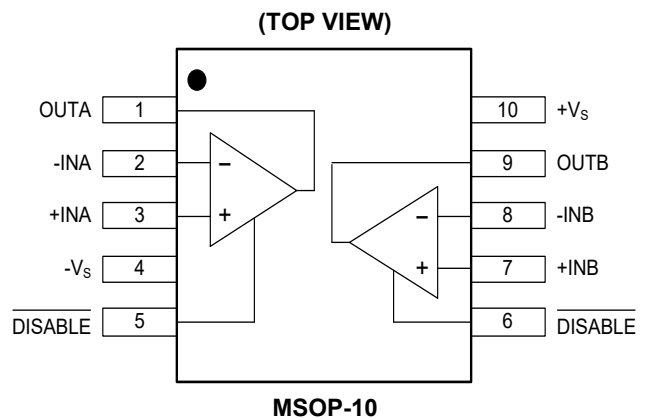
OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle

PIN CONFIGURATION



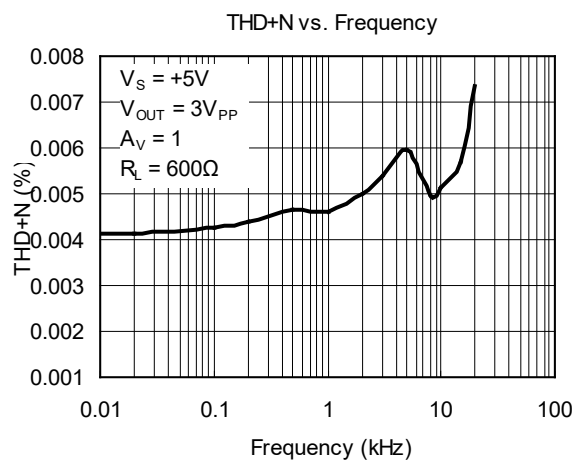
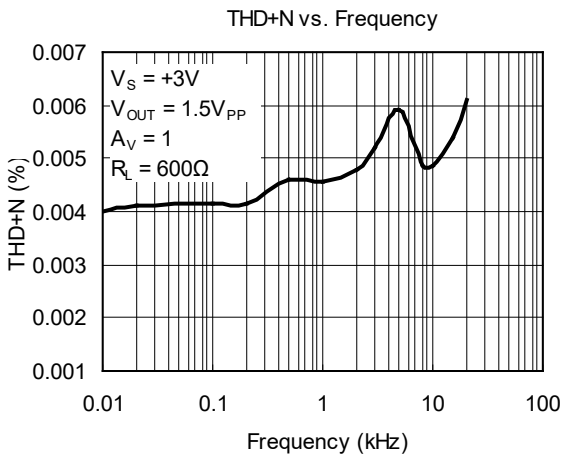
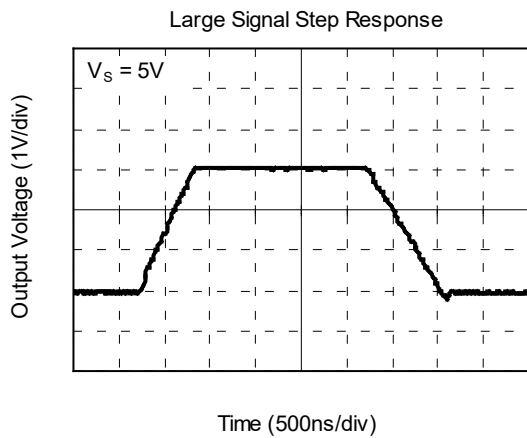
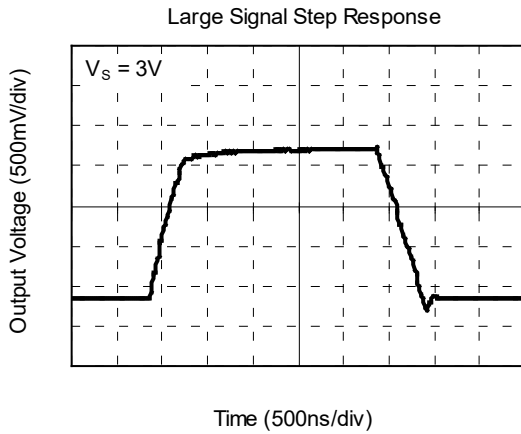
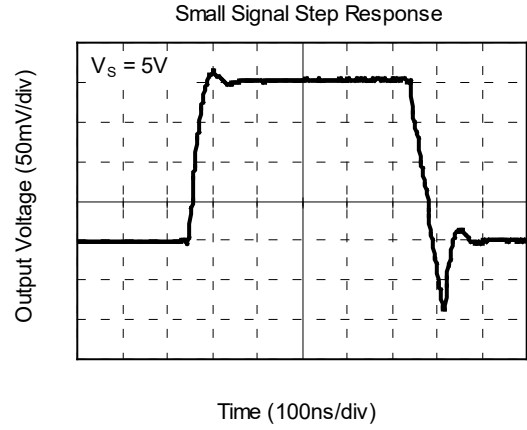
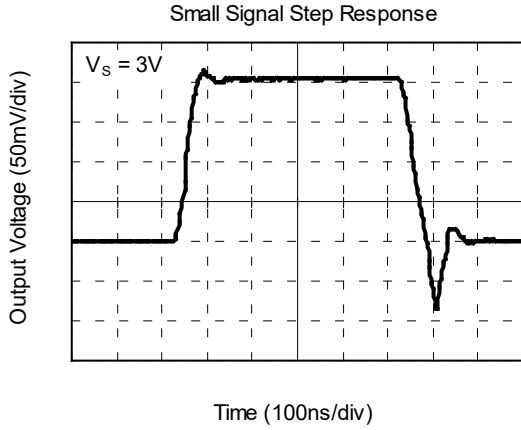
ELECTRICAL CHARACTERISTICS

(At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$, $R_L = 600\Omega$ connected to $V_S/2$, unless otherwise noted.)

PARAMETER	CONDITIONS	SGM8924					
		TYP	MIN/MAX OVER TEMPERATURE			UNITS	MIN /MAX
		+25°C	+25°C	-40°C to +85°C			
Dynamic Performance							
Gain-Bandwidth Product (GBP)	$R_L = 600\Omega$	8.9			MHz	TYP	
Slew Rate	$2V_{PP}$ step, $A_V = 1$	5.13			V/ μs	TYP	
Crosstalk	$f = 1\text{kHz}$	-120			dB	TYP	
Noise/Distortion Performance							
Total Harmonic Distortion + Noise (THD+N)	$V_{OUT} = 2V_{PP}$, $f = 1\text{kHz}$, $A_V = 1$, $R_L = 600\Omega$	0.005			%	TYP	
Input Voltage Noise (e_n)	$f = 1\text{kHz}$	6			nV/ $\sqrt{\text{Hz}}$	TYP	
Phase Margin	$R_L = 600\Omega$, $C_L = 100\text{pF}$	45			degree	TYP	
DC Performance							
Input Offset Voltage (V_{OS})	SGM8924	$V_{CM} = 2.5\text{V}$	-0.05	3	3.5	mV	MAX
	SGM8924A		-0.05	1	1.5	mV	MAX
Input Offset Voltage Drift		1.5			$\mu\text{V}/^\circ\text{C}$	TYP	
Large-Signal Voltage Gain (A_{VO})	$R_L = 600\Omega$, $V_{OUT} = 0.15\text{V}$ to 4.85V	105	100	95	dB	MIN	
	$R_L = 10\text{k}\Omega$, $V_{OUT} = 0.05\text{V}$ to 4.95V	105	100	96	dB	MIN	
Input Characteristics							
Input Common Mode Voltage Range (V_{CM})	$V_{CM} = -0.1\text{V}$ to 3.8V	-0.1 to 3.8			V	TYP	
Common Mode Rejection Ratio (CMRR)	$V_S = 5.5\text{V}$, $V_{CM} = -0.1\text{V}$ to 3.8V	102	88	86	dB	MIN	
Output Characteristics							
Output Voltage Swing from Rails	V_{OH}	$I_{OUT} = 150\text{mA}$	4.84	4.8	4.75	V	MIN
	V_{OL}	$I_{OUT} = -150\text{mA}$	0.16	0.24	0.3	V	MAX
Output Short-Circuit Current		215	212	205	mA	MIN	
Power-Down Disable							
$\overline{\text{DISABLE}}$ High			2.2		V	MIN	
$\overline{\text{DISABLE}}$ Low			0.8		V	MAX	
Power Supply							
Operating Voltage Range			3	3	V	MIN	
			5.5	5.5	V	MAX	
Quiescent Current (per Amplifier)	$I_{OUT} = 0\text{mA}$	5.5	6.5	7.1	mA	MAX	
Shutdown Supply Current	$\overline{\text{DISABLE}} = 0.5\text{V}$	3.9	5.5	6.7	μA	MAX	
Power Supply Rejection Ratio (PSRR)	$V_S = 2.5\text{V}$ to 5.5V ,						
	$V_{CM} = (-V_S) + 0.5\text{V}$	86	75	71	dB	MIN	

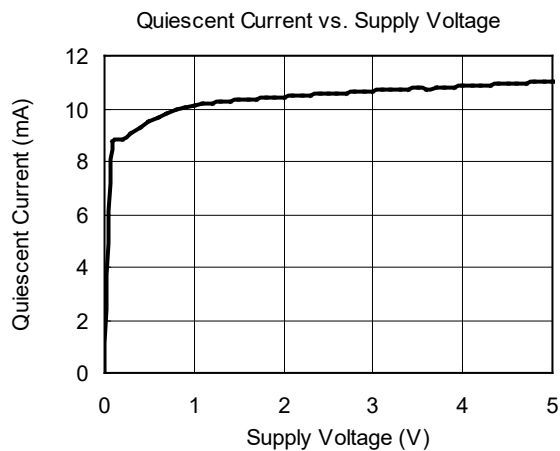
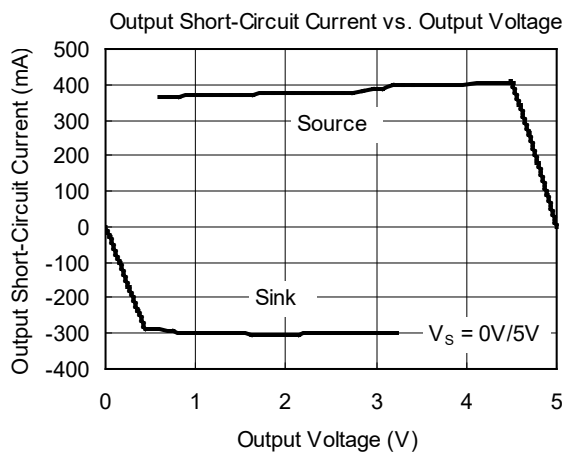
TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $A_V = +1$, $C_L = 100\text{pF}$ and $R_L = 600\Omega$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $A_V = +1$, $C_L = 100\text{pF}$ and $R_L = 600\Omega$, unless otherwise noted.



REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

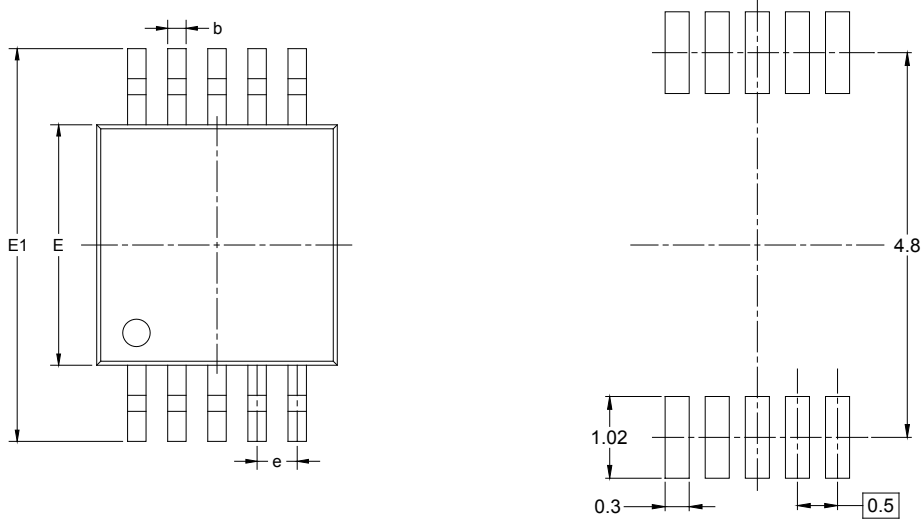
JANUARY 2013 – REV.A.1 to REV.A.2	Page
Changed Package Outline Dimensions section	7
Added Tape and Reel Information section	8, 9

MAY 2011 – REV.A to REV.A.1	Page
Changed package's name	All

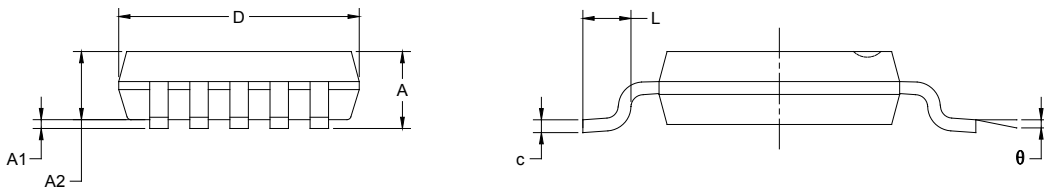
Changes from Original (JULY 2010) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

MSOP-10



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.500 BSC		0.020 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
MSOP-10	13"	12.4	5.20	3.30	1.20	4.0	8.0	2.0	12.0	Q1

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PACKAGE INFORMATION

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13"	386	280	370	5

DD0002