SGM8924
9MHz, Dual Rail-to-Rail Output Operational Amplifier with Shutdown

GENERAL DESCRIPTION

The SGM8924 is a dual, rail-to-rail output operational amplifier that is optimized and fully specified for 5V operation. High output current allows low load impedances to be driven.

The SGM8924 has a wide input common mode voltage range and output voltage swing, running at single-supply voltage from 3V to 5.5V.

The SGM8924 provides excellent overall performance. It exhibits low noise and distortion, low offset and high output current capability, making this device an excellent choice for high quality, low voltage or battery operated audio systems.

The SGM8924 is offered in a Green MSOP-10 package. It is specified over the extended -40℃ to +85℃ temperature range.

FEATURES

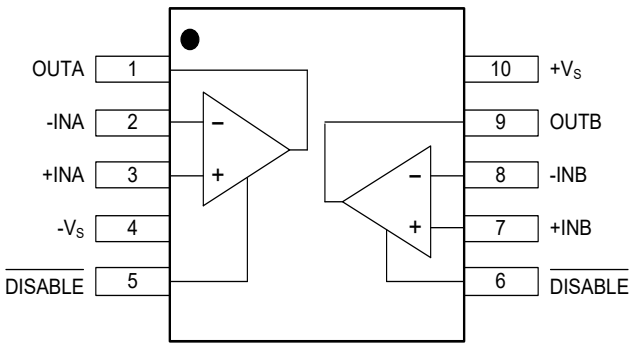
- **Rail-to-Rail Output**
- **Low Noise: 6nV/$\sqrt{Hz}$**
- **Low Distortion**
- **High Output Voltage Swing: 4.75V (with 150mA Output Current)**
- **Low Output Voltage Swing: 0.3V (with 150mA Output Current)**
- **Supply Voltage Range: 3V to 5.5V**
- **Thermal Shutdown Protection Circuitry**
- **Low Input Offset Voltage: 1mV (MAX, SGM8924A)**
- **Gain-Bandwidth Product: 9MHz**
- **Slew Rate: 5.13V/μs**
- **Low Supply Current: 5.5mA/Amplifier (TYP)**
- **-40℃ to +85℃ 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

PIN CONFIGURATION

(TOP VIEW)



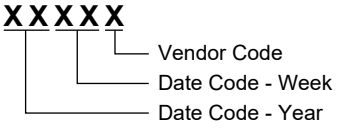
MSOP-10

PACKAGE/ORDERING INFORMATION

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

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.



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

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +85℃

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 by ESD if you don't pay attention to ESD protection. 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 performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

DISCLAIMER

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

ELECTRICAL CHARACTERISTICS

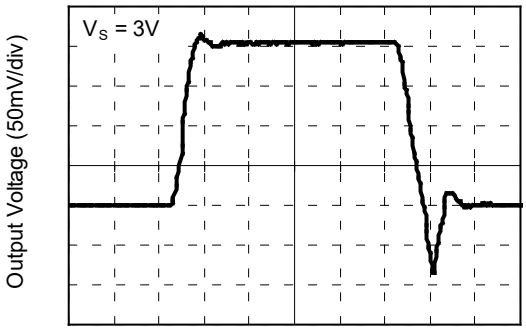
(At T_A = +25℃, V_S = 5V, R_L = 600Ω connected to V_S/2, unless otherwise noted.)

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

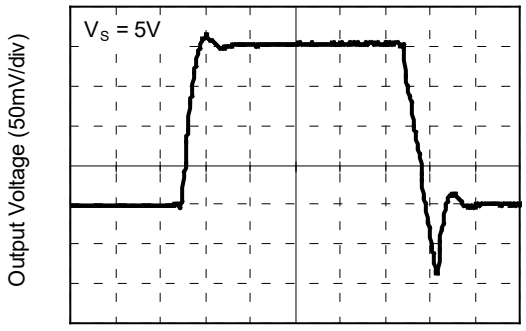
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, A_V = +1, C_L = 100pF and R_L = 600Ω, unless otherwise noted.

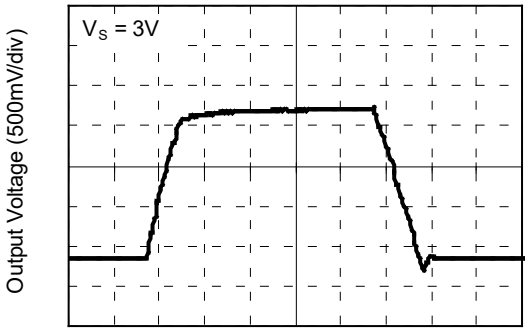
Small Signal Step Response



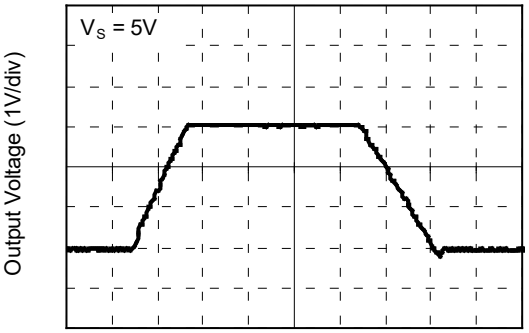
Small Signal Step Response



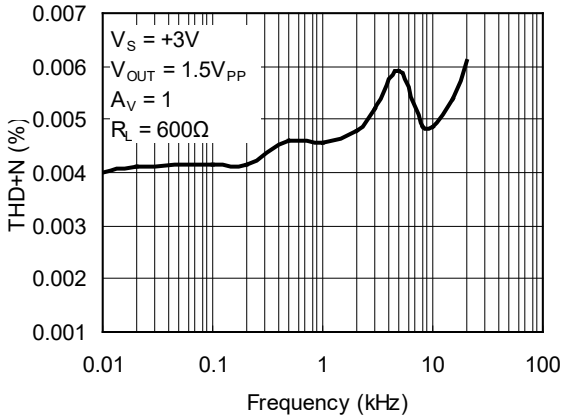
Large Signal Step Response



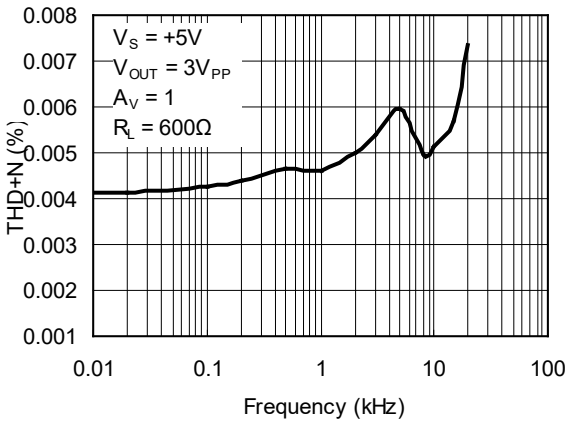
Large Signal Step Response



THD+N vs. Frequency



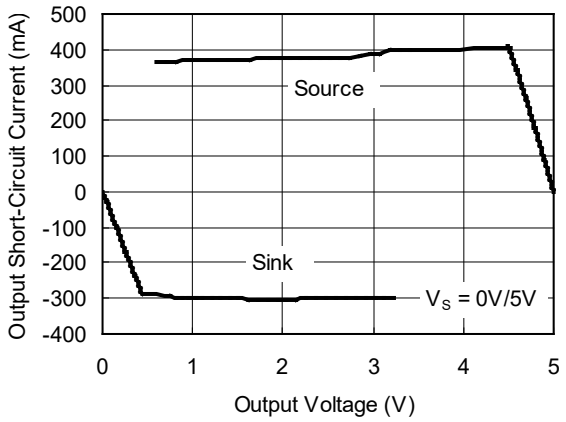
THD+N vs. Frequency



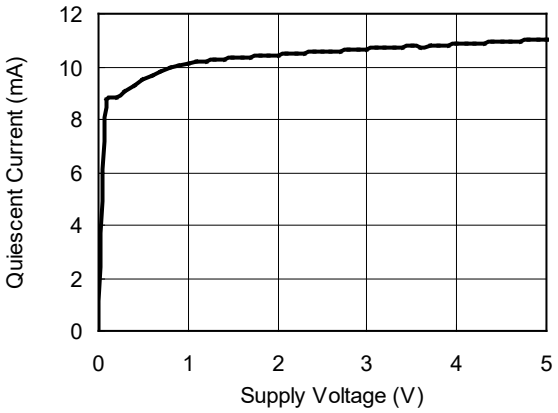
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, A_V = +1, C_L = 100pF and R_L = 600Ω, unless otherwise noted.

Output Short-Circuit Current vs. Output Voltage



Quiescent Current vs. Supply Voltage



REVISION HISTORY

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

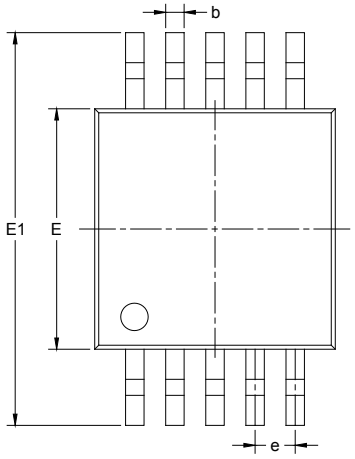
JANUARY 2013 – REV.A.1 to REV.A.2	Page
Changed Package Outline Dimensions section	7
Added Tape and Reel Information section	8, 9

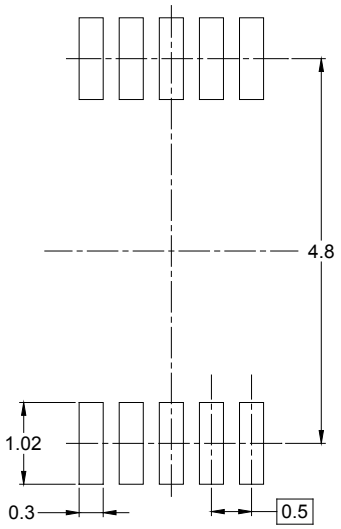
MAY 2011 – REV.A to REV.A.1	Page
Changed package's name	All

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

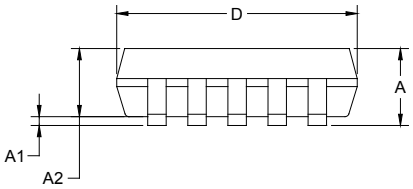
PACKAGE OUTLINE DIMENSIONS

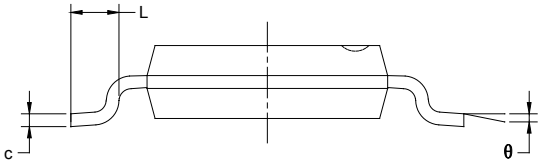
MSOP-10





RECOMMENDED LAND PATTERN (Unit: mm)

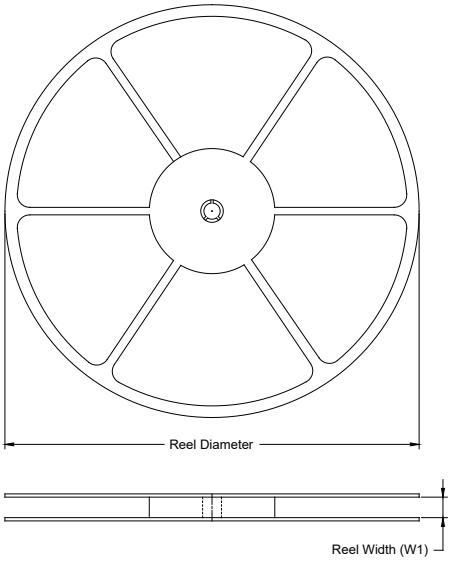




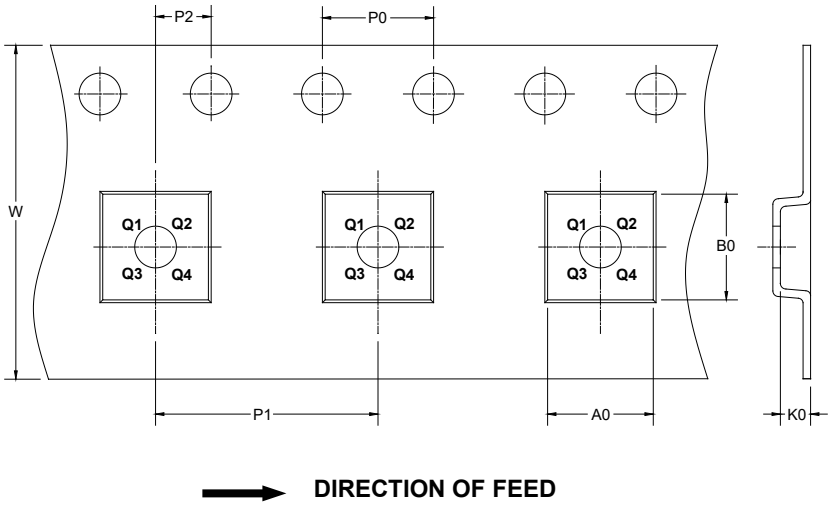
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.500 BSC		0.020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

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

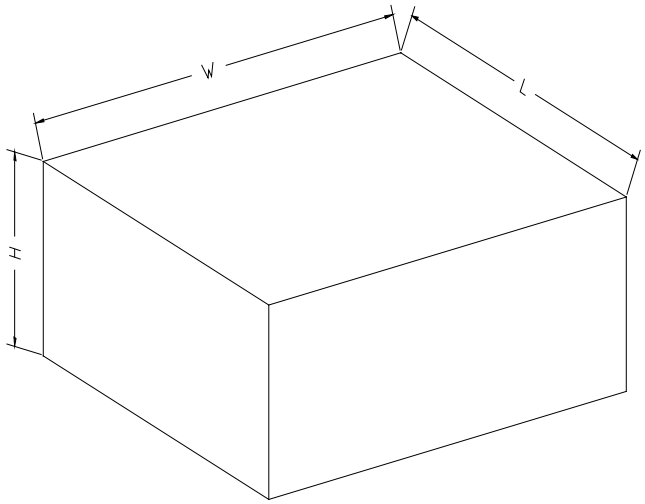
NOTE: The picture is only for reference. Please make the object as the standard.

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

DD0001

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