SGM4918
80mW, Capless, Stereo Headphone Amplifier with Shutdown

GENERAL DESCRIPTION

The SGM4918 stereo headphone amplifier is designed for portable equipment where board space is at a premium. The SGM4918 uses capless architecture to produce a ground-referenced output from a single power supply, eliminating the need for large DC-blocking capacitors for output, saving cost, board space, and component height. Additionally, for SGM4918B, the gain is set internally (-2V/V), further reducing component count. For SGM4918A, the gain can be adjusted by external feedback resistors.

The SGM4918 delivers up to 80mW per channel into a 32Ω load and has low 0.03% THD+N. A -78dB power supply rejection ratio (PSRR) at 217Hz allows this device to operate from noisy digital supplies without an additional linear regulator. Comprehensive click-and-pop circuitry suppresses audible clicks and pops on startup and shutdown.

The SGM4918 operates from a single 2.7V to 5.1V supply, consumes only 5.8mA supply current, has short-circuit and thermal-overload protections, and is specified over the extended -40℃ to +85℃ temperature range. The SGM4918 is available in a Green TDFN-3×3-10L package.

FEATURES

- **SGM4918A: External Feedback Gain Network**
  SGM4918B: Fixed -2V/V Gain
- **No Bulky DC-Blocking Capacitors Required**
- **Ground-Referenced Outputs Eliminate DC-Bias Voltage on Headphone Ground Pin**
- **No Degradation of Low-Frequency Response Due to Output Capacitors**
- **80mW into 32Ω Load from 5V Power Supply at THD+N = 0.1% (TYP, per Channel)**
- **Low 0.03% THD+N**
- **High PSRR (-78dB at 217Hz)**
- **Integrated Click-and-Pop Suppression**
- **2.7V to 5.1V Single Supply Operation**
- **Low Quiescent Current (5.8mA at V_{DD} = 5V)**
- **Shutdown Control**
- **Short-Circuit and Thermal-Overload Protections**
- **Undervoltage Lockout Function**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green TDFN-3×3-10L Package**

APPLICATIONS

Notebook PCs
Cellular Phones
PDAs
MP3 Players
Smart Phones
Portable Audio Equipment

PACKAGE/ORDERING INFORMATION

MODEL	ORDER NUMBER	PACKAGE DESCRIPTION	GAIN (V/V)	MARKING INFORMATION	PACKAGE OPTION
SGM4918A	SGM4918AYD10G/TR	TDFN-3×3-10L	ADJ	SGM 4918AD XXXXX	Tape and Reel, 3000
SGM4918B	SGM4918BYD10G/TR	TDFN-3×3-10L	-2	SGM 4918BD XXXXX	Tape and Reel, 3000

NOTE: **XXXXX** = Date Code and Vendor Code.

ABSOLUTE MAXIMUM RATINGS

V_{DD} to GND.....-0.3V to +6V
C1P to GND..... -0.3V to (V_{DD} + 0.3V)
C1N to GND..... (V_{SS} - 0.3V) to + 0.3V
V_{SS} to GND .....-6V to +0.3V
OUTR, OUTL to GND..... (V_{SS} - 0.3V) to (V_{DD} + 0.3V)
$\overline{SHDN}$ to GND..... -0.3V to +6V
INR, INL to GND..... (V_{SS} - 0.3V) to (V_{DD} + 0.3V)
Output Short Circuit to GND or V_{DD}.....Continuous
Junction Temperature.....150℃
Operating Temperature Range .....-40℃ to +85℃
Storage Temperature Range .....-65℃ to +150℃
Lead Temperature (Soldering, 10s) .....260℃
ESD Susceptibility
HBM 3000V
HBM (Output pins to Supply and Ground pins).....4000V
MM.....200V

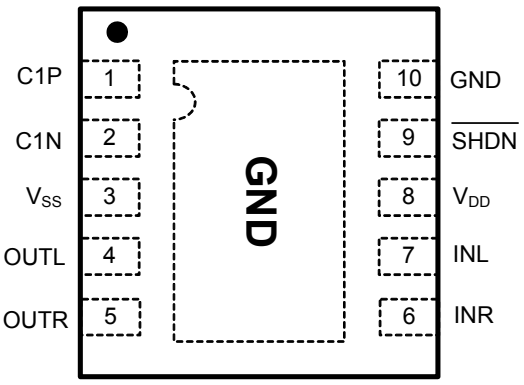
NOTE:
Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

PIN CONFIGURATION (TOP VIEW)



TDFN-3×3-10L

PIN DESCRIPTIONS

PIN	NAME	DESCRIPTION
1	C1P	Flying Capacitor Positive Terminal. Connect a 1μF ceramic capacitor from C1P to C1N.
2	C1N	Flying Capacitor Negative Terminal. Connect a 1μF ceramic capacitor from C1N to C1P.
3	V_{SS}	Charge-Pump Output. Bypass with a 1μF capacitor to GND.
4	OUTL	Left-Channel Output.
5	OUTR	Right-Channel Output.
6	INR	Right-Channel Input.
7	INL	Left-Channel Input.
8	V_{DD}	Positive Power-Supply Input. Bypass with 4.7μF and 0.1μF capacitor to GND.
9	$\overline{SHDN}$	Active-Low Shutdown Input.
10	GND	Signal Ground.
Exposed Paddle	GND	Exposed pad must be soldered to GND.

ELECTRICAL CHARACTERISTICS

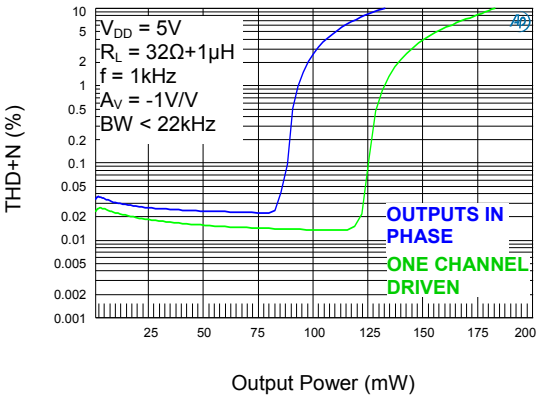
(T_A = +25℃, V_{DD} = $\overline{SHDN}$ = 5V, V_{GND} = 0V, R_{IN} = R_F = 40kΩ (gain = -1V/V), C1 = C2 = 1μF, C3 = 4.7μF, C4 = 0.1μF, R_L = ∞, unless otherwise noted.) (1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
GENERAL							
Supply Voltage Range	V_{DD}			2.7		5.1	V
Undervoltage Lockout	UVLO				2.2		V
Quiescent Supply Current	I_{DD}	$\overline{SHDN}$ = V_{DD}	V_{DD} = 3.3V		5.5		mA
			V_{DD} = 5V		5.8	8.2	
Shutdown Supply Current	I_{SHDN}	$\overline{SHDN}$ = 0V			0.01	3	μA
$\overline{SHDN}$ Input Logic High	V_{IH}			1.2			V
$\overline{SHDN}$ Input Logic Low	V_{IL}					0.4	V
Turn-On Time	t_{ON}	V_{DD} = 5V			2.8		ms
AMPLIFIERS							
Output Offset Voltage	V_{OS}	Input AC-coupled to ground	V_{DD} = 3.3V		1.0		mV
			V_{DD} = 5V	-5.5	1.2	5.5	
Power Supply Rejection Ratio	PSRR	V_{DD} = 5V	f = 217Hz, V_{RIPPLE} = 200mV_{P-P}		-78		dB
			f = 1kHz, V_{RIPPLE} = 200mV_{P-P}		-68		
			f = 20kHz, V_{RIPPLE} = 200mV_{P-P}		-63		
Output Power	P_{OUT}	R_L = 32Ω + 1μH, f = 1kHz, THD+N = 0.1%	V_{DD} = 3.6V		40		mW
			V_{DD} = 5V		80		
Output Impedance in Shutdown		$\overline{SHDN}$ = 0V			2		kΩ
Total Harmonic Distortion Plus Noise	THD+N	V_{DD} = 3.6V	R_L = 32Ω + 1μH, f = 1kHz P_{OUT} = 10mW		0.02		%
		V_{DD} = 5V	R_L = 32Ω + 1μH, f = 1kHz P_{OUT} = 20mW		0.03		
Signal-to-Noise Ratio	SNR	V_{DD} = 5V, R_L = 32Ω + 1μH, P_{OUT} = 25mW, BW < 22kHz			100		dB
Crosstalk		L to R, R to L, f = 10kHz	R_L = 32Ω + 1μH, V_{OUT} = 360mV_{RMS}		68		dB
			R_L = 32Ω + 1μH, V_{OUT} = 2V_{RMS}		68		
Capacitive Drive	C_L	No sustained oscillations			200		pF
Charge-Pump Oscillator Frequency	f_{OSC}			200	345	515	kHz
Thermal Shutdown Threshold					140		℃
Thermal Shutdown Hysteresis					15		℃

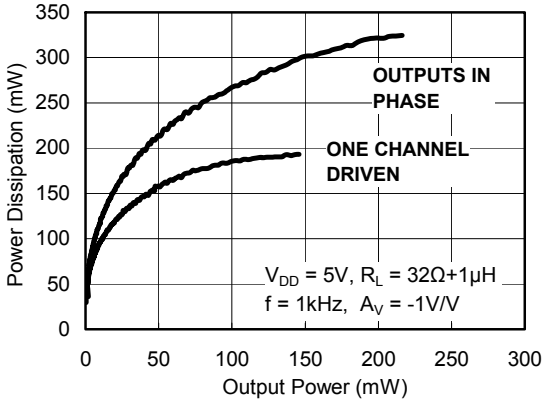
NOTE:
1. For R_{IN}, R_F, C1 and etc, please refer to the FUNCTIONAL DIAGRAM/TYPICAL APPLICATION CIRCUIT on page 8.

TYPICAL PERFORMANCE CHARACTERISTICS

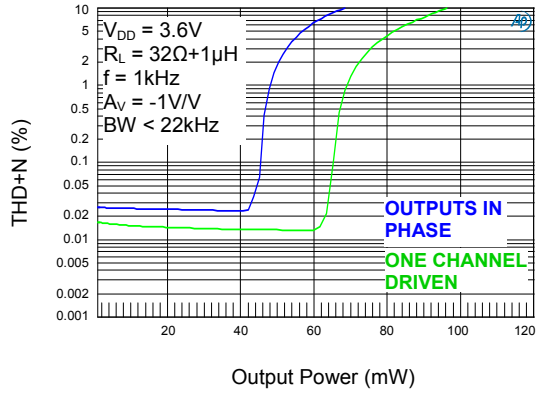
THD+N vs. Output Power



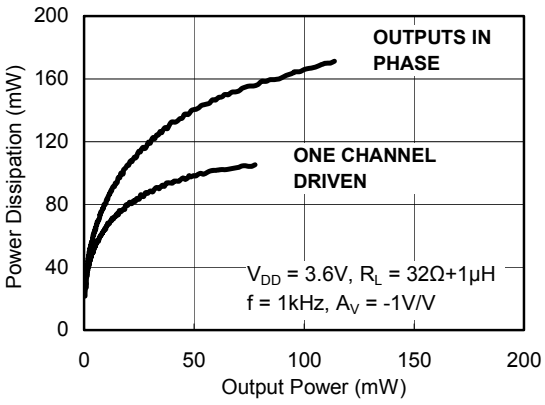
Power Dissipation vs. Output Power



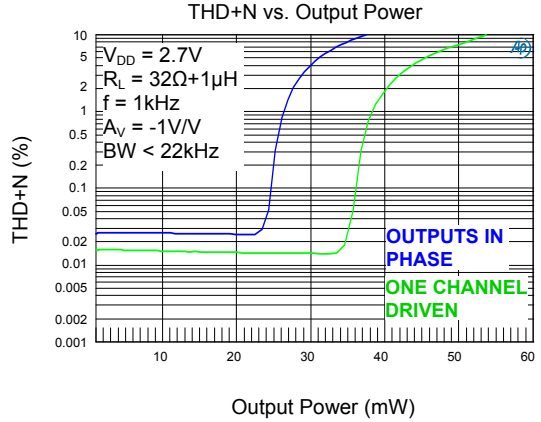
THD+N vs. Output Power



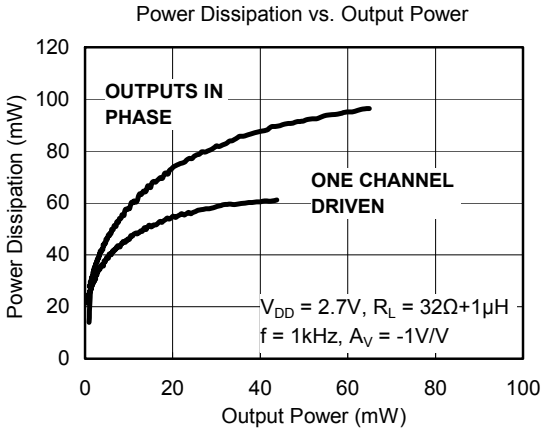
Power Dissipation vs. Output Power



THD+N vs. Output Power

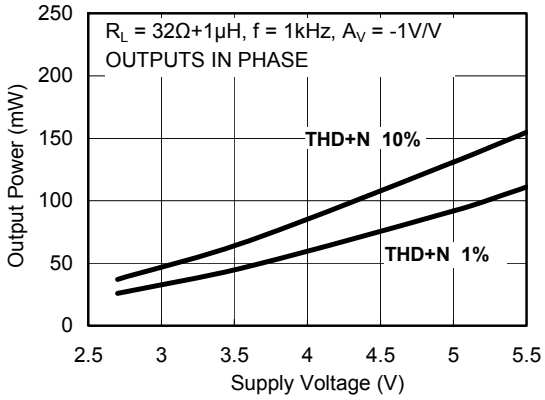


Power Dissipation vs. Output Power

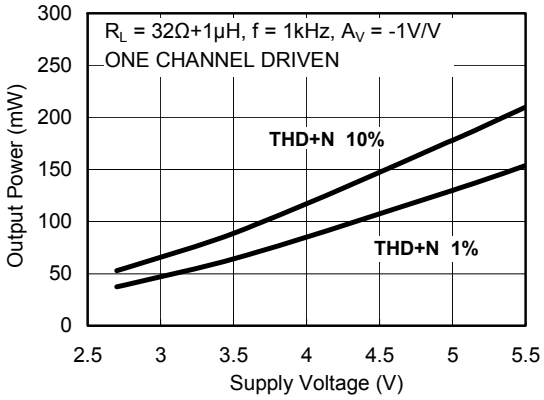


TYPICAL PERFORMANCE CHARACTERISTICS

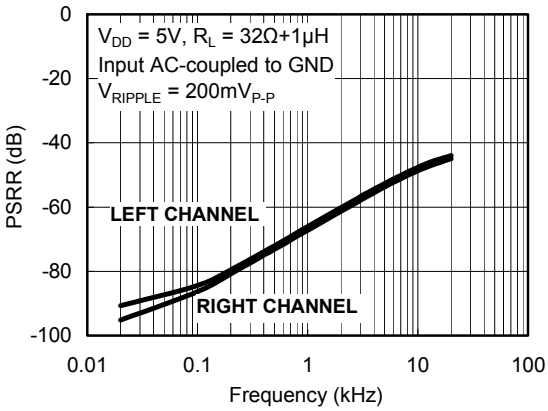
Output Power vs. Supply Voltage



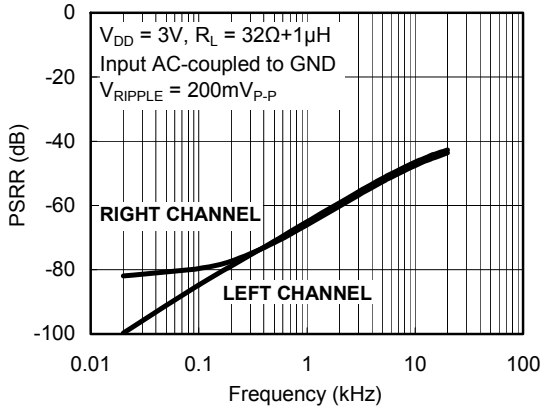
Output Power vs. Supply Voltage



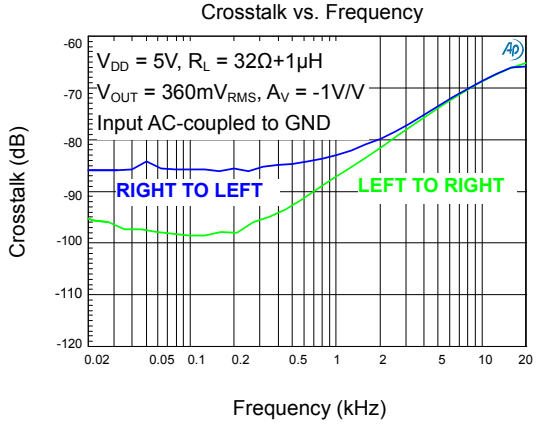
Power Supply Rejection Ratio vs. Frequency



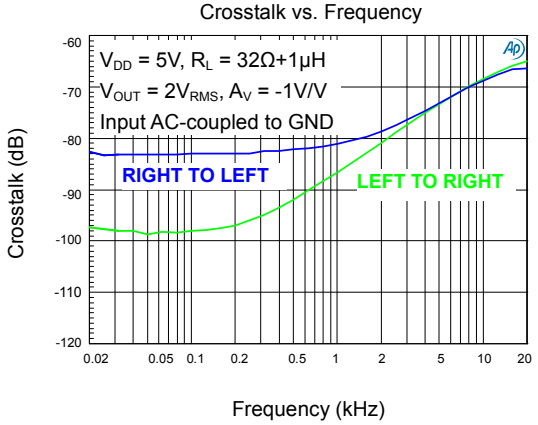
Power Supply Rejection Ratio vs. Frequency



Crosstalk vs. Frequency

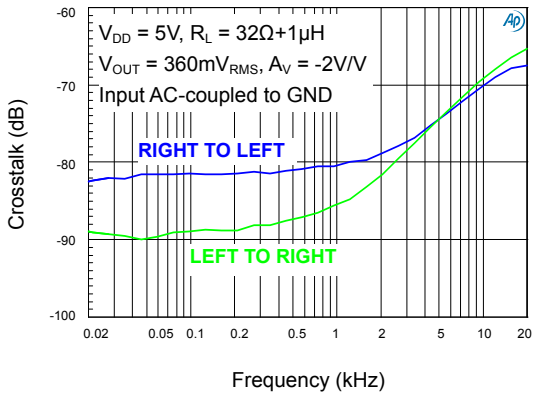


Crosstalk vs. Frequency

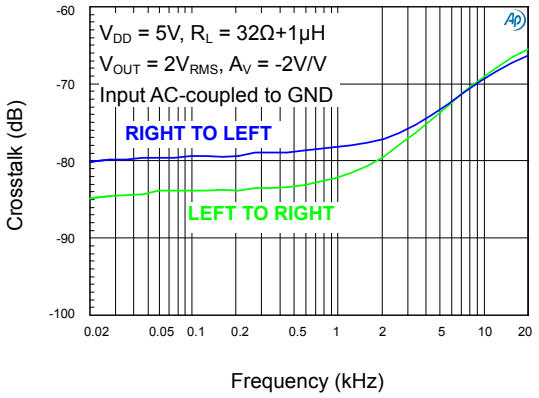


TYPICAL PERFORMANCE CHARACTERISTICS

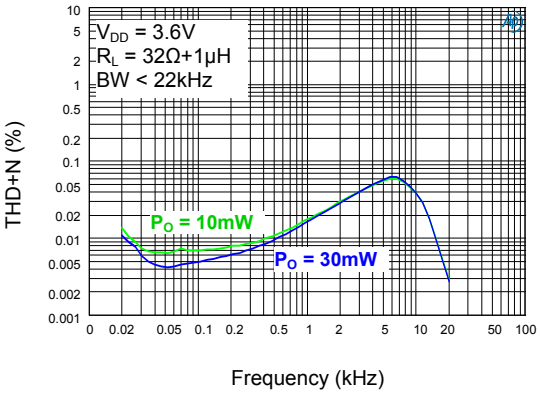
Crosstalk vs. Frequency



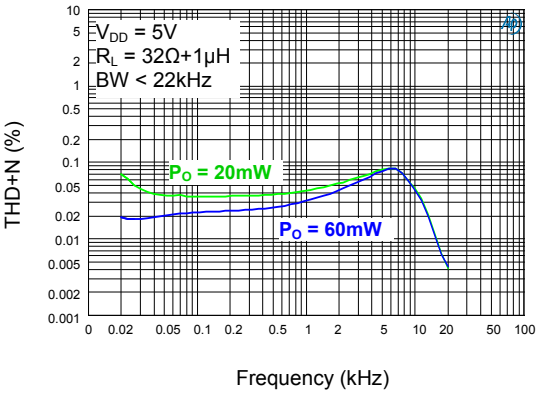
Crosstalk vs. Frequency



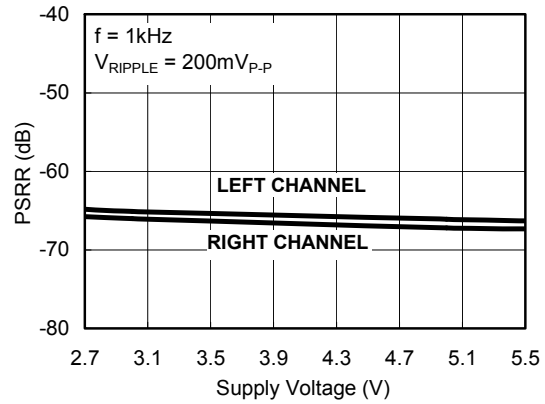
THD+N vs. Frequency



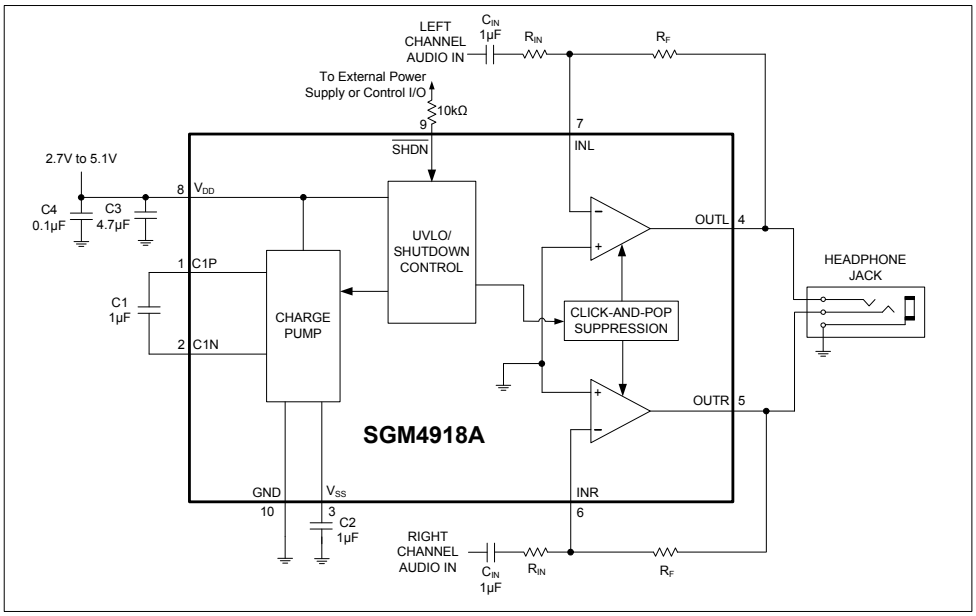
THD+N vs. Frequency

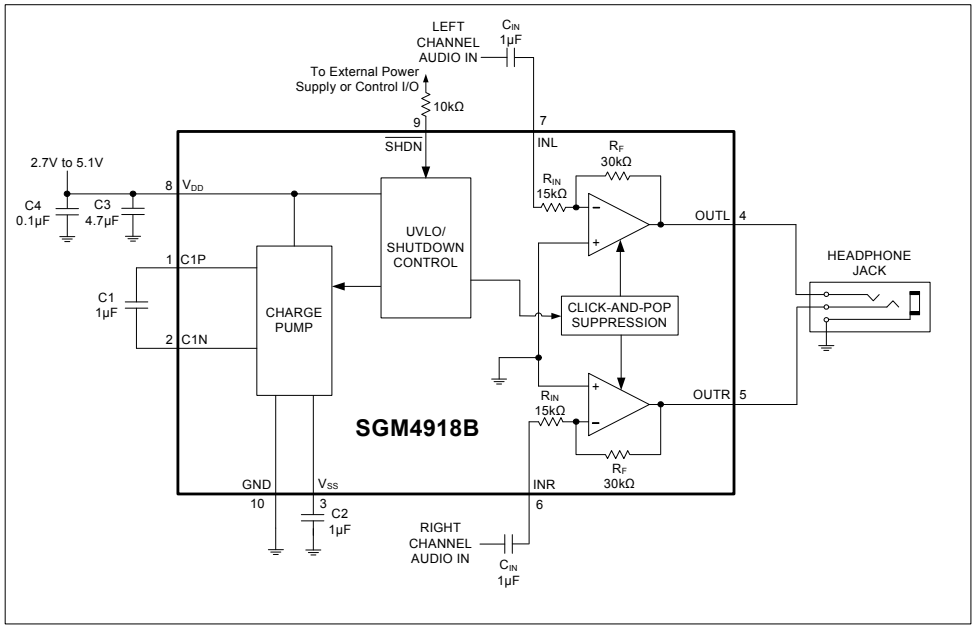


PSRR vs. Supply Voltage



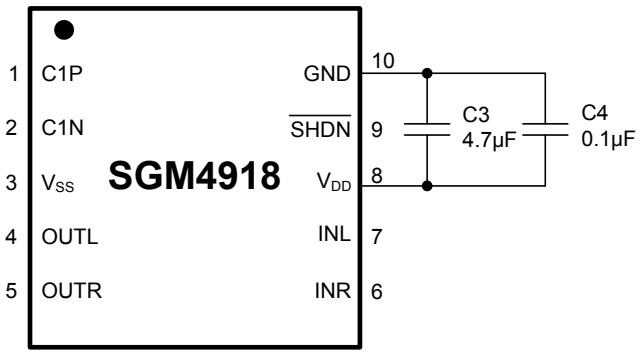
FUNCTIONAL DIAGRAM/TYPICAL APPLICATION CIRCUIT





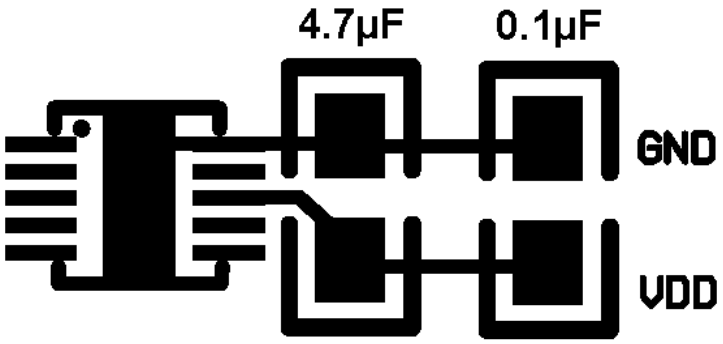
NOTES:
1. In order to get good performance, it's important to select the right C1, C2 and C3 in application. All tests are performed with circuit set up with X5R and X7R capacitors. Capacitors having high dissipative loss, such as Y5V capacitor, may cause performance degradation and unexpected system behavior.
2. A 10kΩ resistor must be serially connected to $\overline{\text{SHDN}}$ pin.

PCB LAYOUT GUIDE



TDFN-3×3-10L

The reference PCB layout is shown below:



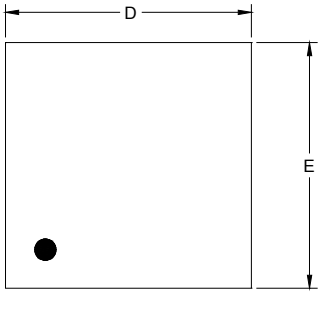
NOTES:

1. To ensure the normal operation of the device, decoupling capacitors (C3 and C4) must be placed as close to SGM4918 as possible. The loop length formed by C3/C4, V_{DD} and GND should be no longer than 5mm; otherwise the device will not start up at high supply voltage.

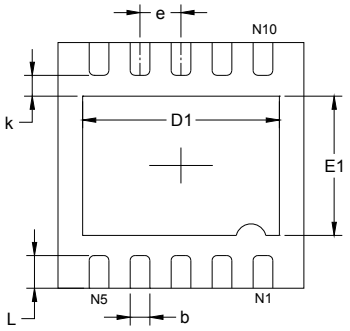
2. Proper layout and ground connection are essential for optimum performance. Connect Exposed Paddle and GND together at a single point on the PCB. Ensure ground return resistance is minimized for optimum THD and crosstalk performance. Place the power-supply bypass capacitor, the charge-pump hold capacitor, and the charge-pump flying capacitor as close as possible to the SGM4918. Route all traces that carry switching transients away from the audio signal path.

PACKAGE OUTLINE DIMENSIONS

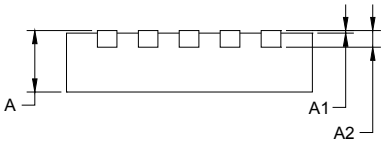
TDFN-3×3-10L



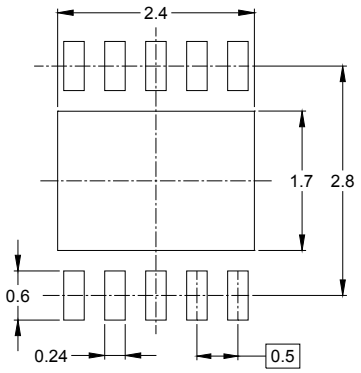
TOP VIEW



BOTTOM VIEW



SIDE VIEW

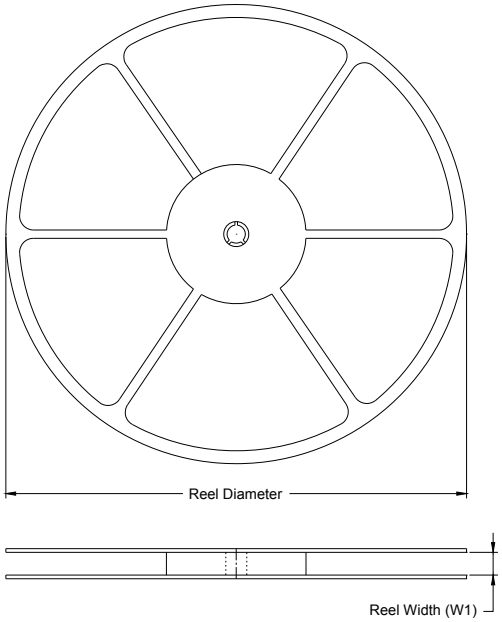


RECOMMENDED LAND PATTERN (Unit: mm)

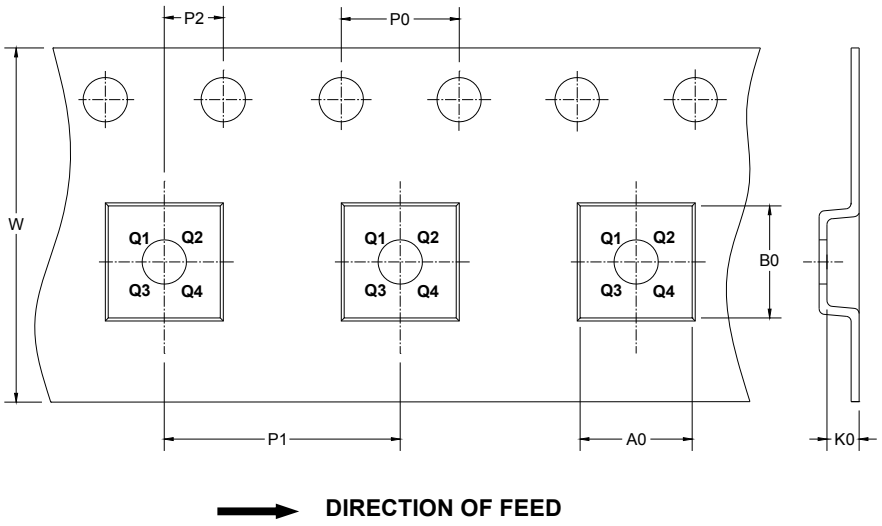
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.103
E	2.900	3.100	0.114	0.122
E1	1.500	1.800	0.059	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS

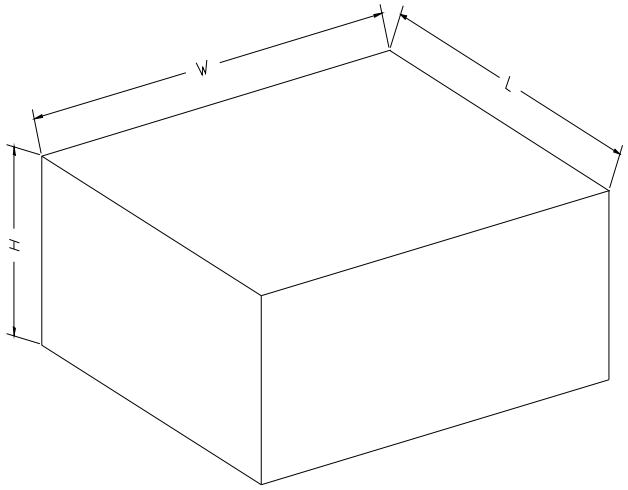


NOTE: The picture is only for reference. Please make the object as the standard.

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
TDFN-3×3-10L	13″	12.4	3.35	3.35	1.13	4.00	8.00	2.00	12.00	Q1

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