SGM4917
125mW, Capless, Stereo Headphone Amplifier with Shutdown

GENERAL DESCRIPTION

The SGM4917 stereo headphone amplifier is designed for portable equipment where board space is at a premium. The SGM4917 uses capless Direct-drive architecture to produce a ground-referenced output from a single power supply, eliminating the need for large DC-blocking capacitors for output, and saving cost, board space, and component height. Additionally, for SGM4917B and SGM4917C, the gain is set internally (-2V/V or -1.5V/V), further reducing component count. For SGM4917A, the Gain can be adjusted by external feedback resistors.

The SGM4917 delivers up to 125mW per channel into a 32Ω load and has low 0.02% THD+N. A 78dB at 217Hz power-supply rejection ratio (PSRR) 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 SGM4917 operates from a single 2.7V to 5.5V supply, consume only 2.7mA of supply current, and is specified over the extended -40°C to +85°C temperature range. The SGM4917 is available in a Green TSSOP16 and TQFN3×3-16L packages.

FEATURES

- **SGM4917A: External Feedback Gain Network**
  SGM4917B: Fixed -2V/V Gain
  SGM4917C: Fixed -1.5V/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**
- **Differential Inputs for Enhanced Noise Cancellation**
- **125mW per Channel into 32Ω Headset**
- **Low 0.02% THD+N**
- **High PSRR (78dB at 217Hz)**
- **Integrated Click-and-Pop Suppression**
- **2.7V to 5.5V Single Supply Operation**
- **Low Quiescent Current (2.7mA)**
- **Shutdown Control**
- **Undervoltage Lockout Function**
- **-40℃ to +85℃ Operating Temperature Range**
- **Green TSSOP16 and TQFN3×3-16L Packages**

APPLICATIONS

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

PACKAGE/ORDERING INFORMATION

MODEL	ORDER NUMBER	PACKAGE DESCRIPTION	MARKING INFORMATION	PACKAGE OPTION
SGM4917	SGM4917YTQ16G/TR	TQFN3×3-16L	4917TQ	Tape and Reel, 3000
	SGM4917YTS16G/TR	TSSOP16	SGM4917YTS16	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

PGND to SGND .....-0.3V to +0.3V
PV_{DD} and SV_{DD} to PGND or SGND.....-0.3V to +6V
PV_{SS} and SV_{SS} to PGND.....+0.3V to -6V
IN_ to SGND..... (SV_{SS} - 0.3V) to (SV_{DD} + 0.3V)
OUT_ to PGND..... (SV_{SS} - 0.3V) to (SV_{DD} + 0.3V)
$\overline{SHDN}$_ to SGND..... (SGND - 0.3V) to (SV_{DD} + 0.3V)
C1P to PGND..... - 0.3V to (PV_{DD} + 0.3V)
C1N to PGND..... (SV_{SS} - 0.3V) to + 0.3V
PV_{DD} to SV_{DD} 0V
PV_{SS} to SV_{SS} 0V
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℃

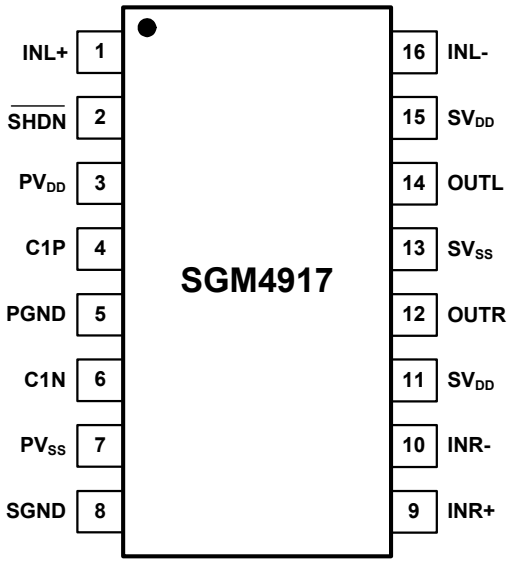
Note: Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

CAUTION

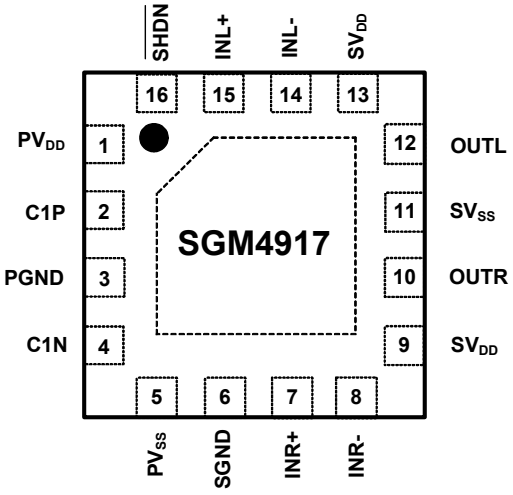
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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 last datasheet.

PIN CONFIGURATION (Top View)



TSSOP16



TQFN3×3-16L

PIN DESCRIPTIONS

PIN	NAME	DESCRIPTION
1	PV_{DD}	Charge-Pump Power Supply. Powers charge-pump inverter, charge-pump logic, and oscillator. Connect to positive supply (2.7V to 5.5V). Bypass with a 1μF capacitor to PGND as close to the pin as possible.
2	C1P	Flying Capacitor Positive Terminal
3	PGND	Power Ground. Connect to ground.
4	C1N	Flying Capacitor Negative Terminal
5	PV_{SS}	Charge-Pump Output. Connect to SV_{SS}.
6	SGND	Signal Ground. Connect to ground.
7	INR+	Noninverting Right-Channel Audio Input
8	INR-	Inverting Right-Channel Audio Input
9,13	SV_{DD}	Amplifier Positive Power Supply. Connect to positive supply (2.7V to 5.5V). Bypass with a 1μF capacitor to SGND as close to the pin as possible.
10	OUTR	Right-Channel Output
11	SV_{SS}	Amplifier Negative Power Supply. Connect to PV_{SS}.
12	OUTL	Left-Channel Output
14	INL-	Inverting Left-Channel Audio Input
15	INL+	Noninverting Left-Channel Audio Input
16	$\overline{SHDN}$	Active-Low Shutdown Input
-—	EP	Exposed Paddle. Leave unconnected.

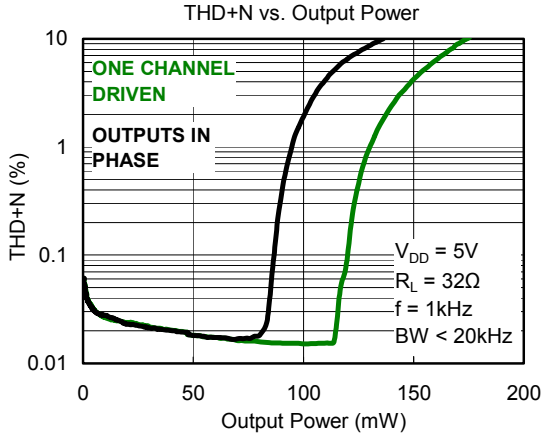
ELECTRICAL CHARACTERISTICS

(PV_{DD} = SV_{DD} = +5V, PGND = SGND = 0V, $\overline{SHDN}$ = SV_{DD}, C1 = C2 = 1μF, R_L = ∞, resistive load referenced to ground, for SGM4917A gain = -1V/V (R_{IN} = R_F = 10kΩ), for SGM4917B and SGM4917C (internally set). Typical values are at T_A = +25°C, unless otherwise noted.)

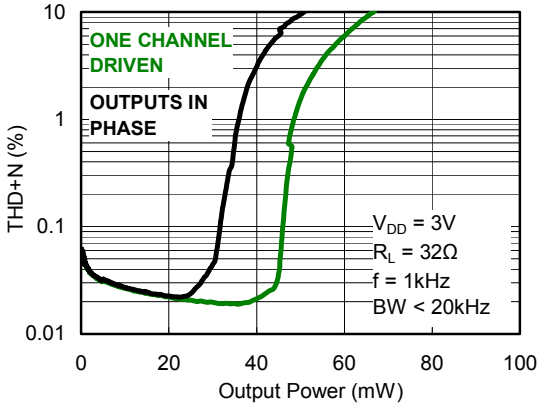
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
GENERAL						
Supply Voltage Range	V_{DD}	Guaranteed by PSRR test	2.7		5.5	V
Quiescent Supply Current	I_{DD}	R_L = ∞, $\overline{SHDN}$ = V_{DD}		2.7		mA
Shutdown Supply Current	$I_{\overline{SHDN}}$	$\overline{SHDN}$ = SGND		0.01		μA
$\overline{SHDN}$ Input Logic High	V_{IH}		1.2			V
$\overline{SHDN}$ Input Logic Low	V_{IL}				0.4	V
$\overline{SHDN}$ to Full Operation Time	t_{SON}			3.2		ms
AMPLIFIERS						
Voltage Gain	A_V	SGM4917B		1.99		V/V
Gain Matching		SGM4917B, between the right and left channels		0.2		%
Input Offset Voltage	V_{IS}	Between IN_+ and IN_-, AC-coupled (SGM4917A)		0.4		mV
Input Impedance	R_{IN}	SGM4917B, measured at IN_		14.6		kΩ
Common-Mode Rejection Ratio	CMRR	Input referred, SGM4917A, T_A = +25°C		-70		dB
Power-Supply Rejection Ratio	PSRR	DC, V_{DD} = 2.7V to 5.5V		-85		dB
		f = 217Hz, V_{RIPPLE} = 200mV_{P-P}		-78		
		f = 10kHz, V_{RIPPLE} = 200mV_{P-P}		-70		
Output Power	P_{OUT}	R_L = 32Ω, THD+N = 1%, T_A = +25°C		125		mW
Output Impedance in Shutdown				1.92		kΩ
Total Harmonic Distortion Plus Noise	THD+N	R_L = 32Ω, P_{OUT} = 55mW, f = 1kHz		0.02		%
Signal-to-Noise Ratio	SNR	R_L = 32Ω, P_{OUT} = 20mW, BW < 20kHz		100		dB
Maximum Capacitive Load	C_L	No sustained oscillation		200		pF
Charge-Pump Oscillator Frequency	f_{OSC}			350		kHz
Crosstalk		R_L = 32Ω, V_{IN} = 200mV_{P-P}, f = 10kHz A_V = -1V/V		90		dB
Thermal-Shutdown Threshold				160		°C
Thermal-Shutdown Hysteresis				24		°C

TYPICAL PERFORMANCE CHARACTERISTICS

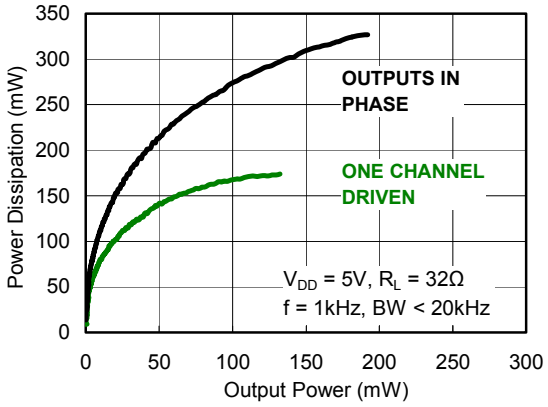
THD+N vs. Output Power



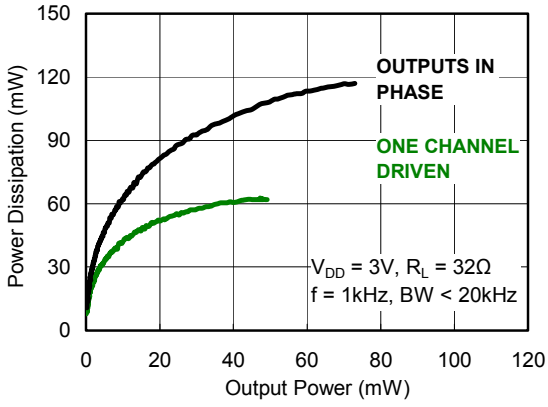
THD+N vs. Output Power



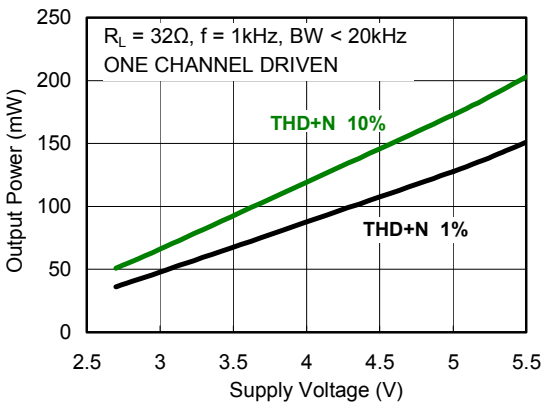
Power Dissipation vs. Output Power



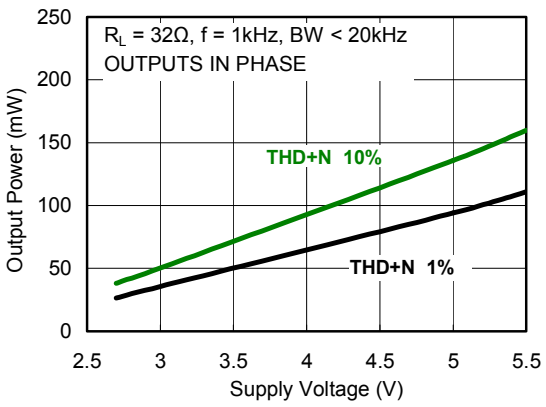
Power Dissipation vs. Output Power



Output Power vs. Supply Voltage

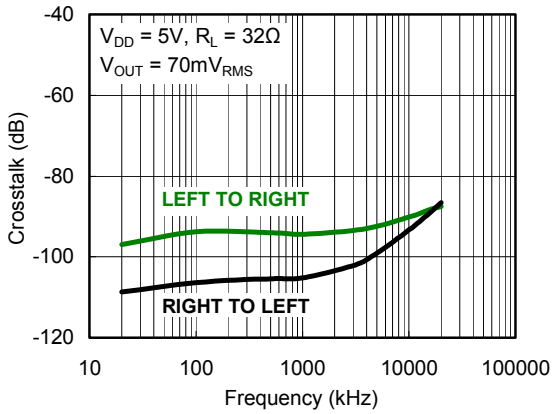


Output Power vs. Supply Voltage

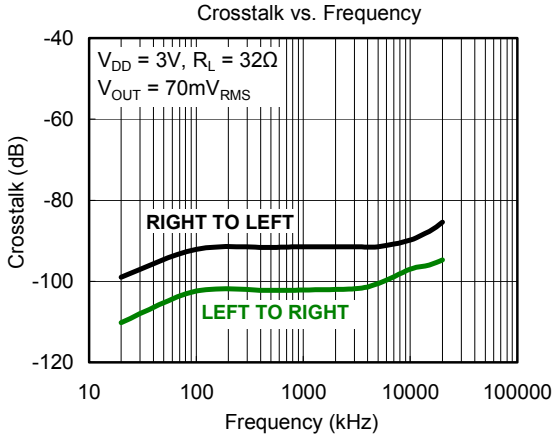


TYPICAL PERFORMANCE CHARACTERISTICS

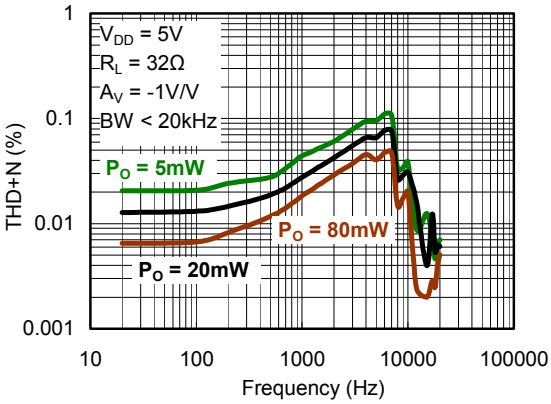
Crosstalk vs. Frequency



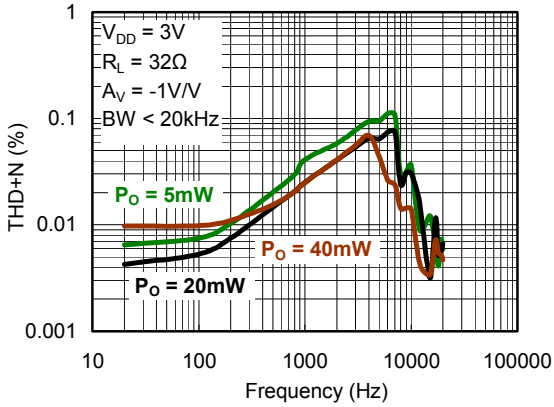
Crosstalk vs. Frequency



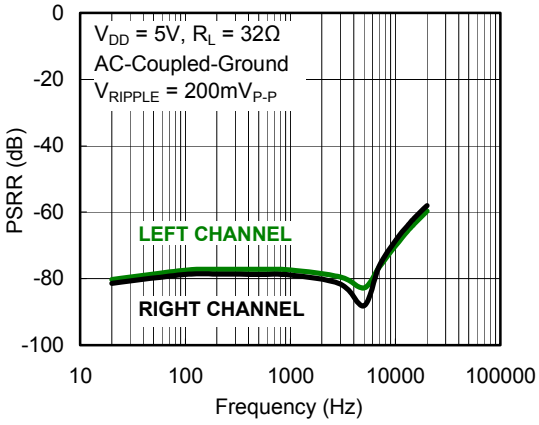
THD+N vs. Frequency



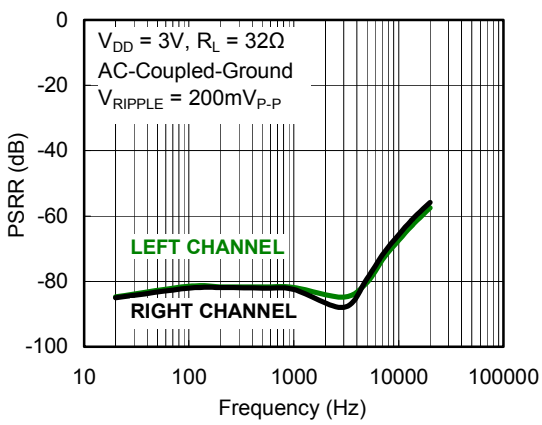
THD+N vs. Frequency



Power Supply Rejection Ratio vs. Frequency

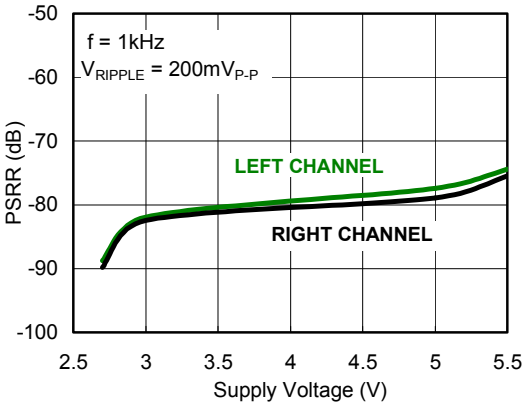


Power Supply Rejection Ratio vs. Frequency

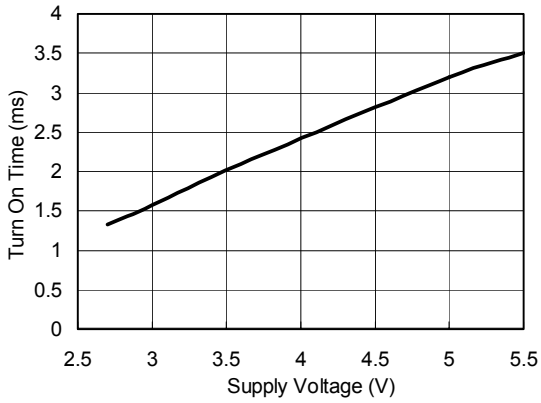


TYPICAL PERFORMANCE CHARACTERISTICS

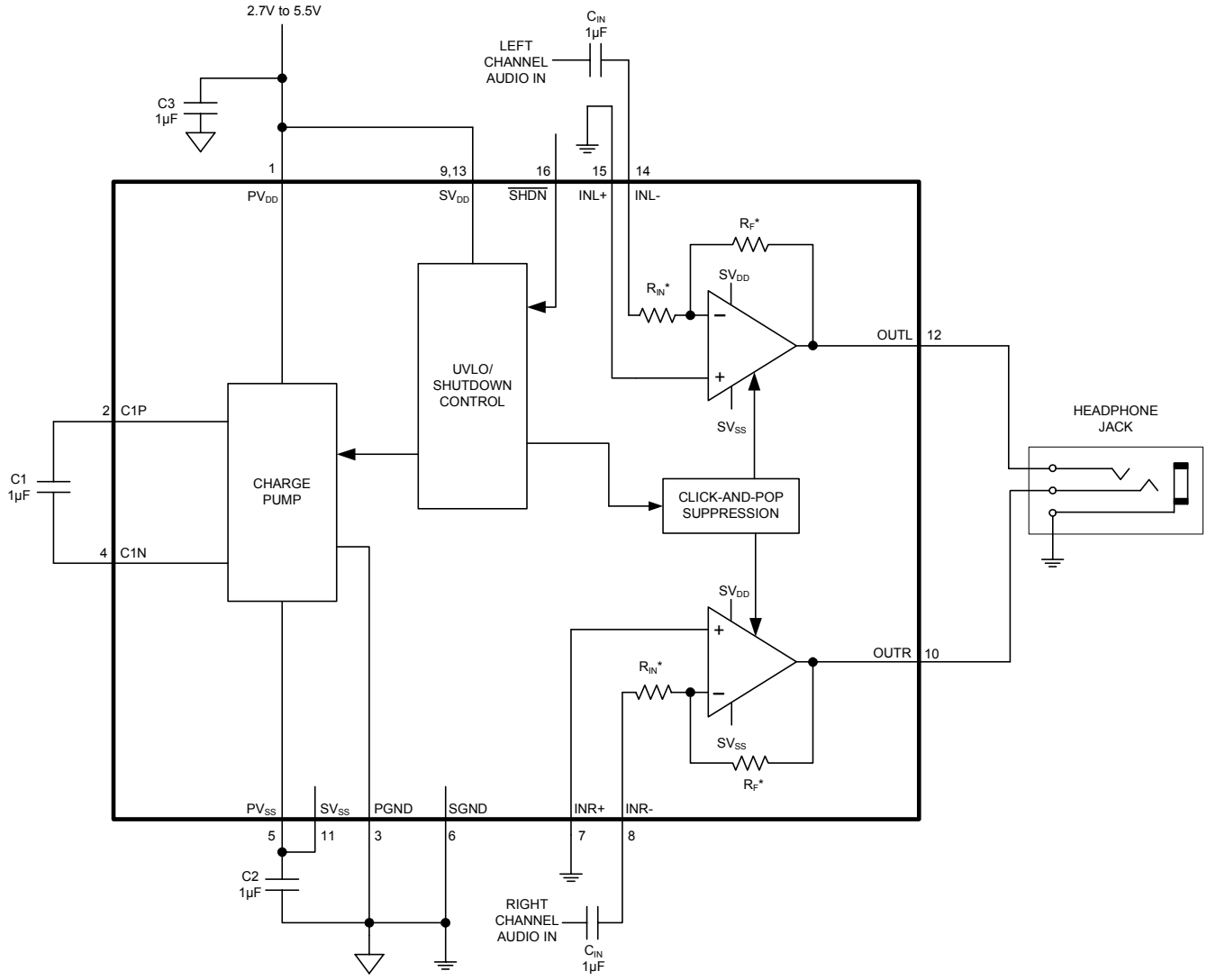
PSRR vs. Supply Voltage



Turn On Time vs. Supply Voltage



Functional Diagram/Typical Application Circuit

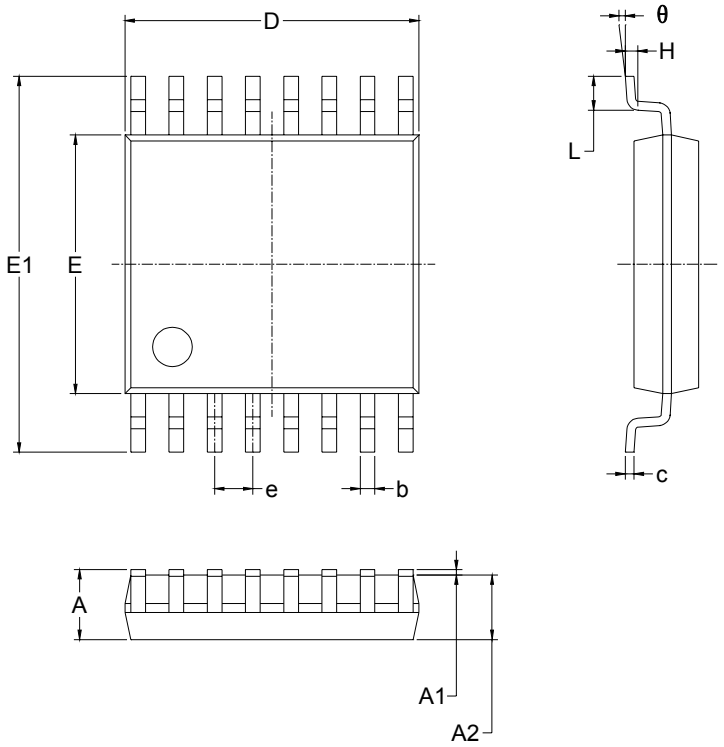


* FOR SGM4917A, R_{IN} AND R_F ARE EXTERNAL TO THE DEVICE.
FOR SGM4917B, R_{IN} = 15kΩ, R_F = 30kΩ
FOR SGM4917C, R_{IN} = 15kΩ, R_F = 22.5kΩ

Note: For ensure the normal operation of the device, 0.1μF decoupling capacitor (C3) must be placed as close to SGM4917, otherwise the device will not start up at high supply voltage.

PACKAGE OUTLINE DIMENSIONS

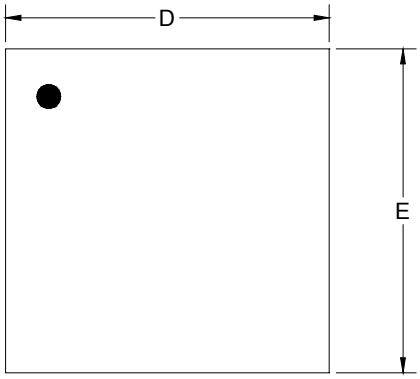
TSSOP16



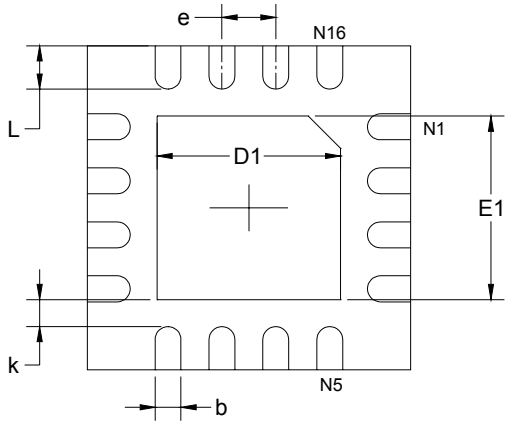
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.100		0.043
A1	0.050	0.150	0.002	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.900	5.100	0.193	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

PACKAGE OUTLINE DIMENSIONS

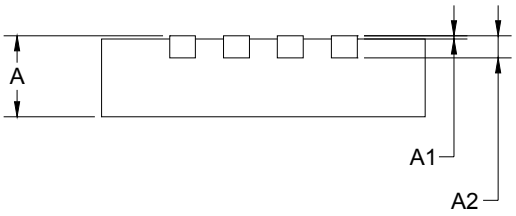
TQFN3×3-16L



TOP VIEW



BOTTOM VIEW



SIDE VIEW

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	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	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