



SGM4808

Wide Power Supply Range Audio Click-Pop Noise Eliminator

GENERAL DESCRIPTION

The SGM4808 is an audio click-pop eliminator which can operate from a 2.7V to 12V single power supply. It is designed for HiFi audio system or portable devices.

The SGM4806 allows $-V_{CC}$ to $+V_{CC}$ wide range audio signals passing with low distortion. An external processor can eliminate the click-pop noise.

The SGM4808 is available in Green TQFN-2.6×1.8-16L and SOIC-16 packages. It operates over an ambient temperature range of -40°C to $+85^{\circ}\text{C}$.

FEATURES

- **Supply Voltage Range:** 2.7V to 12V
- **Low On-Resistance:** 1.1Ω (TYP)
- **$-V_{CC}$ to $+V_{CC}$ Rail-to-Rail Low Distortion Audio Signals Passing**
- **Fast Switching Times**
- **High Off-Isolation**
- **Low Crosstalk**
- **1.8V Logic Control**
- **-40°C to $+85^{\circ}\text{C}$ Operating Temperature Range**
- **Available in Green TQFN-2.6×1.8-16L and SOIC-16 Packages**

APPLICATIONS

HiFi Audio System
Portable Equipment

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4808	TQFN-2.6×1.8-16L	-40°C to +85°C	SGM4808YTQA16G/TR	4808 XXXXXX	Tape and Reel, 3000
	SOIC-16	-40°C to +85°C	SGM4808YS16G/TR	SGM4808YS16 XXXXXX	Tape and Reel, 2500

NOTE: XXXXXX = 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

V_{CC} to GND 0V to 13.2V
 MUTER, MUTEL, EN to GND 0V to 6V
 Passing Audio Signals Range ⁽¹⁾
 (- V_{CC} - 0.3V) to (V_{CC} + 0.3V)
 Continuous Current ±200mA
 Peak Current ±250mA
 I/O Clamp Current ($V_I < 0$) -30mA
 Junction Temperature +150°C
 Storage Temperature Range -65°C to +150°C
 Lead Temperature (Soldering, 10s) +260°C
 ESD Susceptibility
 HBM 7000V
 MM 300V
 CDM 1000V

NOTE:

1. Signals on RIN, LIN, ROUT, LOUT, exceeding V_{CC} will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range 2.7V to 12V
 Operating Temperature Range -40°C to +85°C

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.

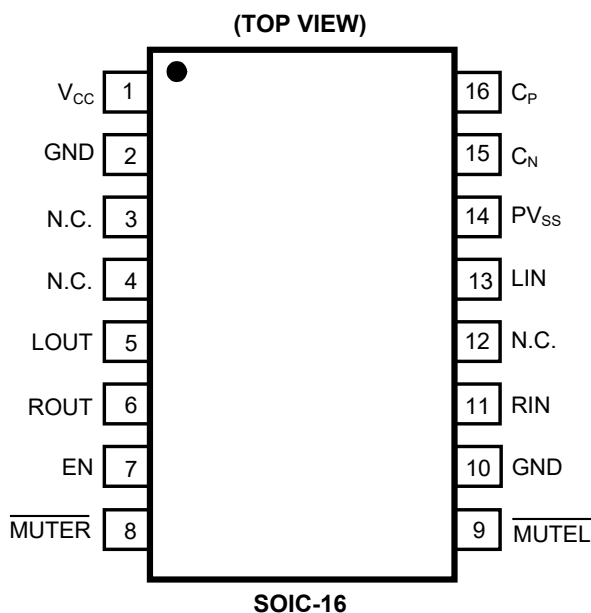
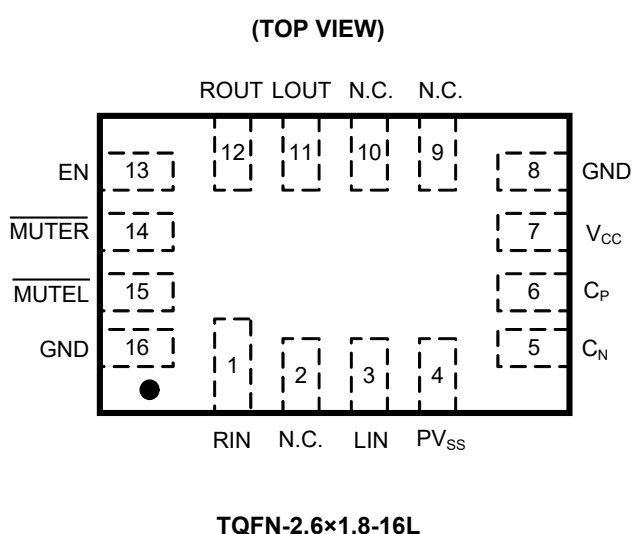
ESD SENSITIVITY CAUTION

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 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.

PIN CONFIGURATIONS



PIN DESCRIPTION

PIN		NAME	FUNCTION
TQFN-2.6×1.8-16L	SOIC-16		
1	11	RIN	Right Channel Audio Signals Input.
2, 9, 10	3, 4, 12	N.C.	No Connection.
3	13	LIN	Left Channel Audio Signals Input.
4	14	PV _{SS}	Negative Supply Voltage Output. Connect one 0.1μF ceramic capacitor from PV _{SS} to GND.
5	15	C _N	Negative Terminal for Charge Pump Flying Capacitor.
6	16	C _P	Positive Terminal for Charge Pump Flying Capacitor.
7	1	V _{CC}	Power Supply.
8, 16	2, 10	GND	Ground.
11	5	LOUT	Left Channel Audio Signals Output.
12	6	ROUT	Right Channel Audio Signals Output.
13	7	EN	Enable Control. When EN = "Low", both RIN to ROUT and LIN to LOUT channels will be disconnected, negative charge pump doesn't work, the SGM4808 will be in shutdown state. When EN = "High", negative charge pump will work, the SGM4808 will be in working state, whether the audio signals channel works depends on the logical state of $\overline{\text{MUTER}}$ or $\overline{\text{MUTEL}}$.
14	8	$\overline{\text{MUTER}}$	Digital Control Pin to Mute Right Audio Signals Channel.
15	9	$\overline{\text{MUTEL}}$	Digital Control Pin to Mute Left Audio Signals Channel.

FUNCTION TABLE

Table 1. Function Table:

EN	MUTER	RIGHT CHANNEL WORKING STATE	NEGATIVE CHARGE PUMP
0	X	Shutdown	Turn off
1	0	Mute	Turn on
1	1	Active	Turn on

Table 2. Function Table:

EN	MUTEL	LEFT CHANNEL WORKING STATE	NEGATIVE CHARGE PUMP
0	X	Shutdown	Turn off
1	0	Mute	Turn on
1	1	Active	Turn on

ELECTRICAL CHARACTERISTICS

(V_{CC} = 3.3V, Full = -40°C to +85°C. Typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Analog Switch							
Analog Signal Range	V _{RIN} , V _{LIN} , V _{ROUT} , V _{LOUT}		Full	-V _{CC}		+V _{CC}	V
On-Resistance	R _{ON}	-V _{CC} ≤ V _{RIN} or V _{LIN} ≤ V _{CC} - 3V, I _{ROUT} or I _{LOUT} = -50mA, Test Circuit 1	+25°C		1.1	1.35	Ω
			Full			1.9	
On-Resistance Match between Channels	ΔR _{ON}	-V _{CC} ≤ V _{RIN} or V _{LIN} ≤ V _{CC} - 3V, I _{ROUT} or I _{LOUT} = -50mA, Test Circuit 1	+25°C		0.03	0.12	Ω
			Full			0.2	
On-Resistance Flatness	R _{FLAT(ON)}	-V _{CC} ≤ V _{RIN} or V _{LIN} ≤ V _{CC} - 3V, I _{ROUT} or I _{LOUT} = -50mA, Test Circuit 1	+25°C		0.05	0.1	Ω
			Full			0.15	
Mute Resistance	R _{MUTE}	V _{RIN} or V _{LIN} = ±1V	+25°C		1300		Ω
Digital Inputs							
Input High Voltage	V _{INH}	V _{CC} = 2.7V to 12V	Full	1.4		5.5	V
Input Low Voltage	V _{INL}	V _{CC} = 2.7V to 12V	Full			0.4	V
Pull-Down Resistor	R _{PULL-DOWN}		+25°C		600		kΩ
Dynamic Characteristics							
Turn-On Time	t _{ON}	V _{RIN} or V _{LIN} = 1.0V, R _L = 50Ω, C _L = 35pF, Test Circuit 2	+25°C		890		μs
Turn-Off Time	t _{OFF}	V _{RIN} or V _{LIN} = 1.0V, R _L = 50Ω, C _L = 35pF, Test Circuit 2	+25°C		120		μs
Off Isolation	O _{ISO}	f = 1kHz, R _L = 32Ω, Signal = 0dBm, Test Circuit 3	+25°C		-120		dB
		f = 1MHz, R _L = 50Ω, Signal = 0dBm, C _L = 5pF, Test Circuit 3			-50		
Channel-to-Channel Crosstalk	X _{TALK}	f = 1kHz, R _L = 32Ω, Signal = 0dBm, Test Circuit 4	+25°C		-110		dB
		f = 1MHz, R _L = 50Ω, Signal = 0dBm, C _L = 5pF, Test Circuit 4			-75		
-3dB Bandwidth	BW	Signal = 0dBm, R _L = 50Ω, C _L = 5pF, Test Circuit 5	+25°C		160		MHz
Channel ON Capacitance	C _{ON}		+25°C		30		pF
Charge Injection	Q	V _G = GND, R _G = 0Ω, C _L = 1.0nF, Test Circuit 6	+25°C		500		pC
Total Harmonic Distortion + Noise	THD+N	A-Weighting, Test Circuit 7	+25°C		-80		dB
					-67		
					-90		
					-78		
					-98		
					-85		
Start-Up Time	t _{START}	Switch V _{EN} = 0V to V _{EN} = 1.4V	+25°C		0.2		ms

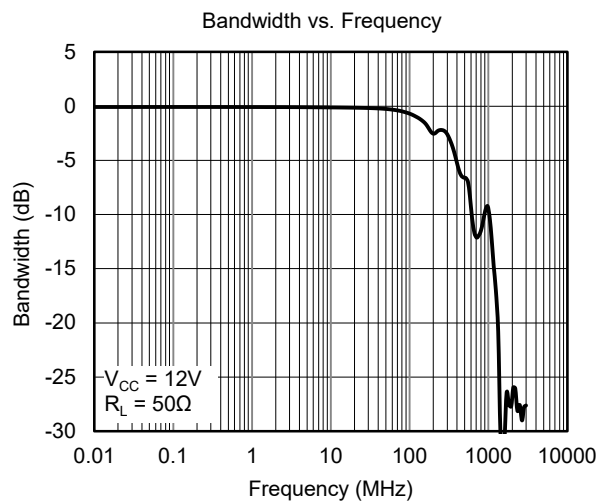
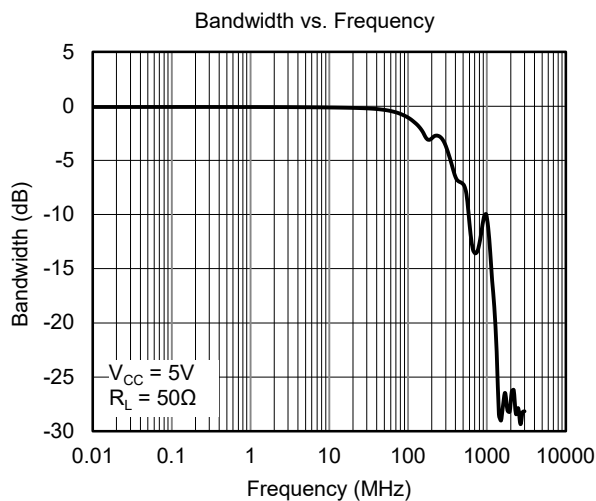
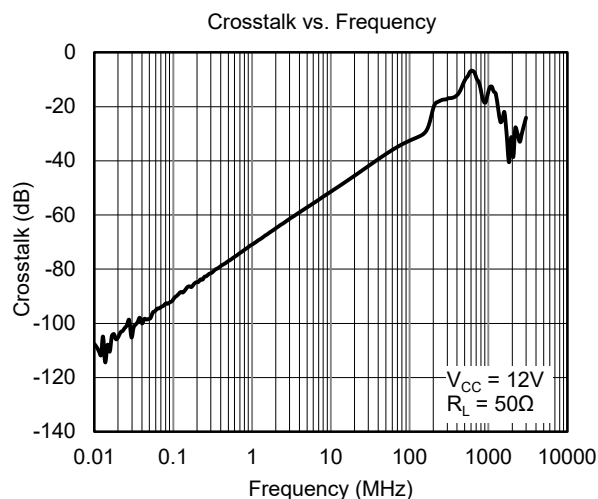
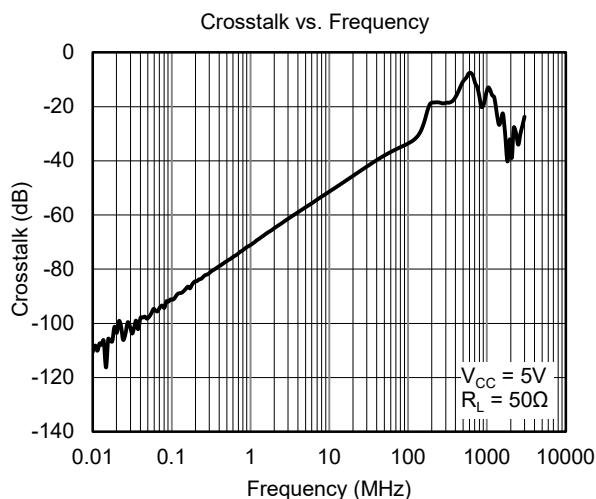
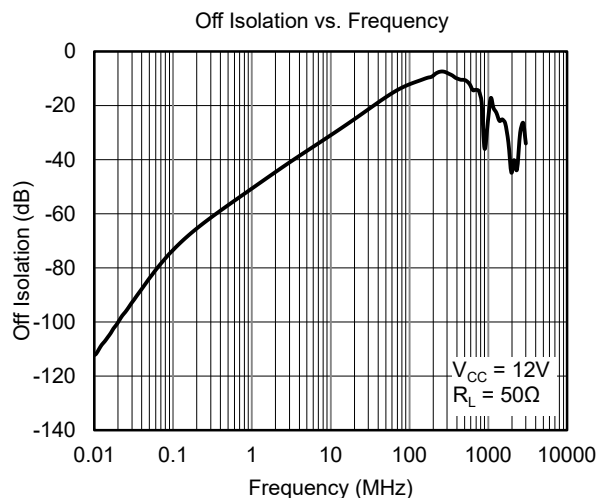
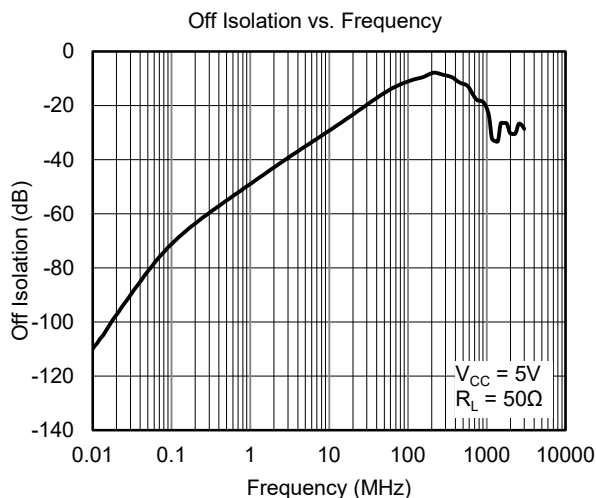
ELECTRICAL CHARACTERISTICS (continued)(V_{CC} = 5V, Full = -40°C to +85°C. Typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Analog Switch								
Analog Signal Range	$V_{RIN}, V_{LIN}, V_{ROUT}, V_{LOUT}$			Full	-V _{CC}		+V _{CC}	V
On-Resistance	R _{ON}	-V _{CC} ≤ V _{RIN} or V _{LIN} ≤ V _{CC} - 3V, I _{ROUT} or I _{LOUT} = -50mA, Test Circuit 1		+25°C		1.1	1.35	Ω
				Full			1.9	
On-Resistance Match between Channels	ΔR _{ON}	-V _{CC} ≤ V _{RIN} or V _{LIN} ≤ V _{CC} - 3V, I _{ROUT} or I _{LOUT} = -50mA, Test Circuit 1		+25°C		0.03	0.12	Ω
				Full			0.2	
On-Resistance Flatness	R _{FLAT(ON)}	-V _{CC} ≤ V _{RIN} or V _{LIN} ≤ V _{CC} - 3V, I _{ROUT} or I _{LOUT} = -50mA, Test Circuit 1		+25°C		0.05	0.1	Ω
				Full			0.15	
Mute Resistance	R _{MUTE}	V _{RIN} or V _{LIN} = ±1V		+25°C		1300		Ω
Channel ON Leakage Current	$I_{RIN(ON)}, I_{LIN(ON)}, I_{ROUT(ON)}, I_{LOUT(ON)}$	V _{RIN} or V _{LIN} = -4.5V, 4.5V, V _{ROUT} or V _{LOUT} = floating, or V _{RIN} or V _{LIN} = floating, V _{ROUT} or V _{LOUT} = -4.5V, 4.5V		+25°C		0.01	0.4	μA
				Full			1	
Digital Inputs								
Input High Voltage	V _{INH}	V _{CC} = 2.7V to 12V		Full	1.4		5.5	V
Input Low Voltage	V _{INL}	V _{CC} = 2.7V to 12V		Full			0.4	V
Pull-Down Resistor	R _{PULL-DOWN}			+25°C		600		kΩ
Dynamic Characteristics								
Turn-On Time	t _{ON}	V _{RIN} or V _{LIN} = 1.0V, R _L = 50Ω, C _L = 35pF, Test Circuit 2		+25°C		960		μs
Turn-Off Time	t _{OFF}	V _{RIN} or V _{LIN} = 1.0V, R _L = 50Ω, C _L = 35pF, Test Circuit 2		+25°C		130		μs
Off Isolation	O _{ISO}	f = 1kHz, R _L = 32Ω, Signal = 0dBm, Test Circuit 3		+25°C		-120		dB
		f = 1MHz, R _L = 50Ω, Signal = 0dBm, C _L = 5pF, Test Circuit 3				-50		
Channel-to-Channel Crosstalk	X _{TALK}	f = 1kHz, R _L = 32Ω, Signal = 0dBm, Test Circuit 4		+25°C		-110		dB
		f = 1MHz, R _L = 50Ω, Signal = 0dBm, C _L = 5pF, Test Circuit 4				-75		
-3dB Bandwidth	BW	Signal = 0dBm, R _L = 50Ω, C _L = 5pF, Test Circuit 5		+25°C		160		MHz
Channel ON Capacitance	C _{ON}			+25°C		30		pF
Charge Injection	Q	V _G = GND, R _G = 0Ω, C _L = 1.0nF, Test Circuit 6		+25°C		600		pC
Total Harmonic Distortion + Noise	THD+N	A-Weighting, Test Circuit 7	V _{RIN} or V _{LIN} = 2V _{PP} , R _L = 600Ω	+25°C		-115		dB
			V _{RIN} or V _{LIN} = 2V _{PP} , R _L = 32Ω			-113		
			V _{RIN} or V _{LIN} = 1V _{PP} , R _L = 600Ω			-110		
			V _{RIN} or V _{LIN} = 1V _{PP} , R _L = 32Ω			-110		
			V _{RIN} or V _{LIN} = 0.5V _{PP} , R _L = 600Ω			-107		
			V _{RIN} or V _{LIN} = 0.5V _{PP} , R _L = 32Ω			-105		
Start-Up Time	t _{START}	Switch V _{EN} = 0V to V _{EN} = 1.4V		+25°C		0.2		ms
Power Requirements								
Power Supply Current	I _{CC}	V _{EN} = 1.4V		+25°C		260	350	μA
				Full			360	
Power Supply Current in Shutdown State	I _{CC}	V _{EN} = 0V		+25°C		0.3	0.8	μA
				Full			1.2	

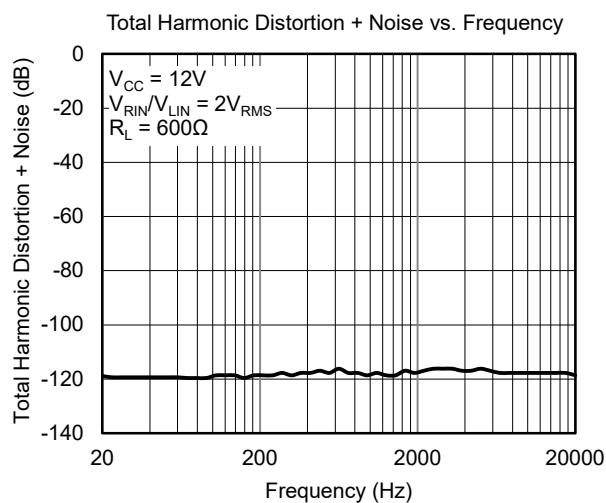
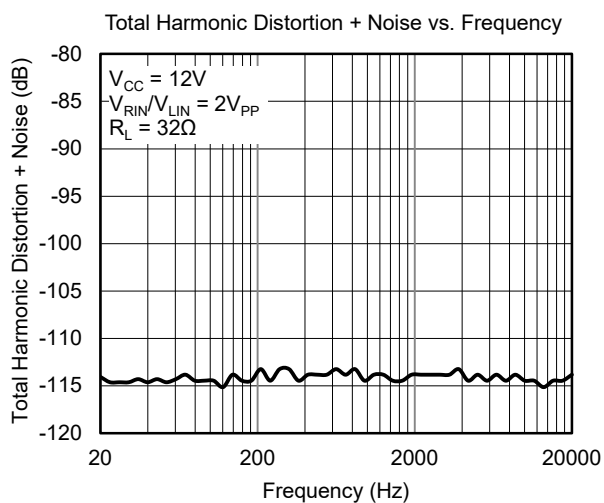
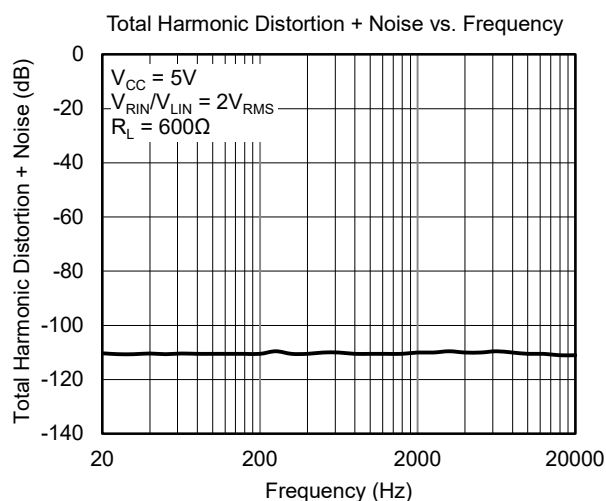
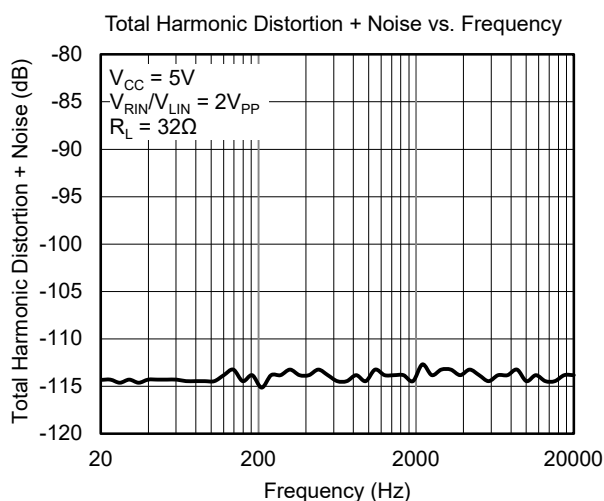
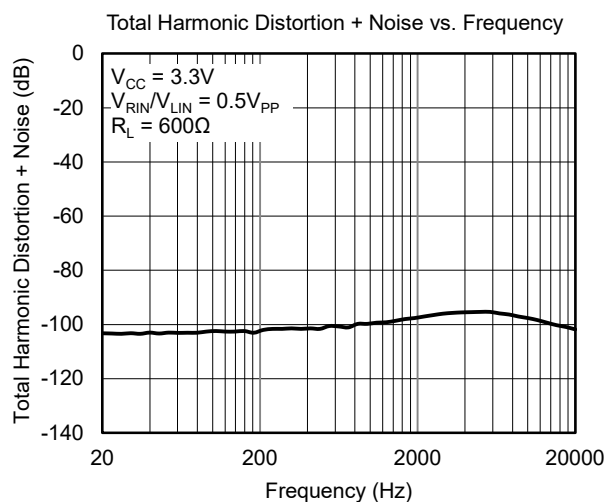
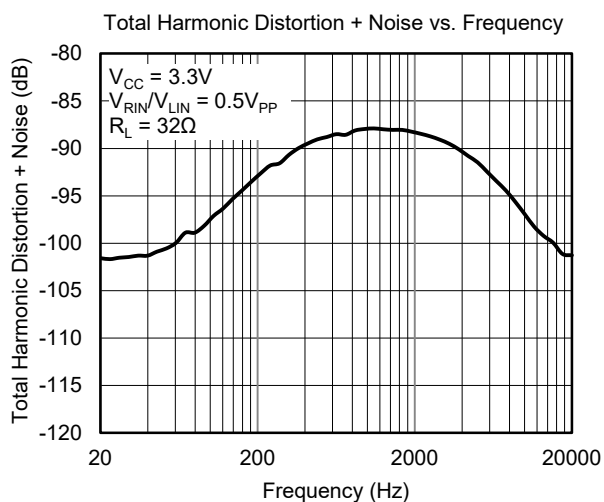
ELECTRICAL CHARACTERISTICS (continued)(V_{CC} = 12V, Full = -40°C to +85°C. Typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Analog Switch								
Analog Signal Range	$V_{RIN}, V_{LIN}, V_{ROUT}, V_{LOUT}$			Full	-V _{CC}		+V _{CC}	V
On-Resistance	R _{ON}	-V _{CC} ≤ V _{RIN} or V _{LIN} ≤ V _{CC} - 3V, I _{ROUT} or I _{LOUT} = -50mA, Test Circuit 1		+25°C		1.1	1.35	Ω
				Full			1.9	
On-Resistance Match between Channels	ΔR _{ON}	-V _{CC} ≤ V _{RIN} or V _{LIN} ≤ V _{CC} - 3V, I _{ROUT} or I _{LOUT} = -50mA, Test Circuit 1		+25°C		0.03	0.12	Ω
				Full			0.2	
On-Resistance Flatness	R _{FLAT(ON)}	-V _{CC} ≤ V _{RIN} or V _{LIN} ≤ V _{CC} - 3V, I _{ROUT} or I _{LOUT} = -50mA, Test Circuit 1		+25°C		0.05	0.1	Ω
				Full			0.15	
Mute Resistance	R _{MUTE}	V _{RIN} or V _{LIN} = ±1V		+25°C		1300		Ω
Channel ON Leakage Current	$I_{RIN(ON)}, I_{LIN(ON)}, I_{ROUT(ON)}, I_{LOUT(ON)}$	V _{RIN} or V _{LIN} = -11.5V, 11.5V, V _{ROUT} or V _{LOUT} = floating, or V _{RIN} or V _{LIN} = floating, V _{ROUT} or V _{LOUT} = -11.5V, 11.5V		+25°C		0.05	1	μA
				Full			3	
Digital Inputs								
Input High Voltage	V _{INH}	V _{CC} = 2.7V to 12V		Full	1.4		5.5	V
Input Low Voltage	V _{INL}	V _{CC} = 2.7V to 12V		Full			0.4	V
Pull-Down Resistor	R _{PULL-DOWN}			+25°C		600		kΩ
Dynamic Characteristics								
Turn-On Time	t _{ON}	V _{RIN} or V _{LIN} = 1.0V, R _L = 50Ω, C _L = 35pF, Test Circuit 2		+25°C		1200		μs
Turn-Off Time	t _{OFF}	V _{RIN} or V _{LIN} = 1.0V, R _L = 50Ω, C _L = 35pF, Test Circuit 2		+25°C		130		μs
Off Isolation	O _{ISO}	f = 1kHz, R _L = 32Ω, Signal = 0dBm, Test Circuit 3		+25°C		-120		dB
		f = 1MHz, R _L = 50Ω, Signal = 0dBm, C _L = 5pF, Test Circuit 3				-50		
Channel-to-Channel Crosstalk	X _{TALK}	f = 1kHz, R _L = 32Ω, Signal = 0dBm, Test Circuit 4		+25°C		-110		dB
		f = 1MHz, R _L = 50Ω, Signal = 0dBm, C _L = 5pF, Test Circuit 4				-75		
-3dB Bandwidth	BW	Signal = 0dBm, R _L = 50Ω, C _L = 5pF, Test Circuit 5		+25°C		160		MHz
Channel ON Capacitance	C _{ON}			+25°C		30		pF
Charge Injection	Q	V _G = GND, R _G = 0Ω, C _L = 1.0nF, Test Circuit 6		+25°C		800		pC
Total Harmonic Distortion + Noise	THD+N	A-Weighting, Test Circuit 7	V _{RIN} or V _{LIN} = 2V _{PP} , R _L = 600Ω	+25°C		-115		dB
			V _{RIN} or V _{LIN} = 2V _{PP} , R _L = 32Ω			-113		
			V _{RIN} or V _{LIN} = 1V _{PP} , R _L = 600Ω			-110		
			V _{RIN} or V _{LIN} = 1V _{PP} , R _L = 32Ω			-110		
			V _{RIN} or V _{LIN} = 0.5V _{PP} , R _L = 600Ω			-107		
			V _{RIN} or V _{LIN} = 0.5V _{PP} , R _L = 32Ω			-105		
Start-Up Time	t _{START}	Switch V _{EN} = 0V to V _{EN} = 1.4V		+25°C		0.2		ms
Power Requirements								
Power Supply Current	I _{CC}	V _{EN} = 1.4V		+25°C		350	450	μA
				Full			500	
Power Supply Current in Shutdown State	I _{CC}	V _{EN} = 0V		+25°C		0.5	1.2	μA
				Full			1.5	

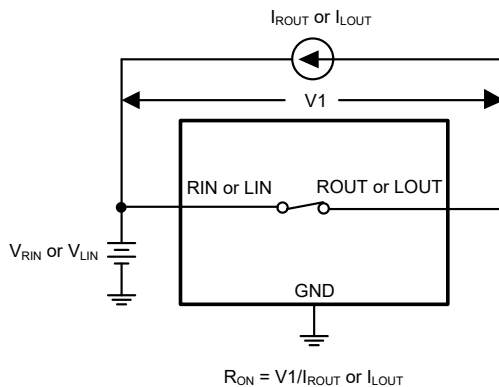
TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, unless otherwise noted.

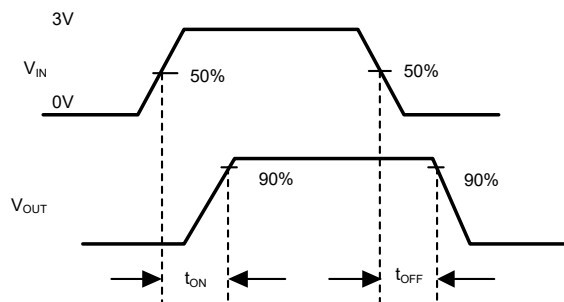
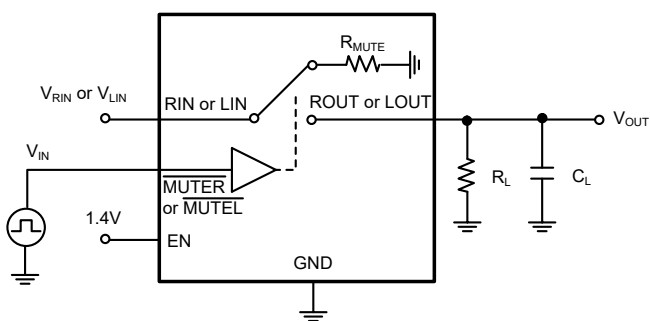
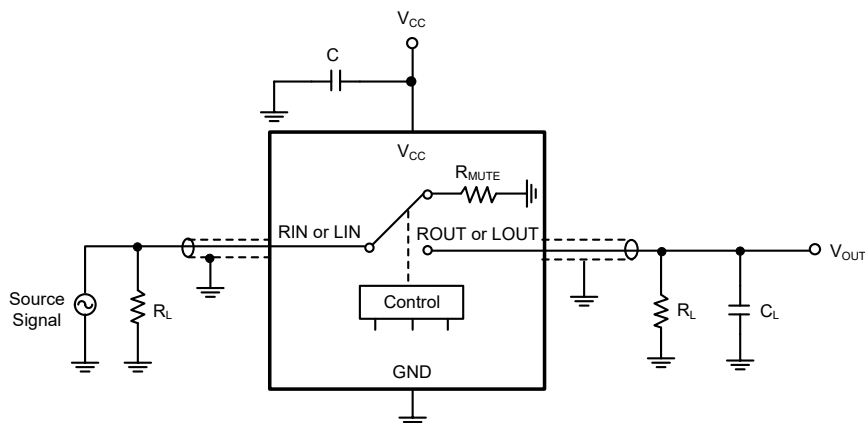
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, unless otherwise noted.

TEST CIRCUITS

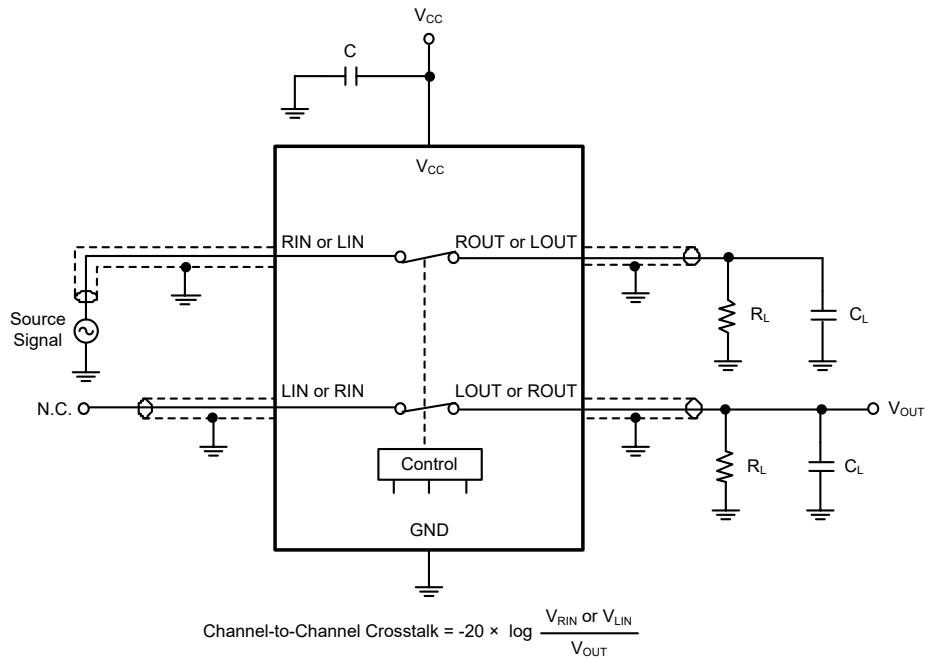


Test Circuit 1. On-Resistance

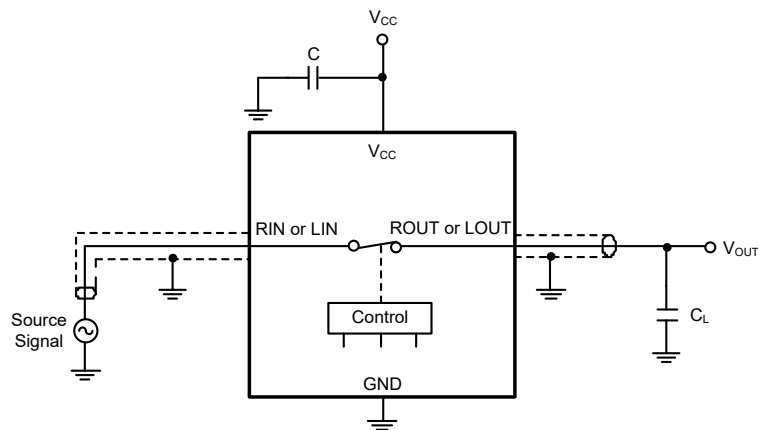
Test Circuit 2. Switching Times (t_{ON} , t_{OFF})

Test Circuit 3. Off Isolation

TEST CIRCUITS (continued)

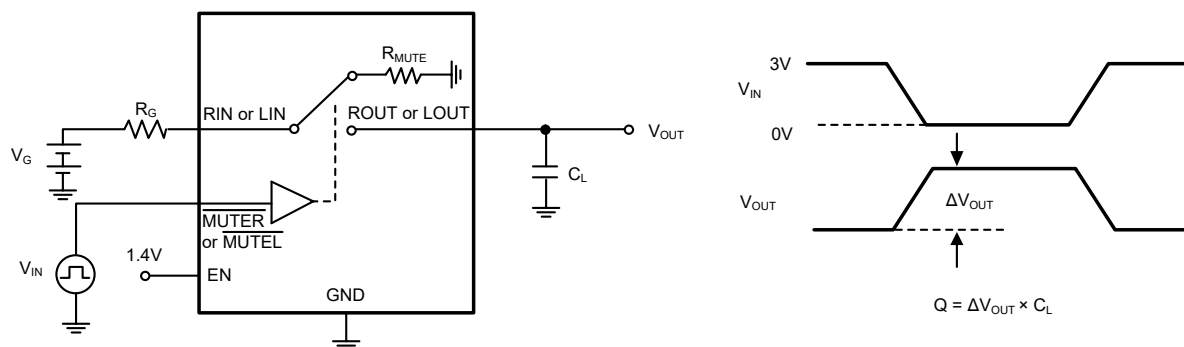


Test Circuit 4. Channel-to-Channel Crosstalk

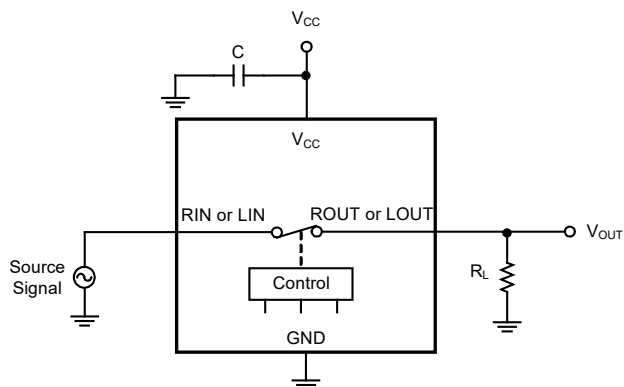


Test Circuit 5. -3dB Bandwidth

TEST CIRCUITS (continued)



Test Circuit 6. Charge Injection (Q)



Test Circuit 7. Total Harmonic Distortion + Noise (THD+N)

APPLICATION INFORMATION

The SGM4808 can be used at the input or output of audio system to eliminate the click-pop noise. The circuit is shown in Figure 1.

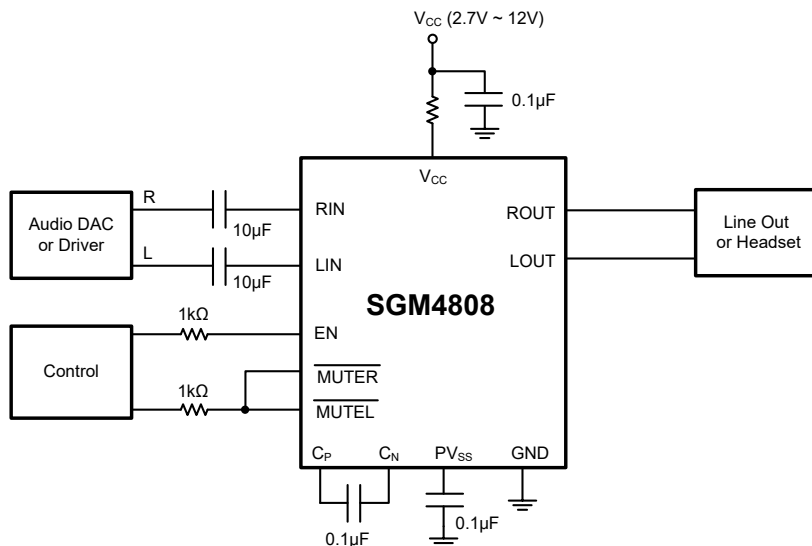


Figure 1. Typical Application Circuit

REVISION HISTORY

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

MARCH 2018 – REV.A to REV.A.1

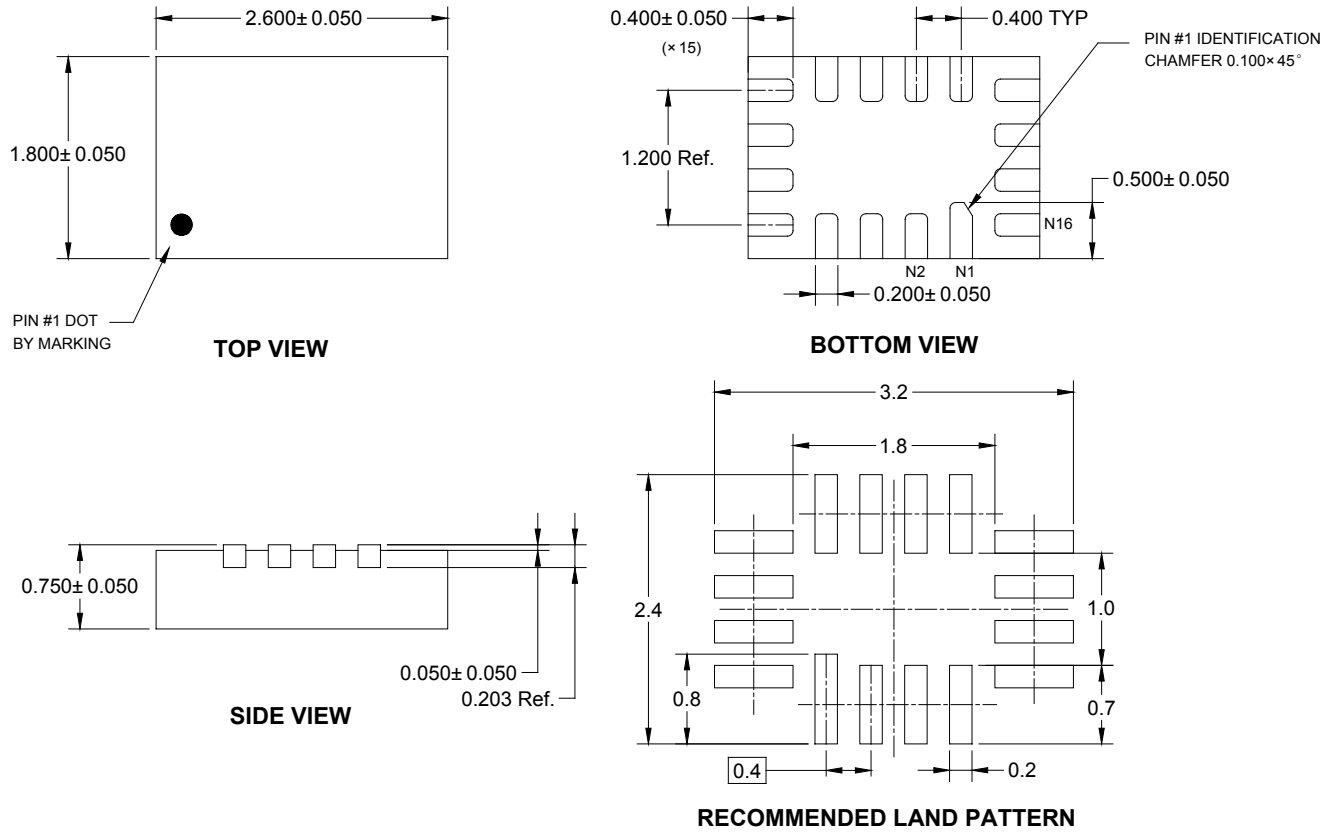
Updated Electrical Characteristics and Off Isolation vs. Frequency curves 5-8

Changes from Original (NOVEMBER 2016) to REV.A

Changed from product preview to production data..... All

PACKAGE OUTLINE DIMENSIONS

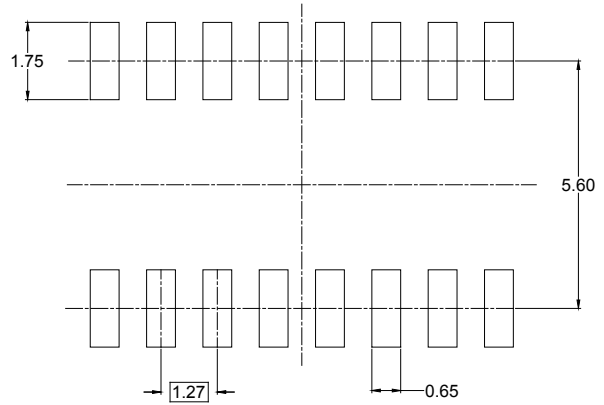
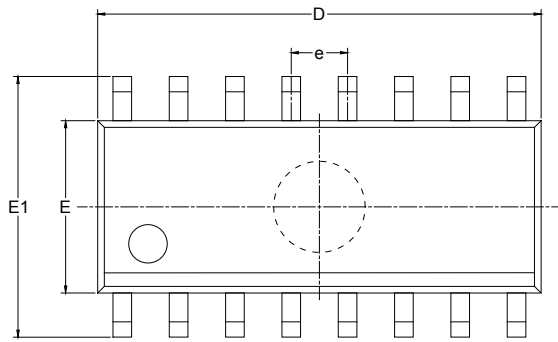
TQFN-2.6×1.8-16L



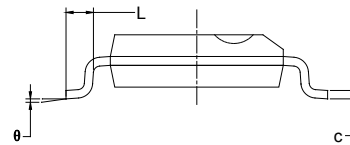
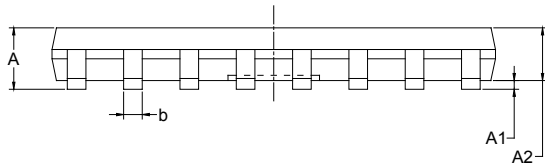
NOTE: All linear dimensions are in millimeters.

PACKAGE OUTLINE DIMENSIONS

SOIC-16



RECOMMENDED LAND PATTERN (Unit: mm)

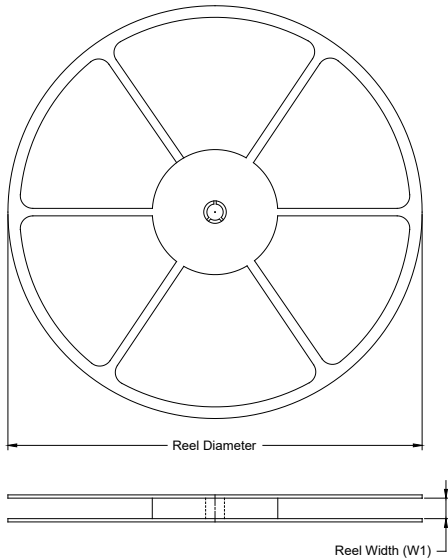


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

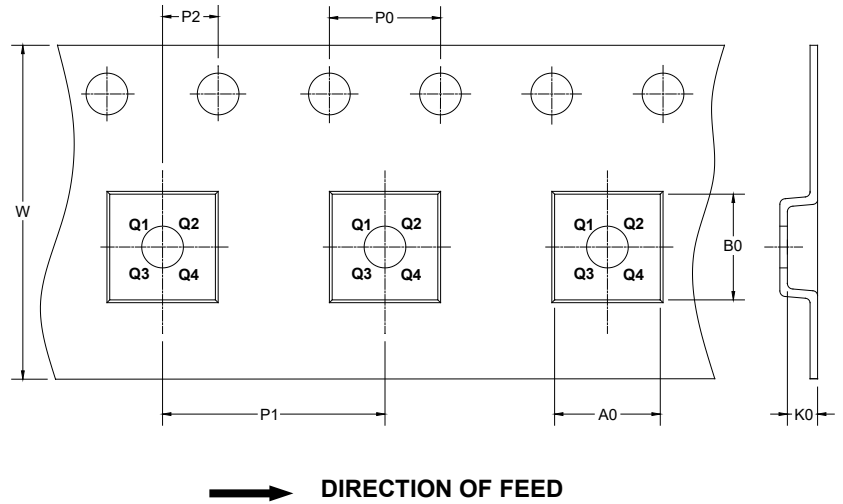
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

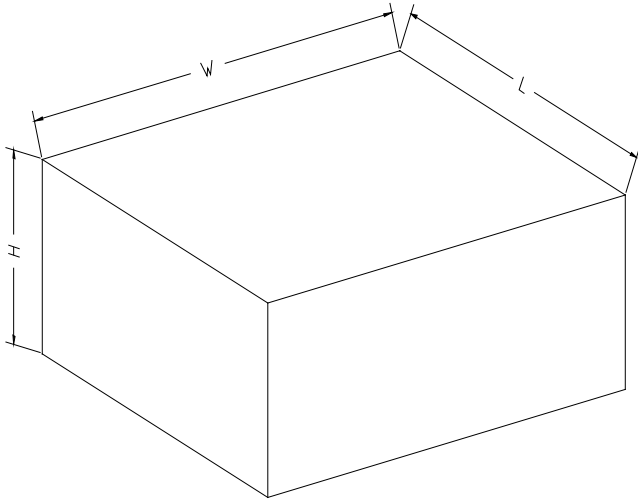
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
TQFN-2.6×1.8-16L	7"	9.0	2.01	2.81	0.93	4.0	4.0	2.0	8.0	Q1
SOIC-16	13"	16.4	6.50	10.30	2.10	4.0	8.0	2.0	16.0	Q1

DD0001

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
7" (Option)	368	227	224	8
7"	442	410	224	18
13"	386	280	370	5

DD0002