SGM4888
Dual 2.1W Audio Power Amplifier Plus Stereo Headphone & 3D Enhancement

GENERAL DESCRIPTION

The SGM4888 is a dual bridge-connected audio power amplifier which, when connected to a 5V supply, will deliver 2.1W to a 4Ω load or 2.5W to a 3Ω load with 1% THD+N

The SGM4888 has two separate HP (headphone) enable inputs, each having different logic level thresholds. Either HP enable input activates the single ended headphone mode and disables the BTL output mode. The HP Sense input is for use with a normal stereo headphone jack. The remaining input, HP Logic, accepts standard logic level thresholds.

To simplify audio system design, the SGM4888 combines dual bridge speaker amplifiers and stereo headphone amplifiers on one chip.

The SGM4888 features a low-power consumption shutdown mode and thermal shutdown protection. It also utilizes circuitry to reduce “clicks and pops” during device turn-on.

The SGM4888 is available in Green TQFN4×4-24L package. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- **P_O at 1% THD+N, V_{CC} = 5V**
  - **R_L = 3Ω 2.5W (typ)**
  - **R_L = 4Ω 2.1W (typ)**
  - **R_L = 8Ω 1.3W (typ)**
- **Low Shutdown Current 0.02μA**
- **Operation Supply Voltage 2.6V to 5.5V**
- **PSRR at 217Hz 80dB (typ)**
- **3D Enhancement**
- **Selectable Headphone Enable Modes**
- **Stereo Headphone Amplifier Mode**
- **Improved “click and pop” Suppression Circuitry**
- **Thermal Shutdown Protection Circuitry**
- **-40℃ to +85℃ Operating Temperature Range**
- **Green TQFN4×4-24L Package**

APPLICATIONS

Cell phones, PDAs, MP4s, PMPs
Portable and Desktop Computers
Desktops Audio System
Multimedia Monitors

PACKAGE/ORDERING INFORMATION

MODEL	ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION	MARKING INFORMATION
SGM4888	SGM4888YTQF24G/TR	TQFN4×4-24L	Tape and Reel, 3000	SGM4888YTQF24

SGM4888 X X G / TR

- G / TR: Tape and Reel
- G: Green Product
- X: Package Type
  - TQF24 TQFN4×4-24L
- X: Operating Temperature Range
  - Y -40℃ to +85℃

ABSOLUTE MAXIMUM RATINGS

Supply Voltage 6V
Input Voltage . . . . . -0.3V to (V_{CC}) + 0.3V
Storage Temperature Range . .. .–65℃ to +150℃
Junction Temperature. . . . . 150℃
Operating Temperature Range . . . . . –40℃ to +85℃
Lead Temperature Range (Soldering 10 sec)
. . . . . 260℃
ESD Susceptibility
HBM 2000V
MM 200V

NOTES

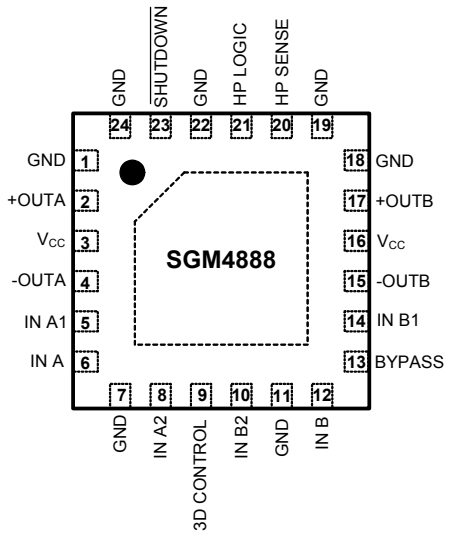
1. Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to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

PIN CONFIGURATION (Top View)



PIN DESCRIPTION

PIN	NAME	FUNCTION
6	INA	Left channel input
5	INA1	Left channel feedback in no 3D mode
8	INA2	Left channel feedback in 3D mode
12	INB	Right channel input
14	INB1	Right channel feedback in no 3D mode
10	INB2	Right channel feedback in 3D mode
4	-OUTA	Left channel –output in BTL mode
2	+OUTA	Left channel +output in BTL mode
15	-OUTB	Right channel –output in BTL mode
17	+OUTB	Right channel +output in BTL mode
9	3D CONTROL	Hold high for 3D mode, hold low for general stereo mode
21	HP LOGIC	Headphone logic control
20	Hp SENSE	Headphone sense control
3,16	V_{CC}	Supply Voltage
23	$\overline{SHUTDOWN}$	Shutdown control, hold low for shutdown mode
13	BYPASS	Bypass capacitor which provides the common mode voltage
1,7,11,18,19,22,24	GND	GND

LOGIC LEVEL TRUTH TABLE

SHUTDOWN PIN	HEADPHONE LOGIC PIN	HEADPHONE JACK SENSE PIN	OPERATIONAL OUTPUT MODE
Logic High	High	Don't Care	SINGLE ENDED
Logic High	Low	Low (HP not plugged in)	High BRIDGED/BTL
Logic High	Don't Care	High (HP plugged in)	SINGLE ENDED
Logic Low	Don't Care	Don't Care	Micro-Power Shutdown

ELECTRICAL CHARACTERISTICS (5V)

(The following specifications apply for V_{CC} = 5V unless otherwise noted. Limits apply for T_A = 25°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	V_{CC}		2.6		5.5	V
Quiescent Power Supply Current	I_Q	V_{IN} = 0V, I_O = 0A (Note 1) , BTL mode		6		mA
		V_{IN} = 0V, I_O = 0A (Note 1) , SE mode		3		
Shutdown Current	I_{SD}	GND applied to the $\overline{\text{SHUTDOWN}}$ pin		0.02		μA
Headphone Sense High Input Voltage	V_{IH}		4			V
Headphone Sense Low Input Voltage	V_{IL}				3.6	V
Shutdown, Headphone micro, 3D control High Input voltage	V_{SDIH}		1			V
Shutdown, Headphone micro, 3D control Low Input voltage	V_{SDIL}				0.8	V
Turn On Time	T_{ON}	1μF Bypass Cap (C6)		180		ms

EIECTRICAL CHARACTERISTICS FOR BRIDGED-MODE OPERATION (5V)

(The following specifications apply for V_{CC} = 5V unless otherwise noted. Limits apply for T_A = 25°C.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Output Offset Voltage	V_{OS}	V_{IN} = 0V			5		mV
Output Power(Note 2)	P_O	THD+N = 1%, f = 1kHz	R_L = 3Ω		2.5		W
			R_L = 4Ω		2.1		
			R_L = 8Ω		1.3		
		THD+N = 10%, f = 1kHz	R_L = 3Ω		3.2		
			R_L = 4Ω		2.6		
			R_L = 8Ω		1.6		
Total Harmonic Distortion + Noise	THD+N	f = 1kHz, A_{VD} = 2	R_L = 4Ω, P_O = 1W		0.07		%
			R_L = 8Ω, P_O = 0.4W		0.04		
Power Supply Rejection Ratio	PSRR	Input Unterminated, 217Hz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 8Ω			-80		dB
		Input Unterminated, 1kHz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 8Ω			-69		
		Input grounded with 10Ω, 217Hz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 8Ω			-68		
		Input grounded with 10Ω, 1kHz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 8Ω			-70		
Channel Separation	X_{TALK}	f = 1kHz, C_6 = 1.0μF, 3D Control = Low			-90		dB

EIECTRICAL CHARACTERISTICS FOR SINGLE-MODE OPERATION (5V)

(The following specifications apply for V_{CC} = 5V unless otherwise noted. Limits apply for T_A = 25°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Power	P_O	THD+N = 0.5%, f = 1kHz, R_L = 32Ω		95		mW
Total Harmonic Distortion + Noise	THD+N	P_O = 20mW, 1kHz, R_L = 32Ω		0.015		%
Power Supply Rejection Ratio	PSRR	Input Unterminated, 217Hz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 32Ω		-74		dB
		Input Unterminated, 1kHz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 32Ω		-75		
		Input grounded with 10Ω, 217Hz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 32Ω		-69		
		Input grounded with 10Ω, 1kHz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 32Ω		-74		
Channel Separation	X_{TALK}	f = 1kHz, C_6 = 1.0μF, 3D Control = Low		-84		dB

Specifications subject to changes without notice.

ELECTRICAL CHARACTERISTICS (3V)

(The following specifications apply for V_{CC} = 3V unless otherwise noted. Limits apply for T_A = 25°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Quiescent Power Supply Current	I_Q	V_{IN} = 0V, I_O = 0A (Note 1) , BTL mode		5		mA
		V_{IN} = 0V, I_O = 0A (Note 1) , SE mode		2.6		
Shutdown Current	I_{SD}	GND applied to the $\overline{\text{SHUTDOWN}}$ pin		0.02		μA
Headphone Sense High Input Voltage	V_{IH}		2.4			V
Headphone Sense Low Input Voltage	V_{IL}				2.2	V
Shutdown, Headphone micro, 3D control High Input voltage	V_{SDIH}		1			V
Shutdown, Headphone micro, 3D control Low Input voltage	V_{SDIL}				0.6	V
Turn On Time	T_{ON}	1μF Bypass Cap (C6)		130		ms

EIECTRICAL CHARACTERISTICS FOR BRIDGED-MODE OPERATION (3V)

(The following specifications apply for V_{CC} = 3V unless otherwise noted. Limits apply for T_A = 25°C.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Output Offset Voltage	V_{OS}	V_{IN} = 0V			5		mV
Output Power(Note 2)	P_O	THD+N = 1%, f = 1kHz	R_L = 3Ω		0.85		W
			R_L = 4Ω		0.7		
			R_L = 8Ω		0.45		
		THD+N = 10%, f = 1kHz	R_L = 3Ω		1		
			R_L = 4Ω		0.85		
			R_L = 8Ω		0.55		
Total Harmonic Distortion + Noise	THD+N	f = 1kHz	R_L = 4Ω, P_O = 280mW		0.06		%
			R_L = 8Ω, P_O = 200mW		0.04		
Power Supply Rejection Ratio	PSRR	Input Unterminated, 217Hz V_{ripple} = 200mVp-p, C_6 = 1μF, R_L = 8Ω			-73		dB
		Input Unterminated, 1kHz V_{ripple} = 200mVp-p, C_6 = 1μF, R_L = 8Ω			-67		
		Input grounded with 10Ω, 217Hz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 8Ω			-66		
		Input grounded with 10Ω, 1kHz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 8Ω			-67		
Channel Separation	X_{TALK}	f = 1kHz, C_6 = 1.0μF, 3D Control = Low			-92		dB

EIECTRICAL CHARACTERISTICS FOR SINGLE-MODE OPERATION (3V)

(The following specifications apply for V_{CC} = 3V unless otherwise noted. Limits apply for T_A = 25°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Power	P_O	THD+N = 0.5%, f = 1 kHz, R_L = 32Ω		33		mW
Total Harmonic Distortion + Noise	THD+N	P_O = 25mW, 1kHz, R_L = 32Ω		0.015		%
Power Supply Rejection Ratio	PSRR	Input Unterminated, 217Hz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 32Ω		-74		dB
		Input Unterminated, 1kHz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 32Ω		-75		
		Input grounded with 10Ω, 217Hz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 32Ω		-69		
		Input grounded with 10Ω, 1kHz V_{ripple} = 200mV_{p-p}, C_6 = 1μF, R_L = 32Ω		-74		
Channel Separation	X_{TALK}	f = 1kHz, C_6 = 1.0μF, 3D Control = Low		-84		dB

Specifications subject to changes without notice.

Note 1: The quiescent power supply current depends on the offset voltage when a practical load is connected to the amplifier.
Note 2: When driving 3Ω or 4Ω loads , the SGM4888 must be mounted to a circuit board that has a minimum of 2.5in^2 of exposed, uninterrupted copper area connected to the TQFN4×4-24L package's exposed DAP

TYPICAL APPLICATION

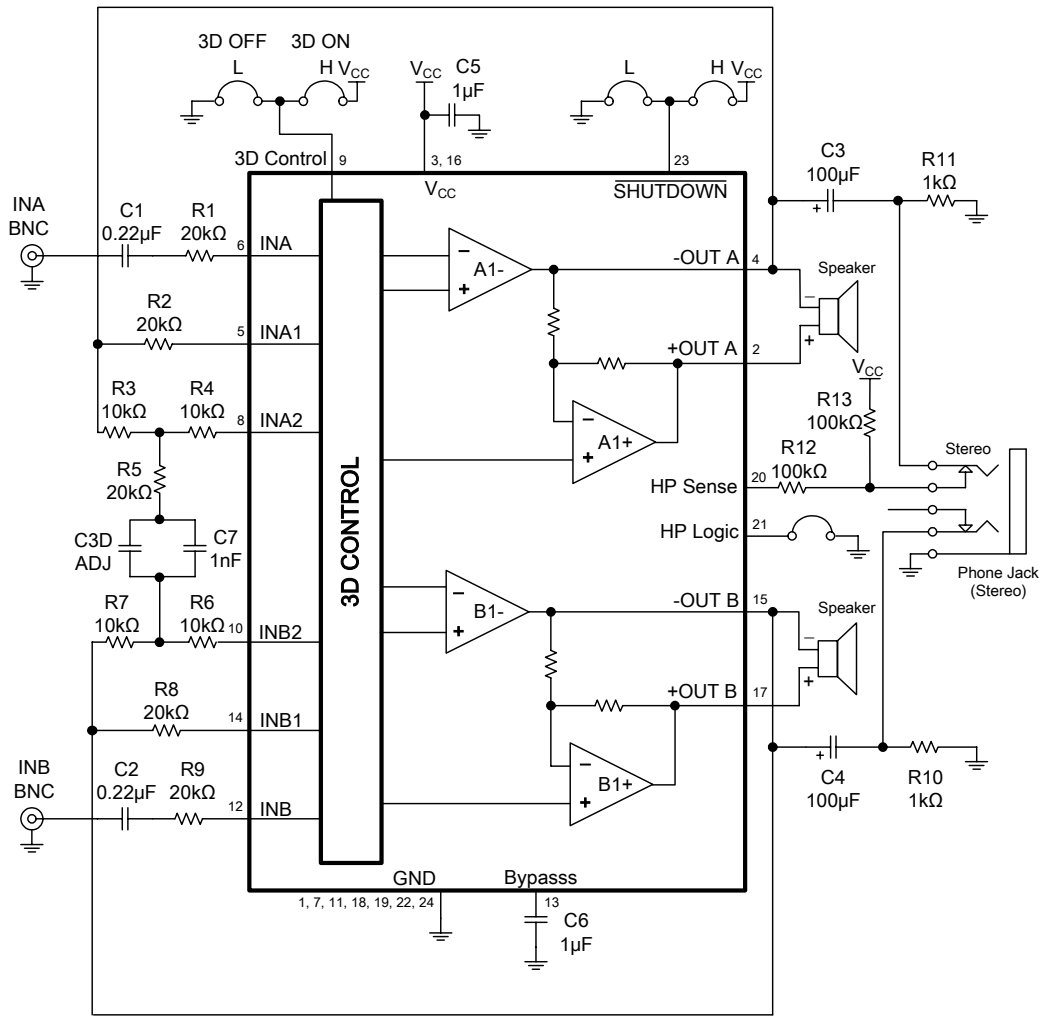
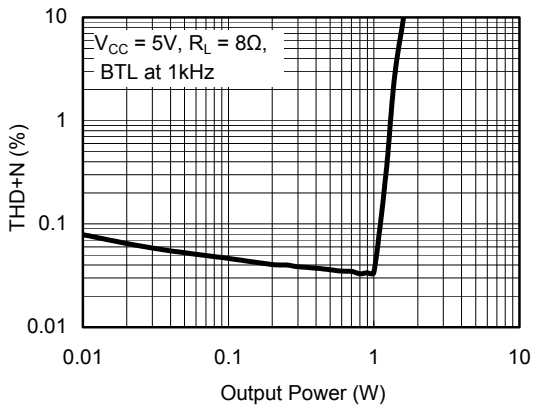


FIGURE 1. Typical Audio Amplifier Application Circuit

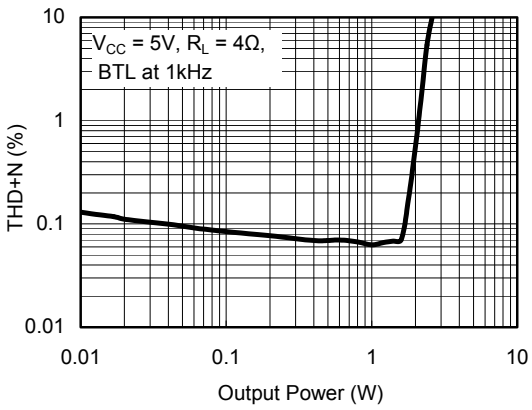
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A= +25℃, C6 = 1μF, unless otherwise noted.

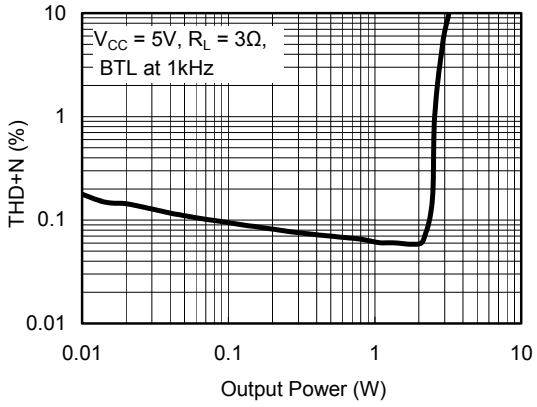
THD+N vs. Output Power



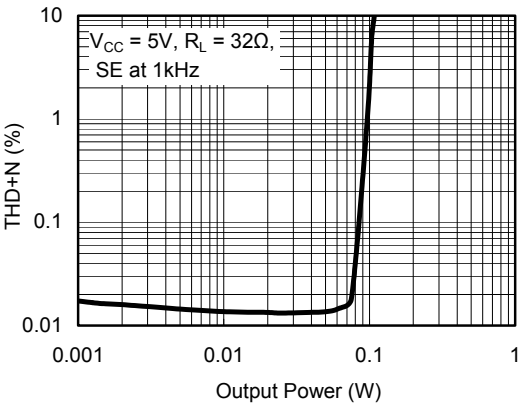
THD+N vs. Output Power



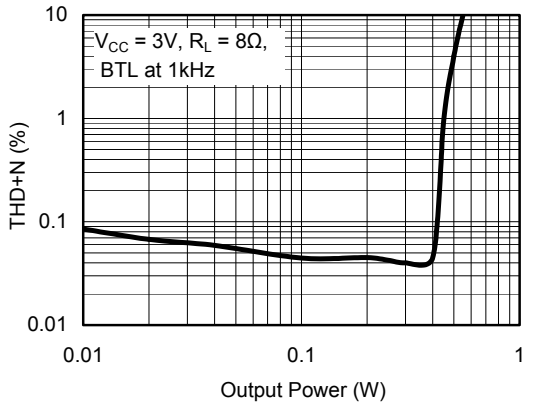
THD+N vs. Output Power



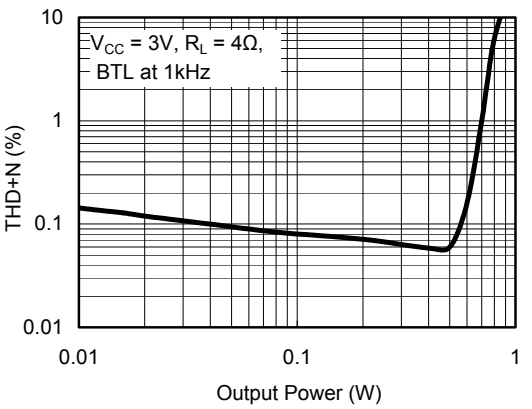
THD+N vs. Output Power



THD+N vs. Output Power



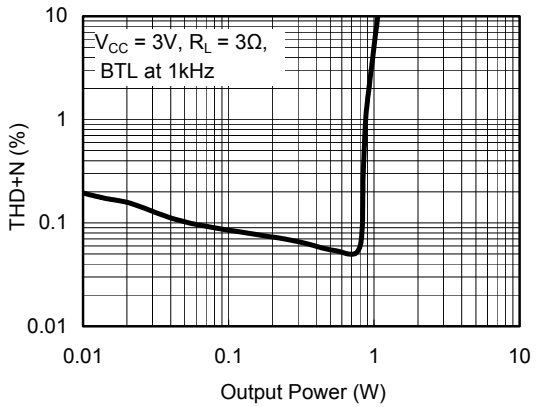
THD+N vs. Output Power



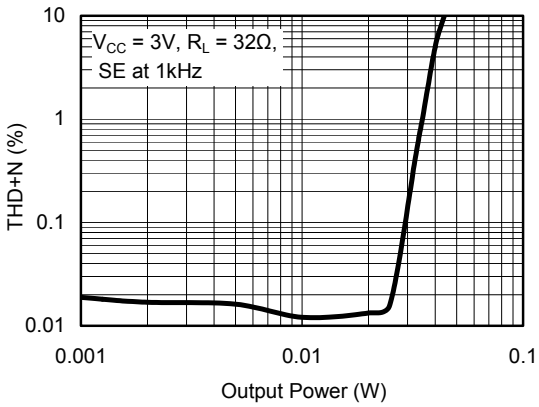
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A= +25℃, C6 = 1μF, unless otherwise noted.

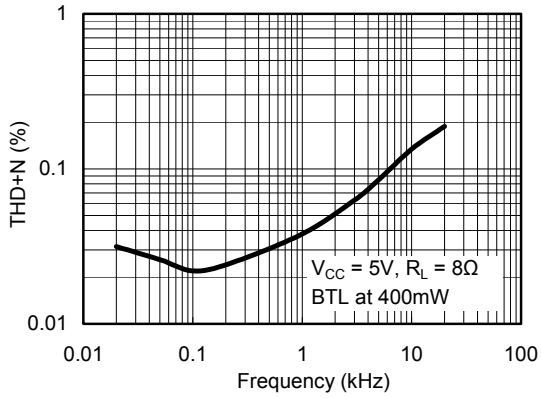
THD+N vs. Output Power



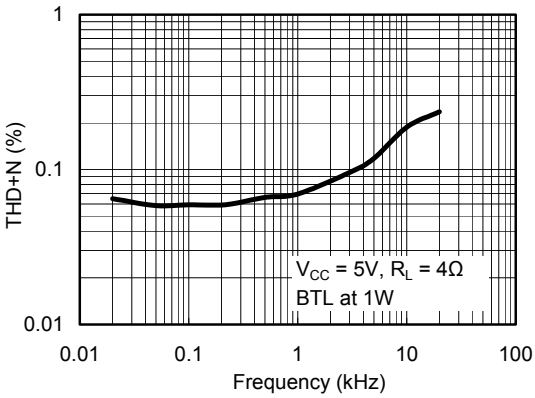
THD+N vs. Output Power



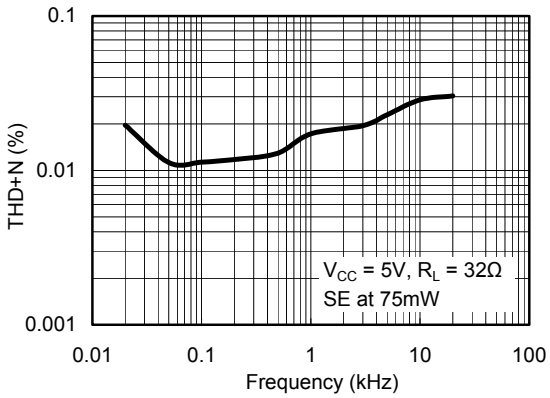
THD+N vs. Frequency



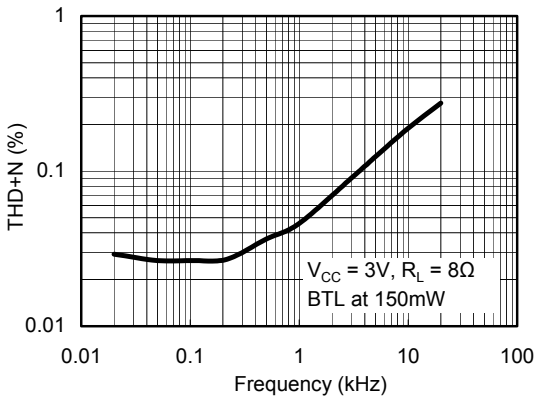
THD+N vs. Frequency



THD+N vs. Frequency



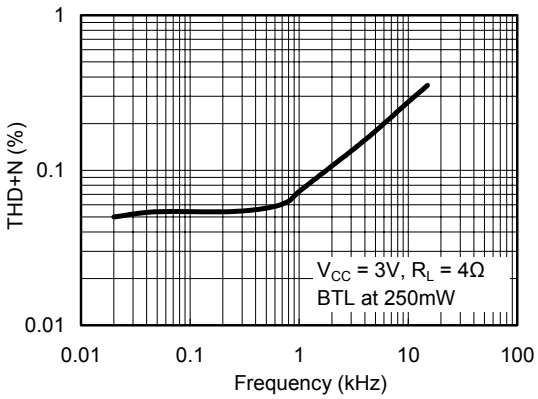
THD+N vs. Frequency



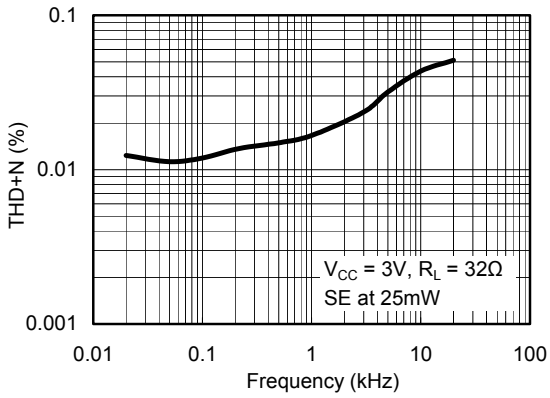
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A= +25℃, C6 = 1μF, unless otherwise noted.

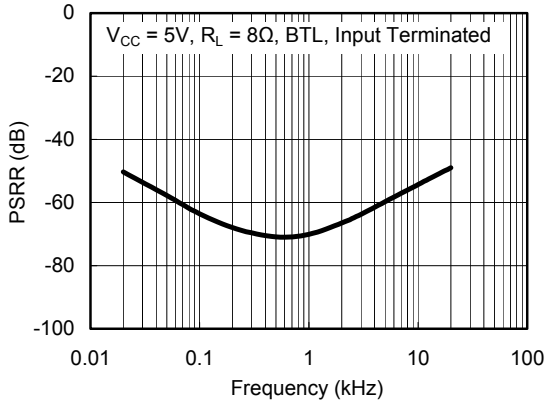
THD+N vs. Frequency



THD+N vs. Frequency



Power-Supply Rejection Ratio vs. Frequency



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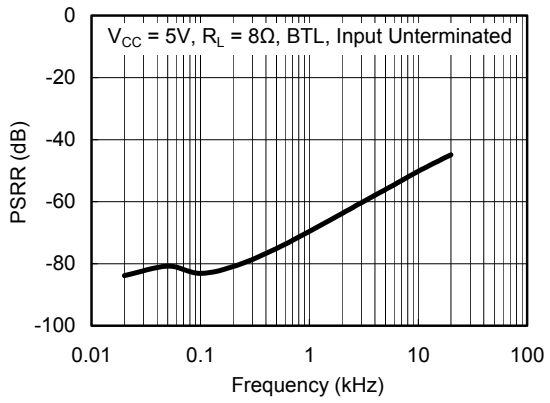

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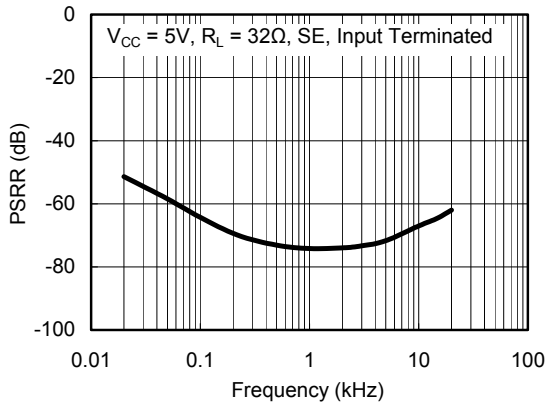
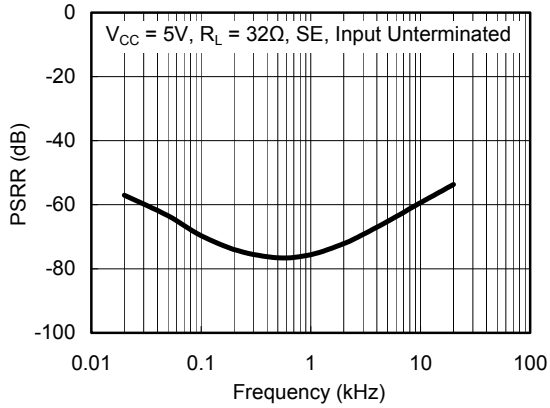


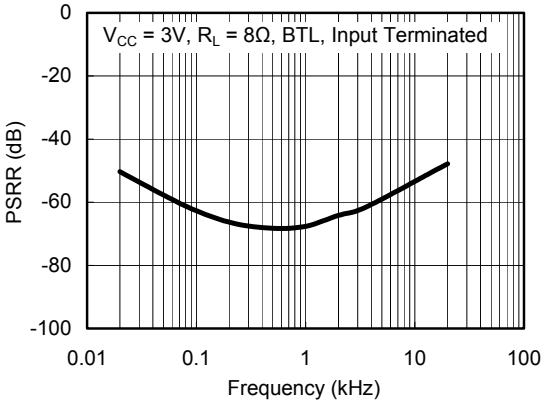
Power-Supply Rejection Ratio vs. Frequency



TYPICAL PERFORMANCE CHARACTERISTICS

At T_A= +25℃, C6 = 1μF, unless otherwise noted.

Power-Supply Rejection Ratio vs. Frequency



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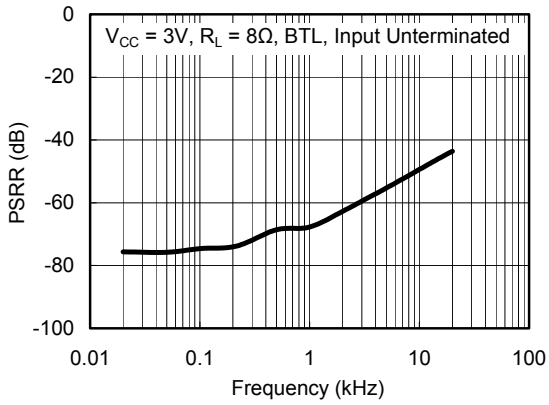
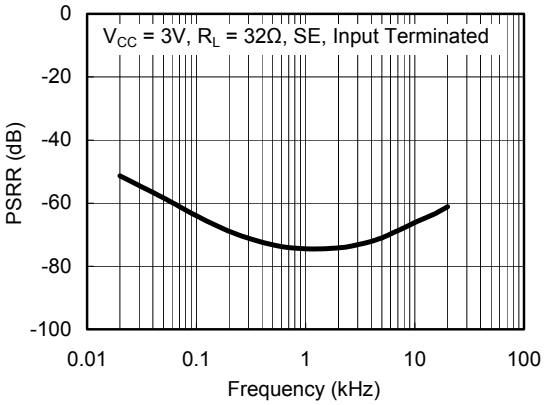
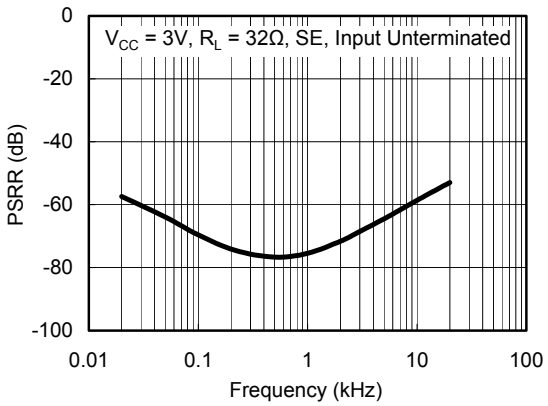


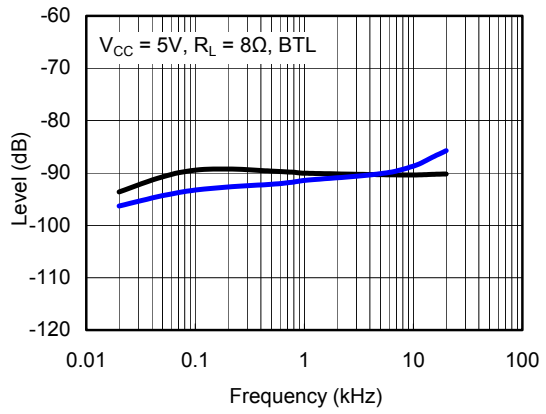
Power-Supply Rejection Ratio vs. Frequency



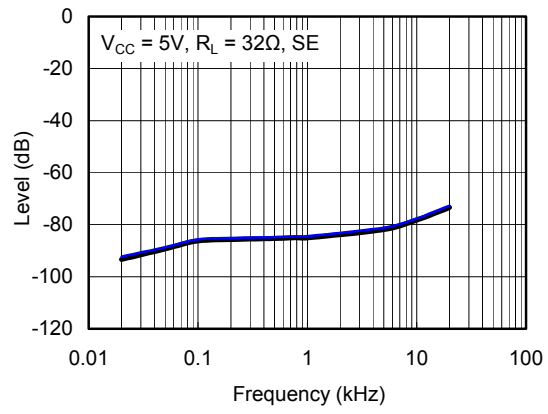
Power-Supply Rejection Ratio vs. Frequency



Crosstalk vs. Frequency



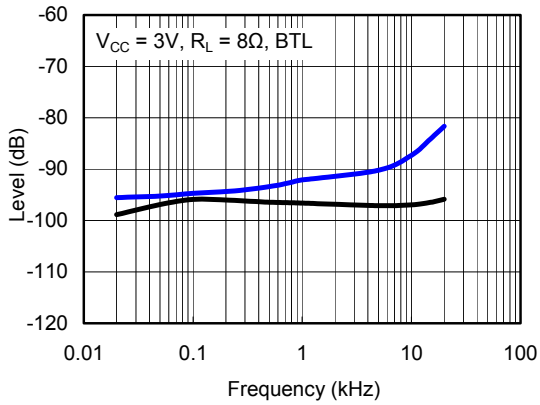
Crosstalk vs. Frequency



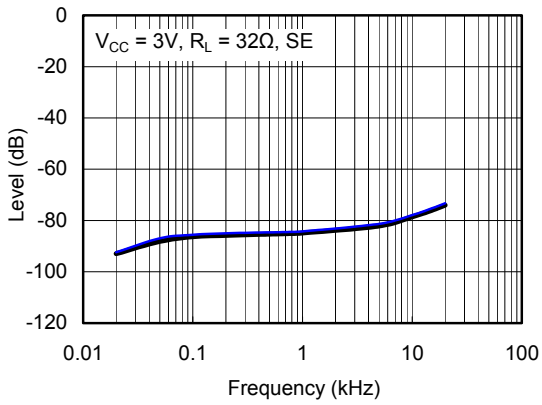
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A= +25℃, C6 = 1μF, unless otherwise noted.

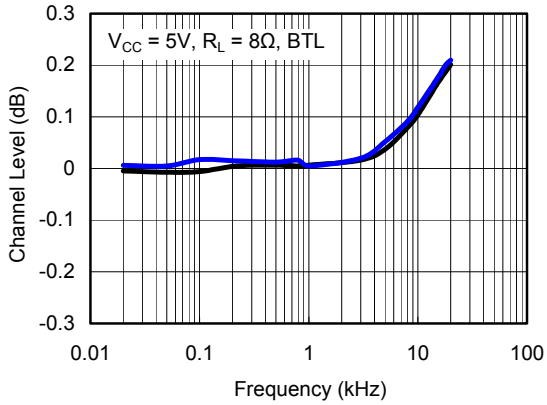
Crosstalk vs. Frequency



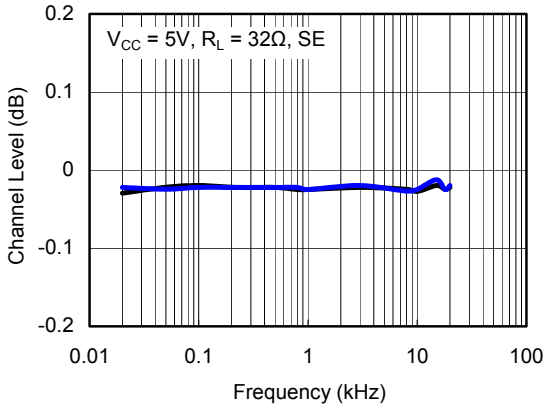
Crosstalk vs. Frequency



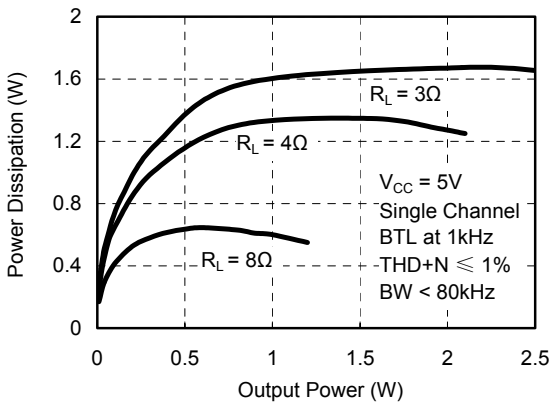
Channel Level vs. Frequency



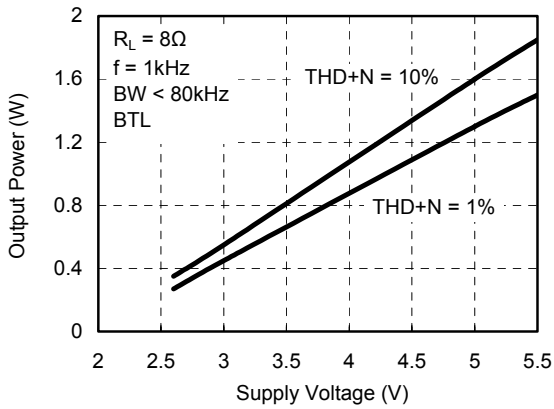
Channel Level vs. Frequency



Power Dissipation vs. Output Power

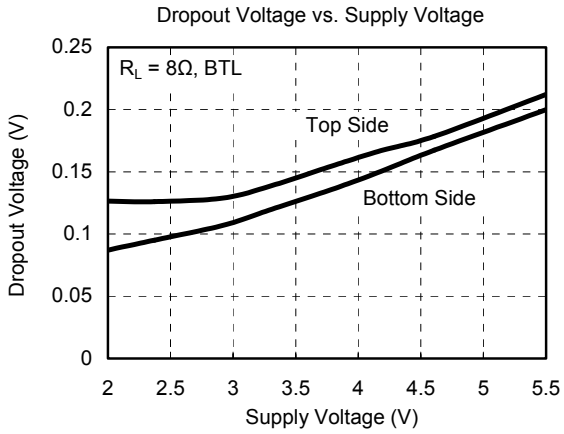


Output Power vs. Supply Voltage



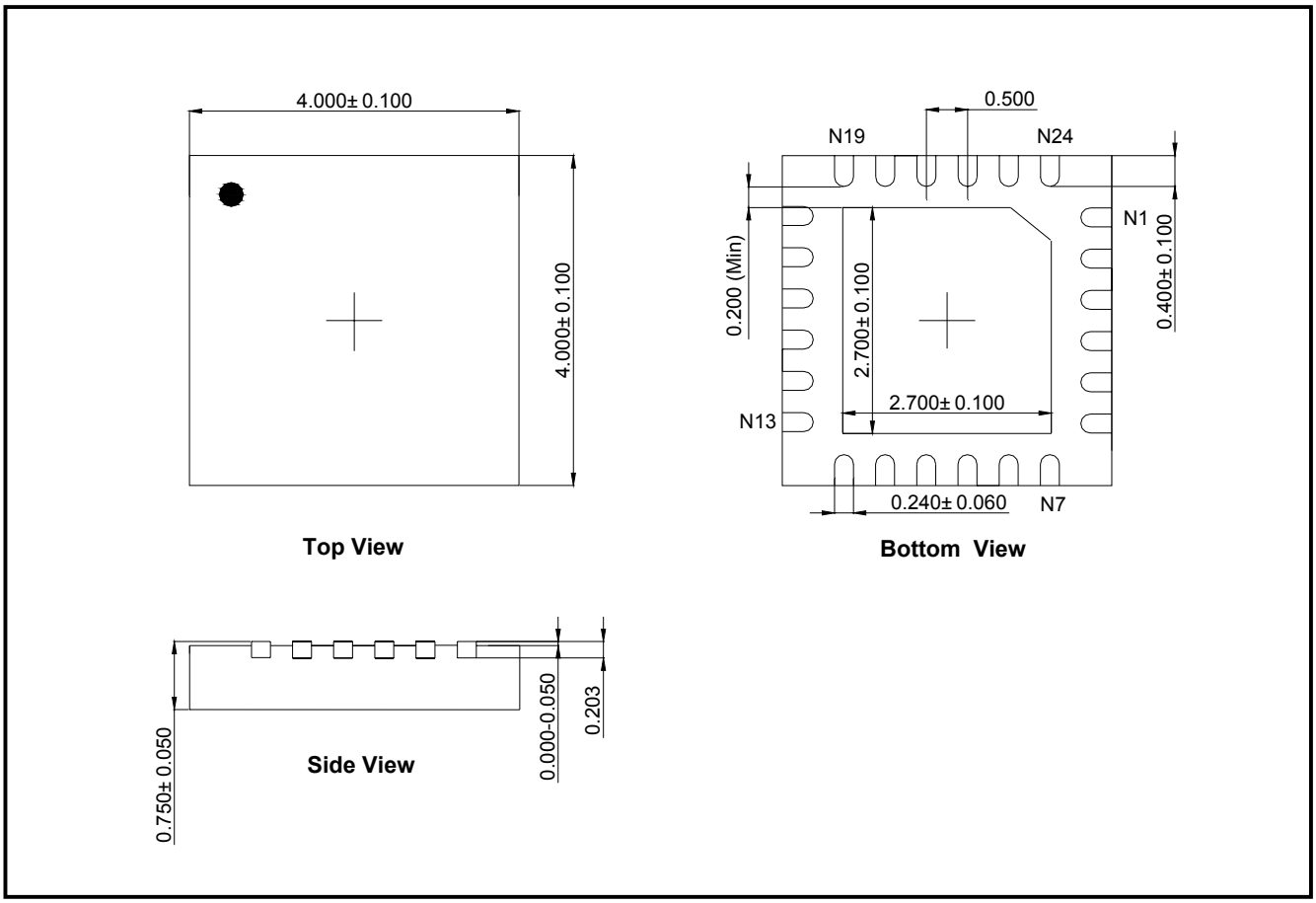
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A= +25℃, C6 = 1μF, unless otherwise noted.



PACKAGE OUTLINE DIMENSIONS

TQFN4×4-24L



Note: All linear dimensions are in millimeters.