1.6 WATT BRIDGED AUDIO POWER AMPLIFIER
EXTERNAL GAIN CONFIGURATION CAPABILITY

A2216

Description

The A2216 is a 1.6W bridged audio power amplifiers designed for portable communication device applications. It provides a very low cost solution by eliminating external components when used with 2.7V to 5.5V-powered circuits.

The A2216 has superb THD (Total Harmonic Distortion) at high-power output and excellent power supply rejection with 4 and 8Ω loads.

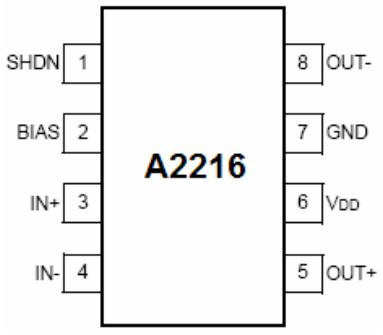
The A2216 integrated over-temperature and over-current protection circuitry switch the devices off in case of an output short-circuit. A digital input allows the devices to automatically switch into shutdown mode.

The advanced pop & click circuitry, a minimal count of external components and low-power shutdown mode make A2216 idea for wireless handsets, and the gain (Av) of the A2216 is controlled using external resistors.

The space-saving 8-pin MSOP8 package is available.

Ordering Information

MSOP8 Package



Top View

PN: A2216MS8

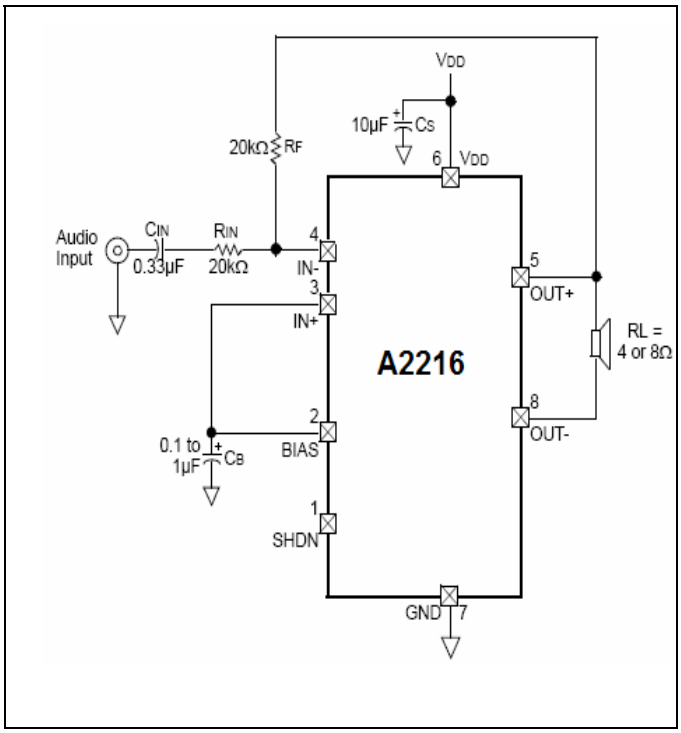
Features

- Click and Pop Suppression
- Improved PSRR Greater Than 65dB @ 217Hz
- THD + Noise: 1.6W into 4Ω at 1%
- 2.7 to 5.5V (V_{DD}) Single-Supply Operation
- Ultra Low Shutdown Current: 10nA
- Over-Temperature and Over Current Protection
- No Output Coupling Capacitors required
- External Gain Configuration Capability
- Space-saving 8-pin MSOP Package

Application

- Wireless Handsets
- Portable Audio Devices
- Portable DVD Players
- PDA, MP3, CD Player, Mobile Phone
- Smartphone
- Handheld Battery-Powered Devices

Typical Application



Pin Description

Pin #	Name	Function
1	SHDN	Connect this pin to GND to Shutdown (A2216MS8-H); connect this pin to V_{DD} to Shutdown (A2216MS8-L)
2	BIAS	DC Bias Bypass
3	IN+	Non-Inverting Input
4	IN-	Inverting Input
5	OUT+	Positive Differential Output
6	V_{DD}	Power Supply
7	GND	Ground
8	OUT-	Negative Differential Output

Absolute Maximum Ratings

Parameter	Min	Max	Unit
V_{DD} to GND	-0.3	+7	V
Any Other Pin to GND	-0.3	V_{DD}+0.3	V
Input Current (Latch-up Immunity)	-100	100	mA
Continuous Power Dissipation		362	mW
Electro-Static Discharge (ESD)		1	kV
Operating Temperature Range (T_A)	-40	+85	^oC
Storage Temperature (Ts)	-65	+150	^oC
Lead Temperature and Time			260^oC, 10S

Electrical Characteristics

1. V_{DD}=5V, R_L=∞, C_{BIAS}=0.1uF to GND, SHDN=GND, T_A=25°C, unless otherwise noted.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DD}	Supply Voltage Range	Inferred from PSRR Test		2.7		5.5	V
I_{DD}	Supply Current (Note1)	T_A=-40 to +85°C			6.8	10.4	mA
I_{SHDN}	Shutdown Supply Current	SHDN=V_{DD}			0.01	1	uA
	SHDN Threshold	V_{IH}		V_{DD}x0.7			V
		V_{IL}				V_{DD}x0.3	
V_{BIAS}	Common-Mode Bias Voltage (Note2)			V_{DD}/2-5%	V_{DD}/2	V_{DD}/2+5%	V
V_{OS}	Output Offset Voltage	Av=2, IN-=OUT+, IN-=BIAS			±1	±10	mV
PSRR	Power Supply Rejection Ratio	Inputs Grounded, V_{RIPPLE}=200mVp-p, R_L=4Ω, V_{IN-}=V_{IN+}=V_{BIAS}	217Hz		65		dB
			1KHz		63		
P_{OUT}	Output Power (Note3)	R_L=4Ω, THD+N=1%, f_{IN}=1KHz			1.6		W
		R_L=8Ω, THD+N=1%, f_{IN}=1KHz		0.8	1.2		
THD+N	Total Harmonic Distortion + Noise	Av=2, R_L=4Ω, f_{IN}=1KHz, P_{OUT}=1.3W			0.09		%
		Av=2, R_L=8Ω, f_{IN}=1KHz, P_{OUT}=1W			0.05		
	Thermal-Shutdown Threshold				145		°C
	Thermal-Shutdown Hysteresis				0		°C
t_{PU}	Power-Up/Enable from Shutdown Time				150		ms
t_{SHDN}	Shutdown Time				1		us
V_{POP}	Turn-Off Transient				20		mv

2. V_{DD}=3V, R_L=∞, C_{BIAS}=0.1uF to GND, SHDN=GND, T_A=25°C, unless otherwise noted.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{DD}	Supply Current (Note1)	T_A=-40 to +85°C			6	10	mA
I_{SHDN}	Shutdown Supply Current	SHDN=V_{DD}			0.01	1	uA
PSRR	Power Supply Rejection Ratio	V_{RIPPLE}=200mVp-p, R_L=4Ω, V_{IN-}=V_{IN+}=V_{BIAS}	217Hz		65		dB
			1KHz		63		
P_{OUT}	Output Power (Note3)	R_L=4Ω, THD+N=1%, f_{IN}=1KHz			0.6		W
		R_L=8Ω, THD+N=1%, f_{IN}=1KHz			0.4		
THD+N	Total Harmonic Distortion + Noise	Av=2, R_L=4Ω, f_{IN}=1KHz, P_{OUT}=500mW			0.09		%
		Av=2, R_L=8Ω, f_{IN}=1KHz, P_{OUT}=350mW			0.05		

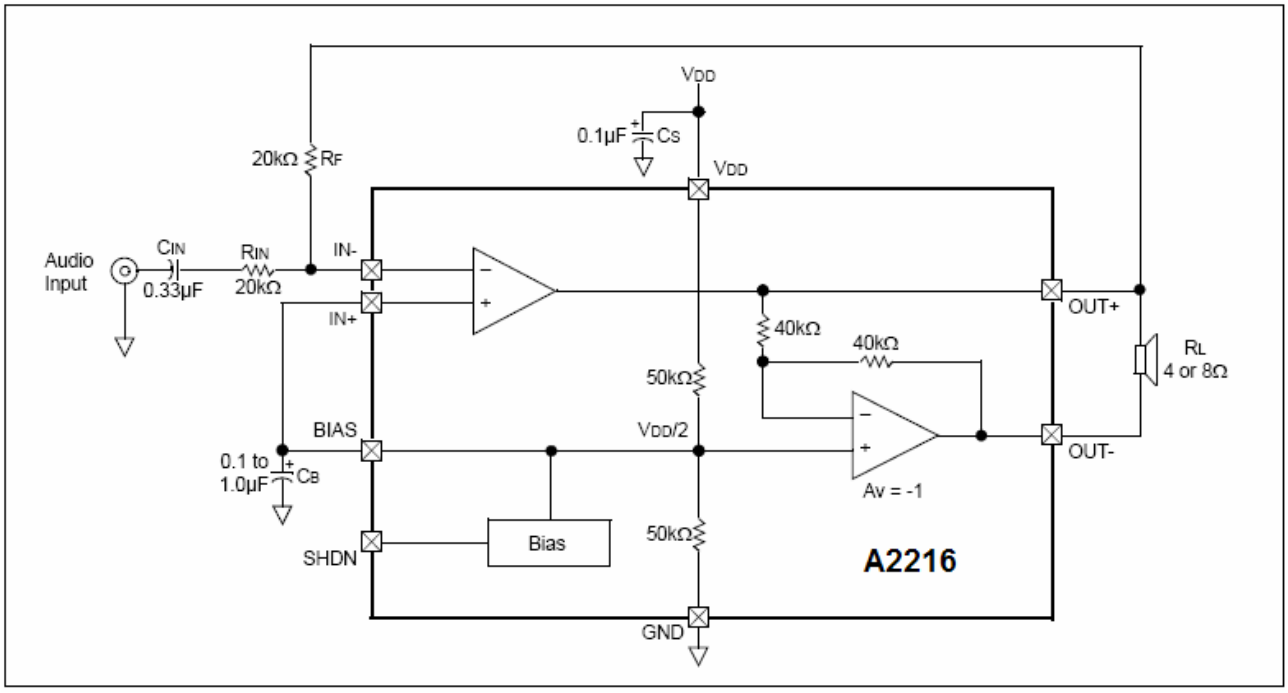
Note1: Quiescent power supply current is specified and tested without loads on the outputs. Quiescent power supply current depends on the offset voltage when a practical load is connected to the devices.

Note2: Common-mode bias voltage is the voltage on pin BIAS and is nominally V_{DD}/2.

Note3: Guaranteed by design.

Block Diagram

The A2215 bridged audio power-amplifiers can deliver 1.6W into 4Ω while operating from a single 2.7 to 5.5V supply. The A2216 consist of two high-output-current operational amplifiers configured as a bridge-tied load (BTL) amplifier as shown below.



The gain of the A2216 is set by the closed-loop gain of the input operational amplifier. As shown above the output of the first amplifier serves as the input to the second amplifier, which is configured as an inverting unity-gain follower in both devices. This results in two outputs, identical in magnitude, and 180° out-of-phase.

Bias

The A2216 operate from a single 2.7 to 5.5V supply and contain an internally generated, common-mode bias voltage of $V_{DD}/2$, referenced to ground. Bias provides click-and –pop suppression and sets the DC bias level for the audio outputs. For selection of the value for the bias bypass capacitor (C_{BIAS}), Pin BIAS is internally connected to the non-inverting input of one amplifier, and should be connected to the non-inverting input fo the other amplifier for proper signal biasing.

Shutdown

The integrated 100nA, low-power shutdown circuitry reduces quiescent current consumption. As shutdown commences, the bias circuitry is automatically disabled, the A2216 outputs go high impedance and bias is driven to GND.

Note: Connect SHDN to GND to shutdown (A2216MS8-H); connect SHDN to V_{DD} to shutdown (A2216MS8-L)

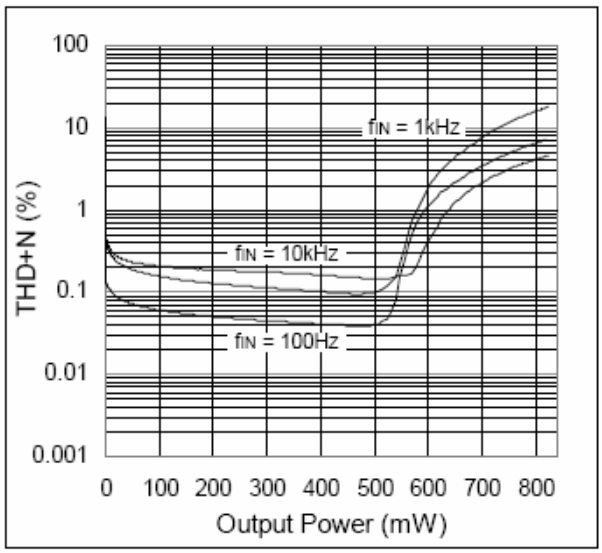
Current Limit

The A2216 current limit circuitry protects the device during output short-circuit and overload conditions. When A2216 outputs are shorted to either V_{DD} or GND, the short-circuit protection is enabled and the amplifier enters a pulsing mode, reducing the average output current to a safe level. The A2216 remains in this mode until the short-circuit or overload condition is corrected.

Typical Performance Characteristics

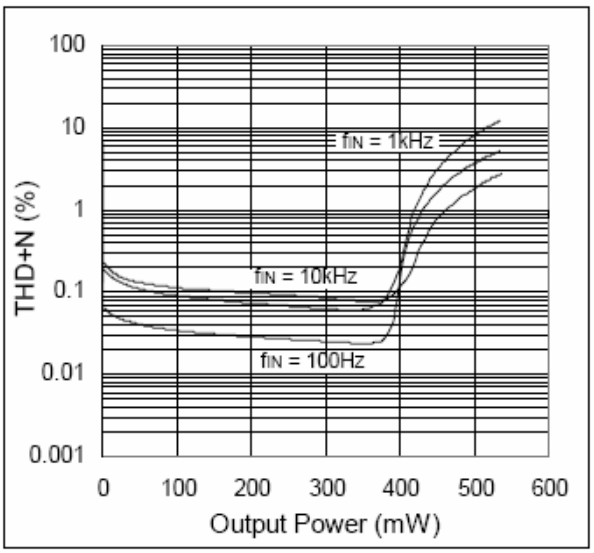
1. THD + Noise vs. Output Power

V_{DD}=3V, R_L =4Ω, Av=2



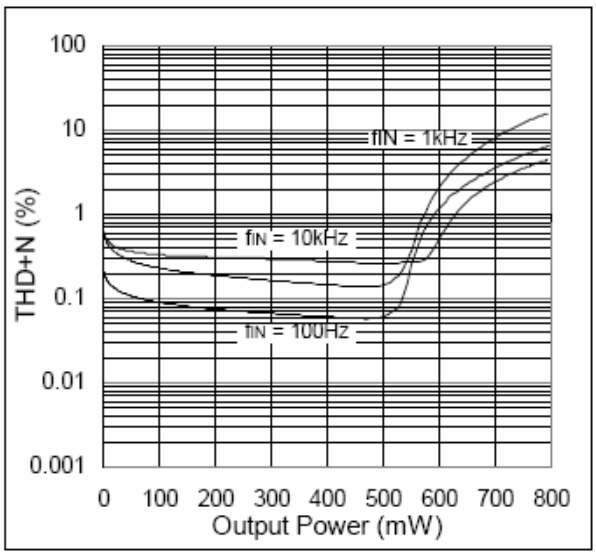
2. THD + Noise vs. Output Power

V_{DD}=3V, R_L =8Ω, Av=2



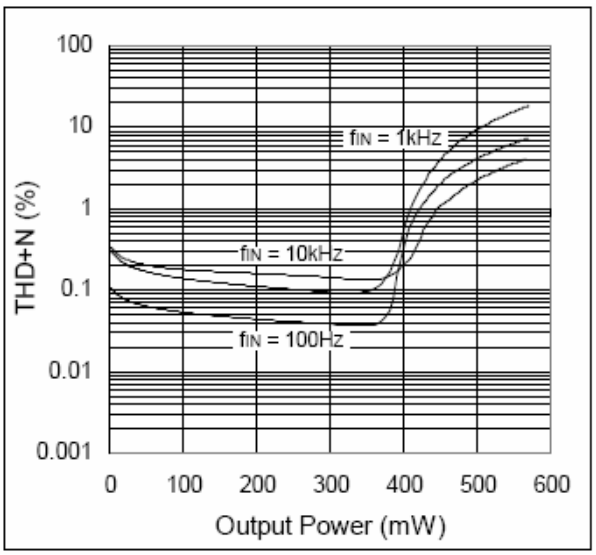
3. THD + Noise vs. Output Power

V_{DD}=3V, R_L =4Ω, Av=4



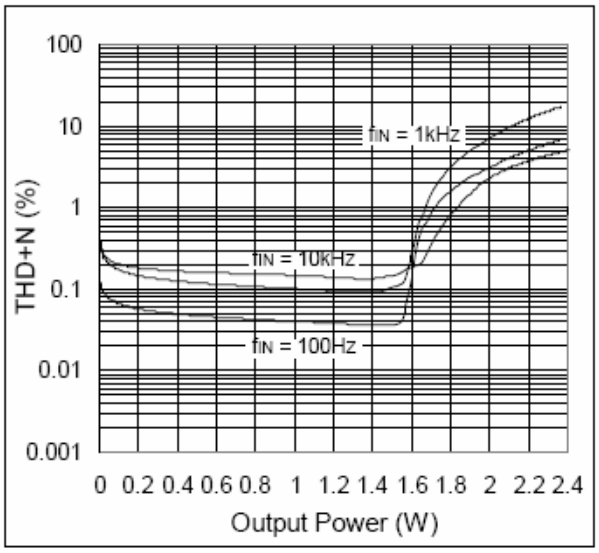
4. THD + Noise vs. Output Power

V_{DD}=3V, R_L =8Ω, Av=4



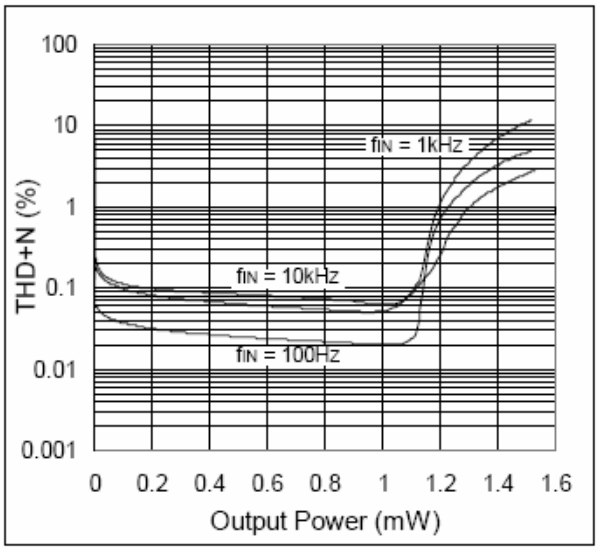
5. THD + Noise vs. Output Power

V_{DD}=5V, R_L =4Ω, Av=2



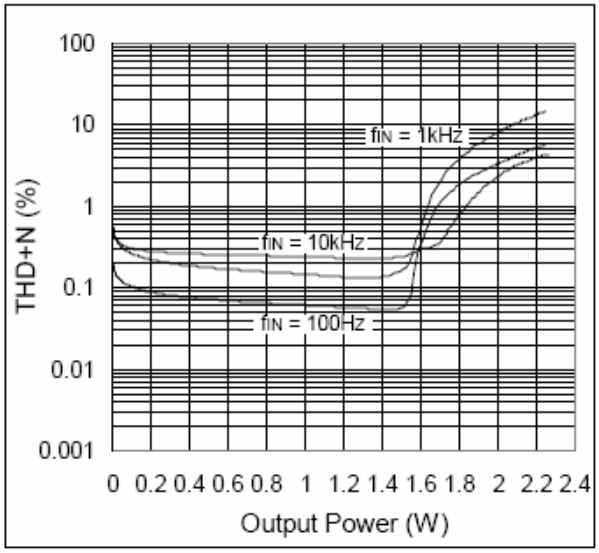
6. THD + Noise vs. Output Power

V_{DD}=5V, R_L =8Ω, Av=2



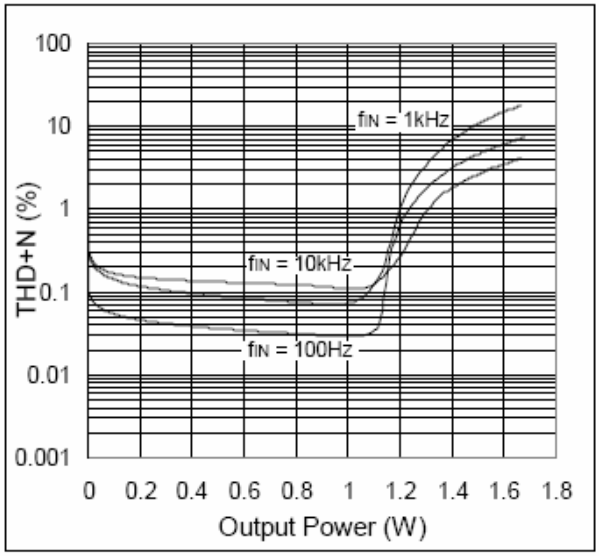
7. THD + Noise vs. Output Power

V_{DD}=5V, R_L =4Ω, Av=4



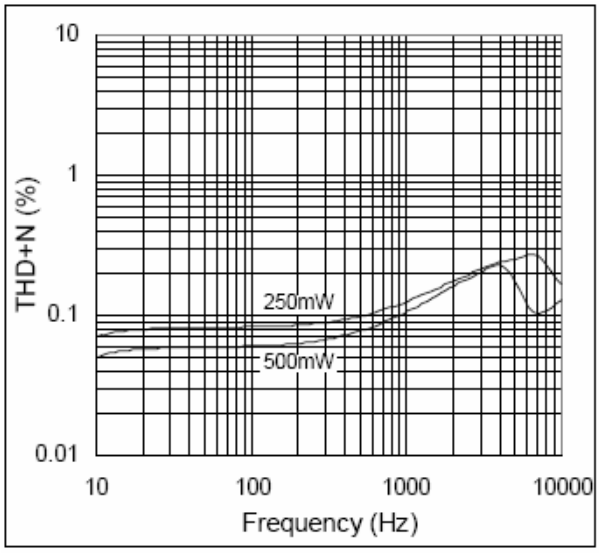
8. THD + Noise vs. Output Power

V_{DD}=5V, R_L =8Ω, Av=4



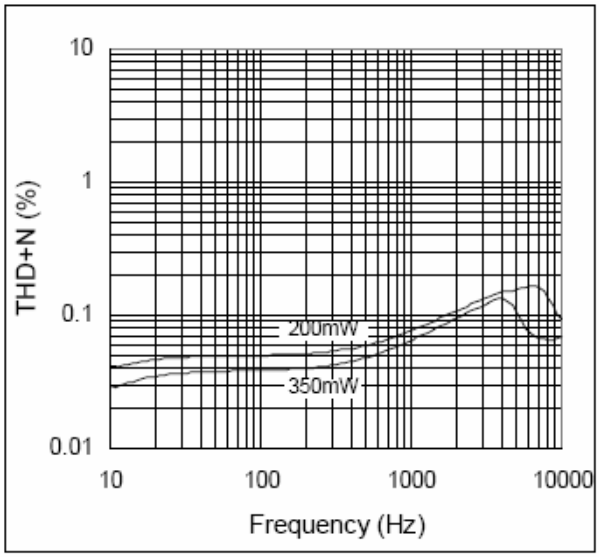
9. THD + Noise vs. Frequency

V_{DD}=3V, R_L=4Ω, Av=2



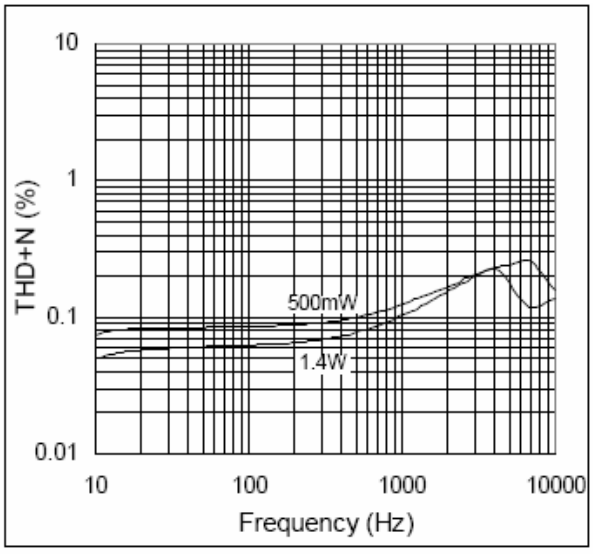
10. THD + Noise vs. Frequency

V_{DD}=3V, R_L =8Ω, Av=2



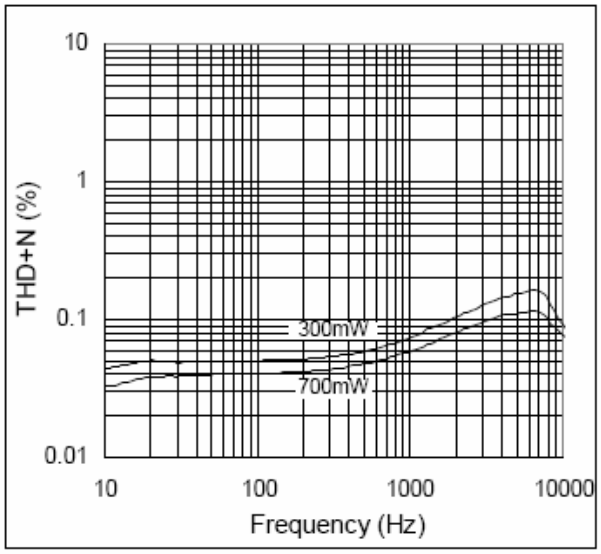
11. THD + Noise vs. Frequency

V_{DD}=5V, R_L=4Ω, Av=2



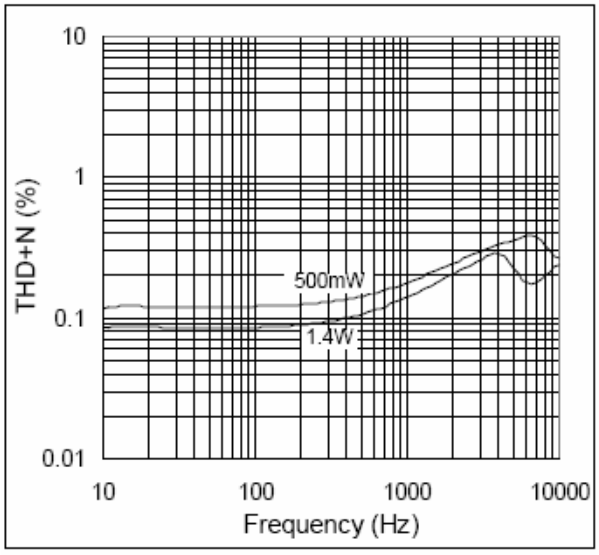
12. THD + Noise vs. Frequency

V_{DD}=5V, R_L =8Ω, Av=2



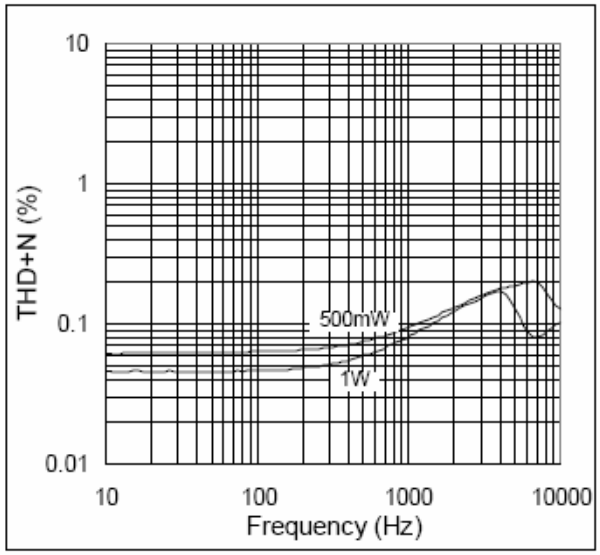
13. THD + Noise vs. Frequency

V_{DD}=5V, R_L=4Ω, Av=4



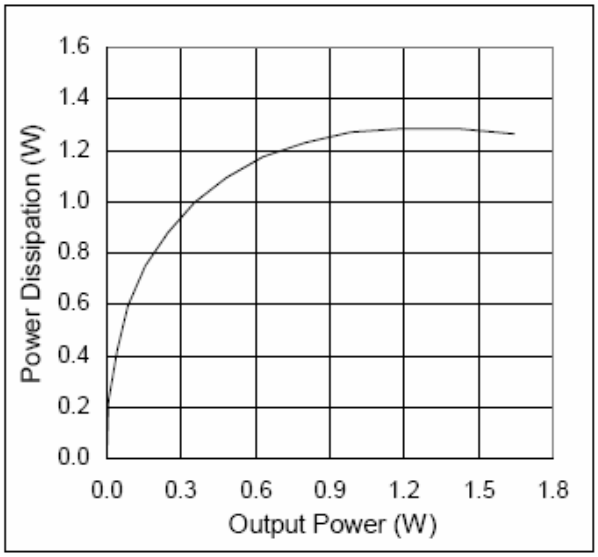
14. THD + Noise vs. Frequency

V_{DD}=5V, R_L =8Ω, Av=4



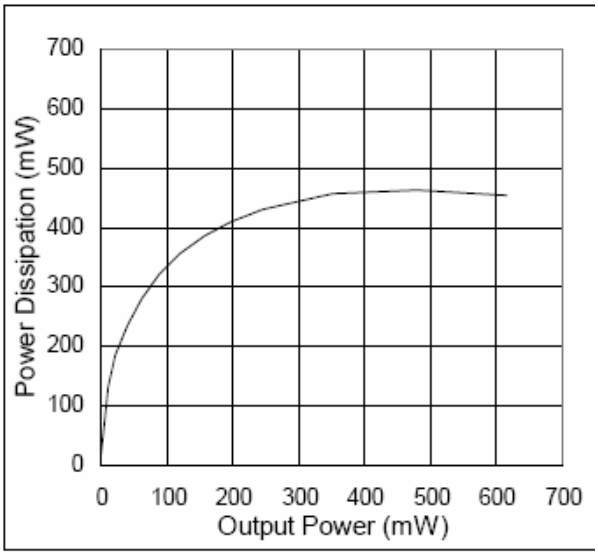
15. Power Dissipation vs. P_{OUT}

V_{DD}=5V, R_L=4Ω, Av=2, f=1KHz, THD+N<1%



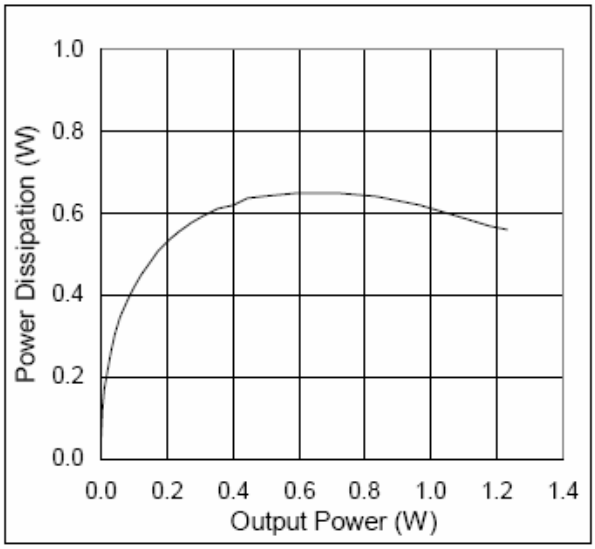
16. Power Dissipation vs. P_{OUT}

V_{DD}=3V, R_L =4Ω, Av=2, f=1KHz, THD+H<1%



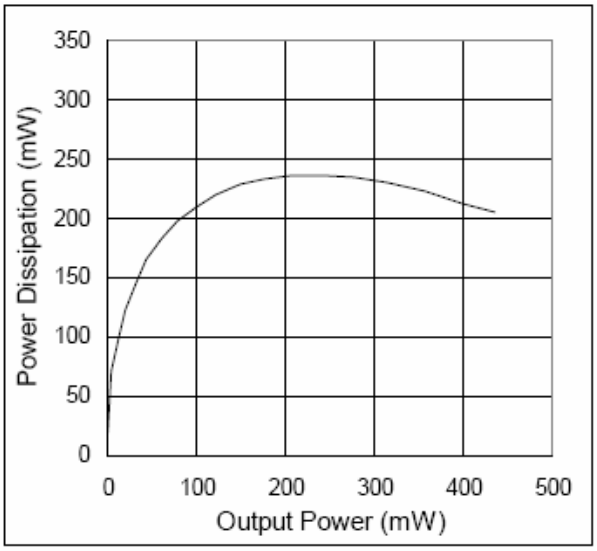
17. Power Dissipation vs. P_{OUT}

V_{DD}=5V, R_L=8Ω, Av=2, f=1KHz, THD+N<1%



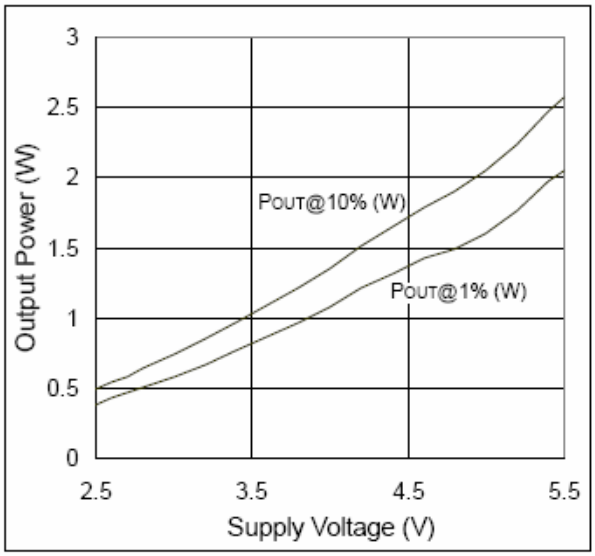
18. Power Dissipation vs. P_{OUT}

V_{DD}=3V, R_L =8Ω, Av=2, f=1KHz, THD+H<1%



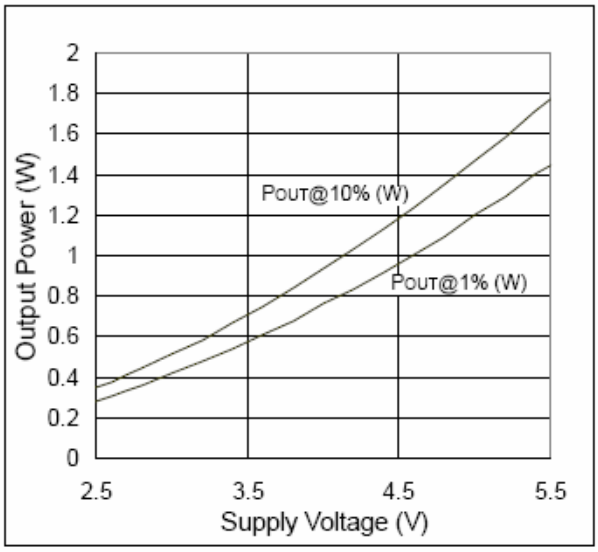
19. Output Power vs. Supply Voltage

R_L=4Ω, Av=2, f=1KHz



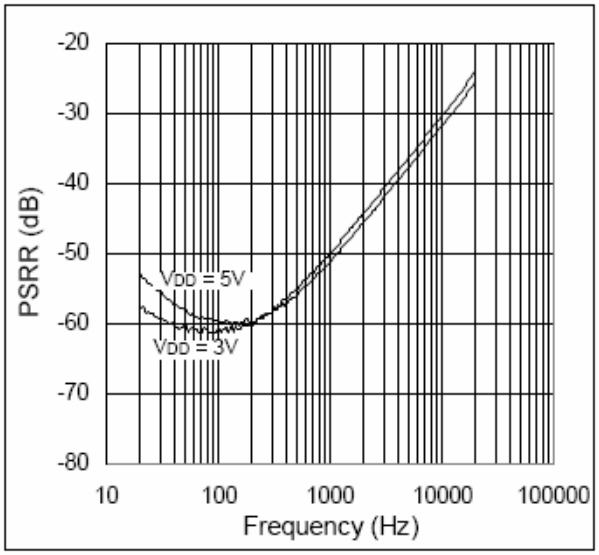
20. Output Power vs. Supply Voltage

R_L =8Ω, Av=2, f=1KHz



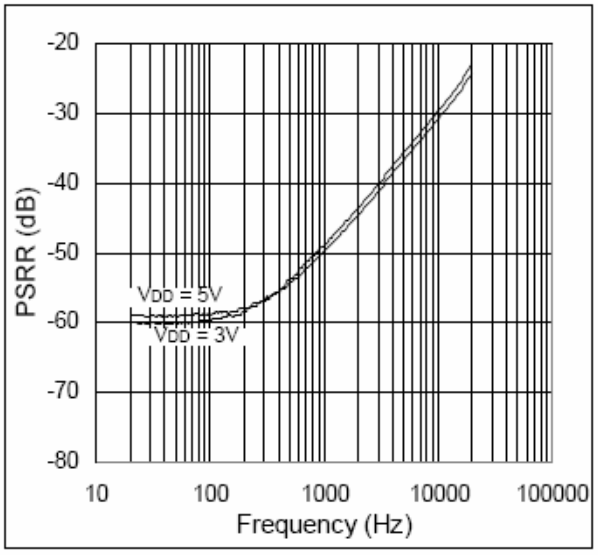
21. PSRR vs. Frequency, V_{RIPPLE}=200mVpp

C_{BP}=C_{IN}=1uF, R_L=4Ω, Av=2, In1 Grounded



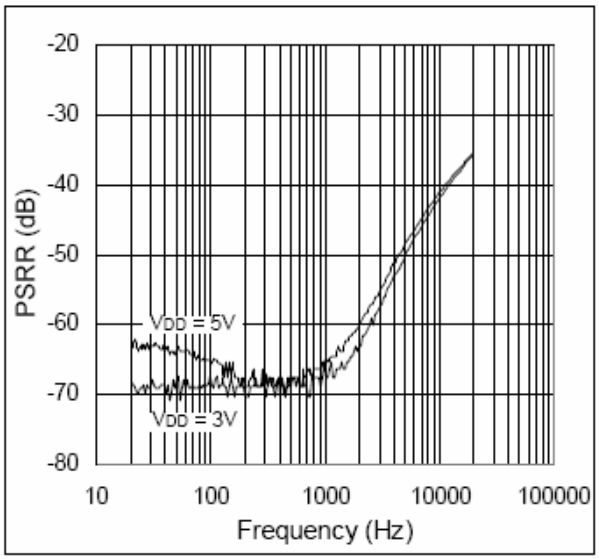
22. PSRR vs. Frequency, V_{RIPPLE}=200mVpp

C_{BP}=C_{IN}=1uF, R_L=4Ω, Av=2, Floating Input

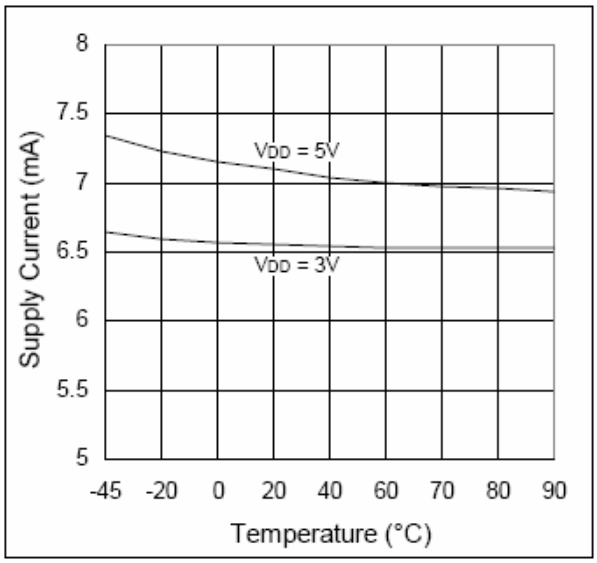


23. PSRR vs. Frequency, V_{RIPPLE}=200mVpp

C_{BP}=C_{IN}=1uF, R_L=4Ω, Av=2, Inputs Grounded

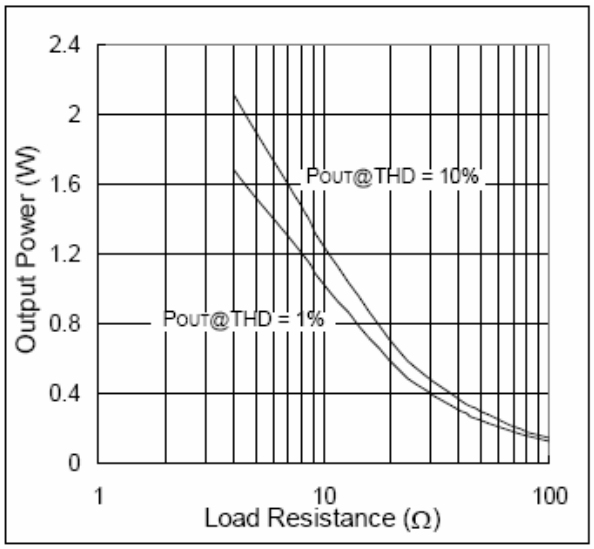


24. Supply Current vs. Temperature



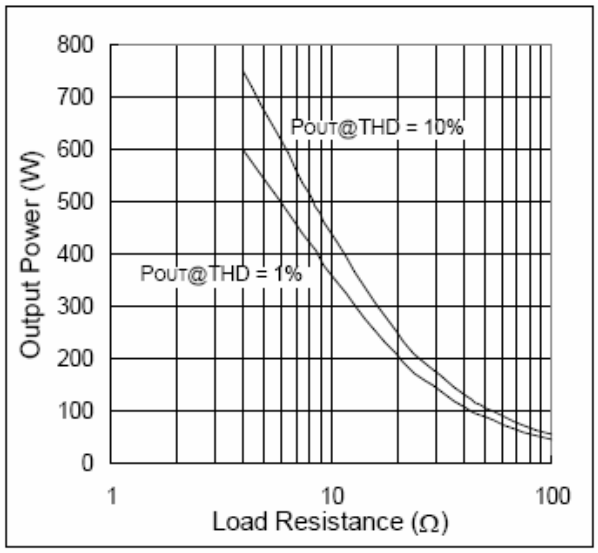
25. Output Power vs. Load Resistance

V_{DD}=5V



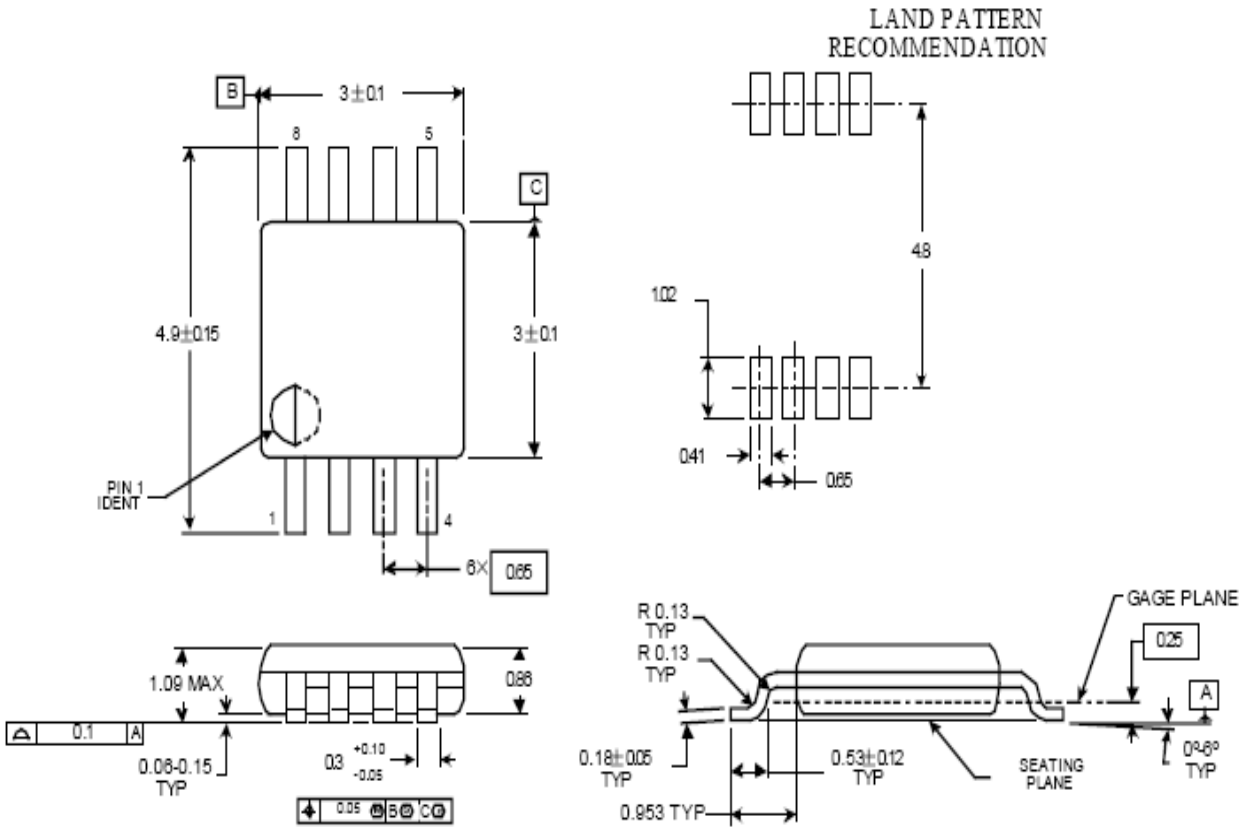
26. Output Power vs. Load Resistance

V_{DD}=3V



Package Information

Dimension in MSOP8 Package (Unit: mm)



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