1.8 WATT SINGLE-CHANNEL AUDIO POWER AMPLIFIER FIXED AND ADJUSTABLE GAINS

A2218

Description

The A2218 is a single-channel differential audio power-amplifier designed to drive 4 and 8Ω loads. The integrated gain circuitry of A2218 and it's small size make them ideal for 2.7 to 5V powered portable audio devices.

The differential input design improves noise rejection and provides common-mode rejection. A bridge-tied load (BTL) design minimizes external component count, while providing high-fidelity audio power amplification.

The A2218 deliver 1.8W continuous average power per channel to a 4Ω load with less than 1% THD (plus noise), while operating from a single 2.7 to 5V supply.

For reduced component designs, the A2218 are available with different gain levels as Av=0, 3, 6 & adjustable dB.

Integrated shutdown circuitry disables the bias generator and amplifiers, and reduces quiescent current consumption to less than 100nA. The shutdown input can be set active-high or active-low. A2218 contain click- and- Pop suppression circuitry that reduces audible clicks and pops during power-up and shutdown.

The space-saving 10-pin MSOP and DFN package are available.

Package	Part Number
10-Pin MSOP	A2218M10-X
10-Pin DFN (3x3mm)	A2218J10-X
X: Gains, A2218M10-0 (0dB), A2218M10-3 (3dB), A2218M10-6 (6dB), A2218M10-A (Adj)	

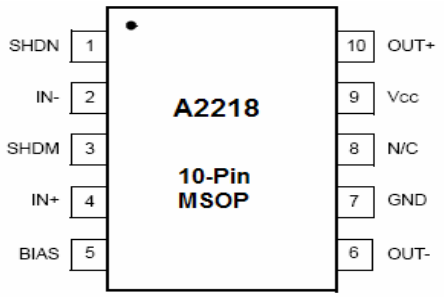
Features

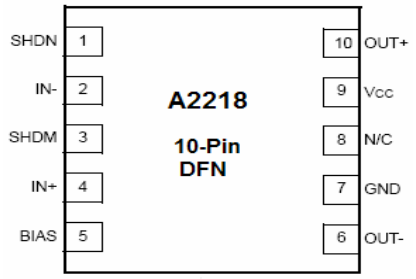
- Differential Input
- Adjustable Gain Option
- THD + Noise: 1.8W into 4Ω at 1% (Per Channel)
- 2.7 to 5.5V (V_{CC}) Single-Supply Operation
- Low-Power Shutdown Mode: < 100nA
- Click-and-Pop Suppression
- Internal Fixed Gain to Reduce External Component Count
- Space-saving 10-pin MSOP & DFN Package

Application

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

Ordering Information

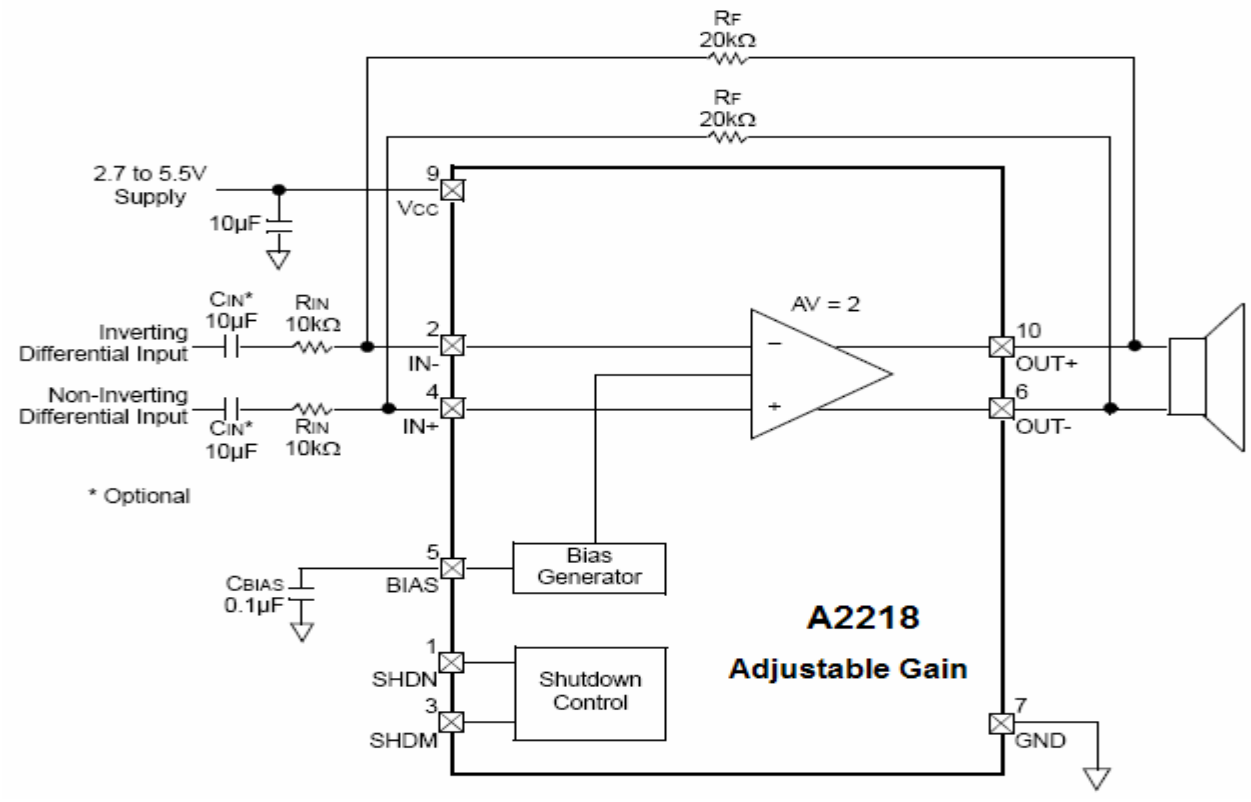


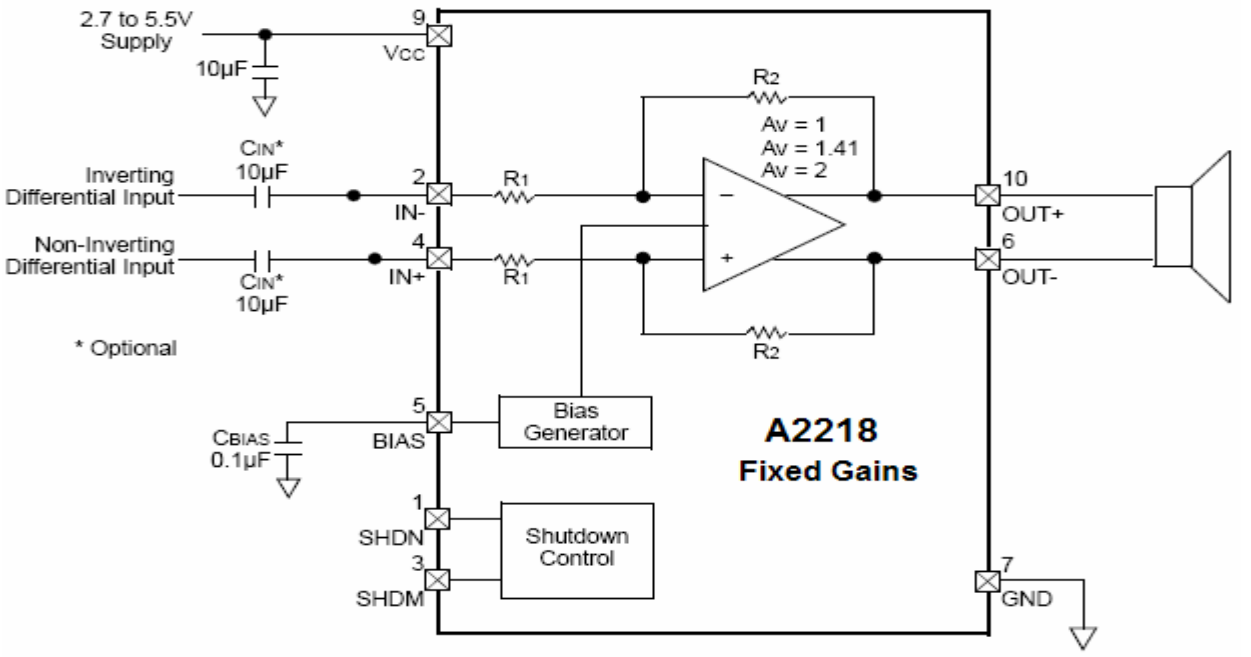


Pin Description

Pin #	Name	Function
1	SHDN	Shutdown Input. The polarity of this pin is dependent on the state of pin SHDM
2	IN-	Inverting Input
3	SHDM	Shutdown-Mode Polarity Input. This pin controls the polarity of pin SHDN. Connect this pin high for an active-high SHDN input. Connect this pin low for an active-low SHDN input.
4	IN+	Non-Inverting Input
5	BIAS	DC Bias Bypass
6	OUT-	Bridge Amplifier Negative Output
7	GND	Ground
8	N/C	Not Connected. No internal connection.
9	Vcc	Power Supply
10	OUT+	Bridge Amplifier Positive Output

Typical Application





Absolute Maximum Ratings

Parameter	Min	Max	Unit
Supply Voltage (V_{CC} to GND)	-0.3	+7	V
Any Other Pin to GND	-0.3	V_{CC}+0.3	V
Input Current (Latch-up Immunity)	-50	50	mA
Continuous Power Dissipation (T_A=+70°C)*		600	mW
Continuous Power Dissipation (T_A=+25°C)*		1000	mW
Electro-Static Discharge (ESD)		1	kV
Operating Temperature Range (T_A)	-40	+85	°C
Storage Temperature (Ts)	-65	+150	°C
Lead Temperature and Time			260°C, 10S

*Using PCB metal plane and thermally-conductive paste.

Electrical Characteristics

1. 5V Supply, T_A=25°C, unless otherwise noted.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CC}	Supply Voltage Range	T_A=-40 to +85°C		2.7		5.5	V
I_{CC}	Supply Current (Note1)	V_{IN}=V_{IN+}=V_{BIAS}; T_A=-40 to +85°C			8	10.4	mA
I_{SHDN}	Shutdown Supply	SHDN=SHDM=GND			0.05	1	uA
	SHDN Threshold	V_{IH}		V_{CC}x0.7			V
		V_{IL}				V_{CC}x0.3	
V_{BIAS}	Common-Mode Bias Voltage (Note2)			V_{CC}/2-5%	V_{CC}/2	V_{CC}/2+5%	V
V_{OS}	Output Offset Voltage	V_{IN}=V_{IN+}=V_{BIAS}	Av=0dB		±1	±10	mV
			Av=3dB		±1	±15	
			Av=6dB		±1	±20	
V_{IC}	Common-Mode-Input Voltage (Note3)	Inferred from CMRR test	Av=0dB	0.2		Vcc-0.2	V
			Av=3dB	0.9		Vcc-0.9	
			Av=6dB	1.5		Vcc-1.5	
		External Gain (Adjustable)		1.5		Vcc-1.5	
R_{IN}	Input Impedance	A2218-0, 3 & 6		10	15	20	KΩ
CMRR	Common-Mode Rejection Ratio	f_N=1KHz			-64		dB
PSRR	Power Supply Rejection Ratio	V_{RIPPLE}=200mVp-p, C_{BIAS}=1uF, R_L=8Ω, V_{IN-}=V_{IN+}=V_{BIAS}	217Hz		-79		dB
			1KHz		-73		
P_{OUT}	Output Power (Note3)	R_L=8Ω, THD+N=1%, f_{IN}=1KHz		0.8	1.25		W
		R_L=4Ω, THD+N=1%, f_{IN}=1KHz			1.8		
THD+N	Total Harmonic Distortion + Noise (Note4)	Av=6dB, R_L=4Ω, f_{IN}=1KHz, P_{OUT}=1.28W, Vcc=5V			0.06		%
		Av=6dB, R_L=8Ω, f_{IN}=1KHz, P_{OUT}=0.9W, Vcc=5V			0.03		
	Gain Accuracy	A2218-0, 3 & 6			±1	±2	%
	Thermal-Shutdown Threshold				+145		°C
	Thermal-Shutdown Hysteresis				9		°C
t_{PU}	Power-Up/Enable from Shutdown Time				125		ms
t_{SHDN}	Shutdown Time				3.5		us
V_{POP}	Turn-Off Transient (Note 5)				50		mv

Note1: Quiescent power supply current is specified and tested with no load. Quiescent power supply current depends on the offset voltage when a practical load is connected to the amplifier.

Note 2: Common-mode bias voltage is the voltage on BIAS and is nominally Vcc/2.

Note 3: Guaranteed by design.

Note 4: Measurement bandwidth for THD+N is 2Hz to 22KHz.

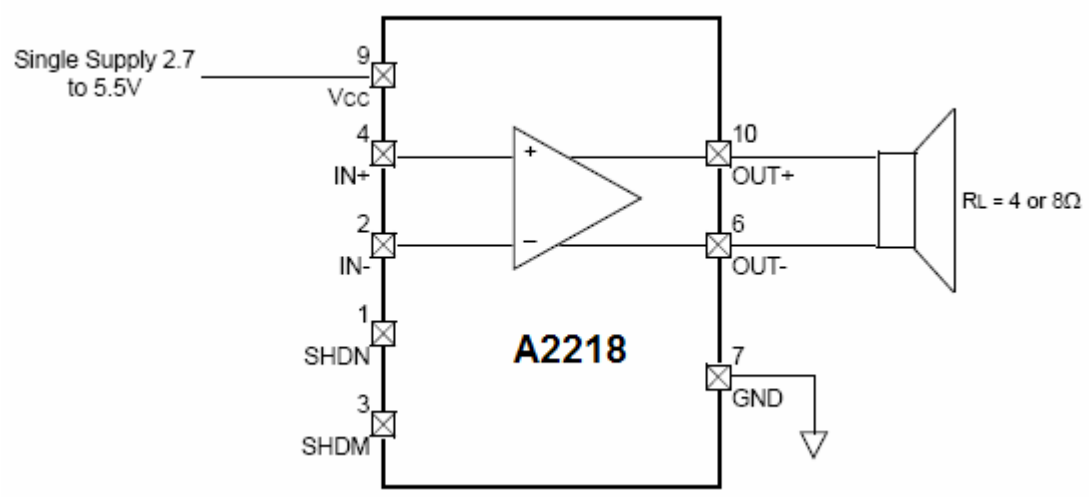
Note 5: Peak voltage measured at power-on, power-off, into or out of SHDN, Bandwidth defined by A-weighted filters, inputs at AC GND. Vcc rise and fall times ≧ 1ms.

2. 3V Supply, T_A=25°C, unless otherwise noted.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CC}	Supply Current (Note1)	V_{IN}=V_{IN+}=V_{BIAS}; T_A=-40 to +85°C			7.5		mA
I_{SHDN}	Shutdown Supply	SHDN=SHDM=GND			0.05	1	uA
	SHDN Threshold	V_{IH}		V_{CC}x0.7			V
		V_{IL}				V_{CC}x0.3	
V_{BIAS}	Common-Mode Bias Voltage (Note2)			V_{CC}/2-5%	V_{CC}/2	V_{CC}/2+5%	V
V_{OS}	Output Offset Voltage	V_{IN}=V_{IN+}=V_{BIAS}	Av=0dB		±1	±10	mV
			Av=3dB		±1	±15	
			Av=6dB		±1	±20	
V_{IC}	Common-Mode-Input Voltage (Note3)	Inferred from CMRR test	Av=0dB	0.2		Vcc-0.2	V
			Av=3dB	0.6		Vcc-0.6	
			Av=6dB	1.0		Vcc-1.0	
		External Gain (Adjustable)		1.0		Vcc-1.0	
R_{IN}	Input Impedance	A2218-0, 3 & 6		10	15	20	KΩ
CMRR	Common-Mode Rejection Ratio	f_N=1KHz			-64		dB
PSRR	Power Supply Rejection Ratio	V_{RIPPLE}=200mVp-p, C_{BIAS}=1uF, R_L=8Ω, V_{IN-}=V_{IN+}=V_{BIAS}	217Hz		-79		dB
			1KHz		-73		
P_{OUT}	Output Power (Note3)	R_L=8Ω, THD+N=1%, f_{IN}=1KHz			640		mW
		R_L=4Ω, THD+N=1%, f_{IN}=1KHz			440		
THD+N	Total Harmonic Distortion + Noise (Note4)	Av=6dB, R_L=4Ω, f_{IN}=1KHz, P_{OUT}=460mW			0.06		%
		Av=6dB, R_L=8Ω, f_{IN}=1KHz, P_{OUT}=330mW			0.04		
	Gain Accuracy	A2218-0, 3 & 6			±1	±2	%
	Thermal-Shutdown Threshold				+145		°C
	Thermal-Shutdown Hysteresis				9		°C
t_{PU}	Power-Up/Enable from Shutdown Time				125		ms
t_{SHDN}	Shutdown Time				3.5		us
V_{POP}	Turn-Off Transient (Note 5)				50		mv

Block Diagram

The A2218 is 1.8W high output-current audio amplifier (configured as BTL amplifier) and contain integrated low-power shutdown and click-and-pop suppression circuitry. Two inputs (SHDM and SHDN) allow shutdown mode to be configured as active-high or active-low. Provide adjustable and Fixed gains (0dB, 3dB & 6dB).



Bias

The A2218 operate from a single 2.7 to 5.5V supply and contain an internally generated, common-mode bias voltage of Vcc/2 referenced to ground. Bias provides click-and-pop suppression and sets the DC bias level for the audio outputs.

Note: Do not connect external loads to BIA as this can adversely affect overall device performance.

Shutdown

A2218 implements a 100nA, low-power shutdown circuit which reduces quiescent current consumption. As shutdown mode commences, the bias circuitry is automatically disabled, the A2218 outputs go high impedance and bias is driven to GND.

Shutdown Mode Selection Configurations

SHDM	SHDN	Mode
0	0	Shutdown Mode Enabled
0	1	Normal Operation Enabled
1	0	Normal Operation Enabled
1	1	Shutdown Mode Enabled

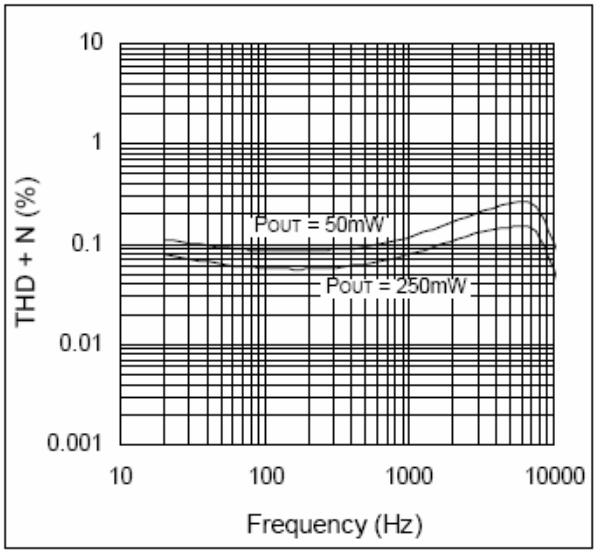
Click- and-Pop Suppression

During power-up, the A2218 common-mode bias voltage (V_{BIAS}) ramps to the DC bias point. When entering shutdown, the A2218 outputs are driven high impedance to 100KΩ between both outputs minimizing the energy present in the audio band, thus preventing clicks and pops.

Typical Performance Characteristics

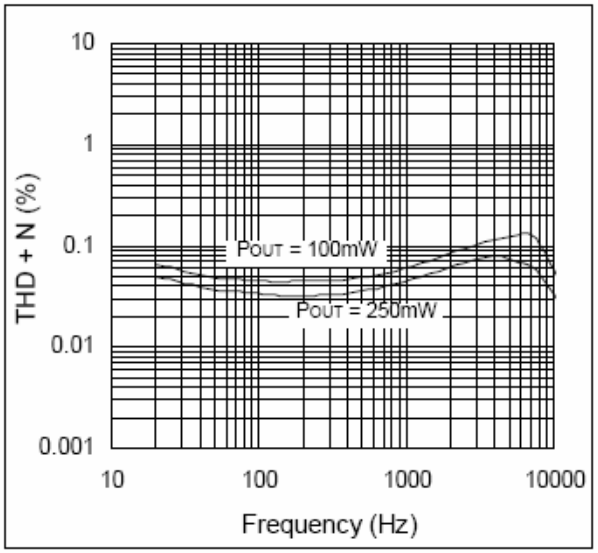
1. THD + Noise vs. Frequency

V_{DD}=3V, R_L =4Ω, Av=2



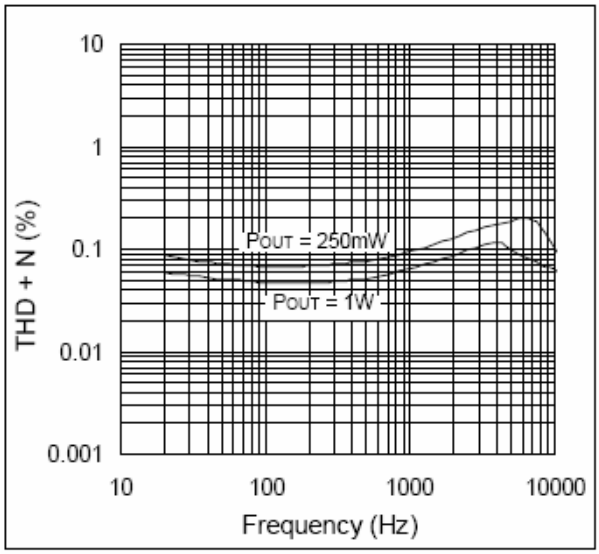
2. THD + Noise vs. Frequency

V_{DD}=3V, R_L =8Ω, Av=2



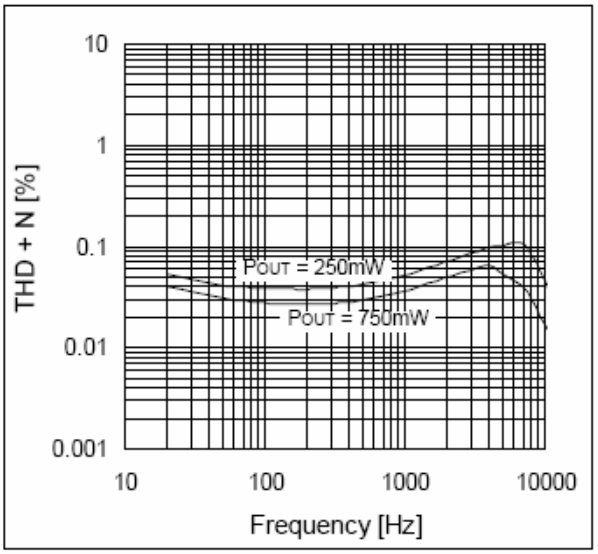
3. THD + Noise vs. Frequency

V_{DD}=5V, R_L =4Ω, Av=2



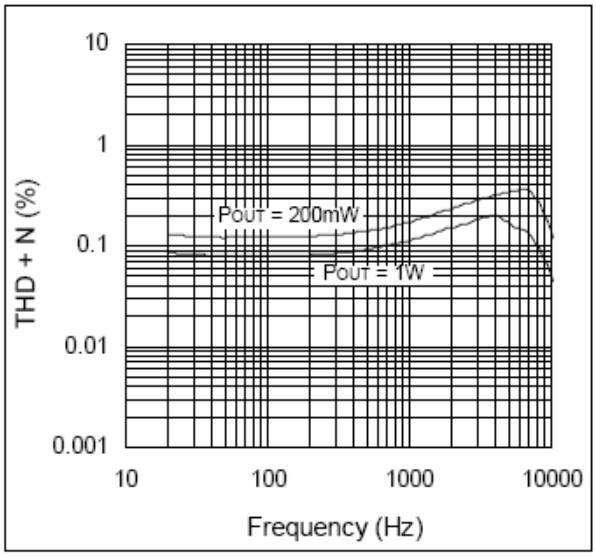
4. THD + Noise vs. Frequency

V_{DD}=5V, R_L =8Ω, Av=2



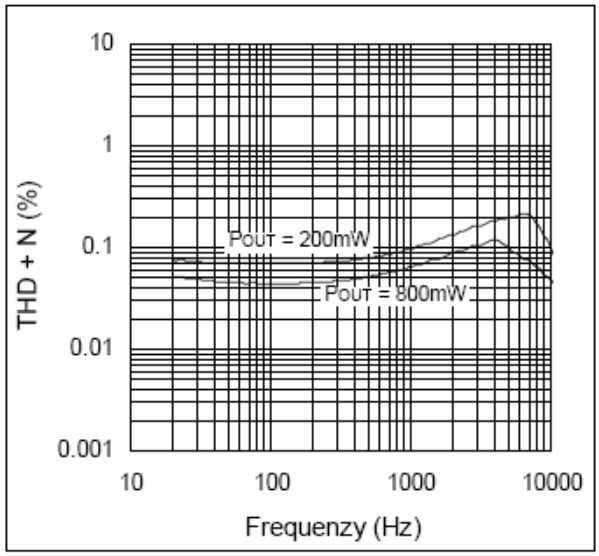
5. THD + Noise vs. Frequency

V_{DD}=5V, R_L =4Ω, Av=4



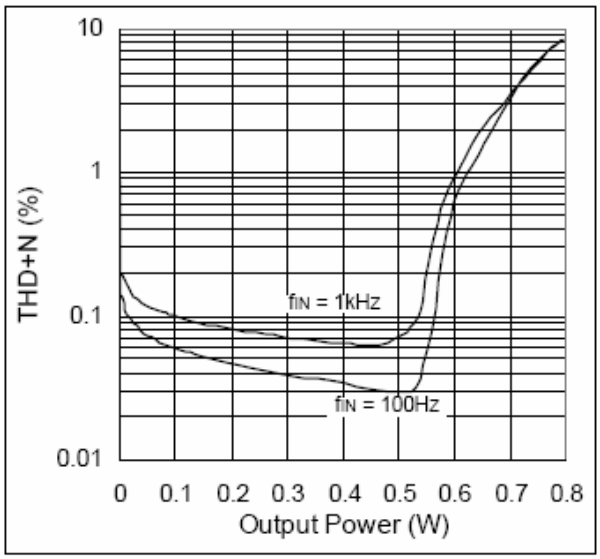
6. THD + Noise vs. Frequency

V_{DD}=5V, R_L =8Ω, Av=4



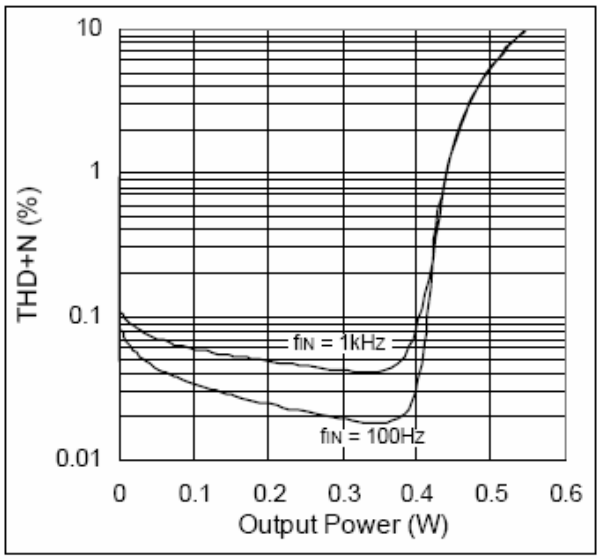
7. THD + Noise vs. Output Power

V_{DD}=3V, R_L =4Ω, Av=2



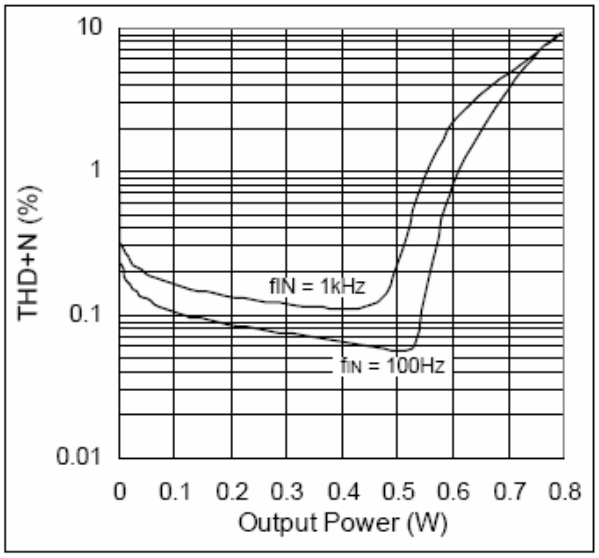
8. THD + Noise vs. Output Power

V_{DD}=3V, R_L =8Ω, Av=2



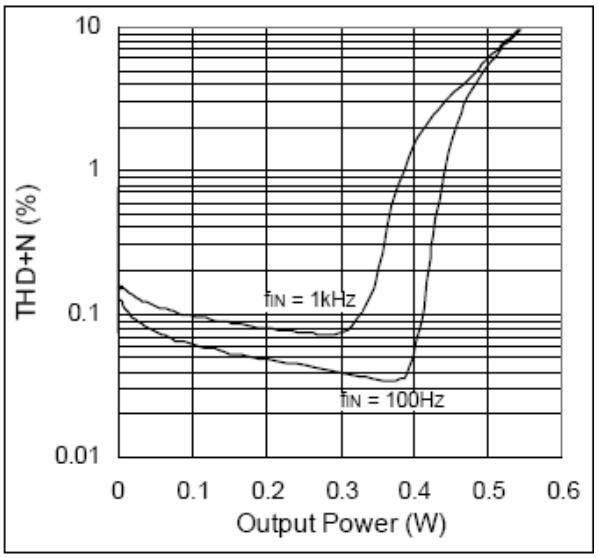
9. THD + Noise vs. Output Power

V_{DD}=3V, R_L=4Ω, Av=2



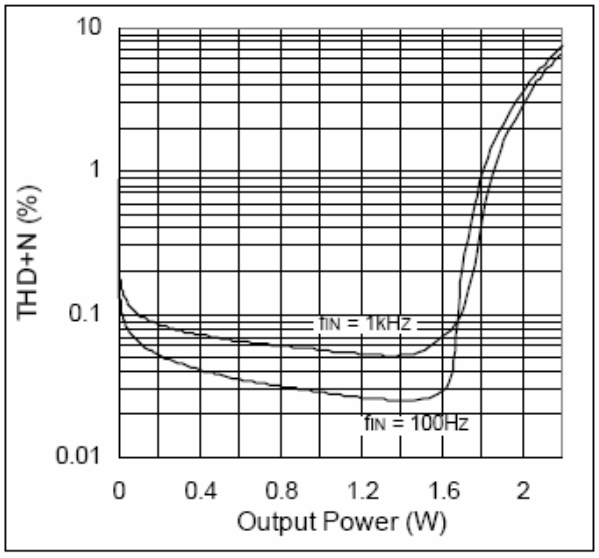
10. THD + Noise vs. Output Power

V_{DD}=3V, R_L =8Ω, Av=2



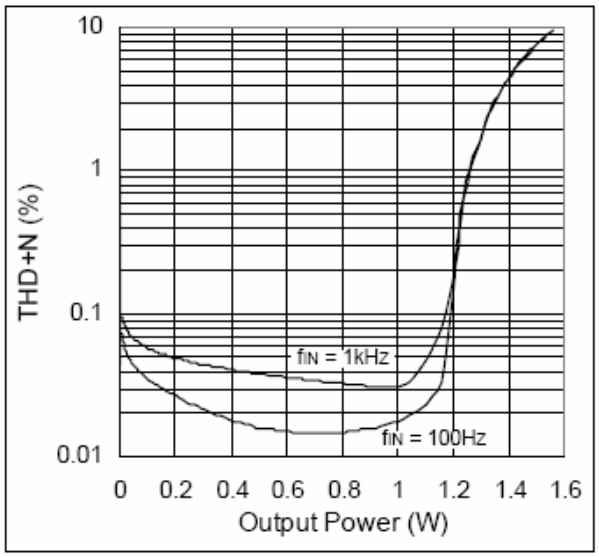
11. THD + Noise vs. Output Power

V_{DD}=5V, R_L=4Ω, Av=2



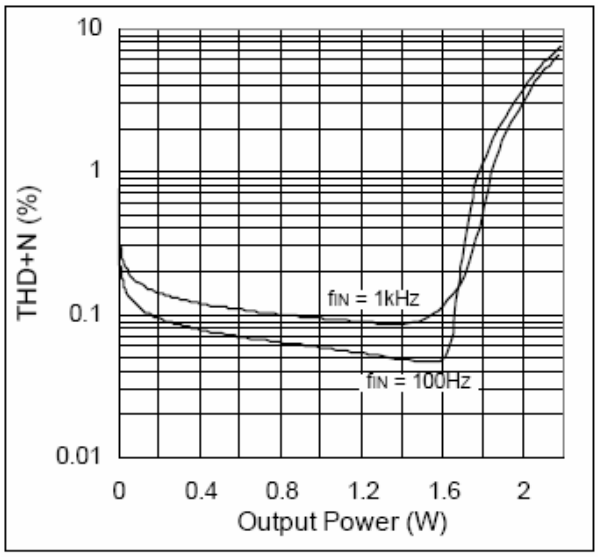
12. THD + Noise vs. Output Power

V_{DD}=5V, R_L =8Ω, Av=2



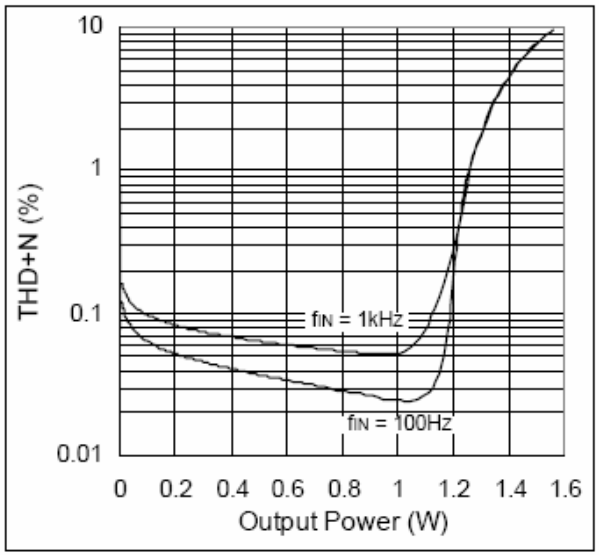
13. THD + Noise vs. Output Power

V_{DD}=5V, R_L=4Ω, Av=4



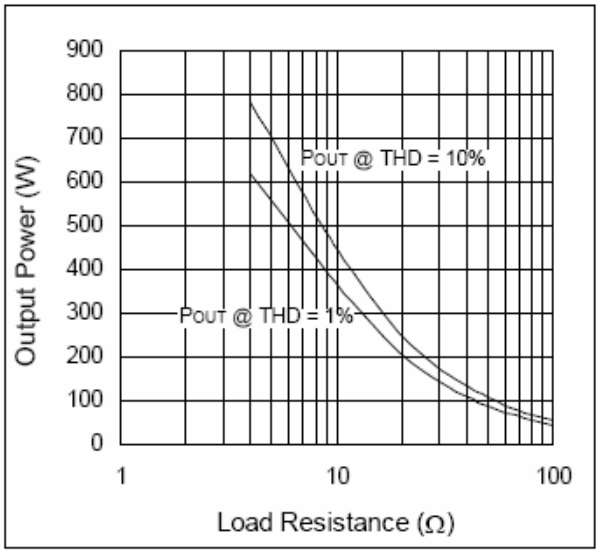
14. THD + Noise vs. Output Power

V_{DD}=5V, R_L =8Ω, Av=4



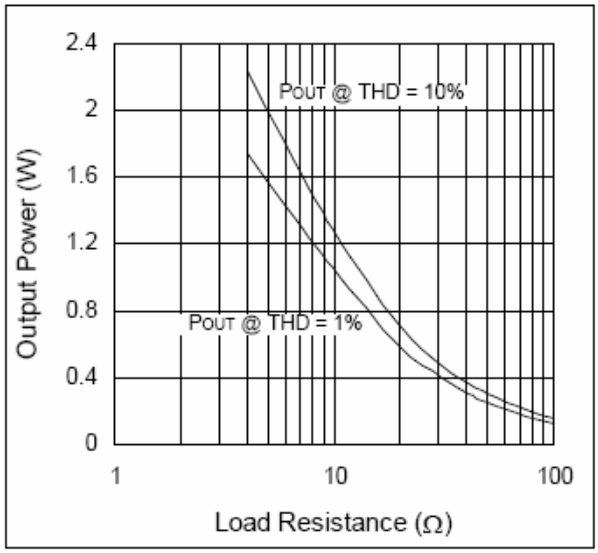
15. Output Power vs. Load Resistance

V_{DD}=3V



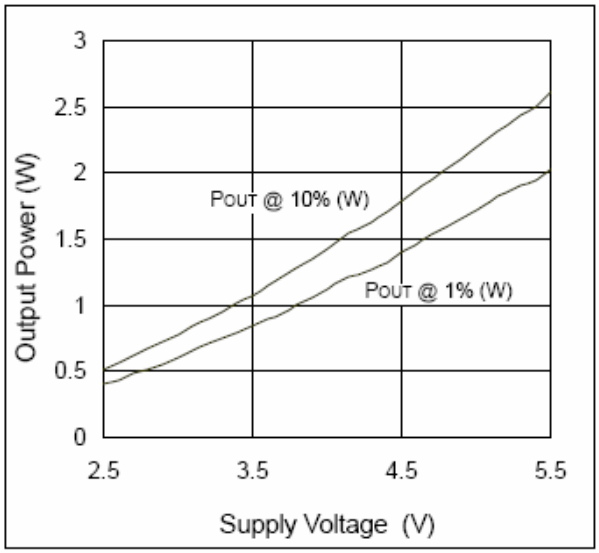
16. Output Power vs. Load Resistance

V_{DD}=5V



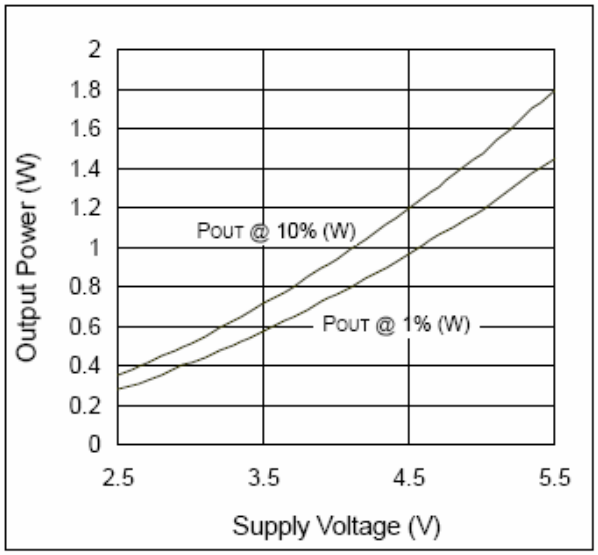
17. Output Power vs. Supply Voltage

R_L=4Ω



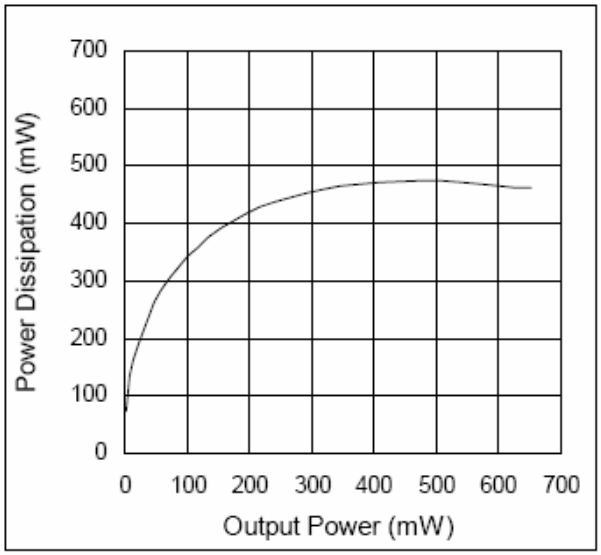
18. Output Power vs. Supply Voltage

R_L =8Ω



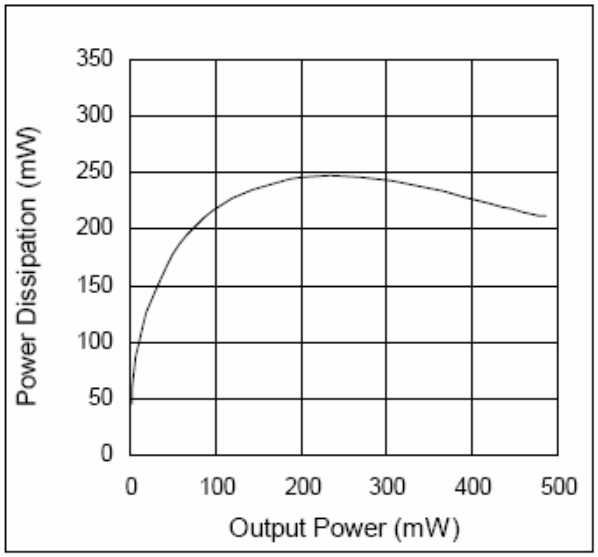
19. Power Dissipation vs. Output Power

V_{DD}=3V, R_L=4Ω, Av=2, f=1KHz



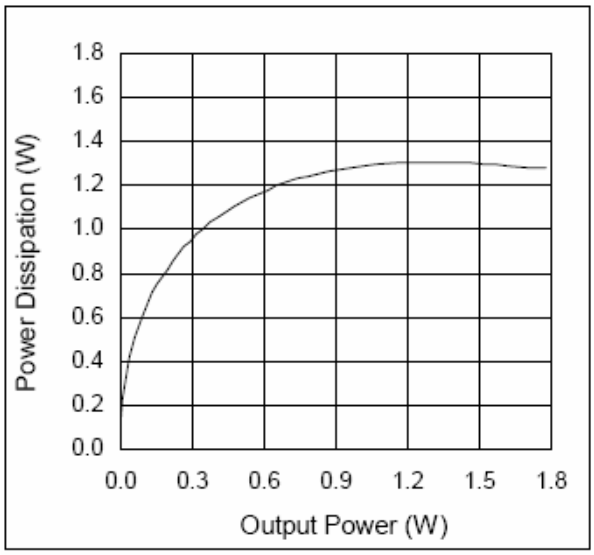
20. Power Dissipation vs. Output Power

V_{DD}=3V, R_L =8Ω, Av=2, f=1KHz



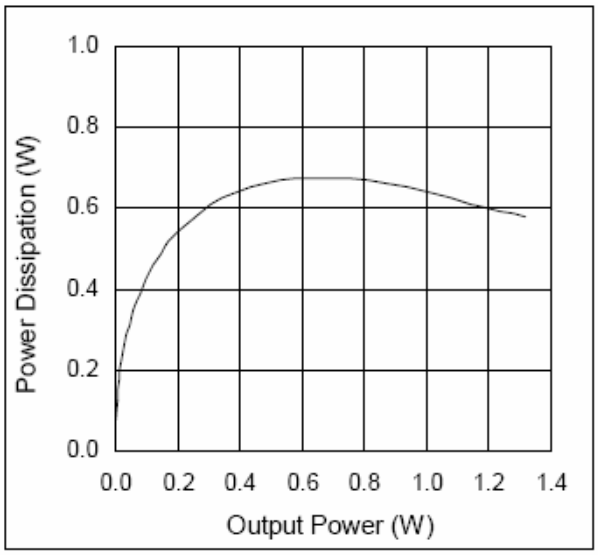
21. Power Dissipation vs. Output Power

V_{DD}=5V, R_L=4Ω, Av=2, f=1KHz



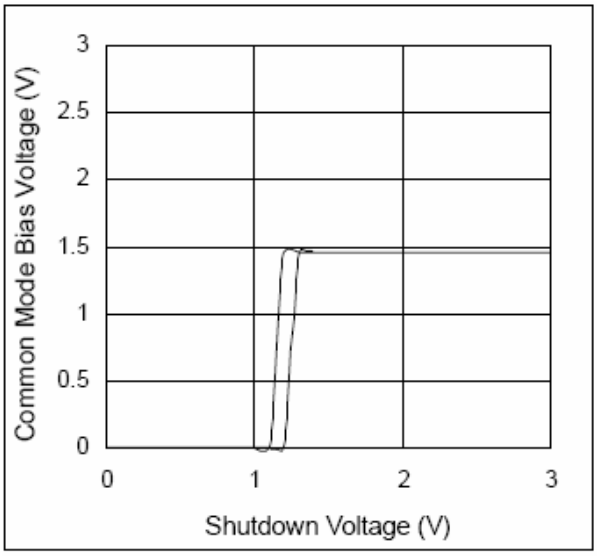
22. Power Dissipation vs. Output Power

V_{DD}=5V, R_L=8Ω, Av=2, f=1KHz



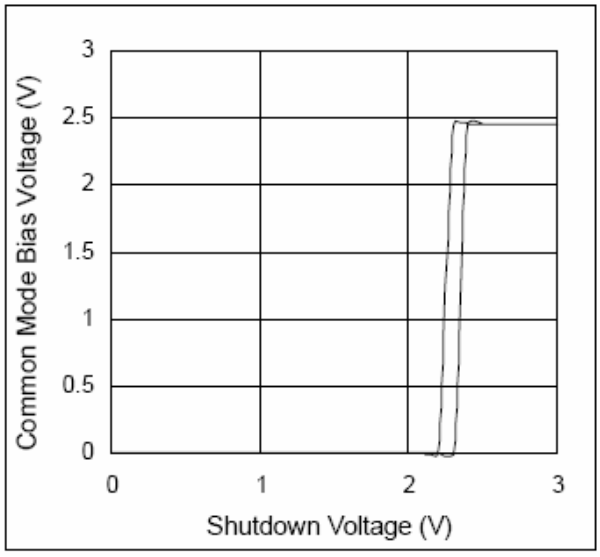
23. Shutdown Hysteresis Voltage

V_{DD}=3V

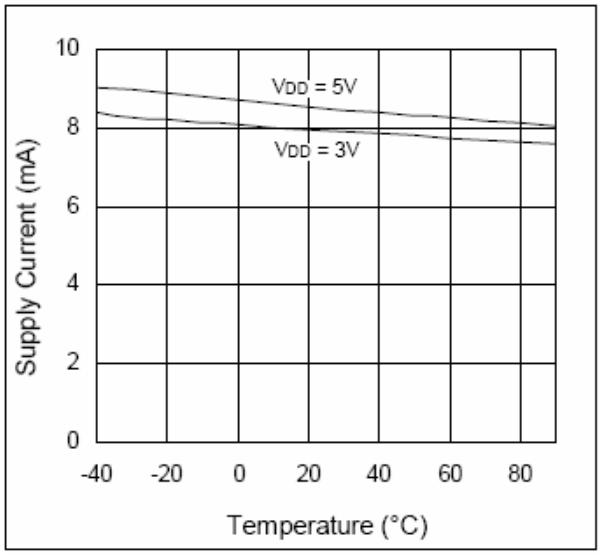


24. Shutdown Hysteresis Voltage

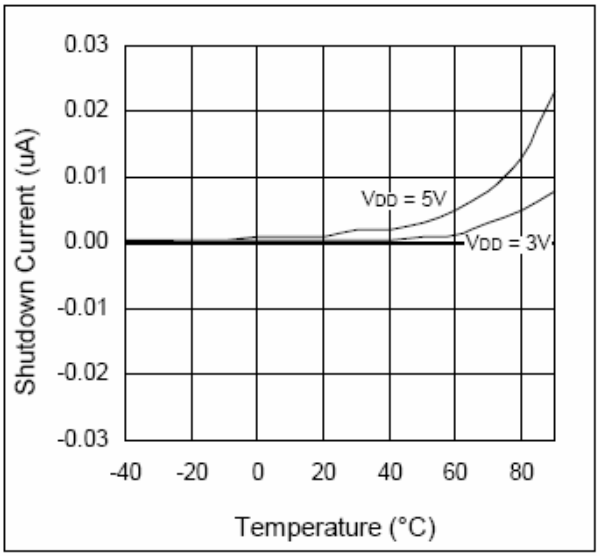
V_{DD}=5V



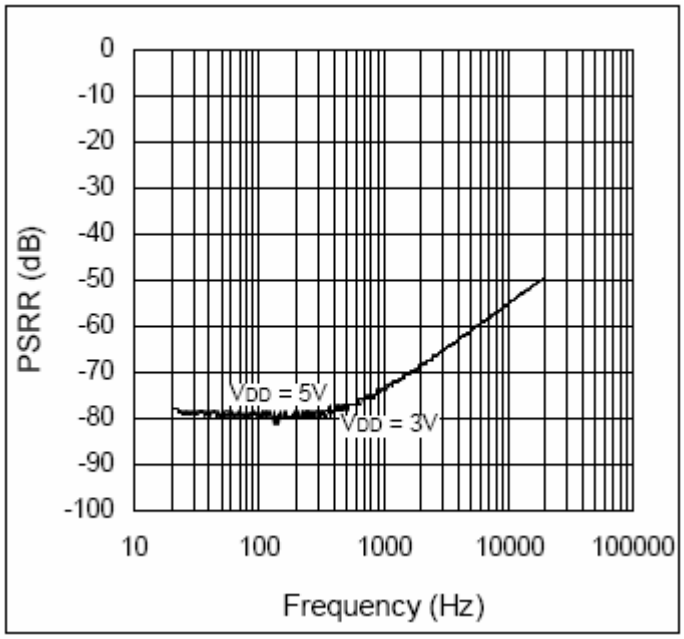
25. Shutdown Current vs. Temperature



26. Shutdown Current vs. Temperature

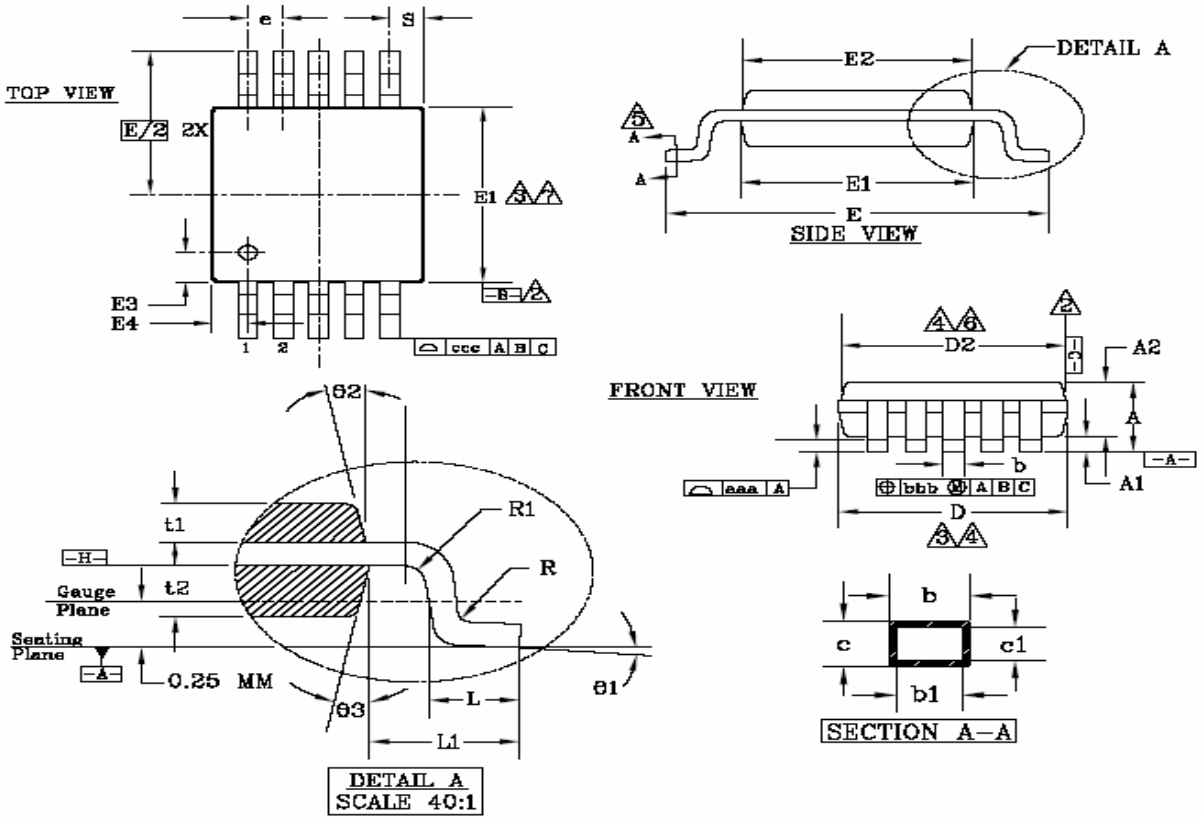


27. Power Supply Rejection Ratio vs. Frequency



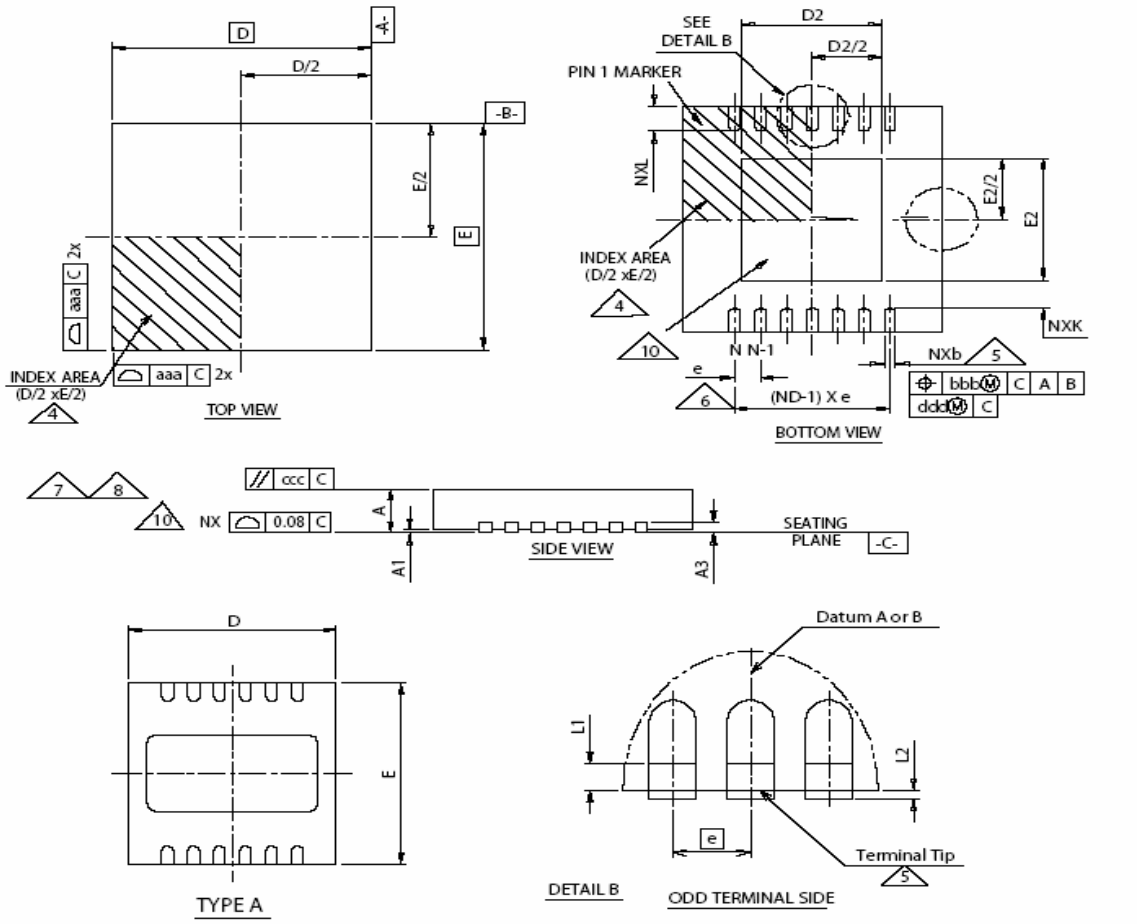
Package Information

Dimension in 10-Pin MSOP Package (Unit: mm)



Symbol	Typ	±Tol	Symbol	Typ	±Tol
A	1.10	Max	b	0.23	+0.07/-0.08
A1	0.10	±0.05	b1	0.20	±0.05
A2	0.86	±0.08	c	0.18	±0.05
D	3.00	±0.10	c1	0.15	+0.03/-0.02
D2	2.95	±0.10	θ1	3.0°	±3.0°
E	4.90	±0.15	θ2	12.0°	±3.0°
E1	3.00	±0.10	θ3	12.0°	±3.0°
E2	2.95	±0.10	L	0.55	±0.15
E3	0.51	±0.13	L1	0.95BSC	-
E4	0.51	±0.13	aaa	0.10	-
R	0.15	+0.15/-0.08	bbb	0.08	-
R1	0.15	+0.15/-0.08	ccc	0.25	-
t1	0.31	±0.08	e	0.50 BSC	-
t2	0.41	±0.08	S	0.50 BSC	-

Dimension in 10-Pin DFN (3x3mm) Package (Unit: mm)



Symbol	Min	Typ	Max	Notes
A	0.80	0.90	1.00	1, 2
A1	0.00	0.02	0.05	1, 2
A3		0.20 REF		1, 2
L1			0.15	1, 2
L2			0.13	1, 2
θ	0º		14º	1, 2
K	0.20			1, 2
K2	0.17			1, 2
b	0.18	0.25	0.30	1, 2, 5
e		0.5		
aaa		0.15		1, 2
bbb		0.10		1, 2
ccc		0.10		1, 2
ddd		0.05		1, 2
eee		0.08		1, 2
ggg		0.10		1, 2

Variations				
Symbol	Min	Typ	Max	Notes
D BSC		3.00		1, 2
E BSC		3.00		1, 2
D2	2.20		2.70	1, 2
E2	1.40		1.75	1, 2
L	0.30	0.40	0.50	1, 2
N		10		1, 2
ND		5		1, 2, 5

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