2 Watt Audio Power Amplifier with Selectable Shutdown Logic Level

■ General Description

The LN4990A is an audio power amplifier primarily designed for demanding applications in mobile phones and other portable communication device applications. It is capable of delivering 1.25 watts of continuous average power to an 8Ω BTL load and 2 watts of continuous average power (LD and MH only) to a 4Ω BTL load with less than 1% distortion (THD+N) from a 5VDC power supply. Boomer audio power amplifiers were designed specifically to provide high quality output power with a minimal amount of external components. The LN4990A does not require output coupling capacitors or bootstrap capacitors, and therefore is ideally suited for mobile phone and other low voltage applications where minimal power consumption is a primary requirement.

The LN4990A features a low-power consumption shutdown mode. To facilitate this, Shutdown may be enabled by either logic high or low depending on mode selection. Driving the shutdown mode pin either high or low enables the shutdown pin to be driven in a likewise manner to enable shutdown.

The LN4990A contains advanced pop & click circuitry which eliminates noise which would otherwise occur during turn-on and turn-off transitions. The LN4990A is unity-gain stable and can be configured by external gain-setting resistors.

■ Key Specifications

- PSRR@fIN=217H，VDD=5V 62dB(TYP)
- Power Output@VDD=5V&1%THD 4Ω 2W(TYP)
- Power Output@VDD=5V&1%THD 8Ω 1.25W(TYP)
- Power Output@VDD=3V&1%THD 4Ω 600mW(TYP)
- Power Output@VDD=3V&1%THD 8Ω 425W(TYP)
- Shutdown Current 0.1μA(TYP)

■ Features

- Available in space-saving packages: UTQFN
- Ultra low current shutdown mode
- Improved pop & click circuitry eliminates noise during
- Turn-on and turn-off transitions
- 2.2 - 5.5V operation
- No output coupling capacitors, snubber networks or bootstrap capacitors required
- Unity-gain stable
- External gain configuration capability
- User selectable shutdown high or low logic Level

■ Applications

- Mobile Phones
- PDAs
- Portable electronic devices

■ Package

- UTQFN9

■ Ordering Information

Ordering Number	Package	Mark
LN4990A	UTQFN9	AXY

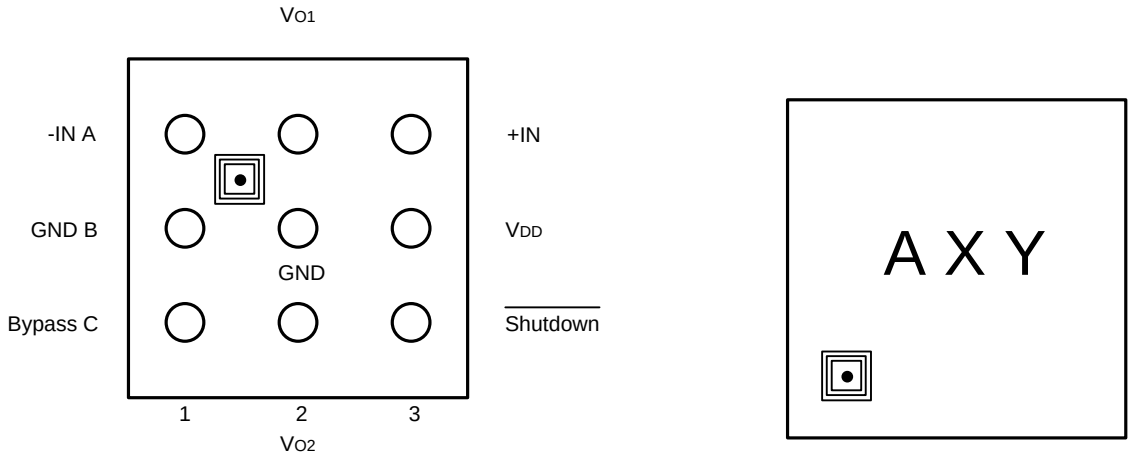
■ Operating Ratings

Temperature Range

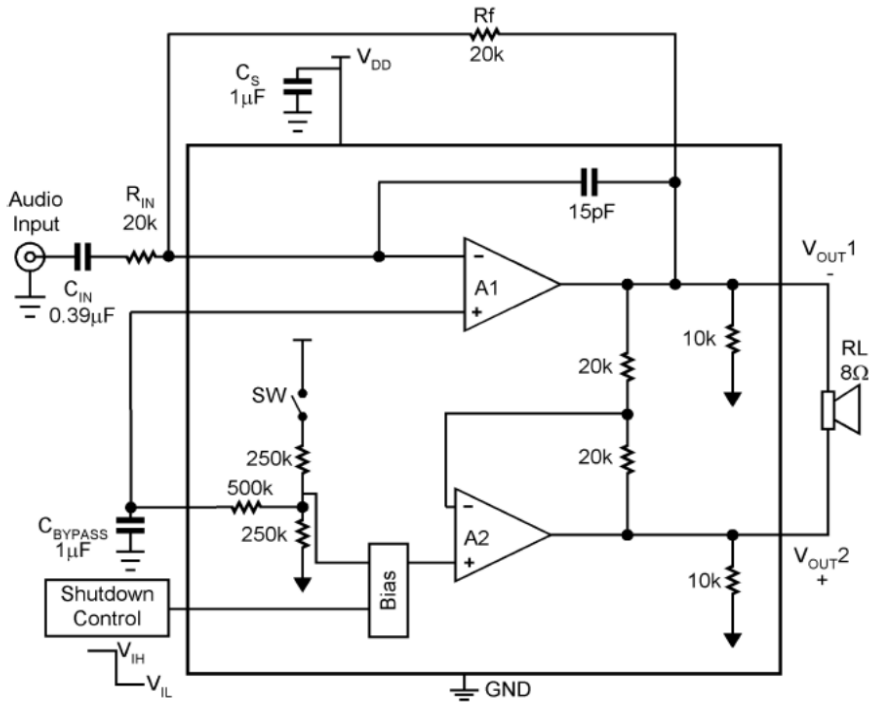
TMIN ≤ TA ≤ TMAX---------- −40°C ≤ TA ≤ 85°C

Supply Voltage ---------- 2.2V ≤ VDD ≤ 5.5V

■ Pin Configuration



■ Function Block Diagram



■ Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage	VDD	-0.3—6.0	V
Input Voltage	VIN	-0.3—VDD+0.3	V
Operation Temperature	Topr	-40—85	℃
Storage Temperature	Tstg	-65—150	℃
ESD Susceptibility	-	4000	V

■ Electrical Characteristics

(VDD = 5V, Unless otherwise specified. Limits apply for TA = 25°C.)

Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
I_{DD}	Quiescent Power Supply Current	VIN = 0V, Io = 0A, No Load	—	3	7	mA
		VIN = 0V, Io = 0A, 8Ω Load	—	4	10	mA
I_{SD}	Shutdown Current	$V_{SHUTDOWN}$ = 0V	—	0.1	2	μA
V_{SDIH}	Shutdown Voltage Input High	$V_{SD\ MODE}$=VDD	—	1.5	—	V
V_{SDIL}	Shutdown Voltage Input Low	$V_{SD\ MODE}$=VDD	—	1.3	—	V
V_{SDIH}	Shutdown Voltage Input High	$V_{SD\ MODE}$=GND	—	1.5	—	V
V_{SDIL}	Shutdown Voltage Input Low	$V_{SD\ MODE}$=GND	—	1.3	—	V
V_{OS}	Output Ofsett Voltage		—	7	50	mV
$R_{OUT-GND}$	Resistor Output to GND		7.0	8.5	9.7	kΩ
P_O	Output Power -8Ω	THD = 1% (max); f = 1 kHz	0.9	1.25	—	W
	Output Power -4Ω	THD = 1% (max); f = 1 kHz	—	2	—	W
T_{WU}	Wake-up time		—	170	220	ms
T_{SD}	Thermal Shut Down temperature		150	170	190	℃
THD+N	Total Harmonic Distortion+Noise	Po = 0.5 Wrms; f = 1kHz	—	0.2	—	%
PSRR	Power Supply Rejection Ratio	V_{ripple} = 200mV $_{sine\ p-p}$ f=217Hz	55	60	—	dB
		V_{ripple} = 200mV $_{sine\ p-p}$ f=1kHz		66		
T_{SDT}	Shut Down Time	8Ω Load	—	1.0	—	ms

(VDD = 3V , Unless otherwise specified. Limits apply for TA = 25°C.)

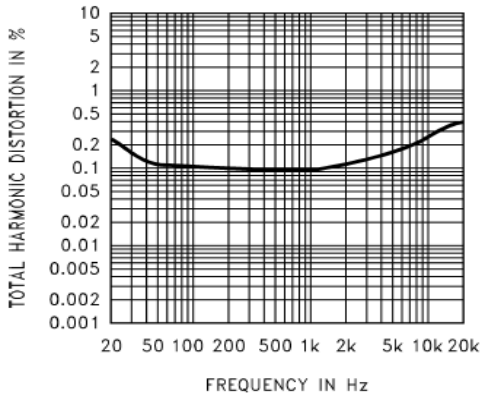
Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
I_{DD}	Quiescent Power Supply Current	VIN = 0V, Io = 0A, No Load	—	2	7	mA
		VIN = 0V, Io = 0A, 8Ω Load	—	3	9	mA
I_{SD}	Shutdown Current	$V_{SHUTDOWN}$ = 0V	—	0.1	2	μA
V_{SDIH}	Shutdown Voltage Input High	$V_{SD\ MODE}$=VDD	—	1.1	—	V
V_{SDIL}	Shutdown Voltage Input Low	$V_{SD\ MODE}$=VDD	—	0.9	—	V
V_{SDIH}	Shutdown Voltage Input High	$V_{SD\ MODE}$=GND	—	1.3	—	V
V_{SDIL}	Shutdown Voltage Input Low	$V_{SD\ MODE}$=GND	—	1.0	—	V
V_{OS}	Output Ofsett Voltage		—	7	50	mV
$R_{OUT-GND}$	Resistor Output to GND		7.0	8.5	9.7	kΩ
P_O	Output Power -8Ω	THD = 1% (max); f = 1 kHz	—	425	—	mW
	Output Power -4Ω	THD = 1% (max); f = 1 kHz	—	600	—	mW
T_{WU}	Wake-up time		—	100	150	ms
T_{SD}	Thermal Shut Down temperature		150	170	190	℃
THD+N	Total Harmonic Distortion+Noise	Po = 0.25 Wrms; f = 1kHz	—	0.1	—	%
PSRR	Power Supply Rejection Ratio	V_{ripple} = 200mV $_{sine\ p-p}$ f=217Hz	45	62	—	dB
		V_{ripple} = 200mV $_{sine\ p-p}$ f=1kHz		68		

(VDD = 2.6V, Unless otherwise specified. Limits apply for TA = 25°C.)

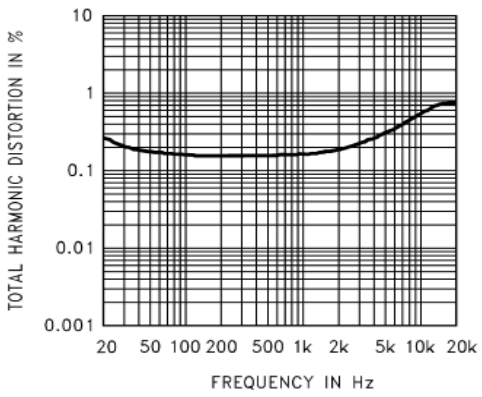
Symbol	Parameters	Test Conditions		Min.	Typ.	Max.	Unit
I_{DD}	Quiescent Power Supply Current	VIN = 0V, Io = 0A, No Load		—	2.0	—	mA
I_{DD}	Quiescent Power Supply Current	VIN = 0V, Io = 0A, 8Ω Load		—	3.0	—	mA
I_{SD}	Shutdown Current	$V_{SHUTDOWN}$ = 0V		—	0.1	2	μA
P_O	Output Power	THD = 1% (max); f = 1 kHz	8Ω Load		0.3	—	W
			4Ω Load		0.4		
THD+N	Total Harmonic Distortion+Noise	Po = 0.15 Wrms; f = 1kHz		—	0.1	—	%
PSRR	Power Supply Rejection Ratio	V_{ripple} = 200mV $_{sine\ p-p}$ f=217Hz		—	51	—	dB
		V_{ripple} = 200mV $_{sine\ p-p}$ f=1kHz			55		

■ Typical Performance Characteristics

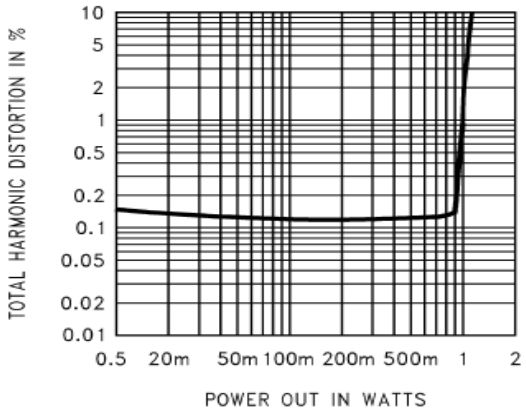
THD+N vs Frequency
at V_{DD} = 5V, 8Ω R_L, and PWR = 250mW, A_V = 2



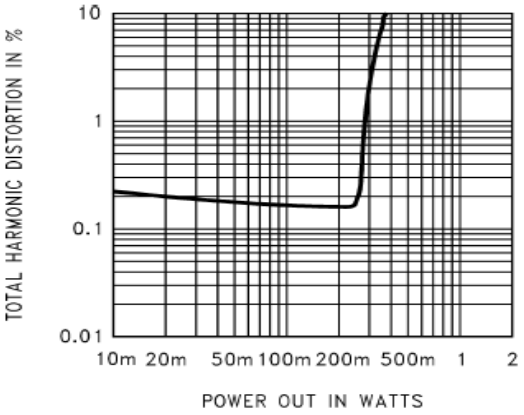
THD+N vs Frequency
at V_{DD} = 3V, R_L = 8Ω, PWR = 250mW, A_V = 2



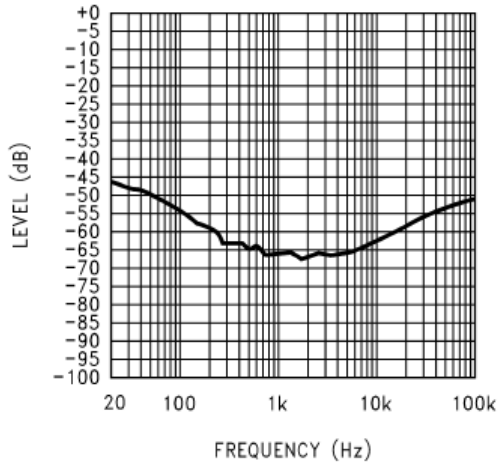
THD+N vs Power Out
@ V_{DD} = 5V, R_L = 8Ω, 1kHz, A_V = 2



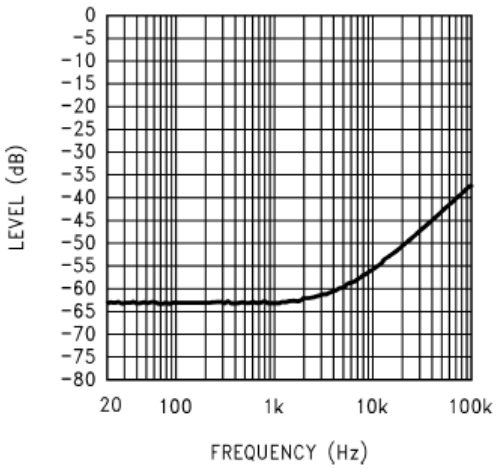
THD+N vs Power Out
@ V_{DD} = 3V, R_L = 8Ω, 1kHz, A_V = 2



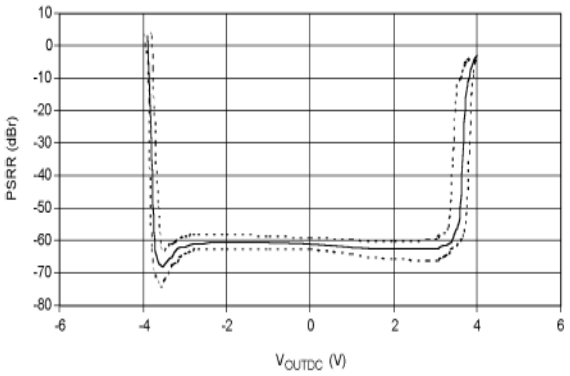
Power Supply Rejection Ratio (PSRR) @ A_V = 2
V_{DD} = 5V, V_{ripple} = 200mvp-p
R_L = 8Ω, R_{IN} = 10Ω



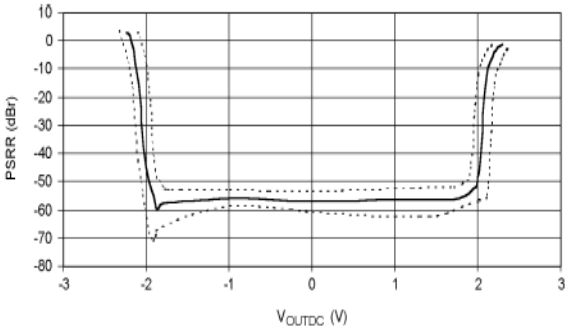
Power Supply Rejection Ratio (PSRR) @ A_V = 4
V_{DD} = 5V, V_{ripple} = 200mvp-p
R_L = 8Ω, R_{IN} = Float



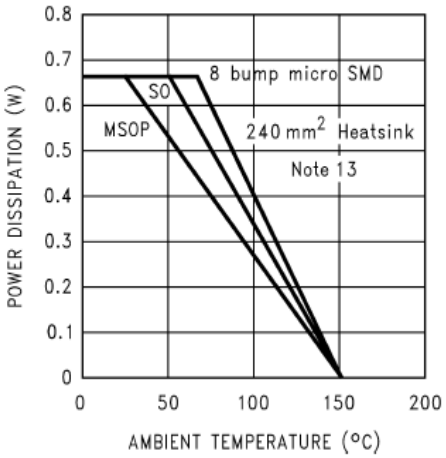
PSRR vs DC Output Voltage
V_{DD} = 5V, A_V = 2



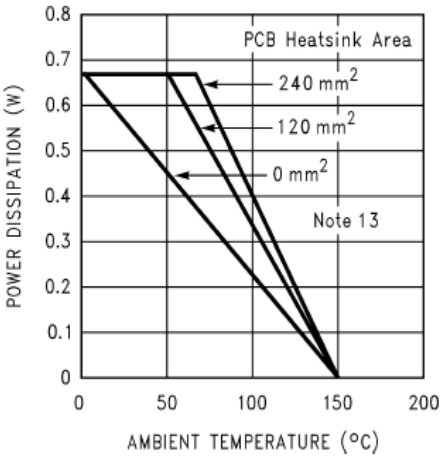
PSRR vs DC Output Voltage
V_{DD} = 3V, A_V = 2



Power Derating Curves (P_{DMAX} = 670mW)

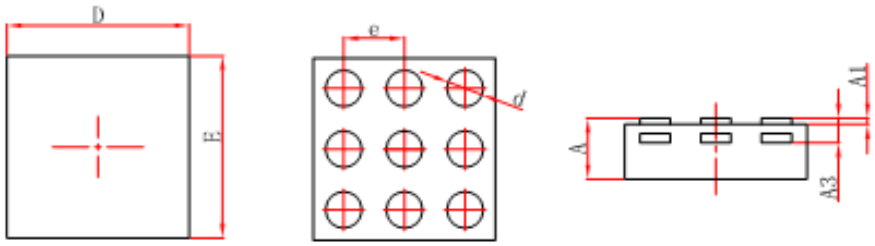


Power Derating - 8 bump µSMD (P_{DMAX} = 670mW)



■ Package Information

- **UTQFN9**



Top View　　Bottom View　　Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.450/0.550	0.550/0.650	0.018/0.022	0.022/0.026
A1	0.000	0.050	0.000	0.002
A3	0.152REF.		0.006REF.	
D	1.424	1.576	0.056	0.062
E	1.424	1.576	0.056	0.062
D1	—	—	—	—
E1	—	—	—	—
k	—		—	
b	—	—	—	—
e	0.500TYP.		0.020TYP.	
L	—	—	—	—
d	0.199	0.351	0.008	0.014