Low-Cost 1.27W Audio Power Amplifier

■ General Description

The LN3990 is a Class-AB audio power amplifier designed for mobile phones and other portable communication devices. It is capable of delivering 1.2W of continuous average power to an 8Ω BTL load with less than 1% distortion (THD+N) from a 5V DC power supply.

The LN3990 was designed specifically to provide high quality output power with a minimal amount of external components. It does not require output coupling capacitors or bootstrap capacitors. And with ultra low shutdown current, the LN3990 is ideally suited for mobile phone and other low voltage applications where minimal power consumption is a primary requirement. With special pop-click eliminating circuit, the LN3990 provides perfect pop-click characteristic during turn-on and turn-off transitions.

The LN3990 is unity-gain stable and can be configured by external gain-setting resistors.

■ Features

- 2.2V – 5.5V operation
- Improved circuitry eliminates pop-click noise during turn-on and turn-off transitions
- No output coupling capacitors, snubber networks or bootstrap capacitors required
- Unity-gain stable
- External gain configuration capability
- Available in space-saving packages: DFN 3x3-8L

■ Applications

- Mobile Phones
- PDAs
- Portable electronic devices

■ Package

- DFN2×2-8L

■ Key Specifications

- PSRR @f_{IN}= 217Hz, VDD = 5V 62dB(typ.)
- Power Output @VDD =5.0V & 1% THD RL=8Ω 1.27W(typ.)
- Power Output @VDD =3.0V & 1% THD RL=8Ω 400mW(typ.)
- Power Output @VDD = 5.0V & 1% THD RL=4Ω 2W(typ.)
- Shutdown Current 0.1μA(typ.)

■ Operating Ratings

Temperature Range

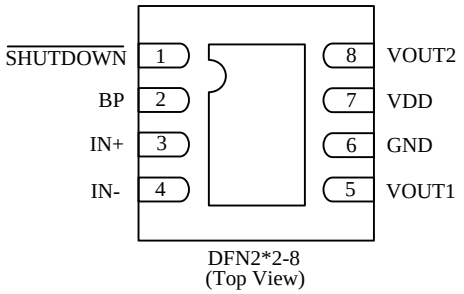
TMIN ≤ TA ≤ TMAX---------- −40°C ≤ TA ≤ 85°C

Supply Voltage ---------- 2.2V ≤ VDD ≤ 5.0V

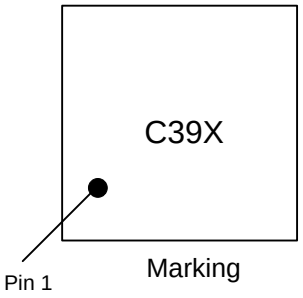
■ Ordering Information

Ordering Number	Package
LN3990LC	DFN2×2-8

■ Pin Configuration

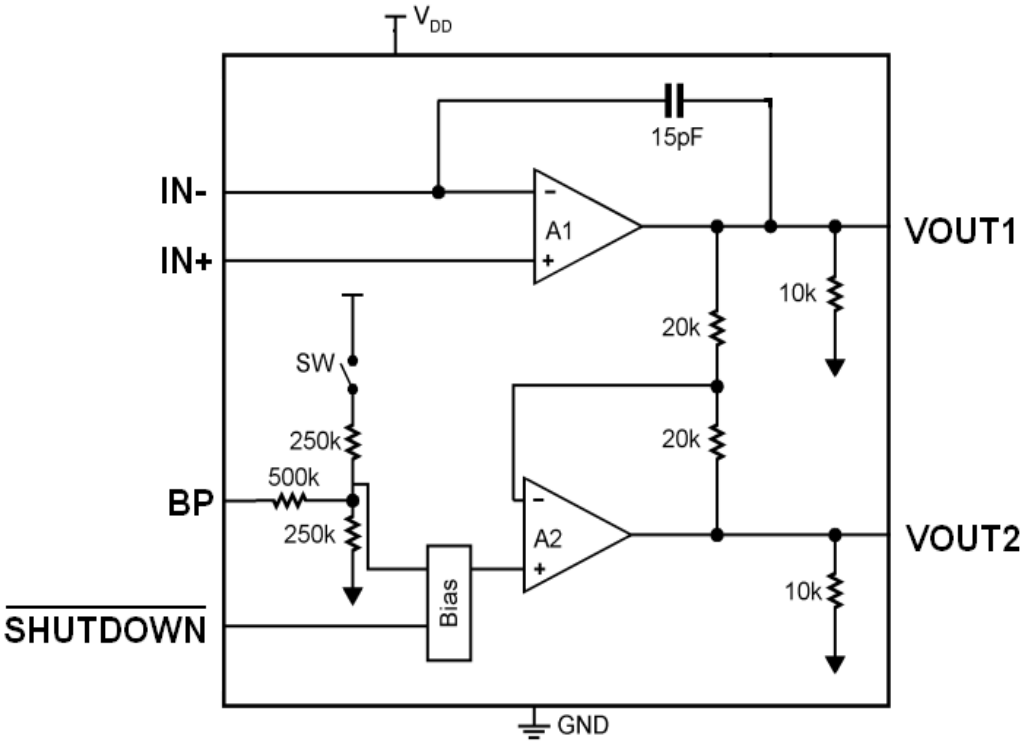


DFN2*2-8
(Top View)



x: Date Code

■ 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	—	4	8	mA
		VIN = 0V, Io = 0A, 8Ω Load	—	5	10	mA
I_{SD}	Shutdown Current	$V_{\overline{SHUTDOWN}}$ = 0V	—	0.1	2	μA
V_{SDIH}	Shutdown Voltage Input High		1.2	—	—	V
V_{SDIL}	Shutdown Voltage Input Low		—	—	0.4	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 = 2% (max); f = 1 kHz 8Ω Load	0.8	1.2	—	W
T_{WU}	Wake-up time		—	170	220	ms
T_{SD}	Thermal Shutdown Temperature		150	170	190	℃
THD+N	Total Harmonic Distortion+Noise	Po = 0.4 Wrms; f = 1kHz	—	0.1	—	%
PSRR	Power Supply Rejection Ratio	V_{ripple} = 200mV $_{sine\ p-p}$ f=217Hz	55	62	—	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.)

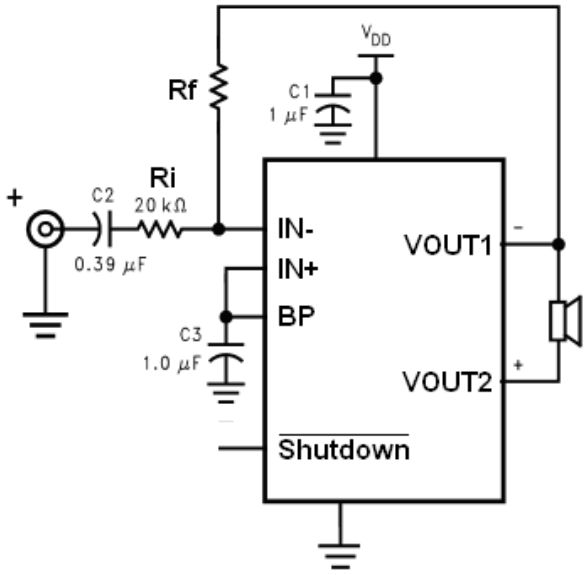
Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
I_{DD}	Quiescent Power Supply Current	VIN = 0V, Io = 0A, No Load	—	3.5	7	mA
		VIN = 0V, Io = 0A, 8Ω Load	—	4.5	9	mA
I_{SD}	Shutdown Current	$V_{\overline{SHUTDOWN}}$ = 0V	—	0.1	2	μA
V_{SDIH}	Shutdown Voltage Input High		1.2	—	—	V
V_{SDIL}	Shutdown Voltage Input Low		—	—	0.4	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 = 2% (max); f = 1 kHz 8Ω Load	0.28	0.41	—	W
T_{WU}	Wake-up time		—	170	220	ms
T_{SD}	Thermal Shutdown Temperature		150	170	190	℃
THD+N	Total Harmonic Distortion+Noise	Po = 0.4 Wrms; f = 1kHz	—	0.1	—	%
PSRR	Power Supply Rejection Ratio	V_{ripple} = 200mV $_{sine\ p-p}$ f=217Hz	45	56	—	dB
		V_{ripple} = 200mV $_{sine\ p-p}$ f=1kHz		62		

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

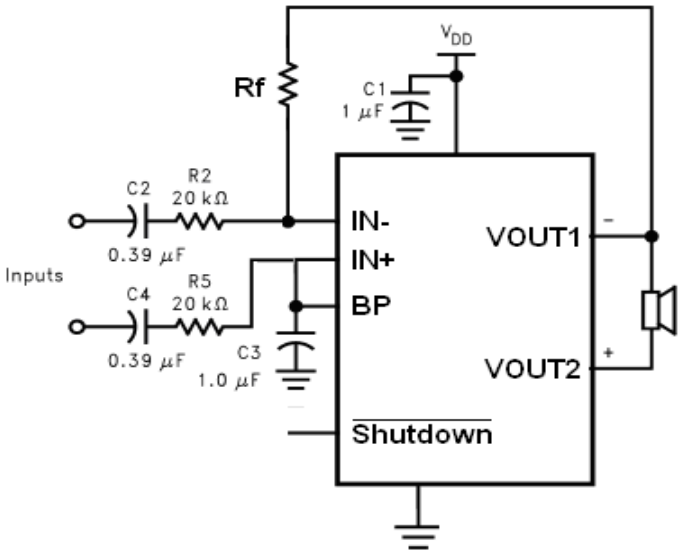
Symbol	Parameters	Test Conditions		Min.	Typ.	Max.	Unit
I_{DD}	Quiescent Power Supply Current	VIN = 0V, Io = 0A, No Load		—	2.6	5.5	mA
I_{SD}		$V_{\overline{SHUTDOWN}}$ = 0V		—	0.1	2	μA
P_O	Output Power	THD = 1% (max); f = 1 kHz	8Ω Load		0.3	—	W
			4Ω Load		0.5		
THD+N	Total Harmonic Distortion+Noise	Po = 0.1 Wrms; f = 1kHz		—	0.08	—	%
PSRR	Power Supply Rejection Ratio	V_{ripple} = 200mV $_{sine\ p-p}$ f=217Hz		—	44	—	dB
		V_{ripple} = 200mV $_{sine\ p-p}$ f=1kHz			44		

■ Typical Application Circuit

- **Single-Ended Input Configuration**



- **Differential Input Configuration**

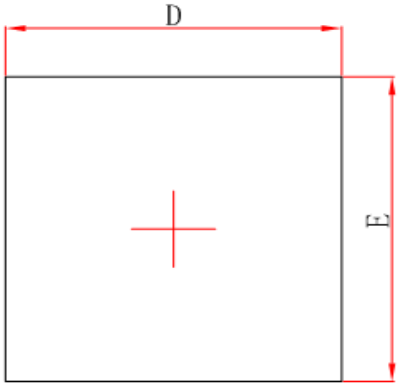


Note: The resistors (Rf) set the gain of the amplifier according to equation Gain = 2 * Rf / Ri

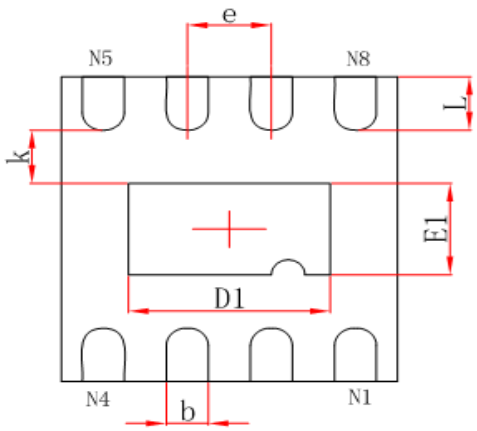
Typical Ri=20K Rf=20K,GAIN=2； Gain depends on the values of the size of the source signal and VDD. If the source signal amplitude is too small proposed increase in Rf to increase gain.

■ Package Information

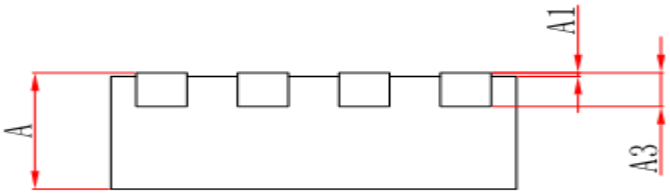
- **DFN2×2-8L**



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	1.900	2.100	0.075	0.083
E	1.900	2.100	0.075	0.083
D1	1.100	1.300	0.043	0.051
E1	0.500	0.700	0.020	0.028
k	0.200MIN.		0.008MIN.	
b	0.180	0.300	0.007	0.012
e	0.500TYP.		0.020TYP.	
L	0.250	0.450	0.010	0.018