1.7W Mono Fully Differential Audio Power Amplifier

■ General Description

The LN3992 is a 1.7W mono fully-differential amplifier designed to drive a speaker with at least 8Ω impedance while consuming only 20 mm^2 total printed-circuit board (PCB) area in most applications. The device operates from 2.5V to 5.5V, drawing only 4mA of quiescent supply current.

The LN3992 is ideal for PDA/smart phone applications due to features such as −80 dB supply voltage rejection from 2 Hz to 20kHz, improved RF rectification immunity, small PCB area, and a fast startup with minimal pop.

■ Features

- Designed for Wireless or Cellular Handsets and PDAs
- 1.7 W Into 8 Ω From a 5V Supply at THD = 10% (Typ)
- Low Supply Current: 4 mA (typ)at 5 V
- Shutdown Current: 0.01μA (Typ)
- Fast Startup With Minimal Pop
- Only Three External Components
- Improved PSRR (−80dB) and Wide Supply Voltage (2.5V to 5.5V) for Direct Battery Operation
- Fully Differential Design Reduces RF Rectification
- -60dB CMRR Eliminates(No Input Coupling Capacitor)

■ Applications

- Ideal for Wireless Handsets
- PDAs
- Notebook Computers

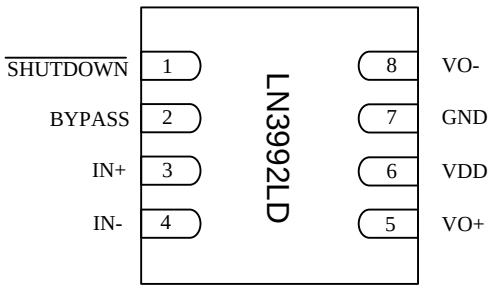
■ Package

- DFN3×3-8L

■ Ordering Information

Ordering Number	Package
LN3990LD	DFN3×3-8

■ Pin Configuration

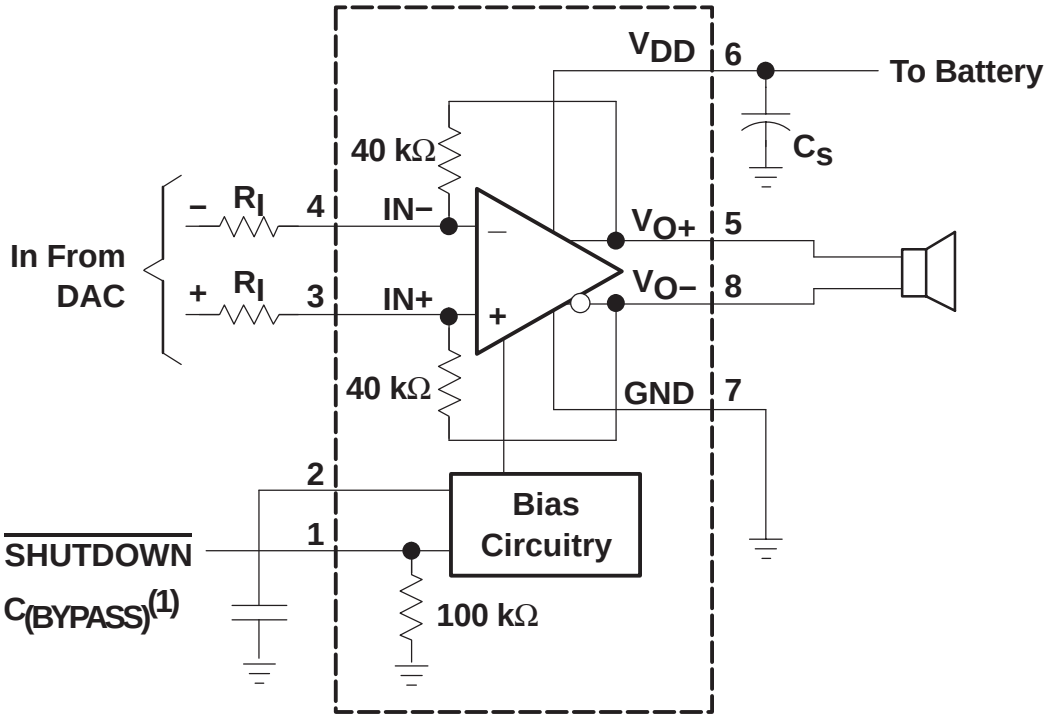


DFN3*3-8
(Top View)

■ Pin Assignment

Pin Name	DRB	I/O	Function Description
IN-	4	I	Negative differential input
IN+	3	I	Positive differential input
V_{DD}	6	I	Power supply
VO+	5	O	Positive BTL output
GND	7	I	High-current ground
VO-	8	O	Negative BTL output
$\overline{SHUTDOWN}$	1	I	Shutdown terminal (active low logic)
BYPASS	2		Mid-supply voltage, adding a bypass capacitor improves PSRR
Thermal Pad	-	-	Connect to ground. Thermal pad must be soldered down in all applications to properly secure device on the PCB.

■ 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	℃
Junction Temperature	T_j	-45—150	℃
ESD Susceptibility	-	4000	V

■ Recommended Operating Conditions

Pin Name		Min	Typ	Max	Unit
Supply voltage VDD		2.5		5.5	V
$\overline{SHUTDOWN}$	High-level input voltage, VIH	1.6			V
	Low-level input voltage, VIL			0.5	V

■ Electrical Characteristics

(Unless otherwise specified. Limits apply for TA = 25°C.)

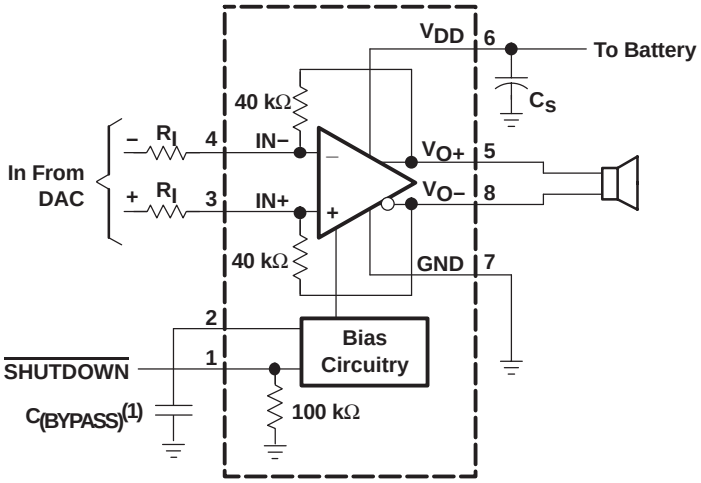
Symbol	Parameters	Test Conditions		Min.	Typ.	Max.	Unit
VOS	Output OffsettVoltage	VI = 0 V differential, Gain = 1 V/V, VDD = 5.5 V		-9	0.3	9	mV
PSRR	Power Supply Rejection Ratio	VDD = 2.5 V to 5.5 V			-85	-60	dB
VIC	Common mode input range	VDD = 2.5 V to 5.5 V		0.5		VDD-0.8	V
CMRR	Commonmode rejection ration	VDD = 5.5 V, VIC = 0.5 V to 4.7 V		-60		-40	dB
		VDD = 2.5 V, VIC = 0.5 V to 1.7 V					
VOL	Low-output swing	RL=8, Gain=1V/V, Vin+=VDD Vin-=0V or Vin+=0V Vin-= VDD	VDD = 5.5 V		0.45		V
			VDD = 3.6 V		0.37		
			VDD = 2.5 V		0.26		
VOH	High-output swing	RL=8, Gain=1V/V, Vin+=VDD Vin-=0V or Vin+=0V Vin-= VDD	VDD = 5.5 V		4.95		V
			VDD = 3.6 V		3.18		
			VDD = 2.5 V		2.13		
IQ	Quiescent current	VDD = 2.5 V to 5.5 V, no load			4	6	mA
I(SD)	Shutdown Current	$V_{\overline{SHUTDOWN}}$ ≤0.5V, VDD = 2.5 V to 5.5 V, RL = 8 Ω			0.01	1	μA
Rf		RL = 8 Ω			$\frac{40k\Omega}{R_i}$		kΩ
RGND	Resistance from $\overline{SHUTDOWN}$ to GND				100		kΩ

■ Operating Characteristics

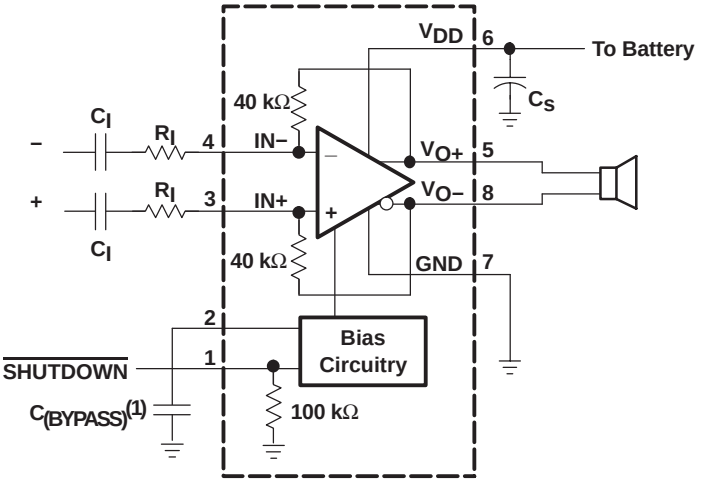
Parameter		Test Conditions		Min	Typ	Max	Unit
PO	Output power	THD+N=1%, f= 1kHz RL=8Ω	VDD = 5 V		1.36		W
			VDD = 3.6 V		0.72		
			VDD = 2.5 V		0.33		
		THD+N=10%, f= 1kHz RL=8Ω	VDD = 5 V		1.7		
			VDD = 3.6 V		0.85		
			VDD = 2.5 V		0.4		
THD+N	Total harmonic distortion plus noise	VDD = 5V, PO = 1W, RL = 8Ω, f = 1 kHz			0.02%		
		VDD = 3.6V, PO = 0.5W, RL = 8Ω, f = 1kHz			0.02%		
SNR	Signal-to-noise ration	VDD = 5V, PO = 1W, RL = 8Ω			0.03%		dB
tON	Start-up time fromshutdown	VDD = 3.6V, C_{BYPASS} = 0.1μF			20		ms

■ Typical Application Circuit

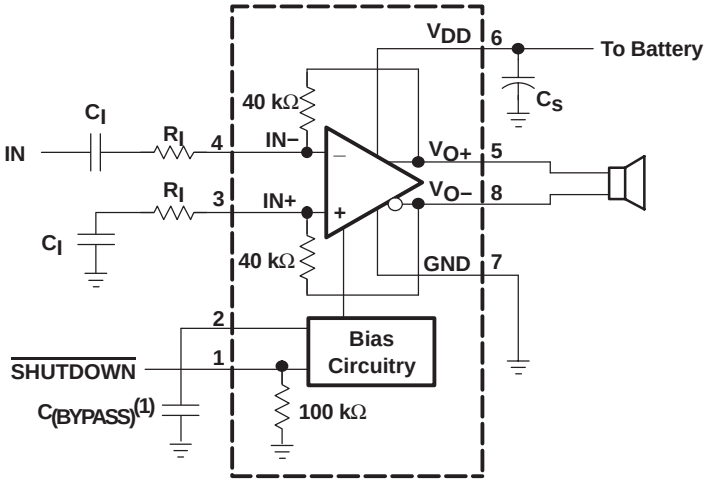
- **Typical Differential Input Application Schematic**



- **Differential Input Application Schematic Optimized With Input Capacitors**



- **Single-Ended Input Application Schematic**



■ Typical Performance Characteristics

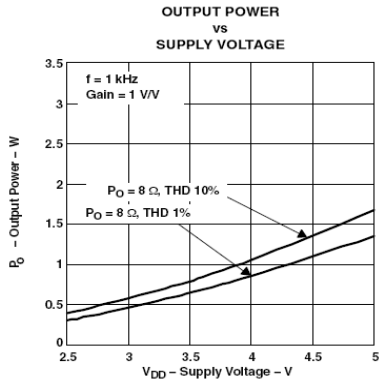


Figure 1

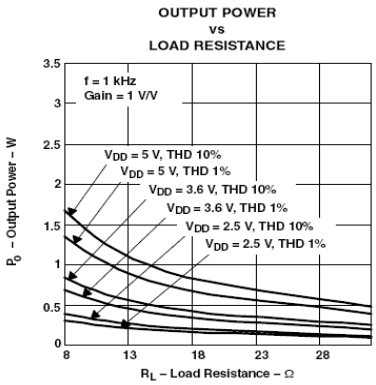


Figure 2

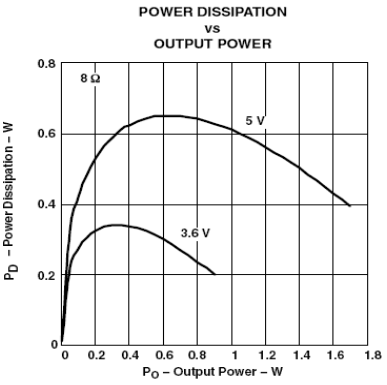


Figure 3

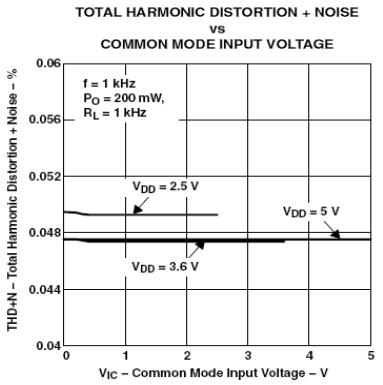


Figure 4

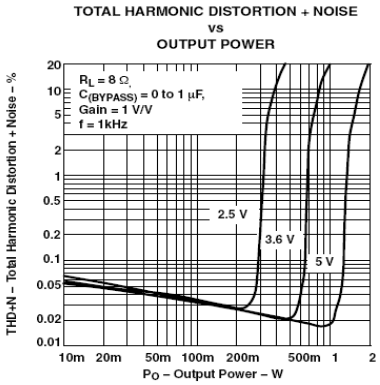


Figure 5

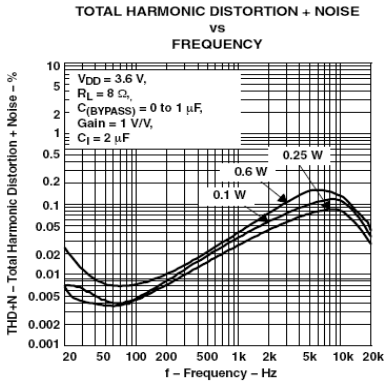


Figure 6

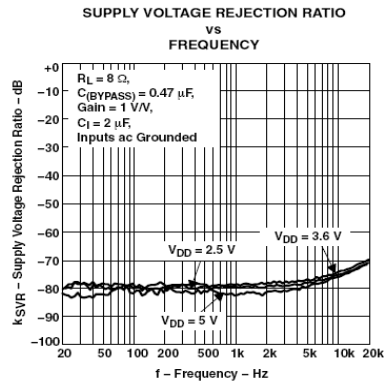


Figure 7

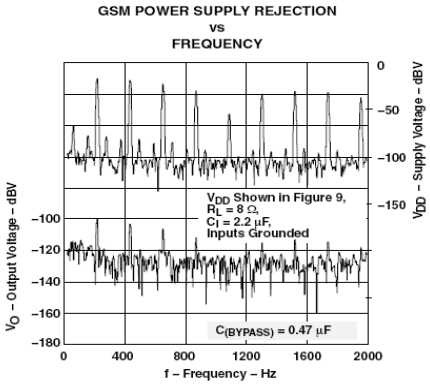


Figure 8

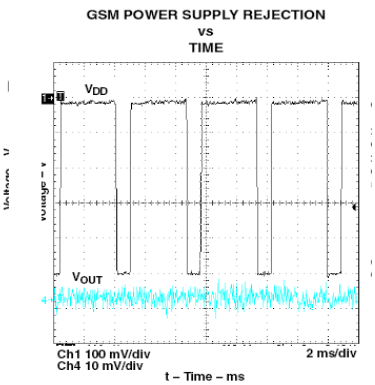


Figure 9

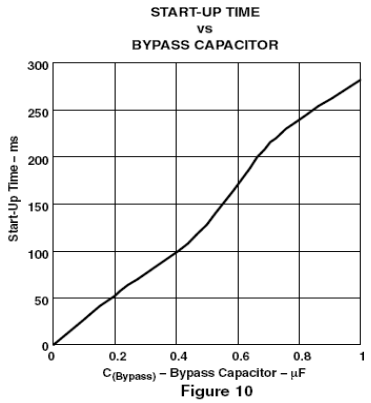


Figure 10

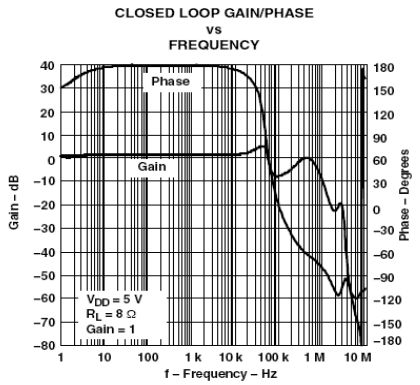


Figure 11

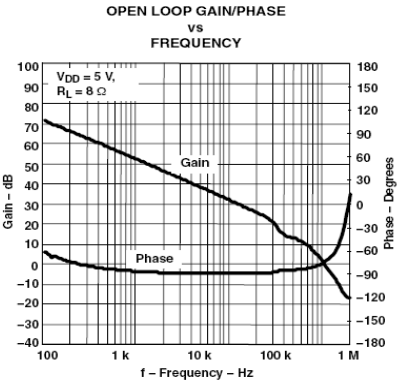
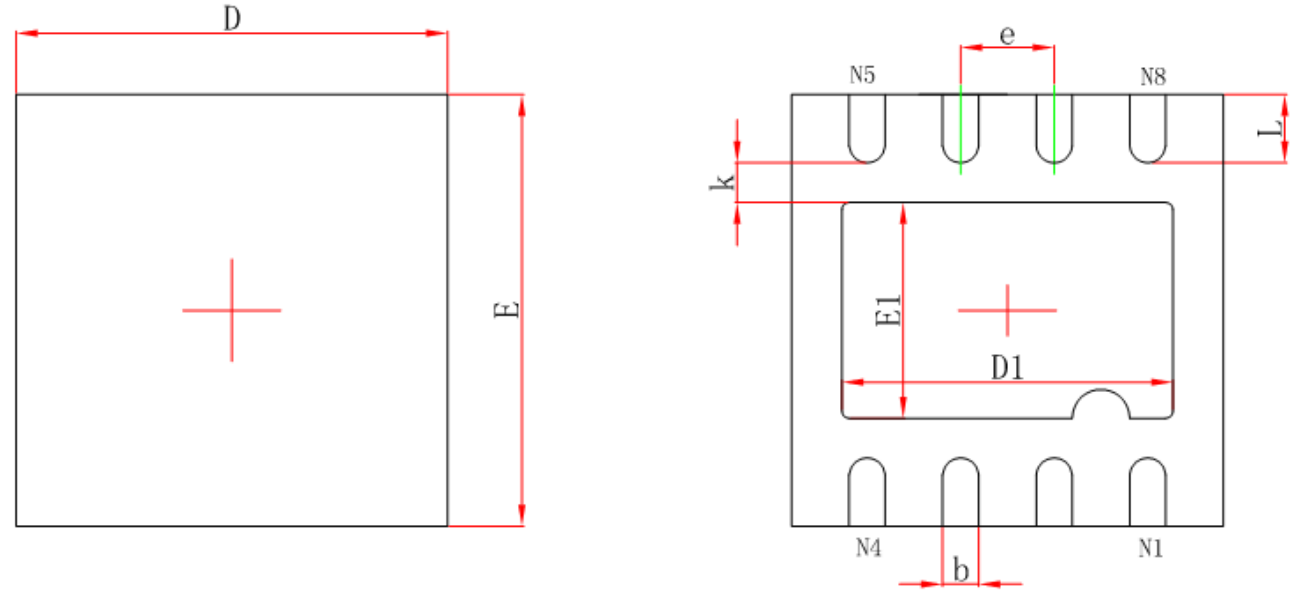


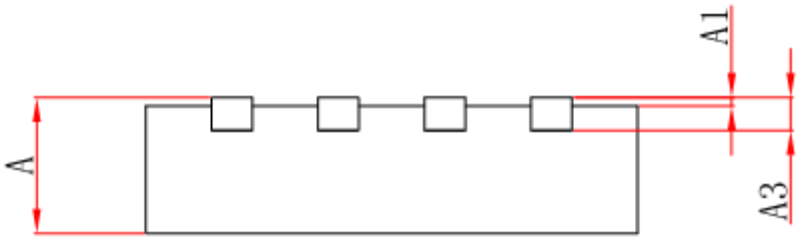
Figure 12

■ Package Information

- **DFN3×3-8L**



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	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
D1	2.200	2.400	0.087	0.094
E1	1.400	1.600	0.055	0.063
k	0.200MIN.		0.008MIN.	
b	0.180	0.300	0.007	0.012
e	0.650TYP.		0.026TYP.	
L	0.375	0.575	0.015	0.023