

Low-Cost 1.27W Audio Power Amplifier

General Description

The LN2990 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 LN2990 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 LN2990 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 LN2990 provides perfect pop-click characteristic during turn-on and turn-off transitions.

The LN2990 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

Applications

- Mobile Phones
- PDAs
- Portable electronic devices

Package

- DFN3×3-8L
- DFN2×2-8L

Key Specifications

- PSRR @ $f_{IN}=217\text{Hz}$, 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

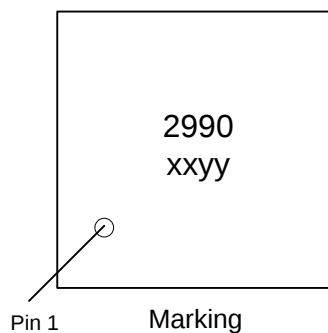
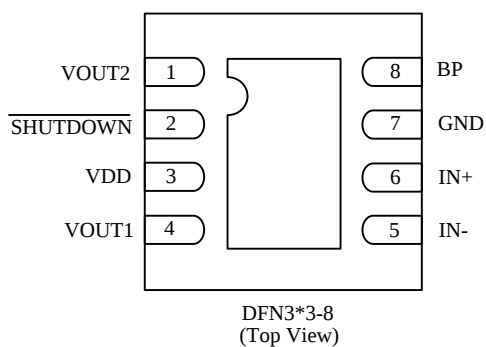
TMIN ≤ TA ≤ TMAX----- -40°C ≤ TA ≤ 85°C

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

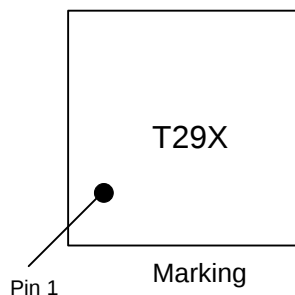
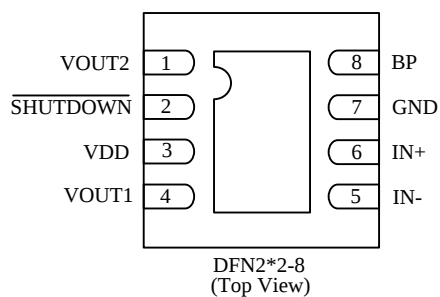
Ordering Information

Ordering Number	Package
LN2990J	DFN3×3-8
LN2990LD	DFN2×2-8

Pin Configuration

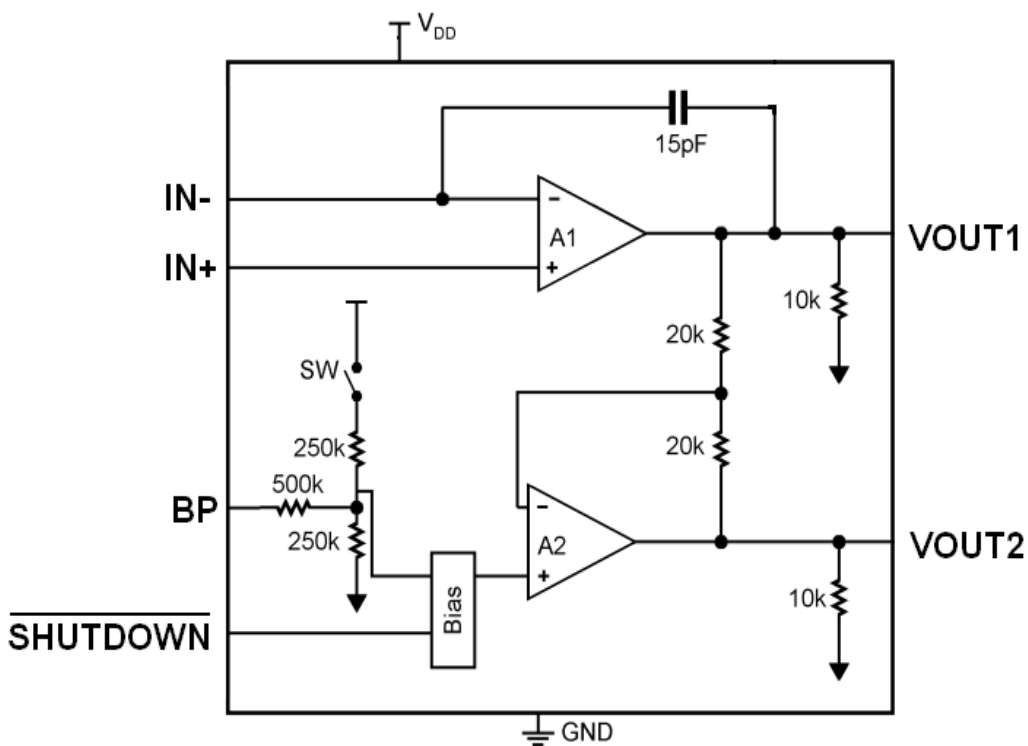


xxyy: Product lot number



x: Product lot number

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	°C
Storage Temperature	Tstg	-65—150	°C
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
IDD	Quiescent Power Supply Current	VIN = 0V, Io = 0A, No Load	—	4	8	mA
		VIN = 0V, Io = 0A, 8Ω Load	—	5	10	mA
ISD	Shutdown Current	VSHUTDOWN = 0V	—	0.1	2	μA
VSDIH	Shutdown Voltage Input High		1.2	—	—	V
VSDIL	Shutdown Voltage Input Low		—	—	0.4	V
VOS	Output Offset Voltage		—	7	50	mV
ROUT-GND	Resistor Output to GND		7.0	8.5	9.7	kΩ
PO	Output Power (8Ω)	THD = 2% (max); f = 1 kHz 8Ω Load	0.8	1.2	—	W
TWU	Wake-up time		—	170	220	ms
TSD	Thermal Shutdown Temperature		150	170	190	°C
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		
TSDT	Shut Down Time	8Ω Load	—	1.0	—	ms

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

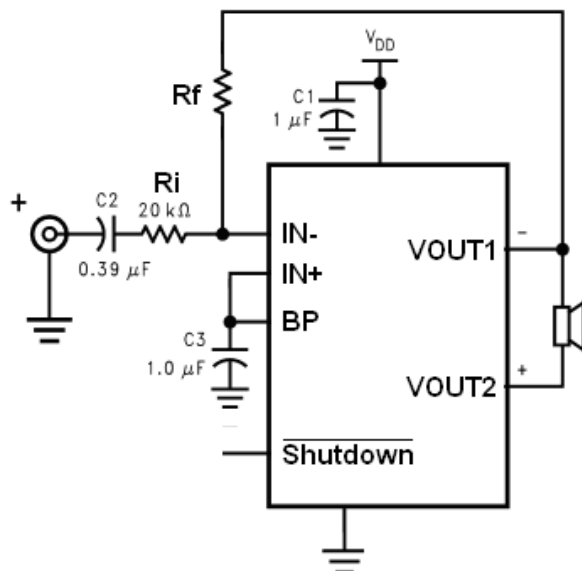
Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
I _{DD}	Quiescent Power Supply Current	VIN = 0V, Io = 0A, No Load	—	3.5	7	mA
		VIN = 0V, Io = 0A, 8Ω Load	—	4.5	9	mA
I _{SD}	Shutdown Current	V _{SHUTDOWN} = 0V	—	0.1	2	μA
V _{SDIH}	Shutdown Voltage Input High		1.2	—	—	V
V _{SDIL}	Shutdown Voltage Input Low		—	—	0.4	V
V _{OS}	Output Offset 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	°C
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.)

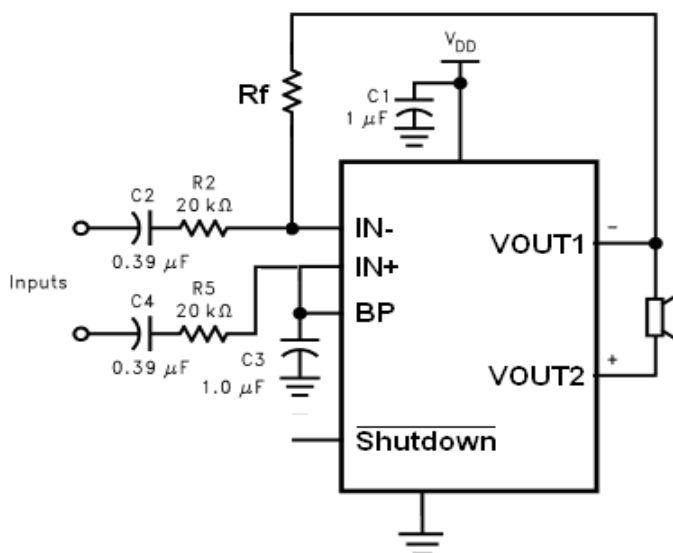
Symbol	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
I _{DD}	Quiescent Power Supply Current	VIN = 0V, Io = 0A, No Load	—	2.6	5.5	mA
I _{SD}		V _{SHUTDOWN} = 0V	—	0.1	2	μA
P _O	Output Power	THD = 1% (max); f = 1 kHz		0.3	—	W
		8Ω Load 4Ω Load		0.5		
THD+N	Total Harmonic Distortion+Noise	Po = 0.1 Wrms; 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

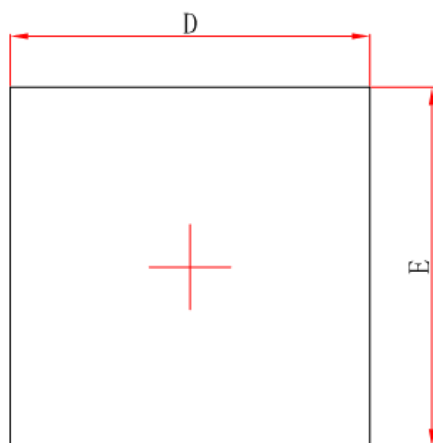


Note: The resistors (R_f) set the gain of the amplifier according to equation $\text{Gain} = 2 * R_f / R_i$

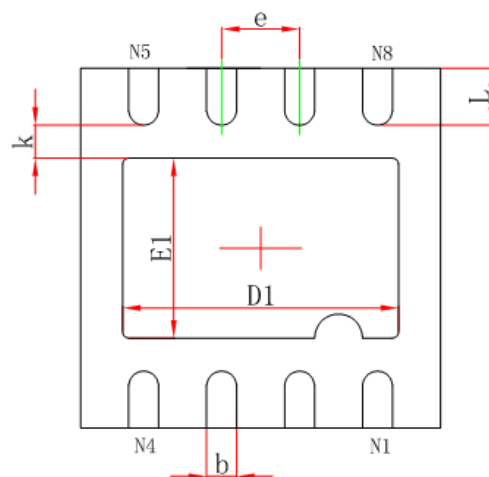
Typical $R_i=20K$ $R_f=20K$, $\text{GAIN}=2$; Gain depends on the values of the size of the source signal and V_{DD} . If the source signal amplitude is too small proposed increase in R_f to increase gain.

Package Information

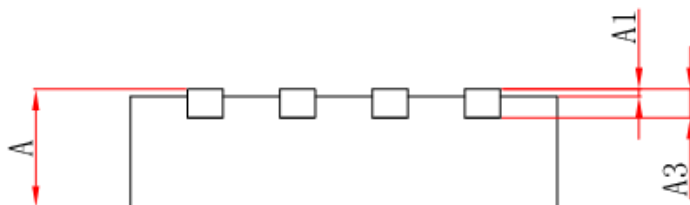
- DFN3×3-8L



Top View



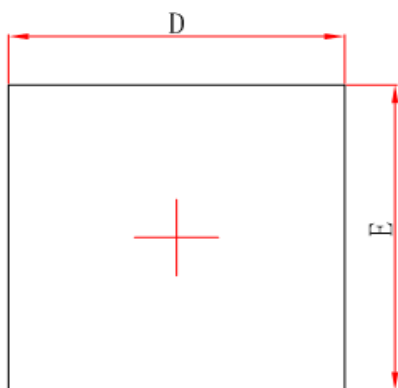
Bottom View



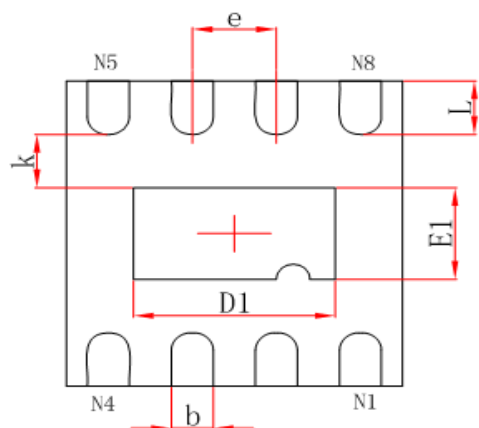
Side View

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

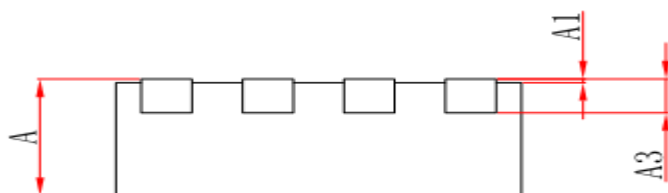
● DFN2×2-8L



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