

# NCP2993



ON Semiconductor

<http://onsemi.com>

The NCP2993 is an audio power amplifier designed for portable communication device applications such as mobile phone applications. The NCP2993 is capable of delivering 1.3 W of continuous average power to an 8.0  $\Omega$  BTL load from a 5.0 V power supply, and 1.1 W to a 4.0  $\Omega$  BTL load from a 3.6 V power supply.

The NCP2993 provides high quality audio while requiring few external components and minimal power consumption. It features a low-power consumption shutdown mode, which is achieved by driving the SHUTDOWN pin with logic low.

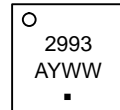
The NCP2993 contains circuitry to prevent from “pop and click” noise that would otherwise occur during turn-on and turn-off transitions. It is a zero pop noise device when a single ended or a differential audio input is used.

For maximum flexibility, the NCP2993 provides an externally

## MARKING DIAGRAM

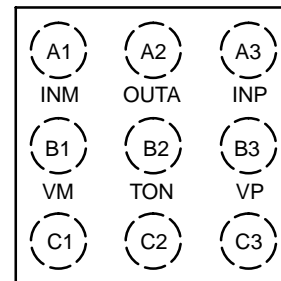


WLCSP9  
FC SUFFIX  
CASE 499BM



2993 = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

## PIN CONNECTIONS



BYPASS OUTB SHUTDOWN  
(Top View)

### Zero Pop Noise Signature with a Single Ended Audio Input

- Ultra Low Current Shutdown Mode: 10 nA
- 2.5 V–5.5 V Operation
- External Gain Configuration Capability
- External Turn-on Time Configuration Capability: 15 ms or 30 ms
- Thermal Overload Protection Circuitry
- This is a Pb-Free Device\*

### Typical Applications

- Portable Electronic Devices
- PDAs
- Wireless Phones

## ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 11 of this data sheet.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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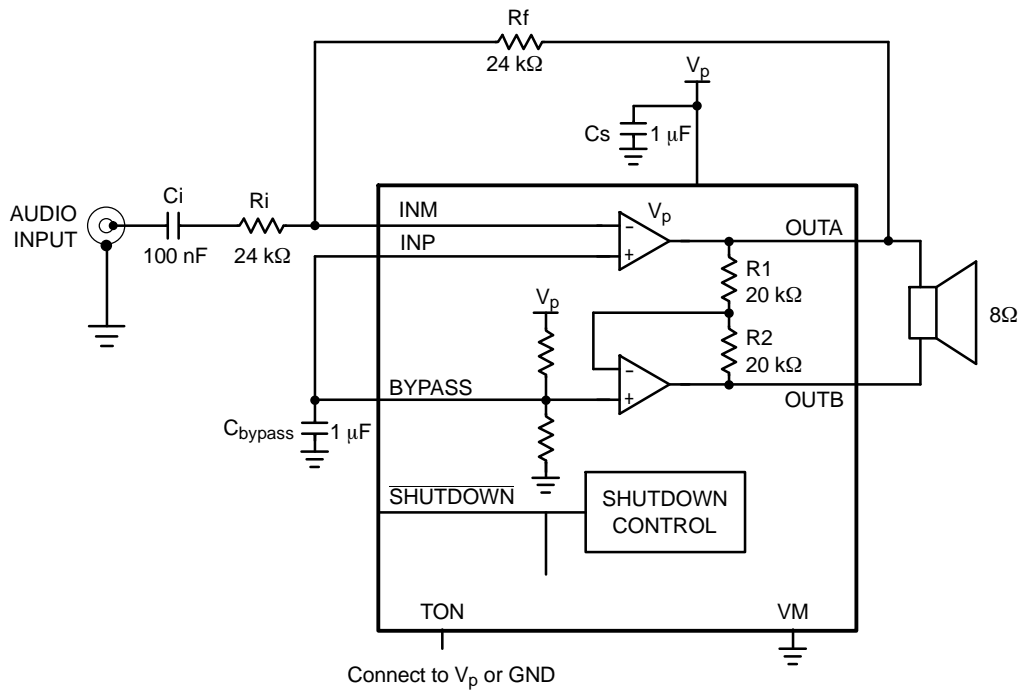


Figure 1. Typical Audio Amplifier Application Circuit with Single Ended Input

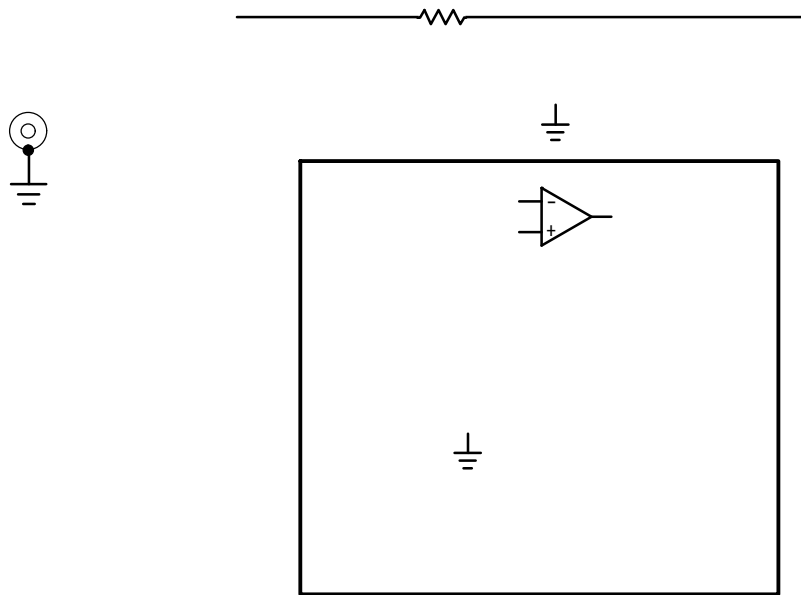


Figure 2. Typical Audio Amplifier Application Circuit with a Differential Input



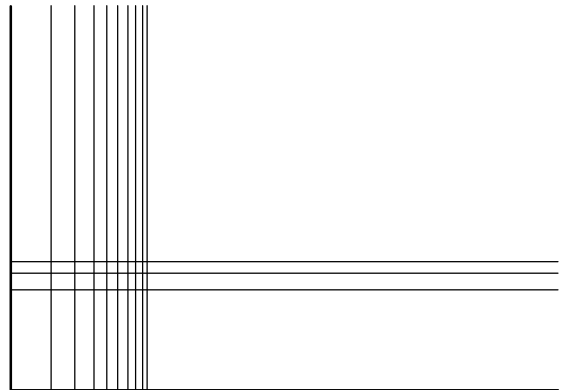
# NCP2993

**ELECTRICAL CHARACTERISTICS** Limits apply for  $T_A$  between  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  (Unless otherwise noted).

Characteristic	Symbol	Conditions	Min (Note 6)	Typ	Max (Note 6)	Unit
Supply Quiescent Current	$I_{dd}$	$V_p = 2.5\text{ V, No Load}$ $V_p = 5.0\text{ V, No Load}$	- -	1.8 1.95	3.5	

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## TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS

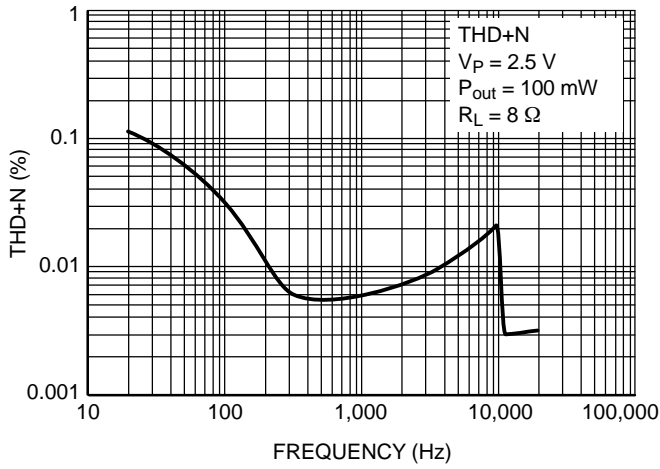


Figure 9. THD+N vs. Frequency, Differential Input

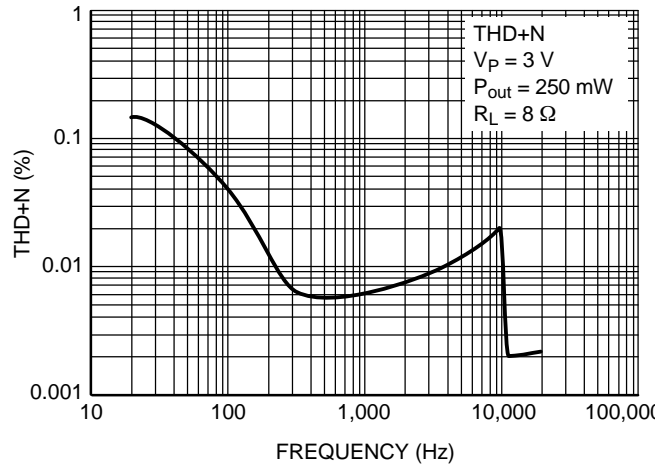


Figure 10. THD+N vs. Frequency, Differential Input

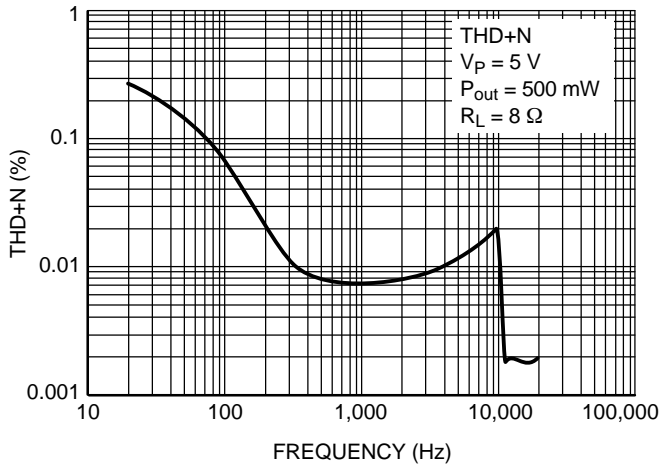


Figure 11. THD+N vs. Frequency, Differential Input

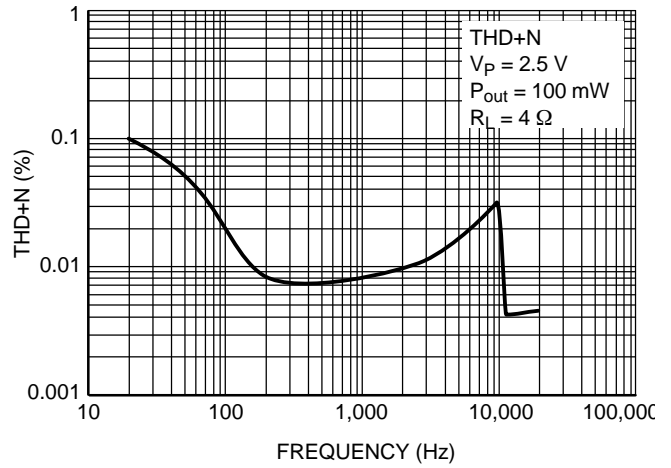


Figure 12. THD+N vs. Frequency, Differential Input

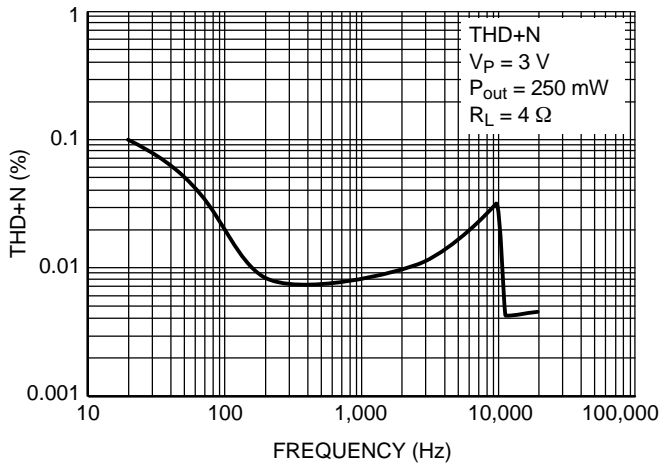


Figure 13. THD+N vs. Frequency, Differential Input

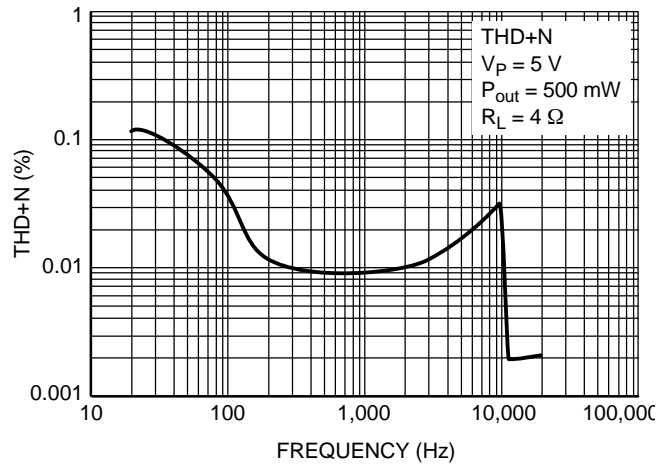


Figure 14. THD+N vs. Frequency, Differential Input



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## TYPICAL CHARACTERISTICS

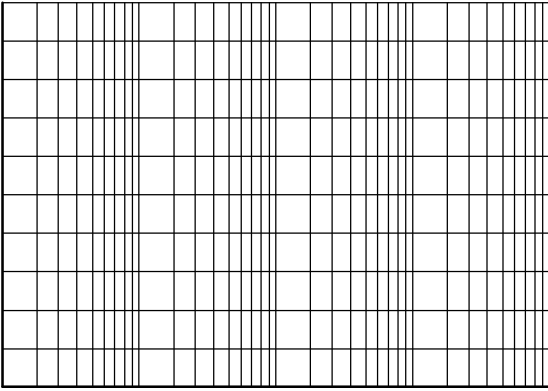


Figure 19. PSRR vs. Frequency

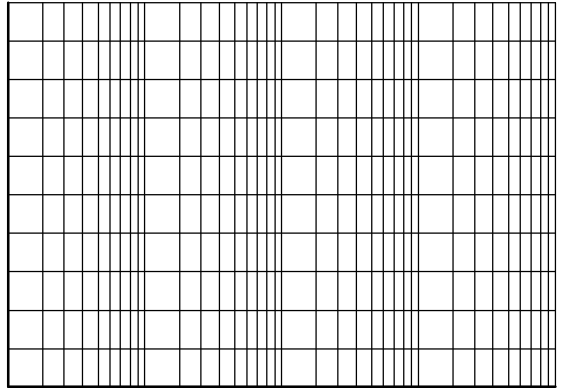


Figure 20. PSRR vs. Frequency

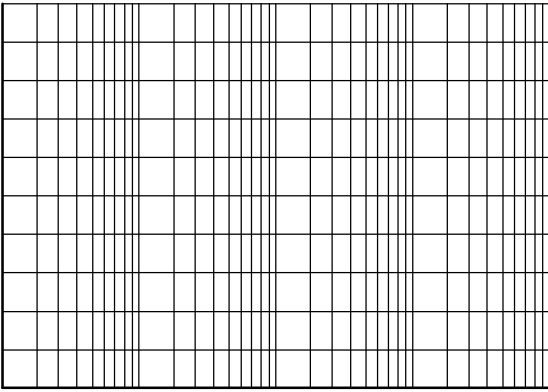


Figure 21. PSRR vs. Frequency

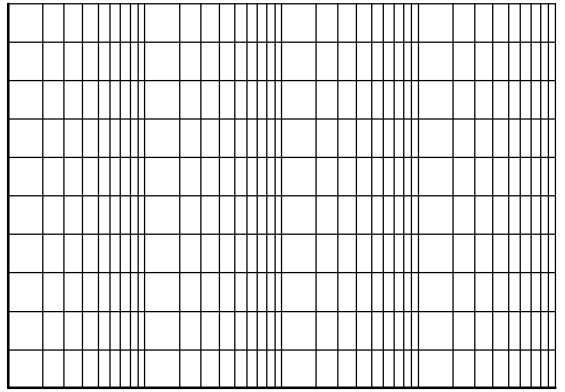


Figure 22. PSRR vs. Frequency

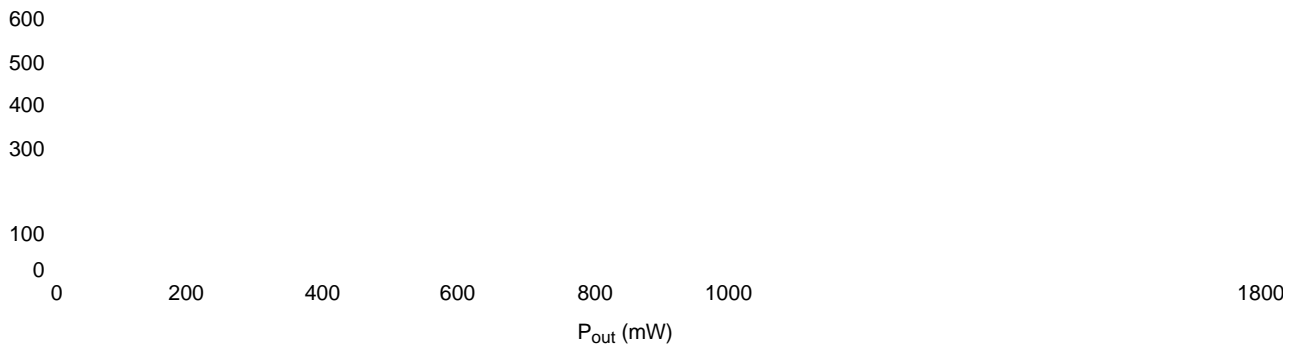


Figure 23. Power Dissipation vs.  $P_{out}$



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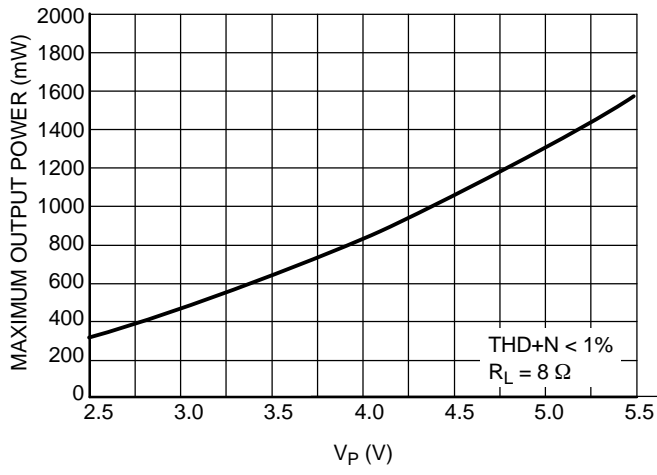


Figure 24. Maximum Output Power vs.  $V_P$

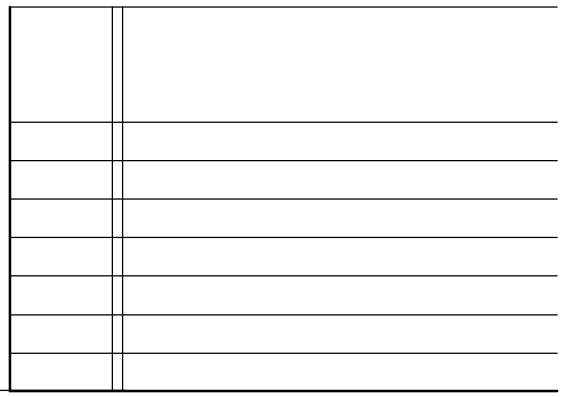


Figure 25. SNR vs. Frequency

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## APPLICATION INFORMATION

Detailed Description

## NCP2993

high-pass filter with  $R_{in}$ , the cut-off frequency is given by

$$f_c = \frac{1}{2 * \pi * R_{in} * C_{in}} .$$

The size of the capacitor must be large enough to couple in low frequencies without severe attenuation.

### IEC 61000-4-2 Level 4

In some particular applications, NCP2993 may need extra ESD protection to pass IEC 61000-4-2 Level 4 qualification.

Depending on the test, user can consider different level of protection:

- up to 22 pF capacitor connected between each amplifier output terminals and ground.
- Dedicated IEC filters such as ESD7.0 series from ON Semiconductor.

In any case, the protection should be placed as close as possible to the ESD stress entry point. Proper and carefull layout is a key factor to ensure optimum protection level is achieved. Designer should make sure the connection impedance between protection and



SCALE 4:1

**WLCSP9, 1.22x1.22**  
CASE 499BM  
ISSUE O

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