

## LM49155

# PRODUCT BRIEF **Boomer®** Audio Power Amplifier Series Uplink Noise Suppression & Downlink SNR Enhancement Analog Audio Subsystem

Check for Samples: [LM49155](#)

## FEATURES

- Noise cancellation for uplink and downlink without DSP-type artifacts, distortions or delays
- Adapting AGC on ambient noise level & downlink signal strength for earpiece
- Downlink adjustable noise-reducing high pass filter

- E<sup>2</sup>S Class D Amplifier with ALC
- Ground Referenced Headphone Outputs with Advanced Click Pop Suppression
- Micro-power shutdown

## APPLICATIONS

- Mobile Phones
- Portable Electronic Devices

## DESCRIPTION

The LM49155 is a fully integrated audio subsystem designed for portable handheld applications such as cellular phones. The LM49155 combines a Noise Suppression microphone amplifier, a 1.35W mono class D amplifier with ALC, class AB earpiece driver with AGC, a high efficiency, stereo, ground referenced headphone amplifier with click pop suppression and I<sup>2</sup>C modes select and volume control.

The LM49155 features analog fully differential input, and differential output microphone amplifier designed to reduce background acoustic noise, while delivering superb speech clarity in voice communication applications. Downlink SNR enhancement with an advanced acoustic AGC technology to adjust output levels.

The LM49155 speaker amplifier features National's unique output limiter that provides both a no-clip feature and speaker protection. The E<sup>2</sup>S class D amplifier features a patented, ultra low EMI PWM architecture that significantly reduces RF emissions while preserving audio quality and efficiency. The headphone drivers feature National's ground referenced architecture that creates a ground-referenced output from a single, low-voltage supply.

The LM49155 is available in an ultra-small 36-bump micro SMD package (3.434mm x 3.459mm x 0.6mm).

**Notice: This document is not a full datasheet. For more information regarding this product or to order samples please contact your local National Semiconductor sales office or visit <http://www.national.com/support/dir.html>**



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

**Table 1. Key Specifications**

|                                                                                                                     |                            | VALUE   | UNIT     |
|---------------------------------------------------------------------------------------------------------------------|----------------------------|---------|----------|
| Uplink Far Field Noise Suppression<br>Electrical FFNS <sub>E</sub> at f = 1kHz                                      |                            | 34      | dB (typ) |
| Downlink SNR Enhancement Earpiece Amplifier                                                                         | Near-Field SNR Enhancement | 6 to 18 | dB (typ) |
|                                                                                                                     | Downlink SNRI <sub>E</sub> | 16      |          |
| Class D Loudspeaker Amplifier R <sub>L</sub> = 15μH+8Ω+15μH<br>P <sub>OUT</sub> , THD+N ≤ %, V <sub>DD</sub> = 5.0V |                            | 1.35    | W (typ)  |
| Headphone Amplifier R <sub>L</sub> = 32Ω<br>P <sub>OUT</sub> , THD+N ≤ %, HPV <sub>DD</sub> = 1.8V                  |                            | 19      | mW (typ) |



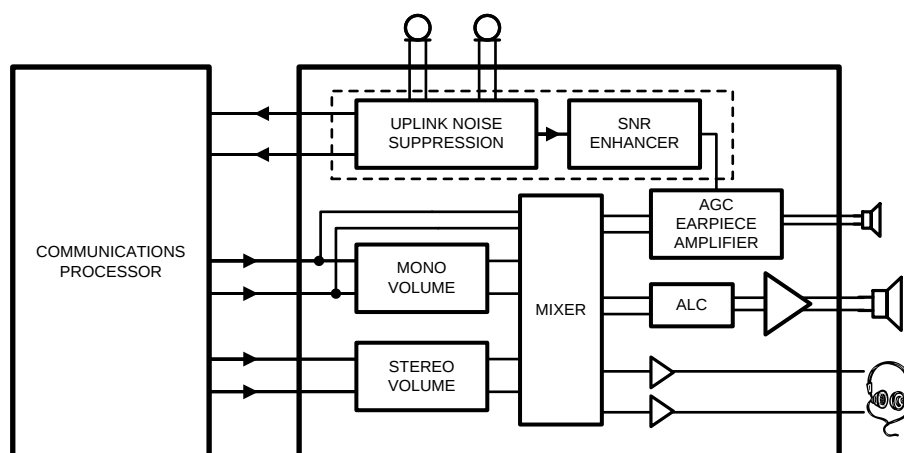
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## Simplified Block Diagram



## Typical Application

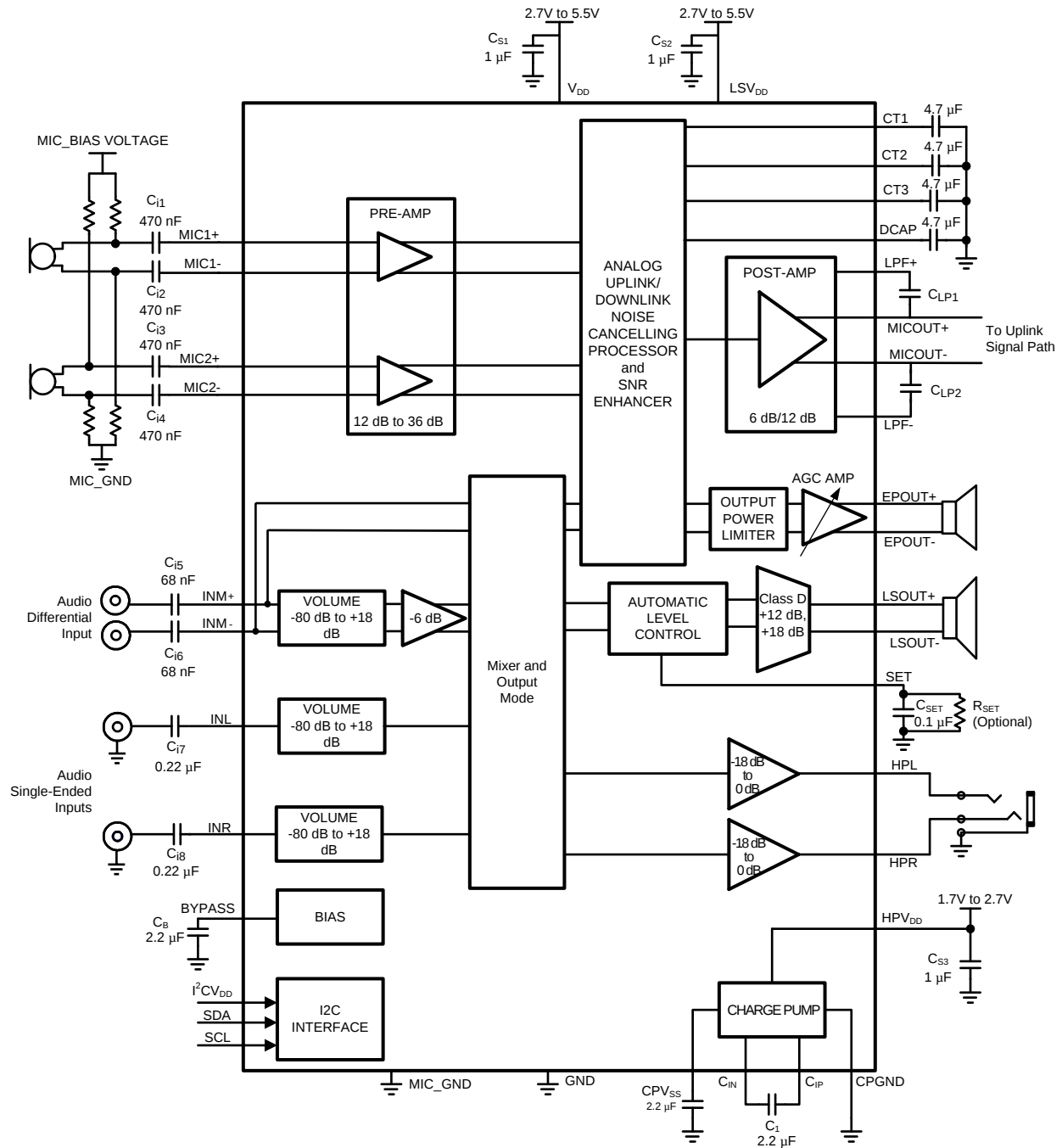
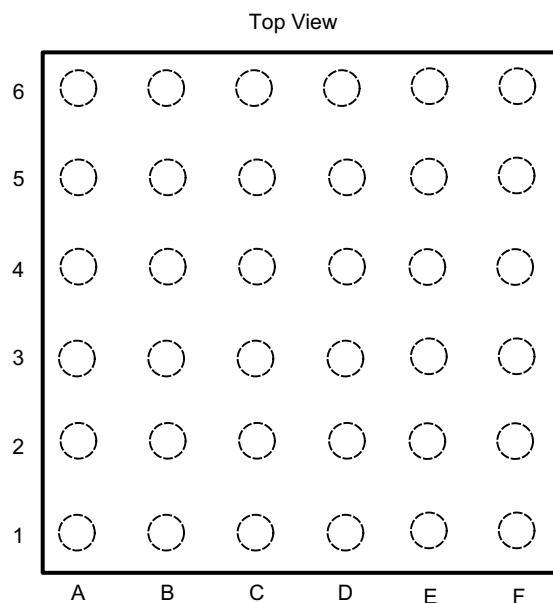


Figure 1. Typical Application Circuit

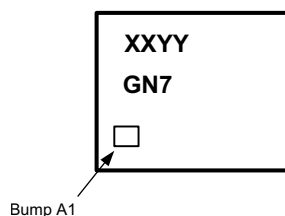
## Connection Diagrams

### TL Package (3.434mm x 3.459mm x 0.6mm)



**Figure 2. Top View (Bump Side Down)**

### 36 Bump micro SMD Marking



**Figure 3. Top View**  
**XX — Date Code**  
**YY — Die Traceability**  
**G — Boomer**  
**N7 — LM49155TL**

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Samples<br>(Requires Login) |
|------------------|---------------|--------------|--------------------|------|-------------|----------------------------|------------------|----------------------|-----------------------------|
| LM49155TL/NOPB   | ACTIVE        | DSBGA        | YZR                | 36   | 250         | Green (RoHS<br>& no Sb/Br) | SNAGCU           | Level-1-260C-UNLIM   |                             |
| LM49155TLX/NOPB  | ACTIVE        | DSBGA        | YZR                | 36   | 1000        | Green (RoHS<br>& no Sb/Br) | SNAGCU           | Level-1-260C-UNLIM   |                             |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

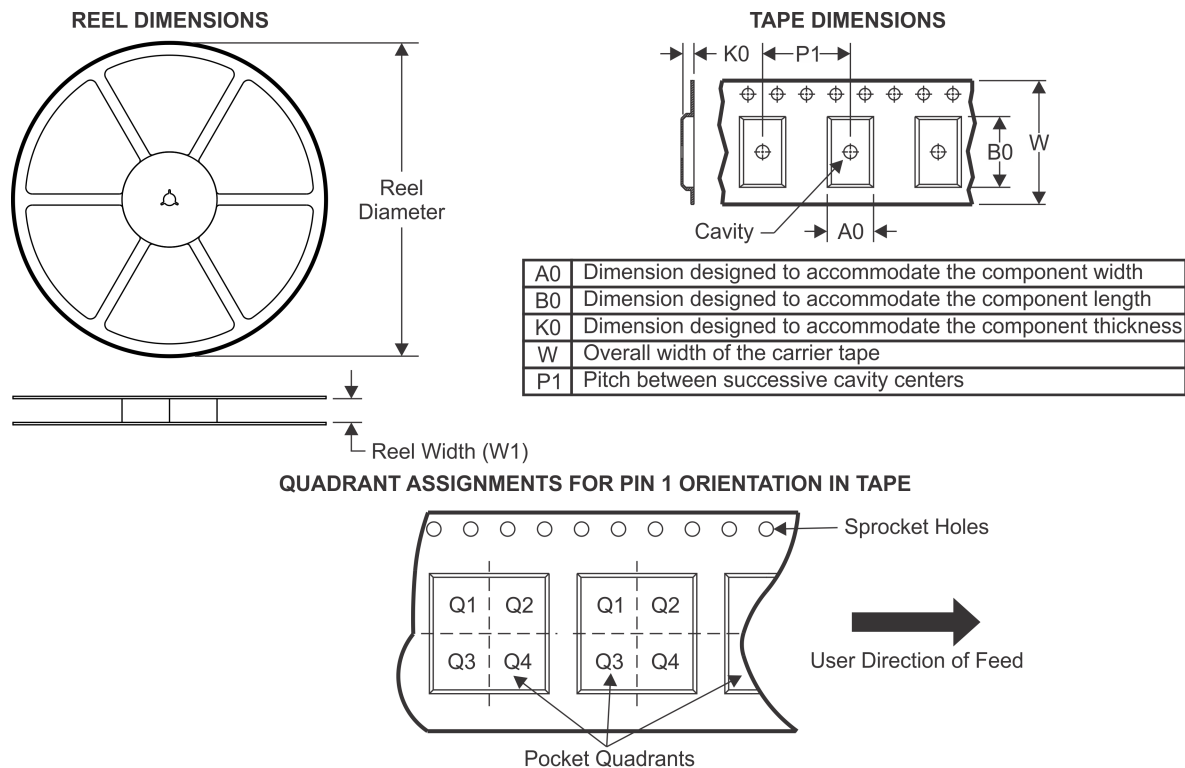
**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| LM49155TL/NOPB  | DSBGA        | YZR             | 36   | 250  | 178.0              | 12.4               | 3.63    | 3.63    | 0.76    | 8.0     | 12.0   | Q1            |
| LM49155TLX/NOPB | DSBGA        | YZR             | 36   | 1000 | 178.0              | 12.4               | 3.63    | 3.63    | 0.76    | 8.0     | 12.0   | Q1            |

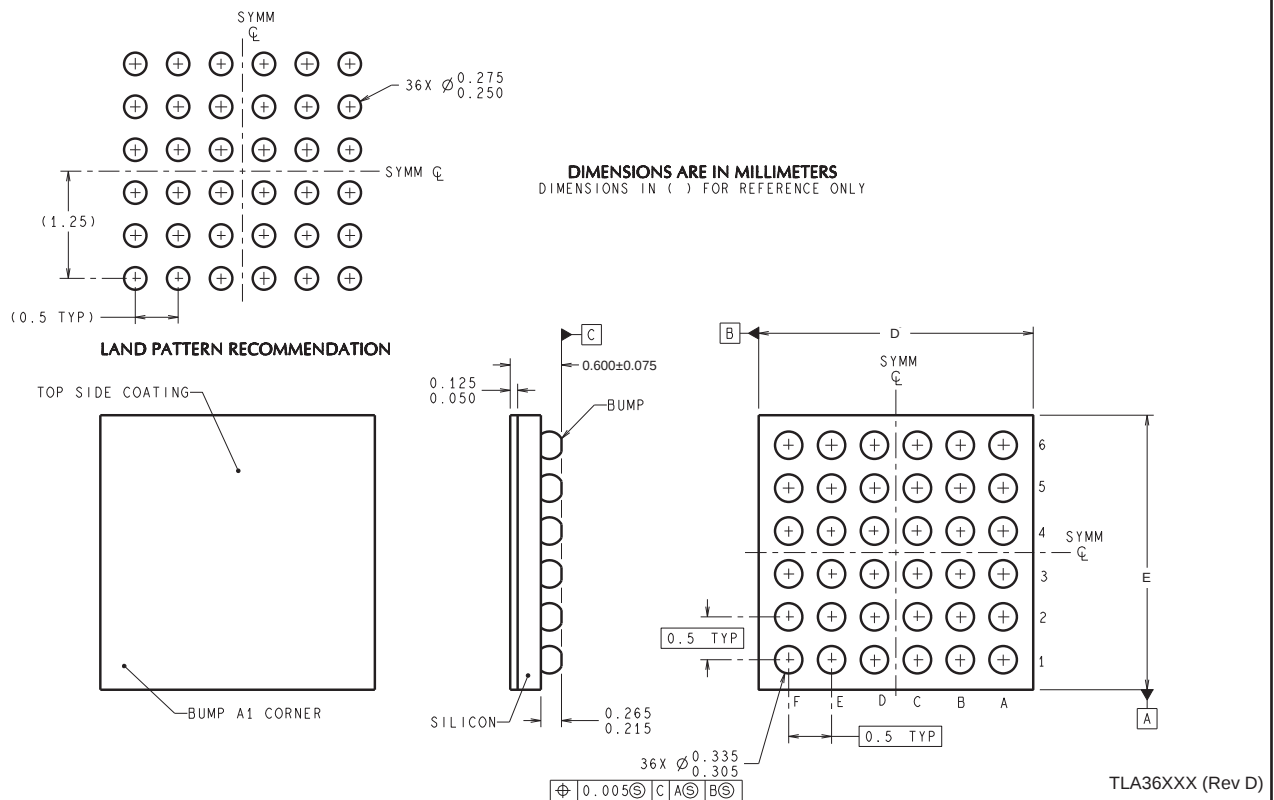
## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| LM49155TL/NOPB  | DSBGA        | YZR             | 36   | 250  | 203.0       | 190.0      | 41.0        |
| LM49155TLX/NOPB | DSBGA        | YZR             | 36   | 1000 | 206.0       | 191.0      | 90.0        |

YZR0036



D: Max = 3.509 mm, Min = 3.409 mm

E: Max = 3.485 mm, Min = 3.385 mm

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NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.  
B. This drawing is subject to change without notice.

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|                               |                                                                                          |
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