# LM49155

# PRODUCT BRIEFBoomer® 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**
- **E²S 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 $I^2C$ 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 $E^2S$ 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

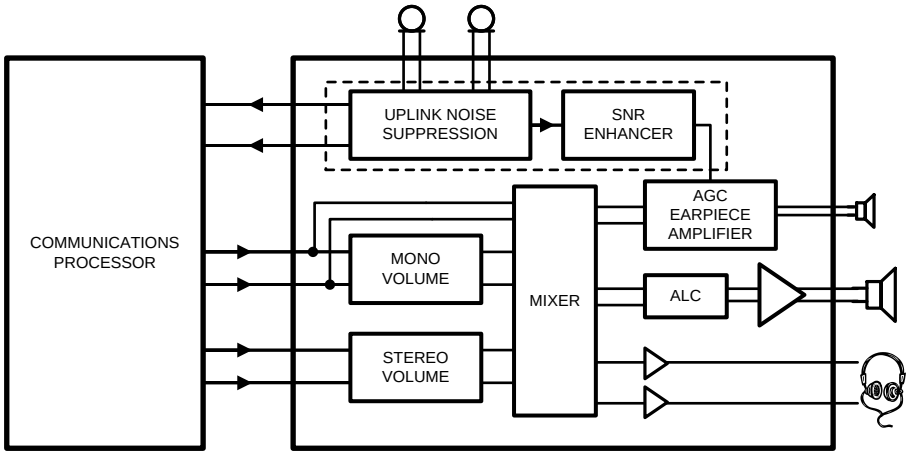
These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

**Table 1. Key Specifications**

| | | VALUE | UNIT |
|---|---|---|---|
| Uplink Far Field Noise Suppression<br>Electrical $FFNS_E$ at f = 1kHz | | 34 | dB (typ) |
| Downlink SNR Enhancement Earpiece Amplifier | Near-Field SNR Enhancement | 6 to 18 | dB (typ) |
| | Downlink $SNRI_E$ | 16 | |
| Class D Loudspeaker Amplifier $R_L$ = 15µH+8Ω+15µH<br>$P_{OUT}$, THD+N ≤ %, $V_{DD}$ = 5.0V | | 1.35 | W (typ) |
| Headphone Amplifier $R_L$ = 32Ω<br>$P_{OUT}$, THD+N ≤ %, $HPV_{DD}$ = 1.8V | | 19 | mW (typ) |

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

## Simplified Block Diagram



## Typical Application

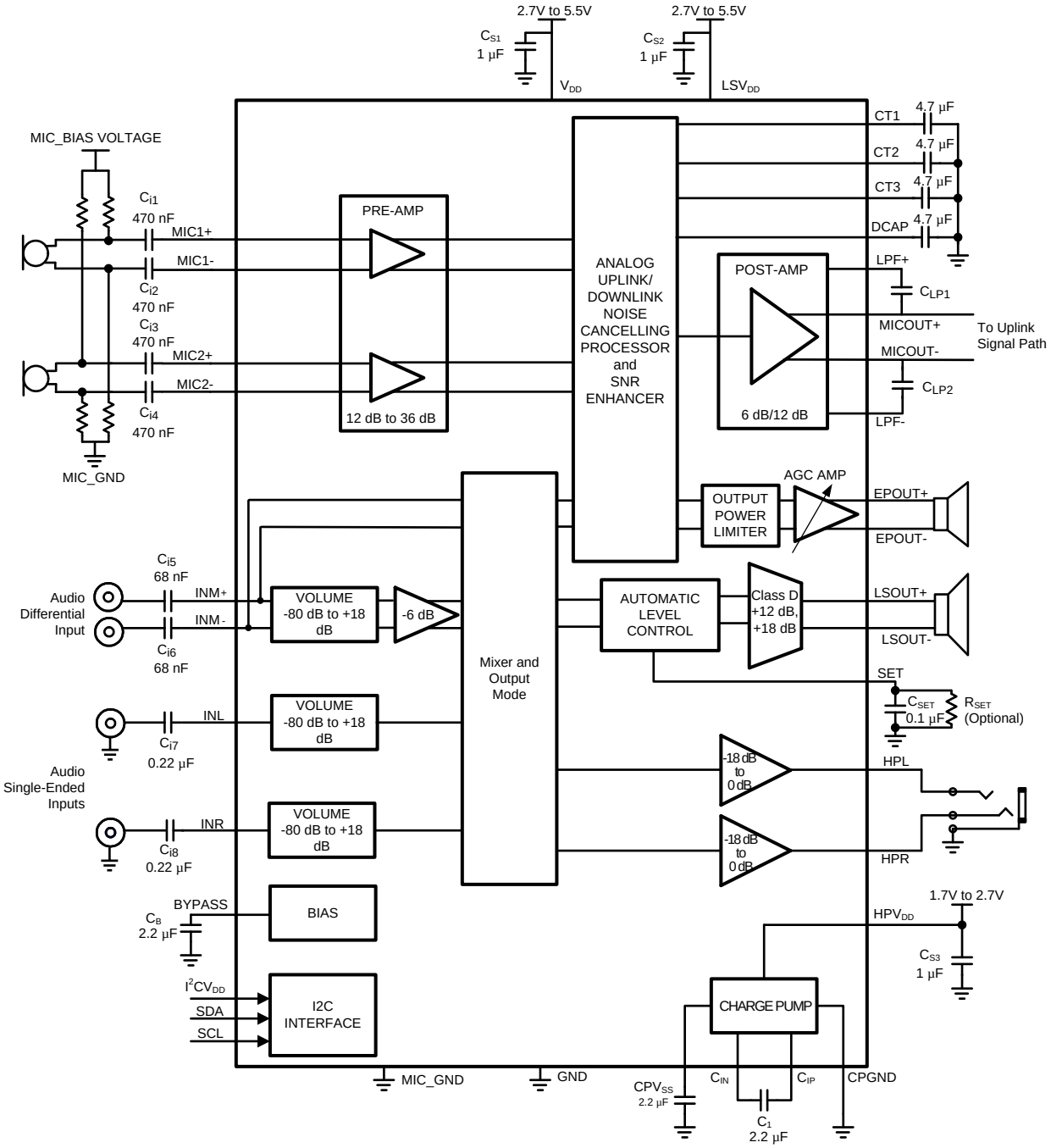



**Figure 1. Typical Application Circuit**

## Connection Diagrams

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

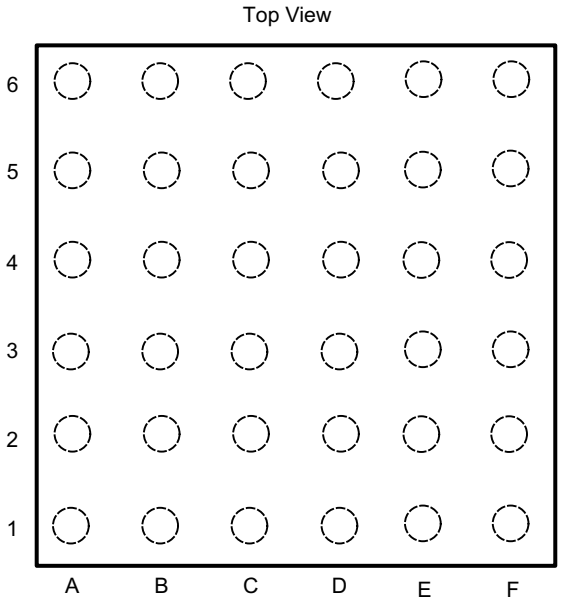



**Figure 2. Top View (Bump Side Down)**

**36 Bump micro SMD Marking**

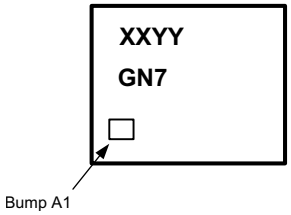



**Figure 3. Top View**
**XX — Date Code**
**YY — Die Traceability**
**G — Boomer**
**N7 — LM49155TL**

## PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package \| Pins | Package qty \| Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|---|---|---|---|---|---|---|---|---|---|
| LM49155TL/NOPB | Active | Production | DSBGA (YZR) \| 36 | 250 \| SMALL T&R | Yes | SNAGCU | Level-1-260C-UNLIM | - | GN7 |
| LM49155TL/NOPB.A | Active | Production | DSBGA (YZR) \| 36 | 250 \| SMALL T&R | Yes | SNAGCU | Level-1-260C-UNLIM | See LM49155TL/NOPB | GN7 |
| LM49155TLX/NOPB | Active | Production | DSBGA (YZR) \| 36 | 1000 \| LARGE T&R | Yes | SNAGCU | Level-1-260C-UNLIM | - | GN7 |
| LM49155TLX/NOPB.A | Active | Production | DSBGA (YZR) \| 36 | 1000 \| LARGE T&R | Yes | SNAGCU | Level-1-260C-UNLIM | See LM49155TLX/ NOPB | GN7 |

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

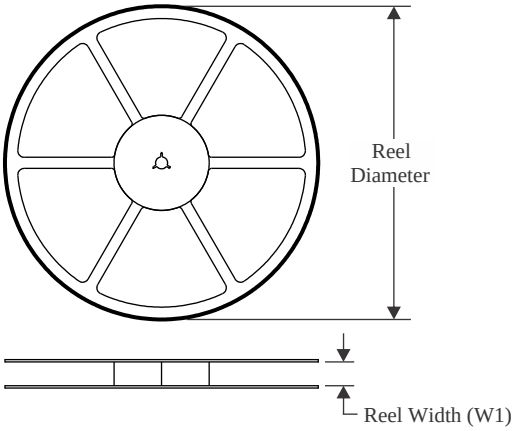
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

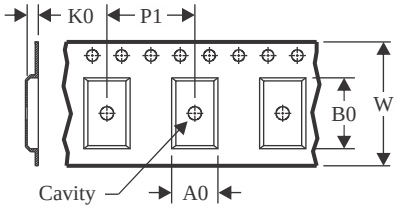
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

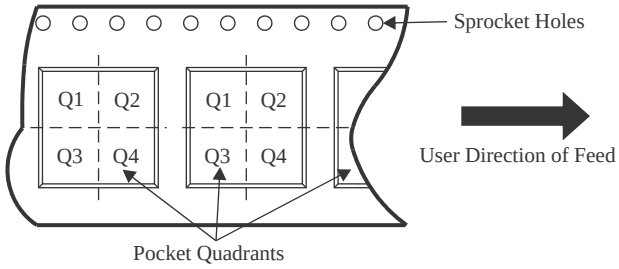



**TAPE DIMENSIONS**




| | |
|---|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

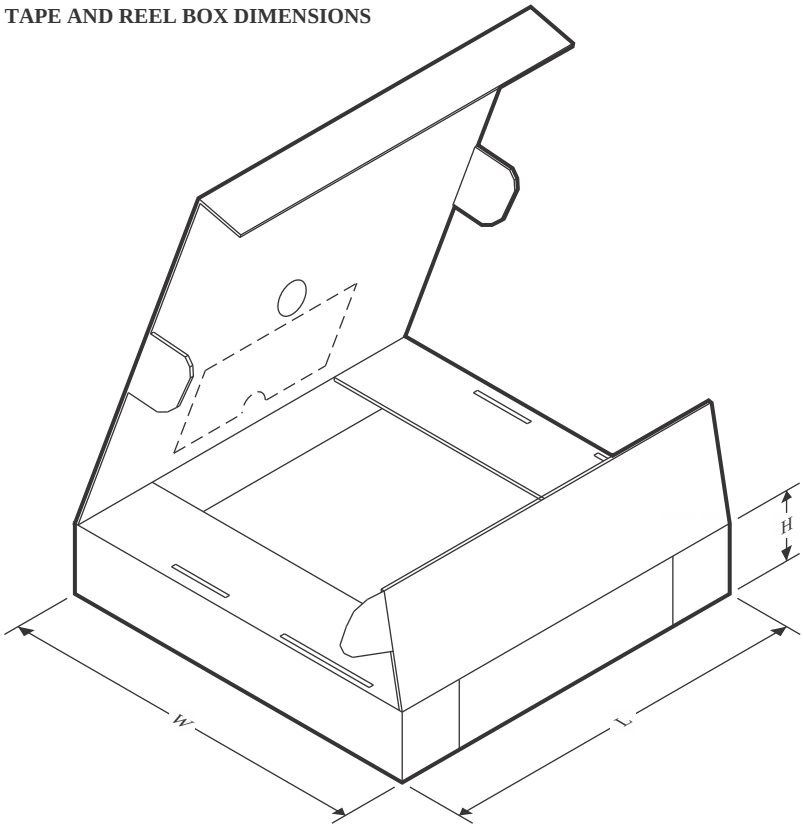
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




*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 | 177.8 | 12.4 | 3.63 | 3.63 | 0.76 | 8.0 | 12.0 | Q1 |
| LM49155TLX/NOPB | DSBGA | YZR | 36 | 1000 | 177.8 | 12.4 | 3.63 | 3.63 | 0.76 | 8.0 | 12.0 | Q1 |

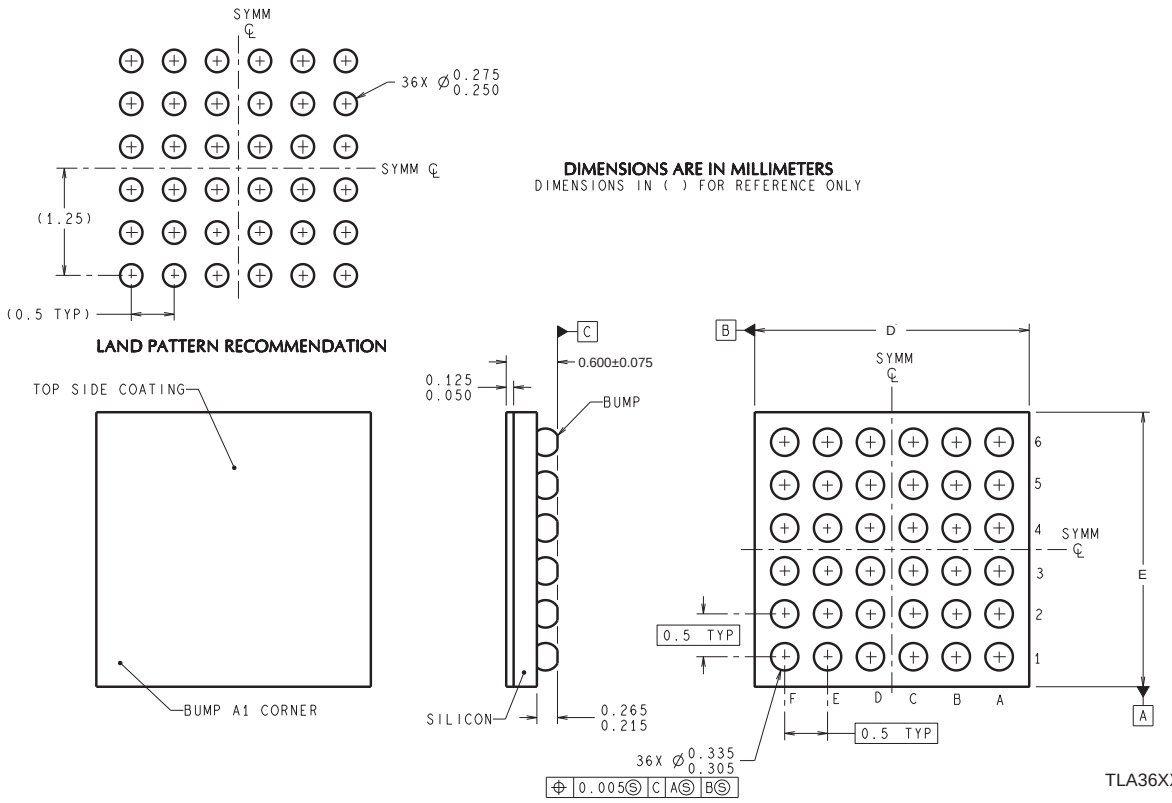
TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| LM49155TL/NOPB | DSBGA | YZR | 36 | 250 | 208.0 | 191.0 | 35.0 |
| LM49155TLX/NOPB | DSBGA | YZR | 36 | 1000 | 208.0 | 191.0 | 35.0 |

YZR0036




D: Max = 3.489 mm, Min =3.429 mm

E: Max = 3.465 mm, Min =3.405 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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Last updated 10/2025