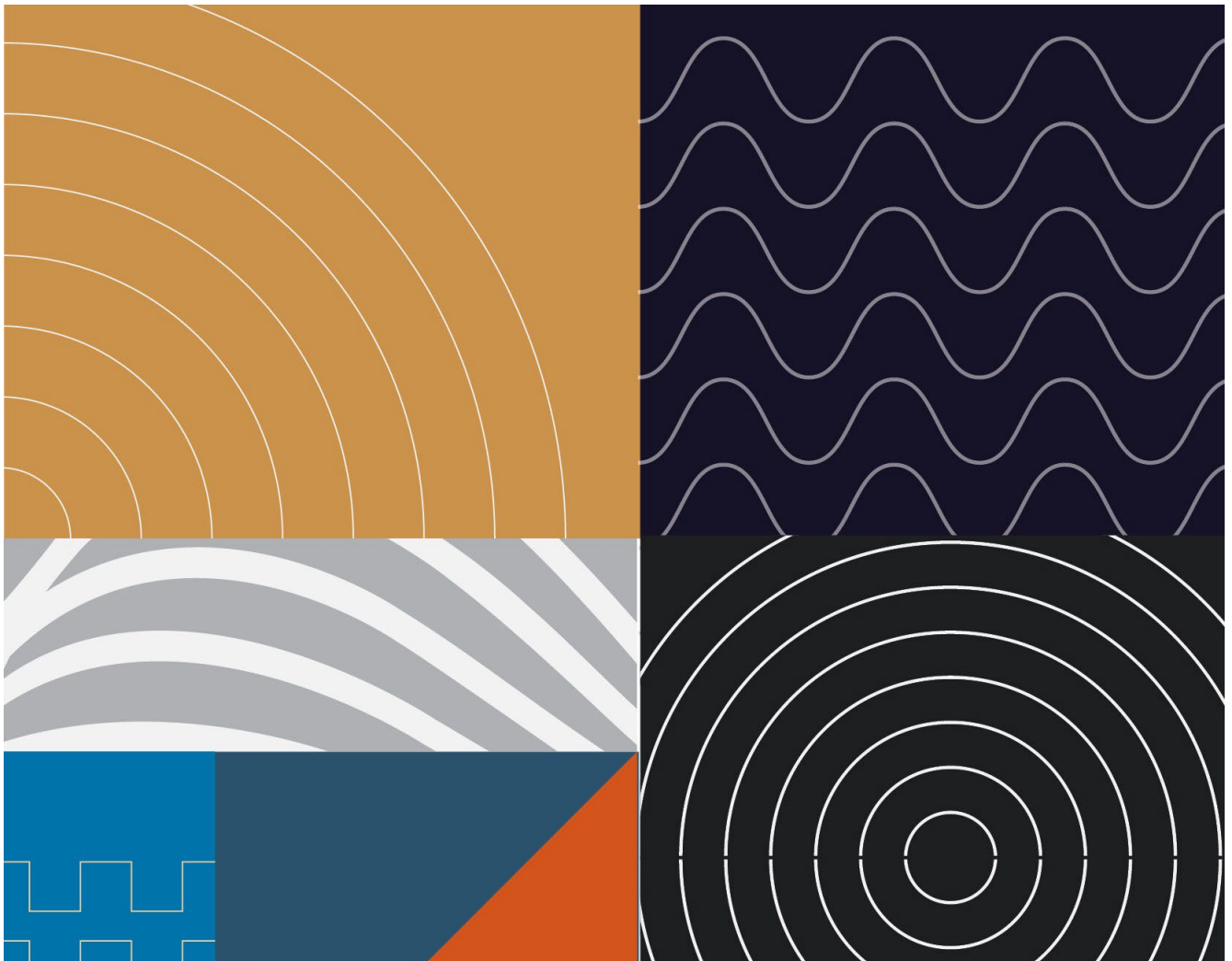




NEW PRODUCT HIGHLIGHT
SEPT 2023

SPEAKERS



[PUIAUDIO.COM](https://puiaudio.com)

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New Product Introduction

PUI Audio is thrilled to introduce our newest speaker additions, enhancing our diverse speaker portfolio. Our innovative 15 – 45 mm moving-coil dynamic drivers are meticulously designed to meet various application needs.

Our new AS01508MS-SC14-WP, AS01508MS-WP, and AS02508MS speakers have premium neodymium magnetic motors, ensuring maximum output in a compact design!

We are also proud to introduce our AS04504PR-WP and ASE04008MS-LWC25-2 speakers, with their robust construction, accommodate larger diaphragms—resulting in an enhanced low-end frequency response!

Whether your design requires communication between people around the world, within a virtual world, or even giving clear instructions –

PUI Audio has a speaker for when you need to be heard!

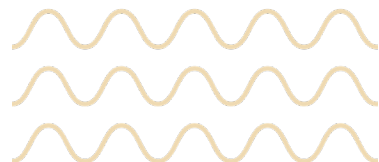




AS02508MS

Key Features:

- SPL: 100dB 550Hz~5kHz (1W, 0.1m)
- Rated Input Power: 1W
- Maximum Input Power: 1.2W
- Impedance: 8 Ohm
- Length: 25mm, Width: 9mm, Height: 3mm
- Operating Temperatures: -20 ~ +60 °C
- Suggested sealed back-volume: 1cc



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AS01508MS-SC14-WP

Key Features:

- SPL: 81dB 850Hz~20kHz (0.894V, 0.1m)
- Rated Input Power: 0.5W
- Maximum Input Power: 0.7W
- Impedance: 8 Ohm
- Length: 15mm, Width: 6mm, Height: 3mm
- Operating Temperatures: -30 ~ +70 °C
- Suggested sealed back-volume: 1cc



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AS01508MS-WP

Key Features:

- SPL: 95dB 950Hz~20kHz (1W, 0.1m)
- Rated Input Power: 1W
- Maximum Input Power: 1.5W
- Impedance: 8 Ohm
- Length: 15mm, Width: 11mm, Height: 3mm
- Operating Temperatures: -20 ~ +60 °C
- Suggested sealed back-volume: 1cc



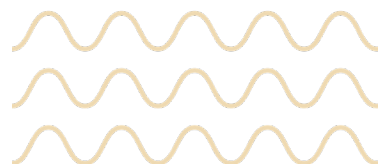
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AS04504PR-WP

Key Features:

- SPL: 101dB 180Hz~20kHz (1W, 0.1m)
- Rated Input Power: 5W
- Maximum Input Power: 6W
- Impedance: 4 Ohm
- Diameter: 45mm, Height: 24mm
- Operating Temperatures: -30 ~ +70 °C
- IP65 Ingress Protection



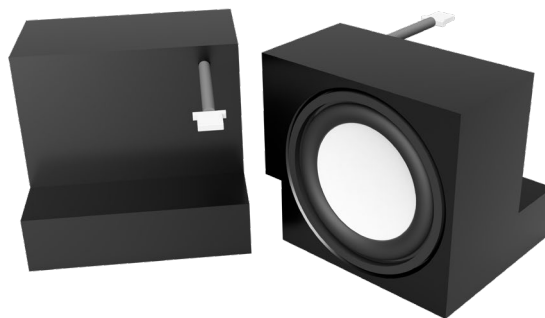
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ASE04008MS-LWC25-2

Key Features:

- SPL: 94dB 380Hz~20kHz (1W, 0.1m)
- Rated Input Power: 2W
- Maximum Input Power: 2.5W
- Impedance: 8 Ohm
- Length: 40mm, Width: 35mm, Height: 33mm
- Operating Temperatures: -40 ~ +85 °C



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Additional speaker products at

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Design Considerations

The human auditory system is most receptive between 500 Hz and 6 kHz – while lower frequencies are often felt rather than heard. Our new speakers have distinct features to cater to a wide frequency response range. To achieve superior sound from smaller speakers, various strategies, such as optimizing the enclosure design, considering the speaker's proximity to the ear, or refining signal processing, can be employed, as discussed below. Incorporating multiple speakers from PUI Audio into your design will ensure that users can hear everything when it needs to be heard!

A. Enclosure Design

The design of a speaker's enclosure is crucial to its performance. Manufacturers can fine-tune the speaker's output by varying the material, size, and shape. The figures below illustrate how varying the back volume of these speakers can influence sound quality and shift resonant frequencies.

AS01508MS-SC14-WP

Resonant	<i>Figure 1 (Icc)</i>	1050 \pm 20% Hz
Frequency	<i>Figure 2 (Free Air)</i>	850 \pm 20% Hz

Typical Frequency Response (0.1W / 0.1M / Free Air)

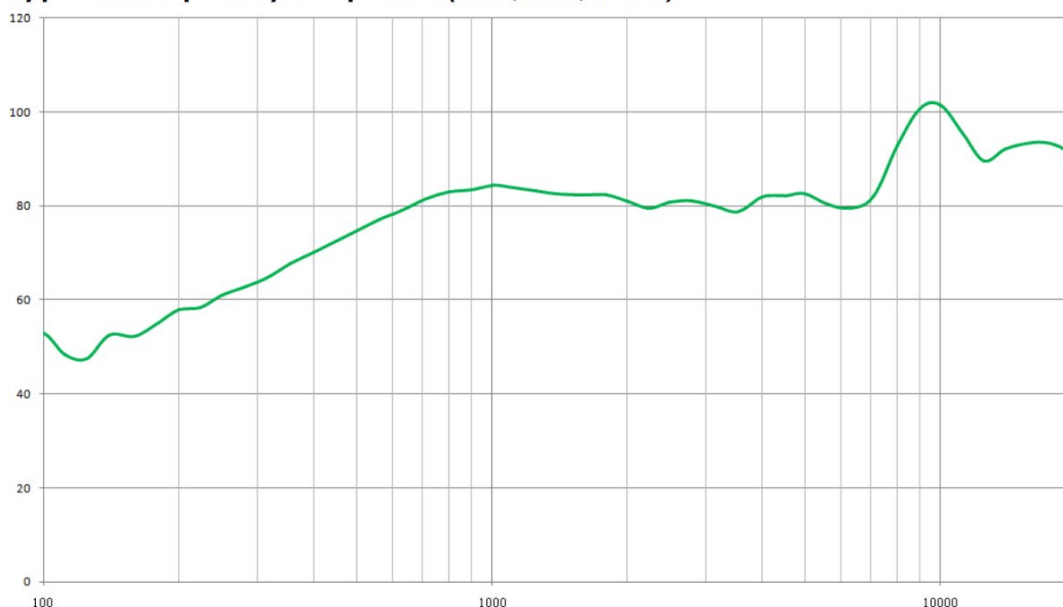


Figure 1

Typical Frequency Response (0.1W / 0.1M / 1cc enclosure)

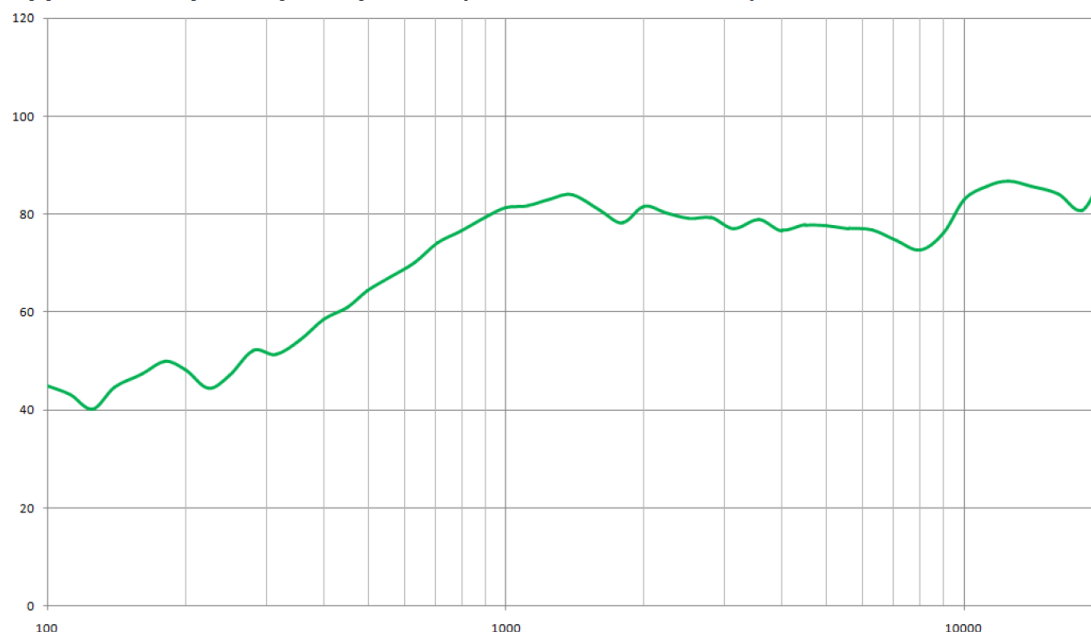


Figure 2

PUI Audio offers all-in-one speaker solutions, such as the ASE04008MS-LWC25-2. These speaker systems place the speaker driver in an enclosure specially designed and optimized to maximize SPL and sound quality from each speaker. If your application requires a custom enclosure design to fit space constraints, adhere to specific regulations or standards, or even align with aesthetic preferences, contact our dedicated team of experts!

ASE04008MS



B. Ear Proximity & Power

Considering the typical placement of speaker drivers about or near a user's ears, bass frequencies don't need to traverse long distances to be perceived. A speaker with a sensitivity of 95 dB @ 1W/50cm offers the same SPL as one rated at 89 dB @ 1W/1m and is equivalent to a speaker rated at 109 dB @ 1W/10 cm.

The following image shows a typical effect of distance on SPL, assuming that:

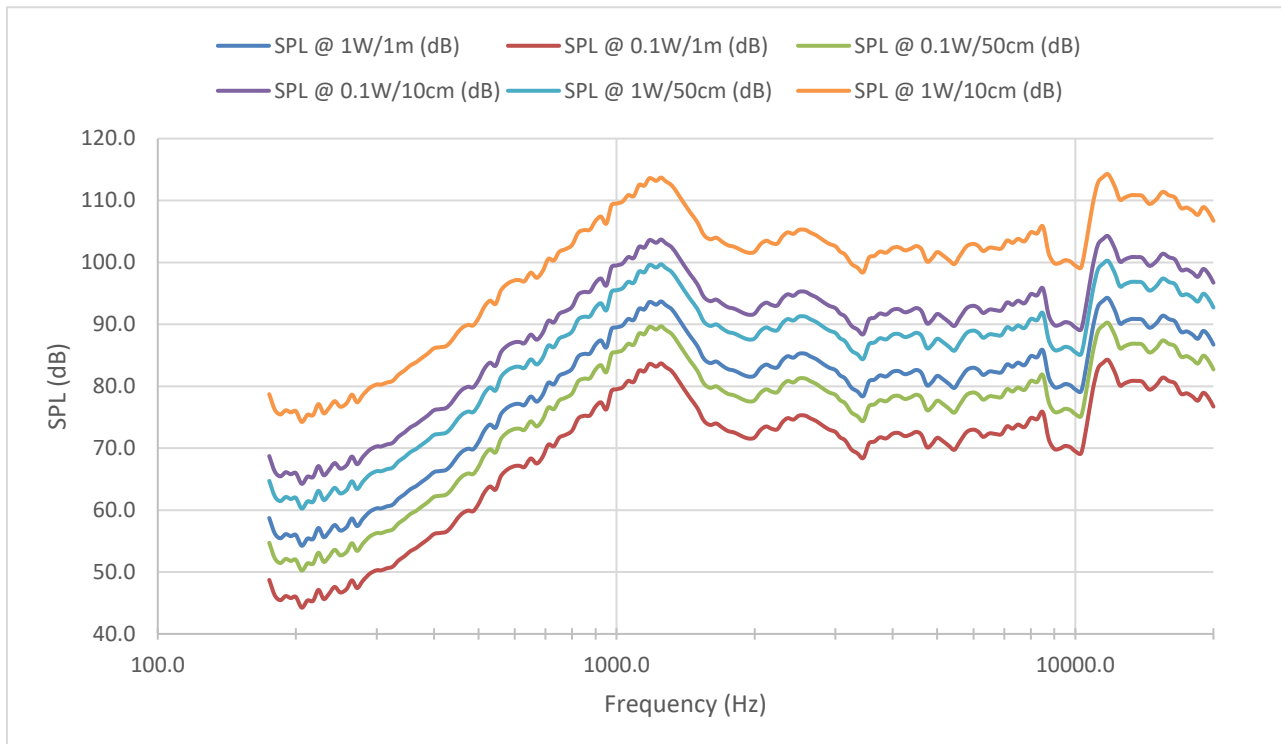
1. The measurement frequency range is from 100Hz ~ 20kHz, within the typical audible range for humans.
2. A 6dB increase in SPL is present for every halving of the measurement distance, and a 20dB boost is present at 10% of the original measurement distance.
3. Doubling input power results in a 3dB increase in SPL; halving input power results in a -3dB decrease. The relationship between power and SPL is as follows:

$$\Delta SPL = 10 * \log_{10} \left(\frac{P_2}{P_1} \right)$$

Where:

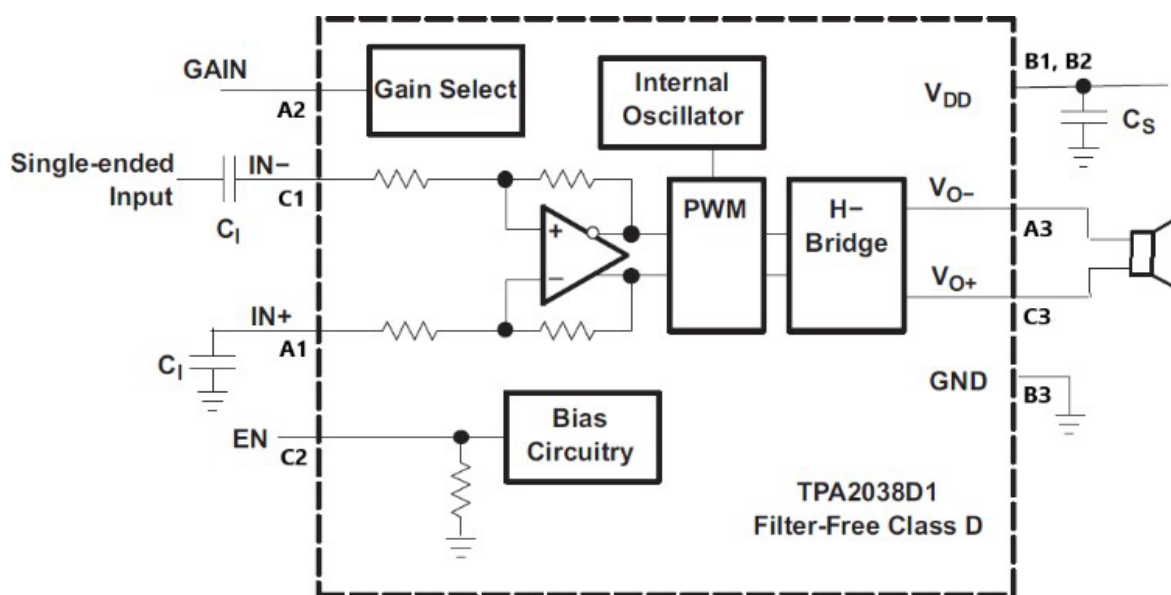
- ΔSPL = change in SPL (in dB)
- P_1 is the initial power
- P_2 is the final power

Given a 10x increase in original power or a decrease to 1/10th original power, this results in a respective 10dB increase/decrease in SPL.



C. Amplification

Class D amplifiers have the primary benefit of higher efficiency when compared to analog amplifiers operating at the same output power level. The amplifier below operates on a single supply (applied to pins B1 and B2) ranging from 2.5V to 5.5V. At $V_{DD} = 5.0V$, the output power into an 8Ω load is a nominal 1.46W and 2.57W into a 4Ω load.



Filterless, Single-Supply Class D Amplifier Drives 8Ω Speaker with 1.4W

Utilizing the TPA2038D1 from Texas Instruments, this amplifier has two gain settings determined by the GAIN pin (A2) voltage applied. A gain of 6dB is selected by connecting GAIN to the supply voltage (V_{DD}), and a gain of 12dB is achieved by applying GND.

The input coupling capacitor (C_I) value working with the input resistance of IN will determine the high-pass filter's cutoff frequency formed at the amplifier's input. The input resistance is a function of the voltage applied to the GAIN pin: with the supply voltage applied, the input resistance is a nominal $150k\Omega$; with GND applied to the GAIN pin, the input resistance is $75k\Omega$. Therefore, the capacitor's value can be determined as follows:

$$C_I = 1/2\pi(R_{IN})f_{(-3dB)}$$

Review our new
speakers today!

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