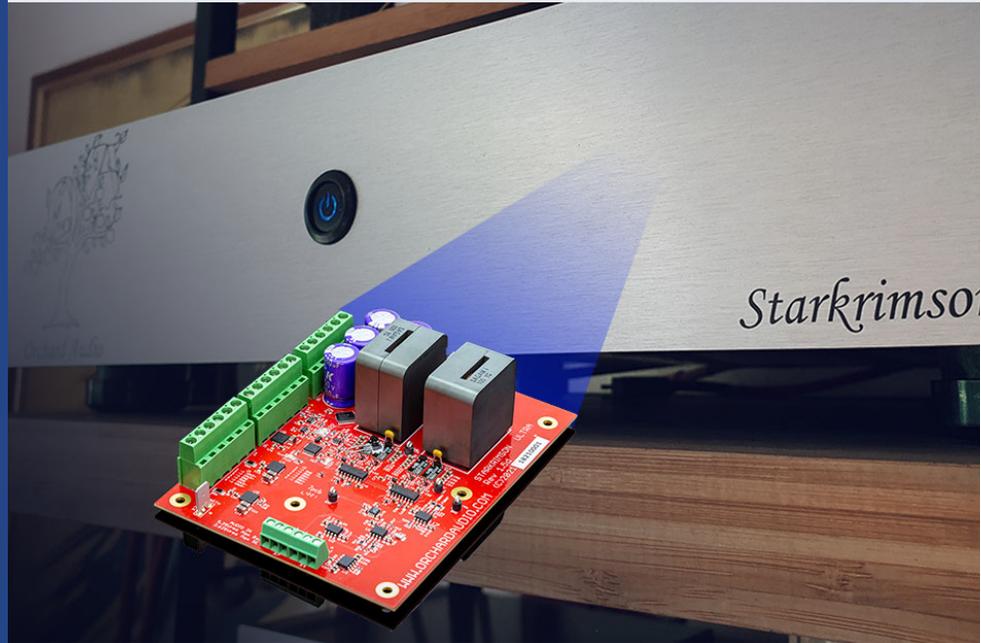


**CASE STUDY:  
ORCHARD AUDIO**

Orchard  
Audio Delivers  
“Near Perfect”  
Fidelity with  
GaN



## CUSTOMER OVERVIEW

Orchard Audio is a U.S.-based company dedicated to delivering the ultimate sonic listening experience. With a range of expertly designed, high-performance digital-to-analog converters (DACs), streamers, and amplifiers, the company is helping consumers elevate the sound in their home theaters, listening rooms, or recording studios.

Orchard Audio solutions use state-of-the-art technologies to deliver sonically accurate, unbiased sound. The company's belief that all aspects of sound can be measured drives its research and development efforts, focusing on achieving the best possible objective measurements and results.

Orchard Audio's latest design - the Starkrimson Streamer Ultra - combines a digital to analog converter (DAC), streamer, and amplifier, all inside an easy-to-use enclosure that will blend into any décor. The Starkrimson Streamer Ultra represents a new kind of high-end audio system that offers commanding performance in a discrete package. It can perform the same functions that otherwise requires a rack full of components.



# MARKET SITUATION

Home audio has changed over the past couple of years, due in part to the pandemic-driven shut-down of traditional entertainment sources, including movie theatres and live music venues. The more time people have spent at home streaming movies to enjoying virtual concerts, the more they want and demand high-quality home audio.

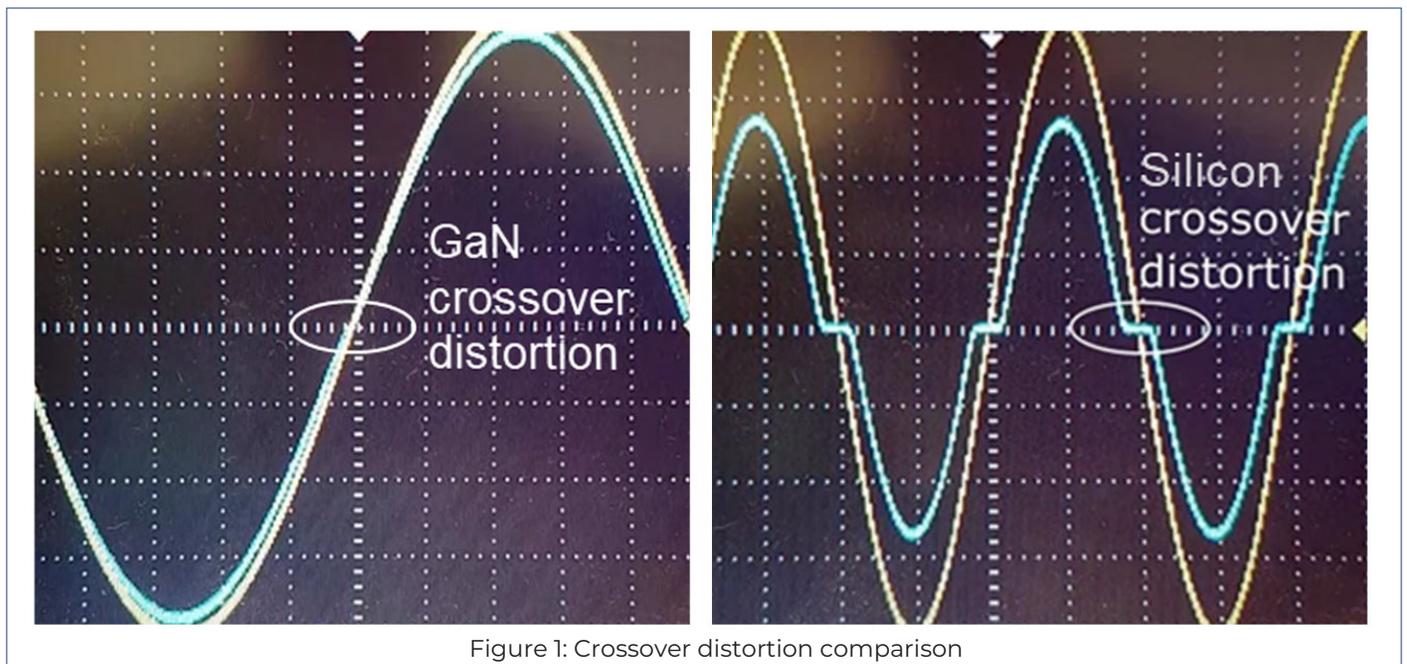
This demand for high-quality audio is fueling the growth of the Class-D audio amplifier market, which is expected to reach \$4.9B by 2026. Driven by the latest advancements in semiconductor technology, including those enabled by Gallium Nitride (GaN), Class-D amplifiers are now being used in more audio applications, including home theaters, high-power smart speakers, pro-touring amplifiers, portable speakers, automotive, marine, and power sports.

# PRODUCT CHALLENGE

A typical Class-D audio amplifier operates at high switching frequencies. However, achieving an acceptable level of total harmonic distortion + noise (THD+N) is challenging due to the need for faster and cleaner switching transitions. Class-D amplifiers based on silicon MOSFETs have to incorporate large amounts of feedback circuitry to compensate for poor open-loop performance and the subsequent noise. While this noise can be reduced with larger devices, it increases the switching losses and reduces efficiency, increasing the system size and driving up material costs.

But all this has changed with GaN.

GaN transistors provide significant sound quality benefits over traditional silicon alternatives, including less harshness, cleaner highs, better transparency, and greater audio detail. This is partly due to the technology's increased slew rate, reduced ringing, and faster overload recovery, which results in a high-quality amplifier with decreased noise, less distortion, better transient response, and higher bandwidth. In addition, GaN-based components operate at a much higher frequency, providing fast, clean switching transitions - essentially, the near-ideal square wave signal. These faster switching capabilities result in smaller "dead time," enabling much lower crossover distortion, see Figure 1, and a lower total THD measurement than silicon solutions.



# PRODUCT SOLUTION

Orchard Audio chose GaN Systems' FETs for its latest designs due to the extreme performance capability and reliability they provide for Class-D audio applications. The GaN-based solutions deliver higher-quality sound and lower system costs while offering switching performance, resulting in near ideal waveforms for lower distortion and higher audio quality than silicon alternatives. By leveraging the benefits of the GaN transistors, the Starkrimson Stereo Ultra amplifier and Starkrimson Streamer Ultra deliver less harshness, cleaner highs, and better overall transparency and detail with irrelevant noise levels.

All Starkrimson Ultra branded devices deliver up to 500WRMS (1,000WPEAK) of power and 20A of current while maintaining extremely low noise and distortion. In addition, the amplifier offers an enormous reserve of energy for extended transition. It expands linearly with the load: 125 watts into 16 ohms, 250 watts into 8 ohms, and 500 watts into 4 ohms for powerful, unrestrained music.

The filter is a significant part of all Class-D amplifiers. The high-speed switching of GaN Systems' transistors - 2 to 3X faster than traditional Class D amplifiers using silicon transistors - allows for the use of a simple LC inductor and capacitor filter, which enables the Starkrimson Stereo Ultra amplifier to have practically no phase shift from DC (0Hz) to 30kHz.

Orchard Audio's GaN-based Starkrimson Streamer Ultra represents a new kind of high-end audio system. The innovative audio solution combines the DAC, amplifiers, and streamer inside an easy-to-use enclosure (Figure 2).

A rack of components is typically required to perform the same functions as a Starkrimson Streamer Ultra. A comparable system would include an amplifier, preamplifier, DAC, and a streamer with a price tag of 2 to 3 times that of the Orchard Audio solution (Figure 3).



Figure 2: Starkrimson Streamer Ultra

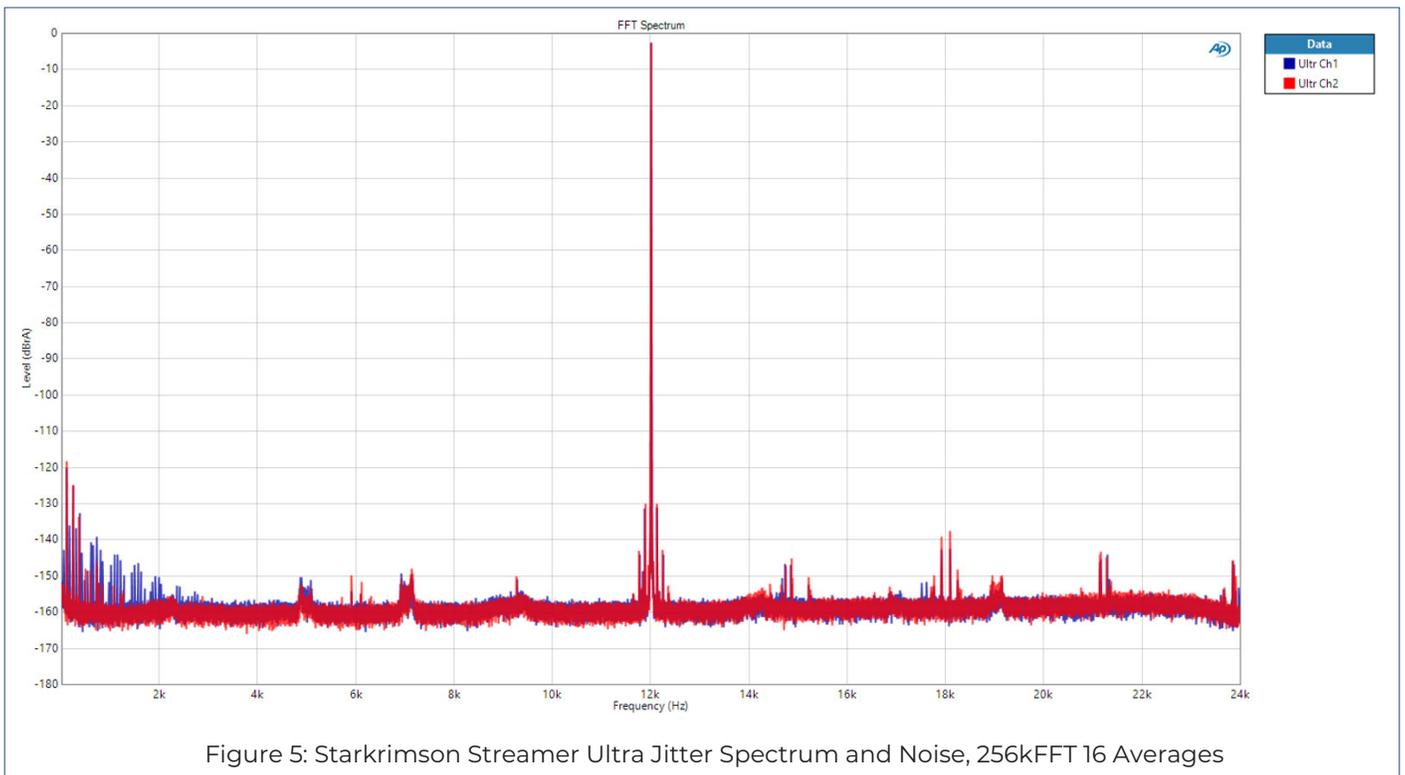
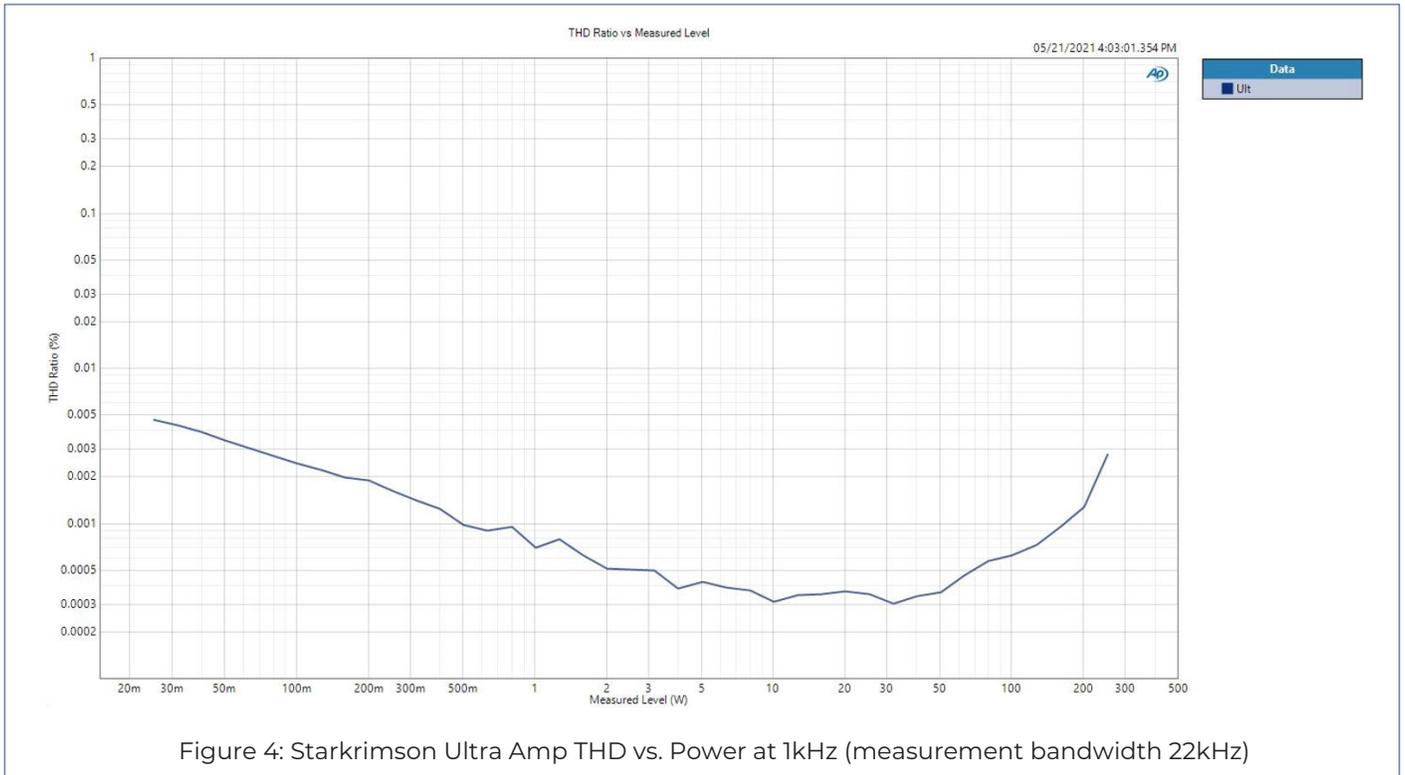


Figure 3: Comparable System

## STARKRIMSON STREAMER ULTRA **FEATURES:**

- Controlled with any smartphone/tablet/PC
- Fully balanced output
- Extremely low noise and distortion
- Completely flat frequency response
- Ultra-low jitter
- 2-ohm capable

The Starkrimson Streamer Ultra is 2-ohm capable and offers fully balanced output, extremely low noise and distortion (Figure 4), ultra-low jitter (Figure 5), and native playback up to 24Bit/192k.



## ABOUT GAN SYSTEMS



GaN Systems is the global leader in GaN power semiconductors with the largest portfolio of transistors that uniquely address the needs of today's most demanding industries including consumer electronics, data center servers, renewable energy systems, industrial motors and automotive.

As a market-leading innovator, GaN Systems makes possible the design of smaller, lower cost, more efficient power systems.

The company's award-winning products provide system design opportunities free from the limitations of yesterday's silicon. By changing the rules of transistor performance, GaN Systems is enabling power conversion companies to revolutionize their industries and transform the world.

For more information, please visit: [www.gansystems.com](http://www.gansystems.com) or on [Facebook](#), [Twitter](#) and [LinkedIn](#).

[WWW.GANSYSTEMS.COM](http://WWW.GANSYSTEMS.COM)



## MUST-HAVE: GaN TRANSISTORS

High-quality audio is now a “must-have” across all segments, from Pro-Audio to Home-Audio to Portable Audio. Class-D audio systems with GaN technology are not only smaller and lighter but provide better sound quality.

GaN Systems' power transistors are key components helping the next generation of Orchard Audio's Starkrimson products achieve higher power levels. In addition, high-efficiency GaN designs have significantly less deadtime than silicon alternatives while delivering extremely fast slew rates that enable an almost perfect square wave.

GaN-based amplifiers enable a high-performance, cost-effective Class-D audio system that doesn't require active cooling and works with no or minimal heat sinking.

## BY THE NUMBERS

# 5-10X

Better THD+N

# 20dB

Better Noise Floor (system level)

# 4-5X

Better Frequency Response

# 4X

Reduction in Power Loss