

RAW POWER, REFINED

Linea Research emerges with a range of innovative platforms.

by **Gregory A. DeTogne**

LINEA RESEARCH may just be the largest power amplifier manufacturer you've never heard of. Rather quietly, the company has developed technologies that have redefined the concepts of efficiency, quality, and performance. All the while, Linea has amassed an impressive share of prestigious OEM clients around the globe.

For much of its 15-year history, the UK-based firm has seemed to be a closely guarded secret, but those times are changing. Founded in 2003 by Davey Smalley, Paul Williams, Ben Ver and Pip Wilson (now retired), Linea came to life as a natural extension of the vision that the founders all shared while working together at Harman, creating products such as BSS Omnidrive and Soundweb systems.

Williams and Ver were natural counterparts. While Williams was a seminal force in helping to shape the progression of DSP technology in professional audio, Ver's focus was more on hardware such as clever networking circuitry, converters and power supplies. Smalley, who managed sales while at BSS, took on the same role at Linea while also bringing an inspirational talent for developing product feature ideas and refining how those features should work.

"Our 'parting gift' to BSS was when the three of us locked ourselves in a room with a whiteboard and defined what became Soundweb London," Williams recalls. "The title at the top of the



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Paul Williams, Ben Ver and Davey Smalley (left to right) having a discussion at the Linea Research production facility.

board was SW2 (Soundweb 2). This London postcode became the inspiration for the name for the product range. The technologies we were dealing with didn't really lead to Linea Research, but the relationship we had between us did."

Still, the team was quite well versed with networked DSP and its control software, as well as switch-mode power supplies and clean, high-power class D amplifiers. A significant demand for these technologies was building, and Linea stepped up to offer them all in a tightly integrated package.

The Linea vision encompassed careful development of every aspect of the products it intended to create. No development work would be outsourced. The end results would offer technologies that were leading edge in both design and function, as well as cost effective and high performing.

OPTIMUM INTEGRATION

Following a start-up period of research and development, Linea launched its first product, the X-Pod power module, which housed two high-power class D amplifiers joined by an integrated universal switch-mode power supply and networked 96 kHz DSP. Quickly adopted by OEM clients seeking amplification for self-powered loudspeakers, as well as by makers of premium monitor systems and some hi-fi companies, X-Pod proved to be a success, and developed relationships between Linea and a host of manufacturers. The module's high effi-

ciency allowed minimalist dimensions and convection cooling, while DSP configuration and monitoring was provided via the Podware app.

As Smalley stated not long after X-Pod debuted, “Our potency lies with integrating the key technologies of the future. While initially focused on high-power amplifier modules for integration within OEM loudspeakers, we’re not fixed in product strategy or routes to market. Rather, we’re combining our design experience with these modern technologies to create the building blocks from which a range of complete solutions will flow.”

To which Ver adds, “Yes, we’ve developed building blocks of technology that can be combined into products, but it’s important to note that these blocks rarely move from one product to another without significant changes. In addition to their natural evolution, we can make changes to optimize the blocks for a particular application. We can do this readily because we designed them all and thus have a deep understanding of their functions, and very importantly, their interactions.”

Linea’s strategy proved to be spot on. While every loudspeaker manufacturer at the time seemed to be placing a priority on self-powered designs, trying to do DSP and all of the supporting electronics involved was a difficult and costly proposition.

“Many thought they could do it all themselves,” Ver notes. “Others realized there was a lot more to it, and that the devil was in the details. Those in the latter camp saw the advantages of working with us. Our technology was different, and after all, you simply can’t put a conventional 1,000-watt class A/B amplifier, let alone two of them, in the back of a speaker, so it has to be class D. We then began to dispel the bad connotations associated with the sound quality of the class D amplification of the time by proving that excellent sonics were possible.”

Williams adds, “We focused on ensuring that these products were designed to perform in real-world circumstances, not just for the data sheet.”

Ver provides additional insight into exactly how that goal was achieved. “Our class D designs look deceptively conventional, and in a way they are, being based on the classical half-bridge topology. The problem is that, unlike class A/B or related designs, there’s not a great deal of scope for using large amounts of negative feedback to band-aid either component deficiencies



Linea makes all of its own test equipment for production, and this is one example.

or plain poor design. The only way to deal with problems is to not create them in the first place.

“Even though X-Pod was Linea’s first amplifier product, it was my fourth or fifth class D design, so I was well past the point of struggling to get it to work reliably,” he continues. “As a result, I was able to spend my efforts really understanding and optimizing the complex way that the various parts interact, particularly in the output stage, to achieve a result that was very clean even before feedback was applied.”

INTEGRATED WHOLE

One of the next building blocks within Linea’s worldview is the ObCom protocol. Conceived based on the belief that networking would play a large and dominating role in the future of loudspeaker systems, ObCom first revealed itself to the industry as a versatile, object-oriented messaging technology.

Ultimately moving on to become the backbone of many of the company’s product offerings, ObCom provided the power and capability for control of a single component or the power to configure and monitor hundreds of devices spread across multiple networks. In short order, it became the fabric that tied together disparate elements of a system into an integrated whole, with connectivity internally within components, between devices, and spanning entire networks.

As Linea’s self-powered loudspeaker OEM work flourished, the company began to make progress on other fronts as well. “At this point we had developed extremely high quality, powerful loudspeaker DSP,” Williams notes. “We had a lot of knowledge of A/D converters and digital electronics, and as an early partner with Audinate, we’d even developed Dante digital networking



Current components include 48M Series multichannel amplifiers and the ASC48 system controller.

interfaces for some of our OEMs. But we didn't stop and rest upon our laurels."

One of Linea's silicon vendors had created a prototype breed of power semiconductors for an unrelated industry. Inspired, Ver initiated the design of new proprietary output stage circuitry that advances efficiency.

"If the output stage is more efficient, then the product as a whole generates less heat," explains Rik Kirby of Allied Professional Technologies, the U.S. sales and distribution arm of Linea. "Our circuitry can produce as much as 20 percent less heat than other class D designs, depending on whom we're comparing ourselves to. That has a direct benefit not only in terms of how warm our rack-mount amps keep a monitor engineer's knees, but also in terms of the energy we need to invest in the first place. Less current is drawn since there's less energy being wasted, so we're able to store more useful energy and hold it in reserve, sustaining power delivery for a longer time."

Williams states that Linea took the same intensive approach when researching and developing the DSP engine and algorithms. "There's so much more to it than the number of bits or the sample rate," he details. "With my background in high-quality analog design, I understood the demands that the uniquely sensitive human ear placed on this area. Our handcrafted DSP algorithms draw every last ounce of performance from the DSP silicon, using techniques we collectively call Linea Micro Detail (LMD), details you can hear."

STEADY DEVELOPMENT

Moving beyond its traditional OEM business, Linea continued forge its singular path with a series of rack-mount products based on a range of innovations including their new output stage. Among them were the company's 44M and 48M Series amplifiers for live sound applications, a line of 4- and 8-channel amps offered in models stated as capable of providing anywhere from 400 to 5,000 watts (RMS) per channel.

A staple of the design is high-capacity power supplies intended to ensure that the full power specification can be delivered into 2 ohms. Optimized for live sound applications, the amps are outfitted with 96 kHz DSP, Ethernet for system operation and monitoring, multilayer EQ, uniquely capable limiters, and analog, AES3, and optional Dante networking.

To address the needs of permanent installations, the 44C and 88C Series components include tamper-proof front panels and contractor-friendly connectors in 4- and 8-channel models also stated as capable of the same per-channel wattage as the M Series. The information provided on Linea data sheets underscores the fact that its power ratings are not given in "transient," "burst," or "peak" figures, but rather state output delivered by all channels simultaneously, even when driven with diverse and complex program material.

For applications requiring digital processing, the company offers the single rack-space ASC48 system controller, while



A screenshot of the System Engineer app for setting up, controlling, and monitoring all Linea products.

Podware has given way to System Engineer, a proprietary app optimized for setting up, controlling, and monitoring all Linea products, as well as those of OEM partners.

"Development never stops, though," Williams adds. "We've just unveiled new FIR (Finite Impulse Response) capabilities for both the M and C Series, plus the ASC48 that allows users to import proprietary FIR settings supplied by their loudspeaker manufacturers."

COMPLETELY COMMITTED

To date, Linea has supplied tens of thousands of products to its OEM partners around the world. With this number on an increasing upward trajectory due in part to the addition of adding its own branded products to the mix, the company stands poised to come out of the shadows in this, its 15th year.

"We're independent by nature," Smalley notes, "and privately owned. That makes a huge difference in the way we can run our business. We're not beholden to anyone, and you won't find us scrambling around at the end of the month chasing sales just to give the profits away in a management fee to a holding company, venture capital firm or anything like that.

"Our owners and directors are involved in daily operations, and we all have a live sound background, which is a very immediate business and makes us used to being in rapid response mode. Choose Linea, and you get the actual people who design and use the products that we sell, and more importantly, people who know pro audio inside-out and are truly committed to both high quality and performance."

Ver concludes, "I left a senior position at Harman Pro to help found Linea because I have passions for audio and the technology behind great sound. Being able to indulge these passions is a blessing and is why I'll probably never stop trying to make things better or investigate new ways of doing things. One thing's for sure: I'm not finished yet." **LSI**

Gregory A. DeTogne is a writer and editor who has served the pro audio industry for the past 35 years.

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