SPEED OF THE ESSENCE: HOW ANALOG DEVICES HELPED DAMSON GLOBAL GET TO MARKET QUICKLY WITH A PIONEERING NEW WIRELESS SURROUND SOUND SYSTEM

Damson Global

In 2017 Damson Global, a challenger brand in the highly competitive home audio equipment market, saw the ideal opportunity to take market share from more established home cinema product manufacturers with the introduction of a new speaker system based on the latest Dolby® Atmos™ surround sound technology. Damson Global's product concept was for a modular surround sound system that implemented Dolby Atmos wirelessly, an idea that combines the promise of a breathtakingly immersive audio experience with the convenience and easy setup of a wirefree multispeaker system.

Designing a system that brings to life the full 3D audio capabilities of Dolby Atmos is hard enough. Doing this in a wireless architecture raised the technical complexity to an even higher level.

To help Damson Global through the process of implementing Dolby Atmos in its new S-Series product, the company chose to partner with Analog Devices. This is the story of the S-Series development project, and the successful collaboration between the audio processing experts at Analog Devices and the world-class audio system designers at Damson Global (see Figure 1).

Figure 1. The compact, wireless S-Series from Damson Global runs the Dolby Atmos 3D audio codec.

3D Audio: The New Frontier in Home Cinema

York, UK-based Damson Global is positioned at the premium end of the mainstream hi-fi and home cinema market. Its products appeal to consumers who appreciate superior audio quality, and who will not accept the sound quality of the speakers embedded in flat-panel TVs. Damson Global offers high audio quality, but its premium pricing is more affordable than that of the esoteric audiophile products aimed at buyers for whom money is no object.

The Dolby Atmos technology is highly attractive to this premium market. While previous generations of surround sound technology, such as 5.1 systems and Dolby Audio™, provided an attractive 2D surround soundscape, Dolby Atmos technology adds a third dimension, filling the space above as well as around the viewer with a perfectly synchronized soundtrack. Now, in a war movie's battle scenes, bullets sound as though they are not only whizzing past viewers' ears, but over their heads as well. The experience is more immersive and exciting than any home cinema technology has achieved before.

The Design Challenge that Damson Global Set Itself

Damson Global's idea was to implement Dolby Atmos in a modular wirefree surround sound setup. With the S-Series, the user can add between two and 14 rear speakers to the front soundbar and subwoofer.

Such a design presented two main technical challenges to Damson Global: first, to implement the hugely complex Dolby Atmos codec, which operates from a code base consisting of millions of lines of code. For Damson Global, development time was a critical parameter: it was keen to enjoy the advantage of entering the market early with a wireless Dolby Atmos product before direct competitors in the premium market.

Second, the system had to meet an absolute maximum latency value of 35 ms for the interval between the transmission of the audio signal from the source, such as a set-top box or Blu-ray player, and playback at each speaker. Above a 35 ms interval, the timing mismatch between the video and audio signals is noticeable to the viewer.

To meet this overall latency budget, Damson Global had to minimize all delay sources throughout the system. This was a prime consideration in its choice of key components, particularly the processor that executes the complex Dolby Atmos codec.

Both this consideration and the need for a fast time to market led Damson Global to its decision to partner with Analog Devices, which provides audio solutions to customers across many electronics market sectors, not only
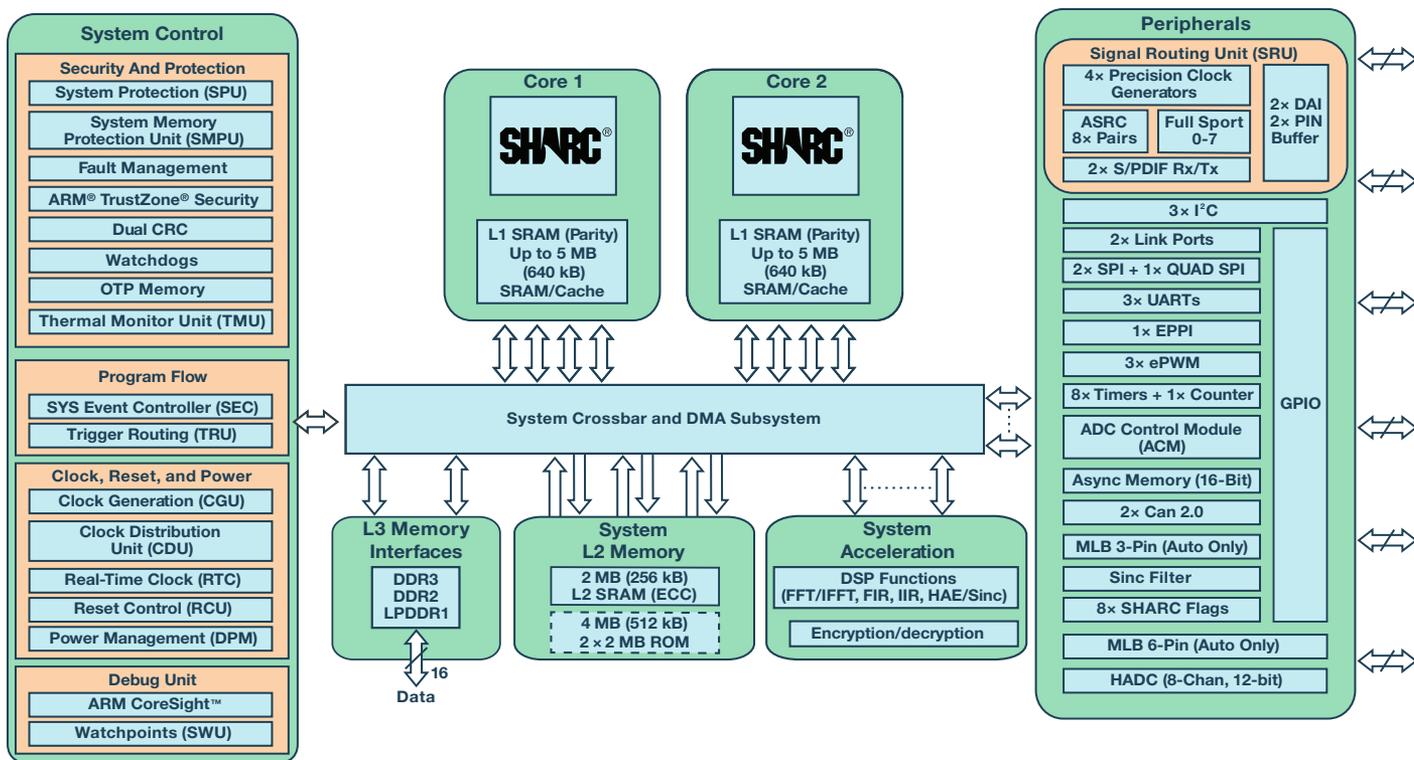
Figure 2. A block diagram of the dual SHARC core ADSP-21584 digital signal processor from Analog Devices.

in consumer electronics but also in automotive, professional audio, the industrial sector, and military and aerospace.

Analog Devices provides a comprehensive offering of components, middleware, software, reference designs, tools, and expertise to help customers implement both professional and consumer audio designs. In Damson Global's case, a crucial benefit of the relationship with Analog Devices was the existence of a demonstration design for a Dolby Atmos system running on its ADSP-21584, a dual-core SHARC+ digital signal processor. This Dolby Atmos implementation is backed by a world-class team of Analog Devices' audio signal processing experts who are available to support customers in the implementation of the technology.

Design engineers using SHARC® core-based DSPs also benefit from accelerated development cycles because of the availability of comprehensive and intuitive tool suites dedicated to the SHARC series of DSPs. These tools include:

▶ The SigmaStudio™ graphical development tool, which provides programming, development, and tuning software for Analog Devices' DSP audio processors.

▶ The CrossCore® Embedded Studio™ integrated development environment (IDE) for Analog Devices' SHARC processor families.

These software tools helped Damson Global's engineers to configure the operation of the ADSP-21584 to meet the requirements of the S-Series

product. But Dolby Atmos is an all-new codec that is more complex than any previous surround sound technology, including previous Dolby products such as Dolby Audio or Dolby Digital Plus. So while Damson Global's engineers are themselves experts in the design of audio electronics products, the backing of the Analog Devices audio processing engineers provided a crucial advantage, helping Damson Global shave weeks off the normal development time for such a complex technology.

James Talbot, CEO of Damson Global, says: "The support provided to us by the Analog Devices engineers was excellent. Until you start working with a brand new codec such as Dolby Atmos, you do not realize how many new aspects there are to the development beyond what you have been used to with earlier technologies such as 5.1 surround sound or Dolby Audio. The support provided by Analog Devices in getting Dolby Atmos running on our ADSP-21584 enabled us to focus our effort on system-level functions such as audio balancing and synchronization."

Two-Chip System Architecture

The S-Series development was performed by two Damson Global teams in parallel, reflecting the architecture of the S-Series product. The base control unit's design has a partition between the wireless communications function, implemented on a radio system on a chip (SoC), and the audio processing functions, executing the Dolby Atmos codec on the Analog Devices ADSP-21584 (see Figure 2). This meant that one of Damson Global's development teams could focus on the design of the high frequency radio system. This system had to offer an extremely high data-transfer rate in order to carry the Dolby Atmos audio signal to each speaker at very low latency.

"WE RAN TESTS SIMULATING THE KIND OF LOAD THAT THE DSP WOULD HAVE TO PROCESS WHEN RUNNING THE DOLBY ATMOS CODEC, AND THE ADSP-21584 WAS THE FASTEST."

James Talbot, Founder and CEO of Damson Audio

The other development team simultaneously implemented Dolby Atmos on the ADSP-21584, supported by the audio processing experts at Analog Devices. As for the radio system, speed and latency were important parameters for the audio processing system. According to James Talbot, "The ADSP-21584 came out top in our evaluations of suitable DSPs for the S-Series base unit. We ran tests simulating the kind of load that the DSP would have to process when running the Dolby Atmos codec, and the ADSP-21584 was the fastest. This was a really important reason for our choice of the part: every millisecond of delay counts when you are trying to hit a 35 ms latency budget, and the superior performance of the ADSP-21584 gave us some extra headroom, which we knew we might need elsewhere in the system."

Development Success in Record Time

In collaboration with Analog Devices audio processing experts, Damson Global's engineers completed a highly successful development project, bringing the S-Series to market at the start of 2018 to overwhelmingly positive reviews from hi-fi critics and from users.

Thanks in part to the high performance of the ADSP-21584, the latency goal was met by a wide margin: latency in the S-Series is below 20 ms, while the audio experience brings the promise of 3D audio to a fully immersive reality. In the words of user Rob Goult, "Normal TV is … taken to the next level with this system. Normal 5.1/7.1 soundtracks sound absolutely amazing. In fact, I have been repeat watching some older films and it's like hearing them anew."

High praise from the reviewers who matter most—the S-Series' customers. What is more, Damson Global achieved its goal of bringing this premium surround sound product to market before any other wireless Dolby Atmos-based product was available, and providing Damson Global with a unique sales proposition that is now powering it to success in a competitive market.

Please find out more about Analog Devices digital imaging, home theater, ProAV, and portable solutions at *analog.com/consumer*.

About Damson Audio

James Talbot, founder and CEO of Damson Audio, is a self-starting entrepreneur with a solid track record of organizing and overseeing business development of teams from start-up to much more advanced structures.

A passionate audiophile, James was frustrated by the lack of a high quality yet truly portable speaker in the market. Inspired to change this, James took up the task of creating this ideal speaker for himself, founding Damson Audio in 2011. Damson Audio prides itself in pushing the boundaries and exploring new ways to create audio products that seamlessly blend convenience, stunning design, and rich sound quality.

Today, Damson Audio is shaking up the home theater, active noise cancelling headphones, and sports headphone markets and developing other innovative products that help solve the everyday problems we face in our lives.

About Analog Devices

Analog Devices designs and manufactures semiconductor products and solutions. We enable our customers to interpret the world around us by intelligently bridging the physical and digital with unmatched technologies that sense, measure, and connect. Visit *analog.com*.

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