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WIRELESS AUDIO: MUSICAL INSTRUMENTS

Wireless guitar system streams uncompressed audio using pair of nRF24Z1s

The WaveAngle Radian™ Gold Series wireless guitar system streams uncompressed audio from an electric guitar to an amplifier to free performers from traditional trailing wires when on stage. This is achieved without loss of audio quality or reliability compared to a traditional wired link and at a pricing level that makes the solution accessible to amateur and professional performers

Oslo, Norway – JUNE 01, 2009 – Ultra low power (ULP) 2.4GHz RF specialist, Nordic Semiconductor, today announces that WaveAngle has specified a pair of its nRF24Z1 transceivers to provide the wireless audio link at both ends of its US$299 Radian™ Gold Series wireless electric guitar system.

Targeted at amateur and professional electric and bass guitarists performing live on stage at small venues, clubs and houses of worship, the Radian Gold Series operates using a small form factor attachment for wireless guitar audio that plugs directly into the output jack of any electric guitar and then transmits audio wirelessly back to a partner attachment plugged into the input jack on any guitar amp. This completely eliminates the underfoot clutter of trailing cables common to on-stage guitarists, and makes it simpler for multiple acts to get on and off stage quickly.

“Wireless guitar audio is nothing new, but it has yet to take off in a big way in the mid-range market,” says Sean Michaud, president of WaveAngle. “Low end analog solutions based on analog UHF and VHF radio have existed since the late 1970s, but there has not until now been a mid-range, digital audio solution priced at an affordable level that does not noticeably sacrifice audio quality and reliability (i.e. immunity to dropouts and fuzz-outs) for wireless convenience. This has hindered widescale adoption of wireless by guitarists.”

While other mid-range wireless guitar products do exist, Michaud says these invariably employ some form of compression which degrades sound quality compared to a wired link. In comparison, the Nordic nRF24Z1 2.4GHz transceiver is capable of streaming crystal clear uncompressed stereo audio at up to 4Mbit/s with native ‘CD-quality’ 16-bit, 48 kHz resolution.

“Using the Nordic nRF24Z1 and one of Nordic’s standard wireless audio application notes, we were able to develop a product that delivers completely uncompressed audio with enough bandwidth headroom to allow us to engineer out latency to an imperceptible level to the human ear,” continues Michaud. “All digital audio wireless solutions are susceptible to latency issues – particularly standards-bases solutions that have to be able to operate with the ‘rest of the world’ – but the Nordic nRF24Z1 is designed specifically for digital audio and as such supports a degree and precision of latency tuning that simply does not exist on generic [i.e. non-audio specialized] chips.”

In addition, the nRF24Z1 is designed ‘out-of-the-box’ to cope with other 2.4GHz interferers [such as *Bluetooth*® wireless technology and Wi-Fi®] that may be operating in the vicinity. It does this via a proprietary frequency agility protocol that automatically looks for an adjacent clear channel to swap to before interference becomes so severe that too many packets are being lost for audio quality to remain unaffected.

“The nRF24Z1 also pairs automatically which means the end user doesn’t have to worry about choosing channels, making the product quite literally plug and play,” adds Michaud. “And up to 10 Radian Gold Series attachments can be used alongside each other in the same room. All of these achievements are directly attributable to the Nordic nRF24Z1, and help to distinguish the WaveAngle products from those of competitors.” (See ‘About the nRF24Z1’ below.)

As a result, Michaud claims the Radian Gold Series achieves a sound quality and connection solidity as good as wired. This includes a class-leading battery life (20 hours continuous usage from a single AAA cell) and form factor (competing digital guitar systems are much bulkier), excellent range (up to 30m), and the ability to succeed in a direct audio quality (wireless to wired) comparison.

“We did actually start our product development using a generic 2.4GHz transceiver from a Nordic competitor,” admits Michaud. “But when we evaluated the nRF24Z1 we concluded it was worth going back and doing a redesign because of the integrated protocol and other features that would save us an awful lot of work on the software debug and validation side later on.”

“The Nordic nRF24Z1 is helping to make high quality wireless audio products that can genuinely serve as cable replacement technologies affordable and viable,” concludes Geir Langeland, Director of Sales & Marketing at Nordic Semiconductor. “The Radian Gold Series is a truly excellent application example in the musical instrument segment.”

About WaveAngle Inc. (www.waveangle.com)
Based in Austin, Texas, US WaveAngle Inc. manufactures high performance wireless audio solutions for professional sound reinforcement in musical instruments and systems. It’s specialist focus is musical applications that haven’t been made wireless before or where early wireless attempts have proved somewhat unsatisfactory with end users.

About the nRF24Z1™
The nRF24Z1™ is a unique single chip solution for wireless streaming of crystal clear CD-quality stereo audio up to16-bit, 48 kHz without using compression. The nRF24Z1 also features input support of up to 24-bit, 96 kHz.

Operating in the global 2.4 GHz band the nRF24Z1 offers unrivalled performance and integration coupled with an ultra-low solution cost. The nRF24Z1 uses Nordic Semiconductor’s 4 Mbit/s MegaZtream™ platform embedding a state of the art Quality of Service (QoS) subsystem with an ultra low power robust 4 Mbit/s wireless 2.4 GHz transceiver and all appropriate digital audio interfaces creating a complete digital wireless audio streamer solution in a 6 by 6 mm package. In addition to streaming audio up to 4 Mbit/s, the nRF24Z1 also boasts a digital control information channel for transfer of control information such as volume, balance and display details.

Using industry standard I2S and S/PDIF interfaces for audio, the nRF24Z1 can interface without glue logic to virtually any digital audio source, or external industry standard low cost analogue-to-digital and digital-to-analogue converters for analogue audio input and output. Control information uses SPI or 2-wire (I2C compatible).

The nRF24Z1 features a well-balanced design where attention is paid to every detail of the audio interface and the challenging tasks of streaming CD-quality audio with no glitches and degradation in performance in the presence of other 2.4 GHz sources such as Bluetooth. The circuit has embedded voltage regulators, giving maximum noise immunity and operation from a single 2.0 to 3.6 V supply.

About Nordic Semiconductor ASA
Nordic Semiconductor is a fabless semiconductor company specializing in ultra-low power (ULP) short-range wireless communication. Nordic is a public company listed on the Norwegian stock exchange.

Nordic provides RF silicon solutions including:

- Highly integrated RF silicon
- Sophisticated and flexible development tools
- Application specific communication software
- Complete reference designs

The company's innovative range of wireless solutions includes:

- The nRF24LE1™ single-chip, ultra-low cost and power, fully integrated 2.4GHz transceiver with radio, microprocessor, flash memory and MultiCeiver™ technology supporting up to six simultaneous wireless devices;
- The nRF24L01+™ ultra-low cost and power 2.4GHz transceiver with MultiCeiver technology supporting up to six simultaneous wireless devices;
- The nRF24LU1+™ single chip 2.4GHz transceiver with full-speed USB, microcontroller and flash memory enabling ultra-compact USB dongles for wireless peripherals;
- The nRF24AP1™ ultra-low power 2.4GHz transceiver for wireless communication with Dynastream Innovation's production-proven low-power network protocol, ANT™;
- The nRF24E1™ and nRF24E2™ low cost transceivers paired with an industry standard 8051 MCU core, and leading peripherals to create the world's first complete low cost SoCs for global 2.4GHz operation;
- The nRF24Z1™ single-chip system for CD quality audio streaming of up to 16-bit, 48-kHz audio;
- The nRF905™ single-chip multiband radio transceiver for the 433, 868 or 915MHz ISM band;
- The nRF9E5™ low-cost, single-chip system with fully integrated RF transceiver for the 433, 868 or 915MHz ISM band.

Nordic Semiconductor's nRF24xx range of 2.4GHz transceiver and transmitter devices are aimed at applications such as PC peripherals such as wireless keyboards/mice, game controllers, intelligent sports equipment and wireless audio (for example, mp3 and portable CD player headphones and PC speakers). The latest nRF24L01 family, for instance, is

targeted at ultra-low cost and power applications such as wireless desktops and intelligent (for example, wristwatch-based) sports equipment.

Nordic is an associate member of the Bluetooth SIG and has contributed core expertise in ultra-low power RF design to the forthcoming specification for *Bluetooth* low energy wireless technology (formerly ultra low power *Bluetooth*). *Bluetooth* low energy wireless technology is a short range RF communication technology featuring ultra-low power consumption, a lightweight protocol stack and simple integration with *Bluetooth*® wireless technology chips. *Bluetooth* low energy wireless technology ushers in the next generation of RF communications by opening up many new opportunities for wireless data links between suitably equipped mobile phones or personal computers (PCs) and coin cell battery-powered devices such as sports and health sensors.

Nordic's products are all manufactured in ultra modern semiconductor process technologies through strong relationships with world-best manufacturing facilities. Sales are primarily made through a carefully selected worldwide distribution network. The company has offices in Trondheim and Oslo, Norway, the US (west coast), Hong Kong, Korea and Japan, and is listed on the Norwegian Stock Exchange (OSX: NOD). All operations are managed according to the ISO 9001:2000-approved quality assurance system.

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