

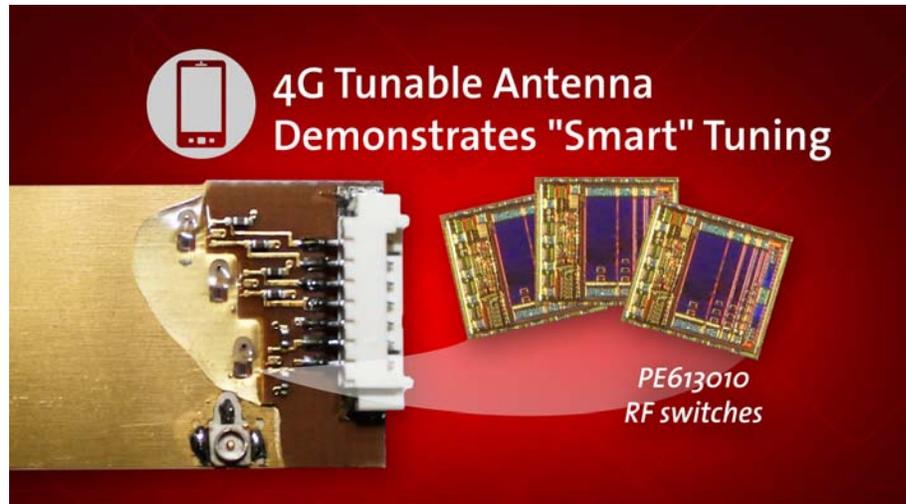
NEWS RELEASE



Peregrine Semiconductor's RF Switches Enable "Smart" Tuning in Monarch Antenna's New Prototype—a 4G Tunable Antenna

Monarch Antenna Inc. Selects Peregrine's PE613010 Switch to Showcase the Capabilities of Self-Structuring Antenna Technology in Mobile Handsets

SAN DIEGO – June 27, 2017 – Peregrine Semiconductor Corp., founder of RF SOI (silicon on insulator) and pioneer of advanced RF solutions, announces that [Monarch Antenna Inc.](#) is using [UltraCMOS® PE613010](#) tuning-control switches in Monarch's latest prototype—a compact 4G tunable antenna. Monarch Antenna—a spinout of Delphi Automotive Systems, LLC—selected the PE613010 switch to showcase the "smart" switching capabilities of self-structuring antenna (SSA) technology in mobile handsets. Patented SSA technology is the culmination of 15 years of R&D, and initial prototypes show superior performance compared to existing antenna solutions. Monarch's 4G tunable antenna delivers a high signal-to-noise ratio (SNR), which translates into end-user benefits of better connectivity, faster downloads and longer battery life.



Peregrine Semiconductor's PE613010 RF switches enable "smart" tuning in Monarch Antenna's 4G tunable antenna. Pictured is the ground-plane side of the antenna board; the PE613010 RF switches are wire bonded to the board.

"To fully demonstrate the advanced tuning capabilities of SSA technology, our team needed to find a SPST switch with low on-state resistance," says Tayfun Ozdemir, Ph.D., co-founder and chief technology officer of Monarch Antenna. "Our engineers had a long list of desired technical specifications, and Peregrine's PE613010 was the only switch on the market that could meet

our performance demands. Thanks to Peregrine's RF switches, Monarch's 4G tunable antenna demonstrates a clear advantage in antenna tunability and efficiency."

For their 4G tunable antenna, Monarch selected a bare-die version of Peregrine's PE613010 switch to minimize parasitic effects and to enable reliable and efficient tuning across the 700-800 MHz frequency range. Inside a mobile handset, the antenna is controlled by a baseband processor, which tunes to a particular channel or searches through tuning states to recover from detuning. In Monarch's antenna, three Peregrine switches provide eight ($2^3=8$) tuning states, and each state provides communication over a channel 15 MHz wide. The narrow-band nature of Monarch's tunable antenna also makes it more efficient than a passive-antenna counterpart covering the entire 700-800 MHz band. In addition, the low on-state resistance (R_{ON}) of Peregrine's UltraCMOS switches leads to high radiation efficiency of the antenna.

"In talking with Monarch, it quickly became evident that Peregrine's PE613010 switch would be an ideal fit for their 4G tunable antenna design," says Colin Hunt, vice president of worldwide sales at Peregrine Semiconductor. "Peregrine manufactures phenomenal switches, and it is always exciting to see our switches designed into advanced systems—like Monarch's SSA system—that are clearly on the forefront of innovation."

SSA is a disruptive antenna technology enabling 3G and 4G devices to deliver richer content over a multitude of protocols and to offer higher mobility. SSA continuously monitors the RF signal and adjusts its configuration to increase signal strength and maximize the SNR. This adjustment is accomplished through continuous "smart" switching/selection of a "set" of antenna combinations through its feedback loop. SSA not only simplifies the antenna design process, but it also counteracts some of the compromises, which had to be introduced due to packaging.

A demo board of Monarch's 4G tunable antenna is available upon request. Please contact Monarch by email at info@monarchantenna.com or by phone at (734) 213-4944.

For more information on the PE613010 tuning-control switch, please visit the [product page](#) on Peregrine's website or contact Peregrine's [global sales team](#).

ABOUT MONARCH ANTENNA, INC.

Monarch Antenna is owned by Delphi Automotive Systems, LLC., Michigan State University and Automation Alley. Monarch's mission is to develop and apply its patented Self-Structuring Antenna (SSA) technology to create leading edge product solutions for wireless applications. SSA responds to changes in the RF signal environment by dynamically reconfiguring its electrical shape to maximize the Signal-To-Noise-Ratio (SNR). The technology is the product of R&D efforts by Delphi Automotive Systems, LLC and Michigan State University and is an important enabler for adoption in machine-to-machine communication for consumer electronics and military markets. SSA is a disruptive antenna technology enabling 3G and 4G devices to deliver richer content over a multitude of protocols and to offer higher mobility. Monarch's first-generation embedded tunable antenna was developed in April 2013 and operates in the global roaming band of 2.3-2.7GHz. Monarch's recently launched 4G tunable antenna operates in the 700-800MHz band. Both antennas are unique in their tunability range and efficiency, and Monarch is in talks with stakeholders to commercialize these tunable antennas. For more information, contact John Carney at 248-561-4795 or john.carney@monarchantenna.com.

ABOUT PEREGRINE SEMICONDUCTOR

Peregrine Semiconductor Corporation, a Murata company, is the founder of RF silicon on insulator (SOI) and is a leading fabless provider of high-performance, integrated RF solutions.

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Since 1988 Peregrine and its founding team have been perfecting UltraCMOS® technology—a patented, advanced form of SOI—to deliver the performance edge needed to solve the RF market's biggest challenges, such as linearity. By delivering best-in-class performance and monolithic integration, Peregrine's product portfolio is the trusted choice for market leaders in automotive, broadband, industrial, Internet of Things, mobile devices, smartphones, space, test-and-measurement equipment and wireless infrastructure. A Murata company since December 2014, Peregrine holds more than 400 issued and pending patents and has shipped over 3.5 billion UltraCMOS units. For more information, visit www.psemi.com.

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Editorial Contact:

Elizabeth Brown
Peregrine Semiconductor
Phone: 619.993.4648
pr@psemi.com