

SWITCHES

Enhanced UltraCMOS Yields GSM/WCDMA Switches

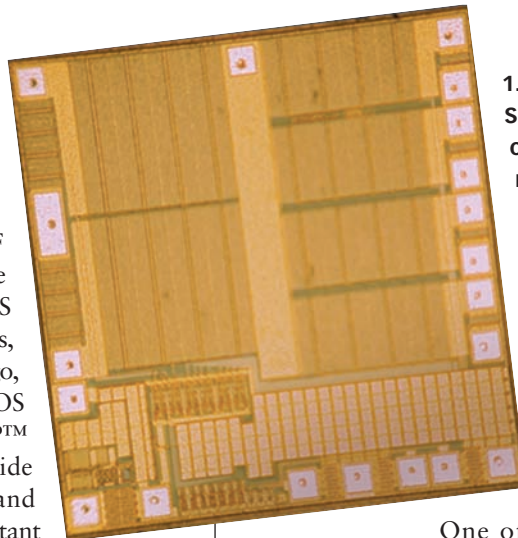
The latest generation of the advanced mixed-signal UltraCMOS™ semiconductor process provides improvements in linearity and harmonics for multiple cellular standards.

JACK BROWNE
Technical Director

CMOS process technology was once thought unsuitable for RF applications. But some companies are pushing CMOS well past those early expectations, including Peregrine Semiconductor (San Diego, CA). The latest version of their UltraCMOS process benefits from the company's HaRP™ technology enhancements, which provide dramatic improvements in harmonic and linearity performance—particularly important for wireless applications. The company has fabricated several single-pole, multithrow switches for quad-band GSM and GSM/WCDMA handset applications, including the model PE42660 single-pole, six-throw (SP6T) switch, and the PE42671 and PE42672 single-pole, seven-throw (SP7T) switches, all capable of operating from 100 to 3000 MHz and designed for a +2.75-VDC supply.

The model PE42660 SP6T switch (**Fig. 1**) offers an input third-order intercept point (IP3) of +70 dBm, second-harmonic performance of -86 dBc, and third-harmonic performance of -83 dBc. The model PE42671 and PE42672 SP7T switches (**Fig. 2**) achieve input IP3 of +68 dBm with second-harmonic performance of -88/-85 dBc (respectively) for +35-dBm output power and third-harmonic performance of -80/-78 dBc (respectively) for +35-dBm output power. The PE42671 boasts impressive third-order intermodulation distortion of -111 dBm at 2.14 GHz.

These linearity and harmonic levels fit well with the requirements of the 3G Partnership Program (3GPP) standards for GSM/WCDMA, making these switches



1. The PE42660 100-to-3000-MHz SP6T UltraCMOS switch features outstanding linearity and harmonic suppression for quad-band GSM/PCS/EDGE/WCDMA handsets.

among the most linear monolithic switches ever offered for commercial sale and the only monolithic devices on the market to meet 3GPP intermodulation-distortion (IMD3) specifications.

One of the advantages of having a CMOS process with such outstanding RF performance is the capability of also integrating logic and digital functions on the same chip. The PE42671 and PE42672 SP7T switches include on-chip decode logic to facilitate both 1.8- and 2.75-V three-pin CMOS control inputs.

The PE42660 has two high-power transmit ports and four lower-power receive ports. Isolation between transmit and receive ports is typically 48 dB at 900 MHz and 40 dB at 1900 MHz. The isolation between the two transmit ports is typically 29 dB at 900 MHz and 25 dB at 1900 MHz. The PE42671 has two transmit, three receive, and two transmit/receive ports, while the PE42672 has three transmit and four receive ports. The transmit ports can be used for GSM/PCS/EDGE and the transmit/receive ports can be used for WCDMA or as receive ports. The three symmetric receive ports provide additional flexibility.

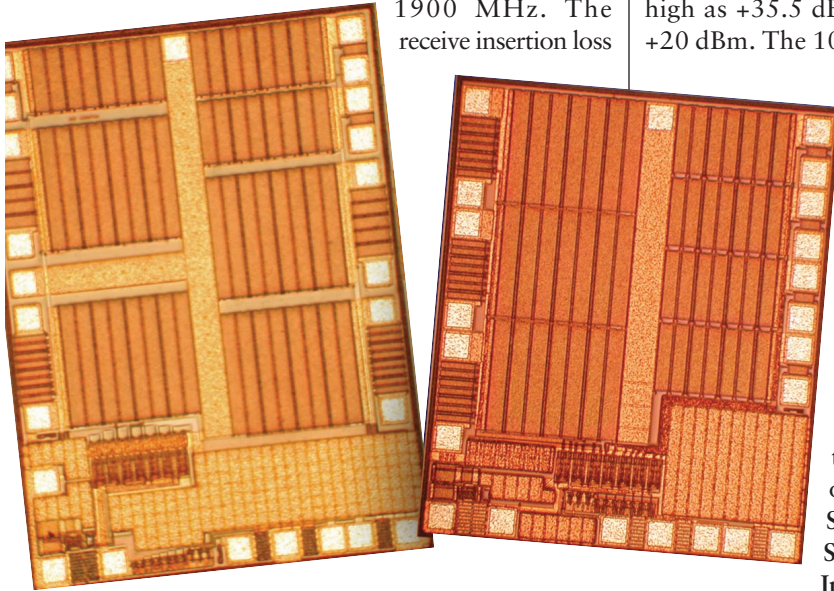
The SP7T models PE42671 and PE42672 exhibit transmit-receive isolation of 47/44 dB at 900 MHz and 40/38 dB at 1900 MHz, respectively. Insertion loss for the PE42672 matches the SP6T model at 0.55 dB, and the PE42671 insertion loss is only slightly higher with

0.65 dB at 900 MHz and 0.8 dB at 1900 MHz.

All three devices boast low transmit insertion loss typically as low as 0.55 dB at 900 MHz and 0.65 dB at 1900 MHz. The receive insertion loss

is typically as low as 0.9 dB at 900 MHz and 1 dB at 1900 MHz. The switches feature a 1-dB compression point of +41 dBm and are designed for transmit power levels as high as +35.5 dBm and receive power levels as high as +20 dBm. The 10-to-90-percent switching speed is 2 μ s.

All three 50- Ω multithrow switches are built to withstand the rigors of the manufacturing floor, with electrostatic-discharge (ESD) tolerance of 1500 V on all ports. They do not require blocking capacitors, and on-chip surface-acoustic-wave (SAW) filter over-voltage protection devices simplify higher-level integration in cellular handsets. As the company puts it, the UltraCMOS yields devices with performance superior to GaAs but with the economy and integration capabilities of conventional CMOS. Peregrine Semiconductor, 9450 Carroll Park Dr., San Diego, CA 92121; (858) 731-9400, Internet: www.psemi.com.



2. The PE42671 and PE42672 SP7T switches provide exceptional third-order intermodulation distortion of -111 dBm from 100 to 3000 MHz.

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