WIRELESS: China ICs, tester raise prospects for TD-SCDMA

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Shanghai, China -- Although the future of China's domestic 3G standard is still uncertain, a few more roadblocks have been cast aside with the pending release of a Chinese single-chip transceiver IC and the introduction of a TD-SCDMA field tester.

Shanghai-based Comlent Technology Inc. will release two chips this week--an RF transceiver (CL4020) and an analog baseband (CL4520). This means that two local companies--the other being Rising Microelectronics Co. Ltd.--will have TD-SCDMA transceiver technology available, something the government considers an important factor when determining the issuance of third-generation licenses.

One of the main holdups in commercializing 3G in China is the readiness of time-division synchronous code-division multiple access (TD-SCDMA), long considered the underdog standard because of the relatively small amount of R&D funds invested in it. Silicon is slowly coming into the market, but network testing has been slow.

Late last month, an important step forward was made on that front when Tektronix Inc. said it would add TD-SCDMA as an option to its NetTek Wireless RF Field Tester. Tektronix believes it is the first company to offer TD-SCDMA RF field test and measurement in a handheld form, which should make it easier for companies to diagnose Node B transmitter problems.

Government-controlled operators have been testing the TD-SCDMA standard for at least three years. The third, and latest, round of testing is due to wrap up in December. One of the key problems remains reliable connections between terminals and the networks, especially at data rates above 128 kbits/second. The lack of a strong test environment has hindered a quick solution to those problems.

A number of chip companies have rolled out silicon for the TD-SCDMA market, but the Chinese government is eager to see local companies benefit from its local standard. So even though companies like ADI and Maxim have TD-SCDMA transceivers ready, that part of the IC design chain was still considered a bottleneck by Chinese officials.

Until now, TD-SCDMA transceivers have been based on BiCMOS technology, making it easier to integrate the power amplifier. Most have also been single-band implementations. Comlent's release will differentiate itself by being based on RF CMOS technology and by being a dual-band solution--1880 to 1920 MHz and 2010 to 2025 MHz. China's Rising Microelectronics Co. Ltd. also has a dual-band solution, but it is based on SiGe.

Comlent used BiCMOS technology in its first chips for the Personal Handyphone System market, a digital cordless telephone system first developed in Japan. The company

started down that path for the TD-SCDMA platform, but decided to switch over to RF CMOS. (It has also used RF CMOS for a 2.4-GHz cordless-phone transceiver.) The transition begs the question of whether it will look to build up a baseband team and pursue further integration, but the company is not fully tipping its hand on that yet.

"For simple products, such as our FM radio receiver, we are able to do the backend digital part and are already developing the SoC [system-on-chip] in-house," said Chen Kai, Comlent's CEO. "For the more complicated basebands, such as with W-CDMA or TD-SCDMA, we are working closely with partners. So it is a hybrid approach."

However, it is already clear that competitors are aggressively moving to reduce the chip counts in reference designs to drive down the costs of TD-SCDMA, which will start out with a disadvantage because of its lower economy of scale. Comlent will probably need to move beyond alliances on the digital side to remain competitive.

The Comlent transceiver is based on 0.18-micron technology. It uses a direct-conversion architecture that integrates the voltage-controlled oscillator, fractional-N phase-locked loop, a receive channel select filter and a transmit driver amplifier into a single chip, according to Li Zhenbiao, vice president of engineering at Comlent. The power amplifier is external.

Li said that one of the key challenges for his team during the two-year development phase was handling dc offset on the receiver. "To remove the dc offset, a high-pass filter is adopted by some solutions. But this causes signal distortion and thus cannot support HSDPA [high-speed downlink packet access]," he said. Comlent's solution "is to utilize digital detection and cancellation loop."

To do this, the analog baseband IC uses digital signal processing logic to compensate for the imperfections in the analog channel-select filter and to perform dc-offset calibration, he said. The noise is then suppressed in the digital domain. Comlent believes that leveraging the digital domain makes it easier to design the analog circuits while also reducing power and area.

Comlent plans to release engineering samples of its chips in mid-November, targeting mass production for the third quarter of 2007.

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