Toshiba develops the circuit technique for power efficiency improvement in CMOS power amplifier for mobile phones

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Toshiba Corporation today announced that it has developed the world's first circuit technology to remove distortion in wireless transmissions that can be directly integrated into a CMOS radio frequency (RF) power amplifier. The new circuit will be unveiled on February 20, 2012 at the 2012 IEEE International Solid-State Circuits Conference (ISSCC) in San Francisco.

The various wireless communication standards deployed today use different frequency ranges, but in all of them the output radio frequency signals are amplified by power amplifiers designed for these standards. The optimum solution would be compact, easy to fabricate CMOS RF power amplifiers, but these have proved difficult to achieve.

Battery-powered mobile phones and smartphones must sip rather than gulp power. For successful transmission to a base station, the amplitude of the signal, and therefore its power, is boosted by an RF power amplifier. As RF power amplifiers in mobile phones consume a lot of power, high efficiency is essential to extend the battery life.

The most widely used power amplifiers for mobile phones are compound semiconductors, but they are large and difficult to fabricate. CMOS would offer a more compact alternative that is easier to fabricate. However, CMOS power amplifiers require a distortion correction circuit that is relatively large, as it has to perform a huge

number of calculations. Such a circuit is too large for integration into the power amplifier, and even for embedding into a mobile phone as a peripheral circuit.

Toshiba has successfully simplified and downsized the distortion correction circuit, allowing it to be integrated into a CMOS power amplifier, by identifying the threshold beyond which distortion degrades the RF signal. Correction is applied only when the output power from the power amplifier exceeds 0.2W, the level required for communication with a relatively distant base station.

A CMOS power amplifier with the circuit improves the power efficiency 1.4 times. It secures high level RF signal stability by correcting distortion automatically. Another plus is the increased versatility secured by removing the need for an external correction circuit that allows simple integration into the system design of a typical mobile phone.

Toshiba will first apply the CMOS power amplifier to WCDMA devices and also aims to apply it to next-generation communications standards. Going forward, the company will develop related peripheral circuits, toward realizing even more compact, low power CMOS power amplifiers and launching products at an early date.

Provided by Toshiba Corporation