LDMOS RF Power Transistor Exceeds 30% Efficiency

A major advance in Laterally Diffused MOS (LDMOS) technology that, for the first time, will allow Wideband-CDMA (W-CDMA) base station manufacturers to break through the 30% efficiency barrier for RF power amplifier output stages is announced by Royal Philips Electronics. The rollout of W-CDMA cellular infrastructures for the delivery of advanced multi-media and data services has created a high demand for efficient base station amplifiers that combat the inherent power inefficiencies of W-CDMA systems. By achieving an RF power output efficiency of more than 30%, Philips' new fifth-generation LDMOS technology raises W-CDMA efficiency by as much as 4 %. Using this technology for W-CDMA base stations, RF power amplifiers can therefore reduce the power consumption by more than 15 %, lowering operating costs and reducing dissipated power and cooling.

Fabricated on the company's advanced 0.14-mm CMOS megafab production lines, Philips' next-generation LDMOS technology produces RF power transistors with a feature size of 0.4-mm and four-layer metalization, giving them a unique combination of high operating efficiency, high gain and excellent linearity. The technology is applicable across all frequency bands from 800 MHz to 2.2 GHz. In addition to the advantages accrued in W-CDMA systems, the high gain (17 dB) and efficiency of Philips' fifth-generation LDMOS devices also make them suitable to higher performance RF power amplifiers for 1 GHz and 2 GHz GSM/EDGE and CDMA base stations.

The Aluminum-Copper (AlCu) metalizations used in fifth-generation LDMOS transistors, which replace the gold metalizations used on Philips' previous-generation devices, retain similar levels of reliability. These extremely thick and wide AlCu metalizations offer a four-fold increase in reliability and significantly reduce the transistors' parasitics. Enhanced reliability allows designers to run the junctions of these LDMOS transistors at temperatures up to 25&#176 K higher than conventional devices, while the reduced parasitics improve RF performance. The ability to operate the junctions at elevated temperatures and a transistor design that reduces junction-to-case thermal resistance to less than 0.5&#176 K/W allow base station amplifiers to be developed with smaller, lower-cost heat sinking. The high gain of these LDMOS transistors (typically greater than 17 dB) also minimizes power dissipation and circuit complexity in driver stages.

Philips is the first company to have a 0.4-&#956m LDMOS RF power transistor technology in volume production, with the company's first devices targeting UMTS and 2 GHz PCS/DCS bands. The BLF5G22-100, for example, is a W-CDMA transistor with 17 dB gain, an ACLR5 of &#15039 dBc, an operating efficiency of 30% at an average power output of 26 W, and a peak output power of over 160 W (all figures quoted for two-carrier W-CDMA operation, 10 MHZ spacing and PAR of 8.5 dB at

0.01 percent probability on CCDF).

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