RF-to-Digital uModule Receivers Reduce Size, Cost & Time-to-Market for Base Station Designs

MILPITAS, CA – October 13, 2010 – Linear Technology introduces the LTM9004 and LTM9005, two breakthrough RF-to-digital uModule® receivers that integrate the key components for 3G and 4G base station receivers (WCDMA, TD-SCDMA, LTE, etc.) and smart antenna WiMAX base stations. The integrated uModule receivers offer a dramatic reduction in board space, integrating the RF mixer/demodulator, amplifiers, passive filtering and 14-bit, 125Msps ADCs in one conveniently small package. The LTM9004 implements a direct conversion architecture with an I/Q demodulator, low-pass filter and a dual ADC. The LTM9005 implements an IF-sampling architecture with a downconverting mixer, SAW filter and a single ADC. This high level of integration enables smaller boards or higher channel count systems, alleviating issues related to separation and routing of signals, while providing a significant reduction in design and debug time. These receivers harness years of signal chain design experience and offer it in an easy-to-use 22mm × 15mm µModule package.

Cellular service providers are under intense pressure to reduce capital (CAPEX) and operating (OPEX) expenses. Supporting trends include the need for smaller, lighter, lower power base stations such as remote radio heads (RRH) that can be mounted on the tower with the antenna; and high density, high channel-count macrocell base stations with higher efficiency; and the use of small, digital repeaters. These uModule receivers address these trends directly. At only 25% of the board space area of discrete designs, the LTM9004 and LTM9005 save

critical space and also reduce the time and effort required for optimizing the design and layout of dozens of high frequency components. This leads to lower development costs, fewer components to source and stock, and faster time to market.

Two receiver architectures dominate base station designs: direct conversion and IF-sampling. Direct conversion demodulates the RF signal and downconverts to DC (0MHz in the frequency domain). This simplifies the filter, allowing low-pass filters with a 10MHz cutoff (20MHz signal bandwidth). The LTM9004 implements this architecture. Other filter options are available for different signal bandwidths. IF-sampling downconverts to an intermediate frequency (IF), 140MHz in this case, and the signal is demodulated in the digital domain. The 20MHz signal filtering is done with a surface acoustical wave (SAW) filter integrated in the LTM9005. Other filter bandwidths are available.

The LTM9004 and LTM9005 are packaged in a space-saving 22mm x 15mm LGA package, utilizing a multilayer substrate that shields sensitive analog lines from the digital traces to minimize digital feedback. Supply and reference bypass capacitance is placed inside the uModule package, tightly coupled to the die, providing a space, cost and performance advantage over traditional packaging.

The LTM9004 and LTM9005 are sampling today with production volumes next quarter, priced at $75.00 each in 1,000 piece quantities. Demo boards and samples are available from www.linear.com or via a local Linear Technology sales office. For more information, visit www.linear.com/9004.

Photo Caption: 14-Bit, 125Msps Direct Conversion & IF-Sampling uModule® Receivers

Summary of Features: LTM9004 & LTM9005

- Fully Integrated RF-to-Digital Receivers for Base Station Applications
- 14-Bit, 125Msps Low Power ADC
- Direct Conversion Architecture (LTM9004)
    a. 800MHz to 2.7GHz RF Input Range
    b. I/Q Demodulation & Dual ADC
    c. DC-Coupled, Fixed Gain, Fixed Cutoff LPF
    d. 5V & 3V Supplies, 1.8W Total Power Consumption
- IF-Sampling Architecture (LTM9005)
    a. 400MHz to 3.8GHz RF Input Range
    b. Continuous 20dB Attenuation Range
    c. 20MHz SAW Filter, 140MHz IF
    d. 3.3V Supply, 1.3W Total Power Consumption
- 22mm x 15mm LGA Package

About Linear Technology

Linear Technology Corporation, a manufacturer of high performance linear integrated circuits, was founded in 1981, became a public company in 1986 and joined the S&P 500 index of major public companies in 2000. Linear Technology products include high performance amplifiers, comparators, voltage references, monolithic filters, linear regulators, DC-DC converters, battery chargers, data converters, communications interface circuits, RF signal conditioning circuits, uModule® products, and many other analog functions. Applications for Linear Technology's high performance circuits include telecommunications, cellular telephones, networking products such as optical switches, notebook and desktop computers, computer peripherals, video/multimedia, industrial instrumentation, security monitoring devices, high-end consumer products such as digital cameras and MP3 players, complex medical devices, automotive electronics, factory automation, process control, and military and space systems.

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