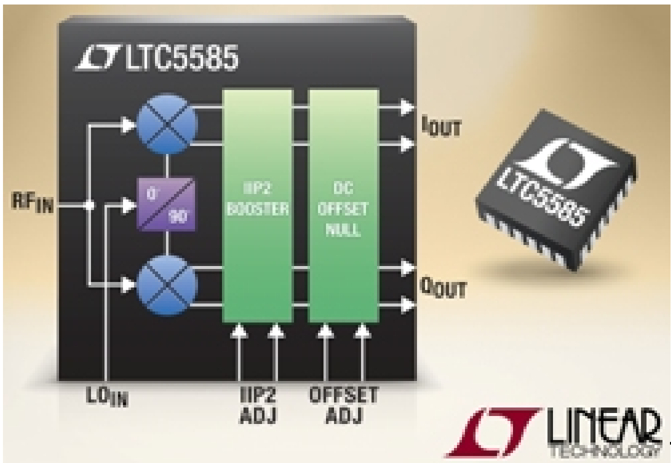
Base Station Market Trends: LTC5585 Wideband I/Q Demodulator



The exponential growth of smart phones, iPADs, tablet PCs, notebooks and netbooks has contributed to an insatiable demand for wireless network data speed and capacity.

Wireless service providers everywhere are scrambling to accelerate the deployment schedule for 4th generation wireless technology, LTE, which promises a significant increase in data rate.

To help reduce their cost of deployment, the base station industry is trending toward building few platforms – ultimately moving to a single platform – that can be field-configured for different frequency bands and different standards for specific markets and countries. In effect, the goal is to develop a flexible, software-configurable base station that can cover all the frequency bands and can seamlessly communicate with all cellular standards including LTE, W-CDMA, UMTS, CDMA and GSM. Doing so will have a positive financial impact, as it provides efficient use of equipment design resources and reuse of technology, hence improving their cost structure.

This goal illuminates a number of difficult design challenges.

First, to make a base station configurable, it must be capable of operating in all cellular frequency bands including the low bands of 700MHz and 880MHz, as well as the high bands of 1.7GHz, 1.8GHz, 1.95GHz, 2.14GHz and 2.4/2.6GHz. This necessitates that base station transmitters and receivers are able to tune over all of these bands. Frequency matching over such a wide frequency range is difficult and can have a negative impact on a radio’s performance. Additionally, wider band receivers open up the noise band, resulting in a signal-to-noise performance hit.

The second challenge is that within each band, there is at least 60MHz bandwidth available, split into three 20MHz spectrum. Each is typically licensed and auctioned to different service providers in various geographic markets. So a configurable base station must have the flexibility to transmit and receive in the entire 60MHz band. Opening up the basestation bandwidth to 60MHz wide in itself isn't too difficult to implement. However, the burden is in the transmitter's DPD (digital predistortion) receiver to correct the transmitter's harmonic spurs to 5th order, which correspondingly pushes its receiver bandwidth out to at least 300MHz. To perform this function properly and to meet the requirements of the cellular standard, the passband flatness must be better than ½ dB, which is difficult to attain. Within this bandwidth, the receiver distortion spurs must be less than those generated by the transmitter.

The common DPD receiver employed is a heterodyne architecture which downconverts the RF signal to an IF frequency and then filters and digitizes the signal. But a 300MHz bandwidth signal riding on an IF frequency requires an exceedingly high speed A/D converter pushing sampling speeds over 500Msps, which is costly and at a performance level that is difficult to attain.

Hence, a wideband direct-conversion I/Q demodulator such as the LTC5585 offers an attractive alternative solution to this problem. This device can directly downconvert the RF signal to baseband or a very low IF frequency. At the baseband, the 300MHz RF signal is split into two 150MHz wide I (In-phase) and Q (Quadrature-phased) signals. With this reduced bandwidth, achieving better than 1/2dB gain flatness is more manageable. The real compelling benefit is that the baseband signal can now be easily digitized with a 300Msps A/D converter – a commonly available and potentially cost-effective solution – albeit two channels are required.

Conclusion: the LTC5585 offers a potentially cost-effective, compelling alternative to wideband DPD and main receivers for the emerging 4G infrastructure and other high performance wireless applications.

www.linear.com [1]

Posted by Janine E. Mooney, Editor

January 30, 2012

Source URL (retrieved on *01/27/2015 - 4:36pm*):
http://www.wirelessdesignmag.com/product-releases/2012/01/base-station-market-trends-ltc5585-wideband-i/q-demodulator?qt-most_popular=0

Links:
[1] http://www.linear.com