



QUALCOMM's radioOne™ Technology for Direct Conversion

From the earliest days, both cellular phone manufacturers and end users demanded handsets that were smaller, contained fewer components, and cost less. Today, with the introduction of radioOne technology from QUALCOMM, these three requirements are simultaneously satisfied due to the nature of the technology.

The target market for radioOne chipsets initially will be CDMA users, but soon the technology will be available for use with other major cellular standards: GSM, GPRS, WCDMA, and CDMA2000 1xEV-DO — as well as for multimode/multi-band operation. Major benefits to handset OEMs will be faster time-to-market, enhanced yields, reduced manufacturing cost, and simplified inventory management.

About radioOne

RadioOne is a technology that is based on an architecture called direct conversion or Zero IF (ZIF). Direct conversion offers a tremendous improvement over its predecessor technology, super-heterodyne, in that it eliminates the need for many components, resulting in cellular phones with reduced cost and size. In particular, the entire intermediate frequency (IF) subsection of the phone is eliminated: IF IC, SAW filters, voltage control oscillators (VCO), phase locked loop (PLL) IC, electromagnetic (EMI) shields and a multitude of resistors, capacitors and inductors.

Direct conversion is not a new concept. It has existed for almost as long as wireless itself, and was the most natural and logical choice of architecture. Until recently, however, technical barriers prohibited practical implementation in CDMA devices and only with recent improvements in the semiconductor process, coupled with the development of high-speed, low power digital processors, has the mass production of direct conversion chips become feasible.

In terms of semiconductor content, a phone system can be broken into three distinct sections: the radio frequency subsection (RF), the baseband processor subsection and the power management system. The radioOne chipset, which constitutes the RF portion, is designed and optimized to work with QUALCOMM's MSM6xxx family of baseband processors: MSM6000™, MSM6050™, MSM6100™, MSM6200™, MSM6300™ and MSM6500™. Together with QUALCOMM's power management IC, the PM6000™/PM6050™, the MSM and radioOne chipset form the entire semiconductor content of a cellular phone (minus the power amplifier).

- **Elimination of entire IF section**
 - Reduces bill of materials
 - Reduces printed circuit board area and phone size
 - Faster time-to-market time due to less development time

- **Simplifies multimode, multi-band designs**
 - Eliminates mode-specific IF SAW filters (e.g., GSM IF filter, WCDMA IF filter, AMPS IF filter, and CDMA IF filter)
 - Eliminates supporting components for IF SAW
 - Reduces engineering development time
 - Only one single-band VCO needed for all CDMA band of operation

- **Complete solution**
 - Includes radioOne chipset, MSM6xxx baseband processors and power management IC
 - Complete receiver, transmitter and advanced power management solution
 - Entire semiconductor content of cell phone (minus the power amplifier)
 - RadioOne is designed and optimized to work with the MSM6xxx series

- **Eases manufacturing and inventory control**
 - Fewer components to assemble
 - Enhanced yield
 - Same devices work in all bands
 - No need to stock different flavor of the same device for different air interface standards

- **Regional Markets and Applicable Cellular Standards**
 - North America, Latin America, China, India, Japan, Korea and Europe
 - Cellular, JCDMA, PCS US, PCS Korea, IMT and GPS
 - CDMA2000 1x, CDMA2000 1xEV-DO, AMPS, GPS, WCDMA, GSM and GPRS