Clearing the Path to 3G Handset RF Integration

The economics of RF subsystem integration and manufacturing can be dramatically changed by embedding RF intelligence into the subsystem.

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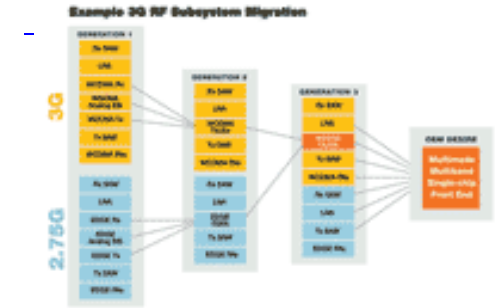
Time has always been a scarce commodity for mobile phone designers, and integration of the phone's RF section has consumed more than its share of precious development resources. As the complexity of cellular handsets has grown, the burden of RF IC integration has continued to increase. However, as wireless handset



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OEMs work to incorporate EDGE and 3G support into their products, RF component and subsystem vendors can no longer place the burden of this task on the OEM. Rather, the burden is now on RF vendors to not only reduce the component count and cost of their RF subsystems, but to provide the most trouble-free, robust RF front-end subsystems that improve this time to market with yields comparable to last-generation 2G subsystems.

Initial BOM cost and size reduction has traditionally been the principal focus. Typical cellular RF roadmaps reflect this focus as parts shrink and become less expensive over time. For 3G RF subsystems, there has been a migration from multi-chip solutions requiring a number of discrete RF ICs and front end components, typically with two parallel RF paths (one for GSM/GPRS/EDGE signals and a separate path for the 3G UMTS signals) to more recent lineups with significantly higher levels of integration (see Figure 1).

The resulting board-area parts count reductions, vendor consolidation, and supply chain consolidation efficiencies shown in Figure 1 create significant cost reductions for handset OEMs. However, this is only part of the total cost of ownership (TCO) challenge faced by handset manufacturers. They face huge development costs and costs related to manufacturing quality caused by the incredible complexity of state-of-the-art 3G feature phones. Addressing these additional elements of cell phone TCO requires a new approach to RF subsystem design.

The development costs associated with RF subsystem integration include all of the engineering staff costs to insert the RF ICs, power amplifiers, filter elements, low-noise amplifiers, and switches needed to support each mode (GSM/EDGE/UMTS) and frequency band for each phone model. The costs also include creating or modifying the phone’s layer one software to drive all of these