Mobile RF front-end integration

Peter Gammel

Skyworks Solutions Inc., Woburn, MA, USA

The mobile phone has become an essential part of our daily lives. Streaming video and real time information services have created an exponential growth in the network data and seemingly unstoppable increase in RF complexity. Increases in band count and aggregation, multi-standard support and heterogeneous network connectivity will continue for the next 5 years at least. Without a revolution in RF architectures, more complex requirements for filters, switches, and power amplifiers (PA) in the front end are the only solution. A migration from discrete solutions to highly integrated solutions creates significant design challenges. Two implementations competing for market share are a system on chip (SOC) and system in package (SIP) solution. The best technology of choice is clear from a performance perspective. For the best performance a combination of SOI, SAW, and HBT technologies is required. If we are to pick the best SOC technology, SOI is the leader with the exception of filter integration. While it is typically assumed that a SOC solution has the advantage in cost and size based on digital trends, this is not true for analog and less true for RF front ends. By moving the PA output match into the laminate package and all logic and bias into a low-cost CMOS process, the resulting product is both lower in cost and smaller in size. This is because the HBT die size becomes a small fraction of the SOI SOC solution, lowering cost. The logic and bias functions are in CMOS rather than SOI further lowering cost. Plus with these two separate dice, we can stack one on top of the other, reducing the overall size of the implementation. The result is that by choosing the best performing technology and proper partitioning of circuit blocks, the SIP solution becomes the clear winner for performance, cost and size.