Timely WiMedia solutions fuel UWB Ecosystem expansion

Earlier wireless support lessons prove valuable, but the timing of resources is more critical than ever.

By Mike Tanahashi

As the name implies, today's "ultrawideband (UWB) Ecosystem" forms a complex network of processes and organizations working together to provide a total customer solution. Experience shows that most OEMs prefer to integrate the modules they procure from their suppliers. This is especially true when introducing state-of-the-art wireless technologies requiring a completely new test setup for in-house certification that may be impacted by different regulatory requirements for each country or region. However, most OEMs are now looking for a "one-stop-solution provider" to help them simplify the development process, ensure smooth and reliable implementation and shorten the time to market.

WiMedia UWB Ecosystem support optimizes OEM time to market through a full range of hardware and software elements—including passive components, front-end devices and modules—all the way through the necessary measurement and certification processes.

Silicon development efforts

Silicon manufacturers, having spent significant resources to develop highly advanced UWB solutions, often find it challenging to integrate their silicon into customer applications. Realizing the importance of a well-established Ecosystem prior to customer implementation, some early WiMedia Alliance members have worked to proactively study and understand UWB technology. They also helped to define the specification at the earliest stages and have remained in close contact with each silicon manufacturer to better optimize their respective solutions.

In some cases, solution providers like Taiyo Yuden were able to apply expertise gained during the Bluetooth module development and certification experience to the requirements of UWB Ecosystem support. This entailed the development and optimization of front-end passive devices such as miniaturized ceramic chip antennas, bandpass filters, baluns, complete modules and other elements (see the figure). Since the Bluetooth SIG has opted to work with the WiMedia Alliance to define the high-speed Bluetooth technology specification, it seems obvious that UWB will soon be implemented in battery-operated, handheld applications requiring miniaturized module solutions, such as with cellular phones.

Silicon manufacturers are introducing chip-scale package (CSP) options that will help manufacturers optimize solutions such as highly integrated low-temperature co-fired ceramic (LTCC) modules into small form factors. Antenna requirements, another critical function for Ecosystem support, are seeing WiMedia providers respond with commercially available ceramic chip, film, printed circuit board (PCB) and other antenna technologies targeting specific applications.

Challenges still remain, however. For example, different wireless technologies may be implemented in the same end device, but each may require its own antenna. At this stage of the technology, all frequency bands cannot use the same antenna. It is only a matter of time though, before this technological hurdle is surpassed.

A parallel development

Unlike earlier wireless system implementations, the WiMedia Alliance

has successfully worked from the start to develop a total Ecosystem in parallel to silicon development, such that optimized antenna solutions are available. For example, PC manufacturers may implement UWB/Bluetooth dual-physical layer (PHY) solutions using a readily available broadband antenna that accommodates both bands with a single device.

The requirement for small form factors, omnidirectional patterns needed by portable devices, wide bandwidth, high gain and efficiency, and flat group delay over wide bandwidth are all major antenna design considerations that must be solved by Ecosystem providers. Another difficult challenge, broadband filter design, may be appreciated by comparing the ratio of bandwidth to center frequency, as follows:

rbw = Bw/Fc,

where rbw = bandwidth ratio; Bw = pass bandwidth and Fc = passband center frequency. The higher the rbw, the more difficult the design. Compared to an rbw of 4.1% for the 802.11b standard, first-generation, low-band UWB solutions call for an rbw of 40%.

External filters, as opposed to silicon-based solutions, are required to achieve this level of result. And, once the design know-how has been obtained, it is relatively easy to provide the filter solution for a specified spectrum mask. For example, a bandpass filter for WiMedia Band Group 1 TFC7 (4224 MHz to 4752 MHz) was recently developed and optimized by Taiyo Yuden for the spectrum mask in Japan. This solution will fast-forward many OEMs through the Telecom Engineering Center (TELEC) approval process in that country. By having access to certified or certifiable UWB module solutions, OEM customers will typically require no additional RF test facility approvals—thus greatly shortening time to market.

In addition to the certifications required by various organizations to sell UWB products in the global market, proof of interoperability is also critically important. Finally, any supplier that would be a player must be ready, willing and eager to invest the resources required for a substantial ongoing support commitment, including world class R&D, manufacturing and distribution. The market deserves—and demands—no less from a rapidly expanding universe of UWB Ecosystem solutions providers. EWT

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