

Philips Semiconductors Develops Stand-alone and Embedded Bluetooth Solutions

Bluetooth capability, although first appearing in mobile phones and laptop computers to bring mobile office communications to business users, has the potential to revolutionize connectivity in high-volume consumer markets. Low cost ARM-based silicon system solutions from Philips Semiconductors will soon make this possible.

INTRO

In January of this year Philips Semiconductors became the first semiconductor company in the world to introduce a commercially available Bluetooth 1.0 compliant silicon system solution. With a clear product roadmap towards ever more highly integrated Bluetooth solutions and highly flexible embedded Bluetooth cores, Philips Semiconductors now leads the field in bringing Bluetooth connectivity to mass-market communications and consumer products, ranging from cellular and cordless telephones, to PDAs, computers and digital cameras. Philips Semiconductors is already the world's third largest producer of communications ICs, and Philips semiconductor devices, components and/or technologies can already be found in 80% of the cellular telephones produced worldwide. Specifically in the area of Bluetooth, the company has now entered into a co-operation and development agreement with Ericsson Mobile Communications to develop advanced Bluetooth products.

"The similarities to DECT, in which we are already a recognized world leader, meant that we were sixty to seventy percent there with the Bluetooth design before we even started," said Dirk Braune, International Product Marketing Manager for Cordless and Corded Telephone ICs at Philips Semiconductors' Telecom Terminals Business Unit. "Adding VLSI Technology's baseband technology, which was developed in direct collaboration with Bluetooth founder Ericsson, virtually gave us an instant total solution."

Philips Semiconductors' current Bluetooth chip-set, which is fully compliant with Revision 1.0 of the official Bluetooth specification, comprises a baseband controller (part no. VWS26002) that implements the Ericsson Bluetooth engine and protocol stack, plus a 'Low IF' single-chip transceiver (part no. UAA3558) and an interface chip that couples the baseband controller to the transceiver.

"This provides our customers with a fully tested solution they can start using today, and it is just the beginning of a roadmap to more highly integrated and advanced Bluetooth products," said Braune. "By April this year we will have an enhanced baseband controller working with the UAA3558 transceiver, with spe-

cialized hardware and software for highly integrated Bluetooth solutions. And soon after that we'll have embedded system components to meet a wide range of different Bluetooth profiles."

This comprehensive range of Bluetooth solutions will depend much on the synergies between Philips Semiconductors and VLSI Technology that prompted the merger of the two companies. On the RF side Philips Semiconductors contributes its 'Low IF' transceiver technology, originally developed for DECT, which allows high-sensitivity alignment-free radio transceivers to be implemented without the need for SAW filters. This Low IF transceiver technology therefore meets the low cost and small size requirements of Bluetooth applications. Philips Semiconductors also adds its RF power amplifier technology, with add-on power amplifiers that boost the Bluetooth wireless range from 10 metres to the 100 metres required in large office and outdoor applications.

VLSI ADDS BASEBAND TECHNOLOGY AND ASIC DESIGN TOOLS

On the baseband side, VLSI Technology not only provided the first commercially available Bluetooth baseband controller. Its 'Velocity' Rapid Silicon Prototyping system has also been upgraded with all the elements needed for hardware/software co-design of Bluetooth systems or embedded Bluetooth ASICs using libraries of fully tested and re-usable IP blocks. Hardware IP blocks will allow high performance ARM processor cores, memory systems, and peripheral interfaces such as USB ports or UARTs to be integrated alongside the company's new 'LightBlue' Bluetooth link controller. Velocity's software design tools enable designers to bring together only those software blocks that are needed for the desired Bluetooth profile, so that they can meet critical ROM size requirements.

Future generations of Bluetooth products will also benefit from new process and packaging technologies being introduced by Philips Semiconductors, with the ultimate aim of integrating the baseband and RF parts into a single IC. Together with Philips Semiconductors' wealth of knowledge in the fields of cellular, cordless and wired communications and in audio, video and display technologies, these Bluetooth solutions will make the penetration of Bluetooth into mass market

consumer applications only a few short steps away.

PHILIPS RESEARCH ADDRESSES CRITICAL DESIGN ISSUES

In collaboration with Philips Research, the world's second largest privately funded research organization, Philips Semiconductors is already tackling the design issues that will make single-chip Bluetooth a reality. These include new transistor models that allow RF circuitry to be designed using CMOS instead of bipolar transistors, isolation techniques to prevent noise generated by the baseband logic from swamping Bluetooth's sensitive RF receiver, and new techniques to integrate the high quality passive components needed for accurate impedance matching. It is also working on new test methodologies to test the closely linked RF and digital sections of a single-chip Bluetooth solution, and innovative packaging techniques that match the low inductance lead-out requirements of Bluetooth's RF section with the higher pin-count requirements of its logic part.

Yet even before this single-chip solution is realized, Philips Semiconductors will have ultra-small single-package Bluetooth solutions in the form of multi-chip modules for on-chip or host system protocol handling. And its Bluetooth portfolio will also include peripheral devices such as silicon RF power amplifiers and ceramic antenna, making Philips Semiconductors a single, reliable partner in the development of advanced Bluetooth enabled consumer products ■

Gerton Jansen from Philips Semiconductors wrote this article.