

Low cost ASIC technology powers Wireless Credit Card Reader

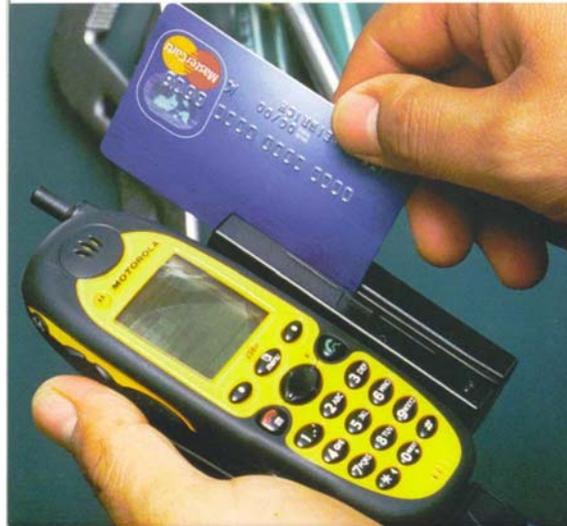
Handheld PCs, PDAs and smart cell phones are showing up in new applications every day. These new products are made possible by the adoption of wireless technology and the internet. Taxi and delivery services, vendors at fairs and swap meets and many other mobile merchants are now able to accept credit cards in the field. Soon waiters in restaurants will accept payments at the tables while other businesses will allow customers to checkout without waiting in lines

Semtek Corp, a San Diego based company that manufactures credit card readers, was developing a new wireless credit card reader for an emerging market that demanded much higher levels of security. This new product needed to be compliant with the Cardholder Information Security Program (CISP) for Magnetic Strip Readers (MSR) and include Semtek's novel Triple-DES encryption algorithm built inside the magnetic head itself. "Our new reader had to be small, very low power and low cost," remarked Dennis Mos, VP Sales and Marketing at Semtek.

Size, power and cost are all benefits of ASIC technology; however, developing an ASIC, particularly a Mixed Signal ASIC, can be expensive and time consuming. Such an undertaking may prove especially risky for a new product like Semtek's wireless credit card reader. Many engineering managers are of the mind that ASIC's are best left to the "Big Boys." And considering the high cost of tools, masks and fabrication they are probably correct, but not completely.

A unique ASIC process developed by System To ASIC provided Semtek with the mixed-signal technology they needed, at a cost far less than that of standard cells or a full custom chip. According to Douglas Shorb, Vice President of Sales at System to ASIC, Inc. (STA) our customers do not have to pay exorbitant development cost or inflated unit prices because only the last few steps of the manufacturing process are custom. This means that no single customer bears the entire design and manufacturing cost.

At first Semtek, like many other companies, couldn't imagine that an ASIC would work for them. Having just started production on the new credit card reader, the initial expectation was that somewhere around 50,000 units would be manufactured in the first year. While there were a lot of components on the tightly packed PCB, and power



consumption was higher than they had wanted, the new product would do well in the market, and cost reduction would be considered after production volumes increased.

It takes quite a few analog parts to read a three track credit card" explains Clay von Mueller, CTO at Semtek. After discussing the design with the team at STA, Semtek decided to take a closer look at using an ASIC in their new product. The goal was to eliminate the entire PCB assembly which included 2 connectors, 10 amplifiers and 45 components, and reduce the cost by enough that the project could pay for itself in its first year.

"Developing this ASIC was much easier than I expected," notes von Mueller. "We gave System To ASIC a copy of the schematic and our wish list. Within a few days we received a block diagram for our new chip, including the development cost, unit price, schedule and even an ROI calculation to help with the financial analysis."

After thorough cost/benefit analysis, Semtek decided to proceed with the development of their first ASIC. The teams quickly developed detailed specifications, including a priority list of features and functions. At the top of the list was battery life followed closely by peak detector performance and overall size of the ASIC.

Controlling every aspect of the chip's operation was critical in meeting Semtek's low power requirements. Taking advantage of the fact that credit card readers need to be

fully powered only during the actual card swipe, most sections of the chip were completely turned off, while others were placed in the low power mode in order to conserve energy. Once the credit card was detected, the microcontroller quickly activated sections of the ASIC responsible for acquiring credit card information, interpreted the received data and returned to low power mode.

With sleep current under control, the team at STA reinvested some of the saved power back into higher performance amplifiers and detection circuitry. Any trade-off between peak performance and stand-by current did not present an issue due to the fact that credit card readers consume almost 95% of their power while sleeping.

System To ASIC delivered prototypes in just under 4 months. "Our new chip worked right out of the box" recalls von Mueller. "Sleep current dropped by over 90%, detection accuracy and speed had improved significantly, in fact the ASIC exceeded our expectations in every category" von Mueller added.

Using the 4x4mm ASIC and a small form factor microprocessor, Semtek reduced the size of the MSR electronics from 2.25 in² to .25 in². "The size reduction made possible our new MICRO MSR™ where all the functions of an intelligent MSR are built into the magnetic head providing new levels of security impossible with the previous electronics" noted von Mueller.

As promised, the ASIC came in on schedule exactly as quoted, and it paid for itself in less than 6 months. Any preconceived notions about mixed-signal ASICs need to be rethought. This new technology from STA can help small and large companies alike.