

Embedding a transponder in products—particularly consumer electronics—delivers more value with no business process change, and the incremental cost is almost insignificant.

By Mark Roberti

Nov. 16, 2009—Many companies still see radio frequency identification as something that's applied to a finished product to improve supply chain tracking. To these firms, the technology is usually an added cost that they fear they won't recoup by improving processes and better managing inventory. But some businesses are realizing RFID is not just a radio bar code—it's something that can be embedded into a product at little extra cost, so that product can be tracked throughout its lifecycle.

A number of electronics firms have been working with RFID technology providers to develop RFID chips that can be placed on or embedded in printed circuit boards (PCBs). There are a number of benefits to this approach, over sticking a label with an embedded transponder on a box containing a cell phone, DVD player or Internet router.



First, tagging a box means you can only track the product from the moment it's boxed up until the point of sale. If the transponder is in the PCB, however, you can track the product from the time the manufacturing process begins until the item is recycled. There might not be huge benefits to tracking work-in-process, because many electronics facilities are highly automated, with robots picking components and adding them to the PCB. But a manufacturer would be able to track finished products as they are moved into inventory, monitor how long they remain in inventory and ensure the proper items are picked and shipped to the correct customers.

A manufacturer could send an advance shipping notice (ASN) to its retail partner, letting it know what items are coming, and with what serial numbers. The retail partner could then receive the items into inventory, check the serial numbers against the ASN automatically and identify which items, if any, went missing during the trip (theft is a huge problem in the electronics supply chain). [Telstra](#), an Australian telecommunications firm, recently ran an RFID trial that, if rolled out across its 130 retail outlets, would save the company up to \$3.2 million in annual labor costs and product shrinkage.

There might be some benefits to consumers as well. For instance, a phone manufacturer could create a database of owners, so that when a phone is lost, someone need only read its tag ID to look up the owner's address. Or the manufacturer could offer an additional service, by which a phone could be turned in to the manufacturer, which would then ship it back to the owner at no additional charge.

When it's time for the phone to be discarded, the tag in the phone's PCB might be useful for recycling. In countries in which manufacturers are responsible for recycling electronics, an RFID tag could identify the manufacturer. But it could also be used to enable a waste-management firm to quickly retrieve

information regarding which parts can be recycled, as well as any hazardous materials the phone might contain.

The great thing about embedding a transponder in an electronics product is that the additional 10 cents or 20 cents for an RFID chip then becomes an insignificant item on a bill of materials that could total \$10, \$20, \$50 or more. And as Bill Colleran, CEO of [Impinj](#), points out, the business process doesn't have to change (as it does with applying an RFID label). "Robots typically pick the components of a tape reel and place them on the board, so the RFID chip would just be another item to add to the PCB," he says. "It doesn't change the process, doesn't add much to the bill of materials and delivers a lot of benefits. RFID becomes a no-brainer."

Impinj has been working with several electronics and microchip manufacturers to develop chips that can be added to PCBs. So have other RFID companies. While hosting our [RFID Journal LIVE! Europe 2009](#) event a weeks ago, in Germany, I got a chance to sit down with Alexander Schmoltdt, a business development engineer at [Murata Elektronik GmbH](#). His company has developed a new RFID module, known as the Magicstrap, which comprises a low-temperature co-fired ceramic substrate and an embedded RFID chip. The module can be mounted on or embedded in a PCB and, according to Murata, can be read over the 800 MHz to 1,000 MHz band at a distance of 5 meters (16.4 feet). That means a tag on a PCB could be used to track the item through the supply chain to the retail store.

I recently visited [NXP Semiconductors'](#) Application and System Center, in Graz, Austria. While I was there, Martin Schatzmayer, the head of the center, showed me a prototype of a chip that can be embedded in a PCB, and that can use the ground plane in the PCB as its antenna. The product is not yet ready for commercialization, but Schatzmayer believes NXP can create a design that will work on virtually any PCB.

Impinj's Colleran says there are essentially three options for adding RFID to PCBs. One is to place a chip on the board, connecting it in the process to an antenna on the board. Another is to embed the transponder in the board, and a third is to have connections from the chip to an antenna that is not part of the board.

"There are pros and cons to each approach," Colleran explains. "If you put the chip on the board, you are potentially taking up valuable real estate. If you embed the transponder in the PCB, the components that go on it have a lot of metal and could block a signal from reaching the antenna, which affects performance. And if you connect the chip to an antenna that is not on the board, there might be a metal housing that blocks the signal."

Electronics manufacturers will have to choose one approach or another, depending on the product being made, but Colleran says achieving the 5 to 8 feet of read range needed to track electronic products in the supply chain is feasible. He thinks the first products with RFID transponders on the circuit board will begin hitting the market in the second half of next year. It will likely take a longer time to develop transponders that can be embedded in PCBs, but when RFID becomes just another

component on a PCB, companies will likely jump at the opportunity to use it to track their electronics products throughout their lifecycle.

Mark Roberti is the founder and editor of RFID Journal. If you would like to comment on this article, click on the link below. To read more of Mark's opinions, visit the [RFID Journal Blog](#) or click [here](#).