A 2-Cent RFID Tag?

The much-anticipated 5-cent RFID tag would be competitive with the low cost of the bar code and make item-level tagging cost-effective. But even when produced in high volumes, a silicon-based tag cannot meet the 5-cent cost target.

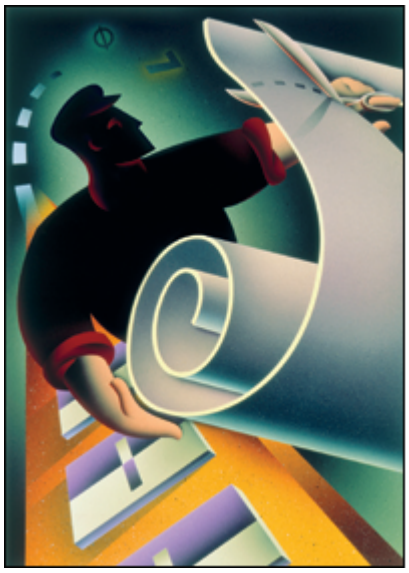
The silicon tag technology used today must have an integrated circuit (silicon), an attachment method (wire, solder, gold,

epoxy) and an antenna (printed, etched or stamped). The semiconductor industry says that with advanced assembly processes—which are not commonplace today—it could produce an integrated circuit that costs between 2 and 3 cents, and an antenna as well as the assembly that costs no more than 1 cent. The probability of achieving these cost goals is at best very aggressive and at worst highly improbable.

Why? Compare the RFID chip with the light-emitting diode (LED), which is a mature product with huge volumes. The LED is a very small integrated circuit with only two connections. But the best pricing in 500 million quantities is still not less than 5 cents. If a lower-cost model could have been developed for the LED, which has been in production for more than 30 years, it would have been.

But there is a solution to the low-cost tag: printable electronics. This technology, developed in the 1970s, is based on the semiconducting properties of organic materials. Various types of electronics-grade inks that have conductive, insulating or semiconducting properties are printed in successive layers to produce an electronic circuit.

The printable electronics process is virtually the same as the color printing process, which uses one print plate for each of the four basic colors. Printable electronics uses multiple print plates, one for each type of printable pattern. The top print layer is the interconnect layer, which includes the antenna. This is a complete tag and needs no further assembly.



It’s a very low-cost manufacturing process, because it uses inexpensive components: ink and paper or film made of polyester or other materials. Additional savings come from the process itself. A silicon-based tag consists of approximately 280 steps and must be produced by a silicon-assembly manufacturer. A printable tag consists of fewer than 10 steps and can be produced at the item level during the printing process for the packaging. The retail price per printed page in a color magazine is roughly 1.8 cents, and that would be the same price for a complete tag.

Three companies are pursuing the development of printable electronics, including an RFID tag: Motorola in Schaumburg, Ill.; OrganicID in Colorado Springs, Colo.; and PolyIC GmbH & Co. in Erlangen, Germany. Several other companies are developing or already offer materials and equipment to support printable electronics. Production of printable RFID tags is still 12 to 18 months away.

I recently saw an active printed circuit that works in the lab. It doesn’t exhibit the electronic functions required to produce the integrated circuit that is the “heart” of a tag. But it doesn’t seem that technology breakthroughs are needed for the tag to meet expectations. Production, not engineering, issues are the only hurdles that need to be overcome.

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