

# Hitachi Unveils Smallest RFID Chip

The Japanese chipmaker recently showed off an RFID microchip that is just 0.3 square millimeter square.

March 14, 2003 - [Hitachi](#), the Japanese semiconductor company, has unveiled a prototype for the next generation of its [μ-Chip](#) (pronounced mu-chip). The chip is just 0.3 millimeters square, roughly half the size of the smallest RFID chip on the market.

The decrease in size was achieved by employing semiconductor fabrication processes that creates structures on the wafer that are just 0.18 microns. Most existing RFID chips use older 0.35 micron processes. The prototype of the mu-chip was shown at the International Solid-State Circuits Conference held in San Francisco, Calif., last month.

The chip operates at 2.45 GHz and stores a 128-bit number based on the "mu-chip ID number criterion" developed by Hitachi, which issues the numbers. The number is written to the chip during the silicon fabrication process and cannot be changed. The current mu-chip can be read from about a foot away (30 cm). The new version is expected to maintain the same performance standards.

Another innovation in the new mu chip involves the electrodes, where the ends of the coiled antenna are attached. These are usually on the top of the chip, but on the new mu-chip, one is on the top and one is on the bottom. Hitachi says this will dramatically improve its ability to mass-produce RFID tags with mu-chips.

With very small chips, it becomes difficult to attach the antenna using conventional flip chip technology, in which the electrodes are coated with adhesive, and then the chip is turned over and pressed onto the antenna. Hitachi decline to describe the mass production technique it uses to attach the antennas for competitive reasons.

Hitachi currently sells RFID inlets (the chip with an antenna attached, on a substrate) for 50 yen (43 US cents) for orders of 70,000 or more. Readers currently cost about \$1,500. The company has not established pricing for the new chip, but a spokesperson for Hitachi told *RFID Journal* that the company plans to sell complete systems -- tags, readers, software and networking infrastructure -- in 2005.

Hitachi sees the mu-chip as an attractive alternative to applications where a bar code isn't suitable and more conventional RFID tags are too expensive. Among the markets it is targeting are supply chain management, product tracability, and security applications.

A number of Hitachi divisions are already using the mu-chip. And Marubeni-Itochu Steel has purchased tags for tracking items. The mu-chip doesn't conform to any international standards, so it is currently being used in closed-loop applications.

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