

'Printed chips' could be boon for consumers

August 12 2009, By Steve Johnson

Until now, creating the microchips that power all of our electronic gadgets has been a laborious, complex and time-consuming process costing billions of dollars. But if a Milpitas, Calif.-based startup succeeds, making them could be as easy as printing a piece of paper.

And that could open up a huge market for so called "printed semiconductors," which would contain an enormous amount of data but would be cheap enough to slap on thousands of products. Imagine going to the grocery store and being able to find out what wine works best with your favorite chicken recipe.

Backed by investors who include former San Francisco 49ers Brent Jones and Tommy Vardell -- and a board that boasts [Sun Microsystems](#) co-founder Vinod Khosla -- privately held Kovio hopes to launch in a matter of weeks what is believed to be the world's first manufacturing plant for printed semiconductors.

By using inkjet and other types of printers, the company plans to make radio frequency identification devices -- so called RFID tags. Such tags traditionally contain microchips, but are so expensive now their use has been relatively limited.

If Kovio succeeds in keeping the price of the devices low, according to its executives and others familiar with the company, it could herald a new era for consumers and the chip business.

"If Kovio can pull that off, it's an enormous opportunity," said Carl

Taussig, director of Hewlett-Packard's Information Surfaces Lab, which is exploring a different but related technology. "It's going to revolutionize that whole industry."

What Kovio, HP and a growing list of other companies are working on falls under the broad category of printed electronics, which includes such things as solar panels, disposable blood glucose sensors and gadgets for displaying various types of information.

Using an imprinting method it has developed, for example, Taussig's group at HP is trying to make flexible electronic displays that can fold like a newspaper or bend around a building. Possible applications for the displays range from computer games to product promotions. HP also is working on what Taussig calls a "Dick Tracy watch" for the Army, which could tell soldiers where an enemy is located or how to clean a rifle.

Research firm IDTechEx predicts the printed electronics market will surge from less than \$2 billion this year to about \$57 billion in 2019.

The niche Kovio is exploring -- offering printed semiconductors featuring memory and logic capabilities like those on traditional chips -- now is only about \$10 million a year, according to Raghu Das, IDTechEx's CEO. But IDTechEx expects printed semiconductor sales to hit \$100 million by 2012, and Das expects Kovio to be the first to begin manufacturing them.

Kovio's CEO, Amir Mashkoori, who has labored for 28 years in the chip industry, believes the market one day will be much bigger than that. He sees printed semiconductors eventually becoming a multibillion-dollar business.

"This is just a humongous potential," he said.

Founded in 2001 by scientists at the Massachusetts Institute of Technology, Kovio initially focused on making flexible displays, but it switched to printed semiconductors, believing those devices hold greater promise.

By using silicon-based ink, the company says it can print RFID tags on soup cans, textiles and a wide range of other surfaces. While Kovio's printed semiconductors aren't nearly as complex and powerful as many other traditional chips, particularly the brainy microprocessors made by such companies as Intel, Mashkoori said his tags take far less time to make. They also don't require as many chemicals to manufacture, making them a greener alternative, he added.

But the biggest selling point is their cost. Mashkoori said Kovio should be able to produce them for about five cents per tag -- perhaps even for as little as a penny -- making them appealing, he says, to a broad assortment of businesses.

Kovio plans to especially target its tags at consumer goods. By approaching the product with a cell phone equipped with the right program, Mashkoori says people will be able to access whatever information is stored on the product's RFID tag.

That way the person could tell how old merchandise is, for example, or if it contains something the person is allergic to, Mashkoori said. He also envisions people using the phones to pick out the perfect wine for a meal.

"We see that application evolving to the point where you can actually put in, 'I'm having chicken for dinner tonight with a Greek salad,' and you can scan your phone over the wine bottles to see what's a better match with that food," he said.

"There is quite a bit of interest in this," agreed Randall Sherman, who tracks the industry as president of New Venture Research. Although he noted that some advocates of printed semiconductors have been too optimistic about when that business will take off, he said the market seems likely to grow.

"I don't think it's a question of it not happening," Sherman said. "It's more when."

PRINTED SEMICONDUCTORS

WHAT THEY ARE: Kovio of Milpitas, Calif., plans to print [radio frequency identification](#) tags using silicon-based inks. The company says the tags will have the same sort of memory and logic capabilities that are in microchips etched into silicon the traditional way.

HOW THEY MIGHT BE USED: Kovio envisions the tags containing information about whatever product they are attached to. That could include everything from the age and nutritional content of packaged food to tips on how to take a prescription medicine and whether an item has been exposed to contaminants.

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