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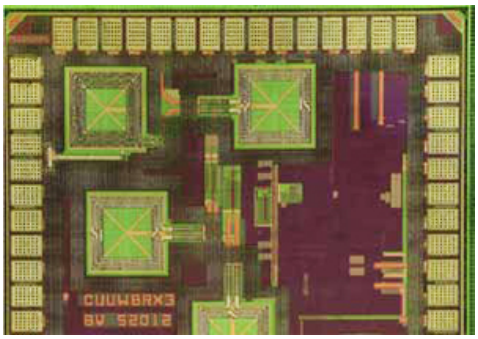
Harvesting Energy to Power Nanoscale Sensors

Tom Lombardo posted on February 26, 2013 |



Passive Radio Frequency Identification (RFID) tags don't need batteries - they use the electromagnetic energy provided by the RFID scanner to power themselves and reflect some of that energy back to the scanner when they respond to the signal. That only works at very close range. For longer distances, active RFID devices - those that include batteries - are required.

Professor Peter Kinget, a researcher at Columbia University's Electrical Engineering department, is working on nanoscale sensors that harvest ambient solar energy to power themselves. Such devices would be able to transmit radio signals over longer distances while maintaining the advantage of not requiring batteries.

The small scale of nanotechnology devices is a double-edged sword: on one hand they use much less power, but on the other hand, they can't withstand large voltages. This makes it difficult for them to transmit signals over long distances. To compensate for that, Kinget enhanced the devices with networking abilities that allow them to act as repeaters, relaying signals over long distances through very short hops. They even have the ability to "learn" the transmission habits of their neighbors so they can listen only at times when there is a likely to be a

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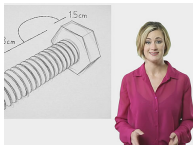

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transmission. This reduces their energy consumption even further. Professor Kinget claims that this technology can produce devices that are 100 times more energy efficient than their modern counterparts.

These circuits could be used in remote sensors on buildings or bridges, embedded in clothing, or to monitor weather conditions at different locations. Kinget envisions a wireless sensor network with nanoscale devices dispersed throughout a building, monitoring energy usage, and communicating with the smart grid.

Image courtesy of Baradwaj Vigraham and Peter Kinget (Columbia Engineering)

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