F-RAM Technology Enables Greener Wireless Sensor Applications

Ramtron International Corporation revealed that the Zurich University of Applied Sciences Institute of Embedded Systems (ZHAW InES) recently presented a paper summarizing research conducted with Ramtron F-RAM designed into a battery-free wireless sensor node. The research, presented this summer at the European ZigBee® Developers Conference in Munich, Germany, demonstrated that the use of F-RAM nonvolatile memory in energy harvesting applications can reduce energy consumption of the wireless sensor node by over 40 percent while reducing the total wireless sensor system cost, as compared to systems built with standard nonvolatile memory components.

Wireless sensor — an ingenious, high-tech Rube Goldberg device Wireless sensor networks are designed into state-of-the-art building automation systems. A wireless switch, for example, can operate without batteries or hardwired electrical infrastructure. The switch uses energy harvested from solar, mechanical or piezoelectric input (energy formed by compressing or deforming a material). The minute amount of energy given off from the switch is sufficient to power up a transmitter that sends a radio signal to a receiver that powers up lighting or other systems in a home or office. The wireless switch is economical and eliminates wiring, battery replacement, and labor costs. A wireless switch can also provide creative design flexibility for architects, as the wireless switch can be positioned virtually anywhere, uninhibited by wires and conduit.

F-RAM reduces cost, improves performance Research led by ZHAW professor, Dr. Marcel Meli, concluded that the use of F-RAM nonvolatile memory in a wireless switch can improve the performance of energy harvesting powered ZigBee wireless nodes (low-power digital radio). “The justification for using a wireless switch comes from lower installation and maintenance costs, but a ZigBee-sensor requires a lot of overhead. The more energy is required, the more expensive the system,” comments Prof. Dr. Meli. “We have discovered that by using the inherently low-power F-RAM from Ramtron in our experimental board designs, more energy is available for the transmitter and other functions, like saving the processor status. We also recognize the longevity of the F-RAM cell. Compared to traditional nonvolatile memories like EEPROM or Flash, F-RAM can be rewritten virtually forever—well in excess of a typical wireless product’s lifetime.”

Prof. Dr. Meli’s research also suggests that F-RAM can reduce the total bill-of-materials associated with wireless sensor nodes powered by harvested energy. By using F-RAM to restore the state of the processor only when enough energy is available, less power management is required and there are fewer constraints on the storage system, thereby reducing system complexity and component costs.

A PDF presentation of the research by Prof. Dr. Marcel Meli and Mr. Marcel da Silva, Using F-RAM in Battery-less 802.15.4/ZigBee Applications, is available for download from bit.ly/Qlaq9r [1].

For more information, visit www.ines.zhaw.ch/en.html [2].

For more information, visit www.ramtron.com [3].

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