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To all Press

YRP Ubiquitous Networking Laboratory

## **Successful Development of the World's Smallest 15mm x 15mm Active Electronic Tag, "Dice"**

The YRP Ubiquitous Networking Laboratory which is a research laboratory for the core technology of ubiquitous computing (Shinagawa Ward, Tokyo, Director: Ken Sakamura, University of Tokyo Professor / Chairman of the T-Engine Forum and the Ubiquitous ID Center) has been working on the development of active electronic tags used for ubiquitous computing. The laboratory has reduced the size and power consumption of such tags, and successfully developed the world's smallest active electronic tag named "Dice" which measures 15mm x 15mm including the battery. The active electronic tag "Dice" was designed to conform to the specifications of the pT-Engine (pico T-Engine) of the T-Engine Forum, which is an organization that works on the standardization and promotion of the core technology for Ubiquitous Computing.

The YRP Ubiquitous Networking Laboratory has been advancing research and development to establish the core technology for automatic identification of "physical objects" and the realization of a ubiquitous computing environment. Within the research framework, the active electronic tag "Dice" is an ultra-tiny computer with a built-in power source and can be attached to locations and physical objects in surrounding environment. It is to be positioned as the smallest unit of ubiquitous computing that continually obtains information on physical objects, locations and environment for a long period of time and communicates wirelessly.

When active electronic tags employ wireless communication, it is extremely important to ensure communication security in order to protect the communication contents and privacy from prying eyes. YRP Ubiquitous Networking Laboratory has been conducting research and development on the core technology for communications security called "eTRON" and has been working towards building networks that allow access only from authorized network nodes and the realization of secure communication to prevent contents from being eavesdropped. The "Dice" is equipped with an interface socket to install an eTRON chip for secure communication.

### **[Features of the Active Electronic Tag "Dice"]**

#### **(1) The world's smallest Active Electronic Tag**

By implementing the whole LSI including the 315MHz low-power wireless communications circuit in the CSP (Chip Size Package), the smallest active electronic tag in the world with a volume of 3.4cm<sup>3</sup> (15mm x 15mm horizontal area) including the battery has been successfully developed (half the size of the previous products of our laboratory).

**(2) Long operating time due to very low-power consumption**

Now we have a mechanism that completely stops the microcomputer clock while waiting during intermittent operations. Coupled with the reduced elapsed processing time due to further improvements in microcomputer performance have successfully realized extremely low average current usage of 7.6μA. This tag will operate for approximately 2.3 years with intermittent communication at 5 minutes interval (theoretical value when a CR2302 coin battery is used) or will operate for 5.5 months with the installed ultra-tiny secondary battery (theoretical value)..

**(3) Anti-collisions for 1000 Dices**

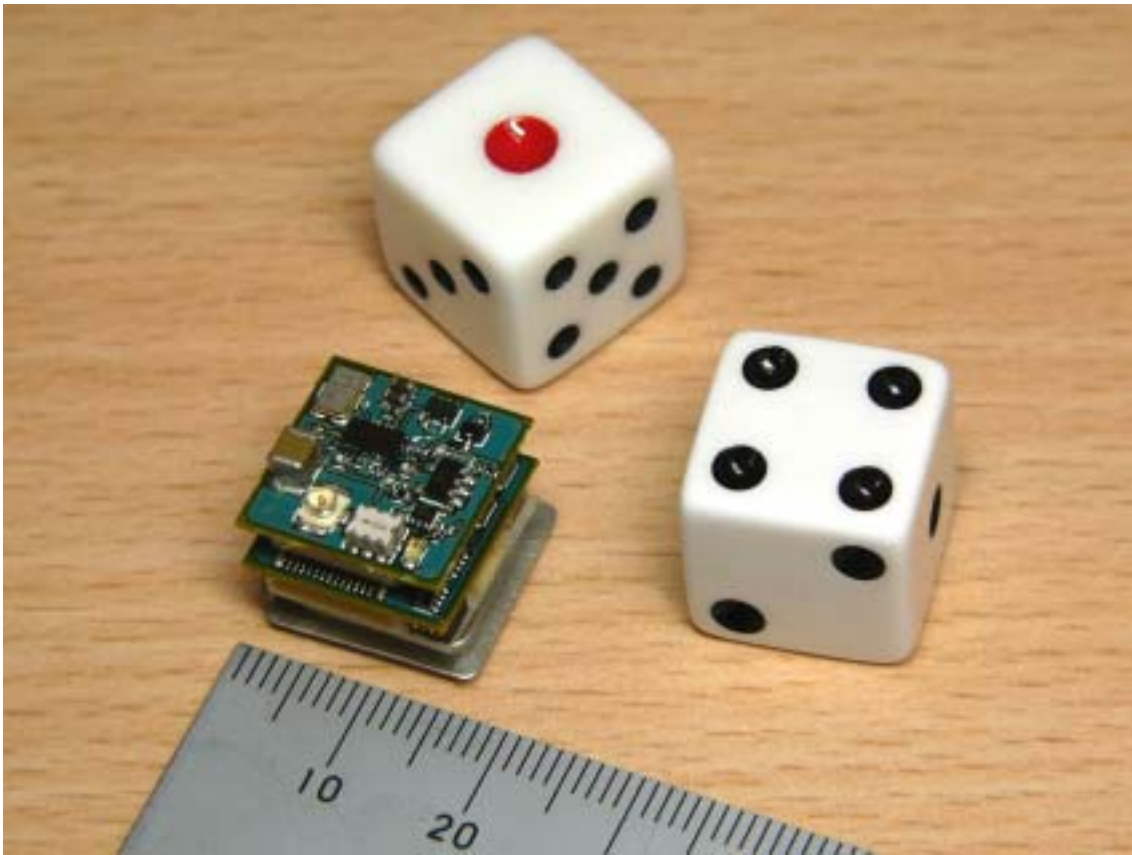
It has an anti-collision function that permits a receiver to identify more than 1000 Dices simultaneously.

**(4) The eTRON framework provided for secure communications**

It is possible to use DES to encrypt data for communication between the “Dice” and the receiver. Furthermore, the eTRON interface board allows the use of stronger security protocols. An eTRON chip provides nonvolatile memory internally and has a secure storage function that prevents electronic data from being changed or retrieved without the use of the dedicated communication protocol. Moreover, it has a cryptographic processing circuit for efficient, authenticated communication using the public key cryptography.

This active electronic tag “Dice” has a wide range of applications in many fields from distribution and supply chain management to drug tracing, and large numbers of “Dice” will be used for feasibility study experiments in months to come.

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\* A part of the results of the research sponsored by the Ministry of Internal Affairs and Communications, “Research and development of ubiquitous networking technology/ultra-tiny chip networking technology” is included in the research and development of “Dice”.