

Toppan Printing Develops Electronic Paper Display Powered by Energy Harvesting Technology

Enables display functionality on batteryless EnOcean-compliant IoT devices

Toppan Printing Co., Ltd. (hereafter Toppan Printing; head office: Chiyoda Ward, Tokyo; President & Representative Director: Shingo Kaneko) has developed an electronic paper display (EPD) powered by energy harvesting technology. This EPD can be used to provide a display on batteryless Internet of Things (IoT) devices compliant with the EnOcean wireless communication standard. Toppan Printing will launch sample shipments in September 2018 and target collaboration with manufacturers of IoT devices.

As an example of an IoT device using the EPD, Toppan Printing will showcase a prototype of a batteryless switch at the 29th Design Engineering & Manufacturing Solutions Expo at Tokyo Big Sight from June 20 to 22.



Left: Newly developed electronic paper display. Segmented EPD technology enables ultralow power consumption.

Right: Example of the EPD applied to a batteryless switch that will be showcased at the 29th Design Engineering & Manufacturing Solutions Expo.

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■ Background

With Industry 4.0 and the IoT receiving significant attention, the use of information and communications technology (ICT) to leverage and visualize information in the manufacturing and logistics industries is becoming increasingly important.

EnOcean is a standard for batteryless wireless communication based on energy harvesting technology, whereby minute amounts of energy from external sources, such as sunlight, heat, and vibration, are captured and converted into electrical energy. The use of energy harvesting for sensors and switches is increasing rapidly, as it eliminates the need to provide a power source or change batteries. EPDs, meanwhile, have various advantages over other types of displays. They are thin and lightweight and offer visibility close to that of paper while consuming very little power.

Recognizing the potential offered by the characteristics of EnOcean and EPDs, Toppan Printing has applied its EPD manufacturing and development expertise, accumulated over the past two decades, to successfully create an EPD that can be powered by energy harvesting technology. This can help to enhance the user-friendliness of batteryless IoT devices by enabling them to now have a display that can show information at all times.

■ **Features of the technology**

• **EnOcean-compliant**

The new technology is compliant with the widely-adopted EnOcean wireless communication standard. Devices that adopt this technology can therefore be introduced easily in combination with systems that use existing data communication infrastructure.

• **Power required to change information displayed is extremely low**

Due to the ultralow power consumption of the EPD, information displayed can be changed using the minute amount of power provided by energy harvesting.

• **Segmented EPD technology**

A segmented EPD has been selected to take advantage of its ability to display numbers, letters, icons, and other pre-defined patterns smoothly with the lowest power consumption among the various EPD technologies.

• **Display can be maintained without power**

Information is constantly displayed until it is next changed.

■ **Batteryless switch prototype specifications**

Display screen	1.11 inch segmented E Ink electronic paper display
Power consumption	Approximately 200 μJ (up to approximately 2 inches)
External dimensions	Switch: 138 mm × 84 mm × 18 mm Display: 20 mm × 20 mm
Communication method	EnOcean wireless standard

■ **Future goals**

Toppan Printing intends to further develop the technology, select partners for collaboration, and begin mass production in spring 2019.

Toppan Printing will continue to leverage EPD products in both domestic and global markets to advance the development of products and services that enable the visualization of sensor information for a range of applications, including IoT-based process and status management.

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