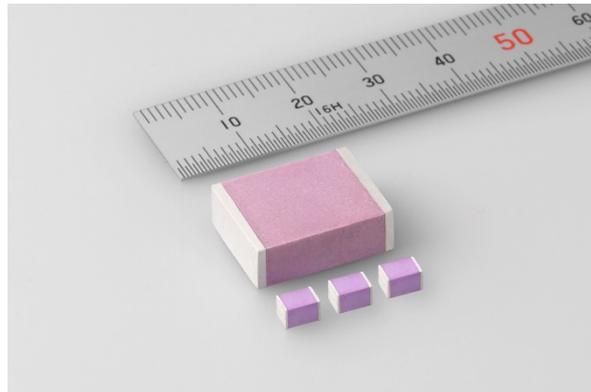


For immediate release

**TAIYO YUDEN Develops All-Solid-State Lithium-Ion Secondary Batteries**  
*Various Technologies Used in Multilayer Ceramic Capacitors Applied  
 to Effect a High Level of Safety*



TOKYO, December 10, 2019—TAIYO YUDEN CO., LTD. announced today the development of all-solid-state lithium-ion secondary batteries (hereinafter referred to as “all-solid-state batteries”) in which various technologies including the process technology of multilayer ceramic capacitors (MLCCs) are capitalized.

All-solid-state batteries are secondary batteries in which the electrolyte solution used in conventional lithium-ion secondary batteries is replaced with a solid. TAIYO YUDEN has realized all-solid-state batteries using oxide-based solid electrolyte ceramics by applying the materials and process technologies we have nurtured through the development of our core products, MLCCs.

TAIYO YUDEN's all-solid-state battery barely reacts with moisture and carbon dioxide contained in the air and will not burn since it contains no electrolyte solution. The possibility of diverting the production process used for MLCCs allows us to produce a laminated and multilayered solid electrolyte by applying existing process technology, which will contribute to realizing smaller, higher-capacity products.

With a lineup of products of various sizes, the majority of which with the same dimensions as MLCCs from 4532-size (4.5 x 3.2 x 3.2 mm) to 1005-size (1.0 x 0.5 x 0.5 mm), we plan to commence sample shipment in 2020 and mass production in 2021.

**Background**

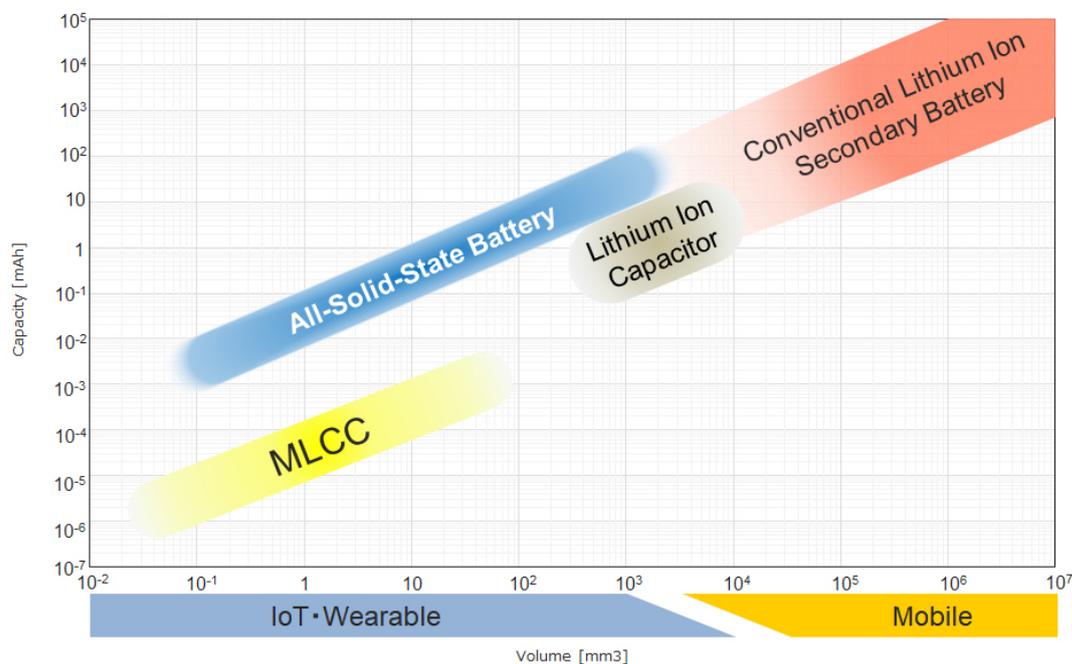
Recently, mobile devices such as wearable devices have increasingly become smaller and thinner. At the same time, the batteries embedded are required to have more capacity to support higher performance and longer operation time. On the other hand, wearable devices, which are placed very closely to the human body, must have a high-level of safety to prevent their ignition and abnormal heating of batteries. Therefore, the batteries embedded must be small, high-capacity, and have a high level of safety.

However, widely distributed lithium-ion secondary batteries use a liquid or polymer as the electrolyte and therefore require separators and an external package, which do not directly contribute to the capacity. This has been a challenge in the realization of smaller and more advanced devices. In addition, lithium-ion secondary batteries are associated with various risks such as the release of hazardous substances from decomposed electrolyte, as well as abnormal heating and ignition caused by a short circuit. To resolve such disadvantages, all-solid-state batteries, in which the electrolyte is replaced with a solid, have been actively developed.

The all-solid-state batteries TAIYO YUDEN has developed use our proprietary oxide-based solid electrolyte ceramics; thus, no separator is required. By using multilayer process, smaller dimensions and a higher capacity can be achieved simultaneously. Our original oxide-based solid electrolyte ceramics barely react with the constituents in the air and therefore do not require any special environments such as a high-level dry room, allowing us to divert the production process technology used for our core MLCC products.

We will continue to develop products with advantages such as small shape, from material development to product design, in response to market demand.

## TAIYO YUDEN



Coverage areas of conventional lithium-ion secondary batteries,  
our existing products, and all-solid-state batteries