

# Integrated Backup Power Supply for Automotive X-by-Wire System

## 1. Overview

In recent years, the shift toward electric vehicles and the accelerated electrification of automotive equipment have led to the expanding adoption of by-wire control, which operates control targets using electrical signals. However, by-wire control faces the challenge of becoming uncontrollable when the vehicle power source (such as a lead-acid battery) malfunctions. (Fig. 1)

Sumitomo Wiring Systems, Ltd., a member of the Sumitomo Electric Group, developed an integrated backup power supply (GEN3) enabling multiple by-wire controls to continue functioning during vehicle power supply failures. Adopted in the Prius launched in 2023, it is being progressively deployed. (Photo 1)

This time, mass production has begun for the GEN4 integrated backup power supply, which maintains the energy capacity of GEN3 while achieving a smaller size and lighter weight. It has been adopted for the Toyota Aqua launched in 2025. Compared to the previous model, the new product achieves a volume reduction of approximately 30% and a weight reduction of approximately 50%, contributing to improved vehicle mounting flexibility and resource conservation.

## 2. Features

We adopt a DC / DC converter and high-voltage energy storage element (electric double-layer capacitor). Furthermore, changing the housing material from metal to resin enables miniaturization and weight reduction. (Photo 2)

### • Miniaturization and weight reduction

This product utilizes a high-voltage electric double-layer capacitors manufactured by Nippon Chemi-Con Corporation. To maximize capacitor performance, the conventional bidirectional DC / DC converter control was revised, optimizing voltage and current control. Increasing the energy storage per capacitor reduced the required number of units, contributing to miniaturization (~25% compared to conventional models).

Furthermore, the noise-shielding metal case was replaced with a resin case. A partial shielding structure, which locally covers noise sources with metal, was adopted. Combined with noise suppression control technology, this ensures noise resistance while achieving a weight reduction of over 50%.

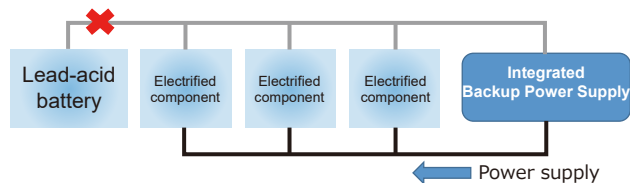


Fig. 1. X-by-wire components and backup power supply

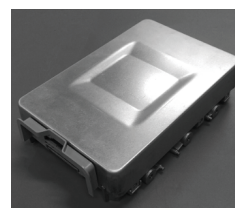


Photo 1. Exterior of integrated backup power supply

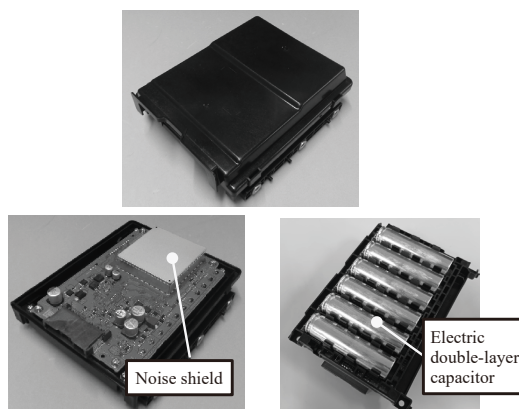


Photo 2. Exterior of integrated backup power supply, internal circuitry, and energy storage element

Table 1. Key specifications

	Integrated backup power supply for x-by-wire		
	GEN 2	GEN 3	GEN 4
Stored energy	0.36 Wh	0.48 Wh	<b>0.48 Wh</b>
Operating temperature range	-30°C ~ 65°C	-30°C ~ 65°C	<b>-30°C ~ 65°C</b>
Storage temperature range	-40°C ~ 85°C	-40°C ~ 85°C	<b>-40°C ~ 85°C</b>
Outside dimensions	150×131×50 mm	200×131×50 mm	<b>161×131×45 mm</b>
Weight	700 g	920 g	<b>435 g</b>