Combining ultra-thin rechargeable battery and ultra-low power consumption technologies!

Achieves maintenance-free devices 「EnerCera® x Nano Energy™」

January 14, 2022
NGK INSULATORS, LTD.
ROHM Co., Ltd.

Collaboration Concept

NGK INSULATORS

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Battery

EnerCera®

Ultra-compact li-ion rechargeable batteries ideal for IoT applications.
Power storage device that outputs high current while maintaining constant voltage.

✖

ROHM SEMICONDUCTOR

Power Supply Technology

Nano Energy™

Ultra-low consumption power supply technology that enables 10-year drives on a single coin battery.

Achieves longer battery life, faster response, and smaller mounting area!

Optimal solution for achieving maintenance-free devices

Features of Nano Energy™

“ROHM’s Nano technologies”

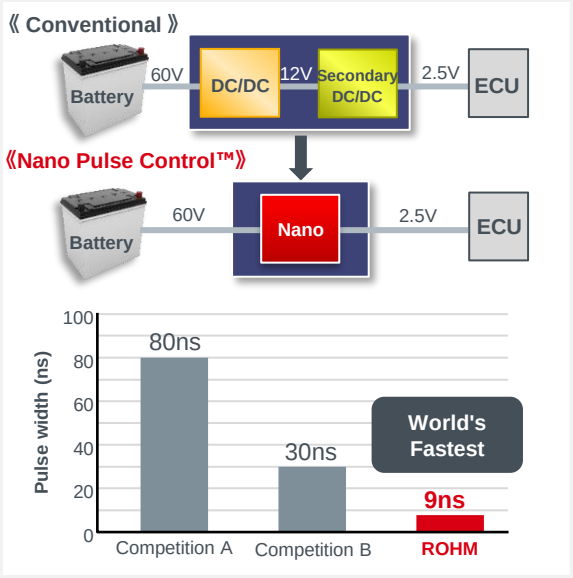
Nano Pulse Control™

Voltage conversion from high voltage to low voltage is achieved with single power supply IC.

ns

Ultra-fast pulse control technology

World’s fastest switching (9ns).
Capable of stepping down a 60V power supply to 2.5V immediately.



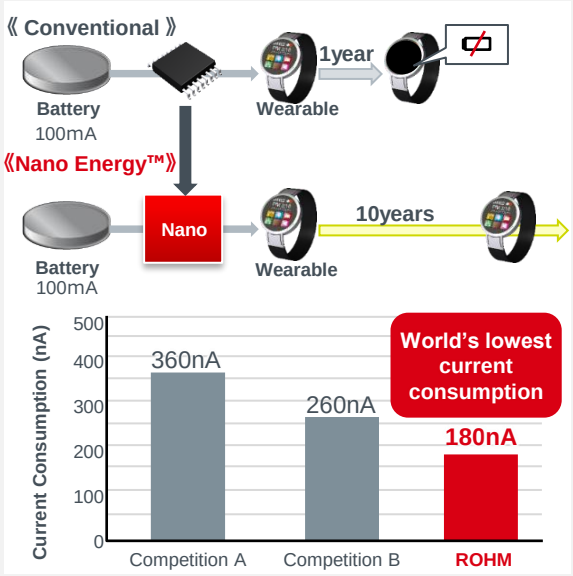
Nano Energy™

Ultra-low power consumption technology.

nA

Ultra-low current consumption technology

Achieves ultra-low current consumption of 180 nA. Achieves "10-year operation” with coin cell batteries.



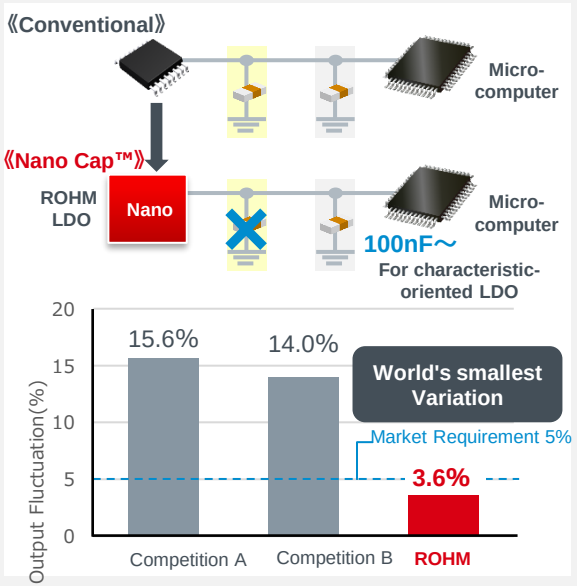
Nano Cap™

Technology that enables stable control even at capacitances in the magnitude of nF.

nF

Ultra-stable control technology

World's smallest voltage fluctuation at each capacitor capacity.



*Nano Pulse Control™, Nano Energy™ and Nano Cap™ are trademarks of ROHM Co., Ltd.

Ultra-low Power Consumption Technology
Nano Energy™

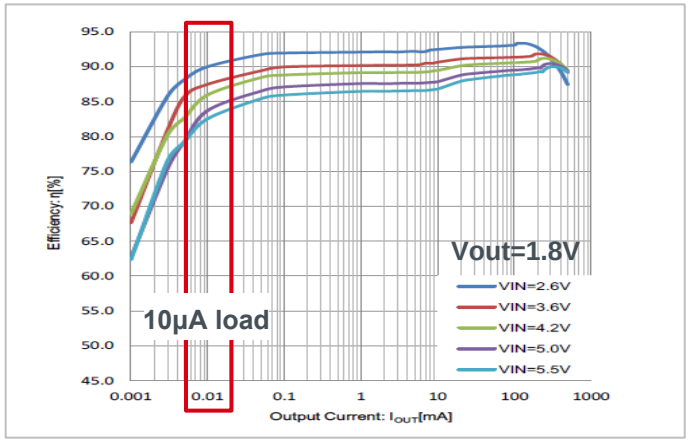
Developed with a goal of “10-year drive using single coin battery” for the IoT Industry.
Ultra-low consumption technology enables long-term drive for devices.

Nano Energy™ Step-down DC/DC Converter

Reduced standby operating current to 180nA ; making it the world's smallest, without compromising responsiveness!

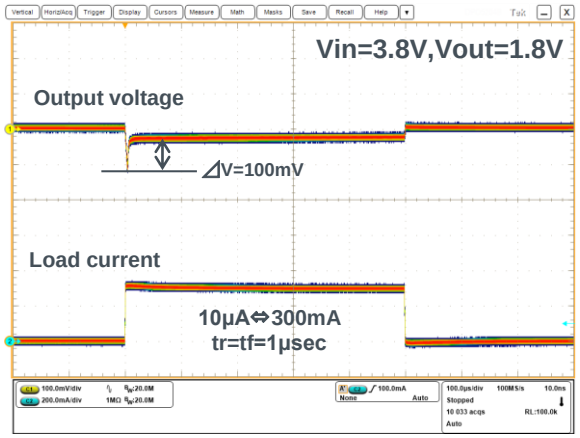
High efficiency at light loads

Maximum efficiency of 90% at load current of 10μA.
→ Losses in standby state is significantly reduced.



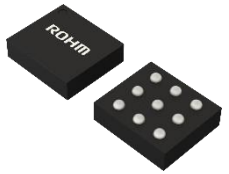
High speed response

Fast load response at light load conditions.
→ Ideal for systems with intermittent operation!



Space-saving

Thin and small
WLCSP package

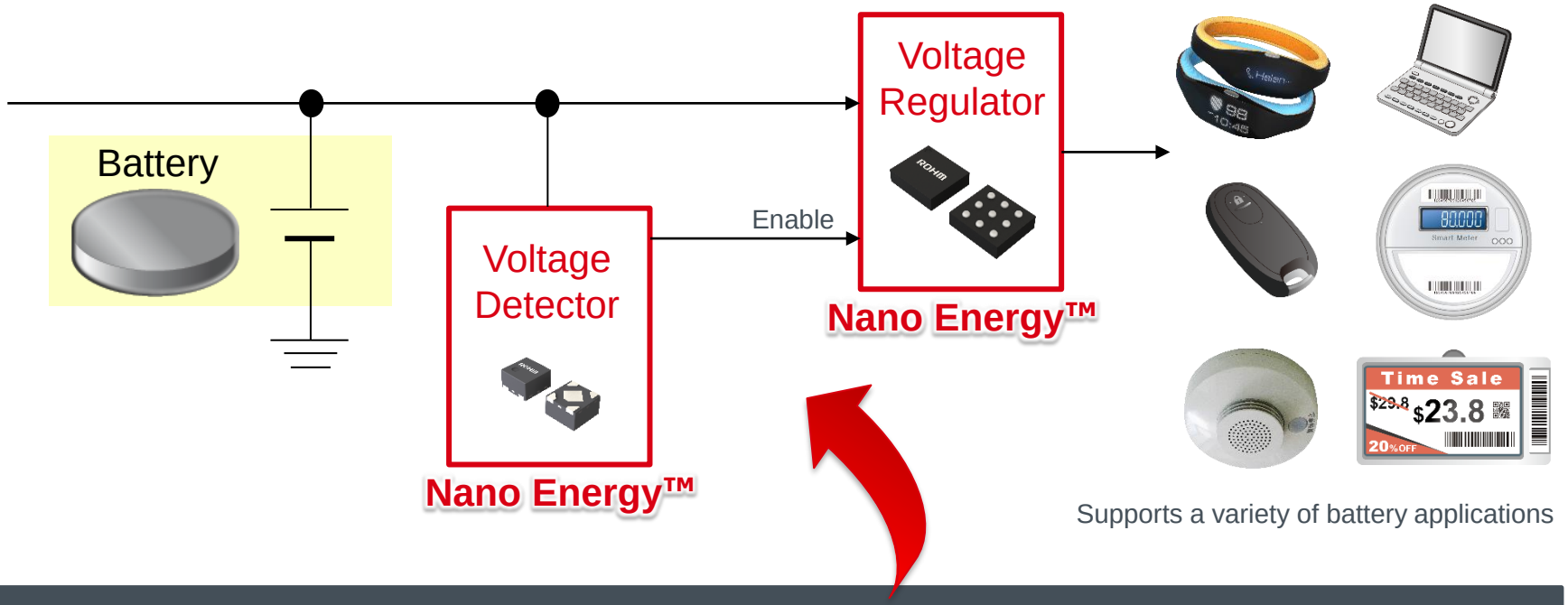


1.76x 1.56 x 0.57mm

Fields of application

Lithium-ion battery, Coin cell, Dry cell, Energy Harvesting, and others

Nano Energy™: Ideal for Battery Applications



Supports a variety of battery applications

Nano Energy™ Technology Lineup

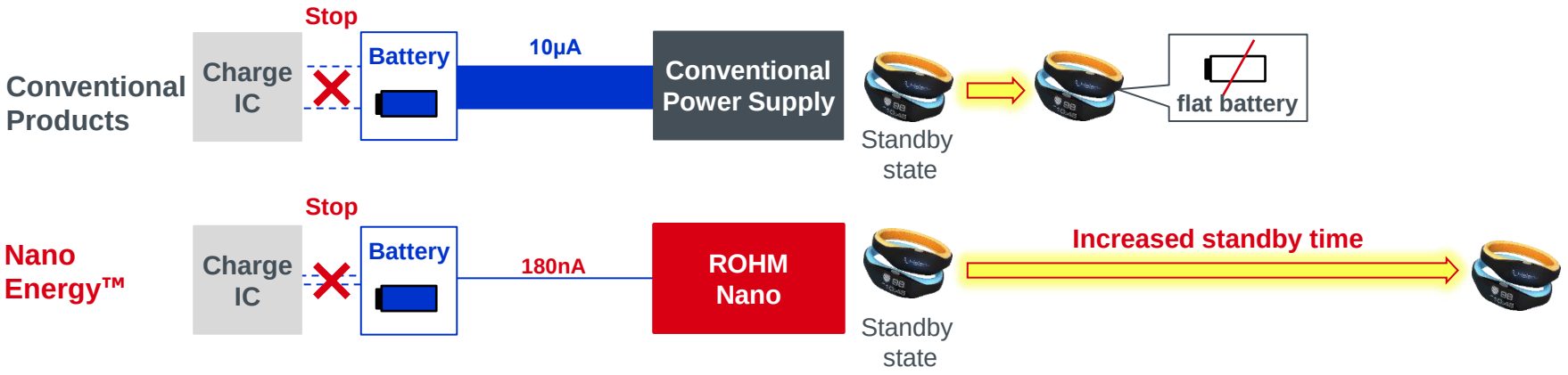
① **Step-down DC/DC Converter (Mass production)** … Current consumption 180nA
② **Step-up DC/DC converter (Under development)** … Current consumption of 180nA
③ **LDO Regulator (Under development)**
④ **RESET (Mass production)** … Ultra-small package!

Nano Energy™ technology extends the life of battery application products!

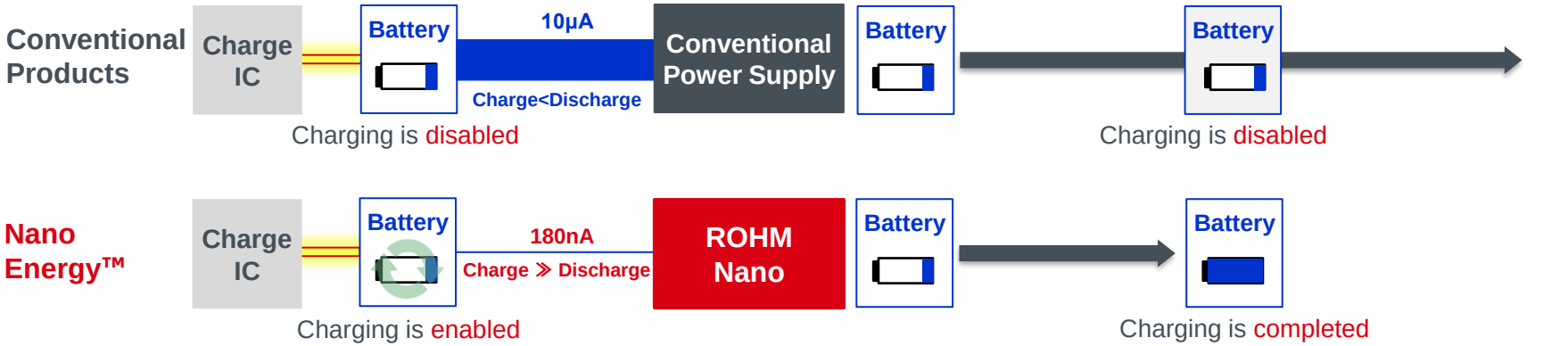
Nano Energy™: Application effects

Nano Energy™ technology maximizes the features of the battery charge/drive system!

① Extends standby time without recharging!



② Can be recharged even with low power supply while maintaining standby operation!

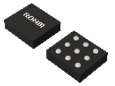


Solutions Lineup for EnerCera Pouch

Nano Energy™ Step-down DC/DC Converter BD70522GUL

Current Consumption	180nA Typ. (Current when switching is stopped)								
Output voltage (Switched by VSEL1/2)	1.2V	1.5V	1.8V	2.0V	2.5V	2.8V	3.0V	3.2V	3.3V
Output current	500mA								
Function	Power-good output								

Ultra-small !!
WLCSP



Mass production

Nano Energy™ RESET BD52(53)xxNVX

Current Consumption	270nA Typ.					
Detection voltage	2.6V	2.7V	2.8V	2.9V	3.0V	3.1V
Detection Voltage Accuracy	±2.5% (-40°C~125°C)					
Output form	BD52xx : Nch open drain BD53xx : CMOS					

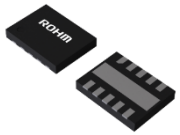
Ultra-small !!
1mm□

Mass production

Charge IC BD71631QWZ

Charging method	Optimal charging current and full charge voltage control for EnerCera pouches (CC-CV)
Input voltage range	3.0V ~ 5.5V
Function	Charging sequence Temperature detection Programmable end-of-charge current setting 10-hour charge timer Charge notification LED driver

Ultra-thin !!
t=0.4mm



Mass production

Collaboration of Battery and Power supply!

EnerCera® x Nano Energy™

EnerCera® & Nano Energy™ Collaboration Effect

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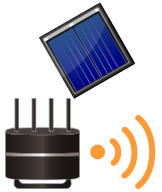
SUSTAINABLE DEVELOPMENT GOALS

Effect 1) "Charging >> Consumption" is achieved even when charging with low power.

Power Supply

Low power



Example:
Solar cells / Radio waves

Charging
>180nA

"Ultra-high efficiency energy storage unit."

EnerCera®

Large-capacity Battery

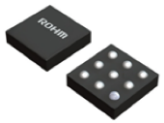
Thin and large capacity
Low self-discharge characteristics

High Output Power

Power consumption 180nA

Nano Energy™

High Efficiency DCDC at light load



Ultra-low current consumption

Suppresses discharge (loss) from EnerCera®

Standby
State ≒ 0

IoT Functions

- Various sensors
- Communication modules
- CPU
- Memory

Example:
Electronic shelf label

Effect 2) Combination of large capacity and low current consumption significantly extends standby time

Standby time		ROHM Conventional power supply	Nano Energy™
		10μA	0.18μA (180nA)
Thin, all-solid cell ※Height: 2 mm or less (equivalent to a lithium coin cell) (January 2021 ROHM Research)	0.1~10 mAh	41 days	2315 days
EnerCera® Coin (ET2016C-R)	25 mAh	104 days	5787 days
EnerCera® Pouch (EC382704P-C)	27 mAh	112 days	6250 days

Large capacity + low power consumption

Standby time: Calculated value obtained from "battery capacity" and "standby current consumption"

Nano Energy™ Technology: Utilizing 180nA current consumption

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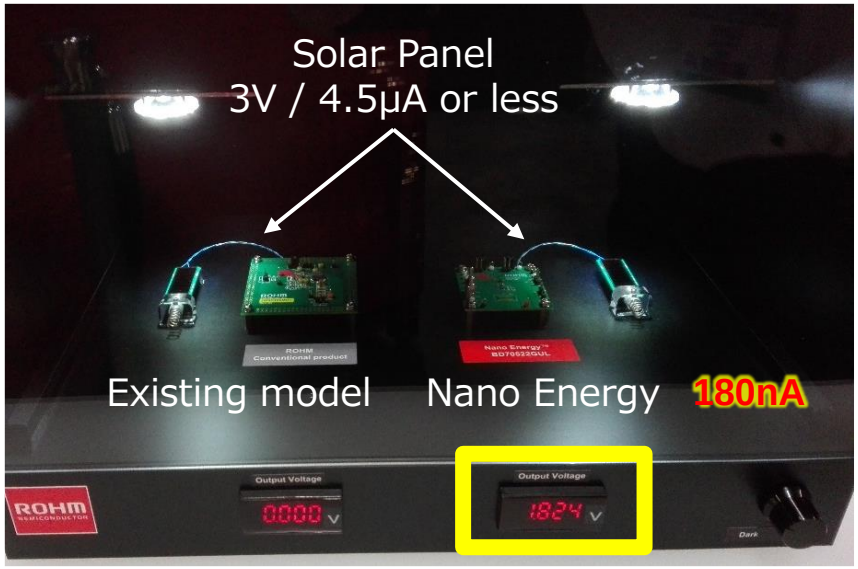
Example of Application for solar cells

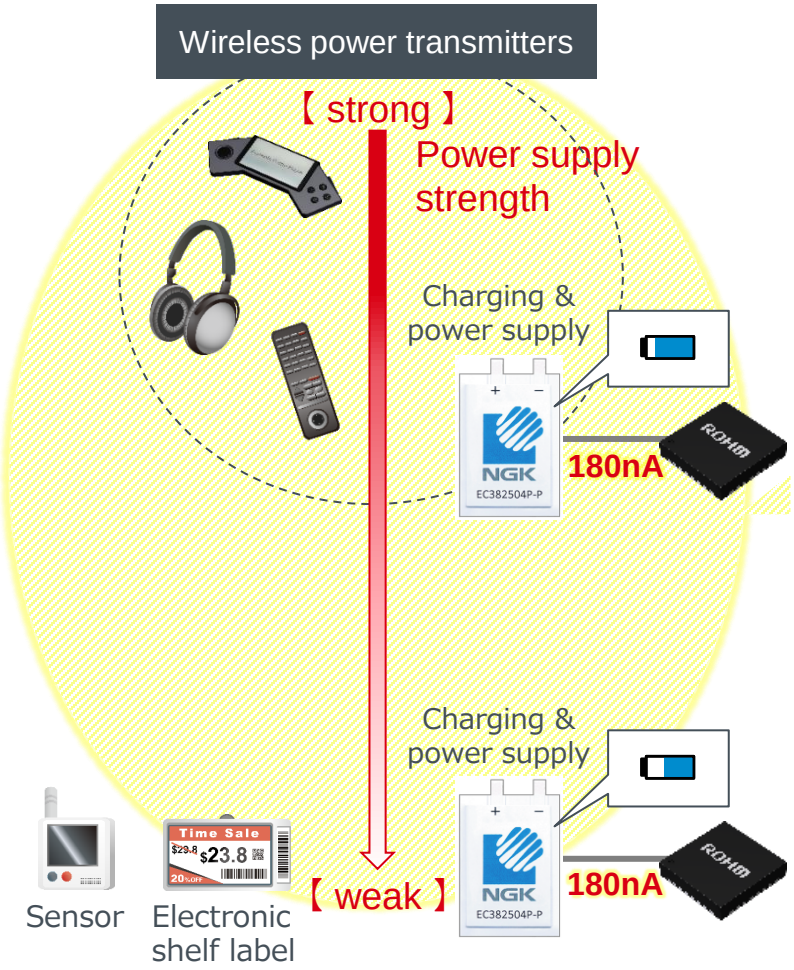
※ Solar Panel (8 cells)
Operating voltage/current : 3V/4.5μA @200lux



Maintains output voltage

Can operate even with low generated power

Example of Application for wireless power supply



Significantly expanded wireless power supply range

High Efficiency Charging & Power Supply

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"Ultra-efficient power storage unit."

EnerCera　Nano Energy

Example of application to Electronic shelf label

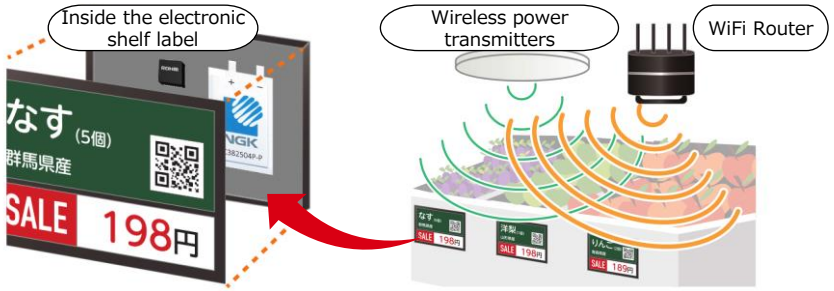
Point① Contributes to thinness and miniaturization

EnerCera

Ultra-thin

Nano Energy

Reduced mounting area



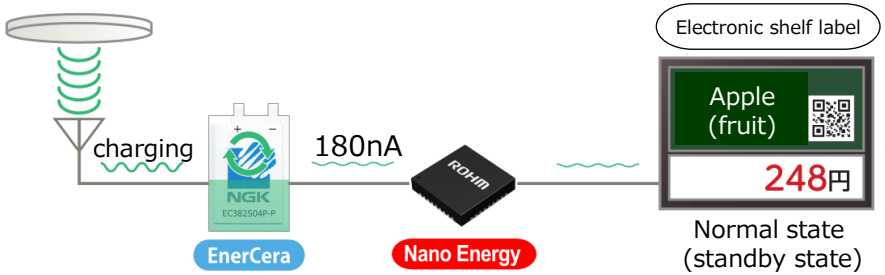
Point② Charged by low power!

EnerCera

Store power
in large-capacity batteries.

Nano Energy

Ultra-low consumption operation
that always stays on.



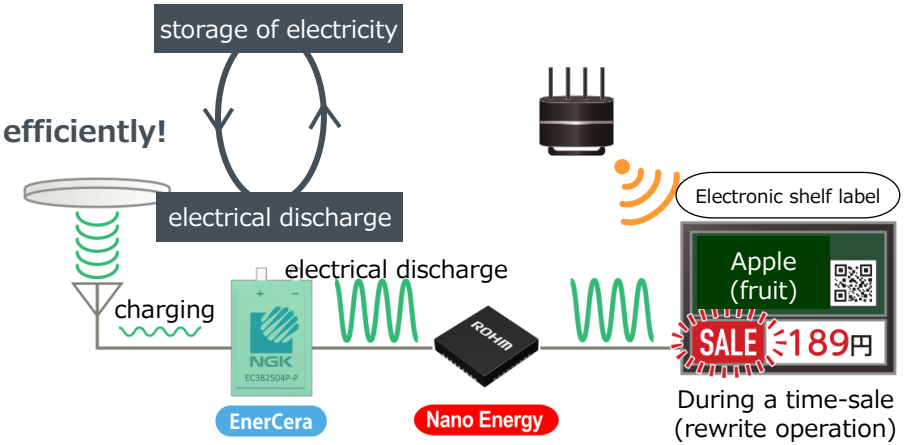
Point③ Discharges high power efficiently!

EnerCera

Discharges the stored large amounts of power at once

Nano Energy

Highly efficient conversion of power from EnerCera



High-Efficiency Battery Management Board

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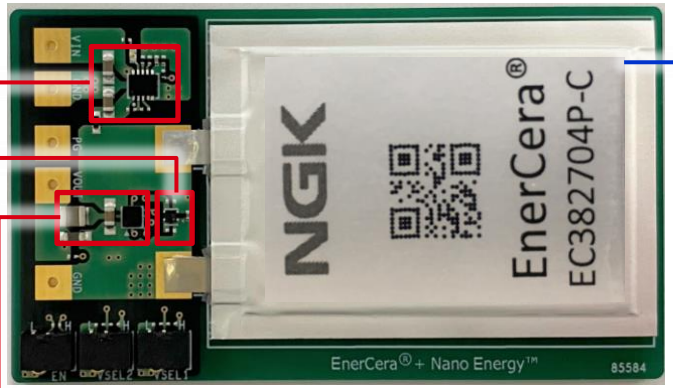
"EnerCera" and "ROHM ICs" made up an ultra-efficient power storage unit!

PCB size : 56mm x 32mm



EnerCera® Pouch
EC3822xx/EC3825xx/EC3827xx

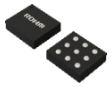
Ultra-thin (thickness≦0.45mm)
Large-capacity rechargeable battery

W(Typ) x D(Typ) x H(Max)
38mm × 27mm × 0.45mm
*EC3827xx Dimensions

Step-down DC/DC
BD70522GUL

Nano Energy™

High efficiency operation with ultra-low current consumption at light load
W(Typ) x D(Typ) x H(Max)
1.76mm x 1.56mm x 0.57mm



RESET
BD5230NVX

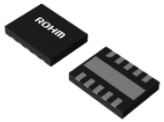
Nano Energy™ NEW!!

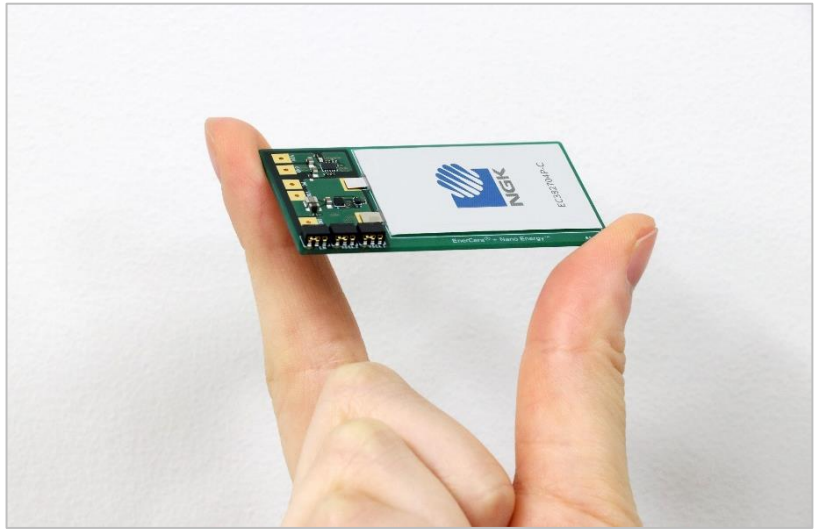
RESET IC in ultra-small package
W(Typ) x D(Typ) x H(Max)
1.00 mm x 1.00 mm x 0.60 mm

Charge control IC
BD71631QWZ

NEW!!

Ideal for charging low-voltage lithium-ion batteries
W(Typ) x D(Typ) x H(Max)
1.80 mm x 2.40 mm x 0.40 mm





- ✓ Low profile, small mounting area
- ✓ Total characteristics of "battery + power supply" can be evaluated.

Substrate Configuration that takes Advantage of EnerCera®'s Thinness

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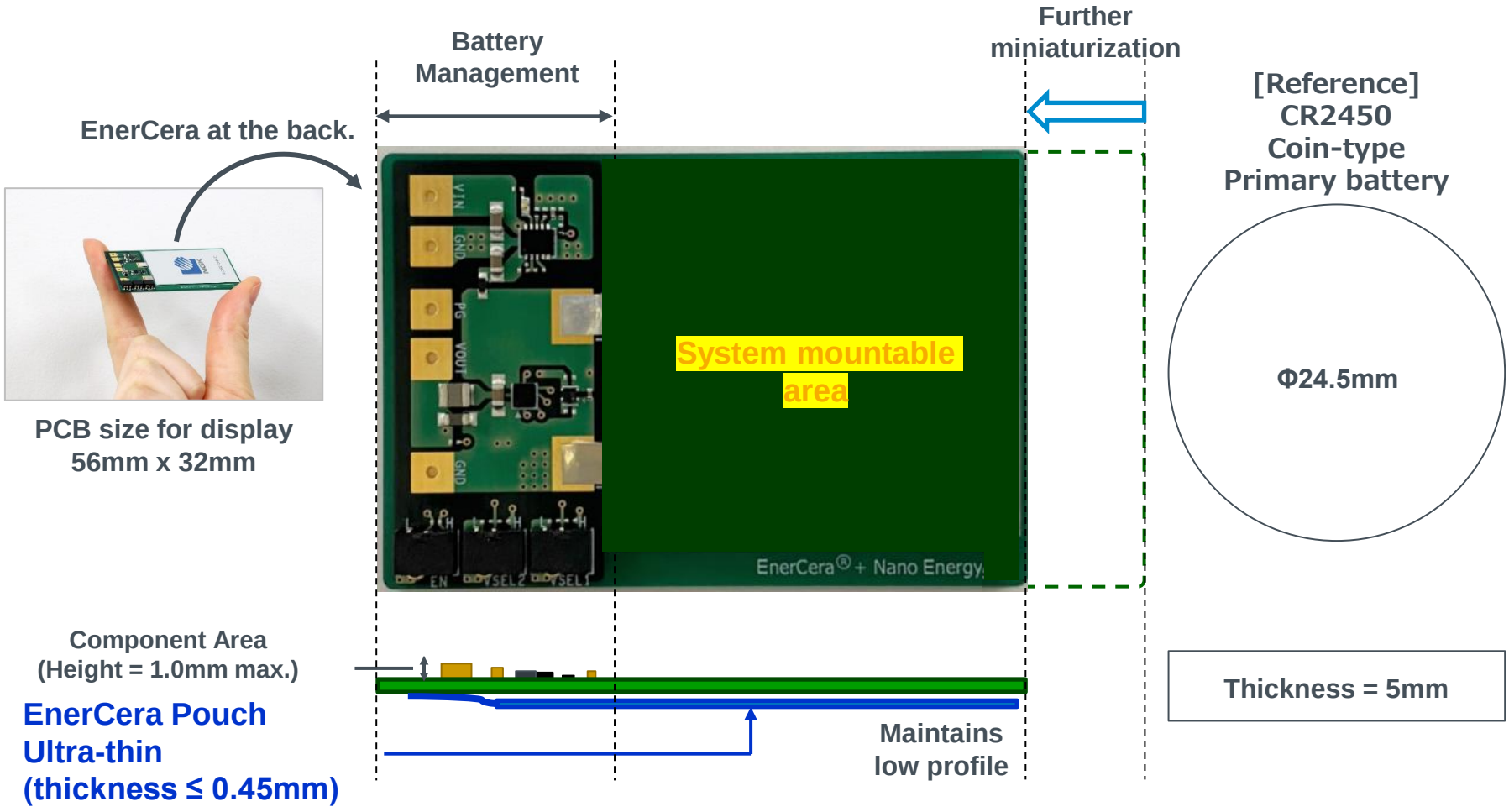
If the EnerCera Pouch is mounted on the back side, the battery mounting area is virtually zero!
Thus, contributing to the miniaturization and thinning of IoT devices!



Development of Applications in IoT Society

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The world of applications made possible by EnerCera + Nano Energy

The IoT device market is expanding toward an IoT society where all things are connected to the Internet.

Approximately 40 billion units in 2020 ※

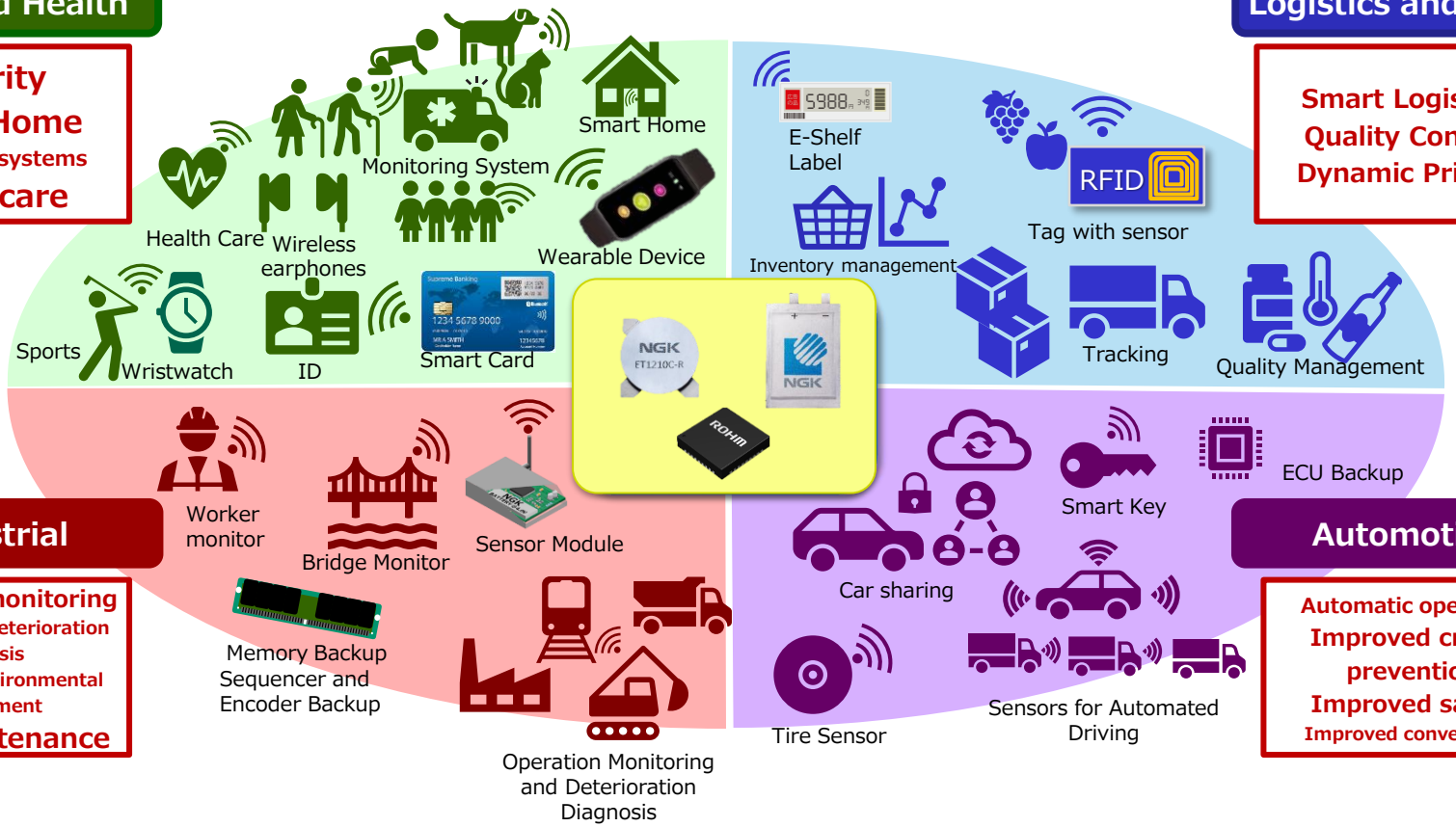
※ Ministry of Internal Affairs and Communications 2017 Information and Communication White Paper

Home and Health

Security
Smart Home
Monitoring systems
Healthcare

Logistics and Retail

Smart Logistics
Quality Control
Dynamic Pricing



Industrial

Equipment monitoring
Infrastructure deterioration diagnosis
Worker and environmental management
Data maintenance

Automotive

Automatic operation
Improved crime prevention
Improved safety
Improved convenience

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