The Eighth International Workshop on Power Supply on Chip (PwrSoC)
Leibniz University Hannover, Hannover, Germany
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Attracting Tomorrow

TDK

CeraCharge™

World’s first rechargeable solid-state SMD battery

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Contents

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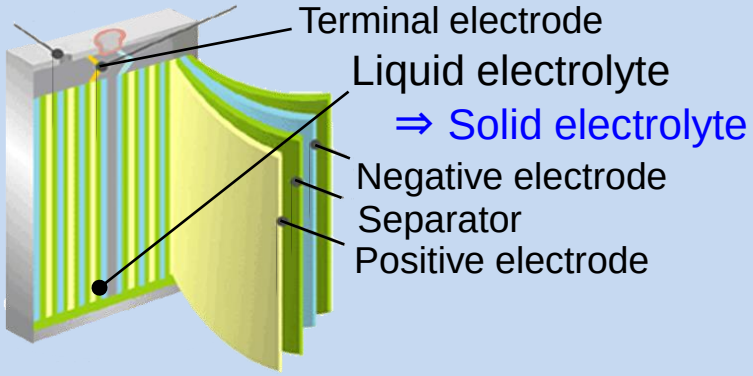
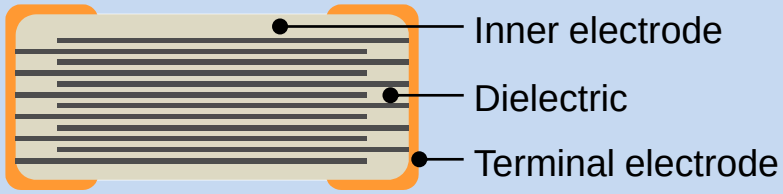
Development concept of CeraCharge™

Li-ion battery



Multilayer ceramic



CeraCharge™

- ✓ **Small**
- ✓ **Extremely safe**
  - Cannot leak, burn, explode
  - Pb-free
- ✓ **Easy to assemble**
  - Available in EIA case size
  - Reflow solderable
  - Embeddable
- ✓ **High volume productivity**

CeraCharge combines the advantages of Li-ion batteries with the safety and manufacturing benefits of multilayer ceramic components

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Specification

CeraCharge™		
Chip size	[EIA]	1812
Dimensions	[mm]	4.4 x 3.0 x 1.1
Nominal voltage	[V]	1.5
Operating voltage	[V_{op}]	0 to 1.6
Nominal capacity	[µAh]	100
Nominal discharge current	[µA]	20
Operating temperature	[°C]	-20 to +80

- Small, high safety, wide operation temperature, surface mountable
- Voltage and capacity can be arbitrarily controlled by connecting batteries in series or in parallel

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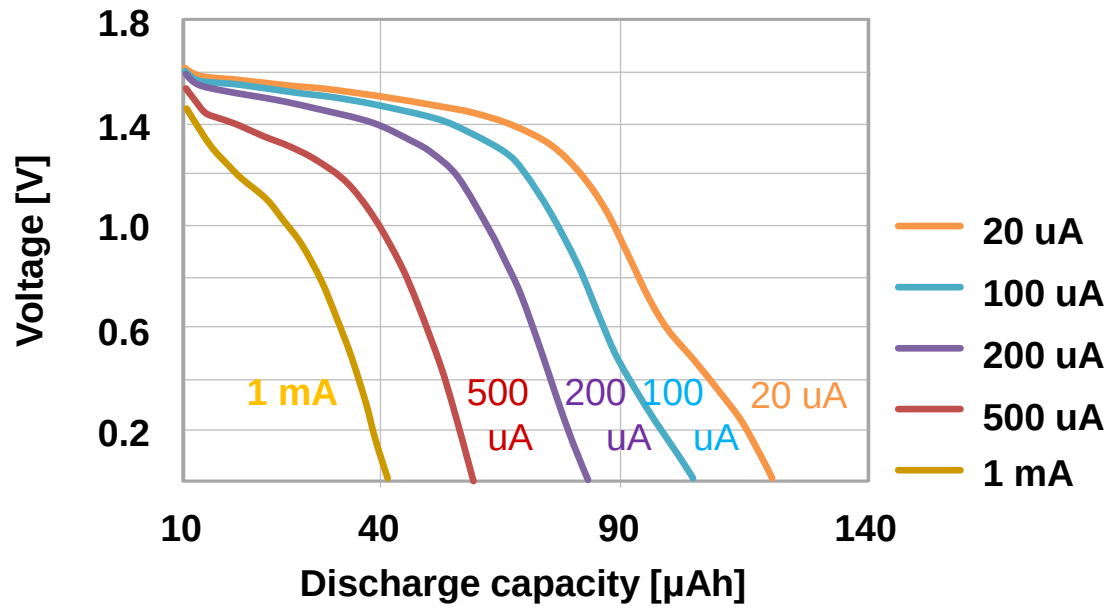
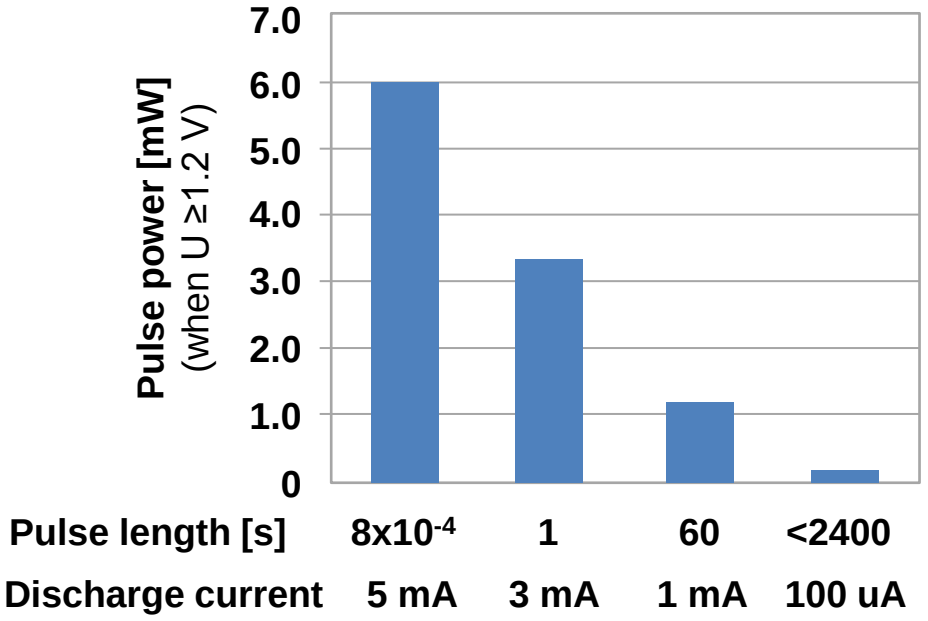
CeraCharge features fast and pulsed discharging

Typical discharge curves



Typical pulse power characteristics



CeraCharge can support a current up to 1 mA (10 C) and pulse current 3 mA for 1 sec

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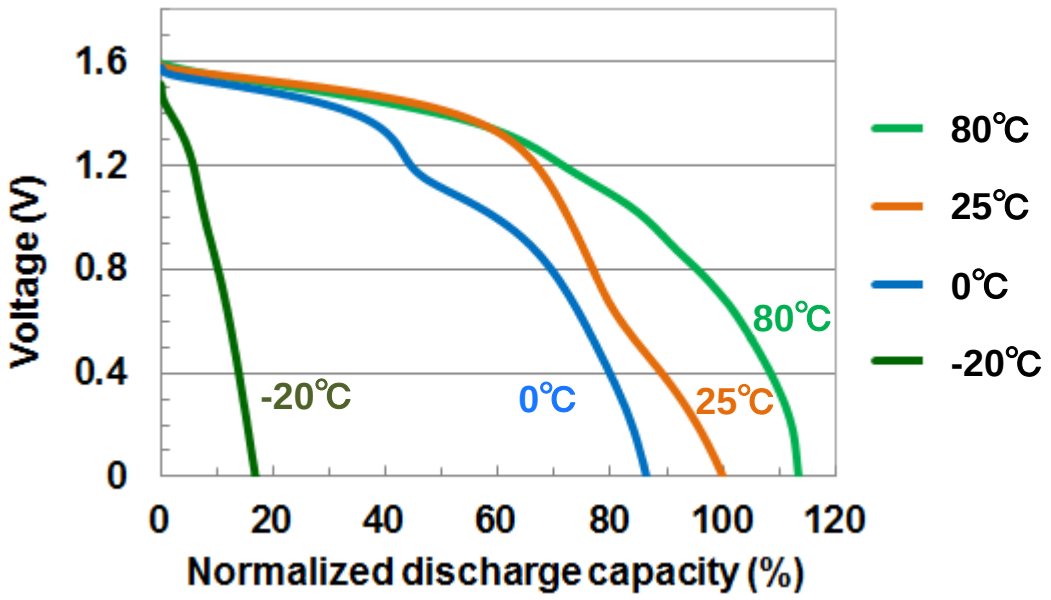
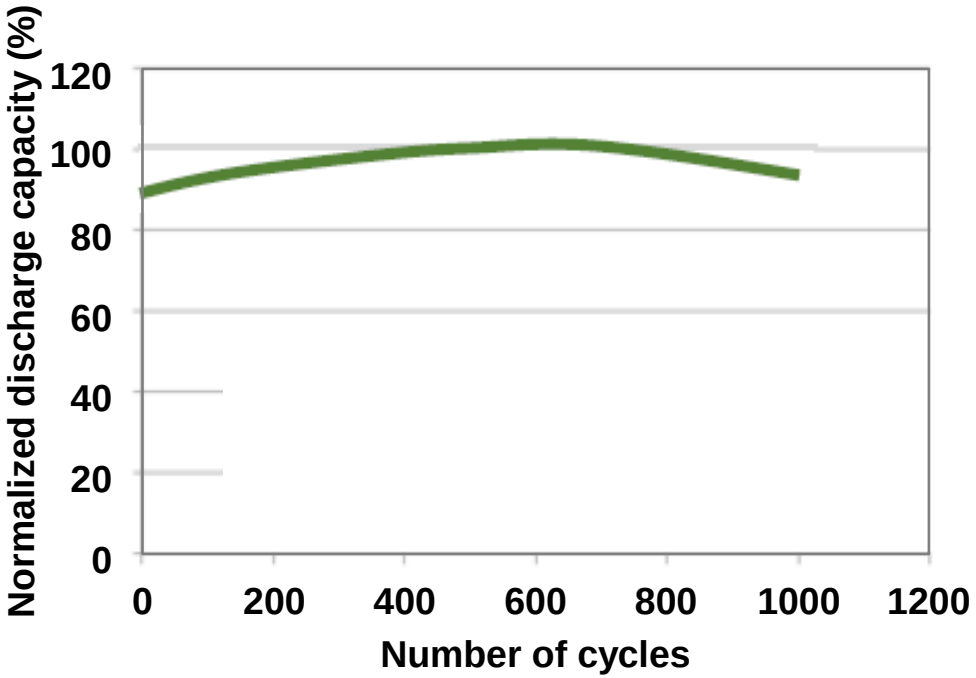
CeraCharge features wide temperature and long cycle operating

Temperature characteristics



Cycle characteristics



CeraCharge is able to work from -20°C to 80°C and up to 1000 cycles without any significant capacity loss

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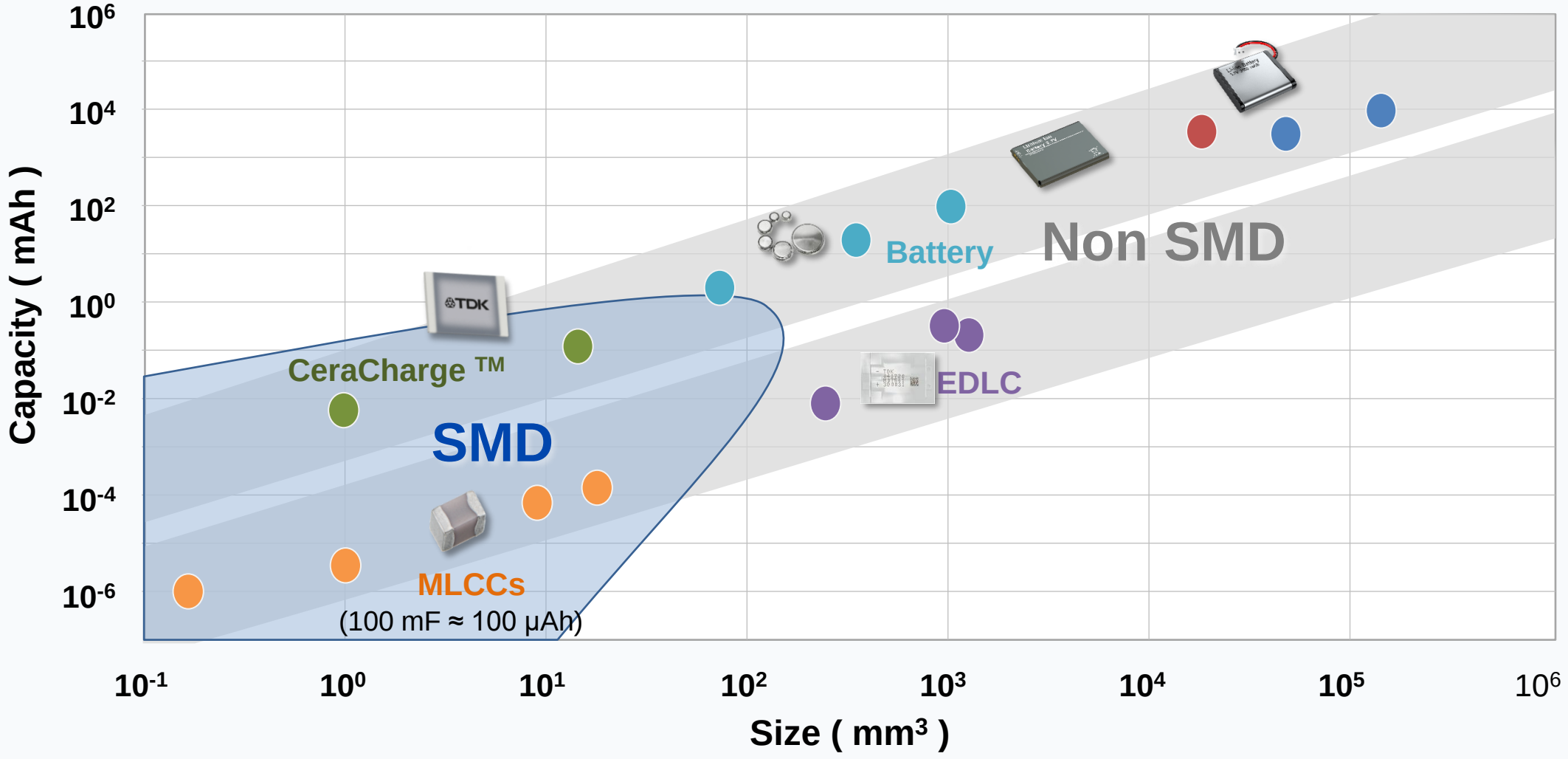
Comparison of energy storage devices



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Possible application of CeraCharge

Key benefits

- Small
- Extremely safe
- Easy to assemble

Real Time Clock (RTC)

- Smart-meter
- PLC

Beacon

- Sensors
- Tags
- Electronic shelf label
- Robotics

Wearable

- Solar Watch
- Fitness Bracelet
- hearing aids

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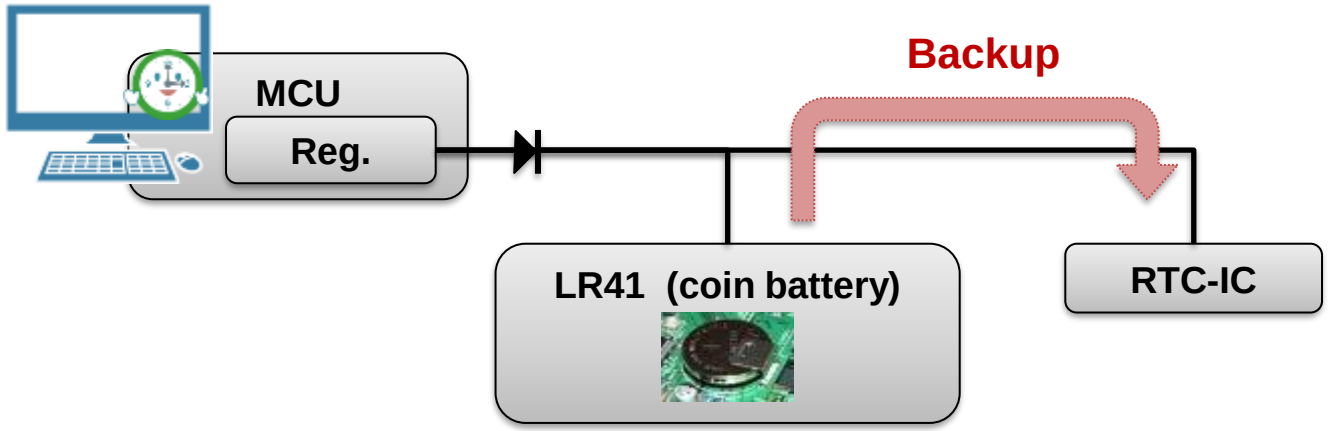
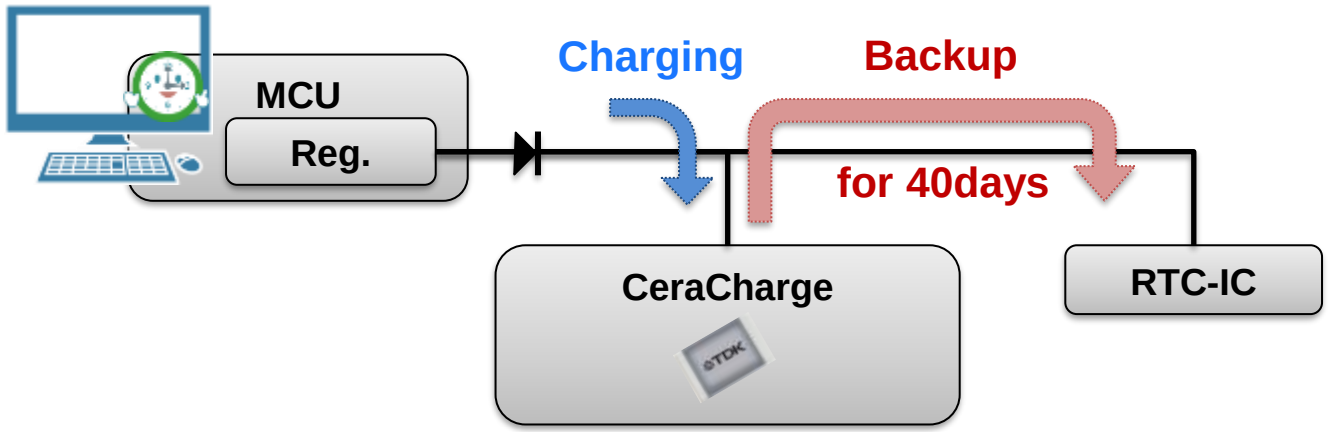
Real Time Clock (RTC) backup circuits

¬To keep an internal clock of µController





	LR41 (Coin battery)	CeraCharge
Voltage (V)	1.5	1.5
Capacity (mAh)	25	0.1
Charging	Not available	Available
Capacity consumption after 1000 uses (mAh)	25	0.1*1000 = 100
Replacement	need	no need
Size (mm)	Φ7.9*3.6 = 176 mm^3	4.5*3.2*1.1 = 16 mm^3
Operating temperature	-10 ～ 60 °C	-20 ～ 80 °C

CeraCharge can be used for RTC battery

Application example of CeraCharge™
– Energy-harvesting devices with all solid-state battery module

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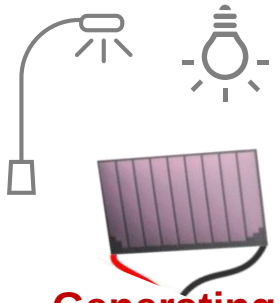
Sensing from everywhere without external power supply.
It brings new value to lives of people.

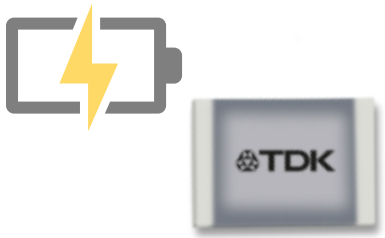
Solar cell



Generating

Generate electric power from outdoor & indoor lights

CeraCharge



Storing

Electric power is stored to CeraCharge

IoT

BLE

Transmitting

Sensor

Operating

No replacement required, no leakage, no burning

Maintenance-free energy harvesting device

Application

Application example of CeraCharge™ - Wireless cooking thermometer

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https://www.tdk.com/ja/featured_stories/entry_024.html

Device configuration

- 5 temperature sensor
- BLE communication module
- 2 CeraCharge

Key benefits

- Small
- Extremely safe
- Easy to assemble
- Wide temperature range

By inserting meat thermometer, you can monitor the temperature inside of meat with your smartphone and cook at optimum temperature

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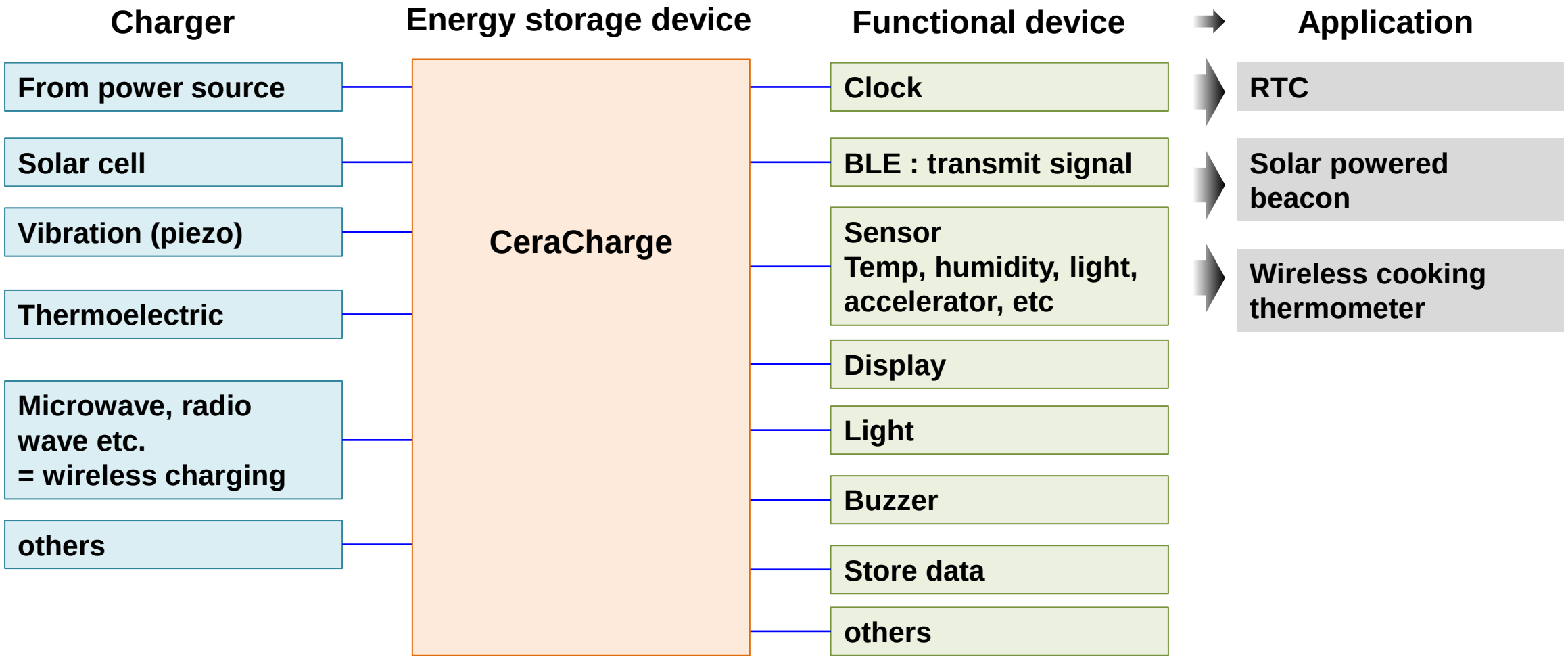
Other applications



We are open to discuss further applications !!!

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Contents

What all-solid-state battery can contribute to

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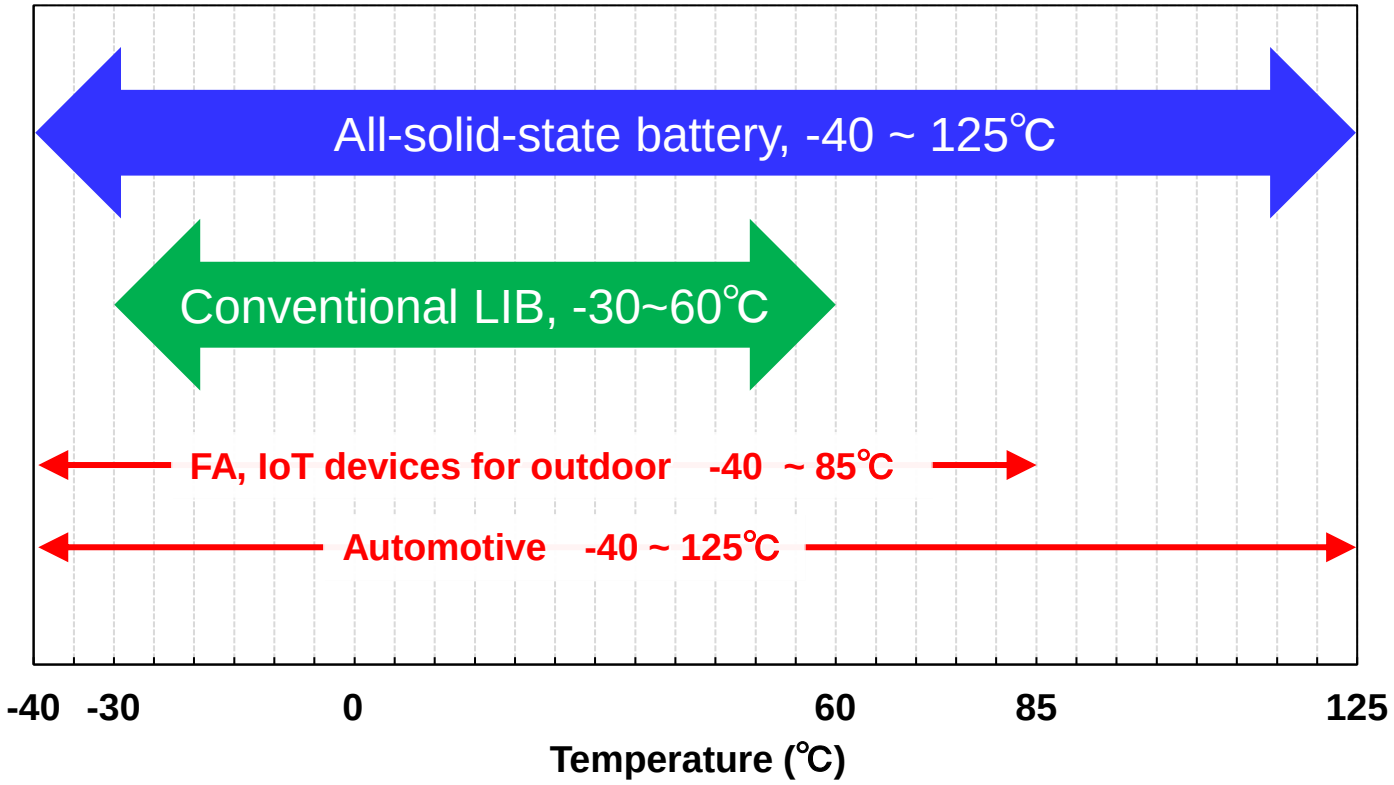
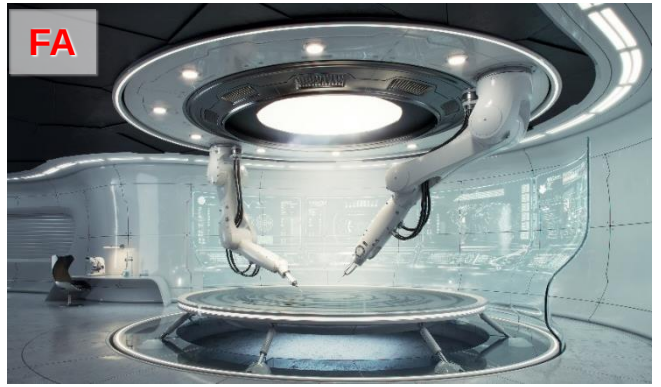
Expected features

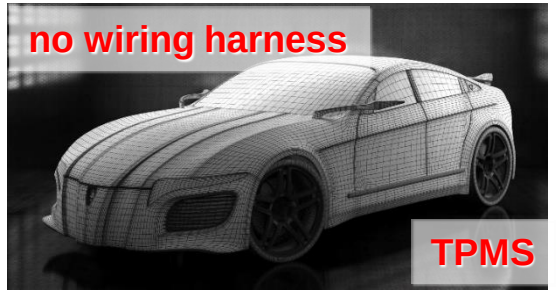
- ✓ **Extremely safe (No burning and leakage)**
- ✓ **Wide operation temperature**



Expected application



IoT devices for outdoor like infrastructure monitoring (aging roads, bridges and buildings)



Smart key

All-solid-state battery can contribute to use cases in harsh environments where LIBs cannot

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If you are interested in CeraCharge please contact us!

https://www.tdk-electronics.tdk.com/en/ceracharge


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