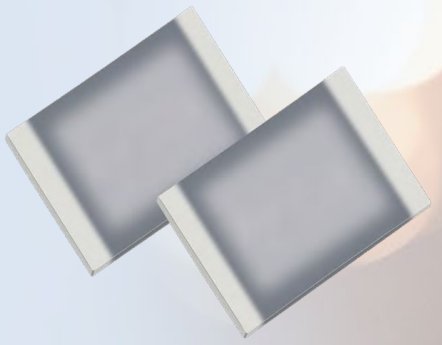
Attracting Tomorrow

TDK

CeraCharge

Rechargeable Multilayer Ceramic Chips

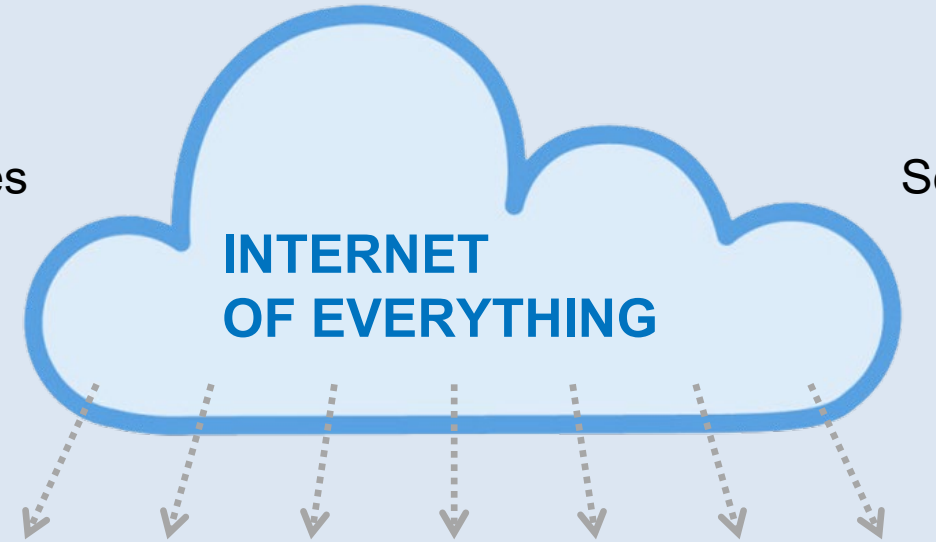


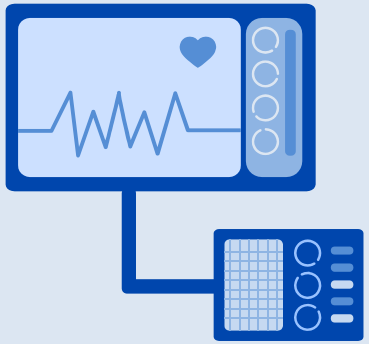
https://www.tdk-electronics.tdk.com/en/ceracharge

Demands for a New Energy Solution

Billions of devices

Sensors everywhere





Healthcare

Wearables

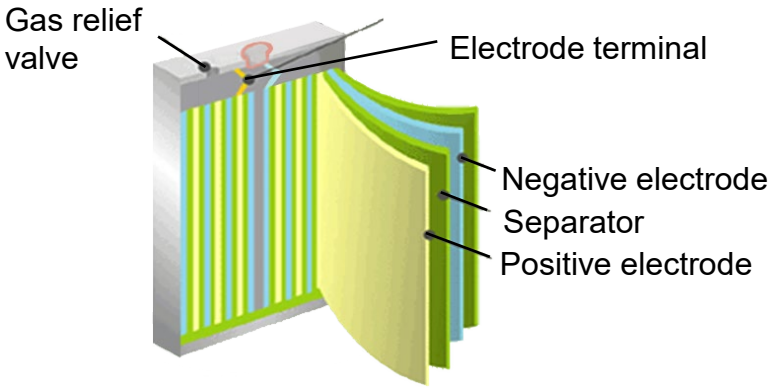
Energy harvesting

Smart home

New application fields are driving the demand for compact, safe, and rechargeable energy sources.

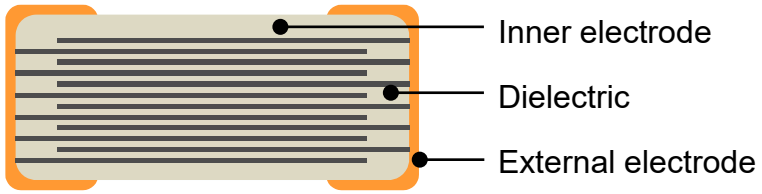
CeraCharge – Rechargeable Multilayer Ceramic Chip

Li-ion battery



Organic electrolyte (Li-ion)

Multilayer ceramic



High-energy Li-ion battery technology

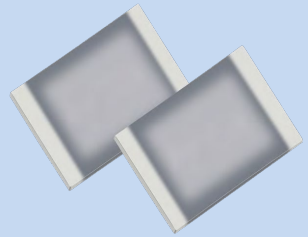
High-volume production process

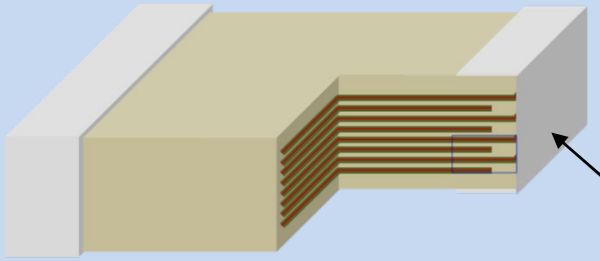
CeraCharge

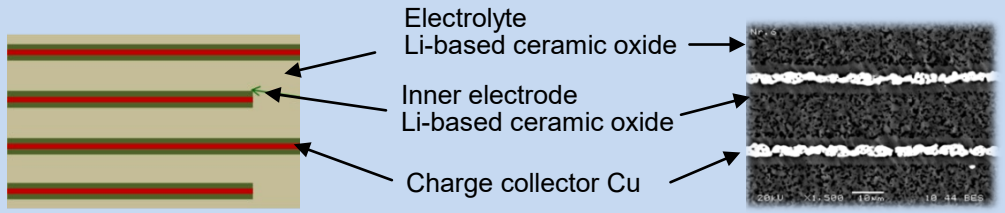
All solid state

Multilayer ceramic chip

- High safety
- SMT compatible
- Rechargeable

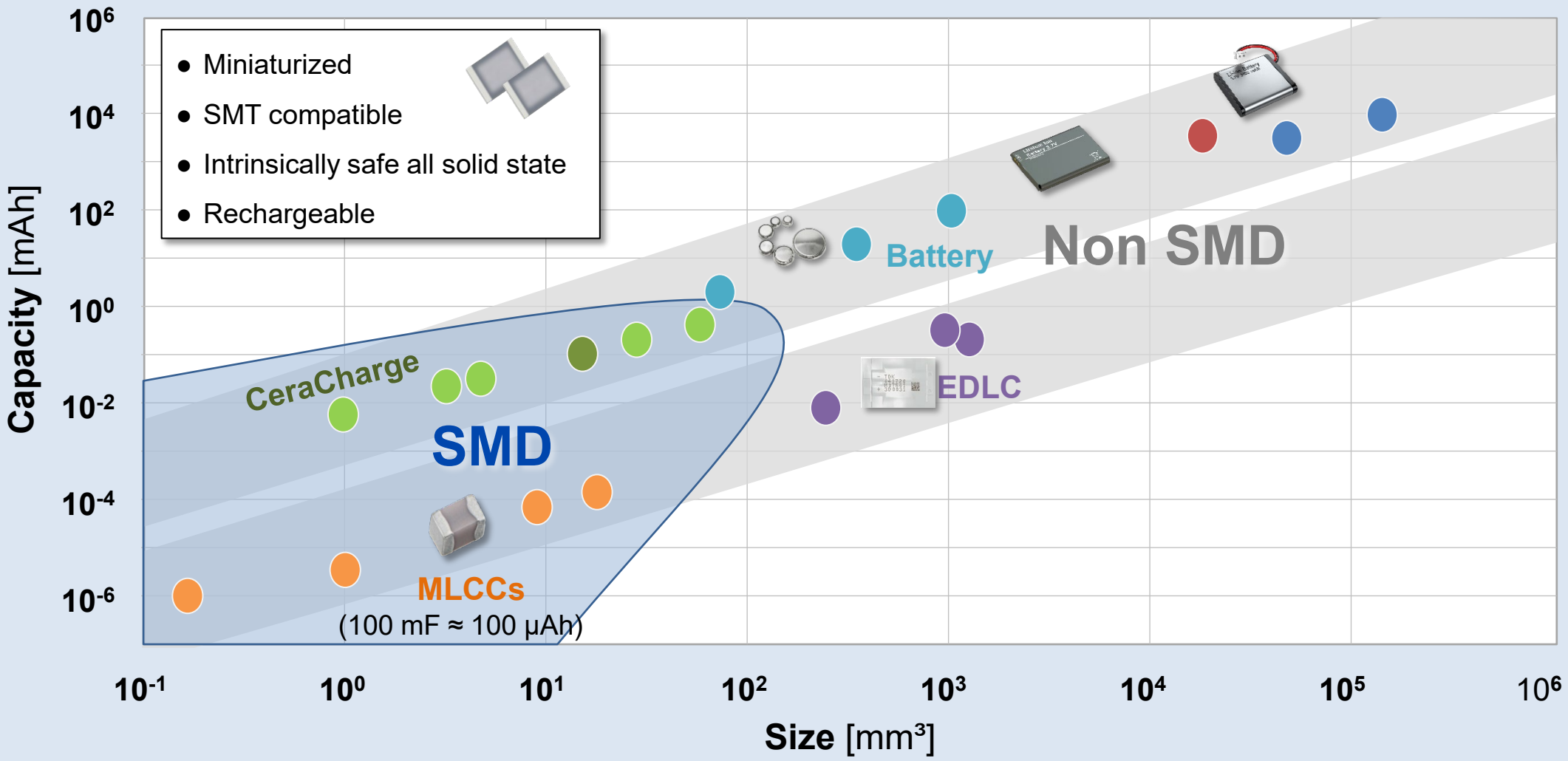






CeraCharge combines the advantages of Li-ion batteries with the safety and manufacturing benefits of ceramic multilayer components.

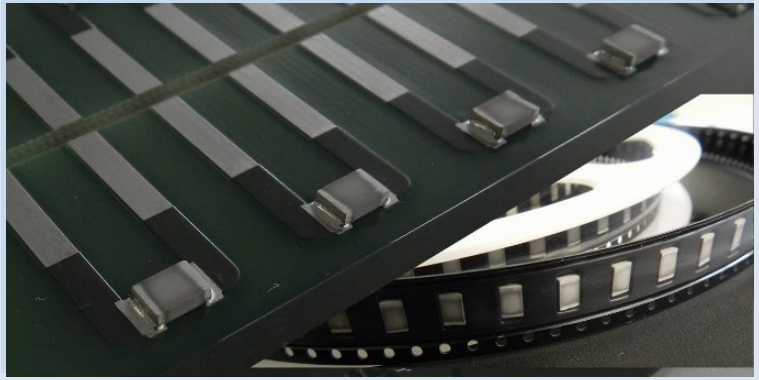
Comparison of Energy Storage Devices



CeraCharge Unique Features & Key Benefits

CeraCharge

- All solid-state rechargeable component without liquid electrolyte
- Based on a multilayer technology, like MLCCs, but with 1000 times the capacity of a capacitor in the same case size
- Replacement of coin cells and supercapacitors
- To increase capacity and voltage, individual components can be connected in series and/or in parallel



Key benefits

Intrinsically safe

- Cannot leak, burn, explode
- 100% Pb-free
- RoHS compatible

Easy to assemble

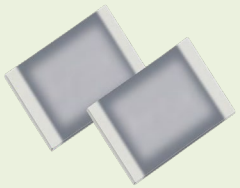
- Reflow solderable
- Embeddable
- No need to change
- Available in EIA case size

Robust design

- Wide operating temperature range
- Suitable for vacuum applications

Main applications

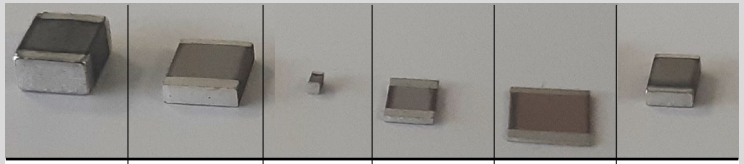
IoT devices, real-time clocks, BLE beacons, systems for energy harvesting



Specifications

TYPE: BCT1812M101AG*		
Nominal voltage	[V]	1.5
Operating voltage	[V_{op}]	0 … 1.6
Nominal capacity	[µAh]	100
Nominal discharge current	[µA]	20
Operating temperature	[°C]	-20 … +80
Case size	[EIA]	1812
Dimensions	[mm]	4.5 x 3.2 x 1.1

Available samples



2220 2.6 mm 400 µAh	2220 1.6 mm 250 µAh	0603 0.8 mm 4 µAh	1812 0.5 mm 40 µAh	2220 0.3 mm 50 µAh	**1812*** **1.1 mm** **100 µAh**

* In mass production since 2020

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

CeraCharge Features
Fast & Pulsed Discharging

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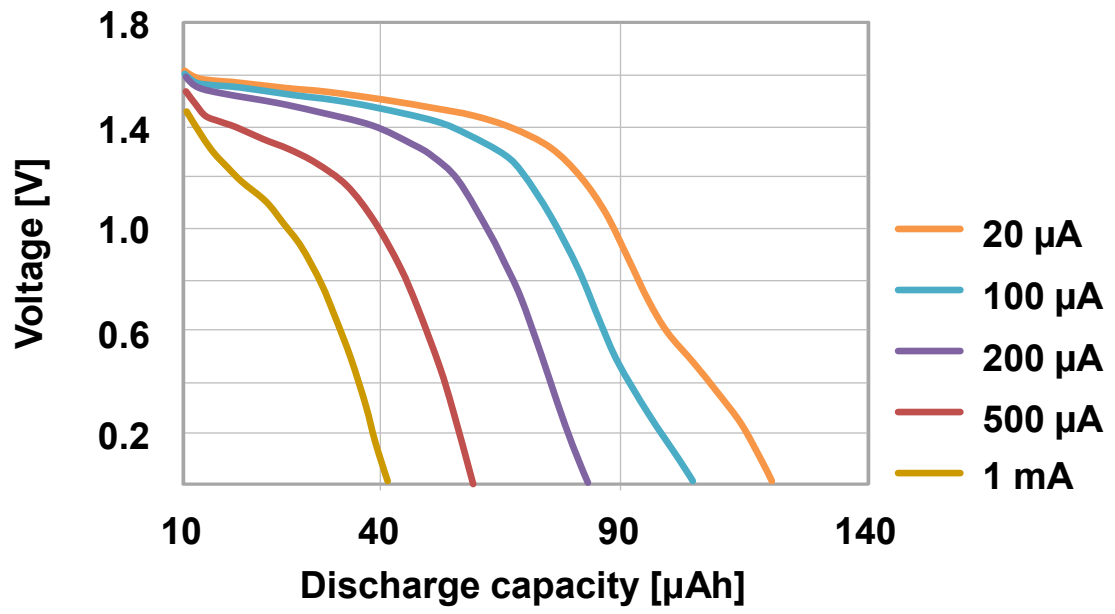
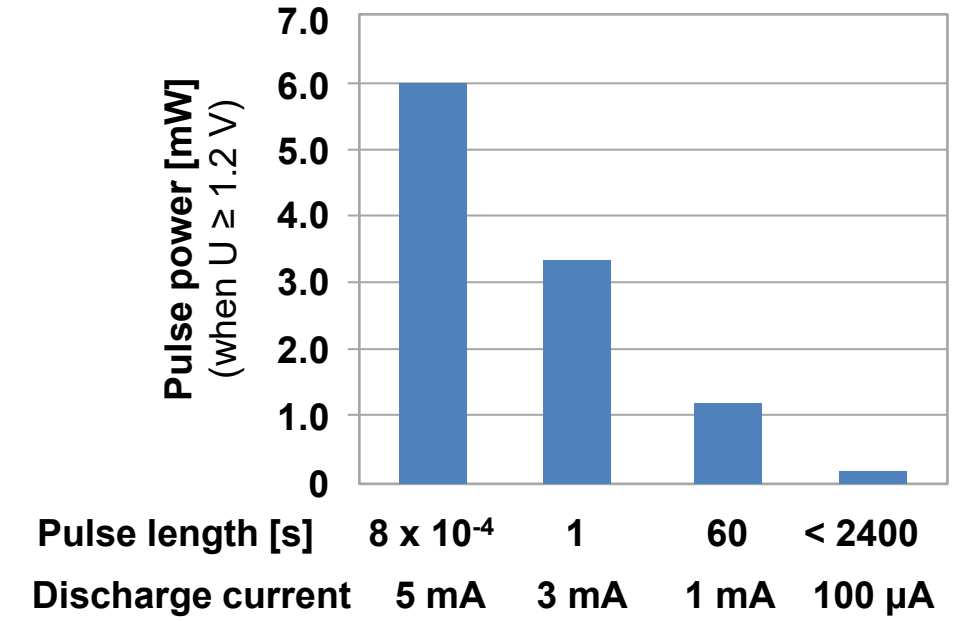
Typical discharge curves



Typical pulse power characteristics



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

CeraCharge Features Wide Temperature & Long Cycle Operating

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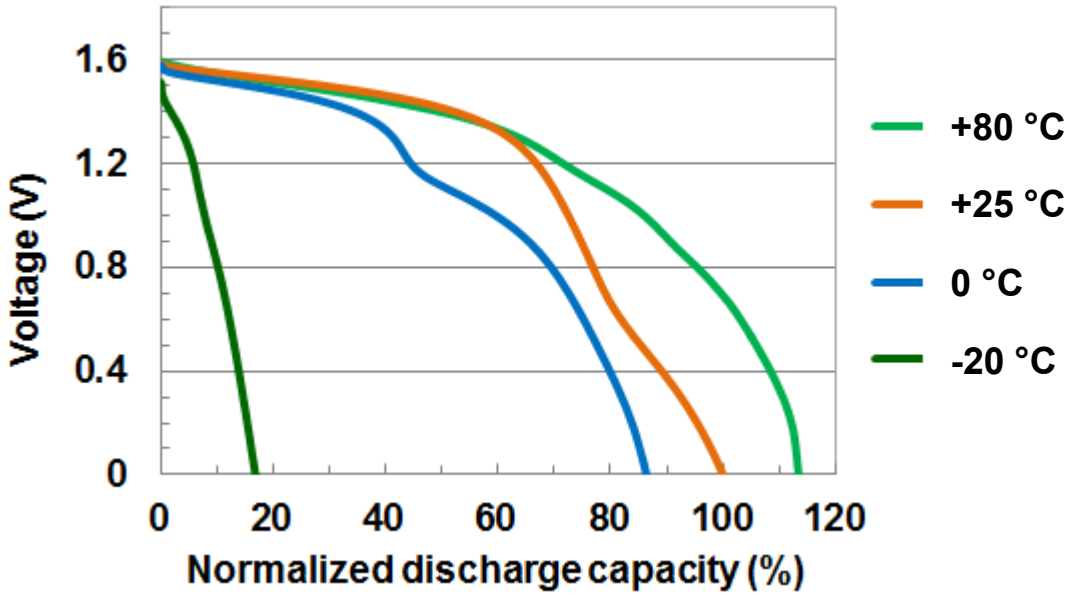
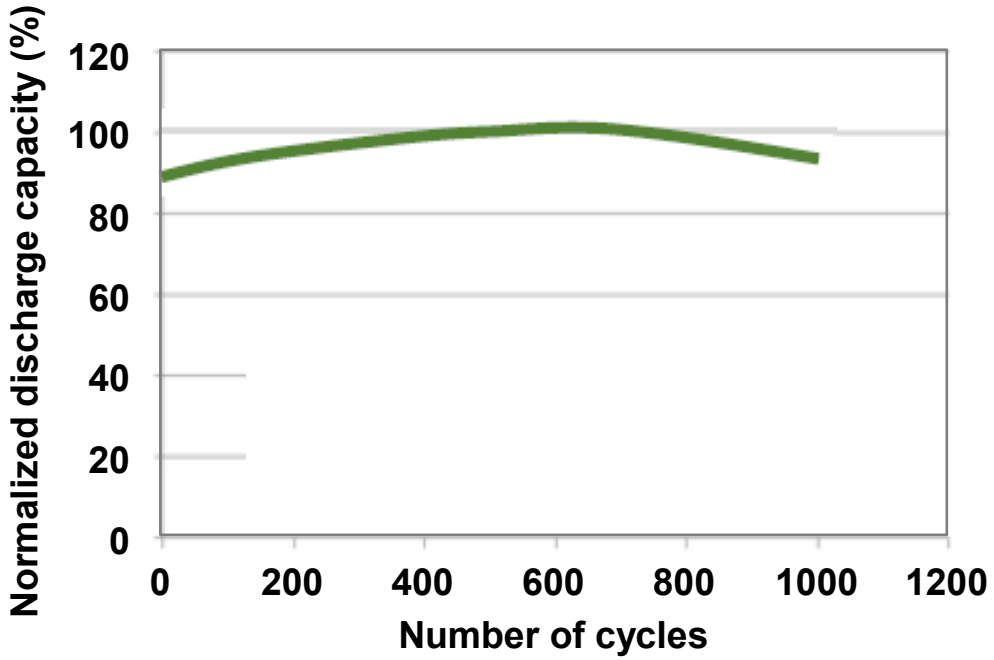
Temperature characteristics



Cycle characteristics



CeraCharge can work from -20 to +80 °C and up to 1000 cycles without any significant capacity loss.

CeraCharge as Energy Storage in Stand-Alone Beacons

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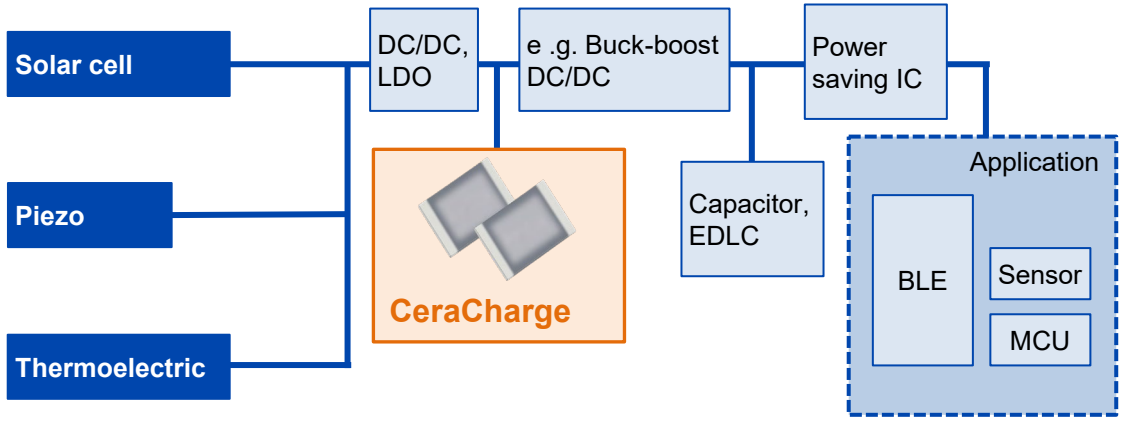
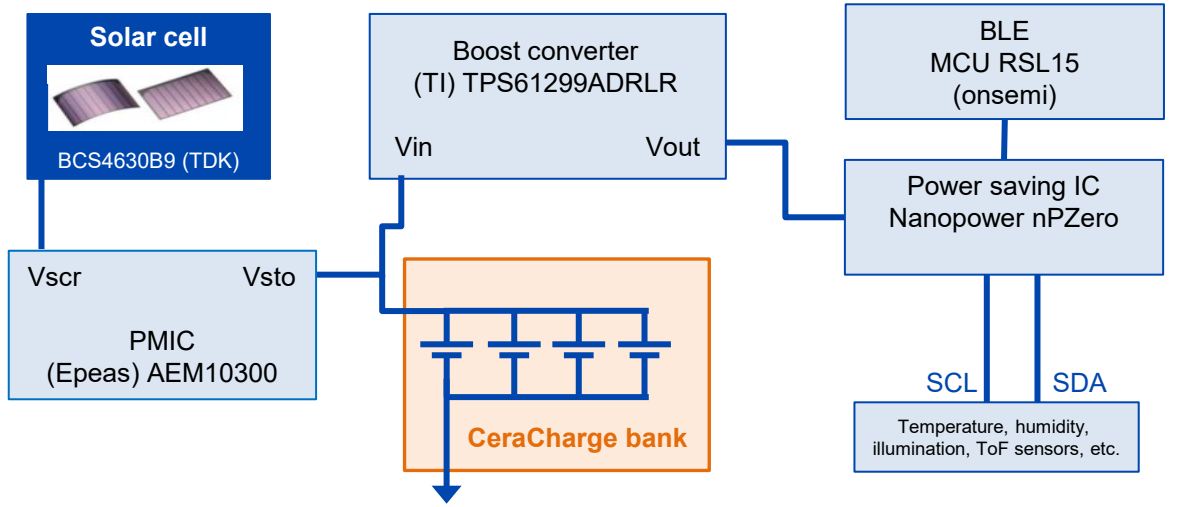
- **Beacon:** Stand-alone systems that collect and broadcast data using **harvested energy**
- **CeraCharge** is the ideal storage medium to support modern IC technology (MPUs, sensors). Those ICs are extremely **low energy demanding** and require **long operation lifetime.**
- Smart home, medical, and **Industry 4.0** are driving the demand for Beacon systems

Topology



Circuit example

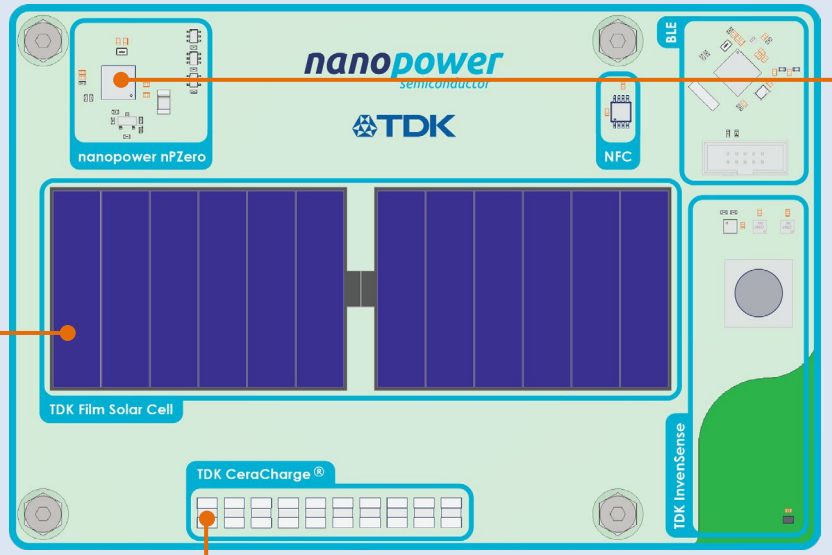


Application note
Teaser
Development kit

Smart Energy Solution for Stand-Alone Beacons

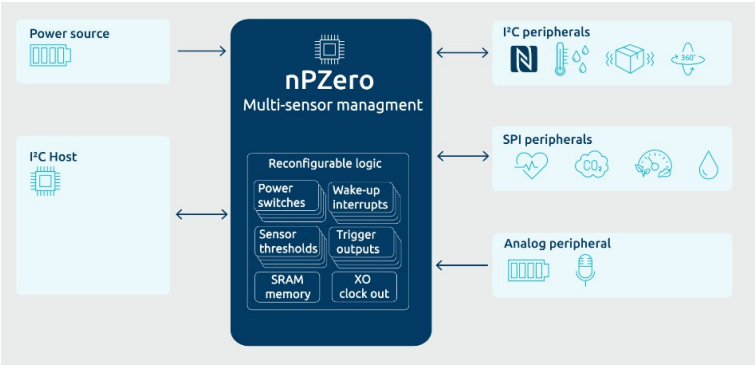
Film solar cell

- Amorphous silicon film solar cell
- Light weight (< 0.1 g)
- Thin thickness (< 0.2 mm)
- Mechanical flexibility, bendable
- Customizable shape and size



nPZero power-saving IC

- A new architecture and new method to dramatically reduce the power consumption



CeraCharge

- Rechargeable multilayer ceramic chip

Intrinsically safe

- Cannot leak, burn, explode
- 100% Pb-free
- RoHS compatible

Easy to assemble

- Reflow solderable
- Embeddable
- No need to change
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Robust design

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- Suitable for vacuum applications

Find more details on the website:

CeraCharge as a Backup Power Supply for Real-Time Clocks (RTCs)

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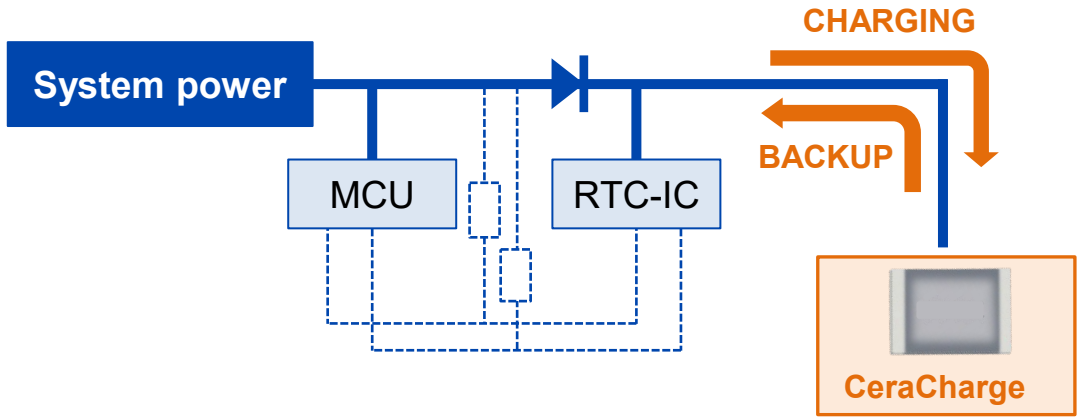
- RTCs must continue counting the time during **energy interruption** and for that need a backup source of energy.
- **CeraCharge** is the ideal backup energy solution for RTCs, offering many opportunities for process/product optimizations to designers.

Charging circuit suggestion

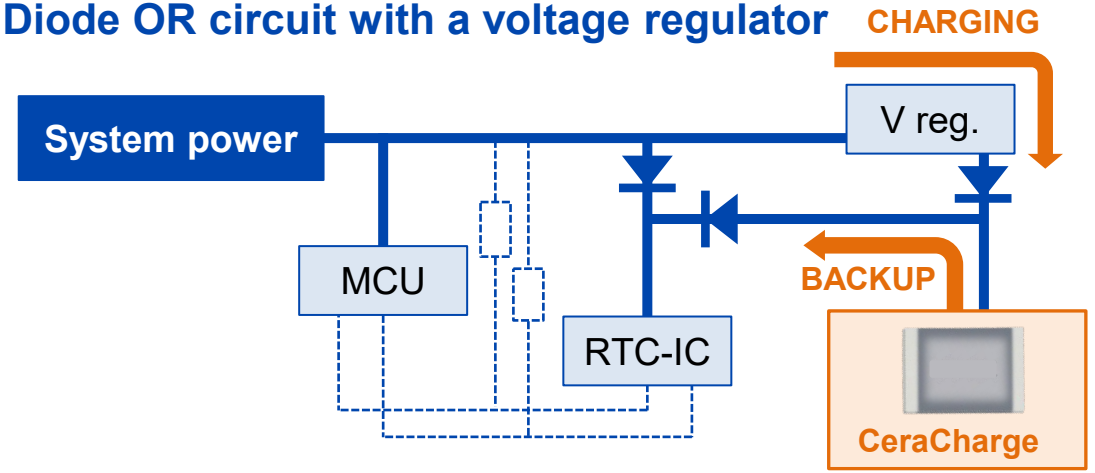
1. Power line voltage is compatible with CeraCharge specifications

Connected to a power line in parallel with RTC-IC



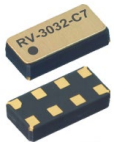
2. Power line voltage is higher than CeraCharge specifications

Diode OR circuit with a voltage regulator



Reference design: RV-3032-C7

https://www.microcrystal.com/en/products/real-time-clock-rtc-modules/rv-3032-c7



MICRO CRYSTAL SWITZERLAND

- Low power consumption
- Temperature compensated
- Plug-and-play for CeraCharge

Application note
Teaser
Development kit

Miniaturization / High-Temperature Applications

CeraCharge is used

- in a thin tube of ~ 4 mm in diameter
- reading 5 temperature sensors
- broadcasting with BLE
- for more than 12 hours

For more details, please refer to: https://cookperfect.com/collections/cooking-thermometers/products/cookperfect-wireless
https://www.witt.dk/brands/witt/witt-cookperfect