



New solution for maintenance free IoT devices by semi-solid state Li-ion rechargeable EnerCera[®] batteries



NGK INSULATORS, LTD.

Vice President

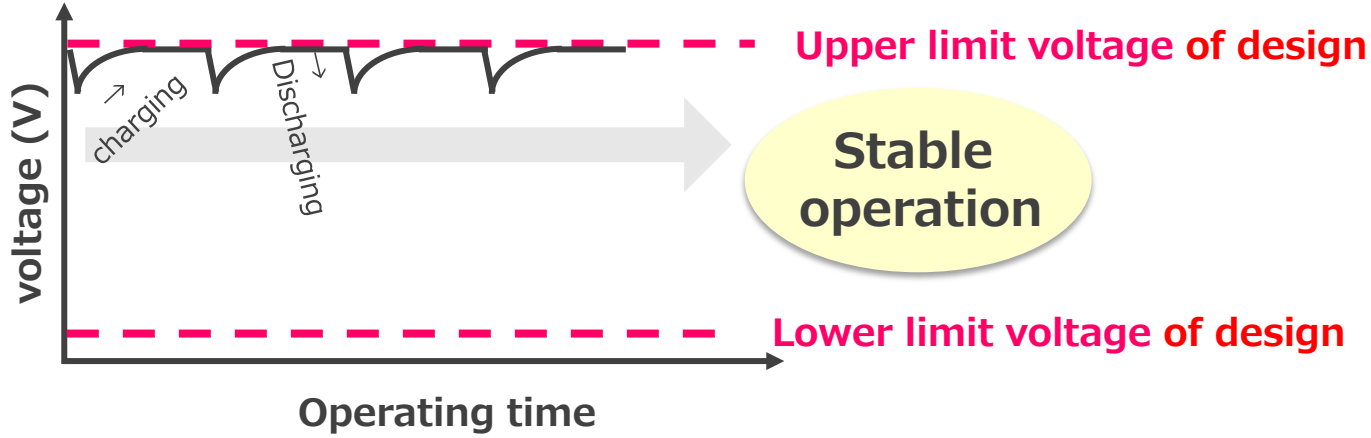
Iwao Ohwada



Required for a self-supporting IoT device

Ideal design

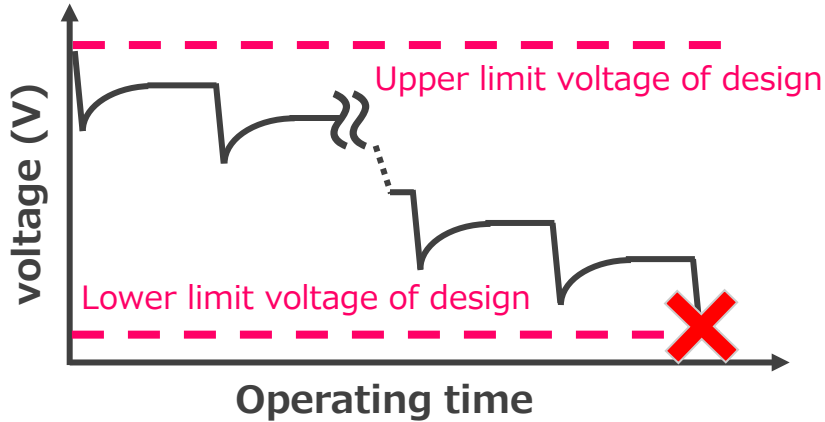
“Reliability that continues to operate” is required for a self-supporting IoT device



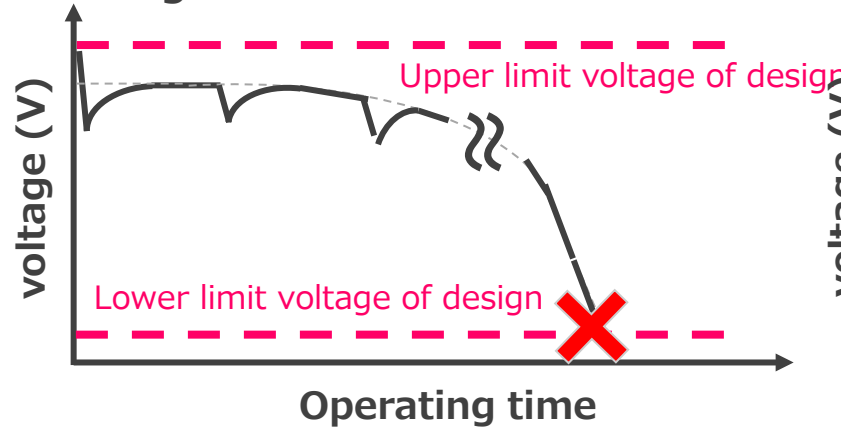
Required battery characteristics

1. Low self-discharge current
2. Good float resistance
3. Good cycle/storage characteristics

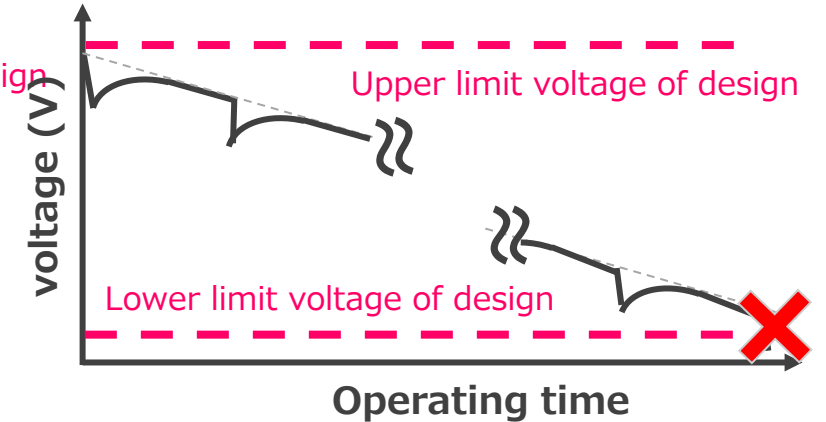
1. If the self-discharge current is large



2. If float resistance is not good



3. If the cycle/storage characteristics are not good



Self-discharge current (@25°C)

	Self-discharge current
Pouch ET271704P-H	0.09 μA
Coin ET1210C-H	0.30 μA

Reference)
ROHM Corporation
Ultra-low current consumption technology Nano Energy™
Step-Down DC/DC Converter I C "BD70522GUL"
Standby supply current 0.18 μ A

**The self-discharge current is small and
EnerCera battery can store even small charging currents.**

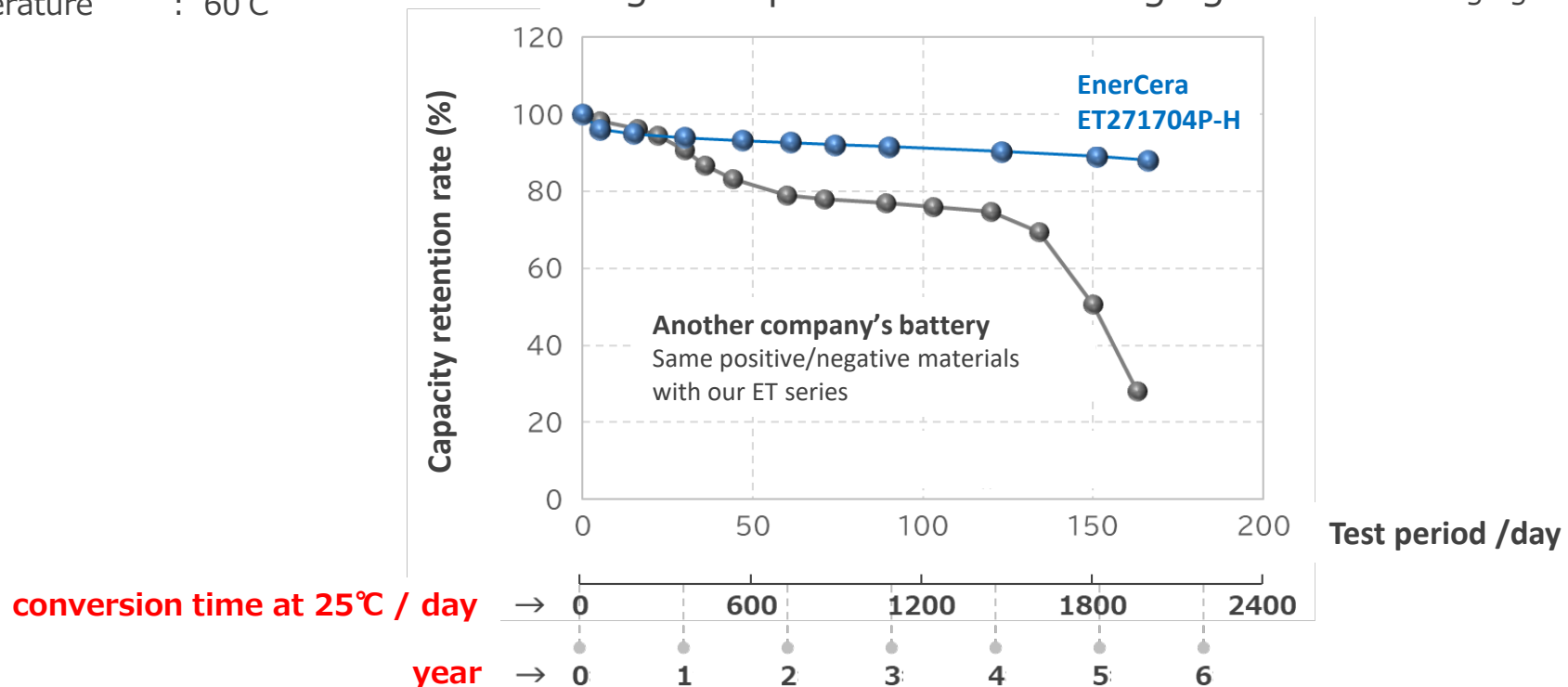
EnerCera ET series has high resistance regarding “Float charging”.

Float charging – Comparison with another company’s battery

Charging Voltage : 2.7V (Float)
 Temperature : 60°C

High Temperature Float Charging*

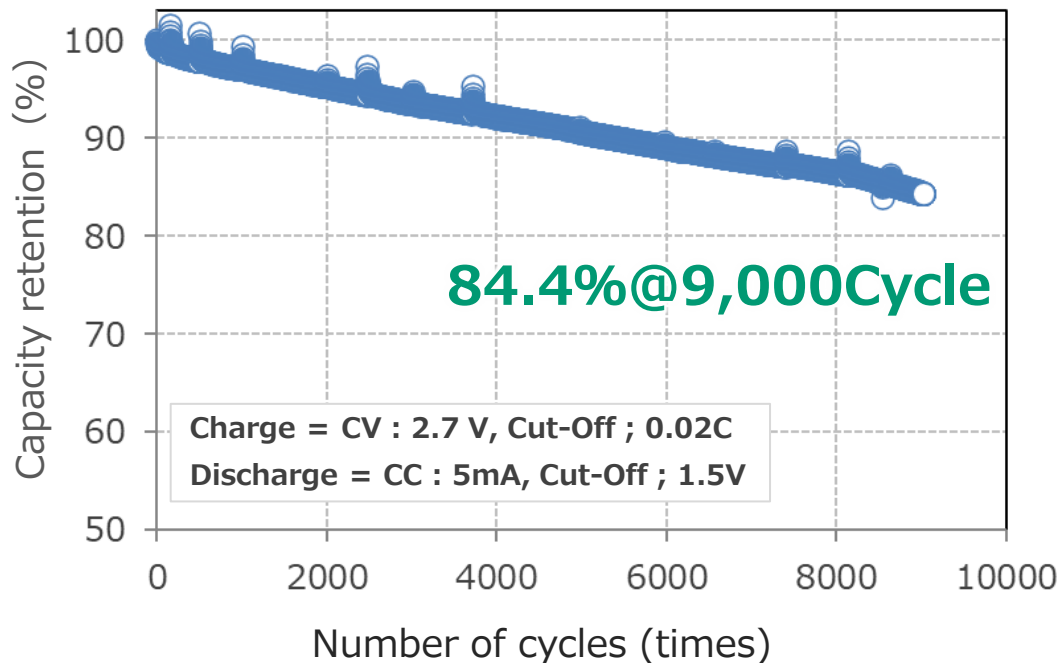
*Float Charging : Keeping full charged



EnerCera ET series is suitable for combinations of Energy Harvesting and Wireless Power Supply.

Test sample: ET271704P-H

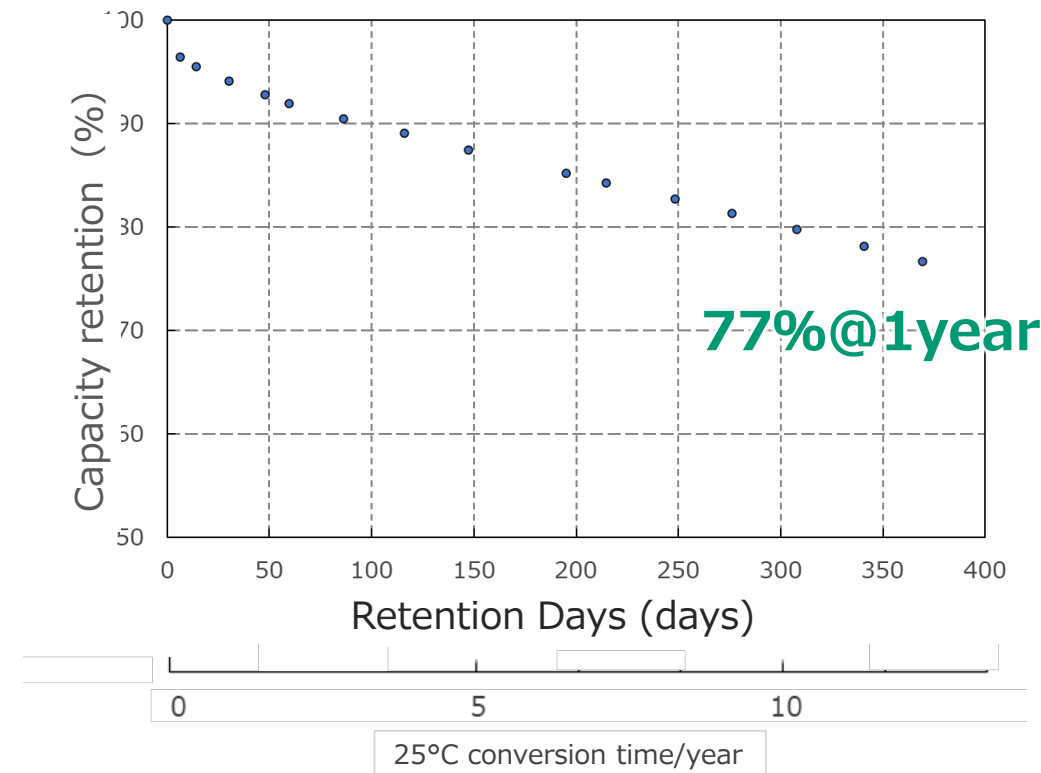
Cycle characteristics / @25°C



One cycle : 0% → 100% charge, 100% → 0% discharge

High-temperature storage characteristics / @60°C

Storage conditions: 2.7V (stored in a fully charged state)



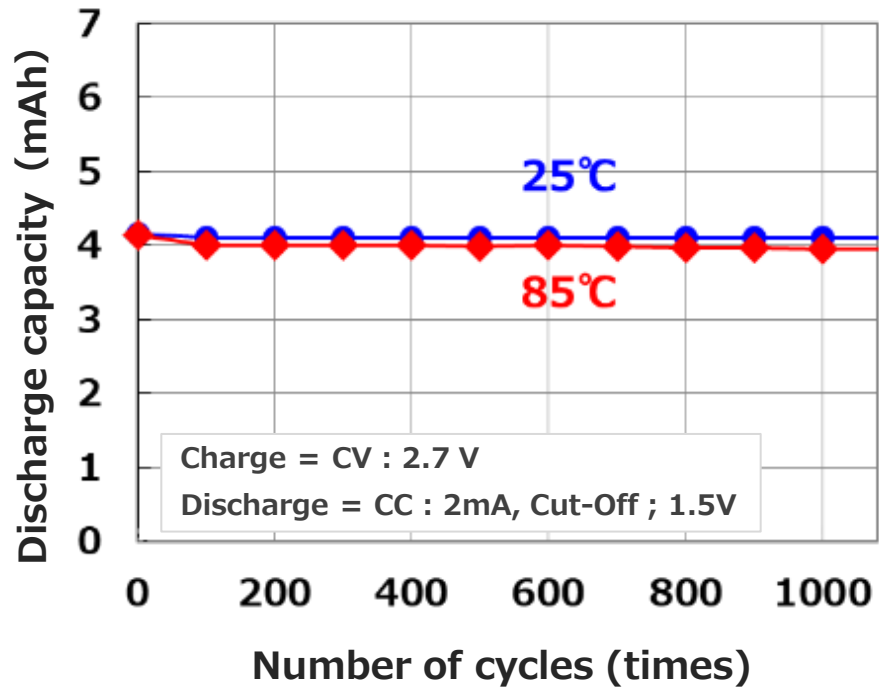
Degradation by cycle test is small.
It can be used repeatedly and has a long life!
Capacity retention > 84% @ 9,000 cycles (under continuous testing)

Test sample: ET1210C-H

※Characteristics of a single battery without reflow mounting

Cycle characteristics / @85°C

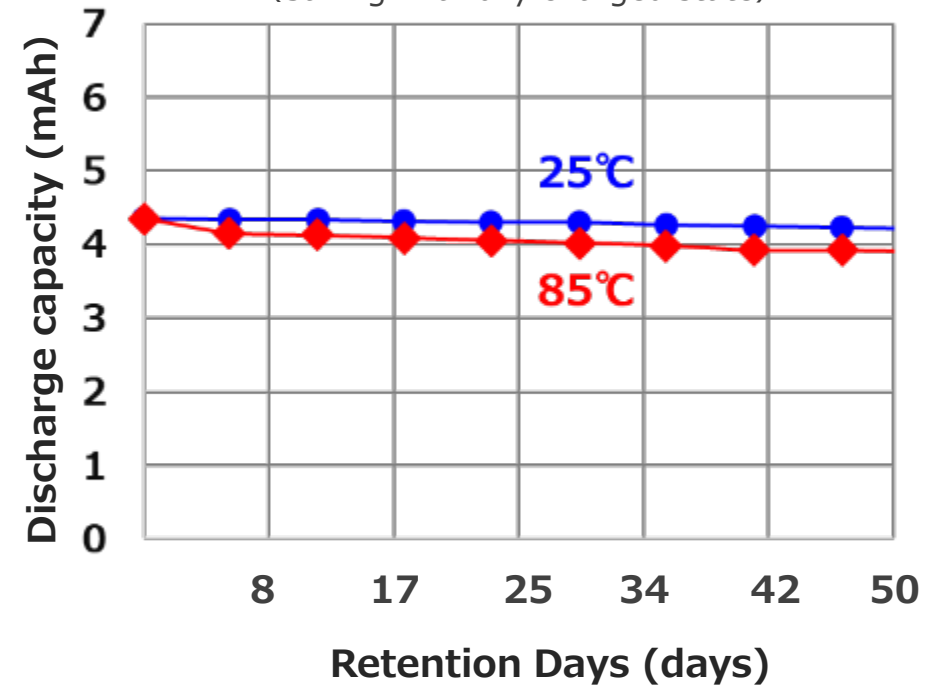
Conditions : Charge CV(2.7V) Discharge 0.5C



One cycle : 0% → 100% charge, 100% → 0% discharge

Storage properties / @85°C

Condition : 2.7V storage
(Saving in a fully charged state)



- **EnerCera battery is a highly reliable battery that is resistant to fully charged conditions.**
- **EnerCera battery helps Self-supporting IoT device continue to operate stably.**