Optimum Energy Device for Wireless Sensor Node

RoHS REACH Hand Soldering Only

1. Overview

Numbers of sensor nodes are needed for IoT in order to collect various information. Energy harvesting is expected to be used as a power source in sensor nodes for wireless sensor networks. This is because energy harvesting eliminates the need for periodic battery replacements. In general, an energy storage device is needed for energy harvesting system because the amount of harvested energy is unstable. In addition, an energy device is expected to be surely charged with small current and keep energy without leakage for long time at various environments.

Murata's small energy device (UMA series) has optimum characteristics for energy harvesting compared to other existing storage devices such as supercapacitors or Li-ion batteries. It enables high efficient and maintenance-free sensor node in small space with light weight.

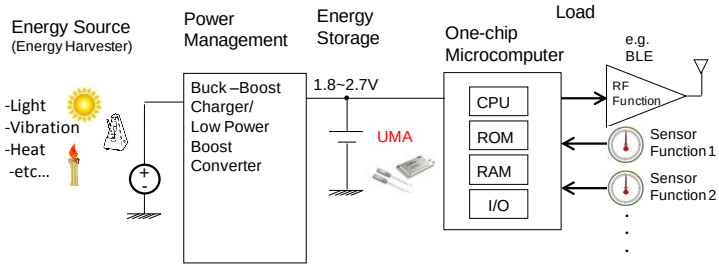
	Supercapacitor	UMA	Conventional LIB
Maintenance free (long cycle life)	Good	Good	Poor
Low Loss (Low leakage current)	Poor	Good	Good
Directly drives the load (High rate discharge)	Good	Good	Poor
Quick start-up time (Charge characteristic)	Poor	Good	Good

*1 Comparison of same size devices

2. Applications

Sensor nodes, beacons, tracking devices with energy harvesting generators (SHM, smart house, smart building, smart agriculture, iBeacon, asset tracking, inventory tracking, baggage tracking, animal/pet tracking, children/elderly tracking, patient monitor, RFID tags for farm animals, and so on.)

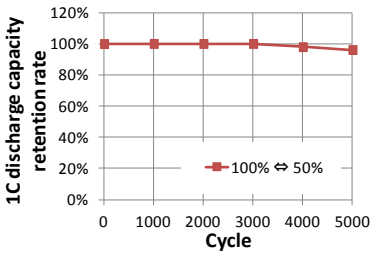
3. Block Diagram



4. Benefits

1) Maintenance Free

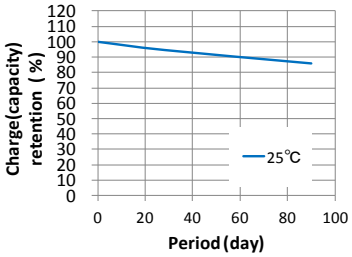
Even after 5000 Charge-discharge cycles (depth of discharge: 50 %), the capacity degradation is very small. 5000 cycles is about 13 years when charging-discharging UMA once a day.



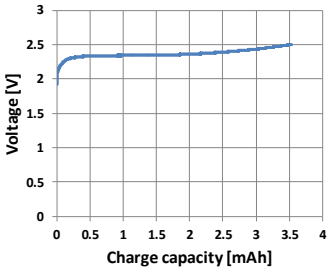
<Cycle Characteristics*2 >

2) Low loss

UMA having excellent charge(capacity) retention rate can be charged even with small current of 5μA. It can keep charged energy for a long time because of its low leakage current.



<Long capacity retention characteristic*2>

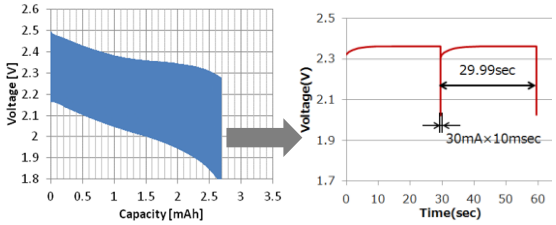


<Charge characteristic (charge current 5μA)*2>

Charge (capacity) retention rate after 90 days is 88%*2.
Leakage current is equivalent to 0.17μA*2.

3) Directly drives the load

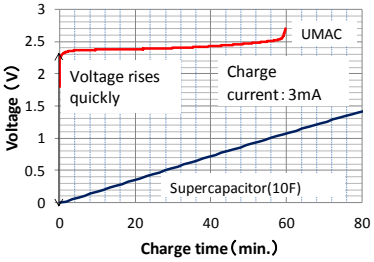
UMA can discharge at high rate. It can support peak load directly at the time of data transmission in near field communication devices (such as BLE, Zigbee, and so on). Because of its low ESR, UMA can support the load condition of BLE (30mA/10msec, interval 30sec.) even at -20℃.



<30mA discharge characteristic at -20℃ (intermittent discharge)*2>

4) Quick start-up time

UMA can be charged to nominal voltage quickly after the start of harvesting. It contributes to shrink charging time or eliminate the use of a primary battery for pre-charging.



<Charge rate: VT characteristic comparison of UMA and supercapacitor*2>

*2 Example data of UMAC040130A003TA01

5. Product Lineup

	Cylinder type	Thin laminate type
Part number	UMAC040130A003TA01	UMAL361421B024TA01
Nominal voltage/ Charge voltage / Cut-off voltage	2.3V / 2.7V / 1.8V	2.3V / 2.7V / 1.8V
Nominal capacity / ESR	3mAh / 800mΩ	24mAh / 100mΩ
Max. discharge current	30mA (10 C)	240mA (10 C)
Size / Weight	φ4 x 12 mm / 0.29g	21 x 14 x 3.6 mm / 1.3g

6. Technical Support

Sample: Please contact Murata sales or distributors.
Technical support: Please access our website.

http://www.murata.com/en-global/products/smallenergydevice/uma