



Maxell's Micro Battery History

Maxell successfully commercialized their first SR (silver oxide) button battery in 1976. Manufacturing over 40 years in Japan, we have produced over 9 billion SR button cells, supporting the growth of small electronic devices such as quartz watches, handy calculators and medical devices.

Maxell continues to develop advanced SR technology to support new emerging markets and trends with various cell sizes and enhanced performance.

Key Component for Future Digital Health

Micro batteries have good affinity with medical devices due to their small footprint and various chemistries. Maxell technology optimizes cell performance based on requirements of device and application requirement. In 2005, Maxell released ME927 (design for medical applications) that is designed for Capsule Endoscopy. This application includes a small ingestible capsule containing a micro-camera which takes images while passing through the digestive tract and small intestine. New Maxell battery technology introduced a process to achieve medical reliability requirements while optimizing battery performance.

In addition to Capsule Endoscopy, wearable medical devices for health monitoring continue to play an important role in resolution for life-style diseases such as diabetes, heart disease, and cancer. For example, treatment of diabetes which involves monitoring of diet and physical activity along with maintaining blood glucose levels is accomplished by using Continuous Glucose Monitoring devices (CGM).

Table 1. Battery Design Comparison SR/ME

Battery Designation	SR	ME
Chemistry	Ag ₂ O / Zinc, Aqueous electrolyte solution	
Cell design	Standard design for general applications	High discharge performance in-body temperature. Tight variation of the battery performance.
Electrical performance	Standard performance for general applications	Customized spec. Electrical performance can be enhanced upon customer's request. - High current load - High capacity

Preferable Battery for Medical Wearable Devices

The wearable health care device is connected via communication system and consists of a closed loop system around the body. Using Bluetooth is suitable with 2.4GHz transmitter due to recent advances in power saving technology and its affinity with devices like smartphones. The following are general requirements of the battery.

- Small footprint and thinness
- Energy density

- High load durability
- Long reliability
- Safety

Silver Oxide button battery (SR) is appropriate chemistry to manage these requirements. LR (Manganese dioxide zinc battery) is also known as the same aqueous electrolyte battery, however, SR is the better option technology and design for medical devices.

The most important point to consider for transmitting devices is that SR battery has flat voltage, and low impedance until the end of discharge. BLE chipset has approximately 1.2V minimum voltage and with SR 1.55V high and flat working voltage, it promises consistent performance until life end with higher energy density.

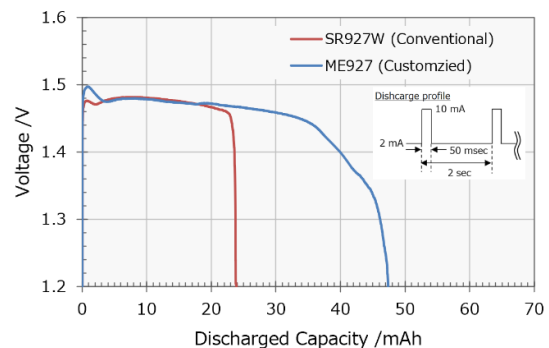
Table 2. Battery Design Comparison SR/LR

Chemistry	Zinc Silver oxide	Zinc Manganese dioxide
Cell Designation	SR	LR
Nominal Voltage	1.55 V	1.5 V
Positive Material	Silver oxide	Manganese dioxide
Negative Material	Zinc	Zinc
Discharge Property		
Energy Density	448 Wh/L	289 Wh/L
General Features	<ul style="list-style-type: none"> • High energy density • High load current capability • High & flat voltage • Long use reliability • No transporting regulations (Non-lithium) 	<ul style="list-style-type: none"> • High load current capability • Voltage slope along discharge • No transporting regulations (Non-lithium)
Application	Quartz watches Healthcare devices (CGM, Insulin Pen/Pump) Capsule endoscope	Toys LED lights

* The energy density is general value when it is considered SR/LR44 size (D: 11.6 mm x H; 5.4 mm).

Battery Technology Features

High load durability is often required for the data transmission function on medical devices. Maxell's ME927 shows high durability on high discharge.



Battery was discharged for 10 mA/ 50 msec of pulse current over 2mA of continuous base current flow at 20 °C.

*These are actual tested data and not guaranteed value.

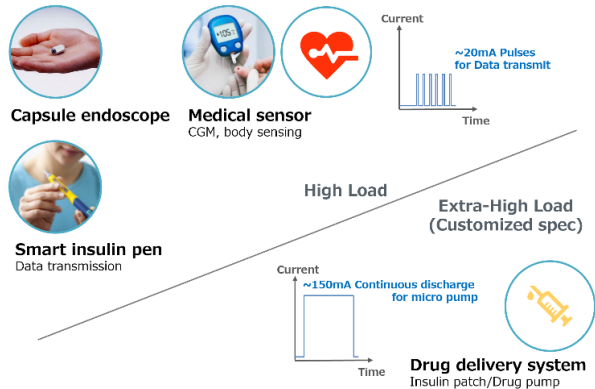
* This is performance example. Maxell can provide the suitable solution upon each customer's request.

Maxell Battery Product Lineup

Part number	SR44W	SR44W	SR927W	SR916W	SR41W	SR721W	SR716W	SR621W	SR516SW	SR416SW
Nominal Voltage (V)	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Nominal Capacity (mAh)	165	165	60	23	39	25	18	18	12.5	8.3
Nominal Discharge Current (μA)	200	200	100	100	50	50	50	50	20	10
Diameter (mm)	11.6	11.6	9.5	9.5	7.9	7.9	7.9	6.8	5.8	4.8
Height (mm)	5.4	5.4	2.73	1.65	3.6	2.1	1.65	2.15	1.65	1.65
Weight (g)	2.2	2.2	0.8	TBC	0.7	0.45	TBC	0.3	0.2	0.17

Please visit at https://biz.maxell.com/en/primary_batteries/sr_coin.html for full product lineup.

Maxell Designs for the Future



As the need for digital healthcare increases, the requirements for smaller and more reliable power sources are critical to support these devices. SR technology button cell is an optimal power solution. Maxell continues to develop technology represented with SR button battery that will achieve the requirements for new evolving markets and devices in the digital healthcare industry.

- Miniaturization; Smaller & thinner battery is required for wearable device for quality-of-life perspective.
- Reliability; Power source needs to be accurate and consistent for health monitoring.
- High Load Durability; Extremely high pulse capability required for wearable drug delivery devices.

Please contact us at OEMBatterySupport@maxell.com for more information or visit us at <https://maxell-usa.com/>