

Li-ion

Lithium-ion Rechargeable Battery

Secondary Battery



LITHIUM-ION RECHARGEABLE BATTERY

Notes for Designers

Select the correct type of battery to match the operating conditions such as load current, etc.

■ The information in this section is for lithium-ion cells only. Maxell offers these cells (excluding CLB) in battery pack format only. These include electronic circuits to prevent overcharge, overdischarge and so on. These battery packs are custom-developed and produced according to special requirements regarding operating conditions and specifications. As a result, a minimum number of units may apply to such customized orders from customers purchasing battery packs. For details, consult your nearest Maxell dealer or distributor.

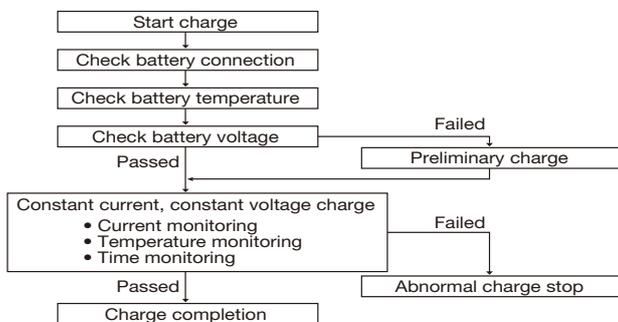
■ Charge conditions

To get the most out of lithium-ion batteries and use them safely, please read the following requirements carefully:

Charge mode	Constant current, constant voltage charge (CCCV)
Charge voltage	4.20±0.05V / cell, 4.35±0.05V / cell, 4.40±0.05V / cell
Max. charge current	1I _t A
Charge temperature	0 to +45 deg. C

■ Charge control flowchart (sample)

Refer to the following flowchart when designing constant current and constant voltage battery chargers.



Safety Instructions

Improper use of the battery may cause heat, fire, explosion, damage or reduced battery capacity. Please read and follow the handling instructions for the battery before and during usage. The followings are general cautions and guidelines only and as such may not include every possible usage scenario. The manufacturer will not be liable for actions taken or accidents caused.

⚠ Danger

- Do not dip or wet the battery in water, seawater, or other liquid. Otherwise the battery may be shorted, which may generate heat or cause damage.
- Do not put the battery into a fire. Otherwise, the electrolyte may burn or cause an explosion.
- Do not heat the battery. Otherwise the electrolyte may gasify and resin parts may melt, causing leakage, explosion or fire.
- The battery has a predetermined polarity. If the battery will not connect well to the charger or equipment, do not try to connect the battery forcefully. Check the polarity first. If the battery is connected in reverse, it will be charged in reverse and may cause leakage, heat generation, explosion or fire due to an abnormal chemical reaction.
- Do not connect the battery in reverse relation to the positive (+) and negative (-) terminals in the charger or equipment. If the battery is connected in reverse, it will be charged in reverse, discharge excessive current and may cause heat generation, explosion or fire due to an abnormal chemical reaction.
- Do not let the battery terminals (+ and -) come into contact with a wire or any metal (like a metal necklace or a hairpin) with which it is carried or stored. In such a case, the battery will be shorted and discharge excessive current, which may result in heat generation, explosion or fire.
- Do not apply any heavy impact to the battery, throw or drop it. Otherwise the battery may be shorted and result in heat generation, explosion or fire.

- Do not drive a nail into, hammer or stamp on the battery. Otherwise the battery may be shorted and result in heat generation, explosion or fire.
- Do not solder the battery directly. Heat applied during soldering may melt resin parts such as separator or gasket, and result in leakage, heat generation, explosion or fire.
- Do not disassemble or alter the battery. Otherwise the battery may be shorted and result in heat generation or fire.
- Do not use or leave the battery near fire, heaters, inside an automobile in hot weather or under strong sunshine. Such conditions of high temperature may damage the separator, and the battery may be shorted and result in heat generation, explosion or fire.
- When charging the battery, do not use any battery charger not specified by the manufacturer. Always follow the charge conditions specified by the manufacturer. If the battery is charged under other conditions (a high temperature, a high voltage/current or an altered charger) not specified by the manufacturer, the battery may cause heat generation, explosion or fire due to abnormal chemical reactions.
- Do not connect the battery directly to an electric outlet or cigarette lighter socket in a car. Applying a high voltage may generate an excessive current and cause an electric shock. In such a case, the battery may leak electrolyte, overheat, explode or cause fire.

Warnings

- Do not put the battery in a microwave oven or a pressure cooker. Sudden heat may damage the seal of the battery and may cause heat generation, explosion or fire.
- Do not use the battery together with a primary battery such as a dry battery or other battery of a different capacity, type and/or brand. In such a case, over-discharge during use or over-charge during charging may occur and abnormal chemical reactions may cause heat generation, explosion or fire from the battery.
- If you notice any unusual odor, heat, discoloration, deformation or any other characteristic apart from what you are used to while using, charging or storing the battery, then take it out of the equipment or charger, and avoid using it. Using it in such state may result in heat generation, explosion or fire.
- If the battery leaks or emits an unusual odor, remove it from the vicinity of any fire immediately. The electrolyte may catch fire, which may cause heat generation or explosion.
- Do not let leaked electrolyte come into contact with the eyes. In the event of such contact, flush the eyes with plenty of water immediately and consult a doctor. Otherwise prolonged contact may cause serious injury.

Caution

- If the battery leaks and its electrolyte comes into contact with skin or clothes, wash the contact area well with tap water or other clean water right away. Otherwise skin may break out in a rash.
- When the battery is expected not to be used for a long time, take the battery out of the equipment or device and store it in a less humid area.
- After long periods of storage without being used, the battery should be charged before it is used. Charge the battery every 6 months to the level specified by the manufacturer, even if the battery is not used.
- Do not leave the battery pack connected to the charger. It may cause the degradation of battery performance, such as a shortening of battery life.
- Turn off your equipment or device power switch after use.
- Do not use the battery in other than the following temperature ranges:

Charge	0 deg. C to +45 deg. C
Discharge	-20 deg. C to +60 deg. C
Storage (less than 30 days)	-20 deg. C to +50 deg. C
Storage (less than 90 days)	-20 deg. C to +35 deg. C

Notes for treating used batteries

- Insulate (+) and (-) terminals with tape.
- Do not remove coating.
- Do not expose to rain or water.
- Do not disassemble.
- Do not leave under strong sunshine.
- Store in rugged receptacle and cover with a lid.



Features

Thin battery with high capacity

Maxell's original technologies, such as electrode technology, have realized thin batteries with high capacity that can be used in compact high-performance mobile devices.

Stable discharge under various temperature conditions

Lithium-ion batteries provide stable discharge within a wide range of temperatures, between -20 deg. C and 60 deg. C.

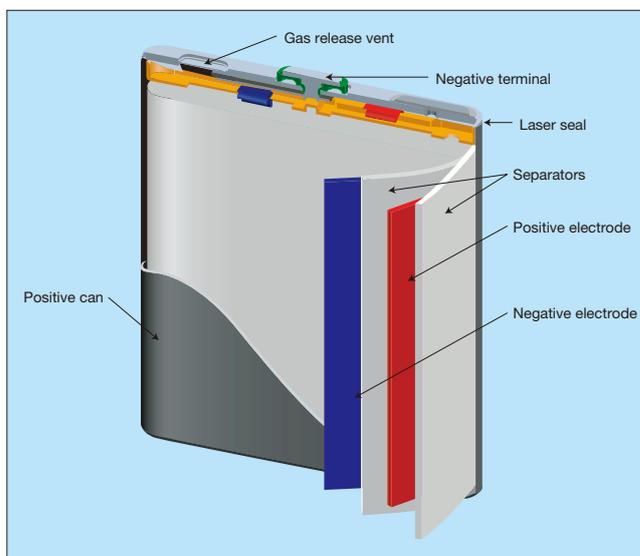
Excellent cost performance

Superior recharging properties ensure a service life of about 500 charge/discharge cycles under normal usage conditions. The superior cost/performance ratio ensures that lithium-ion batteries are ultimately more economical than primary batteries.

Higher energy density and an operating voltage of over 3.7V

A lithium-ion battery delivers and maintains a stable operating voltage of over 3.7V until final discharge — three times as much voltage as an Ni-Cd or Ni-MH battery provides. Therefore, it takes only one-third as many lithium-ion batteries to provide the equivalent amount of voltage as Ni-Cd or Ni-MH batteries provide. This means that portable devices can be made much smaller and lighter.

Cell Structure

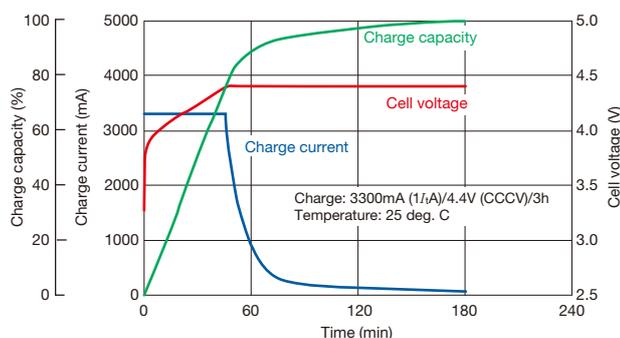


Applications

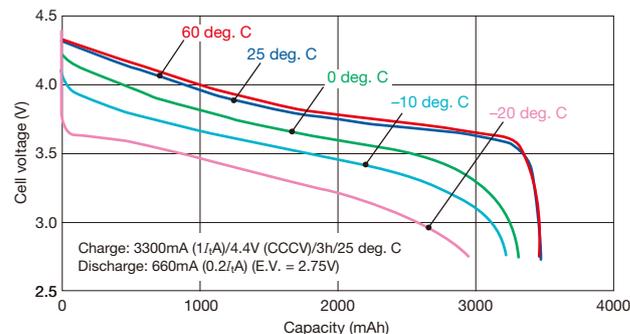
- Mobile phones, Smartphones
- Portable game devices
- Electronic books
- Electronic dictionaries
- Digital still cameras
- Digital audio players, etc.

Characteristics (ICP474998SWS)

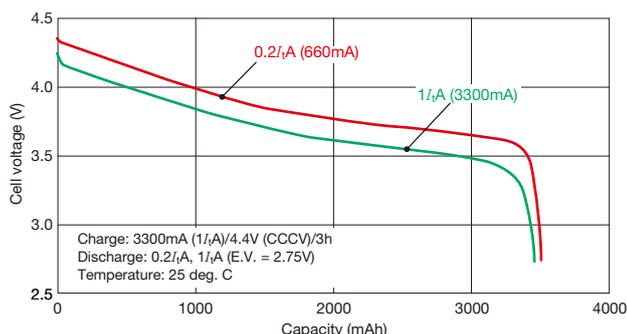
Charge characteristics



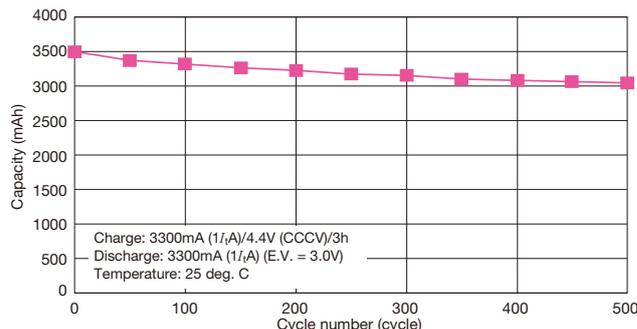
Discharge temperature characteristics



Discharge load characteristics



Cycle life characteristics



Li-ion

Products (Cell)

Model*1		ICP382230AQS	ICP415168SWR	ICP456475AWR	ICP463048XS	ICP474998SWS	ICP492547SRU
Dimensions (mm) ²	Thickness	3.65±0.15	3.85±0.2	4.25±0.15	4.3±0.2	4.45±0.25	4.6±0.2
	Width	21.85±0.15	50.85±0.1	63.15±0.1	29.3±0.2	48.5±0.2	24.1±0.2
	Height	30.0+0/-0.4	67.45+0/-0.5 ⁵	74.55+0/-0.4 ⁵	47.8+0/-0.6	97.35+0/-0.5 ⁵	46.1+0/-0.5 ⁵
Weight (g) ³		5.5	33	49	15.5	52	11
Charge (CCCV)	Max. voltage (V)	4.35	4.40	4.40	4.20	4.40	4.20
	Max. current (A)	0.40	2.05	3.00	0.75	3.30	0.54
Discharge (CC)	End voltage (V)	2.75	2.75	2.75	2.75	2.75	2.75
	Max. current (A)	0.50	3.08	4.50	1.13	4.95	0.80
Nominal voltage (V)		3.8	3.85	3.85	3.7	3.85	3.7
Minimum capacity (mAh) ⁴		250	2050	3000	750	3300	535

Model*1		ICP545483AHR (Under development)	ICP653450AHR	ICP653865SRU	ICP103444AHRU	ICP103450AHR
Dimensions (mm) ²	Thickness	5.1±0.2	6.2±0.3	6.2±0.3	9.7±0.3	9.7±0.3
	Width	53.35±0.1	33.8±0.2	37.8±0.2	33.6±0.2	33.6±0.2
	Height	82.65+0/-0.5 ⁵	49.6+0/-0.5	64.35+0/-0.5 ⁵	44.0+0/-0.4 ⁵	50.15+0/-0.5
Weight (g) ³		55	24	35	32	35.5
Charge (CCCV)	Max. voltage (V)	4.20	4.35	4.20	4.35	4.35
	Max. current (A)	3.00	1.36	1.80	1.85	2.16
Discharge (CC)	End voltage (V)	2.75	2.75	2.75	2.75	2.75
	Max. current (A)	4.50	2.04	2.70	2.78	3.24
Nominal voltage (V)		3.7	3.8	3.7	3.8	3.8
Minimum capacity (mAh) ⁴		2660	1360	1800	1850	2160

*1 "U" indicates that the cell has an upper positive terminal.

*2 Dimensions of fresh cell without tube

*3 Approximate values

*4 Measured under the following conditions: Charge CCCV: 1I_t/4.20V-4.40V/3h, Discharge CC: 0.2I_t/E.V. = 2.75V, Temperature: 25 deg. C

*5 No positive terminal plate on the cell bottom

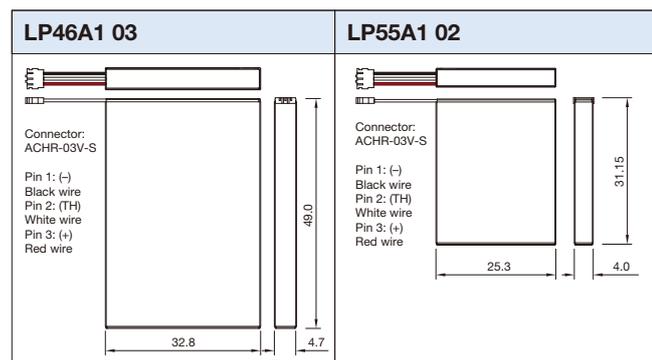
- Characteristics listed in this catalog are standard measured examples. Maxell does not guarantee these data.
- Specifications are subject to change without notice.
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- For further details, please contact your nearest Maxell dealer or distributor.

Standard Prismatic Lithium-ion Rechargeable Battery Pack (Soft Pack)

Features

- Small and light
- Allows our customers to adopt a lithium-ion rechargeable battery with minimal cost (no initial costs for development or a new tooling)
- Small minimum order quantity

External Dimensions (unit : mm)



Products

Model		LP46A1 03	LP55A1 02
Dimensions (mm) ¹	Thickness	4.7±0.3	4.0±0.3
	Width	32.8±0.5	25.3±0.5
	Height	49.0±0.5	31.15±0.5
Weight (g) ²		16	7
Charge (CCCV)	Max. voltage (V)	4.20±0.05	4.35±0.05
	Max. current (A)	0.75	0.40
Discharge (CC)	End voltage (V)	3.00	3.00
	Max. current (A)	1.125	0.50
Nominal voltage (V)		3.7	3.8
Minimum capacity (mAh) ³		750	250
Minimum order quantity		200 pcs	250 pcs

*1 Dimensions of unused battery without wire

*2 Approximate values

*3 Charge CCCV: 1I_t/4.2V-4.35V/3h

Discharge CC: 0.2I_t/E.V. = 3.00V

Visit our website for more information

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Catalog contents accurate as of January 2018.

Data and dimensions are just reference values.

Contents on this catalog are subject to change without notice.

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Maxell, Ltd. Energy Division

