

Charging for ML series

■ Charging circuits

| | |
|------------------------------|--|
| Charging / discharging cycle | Approx. 1000 times at 10% discharge depth to nominal capacity |
| Charging system | Constant-voltage charging (Please strictly adhere to the specified charge voltage) |
| Operating temperature | -20°C to +60°C |

*Consult with Panasonic Energy concerning constant-current charging systems.

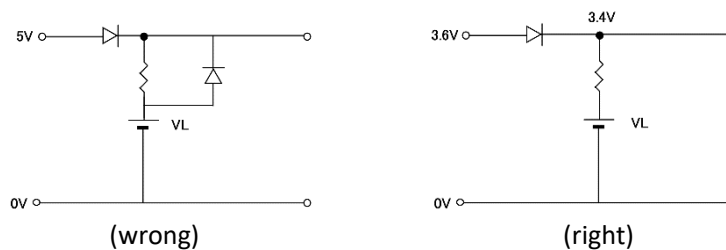
The charging circuit is crucial in terms of ensuring that full justice will be done to the battery characteristics.

Consider it carefully as the wrong charging circuit can cause trouble.

■ Precautions regarding the charge voltage setting

Under no circumstances should trickle charging, which is used for nickel-cadmium batteries, be used.

Ignoring this precaution will cause the battery voltage to rise to about 5V, resulting in a deterioration of performance.



■ Charge voltage range

If a fixed-charging method is applied, please adhere to the specified charging voltage.

Guaranteed voltage is 2.8V to 3.2V at the temperature of -20 °C to +60°C.

*If the charging voltage exceeds the specifications, the internal resistance of the battery will rise and may cause battery deterioration. Also, with a charge voltage around 4V, corrosion of the (+) terminal (case) may occur, causing leakage.

*It is not possible for the battery capacity to recover completely when the charging voltage is below the specification.

■ Recommended charging circuits

● Basic conditions

Fixed-voltage charge

Charge voltage: 2.8 to 3.2V (Standard voltage: 3.1V)

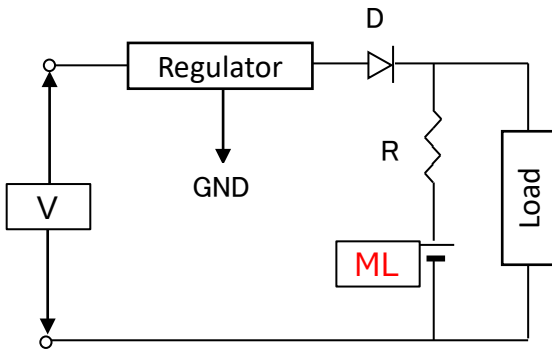
Charge current: For a battery voltage of 2.5V

ML2020 Approx. 3.0mA or below

■ Mixed usage of batteries

Do not use these batteries and primary lithium batteries or other rechargeable batteries together, and do not use new batteries and old batteries together even if they are of the same type.

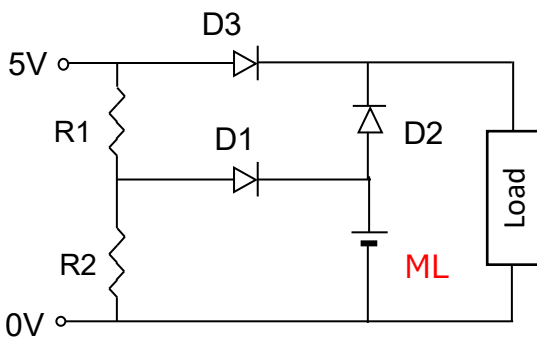
Example of Charging Circuits for ML series



Standard Circuit

Diode D: RB751VM-40

| Model | Reg. | R |
|--------|------|------|
| ML2020 | 3.2V | 180Ω |
| | 3.1V | 150Ω |

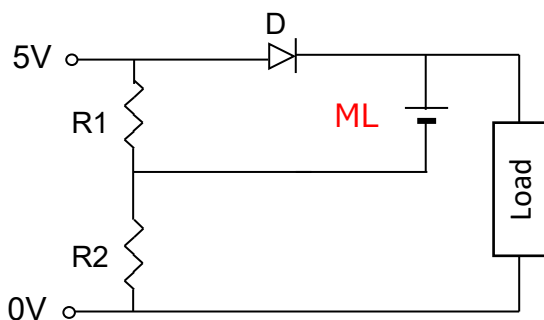


Standard Circuit (Charging from 5V line)

Diode D: RB751VM-40

| Model | R1 | R2 |
|--------|------|------|
| ML2020 | 180Ω | 330Ω |

For diode D2, select a diode of small inverse current ($I_R=1\mu A$ below / 5V)



Cost performance type

During charging, there is voltage drop V_f at D.

Diode D: RB751VM-40

In case the current flows through D is less than 1mA, when the battery is full charged.

| Model | R1 | R2 |
|--------|------|------|
| ML2020 | 330Ω | 180Ω |

If the current exceeds 1mA, these value of resistances is different.