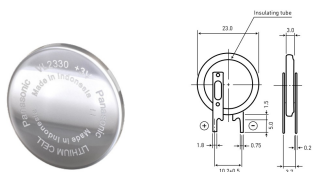


VL-2330

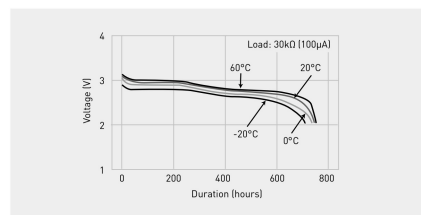


SPECIFICATIONS

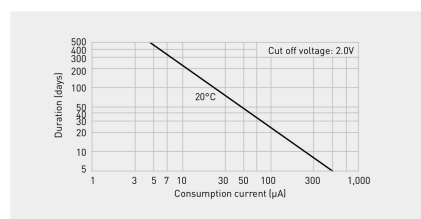
VL-2330

Nominal voltage [V]	3
Nominal capacity [mAh]	50.0
Diameter [mm]	23.0
Total height [mm]	3.0
Discharging temperature range [°C]	-20 to +60
Weight [g]	3.5

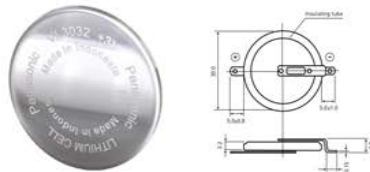
DISCHARGE TEMPERATURE CHARACTERISTICS



CONSUMPTION CURRENT VS. DURATION TIME



VL-3032

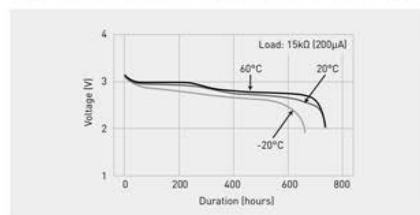


SPECIFICATIONS

VL-3032

Nominal voltage [V]	3
Nominal capacity [mAh]	100.0
Diameter [mm]	30.0
Total height [mm]	3.2
Discharging temperature range [°C]	-20 to +60
Weight [g]	6.3

DISCHARGE TEMPERATURE CHARACTERISTICS



CONSUMPTION CURRENT VS. DURATION TIME



MANGANESE RECHARGEABLE LITHIUM BATTERIES (ML SERIES) – COIN TYPE

(RECHARGEABLE)

These super compact rechargeable lithium batteries feature a manganese compound oxide for the positive electrode, a lithium/aluminum alloy for the negative electrode and a special non-aqueous solvent for the electrolyte. They can easily be incorporated into circuits where 3V ICs are used to save space.

FEATURES

- Rechargeable Lithium technology
- Self discharge rate at 20°C is only 2.0% per year
- 1,000 charge-discharge cycles at 10% depth of discharge [DoD]
- Superior long-term reliability
- Over 23 years of experience in production

APPLICATIONS

- Real Time Clock (RTC)
- Tracking & RFID
- Memory back-up power supplies for mobile phones
- Pagers and other compact communications equipment, etc.

MODEL NUMBER		Nominal voltage [V]	Nominal ^{*)} capacity [mAh]	Diameter [mm]	Total height [mm]	Weight [g]	Discharging temperature [°C]
ML-2020		3	45	20.0	2.0	2.2	-20 to +60

CHARGING

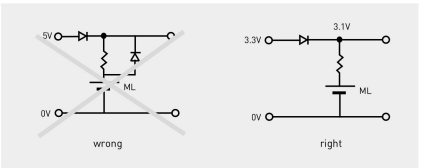
CHARGING CIRCUITS

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.

CHARGING / DISCHARGING CYCLE	Approx. 1,000 times at 10% discharge depth to nominal capacity
CHARGING SYSTEM*1	Constant-voltage charging. [Please strictly adhere to the specified charge voltage]
OPERATING TEMPERATURE	-20°C to +60°C

PRECAUTIONS REGARDING THE CHARGE VOLTAGE SETTING

Under no circumstances should constant current 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)

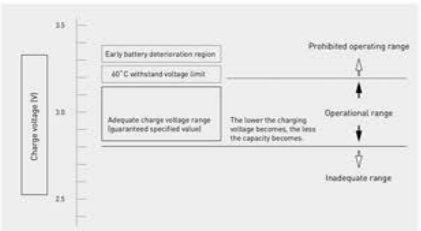
Charge current: For a battery voltage of 2.5V

ML-2020 Approx. 3.0mA or below

MIXED USAGE OF BATTERIES

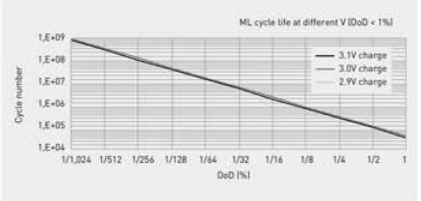
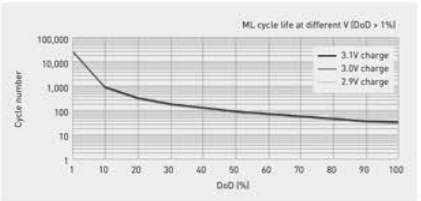
Do not use these batteries and lithium primary batteries or other rechargeable batteries together, and do not use new batteries and old batteries together even if they are of the same type.

INFLUENCE OF THE CHARGE VOLTAGE ON ML BATTERIES

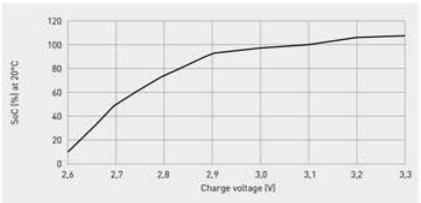


If the charge voltage goes beyond its adequate range, battery performance may deteriorate early. Be sure to observe the guaranteed charge voltage.

ML CYCLE LIFE



ML CHARGING



REFERENCE: EXAMPLES OF CHARGING CIRCUITS

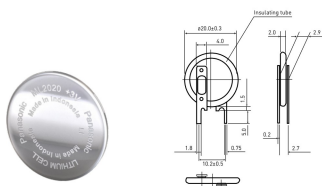
WHEN CHARGING USING ANOTHER BATTERY		
ML-2020 REG	D	R
3.2V	MA2J728	180Ω
3.1V	MA2J728	150Ω

STANDARD CIRCUITS		
For D ₁ , select a diode of small inverse current (I _r =1μA/5V) D ₁ , D ₂ : MA3X716 (Diode type code) D ₂ : MA3X704, MA2J728		
ML-2020	R ₁	R ₂
	180Ω	330Ω

Simple economical circuits		
Load	100μA below	
D, Vf	0~0.2V	
	R ₁	R ₂
ML-2020	330Ω	180Ω

Vf of D will be different from the value given above if a current in excess of 10μA flows to the load during operation. Compensation must be provided by the resistors in such cases.

ML-2020

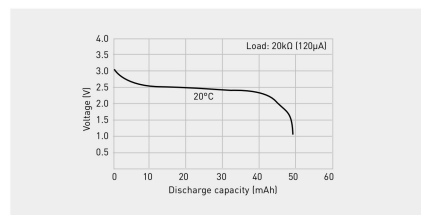


SPECIFICATIONS

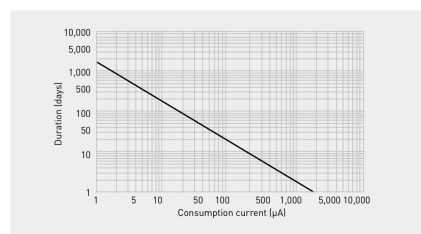
ML-2020

Nominal voltage [V]	3
Nominal capacity [mAh]	45.0
Diameter [mm]	20.0
Total height [mm]	2.0
Discharging temperature range [°C]	-20 to +60
Weight [g]	2.2

DISCHARGE TEMPERATURE CHARACTERISTICS



CHARGE VOLTAGE VS. DISCHARGE CAPACITY



COBALT TITANIUM RECHARGEABLE LITHIUM BATTERIES (CTL SERIES) – COIN TYPE

(RECHARGEABLE)

These cobalt titanium rechargeable lithium batteries have excellent cycle characteristics. Compared to MT series, CTL series can keep higher voltage (2.3V). CTL series have long term reliability, that is why many solar watches use CTL series.

APPLICATIONS



IoT / sensing devices



Watches

FEATURES

- Excellent charging and discharging cycle characteristics
- Can keep higher voltage (2.3 V) compared to MT series
- Long term reliability that many solar watches prove

MODEL NUMBER		Nominal voltage [V]	Nominal ^{*)} capacity [mAh]	Diameter [mm]	Total height [mm]	Weight [g]	Discharging temperature [°C]
CTL-621F		2.3	3.6	6.8	2.1	0.25	-20 to +60
CTL-920F		2.3	7.7	9.5	2.0	0.45	-20 to +60
CTL-1616F		2.3	13	16	1.6	1.00	-20 to +60

CHARGING

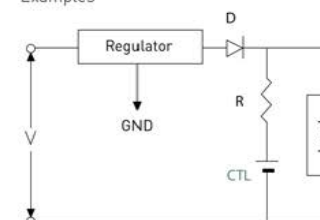
CHARGING CIRCUITS

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. Maintain the base conditions as below. Otherwise, battery quality may be damaged.

Base conditions:	Constant Voltage Charging
Charge voltage:	2.5V to 2.7V
Charge current:	[CTL621F] Max. 0.63mA (at 2.5V of battery voltage) [CTL920F] Max. 1.0mA (at 2.5V of battery voltage) [CTL1616F] Max. 2.0mA (at 2.5V of battery voltage)

If you have any questions, please contact Panasonic.

Examples



MODEL NUMBER	Regulator [V]	D [Diode]	R [Ω]
CTL-621F	2.7	RB751VM-40	160
	2.8	RB751VM-40	320
CTL-920F	2.7	RB751VM-40	100
	2.8	RB751VM-40	200
CTL-1616F	2.7	RB751VM-40	51
	2.8	RB751VM-40	100