

RECHARGEABLE COIN TYPE LITHIUM BATTERIES

Vanadium pentoxide lithium rechargeable batteries (VL series)

Overview

This coin type lithium rechargeable battery has a totally new composition, employing vanadium pentoxide cathode, lithium alloy anode, and non-aqueous solvents in the electrolyte solution. With an energy density about twice that of button type nickel cadmium batteries, this battery is especially suited for applications such as memory backup power supply in electronic devices.

Applications

- Memory backup power supplies for OA equipment (personal computers, facsimiles, etc.), AV equipment (VTRs), and communications equipment (portable telephones, etc.)
- Hybrid systems with solar batteries (solar remote controls, etc.)

Features

- **Flat high voltage of about 3 V**
A single battery can provide the voltage equivalent to two or even three nickel cadmium batteries (approx. 1.2 V) and capacitors. Benefits include: Compact design and cost reduction.
- **Several months of continuous backup**
VL3032 (nominal capacity 100mAh) is capable of continuous backup for 10,000 hours at a memory backup load of 10 μ A (when discharged to 2.5 V).
- **Small self-discharge allows use without recharging even after long storage.**
Unlike nickel cadmium batteries which lose considerable capacity in 6 months due to self-discharge, the vanadium lithium secondary battery's self-discharge is very small, i.e., annual rate of approximately 2% at normal temperature.
- **Stable to continuous overcharging and overdischarging.**
Vanadium lithium batteries exhibit stable characteristics in continuous overcharging and overdischarging to 0V, important in memory backup considerations.

Specification Table

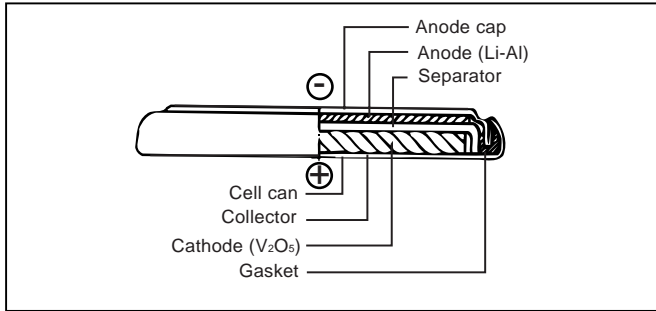
Model No.	JIS	IEC	Electrical characteristics 20°C			Dimensions (Max.)		Approx. weight (g)
			Nominal voltage (V)	Nominal ^{*1} capacity (mAh)	Continuous drain Standard (mA)	Diameter (mm)	Height (mm)	
						VL621	---	
VL1216	---	---	3	5	0.03	12.5	1.6	0.7
VL1220	---	---	3	7	0.03	12.5	2.0	0.8
VL2020	---	---	3	20	0.07	20.0	2.0	2.2
VL2320	---	---	3	30	0.10	23.0	2.0	2.8
VL2330	---	---	3	50	0.10	23.0	3.0	3.7
VL3032	---	---	3	100	0.20	30.0	3.2	6.3

* 1 Nominal capacity shown above is based on standard drain and cut off voltage down to 2.5 V at 20°C

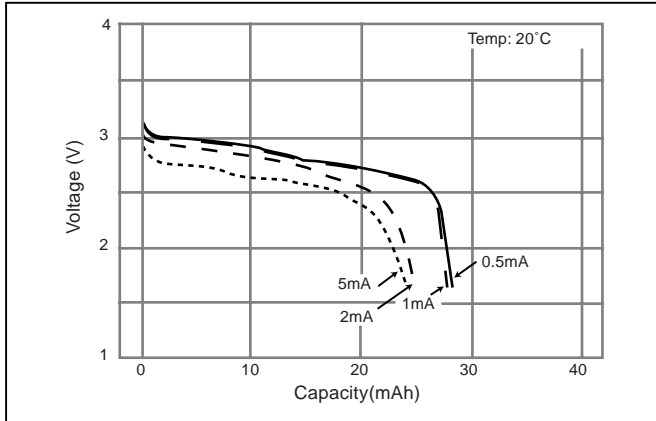
Charge and discharge cycle	About 1,000 times at 10% discharge depth to nominal capacity
Charge	Constant-voltage charging (Refer to recommended charging circuit)
Operating temperature	-20°C to 60°C

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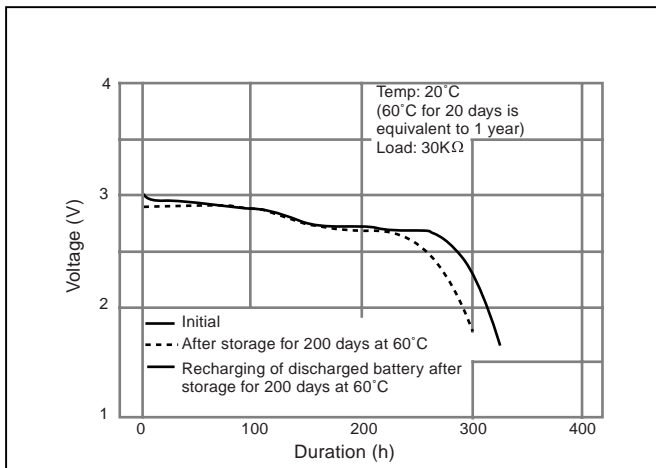
Cutaway view



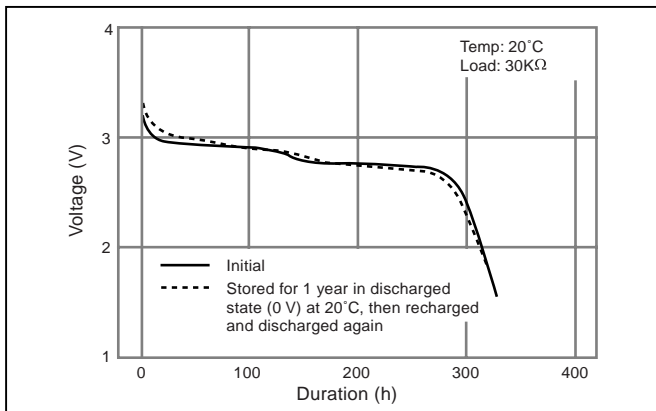
Load characteristics (VL2020)



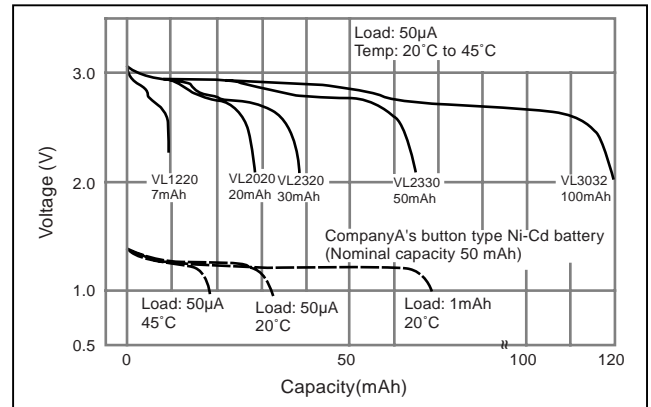
Storage characteristics (without charge) (VL2020)



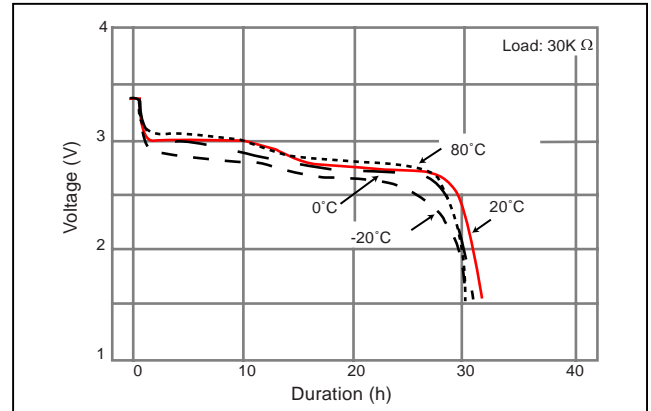
Overdischarge characteristics (VL2020)



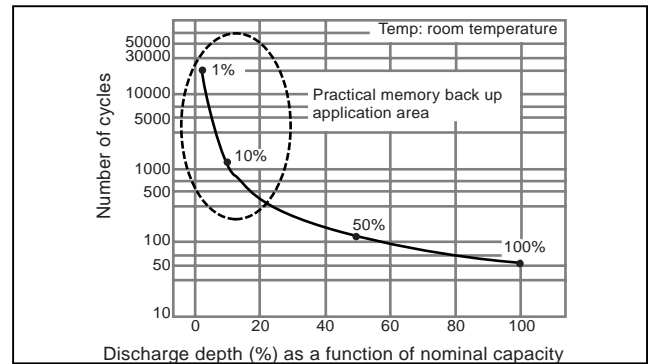
VL discharge characteristics



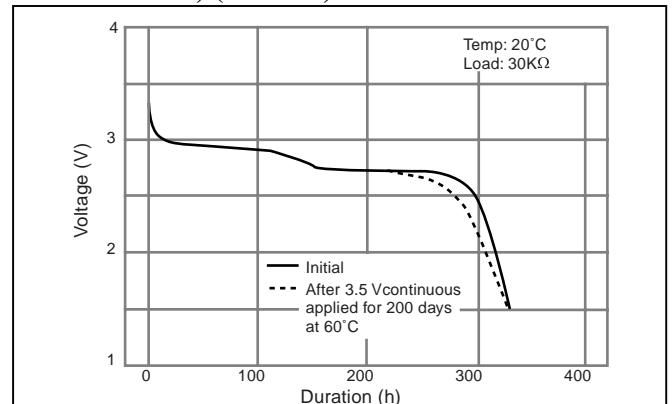
Temperature characteristics (VL2020)



Charge/discharge characteristics vs. discharge depth (VL2020)

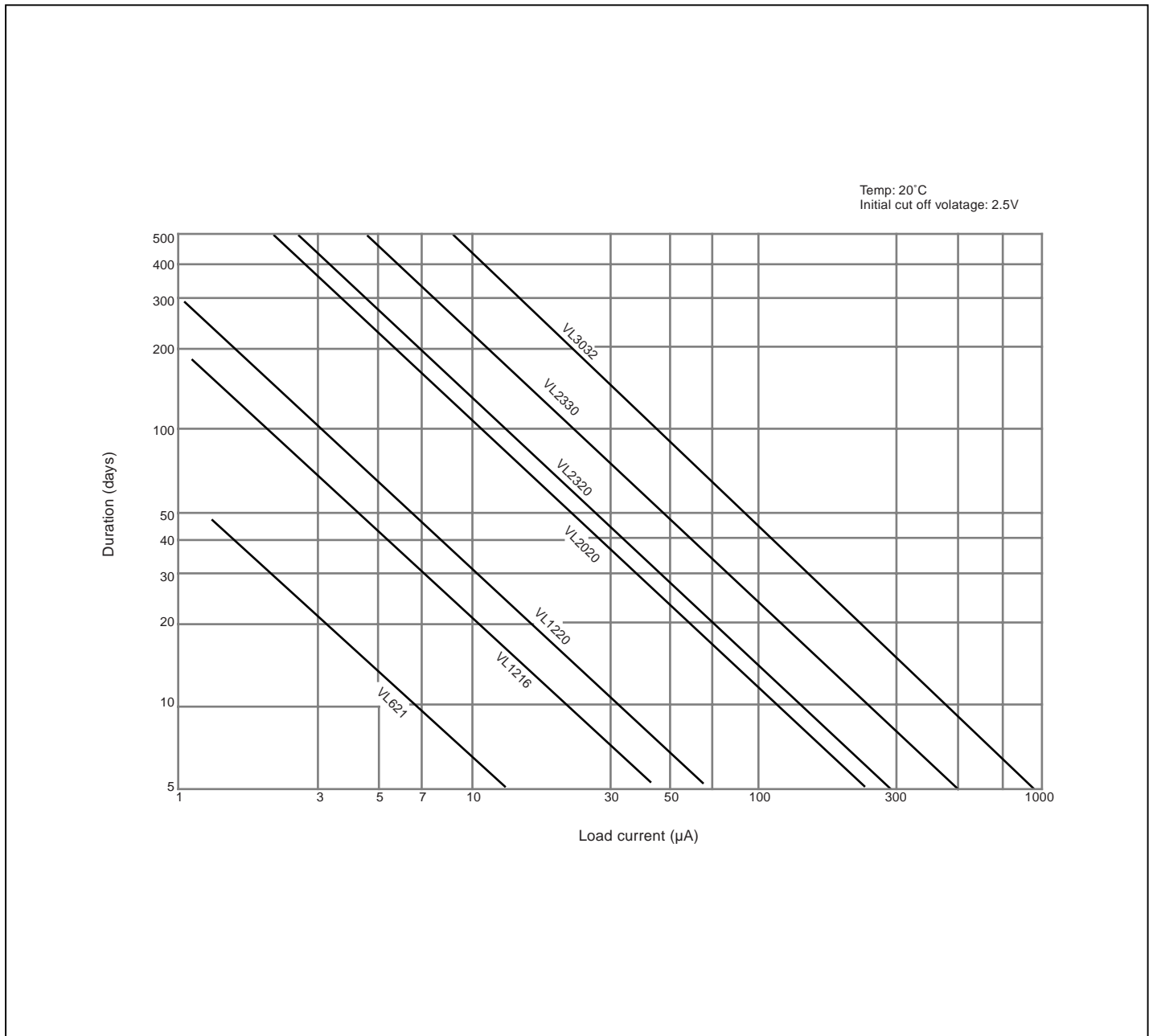


Withstand voltage characteristics (Overcharge characteristics) (VL2020)



BATTERY SELECTOR CHART

Current drain as a function of duration



RECOMMENDED CHARGING CIRCUITS

Basic conditions: Fixed-voltage charging

Charge voltage: 3.4 ± 0.15 V

Current: at battery voltage 3 V

VL 621 approx. 0.2 mA or below

VL 1216, VL1220 approx. 0.5 mA or below

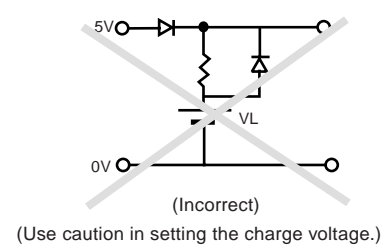
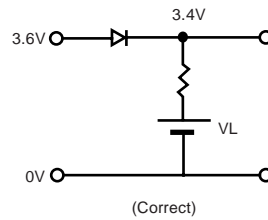
VL 2020 approx. 1.5 mA or below

VL 2320, VL2330 approx. 2.0 mA or below

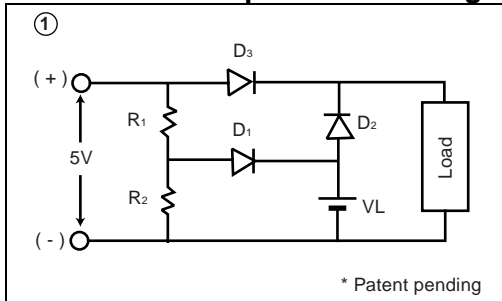
VL 3032 approx. 4 mA or below

(Note: current can be increased when voltage is below 3 V.)

Charging circuits are important. Be sure to refer to "Precautions in handling" (page 61).



Reference: Examples of 5-V charging circuits



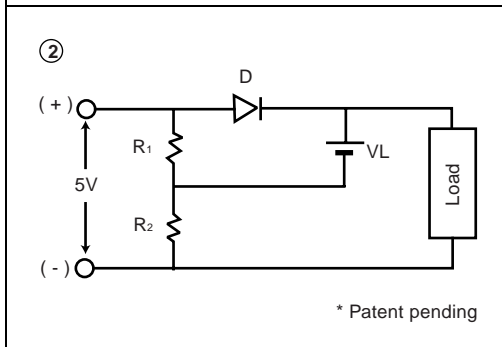
Standard circuits

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

D₁, D₂ = MA716 (Diode type code)

D₃ = MA704, MA700

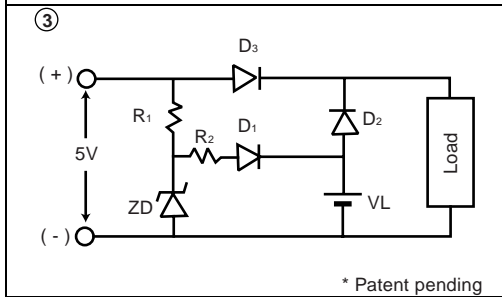
	R ₁	R ₂
VL621	2.2kΩ	5.6kΩ
VL1220, VL1216	750Ω	2000Ω
VL2020	200Ω	510Ω
VL2320, VL2330	150Ω	390Ω
VL3032	68Ω	160Ω



Simple economical circuits

D: MA700 = (very small inverse current)

Load with 5 V applied V _f of D	100μA to 10mA		100μA or below	
	R ₁	R ₂	R ₁	R ₂
VL621	8.2kΩ	2.4kΩ	6.8kΩ	2.7kΩ
VL1220, VL1216	2000Ω	510Ω	1500Ω	560Ω
VL2020	1300Ω	330Ω	470Ω	180Ω
VL2320, VL2330	1100Ω	270Ω	390Ω	150Ω
VL3032	510Ω	120Ω	180Ω	68Ω

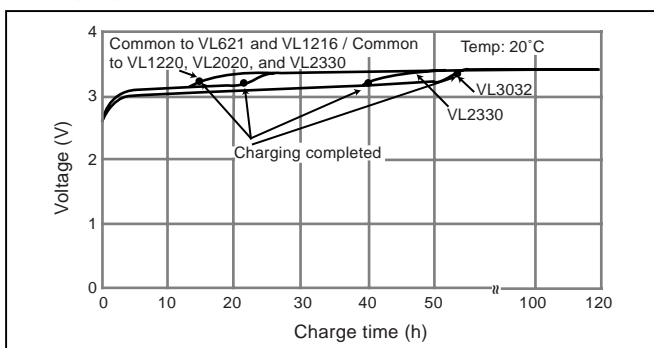


	ZD	D ₁	R ₁	(common to all types)			
A	MA3036L	MA704	300Ω				
B	MA3036H	MA700	270Ω				

Type	VL3032	VL2330	VL2320	VL2020	VL1220	VL1216	VL621
R ₂	A	Not required			470Ω	1.5kΩ	
	B	Not required			560Ω	1.6kΩ	

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

Charging curve: circuits ① and ②



UL recognition conditions

When a protective component is shorted or opened, maximum charge current is regulated to the following value.

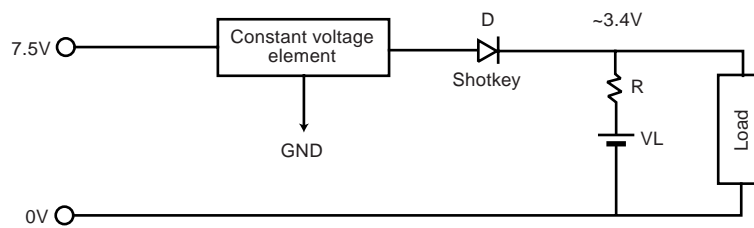
VL621	300mA
VL1216	300mA
VL1220	300mA
VL2020	300mA
VL2320	300mA
VL2330	300mA
VL3032	300mA

Call Panasonic for answers to specific questions about UL.

OTHER CHARGING CIRCUITS

Sample circuits

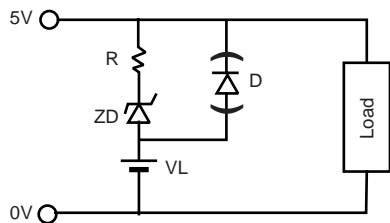
④ For minimizing current leakage due to resistance, etc., In such a case as charging by another battery



REG.	D
3.7V	MA700

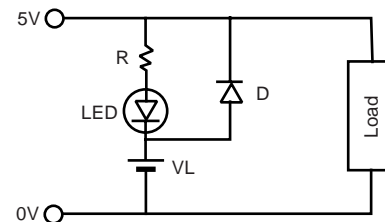
For the details, refer to the constant voltage element specifications

⑤ Zener control



ZD = HZ2ALL
 R - 43 ohm for VL 2320
 68 ohm for VL2020
 * D = MA700 or MA704

⑥ LED control

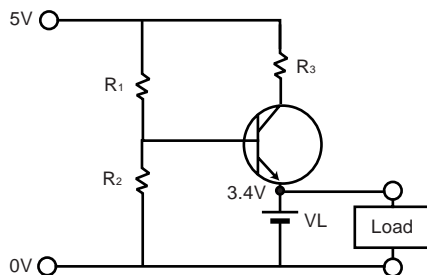


LED
 R = 51 ohm for VL2320
 * D = MA700 or MA704

* Patent pending

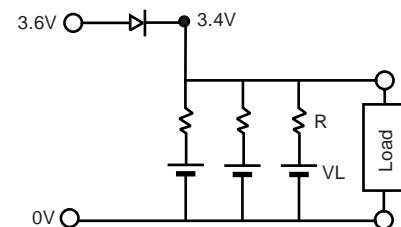
* Select a diode having an inverse current as small as possible. (IR=1μA or below / 5 V)

⑦ Transistor control



(for VL2320)
 $R_1 = 4.3k \Omega$
 $R_2 = 15.0k \Omega$
 $R_3 = 680 \Omega$

⑧ Parallel circuit



(Note) Be sure to consult with us regarding the charge circuit to be used.

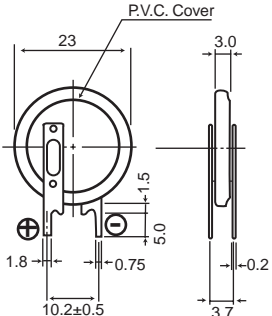
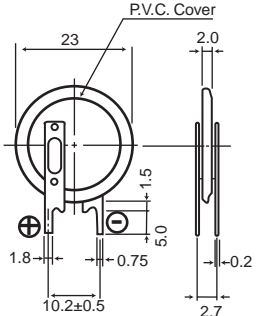
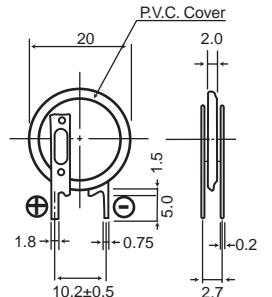
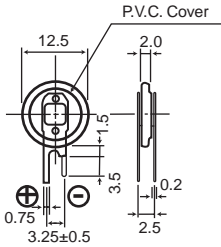
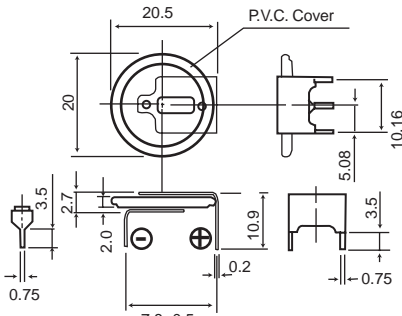
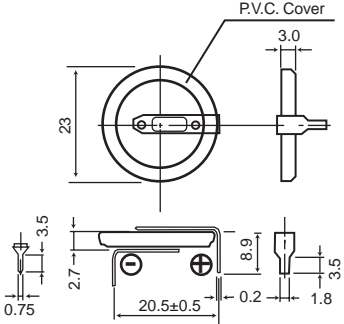
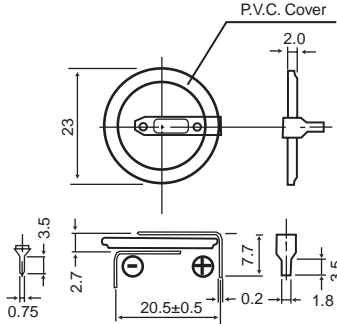
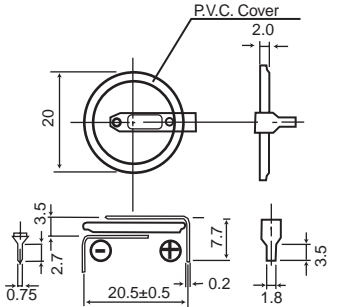
VANADIUM PENTOXIDE LITHIUM RECHARGEABLE BATTERIES (VL SERIES)

Specification Table (Vanadium pentoxide lithium rechargeable batteries with terminals)

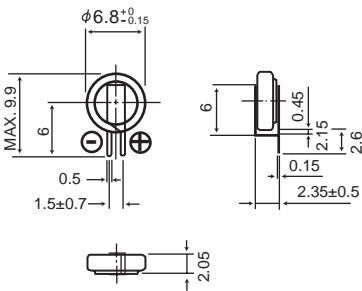
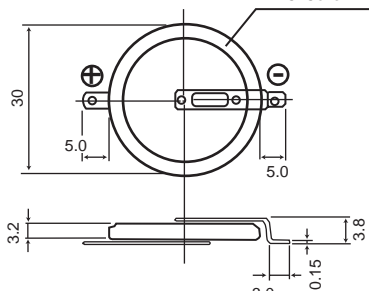
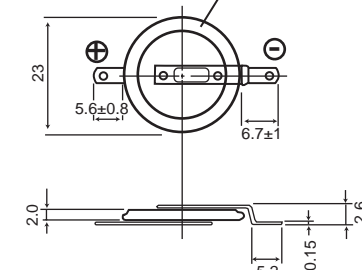
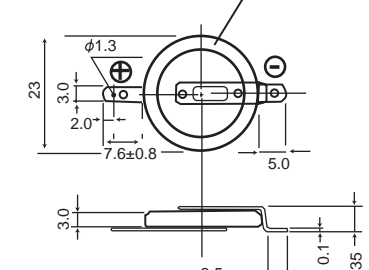
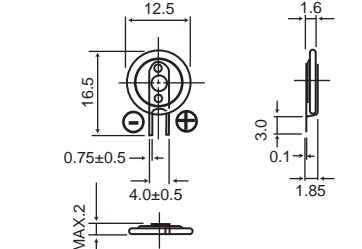
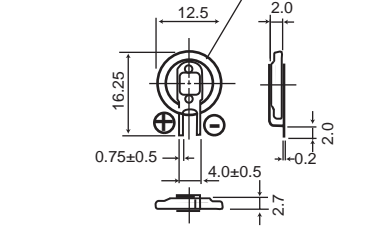
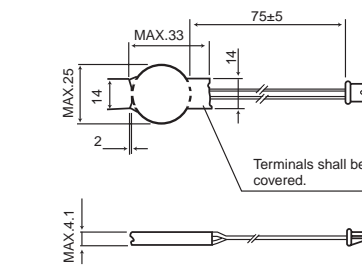
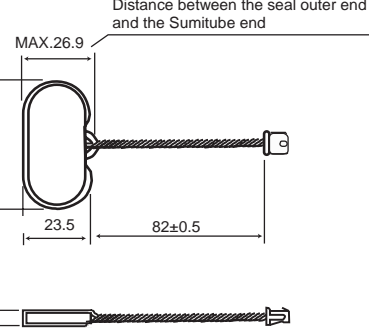
Type	Model No.	P.V.C. Cover		Fig. No.	Nominal		Product availability	
		With P.V.C. cover	Without P.V.C. cover		Voltage (V)	Capacity (mAh)	Standard	Special
V type	VL2330	/1VC		1	3	50	⊗	
	VL2320	/1VC		2	3	30	⊗	
	VL2020	/1VC		3	3	20	⊗	
	VL1220	/1VC		4	3	7	⊗	
G type	VL2020	/1GU7		5	3	20	⊗	
	VL3032	/1GUF		-	3	100	⊗	
H type	VL2330	/1HF		6	3	50	⊗	
	VL2320	/1HF		7	3	30	⊗	
	VL2020	/1HF		8	3	20	⊗	
F type	VL621		/F9D	9	3	1.5	⊗	
	VL3032	/1F2		10	3	100	⊗	
	VL2320	/1F2		11	3	30	⊗	
	VL2330	/1F3		12	3	50	⊗	
	VL1216		/1F5U	13	3	5	⊗	
	VL1220	/1FC		14	3	7	⊗	
Connecting type	VL2330	/1S22		15	3	50	⊗	
	VL2330	/2S22		16	6	50	⊗	

- See page 61 for precautions in charging and handling. Recommended charging circuit is shown on page 52.
- Items with terminals other than those listed above are also available. Contact Panasonic for details.

DIMENSIONS (MM)

Model No.	Dimension (mm)	Model No.	Dimensions (mm)
VL2330/1VC (50mAh)	① 	VL2320/1VC (30mAh)	② 
VL2020/1VC (20mAh)	③ 	VL1220/1VC (7mAh)	④ 
VL2020/1GU7 (20mAh)	⑤ 	VL2330/1HF (50mAh)	⑥ 
VL2320/1HF (30mAh)	⑦ 	VL2020/1HF (20mAh)	⑧ 

DIMENSIONS (MM) - CONTINUED

Model No.	Dimension (mm)	Model No.	Dimensions (mm)
VL621/F9D (1.5mAh)	<p>⑨</p> 	VL3032/1F2 (100mAh)	<p>⑩</p> 
VL2320/1F2 (30mAh)	<p>⑪</p> 	VL2330/1F3 (50mAh)	<p>⑫</p> 
VL1216/1F5U (5mAh)	<p>⑬</p> 	VL1220/1FC (7mAh)	<p>⑭</p> 
VL2330/1S22 (50mAh)	<p>⑮</p> 	VL2330/2S22 (50mAh)	<p>⑯</p>  <p>(Two unit cells connected in series)</p>