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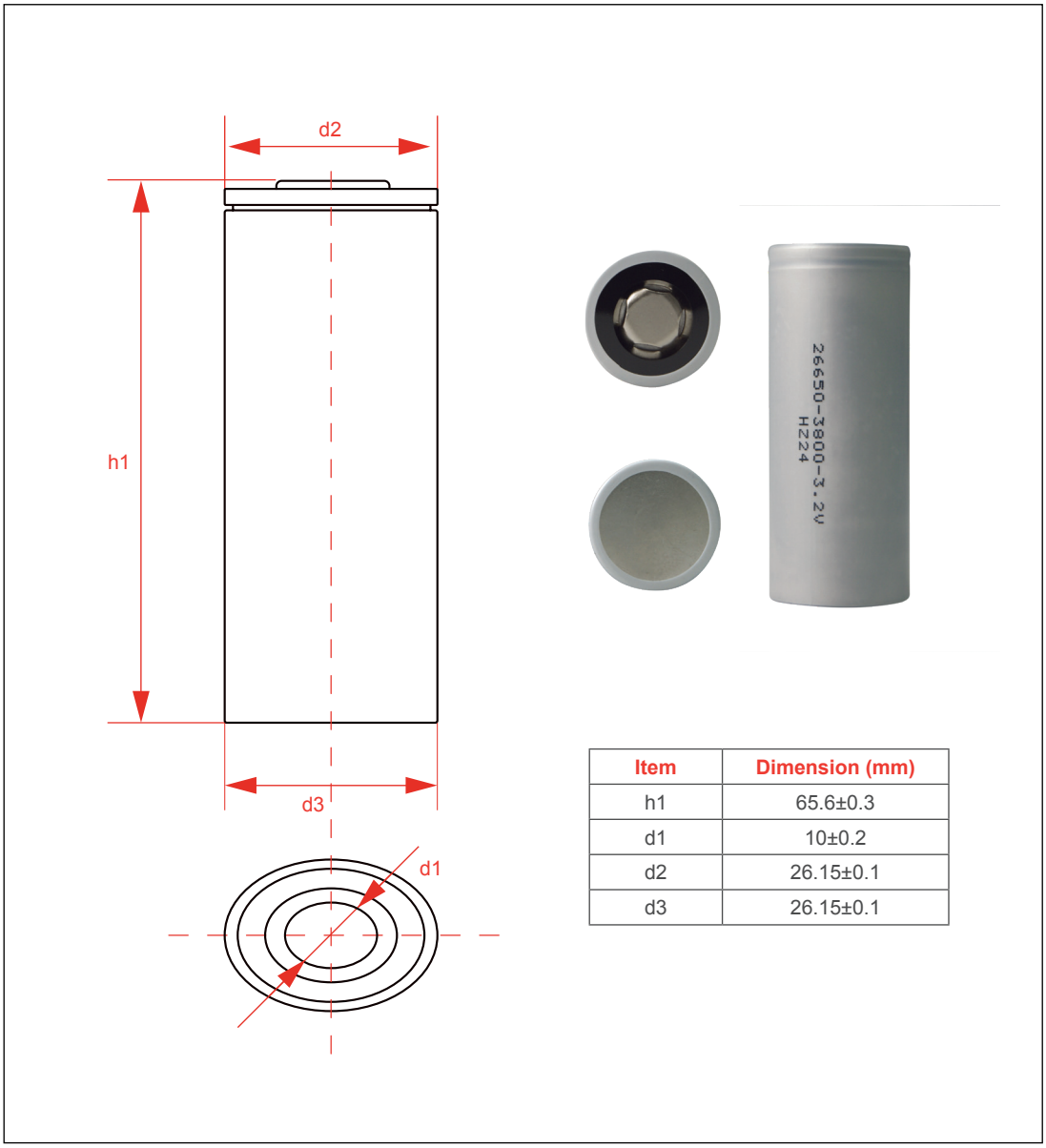
LFP26650-38I • LiFePO4 battery pack

1. Scope

This product specification describes product performance indicators of Cylindrical LiFePO4 Cell.

2. Appearance and dimension

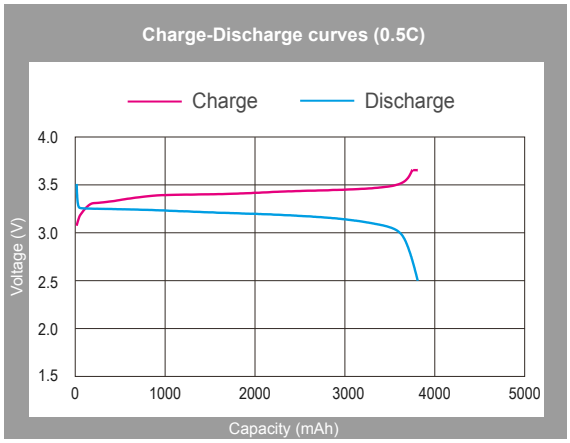


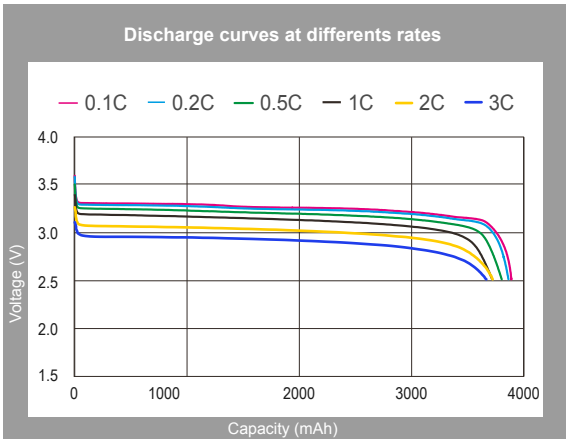
Item	Dimension (mm)
h1	65.6±0.3
d1	10±0.2
d2	26.15±0.1
d3	26.15±0.1

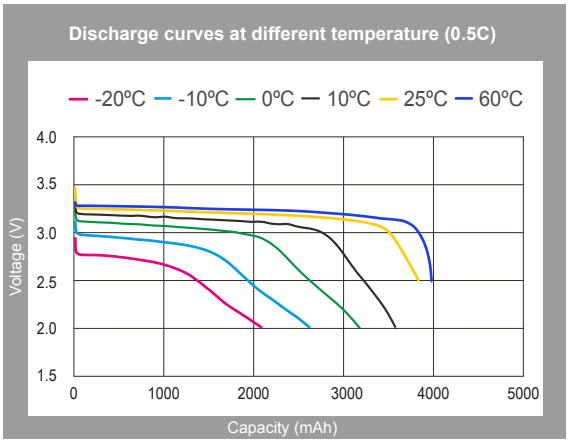
3. Major technical parameters

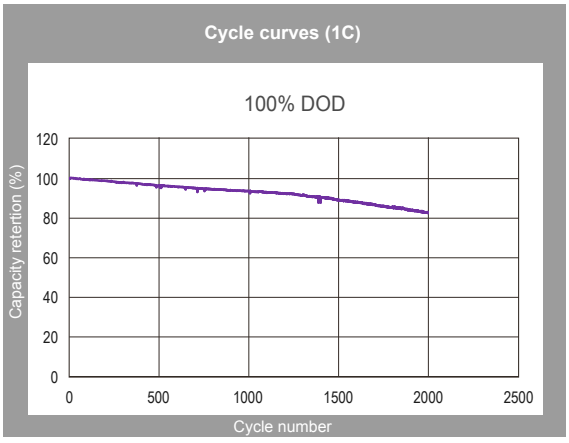
NO.	Item		Standard	Note
1	Standard capacity		3800mAh	0.2C (current value of 3800mA at 1C)
2	Capacity range		≥3750mAh	0.2C
3	Standard voltage		3.2V	
4	Alternating internal resistance		≤25mΩ	
5	Charge conditions	Cut-off voltage	3.65±0.05V	Constant-current charge to 3.65V at 0.5C, constant voltage charge to stop until 0.01C mA
		Cut-off current	0.01C	
6	Max. charging current		3.8A	
7	Discharge cut-off voltage		2.5V	
8	Standard discharge current		1.9A	
9	Fast discharge current		3.8A	
10	Max. continuous discharge current		11.4A	Only for single cell
11	Pulse discharge current		20A, 5s	
12	Cycle characteristic		2000 times (100%DOD)	The residual capacity is no less than 80% of rated capacity at 1C rate.
			4000 times (80%DOD)	
			7000 times (50%DOD)	
13	Working temperature		Charge: 0ºC~55ºC	
			Discharge:-20ºC~60ºC	
14	Storage temperature		-20ºC~55ºC	Short-term storage (<3 months)
15	Cell weight		Approx 87.5g	

4. Characteristics curves









5. Safety characteristics

NO.	Item	Test method	Standard
1	Overcharge	The cell is discharged according to the standard discharge method. Apply a 1C Constant current 12V constant voltage charge for 1.5h.	No explosion, No fire
2	Over discharge	After normal charge, test the batteries' initial state. When the batteries are normal, Discharge to 0V at 0.5C. Observe cell's variation of appearance.	No explosion, No fire
3	Internal short-circuit	After normal charge, test the batteries initial state, Keep the cell into explosion protection cover, short-circuit the positive and negative terminals directly (general resistance shall be less than or equal to 50mΩ). Stop the test when the temperature falls to 10ºC lower than the peak value. Observe the variation of the batteries' appearance and temperature.	No explosion, No fire
4	Thermal abuse	Test the batteries' initial state and capacity. Standard charge. Put cell into oven, increase the temperature to 130±2ºC at rate of (5±2ºC)/min, and keep it for 30min. Observe the variation of batteries' appearance.	No explosion, No fire
5	Drop	After normal charge, test the batteries' initial state and capacity. Then let it fall from a height of 1m (the lowest height) to a smooth cement floor, twice.	No explosion, No fire
6	Heavy impact	A diameter of 15.8mm steel rod is placed in the middle of the fully charged cell, then the weight of 10Kg hammer from 1.0m height free falls to the cell upper.	No explosion, No fire
7	Extrusion test	Place the cell in between the pressing surface of extrusion apparatus, parallel the axes of cylindrical cell to the pressing surface, and gradually increase pressure up to 13KN, keeping the pressure for 1min.	No explosion, No fire
8	Prick test	UseΦ3~5 mm high temperature resistant steel needle, to 10~40mm/s of speed, from the perpendicular to the direction of the cell plate (Steel needle stops in the cell).	No explosion, No fire

6. Environmental adaptability

NO.	Item	Test method	Standard
1	Temperature cycle	Store the cell for 48 hours at 75±2ºC after standard charge, then store the cell at -20ºC for 6 hours, and at room temperature for 24 hours. Observe the batteries' appearance.	No leakage, No smoke, No fire, No explosion
2	Static Humidity	Put the cell at 40ºC±5ºC and 95%RH chamber for 48h, then get it out and store it for 2h at room temperature. Observe the appearance and discharge at 0.5C to 2.5V, then test the final capacity.	Discharge capacity after storage is more than 90% of rated capacity. No obvious outside damage, No corrosion, No smoke, No explosion
3	Vibration	Standard charge. Equip it to the vibration platform, prepare the test equipment according to following vibration frequency and relevant swing, doing frequency sweeping from X, Y, Z three directions, each from 10Hz to 55Hz for 30 minutes of recycling, rating of which is 1oct/min: A) vibration frequency:10Hz~30Hz Displacement breadth (single swing): 0.38mm B) vibration frequency:30Hz~55Hz Displacement breadth (single swing): 0.19mm. Observe the final state after scanning.	Residual Capacity≥90% Rated Capacity Voltage Decrease Rate ≤0.5% No obvious outside damage, No leakage, No smoke, No explosion.
4	Normal Storage	Test the batteries' initial state and capacity; store the cell for 30 days after standard charge, test the final state. Discharge at 0.5C to 2.5V, then test batteries' residual capacity. Then after normal charge, discharge at 0.5C to 2.5V, then test the batteries' recovery capacity, Three cycles are permitted for this test, If one of the three cycles can reach the standard, it represents the cell has reached the standard.	Residual Capacity ≥90% Initial Capacity Recuperative Capacity ≥95% Initial Internal

7. Standard Test Environment

Unless especially specified, all tests stated in this Product Specification are conducted at below condition:

Temperature: 25±2ºC

Humidity: (65±20) % RH

8. Storage and Others

8.1 Long Time Storage

If the cell is stored for a long time (more than three months),the cell should be stored in dry and cool place. The cell should be charged and discharged every there months. The batteries' storage voltage should be 3.3~3.4V and the cell should be stored in a condition as NO.8.

Any matters that this specification does not cover should be consulted between the customer and Goldencell.

9. Notice in Using Cell

Please pay attention to followings in case of cell will have leakage, heat etc.

- Do not immerse the cell in water or seawater, and keep the cell in a cool dry surrounding if it stands by.
- Do not use or leave the cell at high temperature as fire or heater. Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
- Do not reverse the position and negative terminals.
- Do not connect the cell electrodes to an electrical outlet.
- Do not short circuit. Otherwise it will cause serious damage of the cell.
- Do not transport or store the cell together with metal objects such as hairpins, necklaces, etc.
- Do not strike, trample, throw, fall and shock the cell.
- Do not directly solder the cell and pierce the cell with a nail or other sharp objects.
- Do not use the cell in a location where static electricity and magnetic field is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
- Use the cell charger specifically when recharging.
- If the cell leaks and the electrolyte gets into the eyes, do not rub the eyes, instead, rinse the eyes with clean water, and immediately seek medical attention. Otherwise, it may injure eyes.
- If the cell gives off strange odor, generates heat, becomes discolored or deformed, or in any way appears abnormal during use, recharging or storage, immediately stop charging, using, and remove it from the device.
- In case the cell terminals are dirty, clean the terminals with a dry cloth before use. Otherwise poor performance may occur due to the poor connection with the instrument.
- Tape the discarded cell terminals to insulate them.

Note:

- The following is the interpretation of some terms in the above test project:
- Standard charge: Under the environment of 25ºC±2ºC, for constant current cell charging 0.5C to cut-off voltage, to a constant voltage charging to the cut-off current, stop charging.
- Initial state: Initial state of voltage and internal resistance of the cell.
- Final state: State of cell internal resistance and voltage.
- Residual capacity: The first discharge capacity batteries after a specific test.
- Recovery capacity: The discharge capacity by specifically charge-discharge cycle repeatedly after being tested by the specific procedure.

10. Warranty

The warranty is specified in our warranties section of Terms of Sales. If the product is to be stored for more than three months it is necessary to perform the appropriate maintenance to ensure the good condition of the batteries. Consult our annex to the Terms of Sales on the recommended maintenance.

APPENDIX

Suggestions for cell packs

1. Selecting principle of nickel strip is often applied to the design of cell packs

Based on the working current of cell packs to make the shunt selection of nickel strip. The common nickel strip could under the current as below:

Nickel strip type	3*0.1	4*0.1	7*0.15	8*0.15
Normal working current	2A	3A	7A	8A
Maximum continuous current	4A	5A	13A	15A

2. Relation between the cell packs design current and lead wires current breakdown, and principle of wires selection

Based on the working current of cell packs to make the shunt selection of wires. Different wires could under the current as below:

AWG	Diameter		Cross-sectional	resistance	normal current	Max-current	AWG	Diameter		Cross-sectional	resistance	normal current	Max-current
	Metric/mm	Imperial/inch	mm^2	Ω/km	A	A		Metric/mm	Imperial/inch	mm^2	Ω/km	A	A
0000	11.68	0.46	107.22	0.17	423.2	482.6	22	0.643	0.0253	0.3247	54.3	1.280	1.460
000	10.4	0.4096	85.01	0.21	335.5	382.6	23	0.574	0.0226	0.2588	48.5	1.002	1.165
00	9.27	0.3648	67.43	0.26	266.2	303.5	24	0.511	0.0201	0.2047	89.4	0.808	0.921
0	8.25	0.3249	53.49	0.33	211.1	240.7	25	0.44	0.0179	0.1624	79.6	0.641	0.731
1	7.35	0.2893	42.41	0.42	167.4	190.9	26	0.404	0.0159	0.1281	143	0.506	0.577
2	6.54	0.2576	33.62	0.53	132.7	151.3	27	0.361	0.0142	0.1021	128	0.403	0.460
3	5.83	0.2294	26.67	0.66	105.2	120.0	28	0.32	0.0126	0.0804	227	0.318	0.362
4	5.19	0.2043	21.15	0.84	83.5	95.2	29	0.287	0.0113	0.0647	289	0.255	0.291
5	4.62	0.1819	16.77	1.06	66.2	75.5	30	0.254	0.0100	0.0507	361	0.200	0.228
6	4.11	0.0162	13.3	1.33	52.5	59.9	31	0.226	0.0089	0.0401	321	0.158	0.181
7	3.67	0.1443	10.55	1.68	41.6	47.5	32	0.203	0.0080	0.0316	583	0.128	0.146
8	3.26	0.1285	8.37	2.11	33.0	37.7	33	0.18	0.0071	0.0255	944	0.101	0.115
9	2.91	0.1144	6.63	2.67	26.2	29.8	34	0.16	0.0063	0.0201	956	0.079	0.091
10	2.59	0.1019	5.26	3.36	20.8	23.7	35	0.142	0.0056	0.0169	1200	0.063	0.072
11	2.3	0.0907	4.17	4.24	16.5	18.8	36	0.127	0.0050	0.0127	1530	0.050	0.057
12	2.05	0.0808	3.332	5.31	13.1	14.9	37	0.114	0.0045	0.0098	1377	0.041	0.046
13	1.82	0.0720	2.627	6.69	10.4	11.8	38	0.102	0.0040	0.0081	2400	0.032	0.036
14	1.63	0.0641	2.075	8.45	8.2	9.4	39	0.089	0.0035	0.0062	2100	0.025	0.028
15	1.45	0.0571	1.646	10.6	6.5	7.4	40	0.079	0.0031	0.0049	4080	0.019	0.022
16	1.29	0.0508	1.318	13.5	5.2	5.9	41	0.071	0.0028	0.004	3685	0.016	0.018
17	1.15	0.0453	1.026	16.3	4.1	4.7	42	0.064	0.0025	0.0032	6300	0.013	0.014
18	1.02	0.0403	0.8107	21.4	3.2	3.7	43	0.056	0.0022	0.0025	5544	0.010	0.011
19	0.912	0.0369	0.5667	26.9	2.6	2.9	44	0.051	0.0020	0.002	10200	0.008	0.009
20	0.813	0.032	0.5189	33.9	2.0	2.3	45	0.046	0.0018	0.0016	9180	0.006	0.007
21	0.724	0.0285	0.4116	42.7	1.6	1.9	46	0.041	0.0016	0.0013	16300	0.005	0.006

3. Voltage protection point value (for single cell) of protection board or BMS, and selecting principle of protection board

	Over-charged Protection Voltage	Over-discharged Protection Voltage	The protection voltage point for monomer should be selected also based on the safety voltage point of cell and protection voltage point of IC.
Lithium Iron Phosphate	3.6-3.9	2.0-2.5	
Ni-Co- Mn	4.05-4.25	2.5-3.0	

Selecting principles of protection board: based on the safety needs of the cell and customers' requirements. To select the suitable protection board according to the size of cell packs.

4. Selecting principles of chargers.

(1) Voltage should be regulated by the safest voltage of chargeable cell*n (make the Lithium iron phosphate as 3.6V and Ni- Co- Mn as 4.2V);

(2) Current should be limited by the safe current of chargeable cell, and the customers' specific requirements also should be considered.

(3) If above 120W, chargers with aluminium alloy cooling fin or cooling fan will be suggested.

(4) If under 60W, chargers with plastic shell will be suggested.

5. In the process of packs structure design and production, some measures and skills could be handled to avoid cell short circuit.

(1) To strengthen the positive insulation treatment of the monomer batteries, with barley paper or other high temperature resistant material;

(2) Cell in the case of size allowed, should try to use batteries of the isolation.

(3) Cell when working current is larger and can't use bracket, should strengthen the insulation of the batteries shell, for example, using paper sleeve, PVC casing.

(4) The power line shall not directly contact with the surface of the batteries, avoid cross; Must cross the line and the line between the bracket with high temperature tape or barley paper.

(5) Power line is not connected to the nickel spot welding surface as far as possible, cannot be avoided, the power line between nickel and high temperature insulation tape to stick a highland barley paper.

(6) The reasonable design of nickel welding way, minimize nickel piece of calorific value.