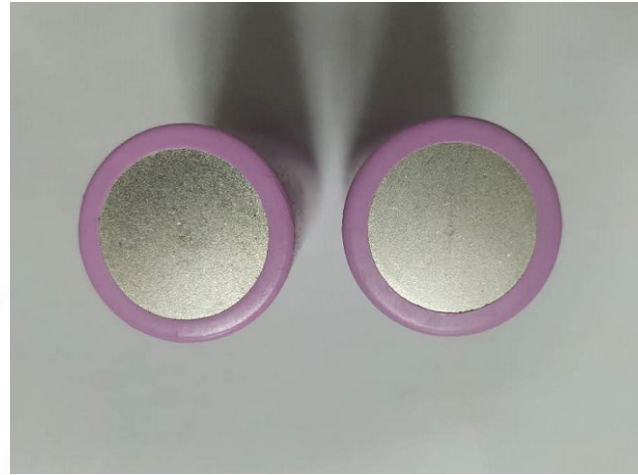




INR18650-26E Test Report



1.1、 Cell appearance (picture)



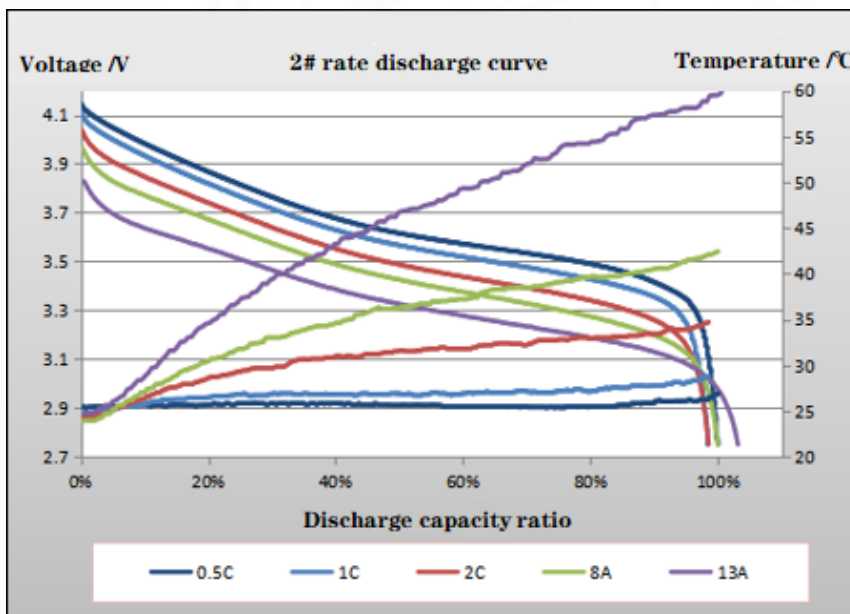
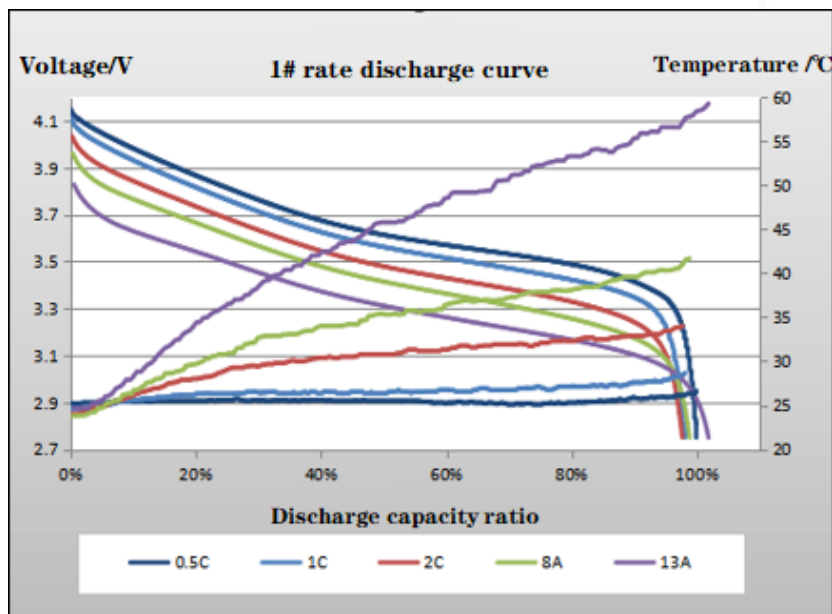
1.2、 Cell Weight Size

Item	Parameter
Weight	<47 g
Height	64.95mm±0.20 mm
Diameter	18.25 mm±0.20 mm

2、Electric Performance Test

2.1、Rate Discharge

Cell number	Initial state of the cell			0.5C Discharge			1C Discharge			2C Discharge			8A Discharge			13A Discharge		
	Resistance /mΩ	voltage /V	initial capacity /mAh	discharge capacity /mAh	Retention rate /0.5C	0.5C rise	discharge capacity /mAh	Retention rate 1C/0.5C	1C rise	discharge capacity /mAh	Retenti on rate 2C/0.5 C	2C rise	discharge capacity /mAh	Retenti on rate 8A/0.5 C	8A rise	discharge capacity /mAh	Retention rate /0.5C	13 A rise
1#	15.68	4.116	2587	2587.8	100.00%	1.6	2537.7	98.06%	4.1	2525.6	97.60%	10	2555.8	98.76%	17.9	2634.2	101.79%	34.6
2#	16.23	4.115	2574	2574.1	100.00%	1.6	2535.9	98.52%	4.2	2536.6	98.54%	10.5	2573.6	99.98%	18.5	2654.6	103.13%	36.7

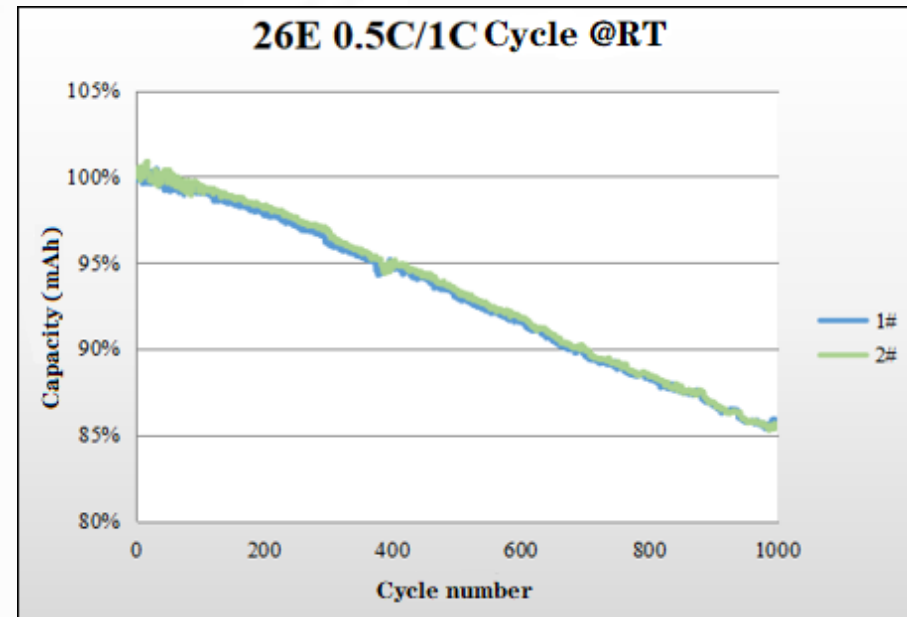
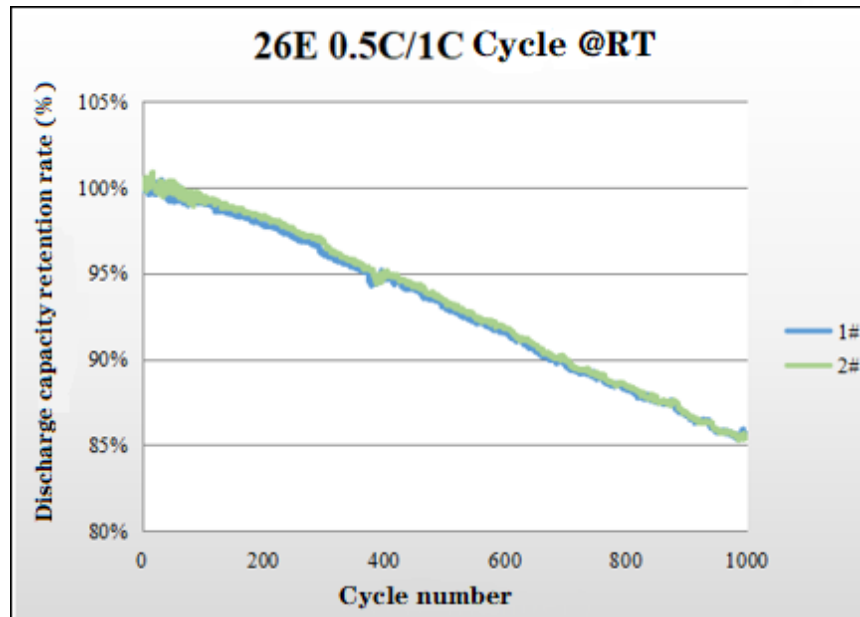


Test method: After standard charging, the battery cell is left for 5min and discharged to the termination voltage with 0.5C/1C/2C/8A/13A at the ambient temperature of $25 \pm 2^\circ\text{C}$;

2、Electrical Performance Test

2.2.1、Normal Temperature Cycle (0.5C/1C)

Cell Number	Initial state of the cell		Initial Capacity /mAh	300weeks Remaining capacity/mAh	500weeks Remaining capacity/mAh	1000weeks Remaining capacity/mAh	300weeks Retention rate	500weeks Retention rate	1000weeks Retention rate
	Voltage/V	Resistance/mΩ							
1#	4.128	17.37	2606.9	2510.7	2427.1	2232.6	96.31%	93.10%	85.64%
2#	4.128	17.40	2617.7	2534.2	2444.9	2236.1	96.81%	93.40%	85.42%

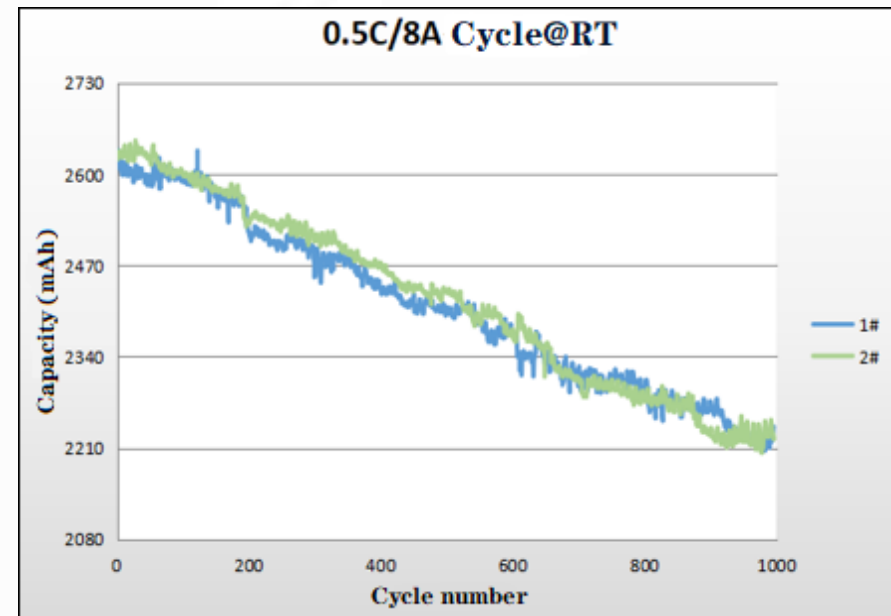
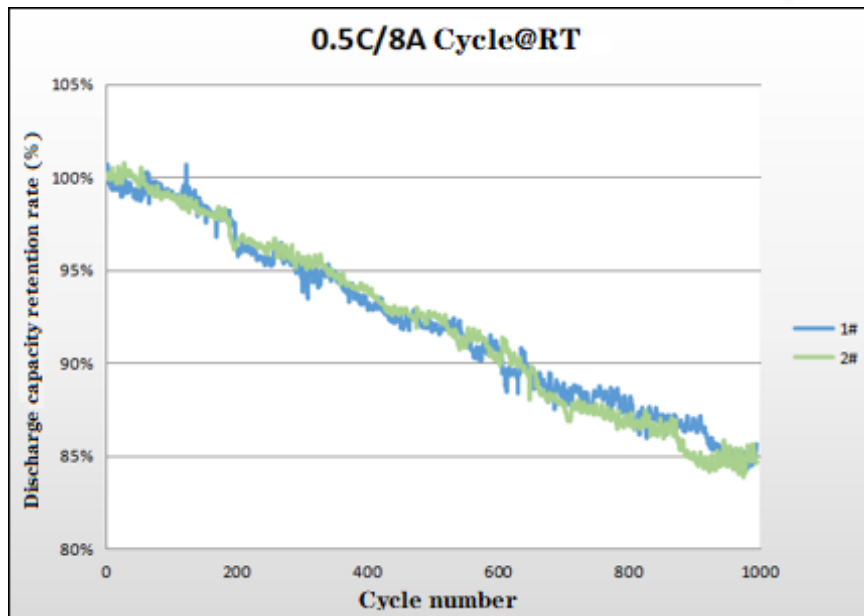


Test method: Under the ambient temperature of $25 \pm 3^\circ\text{C}$, 0.5C was charged to 4.2V to constant voltage, 0.05C was cut off, 1C was discharged to 2.75V, and the cycle was more than 1000 times;

2、Electrical Performance Test

2.2.2、Normal Temperature Cycle(0.5C/8A)

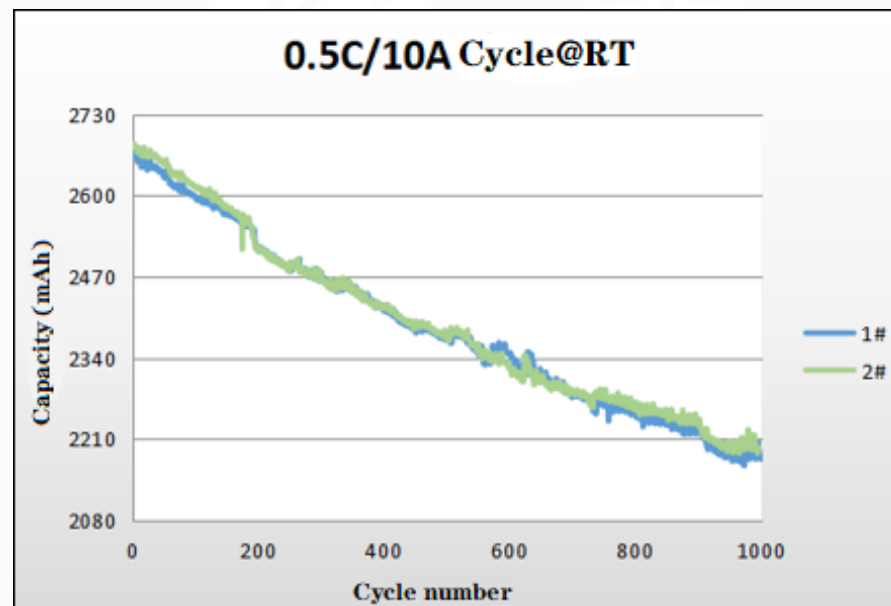
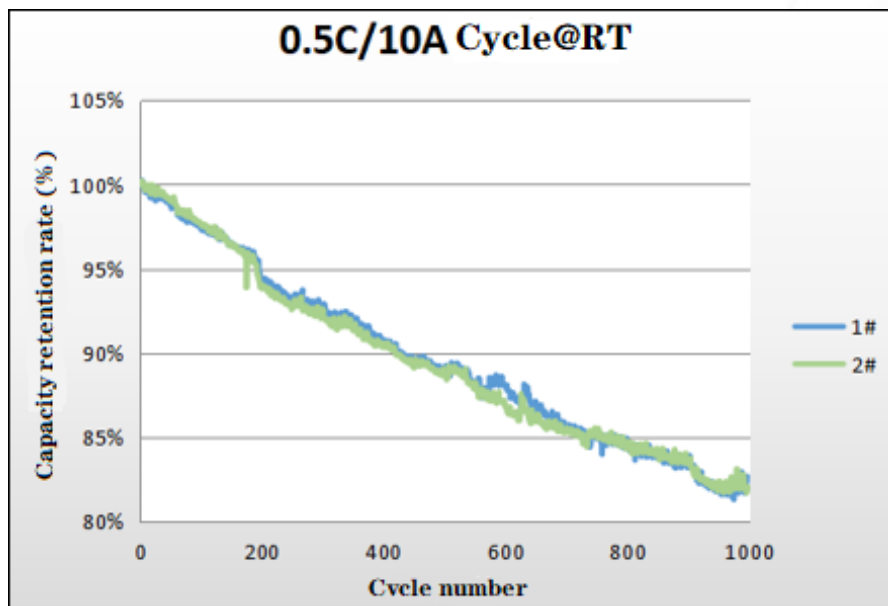
Cell Number	Initial State of the Cell		Initial Capacity /mAh	300weeks Remaining Capacity/mAh	500weeks Remaining Capacity/mAh	1000weeks Remaining Capacity/mAh	300weeks Retention Rate	500weeks Retention Rate	1000weeks Retention Rate
	Voltage/V	Resistance/mΩ							
1#	4.124	16.17	2621	2479	2409	2223	94.58%	91.91%	84.98%
2#	4.126	16.31	2628	2504	2431	2251	95.28%	92.50%	85.68%



Test method: Under the ambient temperature of $25 \pm 3^\circ\text{C}$, 0.5C was charged to 4.2V to constant voltage, 0.05C was cut off, 8A was discharged to 2.75V, and the cycle was more than 1000 times;

2.2.3、Normal Temperature Cycle(0.5C/10A)

Cell Number	Initial State of the cell		Initial Capacity /mAh	300weeks Remaining Capacity/mAh	500weeks Remaining Capacity/mAh	1000weeks Remaining Capacity/mAh	300weeks Retention Rate	500weeks Retention Rate	1000weeks Retention Rate
	Voltage/V	Resistance/mΩ							
1#	4.121	16.24	2668	2474	2377	2218	92.73%	89.09%	81.68%
2#	4.123	16.18	2684	2476	2373	2201	92.25%	88.41%	82.20%
Mean value	4.122	16.21	2676	2475	2375	2210	92.49%	88.75%	81.94%

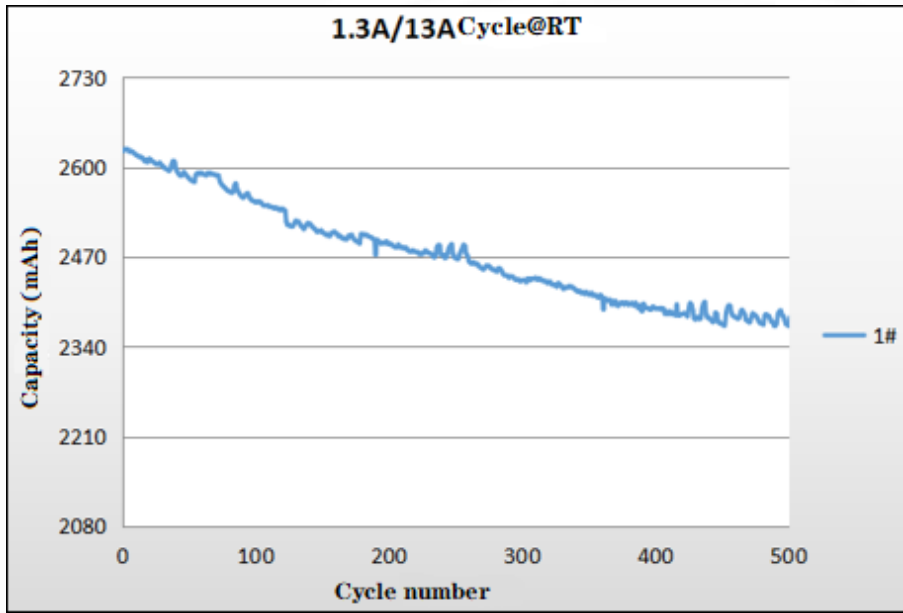
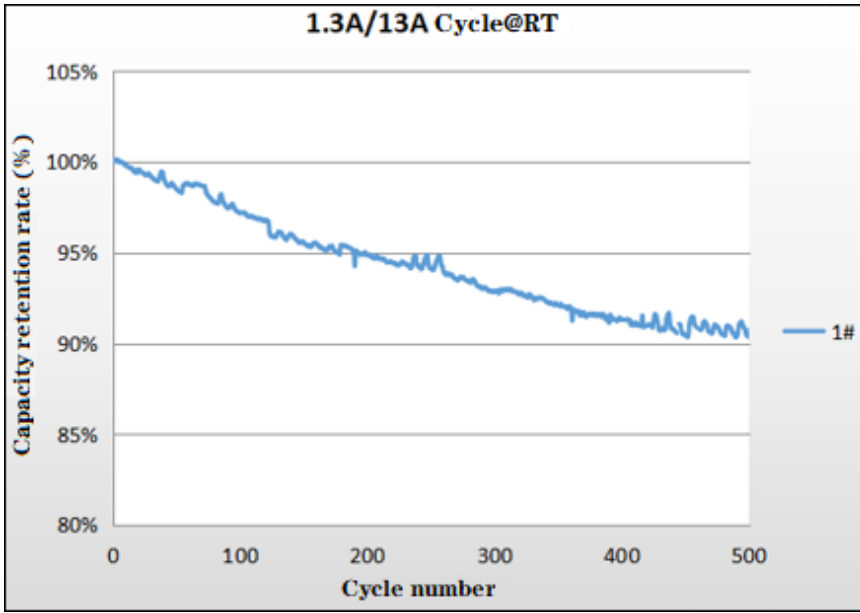


Test method: Under the ambient temperature of $25 \pm 3^\circ\text{C}$, 0.5C was charged to 4.2V to constant voltage, 0.05C was cut off, 10A was discharged to 2.75V, and the cycle was more than 1000 times;



2.2.4、Normal temperature cycle(0.5C/13A)

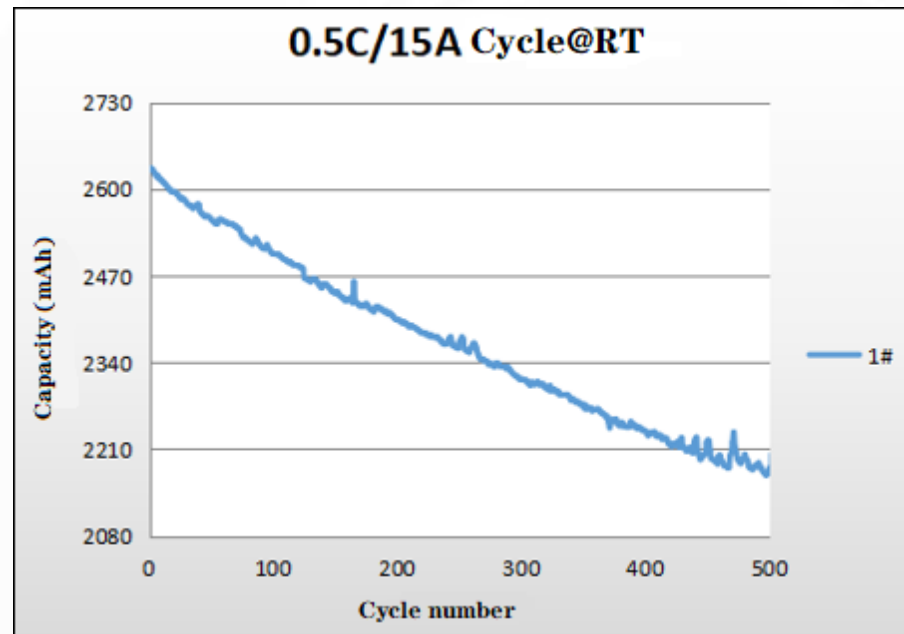
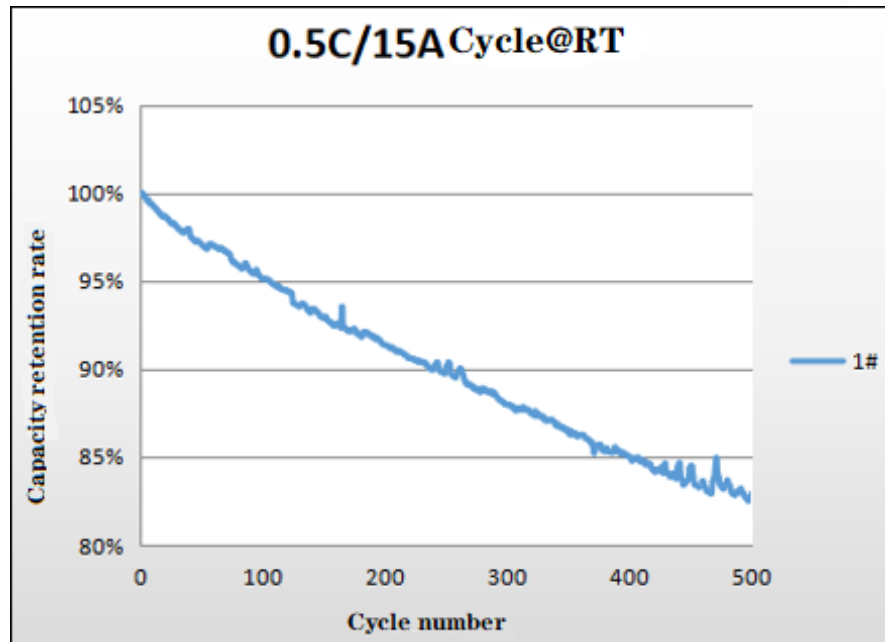
Cell Number	Initial state of the cell		Initial capacity /mAh	300weeks Remaining Capacity/mAh	500weeks Remaining Capacity/mAh	300weeks Retention Rate	500weeks Retention Rate
	Voltage/V	Resistance/mΩ					
1#	4.125	15.87	2623	2435	2373	92.82%	90.48%



Test method: Under the ambient temperature of $25 \pm 3^{\circ}\text{C}$, 0.5C was charged to 4.2V to constant voltage, 0.05C was cut off, 13A was discharged to 2.75V, and the cycle was more than 1000 times;

2.2.5、 Normal Temperature Cycle(0.5C/15A)

Cell Number	Initial state of the cell		Initial Capacity /mAh	300weeks Remaining capacity/mAh	500weeks Remaining capacity/mAh	300weeks Retention rate	500weeks Retention rate
	Voltage/V	Resistance/mΩ					
1#	4.125	16.34	2631	2315	2177	87.98%	82.73%

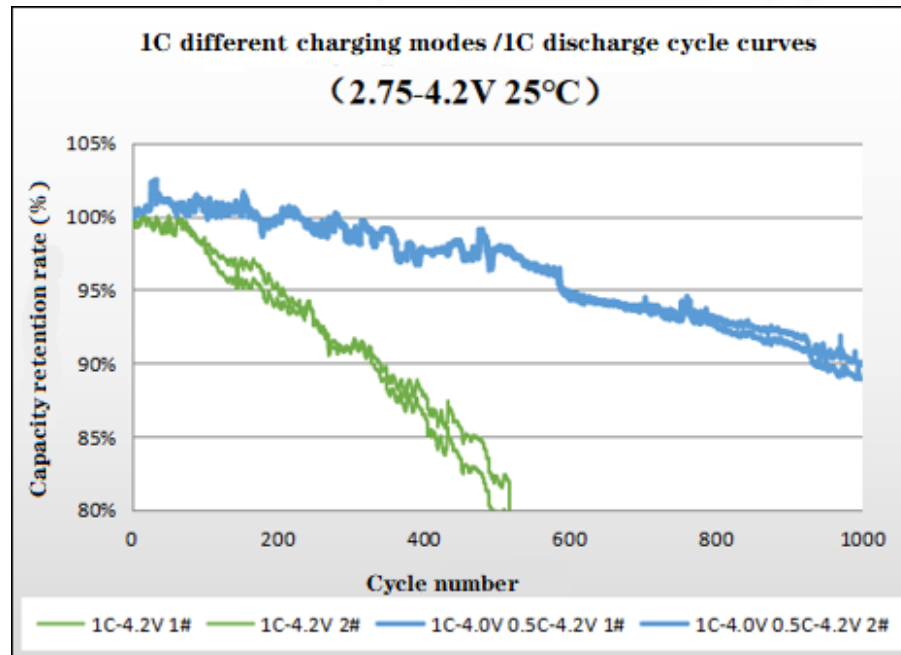


Test method: Under the ambient temperature of $25 \pm 3^\circ\text{C}$, 0.5C was charged to 4.2V to constant voltage, 0.05C was cut off, 15A was discharged to 2.75V, and the cycle was more than 1000 times;

2、Electrical Performance Test

2.2.6、Improved fast Charging Scheme (multi-stage charging)

Cell number	Initial state of the cell		Initial Capacity /mAh	300weeks Remaining capacity/mAh	500weeks Remaining capacity/mAh	1000weeks Remaining capacity/mAh	300weeks Retention rate	500weeks Retention rate	1000week Retention rate
	voltage/V	Resistance/mΩ							
1C-4.2V 1#	4.123	15.79	2539	2306	2030	/	90.82%	79.95%	/
1C-4.2V 2#	4.124	15.97	2548	2312	2090	/	90.74%	82.03%	/
1C-4.0V 0.5C-4.2V 1#	4.124	16.25	2543	2517	2487	2290	98.98%	97.80%	90.07%
1C-4.0V 0.5C-4.2V 2#	4.125	16.33	2526	2481	2468	2246	98.21%	97.72%	88.90%

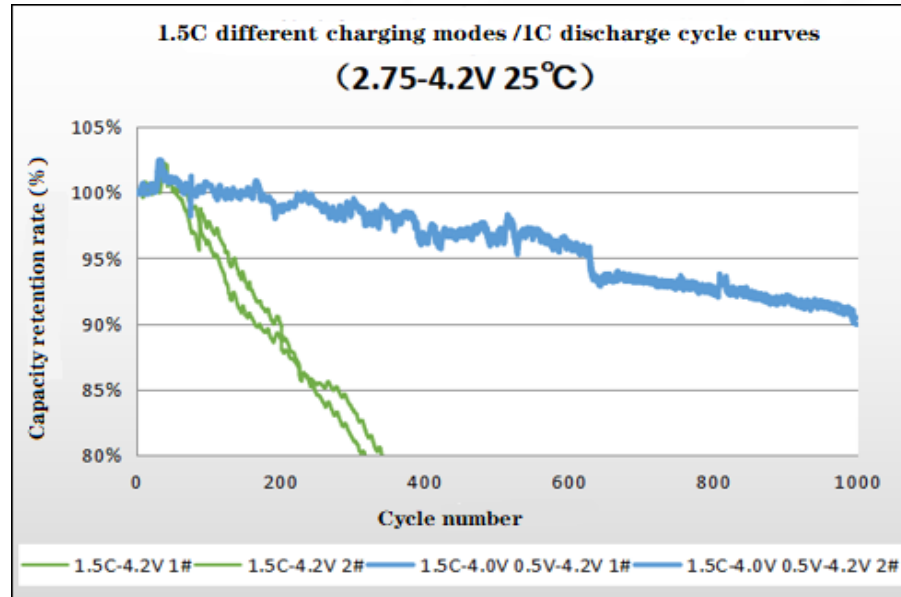


The initial scheme: at the ambient temperature of $25 \pm 3^\circ\text{C}$, 1C is charged to 4.2V, constant voltage, 0.05C cut-off; 1C discharge to 2.75V, 500 cycles remaining capacity of about 80%; Improvement scheme: At the ambient temperature of $25 \pm 3^\circ\text{C}$, 1C is charged to 4.0V, then 0.5C is charged to 4.2V, then constant voltage is changed, and 0.05C is cut off. 1C Discharge to 2.75V, cycle 1000

2、Electrical Performance Test

2.2.7、Improved fast charging scheme (multi-stage charging)

Cell number	Initial state of the cell		Initial capacity /mAh	300weeks Remaining capacity/mAh	500weeks Remaining capacity/mAh	1000weeks Remaining capacity/mAh	300weeks Retention rate	500weeks Retention rate	1000week Retention rate
	voltage/V	Resistance/mΩ							
1.5C-4.2V 1#	4.124	16.21	2546	2114	/	/	83.03%	/	/
1.5C-4.2V 2#	4.127	16.13	2539	2057	/	/	80.12%	/	/
1.5C-4.0V 0.5C-4.2V 1#	4.127	16.34	2534	2494	2448	2292	98.44%	96.63%	90.45%
1.5C-4.0V 0.5C-4.2V 2#	4.126	16.28	2554	2522	2452	2298	98.78%	96.04%	89.97%



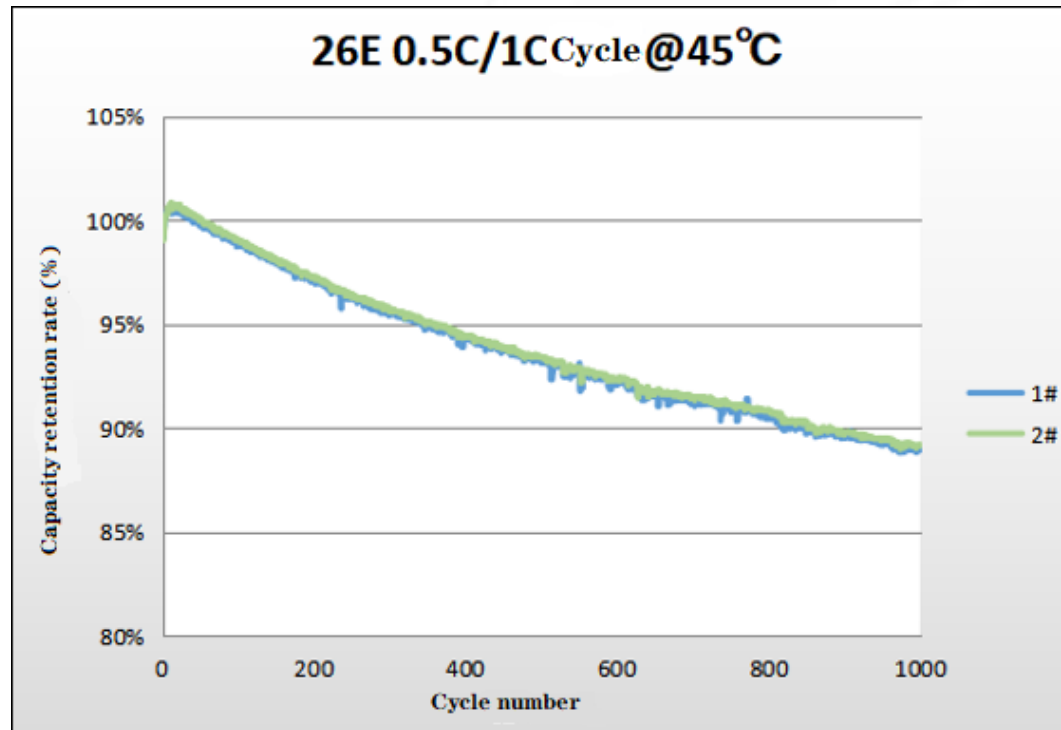
Initial Solution: At an ambient temperature of $25 \pm 3^\circ\text{C}$, charge 1.5C to 4.2V, turn constant voltage, and cut off at 0.05C; 1C discharge to 2.75V, 300 cycles remaining capacity of about 80%;

Improvement Scheme: Under the ambient temperature of $25 \pm 3^\circ\text{C}$, 1.5C charge to 4.0V, then 0.5C charge to 4.2V, turn constant voltage, 0.05C cut-off; 1C discharge to 2.75V, 1000 cycles remaining capacity of about 90%;

2、lectrical Performance Test

2.2.8、45°C Cycle (0.5C/1C)

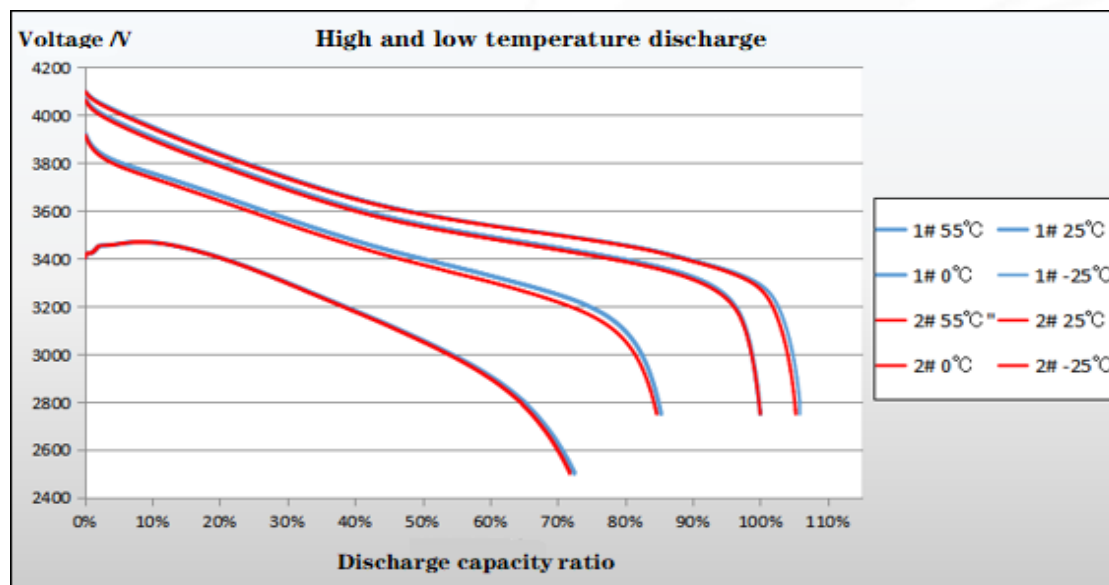
Cell number	Initial state of the cell		Initial capacity /mAh	300weeks Remaining capacity/mAh	500weeks Remaining capacity/mAh	1000weeks Remaining capacity/mAh	300weeks Retention rate	500weeks Retention rate	1000weeks Retention rate
	Voltage/V	Resistance/mΩ							
1#	4.125	16.43	2694.0	2570.2	2511.0	2397.1	95.40%	93.21%	88.98%
2#	4.124	16.47	2695.7	2577.5	2518.1	2403.9	95.61%	93.41%	89.18%



Test method: Under the ambient temperature of $45 \pm 3^\circ\text{C}$, 0.5C was charged to 4.2V to constant voltage, 0.05C was cut off, 1C was discharged to 2.75V, and the cycle was more than 1000 times;

2.3、 High and low Temperature Discharge

Cell number	-20°C Capacity	0°C Capacity	25°C Capacity	55°C Capacity
1#	1876.8	2205.5	2585.1	2740.1
	72.60%	85.32%	100.00%	106.00%
2#	1878.8	2210.3	2610.4	2747.4
	71.97%	84.67%	100.00%	105.25%

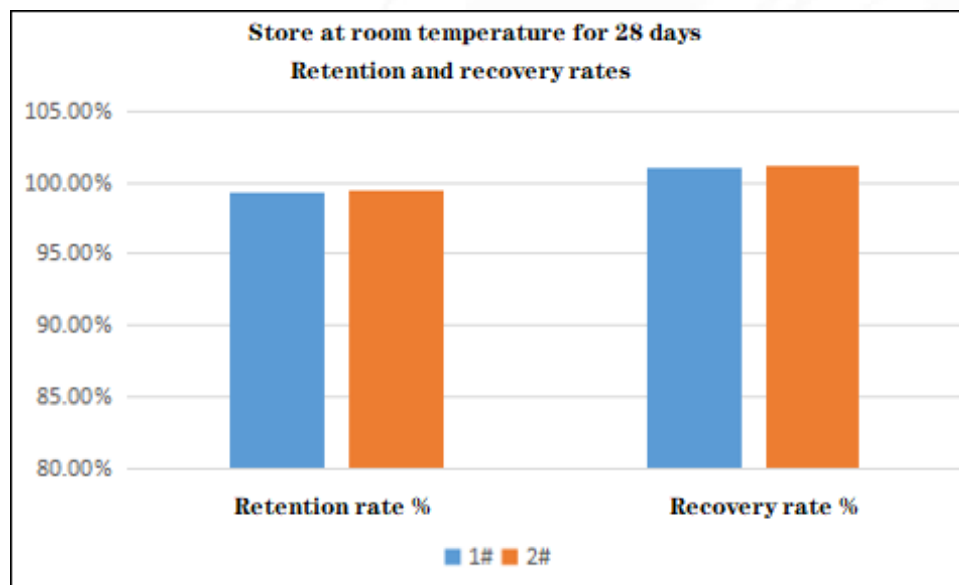


Test method: Perform standard charging on the battery cells discharged to the termination voltage at 25°C, place them in a constant temperature box at $55 \pm 2^\circ\text{C}$ for at least 5h, and then discharge them at 1C current to the termination voltage (4.2-2.75V) at this temperature; (The same method is used for the 45°C test)

Perform standard charging on the battery cells discharged to the termination voltage at a temperature above zero, then place them in a constant temperature box at $0 \pm 2^\circ\text{C}$ for at least 24h, and then discharge them at 1C current to the termination voltage (4.2-2.50V) at this temperature; (The same method is used for the -10°C and -20°C tests)

2.4.1、Store at room temperature for 28 days

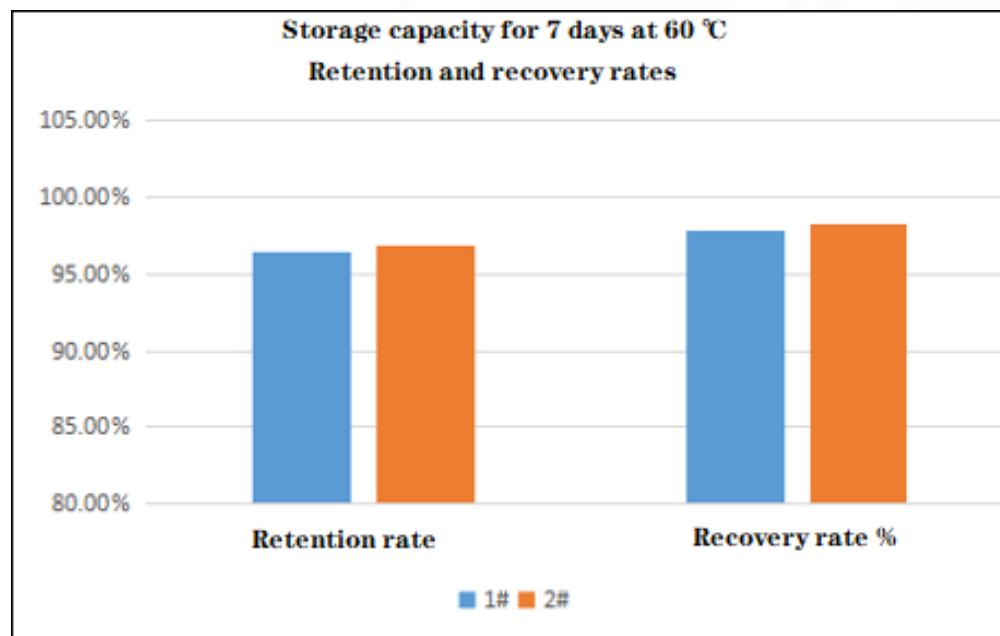
Item		Voltage/V		Resistance/mΩ		Discharge capacity/mAh			Capacity ratio	
Sample number		Before the test	After the test	Before the test	After the test	Initial capacity	Residual capacity	Recovery capacity	Retention rate%	Recovery rate%
26E	1#	4.158	4.146	16.38	17.64	2599	2580	2627	99.27%	101.08%
	2#	4.163	4.150	16.18	17.32	2610	2594	2640	99.39%	101.15%
	Mean value	4.161	4.148	16.28	17.48	2605	2587	2634	99.33%	101.11%



Test method: At room temperature, fully charged with standard charging method (100%SOC), stored at room temperature for 28d; Discharge at 1C to discharge final pressure at room temperature to calculate the capacity;

2.4.2、Store at 60°C for 7 days

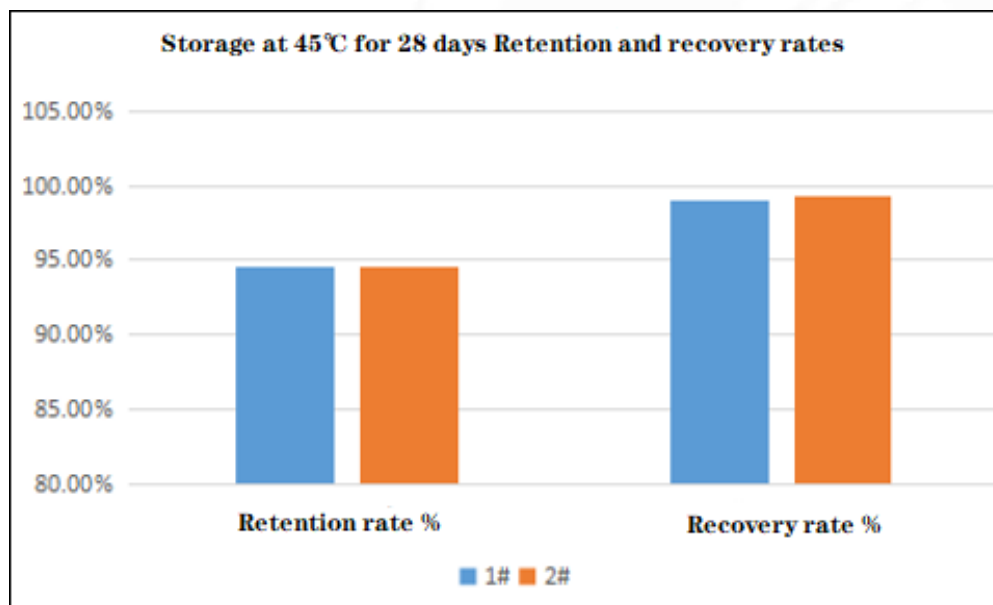
Item		Voltage/V		Resistance/mΩ		Discharge capacity/mAh			Capacity ratio	
Sample number		Before the test	After the test	Before the test	After the test	Initial capacity	Residual capacity	Recovery capacity	Retention rate%	Recovery rate%
26E	1#	4.169	4.128	16.23	18.02	2585	2494	2530	96.48%	97.87%
	2#	4.168	4.126	16.10	18.08	2594	2513	2547	96.88%	98.19%
	Mean value	4.168	4.127	16.16	18.05	2590	2504	2539	96.68%	98.03%



Test method: At room temperature, fully charged with standard charging method (100%SOC), stored at 60°C for 7 days; After leaving it at room temperature for 5h, discharge at 1C to the final discharge pressure to calculate the capacity;

2.4.3、 Store at 45°C for 28 days

Item		Voltage/V		Resistance/mΩ		Discharge capacity/mAh			Capacity ratio	
Sample number		Before the test	After the test	Before the test	After the test	Initial capacity	Residual capacity	Recovery capacity	Retention rate%	Recovery rate%
26E	1#	4.16	4.093	15.23	18.05	2610	2469	2584	94.60%	99.00%
	2#	4.16	4.091	15.32	18.38	2605	2462	2586	94.51%	99.27%
	Mean value	4.16	4.092	15.275	18.215	2608	2466	2585	94.55%	99.14%



Test method: At room temperature, fully charged by standard charging method (100%SOC), stored at 45°C for 28d; After leaving it at room temperature for 5h, discharge at 1C to the final discharge pressure to calculate the capacity;

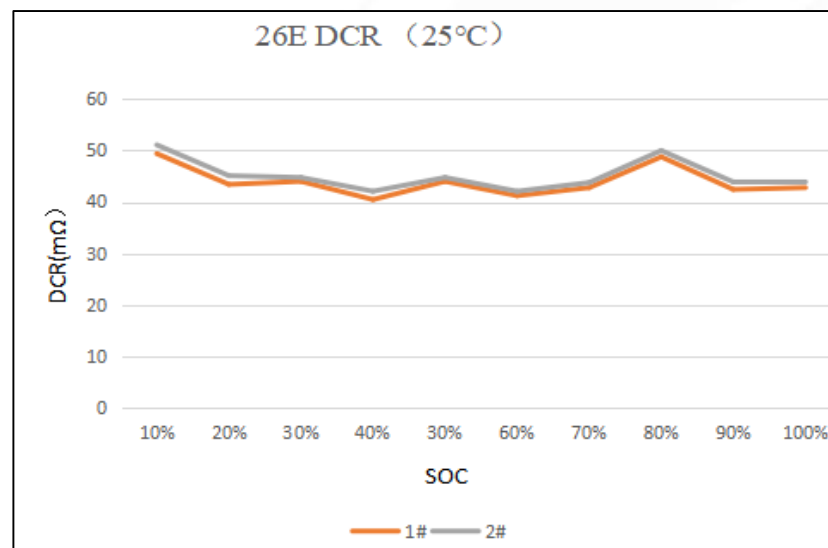
2.5、 Different temperatures,OCV under different SOC

		OCV/V								
SOC TEMP	10	20	30	40	50	60	70	80	90	100
-20	3.581	3.613	3.647	3.689	3.744	3.813	3.89	3.972	4.059	4.174
-10	3.568	3.597	3.626	3.663	3.717	3.79	3.872	3.957	4.051	4.174
0	3.616	3.638	3.672	3.722	3.772	3.827	3.888	3.953	4.024	4.112
10	3.542	3.582	3.609	3.639	3.695	3.762	3.837	3.925	4.025	4.155
20	3.467	3.555	3.594	3.622	3.662	3.736	3.809	3.901	4.004	4.131
40	3.431	3.519	3.586	3.617	3.651	3.725	3.797	3.893	4.001	4.134
60	3.363	3.475	3.555	3.607	3.637	3.7	3.767	3.859	3.966	4.092

Test method: 0.5C constant current and constant voltage charge to 4.2V (cut-off current 0.05C), stand for 180min;0.5C discharge to 2.75V, discharge capacity as the standard capacity to adjust different SoCs;0.5C constant current constant voltage charge to 4.2V (cut-off current 0.05C); Stand for 180min;0.5C discharge, cut-off capacity 10%SOC, stand for 60min, cycle 10 times;

2.6、PLR Test (25°C)

Item	SOC ID	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
		PLR	1#	49	43	44	40	44	41	43	49
	2#	51	45	45	42	45	42	44	50	44	44



Test methods:

- 1, at 25°C, 1C constant current constant voltage charge to the charging cut-off voltage, 0.01C cut-off, stand for 30min, 1min sampling;
- 2, stand at the corresponding temperature for 6h, 1min sampling
- 3, 1C constant current discharge 30S, 1S sampling; Stand for 60min, sample for 1min;
- 4, 1C constant current charging 30S, 1S sampling; Stand for 60min, sample for 1min;
- 5, 1C constant current discharge 360S to 95%SOC25°C, 1s sampling;
6. Let it stand for 60min, sample for 1min;
- 7, and so on, adjust to 10%SOC;

3、 Safety Test

3.1、 Overshoot test

Item	Pretest state		Discharge rate	Discharge time	Maximum temperature°C	Liquid leakage	Fire breaking out	Blow up	result
	resistance/ mΩ	Voltage/V							
Overshoot test	17.14	4.158	1C	90min	45.25	NO	NO	NO	Pass
	17.02	4.158			40.37	NO	NO	NO	Pass

Test picture

picture one



Picture two



Test method: Full charge with standard charging method; Discharge at 1C for 90min; Observation 1h

3、 Safety Test

3.2、 Overcharge test

Item	Pretest state		Charging ratio (C)	Maximum voltage/V	Set current (A)	Jump voltage/V	Maximum temperature °C	Liquid leakage	Fire breaking out	Blow up	result
	resistance/mΩ	Voltage/V									
Overcharge test	16.16	4.109	1	10	2.6	5.212	43.9	NO	NO	NO	Pass
	16.33	4.109				5.109	37.4	NO	NO	NO	Pass

Test picture

picture one



Picture two



Est method: Full charge with standard charging method; Charge at 1C constant current until the voltage reaches 10V or stop charging after disconnecting; Observe for 1h.

3.3、 25°C Short-circuit test

Item	Before the test		After the test		Maximum temperature (°C)	Fire breaking out	Blow up	Decision result
	Resistance/mΩ	voltage/V	Resistance/mΩ	voltage/V				
short-circuit	16.95	4.159	/	0.124	100.3	NO	NO	pass
	17.10	4.158	/	0.236	102.1	NO	NO	pass

Test picture

picture one



Picture two



Test method: Full charge with standard charging method; The positive and negative electrodes of the cell are short-circuited externally for 10min, and the resistance of the external line should be less than 5mΩ. Observe for 1h.

3、 Safety Test

3.4、 Drop test

Item	Before the test		After the test		Maximum temperature (°C)	Fire breaking out	Blow up	Decision result
	Resistance/mΩ	voltage/V	Resistance/mΩ	voltage/V				
Drop test	17.00	4.158	16.00	4.156	NO	NO	NO	pass
	17.11	4.158	16.12	4.158	NO	NO	NO	pass

Test picture

picture one



Picture two



Test method: Full charge with standard charging method; The positive and negative terminals of the battery cell fall freely to the concrete floor from a height of 1.5m; The positive and negative terminals of the battery cell fall freely to the concrete floor from a height of 1.5m;

3、 Safety test

3.5、 130°C Hot box test

Item	Set temperature (°C)	Constant temperature time (min)	Before the test		After the test		Fire breaking out	Blow up	Decision result
			resistance/ mΩ	voltage/ V	resistance/ mΩ	voltage/V			
Thermal shock	130	30	17.03	4.158	0	1.164	NO	NO	pass
			17.12	4.157	0	1.236	NO	NO	pass

Test picture

picture one



Picture two



Test method: Full charge with standard charging method; The battery cell is put into the temperature box, and the temperature box rises from room temperature to $130 \pm 2^\circ\text{C}$ at the rate of $5^\circ\text{C}/\text{min}$, and stops heating after maintaining the temperature for 30min. Observe for 1h; The battery cell is put into the temperature box, and the temperature box rises from room temperature to $130 \pm 2^\circ\text{C}$ at the rate of $5^\circ\text{C}/\text{min}$, and stops heating after maintaining the temperature for 30min. Observe for 1h;

3、 Safety Test

3.6、 Extrusion test

Item	Before the test		After the test		Maximum temperature °C	Fire breaking out	Blow up	Decision result
	resistance/m Ω	voltage/V	resistance/ mΩ	voltage/V				
Extrusion test	16.14	4.112	23.64	4.104	30.1	NO	NO	pass
	15.75	4.112	24.32	4.110	28.0	NO	NO	pass

Test picture

picture one



Picture two



Test method: The battery cell is fully charged according to the standard charging mode; The battery cell is placed on a plane, the extrusion plate is a half cylinder with a radius of 75mm, the length of the half cylinder (L) is greater than the size of the extruded battery, and the extrusion speed is (5 ± 1) mm/s; When the deformation reaches 30%; Observe 1h and record the highest surface cell temperature during the test.

3、 Safety Test

3.7、 Temperature cycle test

Item	Before the test			After the test			Weight difference ratio	Liquid leakage	Fire breaking out	Blow up	Decision result
	resistance/mΩ	voltage/V	weight (g)	resistance/mΩ	voltage/V	weight (g)					
Temperature cycle	15.70	4.182	44.014	16.10	4.135	44.001	0.03%	NO	NO	NO	pass
	15.90	4.181	44.102	16.10	4.136	44.098	0.01%	NO	NO	NO	pass

Test picture

picture one



Picture two



Temperature°C	Time increment t(min)	Accumulated time (min)
25	0	0
- 40	60	60
- 40	90	150
25	60	210
85	90	300
85	110	410
25	70	480

Test method: Charging to the upper limit voltage with standard charging mode; Put the battery cell into the temperature box, the temperature of the temperature box is adjusted according to the following table, and the number of cycles is 5 times; Observation 1h .

3.8、 Heavy impact test

Item	Before the test		After the test		Maximum temperature°C	Fire breaking out	Blow up	Decision result
	resistance/mΩ	voltage/V	resistance/mΩ	voltage/V				
Heavy impact	17.11	4.157	0	0.136	85.6	NO	NO	pass
	17.14	4.159	0	1.136	37.8	NO	NO	pass

Test picture

picture one



Picture two



Test method: The battery cell is placed on a plane, a metal rod with a diameter of $15.8\text{mm} \pm 0.2\text{mm}$ is placed horizontally on the upper surface of the geometric center of the battery, and a weight of $9.1 \pm 0.1\text{KG}$ is dropped from a height of $610 \pm 25\text{mm}$ to the battery surface where the metal rod is placed; Observe 6h.