

PRODUCT SPECIFICATION

LTC-100 Low-Temperature LFP Rechargeable Cell

Cell Type: LTC-50160118-100 (3.2 V 100 Ah)

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1. Overview

This document specifies the performance, test methods, applications, transportation, storage, safety and risk warnings of the LTC-100 low-temperature lithium iron phosphate (LFP) cell supplied by Siri Techno Fabs (STF).

2. Confidentiality

This document is confidential and shall not be released to any third party without the prior consent of the disclosing party. The recipient may disclose this document only to employees who have a necessary need to know, provided that those employees are instructed to comply with the confidentiality and non-disclosure obligations of this provision.

3. Relevant Regulations

The following documents are essential for the application of this document. For dated references, only the dated version applies. For undated references, the latest version (including all amendments) applies.

- GB/T 19596 — Terminology of electric vehicles
- GB/T 36276-2018 — Lithium-ion battery for electrical energy storage
- IEC 62619 — Secondary cells and batteries containing alkaline or other non-acid electrolytes: safety requirements for secondary lithium cells and batteries for use in industrial applications
- IEC 62620 — Secondary cells and batteries containing alkaline or other non-acid electrolytes: secondary lithium cells and batteries for use in industrial applications
- UN 38.3 — UN Manual of Tests and Criteria, Part III, Sub-section 38.3: test methods and criteria for lithium batteries
- UL 1973 — Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications

4. Product Specification

4.1 Basic Information

Item	Specification
Cell Name	LTC-100
Cell Model	50160118
Cell Type	Prismatic aluminium-case lithium-ion cell
Chemistry	Lithium iron phosphate – graphite
Rated Voltage	3.2 V
Rated Capacity	100 Ah
Voltage Range	2.5 V – 3.65 V
Rated Energy	320 Wh

Item	Specification
Rated C-rate	0.5C
Max. Continuous Charge/Discharge C-rate	See 4.9.3
Max. Pulse Charge/Discharge C-rate	See 4.9.4
Weight	1.85 ± 0.1 kg
Dimensions	See Figure 1
DCIR	≤ 1.00 m Ω (2.0C discharge 30 s @ 50% SOC)
ACIR	≤ 0.40 m Ω (1 kHz @ 27% SOC)
Gravimetric Energy Density	≥ 173 Wh/kg
Volumetric Energy Density	≥ 339 Wh/L

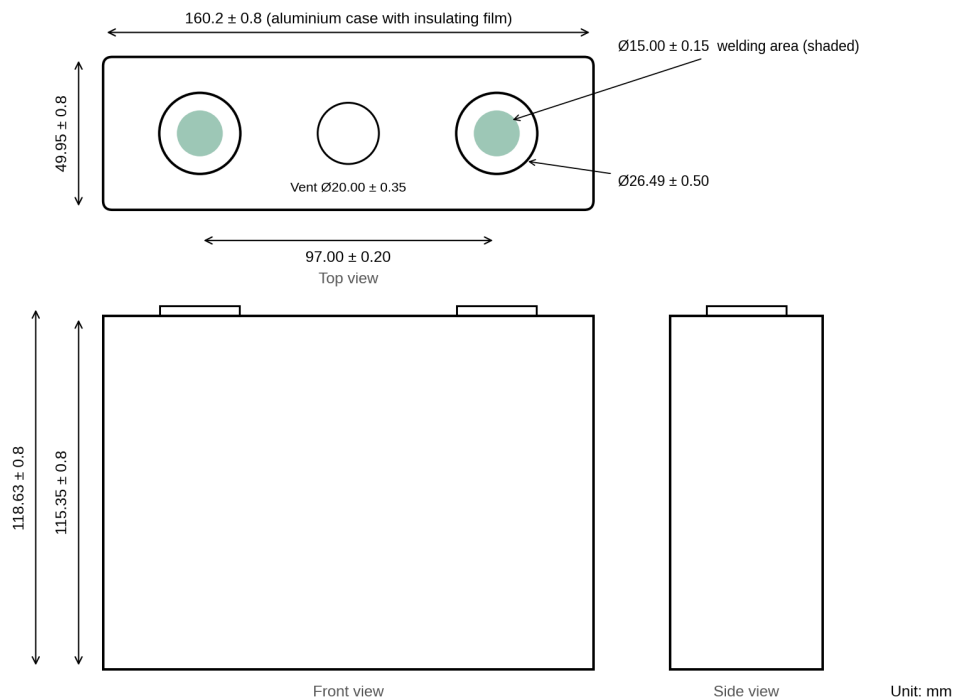


Figure 1. Cell dimensions of the LTC-100 (mm)

4.2 Connections

- The cell pack assembly line should include a terminal cleaning process to ensure the welding surface is clean before welding.
- Appropriate welding methods and parameters should be selected for the electrical connection of the cells, and an effective method of monitoring weld quality should be established. During welding, protective measures must prevent spatter and ensure that the

insulating plastic around the terminals does not warp, melt, or allow the terminals to sink because of excessive welding temperature.

The terminal parameters are shown in the table below:

Item	Parameter
Terminal Material	Al1060-H18
Soldering Area	Shaded area in Figure 1 (top view)
Max. Allowed Soldering Temperature	$\leq 200^{\circ}\text{C}$
Max. Torque on XZ Plane of Terminal	$\leq 7 \text{ N}\cdot\text{m}$
Max. Force in Y Direction of Terminal	$\leq 500 \text{ N}$
Max. Weld Depth	$\leq 2.0 \text{ mm}$

4.3 Electrical Performance

4.3.1 Basic Characteristics

Item	Specification	Condition
Rated Capacity	100 Ah	Standard charge/discharge: 25°C ; rest 10 min; 0.5C CCCV charge to 3.65 V until $I < 0.05\text{C}$; rest 10 min; 0.5C CC discharge to 2.5 V.
Nominal Voltage	3.2 V	/
Rated Energy	320 Wh	Standard charge/discharge: 25°C ; rest 10 min; 0.5C CCCV charge to 3.65 V until $I < 0.05\text{C}$; rest 10 min; 0.5C CC discharge to 2.5 V.
Rated Charge/Discharge Rate	0.5C	25°C
Max. Continuous Charge Rate	See 4.9.3	/
Operating Voltage Range	2.5 ~ 3.65 V 2.0 ~ 3.65 V	$T > 0^{\circ}\text{C}$ $T \leq 0^{\circ}\text{C}$
Discharge Temperature Range	$-40 \sim 60^{\circ}\text{C}$	Maximum cell temperature $\leq 60^{\circ}\text{C}$
Charging Temperature Range	$-20 \sim 60^{\circ}\text{C}$	Charging current $\leq 0.2\text{C}$ within (55°C , 60°C]
End-of-Life Management	Capacity / nominal capacity $< 70\%$	The customer shall stop using the cells when the end-of-life criteria are exceeded.

4.3.2 Power Capability

Item	Specification	Condition / Description
Initial Charge / Discharge	Initial charge: 25°C, 0.5C CC discharge to 2.5 V; rest 10 min; 0.5C CCCV charge to 3.65 V until $I < 0.05C$; rest 10 min. Initial discharge: 25°C, 0.5C CCCV charge to 3.65 V until $I < 0.05C$; rest 10 min; 0.5C CC discharge to 2.5 V; rest 10 min.	Initialisation of the cell's state of charge under the specified test conditions; required before the tests below.
Standard Charge / Discharge	25°C; rest 10 min; 0.5C CCCV charge to 3.65 V until $I < 0.05C$; rest 10 min; 0.5C CC discharge to 2.5 V.	One complete charge–discharge cycle under the specified conditions; required for the tests below.
Discharge Temperature Rise	$\leq 5^\circ\text{C} @ 25^\circ\text{C} @ 0.5C$ $\leq 10^\circ\text{C} @ 25^\circ\text{C} @ 1C$	After initial charge, rest at $25 \pm 2^\circ\text{C}$ for 20 h, then discharge at the set power to 2.5 V. Cell fixed in an aluminium-alloy jig; temperature probe on the large face.
Discharge Performance at Various Temperatures (vs. 25°C)	45°C Capacity $\geq 100\%$ 35°C Capacity $\geq 100\%$ 15°C Capacity $\geq 96\%$ 5°C Capacity $\geq 92\%$ 0°C Capacity $\geq 90\%$ -10°C Capacity $\geq 85\%$ -20°C Capacity $\geq 80\%$ Note: $> 0^\circ\text{C}$ discharge to 2.5 V; $\leq 0^\circ\text{C}$ discharge to 2.0 V	After initial charge, rest at each temperature for 5 h, then discharge at 0.5C.
0.5C Energy Efficiency	$\geq 95\%$	After initialisation, rest at $25 \pm 2^\circ\text{C}$ for 5 h; perform three standard 0.5C charge/discharge cycles; the last energy efficiency is taken.
Rate Discharge Performance at Room Temperature (vs. 0.5C)	0.5C: Capacity $\geq 100\%$; $\Delta T \leq 5^\circ\text{C}$; Energy $\geq 95\%$ 1.0C: Capacity $\geq 98\%$; $\Delta T \leq 10^\circ\text{C}$; Energy $\geq 93\%$ 2.0C: Capacity $\geq 96\%$; $\Delta T \leq 18^\circ\text{C}$; Energy $\geq 92\%$	After initial charge, rest at $25 \pm 2^\circ\text{C}$ for 5 h, then discharge at different rates to 2.5 V. Cell fixed in an aluminium-alloy jig; temperature probe on the front face.

4.3.3 Protection Voltage

Item	Value
Charging Cut-off Voltage	3.65 V
Level 1 Overcharge Protection Voltage	3.70 V
Level 2 Overcharge Protection Voltage	3.75 V
Level 3 Overcharge Protection Voltage	3.80 V
Discharging Cut-off Voltage	2.50 V

Item	Value
Level 1 Over-discharge Protection Voltage	2.40 V ($> 0^{\circ}\text{C}$); 1.90 V ($\leq 0^{\circ}\text{C}$)
Level 2 Over-discharge Protection Voltage	2.30 V ($> 0^{\circ}\text{C}$); 1.85 V ($\leq 0^{\circ}\text{C}$)
Level 3 Over-discharge Protection Voltage	2.00 V ($> 0^{\circ}\text{C}$); 1.80 V ($\leq 0^{\circ}\text{C}$)

4.3.4 Corrosion and Prevention

- No function-related corrosion occurs during the service life of the cell.
- The customer shall ensure that the operating humidity is $\leq 80\%$ and that the cell and adjacent components are not affected by wear, water or dust.

4.4 Cell Life

4.4.1 Cycle Life

Item	Specification	Condition
25°C 0.5C/0.5C Cycle Life	≥ 6000 cycles @ 75%	Charge–discharge cycling at 0.5C at $25\pm 2^{\circ}\text{C}$.
45°C 1C/1C Cycle Life	≥ 3000 cycles @ 75%	Charge–discharge cycling at 1C at $45\pm 2^{\circ}\text{C}$.
25°C 1C/1C Cycle Life	≥ 4000 cycles @ 75%	Charge–discharge cycling at 1C at $25\pm 2^{\circ}\text{C}$.
25°C 2C/2C Cycle Life	≥ 3000 cycles @ 75%	Charge–discharge cycling at 2C (0%–80%) / 2C (100%–20%) at $25\pm 2^{\circ}\text{C}$.

4.4.2 Storage Life

Item	Specification	Condition
Room-Temperature Charge Retention (28 days)	Remaining energy $\geq 97\%$ of initial discharge energy Charge energy recovery $\geq 97\%$ Discharge energy recovery $\geq 97.5\%$	After initial charge, rest at $25\pm 2^{\circ}\text{C}$ for 28 days, then: 1. initial charge; 2. discharge at 0.5C to 2.5 V.
45°C Charge Retention (7 days)	Remaining energy $\geq 97\%$ of initial discharge energy Charge energy recovery $\geq 97.5\%$ Discharge energy recovery $\geq 98\%$	After initial charge, rest at $45\pm 2^{\circ}\text{C}$ for 7 days, then: 1. initial charge; 2. discharge at 0.5C to 2.5 V.
45°C Charge Retention (30 days)	Remaining energy $\geq 95.5\%$ of initial discharge energy Charge energy recovery $\geq 95.5\%$ Discharge energy recovery $\geq 96\%$	After initial charge, rest at $45\pm 2^{\circ}\text{C}$ for 30 days, then: 1. initial charge; 2. discharge at 0.5C to 2.5 V.
45°C Storage Performance (28 days)	Charge energy recovery $\geq 98\%$ Discharge energy recovery $\geq 98\%$	Rest at $45\pm 2^{\circ}\text{C}$ for 28 days at 50% SOC, then: 1. initial charge; 2. discharge at 0.5C to 2.5 V.

4.5 Swelling Force

Item	Specification	Condition
EOL Swelling Force (@ 80% SOH)	$\leq 15,000 \text{ N @ } 80\% \text{ SOH}$	At 28% SOC, cell mounted in a stainless-steel jig with 0 mm gap (no pre-load) and cycled at room temperature.

4.6 Thermal Management

4.6.1 Cooling

Bottom liquid cooling (XZ plane, see Figure 1) is recommended. Relevant parameters are as follows (for reference only):

Item	Value
0.5C Heat Generation	About 5.0 W
1C Heat Generation	About 14.0 W
Thermal Conductivity (XY direction)	About 11.3 W/(m·K)
Thermal Conductivity (Z direction)	About 1.08 W/(m·K)
Cell Specific Heat Capacity	About 1000 J/(kg·K)

4.6.2 Temperature Protection

Item	Parameter
Level 1 High-Temperature Alarm	65°C
Level 2 High-Temperature Alarm	70°C
Level 3 High-Temperature Alarm	75°C
Level 1 Low-Temperature Alarm	-20°C
Level 2 Low-Temperature Alarm	-30°C
Level 3 Low-Temperature Alarm	-40°C

4.7 Safety

The cell conforms to the requirements, test procedures and result-assessment procedures of GB/T 36276, UN 38.3 and internal enterprise standards.

4.7.1 Electrical Safety

Item	Phenomenon	Result
Overcharge	After initial charge, charge at constant current (rated power $\div$ rated voltage) until the voltage reaches $1.5 \times$ the charge cut-off voltage or 1 h has elapsed. No fire, no explosion, no rupture other than at the venting valve.	Pass

Item	Phenomenon	Result
Over-discharge	After initial discharge, discharge at constant current (rated power ÷ rated voltage) until the voltage reaches 0 V or 1.5 h has elapsed. No leakage, smoke, fire or explosion.	Pass
External Short Circuit at Room Temperature	After initial charge, apply an external short circuit of (1 ± 0.2) m Ω for 10 min. No fire, no explosion, no rupture other than at the venting valve.	Pass
High-Temperature External Short Circuit	After initial charge, heat the cell to $57 \pm 4^\circ\text{C}$ and hold for at least 6 h, then short-circuit through 1 Ω . Case temperature shall not exceed 170°C ; no disintegration, rupture or fire during the test and for 6 h afterwards.	Pass
Forced Discharge	At room temperature, connect the cell in series with a 12 V DC supply and a resistive load, with initial discharge current equal to the maximum discharge current; observe for 2 h. No disintegration or fire during the test or within 7 days afterwards.	Pass

4.7.2 Mechanical Safety

Item	Phenomenon	Result
Drop Test	After initial charge, drop freely from 1.5 m onto a cement surface. No smoke, fire, explosion, or rupture other than at the venting valve.	Pass
Crush	After initial charge, crush until the voltage reaches 0 V or the force reaches (50 ± 1) kN. No leakage, smoke, fire, explosion, or rupture other than at the venting valve.	Pass
Nail Penetration	After initial charge, penetrate perpendicular to the electrode plates with a high-temperature-resistant steel nail ($\varnothing 5$ – $\varnothing 8$ mm), leave it in the cell and observe for 1 h. No fire, no explosion.	Pass
Vibration	After initial charge, apply sine-sweep vibration. No leakage, venting, disintegration, rupture or fire; OCV after test $\geq 90\%$ of pre-test voltage; mass loss $\leq 0.1\%$.	Pass
Impact	After initial charge, apply half-sine shock with peak acceleration 150 gn and 6 ms pulse duration. No leakage, venting, disintegration, rupture or fire; OCV after test $\geq 90\%$ of pre-test voltage; mass loss $\leq 0.1\%$.	Pass

4.7.3 Thermal Safety

Item	Phenomenon	Result
Adiabatic Temperature Rise	The adiabatic temperature-rise characteristics of the cell meet the following: 1. When the cell surface temperature is at or below the level 1 high-temperature alarm, the self-heating rate shall be $< 0.02^\circ\text{C}/\text{min}$. 2. No fire, no explosion, no rupture other than at the venting valve.	Pass

Item	Phenomenon	Result
Thermal Runaway	Throughout the life cycle, the thermal runaway onset temperature shall be $> 90^{\circ}\text{C}$, with no fire, explosion, or rupture other than at the venting valve.	Pass

4.7.4 Environmental Safety

Item	Phenomenon	Result
Temperature Cycling	After initial charge, subject the cell to the temperature cycling procedure. No leakage, venting, disintegration, rupture or fire; OCV after test $\geq 90\%$ of pre-test voltage; mass loss $\leq 0.1\%$.	Pass

4.8 Venting

The cell releases pressure through a venting valve (see Figure 1). Venting pressure: 0.7 ± 0.2 MPa.

4.9 BMS Strategy

When designing cell assemblies and BMS strategies, users shall agree the relevant boundary conditions and corresponding protection strategies with STF.

4.9.1 SOC-OCV

Open-circuit voltage (V) vs. SOC and temperature									
SOC / T	45°C	35°C	25°C	15°C	10°C	0°C	-5°C	-10°C	-20°C
100.0%	3.4017	3.3997	3.3981	3.3965	3.3956	3.3942	3.3934	3.3928	3.3915
95.5%	3.3359	3.3355	3.3348	3.3343	3.3338	3.3327	3.3320	3.3315	3.3303
90.9%	3.3350	3.3347	3.3343	3.3340	3.3338	3.3331	3.3325	3.3322	3.3311
86.4%	3.3345	3.3344	3.3341	3.3338	3.3335	3.3330	3.3325	3.3322	3.3312
81.8%	3.3339	3.3339	3.3339	3.3337	3.3336	3.3331	3.3328	3.3323	3.3316
77.3%	3.3338	3.3337	3.3336	3.3333	3.3333	3.3328	3.3325	3.3323	3.3315
72.7%	3.3335	3.3335	3.3335	3.3334	3.3333	3.3330	3.3328	3.3326	3.3320
68.2%	3.3333	3.3334	3.3333	3.3334	3.3332	3.3330	3.3329	3.3327	3.3322
63.6%	3.3329	3.3331	3.3332	3.3333	3.3332	3.3330	3.3330	3.3328	3.3324
59.1%	3.3111	3.3099	3.3086	3.3073	3.3065	3.3053	3.3043	3.3037	3.3020
54.6%	3.3029	3.3017	3.3002	3.2989	3.2981	3.2967	3.2959	3.2950	3.2934
50.0%	3.3009	3.2997	3.2984	3.2969	3.2962	3.2948	3.2941	3.2933	3.2917
45.5%	3.2998	3.2987	3.2975	3.2961	3.2954	3.2943	3.2934	3.2928	3.2913
40.9%	3.2987	3.2977	3.2965	3.2953	3.2945	3.2934	3.2927	3.2921	3.2909
36.4%	3.2978	3.2971	3.2960	3.2950	3.2944	3.2934	3.2927	3.2921	3.2911
31.8%	3.2941	3.2938	3.2935	3.2931	3.2929	3.2925	3.2922	3.2920	3.2914
27.3%	3.2833	3.2835	3.2836	3.2838	3.2837	3.2841	3.2841	3.2843	3.2842
22.7%	3.2701	3.2706	3.2712	3.2718	3.2722	3.2731	3.2733	3.2737	3.2744
18.2%	3.2493	3.2501	3.2511	3.2521	3.2526	3.2536	3.2541	3.2547	3.2557
13.6%	3.2201	3.2212	3.2227	3.2239	3.2247	3.2259	3.2266	3.2272	3.2284
9.1%	3.2080	3.2096	3.2112	3.2128	3.2133	3.2145	3.2151	3.2158	3.2169
4.6%	3.1177	3.1198	3.1267	3.1312	3.1335	3.1376	3.1399	3.1421	3.1461
0.0%	2.6989	2.7104	2.7181	2.7244	2.7278	2.7331	2.7362	2.7390	2.7435

4.9.2 SOC-Voltage Reference (0.5C Discharge)

Cell voltage (V) during 0.5C discharge vs. SOC and temperature							
SOC / T	25°C	15°C	5°C	0°C	-5°C	-10°C	-20°C
100%	3.4983	3.4808	3.4654	3.4520	3.4416	3.4007	3.3208
95%	3.2932	3.2784	3.2538	3.2344	3.2063	3.1601	3.0363
90%	3.2920	3.2776	3.2523	3.2324	3.2050	3.1616	3.0489
85%	3.2893	3.2754	3.2497	3.2297	3.2033	3.1622	3.0572
80%	3.2857	3.2717	3.2455	3.2258	3.2001	3.1606	3.0608
75%	3.2811	3.2663	3.2403	3.2208	3.1958	3.1576	3.0604
70%	3.2752	3.2585	3.2339	3.2149	3.1905	3.1532	3.0564
65%	3.2659	3.2500	3.2277	3.2091	3.1845	3.1479	3.0491
60%	3.2548	3.2438	3.2220	3.2030	3.1785	3.1413	3.0375
55%	3.2488	3.2389	3.2164	3.1971	3.1718	3.1335	3.0205
50%	3.2440	3.2342	3.2110	3.1909	3.1642	3.1239	2.9951
45%	3.2390	3.2288	3.2048	3.1835	3.1555	3.1121	2.9576
40%	3.2334	3.2231	3.1980	3.1751	3.1452	3.0968	2.9005
35%	3.2270	3.2164	3.1903	3.1656	3.1323	3.0749	2.8168
30%	3.2182	3.2084	3.1811	3.1536	3.1150	3.0398	2.7119
25%	3.2062	3.1971	3.1693	3.1378	3.0891	2.9761	2.6021
20%	3.1883	3.1796	3.1530	3.1137	3.0410	2.8494	2.5063
15%	3.1615	3.1532	3.1281	3.0721	2.9251	2.6537	2.4195
10%	3.1385	3.1304	3.0927	2.9584	2.6829	2.4511	2.3268
5%	3.0574	3.0484	2.9987	2.6232	2.3791	2.2637	2.2013
0%	2.5000	2.5000	2.5000	2.0000	2.0000	2.0000	2.0000

4.9.3 Continuous Charge/Discharge Current Limits (Recommended)

During testing and use, a rest of more than 1 s shall be inserted between steps when switching current, to allow the voltage to settle. Values are in amperes (A). Unless otherwise stated, the upper charge voltage limit is 3.65 V.

Continuous charging, current limit 2C (A)																
SOC / T	< -20℃	[-20, -10℃)	[-10, 0℃)	[0, 10℃)	[10, 15℃)	[15, 25℃)	[25, 35℃)	[35, 45℃)	[45, 55℃)	[55, 60℃)	≥ 60℃					
0%~3%	0	60	150	200	200	200	200	200	100	20	0					
3%~10%																
11%~20%																
21%~30%																
31%~40%		45	100	200	100	100	100	100	50	50						
41%~50%																
51%~60%		20	80	200	50	50	100	50	50							
61%~70%		20 A, 3.5 V cut-off	50	100												
71%~80%		15 A, 3.5 V cut-off	20	50												
81%~90%		10 A, 3.5 V cut-off	10	20												
91%~95%		5 A, 3.5 V cut-off														
96%~100%		0	10	20												

Continuous charging, current limit 1C (A)											
SOC / T	< -20℃	[-20, -10℃)	[-10, 0℃)	[0, 10℃)	[10, 15℃)	[15, 25℃)	[25, 35℃)	[35, 45℃)	[45, 55℃)	[55, 60℃)	≥ 60℃
0%~3%	0	60	100	100	100	100	100	100	100	20	0
3%~10%											
11%~20%											
21%~30%											
31%~40%											
41%~50%		45									
51%~60%		20									
61%~70%		20 A, 3.5 V cut-off	80								
71%~80%		15 A, 3.5 V cut-off	50								
81%~90%		10 A, 3.5 V cut-off	20	50	50						
91%~95%		5 A, 3.5 V cut-off									
96%~100%		0	10	20							

Continuous discharging, current limit 2C (A)											
SOC / T	< -20℃ (min 2 V)	[-20, -10℃) (min 2 V)	[-10, 0℃) (min 2 V)	[0, 10℃)	[10, 15℃)	[15, 25℃)	[25, 35℃)	[35, 45℃)	[45, 55℃)	[55, 60℃)	≥ 60℃
0%~3%	20	50	50	50	50	50	50	50	50	100	0
3%~10%	50			100	100	100	100	100			
11%~20%				100	100	100	100	100			
21%~30%											
31%~40%											
41%~50%											
51%~60%											
61%~70%											
71%~80%											
81%~90%											
91%~95%											
96%~100%											

Continuous discharging, current limit 1C (A)											
SOC / T	< -20°C (min 2 V)	[-20, -10°C) (min 2 V)	[-10, 0°C) (min 2 V)	[0, 10°C)	[10, 15°C)	[15, 25°C)	[25, 35°C)	[35, 45°C)	[45, 55°C)	[55, 60°C)	≥ 60°C
0%~3%	20	50	50	50	50	50	50	50	50	50	0
3%~10%	50			100	100	100	100	100	100		
11%~20%											
21%~30%											
31%~40%											
41%~50%											
51%~60%											
61%~70%											
71%~80%											
81%~90%											
91%~95%											
96%~100%											

4.9.4 Pulse Charge/Discharge Current Limits (Peak)

Pulse charging for 30 s, current limit 4C (A)							
SOC / T	-20℃	-10℃	-5℃	0℃	5℃	15℃	25℃
0%~3%	50	100	150	250	300	400	400
3%~10%		75		200	250		
11%~20%		100			350		
21%~30%		50		150			
31%~40%		75			300		
41%~50%		20	20	50	100		
51%~60%							
61%~70%	75		150		250	350	
71%~80%	20	20	50	100	150	300	
81%~90%						250	
91%~95%						200	
96%~100%	/	/	20	20	50	100	100

Pulse discharging for 30 s, current limit 4C (A)									
SOC / T	-20℃	-10℃	-5℃	0℃	5℃	15℃	25℃		
0%~3%	20	50	75	100	100	100	100		
3%~10%	50	100	150	200	200	200	200		
11%~20%	100	150	200	300	300	300	300		
21%~30%	150	200	250	400	400	400	400		
31%~40%		250	300						
41%~50%		300	350						
51%~60%	200	350							
61%~70%			350					400	
71%~80%			400						400
81%~90%									
91%~95%	400								
96%~100%		250							

5. Test Conditions

5.1 Test Environment Requirements

Unless otherwise specified, tests shall be conducted at a relative humidity of $\leq 80\%$ and an atmospheric pressure of 86 kPa to 106 kPa.

5.2 Fixture Requirements

For all electrical performance, life assessment and reliability/abuse tests, unless otherwise specified, special fixtures shall be used so that thermal coupling and clamping force are consistent with actual use.

5.3 Number of Test Samples

Unless otherwise required, at least 3 samples shall be tested for each test item.

5.4 Equipment Accuracy Requirements

The accuracy of measuring instruments shall meet the following requirements:

- Voltage measurement: ± 0.1 mV

- Current measurement: ± 0.1 A
- Temperature measurement: $\pm 0.5^{\circ}\text{C}$
- Time measurement: $\pm 0.1\%$
- Dimension measurement: $\pm 0.1\%$
- Mass measurement: $\pm 0.1\%$

5.5 Test Records

Unless otherwise stated for a specific test item, test data such as time, temperature, current and voltage shall be recorded at least at every 1% interval of the expected charge or discharge time.

Item	Requirement
Record Content	Description, batch number, start/end time, remarks, responsible person, special circumstances and errors, test result charts, serial numbers of samples used (table).
Raw Data	All raw test data shall be saved in CSV, ASCII or MAT format and archived.
Report Format	Excel
Unique Correspondence	The test results of each sample shall be reported separately.

6. Delivery, Transportation and Storage

6.1 Delivery Status

Item	Specification	Condition
Capacity	≥ 100 Ah	Standard charge/discharge: 25°C ; rest 10 min; 0.5C CCCV charge to 3.65 V until $I < 0.05\text{C}$; rest 10 min; 0.5C CC discharge to 2.5 V.
Shipping State of Charge	$27 \pm 2\%$	/
Shipping Voltage Range	3.27 ~ 3.31 V	/
Appearance	No scratches, dents, bumps, damage, creases, wrinkles, etc.	Visual

6.2 Transportation

Suitable cell packaging shall be selected according to the destination and mode of transport. During transport, severe vibration, external impact or compression, and exposure to direct sunlight or rain shall be prevented. Cells shall be transported at 10%–30% SOC.

6.3 Storage

Cells shall be kept away from corrosive substances and magnetic environments, and stored in a clean, dry, well-ventilated place away from heat sources and open flames. When not in use, keep the SOC between 10% and 40%. Recommended top-up charging interval: every 3 months at -30°C

to 30°C, and every 2 months at 30°C to 40°C. These conditions do not account for self-consumption by the BMS or other components; where such loads exist, adjust the storage and top-up intervals accordingly.

7. Safety Precautions

- Do not immerse cells in water.
- Do not drop cells into fire or expose them to temperatures above the limits set out in 4.6.2; otherwise fire may result.
- Do not short-circuit the cell terminals; high current and temperature may cause injury or fire. Adequate safety precautions shall be taken to avoid short circuits during pack assembly and electrical connection.
- Always connect cell terminals according to the polarity marking. Reverse charging is strictly prohibited.
- Overcharging a cell is extremely dangerous and may cause overheating and fire. Multiple levels of fail-safe overcharge protection shall be implemented in hardware and software.
- Avoid over-discharge. Below 1.8 V the cell chemistry may be permanently damaged. If the cell is discharged below 2.5 V, the customer shall train users to recharge it as soon as possible to prevent over-discharge.
- If electrolyte leaks, avoid skin and eye contact. In case of contact, rinse the area with plenty of clean water and seek medical help.
- If a cell malfunctions, do not reuse it until the root cause has been identified and fully resolved.
- Testing shall be carried out only in a professional laboratory by trained personnel with appropriate protective equipment; otherwise serious injury and property damage may result.

8. Risk Warning

8.1 Warning Statement

WARNING

BATTERY CELLS CARRY POTENTIAL RISKS, AND APPROPRIATE PROTECTIVE MEASURES MUST BE TAKEN DURING OPERATION AND MAINTENANCE.

INCORRECT OPERATION, INCLUDING TESTING OR ASSEMBLY, MAY RESULT IN SERIOUS PERSONAL INJURY AND PROPERTY DAMAGE.

USE THE CORRECT TOOLS AND PROTECTIVE EQUIPMENT WHEN HANDLING BATTERY CELLS.

BATTERY MAINTENANCE MUST BE CARRIED OUT BY PERSONNEL WITH PROFESSIONAL KNOWLEDGE AND SAFETY TRAINING.

FAILURE TO COMPLY WITH THE ABOVE WARNINGS MAY RESULT IN SERIOUS HAZARDS.

8.2 Potential Hazards

The customer should be aware of potential hazards during the use and operation of the cells, including the risk of operators being harmed by chemicals, electric shock or arcs. The customer must take protective measures to prevent such injuries. There is also a chemical risk associated with electrolyte leakage from the cells.

9. Disclaimers

- STF shall not be liable for malfunctions, injuries or other adverse effects resulting from use of the cells outside the conditions specified in this Specification.
- STF reserves the right to update the technical status of the product; customers shall confirm the latest product status with STF before purchase.
- The technical parameters in this Specification do not constitute a product warranty commitment; warranty conditions are set out separately in the quality guarantee agreement.