





Test Report issued under the responsibility of:






TEST REPORT IEC 62133-2 Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems	
Report Number :	6175658.50
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Name of Testing Laboratory preparing the Report	DEKRA Testing and Certification (Shanghai) Ltd.
Applicant's name	Hengxun Appliance (Suzhou) Co., Ltd.
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Test specification:	
Standard	IEC 62133-2:2017
Test procedure	CB Scheme
Non-standard test method	N/A
Test Report Form No.	IEC62133_2A
Test Report Form(s) Originator :	DEKRA
Master TRF	Dated 2017-08-10
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Test item description	Rechargeable Li-ion battery pack	
Trade Mark	N/A	
Manufacturer	Cinderson Tech (Suzhou) Co., Ltd 2/F, Main Workshop, No.15, Linbu Street, Weiting, Suzhou Industrial Zone, 215127 Suzhou Jiangsu China	
Model/Type reference	VC7231, AMC-3501A	
Ratings	25,2 Vdc, 2500 mAh, 63 Wh	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	DEKRA Testing and Certification (Shanghai) Ltd.
Testing location/ address		Building 1, No.1050, Xingxian Road, Jiading District Shanghai 201815, China.
Tested by (name, function, signature)		Tao Gong, Engineer 
Approved by (name, function, signature)		Alan Yang, Reviewer 
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature)		
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature) .:		
Approved by (name, function, signature)		
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	
Testing location/ address		
Tested by (name, function, signature)		
Witnessed by (name, function, signature) .:		
Approved by (name, function, signature)		
Supervised by (name, function, signature) :		

<p>List of Attachments (including a total number of pages in each attachment):</p> <p>Attachment 1: National Differences (3 pages)</p> <p>Attachment 2: Photos (7 pages)</p>	
<p>Summary of testing:</p>	
<p>Tests performed (name of test and test clause):</p> <p>All applicable tests were performed on battery pack VC7231,</p> <ul style="list-style-type: none"> —7.2.2 Case stress at high ambient temperature (battery) —7.3.2 External short circuit (battery) —7.3.3 Free fall —7.3.6 Over-charging of battery —7.3.8 Mechanical tests (batteries) <p>and the test results comply with the requirement of IEC 62133-2:2017.</p>	<p>Testing location:</p> <p>DEKRA Testing and Certification (Shanghai) Ltd. Building 1, No.1050, Xingxian Road, Jiading District Shanghai 201815, China.</p>
<p>Summary of compliance with National Differences (List of countries addressed):</p> <p>EU Group Differences (no differences), KR KR: Republic of Korea</p> <p><input checked="" type="checkbox"/> The products fulfils the requirements of <u>KC 62133-2:2020</u></p>	

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Rechargeable Lithium Battery Pack		
Model : VC7231	71NR19/66	Li-ion
Rate : 25.2V, 2500mAh, 63Wh		
CINDERSON TECH (SuZhou) Co.,Ltd		
2/F, Main Workshop, No.15, Linbu Street, Weiting,		
Suzhou Industrial Zone, Jiangsu Province, P.R.China		
Made in China	YYYY-MM-DD	
	Risk of fire and burn. Do not short circuit. Do not disassemble, crush, incinerate or expose to high temperature. Refer to the user manual before using the battery.	

Rechargeable Lithium Battery Pack		
Model : AMC-3501A	71NR19/66	Li-ion
Rate : 25.2V, 2500mAh, 63Wh		
CINDERSON TECH (SuZhou) Co.,Ltd		
2/F, Main Workshop, No.15, Linbu Street, Weiting,		
Suzhou Industrial Zone, Jiangsu Province, P.R.China		
Made in China	YYYY-MM-DD	
	Risk of fire and burn. Do not short circuit. Do not disassemble, crush, incinerate or expose to high temperature. Refer to the user manual before using the battery.	

Remark:

1. Cells used in the manufacturer of a battery need not be marked.
2. The external connector of battery pack is designed for the specific end products, and prevents reverse polarity.
3. Date of manufacture is printed on the every product at the time of production.

Test item particulars	Rechargeable Li-ion battery pack
Classification of installation and use	To be defined in a final product
Supply Connection	DC connection
Recommend charging method declared by the manufacturer	charged by specified charger
Discharge current (0,2 It A)	500 mAh
Specified final voltage	19,25 Vdc
Upper limit charging voltage per cell	4,25 Vdc
Maximum charging current	1,2 A
Charging temperature upper limit	45 °C
Charging temperature lower limit	0 °C
Polymer cell electrolyte type	<input type="checkbox"/> gel polymer <input type="checkbox"/> solid polymer <input checked="" type="checkbox"/> N/A
Possible test case verdicts:	
- test case does not apply to the test object.....	N/A
- test object does meet the requirement.....	P (Pass)
- test object does not meet the requirement.....	F (Fail)
Testing :	
Date of receipt of test item	2023-11-18
Date (s) of performance of tests	2023-11-18 to 2023-12-18
General remarks:	
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to calculate the uncertainty associated with the measurement result. This report is not used for social proof in China market.</p> <p>Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC62133:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies)	Cinderson Tech (Suzhou) Co., Ltd 2/F, Main Workshop, No.15, Linbu Street, Weiting, Suzhou Industrial Zone, 215127 Suzhou Jiangsu China

General product information and other remarks:

1. Details information of the battery pack, as following:

Model	VC7231, AMC-3501A
Nominal voltage	25,2 Vdc
Rated capacity	2500 mAh
Cell type(s)	18650 2500 mAh (3,6 Vdc, 2500 mAh)
Constructions	7S1P
Cells used in the battery assembly have closely matched capacities, are of the same design, and are of the same chemistry and same manufacturer.	

2. The cell type 18650 2500 mAh has been tested according to IEC 62133-2:2017 in CB report no. 50215125 001 issued on 2019-02-27 with CB certificate no. JPTUV-094690 issued by TÜV Rheinland Japan Ltd on date 2019-02-27.

There is no difference between VC7231 and AMC-3501A except for the model name. After review, all tests need to be performed, VC7231 is selected to be subjected to all applicable tests.

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
4	PARAMETER MEASUREMENT TOLERANCES		P
	Parameter measurement tolerances		P
5	GENERAL SAFETY CONSIDERATIONS		P
5.1	General		P
	Cells and batteries so designed and constructed that they are safe under conditions of both intended use and reasonably foreseeable misuse		P
5.2	Insulation and wiring		P
	The insulation resistance between the positive terminal and externally exposed metal surfaces of the battery (excluding electrical contact surfaces) is not less than 5 MΩ		N/A
	Insulation resistance (MΩ) :	>5	—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		P
	Orientation of wiring maintains adequate clearance and creepage distances between conductors		P
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		P
5.3	Venting		P
	Battery cases and cells incorporate a pressure relief mechanism or are constructed so that they relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition		P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief		N/A
5.4	Temperature, voltage and current management		P
	Batteries are designed such that abnormal temperature rise conditions are prevented		P
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer		P
	Batteries are provided with specifications and charging instructions for equipment manufacturers so that specified chargers are designed to maintain charging within the temperature, voltage and current limits specified		P
5.5	Terminal contacts		P
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current		P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance		P
	Terminal contacts are arranged to minimize the risk of short-circuit		P
5.6	Assembly of cells into batteries		P
5.6.1	General		P
	Each battery have an independent control and protection for current, voltage, temperature and any other parameter required for safety and to maintain the cells within their operating region		P
	This protection may be provided external to the battery such as within the charger or the end devices		N/A
	If protection is external to the battery, the manufacturer of the battery provide this safety relevant information to the external device manufacturer for implementation		N/A
	If there is more than one battery housed in a single battery case, each battery have protective circuitry that can maintain the cells within their operating regions		N/A
	Manufacturers of cells specify current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly		P
	Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate circuitry to prevent operation of cells outside the limits specified by the cell manufacturer		N/A
	Protective circuit components added as appropriate and consideration given to the end-device application		P
	The manufacturer of the battery provide a safety analysis of the battery safety circuitry with a test report including a fault analysis of the protection circuit under both charging and discharging conditions confirming the compliance		N/A
5.6.2	Design recommendation		P
	For the battery consisting of a single cell or a single cellblock, it is recommended that the charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Table 2		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that the voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Table 2, by monitoring the voltage of every single cell or the single cellblocks		P
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that charging is stopped when the upper limit of the charging voltage is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks		P
	For batteries consisting of series-connected cells or cell blocks, nominal charge voltage not be counted as an overcharge protection		P
	For batteries consisting of series-connected cells or cell blocks, cells have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer		P
	It is recommended that the cells and cell blocks not discharged beyond the cell manufacturer's specified final voltage		P
	For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry incorporated into the battery management system		P
5.6.3	Mechanical protection for cells and components of batteries		P
	Mechanical protection for cells, cell connections and control circuits within the battery provided to prevent damage as a result of intended use and reasonably foreseeable misuse		P
	The mechanical protection can be provided by the battery case or it can be provided by the end product enclosure for those batteries intended for building into an end product		P
	The battery case and compartments housing cells designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer		P
	For batteries intended for building into a portable end product, testing with the battery installed within the end product considered when conducting mechanical tests		N/A
5.7	Quality plan		P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	The manufacturer prepares and implements a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery		P
5.8	Battery safety components		P
	According annex F		P
6	TYPE TEST AND SAMPLE SIZE		P
	Tests are made with the number of cells or batteries specified in Table 1 using cells or batteries that are not more than six months old		P
	Coin cells with resistance $\leq 3 \Omega$ (measured according annex D) are tested according table 1		N/A
	Unless otherwise specified, tests are carried out in an ambient temperature of $20 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$		P
	The safety analysis of 5.6.1 identify those components of the protection circuit that are critical for short-circuit, overcharge and overdischarge protection		P
	When conducting the short-circuit test, consideration given to the simulation of any single fault condition that is likely to occur in the protecting circuit that would affect the short-circuit test		P
7	SPECIFIC REQUIREMENTS AND TESTS		P
7.1	Charging procedure for test purposes		P
7.1.1	First procedure		P
	This charging procedure applies to subclauses other than those specified in 7.1.2		P
	Unless otherwise stated in this document, the charging procedure for test purposes is carried out in an ambient temperature of $20 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$, using the method declared by the manufacturer		P
	Prior to charging, the battery have been discharged at $20 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ at a constant current of 0,2 It A down to a specified final voltage		P
7.1.2	Second procedure		N/A
	This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9		N/A
	After stabilization for 1 h and 4 h, respectively, at ambient temperature of highest test temperature and lowest test temperature, as specified in Table 2, cells are charged by using the upper limit charging voltage and maximum charging current, until the charging current is reduced to 0,05 It A, using a constant voltage charging method		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.2	Intended use		P
7.2.1	Continuous charging at constant voltage (cells)		N/A
	Fully charged cells are subjected for 7 days to a charge using the charging method for current and standard voltage specified by the cell manufacturer		N/A
	Results: No fire. No explosion. No leakage..... :	(See appended table 7.2.1)	N/A
7.2.2	Case stress at high ambient temperature (battery)		P
	Oven temperature (°C)..... :	70 °C	—
	Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells		P
7.3	Reasonably foreseeable misuse		P
7.3.1	External short-circuit (cell)		N/A
	The cells were tested until one of the following occurred:		N/A
	- 24 hours elapsed; or		N/A
	- The case temperature declined by 20 % of the maximum temperature rise		N/A
	Results: No fire. No explosion..... :	(See appended table 7.3.1)	N/A
7.3.2	External short-circuit (battery)		P
	The batteries were tested until one of the following occurred:		P
	- 24 hours elapsed; or		P
	- The case temperature declined by 20 % of the maximum temperature rise		N/A
	In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition		N/A
	A single fault in the discharge protection circuit conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test		P
	A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor		P
	Results: No fire. No explosion..... :	(See appended table 7.3.2)	P
7.3.3	Free fall		P
	Results: No fire. No explosion		P
7.3.4	Thermal abuse (cells)		N/A
	Oven temperature (°C)..... :		—
	Results: No fire. No explosion		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.3.5	Crush (cells)		N/A
	The crushing force was released upon:		N/A
	- The maximum force of 13 kN ± 0,78 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	Results: No fire. No explosion..... :	(See appended table 7.3.5)	N/A
7.3.6	Over-charging of battery		P
	The supply voltage which is:		P
	- 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed 6,0 V) for single cell/cell block batteries or		N/A
	- 1,2 times the upper limit charging voltage resented in Table A.1 per cell for series connected multi-cell batteries, and		P
	- Sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached		P
	Test was continued until the temperature of the outer casing:		P
	- Reached steady state conditions (less than 10 °C change in 30-minute period); or		P
	- Returned to ambient		N/A
	Results: No fire. No explosion..... :	(See appended table 7.3.6)	P
7.3.7	Forced discharge (cells)		N/A
	If the discharge voltage reaches the negative value of upper limit charging voltage within the testing duration, the voltage is maintained at the negative value of the upper limit charging voltage by reducing the current for the remainder of the testing duration		N/A
	If the discharge voltage does not reach the negative value of upper limit charging voltage within the testing duration, the test is terminated at the end of the testing duration		N/A
	Results: No fire. No explosion..... :	(See appended table 7.3.7)	N/A
7.3.8	Mechanical tests (batteries)		P
7.3.8.1	Vibration		P
	Results: No fire, no explosion, no rupture, no leakage or venting. :	(See appended table 7.3.8.1)	P
7.3.8.2	Mechanical shock		P
	Results: No leakage, no venting, no rupture, no explosion and no fire :	(See appended table 7.3.8.2)	P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.3.9	Design evaluation – Forced internal short-circuit (cells)		N/A
	The cells complied with national requirement for:	France, Japan, Korea, Switzerland	—
	The pressing was stopped upon:		N/A
	- A voltage drop of 50 mV has been detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached		N/A
	Results: No fire	(See appended table 7.3.9)	N/A
8	INFORMATION FOR SAFETY		P
8.1	General		P
	Manufacturers of secondary cells ensure that information is provided about current, voltage and temperature limits of their products		P
	Manufacturers of batteries ensure that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards		P
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		P
	As appropriate, any information relating to hazard avoidance resulting from a system analysis provided to the end user		P
	Do not allow children to replace batteries without adult supervision		P
8.2	Small cell and battery safety information		N/A
	The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them:		N/A
	- Keep small cells and batteries which are considered swallowable out of the reach of children		N/A
	- Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion		N/A
	- In case of ingestion of a cell or battery, seek medical assistance promptly		N/A
9	MARKING		P
9.1	Cell marking		N/A
	Cells marked as specified in IEC 61960, except coin cells		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Coin cells whose external surface area is too small to accommodate the markings on the cells show the designation and polarity		N/A
	By agreement between the cell manufacturer and the battery and/or end product manufacturer, component cells used in the manufacture of a battery need not be marked		P
9.2	Battery marking		P
	Batteries marked as specified in IEC 61960, except for coin batteries		P
	Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity. Batteries also marked with an appropriate caution statement		N/A
	Terminals have clear polarity marking on the external surface of the battery		P
	Batteries with keyed external connectors designed for connection to specific end products need not be marked with polarity markings if the design of the external connector prevents reverse polarity connections		P
9.3	Caution for ingestion of small cells and batteries		N/A
	Coin cells and batteries identified as small batteries according to 8.2 include a caution statement regarding the hazards of ingestion in accordance with 8.2		N/A
	When small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion given on the immediate package		N/A
9.4	Other information		P
	Storage and disposal instructions		P
	Recommended charging instructions		P
10	PACKAGING AND TRANSPORT		P
	Packaging for coin cells not small enough to fit within the limits of the ingestion gauge of Figure 3		N/A
	The materials and packaging design are chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants		P
ANNEX A	CHARGING AND DISCHARGING RANGE OF SECONDARY LITHIUM ION CELLS FOR SAFE USE		P
A.1	General		P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
A.2	Safety of lithium ion secondary battery		P
A.3	Consideration on charging voltage		P
A.3.1	General		P
A.3.2	Upper limit charging voltage		P
A.3.2.1	General		P
A.3.2.2	Explanation of safety viewpoint		P
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied		N/A
A.4	Consideration of temperature and charging current		P
A.4.1	General		P
A.4.2	Recommended temperature range		P
A.4.2.1	General		P
A.4.2.2	Safety consideration when a different recommended temperature range is applied		P
A.4.3	High temperature range		P
A.4.3.1	General		P
A.4.3.2	Explanation of safety viewpoint		P
A.4.3.3	Safety considerations when specifying charging conditions in the high temperature range		P
A.4.3.4	Safety considerations when specifying a new upper limit in the high temperature range		P
A.4.4	Low temperature range		P
A.4.4.1	General		P
A.4.4.2	Explanation of safety viewpoint		P
A.4.4.3	Safety considerations, when specifying charging conditions in the low temperature range		P
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range		P
A.4.5	Scope of the application of charging current		P
A.4.6	Consideration of discharge		P
A.4.6.1	General		P
A.4.6.2	Final discharge voltage and explanation of safety viewpoint		P
A.4.6.3	Discharge current and temperature range		P
A.4.6.4	Scope of application of the discharging current		P
A.5	Sample preparation		N/A
A.5.1	General		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
A.5.2	Insertion procedure for nickel particle to generate internal short		N/A
A.5.3	Disassembly of charged cell		N/A
A.5.4	Shape of nickel particle		N/A
A.5.5	Insertion of nickel particle in cylindrical cell		N/A
A.5.5.1	Insertion of nickel particle in winding core		N/A
A.5.5.2	Marking the position of the nickel particle on both ends of the winding core of the separator		N/A
A.5.6	Insertion of nickel particle in prismatic cell		N/A
A.6	Experimental procedure of the forced internal short-circuit test		N/A
A.6.1	Material and tools for preparation of nickel particle		N/A
A.6.2	Example of a nickel particle preparation procedure		N/A
A.6.3	Positioning (or placement) of a nickel particle		N/A
A.6.4	Damaged separator precaution		N/A
A.6.5	Caution for rewinding separator and electrode		N/A
A.6.6	Insulation film for preventing short-circuit		N/A
A.6.7	Caution when disassembling a cell		N/A
A.6.8	Protective equipment for safety		N/A
A.6.9	Caution in the case of fire during disassembling		N/A
A.6.10	Caution for the disassembling process and pressing the electrode core		N/A
A.6.11	Recommended specifications for the pressing device		N/A
ANNEX B	RECOMMENDATIONS TO EQUIPMENT MANUFACTURERS AND BATTERY ASSEMBLERS		P
ANNEX C	RECOMMENDATIONS TO THE END-USERS		P
ANNEX D	MEASUREMENT OF THE INTERNAL AC RESISTANCE FOR COIN CELLS		N/A
D.1	General		N/A
D.2	Method		N/A
	A sample size of three coin cells is required for this measurement..... :	(See appended table D.2)	N/A
	Coin cells with an internal resistance of less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1		N/A
	Coin cells with an internal resistance greater than 3 Ω require no further testing		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
ANNEX E	PACKAGING AND TRANSPORT		P
ANNEX F	COMPONENT STANDARDS REFERENCES		P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE: Critical components information					P
Object / part No.	Manufacturer / trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Cell	TESSON NEW ENERGY (WEI NAN) CO., LTD.	18650 2500 mAh	3,6 Vdc, 2500 mAh, Li-ion	IEC 62133-2	TÜV Rheinland CB cert. JPTUV-094690
PCB	GUANGDE DONGFENG ELECTRONICS CO., LTD	DF-2H	V-0, 130°C	IEC 62133-2 UL 796	Tested with battery + UL E199900
Alternative	Jiansu xingzhisheng Electronics Co., Ltd	XZS	V-0, 130°C	UL 796	UL E513169
IC (U1)	Shenzhen China Micro Semicon Co., Ltd	CMS8S6990	VDD:2.1V~5.5V TOPR=-40 to 105°C	IEC 62133-2	Tested with battery
IC (U3)	Guangdong Cellwise Microelectronics Co., Ltd	CW1072ALBS	VDD: GND-0.3V~GND+40 V TOPR=-40 to 105°C	IEC 62133-2	Tested with battery
Resistance (RS1)	Nanjing SART Science& Technology Development Co., Ltd	SMR25M2FR002 T	2mR 2W 1%	IEC 62133-2	Tested with battery
Resistance (RS2)	Nanjing SART Science& Technology Development Co., Ltd	SMR25M2FR020 T	20mR 1W 1%	IEC 62133-2	Tested with battery
Fuse (F1)	CONQUER ELECTRONICS Co., LTD	CQ12LI20A 63V	63 V, 20 A	IEC 62133-2	Tested with battery
NTC (RT1)	Suzhou Showme Electronic & Technology Co., Ltd.	SE103F3435F A9MTY	10K±1% 3435K	IEC 62133-2	Tested with battery
MOSFET (Q7, Q8, Q9)	WUXI CHINA RESOURCES HUAJING MICROELECTRONICS CO., LTD	CRTD045N04L2 P	40 V, 90 A	IEC 62133-2	Tested with battery

IEC 62133-2					
Clause	Requirement + Test			Result - Remark	Verdict
MOSFET (Q13, Q14)	Shanghai Natlinear Electronics Co., Ltd	NP12P04SR-G	40 V, 12 A	IEC 62133-2	Tested with battery
NPN type triode (Q16)	WILLAS ELECTRONIC CORP	MMBT5551LT1	160 V, 0,6 A	IEC 62133-2	Tested with battery
Enclosure	LG CHEM HUIZHOU PETROCHEMICA L CO., LTD	AF312	2.2mm v-0	IEC 62133-2 UL 746	Tested with battery + UL E476284
Internal wire	SUZHOU DIAN HANG ELECTRONICO., LTD	1007	300 V, 80 °C, 16~28 AWG	IEC 62133-2 UL 758	Tested with battery + UL E354173
Alternative	KUNSHAN NEW ZHICHNG ELECTRONICS TECHNOLOGIES CO., LTD	1007	300 V, 80 °C, 16~28 AWG	UL 758	UL E237831
Alternative	KUNSHAN XINGHONGMENG ELECTRONIC CO., LTD	1007	300 V, 80 °C, 16~28 AWG	UL 758	UL E315421
Supplementary information:					
1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.1	TABLE: Continuous charging at constant voltage (cells)			N/A
Sample no.	Recommended charging voltage V _c (Vdc)	Recommended charging current I _{rec} (A)	OCV before test (Vdc)	Results
Supplementary information:				
<ul style="list-style-type: none"> - No fire or explosion - No leakage - Others (please explain) 				

7.3.1	TABLE: External short-circuit (cell)				N/A
Sample no.	Ambient T (°C)	OCV before test (Vdc)	Resistance of circuit (mΩ)	Maximum case temperature (°C)	Results
Samples charged at charging temperature upper limit					
Samples charged at charging temperature lower limit					
Supplementary information:					
- No fire or explosion					

7.3.2	TABLE: External short-circuit (battery)					P
Sample no.	Ambient T (°C)	OCV before test (Vdc)	Resistance of circuit (mΩ)	Maximum case temperature (°C)	Component single fault condition	Results
B04	18,2	29,03	88	20,2	-	P
B05	18,2	29,01	88	23,7	Q8, S-D, SC	P
B06	18,2	29,07	88	22,1	F1, SC	P
B07	18,2	29,09	88	20,1	-	P
B08	18,2	29,08	88	23,5	Q16, S-D, SC	P
Supplementary information: or Samsung cell						
<ul style="list-style-type: none"> - No fire or explosion - No leakage 						

7.3.6	TABLE: Over-charging of battery		P
Constant charging current (A)	5		—
Supply voltage (Vdc)	35,7		—

IEC 62133-2				
Clause	Requirement + Test	Result - Remark		Verdict
Sample no.	OCV before charging (Vdc)	Total charging time (minute)	Maximum outer case temperature (°C)	Results
B12	20,41	31	23,4	P
B13	20,79	31	23,5	P
B14	20,63	31	23,8	P
B15	20,73	31	23,1	P
B16	20,68	31	23,5	P
Supplementary information: for Samsung cell				
- No fire or explosion				
- No leakage				

7.3.7	TABLE: Forced discharge (cells)			N/A
Sample no.	OCV before application of reverse charge (Vdc)	Measured reverse charge I_t (A)	Results	
Supplementary information:				
- No fire or explosion				

7.3.8.1	TABLE: Vibration					P
Sample no.	OCV before test (Vdc)	OCV after test (Vdc)	Mass before test (g)	Mass after test (g)	Results	
B17	29,02	29,02	507,38	507,25	P	
B18	29,04	29,04	507,85	507,73	P	
B19	29,01	29,01	508,03	507,91	P	
Supplementary information:						
- No fire or explosion						
- No rupture						
- No leakage						
- No venting						

7.3.8.2	TABLE: Mechanical shock					P
Sample no.	OCV before test (Vdc)	OCV after test (Vdc)	Mass before test (g)	Mass after test (g)	Results	
B20	29,03	29,03	507,31	507,28	P	
B21	29,02	29,02	507,35	507,33	P	
B22	29,05	29,05	507,46	507,44	P	

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

- No fire or explosion
- No rupture
- No leakage
- No venting

7.3.9	TABLE: Forced internal short circuit (cells)				N/A
Sample no.	Chamber ambient T (°C)	OCV before test (Vdc)	Particle location ¹⁾	Maximum applied pressure (N)	Results

Supplementary information:

¹⁾ Identify one of the following:

- 1: Nickel particle inserted between positive and negative (active material) coated area.
- 2: Nickel particle inserted between positive aluminium foil and negative active material coated area.

- No fire or explosion
- Others (please explain)

D.2	TABLE: Internal AC resistance for coin cells				N/A
Sample no.	Ambient T (°C)	Store time (h)	Resistance Rac (Ω)	Results ¹⁾	

Supplementary information:

¹⁾ Coin cells with internal resistance less than or equal to 3 Ω, see test result on corresponding tables

Attachment 1: National Differences

IEC 62133-2:2017 ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT IEC 62133-2:2017 (Republic of Korea) NATIONAL DIFFERENCES (Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems)			
Differences according to.....: National standard KC62133(2020-07)			
TRF template used:.....: IECEE OD-2020-F3, Ed. 1.1			
Attachment Form No.....: KR_ND_IEC62133_2A			
Attachment Originator: KTR			
Master Attachment.....: Dated 2020-08-03			
Copyright © 2020 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.			
	National Differences		N/A
7.3.6	Over-charging of battery		N/A
(Revision)	[Add the bolded text] b) Test The test shall be carried out in an ambient temperature of 20 °C ± 5 °C. Each test battery shall be discharged at a constant current of 0,2 It A, to a final discharge voltage specified by the manufacturer. Sample batteries shall then be charged at a constant current of 2,0 It A, using a supply voltage which is: <ul style="list-style-type: none"> • 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed 6,0 V) for single cell/cell block batteries or • 1,2 times the upper limit charging voltage presented in Table A.1 per cell for series connected multi-cell batteries, and • sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached. <u>• In case the charging voltage specified by the manufacturer is higher than the overcharge test voltage, the maximum charging voltage specified by manufacturer should be applied with 2.0 ItA, (e.g., quick charging power bank, etc.)</u>	N/A	

IEC 62133-2:2017 ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>[Replace to the following statement]</p> <p>c) Acceptance criteria</p> <p>Overcharging exceeding to the limits specified by the manufacturer should not result in fire or explosion.</p>		N/A
Annex D	Definition for shape and materials of outer case for cell		—
<i>(Addition)</i>	<p>D.1 General</p> <p>Annex D provides definitions for shape and materials of outer case for cell</p> <p>D.2 Shape of outer case for cell</p> <p>D2.1 Cylindrical cell</p> <p>Cell with a cylindrical shape in which the overall height is equal to or greater than diameter.</p> <p>D2.2 Prismatic cell</p> <p>Cell having the shape of a parallelepiped whose faces are rectangular</p> <p>D.3 Materials of outer case for cell</p> <p>D.3.1 Soft case</p> <p>Non-metallic outer case or container for cell</p> <p>D.3.2 Hard case</p> <p>Metallic outer case or container for cell.</p>	<p>(Shape of outer cases)</p> <p><input checked="" type="checkbox"/> Cylindrical</p> <p><input type="checkbox"/> Prismatic</p> <p>(Materials of outer cases)</p> <p><input checked="" type="checkbox"/> Hard</p> <p><input type="checkbox"/> Soft</p>	—
Annex E	Calculation method of the volumetric energy density for cell		—
<i>(Addition)</i>	<p>Annex E provide a calculation method of the volumetric energy density for cell in use of smart phone, tablet, notebook.</p> <p>E.1 General</p> <p>Unless otherwise stated in the Annex E, the dimensions for calculation are based on these for cell before shipment and the volumetric energy density shall be calculated with a maximum values specified by manufacturer. If the specification for cell can't be provided a dimension for calculation, the manufacturer's other documentation shall be provided to demonstrate compliance for its calculation.</p>	Cell: 507,24 Wh / L	—

IEC 62133-2:2017 ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>E.2 Calculation Method</p> <p>L : Length (max.) of cell (including terrace) W : Width (max.) of cell T : Thickness (max.) when shipping charge (For reference, Please Exclude the dimension of any tape that is attached to cell)</p> $\text{Volumetric energy density (Wh/L)} = \frac{\text{Nominal voltage (V)} \times \text{Rated capacity (Ah)}}{\text{Length (L)} \times \text{Width (W)} \times \text{Thickness (T)}}$ <p>[E.1 – Prismatic cell using soft case]</p> <p>L : Length (max.) of cell W : Width (max.) of cell T : Thickness when shipping charge (For reference, Please Exclude the dimension of any tape that is attached to cell)</p> $\text{Volumetric energy density (Wh/L)} = \frac{\text{Nominal voltage (V)} \times \text{Rated capacity (Ah)}}{\text{Length (L)} \times \text{Width (W)} \times \text{Thickness (T)}}$ <p>[E.2 – Prismatic cell using hard case]</p> <p>D : Diameter (max.) of cell L : Length (max.) of cell (According to shape of cell at shipping, The dimension of tube for cell may be included in overall dimension of cell)</p> $\text{Volumetric energy density (Wh/L)} = \frac{\text{Nominal voltage (V)} \times \text{Rated capacity (Ah)}}{3.14159 \times \frac{\text{Diameter (D)}^2}{4} \times \text{Length(L)}}$ <p>[E.3 – Cylindrical cell using hard case]</p>		—

Attachment 2: Photos

Overview



Overview



Overview



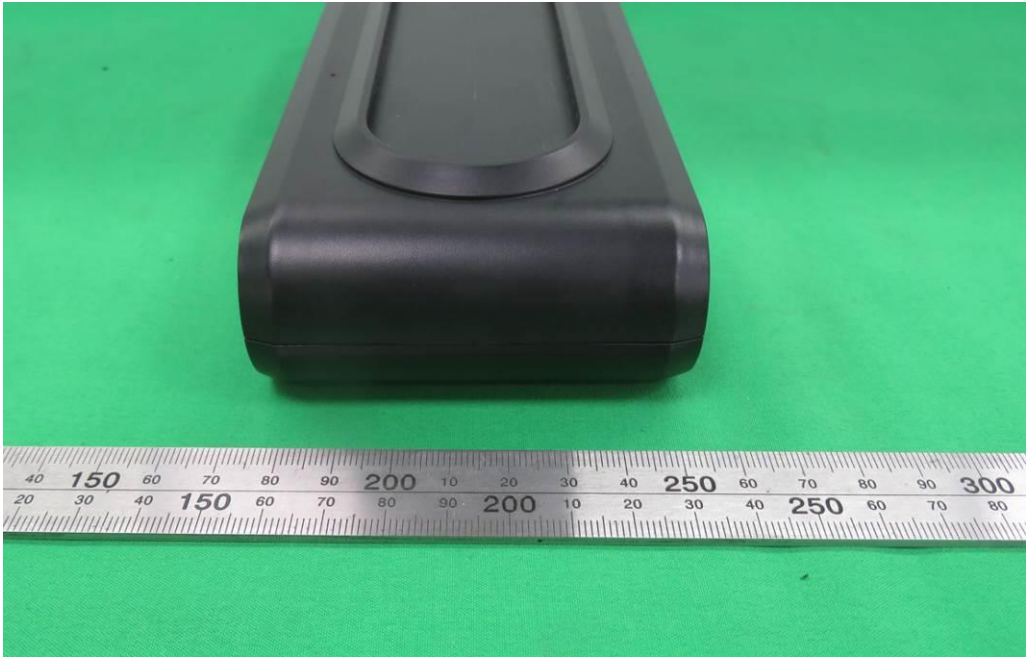
Overview



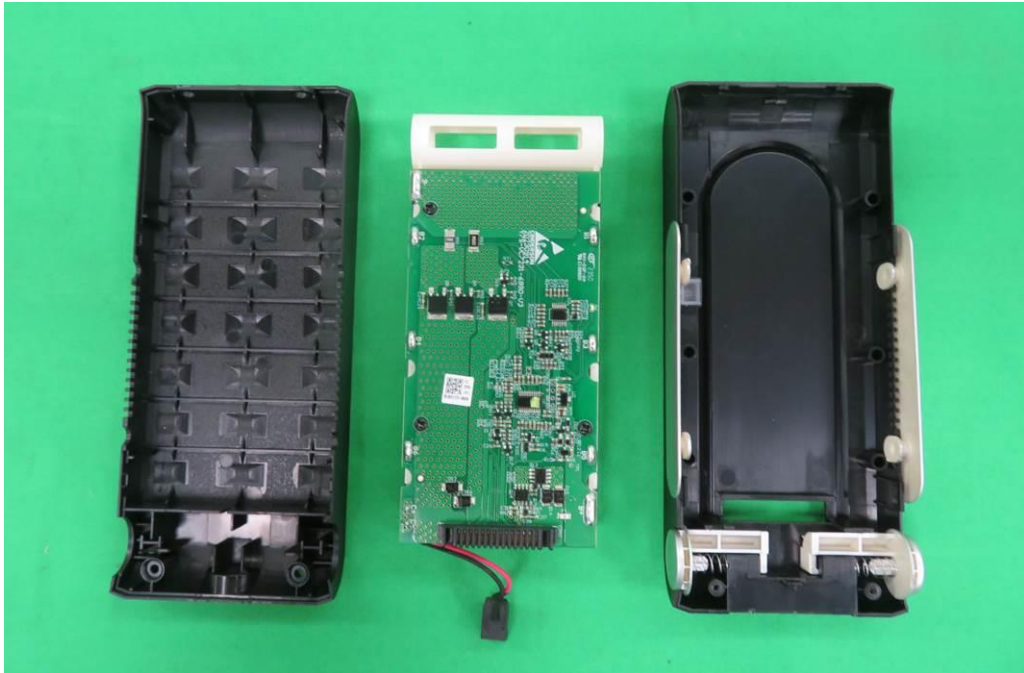
Overview



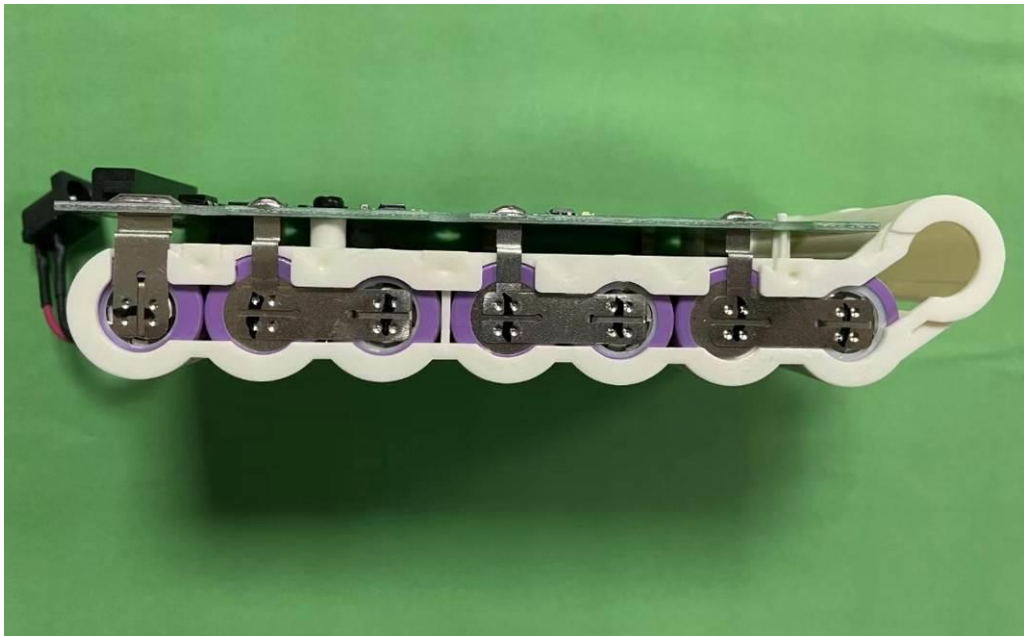
Overview



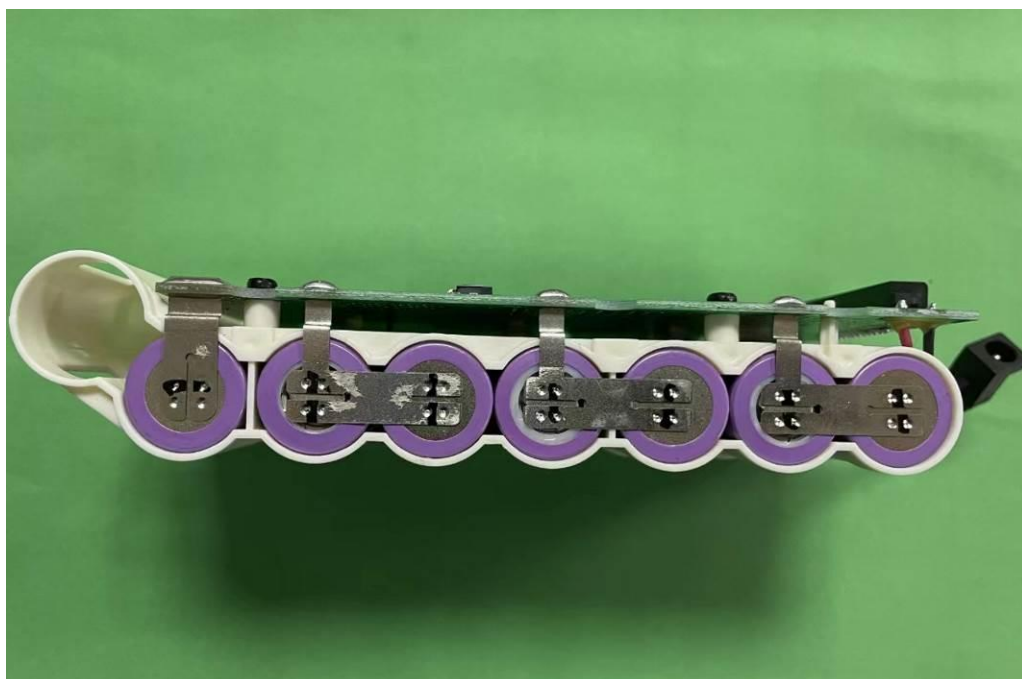
Internal view



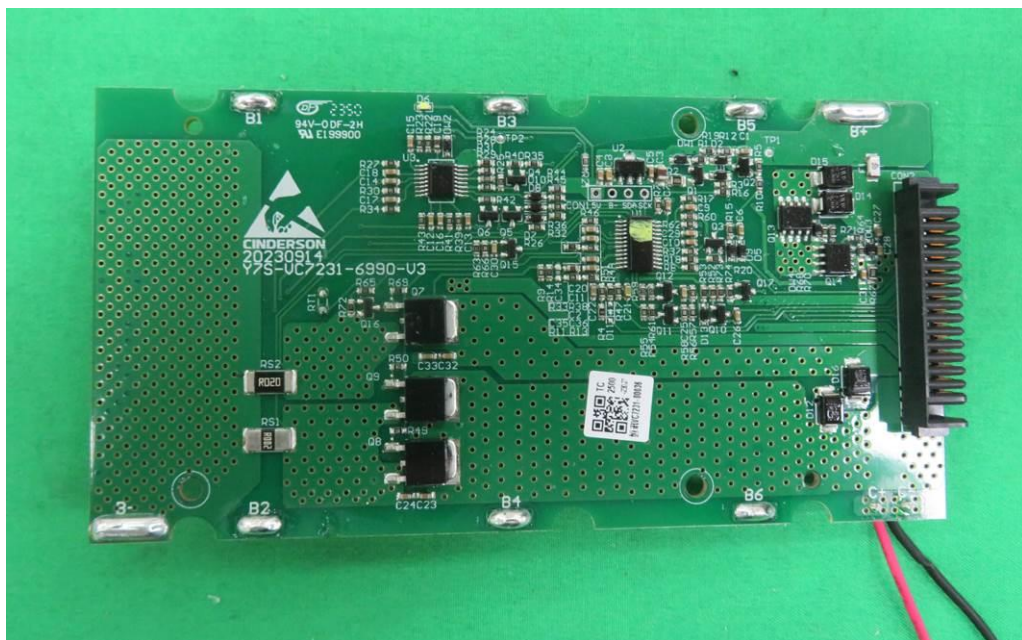
Cell connection view



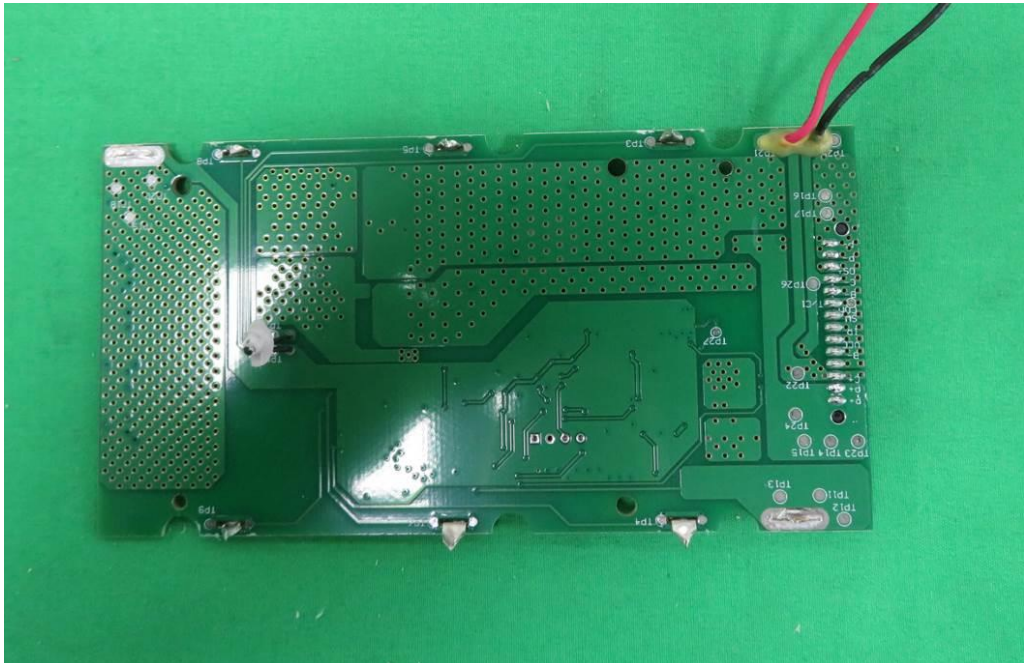
Cell connection view



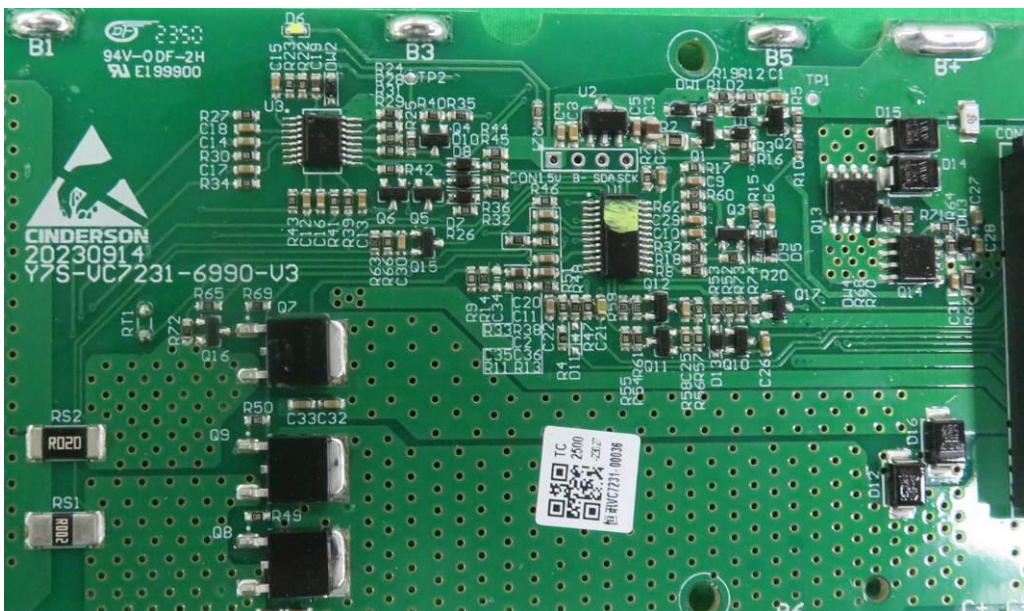
PCBA view



PCBA view



PCBA view



Cell view



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