



Test Report issued under the responsibility of:



**TEST REPORT
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

Report Number: CN23P29C 001

Date of issue: 2023-10-08

Total number of pages: 21 pages

Name of Testing Laboratory preparing the Report: TÜV Rheinland (Shenzhen) Co., Ltd.

Applicant's name: CBQ Auto and Leisure (Aust) Pty Ltd

Address: Building 9, 83 Burnside Road Stapylton 4207, Australia

Test specification:

Standard: IEC 62619:2022

Test procedure: CB Scheme

Non-standard test method: N/A

TRF template used: IECEE OD-2020-F1:2022, Ed.1.5

Test Report Form No: IEC62619B

Test Report Form(s) Originator: UL Solutions (Demko)

Master TRF: Dated 2023-02-24

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General disclaimer:

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Test item description :	Secondary Li-ion Battery	
Trademark(s)	HARD KORR	
Manufacturer	[REDACTED]	
Model/Type reference :	HKPBATLSL105	
Ratings :	12.8VDC, 105Ah, 1344Wh	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.
Testing location/ address	1F East, 3F West – 4F, Cybio Technology Building No.1, No.16 Kejibei 2 nd Road, High-Tech Industrial Park North Nanshan District, 518057, Shenzhen, China	
Tested by (name, function, signature) :	Locs Lai, Engineer	<i>Locs Lai</i>
Approved by (name, function, signature) .. :	Alvin Zheng, Reviewer	<i>Alvin Zheng</i>
<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) :		

List of Attachments (including a total number of pages in each attachment): Attachment 1: Photo documentation (7 pages).	
Summary of testing:	
Tests performed (name of test, test clause and date test performed): cl.7.2.3.3 Edge and corner drop test (battery system); 2023-07-21 cl.8.2.2 Overcharge control of voltage (battery system); 2023-07-21 cl.8.2.3 Overcharge control of current (battery system); 2023-07-21 cl.8.2.4 Overheating control (battery system) 2023-07-24 The component cell (LF105) used inside was complied with the requirement of IEC 62619:2022, certified by TÜV SUD, Certif. No.: B 098952 0029 Rev. 00. The samples comply with the requirement of IEC 62619: 2022.	Testing location: TÜV Rheinland (Shenzhen) Co., Ltd. 1F East & 3F West -4F, Cybio Technology Building No.1, No.16 Kejibei 2 nd Road, High-Tech Industrial Park North Nanshan District, 518057, Shenzhen, China
Summary of compliance with National Differences (List of countries addressed): No EU Group Differences <input checked="" type="checkbox"/> The product fulfils the requirements of <u>EN IEC 62619:2022</u>.	
Use of uncertainty of measurement for decisions on conformity (decision rule): <input checked="" type="checkbox"/> No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method"). <input type="checkbox"/> Other: N/A Information on uncertainty of measurement: The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE. IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer. Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.	

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.

The markings below are indicated on the Battery.

<h2 style="margin: 0;">HARD KORR</h2>	
Secondary Li-ion Battery	
Red (+)	Black (-)
Model type: HKPBATLSL105	
Date of manufacture: YYMMDD	
Rated capacity:	105Ah
Nominal voltage:	12.8Vdc
Energy:	1344Wh
IFpP/38/131/201/[4S1P]M/-10+40/90	
Caution:	
Prohibition short circuit.	
Don't discard the battery in fire or heater.	
Don't reverse the positive and negative terminals.	
Don't pierce the battery with a nail or other sharp object.	
Disposal acc. to local regulations	
[Redacted]	

The others required marking items below are indicated in the battery specification.

Recommended charge instructions:

11. Regulations vary for different countries.↕

Dispose of in accordance with local regulations.↕

Recommend Charging method declared by the Manufacturer.....↕	Charged with constant current 21A till battery voltage reaches 14.4V d.c., then switch to constant voltage 14.4V d.c. till charging current drops to 2.1A, at 25±3°C.↕
--	--

Remark(s):

YYMMDD means date of manufacture:

YY means year of manufacture, 2021=21, 2022=22, 2023=23...

MM means month of manufacture, Jan.=01, Feb.=02, Mar.=03...

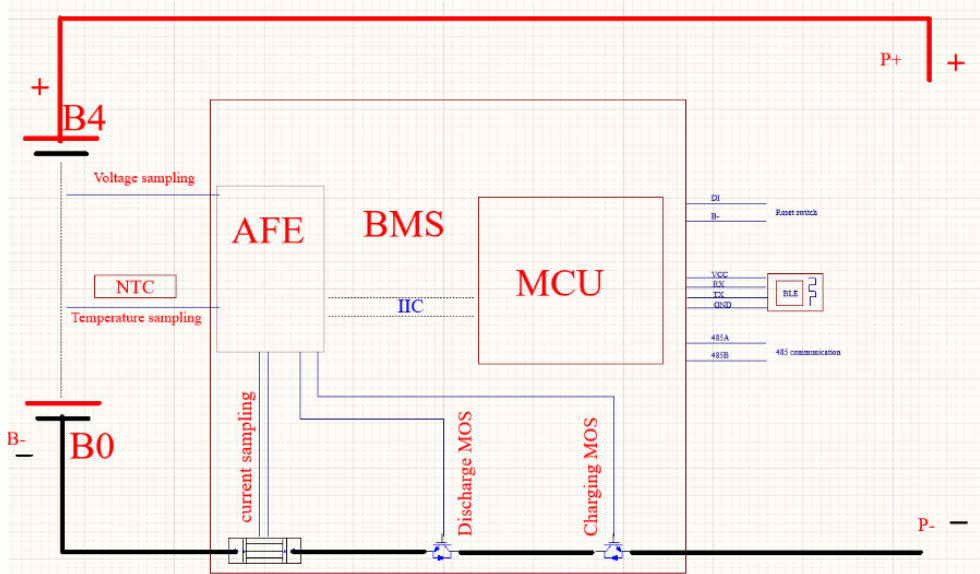
DD means day of manufacture, First day=01, Second day=02, Third day=03.

Test item particulars :	
Classification of installation and use : To be defined in final system.	
Supply Connection : Not directly connected mains. :	
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 : 2023-07-11	
Date (s) of performance of tests : 2023-07-19 to 2023-07-24	
General remarks:	
“(See Enclosure #)” refers to additional information appended to the report. “(See appended table)” refers to a table appended to the report.	
Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
Manufacturer’s Declaration per sub-clause 4.2.5 of IEC60335-1:	
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) : Same as manufacturer	

General product information and other remarks:

-The battery module shown on below has 4 lithium-ion cells in 4S1P connection and monitoring circuit inside management system.

-The electric, electronic and software controls and systems for critical safety were subjected to analysis for functional safety according to IEC 60730-1 Annex H. Redundant protections need to communicate with the end device and relies on the end device to achieve.

Tropology Diagram:


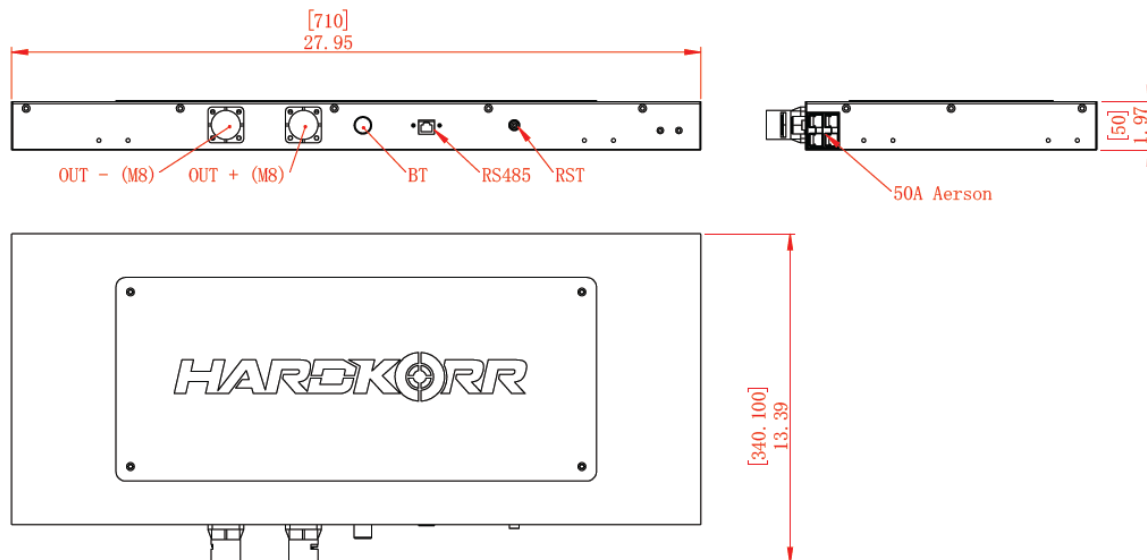
The main features of the battery are shown as below:

Product name	Secondary Li-ion Battery
Model	HKPBATLSL105
Rated Capacity	105Ah
Nominal voltage	12.8V d.c.
Energy	1344Wh
Maximum continuous Charging current	100A
Maximum continuous Discharging current.....	200A
Maximum Charge voltage	14.4V d.c.
End of Discharging voltage	10.0V d.c.
Upper Charge temperature limit	65°C
Lower Charge temperature limit	0°C
Upper Discharge temperature limit	65°C
Lower Discharge temperature limit	-20°C
Storage temperature range, recommended	0°C to 40°C
Recommend Charging method declared by the Manufacturer	Charged with constant current 21A till battery voltage reaches 14.4V d.c., then switch to constant voltage 14.4V d.c. till charging current drops to 2.1A, at 25±3°C.

Recommend Discharging method declared by the Manufacturer	Discharged with constant current 52.5A to end off discharging voltage 10.0V d.c., at 25±3°C.
Nominal mass	14±1kg
External dimensions.....	Length: 710mm (max) Width: 300mm (max) Height: 50mm (max)
Battery designation	IFpP/38/131/201/[4S1P]M/-10+40/90

Internal cell operating region:

Product name.....	Rechargeable Lithium-ion Cell
Model	LF105
Rated Capacity	105Ah
Nominal voltage	3.2V
Maximum continuous charging current.....	105A
Maximum continuous discharging current	200A
Maximum Charge Voltage	3.8V
End of discharging voltage	2.0V
Charge temperature range	0°C to 65°C
Discharge temperature range	-20°C to 60°C
Cell designation	IFpP/38/131/201/M/-10+40/90

Construction unit (mm):


IEC 62619			
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 are safe under conditions of both intended use and reasonably foreseeable misuse...	See also table 5.1 for Critical components information	P
	Reduce the risk of injuries from moving parts		N/A
5.2	Insulation and wiring		P
	Voltage, current, altitude, and humidity requirements		P
	Adequate clearances and creepage distances between connectors and live parts at different voltages or between live parts and non-current-carrying accessible parts	The battery system was less than 60 V d.c., should be re-evaluated in final system.	P
	Protect from hazardous live parts, including during installation		N/A
	The mechanical integrity of internal connections		P
5.3	Venting		P
	Pressure relief function	Explosion-proof safety valve for venting exists, and vent design in cell.	
	Encapsulation used to support cells within an outer casing		P
5.4	Temperature/voltage/current management		P
	The design prevents abnormal temperature-rise	Integrated in BMS.	P
	Voltage, current, and temperature limits of the cells		P
	Specifications and charging instructions for equipment manufacturers		P
5.5	Terminal contacts of the battery pack and/or battery system		P
	Polarity marking(s)		N/A
	Polarity marking not provided for keyed external connector		P
	Capability to carry the maximum anticipated current		P
	External terminal contact surfaces		P
	Terminal contacts are arranged to minimize the risk of short circuits		P
5.6	Assembly of cells, modules, or battery packs into battery systems		P
5.6.1	General		P
	Independent control and protection method(s)	No more assembly battery system.	N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Recommendations of cell operating limits, mounting advice, storage conditions and other design recommendations by the cell manufacturer		P
	Batteries designed for the selective discharge of a portion of their series connected cells	No such design.	N/A
	Protective circuit component(s) and consideration to the end-device application		P
5.6.2	Battery system design		P
	The voltage control function	Integrated in BMS.	P
	Maximum charging/discharging current of the cell are not exceeded		P
5.7	Operating region of lithium cells and battery systems for safe use		P
	The cell operating region..... :	Listed in the specification of cell.	P
	Designation of battery system to comply with the cell operating region	Information mentioned in manufacturer's specifications	P
5.8	System lock (or system lock function)		P
	Non-resettable function to stop battery operation		P
	Manual with procedure for resetting of battery operation		P
	Emergency battery final discharge	No such design.	N/A
5.9	Quality plan		P
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented..... :	ISO9001 Implemented.	P
	The process capabilities and the process controls		P
6	TYPE TEST CONDITIONS		P
6.1	General		P
6.2	Test items		P
	Cells or batteries that are not more than six months old (See Table 1 of IEC 62619)		P
	Capacity confirmation of the cells or batteries		P
	Default ambient temperature of test, 25 °C ± 5 °C	Tests were carried out in an ambient temperature of 25°C ± 5°C	P
7	SPECIFIC REQUIREMENTS AND TESTS		P
7.1	Charging procedure for test purposes		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	The battery discharged to a specified final voltage prior to charging		P
	The cells or batteries charged using the method specified by the manufacturer	The method mentioned in manufacturer's specifications	P
7.2	Reasonably foreseeable misuse		P
7.2.1	External short-circuit test (cell or cell block)	Approved cell used.	N/A
	Short circuit with total resistance of 30 mΩ ± 10 mΩ at 25 °C ± 5 °C		N/A
	Results: no fire, no explosion		N/A
7.2.2	Impact test (cell or cell block)	Approved cell used.	N/A
	Cylindrical cell, longitudinal axis impact		N/A
	Prismatic cell, longitudinal axis and lateral axis impact		N/A
	Results: no fire, no explosion.		N/A
7.2.3	Drop test (cell or cell block, and battery system)	Approved cell used.	P
7.2.3.1	General		P
7.2.3.2	Whole drop test (cell or cell block, and battery system)	The mass of battery system is less than 20 kg.	N/A
	Description of the Test Unit		—
	Mass of the test unit (kg)		—
	Height of drop (m)		—
	Results: no fire, no explosion		N/A
7.2.3.3	Edge and corner drop test (cell or cell block, and battery system)		P
	Description of the Test Unit	Battery system	—
	Mass of the test unit (kg)	13.419kg	—
	Height of drop (m)	10 cm	—
	Results: no fire, no explosion		P
7.2.4	Thermal abuse test (cell or cell block)	Approved cell used	N/A
	Results: no fire, no explosion		N/A
7.2.5	Overcharge test (cell or cell block)	Approved cell used	N/A
	For those battery systems that are provided with only a single protection for the charging voltage control		N/A
	Results: no fire, no explosion		N/A
7.2.6	Forced discharge test (cell or cell block)	Approved cell used	N/A
	Cells connected in series in the battery system		N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Redundant or single protection for discharge voltage control provided in battery system		N/A
	Target Voltage		N/A
	Maximum discharge current of the cell, I_m		N/A
	Discharge current for forced discharge, 1.0 It		N/A
	Discharging time, $t = (1 It / I_m) \times 90$ (min.)		N/A
	Results: no fire, no explosion		N/A
7.3	Considerations for internal short-circuit – Design evaluation		N/A
7.3.1	General	Approved cell used	N/A
7.3.2	Internal short-circuit test (cell)		N/A
	Samples preparation procedure: In accordance with Clause A.5 and A.6 of IEC 62133-2:2017		N/A
	Tested per 7.3.2 b) in an ambient temperature of $25\text{ °C} \pm 5\text{ °C}$.		N/A
	The appearance of the short-circuit location recorded by photograph or other means		—
	The pressing was stopped - When a voltage drop of 50 mV was detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) was reached		N/A
	Results: no fire		N/A
7.3.3	Propagation test (battery system)	Alternate test item clause.7.3.2 of cell was performed.	N/A
	Method to create a thermal runaway in one cell ... :		N/A
	Results: No external fire from the battery system, no battery case rupture.....		N/A
8	BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)		P
8.1	General requirements		P
	Functional safety analysis for critical controls	Evaluated according to IEC 60730-1 Annex H. Full Functional safety needs to be evaluated on the end device. Redundant protections need to communicate with the end device and relies on the end device to achieve.	P
	Conduct of a process hazard analysis for both the cell manufacturing process and the battery system manufacturing process	FMEA document were provided.	P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Conduct of risk assessment and mitigation of the battery system		P
8.2	Battery management system (or battery management unit)		P
8.2.1	Requirements for the BMS	Class B according to IEC 60730 Annex H	P
	The safety integrity level (SIL) target of the BMS		P
	The charge control evaluated by tests in clauses 8.2.2 to 8.2.4		P
8.2.2	Overcharge control of voltage (battery system)		P
	The exceeded charging voltage applied to the whole battery system	16.72Vd.c applied	P
	The exceeded charging voltage applied to only a part of the battery system, such as the cell(s)..... :		N/A
	Results: no fire, no explosion..... :	See Table 8.2.2.	P
	The BMS terminated the charging before exceeding the upper limit charging voltage	Tested complied.	P
8.2.3	Overcharge control of current (battery system)		P
	Results: no fire, no explosion..... :	See Table 8.2.3	P
	The BMS detected the overcharging current and controlled the charging to a level below the maximum charging current		P
8.2.4	Overheating control (battery system)		P
	The cooling system, if provided, was disconnected	No cooling system.	N/A
	Elevated temperature for charging, 5 °C above maximum operating temperature..... :	65°C applied.	P
	Results: no fire, no explosion..... :		P
	The BMS detected the overheat temperature and terminated charging	See Table 8.2.4	P
	The battery system operated as designed during test	Complied.	P
9	EMC		N/A
	Battery system fulfil EMC requirements of the end-device application..... :	Relay on final system.	N/A
10	INFORMATION FOR SAFETY		P
	The cell manufacturer provides information about current, voltage and temperature limits of their products	Approved cell used	N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	The battery system manufacturer provides information regarding how to mitigate hazards to equipment manufacturers or end-users.		P
11	MARKING AND DESIGNATION (REFER TO CLAUSE 5 OF IEC 62620)		P
	The marking items shown in Table 1 in IEC 62620 indicated on the cell, battery system or instruction manual.	The trademark to applicant. Name of manufacturer show on label.	P
	Cell or battery system has clear and durable markings		P
	Cell designation		N/A
	Battery designation	IFpP/38/131/201/[4S1P]M/-10+40/90	P
	Battery structure formulation	4S1P	P
12	PACKAGING AND TRANSPORT		N/A
	Refer to Annex D	Informative.	N/A
ANNEX A	OPERATING REGION OF CELLS FOR SAFE USE		P
A.1	General		P
A.2	Charging conditions for safe use		P
A.3	Consideration on charging voltage		P
A.4	Consideration on temperature		P
A.5	High temperature range		P
A.6	Low temperature range		P
A.7	Discharging conditions for safe use		P
A.8	Example of operating region		P
ANNEX B	PROCEDURE OF 7.3.3 PROPAGATION TEST BY LASER IRRADIATION		N/A
B.1	General		N/A
B.2	Test conditions		N/A
B.2.1	Cell test (preliminary test)		N/A
	The cell fully charged according to the manufacturer recommended conditions		—
	Laser irradiation point on the cell		—
	Output power of laser irradiation		—
	Tested in an ambient temperature of 25 °C ± 5 °C		N/A
	Repeat of cell test for 3 times		N/A
B.2.2	Battery system test (main test)		N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	The battery system fully charged according to the manufacturer recommended conditions		—
	Target cell to be laser irradiated.....		—
	The irradiation point on the target cell same or similar as that on the cell test		N/A
	Output power of laser irradiation.....		—
	Tested in an ambient temperature of 25 °C ± 5 °C		N/A
ANNEX C	PROCEDURE OF 7.3.3 PROPAGATION TEST BY METHODS OTHER THAN LASER		N/A
C.1	General		N/A
C.2	Test conditions:		N/A
	– The battery fully charged according to the manufacturer recommended conditions		—
	– Target cell forced into thermal runaway		—
	– A specially prepared sample (e.g. a heater or a hole for nail penetration provided) used for ease of testing.....		—
C.3	Method used for initiating the thermal runaway. 1) Heater (Heater, Burner, Laser, Inductive heating 2) Overcharge 3) Nail penetration of the cell 4) Combination of above methods 5) Other methods.....		—
ANNEX D	PACKAGING AND TRANSPORT		N/A
	The materials and pack design chosen in a way as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants	Informative.	N/A
	Regulations concerning international transport of secondary lithium batteries	Informative.	N/A

IEC 62619					
Clause	Requirement + Test			Result - Remark	Verdict
5.1	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Cell	EVE Power Co., Ltd	LF105	3.2V, 105Ah	IEC 62619: 2022	TÜV SUD, Certif. No.: B 098952 0029 Rev. 00.
BMS					
Metal Enclosure	Zaozhuang Baihui general machinery Co., LTD	1016	aluminum, Min. Thickness: 2mm	IEC 62619: 2022	Tested with appliance
Power connector (Red and Black)	Shenzhen Connection Electronic Co., Ltd.	ACTB135-M8	1500VDC, 35mm ²	EN 60947-7-1:2009, EN IEC 60947-1:2021, EN 60947-1:2007/A2:2014, IEC 60947-7-1:2009, IEC 60947-1:2020, IEC 60947-1:2007/AMD2:2014	TÜV SUD, Certif. No.: B 108338 0003 Rev. 00.
External connector (Gray)	Anderson Power Products, Inc.	992Gx (SB 50)	600V, 50A	EN 61984-1:2009	TÜV Certif. No: R 72172663
Lead Wire (Red)	DONG GUAN SHENG PAI ELECTRIC WIRE & CABLE CO LTD	3135	10AWG, 200°C, 600Vac	UL 758	UL E347603
Lead Wire (Red) (Alternative)	Interchangeable	Interchangeable	Min.10AWG, 200°C, 600Vac	UL 758	UL approved
Lead Wire (Black)	DONG GUAN SHENG PAI ELECTRIC WIRE & CABLE CO LTD	3512	Min.10AWG, 200°C, 600Vac	UL758	UL E347603
Lead Wire (Black)	Interchangeable	Interchangeable	Min.10AWG, 200°C, 600Vac	UL758	UL approved
PCB	GUANGDE LONGTAI ELECTRONIC SCI-TECH CO LTD	LT140	V-0, 130°C	UL796	UL E357246
PCB (Alternative)	Interchangeable	Interchangeable	V-0, 130°C	UL 796	UL approved

IEC 62619					
Clause	Requirement + Test			Result - Remark	Verdict
IC (U12)	Geehy Semiconductor	APM32F030C8T6	VDD: 2.6V - 3.60V, Operating temperature range:-40°C to 85°C	IEC 62619: 2022	Tested with appliance
IC (AFE2)	TEXAS INSTRUMENTS	bq76920	V _{BAT} : -0.3- 36V T _{OPR} :-40°C to 85°C	IEC 62619: 2022	Tested with appliance
MOSFET (QC22 to QC30 to QC34, QC36, QC38, QC39, QC40, QD22 to QD30, QD32 to QD34, QD36, QD37, QD39, QD40)	Chongqing Pingwei Enterprise Co., Ltd.	PW028N10TS	V _{DSS} : 100V, I _D : 200A, V _{GS} : ±20V, T _j , T _{stg} : -55 to 175°C	IEC 62619: 2022	Tested with appliance
NTC	Guangdong Xinshiheng Technology Co., Ltd	MF52\$103&3435	R25: 10KΩ±1% B25: 3435K±1% Topr : -40°C to 105°C	UL1434	UL E526963
Current Sensing Resistor (RB1 to RB4)	RALEC	2512	2.0mΩ	IEC 62619: 2022	Tested with appliance
Voltage Sensing Resistor (RS3 to RS20)	YAGEO	RC1206	2.0mΩ	IEC 62619: 2022	Tested with appliance
Supplementary information:					
1) Provided evidence ensures the agreed level of compliance. See OD-2039. License available upon request.					

IEC 62619						
Clause	Requirement + Test				Result - Remark	Verdict
7.2.1	TABLE: External short-circuit test (cell or cell block)				N/A	
Sample No.	Ambient (at 25°C ± 5°C)	OCV at start of test (V dc)	Resistance of Circuit (mΩ)	Maximum Case Temperature Rise ΔT (°C)	Results	
--	--	--	--	--	--	
--	--	--	--	--	--	
--	--	--	--	--	--	
Supplementary information:						
A – No fire or Explosion						
B – Fire						
C – Explosion						
D – The test was completed after 6 h						
E – The test was completed after the cell casing cooled to 20% of the maximum temperature rise						
F – Other (Please explain): _____						

7.2.5	TABLE: Overcharge test (cell or cell block)					N/A
Sample No.	OCV at start of test (V dc)	OCV at end of test (V dc)	Measured Maximum Charging Current (A)	Measured Maximum Charging Voltage (V dc)	Max. Cell Case Temperature, (°C)	Results
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
Supplementary information:						
Results:						
A – No fire or Explosion						
B – Fire						
C – Explosion						
D – Test concluded when temperature reached a steady state condition						
E – Test concluded when temperature returned to ambient						
F – Other (Please explain): _____						

IEC 62619					
Clause	Requirement + Test			Result - Remark	Verdict
7.2.6	TABLE: Forced discharge test (cell or cell block)				N/A
Sample No.	OCV before applying reverse charge, (V dc)	Target Voltage (V dc)	Measured Reverse Charge Current I _t , (A)	Total Time for Reversed Charge Application (min)	Results
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
Supplementary information: Results: A – No fire or Explosion B – Fire C – Explosion D – Other (Please explain): ____					

7.3.2 TABLE: Internal short-circuit test (cell)					N/A
Sample No.	OCV at start of test, (V dc)	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. Results: A – No fire or explosion B – Fire C – Explosion D – Test concluded when 50 mV voltage drop occurred prior to reaching force limit E – Test concluded when 800/400 N pressure was reached and 50 mV voltage drop was not achieved F – Test was concluded when fire or explosion occurred G – Other (Please explain): ____					

IEC 62619					
Clause	Requirement + Test			Result - Remark	Verdict
7.3.3	TABLE: Propagation test (battery system)				N/A
Sample No.	OCV of Battery System Before Test, (V dc)	OCV of Target Cell Before Test, (V dc)	Maximum Cell Case Temperature, (°C)	Maximum DUT Enclosure Temperature, (°C)	Results
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
Method of cell failure ¹⁾		Location of target cell		Area for fire protection (m ²)	
--		--		--	
--		--		--	
--		--		--	
<p>Supplementary information:</p> <p>Cell can be failed through laser exposure, applied heat, overcharge, nail penetration or combinations of these failures or other acceptable methods. See supporting documentation for details on cell failure method</p> <p>If the battery system has no outer covering, the manufacturer is required to specify the area for fire protection.</p> <p>Results:</p> <p>A – No fire external to DUT enclosure or area for fire protection or no battery case rupture</p> <p>B – Fire external to DUT enclosure or area for fire protection</p> <p>C – Explosion</p> <p>D – Battery case rupture</p> <p>E – Other (Please explain): __</p>					

IEC 62619					
Clause	Requirement + Test			Result - Remark	Verdict
8.2.2	TABLE: Overcharge control of voltage (battery system)				P
Sample No.	OCV at start of test for Cell/Cell Blocks, (V dc)	Maximum Charging Current, (A)	Max. Charging Voltage, (V dc)	Max. Voltage of Cell/Cell Blocks, (V dc)	Results
A-001	2.945~2.977	100	14.740	3.686	A, D, F
			Charge Voltage Applied Battery System: 1)		
			Whole	Part	
			16.72Vd.c	N/A	
Supplementary information:					
1) The exceeded voltage can be applied to only a part of the system such as the cell(s) in the battery system per Figure 6 of IEC 62619, if it is difficult to do it in using the whole battery system. The upper limit charge voltage of the internal cell is 3.8V d.c.					
Results:					
A – No Fire or Explosion					
B – Fire					
C – Explosion					
D – The voltage of the measured cells or cell blocks did not exceed the upper limit charging voltage					
E – The voltage of the measured cells or cell blocks did exceed the upper limit charging voltage					
F – All function of battery system did operate as intended during the test.					
G – All function of battery system did not operate as intended during the test.					
H – Other (Please explain): ____					

8.2.3 TABLE: Overcharge control of current (battery system)					P
Sample No.	OCV at start of test, (V dc)	Max. Charging Current, (A)	Max. Charging Voltage, (V dc)	Results	
A-001	12.83	106.5	13.42	A, D, F	
A-001	12.90	120.0	13.43	A, D, F	
A-001	12.88	126.0	13.42	A, D, F	
Supplementary information:					
The maximum charging current of the internal cell is 105A					
Results:					
A – No fire or Explosion					
B – Fire					
C – Explosion					
D – Overcurrent sensing function of BMU did operate and then charging stopped					
E – Overcurrent sensing function of BMU did not operate and then charging stopped					
F – All function of battery system did operate as intended during the test.					
G – All function of battery system did not operate as intended during the test.					
H – Other (Please explain): ____					

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
8.2.4	TABLE: Overheating control (battery system)		P
Model No.	OCV at start(SOC 50%) of test, V dc	Maximum Charging Current, A	Measured Maximum Charging Voltage, V dc
A-001	13.19	100	14.13
Maximum Specified Temperature of Battery System, °C		Maximum Measured Cell Case Temperature, °C	Results
65		64	A, D, F
Supplementary information:			
The charging temperature limit of the internal cell is 65°C.			
Results:			
A – No fire or Explosion			
B – Fire			
C – Explosion			
D – Temperature sensing function of BMU did operate and then charging stopped			
E – Temperature sensing function of BMU did not operate and then charging stopped			
F – All function of battery system did operate as intended during the test.			
G – All function of battery system did not operate as intended during the test.			
H – Other (Please explain): _____			

9	TABLE: EMC				N/A
Standard used for EMC test:					
Sample No.	EMC Test Item	Battery Condition	EMC Test Level/ Parameters	Compliance Criteria	Results
--	--	--	--	--	--
Supplementary information:					
Battery Condition During EMC test					
1 – In Operation Mode, [] Supplied at _____, [] Load at _____					
2 – In non-operation Mode, Battery state of charge (SOC) before test at around _____					
Compliance Criteria and Test Results:					
A – No fire or Explosion					
B – Fire					
C – Explosion					
D – Battery system did operate as intended during the test.					
E - All function of battery system did operate as intended after the test.					
F - All function of battery system did not operate as intended during the test, (Please explain): _____					
G - Other (Please explain): _____					

- End of test report -

Attachment 1 Photo Documentation

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Page 1 of 7

Report No.: CN23P29C 001

Product: Secondary Li-ion Battery

Type Designation: HKPBATLSL105



Figure 1 Overall view 1 of battery

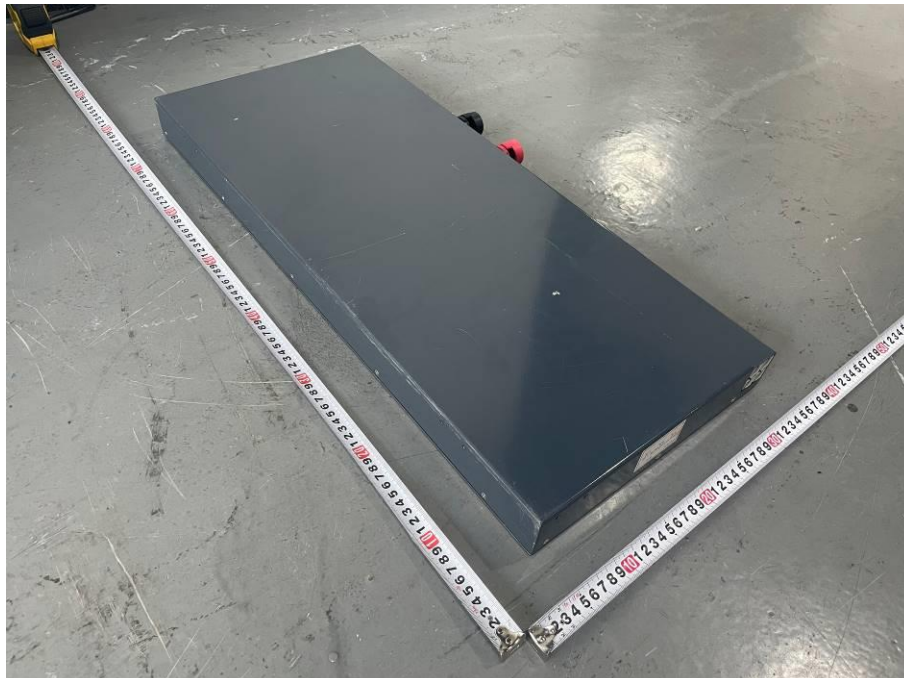


Figure 2 Overall view 2 of battery

Product: Secondary Li-ion Battery

Type Designation: HKPBATLSL105



Figure 3 Overall view 3 of battery

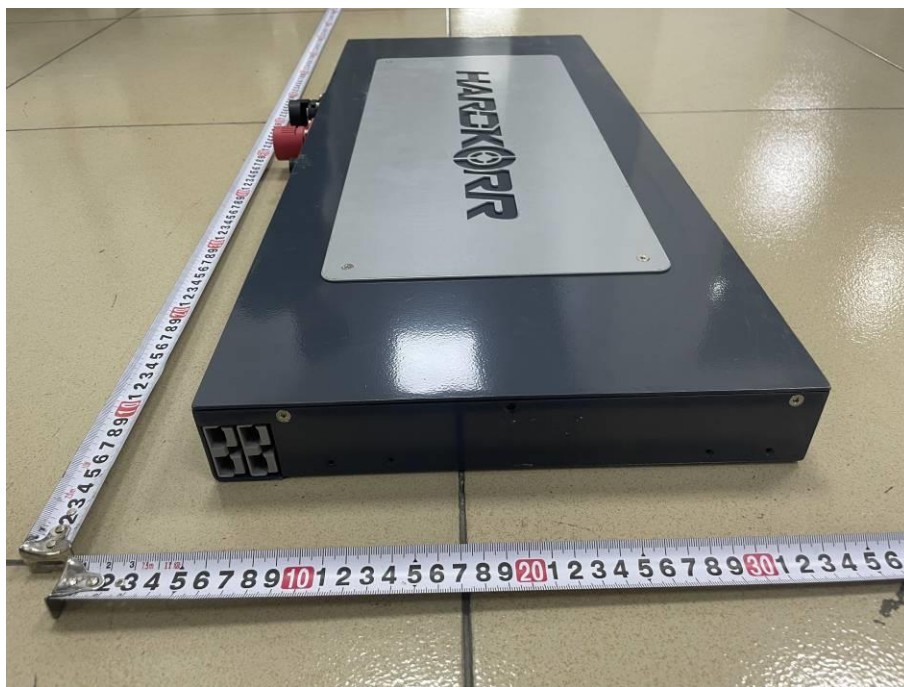


Figure 4 Overall view 4 of battery

Product: Secondary Li-ion Battery

Type Designation: HKPBATLSL105

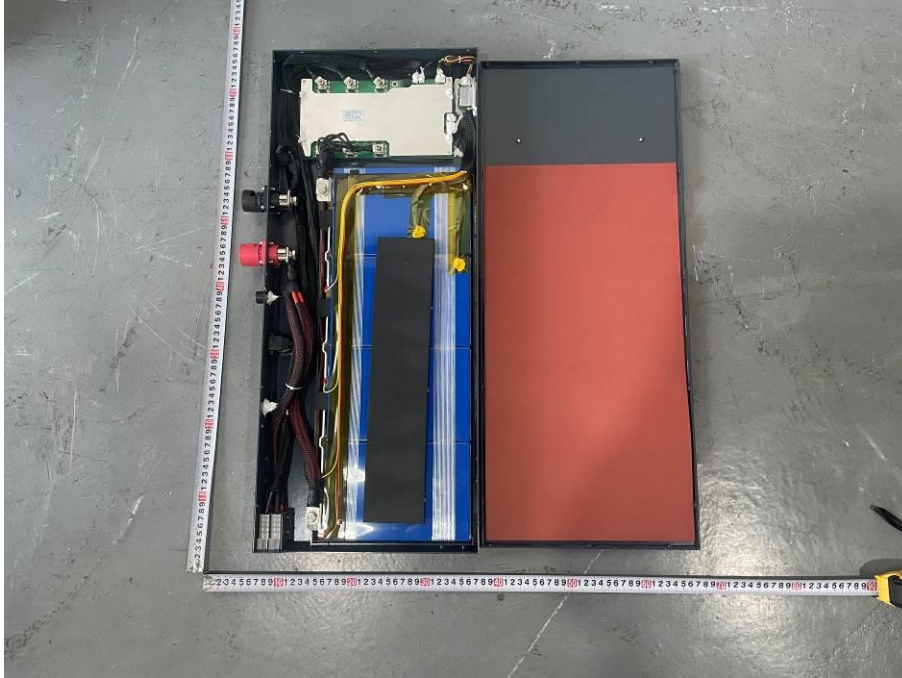


Figure 5 Internal view 1 of battery

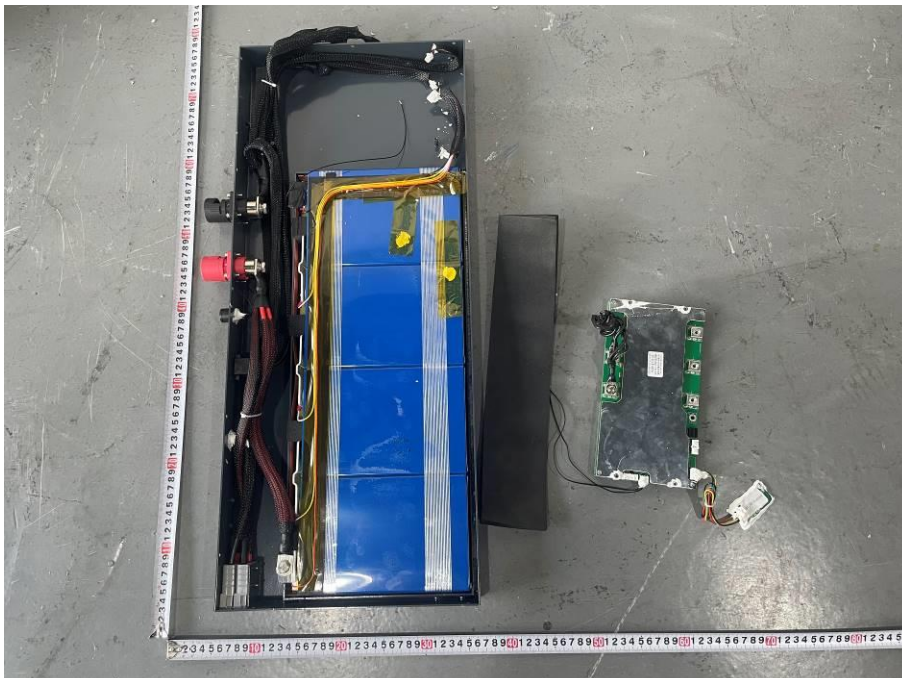


Figure 6 Internal view 2 of battery

Product: Secondary Li-ion Battery

Type Designation: HKPBATLSL105



Figure 7 Internal view 3 of battery

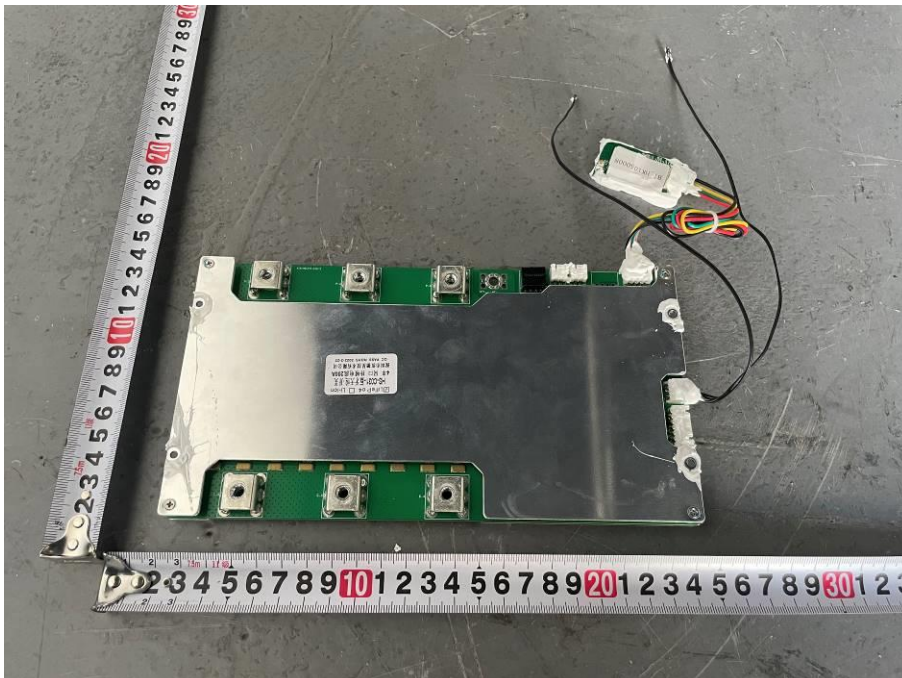


Figure 8 Front view of PCB with BMS and Bluetooth

Product: Secondary Li-ion Battery

Type Designation: HKPBATLSL105



Figure 9 Front view 1 of PCB with BMS

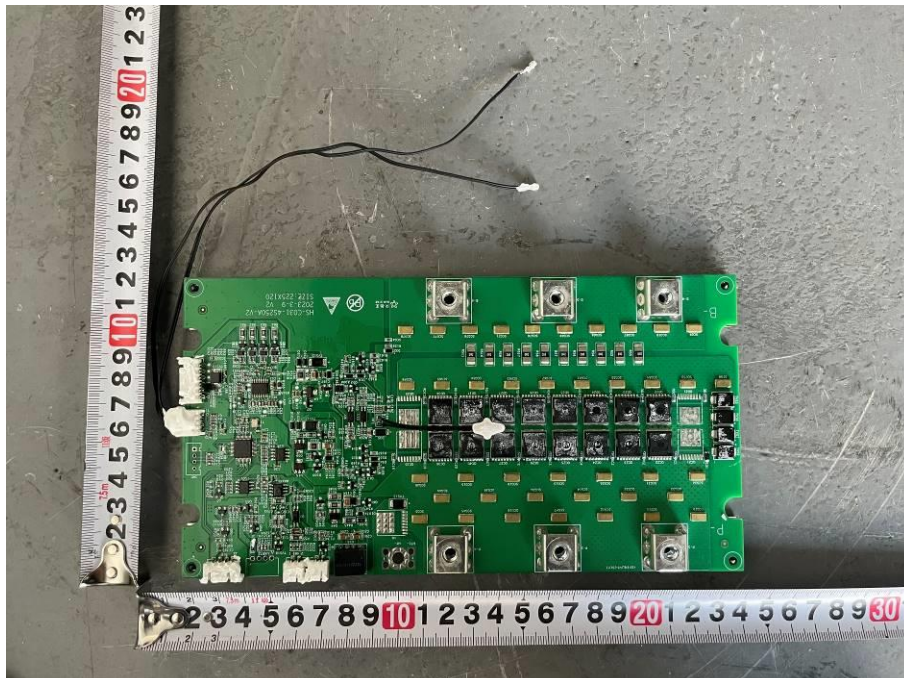


Figure 10 Front view 2 of PCB with BMS

Product: Secondary Li-ion Battery

Type Designation: HKPBATLSL105



Figure 11 Back view 3 of PCB with BMS

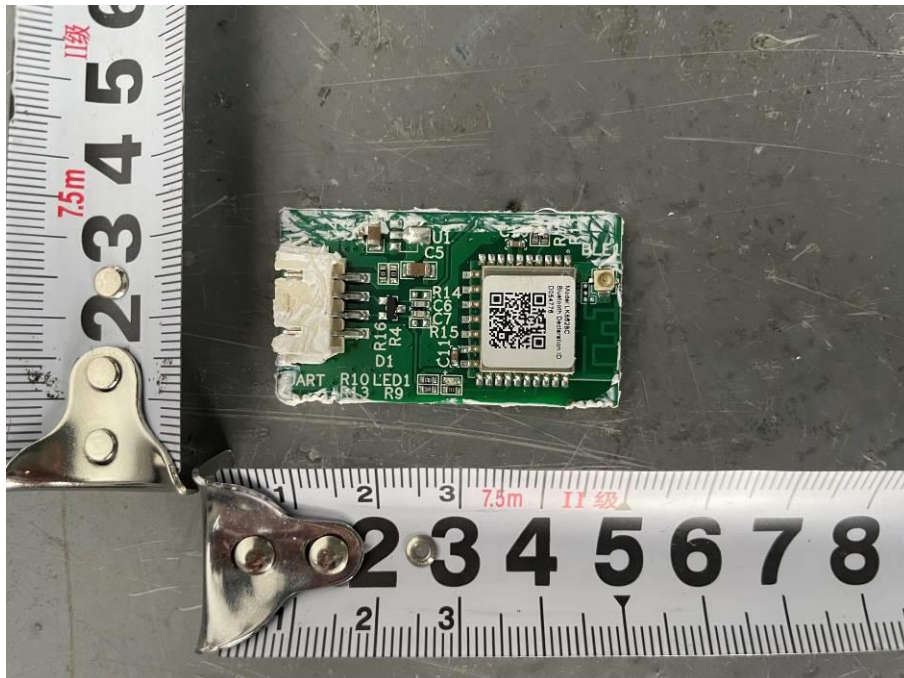


Figure 12 Front view 4 of PCB with Bluetooth

Attachment 1 Photo Documentation

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Page 7 of 7

Report No.: CN23P29C 001

Product: Secondary Li-ion Battery

Type Designation: HKPBATLSL105



Figure 13 Back view 5 of PCB with Bluetooth