

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST
CERTIFICATES FOR ELECTRICAL EQUIPMENT
(IECEE) CB SCHEME

SYSTEME CEI D'ACCEPTATION MUTUELLE DE
CERTIFICATS D'ESSAIS DES EQUIPEMENTS
ELECTRIQUES (IECEE) METHODE OC

CB TEST CERTIFICATE

CERTIFICAT D'ESSAI OC

Product
Produit

Back-up LiFe Battery Module

Name and address of the applicant
Nom et adresse du demandeur

SHUANGDENG GROUP Co., LTD
No. 999, TianMu West Road,
Jiangyan Economic Development Zone, Jiangsu 225500, P. R. China

Name and address of the manufacturer
Nom et adresse du fabricant

JIANGSU SHUANGDENG FRONT NEW ENERGY CO.,LTD
NO.666,TIANMU WEST ROAD,JIANGYAN ECONOMIC DEVELOPMENT
ZONE,
TAIZHOU CITY, JIANGSU, P. R. China

Name and address of the factory
Nom et adresse de l'usine

JIANGSU SHUANGDENG FRONT NEW ENERGY CO.,LTD
NO.666,TIANMU WEST ROAD,JIANGYAN ECONOMIC DEVELOPMENT
ZONE,
TAIZHOU CITY, JIANGSU, P. R. China

Ratings and principal characteristics
Valeurs nominales et caractéristiques principales

DC 48V, 100Ah

Trademark (if any)
Marque de fabrique (si elle existe)

shoto (logo)

Type of Manufacturer's Testing Laboratories used
Type de programme du laboratoire d'essais constructeur

N/A

Model / Type Ref.
Ref. de type

SDA10-48100

Additional information (if necessary may also be
reported on page 2)
Les informations complémentaires (si nécessaire,
peuvent être indiqués sur la 2^{ème} page)

A sample of the product was tested and found
to be in conformity with
Un échantillon de ce produit a été essayé et a été
considéré conforme à la

IEC 62619:2017

As shown in the Test Report Ref. No. which forms part
of this Certificate
Comme indiqué dans le Rapport d'essais numéro de
référence qui constitue partie de ce Certificat

50229619 001

This CB Test Certificate is issued by the National Certification Body
Ce Certificat d'essai OC est établi par l'Organisme National de Certification



TÜVRheinland®

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Global Technology Assessment Center
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Date: 30.05.2019

Signature:


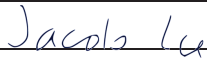

Dipl.-Ing. Univ. S. O. Steinke



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.....	50229619 001
Date of issue.....	2019.05.28
Total number of pages	21
Name of Testing Laboratory preparing the Report	TÜV Rheinland (Shenzhen) Co., Ltd.
Applicant's name	SHUANGDENG GROUP Co., LTD
Address.....	No. 999, TianMu West Road, Jiangyan Economic Development Zone, Jiangsu 225500, P. R. China
Test specification:	
Standard	IEC 62619: 2017
Test procedure	CB Scheme
Non-standard test method	N/A
Test Report Form No.	IEC62619A
Test Report Form(s) Originator	UL(Demko)
Master TRF	Dated 2018-06-07
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If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.	
This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.	
General disclaimer:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.	

Test item description :	Back-up LiFe Battery Module	
Trade Mark :		
Manufacturer	JIANGSU SHUANGDENG FRONT NEW ENERGY CO., LTD NO.666, TIANMU WEST ROAD, JIANGYAN ECONOMIC DEVELOPMENT ZONE, TAIZHOU CITY, JIANGSU, P. R. China	
Model/Type reference	SDA10-48100	
Ratings	DC 48V, 100Ah	
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 :	East of F/1, F/2~F/4, Building 1, Cybio Technology Building No. 6 Langshan No.2 Road, North Hi-tech Industry Park 518057 Shenzhen Nanshan District CHINA	
Tested by (name, function, signature) :	Jacob Lu	
Approved by (name, function, signature) ... :	Daniel Dai	
<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 (6 pages).

Summary of testing:**Tests performed (name of test and test clause):**

cl.7.1 Charging procedure for test purposes; cl.7.2.1 External short-circuit test (Cell); cl.7.2.2 Impact test(Cell); cl.7.2.3 Drop test(Cell and battery system); cl.7.2.4 Thermal abuse test(Cell); cl.7.2.5 Overcharge test(Cell); cl.7.3.2 Internal short-circuit test(Cell); cl.7.3.3 Propagation test (battery system); cl.8.2.2 Overcharge control of voltage (battery system); cl.8.2.3 Overcharge control of current(battery system); cl.8.3.3 Overheating control(battery system).

The samples comply with the requirement of IEC 62619: 2017.

Testing location:**TÜV Rheinland (Shenzhen) Co., Ltd.**

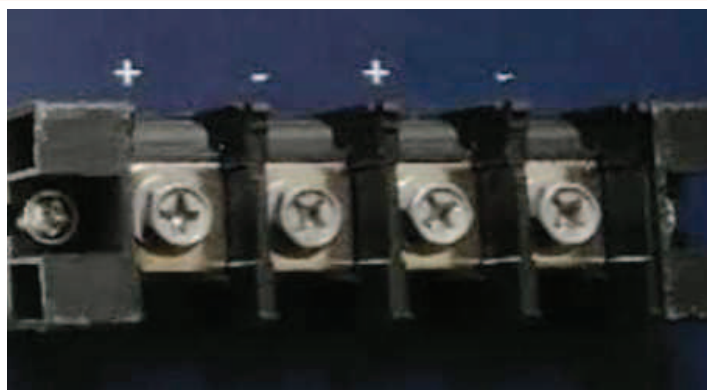
East of F/1, F/2~F/4, Building 1, Cybio Technology Building No. 6 Langshan No.2 Road, North Hi-tech Industry Park 518057 Shenzhen Nanshan District CHINA

Summary of compliance with National Differences (List of countries addressed):

The product fulfils the requirements of EN 62619: 2017 (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)

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.



Test item particulars.....:	
Classification of installation and use.....: Lithium-ion battery module used for telecommunication	
Supply Connection : Terminal block	
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 : 2019-03-06	
Date (s) of performance of tests : 2019-03-14 to 2019-04-05	
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 IEC62061:	
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) : JIANGSU SHUANGDENG FRONT NEW ENERGY CO., LTD NO.666, TIANMU WEST ROAD, JIANGYAN ECONOMIC DEVELOPMENT ZONE, TAIZHOU CITY, JIANGSU, P. R. China	
General product information and other remarks:	
The Back-up LiFe Battery Module SDA10-48100 is specially used as energy system for telecommunication. It consists thirty cells in parallel and series connected (2P15S), and the battery is integrated with the protective device, which is intended to protect battery against abnormal operations. The battery module's designed upper limit charge voltage is 56.4V and designed charging protective temperature limit is 55°C, so the battery module's protective device will be operated to stop charging before the charge voltage reach to 56.4V or the charging temperature exceed 60°C. See test of clause 8.2 for details. The battery module mainly consists of: two strings in parallel, and one string consists of 15 cells in series BMS (Battery Management System) Limit current circuit board Metal enclosure Terminal block as charge and discharger interfaces	

Battery module and cell general parameters:

The general parameters of battery module used in electrical energy storage system (ESS) as follows:

Product Name	Back-up LiFe Battery Module
Model	SDA10-48100
Nominal Capacity	100Ah
Nominal Voltage	48V
Recommend Charge Current	20A
Recommend Discharge Current	50A
Max. Charge Current	100A
Max. Discharge Current	100A
Upper limit Charging Voltage	56.4V
Discharge Cut-off voltage	40V
Charge Temperature Range	0°C ~ 45°C
Discharge Temperature Range	-20°C ~ 50°C
Storage Temperature Range	-40°C ~ 45°C
Recommend charging method declared by the manufacturer	Charging the battery with 20A constant current until to 56.4V, then constant voltage until charging current reduces to 2.5A.
Recommend discharging method declared by the manufacturer	Discharge the battery with 50A constant current until to cut-off voltage 40V.
Nominal Mass	Approx. 44.7Kg
External Dimensions (T×W×L)	442mm × 177mm × 400mm

The cell is used in battery module as follow:

Product Name	Lithium-ion Cell	
Model	IFP11190316-050	
Nominal Capacity	50Ah	
Nominal Voltage	3.2V	
Recommend Charge Current at different temperature range	10A	0°C~10°C
	25A	10°C~20°C
	50A	20°C~45°C
	25A	45°C~65°C
Recommend Discharge Current at different temperature range	5A	-33°C~-20°C
	25A	-20°C~-10°C
	50A	-10°C~60°C
Rated Charge Voltage	3.65V	
Upper limit Charging Voltage	3.8V	
Discharge Cut-off voltage	2.5V	
Charge Temperature Range	0°C ~ 65°C	
Discharge Temperature Range	-33°C ~ 60°C	
Storage Temperature Range	-40°C ~ 70°C	
Recommend charging method declared by the manufacturer	Charging the cell with 10A constant current until to 3.65V, then constant voltage until charging current reduces to 1A.	
Charging procedure for internal short-circuit test	Charging the cell with 50A constant current until to 3.65V, then constant voltage until charging current reduces to 2.5A.	
Recommend discharging method declared by the manufacturer	Discharge the cell with 10A constant current to discharge cut-off voltage 2.5V.	
Nominal Mass	Approx. 1.2Kg	
External Dimensions (T×W×L)	(10.0±1.0)mm×(190+0/-2.0)mm ×(316+0/-2.0)mm	

Protective Circuit Diagram:

Circuit Diagram for BMS Board

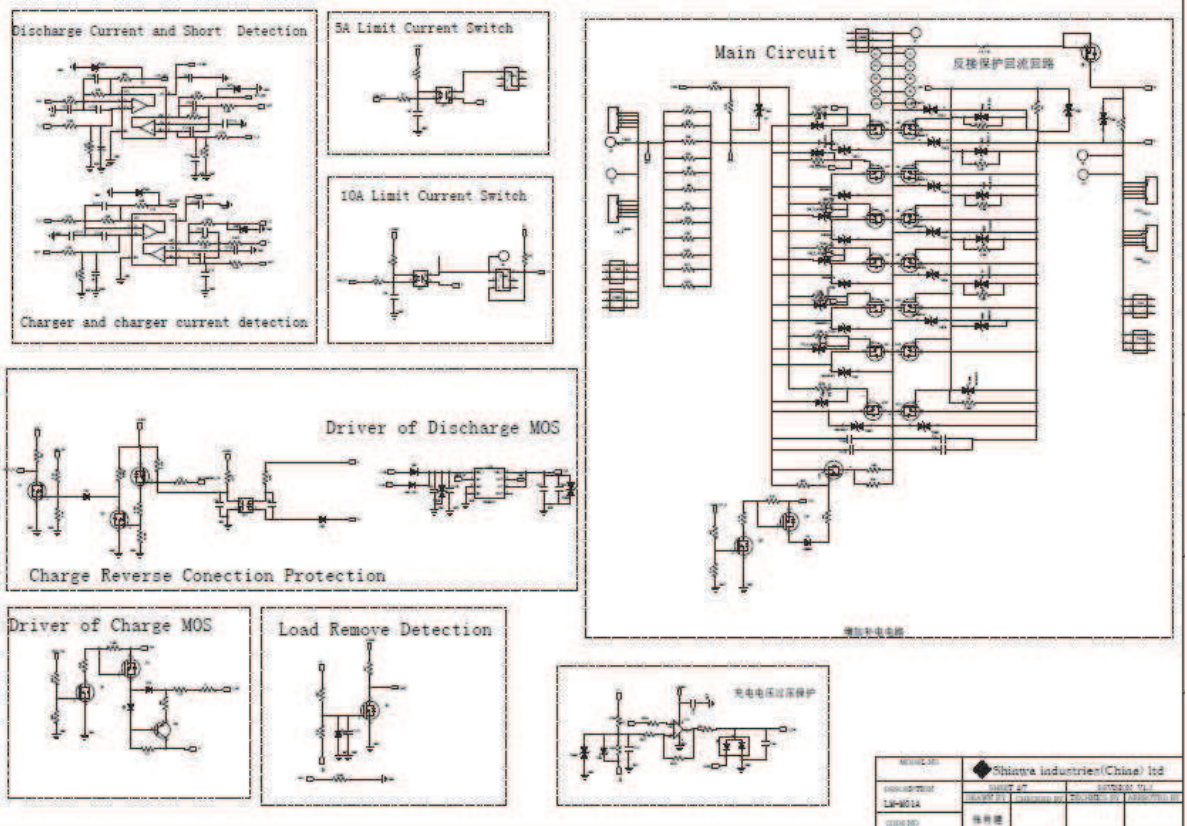
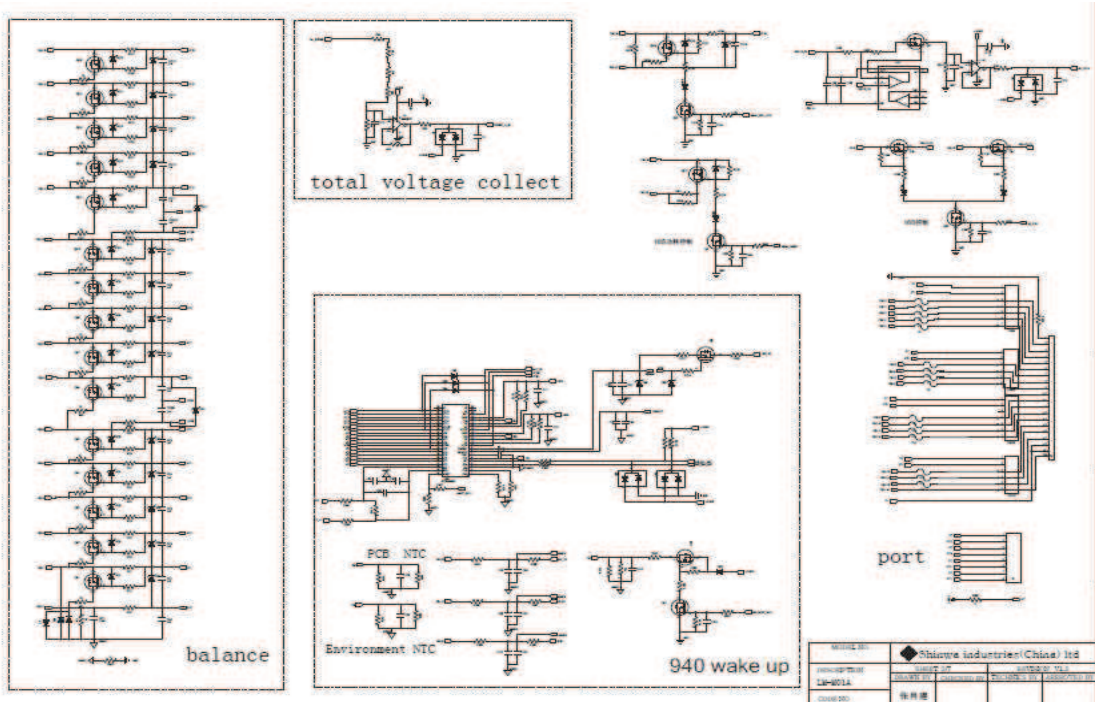
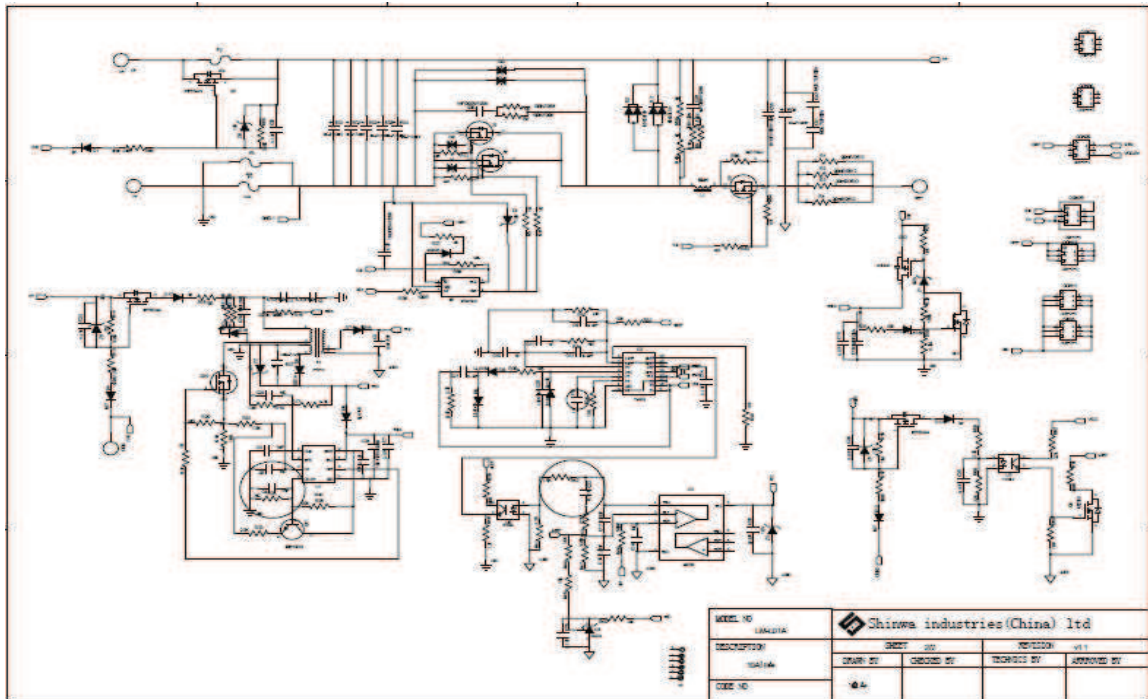
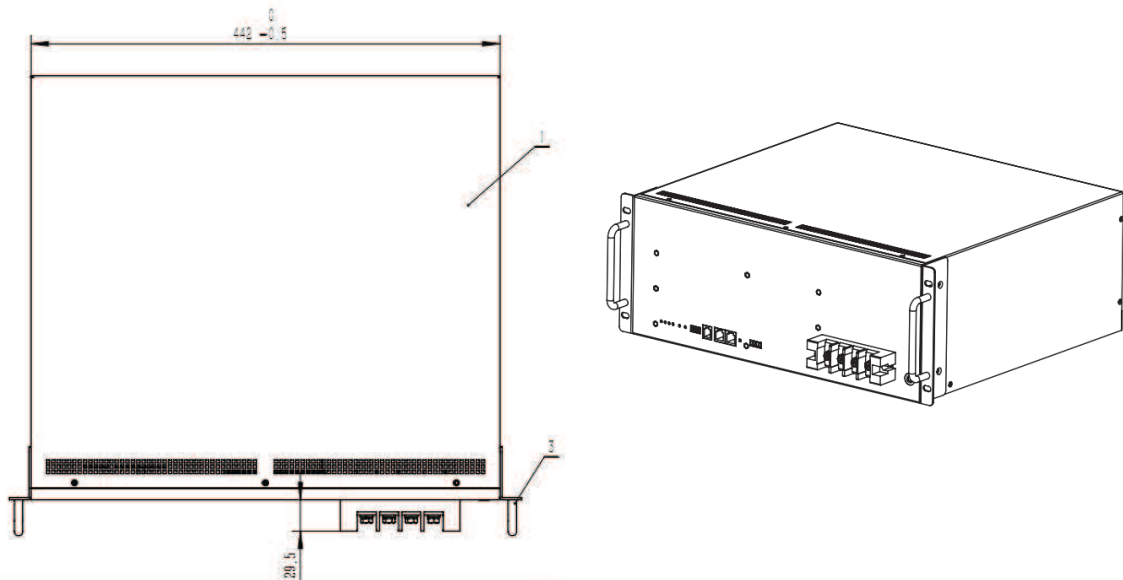


Diagram for Current Limit Circuit Board



Construction:



BMS functional safety was evaluated according to IEC 60730-1 Annex H by CTIHEA, see test report WLz-19-1094.

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
5.2	Insulation and wiring		P
	Voltage, current, altitude, and humidity requirements		P
	Adequate clearances and creepage distances between connectors		P
	The mechanical integrity of internal connections		P
5.3	Venting		P
	Pressure relief function	Venting mechanism exists on the narrow side of pouch cell.	P
	Encapsulation used to support cells within an outer casing		N/A
5.4	Temperature/voltage/current management		P
	The design prevents abnormal temperature-rise	Overcharge, over discharge, over current and short-circuit proof circuit used in this battery. See tests of clause 8.	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)	The "+" and "-" polarity explicitly marked on surface of the battery.	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)		P
	Recommendations of cell operating limits by the cell manufacturer		P
	Batteries designed for the selective discharge of a portion of their series connected cells		P

	Protective circuit component(s) and consideration to the end-device application		N/A
5.6.2	Battery system design		P
	The voltage control function		P
	The voltage control for series-connected batteries		P
5.7	Operating region of lithium cells and battery systems for safe use		P
	The cell operating region..... :	See page 6 for cell and battery operating region.	P
	Designation of battery system to comply with the cell operating region		P
5.8	Quality plan		P
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented..... :	Reference: ISO9001 Certificate provided.	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 IEC62619)		P
	Capacity confirmation of the cells or batteries		P
	Default ambient temperature of test, 25 °C ± 5 °C		

7	SPECIFIC REQUIREMENTS AND TESTS		P
7.1	Charging procedure for test purposes		P
	The battery discharged to a specified final voltage prior to charging		P
	The cells or batteries charged using the method specified by the manufacturer..... :		P
7.2	Reasonably foreseeable misuse		P
7.2.1	External short-circuit test (cell or cell block)		P
	Short circuit with total resistance of 30 mΩ ± 10 mΩ at 25 °C ± 5 °C		P
	Results: no fire, no explosion	See Table 7.2.1.	P
7.2.2	Impact test (cell or cell block)		P
	Cylindrical cell, longitudinal axis impact		N/A
	Prismatic cell, longitudinal axis and lateral axis impact		P
	Results: no fire, no explosion.		P
7.2.3	Drop test (cell or cell block, and battery system)		P

7.2.3.1	General		P
7.2.3.2	Whole drop test (cell or cell block, and battery system)	Test on cell only.	P
	Description of the Test Unit..... :	Cell	—
	Mass of the test unit (kg)..... :	1.2	—
	Height of drop (m)..... :	1.0	—
	Results: no fire, no explosion	no fire, no explosion	P
7.2.3.3	Edge and corner drop test (cell or cell block, and battery system)	Test on battery module	P
	Description of the Test Unit..... :	Battery module	—
	Mass of the test unit (kg)..... :	44.7	—
	Height of drop (m)..... :	0.1	—
	Results: no fire, no explosion	no fire, no explosion	P
7.2.4	Thermal abuse test (cell or cell block)		P
	Results: no fire, no explosion		P
7.2.5	Overcharge test (cell or cell block)		P
	For those battery systems that are provided with only a single protection for the charging voltage control		—
	Results: no fire, no explosion..... :	See Table 7.2.5.	P
7.2.6	Forced discharge test (cell or cell block)		P
	Upper limit charge voltage of the cell..... :	3.8V	P
	Cells connected in series in the battery system..... :	2P15S	P
	Redundant or single protection for discharge voltage control provided in battery system..... :	Single protection used for discharge voltage control in battery module.	P
	Target Voltage..... :	-53.2V	P
	Maximum discharge current of the cell, I_m :	50A	P
	Discharge current for forced discharge, 1.0 It..... :	50A	P
	Discharging time, $t = (1 It / I_m) \times 90$ (min.)..... :	90min	P
	Results: no fire, no explosion..... :	See Table 7.2.6.	P
7.3	Considerations for internal short-circuit – Design evaluation		P
7.3.1	General		P
7.3.2	Internal short-circuit test (cell)		P
	Samples preparation procedure: a), in accordance with 8.3.9 of IEC62133:2012; or b), the nickel particle inserted before charging, or c), the nickel particle was inserted before electrolyte filling..... :	Test accordance with 8.3.9 of IEC 62133: 2012.	P

	Tested according to Cl. 8.3.9 of IEC 62133:2012 test method, except all tests were carried out in an ambient temperature of 25 °C ± 5 °C.		P
	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		P
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) was reached	400N	P
	Results: no fire, no explosion..... :	See Table 7.3.2.	P
7.3.3	Propagation test (battery system)		N/A
	Method to create a thermal runaway in one cell ... :		—
	Results: No external fire from the battery system or no battery case rupture		—

8	BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)		P
8.1	General requirements		P
	Functional safety analysis for critical controls	Evaluated according to Annex H of IEC 60730-1: 2013.	P
	Conduct of a process hazard, risk assessment and mitigation of the battery system	FMEA evaluated by battery module manufacturer.	P
8.2	Battery management system (or battery management unit)		P
8.2.1	Requirements for the BMS	See test report WLZ-19-1094.	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		P
	The exceeded charging voltage applied to only a part of the battery system, such as the cell(s)..... :		P
	Results: no fire, no explosion..... :	See Table 8.2.2.	P
	The BMS interrupted the overcharging before reaching 110% of the upper limit charging voltage		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..... :	55°C applied.	P
	Results: no fire, no explosion..... :	See Table 8.2.4	P
	The BMS detected the overheat temperature and terminated charging	56.1°C	P
	The battery system operated as designed during test		P

9	INFORMATION FOR SAFETY		P
	The cell manufacturer provides information about current, voltage and temperature limits of their products	Information for safety mentioned in manufacturer's specifications.	P
	The battery system manufacturer provides information regarding how to mitigate hazards to equipment manufacturers or end-users.	Information for safety mentioned in manufacturer's specifications.	P

10	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.		P
	Cell or battery system has clear and durable markings		P
	Cell designation	Final product is battery	N/A
	Battery designation	IFpP11/190/316[2P15S]M/0+40/95	P
	Battery structure formulation		P

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	3.65V	P
A.4	Consideration on temperature	Battery charging temperature declared by client: 0°C~45°C. Cell charging temperature declared by client: 0°C~65°C.	P
A.5	High temperature range	Battery high charging temperature declared by client: 45°C. Cell high charging temperature declared by client: 65°C.	P
A.6	Low temperature range	Cell and battery low charging temperature declared by client: 0°C.	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		N/A
B.1	General		
B.2	Test conditions:		
	– 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.....		—
B.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 C	PACKAGING	P
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	The materials and pack design chosen in such a way as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants		P
--	---	--	---

5.1	TABLE: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity ¹⁾	
Metal Enclosure	--	--	Gavanized steel, Thickness 1.0mm	IEC 62619	Test with appliance	
Terminal Block	Hoppy Industrial Co., Ltd.	HP-T4055-1-4P	600V, 100A	EN 60947-7-1	VDE 40016107	
Internal lead wire	DONGGUAN ZHONGZHEN ELECTRONIC WIRE CO LTD	3386	AC 300V, 105°C, 10AWG.	UL 758	UL E355578	
BMS Board						
BMS	Shinwa (China) Industries Ltd.	48100	15S, 10A limited, 1C discharge with storage function dry contact B+/P+.	IEC 62619	Test with appliance	
-PCB	SHENGYI TECHNOLOGY CO LTD	S1000-2	V-0, 130°C	UL 94	UL E109769	
- MCU(U14)	ST	STM32F100VC T6	32-bit CPU, 24MHz, Operating Voltage 2- 3.6V	IEC 62619	Test with appliance	
- AFE (U36)	TEXAS INSTRUMENTS	BQ7694003	Supply voltage: - 0.3V to 36V, Topr:-40°C to 85°C, 15S CELL	IEC 62619	Test with appliance	
- Charge Protection MOSFET (M2, M4, M6, M8, M10, M12, M14)	Toshiba	TK160F10N1	Vds=100V, Vgs(th)=2~4V, Rds(on)=2mΩ.	IEC 62619	Test with appliance	
-Discharge Protection MOSFET (M1, M3, M5, M7, M9, M11, M15)	Toshiba	TK160F10N1	Vds=100V, Vgs(th)=2~4V, Rds(on)=2mΩ.	IEC 62619	Test with appliance	
-IC for Photocoupler (PC2) for protective of reverse connect	EVERLIGHT ELECTRONICS CO., LTD.	EL817S1C(TU)- F	CTR(min)=50% (At If =5mA ,Vce =5V)	IEC 62619	Test with appliance	
-IC for Photocoupler (PC3) for 10A Current limit switch	EVERLIGHT ELECTRONICS CO., LTD.	EL817S1C(TU)- F	CTR(min)=50% (At If =5mA ,Vce =5V)	IEC 62619	Test with appliance	
Thermistor (NTC)	TKS	TSM1A104F395 3RZ	R ₂₅ =10KΩ R _{25/85} =3435	IEC 62619	Test with appliance	
For current limiting board						
Current limit board	Shinwa Industries (China) Ltd.	LM-L01A	Current limit: 10A	IEC 62619	Test with appliance	

-IC for Current-Mode PWM Controller (U1)	TI	UC2843A	500-kHz Operation, -40°C~85°C	IEC 62619	Test with appliance
-IC for PWM Control (U2)	TI	TL494I	-40°C~85°C	IEC 62619	Test with appliance
-IC for Gate Driver (U6)	TI	UCC27519DB V R	-40°C~140°C	IEC 62619	Test with appliance
- MOSFET (Q1,Q2)	Hunteck	Hunteck,NMOS , HGB037N10S, T O263	Vds=100V, Vgs(th)=2~4V, Rds(on)=3.1mΩ	IEC 62619	Test with appliance
-FUSE (F1, F3)	Nanjing SART Science & Technology Development Co., Ltd.	S6125-F-15.0A	65V, 15A	UL 248-1 UL 248-14	UL E319512
Cell	Jiangsu Shuangdeng Front New Energy Co. Ltd.	IFP11190316-050	DC 3.2V, 50Ah	IEC 62619	Test with appliance
-Positive Electrode	Aleees (Ames)Energy Technology (Shanghai) Co. Ltd.	M121	Positive material LiFePO4, coated on Al film	--	--
-Negative Electrode	Shenzhen BTR new energy materials co. LTD	cmb-S	Negative material C coated on Cu film	--	--
	DongGuan KaiJin New energy materials Co. Ltd.	AML906		--	--
-Separator	Foshan Yingbolai Technology Co., Ltd	32μm	PP /PP.	--	--
-Electrolyte	Jiujiang Tianji High-Tech Materials Co. Ltd.	TC-E8082-5, FLT-07	LiFP6 dissolved in organic solvent (EC+EMC)	--	--
Supplementary information:					
1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

7.2.1	TABLE: External short-circuit test (cell or cell block)					P
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	
No. 1	24.9	3.33	35.45	25.8	A, E	
No. 2	24.9	3.33	34.87	22.9	A, E	
No. 3	24.9	3.33	34.95	25.7	A, E	
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)					P
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
No. 13	3.08	3.34	50	4.015	36.7	A, E
No. 14	3.07	3.34	50	4.015	35.7	A, E
No. 15	3.04	3.34	50	4.015	36.0	A, E
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): _____						

7.2.6	TABLE: Forced discharge test (cell or cell block)				P
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
No. 16	2.72	-53.2	50	90	A
No. 17	2.79	-53.2	50	90	A
No. 18	2.91	-53.2	50	90	A

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)			P
Sample No.	OCV at start of test, (V dc)	Particle location ¹⁾	Maximum applied pressure, (N)	Results
No. 19	3.36	1	403	A, E
No. 20	3.37	1	405	A, E
No. 21	3.35	1	410	A, E
No. 22	3.35	1	407	A, E
No. 23	3.34	1	402	A, E

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): ____

7.3.3	TABLE: Propagation test (battery system)					P
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)		
--		--		-		
Supplementary information:						
<p>1) Cell can be failed through 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>2) 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>						

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	
No. 1	2.92	100	56.4	3.8	A, D, F	
			Charge Voltage Applied Battery System: 1)			
			Whole		Part	
			62.04V		--	
Supplementary information:						
<p>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.</p> <p>Results:</p> <p>A - No Fire or Explosion</p> <p>B – Fire</p> <p>C - Explosion</p> <p>D - The voltage of the measured cells or cell blocks did not exceed the upper limit charging voltage</p> <p>E - The voltage of the measured cells or cell blocks did exceed the upper limit charging voltage</p> <p>F - All function of battery system did operate as intended during the test.</p> <p>G - All function of battery system did not operate as intended during the test.</p> <p>H - Other (Please explain): ___</p>						

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	
No. 2	44.6	120.09	44.6	A,D,F	
Supplementary information:					
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): _____					

8.2.4	TABLE: Overheating control (battery system)			P
Sample No.	OCV at start(SOC 50%) of test, V dc	Maximum Charging Current, A	Maximum Charging Voltage, V dc	
No. 3	49.2	20	49.2*	
Maximum Specified Temperature of Battery System, °C		Maximum Measured Cell Case Temperature, °C	Results	
50		56.1	A,D,F	
Supplementary information:				
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): _____				
* The overheating protection worked immediately when charging at 55°C began. The data monitoring continued for one hour, the cell temperature increased to 56.1°C due to the ambient change.				

--End of test report--

Attachment 1

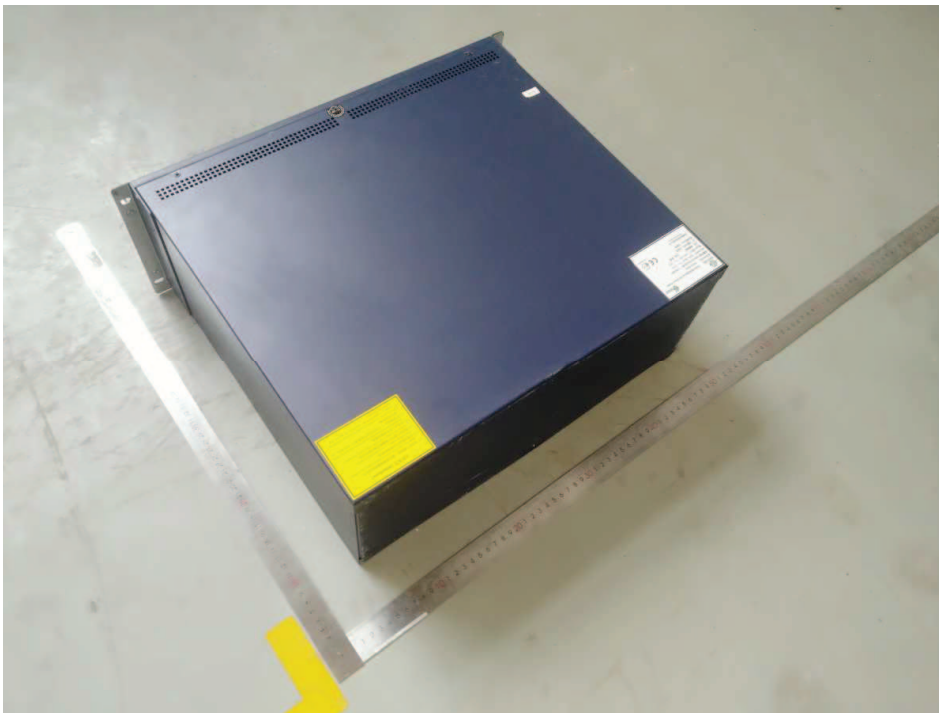
Photo Documentation

Report No.: 50229619 001

Type Designation: SDA10-48100



Pic.1 General View of Battery Module



Pic.2 General View of Battery Module

Attachment 1 Photo Documentation

Report No.: 50229619 001

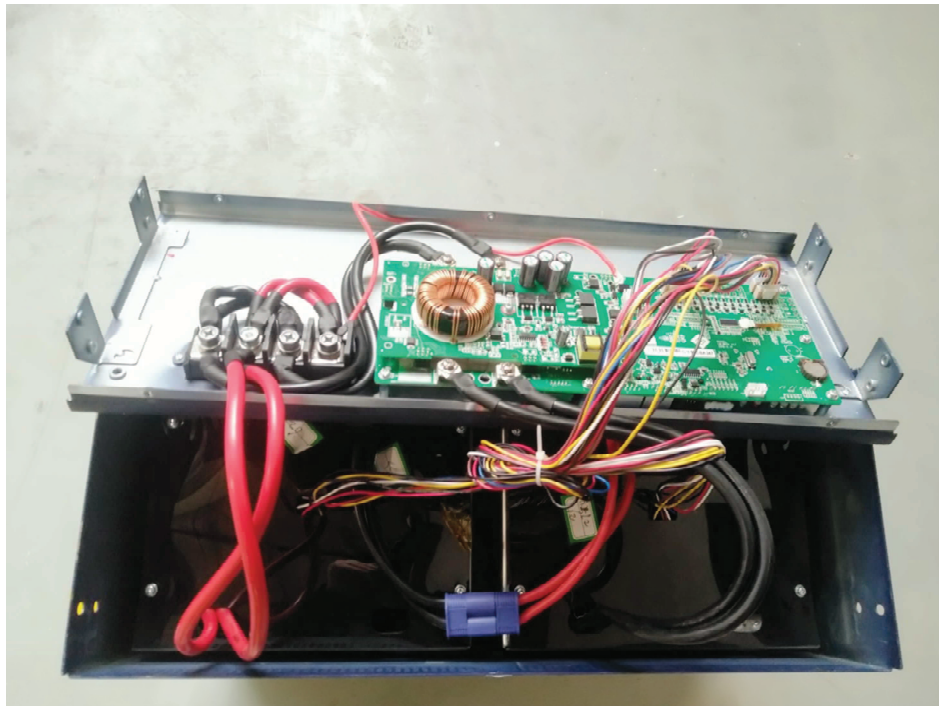
Type Designation: SDA10-48100



Pic.3 Front Terminal View of Battery Module



Pic.4 Internal View of Battery Module



Pic.5 Internal View of Battery Module

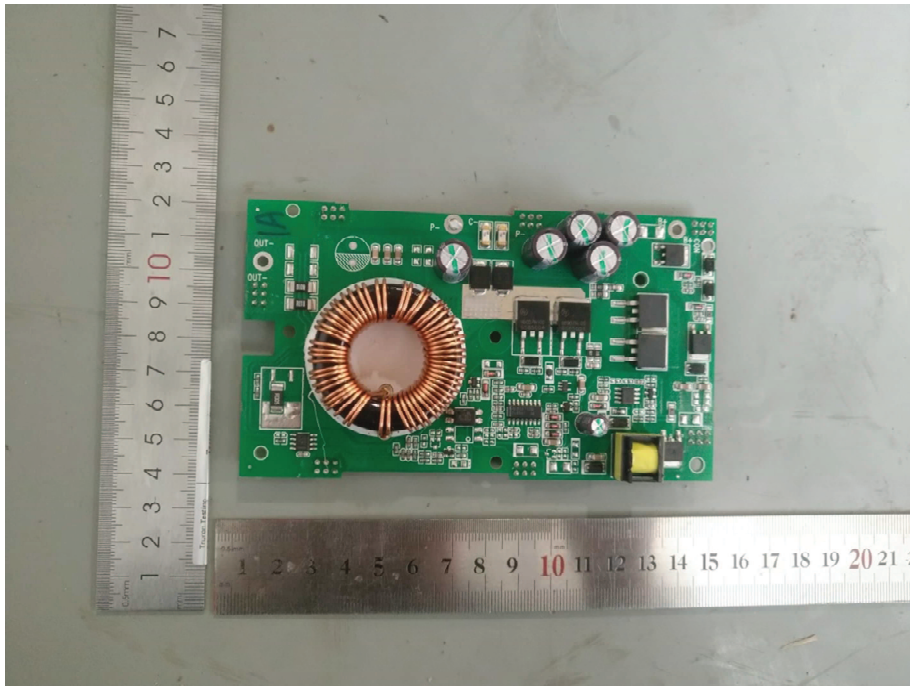


Pic.6 Internal View of Battery Module

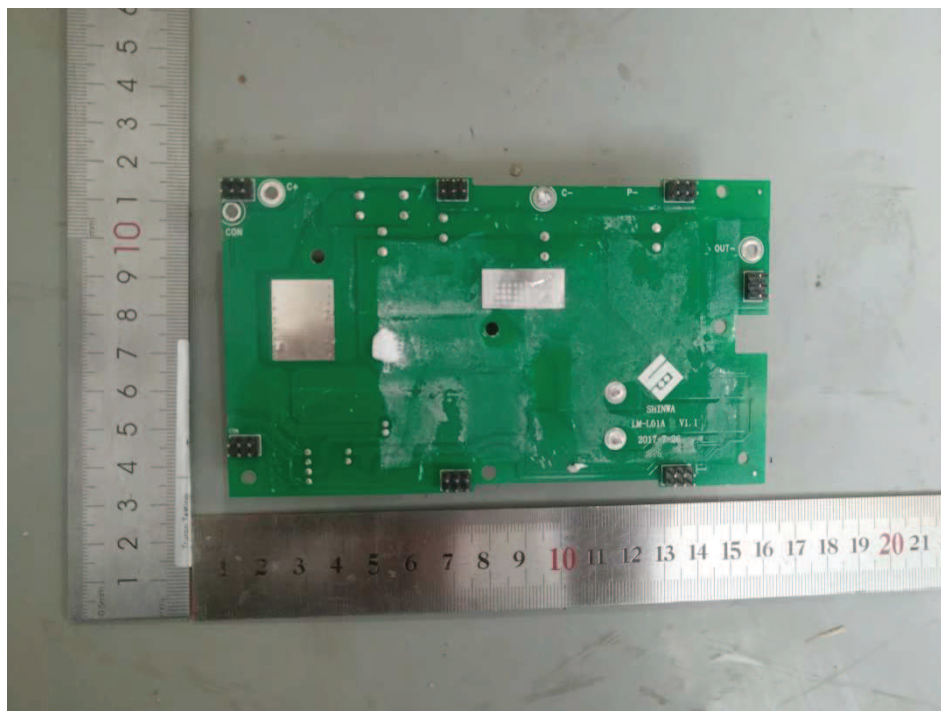
Attachment 1 Photo Documentation

Report No.: 50229619 001

Type Designation: SDA10-48100



Pic.7 Front View of Current Limit Board



Pic.8 Rear View of Current Limit Board

Attachment 1 Photo Documentation

Report No.: 50229619 001

Type Designation: SDA10-48100

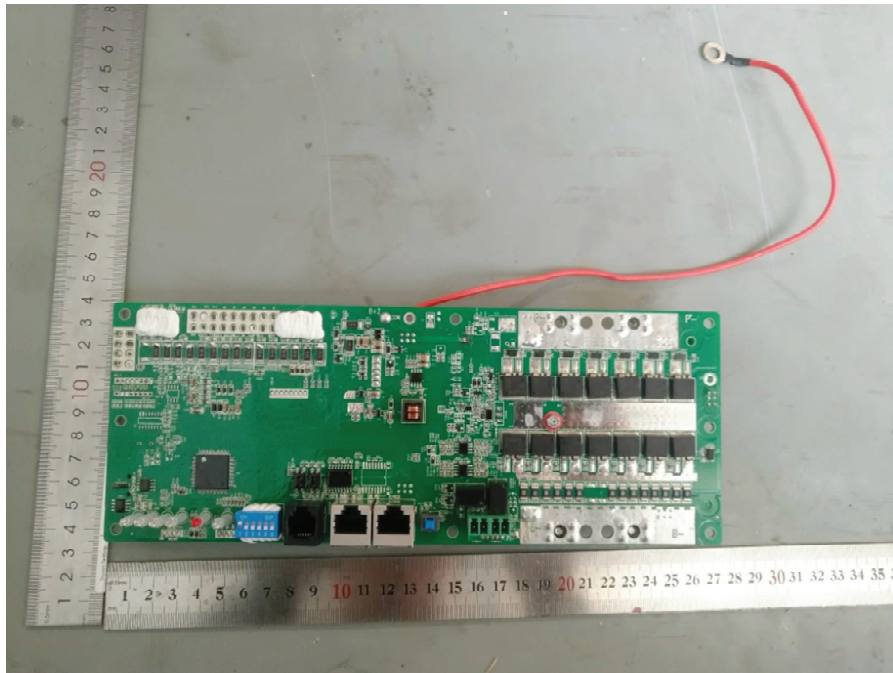


Figure 9: Front View of BMS Board

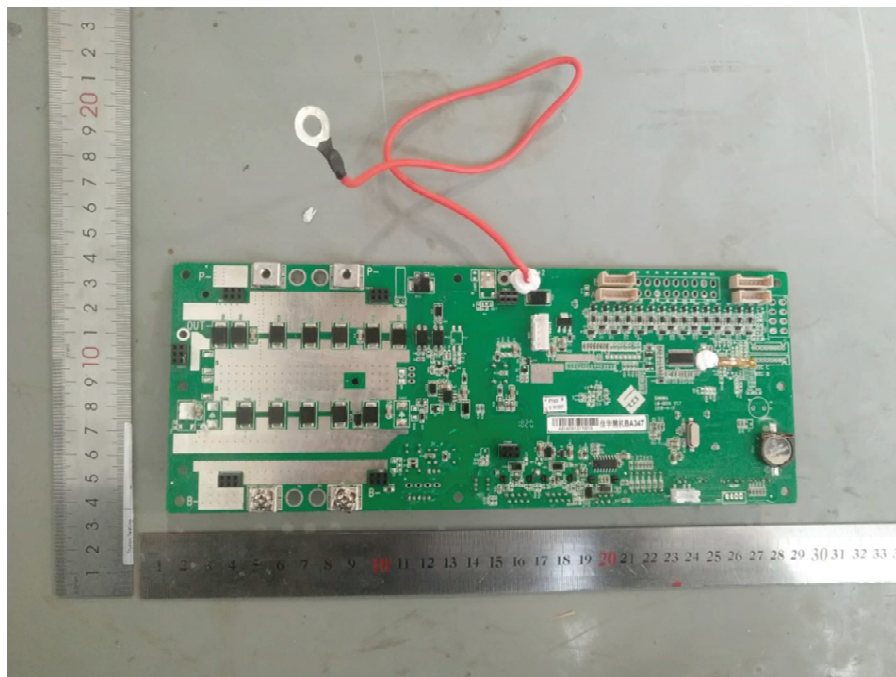


Figure 10: Rear View of BMS Board

Attachment 1 Photo Documentation

Report No.: 50229619 001

Type Designation: SDA10-48100



Figure 11: Front View of Cell

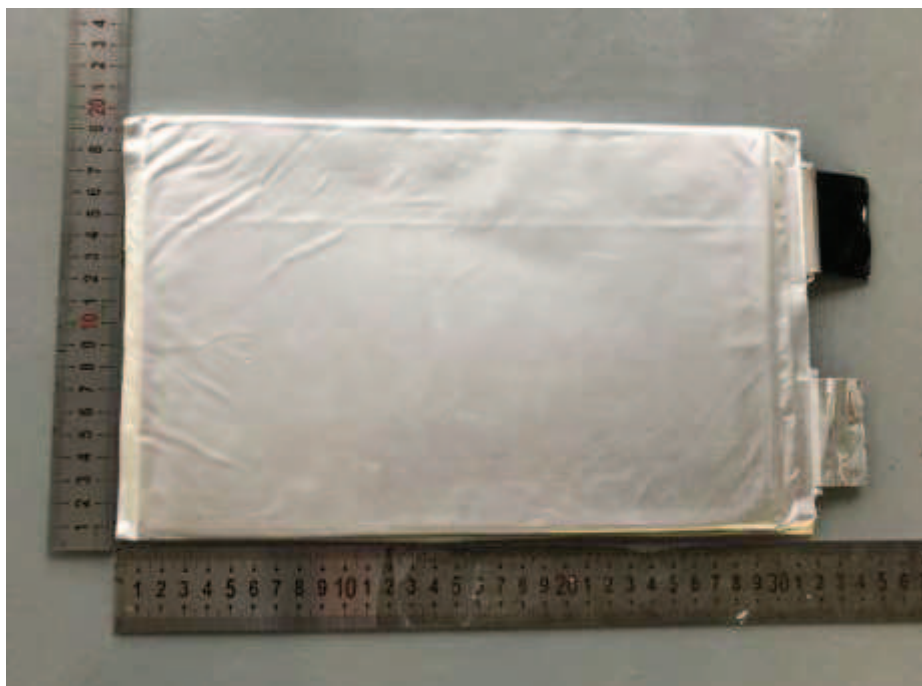


Figure 12: Rear View of Cell