Prüfbericht-Nr.: *Test report no.:*	CN24NQLV 001	**Auftrags-Nr.:** *Order no.*:	168512684	Seite 1 von 35 *Page 1 of 35*
Kunden-Referenz-Nr.: *Client reference no.*:	N/A	**Auftragsdatum:** *Order date:*	2024-11-05	
Auftraggeber: *Client*:	Fujian SCUD Power Technology Co., Ltd. 6/F, No.98 Jiangbin East Avenue, Mawei District, Fuzhou, Fujian, P.R. China			
Prüfgegenstand: *Test item*:	LI-ION BATTERY PACK			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	NDAF7230B			
Auftrags-Inhalt: *Order content*:	TÜV Rheinland Test Report			
Prüfgrundlage: *Test specification*:	EN 62133-2:2017, EN 62133-2:2017/A1:2021			
Wareneingangsdatum: *Date of sample receipt*:	2024-11-13			
Prüfmuster-Nr.: *Test sample no:*	RZ240041-001 to RZ240041-022			
Prüfzeitraum: *Testing period*:	2024-11-13 - 2024-12-05			
Ort der Prüfung: *Place of testing*:	Fujian SCUD Power Technology Co., Ltd.			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: *Test result**:	Pass			

erstellt von: *created by:*	Marco Huang	**genehmigt von:** *authorized by*:	Harry Han
Datum: *Date:* 2025-01-13		**Ausstellungsdatum:** *Issue date:* 2025-01-13	
Stellung / Position:	Project Engineer	**Stellung** / Position:	Authorizer

Sonstiges /
Other:

This report does not evidence compliance of the provided sample with the relevant standards but only with the referred tests. This test report documents the findings of examination conducted on the delivered product mentioned above only. This report does not entitle the applicant to carry any safety mark on this or similar products. Further for sales or other application purposes of the tested product, any reference to TÜV Rheinland or a test through TÜV Rheinland is only permissible with prior written consent of TÜV Rheinland.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested

Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature *As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature*
3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.*

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. ..... :	CN24NQLV 001
Date of issue ..... :	See cover page
Total number of pages ..... :	See cover page
Name of Testing Laboratory preparing the Report ..... :	TÜV Rheinland (Shenzhen) Co., Ltd.
Applicant's name ..... :	See cover page
Address ..... :	See cover page
Test specification:	
Standard ..... :	See cover page
Test procedure ..... :	Test Report
Non-standard test method ..... :	N/A
TRF template used ..... :	IECEE OD-2020-F1:2021, Ed.1.4
Test Report Form No. ..... :	IEC62133_2C
Test Report Form(s) Originator .... :	DEKRA Certification B.V.
Master TRF ..... :	Dated 2022-07-01

This report is not valid as a CB Test Report unless signed by an approved IECEE 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 NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description ..... :	LI-ION BATTERY PACK
Trade Mark(s) ..... :	SEGWAY
Manufacturer ..... :	Fujian SCUD Power Technology Co., Ltd. No.135, Rujiang East Road, Mawei District, Fuzhou, Fujian, P.R. China
Model/Type reference ..... :	NDAF7230B
Ratings ..... :	72 VDC, 30 Ah, 2160 Wh

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☐	**CB Testing Laboratory:**		
Testing location/ address.....:			
Tested by (name, function, signature).....:		See cover page	
Approved by (name, function, signature)...:		See cover page	
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address.....:			
Tested by (name, function, signature).....:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address.....:			
Tested by (name + signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 3:**		
☐	**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):	**Testing location:**
cl.5.2 Insulation and wiring cl.5.6.2 Design recommendation; cl.7.1 Charging procedure for test purposes (for Batteries); cl.7.2.2 Case stress at high ambient temperature (batteries); cl.7.3.2 External short circuit (batteries); cl.7.3.3 Free fall (batteries); cl.7.3.6 Over-charging of battery; cl.7.3.8 Mechanical tests (batteries); cl.8.2 Small cell and battery safety information. The component cell (N21700CG-50E) has been evaluated according to IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021(Certificate No.: JPTUV-143339, Report No.: CN2256KD 001), which is considered as complied with EN 62133-2:2017, EN 62133-2:2017/A1:2021 after reviewing the cell CB report. Tests are made with the number of batteries specified in EN 62133-2:2017, EN 62133-2:2017/A1:2021 Table 1.	Fujian SCUD Power Technology Co., Ltd. No.135, Rujiang East Road, Mawei District, Fuzhou, Fujian, P.R. China

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

N/A

Use of uncertainty of measurement for decisions on conformity (decision rule) :

☒ 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").

☐ Other:… (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

Information on uncertainty of measurement:

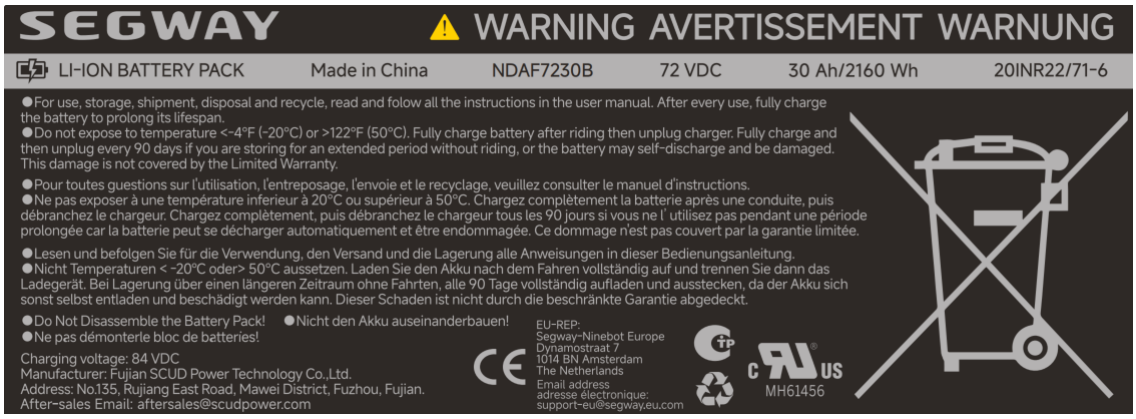
The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.

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.



****	*	EQ	**	*	*	*	****
①	②	③	④	⑤	⑥	⑦	⑧

Remark:

“ ④ ” represents the year of production: “23” represents “2023”, “24” represents “2024” and so on.

“ ⑤ ” represents the month of production: “A” to “M” from January to December, “I” is not used.

“ ⑥ ” represents the date of production: “1 to 9” represents the date of “1st to 9th”; “A to X” represents the date of “10th to 31st”; “I” and “O” are not used.

Test item particulars.....:	
Classification of installation and use.....:	N/A
Supply Connection.....:	DC connector
Recommend charging method declared by the manufacturer.....:	Charging the battery with 4000mA constant current and 84V constant voltage until current reduces to 600mA at ambient 20°C±5°C
Discharge current (0,2 It A).....:	6000mA
Specified final voltage.....:	56V
Upper limit charging voltage per cell.....:	4.2V
Maximum charging current.....:	8000mA
Charging temperature upper limit.....:	45°C
Charging temperature lower limit.....:	0°C
Polymer cell electrolyte type.....:	☐ gel polymer ☐ solid polymer ☒ 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 .....:	See cover page
Date (s) of performance of tests.....:	See cover page

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 ☐ comma / ☒ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

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 ..... :	☐ **Yes** ☒ **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:

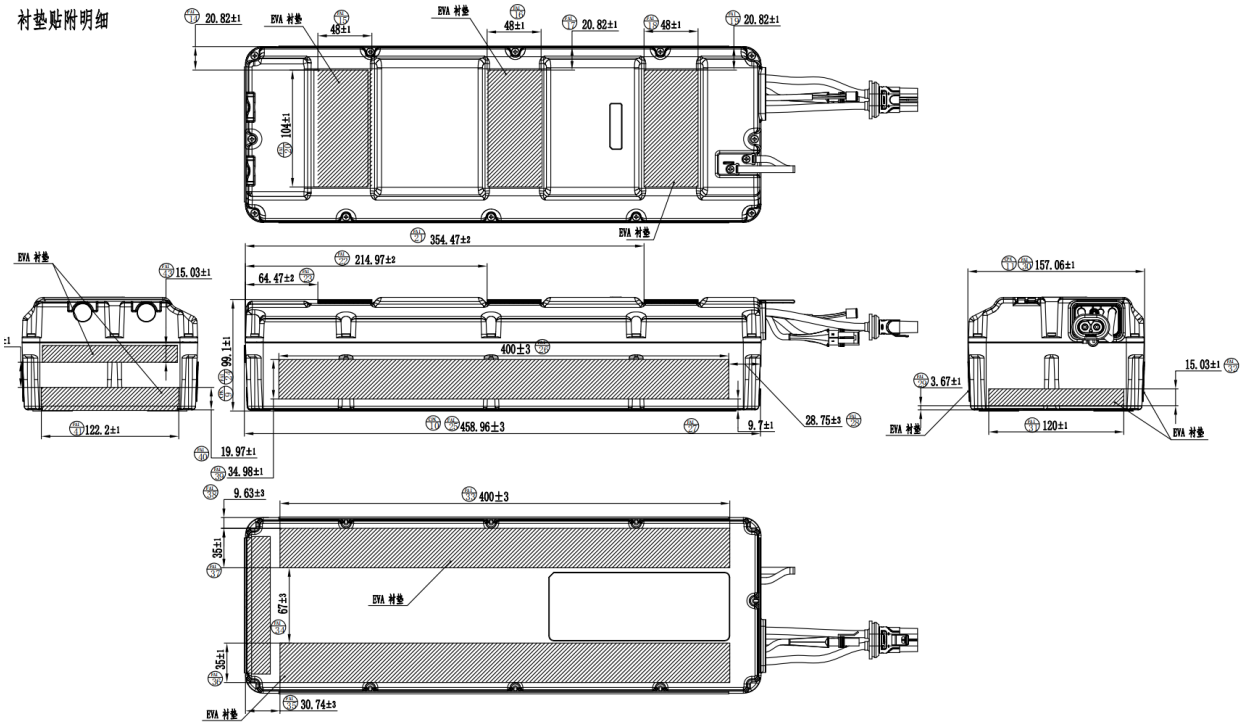
This battery is constructed with one hundred and twenty Lithium-ion cells (20S6P), and has overcharge, over-discharge, over current and short-circuits proof circuit.

The component cell (N21700CG-50E) has been evaluated according to IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021(Certificate No.: JPTUV-143339, Report No.: CN2256KD 001), which is considered as complied with EN 62133-2:2017, EN 62133-2:2017/A1:2021 after reviewing the cell CB report.

The main features of the battery are shown as below (clause 7.1.1):

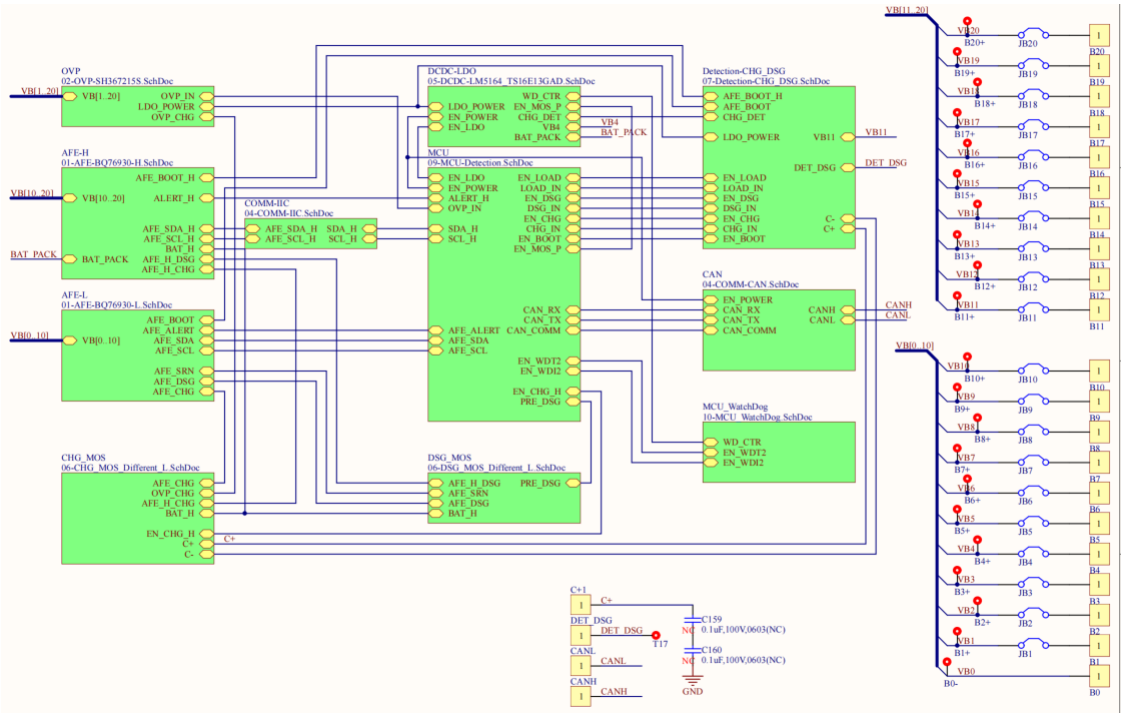
Model	Rated capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Specified final voltage
NDAF7230B	30000mAh	72V	4000mA	10800mA	8000mA	65000mA	84V	56V

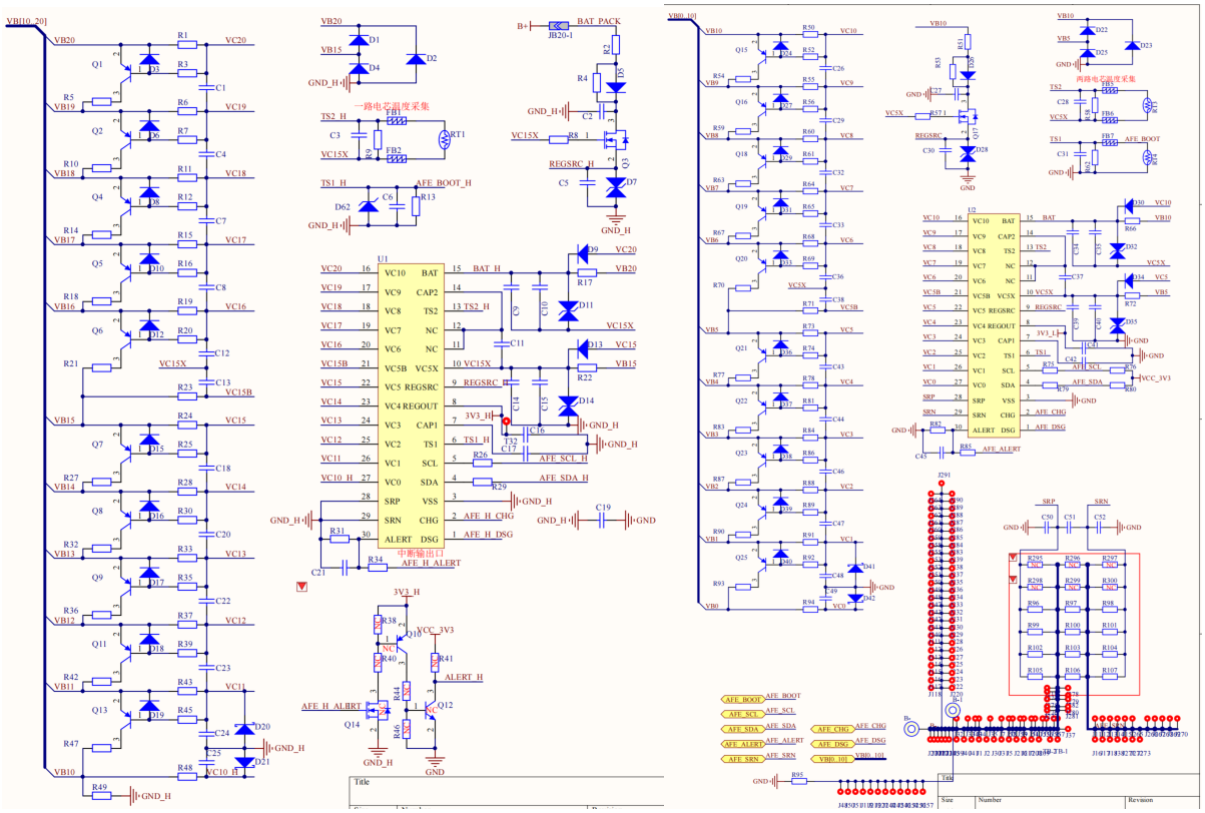
Construction:

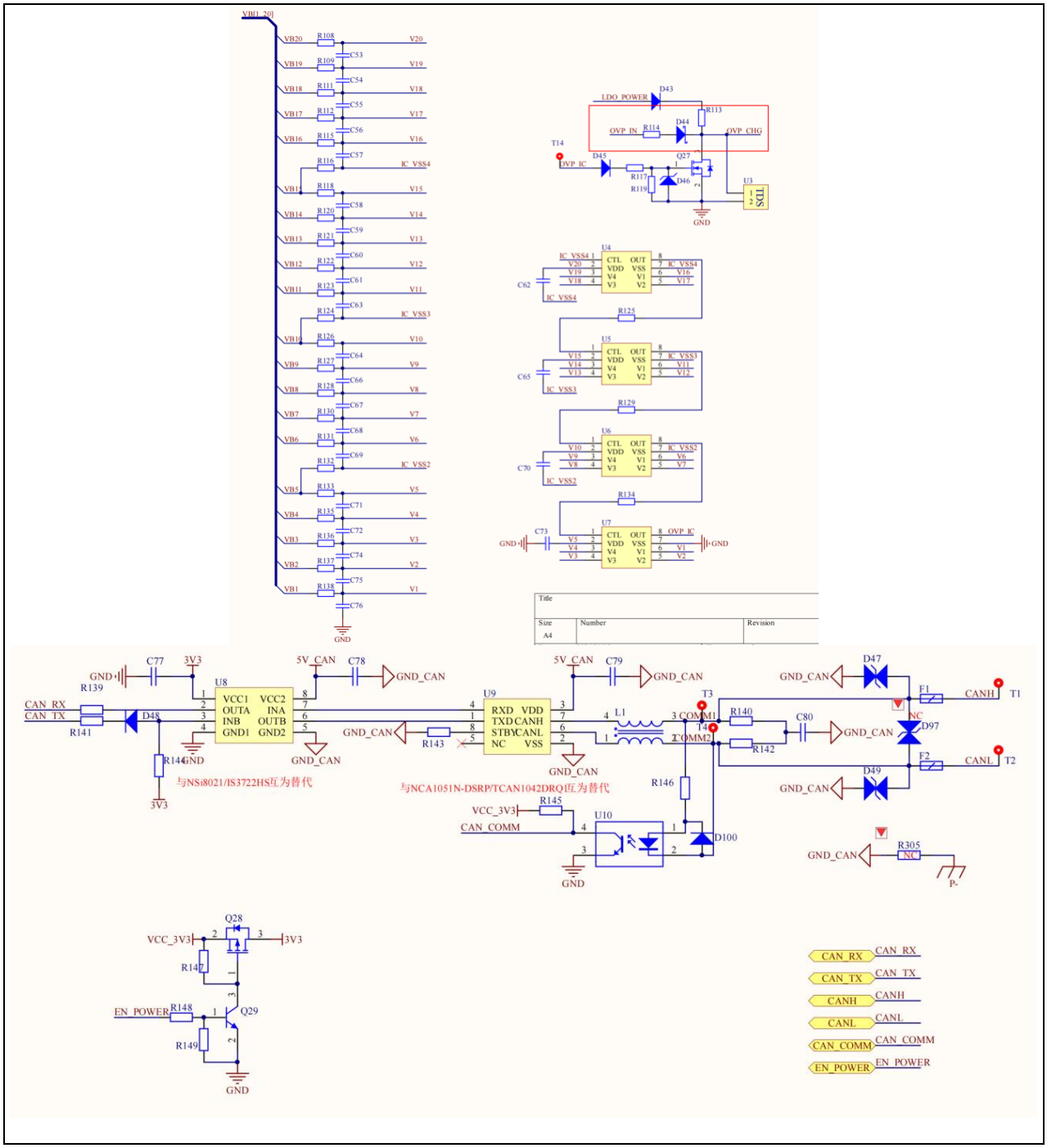


Battery (Unit: mm)

Circuit diagram:



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VB19
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VB17
VB16
VB15
VB14
VB13
VB12
VB11
VB10
VB9
VB8
VB7
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VB4
VB3
VB2
VB1
V20
V19
V18
V17
V16
IC_VSS4
V15
V14
V13
V12
V11
IC_VSS3
V10
V9
V8
V7
V6
IC_VSS2
V5
V4
V3
V2
V1
GND
LDO_POWER
OVP_IN
OVP_CHG
OVP_IC
TDS
U4
U5
U6
U7
IC_VSS4
IC_VSS3
IC_VSS2
OVP_IC
Title
Size
Number
Revision
A4
3V3
5V_CAN
GND_CAN
CAN_RX
CAN_TX
U8
U9
VCC1
VCC2
OUTA
INA
INB
OUTB
GND1
GND2
RXD
VDD
TXD
CANH
STBY
CANL
NC
VSS
与NSi8021/IS3722HS互为替代
与NCA1051N-DSRP/TCAN1042DRQ1互为替代
CAN_COMM
VCC_3V3
EN_POWER
U10
Q28
Q29
D47
D49
D97
D100
CANH
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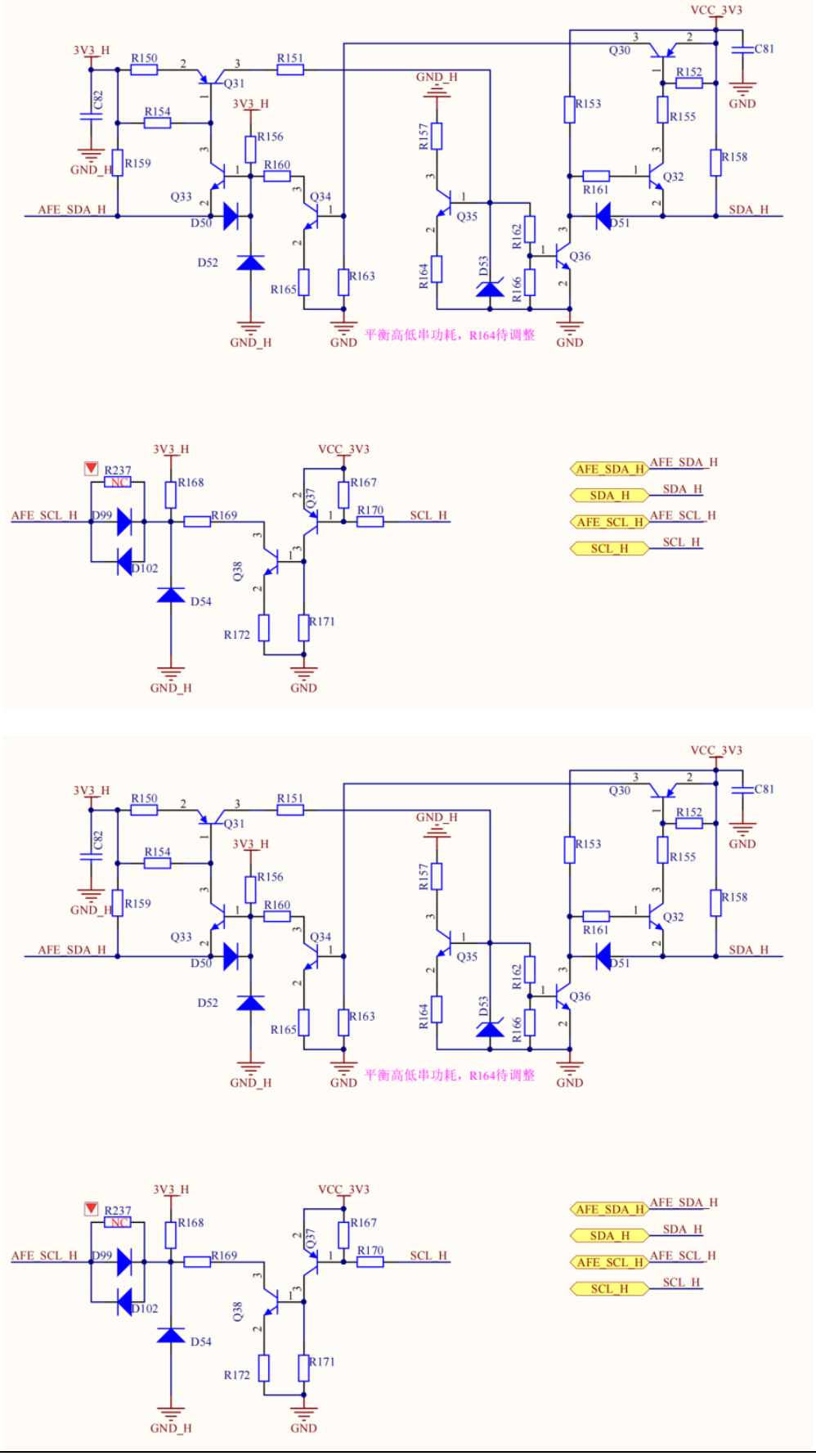
T1
T2
T3
T4
L1
COMM1
COMM2
F1
F2
NC
P-


VCC_3V3
3V3_H
R150
Q31
R151
C81
Q30
R152
GND
C82
R154
3V3_H
R156
GND_H
R159
R160
Q33
Q34
R157
R153
R155
R158
R161
Q32
AFE_SDA_H
D50
D52
R165
R163
Q35
R162
Q36
R164
D53
R166
D51
SDA_H
GND_H
GND
平衡高低串功耗，R164待调整
GND
3V3_H
VCC_3V3
R237
NC
R168
R167
Q37
AFE_SCL_H
D99
R169
R170
SCL_H
D102
Q38
D54
R172
R171
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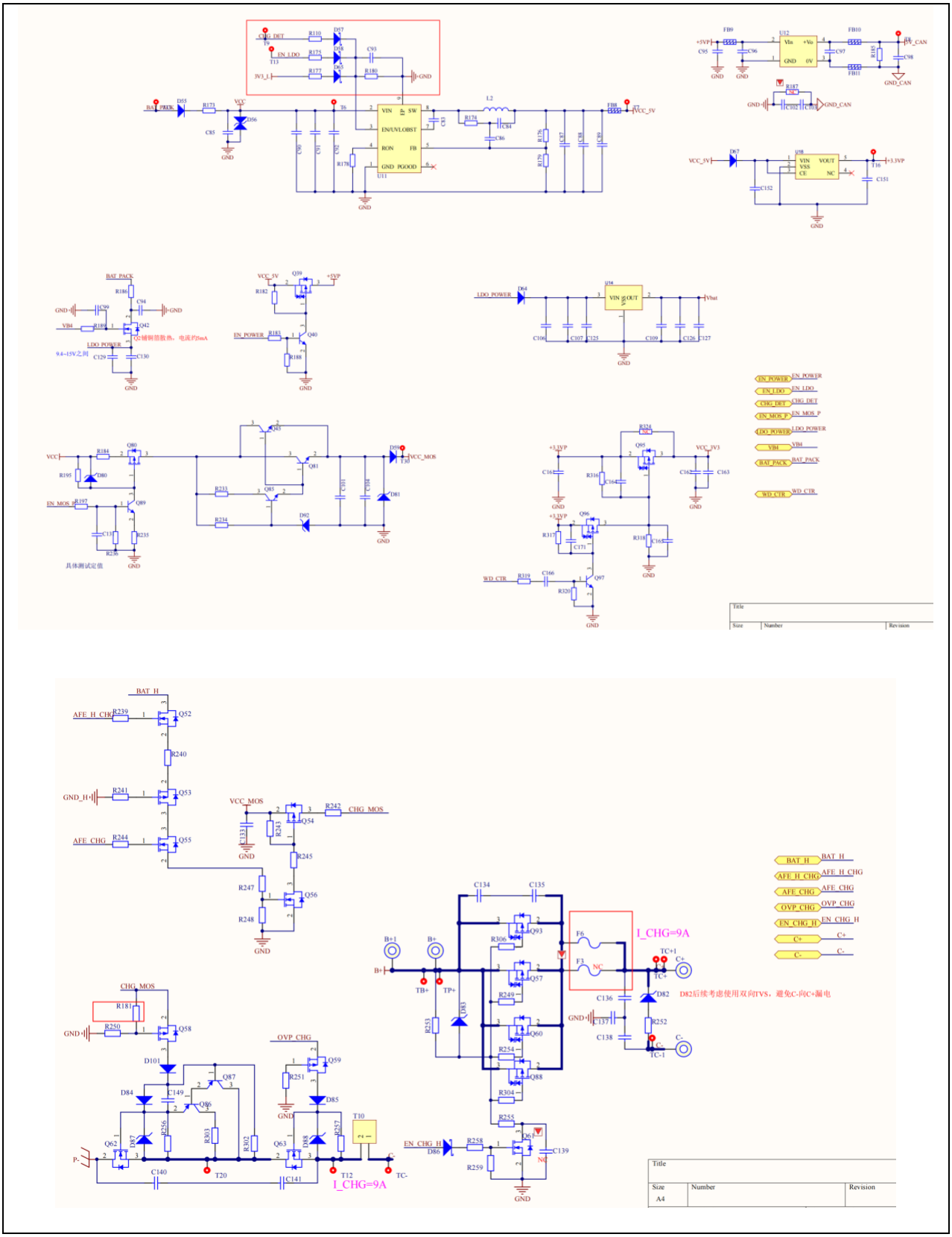
SCL_H
SCL_H


CHG_DET
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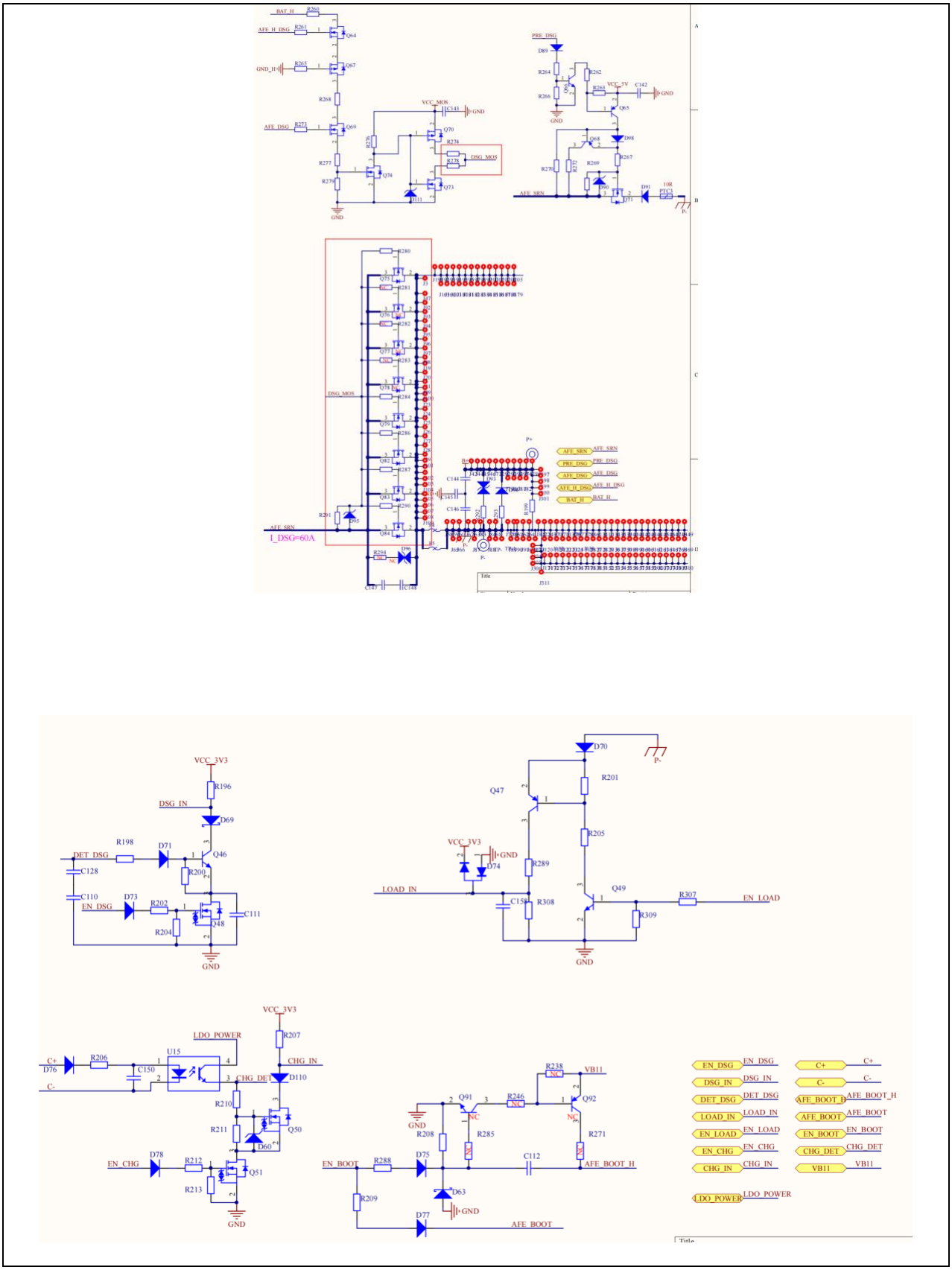
3V3_L
VCC
VCC_5V
+5VP
+3.3VP
BAT_PACK
LDO_POWER
EN_POWER
VIB
VCC_MOS
EN_MOS
WD_CTR
CHG_MOS
OVP_CHG
EN_CHG_H
AFE_H_CHG
AFE_CHG
BAT_H
GND_H
CHG_MOS
I_CHG=9A
D82后续考虑使用双向TVS，避免C-向C+漏电
Title
Size
Number
Revision
A4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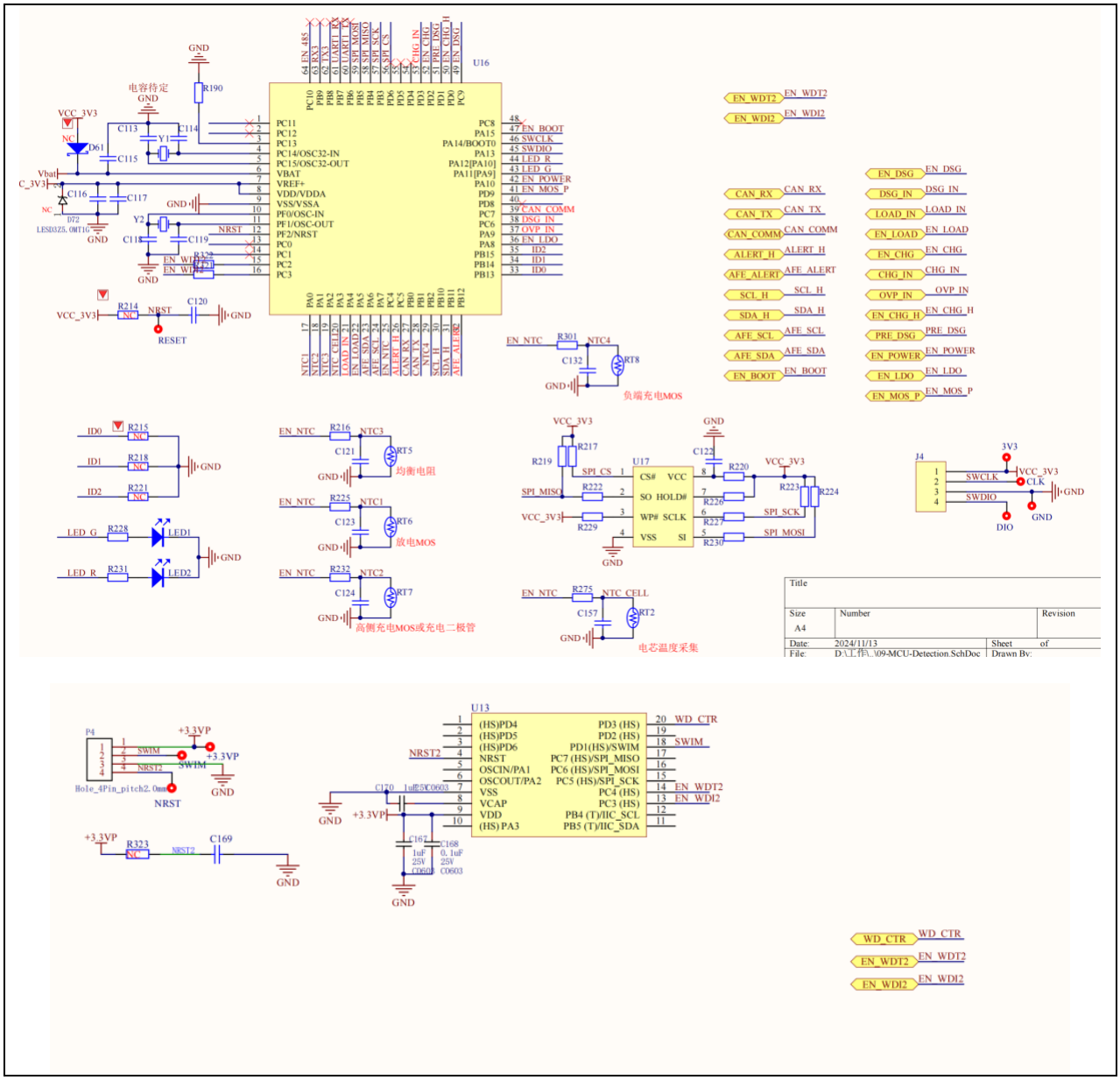
GND_H
AFE_DSG
VCC_MOS
DSG_MOS
PRE_DSG
VCC_5V
AFE_SRN
I_DSG=60A
P+
P-
DET_DSG
EN_DSG
LOAD_IN
EN_LOAD
LDO_POWER
CHG_IN
CHG_DET
EN_CHG
EN_BOOT
AFE_BOOT
AFE_BOOT_H
VCC_3V3
GND


U16
U13
U17
U18
电容待定
均衡电阻
放电MOS
高侧充电MOS或充电二极管
负端充电MOS
电芯温度采集
RESET
Title
Size
Number
Revision
A4
Date: 2024/11/13
Sheet of
File: D:\工作\..\09-MCU-Detection.SchDoc
Drawn By:

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		P
	Insulation resistance (MΩ) ..... :	35700	--
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		P
	Orientation of wiring maintains adequate clearances 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	Venting mechanism exists on the top of the cylindrical cell.	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	Overcharge, over discharge, over current and short-circuit proof circuit used in this battery. See tests of clause 7.	P
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer	See above.	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	The charging limits specified in the manufacturer's specification.	P
5.5	**Terminal contacts**		P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current		P
	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 circuits		P
5.6	**Assembly of cells into batteries**		P
5.6.1	General		P
	Each battery has 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	Protective circuit equipped on battery.	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 has 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	Current, voltage and temperature limits specified by cell manufacturer.	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 are 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	Safety analysis report provided by manufacturer.	P
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	20S6P Max. charging voltage of each cell: 4.2V, not exceed 4.2V specified in cell CB report.	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		N/A
	For batteries consisting of series-connected cells or cell blocks, nominal charge voltage are not 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 are not discharged beyond the cell manufacturer's specified final voltage	Final voltage of battery per cell: 2.8V, not exceed the final voltage specified by cell manufacturer.	P
	For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry are 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 are provided to prevent damage as a result of intended use and reasonably foreseeable misuse	Mechanical protection for cell connections and control circuit provided.	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	The mechanical protection can be provided by the battery case.	P
	The battery case and compartments housing cells are 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 is 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	Complied. ISO 9001: 2015 certificate provided.	P
5.8	**Battery safety components**		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
	The internal resistance of coin cells are measured in accordance with Annex D. Coin cells with internal resistance less than or equal to 3 Ω are tested in accordance with Table 1	Not coin cells	N/A
	Unless otherwise specified, tests are carried out in an ambient temperature of 20 °C ± 5 °C		P
	The safety analysis of 5.6.1 identify those components of the protection circuit that are critical for short-circuit, overcharge and over discharge protection		P
	When conducting the short-circuit test, consideration is 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	See clause 7.3.2.	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 °C ± 5 °C, using the method declared by the manufacturer	See page 8	P
	Prior to charging, the battery has been discharged at 20 °C ± 5 °C at a constant current of 0,2 It A down to a specified final voltage	See page 8	P
7.1.2	Second procedure	CB approved cell used.	N/A
	This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	After stabilization for 1 h to 4 h, at an ambient temperature of the highest test temperature and the lowest test temperature, respectively, 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 current to constant voltage charging method		N/A
7.2	**Intended use**		P
7.2.1	Continuous charging at constant voltage (cells)	CB approved cell used.	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)	Tested complied.	P
	Oven temperature (°C).....:	70	—
	Results: no physical distortion of the battery case resulting in exposure of internal protective components and cells	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)	CB approved cell used.	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)	Tested complied.	P
	The batteries were tested until one of the following occurred:		P
	- 24 hours elapsed; or		N/A
	- 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		P
	A single fault in the discharge protection circuit is conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test	Single fault conducted, details see appended table 7.3.2.	P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	A single fault applies to protective component parts such as MOSFET (metal oxide semiconductor field-effect transistor), fuse, thermostat or positive temperature coefficient (PTC) thermistor	Single fault conducted, details see appended table 7.3.2.	P
	Results: no fire, no explosion ..... :	(See appended table 7.3.2)	P
7.3.3	Free fall	Tested complied.	P
	Results: no fire, no explosion	No fire. No explosion.	P
7.3.4	Thermal abuse (cells)	CB approved cell used.	N/A
	Oven temperature (°C) ..... :	130	—
	Results: no fire, no explosion	No fire. No explosion	N/A
7.3.5	Crush (cells)	CB approved cell used.	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	Tested complied.	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)	CB approved cell used.	N/A
	Discharge a single cell to the lower limit discharge voltage specified by the cell manufacturer		N/A
	The discharged cell is then subjected to a forced discharge at 1 It A to the negative value of the upper limit charging voltage		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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
	- 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	Tested complied.	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	Tested complied.	P
	Results: no leakage, no venting, no rupture, no explosion and no fire ..... :	(See appended table 7.3.8.2)	P
7.3.9	Design evaluation – Forced internal short-circuit (cells)	CB approved cell used.	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 provides information about current, voltage and temperature limits of their products	Cell CB report provided.	P
	Manufacturers of batteries provides information regarding how to minimize and mitigate hazards to equipment manufacturers or end-users	Information for safety mentioned in manufacturer's specifications	P
	Systems analyses are performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		N/A
	As appropriate, any information relating to hazard avoidance resulting from a system analysis is provided to the end user		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Do not allow children to replace batteries without adult supervision		N/A
8.2	**Small cell and battery safety information**	Not small battery	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**	The final product is battery	N/A
	Cells are marked as specified in IEC 61960, except coin cells		N/A
	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		N/A
9.2	**Battery marking**		P
	Batteries are marked as specified in IEC 61960, except for coin batteries	The battery is marked in accordance with IEC 61960-3, also see page 7.	P
	Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity		N/A
	Batteries are marked with an appropriate caution statement		P
	- Terminals have clear polarity marking on the external surface of the battery, or		N/A
	- Not be marked with polarity markings if the design of the external connector prevents reverse polarity connections	Keyed external connectors used to prevent reverse polarity connections.	P
9.3	**Caution for ingestion of small cells and batteries**	Not small battery	N/A
	Coin cells and batteries identified as small batteries include a caution statement regarding the hazards of ingestion in accordance with 8.2		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion is given on the immediate package		N/A
9.4	**Other information**		P
	The following information are marked on or supplied with the battery:		P
	- Storage and disposal instructions	Information for storage and disposal instructions mentioned in manufacturer's specifications.	P
	- Recommended charging instructions	Information for recommended charging instructions mentioned in manufacturer's specifications.	P
10	**PACKAGING AND TRANSPORT**		N/A
	Packaging for coin cells are not be small enough to fit within the limits of the ingestion gauge of Figure 3	Not coin cells	N/A
ANNEX A	**CHARGING AND DISCHARGING RANGE OF SECONDARY LITHIUM ION CELLS FOR SAFE USE**		N/A
A.1	**General**	CB approved cell used.	N/A
A.2	**Safety of lithium ion secondary battery**		N/A
A.3	**Consideration on charging voltage**		N/A
A.3.1	General		N/A
A.3.2	Upper limit charging voltage		N/A
A.3.2.1	General		N/A
A.3.2.2	Explanation of safety viewpoint		N/A
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied		N/A
A.4	**Consideration of temperature and charging current**		N/A
A.4.1	General		N/A
A.4.2	Recommended temperature range		N/A
A.4.2.1	General		N/A
A.4.2.2	Safety consideration when a different recommended temperature range is applied		N/A
A.4.3	High temperature range		N/A
A.4.3.1	General		N/A
A.4.3.2	Explanation of safety viewpoint		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
A.4.3.3	Safety considerations when specifying charging conditions in the high temperature range		N/A
A.4.3.4	Safety considerations when specifying a new upper limit in the high temperature range		N/A
A.4.4	Low temperature range		N/A
A.4.4.1	General		N/A
A.4.4.2	Explanation of safety viewpoint		N/A
A.4.4.3	Safety considerations, when specifying charging conditions in the low temperature range		N/A
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range		N/A
A.4.5	Scope of the application of charging current		N/A
A.4.6	Consideration of discharge		N/A
A.4.6.1	General		N/A
A.4.6.2	Final discharge voltage and explanation of safety viewpoint		N/A
A.4.6.3	Discharge current and temperature range		N/A
A.4.6.4	Scope of application of the discharging current		N/A
A.5	**Sample preparation**		N/A
A.5.1	General		N/A
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

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
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**		N/A
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 greater than 3 Ω require no further testing .....:		N/A
	Coin cells with an internal resistance less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1		N/A
ANNEX E	**PACKAGING AND TRANSPORT**		**N/A**
ANNEX F	**COMPONENT STANDARDS REFERENCES**		**N/A**

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 Vc (Vdc)**	**Recommended charging current I_{rec} (A)**	**OCV before test (Vdc)**	**Results**
Supplementary information:				

7.3.1	TABLE: External short circuit (cell)				N/A
Sample No.	**Ambient (°C)**	**OCV at start of test (Vdc)**	**Resistance of circuit (mΩ)**	**Maximum case temperature ~~rise ΔT~~ (°C)**	**Results**
Samples charged at charging temperature upper limit					
Samples charged at charging temperature lower limit					
Supplementary information:					

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

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 ~~rise ΔT~~ (°C)**	**Component single fault condition**	**Results**
RZ240041-004	23.0	82.52	71.8	24.2	--	P
RZ240041-005	23.0	82.73	72.3	24.9	--	P
RZ240041-006	23.0	82.41	70.1	24.5	--	P
RZ240041-007	23.5	83.25	73.3	23.8	MOSFET Q84 (Pin 2-3) SC*	P
RZ240041-008	23.5	83.12	72.5	24.0	Fuse F4 SC*	P

Supplementary information:

- No fire or explosion

Remark:

*SC: short circuit.

7.3.5	TABLE: Crush (cells)				N/A
Sample No.	**OCV before test (Vdc)**	**OCV at removal of crushing force (Vdc)**	**Maximum force applied to the cell during crush (kN)**	**Results**	
Samples charged at charging temperature upper limit					
Samples charged at charging temperature lower limit					

Supplementary information:

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

7.3.6	TABLE: Over-charging of battery				P
Constant charging current (A) .....:		60			—
Supply voltage (Vdc) .....:		100.8			—
Sample No.	**OCV before charging (Vdc)**	**Total charging time (minute)**	**Maximum outer case temperature (°C)**	**Results**	
RZ240041-012	63.32	70	22.6	P	
RZ240041-013	63.37	70	23.6	P	
RZ240041-014	63.39	70	23.7	P	
RZ240041-015	63.40	70	22.6	P	
RZ240041-016	63.34	70	23.6	P	

Supplementary information:

- No fire or explosion

7.3.7	TABLE: Forced discharge (cells)			N/A
Sample No.	**OCV before application of reverse charge (Vdc)**	**Measured reverse charge I_t (A)**	**Lower limit discharge voltage (Vdc)**	**Results**

Supplementary information:

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

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**
RZ240041-017	83.12	83.11	13964.5	13964.5	P
RZ240041-018	83.20	83.20	13976.0	13976.0	P
RZ240041-019	82.98	82.98	13979.5	13979.5	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**
RZ240041-020	82.98	82.98	13971.0	13971.0	P
RZ240041-021	83.04	83.04	13980.0	13980.0	P
RZ240041-022	82.87	82.87	13974.5	13974.5	P

Supplementary information:
- No fire or explosion
- No rupture
- No leakage
- No venting

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

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**
Samples charged at charging temperature upper limit					
Samples charged at charging temperature lower limit					

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.

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 an internal resistance less than or equal to 3 Ω, see test result on corresponding tables according to Clause 6 and Table 1.

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	Zhengzhou BAK Battery CO., LTD	N21700CG-50E	3.6V, 5000mAh, 18Wh	IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021	CB Certificate No.: JPTUV-143339
PCB	EXPRESS ELECTRONICS LTD	13MV0	V-0, 130°C	UL 796 UL 94	UL E157925
PCB (Alternative)	Interchangeable	Interchangeable	V-0, 130°C	UL 796 UL 94	UL approved
AFE (U1, U2)	Texas Instruments Incorporated	BQ7693003DBTR	VBAT: -0.3V to 36V; T_{STG}: -65°C to 150°C	--	Tested with appliance
MCU (U16)	STMicroelectronics	STM32G0B1RBT6	External supply voltage: -0.3 to 4V, T: -40°C to 85°C	--	Tested with appliance
Protection IC (U4, U5, U6, U7)	SINO WEALTH	SH367215S	VDD: -0.3V to 30V, Overcharge detection voltage: 4.22V, T: -40°C -85°C	--	Tested with appliance
MOSFET (Q75, Q79, Q82, Q83, Q84, Q62, Q63）	Wuxi NCE Power Co., Ltd	NCEP028N12LL	V_{DS}: 120V, V_{GS}: ±20V; I_D: 230A, T_{STG}: -55°C to 175°C	--	Tested with appliance
MOSFET (Q93, Q57, Q60, Q88)	Wuxi NCE Power Co., Ltd	NCE01P30K	V_{DS}: -100V, V_{GS}: ±20V, I_D: -30A, T_{STG}: -55°C to 175°C	--	Tested with appliance
Fuse (F4, F5)	ADVANCED SURGETECH MATERIALS LTD	A121001-50	50A, 125V	UL 248-1 UL 248-14	UL E470032
Fuse(F6)	ADVANCED SURGETECH MATERIALS LTD	PB05.15	15A, 125V	UL 248-1 UL 248-14	UL E355868
Plastic holder	Covestro Deutschland AG [PC Resins]	FR6005	105°C, V-0	UL 94 UL 746	UL E41613
Charge Connector	ZHEJIANG LIANHE ELECTRONIC CO LTD	SUPERSEAL 1.5	14A, 24V	UL 1977	UL E364711
Discharge Connector	Changzhou Amass Electronics Co Ltd	LCB50-F	MAX 90A, 600V	UL 1977	UL E482722

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

Charge Wiring	DONGGUAN ZHONGZHEN NEW ENERGY TECHNOLOGY CO.,LTD	2464	18AWG, 80 deg C, 300 Vac	UL 758	UL E355578
Charge Wiring (Alternative)	Interchangeable	Interchangeable	18AWG, 80 deg C, 300 Vac	UL 758	UL approved
Discharge Wiring	DONGGUAN ZHONGZHEN NEW ENERGY TECHNOLOGY CO.,LTD	3512	8AWG, 200 deg C, 600 Vac	UL 758	UL E355578
Discharge Wiring (Alternative)	Interchangeable	Interchangeable	8AWG, 200 deg C, 600 Vac	UL 758	UL approved
Enclosure	Dongguan Jingju Hardware Products Co., Ltd	ADC12	Thickness min: 3.5mm	--	--
Supplementary information: 1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

List of test equipment used:

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
5.2	Insulation and wiring	Insulation pressure tester (W-TC-028)	500V to 1000V DC,0.01MΩ to 9.99GΩ	2024-04-16	2025-04-15
7.1.1	First procedure	Charge discharge equipment (W-TC-067)	0V to 100V, 0.05A to 30A	2024-04-16	2025-04-15
7.2.2	Case stress at high ambient temperature (battery)	Temperature box (W-TC-091)	0°C to 100°C	2024-11-11	2025-11-10
		Handheld digital multimeter (W-TC-039)	0V to 100V	2025-01-02	2026-01-01
7.3.2	External short-circuit (battery)	Short-circuit test machine (W-TC-123)	0V to 100V, 0A to 300A	2024-09-02	2025-09-01
		Internal resistance tester (For measuring resistance of circuit) (W-TC-030)	1mΩ to 3Ω	2025-01-02	2026-01-01
		Handheld digital multimeter (W-TC-039)	0V to 100V	2025-01-02	2026-01-01
		Data collector/temperature recorder (W-TC-073)	0°C to 500°C	2024-04-16	2025-04-15
7.3.3	Free fall	Controlled drop platform (W-TC-021)	300mm to 1500mm	2024-04-16	2025-04-15
		Handheld digital multimeter (W-TC-039)	0V to 100V	2025-01-02	2026-01-01
7.3.6	Over-charging of battery	Charge discharge equipment (W-TC-067)	0V to 100V, 0.05A to 30A	2024-04-16	2025-04-15
		Handheld digital multimeter (W-TC-039)	0V to 100V	2025-01-02	2026-01-01
		Data collector/temperature recorder (W-TC-073)	0°C to 500°C	2024-04-16	2025-04-15
7.3.8.1	Vibration	Electric vibration system (W-TC-062)	0 to 200Hz; Acceleration 0g to 50g; 0mm to 20mm	2024-04-15	2025-04-14

		Handheld digital multimeter (W-TC-039)	0V to 100V	2025-01-02	2026-01-01
		Electronic balance (W-TC-060)	0.5g to 30000g	2024-09-02	2025-09-01
		Electric vibration system (W-TC-058)	0 to 200Hz; Acceleration 0g to 50g; 0mm to 20mm	2024-04-16	2025-04-15
7.3.8.2	Mechanical shock	Acceleration impact testing machine (W-TC-022)	Acceleration 1g to 590g; Pulse Width 1.5ms to 24ms	2024-05-24	2025-05-23
		Handheld digital multimeter (W-TC-039)	0V to 100V	2025-01-02	2026-01-01
		Electronic balance (W-TC-060)	0.5g to 30000g	2024-09-02	2025-09-01
8.2	Small cell and battery safety information	Food intake gauge (W-BZ-014)	A: 25.43 B: 57.15 C: Φ31.75	2024-09-04	2025-09-03

Attachment 1 Photo Documentation

Product: LI-ION BATTERY PACK

Type Designation: NDAF7230B

Picture 1. Front view of battery

Picture 2. Rear view of battery

Product: LI-ION BATTERY PACK

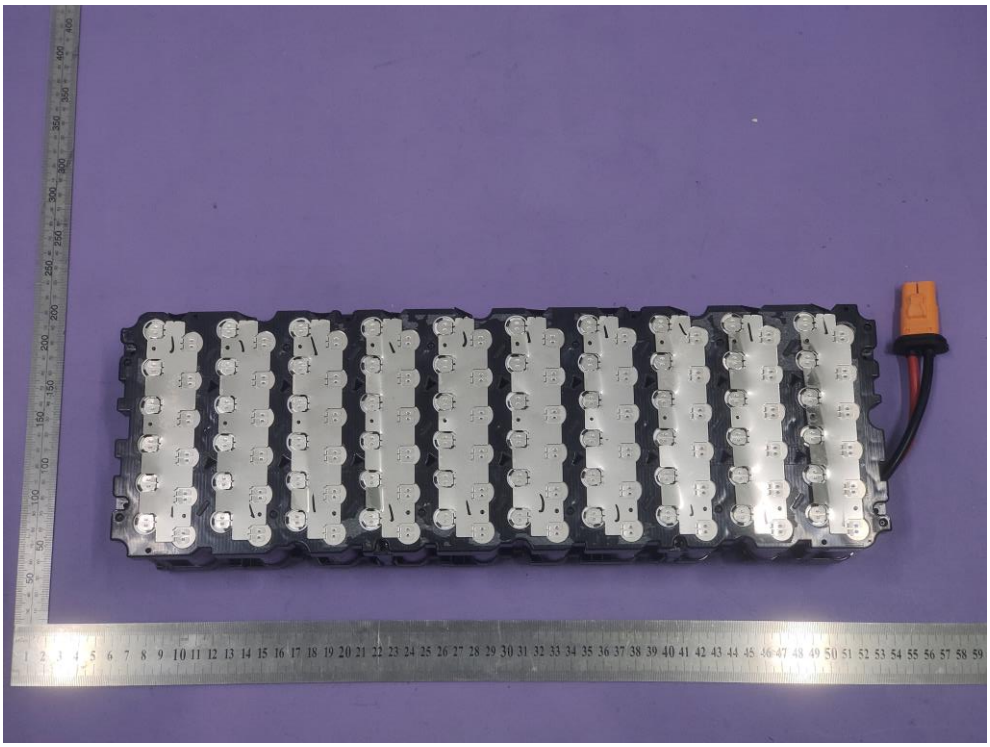
Type Designation: NDAF7230B

Picture 3. Top view of battery

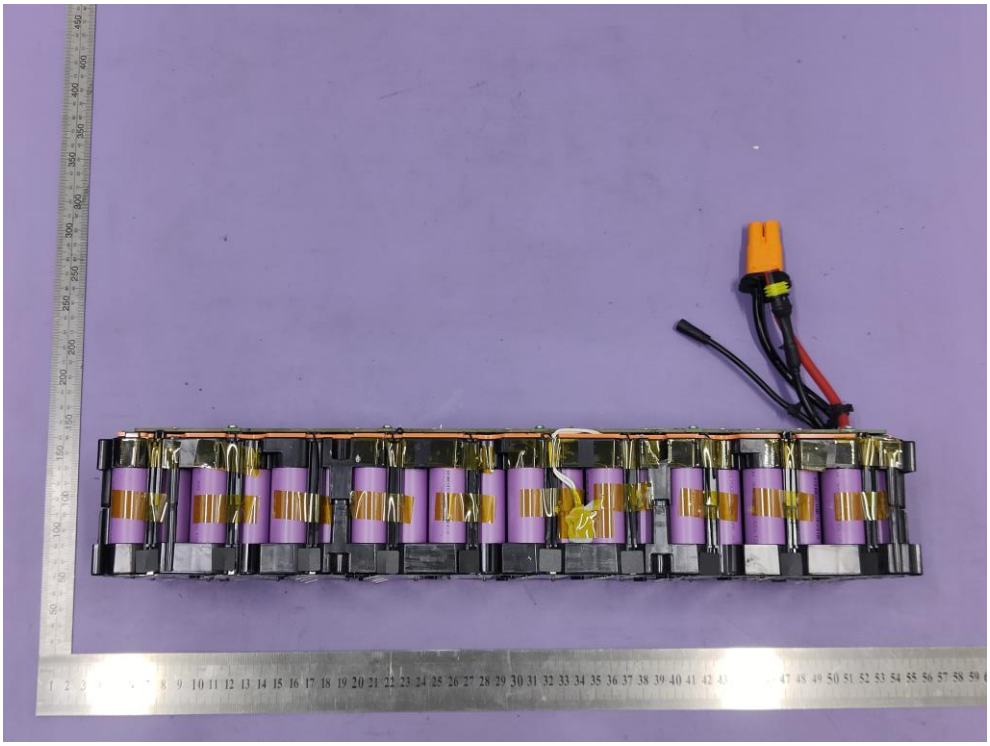
Picture 4. Internal view 1 of battery

Product: LI-ION BATTERY PACK

Type Designation: NDAF7230B



Picture 5. Internal view 2 of battery



Picture 6. Internal view 3 of battery

Product: LI-ION BATTERY PACK

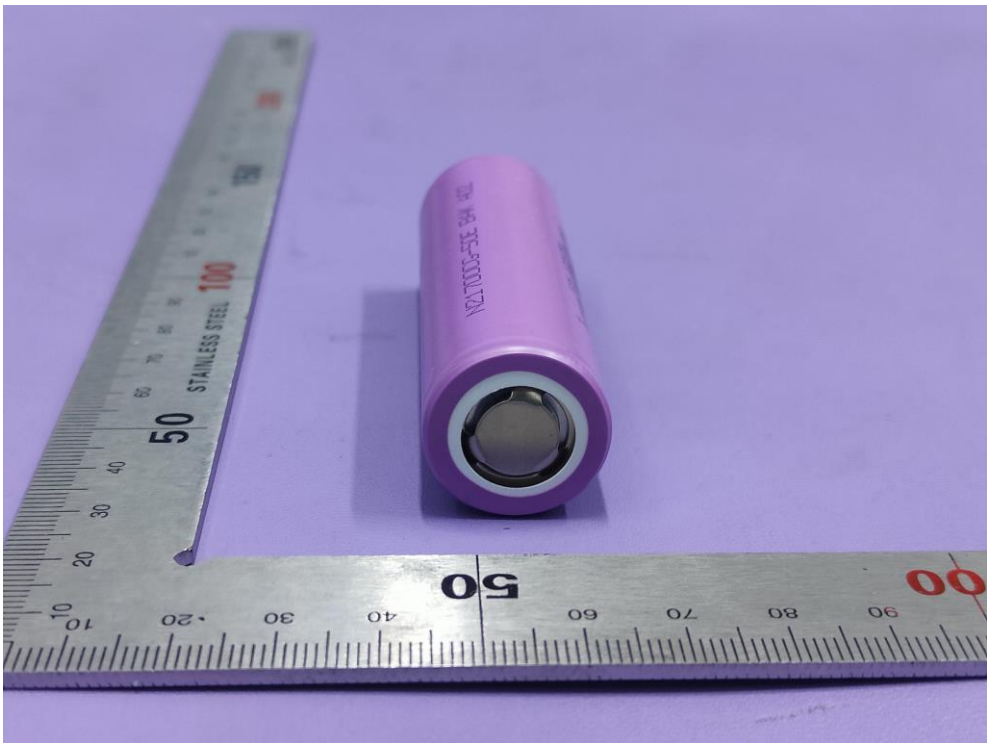
Type Designation: NDAF7230B

Picture 7. Front view 1 of the component cell

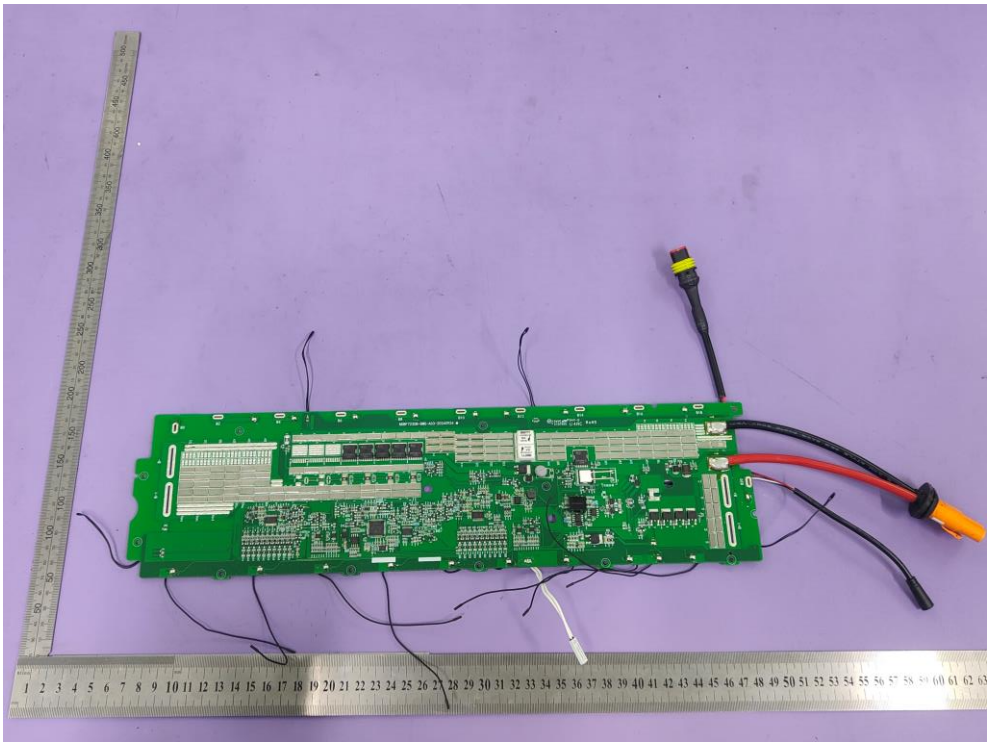
Picture 8. Rear view of the component cell

Product: LI-ION BATTERY PACK

Type Designation: NDAF7230B



Picture 9. Top view of the component cell

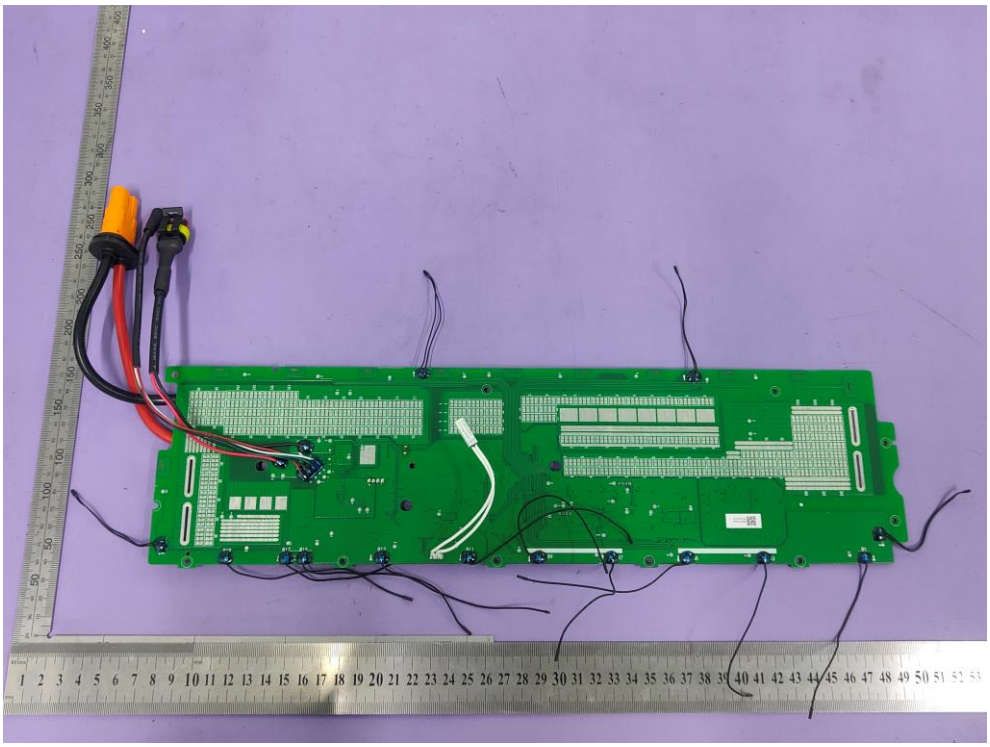


Picture 10. Front view of PCM

Attachment 1 Photo Documentation

Product: LI-ION BATTERY PACK

Type Designation: NDAF7230B



Picture 11. Rear view of PCM