

Specification of Product

- 1. Customer : General
- 2. Product : Lithium-ion Rechargeable Cell
- 3. SDI Model : INR21700-53G1 (non-tube cell)
- 4. Approved by

Division						
Signature						
Date	/	/	/	/	/	/

- 5. Date of Application (YY/MM/DD) : 2022/05/25
- 6. Supplier : **SAMSUNG SDI Co., Ltd.** Battery Business Division

Issued	Checked	Approved
SJ, Kim		
2022/05/25		

	SAMSU	SAMSUNG		
Spec. No.	INR21700-53G1	Version No.	1.2	SDI

Revision history

Revision No.	Date ('yr-m-d)	Page	Item	Description	Changes / Author
V0.0	`20-03-09			First version (Tentative)	SJ, KIM
V0.1	`20-04-27		Size of normal 2D is revised: 5.5mm * 5.5mm→6.4mm * 6.4mm (± 1mm)		SJ, KIM
V0.2	`20-05-12			Outline dimension is added: @SOC30	SJ, KIM
V0.3	′21-09-28			 Weight of Cell is revised. Inspection criteria is added. Spec. of Cell OCV is revised. Figure of cell outline dimensions is revised. Figure of upper and bottom tray drawing, pallet packaging process drawing is revised. Operating charging guide is added. 	Inae, Choi
V0.4	′21-12-09		9. Warranty	Updated with the latest information	Hoon Yim
V1.0	′22-02-17		5. Appearance	Fig 3 is revised.	Inae, Choi
V1.1	′22-05-13		9. Warranty	 Period of warranty is revised. : 24months → 36months 	Inae, Choi
V1.2	′22-05-25		5.2 2D marking	Fig. 4 Marking code of INR21700-53G1 is revised : Cell version marking is added.	Inae, Choi

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1. Scope

This product specification has been prepared to specify the rechargeable lithium-ion cell ("Cell" or "Cells") to be supplied to the customer by Samsung SDI Co., Ltd.("Samsung SDI")

2. Description and Model

2.1 Description	Cell (lithium-ion rechargeable cell)
2.2 Model	INR21700-53G (non-tube cell)

3. Nominal Specifications (*1)

Item	Specification
3.1 Standard discharge Capacity	Min. 5,140mAh, Typ. 5,300mAh - Charge: 0.33C(1,749mA), 4.2V, 0.025C(133mA) cutoff @ RT - Discharge : 0.2C(1,060mA), 2.5V cutoff @ RT (Avoid direct wind), * 1C = 5,300mA
3.2 Rated discharge capacity	Min. 5,140mAh, Typ. 5,300mAh - Charge: 0.33C(1,749mA), 4.2V, 0.025C(133mA) cutoff @ RT - Discharge : 1.0C(5,300mA), 2.5V cutoff @ RT (Avoid direct wind), * 1C = 5,300mA
3.3 Max charging Voltage	4.2V (4.15V for cycle life)
3.4 Nominal Voltage	3.63V
3.5 Charging Method	CC-CV (constant voltage with limited current)
3.6 Charging Current rate	0.33C (1,749mA)
3.7 Discharge Cut-off Voltage	2.5V (3.0V for cycle life)
3.8 Cycle life	RPT Capacity \geq 80% @ after 1,000cycles (80% of the Initial RPT Capacity @ RT) - Charge : 0.33C(1,749mA), 4.15V, CCCV 0.05C(265mA) cut-off @ RT - Discharge: 1C(5,300mA), 3.0V cut-off @ RT - RPT Method: Standard discharge Capacity test every 100cycles @RT
3.9 Cell Weight	70.5g±1.5g
3.10 Cell Dimension	Cell height: 70.00 ± 0.15 mm Diameter: Φ 21.15 \pm 0.20mm
3.11 Operating Temperature(^{*2}) (Cell Surface Temperature)	Charge : 0 to 50°C (refer to 13. operating charging guide) Discharge : -30 to 60°C
3.12 Recovery 80% after storage(* ³)	1 year : -20~25°C 3 months : -40~45°C 1 month : -40~60°C

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- Note (*1): Protection function of the battery pack should be set within the specified charge, discharge and temperature range in Cell Specification.
- Note (*²): Discharge OTP (over temp. protection) should not be over 65'C of Cell surface temperature. Protection set should be based on the location of Cell surface with the highest temp increase part of the battery pack (refer to 13-1. protection guide)
- Note (*³): If Cell is kept as ex-factory status (30% of charge), the capacity recovery rate is more than 80%.

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4. Outline Dimensions

See the Fig. 1



Fig. 1 Outline Dimensions of INR21700-53G1 (@SOC30)

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5. Appearance

There shall be no such defects as scratch, rust, discoloration, leakage which may adversely affect form, fit, function or safety of Cell.

5.1 Cosmetic: Cells shall arrive clean on all visible surfaces. Cells shall not exhibit signs of dirt, dust, pitch, electrolyte residue, haze, wax, oil, salts, powder, industrial fallout, contaminants, debris that could become loose, etc.



Fig. 2 SDI's inspection criteria of cell crimping area dent, provided that no electrolyte leak is observed and cells outer dimensions are within drawing requirements

Category	Detection area	Sample No.	Defect name	21700	Remark
Lategory	Detection area	Sample No.	Derect name	Non-tubing	(NG judgment standard)
		1	Can dented		Depth more than 0.1mm NG No Tube damage If can feel using fingertips
		2	Can scratch		Scratch length more than 5mm NG If can feel scratch using fingertips When check visually, can observe severe scratc
cida	Side	3	UL marking	Sensur 2	Marking partially erased
Side		4	2D marking		2D barcode not recognized Barcode erased
		5	No marking	U U U U U U U U U U U U U U U U U U U	-
	Impurity	6	Impurity		Impurity bigger than 0.5mm (Non-Tubing) / 1.5mm (Tubing) NG (Impurity, Contamination(include oil, grease) Short cells must all be scrapped
		7	Can dented		Depth more than 0.1mm NG
	тор	8	Can scratch		Scratch length more than 5mm NG If can feel scratch using fingertips When check visually, can observe severe scrat
Тор		9	Crimping Dent		Depth more than 0.2mm NG
	Impurity	10	Impurity		Impurity bigger than 0.5mm (Non-Tubing) , 1.5mm (Tubing) NG (Impurity, Contamination((include oil, grease Short cells must all be scrapped
		11	Can dented		Depth more than 0.1mm NG
Rottom	Bottom	12	Welding rod marking		Depth more than 0.1mm NG If can feel using fingertips except for copper tab model, should be no marking for welding rod % When welding rod marking occur during punching, require discussion among related
Bottom		13	Can scratch		Scratch length more than 5mm NG If can feel scratch using fingertips When check visually, can observe scratch
	Impurity	14	Impurity		Impurity bigger than 0.5mm (Non-Tubing) / 1.5mm (Tubing) NG (Impurity, Contamination((include oil, grease)

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Fig. 3 Cell cosmetic inspection criteria of INR21700-53G1

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5.2 2D Marking

- (1) Purpose
 - To reinforce detecting cell defects through comparing OCV before pack Manufacturing
 - → Check the difference of OCV between OCV of 2D barcode and OCV of Customer sorting.
- (2) 2D Marking Information
 - Cell batch number & Serial number (for SDI Internal)
 - IR/OCV in outgoing inspection (for Customers)
- (3) Size
 - Normal 2D: 6.4mm * 6.4mm (± 1mm)

				Ba	tch r	numl	oer					S	Seria	l Nu	mge	r	М	P da	te	Ver.	Ass lir	se'y ne			ocv	,			IR	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Ν	D	M	A	5	3	G	4	В	Α	0	3	1	0	1	Κ	Q	J	1	7	1	С	Τ	3	5	8	3	3	1	3	5

MP date

- character 18 : J year of 2019 (A 2010, B 2011...)
- character 19 : 1 month of Jan (A Oct., B Nov., C Dec.)
- character 20 : 7 day of 7 (A 10, B 11, ...)

Version

- character 21 : 1 of 53G1 (2 53G2, 3 53G3, ...)

- character 22 : C, Cheon-An of Korea

- character 23 : I of 18 line (1 1line, 2line, A 10line, B 11line, ...) OCV/IR
- character 24,25,26,27,28:3.5833mV
- ...) character 29,30,31 : 13.5mohm

Fig. 4 Marking code of INR21700-53G1

5.3 Appearance (Picture)



6. Standard Test Conditions

6.1 Environmental Conditions

Unless otherwise specified, all tests stated in this specification are conducted at temperature $25\pm3^{\circ}$ C and humidity under 60%.

- 6.2 Measuring Equipment
 - (1) Amp-meter and Volt-meter

The amp-meter and volt-meter should have an accuracy of the grade 0.5mA and mV or higher.

(2) Slide caliper

The slide caliper should have 0.01 mm scale.

(3) Impedance meter

The impedance meter with AC 1kHz should be used.

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7. Characteristics

7.1 Standard Charge

This "Standard Charge" means charging Cell CCCV with charge current of 0.33C (1,749mA) and constant voltage 4.2V and 0.025C(133mA) cut-off in CV mode at 25°C.

7.2 Standard Discharge Capacity

The standard discharge capacity is the initial discharge capacity of Cell, which is measured with discharge current of 0.2C(1,060mA) with 2.50V cut-off at 25°C within 10 min after the Standard charge.

Standard Discharge Capacity \geq 5,140mAh

7.3 Initial internal impedance

Initial internal impedance measured at AC 1kHz and SOC 30% (Shipping SOC).

Initial internal impedance 13.0 ± 5.0 m

7.4 Temperature Dependence of Discharge Capacity

Discharge capacity comparison at each temperature, measured with discharge constant current 0.2C (1,060mA) and 2.5V cut-off with follow temperature after the standard charging at 25°C.

Charge temperature		C	Discharge t	emperatur	е	
25 ℃	-20 ℃	-10 ℃	0 ℃	25 ℃	45 ℃	60 ℃
Cut-off voltage	2.5V	2.5V	2.5V	2.5V	2.5V	2.5V
Relative capacity	70%	75%	85%	100%	100%	95%

Note: If charge temperature and discharge temperature is not the same, the interval for temperature change is 4 hours.

Percentage as an index of the Standard discharge capacity (=5,140mAh) is 100%

7.5 Temperature Dependence of Charge Capacity

Capacity comparison at each temperature, measured with discharge constant current 0.2C (1,060mA) and 2.5V cut-off at 25°C after the standard charge is as follow temperature.

	Charg	e tempe	rature	Discharge temperature
	℃	25 ℃	50 ℃	25℃
Relative Capacity	90%	100%	95%	250

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Note: If charge temperature and discharge temperature is not the same, the interval for temperature change is 4 hours.

Percentage as an index of the standard discharge capacity (=5,140mAh) is 100%.

7.6 Charge Rate Capabilities

Discharge capacity is measured with constant current 0.2C (1,060mA) and 2.5V cut-off after Cell is charged with 4.2V at 25°C as follows.

	Charge Condition						
Current	0.33C (1,749mA)	0.5C (2,650mA)	1.0C (5,300mA)				
Cut-off	0.025C	0.025C	0.025C				
Relative Capacity	100%	100%	95%				

Note: Percentage as an index of the standard discharge capacity (=5,140mAh) is 100%.

7.7 Discharge Rate Capabilities

Discharge capacity is measured with the various currents in under table and 2.5V cut-off after the Standard charge at 25°C.

	Discharge Condition							
Current	0.2C (1,060mA)	0.5C (2,650mA)	1.0C (5,300mA)	1.5C (7,950mA)	2C (10,600mA)			
Relative Capacity	100%	100%	100%	85%	80%			

Note: Percentage as an index of the standard discharge capacity (=5,140mAh) is 100%.

7.8 Cycle Life

Each cycle is an interval between the charge [charge current 0.33C (1,749mA)] with 4.15V 0.05C cut-off and the discharge [discharge current 1C (5,300mA)] with 3.0V cut-off.

Capacity after 1000 cycles. RPT Capacity ≥ 80% of Initial RPT capacity

7.9 Status of Cell as of ex-factory

Cell should be shipped in $3.560V \sim 3.605V$ Charging voltage range.

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8. Safety

: UN38.3, UL1642

9. Warranty

Samsung SDI warrants that Cell will be free from defects in manufacturing and conform to this product specification for a period of 36 months from the date of shipping ("Warranty Period"). In case of breach of foregoing warranty during the Warranty Period, Samsung SDI shall provide replacement battery cells for the defective and/or non-conforming Cells as a sole and exclusive remedy for Customer. However, Samsung SDI shall not be liable for if (i) Cell was improperly installed, repaired, altered or otherwise modified (other than by Samsung SDI), (ii) Cell was subjected to misuse, abuse, negligence or accident, or (iii) Cell was used, handled, stored, sold or distributed in a manner contrary or inconsistent to the handling /use instructions provided in this product specification (including but not limited to the "Proper Use and Handling of Lithium Ion Cells", the "Pack Design Guideline for Lithium Ion Cells" and the "Handling precaution and prohibitions of lithium rechargeable Cells and batteries")and the customer environment test guidelines (if any).

THE WARRANTY IN THIS SECTION ARE IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED INCLUDING OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Customer shall not (a) resell the Products to third parties without SDI's prior consent; (b) reuse, or recycle the Products; or (c) use or store the Products (including the battery modules and packs incorporating Products) in a manner inconsistent with the Product Specification or for any purpose other than for the use and application agreed between Samsung SDI and Customer. ("Unauthorized Use"). In case of breach of the foregoing obligation, SDI shall not be liable for any of the warranties set forth in this Warranty Section. Further, Customer shall indemnify and hold harmless SDI and its affiliates, and their respective officers, directors, employees, agents, contractors and representatives from and against any and all losses, liabilities, claims, damages, investigations, proceedings, and cost and expenses (including court costs and attorney fees) arising out of or in connection with any Unauthorized Use or any use, reuse, recycle, handling, resale, distribution or storage of the Products that is inconsistent with this Warranty Section.

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10. Packaging

See Fig.5-1 ~ 5: Package Drawing



Fig. 5-1. Outer box package drawing.

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Fig. 5-2. Inner box package drawing.



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Fig. 5-3. Upper tray drawing.





Fig. 5-4. Bottom tray drawing.

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Fig. 5-5. Pallet packaging process



11. Cell Sorting Guideline

- \Box Cell Stock Condition: Temp 25 \pm 3 $^{\circ}$ C, Humidity less than 60%
- \Box FIFO(First in, first out)
- □ Batch Mixing: Within 1Month (30days) after receiving
- □ Do not mix use mass production Cells with sample Cells
- \Box Do not mix use Cells from different manufacturing site
- \Box Cell should be checked before being used (appearance, dv and IR etc)

Model	Shipping SOC	Cell OCV	Cell IR
■ INR21700-53G	30%	3.560~3.605V	Same as spec.

11.1 Cell OCV

- 11.1.1 During OCV inspection, OCV shifting value dV = OCV1 OCV2 need to be calculated, where OCV1 is OCV recorded in the cell barcode, OCV2 is cell OCV at the inspection date
- 11.1.2 Refer to Table 1 for dV spec. from manufacturing date to inspection date

day	Avg	Min	Max
0	0	0	0
10	3.6	1.8	6.1
20	5.3	2.6	9.1
30	6.6	3.2	11.6
40	7.8	3.7	13.7
50	8.9	4.2	15.7
60	9.9	4.6	17.6
70	10.8	5.0	19.4
80	11.7	5.4	21.0
90	12.6	5.8	22.7
100	13.4	6.1	24.2
110	14.2	6.5	25.7
120	15.0	6.8	27.2
130	15.7	7.1	28.6
140	16.4	7.4	30.0
150	17.2	7.7	31.4
160	17.9	8.0	32.8
170	18.5	8.3	34.1
180	19.2	8.6	35.4

Table 1. Specification of dV shifting with time (Effective for up to 180 days)

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12. xEV Pack Design & Validation

Sector	Item	Unit	Specification	
	🛛 Thermal Runaway	Module Design Checking (MUST)	 The purpose of gap between each cell in battery pack is; to minimize risk of fire of adjacent battery cells to prevent degradation of cell or CID open due to exposure on high temperature through facilitating heat emission At least 1.0mm gap between each cell must be maintained. Cell holder shall not be flamed. Cell holder must be non-flammable level V0 (or above V0). 	
Module Design	Current Distribution	Module Design Checking (MUST)	Multi-structure battery pack is composed of significant amount of Cyl, battery cells by serial-parallel. With this significant serial-parallel structure, level of cycle life, heat, voltage imbalance at charging or discharging, and safety level will be effected by current distribution design of the battery pack. → The current distribution design of pack must enable even distribution of current on each cell when charging/discharging.	
	፼ Heat Generation (Ni Tab & Cell Body)	1.0C to 2.0C Discharging Test	Abnormal heat source from the welding material can damage the battery (thermal damage). This phenomenon can cause safety or charging/discharging efficiency issues. → The temperature between the welding material and battery cell body must be under 10degC at maximum continuous discharge.	
	🖾 Non Soldering	Welding Design Checking	If battery cell is soldered, this can cause leakage of cell or unpredictable defect due to thermal damage. \rightarrow Soldering is PROHIBITED. Samsung SDI will NOT be liable for any defects caused by customer's misuse of the battery cells (including soldering).	
	🖾 Thermal Imbalance	Simulation Discharging Test	Thermal management for multi-structure battery pack that is composed of significant amount of cylindrical	
Pack Design	Charging Imbalance	Rated Charging Test	If the customer fails to equalize temperature in the battery pack, this can cause abnormal degradation of cycle life, imbalance, or inefficiency of charging/discharging. → The temperature difference between the center of the battery pack and each side of the pack must be below 5°C when charging, and under 10°C when discharging, which must be facilitated through	
	Discharging Imbalance	1.0C Discharging Test	 proper thermal management. % If needed, Samsung SDI can request and check thermal distribution record of battery pack and voltage imbalance data during pack charging/discharging from the customers. 	

- Samsung SDI may, at any time, conduct module or pack analyses at the customer's site to check the customer's compliance with the above specifications. The customer must provide all necessary assistance to Samsung SDI.

- If the parties are unable to resolve issues found during such site inspection, Samsung SDI may refuse to supply further products to the customer.

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13. Operating Charging Guide

Temperature(°C)	<0	0~5	5~10	10~20	20~30	30~40	40~50	>50
Charging Condition	Not permitted	0.15C 4.000 V	0.20C 4.050 V	0.25C 4.100 V	0.33C 4.150 V	0.33C 4.150 V	0.33C 4.125 V	Not permitted

* Notice

- Charging C-rate and voltage limit are determined according to ambient temperature

14. Compliance

. Customer shall comply with Cell's warranty conditions and guidelines in the specification sheet, and customer shall immediately notify Samsung SDI if customer reasonably believes that it cannot comply with the aforementioned conditions and guidelines.

15. Others

15.1 Storage for a long time

If Cell is kept for a long time (3months or more), It is strongly recommended that Cell is preserved at dry and low-temperature.

15.2 Other

Any matters that specifications does not have, should be conferred with between the both parties.

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Proper Use and Handling of Lithium Ion Cells

See before using lithium-ion cell

This document has been prepared to describe the appropriate cautions and prohibitions, which the customer should take or employ when the customer uses and handles the lithium ion cell to be manufactured and supplied by Samsung SDI in order to obtain optimum performance and safety.

1. Charging

1.1 Charging current

Charging current should be less than maximum charge current specified in the product specification.

1.2 Charging voltage

Charging should be done by voltage less than that specified in the product specification.

1.3 Charging time

Continuous charging under specified voltage does not cause any loss of performance characteristics. However, the charge timer is recommended to be installed from a safety consideration, which shuts off further charging at time specified in the product specification.

- 1.4 Charging temperature Cell should be charged within a range of specified temperatures in the specification.
- 1.5 Reverse charging

Cell should be connected, confirming that its poles are correctly aligned. Inverse charging should be strictly prohibited. If Cell is connected improperly, it may be damaged.

2. Discharging

2.1 Discharging

Cell shall be discharged continuously at less than maximum discharge current specified in the product specification. In case of the higher discharge current should be set, it shall be discussed together with SDI.

- 2.2 Discharging temperature
 - 2.2.1 Cell should be discharged within a range of temperatures specified in the product specification.
 - 2.2.2 Otherwise, it may cause loss of characteristics.

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- 2.3 Over-discharging
 - 2.3.1 The system should be equipped with a device to prevent further discharging exceeding discharging cut-off voltage specified in the product specification.
 - 2.3.2 Over-discharging may cause loss of performance, characteristics of battery function.
 - 2.3.3 Over-discharging may occur by self-discharge if the battery is left for a very long time without any use.
 - 2.3.4 The charger should be equipped with a device to detect Cell voltage and to determine recharging procedures.

3. Storage

- 3.1 Storage conditions
 - 3.1.1 Cell should be stored within a range of temperatures specified as below^{*1}. ^{*1} Store the battery at $0 \sim 23^{\circ}$ C, low humidity (below 60%), no dust and no
 - corrosive gas atmosphere
 - 3.1.2 Otherwise, it may cause loss of performance characteristics, leakage and/or rust etc.
- 3.2 Long-term storage
 - 3.2.1 Cell should be used within a short period after charging because long-term storage may cause loss of capacity by self-discharging.
 - 3.2.2 If long-term (but not longer than Warranty Period as set forth in Section 9 (Warranty)) storage is necessary, Cell shall be stored at shipping voltage, because storage with higher voltage may cause more loss of performance characteristics.
- 3.3 Storage period : Samsung SDI shall not be liable for any defects of cell after a period of 12 months from the date of shipping even if Cell is stored in accordance with Sections 3.1 and 3.2 above

4. Cycle life

- 4.1 Cycle life performance
 - 4.1.1 Cell can be charged/discharged repeatedly up to times specified in the produce specification with a certain level of capacity also specified in the product specification.
 - 4.1.2 Cycle life may be determined by conditions of charging, discharging, operating temperature and/or storage.

5. Battery Pack Assembly

- 5.1 Prohibition of usage of damaged Cell
 - 5.1.1 Cell should be inspected visually before battery assembly.

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- 5.1.2 Cell should not be used if sleeve-damage, can-distortion and/or electrolyte-smell is detected.
- 5.2 Terminals handling
 - 5.2.1 Excessive force on the negative terminal should be avoided when external strip terminal is welled.
- 5.3 Transportation
 - 5.3.1 If Cell is necessary to be transported to such as the battery manufacturer, careful precautions should be taken to avoid damage of Cell.

6. Others

- 6.1 Disassembly
 - 6.1.1 Cell should not be dismantled from the battery pack.
 - 6.1.2 Internal short-circuit caused by disassembly may lead to heat generation and/or venting.
 - 6.1.3 When the electrolyte is coming in contact with the skin or eyes, wash immediately with fresh water and seek medical advice.
- 6.2 Short-circuiting
 - 6.2.1 Short-circuit results in very high current which leads to heat generation.
 - 6.2.2 An appropriate circuitry should be employed to protect accidental short-circuiting.
- 6.3 Incineration
 - 6.3.1 Incinerating and disposing of Cell in fire are strictly prohibited, because it may cause rupture and explosion.

6.4 Immersion

6.4.1 Soaking Cell in water is strictly prohibited, because it may cause corrosion and leakage of components to be damaged to functions.

6.5 Mixing use

- 6.5.1 Different types of Cell, or same types but different Cell manufacturer's shall not be used, which may lead to Cell imbalance, Cell rupture or damage to system due to the different characteristics of Cell.
- 6.5.2 Do not mix use Cells from different batches/ranks even they are the same Cell types from the same manufacturer.

6.6 Battery disposal

- 6.6.1 Although Cell contains no environmentally hazardous component, such as lead or cadmium. the battery should be disposed according to the local regulations when it is disposed.
- 6.6.2 Cell should be disposed with a discharged state to avoid heat generation by an inadvertent short-circuit.

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6.7 Caution

- 6.7.1 The Battery used in this device may present a risk of fire or chemical burn if mistreated.
- 6.7.2 Do not disassemble, expose to heat above 100 $^\circ\!\!\! C$ or incinerate it.
- 6.7.3 Replace battery with Samsung SDI battery only.
- 6.7.4 Use of another battery may present a risk of fire or explosion.
- 6.7.5 Dispose of used battery promptly.
- 6.7.6 Keep away from children.
- 6.7.7 Do not disassemble and do not dispose of in fire.

1.2



Handling precaution and prohibitions of lithium rechargeable Cells and batteries

Inaccurate handling of lithium ion and lithium ion batteries rechargeable battery may cause leakage, heat, smoke, an explosion, or fire.

This could cause deterioration of performance or failure. Please be sure to follow instructions carefully.

1. Safety precaution and prohibitions

To assure product safety, describe the following precautions in the instruction manual of the application.

2. Danger

- 2.1 Electrical misusage
 - 2.1.1 Use dedicated charger.
 - 2.1.2 Use or charge the battery only in the dedicated application.
 - 2.1.3 Don't charge the battery by an electric outlet directly or a cigarette lighter charger.
 - 2.1.4 Don't charge the battery reversely.
- 2.2 Environmental misusage
 - 2.2.1 Don't leave the battery near the fire or a heated source.
 - 2.2.2 Don't throw the battery into the fire.
 - 2.2.3 Don't leave, charge or use the battery in a car or similar place where inside of temperature may be over 60° C.
 - 2.2.4 Don't immerse, throw, wet the battery in water / seawater.

2.3 Others

- 2.3.1 Don't fold the battery cased with laminated film such as pouch and Polymer.
- 2.3.2 Don't store the battery in a pocket or a bag together with metallic objects such as keys, necklaces, hairpins, coins, or screws.
- 2.3.3 Don't short circuit (+) and (-) terminals with metallic object intentionally.
- 2.3.4 Don't pierce the battery with a sharp object such as a needle, screw drivers.
- 2.3.5 Don't heat partial area of the battery with heated objects such as soldering iron.
- 2.3.6 Don't hit with heavy objects such as a hammer, weight.
- 2.3.7 Don't step on the battery and throw or drop the battery on the hard floor to avoid mechanical hock.
- 2.3.8 Don't disassemble the battery or modify the battery design including electric circuit.
- 2.3.9 Don't solder on the battery directly.
- 2.3.10 Don't use seriously scarred or deformed battery.
- 2.3.11 Don't put the battery into a microwave oven, dryer ,or high-pressure container.
- 2.3.12 Don't use or assemble the battery with other makers' batteries, different types and/or models of batteries such as dry batteries, nickel-metal hydride batteries, or nickel-cadmium batteries.
- 2.3.13 Don't use or assemble old and new batteries together.

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3. Warning

- 3.1 Stop using the battery if the battery becomes abnormally hot, odor, discoloration, deformation, or abnormal conditions is detected during use, charge, or storage.
- 3.2 Keep away from fire immediately when leakage or foul odors are detected. If liquid leaks onto your skin or clothes, wash well with fresh water immediately.
- 3.3 If liquid leaking from the battery gets into your eyes, don't rub your eyes and wash them with clean water and go to see a doctor immediately.
- 3.4 If the terminals of the battery become dirty, wipe with a dry cloth before using the battery.
- 3.5 Cover terminals with proper insulating tape before disposal.
- Vape or E-cigarette devices warning

Samsung SDI's cells are not designed or manufactured for use in any vape or e-cigarette devices.

Samsung SDI's cells are designed for use and to be incorporated in a battery management unit that reduces the risk of thermal runway.

Samsung SDI's cells are not designed for and should not be handled by any individual consumer.

Samsung SDI did not authorize any third parties, including vape or e-cigarette device manufacturers, retailers and distributors to sell or use Samsung SDI's cells for individual consumers as power sources in e-cigarettes or vape devices.

Any online e-commerce sales, sales to individual consumers, or sales to third parties for such purpose are strictly prohibited.

4. Caution

4.1 Electrical misusage

Battery must be charge with constant current-constant voltage (CC/CV).

- 4.2 Others
 - 4.2.1 Keep the battery away from babies and children to avoid any accidents such as swallow.
 - 4.2.2 If younger children use the battery, their guardians should explain the proper handling method and precaution before using.
 - 4.2.3 Before using the battery, be sure to read the user's manual and precaution of its handling.
 - 4.2.4 Before using charger, be sure to read the user's manual of the charger.
 - 4.2.5 Before installing and removing the battery from application, be sure to read user's manual of the application.
 - 4.2.6 Replace the battery when using time of battery becomes much shorter than usual.
 - 4.2.7 Cover terminals with insulating tape before proper disposal.
 - 4.2.8 If the battery is needed to be stored for an long period, battery should be removed from the application and stored in a place where humidity and temperature are low.
 - 4.2.9 While the battery is charged, used and stored, keep it away from object materials with static electric chargers.

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5. Safety Handling Procedure for the Transporter

5.1 Quarantine

Packages that are crushed, punctured or torn open to reveal contents should not be transported. Such packages should be isolated until the shipper has been consulted, provided instructions and, if appropriate, arranged to have the product inspected and repacked.

5.2 Spilled Product

In the event that damage to packaging results in the release of Cells or batteries, the spilled products should be promptly collected and segregated and the shipper should be contacted for instructions.

Handling Guide for Non-Tubing (Nude) Cells

Improper handling of Non-Tubing Cells may cause short, rust or appearance defects. Please be sure to follow instructions carefully.

1. Rust Prevention

Do not handle Cells with bare hands. Use gloves & mask when handling Cells. (Palm Fit Gloves are recommended.)

Do not use contaminated gloves by water, sweat or any kinds of stains.

Do not expose Cells to the high temperature and humidity.

* Battery shall be stored at 0 \sim 23 $^\circ\!{\rm C}$, and humidity below 60%.

2. Short Protection

Do not short circuit (+) and (-) terminals with metallic object. Do not put a Cell in contact with the other Cells. Do not drop Cells on the other Cells when take out Cells from the box.

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