

Spec. No.	INR18650-29E	Version No.	1.0
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# **Specification of Product (For EV)**

**for Lithium-ion rechargeable cell**

**Model name : INR18650-29E**

**October 11, 2016**

**Samsung SDI Co., Ltd.  
Battery Business Division**



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**Revision history**

Revision No.	Date (yr-m-d)	Page	Item	Description	Changes / Author
V0.0	'15-03-25			First version	SangHun Jeong Bryan Lim
V1.0	'16-07-06			First version _ for GBT	SangHun Jeong

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## 1. Scope

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

## 2. Description and Model

2.1 Description	Cell (lithium-ion rechargeable cell)
2.2 Model	INR18650-29E
2.3 Site	Manufactured in China & Korea

## 3. Nominal Specifications

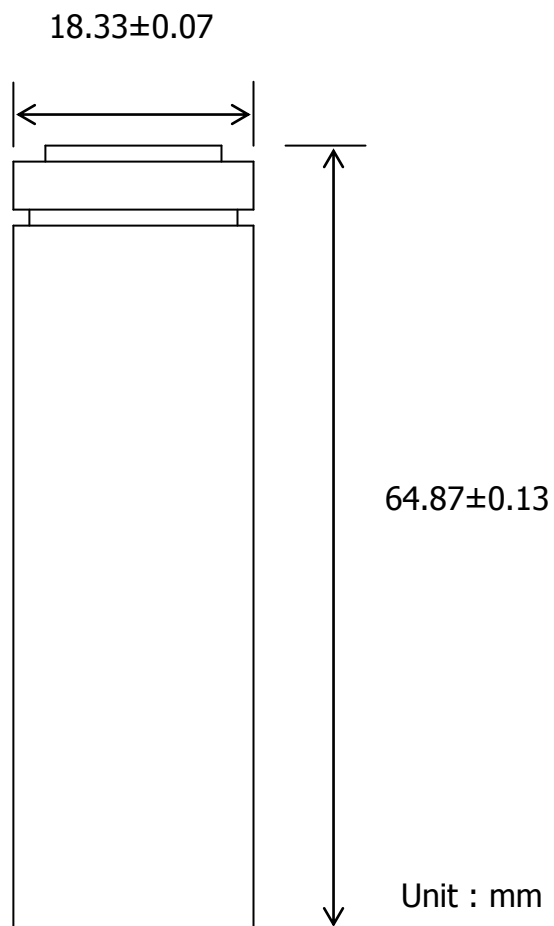
Item	Specification
3.1 Standard Discharge Capacity	<u>Min 2,500mAh</u> - Charge : 0.33C(825mA), 4.125V, 0.025C(62.5mA) cutoff @RT - Discharge : 1C(2,500mA), 2.5V cutoff @ RT * 1C = 2,500mA
3.2 Charging Voltage	4.125V
3.3 Nominal Voltage	3.70V
3.4 Charging Method	CC-CV (constant voltage with limited current)
3.5 Charging Current rate	0.33C (825mA)
3.6 Discharge Current rate	1C (2,500mA)
3.7 Discharge Cut-off Voltage	2.5V
3.8 Operating Temperature (Cell Surface Temperature)	Charge : 0 to 45°C Discharge : -20 to 60°C
3.9 Cycle life	Capacity ≥ 2,000mAh @ after 1000cycles (80% of the standard discharge Capacity @ RT) - Charge : 0.33C(825mA), 4.125V, CCCV 62.5mA cut-off @ RT - Discharge: 1C(2,500mA) , 2.5V cut-off @ RT
3.10 Storage Temperature	1 year : -20~25°C (1*) 3 months : -20~45°C (1*) 1 month : -20~55°C (1*)
3.11 Cell Weight	44.8±2g
3.12 Cell Dimension	Height: 64.87±0.13 mm Diameter: 18.33±0.07 mm

Note (\*1) : Item 3.1~3.10 shall follow "7. INR18650-29E Performance Usable Range"

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#### 4. Outline Dimensions

See the Fig. 1



**Fig. 1 Outline Dimensions of INR18650-29E**

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## 5. Appearance

There shall be no such defects as scratch, rust, discoloration, leakage which may adversely affect commercial value of the cell.

### 5.1 2D Marking

#### (1) Purpose

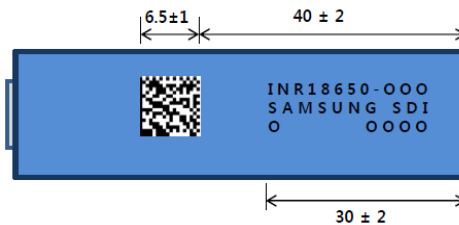
- To reinforce detecting cell defects through comparing OCV & IR before pack manufacturing  
→ Check the difference of OCV/IR between OCV/IR of 2D barcode and OCV/IR of customer sorting.
- To improve traceability

#### (2) 2D Marking Information

- Cell batch number & Serial number (for SDI Internal)
- IR/OCV in outgoing inspection (for Customers)

#### (3) Size & Location

- Size : 6.5mm \* 6.5mm ( $\pm 1$ mm)
- Location :  $40 \pm 2$ mm



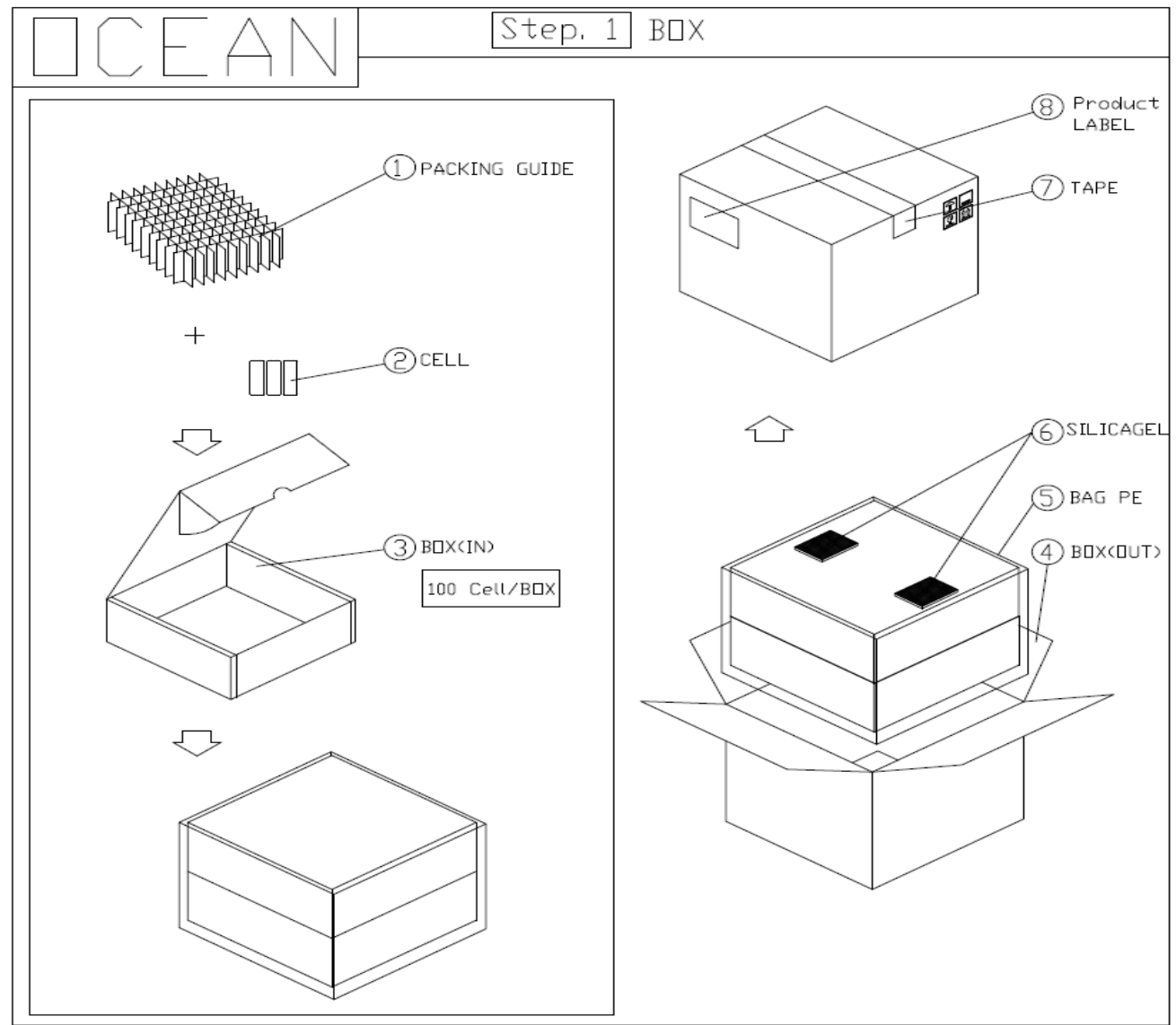
### 5.2. Appearance (Picture)



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## 6. Packaging

NO	PART NAME	MATERIAL	Q'ty	NO	PART NAME	MATERIAL	Q'ty
1	PACKING GUIDE	MANILA 300g	2 pcs /BOX	9	Ship.Lot LABEL	ART PAPER	1 pcs /PALLET
2	CELL	CILINDERICAL	200 pcs /BOX	10	PAL LABEL	ART PAPER	1 pcs /PALLET
3	BOX(PACKING CASE IN)	SW1-E	2 pcs /BOX	11	PALLET	PLASTIC	1 pcs /PALLET
4	BOX(PACKING CASE OUT)	DW1-BA	1 pcs /BOX	12	CORNER BLOCK	C.F.B	8 pcs /PALLET
5	BAG PE	LD-PE	1 pcs /BOX	13	PALLET VINYL	LD-PE	1 pcs /PALLET
6	SILICAGEL	SI	2 pcs /BOX	14	WRAP STRETCH	LD-PE	0.044 ROL/PALLET
7	TAPE	OPP	0.02ROL/BOX	15	BAND (BAND PP)	PP	0.016 ROL/PALLET
8	Product LABEL	ART PAPER	1 pcs/BOX	16	Stack LABEL	ART PAPER	1 pcs /PALLET
				17	Inspection LABEL	ART PAPER	1 pcs /PALLET



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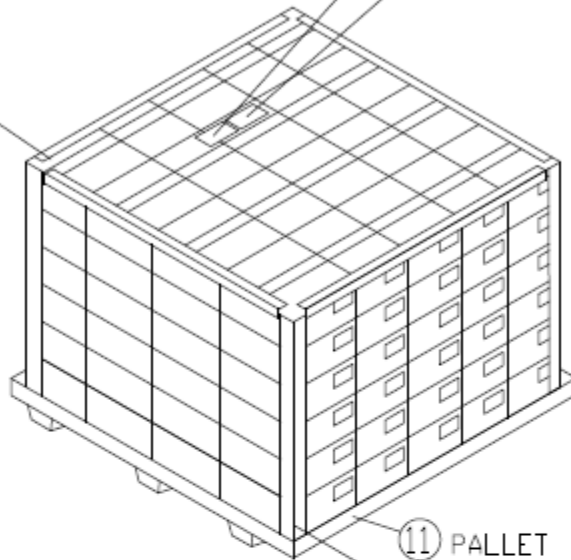
OCEAN

Step. 2 PALLET

->Attach a label on the Box. ⑨ Ship.Lot LABEL

⑩ PAL LABEL

20 X 6 Layer



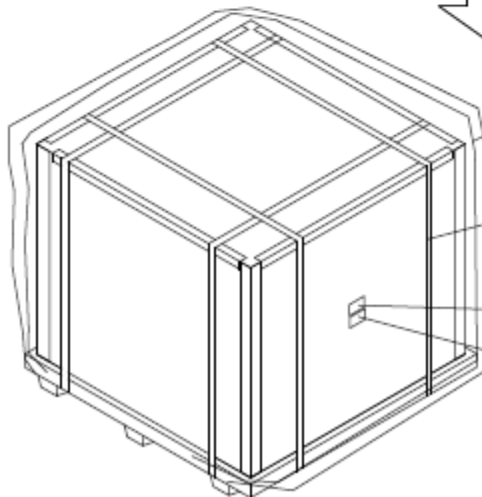
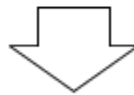
⑪ PALLET

⑫ CORNER BLOCK

200 Cell/Box  
120 Box/Pallet  
24,000 Cell/Pallet  
Full Pallet

->Boxes must piled up in Block Pattern.

Block Pattern



⑬ PALLET VINYL

⑭ WRAP STRETCH

⑮ BAND

⑯ Stack LABEL

⑰ Inspection LABEL

->Attach a label on wrap stretch.

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### 7. INR18650-29E Performance Usable Range

④ Usable Voltage Range      Low Temp Charging Algorithm Check      DC/AC Inverter Operating Voltage Check

Cell Surface	Charge Max Voltage (V)			Discharge Min Voltage (V)		
	Operating Limit	Pulse Limit	Safety Limit	Operating Limit	Pulse Limit	Safety Limit
-20°C	Not permitted			2.000V	2.000V	1.500V
-10°C				2.000V	2.000V	1.500V
0°C	4.025V	4.150V	4.200V	2.300V	2.300V	2.000V
10°C	4.100V	4.150V	4.200V	2.300V	2.300V	2.000V
25°C	4.100V	4.150V	4.200V	2.500V	2.300V	2.000V
45°C	4.100V	4.150V	4.200V	2.500V	2.300V	2.000V
50°C	4.000V	4.150V	4.200V	2.500V	2.300V	2.000V
60°C	Not permitted			2.500V	2.300V	2.000V

④ Usable Current Range

Cell Surface	Charge Max Current (A)				Discharge Max Current / BOL (A)				
	2sec	5sec	10sec	Continuous	2sec	5sec	10sec	30sec	Continues
-20°C	Not permitted				2A	1A	1A	1A	1A
-10°C					1A	1A	0.3A	6A	5A
0°C	2A	2A	1A	0.5A	10A	8A	6A	5A	3A
10°C	3A	2A	2A	1A	12A	10A	8A	6A	3A
25°C	5A	3A	2A	1A	12A	10A	8A	6A	4A
40°C	5A	3A	2A	1A	12A	10A	8A	6A	4A
50°C	2A	1A	1A	0.5A	8A	6A	5A	4A	2A
60°C	Not permitted				6A	4A	3A	2A	1A

Motor Regeneration Charging (SOC 95%)

Usable Discharge Power Range (30sec)

Cell Surface	Discharge Max Power (W)									
	SOC10	SOC20	SOC30	SOC40	SOC50	SOC60	SOC70	SOC80	SOC90	SOC100
-20°C	1	3	8	12	13	17	18	18	18	18
-10°C	2	9	16	20	23	23	23	23	23	23
0°C	5	15	23	23	23	23	23	23	23	23
10°C	11	23	23	23	23	23	23	23	23	23
25°C	23	23	23	23	23	23	23	23	23	23
40°C	23	23	23	23	23	23	23	23	23	23
50°C	18	18	18	18	18	18	18	18	18	18
60°C	12	12	12	12	12	12	12	12	12	12

Usable Charge Power Range (10sec)

Cell Surface	Charge Max Power (W)									
	SOC0	SOC10	SOC20	SOC30	SOC40	SOC50	SOC60	SOC70	SOC80	SOC90
-20°C	Not permitted									
-10°C	10	10	10	10	10	9	5	4	2	-
0°C	18	18	18	18	18	14	11	7	5	2
10°C	18	18	18	18	18	18	18	11	8	4
25°C	18	18	18	18	18	18	18	18	14	6
40°C	18	18	18	18	18	18	18	18	18	8
50°C	16	16	16	16	16	16	16	16	16	8
60°C	Not permitted									

Usable Discharge Power Range (Continuous)

Cell Surface	Discharge Max Power (W)									
	SOC10	SOC20	SOC30	SOC40	SOC50	SOC60	SOC70	SOC80	SOC90	SOC100
-20°C	1	3	8	12	13	17	18	18	18	18
-10°C	2	9	16	20	23	23	23	23	23	23
0°C	5	15	23	23	23	23	23	23	23	23
10°C	11	23	23	23	23	23	23	23	23	23
25°C	16	16	16	16	16	16	16	16	16	16
40°C	14	14	14	14	14	14	14	14	14	14
50°C	12	12	12	12	12	12	12	12	12	12
60°C	7	7	7	7	7	7	7	7	7	7

Usable Charge Power Range (Continuous)

Cell Surface	Charge Max Power (W)									
	SOC0	SOC10	SOC20	SOC30	SOC40	SOC50	SOC60	SOC70	SOC80	SOC90
-20°C	Not permitted									
-10°C	Not permitted									
0°C	18	18	18	18	18	14	11	7	5	2
10°C	18	18	18	18	18	18	18	11	8	4
25°C	13	13	13	13	13	13	13	13	10	6
40°C	11	11	11	11	11	11	11	11	11	6
50°C	10	10	10	10	10	10	10	10	10	5
60°C	Not permitted									

- This above table has been prepared to help minimize field cycle degradation, therefore must be reflected in the customer's module/pack design.



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## 8. Pack Design Guideline

### 8-1. Pack Design Guideline (For electrical design)

Item	1級	2級	3級	Protection	Remark
☒ Cell Over Voltage	4.150V	4.175V	4.200V	4.200V	Warning & Protection
☒ Cell Under Voltage	3.40V	3.00V	2.50V	29E 33G 2.50V 22P 26P 2.80V	Warning & Protection
☒ Warning SOC %	SOC 40%	SOC 30%	SOC 20%	SOC 0%	Power Control
☒ Charging Over Temperature	45℃	50℃	55℃	55℃	Warning & Protection
☒ Charging Under Temperature	10℃	5℃	0℃	0℃	Power Control
☒ Discharging Over Temperature	50℃	55℃	60℃	65℃	Power Control
☒ Discharging Under Temperature	0℃	-10℃	-20℃	-30℃	Power Control
☒ Charging Over Current	0.6C	0.8C	1.0C	1.0C	Protection
☒ Discharging Over Current	4.0C	5.0C	6.0C	6.0C	Protection
☒ Charging Imbalance Voltage	150mV	300mV	500mV	500mV	Warning & Protection
☒ Discharging Imbalance Voltage	300mV	500mV	1000mV	1000mV	Warning & Protection
☒ Charging Imbalance Temp	5℃	10℃	15℃	15℃	Warning & Protection
☒ Discharging Imbalance Temp	10℃	15℃	20℃	20℃	Warning & Protection
☒ Communication Error			○	○	Protection
☒ Thermal Runaway			○	○	Protection

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## 8-2. Pack Design Guideline (For mechanical design)

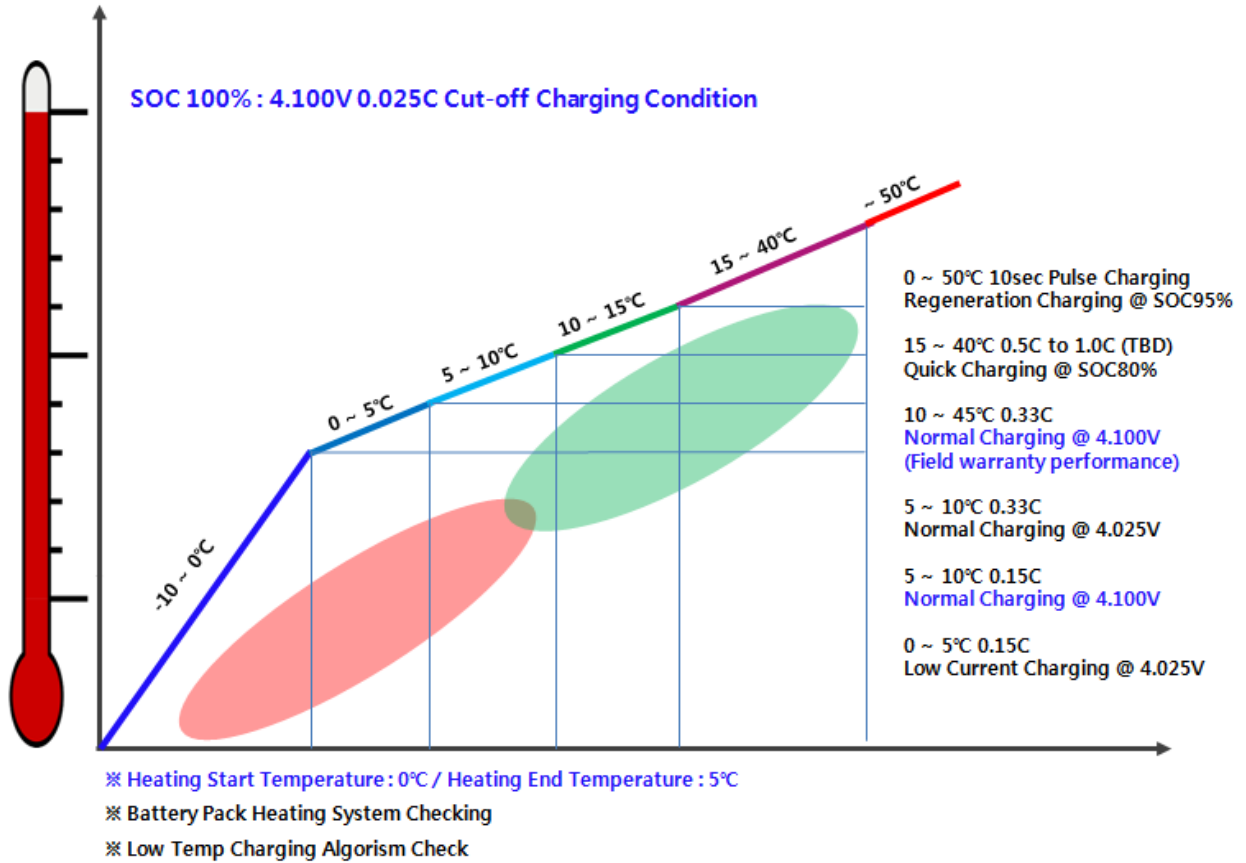
Item	Discription
☒ Thermal Runaway Design → Module Design Checking	1. The purpose of gap between each cell in battery pack is; 1) to minimize risk of fire of adjacent battery cells 2) to prevent degradation of cell or CID open due to exposure on high temperature through facilitating heat emission <b>→ At least 2.0mm gap between each cell must be maintained.</b> 2. Cell core case shall not be flamed. <b>→ Cell core case must be non-flammable level V0 (or above V0).</b>
☒ Current Distribution Design → Module Design Checking	Basically, battery pack for xEV is composed of significant amount of cylindrical 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. <b>→ The current distribution design of pack must enable even distribution of current on each cell when charging/discharging.</b>
☒ 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. <b>→ The temperature between the welding material and battery cell body must be under 10degC at maximum continuous discharge.</b>
☒ Non Soldering Design	If battery cell is soldered, this can cause leakage of cell or unpredictable defect due to thermal damage. <b>→ Soldering is PROHIBITED. Samsung SDI will NOT be liable for any defects caused by customer' s misuse of the battery cells (including soldering).</b>
☒ Thermal Imbalance Check	Thermal management for Li-ion battery pack of xEV that is composed of significant amount of cylindrical Li-ion battery cell is very important. 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. <b>→ The temperature difference between the center of the battery pack and each side of the pack must be below 5℃ when charging, and under 10℃ when discharging, which must be facilitated through proper thermal management.</b> ※ If needed, Samsung SDI can request and check thermal distribution record of xEV pack and voltage imbalance data during pack charging/discharging from the customers.
☒ BOL Charging Imbalance Check	
☒ BOL Discharging Imbalance Check	

**- 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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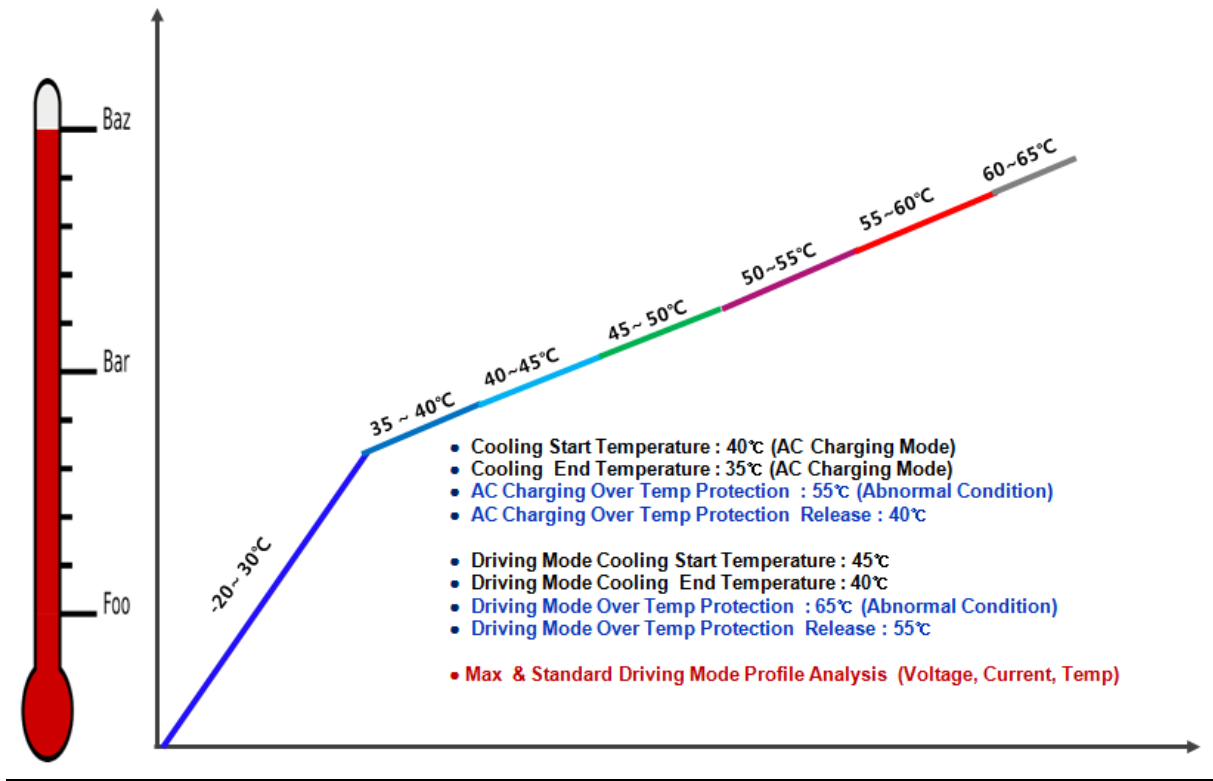
### 9. Low Temp Charging & Heating & Regeneration Charging Guide



- The above condition must be complied with when low temperature charging, heating, and regeneration charging of the cylindrical Li-ion battery for xEV.
- If the customer anticipates any problems in meeting the above conditions, customer must immediately notify Samsung SDI, and the parties will discuss.

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### 10. Charging & Driving Mode Cooling Guide



- The above conditions must be complied with, when cooling at charging or at driving mode of the cylindrical Li-ion battery for xEV.
- If the customer anticipates any problems in meeting the above conditions, customer must immediately notify Samsung SDI, and the parties will discuss.

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### 11. Cell Sorting Guideline

- Cell Stock Condition : Temp  $25 \pm 3^{\circ}\text{C}$ , Humidity less than 60%
- Batch Mixing : 1 Month (30days)
- 1<sup>st</sup> Pack Charging Imbalance Voltage : Less than 15mV

Model	Shipping SOC	Cell OCV	Cell IR
<input checked="" type="checkbox"/> ICR18650-22P	50% → 30%	X bar $\pm$ 10mV	Same as spec.
<input checked="" type="checkbox"/> INR18650-26P	50% → 30%	X bar $\pm$ 10mV	Same as spec.
<input checked="" type="checkbox"/> INR18650-29E	30%	X bar $\pm$ 10mV	Same as spec.
<input checked="" type="checkbox"/> INR18650-33G	30%	X bar $\pm$ 10mV	Same as spec.

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## 12. Standard Test Conditions

### 12.1 Environmental Conditions

Unless otherwise specified, all tests stated in this specification are conducted at temperature  $25\pm 3^{\circ}\text{C}$  and humidity under 60%.

### 12.2 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.

## 13. Characteristics

### 13.1 Standard Charge

This "Standard Charge" means charging the cell with charge current of 0.33C(825mA) and constant voltage 4.125V at  $25^{\circ}\text{C}$ , 0.025C(62.5mA) cutoff.

### 13.2 Standard Discharge Capacity

The standard discharge capacity is the initial discharge capacity of the cell, which is measured with discharge current of 1C(2,500mA) with 2.50V cut-off at  $25^{\circ}\text{C}$  within 1 hour after the Standard charge.

$$\text{Standard Discharge Capacity} \geq 2,500\text{mAh}$$

### 13.3 Initial internal impedance

Initial internal impedance is measured at AC 1kHz after Standard charge.

$$\text{Initial internal impedance} = 21 \pm 4\text{m}\Omega$$

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#### 13.4 Temperature Dependence of Discharge Capacity

Discharge capacity comparison at each temperature, measured with discharge constant current 1C(2,500mA) and each cut-off voltage with follow temperature after the Standard charging at 25°C.

Charge temperature	Discharge temperature						
	25°C	-20°C	-10°C	0°C	25°C	40°C	60°C
Cut-off voltage	2.0V	2.5V	2.5V	2.5V	2.5V	2.5V	2.5V
Relative capacity	70%	80%	85%	100%	100%	100%	95%

Note: If charge temperature and discharge temperature is not the same, the interval for temperature change is 2 hours.

Percentage as an index of the Standard discharge capacity (=2,500mAh) is 100%.

#### 13.5 Temperature Dependence of Charge Capacity

Capacity comparison at each temperature, measured with discharge constant current 1C(2,500mA) and 2.50V cut-off at 25°C after the Standard charge is as follow temperature.

	Charge temperature				Discharge temperature
	0°C	10°C	25°C	45°C	
Relative Capacity	90%	90%	100%	100%	25°C

Note: If charge temperature and discharge temperature is not the same, the interval for temperature change is 2 hours.

Percentage as an index of the Standard discharge capacity(=2500mAh) is 100%.

#### 13.6 Charge Rate Capabilities

Discharge capacity is measured with constant current 1C(2,500mA) and 2.50V cut-off after the cell is charged with 4.125V at 25°C as follows.

	Charge Condition		
Current	0.33C (825mA)	0.5C (1250mA)	1.0C (2500mA)
Cut-off	0.025C	0.025C	0.025C
Relative Capacity	100%	100%	95%

Note: Percentage as an index of the Standard discharge capacity (=2500mAh) is 100%.

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### 13.7 Discharge Rate Capabilities

Discharge capacity is measured with the various currents in under table and 2.50V cut-off after the Standard charge at 25°C.

Current	Discharge Condition			
	0.33C (825mA)	0.5C (1250mA)	1C (2,500mA)	2C (5,000mA)
Relative Capacity	100%	100%	100%	90%

Note: Percentage as an index of the Standard discharge capacity (=2,500mAh) is 100%.

### 13.8 Cycle Life

Each cycle is an interval between the charge (charge current 0.33C(825mA) )with 0.025C cut-off and the discharge (discharge current 1C(2500mA) with 2.50V cut-off. Capacity after 1000 cycles.

Capacity  $\geq$  2,000mAh (80% of Standard discharge capacity)

### 13.9 Storage Characteristics 1

After storage for 7days at 55 $\pm$ 2 °C with the standard charge, capacity after storage for 5hr at RT is measured with discharge current 1C(2500mA) with 2.50V cut-off at 25°C.

Capacity recovery(after the storage)  $\geq$  2,250mAh (90% of Standard discharge capacity)

### 13.10 Storage Characteristics 2

After storage for 28days at RT with the standard charge, capacity is measured with discharge current 1C(2500mA) with 2.50V cut-off at 25°C.

Capacity recovery(after the storage)  $\geq$  2,250mAh (90% of Standard discharge capacity)

### 13.11 Status of the cell as of ex-factory

The cell should be shipped in 3.450~3.650V(Xbar $\pm$ 10mV) Charging voltage range.



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## 14. Safety

☒ **GB/T 31484 31485 31486 Certificate, UN38.3**

## 15. Warranty

Samsung SDI warrants that the battery products will be free from defects in manufacturing for a period of twenty four (24) months from the date of shipping. In case of defects, Samsung SDI will replace the affected battery cells, provided that Samsung SDI will not be liable for any defects which are caused by customer or any other person's misuse or mishandling of the products (including any non-compliance with the handling / use instructions provided by Samsung SDI hereunder), or any malfunction of the equipments to which Samsung SDI's products are incorporated. Samsung SDI's standard warranty policy shall apply.

## 16. Others

### 16.1 Storage for a long time

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

### 16.2 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 Co., Ltd., 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

The cell should be charged within a range of specified temperatures in the specification.

#### 1.5 Reverse charging

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

### 2. Discharging

#### 2.1 Discharging

The 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 The 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 The cell should be stored within a range of temperatures specified in the product specification.
- 3.1.2 Otherwise, it may cause loss of performance characteristics, leakage and/or rust.

### 3.2 Long-term storage

- 3.2.1 The 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 Store the battery at 0 ~ 23°C, low humidity (below 65%), no dust and no corrosive gas atmosphere.

## 4. Cycle life

### 4.1 Cycle life performance

- 4.1.1 The cell can be charged/discharged repeatedly up to times specified in the product 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 The cell should be inspected visually before battery assembly.
- 5.1.2 The 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 welded.

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### 5.3 Transportation

- 5.3.1 If the 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 The 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 the cell in fire are strictly prohibited, because it may cause rupture and explosion.

### 6.4 Immersion

- 6.4.1 Soaking the 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 the cells from different batches/ranks even they are the same cell types from the same manufacturer.

### 6.6 Battery disposal

- 6.6.1 Although the 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 The cell should be disposed with a discharged state to avoid heat generation by an inadvertent short-circuit.

### 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°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.



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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.

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## 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.

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- 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 scared 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.

### 3. Warning

- 3.1 Stop using the battery if the battery becomes abnormally hot, order, 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 cloths, 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.

### 4. Caution

- 4.1 Electrical misuseage
  - 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.

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- 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.

## **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.



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