

Spec. No.	INR18650-35E	Version No.	Ver. 1.1
-----------	--------------	-------------	----------

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	INR18650-35E
2.3 Site	Manufactured in Korea

3. Nominal Specifications

Item	Specification
3.1 Standard discharge Capacity	Min 3,350mAh - Charge : 0.5C(1,700mA), 4.2V, 0.02C(68mA) cut-off @RT - Discharge : 0.2C(680mA), 2.65V cut-off @RT *1C=3,400mA
3.2 Charging Voltage	4.2V
3.3 Nominal Voltage	3.60V
3.4 Charging Method	CC-CV (constant voltage with limited current)
3.5 Charging Current	Standard charge: 1,700mA For cycle life : 1,020mA
3.6 Charging Time	Standard charge: 4hours
3.7 Max. Charge Current	2,000mA (not for cycle life)
3.8 Max. Discharge Current	8,000mA (for continuous discharge) 13,000mA (not for continuous discharge)
3.9 Discharge Cut-off Voltage	2.65V
3.10 Cell Weight	50 g max
3.11 Cell Dimension	Height : Max. 65.25 mm Diameter: Max. Φ 18.55 mm
3.12 Operating Temperature (Cell Surface Temperature)	Charge : 0 to 45°C Discharge : -10 to 60°C
3.13 Storage Temperature	1 year : -20~25°C (1*) 3 months : -20~45°C (1*) 1 month : -20~60°C (1*)

Note (1): If the cell is kept as ex-factory status (30% of charge),
The capacity recovery rate is more than 80%.

Spec. No.	INR18650-35E	Version No.	Ver. 1.1
-----------	--------------	-------------	----------

4. Outline Dimensions

See the Fig. 1

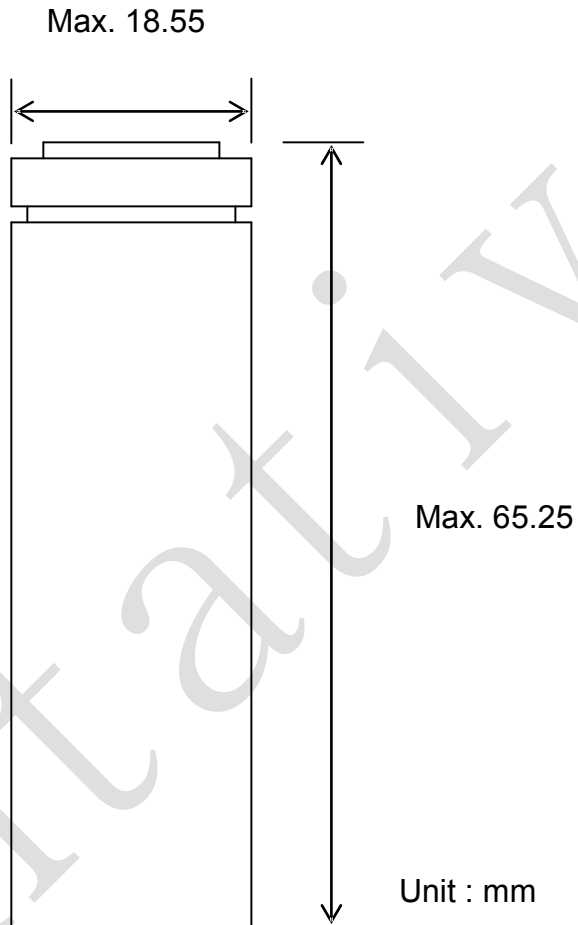


Fig. 1 Outline Dimensions of INR18650-35E

Spec. No.	INR18650-35E	Version No.	Ver. 1.1
-----------	--------------	-------------	----------

5. Appearance

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

6. Standard Test Conditions

6.1 Environmental Conditions

Unless otherwise specified, all tests stated in this specification are conducted at temperature $23 \pm 3^{\circ}\text{C}$ and humidity 65%.

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.

7. Characteristics

7.1 Standard Charge

This "Standard Charge" means charging the cell with charge current of 1,700mA and constant voltage 4.2V at 23°C , 0.02C(68mA) cut-off.

7.2 Standard Discharge Capacity

The standard discharge capacity is the initial discharge capacity of the cell, which is measured with discharge current of 0.2C(680mA) with 2.65V cut-off at 23°C within 1 hour after the Standard charge.

$$\text{Standard Discharge Capacity} \geq 3,350\text{mAh}$$

7.3 Rated Discharge Capacity

The rated discharge capacity is the initial discharge capacity of the cell, which is measured with discharge current of 1C(3,400mA) with 2.65V cut-off at 23°C within 1 hour after the Standard charge.

$$\text{Rated Discharge Capacity} \geq 3,250\text{mAh (97\% of 3,350mAh)}$$

7.4 Initial internal impedance

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

$$\text{Initial internal impedance} \leq 35\text{m}\Omega$$

Spec. No.	INR18650-35E	Version No.	Ver. 1.1
-----------	--------------	-------------	----------

7.5 Temperature Dependence of Discharge Capacity

Discharge capacity comparison at each temperature, measured with discharge constant current 3,400mA and 2.65V cut-off with follow temperature after the Standard charging at 23°C.

Charge Temperature	Discharge temperature		
	-10°C	23°C	40°C
23°C			
Relative Capacity	40%	97%	97%

Note: If charge temperature and discharge temperature is not the same, the interval for temperature change is 3 hours.

Percentage as an index of the Standard discharge capacity (=3,350mAh) is 100%.

7.6 Temperature Dependence of Charge Capacity

Capacity comparison at each temperature, measured with discharge constant current 680mA and 2.65V cut-off at 23°C after the Standard charge is as follow temperature.

	Charge temperature			Discharge temperature
	0°C	23°C	45°C	
				23°C
Relative Capacity	60%	100%	100%	

Note: If charge temperature and discharge temperature is not the same, the interval for temperature change is 3 hours.

Percentage as an index of the Standard discharge capacity (=3,350mAh) is 100%.

7.7 Charge Rate Capabilities

Discharge capacity is measured with constant current 680mA and 2.65V cut-off after the cell is charged with 4.2V at 23°C as follows.

	Charge Condition	
	0.5C (1,700mA)	1.0C (3,400mA)
Current		
Cut-off	3h or 0.02C	2.5h or 0.02C
Relative Capacity	100%	97%

Note: Percentage as an index of the Standard discharge capacity (=3,350mAh) is 100%.

Spec. No.	INR18650-35E	Version No.	Ver. 1.1
-----------	--------------	-------------	----------

7.8 Discharge Rate Capabilities

Discharge capacity is measured with the various currents in under table and 2.65V cut-off after the Standard charge at 23°C.

Current	Discharge Condition			
	0.2C (680mA)	1C (3,400mA)	2C (6,800mA)	8000mA
Relative Capacity	100%	97%	95%	92%

Note: Percentage as an index of the Standard discharge capacity (=3,350mAh) is 100%.

7.9 Cycle Life

Each cycle is an interval between the charge (charge current **1,020mA**) with 100mA cut-off and the discharge (discharge current **3,400mA**) with 2.65V cut-off. Capacity after 500cycles.

Capacity \geq 2,010mAh (60% of Standard Capacity)

7.10 Storage Characteristics

Capacity after storage for 20days at 60°C after the Standard charged at 23°C, measured with discharge current 680mA with 2.65V cut-off at 23°C.

Capacity recovery(after the storage) \geq 3,183mAh (95% of Standard Discharge Capacity)

7.11 Status of the cell as of ex-factory

The cell should be shipped in 3.49V ~ 3.69V Charging voltage range.

8. Mechanical Characteristics

8.1 Drop Test

Test method: Each fully charged cell or battery is dropped three times from a height of 1.0 m onto a concrete floor. The cells or batteries are dropped so as to obtain impacts in random orientations. After the test, the sample shall be put on rest for a minimum of one hour and then a visual inspection shall be performed.

Criteria: No fire, no explosion

(Test shall be performed with the following criteria IEC 62133)

8.2 Vibration Test

Test method: As to the UN transportation regulation(UN38.3), for each axis (X and Y axis with cylindrical cells) 7Hz→200Hz→7Hz for 15min, repetition 12 times totally 3hours, the acceleration 1g during 7 to 18Hz and 8g (amplitude 1.6mm) up to 200Hz.

Criteria: No leakage, with less than 10mV of OCV drop

Spec. No.	INR18650-35E	Version No.	Ver. 1.1
-----------	--------------	-------------	----------

9. Safety

9.1 Overcharge Test

Test method: To charge the standard charged cell with 12V and 3C(10.2A) at 23°C for 7 hours.

Criteria: No fire, and no explosion.

Overcharge test shall be performed with the UL1642 standard

9.2 External Short-circuit Test

Test method: To short-circuit the standard charged cell by connecting positive and negative terminal by less than 8020mΩ wire for 3 hours.

Criteria: No fire, and no explosion.

9.3 Reverse Charge Test

Test method: To charge reversely the standard discharged cell with charge current 3,400mA for 1.5 hours.

Criteria: No fire, and no explosion.

9.4 Heating Test

Test method: To heat the standard charged cell at heating rate of 5°C per minute up to 130°C and keep the cell in oven for 10 minutes.

Criteria: No fire, and no explosion.

10. Warranty

Samsung SDI will be responsible for replacing the cell against defects or poor workmanship for 15month from the date of shipping. Any other problems caused by malfunction of the equipment or unsuitable use of the cell are not under this warranty.

The warranty set forth in proper use, handling conditions described above, and excludes in the case of a defect which is not related to manufacturing of the cell.

11. Others

11.1 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.

11.2 Other

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