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INR18650-25R • Lithium-ion rechargeable cell



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**1. Description and model name**

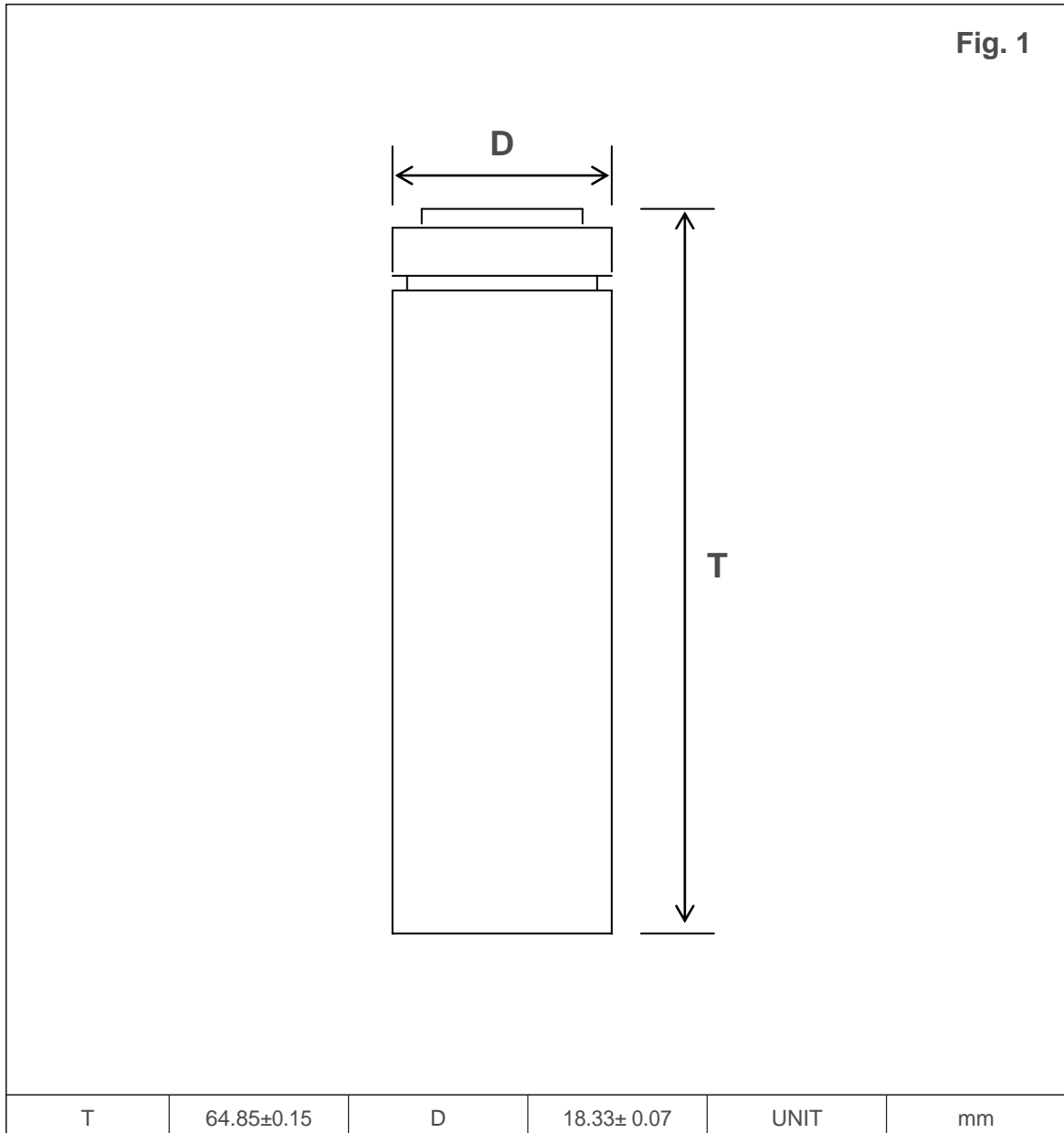
**Description** lithium-ion rechargeable cell

**Model name** INR18650-25R

**2. 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.

**3. Initial dimension**



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#### 4. Nominal specification

NO.	Item	Specifications
4.1	Nominal discharge capacity	2,500mAh Charge: 1.25A, 4.20V, CCCV 125mA cut-off Discharge: 0.2C, 2.5V discharge cut-off
4.2	Nominal voltage	3.6V
4.3	Standard charge	CCCV, 1.25A, 4.20 ± 0.05 V, 125mA cut-off
4.4	Rapid charge	CCCV, 4A, 4.20 ± 0.05 V, 100mA cut-off
4.5	Charging time	Standard charge : 180min / 125mA cut-off Rapid charge: 60min (at 25°C) / 100mA cut-off
4.6	Max. continuous discharge (continuous)	20A (at 25°C), 60% at 250 cycle
4.7	Discharge cut-off voltage End of discharge	2.5V
4.8	Cell weight	45.0g max
4.9	Cell dimension	Height : 64.85 ± 0.15mm Diameter : 18.33 ± 0.07mm
4.10	Operating temperature (surface temperature)	Charge: 0 to 50°C (recommended recharge release < 45°C) Discharge: -20 to 75°C (recommended re-discharge release < 60°C)
4.11	Storage temperature (Recovery 90% after storage)	1.5 year -30~25°C (1*) 3 months -30~45°C (1*) 1 month -30~60°C (1*)

**Note (1):** If the cell is kept as ex-factory status (50±5% SOC, 25°C), the capacity recovery rate is more than 90% of 10A discharge capacity 100% is 2,450mAh at 25°C with SOC 100% after formation.

#### 5. Outline dimensions

See the attachment (Fig. 1)

#### 6. Appearance

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

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**7. Standard test conditions**

**Environmental conditions**

Unless otherwise specified, all tests stated in this specification are conducted at temperature  $25\pm 5^{\circ}\text{C}$  and humidity  $65\pm 20\%$ .

**Measuring equipments**

**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.

**8. Characteristics**

**Standard charge**

This "Standard charge" means charging the cell CCCV with charge current 0.5CmA (1,250mA), constant voltage 4.2V and 125mA cut-off in CV mode at  $25^{\circ}\text{C}$  for capacity.

**Rapid charge**

Rapid charge means charging the cell CCCV with charge current 4A and 100mA cut-off at  $25^{\circ}\text{C}$ .

**Nominal discharge capacity**

The standard discharge capacity is the initial discharge capacity of the cell, which is measured with discharge current of 500mA(0.2C) with 2.5V cut-off at  $25^{\circ}\text{C}$  within 1 hour after the standard charge.

$$\text{Nominal discharge capacity} \geq 2,500\text{mAh}$$

Which complying to the minimum capacity of IEC61960 standard.

**Standard rate discharge capacity**

The standard rated discharge is the discharge capacity of the cell, which is measured with discharge current of 10A with 2.5V cut-off at  $25^{\circ}\text{C}$  within 1 hour after the standard charge.

$$\text{Standard rated discharge capacity} \geq 2,450\text{mAh}$$

**Initial internal impedance**

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

$$\text{Initial internal impedance} \leq 18\text{m}\Omega$$

**Temperature dependence of discharge capacity**

Capacity comparison at each temperature, measured with discharge constant current 10A and 2.5V cut-off after the standard charge is as follows.

Discharge temperature				
-20°C	-10°C	0°C	25°C	60°C
60%	75%	80%	100%	100%

**Note:** If charge temperature and discharge temperature is not the same, the interval for temperature change is 3 hours.  
Percentage index of the discharge at  $25^{\circ}\text{C}$  at 10A (=2,450mAh) is 100%.

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### Temperature dependence of charge capacity

Capacity comparison at each temperature, measured with discharge constant current 10A and 2.5V cut-off after the standard charge is as follows.

	Charge temperature					Discharge temperature
	0°C	5°C	25°C	45°C	50°C	
Relative capacity	80%	90%	100%	95%	95%	25°C

**Note:** If charge temperature and discharge temperature is not the same, the interval for temperature change is 3 hours. Percentage index of the discharge at 25°C at 10A (=2,450mAh) is 100%.

### Charge rate capabilities

Discharge capacity is measured with constant current 10A and 2.5V cut-off after the cell is charged with 4.2V as follows.

	Charge condition	
Current	Standard 1.25A	Maximum rapid charge 4A
Cut-off	125mA	100mA
Relative Capacity	100%	98%

**Note:** Percentage index of the discharge at 25°C at 10A (=2,450mAh) is 100%.

### Discharge rate capabilities

Discharge capacity is measured with the various currents in under table and 2.5V cut-off after the standard charge.

	Discharge condition				
Current	0.50A	5A	10A	15A	20A
Relative Capacity	100%	97%	100%	97%	95%

**Note:** Percentage index of the discharge at 25°C at 10A (=2,450mAh) is 100%.

### Cycle life

With standard charge and maximum continuous discharge.

Capacity after 250cycles,

Capacity  $\geq$  1,500mAh (60% of the nominal capacity at 25°C)

### Storage characteristics

Standard rated discharge capacity after storage for 1 month at 60 from the standard charged state is  $\geq$  90% of the initial 10A discharge capacity at 25°C.

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

The cell should be shipped in  $50 \pm 5\%$  charged state. In this case, OCV is from 3.600V to 3.690V.

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### 9. Mechanical Characteristics

#### Drop test

Test method: Cell(as of shipment or full charged) drop onto a concrete from 1.0m height at 3 sides.

Criteria: No leakage, Voltage decrease  $\leq 0.025V$ , AC iR increase  $\leq 1.0m\Omega$

#### 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 3 hours, 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.

### 10. Safety

#### Overcharge test

Test method: To charge with 20A-20V at 25°C for 3hr.

Criteria: No fire, and no explosion.

#### External short-circuit test

Test method: To short-circuit the standard charged cell (or 50% discharged cell) by connecting positive and negative terminal by 80m $\Omega$  wire for 10min.

Criteria: No fire, and no explosion.

#### Reverse charge test

Test method: To charge the standard charged cell with charge current 10A  
By 0V for 2.5 hours.

Criteria: No fire, and no explosion.

#### Heating test

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

Criteria: No fire, and no explosion.

### 11. Warranty

Samsung SDI will be responsible for replacing the cell against defects or poor workmanship for 18months from the date of shipping. Any other problem caused by malfunction of the equipment or mix-use of the cell is not under this warranty.

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

### 12. Others

#### Storage for a long time

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

#### Others

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