



Test Report issued under the responsibility of:



TEST REPORT IEC 62133 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	
Report Number.	BA-13CA36829-A-1
Date of issue	2013-07-17
Total number of pages.....	27
Applicant's name.....	SAMSUNG SDI CO LTD
Address	508 SUNGSUNG-DONG CHEONAN-SI, CHUNGCHONGNAM-DO 331-300 KR
Test specification: Standard IEC 62133: 2012 (Second Edition) Test procedure CB Scheme Non-standard test method..... N/A	
Test Report Form No.....	IEC62133B
Test Report Form(s) Originator	UL(Demko)
Master TRF	Dated 2013-03
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Test item description	Cylindrical Li-ion Cell
Trade Mark	Samsung SDI
Manufacturer.....	SAME AS APPLICANT
Model/Type reference	ICR18650-26++ / ICR19/65 (++ These cells may have an optional single alphanumeric suffix or blank not related safety)
Ratings	3.7Vdc or 3.63Vdc, 2600mAh

Testing procedure and testing location:		
☒	CB Testing Laboratory:	
Testing location/ address		Underwriters Laboratories Taiwan Co., Ltd./ 1st Fl, 260 Da-Yeh Road, Peitou, Taipei City, Taiwan 112
☐	Associated CB Testing Laboratory:	
Testing location/ address		
Tested by (name + signature)		MyungAh Lim 
Approved by (name + signature)		ShinHwan Ryu 
☒	Testing procedure: TMP	
Testing location/ address		SAMSUNG SDI CO LTD / 508 SUNGSUNG-DONG CHEONAN-SI, CHUNGCHEONGNAM-DO 331-300 KR
Tested by (name + signature)		MyungAh Lim 
Approved by (name + signature)		ShinHwan Ryu 
☐	Testing procedure: WMT	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name + signature)		
Approved by (name + signature)		
☐	Testing procedure: SMT	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature)		
Supervised by (name + signature) ..		

List of Attachments (including a total number of pages in each attachment): National Differences (0 pages) Enclosures (11 pages)	
Summary of testing:	
Tests performed (name of test and test clause): Original 4.2.1 - Continuous Low Rate Charging 4.2.2 - Vibration 4.2.4 - Temperature Cycling 4.3.2 - External Short Circuit: at 20°C ± 5°C 4.3.2 - External Short Circuit: at 55°C ± 5°C 4.3.3 - Free Fall 4.3.4 - Mechanical Shock (Crash Hazard) 4.3.5 - Thermal Abuse 4.3.6 - Crushing of Cells 4.3.7 - Low Pressure 4.3.9 - Overcharge for Lithium Systems 4.3.10 - Forced Discharge 4.3.11 - Cell Protection Against a High Charging Rate (Lithium Systems Only)	Testing location: Underwriters Laboratories Taiwan Co., Ltd. 1st Fl, 260 Da-Yeh Road, Peitou, Taipei City, Taiwan 112
New 8.1.2 – Charge (procedure 2) 8.3.1 – External short circuit (cells)	Underwriters Laboratories Taiwan Co., Ltd. 1st Fl, 260 Da-Yeh Road, Peitou, Taipei City, Taiwan 112
New 8.1.2 – Charge (procedure 2) 8.3.4 – Thermal abuse (cells) 8.3.5 – Crush (cells) 8.3.9 – Forced internal short circuit (cells)	SAMSUNG SDI CO LTD 508 SUNGSUNG-DONG CHEONAN-SI, CHUNGHEONGNAM-DO 331-300 KR
Summary of compliance with National Differences List of countries addressed: Denmark, Hungary and Sweden (No changes to the clauses in the IEC standard)	

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.

Product Label			
Cylindrical Li-ion Cell		Samsung SDI	
Model Code	ICR18650-26++/ ICR 19/65	Rating	3.7Vdc, 2600mAh
Batch No	6R9A09A55205	Rank	A
Q'ty	200 EA	Date	YYYY/MM/DD
Remark	고객 요구사항 기입		
Tracking No	Barcode(6R9A09A55205A001)		

Product Label			
Cylindrical Li-ion Cell		Samsung SDI	
Model Code	ICR18650-26++/ ICR 19/65	Rating	3.63Vdc, 2600mAh
Batch No	6R9A09A55205	Rank	A
Q'ty	200 EA	Date	YYYY/MM/DD
Remark	고객 요구사항 기입		
Tracking No	Barcode(6R9A09A55205A001)		

Test item particulars.....:	
Classification of installation and use.....:	N/A
Supply connection.....:	N/A
Recommend charging method declared by the manufacturer	CC/CV
Discharge current (0,2 I_L A)	0.520A
Specified final voltage	2. 75Vdc
Chemistry	☐ nickel systems ☒ lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell.....:	4.25Vdc
Maximum charging current	2600mA
Charging temperature upper limit	45°C
Charging temperature lower limit.....:	10°C
Polymer cell electrolyte type	☐ gel polymer ☐ solid polymer
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	2013-06-26
Date (s) of performance of tests	2013-06-26 to 2013-06-28
General remarks:	
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 testing laboratory. "(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 IEC62133B:	
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)	1. TIANJIN SAMSUNG SDI CO LTD DEVELOPING ZONE OF YI XIAN PARK WUQING COUNTY TIANJIN 301726 CHINA 2. SAMSUNG SDI CO LTD 508 SUNGSUNG-DONG CHEONAN-SI , CHUNGCHONGNAM-DO 331-300, Korea 3. SAMSUNG SDI CO LTD PUSAN PLANT 818 KACHUN-RI ULJU-GUN, SAMNAM-MYUN ULSAN 689-810 KOREA 4. SAMSUNG SDI ENERGY MALAYSIA SDN.BHD Lot 635 & 660 Kawasan Perindustrian Tuanku Jaafar 71450 Sungai Gadut, Negeri Sembilan Darul Khusus Malaysia
General product information: The suffix,++ of the model name is not related safety. This cell consists of Positive Electrode, Negative Electrode, Separator, Electrolyte and is covered by Stainless Steel. This cell is also investigated to UL 1642. The product was investigated to the following additional standards: EN 62133:2013 The original report was issued in 2010-04-23. The original report no. is BA-10CA07110-A-1. Amendment 1 -Add factory location and contact information Amendment 2 -Correct the capacity from 2000mAh to 2600mAh. The original capacity was 2600mAh but for amendment 1, the capacity was changed by error. -The previous report was BA-11CA19490-A-1. Amendment 3 -Alternate nominal voltage, 3.63Vdc without any construction change. -Correct applicant address from 508 SUNGSUNG-DONG CHONAN-SHI CHONGCHONGNAM-DO, Korea to 508 SUNGSUNG-DONG CHEONAN-SI , CHUNGCHONGNAM-DO 331-300, Korea. -The previous report is BA-11CA18646-C-1. Reissue 1 -Previous report no. is BA-12CA18674-A-1 -Change model name from ICR18650-26++ / ICR18/65 to ICR18650-26++ / ICR19/65 -Change the address of Applicant and Manufacturer from SAMSUNG SDI CO LTD/ 508 SUNGSUNG-DONG CHONAN-SHI CHONGCHONGNAM-DO, Korea to SAMSUNG SDI CO LTD/ 508 SUNGSUNG-DONG CHEONAN-SI , CHUNGCHONGNAM-DO 331-300 KR -Add factory, SAMSUNG SDI ENERGY MALAYSIA SDN.BHD / Lot 635 & 660 Kawasan Perindustrian Tuanku Jaafar 71450 Sungai Gadut, Negeri Sembilan Darul Khusus Malaysia -Change the address of Factory from SAMSUNG SDI CO LTD/ 508 SUNGSUNG-DONG CHONAN-SHI CHONGCHONGNAM-DO, Korea to SAMSUNG SDI CO LTD/ 508 SUNGSUNG-DONG CHEONAN-SI , CHUNGCHONGNAM-DO 331-300 KR -Add the comment for addition of evaluating standard EN 62133:2003. -Add the explanation of suffix ++ of model name. -This report is a reissue of CBTR Ref. No.: BA-10CA07110-A-1, BA-11CA19490-A-1, BA-11CA18646-C-1 and BA-12CA18674-A-1. Based on the previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, has been determined that the product continues to comply with the standard.	

Reissue 2 / BA-13CA36829-A-1

- Upgrade standard from IEC 62133:2002 1st to IEC 62133:2012 2nd.
- This report is a reissue of CBTR Ref. No.: BA-10CA07110-A-1, BA-11CA19490-A-1, BA-11CA18646-C-1, BA-12CA18674-A-1 and 12CA43710-G-1, CB Test Certificate Ref. No. DK-27544-UL. Based on previously conducted testing and the review of product construction, only CONTINUOUS CHARGING AT CONSTANT VOLTAGE (CELL), EXTERNAL SHORT CIRCUIT (CELL), THERMAL ABUSE TEST, CRUSHING OF CELLS, FORCED INTERNAL SHORT CIRCUIT OF CELLS tests were deemed necessary.

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Clause	Requirement + Test	Result - Remark	Verdict
4	Parameter measurement tolerances		Pass
	Parameter measurement tolerances		Pass
5	General safety considerations		Pass
5.1	General		Pass
5.2	Insulation and wiring	Considered in Battery Pack.	N/A
	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		N/A
	Insulation resistance (MΩ) :		—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		N/A
	Orientation of wiring maintains adequate creepage and clearance distances between conductors		N/A
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		N/A
5.3	Venting		Pass
	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	Vent design in cell.	Pass
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief	Considered in Battery Pack.	N/A
5.4	Temperature/voltage/current management	Considered in Battery Pack.	N/A
	Batteries are designed such that abnormal temperature rise conditions are prevented		N/A
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer		N/A
	Batteries are provided with specifications and charging instructions for equipment manufacturers so that associated chargers are designed to maintain charging within the temperature, voltage and current limits specified		N/A
5.5	Terminal contacts	Considered in Battery Pack.	N/A
	Terminals have a clear polarity marking on the external surface of the battery		N/A
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance		N/A
	Terminal contacts are arranged to minimize the risk of short circuits		N/A
5.6	Assembly of cells into batteries	Considered in Battery Pack.	N/A
5.6.1	If there is more than one battery housed in a single battery case, cells used in the assembly of each battery have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer		N/A
	Each battery has an independent control and protection		N/A
	Manufacturers of cells make recommendations about current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly		N/A
	Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate separate circuitry to prevent the cell reversal caused by uneven discharges		N/A
	Protective circuit components are added as appropriate and consideration given to the end-device application		N/A
	When testing a battery, the manufacturer of the battery provides a test report confirming the compliance according to this standard		N/A
5.6.2	Design recommendation for lithium systems only	Considered in Battery Pack.	N/A
	For the battery consisting of a single cell or a single cellblock: - Charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Clause 8.1.2, Table 4; or		N/A
	- Charging voltage of the cell does not exceed the different upper limit of the charging voltage determined through Clause 8.1.2, NOTE 1.		N/A
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks: - The voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, by monitoring the voltage of every single cell or the single cellblocks; or		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- The voltages of any one of the single cells or single cellblocks does not exceed the different upper limit of the charging voltage, determined through Clause 8.1.2, NOTE 1, by monitoring the voltage of every single cell or the single cellblocks		N/A
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks: - Charging is stopped when the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks; or		N/A
	- Charging is stopped when the upper limit of the different charging voltage, determined through Clause 8.1.2, NOTE 1, 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
5.7	Quality plan		Pass
	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		Pass
6	Type test conditions		Pass
	Tests were made with the number of cells or batteries specified in Table 1 for nickel-cadmium and nickel-metal hydride systems and Table 2 for lithium systems, using cells or batteries that are not more than six months old	Lithium System	Pass
	Unless noted otherwise in the test methods, testing was conducted in an ambient of 20°C ± 5°C.		Pass
7	Specific requirements and tests (nickel systems)		N/A
7.1	Charging procedure for test purposes		N/A
7.2	Intended use		N/A
7.2.1	Continuous low-rate charging (cells)		N/A
	Results: No fire. No explosion	(See Table 7.2.1)	N/A
7.2.2	Vibration		N/A
	Results: No fire. No explosion. No leakage	(See Table 7.2.2)	N/A
7.2.3	Moulded case stress at high ambient temperature		N/A
	Oven temperature (°C).....:		—
	Results: No physical distortion of the battery casing resulting in exposure if internal components		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.4	Temperature cycling		N/A
	Results: No fire. No explosion. No leakage.		N/A
7.3	Reasonably foreseeable misuse		N/A
7.3.1	Incorrect installation cell		N/A
	The test was carried out using: - Four fully charged cells of the same brand, type, size and age connected in series, with one of them reversed; or		N/A
	- A stabilized dc power supply.		N/A
	Results: No fire. No explosion..... :	(See Table 7.3.1)	N/A
7.3.2	External short circuit		N/A
	The cells or batteries were tested until one of the following occurred: - 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 Table 7.3.2)	N/A
7.3.3	Free fall		N/A
	Results: No fire. No explosion.		N/A
7.3.4	Mechanical shock (crash hazard)		N/A
	Results: No fire. No explosion. No leakage.		N/A
7.3.5	Thermal abuse		N/A
	Oven temperature (°C)..... :		—
	Results: No fire. No explosion.		N/A
7.3.6	Crushing of cells		N/A
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	The cell is prismatic type and a second set of samples was tested, rotated 90° around longitudinal axis compared to the first set		N/A
	Results: No fire. No explosion..... :	(See Table 7.3.6)	N/A
7.3.7	Low pressure		N/A
	Chamber pressure (kPa)..... :		—
	Results: No fire. No explosion. No leakage.		N/A
7.3.8	Overcharge		N/A
	Results: No fire. No explosion..... :	(See Table 7.3.8)	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.3.9	Forced discharge		N/A
	Results: No fire. No explosion..... :	(See Table 7.3.9)	N/A
8	Specific requirements and tests (lithium systems)		Pass
8.1	Charging procedures for test purposes		Pass
8.1.1	First procedure: This charging procedure applied to tests other than those specified in 8.1.2		Pass
8.1.2	Second procedure: This charging procedure applied to the tests of 8.3.1, 8.3.2, 8.3.4, 8.3.5, and 8.3.9		Pass
	If a cell's specified upper and/or lower charging temperature exceeds values for the upper and/or lower limit test temperatures of Table 4, the cells were charged at the specified values plus 5 °C for the upper limit and minus 5 °C for the lower limit	Charging temperature upper limit: 45°C Charging temperature lower limit: 10°C	Pass
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) :		Pass
	For a different upper limit charging voltage (i.e. other than for lithium cobalt oxide systems at 4,25 V), the applied upper limit charging voltage and upper limit charging temperatures were adjusted accordingly	Upper charging voltage: 4.25Vdc	Pass
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) :		Pass
8.2	Intended use		Pass
8.2.1	Continuous charging at constant voltage (cells)		Pass
	Results: No fire. No explosion..... :	(See Table 8.2.1)	Pass
8.2.2	Moulded case stress at high ambient temperature (battery)	Considered in Battery Pack.	N/A
	Oven temperature (°C)..... :		—
	Results: No physical distortion of the battery casing resulting in exposure if internal components		N/A
8.3	Reasonably foreseeable misuse		Pass
8.3.1	External short circuit (cell)		Pass
	The cells were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		Pass
	Results: No fire. No explosion..... :	(See Table 8.3.1)	Pass
8.3.2	External short circuit (battery)	Considered in Battery Pack.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The cells were tested until one of the following occurred: - 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		N/A
	Results: No fire. No explosion..... :	(See Table 8.3.2)	N/A
8.3.3	Free fall		Pass
	Results: No fire. No explosion.		Pass
8.3.4	Thermal abuse (cells)		Pass
	The cells were held at 130°C ± 2°C for: - 10 minutes; or		Pass
	- 30 minutes for large cells (gross mass of more than 500 g as defined in IEC 62281)		N/A
	Oven temperature (°C)..... :		—
	Gross mass of cell (g) :		—
	Results: No fire. No explosion.		Pass
8.3.5	Crush (cells)		Pass
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or		Pass
	- An abrupt voltage drop of one-third of the original voltage has been obtained; or		N/A
	- 10% of deformation has occurred compared to the initial dimension		N/A
	Results: No fire. No explosion..... :	(See Table 8.3.5)	Pass
8.3.6	Over-charging of battery		N/A
	Test was continued until the temperature of the outer casing: - Reached steady state conditions (less than 10°C change in 30-minute period); or		N/A
	- Returned to ambient		N/A
	Results: No fire. No explosion..... :	(See Table 8.3.6)	N/A
8.3.7	Forced discharge (cells)		Pass
	Results: No fire. No explosion..... :	(See Table 8.3.7)	Pass
8.3.8	Transport tests		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
	Manufacturer's documentation provided to show compliance with UN Recommendations on Transport of Dangerous Goods		Pass
8.3.9	Design evaluation – Forced internal short circuit (cells)		N/A
	The cells complied with national requirement for :		—
	The pressing was stopped upon: - 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 Table 8.3.9)	N/A
9	Information for safety		Pass
	The manufacturer of secondary cells ensures that information is provided about current, voltage and temperature limits of their products.		Pass
	The manufacturer of batteries ensures that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards.		N/A
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		N/A
	As appropriate, information relating to hazard avoidance resulting from a system analysis is provided to the end user :		N/A
10	Marking		Pass
10.1	Cell marking		Pass
	Cells marked as specified in the applicable cell standards: IEC 61951-1, IEC 61951-2 or IEC 61960.	IEC 61960	Pass
10.2	Battery marking		N/A
	Batteries marked in accordance with the requirements for the cells from which they are assembled.		N/A
	Batteries marked with an appropriate caution statement.		N/A
10.3	Other information		N/A
	Storage and disposal instructions marked on or supplied with the battery.		N/A
	Recommended charging instructions marked on or supplied with the battery.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
11	Packaging		Pass
	The materials and packaging design are chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants.		Pass

Annex A	Charging range of secondary lithium ion cells for safe use		Pass
A.1	General		Pass
A.2	Safety of lithium-ion secondary battery		Pass
A.3	Consideration on charging voltage		Pass
A.3.1	General		Pass
A.3.2	Upper limit charging voltage		Pass
A.3.2.1	General		Pass
A.3.2.2	Explanation of safety viewpoint		Pass
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied		Pass
A.4	Consideration of temperature and charging current		Pass
A.4.1	General		Pass
A.4.2	Recommended temperature range		Pass
A.4.2.1	General		Pass
A.4.2.2	Safety consideration when a different recommended temperature range is applied		Pass
A.4.3	High temperature range		Pass
A.4.3.1	General		Pass
A.4.3.2	Explanation of safety viewpoint		Pass
A.4.3.3	Safety considerations when specifying charging conditions in high temperature range		Pass
A.4.3.4	Safety consideration when specifying new upper limit in high temperature range		Pass
A.4.4	Low temperature range		Pass
A.4.4.1	General		Pass
A.4.4.2	Explanation of safety viewpoint		Pass
A.4.4.3	Safety considerations, when specifying charging conditions in low temperature range		Pass
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range		Pass
A.4.5	Scope of the application of charging current		Pass
A.5	Sample preparation		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
A.5.1	General		Pass
A.5.2	Insertion procedure for nickel particle to generate internal short		Pass
	The insertion procedure carried out at 20°C±5°C and under -25 °C of dew point		Pass
A.5.3	Disassembly of charged cell		Pass
A.5.4	Shape of nickel particle		Pass
A.5.5	Insertion of nickel particle to cylindrical cell		Pass
A.5.5.1	Insertion of nickel particle to winding core		Pass
A.5.5.2	Mark the position of nickel particle on the both end of winding core of the separator		Pass
A.5.6	Insertion of nickel particle to prismatic cell		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE: Critical components information					
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity ¹⁾
Cells					
- Case	--	--	Stainless Steel	--	--
- Electrolyte	--	--	Ethylene carbonate, ethyl methyl carbonate, fluorobenzene, di-methyl carbonate	--	--
- Separator	--	--	PE or PP/PE/PP - SJ72-00XXXX	--	--
- Positive Electrode; Alternate			Lithium Nickel Cobalt Manganese Oxide (LiNiCoMnO ₂)		
- Negative Electrode	--	--	Carbon and PVDF or SBR	--	--
-PTC	Tyco Raychem Div	PSR26039	15Vdc, Ih= 2.9A, It=7.7A	UL1434	RU
Supplementary information: ¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.1	TABLE: Continuous low rate charge (cells)					N/A
Model	Recommended charging method, (CC, CV, or CC/CV)	Recommended charging voltage V_{c1} (Vdc)	Recommended charging current I_{rec1} (A)	OCV at start of test, (Vdc)	Results	
--	--	--	--	--	--	
Supplementary information:						
- No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)						

7.2.2	TABLE: Vibration		N/A
Model		OCV at start of test, (Vdc)	Results
--		--	--
Supplementary information: - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)			

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.1	TABLE: Incorrect installation (cells)		N/A
Model		OCV of reversed cell, (Vdc)	Results
--		--	--
Supplementary information:			
- No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)			

7.3.2	TABLE: External short circuit				N/A
Model	Ambient (at 20°C ± 5°C or 55°C ± 5°C)	OCV at start of test, (Vdc)	Resistance of circuit, (Ω)	Maximum case temperature rise ΔT, (°C)	Results
--	--	--	--	--	--
Supplementary information: - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)					

7.3.6	TABLE: Crush			N/A
Model		OCV at start of test, (Vdc)	OCV at removal of crushing force, (Vdc)	Results
--		--	--	--
Supplementary information:				
- No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)				

7.3.8	TABLE: Overcharge			N/A
--------------	--------------------------	--	--	------------

IEC 62133				
Clause	Requirement + Test		Result - Remark	Verdict
Model	OCV prior to charging, (Vdc)	Maximum charge current, (A)	Time for charging, (hours)	Results
--	--	--	--	--
Supplementary information: - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)				

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.9	TABLE: Forced discharge (cells)				N/A
Model	OCV before application of reverse charge, (Vdc)	Measured reverse charge I_r , (A)	Time for reversed charge, (minutes)	Results	
--	--	--	--	--	
Supplementary information: - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)					

8.2.1	TABLE: Continuous charging at constant voltage (cells)				Pass
Model	Recommended charging voltage V _{c1} (Vdc)	Recommended charging current I _{rec1} (A)	OCV at start of test, (Vdc)	Results	
ICR18650-26++	4.25	2.6	3.0	A,B	
ICR18650-26++	4.25	2.6	3.0	A,B	
ICR18650-26++	4.25	2.6	3.0	A,B	
ICR18650-26++	4.25	2.6	3.0	A,B	
ICR18650-26++	4.25	2.6	3.0	A,B	
Supplementary information: A - No fire or explosion B - No leakage C - Leakage D - Fire E - Explosion F – Bulge G - Others (please explain)					

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

8.3.1	TABLE: External short circuit (cell)					Pass
Model	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 (45°C)						
ICR18650-26++	19.0	4.2420	82.3	43.2	A,B	
ICR18650-26++	19.0	4.2400	84.3	49.7	A,B	
ICR18650-26++	19.0	4.2410	85.1	47.0	A,B	
ICR18650-26++	19.0	4.2420	89.3	50.7	A,B	
ICR18650-26++	19.0	4.2410	81.1	46.8	A,B	
Samples charged at charging temperature lower limit(10°C)						
ICR18650-26++	19.0	4.2100	80.4	43.5	A,B	
ICR18650-26++	19.0	4.2110	81.5	47.4	A,B	
ICR18650-26++	19.0	4.2130	82.3	49.3	A,B	
ICR18650-26++	19.0	4.2120	81.0	45.6	A,B	
ICR18650-26++	19.0	4.2120	82.3	46.4	A,B	
Supplementary information:						
A - No fire or explosion						
B - No leakage						
C - Leakage						
D - Fire						
E - Explosion						
F – Bulge						
G - Others (please explain)						

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

8.3.2	TABLE: External short circuit (battery)					N/A
Model	Ambient, (°C)	OCV at start of test, (Vdc)	Resistance of circuit, (Ω)	Maximum case temperature rise ΔT , (°C)	Results	
Samples charged at charging temperature upper limit						
--	--	--	--	--	--	--
Samples charged at charging temperature lower limit						
--	--	--	--	--	--	--
Supplementary information: - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)						

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

8.3.5	TABLE: Crush					Pass
Model	OCV at start of test, (Vdc)	OCV at removal of crushing force, (Vdc)	Width/ diameter of cell before crush, (mm)	Required deformation for crush, (mm)	Results	
Samples charged at charging temperature upper limit (50°C)						
ICR18650-26++	4.23	4.22	--	--	A,B,G	
ICR18650-26++	4.23	4.22	--	--	A,B,G	
ICR18650-26++	4.23	4.22	--	--	A,B,G	
ICR18650-26++	4.23	4.22	--	--	A,B,G	
ICR18650-26++	4.23	4.22	--	--	A,B,G	
Samples charged at charging temperature lower limit (5°C)						
ICR18650-26++	4.20	4.19	--	--	A,B,G	
ICR18650-26++	4.20	4.19	--	--	A,B,G	
ICR18650-26++	4.20	4.19	--	--	A,B,G	
ICR18650-26++	4.20	4.19	--	--	A,B,G	
ICR18650-26++	4.20	4.19	--	--	A,B,G	
Supplementary information:						
A - No fire or explosion						
B - No leakage						
C - Leakage						
D - Fire						
E - Explosion						
F – Bulge						
G - Others (please explain): The values of diameter of cell were not measured. The test was conducted until the test force was reached max. force.						
Note) Test was conducted at upper/lower charging limit of 50/5°C which is more severe condition than at 45/10°C.						

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

8.3.6	TABLE: Over-charging of battery			N/A
Constant charging current (A)				—
Supply voltage (Vdc)				—
Model	OCV before charging, (Vdc)	Resistance of circuit, (Ω)	Maximum outer casing temperature, ($^{\circ}\text{C}$)	Results
--	--	--	--	--
Supplementary information: - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)				

8.3.7	TABLE: Forced discharge (cells)			Pass
Model	OCV before application of reverse charge, (Vdc)	Measured Reverse charge I_r , (A)	Time for reversed charge, (minutes)	Results
ICR18650-26++	2.75	2.6	90	A,B
ICR18650-26++	2.75	2.6	90	A,B
ICR18650-26++	2.75	2.6	90	A,B
ICR18650-26++	2.75	2.6	90	A,B
ICR18650-26++	2.75	2.6	90	A,B
Supplementary information: A - No fire or explosion B - No leakage C - Leakage D - Fire E - Explosion F – Bulge G - Others (please explain)				

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

8.3.9	TABLE: Forced internal short circuit (cells)					Pass
Model	Chamber ambient, (°C)	OCV at start of test, (Vdc)	Particle location ¹⁾	Maximum applied pressure, (N)	Results	
ICR18650-26++	5	4.20	1	800	A,B	
ICR18650-26++	5	4.20	1	800	A,B	
ICR18650-26++	5	4.20	1	800	A,B	
ICR18650-26++	5	4.20	1	800	A,B	
ICR18650-26++	5	4.20	1	800	A,B	
ICR18650-26++	50	4.23	1	800	A,B	
ICR18650-26++	50	4.23	1	800	A,B	
ICR18650-26++	50	4.23	1	800	A,B	
ICR18650-26++	50	4.23	1	800	A,B	
ICR18650-26++	50	4.23	1	800	A,B	
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. A - No fire or explosion B - No leakage C - Leakage D - Fire E - Explosion F – Bulge G - Others (please explain) Note) Test was conducted at upper/lower charging limit of 50/5°C which is more severe condition than at 45/10°C.						

List of test equipment used

(Note: This is an example of the required attachment. Other forms with a different layout but containing similar information are also acceptable.)

Inst. ID No.	Instrument Type	Test Number +, Test Title or Conditioning	Function/R ange	Last Cal. Date	Next Cal. Date
214860	Temperature recorder	THERMAL ABUSE TEST	0~200 °C	2012-06-28	2013-06-28
211785	Temperature Controller	CHARGE (PROCEDURE 2)	0~50 °C	2012-10-26	2013-10-26
230628	Temperature Controller	THERMAL ABUSE TEST	0~150 °C	2013-02-05	2014-02-05
226061	DC Power Supply	CHARGE (PROCEDURE 2)	0~20V, 0~15A	2013-02-28	2014-02-28
200757	DATA acquisition	THERMAL ABUSE TEST, CRUSHING OF CELLS	0~6V, -40 ~ 170°C	2013-04-08	2014-04-08
229810	Temp Humidity Recorder	ALL	0~30°C, 20~70%	2012-08-30	2013-08-30
218628	Digital Multimeter	ALL	0~1000V, 100Ω~10MΩ, 0~3A	2012-10-23	2013-10-23
217817	Stop watch	THERMAL ABUSE TEST, FORCED INTERNAL SHORT CIRCUIT OF CELLS	0.01 sec	2013-02-20	2015-02-20
226270	Temperature Controller	FORCED INTERNAL SHORT CIRCUIT OF CELLS	0~80°C	2012-10-19	2013-10-19
226407	DATA acquisition	FORCED INTERNAL SHORT CIRCUIT OF CELLS	0~10V/ -10 ~ 400°C	2013-06-10	2014-06-10
226419	Crush tester	FORCED INTERNAL SHORT CIRCUIT OF CELLS	0~1800N	2013-06-26	2014-06-26
229815	Load battery	CRUSHING OF CELLS	3000Kg	2012-08-14	2013-08-14
N/A	Vernier Calipers	FORCED INTERNAL SHORT CIRCUIT OF CELLS	0 ~ 300mm	2013-02-06	2014-02-06

ENCLOSURE

Supplement Id	Description
01	Overall View of Lithium Ion Rechargeable Cell, Model ICR18650-26++
02	Safety Instruction
03	UN DOT

ID 01



ID 02



Handling Precaution and Prohibitions of Lithium Ion & Lithium Ion Polymer Rechargeable Cells and Batteries

Inaccurate handling of lithium ion and lithium ion polymer 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.

1.1 Storage

Store the battery at low temperature (below 20°C is recommended), low humidity, no dust and no corrosive gas atmosphere.

1.2 Safety precaution and prohibitions

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

[Danger!]

■ Electrical misuseage

Use dedicated charger.

Use or charge the battery only in the dedicated application.

Don't charge the battery by an electric outlet directly or a cigarette lighter charger.

Don't charge the battery reversely.

■ Environmental misuseage

Don't leave the battery near the fire or a heated source.

Don't throw the battery into the fire.

Don't leave, charge or use the battery in a car or similar place where inside of temperature may be over 60°C.

Don't immerse, throw, wet the battery in water / seawater.

■ others

Don't fold the battery cased with laminated film such as pouch and Polymer.

Don't store the battery in a pocket or a bag together with metallic objects such as keys, necklaces, hairpins, coins, or screws.

Don't short circuit (+) and (-) terminals with metallic object intentionally.

Don't pierce the battery with a sharp object such as a needle, screw drivers.

Don't heat partial area of the battery with heated objects such as soldering iron.

Don't hit with heavy objects such as a hammer, weight.

Don't step on the battery and throw or drop the battery on the hard floor to avoid mechanical shock.

Don't disassemble the battery or modify the battery design including electric circuit.

Don't solder on the battery directly.

Don't use seriously scared or deformed battery.

Don't put the battery into a microwave oven, dryer ,or high-pressure container.

ID 02

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.

Don't use or assemble old and new batteries together.

Don't contact electrically the negative terminal of the cell with the surface of the cell and the case of the battery.

Unconsciously handling battery is capable of the corrosion of the battery case.

[Warning!]

Stop charging the battery if charging isn't completed within the specified time.

Stop using the battery if the battery becomes abnormally hot, or discoloration, deformation, or abnormal conditions is detected during use, charge, or storage.

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.

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.

If the terminals of the battery become dirty, wipe with a dry cloth before using the battery.

The battery can be used within the following temperature ranges. Don't exceed these ranges.

Charge temperature ranges : 0℃ ~ 45℃

Discharge Temperature ranges : -20℃ ~ 60℃

Store the battery at temperature below 60℃

Cover terminals with proper insulating tape before disposal.

[Caution!]**■ Electrical misuseage**

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

Charge current must be controlled by specified value in Cell specification.

Cut-off Voltage of charging must be 4.1V.

Charger must stop charging battery by detecting either charging time or current specified in Cell's specification.

Discharge current must be controlled by specified value in Cell's specification.

Cut-off Voltage of discharging must be over 2.5V.

■ others

Keep the battery away from babies and children to avoid any accidents such as swallow.

If younger children use the battery, their guardians should explain the proper handling method and precaution before using.

Before using the battery, be sure to read the user's manual and precaution of it's handling.

Before using charger, be sure to read the user's manual of the charger.

ID 02

Before installing and removing the battery from application, be sure to read user's manual of the application.

Replace the battery when using time of battery becomes much shorter than usual.

Cover terminals with insulating tape before proper disposal.

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.

While the battery is charged, used and stored, keep it away from object materials with static electric chargers.

Safety Handling Procedure for the Transporter

- **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.
- **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.

Design of positioning the battery pack in application and charger

To prevent the deterioration of the battery performance caused by heat, battery shall be positioned away from the area where heat is generated in the application and the charger.

Design of the Battery Pack

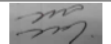
Be sure adopting proper safe device such as PTC specified type or model in Cell Specification. If you intend to adopt different safety device which is not specified in Cell Specification, please contact Samsung SDI to investigate any potential safety problem.

Be sure designing 2nd protective devices such as PTC & PCM at the same time to protect Cell just in case one protective device is fault.

Please contact following offices when you need any help including safety concerns.

ID 03

Model name : ICR18650-26H**Revision 02**

Executive Div.	Safety Center	Confidential	
	Name / Title	Signature	Date
Reported by	HW Ham / Assistant manager		2013.04.05
Approved by	SW Yoo / Senior manager		2013.04.05

Test report; UN Manual of Tests and Criteria,
Part III, Subsection 38.3

2009, 5th Revision**Document No : MT0048080**

SAMSUNG SDI
Energy Business Division



ID 03

Product Information

1. Model name: ICR18650-26H
2. Product classification: Li-ion cylindrical cell
3. Nominal voltage: 3.6 V
4. Rated capacity: 2600 mAh
5. Wh Capacity: 9.36 Wh
6. Weight of product: 43 g
7. Test Date: 2011.07.28 ~ 2011.08.25
8. Test Location: SAMSUNG SDI Safety Center, 508 Sungsungdong, Cheonan
Chungcheongnamdo, Korea

Document Number: MT0048080

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Test summary

Test No.	Test item	Relating Std.	Test begins on	Test Completed on	Judgment
T1	Altitude simulation	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.1	2011.07.28	2011.07.28	Pass
T2	Thermal test	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.2	2011.07.29	2011.08.04	Pass
T3	Vibration	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.3	2011.08.09	2011.08.09	Pass
T4	Shock	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.4	2011.08.24	2011.08.24	Pass
T5	External short circuit	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.5	2011.08.25	2011.08.25	Pass
T6	Impact / Crush	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.6	2013.04.04	2013.04.04	Pass
T7	Overcharge	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.7	N/A	N/A	N/A
T8	Forced discharge	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.8	2011.08.18	2011.08.25	Pass
P1	Packaging Drop	2009 IATA Dangerous Goods Regulations 50 th Edition	2011.08.05	2011.08.05	Pass

- Tests T-1 through T-5 shall be conducted in sequence with the same cell/pack
- For test 6, test should be conducted for cells in a pack or applied cell for battery assembly.
- T7 shall be performed only for Li-rechargeable battery not Li-ion cell.
- T8 shall be performed only for Li-ion cell not Li-rechargeable battery.

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ID 03

T-1~T-5) Transportation Test: Pass

	Initial		T1		T2		T3		T4		T5
Sample No.	Weight(g)	OCV(V)	Weight(g)	OCV(V)	Weight(g)	OCV(V)	Weight(g)	OCV(V)	Weight(g)	OCV(V)	Max Temperature(°C)
1	43.675	4.16	43.674	4.16	43.672	4.09	43.673	4.08	43.674	4.08	61.8
2	43.667	4.16	43.666	4.16	43.662	4.09	43.663	4.08	43.664	4.08	63.5
3	43.596	4.16	43.594	4.16	43.593	4.09	43.593	4.08	43.593	4.08	66.9
4	43.546	4.16	43.546	4.16	43.544	4.09	43.547	4.08	43.548	4.08	64.8
5	43.602	4.16	43.600	4.16	43.595	4.09	43.597	4.08	43.596	4.08	65.7
6	43.592	4.16	43.591	4.16	43.587	4.09	43.588	4.08	43.589	4.08	66.2
7	43.616	4.16	43.616	4.16	43.612	4.09	43.612	4.08	43.613	4.08	67.1
8	43.743	4.16	43.742	4.16	43.740	4.09	43.742	4.08	43.742	4.08	65.9
9	43.641	4.16	43.640	4.16	43.639	4.09	43.639	4.08	43.639	4.08	64.8
10	43.597	4.16	43.595	4.16	43.591	4.09	43.593	4.08	43.594	4.08	66.2
Avg	43.628	4.16	43.626	4.16	43.623	4.09	43.625	4.08	43.625	4.08	65.2
Max.	43.743	4.16	43.742	4.16	43.740	4.09	43.742	4.08	43.742	4.08	67.1
Min.	43.546	4.16	43.546	4.16	43.544	4.09	43.547	4.08	43.548	4.08	61.8

T-6) Impact / Crush Test: Pass

Fresh Cell 50% SOC				
No.	Initial		T6	
	OCV(V)	Max Temp(°C)	Appearance	Result
1	3.65	20	○	PASS
2	3.65	20	○	PASS
3	3.65	20	○	PASS
4	3.65	20	○	PASS
5	3.65	20	○	PASS
[Appearance] O-No Disassembly, No Fine / D-Disassembly / F-Fine				
[Criteria] External temperature does not exceed 170°C, no disassembly.				

■ Cell type

[] Cylindrical cells greater than 20 mm in diameter

[X] Prismatic, Pouch, Cylindrical cells not more than 20 mm in diameter

■ Test procedure

[] Impact

[X] Crush

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ID 03

T-7) Over charge Test: N/A**- Test Condition: N/A****T-8) Forced discharge Test: Pass****- Test condition: 5.2A / 30Min**

	Fresh cell 0% SOC	50 Cycled cell 0% SOC
Sample No.	Max. temperature	Max. temperature
1	81.6	89.6
2	80.8	97.9
3	80.9	92.2
4	77.4	97.4
5	77.3	92.8
6	78.0	90.4
7	76.3	92.6
8	80.9	97.9
9	76.4	96.5
10	81.0	92.1
Avg.	79.1	93.9
Max.	81.6	97.9
Min.	76.3	89.6

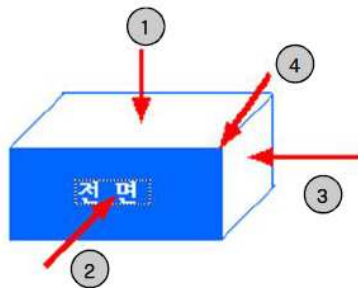
Document Number: MT0048080

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ID 03

P-1) 1.2m Packaging Drop Test: Pass

	Before test	After test
Weight (Kg)	9.34	9.34
Remark	Outer packaging is damaged but samples inside the package remain intact and no damage, no shifting, no release of contents for samples inside the package.	

■ Test Method

Document Number: MT0048080

■ Sample picture

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