SAMSUNG 21700 50G
Cylindrical battery for EV

SAMSUNG SDI

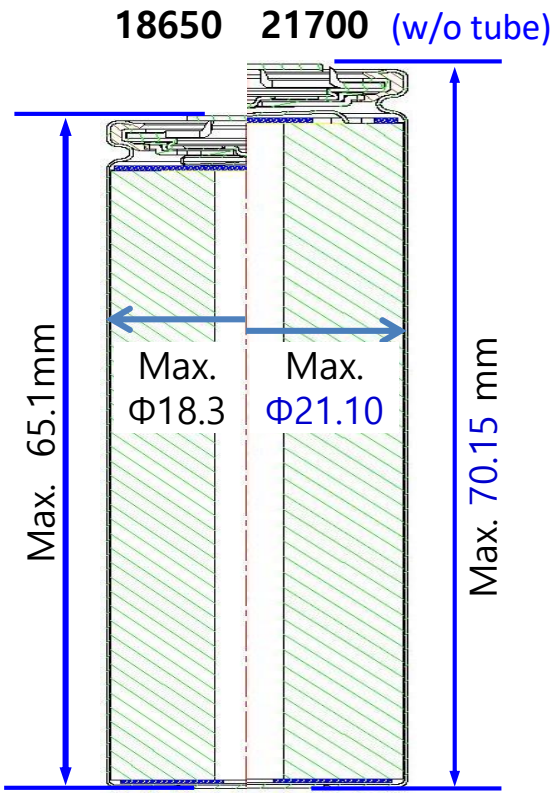
21700 50G

Target Specification

Specification	Product	21700
		50G
General	Typical Energy (4.2V, 0.2C discharge, Wh)	18.15
	Typical Capacity (4.2V, 0.2C discharge, mAh)	5,000
	1) GB/T Capacity (4.2V,0.33C/2.5V,1.0C discharge, mAh)	4,900
	Energy Density (Wh/L, Typical)	749
	Energy Density (Wh/kg, Typical)	267
	IR (AC 1KHz SOC30/ DC SOC50, 10sec, Typ., mΩ)	AC 14.5 / DC 24.5
	Weight (Typ, g)	68.0
	Nominal Voltage (V) (DCH 0.2C)	3.63
Charge	Charging Voltage (V)	4.2
	Standard Charging Current	0.33C
	Max. Charging Current (not for cycle)	1.0C
	Max. Charging Current (cycle)	-
Discharge	Discharging End Voltage (V)	2.5
	Standard Discharging Current	0.2C
	Max. Discharging Current (not for cycle)	3.0C
	Max. Discharging Current (cycle)	
Life	Cycle Life (4.15V, 0.33C charge / 3.0V, 1.0C discharge)	80%@ 1,000cycle

* Target specifications are subject to change with EV & cell requirements

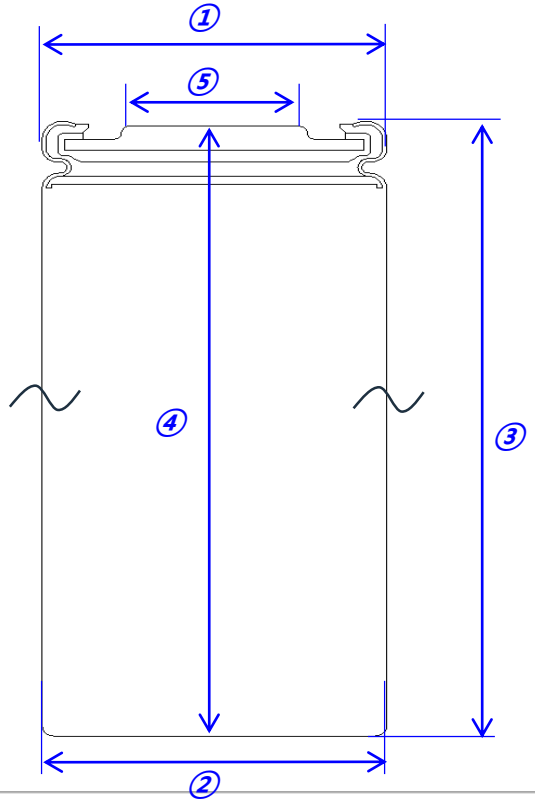
Design Concept



Design	21700-50G	Remarks
Typical Capacity (typ. mAh)	5,000	Charge: 0.33C 4.2V , 0.025C cut-off Discharge: 0.2C 2.5V
GB/T Capacity (min. mAh)	4,900	Charge: 0.33C 4.2V, 0.025C cut-off Discharge: 1C 2.5V
Cathode	NCA	High Ni NCA
Anode	Graphite + SCN	SCN: Silicon Carbon Nano composite
Separator	CCS	CCS: Ceramic Coated Separator
CAN	Steel	-
CID		CID: Current Interrupt Device

Dimensions

☐ 21700-50G Cell Dimensions



☐ Without Tubing

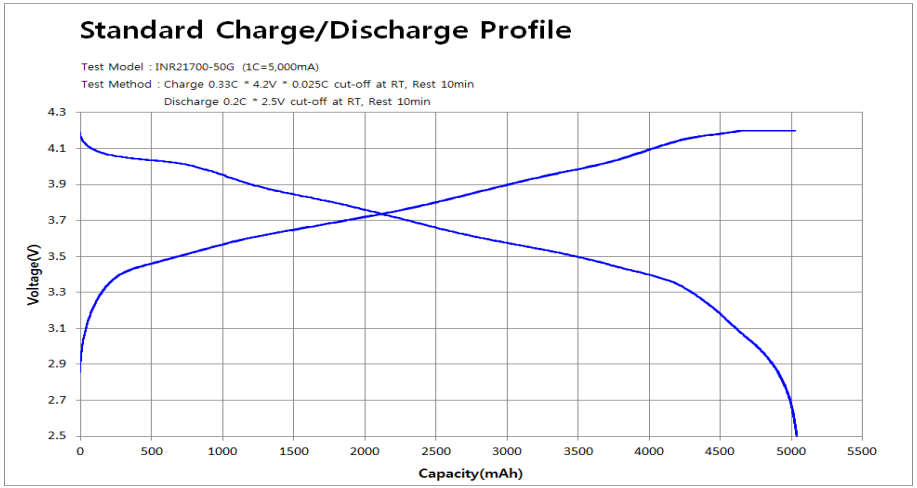
Dimension	Nominal (mm)	Max (mm)	Remark
①	21.00	21.10	Cell diameter
②	21.00	21.10	Cell diameter
③	70.00	70.15	Shoulder height
④	69.90	70.05	Cell height
⑤	9.0	-	Welding area(+)

☐ With Tubing

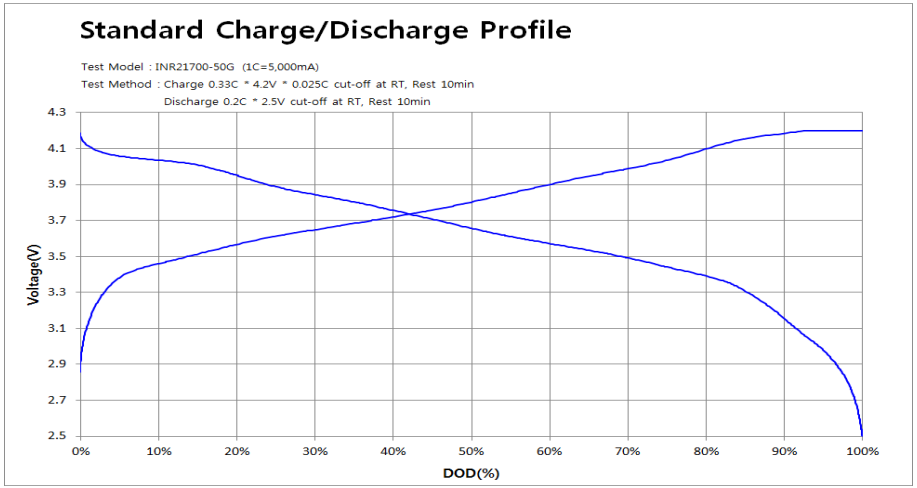
Dimension	Nominal (mm)	Max (mm)	Remarks
①	21.15	21.25	Cell diameter
②	21.15	21.25	Cell diameter
③	70.58	70.78	Shoulder height
④	70.65	70.80	Cell height
⑤	9.0	-	Welding area(+)

Standard Capacity

☐ Standard Charge/Discharge Profile @ RT



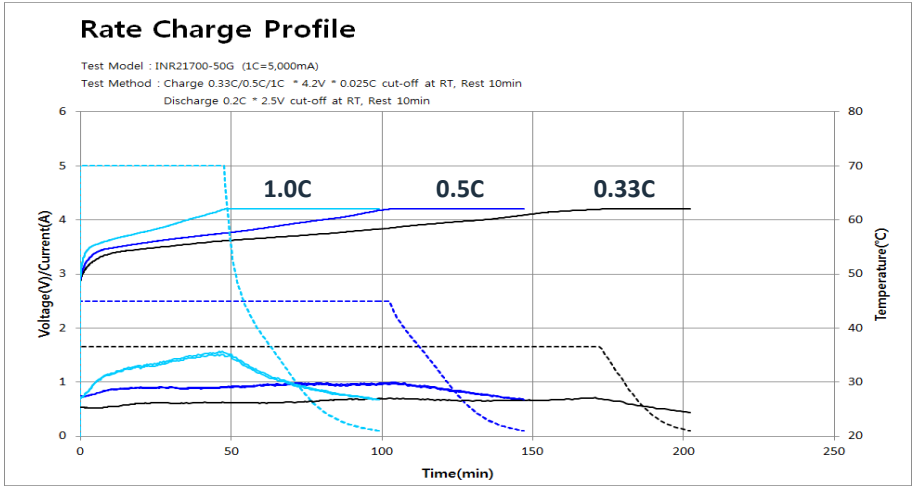
☐ DOD Profile @ RT



	Capacity	Energy	Average Voltage
Standard Capacity	5,000mAh	18.15Wh	3.63V

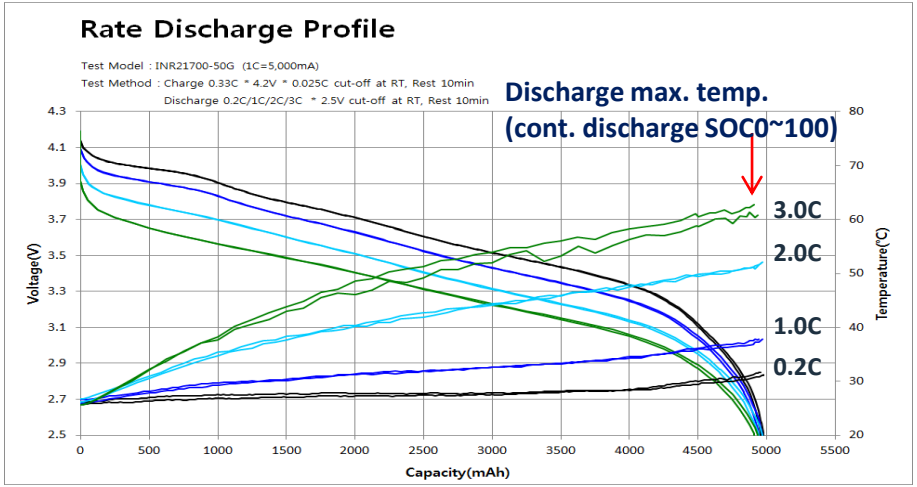
Charge / Discharge capability @ C-rate

☐ Charge capacity w/ charge rate @ RT



	0.33C	0.5C	1C
Capacity (vs. 033C)	100%	99.9%	100.2%
Charging Time	202min.	147min.	99min.
Max. Temp.	27.1℃	29.9℃	35.6℃

☐ Discharge capacity w/ discharge rate @ RT

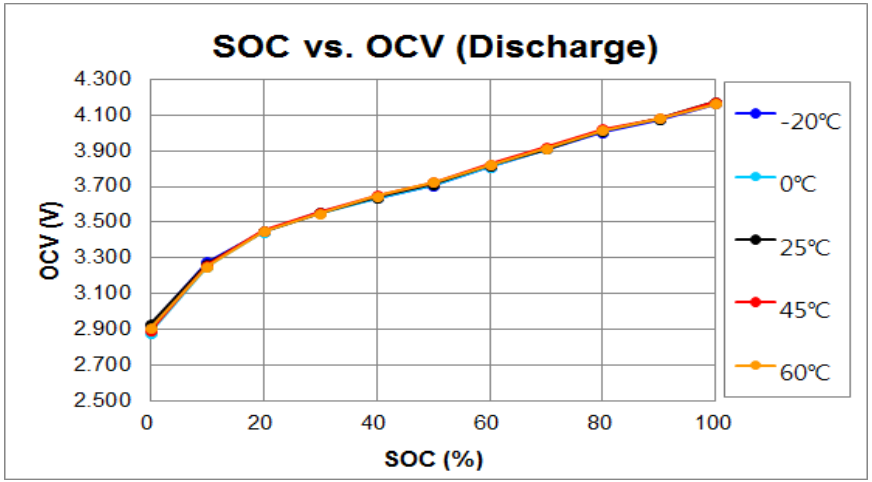


	0.2C	1C	2C	3C
Capacity (vs. 0.2C)	100%	99.8%	99.7%	99.1%
Max. Temp.	30.7℃	37.7℃	51.8℃	62.1℃

OCV vs. SOC (Discharge)

☐ OCV vs. SOC @ Temp.

SOC	-20℃	0℃	25℃	45℃	60℃
100.0	4.164	4.175	4.175	4.175	4.163
90.0	4.074	4.077	4.079	4.082	4.083
80.0	4.005	4.009	4.011	4.022	4.013
70.0	3.909	3.912	3.912	3.920	3.915
60.0	3.809	3.811	3.819	3.826	3.821
50.0	3.705	3.709	3.714	3.726	3.723
40.0	3.634	3.636	3.639	3.649	3.647
30.0	3.557	3.553	3.555	3.556	3.551
20.0	3.450	3.447	3.450	3.452	3.451
10.0	3.278	3.253	3.268	3.259	3.254
0.0	2.923	2.883	2.929	2.894	2.909



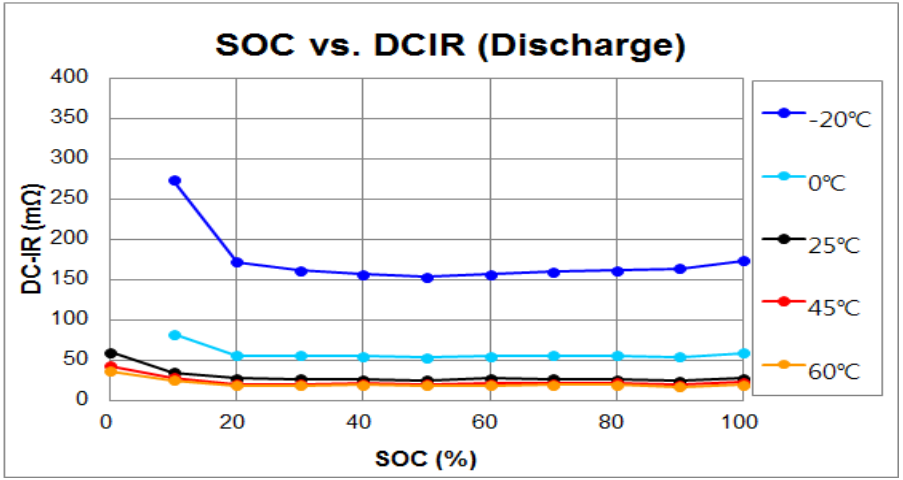
* Test condition :

- SOC setting : Charge 0.33C / Discharge 0.2C
- Rest : 1 hour

DCIR vs. SOC

☐ DCIR (10sec) vs. SOC @ Temp.

SOC	-20℃	0℃	25℃	45℃	60℃
100.0	174.0	58.8	27.6	22.4	19.6
90.0	164.0	54.4	24.4	19.2	16.8
80.0	161.6	56.0	26.0	21.6	19.2
70.0	159.6	55.6	26.4	21.2	19.2
60.0	156.8	55.2	27.2	21.2	18.8
50.0	153.2	53.2	24.8	20.4	18.4
40.0	156.4	54.8	25.6	20.8	19.2
30.0	161.6	56.0	26.4	20.4	18.8
20.0	172.4	55.6	27.2	20.4	18.8
10.0	273.6	82.8	35.2	28.0	24.8
0.0	-	-	59.6	43.2	36.8

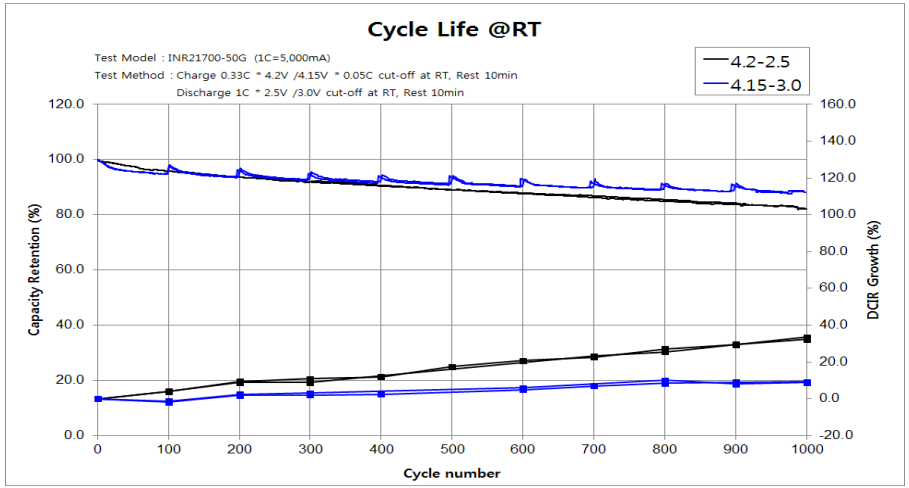


* Test condition :

- SOC setting : Charge 0.33C / Discharge 0.2C
- Rest : 1 hour
- DCIR : 0.5C

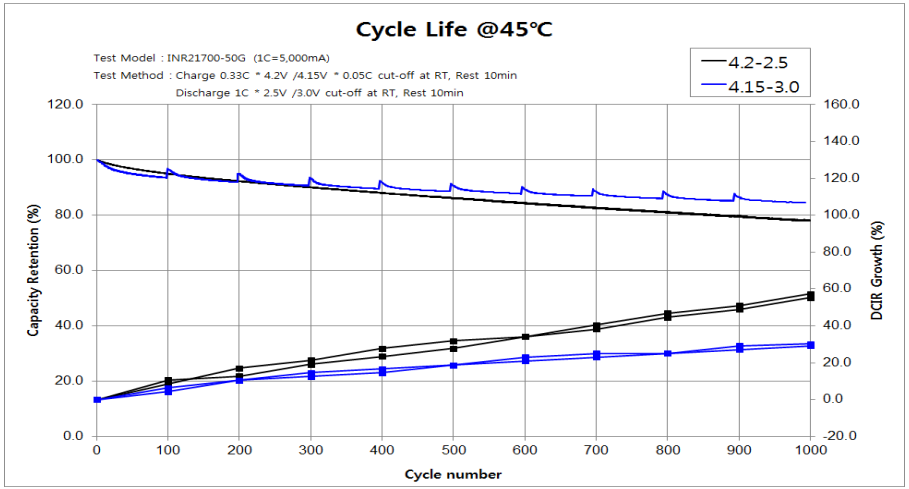
Cycle Life

☐ 0.33C/1C cycle life @ RT



@RT, Capacity Retention	4.2V-2.5V	4.15V-3.0V
500cyc.	89.1%	90.7%
1000cyc.	82.2%	88.6%

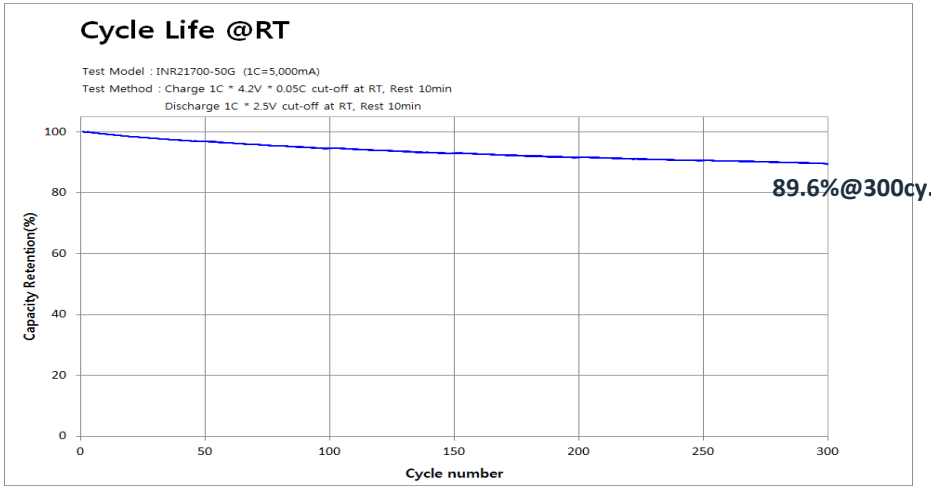
☐ 0.33C/1C cycle life @ 45℃



@45℃, Capacity Retention	4.2V-2.5V	4.15V-3.0V
500cyc.	86.2%	88.6%
1000cyc.	78.0%	84.5%

Fast Charge Cycle Life

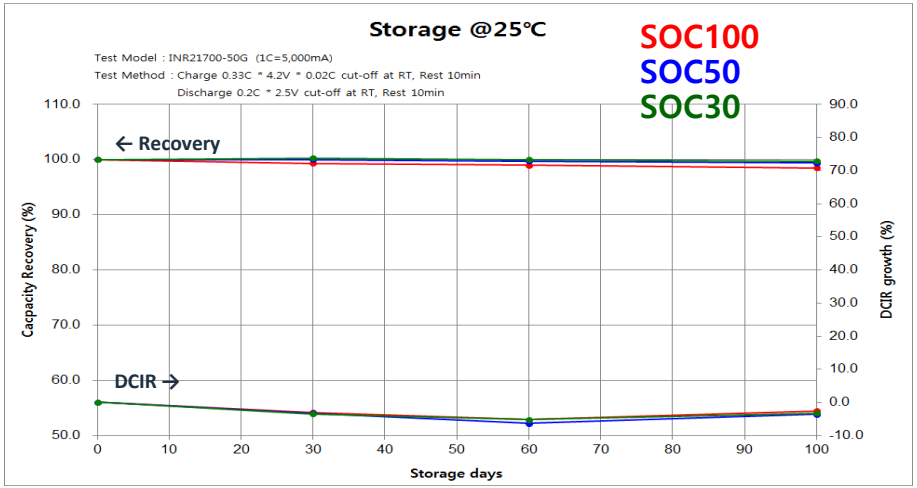
☐ 1C/1C cycle life @ RT



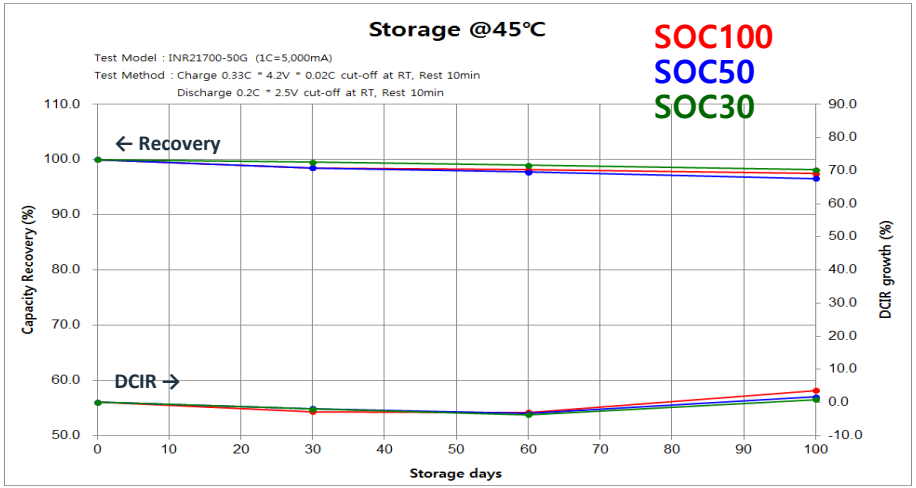
@ RT	Capacity Retention
300cycle	89.6%

Storage

☐ Storage w/ SOC @ 25℃



☐ Storage w/ SOC @ 45℃



@ 25℃, 100days	Capacity Recovery	DCIR growth
SOC100%	98.5%	-2.5%
SOC50%	99.4%	-3.6%
SOC30%	99.7%	-3.3%

@ 45℃, 100days	Capacity Recovery	DCIR growth
SOC100%	97.5%	3.6%
SOC50%	96.6%	1.7%
SOC30%	98.1%	0.9%

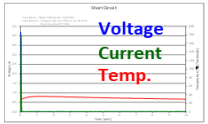
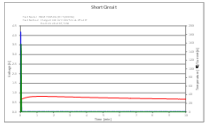
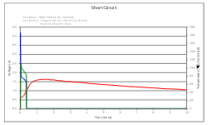
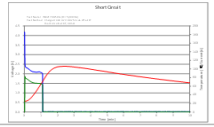
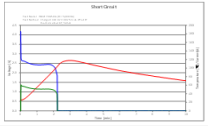
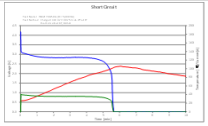
Safety

☐ Results

Items	Test Condition	Criteria	Result	Remarks
Controlled crush	UL 1642 crush test (13kN/2sec)	L2	L2	Replaced module level test with cell level test
Thermal stability	heating rate @ 5℃/min Stay 30min @ 120℃	L2	L2	
Overcharge	1P: CC/CV, 1C 4.6V 7hr	L2	L2	
Overdischarge	CC discharge, 1C, 2.5hr	L2	L2	
External short circuit	SOC 100%, 10min, 5mΩ	L4	L2	
Mechanical Shock	UN 38.3. 4.4	L2	L2	Replaced module level test with cell level test
Voltage reversal	5C, 0V, 1.5hrs	L2	L2	

External Short Circuit

☐ External short circuit test result

Test Condition	Profile	Max. temp.	Max. Current	Result
5mΩ		35.9℃	180A	OK (positive tab melting)
10mΩ		36.1℃	158A	OK (positive tab melting)
20mΩ		72.3℃	111A	OK (fully discharge, CID activation)
30mΩ		106.3℃	83A	OK (fully discharge, CID activation)
50mΩ		117.9℃	61A	OK (fully discharge, CID activation)
80mΩ		105.8℃	41A	OK (fully discharge, CID activation)

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