

5AT3S3 Battery specification

Origin:China

Pack house part number(appearance color):__ EXHE091A2002_____

Ring model No.: 5AT3S3

CM Part Number: 318000804819(Goertek)
89021BG00-29R-G(Goldtek)
13-203-596530(ECS)
58-000315-2ND(Foxconn)

Ring Part Number: 58-000504/58-000670

Cell house part number(single/double fold): LG-INR18650MH1

Description: 1S2P 3.6 V/5960mAh

Origin:Taiwan

Pack house part number(appearance color):__ EXRN011H1003_____

Ring model No.: 5AT3S3

CM Part Number: 318000811321(Goertek)
58-000710(Foxconn)

Ring Part Number: 58-000710

Cell house part number(single/double fold): LG-INR18650MH1

Description: 1S2P 3.6 V/5960mAh

Accepted by: _____

Name in block letters: _____

Company: _____

Date: _____

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Revision history

Rev	Date	Author	Changes
1.0	2021/04/22	Eric	New release
1.1	2021/06/03	Jerry	Remove Page11 PCM BOM Q1 SLD23R075.
1.2	2021/08/30	Jerry	1.Update label Version Number comparison table. 2.Add Ring Part Number.
1.3	2021/09/07	Jerry	Update 2D drawing (P.27)
1.4	2021/09/14	Jerry	Add CM(Goertek 、Goldtek 、ECS) Part Number.
1.5	2021/09/22	Jerry	Modify label drawing. input >>Input
1.6	2021/09/23	Jerry	Add CM(Foxconn) Part Number.
1.7	2021/11/19	CS	Updated label thickness
1.8	2021/12/28	Jerry	Modify 3.3.8 ESD Air $\pm 12\text{kv}$ to $\pm 15\text{kv}$
1.9	2022/10/28	Jerry	Add 4.1.7 BOM list 、4.5 PCB Production Specifications 、4.6 PCB Stack-up figure
2.0	2023/04/11	CS	The weight-bearing capacity of the carton has been changed from 500kg to 750kg.
3.0	2034/03/19	Jerry	Add production labels for the Hsinchu factory, with the following distinctions: ChangZhou Factory: EC code: B, Serial numbers: 00001~30000. Hsinchu Factory: EC code: D, Serial numbers: 30001~65534.
4.0	2024/06/18	Jacob	Add made in Taiwan part number.
5.0	2024/07/19	Jacob	Add CM part number.
6.0	2024/09/10	CS	Updated Production Label Text.
7.0	2024/12/16	Jerry	Steel sheet height control (25.1~25.95mm), revise the finished product drawing to version V3.0.

Project Name: 5AT3S3

1. SCOPE

This product requirement has been prepared to specify the rechargeable lithium-ion pack ('battery pack') 5AT3S3 to be supplied to Ring. Ring reserves itself the rights to make changes to this document. Battery manufacturer is requested to fill and date the Acceptance of the document (on the first page of the document), by duly authorized signature. After any change to this document new version of the document is required to be accepted by signature and date.

2. NOMINAL SPECIFICATIONS

Table 1 – Nominal Specifications

Item	Specification
2.1 Nominal& Minimum Capacity	Nominal: 5960mAh, @0.2C Discharge/2.8 V Cut-off Minimum: 5960mAh, @0.2C Discharge/2.8 V Cut-off Battery pack label must show minimum and typical capacity and power. (Test method refers to rated charge and rated discharge.)
2.2 Nominal Voltage	3.6V
2.3 Charging Method	CC-CV (Refer to rated charge)
2.4 End of Charge Voltage	4.20V
2.5 End of Discharge Voltage	2.80V
2.6 Charge method	Charge temperature Charge Current 0°C~45°C 3.0A(max) to 4.20V, then CV (4.20V) to 124mA Pre-charge voltage range Pre-charge current <3.0V 600mA (max)
2.7 USB Charge	Micro USB input voltage rating: 5 +/- 0.25V
	Micro USB input current rating: 800 +/- 100mA Charge termination current: 390 +/-100 mA
2.8 Max charge current	Continuous: 3.0A
2.9 MaxDischarge Current	Continuous: 3.0A (0.5C) Pulse: 4A (5ms) 10°C~60°C
2.10 Shipment OCV	3.50~3.65V (ground shipping), 3.50~3.65V (air shipping)
2.11Δ load voltage (1.0A/1s discharge)	Maximum: 0.20V
2.12 Pack Weight	Maximum: 130g
2.13 Initial Impedance	Maximum: 120mΩ (measured at AC 1kHz after 100% charge) Cells total impedance: 27mΩ Max; PCM impedance: 70mΩ max

2.14 Operating temperature	Charge : 0~45°C Discharge: -20~60°C
2.15 Storage Temperature	1. At 25°C, after the charging to 100% SOC, store the cells for 30days, then measure the C/5 capacity. Recover capacity >80% 2. At 45°C, after the charging to 100% SOC, store the cells for 30days, then measure the C/5 capacity. Recover capacity >80% 3. At 50% SOC and specified temp VS time. -20°C to 25°C (12 months), recovered capacity 80% 25°C to 45°C (3 months) , recovered capacity 80% 45°C to 60°C (1 months), recovered capacity 80%
2.16 Outline Dimension	1. Length: _70.2__mm max 2. Width: _44.7__mm max 3. Thickness: _21.6__mmmax

3. Performance Criteria

3.1 Electrical characteristics (Vendor should provide information no less than the listed below)

No.	Items	Test Method and Conditions	Criteria
3.1.1	Standard charge	Rated Charge The rated charge means charging battery pack with Constant current of 0.3C then followed by constant Voltage as specified and cut-off at 100mA at 25°C.	
3.1.2	Rated capacity	Rated Charge The rated charge means charging battery pack with constant current of 0.5C then followed by constant voltage as specified and cut-off at 100mA at 25°C. The rated discharge means discharging battery pack with 0.2C and cut-off at 100mA. For rating purpose, the discharge should be done within one hour after rated charge at 25°C.	Battery pack Capacity (C/5 discharge) After rated charging cycle the battery pack is discharged by C/5 current. Capacity 5960mAh minimum Battery pack Capacity (C/2 discharge) After rated charging cycle the battery pack is discharged by C/2 current. Capacity requirement 5960mAh minimum
3.1.3	Capacity retention & recoverable capacity	1 After standard charge at ambient temperature (20±5) °C, then storage at ambient temperature (23±2) °C for 28 days, then 0.2C discharge to cut-off voltage. 2. After standard charge end, then discharge with 0.2C to cut-off voltage.	1.Residual capacity > 90% 2.Recoverable capacity > 95%

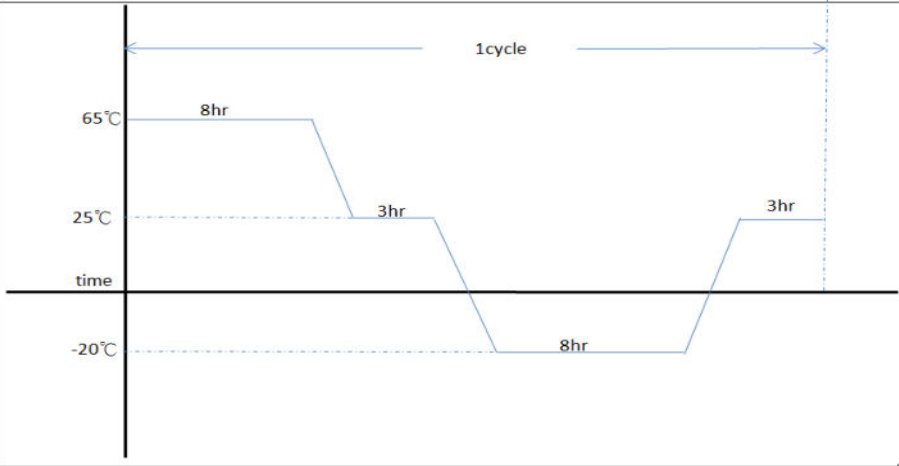
3.1.4	Cycle life	Cycle life testing 1: Charging: 3A to 4.2V cut off 100mA / Discharging: 0.5C, cut off 2.8V Cycle life testing 2 (reference test): Charging: 0.3C to 4.2V, cut off 100mA/ Discharging: 0.5C, cut off 2.8V	Room temperature capacity is measured every 100 cycles by the method defined in rated discharge. Initial Capacity $\geq 100\%$ of the minimum capacity 500cyc. Capacity $\geq 70\%$ of the minimum capacity Pack thickness at fully charged state after 500cycles is maximum 21.6mm Battery manufacturer shall continue cycle life verification beyond 500 cycles until reaching 800 cycles or end of the life. Manufacturer shall demonstrate cell performance and safety after extended testing is finished.
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3.2 Safety characteristics (Vendor should provide information no less than the listed below)

No.	Items	Test Method and Conditions	Criteria
3.2.1	Overcharge voltage protection	After the battery is fully charged, the power with constant current constant voltage source continues to batteries 7 h, constant current constant voltage source voltage is set to 2 times the nominal voltage, and the current set to 2C.	Battery pack should be no flame, explosion, fire no smoke, no hazardous.
3.2.2	Overdischarge voltage protection	Discharge battery at 0.2C to the cut-off voltage, then discharge through a 30 Ω resistor for 7h, the over discharge protection function should work.	Battery pack should be no flame, explosion, fire no smoke, no hazardous
3.2.3	Charge overcurrent protection	After the battery is fully discharged, the power with max. overcurrent protection value (Spec.)	The power cut-off the power path.
3.2.4	Discharge overcurrent protection	After the battery is fully charged, the load with max. overcurrent protection value (Spec.)	The load cut-off the discharge loop.
3.2.5	Short-circuit protection	After the battery fully charged, discharge through a 0.1 Ω resistor for 1h, then charge at 1C for 0.5S, observe the battery's appearance.	Battery pack should be no flame, explosion, fire no smoke, no hazardous.

3.3 Environmental and Mechanical Performance (Vendor should list available test items)

No.	Items	Test Method and Conditions	Criteria
3.3.1	Thermal exposure test	A battery is to be heated in a circulating air oven. The temperature of the oven is to be raised at a rate of $5\pm 2^{\circ}\text{C}$ per minute to a temperature of $130\pm 2^{\circ}\text{C}$ and remain for 30min at that temperature before the test is discontinued.	No fire, no smoking.
3.3.2	Constant temperature and humidity performance.	Charge the battery per section 3.1.1, and then put the battery into a chamber with constant temperature of $40^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and constant humidity of 90% to 95% for 48 hours. After that, take out the battery and put it at ambient temperature of $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 2 hours. Visually check the appearance of the battery and discharge at constant current of 0.2C to the cut-off voltage.	No cosmetic deformation, no rusting, no leak, no venting, no rupture, no fire and no explosion. Discharging time should not be less than 180 minutes.
3.3.3	High temperature performance	When the battery is standard charged, it shall be put into a chamber at $(60\pm 2)^{\circ}\text{C}$ for 2h, then discharged at 0.5C constant current to out-offvoltage.	Discharging shall not be less than 4.5 h
3.3.4	Low temperature performance	After the battery is standard charged and stored in an ambient temperature of $-10\pm 2^{\circ}\text{C}$ for 4h,thendischarged to cut-off voltage at a constant current of 0.5C	Discharging shall not be less than 1h.
3.3.5	Vibration	After standard charging, fixed the cell to vibration. table and subjected to vibration cycling that thefrequency is to be varied at the rate of 1Hz perminute between 10Hz and 55Hz, the excursion ofthe vibration is 1.6mm. The cell shall be vibrated for30 minutes per axis of XYZ axes.	No leak, no smoke, no fire, no explosion.
3.3.6	Free fall test	After standardly charged, drop the battery pack from 1.0m to thesmooth concrete floor for 6 directions: once for each direction. Afterthat, check the appearance of battery pack.	No leak, no smoke, no fire, no explosion.

3.3.7	Thermal shock	Charge the battery per section 3.1.1 and place the battery at control chamber and go through the following steps (see figure 1) : a)Place the battery at $65^{\circ}\text{C}\pm 2^{\circ}\text{C}$ test chamber and maintain for 8 hours. b)Put 3 HRS. Under normal temperature c)Decrease the test chamber temperature to $-20^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and maintain for 8 hours. d)Put 3 HRS. Under normal temperature e)Repeat step a to step d, cycle 8 times in total.	No leak, no venting, no rupture, no fire and , no explosion.
			
3.3.8	ESD	Contact 8 kv : ± 8 kV contact discharge test level is adopted in contact discharge test. After the battery is fully charged, measure its open circuit voltage, internal impedance and NTC. Contact discharge is then applied to each metal contact with 10 single shots in succession at a repetition rate of 1 discharge per second. After the discharge, measure the battery's open circuit voltage, internal impedance and NTC.	No obvious cosmetic damage. All protection functionalities are normal.
		air 15kv : ± 15 kV air discharge test level is adopted in air discharge test. After the battery is fully charged, measure its open circuit voltage, internal impedance and NTC. Air discharge is then applied to the weakest spot of the battery with 10 single shots at a repetition rate of 1 discharge per second. After the discharge, measure the battery's open circuit	No obvious cosmetic damage. All protection functionalities are normal.

3.4 Visual Inspection

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the battery.

3.5 Standard Environmental Test Condition

Unless otherwise specified, all tests stated in this Product Specification are conducted at below condition:

Temperature: 23 +/- 3°C

Relative Humidity: 60 +/- 20% RH

3.6 Storage and others

a). Long Time Storage

If the battery is stored for a long time, the battery's storage voltage should 3.6~3.9V and the battery is to be stored in a condition as No. 3.5

b). Warranty period

The warranty period of pack is 12 months after the manufacture date.

4. Charger, Gauge and Protection Circuit Module (PCM)

4.1.1 Charger bq24074 circuit

Resistors and NTC setting at bq24074			Specifications		
Item	Parameter	Unit	Min	Typical	Max
1	USB input current limit	A	1.259	1.364	1.472
2	Battery charge voltage	V	4.16	4.2	4.23
3	Fast Charge Current (CC phase)	A	0.698	0.788	0.872
4	Pre-charge Current	A	0.061	0.078	0.095
5	Charge Termination Current (CV phase)	A	0.287	0.39	0.498
6	Pre-charge Timer	Hour	0.713	0.96	1.212
7	Safety Timer for CC & CV phase	Hour	7.128	9.6	12.12
8	BAT pin input voltage	V	-0.3		5
9	Junction Temperature rating	°C	-40		150
10	Junction-to-case (bottom) thermal resistance	°C/W		3.8	
11	NTC Cold Trip Point *1	°C	0	3	
	NTC Hot Trip Point *1			47	52

Note 1: Based on NTC thermistor B constant= 3970, 10K +/-1%. NTC thermistor adheres to cell surface and have two wires to board.

4.1.2 Gauge bq27220 circuit

			Specifications		
Item	Parameter	Unit	Min	Typical	Max
1	BAT pin input voltage range	V	-0.3		6
2	Pull-up voltage for open drain I2C	V	1.62		3.6
3	Current Sense Resistor	mΩ	9.9	10	10.1
4	ESD protection resistor of I2C	Ω		100	
5	ESD protection diode of I2C	V		5	
6	NTC B constant		3400	3435	3469
	NTC thermistor	kΩ	9.9	10	10.1

Note: NTC thermistor is SMD mounted on board.

4.1.3 Protection S-8211CAS Circuit

			Specifications		
Item	Parameter	Unit	Min	Typical	Max
1	Discharge over-current detection voltage*1	V	0.079	0.1	0.124
2	Discharge Over-Current Detection*1	A	4.202	7.143	13.37
3	Dual N-MOSFET drain-source on-resistance at VGS=3.1V, ID=5.5A*1	mΩ	11	14	18.8
4	Charge over-current detection voltage*2	V	0.07	0.1	0.13
5	Charge Over-Current Detection*2	A	4.118	8.065	13.542
6	Dual N-MOSFET drain-source on-resistance at VGS=4.0V, ID=5.5A*2	mΩ	9.6	12.4	17

Note 1: PIC discharge over-current detection voltage range is of temperature range -40 to 85°C. Discharge over-current is equal to discharge over-current detection voltage divided by 2x RDS(ON) resistance of N-MOSFET PMEB2516Q and SM9998DSQG at VGS=3.1V~4.0V & ID=5.5A.

Note 2: PIC charge over-current detection voltage range is of temperature 25°C. Charge over-current is equal to charge over-current detection voltage divided by 2x RDS(ON) resistance of N-MOSFET PMEB2516Q at VGS=4.0V & ID=5.5A.

4.1.4 Circuit Loop Impedance

Circuit loop impedance (mΩ)	Minimum	Typical	Maximum
PTC Polytronics : SMD1206P600SLR-YE	1	5	10
10 mΩ sense resistor	9.9	10	10.1
Dual N-MOSFET PMEB2516Q (multiplied by 2)	11	14	18.8
Contact metal	1.5	1.7	1.9
Wire	7	8.2	9.4
FPCB	7.6	8.4	9
PCB trace	4.5	5.2	6
Total impedance	42.5	52.5	65.2

4.1.5 Protection IC

(Temperature: 25°C, Relative Humidity≤85%)

Table 4 – PIC S-8211CAS Electrical Specification

Primary Protection IC: S-8211CAS				Specifications		
Item	Parameter		Unit	Min	Typical	Max
1	Operating Temperature		°C	-20		60
2	Over Charge Voltage Protection	Detect voltage	V	4.255	4.280	4.305
		Release voltage	V	4.080	4.130	4.180
		Delay time	ms	960	1200	1400
3	Charge Overcurrent Protection	Detect voltage	V	-0.13	-0.10	-0.07
		Delay time	ms	7.2	9	11
4	Over Discharge Voltage Protection	Detect voltage	V	2.750	2.800	2.850
		Release voltage	V	3.000	3.100	3.200
		Delay time	ms	120	150	180
5	Discharge Overcurrent Protection	Detect voltage	V	0.085	0.10	0.115
		Delay time	ms	7.2	9	11
6	Short Circuit Protection	Detect current	A	11.27	34.58	62.5
		Delay time	us	240	300	360
7	Operating Voltage	VDD to VSS	V	1.5		8
		VDD to VM	V	1.5		28
8	0V battery charging			Inhibition		
9	0V charge prohibition	Voltage	V			0.5
10	Power Down Function			Available		
11	Current consumption during power down	VDD=VM=1.5V	uA			0.2
12	Current consumption during operation	VDD=3.5V, VM=0V	uA	1.0	3.0	5.5

4.1.6 PCM BOM

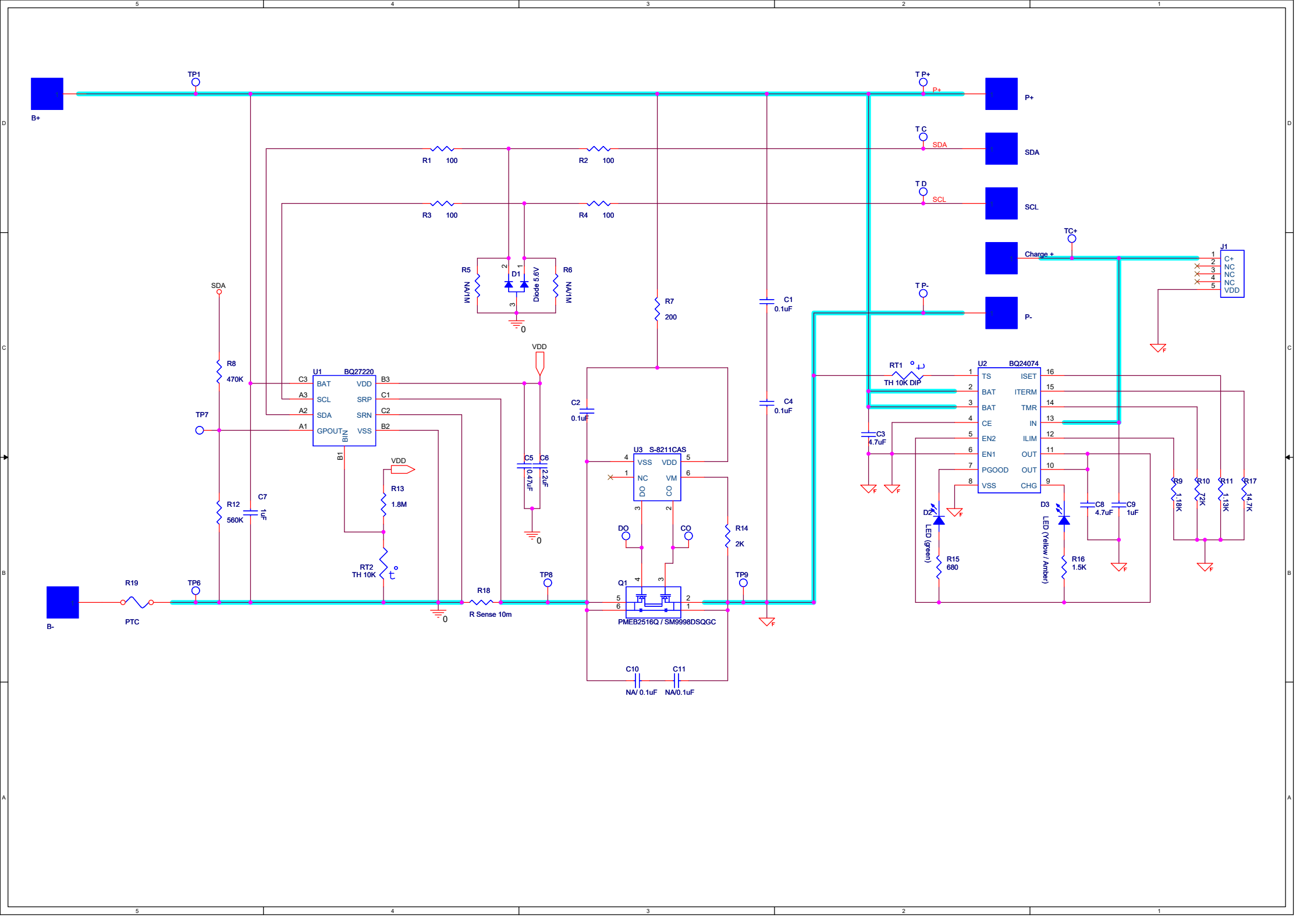
N o.	Symbol	Description	Component	Qty	Vender
1	U1	Gauge IC	TI BQ27220 YZFR TI	1	
2	U2	Charger IC	TI BQ24074 VSON16 TI	1	
3	U3	Protection IC	S-8211CAS-I6T1U	1	
4.	C1,C2,C4	Chip Capacitor	0402 0.1uF X5R 25V SMD	3	
5	C6	Chip Capacitor	0402 2.2uF 16V X5R SMD	1	
6	C3,C8	Chip Capacitor	0402 4.7uF 16V X5R SMD	2	
7	C7,C9	Chip Capacitor	0402 1uF 16V X5R SMD	2	
8	C5	Chip Capacitor	0402 0.47uF 16V Y5V	1	
9	R16	Chip Resistor	0402 1.5KΩ ±5% SMD	1	
10	R1,R2,R3,R4	Chip Resistor	0402 100Ω ±5% SMD	4	
11	R14	Chip Resistor	0402 2KΩ ±5% SMD	1	
12	R7	Chip Resistor	0402 200Ω ±5% SMD	1	
13	R8	Chip Resistor	0402 470KΩ ±5%SMD	1	
14	R9	Chip Resistor	0402 1.18KΩ ±1% SMD	1	
15	R10	Chip Resistor	0402 72KΩ ±5% SMD	1	
16	R11	Chip Resistor	0402 1.13KΩ ±1% SMD	1	
17	R12	Chip Resistor	0402 560KΩ ±5% SMD	1	
18	R13	Chip Resistor	0402 1.8MΩ ±5% SMD	1	
19	R15	Chip Resistor	0402 680Ω ±5% SMD	1	
20	R17	Chip Resistor	0402 14.7KΩ ±1% SMD	1	
21	R18	Sensor Resistor	1206 10mΩ 1W 1% SMD	1	
22	RT2	NTC	0402 10KΩ TSM0A103F34D1RZ SMD	1	
23	RT1	NTC	SS133-103F397FL04020	1	
24	Q1	MOSFET	PMEB2516Q / SM9998DSQG	1	
25	D1	Chip TVS	5.6V STZ5.6NG SOT23	1	
26	D2	LED	LBK0603HGY01A06T SMD 黄绿色	1	
27	D3	LED	LBK0603POY01A06T-H SMD 琥珀色	1	
28	R19	Poly Switch	SMD1206P600SLR-YE	1	
29	J1	connector	MICRO USB MCBF-RDA4(01T)	1	
30	PCB	FR-4	PCB 4 layer	1	
31	P,SCL,SDA,C+,P+	Metals connector	L1.8*W1.3*T0.8mm	5	
32	FPCB	FPCA	FPCB 2 layer	1	
33	wire	Flat cable	UL3302 24AWG L:40mm black	1	
34	wire	Flat cable	UL3302 24AWG L:40mm red	1	

4.1.7 BOM List

NO.	Item	Components Descriptions	Remark
1	Cylindrical	INR18650MH1 2980mAh 3.6V 1A2P 2PCS	LG
2	PCM	BQ24074+BQ27220+S8211CAS+PMEB2516Q/SM9998DSQGC DFN 2*3+SMD1206P600SLR+0.01R+10K NTC(B=3970)	Plan-B-MH1(Program PF1,2,3 default PF1)
3	CASE	FR3010 PC+ABS Grey	1pcs
4	Label	PET 0.12mm	1pcs
5	Metal parts	SUS304 Nickel plated, Frosted matte	1pcs

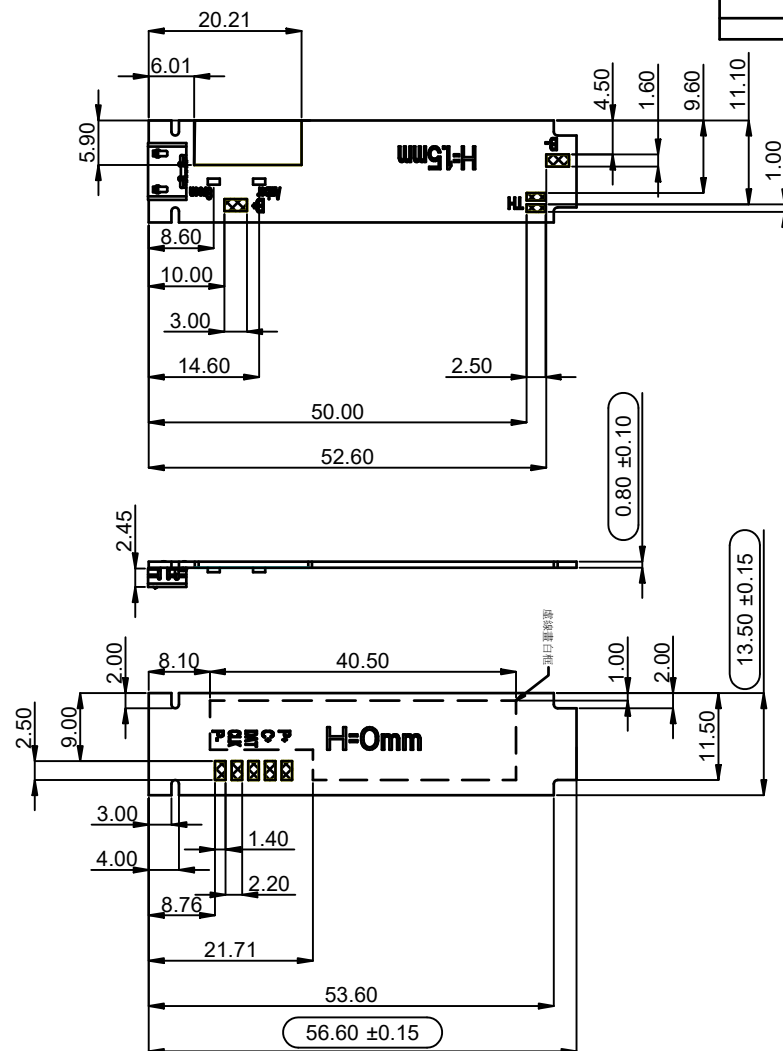
4.2 PCM Schematics

This chapter defines reference schematic drawing. Pre-qualification supplier schematics must be reviewed, approved, and locked by Ring before shipping EV and DV samples. Post-qualification changes require notification to Ring.



4.3 PCM drawing

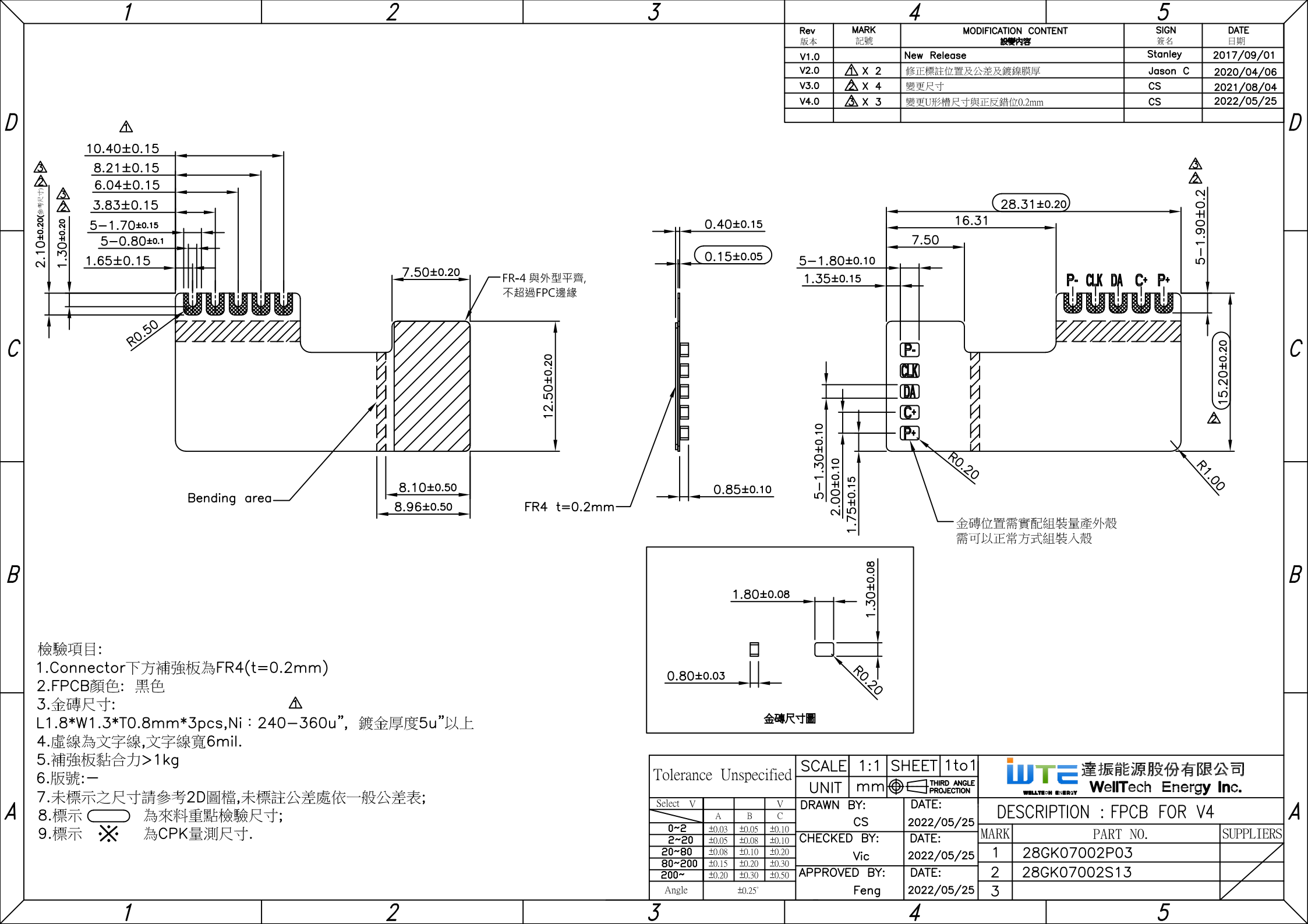
4.3 PCM drawing



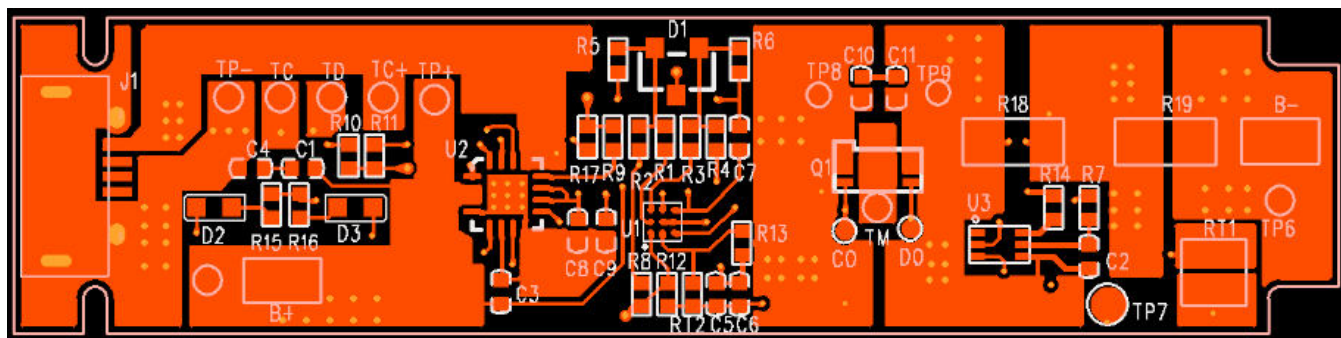
NOTE:

1. 區域鍍金3u"
2. 底漆用黑色
3. 版號:HE15001P03
4. 未標示之尺寸請參考2D圖檔,未標註公差處依一般公差表;
5. 標示 為來料重點檢驗尺寸;
6. 標示 X 為CPK量測尺寸.

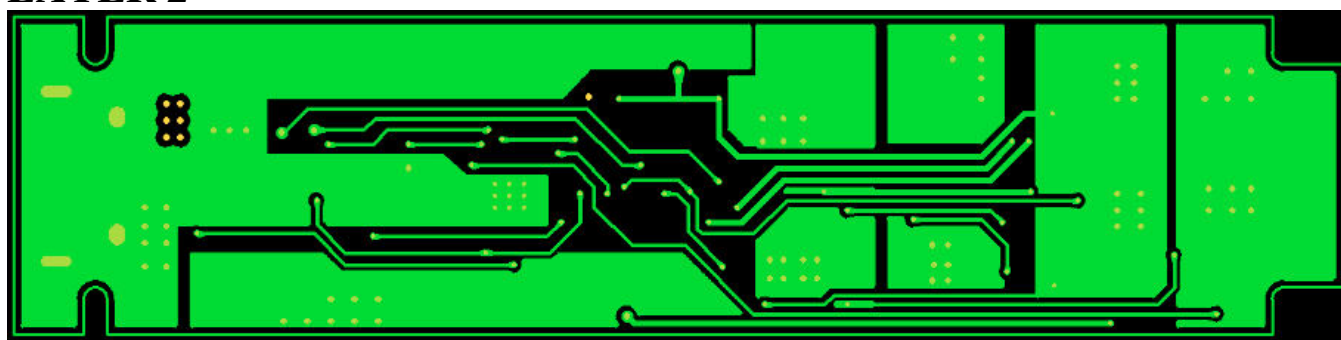
Tolerance Unspecified				SCALE	1:1	SHEET	1 OF 1	WTE 遠東能源股份有限公司 WellTech Energy Inc.		
Select V	A	B	C	UNIT	mm	THIRD ANGLE PROJECTION		DESCRIPTION: PCM FOR WT006-V4MH		
0~2	±0.03	±0.05	±0.08	DRAWN BY:		DATE:		MARK		
2~20	±0.05	±0.08	±0.10	Josh		2021/3/15		PART NO.		
20~80	±0.08	±0.10	±0.20	CHECKED BY:		DATE:		SUPPLIERS		
80~200	±0.15	±0.20	±0.30	Jason C		2021/3/15		1 28HE15001P03		
200~	±0.20	±0.30	±0.50	APPROVED BY:		DATE:		2		
Angle	±0.25°			Feng		2021/3/15		3		



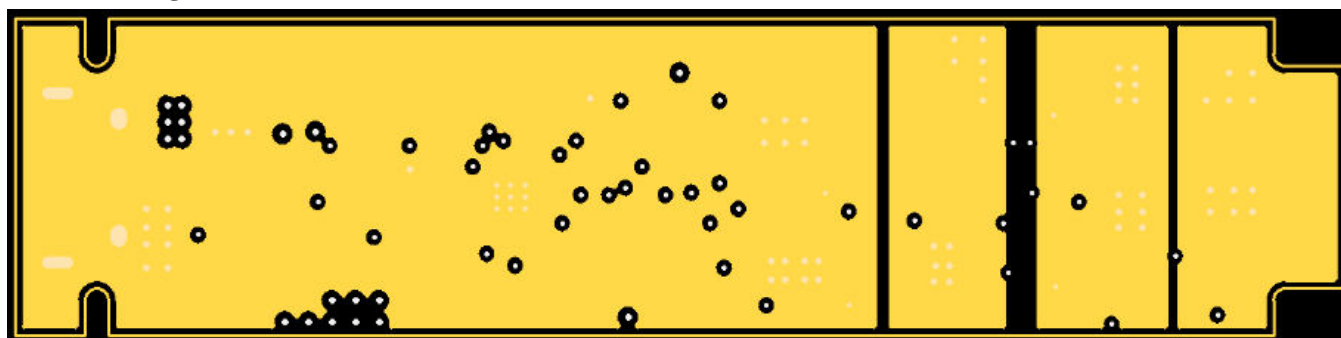
TOP SIDE



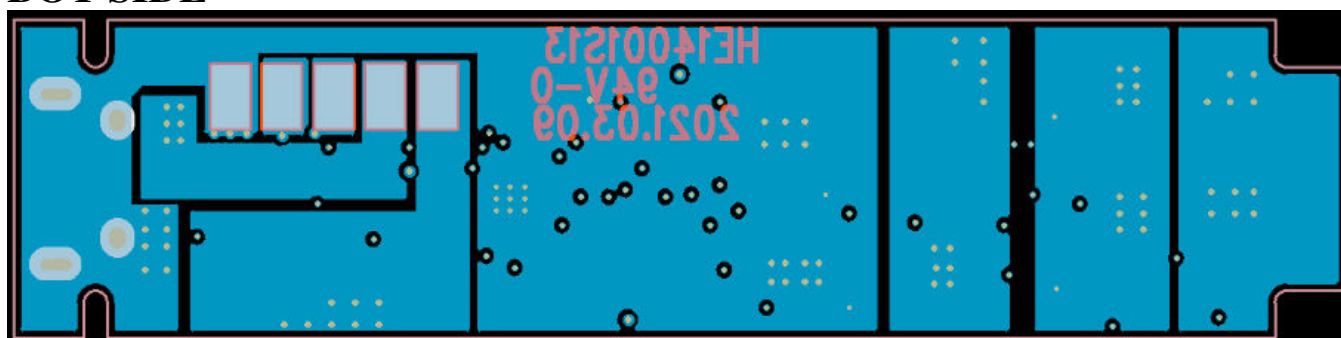
LAYER 2



LAYER 3

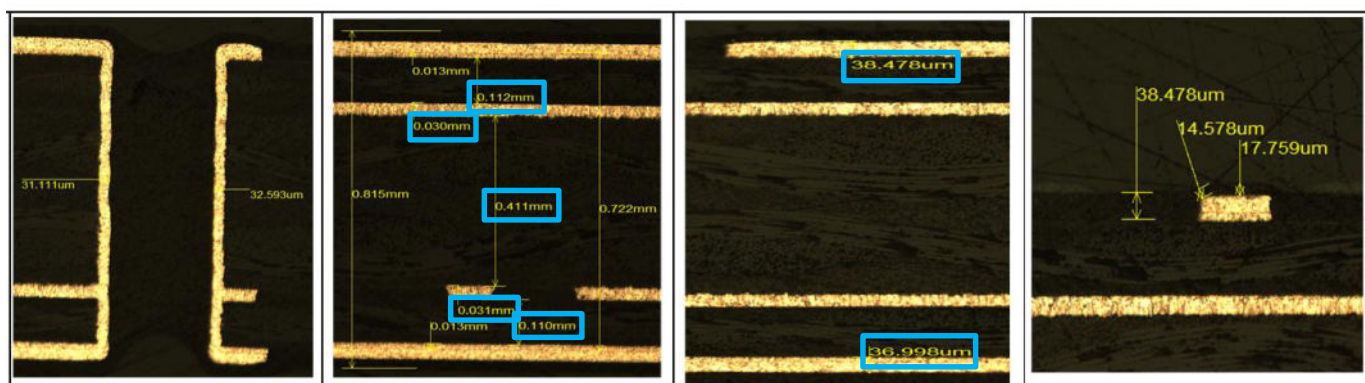


BOT SIDE



4.6 PCB Stack-up figure

Layer	Purpose	Unit	Test data	Unit
TOP Copper thick	≥ 35	um	38.478	um
PP thickness	$120 \pm 10\%$	um	112	um
Middle1 Copper thick	≥ 24.9	um	30	um
Core thickness	$406 \pm 10\%$	um	411	um
Middle2 Copper thick	≥ 24.9	um	31	um
PP thickness	$120 \pm 10\%$	um	110	um
BOT Copper thick	≥ 35	um	36.998	um



5. MECHANICAL SPECIFICATION

The assembled pack (and cells, in the specified conditions) must conform to the mechanical specifications.

Table 8 – Mechanical Specifications

Parameter	Condition	Min	Typ	Max	Units
Cell 18650	X-dim	---	---	18.4	mm
	Y-dim	---	---	65.2	mm
	Z-dim, fresh cell (ship state)	---	---		mm
	Z-dim, fresh cell (100% SOC)	---	---		mm
	Z-dim, after cycle life (100% SOC)	---	---		mm
Official Cell thickness measurement method is to use Parallel Plate Height Gauge. Parallel plate weight should be no more than 700g					
Pack (including tape)	X-dim	---	---	44.7	mm
	Y-dim	---	---	70.2	mm
	Z-dim, fresh (Body/with sheet)	---	---	21.6	mm
	Z-dim, fresh (100% SOC)				mm
	Z-dim, after cycle life (100% SOC)	---	---		mm
Official Cell thickness measurement method is to use Parallel Plate Height Gauge. Parallel plate weight should be no more than 1000g					
Weight	Cell	---	---	45.5	g
	Pack, fully assembled	---	---	130	g

5.1. Mechanical drawing

The assembled pack must conform to the mechanical drawing. Pre-qualification manufacturer 2D/3D drawings must be reviewed, approved, and locked by the Ring before shipping EV and DV samples. Manufacturer shall provide simulated cell and pack swelling models for Ring before shipping EV samples. Post-qualification changes require notification to Ring.

5.2 Battery Type Label drawing

For type label drawing please refer to appendix 1.

5.3 Battery Output Drawing

Schematics and drawing to show the connection spot between battery connector and device.

5.4 Traceability

The battery pack shall be marked with the genealogy markings with Ring specific information:

- **Part Number**
- **Serial Number** – Serial number is not disclosed in this document and it's used for Ring internal purposes only.
- **Date of Manufacturing** – YYYY-MM-DD format

Marking shall be applied by a printing method directly onto the cell so as not to add thickness to the cell. All traceability and safety markings must be printed according to the Ring marking instructions.

6 REGULATORY AND SAFETY

6.1 General Remarks

Battery cells and packs must comply with the applicable regulatory requirements. The battery must be tested to demonstrate compliance to industry safety, environmental, and regulatory requirements. All assembled batteries shall fill requirements as defined and must to conform these requirements in any state of lifetime and in any state of charge. These requirements include, but are not limited to electrical short, over- and under-voltage, over-discharge, abnormal charging, vibration, drop, crush, impact, physical and temperature shock, and water immersion tests. The requirements and specifications contained in the safety and regulatory standards must be adhered to as they apply to the battery.

6.2 Industry Safety Requirements

6.2.1 Certification and compliance

Battery cells and packs must comply with the applicable regulatory requirements. These requirements include but are not be limited to:

- IEC 60950-1, 2nd edition, *Information Technology Equipment – Safety – Part 1: General Requirements*, plus all existing national and group differences within the IECEE CB Scheme applicable to localization plan
- 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*, plus all existing national and group differences
- UL 1642, current edition, *Lithium Batteries*, applicable to the individual cells
- UL 2054, current edition, *Household and Commercial Batteries for battery pack*
- IEEE 1725, *Standard for Rechargeable Batteries for Cellular Telephones*.
- UN/DOT 38.3, *UN Transportation Testing for Lithium Batteries*

Table 9 – List of required cell and battery pack certifications TBD

Certifications	Category
UL1642	Certification
CB(IEC62133+IEC 62368)	Certification
IEEE1725	Certification
UL2054+UL62368	Certification
PSE	Certification
UN 38.3 +1.2m Drop Report	Certification in English and Chinese
2013/56/EU EU battery directive	Report
Reach	Report
MSDS report	Report
CE-EMC	Report
RCM	Report
FCC	Report
RoHs	Report
電池指令(美國)	Report
CP65	Report
IC	Report
UKCA	Report
WERCS	官網註冊
SASO SABE	certification
CEC	Report
DOE	Report
NRCAN	Report

Additional requirements may apply depending on target markets.

6.2.2 Over charge verification

Battery pack must be equipped with protection circuit and secondary protection safety device (PTC). Explosion means an abnormal situation in which a cell vents, ruptures or causes an emission with sufficient force to cause injury, damage or fire.

Battery pack and bare cell (without protection components) shall fulfill UL1642, UL2054, IEC62133 and IEEE-1725.

- A. Over charge 1: Cell with secondary protection device without any other protection components shall not explode or ventilate after charged one day 5.50V / 0...3600mA. Testing ambient temperature is $+23 \pm 3^{\circ}\text{C}$.
- B. Over charge 2: Cell with secondary protection device without any other protection components shall not explode or ventilate after charged one day 6V / 2C. Testing ambient temperature is $+23 \pm 3^{\circ}\text{C}$.
- C. Over charge 3: Cell with secondary protection device without any other protection components shall not explode or ventilate after charged one day 6V / 1C. Testing ambient temperature is $+23 \pm 3^{\circ}\text{C}$.
- D. Over charge 4: Cell with secondary protection device without any other protection components shall not explode or ventilate after charged one day 4.6V / 3C. Testing ambient temperature is $+23 \pm 3^{\circ}\text{C}$.

Safety must be fulfilled with fresh cell and cycled cell in any state of charge.

7 QUALITY DATA

The following Quality documentation is required at each sample build and throughout product life:

Quality documents by DVT
Battery pack FAI data
DFA and process flow chart
Process control parameter template to be filled
Controlled Process Management Plan (PMP) or Quality Assurance/Control (QA/QC) Flow with established IQC, In-process QC (IPQC), OQC, FQC, and Ongoing Reliability Test (ORT) processes
Risk plan/failure mode, effect analysis (DFMEA/PFMEA)
CQP documents including build plan and ramp up plan
Mass production feedback: FPY, Throughput yield, meeting QRR goal Gauge Repeatability & Reproducibility (GR&R) Incoming/Outgoing/Final Quality Control (IQC/OQC/FQC) Data
Failure pareto chart

Table 10 – List of quality documents required to Ring from cell and pack manufacturers.

8 SHIPMENT

The battery pack shall be shipped with at least 3.5~3.65V. This is a specified condition to balance the benefits of self-discharge, cell degradation and first-time use.

8.1 Packing

The battery pack must be shipped from manufacturer packed to protect the battery from shipping and handling damage. Packing must comply with all shipping and safety certification standards. Any adhesive handling sheets must not leave any smudges, marks, or residue on the pack surface or interfere with the integrity of electrical insulation when removed. Manufacturer has to provide delivery package specification and drawing. Max. weight of shipping package is 9.5 kg. The battery pack shall be charged minimum of 3.50~3.65V in active mode when delivered.

8.2 Supply Chain Documentation

The following Supply Chain documentation is required:

- BOM-attributed table of materials for each component which include but are not limited to:
 - Manufacturers
 - Part Numbers
 - Country of Origin
- Material preparation and assembly location information which include but are not limited to:
 - Supply chain flowchart
 - Cost breakdown analysis
 - Packaging specification
 - Key manufacturer qualification data

9 ENVIRONMENTAL REQUIREMENTS

Battery cell and pack must fulfill Ring Restricted Substances requirements. Manufacturer need to provide material content data and all compounds must be listed. The contents must not be changed without mutual agreement

10 BATTERY MASS PRODUCTION APPROVAL

Battery mass production approval can be realised only once all documents and certifications are obtained, battery performance qualification is successfully completed and battery mass production process is accepted.

11 WARRANTY

Battery manufacturer will be responsible for replacing the cell against defects or poor workmanship for 1year from the date of shipping. Any other problem caused by malfunction of the equipment or unsuitable 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 Appendix

Handling Precautions and Guidelines for Li-ion Rechargeable Batteries suggested by the pack vendor.

12.1 Use Attentions:

- 12.1.1 Do not dispose of the battery in fire or expose to the heat.
- 12.1.2 Do not connect battery in charger or equipment with reverse positive and negative terminals.
- 12.1.3 Do not short circuit the battery
- 12.1.4 Do not make battery in physical shock or vibration.
- 12.1.5 Do not disassemble battery.
- 12.1.6 Do not immerse battery in water or get it wet.
- 12.1.7 Do not use batteries mixed with other different type, model.
- 12.1.8 Keep battery away from children.

12.2 Charge :

- 12.2.1 Battery must be charged in appropriate charger.
- 12.2.2 Do not use modified or damaged charger.
- 12.2.3 Do not use unqualified with the specified charger.

12.3 Discharge:

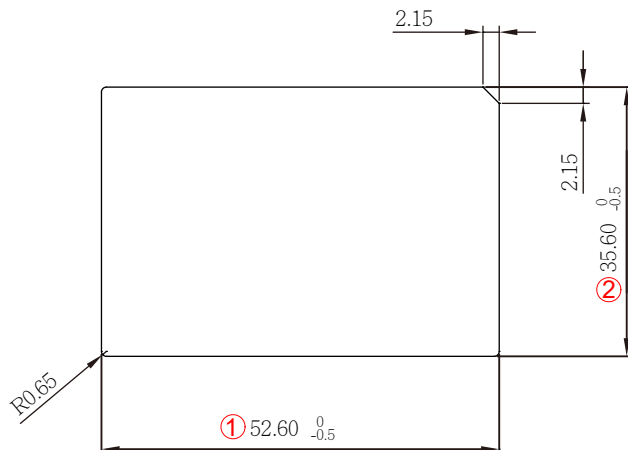
- 12.3.1 Do not discharge battery with surpassing current of specified.
- 12.3.2 Do not discharge battery when the ambient temperature is out of the specified.
- 12.3.3 Do not over discharge battery.

12.4 Disposal:

Dispose of batteries appropriately according to local regulations different from other countries.

ChangZhou Factory Label

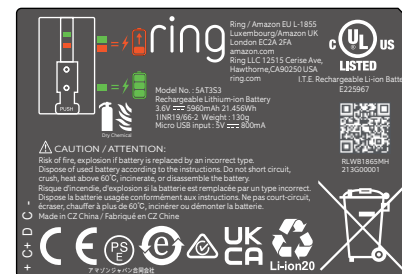
58-000670



Version Number comparison table						
Show	1	2	3	4	5	B
Version	Plan B Safety Version	Plan B Finally Fireware Version	Plan A Safety Version	Plan A Finally Fireware Version	Plan A Plus	Plan B Mass-Production

Date comparison table								
Date	01	02	03	04	05	06	07	08
Show	1	2	3	4	5	6	7	8
Date	09	10	11	12	13	14	15	16
Show	9	A	B	C	D	E	F	G
Date	17	18	19	20	21	22	23	24
Show	H	J	K	L	M	N	P	R
Date	25	26	27	28	29	30	31	
Show	S	T	V	W	X	Y	Z	

Month comparison table				
Month	Jan	Feb	Mar	Apr
Show	1	2	3	4
Month	May	Jun	Jul	Aug
Show	5	6	7	8
Month	Sep	Oct	Nov	Dec
Show	9	A	B	C



QR code 使用model 2 Type列印
QR code底下Barcode字體使用Equip型式

成品編碼原則(Product Barcode Rule)

R L W B 1865MH 21 3 G 00001

Serial Number: 00001~30000, 注意同一天的流水號不得超過30000, 如果超過, 日期順延一天, 並從00001開始流, 同樣不可超過30000, 依此類推
Date: 1=01, 2=02, 3=03, ..., A=10, B=11, ..., Z=31
Month: A=Oct, B=Nov, C=Dec, 1=Jan, 2=Feb, 3=Mar, ..., 9=Sep
Year: 21=2021, 22=2022, 23=2023, ...
Cell Type: 1865MH=LG INR18650MH1
Any ECN, ECR: B=Plan B Mass-Production
後續如ECR變更, 依次D、F、H.....進版
Pack Supplier: W=WTE, K=Kayo, F=Fuji
Cell Supplier: P=Panasonic, L=LGC
Customer code: R=Ring

料號、廠商與圖紙版本請依據此表格

Item	Part Name	Version	Part Number	Vender Code
1	Label	02	6X0000135P03	F0130
2		02	6X0000135S13	F0115

檢驗項目:

- 材質: PET#50+自黏膠MH45513+霧面UV, 單排橫向捲料
- 厚度: 0.1 ± 0.03 mm, 文字為Equip字型, 印刷品質Garde B以上
- 印刷顏色: 底色: Cool Gray 11C; 文字/QR Code底: Cool Gray 3C
LED符號: 綠色/橘色
- 產品不得有髒物、油污、毛刺、斷裂、殘膠及局部多膠缺膠等不良;
- 未標示之尺寸請參考2D圖檔, 未標註公差處依一般公差表;
- 球標為來料重點檢驗尺寸

WTE 達振能源股份有限公司
WellTech Energy Inc.

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Tolerance		Unspecified			
Select	V	A	B	C	D
0~10	±0.03	±0.05	±0.10	±0.20	±1.00
10~50	±0.05	±0.08	±0.20	±0.30	±1.50
50~100	±0.08	±0.12	±0.30	±0.40	±3.00
100~250	±0.12	±0.20	±0.40	±0.50	±5.00
250~	±0.20	±0.30	±0.50	±0.60	±10.00

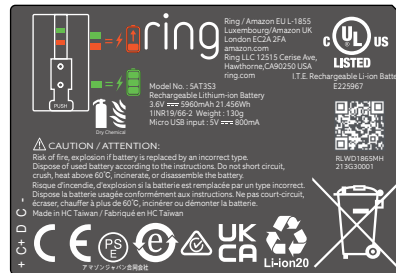
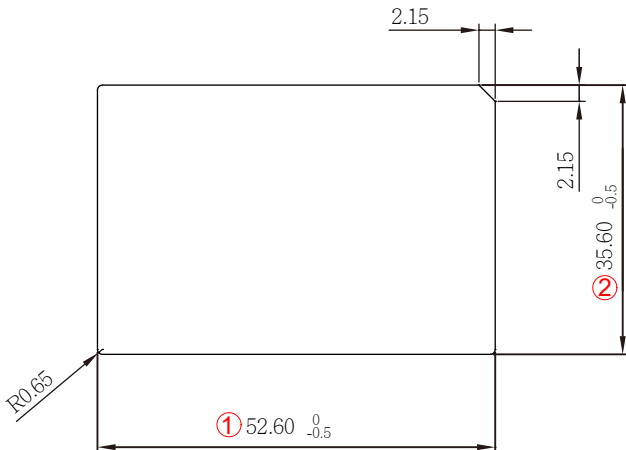
Drawn:	CS
Designed:	CS
Checked:	CS
Approved:	David

Third Angle Projection	Unit	mm
	Scale	1 : 1
	Sheet	1 / 1

Project Code : V4MH			
Part Name :		Ver	02
WT007-V4BDMH LABEL 灰底灰字			
Part Number :		Date	2024.8.23
6X0000135P03			

Hsinchu Factory Label

58-000710



QR code 使用model 2 Type列印
QR code底下Barcode字體使用Equip型式

Version Number comparison table						
Show	1	2	3	4	5	B
Version	Plan B Safety Version	Plan B Finally Fireware Version	Plan A Safety Version	Plan A Finally Fireware Version	Plan A Plus	Plan B Mass-Production

Date comparison table								
Date	01	02	03	04	05	06	07	08
Show	1	2	3	4	5	6	7	8
Date	09	10	11	12	13	14	15	16
Show	9	A	B	C	D	E	F	G
Date	17	18	19	20	21	22	23	24
Show	H	J	K	L	M	N	P	R
Date	25	26	27	28	29	30	31	
Show	S	T	V	W	X	Y	Z	

Month comparison table				
Month	Jan	Feb	Mar	Apr
Show	1	2	3	4
Month	May	Jun	Jul	Aug
Show	5	6	7	8
Month	Sep	Oct	Nov	Dec
Show	9	A	B	C

成品編碼原則(Product Barcode Rule)

R L W D 1865MH 21 3 G 30001

Serial Number: 30001~65534, 注意同一天的流水號不得超過65534, 如果超過, 日期順延一天, 並從30001開始流, 同樣不可超過65534, 依此類推
Date: 1=01, 2=02, 3=03, ..., A=10, B=11, ..., Z=31
Month: A=Oct, B=Nov, C=Dec, 1=Jan, 2=Feb, 3=Mar, ..., 9=Sep
Year: 21=2021, 22=2022, 23=2023, ...
Cell Type: 1865MH=LG INR18650MH1
Any ECR, ECR=B=Plan B Mass-Production
後續如ECR變更, 依次D、F、H.....進版
Pack Supplier: W=WTE, K=Kayo, F=Fuji
Cell Supplier: P=Panasonic, L=LGC
Customer code: R=Ring

料號、廠商與圖紙版本請依據此表格

Item	Part Name	Version	Part Number	Vender Code
1	Label	03	6X0000144P03	F0130
2		03	6X0000144S13	F0115

檢驗項目:

- 材質: PET#50+自黏膠MH45513+霧面UV, 單排橫向捲料
- 厚度: 0.1 ± 0.03 mm, 文字為Equip字型, 印刷品質Garde B以上
- 印刷顏色: 底色: Cool Gray 11C; 文字/QR Code底: Cool Gray 3C

LED符號: 綠色/橘色

- 產品不得有髒物、油污、毛刺、斷裂、殘膠及局部多膠缺膠等不良;
- 未標示之尺寸請參考2D圖檔, 未標註公差處依一般公差表;
- 球標為來料重點檢驗尺寸

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Tolerance		Unspecified				
Select	V	A	B	C	D	E
0~10	±0.03	±0.05	±0.10	±0.20	±1.00	±0.2"
10~50	±0.05	±0.08	±0.20	±0.30	±1.50	±0.4"
50~100	±0.08	±0.12	±0.30	±0.40	±3.00	±0.6"
100~250	±0.12	±0.20	±0.40	±0.50	±5.00	
250~	±0.20	±0.30	±0.50	±0.60	±10.00	

Drawn: CS

Designed: CS

Checked: CS

Approved: David

Third Angle
Projection

Unit mm

Scale 1 : 1

Sheet 1 / 1

Project Code : V4MH

Part Name : WT007-V4BDMH LABEL 灰底灰字 FOR WTE

Part Number : 6X0000144P03

Date 2024.8.23

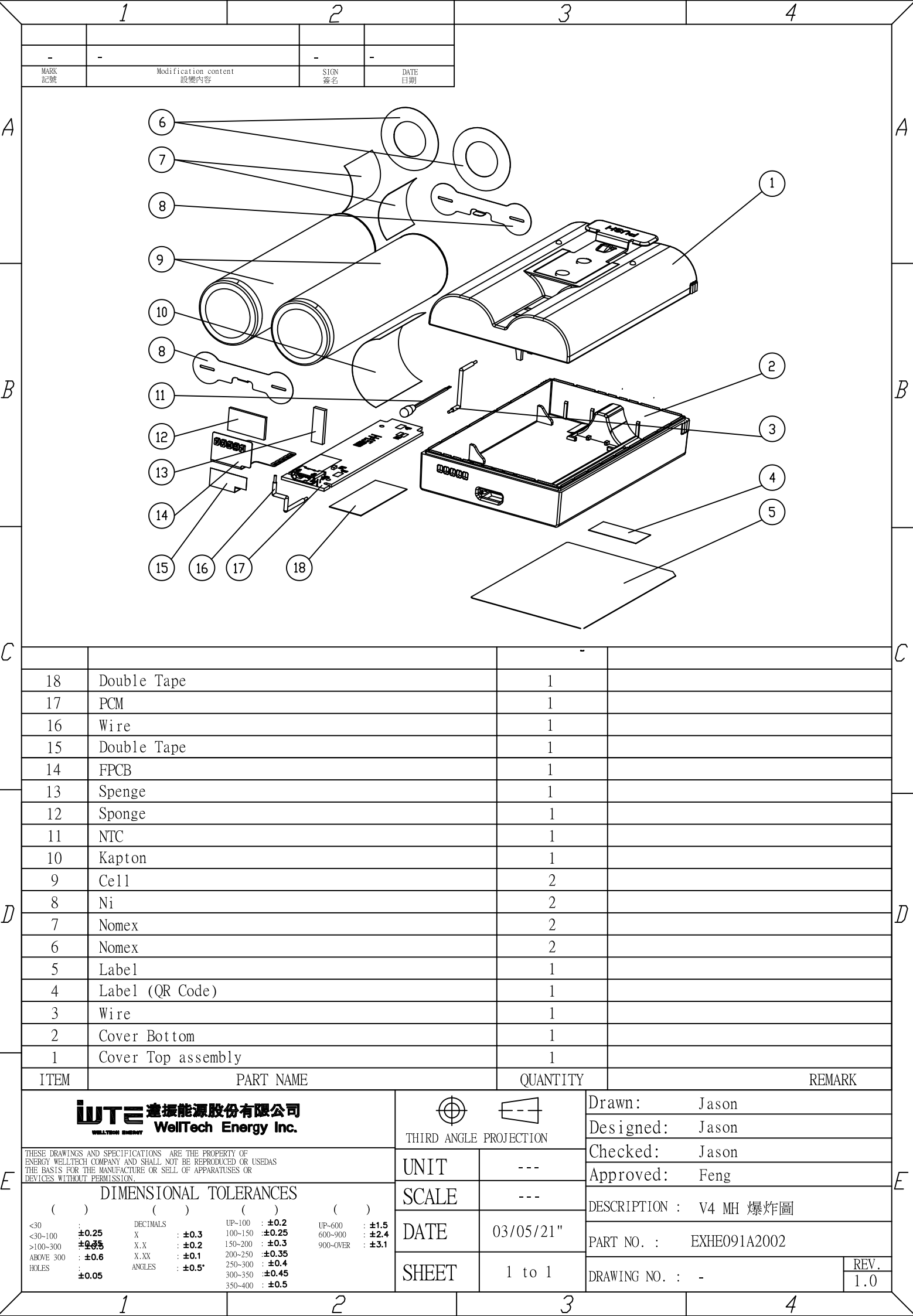
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2

3

4

5



18	Double Tape	1	
17	PCM	1	
16	Wire	1	
15	Double Tape	1	
14	FPCB	1	
13	Spenge	1	
12	Sponge	1	
11	NTC	1	
10	Kapton	1	
9	Cell	2	
8	Ni	2	
7	Nomex	2	
6	Nomex	2	
5	Label	1	
4	Label (QR Code)	1	
3	Wire	1	
2	Cover Bottom	1	
1	Cover Top assembly	1	
ITEM	PART NAME	QUANTITY	REMARK

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THIRD ANGLE PROJECTION

UNIT

SCALE

DATE

03/05/21"

SHEET

1 to 1

Drawn: Jason

Designed: Jason

Checked: Jason

Approved: Feng

DESCRIPTION : V4 MH 爆炸圖

PART NO. : EXHE091A2002

DRAWING NO. : -

REV. 1.0

