

宜電電池科技股份有限公司

Edan Technology Corporation

Lithium-Ion Battery Pack

Specifications

Customer	MCM
Model	ED-C21193766S
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Customer Signatures

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## 1. Scope:

This specification provides general engineering information and electrical specifications for the lithium-ion battery pack ED-C21193766S made by Edan Electronic (Shanghai) Corporation, an ISO9001:2000 certified manufacturer.

## 2. Legends

### 2.1 Model

Format: ED-I-mmmm

- ED: indicates a pack is made by Edan.
- I: Specification Initiator. **S** indicates that the pack is initiated by a well-known company and thus considered as an industrial Standard pack. **C** indicates that the pack is a Custom design initiated by customer or Edan.
- mmmm: Model name, e.g. NP60 indicates the model is known as NP60 in the battery industry. For custom design initiated by Edan, the model name usually has the format nOttwllm, where
  - n: the number of cells connected in serial.
  - O: options of the pack; it includes the information of 4 options encoded in hexadecimal. The MSB is 1 if PTC exists; 0 otherwise. The next bit is for ID register, followed by NTC thermistor and connector. For example, if a pack has PTC, NTC, and Connector, the bits are 1011, which is also represented by B in hexadecimal.
  - tt: thickness of the battery pack
  - ww: width of the battery pack
  - ll: length of the battery pack; not including the wires and connectors if any.
  - m: material of the cell enclosure. A: aluminum, S: Stainless steel. P: Polymer.

### 2.2 Capacity

- 1CmA = minimum capacity / hour. For example, if minimum capacity = 600mAh, 1CmA = 600mA.
- CC: charge with Constant Current when pack voltage < 8.4V.
- CV: charge with Constant Voltage 8.4V.
- Full charge: under ambient temperature  $23\pm 2$ , charge with constant current 0.2CmA until 8.4V, then charge under constant voltage 8.4V

until charge current is less than 0.05CmA. Stop charge process.

- Full discharge: under ambient temperature  $23\pm 2$  , discharge with constant current 0.2CmA until 6.0V.
- Capacity: Full charge and full discharge pack for 2 cycles. Then, full charge the pack and rest for 30 minutes. Full discharge and measure discharge time. Cell capacity is the product of discharge current and charge time in hours.

### 3. Physical Structure

- Pack Dimensions (mm):  $18.5^{+0.30}_{-0.30} * 36.5^{+0.30}_{-0.30} * 65.5^{+0.40}_{-0.40}$

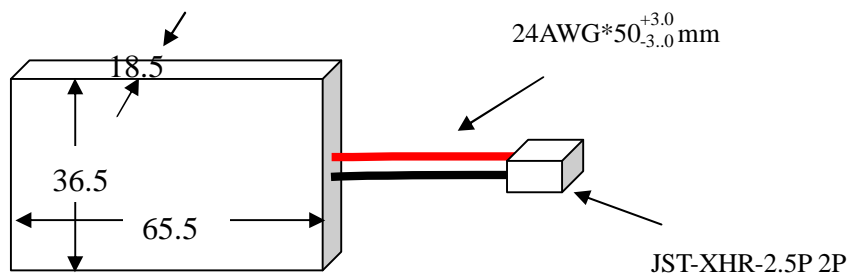


Figure 1. Pack Dimensions

- Connectors & wires: Can be customized to customer's needs.
- Pin Outs
  - Black Wire : connected to “-” of charger or load      PIN2
  - Red Wire : connected to “+” of charger or load      PIN1

■ Circuit Structure

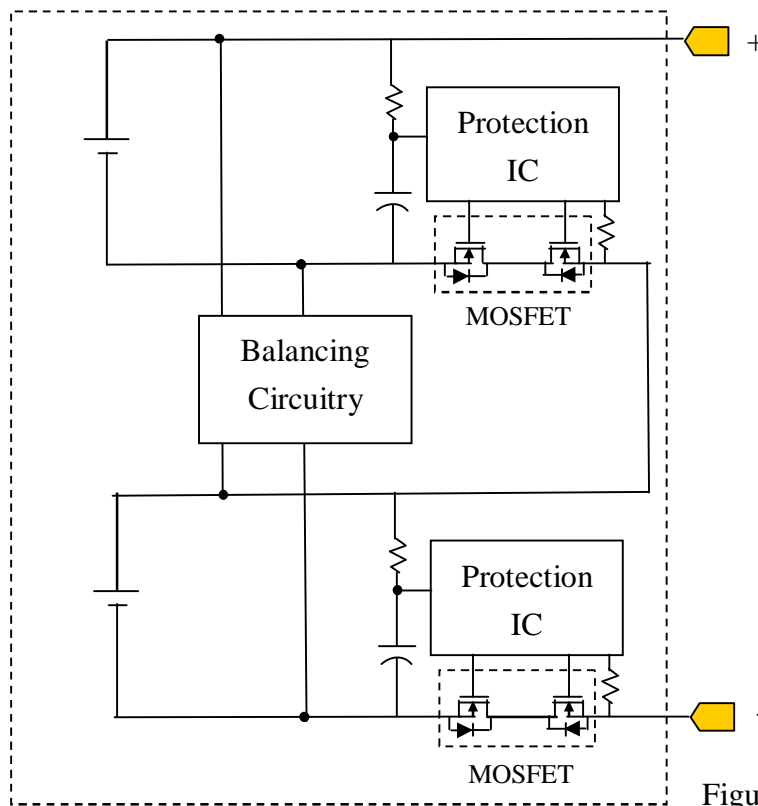


Figure 2. Circuit Structure

**4. Functions of Protection Circuit Module**

- Over charge protection: When any cell in the battery pack is over charged, the charging path will be cut off by the MOSFET on the protection circuit module (PCM).
- Over discharge protection: When any cell in the battery pack is over discharged, the discharge path will be cut off by the MOSFET on the PCM.
- Over current protection: When the battery pack is over current or short circuit, the discharge path will be cut off by the MOSFET on the PCM.
- Cell equalization: When the voltages of the two battery cells are not equivalent, which decreases pack capacity, the PCM will equalize the cell voltages.

**5. Specifications of Battery Pack**

No.	Item	Specifications
5.1	Capacity	2000mAh
5.2	Rated voltage	7.4V
5.3	Dimensions (mm)	18.5 <sup>+0.30</sup> <sub>-0.30</sub> * 36.5 <sup>+0.30</sup> <sub>-0.30</sub> * 65.5 <sup>+0.40</sup> <sub>-0.40</sub>
5.4	Weight (g)	94.0± 1.5 g
5.5	Impedance	< 220 m

5.6	Overcharge detection voltage	4.30V
5.7	Overcharge release voltage	4.10V
5.8	Overdischarge detection voltage	2.30V
5.9	Overdischarge release voltage	3.00V
5.10	Overcurrent detection (by PCM)	Approx. 3.0A / 12 msec
5.11	Charge temperature	0 ~ + 45
5.12	Discharge temperature	-20 ~ + 60
5.13	Storage temperature	-20 ~ + 35
5.14	Storage humidity	< 85%
5.15	Charge status at delivery	40%~50% charged

## 6. Requirements on Charger and Application

- Max charge voltage: 8.4V
- Minimum cut off voltage: 6.0V
- Max charge current: 0.5CmA
- Max discharge current: 1CmA
- Charge temperature: 0 ~ + 45
- Discharge temperature: -20 ~ + 60

## 7. Battery Cell Specifications

No.	Items	Specifications
7.1	Model	ED18650S (UL: MH29117)
7.2	Dimensions	∅ = 18mm, L= 65mm
7.3	Rated voltage	3.7 V
7.4	Weight	47±1 g
7.5	Internal impedance	< 70m
7.6	Max. charge voltage	4.20 ± 0.05V
7.7	Max. charge current	0.5CmA
7.8	Min. discharge voltage	3.0V
7.9	Max. discharge current	1.0CmA
7.10	Charge method	CC-CV
7.11	Charge temperature	0 ~ + 45
7.12	Discharge temperature	-20 ~ + 60
7.13	Storage temperature	-20 ~ + 35 ( 40% charged)
7.14	Ambient relative moisture	45% ~ 85%

8. Cell Performance

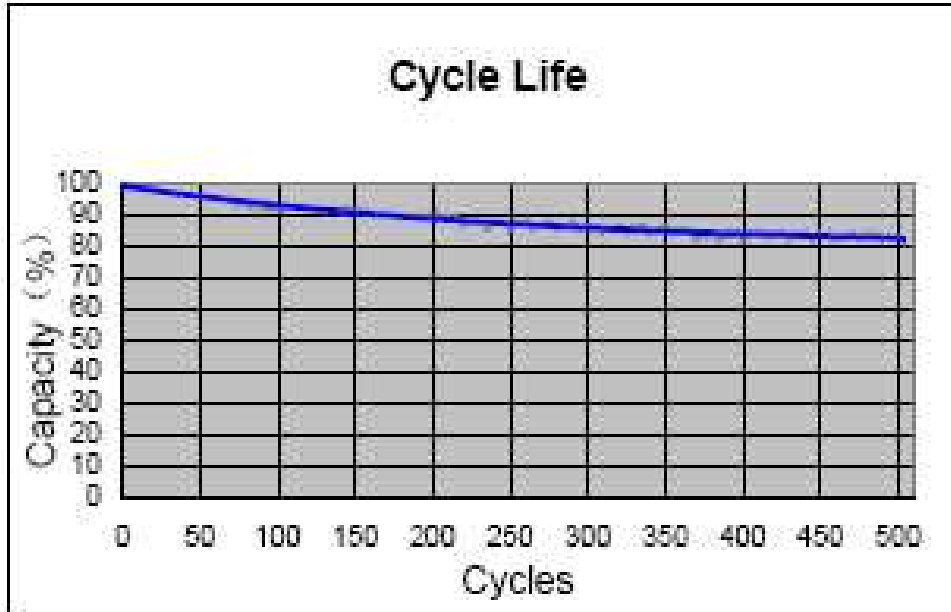


Fig. 3. Cycle Life Characteristic Curves

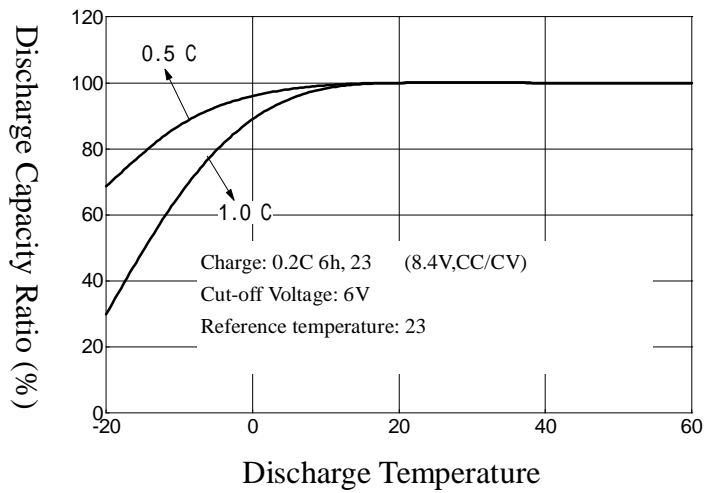


Fig. 4. Temperature Characteristic Curve

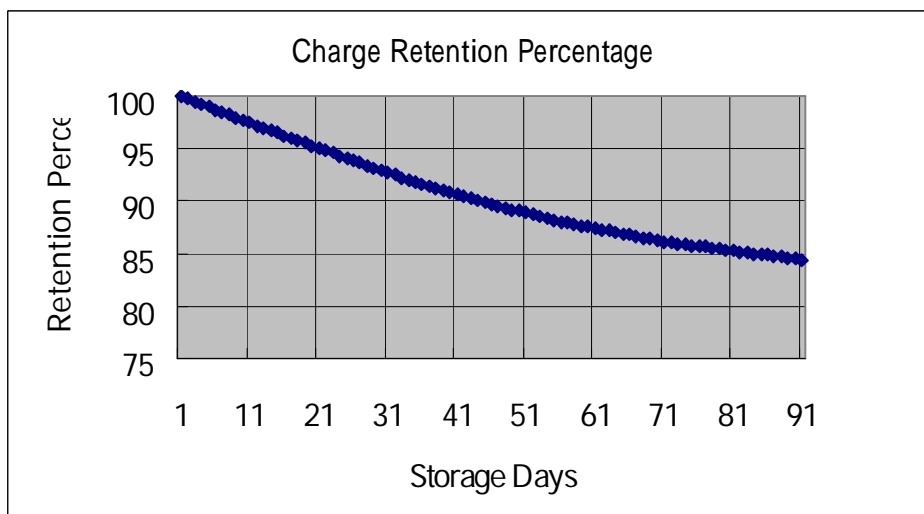


Fig. 5. Self-discharge Characteristic Curve

## 9. Specifications of PCB

- Material FR-4
- Dimension 9.5 x 64 mm
- UL 94V-0
- Material 1 oz copper double sided bonded to FR-4 base material.
- 2 layers with through holes.
- All through holes connections to have solder resist applied.
- Printed Silk.

## 10. Simple Tests

- Over Current Test

See figure 6 below. Connect a  $0.50\Omega/10W$  resistor between the “+” pin and “-“ pin to create over current condition ( $>6\sim 8A$ ). Measure the voltage across the resistor. If the voltage  $> 0.1V$ , fail. Remove the resistor and measure the voltage again. If voltage backs to normal ( $7.6 \pm 0.2V$ ), pass.

- Over Charge Test

See figure 7 below. Full charge the battery pack with a charger. Then charge the pack with a 9V power supply through a  $1\Omega/5W$  resistor. Measure the voltage across the “+” pin and “-“ pin. If the voltage jumps from around 8.6V to 9V within a couple of minutes, pass. Otherwise, fail.

- Over Discharge Test

See figure 8 below. Discharge the battery pack with a 10 $\Omega$ /10W resistor (or connect two 5 $\Omega$ /10W resistors in serial). Measure the voltage across the resistor. If the voltage jumps from around 4.6V to 0V, pass. Otherwise, if the voltage falls below 4V continuously, fail.

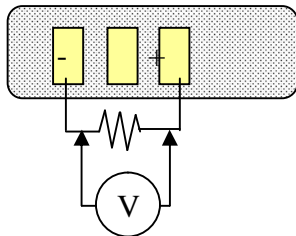


Fig. 6. Over Current Test

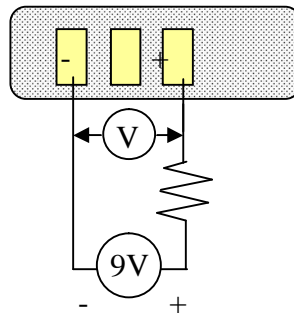


Fig. 7. Overcharge Test

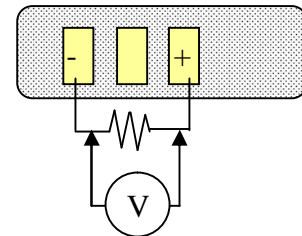


Fig. 8. Overdischarge Test

## 11. Guarantees

- If the battery pack is neither sold nor used, the manufacturer guarantees that
  - within 6 months from the date the product is delivered the output voltage of the pack will be above 6.0V. Otherwise, the manufacturer will replace it with a new one.
  - within 6 months from the date the product is delivered the battery pack will not have leakage. Otherwise, the manufacturer will replace it with a new one.
- After the battery pack is sold, the manufacturer guarantees that
  - 6 months from the date the product is sold and the battery pack is not abused, including but not limited to being charged by a charger not made by the specified customer, the battery pack will have a remaining capacity more than 80% of the rated capacity. Otherwise, the manufacturer will replace it with a new one.
  - 6 months from the date the product is sold and the battery pack is not abused, including but not limited to being charged by a charger not made by the specified customer, the battery pack will neither leak nor break the enclosure materials. Otherwise, the manufacturer will replace it with a new one.

## 12. Product Liability

It is requested to use the battery pack in strict accordance with the specifications and warnings in this document. Improper usage of the battery pack may cause

an accident or a fire due to the heat generated by the abused battery pack. The battery pack manufacturer holds no liability if the battery pack is abused or not used in accordance with the specifications and warnings in this document.

### 13. Updates

This document may be updated without notice.

### 14. Warnings

At least the following warning messages must be marked on the product:

- Use only specified charger.
- Do not short-circuit
- May explode if disposed of in fire

Regarding the guarantee and responsibility described in this specification sheet, it is applied when no wonder that the root cause of the abnormality arise from the manufacture of this product .

Please note that the transaction value is set as the higher limit in the guarantee of this product.