1. Capacity display module.

The battery includes an LED module that displays the remaining battery capacity. This feature provides users with a real-time and convenient way to monitor the battery's charge status.

2. Over voltage/Over-charge protection.

The BMS monitors the voltage of each individual battery cell in real time

2-1 Applicable Cell Types
Lithium iron phosphate : 3.2V nominal
Ternary lithium) : 3.7 V nominal.

2-2 Overcharge threshold:
Lithium iron phosphate: monomer voltage ≥3.65V;
Ternary lithium: monomer voltage ≥4.25V.

2-3. Protection Mechanism
When any cell exceeds the overcharge threshold, the BMS activates the MOSFET or relay to disconnect the charging circuit, thereby halting charging process. Charging resumes automatically once the cell voltage returns to a safe level (e.g., ≤3.5V for lithium iron phosphate).

3. Low voltage/over-discharge protection.

3.1 Over-discharge threshold:
Lithium iron phosphate: cell voltage ≤2.5V;
ternary lithium: cell voltage ≤2.8V.

3.2 Discharge Circuit Cut- off :
When the voltage of any individual cell falls below the threshold, the BMS disconnects the load to prevent deep discharge and potential damage to the battery.

4. Temperature protection function

4-1. Temperature monitoring:
Battery pack temperatures are monitored in real time (Typically 2-4 measurement points) using NTC thermistors or digital temperature sensors.

4-2. High temperature protection:
Charging is disabled when temperature is higher than 45°C,
Discharging is disabled when temperature is higher than 60°C

4-3. Low temperature protection:
Charging is prohibited when temperature is lower than 0°C (due to lithium precipitation)

Discharging current is limited when temperature is lower than -20°C.

5. Static self-balancing

5-1.Passive balancing(Resistive Dissipation):
High-voltage cells discharge through parallel resistors to equalize voltage across cells.

Suitable for low-cost, small -capacity battery packs (balancing current ≤100mA).
5-2. Active Balancing (Energy Transfer)
Energy is transferred from higher-voltage cells to lower – voltage cells using capacitors, inductors or transformers.

5-3. Advantages include high efficiency (up to 85%) and higher balancing current (1-5A), ideal for large-capacity battery packs.

5-4. Balancing Activation Conditions :
Voltage difference between cells ≥30mV (ternary lithium) or 50mV (lithium iron phosphate).

5-5. Balancing strategy:
End-stage charging balancing: High efficiency but may extend charging time;
Real-time balancing: Provides dynamic adjustment during charge/discharge cycles requires advanced BMS processing capabilities.