GalaxyElec TP5100

GalaxyElec TP5100 Lithium Battery Charge Management Module User Manual

Model: TP5100

1. Product Overview

The GalaxyElec TP5100 is a versatile double switch buck charge management chip designed for 8.4V dual-cell and 4.2V single-cell lithium batteries. Its compact QFN16 package and simplified external circuitry make it suitable for portable equipment requiring high-current charging. The module integrates various protection features, including input overcurrent, undervoltage, over-temperature, short-circuit, battery temperature monitoring, and reverse battery protection.
It supports a wide input voltage range of 5V-18V and features a three-phase charging process: trickle charge, constant current, and constant voltage. The pre-charge and trickle charge currents are adjustable via an external resistor, with a maximum charge current of up to 2A. The 400kHz switching frequency allows for smaller external components and efficient heat management during high-current charging. The built-in power PMOSFET and anti-intrusion circuit eliminate the need for external Schottky diodes for reverse protection.

2. Key Features

- Supports double 8.4V / single 4.2V lithium battery charging.
- Programmable charge current from 0.1A to 2A.
- Programmable steady precharge current (10%-100%).
- Wide operating voltage, up to 18V.
- Red and green LED indicators for charge status.
- Integrated chip temperature protection, overcurrent protection, and undervoltage protection.
- Battery temperature protection, reverse battery shutdown, and short circuit protection.
- Switching frequency of 400kHz, compatible with 20uH and larger inductances.
- PWR_ON pin for power battery switching control.

3. Product Components

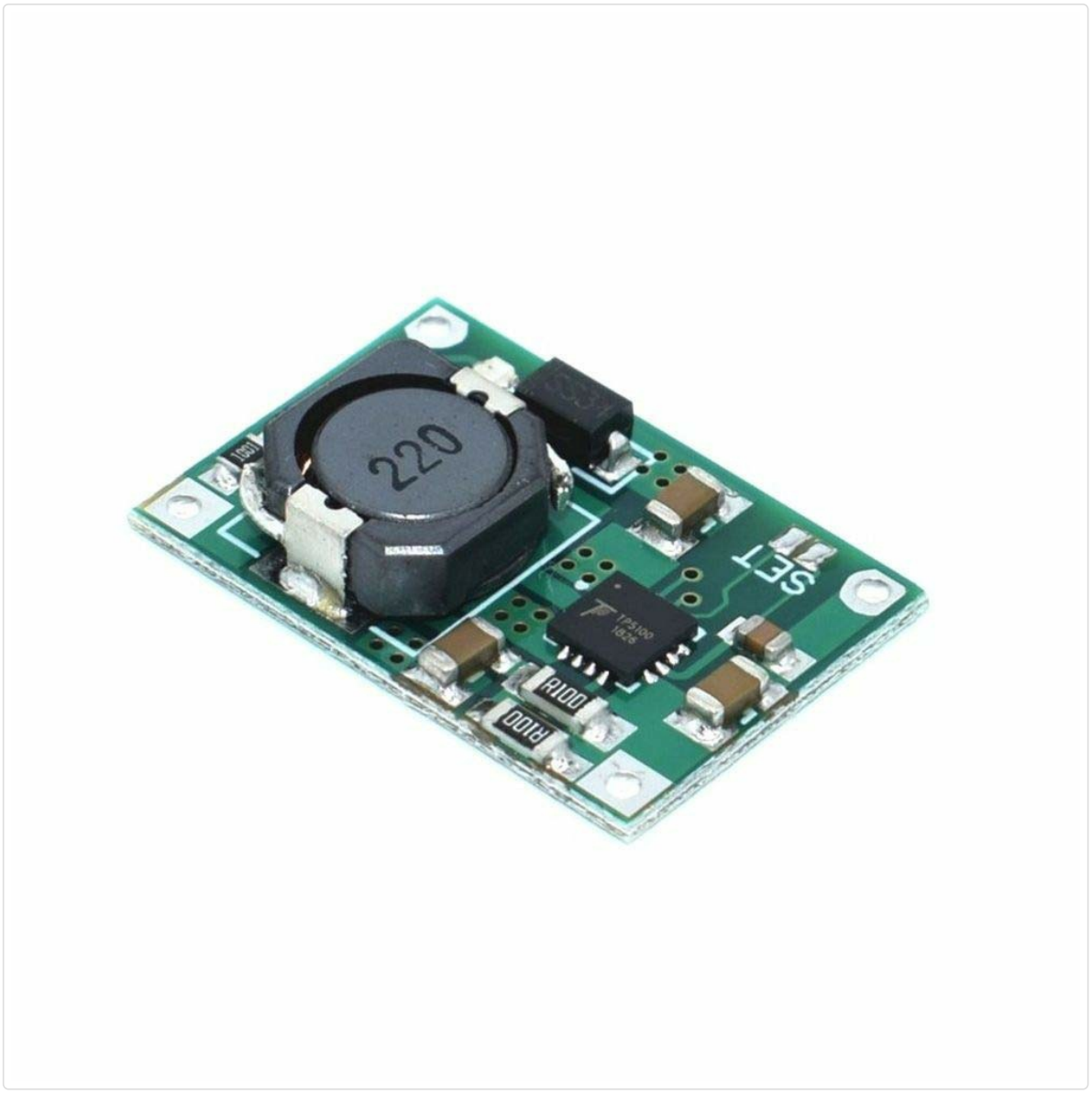

Figure 1: Top view of the TP5100 module. This image displays the main components including the large inductor, the TP5100 integrated circuit, and various resistors and capacitors on the green PCB.

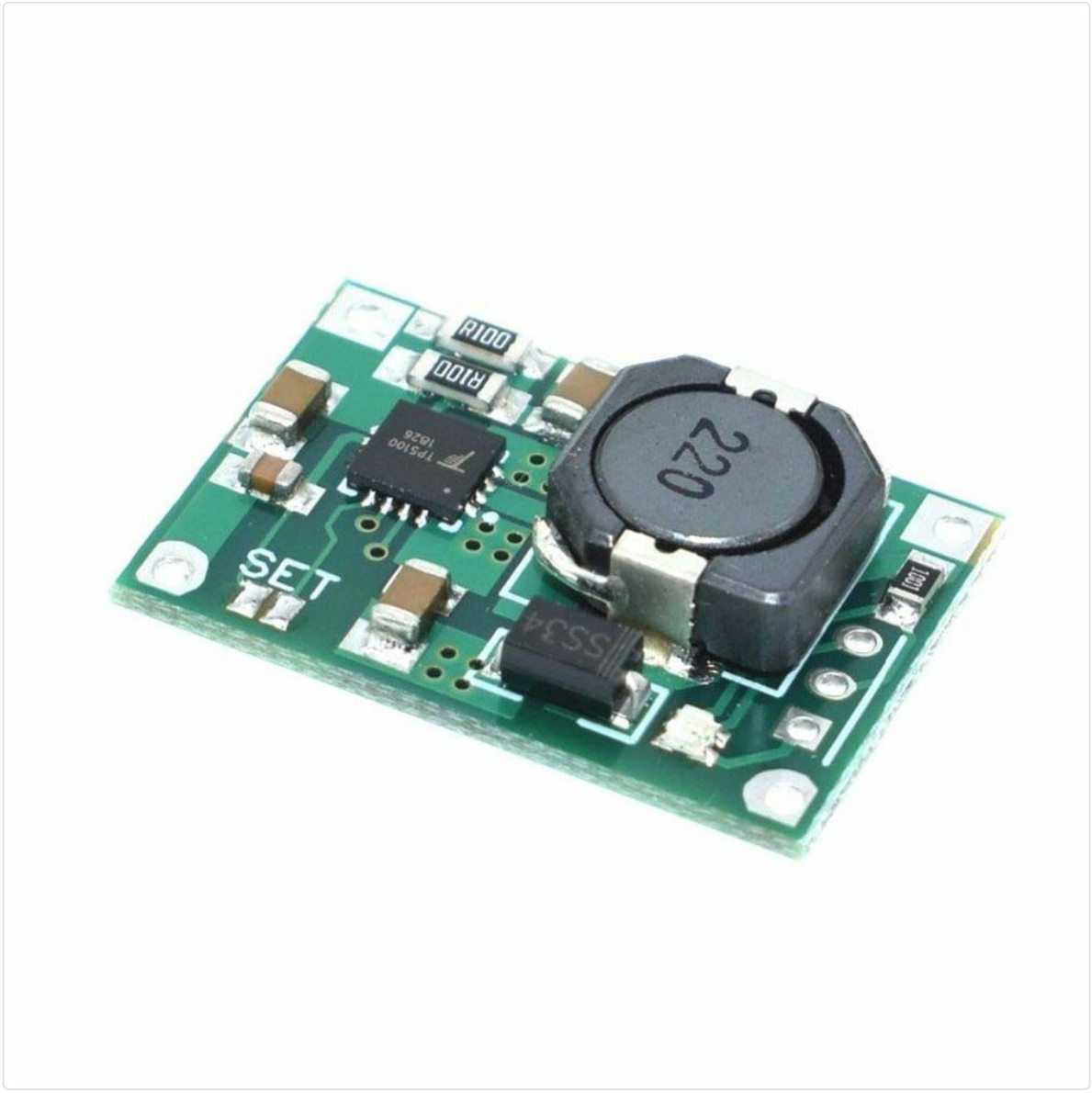

Figure 2: Angled view of the TP5100 module. This perspective shows the layout of the components and the solder pads for input, output, and battery connections.

4. Setup and Connection

Before connecting the TP5100 module, ensure all power sources are disconnected. Observe proper polarity for all connections to prevent damage to the module or connected devices.

4.1 Input Power Connection

- Connect a DC power source (5V-18V) to the input terminals (typically marked VIN+ and VIN- or similar).
- Ensure the input voltage is within the specified range to avoid overvoltage or undervoltage conditions.

4.2 Battery Connection

- Connect the lithium battery (single cell 4.2V or double cell 8.4V) to the battery terminals (typically marked BAT+ and BAT-).
- Verify the battery type and voltage match the module's configuration (single or double cell).
- The module automatically detects the battery configuration (4.2V or 8.4V) and adjusts charging parameters accordingly.

4.3 Output Connection (Optional)

- If the module provides a separate output for load, connect your load to these terminals.
- Note that the PWR_ON pin can be used for switching control of the power battery. Consult the datasheet for specific implementation details.

5. Operating Instructions

Once properly connected, the TP5100 module will begin the charging process automatically.

5.1 Charging Process

- **Trickle Charge:** If the battery voltage is very low, the module will start with a low current trickle charge.
- **Constant Current (CC):** Once the battery voltage reaches a certain threshold, the module switches to constant current charging, delivering the programmed charge current.
- **Constant Voltage (CV):** As the battery approaches full charge, the module enters constant voltage mode, reducing the current until the battery is fully charged.

5.2 LED Indicators

- **Red LED:** Typically indicates charging in progress.
- **Green LED:** Typically indicates charging complete or standby.
- *Note: Specific LED behavior may vary slightly depending on the module's exact implementation.*

5.3 Current Adjustment

The charge current (0.1A-2A) and precharge current (10%-100%) are programmable via external resistors. Refer to the TP5100 datasheet for detailed resistor value calculations and connection diagrams for current setting.

6. Maintenance and Care

- Keep the module clean and free from dust and moisture.
- Avoid exposing the module to extreme temperatures or direct sunlight.
- Do not apply excessive force or bend the PCB.
- Ensure adequate ventilation, especially during high-current charging, to prevent overheating.
- Regularly inspect connections for looseness or corrosion.

7. Troubleshooting

7.1 Module Not Charging

- **Check Input Power:** Verify that the input voltage is within the 5V-18V range and the power supply is capable of providing sufficient current.
- **Check Battery Connection:** Ensure the battery is correctly connected with proper polarity to the BAT+ and BAT- terminals.
- **Battery Voltage:** If the battery voltage is extremely low, the module might be in a protective state or require a very slow trickle charge.

- **LED Indicators:** Observe the LED status for any error indications.

7.2 Overheating

- **Reduce Charge Current:** If the module is getting excessively hot, consider reducing the programmed charge current.
- **Improve Ventilation:** Ensure the module has adequate airflow.
- **Check Load:** If an external load is connected, ensure it is not drawing excessive current.

7.3 Incorrect Charge Voltage

- **Battery Configuration:** Confirm the module is correctly configured for a single (4.2V) or double (8.4V) cell battery. The TP5100 typically auto-detects, but ensure the battery type is compatible.
- **Faulty Battery:** A damaged or unbalanced battery pack can lead to incorrect charging.

8. Specifications

Parameter	Value
Input Supply Voltage (VIN)	5V - 18V
Maximum Charge Current	2A
Programmable Charge Current	0.1A - 2A
Programmable Precharge Current	10% - 100%
Supported Battery Types	Single Cell Lithium (4.2V), Double Cell Lithium (8.4V)
Switching Frequency	400kHz
Operating Temperature Range	-40°C to 85°C
Storage Temperature Range	-65°C to 125°C

Absolute Maximum Ratings:

- Static Input Supply Voltage (VIN): 20V
- BAT Pin Voltage: -8.4V to 20V
- BAT Short-Circuit Duration: Continuous

9. Application Areas

- Portable electronic equipment
- Various battery chargers
- Smartphones and PDAs
- Mobile devices

10. Warranty and Support

This product is covered by a standard manufacturer's warranty against defects in materials and

workmanship. For specific warranty terms and conditions, please refer to the product packaging or contact your retailer.

For technical support, troubleshooting assistance, or further inquiries, please contact GalaxyElec customer service through their official channels or the retailer from whom the product was purchased.