TP4056 Lithium Battery Charging Board Module TYPE-C 1A with Battery Protection

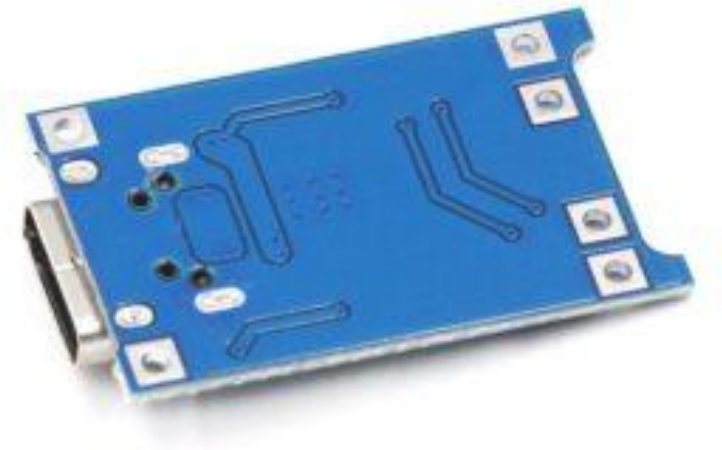
The **TP4056 Lithium Battery Charging Board Module TYPE-C 1A with Battery Protection** is a compact, efficient, and reliable solution for charging and protecting **3.7V Li-ion and Li-polymer batteries**. Designed for DIY electronics enthusiasts, makers, and professionals, this module ensures safe, fast, and stable charging with overcharge, over-discharge, and short-circuit protection features.

Featuring a modern **USB Type-C input**, this module supports 1A charging current, making it compatible with contemporary USB chargers and power banks. It is ideal for a variety of projects, including **Arduino, Raspberry Pi, ESP32, ESP8266, wearable devices, robotics, and battery-powered gadgets**. With its built-in protection circuits, the TP4056 module safeguards your batteries from potential damage while delivering optimal performance.

Key Features

- **USB Type-C Input:** Modern, reversible connector for convenient charging.
- **1A Charging Current:** Efficient and fast charging for 3.7V Li-ion/Li-polymer batteries.
- **Battery Protection:** Protects against overcharging, over-discharging, and short circuits.
- **Compact Design:** Small and lightweight, suitable for embedded projects.
- **Wide Compatibility:** Works with Arduino, Raspberry Pi, ESP32, ESP8266, and other microcontrollers.
- **Easy to Use:** Simple plug-and-play module with LED indicators for charging status.
- **High Reliability:** Stable charging circuit ensures safe and consistent operation.

- **Dual LED Indicators:** Red LED for charging, blue LED for fully charged status.



Applications

The **TP4056 Lithium Battery Charging Module** is highly versatile and can be used in various projects and applications:

1. DIY Electronics

- Rechargeable battery-powered gadgets
- Arduino and microcontroller projects
- Portable DIY devices

2. Robotics and IoT Devices

- Battery-powered robots and drones
- IoT sensors and smart home devices
- Wearable electronics

3. Power Banks and Portable Chargers

- Small-scale DIY power bank projects
- USB charging stations
- Emergency battery backup systems

4. Educational Projects

- Safe lithium battery experiments
- Student and hobbyist learning projects
- Prototyping battery-powered electronics

Technical Specifications

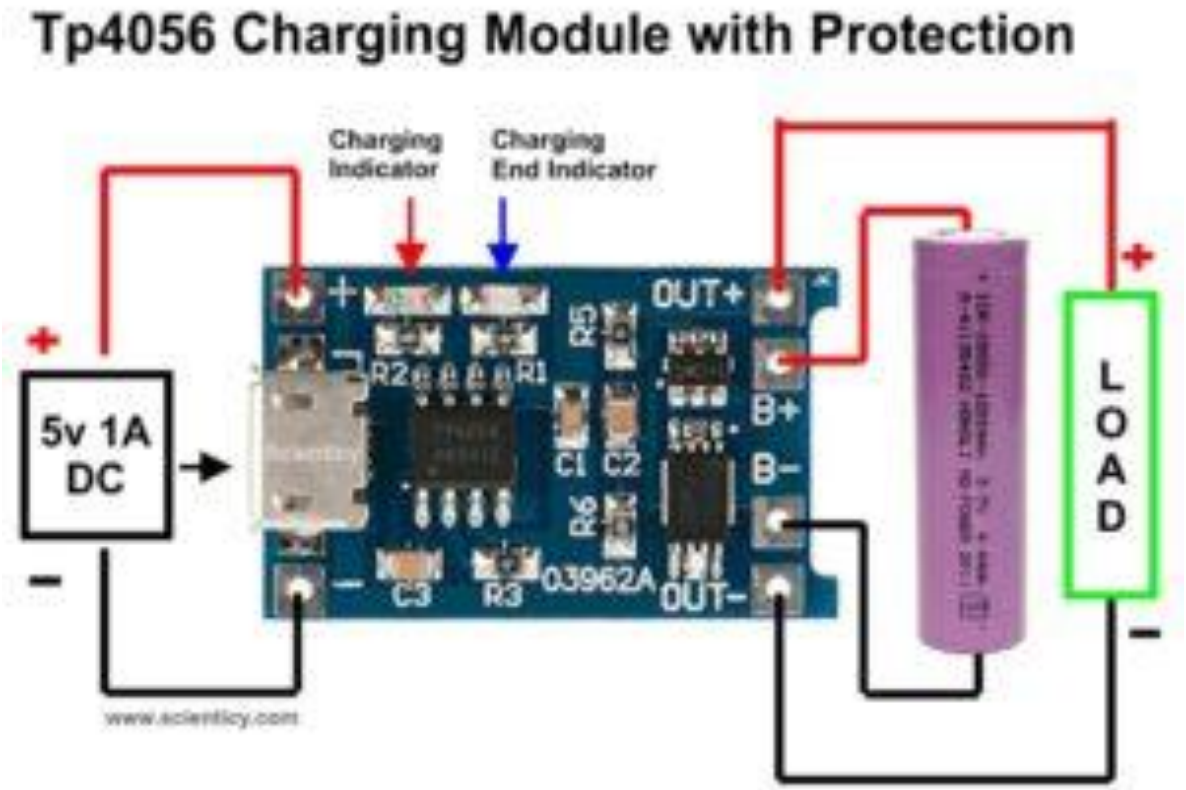
- **Model:** TP4056 Charging Module with Battery Protection
- **Input Voltage:** 5V DC via USB Type-C
- **Charging Current:** 1A (adjustable if needed)
- **Battery Voltage:** 3.7V Li-ion / Li-polymer
- **Protection Features:** Overcharge, over-discharge, overcurrent, and short-circuit protection
- **LED Indicators:** Red (charging), Blue (fully charged)
- **PCB Dimensions:** Compact and lightweight design for easy integration
- **Operating Temperature:** 0°C to 45°C (typical)
- **Compatibility:** Arduino, Raspberry Pi, ESP32, ESP8266, and similar projects

How It Works

The **TP4056 module** uses the TP4056 IC, a linear charger IC for single-cell lithium-ion batteries. It regulates the charging process in three stages: pre-charge, constant current, and constant voltage. The module automatically stops charging once the battery is full, preventing overcharging.

The **built-in battery protection circuit** ensures that the battery is not discharged below a safe voltage, protects against short circuits, and limits the charging current to prevent overheating. The Type-C input allows for a modern and user-friendly connection to standard USB power sources.

The dual LED indicators make it easy to monitor the charging status at a glance, helping users ensure safe and efficient operation.



Advantages

1. **Safe and Reliable:** Protects your batteries from common hazards.
2. **Compact & Lightweight:** Ideal for embedded electronics and small projects.
3. **Fast Charging:** 1A current ensures rapid and efficient battery charging.
4. **Dual LED Indicators:** Easily monitor charging and fully charged status.
5. **Universal Compatibility:** Works with a variety of microcontrollers and battery types.
6. **Cost-Effective Solution:** Affordable option for battery management in DIY projects.

Example Use Case

Consider building a **portable IoT sensor** powered by a 3.7V Li-ion battery. The **TP4056 charging module** ensures that your battery can be safely recharged via any USB Type-C charger. Its protection circuits prevent damage, while the LEDs allow you to quickly check the charging status. This makes it perfect for long-term deployments in projects like environmental monitoring, smart home automation, or portable electronic devices.

Conclusion

The **TP4056 Lithium Battery Charging Board Module TYPE-C 1A with Battery Protection** is an essential accessory for anyone working with rechargeable lithium batteries. Its **compact design, safety features, modern Type-C input, and compatibility with a wide range of microcontrollers** make it a must-have for hobbyists, students, and professionals.

Whether you are building **Arduino projects, IoT devices, wearable electronics, or portable gadgets**, this charging module provides a safe, efficient, and convenient solution for battery management.