

Detailed Documentation of the Circuit Working

1. Working of the BQ51050B IC

The **BQ51050B** is a wireless power receiver and battery charger IC. Below are the key pins and their importance:

Key Pins and Their Functions:

A. AC1/AC2:

1. These pins connect to the receiver coil.
2. They receive the wireless power signal from the transmitter and act as the primary input to the IC.

B. RECT:

1. This pin outputs a rectified DC voltage from the AC1/AC2 input.
2. The rectified voltage is further processed internally to charge the battery.
3. Here, its direct output is not used for any purpose.

C. BAT:

1. Connects directly to the battery to provide the regulated charging voltage.
2. The IC ensures the battery is charged safely by monitoring current, voltage, and temperature.

D. OUT:

1. Provides an output voltage (connected to external loads or circuits).
2. Can also be used to monitor the battery voltage indirectly.

E. TS (Thermistor):

1. Used for battery temperature sensing with an external thermistor.
2. Monitors the battery's temperature to halt charging if overheating occurs.

F. CHG (Charge Status Indicator):

1. Outputs a digital signal indicating the charging status:
 1. Low: Charging in progress.
 2. High: Charging complete or no charging.

G. ILIM (Input Current Limit):

1. Sets the maximum input current using an external resistor to protect the system from over current.

H. PGND:

1. Power ground. All power-related components and the receiver coil are referenced to this pin.

I. EN1/EN2 (Enable Pins):

1. Used to configure the charging mode and other functional parameters of the IC.

2. Working of ESP32 WROOM 32 Pins

The **ESP32** serves as the controller, interfacing with the BQ51050B and other components to monitor and control the circuit.

Key Pins and Their Functions:

A. GPIO36 (Analog Input):

1. Connected to a voltage divider circuit.
2. Reads the scaled battery voltage to calculate the actual battery voltage.

B. GPIO0 (Analog Input):

1. Connected to the thermistor to monitor temperature variations.
2. Measures the voltage across the thermistor for temperature evaluation.

C. GPIO33 (Digital Input):

1. Reads the charging status from the CHG pin of the BQ51050B.
2. Provides a digital signal indicating whether the battery is charging or fully charged.

D. 3V3 (Power Supply):

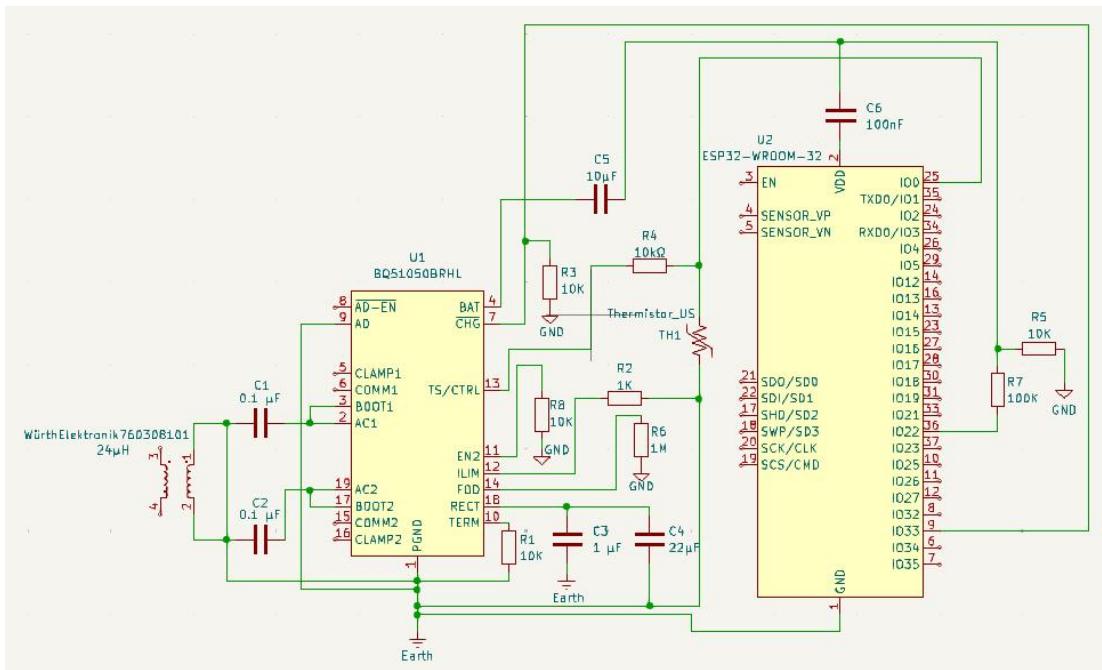
1. Powers the ESP32 from the wireless receiver IC's regulated output voltage.
2. Connected to BAT through capacitor.

E. GND:

1. Common ground shared with the wireless receiver IC and all other components.

3. Connections Between BQ51050B and ESP32

Schematic Circuit:-



A. BAT (BQ51050B) to Voltage Divider:

1. The VOUT pin connects to a voltage divider circuit, which scales the battery voltage to a range measurable by GPIO36 of the ESP32.

B. CHG (BQ51050B) to GPIO33 (ESP32):

1. The CHG pin provides charging status, which is read by the ESP32 as a digital signal.

C. TS (BQ51050B) to Thermistor:

1. The TS pin is connected to a thermistor for temperature monitoring.
2. A parallel connection is made to GPIO0 for ESP32-based temperature monitoring.

D. BAT (BQ51050B) to ESP32 Power:

1. The regulated output from the IC powers the ESP32 via its 3.3V pin.
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4. Complete Working of the Circuit

Step-by-Step Working:

A. Wireless Power Transfer:

1. The receiver coil captures electromagnetic energy from the transmitter.
2. The AC1/AC2 pins of the BQ51050B receive the AC signal, which is rectified at the RECT pin.

B. Battery Charging:

1. The rectified voltage is regulated by the BQ51050B and delivered to the battery through the BAT pin.
2. The IC monitors charging parameters such as current, voltage, and battery temperature.

C. Temperature Monitoring:

1. The thermistor connected to the TS pin measures the battery temperature.
2. If the temperature exceeds safe limits, the IC halts charging to protect the battery.
3. Simultaneously, the ESP32 monitors the thermistor voltage for independent temperature monitoring.

D. Voltage Monitoring:

1. The battery voltage is scaled down using a voltage divider circuit and fed to GPIO36 of the ESP32.
2. The ESP32 calculates the actual battery voltage based on this input.

E. Charging Status Monitoring:

1. The CHG pin of the BQ51050B outputs the charging status.
2. GPIO33 of the ESP32 reads this signal to determine if the battery is charging, fully charged, or disconnected.

F. Data Logging and Output:

1. The ESP32 continuously logs and outputs battery voltage, thermistor voltage, charging status, and calculated power to the serial monitor.
 2. This real-time data provides insights into the system's operation and ensures reliability.
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Summary

- **IC Functionality:** The BQ51050B wirelessly receives power, rectifies it, regulates it, and charges the battery while monitoring temperature and charging status.
- **ESP32's Role:** The ESP32 acts as a monitoring and alerting system, ensuring safe operation by analyzing battery voltage, temperature, and charging status.
- **Connections:** The IC and ESP32 are connected through key pins like CHG, TS, and VOUT for seamless monitoring and control.
- **Working:** The circuit provides a fully integrated wireless charging and monitoring solution, ensuring battery safety and efficient power management.