RTC DS3231 I2C High Precision Real Time Clock Module
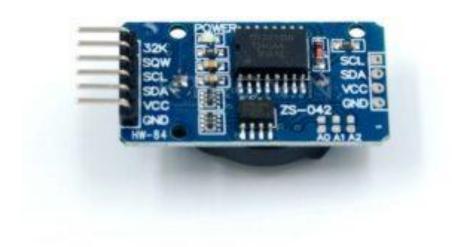
The **RTC DS3231 I2C High Precision Real Time Clock Module** is a highly accurate and reliable timekeeping device designed for **Arduino, Raspberry Pi, ESP32, and other microcontroller platforms**. Unlike the DS1307, which can drift over time, the **DS3231 uses an integrated temperature-compensated crystal oscillator (TCXO)** that maintains superior accuracy, even in varying environmental conditions.

This module provides **timekeeping functions including seconds, minutes, hours, day, date, month, and year**, with built-in leap-year compensation valid up to 2100. Its **I2C communication protocol** makes it simple to connect with development boards, while its onboard **battery backup (CR2032 or equivalent)** ensures that the clock keeps running even during power outages.

The **DS3231 RTC module** is widely used in **data loggers, IoT systems, alarms, automation projects, and time-sensitive embedded applications** that demand consistent and precise real-time tracking.
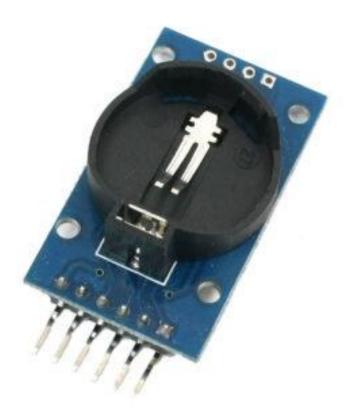
Key Features of DS3231 RTC Module

- **High Precision RTC**: Built-in temperature-compensated crystal oscillator (TCXO) for superior accuracy.
- **Complete Timekeeping**: Tracks seconds, minutes, hours, day, date, month, and year.
- **I2C Communication**: Easy integration with Arduino, Raspberry Pi, ESP8266, ESP32, and other microcontrollers.
- **Leap-Year Compensation**: Automatically accounts for leap years up to 2100.
- **Backup Battery Support**: Keeps accurate time during power loss using a CR2032 battery.
- **Wide Voltage Compatibility**: Operates at both **3.3V and 5V**, suitable for most development boards.
- **Non-Volatile Memory (EEPROM)**: Includes onboard 24C32 EEPROM with 32Kbit storage for data logging.
- **Alarm Functions**: Supports programmable alarms and square-wave output.
- **Compact & Durable**: Small PCB design with clear pin labels for ease of use.

Technical Specifications

- **RTC IC**: DS3231 (temperature-compensated)
- **Interface**: I2C (SDA, SCL)
- **EEPROM**: 24C32, 32Kbit storage
- **Operating Voltage**: 3.3V – 5V DC
- **Accuracy**: ±2ppm (±1 minute per year at 0°C to +40°C)
- **Backup Battery**: CR2032 or equivalent coin cell
- **Temperature Sensor**: Built-in with ±3°C accuracy
- **Operating Temperature Range**: -40°C to +85°C
- **Communication Address**: Default 0x68 (I2C)
- **Dimensions**: Compact and lightweight PCB module

Why Choose the DS3231 RTC Module?

1. **Superior Accuracy** – Far more precise than DS1307 thanks to its TCXO crystal.
2. **Long-Term Reliability** – Maintains accurate timekeeping with minimal drift.
3. **Battery Backup** – Keeps time running even without external power.
4. **Built-in EEPROM** – Store additional project data along with time information.
5. **Versatile Applications** – Suitable for both hobbyist projects and professional embedded systems.

6. **Easy Integration** – Works seamlessly with Arduino IDE libraries (RTClib, DS3231.h) and Raspberry Pi Python libraries.

Applications of DS3231 RTC Module

- **Data Logging**: Time-stamp sensor readings, environmental data, or event triggers.
- **Clocks and Alarms**: Build highly accurate digital clocks with alarm functions.
- **IoT Projects**: Maintain reliable timekeeping for connected smart devices.
- **Automation Systems**: Schedule appliances, lights, or relays based on real-time.
- **Robotics**: Enable time-based tasks in robotic systems.
- **Embedded Systems**: Integrate into industrial control systems requiring precise timing.
- **Weather Stations**: Log environmental data with real-time accuracy.

How to Use the DS3231 RTC Module

1. **Wiring**: Connect VCC to 3.3V or 5V, GND to ground, SDA to data pin, and SCL to clock pin on your Arduino or Raspberry Pi.

2. **Insert Battery**: Place a CR2032 coin cell in the holder to maintain time during power loss.
3. **Install Libraries**: For Arduino, install the **RTClib library** or other compatible RTC libraries.
4. **Set the Time**: Upload an example sketch to initialize the module with the current time and date.
5. **Read Data**: Retrieve real-time values such as hours, minutes, seconds, and date via I2C commands.
6. **Integrate into Projects**: Use the RTC for logging, scheduling, or triggering events.

With these simple steps, you can seamlessly add **precise timekeeping functionality** to your projects.

Package Includes

-   1 × **DS3231 RTC I2C High Precision Real Time Clock Module**

Conclusion

The **RTC DS3231 I2C High Precision Real Time Clock Module** is the ultimate choice for projects that demand **accurate, reliable, and long-term timekeeping**. With its **temperature-compensated crystal oscillator, battery backup, EEPROM storage, and I2C compatibility**, this module outperforms standard RTC modules like the DS1307.

Perfect for **Arduino, Raspberry Pi, ESP8266, ESP32, and other microcontrollers**, it is widely used in **IoT systems, automation, robotics, data logging, and embedded electronics**.

If you want your project to always run on time, the **DS3231 RTC module** is the most dependable option.