

NodeMCU ESP8266-12 CP2102-Based Development Board - Data Sheet

General Description:

The **NodeMCU ESP8266-12 CP2102-based development board** is a low-cost and compact Wi-Fi development platform. It integrates the **ESP8266-12** microcontroller with a **CP2102 USB-to-UART** bridge for seamless USB communication. The board is ideal for IoT projects, home automation, remote sensing, and Wi-Fi-enabled devices.

Key Features:

- **Wi-Fi Connectivity:** Integrated ESP8266-12 module for seamless Wi-Fi access and communication.
- **CP2102 USB-to-UART Bridge:** Enables easy USB connection to the ESP8266 module, providing programming and serial communication.
- **GPIO Pins:** Provides multiple I/O pins for connecting sensors, actuators, and peripherals.
- **Onboard Voltage Regulator:** Stable 3.3V voltage regulation for ESP8266 operation.
- **Built-in LED:** Onboard LED (usually on GPIO2) for testing and status indication.
- **Wide Voltage Range:** 5V input (via USB) to power the board.
- **Open-Source Platform:** Fully compatible with the Arduino IDE and other development environments.
- **Flash Memory:** Usually includes 4MB of flash storage for program storage and Wi-Fi configuration.

Technical Specifications:

Microcontroller	ESP8266-12 (Wi-Fi SoC)
USB-to-UART Bridge	CP2102 (for USB-to-serial communication)
Operating Voltage	3.3V (regulated)
Input Voltage	5V via USB (typical)
GPIO Pins	11 Digital I/O pins
PWM Pins	4 PWM output pins

Electrical Characteristics:

- **Operating Voltage (VCC):** 3.3V (regulated via onboard voltage regulator)
- **Flash Voltage:** 3.3V
- **Input Voltage (VUSB):** 5V via micro-USB connector
- **Output Voltage:** 3.3V for ESP8266, 5V for peripherals connected to VCC

- **Current Consumption:**
 - **Typical:** 160mA during active Wi-Fi transmission
 - **Idle:** 80mA (in deep sleep mode, consumption can drop to 10mA)
- **Logic Voltage Levels:**
 - **Logic High:** 2V to 3.3V (TTL compatible)
 - **Logic Low:** 0V to 0.8V

CP2102 USB-to-UART Bridge Details:

- **Interface:** Provides serial communication between the computer and the ESP8266 over USB.
- **Baud Rate:** Default 115200 bps (can be configured).
- **Drivers:** CP2102 drivers are available for Windows, Linux, macOS, and are typically automatically installed or can be downloaded from the Silicon Labs website.
- **USB Standard:** USB 2.0 full-speed (12Mbps).

Power Supply:

- **USB Input:** 5V from a micro-USB cable or USB port.
- **Onboard Voltage Regulator:** Converts 5V to 3.3V to power the ESP8266 module.
- **Input Capacitor:** Typically includes capacitors for stable voltage regulation.

Applications:

- **Internet of Things (IoT):** Use in smart home devices, wireless sensors, and automation systems.
- **Wi-Fi Communication:** Data logging and remote control using Wi-Fi.
- **Prototyping and Development:** Ideal for rapid prototyping of Wi-Fi-based applications.
- **Remote Monitoring:** Collect sensor data and send it over the internet.
- **Smart Appliances:** Integrating Wi-Fi into home appliances and devices.

Module Dimensions:

- **Length:** 58mm
- **Width:** 31mm
- **Height:** 11mm (including components)

Package Contents:

- 1 x NodeMCU ESP8266-12 CP2102-based development board
- 1 x Micro-USB cable (optional, depending on purchase)