

# LED Blink/Fade with Node MCU

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**ABSTRACT**-We all are living in the modern era of science and technology. Things are changing day by day, everything is becoming automatic and robotic day by day life goes on LED's (light emitting diodes). In this paper we discussed the LED blink using node MCU and that Server is an open software platform that runs on the ESP8266 that allows things to be connected and messages to be transferred using the Wi-Fi network. Furthermore, it may solve most of those developer's demands on its own by supplying many of the most application points of embedded devices such as GPIO(general purpose input /output), PWM (pulse width modulation) and so on. Internet of things (IoT) refers to the tangible items some of which are networked, processor speed, algorithms, and some other techniques, and this also interface to something and transfer information between computers and applications well over World wide web. Because of confluence of network technologies, such as cognitive computing, affordable sensors, more popular internet of things IoT, and advanced analytics, the area has progressed. In this paper we are blinking the LED with the help of a node MCU that is further connected to Wi-Fi and IoT. The future scope of this study is LED light output will continue to improve in the future, allowing mass-market general illumination applications from around 2016. Over the next two to three years, effective generic LED solutions to replace incandescent lamps will arrive on the market, although they will be somewhat pricey at first.

**KEYWORDS**-Internet of things (IoT), Light Emitting Diodes (LED), Microcontroller, Node MCU, Processors.

## I. INTRODUCTION

In telecommunications, an LED (full light-emitting diode) is just a circuit element which, if packed with only an electrical charge, generates infrared or reflected light. Certain electrical equipment employ bright LEDs as backlighting, vehicles use them as back as brake, but billboards and signage use them as alphabet signs or even full-color posters. Ultraviolet LEDs are used in focused photographers and radio joysticks, as well as in fiber-optic multimedia applications as artificial lighting. Light bulb produces light by illumination, a phenomenon where a current flow heats a wire filament, causing the wire to generate light, the primary power packets of light. LEDs work through photoelectric effect, a process where another material's electrical stimulation causes laser release. Doped arsenide has been the most widely used material

used in LEDs; however there are many variants on this fundamental combination, including anodized gas and gallium arsenide [1].

This same word rectifier alludes toward the light-emitting device's sibling configuration. This copper lamp is linked to a battery in a lantern, for example, via two wires, with (the anode) carrying the minus electric current while the other (the base) carrying the positive charge. Such "connectors" in LEDs, like those in comparable semiconductor like semiconductors, are essentially two materials having differing compositions and electromagnetic characteristics that are put together again to create a juncture. Because charged particles with one material (the negativity, or n-type, wide band gap) are atoms, whilst the electric charges under the other (the affirmative, or p-type, n - type) are "holes" formed by the lack of electrons. Energy may be induced to flow all across the p-n junction under the electrical charges (provided by a battery, for example, when the LED is turned on); giving the electrical stimulation that induces the chemical to glow. Figure 1 discloses the Circuit Diagram of LED Connected with Node MCU [2].

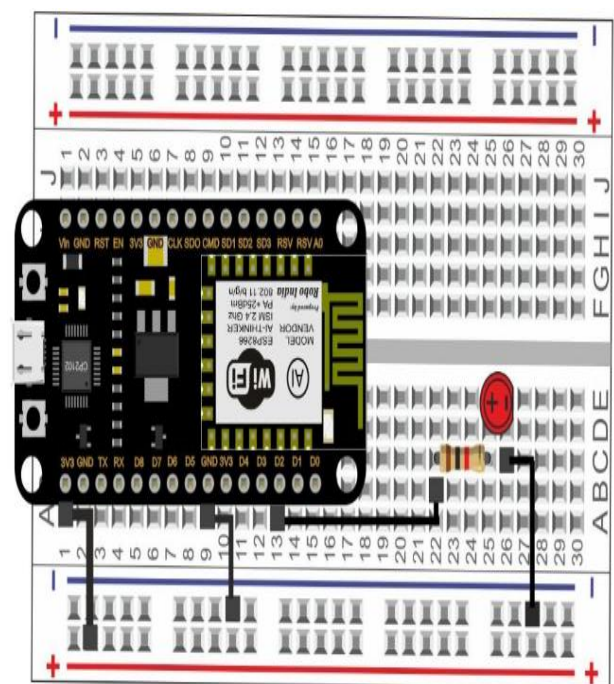


Figure 1: Circuit Diagram of LED Connected with Node MCU [Tutorialspoint]

An Esp8266 Wi-Fi Set of self SOC with an inbuilt TCP/IP internet protocol suite that can provide entry to the Wireless router to any microcontroller. The ESP8266 might also apply for these posts or delegate all Wi-Fi networking functionality to a variety of software processors. Power management plugs, building automation, Wi-Fi destination devices, future cellular monitoring, and secured ID tags are also some of the ESP8266's uses [3].

Wi-Fi Directly (P2P), smooth, and ESP8266 802.11 b/g/n interface capabilities

- TCP/IP protocol stack integrated
- TR switches, providing positive feedback, LNA, voltage regulator, and facilitates the process are all integrated.
- PLLs, regulates, and voltage regulation units that are all combined.
- In 802.11b mode, the output power is +19.5dBm.
- Thermostat built-in.
- Diverse antenna support.
- Reduce the leakage current to less than 10uA.
- As an underlying hardware, a negative symptom 32-bit CPU might be employed.
- In less than 2 milliseconds, wake up and transfer packets.
- 1.0mW of standby power usage (DTIM3).

## II. LITERATURE REVIEW

Gonzalez-Manzano et al. in their case study suggested that the Cell phones have become indispensable in everyday life as a result of their widespread use. As a result, they may be utilized to set up a clandestine network while avoiding detection. Network less conversations are preferable to prevent discovery. In this research, they offer Smart LED, a method for constructing covert channels that makes use of a frequently used mobile component: the indicator LED. Each information is encoded using Manhattan encoding and LED blinks. Smart LED is tested in a variety of authentic indoor and outdoor environments, with wavelengths up to 5 meters. Their findings demonstrate that under dark surroundings, the greatest performance is attained - 34.8 seconds are required to steal private and input signal passwords to a distance of at least 1 m [4].

Kanemoto et al. in their case study suggested that the color mismatch approach integrating light-emitting diode (LED) textiles accessory with just a resistive radio is described in this study. It is feasible to execute a brightness match simply by shifting the component on the receiver coil using a textile rectenna construction with an ultra small key on the keyboard rectifier module coupled to a capacitive antenna. Because the supply point on the receiver coil varies when the component with gamma comparing section moves, the antenna's impedance changes, allowing us to accomplish impedance matching. We make a 4.5-mm-diameter key on the keyboard rectifier module with an LED and a 6-cm-long packaged capacitive radio made of 0.5-mm-thick single yarns to test the efficacy of our textile rectenna construction. Its LED on the converter component glances during dissipation electricity of 1.23 mW at a distance of approximately cm from the radio transmitter

for 2.45-GHz wireless systems with a total transmission power of 1 W, according to the testing data [5].

Murata et al. in their case study suggested that on examining Lights that have high brightness that used a belted shaft furnished with these Lights, the binocular movement's properties of such LED lights are investigated. As a measure of LED hue and luminance, ocular movement's features such as wink frequency, eye regularity, and PERCLOS70 were examined. For all LED hues, the length of the blink tended to grow as the light intensity increased. Under high light intensity, increased blink cadence of the both purple and yellow LEDs with longer wavelengths tended to rise. The blink frequency of green LEDs was unaffected by the light intensity [6].

Our study concludes that the Server is an open source firmware for the ESP8266 wifi chip that uses the LUA programming language. The ESP8266 has a cheap cost and a lot of functions, making it an excellent Internet of Things module (IoT). It may be used in any activity that needs a device to be connected to a local or internet network [7].

## III. DISCUSSION

Arduino uno has different ports and segments; it is divided into analog in and digital pulse width modulation (PWM) and a reset pin. The working of the reset pin is to reset the data set that is coming from the source side, and there are different pins such as A0, A1, A2, A3, A4, and A5 that are used for resetting the microcontroller. Analog Pins: The analog inserts A0 to A5 are utilized as analog inputs and range from 0 to 5V. Digital Pins: The Arduino board's parts 0 to 13 are utilized as digital inputs and outputs. It allows the Arduino board to communicate with computers or other equipment. It is further connected to the LED that is connected with the SPDR (serial peripherals data resistor) switch and a GPIO (general purpose input output) mode This Microcontroller SPI Union Control (SPCR) determines all SPI settings. Its SPI transfer register, for illustration, stores the byte that is going to be pushed out of the MOSI line as well as the info that's just been moved into the MISO line. This state of status registers changes as a result of different microcontroller circumstances. Digital and analogue GPIO pins are shown in this configuration. The GPIO light gets data first from a connected device in the cloud off, and the GPIO light transmits data to the network interface in the cloud off. The board has 14 digital input/output pins, 16 analog, a USB port, and a supply connector [8].

After successfully uploading the following code to the Microcontroller, the intrinsic Green LED of the ESP8266 begins flashing. Remember but the on LED on the ESP-12 and ESP-01 is blue. Which is wired in reverse, with the anode (+ve) of both the LED attached to VCC and the cathode (-ve) to ESP-12 GPIO2. It indicates that when we generate LOW, the LED turns on, and so when we produce HIGH, the LED turns off. This port is also a TX, thus you can't utilize serial with it as an LED. Figure 2 discloses the Circuit Diagram of Arduino Connected with Node MCU [9].

**LED BLINKING PROGRAM CODE**

```

/*
ESP8266 Blink
Blink the blue LED on the ESP8266 module
*/

#define LED 2 //Define blinking LED pin

void setup() {
  pinMode(LED, OUTPUT); // Initialize the LED pin as an output
}
// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED, LOW); // Turn the LED on (Note that LOW is the voltage level)
  delay(1000); // Wait for a second
  digitalWrite(LED, HIGH); // Turn the LED off by making the voltage HIGH
  delay(1000); // Wait for two seconds
}

```

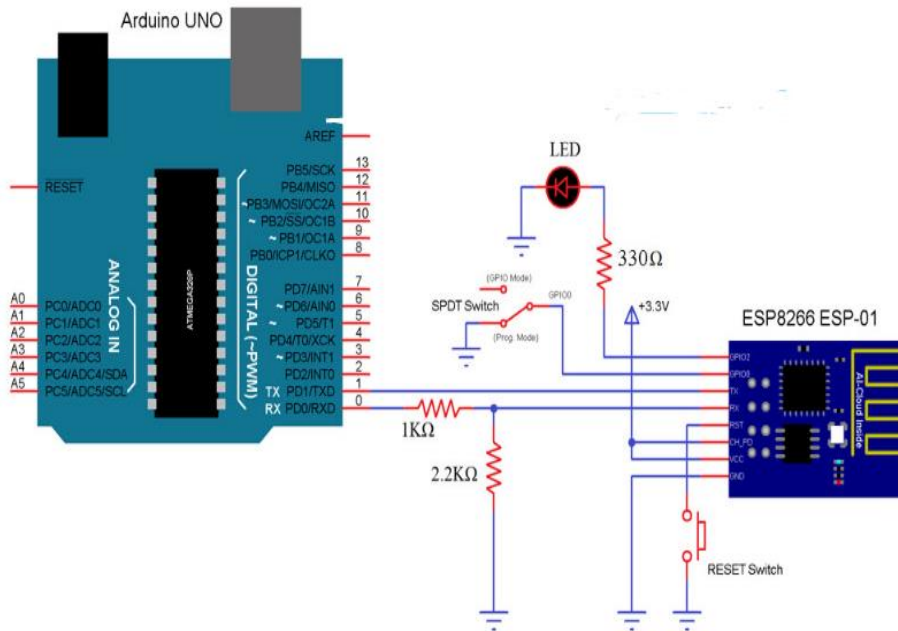


Figure 2: Circuit Diagram of Arduino Connected with Node MCU [Tutorials point]

The board has an LDO switching regulator to maintain the voltage stable at 3.3V, while the ESP8266's operational voltage range is 3V to 3.6V. When the ESP8266 draws up to 80mA during RF broadcasts, it can dependably provide up to 600mA, this would have been more than enough. The regulator's output is likewise separated off with one of the board's sides and designated as 3V3. Power may be supplied to external components through this pin. With an on Micro USB connection produces electricity to the ESP8266 Node MCU. If you have a controllable 5V voltage source, you may utilize the VIN pin to power the Wifi module and its ports directly. Figure 3 discloses the Ports and Function of Node MCU [10].



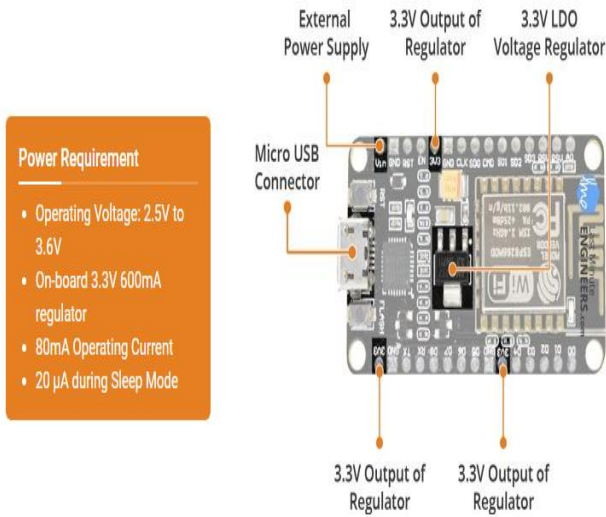


Figure 3: Ports and Function of Node MCU [Last minute engineers].

**A. Peripheral I/O**

The ESP8266 Node MCU includes 17 GPIO pins from both flanks of the test system, which are split off to pin headers. These pins may be used for a variety of different tasks, including:

- A 10-bit ADC circuit is referred to as an ADC channel.
- UART interface — The UART interface is also used to serially load code.
- PWM outputs — PWM pins for controlling motors or dimming LEDs.
- SPI, I2C, and I2S interfaces are used to connect a network of instruments and ports.

**B. On Board Switches And LED Indicators**

There are two options on the ESP8266 Node MCU. The Reset button, label LED RST and placed in the upper left corner, is used to restart the ESP8266 chip. The download button is situated at the base left corner and is used to upgrade firmware.

Indicators and switches

RST — the ESP8266 chip is reset.

Reader blue LED

Hardware Specifications for the ESP8266 Node MCU - Reset Flash Buttons and LED Indicators

A user-programmable LED indication is also included on the motherboard, which is coup LED to the D0 pin.

**C. Serial Communication**

The package includes a Digital Laboratory CP2102 USB-to-UART Bridges Converter, which transforms USB signals to UART (Universal Asynchronous Receiver/Transmitter.) .CP2102 USB-to-UART converts

- 4.5 Mbps connection speed
- Flow Control functionality

**D. ESP8266 Node MCU Pin out**

Pins of Strength One VIN pin and three 3.3V pins make up the four powering pins. If you have a 5v voltage power source, you may utilize the VIN pin to directly feed the

ESP8266 and also its peripherals. The 3.3V terminals are also the result of a voltage regulator on the board. Power may be supplied to external components through these pins. The ground pin on the ESP8266 Microcontroller test system is GND.

I2C Pins are utilized in your project to connect all kinds of I2C accelerometers and accessories. I2C Master and Slave are both supported. I2C communication capability may be implemented programmatically, with a clock speed frequency of approximately kHz. It should be remembered that the I2C clock speed should be greater than the slave Smartphone’s worst clock frequency.

Pins for GPIO the ESP8266 Node MCU seems to have 17 GPIO pins that can be programmatically assigned to multiple functions like I2C, I2S, UART, Comparator, IR Cruise Control, LED Flash, but also Toggle. Each digitally enabled GPIO can really be set to a differential amplifier or inbuilt knock or pull-down. It can be set to perimeter or quality to produce CPU keeps interrupting when designed as an input.

ADC (Audio/Digital Converter) Channel A 10-bit quality SAR ADC is included within the Node MCU. Evaluating the voltage output of the VDD3P3 pin while measuring the input signal of the TOUT pin are two functions that may be done using ADC. They must, however, be deployed at the very same time. Figure 4 discloses the Pin Diagram of Node MCU.

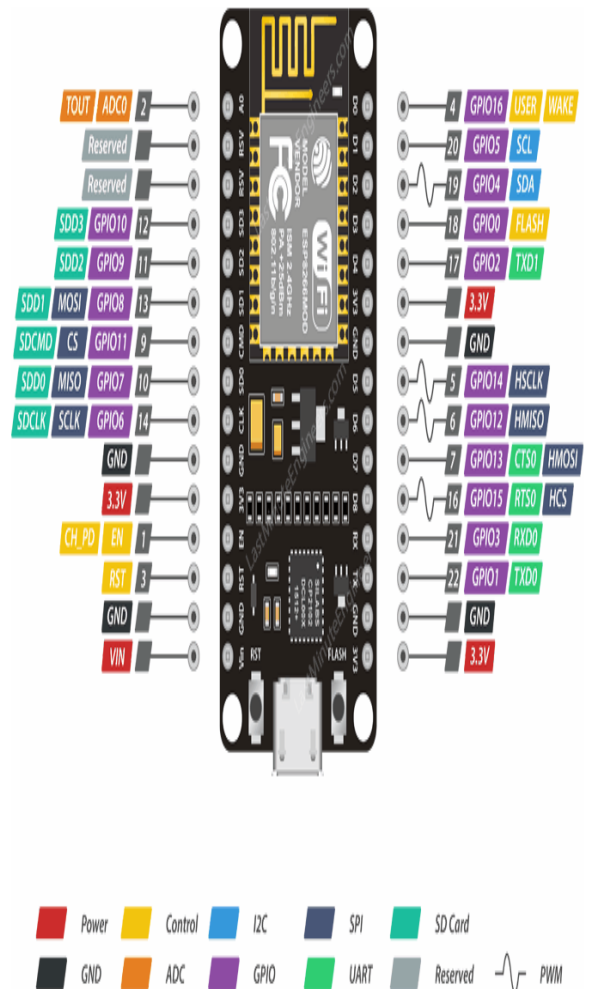


Figure 4: Pin Diagram of Node MCU [Last minute engineers]

#### IV. CONCLUSION

We're all acquainted with flashing LEDs on Arduino boards since it's the first step in learning how to use a big development board. From this tutorial, we learn how to use the Arduino IDE's basic built-in instructions to blink LEDs using the ESP8266 Node MCU or ESP-01 device. And looking for instructions on how to set up the Arduino Software to work with the ESP8266, look no further. Initially, we studied how and when to connect an additional LED to Node MCU and blink it using the ESP8266 NodeMCU's GPIO pins. After that, we learn how to blink a Node MCU onboard LED, and at the conclusion of this study, we see how to control a light emitting diode using the ESP01's GPIO pin, as well as how to program the ESP01 using an FTDI device. The ESP8266's software implementation of PWM generation is fairly similar to Arduino's. Because we're using the Arduino IDE to program the ESP8266, the analog Write function is in charge of creating PWM signals (the same function which we have used in Arduino as well). Two arguments are sent to the analog Write function: pass code and PWM value. Check the code of the Pin via which you wish to utilize the PWM Output in lieu of Pin Number. When it comes to the PWM Figure, we must input a value dependent on the PWM's resolution. Because the resolution of the Arduino is 8 bits, we must input a number between 0 and 255. In the instance of the ESP8266, the PWM has a 10-bit resolution. As a result, we must input a number from 0 and 1023. PWM value "0" indicates 0% duty cycle, whereas PWM value "1023" indicates 100% duty cycle. The duty cycle may be set to any number between 0 and 1023.

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