J.C. BOSE UNIVERSITY OF SCIENCE & TECHNOLOGY , YMCA

FARIDABAD , HARYANA

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PROJECT REPORT : Wi-fi controlled scrolling text LED display

SUBMITTED BY :

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We'd like to thank The University of J.C. BOSE UNIVERSITY OF SCIENCE & TECHNOLOGY for providing me with the opportunity to work on the project **Wi-fi controlled scrolling text LED display** . Last but not least, I would like to express my gratitude to my family, siblings, and friends for their invaluable assistance, and I am deeply grateful to everyone who has contributed to the successful completion of this project.

LED

A 5mm LED (Light Emitting Diode) is a type of electronic component that emits light when an electric current passes through it in the forward direction. It is a small, solid-state device with a diameter of 5mm and is commonly used in various electronic applications, including lighting, signage, and displays.

The LED consists of a semiconductor material, typically made of gallium arsenide (GaAs), that is doped with impurities to create a p-n junction. When a voltage is applied across the junction, electrons and holes recombine, releasing energy in the form of light. The color of the light emitted by the LED depends on the material used and the doping levels.

A 5mm LED typically has a forward voltage drop of around 2-3 volts and can operate at currents ranging from a few milliamps to several hundred milliamps. The maximum rated current and voltage vary depending on the specific LED model and manufacturer.

The LED is typically encapsulated in a plastic package that protects it from damage and provides mechanical stability. The package also helps to shape the emitted light and can be tinted to produce colored light.

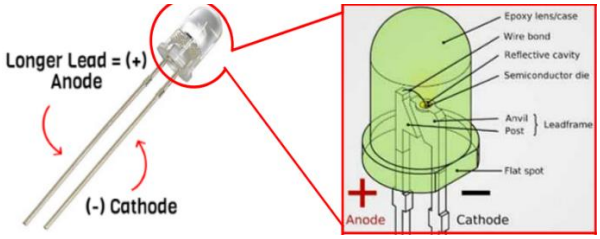
In summary, a 5mm LED is a small electronic component that emits light when a current is passed through it. It is commonly used in various electronic applications, and its properties such as color and operating voltage depend on the specific model and manufacturer.

An LED is a variant on the basic diode. A Diode is an electronic component that only conducts electricity in one direction. Diodes have what is called a forward voltage rating which determines the minimum voltage difference between the Anode (+)

and Cathode (-) in order to allow electrons to flow (sweet electricity). An LED is basically the same as a Diode, with the key difference being it generates light when the electricity flows.

5mm LEDs are a type of LED that hold the die on an anvil post that is encased in an epoxy dome for protection. Connections are then made via the two legs or prongs that come out of the bottom. As we mentioned, a diode only allows flow in one direction. This makes it crucial to differentiate between the positive side (the Anode) and the negative side (the Cathode). With 5mm LEDs it is easy, notice that the legs are different lengths? The longer leg is the Anode and the shorter of the two is the Cathode. If your legs are trimmed down or you have a manufacturer that makes them the same size, there is usually a flat spot around the rim of the 5mm case on the Cathode side (see below) .

Make sure you always connect the positive of your battery/power source to the Anode and your negative or ground to the Cathode. This will make sure polarity matches up and electricity will flow given you have enough input voltage, lighting up your 5mm LED. If you wire it backwards nothing will happen and the circuit will remain closed. In making sure you have enough power for your light emitting diode, there are two key ratings you should pay attention to when looking at LEDs specifications: the forward voltage and the forward current



DATASHEET OF LED

This datasheet provides information on the electrical and optical characteristics of the LED, including its forward voltage and current, luminous intensity, and viewing angle. It also includes mechanical specifications such as the dimensions of the LED package and recommended soldering conditions.

It's important to note that datasheets for 5mm LEDs may vary depending on the manufacturer and model. It's always recommended to consult the specific datasheet provided by the manufacturer to ensure proper use and operation of the LED.

Symbol	Parameter	Conditions
Vf	Forward Voltage	Vcc=Min, Ii=-20mA
Vr	Reverse Voltage	Vcc=Min, Ioh=MAX, Vil=MAX
Ir	Reverse Current	Vr=5V
If	Max DC Forward Current	Vcc=Min, Iol=MAX, Vih=MAX
Ipeak	Peak DC Forward Current	Vcc=Min, Iol=MAX, Vih=MAX
Pd	Max Power Dissipation	Vcc=Max, Vi=5.5V

SHIFT RESISTOR

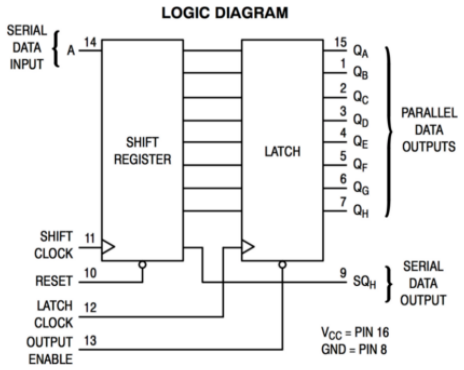
A shift resistor, also known as a shift register, is an electronic component that can store and transfer binary data. It is a sequential logic circuit that can shift its output bit by bit, either to the left or right.

A shift resistor consists of a series of flip-flops connected in a chain, with each flip-flop storing one bit of data. When a clock signal is applied, the data in the first flip-flop is transferred to the second flip-flop, and so on. The final bit in the chain is either outputted or transferred back to the first flip-flop, depending on the circuit design.

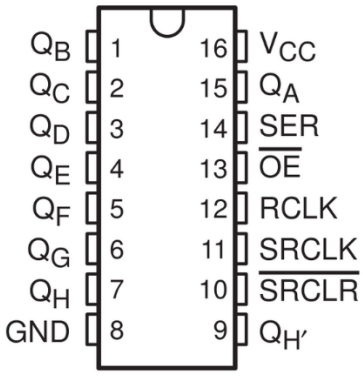
Shift resistors can be constructed using various types of flip-flops, including D flip-flops, JK flip-flops, and SR flip-flops. The number of flip-flops in the chain determines the number of bits that can be stored and transferred by the shift resistor.

Shift resistors have various applications in digital electronics, including serial-to-parallel conversion, parallel-to-serial conversion, data storage, and data transfer. They are often used in conjunction with microcontrollers, digital signal processors, and other digital circuits to perform tasks such as controlling displays, sensors, and motors.

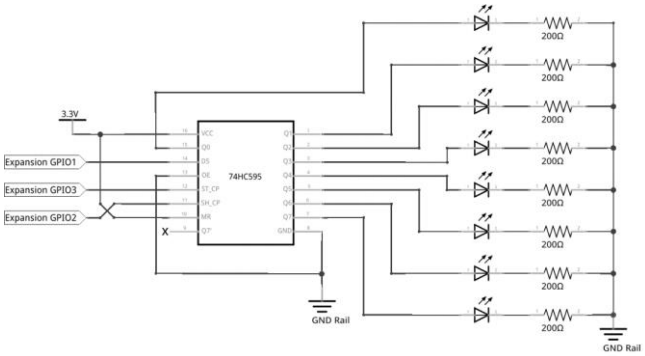
In summary, a shift resistor is an electronic component that can store and transfer binary data by shifting it bit by bit. It consists of a chain of flip-flops and has various applications in digital electronics.



PIN DIAGRAM :



EXPECTED CIRCUIT DIAGRAM



DATA SHEET OF SHIFT RESISTOR

Symbol	Parameter		Value	Unit
V_{CC}	Supply voltage		-0.5 to +7	V
V_I	DC input voltage		-0.5 to V_{CC} + 0.5	
V_O	DC output voltage			
I_{IK}	DC input diode current		±20	mA
I_{OK}	DC output diode current			
I_O	DC output current		±35	
I_{CC} or I_{GND}	DC V_{CC} or ground current		±70	
P_D	Power dissipation	SOP	500(2)	mW
		TSSOP	450(2)	
T_{stg}	Storage temperature		-65 to +150	°C
T_L	Lead temperature (10 sec.)		300	

Symbol	Parameter		Value	Unit
V_{CC}	Supply voltage		2 to 6	V
V_I	Input voltage		0 to V_{CC}	
V_O	Output voltage			
T_{op}	Operating temperature		-55 to 125	°C
t_r, t_f	Input rise and fall time	V_{CC} = 2.0 V	0 to 1000	ns
		V_{CC} = 4.5 V	0 to 500	
		V_{CC} = 6.0 V	0 to 400	

1 Killo Ohm RESISTOR

A kiloohm, denoted by the symbol kΩ, is a unit of electrical resistance in the International System of Units (SI). One kiloohm is equivalent to 1,000 ohms, where an ohm is the standard unit of electrical resistance.

Electrical resistance is a measure of how much a material opposes the flow of electric current. A higher resistance means that the material allows less current to flow through it. Resistance is calculated by dividing the voltage (in volts) by the current (in amperes) flowing through a conductor.

A 1 kiloohm resistor is an electronic component that has a resistance of 1,000 ohms. It is commonly used in various electronic applications, such as voltage dividers, filters, and biasing circuits.

The resistance value of a resistor is determined by its physical dimensions, material, and other factors. Resistors can be made from various materials, including carbon, metal, and ceramics. The physical size and shape of a resistor can also affect its resistance value.

It's important to note that resistors have a tolerance, which is the amount by which the actual resistance can vary from the specified value. A typical tolerance for a 1 kiloohm resistor is 5%, which means that the actual resistance of the resistor can be between 950 ohms and 1,050 ohms.

In summary, a 1 kiloohm resistor is an electronic component that has a resistance of 1,000 ohms. It is commonly used in various electronic applications and is determined by its physical dimensions, material, and other factors.

DATA SHEET OF RESISTOR

Resistance		1K ohm
Tolerance		5%
Color Code		Brown / Black / Red / Gold
Type		Carbon Film
Voltage	Maximum Operating	350V
Polarization		None
Operating Temp		-55C – +155C
Package		Conformal Coated, Axial
Dimensions	Body diameter	2.3mm
	Body Length	6mm
	Lead Length	28mm
	Lead Diameter	0.55mm

SOLDERING IRON

A soldering iron is an electronic tool that is used to melt and flow a metal alloy called solder onto metal joints, in order to create an electrical connection or bond. Soldering irons are commonly used in electronic and electrical work, as well as for plumbing and jewelry-making.

A typical soldering iron consists of a metal tip that is heated by an electrical element, such as a ceramic or metal heater. The temperature of the tip can be controlled by adjusting the power input, which is typically done using a dial or switch. The tip is usually made of copper, which has good heat conductivity and can withstand the high temperatures required for soldering.

When the soldering iron is heated, it is used to melt the solder wire onto the metal joint. The solder then cools and solidifies, creating a permanent bond between the metal surfaces. The solder wire typically contains a mixture of metals, such as tin and lead, that have a lower melting point than the metal being joined.

Soldering irons can be powered by a variety of sources, including electricity, batteries, or gas. Electric soldering irons are the most common type, and are available in a range of sizes and wattages to suit different applications. Battery-powered soldering irons are portable and convenient, but have lower power output than electric irons. Gas-powered soldering irons are often used in outdoor or remote locations, where there is no access to electricity.

In addition to the soldering iron itself, a soldering kit typically includes other accessories such as solder wire, a soldering stand, and a sponge for cleaning the tip. It's important to use the correct type of solder and technique when soldering, in order to ensure a strong and reliable electrical connection.

In summary, a soldering iron is an electronic tool that is used to melt and flow solder onto metal joints, creating a permanent bond. It consists of a heated metal tip and can be powered by electricity, batteries, or gas. Soldering irons are commonly used in electronic and electrical work, as well as for plumbing and **jewelry-making.**

DATA SHEET OF SOLDERING IRON :

Specifications

Voltage	: 220 to 240V ~ 50Hz
Power	: 25W
Temperature	: 380-420°C
Tip	: Long life B2-1

SOLDER WIRE

Solder wires are wires with a low melting point which can melt along with the soldering iron. Depending on the application and soldering temperature, many different types of soldering wires are available.

Solder wires are generally two different types - lead alloy solder wire and lead-free solder. There are also rosin-core solder wire which has a tube in the center of the wire that contains the flux. Lead solder wire is usually made from an alloy of lead and tin. Tin is commonly used with lead as it has a lower melting temperature. It has an alloy ratio of 63/37 or 60/40. When working with electrical components 63/37 is the best. This means that this solder wire has a sharp transition between solid and liquid states when the temperature changes. This property is very useful for reducing cold joints which usually happens when the components move while cooling.

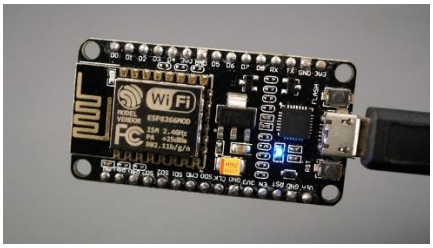
Lead-free solder wire usually contains tin, silver and copper. Lead- free wires are more expensive than lead alloy solder wire, also their melting temperature is higher. This means that they require higher temperature flux. The problem with lead-free solder is that it can be highly brittle. lead -free solders have played a very important role in reducing the size of handheld devices. When small form factors with high-density semiconductors are packages with the help of lead-free solder, they result in fewer problems as compared to lead-based solder.
It is essential to understand your soldering requirements when selecting a soldering wire to make sure that the purchase effectively suits your application. In

plumbing some of the solder used is 95Sn/5Sb, and 97Sn/3Cu. Some examples of materials used in this industry include 15Sn/85Pb, 20Sn/80Pb, 30Sn/70Pb, 25Sn/65Pb and 40Sn/60Pb as well as aluminum and copper. It is recommended in the stained glass industry to get 60Sn/40Pb but you can also use 50Sn/50Pb and 63Sn/37Pb depending on what you are working on. Rosin and acid core solder is also commonly used in electric circuit or electrical connections.

DATASHEET OF SOLDER :

component		Melting point/℃		Solidifying point(℃)	Density g/cm^3	Resistivity uΩ.cm	Heat conductivity	solidity
Sn%	Pb%	liquidus	solidus					
60	40	190	190	0	8.50	14.13	-	10.5

ESP 8266 :



The ESP8266 is a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability, produced by Espressif Systems in Shanghai, China.

The chip was popularized in the English-speaking maker community in August 2014 via the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.

It can be used as a standalone device, or as a UART to Wi-Fi adaptor to allow other microcontrollers to connect to a Wi-Fi network. For example, you can connect an ESP8266 to an Arduino to add Wi-Fi capabilities to your Arduino board. The most practical application is using it as a standalone device.

With the ESP8266, you can control inputs and outputs as you would do with an Arduino, but with Wi-Fi capabilities. This means you can bring your projects online, which is great for home automation and internet of things applications. Why is the ESP8266 so popular? Mainly for the following reasons:

- **Low-cost**: you can get ESP8266 boards starting at $3 (or less) depending on the model.
- **Low-power**: the ESP8266 consumes very little power when compared with other microcontrollers and can even go into deep sleep mode to consume less power;
- **Wi-Fi**: the ESP8266 can generate its own Wi-Fi network (access point) or connect to other Wi-Fi networks (station) to get access to the internet. This means the ESP8266 can access online services to make HTTP requests or save data to the cloud, for example. It can also act as a web server so that you can access it using a web browser and be able to control and monitor your boards remotely.
- **Compatible with the Arduino "programming language"**: those that are already familiar with programming the Arduino board, were happy to know that they can program the ESP8266 in the Arduino style.
- **Compatible with MicroPython**: you can program the ESP8266 with MicroPython firmware, which is a re-implementation of Python 3 targeted for microcontrollers and embedded systems.

USES OF ESP :

- **Create a web server to control outputs;**
- **Create a web server to display sensor readings;**
- **Send HTTP requests;**
- **Control outputs, read inputs, and set interrupts;**
- **Datalogging projects;**
- **Communicate with third-party services;**
- **Create web applications;**
- **Send emails, notifications, post tweets, etc.**

DATASHEET OF ESP :

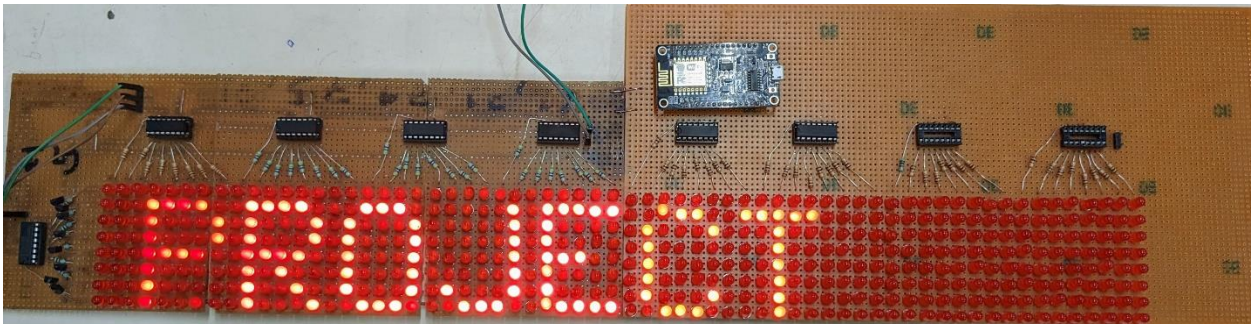
- Processor: L106 32-bit RISC microprocessor core based on the Tensilica Diamond Standard 106Micro running at 80 or 160 MHz.
- Memory:
  - 32 KiB instruction RAM
  - 32 KiB instruction cache RAM
  - 80 KiB user-data RAM
  - 16 KiB ETS system-data RAM
- External QSPI flash: up to 16 MiB is supported (512 KiB to 4 MiB typically included)
- IEEE 802.11 b/g/n Wi-Fi
- Integrated TR switch, balun, LNA, power amplifier, and matching network
- WEP or WPA/WPA2 authentication, or open network
- 17 GPIO pins
- Serial Peripheral Interface Bus (SPI)
- I^2C (software implementation)
- I^2S interfaces with DMA (sharing pins with GPIO)
- UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2
- 10-bit ADC (successive approximation ADC)

SPECIFICATIONS :

- Operating Voltage: 2.5 to 3.3V
- Operating current: 800 mA
- 3.3V 600mA on-board voltage regulation
- ESP8266 comes up with 2 switches one is reset and another one is flash button, Reset button is used to reset NodeMCU and flash button is used to download and is used while upgrading the firmware. The board has build in LED indicator which is connected to D0 pin.
- The NodeMCU board also contains a CP2102 USB to UART module to convert the data from USB to serial so that it can be controlled and programmed via computer.
- The esp8266 has 4 power pins: One VIN pin for input power supply and three 3.3V pins for output power supply. Even if 5V regulated supply is given through VIN, the voltage regulator will decrease it to 3.3v during output.
- The esp8266 has 3 GND pins which indicate ground supply. Generally, the negative terminals are connected to these pins.
- Esp8266 board also has I2C pins which can be used both as I2C master and I2C Slave. These pins are used to connect various I2C sensors and peripherals in your project. I2C interface functionality can be controlled via programming, and the clock frequency is 100 kHz at a maximum.
- Esp8266 NodeMCU has 17 GPIO pins which can be assigned to various functions such as UART, PWM, I2C,IR and Button via programming. When configured as an input pin, the GPIO pins can also be set to edge-trigger or level-trigger to generate CPU interrupts.
- ESP8266 NodeMCU has 2 UART interfaces, i.e. UART0 and UART1, which offer asynchronous communication, and may communicate at up to 4.5 Mbps. TXD0, RXD0, RST0 & CTS0 pins can be used for communication. It supports fluid control. However, TXD1 pin features only data transmit signal so, it's usually used for printing log.
- ESP8266 has two SPI in slave and master modes. These SPIs also support the following general features: 4 timing modes of the SPI format transfer. Up to 64-byte FIFO buffer.

- Esp8266 has a secure digital I/O interface which is used directly control the SD cards.
- Esp8266 has 4 channels of Pulse width modulation (PWM). The output can be controlled via programming and is frequently used for driving motors and LEDs. The frequency ranges from 100Hz to 1KHz.
- There are three control pins on the esp8266: The enable pin (EN), the reset pin (RST) and the wake pin.
- The esp8266 chip works when the enable pin is high. When the enable pin is low, the chip works on minimum power.
- The reset pin is used to reset the esp8266 chip.
- The wake pin is used to wake up the chip from deep sleep mode.

WORKING :



This project is based on WI-FI CONTROLLED SCROLLING TEXT LED DISPLAY , which display the text transferred through Wi-fi

TOTAL PRACTICAL VALUE OF CURRENT IS = .050 - .060 AMPERE

INPUT VOLATGE IN IC74595 IS =4.3VOLT

CU RRENT IN EACH LED = 0.003/8 = 0.000375 A

Matrix 8x1 led in series taking current = 0.003 A

Total current by matrix 8x64 takes => 0.003*64 = 0.192A

TOTAL CURRENT TAKING BY CKT IS = 0.192 AMPERE

TOTAL VOLTAGE = 5 VOLT

OUTPUT VOLTAGE FROM PIN NUMBER 1 TO 7 AND 15 IN COLON SHIFT RESISTOR IS = 0.53VOLT

To control an 8x64 LED matrix using an ESP8266 and Wi-Fi, you would typically follow these steps:

1. Hardware Setup:

- Connect the ESP8266 module to your computer or power source using appropriate wiring.

- Connect the LED matrix to the ESP8266 module, ensuring that the data pins are connected correctly.

2. Software Setup:

- Set up the Arduino IDE on your computer and install the ESP8266 board package.

- Open the Arduino IDE and create a new sketch.

- Include the necessary libraries for controlling the LED matrix and Wi-Fi communication. Common libraries for LED matrix control include "Adafruit_GFX.h" and "Adafruit_NeoMatrix.h".

- Initialize the Wi-Fi connection by providing your network credentials (SSID and password) and connecting to the network.

3. Matrix Initialization:

- Declare variables for the LED matrix width, height, and pin configuration.

- Create an instance of the LED matrix object, specifying the required parameters (width, height, and data pin).

- Initialize the LED matrix object by calling the "begin" function.

4. Displaying Content:

- To display content on the LED matrix, you can use various functions provided by the LED matrix library.

- Typically, you'll create a loop that iterates through the rows of the LED matrix and sets the appropriate LEDs to the desired colors or patterns.

- Update the display by calling the "show" function of the LED matrix object.

5. Handling Wi-Fi Communication:

- To receive commands or data over Wi-Fi, you can set up a server on the ESP8266 module.

- Create a server object, specifying the port number to listen on.

- In the server loop, check for incoming client connections and handle them appropriately.

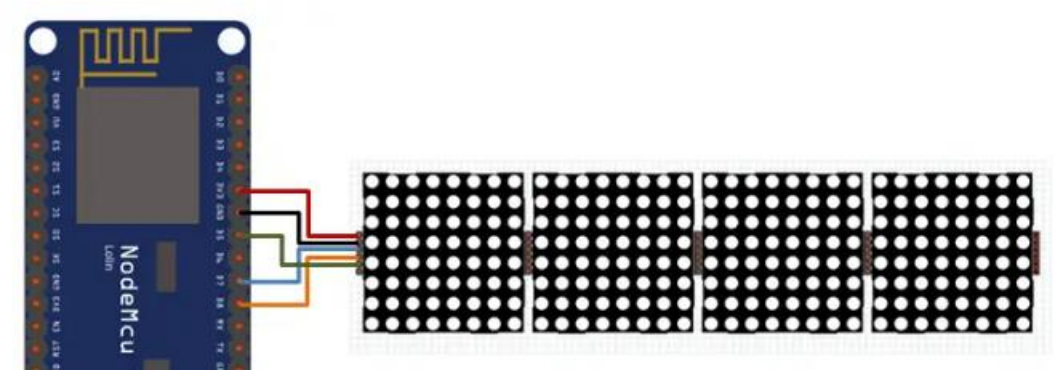
- Once connected to a client, you can receive commands or data and use that information to update the LED matrix display.

6. Continuous Operation:

- To ensure continuous operation, you should implement error handling and recovery mechanisms in case of Wi-Fi disconnections or other issues.

- You may need to handle various events, such as re-establishing a Wi-Fi connection or resetting the LED matrix display.

It's important to note that the specific implementation details may vary based on the LED matrix and libraries you are using. Be sure to consult the documentation and examples provided with your LED matrix library for more detailed instructions and code samples.



	MAX7219 LED MATRIX	NODEMCU
	CLK	D5
	CS	D8
	DIN	D7
	GND	GND
	VCC	3V