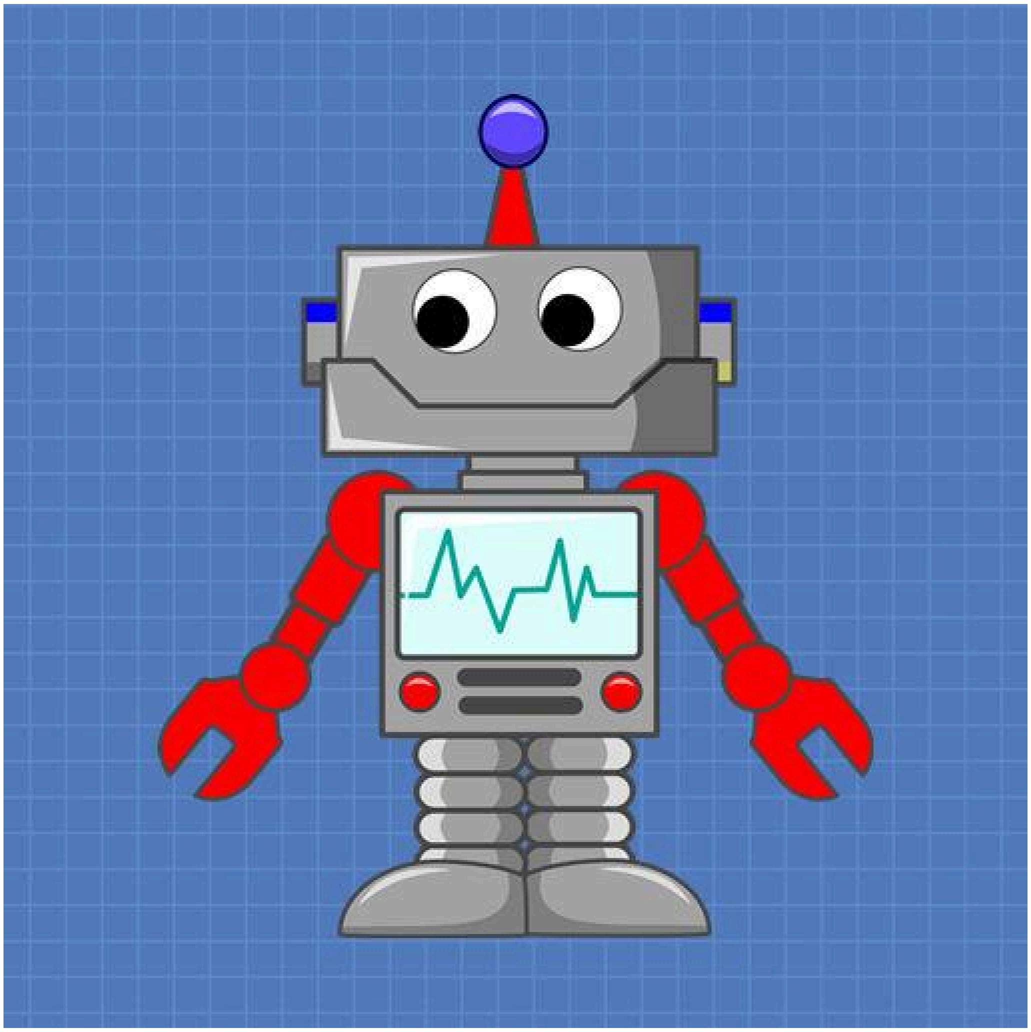
WLED – Getting Started with ESP32



DroneBot Workshop Tutorial

https://dronebotworkshop.com

Today, we will work with an amazing open-source software application that enables you to create sophisticated light displays using LED strip lights and an ESP32. The WLED project is the ultimate LED light controller, and it’s very easy to use.

Introduction

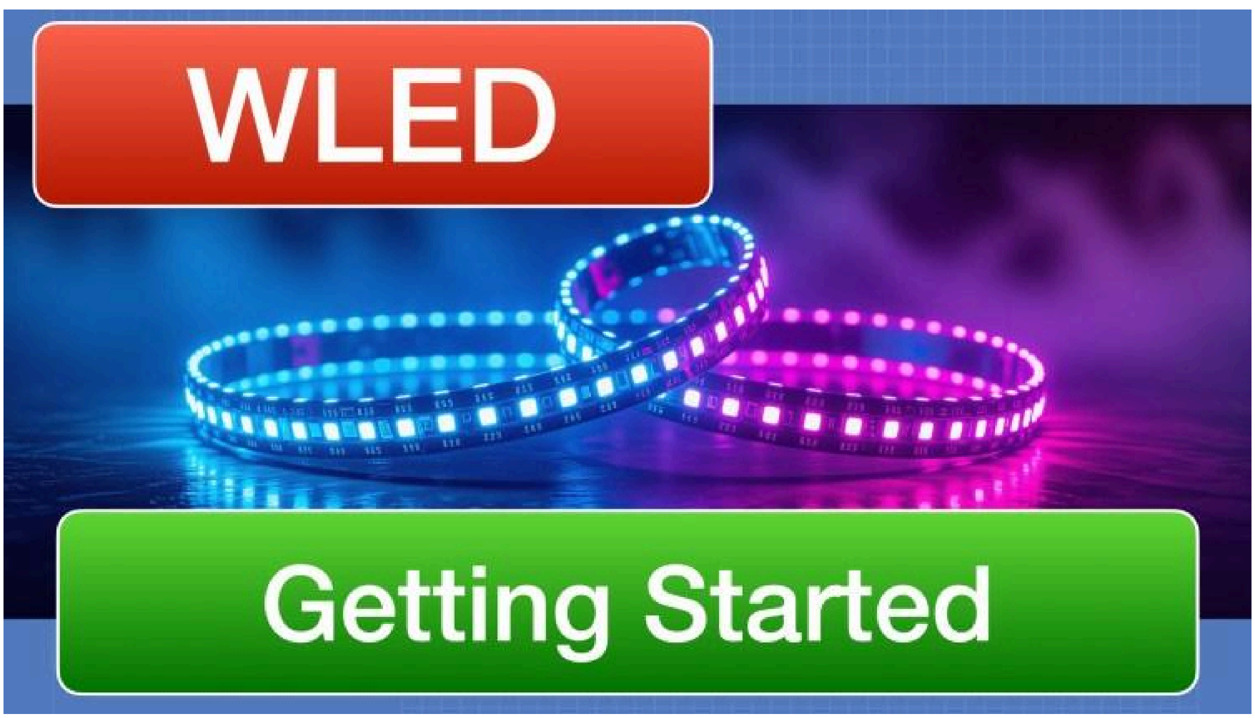
Addressable LED strips have opened up a world of creative lighting projects for everyone. With just a few wires, you can create colorful displays that can be controlled using microcontrollers like the Arduino or ESP32. But what if you aren’t a coder, or if you don’t want to write code every time you want to change the colors or add effects?

That’s where WLED comes in. WLED is a free, open-source firmware for the ESP8266 and ESP32 that turns your microcontroller into a powerful Wi-Fi LED controller capable of driving hundreds of addressable LEDs with beautiful effects. Once installed, you can control your LEDs from a smartphone, computer, or even through IoT smart home systems, such as Home Assistant and Amazon Alexa.

In this article (and accompanying video), we will explore the features of WLED. We'll cover the essentials of selecting the right ESP32 board, understanding different types of LED strips, proper wiring techniques, and power considerations. Then we'll put theory into practice by connecting actual LED devices and building a complete sound-controlled LED lamp project using WLED's built-in Audio Reactive features.

WLED

WLED is an open-source firmware project that transforms ESP32 and ESP8266 microcontrollers into sophisticated LED controllers. Created by Aircoookie (Christian Schwinne) and first released in 2018, WLED has grown from a simple LED control project into one of the most popular and feature-rich lighting control systems available today.



What sets WLED apart from other LED control solutions is its combination of professional features with remarkable ease of use. Unlike many microcontroller projects that require extensive programming knowledge, WLED provides a complete, ready-to-use solution that can be installed in minutes. You won't even need an IDE to perform the installation, as it has an intuitive web-based installer.

One of WLED's greatest strengths is its ability to integrate seamlessly into a smart home ecosystem. It supports a wide range of control interfaces, including :

- **Home Assistant** – WLED offers native integration with Home Assistant, enabling the automatic discovery of your WLED devices on the network. This allows for deep control and powerful automations, treating each LED segment as a separate light entity within your Home Assistant dashboard.
- **Amazon Alexa** – With built-in Alexa emulation, you can control your lights with simple voice commands for on/off, brightness, and color changes. You can even expose WLED presets as individual devices to Alexa, allowing you to trigger complex animations with your voice.
- **MQTT** – For universal compatibility with other platforms, WLED can connect to an MQTT broker, allowing for robust, two-way communication within a broader IoT network.

In this article (and accompanying video), we'll explore WLED and all of its features. We'll install it on an ESP32, connect addressable LEDs, and we'll add "Audio Reactive" features to control our LEDs with sound. By the end, you'll be ready to create your own amazing lighting displays with little or no programming.

WLED Features

Here is a partial list of the features that make WLED so popular:

- **Zero Code Required** – Complete functionality without writing a single line of code.
- **Rich Web Interface** – Intuitive browser-based control with real-time preview.
- **Extensive Effect Library** – Over 100 built-in effects from simple color wipes to complex audio-reactive patterns.

- **Segments** – Divide your LED installation into multiple zones with independent control.
- **Sync Capabilities** – Synchronize multiple WLED devices for large installations.
- **Mobile Apps** – Native iOS and Android apps for convenient control.
- **API Support** – RESTful API and JSON interface for custom integration.
- **Home Automation Ready** – Built-in support for many popular IoT and Smart Home platforms.

WLED has become so popular that several commercial WLED controllers are now available, based on both the ESP8266 and ESP32. Of course, we won't need to purchase one of these as we can just put one together using an ESP32.

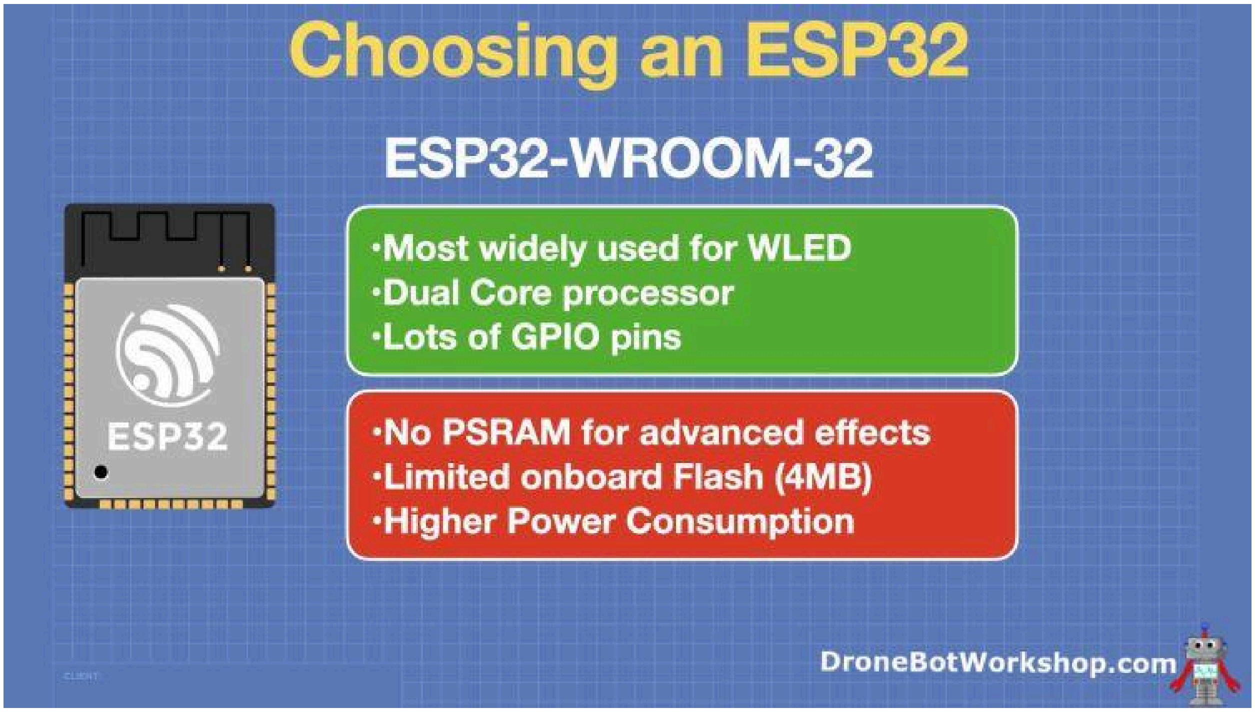
Choosing an ESP32 Board

Although WLED is capable of running on an ESP8266, we will be installing it on an ESP32. The ESP8266 is coming to the end of its support life, so future LED projects should always use an ESP32.

Not all ESP32 boards are created equal when it comes to WLED applications. While WLED will run on virtually any ESP32 (or ESP8266) board, specific characteristics make some boards better suited for LED control projects.

Here are some of the more popular ESP32 variants used with WLED.

ESP32-WROOM-32 (Original ESP32)



The most widely used and recommended board for WLED.

Advantages:

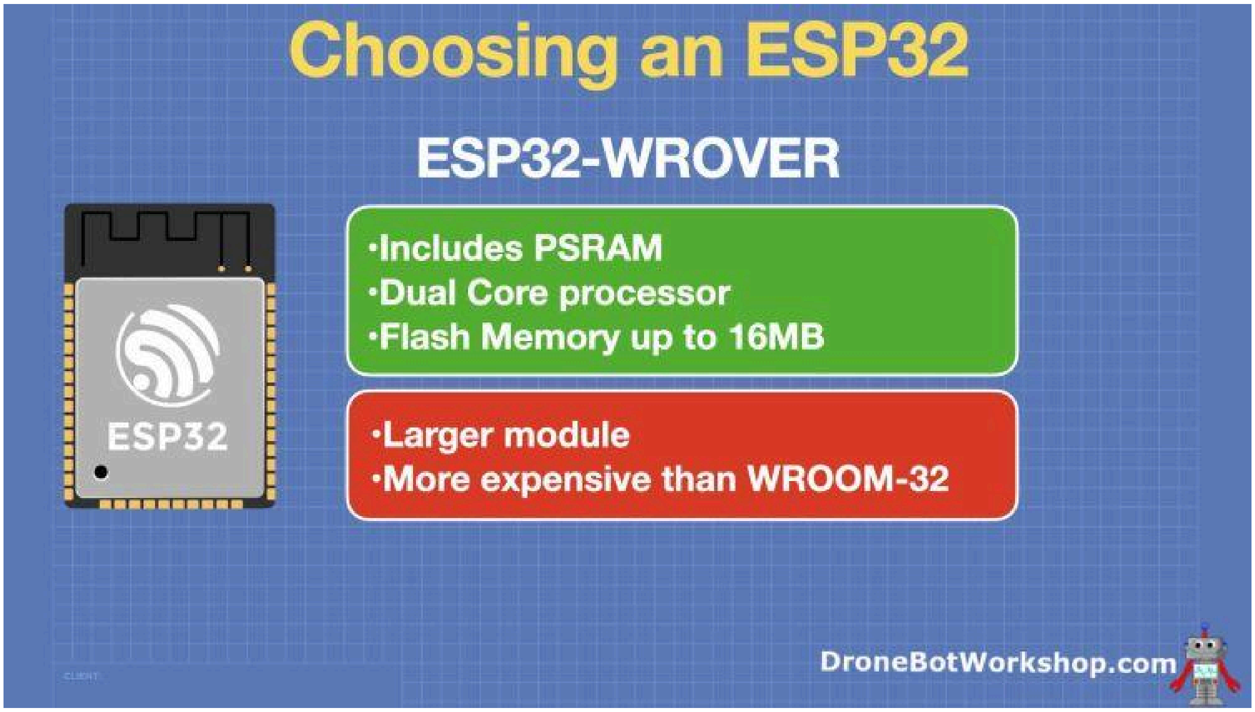
- Excellent compatibility with WLED (officially supported)
- Dual-core processor with good performance
- Widely available and affordable
- Plenty of GPIO pins for LED control and accessories
- Stable Wi-Fi performance

Disadvantages:

- No PSRAM (limits advanced effects or large LED counts)
- Limited onboard flash (usually 4MB)

Best For: Beginners and general-purpose WLED projects

ESP32-WROVER



A beefed-up version of the WROOM with added memory.

Advantages:

- Includes PSRAM (ideal for large LED matrices or advanced effects)
- More flash memory (up to 16MB)
- Same core architecture as WROOM

Disadvantages:

- Slightly more expensive
- Larger footprint (may not fit in compact enclosures)
- Not all WLED features take full advantage of PSRAM yet

Best For: Advanced users building large-scale or memory-intensive LED installations.

ESP32-S2

A single-core variant with USB support and lower power consumption.

Advantages:

- Native USB (no need for USB-to-serial chip)
- Lower power usage
- Improved security features

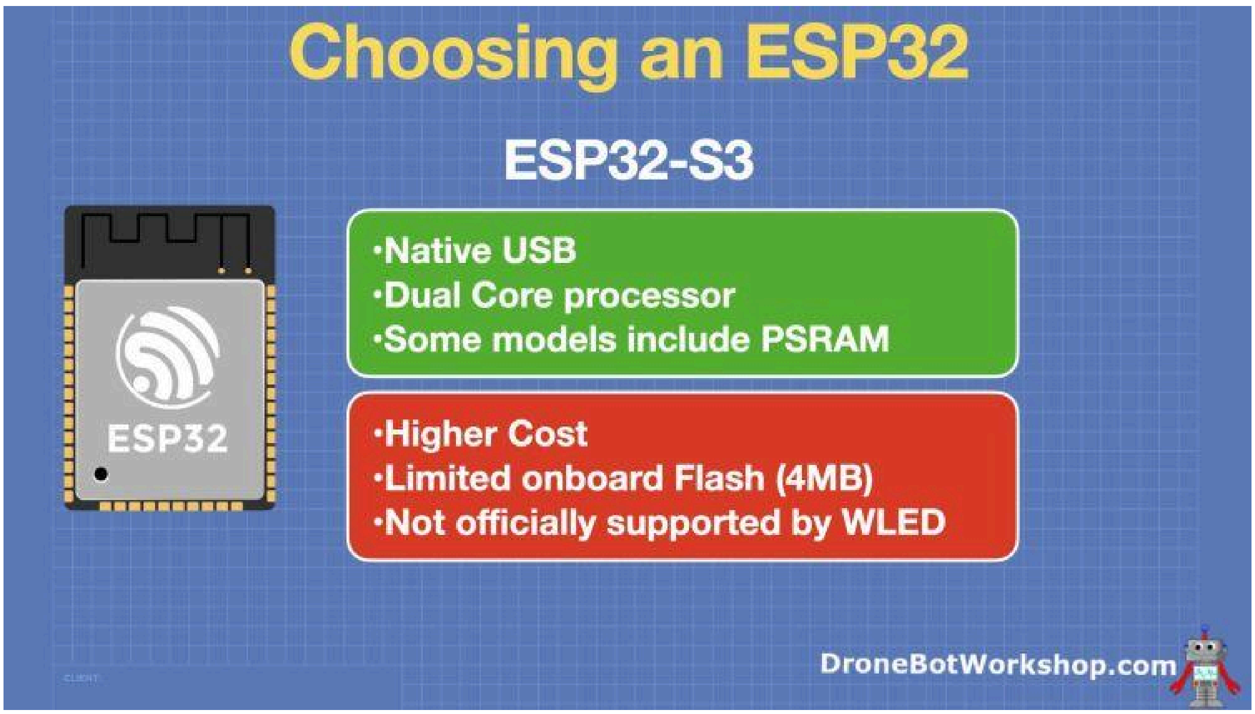
Disadvantages:

- Single-core = lower performance
- No Bluetooth
- Limited WLED support (some effects may not run smoothly)

- Fewer GPIOs and peripherals

Best For: Low-power or USB-centric projects, but not ideal for WLED unless you're experimenting.

ESP32-S3



An upgraded version of S2 with AI acceleration and dual-core performance.

Advantages:

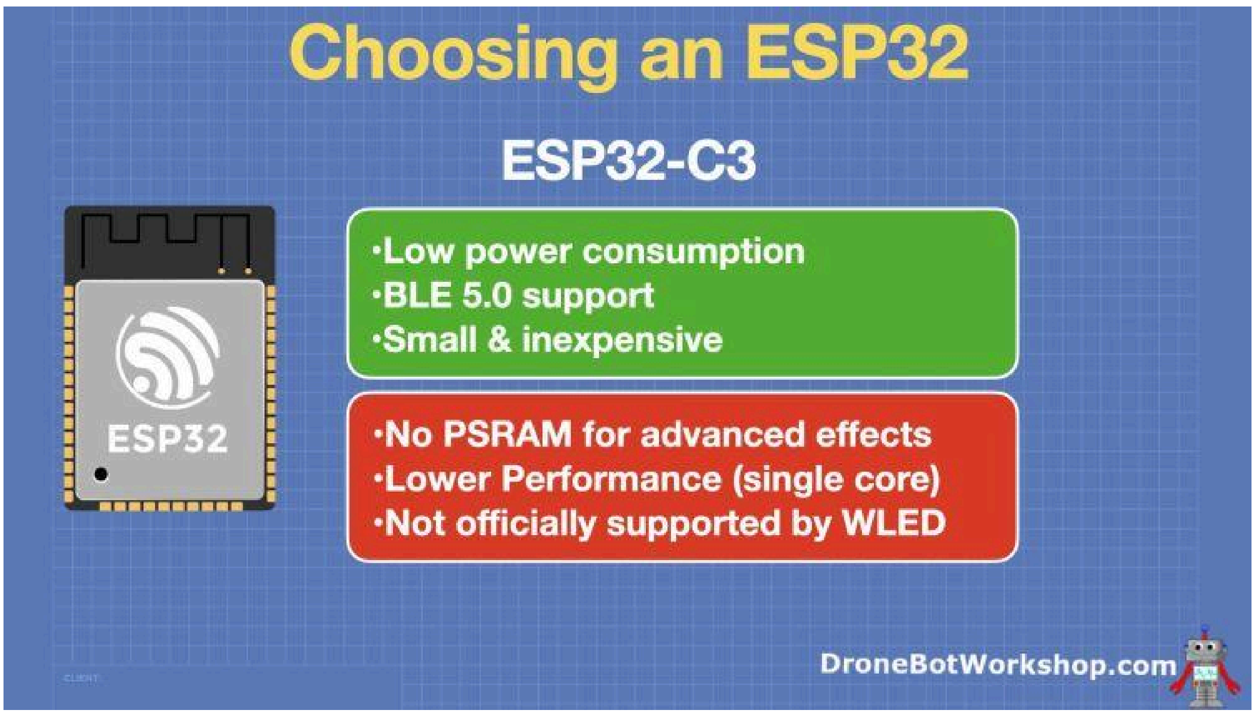
- Dual-core processor (better than S2)
- Native USB support
- Optional PSRAM on some modules
- AI instructions (not used by WLED, but useful for other projects)

Disadvantages:

- Still experimental in WLED (some features may be unstable)
- Limited community support compared to WROOM
- Slightly higher cost

Best For: People who want to future-proof or experiment with newer hardware.

ESP32-C3



A RISC-V-based ESP32 with ultra-low power and BLE 5.0.

Advantages:

- RISC-V architecture (open-source and energy-efficient)
- BLE 5.0 support
- Very low power consumption

- Compact and inexpensive

Disadvantages:

- Single-core = limited performance
- Experimental WLED support (some effects may not work)
- Fewer GPIOs
- No PSRAM

Best For: Minimalist or battery-powered WLED setups, but not recommended for complex effects.

Selecting LEDs

Understanding the various LED strip configurations and chipset specifications is crucial for selecting the right components for your WLED project. Each type offers distinct advantages and is optimized for different applications.

LED Strip Color Configurations

LED strips are available in various color configurations. Choosing the correct one is essential for a successful project.

RGB (Red, Green, Blue)

RGB strips contain three color channels per LED segment, using additive color mixing to produce a broad spectrum of colors. This is the most common and versatile configuration for decorative lighting applications.

Key Characteristics:

- Three color channels: Red, Green, Blue
- Capable of producing approximately 16.7 million color combinations
- White light is created by mixing all three colors at equal intensity
- Mixed white tends to appear slightly bluish or purplish
- Excellent for color-changing effects and mood lighting
- Most cost-effective option for general-purpose applications

Best Applications: Accent lighting, color-changing installations, entertainment lighting, and general decorative purposes where pure white quality isn’t critical.

RGBW (Red, Green, Blue, White)

RGBW strips add a dedicated white LED die alongside the RGB channels, providing superior white light quality and enhanced color mixing capabilities.

Key Characteristics:

- Four channels: Red, Green, Blue, plus dedicated White
- True white light from dedicated white die (typically 3000K-4000K)
- Enhanced color saturation when white is mixed with colors
- Better light output efficiency for white lighting applications
- Can produce pastels and subtle tints more accurately
- Approximately 25-30% higher cost than RGB strips

Best Applications: Task lighting, architectural installations, applications requiring quality white light, and situations where accurate color reproduction is essential.

RGBWW (Red, Green, Blue, Warm White, Cool White)

RGBWW is the premium configuration, offering RGB color capabilities plus two white channels for complete control over color temperature.

Key Characteristics:

- Five channels: RGB plus Warm White (2700K-3200K) and Cool White (5000K-6500K)
- Full color temperature adjustment from warm to cool
- Excellent white light quality across the temperature range
- Maximum flexibility for both decorative and functional lighting
- Highest power consumption and cost
- Complex control requirements (not all controllers support 5-channel)

Best Applications: High-end residential lighting, commercial installations, photography/video applications, and situations requiring precise color temperature control.

RGB+CCT (Red, Green, Blue + Correlated Color Temperature)

RGB+CCT strips combine RGB capability with tunable white using separate warm and cool white LEDs, similar to RGBWW but often implemented differently.

Key Characteristics:

- The dual white system allows smooth color temperature transitions
- RGB channels provide a full color spectrum
- Often more cost-effective than full RGBWW implementation
- Good compromise between RGB flexibility and white quality
- May use different control protocols than standard RGB strips

Best Applications: Smart home lighting systems, applications that require both color effects and high-quality white light, and installations where precise color temperature adjustment is valued.

Single Color (Warm White, Cool White, etc.)

Non-addressable single-color strips remain popular for applications requiring consistent, high-quality illumination without color-changing capabilities.

Key Characteristics:

- Single LED type optimized for a specific color temperature
- Highest luminous efficacy (lumens per watt)

- Simplest control requirements (voltage/PWM dimming)
- Most cost-effective for pure lighting applications
- Available in various color temperatures and CRI ratings

Best Applications: Under-cabinet lighting, cove lighting, general illumination, and applications where consistent color is more important than effects.

Addressable VS. Non-Addressable

LED Strips can be divided into two categories – **Non-Addressable** and **Addressable**.

Non-addressable LED strips are the simplest type of LED strip. All of the LEDs on the strip are wired in parallel, so they act as a single unit — when you set the strip to red, every LED turns red. You can change the brightness and overall color, but you can't make different parts of the strip show different colors at the same time. These strips are inexpensive and easy to use with basic LED drivers or MOSFETs, but they're limited when it comes to creative lighting effects.

Addressable LED strips, on the other hand, contain tiny integrated driver chips inside or next to each LED. This allows you to control each LED independently, setting its color and brightness without affecting the others. With addressable strips, you can create advanced effects like rainbow gradients, chasing lights, or music visualization. They require a microcontroller (such as an ESP32) to send data, but the flexibility is much greater. WLED is designed for addressable strips, making it easy to unleash their full potential without writing custom code. It will, however, also work with non-addressable strips.

There are many varieties of Addressable LEDs:

WS2812B (NeoPixel)

The WS2812B has become the de facto standard for addressable RGB LEDs due to its excellent balance of performance, cost, and ease of use.

Technical Specifications:

- Voltage: 5V DC (3.5V-5.3V operating range)
- Current: ~60mA maximum per LED at full white brightness
- Protocol: Single-wire data transmission, 800kHz data rate
- Color Depth: 24-bit (8 bits per channel, 16.7M colors)
- Data Format: GRB (Green-Red-Blue sequence)
- Package: 5050 SMD with integrated control IC
- Refresh Rate: Up to 400Hz, depending on LED count
- Temperature Range: -25°C to +80°C operating

Key Features:

- Integrated control circuit eliminates external drivers
- Daisy-chain connection simplifies wiring
- Automatic data regeneration at each LED
- Wide availability and competitive pricing
- Excellent WLED compatibility and optimization

WS2811 (External Driver Version)

The WS2811 uses the same protocol as WS2812B but implements the control circuit as a separate IC, allowing for different LED configurations.

Technical Specifications:

- Voltage: 12V DC (9V-12V operating range)
- Current: ~60mA per LED channel at 5V LED operation
- Protocol: Single-wire data transmission, 400kHz or 800kHz
- Control Ratio: One IC typically controls 3 LEDs
- Color Depth: 24-bit color depth

- Data Format: RGB (Red-Green-Blue sequence)
- Package: External SO-8 IC with separate LEDs

Key Features:

- Higher voltage operation reduces current requirements
- One controller per three LEDs reduces per-LED cost
- External IC allows for different LED arrangements
- Better heat dissipation with separate control IC
- Suitable for longer runs with less voltage drop

SK6812 (RGBW NeoPixel)

The SK6812 extends the NeoPixel concept to include a dedicated white channel, providing superior white light quality.

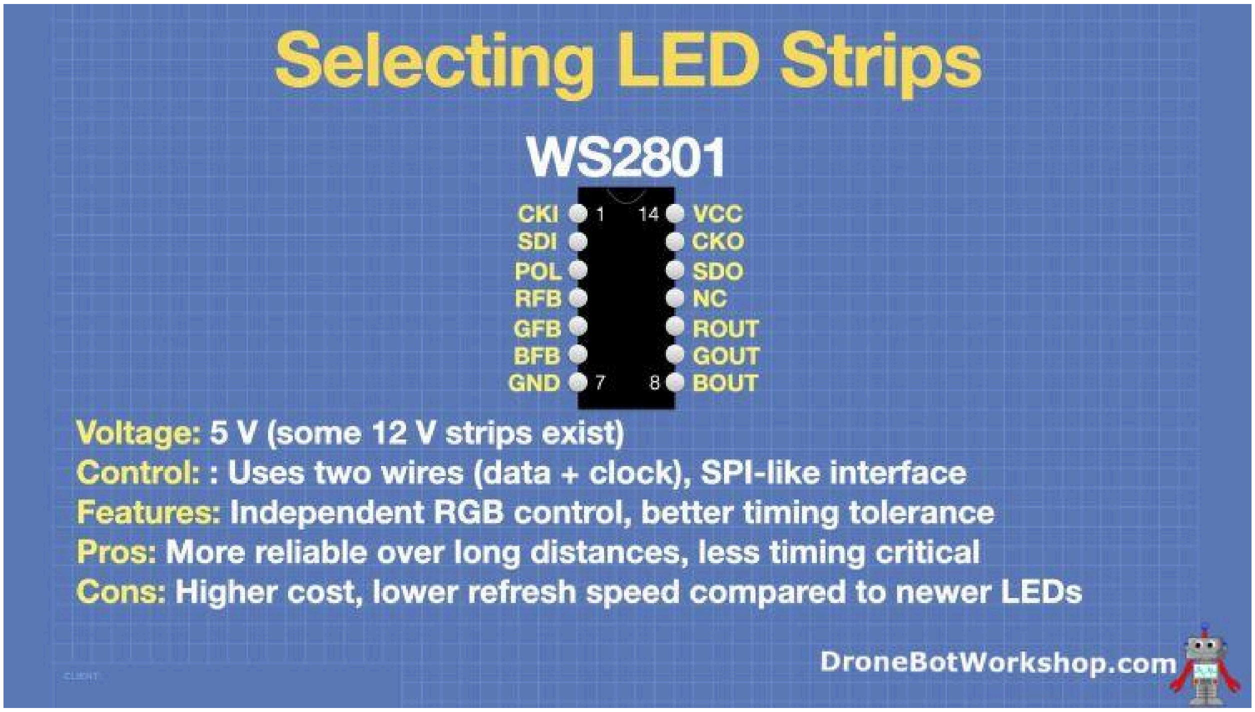
Technical Specifications:

- Voltage: 5V DC (3.5V-5.3V operating range)
- Current: ~80mA maximum per LED at full RGBW
- Protocol: Single-wire data transmission, 800kHz data rate
- Color Depth: 32-bit (8 bits × 4 channels)
- Data Format: GRBW (Green-Red-Blue-White sequence)
- White Options: Various color temperatures available (3000K, 4000K, 6000K)
- Package: 5050 SMD with four LED dies

Key Features:

- True white channel for superior white light quality
- Same protocol and control as WS2812B with additional white data
- Better color mixing capabilities
- Higher power consumption due to the fourth channel
- Ideal for applications requiring quality white light

WS2801 (Clock-Based Legacy)



The WS2801 represents an older generation of addressable LEDs using a two-wire clock-based protocol rather than precise timing.

Technical Specifications:

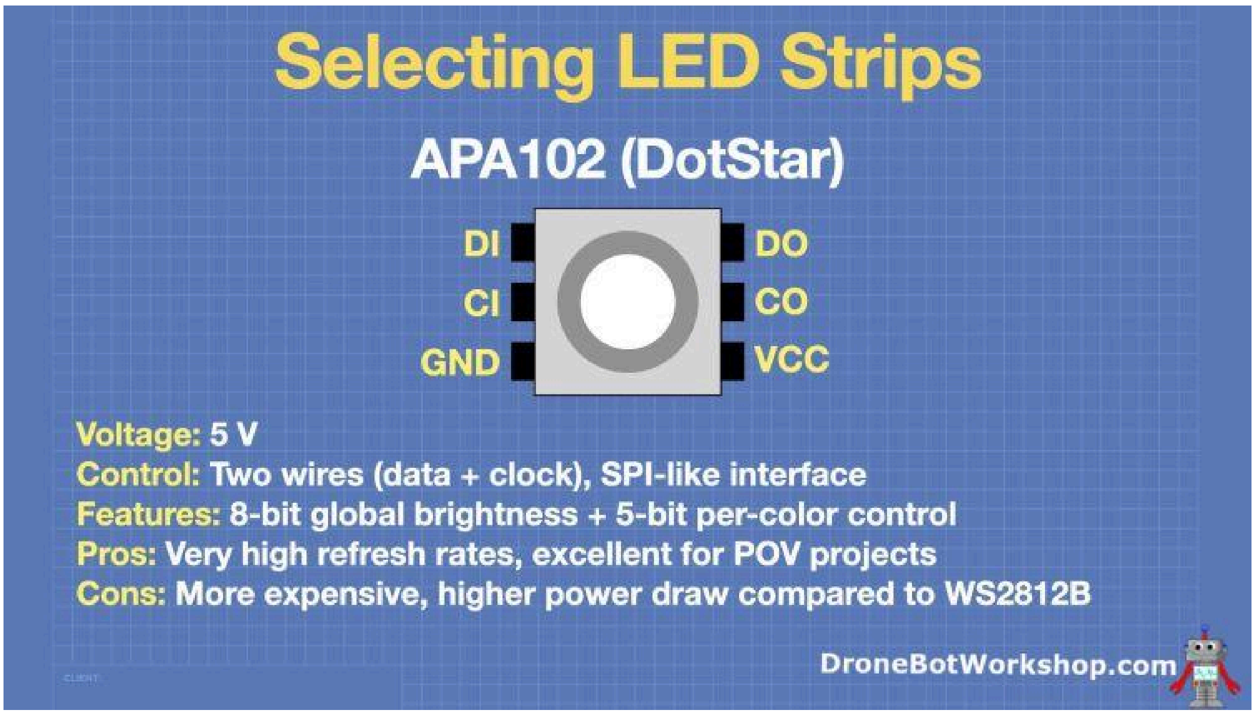
- Voltage: 5V DC for logic, separate power for LEDs
- Current: Depends on connected LED configuration
- Protocol: Two-wire SPI-like (Clock + Data)
- Color Depth: 24-bit RGB color
- Data Rate: Up to 25MHz clock frequency
- Control: External RGB LEDs driven by WS2801 IC
- Package: SO-8 IC with external LED connections

Key Features:

- Clock-based protocol eliminates timing sensitivity

- Higher data rates are possible than timing-based protocols
- Separate power domains for logic and LEDs
- More complex wiring (requires clock and data lines)
- Better noise immunity than single-wire protocols
- Legacy status – largely superseded by newer designs

APA102 (DotStar)



The APA102 represents the modern evolution of clock-based addressable LEDs, offering superior performance for demanding applications.

Technical Specifications:

- Voltage: 5V DC (3.5V-5.3V operating range)
- Current: ~60mA maximum per LED at full white
- Protocol: Two-wire SPI (Clock + Data)
- Color Depth: 24-bit color with 5-bit global brightness
- Data Rate: Up to 30MHz clock frequency

- Data Format: Start frame + LED data + end frame structure
- Package: 5050 SMD with integrated control circuit

Key Features:

- Very high refresh rates (up to 9kHz)
- Global brightness control for smoother dimming
- Excellent color consistency
- Clock-based protocol eliminates timing issues
- Superior performance for video applications
- Higher cost than timing-based alternatives
- Requires two data lines instead of one

Selection Considerations

- **For Beginners:** WS2812B RGB strips offer the best combination of simplicity, cost, and community support.
- **For Quality White Light:** SK6812 RGBW provides excellent color capabilities plus true white illumination.
- **For Large Installations:** WS2815 (12V) or APA102 (clock-based) offer better signal integrity over long distances.
- **For High-Performance Applications:** APA102 delivers superior refresh rates and color consistency for video or rapid animation effects.
- **For Budget-Conscious Projects:** WS2811-based strips provide addressable control at lower per-LED costs.

The key is matching LED specifications to your specific project requirements, considering factors like installation size, desired effects, white light quality needs, and budget constraints.

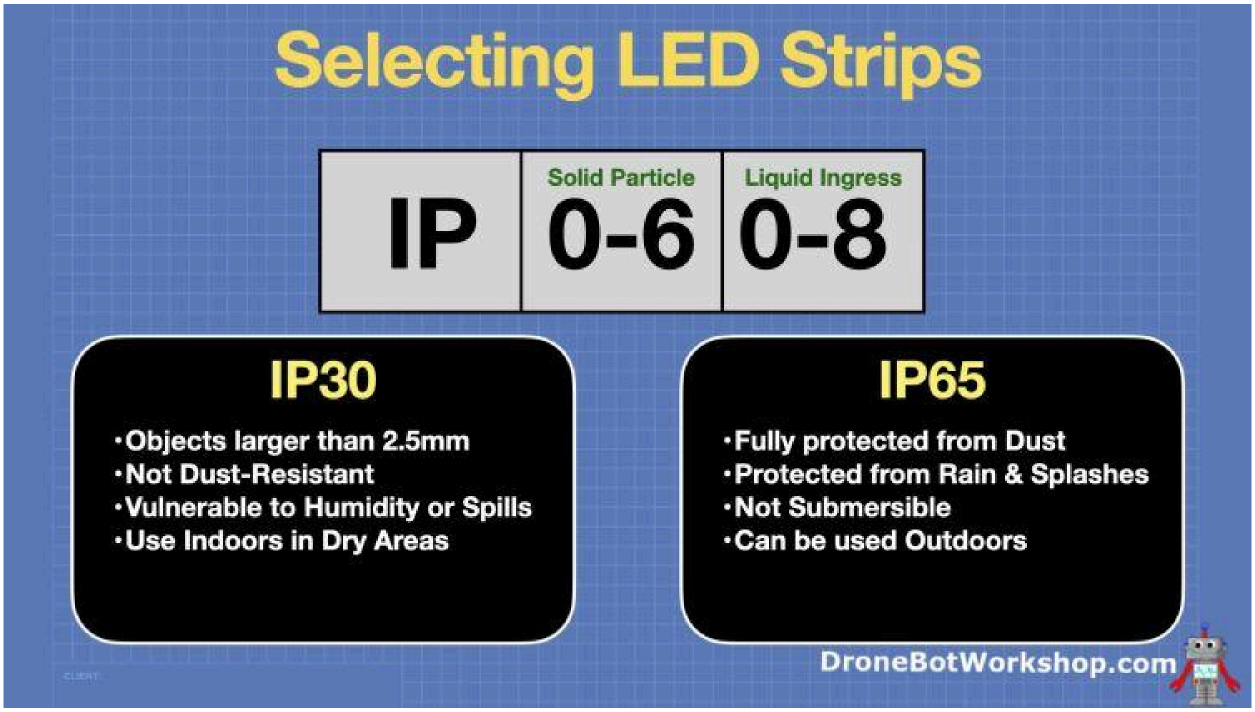
IP Ratings for LED Strips

When choosing LED strips, especially for outdoor or workshop projects, it's important to understand the IP rating. This code describes how well the strip is protected against dust and water. The format is IP*XY*, where:

- X = protection against solid objects (like dust).
- Y = protection against liquids (like splashes or immersion).

Here are the most common ratings you'll encounter with LED strips:

- IP20 – No real protection beyond basic housing. Best for indoor use in enclosures where dust and moisture aren't an issue.
- IP65 – A thin silicone coating protects the strip from dust and low-pressure water jets (like splashes). Suitable for indoor/outdoor use where occasional moisture is possible, but not for submersion.
- IP67 – The strip is encased in a silicone sleeve or filled with epoxy. It can handle heavy splashing and brief submersion in water. Good for outdoor installations exposed to rain.
- IP68 – Fully sealed against dust and designed for continuous submersion in water. These strips are often potted in silicone or epoxy. Best for permanent outdoor use, fountains, or underwater projects.



For most makers, IP30 or IP65 strips are fine for indoor projects. If you're mounting LEDs outdoors or in damp areas, IP67 gives better peace of mind. IP68 is usually overkill unless you truly plan on underwater lighting.

Installing WLED on an ESP32

One of the best things about WLED is how easy it is to install. You don't need to write any Arduino code or use special tools – everything can be done directly from your web browser using the official installer.

What You'll Need

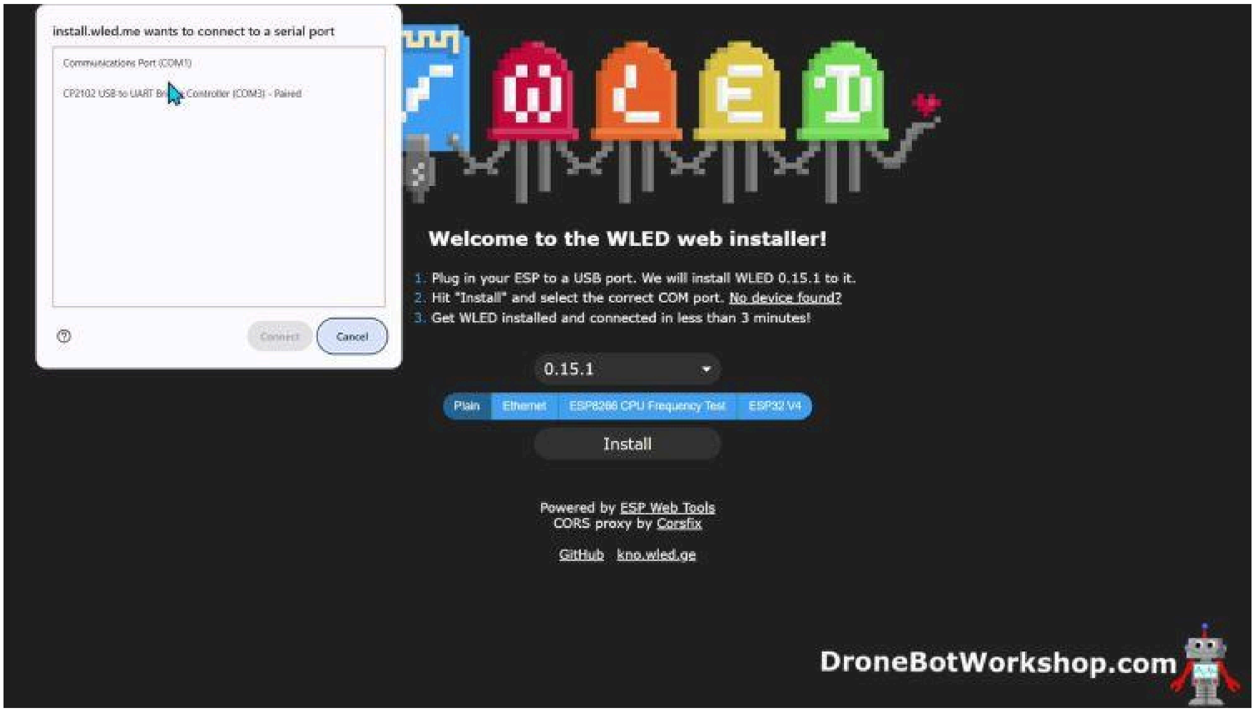
- An ESP32 development board (ESP32-WROOM-32, ESP32-S3, etc.).
- A USB cable that supports data transfer (not just charging).
- A computer running Chrome, Edge, or another Chromium-based browser.

Step 1 – Connect Your ESP32

Plug the ESP32 board into your computer with the USB cable. Make sure it shows up as a serial (COM) port — your operating system should install drivers automatically.

Step 2 – Open the WLED Web Installer

Go to the official installer page at https://install.wled.me. This site automatically detects your ESP32 and guides you through the process.



Step 3 – Select and Install

Click “Connect” and select your ESP32’s COM port. Confirm that you want to install WLED and are aware that all data on the ESP32 will be erased. Click *Install* and wait – the process usually takes about two minutes.

When complete, your ESP32 will automatically restart with WLED installed.

Step 4 – First Connection

After rebooting, the ESP32 will create a Wi-Fi network named something like *WLED-AP*. Connect to this network with your phone or computer. You may also choose to enter your Wi-Fi network credentials. If you do, then WLED will join your existing Wi-Fi network instead of running as an access point.

The default URL for the Access Point (if you use one) is http://4.3.2.1. The default Access Point password is *wled1234*. If you elect to join your Wi-Fi network, then WLED will provide a link to the User Interface page.

Once connected, open a web browser and go to the specified address. This will bring up the WLED control panel.

Step 5 – Test Your Installation

At this point, WLED is running — even if you don't have LEDs connected yet. You can explore the menus, adjust brightness, and test effects. Once you wire up your LED strip, WLED will be ready to bring it to life.

If you ever need to update WLED in the future, return to *install.wled.me* and repeat the process. WLED can also be updated from within its web interface using OTA (Over-The-Air updates).

Hooking Everything Up

Now we have an ESP32 programmed with WLED. All we need to do is hook it up to some LEDs, and we're in business!

Actually, it's a bit more complicated than that. First, we need to provide a suitable power supply.

Powering LED Strips for WLED

One of the most critical parts of any WLED project is getting the power supply right. Addressable LEDs can draw a significant amount of current, and underestimating this is one of the most common mistakes beginners make.

Calculating Power Needs

Each RGB LED can draw up to 60 mA at full white brightness (all three colors at maximum). For example:

- A 60-LED strip could draw up to 3.6 A at 5 V.
- A 300-LED strip could draw nearly 18 A at 5 V.

In practice, you'll rarely run at full brightness, but it's best to size your power supply for the maximum possible load. For larger setups, consider using a dedicated 5 V or 12 V DC power supply rated for your LED count.

You can calculate power using the WLED Power Calculator.

Power Injection

Voltage drop is another issue — the further along the strip you go, the more the voltage falls, causing the far-end LEDs to appear dim or discolored. To fix this, you use power injection.

Power injection means adding additional 5 V (or 12 V) and GND connections along the strip so that every section of LEDs gets a stable supply. You can do this by:

- Supplying power at both ends of the strip.
- Adding extra wires from your power supply to the middle of the strip (or matrix/panel).

Always connect all grounds together (power supply, ESP32, and LED strip) — a common ground is essential for reliable operation.

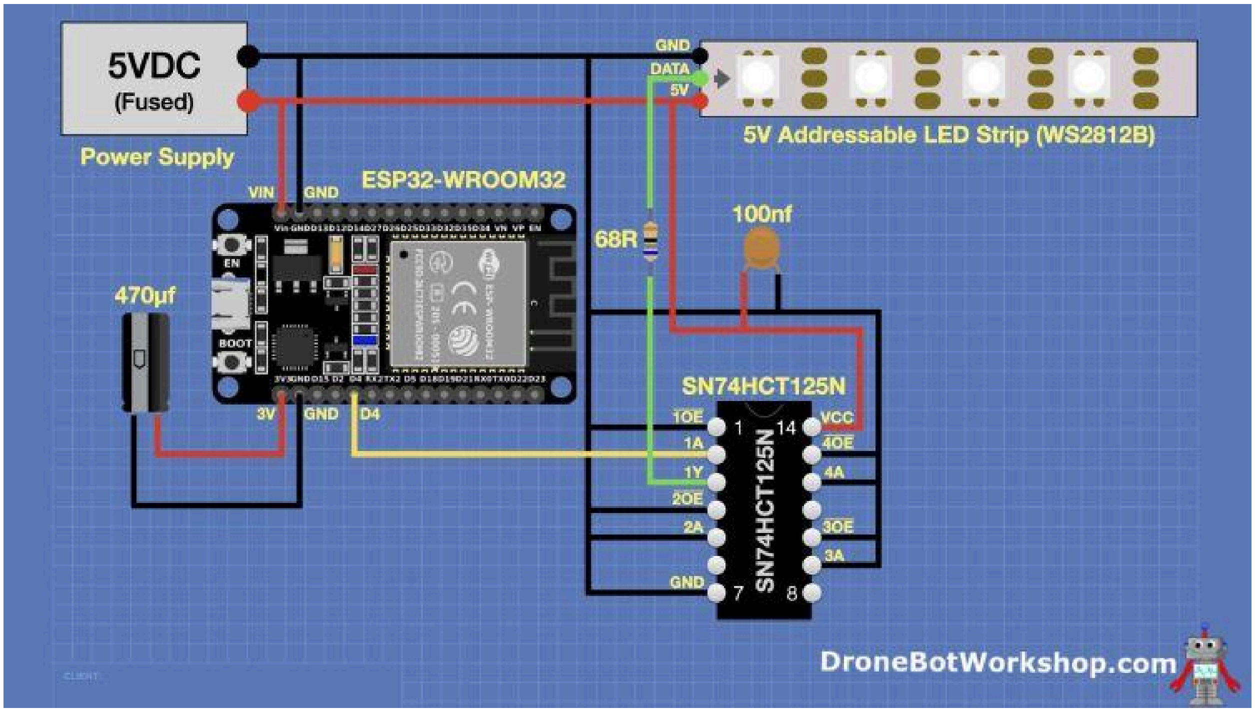
Safety Tips

- Use the correct wire gauge; higher current requires thicker wires.
- Add an inline fuse close to the power supply for protection.
- Never power long strips solely from the ESP32's 5 V pin – it can't supply enough current.

For detailed wiring diagrams showing single strips, multiple strips, and power injection, I recommend the excellent WLED Wiring Guides. These official resources offer clear diagrams for various scenarios.

Hooking up our ESP32

Here is how I hooked up my ESP32-WROOM-32 to a 5-volt NeoPixel LED strip:



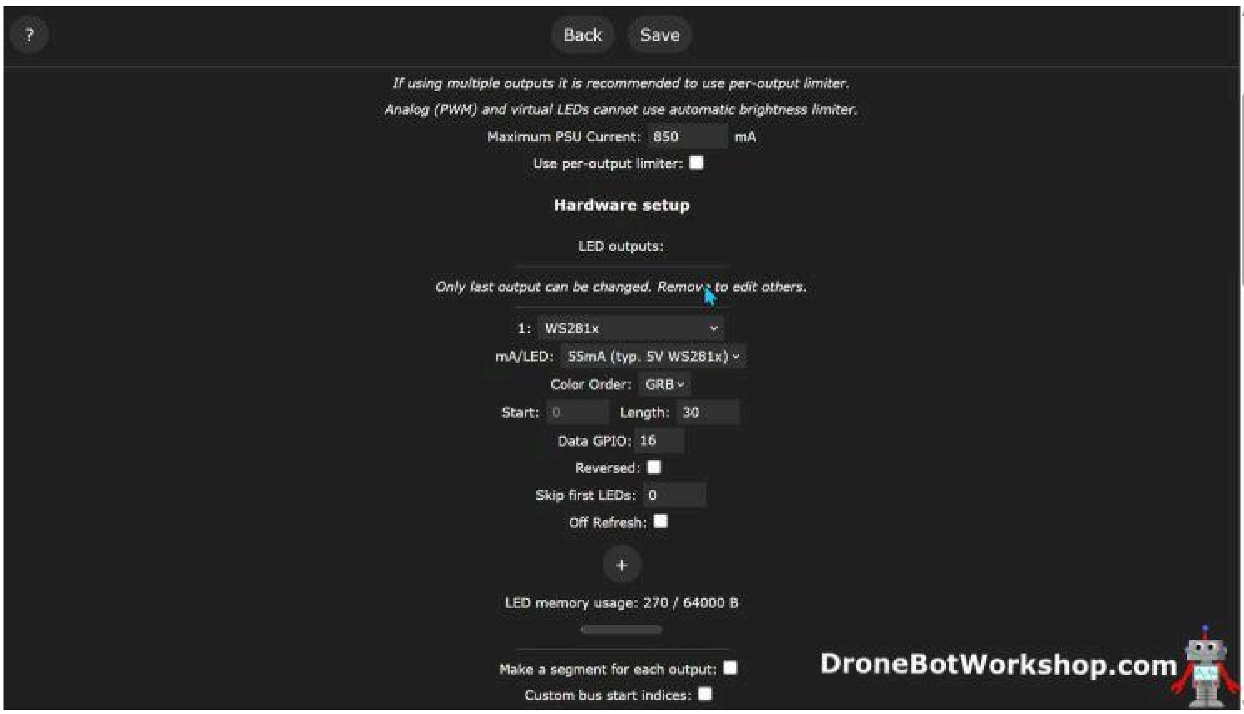
The SN74HCT125N is used as a logic-level converter. It's actually a quad buffer chip, but as the "74HCT" series of chips are CMOS equivalents of popular TTL chips, they can accept logic inputs as low as 2 volts. This is an efficient method of converting the ESP32 3.3-volt output to the 5-volt logic signal required by the LED strip.

The 68 ohm resistor is used to prevent a rush of current to the first LEDs on the strip. You may adjust its value if required.

Testing WLED

Now the moment of truth! Power up your circuit, assuming you have everything properly connected, the ESP32 should start and either connect to your Wi-Fi or provide its own access point. Either way, navigate to the WLED UI.

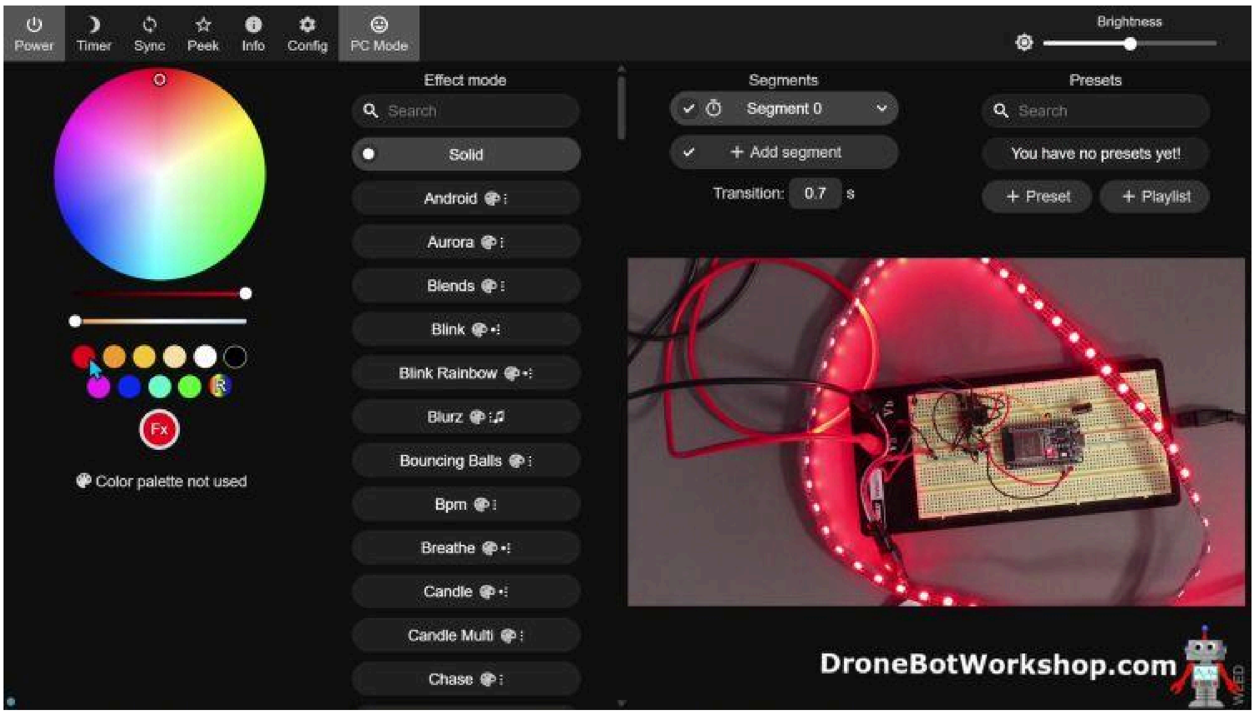
From the main menu, go to *Config → LED Preferences*. This is where you tell WLED exactly what kind of LEDs you've connected and how many there are.



Start by setting the LED GPIO pin. If you wired your circuit following my diagram, then set this value to 4 (GPIO pin 4). Next, select your LED type from the dropdown list – in this case, it's the WS2812B. Finally, enter the number of LEDs in your strip, ring, or panel. WLED requires this number to determine the number of pixels it can address and the amount of memory to allocate. In my case, I have 60 LEDs on my strip; adjust this value to match the number of LEDs on your strip.

Click Save & Reboot, and your ESP32 will restart with the new configuration.

Back on the main control screen, you should now be able to turn on the strip, pick colors, and try out the dozens of built-in effects. A good first test is setting the brightness to 50%, picking a solid color, and then experimenting with the animation effects like Rainbow or Twinkle to confirm everything is working.



Audio Reactive

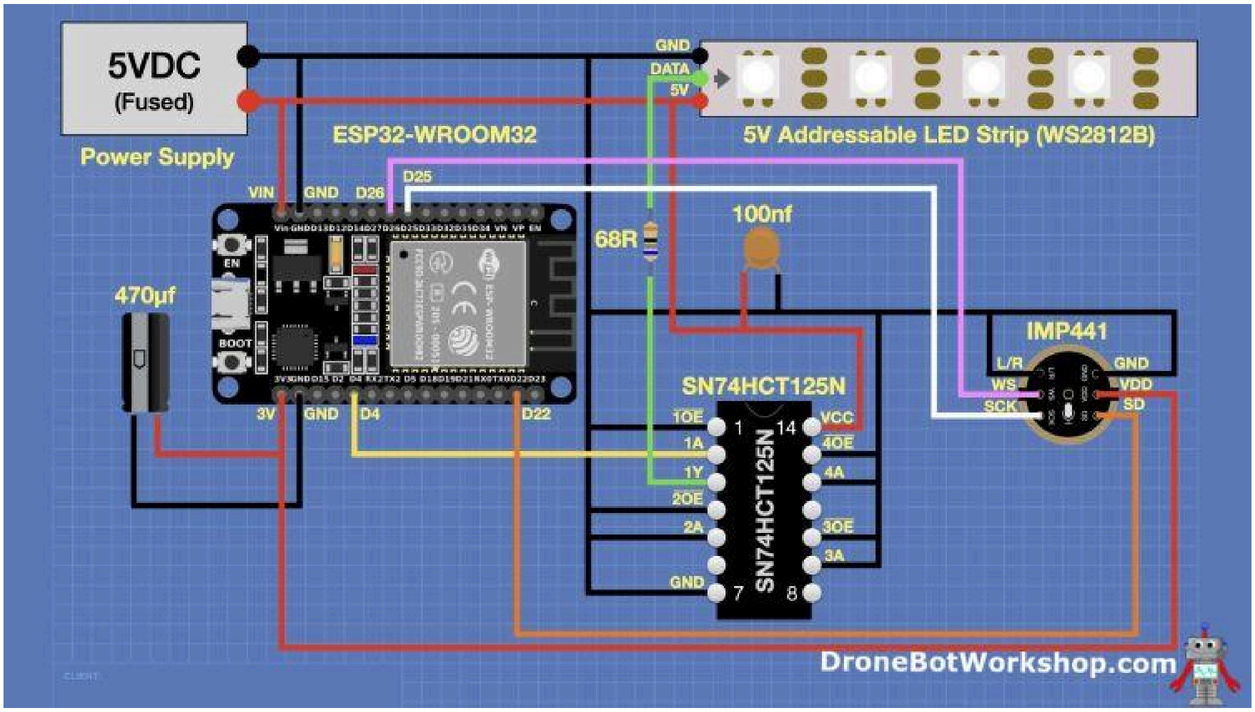
One of the most exciting features of WLED is its Audio Reactive mode, which allows your LEDs to respond dynamically to music or sound. Instead of simply cycling through preset animations, your lighting can pulse, shimmer, and dance in sync with the beat, creating a much more immersive effect.

To use this feature, you'll need an I2S digital microphone, such as the INMP441 or SPH0645. These microphones connect directly to the ESP32 using its I2S interface, allowing WLED to capture audio in real time without needing an external processor. Once connected and enabled in the WLED configuration, the firmware analyzes the audio input and feeds it into a set of special "reactive" effects.

The Audio Reactive extension used to be a separate community project, but as of WLED version 0.15, it is now included in the main firmware. That means no extra installation steps are required — simply connect the microphone, configure the I2S pins in the settings, and you'll find a variety of new audio-based effects ready to use. These range from spectrum analyzers and VU meters to more abstract color patterns that change with volume and frequency.

Audio Reactive Hookup

Here is how I added an INMP441 I2S microphone to the existing WLED Hookup:



Ensure that you power the microphone with the 3.3 volts from the ESP32, not the 5 volts from the power supply, as it is a 3.3-volt unit.

Audio Reactive Setup

Once your I2S microphone is wired to the ESP32, you'll need to enable and configure it in the WLED control panel. Audio Reactive is included in WLED 0.15 and later, but it isn't turned on by default.

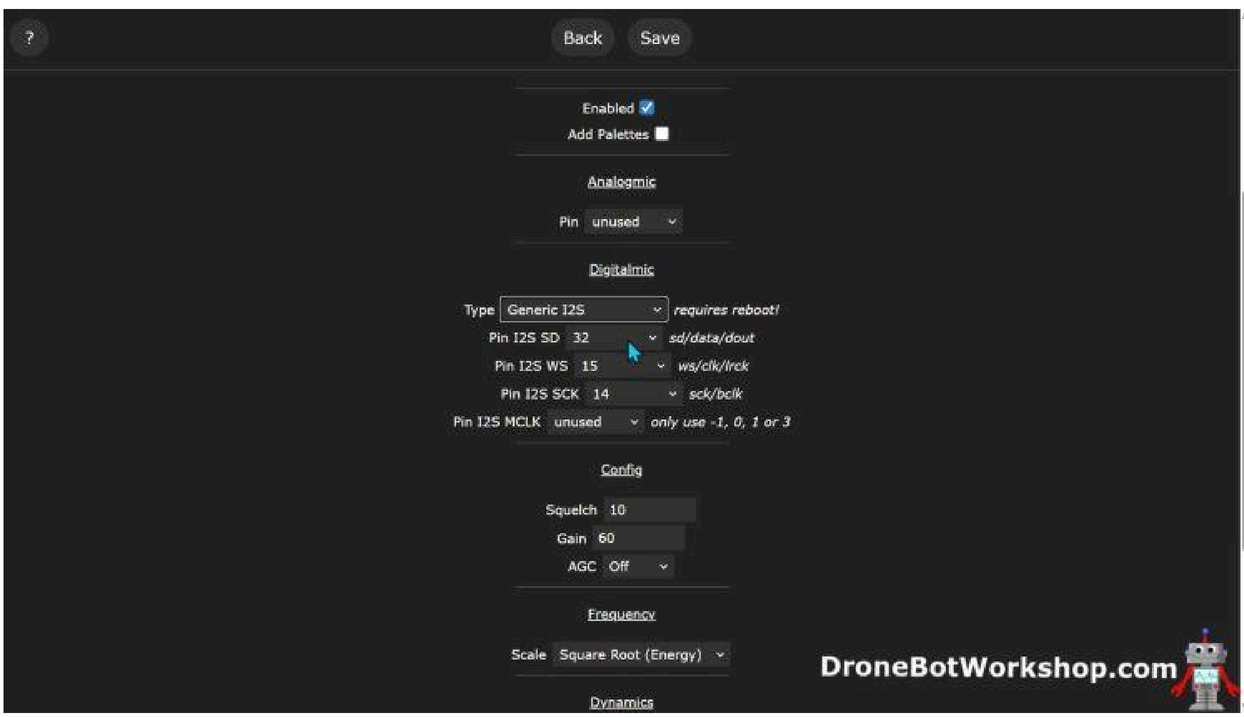
1. Open the WLED web interface (or mobile app) and go to the main menu.
2. Navigate to Config → Usermods.

3. Find the section for Audio Reactive and check the box to enable it.

After enabling, you'll see input fields to define the I2S pin assignments for your microphone. These are labeled as:

- SD (Serial Data): The pin receiving the microphone's audio data output.
- SCK (Serial Clock): The bit clock line for timing.
- WS (Word Select / LRCLK): The line that defines left/right channel frames (used even if you only use one channel).

Enter the GPIO numbers you used when wiring your microphone to the ESP32. In my example, **SD is wired to GPIO 22, SCK to GPIO 25, and WS to GPIO 26**; those are the values you'll set here.



Once the pins are configured, click Save & Reboot. When WLED restarts, the Audio Reactive system will initialize, and you'll find new sound-reactive effects available in the main effects menu.

From there, you can fine-tune microphone gain and sensitivity in the Audio Reactive settings panel. Experiment with different reactive effects, such as the VU meter, Spectrum Analyzer, and Pulse, until you find the look that best suits your project.

For best results, place the microphone close to your sound source and experiment with the sensitivity and gain settings in the WLED Audio Reactive configuration panel. With a little tuning, you can create anything from a subtle mood lamp that gently shifts with background music to a full party light show that bursts into life with every beat.

Conclusion

We’ve covered a lot of ground in this introduction to WLED. You’ve seen how simple it is to install the firmware on an ESP32, how to select and connect different types of addressable LED strips, and how to configure WLED to bring them to life. We also explored important details, such as power requirements, power injection, and selecting the right ESP32 board for your project. Finally, we built a sound-reactive lamp project to demonstrate how WLED can go beyond static lighting effects and truly interact with its environment.

WLED is a powerful tool for anyone who wants to add creative lighting to their projects without writing a single line of code. From a simple LED strip behind your monitor to large-scale holiday displays, WLED scales beautifully and integrates seamlessly with platforms like Home Assistant and voice assistants.

I encourage you to try WLED on your own ESP32 board and let your imagination guide your projects. With just a strip of LEDs and a bit of creativity, the possibilities are endless.