



What is the difference between WS2813 and WS2812B LED strips?

Introduction

LED strips have become incredibly popular in recent years for lighting applications. Among the most common types of LED strips are those based on the WS2812B and WS2813 [integrated circuits](#). Both of these LED driver chips allow for individually addressable RGB LEDs that can be digitally controlled.

While the WS2813 and WS2812B are very similar, there are some key differences between the two that impact performance, wiring, and control. Understanding these differences is helpful when selecting which LED strips to use for a particular lighting project.

This article will examine WS2812B and WS2813 LED strips in detail, compare their specifications and characteristics, and highlight the pros and cons of each to help guide the appropriate selection.

Overview of WS2812B LED Strips

WS2812B LED strips consist of a [flexible printed circuit](#) board onto which surface mount RGB LEDs and WS2812B control ICs are soldered. The WS2812B is a smart LED driver chip that enables independent control of each RGB LED module on the strip.

Some key features of WS2812B LED strips:

- Integrated control circuit, LED driver and RGB chip in each LED module
- Individually addressable – each LED controllable separately
- PWM (pulse width modulation) dimming capability
- Dense packaging – 30 to 144 LEDs per meter
- Flexible form factor – can bend to desired shapes
- Simple digital interface using one data line
- 5V DC operation with data signal levels of 0.35V LOW / 0.7V HIGH
- Built-in constant current regulators for uniform brightness
- Fast data transmission – 2Mbps protocol speed
- Chaining capability – connect strips together into longer runs

WS2812B strips are available in different LED quantity densities to suit lighting needs. Common options are 30, 60, and 144 LEDs per meter. Longer strip lengths can be created by connecting strips using soldering or connectors.

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Applications of WS2812B LED Strips

Due to their digitally controllable and flexible nature, WS2812B LED strips are used in various lighting applications:

- **Accent and Undercabinet Lighting** – Adding visual interest and task lighting under shelves



addressable color changing illumination is desired.

Overview of WS2813 LED Strips

The WS2813 is another integrated LED driver chip that enables individual pixel control. WS2813 LED strips share the same basic architecture as WS2812B strips with the LED driver, chip, and RGB module in each LED.

Key characteristics of WS2813 LED strips include:

- Integrates control circuit, LED driver and RGB chip per LED
- Individually addressable pixels
- Similar data transmission protocol to WS2812B
- PWM dimming capability
- Built-in constant current output per LED
- 5V DC power input
- Data signal voltage levels of 0-0.4V LOW / 2.5-5V HIGH
- Densities from 30 to 240 LEDs per meter
- Flexible form factor for bending into shapes
- Chaining capability – connect strips together

The WS2813 builds on the capabilities of the WS2812B while enhancing some performance and reliability aspects. We will delve into the differences in more detail later in this article.

Applications of WS2813 LED Strips

The applications of WS2813 LED strips largely overlap with WS2812B uses since their architectures are quite similar. Typical uses include:

- Accent, undercabinet, and display case lighting
- Architectural lighting – borders, coves, reception desks
- Entertainment lighting – parties, DJ effects, theater
- Automotive interior lighting
- LED art, displays, and dynamic signage
- Special effects and mood lighting

The higher LED density and added features like improved transmission reliability suit the WS2813 well for demanding lighting applications.

Technical Specification Comparison

Here is a comparison of the key specifications between WS2812B and WS2813 LED strips:

Parameter	WS2812B	WS2813
Supply Voltage	4.5 – 5.5V DC	4.5 – 5.5V DC
Data Protocol	Single NZR communication	Same as WS2812B
Data Rate	0.8-2.4 Mbps	0.8-2.4 Mbps
Number of Pixels	Up to 1024	Up to 1024
LED Current	12mA constant current	Same
Current Draw	60mA per RGB	Same
LED Density	30 – 144 per meter	30 – 240 per meter
Viewing Angle	120 – 150 degrees	Same
Dimensions	5050 SMD package	Same
Flexible PCB	UL-94 V0 flame retardant	Same
Color Depth	24-bit (16.7M colors)	Same
Refresh Rate	1.2 kHz	2-4 kHz



ESD Protection	yes	improved
Operating Temperature	-25°C to +60°C	-30°C to +60°C
IP Rating	IP30	IP30
Certifications	CE, RoHS	CE, RoHS, UL

From the specifications, we can see similarities as well as some enhancements with the WS2813 versus the WS2812B.

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Key Differences Between WS2812B and WS2813

While the WS2812B and WS2813 are comparable in many respects, there are some noteworthy differences that impact the performance, control, and reliability of the LED strips:

1. Transmission Reliability

The WS2813 incorporates enhancements that greatly improve the transmission reliability and signal integrity. This allows for longer run lengths of LED strips on a single data link with fewer issues. WS2812B data signals are more prone to degradation and errors over long distances or strips with many LEDs.

2. Refresh Rate

The WS2813 doubles the LED refresh rate to 2-4 kHz versus 1.2 kHz for the WS2812B. The faster rate reduces flicker and improves the perceived dynamic lighting performance.

3. ESD Protection

Built-in ESD ([electrostatic discharge](#)) protection is stronger on the WS2813. This makes it more robust against static electricity spikes and events. The WS2812B has basic ESD protection.

4. LED Density

WS2813 strips can have up to 240 LEDs per meter versus 144 with WS2812B. The higher density provides options for tighter lighting effects. But density above 144 can present signal transmission challenges.

5. Control Logic Levels

The signal level logic interfaces differ slightly. WS2813 uses 2.5-5V for HIGH versus 0.7V for the WS2812B. And 0-0.4V for LOW versus 0.35V with WS2812B. This allows for better noise immunity.

6. UL Approval

The WS2813 has undergone UL testing and certification while the WS2812B is not UL certified. This is required for use in some lighting fixtures.

7. Operating Temperature

WS2813 specifies a slightly wider operating temperature range from -30°C to 60°C compared to -25°C to 60°C for the WS2812B.

Control Interface Comparison

Both WS2812B and WS2813 provide a simple single-wire interface for [LED](#) control but there are some subtle differences:

WS2812B Interface



- Single data line (CI)
- 5V DC power (VCC)
- Ground connection (GND)
- Optional CLOCK signal can be used but is usually left disconnected

So while pinouts are essentially the same, the WS2813 can support a CLOCK signal for timing whereas the WS2812B uses a self-clocking data method. The clock can help improve synchronization but is not required.

In both cases, the data line connects from the LED driver to the data input pin on the first LED. The data output then damps to the next LED input down the strip. This daisy-chain method allows the LED driver to address each LED through its serial data transmission.

LED Strip Lighting Control Options

There are several options for controlling WS2812B and WS2813 LED strips to digitally set the color, effects, and animation:

LED Controller

Dedicated LED controller modules provide control interfaces like buttons, knobs, touchscreens, or mobile apps to set lighting patterns, colors, motion and effects. Can control multiple strips over long distances.

Microcontroller

Small programmable devices like [Arduino](#) or [Raspberry Pi](#) can be programmed to autonomously control the LEDs. Requires coding skills.

Lighting Software

PC lighting control software like MADRIX can send the LED control data signal through [USB](#) output devices. Enables synchronized lighting shows and effects.

DMX Lighting Control

Using a DMX512 converter allows professional lighting consoles to control the LEDs through standard DMX protocol. Integrates with stage lighting systems.

Smart Home Systems

LED strips can be incorporated into smart home automation systems and voice assistants for app and voice-controlled lighting. Requires compatible LED controllers.

So there are possibilities ranging from stand-alone manual control to fully customizable color changing lighting shows and integration with other smart systems.

Power Supply Considerations

When working with addressable LED strips, the [power supply](#) is an important consideration. A sufficiently rated, quality power supply is recommended to operate WS2812B or WS2813 strips.

Some guidance on selecting LED strip power supplies:

- Strips require a 5V DC supply. Avoid AC power which could damage them.
- Power supply wattage must meet the load. Calculate load as: Number of LEDs x 60mA x 5V
- For longer strips, inject power at intervals to avoid voltage drop.
- Build in a 20% buffer above calculated load wattage.
- Use switched mode power supplies, not linear transformers.
- Select power supplies with overcurrent, short circuit and over temperature protection.
- Mean Well, HLG, or trusted brands recommended. Avoid cheap, generic power supplies.

Proper power supply selection and connection helps ensure reliable, long-life operation of the LEDs. Undervoltage or overcurrent can reduce LED life span or cause failures.

Comparing WS2812B vs WS2813 for LED Projects



When choosing between using WS2812B and WS2813 LED strips, here are some factors to consider:

Lighting Effects

If limited lighting effects are needed like simple color changes, WS2812B may suffice. For more complex effects and longer runs, WS2813 is preferable.

Run Length

For short strip runs like 1-2 meters, either will work well. For longer runs or many LEDs, WS2813 has advantages.

Environment

For outdoor or wet locations, the WS2813's improved transmission reliability helps. WS2812B best for indoor and dry areas.

Price

WS2812B strips tend to cost slightly less than comparable WS2813 strips.

Controller Interface

If the controller provides clock synchronization, WS2813 can leverage this. If not, either will function.

Certifications

For UL certified installations, WS2813 is likely required. WS2812B only has basic CE and RoHS certification.

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Pros and Cons Comparison

Let's examine the relative pros and cons of WS2812B and WS2813 LED strips:

WS2812B Pros

- Widely available and cost effective
- Proven reliability in most indoor uses
- Simple data only interface
- Flexible and great for hobbyist projects

WS2812B Cons

- Limited transmission reliability over long distances
- Noisy data signal degrades quality over long runs
- Lower refresh rate leads to some visible flicker



- Integrated clock line option for better synchronization
- UL certified for commercial and fixture use

WS2813 Cons

- Slightly more expensive than WS2812B
- High LED density can worsen signal transmission
- Overkill for simple, short-length uses

Conclusion

In summary, while WS2812B and WS2813 LED strips are based on very similar integrated LED driver technology, the WS2813 builds on the foundation capabilities to provide better lighting performance, transmission reliability, noise immunity and certifications.

For many simple LED projects, the lower cost WS2812B is likely sufficient. But for professional installations or more demanding lighting effects, the WS2813 represents a worthwhile upgrade. When planning any addressable LED strip lighting project, carefully consider the length, environment, effects needed, regulations, and available control interfaces to select the appropriate option between quality WS2812B and WS2813 LED strips.

FAQ

1. What are some typical densities and lengths available for WS2812B and WS2813 LED strips?

Typical LED strip options:

- Densities: 30, 60, 144 LEDs per meter
- WS2813 also available in 240 LEDs/m
- Lengths: 5 meters, 10 meters spools
- Can be cut and connected to desired length

2. What gauge wire is recommended for connecting power to WS2812B or WS2813 LED strips?

Recommended wiring gauge for power connections:

- 5 meters or less – 20 AWG
- 5-10 meters – 18 AWG
- 10-15 meters – 16 AWG

A thicker gauge helps avoid voltage drops over long cable runs. Separate power injection at intervals may also be needed.

3. What types of controllers can be used to control WS2812B and WS2813 LED strips?

Compatible control options:

- Dedicated LED controllers with digital output
- Microcontrollers like Arduino, Raspberry Pi
- PC lighting software and DMX controllers
- Smart home automation controllers
- Bluetooth or Wifi controllers with app interface

4. What technical skills are needed to work with addressable LED strips?

Helpful skills include:

- Basic electronics wiring and soldering
- Digital logic and microcontrollers
- Understanding of 5V DC power supply requirements
- LED color mixing knowledge
- [Programming](#) for microcontrollers
- Lighting control protocols like DMX512
- Troubleshooting data transmission issues

5. What are some of the most popular applications for WS2812B and WS2813 addressable LED strips?

Top applications:

- Interior accent and undercabinet lighting
- Display and cabinet case lighting
- Dynamic signage and LED art
- Architectural cove and pathway lighting
- Home entertainment lighting effects



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