WS2812 5050 RGB LED Pixel Light

Generic WS2812 Addressable 5050 RGB LED Pixel Light Instruction Manual

Model: WS2812 5050 RGB LED Pixel Light

1. INTRODUCTION

This manual provides detailed instructions for the setup, operation, and maintenance of the Generic WS2812 Addressable 5050 RGB LED Pixel Lights. These individually addressable LEDs offer full-color control and are compatible with various microcontrollers, including Arduino.

2. PRODUCT OVERVIEW

The WS2812 5050 RGB LED Pixel Light features an integrated control IC, allowing each LED to be individually addressed. This enables complex lighting patterns and animations. The LEDs are mounted on a small PCB board, facilitating flexible integration into various projects.
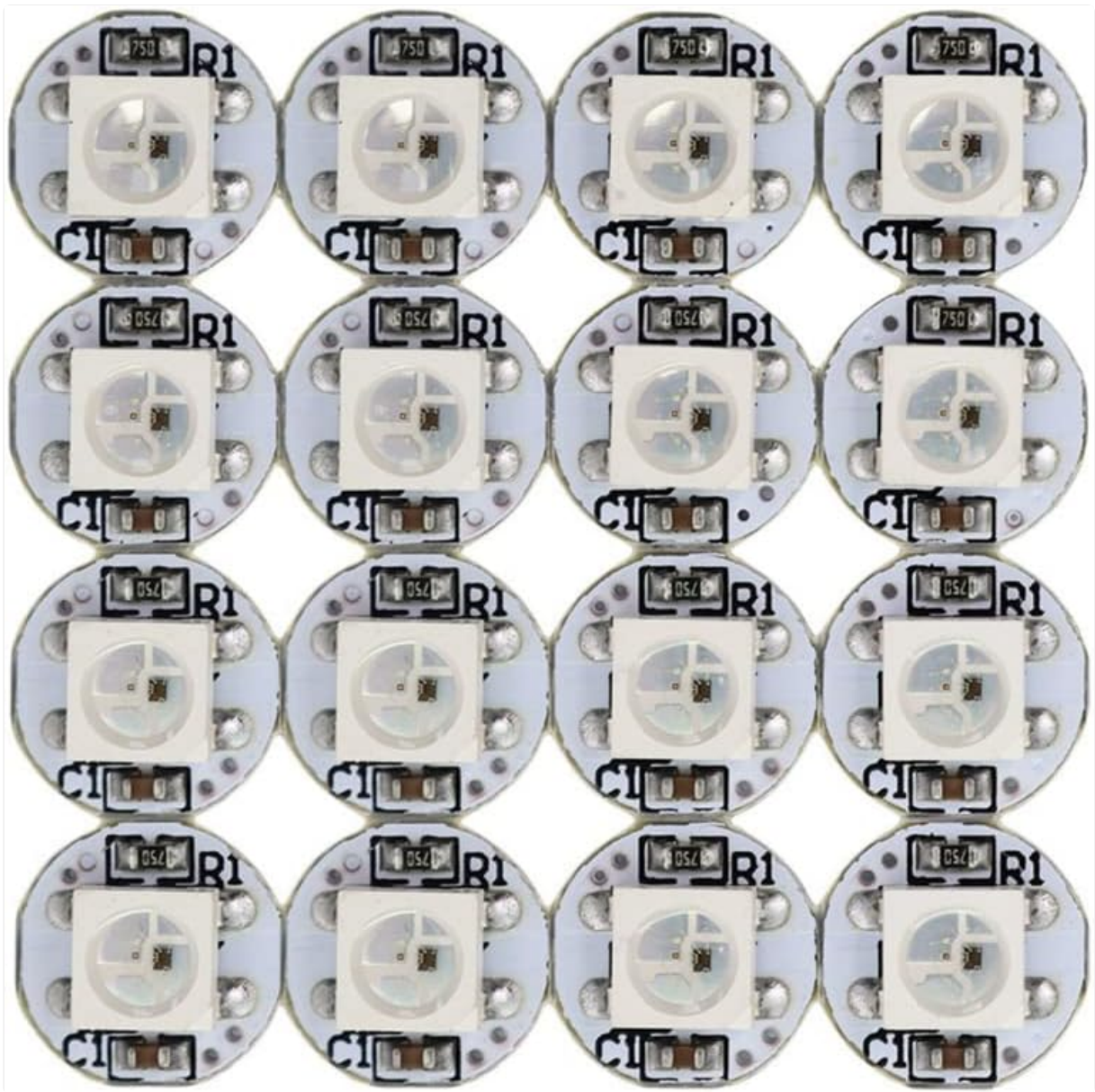
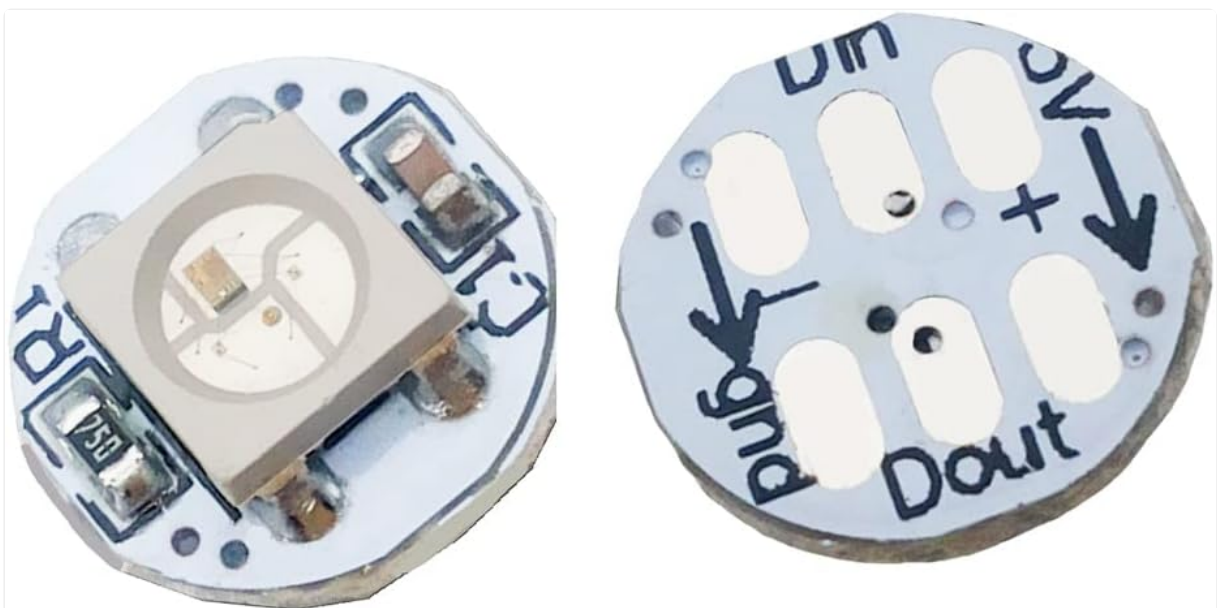Figure 1: A grid of WS2812 5050 RGB LED Pixel Lights on white PCBs.

Figure 2: Detailed view of a single WS2812 LED pixel, showing the top with the LED chip and the bottom with labeled pins (DIN, DOUT, VDD, VSS).

3. Setup and Wiring

These LED pixels are designed for easy integration. Each pixel requires a 5V DC power supply, ground, and a single digital data pin for control. The chainable design simplifies wiring for multiple LEDs.

3.1 Pin Configuration

Pin No.	Symbol	Function Description
1	VSS	Ground
2	DIN	Control data signal input
3	VDD	Power supply for LED (+5V DC)
4	DOUT	Control data signal output (for chaining to next LED)

3.2 Connection Steps

1. Connect the **VDD** pin (Pin 3) of the first LED to a +5V DC power source.
2. Connect the **VSS** pin (Pin 1) of the first LED to the ground of the power source and your microcontroller.
3. Connect the **DIN** pin (Pin 2) of the first LED to a digital output pin on your microcontroller (e.g., Arduino).
4. For chaining multiple LEDs, connect the **DOUT** pin (Pin 4) of the previous LED to the **DIN** pin (Pin 2) of the next LED. Ensure all VDD and VSS pins are connected in parallel to the 5V power supply and ground, respectively.
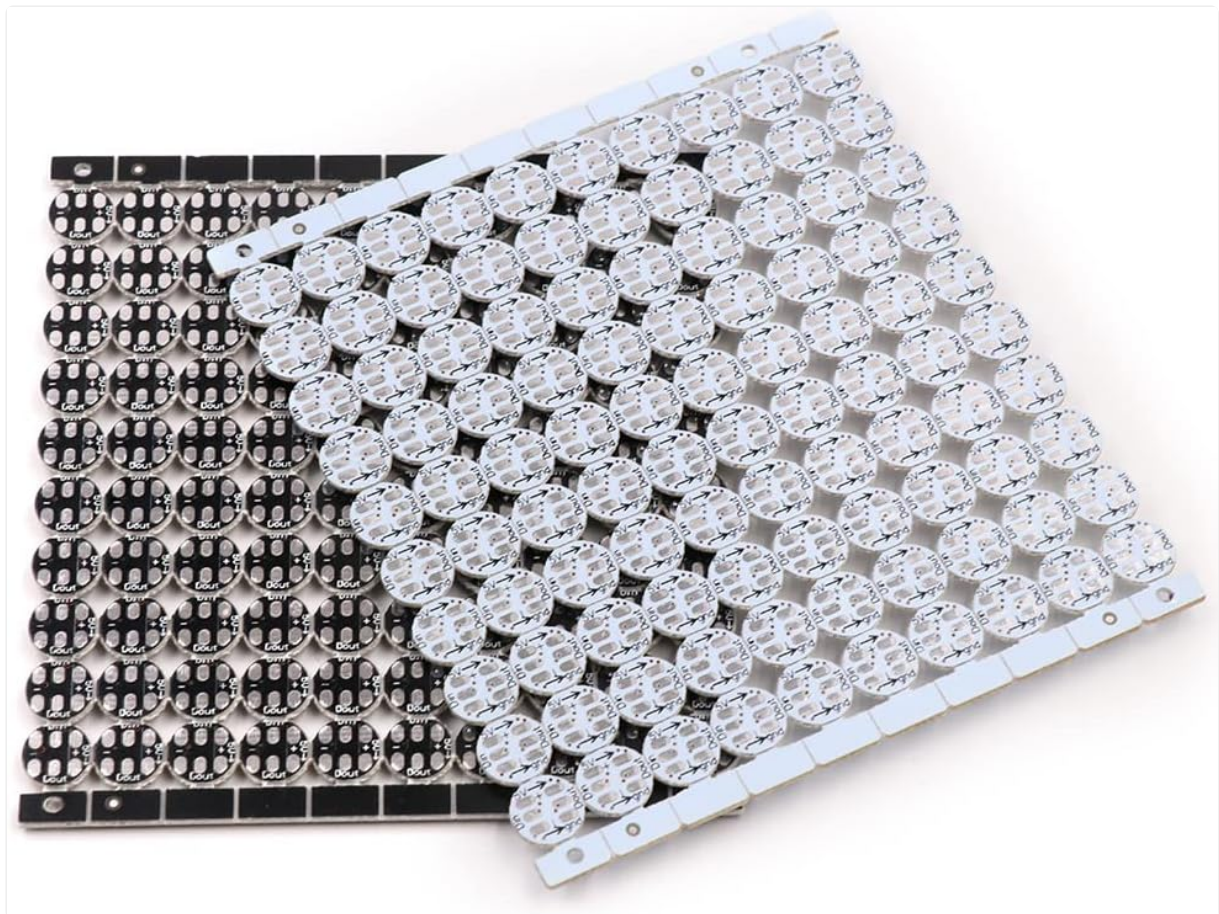

Figure 3: An array of WS2812 LED pixels, demonstrating the compact design on both white and black PCB variants.

4. OPERATING INSTRUCTIONS

The WS2812 LEDs are controlled digitally, allowing for precise manipulation of color and brightness for each individual pixel.

4.1 Software Control

To operate these LEDs, you will need a microcontroller (such as Arduino) and a compatible library (e.g., FastLED or Adafruit NeoPixel library). These libraries provide functions to easily set colors, brightness, and create animations.

- **Individual Addressability:** Each LED can be set to a specific color and brightness independently.
- **Color Depth:** Supports 256 brightness levels per color channel, resulting in a full 24-bit (16,777,216) color display.
- **Animation:** Capable of displaying complex animations and dynamic lighting effects.

4.2 Compatible Controllers

In addition to microcontrollers, these LEDs can be controlled by various dedicated LED controllers:

- Pre-programmed App Controllers: SP105E, SP108E, SP110E
- Music Controllers: SP106E, SP107E
- Smart WiFi Controllers: SP501E, and other 5V smart WiFi controllers.

5. MAINTENANCE

The WS2812 LED pixels are low-maintenance components. Follow these guidelines to ensure longevity:

- **Power Supply:** Always use a stable 5V DC power supply. Over-voltage can damage the LEDs.
- **Environmental Conditions:** While rated for outdoor usage, protect the LEDs from direct water exposure and extreme temperatures to prevent damage.
- **Cleaning:** If necessary, gently clean the PCB and LED surface with a soft, dry cloth. Avoid abrasive materials or harsh chemicals.
- **Handling:** Handle the PCBs by the edges to avoid damaging the components or solder joints.

6. TROUBLESHOOTING

If you encounter issues with your WS2812 LED pixels, consider the following troubleshooting steps:

6.1 LEDs Not Lighting Up

- **Power Connection:** Verify that the 5V DC and Ground connections are correctly made and that the power supply is active.
- **Data Connection:** Ensure the DIN pin is correctly connected to the microcontroller's data output pin.
- **Wiring Order:** For chained LEDs, confirm that DOUT of one LED is connected to DIN of the next.
- **Code Check:** Review your microcontroller code to ensure it initializes the LEDs correctly and sends data to the correct pin.

6.2 Incorrect Colors or Flickering

- **Power Supply Capacity:** Insufficient power supply current can cause flickering or incorrect colors, especially with many LEDs at high brightness. Ensure your power supply can provide enough current

(each LED can draw up to 60mA at full white brightness).

- **Data Signal Integrity:** Long data lines can suffer from signal degradation. Consider adding a data line resistor (e.g., 300-500 Ohm) close to the first LED's DIN pin.
- **Ground Connection:** Ensure a common ground between the power supply, microcontroller, and LEDs.
- **Timing Issues:** Verify that your software library is configured for the correct WS2812 timing.

6.3 Only First Few LEDs Work

- **Data Chain Break:** Check the connections between the DOUT of the last working LED and the DIN of the first non-working LED. A broken solder joint or incorrect connection can interrupt the data chain.
- **Power Drop:** For very long chains, voltage drop can occur. Consider injecting power at multiple points along the strip if you are using many LEDs.
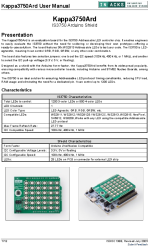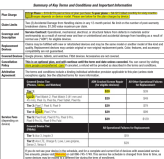
7. SPECIFICATIONS

Detailed technical specifications for the WS2812 5050 RGB LED Pixel Light:

Parameter	Value
LED Type	WS2812 5050 RGB LED (built-in IC)
Input Voltage (VDD)	+3.5V to +5.3V DC (Absolute Max: +5.5V)
Logic Input Voltage (V(IN))	-0.5V to VDD+0.5V
Working Temperature (Topt)	-40°C to +85°C
Storage Temperature (Tstg)	-50°C to +150°C
ESD Pressure (V(ESD))	4KV
Red Wavelength	620-630NM (Luminous intensity: 550-700MCD)
Green Wavelength	515-530NM (Luminous intensity: 1100-1400MCD)
Blue Wavelength	465-475NM (Luminous intensity: 200-400MCD)
Color Depth	24-bit (16,777,216 colors)
Brightness Levels	256 per color channel
PCB Color (Variant)	White (also available in Black)
Indoor/Outdoor Usage	Outdoor (with proper protection)
Special Feature	Dimmable

8. ADDITIONAL INFORMATION

For further technical details, programming examples, or community support, refer to online resources for WS2812 LEDs and Arduino programming.

Related Documents - WS2812 5050 RGB LED Pixel Light

	[WS2812 LED Strip Tutorial: Arduino UNO Connection and NeoPixel Code](#) A comprehensive guide to connecting WS2812 addressable LED strips with an Arduino UNO. Includes wiring instructions, library setup, and example code for controlling NeoPixels.
	[Kappa3750Ard User Manual: IS3750 Addressable LED Controller Arduino Shield](#) User manual for the IN ACKS Kappa3750Ard, an Arduino-compatible evaluation board featuring the IS3750 addressable LED controller. Discover its features, specifications, pinout, schematic, and firmware examples for STM32 and Arduino platforms. Control up to 1200 LEDs with WS2813, WS2812, and other addressable LEDs.
	[Veroboard RGBW Addressable Flexible LED Light Sheet - VBDSH-5050-RGB27D-420-24-NS](#) Detailed specifications and installation guide for the Veroboard VBDSH-5050-RGB27D-420-24-NS RGBW addressable flexible LED light sheet. Features include bendable design, 24V DC, 100W, CRI>90+, IP20 rating, and easy installation.
	[Google Pixel Phones Android 13 Administrator Guidance](#) Administrator guide for Google Pixel phones on Android 13, detailing Common Criteria configuration, security features, device management, VPN, Wi-Fi, and API specifications for enterprise deployment.
	[Google Preferred Care: Summary of Key Terms and Conditions](#) Detailed summary of the Google Preferred Care service plan, outlining coverage, claim limits, service fees, cancellation policy, and arbitration agreement for Google and Fitbit devices.
	[Arduino Guide: Microcontroller Boards, Shields, and Kits](#) Explore the versatile Arduino open-source microcontroller platform. This guide from Maker Shed details various Arduino boards, shields, and accessories, perfect for electronics projects and learning.