WS2813B-RGBW

Intelligent external control integration LED light source

Main features

● All components integrated in5050In the package, no other peripheral components are required to form a complete externally controlled pixel.

● Intelligent reverse connection protection,5VThe components will not be damaged when the power supply is connected reversely.

● Built-in signal shaping circuit, any pixel receives the signal and then outputs it after waveform shaping, ensuring that line waveform distortion will not accumulate.

● The four primary colors of each pixel can be realized256level brightness display.

● Port scanning frequency2KHz。

● Serial cascade interface can complete data reception and decoding through one signal line.

● Resumable transmission at breakpoints, adding an additional signal line to achieve dual signal transmission. Even if a single pixel is damaged, the overall display effect will not be affected. ● The transmission distance between any two points shall not exceed5meters without adding any circuitry. ● When the refresh rate30frame/seconds, the number of cascades is not less than1024point.

● Data transmission speed can reach800Kbps。

● The color of the light is highly consistent and cost-effective.

Main application areas

- LEDFull color luminous character light string,LEDFull color soft light strips and hard light strips,LEDGuardrail tube.

- LEDpoint light source,LEDpixel screen,LEDSpecial screen.

Product overview

WS2813B-RGBWIt is an intelligent external control that integrates control circuit and light-emitting circuit.LEDlight source. Its appearance is similar to that of a5050LEDThe lamp beads are the same, and each component is a pixel. The pixel contains an intelligent digital interface data latch signal shaping amplification drive circuit, an anti-reverse connection circuit, a high-precision internal oscillator and a high-precision constant current control module, which effectively ensures that the color of the pixel light is highly consistent.

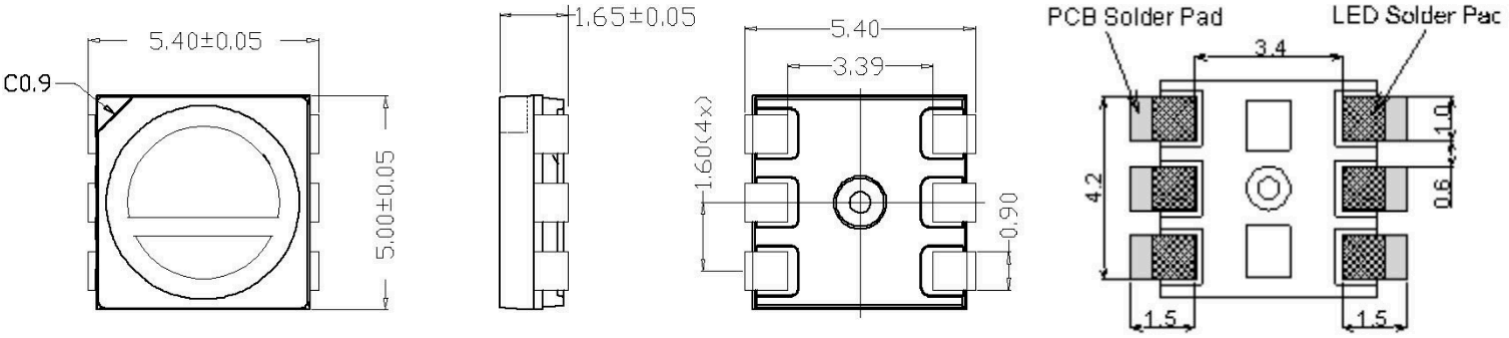
accomplishDual signal transmission, even if a single pixel is damaged, the overall color display will not be affected.

The data protocol adopts single-line return-to-zero code communication method. After the pixel is powered on and reset, DIN1The terminal accepts the data transmitted from the controller, and the first one is sent32bitAfter the data is extracted from the first pixel, it is sent to the data latch inside the pixel. The remaining data is reshaped and amplified by the internal shaping processing circuit and then passes through. DOThe port begins to forward the output to the next cascaded pixel. Each time a pixel is transmitted, the signal decreases. 32bit. The pixel adopts automatic shaping and forwarding technology, so that the number of cascades of the pixel is not limited by the signal transmission, but is only limited by the signal transmission speed requirements.

Gundam **2KHz** The port scanning frequency ensures no flickering when captured by a high-definition camera, making it very suitable for high-speed mobile products.

280μsabove **RESET** time, an interruption will not cause a false reset, and can support lower frequency, cheaperMCU。

Mechanical dimensions (unitmm)



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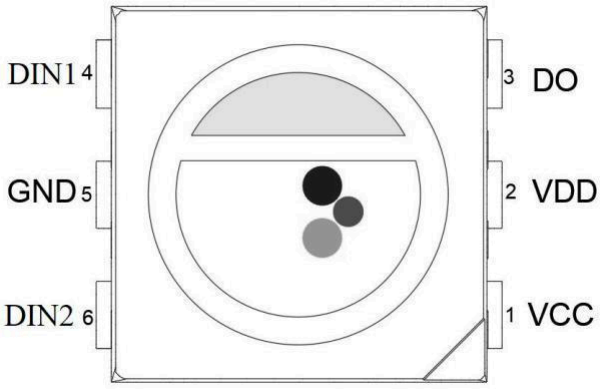
Pinout arrangement



Pin function

serial number	symbol	Pin name	Function description
1	VCC	IC power supply	PCB LAYOUT Time and VDD Connect together directly or in series with resistors
2	VDD	power supply	LED Chip power supply pin, connect +5V power supply
3	DO	data output	Control data signal output pin
4	DIN1	data1enter	control data signal 1 Input pin
5	GND	Ground wire	Signal ground and power ground pins
6	DIN2	data2enter	control data signal 2 Input pin

maximum rating (If there is no special instructions, T_A=25℃, V_{SS}=0V)

parameter	symbol	scope	unit
Supply voltage	V_{DD}	+3.7~+5.3	V
Logic input voltage	V_I	-0.7～VDD+0.7	V
working temperature	Top	-25～+85	℃
storage temperature	Tstg	-40~+105	℃

Electrical parameters (If there is no special instructions, T_A=25℃, V_{DD}=5V, V_{SS}=0V)

parameter	symbol	smallest	typical	maximum	unit	Test conditions
Input current	I_I	——	——	±1	μA	$V_I=V_{DD}/V_{SS}$
High level input	V_{THEM}	$0.7V_{DD}$	——	VDD+0.7	V	D_{IN}
low level input	V_{THE}	-0.7V	——	$0.3\ V_{DD}$	V	D_{IN}
hysteresis voltage	V_H	——	0.35	——	V	D_{IN}

Switching characteristics (If there is no special instructions, T_A=25℃, V_{DD}=5V, V_{SS}=0V)

parameter	symbol	smallest	typical	maximum	unit	Test conditions
transmission delay time	t_{PLZ}	——	——	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Fall time	t_{THZ}	——	——	120	μs	CL=300pF, OUTR/OUTG/OUTB
Input capacitance	C_I	——	——	15	pF	——

LED Characteristic parameters

parameter	symbol	color	Quiescent current (center value):0.6m				Working current (Test conditionsDC=5V)
			minimum value	Typical value	maximum value	unit	
glow strength	IV	Red	300	/	500	mcd	15mA
		Green	800	/	1500		
		Blue	200	/	400		
		IN	1500	/	2500		
wavelength	λd	Red	620	/	630	nm	15mA
		Green	515	/	525		
		Blue	465	/	475		
color temperature	Tc	Honest	6000	-	8000	K	15mA
		natural white	4000	-	5000	K	
		warm white	3000	-	3500	K	

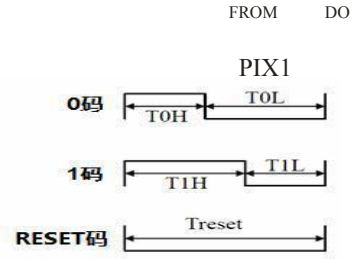
Data transfer time

T0H	0 code, high time	220ns~380ns
T1H	1 code, high time	580ns~1μs
T0L	0 code, low level time	580ns~1μs

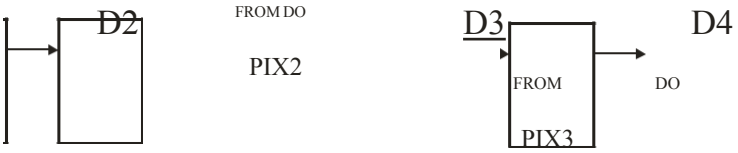
T1L	1 low level time code,	580ns~1μs
RES	Frame unit, low level time	280μs That's all

Timing waveform diagram

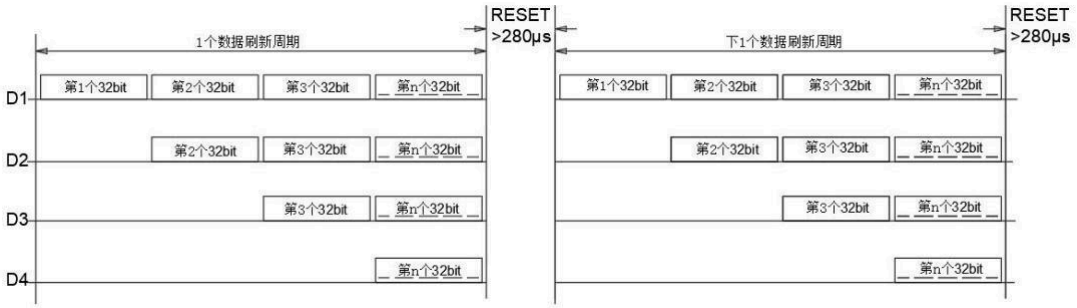
Input pattern:



Connection method:

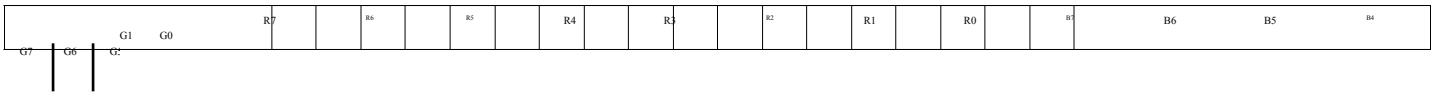


Data transfer method



Note: Among them D1 for MCU The data sent by the terminal, D2、D3、D4 Automatically shapes forwarded data for cascaded circuits.

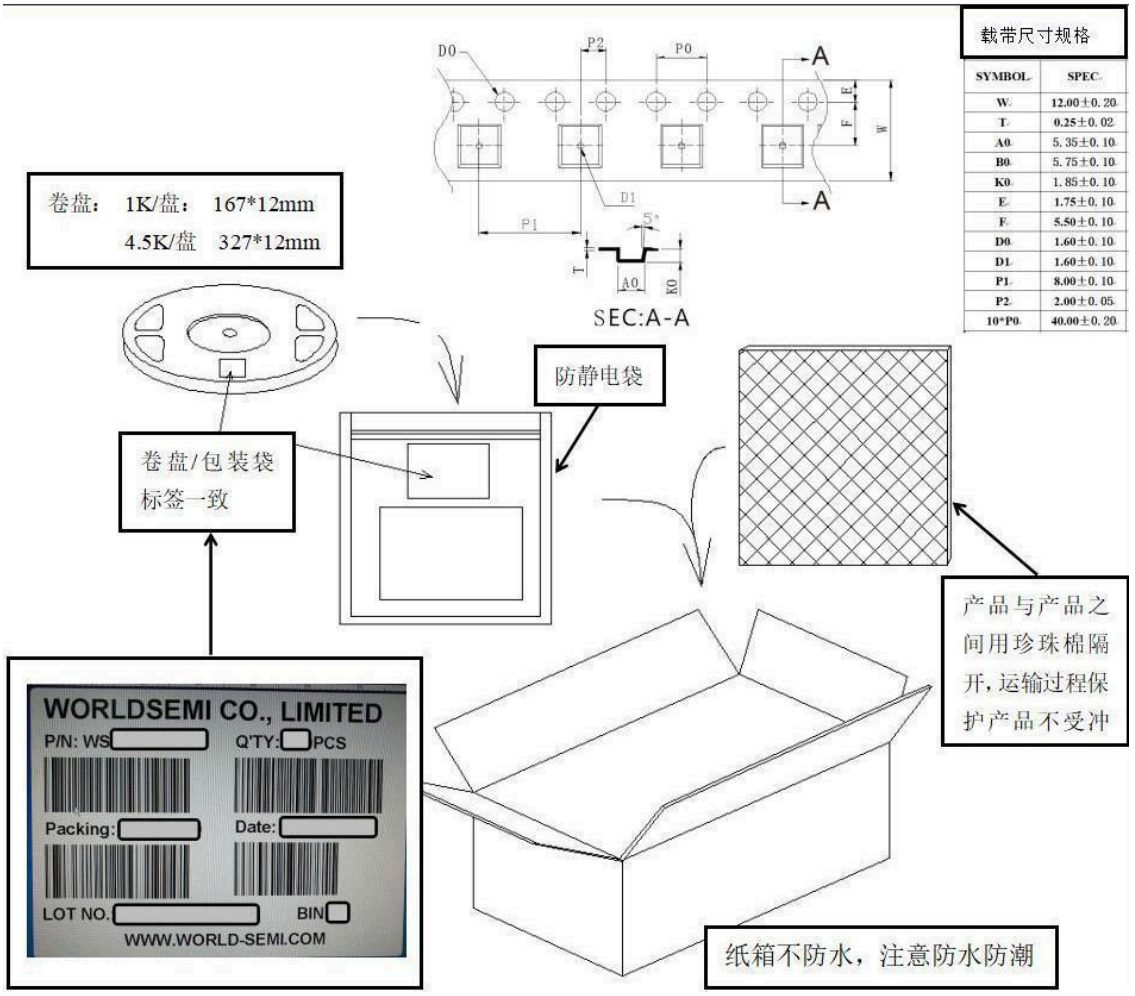
32bit data structure



B3 B2 B1 B0 W7 W6 W

Note: High-ranking starters, as per GRBW Send data in the order.

Packaging standards:



Surface mount LED usage precautions

1. Description:

Generally, LEDs are used in the same way as other electronic components. In order to allow customers to better use Huacaiwei's LED products, please refer to the following LED protection precautions.

2. Notes:

2.1.Dust and cleaning

The surface of the LED is encapsulated with modified epoxy glue. The epoxy glue plays a very good role in protecting the optical system and anti-aging performance of the LED. Epoxy glue easily sticks to dust and keeps the working environment clean. When there is dust within a certain limit on the LED surface, it will not affect the luminous brightness, but we should still avoid dust falling on the LED surface. Priority is given to those that have opened the packaging bag. Components with LEDs installed should be stored in clean containers. When the LED surface needs to be cleaned, if solutions such as triamethylene or acetone are used, the LED surface will dissolve. Do not use utensils. To clean the LED with a soluble solution, you can use an isopropyl solution. Before using any cleaning solution, you should confirm whether it will dissolve the LED. Please do not use ultrasonic waves to clean the LED. If the product must use ultrasonic waves, then It is necessary to evaluate some parameters that affect the LED, such as ultrasonic power, baking time and assembly conditions. Before cleaning, a test run must be performed to confirm whether it will affect the LED.

2.2. Moisture-proof treatment

LEDs are moisture-sensitive components. The purpose of packaging LEDs in aluminum film bags is to prevent the LEDs from absorbing moisture during transportation and storage. A desiccant is placed in the packaging bag to absorb moisture. If the LED absorbs moisture, the moisture will evaporate and expand when the LED is reflowed, which may cause the colloid to separate from the bracket and damage the optical system of the LED. For this reason, moisture-proof packaging is used to avoid moisture in the packaging bag, but the protection time usually only lasts 1 to 2 months. The moisture resistance level (MSL) of this product is:5a. When using SMT, please refer to the material moisture resistance level (MSL) definition specified in IPC/JEDECJ-STD-020 for MSL control.

Moisture-proof grade	Workshop life after unpacking	
	time	condition

LEVEL1	Unlimited	≤30℃/85%RH
LEVEL2	1Year	≤30℃/60%RH
LEVEL2a	4week	≤30℃/60%RH
LEVEL3	168Hour	≤30℃/60%RH
LEVEL4	72 hours	≤30℃160%RH
LEVEL5	48 hours	≤30℃/60%RH
LEVEL5a	**24 hours**	**≤30℃/60%RH**
LETTER 6	Ready to use	≤30℃/60%RH

2.3 SMT Patching requirements:

2.3.1 suggestion LED exist SMT Unpack the bag before placing the whole roll in the oven for dehumidification and drying (70～75℃ bake≧24H)；

2.3.2 From the time the product is taken out of the oven to the completion of high-temperature soldering (including multiple high-temperature operations such as reflow soldering, tin immersion, wave soldering, and heating maintenance)/job), the time period is controlled within 24 within (in T<30℃，RH<60%conditions)；

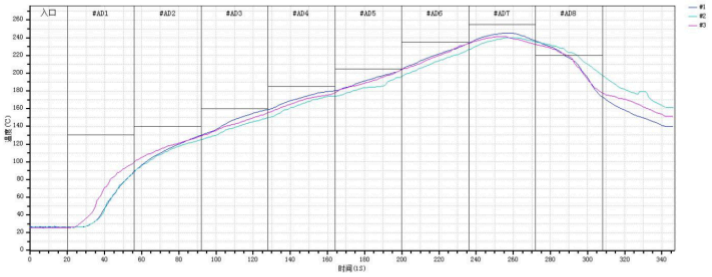
2.3.3 LED After the solder paste is printed on the patch PCB should be completed as soon as possible SMT, it is recommended not to exceed 1H；

2.3.4 Production surplus, machine throwing materials, maintenance materials and other bulk materials LED, if exposed to the air for a long time, it cannot be used directly. It is recommended to dehumidify and dry before use. To bake the whole roll:70～75℃* ≧24H or bulk baking:120℃*4H。

3.Welding

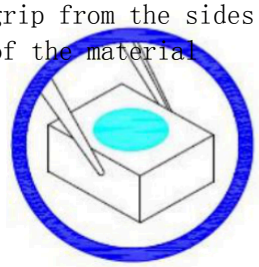
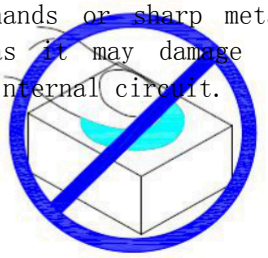
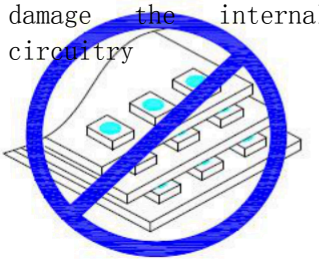
Surface mount application LEDs should comply with the JEDECJ-STD-020C standard. As a general guideline, it is recommended to follow the soldering temperature profile recommended by the solder paste manufacturer used, or use the soldering temperature profile recommended by our company below.

Temperature curve description	scope
30℃～150℃ preheating slope	1～4 ℃/s
30℃～150℃ preheating time	60～120 s
150℃～200℃ constant temperature slope	0～3 ℃/s
150℃～200℃ constant temperature time	60～120 s
liquidus temperature	217℃
peak temperature	245℃
Reflow soldering slope	0～3 ℃/s
Reflow soldering time	45-90 s
cooling rate	-4～0 ℃/s
Residence time from room temperature to peak temperature	<6 min



Note: All the above temperatures refer to the temperatures measured on the solder joint surface of the package body.

4. Precautions during product assembly process

1. By using appropriate tools to grip from the sides of the material	2. Do not press the surface of the colloid directly with your hands or sharp metal, as it may damage the internal circuit.	3. Do not pile module materials together as it may damage the internal circuitry	4. Not available in PH<7 acidic places
			

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File change history

version number	state	Edit summary	Revision date	Revised by	approver
V1.0	N	New	20181016	Shen Jinguo	Yin Huaping
V1.1	M	Add color temperature range and modify patch instructions	20191009	Shen Jinguo	Yin Huaping
V1.2	M	Modify product description	20200522	Shen Jinguo	Yin Huaping
V1.3	M	Modify product description	20210401	Dong Le	Yin Huaping
V1.4	M	Content revision and update	20211105	Yu Xinghui	Yin Huaping

Note: Initial version numberV1.0;After each revision is approved, the version number is sequentially incremented“0.1”;Status includes:N--new, A--Increase, M--Revise, D--delete.