



main feature

- The IC control circuit and the LED point light source share the same power supply.
- The operating current of each channel is 5mA.
- The control circuit and RGB chip are integrated in a 2020 package component to form a complete externally controlled pixel.
- Built-in signal shaping circuit, any pixel receives the signal and then outputs it through waveform shaping, ensuring that line waveform distortion will not accumulate.
- Built-in power-on reset and power-off reset circuit.
- The three primary colors of each pixel can achieve 256 levels of brightness display, achieving full true color display of 16,777,216 colors.
- Port scanning frequency is 2KHz/s.
- Serial cascade interface can complete data reception and decoding through one signal line.
- There is no need to add any circuit when the transmission distance between any two points does not exceed 5 meters.
- When the refresh rate is 30 frames/second, the number of cascades is not less than 1024 points.
- Data transmission speed can reach 800Kbps.
- The color of light is highly consistent and cost-effective.

Main application areas

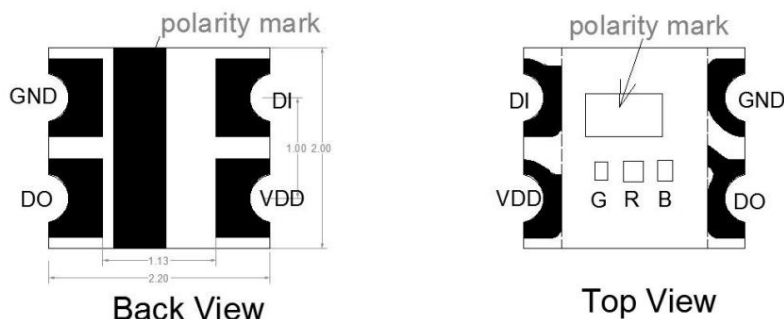
- LED full-color luminous character string lights, LED full-color soft light strips and hard light strips, and LED guardrail tubes.
- LED point light sources, LED pixel screens, LED special-shaped screens, various electronic products, and electrical equipment marquees.

product description

WS2812C-2020-V1 is an intelligent externally controlled LED light source that integrates control circuit and light-emitting circuit. Its appearance adopts the latest molding packaging technology, and the IC and light-emitting chip are packaged in a 2020 package size. Each component is a pixel. The pixel contains an intelligent digital interface data latch signal shaping and amplification drive circuit, a high-precision internal oscillator and a programmable constant current control part, which effectively ensures that the color of the pixel light is highly consistent. The data protocol adopts the communication mode of single-line return-to-zero code. After

the pixel is reset by power-on, the DIN terminal receives the data transmitted from the controller. The first 24-bit data is extracted by the first pixel and sent to the data latch inside the pixel. The remaining data is shaped and amplified by the internal shaping processing circuit and then forwarded to the next cascaded pixel through the DO port. After each pixel is transmitted, the signal is reduced by 24 bits. The pixel adopts automatic shaping forwarding technology, so that the number of cascades of the pixel is not limited by signal transmission, but only by the signal transmission speed requirement. The port scanning frequency of up to **2KHz** will not flicker under the capture of high-definition cameras, which is very suitable for the use of high-speed mobile products. The RESET time of more than 280 μ s will not cause false reset even if there is an interruption, and it can support lower frequency and cheaper MCU. LED has the advantages of low voltage drive, environmental protection and energy saving, high brightness, large scattering angle, good consistency, ultra-low power and ultra-long life. Integrating the control circuit on the LED makes the circuit simpler, small in size and easier to install.

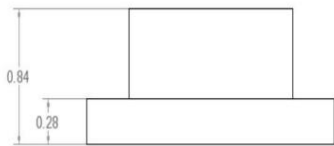
Mechanical dimensions (unit: mm)



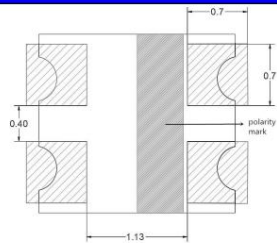


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Intelligent external control integrated LED light source

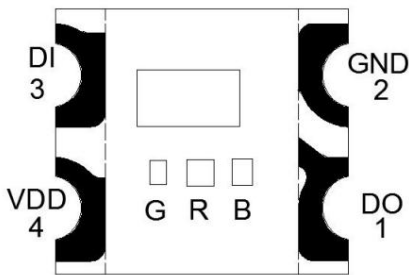


Side View



PCB Solder Pad

Pin arrangement and function



Serial number	symbol	pin name	Function description
1	DO	Data output controls	data signal output
2	GND	land	Signal ground and power ground
3	FROM	Data input control	data signal input
4	VDD	Power supply pin	

Maximum rating (if no special instructions, TA=25℃, VSS=0V)

parameter	symbol	scope	unit
voltage	VDD	+3.7~+5.3	IN
Logic input voltage	WE	-0.3V~VDD+0.7	IN
Operating temperature	Top	-25~+85	℃
Storage temperature	Tstg	-40~+105	℃

Electrical parameters (if no special instructions, TA=25℃, VDD=5V, VSS=0V)

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Test Conditions
Input current II	— ±1				μA	VI=VDD/VSS
High level input VIH		2.7V	—	VDD+0.7V	V	FROM~SET
Low level input VIL		-0.3V	—	0.7V	IN	FROM~SET



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Switching characteristics (unless otherwise specified, $T_A=25^\circ\text{C}$, $V_{DD}=5\text{V}$, $V_{SS}=0\text{V}$)

Parameter Symbol	Minimum	Typical	Maximum	Unit	Test Conditions
Transmission delay time t_{PLZ}	—	300	—	ns	$C_L=15\text{pF}$, $DIN\rightarrow DOUT$, $R_L=10\text{K}\Omega$
Fall time t_{FZ}	—	120	—	μs	$C_L=300\text{pF}$, $OUTR/OUTG/OUTB$
Input capacitance C_I	—	15	—	pF	—

LED characteristic parameters

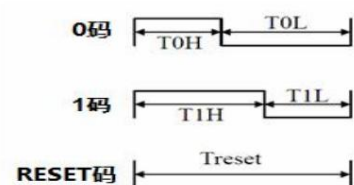
Parameter symbol	color		Quiescent current: $<0.5\text{mA}$				Test conditions: 5V
			Minimum value	Typical value	Maximum value	Unit (operating current)	
glow strength	IV	Red	100	130	150	mcd	5mA
		Green	250	320	400		
		Blue	45	60	75		
Wavelength λ_d		Red	620	624	630	nm	5mA
		Green	520	525	530		
		Blue	464	467	470		

Data transfer time

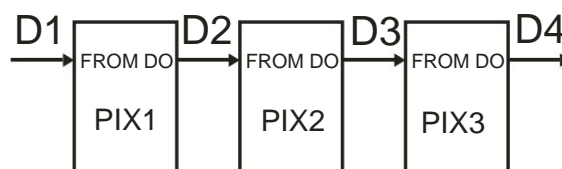
T_{0H}	0 code, high level time	220ns~380ns
T_{1H}	1 code, high level time	580ns~1 μs
T_{0L}	0 code, low level time	580ns~1 μs
T_{1L}	1 code, low level time	580ns~1 μs
RES	Frame unit, low level time	280 μs or more

Timing waveform diagram

Input pattern:



connection method:

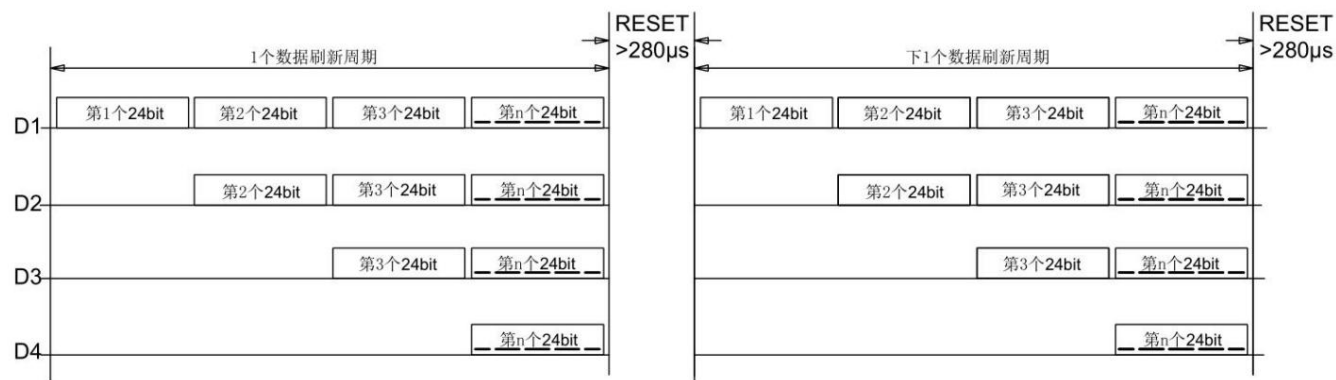




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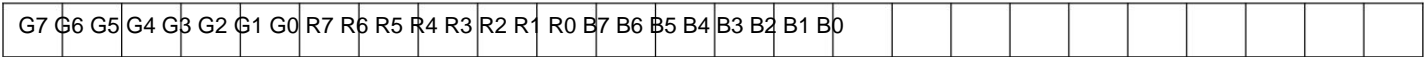
Intelligent external control integrated LED light source

Data transfer method



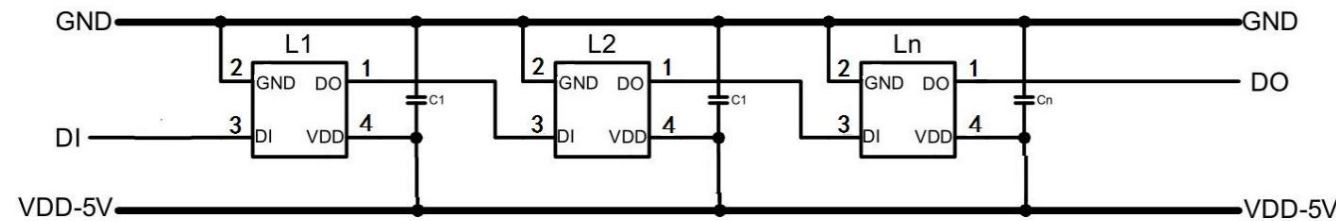
Note: D1 is the data sent by the MCU, and D2, D3, and D4 are the data automatically shaped and forwarded by the cascade circuit.

24bit data structure



Note: The high bit is sent first, and data is sent in the order of GRB.

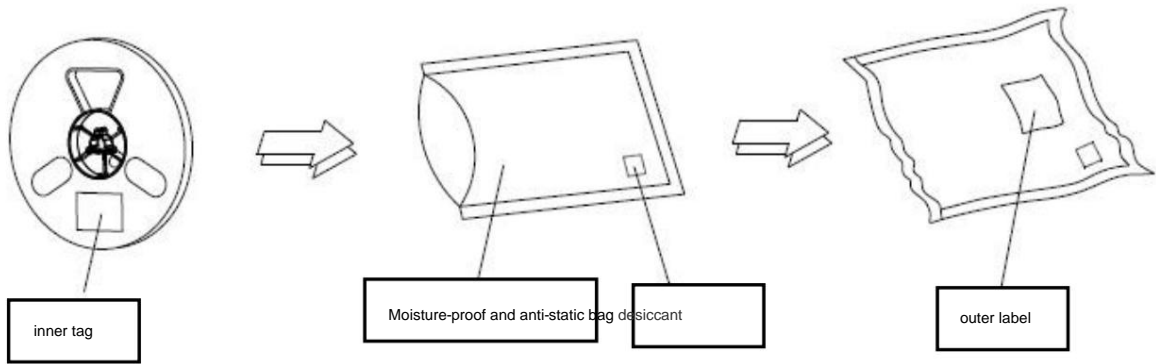
Typical application circuit



Among them, C1 is the filter capacitor of the VDD pin of the lamp bead, which is generally 100NF.

Package

Packing quantity: 4500PCS /bag

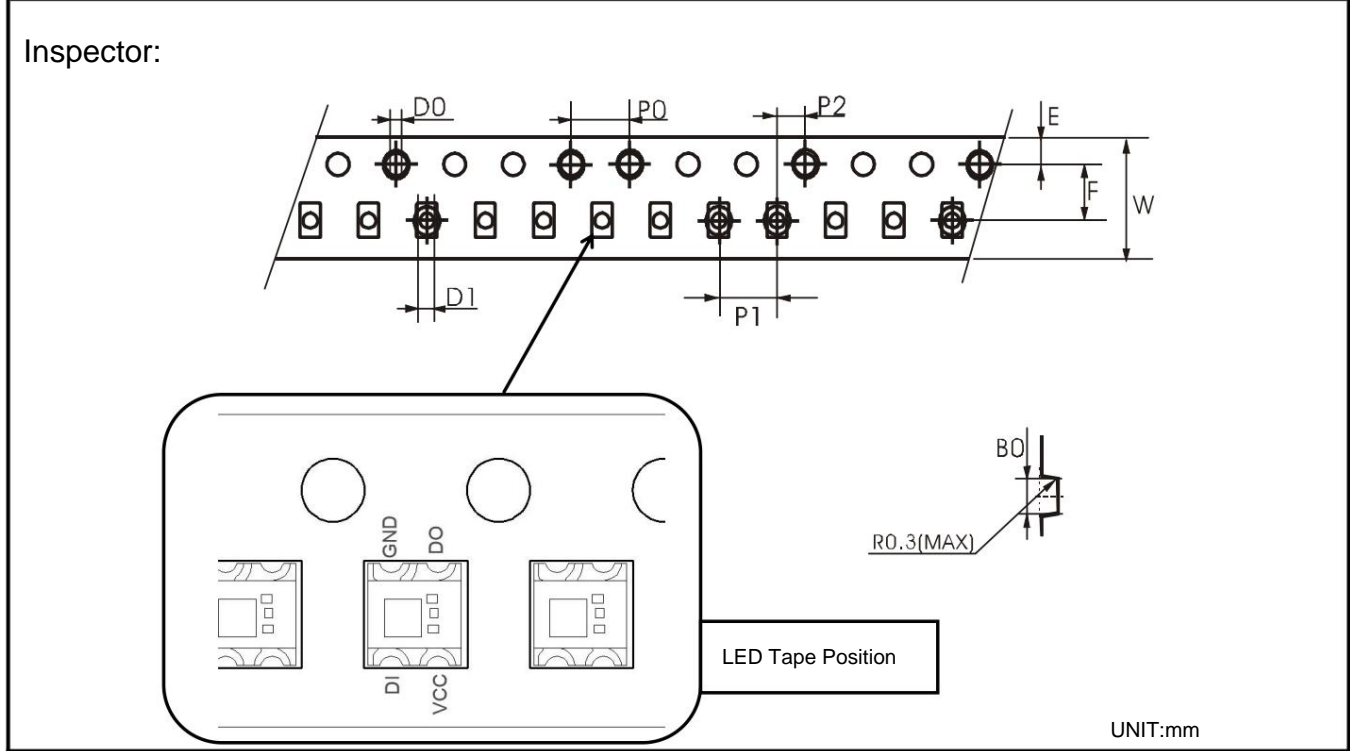




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Carrier tape specifications (unit: mm)

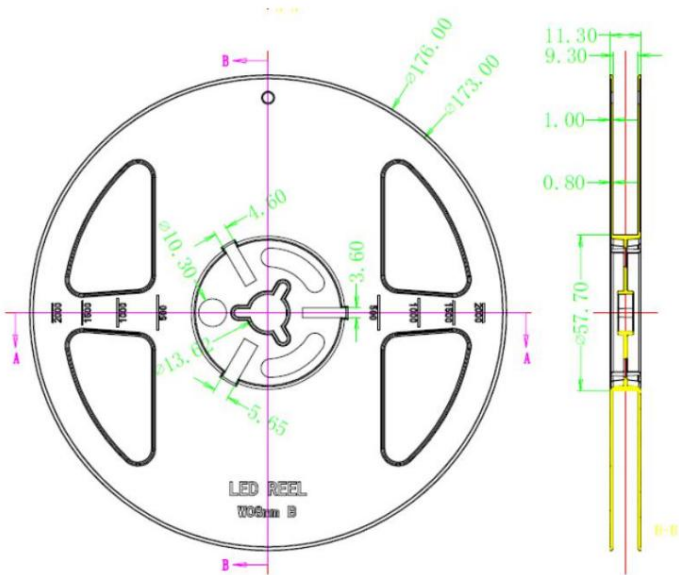


CARRIER TAPES TEST REPORTS

SYMBOL A0		B0	K0	P0	P1	P2	T	AND	F	D0	D1 W	
SPEC	2.20	2.40	1.01	4.00	4.00	2.00	0.18	1.75	3.50	1.50	1.00	8.00

Reel size

Unit: mm





Precautions for using surface mount LEDs

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 LED protection precautions below.

2. Notes:

2.1. Dust and cleaning

The surface of the LED is encapsulated with modified epoxy adhesive, which plays a good protective role in 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 surface of the LED, it will not affect the luminous brightness, but we should still avoid dust falling on the LED surface. Priority will be given to those that have opened the packaging bag. Components with LEDs installed should be stored in clean containers. The surface of the LEDs needs to be cleaned. When cleaning, if you use solutions such as triamethylene or acetone, the LED surface will dissolve. Do not use soluble solutions to clean the LED. 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 methods. 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, etc., must be tested before cleaning to confirm whether it will affect the LED.

2.2. Moisture-proof packaging

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. Desiccant to absorb moisture. If the LED absorbs water vapor, the water vapor will evaporate and expand when the LED is reflowed, which may cause the colloid to interact with the support. The frame may detach and damage the optical system of the LED. For this reason, moisture-proof packaging is designed to avoid moisture inside the packaging bag. Moisture proof level (MSL) of this product For: LEVEL5a. Refer to the definition of material moisture resistance level (MSL) specified in IPC/JEDECJ-STD-020

Moisture-proof grade	Workshop life after unpacking	
	time	condition
LEVEL1	Unlimited	≤30℃/85%RH
LEVEL2	1 year	≤30℃/60%RH
LEVEL2a	4 weeks	≤30℃/60%RH
LEVEL3	168 hours	≤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 patch instructions:

1. Please use it under the conditions of T<30℃ and RH<60%;
2. The time period from product bag opening to reflow soldering completion is controlled within 24 hours;
3. If it times out, the LED product needs to be dehumidified and baked;

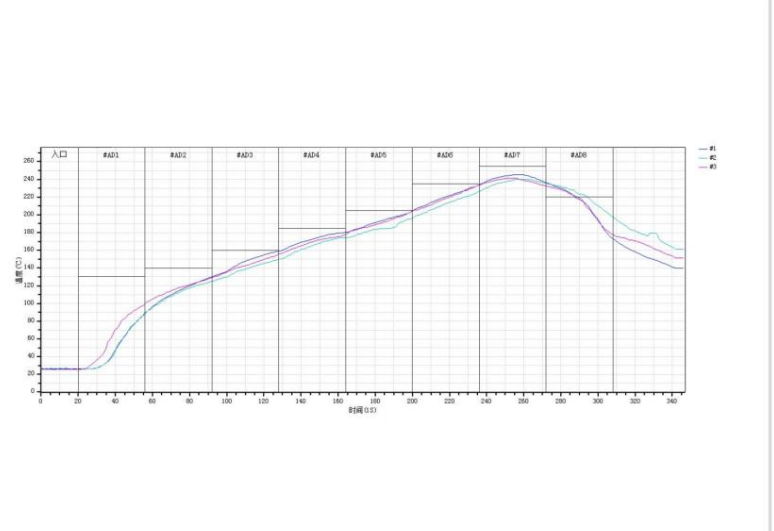
2.4 Dehumidification requirements: 70%~24H.

3. Reflow soldering

Surface mount LEDs have been tested and proven to comply with JEDECJ-STD-020C using the parameters listed below. As a general guideline, it is recommended to follow

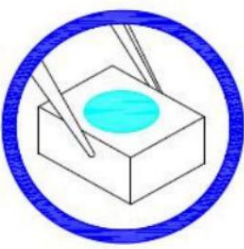
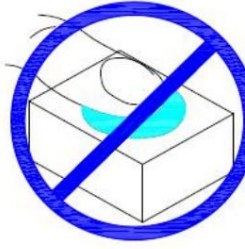
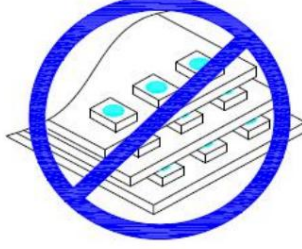

The soldering temperature profile recommended by the solder paste manufacturer used.

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: 1. All the above temperatures refer to the temperature measured on the upper surface of the package body.

4. Precautions during product assembly process

1. By using appropriate tools The tool is clamped from the side of the material	2. Do not use your hands or sharp objects directly metal pressed against a colloidal surface, it may Will damage the internal circuit	3. Do not pile module materials in one place , it may damage the internal circuitry	4. Cannot be used in acidic environments with PH<7 place
			

File Change Log

Version number	status	Edit summary	Revision Date	Revisor	Approver
V1.0	N	Newly built (upgraded from the original WS2812C-2020 product change)	20210624	Yu Xinghui	Yin Huaping