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Intelligent control LED integrated light source

WS2812B LED

WORLDSEMI CO.,LIMITED

WS2812B Datasheet and Specifications

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Jan,2016

V1.0



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Features and Benefits

- Intelligent reverse connect protection, the power supply reverse connection does not damage the IC.
- The control circuit and the LED share the only power source.
- Control circuit and RGB chip are integrated in a package of 5050 components, form a complete control of pixel point.
- Built-in signal reshaping circuit, after wave reshaping to the next driver, ensure wave-form distortion not accumulate.
- Built-in electric reset circuit and power lost reset circuit.
- Each pixel of the three primary color can achieve 256 brightness display, completed 16777216 color full color display, and scan frequency not less than 400Hz/s.
- Cascading port transmission signal by single line.
- Any two point the distance more than 5m transmission signal without any increase circuit.
- When the refresh rate is 30fps, cascade number are not less than 1024 points.
- Send data at speeds of 800Kbps.
- The color of the light were highly consistent, cost-effective..

Applications

- Full-color module, Full color soft lights a lamp strip.
- LED decorative lighting, Indoor/outdoor LED video irregular screen.

General description

WS2812B is a intelligent control LED light source that the control circuit and RGB chip are integrated in a package of 5050 components. It internal include intelligent digital port data latch and signal reshaping amplification drive circuit. Also include a precision internal oscillator and a 12V voltage programmable constant current control part, effectively ensuring the pixel point light color height consistent.

The data transfer protocol use single NZR communication mode. After the pixel power-on reset, the DIN port receive data from controller, the first pixel collect initial 24bit data then sent to the internal data latch, the other data which reshaping by the internal signal reshaping amplification circuit sent to the next cascade pixel through the DO port. After transmission for each pixel, the signal to reduce 24bit. pixel adopt auto reshaping transmit technology, making the pixel cascade number is not limited the signal transmission, only depend on the speed of signal transmission.

LED with low driving voltage, environmental protection and energy saving, high brightness, scattering angle is large, good consistency, low power, long life and other advantages. The control chip integrated in LED above becoming more simple circuit, small volume, convenient installation.

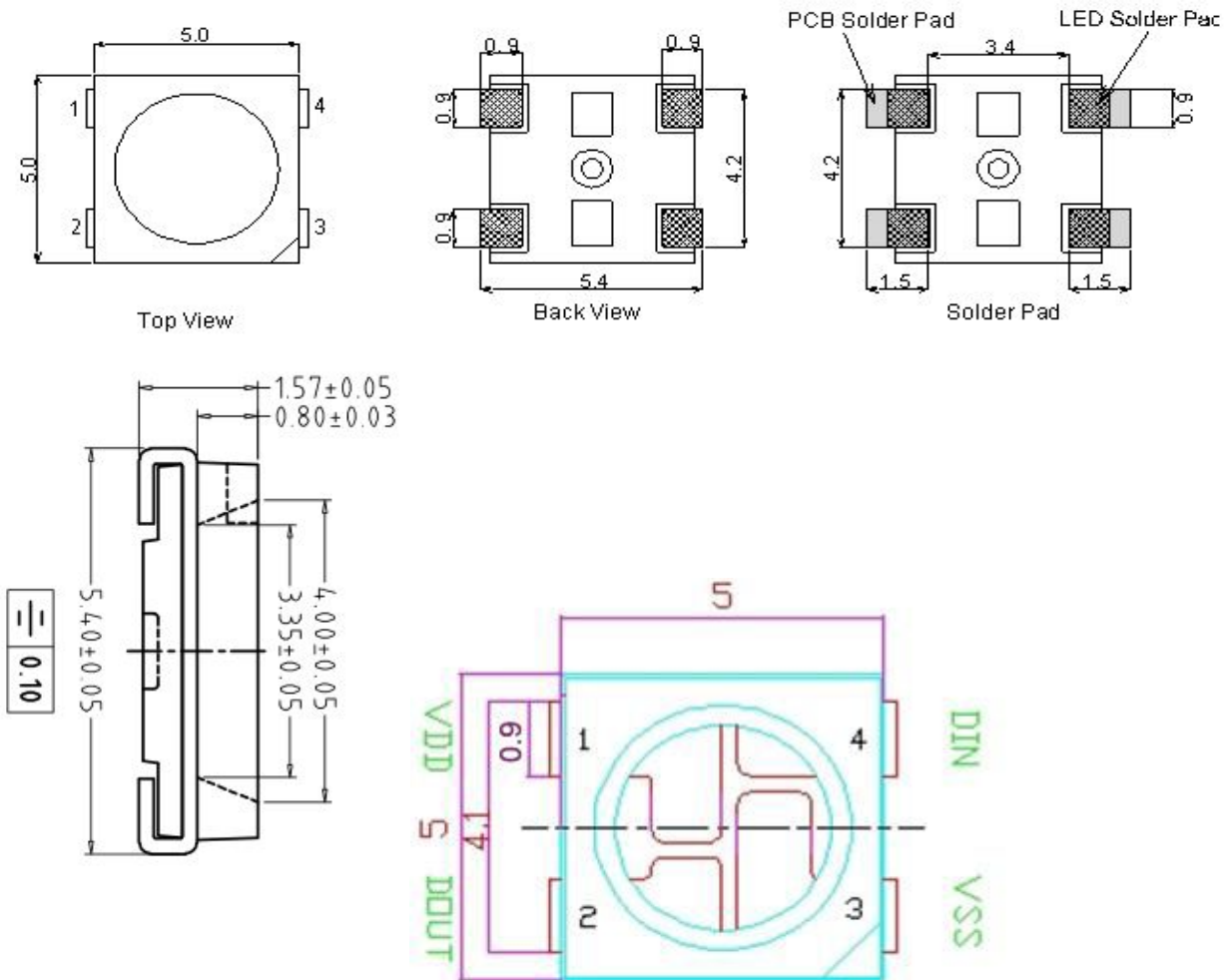


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Mechanical Dimensions



PIN function

NO.	Symbol	Function description
1	VDD	Power supply LED
2	DOUT	Control data signal output
3	VSS	Ground
4	DIN	Control data signal input



Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Power supply voltage	V _{DD}	+3.5~+5.3	V
Input voltage	V _I	-0.5~V _{DD} +0.5	V
Operation junction temperature	T _{opt}	-25~+80	°C
Storage temperature range	T _{stg}	-40~+105	°C

Electrical Characteristics (T_A=-20~+70°C, V_{DD}=4.5~5.5V, V_{SS}=0V, unless otherwise specified)

Parameter	Symbol	conditions	Min	Tpy	Max	Unit
Input current	I _I	V _I =V _{DD} /V _{SS}	—	—	±1	μA
Input voltage level	V _{IH}	D _{IN} , SET	0.7V _{DD}	—	—	V
	V _{IL}	D _{IN} , SET	—	—	0.3 V _{DD}	V
Hysteresis voltage	V _H	D _{IN} , SET	—	0.35	—	V

Switching characteristics (T_A=-20~+70°C, V_{DD}=4.5~5.5V, V_{SS}=0V, unless otherwise specified)

Parameter	Symbol	Condition	Min	Tpy	Max	Unit
Transmission delay time	t _{PLZ}	CL=15pF, D _{IN} → D _{OUT} , RL=10KΩ	—	—	300	ns
Fall time	t _{THZ}	CL=300pF, O _{UTR} /O _U T _G /O _{UTB}	—	—	120	μs
Input capacity	C _I	—	—	—	15	pF

RGB IC characteristic parameter

Emitting color	Model	Wavelength(nm)	Luminous intensity(mcd)	Voltage(V)
Red	13CBAUP	620-630	550-700	1.8-2.2
Green	13CGAUP	515-530	1100-1400	3.0-3.2
Blue	10R1MUX	465-475	200-400	3.0-3.4

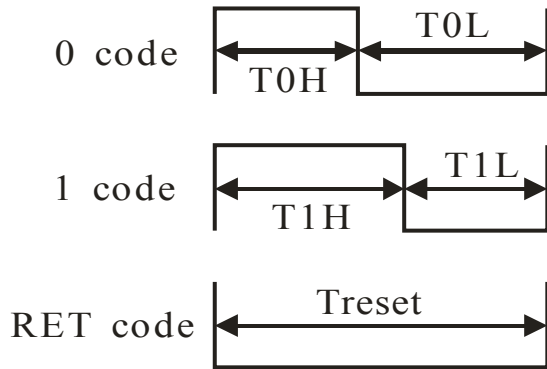


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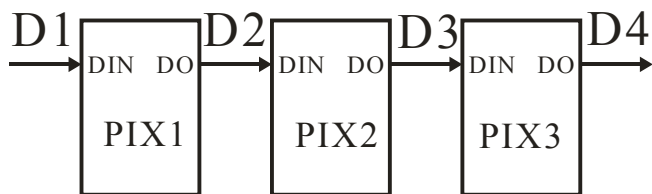
Data transfer time(TH+TL=1.25μs±600ns)

T0H	0 code ,high voltage time	0.4us	±150ns
T1H	1 code ,high voltage time	0.85us	±150ns
T0L	0 code , low voltage time	0.85us	±150ns
T1L	1 code ,low voltage time	0.4us	±150ns
RES	low voltage time	Above 50μs	

Sequence chart:



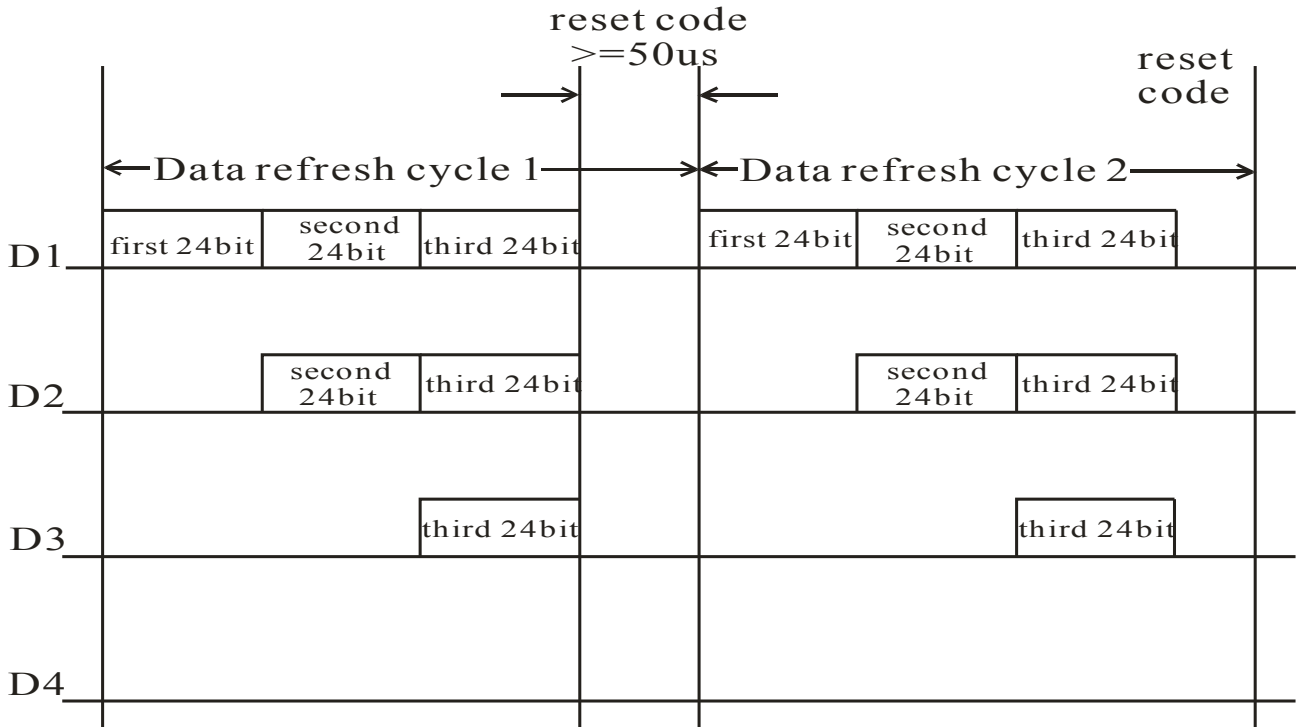
Cascade method:





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Data transmission method:





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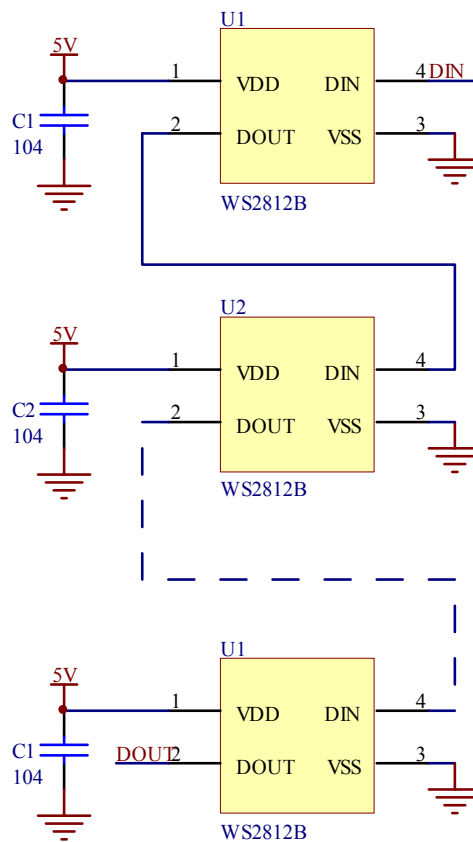
Note: The data of D1 is send by MCU,and D2, D3, D4 through pixel internal reshaping amplification to transmit.

Composition of 24bit data:

G7	G6	G5	G4	G3	G2	G1	G0	R7	R6	R5	R4	R3	R2	R1	R0	B7	B6	B5	B4	B3	B2	B1	B0
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Note: Follow the order of GRB to sent data and the high bit sent at first.

Typical application circuit:





WS2812B Products Using Instructions

MSL=5A Level

1. Purpose:

WS2812B-Mini LED lamp's surface use the high hardness silicone resin, can ensure that no matter customers use PU glue or epoxy resin to do the silicone drop rubber processing, won't lead the LED to die; also has a very good anti sulfide capacity. Good compatibility with bracket, but the silicon resin has a higher requirements on the humidity and dehumidification process, especially pay attention during wet season, ensure the production safety.

2. Transport and application area:

All WS2812S/B products during the transportation process, need to maintain a positive upward, moisture-proof, during the transport process, shall avoid the extrusion, collision and vibration.

3. Product storage and deadline:

Sealed storage at room temperature: 20 °C ~ 30 °C, 40% ~ 60%RH, the product is valid for 3 months;

Moisture seal storage: 20 °C ~ 30 °C, 25% ~ 60%RH, the product is valid for 6 months;

After opening the product packaging, suggest using them within 1 hours, (environmental conditions of temperature <30 °C, humidity <60%).

4. Dehumidification process:

LED products which is beyond the prescribed time limit, or for getting damp for some other reasons, we recommend the customer first do the dehumidification process, then use them. Dehumidification method: under 75 °C / 22 ±2 hours.

5. Electrostatic protection:

LED is the electrostatic sensitive devices, although the LED product has excellent anti-static ability, but after each ESD impact, will cause a certain degree of damage to LED. Thus in using process of LED products, must do the electrostatic protection measures, such as anti-static gloves, anti-static Bracelet etc..

6. Manual welding operation instruction

Suggest using the Electric soldering iron whose power is less than 30W, then control the



electric soldering iron's temperature being not higher than 350 °C , every time when welding electric iron in the bracket pin,stay time shall be no more than 3 seconds,if requiring repeat welding,then interval time shall be no less than 2 seconds.Please don't touch or extrusion the LED's surface,in order to avoid damage to the internal LED, at the same time, please pay attention to avoid the electric iron burns the colloid on the surface of LED and other injuries.

7. Reflow instructions

Set the reflow parameters, check the following drawing and table for reference., recommend using Senju, Alfa, Henkel loctite brand solder paste, recommends customers do the necessary adjustments according to foundation of material properties provided by the solder materials suppliers.

Curve description	Lead in solder reflow	SMT LINE
The lowest preheat temperature(Tsmin)	100°C	150°C
The highest preheat temperature(Tsmax)	150°C	200°C
Preheating time (Tsmin to Tsmax)(ts)	60-120 S	60-180 S
Average rate of temperature rise(Tsmax to Tp)	<3°C/S	<3°C/S
liquid phase temperature (TL)	183°C	217°C
Holding time liquid region (tL)	60-150 S	60-150 S
peak temperature(Tp)	235 °C	250°C
High temperature region (the peak temperature -5 °C) residence time (tp)	<10 S	<10 S
Decreasing temperature rate	<6°C/S	<6°C/S
Stay time from room temperature to the peak temperature	<6 min	<6 min

8. Notice of Production

1.All products ,during SMT, please carefully check, if the vacuum packaging intact, no



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leakage phenomenon, Please use directly, can don't do the bake dehumidification.

2. During use, please open a bag and use a bag, please don't open many bags at one-time which shall lead the LEDs absorb moisture in the air since you don't use them at once.

3. After SMT, please do the reflow soldering furnace immediately, please don't leave them in in the pre-reflow for a long time which absorb moisture. Especially

when off work, please use out the LEDs which is out of packaging, please SMT and reflow, do not let them stay in the air for a long time.

4. Dehumidification process, please under $70-75^{\circ}\text{C}$, bake for 24 hours. Also note during using, use the LEDs immediately after taking out of the bake box, please don't take many reels at one-time, since it is very hot when taking out, LED in the cooling process more easily absorb the moisture in the air into the inside of the LED, which shall cause led dead during reflow.

5. Please pay attention that it is forbidden to secondary reflow soldering.