

Features and Benefits

- The control circuit and RGB chip are integrated in a **5050** components, to form an external control pixel.
- The **12V power supply** voltage effectively reduces the working current of the entire pixel point, lowers the voltage drop on the circuit board, and ensures to the greatest extent that the pixel points achieve good light mixing consistency when transmitted over a long distance.
- Using the built-in signal reshaping circuit to achieve the signal waveform shaping, and no distortion of waveform of signal takes place.
- The gray levels of each pixel's 4 basic colors are of 256 levels.
- The refresh frequency reaches to 4KHz.
- Serial cascade interface, data receiving and decoding depend on just one signal line.
- **Single-wire Self-By pass function.** One additional signal line is added to realize double signal transmission signal break-point continuous transmission. Any single pixel failure won't affect the overall display effect.
- Any two point the distance more than 5M transmission signal without any increase circuit.
- When the refresh rate is 30fps, cascade numbers is at least 1024 pixels.
- Data transmitting at speeds of up to 800Kbps.
- Good color consistency reliability, high cost-effective.

Applications

- Consumer Electronics.
- Landscape lighting fields.
- Computer peripheral products, games devices and machinery equipment etc.

General description

WS2815B-RGBW-V1 is an intelligent control LED light source that the control circuit and RGB chip are integrated in a package of **5050** components. Its internal include intelligent digital port data latch and signal reshaping amplification drive circuit. The RGBIC LED contains an intelligent digital interface, data latch, signal shaping and amplification drive circuit, anti-reverse connection circuit, as well as a high-precision internal oscillator and a high-precision constant current control module, effectively ensuring the high consistency of the color of the LED.

Single-wire Self-By pass function. Any pixel's failure won't affect signal transfer and overall emitting color effect.

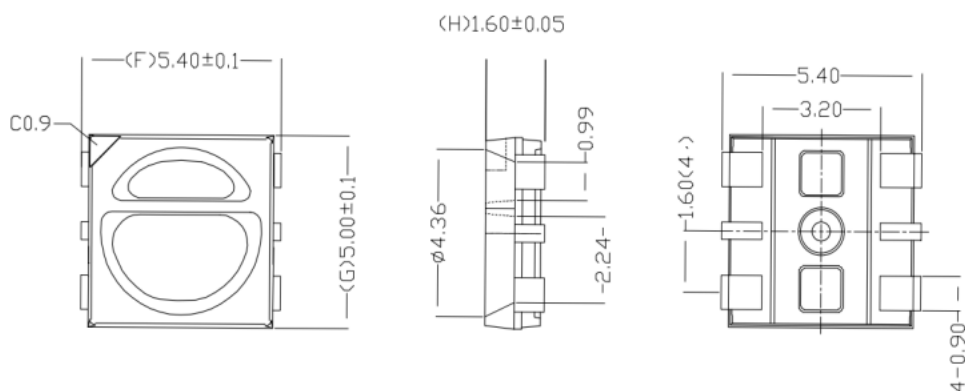
IC use single single wire RZ protocol. After the pixel power-on reset, the DIN port receive data from controller, the first pixel collect initial **32bit** data then sent to the internal data latch, the other data which reshaping by the internal signal reshaping amplification circuit sent to the next cascade pixel through the DO port. After transmission for each pixel, the signal to reduce **32bit**. Every pixel adopts auto-reshaping transmit technology, making the pixel cascade numbers are not limited to the signal transmission, only relate to the speed of signal transmission.

Refresh Frequency updates to **4KHz**, No flicker occurs even when captured by hd camera, which is very suitable for the use of HD Video Camera.

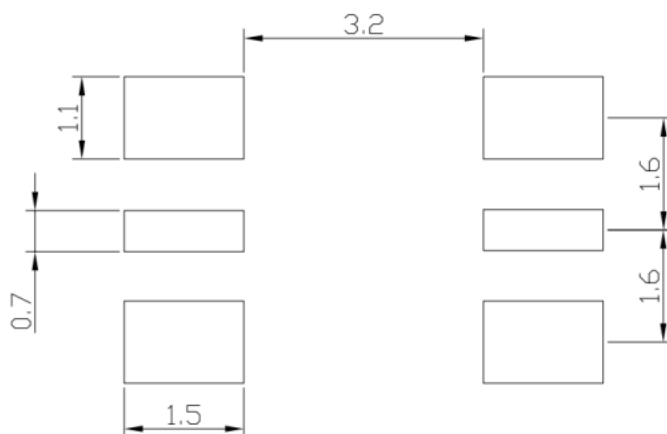
RESET time > **280μs**, it won't cause wrong reset while interruption, it supports the lower frequency and chip MCU.

Mechanical Dimensions(Unit:mm)

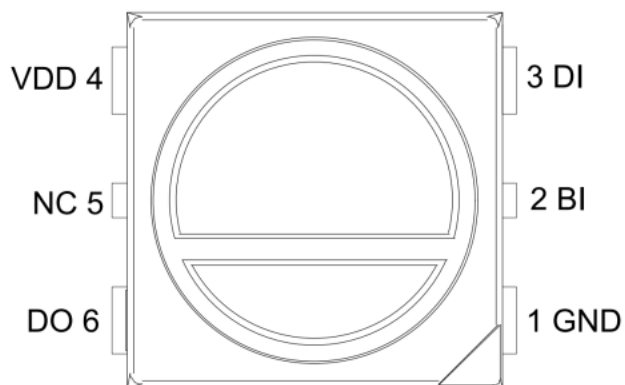
Tolerance: $\pm 0.15\text{mm}$



Recommended pad size (unit: mm)



PIN Configuration



PIN Function

NO.	Symbol	PIN	Function description
1	GND	GND	Data & Power Grounding
2	BIN	BIN	Backup Control data signal input
3	DIN	DIN	Control data signal input
4	VDD	VDD	LED POWER SUPPLY, connect to “+5V”
5	NC	NC	Non connected
6	DO	DO	Control data signal output

Absolute Maximum Ratings($T_A=25^{\circ}\text{C}$, $V_{SS}=0\text{V}$)

Parameter	Symbol	Ratings	Unit
Power supply voltage	V_{DD}	+9.5~+13.5	V
Logical Input Voltage	V_I	-0.3~ $V_{DD}+0.7$	V
Working Temperature	T_{opt}	-40~+85	$^{\circ}\text{C}$
Storage temperature(bulk material)	T_{stg}	-40~+105	$^{\circ}\text{C}$
Storage temperature(Whole reel)	T_{stg}	-40~+70	$^{\circ}\text{C}$

Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}$, $V_{SS}=0\text{V}$)

Parameter	Symbol	Min.	Tpy.	Max.	Unit	Conditions
Quiescent Current	I_o	—	2	—	mA	DC=12V
Input Current	I_I	—	—	± 1	μA	$V_I=V_{DD}/V_{SS}$
High-level Input	V_{IH}	3.0	—	5.7	V	D_{IN}
Low-level Input	V_{IL}	-0.3	—	1.5	V	D_{IN}

Switching Characteristics ($T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}$, $V_{SS}=0\text{V}$)

Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Transmission Delay Time	T_{PLZ}	—	—	300	ns	$CL=15\text{pF}$, $DIN \rightarrow DOUT$, $RL=10\text{K}\Omega$
Fall time	T_{THZ}	—	—	120	μs	$CL=300\text{pF}$, $OUTR/OUTG/OUTB$
Data transmission rate	F_{MAX}	600	—	—	Kbps	Duty cycle 50%
Input-capacitance	C_I	—	—	15	pF	—

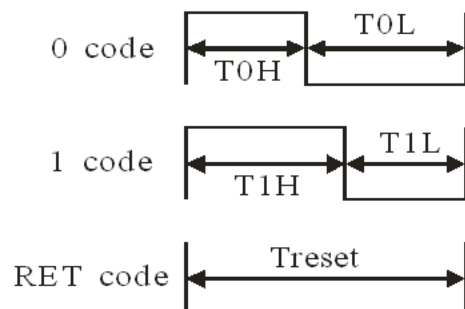
LED Characteristics

Parameter	Symbol	Color	Quiescent Current: 2mA				Condition (Working current)
			Min	Tpy	Max	Unit	
Brightness	IV	Red	200	/	400	mcd	12mA
		Green	600	/	1000		
		Blue	150	/	300		
		W	1500	/	2500		
Wavelength	λ_d	Red	620	/	630	nm	12mA
		Green	515	/	525		
		Blue	465	/	472		
Color Temperature	Pure White		6000	-	6500	K	W=12mA
	Natural White		3500	-	4500		
	Warm White		2700	-	3200		

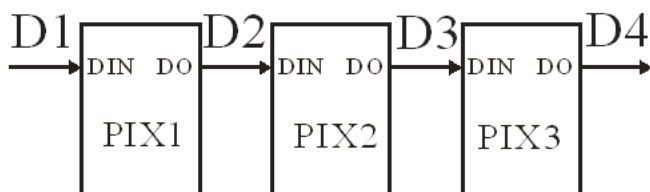
Data Transfer Time

T0H	0-code, High-level time	220ns~380ns
T1H	1-code, High-level time	580ns~840ns
T0L	0-code, Low-level time	900ns~5000ns
T1L	1-code, Low-level time	600ns~5000ns
RES	Frame unit, Low-level time	> 280 μs
T_{DATA}	Data cycle(TH+TL)	$\geq 1.25\mu\text{s}$

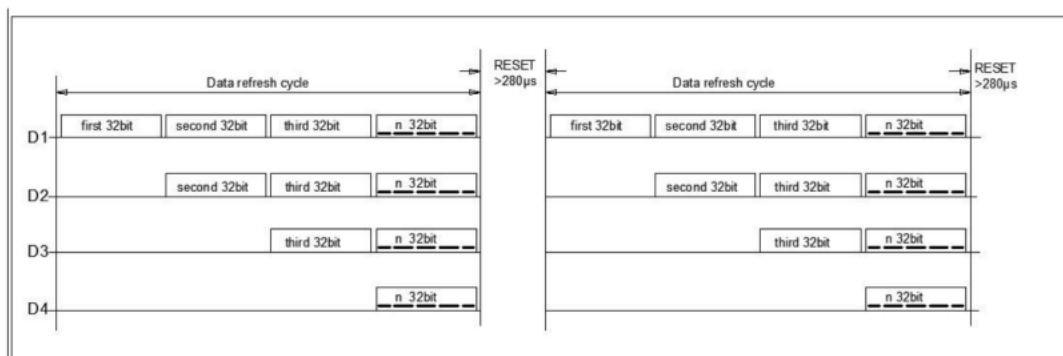
Sequence chart



Cascade method



Data Transmission Method



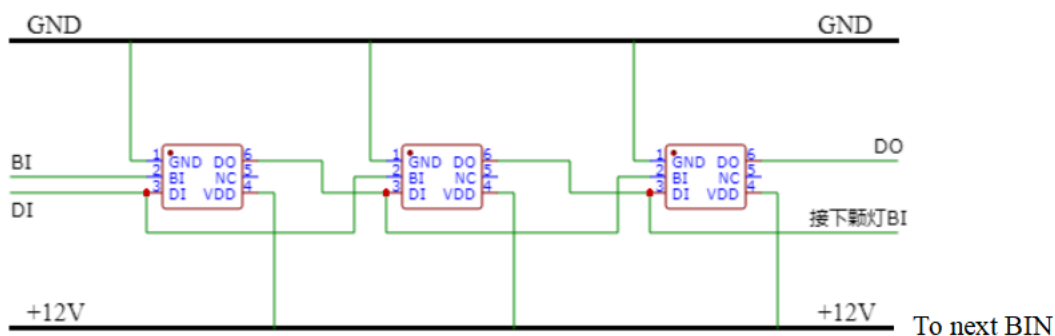
Note: D1 is the data from MCU, and D2, D3, D4 are from Cascade Circuits.

Composition of 32bit data

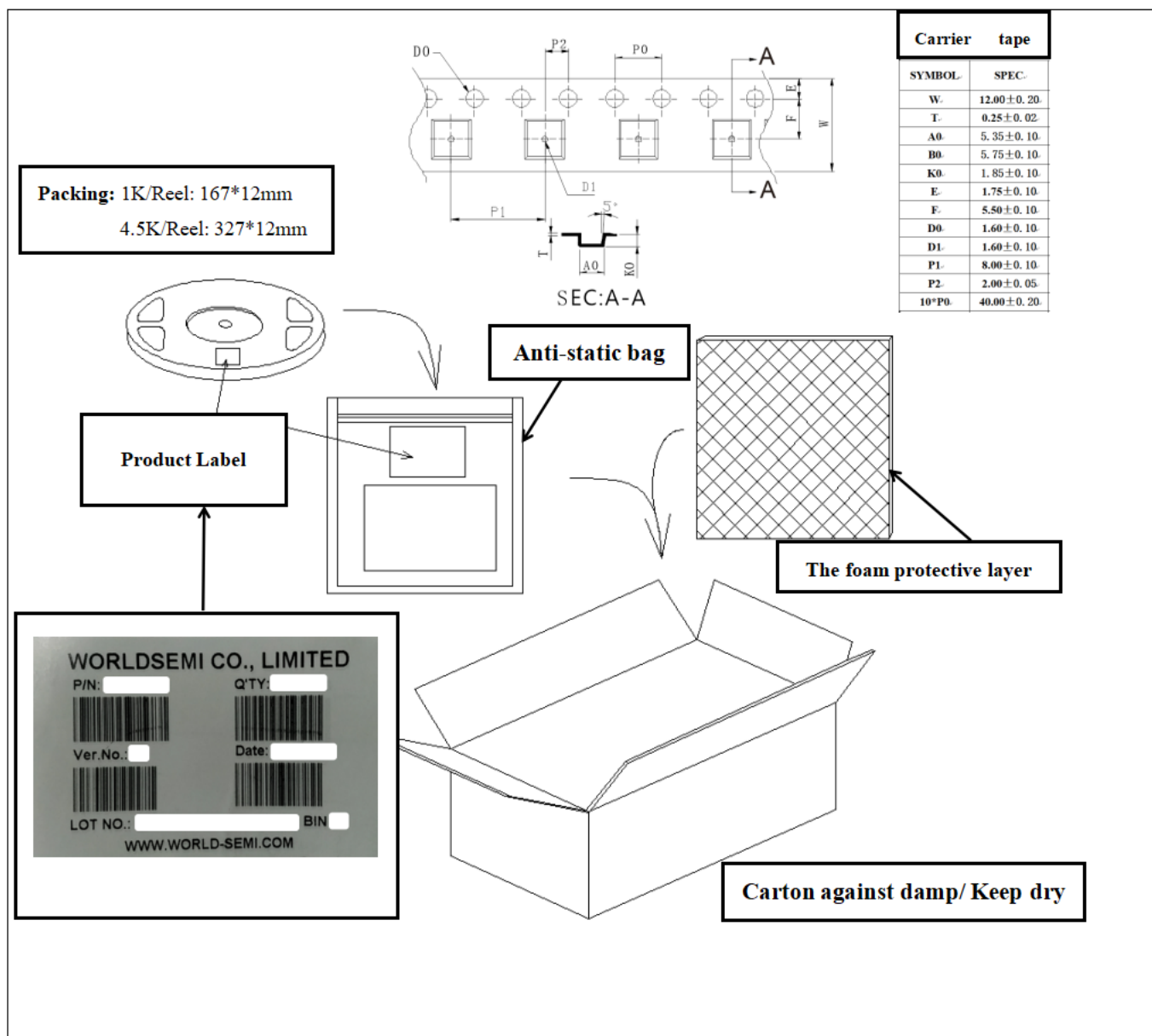
G	G	G	G	G	G	G	G	R	R	R	R	R	R	R	R	B	B	B	B	B	B	B	B	B	W	W	W	W	W	W	W	W
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	1	2	3	4	5	6	7	8	

Note: Data transmit in order of GRBW, high bit data is first.

Typical Application Circuit:



Packing Standard



WORLDSEMI Top SMD LED Using Instructions

1. Summary

To make the best use of WORLDSEMI's LED, please refer to the below precautions, they are of same usage method as other electronic components.

2. Cautions

2.1. Dust & Cleaning

The surface of the LED is encapsulated with modified epoxy resin because it plays a very good role in protecting the optical performance and aging resistance. The modified epoxy resin is easy to stick with dust and must be kept clean. When there's a certain amount of dust on the surface of the LED, it won't affect brightness, but dust proof should be taken care of. Promoting the use of unsealed package in preference to others and the assembled LEDs should be placed in a clean container.

Avoid using the organic solvents to clean the dust on the LED surface and it's necessary to confirm whether the cleaning fluid will dissolve the LED.

Do not clean the LEDs by the ultrasonic. Some parameters affecting the LED performance must be evaluated if have no alternative but to the ultrasonic cleaning method, such as ultrasonic power, baking time and assembly conditions, etc.

2.2. Moisture-proof packaging

TOP SMD LEDs are moisture sensitive components. LEDs are packaged in aluminum foil bag to prevent the from absorbing moisture during transport and storage. A desiccant is placed in the bags to absorb moisture. If the LED absorbs moisture, then it evaporates and expands when in reflow process, which may break the colloid from the bracket and damage the optical performance of LED. For this reason, moisture-proof packaging is to prevent the from absorbing moisture during transport and storage. The moisture resistance rating of WORLDSEMI's LED is: **LEVEL 5a**.

Tabel I - IPC/JEDEC J-STD-020 Moisture/Reflow Sensitivity Classification

MSL Level	Workshop Life	
	Time	Conditions
LEVEL1	Unlimited	≤30°C/85%RH
LEVEL2	1 Year	≤30°C/60%RH
LEVEL2a	4 Weeks	≤30°C/60%RH
LEVEL3	168 Hours	≤30°C/60%RH
LEVEL4	72 Hours	≤30°C/60%RH
LEVEL5	48 Hours	≤30°C/60%RH
LEVEL5a	24 Hours	≤30°C/60%RH
LEVEL6	Take-out and Use immediately	≤30°C/60%RH

2.3.1 It is recommended that opening the Vacuum plastic bag before SMT, and put the whole reel into the oven for dehumidification and drying (**Bake at 70 ~ 75°C $\cong$ 24H**);

2.3.2 From the led taken out of the oven to the completion of high temperature welding (including multiple reflow welding, tin immersion, wave soldering, heating maintenance and other high temperature operations/operations), the time period shall be controlled **within 24Hours** (Under condition of **T<30°C, RH<60%**);

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

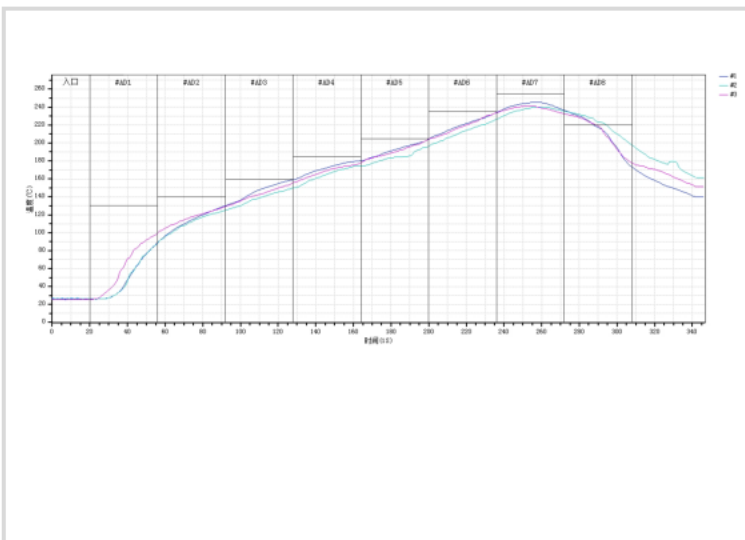
2.3.4 Bulk material LED, such as production surplus, machine material, maintenance material, can not be used directly if exposed to the air for a long time. It is recommended to be dehumidified and dried before being used.

Whole reel baking: 70 ~ 75°C* $\cong$ 24H or bulk led baking: 120°C* 4H.

3. SMT Reflow

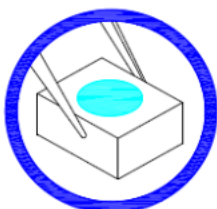
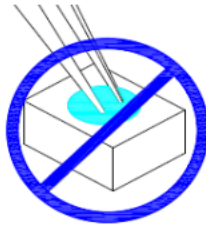
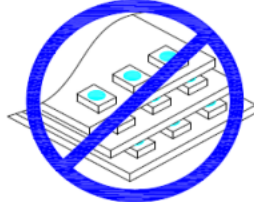
Refer to the parameters listed below, the experimental results prove that the TOP SMD LED meets the JEDEC J-STD-020C standards. As a general guideline, it is recommended to follow the SMT reflow temperature curve recommended by the solder paste manufacturer.

Curve Description	Lead-free
30°C ~ 150°C preheating slope	1~4 °C/s
30°C ~ 150°C preheating time	60~120 s
150°C to 200°C constant temperature slope	0~3 °C/s
150°C ~ 200°C constant temperature time	60~120 s
LIQUID REGION temperature (TL)	217°C
Peak Temperature (Tp)	245°C
Reflow slopeTime (tp)	0~3 °C/s
Reflow soldering time	45~90 s
Cooling Rate	-4~0 °C/s
Room Temperature to Peak Holding Time	<6 min



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

4. Assembly Precautions

1. Clip the LED from its side.	2. Neither directly touch the gel surface with the hand or sharp instrument, it may damage its internal circuit.	3. Not to be double stacked, it may damage its internal circuit.	4. Can not be stored in or applied in the acidic sites of PH<7.
			

Modify Record

Version №	Status Bar	Modify Content Summary	Date	Reviser	Approved
V1.0	N	New	20260331	He WenBin	Yin HuaPing
V1.1	M	Modify working&storage temperature	20260521	He WenBin	Yin HuaPing
V1.2	M	Update Logo	20260803	Chen YongZhao	Shen JinGuo
V1.3	M	Change P/N to WS2815B-RGBW-V1	20260828	Chen YongZhao	Shen JinGuo

Remarks:

1. Initial version: V1.0; Parameter added or modified, version number plus "0.1", for example: V1.0→ V1.1
2. Major version design or more parameters modified, version number plus "1.0", for example: V1.0→V2.0
3. With no version number attached to part number
4. Status bar: N--New, A--Add, M--Modify, D--Delete