WS2916A-RGBW

Intelligent control LED integrated light source

Features and Benefits

- The control circuit and RGBW chip are integrated in a 5050 components, to form an external control pixel.
- DC5V power supply ,effectively reduces the working current of the entire pixel, lowers the voltage drop on the circuit board, and ensures to the greatest extent that the pixels achieve good light mixing consistency during long-distance transmission.
- 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 65536 levels.
- The refresh frequency reaches to 2KHz.
- Serial cascade interface, data receiving and decoding depend on just one signal line.
- **Single-wire Self-Bypass function,**Any single pixel failure won't affect the overall display effect.
- Any two point the distance more than 3M transmission signal without any increase circuit.
- Data transmitting at speeds of up to 800Kbps.
- Good color consistency reliability, high cost-effective.
- **High color rendering index, Ra>90**
- **It features current gain and enables fine current regulation.**
- **To prevent overheating and failure, the Max. brightness of W cannot be fully illuminated simultaneously with the maximum brightness of RGB.**

Applications

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

General description

WS2916A-RGBW 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. Also include a precision internal oscillator and voltage programmable constant current control part, which achieves highly consistent color effect.

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

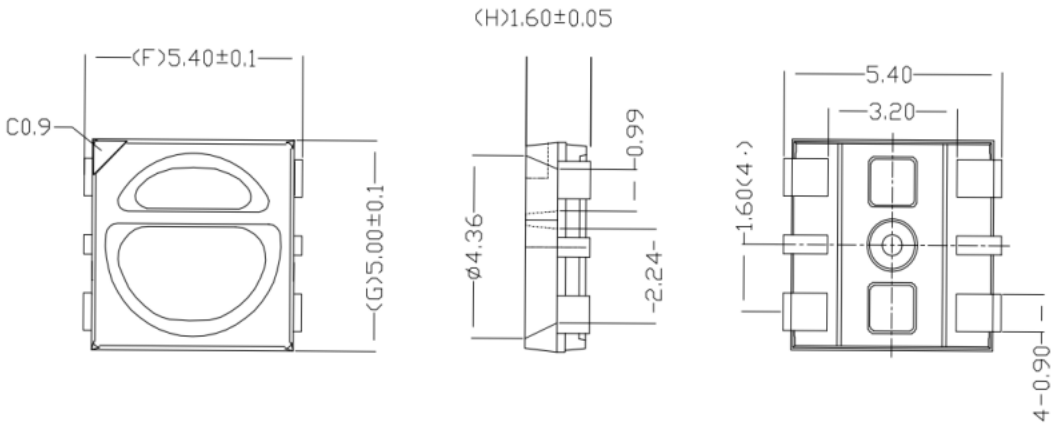
IC use single single wire RZ protocol. After the pixel power-on reset, the DIN port receive data from controller, the first pixel collect initial **64bit** data then sent to the internal data latch, the other data which reshaping by the internal signal reshaping amplification circuit sent to the next cascade pixel through the DO port. After transmission for each pixel, the signal to reduce **64bit.** 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 is **2KHz**, No flicker occurs even when captured by HD camera,suitable for high speed products.

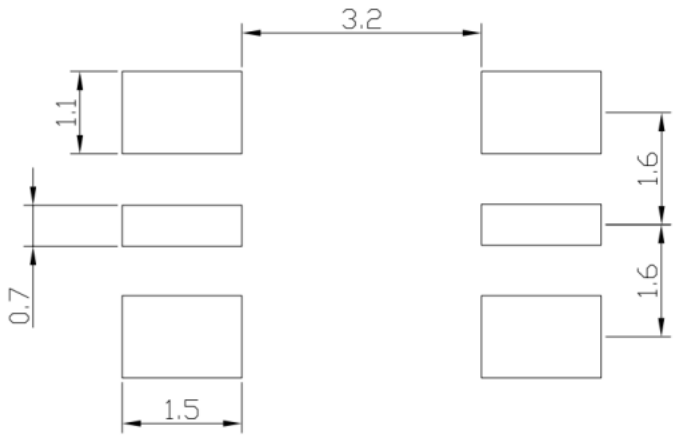
RESET time>**280μs**, it won't cause wrong reset while interruption, it supports the lower frequency and chip MCU.

Mechanical Dimensions(Unit:mm)

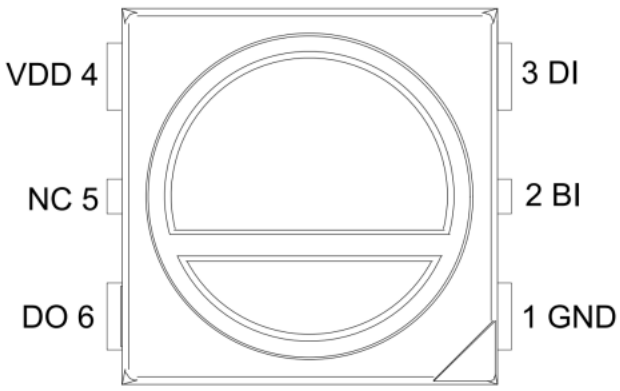
Tolerance: ± 0.15mm



Recommended pad size (unit: mm）



PIN Configuration



PIN Function

NO.	Symbol	PIN	Function description
1	GND	GND	Data & Power Grounding
2	BIN	BIN	Bypass 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°C,V_{SS}=0V)

Parameter	Symbol	Ratings	Unit
Power supply voltage	V_{DD}	3.5～5.7	V
Logical Input Voltage	V_I	-0.3～VDD+0.7	V
Working Temperature	Topt	-40～+85	℃
Storage Temperature	Tstg	-40~+105	℃
Storage temperature(Whole reel)	Tstg	-40~+70	℃

Electrical Characteristics (T_A=25°C, Vcc=5V, V_{SS}=0V)

Parameter	Symbol	Min.	Tpy.	Max.	Unit	Conditions
Quiescent Current	Io	——	0.3	——	mA	DC=5V
Input Current	I_I	——	——	±1	μA	V_I=V_{DD}/V_{SS}
High-level Input	V_{IH}	0.55VDD	——	——	V	D_{IN}
Low-level Input	V_{IL}	-0.3	——	1.5	V	D_{IN}

Switching Characteristics (T_A=25°C, Vcc=5V, V_{SS}=0V)

Parameter	Symbol	Min	Tpy	Max	Unit	Condition
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	——

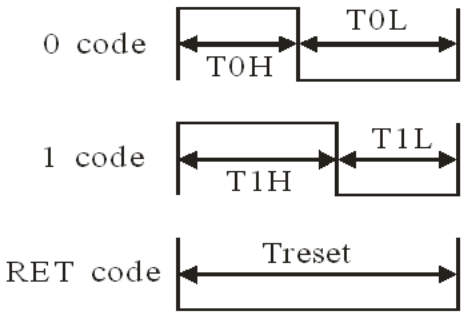
LED Characteristics

Parameter	Symbol	Color	Quiescent Current: **0.3mA**				Condition (Working current DC=5V)
			Min	Tpy	Max	Unit	
Brightness	IV	Red	800	/	1500	mcd	RGB=30mA W=60mA
		Green	2500	/	4500		
		Blue	600	/	1200		
		W	3500	/	5500		
Wavelength	λd	Red	620	/	630	nm	RGB=30mA
		Green	520	/	530		
		Blue	465	/	475		
Color Temperature (Tc)	**Pure** White		6000	-	6500	K	W=60mA
	Natural White		4000	-	5000		
	Warm White		2700	-	3200		

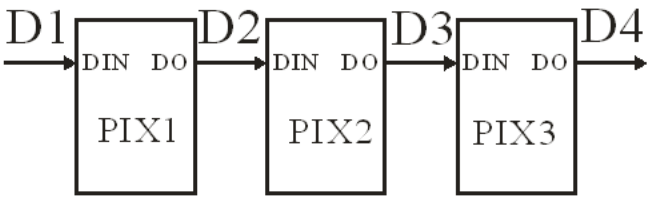
Data Transfer Time

T0H	0-code, High-level time	220ns~380ns
T1H	1-code, High-level time	**520ns~1us**
T0L	0-code, Low-level time	580ns~1μs
T1L	1-code, Low-level time	580ns~1μs
RES	Frame unit, Low-level time	> 280μs
T_{DATA}	Data cycle	⩾1.25us

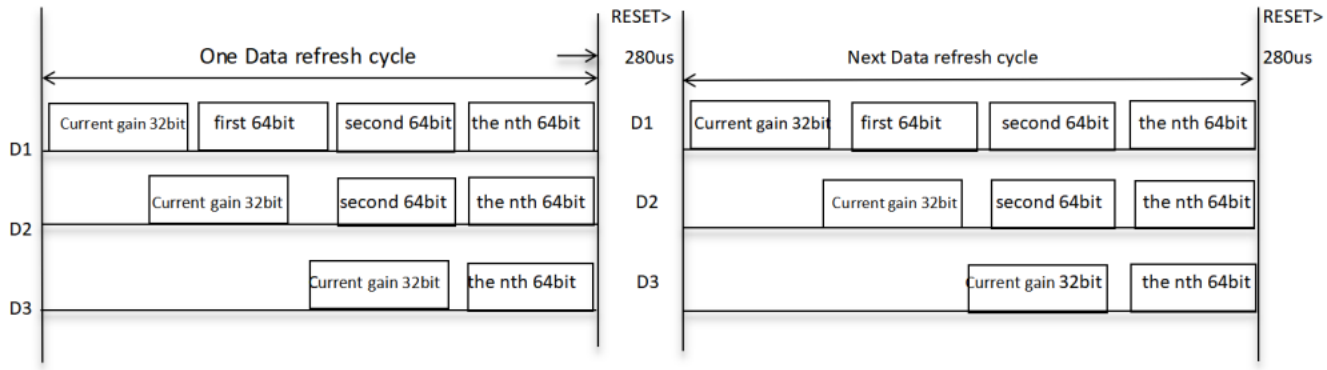
Sequence chart



Cascade method



Data Transmission Method



Note: D1 represents data transmitted by the MCU, while D2, D3, and D4 denote data automatically shaped and forwarded by the cascaded circuit.

4 Channel data structure

GI4	GI3	GI2	GI1	GI0	RI4	RI3	RI2	RI1	RI0	BI4	BI3	BI2	BI1	BI0	WI4
WI3	WI2	WI1	WI0	Check digit 0	Check digit 0	Check digit 0	Check digit 0	Check digit 0	Check digit 0	Check digit 0	Check digit 0	Check digit 0	Check digit 0	Check digit 0	Check digit 0
G15	G14	G13	G12	G11	G10	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0
R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R2	R0
B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
W_15	W_14	W_13	W_12	W_11	W_10	W_9	W_8	W_7	W_6	W_5	W_4	W_3	W_2	W_1	W_0

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

Channel Power& Heat Reference Table (For reference only)（T_A=25℃，V_{DD}=5V，V_{SS}=0V）

Full current gain, 65536 gray scale:

Channel	Power	Heat
G	<0.18W	<36.5℃
R	<0.18W	<37℃
B	<0.18W	<38℃
W	<0.35W	<50℃
R+G+B	<0.5W	<52.5℃

Full current gain, 32768 gray scale:

Channel	Power	Heat
G	<0.1W	<33℃
R	<0.1W	<33℃
B	<0.1W	<33.5℃
W	<0.175W	<38.4℃
R+G+B	<0.275W	<40.8℃

Full current gain,16384gray scale:

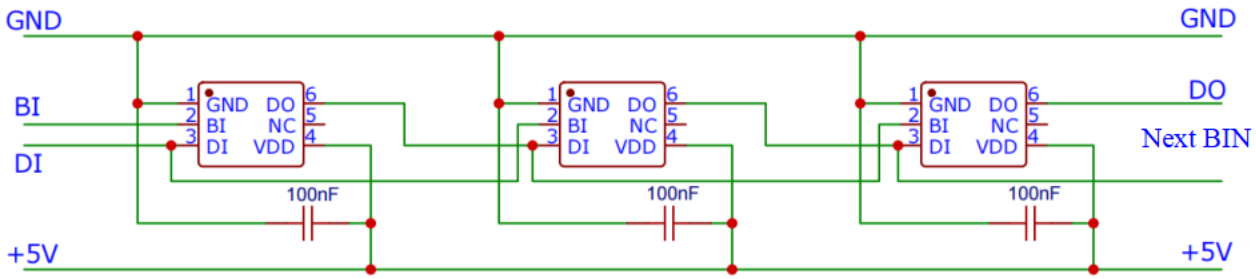
Channel	Power	Heat
G	<0.05W	<31.3℃
R	<0.05W	<31.3℃
B	<0.05W	<31.6℃
W	<0.1W	<33.6℃
R+G+B	<0.15W	<35.5℃

Current gain parameter(for reference):

Current gain Setting	RGB Current（mA）	W Current（mA）
0	0	0
1	0.92	2.09
2	2.04	4.23
3	3.02	6.31
4	4.15	8.51
5	5.11	10.55
6	6.16	12.62
7	7.10	14.64
8	8.27	16.67
9	9.22	18.70
A	10.24	20.73
B	11.18	22.72
C	12.25	24.70
D	13.17	26.67
E	14.17	28.62
F	15.08	30.54
10	16.42	32.59
11	17.34	34.59
12	18.34	36.63
13	19.25	38.63
14	20.28	40.5
15	21.19	42.4
16	22.17	44.3
17	23.06	46.3
18	24.11	47.6
19	24.98	49.6
1A	25.94	51.5
1B	26.82	53.4
1C	27.82	55.1
1D	28.67	57.0
1E	29.61	58.8
1F	30.46	60.7

Typical Application Circuit

Typical Application Circuit:

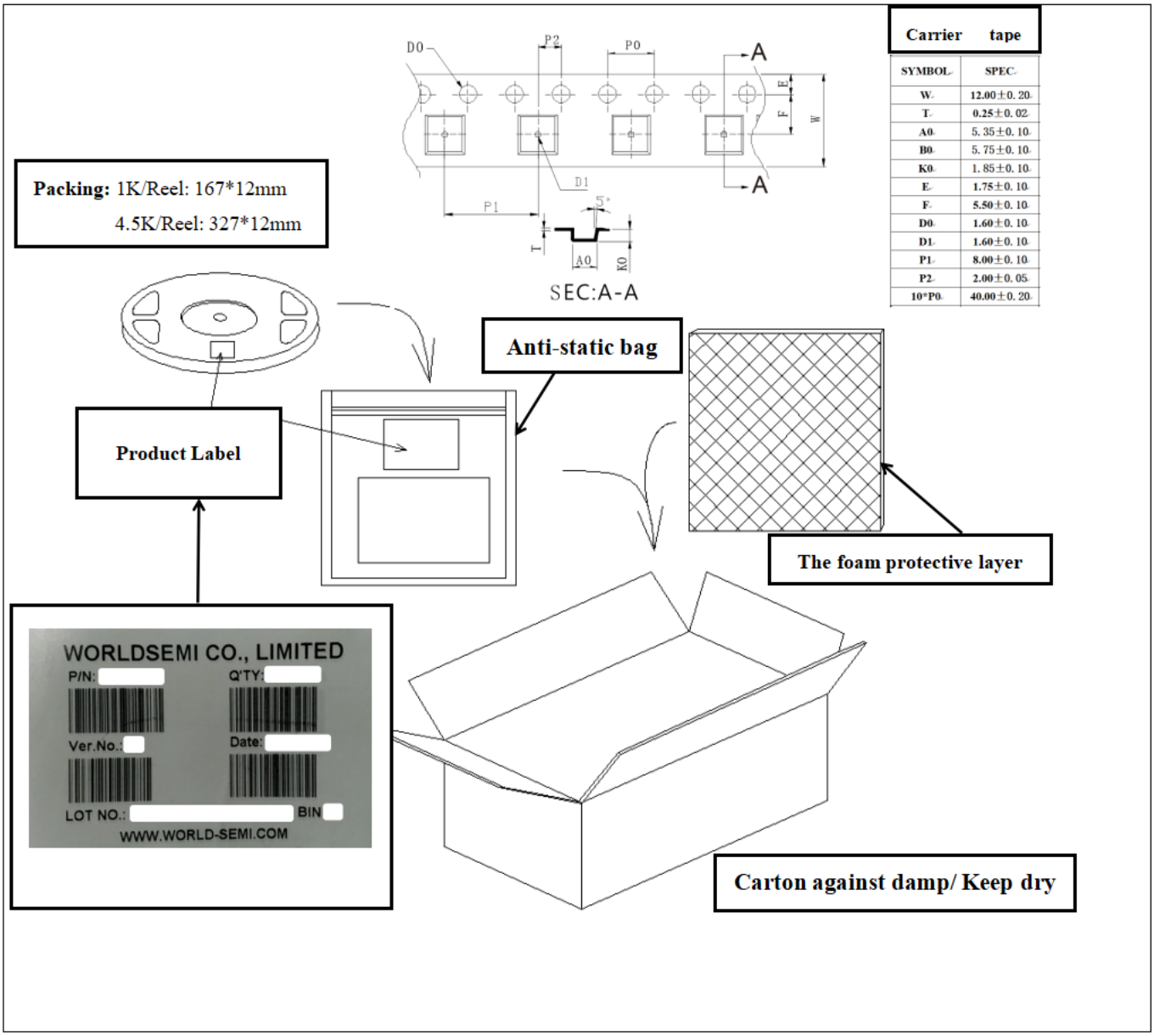


Remark:

1.DIN is the main input signal and BIN is the bypass input signal. Under normal circumstances, the IC extracts signals from the DIN. When one IC among them is damaged, the latter IC extracts the signal from the BIN without affecting the signal transmission of the subsequent ICs.

2. For the finished product application, the BIN pin of the first IC can't be left floating. It is recommended to connect it to GND.

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°C160%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℃≧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℃, 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;**

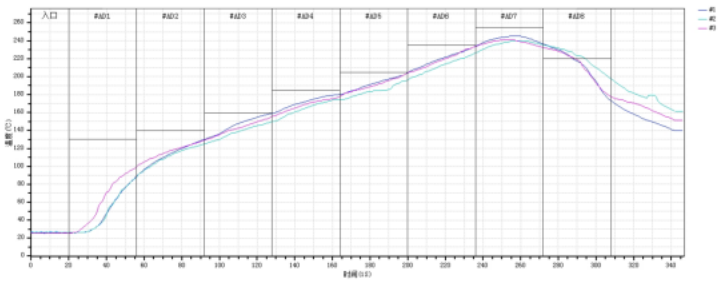
2.3.4 Bulk material LED, such as production surplus, machine material, maintenance material, can not be used directly if exposed to the air for a long time. It is recommended to be dehumidified and dried before being used.

Whole reel baking: 70～75℃* ≧24H or bulk led baking: 120℃*4H.

3. SMT Reflow

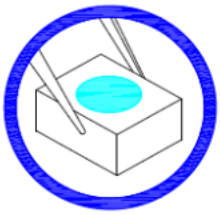
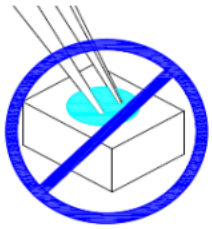
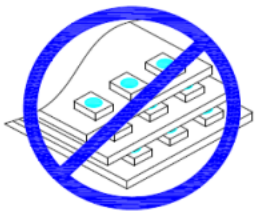
Refer to the parameters listed below, the experimental results prove that the TOP SMD LED meets the JEDEC J-STD-020C standards. As a general guideline, it is recommended to follow the SMT reflow temperature curve recommended by the solder paste manufacturer.

Curve Description	Lead-free
30℃ ~ 150℃ preheating slope	1～4 ℃/s
30°C ~ 150°C preheating time	60～120 s
150°C to 200°C constant temperature slope	0～3 ℃/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 ℃/s
Reflow soldering time	45-90 s
Cooling Rate	-4～0 ℃/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	20260828	Chen YongZhao	Yin HuaPing

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