LIGITEK

LED SMD

LG-4516FRGB-T20A-A02

DATA SHEET
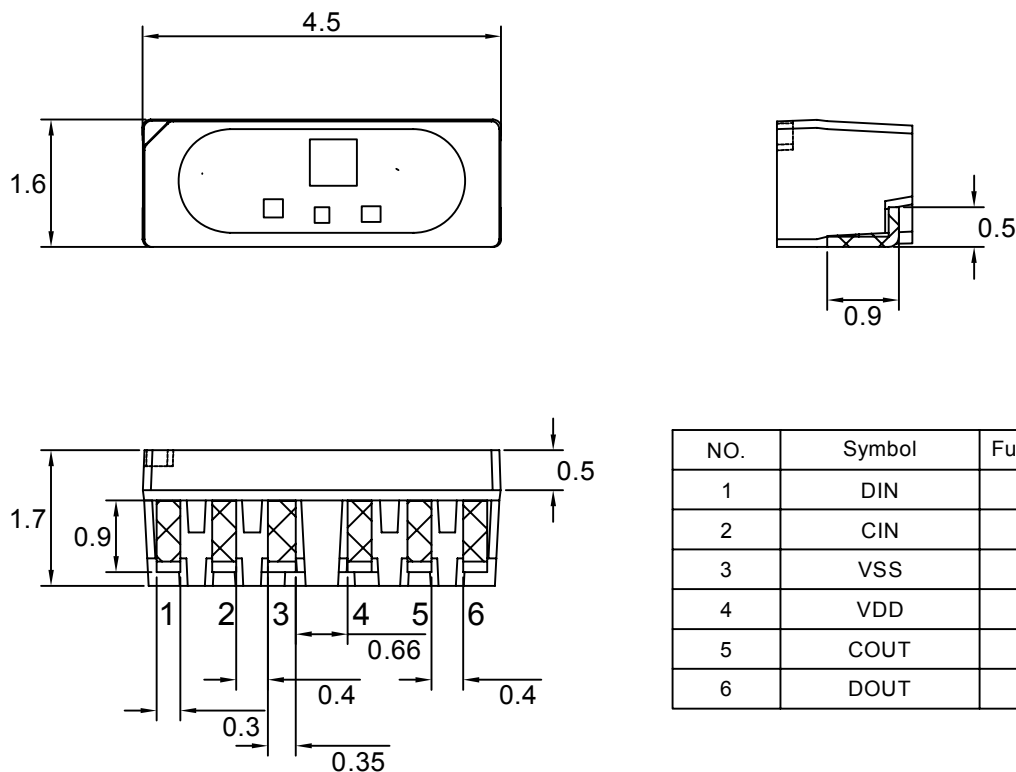
DOC. NO : QW0905-LG-4516FRGB-T20A-A02

REV. : B
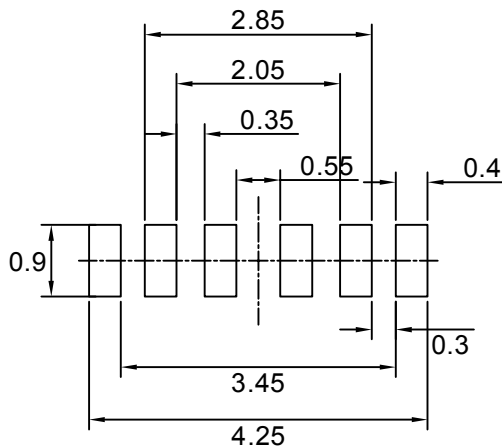
DATE : 25 - May. - 2021

Package Dimensions

NO.	Symbol	Function Description
1	DIN	Serial data input
2	CIN	Clock in
3	VSS	Ground
4	VDD	DC power input
5	COUT	Clock output
6	DOUT	Serial data outupt

Note : 1.All dimension are in millimeter tolerance is ±0.2mm unless otherwise noted.
　　　　2.Specifications are subject to change without notice.

Recommended Soldering Pad Dimensions

Note : The tolerances unless mentioned is ±0.1mm,Angle±0.5. Unit=mm.
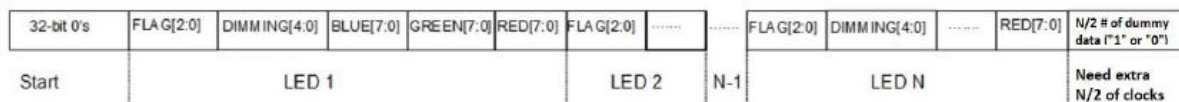
Absolute Maximum Ratings
(Ta=25°C, VDD=5V, VSS=0)

| Parameter	Symbol	Ratings	UNIT
Supply Voltage	VDD	6.5	V
Operating Temperature	Topr	-40~ +85	℃
Storage Temperature	Tstg	-40 ~ +85	℃

Typical Electrical & Optical Characteristics (Ta=25°C)

Items	Symbol	Min.	Typ.	Max.	UNIT	CONDITION
Supply Voltage	VDD	3.3	5	5.5	V	
Operation Current	Ioc			1.5	mA	VDD=5V RGB off
Standby Current	Isleep		1		uA	
Logic input control DIN/CIN						
Input High "H"	VIH	2.7		VDD +0.4	V	
Input Low "L"	VIL	-0.4		1.0	V	
CIN Frequency	CFREQ			15	MHz	
CIN High pulse width	TckH	30			ns	
CIN Low pules width	TckL	30			ns	
DIN to CIN setup	Tsetup	10			ns	
DIN to CIN hold time	THold	5			ns	
Logic output DOUT/COUT						
Output High "H"	VOH	4.5				4mA@VDD=5V
Output Low "L"	VOL			0.4 VDD	V	4mA@VDD=5V

Command Set

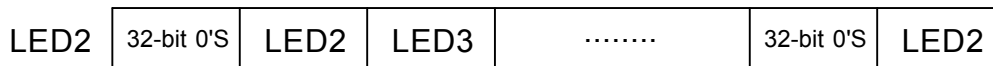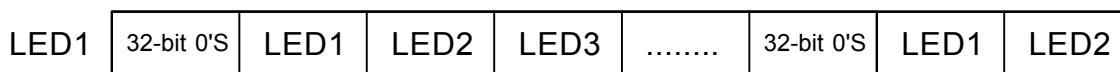| 32-bit 0's	FLAG[2:0]	DIMMING[4:0]	BLUE[7:0]	GREEN[7:0]	RED[7:0]	FLAG[2:0]	......		FLAG[2:0]	DIMMING[4:0]	......	RED[7:0]	N/2 # of dummy data ("1" or "0")
Start			LED 1				LED 2	N-1		LED N			Need extra N/2 of clocks

32 consecutive 0's denote the start of a command for an RGB LED. After receiving 32 0's, LED gets the following 32 bits as the received command, including FLAG, DIMMING, BLUE, GREEN and RED fields.
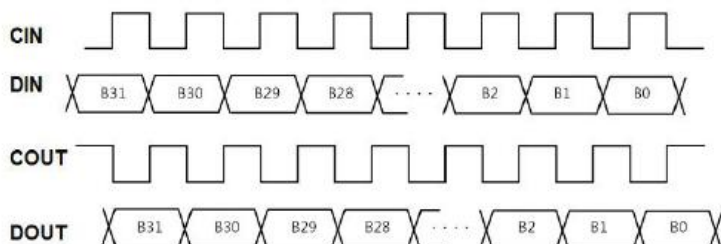
The serial command is transmitted with MSB first, DIN is latched at the rising edge of CIN clock. COUT and DOUT are re-generated for the next RGB LED. COUT is inverted from CIN. When 32 consecutive 0's are encountered, the next 1 is expected to start a 32-bit command, i.e., FLAG[2:0]=111. When FLAG[2:0]=111, then DIMMING, BLUE, GREEN and RED fields are latched respectively.

while the current 32-bit command is got, LED passes remaining command bits to the next RGB LED After the last one command is issued for the last LED (LED n), MCU should issue the extra N/2 numbers of clocks signal if there are N LED lamps totally connected in the strip to make sure the data transfer and display of the last one LED lamp is complete and correct.(the data for the extra N/2 # of clocks may be set as "0" or "1")。

LED1	32-bit 0'S	LED1	LED2	LED3	....	32-bit 0'S	LED1	LED2

LED2	32-bit 0'S	LED2	LED3	....	32-bit 0'S	LED2

FLAG[2:0] : 111 to start a 32-bit command

DIMMING[4:0] : 32-level current control for R/G/B drivers

BLUE[7:0] : 256 gray levels for blue LED

GREEN[7:0] : 256 gray levels for green LED

RED[7:0] : 256 gray levels for red LED

Sleep and power saving mode

LED supports the sleep/wake-up modes for power-saving purpose. In sleep mode, the built-in oscillator and associated circuitry will be disabled. The quiencent current of LED is approximately 1uA(typ.).

Command Setup to enable sleep or wake up mode

When recieving 24-bit 0's BGR data (that is BLUE[7:0]=8h00, G[7:0]=8h00, R[7:0]=8h00), in the meantime, both of the data in 3-bits' flag and 5-bits' DIMMING is 8h'A0' (that is FLAG[2:0]=3b101 and DIMMING[4:0]=5b00000), LED will enter sleep mode.

LED will wake up from sleep mode once receiving the new data with the data of Flag[2:0]、DIMMING[4:0] is not 8h"A0"; after wake-up,all sleeping circuits in LED return to normal working mode within 1ms. Since it takes 1ms for a sleeping LED returning to normal function mode, it is recommended for a host to wait for 1ms to send display data and command after issuing a wake-up command.

Sleeep power-saving mode example:

32 bits 0	Flag[2:0]=3'b101	Dimming[4]=5'b00000	Blue[8'h00]	Green[8'h00]	Red[8'h00]	Sleep mode

Case 1:

Lamp 1	Lamp 2	Lamp 3
1xx111118hFF8hFF8hFF	101000008h008h008h00	101000008h008h008h00
Normal mode	Sleep mode	Sleep mode

Case 2:

Lamp 1	Lamp 2	Lamp 3
1xx111118hFF8hFF8hFF	101000008h008h008h00	1xx111118h1F8h1F8h1F
Normal mode	Sleep mode	Normal mode

In case 2, while lamp2 is under sleep mode, in the following data transfer process, the state of lamp 2 will be not changed as long as the 32 bits data for lamp 2 is received with data of Flag[2:0]、DIMMING[4:0] being
8h"A0" . It means lamp2 will keep in sleep mode as well. In the situation, lamp2 can pass through the remaining
data to lamp 3 (32bits) to change the display data of lamp 3. In other words, the sleeping chip is able to pass the
data to the next chips.

## Electrical Optical Characteristics at Ta=25°C

Items	Symbol		Min.	Typ.	Max.	UNIT	CONDITION
Luminous Intensity	Iv		1680	----	3250	mcd	VDD = 5V
Dominant Wavelength	λD	R	----	622	----	nm	
		G	----	522	----		
		B	----	466	----		
Viewing Angle	2θ 1/2		----	120	----	deg	

1.The luminous intensity data did not including ±15% testing tolerance.
2.The dominant wavelength data did not including ±1nm testing tolerance

Luminous Intensity Classification

BIN CODE	Iv(mcd)	
	Min.	Max.
K1	1680	2100
K2	2100	2600
K3	2600	3250

# Chromaticity Coordinates Specifications For Bin Grading
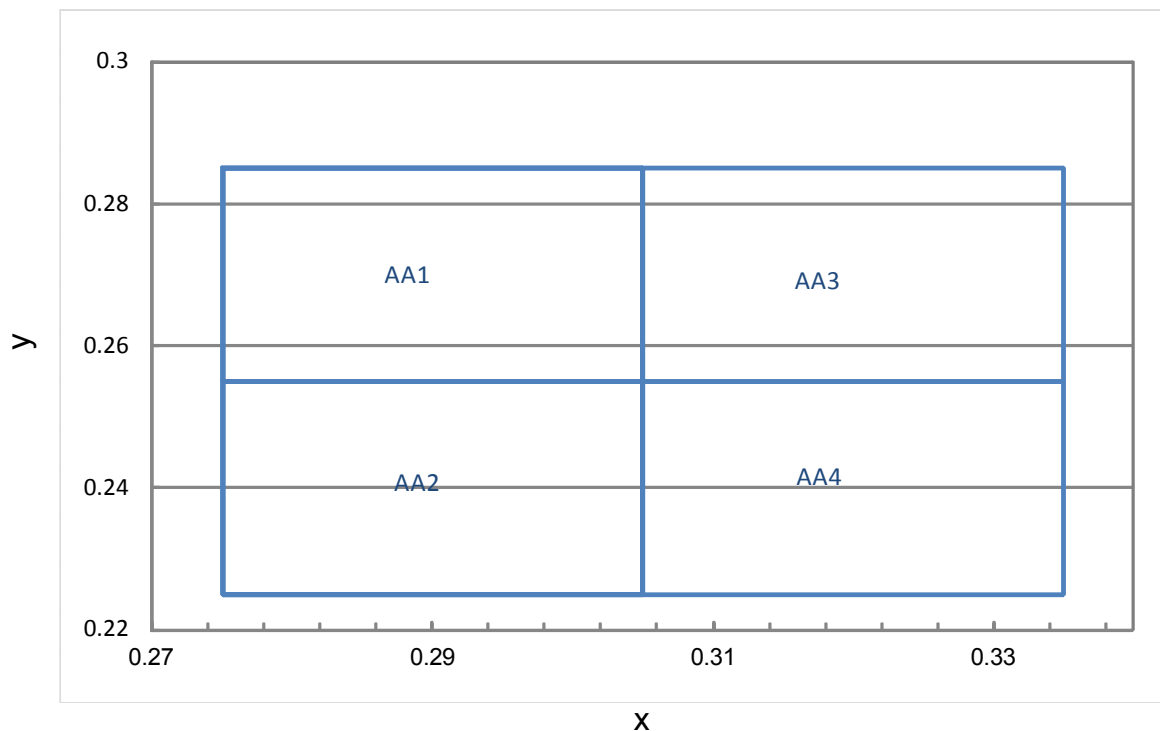
Color Coordiantes								
BIN CODE	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
AA1	0.275	0.255	0.275	0.285	0.305	0.285	0.305	0.255
AA2	0.275	0.225	0.275	0.255	0.305	0.255	0.305	0.225
AA3	0.305	0.255	0.305	0.285	0.335	0.285	0.335	0.255
AA4	0.305	0.225	0.305	0.255	0.335	0.255	0.335	0.225

Carrier Type Dimensions

4.0　　2.0　　ø1.5

1.5

4.8

1.8

12.0

1.75

5.5

4.0　　1.9
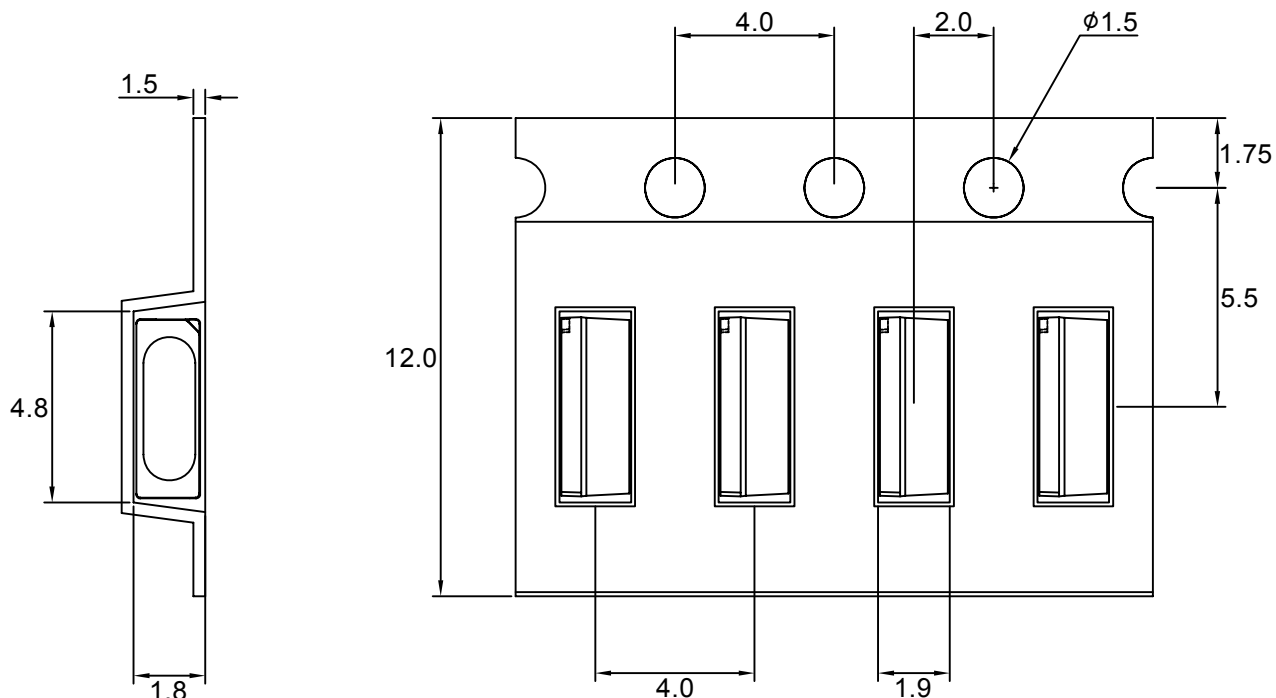
Note : The tolerances unless mentioned is ±0.1mm,Angle± 0.5. Unit=mm.

- Packing　Specifications

Label

Aluminum Moist-Proof bag
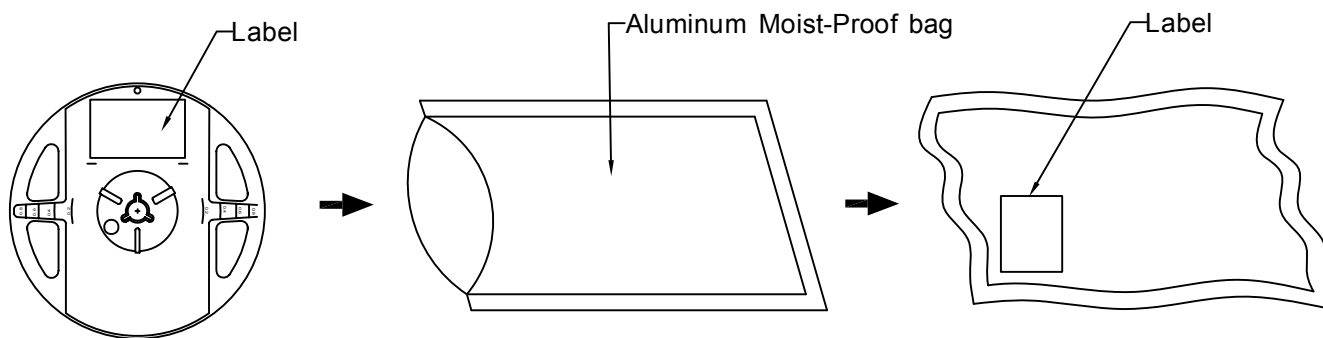
Label

Part No.	Description	Quantity/Reel
LG-4516FRGB-T20A-A02	12.0mm tape,7"reel	2000 PCS

Label Explanation

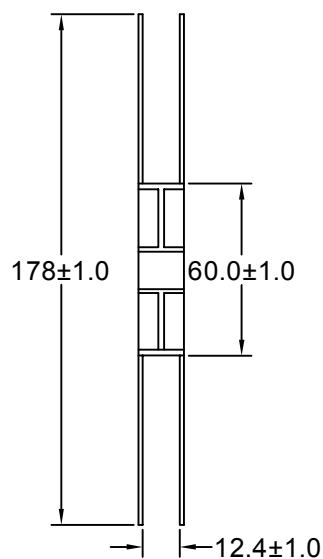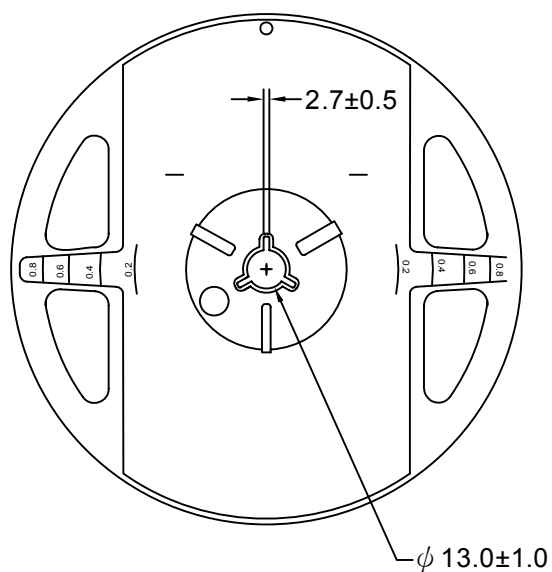|	
Pb (crossed out)	**LIGITEK ELECTRONICS CO., LTD.**
PART :	LG-4516FRGB-T20A-A02
LOT :	GS11730168
QTY(PCS):	2000
BIN/HUE :	K1/AA1

BIN : Luminous Intensity

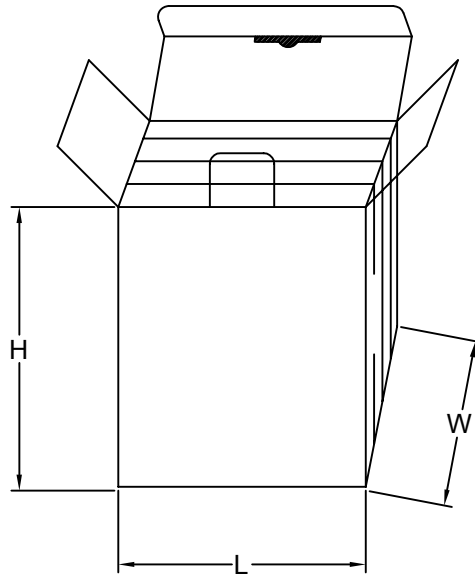HUE : Chromaticity Coordinates
(CIE_x , CIE_y)

VF : Forward Voltage

Reel Dimensions

2.7±0.5

178±1.0

60.0±1.0

12.4±1.0

ϕ 13.0±1.0

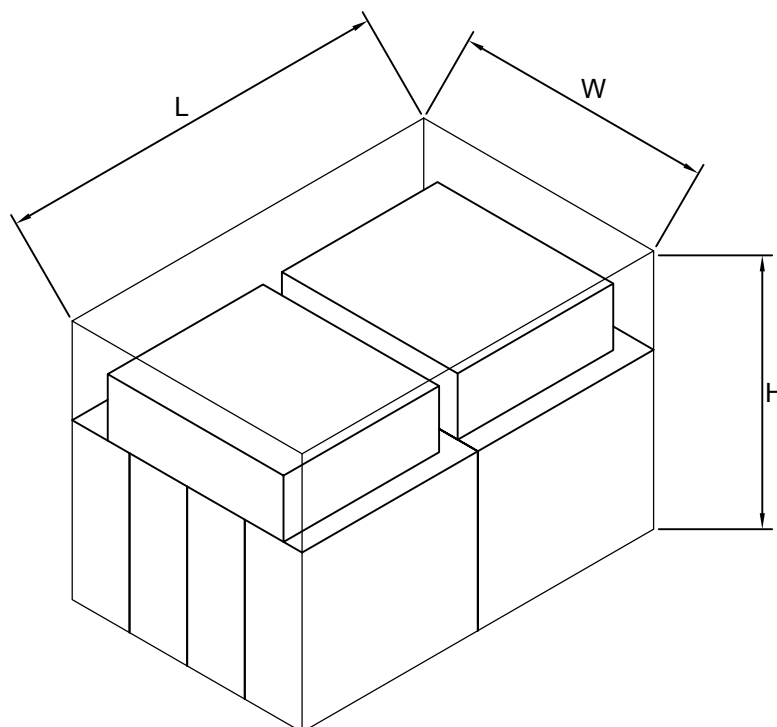0.8 0.6 0.4 0.2   0.2 0.4 0.6 0.8

Box Explanation

1. 4 BAG / INNER BOX

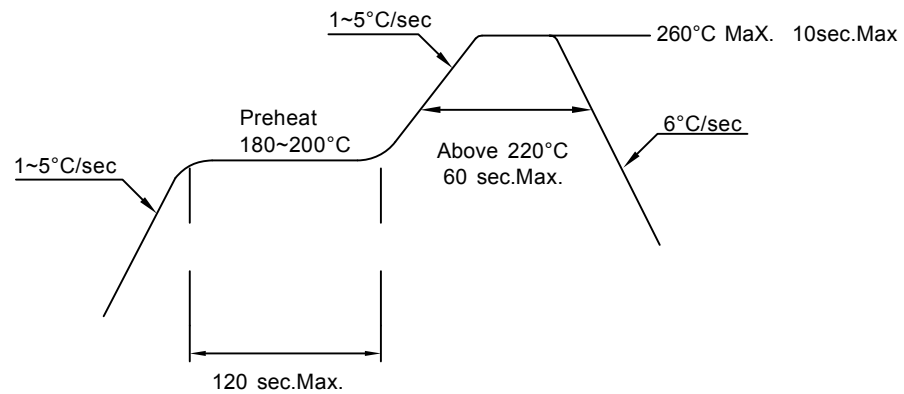2. INNER BOX SIZE : L X W X H   23cm X 8.5cm x 26cm

3. 10 INNER BOXES / CARTON

4. CARTON SIZE : L X W X H   58cm X 34cm x 35cm

Recommended   Soldering   Conditions

   1.   Hand Solder
      Basic spec is ≦ 280°C 3 sec one time only.

  2. PB-Free Reflow Solder

Note:

1.Reflow soldering should not be done more than two times.

2.When soldering,do not put stress on the LEDs during heating.

3.After soldering,do not warp the circuit board.

Precautions For Use:

Storage time:

1. Calculated shelf life before opening is 12 months at < 30°C and < 90% relative humidity (RH)
2. After bag is opened, devices which will be subjected to reflow soldering or other high temperature processes must be
   a) Assemblied within 168 hours in an environment of ≦ 30°C / 60% RH, or
   b) Stored at ambient of 10% RH or less
3. Devices are required baking before assembly if:
   a) Humidity Indicator Card reads >10% (for level 2a -5a)
      or >60% (for level 2) at ambient temperature 23±5°C
   b) 2.a) or 2.b) doesn't meet
4. If baking is required, devices should be baked for >72 hours at 60±5°C / 5% RH.Performing baking only once, and using the baked devices within 72 hours.
   MSL LEVEL 3

Typical Circuit of an RGB LED strip application
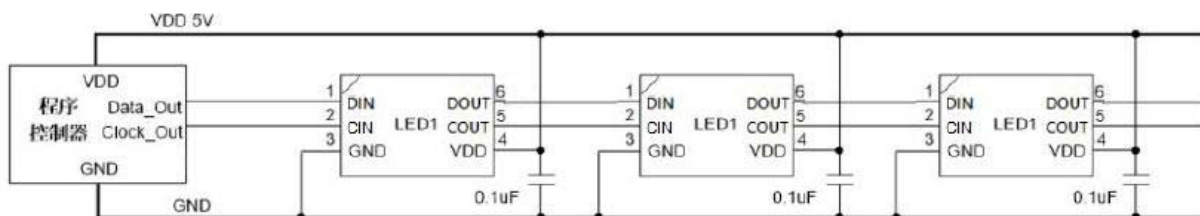
Cleaning:

Use alcohol-based cleaning solvents such as isopropyl alcohol to clean the LED.

ESD(Electrostatic Discharge):

Static Electricity or power surge will damage the LED. Use of a conductive wrist band or anti-electrosatic glove is recommended when handing these LED. All devices, equipment and machinery must be properly grounded.