

### Features

- 3210 with integrated high quality constant current IC and RGB LED chip.
- Built-in IC, with high precision of constant current and internal RGB chips spectral processing in advance.
- Single line data transmission (return to zero code).
- Specific Shaping Transmit Technology - number of LED stacked is not restricted.
- Cascading Enhancement Technology - any 2 LED spacing can be up to 10 meters
- Data transfer rate of 800 kbp/s at 30 frames per second.
- RGB output port PWM control can achieve 256 grey level adjustments.
- Upon powering up, IC performs self-inspection then lights connection on the pin B lamp.
- MSL level 4

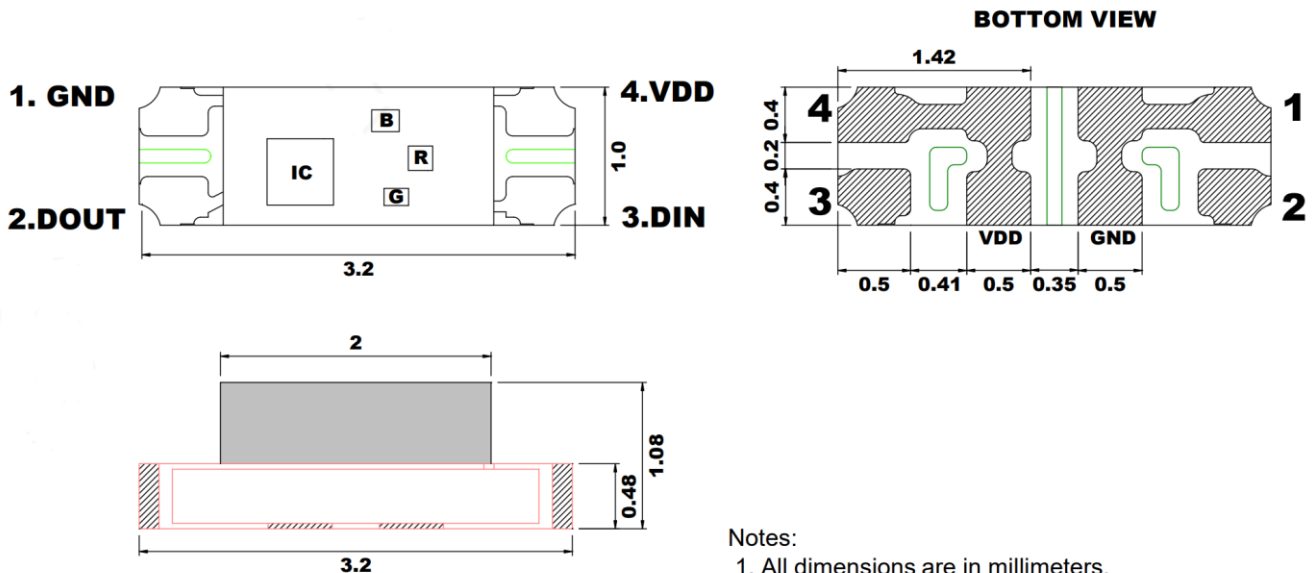
### Description

The IN-PI3210TFS5URGB is 3.2\*1.0\*1.08mm RGB LED with integrated IC. It is a side view SMD type LED with flat diffused lens which can be used in various applications.

### Applications

- Full color LED string light
- LED full color module
- LED guardrail tube
- LED scene lighting
- LED point light
- LED pixel screen
- LED shaped screen

### Package Outline Dimensions & Pin Configuration



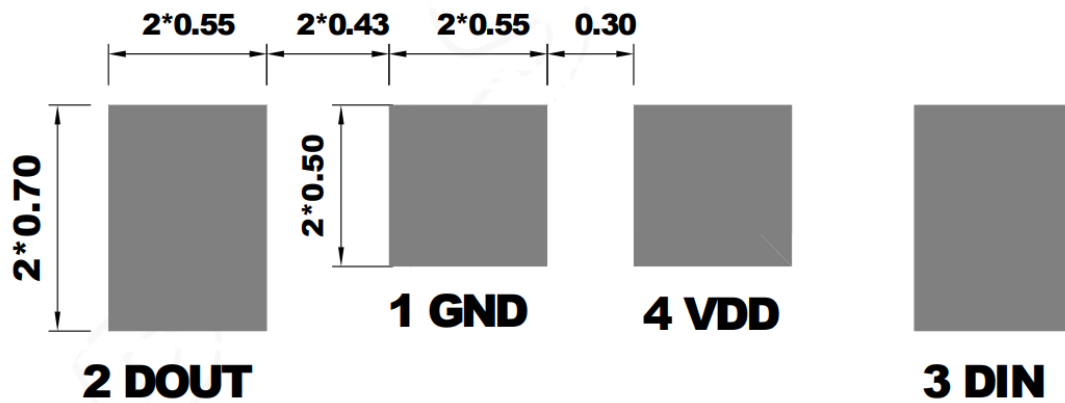
- Notes:
1. All dimensions are in millimeters.
  2. Tolerance is  $\pm 0.1$ mm unless otherwise noted

**Figure 1. IN-PI3210TFS5URGB Package Outline Dimensions**

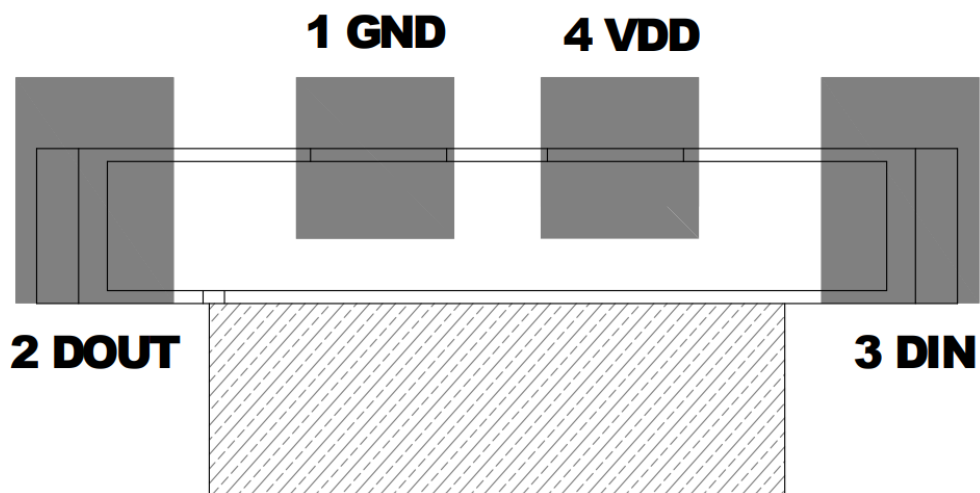
### Pin Configuration

Number	Symbol	Function Description
1	GND	Ground
2	DOUT	Control data signal output
3	DIN	Control data signal input
4	VDD	Power supply LED

### Recommended Dimensions for PCB



### Schematic diagram of the side mount



Notes:

1. Dimension in millimeter, tolerance is  $\pm 0.1$ mm unless otherwise noted.

**Absolute Maximum Rating** ( $T_a = 25\text{ }^\circ\text{C}$ ,  $V_{SS}=0V$ )

Parameter	Symbol	Range	Unit
Power supply voltage	$V_{DD}$	+3.7~+5.5	V
Logic input voltage	$V_{IN}$	-0.5 ~VDD+0.5	V
Operating temperature	$T_{OPT}$	-40 ~ +80	$^\circ\text{C}$
Storage temperature	$T_{STG}$	-40 ~ +80	$^\circ\text{C}$
ESD pressure(HBM)	$V_{ESD}$	2K	V
ESD pressure(DM)	$V_{ESD}$	200	V

**LED Characteristics** ( $T_a = 25^\circ\text{C}$ )

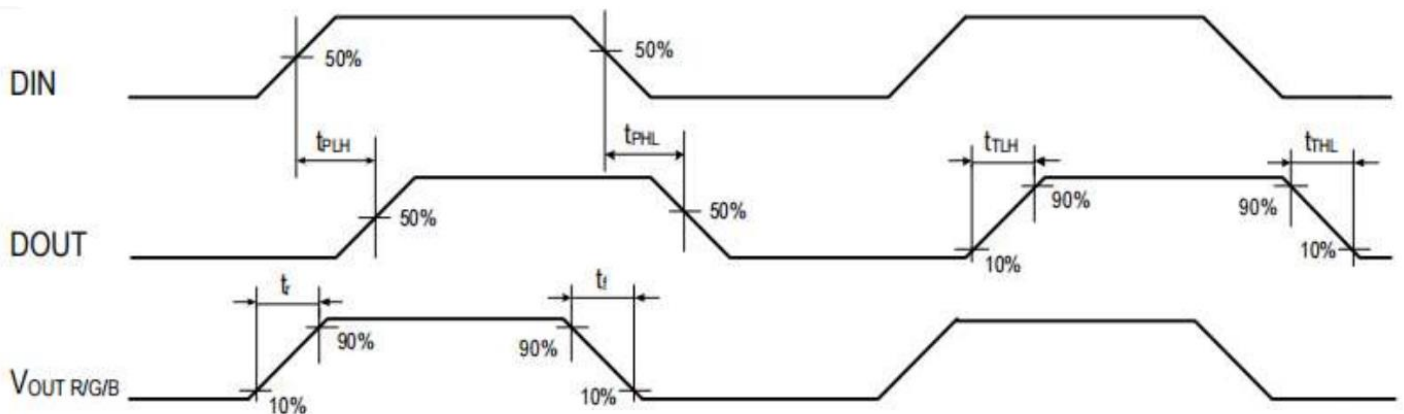
Color	IN-PI3210TFS5URGB	
	Wavelength(nm)	Light Intensity(mcd)
Red	620-630	60-120
Green	520-535	160-320
Blue	460-475	40-80

**Recommended Operating Ranges** (unless otherwise specified,  $T_a = -20 \sim +70 \text{ }^\circ\text{C}$ ,  $V_{DD} = 4.5 \sim 5.5\text{V}$ ,  $V_{SS} = 0\text{V}$ )

Parameter	Symbol	Min.	Typ.	Max	Unit	Test conditions
The chip supply voltage	$V_{DD}$	-	5.2	-	V	-
The signal input flip threshold	$V_{IH}$	$0.7 \cdot V_{DD}$	-	-	V	$V_{DD} = 5.0\text{V}$
	$V_{IL}$	-	-	$0.3 \cdot V_{DD}$	V	$V_{DD} = 5.0\text{V}$
The frequency of PWM	$F_{PWM}$	-	4.0	-	KHZ	-
Static power consumption	$I_{DD}$	-	0.25	-	mA	-

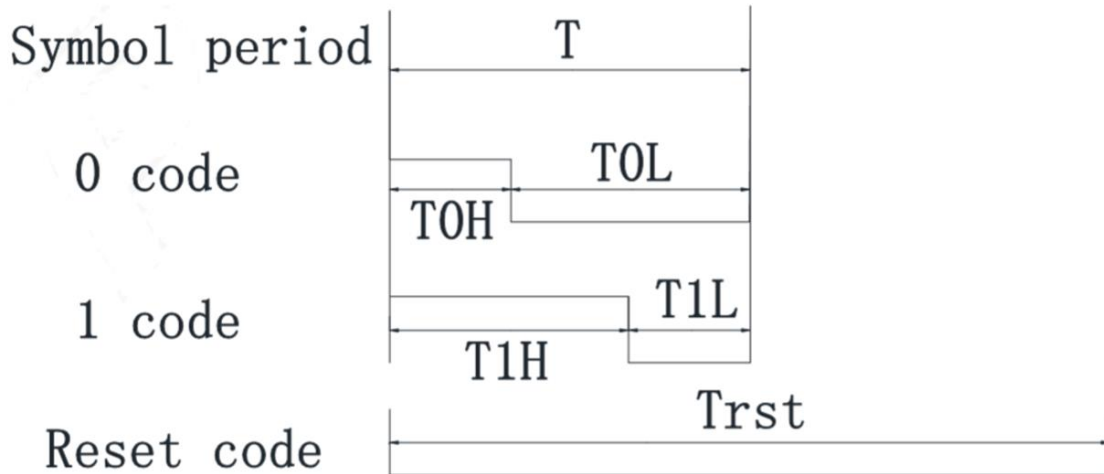
**Switching Characteristics** ( $V_{CC}=5V, T_a=25^{\circ}C$ )

Parameter	Symbol	Min.	Typ.	Max	Unit	Test conditions
The speed of data transmission	$f_{DIN}$	-	800	-	KHZ	The duty ratio of 67% (data 1)
DOUT transmission delay	$T_{PLH}$	-	100	-	ns	The load capacitance out of port to ground is 30pf, signal transmission delay from DIN to DOUT.
	$T_{PHL}$	-	100	-	ns	
$I_{OUT}$ Rise/Drop Time	$T_r$	-	200	-	ns	$I_{OUT} = 5mA$ , out R / g / B port series connection $200\ \Omega$ electric resistance to VDD, load capacitance to ground 30pF.
	$T_f$	-	280	-	ns	
DOUT Conversion time	$T_{TLH}$	-	15	-	ns	The load capacitance of dout port to ground is 30pF.
	$T_{THL}$	-	24	-	ns	



## Timing Waveforms

### 1. Input Code

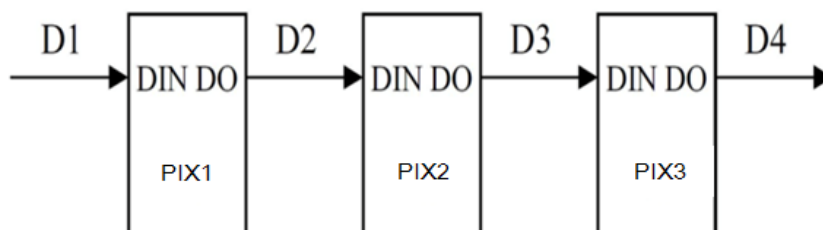


### 2. The data transmission time

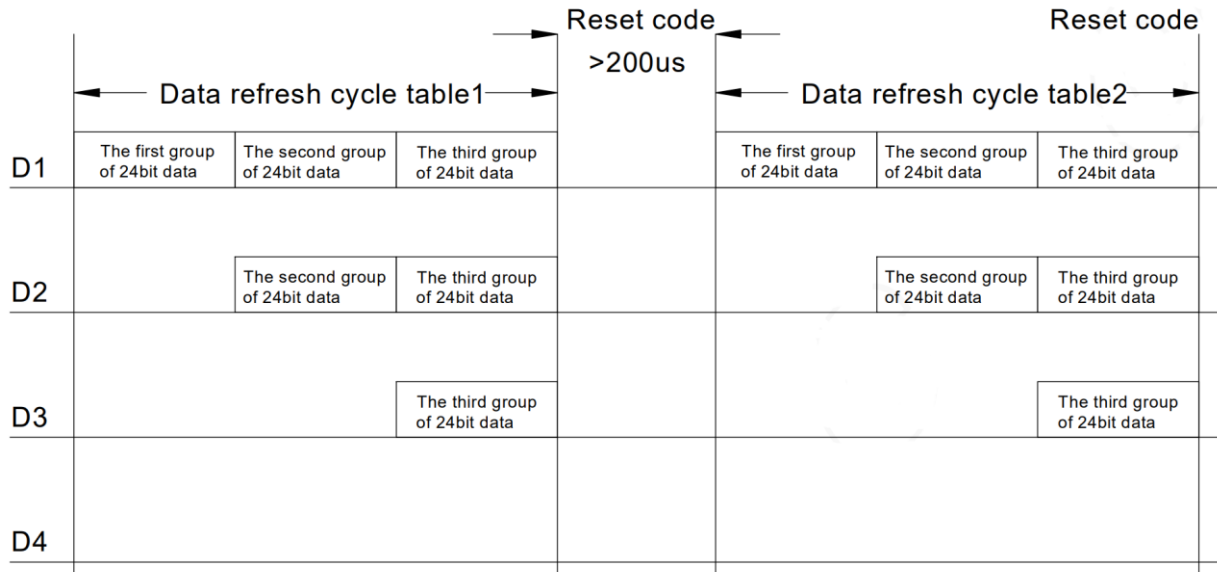
Name	Min	Standard Value	Max	Unit	
<b>T</b>	<b>Code Period</b>	<b>1.20</b>	-	$\mu s$	
<b>T<sub>0H</sub></b>	<b>0 code, high level time</b>	<b>0.2</b>	<b>0.3</b>	<b>0.4</b>	$\mu s$
<b>T<sub>0L</sub></b>	<b>0 code, low level time</b>	<b>0.8</b>	-	-	$\mu s$
<b>T<sub>1H</sub></b>	<b>1 code, high level time</b>	<b>0.65</b>	<b>0.75</b>	<b>1.0</b>	$\mu s$
<b>T<sub>1L</sub></b>	<b>1 code, low level time</b>	<b>0.2</b>	-	-	$\mu s$
<b>Trst</b>	<b>Reset code, low level time</b>	<b>&gt;200</b>	-	-	$\mu s$

- 1.The protocol uses a unipolar zeroing code. Each symbol must have a low level. Each symbol in this protocol starts with a high level. The high time width determines the "0" or "1" code.
- 2.When writing programs, the minimum symbol period is  $1.2\mu s$ .
- 3.The high time of "0" code and "1" code should be in accordance with the stipulated range in the above table. The low time requirement of "0" code and "1" code is less than  $20\mu s$ .

### 3. Connection Scheme



#### 4. Data Transfer Format



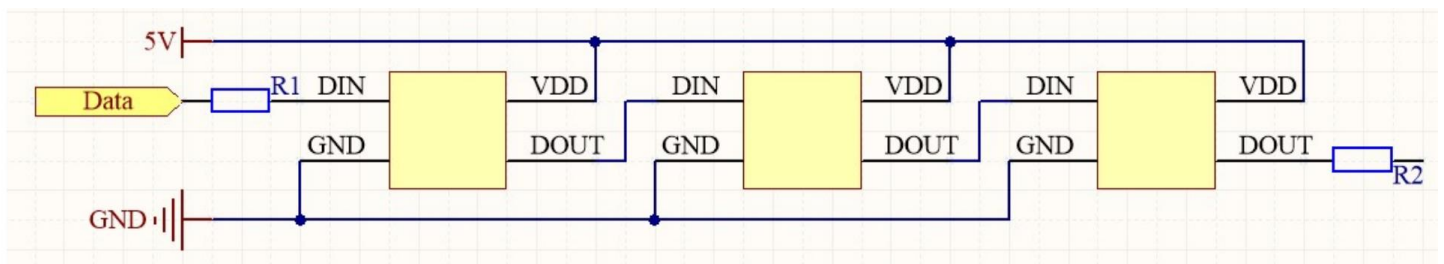
Note: the D1 sends data for MCU, D2, D3, D4 for data forwarding automatic shaping cascade circuit.

#### 5. 24-bit data format



Note: high starting, in order to send data (G7 - G6 - ..... ..B0)

### Typical Application Circuit



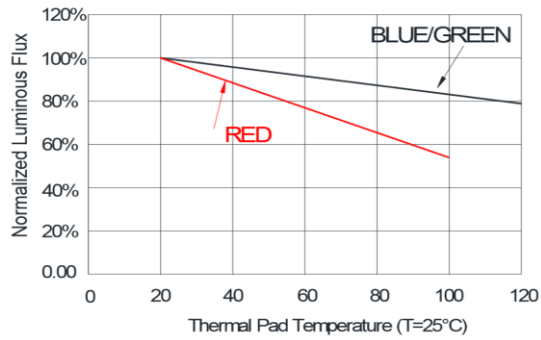
In the practical application circuit, the signal input and output pins of the IC signal input and output pins should be connected to the signal input and output terminals. In addition, in order to make the IC chip is more stable, even the capacitance between beads is essential back.

Application: used for soft lamp strip or hard light, lamp beads transmission distance is short, suggested in signal in time the clock line input and output end of each connected in series protection resistors, R1 of about 500 ohms.

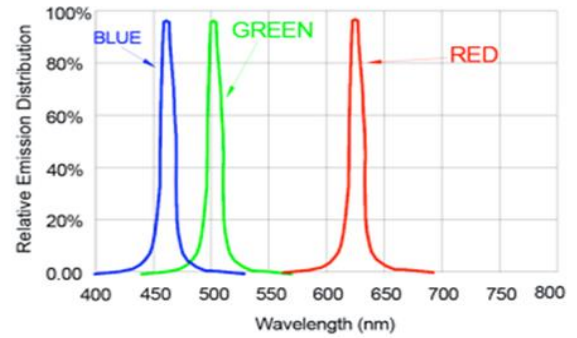
Application: for module or general special-shaped products, lamp beads transmission distance is long, because of different wire and transmission distance, in the signal in time clock at both ends of the line on grounding protection resistance will be slightly different, based on actual usage.

## LED Performance Graph

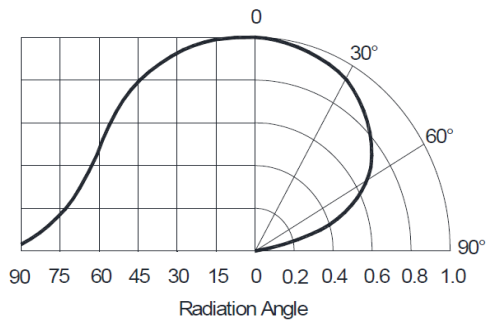
Thermal Pad Temperature vs. Relative Light Output



Wavelength Characteristics



Typical Radiation Pattern 120°

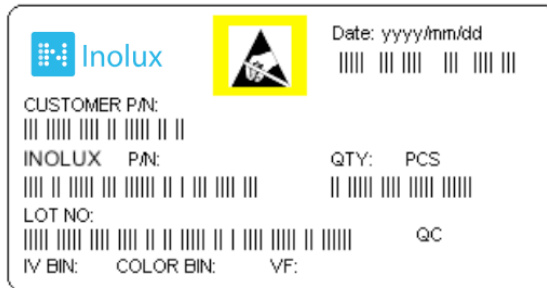




### Ordering Information

Product	Emission Color	Iv (mcd)	Orderable Part Number
IN-PI3210TFS5URGB	R	60-120	IN-PI3210TFS5URGB
	G	160-320	
	B	40-80	

### Label Specifications



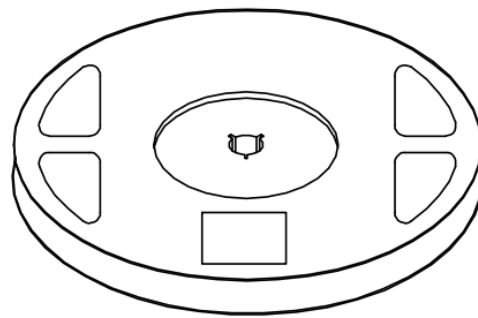
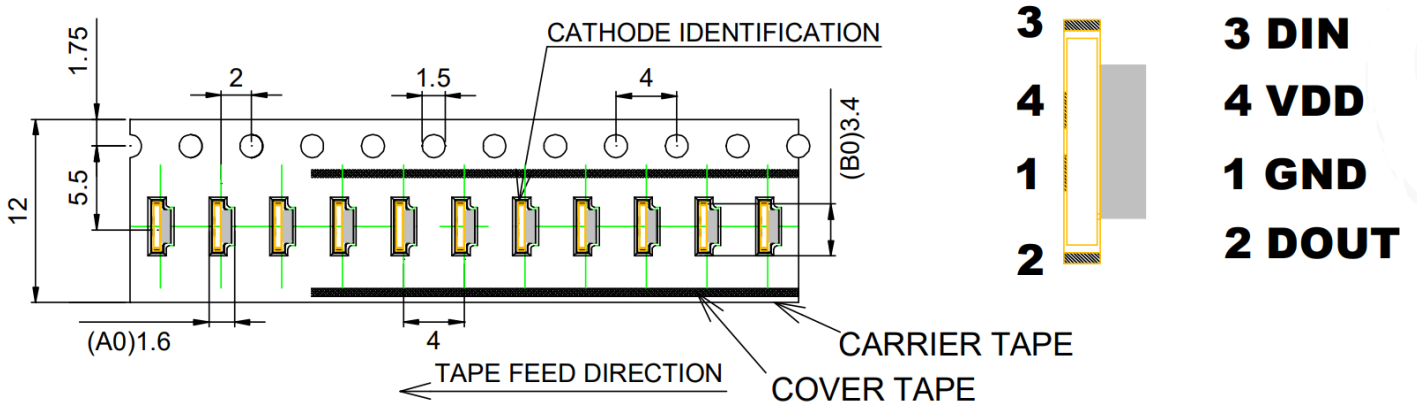
### Inolux P/N:

I	N	PI	-	3210	T	F	S	5	U	R	G	B	-	X	X	X	X
Product		Package	Die Qty.	Variation	Orientation	Current	Lens	Color	Color	Color	Customized Stamp-off						
Inolux		PI- Single trace IC PC- Clock Function IC		3210TF = 3.0 x 1.0 x 1.08 mm flat lens	S = Side Mount	5 = 5mA	U = Diffused	R = 624 nm G = 520 nm B = 470 nm									

### Lot No.:

Z	2	0	1	7	01	24	001
Internal Tracker	Year (2017, 2018, .....)				Month	Date	Serial

## Packaging



**REEL(178x12mm)**  
**(INNER 3000PCS LED MAX)**

## Precautions

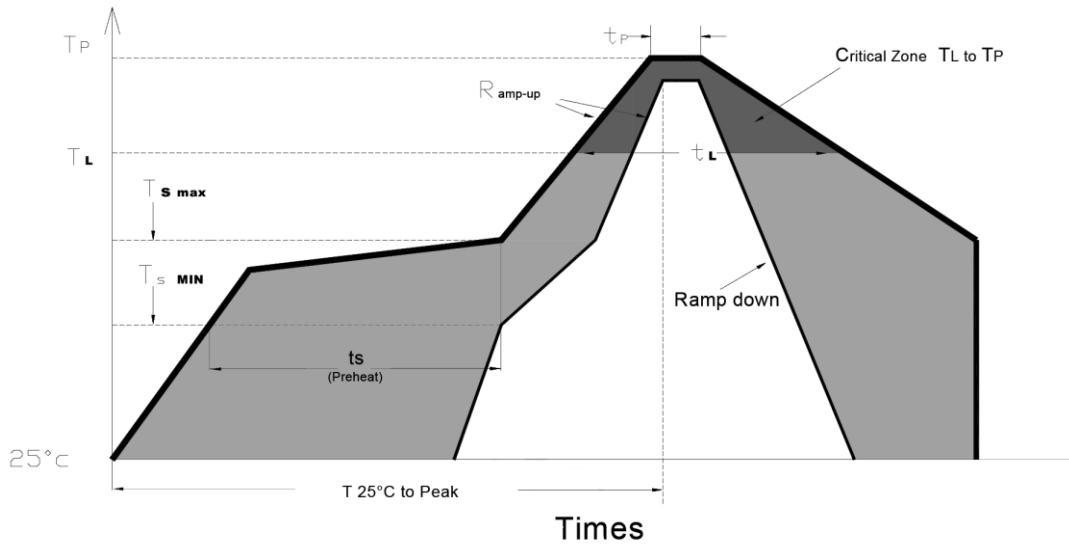
Please read the following notes before using the product:

### 1. Storage

- 1.1 Do not open moisture proof bag before the products are ready to use.
- 1.2 Before opening the package, the LEDs should be kept at 30°C or less and 80%RH or less.
- 1.3 The LEDs should be used within a year.
- 1.4 After opening the package, the LEDs should be kept at 30°C or less and 60%RH or less.
- 1.5 The LEDs should be used within 72 hours after opening the package.
- 1.6 If the moisture adsorbent material has fabled away or the LEDs have exceeded the storage time, baking treatment should be performed using the following conditions. Baking treatment: 60±5°C for 24 hours.

**2. Soldering Condition**

Recommended soldering conditions:



Profile Feature	Lead-Free Solder
Average Ramp-Up Rate ( $T_{s \max}$ to $T_p$ )	3°C/second max.
Preheat: Temperature Min ( $T_{s \min}$ )	150°C
Preheat: Temperature Min ( $T_{s \max}$ )	200°C
Preheat: Time ( $t_{s \min}$ to $t_{s \max}$ )	60-180 seconds
Time Maintained Above: Temperature ( $T_L$ )	217 °C
Time Maintained Above: Time ( $t_L$ )	60-150 seconds
Peak/Classification Temperature ( $T_p$ )	240 °C
Time Within 5°C of Actual Peak Temperature ( $t_p$ )	<10 seconds
Ramp-Down Rate	6°C/second max.
Time 25 °C to Peak Temperature	<6 minutes max.

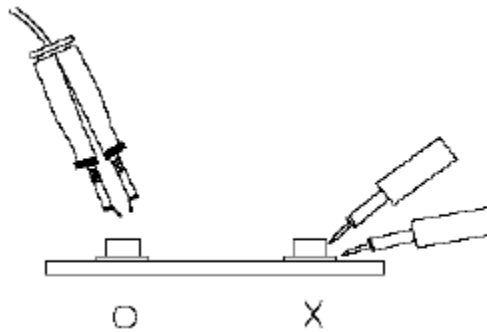
Note: Excessive soldering temperature and / or time might result in deformation of the LED lens or catastrophic failure of the LED.

### 3. Soldering Iron

Each terminal is to go to the tip of soldering iron temperature less than 260°C for 5 seconds within once in less than the soldering iron capacity 25W. Leave two seconds and more intervals, and do soldering of each terminal. Be careful because the damage of the product is often started at the time of the hand solder.

### 4. Repairing

Repair should not be done after the LEDs have been soldered. When repairing is unavoidable, a double-head soldering iron should be used (as below figure). It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.



### 5. Caution in ESD

Static Electricity and surge damages the LED. It is recommended to use a wristband or anti-electrostatic glove when handling the LED. All devices, equipment and machinery must be properly grounded.

## Revision History

Changes since last revision	Page	Version No.	Revision Date
Initial Release		1.0	07-03-2023

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