

### Features

- 5050 with integrated high quality constant current IC and RGBW LED chips.
- Built-in IC, with high precision of constant current and internal RGBW 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.
- RGBW 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.
- SA-I Anti-interference patent technology for single line data transmission.
- Built-in power supply reverse connect protection module, reversed power input will not damage the IC.

### Description

The IN-PI55QATPRPGPBPW-XX is 5.0\*5.0\*1.6mm RGBW LED with integrated IC. It is a SMD type LED 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

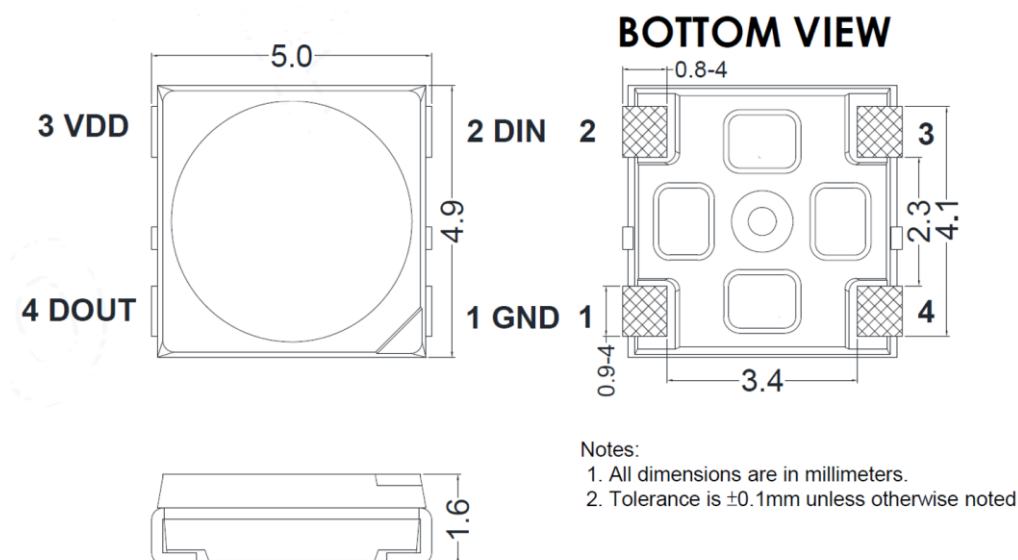
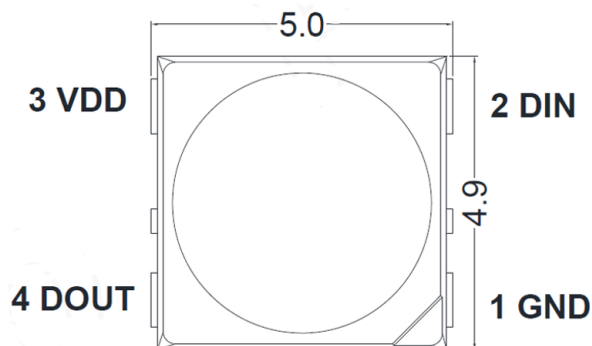


Figure 1. IN-PI55QATPRPGPBPW-XX Package Outline Dimensions

### Pin Configuration



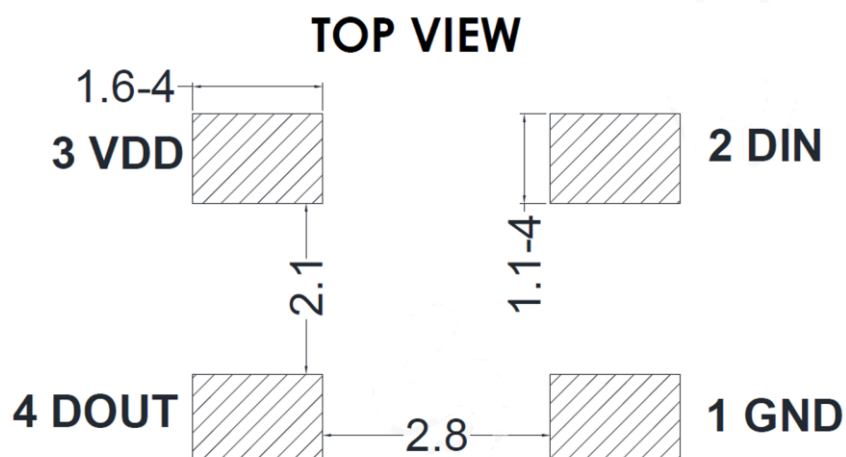
**Figure 2. IN- PI55QATPRPGPBPW-XX Pin Configuration**

**Notes:**

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

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

### Recommended dimensions for PCB products



**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
Working temperature	$T_{OPT}$	-40 ~ +85	$^{\circ}\text{C}$
Storage temperature	$T_{STG}$	-40 ~ +85	$^{\circ}\text{C}$
ESD pressure(HBM)	$V_{ESD}$	2K	V
ESD pressure(DM)	$V_{ESD}$	200	V

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

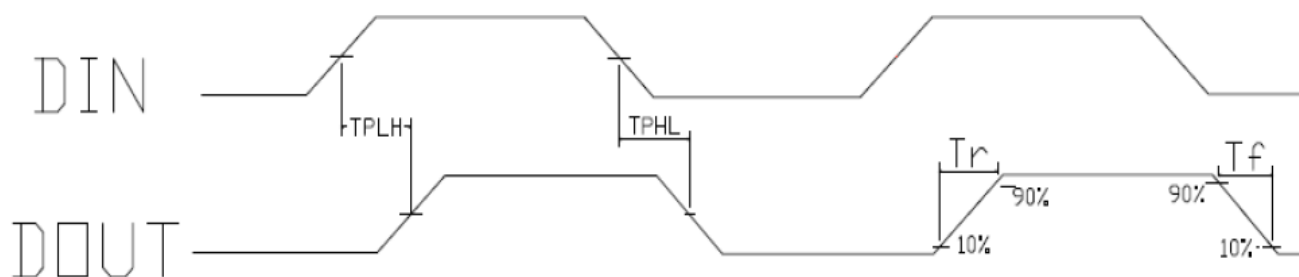
Color	12mA	
	Wavelength(nm)	Light Intensity(mcd)
Red	620-630	200-400
Green	515-530	700-1000
Blue	460-470	100-200
Cool White	6000K	1500-2200
Neutral White	4000k	1500-2200
Warm White	3000k	1500-2200

**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
Supply voltage	$V_{DD}$	-	5.2	-	V	-
The signal input flip threshold	$V_{IH}$	$0.7 \cdot V_{DD}$	-		V	$V_{DD} = 5.0\text{V}$
The signal input flip threshold	$V_{IL}$	-	-	$0.3 \cdot V_{DD}$	V	$V_{DD} = 5.0\text{V}$
The frequency of PWM	$F_{PWM}$	-	1.2	-	KHZ	-
Static power consumption	$I_{DD}$	-	1	-	mA	-

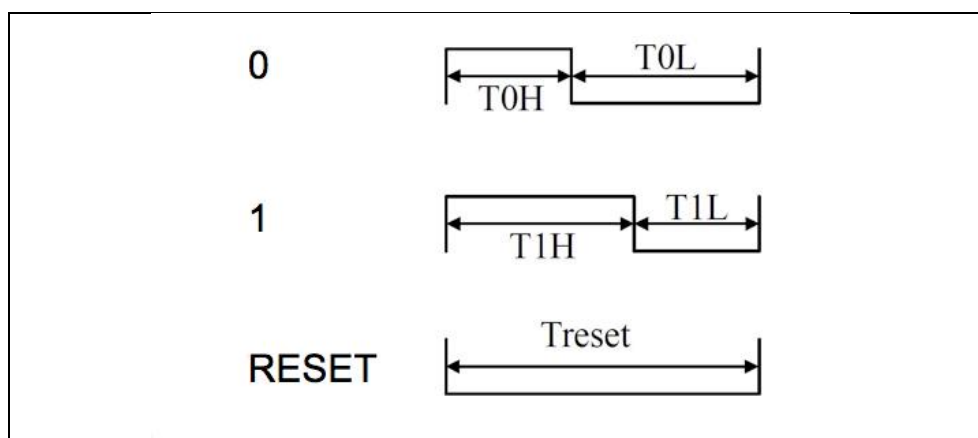
## Switching Characteristics (unless otherwise specified, $T_A=25\text{ }^{\circ}\text{C}$ )

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	$T_{PLH}$	-	-	500	ns	DIN→DOUT
	$T_{PHL}$	-	-	500	ns	
$I_{OUT}$ Rise/Drop Time	$T_r$	-	100	-	ns	V <sub>DS</sub> =1.5 $I_{OUT\ R/G/B}$ =8mA $I_{OUT\ W}$ =16.5mA
	$T_f$	-	100	-	ns	



## Timing Waveforms

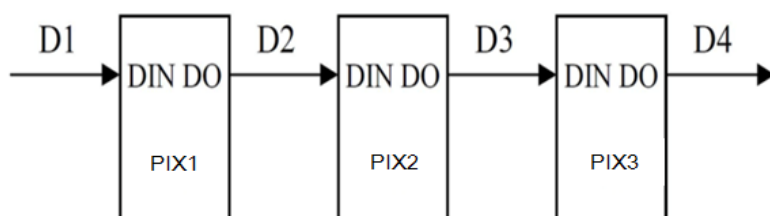
### 1. Input Code



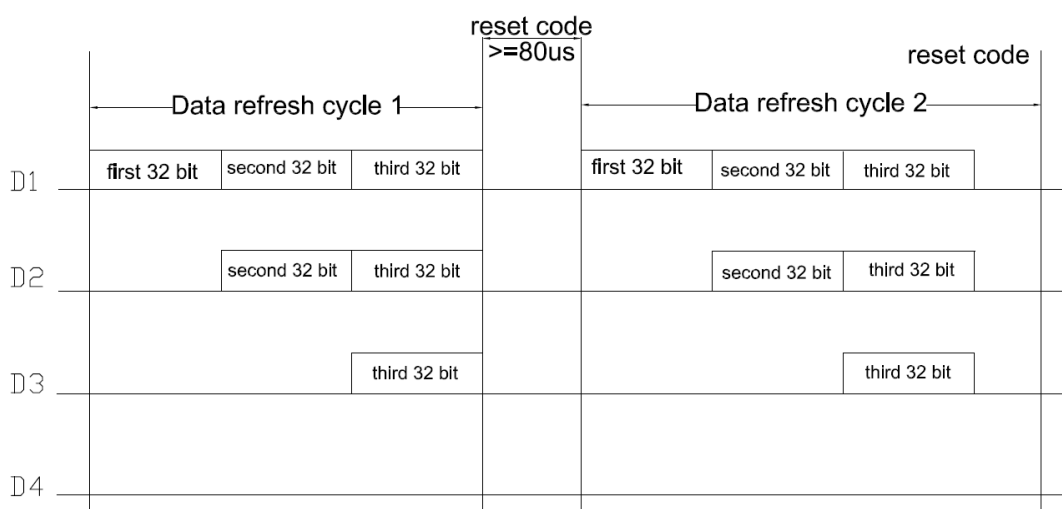
2. The data transmission time ( $T_H + T_L = 1.25\mu s \pm 600ns$ ):

Name		Min.	Standard value	Max.	Unit
<b>T</b>	<b>Code period</b>	<b>1.20</b>	--	--	$\mu s$
<b>T0H</b>	0 code, high level time	<b>0.2</b>	<b>0.3</b>	<b>0.4</b>	$\mu s$
<b>T0L</b>	0 code, low level time	<b>0.8</b>	--	--	$\mu s$
<b>T1H</b>	1 code, high level time	<b>0.62</b>	<b>0.75</b>	<b>1.0</b>	$\mu s$
<b>T1L</b>	1 code, low level time	<b>0.2</b>	--	--	$\mu s$
<b>Trst</b>	Reset code, low level time	<b>&gt;80</b>	--	--	$\mu s$

3. Connection Scheme



4. Data Transfer Format



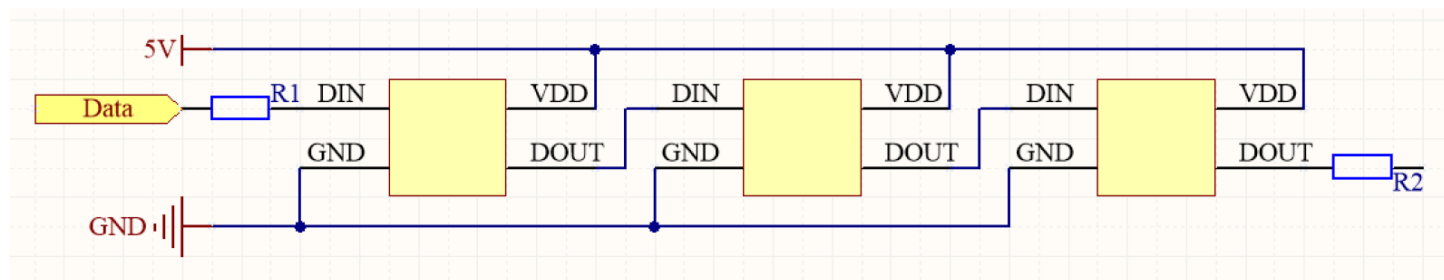
Note: the D1 sends data for MCU, D2, D3, D4 for data forwarding automatic shaping cascade circuit.

5. The data structure of 32bit

<b>G7</b>	<b>G6</b>	<b>G5</b>	<b>G4</b>	<b>G3</b>	<b>G2</b>	<b>G1</b>	<b>G0</b>	<b>R7</b>	<b>R6</b>	<b>R5</b>	<b>R4</b>
<b>R3</b>	<b>R2</b>	<b>R1</b>	<b>R0</b>	<b>B7</b>	<b>B6</b>	<b>B5</b>	<b>B4</b>	<b>B3</b>	<b>B2</b>	<b>B1</b>	<b>B0</b>
<b>W7</b>	<b>W6</b>	<b>W5</b>	<b>W4</b>	<b>W3</b>	<b>W2</b>	<b>W1</b>	<b>W0</b>				

Note: high starting, in order to send data (G7 - G6 - ..... W0)

## Typical Application Circuit

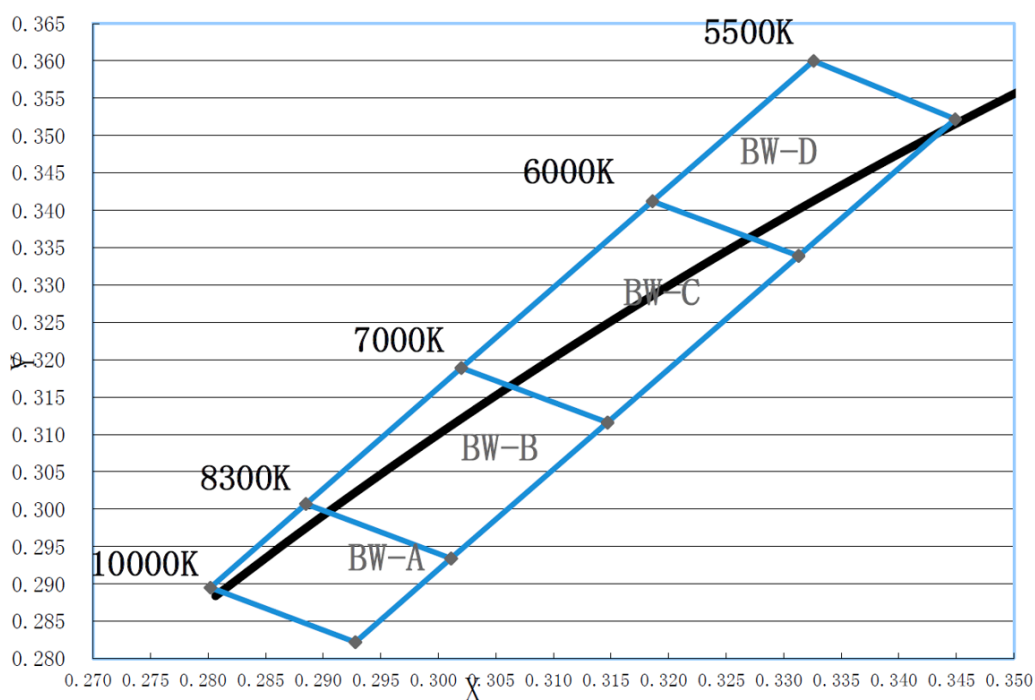


Product signal input and output must be connected in series with protection resistor R1. R1 depends on the size of the cascade amount, the greater the number of cascade, the smaller R1. The general recommended value is between 200-2K $\Omega$ , usually the recommended value is typical 500 $\Omega$ .

## Color Bin Specification

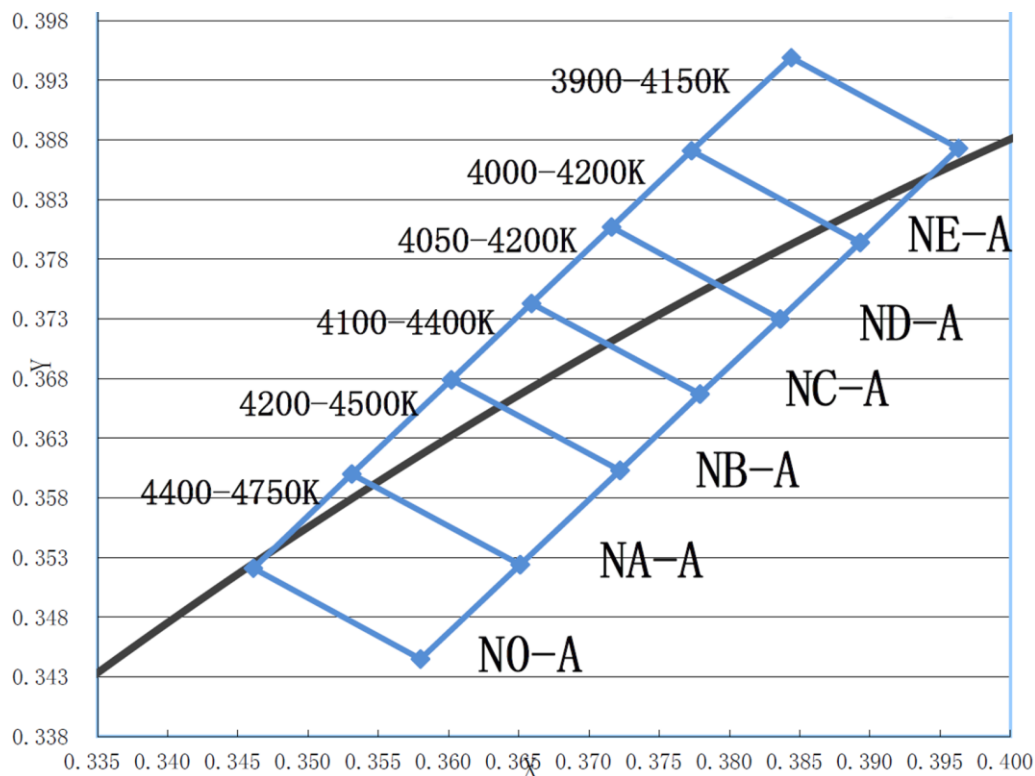
Name	Code	$\lambda_d$ MIN (nm)	$\lambda_d$ MAX (nm)
Red	R1	620	625
	R2	625	630
Blue	B5	460	465
	B6	465	470
Green	G2	515	520
	G3	520	525
	G4	525	530

## Cool White: 5000K~10000K

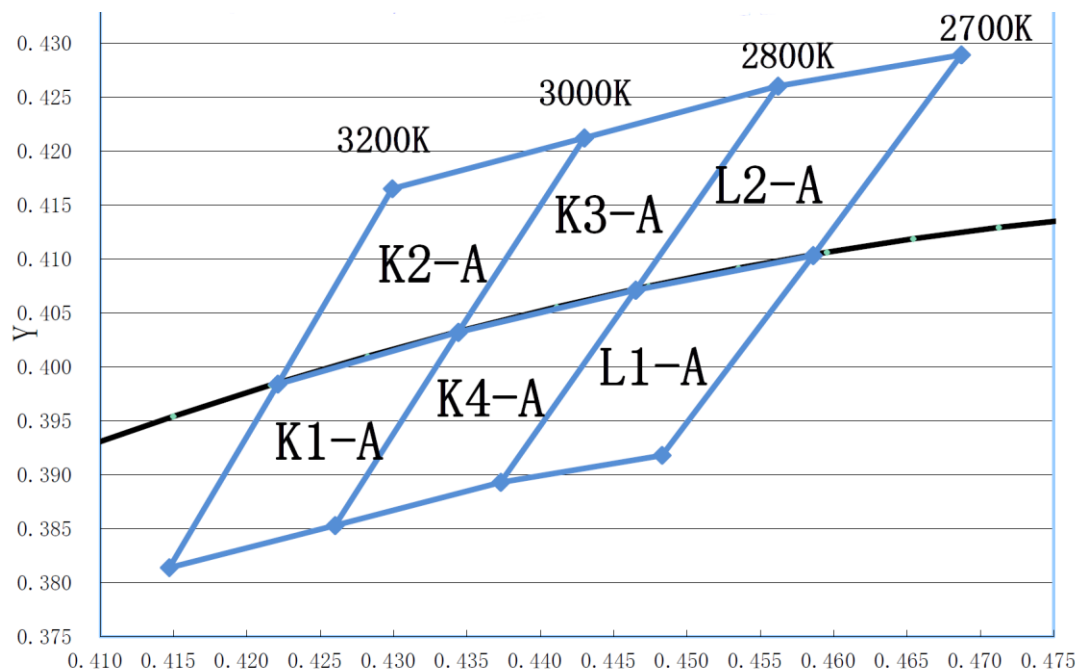


Name	X1	Y1	X2	Y2	X3	Y3	X4	Y4
BW-A	0.2928	0.2822	0.2802	0.2895	0.2885	0.3007	0.3011	0.2934
BW-B	0.3011	0.2934	0.2885	0.3007	0.302	0.3189	0.3147	0.3116
BW-C	0.3147	0.3116	0.302	0.3189	0.3186	0.3412	0.3313	0.3339
BW-D	0.3313	0.3339	0.3186	0.3412	0.3326	0.36	0.3449	0.3522



**Neutral White: 3500K~5000K**


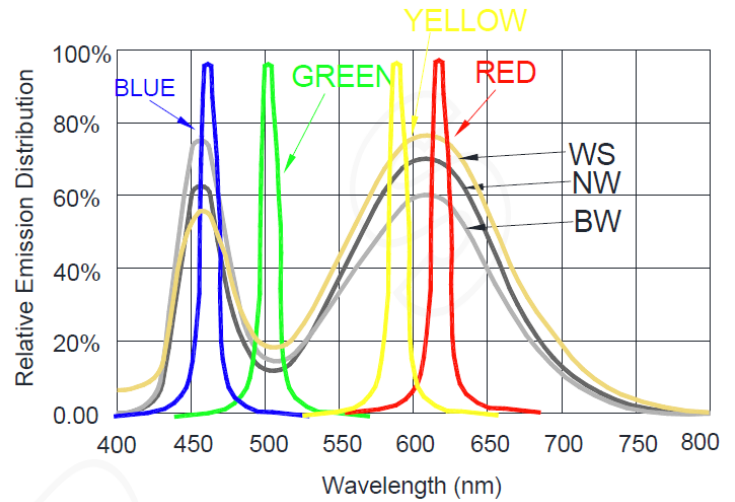
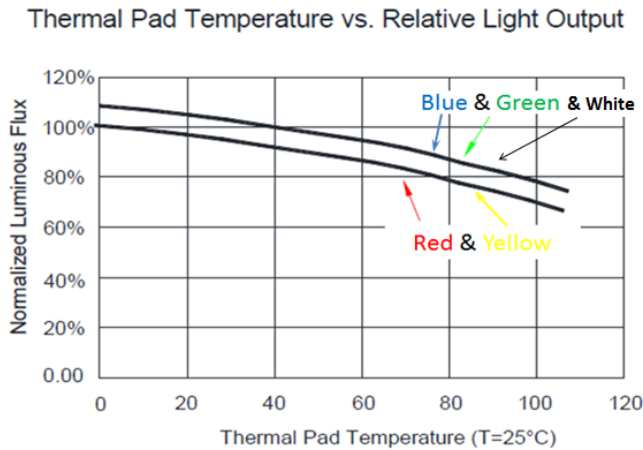
	X1	Y1	X2	Y2	X3	Y3	X4	Y4
NO-A	0.358	0.3445	0.3461	0.3521	0.3531	0.36	0.3651	0.3524
NA-A	0.3651	0.3524	0.3531	0.36	0.3602	0.3679	0.3722	0.3603
NB-A	0.3722	0.3603	0.3602	0.3679	0.3659	0.3743	0.3779	0.3667
NC-A	0.3779	0.3667	0.3659	0.3743	0.3716	0.3807	0.3836	0.373
ND-A	0.3836	0.373	0.3716	0.3807	0.3773	0.3871	0.3893	0.3794
NE-A	0.3893	0.3794	0.3773	0.3871	0.3844	0.3949	0.3963	0.3873

**Warm White: 2700K~3500K**


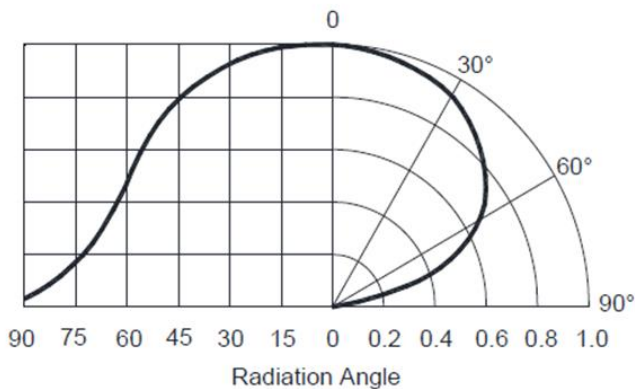
	X1	Y1	X2	Y2	X3	Y3	X4	Y4
K1-A	0.4344	0.4032	0.4221	0.3984	0.4147	0.3814	0.426	0.3853
K2-A	0.443	0.4212	0.4299	0.4165	0.4221	0.3984	0.4344	0.4032
K3-A	0.4562	0.426	0.443	0.4212	0.4344	0.4032	0.4465	0.4071
K4-A	0.4465	0.4071	0.4344	0.4032	0.426	0.3853	0.4373	0.3893
L1-A	0.4586	0.4103	0.4465	0.4071	0.4373	0.3893	0.4483	0.3918
L2-A	0.4687	0.4289	0.4562	0.426	0.4465	0.4071	0.4586	0.4103

## LED Performance Graph

Wavelength Characteristics





Typical Radiation Pattern 120°



## Ordering Information

Product	Emission Color	Iv (mcd) Typ.	Wavelength (Wd) / CCT Typ.	Orderable Part Number
IN-PI55QATPRPGBPBW-60	R	300	625	IN-PI55QATPRPGBPBW-60
	G	850	520	
	B	150	465	
	W	1850	6000k	
IN-PI55QATPRPGBPBW-40	R	300	625	IN-PI55QATPRPGBPBW-40
	G	850	520	
	B	150	465	
	W	1850	4000k	
IN-PI55QATPRPGBPBW-30	R	300	625	IN-PI55QATPRPGBPBW-30
	G	850	520	
	B	150	465	
	W	1850	3000k	

## Label Specifications

		Date: yyyy/mm/dd 
CUSTOMER P/N: 		
INOLUX P/N:	QTY:	PCS
LOT NO:		QC
IV BIN:	COLOR BIN:	VF:

## Inolux P/N:

I	N	PI	-	55	Q	A	T	(X)		-	XX	-	X	X	X	X
Inolux	Product			Package	Die Qty.	Variation	Orientation	Current	Color		Color Temperature of White		Customized Stamp-off			
	PI- Single trace IC PC- Clock Function IC			55QA = 5.0 x 5.0 x 1.6 mm			T = Top Mount	P=12mA 5 = 5mA	R = 624nm G = 520nm B = 470nm W = 2700K-7000K		60: Cool White 40: Neutral White 30: Warm White					

## Lot No.:

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

## Precautions

Please read the following notes before using the product:

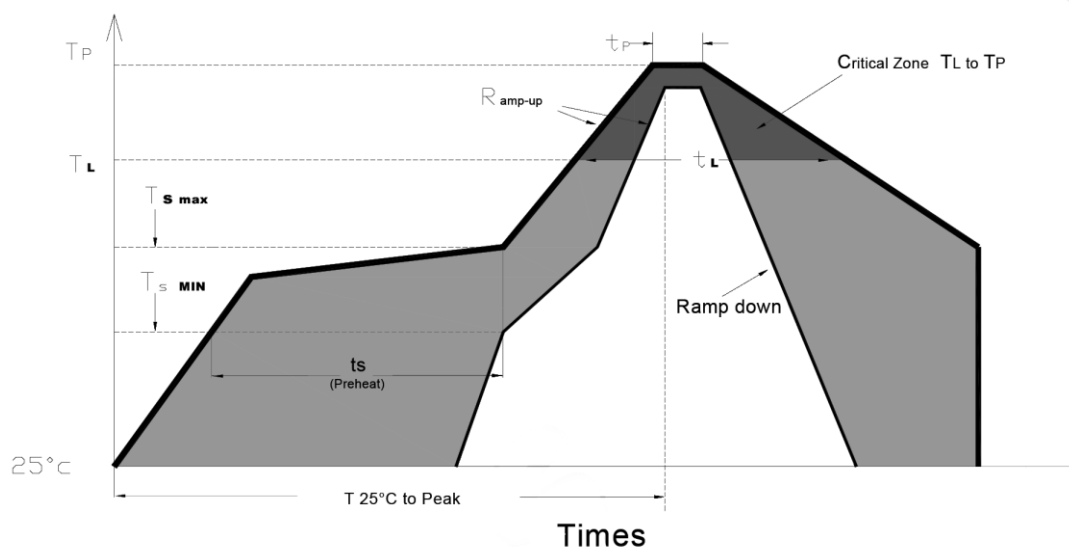
### 1. Storage

- 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 remaining LEDs should be kept in a resealed bag.
- 1.5 The LEDs require mandatory baking before usage. Baking treatment listed below.
- 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.

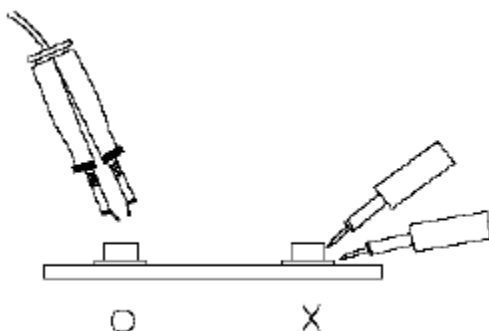
Note: Excessive soldering temperature and / or time might result in deformation of the LED lens or catastrophic failure of the LED.

### 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	05-31-2018
Format adjustment		1.1	07-01-2018
Format adjustment		1.2	08-06-2018
Revise precautions	14	1.3	07-31-2019
Revises the drawing and spec.	1-10	1.4	02-04-2021

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