

## 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-PI55QATPRPGBPW-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

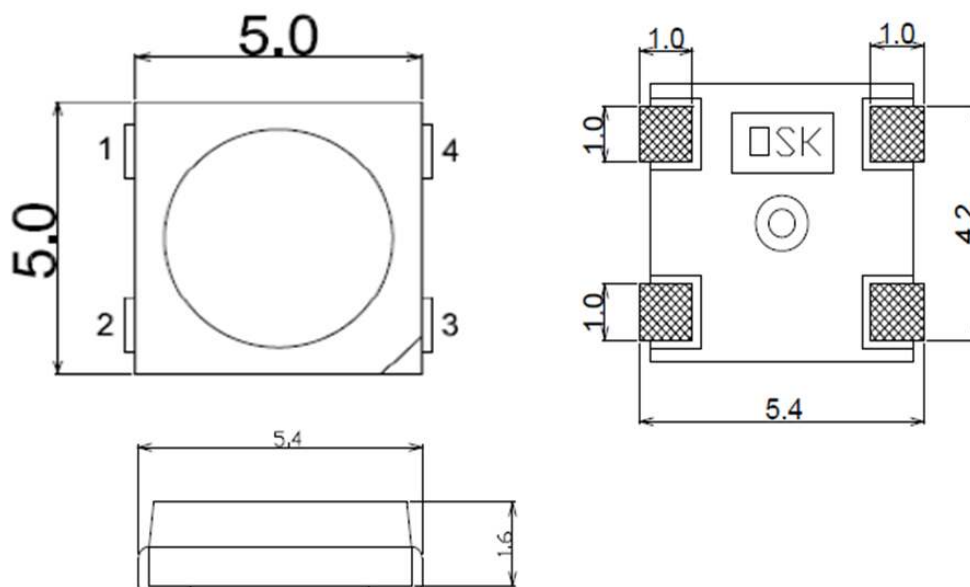


Figure 1. IN-PI55QATPRPGBPW-XX Package Outline Dimensions

### Pin Configuration

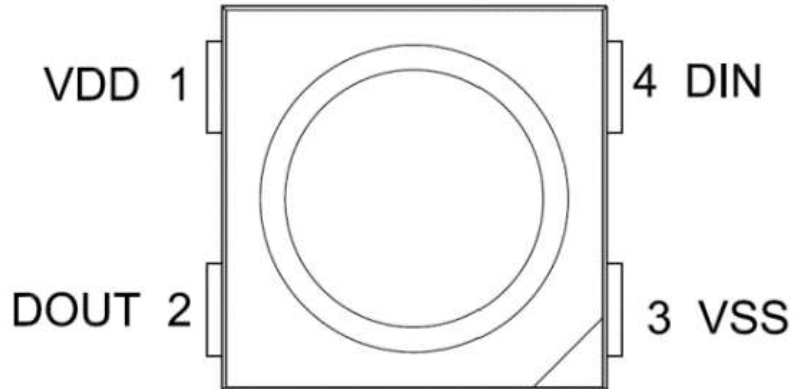


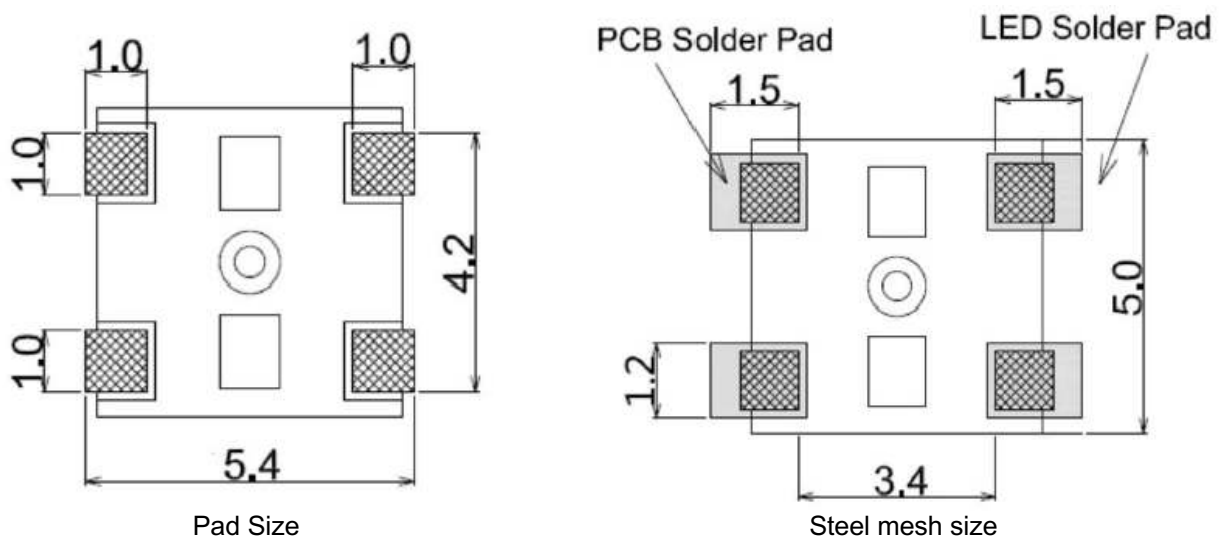
Figure 2. IN- PI55QATPRPGBPW-XX Pin Configuration

Notes:

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

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

### Soldering Pad Size



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

Parameter	Symbol	Range	Unit
Power supply voltage	$V_{DD}$	+3.5~+5.5	V
Logic input voltage	$V_{IN}$	-0.5 ~VDD+0.5	V
Working temperature	$T_{OPT}$	-45 ~ +85	$^\circ\text{C}$
Storage temperature	$T_{STG}$	-50 ~ +150	$^\circ\text{C}$
ESD pressure(HBM)	$V_{ESD}$	4K	V
ESD pressure(DM)	$V_{ESD}$	200	V

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

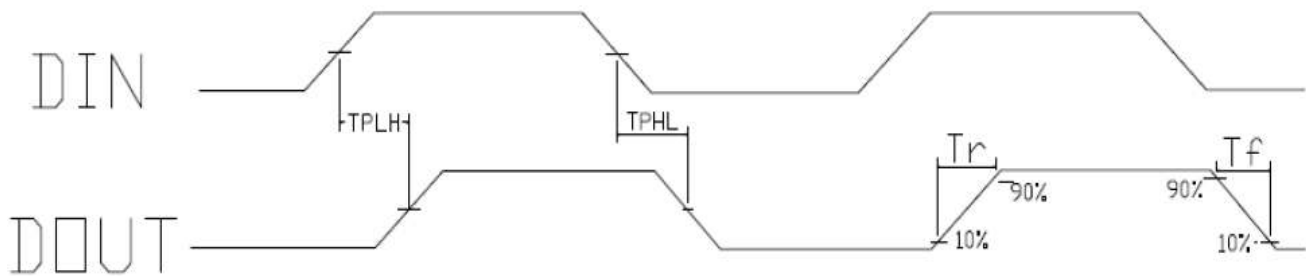
Color	12mA	
	Wavelength(nm)	Light Intensity(mcd)
Red	620-630	200-400
Green	515-530	700-1000
Blue	460-470	100-200
Cool White	6000K	1500-2200
Neutral White	4000k	1500-2200
Warm White	3000k	1500-2200

**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	$V_{DD}$	3.5	5.2	5.5	V	-
R/G/B port pressure	$V_{DS, MAX}$	-	-	26	V	-
DOUT drive capability	$I_{DOH}$	-	49	-	mA	maximum source current
DOUT drive capability	$I_{DOL}$	-	-50	-	mA	maximum sink current
The signal input flip threshold	$V_{IH}$	$0.7*V_{DD}$	-		V	$V_{DD} = 5.0\text{V}$
The signal input flip threshold	$V_{IL}$	-	-	$0.3*V_{DD}$	V	$V_{DD} = 5.0\text{V}$
The frequency of PWM	$F_{PWM}$	-	1.2	-	KHZ	-
Static power consumption	$I_{DD}$	-	1	-	mA	-

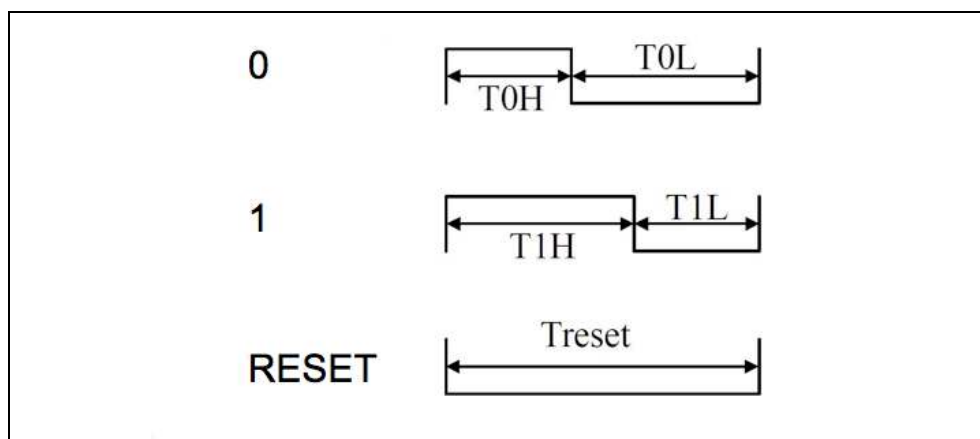
### Switching Characteristics (unless otherwise specified, TA=25 °C)

Parameter	Symbol	Min.	Typ.	Max	Unit	Test conditions
The speed of data transmission	$f_{DIN}$	-	800	-	KHZ	The duty ratio of 67% (data 1)
DOOUT transmission delay	$T_{PLH}$	-	-	500	ns	DIN→DOOUT
	$T_{PHL}$	-	-	500	ns	
I <sub>OUT</sub> Rise/Drop Time	$T_r$	-	100	-	ns	V <sub>DS</sub> =1.5 I <sub>OUT</sub> =9~18mA
	$T_f$	-	100	-	ns	



### Timing Waveforms

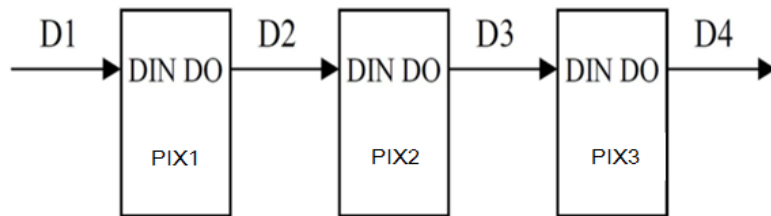
#### 1. Input Code



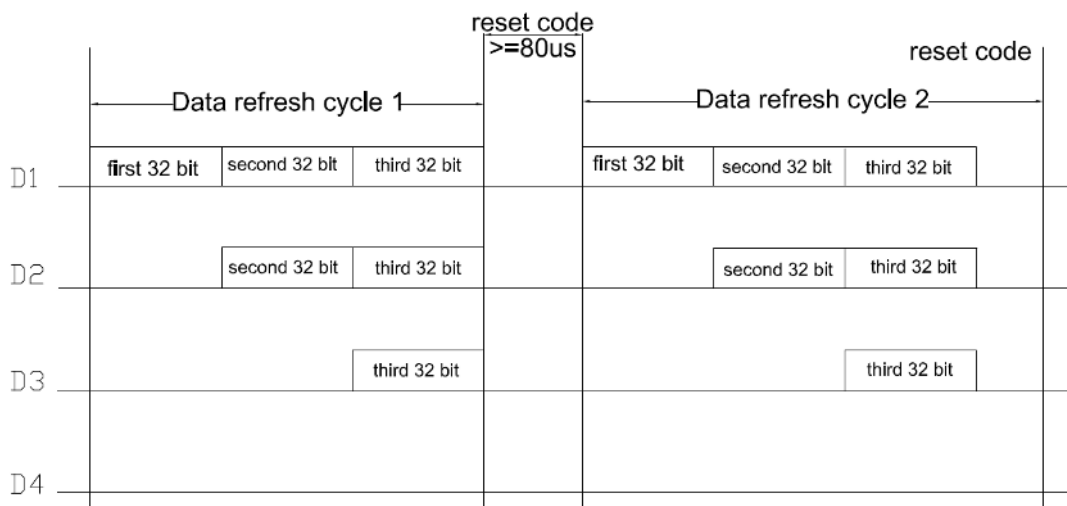
2. The data transmission time ( $T_H+T_L=1.25\mu s\pm 600ns$ ):

Name	Description	Typ. value	error
T0H	0 code, high level time	0.3 $\mu s$	$\pm 0.15\mu s$
T0L	0 code, low level time	0.9 $\mu s$	$\pm 0.15\mu s$
T1H	1 code, high level time	0.9 $\mu s$	$\pm 0.15\mu s$
T1L	1 code, low level time	0.3 $\mu s$	$\pm 0.15\mu s$
Trst	Reset code, low level time	80 $\mu s$	

3. Connection Scheme



4. Data Transfer Format

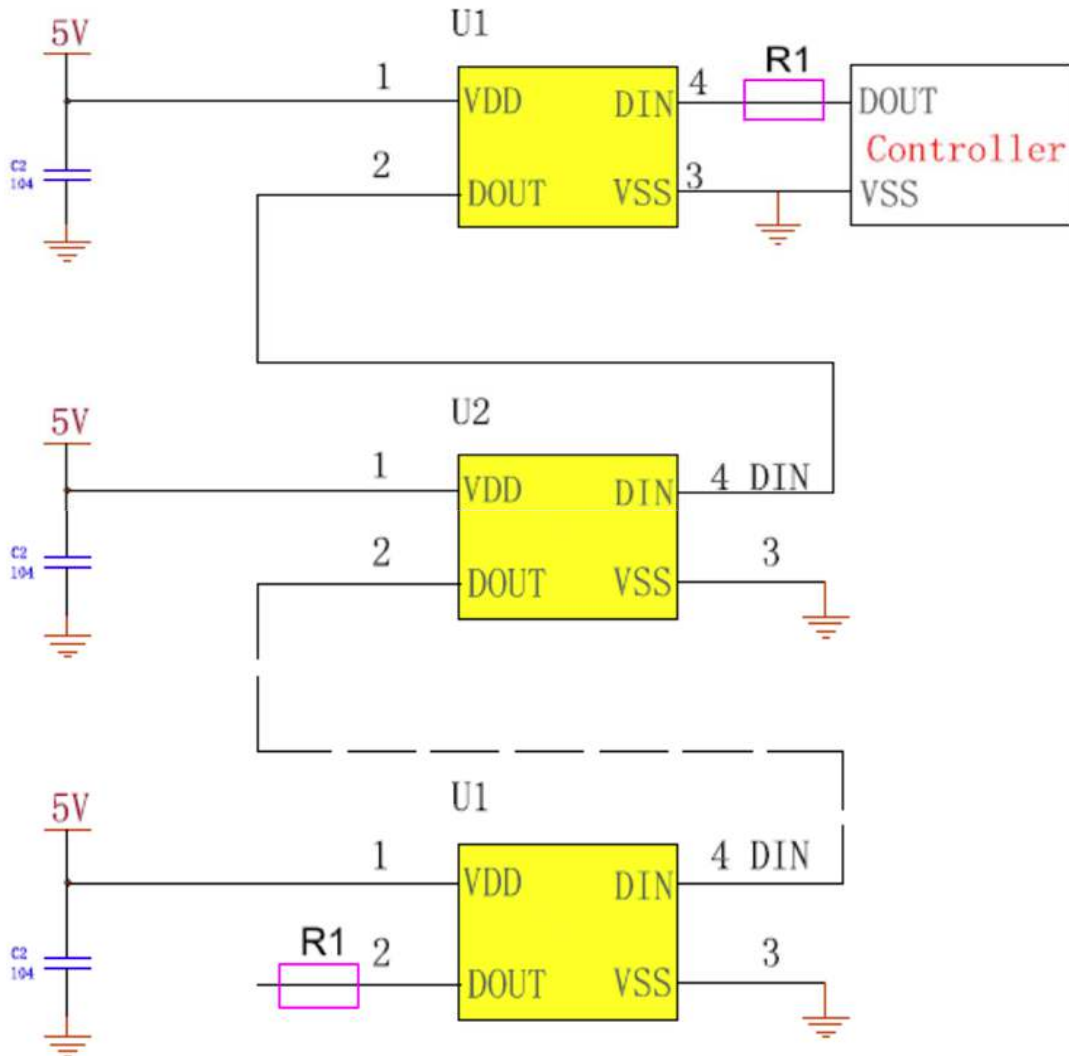


Note: the D1 sends data for MCU, D2, D3, D4 for data forwarding automatic shaping cascade circuit.

5. The data structure of 32bit

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

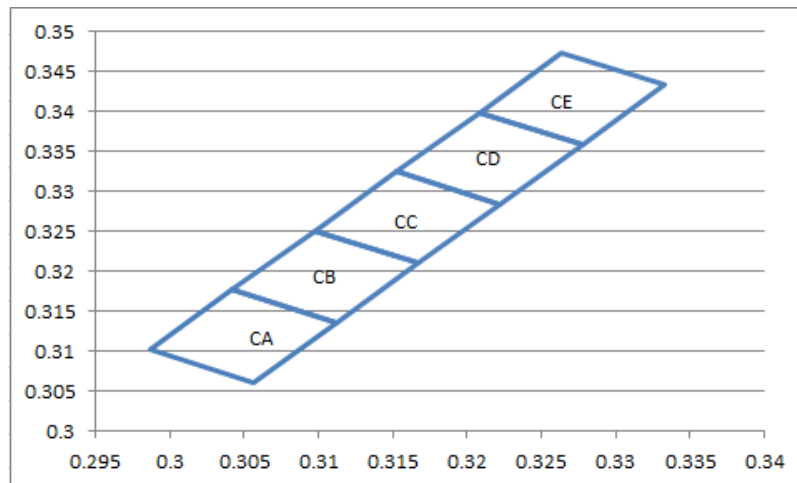
Note: high starting, in order to send data (G7 - G6 - ..... -W0)

**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~7500K**


CA				
X	0.305649	0.29869	0.30422	0.31118
Y	0.30617	0.31022	0.31765	0.3136

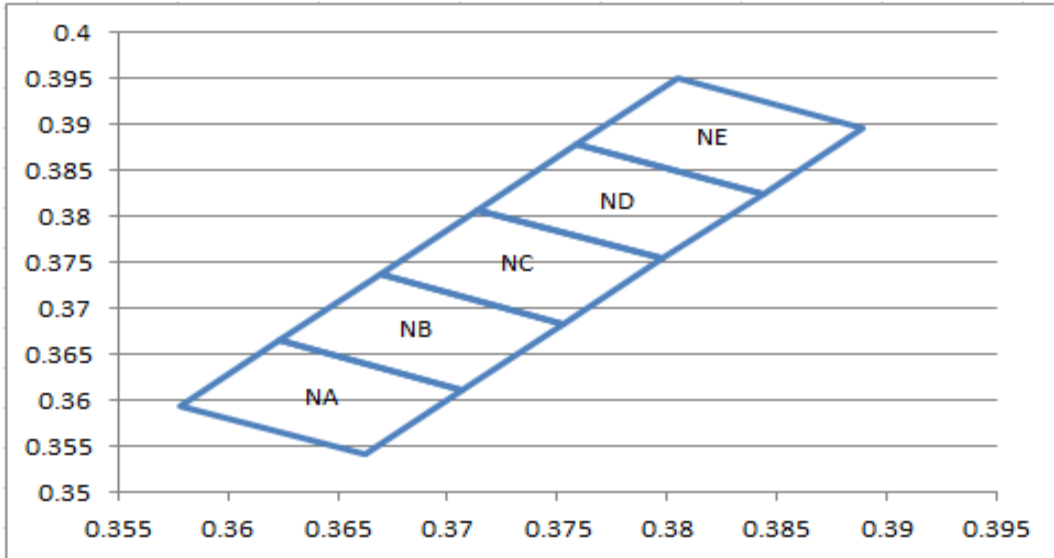
CB				
X	0.311181	0.30422	0.30975	0.31671
Y	0.3136	0.31765	0.32508	0.32103

CC				
X	0.316713	0.30975	0.31529	0.32225
Y	0.32103	0.32508	0.33252	0.32847

CD				
X	0.322245	0.31529	0.32082	0.32778
Y	0.32847	0.33252	0.33995	0.3359

CE				
X	0.327777	0.32082	0.32635	0.33331
Y	0.3359	0.33995	0.34738	0.34333



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


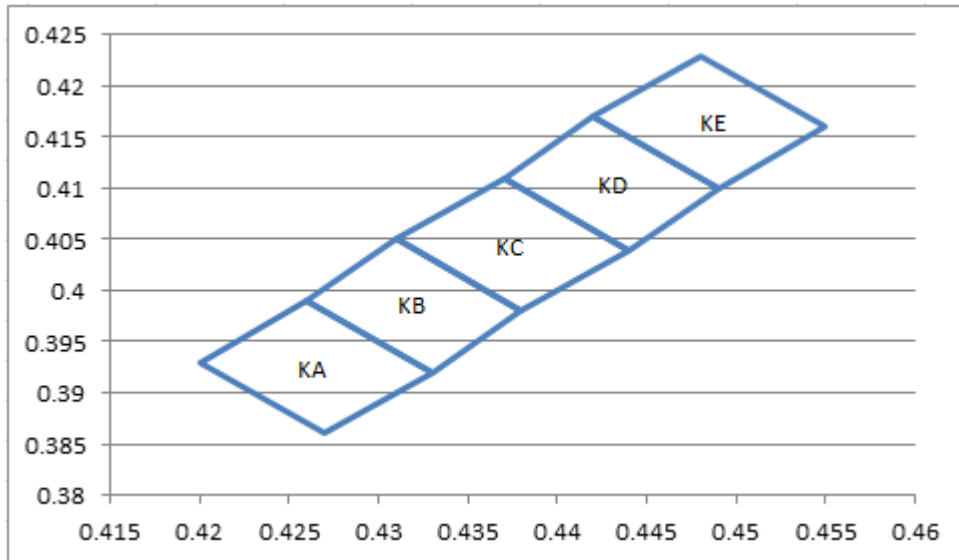
NA				
X	0.3662	0.3578	0.3623	0.3707
Y	0.3541	0.3594	0.3666	0.3612

NB				
X	0.3707	0.3623	0.3669	0.3753
Y	0.3612	0.3666	0.3737	0.3683

NC				
X	0.3753	0.3669	0.3714	0.3798
Y	0.3683	0.3737	0.3808	0.3754

ND				
X	0.3798	0.3714	0.3759	0.3844
Y	0.3754	0.3808	0.3879	0.3825

NE				
X	0.3844	0.3759	0.3805	0.3889
Y	0.3825	0.3879	0.395	0.3897

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


KA				
X	0.427	0.42	0.426	0.433
Y	0.386	0.393	0.399	0.392

KB				
X	0.433	0.426	0.431	0.438
Y	0.392	0.399	0.405	0.398

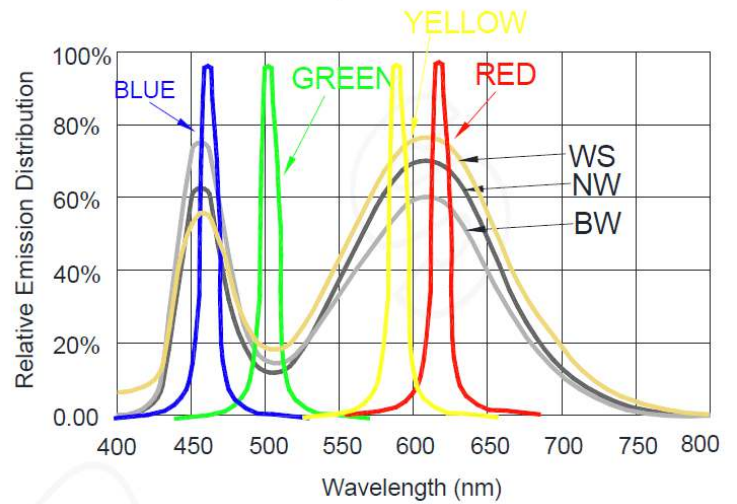
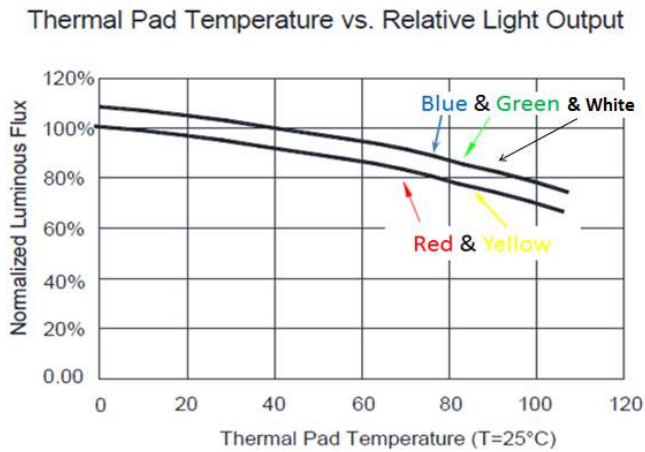
KC				
X	0.438	0.431	0.437	0.444
Y	0.398	0.405	0.411	0.404

KD				
X	0.444	0.437	0.442	0.449
Y	0.404	0.411	0.417	0.41

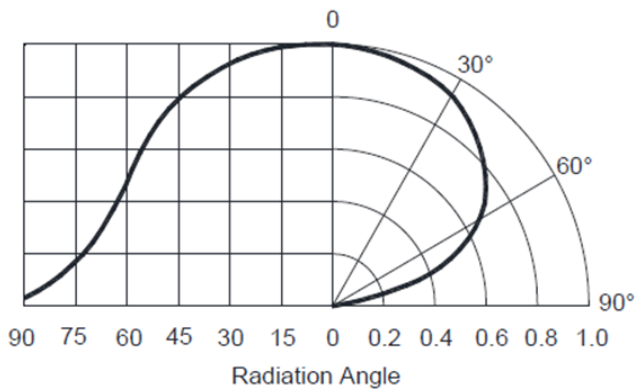
KE				
X	0.449	0.442	0.448	0.455
Y	0.41	0.417	0.423	0.416

## LED Performance Graph

Wavelength Characteristics



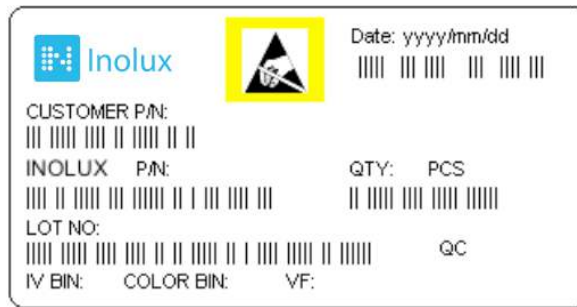
Typical Radiation Pattern 120°



**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**



**Inolux P/N:**

I	N	PI	-	55	Q	A	T	(X)	-	XX	-	X	X	X	X	
		Product		Package	Die Qty.	Variation	Orientation	Current		Color		Color Temperature of White		Customized Stamp-off		
Inolux		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:

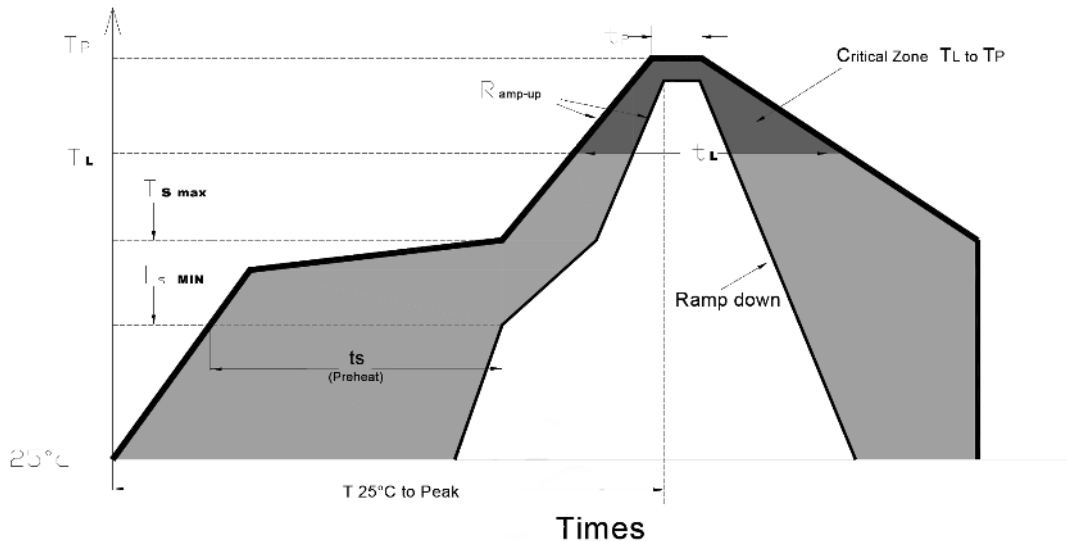
### 1. Storage

- 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 ( $T_S \text{ max}$ to $T_P$ )	3°C/second max.
Preheat: Temperature Min ( $T_S \text{ min}$ )	150°C
Preheat: Temperature Min ( $T_S \text{ max}$ )	200°C
Preheat: Time ( $t_s \text{ min}$ to $t_s \text{ max}$ )	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.

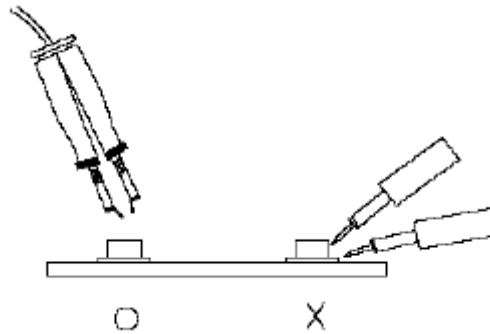
Note: Excessive soldering temperature and / or time might result in deformation of the LED lens or catastrophic failure of the LED.

### 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	1.1	07-31-2019

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