

Features

- Top mount SMD IC integrates serial cascade constant current control with high-quality external signal lines, operates at 5V, and features default on functionality for lighting applications.
- The control circuit integrates with the RGB chip in SMD 5050 packaging to form a complete pixel control system, ensuring uniform color mixing and consistent output.
- Two-wire synchronous serial control interface.
- Three-channel RGB output with 8-bit (256) color control and 5-bit (32) brightness adjustment..
- Three constant-current drivers with automatic signal detection functionality.
- Supports serial data input at up to 30MHz frequency.
- Featuring dual-data transmission and built-in uninterrupted PWM oscillation output, this IC ensures stable static image retention.

Description

The IN-PC55TBTRGB is 5.0*5.0*1.6mm RGB LED with integrated IC. It is a two-wire transmission LED with three channel (RGB) intelligent driving control circuit and light emitting circuit. The LED contains a signal decoding module, data buffer, a built-in constant current circuit, and RC oscillator. It uses CMOS process, low voltage and low power consumption. It has 256 level grayscale PWM adjustment and 32 brightness adjustment. The LED uses double line transfer output, with synchronization of Data and CLK signal.

Applications

- Full color LED string light
- LED full color module
- LED guardrail tube
- LED scene lighting
- LED display

Package Outline Dimensions & Pin Configuration

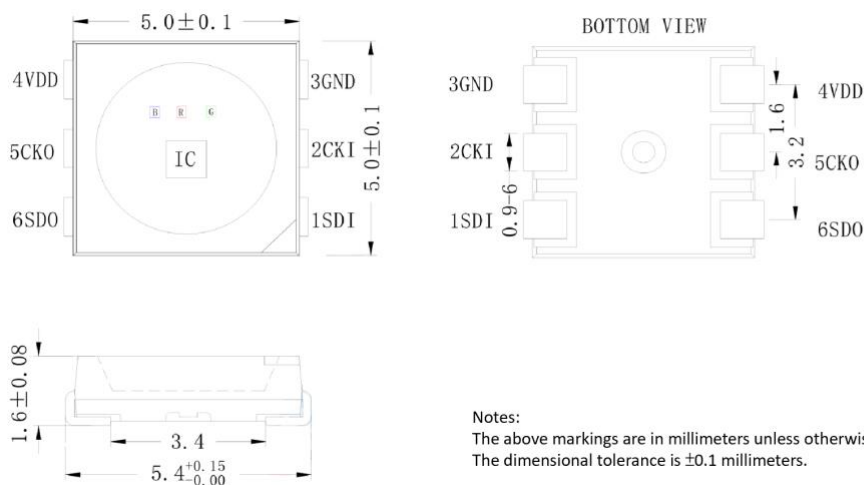


Figure 1. IN-PC55TBTRGB Package Outline Dimensions

Pin Configuration

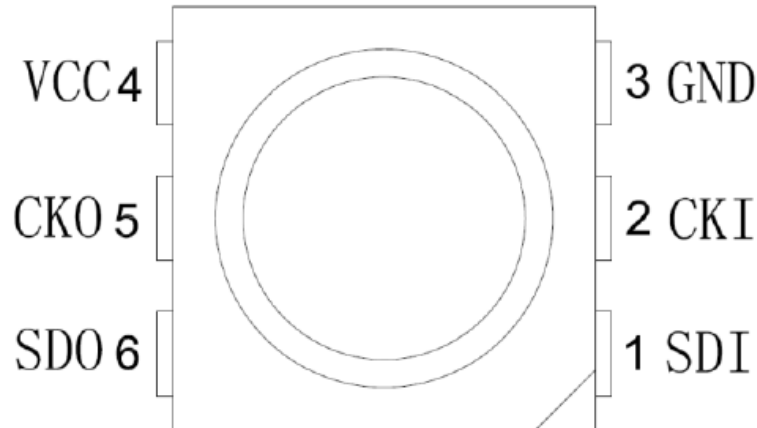


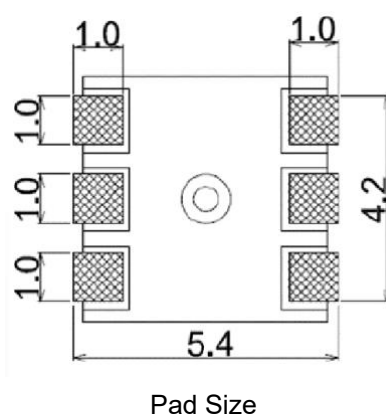
Figure 2. IN-PC55TBTRGB Pin Configuration

Notes:

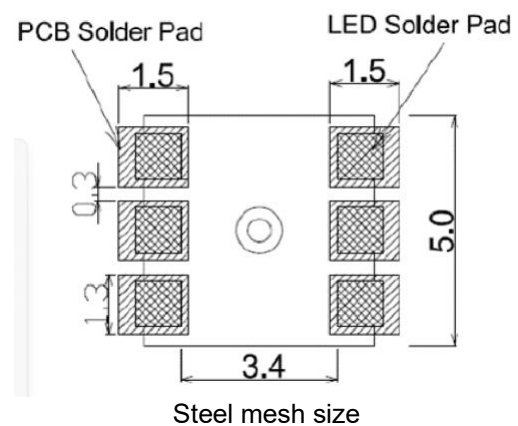
1. Dimension in millimeter, tolerance is ± 0.1 mm unless otherwise noted.

Number	Symbol	Pin Name	Function Description
1	SDI	Data Input	control signal Input data
2	CKI	CLK Input	control signal Input Clock data
3	GND	Ground	The signal and power supply grounding
4	VCC	Power	power supply pin
5	CKO	CLK Output	control signal output Clock data
6	SDO	Data Input	control signal output data

Soldering Pad Size



Pad Size



Steel mesh size

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

Parameter	Symbol	Range	Unit
Logic input voltage	V_{DD}	-0.3 ~ $V_{DD}+0.3$	V
Operating temperature	T_{OPT}	-40 ~ +85	$^\circ\text{C}$
Storage temperature	T_{STG}	-40 ~ +85	$^\circ\text{C}$
ESD pressure(HBM)	V_{ESD}	2K	V

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

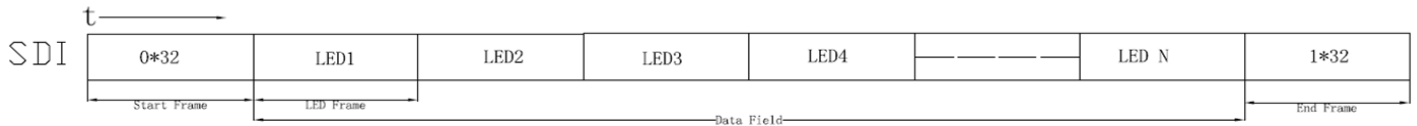
Color	20mA	
	Wavelength(nm)	Light Intensity(mcd)
Red	618-628	385-700
Green	520-530	1050-1500
Blue	465-475	240-450

Recommended Operating Ranges

Parameter	Symbol	Min.	Typ.	Max	Unit	Test conditions
The chip supply voltage	V_{DD}	-	5.0	5.3	V	-
R/G/B port pressure	$V_{DS,MAX}$	-	-	17	V	-
Signal input flip threshold	V_{IH}	3.4	-	5.3	V	-
	V_{IL}	-0.3	-	1.6	V	-
The maximum LED output current	I_{max}	-	-	20	mA	-
The clock high level width	TCLKH	-	-	>30	ns	-
The clock low level width	TCLKL	-	-	>30	ns	-
Data set up time	TSETUP	-	-	>10	ns	-
The frequency of PWM	F_{PWM}	-	1.2	-	KHZ	-
Static power consumption	I_{DD}	-	1	-	mA	-

Feature Descriptions

(1) Series data structure



Start Frame 32 Bits

0000 0000	0000 0000	0000 0000	0000 0000
8 Bits	8 Bits	8 Bits	8 Bits

LED Frame 32 Bits

111	Global	BLUE	GREEN	RED
3 Bits	5 Bits	8 Bits	8 Bits	8 Bits

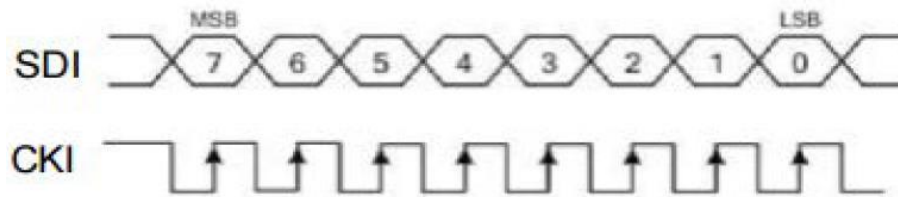
End Frame 32 Bits

1111 1111	1111 1111	1111 1111	1111 1111
8 Bits	8 Bits	8 Bits	8 Bits

(2) 256 level gray scale

Data	Duty Cycle
MSB.....LSB	
0000 0000	0/256
0000 0001	1/256
0000 0010	2/256
—	—
—	—
—	—
—	—
—	—
11111101	253/256
1111 1110	254/256
1111 1111	255/256

(3) PWM input / output signal relationship



(4) 5-Bit (level 32) brightness adjustment (simultaneous control of OUTR\OUTG\OUTB three ports current):

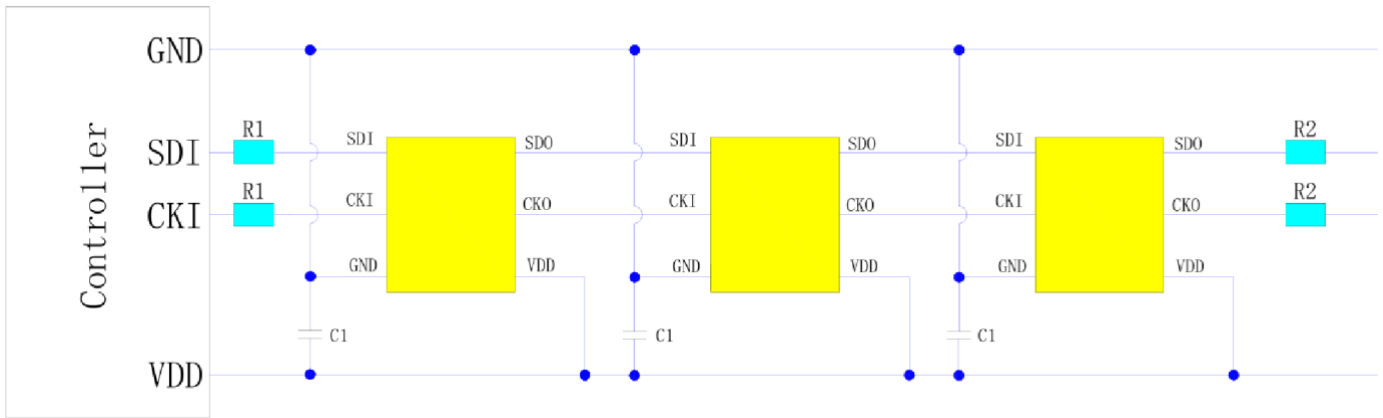
Data	Driving Current
MSB.....LSB	
00000	0/31
00001	1/31
00010	2/31
—	—
—	—
—	—
—	—
—	—
—	—
11101	29/31
11110	30/31
11111	31/31

(5) Refresh Rate

Frame rate = $1 / ((64 + (32 * \text{points})) * \text{CKI (cycle)})$, (unit: frames per second)

Such as: 1024 points, CKI frequency is 1MHZ, is =30 frames per second frame rate.

Typical Application Circuit

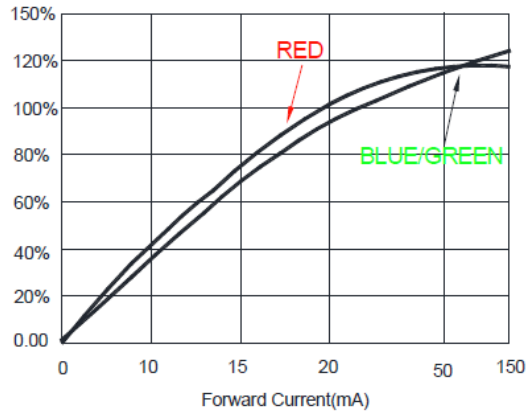


In practical application circuits, to prevent instantaneous high voltage damage to the internal power supply and signal, clock input/output pins of the IC caused by live plugging and unplugging during testing, protective resistors should be connected in series at the signal input and output terminals. In addition, in order to ensure more stable operation between IC chips, the decoupling capacitance between each LED is essential.

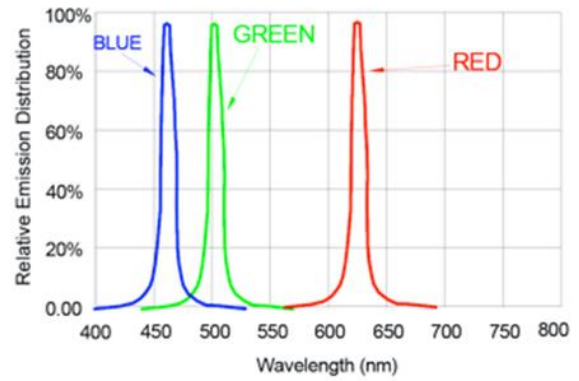
1. It is generally not recommended to omit the decoupling capacitance at both ends of the product.
2. The signal, clock input and output terminals of the product must be connected in series with protective resistors R1/R2. Due to different wire materials and transmission distances, the protective resistors connected in series at both ends may vary slightly; The size of R1/R2 depends on the number of cascaded light beads. The more cascaded the number, the smaller the R1/R2, and the longer the transmission distance between the light beads. It is generally recommended to take a value between 20-2K Ω , and it is usually recommended to take a value of around 500 Ω ; Based on actual usage.

LED Performance Graph

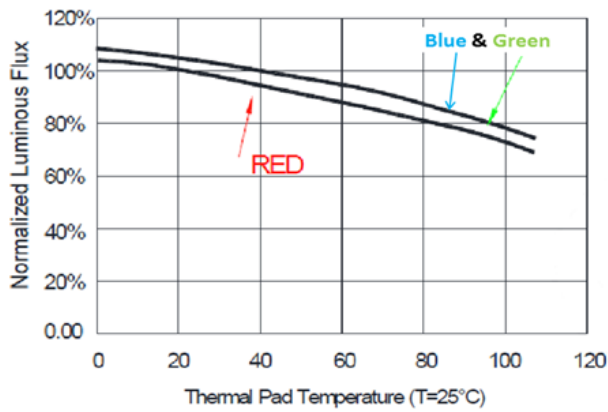
Typical Relative Luminous Flux vs. Forward Current



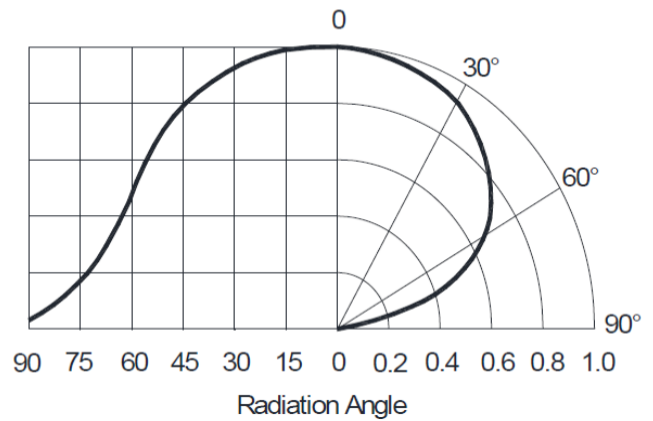
Wavelength Characteristics



Thermal Pad Temperature vs. Relative Light Output



Typical Radiation Pattern 120°



Ordering Information

Product	Emission Color	IV(mcd)	Orderable Part Number
IN-PC55TBTRGB	R	385-700	IN-PC55TBTRGB
	G	1050-1500	
	B	240-450	

Label Specifications

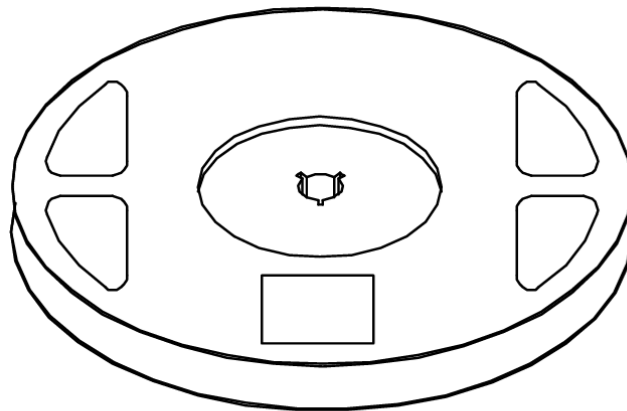
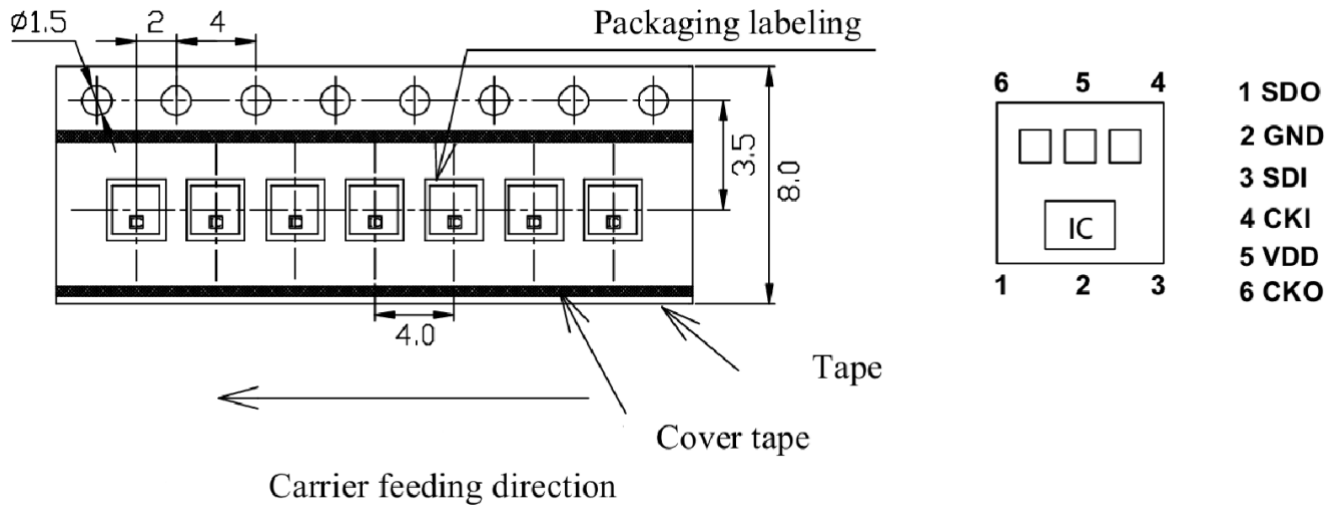
Inolux P/N:

I	N	PC	-	55	T	B	T		R		G		B	-	X	X	X	X
Inolux		Product		Package	Die Qty.	Variation	Orientation	Current	Color	Current	Color	Current	Color		Customized Stamp-off			
		PI- Single trace IC PC- Clock Function IC		55TB = 5.0 x 5.0 x 1.6 mm, 6 pins			T = Top Mount	Blank= 20mA	R = 624 nm	Blank= 20mA	G = 520 nm	Blank= 20mA	B = 470 nm					

Lot No.:

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

Packaging standards



Reel(195x8mm)

Precautions

Please read the following notes before using the product:

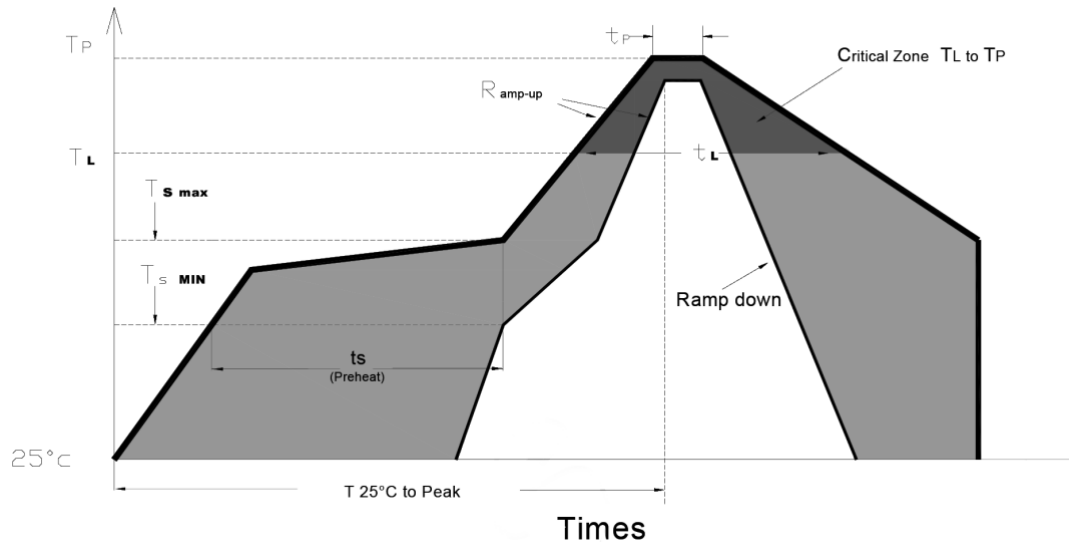
1. Storage

- 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.

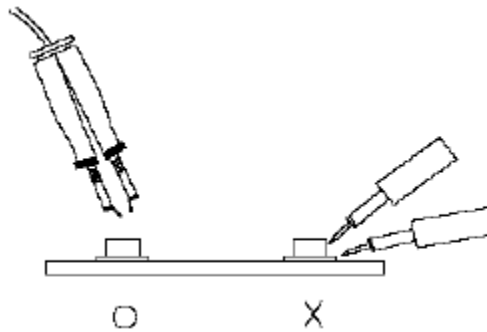
Note: Excessive soldering temperature and / or time might result in deformation of the LED lens or catastrophic failure of the LED.

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	06-30-2018
Revise precautions	11	1.1	07-31-2019
Add Drawing	10	1.2	09-26-2024
Adjust the parameter	9	1.3	02-18-2025

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