

Features

- 3537 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-PI33QBTPRPGPBPW-XX is 3.5*3.7*1.9mm 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

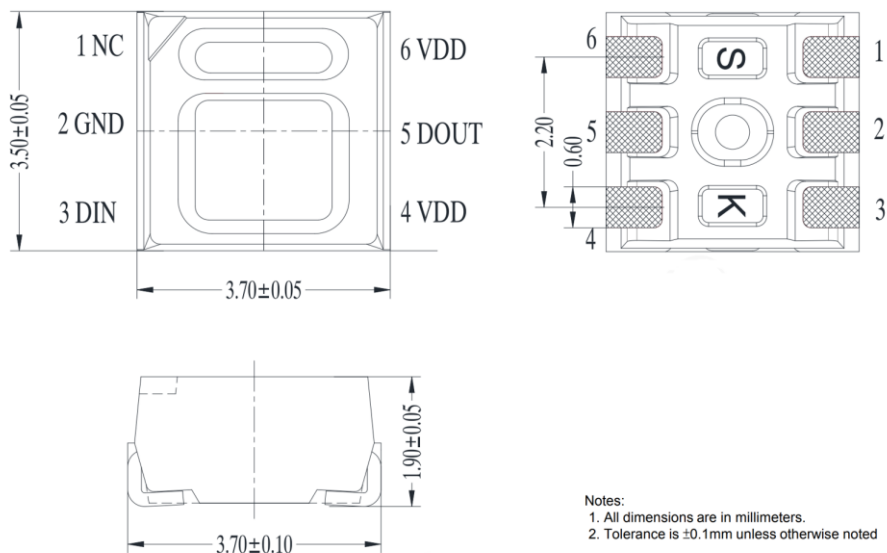


Figure 1. IN-PI33QBTPRPGPBPW-XX Package Outline Dimensions

Pin Configuration

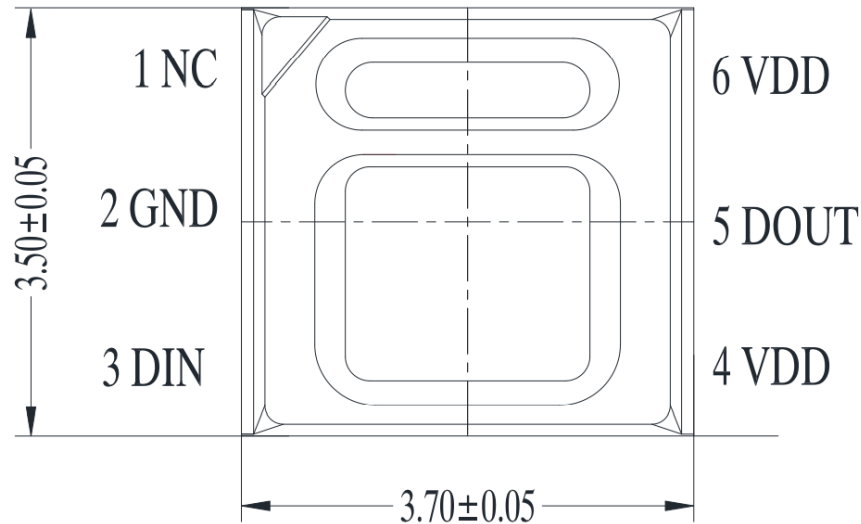


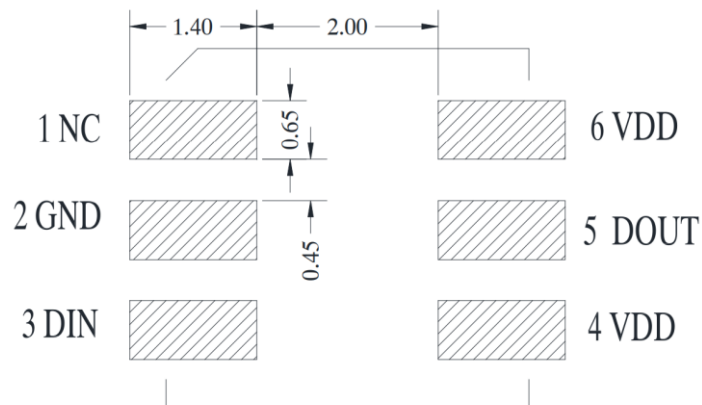
Figure 2. IN- PI35QBTPRPGBPW-XX Pin Configuration

Notes:

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

| Number | Symbol | Function Description |
|--------|--------|---|
| 1 | NC | NC |
| 2 | GND | The signal and power supply and grounding |
| 3 | DIN | Control signal data input |
| 4/6 | VDD | Power supply pin |
| 5 | DOUT | Control signal data output |

Recommended Soldering Pad



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 ~ +80 | $^\circ\text{C}$ |
| Storage temperature | T_{STG} | -40 ~ +80 | $^\circ\text{C}$ |
| ESD pressure(HBM) | V_{ESD} | 4K | V |
| ESD pressure(DM) | V_{ESD} | 200 | V |

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

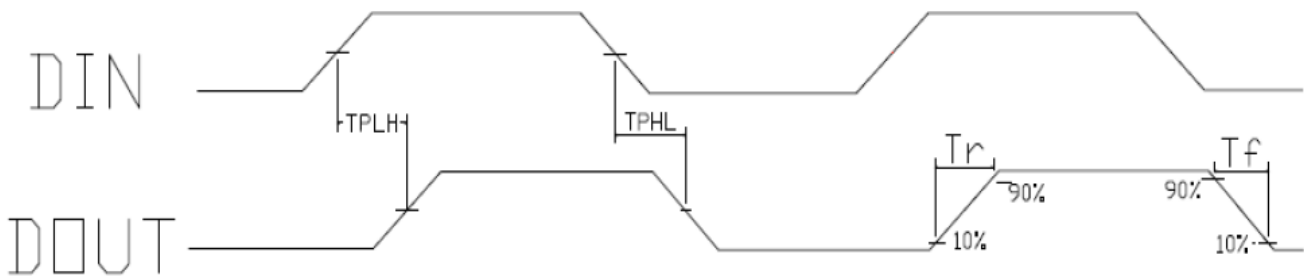
| Color | 12mA | |
|---------------|----------------|----------------------|
| | Wavelength(nm) | Light Intensity(mcd) |
| Red | 620-630 | 300-500 |
| Green | 515-530 | 1000-1500 |
| Blue | 460-470 | 200-400 |
| Cool White | 6000K | 1500-2200 |
| Neutral White | 4000k | 1500-2200 |
| Warm White | 3000k | 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 |
|---------------------------------|-----------|----------------|------|----------------|------|------------------------|
| The chip Supply Voltage | V_{DD} | - | 5.2 | - | V | - |
| 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 | - |

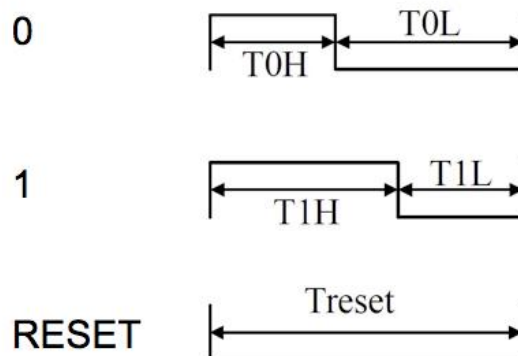
Switching Characteristics *(unless otherwise specified, TA=25 °C)*

| 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 _{OUT} Rise/Drop Time | T_r | - | 100 | - | ns | V _{DS} =1.5 I _{OUT} R/G/B = 9mA I _{OUT} W = 18mA |
| | T_f | - | 100 | - | ns | |



Timing Waveforms

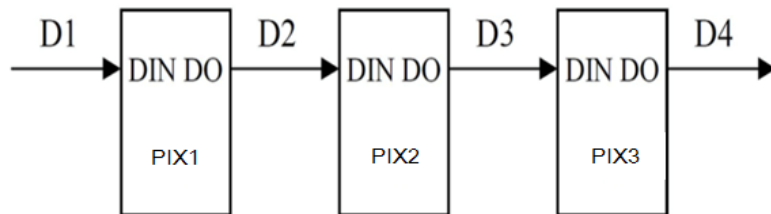
1. Input Code



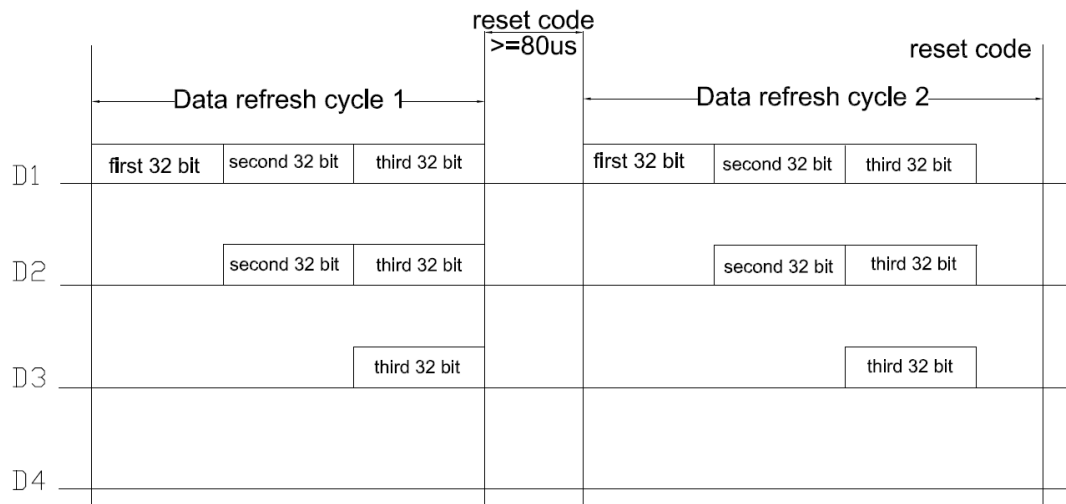
2. The data transmission time ($T_H+T_L=1.25\mu s\pm 600ns$):

| Name | | Min. | Standard value | Max. | Unit |
|-----------------------|----------------------------|---------------|----------------|------------|---------|
| T | Code period | 1.20 | -- | -- | μs |
| T_{0H} | 0 code, high level time | 0.2 | 0.32 | 0.4 | μs |
| T_{0L} | 0 code, low level time | 0.8 | -- | -- | μs |
| T_{1H} | 1 code, high level time | 0.58 | 0.64 | 1.0 | μs |
| T_{1L} | 1 code, low level time | 0.2 | -- | -- | μs |
| Trst | Reset code, low level time | >80 | -- | -- | μs |

3. Connection Scheme



4. Data Transfer Format



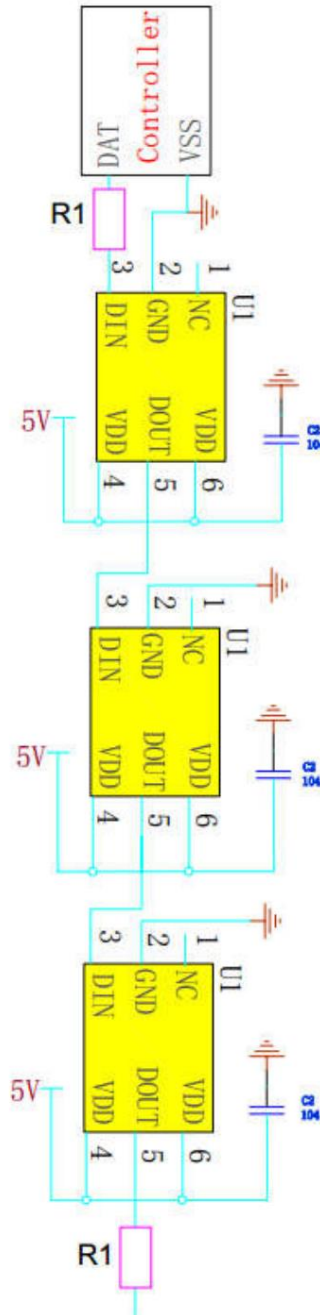
Note: the D1 sends data for MCU, D2, D3, D4 for data forwarding automatic shaping cascade circuit.

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



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, to make the IC chip is more stable, even the capacitance between beads is essential back.

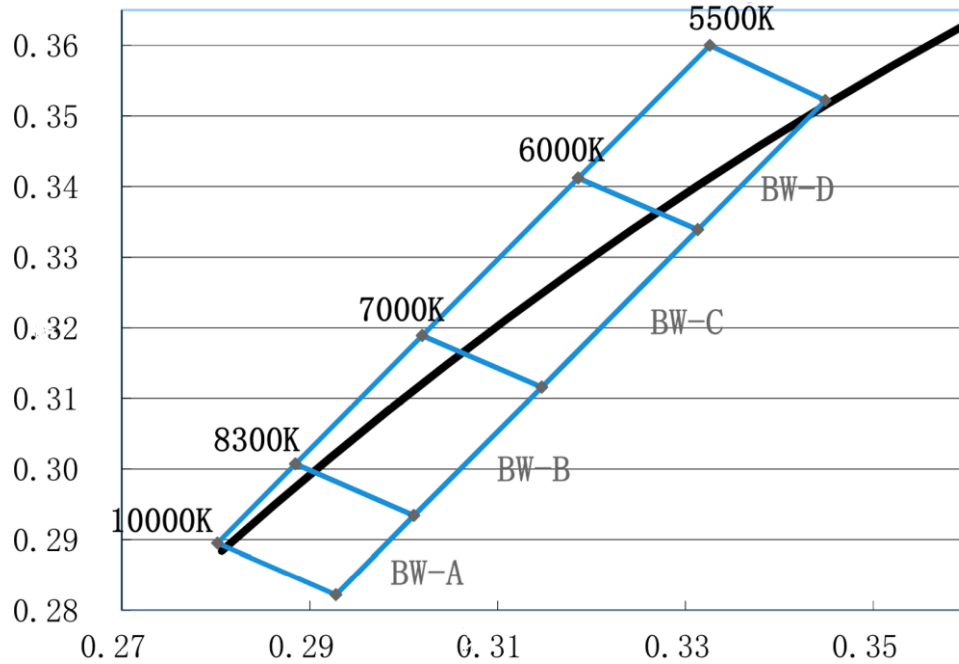
Application: used for soft lamp strip or hard light, lamp beads transmission distance is short, suggested in signal in time the clock line input and output end of each connected in series protection resistors, R1 of about 500 ohms.

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; to the actual use of fixed.

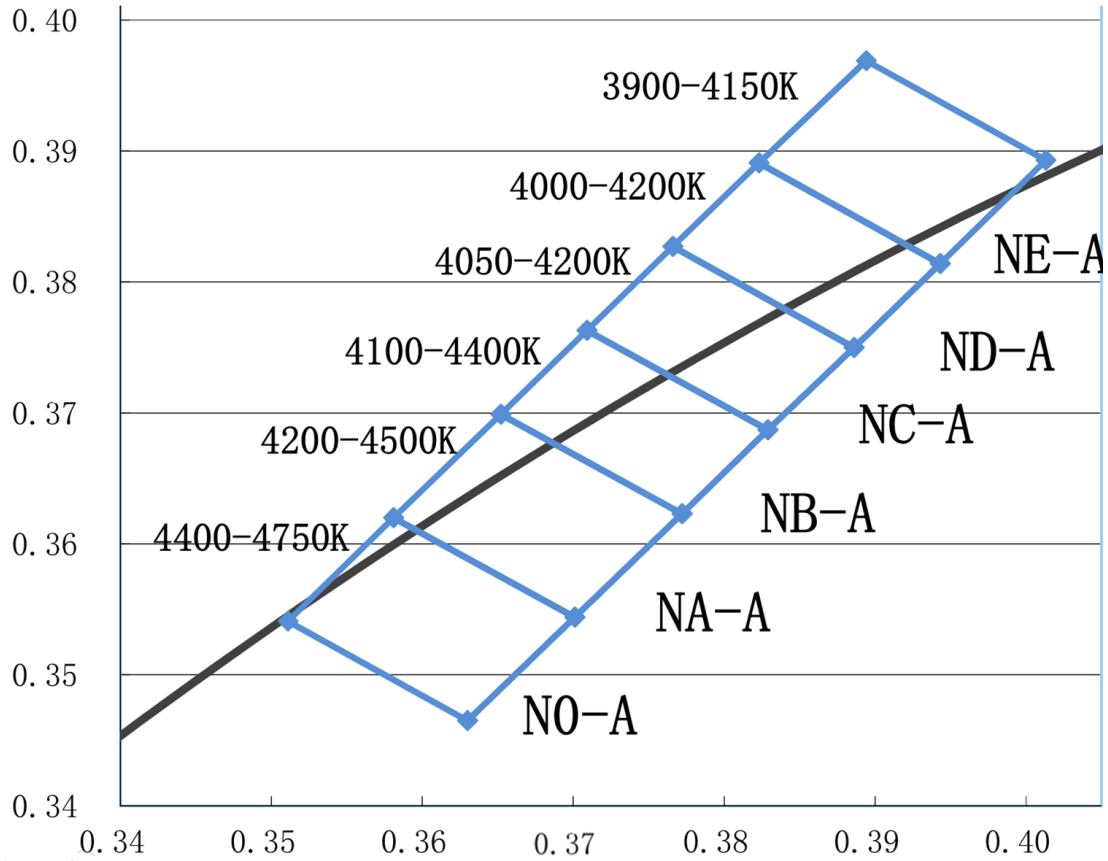
Color Bin Specification

| Name | Code | λ_d MIN (nm) | λ_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: 7000K~10000K

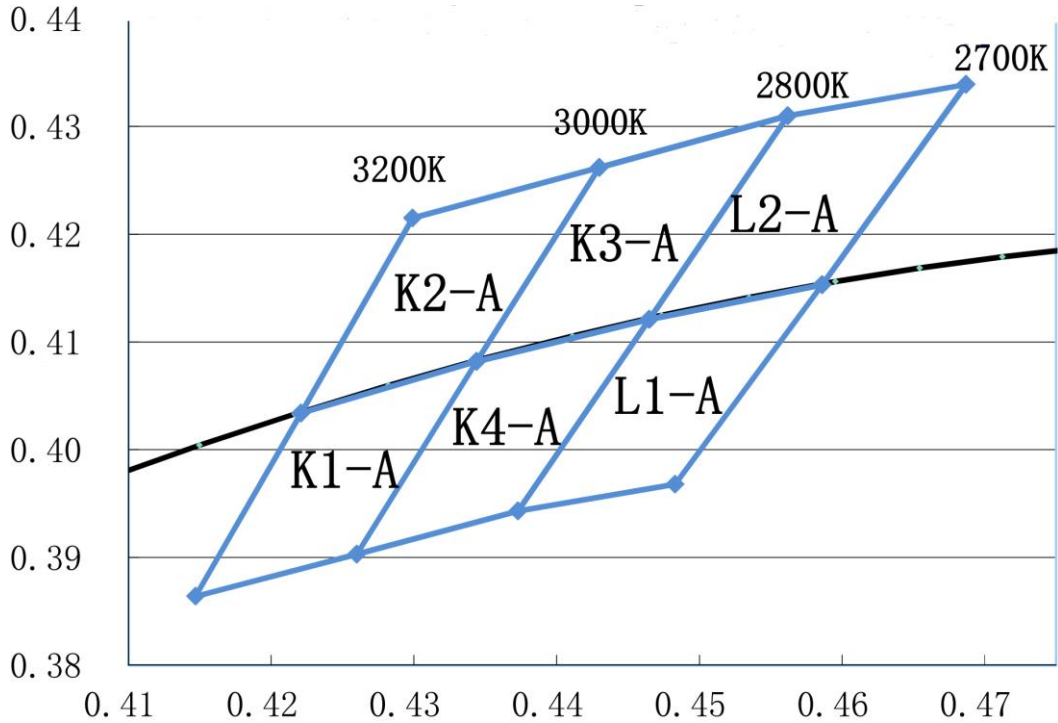


| Name | X1 | Y1 | X2 | Y2 | X3 | Y3 | X4 | Y4 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|
| BW-A | 0.2928 | 0.2822 | 0.2802 | 0.2895 | 0.2885 | 0.3007 | 0.3011 | 0.2934 |
| BW-B | 0.3011 | 0.2934 | 0.2885 | 0.3007 | 0.302 | 0.3189 | 0.3147 | 0.3116 |
| BW-C | 0.3147 | 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: 3900K~4750K


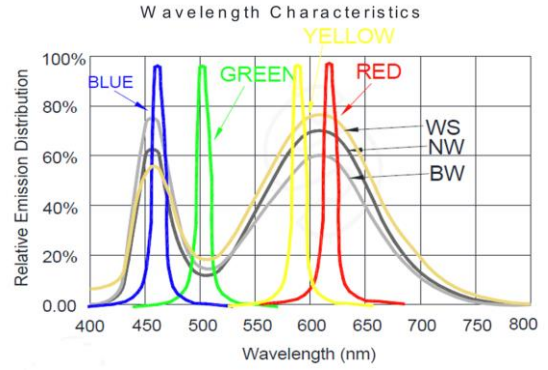
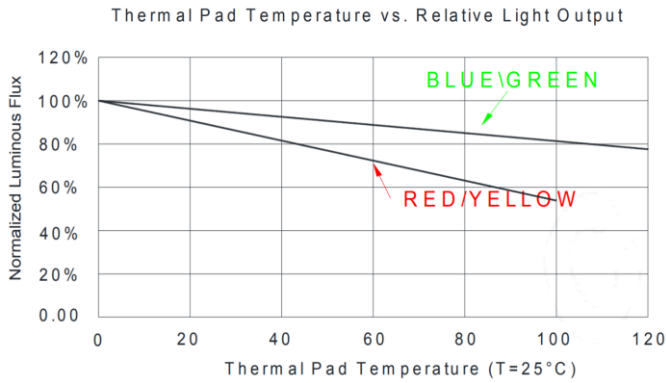
| Name | X1 | Y1 | X2 | Y2 | X3 | Y3 | X4 | Y4 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|
| NO-A | 0.358 | 0.3445 | 0.3461 | 0.3521 | 0.3531 | 0.36 | 0.3651 | 0.3524 |
| NA-A | 0.3651 | 0.3524 | 0.3531 | 0.36 | 0.3602 | 0.3679 | 0.3722 | 0.3603 |
| NB-A | 0.3722 | 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~3200K

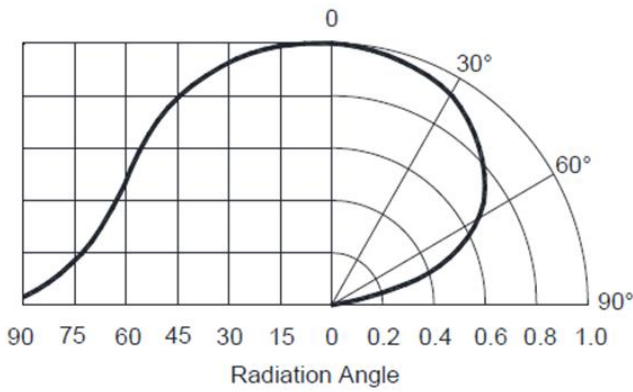


| Name | X1 | Y1 | X2 | Y2 | X3 | Y3 | X4 | Y4 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|
| K1-A | 0.4344 | 0.4032 | 0.4221 | 0.3984 | 0.4147 | 0.3814 | 0.426 | 0.3853 |
| K2-A | 0.443 | 0.4212 | 0.4299 | 0.4165 | 0.4221 | 0.3984 | 0.4344 | 0.4032 |
| K3-A | 0.4562 | 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



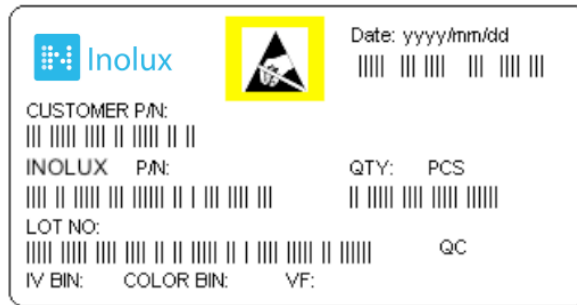
Typical Radiation Pattern 120°



Ordering Information

| Product | Emission Color | Iv (mcd) Typ. | Wavelength (Wd) / CCT Typ. | Orderable Part Number |
|-----------------------|----------------|---------------|----------------------------|-----------------------|
| IN-PI33QBTPRPGBPBW-60 | R | 400 | 625 | IN-PI33QBTPRPGBPBW-60 |
| | G | 1250 | 520 | |
| | B | 300 | 465 | |
| | W | 1850 | 6000k | |
| IN-PI33QBTPRPGBPBW-40 | R | 400 | 625 | IN-PI33QBTPRPGBPBW-40 |
| | G | 1250 | 520 | |
| | B | 300 | 465 | |
| | W | 1850 | 4000k | |
| IN-PI33QBTPRPGBPBW-30 | R | 400 | 625 | IN-PI33QBTPRPGBPBW-30 |
| | G | 1250 | 520 | |
| | B | 300 | 465 | |
| | W | 1850 | 3000k | |

Label Specifications



Inolux P/N:

| I | N | PI | - | 33 | Q | B | 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 | | 33QB = 3.5 x 3.7 x 1.9 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:

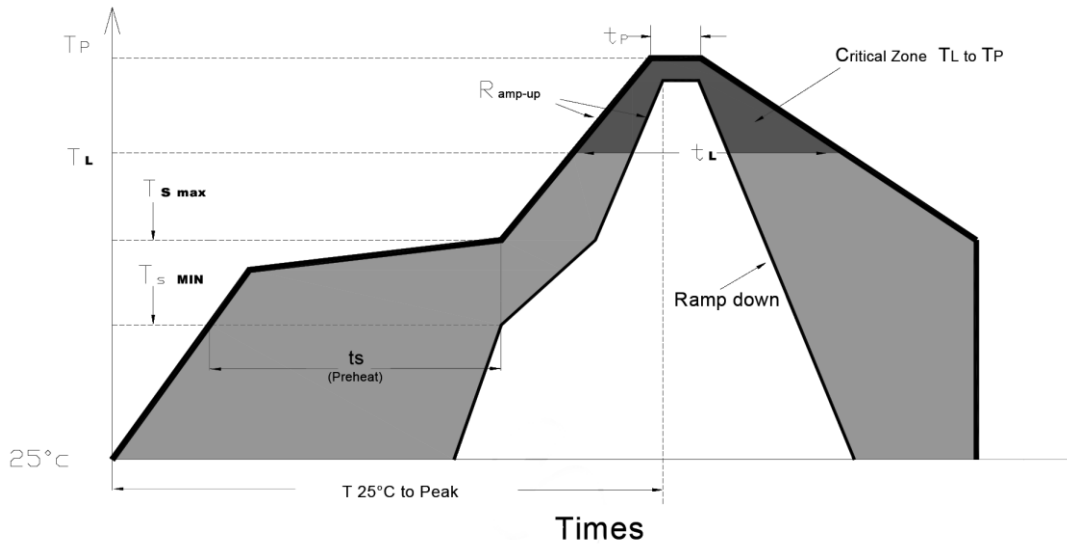
1. Storage

- 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. |

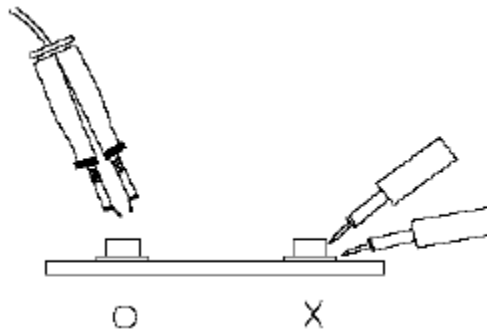
Note: Excessive soldering temperature and / or time might result in deformation of the LED lens or catastrophic failure of the LED.

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 | 08-10-2020 |
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