

## Features

- 5050 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.
- 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-PI55TBTPRGPB is 5.0\*5.0\*1.6mm RGB 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

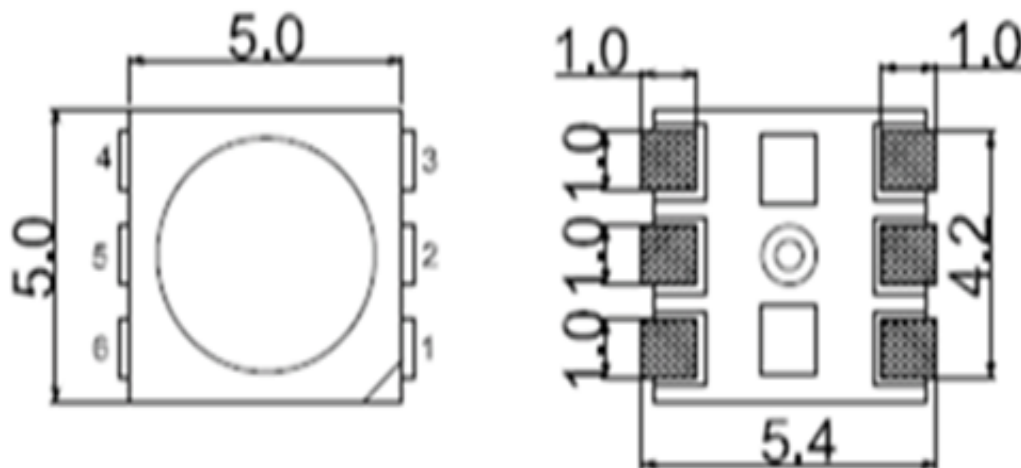
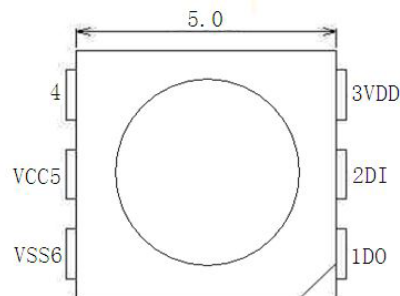


Figure 1. IN-PI55TBTPRGPB Package Outline Dimensions

## Pin Configuration



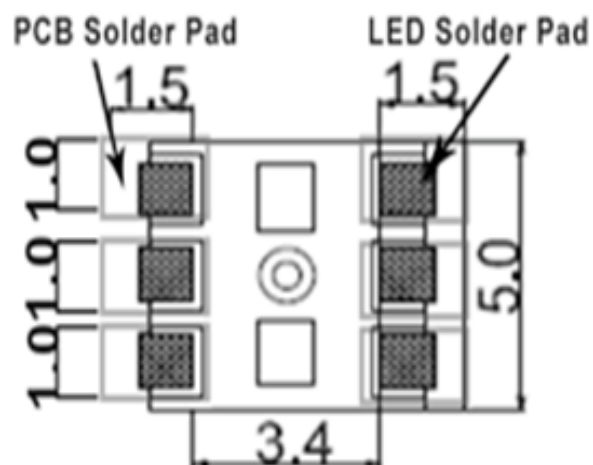
**Figure 2. IN-PI55TBTPRGPB Pin Configuration**

**Notes:**

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

| Number | Symbol | Function Description                    |
|--------|--------|-----------------------------------------|
| 1      | DO     | Display data cascaded output (800k bps) |
| 2      | DI     | Display data cascaded input (800k bps)  |
| 3      | VDD    | Power Supply                            |
| 4      |        | NC                                      |
| 5      | VCC    | Power supply                            |
| 6      | VSS    | Ground                                  |

## Soldering Pad Size



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

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

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

 ( $T_a=-25^\circ\text{C}$ , unless otherwise specified)

| Light color | Wavelength (nm) | Light intensity (mcd) | Working current (mA) | Working voltage (V) |
|-------------|-----------------|-----------------------|----------------------|---------------------|
| R           | 620-625         | 500-1000              | 12                   | 1.8-2.2             |
| G           | 520-525         | 1000-1700             | 12                   | 2.8-3.2             |
| B           | 465-470         | 500-1000              | 12                   | 2.8-3.2             |

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

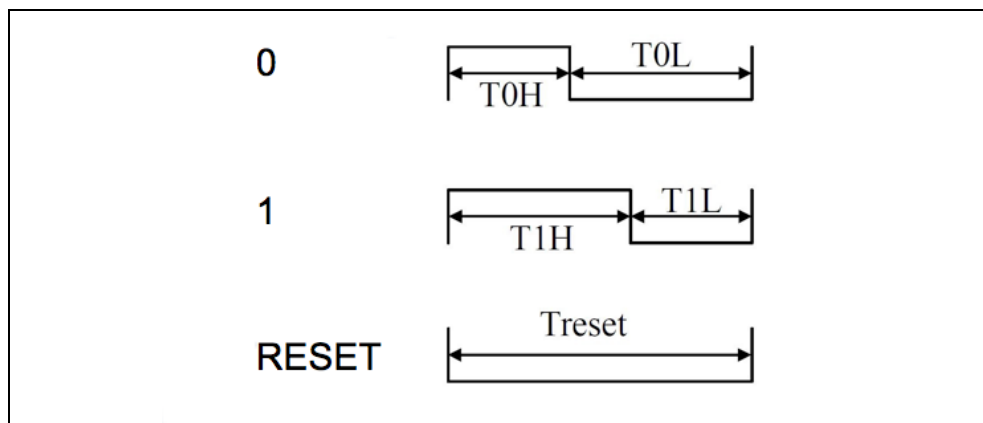
| Parameter                | Symbol        | Min. | Typ. | Max | Unit | Test conditions        |
|--------------------------|---------------|------|------|-----|------|------------------------|
| Supply voltage           | $V_{DD}$      | -    | 5.2  | -   | V    | -                      |
| R/G/B port 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   |
| High level input voltage | $V_{IH}$      | 3.4  | -    |     | V    | $V_{DD} = 5.0\text{V}$ |
| Low level input voltage  | $V_{IL}$      | -    | -    | 1.6 | 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%<br>(data 1) |
| DOUT transmission delay        | $T_{PLH}$ | -    | -    | 500 | ns   | DIN→DOUT                          |
|                                | $T_{PHL}$ | -    | -    | 500 | ns   |                                   |
| $I_{OUT}$ Rise/Drop Time       | $T_r$     | -    | 100  | -   | ns   | VDS=1.5<br>$I_{OUT}=5/13mA$       |
|                                | $T_f$     | -    | 100  | -   | ns   |                                   |

## Timing Waveforms

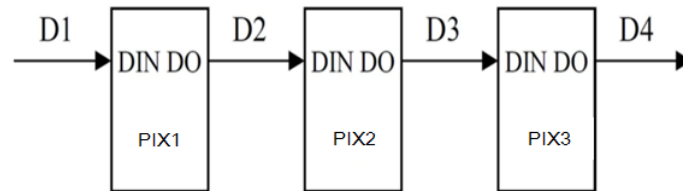
### 1. Input Code



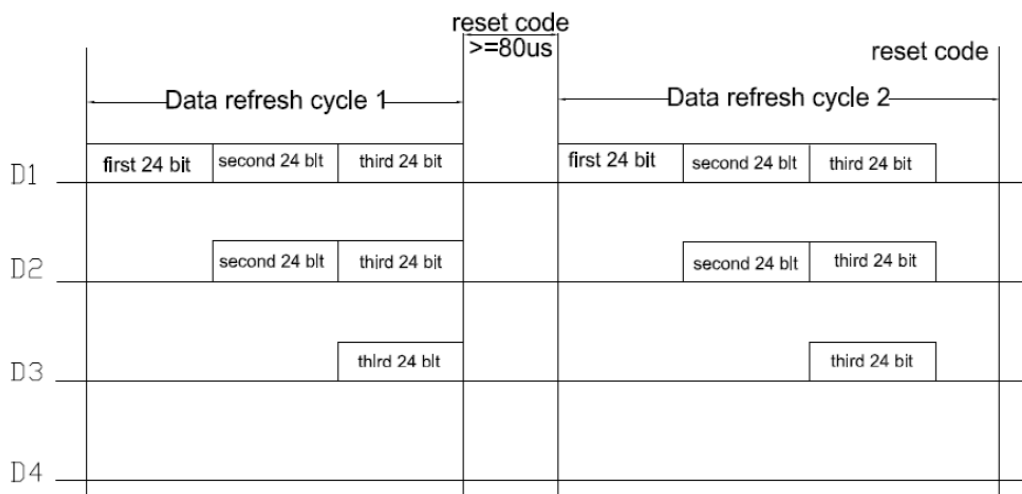
### 2. The data transmission time ( $T_H+T_L=1.25\mu s\pm600ns$ ):

| 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     | 0.6 $\mu s$ | $\pm 0.15\mu s$ |
| T1H  | 1 code, high level time    | 0.9 $\mu s$ | $\pm 0.15\mu s$ |
| T1L  | 1 code, low level time     | 0.6 $\mu s$ | $\pm 0.15\mu s$ |
| 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. 24-bit data format



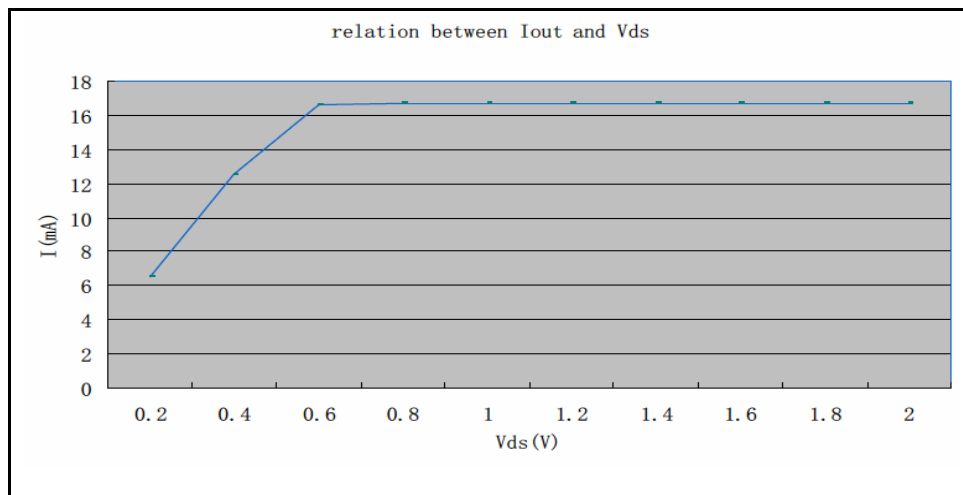
Note: The data is sent in the sequence of GRB, and the MSB is sent first.

## Constant Current Characteristic

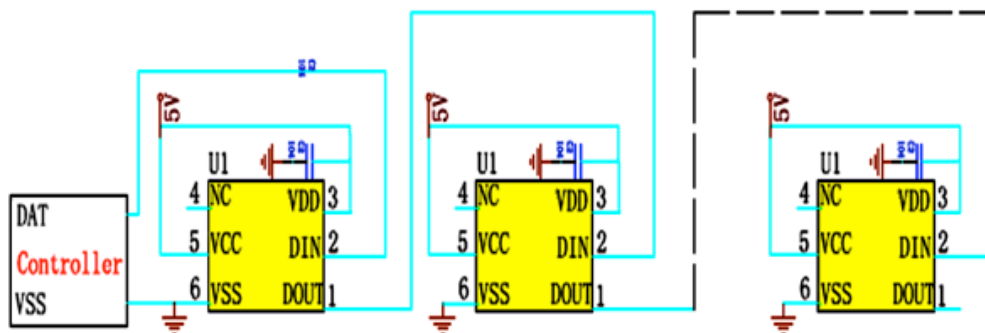
With excellent constant current characteristics,

- (1) The differences of current between Channel is less than  $\pm 1.5\%$
- (2) The differences of current between Chip is less than  $\pm 3\%$
- (3) When the voltage of the load change, the output current is not affected, as shown in the figure below
- (4) Below output port of the current  $I_{out}$  and add on the port voltage  $V_{ds}$  curve relationship.

The smaller the  $I_{out}$  current, the smaller in the condition of constant current need of  $V_{ds}$ .



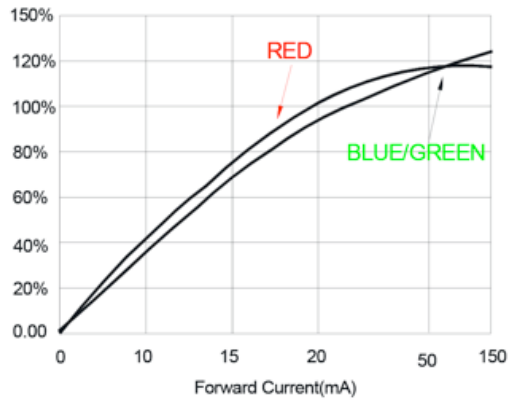
## Typical Application Circuit



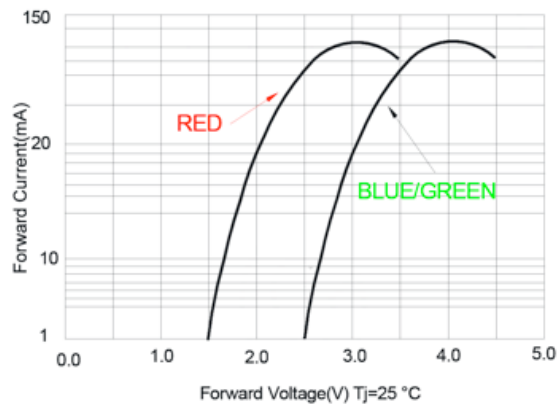
Product signal input and output must be connected in series with protection resistor  $R_1$ .  $R_1$  depends on the size of the cascade amount, the greater the number of cascade, the smaller  $R_1$ . The general recommended value is between 200-2K $\Omega$ , usually the recommended value is typical 500 $\Omega$ .

## LED Performance Graph

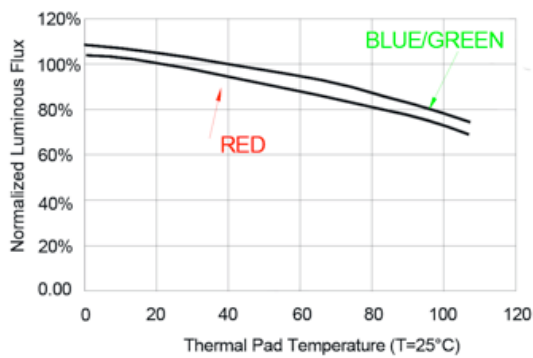
Typical Relative Luminous Flux vs. Forward Current



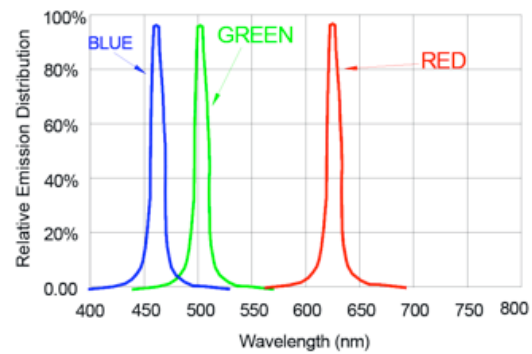
Forward Voltage vs. Forward Current



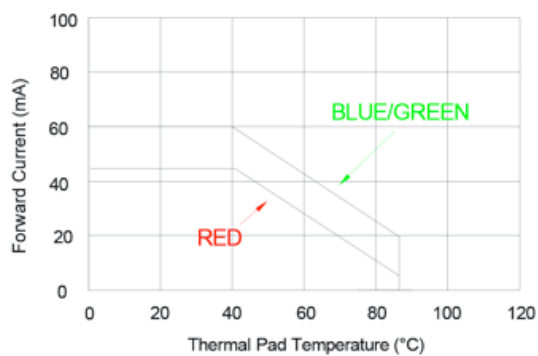
Thermal Pad Temperature vs. Relative Light Output



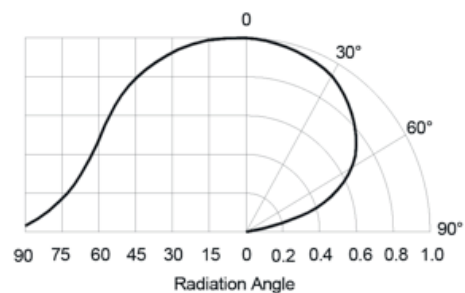
Wavelength Characteristics



Thermal Pad Temperature vs. Forward Current



Typical Radiation Pattern 120°



## Ordering Information

| Product         | Emission Color | IV(mcd)   | Orderable Part Number |
|-----------------|----------------|-----------|-----------------------|
| IN-PI55TBTPRGPB | R              | 500-1000  | IN-PI55TBTPRGPB       |
|                 | G              | 1000-1700 |                       |
|                 | B              | 500-1000  |                       |

## Label Specifications

|                                                                                   |  |                                                                                   |  |                      |  |
|-----------------------------------------------------------------------------------|--|-----------------------------------------------------------------------------------|--|----------------------|--|
|  |  |  |  | Date: yyyy/mm/dd<br> |  |
| CUSTOMER P/N:<br>                                                                 |  |                                                                                   |  |                      |  |
| INOLUX P/N:                                                                       |  | QTY:                                                                              |  | PCS                  |  |
|                                                                                   |  |                                                                                   |  |                      |  |
| LOT NO:<br>                                                                       |  |                                                                                   |  |                      |  |
| IV BIN:                                                                           |  | COLOR BIN:                                                                        |  | VF:                  |  |
|                                                                                   |  |                                                                                   |  | QC                   |  |

## Inolux P/N:

| I      | N                                            | PI | - | 55                                 | T        | B         | T             | (X)     | R          | (X)     | G          | (X)     | 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<br>PC- Clock Function IC |    |   | 55TB = 5.0 x 5.0 x 1.6 mm (6 pins) |          |           | T = Top Mount | P=12mA  | R = 624 nm | P=12mA  | G = 520 nm | P=12mA  | B = 470 nm |   |                      |   |   |   |

## Lot No.:

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

## Precautions

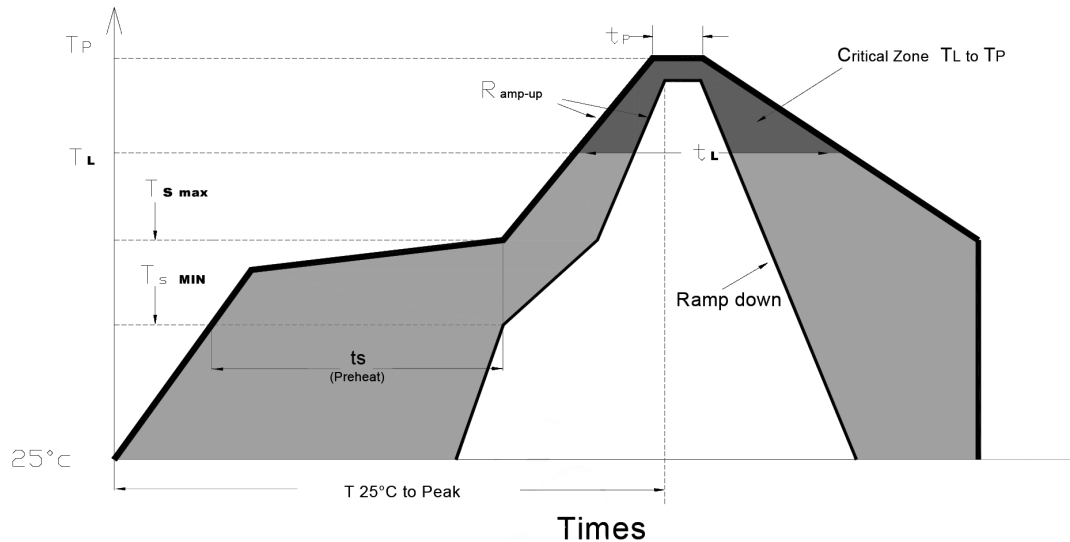
Please read the following notes before using the product:

### 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 LEDs should be kept at 30°C or less and 60%RH or less.
- 1.5 The LEDs should be used within 24 hours (1 days) 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.  |

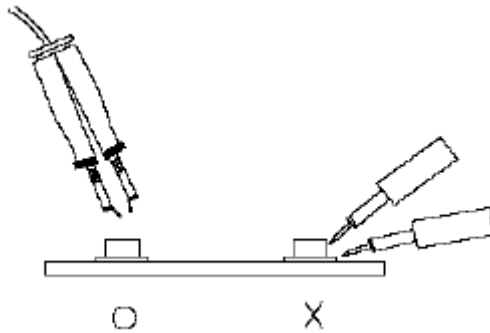
Note: Excessive soldering temperature and / or time might result in deformation of the LED lens or catastrophic failure of the LED.

### 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         | 05-31-2018    |
| Format Adjustment           |      | 1.1         | 07-01-2018    |
|                             |      |             |               |
|                             |      |             |               |
|                             |      |             |               |
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