

Features

- 2020 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 connects protection module, reversed power input will not damage the IC.

Description

The IN-PI20TBT5R5G5B is 2.0*2.0*0.65mm 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

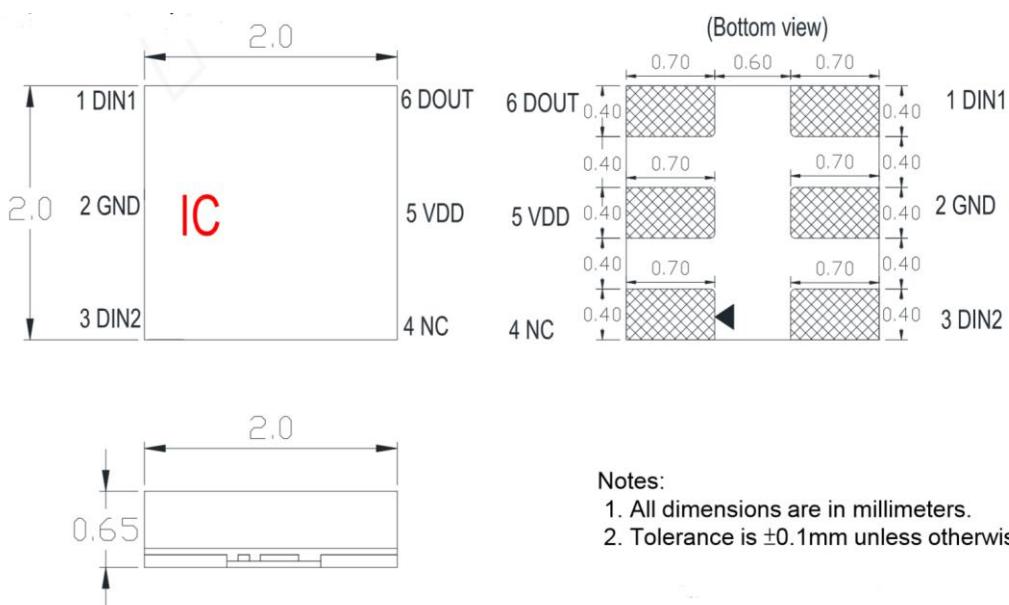
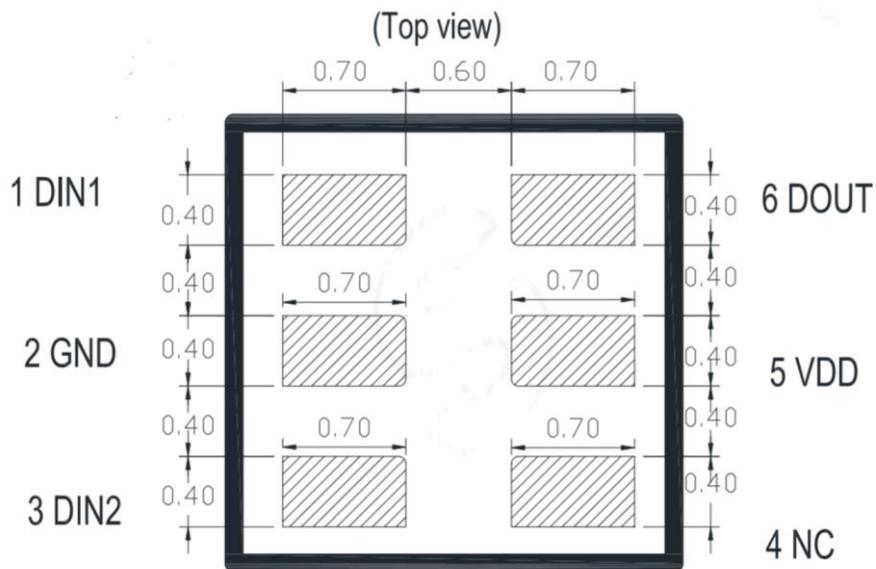


Figure 1. IN-PI20TBT5R5G5B Package Outline Dimensions

Pin Configuration

| Number | Symbol | Pin Name | Function Description |
|--------|--------|-------------|---|
| 1 | DIN1 | Data Input | Control data signal input |
| 2 | GND | Ground | The signal and power supply and grounding |
| 3 | DIN2 | Data Input | Control data signal input |
| 4 | NC | NC | NC |
| 5 | VDD | Power | Power supply pin |
| 6 | DOUT | Data Output | Control data signal output |

Recommended Dimensions for PCB



Notes:

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

Absolute Maximum Rating ($T_a = 25^\circ C$, VSS=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 |
| Operating temperature | T_{OPT} | -40 ~ +80 | ° C |
| Storage temperature | T_{STG} | -40 ~ +80 | ° C |
| ESD pressure (HBM) | V_{ESD} | 2K | V |
| ESD pressure (DM) | V_{ESD} | 200 | V |

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

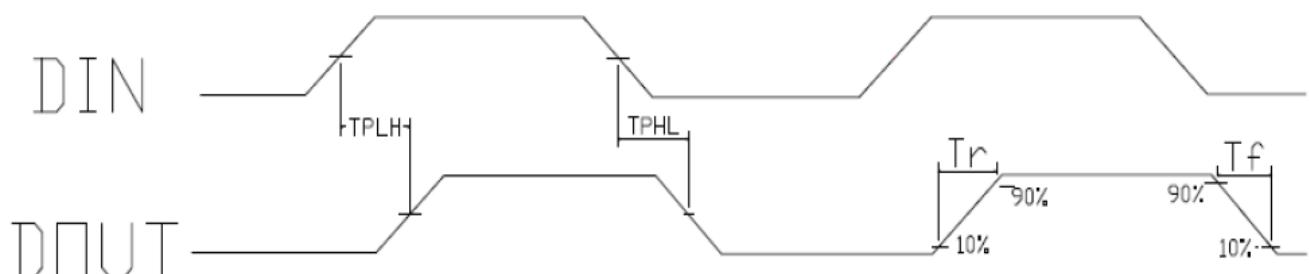
| Color | IN-PI20TBT5R5G5B | |
|-------|------------------|----------------------|
| | Wavelength(nm) | Light Intensity(mcd) |
| Red | 620-630 | 100-200 |
| Green | 520-530 | 300-500 |
| Blue | 460-475 | 50-100 |

Recommended Operating Ranges (unless otherwise specified, Ta= -20 ~ +70 °C, VDD=4.5 ~ 5.5V, VSS=0V)

| 20 | 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*VDD | - | - | V | VDD=5.0V |
| | V_{IL} | - | - | 0.3*VDD | V | |
| The frequency of PWM | F_{PWM} | - | 1.2 | - | KHZ | - |
| Static power consumption | I_{DD} | - | 1 | - | mA | - |

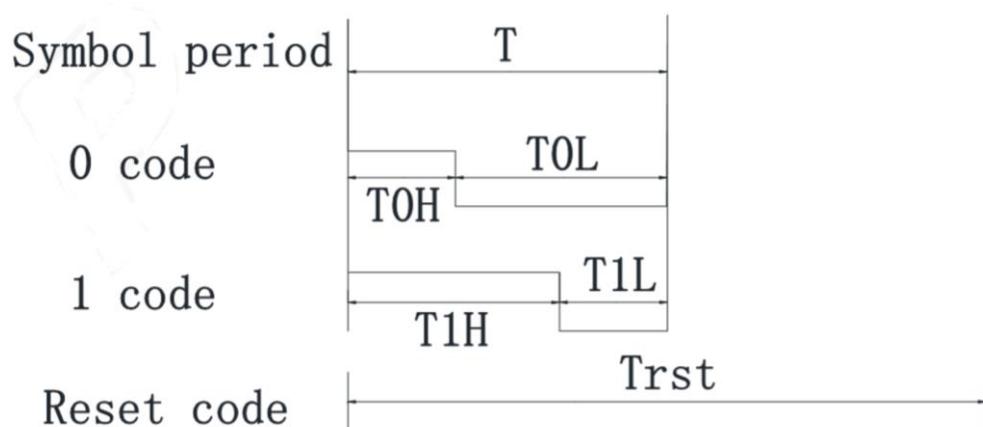
Switching Characteristics ($VCC=5V$, $Ta=25^\circ C$)

| Parameter | Symbol | Min. | Typ. | Max | Unit | Test conditions |
|--------------------------------|-----------|------|------|-----|------|--------------------------------|
| The speed of data transmission | $fDIN$ | - | 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 | $VDS=1.5$ $I_{OUT}=5mA$ |
| | T_f | - | 100 | - | ns | |



Timing Waveforms

1. Input Code

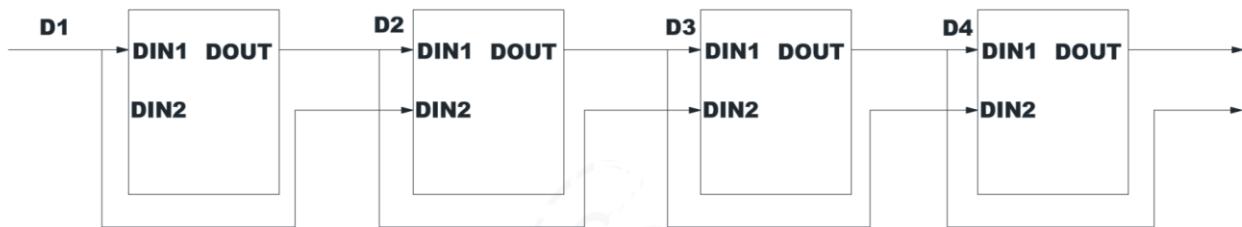


2. The data transmission time ($TH+TL=1.25\mu s \pm 600ns$):

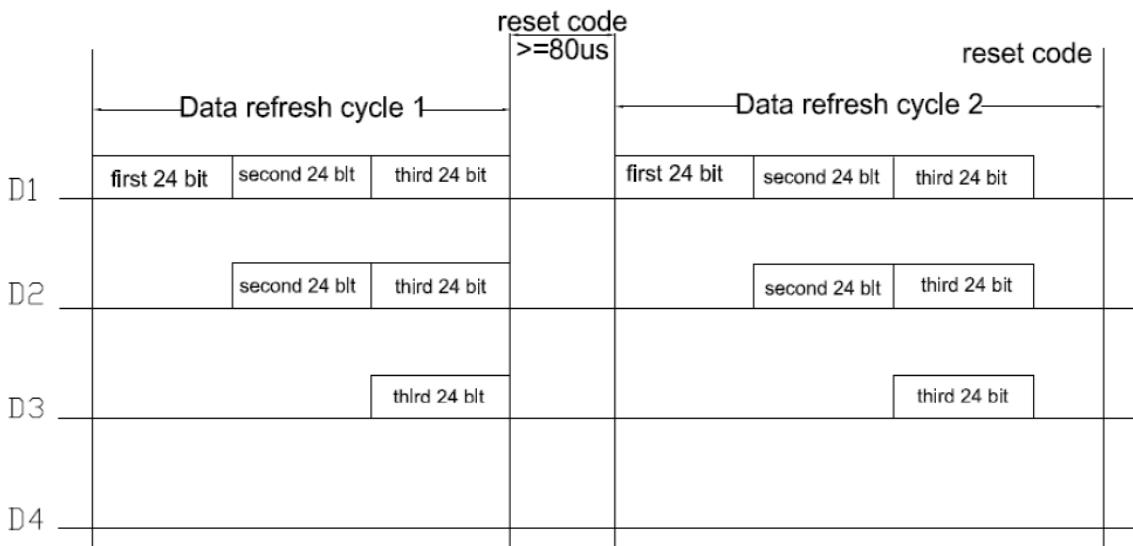
| Name | | Min | Standard Value | Max | Unit |
|------|-----------------------------------|------|----------------|-----|---------|
| T | Code Period | 1.2 | - | - | μs |
| T0H | 0 code, high level time | 0.2 | 0.24 | 0.4 | μs |
| T0L | 0 code, low level time | 0.8 | - | - | μs |
| T1H | 1 code, high level time | 0.62 | 0.74 | 1.0 | μs |
| T1L | 1 code, low level time | 0.2 | - | - | μs |
| Trst | Reset code, low level time | >80 | - | - | μs |

The protocol uses a unipolar zeroing code. Each symbol must have a low level. Each symbol in this protocol starts with a high level. The high time width determines the "0" or "1" code. . 2. When writing programs, the minimum symbol period is $1.2\mu s$. 3. The high time of "0" code and "1" code should be in accordance with the stipulated range in the above table. The low time requirement of "0" code and "1" code is less than $20\mu s$.

3. Connection Scheme



4. Data Transfer Format



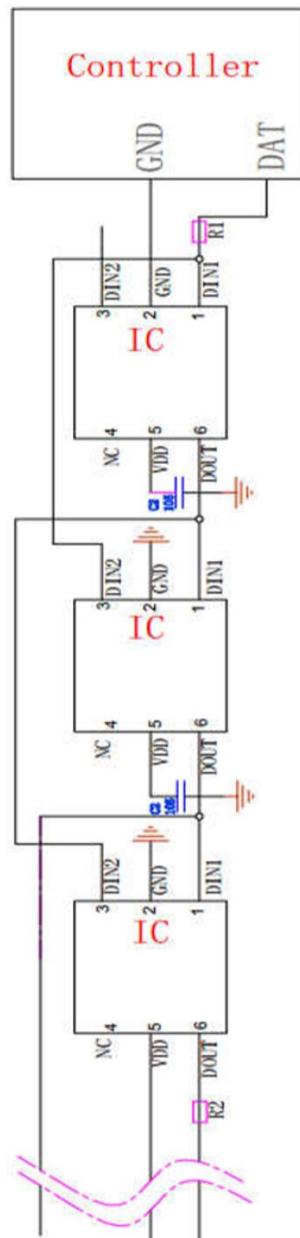
Note: the D1 sends data for MCU, D2, D3, D4 for data forwarding automatic shaping cascade circuit.

5. 24-bit data format

| | | | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | R7 | R6 | R5 | R4 |
| R3 | R2 | R1 | R0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

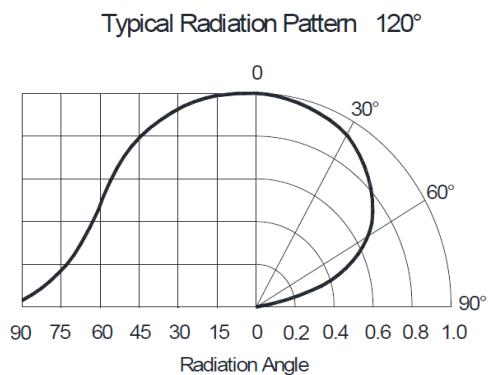
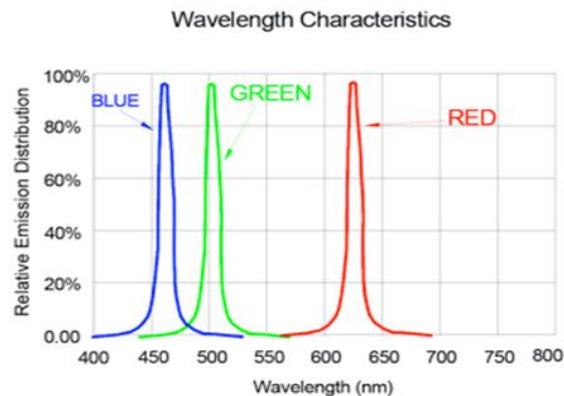
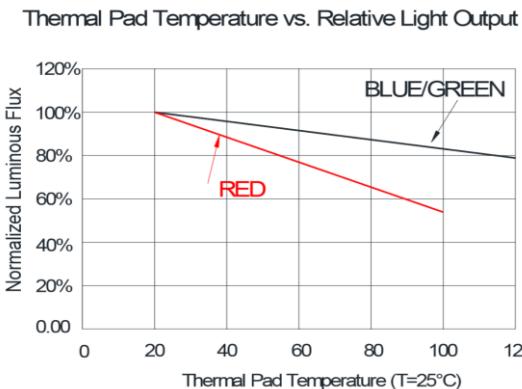
Note: high starting, in order to send data (G7 - G6 -B0)

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 cascades, the smaller R1. The general recommended value is between 200-2KΩ, usually the recommended value is typical 500Ω.

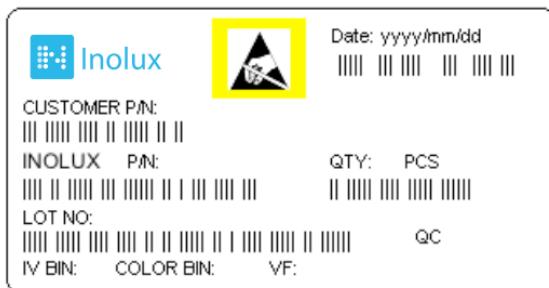
LED Performance Graph



Ordering Information

| Product | Emission Color | IV(mcd) | Orderable Part Number |
|------------------|----------------|---------|-----------------------|
| IN-PI20TBT5R5G5B | R | 100-200 | IN-PI20TBT5R5G5B |
| | G | 300-500 | |
| | B | 50-100 | |

Label Specifications



Inolux P/N:

| I | N | PI | - | 20 | 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 PC- Clock Function IC | | 20TA = 2.0 x 2.0 x 0.65 mm (6 pins) | | T = Top Mount | P=12mA 5 = 5mA | R = 624 nm | P=12mA 5 = 5mA | G = 520 nm | P=12mA 5 = 5mA | B = 470 nm | | | | | | | |

Lot No.:

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

Precautions

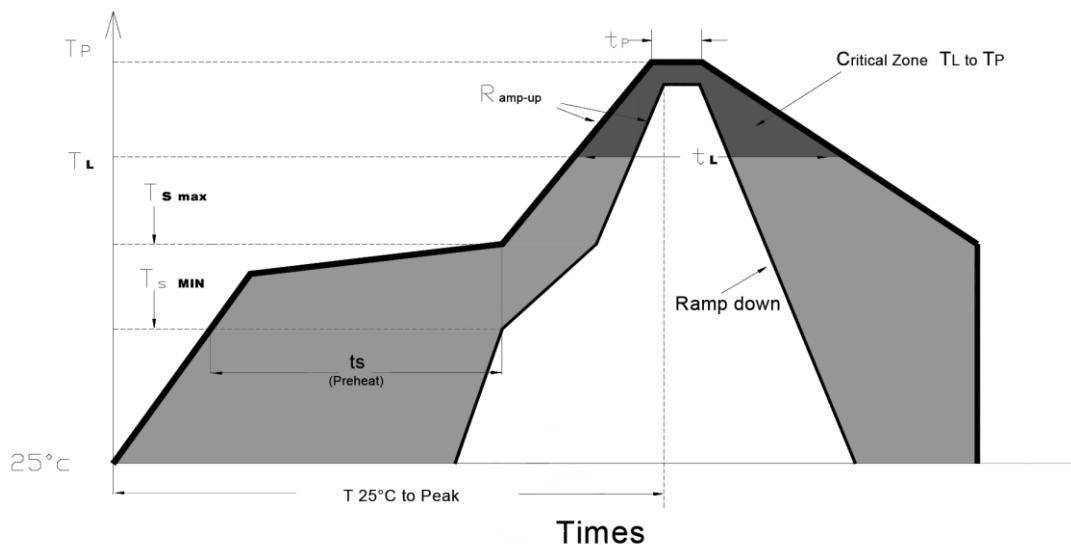
Please read the following notes before using the product:

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 72 hours 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. |

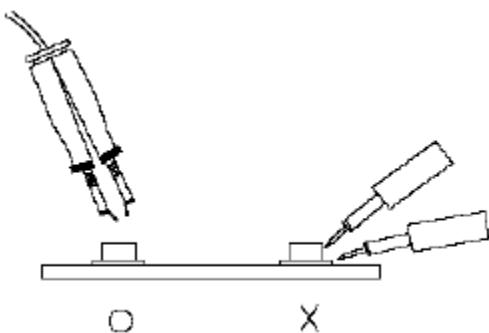
Note: Excessive soldering temperature and / or time might result in deformation of the LED lens or catastrophic failure of the LED.

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 | 03-20-2020 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DISCLAIMER

INOLUX reserves the right to make changes without further notice to any products herein to improve reliability, function or design. INOLUX does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights, nor the rights of others.

LIFE SUPPORT POLICY

INOLUX's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President of INOLUX or INOLUX CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.