**ProLight PBVL-17FWE-F5GR**
**17W Power LED**
**Technical Datasheet**
**Version: 2.1**

# ProLight Opto ProEngine Series

## Features

- High flux density of lighting source
- Good color uniformity
- RoHS compliant
- More energy efficient than incandescent and most halogen lamps
- Long lifetime
- AEC-Q102 compliant
- SAE/ECE compliant

## Main Applications

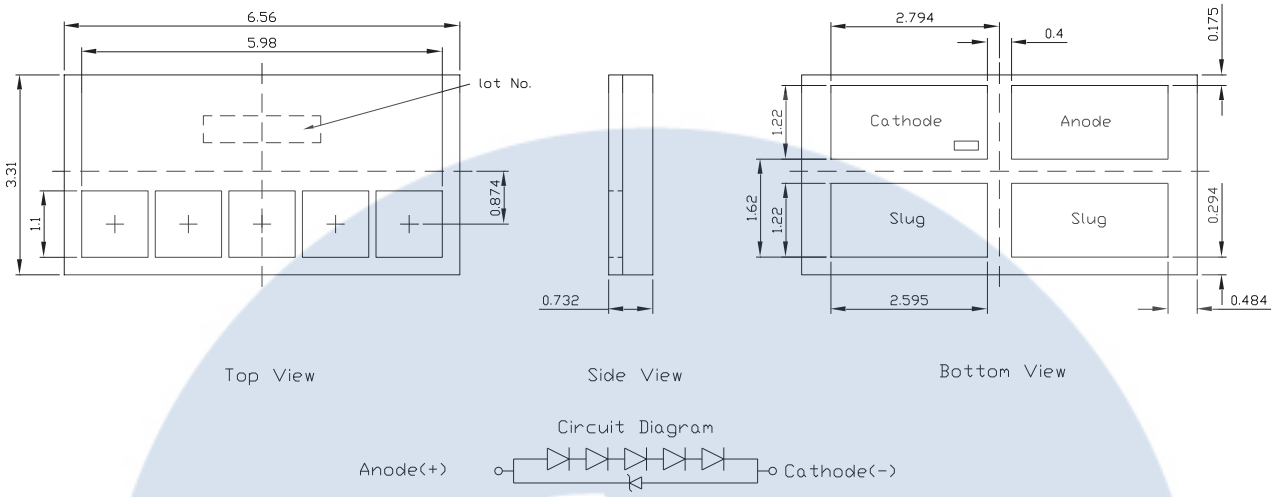
- Bicycle Lamps
- Exterior Automotive Lighting
- Floodlight
- Bending Light
- Daytime Running Light

Automotive

## Introduction

- The input power is 17 Watt, the multi-chip ultra high power ProEngine Series delivers never before seen luminous flux output from a single emitter. The superficial illuminating nature of ProEngine makes them the preference bicycle lamps, typical applications include exterior automotive lighting Bending and Daytime Running Light.

# Emitter Mechanical Dimensions




Notes:
1. Drawing not to scale.
2. All dimensions are in millimeters.
3. Unless otherwise indicated, tolerances are ± 0.1mm.
4. **Please do not use a force of over 0.3kgf impact or pressure on the lens of the LED, otherwise it will cause a catastrophic failure.**

*The appearance and specifications of the product may be modified for improvement without notice.

## Flux Characteristics, $T_J$ = 25˚C

| Radiation Pattern | Color | Part Number Emitter | Luminous Flux $\Phi_V$ (lm) @1000mA Min. | Luminous Flux $\Phi_V$ (lm) @1000mA Typ. | Luminous Flux $\Phi_V$ (lm) Refer @1200mA Min. | Luminous Flux $\Phi_V$ (lm) Refer @1200mA Typ. |
|---|---|---|---|---|---|---|
| Lambertian | White | PBVL-17FWE-F5GR | 1650 | 1950 | 1900 | 2230 |

- ProLight maintains a tolerance of ± 7% on flux and power measurements.
- Please do not drive at rated current more than 1 second without proper heat sink.

## Electrical Characteristics, $T_J$ = 25˚C

| Color | Forward Voltage $V_F$ (V) @1000mA Min. | Forward Voltage $V_F$ (V) @1000mA Typ. | Forward Voltage $V_F$ (V) @1000mA Max. | Forward Voltage $V_F$ (V) Refer @1200mA Typ. | Real Thermal Resistance Junction to Slug (˚C/ W) | Electrical Thermal Resistance Junction to Slug (˚C/ W) |
|---|---|---|---|---|---|---|
| White | 12.0 | 16.2 | 19.2 | 16.5 | 1.4 | 0.95 |

- ProLight maintains a tolerance of ± 0.1V for Voltage measurements.

## Optical Characteristics at 1000mA, $T_J$ = 25˚C

| Radiation Pattern | Color | Color Temperature CCT Min. | Color Temperature CCT Typ. | Color Temperature CCT Max. | Viewing Angle (degrees) $2\theta_{1/2}$ |
|---|---|---|---|---|---|
| Lambertian | White | 5380 K | 5620 K | 5860 K | 120 |
| | | 5620 K | 5880 K | 6140 K | 120 |
| | | 5870 K | 6150 K | 6430 K | 120 |
| | | 6140 K | 6450 K | 6760 K | 120 |

- ProLight maintains a tolerance of ± 5% for CCT measurements.

# Absolute Maximum Ratings

| Parameter | White |
|---|---|
| Max DC Forward Current (mA) | 1500 |
| Peak Pulsed Forward Current (mA) | 1500 (less than 1/10 duty cycle@1KHz) |
| LED Junction Temperature | 150˚C |
| Junction Temperature for short time applications* | 175˚C |
| Operating Temperature | -40˚C - 125˚C |
| Storage Temperature | -40˚C - 125˚C |
| Reverse Voltage | Not designed to be driven in reverse bias |
| ESD withstand voltage(kV) acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 3B) | up to 8 |

Note: * The LED chip exhibits excellent performance but slight package discoloration occurs at highest temperatures. Exemplary median lifetime for $T_J$ = 175˚C is 100h.

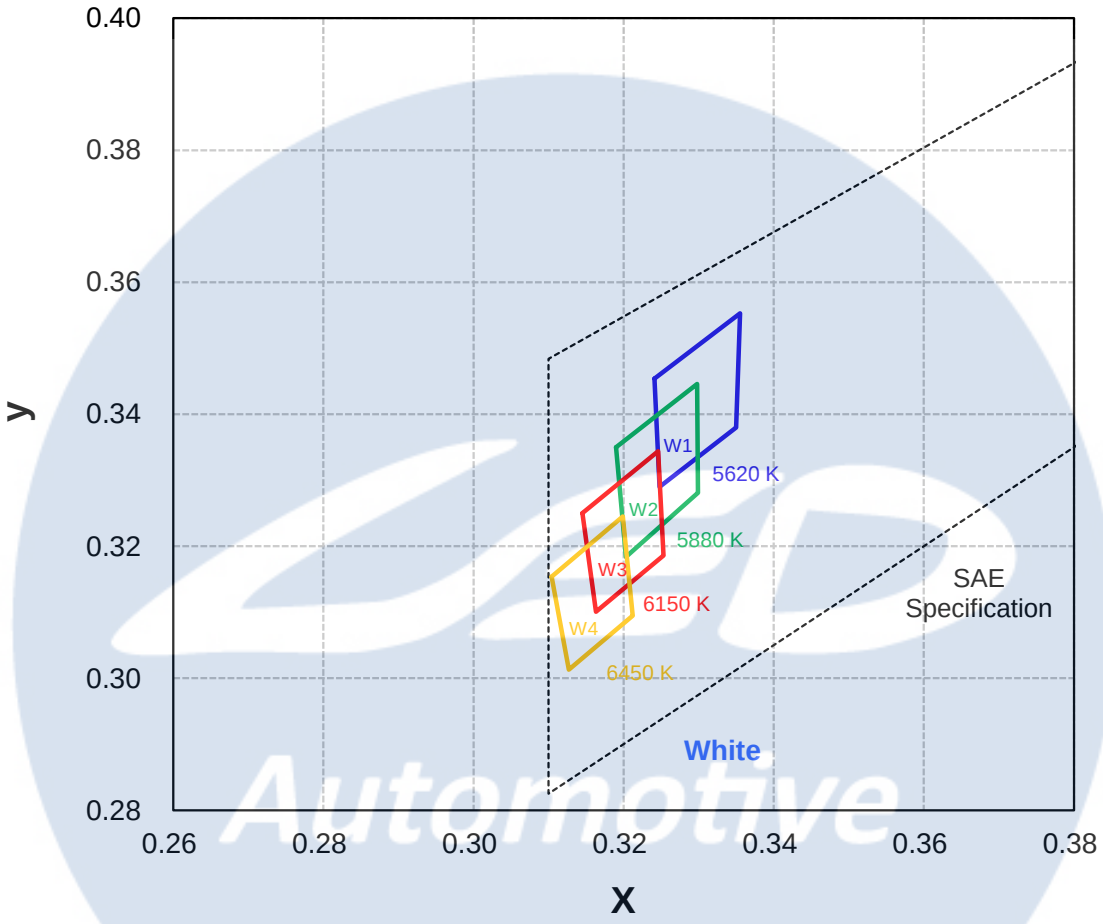
# Photometric Luminous Flux Bin Structure

| Color | Bin Code | Minimum Photometric Flux (lm) | Maximum Photometric Flux (lm) | Available Color Bins |
|---|---|---|---|---|
| White | F8 | 1650 | 1700 | All |
| | F9 | 1700 | 1760 | All |
| | FA | 1760 | 1820 | All |
| | FB | 1820 | 1880 | All |
| | FC | 1880 | 2000 | All |
| | FD | 2000 | 2200 | 【1】 |
| | FE | 2200 | 2400 | 【1】 |

- ProLight maintains a tolerance of ± 7% on flux and power measurements.
- The flux bin of the product may be modified for improvement without notice.
- 【1】 The rest of color bins are not 100% ready for order currently. Please ask for quote and order Possibility.

# Color Bin

**White Binning Structure Graphical Representation**



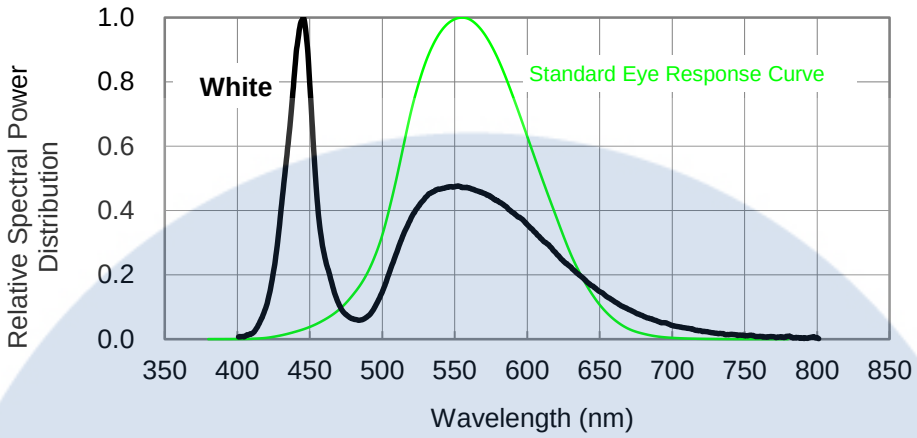

**White Bin Structure**

| Bin Code | x | y | Typ. CCT (K) | Bin Code | x | y | Typ. CCT (K) |
|---|---|---|---|---|---|---|---|
| W1 | 0.3241 | 0.3454 | 5620 | W3 | 0.3145 | 0.3250 | 6150 |
| | 0.3248 | 0.3290 | | | 0.3163 | 0.3101 | |
| | 0.3350 | 0.3380 | | | 0.3253 | 0.3186 | |
| | 0.3355 | 0.3553 | | | 0.3246 | 0.3344 | |
| W2 | 0.3190 | 0.3350 | 5880 | W4 | 0.3104 | 0.3154 | 6450 |
| | 0.3203 | 0.3184 | | | 0.3127 | 0.3013 | |
| | 0.3299 | 0.3281 | | | 0.3212 | 0.3095 | |
| | 0.3298 | 0.3446 | | | 0.3199 | 0.3245 | |

- Tolerance on each color bin (x , y) is ± 0.005

# Color Spectrum, $T_J$ = 25˚C

1. White



# Junction Temperature Relative Characteristics

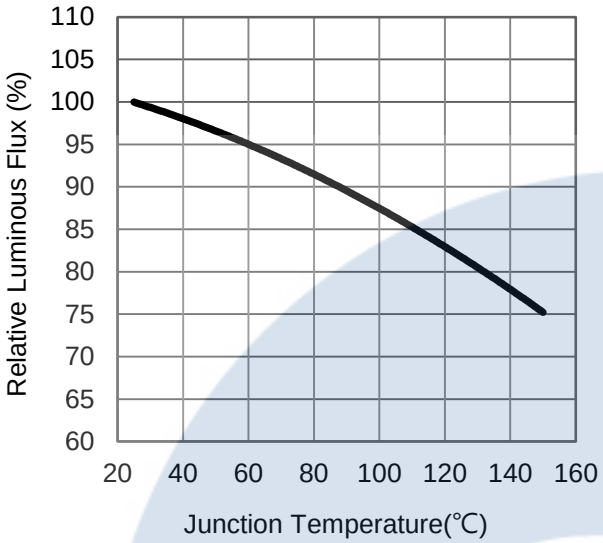



Fig 1. Junction Temperature vs. Relative Luminous Flux at 1000mA.

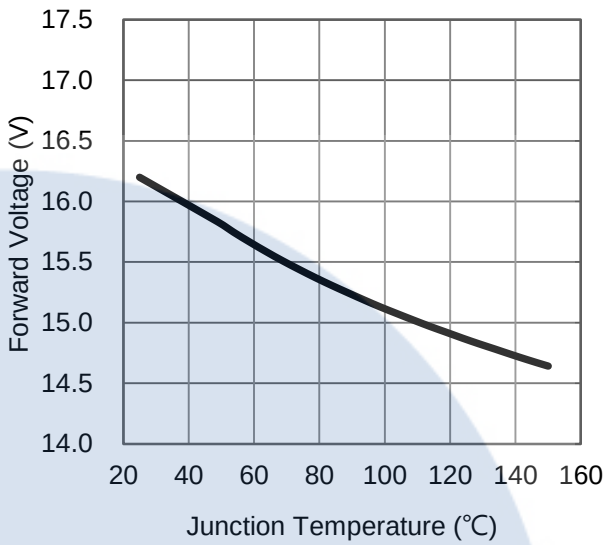



Fig 2. Junction Temperature vs. Forward Voltage at 1000mA.

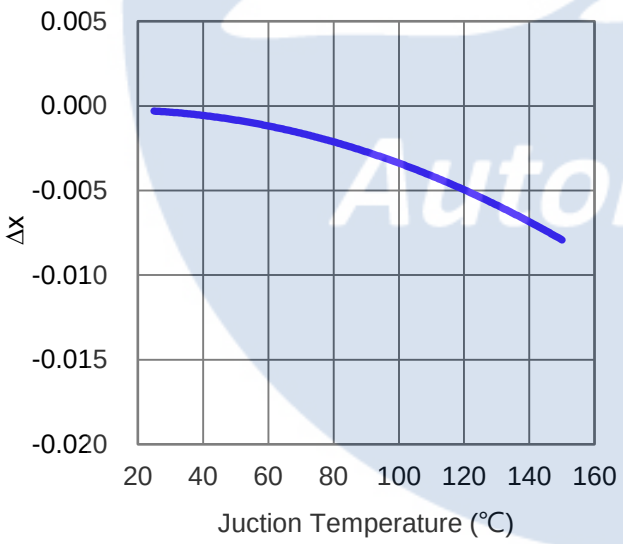



Fig 3. Junction Temperature vs. Chromaticity Coordinate Δx at 1000mA.

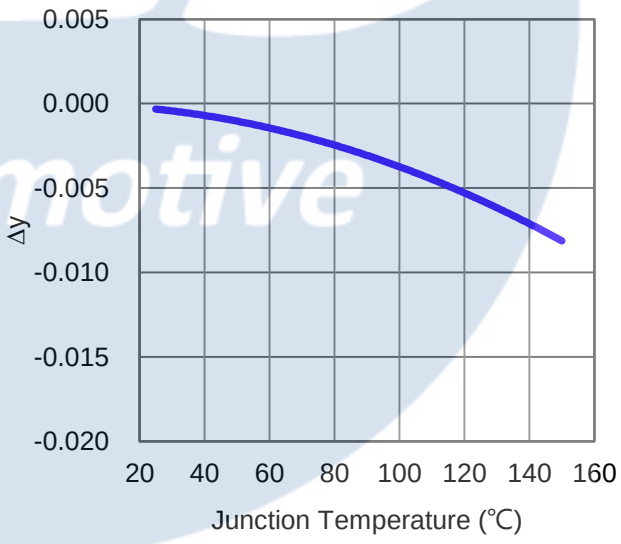



Fig 4. Junction Temperature vs. Chromaticity Coordinate Δy at 1000mA.

# Forward Current Relative Characteristics

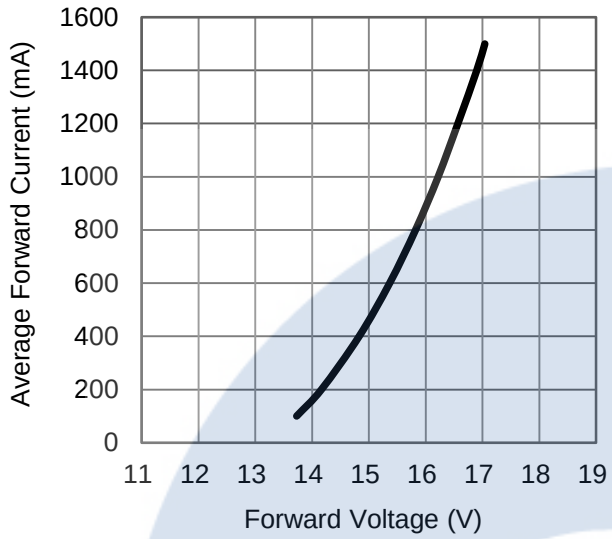



Fig 5. Forward Voltage vs. Forward Current at $T_J$=25℃.

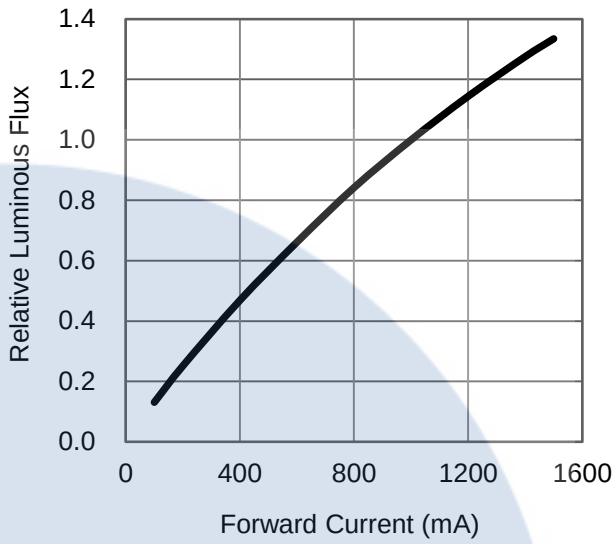



Fig 6. Forward Current vs. Relative Luminous Flux at $T_J$=25℃.

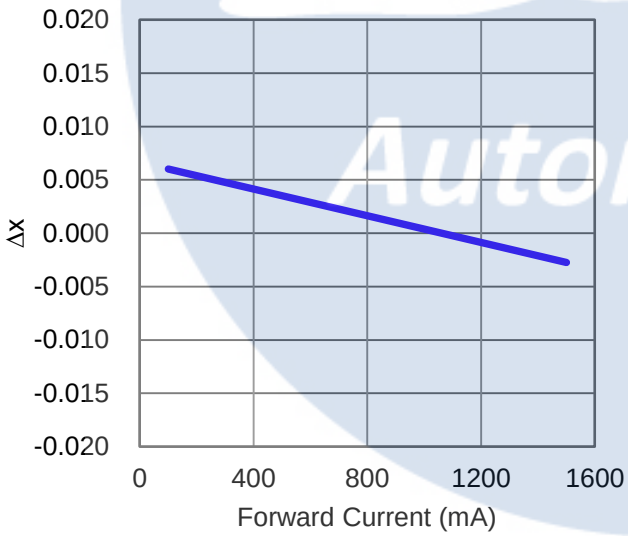



Fig 7. Forward Current vs. Chromaticity Coordinate Δx at $T_J$=25℃.

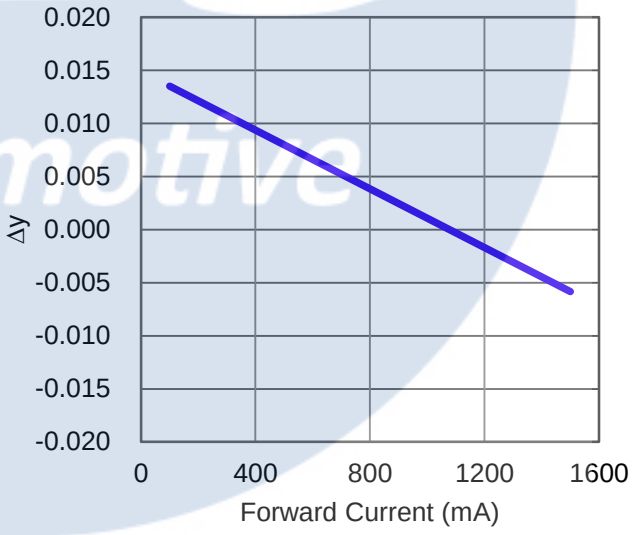
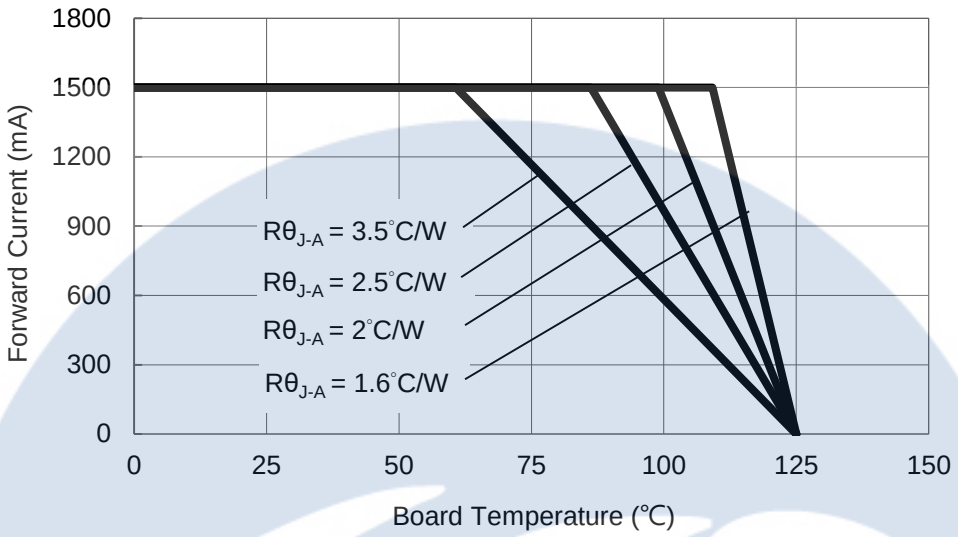


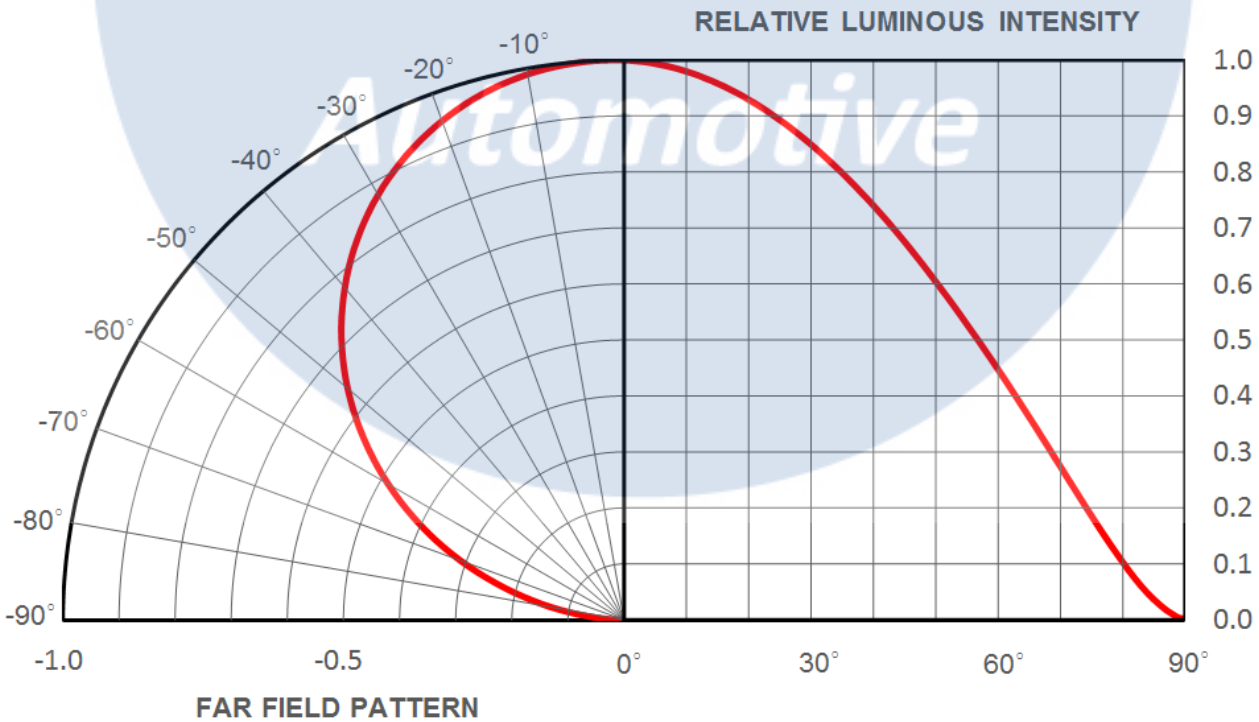

Fig 8. Forward Current vs. Chromaticity Coordinate Δy at $T_J$=25℃.

# Board Temperature vs. Maximum Forward Current

Maximum Forward Current




# Typical Representative Spatial Radiation Pattern



# Moisture Sensitivity Level – JEDEC Level 1

| Level | Floor Life | | Soak Requirements | | | |
|---|---|---|---|---|---|---|
| | | | Standard | | Accelerated Environment | |
| | Time | Conditions | Time (hours) | Conditions | Time (hours) | Conditions |
| 1 | Unlimited | ≤30˚C / 85% RH | 168 +5/-0 | 85˚C / 85% RH | NA | NA |

- The standard soak time includes a default value of 24 hours for semiconductor manufature's exposure time (MET) between bake and bag and includes the maximum time allowed out of the bag at the distributor's facility.
- Table below presents the moisture sensitivity level definitions per IPC/JEDEC's J-STD-020C.

| Level | Floor Life | | Soak Requirements | | | |
|---|---|---|---|---|---|---|
| | | | Standard | | Accelerated Environment | |
| | Time | Conditions | Time (hours) | Conditions | Time (hours) | Conditions |
| 1 | Unlimited | ≤30˚C / 85% RH | 168 +5/-0 | 85˚C / 85% RH | NA | NA |
| 2 | 1 year | ≤30˚C / 60% RH | 168 +5/-0 | 85˚C / 60% RH | NA | NA |
| 2a | 4 weeks | ≤30˚C / 60% RH | 696 +5/-0 | 30˚C / 60% RH | 120 +1/-0 | 60˚C / 60% RH |
| 3 | 168 hours | ≤30˚C / 60% RH | 192 +5/-0 | 30˚C / 60% RH | 40 +1/-0 | 60˚C / 60% RH |
| 4 | 72 hours | ≤30˚C / 60% RH | 96 +2/-0 | 30˚C / 60% RH | 20 +0.5/-0 | 60˚C / 60% RH |
| 5 | 48 hours | ≤30˚C / 60% RH | 72 +2/-0 | 30˚C / 60% RH | 15 +0.5/-0 | 60˚C / 60% RH |
| 5a | 24 hours | ≤30˚C / 60% RH | 48 +2/-0 | 30˚C / 60% RH | 10 +0.5/-0 | 60˚C / 60% RH |
| 6 | Time on Label (TOL) | ≤30˚C / 60% RH | Time on Label (TOL) | 30˚C / 60% RH | NA | NA |

# Reliability testing in accordance with AEC-Q102

The development of this product included extensive operational life-time testing and environmental testing. Table 1 summarizes the tests applied and cumulative test results obtained from testing performed in accordance with AEC-Q102.

**Table 1. Operating life, mechanical and environmental tests performed on it's package in accordance with AEC-Q102.**

| # | STRESS | ABV | Conditions | Duration | Failure Criteria | Rejects |
|---|---|---|---|---|---|---|
| 1 | Pre- and Post-Stress Electrical Test | TEST | Test is performed as specified in the applicable stress reference at room temperature. | N/A | See notes [2] | 0 |
| A1 | Pre-conditioning | PC | Soak Tamb = 85 °C, RH = 85% Reflow soldering | N/A | See notes [2] | 0 |
| A2a | Wet High Temperature Operating Life | WHTOL 1 | Tambient = 85 °C / 85% RH IF = max. DC [1] | 1000 hours | See notes [2] | 0 |
| A3a | Power Temperature Cycling | PTC | -40°C to 125°C, 10 minutes dwell, 20 minutes transfer (1 hour cycle), 2 minutes ON/2 minutes OFF, IF = max. DC [1] | 1000 hours | See notes [2] | 0 |
| A4 | Temperature Cycling | TC | -40°C to 125°C,15 minutes dwell | 1000 cycles | See notes [2] | 0 |
| B1a | High Temperature Operating Life | HTOL1 | Tsolder =85°C, IF = max. DC [1] | 1000 hours | See notes [2] | 0 |
| B1b | High Temperature Operating Life | HTOL2 | Maximum specified Tsolder, IF = max. DC [1] | 1000 hours | See notes [2] | 0 |
| C9 | Thermal Resistance | TR | All qualification parts submitted for testing | N/A | See notes [2] | 0 |
| C10 | Solderability | SD | 245 °C ± 5 °C | 3s | See notes [3] | 0 |
| C12 | Hydrogen Sulphide | H2S | Corrosion class A: (preferred) Duration 336 h at 40 °C and 90% RH. H2S concentration: 15ppm | 336 hours | See notes [2] | 0 |
| E3 | Electrostatic Discharge Human Body Model | HBM | ANSI/ESDA/JEDEC JS-001 | N/A | See notes [3] | 0 |
| G2 | Vibration Variable Frequency | VVF | 10-2000-10 Hz, log or linear sweep rate, 20 G about 1 min., 1.5 mm, 3X/axis | N/A | See notes [3] | 0 |
| G3 | Mechanical Shock | MS | 1500 G, 0.5 msec. pulse, 5 shocks each 6 axis | N/A | See notes [3] | 0 |

Notes:

1. Depending on the maximum derating curve.
2. Criteria for judging failure

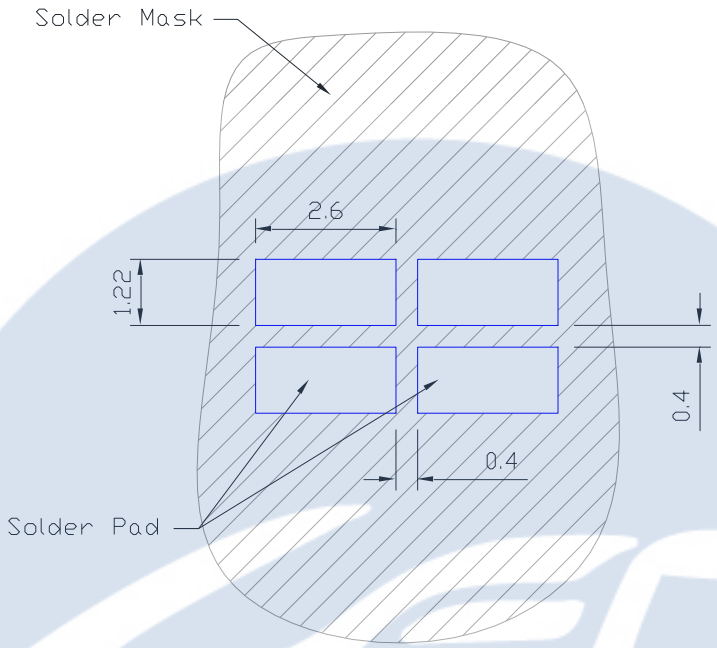
| Item | Test Condition | Criteria for Judgement | |
|---|---|---|---|
| | | Min. | Max. |
| Forward Voltage ($V_F$) | $I_F$ = max DC | -- | Initial Level x 1.1 |
| Luminous Flux or Radiometric Power ($\Phi_V$) | $I_F$ = max DC | Initial Level x 0.8 | -- |
| Reverse Current ($I_R$) | $V_R$ = 5V | -- | 50 μA |

* The test is performed after the LED is cooled down to the room temperature.

3. A failure is an LED that is open or shorted.

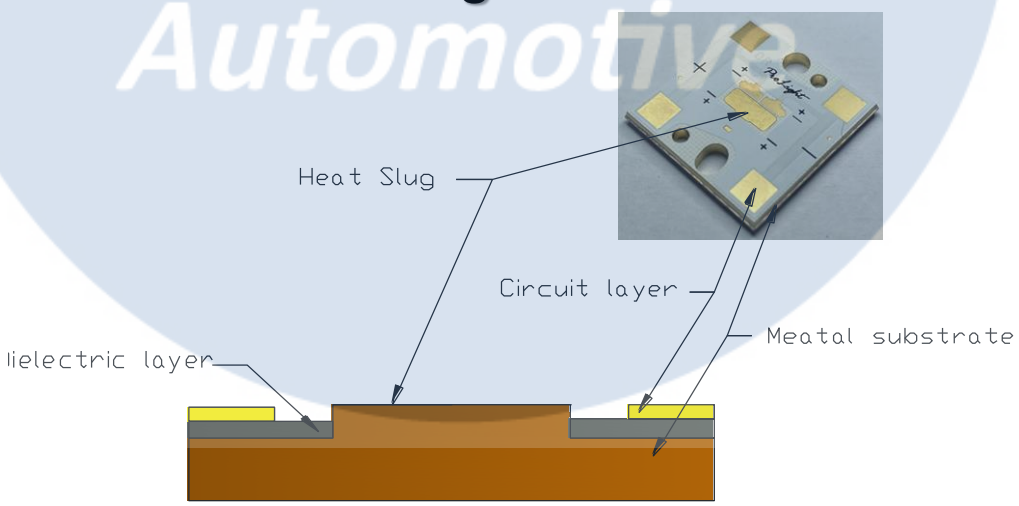
# Recommended Solder Pad Design

**Standard Emitter**



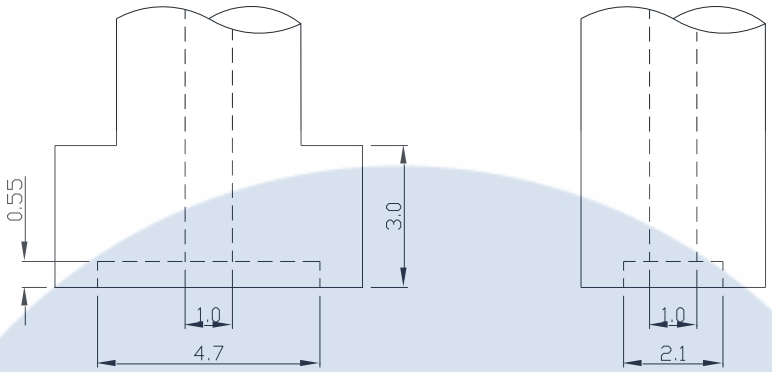

- All dimensions are in millimeters.

# Recommended MCPCB Design

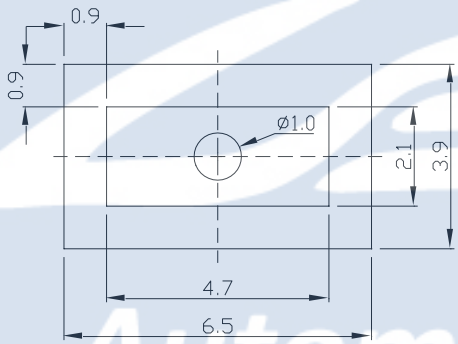



- Copper(Cu) substrate is recommended.
- The thermal conductivity of dielectric layer in the Aluminum(Al) substrate is greater or equal than 6w/mk.
- If the thermal conductivity of dielectric layer equal to 2w/mk, the power consumption should be lower than 20w.

# Recommended Suction Nozzle Design

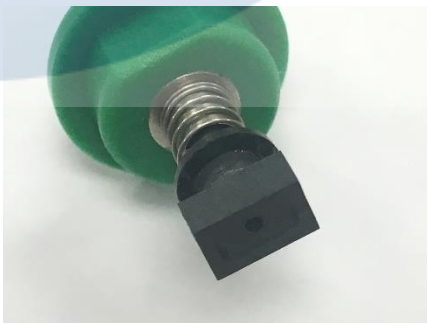



Side View



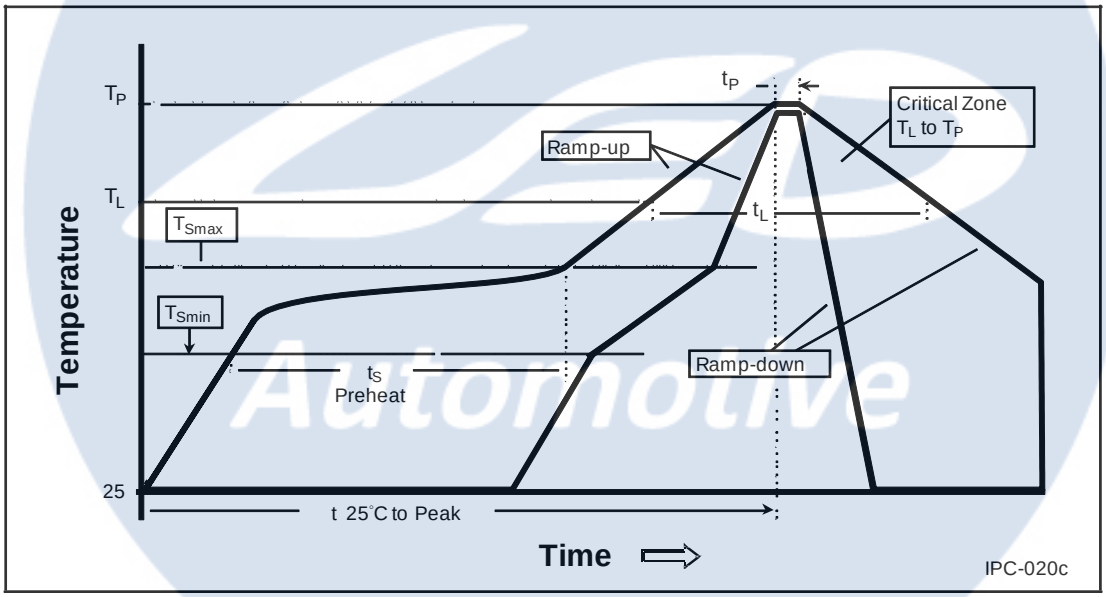

Bottom View

Notes:
1. All dimensions are in millimeters and tolerances are ± 0.05mm.
2. Recommended the material of suction nozzle was PEEK.
3. The actual suction nozzle like below picture.



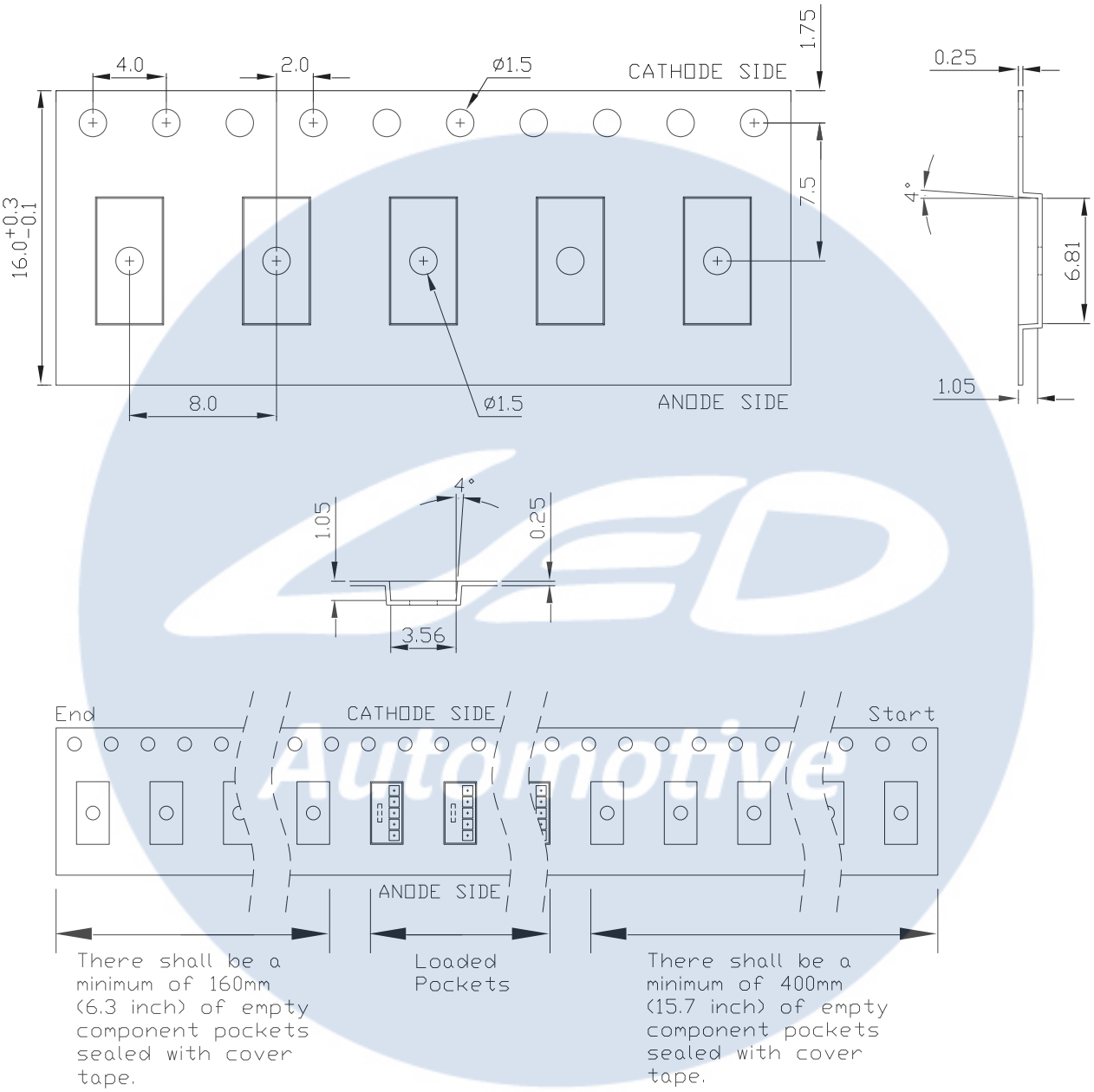
# Reflow Soldering Condition

| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|---|---|---|
| Average Ramp-Up Rate ($T_{Smax}$ to $T_P$) | 3°C / second max. | 3°C / second max. |
| Preheat<br>– Temperature Min ($T_{Smin}$)<br>– Temperature Max ($T_{Smax}$)<br>– Time ($t_{Smin}$ to $t_{Smax}$) | <br>100°C<br>150°C<br>60-120 seconds | <br>150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>– Temperature ($T_L$)<br>– Time ($t_L$) | <br>183°C<br>60-150 seconds | <br>217°C<br>60-150 seconds |
| Peak/Classification Temperature ($T_P$) | 240°C | 260°C |
| Time Within 5°C of Actual Peak Temperature ($t_P$) | 10-30 seconds | 20-40 seconds |
| Ramp-Down Rate | 6°C/second max. | 6°C/second max. |
| Time 25°C to Peak Temperature | 6 minutes max. | 8 minutes max. |



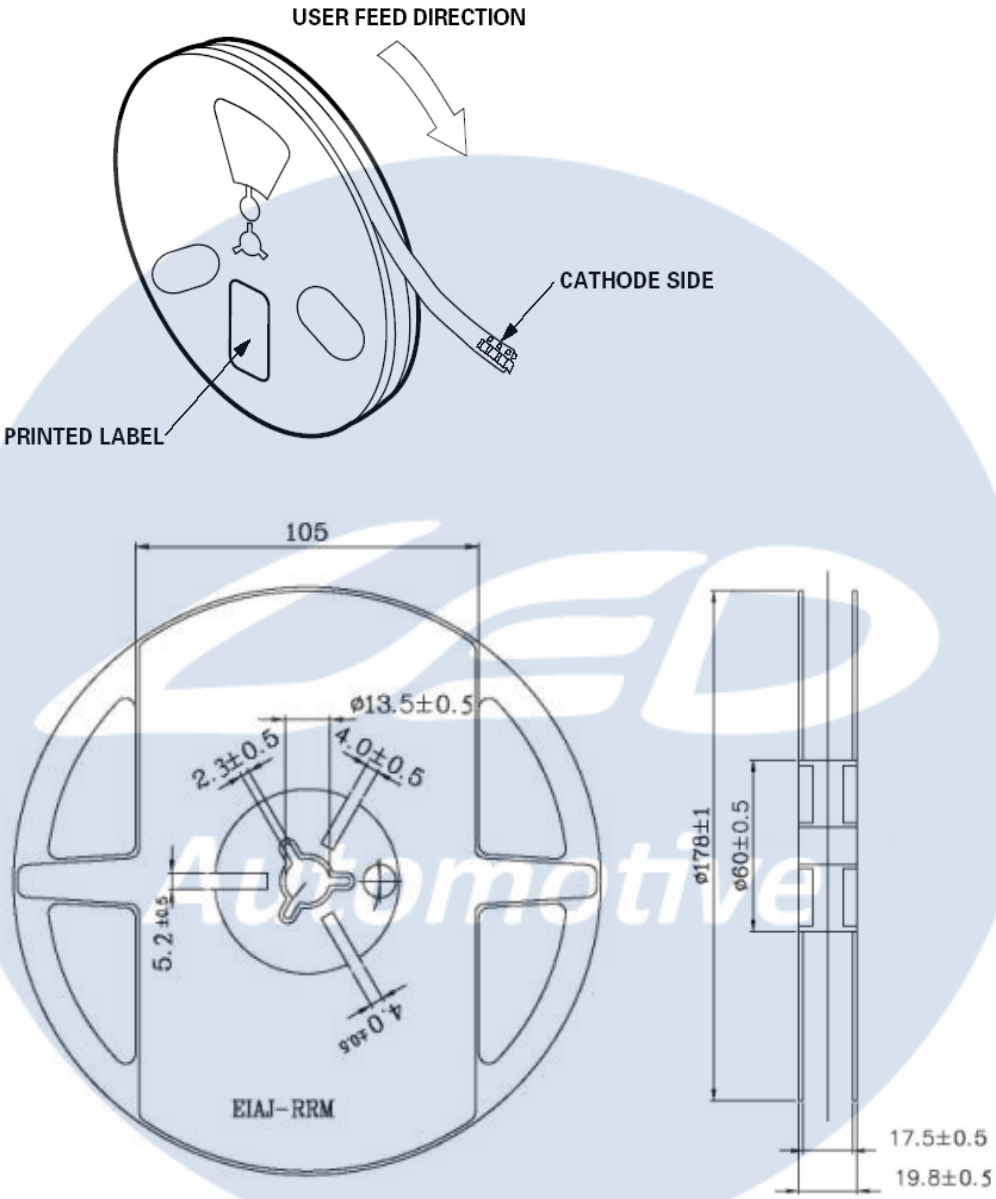

- **We recommend using the M705-S101-S4 solder paste from SMIC (Senju Metal Industry Co., Ltd.) for lead-free soldering.**
- **Do not use solder pastes with post reflow flux residue>47%. (58Bi-42Sn eutectic alloy, etc) This kind of solder pastes may cause a reliability problem to LED.**
- All temperatures refer to topside of the package, measured on the package body surface.
- Repairing should not be done after the LEDs have been soldered. When repairing is unavoidable, a double-head soldering iron should be used. It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.
- Reflow soldering should not be done more than three times.
- When soldering, do not put stress on the LEDs during heating.
- After soldering, do not warp the circuit board.

# Emitter Reel Packaging




Notes:
1. Drawing not to scale.
2. All dimensions are in millimeters.
3. Unless otherwise indicated, tolerances are ± 0.1mm.

# Emitter Reel Packaging




Notes:
1. Empty component pockets sealed with top cover tape.
2. 500 or 1000 pieces per reel.
3. Drawing not to scale.
4. All dimensions are in millimeters.

# Recommended Soldering Condition

- Please use lead free and “no clean ” solders.
- Soldering shall be implemented using a soldering tip at a temperature lower than 350 ℃, and shall be finished within 3.5 seconds for each pad.
- During the soldering process, put the LEDs on materials whose conductivity is poor enough not to radiate heat of soldering.
- Properly solder tin wires before soldering them to LEDs.
- Avoid touching the glass lens with the soldering iron.
- Please prevent flux from touching to the glass lens.
- Please solder evenly on each pad.
- Contacts number of a soldering tip should be within twice for each pad.
- Next process of soldering should be carried out after the LEDs have return to ambient temperature.

*ProLight cannot guarantee if usage exceeds these recommended conditions.
Please use it after sufficient verification is carried out on your own risk if absolutely necessary.

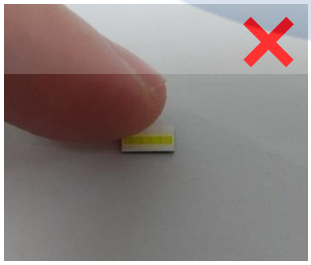
# Precaution for Use

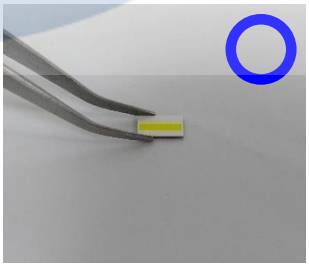
- The modules light output are intense enough to cause injury to human eyes if viewed directly. Precautions must be taken to avoid looking directly at the modules with unprotected eyes.
- The modules are sensitive to electrostatic discharge. Appropriate ESD protection measures must be taken when working with the modules. Non-compliance with ESD protection measures may lead to damage or destruction of the product.
- Chemical solvents or cleaning agents must not be used to clean the modules. Mechanical stress on the Emitters must be avoided. It is best to use a soft brush, damp cloth or low-pressure compressed air.
- The products should be stored away from direct light in dry location.
- The appearance, specifications and flux bin of the product may be modified for improvement without notice. Please refer to the below website for the latest datasheets. http://www.prolightopto.com/

# Handling of without Cover Lens LEDs

Notes for handling of without cover lens LEDs

- Please do not use a force of over 0.3kgf impact or pressure on the emitting area, otherwise it will cause a catastrophic failure.
- Avoid touching the emitting area especially by sharp tools such as Tweezers.
- Avoid leaving fingerprints on the emitting area .
- Please store the LEDs away from dusty areas or seal the product against dust.
- Please do not mold over the emitting area with another resin. (epoxy, urethane, etc)





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