High Power LED

1W RC Edixeon®

# RC Edixeon® Emitter

| Approved By Customer | Designer | Checker | Approval |
|---|---|---|---|
| | | | |

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# 1W RC Edixeon®

RC Edixeon® emitters are one of the highest flux LEDs in the world by Edison Opto. RC Edixeon® emitters are designed to satisfy more and more Solid-State lighting High Power LED applications for brilliant world such as flash light, indoor and outdoor decoration light. RC Edixeon® emitters are designed by particular package for reflow process application. 1W RC Edixeon white has typical 55 lumens @350mA. Unlike most fluorescent sources, Edixeon® contains no mercury and has more energy efficient than other incandescent light source.

## Features

- Various colors
- More energy efficient than incandescent and most halogen lamps
- Low voltage operated
- Instant light
- Long operating life
- Reflow process compatible.

## Typical Applications

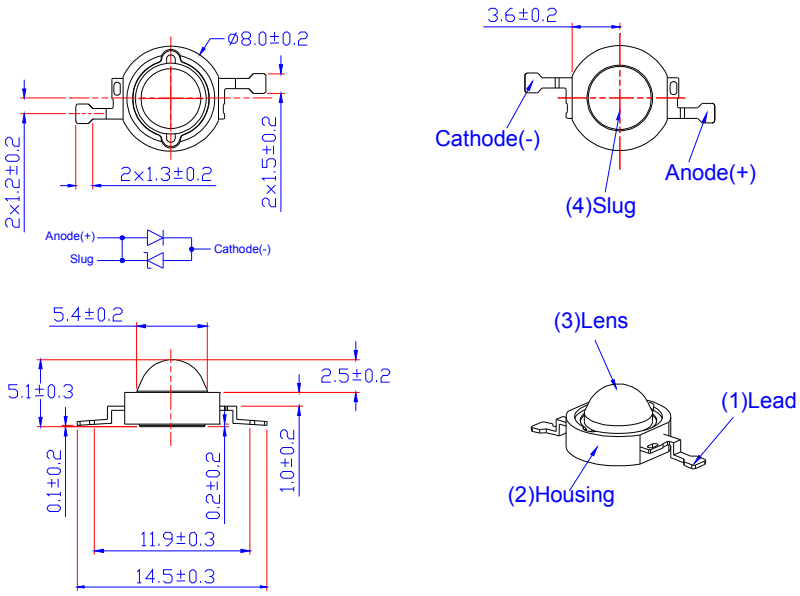
- Reading lights
- Portable flashlight
- Up-lighters and Down-lighters
- LCD Backlights
- General lighting
- Contour lights
- Ceiling lights
- Garden lighting
- Decoration lights
- Architectural lighting
- Beacon lights

## RC Edixeon® Technology

- Tjmax = 150 $^{O}$C
- High Lumen performance
- Low thermal resistance 12 ℃/W
- Industrial best moisture sensitivity level — JEDEC 2a
- Lead free reflow solder JEDEC 020C compatible
- RoHS compliant
- Industrial best lumen maintenance — 50,000hrs life at $I_{Fmax}$ with 70% lumen if Tj is lower than 70 $^{O}$C

## Package Outlines

### Lambertian




**Notes:**

1. **All dimensions are in mm.**
2. **Drawings are not to scale.**
3. **It is strongly recommended that the temperature of lead be not higher than 55℃.**
4. **Lambertian series slug has polarity as anode.**
5. **It is important that the slug can't contact aluminum surface, It is strongly recommended that there should coat a uniform electrically isolated heat dissipation film on the aluminum surface.**

## Absolute Maximum Ratings

| Parameter | Symbol | Rating | Units |
|---|---|---|---|
| **DC Forward Current** | $I_F$ | **350** | mA |
| **Peak pulse current;(tp≦100μs, Duty cycle=0.25)** | $I_{pulse}$ | **500** | mA |
| **Reverse Voltage** | $V_R$ | **5** | V |
| **Forward Contact Voltage** | $V_{FC}$ | **16** | V |
| **LED junction Temperature** | $T_j$ | **150** | ℃ |
| **Operating Temperature** | $T_{opr}$ | **-30 ~ +110** | ℃ |
| **Storage Temperature** | $T_{stg}$ | **-40 ~ +120** | ℃ |
| **Soldering Temperature** | **JEDEC 020c** | **260** | ℃ |
| **ESD Sensitivity** | $V_B$ | **4000** | V |
| **Manual Soldering Time at 260**℃(Max.) | $T_{sol}$ | **5** | *seconds* |

**Notes:**

1. **Proper current derating must be observed to maintain junction temperature below the maximum.**
2. **LEDs are not designed to be driven in reserve bias.**
3. **Allowable reflow cycles are 3 times for each LED.**

## Luminous Flux & Radiometric Power[1] Characteristics at $I_F$=350mA(Tj=25℃):

| Lens Item | Part Name | Color | Flux | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Lambertian | **EDEW-1LC1** | White | ***30.3*** | ***55.0*** | **--** | *lm* |
| | **EDEW-1LC7** | White | ***30.3*** | ***55.0*** | **--** | *lm* |
| | **EDEX-1LC1** | Warm White | ***17.9*** | ***35.0*** | **--** | *lm* |
| | **EDER-1LC3** | Red | ***23.3*** | ***40.0*** | **--** | *lm* |
| | **EDEO-1LC3** | Red Orange | ***23.3*** | ***45.0*** | **--** | *lm* |
| | **EDEA-1LC3** | Amber | ***23.3*** | ***40.0*** | **--** | *lm* |
| | **EDET-1LC1** | True Green | ***30.3*** | ***55.0*** | **--** | *lm* |
| | **EDEB-1LC1** | Blue | ***8.2*** | ***20.0*** | **--** | *lm* |
| | **EDEC-1LC1** | Royal Blue[1] | **--** | ***200.0*** | **--** | *mW* |

## Forward Voltage Characteristics at $I_F$=350mA(Tj=25℃):

| Lens Item | Part Name | Color | $V_F$ | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Lambertian | **EDEW-1LC1** | White | ***3.1*** | **--** | ***4.3*** | *V* |
| | **EDEW-1LC7** | White | ***3.1*** | **--** | ***3.7*** | *V* |
| | **EDEX-1LC1** | Warm White | ***3.1*** | **--** | ***4.3*** | *V* |
| | **EDER-1LC3** | Red | ***2.0*** | **--** | ***3.0*** | *V* |
| | **EDEO-1LC3** | Red Orange | ***2.0*** | **--** | ***3.0*** | *V* |
| | **EDEA-1LC3** | Amber | ***2.0*** | **--** | ***3.0*** | *V* |
| | **EDET-1LC1** | True Green | ***2.8*** | **--** | ***4.0*** | *V* |
| | **EDEB-1LC1** | Blue | ***3.1*** | **--** | ***4.3*** | *V* |
| | **EDEC-1LC1** | Royal Blue | ***3.1*** | **--** | ***4.3*** | *V* |

## Dominant Wavelength or Peak wavelength[1] or Color Temperature Characteristics at $I_F$=350mA(Tj=25℃):

| Lens Item | Part Name | Color | λd/CCT | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Lambertian | **EDEW-1LC1** | White | ***5000*** | **--** | ***8000*** | *K* |
| | **EDEW-1LC7** | White | ***5000*** | **--** | ***8000*** | *K* |
| | **EDEX-1LC1** | Warm White | ***2800*** | **--** | ***3800*** | *K* |
| | **EDER-1LC3** | Red | ***620*** | **--** | ***630*** | *nm* |
| | **EDEO-1LC3** | Red Orange | ***610*** | **--** | ***620*** | *nm* |
| | **EDEA-1LC3** | Amber | ***585*** | **--** | ***595*** | *nm* |
| | **EDET-1LC1** | True Green | ***515*** | **--** | ***535*** | *nm* |
| | **EDEB-1LC1** | Blue | ***460*** | **--** | ***475*** | *nm* |
| | **EDEC-1LC1** | Royal Blue[1] | ***450*** | **--** | ***470*** | *nm* |

**Temperature Coefficient of Forward Voltage & Thermal Resistance Junction to Case Characteristics at $I_F$=350mA(Tj=25℃) :**

| Lens Item | Part Name | Color | △$V_F$/△T | | $R\theta_{J-B}$ | |
|---|---|---|---|---|---|---|
| | | | Typ. | Units | Typ. | Units |
| Lambertian | **EDEW-1LC1** | White | ***-2*** | *mV/℃* | ***12*** | *℃/W* |
| | **EDEW-1LC7** | White | ***-2*** | *mV/℃* | ***12*** | *℃/W* |
| | **EDEX-1LC1** | Warm White | ***-2*** | *mV/℃* | ***12*** | *℃/W* |
| | **EDER-1LC3** | Red | ***-2*** | *mV/℃* | ***12*** | *℃/W* |
| | **EDEO-1LC3** | Red Orange | ***-2*** | *mV/℃* | ***12*** | *℃/W* |
| | **EDEA-1LC3** | Amber | ***-2*** | *mV/℃* | ***12*** | *℃/W* |
| | **EDET-1LC1** | True Green | ***-2*** | *mV/℃* | ***12*** | *℃/W* |
| | **EDEB-1LC1** | Blue | ***-2*** | *mV/℃* | ***12*** | *℃/W* |
| | **EDEC-1LC1** | Royal Blue | ***-2*** | *mV/℃* | ***12*** | *℃/W* |

**Emission Angle Characteristics at $I_F$=350mA(Tj=25℃):**

| Part Name | Color | 2Θ½(Typ.) Lambertian | Units |
|---|---|---|---|
| **EDEW-1LC1** | White | ***130*** | Degrees |
| **EDEW-1LC7** | White | ***120*** | Degrees |
| **EDEX-1LC1** | Warm White | ***130*** | Degrees |
| **EDER-1LC3** | Red | ***120*** | Degrees |
| **EDEO-1LC3** | Red Orange | ***120*** | Degrees |
| **EDEA-1LC3** | Amber | ***120*** | Degrees |
| **EDET-1LC1** | True Green | ***150*** | Degrees |
| **EDEB-1LC1** | Blue | ***150*** | Degrees |
| **EDEC-1LC1** | Royal Blue | ***150*** | Degrees |

**Note**

1. **Flux is measured with an accuracy of ± 10%.**
2. **CCT selection acc. to CCT groups and an accuracy of ± 200K**
3. **Forward Voltage is measured with an accuracy of ± 0.1V**
4. **Wavelength is measured with an accuracy of ± 0.5nm**
5. **All white、warm white 、True green and blue emitters are built with InGaN**
6. **All red、red-orange and amber emitters are built with AlGaInP**

**JEDEC Moisture Sensitivity:**

| Level | Floor Life | | Soak Requirements | | | |
|---|---|---|---|---|---|---|
| | | | Standard | | Accelerated Environment | |
| | Time | Conditions | Time (hours) | Conditions | Time (hours) | Conditions |
| **2a** | **4 weeks** | **≦30℃ / 60% RH** | **696 +5/-0** | **30℃ / 60% RH** | **120 +1/-0** | **60℃ / 60% RH** |

| | FLOOR LIFE | | SOAK REQUIREMENTS | | | |
|---|---|---|---|---|---|---|
| | | | STANDARD | | ACCELERATED EQUIVALENT [1] | |
| LEVEL | TIME | CONDITIONS | TIME (hours) | CONDITIONS | TIME (hours) | CONDITIONS |
| 1 | Unlimited | ≤30°C/85% RH | 168 +5/-0 | 85°C/85% RH | | |
| 2 | 1 year | ≤30°C/60% RH | 168 +5/-0 | 85°C/60% RH | | |
| 2a | 4 weeks | ≤30°C/60% RH | 696[2] +5/-0 | 30°C/60% RH | 120 +1/-0 | 60°C/60% RH |
| 3 | 168 hours | ≤30°C/60% RH | 192[2] +5/-0 | 30°C/60% RH | 40 +1/-0 | 60°C/60% RH |
| 4 | 72 hours | ≤30°C/60% RH | 96[2] +2/-0 | 30°C/60% RH | 20 +0.5/-0 | 60°C/60% RH |
| 5 | 48 hours | ≤30°C/60% RH | 72[2] +2/-0 | 30°C/60% RH | 15 +0.5/-0 | 60°C/60% RH |
| 5a | 24 hours | ≤30°C/60% RH | 48[2] +2/-0 | 30°C/60% RH | 10 +0.5/-0 | 60°C/60% RH |
| 6 | Time on Label (TOL) | ≤30°C/60% RH | TOL | 30°C/60% RH | | |

**Note**

1. **The standard soak time includes a default value of 24 hours for semiconductor manufacturer's exposure time (MET) between bake and bag and includes the maximum time allowed out of the bag at the distributor's facility.**

## Operating life, mechanical, and environmental tests performed on Edixeon® package:

| Stress Test | Stress Conditions | Stress Duration | Failure Criteria |
|---|---|---|---|
| Room Temperature Operating Life | 25℃, $I_F$ = max DC (Note 1) | 1000 hours | Note 2 |
| High Temperature High Humidity | 85℃ / 85%RH | 1000 hours | Note 2 |
| Temperature Cycle | -40℃/100℃ ,30 min dwell /＜5min transfer | 200 cycles | Note 2 |
| High Temperature Storage Life | 110℃ | 1000 hours | Note 2 |
| Low Temperature Storage Life | -55℃ | 1000 hours | Note 2 |
| Thermal Shock | -40 / 120℃, 20 min dwell /＜20 sec transfer | 200 cycles | No catastrophics |
| Mechanical Shock | 1500 G, 0.5 msec pulse, 5 shocks each 6 axis | | No catastrophics |
| Natural Drop | On concrete from 1.2 m, 3X | | No catastrophics |
| Variable Vibration Frequency | 10-2000-10 Hz, log or linear sweep rate, 20 G about 1 min, 1.5 mm, 3X/axis | | No catastrophics |
| Solder Heat Resistance (SHR) | 260℃ ± 5℃, 10 sec | | No catastrophics |
| Solderability | Steam age for 16 hr, then solder dip at 260℃ for 5 sec | | Solder coverage on lead |

**Note**

1. **Depending on the maximum derating curve.**
2. **Failure Criteria:**

**Electrical failures**

**$V_F$ shift >=10%**

**$I_R$<50uA @Vr=5V**

**Light Output Degradation**

**% Iv shift >= 30% @1000hrs or 200cycle**

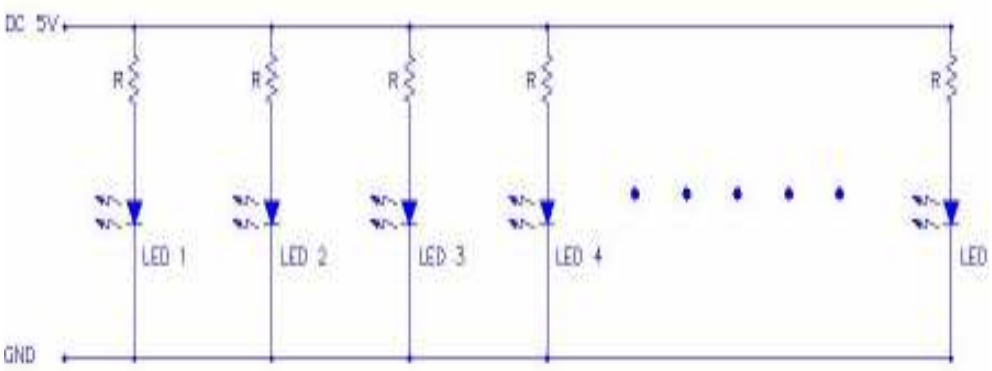
**Visual failures**

**Broken or damaged package or lead**

**Solderability < 95% wetting**

**Dimension out of tolerance**

## Burn-in Condition RC Edixeon® Reliability




When we talk about MTBF of Edixeon®, we can provide a formula for customers.

$$\log(\text{Life}) = \frac{1600}{Tj(^{\circ}C)+273}$$

Life means the time light output becomes 70%

| Tj (°C) | Life (hours) | Tj (°C) | Life (hours) |
|---|---|---|---|
| *25* | *234,000* | *85* | *29,500* |
| *30* | *191,000* | *90* | *25,700* |
| *35* | *157,000* | *95* | *22,300* |
| *40* | *129,000* | *100* | *19,500* |
| *45* | *107,000* | *105* | *17,100* |
| *50* | *90,000* | *110* | *15,100* |
| *55* | *75,000* | *115* | *13,300* |
| *60* | *64,000* | *120* | *11,700* |
| *65* | *54,000* | *125* | *10,500* |
| *70* | *46,000* | *130* | *9,300* |
| *75* | *39,600* | *140* | *7,500* |
| *80* | *34,000* | *150* | *6,000* |

When we talk about MTTF of Edixeon®, we can provide a formula for customers_

MTTF is assumed to be 100,000,000

The failure rates at different hours and different systems (LED quantity) are as below:

if there is 1 failure of 1 emitter in a system

Tj=75℃ is giving 0.01%(100ppm) at 10,000hrs

if there is 1 failure of 10 emitters in a system

Tj=75℃ is giving 0.1%(1,000ppm) at 10,000hrs

if there is 1 failure of 1 emitter in a system

Tj=75℃ is giving 0.05%(500ppm) at 50,000hrs

if there is 1 failure of 10 emitters in a system

Tj=75℃ is giving 0.5%(5,000ppm) at 50,000hrs if there are 10 emitters

## How to Know Tj in Your Application?

If it is white Edixeon®, Rth(junction to case)=12°C/W

The thermal grease is 200um.

K(Aluminum PCB)=2.6 W/mk

Then Rth(case to board)= $\frac{200}{2.6\text{x}(6.4/2)^2\,\pi}$ =2.4 °C/W

The Rth between board and air is mainly dependent on the total surface air.

Rth(board-air) ≒ $\frac{500}{\text{Area}(\text{cm}^2)}$

| | | |
|---|---|---|
| If Area is 30cm$^2$ | Rth=16.7 | T(junction-air)=(12+2.4+16.7)x1=31.1 °C |
| If Area is 60cm$^2$ | Rth=8.3 | T (junction-air)=(12+2.4+8.3)x1=22.7 °C |
| If Area is 90cm$^2$ | Rth=5.5 | T (junction-air)=(12+2.4+5.5)x1=19.9 °C |

## ASSIST FORM about High Power LED Reliability(White Edixeon®)

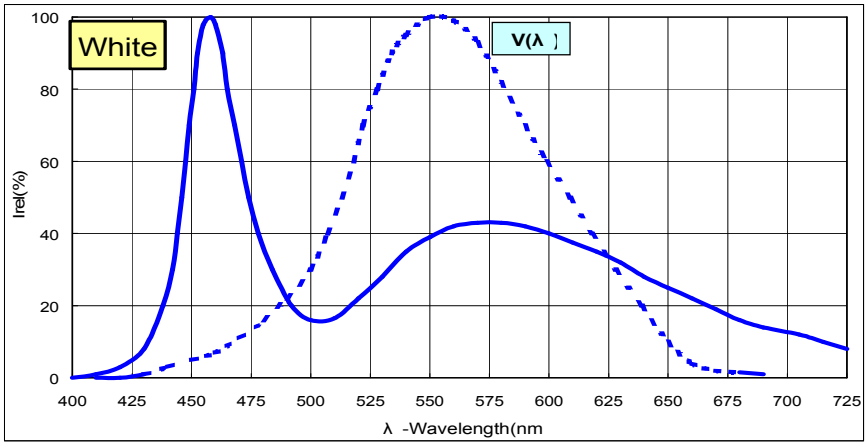
| | Ts=45°C | Ts=65°C | Ts=85°C |
|---|---|---|---|
| Voltage | 3.5V | 3.5V | 3.5V |
| Current | 350mA | 350mA | 350mA |
| Wattage | 1.2W | 1.2W | 1.2W |
| Heat | 1.0W | 1.0W | 1.0W |
| Rth | 12 °C/W | 12 °C/W | 12 °C/W |
| Tj | 57 °C | 77 °C | 97 °C |
| $L_{70\%}$ | 64,000hrs | 34,000hrs | 19,500hrs |

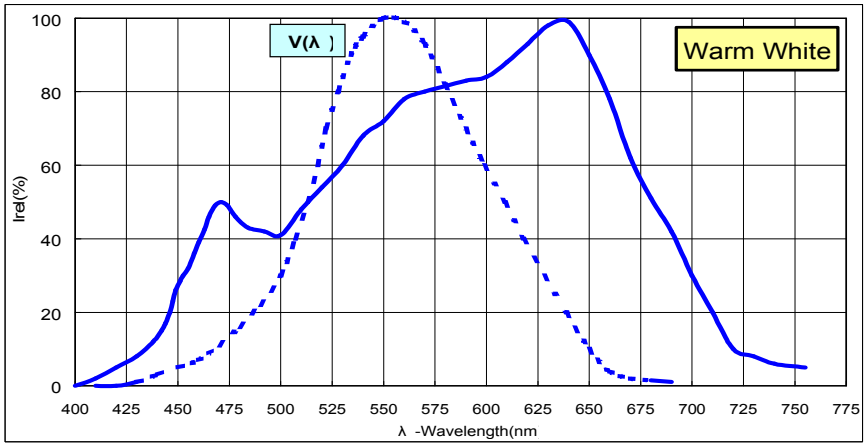
## ESD Sensitivity test:

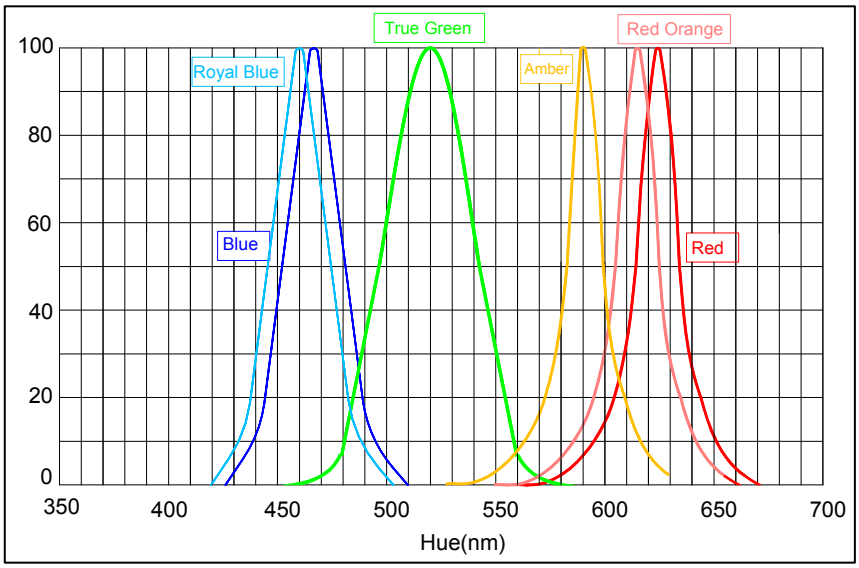
| | |
|---|---|
| **Part No.** | ***EDEx-1LCx*** |
| **Test Quantity** | *Each 10 pcs* |
| **Test Item** | *ESD-HBM* |
| **Test Method** | *MIL-STD-883E Method 3015.7* |
| Class Ⅰ | *0V ~ 1,999V* |
| Class Ⅱ | *2,000V ~ 3,999V* |
| Class Ⅲ | *4,000V ~ to above* |
| **Failure Criteria** | *IR>5μA@$V_R$=5V* |
| **Test Voltage** | *-100 ~ -500V ,Step: -100V*<br>*-500 ~ -8,000V ,Step: -500V* |
| **Test Date** | *18-Mar-05* |
| **Test Equipment** | *Keytek Zapmaster* |
| **Test Environmental** | *25℃±5℃,55%±10%RH* |

| Sample | Voltage(V) | | MIL-STD |
|---|---|---|---|
| | Forward | Reverse | |
| #1 | ***Pass*** | ***Pass*** | **Class Ⅲ** |
| #2 | ***Pass*** | ***Pass*** | **Class Ⅲ** |
| #3 | ***Pass*** | ***Pass*** | **Class Ⅲ** |
| #4 | ***Pass*** | ***Pass*** | **Class Ⅲ** |
| #5 | ***Pass*** | ***Pass*** | **Class Ⅲ** |
| #6 | ***Pass*** | ***Pass*** | **Class Ⅲ** |
| #7 | ***Pass*** | ***Pass*** | **Class Ⅲ** |
| #8 | ***Pass*** | ***Pass*** | **Class Ⅲ** |
| #9 | ***Pass*** | ***Pass*** | **Class Ⅲ** |
| #10 | ***Pass*** | ***Pass*** | **Class Ⅲ** |

## Electrical & Optical Curves-Spectrum

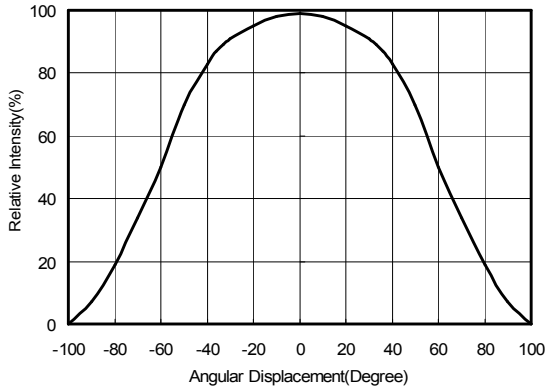


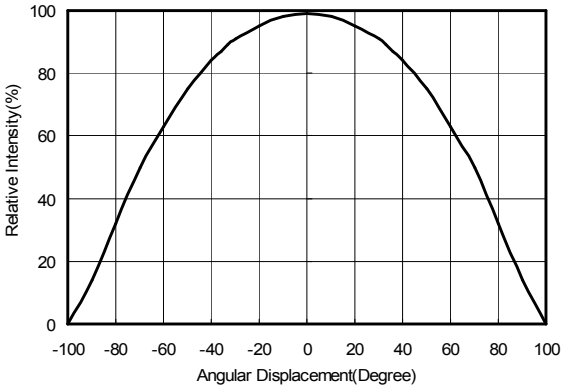



## Typical Radiation Pattern for

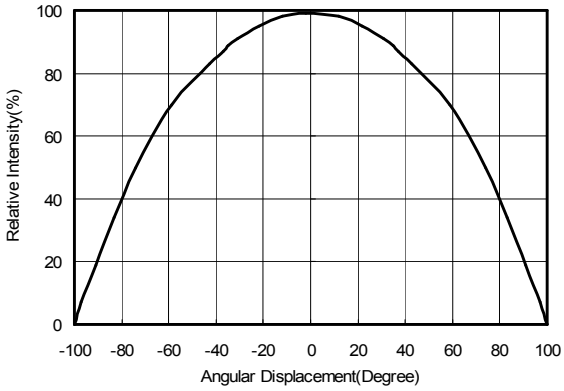
## Lambertian




for Red、Amber、Red Orange、EDEW-1LC7




for White、Warm white




for Blue、Royal Blue、True Green

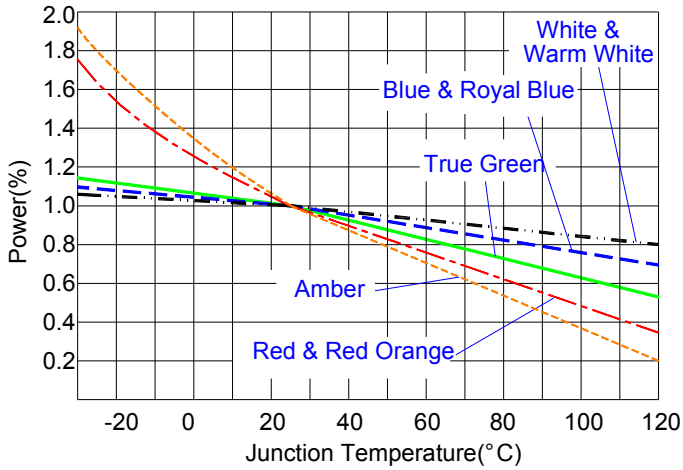
**Available Ray Data List**

| 1W Edixeon | Provide Ray source file type | Red | Blue | True Green | White |
|---|---|---|---|---|---|
| Lambertian | From ASAP (*.DIS) | ◎ | △ | △ | △ |
| | From Trace Pro (*.DAT) | ◎ | △ | △ | △ |
| | From Radiant Image (*.RSM) | ◎ | △ | △ | △ |

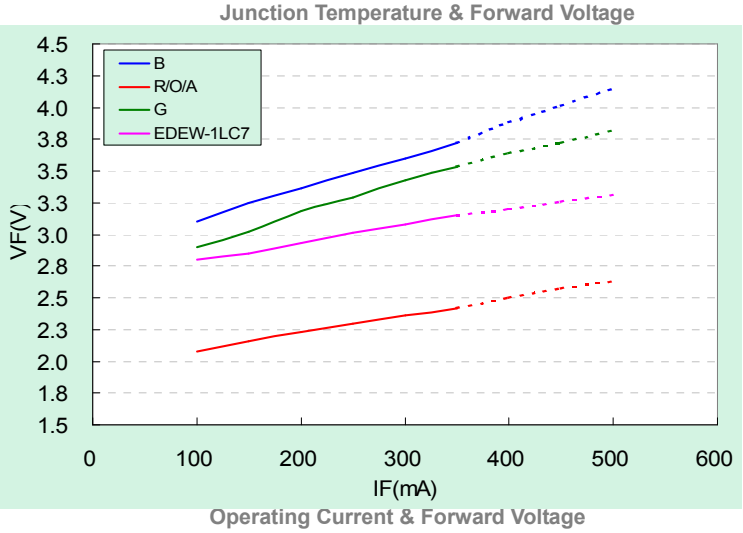
Note:

1. “◎”➔ Ready
2. “△”➔ Not ready

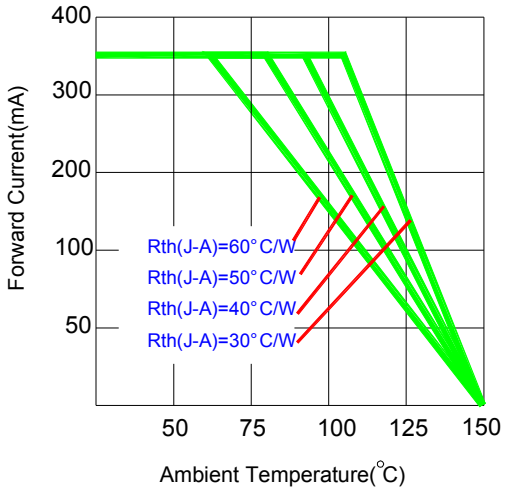
## Typical Optical and Electrical Curves



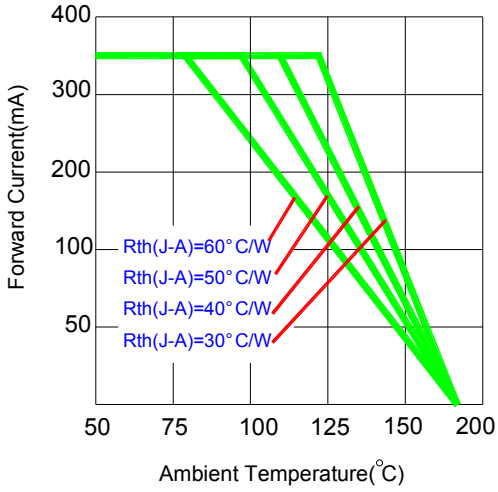

Junction Temperature & Forward Voltage




Operating Current & Forward Voltage

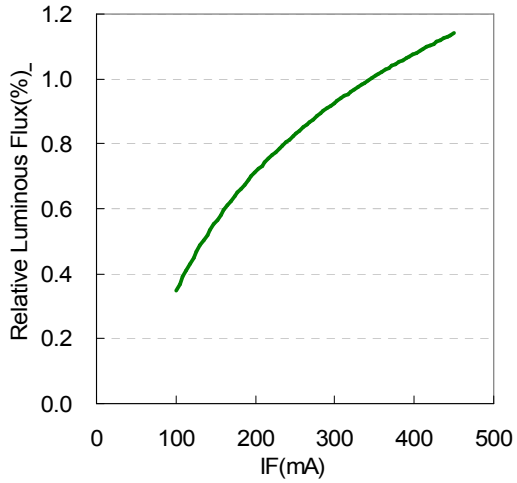



Operating Current & Ambient Temperature
(White、Warm White、Red、Amber、Red Orange)

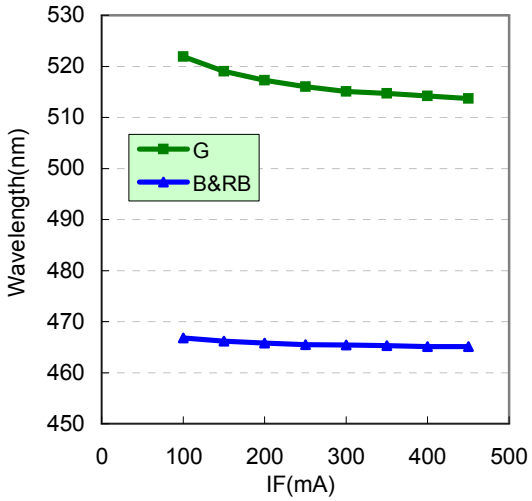


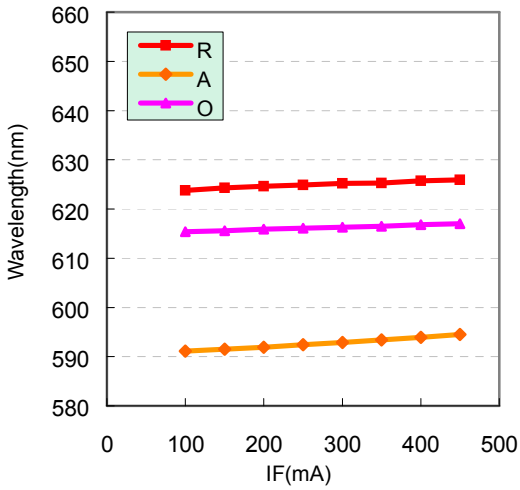

Operating Current & Ambient Temperature
(Blue、Royal Blue、True Green)

## Typical Optical and Electrical Curves

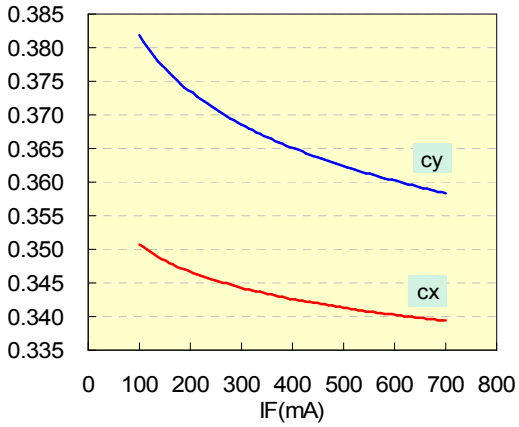



Forward Current & Luminous Flux

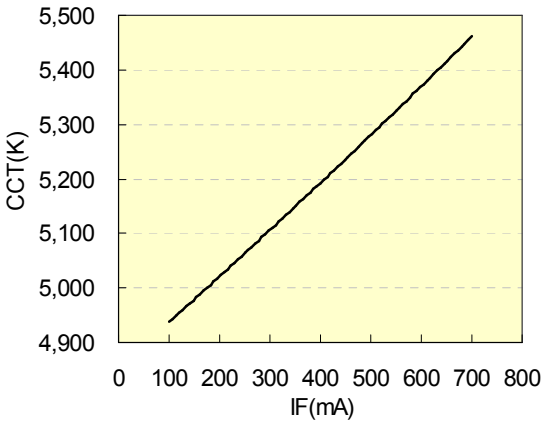



Forward Current & Wavelength

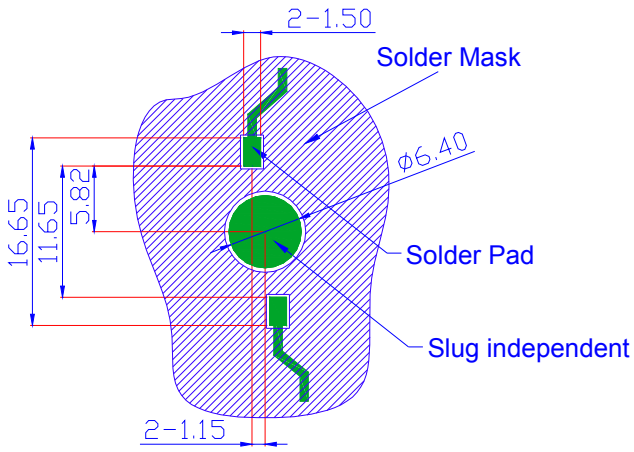



Forward Current & chromaticity coordinate




Forward Current & CCT

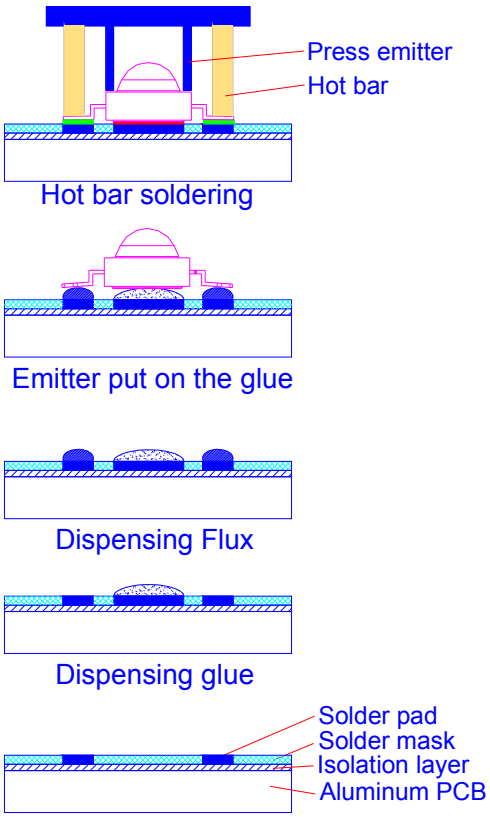
## Recommended Solder Pad Design




**Note:**

1. All dimensions are in mm.
2. Tolerance:±0.2mm
3. Solder pad and slug pad must be independent.

## Recommended Solder Steps for hot bar solder




**Notes:**

1. Aluminum PCB material with a thermal conductivity greater than 2.0 W/mK.
2. If customers use hot bar solder, recommended solder steps is as left. The thermal glue should be as thin as possible for better heat conductivity.
3. If customers use reflow soldering, the profile is suggested as below.
4. During any assembly process touching lens too heavily is avoided. This will cause pollution or scratch on the surface of lens.
5. Thermal glue with a thermal conductivity greater than 1.0 W/mK and the thickness must be less than 100μm.

## Recommended Profile for Reflow Soldering

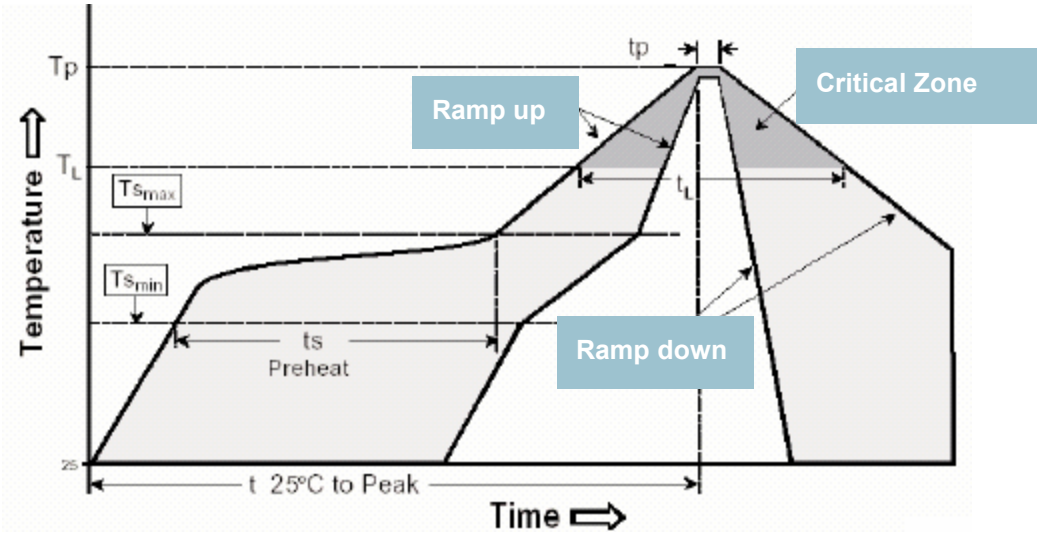



Table 5-2 Classification Reflow Profiles

| Profile Feature | Sn-Pb Eutectic Assembly | | Pb-Free Assembly | |
|---|---|---|---|---|
| | Large Body | Small Body | Large Body | Small Body |
| Average ramp-up rate ($T_L$ to Tp) | 3°C/second max. | | 3°C/second max. | |
| Preheat<br>– Temperature Min ($Ts_{min}$)<br>– Temperature Max ($Ts_{max}$)<br>– Time (min to max) (ts) | 100°C<br>150°C<br>60-120 seconds | | 150°C<br>200°C<br>60-180 seconds | |
| Tsmax to $T_L$<br>– Ramp-up Rate | | | 3°C/second max. | |
| Time maintained above:<br>– Temperature ($T_L$)<br>– Time ($t_L$) | 183°C<br>60-150 seconds | | 217°C<br>60-150 seconds | |
| Peak Temperature (Tp) | 225 +0/-5°C | 240 +0/-5°C | 245 +0/-5°C | 250 +0/-5°C |
| Time within 5°C of actual Peak Temperature (tp) | 10-30 seconds | 10-30 seconds | 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. | |

Note: All temperatures refer to topside of the package, measured on the package body surface.

## Adhesive for Emitter to Aluminum PCB

## Suggestion:

- Ease of use

  Non-solvent, One-part
- Fast tack free

  3 minutes at 25°C
- No corrosion

  Alcohol type of RTV
- Low volatility

  Low weight loss of silicone volatiles
- Adhesion

  Excellent adhesion to most materials without use of a primer
- Dielectric properties

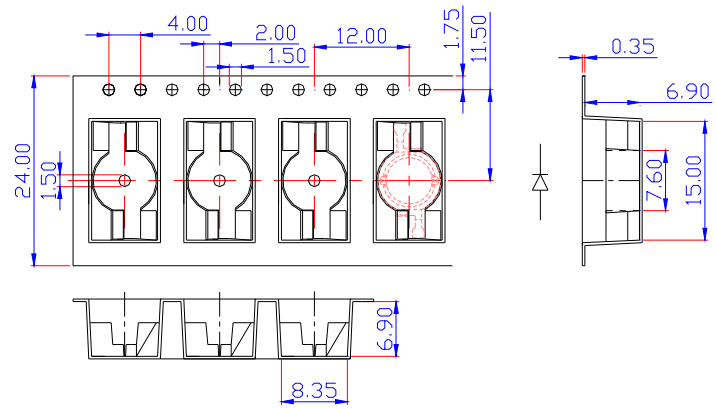
  Cured rubber exhibits good dielectric properties
- Excellent thermal stability and cold resistance

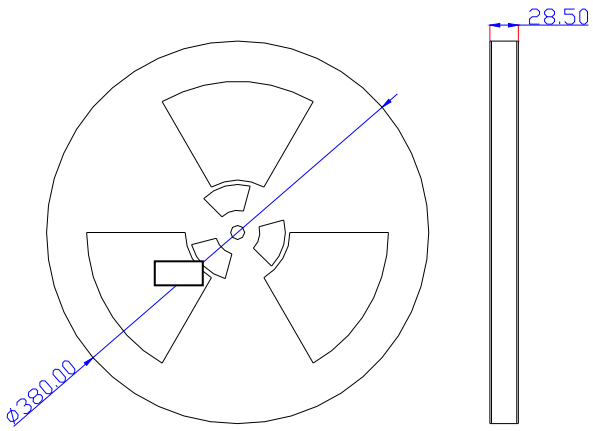
  Cured rubber provides wide service temperature range

## Typical Properties

| Specification | Suggested Properties |
|---|---|
| Take-free time | 3~10 minutes |
| Specific gravity | < 3 g/cm$^2$ |
| Thermal conductivity | > 2.5 W/mK |
| Rth in using | < 1.8 °C/W |
| Volume resistance | > 1x10$^{14}$ |
| Lap shear adhesion strength | > 200 N/ cm$^2$ |
| Tensile strength | > 4 Mpa |

## Package Specifications




**Notes:**

1. **All dimensions are in mm.**
2. **There are 1000pcs emitters in full reel**
3. **There is a reel in a bag**
4. **There are 2 bags in an inner box**
5. **There are 5 inner boxes in an outer box**
6. **A bag contains one humidity indicator card and drying agent**

| Packing Step | Type | Dimension(mm) | Emitter Q'ty(Max.) |
|---|---|---|---|
| 1 | Reel | *Φ380*28.5* | *1,000* |
| 2 | Inner Box | *400*385*56* | *2,000* |
| 3 | Outer Box | *425*405*320* | *10,000* |