

Edixeon[®] ARC Series



Edixeon[®] ARC series emitters are one of the high power LEDs packaged by Edison-Opto delivering high luminous flux in the world. With its advanced packaging process, Edixeon[®] ARC is introduced to satisfy various solid-state lighting application such as automotive headlamp, decorative wall washer and general lighting. Edixeon[®] ARC series emitters have a typical luminous output of 95 lumens at 350mA, and are built specifically for reflow process. Unlike most fluorescent sources, Edixeon[®] ARC series contains no mercury and is more energy efficient than incandescent and halogen light source.

Features

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

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Product Nomenclature

The following table describes the available color, power, and lens type. For more flux and forward voltage information, please consult the Bin Group document.

< Table 1 Edixeon® ARC series nomenclature >

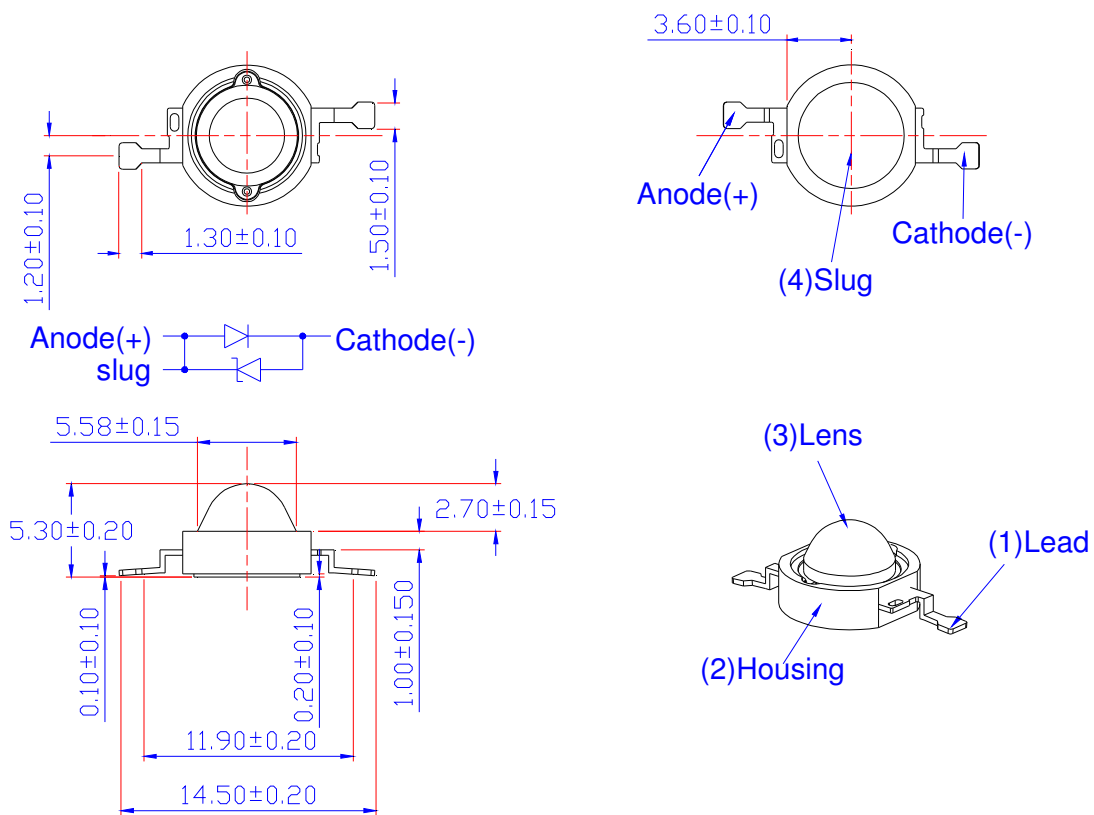
| E | | D | | E | | W | | - 1 | | L | | S | | 5 | | - B | | 1 | | - A | | B | | 16 | |
|----------|----------|--------|---------|----------------|--------------|-------|------|-----------|------------|--------------|---------|----|--|----|--|-----|--|-----|--|-----|--|-----|--|----|--|
| X1 | | X2 | | X3 | | X4 | | X5 | | X6 | | X7 | | X8 | | X9 | | X10 | | X11 | | X12 | | | |
| LED Item | | Module | | Emitting Color | | Power | | Lens Item | | Housing Item | | | | | | | | | | | | | | | |
| Code | Type | Code | Type | Code | Type | Code | Type | Code | Type | Code | Type | | | | | | | | | | | | | | |
| ED | Edixeon® | E | Emitter | W | Cool White | 1 | 1 W | L | Lambertian | S | White-2 | | | | | | | | | | | | | | |
| | | S | Star | H | Neutra White | 3 | 3 W | | | | | | | | | | | | | | | | | | |
| | | | | X | Warm White | | | | | | | | | | | | | | | | | | | | |

| X7 | | X8 | | X9 | | X10 | | X11 | | X12 | |
|----------|---------------|-----------------|-------|------------|-----------------|--------------|-------|-----------|-------|-----|--|
| Material | Phosphor Item | Testing Current | | Shape Item | | Al PCB Color | | Thickness | | | |
| | | Code | Type | Code | Type | Code | Type | Code | Type | | |
| | | 1 | 350mA | A | Star | W | White | 10 | 1.0mm | | |
| | | 3 | 700mA | B | Square(25*25mm) | G | Green | 16 | 1.6mm | | |
| | | | | C | Square(30*30mm) | B | Black | 20 | 2.0mm | | |

Environmental Compliance

Edixeon[®] ARC series are compliant to the Restriction of Hazardous Substances Directive or RoHS. The restricted materials including lead, mercury cadmium hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ether (PBDE) are not used in Edixeon[®] ARC series to provide an environmentally friendly product to the customers.

LED Package Dimensions and Polarity



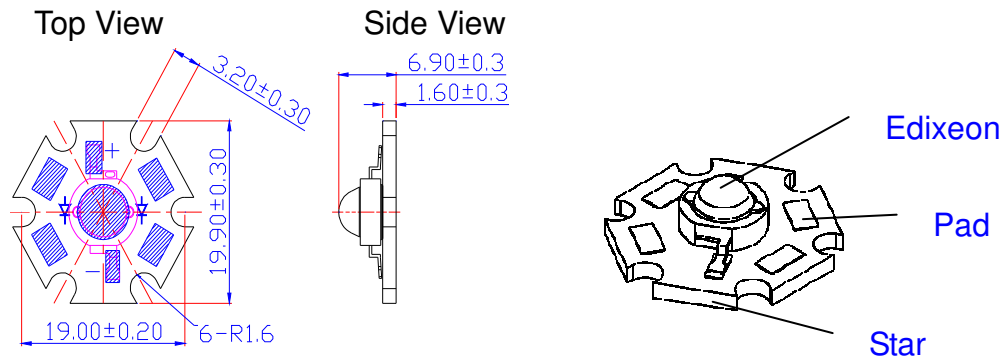
< Figure 1 Edixeon[®] ARC series dimensions >

Notes:

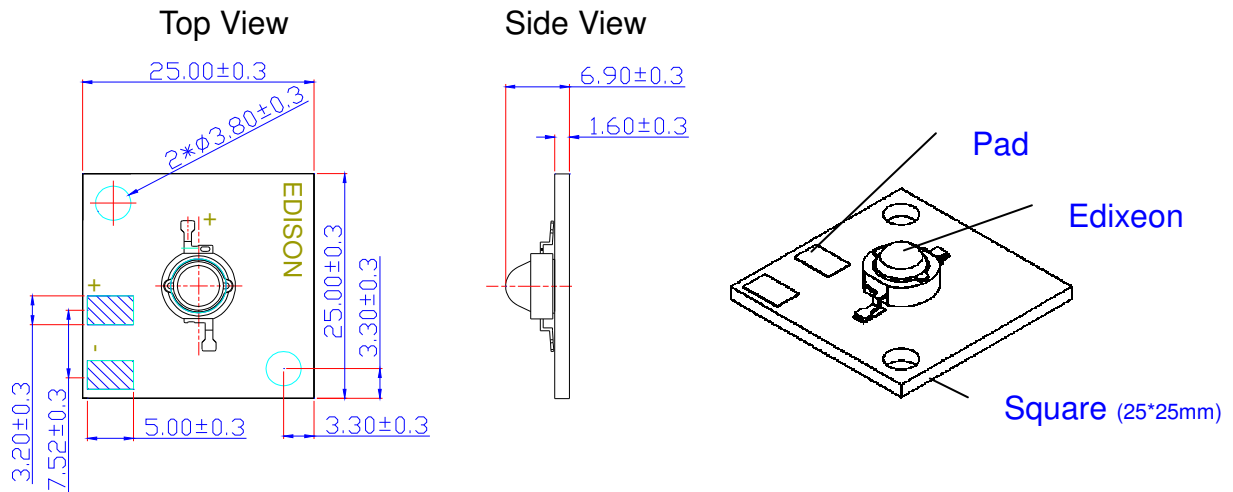
1. All dimensions are measured in mm.
2. Drawings are not to scale.
3. It is strongly recommended to apply on electrically isolated heat conducting film between the slug and contact surfaces.

LED Package with Star Dimensions and Polarity

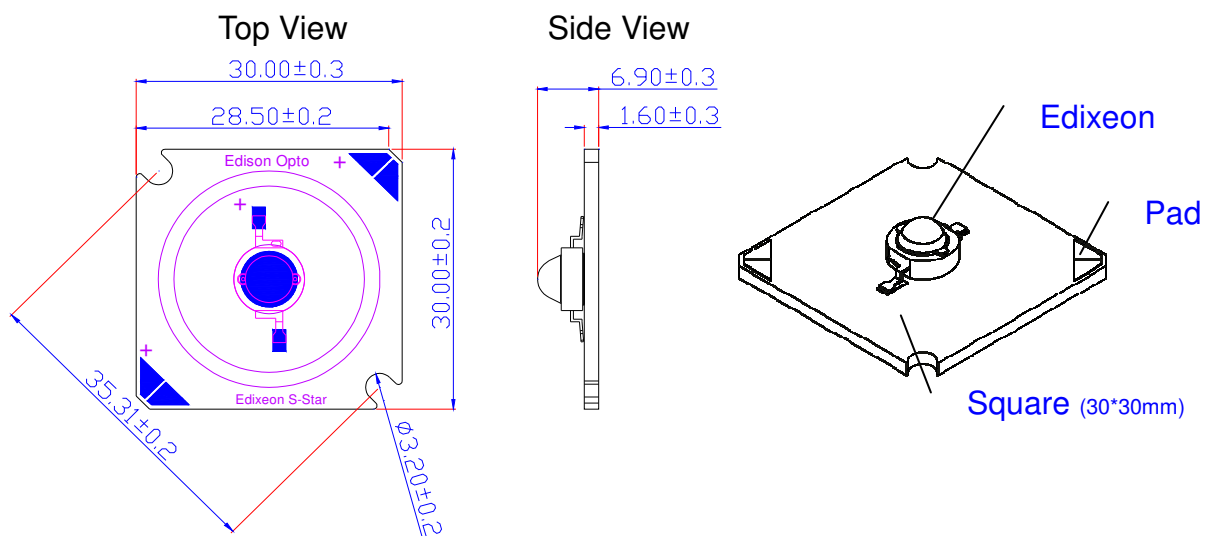
EDSx-xLSx-xx-Ax16



EDSx-xLSx-xx-Bx16



EDSx-xLSx-xx-Cx16



<Figure 2 Edixeon® star dimensions>

Notes:

- 1.All Dimensions are in mm.

Absolute Maximum Ratings

The following tables describe the characteristics of Edixon® ARC series under various current.

< Table 2 Absolute maximum ratings for Edixon® ARC series >

| Parameter | Rating(1W) | Rating(3W) | Unit | Symbol |
|--|------------|------------|------|----------------|
| DC Forward Current(1W) | 350 | 700 | mA | I _F |
| Peak pulse current;(tp ≤ 100μs, Duty cycle=0.25) | 500 | 1,000 | mA | |
| Reverse Voltage | 5 | 5 | V | V _R |
| Drive Voltage | 7 | 7 | V | V _D |
| LED junction Temperature | 125 | 125 | °C | T _j |
| Operating Temperature | -30 ~ +110 | -30 ~ +110 | °C | |
| Storage Temperature | -40 ~ +120 | -40 ~ +120 | °C | |
| Soldering Temperature | 260 | 260 | °C | |
| ESD Sensitivity | 4,000 | 4,000 | V | V _B |
| Manual Soldering Time at 260°C (Max.) | 5 | 5 | Sec. | |

Notes:

1. Proper current derating must be observed to maintain junction temperature below the maximum at all time.
2. LEDs are not designed to be driven in reverse bias.
3. Allowable reflow cycles are 3 times for each LED.
4. tp: Pulse width time

The following tables describe thermal resistance of Edixon® ARC series under various current and different color.

< Table 3 Temperature Coefficient of Forward Voltage & Thermal Resistance Junction to Case

Characteristics at T_j=25°C for Edixon® ARC series >

| Part Name | Color | ΔV _F /ΔT | | Rθ _{J-B} | |
|-----------|-------|---------------------|-------|-------------------|------|
| | | Typ. | Units | Typ. | Unit |
| EDEX-1LSx | -- | -2 | mV/°C | 13 | °C/W |
| EDEX-3LSx | -- | -2 | mV/°C | 13 | °C/W |

Luminous Flux Characteristics

The following tables describe flux of Edixeon[®] ARC series under various current and different color.

< Table 4 Luminous flux characteristics at $I_F=350\text{mA}$ and $T_J=25^\circ\text{C}$: for 1W Edixeon[®] ARC series >

| Part Name | Color | Flux | | | Unit |
|--------------|---------------|------|------|------|------|
| | | Min. | Typ. | Max. | |
| EDEW-1LS5-B1 | Cool White | 80.0 | 95.0 | -- | lm |
| EDEH-1LS5-E1 | Neutral White | 60.0 | 75.0 | -- | lm |
| EDEX-1LS5-E1 | Warm White | 50.0 | 65.0 | -- | lm |
| EDEW-1LS5-D1 | Cool White | 30.3 | 55.0 | -- | lm |
| EDEH-1LS5-D1 | Neutral White | 23.3 | 45.0 | -- | lm |
| EDEX-1LS5-D1 | Warm White | 23.3 | 40.0 | -- | lm |

< Table 5 Luminous flux characteristics at $I_F=700\text{mA}$ and $T_J=25^\circ\text{C}$: for 3W Edixeon[®] ARC series >

| Part Name | Color | Flux | | | Unit |
|--------------|---------------|-------|-------|------|------|
| | | Min. | Typ. | Max. | |
| EDEW-3LS5-B3 | Cool White | 120.0 | 150.0 | -- | lm |
| EDEH-3LS5-E3 | Neutral White | 90.0 | 125.0 | -- | lm |
| EDEX-3LS5-E3 | Warm White | 80.0 | 105.0 | -- | lm |
| EDEW-3LS5-D3 | Cool White | 51.2 | 80.0 | -- | lm |
| EDEH-3LS5-D3 | Neutral White | 39.4 | 70.0 | -- | lm |
| EDEX-3LS5-D3 | Warm White | 39.4 | 65.0 | -- | lm |

Notes:

1. Flux is measured with an accuracy of $\pm 10\%$.
2. Cool white 、 neutral white 、 warm white emitters are built with InGaN

Forward Voltage Characteristics

The following tables describe forward voltage of Edixeon® ARC series emitter under various current.

< Table 6 Forward voltage characteristics at $I_F=350\text{mA}$ and $T_J=25^\circ\text{C}$ for 1W Edixeon® ARC series >

| Part Name | Color | V_F | | Unit |
|--------------|---------------|-------|------|------|
| | | Min. | Max. | |
| EDEW-1LS5-x1 | Cool White | 3.1 | 4.0 | V |
| EDEH-1LS5-x1 | Neutral White | 3.1 | 4.0 | V |
| EDEX-1LS5-x1 | Warm Whit | 3.1 | 4.0 | V |

< Table 7 Forward voltage characteristics at $I_F=700\text{mA}$ and $T_J=25^\circ\text{C}$ for 3W Edixeon® ARC series >

| Part Name | Color | V_F | | Unit |
|--------------|---------------|-------|------|------|
| | | Min. | Max. | |
| EDEW-3LS5-x3 | Cool White | 3.1 | 4.3 | V |
| EDEH-3LS5-x3 | Neutral White | 3.1 | 4.3 | V |
| EDEX-3LS5-x3 | Warm White | 3.1 | 4.3 | V |

JEDEC Information

JEDEC moisture sensitivity classification is used to determine what classification level should be used for initial reliability qualification. Once identified, the LEDs can be properly packaged, stored and handled to avoid subsequent thermal and mechanical damage during the assembly solder reflow attachment and/or repair operation. The present moisture sensitivity standard contains six levels, the lower the level, the longer the devices floor life. Edixeon[®] ARC series are certified at level 2a. This means Edixeon[®] ARC series have a floor life of 4 weeks before Edixeon[®] ARC series need to re-baked.

< Table 8 JEDEC characteristics at T_J=25°C for Edixeon[®] ARC series >

| Level | Floor Life | | Soak Requirements | | | | |
|-------|------------|--------------|-----------------------|-------------|------------------------|-----------------|-------------|
| | | | Standard | | Accelerated Equivalent | | |
| | | | | | eV 0.40~0.48 | eV 0.30~0.39 | Condition |
| Time | Condition | Time(hours) | Condition | Time(hours) | Time(hours) | | |
| 4 | 72 hours | ≤30°C/60% RH | 96 ¹ +5/-0 | 30°C/60% RH | 20 +5/-0 | 24 +5/-0 | 60°C/60% RH |

| Level | Floor Life | | Soak Requirements | | | | |
|-------|---------------------|--------------|------------------------|-------------|------------------------|-----------------|-------------|
| | | | Standard | | Accelerated Equivalent | | |
| | | | | | eV 0.40~0.48 | eV 0.30~0.39 | Condition |
| Time | Condition | Time(hours) | Condition | Time(hours) | Time(hours) | | |
| 1 | Unlimited | ≤30°C/85% RH | 168 +5/-0 | 85°C/85% RH | NA | NA | NA |
| 2 | 1 year | ≤30°C/60% RH | 168 +5/-0 | 85°C/60% RH | NA | NA | NA |
| 2a | 4 weeks | ≤30°C/60% RH | 696 ¹ +5/-0 | 30°C/60% RH | 120 +1/-0 | 168 +1/-0 | 60°C/60% RH |
| 3 | 168 hours | ≤30°C/60% RH | 192 ¹ +5/-0 | 30°C/60% RH | 40 +5/-0 | 52 +5/-0 | 60°C/60% RH |
| 4 | 72 hours | ≤30°C/60% RH | 96 ¹ +5/-0 | 30°C/60% RH | 20 +5/-0 | 24 +5/-0 | 60°C/60% RH |
| 5 | 48 hours | ≤30°C/60% RH | 72 ¹ +5/-0 | 30°C/60% RH | 15 +5/-0 | 20 +5/-0 | 60°C/60% RH |
| 5a | 24 hours | ≤30°C/60% RH | 48 ¹ +5/-0 | 30°C/60% RH | 10 +5/-0 | 13 +5/-0 | 60°C/60% RH |
| 6 | Time on label (TOL) | ≤30°C/60% RH | TOL | 30°C/60% RH | NA | NA | NA |

Notes:

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.
2. Joint Electron Devices Engineering Councils (JEDEC) is the leading developer of standards for the solid-state industry. Almost 3100 participants, appointed by some 290 companies work together in 50 JEDEC committees to meet the needs of every segment of the industry, manufacturers and consumers alike. The publications and standards that they generate are accepted throughout the world.
(<http://www.jedec.org>)

Reliability Items and Failure Measures

Reliability test

The following table describes operating life, mechanical, and environmental tests performed on Edixeon® ARC series package.

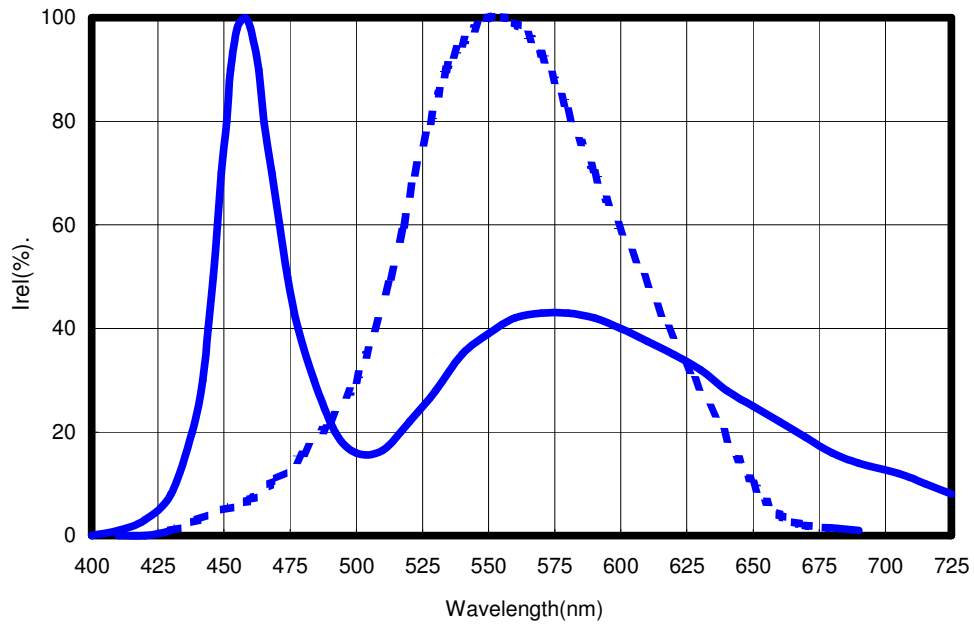
< Table 9 Operating life, mechanical, and environmental characteristics and $T_J=25^{\circ}\text{C}$ for Edixeon® ARC series >

| Stress Test | Stress Conditions | Stress Duration | Failure Criteria |
|---|--|-----------------|------------------|
| Room Temperature Operating Life | 25°C , $I_F = I_F \text{ Max DC}$ (Note 1) | 1,000 hours | Note 2 |
| High Temperature High Humidity Storage Life | 85°C / 85%RH | 1,000 hours | Note 2 |
| High Temperature Storage Life | 110°C | 1,000 hours | Note 2 |
| Low Temperature Storage Life | -40°C | 1,000 hours | Note 2 |
| Thermal Shock | $-40 / 125^{\circ}\text{C}$, 15 min dwell / < 10 sec transfer | 500 cycles | No catastrophics |
| Mechanical Shock | 1500 G, 0.5 msec pulse, 5 shocks each of 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) | $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$, 10 sec | | No catastrophics |

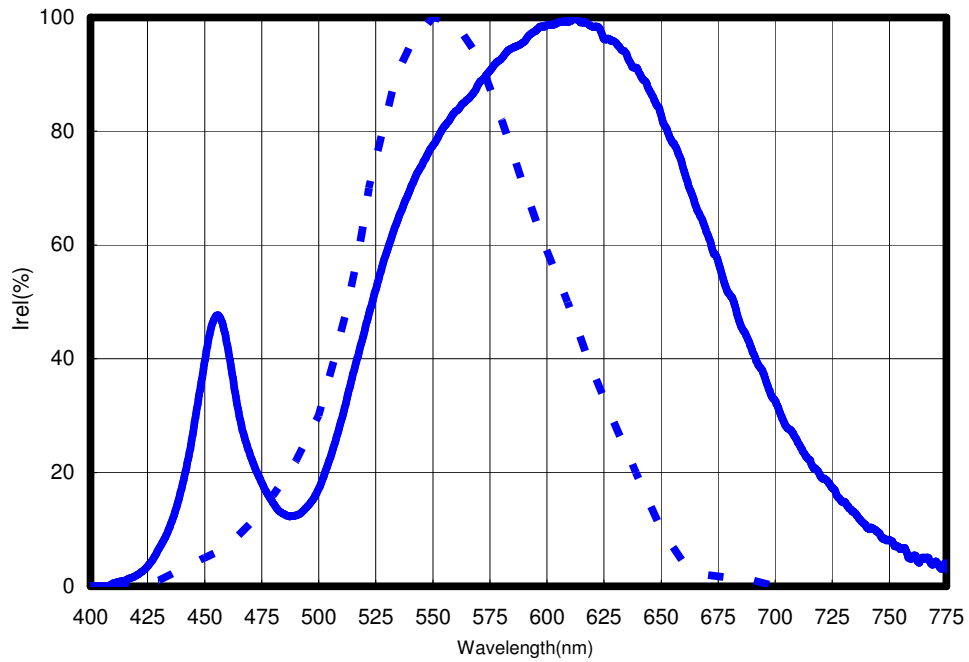
Notes:

1. Depending on the maximum derating curve.
2. Failure Criteria:
 - Electrical failures
 - V_F shift $\geq 10\%$
 - Light Output Degradation
 - % I_v shift $\geq 30\%$ @ 1,000hrs or 200cycle
 - Visual failures
 - Broken or damaged package or lead
 - Solderability < 95% wetting
 - Dimensions out of tolerance

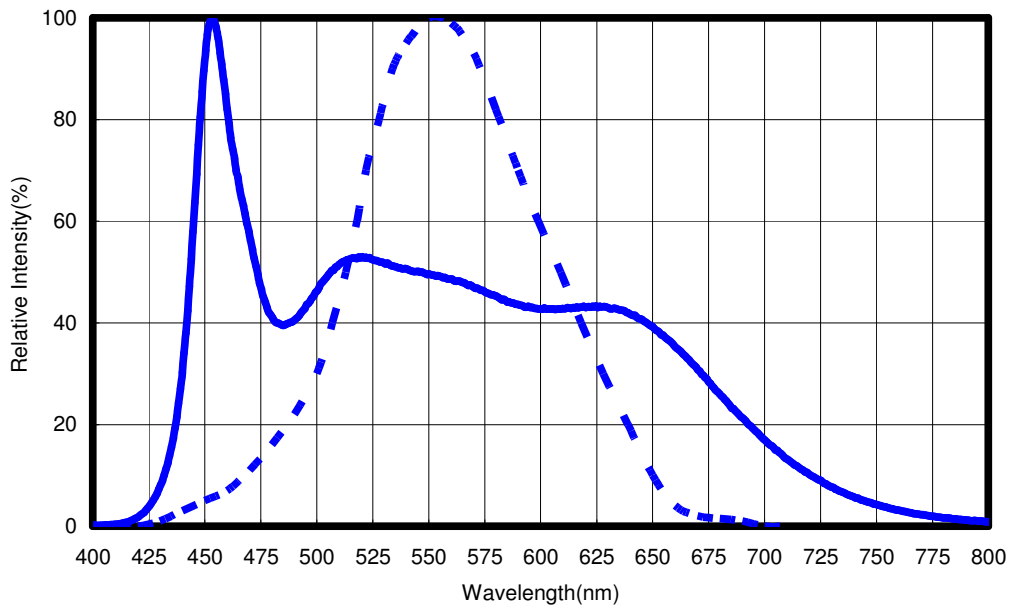
Color Spectrum and Radiation Pattern



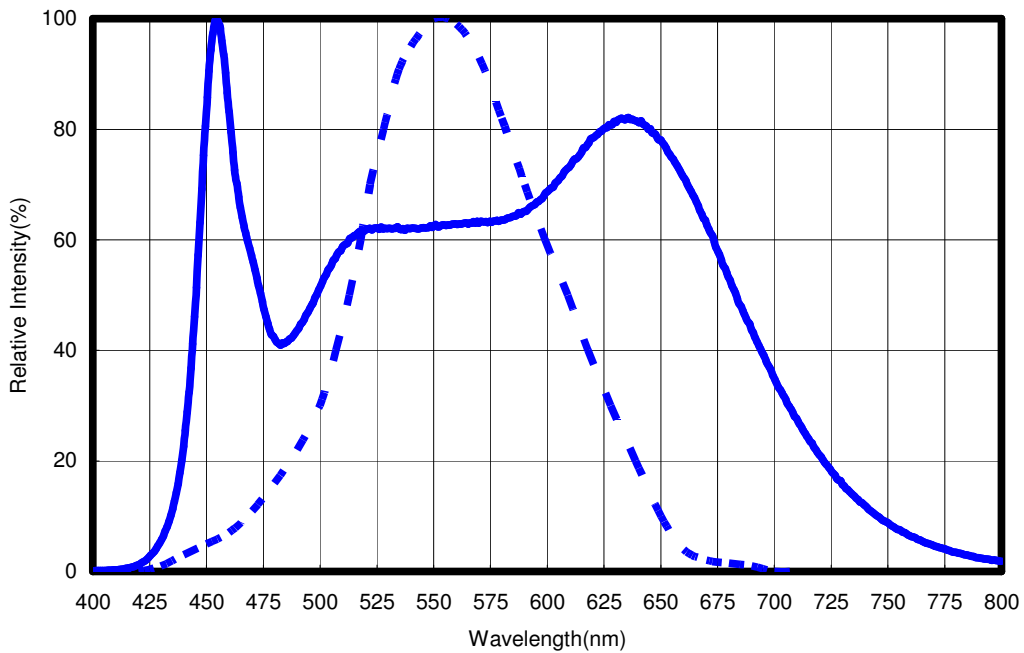
<Figure 3. Cool white color spectrum at $T_J = 25^\circ\text{C}$.for Edixeon[®] ARC series >



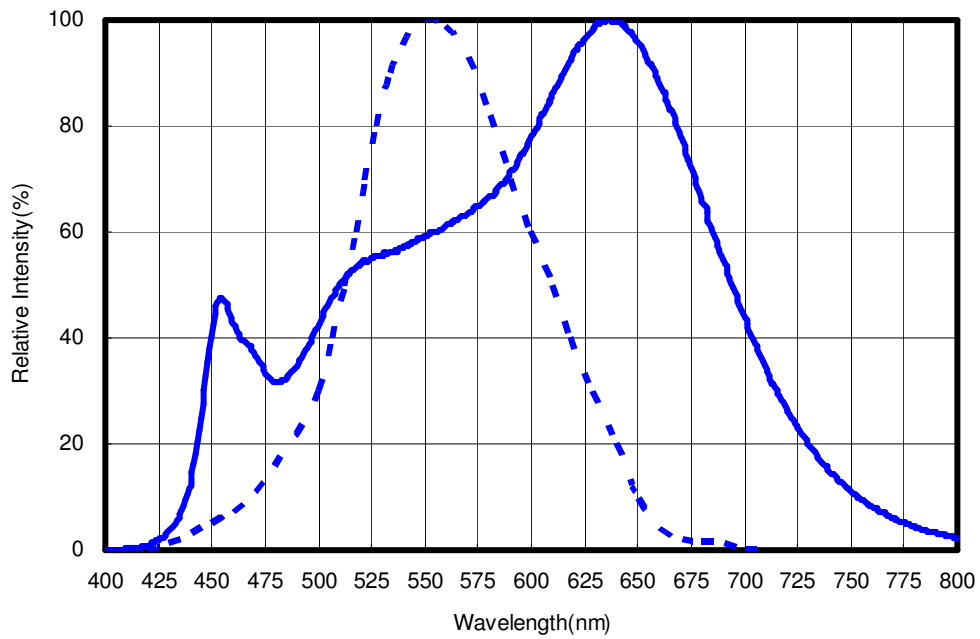
< Figure 4. Neutral White 、 Warm white color spectrum at $T_J = 25^\circ\text{C}$.for Edixeon[®] ARC series >



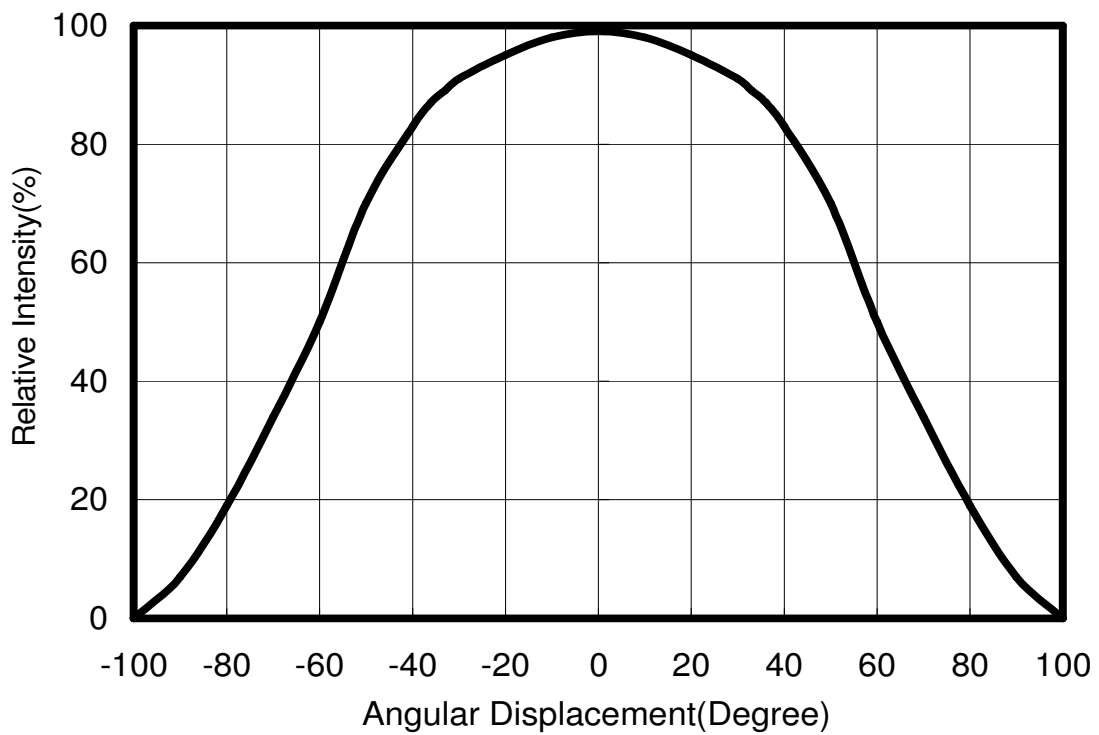
< Figure 5. Cool white color spectrum at $T_j = 25^\circ\text{C}$.for Edixeon[®] ARC series EDEW-xLS5-Dx >



< Figure 6. Neutral white color spectrum at $T_j = 25^\circ\text{C}$.for Edixeon[®] ARC series EDEH-xLS5-Dx >



< Figure 7. Warm white color spectrum at $T_j = 25^\circ\text{C}$.for Edixeon[®] ARC series EDEX-xLS5-Dx >



<Figure 8.Lambertain at $T_j = 25^\circ\text{C}$ for Cool White · Neutral White · Warm white.>

Emission Angle Characteristics

< Table 10 Emission angle Characteristics at $T_j=25^\circ\text{C}$ for Edixeon[®] ARC series >

| Part Name | Color | 2 θ $\frac{1}{2}$ (Typ.) | Unit |
|--------------|---------------|---------------------------------|------|
| | | Lambertian | |
| EDEW-xLS5-xx | Cool White | 120 | Deg. |
| EDEH-xLS5-xx | Neutral White | 120 | Deg. |
| EDEX-xLS5-xx | Warm White | 120 | Deg. |

Notes:

- Emission is measured with an accuracy of ± 10 Degree.

Color Temperature Characteristics $T_j=25^\circ\text{C}$

< Table 11 Color Temperature Characteristics at $T_j=25^\circ\text{C}$ for Edixeon[®] ARC series >

| Part Name | Color | CCT | | Unit |
|--------------|---------------|-------|--------|------|
| | | Min. | Max. | |
| EDEW-xLS5-xx | Cool White | 5,000 | 10,000 | K |
| EDEH-xLS5-xx | Neutral White | 3,800 | 5,000 | K |
| EDEX-xLS5-xx | Warm White | 2,670 | 3,800 | K |

Notes:

- CCT is measured with an accuracy of $\pm 200\text{K}$

Color Temperature Characteristics $T_j=25^\circ\text{C}$

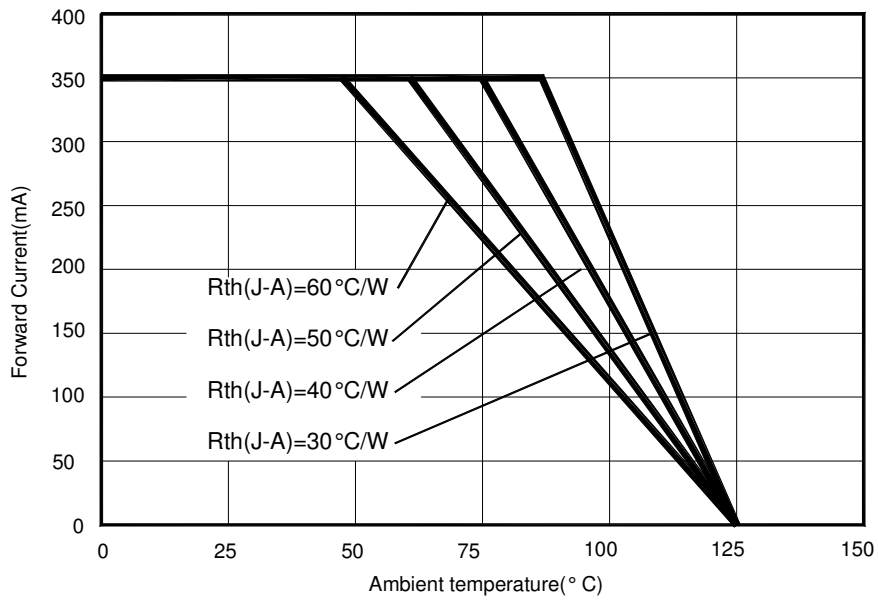
< Table 12 Color Rendering Index Characteristics at $T_j=25^\circ\text{C}$ for Edixeon[®] ARC series >

| Part Name | Color | CRI |
|--------------|---------------|-----|
| | | Typ |
| EDEW-xLS5-Bx | Cool White | 65 |
| EDEH-xLS5-Ex | Neutral White | 75 |
| EDEX-xLS5-Ex | Warm White | 75 |
| EDEW-xLS5-Dx | Cool White | 90 |
| EDEH-xLS5-Dx | Neutral White | 90 |
| EDEX-xLS5-Dx | Warm White | 90 |

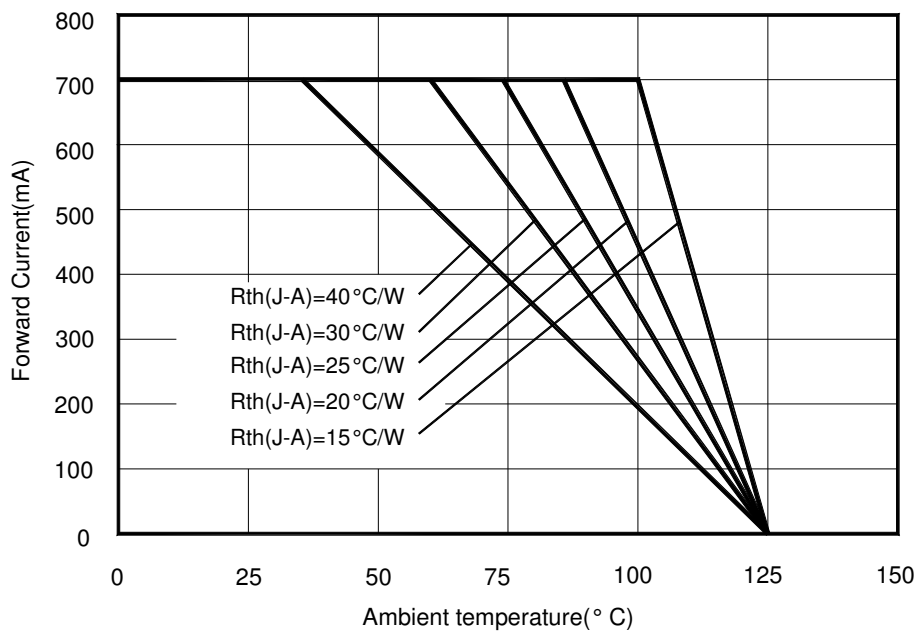
Notes:

- DRI is measured with an accuracy of ± 5

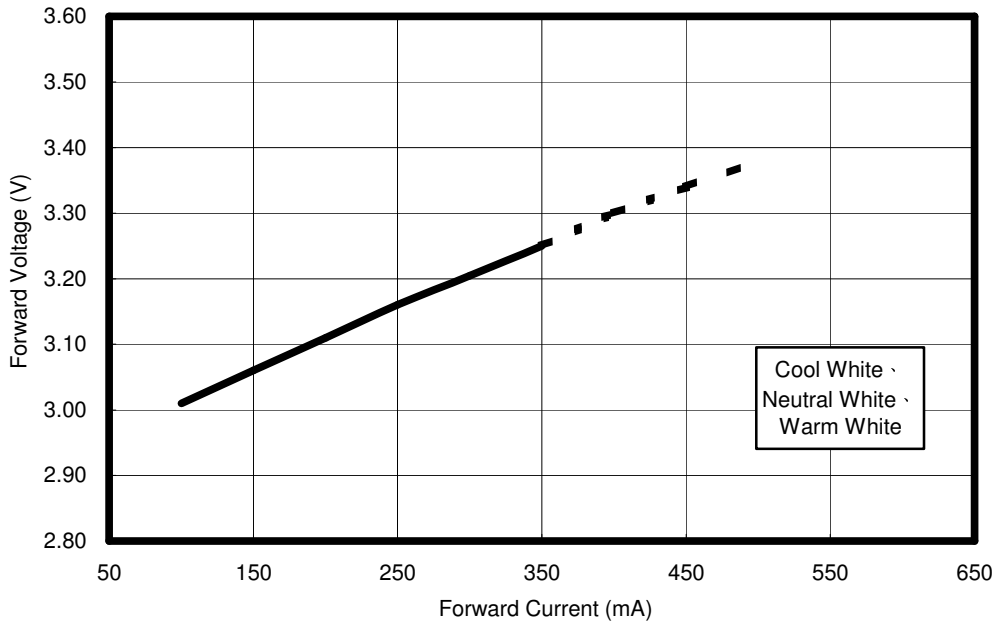
Optical & Electrical Characteristics



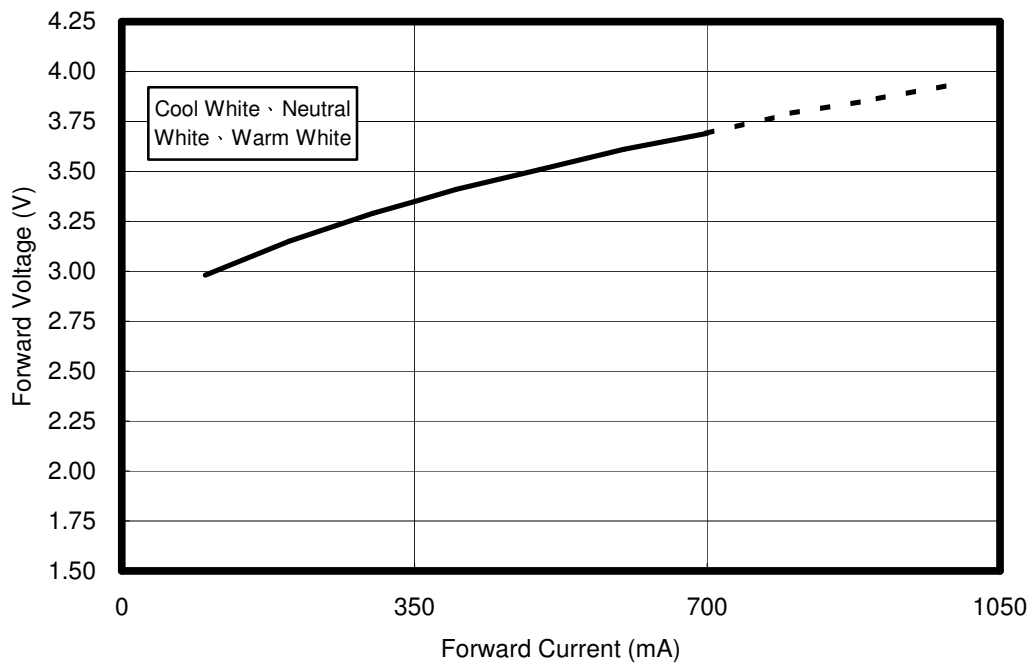
< Figure 9 Operating Current & Ambient Temperature for 1W Edixeon[®] ARC series >



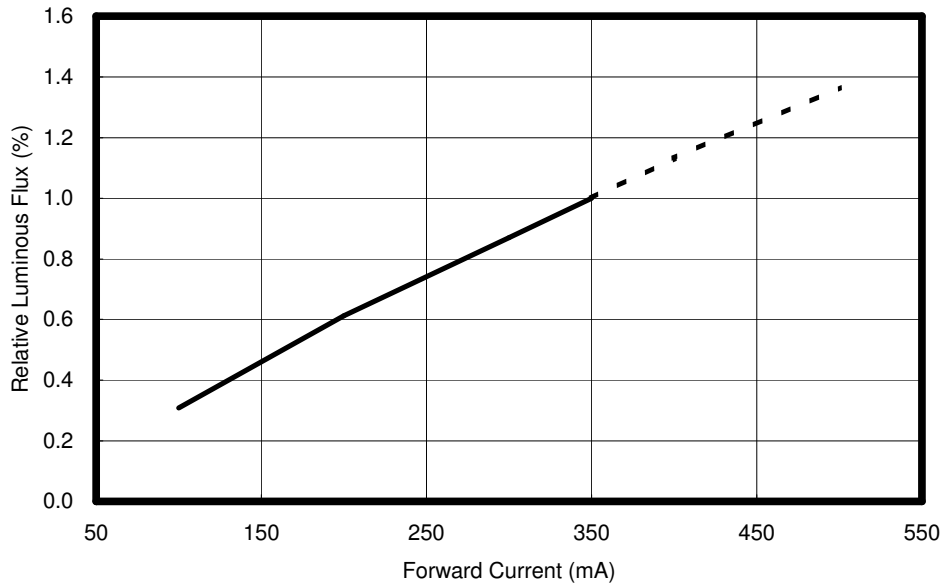
< Figure 10 Operating Current & Ambient Temperature for 3W Edixeon[®] ARC series >



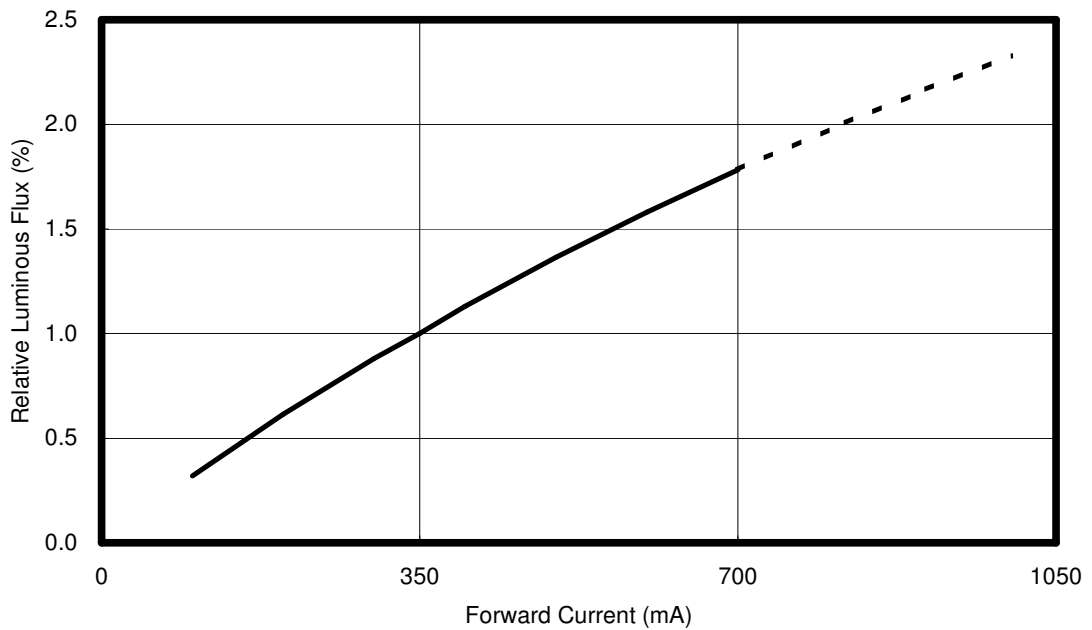
< Figure 11 Forward Current & Forward Voltage at $T_J=25^{\circ}\text{C}$ for 1W Edixeon[®] ARC series >



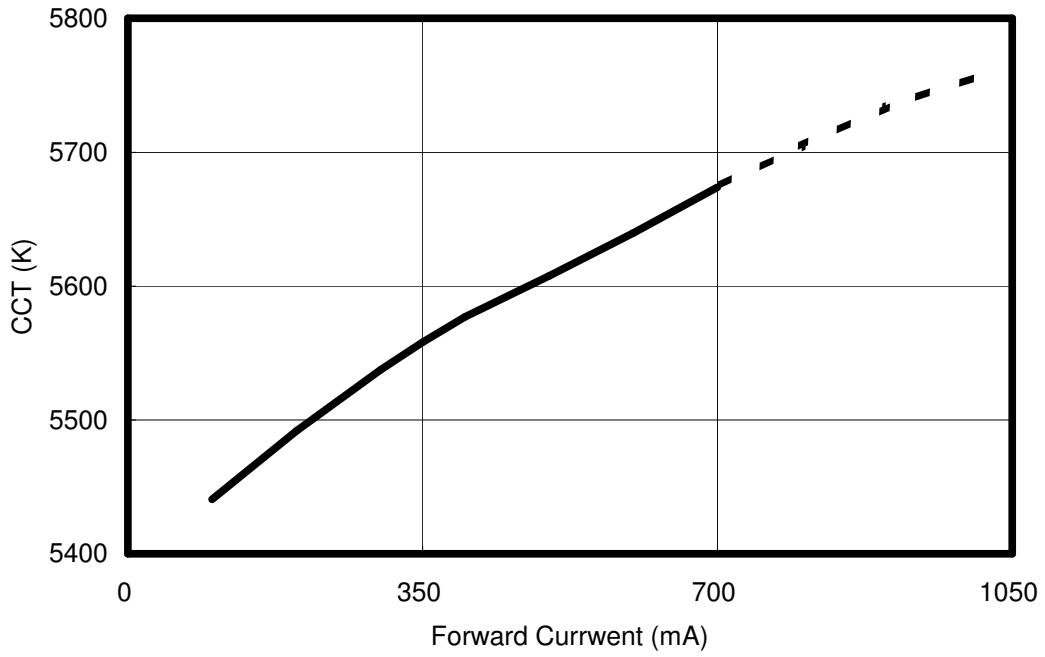
< Figure 12 Forward Current & Forward Voltage at $T_J=25^{\circ}\text{C}$ for 3W Edixeon[®] ARC series >



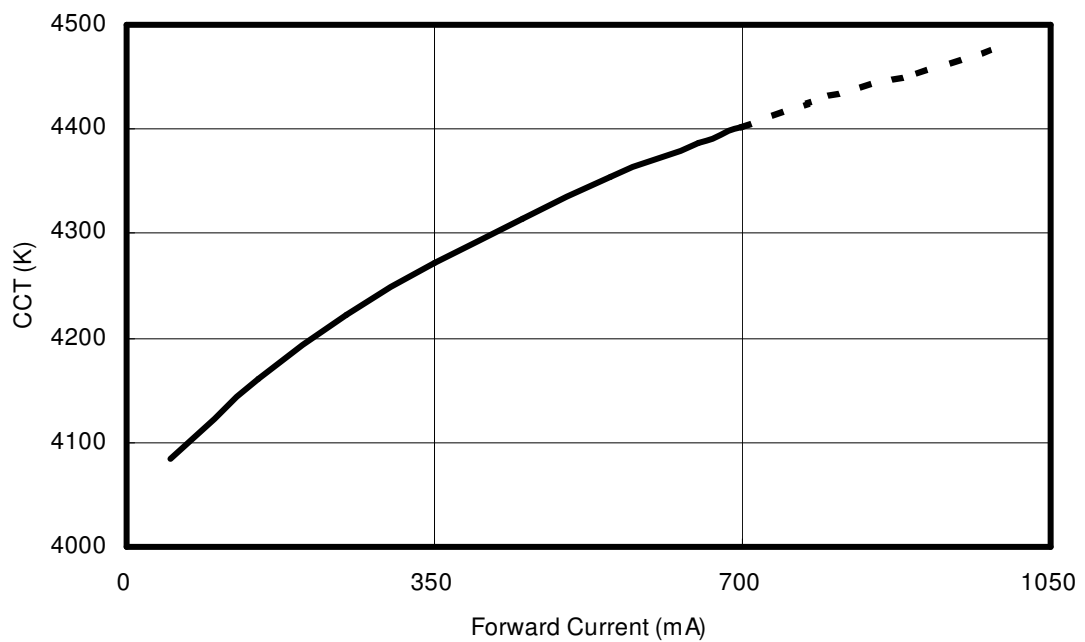
< Figure 13 Forward Current & Relative Luminous at $T_J=25^\circ\text{C}$ for 1W Edixeon[®] ARC series>



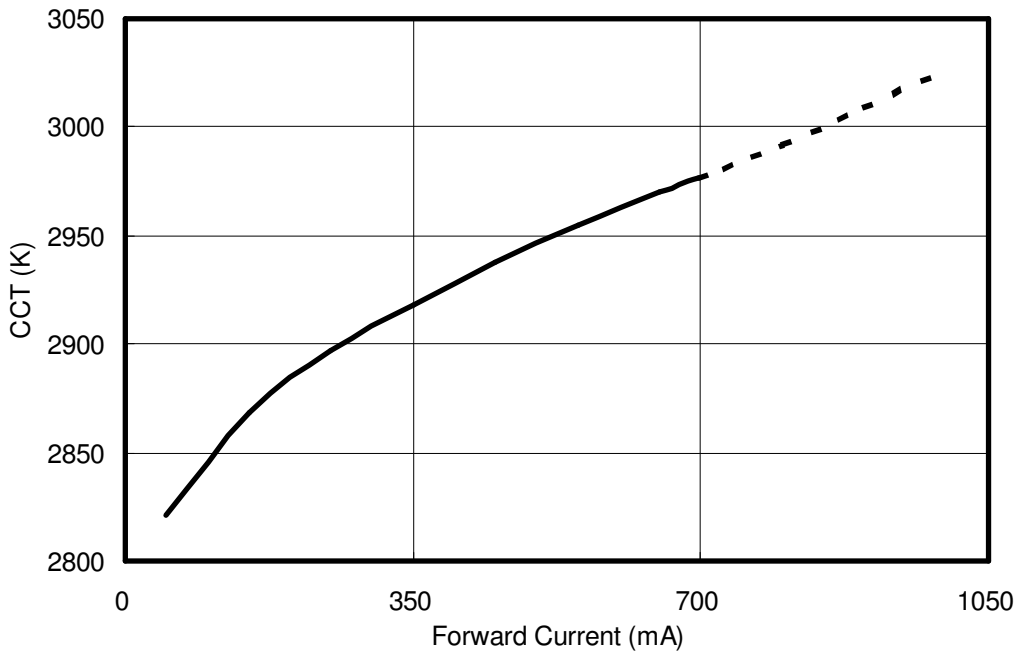
< Figure 14 Forward Current & Relative Luminous at $T_J=25^\circ\text{C}$ for 3W Edixeon[®] ARC series>



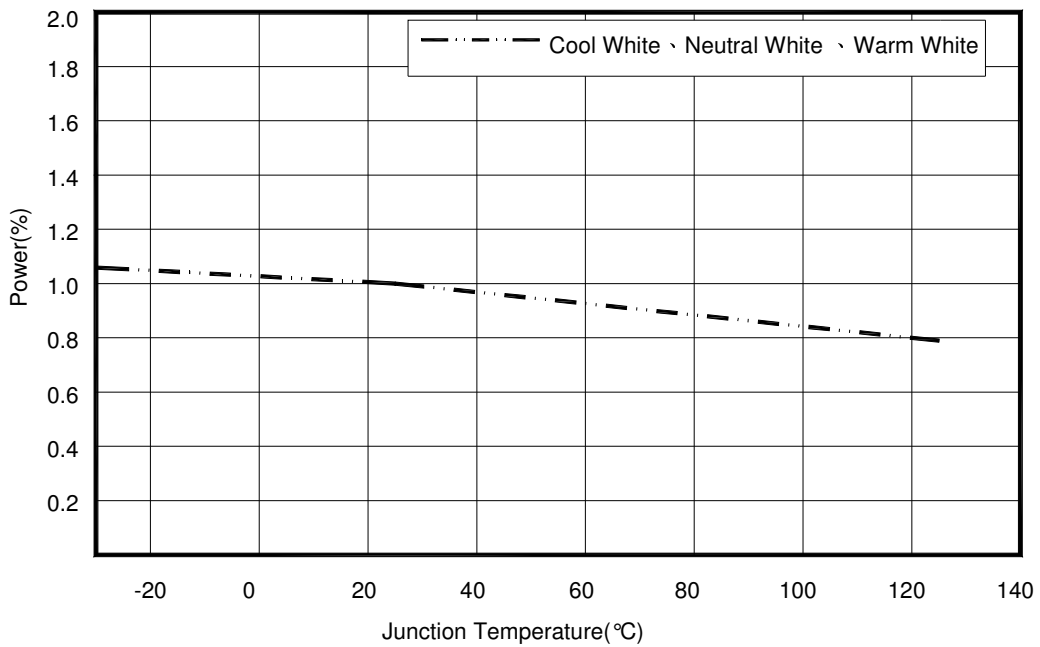
< Figure 15.Forward Current & CCT at $T_J=25^{\circ}\text{C}$ for Edixeon[®] ARC series Cool White>



< Figure 16.Forward Current & CCT at $T_J=25^{\circ}\text{C}$ for Edixeon[®] ARC series Neutral White>



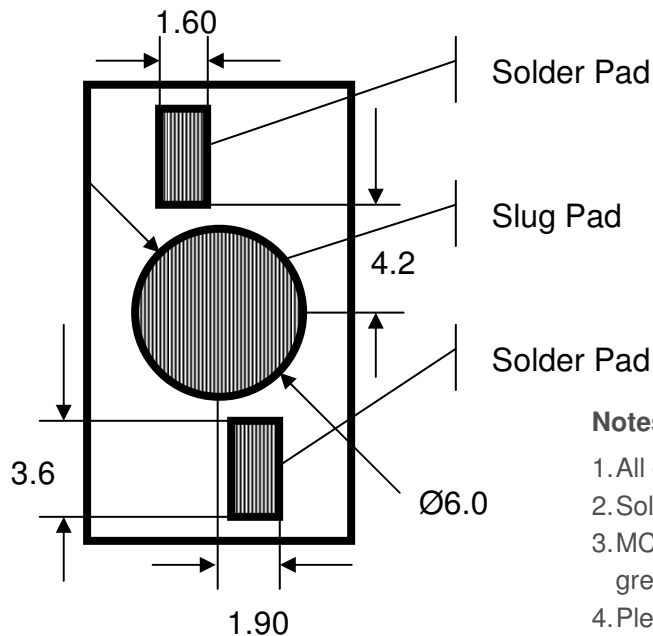
< Figure 17. Forward Current & CCT at $T_J=25^{\circ}\text{C}$ for Edixeon[®] ARC series Warm White >



< Figure 18. Junction temperature & power rate for Edixeon[®] ARC series >

Product Soldering Instructions

The central circle pad at the bottom face of the package provides the main path for heat dissipation from the LED to the heat sink (heat sink contact).



< Figure 19. Pad dimensions >

Notes:

1. All dimensions are measured in mm.
2. Solder pad cannot be connected to slug pad.
3. MCPCB material with a thermal conductivity greater than 3.0 W/mK.
4. Please avoid touching the Edixeon[®] lens during assembly processes. This may cause pollution or scratch on the surface of lens.

The choice of solder and the application method will dictate the specific amount of solder. For most consistent results, an automated dispensing system or a solder stencil printer is recommended.

Positive results will be used solder thickness that results in 50µm. The lamp can be placed on the PCB simultaneously with any other required SMD and reflow completed in a single step. Automated pick-and-place tools are recommended.

The central slug at the bottom face of the package provides the main path for heat dissipation from the LED to the heat sink (heat sink contact). A key feature of Edixeon[®] ARC series is an electrically neutral heat path that is separate from the LED's electrical contacts. This electrically isolated thermal pad makes Edixeon[®] ARC series perfect for use with either FR4 circuit boards with thermal via or with metal-core printed circuit boards (MCPCB).

Recommend Solder Steps

To prevent mechanical failure of LEDs in the soldering process, a carefully controlled pre-heat and post-cooling sequence is necessary. The heating rate in an IR furnace depends on the absorption coefficients of the material surfaces and on the ratio of the component's mass to its irradiated surface. The temperature of parts in an IR furnace, with a mixture of radiation and convection, cannot be determined in advance.

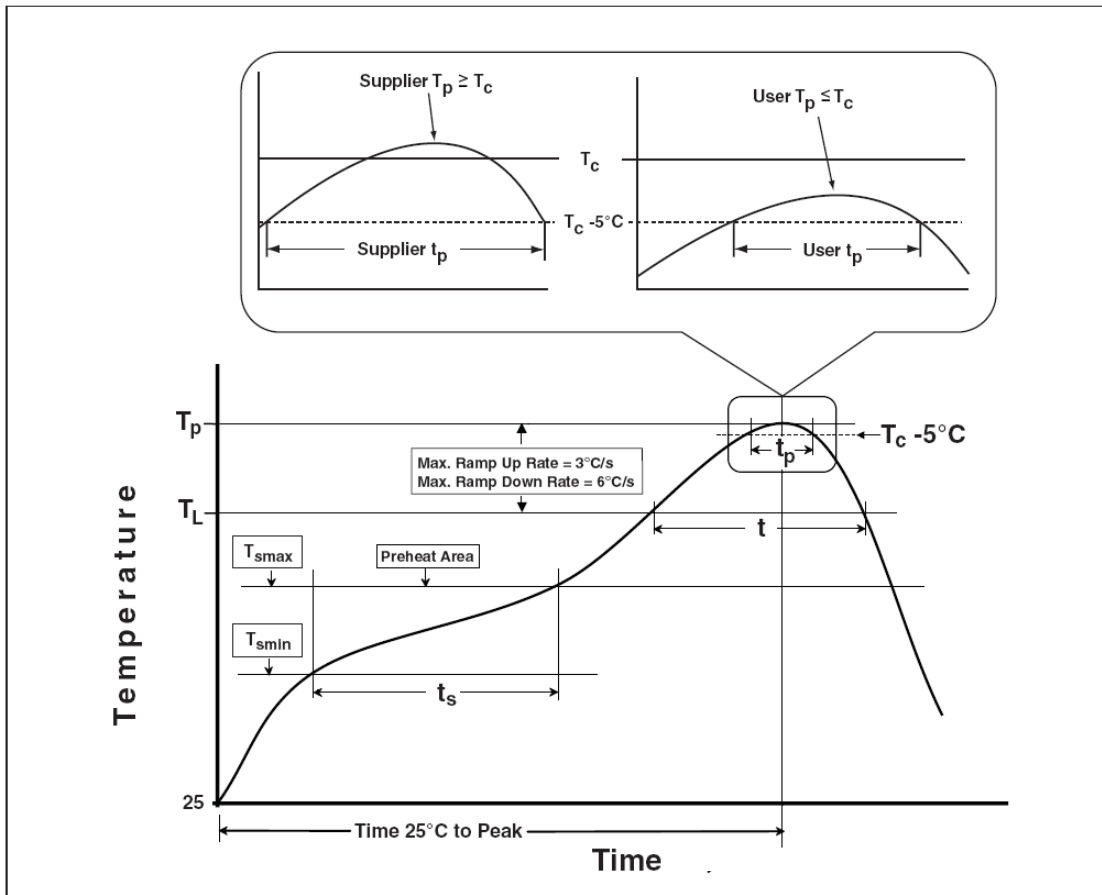
Temperature measurement may be performed by measuring the temperature of a specific component while it is being transported through the furnace. Influencing parameters on the internal temperature of the component are as follows:

- Time and power
- Mass of the component (for Edixeon[®] ARC series on MCPCB)
- Size of the component
- Size of the printed circuit board
- Absorption coefficient of the surfaces and MCPCB
- Packing density

Peak temperatures can vary greatly across the PC board during IR processes. The variables that contribute to this wide temperature range include the furnace type and the size, mass and relative location of the components on the board. Profiles must be carefully tested to determine the hottest and coolest points on the board. The hottest and coolest points should fall within the recommended temperatures. The profile of the reflow system should be based on design needs, the selected solder system and the solder-paste manufacturer's recommended reflow profile.

Recommended Profile for Reflow Soldering

The following reflow soldering profiles are provided for reference. Edison recommends that users follow the recommended soldering profile provided by the manufacturer of the solder paste used.



< Figure 20 Reflow profiles >

Table of Classification Reflow Profiles

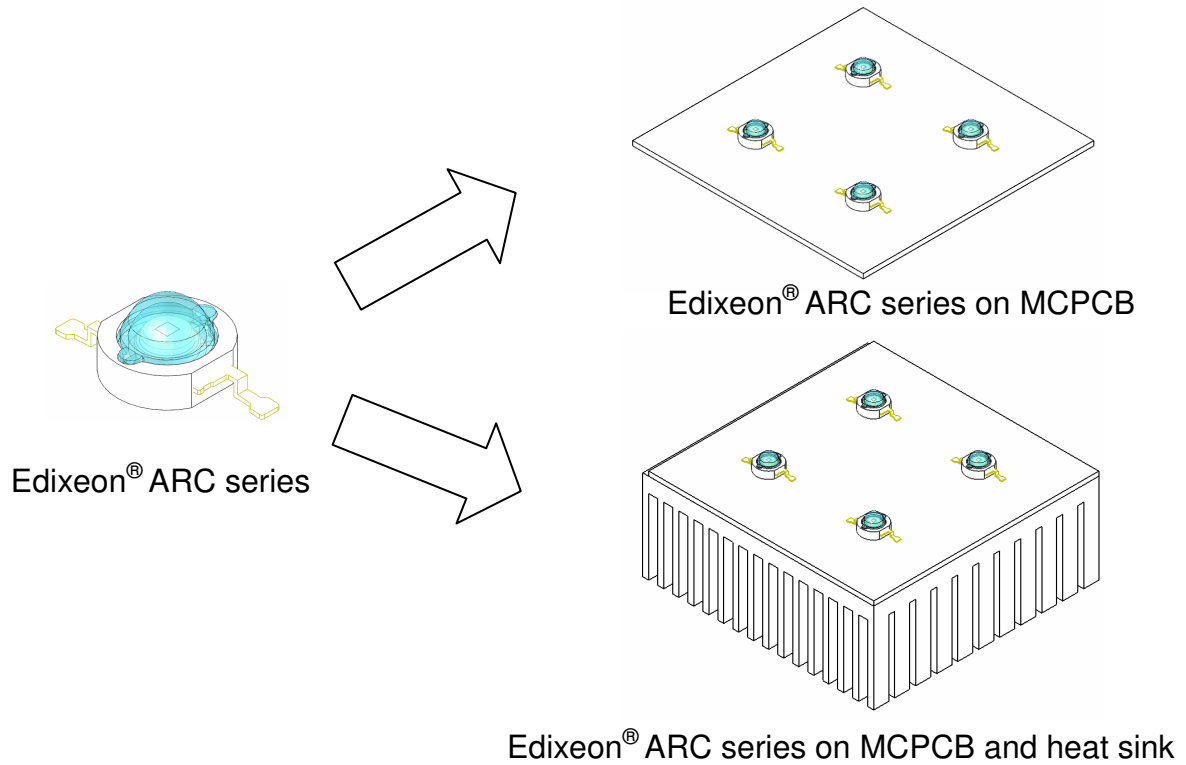
< Table 13 Reflow profiles >

| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|--|------------------------------------|------------------------------------|
| Preheat & Soak Temperature min (T _{min}) Temperature max (T _{max}) Time (T _{min} to T _{max}) (ts) | 100 °C 150 °C 60-120 seconds | 150 °C 200 °C 60-120 seconds |
| Average ramp-up rate (T _{max} to T _p) | 3 °C/second max. | 3 °C/second max. |
| Liquidous temperature (TL) Time at liquidous (tL) | 183 °C 60-150 seconds | 217 °C 60-150 seconds |
| Peak package body temperature (T _p)* | 230 °C ~235 °C * | 255 °C ~260 °C * |
| Classification temperature (T _c) | 235 °C | 260 °C |
| Time (tp)** within 5 °C of the specified classification temperature (T _c) | 20** seconds | 30** seconds |
| Average ramp-down rate (T _p to T _{max}) | 6 °C/second max. | 6 °C/second max. |
| Time 25 °C to peak temperature | 6 minutes max. | 8 minutes max. |
| * Tolerance for peak profile temperature (T _p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum. | | |

Product Thermal Application Information

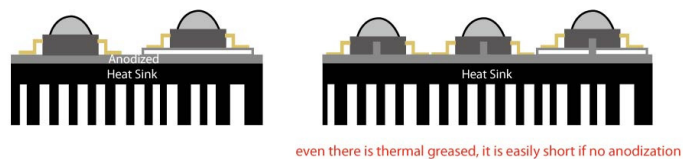
Thermal grease should be evenly spreaded with a thickness <math>< 100\mu\text{m}</math>.

When assembling on MCPCB or heat sink carrier.



< Figure 21 Edixeon[®] ARC series heatsink application >

—It is strongly recommended the heat sink should be anodized.

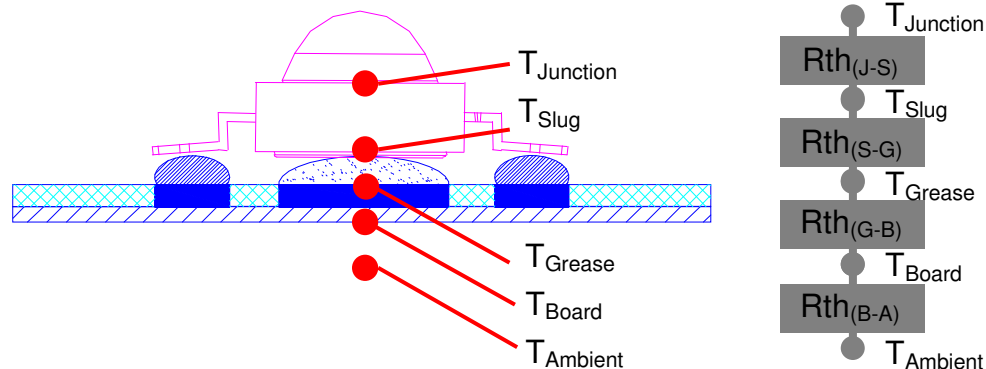


—Please ensure the heat sink is flat enough to prevent the bad heat conductivity.



<Figure 22 Edixeon[®] ARC series assemble with heatsink>

Thermal Resistance Application



$$R_{th(J-A)} = R_{th(J-S)} + R_{th(S-G)} + R_{th(G-B)} + R_{th(B-A)}$$

$$T_{Junction} = T_{Ambient} + R_{th(J-A)} \times P_{Dissipation}$$

$$(T_J = T_A + R_{th(J-A)} \times P_{Dissipation})$$

<Figure 23 Rth and T_J for Edixeon® ARC series >

Suggested Adhesive for Selection(such as thermal grease)

- Ease of use
- Non-solvent, One-part
- Fast tack free
 - 3 minutes at 25°C
- No corrosion
 - Alcohol type of room temperature vulcanization (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

< Table 14 Specification for adhesive 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 |

Thermal Resistance Calculation

The thermal resistance between two points is defined as the ratio of the difference in temperature to the power dissipated. For calculations in the following units used are °C/W. In the case of LEDs, the resistance of two important thermal paths affects the junction temperature:

From the LED junction to the thermal contact at the bottom of the package, this thermal resistance is governed by the package design. It is referred to as the thermal resistance between junction and slug ($R_{th(J-S)}$)

From the thermal contact to ambient conditions, this thermal resistance is defined by the path between the slug ,board ,and ambient. It is referred to as the thermal resistance between slug and board ($R_{th(S-B)}$) and between board and ambient ($R_{th(B-A)}$).

The overall thermal resistance between the LED junction and ambient ($R_{th(J-A)}$) can be modeled as the sum of the series resistances $R_{th(J-S)}$, $R_{th(S-B)}$., and $R_{th(B-A)}$.

The following will show how to calculate R_{th} for each part of LED module.

1. $R_{th(J-S)}$

Assume Edixeon® $R_{th(J-S)}=10\text{ °C/W}$

2. $R_{th(S-G)}$

If the thickness of thermal grease is 100um and area is $(6.4/2)^2\pi\text{ mm}^2$.

Thermal conductivity of thermal grease is 2.6 W/mK.

The Formula of R_{th} is
$$\frac{\text{Thickness(um)}}{\text{Thermal Conductivity (W/mK) x Area(mm}^2\text{)}}$$

Therefore $R_{th(S-G)} = \frac{100}{2.6 \times (6.4/2)^2 \pi} = 1.2 \text{ } ^\circ\text{C/W}$

3. $R_{th(G-B)}$

The R_{th} of standard MCPCB is $1.5 \text{ } ^\circ\text{C/W}$

4. $R_{th(B-A)}$

The R_{th} between board and air is mainly dependent on the total surface area.

Therefore $R_{th(B-A)} \doteq \frac{500}{\text{Area}(\text{cm})^2}$

If Area is 30cm^2 $R_{th}=16.7$ $R_{th(J-A)} = 10+1.2+1.5+16.7 = 29.4 \text{ } ^\circ\text{C/W}$

If Area is 60cm^2 $R_{th}=8.3$ $R_{th(J-A)} = 10+1.2+1.5+8.3 = 21 \text{ } ^\circ\text{C/W}$

If Area is 90cm^2 $R_{th}=5.5$ $R_{th(J-A)} = 10+1.2+1.5+5.5 = 18.2 \text{ } ^\circ\text{C/W}$

Junction Temperature Calculation

The total power dissipated by the LED is the product of the forward voltage (V_F) and the forward current (I_F) of the LED.

The temperature of the LED junction is the sum of the ambient temperature and the product of the thermal resistance from junction to ambient and the power dissipated.

$T_{\text{Junction}} = T_{\text{Air}} + R_{th(J-A)} \times P_{\text{Dissipation}}$

If one white Edixeon[®] in room temperature (25°C) operated 350mA and $V_F=3.3\text{V}$, the $P_{\text{Dissipation}}=0.35 \times 3.3=1.155\text{W}$

And junction temperature is

$T_{\text{Junction}} = 25^\circ\text{C} + 18.2 \times 1.155 = 46.021^\circ\text{C}$ (total surface area = 90cm^2)

$T_{\text{Junction}} = 25^\circ\text{C} + 21 \times 1.155 = 49.255^\circ\text{C}$ (total surface area = 60cm^2)

$T_{\text{Junction}} = 25^\circ\text{C} + 29.4 \times 1.155 = 58.957^\circ\text{C}$ (total surface area = 30cm^2)

Example : Junction Temperature Calculation

One white LED is used under ambient temperature (T_{Ambient}) of 30°C . This LED is soldered on MCPCB (Area= 10cm^2). Calculate junction temperature.

Assuming a forward voltage of $V_F=3.3\text{V}$ at 350mA and total power dissipated is

$P_{\text{Dissipation}}=1 \times 0.35 \times 3.3= 1.155 \text{ W.}$

LED $R_{th(J-S)}=10 \text{ } ^\circ\text{C /W.}$

With good design, $R_{th(S-G)}$ can be minimized to $1 \text{ } ^\circ\text{C /W.}$

$R_{th(G-B)}$ of a standard MCPCB can be $1.5 \text{ } ^\circ\text{C /W.}$

The R_{th} between board and air is mainly dependent on the total surface area.

Therefore it can be calculated in formula $\frac{500}{\text{Area(cm)}^2}$

$$R_{th(B-A)} = \frac{500}{10} = 50 \text{ } ^\circ\text{C/W}.$$

Following the formula $T_{\text{Junction}} = T_{\text{Ambient}} + R_{th(J-A)} \times P_{\text{Dissipation}}$

$$T_{\text{Junction}} = 30 \text{ } ^\circ\text{C} + (10 \text{ } ^\circ\text{C/W} + 1 \text{ } ^\circ\text{C/W} + 1.5 \text{ } ^\circ\text{C/W} + 50 \text{ } ^\circ\text{C/W}) \times 1.155\text{W}$$
$$= 102.1875 \text{ } ^\circ\text{C}$$

That means this LED emitter is operated under good condition ($T_{\text{Junction}} < 125 \text{ } ^\circ\text{C}$).

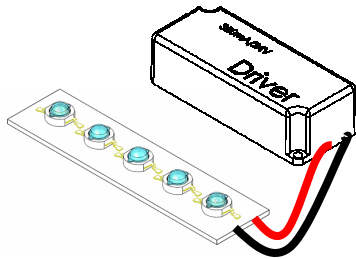
It's strongly recommended to keep the junction temperature under $125 \text{ } ^\circ\text{C}$

Or keep the temperature of emitter lead not exceed $55 \text{ } ^\circ\text{C}$

Product Electrical Application Information

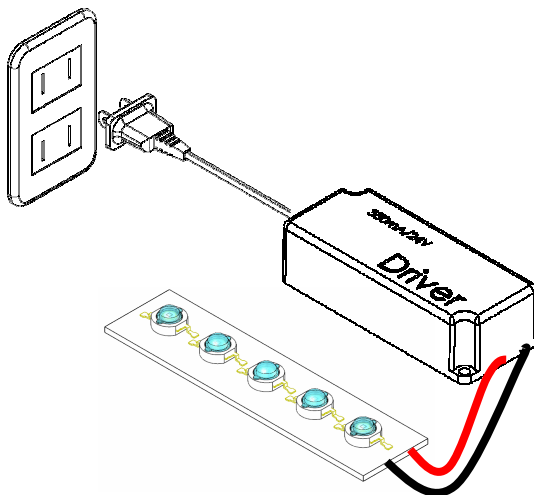
Following graphs and descriptions show how to connect LED or LED module and plug to AC outlet.

Step1: Connect the wires of LED Module to the DC output of the driver.



<Figure 24 LED Module connect to the DC output of the driver>

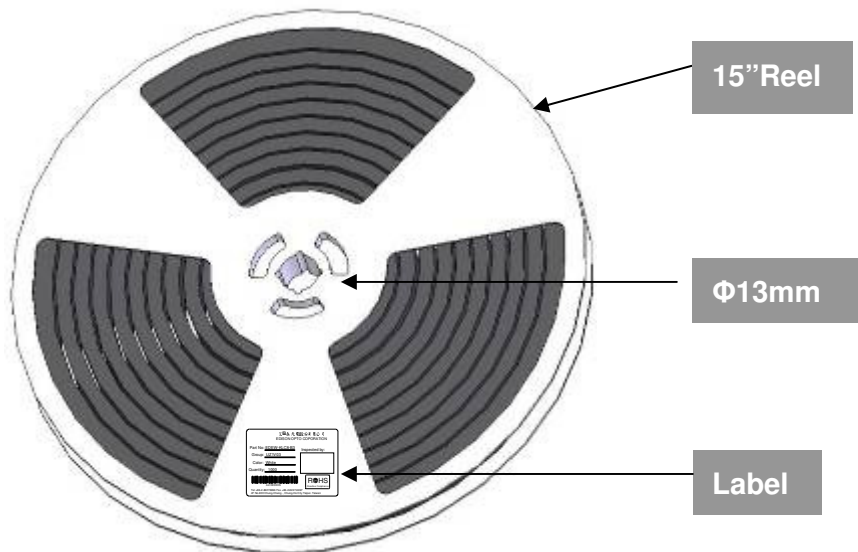
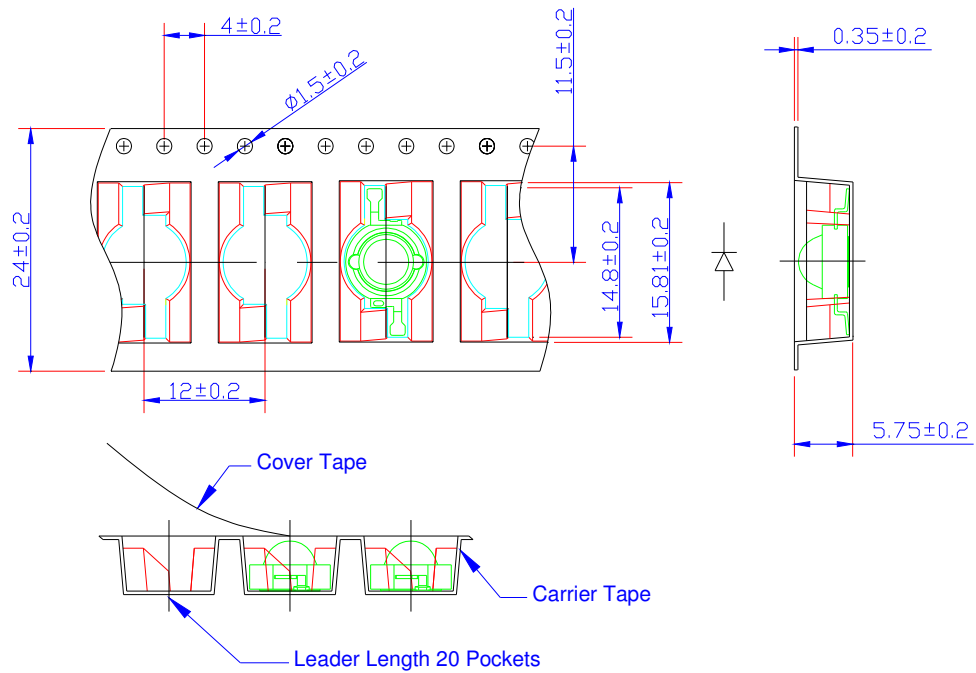
Step2 : Plug the driver to AC outlet.



<Figure 25 Plug the AC output of the driver to AC outlet>

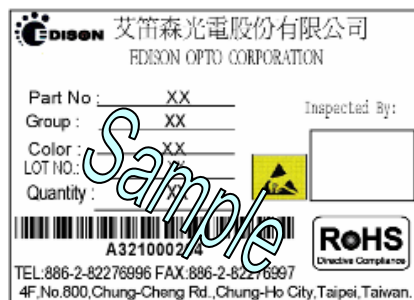
Caution: Never plug the driver to AC outlet before the LED Module is properly connected as this may generate transient voltage damage the LEDs permanently with a short or open circuit.

Product Packaging Information



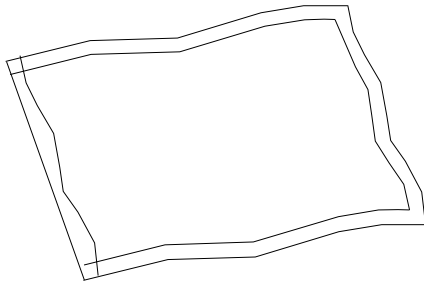
<Figure 26 Taping reel dimensions>

The Label

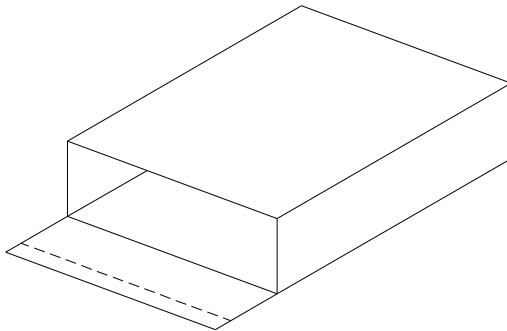


< Figure 27 Label on taping reel >

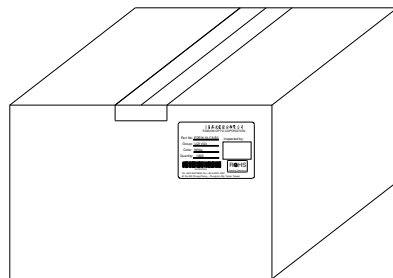
Packaging Steps



1 reel in a bag.



2 bags in an inner box.



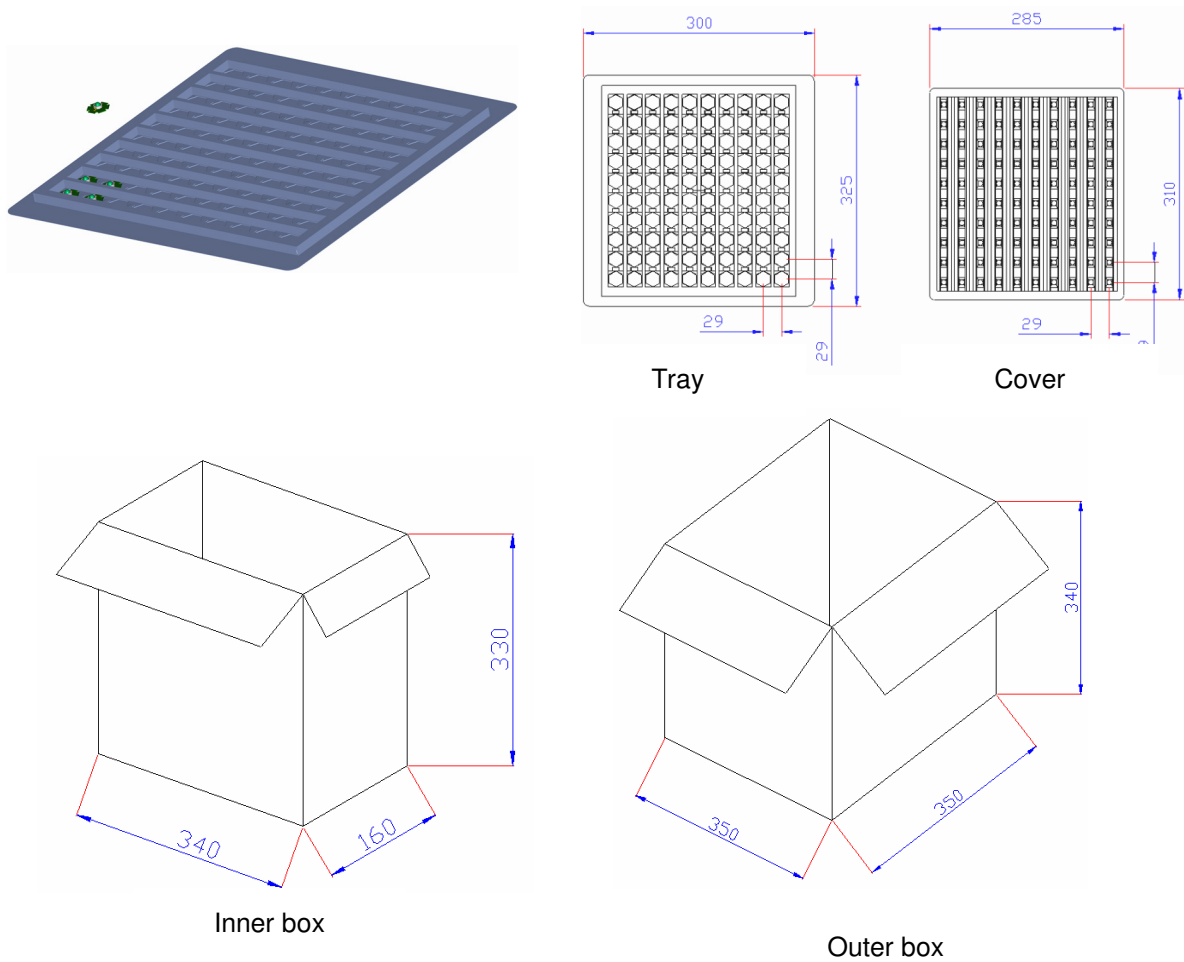
2 inner boxes in an outer box.

<Figure 28 Packaging steps>

Notes:

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

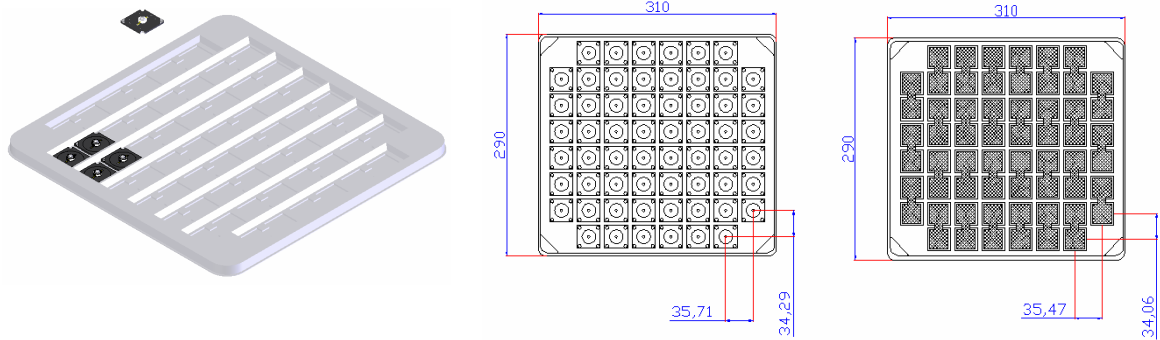
Star Product Packaging Information



<Figure 29 Edixon® Star Package>

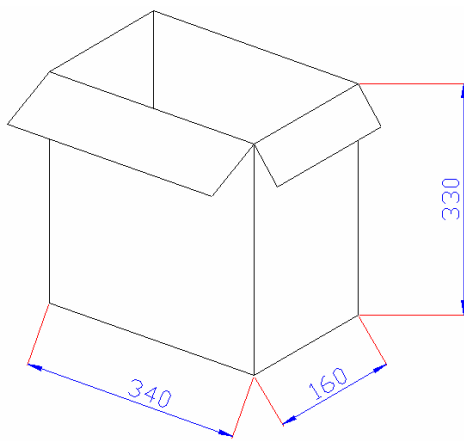
Notes:

1. All dimensions are in mm.
2. There are 100pcs stars in a tray.(Tray+Cover)
3. There are 10 trays in an inner box.
4. There are 2 inner boxes in an outer box.

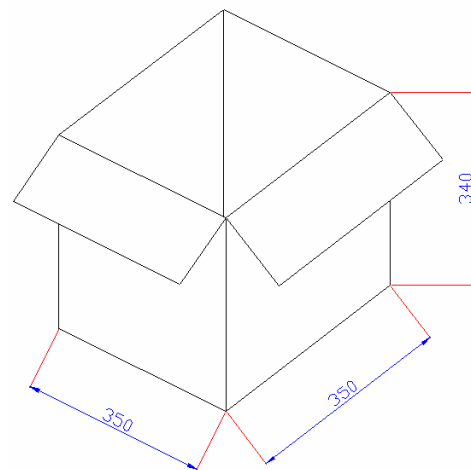


Tray

Cover



Inner box



Outer box

<Figure 30 Edixeon® Star Package>

Notes

1. All dimensions are in mm.
2. There are 60 pcs stars in a tray.(Tray+Cover)
3. There are 10 trays in an inner box.
4. There are 2 inner boxes in an outer box.