

# Specification

**AX32X0**

| SSC   |          | 고객명      |
|-------|----------|----------|
| Drawn | Approval | Approval |
|       |          |          |

Rev. 04

Jan 2010

[www.ACRICHE.com](http://www.ACRICHE.com)

서식번호 : SSC-QP-7-07-25 (Rev.00)

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# AX32X0

## Description

The Acriche series of LEDs are designed for AC operation and high flux output applications. Acriche LEDs are an environmentally friendly semiconductor lighting source that can be directly connected to an AC power source without any DC conversion required.

Acriche's thermal management performance exceeds other power LED solutions by incorporating state-of-the-art SMD design and use of specialized thermal emission material. Acriche is an ideal light source for general purpose illumination applications



# AX32X0

## Features

- Connect directly to AC power
- Power Saving
- Long Life
- Simplified B.O.M
- Small design footprint
- Low thermal resistance
- SMT solderability
- Lead Free and RoHS compliant

## Applications

- Architectural lighting
- Task lighting
- Decorative and Pathway lighting
- White goods and gaming
- Spot lighting

\* product specification may change without notice

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## Part number of AX32X0

### 1. Part Number form : A X<sub>1</sub> X<sub>2</sub> X<sub>3</sub> X<sub>4</sub> X<sub>5</sub>

| X <sub>1</sub> | Color      |
|----------------|------------|
| W              | Pure White |
| N              | Warm White |

| X <sub>2</sub> | Acriche Series |
|----------------|----------------|
| 1              | -              |
| 2              | -              |
| 3              | A3             |

| X <sub>3</sub> | LENS Type |
|----------------|-----------|
| 2              | Dome Type |

| X <sub>4</sub> | Operating Voltage [V] |
|----------------|-----------------------|
| 0              | 100 / 110 / 120       |
| 1              | -                     |
| 2              | 220 / 230             |
| 3              | -                     |

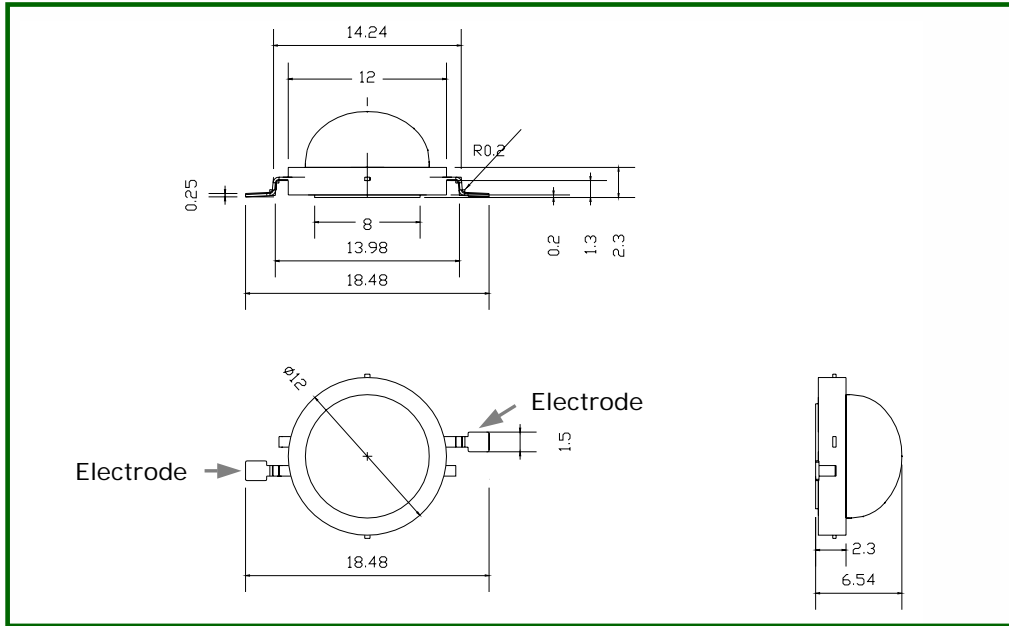
| X <sub>5</sub> | PCB Type |
|----------------|----------|
| 0              | Emitter  |
| 1              | -        |

### 2. Part Number of AX32X0

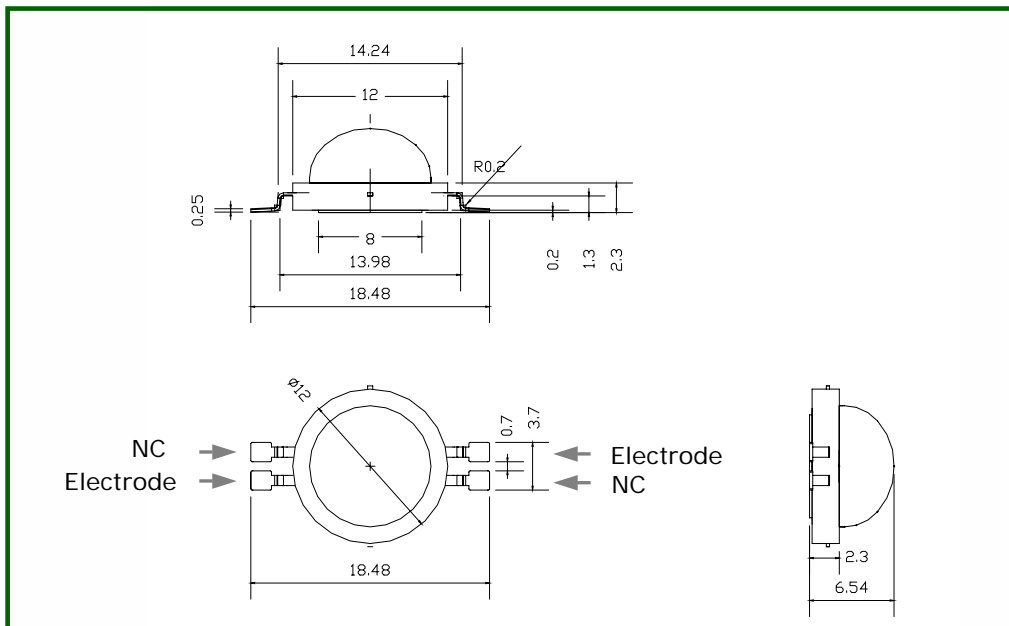
| Part number     | Operating voltage   | Operating current |
|-----------------|---------------------|-------------------|
| AW3200 / AN3200 | 100V/110V/120 [RMS] | 40mA [RMS]        |
| AW3220 / AN3220 | 220V/230V [RMS]     | 20mA [RMS]        |

## Outline dimensions

## 1. AX3200



## 2. AX3220



Notes :

- [1] All dimensions are in millimeters.
- [2] Scale : none
- [3] Drawings without tolerances are for reference only
- [4] Slug of package is electrically isolated
- [5] NC pin has no electrical or thermal connection

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## Characteristics of Acriche

### 1. AW3200

1-1 Electro-Optical characteristics at 100V/110V/120V Ta=25°C

| Parameter                                   | Symbol                  | Value   |      |     | Unit        |
|---|-------------------------|---------|------|-----|-------------|
|   |                         | Min     | Typ  | Max |             |
| Luminous Flux <sup>[1]</sup>                | $\Phi_V$ <sup>[2]</sup> | -       | 215  | -   | lm          |
| Illuminance <sup>[3]</sup>                  | $\Phi_I$                | -       | 240  | -   | lx          |
| Correlated Color Temperature <sup>[4]</sup> | CCT                     | -       | 6300 | -   | K           |
| CRI   | R <sub>a</sub>          | -       | 65   | -   | -           |
| Operating Current                           | I <sub>opt</sub>        | -       | 40   | -   | mA<br>[RMS] |
| Power Dissipation                           | P <sub>D</sub>          | 3.3     |      |     | W           |
| Operating Frequency                         | Freq                    | 50 / 60 |      |     | Hz          |
| View Angle                                  | 2 $\Theta$ 1/2          | 130     |      |     | deg.        |

### 1-2 Absolute Maximum Ratings

| Parameter             | Symbol                          | Value       | Unit    |
|-----------------------|---------------------------------|-------------|---------|
| Operating Voltage     | V <sub>opt</sub> <sup>[5]</sup> | 115/127/138 | V [RMS] |
| Power Dissipation     | P <sub>D</sub>                  | 6.4         | W       |
| Junction Temperature  | T <sub>j</sub>                  | 125         | °C      |
| Operating Temperature | T <sub>opr</sub>                | -40 ~ +85   | °C      |
| Storage Temperature   | T <sub>stg</sub>                | -40 ~ +120  | °C      |
| ESD Sensitivity       | -                               | ±2,000V HBM | -       |

\*Notes :

[1] Acriche series maintains a tolerance of ±10% on flux and power measurements.

[2]  $\Phi_V$  is the total luminous flux output as measured with an integrating sphere.

[3] Illuminance is measured at 50cm distance

[4] Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

CCT ±5% tester tolerance

[5] 'Operating Voltage' doesn't indicate the maximum voltage which customers use, but it means tolerable voltage according to the voltage variation rate by one's country.

It is recommended that the temperature of lead frame should be below 70 °C.

## Characteristics of Acriche

### 2. AN3200

1-1 Electro-Optical characteristics at 100V/110V/120V Ta=25°C

| Parameter                                   | Symbol                  | Value   |      |     | Unit        |
|---|-------------------------|---------|------|-----|-------------|
|   |                         | Min     | Typ  | Max |             |
| Luminous Flux <sup>[1]</sup>                | $\Phi_V$ <sup>[2]</sup> | -       | 145  | -   | lm          |
| Illuminance <sup>[3]</sup>                  | $\Phi_I$                | -       | 160  | -   | lx          |
| Correlated Color Temperature <sup>[4]</sup> | CCT                     | -       | 3000 | -   | K           |
| CRI   | R <sub>a</sub>          | -       | 80   | -   | -           |
| Operating Current                           | I <sub>opt</sub>        | -       | 40   | -   | mA<br>[RMS] |
| Power Dissipation                           | P <sub>D</sub>          | 3.3     |      |     | W           |
| Operating Frequency                         | Freq                    | 50 / 60 |      |     | Hz          |
| View Angle                                  | 2 $\Theta$ 1/2          | 130     |      |     | deg.        |

1-2 Absolute Maximum Ratings

| Parameter             | Symbol                          | Value       | Unit    |
|-----------------------|---------------------------------|-------------|---------|
| Operating Voltage     | V <sub>opt</sub> <sup>[5]</sup> | 115/127/138 | V [RMS] |
| Power Dissipation     | P <sub>D</sub>                  | 6.4         | W       |
| Junction Temperature  | T <sub>j</sub>                  | 125         | °C      |
| Operating Temperature | T <sub>opr</sub>                | -40 ~ +85   | °C      |
| Storage Temperature   | T <sub>stg</sub>                | -40 ~ +120  | °C      |
| ESD Sensitivity       | -                               | ±2,000V HBM | -       |

\*Notes :

[1] Acriche series maintains a tolerance of ±10% on flux and power measurements.

[2]  $\Phi_V$  is the total luminous flux output as measured with an integrating sphere.

[3] Illuminance is measured at 50cm distance

[4] Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

CCT ±5% tester tolerance

[5] 'Operating Voltage' doesn't indicate the maximum voltage which customers use, but it means tolerable voltage according to the voltage variation rate by one's country.

It is recommended that the temperature of lead frame should be below 70 °C.

## Characteristics of Acriche

### 3. AW3220

1-1 Electro-Optical characteristics at 220V/230V Ta=25°C

| Parameter                                   | Symbol                  | Value   |      |     | Unit        |
|---|-------------------------|---------|------|-----|-------------|
|   |                         | Min     | Typ  | Max |             |
| Luminous Flux <sup>[1]</sup>                | $\Phi_V$ <sup>[2]</sup> | -       | 215  | -   | lm          |
| Illuminance <sup>[3]</sup>                  | $\Phi_I$                | -       | 240  | -   | lx          |
| Correlated Color Temperature <sup>[4]</sup> | CCT                     | -       | 6300 | -   | K           |
| CRI   | R <sub>a</sub>          | -       | 65   | -   | -           |
| Operating Current                           | I <sub>opt</sub>        | -       | 20   | -   | mA<br>[RMS] |
| Power Dissipation                           | P <sub>D</sub>          | 3.3     |      |     | W           |
| Operating Frequency                         | Freq                    | 50 / 60 |      |     | Hz          |
| View Angle                                  | 2 $\Theta$ 1/2          | 130     |      |     | deg.        |

1-2 Absolute Maximum Ratings

| Parameter             | Symbol                          | Value       | Unit    |
|-----------------------|---------------------------------|-------------|---------|
| Operating Voltage     | V <sub>opt</sub> <sup>[5]</sup> | 253/265     | V [RMS] |
| Power Dissipation     | P <sub>D</sub>                  | 6.4         | W       |
| Junction Temperature  | T <sub>j</sub>                  | 125         | °C      |
| Operating Temperature | T <sub>opr</sub>                | -40 ~ +85   | °C      |
| Storage Temperature   | T <sub>stg</sub>                | -40 ~ +120  | °C      |
| ESD Sensitivity       | -                               | ±2,000V HBM | -       |

\*Notes :

[1] Acriche series maintains a tolerance of ±10% on flux and power measurements.

[2]  $\Phi_V$  is the total luminous flux output as measured with an integrating sphere.

[3] Illuminance is measured at 50cm distance

[4] Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

CCT ±5% tester tolerance

[5] 'Operating Voltage' doesn't indicate the maximum voltage which customers use, but it means tolerable voltage according to the voltage variation rate by one's country.

It is recommended that the temperature of lead frame should be below 70 °C.



## Characteristics of Acriche

### 4. AN3220

#### 1-1 Electro-Optical characteristics at 220V/230V Ta=25°C

| Parameter                                   | Symbol                  | Value   |      |     | Unit        |
|---|-------------------------|---------|------|-----|-------------|
|   |                         | Min     | Typ  | Max |             |
| Luminous Flux <sup>[1]</sup>                | $\Phi_V$ <sup>[2]</sup> | -       | 145  | -   | lm          |
| Illuminance <sup>[3]</sup>                  | $\Phi_I$                | -       | 160  | -   | lx          |
| Correlated Color Temperature <sup>[4]</sup> | CCT                     | -       | 3000 | -   | K           |
| CRI   | R <sub>a</sub>          | -       | 80   | -   | -           |
| Operating Current                           | I <sub>opt</sub>        | -       | 20   | -   | mA<br>[RMS] |
| Power Dissipation                           | P <sub>D</sub>          | 3.3     |      |     | W           |
| Operating Frequency                         | Freq                    | 50 / 60 |      |     | Hz          |
| View Angle                                  | 2 $\Theta$ 1/2          | 130     |      |     | deg.        |

#### 1-2 Absolute Maximum Ratings

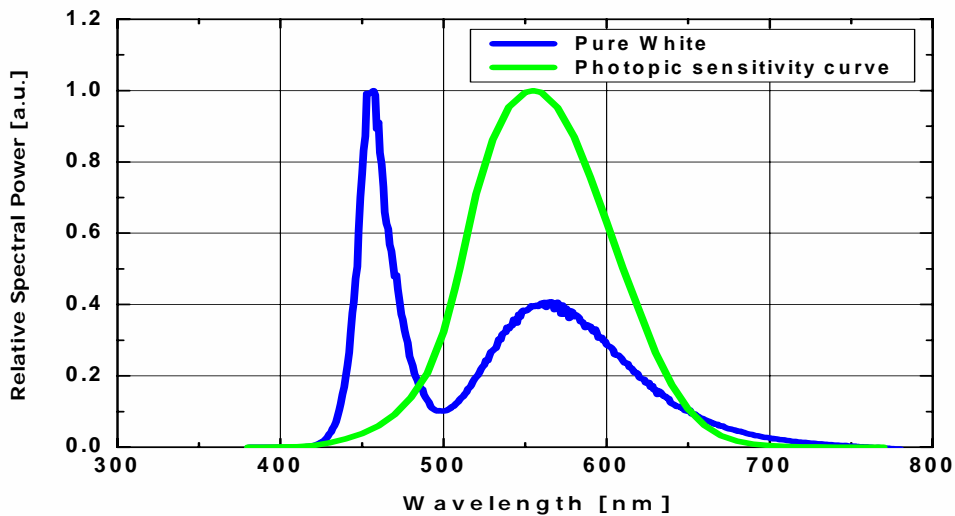
| Parameter             | Symbol                          | Value       | Unit    |
|-----------------------|---------------------------------|-------------|---------|
| Operating Voltage     | V <sub>opt</sub> <sup>[5]</sup> | 253/265     | V [RMS] |
| Power Dissipation     | P <sub>D</sub>                  | 6.4         | W       |
| Junction Temperature  | T <sub>j</sub>                  | 125         | °C      |
| Operating Temperature | T <sub>opr</sub>                | -40 ~ +85   | °C      |
| Storage Temperature   | T <sub>stg</sub>                | -40 ~ +120  | °C      |
| ESD Sensitivity       | -                               | ±2,000V HBM | -       |

\*Notes :

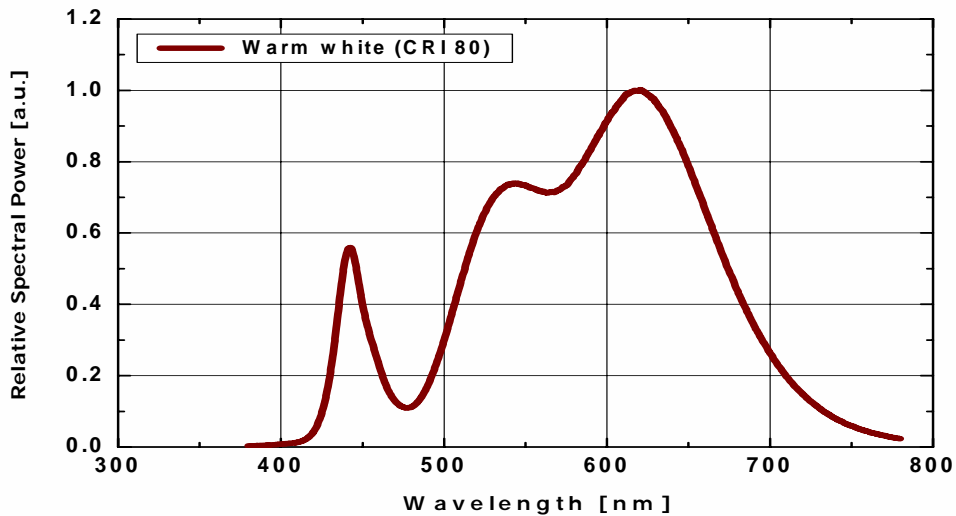
- [1] Acriche series maintains a tolerance of ±10% on flux and power measurements.
- [2]  $\Phi_V$  is the total luminous flux output as measured with an integrating sphere.
- [3] Illuminance is measured at 50cm distance
- [4] Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.  
CCT ±5% tester tolerance
- [5] 'Operating Voltage' doesn't indicate the maximum voltage which customers use, but it means tolerable voltage according to the voltage variation rate by one's country.  
It is recommended that the temperature of lead frame should be below 70 °C.

## Color spectrum, $T_a=25^{\circ}\text{C}$

### 1. Pure white

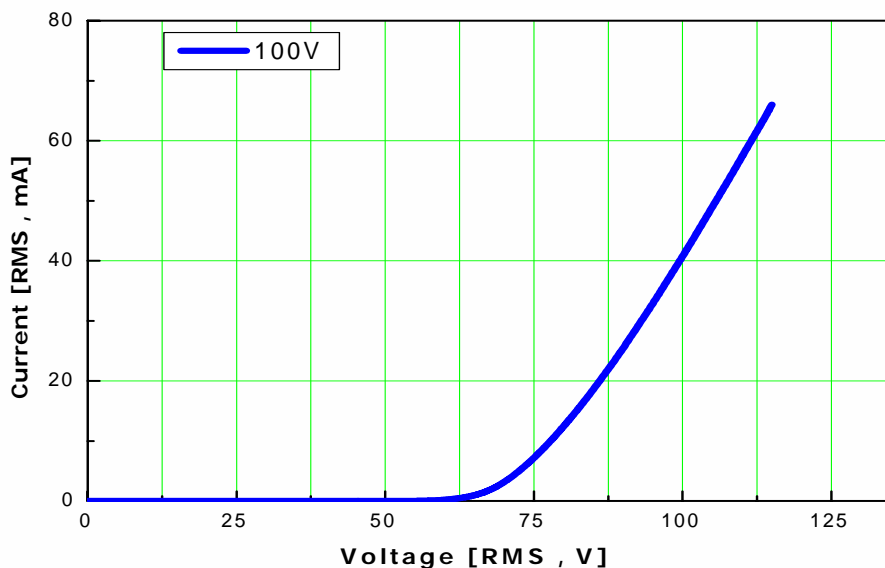


### 2. Warm white

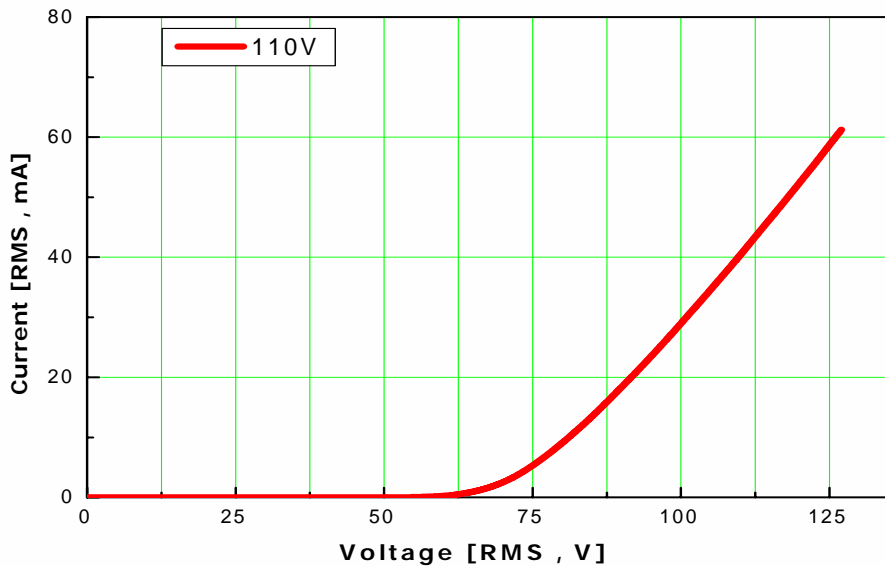


## Current – Voltage characteristics, $T_a=25^{\circ}\text{C}$

### 1. AX3200 with external resistor @100V

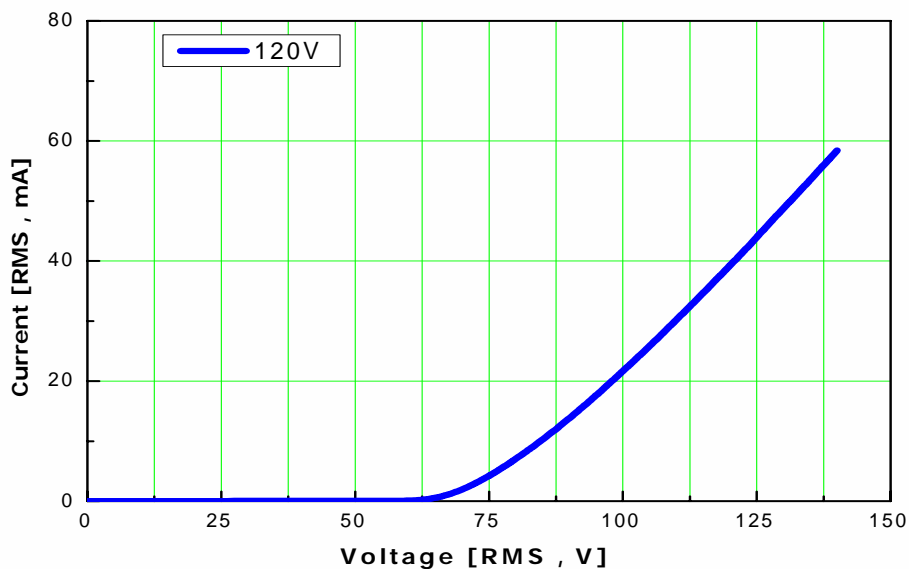


### 2. AX3200 with external resistor @110V



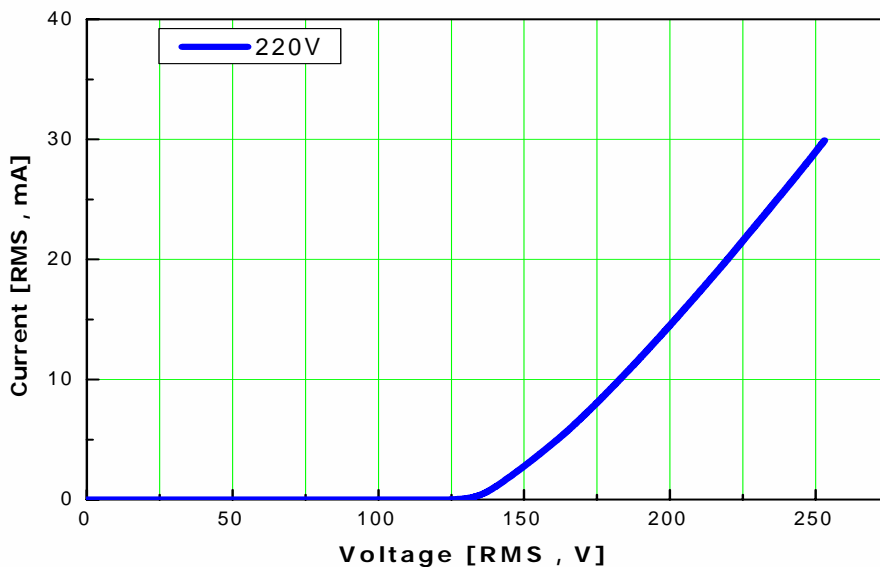
## Current – Voltage characteristics, $T_a=25^{\circ}\text{C}$

### 3. AX3200 with external resistor @120V

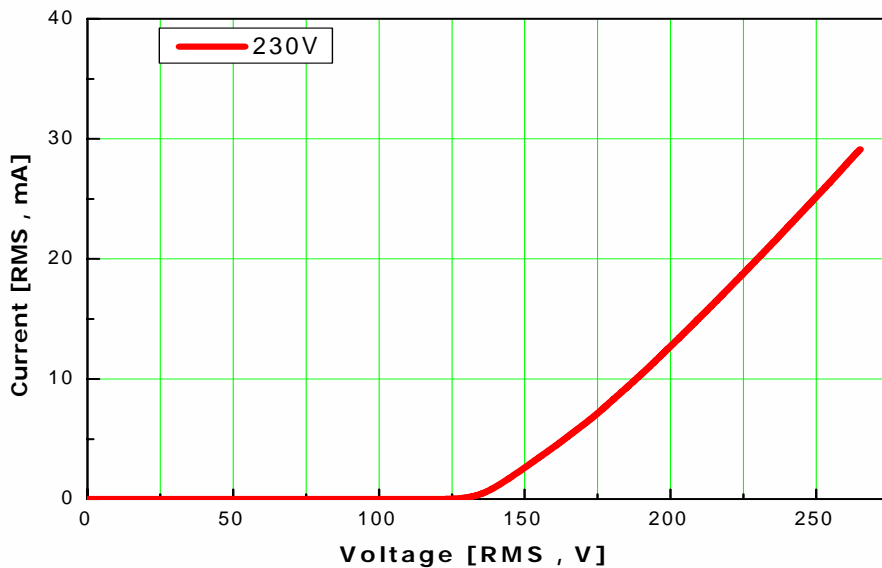


## Current – Voltage characteristics, $T_a=25^{\circ}\text{C}$

### 4. AX3220 with external resistor @220V

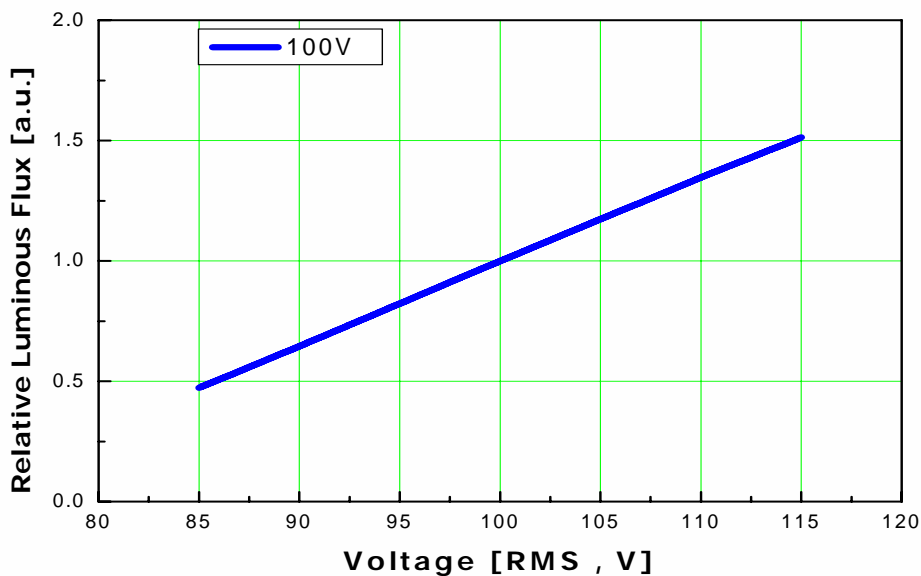


### 5. AX3220 with external resistor @230V

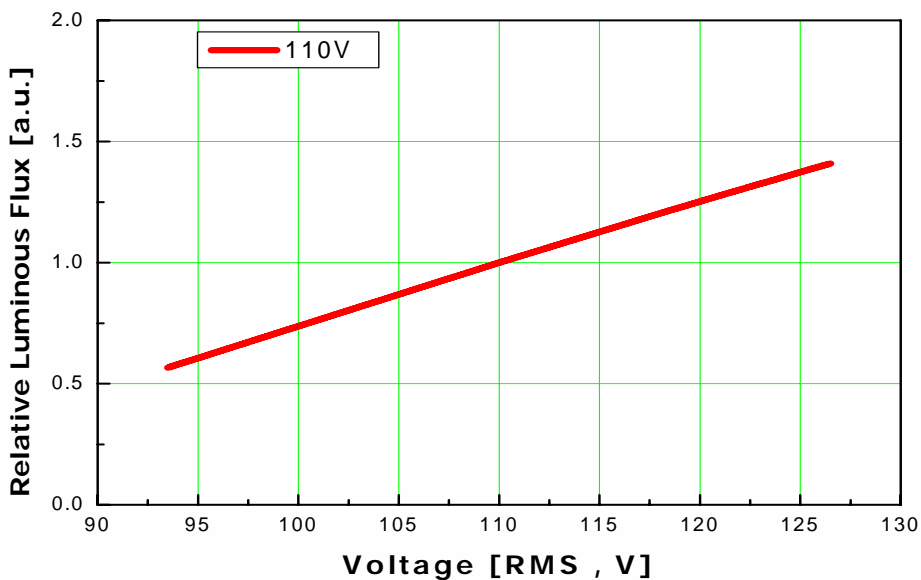


## Voltage – Relative flux characteristics, $T_a=25^{\circ}\text{C}$

### 1. AX3200 with external resistor @100V

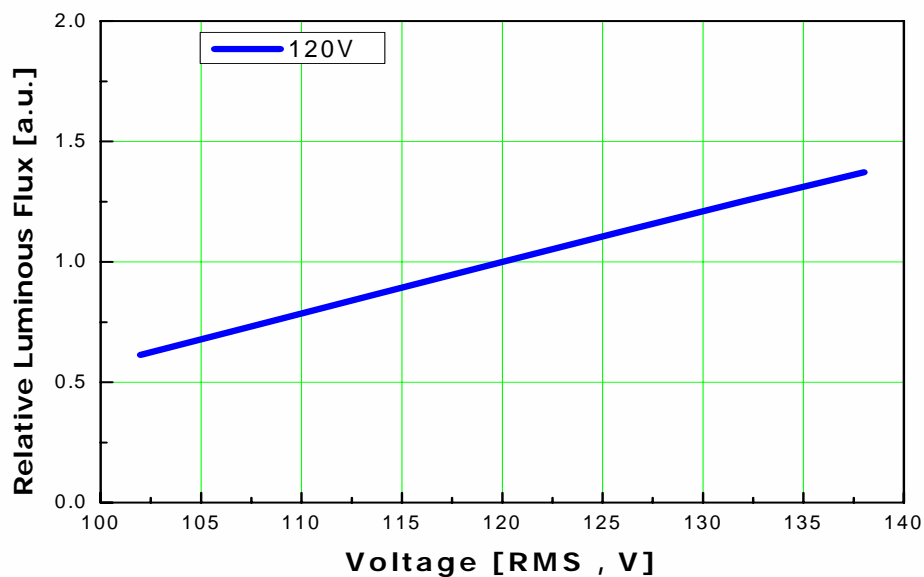


### 2. AX3200 with external resistor @110V



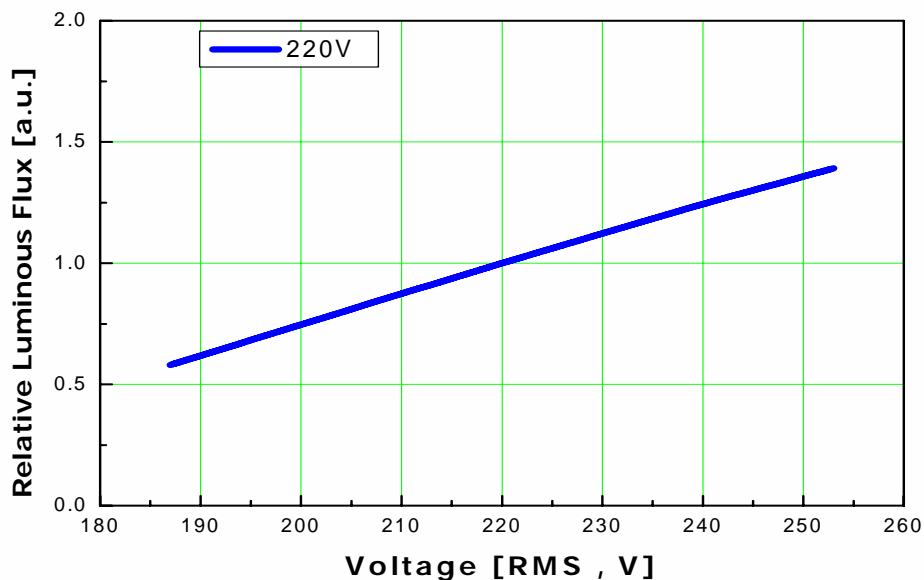
## Voltage – Relative flux characteristics, Ta=25°C

### 3. AX3200 with external resistor @120V

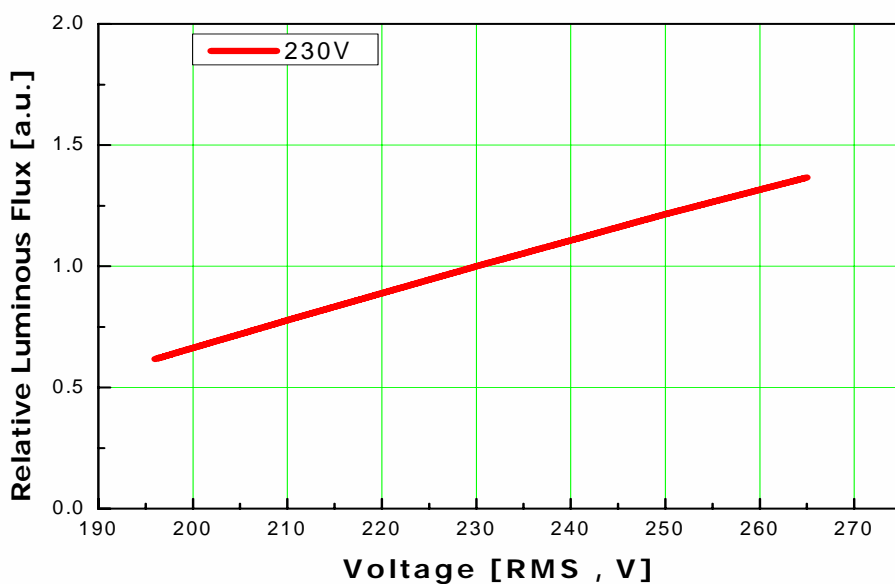


## Voltage – Relative flux characteristics, $T_a=25^{\circ}\text{C}$

### 4. AX3220 with external resistor @220V



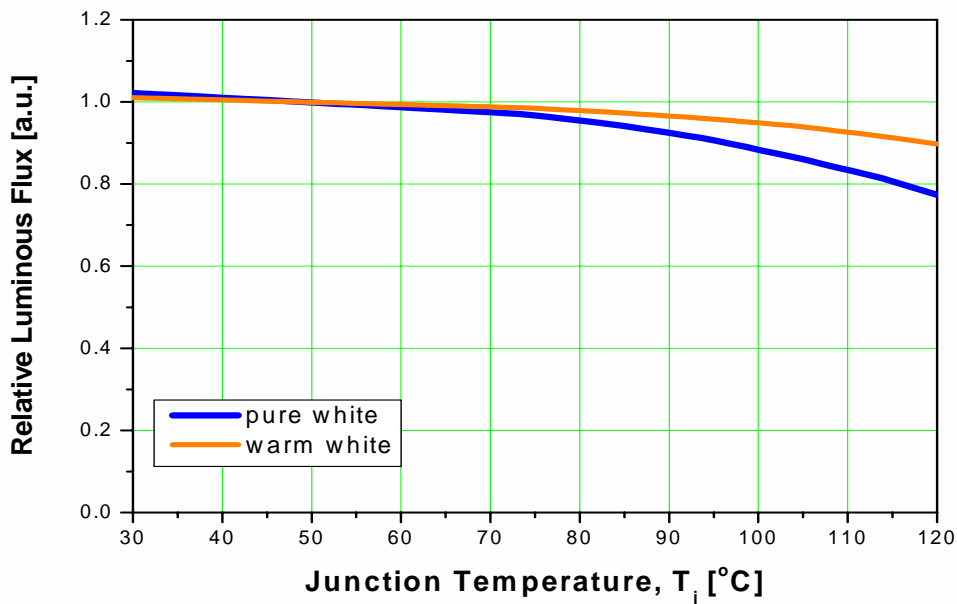
### 5. AX3220 with external resistor @230V





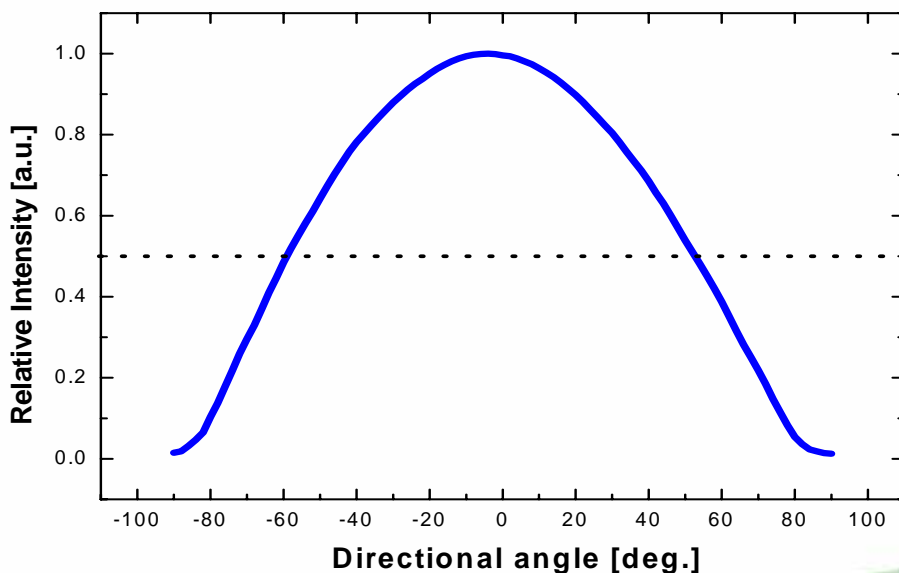
## Relative Flux – Junction temperature characteristics

### 1. AX32X0



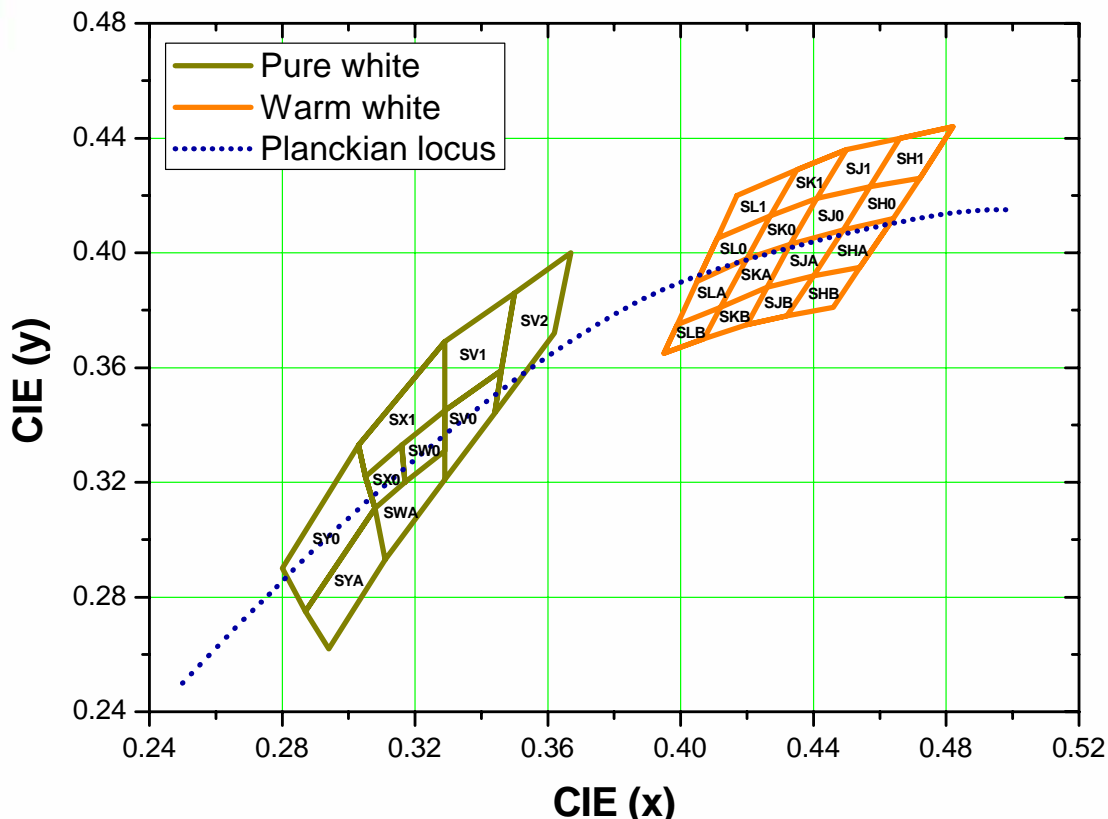
## Typical dome type radiation pattern, $T_a=25^\circ\text{C}$

### 1. AX32X0



## Acriche Binning structure graphical representation

### 1. AX32X0



\*Notes : For more detailed information on Acriche binning see the "Acriche Binning and Labeling" document at [www.ACRICHE.com](http://www.ACRICHE.com)

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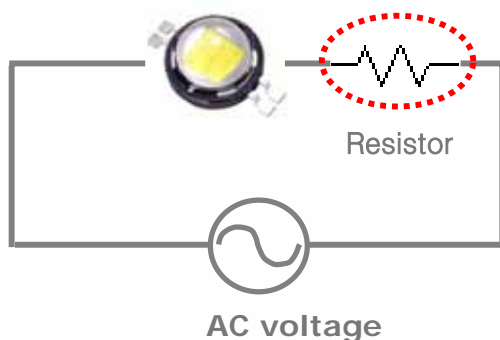
[www.ACRICHE.com](http://www.ACRICHE.com)

서식번호 : SSC-QP-7-07-25 (Rev.00)

## Operating and biasing instructions of AX32X0

### 1. Operating circuit

Attention: see notes 1 through 4 below



### 2. Resistor sheet

| VF<br>Bin | AX3200 <sup>[1]</sup>                     |      |      | AX3220 <sup>[1]</sup>                     |        |        |
|-----------|---|------|------|---|--------|--------|
|           | Drive current : 40mA [RMS] <sup>[2]</sup> |      |      | Drive current : 20mA [RMS] <sup>[2]</sup> |        |        |
|           | Resister value <sup>[3] [4]</sup>         |      |      | Resister value <sup>[3] [4]</sup>         |        |        |
|           | 100V                                      | 110V | 120V | 220V                                      | 230V   | 240V   |
| A         | 300Ω                                      | 500Ω | 750Ω | 2.2kΩ                                     | 2.6kΩ  | 3kΩ    |
| B         | 250Ω                                      | 450Ω | 700Ω | 1.9kΩ                                     | 2.35kΩ | 2.75kΩ |
| C         | 200Ω                                      | 400Ω | 650Ω | 1.63kΩ                                    | 2.1kΩ  | 2.55kΩ |
| D         | -   | 350Ω | 600Ω | 1.36kΩ                                    | 1.85kΩ | 2.3kΩ  |

Notes :

- [1] External resistor is required for proper Acriche biasing.
- [2] Drive current and voltage levels must not cause Acriche to operate outside Absolute Maximum Rating for power dissipation in table 1-2.
- [3] Drive current tolerance is  $\pm 10\%$  on each resistor value.
- [4] Resistor power value must be taken into consideration when choosing the type of resistor.  
[rated power = operating current<sup>2</sup> X resistance]

## Operating and biasing instructions of AX32X0

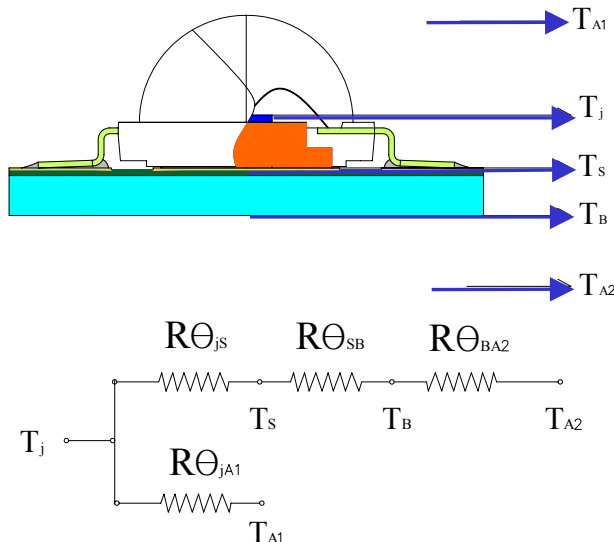
### 3. Operating temperature



Lead Temperature ( $T_L$ )

| Parameter         | Value | Unit                        |
|-------------------|-------|-----------------------------|
| $R\theta_{jL}$    | 7     | $^{\circ}\text{C}/\text{W}$ |
| $T_j \text{ max}$ | 125   | $^{\circ}\text{C}$          |
| $T_L \text{ max}$ | 100   | $^{\circ}\text{C}$          |

### 4. Thermal modeling

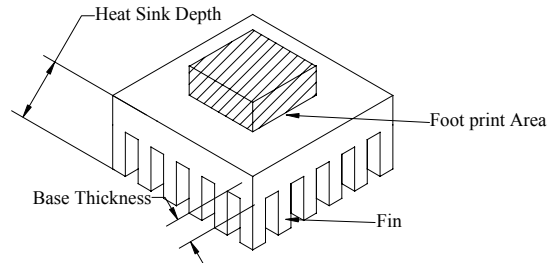


Notes :

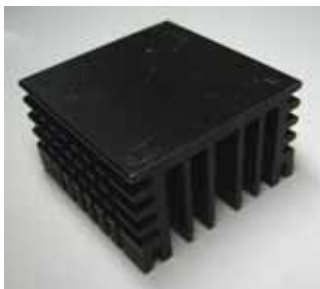
- [1] Acriche must be used with proper heat management.
- [2] It is recommended that the temperature of board should be below  $70^{\circ}\text{C}$ .
- [3] For more information, refer to Z Power led Thermal Management Guide.  
([www.essc.co.kr/HOMEPAGE/home\\_kor/product/spec/thermal.pdf](http://www.essc.co.kr/HOMEPAGE/home_kor/product/spec/thermal.pdf))

## Operating and biasing instructions of AX32X0

### 5. Heat sink



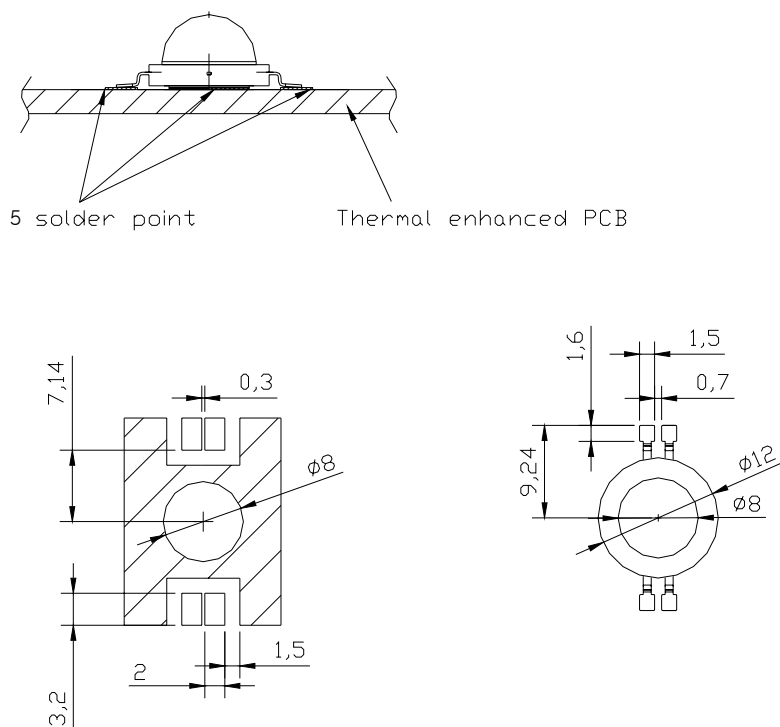
| Specification & Size  | $T_B(^{\circ}\text{C})$ | $R\theta_{BA}(^{\circ}\text{C} / \text{W})$ |
|---|-------------------------|---|
| Size : 44 x 44 mm<br>S : 7mm $T_B$ : 4mm,<br>$D_H$ : 22.mm $F_H$ : 18mm      N : 7ea<br>Footprint: 745mm <sup>2</sup> Power Dissipation: 4W | 73.8                    | 10  |



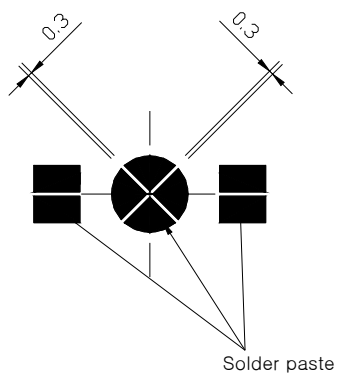
| Specification & Size   | $T_B(^{\circ}\text{C})$ | $R\theta_{BA}(^{\circ}\text{C} / \text{W})$ |
|--|-------------------------|---|
| Size : 50 x 50 mm<br>S : $T_B$ :      mm,<br>$D_H$ : 25 mm $F_H$ :      mm      N :<br>Footprint: 745mm <sup>2</sup> Power Dissipation: 4W | 56.2                    | 5   |

## Recommended solder pad

### 1. Solder pad



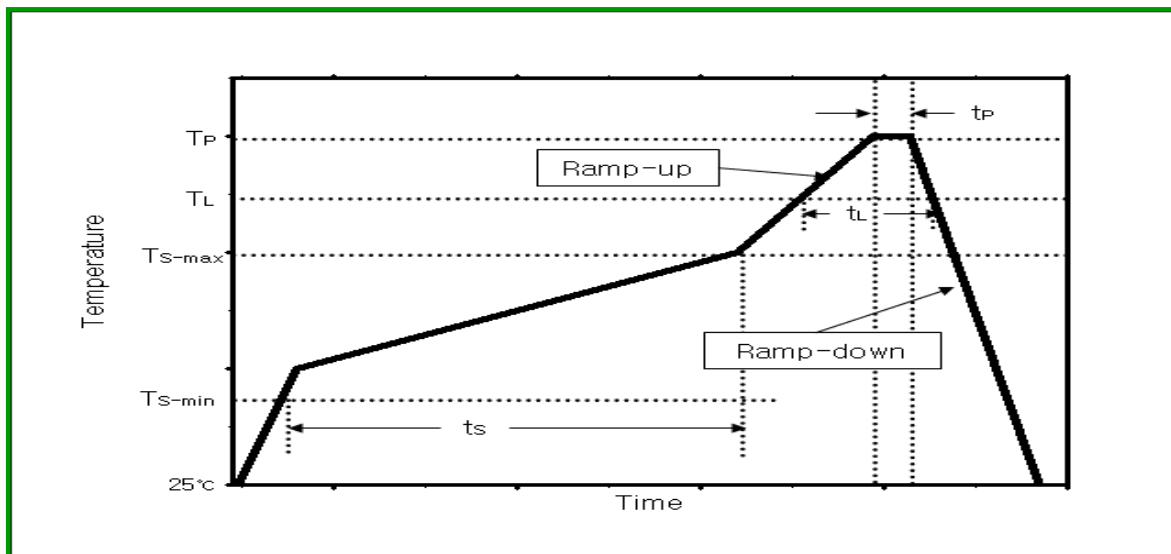
### 2. Solder paste pattern



- Paste thickness : 0.2 mm

## Solder profile

### 1. Reflow solder conditions / profile



| Reflow condition                                   | Pb-Free assembly |
|--|------------------|
| Average ramp-up rate (TS-max to Peak)              | 2~3℃ / second    |
| Preheat Temperature Min (TS-min)                   | 150℃             |
| Preheat Temperature Max (TS-max)                   | 200℃             |
| Time maintained above: : Liquidus Temperature (TL) | 217~220℃         |
| Time maintained above: Time (tL)                   | 60~150 seconds   |
| Peak Temperature (TP)                              | 250℃             |
| Time within 5℃ of actual Peak Temperature (tp)     | 20~40 seconds    |
| ramp-down rate                                     | 4~6℃ / second    |
| Time 25℃ to Peak Temperature                       | 6 minutes max    |

### 2. Hand Solder conditions

2-1 Lead : Not more than 3 seconds @MAX280℃

2-2 Slug : Use a thermal adhesive

#### \* Caution

- [1] Reflow soldering should not be done more than one time.
- [2] Repairs should not be done after the LED has been soldered to the board. If repairs are unavoidable, suitable tools must be used.
- [3] Die slug is to be soldered.
- [4] During the soldering process, do not put stress on the LED.
- [5] After soldering, do not warp or twist circuit board.
- [6] Recommend to use a convection type reflow machine with 7 ~ 8 zones. Rev. 04

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## Precautions for use

- [1] Please note Acriche runs on high voltage so use caution when near the leads or if a dome is inadvertently removed while circuit is active
- [2] Please do not touch any of the circuit board, components or terminals with bare hands or metal while circuit is electrically active.
- [3] Please do not add or change wires while Acriche circuit is active

## Handling of silicone resin for LEDs

- [1] Acriche series is encapsulated by silicone resin for the highest flux efficiency.
- [2] Avoid touching silicone resin portion of LED especially with sharp tools such as Pincette (tweezers).
- [3] Avoid leaving fingerprints on silicone resin parts.
- [4] Silicone resin is dust sensitive and needs a covered container for storage
- [5] When populating boards in SMT production there are no unusual restrictions regarding the form of the pick and place nozzle except that mechanical essure on the surface of the resin must be avoided.
- [6] Please do not apply diagonal force to the silicone lens in excess of 3000gf or permanent and fatal damage will occur.
- [7] Please do not cover the silicone resin with any other resin (epoxy, urethane, etc)