



# PC56H19 V1

## Product Specification

## Approval Sheet

PC56H19 V1

Product Specification

RoHS

|                    |               |
|--------------------|---------------|
| <b>Product</b>     | White SMD LED |
| <b>Part Number</b> | PC56H19 V1    |
| <b>Issue Date</b>  | 2015/03/17    |



### ■ Feature

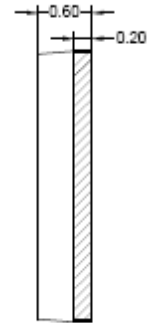
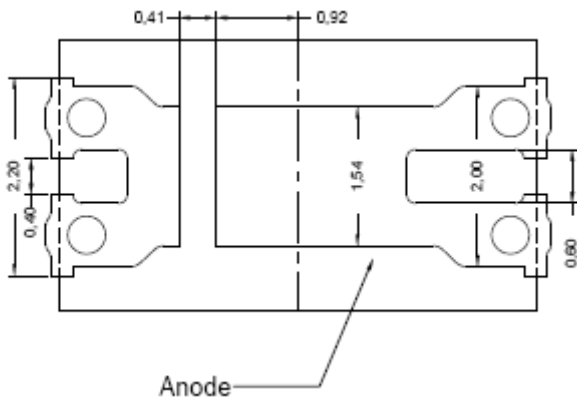
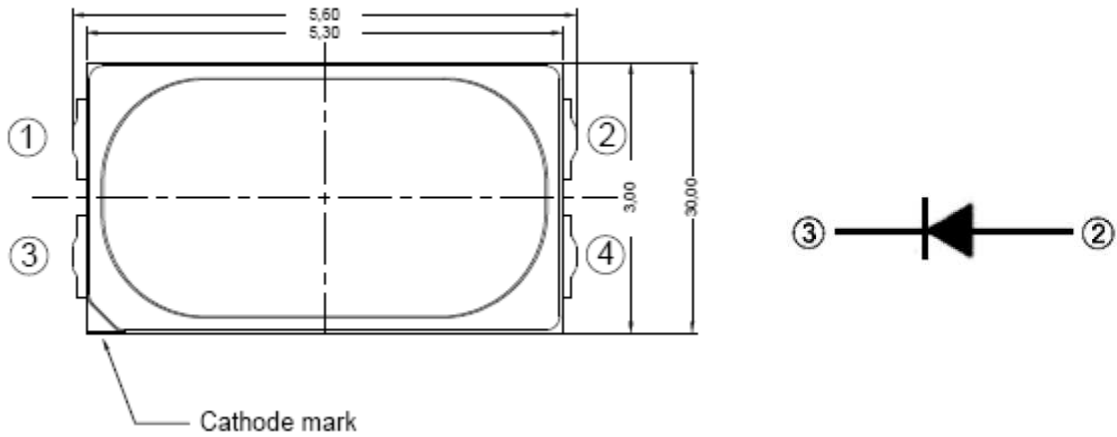
- ✓ White SMD LED (L x W x H) of 5.6 x 3.0 x 0.6 mm
- ✓ ASNI hybrid binning
- ✓ Dice Technology : InGaN
- ✓ Qualified according to JEDEC moisture sensitivity Level 3
- ✓ Environmental friendly ; RoHS compliance
- ✓ Packing : 1,000 or 2,000 pcs/reel

### ■ Applications

- ✓ Portable flashlight
- ✓ Reading lights
- ✓ Security / garden lighting
- ✓ General lighting
- ✓ Indoor and outdoor commercial lighting

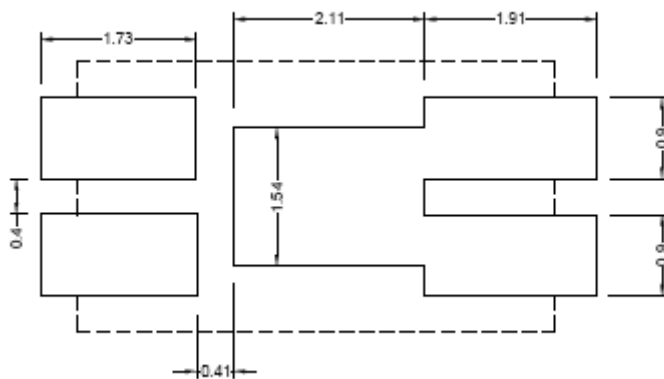
## Outline Dimension

PC56H19 V1  
Product Specification



Unit: mm, Tolerance:  $\pm 0.1$ mm

## Recommended Soldering Pad



Performance

PC56H19 V1  
 Product Specification

■ **Electro-Optical Characteristics (Ta=25°C)**

| Parameter                            | Symbol          | Condition              | Min. | Typ. | Max. | Unit |
|--------------------------------------|-----------------|------------------------|------|------|------|------|
| Forward Voltage <sup>(1)</sup>       | V <sub>F</sub>  | I <sub>F</sub> = 65 mA | 2.6  | -    | 3.1  | V    |
| Color Rendering Index <sup>(2)</sup> | R <sub>a</sub>  |                        | 80   | -    | -    | -    |
| Color Rendering Index <sup>(3)</sup> | R <sub>9</sub>  |                        | 0    |      |      |      |
| View Angle                           | θ               |                        | -    | 120  | -    | deg  |
| Thermal Resistance <sup>(3)</sup>    | R <sub>th</sub> |                        | -    | 16   | -    | °C/W |

- (1) The Forward Voltage tolerance is ±0.1V
- (2) The Color Rendering Index tolerance is ±2
- (3) The R<sub>9</sub> is measured at Ta=25°C with the tolerance of ±6
- (4) Thermal resistance is calculated from junction to solder

■ **Luminous Flux (Ta=25°C)**

| CCT         | Condition              | Rank           |
|-------------|------------------------|----------------|
| 2600K~3700K | I <sub>F</sub> = 65 mA | VG, H1, H2     |
| 3700K~7000K |                        | H1, H2, I1, I2 |

\* The luminous flux tolerance is ± 7%

■ **Absolute Maximum Ratings**

| Parameter                            | Symbol           | value           | Unit |
|--------------------------------------|------------------|-----------------|------|
| DC Forward Current <sup>(1)</sup>    | I <sub>F</sub>   | 180             | mA   |
| Power Dissipation                    | P <sub>d</sub>   | 0.58            | W    |
| Pulse Forward Current <sup>(2)</sup> | I <sub>FP</sub>  | 300             | mA   |
| Storage Temperature                  | T <sub>S</sub>   | -40 ~ 100       | °C   |
| Operating Temperature                | T <sub>opr</sub> | -40 ~ 85        | °C   |
| Junction Temperature                 | T <sub>J</sub>   | 120             | °C   |
| Assembly Temperature                 | -                | 260 (max. 5sec) | °C   |

- (1) Proper current rating must be observed to maintain junction temperature below maximum at all time
- (2) IFP Condition: Duty 1/10, Pulse within 10msec

## Ordering Code

**P C 5 6 H 1 9 1 - A 2 7 0 C 0 V G H 2 8 2 - 0 0 0**

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

| Item                         | Pos.               | Code     | Spec                                |  |
|------------------------------|--------------------|----------|-------------------------------------|--|
| Model Name                   | 1-8                | PC56H191 | PC56H19 V1                          |  |
| CIE Center Point             | 9                  | A        | ANSI 1931 on B.B.L                  |  |
| CCT                          | 10,11              | 27       | 27 = 2700K                          |  |
|                              |                    | 30       | 30 = 3000K                          |  |
|                              |                    | 35       | 35 = 3500K                          |  |
|                              |                    | 40       | 40 = 4000K                          |  |
|                              |                    | 50       | 50 = 5000K                          |  |
|                              |                    | 57       | 57 = 5700K                          |  |
|                              |                    | 65       | 65 = 6500K                          |  |
| R9                           | 12                 | 0        | No requirements                     |  |
| CIE Bin Group <sup>(1)</sup> | 13,14              | A0       | 27A                                 |  |
|                              |                    | B0       | 27A,27B,27C,27D,27E                 |  |
|                              |                    | C0       | 27A,27B,27C,27D,27E,27F,27G,27H,27I |  |
| IV Bin Group                 | 15,16,             | VG H2    | Bin code : VG,H1,H2                 |  |
|                              | 17,18              | H1I2     | Bin code : H1,H2,I1,I2              |  |
| Vf Bin Group                 | 19,20              | 82       | Bin code : 8,9,0,1,2                |  |
| Kitting Rules                | CIE <sup>(1)</sup> | 21       | 0                                   | No requirements.   |
|                              |                    |          | 1 <sup>(2)</sup>                    | Single Bin : 27A,27B,27C,27D,27E<br>Mixing Bin : 27F+27H,27G+27I |
|                              |                    |          | 2 <sup>(2)</sup>                    | Single Bin : 27A<br>Mixing Bin : 27C+27E,27B+27D,27F+27H,27G+27I |
|                              |                    |          | 3 <sup>(2)</sup>                    | Single Bin : 27A<br>Mixing Bin : 27C+27E,27B+27D                 |
|                              | IV                 | 22       | 0                                   | No requirements.   |
|                              | Vf                 | 23       | 0                                   | No requirements.   |

(1) The first two digits 27 means CCT in 2700K, can be replaced to 30, 35, 40, 50, 57, 65 for different CCT requirements.

(2) Only under an agreement between customer and Lextar Electronics, kitting rules besides "0" can be supplied.

■ **Standard Ordering Code:**

| CCT   | Ordering Code <sup>(1)</sup> | CIE Bin Group | IV Bin Group | Vf Bin Group |
|-------|------------------------------|---------------|--------------|--------------|
| 2700K | PC56H191-A270A0VGH282-000    | A0            |              |              |
|       | PC56H191-A270B0VGH282-000    | B0            | VG,H1,H2     | 8,9,0,1,2    |
|       | PC56H191-A270C0VGH282-000    | C0            |              |              |
| 3000K | PC56H191-A300A0VGH282-000    | A0            |              |              |
|       | PC56H191-A300B0VGH282-000    | B0            | VG,H1,H2     | 8,9,0,1,2    |
|       | PC56H191-A300C0VGH282-000    | C0            |              |              |
| 3500K | PC56H191-A350A0VGH282-000    | A0            |              |              |
|       | PC56H191-A350B0VGH282-000    | B0            | VG,H1,H2     | 8,9,0,1,2    |
|       | PC56H191-A350C0VGH282-000    | C0            |              |              |
| 4000K | PC56H191-A400A0H1I282-000    | A0            |              |              |
|       | PC56H191-A400B0H1I282-000    | B0            | H1,H2,I1,I2  | 8,9,0,1,2    |
|       | PC56H191-A400C0H1I282-000    | C0            |              |              |
| 5000K | PC56H191-A500A0H1I282-000    | A0            |              |              |
|       | PC56H191-A500B0H1I282-000    | B0            | H1,H2,I1,I2  | 8,9,0,1,2    |
|       | PC56H191-A500C0H1I282-000    | C0            |              |              |
| 5700K | PC56H191-A570A0H1I282-000    | A0            |              |              |
|       | PC56H191-A570B0H1I282-000    | B0            | H1,H2,I1,I2  | 8,9,0,1,2    |
|       | PC56H191-A570C0H1I282-000    | C0            |              |              |
| 6500K | PC56H191-A650A0H1I282-000    | A0            |              |              |
|       | PC56H191-A650B0H1I282-000    | B0            | H1,H2,I1,I2  | 8,9,0,1,2    |
|       | PC56H191-A650C0H1I282-000    | C0            |              |              |

(1) Only under an agreement between customer and Lextar Electronics, Ordering codes not in "Standard Ordering Code Definitions" can be supplied.

**Binning**

PC56H19 V1  
 Product Specification

**Bin code definition**

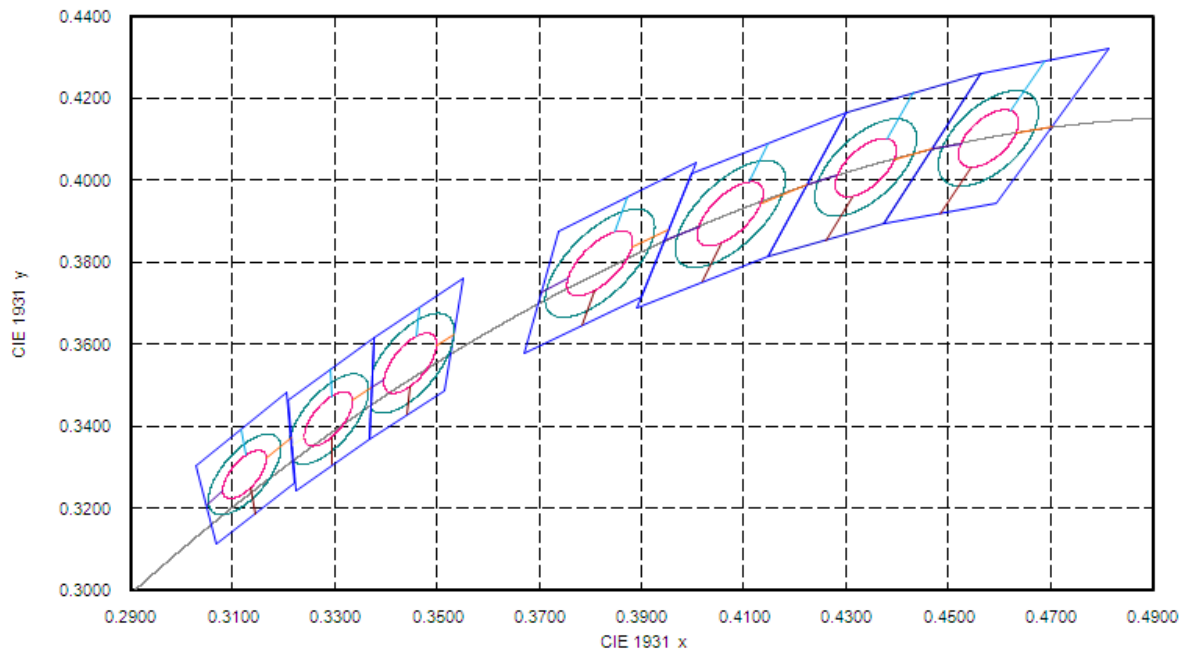
| V <sub>F</sub> Rank | Luminous Flux Rank | CIE Rank |
|---------------------|--------------------|----------|
| 0                   | H1                 | 27A      |

| V <sub>F</sub> Rank | Condition              | Min. | Max. |
|---------------------|------------------------|------|------|
| 8                   | I <sub>F</sub> = 65 mA | 2.6  | 2.7  |
| 9                   |                        | 2.7  | 2.8  |
| 0                   |                        | 2.8  | 2.9  |
| 1                   |                        | 2.9  | 3.0  |
| 2                   |                        | 3.0  | 3.1  |

| Luminous Flux Rank | Condition              | Min | Max. |      |
|--------------------|------------------------|-----|------|------|
| VG                 | I <sub>F</sub> = 65 mA | 28  | 31.5 |      |
| VH*                |                        | H1  | 31.5 | 33.5 |
|                    |                        | H2  | 33.5 | 35.5 |
| VI*                |                        | I1  | 35.5 | 38   |
|                    |                        | I2  | 38   | 40.5 |

\*For finer bin selection, VH is replaced by H1 and H2, whereas VI by I1 and I2.

## ■ Chromaticity Coordinates



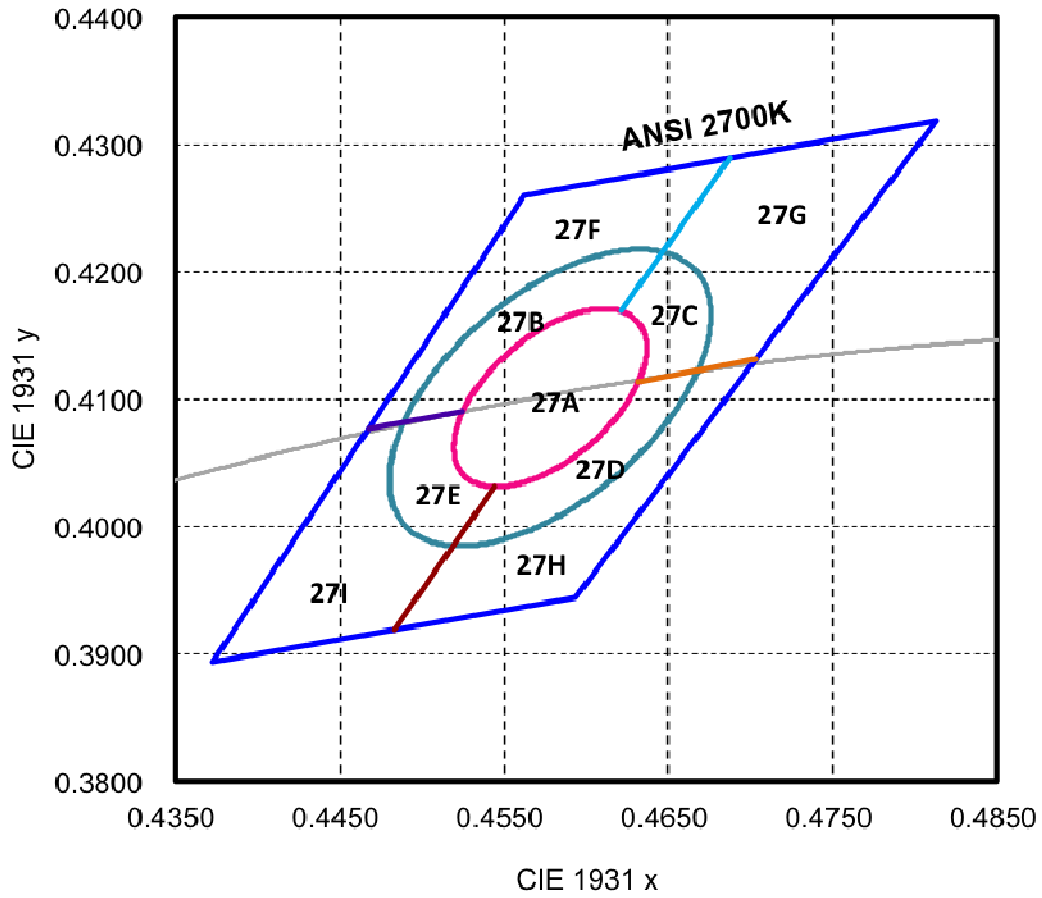
Note:

- (1) Correlated color Temperature is derived from the CIE 1931 Chromaticity diagram
- (2) CIE measurement tolerance is  $\pm 0.005$
- (3) The luminous flux tolerance is  $\pm 7\%$
- (4) The Forward Voltage tolerance is  $\pm 0.1V$

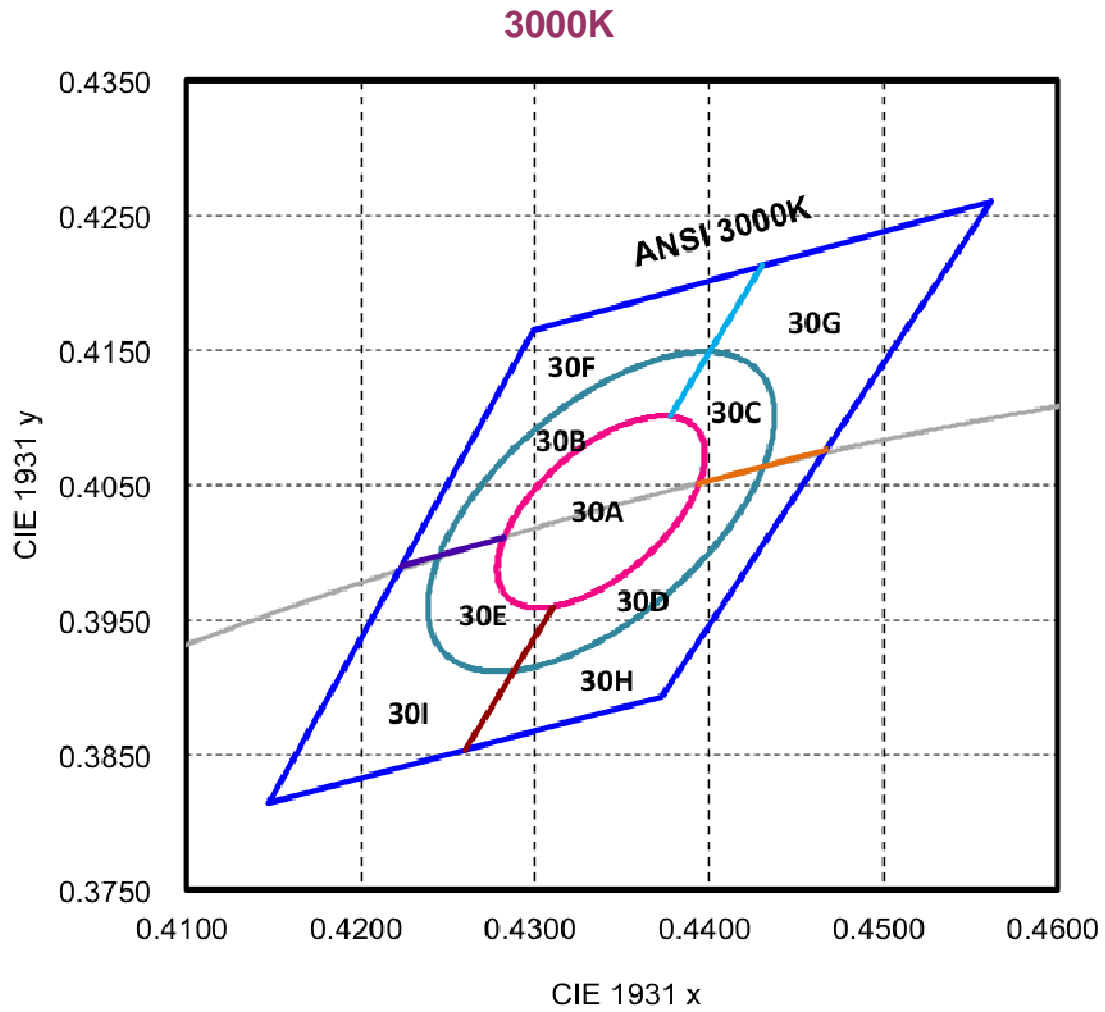


■ **Bin code definition**

**2700K**

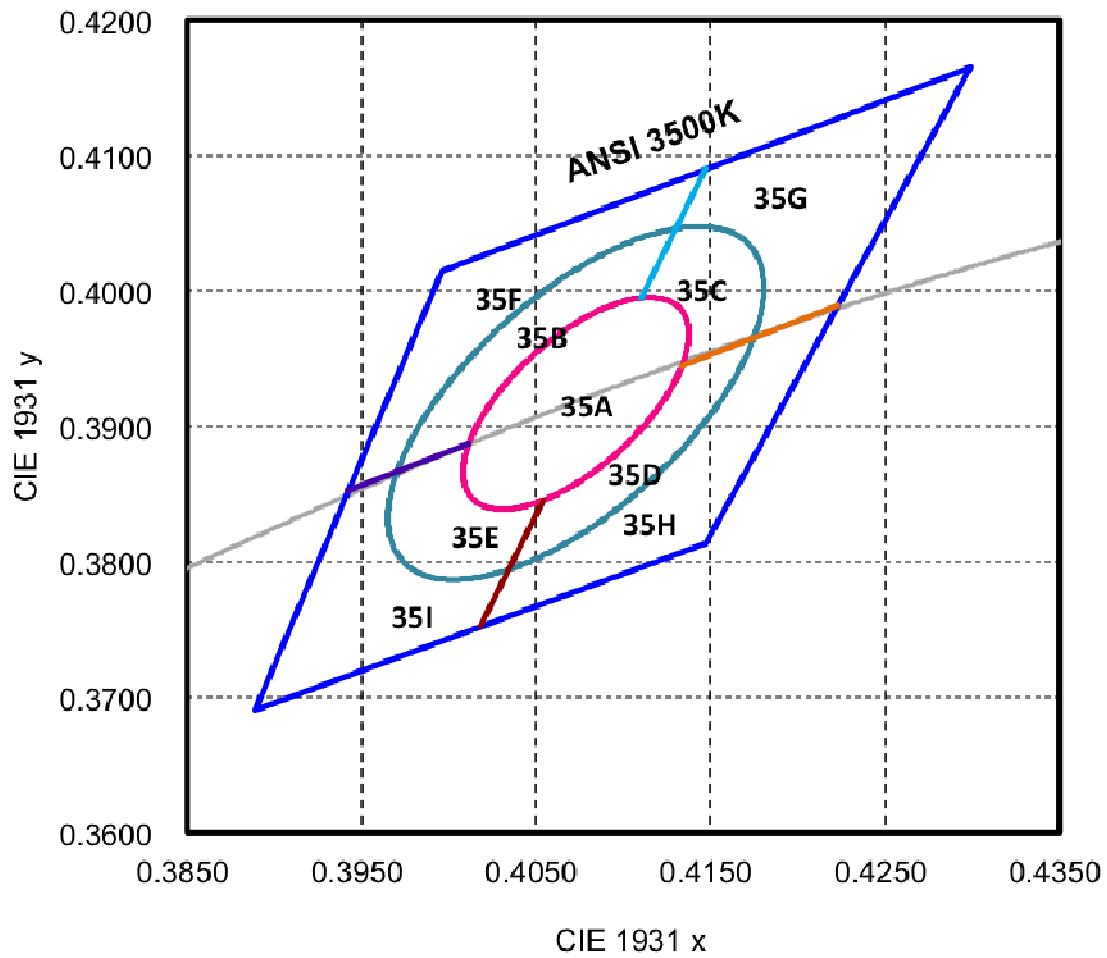


| Nominal ANSI CCT | Color Space                   | Target Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle |
|------------------|-------------------------------|------------------------------|---------------|---------------|------------------------|
| 2700K            | Single 3-step MacAdam ellipse | (0.4578, 0.4101)             | 0.00810       | 0.00420       | 53.70°                 |
| 2700K            | Single 5-step MacAdam ellipse | (0.4578, 0.4101)             | 0.01350       | 0.00700       | 53.70°                 |



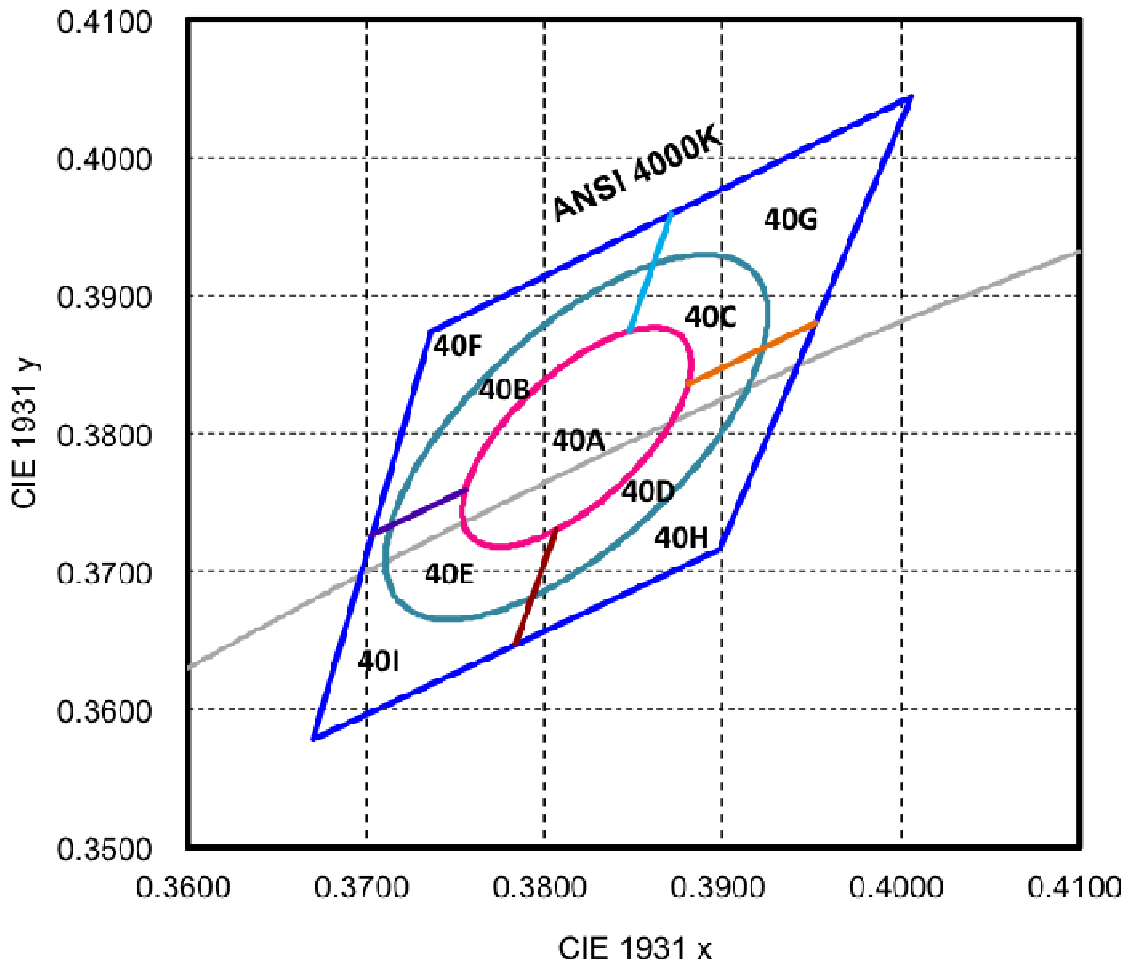
| Nominal ANSI CCT | Color Space                   | Target Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle |
|------------------|-------------------------------|------------------------------|---------------|---------------|------------------------|
| 3000K            | Single 3-step MacAdam ellipse | (0.4338, 0.403)              | 0.00834       | 0.00408       | 53.22°                 |
| 3000K            | Single 5-step MacAdam ellipse | (0.4338, 0.403)              | 0.01390       | 0.00680       | 53.22°                 |

**3500K**

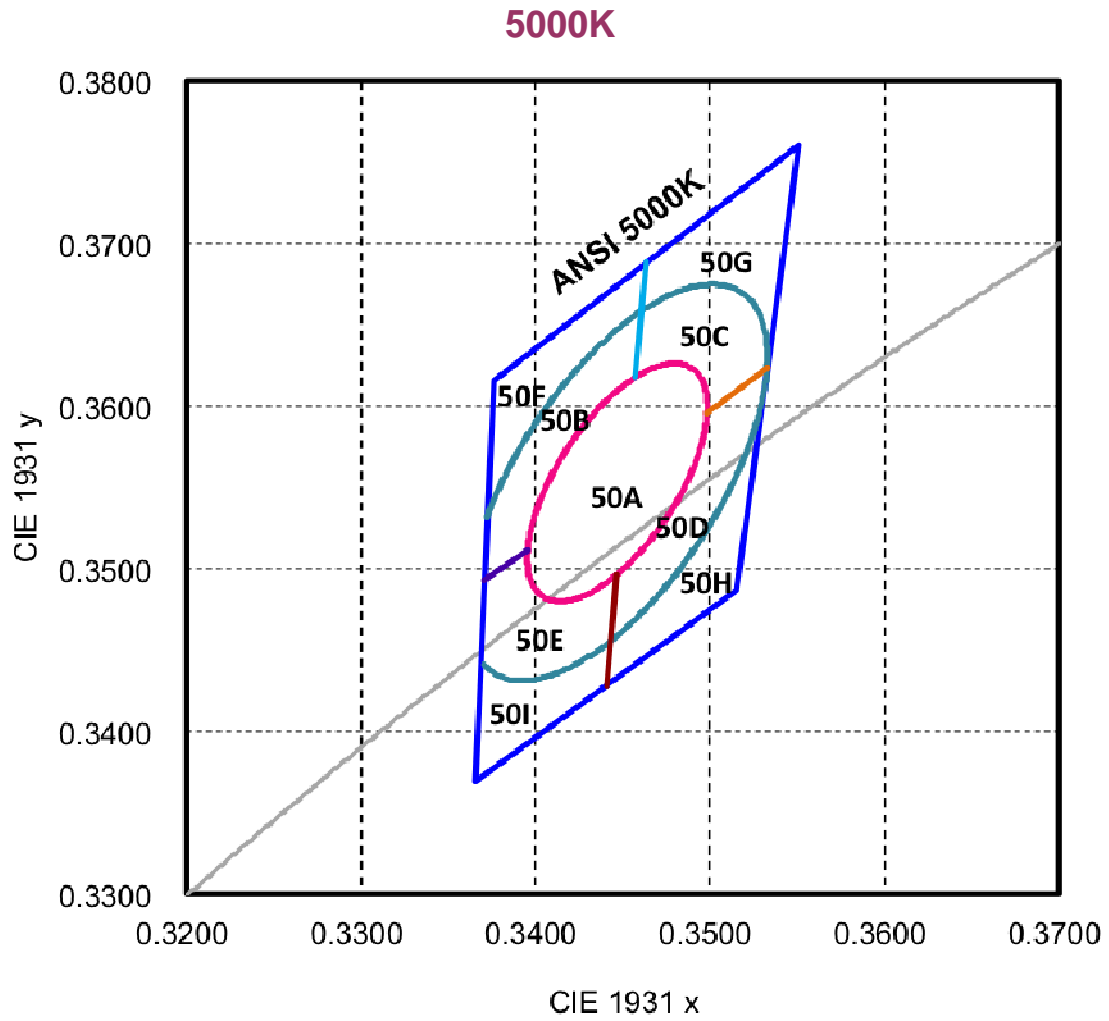


| Nominal ANSI CCT | Color Space                   | Target Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle |
|------------------|-------------------------------|------------------------------|---------------|---------------|------------------------|
| 3500K            | Single 3-step MacAdam ellipse | (0.4073, 0.3917)             | 0.00927       | 0.00414       | 53.22°                 |
| 3500K            | Single 5-step MacAdam ellipse | (0.4073, 0.3917)             | 0.01545       | 0.00690       | 53.22°                 |

**4000K**

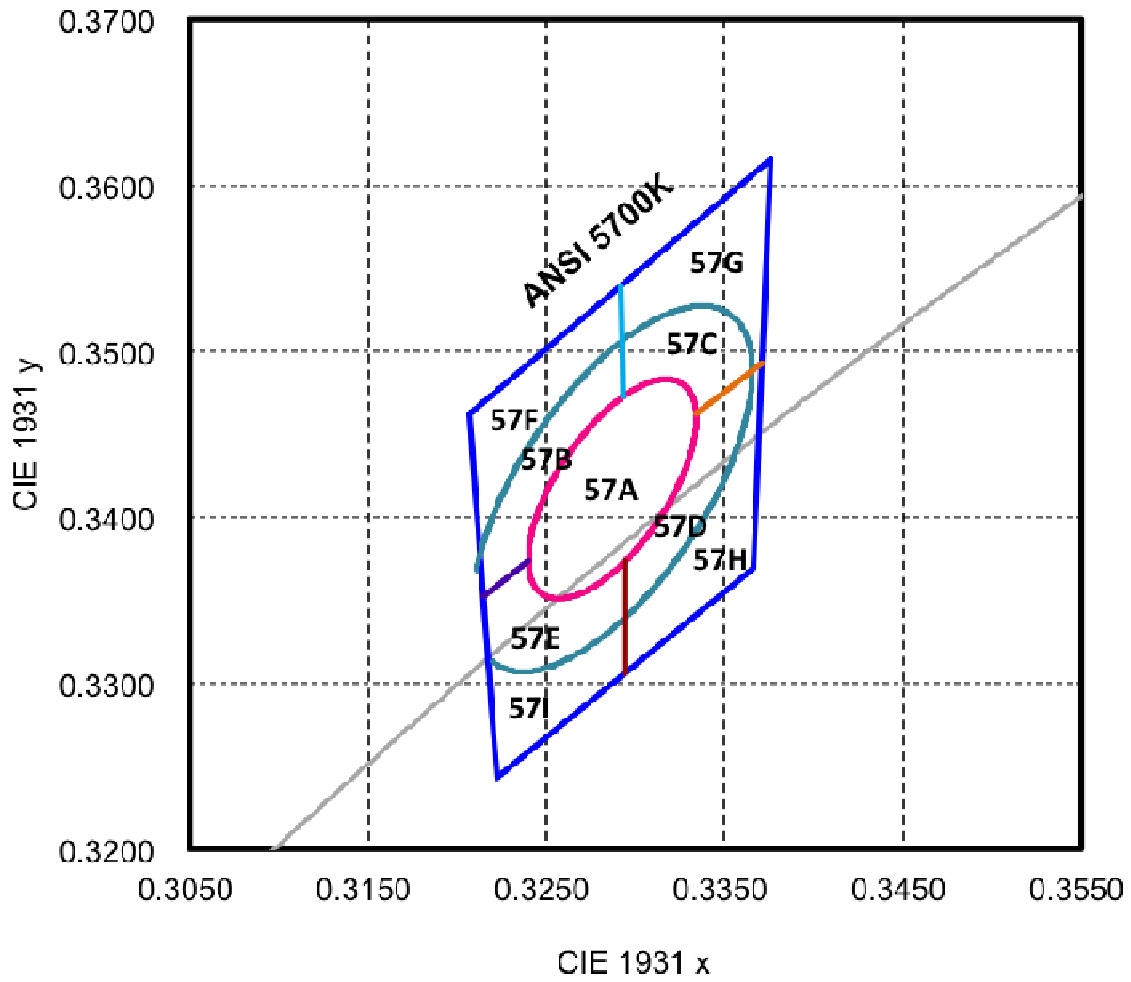


| Nominal ANSI CCT | Color Space                   | Target Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle |
|------------------|-------------------------------|------------------------------|---------------|---------------|------------------------|
| 4000K            | Single 3-step MacAdam ellipse | (0.3818, 0.3797)             | 0.00939       | 0.00402       | 53.72°                 |
| 4000K            | Single 5-step MacAdam ellipse | (0.3818, 0.3797)             | 0.01565       | 0.00670       | 53.72°                 |



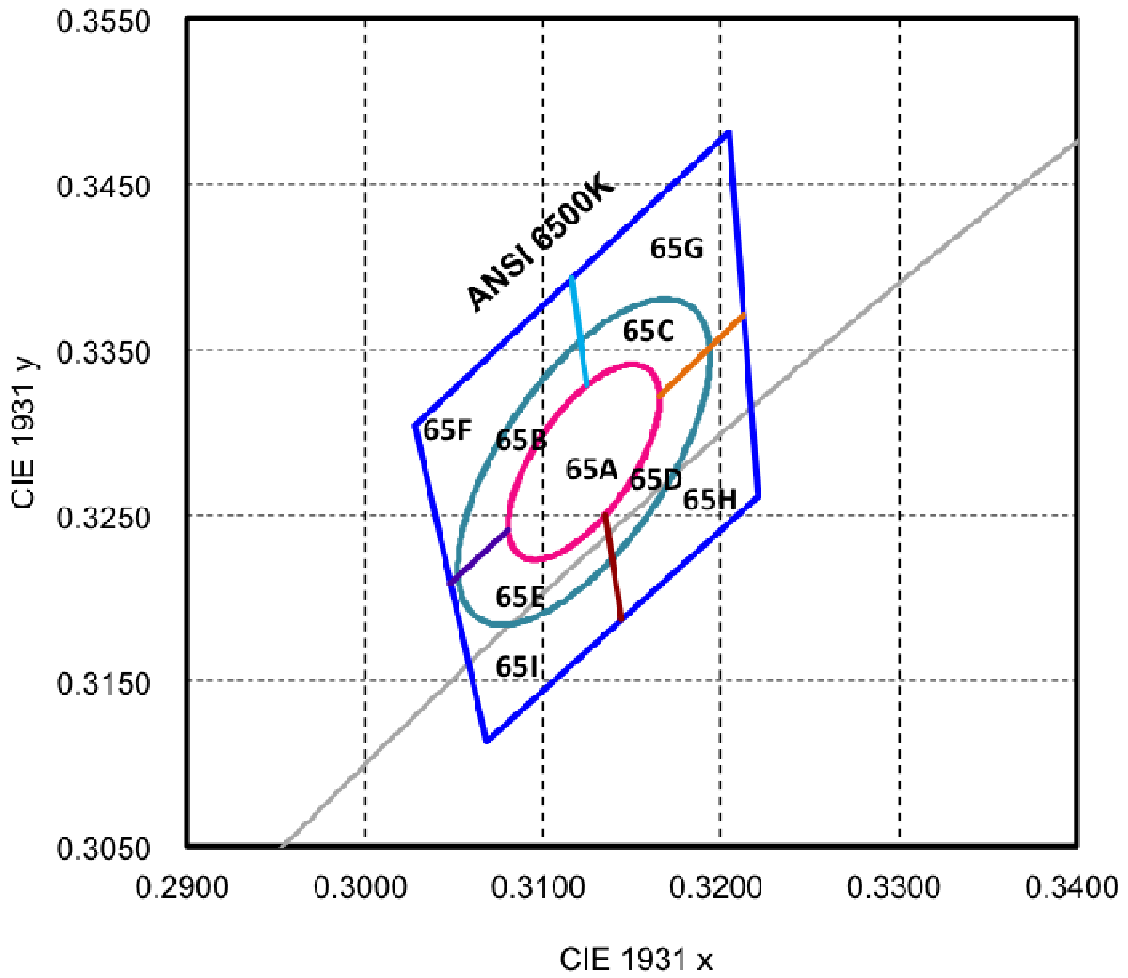
| Nominal ANSI CCT | Color Space                   | Target Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle |
|------------------|-------------------------------|------------------------------|---------------|---------------|------------------------|
| 5000K            | Single 3-step MacAdam ellipse | (0.3447, 0.3553)             | 0.00822       | 0.00354       | 59.62°                 |
| 5000K            | Single 5-step MacAdam ellipse | (0.3447, 0.3553)             | 0.01370       | 0.00590       | 59.62°                 |

**5700K**



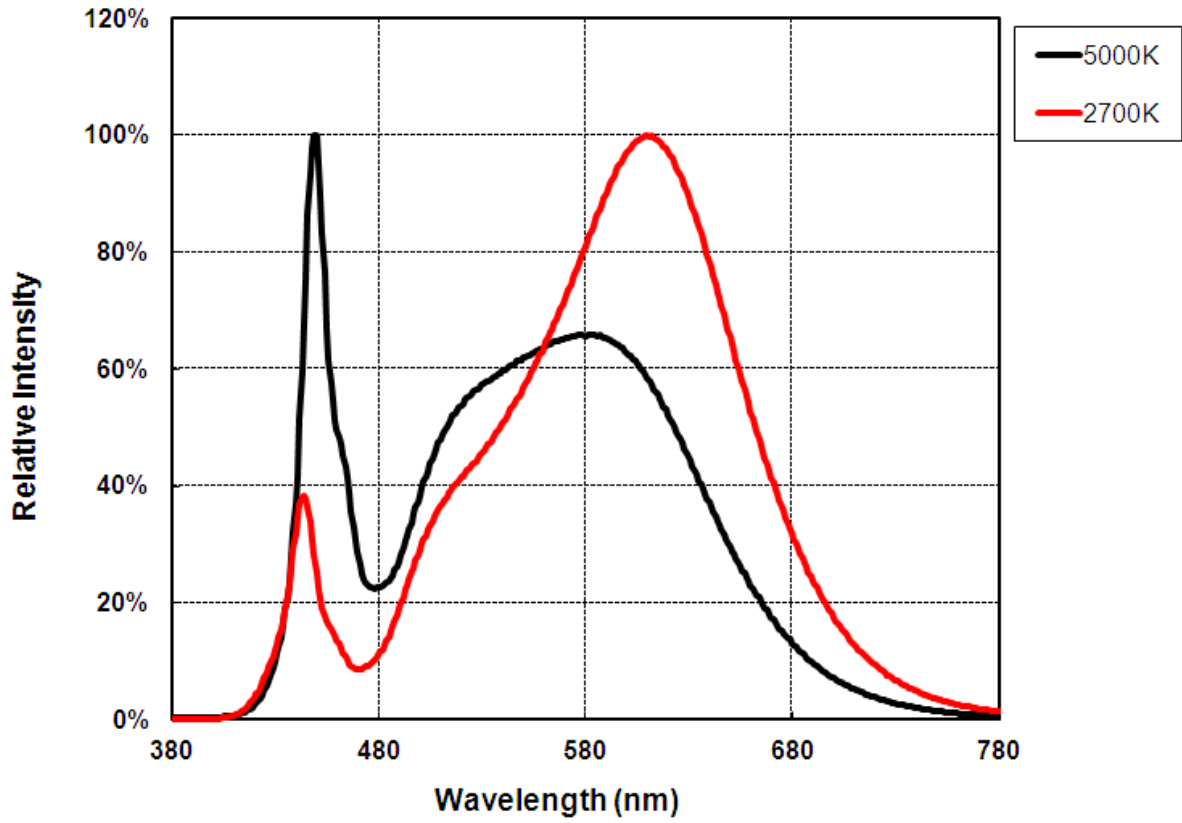
| Nominal ANSI CCT | Color Space                   | Target Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle |
|------------------|-------------------------------|------------------------------|---------------|---------------|------------------------|
| 5700K            | Single 3-step MacAdam ellipse | (0.3287, 0.3417)             | 0.00746       | 0.00320       | 59.09°                 |
| 5700K            | Single 5-step MacAdam ellipse | (0.3287, 0.3417)             | 0.01243       | 0.00533       | 59.09°                 |

**6500K**

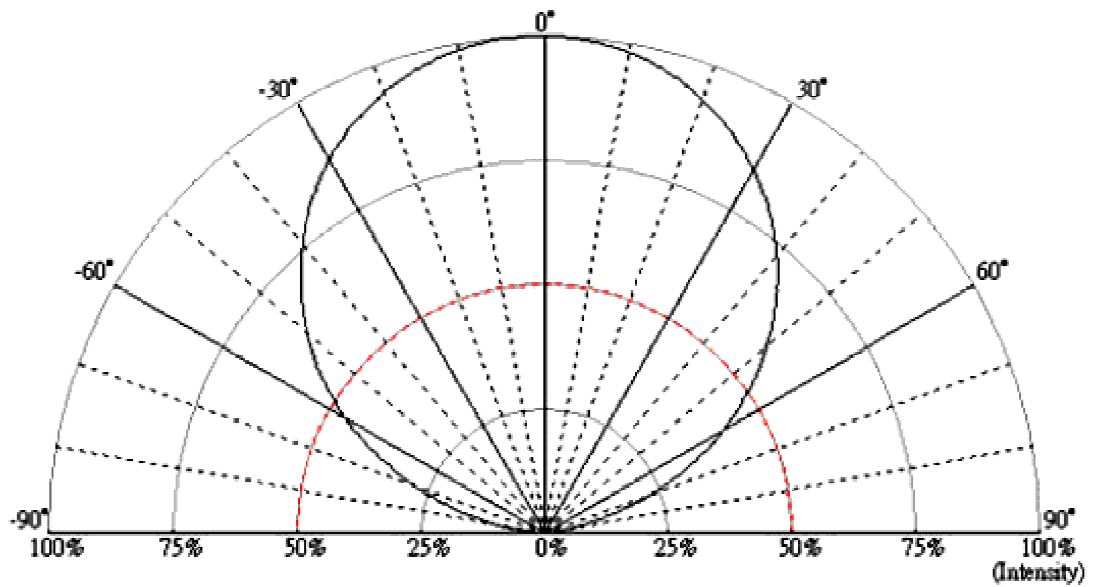


| Nominal ANSI CCT | Color Space                   | Target Center Point (cx, cy) | Major Axis, a | Minor Axis, b | Ellipse Rotation Angle |
|------------------|-------------------------------|------------------------------|---------------|---------------|------------------------|
| 6500K            | Single 3-step MacAdam ellipse | (0.3123, 0.3282)             | 0.00669       | 0.00285       | 58.57°                 |
| 6500K            | Single 5-step MacAdam ellipse | (0.3123, 0.3282)             | 0.01115       | 0.00475       | 58.57°                 |

■ **Spectrum**

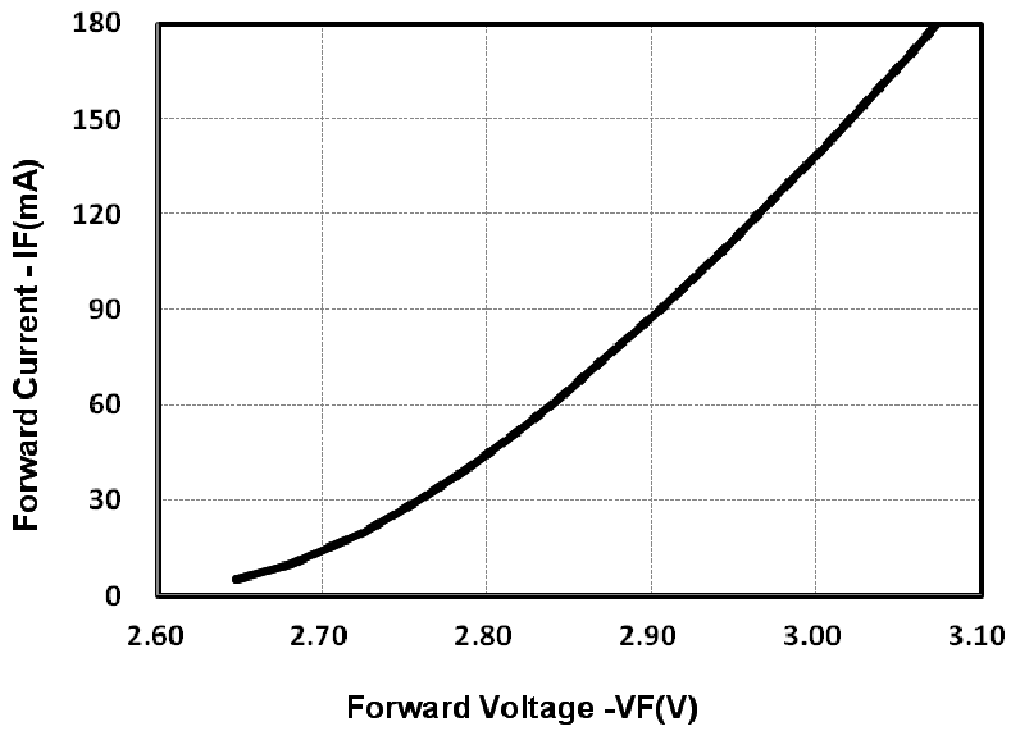


■ **Radiation Pattern**

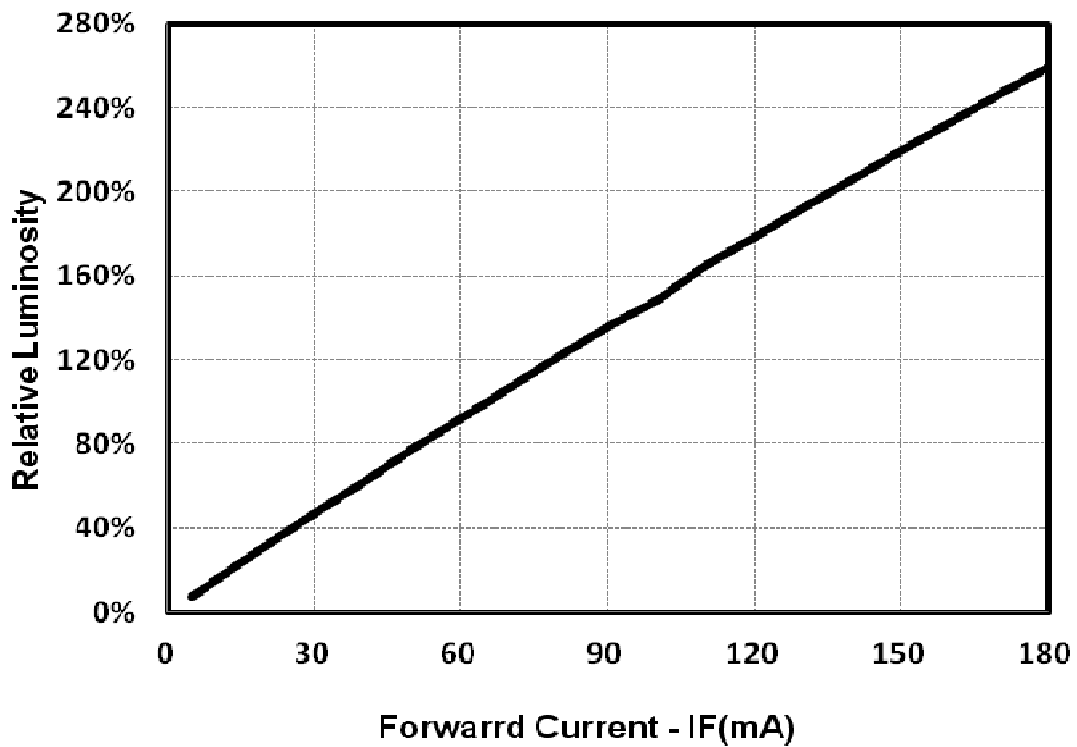




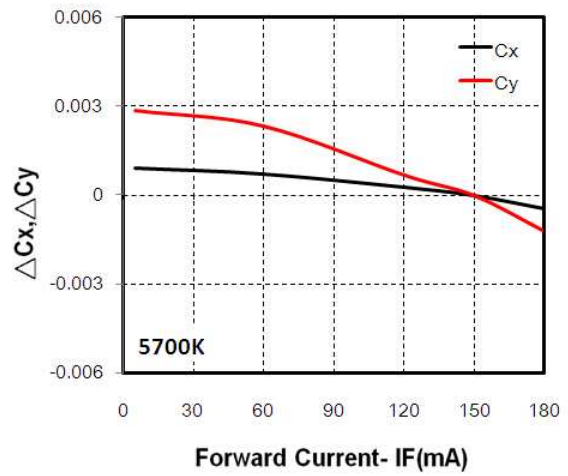
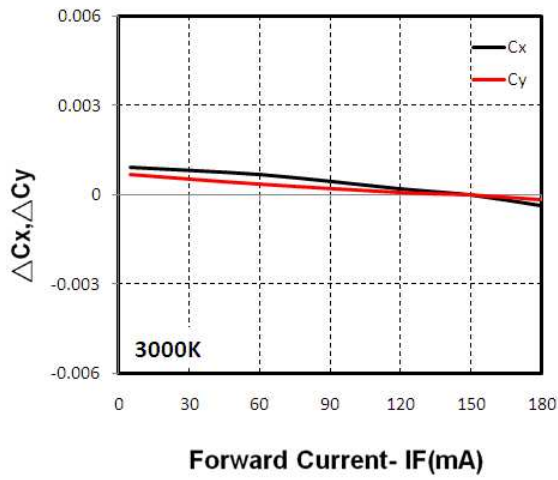
■ **Forward Voltage vs. Forward Current**



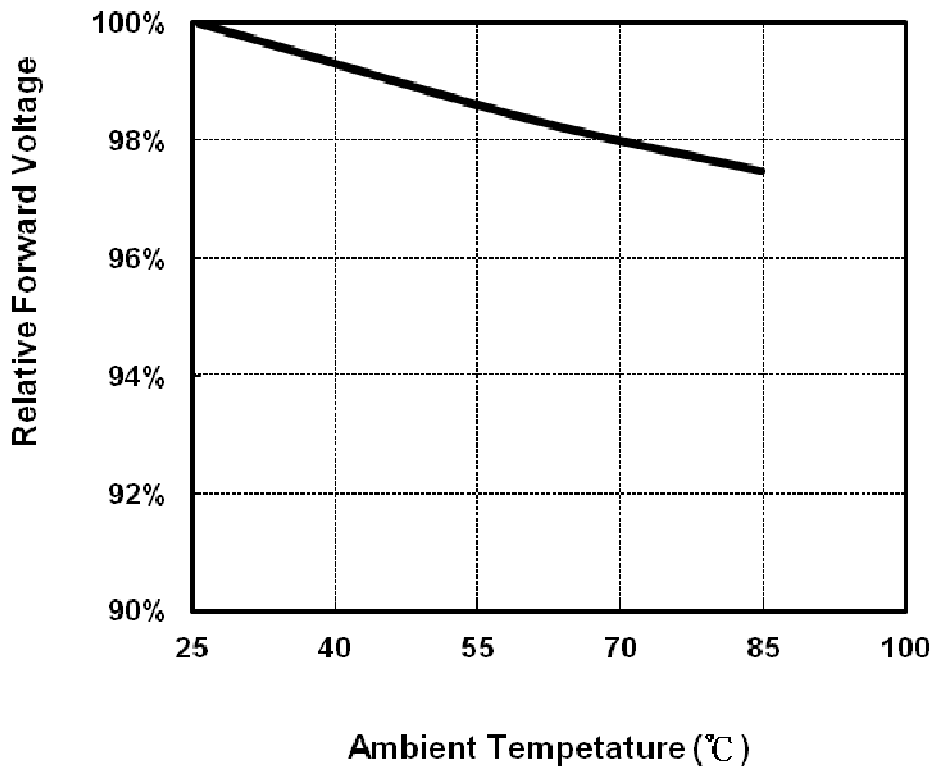
■ **Forward Current vs. Relative Luminosity**



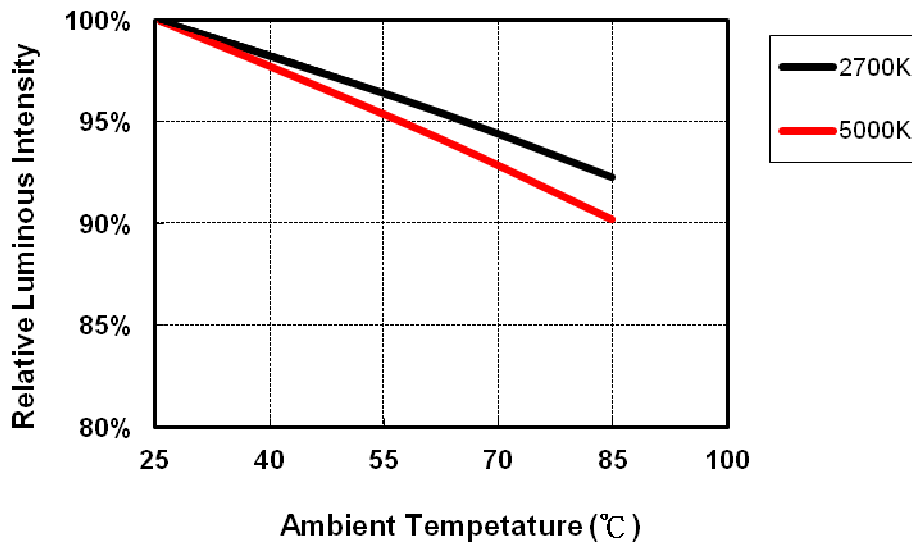
■ **Forward Current vs. Chromaticity Coordinate**



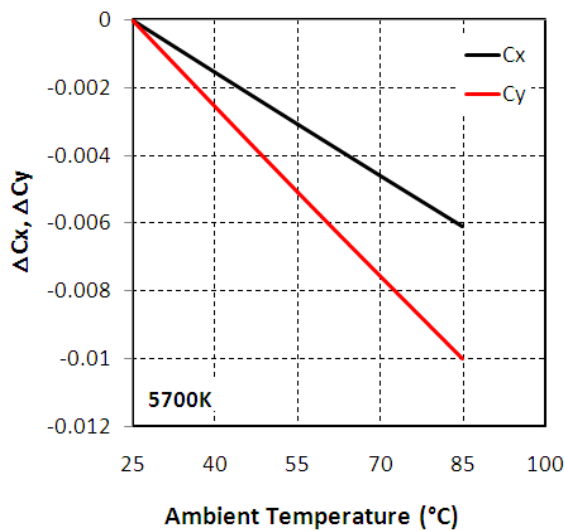
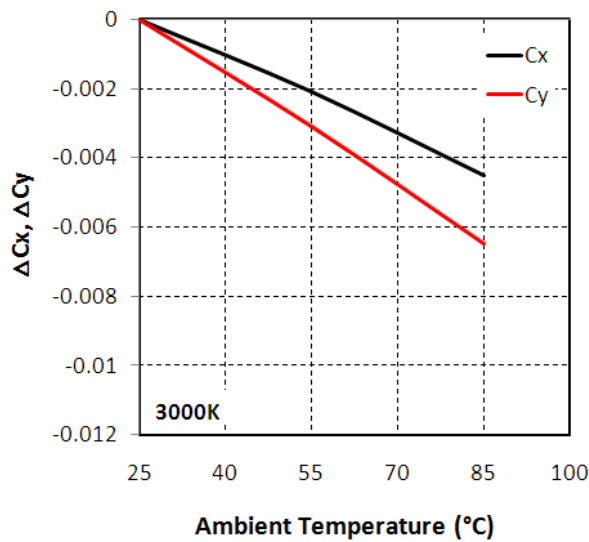
■ **Relative Forward Voltage vs. Ambient Temperature**



■ **Relative Luminous Intensity vs. Ambient Temperature**



■ **Chromaticity vs. Ambient Temperature**



**Reliability**

PC56H19 V1  
 Product Specification

**Reliability test**

| Item   | Condition   | Current | Time/Cycle |
|--|---|---------|------------|
| Steady State Operating Life of Low Temperature -40°C       | -40°C Operating   | 180mA   | 1000 Hrs   |
| Steady State Operating Life of High Temperature 60°C       | 60°C Operating  | 180mA   | 1000 Hrs   |
| Steady State Operating Life of High Temperature 85°C       | 85°C Operating  | 180mA   | 1000 Hrs   |
| Low temperature storage -40°C                              | -40°C Storage   | NA      | 1000 Hrs   |
| High temperature storage 100°C                             | 100°C Storage   | NA      | 1000 Hrs   |
| Steady State Operating Life of High Humidity Heat 60°C 90% | 60°C/90% Operating  | 180mA   | 1000 Hrs   |
| Resistance to soldering heat on PCB (JEDEC MSL3)           | pre-store@60°C, 60%RH<br>for 52hrs Tsld max.=260°C<br>10sec | NA      | 3 Times    |
| Thermal shock  | -40°C/20minr ~5minr ~<br>100°C/20min                        | NA      | 300 Cycles |

**Judgment Criteria**

| Item            | Symbol | Test Condition | Judgment Criteria   |
|-----------------|--------|----------------|---------------------|
| Forward Voltage | Vf     | 180mA          | $\Delta Vf < 10 \%$ |
| Luminous Flux   | Iv     | 180mA          | $\Delta Iv < 30 \%$ |

## Packing

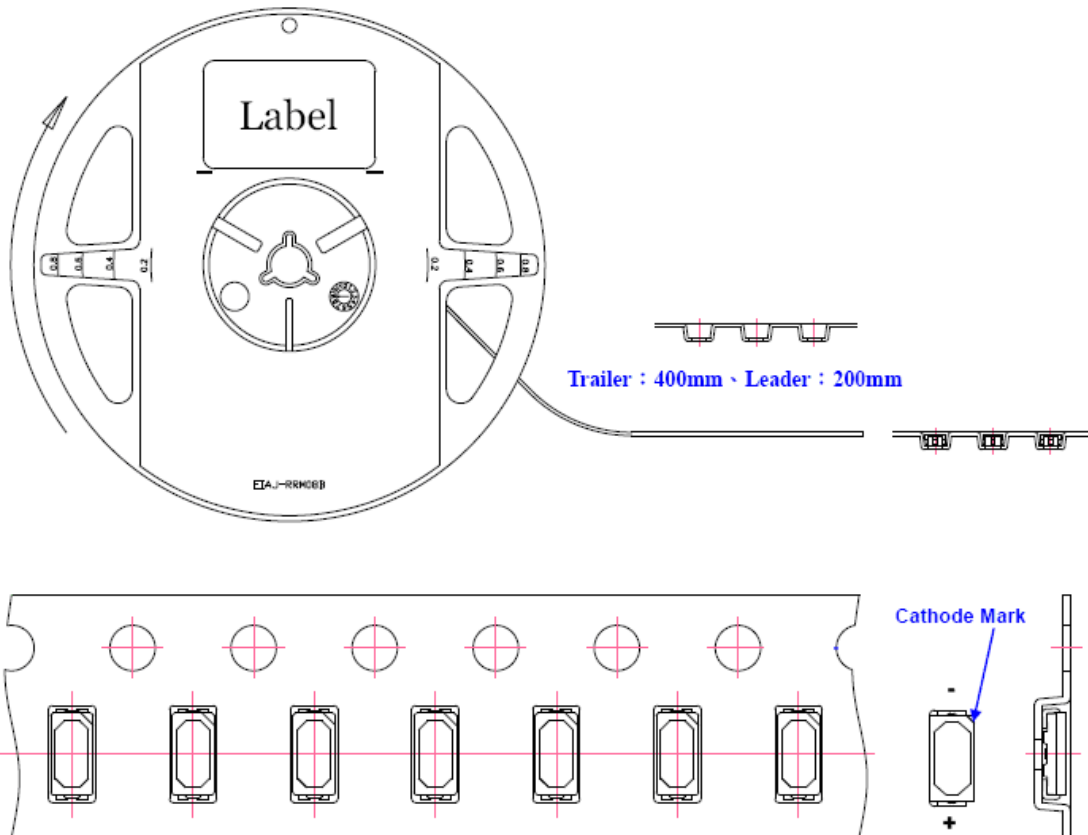
PC56H19 V1

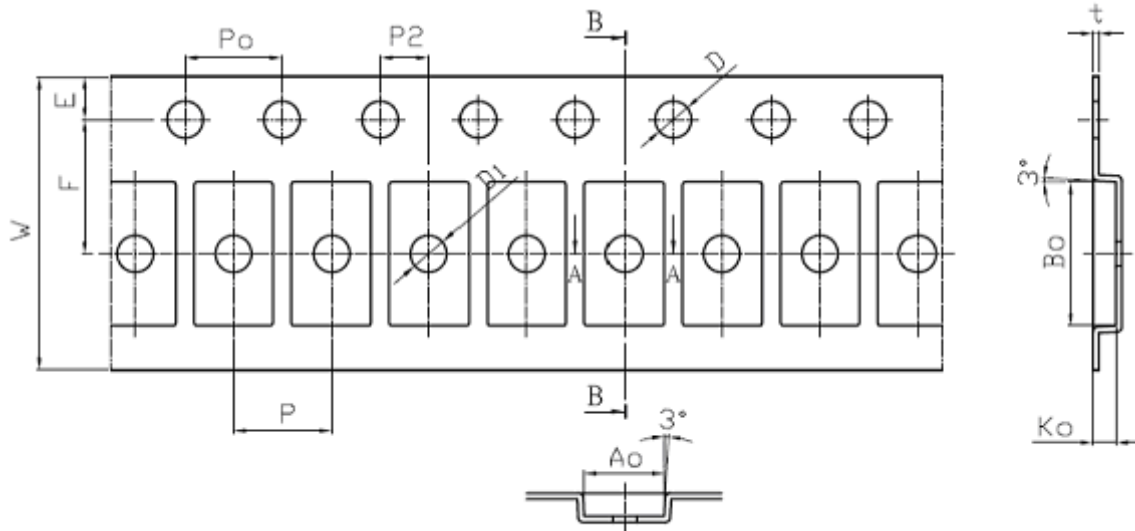
Product Specification

### Label



### Carrier Taping

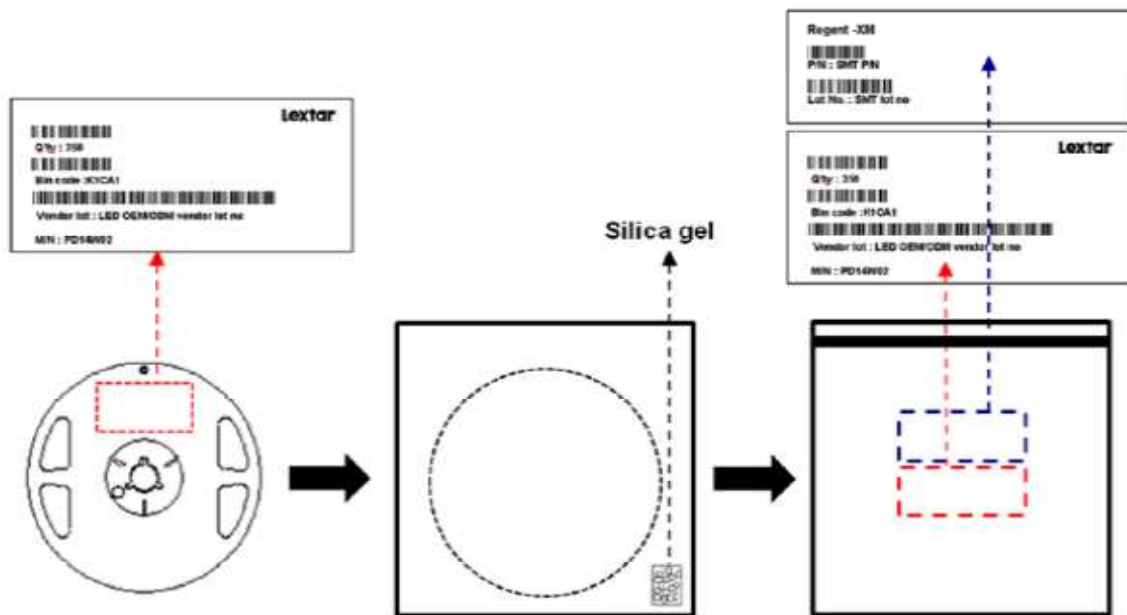




Unit: mm

| Item  | Spec  | To1. (+/- )  | Item    | Spec  | To1. (+/- ) |
|-------|-------|--------------|---------|-------|-------------|
| W     | 12.00 | ±0.10        | P2      | 2.00  | ±0.05       |
| E     | 1.75  | ±0.10        | P0 x 10 | 40.00 | ±0.20       |
| F     | 5.50  | ±0.05        | t1      | 0.25  | ±0.05       |
| D     | 1.50  | +0.10, -0.00 | A0      | 3.25  | ±0.10       |
| D1    | 1.50  | ±0.10        | B0      | 5.90  | ±0.10       |
| P0、P1 | 4.00  | ±0.20        | K0      | 0.95  | ±0.10       |

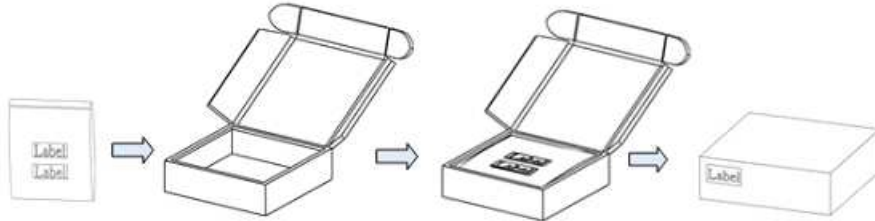
■ Shield Bag Taping



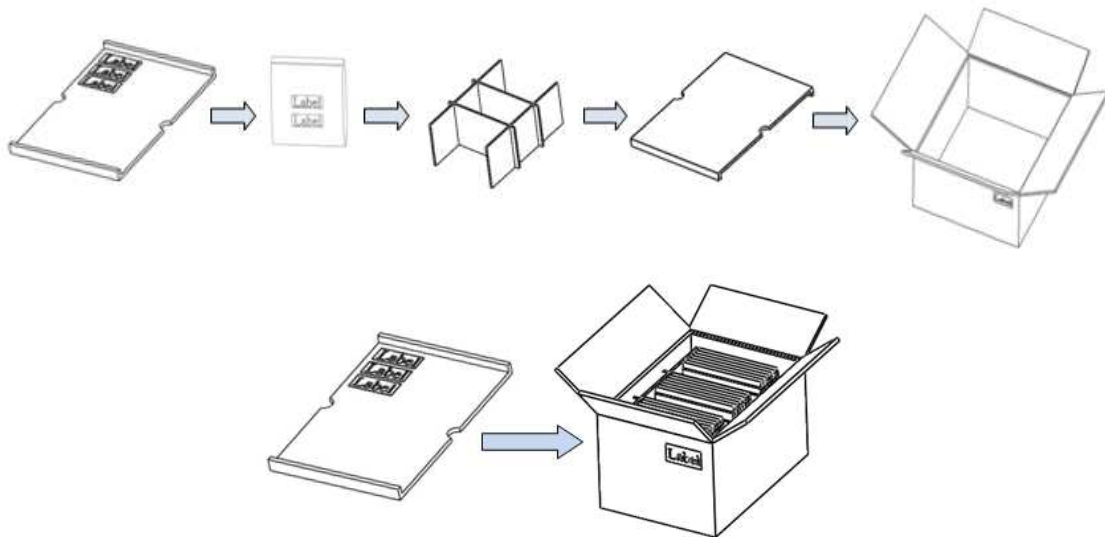
■ **Packing Box**

| Type          | Large Box     |      | Medium Box    |      | Small Box    |     |
|---------------|---------------|------|---------------|------|--------------|-----|
| Dimension     | 541X511X276mm |      | 385X303X260mm |      | 283X235x70mm |     |
| Maximum Reels | 7"X12mm Reel  | 64/R | 7"X12mm Reel  | 21/R | 7"X12mm Reel | 4/R |
| Minimum Reels | 7"X12mm Reel  | 32/R | 7"X12mm Reel  | 9/R  | 7"X12mm Reel | 1/R |

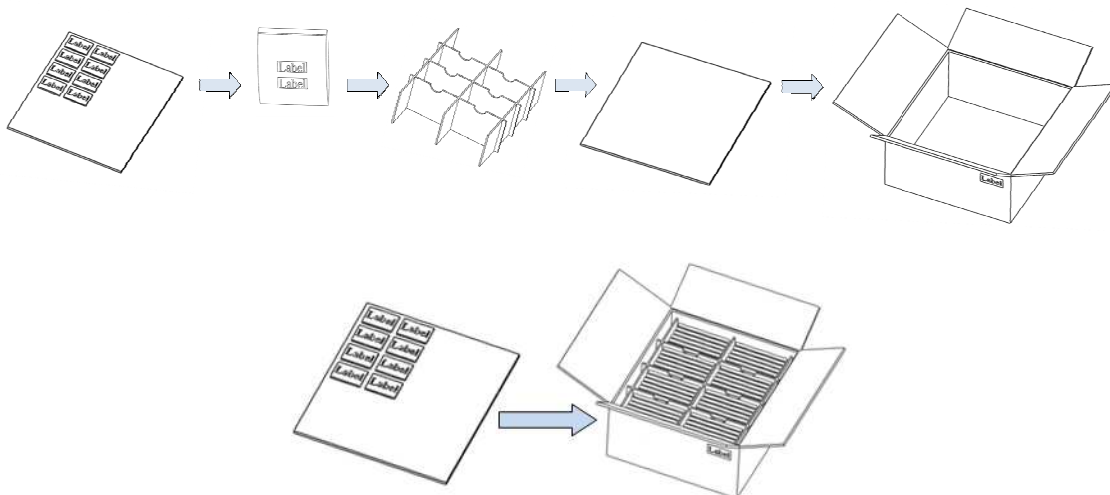
■ **Small Box**



■ **Medium Box**



■ **Large Box**



## Precautions

PC56H19 V1  
Product Specification

### ■ Safety Precautions

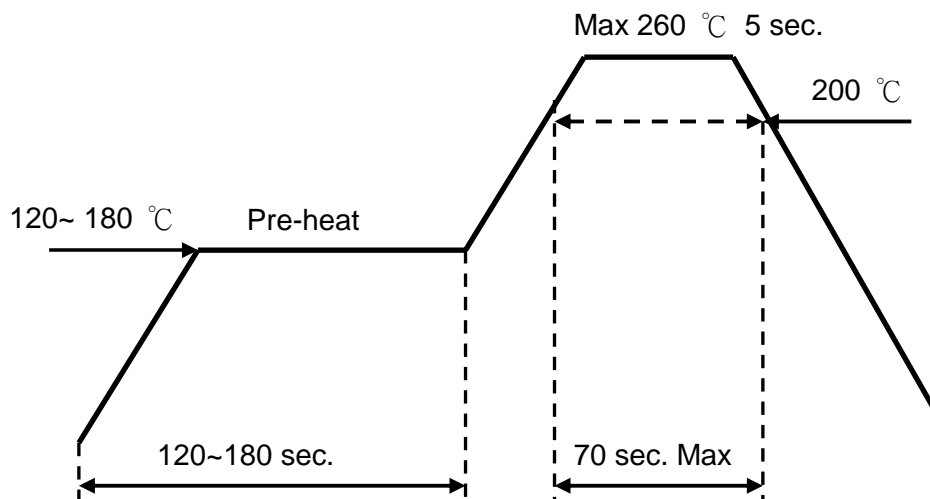
- The LED light output is too strong for human eyes without shield. Prevent eye contact directly more than seconds.
- Ensure operating under maximum rating.

### ■ Storage

- Before opening the package, the LEDs should storage under 30°C, 60% RH.
- After opening the package bag, the LEDs should be keep under 30°C, 60% RH. Recommend to use within 168 hrs. If unused LEDs remain, suggest to store into moisture proof bag or original package bag with moisture absorbent material such as silica gel. Reseal well is necessary.
- If the product exceeded the storage period or the moisture absorbent material faded away, baking treatment should be done by following conditions.  
Bake condition: 60°C, 12hours (One time only).

### ■ Soldering Notice and Conditions

- When soldering LEDs,
- Do not solder/reflow the same LED over two times.
- Recommend soldering conditions:  
Hand soldering: 350 °C max , 3 sec. max.  
Reflow soldering: Pre-heat 180 °C max , 180 sec. max.  
Peak 260 °C max , 5 sec. max.
- Reflow temperature profile as below: (lead-free solder)





- When soldering, don't put stress on the LEDs
- After LEDs have been soldered, strongly recommend not to repair to keep the LEDs performance.

### ■ Static Electricity

- LED package is extremely sensitive to static electricity. It's recommended that anti-electrostatic glove and wrist band is necessary when handling the LEDs. All devices are also be grounded properly as well.
- Protection devices design should be considered in the LED driving circuit.

### ■ Cleaning

- If washing is required, recommend to use alcohol as a solvent.
- Recommend to avoid cleaning the LEDs by ultrasonic. If necessary, pre-test the LED is necessary to confirm whether any damage occur after the process.

## Revision History

PC56H19 V1

Product Specification

| Date       | Contents                         | Writer     | Approved     |
|------------|----------------------------------|------------|--------------|
| 2015.03.17 | New version                      | Louis Chou | Berris Huang |
| 2015.06.05 | Revise dimension and binning     | Louis Chou | Berris Huang |
| 2015.10.02 | Revise drawing and max rating    | Louis Chou | Berris Huang |
| 2015.10.26 | R9 value and RA current update   | Louis Chou | Berris Huang |
| 2016.03.15 | CIE binning temperature update   | Louis Chou | Berris Huang |
| 2016.07.1  | Add ordering code & fine binning | Louis Chou | Berris Huang |

## *Smart Lighting* *Amazing Life*

Lextar Electronics Corp. is the leading LED (Light Emitting Diode) maker integrating upper stream epitaxial, middle stream chip, and downstream package, SMT and LED lighting applications.

Founded in May, 2008, Lextar is a subsidiary of AU Optronics, the leading TFT-LCD and solar PV manufacturer.

Lextar's product applications include lighting and LCD backlight. Lextar's manufacturing sites include Hsinchu and Chunan in Taiwan, and Suzhou in China. The company turnover in 2012 is 340 million USD.