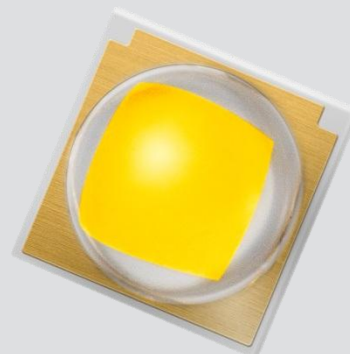


## High Power LED Series 3535 Ceramic Hot Binning

# LH351B



High efficacy and high quality color rendering makes the LH351B suitable use in a broad range of applications

### Features & Benefits

- Operates at a maximum current of up to 1.5 A
- Uniform light distribution under any beam angle
- 80 CRI makes it well suited for most applications
- Hot binning @ 85 °C
- Completed 10,000 hours of LM-80 testing @ 1 A, 105°C

### Applications

- Indoor Lighting: Spotlight, Downlight
- Outdoor Lighting: Street Light, Tunnel Light, Security Light, Parking Lot Light
- Industrial Lighting: High Bay Light, Low Bay Light
- Consumer Lighting: Torch Light



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## 1. Characteristics

### a) Absolute Maximum Rating

| Item                         | Symbol    | Rating     | Unit    | Condition                  |
|------------------------------|-----------|------------|---------|----------------------------|
| Operating Temperature        | $T_{opr}$ | -40 ~ +105 | °C      | Note 1)*                   |
| Storage Temperature          | $T_{stg}$ | -40 ~ +120 | °C      | -                          |
| LED Junction Temperature     | $T_j$     | 150        | °C      | -                          |
| Forward Current              | $I_F$     | 1500       | mA      | -                          |
| Peak Pulse Forward Current   | $I_{FP}$  | 2000       | mA      | Duty 1/10 pulse width 10ms |
| Assembly Process Temperature |           | 260<br><10 | °C<br>s | -                          |
| ESD (HBM)                    | -         | ±8         | kV      | -                          |

#### Notes:

- 1) Refer to the derating curve, '3. Typical Characteristics Graph', for proper driving current that maintained below maximum junction temperature.

## b) Electro-optical Characteristics

| Item                                             | Unit | Nominal CCT<br>(K) | Condition           |                     | Value<br>Typ. |
|--------------------------------------------------|------|--------------------|---------------------|---------------------|---------------|
|                                                  |      |                    | I <sub>F</sub> (mA) | T <sub>J</sub> (°C) |               |
| Luminous Flux (Φ <sub>v</sub> )                  | lm   | 3000<br>(80 CRI)   | 350                 | 25                  | 149           |
|                                                  |      |                    | 350                 | 85                  | 136           |
|                                                  |      |                    | 700                 | 85                  | 249           |
|                                                  |      |                    | 1000                | 85                  | 332           |
|                                                  |      |                    | 1500                | 85                  | 446           |
|                                                  |      | 5000<br>(70 CRI)   | 350                 | 25                  | 175           |
|                                                  |      |                    | 350                 | 85                  | 160           |
|                                                  |      |                    | 700                 | 85                  | 292           |
|                                                  |      |                    | 1000                | 85                  | 391           |
|                                                  |      |                    | 1500                | 85                  | 525           |
| Forward Voltage (V <sub>F</sub> )                | V    |                    | 350                 | 25                  | 2.86          |
|                                                  |      |                    | 350                 | 85                  | 2.75          |
|                                                  |      |                    | 700                 | 85                  | 2.89          |
|                                                  |      |                    | 1000                | 85                  | 2.99          |
|                                                  |      |                    | 1500                | 85                  | 3.12          |
| Reverse Voltage<br>(@ 5 mA)                      | V    |                    | 350                 | 25                  | 14~19.5       |
| Thermal Resistance<br>(junction to solder point) | °C/W |                    | 350                 | 25                  | 4             |
| Beam Angle                                       | °    |                    | 350                 | 25                  | 120           |

**Notes:**

- 1) Samsung maintains measurement tolerance of: luminous flux = ±7 %, forward voltage = ±0.1 V
- 2) Characteristics @ 25 °C are for reference only

c) Luminous Flux Characteristics ( $T_j = 85\text{ °C}$ )

| Nominal CCT<br>(K) | CRI (R <sub>a</sub> )<br>Min. <sup>1)</sup> | Sorting @ 350 mA (lm) |                         | Calculated Minimum Flux <sup>2)</sup> (lm) |              |              |
|--------------------|---------------------------------------------|-----------------------|-------------------------|--------------------------------------------|--------------|--------------|
|                    |                                             | Flux Rank             | Flux Min. <sup>1)</sup> | @ 700 mA                                   | @ 1000 mA    | @ 1500 mA    |
| 2200               | 80                                          | G3<br>(H3)            | 100<br>(110)            | 181<br>(199)                               | 238<br>(262) | 322<br>(353) |
|                    |                                             | H3<br>(J3)            | 110<br>(121)            | 199<br>(218)                               | 262<br>(288) | 354<br>(389) |
|                    |                                             | K3<br>(M3)            | 130<br>(143)            | 235<br>(258)                               | 310<br>(340) | 418<br>(460) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
| 2700               | 70                                          | N3<br>(P3)            | 150<br>(164)            | 270<br>(295)                               | 359<br>(392) | 489<br>(534) |
|                    |                                             | H3<br>(J3)            | 110<br>(121)            | 199<br>(218)                               | 262<br>(288) | 354<br>(389) |
|                    |                                             | J3<br>(K3)            | 120<br>(132)            | 217<br>(238)                               | 286<br>(314) | 386<br>(424) |
|                    |                                             | K3<br>(M3)            | 130<br>(143)            | 235<br>(258)                               | 310<br>(340) | 418<br>(460) |
|                    | 80                                          | F3<br>(G3)            | 90<br>(99)              | 163<br>(179)                               | 214<br>(236) | 289<br>(318) |
|                    |                                             | K3<br>(M3)            | 130<br>(143)            | 235<br>(258)                               | 310<br>(340) | 418<br>(460) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    |                                             | N3<br>(P3)            | 150<br>(164)            | 270<br>(295)                               | 359<br>(392) | 489<br>(534) |
|                    | 90                                          | H3<br>(J3)            | 110<br>(121)            | 199<br>(218)                               | 262<br>(288) | 354<br>(389) |
|                    |                                             | J3<br>(K3)            | 120<br>(132)            | 217<br>(238)                               | 286<br>(314) | 386<br>(424) |
|                    |                                             | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
| 3000               | 70                                          | N3<br>(P3)            | 150<br>(164)            | 270<br>(295)                               | 359<br>(392) | 489<br>(534) |
|                    |                                             | H3<br>(J3)            | 110<br>(121)            | 199<br>(218)                               | 262<br>(288) | 354<br>(389) |
|                    |                                             | J3<br>(K3)            | 120<br>(132)            | 217<br>(238)                               | 286<br>(314) | 386<br>(424) |
|                    |                                             | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |
|                    | 80                                          | F3<br>(G3)            | 90<br>(99)              | 163<br>(179)                               | 214<br>(236) | 289<br>(318) |
|                    |                                             | G3<br>(H3)            | 100<br>(110)            | 181<br>(199)                               | 238<br>(262) | 322<br>(353) |
|                    |                                             | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    | 90                                          | J3<br>(K3)            | 120<br>(132)            | 217<br>(238)                               | 286<br>(314) | 386<br>(424) |
|                    |                                             | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    |                                             | G3<br>(H3)            | 100<br>(110)            | 181<br>(199)                               | 238<br>(262) | 322<br>(353) |
| 3500               | 80                                          | H3<br>(J3)            | 110<br>(121)            | 199<br>(218)                               | 262<br>(288) | 354<br>(389) |
|                    |                                             | J3<br>(K3)            | 120<br>(132)            | 217<br>(238)                               | 286<br>(314) | 386<br>(424) |
|                    |                                             | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    | 90                                          | G3<br>(H3)            | 100<br>(110)            | 181<br>(199)                               | 238<br>(262) | 322<br>(353) |
|                    |                                             | H3<br>(J3)            | 110<br>(121)            | 199<br>(218)                               | 262<br>(288) | 354<br>(389) |
|                    |                                             | J3<br>(K3)            | 120<br>(132)            | 217<br>(238)                               | 286<br>(314) | 386<br>(424) |
|                    |                                             | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |

(value in bracket): Minimum luminous flux @ 25 °C, for reference only

## Notes:

- 1) Samsung maintains measurement tolerance of: luminous flux =  $\pm 7\%$ , CRI =  $\pm 3$
- 2) Calculated minimum flux values are for reference only

c) Luminous Flux Characteristics (T<sub>j</sub> = 85 °C)

| Nominal CCT<br>(K) | CRI (R <sub>a</sub> )<br>Min. <sup>1)</sup> | Sorting @ 350 mA (lm) |                         | Calculated Minimum Flux <sup>2)</sup> (lm) |              |              |
|--------------------|---------------------------------------------|-----------------------|-------------------------|--------------------------------------------|--------------|--------------|
|                    |                                             | Flux Rank             | Flux Min. <sup>1)</sup> | @ 700 mA                                   | @ 1000 mA    | @ 1500 mA    |
| 4000               | 70                                          | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    |                                             | N3<br>(P3)            | 150<br>(164)            | 270<br>(295)                               | 359<br>(392) | 489<br>(534) |
|                    |                                             | P3<br>(Q3)            | 160<br>(174)            | 288<br>(312)                               | 382<br>(415) | 518<br>(562) |
|                    | 80                                          | J3<br>(K3)            | 120<br>(132)            | 217<br>(238)                               | 286<br>(314) | 386<br>(424) |
|                    |                                             | K3<br>(M3)            | 130<br>(143)            | 235<br>(258)                               | 310<br>(340) | 418<br>(460) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
| 5000               | 70                                          | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    |                                             | N3<br>(P3)            | 150<br>(164)            | 270<br>(295)                               | 359<br>(392) | 489<br>(534) |
|                    |                                             | P3<br>(Q3)            | 160<br>(174)            | 288<br>(312)                               | 382<br>(415) | 518<br>(562) |
|                    | 80                                          | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    |                                             |                       |                         |                                            |              |              |
| 5700               | 70                                          | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    |                                             | N3<br>(P3)            | 150<br>(164)            | 270<br>(295)                               | 359<br>(392) | 489<br>(534) |
|                    |                                             | P3<br>(Q3)            | 160<br>(174)            | 288<br>(312)                               | 382<br>(415) | 518<br>(562) |
|                    | 80                                          | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    |                                             |                       |                         |                                            |              |              |
| 6000K              | 80                                          | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
| 6500               | 70                                          | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    |                                             | N3<br>(P3)            | 150<br>(164)            | 270<br>(295)                               | 359<br>(392) | 489<br>(534) |
|                    |                                             | P3<br>(Q3)            | 160<br>(174)            | 288<br>(312)                               | 382<br>(415) | 518<br>(562) |
|                    | 80                                          | K3<br>(M3)            | 130<br>(142)            | 234<br>(256)                               | 311<br>(340) | 424<br>(463) |
|                    |                                             | M3<br>(N3)            | 140<br>(153)            | 252<br>(276)                               | 335<br>(366) | 457<br>(499) |
|                    |                                             |                       |                         |                                            |              |              |

(value in bracket): Minimum luminous flux @ 25 °C, for reference only

**Notes:**

- 1) Samsung maintains measurement tolerance of: luminous flux =  $\pm 7\%$ , CRI =  $\pm 3$
- 2) Calculated minimum flux values are for reference only

## 2. Product Code Information

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| S | P | H | W | H | 2 | L | 3 | D | 3  | 0  | E  | D  | 4  | V  | 0  | K  | 3  |

| Digit | PKG Information            | Code                                                                                                                    | Specification                                                               |           |                                                                    |            |  |  |
|-------|----------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------|--------------------------------------------------------------------|------------|--|--|
| 1 2 3 | Samsung Package High Power | SPH                                                                                                                     |                                                                             |           |                                                                    |            |  |  |
| 4 5   | Color                      | WH                                                                                                                      | White                                                                       |           |                                                                    |            |  |  |
| 6     | Product Version            | 2                                                                                                                       |                                                                             |           |                                                                    |            |  |  |
| 7 8   | Product                    | L3                                                                                                                      | LH351 Series                                                                |           |                                                                    |            |  |  |
| 9     | Lens Type                  | D                                                                                                                       | Dome lens                                                                   |           |                                                                    |            |  |  |
| 10    | Internal Code              | 3                                                                                                                       |                                                                             |           |                                                                    |            |  |  |
| 11    | Not Defined                | 0                                                                                                                       | Default                                                                     |           |                                                                    |            |  |  |
| 12    | CRI & Sorting Temperature  | C                                                                                                                       | Min. 70                                                                     | 85°C      |                                                                    |            |  |  |
|       |                            | D                                                                                                                       | Min. 75                                                                     |           |                                                                    |            |  |  |
|       |                            | E                                                                                                                       | Min. 80                                                                     |           |                                                                    |            |  |  |
|       |                            | F                                                                                                                       | Min. 85                                                                     |           |                                                                    |            |  |  |
|       |                            | G                                                                                                                       | Min. 90                                                                     |           |                                                                    |            |  |  |
| 13 14 | Forward Voltage (V)        | D 4                                                                                                                     | 2.6~3.0                                                                     | Bin Code: | D2 2.6~2.8                                                         | F2 2.8~3.0 |  |  |
| 15 16 | CCT (K)                    | Y★                                                                                                                      | 2200                                                                        | Bin Code: | Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8, Y9, YA, YB, YC, YD, YE, YF, YG, YM |            |  |  |
|       |                            | W★                                                                                                                      | 2700                                                                        |           | W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG, WM |            |  |  |
|       |                            | V★                                                                                                                      | 3000                                                                        |           | V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG, VM |            |  |  |
|       |                            | U★                                                                                                                      | 3500                                                                        |           | U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG, UM |            |  |  |
|       |                            | T★                                                                                                                      | 4000                                                                        |           | T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG, TM |            |  |  |
|       |                            | R T                                                                                                                     | 5000                                                                        |           | R1, R2, R3, R4                                                     |            |  |  |
|       |                            | Q T                                                                                                                     | 5700                                                                        |           | Q1, Q2, Q3, Q4                                                     |            |  |  |
|       |                            | P Q                                                                                                                     | 6000                                                                        |           | P2, Q1, P4, Q3                                                     |            |  |  |
|       |                            | P T                                                                                                                     | 6500                                                                        |           | P1, P2, P3, P4                                                     |            |  |  |
|       |                            |                                                                                                                         | ★ : "0" (Whole bin), "P" (Quarter bin), or "M" (MacAdam 3-step ellipse bin) |           |                                                                    |            |  |  |
| 17 18 | Luminous Flux (lm)         | F 3                                                                                                                     | 90~120                                                                      | F1        | 90~100                                                             |            |  |  |
|       |                            | G 3                                                                                                                     | 100~130                                                                     | G1        | 100~110                                                            |            |  |  |
|       |                            | H 3                                                                                                                     | 110~140                                                                     | H1        | 110~120                                                            |            |  |  |
|       |                            | J 3                                                                                                                     | 120~150                                                                     | J1        | 120~130                                                            |            |  |  |
|       |                            | K 3                                                                                                                     | 130~160                                                                     | K1        | 130~140                                                            |            |  |  |
|       |                            | M 3                                                                                                                     | 140~170                                                                     | M1        | 140~150                                                            |            |  |  |
|       |                            | N 3                                                                                                                     | 150~180                                                                     | N1        | 150~160                                                            |            |  |  |
|       |                            | P 3                                                                                                                     | 160~190                                                                     | P1        | 160~170                                                            |            |  |  |
|       |                            |                                                                                                                         |                                                                             | Q1        | 170~180                                                            |            |  |  |
|       |                            | R1                                                                                                                      | 180~190                                                                     |           |                                                                    |            |  |  |
|       |                            | Digit 17: Min. spec.<br>Digit 18: The number of higher bin(s) from min. spec.<br>e.g.: K1 = 130~140 lm, K3 = 130~160 lm |                                                                             |           |                                                                    |            |  |  |

a) Luminous Flux Bins ( $I_F = 350 \text{ mA}$ ,  $T_j = 85^\circ \text{C}$ )

| Nominal CCT (K) | CRI (R <sub>a</sub> ) Min. | Product Code         | Flux Rank | Flux Bin | Flux Range ( $\Phi_v$ , lm) |
|-----------------|----------------------------|----------------------|-----------|----------|-----------------------------|
| 2200            | 80                         | SPHWH2L3D30ED4Y ☆ G3 | G3        | G1       | 100 ~ 110                   |
|                 |                            |                      |           | H1       | 110 ~ 120                   |
|                 |                            |                      |           | J1       | 120 ~ 130                   |
|                 |                            | SPHWH2L3D30ED4Y ☆ H3 | H3        | H1       | 110 ~ 120                   |
|                 |                            |                      |           | J1       | 120 ~ 130                   |
|                 |                            |                      |           | K1       | 130 ~ 140                   |
|                 | 70                         | SPHWH2L3D30CD4W ☆ K3 | K3        | K1       | 130 ~ 140                   |
|                 |                            |                      |           | M1       | 140 ~ 150                   |
|                 |                            |                      |           | N1       | 150 ~ 160                   |
|                 |                            | SPHWH2L3D30CD4W ☆ M3 | M3        | M1       | 140 ~ 150                   |
|                 |                            |                      |           | N1       | 150 ~ 160                   |
|                 |                            |                      |           | P1       | 160 ~ 170                   |
|                 |                            | SPHWH2L3D30CD4W ☆ N3 | N3        | N1       | 150 ~ 160                   |
|                 |                            |                      |           | P1       | 160 ~ 170                   |
|                 |                            |                      |           | Q1       | 170 ~ 180                   |
|                 |                            |                      |           | H1       | 110 ~ 120                   |
| 2700            | 80                         | SPHWH2L3D30ED4W ☆ H3 | H3        | J1       | 120 ~ 130                   |
|                 |                            |                      |           | K1       | 130 ~ 140                   |
|                 |                            |                      |           | J1       | 120 ~ 130                   |
|                 |                            | SPHWH2L3D30ED4W ☆ J3 | J3        | K1       | 130 ~ 140                   |
|                 |                            |                      |           | M1       | 140 ~ 150                   |
|                 |                            |                      |           | K1       | 130 ~ 140                   |
|                 | 90                         | SPHWH2L3D30ED4W ☆ K3 | K3        | M1       | 140 ~ 150                   |
|                 |                            |                      |           | N1       | 150 ~ 160                   |
|                 |                            |                      |           | F1       | 90 ~ 100                    |
|                 |                            | SPHWH2L3D30GD4W ☆ F3 | F3        | G1       | 100 ~ 110                   |
|                 |                            |                      |           | H1       | 110 ~ 120                   |
|                 |                            |                      |           | K1       | 130 ~ 140                   |
|                 |                            | SPHWH2L3D30CD4V ☆ K3 | K3        | M1       | 140 ~ 150                   |
|                 |                            |                      |           | N1       | 150 ~ 160                   |
|                 |                            |                      |           | M1       | 140 ~ 150                   |
|                 | 70                         | SPHWH2L3D30CD4V ☆ M3 | M3        | N1       | 150 ~ 160                   |
|                 |                            |                      |           | P1       | 160 ~ 170                   |
|                 |                            |                      |           | N1       | 150 ~ 160                   |
|                 |                            | SPHWH2L3D30CD4V ☆ N3 | N3        | P1       | 160 ~ 170                   |
|                 |                            |                      |           | Q1       | 170 ~ 180                   |
|                 |                            |                      |           | H1       | 110 ~ 120                   |
| 3000            | 80                         | SPHWH2L3D30ED4V ☆ H3 | H3        | J1       | 120 ~ 130                   |
|                 |                            |                      |           | K1       | 130 ~ 140                   |
|                 |                            |                      |           | J1       | 120 ~ 130                   |
|                 |                            | SPHWH2L3D30ED4V ☆ J3 | J3        | K1       | 130 ~ 140                   |
|                 |                            |                      |           | M1       | 140 ~ 150                   |
|                 |                            |                      |           | K1       | 130 ~ 140                   |
|                 | 90                         | SPHWH2L3D30ED4V ☆ K3 | K3        | M1       | 140 ~ 150                   |
|                 |                            |                      |           | N1       | 150 ~ 160                   |
|                 |                            |                      |           | F1       | 90 ~ 100                    |
|                 |                            | SPHWH2L3D30GD4V ☆ F3 | F3        | G1       | 100 ~ 110                   |
|                 |                            |                      |           | H1       | 110 ~ 120                   |
|                 |                            |                      |           | G1       | 100 ~ 110                   |
|                 |                            | SPHWH2L3D30GD4V ☆ G3 | G3        | H1       | 110 ~ 120                   |
|                 |                            |                      |           | J1       | 120 ~ 130                   |
|                 |                            |                      |           | J1       | 120 ~ 130                   |

"☆" can be "0" (Whole bin), "P" (Quarter bin), or "M" (MacAdam 3-step ellipse bin) of the color binning

a) Luminous Flux Bins ( $I_F = 350 \text{ mA}$ ,  $T_j = 85^\circ\text{C}$ )

| Nominal CCT (K) | CRI (R <sub>a</sub> ) Min. | Product Code       | Flux Rank | Flux Bin | Flux Range ( $\Phi_v$ , lm) |
|-----------------|----------------------------|--------------------|-----------|----------|-----------------------------|
| 3500            | 70                         | SPHWH2L3D30CD4U☆K3 | K3        | K1       | 130 ~ 140                   |
|                 |                            |                    |           | M1       | 140 ~ 150                   |
|                 |                            |                    |           | N1       | 150 ~ 160                   |
|                 |                            | SPHWH2L3D30CD4U☆M3 | M3        | M1       | 140 ~ 150                   |
|                 |                            |                    |           | N1       | 150 ~ 160                   |
|                 |                            |                    |           | P1       | 160 ~ 170                   |
|                 | 80                         | SPHWH2L3D30ED4U☆J3 | J3        | J1       | 120 ~ 130                   |
|                 |                            |                    |           | K1       | 130 ~ 140                   |
|                 |                            |                    |           | M1       | 140 ~ 150                   |
|                 |                            | SPHWH2L3D30ED4U☆K3 | K3        | K1       | 130 ~ 140                   |
|                 |                            |                    |           | M1       | 140 ~ 150                   |
|                 |                            |                    |           | N1       | 150 ~ 160                   |
|                 | 90                         | SPHWH2L3D30ED4U☆M3 | M3        | M1       | 140 ~ 150                   |
|                 |                            |                    |           | N1       | 150 ~ 160                   |
|                 |                            |                    |           | P1       | 160 ~ 170                   |
|                 |                            | SPHWH2L3D30GD4U☆G3 | G3        | G1       | 100 ~ 110                   |
|                 |                            |                    |           | H1       | 110 ~ 120                   |
|                 |                            |                    |           | J1       | 120 ~ 130                   |
| 4000            | 70                         | SPHWH2L3D30GD4U☆H3 | H3        | H1       | 110 ~ 120                   |
|                 |                            |                    |           | J1       | 120 ~ 130                   |
|                 |                            |                    |           | K1       | 130 ~ 140                   |
|                 |                            | SPHWH2L3D30CD4T☆M3 | M3        | M1       | 140 ~ 150                   |
|                 |                            |                    |           | N1       | 150 ~ 160                   |
|                 |                            |                    |           | P1       | 160 ~ 170                   |
|                 | 80                         | SPHWH2L3D30CD4T☆N3 | N3        | N1       | 150 ~ 160                   |
|                 |                            |                    |           | P1       | 160 ~ 170                   |
|                 |                            |                    |           | Q1       | 170 ~ 180                   |
|                 |                            | SPHWH2L3D30CD4T☆P3 | P3        | P1       | 160 ~ 170                   |
|                 |                            |                    |           | Q1       | 170 ~ 180                   |
|                 |                            |                    |           | R1       | 180 ~ 190                   |
|                 | 90                         | SPHWH2L3D30ED4T☆J3 | J3        | J1       | 120 ~ 130                   |
|                 |                            |                    |           | K1       | 130 ~ 140                   |
|                 |                            |                    |           | M1       | 140 ~ 150                   |
|                 |                            | SPHWH2L3D30ED4T☆K3 | K3        | K1       | 130 ~ 140                   |
|                 |                            |                    |           | M1       | 140 ~ 150                   |
|                 |                            |                    |           | N1       | 150 ~ 160                   |
|                 | 90                         | SPHWH2L3D30ED4T☆M3 | M3        | M1       | 140 ~ 150                   |
|                 |                            |                    |           | N1       | 150 ~ 160                   |
|                 | 90                         | SPHWH2L3D30ED4T☆M3 | M3        | P1       | 160 ~ 170                   |
|                 |                            |                    |           | P1       | 160 ~ 170                   |

"☆" can be "0" (Whole bin), "P" (Quarter bin), or "M" (MacAdam 3-step ellipse bin) of the color binning

a) Luminous Flux Bins ( $I_F = 350 \text{ mA}$ ,  $T_j = 85^\circ\text{C}$ )

| Nominal CCT<br>(K) | CRI (R <sub>a</sub> )<br>Min. | Product Code       | Flux Rank | Flux Bin | Flux Range<br>( $\Phi_v$ , lm) |
|--------------------|-------------------------------|--------------------|-----------|----------|--------------------------------|
| 5000               | 70                            | SPHWH2L3D30CD4RTM3 | M3        | M1       | 140 ~ 150                      |
|                    |                               |                    |           | N1       | 150 ~ 160                      |
|                    |                               |                    |           | P1       | 160 ~ 170                      |
|                    |                               | SPHWH2L3D30CD4RTN3 | N3        | N1       | 150 ~ 160                      |
|                    |                               |                    |           | P1       | 160 ~ 170                      |
|                    |                               |                    |           | Q1       | 170 ~ 180                      |
|                    | 80                            | SPHWH2L3D30CD4RTP3 | P3        | P1       | 160 ~ 170                      |
|                    |                               |                    |           | Q1       | 170 ~ 180                      |
|                    |                               |                    |           | R1       | 180 ~ 190                      |
|                    |                               | SPHWH2L3D30ED4RTK3 | K3        | K1       | 130 ~ 140                      |
|                    |                               |                    |           | M1       | 140 ~ 150                      |
|                    |                               |                    |           | N1       | 150 ~ 160                      |
| 5700               | 70                            | SPHWH2L3D30ED4RTM3 | M3        | M1       | 140 ~ 150                      |
|                    |                               |                    |           | N1       | 150 ~ 160                      |
|                    |                               |                    |           | P1       | 160 ~ 170                      |
|                    |                               | SPHWH2L3D30CD4QTM3 | M3        | M1       | 140 ~ 150                      |
|                    |                               |                    |           | N1       | 150 ~ 160                      |
|                    |                               |                    |           | P1       | 160 ~ 170                      |
|                    | 80                            | SPHWH2L3D30CD4QTN3 | N3        | N1       | 150 ~ 160                      |
|                    |                               |                    |           | P1       | 160 ~ 170                      |
|                    |                               |                    |           | Q1       | 170 ~ 180                      |
|                    |                               | SPHWH2L3D30CD4QTP3 | P3        | P1       | 160 ~ 170                      |
|                    |                               |                    |           | Q1       | 170 ~ 180                      |
|                    |                               |                    |           | R1       | 180 ~ 190                      |
| 5700               | 80                            | SPHWH2L3D30ED4QTK3 | K3        | K1       | 130 ~ 140                      |
|                    |                               |                    |           | M1       | 140 ~ 150                      |
|                    |                               |                    |           | N1       | 150 ~ 160                      |
|                    |                               | SPHWH2L3D30ED4QTM3 | M3        | M1       | 140 ~ 150                      |
|                    |                               |                    |           | N1       | 150 ~ 160                      |
|                    |                               |                    |           | P1       | 160 ~ 170                      |

"☆" can be "0" (Whole bin), "P" (Quarter bin), or "M" (MacAdam 3-step ellipse bin) of the color binning

a) Luminous Flux Bins ( $I_F = 350 \text{ mA}$ ,  $T_j = 85^\circ \text{C}$ )

| Nominal CCT (K) | CRI (R <sub>a</sub> ) Min. | Product Code        | Flux Rank | Flux Bin | Flux Range (Φ <sub>v</sub> , lm) |
|-----------------|----------------------------|---------------------|-----------|----------|----------------------------------|
| 6000            | 80                         | SPHWH2L3D30ED4PQK3  | K3        | K1       | 130 ~ 140                        |
|                 |                            |                     |           | M1       | 140 ~ 150                        |
|                 |                            |                     |           | N1       | 150 ~ 160                        |
|                 |                            | SPHWH2L3D30ED4PQM3  | M3        | M1       | 140 ~ 150                        |
|                 |                            |                     |           | N1       | 150 ~ 160                        |
|                 |                            |                     |           | P1       | 160 ~ 170                        |
|                 | 70                         | SPHWH2L3D30CD4PTM3  | M3        | M1       | 140 ~ 150                        |
|                 |                            |                     |           | N1       | 150 ~ 160                        |
|                 |                            |                     |           | P1       | 160 ~ 170                        |
|                 |                            | SPHWH2L3D30CD4PTN3  | N3        | N1       | 150 ~ 160                        |
|                 |                            |                     |           | P1       | 160 ~ 170                        |
|                 |                            |                     |           | Q1       | 170 ~ 180                        |
| 6500            | 80                         | SPHWH2L3D30CD4PTNP3 | P3        | P1       | 160 ~ 170                        |
|                 |                            |                     |           | Q1       | 170 ~ 180                        |
|                 |                            |                     |           | R1       | 180 ~ 190                        |
|                 |                            | SPHWH2L3D30ED4PTK3  | K3        | K1       | 130 ~ 140                        |
|                 |                            |                     |           | M1       | 140 ~ 150                        |
|                 |                            |                     |           | N1       | 150 ~ 160                        |
|                 | 80                         | SPHWH2L3D30ED4PTM3  | M3        | M1       | 140 ~ 150                        |
|                 |                            |                     |           | N1       | 150 ~ 160                        |
|                 |                            |                     |           | P1       | 160 ~ 170                        |

b) Color Bins ( $I_F = 350 \text{ mA}$ ,  $T_j = 85^\circ\text{C}$ )

| Nominal CCT (K) | CRI (R <sub>a</sub> ) Min. | Product Code       | Color Rank             | Chromaticity Bins                                                 |
|-----------------|----------------------------|--------------------|------------------------|-------------------------------------------------------------------|
| 2200            | 80                         | SPHWH2L3D30ED4Y0G3 | Y0<br>(Whole bin)      | Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8,<br>Y9, YA, YB, YC, YD, YE, YF, YG |
|                 |                            | SPHWH2L3D30ED4Y0H3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4YPG3 | YP<br>(Quarter bin)    | Y6, Y7, YA, YB                                                    |
|                 |                            | SPHWH2L3D30ED4YPH3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4YMG3 | YM<br>(MacAdam 3-step) | YM                                                                |
|                 |                            | SPHWH2L3D30ED4YMH3 |                        |                                                                   |
|                 | 70                         | SPHWH2L3D30CD4W0K3 | W0<br>(Whole bin)      | W1, W2, W3, W4, W5, W6, W7, W8,<br>W9, WA, WB, WC, WD, WE, WF, WG |
|                 |                            | SPHWH2L3D30CD4W0M3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30CD4W0N3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30CD4WPK3 | WP<br>(Quarter bin)    | W6, W7, WA, WB                                                    |
|                 |                            | SPHWH2L3D30CD4WPM3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30CD4WPN3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30CD4WMK3 | WM<br>(MacAdam 3-step) | WM                                                                |
|                 |                            | SPHWH2L3D30CD4WMM3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30CD4WMN3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4W0H3 | W0 (Whole bin)         | W1, W2, W3, W4, W5, W6, W7, W8,<br>W9, WA, WB, WC, WD, WE, WF, WG |
| 2700            | 80                         | SPHWH2L3D30ED4W0J3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4W0K3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4WPH3 | WP<br>(Quarter bin)    | W6, W7, WA, WB                                                    |
|                 |                            | SPHWH2L3D30ED4WPJ3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4WPK3 | WM<br>(MacAdam 3-step) | WM                                                                |
|                 |                            | SPHWH2L3D30ED4WMH3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4WMJ3 |                        |                                                                   |
|                 | 90                         | SPHWH2L3D30ED4WMK3 | W0 (Whole bin)         | W1, W2, W3, W4, W5, W6, W7, W8,<br>W9, WA, WB, WC, WD, WE, WF, WG |
|                 |                            | SPHWH2L3D30GD4W0F3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30GD4WPF3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30GD4WPF3 | WP<br>(Quarter bin)    | W6, W7, WA, WB                                                    |
|                 |                            | SPHWH2L3D30GD4WMF3 | WM<br>(MacAdam 3-step) | WM                                                                |
|                 |                            | SPHWH2L3D30GD4VMK3 |                        |                                                                   |
|                 | 70                         | SPHWH2L3D30CD4V0M3 | V0<br>(Whole bin)      | V1, V2, V3, V4, V5, V6, V7, V8,<br>V9, VA, VB, VC, VD, VE, VF, VG |
|                 |                            | SPHWH2L3D30CD4V0N3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30CD4VPK3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30CD4VPM3 | VP<br>(Quarter bin)    | V6, V7, VA, VB                                                    |
|                 |                            | SPHWH2L3D30CD4VPN3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30CD4VMK3 |                        |                                                                   |
| 3000            | 80                         | SPHWH2L3D30CD4VMM3 | VM<br>(MacAdam 3-step) | VM                                                                |
|                 |                            | SPHWH2L3D30CD4VMN3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4V0H3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4V0J3 | V0<br>(Whole bin)      | V1, V2, V3, V4, V5, V6, V7, V8,<br>V9, VA, VB, VC, VD, VE, VF, VG |
|                 |                            | SPHWH2L3D30ED4V0K3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4VPH3 |                        |                                                                   |
|                 | 90                         | SPHWH2L3D30ED4VPJ3 | VP<br>(Quarter bin)    | V6, V7, VA, VB                                                    |
|                 |                            | SPHWH2L3D30ED4VPK3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4VMH3 | VM<br>(MacAdam 3-step) | VM                                                                |
|                 |                            | SPHWH2L3D30ED4VMJ3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30ED4VMK3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30GD4V0F3 | V0<br>(Whole bin)      | V1, V2, V3, V4, V5, V6, V7, V8,<br>V9, VA, VB, VC, VD, VE, VF, VG |
|                 |                            | SPHWH2L3D30GD4V0G3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30GD4VPF3 |                        |                                                                   |
|                 | 90                         | SPHWH2L3D30GD4VPG3 | VP<br>(Quarter bin)    | V6, V7, VA, VB                                                    |
|                 |                            | SPHWH2L3D30GD4VMF3 |                        |                                                                   |
|                 |                            | SPHWH2L3D30GD4VMG3 | VM<br>(MacAdam 3-step) | VM                                                                |
|                 |                            | SPHWH2L3D30GD4VVG3 |                        |                                                                   |

b) Color Bins ( $I_f = 350 \text{ mA}$ ,  $T_j = 85 \text{ °C}$ )

| Nominal CCT<br>(K) | CRI (R <sub>a</sub> )<br>Min. | Product Code       | Color Rank             | Chromaticity Bins                                                 |
|--------------------|-------------------------------|--------------------|------------------------|-------------------------------------------------------------------|
| 3500               | 70                            | SPHWH2L3D30CD4U0K3 | U0<br>(Whole bin)      | U1, U2, U3, U4, U5, U6, U7, U8,<br>U9, UA, UB, UC, UD, UE, UF, UG |
|                    |                               | SPHWH2L3D30CD4U0M3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30CD4UPK3 | UP<br>(Quarter bin)    | U6, U7, UA, UB                                                    |
|                    |                               | SPHWH2L3D30CD4UPM3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30CD4UMK3 | UM<br>(MacAdam 3-step) | UM                                                                |
|                    |                               | SPHWH2L3D30CD4UMM3 |                        |                                                                   |
|                    | 80                            | SPHWH2L3D30ED4U0J3 | U0<br>(Whole bin)      | U1, U2, U3, U4, U5, U6, U7, U8,<br>U9, UA, UB, UC, UD, UE, UF, UG |
|                    |                               | SPHWH2L3D30ED4U0K3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4U0M3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4UPJ3 | UP<br>(Quarter bin)    | U6, U7, UA, UB                                                    |
|                    |                               | SPHWH2L3D30ED4UPK3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4UPM3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4UMJ3 | UM<br>(MacAdam 3-step) | UM                                                                |
|                    |                               | SPHWH2L3D30ED4UMK3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4UMM3 |                        |                                                                   |
|                    | 90                            | SPHWH2L3D30GD4U0G3 | U0<br>(Whole bin)      | U1, U2, U3, U4, U5, U6, U7, U8,<br>U9, UA, UB, UC, UD, UE, UF, UG |
|                    |                               | SPHWH2L3D30GD4U0H3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30GD4UPG3 | UP<br>(Quarter bin)    | U6, U7, UA, UB                                                    |
|                    |                               | SPHWH2L3D30GD4UPH3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30GD4UMG3 | UM<br>(MacAdam 3-step) | UM                                                                |
|                    |                               | SPHWH2L3D30GD4UMH3 |                        |                                                                   |
| 4000               | 70                            | SPHWH2L3D30CD4T0M3 | T0<br>(Whole bin)      | T1, T2, T3, T4, T5, T6, T7, T8,<br>T9, TA, TB, TC, TD, TE, TF, TG |
|                    |                               | SPHWH2L3D30CD4T0N3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30CD4T0P3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30CD4TPM3 | TP<br>(Quarter bin)    | T6, T7, TA, TB                                                    |
|                    |                               | SPHWH2L3D30CD4TPN3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30CD4TPP3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30CD4TMM3 | TM<br>(MacAdam 3-step) | TM                                                                |
|                    |                               | SPHWH2L3D30CD4TMN3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30CD4TMP3 |                        |                                                                   |
|                    | 80                            | SPHWH2L3D30ED4T0J3 | T0<br>(Whole bin)      | T1, T2, T3, T4, T5, T6, T7, T8,<br>T9, TA, TB, TC, TD, TE, TF, TG |
|                    |                               | SPHWH2L3D30ED4T0K3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4T0M3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4TPJ3 | TP<br>(Quarter bin)    | T6, T7, TA, TB                                                    |
|                    |                               | SPHWH2L3D30ED4TPK3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4TPM3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4TMJ3 | TM<br>(MacAdam 3-step) | TM                                                                |
|                    |                               | SPHWH2L3D30ED4TMK3 |                        |                                                                   |
|                    |                               | SPHWH2L3D30ED4TMM3 |                        |                                                                   |

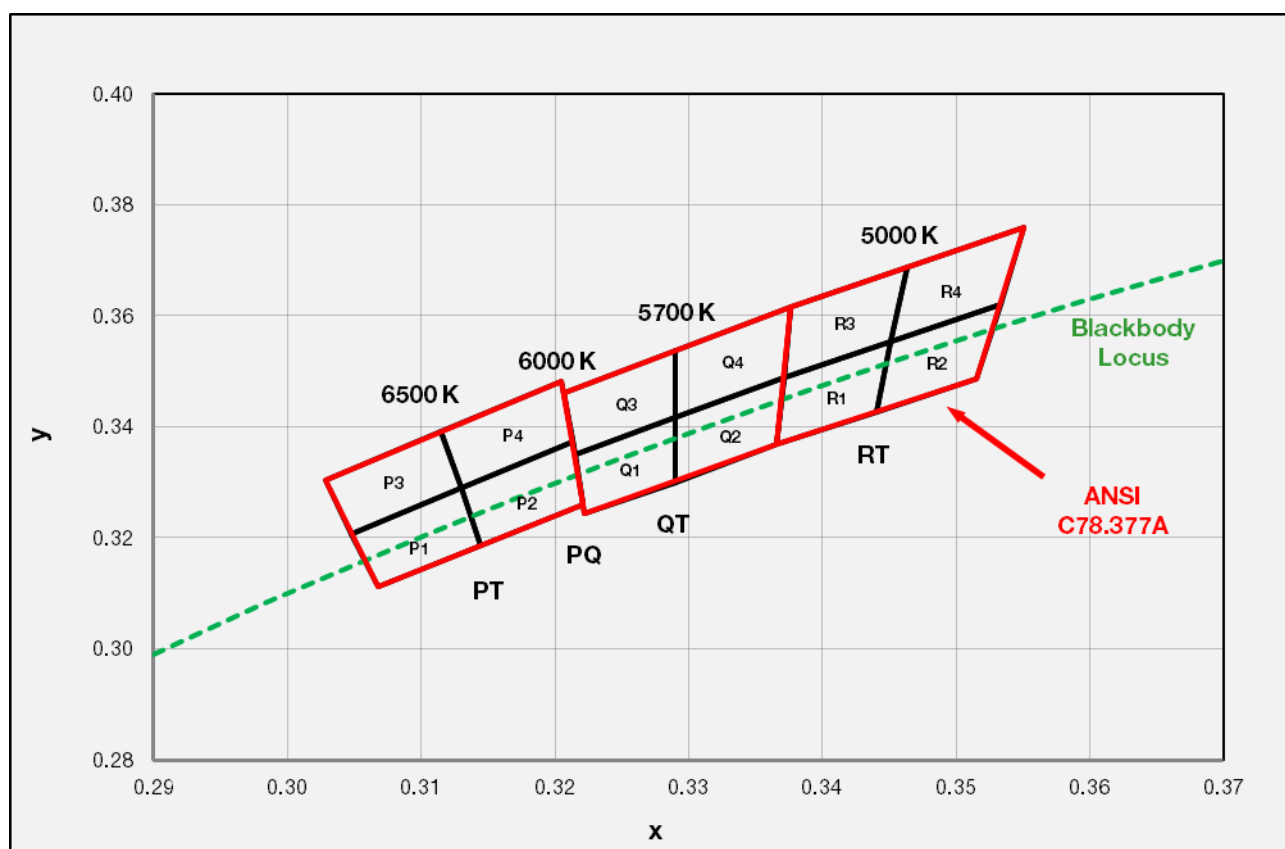
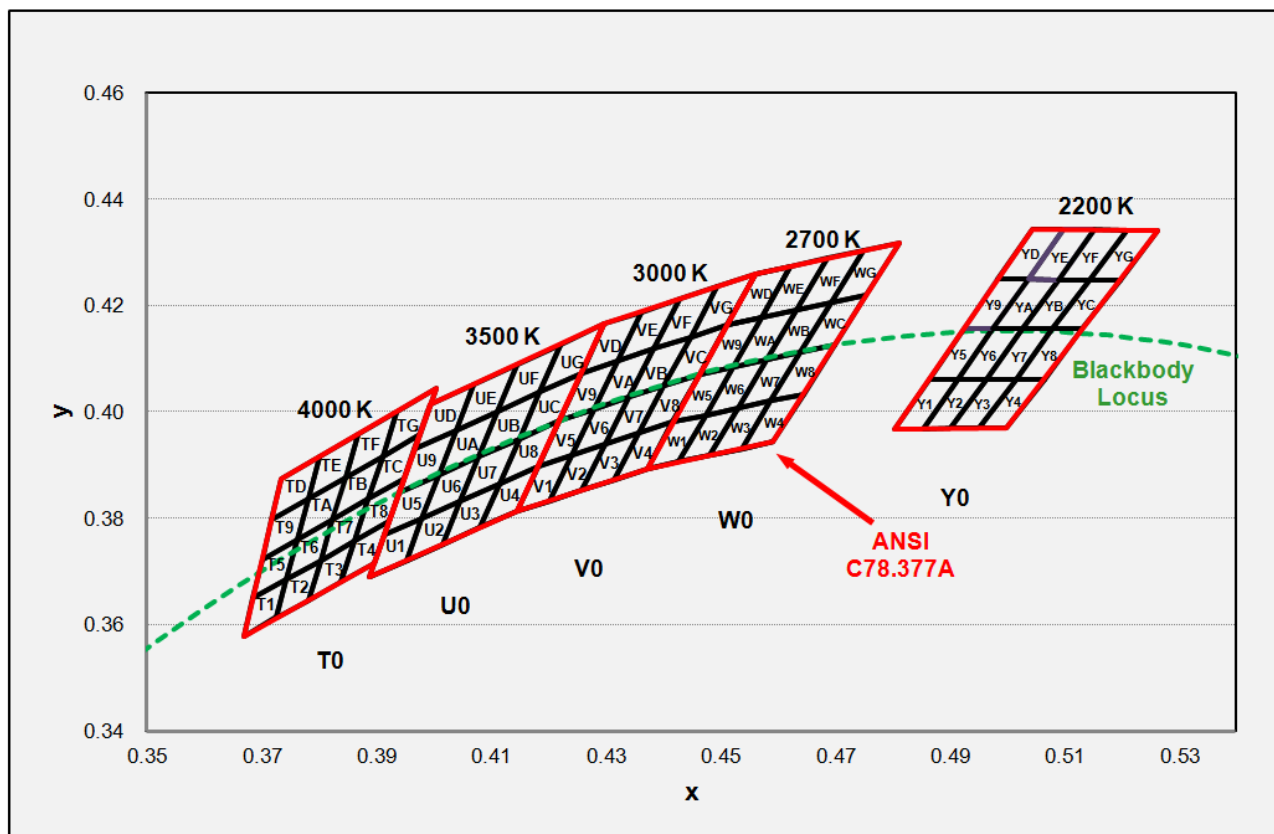
b) Color Bins ( $I_F = 350 \text{ mA}$ ,  $T_j = 85^\circ\text{C}$ )

| Nominal CCT (K) | CRI (R <sub>a</sub> ) Min. | Product Code       | Color Rank       | Chromaticity Bins |
|-----------------|----------------------------|--------------------|------------------|-------------------|
| 5000            | 70                         | SPHWH2L3D30CD4RTM3 | RT<br>(Half bin) | R1, R2, R3, R4    |
|                 |                            | SPHWH2L3D30CD4RTN3 |                  |                   |
|                 |                            | SPHWH2L3D30CD4RTP3 |                  |                   |
|                 | 80                         | SPHWH2L3D30ED4RTK3 |                  |                   |
|                 |                            | SPHWH2L3D30ED4RTM3 |                  |                   |
|                 |                            | SPHWH2L3D30CD4QTM3 |                  |                   |
| 5700            | 70                         | SPHWH2L3D30CD4QTN3 | QT<br>(Half bin) | Q1, Q2, Q3, Q4    |
|                 |                            | SPHWH2L3D30CD4QTP3 |                  |                   |
|                 |                            | SPHWH2L3D30ED4QTK3 |                  |                   |
|                 | 80                         | SPHWH2L3D30ED4QTM3 |                  |                   |
|                 |                            | SPHWH2L3D30ED4PQK3 |                  |                   |
|                 |                            | SPHWH2L3D30ED4PQM3 |                  |                   |
| 6000            | 80                         | SPHWH2L3D30CD4PTM3 | PT<br>(Half bin) | P1, P2, P3, P4    |
|                 |                            | SPHWH2L3D30CD4PTN3 |                  |                   |
|                 |                            | SPHWH2L3D30CD4PTP3 |                  |                   |
|                 | 70                         | SPHWH2L3D30ED4PTK3 |                  |                   |
|                 |                            | SPHWH2L3D30ED4PTM3 |                  |                   |
|                 |                            | SPHWH2L3D30ED4PTN3 |                  |                   |

**c) Voltage Bins ( $I_f = 350 \text{ mA}$ ,  $T_j = 85 \text{ °C}$ )**

| Nominal CCT<br>(K) | CRI (R <sub>a</sub> )<br>Min. | Product Code | Voltage Rank | Voltage Bin | Voltage Range<br>(V) |
|--------------------|-------------------------------|--------------|--------------|-------------|----------------------|
| -                  | -                             | -            | D4           | D2          | 2.6 ~ 2.8            |
|                    |                               |              |              | F2          | 2.8 ~ 3.0            |

d) Chromaticity Region & Coordinates ( $I_f = 350 \text{ mA}$ ,  $T_j = 85^\circ\text{C}$ )



**d) Chromaticity Region & Coordinates ( $I_F = 350 \text{ mA}$ ,  $T_j = 85 \text{ }^\circ\text{C}$ )**

| Region                 | CIE x  | CIE y  | Region | CIE x  | CIE y  |
|------------------------|--------|--------|--------|--------|--------|
| <b>Y rank (2200 K)</b> |        |        |        |        |        |
| Y1                     | 0.4805 | 0.3968 | Y9     | 0.4925 | 0.4156 |
|                        | 0.4854 | 0.3968 |        | 0.4976 | 0.4156 |
|                        | 0.4915 | 0.4062 |        | 0.5038 | 0.4250 |
|                        | 0.4865 | 0.4062 |        | 0.4984 | 0.4250 |
| Y2                     | 0.4854 | 0.3968 | YA     | 0.4976 | 0.4156 |
|                        | 0.4903 | 0.3969 |        | 0.5028 | 0.4156 |
|                        | 0.4966 | 0.4062 |        | 0.5091 | 0.4249 |
|                        | 0.4915 | 0.4062 |        | 0.5038 | 0.4250 |
| Y3                     | 0.4903 | 0.3969 | YB     | 0.5028 | 0.4156 |
|                        | 0.4952 | 0.3969 |        | 0.5080 | 0.4156 |
|                        | 0.5016 | 0.4062 |        | 0.5145 | 0.4249 |
|                        | 0.4966 | 0.4062 |        | 0.5091 | 0.4249 |
| Y4                     | 0.4952 | 0.3969 | YC     | 0.5080 | 0.4156 |
|                        | 0.5000 | 0.3969 |        | 0.5132 | 0.4156 |
|                        | 0.5066 | 0.4062 |        | 0.5198 | 0.4249 |
|                        | 0.5016 | 0.4062 |        | 0.5145 | 0.4249 |
| Y5                     | 0.4865 | 0.4062 | YD     | 0.4984 | 0.4250 |
|                        | 0.4915 | 0.4062 |        | 0.5038 | 0.4250 |
|                        | 0.4976 | 0.4156 |        | 0.5099 | 0.4344 |
|                        | 0.4925 | 0.4156 |        | 0.5044 | 0.4344 |
| Y6                     | 0.4915 | 0.4062 | YE     | 0.5038 | 0.4250 |
|                        | 0.4966 | 0.4062 |        | 0.5091 | 0.4249 |
|                        | 0.5028 | 0.4156 |        | 0.5154 | 0.4343 |
|                        | 0.4976 | 0.4156 |        | 0.5099 | 0.4344 |
| Y7                     | 0.4966 | 0.4062 | YF     | 0.5091 | 0.4249 |
|                        | 0.5016 | 0.4062 |        | 0.5145 | 0.4249 |
|                        | 0.508  | 0.4156 |        | 0.5209 | 0.4342 |
|                        | 0.5028 | 0.4156 |        | 0.5154 | 0.4343 |
| Y8                     | 0.5016 | 0.4062 | YG     | 0.5145 | 0.4249 |
|                        | 0.5066 | 0.4062 |        | 0.5198 | 0.4249 |
|                        | 0.5132 | 0.4156 |        | 0.5264 | 0.4342 |
|                        | 0.5080 | 0.4156 |        | 0.5209 | 0.4342 |

| Region                 | CIE x  | CIE y  | Region | CIE x  | CIE y  |
|------------------------|--------|--------|--------|--------|--------|
| <b>W rank (2700 K)</b> |        |        |        |        |        |
| W1                     | 0.4373 | 0.3893 | W9     | 0.4465 | 0.4071 |
|                        | 0.4418 | 0.3981 |        | 0.4513 | 0.4164 |
|                        | 0.4475 | 0.3994 |        | 0.4573 | 0.4178 |
|                        | 0.4428 | 0.3906 |        | 0.4523 | 0.4085 |
| W2                     | 0.4428 | 0.3906 | WA     | 0.4523 | 0.4085 |
|                        | 0.4475 | 0.3994 |        | 0.4573 | 0.4178 |
|                        | 0.4532 | 0.4008 |        | 0.4634 | 0.4193 |
|                        | 0.4483 | 0.3919 |        | 0.4582 | 0.4099 |
| W3                     | 0.4483 | 0.3919 | WB     | 0.4582 | 0.4099 |
|                        | 0.4532 | 0.4008 |        | 0.4634 | 0.4193 |
|                        | 0.4589 | 0.4021 |        | 0.4695 | 0.4207 |
|                        | 0.4538 | 0.3931 |        | 0.4641 | 0.4112 |
| W4                     | 0.4538 | 0.3931 | WC     | 0.4641 | 0.4112 |
|                        | 0.4589 | 0.4021 |        | 0.4695 | 0.4207 |
|                        | 0.4646 | 0.4034 |        | 0.4756 | 0.4221 |
|                        | 0.4593 | 0.3944 |        | 0.4700 | 0.4126 |
| W5                     | 0.4418 | 0.3981 | WD     | 0.4513 | 0.4164 |
|                        | 0.4465 | 0.4071 |        | 0.4562 | 0.4260 |
|                        | 0.4523 | 0.4085 |        | 0.4624 | 0.4274 |
|                        | 0.4475 | 0.3994 |        | 0.4573 | 0.4178 |
| W6                     | 0.4475 | 0.3994 | WE     | 0.4573 | 0.4178 |
|                        | 0.4523 | 0.4085 |        | 0.4624 | 0.4274 |
|                        | 0.4582 | 0.4099 |        | 0.4687 | 0.4289 |
|                        | 0.4532 | 0.4008 |        | 0.4634 | 0.4193 |
| W7                     | 0.4532 | 0.4008 | WF     | 0.4634 | 0.4193 |
|                        | 0.4582 | 0.4099 |        | 0.4687 | 0.4289 |
|                        | 0.4641 | 0.4112 |        | 0.4750 | 0.4304 |
|                        | 0.4589 | 0.4021 |        | 0.4695 | 0.4207 |
| W8                     | 0.4589 | 0.4021 | WG     | 0.4695 | 0.4207 |
|                        | 0.4641 | 0.4112 |        | 0.4750 | 0.4304 |
|                        | 0.4700 | 0.4126 |        | 0.4813 | 0.4319 |
|                        | 0.4646 | 0.4034 |        | 0.4756 | 0.4221 |

## d) Chromaticity Region &amp; Coordinates

| Region          | CIE x  | CIE y  | Region | CIE x  | CIE y  |
|-----------------|--------|--------|--------|--------|--------|
| V rank (3000 K) |        |        |        |        |        |
| V1              | 0.4147 | 0.3814 | V9     | 0.4221 | 0.3984 |
|                 | 0.4183 | 0.3898 |        | 0.4259 | 0.4073 |
|                 | 0.4242 | 0.3919 |        | 0.4322 | 0.4096 |
|                 | 0.4203 | 0.3833 |        | 0.4281 | 0.4006 |
| V2              | 0.4203 | 0.3833 | VA     | 0.4281 | 0.4006 |
|                 | 0.4242 | 0.3919 |        | 0.4322 | 0.4096 |
|                 | 0.4300 | 0.3939 |        | 0.4385 | 0.4119 |
|                 | 0.4259 | 0.3853 |        | 0.4342 | 0.4028 |
| V3              | 0.4259 | 0.3853 | VB     | 0.4342 | 0.4028 |
|                 | 0.4300 | 0.3939 |        | 0.4385 | 0.4119 |
|                 | 0.4359 | 0.3960 |        | 0.4449 | 0.4141 |
|                 | 0.4316 | 0.3873 |        | 0.4403 | 0.4049 |
| V4              | 0.4316 | 0.3873 | VC     | 0.4403 | 0.4049 |
|                 | 0.4359 | 0.3960 |        | 0.4449 | 0.4141 |
|                 | 0.4418 | 0.3981 |        | 0.4513 | 0.4164 |
|                 | 0.4373 | 0.3893 |        | 0.4465 | 0.4071 |
| V5              | 0.4183 | 0.3898 | VD     | 0.4259 | 0.4073 |
|                 | 0.4221 | 0.3984 |        | 0.4299 | 0.4165 |
|                 | 0.4281 | 0.4006 |        | 0.4364 | 0.4188 |
|                 | 0.4242 | 0.3919 |        | 0.4322 | 0.4096 |
| V6              | 0.4242 | 0.3919 | VE     | 0.4322 | 0.4096 |
|                 | 0.4281 | 0.4006 |        | 0.4364 | 0.4188 |
|                 | 0.4342 | 0.4028 |        | 0.4430 | 0.4212 |
|                 | 0.4300 | 0.3939 |        | 0.4385 | 0.4119 |
| V7              | 0.4300 | 0.3939 | VF     | 0.4385 | 0.4119 |
|                 | 0.4342 | 0.4028 |        | 0.4430 | 0.4212 |
|                 | 0.4403 | 0.4049 |        | 0.4496 | 0.4236 |
|                 | 0.4359 | 0.3960 |        | 0.4449 | 0.4141 |
| V8              | 0.4359 | 0.3960 | VG     | 0.4449 | 0.4141 |
|                 | 0.4403 | 0.4049 |        | 0.4496 | 0.4236 |
|                 | 0.4465 | 0.4071 |        | 0.4562 | 0.4260 |
|                 | 0.4418 | 0.3981 |        | 0.4513 | 0.4164 |

| Region          | CIE x  | CIE y  | Region | CIE x  | CIE y  |
|-----------------|--------|--------|--------|--------|--------|
| U rank (3500 K) |        |        |        |        |        |
| U1              | 0.3889 | 0.3690 | U9     | 0.3941 | 0.3848 |
|                 | 0.3915 | 0.3768 |        | 0.3968 | 0.3930 |
|                 | 0.3981 | 0.3800 |        | 0.4040 | 0.3966 |
|                 | 0.3953 | 0.3720 |        | 0.4010 | 0.3882 |
| U2              | 0.3953 | 0.3720 | UA     | 0.4010 | 0.3882 |
|                 | 0.3981 | 0.3800 |        | 0.4040 | 0.3966 |
|                 | 0.4048 | 0.3832 |        | 0.4113 | 0.4001 |
|                 | 0.4017 | 0.3751 |        | 0.4080 | 0.3916 |
| U3              | 0.4017 | 0.3751 | UB     | 0.4080 | 0.3916 |
|                 | 0.4048 | 0.3832 |        | 0.4113 | 0.4001 |
|                 | 0.4116 | 0.3865 |        | 0.4186 | 0.4037 |
|                 | 0.4082 | 0.3782 |        | 0.4150 | 0.3950 |
| U4              | 0.4082 | 0.3782 | UC     | 0.4150 | 0.3950 |
|                 | 0.4116 | 0.3865 |        | 0.4186 | 0.4037 |
|                 | 0.4183 | 0.3898 |        | 0.4259 | 0.4073 |
|                 | 0.4147 | 0.3814 |        | 0.4221 | 0.3984 |
| U5              | 0.3915 | 0.3768 | UD     | 0.3968 | 0.3930 |
|                 | 0.3941 | 0.3848 |        | 0.3996 | 0.4015 |
|                 | 0.4010 | 0.3882 |        | 0.4071 | 0.4052 |
|                 | 0.3981 | 0.3800 |        | 0.4040 | 0.3966 |
| U6              | 0.3981 | 0.3800 | UE     | 0.4040 | 0.3966 |
|                 | 0.4010 | 0.3882 |        | 0.4071 | 0.4052 |
|                 | 0.4080 | 0.3916 |        | 0.4146 | 0.4089 |
|                 | 0.4048 | 0.3832 |        | 0.4113 | 0.4001 |
| U7              | 0.4048 | 0.3832 | UF     | 0.4113 | 0.4001 |
|                 | 0.4080 | 0.3916 |        | 0.4146 | 0.4089 |
|                 | 0.4150 | 0.3950 |        | 0.4222 | 0.4127 |
|                 | 0.4116 | 0.3865 |        | 0.4186 | 0.4037 |
| U8              | 0.4116 | 0.3865 | UG     | 0.4186 | 0.4037 |
|                 | 0.4150 | 0.3950 |        | 0.4222 | 0.4127 |
|                 | 0.4221 | 0.3984 |        | 0.4299 | 0.4165 |
|                 | 0.4183 | 0.3898 |        | 0.4259 | 0.4073 |

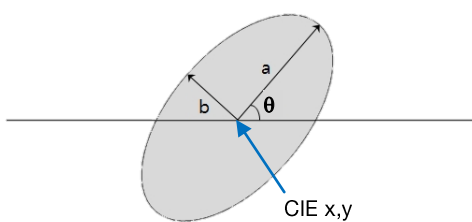
## d) Chromaticity Region &amp; Coordinates

| Region          | CIE x  | CIE y  | Region | CIE x  | CIE y  |
|-----------------|--------|--------|--------|--------|--------|
| T rank (4000 K) |        |        |        |        |        |
| T1              | 0.3670 | 0.3578 | T9     | 0.3702 | 0.3722 |
|                 | 0.3726 | 0.3612 |        | 0.3763 | 0.3760 |
|                 | 0.3744 | 0.3685 |        | 0.3782 | 0.3837 |
|                 | 0.3686 | 0.3649 |        | 0.3719 | 0.3797 |
| T2              | 0.3726 | 0.3612 | TA     | 0.3763 | 0.3760 |
|                 | 0.3783 | 0.3646 |        | 0.3825 | 0.3798 |
|                 | 0.3804 | 0.3721 |        | 0.3847 | 0.3877 |
|                 | 0.3744 | 0.3685 |        | 0.3782 | 0.3837 |
| T3              | 0.3783 | 0.3646 | TB     | 0.3825 | 0.3798 |
|                 | 0.3840 | 0.3681 |        | 0.3887 | 0.3836 |
|                 | 0.3863 | 0.3758 |        | 0.3912 | 0.3917 |
|                 | 0.3804 | 0.3721 |        | 0.3847 | 0.3877 |
| T4              | 0.3840 | 0.3681 | TC     | 0.3887 | 0.3837 |
|                 | 0.3898 | 0.3716 |        | 0.3950 | 0.3875 |
|                 | 0.3924 | 0.3794 |        | 0.3978 | 0.3958 |
|                 | 0.3863 | 0.3758 |        | 0.3912 | 0.3917 |
| T5              | 0.3686 | 0.3649 | TD     | 0.3719 | 0.3797 |
|                 | 0.3744 | 0.3685 |        | 0.3782 | 0.3837 |
|                 | 0.3763 | 0.3760 |        | 0.3802 | 0.3916 |
|                 | 0.3702 | 0.3722 |        | 0.3736 | 0.3874 |
| T6              | 0.3744 | 0.3685 | TE     | 0.3782 | 0.3837 |
|                 | 0.3804 | 0.3721 |        | 0.3847 | 0.3877 |
|                 | 0.3825 | 0.3798 |        | 0.3869 | 0.3958 |
|                 | 0.3763 | 0.3760 |        | 0.3802 | 0.3916 |
| T7              | 0.3804 | 0.3721 | TF     | 0.3847 | 0.3877 |
|                 | 0.3863 | 0.3758 |        | 0.3912 | 0.3917 |
|                 | 0.3887 | 0.3836 |        | 0.3937 | 0.4001 |
|                 | 0.3825 | 0.3798 |        | 0.3869 | 0.3958 |
| T8              | 0.3863 | 0.3758 | TG     | 0.3912 | 0.3917 |
|                 | 0.3924 | 0.3794 |        | 0.3978 | 0.3958 |
|                 | 0.3950 | 0.3875 |        | 0.4006 | 0.4044 |
|                 | 0.3887 | 0.3836 |        | 0.3937 | 0.4001 |

#### d) Chromaticity Region & Coordinates

| Region          | CIE x  | CIE y  | Region           | CIE x  | CIE y  | Region          | CIE x  | CIE y  | Region           | CIE x  | CIE y  | Region          | CIE x  | CIE y  |
|-----------------|--------|--------|------------------|--------|--------|-----------------|--------|--------|------------------|--------|--------|-----------------|--------|--------|
| R rank (5000 K) |        |        | QR rank (5300 K) |        |        | Q rank (5700 K) |        |        | PQ rank (6000 K) |        |        | P rank (6500 K) |        |        |
| R1              | 0.3371 | 0.3490 | Q2               | 0.3290 | 0.3417 | Q1              | 0.3215 | 0.3350 | P2               | 0.3144 | 0.3186 | P1              | 0.3068 | 0.3113 |
|                 | 0.3451 | 0.3554 |                  | 0.3371 | 0.3490 |                 | 0.3290 | 0.3417 |                  | 0.3221 | 0.3261 |                 | 0.3144 | 0.3186 |
|                 | 0.344  | 0.3427 |                  | 0.3366 | 0.3369 |                 | 0.3290 | 0.330  |                  | 0.3213 | 0.3373 |                 | 0.3130 | 0.329  |
|                 | 0.3366 | 0.3369 |                  | 0.3290 | 0.3300 |                 | 0.3222 | 0.3243 |                  | 0.3130 | 0.3290 |                 | 0.3048 | 0.3207 |
| R2              | 0.3451 | 0.3554 | R1               | 0.3371 | 0.3490 | Q2              | 0.3290 | 0.3417 | Q1               | 0.3215 | 0.335  | P2              | 0.3144 | 0.3186 |
|                 | 0.3533 | 0.3620 |                  | 0.3451 | 0.3554 |                 | 0.3371 | 0.3490 |                  | 0.3290 | 0.3417 |                 | 0.3221 | 0.3261 |
|                 | 0.3515 | 0.3487 |                  | 0.3440 | 0.3427 |                 | 0.3366 | 0.3369 |                  | 0.3290 | 0.3300 |                 | 0.3213 | 0.3373 |
|                 | 0.3404 | 0.3427 |                  | 0.3366 | 0.3369 |                 | 0.3290 | 0.3300 |                  | 0.3222 | 0.3243 |                 | 0.3130 | 0.3290 |
| R3              | 0.3376 | 0.3616 | Q4               | 0.3290 | 0.3538 | Q3              | 0.3207 | 0.3462 | P4               | 0.3130 | 0.3290 | P3              | 0.3048 | 0.3207 |
|                 | 0.3463 | 0.3687 |                  | 0.3376 | 0.3616 |                 | 0.3290 | 0.3538 |                  | 0.3213 | 0.3373 |                 | 0.3130 | 0.3290 |
|                 | 0.3451 | 0.3554 |                  | 0.3371 | 0.3490 |                 | 0.3290 | 0.3417 |                  | 0.3205 | 0.3481 |                 | 0.3115 | 0.3391 |
|                 | 0.3371 | 0.349  |                  | 0.3290 | 0.3417 |                 | 0.3215 | 0.3350 |                  | 0.3115 | 0.3391 |                 | 0.3028 | 0.3304 |
| R4              | 0.3463 | 0.3687 | R3               | 0.3376 | 0.3616 | Q4              | 0.3290 | 0.3538 | Q3               | 0.3207 | 0.3462 | P4              | 0.3130 | 0.3290 |
|                 | 0.3551 | 0.3760 |                  | 0.3463 | 0.3687 |                 | 0.3376 | 0.3616 |                  | 0.3290 | 0.3538 |                 | 0.3213 | 0.3373 |
|                 | 0.3533 | 0.3620 |                  | 0.3451 | 0.3554 |                 | 0.3371 | 0.3490 |                  | 0.3290 | 0.3417 |                 | 0.3205 | 0.3481 |
|                 | 0.3451 | 0.3554 |                  | 0.3371 | 0.3490 |                 | 0.3290 | 0.3417 |                  | 0.3215 | 0.3350 |                 | 0.3115 | 0.3391 |

#### e) MacAdam 3-step Ellipse ( $I_F = 350 \text{ mA}$ , $T_j = 85^\circ\text{C}$ )



| Nom. CCT (K) | Color Rank | Center |        | Rotation Angle $\theta$ (°) | a      | b      |
|--------------|------------|--------|--------|-----------------------------|--------|--------|
|              |            | CIE x  | CIE y  |                             |        |        |
| 2200         | YM         | 0.5018 | 0.4153 | 53.45                       | 0.0072 | 0.0040 |
| 2700         | WM         | 0.4578 | 0.4101 | 53.70                       | 0.0081 | 0.0042 |
| 3000         | VM         | 0.4338 | 0.4030 | 53.22                       | 0.0083 | 0.0041 |
| 3500         | UM         | 0.4073 | 0.3917 | 54.00                       | 0.0093 | 0.0041 |
| 4000         | TM         | 0.3818 | 0.3797 | 53.72                       | 0.0094 | 0.0040 |

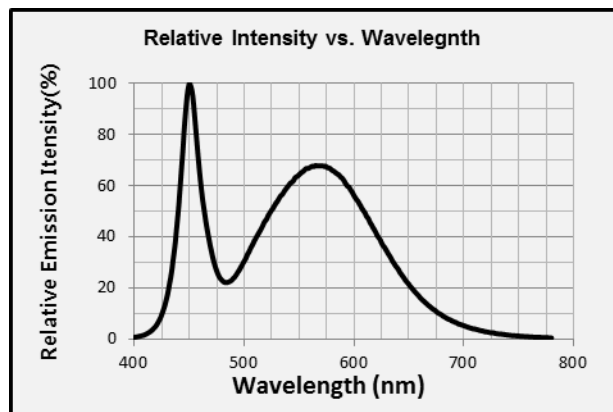
#### Note:

Samsung maintains measurement tolerance of:  $C_x, C_y = \pm 0.005$

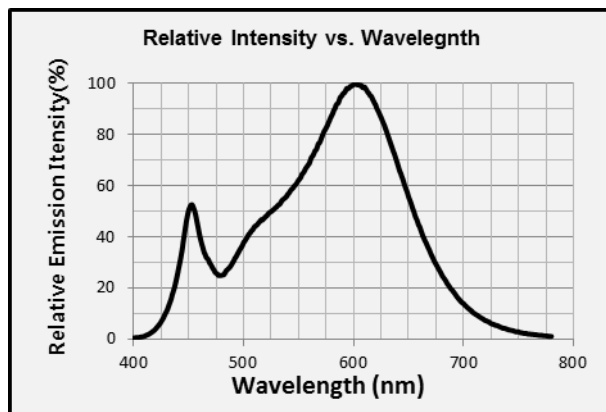
### 3. Typical Characteristics Graphs

#### a) Spectrum Distribution ( $I_f = 350 \text{ mA}$ , $T_j = 85^\circ\text{C}$ )

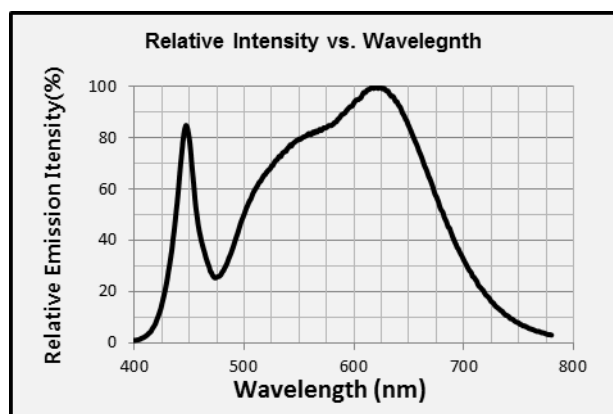
Cool White (CRI70)



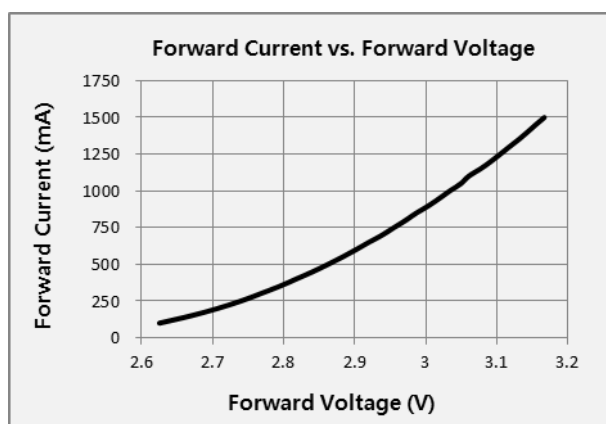
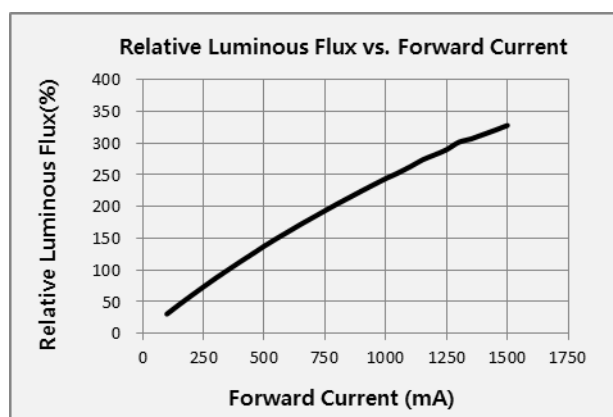
Warm White (CRI80)



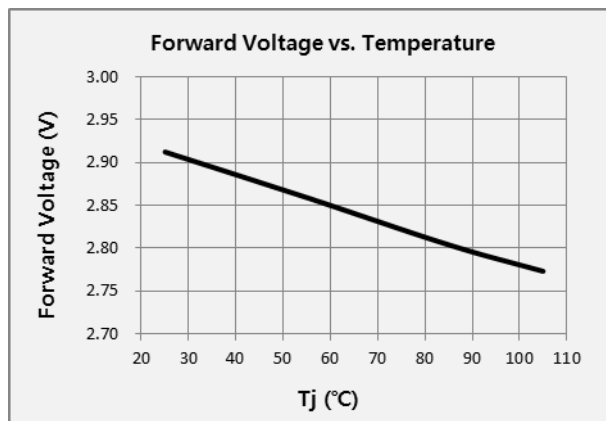
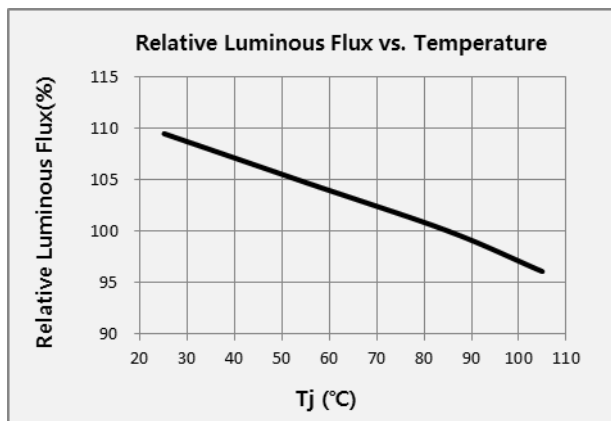
Warm White (CRI90)



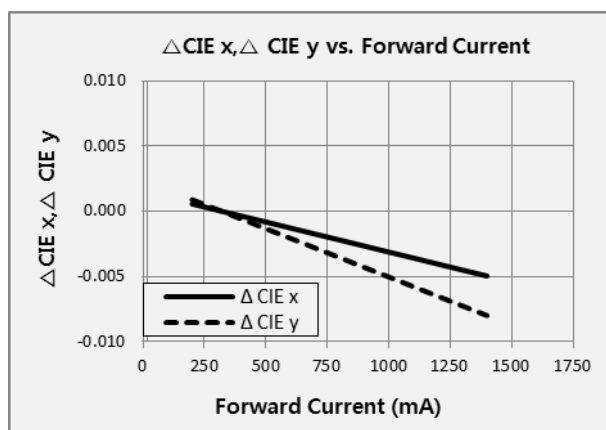
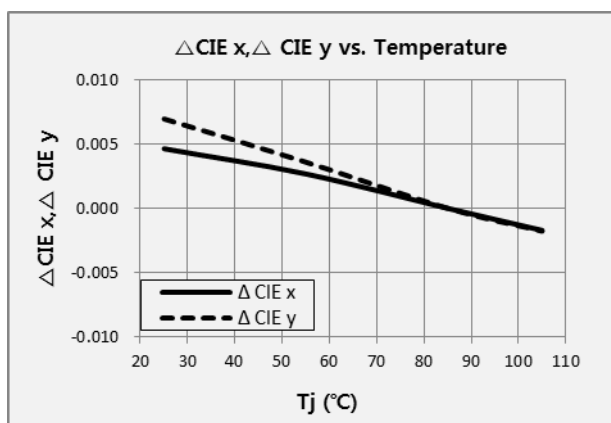
#### b) Forward Current Characteristics ( $T_j = 85^\circ\text{C}$ )



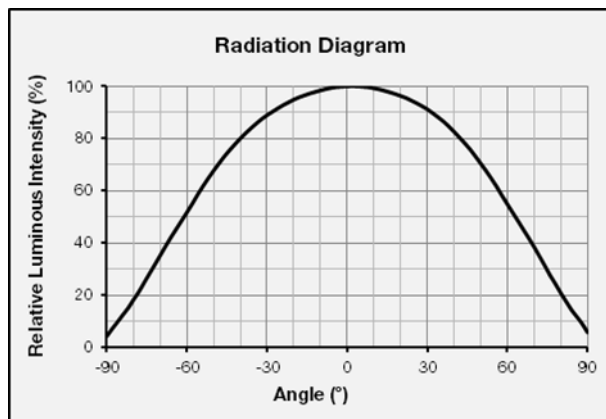
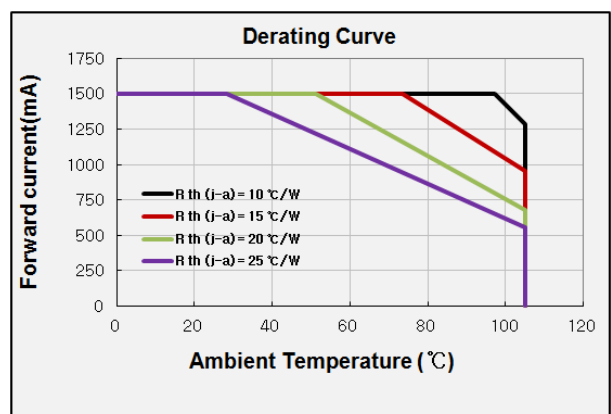
c) Temperature Characteristics ( $I_F = 350 \text{ mA}$ )



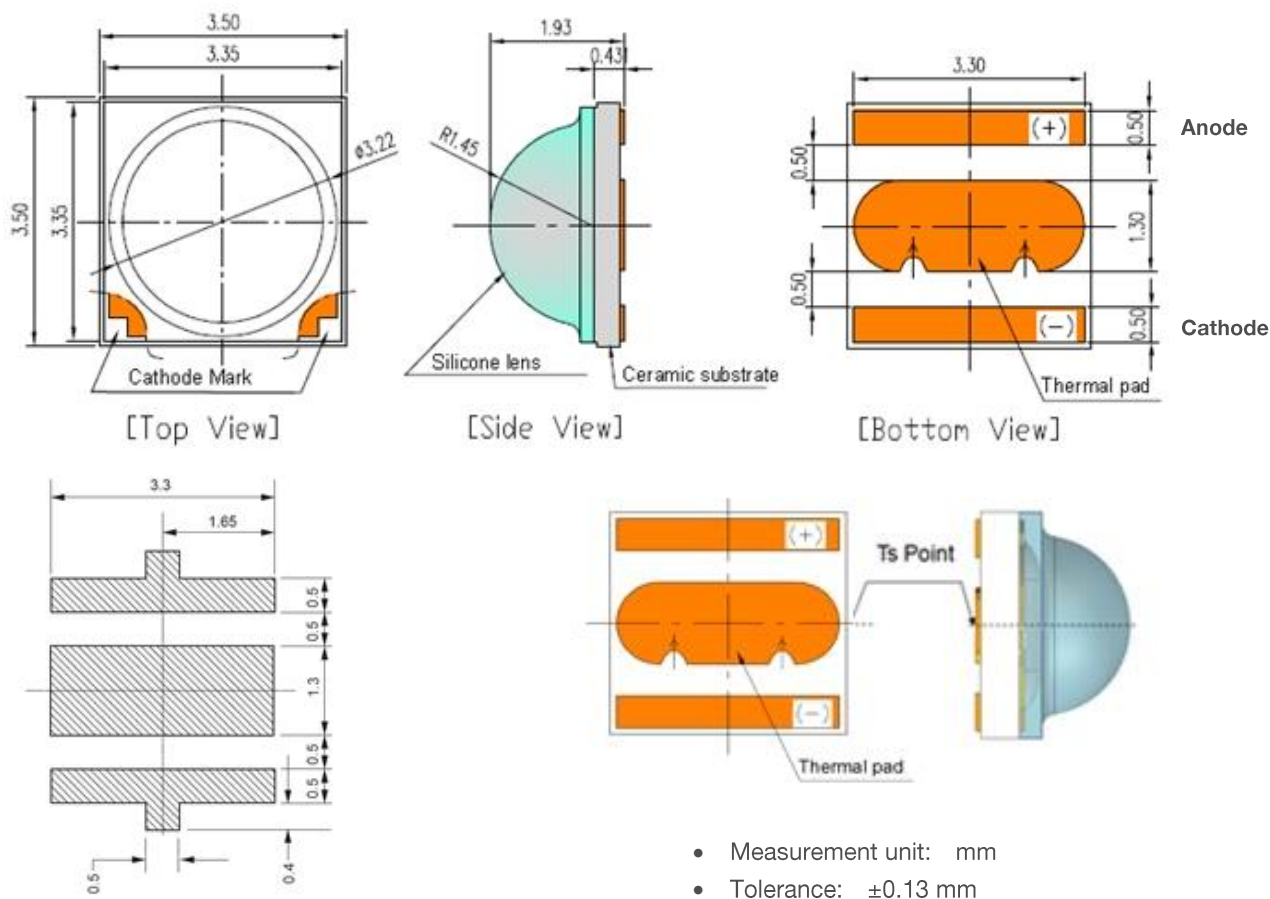
d) Color Shift Characteristics ( $I_F = 350 \text{ mA}$ ,  $T_j = 85 \text{ °C}$ )



e) Derating Curve and Beam Angle Characteristics ( $I_F = 350 \text{ mA}$ ,  $T_j = 25 \text{ °C}$ )



#### 4. Outline Drawing & Dimension



#### Recommended Soldering Pattern

##### Notes:

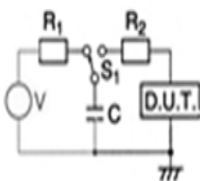
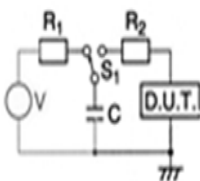
- 1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
- 2) The thermal pad is electrically isolated from the anode and cathode contact pads.
- 3)  $T_s$  point and measurement method:
  - ① Measure the nearest point to thermal pad as shown above. If necessary, remove PSR of PCB to reach  $T_s$  point.
  - ② All pads must be soldered to the PCB to dissipate heat properly, otherwise the LED can be damaged.

##### Precautions:

- 1) Pressure on the LEDs will influence to the reliability of the LEDs. Precautions should be taken to avoid strong pressure on the LEDs. Do not put stress on the LEDs during heating.
- 2) Re-soldering should not be done after the LEDs have been soldered. If re-soldering is unavoidable, LED's characteristics should be carefully checked before and after such repair.
- 3) Do not stack assembled PCBs together. Since materials of LEDs is soft, abrasion between two PCB assembled with LED might cause catastrophic failure of the LEDs.

## 5. Reliability Test Items & Conditions

### a) Test Items

| Test Item                           | Test Condition                                                                                                                                                                                                   | Test Hour / Cycle | Sample Size |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|
| Room Temperature Life Test          | 25 °C, DC Derating I <sub>F</sub>                                                                                                                                                                                | 1000 h            | 22          |
| High Temperature Life Test          | 85 °C, DC Derating I <sub>F</sub>                                                                                                                                                                                | 1000 h            | 22          |
| High Temperature Humidity Life Test | 85 °C, 85 % RH, DC Derating I <sub>F</sub>                                                                                                                                                                       | 1000 h            | 22          |
| Low Temperature Life Test           | -40 °C, DC Derating I <sub>F</sub>                                                                                                                                                                               | 1000 h            | 22          |
| Damp Heat Cycling                   | -10 °C ↔ 25 °C 95 % RH ↔ 65 °C 95 % RH<br>DC Derating I <sub>F</sub> , 24 h / 1 cycle                                                                                                                            | 10 cycles         | 11          |
| Powered Temperature Cycle           | -40 °C / 85 °C each 20 min, 100 min transfer<br>power on/off each 5 min, DC Derating I <sub>F</sub>                                                                                                              | 100 cycles        | 11          |
| Temperature Cycling                 | -45 °C / 15 min ↔ 125 °C / 15 min<br>temperature change within 5 min                                                                                                                                             | 500 cycles        | 100         |
| High Temperature Storage            | 120 °C                                                                                                                                                                                                           | 1000 h            | 11          |
| Low Temperature Storage             | -40 °C                                                                                                                                                                                                           | 1000 h            | 11          |
| ESD (HBM)                           | <div></div> <div><div>R<sub>1</sub>: 10 MΩ</div><div>R<sub>2</sub>: 1.5 kΩ</div><div>C: 100 pF</div><div>V: ±8 kV</div></div> | 5 times           | 30          |
| ESD (MM)                            | <div></div> <div><div>R<sub>1</sub>: 10 MΩ</div><div>R<sub>2</sub>: 0</div><div>C: 200 pF</div><div>V: ±0.5 kV</div></div>    | 5 times           | 30          |
| Vibration Test                      | 20~2000~20 Hz, 200 m/s <sup>2</sup> , sweep 4 min<br>X, Y, Z 3 direction, each 1 cycle                                                                                                                           | 4 cycles          | 11          |
| Mechanical Shock Test               | 1500 g, 0.5 ms<br>3 shocks each X-Y-Z axis                                                                                                                                                                       | 5 cycles          | 11          |

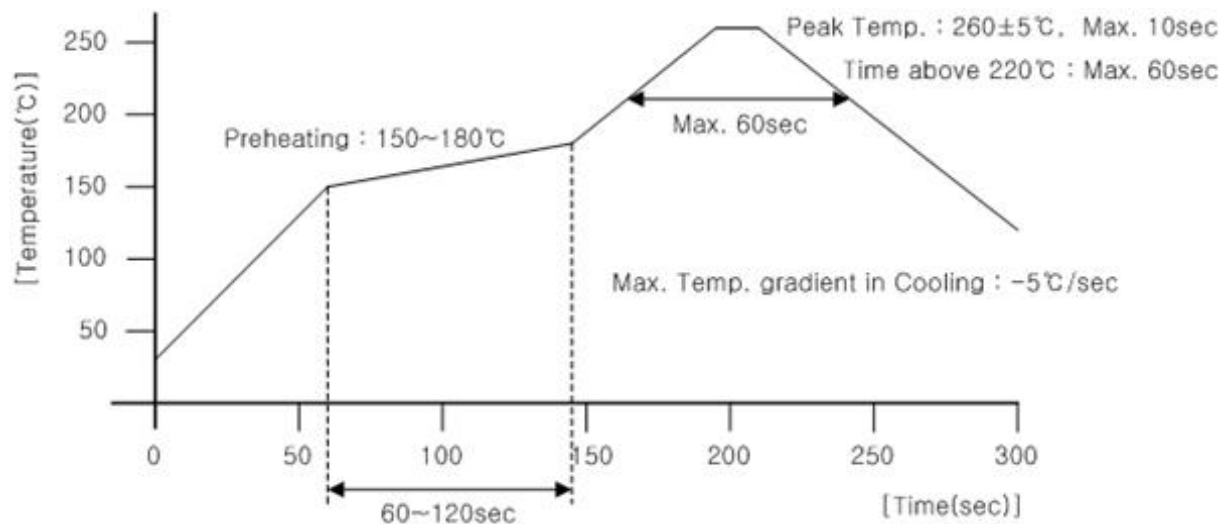
### b) Criteria for Judging the Damage

| Item            | Symbol   | Test Condition<br>( $T_j = 25$ °C) | Limit             |                   |
|-----------------|----------|------------------------------------|-------------------|-------------------|
|                 |          |                                    | Min.              | Max.              |
| Forward Voltage | $V_F$    | $I_F = 350$ mA                     | Init. Value * 0.9 | Init. Value * 1.1 |
| Luminous Flux   | $\Phi_v$ | $I_F = 350$ mA                     | Init. Value * 0.7 | Init. Value * 1.1 |

## 6. Soldering Conditions

### a) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



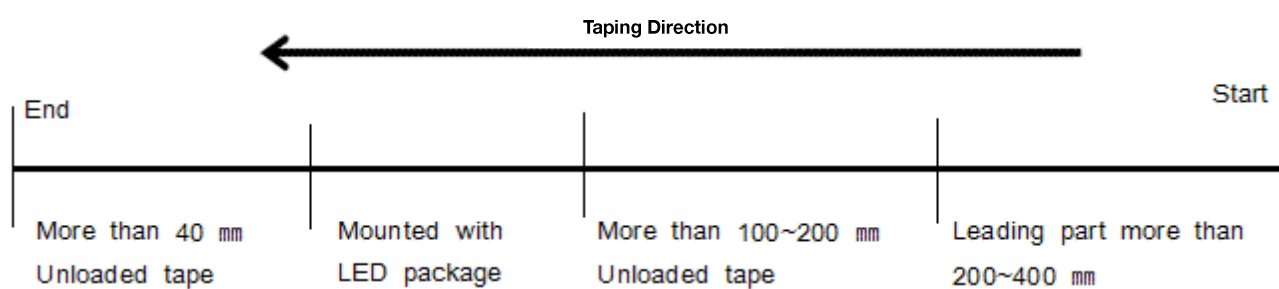
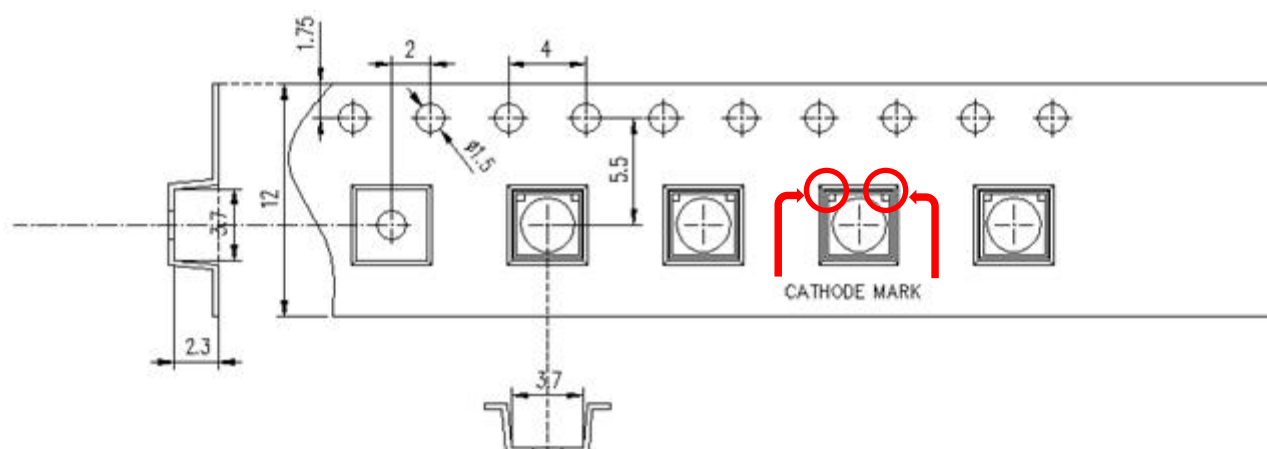
### b) Manual Soldering Conditions

Not more than 5 seconds @ max. 300 °C, under soldering iron.

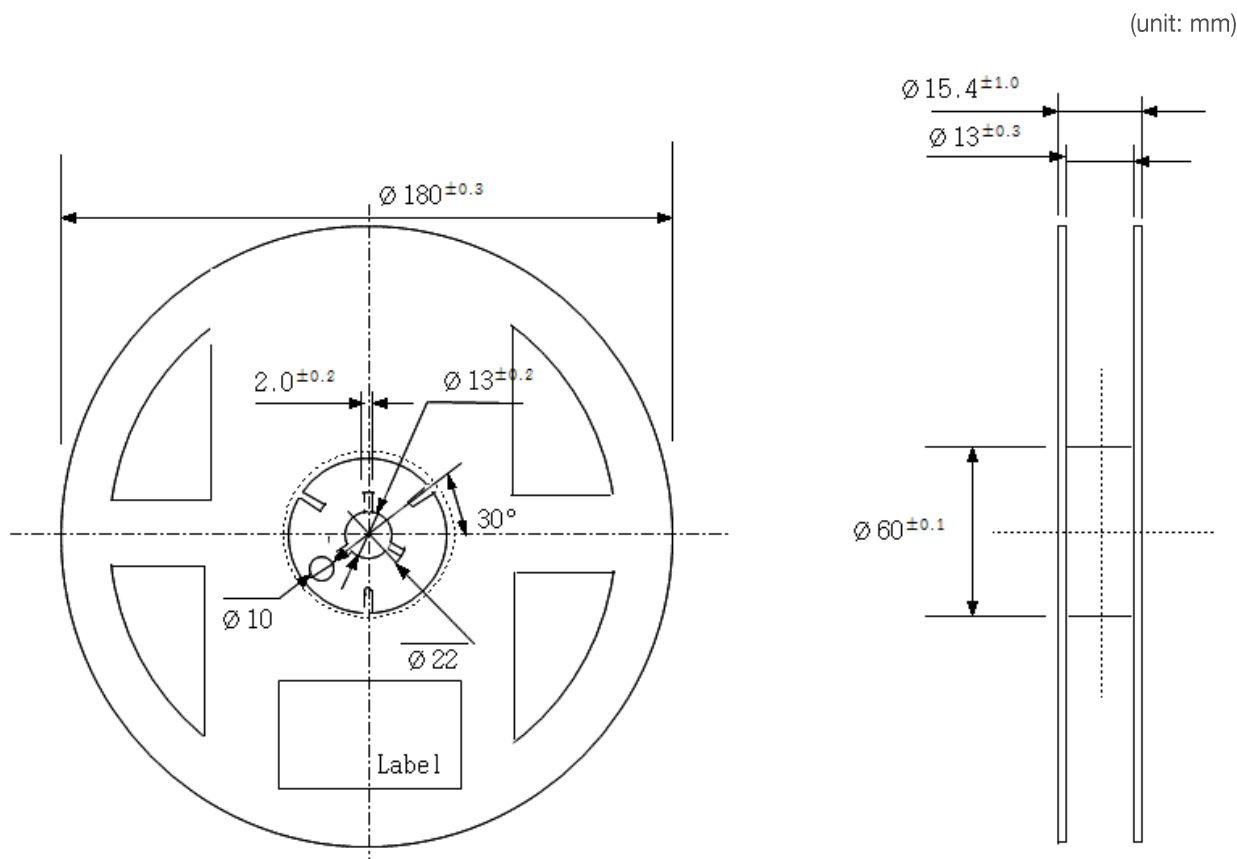
## 7. Tape & Reel

### a) Taping Dimension

(unit: mm)



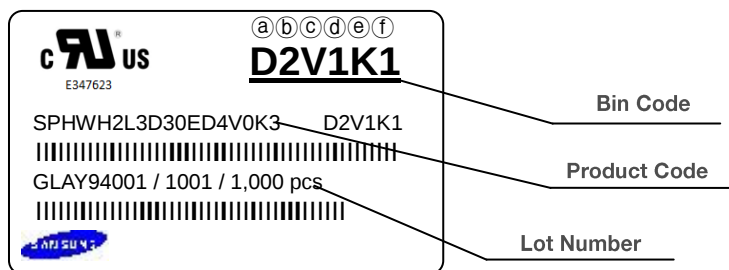
## b) Reel Dimension

**Notes:**

- 1) Quantity: The quantity/reel is 1,000 pcs
- 2) Cumulative tolerance: Cumulative tolerance / 10 pitches is  $\pm 0.2$  mm
- 3) Adhesion strength of cover tape: Adhesion strength is 0.1-0.7 N when the cover tape is turned off from the carrier tape at  $10^\circ$  angle to the carrier tape
- 4) Packaging: P/N, Manufacturing data code no. and quantity are indicated on the aluminum packing bag

## 8. Label Structure

### a) Label Structure



Note: Denoted bin code and product code above is only an example (see description on page 7)

Bin Code:

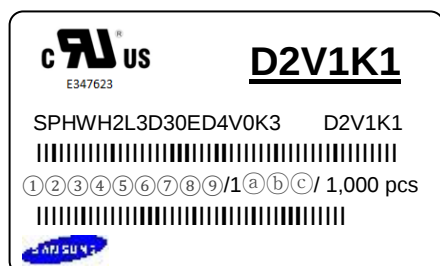
ⒶⒷ: Forward Voltage bin (refer to page 15)

ⒸⒹ: Chromaticity bin (refer to page 16-19)

ⒺⒻ: Luminous Flux bin (refer to page 8-11)

### b) Lot Number

The lot number is composed of the following characters:



①②③④⑤⑥⑦⑧⑨ / 1 Ⓐ Ⓑ Ⓒ / 1,000 pcs

- ① : Production site (S: Giheung, Korea, G: Tianjin, China)
- ② : L (LED)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : year (Y: 2014, Z: 2015, A: 2016, ...)
- ⑤ : Month (1~9, A, B, C)
- ⑥ : Day (1~9, A, B~V)
- ⑦⑧⑨ : Product serial number (001 ~ 999)
- Ⓐ Ⓑ Ⓒ : Reel number (001 ~ 999)



## b) Aluminum Vinyl Packing Bag



**CAUTION**

This bag contains  
**MOISTURE SENSITIVE DEVICES**

**LEVEL**  
**2a**

- Shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
- Peak package body temperature: 240 °C
- After this bag is opened, devices that will be subjected to reflow solder or other high temperature processes must be:
  - Mounted within 672 hours at factory conditions of equal to or less than 30°C /60% RH, or
  - Stored at < 10% RH
- Devices require bake, before mounting, if:
  - Humidity Indicator Card is > 65% when read at 23±5°C, or
  - 2a is not met.
- If baking is required, devices must be baked for 1 hours at 60±5°C

Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure.

Bag seal due date: \_\_\_\_\_  
(If blank, see code label)

Note: Level and body temperature by IPC/JEDEC J-STD-020



**D2V1K1**

SPHWH2L3D30ED4V0K3     D2V1K1

|||||

GLAY94001 / 1001 / 1,000 pcs

|||||





**ATTENTION**

OBserve PRECAUTIONS  
FOR HANDLING  
ELECTROSTATIC  
SENSITIVE  
DEVICES



■ 주의 사항

이 알루미늄 지퍼 백은 습기 및 정전기로부터 제품을 보호하기 위하여 제작되었습니다. 개봉 후에는 즉시 솔더 작업을 실시하는 것을 권장합니다.

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■ Important

This Al Zipper bag is designed to protect the enclosed products from moisture and ESD. Once opened, the products should be soldered onto the printed circuit board immediately. When not in use, please do not leave the products unprotected by the Al Zipper Bag. To repack unused products., please ensure the zip-lock is completely sealed with the dry pack left inside.

## c) Silica Gel &amp; Humidity Indicator Card inside Aluminum Vinyl Bag



## 10. Precautions in Handling & Use

- 1) For over-current protection, users are recommended to apply resistors connected in series with the LEDs to mitigate sudden change of the forward current caused by shift of forward voltage.
- 2) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. When cleaning is required, IPA is recommended as the cleaning agent. Some solvent-based cleaning agent may damage the silicone resins used in the device.
- 3) When the device is in operation, the forward current should be carefully determined considering the maximum ambient temperature and corresponding junction temperature.
- 4) LEDs must be stored in a clean environment. If the LEDs are to be stored for three months or more after being shipped from Samsung, they should be packed with a nitrogen-filled container (shelf life of sealed bags is 12 months at temperature 0~40 °C, 0~90 % RH).
- 5) After storage bag is opened, device subjected to soldering, solder reflow, or other high temperature processes must be:
  - a. Mounted within 672 hours (28 days) at an assembly line with a condition of no more than 30 °C / 60 % RH, or
  - b. Stored at <10 % RH
- 6) Repack unused devices with anti-moisture packing, fold to close any opening and then store in a dry place.
- 7) Devices require baking before mounting, if humidity card reading is >60 % at 23 ± 5 °C.
- 8) Devices must be baked for 1 hour at 60 ± 5 °C, if baking is required.
- 9) The LEDs are sensitive to the static electricity and surge current. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs. If voltage exceeding the absolute maximum rating is applied to LEDs, it may cause damage or even destruction to LED devices. Damaged LEDs may show some unusual characteristics such as increase in leakage current, lowered turn-on voltage, or abnormal lighting of LEDs at low current.
- 10) VOCs (Volatile Organic Compounds) can be generated from adhesives, flux, hardener or organic additives used in luminaires (fixtures). Transparent LED silicone encapsulant is permeable to those chemicals and they may lead to a discoloration of encapsulant when they exposed to heat or light. This phenomenon can cause a significant loss of light emitted (output) from the luminaires. In order to prevent these problems, we recommend users to know the physical properties of materials used in luminaires and they must be carefully selected.

# Legal and additional information.

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