



**THE DATASHEET OF
SPMWH3326FD7GBP0SA**



Middle Power LED Series
3030

LM302Z
CRI 90



Features & Benefits

- 0.3 W class middle power LED
- EMC resin for high reliability
- Standard form factor for design flexibility (3.0 × 3.0 mm)



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1. Characteristics

a) Absolute Maximum Rating

| Item | Symbol | Rating | Unit | Condition |
|---------------------------------|-----------|------------|---------|------------------------------|
| Ambient / Operating Temperature | T_a | -40 ~ +85 | °C | - |
| Storage Temperature | T_{stg} | -40 ~ +100 | °C | - |
| LED Junction Temperature | T_j | 125 | °C | - |
| Forward Current | I_F | 200 | mA | - |
| Pulse Forward Current | I_{FP} | 400 | mA | Duty 1/10, pulse width 10 ms |
| Assembly Process Temperature | - | 260 <10 | °C s | - |
| ESD (HBM) | - | 5 | kV | - |

b) Electro-optical Characteristics ($I_F = 150 \text{ mA}$, $T_s = 25 \text{ °C}$)

| Item | Nominal CCT (K) | Rank | Bin | Min. | Typ. | Max. | Unit |
|---|-----------------|------|-----|------|------|------|------|
| Forward Voltage (V_F) | | GB | BZ | 5.8 | - | 6.0 | V |
| | | | B1 | 6.0 | - | 6.2 | |
| | | | B2 | 6.2 | - | 6.4 | |
| | | | B3 | 6.4 | - | 6.6 | |
| Reverse Voltage (@ 5 mA) | | | | 0.7 | - | 1.2 | V |
| Color Rendering Index (R_a) | | 7 | | 90 | - | - | |
| Special CRI (R9) | | | | 50 | - | - | - |
| Thermal Resistance (junction to solder point) | | | | - | 12 | - | °C/W |
| Beam Angle | | | | - | 120 | - | ° |

Note:

Samsung maintains measurement tolerance of: forward voltage = $\pm 0.1 \text{ V}$, luminous flux = $\pm 5 \%$, CRI = ± 3 , R9 = ± 6.5

2. Product Code Information

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| S | P | M | W | H | T | 3 | 2 | 6 | F | D | 7 | G | B | V | 0 | S | A |

| Digit | PKG Information | Code | Specification |
|-------|------------------------------|--|---|
| 1 2 3 | Samsung Package Middle Power | SPM | |
| 4 5 | Color | WH | White |
| 6 | Product Version | T | 1 : No Zener version 3 : Zener version |
| 7 8 9 | Form Factor | 326 | 3.0 x 3.0 x 0.65 mm |
| 10 | Sorting Current | F | 150 mA |
| 11 | Chromaticity Coordinates | D | MacAdam |
| 12 | CRI | 7 | Min. 90 |
| 13 14 | Forward Voltage (V) | GB | 5.8~6.6 Bin Code: BZ 5.8~6.0 B1 6.0~6.2 B2 6.2~6.4 B3 6.4~6.6 |
| 15 16 | CCT (K) | W ☆ V ☆ U ☆ T ☆ R ☆ Q ☆ P ☆ | 2700 WN, WP, WQ, WR, WS, WT, WU 3000 VN, VP, VQ, VR, VS, VT, VU 3500 UN, UP, UQ, UR, US, UT, UU 4000 Bin Code: TN, TP, TQ, TR, TS, TT, TU 5000 RN, RP, RQ, RR, RS, RT, RU 5700 QN, QP, QQ, QR, QS, QT, QU 6500 PN, PP, PQ, PR, PS, PT, PU ☆ : "0" (Whole Bin) "3" (MacAdam 3- step) "Y" (Kitting) |
| 17 18 | Luminous Flux (lm) | SA | Bin Code: SA |

a) Luminous Flux Bins ($I_F = 150 \text{ mA}$, $T_s = 25 \text{ °C}$)

| Nominal CCT (K) | CRI Min. | Product Code | Flux Bin | Flux Range (Φ_v , lm) |
|-----------------|----------|--------------------|----------|-----------------------------|
| 2700 | 90 | SPMWH★326FD7GBW☆SA | SA | 103 - 113 |
| 3000 | 90 | SPMWH★326FD7GBV☆SA | SA | 107 - 117 |
| 3500 | 90 | SPMWH★326FD7GBU☆SA | SA | 109 - 119 |
| 4000 | 90 | SPMWH★326FD7GBT☆SA | SA | 113 - 123 |
| 5000 | 90 | SPMWH★326FD7GBR☆SA | SA | 114 - 124 |
| 5700 | 90 | SPMWH★326FD7GBQ☆SA | SA | 113 - 123 |
| 6500 | 90 | SPMWH★326FD7GBP☆SA | SA | 112 - 122 |

Note:

★ : "1" (No Zener) or "3" (Zener)

☆ : "0" (Whole Bin), "3" (MacAdam 3-step), "Y" (Kitting)

b) Kitting Rule

1) Y Kitting bin Concept

1. Under agreement between customer and SAMSUNG ELECTRONICS, SAMSUNG can supply kitting bin (VF, Color, Im).
2. A forward voltage (VF) of kitting bin is combined by a pair of same VF rank such as (A2+A2) or (A3+A3).
3. A Chromaticity Coordinates of kitting bin is mixed by kitting procedure.(below kitting simulation)

[Kitting example]



[Binning Information]

| | | Bin #1 | Bin #2 |
|-----|--|--------|--------|
| VF | | BZ | BZ |
| | | B1 | B1 |
| | | B2 | B2 |
| | | B3 | B3 |
| CIE | | U | U |
| | | N | R |
| | | P | S |
| | | Q | T |

c) Color Bins (I_F = 150 mA, T_s = 25 °C)

| Nominal CCT | CRI | Product Code | Color Rank | Chromaticity Bins |
|-------------|-----|--------------------|------------------------|----------------------------|
| 2700 | 90 | SPMWH★326FD7GBW0SA | W0 (Whole Bin) | WN, WP, WQ, WR, WS, WT, WU |
| | | SPMWH★326FD7GBW3SA | W3 (MacAdam 3-step) | WU |
| | | SPMWH★326FD7GBWYSA | WY (Kitting) | WN, WP, WQ, WR, WS, WT, WU |
| 3000 | 90 | SPMWH★326FD7GBV0SA | V0 (Whole Bin) | VN, VP, VQ, VR, VS, VT, VU |
| | | SPMWH★326FD7GBV3SA | V3 (MacAdam 3-step) | VU |
| | | SPMWH★326FD7GBVYSA | VY (Kitting) | VN, VP, VQ, VR, VS, VT, VU |
| 3500 | 90 | SPMWH★326FD7GBU0SA | U0 (Whole Bin) | UN, UP, UQ, UR, US, UT, UU |
| | | SPMWH★326FD7GBU3SA | U3 (MacAdam 3-step) | UU |
| | | SPMWH★326FD7GBUYSA | UY (Kitting) | UN, UP, UQ, UR, US, UT, UU |
| 4000 | 90 | SPMWH★326FD7GBT0SA | T0 (Whole Bin) | TN, TP, TQ, TR, TS, TT, TU |
| | | SPMWH★326FD7GBT3SA | T3 (MacAdam 3-step) | TU |
| | | SPMWH★326FD7GBTYSA | TY (Kitting) | TN, TP, TQ, TR, TS, TT, TU |
| 5000 | 90 | SPMWH★326FD7GBR0SA | R0 (Whole Bin) | RN, RP, RQ, RR, RS, RT, RU |
| | | SPMWH★326FD7GBR3SA | R3 (MacAdam 3-step) | RU |
| | | SPMWH★326FD7GBRYSA | RY (Kitting) | RN, RP, RQ, RR, RS, RT, RU |
| 5700 | 90 | SPMWH★326FD7GBQ0SA | Q0 (Whole Bin) | QN, QP, QQ, QR, QS, QT, QU |
| | | SPMWH★326FD7GBQ3SA | Q3 (MacAdam 3-step) | QU |
| | | SPMWH★326FD7GBQYSA | QY (Kitting) | QN, QP, QQ, QR, QS, QT, QU |
| 6500 | 90 | SPMWH★326FD7GBP0SA | P0 (Whole Bin) | PN, PP, PQ, PR, PS, PT, PU |
| | | SPMWH★326FD7GBP3SA | P3 (MacAdam 3-step) | PU |
| | | SPMWH★326FD7GBPYSA | PY (Kitting) | PN, PP, PQ, PR, PS, PT, PU |

★ : “1” (No Zener) or “3” (Zener)

d) Voltage Bins (I_F = 150 mA, T_s = 25 °C)

| Nominal CCT (K) | CRI Min | Product Code | Voltage Rank | Voltage Bin | Voltage Range (V) |
|-----------------|------------|--------------|--------------|-------------|----------------------|
| - | - | - | GB | BZ | 5.8 ~ 6.0 |
| - | - | - | | B1 | 6.0 ~ 6.2 |
| - | - | - | | B2 | 6.2 ~ 6.4 |
| - | - | - | | B3 | 6.4 ~ 6.6 |

f) Chromaticity Region & Coordinates ($I_F = 150 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

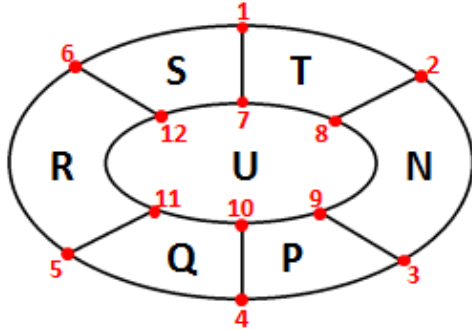


| MacAdam | CCT (K) | Center point | | Major-axis | Minor-axis | Rotation |
|---------|---------|--------------|--------|------------|------------|----------|
| | | CIE x | CIE y | a | b | ϕ |
| 3 step | 2700 | 0.4578 | 0.4101 | 0.0081 | 0.0042 | 53.70 |
| | 3000 | 0.4338 | 0.4030 | 0.0083 | 0.0041 | 53.22 |
| | 3500 | 0.4073 | 0.3917 | 0.0093 | 0.0041 | 54.00 |
| | 4000 | 0.3818 | 0.3797 | 0.0094 | 0.0040 | 53.72 |
| | 5000 | 0.3447 | 0.3553 | 0.0082 | 0.0035 | 59.62 |
| | 5700 | 0.3287 | 0.3417 | 0.0075 | 0.0032 | 59.10 |
| | 6500 | 0.3123 | 0.3282 | 0.0067 | 0.0029 | 58.57 |
| 5 step | 2700 | 0.4578 | 0.4101 | 0.0135 | 0.0070 | 53.70 |
| | 3000 | 0.4338 | 0.4030 | 0.0138 | 0.0068 | 53.22 |
| | 3500 | 0.4073 | 0.3917 | 0.0155 | 0.0068 | 54.00 |
| | 4000 | 0.3818 | 0.3797 | 0.0157 | 0.0067 | 53.72 |
| | 5000 | 0.3447 | 0.3553 | 0.0137 | 0.0058 | 59.62 |
| | 5700 | 0.3287 | 0.3417 | 0.0125 | 0.0053 | 59.10 |
| | 6500 | 0.3123 | 0.3282 | 0.0112 | 0.0048 | 58.57 |

Note:

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

e) Chromaticity Region & Coordinates



| CCT | Region | CIE x | CIE y |
|-------|--------|--------|--------|
| 2700K | 1 | 0.4521 | 0.4142 |
| | 2 | 0.4619 | 0.4216 |
| | 3 | 0.4675 | 0.4175 |
| | 4 | 0.4634 | 0.4059 |
| | 5 | 0.4537 | 0.3986 |
| | 6 | 0.4481 | 0.4028 |
| | 7 | 0.4544 | 0.4126 |
| | 8 | 0.4603 | 0.417 |
| | 9 | 0.4636 | 0.4145 |
| | 10 | 0.4612 | 0.4076 |
| | 11 | 0.4553 | 0.4032 |
| | 12 | 0.452 | 0.4057 |

| CCT | Region | CIE x | CIE y | CCT | Region | CIE x | CIE y | CCT | Region | CIE x | CIE y |
|-------|--------|--------|--------|-------|--------|--------|--------|-------|--------|--------|--------|
| 3000K | 1 | 0.4283 | 0.4071 | 3500K | 1 | 0.4018 | 0.3957 | 4000K | 1 | 0.3764 | 0.3837 |
| | 2 | 0.4382 | 0.4146 | | 2 | 0.4125 | 0.4046 | | 2 | 0.3871 | 0.3926 |
| | 3 | 0.4437 | 0.4105 | | 3 | 0.418 | 0.4005 | | 3 | 0.3925 | 0.3887 |
| | 4 | 0.4393 | 0.3989 | | 4 | 0.4128 | 0.3877 | | 4 | 0.3872 | 0.3758 |
| | 5 | 0.4293 | 0.3913 | | 5 | 0.4022 | 0.3788 | | 5 | 0.3765 | 0.3668 |
| | 6 | 0.4239 | 0.3954 | | 6 | 0.3966 | 0.3828 | | 6 | 0.3711 | 0.3707 |
| | 7 | 0.4305 | 0.4054 | | 7 | 0.404 | 0.3941 | | 7 | 0.3786 | 0.3821 |
| | 8 | 0.4364 | 0.41 | | 8 | 0.4104 | 0.3994 | | 8 | 0.385 | 0.3874 |
| | 9 | 0.4397 | 0.4075 | | 9 | 0.4137 | 0.397 | | 9 | 0.3882 | 0.3851 |
| | 10 | 0.4371 | 0.4005 | | 10 | 0.4106 | 0.3893 | | 10 | 0.385 | 0.3773 |
| | 11 | 0.4311 | 0.396 | | 11 | 0.4042 | 0.384 | | 11 | 0.3786 | 0.372 |
| | 12 | 0.4279 | 0.3984 | | 12 | 0.4009 | 0.3864 | | 12 | 0.3754 | 0.3743 |
| 5000K | 1 | 0.3397 | 0.3583 | 5700K | 1 | 0.3242 | 0.3445 | 6500K | 1 | 0.3082 | 0.3307 |
| | 2 | 0.3482 | 0.367 | | 2 | 0.332 | 0.3524 | | 2 | 0.3153 | 0.3377 |
| | 3 | 0.3532 | 0.364 | | 3 | 0.3365 | 0.3496 | | 3 | 0.3194 | 0.3352 |
| | 4 | 0.3497 | 0.3524 | | 4 | 0.3333 | 0.339 | | 4 | 0.3164 | 0.3257 |
| | 5 | 0.3412 | 0.3436 | | 5 | 0.3254 | 0.331 | | 5 | 0.3093 | 0.3187 |
| | 6 | 0.3362 | 0.3465 | | 6 | 0.3209 | 0.3338 | | 6 | 0.3052 | 0.3212 |
| | 7 | 0.3417 | 0.3571 | | 7 | 0.326 | 0.3434 | | 7 | 0.3098 | 0.3297 |
| | 8 | 0.3468 | 0.3623 | | 8 | 0.3307 | 0.3481 | | 8 | 0.3141 | 0.3339 |
| | 9 | 0.3498 | 0.3605 | | 9 | 0.3334 | 0.3464 | | 9 | 0.3166 | 0.3324 |
| | 10 | 0.3477 | 0.3535 | | 10 | 0.3314 | 0.3401 | | 10 | 0.3148 | 0.3267 |
| | 11 | 0.3426 | 0.3483 | | 11 | 0.3267 | 0.3353 | | 11 | 0.3105 | 0.3225 |

12

0.3396

0.35

12

0.324

0.3369

12

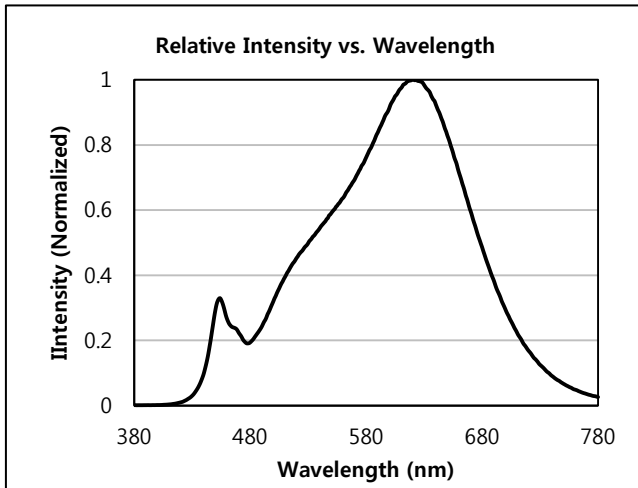
0.308

0.324

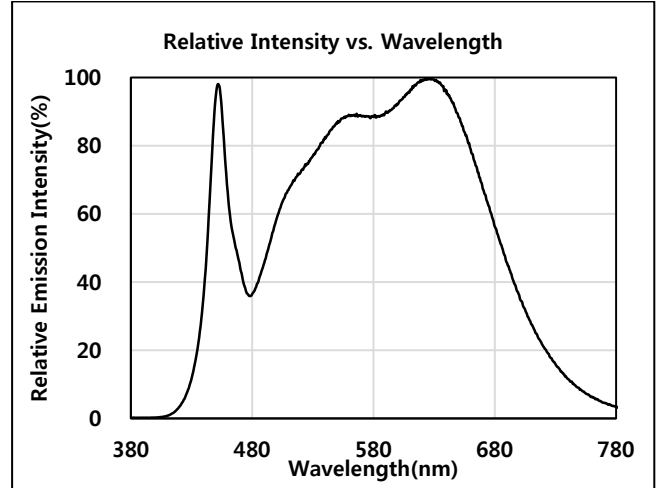
3. Typical Characteristics Graphs

a) Spectrum Distribution ($I_f = 150 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

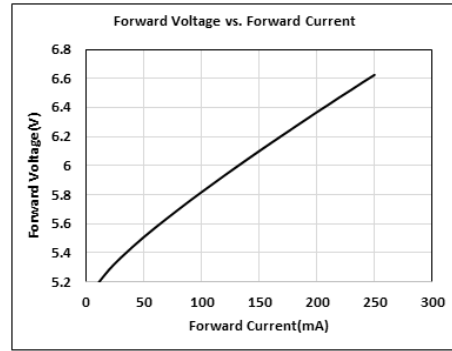
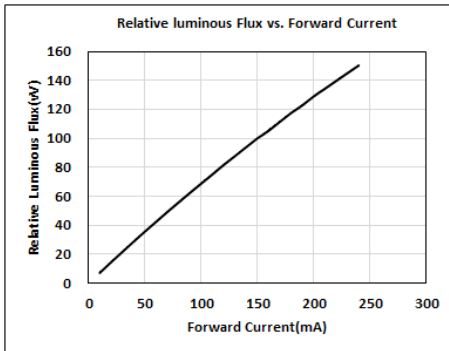
CCT: 2700 K (90 CRI)



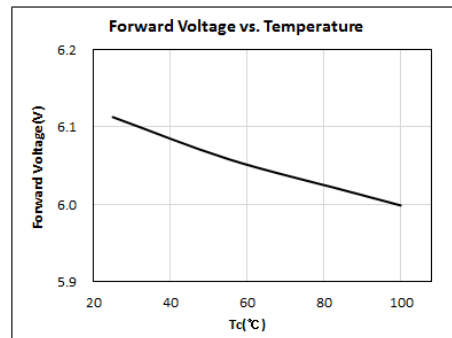
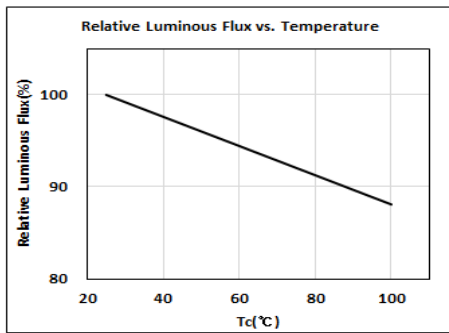
CCT: 4000 K (90 CRI)



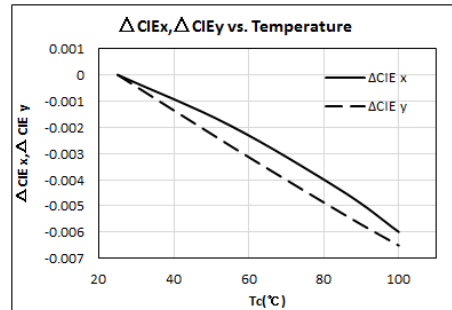
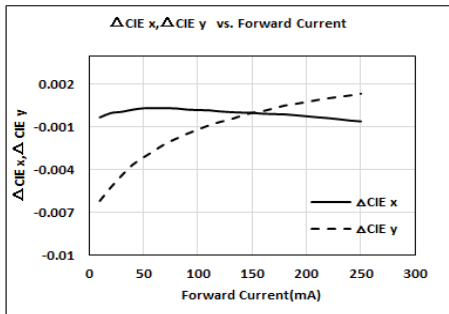
b) Forward Current Characteristics (Ts = 25 °C)



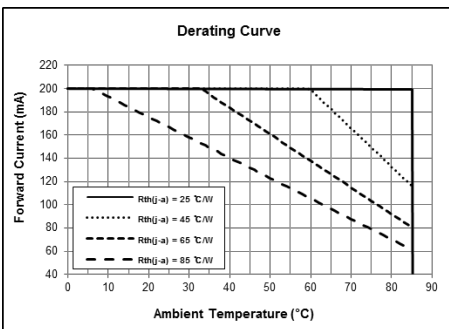
c) Temperature Characteristics (IF = 150 mA)



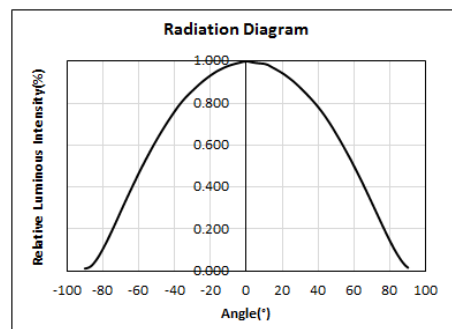
d) Color Shift Characteristics (Ts = 25 °C, IF = 150 mA)



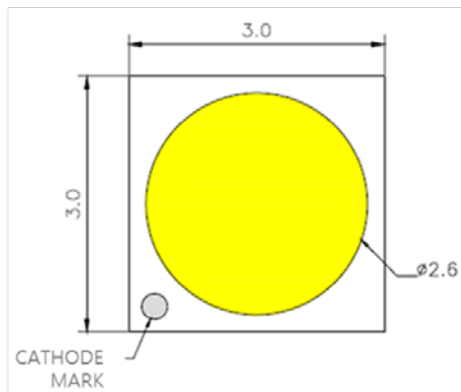
e) Derating Curve



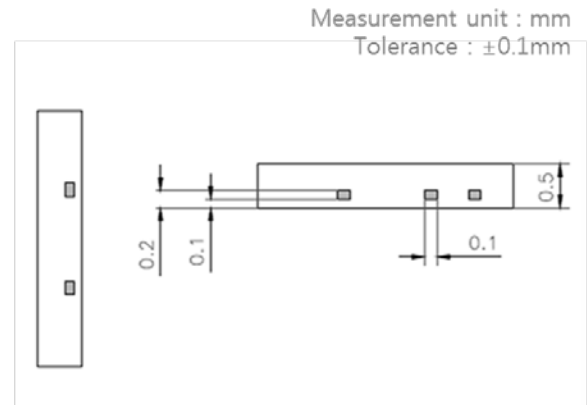
f) Beam Angle Characteristics (IF = 150 mA, Ts = 25 °C)



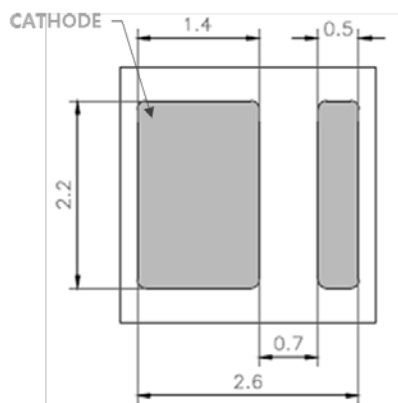
4. Outline Drawing & Dimension



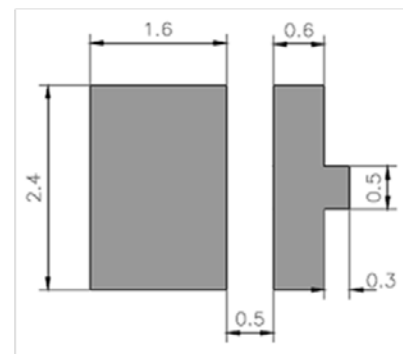
[TOP VIEW]



[SIDE VIEW]



[BOTTOM VIEW]



[RECOMMENDED PCB SOLDER PAD]

Notes:

- 1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
- 2) T_s point and measurement method:
 - ① Measure one point at the cathode pad, 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.

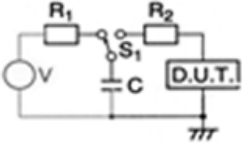
Precautions:

- 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 No. |
|-------------------------------------|--|-------------------|------------|
| Room Temperature Life Test | 25 °C, DC 200 mA | 1000 h | 22 |
| High Temperature Life Test | 85 °C, DC 200 mA | 1000 h | 22 |
| High Temperature Humidity Life Test | 60 °C, 90 % RH, DC 200 mA | 1000 h | 22 |
| Low Temperature Life Test | -40 °C, DC 200 mA | 1000 h | 22 |
| Powered Temperature Cycle Test | -45 °C / 20 min ↔ 85 °C / 20 min, sweep 100 min cycle on/off: each 5 min, DC 200 mA | 100 cycles | 22 |
| Thermal Cycle | -40 °C / 15 min ↔ 100 °C / 15 min → Hot plate 180 °C | 500 cycles | 100 |
| High Temperature Storage | 120 °C | 1000 h | 11 |
| Low Temperature Storage | -40 °C | 1000 h | 11 |
| ESD (HBM) |  | 5 times | 30 |
| ESD (MM) | | | |
| Vibration Test | 20~2000~20 Hz, 200 m/s ² , sweep 4 min X, Y, Z 3 direction, each 1 cycle | 4 cycles | 11 |
| Mechanical Shock Test | 1500 g, 0.5 ms 3 shocks each X-Y-Z axis | 5 cycles | 11 |

b) Criteria for Judging the Damage

| Item | Symbol | Test Condition (T _s = 25 °C) | Limit | |
|-----------------|----------------|--|-------------------|-------------------|
| | | | Min | Max |
| Forward Voltage | V _F | I _F = 150 mA | Init. Value * 0.9 | Init. Value * 1.1 |
| Luminous Flux | Φ _v | I _F = 155 mA | Init. Value * 0.7 | Init. Value * 1.1 |

6. Soldering Conditions

a) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



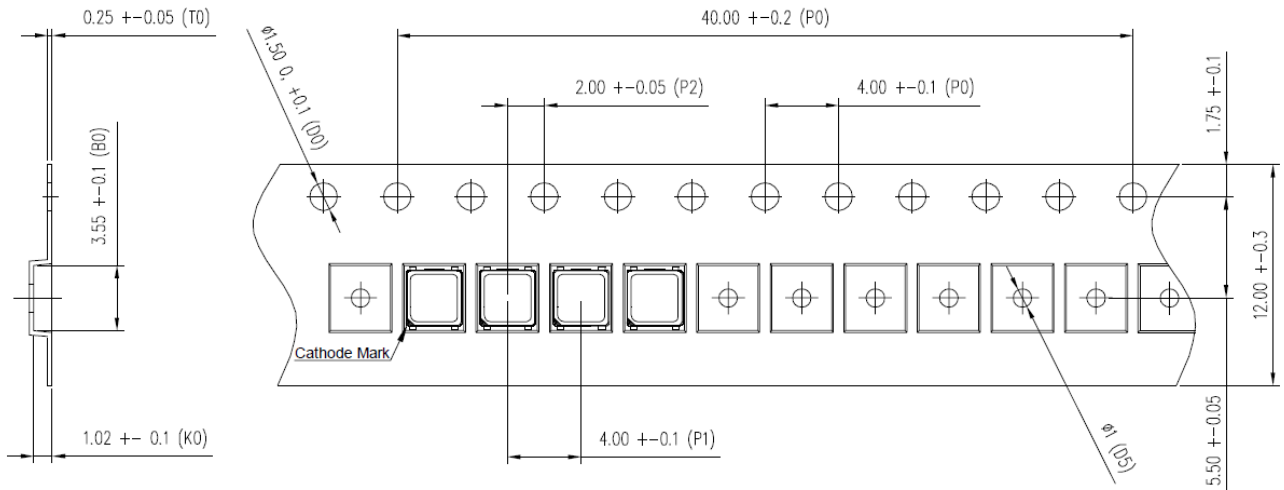
b) Manual Soldering Conditions

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

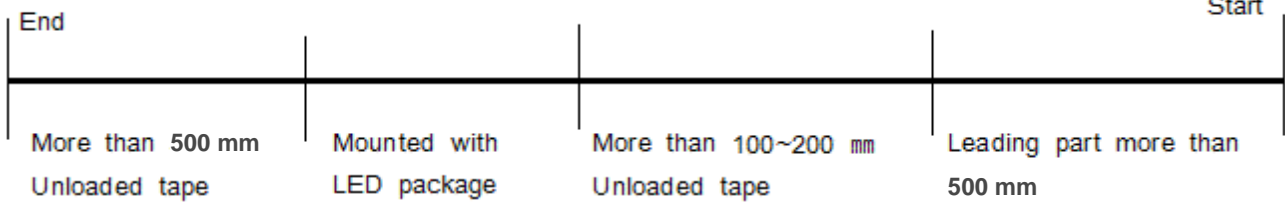
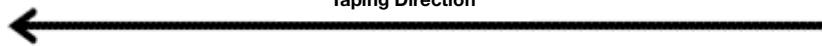
7. Tape & Reel

a) Taping Dimension

(unit: mm)



Taping Direction



b) Reel Dimension

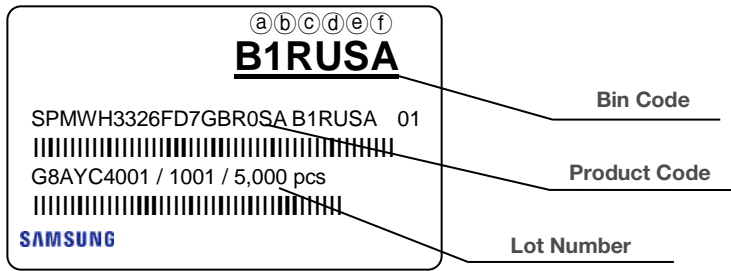
(unit: mm)

**Notes:**

- 1) Quantity: The quantity/reel is 5,000 pcs
- 2) Cumulative Tolerance: Cumulative tolerance / 10 pitches is ± 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° 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



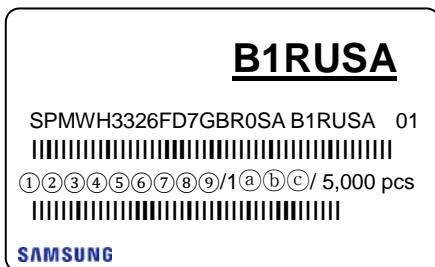
Note: Denoted bin code and product code above is only an example (see description on page 5)

Bin Code:

- ⒶⒷ: Forward Voltage bin (refer to page 8)
- ⒸⒹ: Chromaticity bin (refer to page 10-13)
- ⒺⒻ: Luminous Flux bin (refer to page 8)

b) Lot Number

The lot number is composed of the following characters:

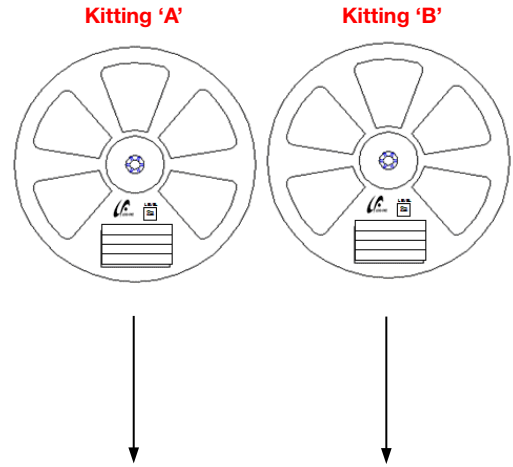
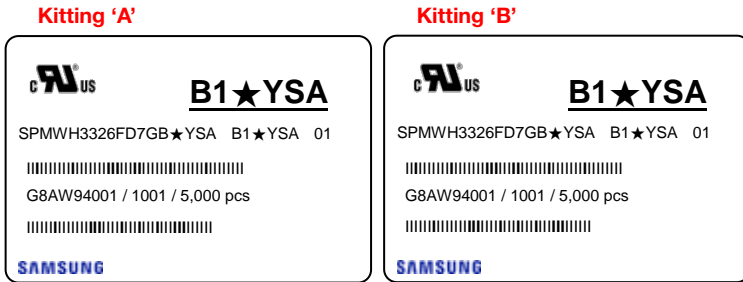


① ②③④⑤⑥⑦⑧⑨ / 1ⒶⒷⒸ / 5,000 pcs

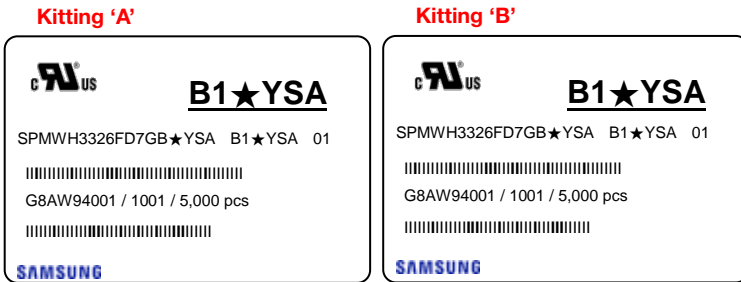
- ① : Production site (S: Giheung, Korea, G: Tianjin, China)
- ② : 8 (LED)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (Z: 2015, A: 2016, B: 2017...)
- ⑤ : Month (1~9, A, B, C)
- ⑥⑦⑧⑨ : Day (1~9, A, B~V)
- ⒶⒷⒸ : Product serial number (001 ~ 999)

b) Packing Process for kitting (The quantity of PKG on the Reel to be Max 5,000pcs)

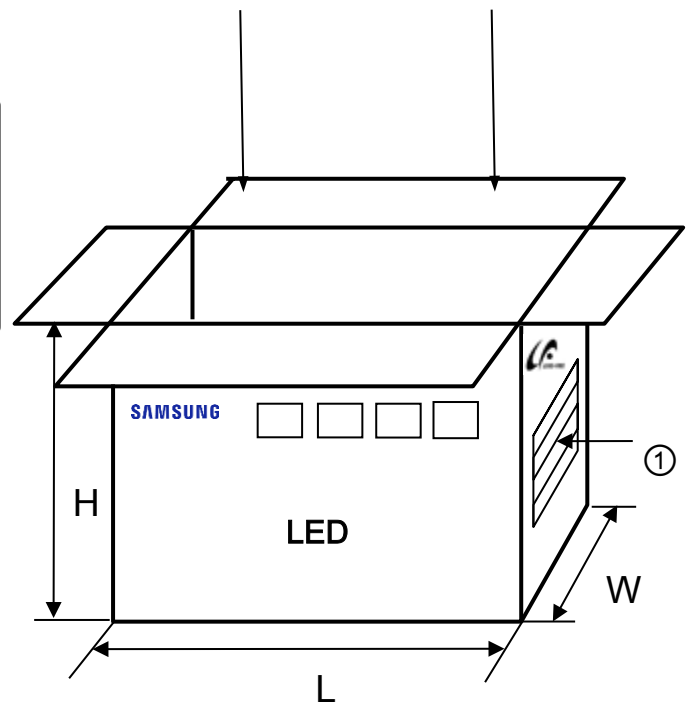
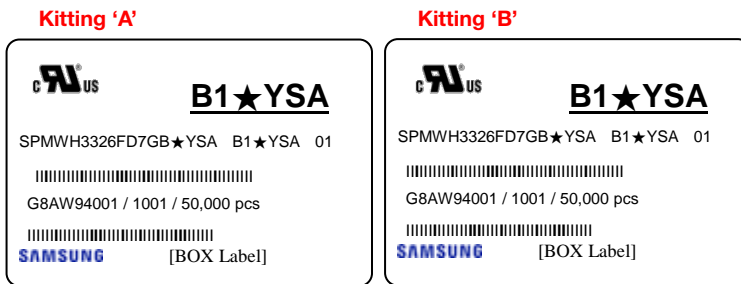
Reel



Aluminum Vinyl Packing Bag



Outer Box



Note: "★" can be Nominal CCT code.

Material: Paper (SW3B(B))

| Type | Size (mm) | | | Note |
|----------|-----------|---------|---------|----------------|
| | L | W | H | |
| 7 inch L | 245 ± 5 | 220 ± 5 | 182 ± 5 | Up to 10 reels |

10. Precautions in Handling & Use

- 1) For over-current-proof function, customers are recommended to apply resistors to prevent sudden change of the current caused by slight shift of the voltage.
- 2) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. When washing is required, IPA is recommended to use.
- 3) When the LEDs illuminate, operating current should be decided after considering the ambient maximum 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 by a sealed container with nitrogen gas injected (shelf life of sealed bags: 12 months, temperature $\sim 40\text{ }^{\circ}\text{C}$, $\sim 90\text{ \% RH}$).
- 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 $30\text{ }^{\circ}\text{C}$ / 60 \% RH , or
 - b. Stored at $<10\text{ \% RH}$
- 6) Repack unused products 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 $>60\text{ \%}$ at $23 \pm 5\text{ }^{\circ}\text{C}$.
- 8) Devices must be baked for 10~24 hours at $60 \pm 5\text{ }^{\circ}\text{C}$, if baking is required.
- 9) The LEDs are sensitive to the static electricity and surge. 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 leak 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 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 (fixtures). In order to prevent these problems, we recommend users to know the physical properties of the materials used in luminaires, and they must be selected carefully.
- 11) Risk of sulfurization (or tarnishing)

The LED from Samsung Electronics Co., Ltd. uses a silver-plated lead frame and its surface color may change to black (or dark colored) when it is exposed to sulfur (S), chlorine (Cl) or other halogen compound. Sulfurization of lead frame may cause intensity degradation, change of chromaticity coordinates and, in extreme cases, open circuit. It requires caution. Due to possible sulfurization of lead frame, LED should not be used and stored together with oxidizing substances made of materials such as: rubber, plain paper, lead solder cream, etc.

Legal and additional information.

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