

LM362A – 3623 LED PKG




Introduction

Features

- Beam Angle: 120°
- Precondition : JEDEC Level 2a
- Dimension : 3.6 x 2.3 x 0.6 mm
- ESD withstand Voltage : up to ± 5 KV [HBM]
- Reliability Test : Refer to page 25

SAMSUNG ELECTRONICS

95, Samsung2-Ro, Giheung-Gu,
Yongin-City, Gyeonggi-Do 446-711, KOREA

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1. Product Code Information

1) Luminous Flux Bins (Ts = 25°C)

| Nominal CCT | Product Code | Flux Rank | Sorting Condition Im@100mA | |
|-------------|--|-----------|----------------------------|-----------------|
| | | | Flux Bin | Flux Range (lm) |
| 2700K | SPMWHT325AD5YBW0SC | SC | S3 | 68 ~ 78 |
| | | | S4 | 78 ~ 88 |
| 3000K | SPMWHT325AD5YBV0SC | SC | S3 | 70 ~ 80 |
| | | | S4 | 80 ~ 90 |
| 3500K | SPMWHT325AD5YBU0SC | SC | S3 | 73 ~ 83 |
| | | | S4 | 83 ~ 93 |
| 4000K | SPMWHT325AD5YBT0SC SPMWHT325AD5Y6T0SC | SC | S3 | 75 ~ 85 |
| | | | S4 | 85 ~ 95 |
| 5000K | SPMWHT325AD5YBR0SC SPMWHT325AD5Y6R0SC | SC | S3 | 76 ~ 86 |
| | | | S4 | 86 ~ 96 |
| 5700K | SPMWHT325AD5YBQ0SC | SC | S3 | 75 ~ 85 |
| | | | S4 | 85 ~ 95 |
| 6500K | SPMWHT325AD5YBP0SC | SC | S3 | 75 ~ 85 |
| | | | S4 | 85 ~ 95 |

Notes: SAMSUNG ELECTRONICS maintains a tolerance of $\pm 5\%$ on Luminous Flux measurements

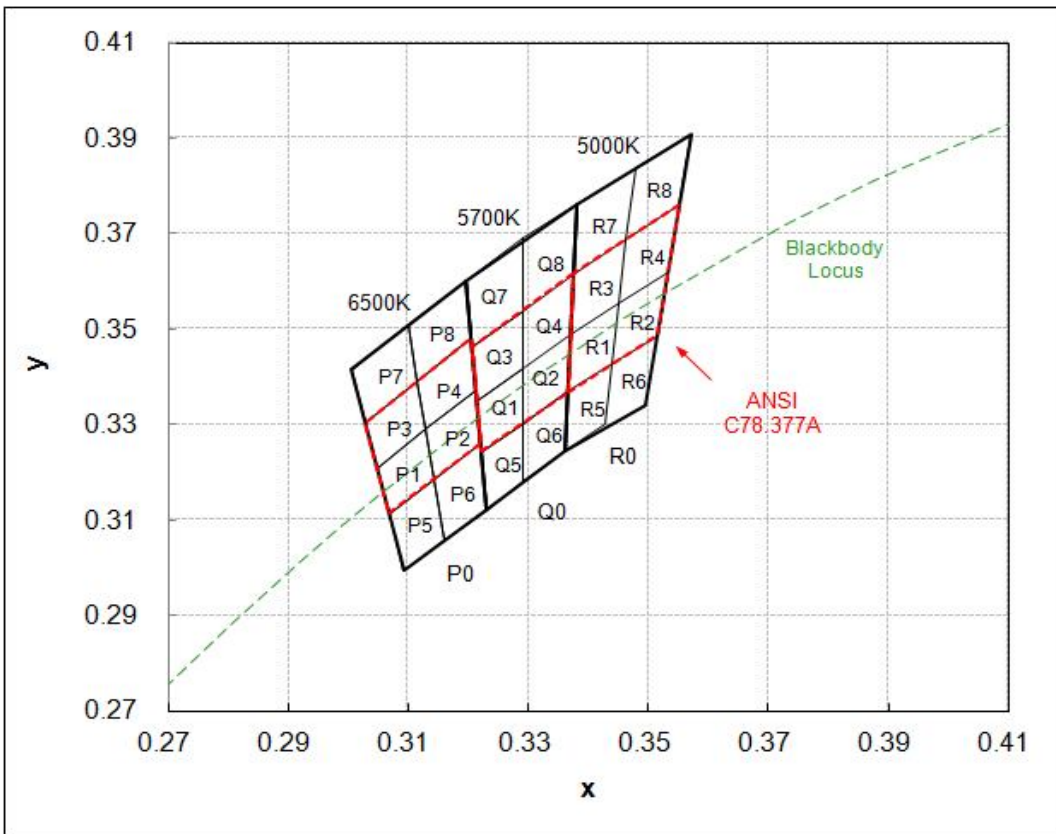
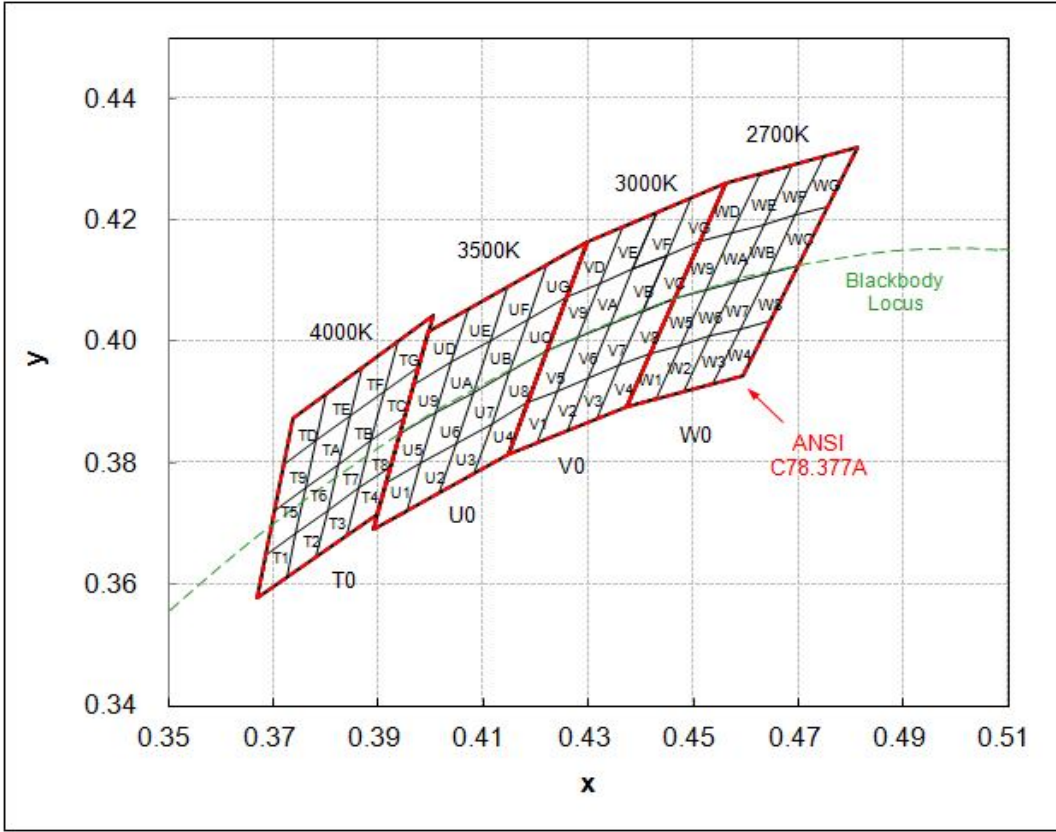


2) Color Bins (Ts = 25°C)

1) Color Binning

| Nominal CCT | Product Code | Color Rank | Chromaticity Bins |
|-------------|--|-----------------|---|
| 2700K | SPMWHT325AD5YBW0SC | W0 (Whole Bin) | W1,W2,W3,W4,W5,W6,W7,W8, W9,WA,WB,WC,WD,WE,WF,WG |
| | SPMWHT325AD5YBWMSC | WM (Quater Bin) | W6,W7,WA,WB |
| 3000K | SPMWHT325AD5YBV0SC | V0 (Whole Bin) | V1,V2,V3,V4,V5,V6,V7,V8, V9,VA,VB,VC,VD,VE,VF,VG |
| | SPMWHT325AD5YBVMSC | VM (Quater Bin) | V6,V7,VA,VB |
| 3500K | SPMWHT325AD5YBU0SC | U0 (Whole Bin) | U1,U2,U3,U4,U5,U6,U7,U8, U9,UA,UB,UC,UD,UE,UF,UG |
| | SPMWHT325AD5YBUMSC | UM (Quater Bin) | U6,U7,UA,UB |
| 4000K | SPMWHT325AD5YBT0SC SPMWHT325AD5Y6T0SC | T0 (Whole Bin) | T1,T2,T3,T4,T5,T6,T7,T8, T9,TA,TB,TC,TD,TE,TF,TG |
| | SPMWHT325AD5YBTMSC | TM (Quater Bin) | T6,T7,TA,TB |
| 5000K | SPMWHT325AD5YBR0SC SPMWHT325AD5Y6R0SC | R0 (Whole Bin) | R1,R2,R3,R4,R5,R6,R7,R8, |
| | SPMWHT325AD5YBRMSC | RM (Quater Bin) | R1,R2,R3,R4 |
| 5700K | SPMWHT325AD5YBQ0SC | Q0 (Whole Bin) | Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8, |
| | SPMWHT325AD5YBQMSC | QM (Quater Bin) | Q1,Q2,Q3,Q4 |
| 6500K | SPMWHT325AD5YBP0SC | P0 (Whole Bin) | P1,P2,P3,P4,P5,P6,P7,P8, |
| | SPMWHT325AD5YBPMSC | PM (Quater Bin) | P1,P2,P3,P4 |

2) Chromaticity Region & Coordinates



2) Chromaticity Region & Coordinates (Continued)

| Region | CIE X | CIE Y | Region | CIE X | CIE Y |
|----------------|--------|--------|--------|--------|--------|
| W rank (2700K) | | | | | |
| 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 |

| Region | CIE X | CIE Y | Region | CIE X | CIE Y |
|----------------|--------|--------|--------|--------|--------|
| V rank (3000K) | | | | | |
| 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 |

2) Chromaticity Region & Coordinates (Continued)

| Region | CIE X | CIE Y | Region | CIE X | CIE Y |
|----------------|--------|--------|--------|--------|--------|
| U rank (3500K) | | | | | |
| 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 |

| Region | CIE X | CIE Y | Region | CIE X | CIE Y |
|----------------|--------|--------|--------|--------|--------|
| T rank (4000K) | | | | | |
| T1 | 0.367 | 0.3578 | T9 | 0.3702 | 0.3722 |
| | 0.3726 | 0.3612 | | 0.3763 | 0.376 |
| | 0.3744 | 0.3685 | | 0.3782 | 0.3837 |
| | 0.3686 | 0.3649 | | 0.3719 | 0.3797 |
| T2 | 0.3726 | 0.3612 | TA | 0.3763 | 0.376 |
| | 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 |
| | 0.384 | 0.3681 | | 0.3887 | 0.3836 |
| | 0.3863 | 0.3758 | | 0.3912 | 0.3917 |
| | 0.3804 | 0.3721 | | 0.3847 | 0.3877 |
| T4 | 0.384 | 0.3681 | TC | 0.3887 | 0.3837 |
| | 0.3898 | 0.3716 | | 0.395 | 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 | 0.376 | | 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 | 0.376 | | 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 |
| | 0.395 | 0.3875 | | 0.4006 | 0.4044 |
| | 0.3887 | 0.3836 | | 0.3937 | 0.4001 |



2) Chromaticity Region & Coordinates (Continued)

| Region | CIE X | CIE Y | Region | CIE X | CIE Y |
|----------------|--------|--------|--------|--------|--------|
| R rank (5000K) | | | | | |
| R1 | 0.3371 | 0.3490 | R5 | 0.3366 | 0.3369 |
| | 0.3451 | 0.3554 | | 0.3440 | 0.3428 |
| | 0.3440 | 0.3427 | | 0.3429 | 0.3307 |
| | 0.3366 | 0.3369 | | 0.3361 | 0.3245 |
| R2 | 0.3451 | 0.3554 | R6 | 0.3440 | 0.3428 |
| | 0.3533 | 0.3620 | | 0.3515 | 0.3487 |
| | 0.3515 | 0.3487 | | 0.3495 | 0.3339 |
| | 0.3440 | 0.3427 | | 0.3429 | 0.3307 |
| R3 | 0.3376 | 0.3616 | R7 | 0.3381 | 0.3762 |
| | 0.3463 | 0.3687 | | 0.3480 | 0.3840 |
| | 0.3451 | 0.3554 | | 0.3463 | 0.3687 |
| | 0.3371 | 0.3490 | | 0.3376 | 0.3616 |
| R4 | 0.3463 | 0.3687 | R8 | 0.3480 | 0.3840 |
| | 0.3551 | 0.3760 | | 0.3571 | 0.3907 |
| | 0.3533 | 0.3620 | | 0.3551 | 0.3760 |
| | 0.3451 | 0.3554 | | 0.3463 | 0.3687 |
| Q rank (5700K) | | | | | |
| Q1 | 0.3215 | 0.3350 | Q5 | 0.3222 | 0.3243 |
| | 0.3290 | 0.3417 | | 0.3290 | 0.3300 |
| | 0.3290 | 0.3300 | | 0.3290 | 0.3180 |
| | 0.3222 | 0.3243 | | 0.3231 | 0.3120 |
| Q2 | 0.3290 | 0.3417 | Q6 | 0.3290 | 0.3300 |
| | 0.3371 | 0.3490 | | 0.3366 | 0.3369 |
| | 0.3366 | 0.3369 | | 0.3361 | 0.3245 |
| | 0.3290 | 0.3300 | | 0.3290 | 0.3180 |
| Q3 | 0.3207 | 0.3462 | Q7 | 0.3196 | 0.3602 |
| | 0.3290 | 0.3538 | | 0.3290 | 0.3690 |
| | 0.3290 | 0.3417 | | 0.3290 | 0.3538 |
| | 0.3215 | 0.3350 | | 0.3207 | 0.3462 |
| Q4 | 0.3290 | 0.3538 | Q8 | 0.3290 | 0.3690 |
| | 0.3376 | 0.3616 | | 0.3381 | 0.3762 |
| | 0.3371 | 0.3490 | | 0.3376 | 0.3616 |
| | 0.3290 | 0.3417 | | 0.3290 | 0.3538 |

| Region | CIE X | CIE Y | Region | CIE X | CIE Y |
|----------------|--------|--------|--------|--------|--------|
| P rank (6500K) | | | | | |
| P1 | 0.3068 | 0.3113 | P5 | 0.3093 | 0.2993 |
| | 0.3144 | 0.3186 | | 0.3161 | 0.3059 |
| | 0.3130 | 0.3290 | | 0.3144 | 0.3186 |
| | 0.3048 | 0.3207 | | 0.3068 | 0.3113 |
| P2 | 0.3144 | 0.3186 | P6 | 0.3161 | 0.3059 |
| | 0.3221 | 0.3261 | | 0.3231 | 0.3120 |
| | 0.3213 | 0.3373 | | 0.3221 | 0.3261 |
| | 0.3130 | 0.3290 | | 0.3144 | 0.3186 |
| P3 | 0.3048 | 0.3207 | P7 | 0.3028 | 0.3304 |
| | 0.3130 | 0.3290 | | 0.3115 | 0.3391 |
| | 0.3115 | 0.3391 | | 0.3099 | 0.3509 |
| | 0.3028 | 0.3304 | | 0.3005 | 0.3415 |
| P4 | 0.3130 | 0.3290 | P8 | 0.3115 | 0.3391 |
| | 0.3213 | 0.3373 | | 0.3205 | 0.3481 |
| | 0.3205 | 0.3481 | | 0.3196 | 0.3602 |
| | 0.3115 | 0.3391 | | 0.3099 | 0.3509 |

SAMSUNG ELECTRONICS maintains ± 0.005 tolerance of Cx, Cy



2. Luminous Flux Characteristics (Ts = 25°C)

| Nominal CCT | Minimum CRI ⁽¹⁾ | If(mA) | Vf(V) | Power(W) | Flux(lm) | lm/W |
|-------------|----------------------------|--------|-------|----------|----------|------|
| 2700K | 80 | 50 | 5.71 | 0.29 | 39 | 138 |
| | | 100 | 5.96 | 0.60 | 72 | 121 |
| | | 110 | 5.99 | 0.66 | 78 | 117 |
| | | 120 | 6.03 | 0.72 | 84 | 115 |
| | | 130 | 6.06 | 0.79 | 89 | 113 |
| | | 140 | 6.09 | 0.85 | 94 | 110 |
| | | 150 | 6.11 | 0.92 | 100 | 108 |
| | | 160 | 6.14 | 0.98 | 104 | 106 |
| | | 170 | 6.17 | 1.05 | 108 | 103 |
| | | 180 | 6.20 | 1.12 | 113 | 101 |
| | | 190 | 6.23 | 1.18 | 118 | 99 |
| | | 200 | 6.27 | 1.25 | 122 | 97 |
| 3000K | 80 | 50 | 5.71 | 0.29 | 41 | 144 |
| | | 100 | 5.96 | 0.60 | 75 | 126 |
| | | 110 | 5.99 | 0.66 | 81 | 122 |
| | | 120 | 6.03 | 0.72 | 87 | 120 |
| | | 130 | 6.06 | 0.79 | 93 | 118 |
| | | 140 | 6.09 | 0.85 | 98 | 115 |
| | | 150 | 6.11 | 0.92 | 104 | 113 |
| | | 160 | 6.14 | 0.98 | 109 | 110 |
| | | 170 | 6.17 | 1.05 | 113 | 108 |
| | | 180 | 6.20 | 1.12 | 118 | 106 |
| | | 190 | 6.23 | 1.18 | 122 | 103 |
| | | 200 | 6.27 | 1.25 | 127 | 101 |



| Nominal CCT | Minimum CRI ⁽¹⁾ | If(mA) | Vf(V) | Power(W) | Flux(lm) | lm/W |
|-------------|----------------------------|--------|-------|----------|----------|------|
| 3500K | 80 | 50 | 5.71 | 0.29 | 42 | 148 |
| | | 100 | 5.96 | 0.60 | 77 | 129 |
| | | 110 | 5.99 | 0.66 | 83 | 126 |
| | | 120 | 6.03 | 0.72 | 89 | 123 |
| | | 130 | 6.06 | 0.79 | 95 | 121 |
| | | 140 | 6.09 | 0.85 | 101 | 118 |
| | | 150 | 6.11 | 0.92 | 106 | 116 |
| | | 160 | 6.14 | 0.98 | 112 | 113 |
| | | 170 | 6.17 | 1.05 | 116 | 111 |
| | | 180 | 6.20 | 1.12 | 121 | 108 |
| | | 190 | 6.23 | 1.18 | 126 | 106 |
| | | 200 | 6.27 | 1.25 | 130 | 104 |
| 4000K | 80 | 50 | 5.71 | 0.29 | 44 | 154 |
| | | 100 | 5.96 | 0.60 | 80 | 134 |
| | | 110 | 5.99 | 0.66 | 86 | 131 |
| | | 120 | 6.03 | 0.72 | 93 | 128 |
| | | 130 | 6.06 | 0.79 | 99 | 125 |
| | | 140 | 6.09 | 0.85 | 105 | 123 |
| | | 150 | 6.11 | 0.92 | 111 | 120 |
| | | 160 | 6.14 | 0.98 | 116 | 118 |
| | | 170 | 6.17 | 1.05 | 121 | 115 |
| | | 180 | 6.20 | 1.12 | 126 | 113 |
| | | 190 | 6.23 | 1.18 | 131 | 110 |
| | | 200 | 6.27 | 1.25 | 135 | 108 |



| Nominal CCT | Minimum CRI ⁽¹⁾ | If(mA) | Vf(V) | Power(W) | Flux(lm) | lm/W |
|-------------|----------------------------|--------|-------|----------|----------|------|
| 5000K | 80 | 50 | 5.71 | 0.29 | 44 | 155 |
| | | 100 | 5.96 | 0.60 | 81 | 136 |
| | | 110 | 5.99 | 0.66 | 87 | 132 |
| | | 120 | 6.03 | 0.72 | 94 | 129 |
| | | 130 | 6.06 | 0.79 | 100 | 127 |
| | | 140 | 6.09 | 0.85 | 106 | 124 |
| | | 150 | 6.11 | 0.92 | 112 | 122 |
| | | 160 | 6.14 | 0.98 | 118 | 119 |
| | | 170 | 6.17 | 1.05 | 122 | 116 |
| | | 180 | 6.20 | 1.12 | 127 | 114 |
| | | 190 | 6.23 | 1.18 | 132 | 112 |
| | | 200 | 6.27 | 1.25 | 137 | 109 |



| Nominal CCT | Minimum CRI ⁽¹⁾ | If(mA) | Vf(V) | Power(W) | Flux(lm) | lm/W |
|-------------|----------------------------|--------|-------|----------|----------|------|
| 5700K | 80 | 50 | 5.71 | 0.29 | 44 | 154 |
| | | 100 | 5.96 | 0.60 | 80 | 134 |
| | | 110 | 5.99 | 0.66 | 86 | 131 |
| | | 120 | 6.03 | 0.72 | 93 | 128 |
| | | 130 | 6.06 | 0.79 | 99 | 125 |
| | | 140 | 6.09 | 0.85 | 105 | 123 |
| | | 150 | 6.11 | 0.92 | 111 | 120 |
| | | 160 | 6.14 | 0.98 | 116 | 118 |
| | | 170 | 6.17 | 1.05 | 121 | 115 |
| | | 180 | 6.20 | 1.12 | 126 | 113 |
| | | 190 | 6.23 | 1.18 | 131 | 110 |
| | | 200 | 6.27 | 1.25 | 135 | 108 |
| 6500K | 80 | 50 | 5.71 | 0.29 | 43 | 152 |
| | | 100 | 5.96 | 0.60 | 79 | 133 |
| | | 110 | 5.99 | 0.66 | 85 | 129 |
| | | 120 | 6.03 | 0.72 | 92 | 126 |
| | | 130 | 6.06 | 0.79 | 98 | 124 |
| | | 140 | 6.09 | 0.85 | 104 | 121 |
| | | 150 | 6.11 | 0.92 | 109 | 119 |
| | | 160 | 6.14 | 0.98 | 115 | 116 |
| | | 170 | 6.17 | 1.05 | 119 | 113 |
| | | 180 | 6.20 | 1.12 | 124 | 111 |
| | | 190 | 6.23 | 1.18 | 129 | 109 |
| | | 200 | 6.27 | 1.25 | 134 | 106 |

3. Characteristics

1) Absolute Maximum Rating

| Item | Symbol | Rating | Condition |
|------------------------------|---------------|------------------|----------------------------|
| Operating temperature range | T_{op} | -40 °C ~ +85 °C | - |
| Storage temperature range | T_{stg} | -40 °C ~ +100 °C | - |
| LED junction temperature | T_J | 125 °C | - |
| Forward Current | I_F | 200 mA | - |
| Peak Pulsed Forward Current | I_{FP} | 400 mA | Duty 1/10 pulse width 10ms |
| Thermal resistance | $R_{th, j-s}$ | 15 °C/W | Junction to solder point |
| Assembly Process Temperature | - | 260 °C, < 10sec | - |
| ESD | - | 5kV | HBM |

2) Electro-optical Characteristics – Voltage and CRI

| Item | Unit | Rank | Min | Typ | Max | |
|--|------|----------|-----|-----|-----|-----|
| Forward Voltage (@100 mA, $T_s = 25^\circ\text{C}$) | V | Y6 YB | A1 | 5.6 | - | 5.8 |
| | | | A2 | 5.8 | - | 6.0 |
| | | | A3 | 6.0 | - | 6.2 |
| | | | A4 | 6.2 | - | 6.4 |
| | | | A5 | 6.4 | - | 6.6 |
| Reverse Voltage (@5 mA, $T_s = 25^\circ\text{C}$) | V | - | 0.7 | - | 1.2 | |
| Color Rendering Index | Ra | 5 | 80 | - | - | |

Notes:

1)~2) SAMSUNG ELECTRONICS maintains a tolerance of $V_F:\pm 0.1$ V, $\Phi_V:\pm 5$ %, $R_a:\pm 3.0$ on measurements

3) Electro-optical Characteristics

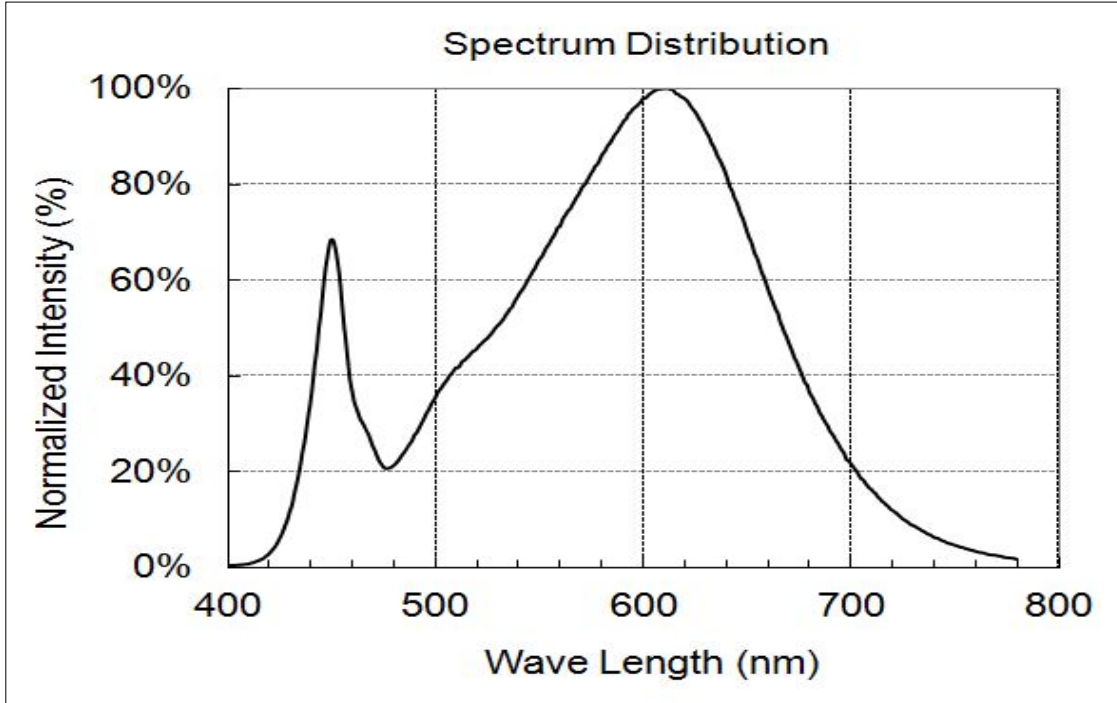
| Item | Unit | CCT | Rank | Min | Typ | Max |
|---------------------------------------|------|-------|------|-----|-----|-----|
| Luminous Flux (@100 mA, Ts = 25°C) | lm | 2700K | S3 | 68 | - | 78 |
| | | | S4 | 78 | - | 88 |
| | | 3000K | S3 | 70 | - | 80 |
| | | | S4 | 80 | - | 90 |
| | | 3500K | S3 | 73 | - | 83 |
| | | | S4 | 83 | - | 93 |
| | | 4000K | S3 | 75 | | 85 |
| | | | S4 | 85 | | 95 |
| | | 5000K | S3 | 76 | | 86 |
| | | | S4 | 86 | | 96 |
| | | 5700K | S3 | 75 | | 85 |
| | | | S4 | 85 | | 95 |
| | | 6500K | S3 | 75 | | 85 |
| | | | S4 | 85 | | 95 |

4. Typical Characteristics Graph (@100mA)

1) Spectrum Distribution

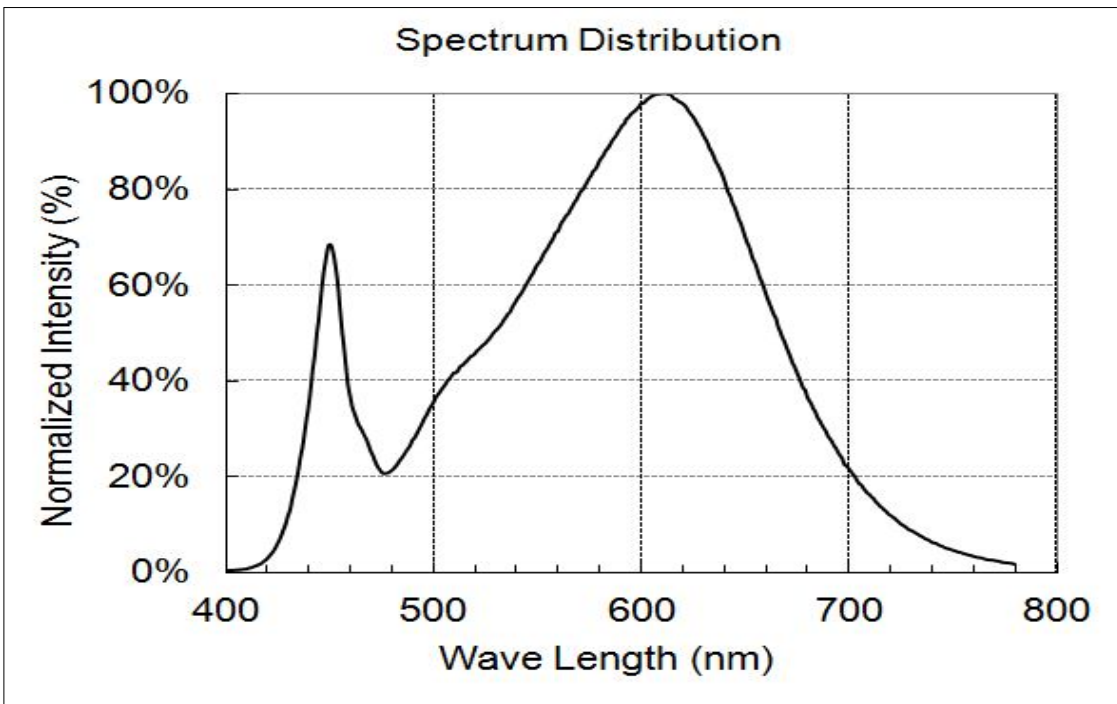
2700K

$T_s = 25^\circ\text{C}$



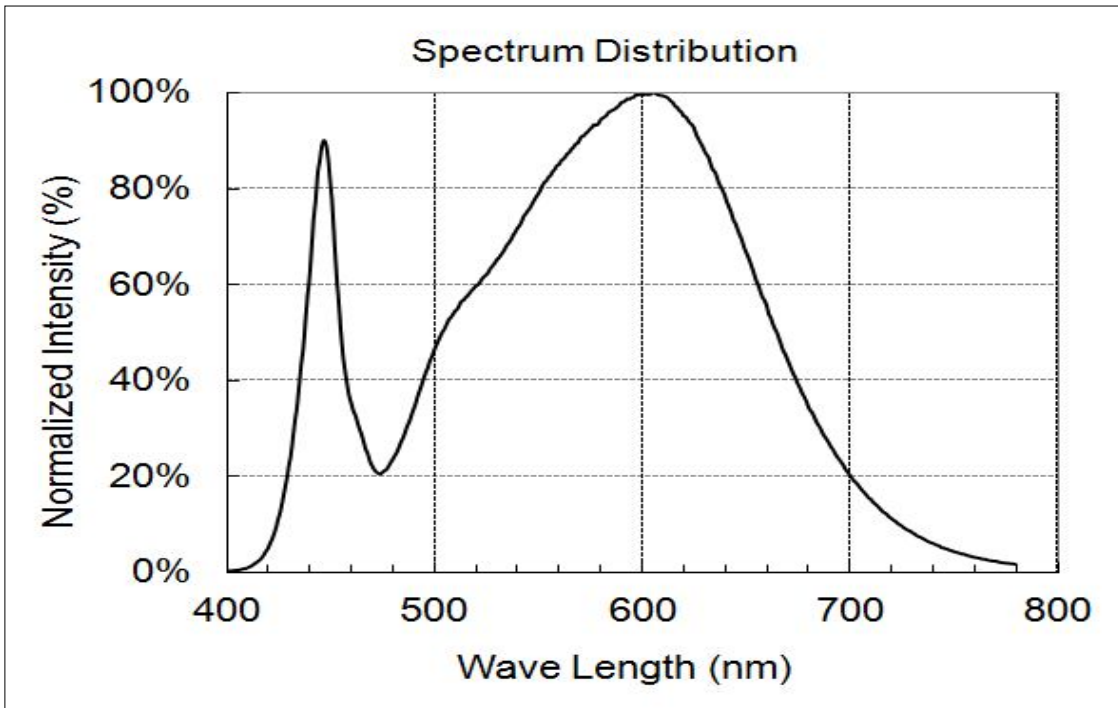
3000K

$T_s = 25^\circ\text{C}$



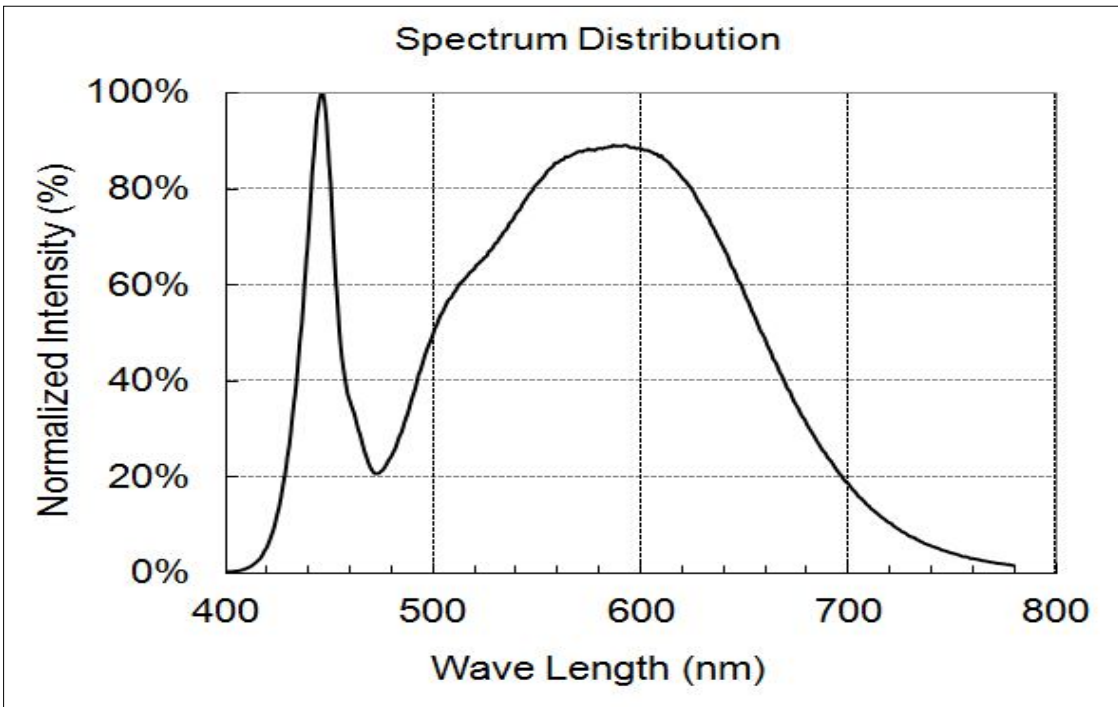
3500K

$T_s = 25^\circ\text{C}$



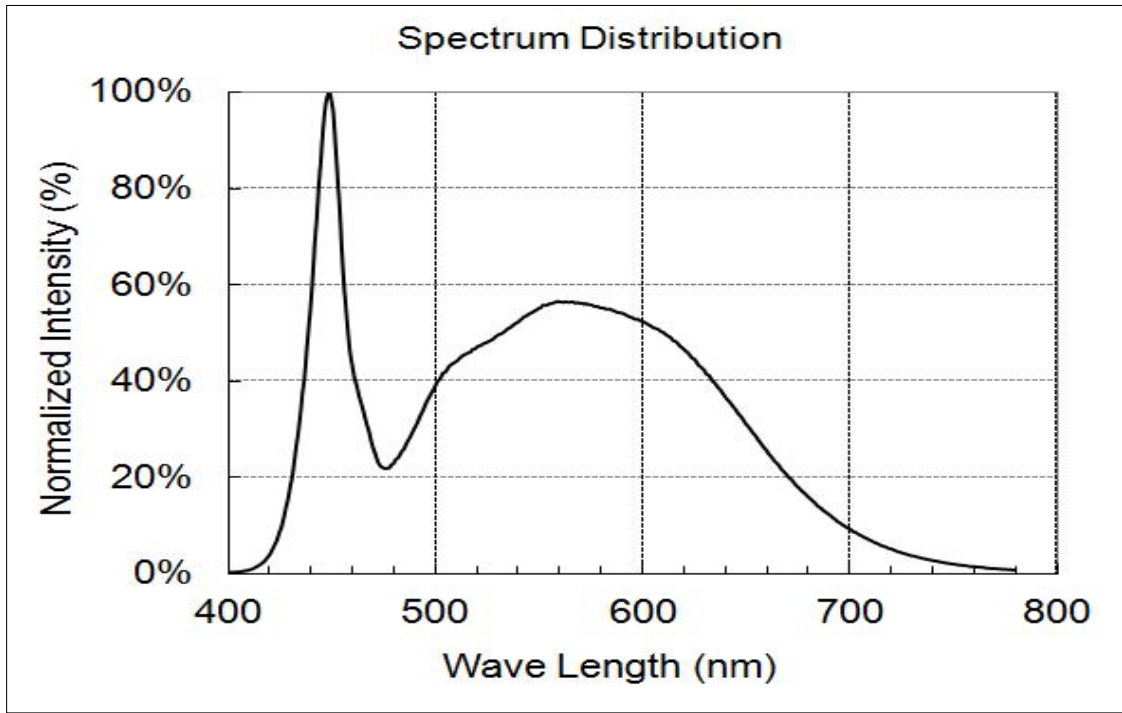
4000K

$T_s = 25^\circ\text{C}$



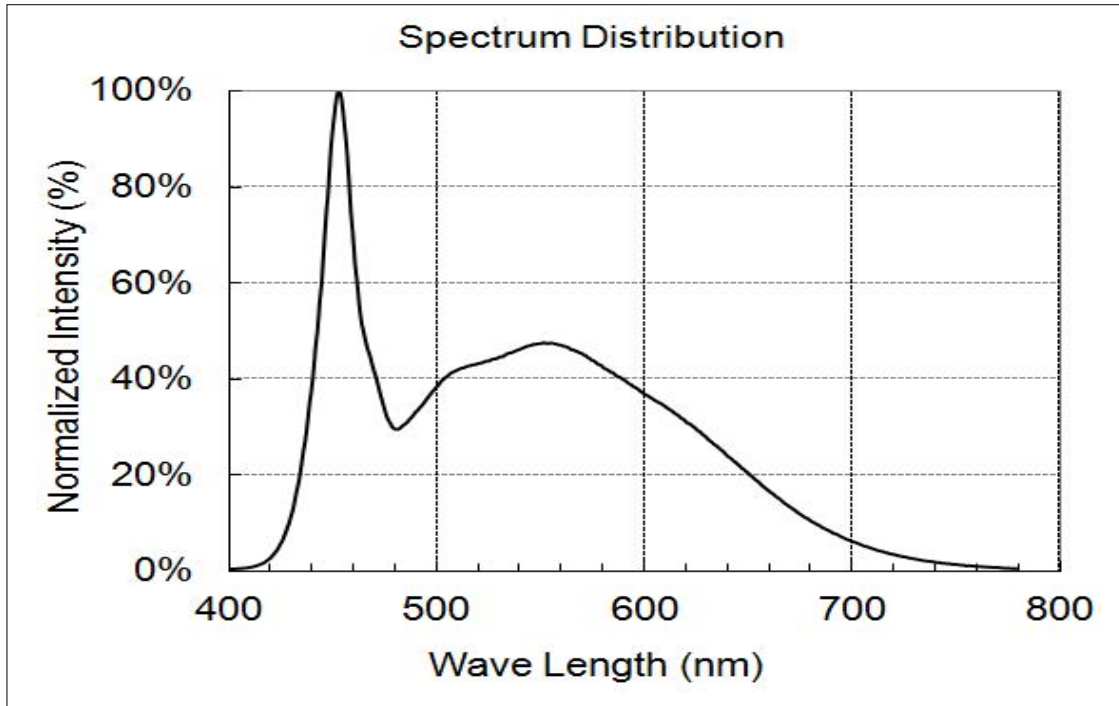
5000K

$T_s = 25^\circ\text{C}$



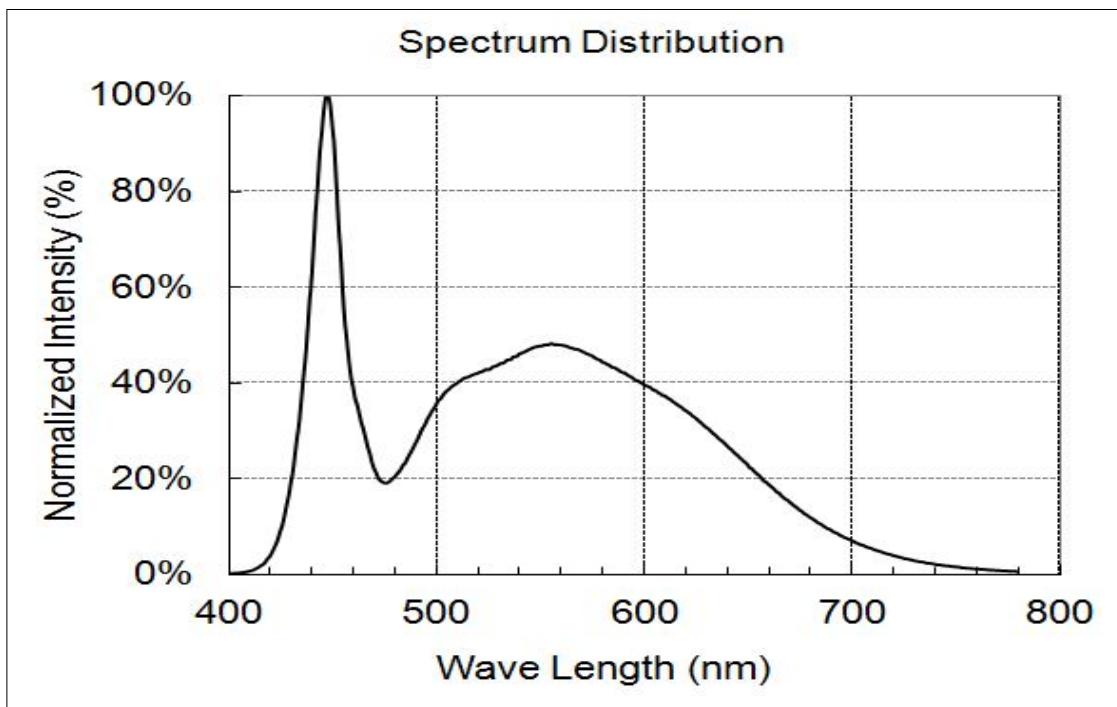
5700K

$T_s = 25^\circ\text{C}$



6500K

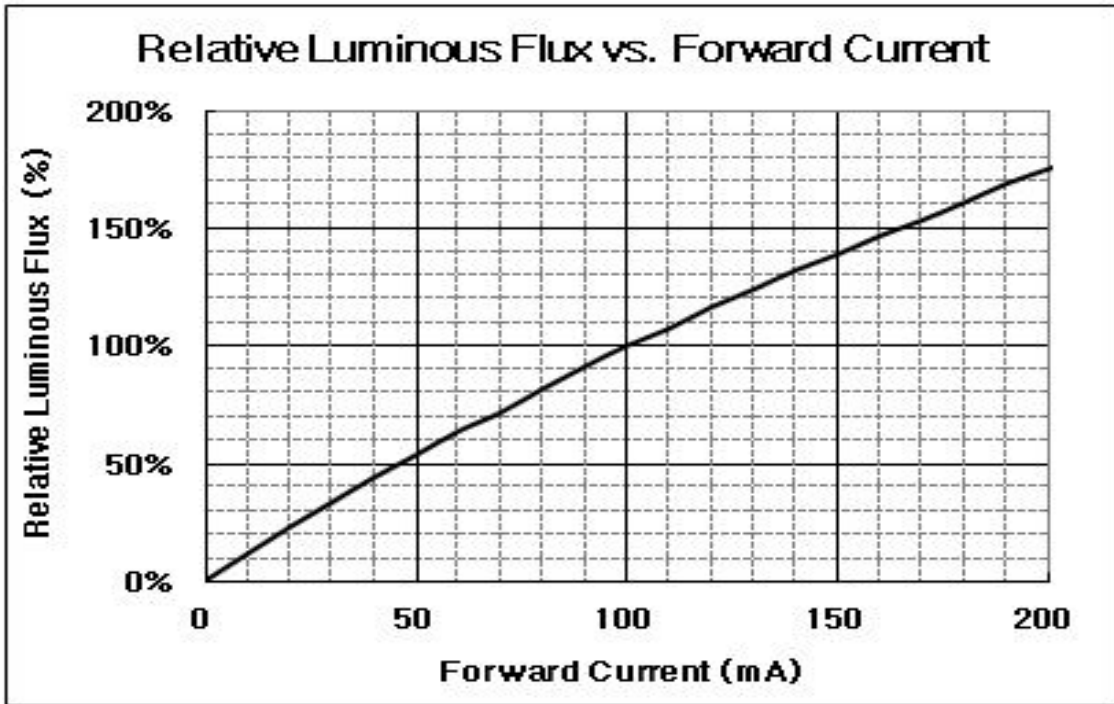
$T_s = 25^\circ\text{C}$



2) Forward Current Characteristics

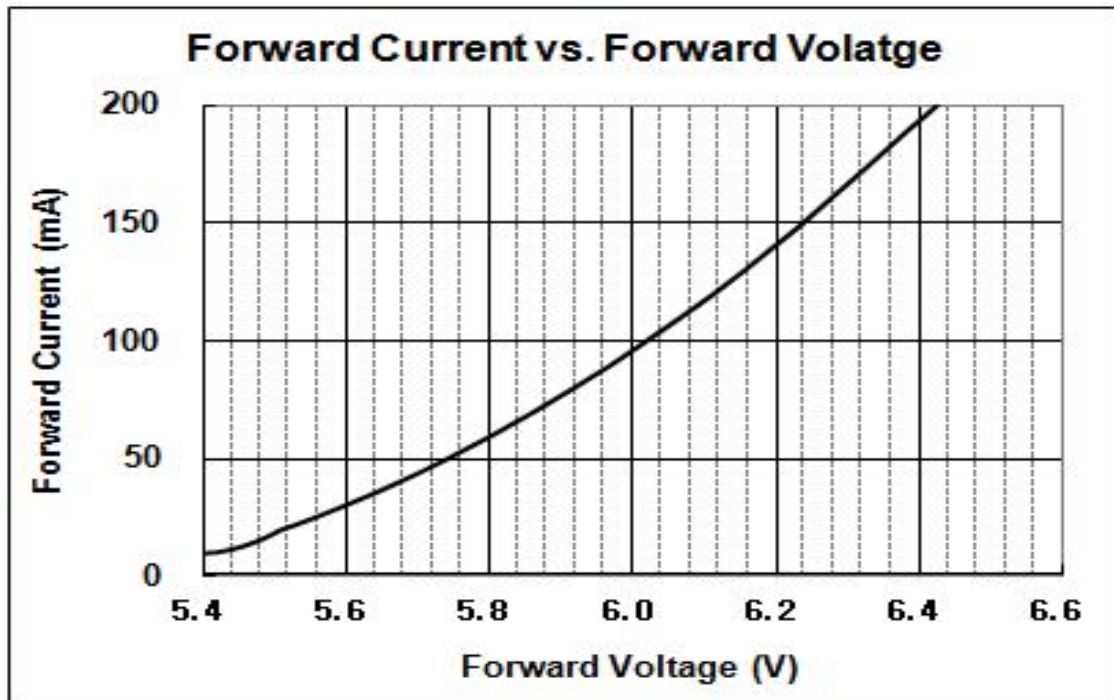
Relative Luminous Flux vs. Forward Current

$T_s = 25^\circ\text{C}$



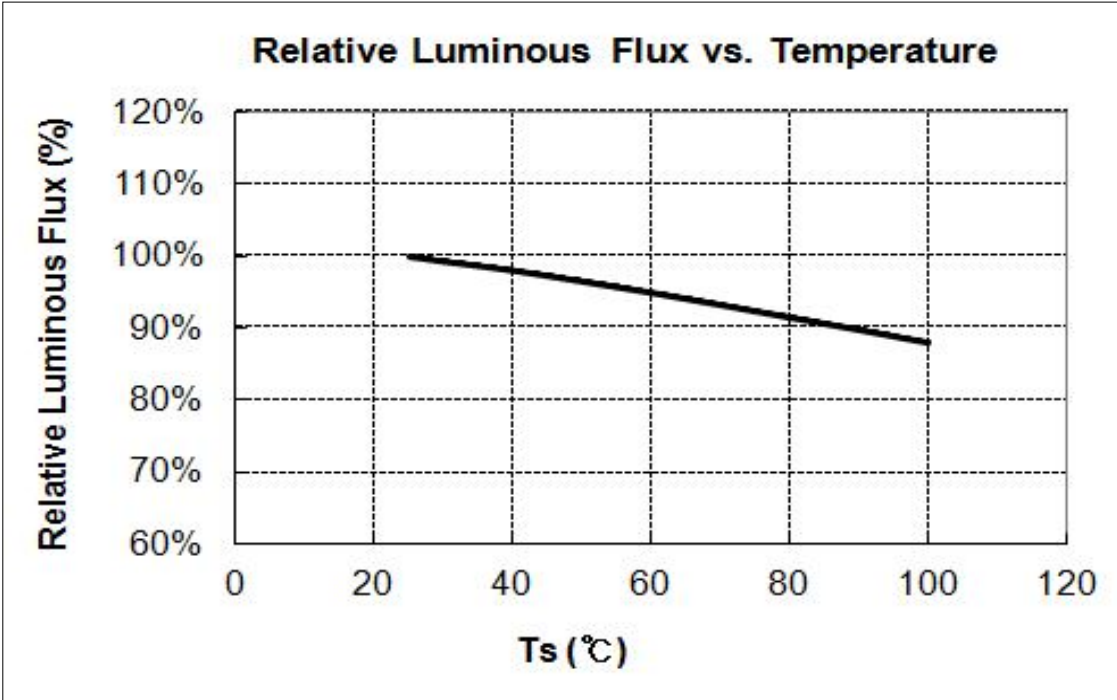
Forward Current vs. Forward Voltage

$T_s = 25^\circ\text{C}$

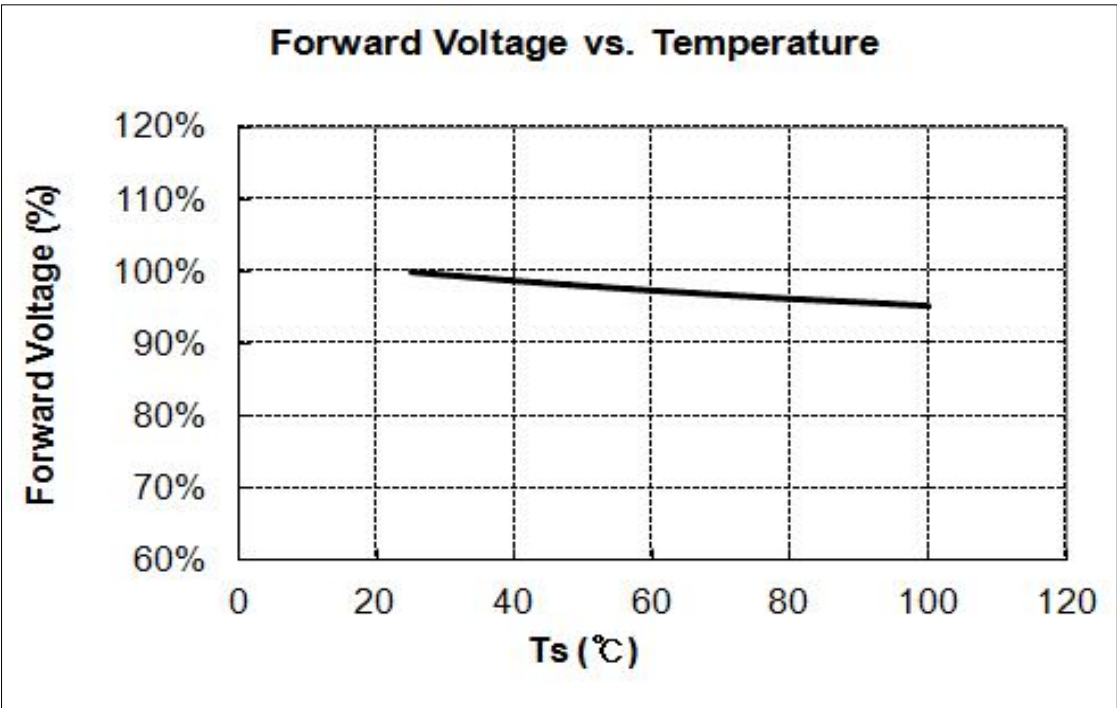


3) Temperature Characteristics (@100mA)

Relative Luminous Flux vs. Ts(solder temp.)

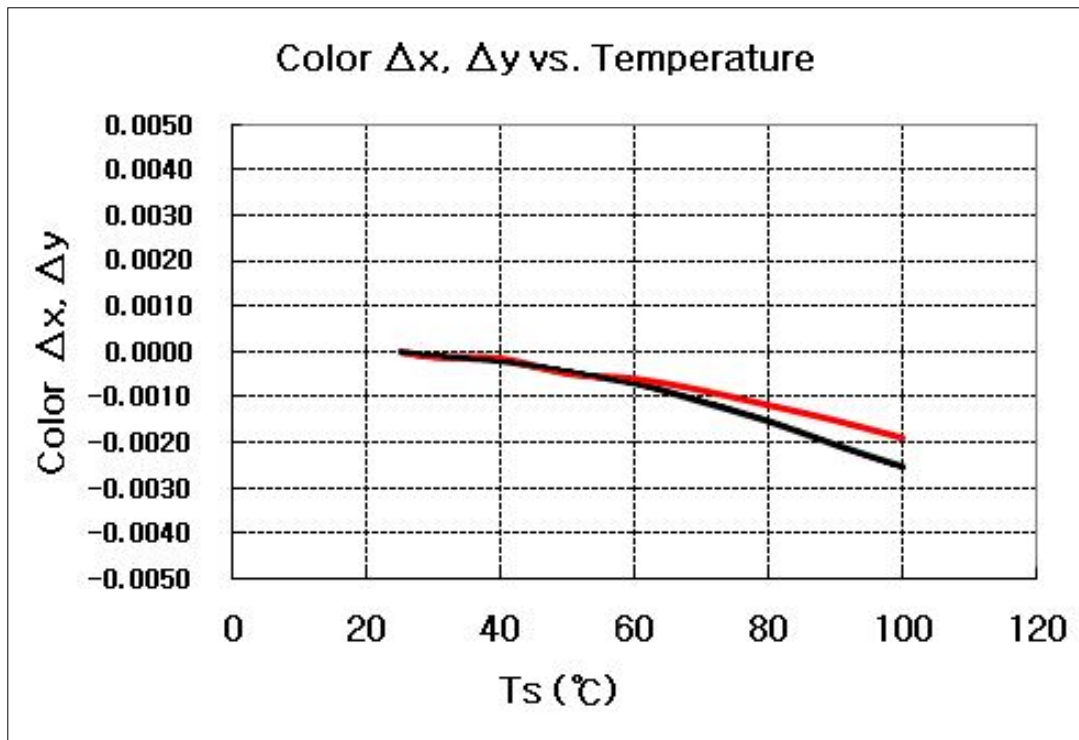


Forward Voltage vs. Ts(solder temp.)



Color Δx , Δy vs. T_s (solder temp.) @100mA

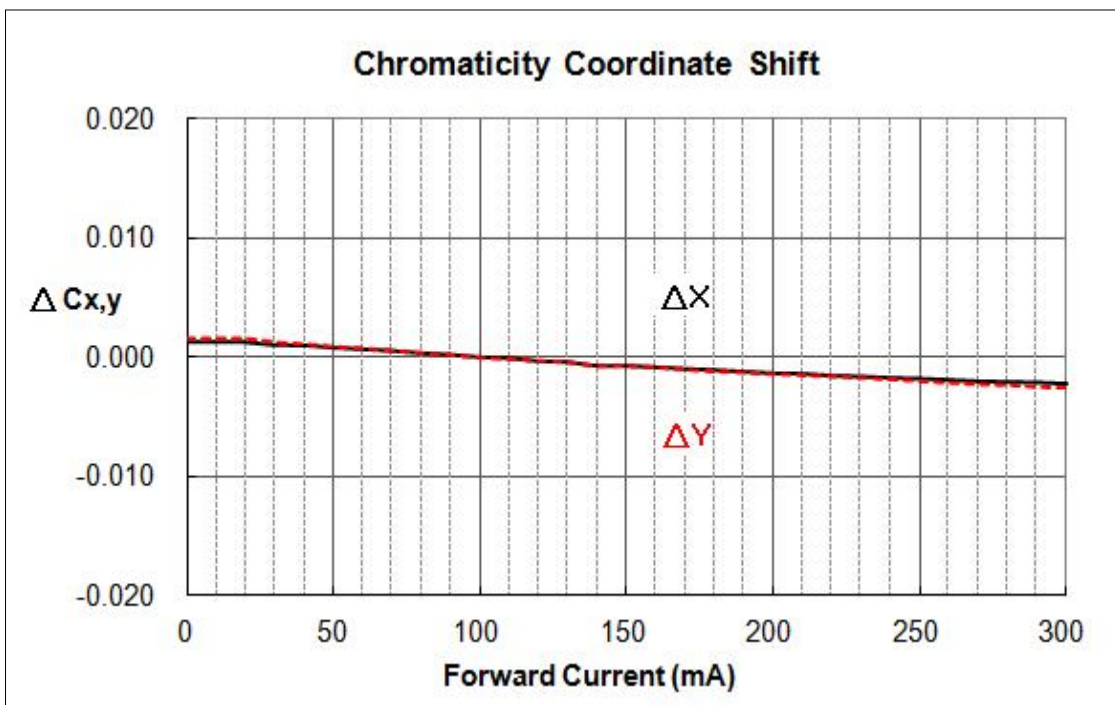
CCT : 5000K



4) Color shift Characteristics

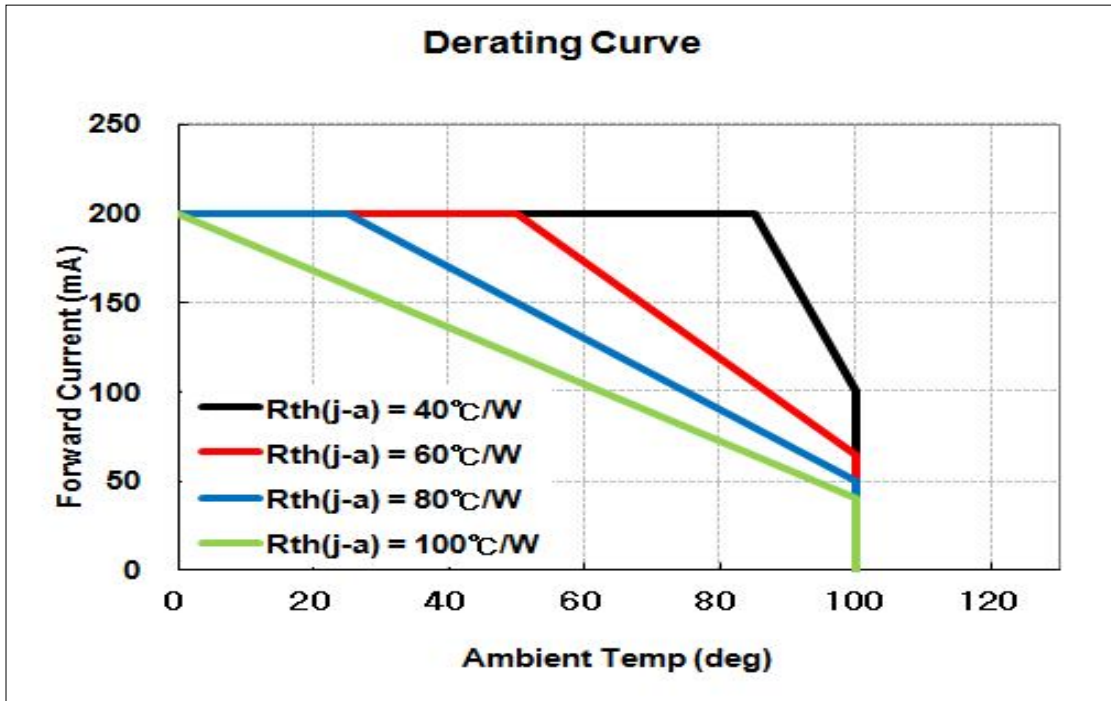
Color Δx , Δy vs. Forward Current

$T_s = 25^\circ\text{C}$



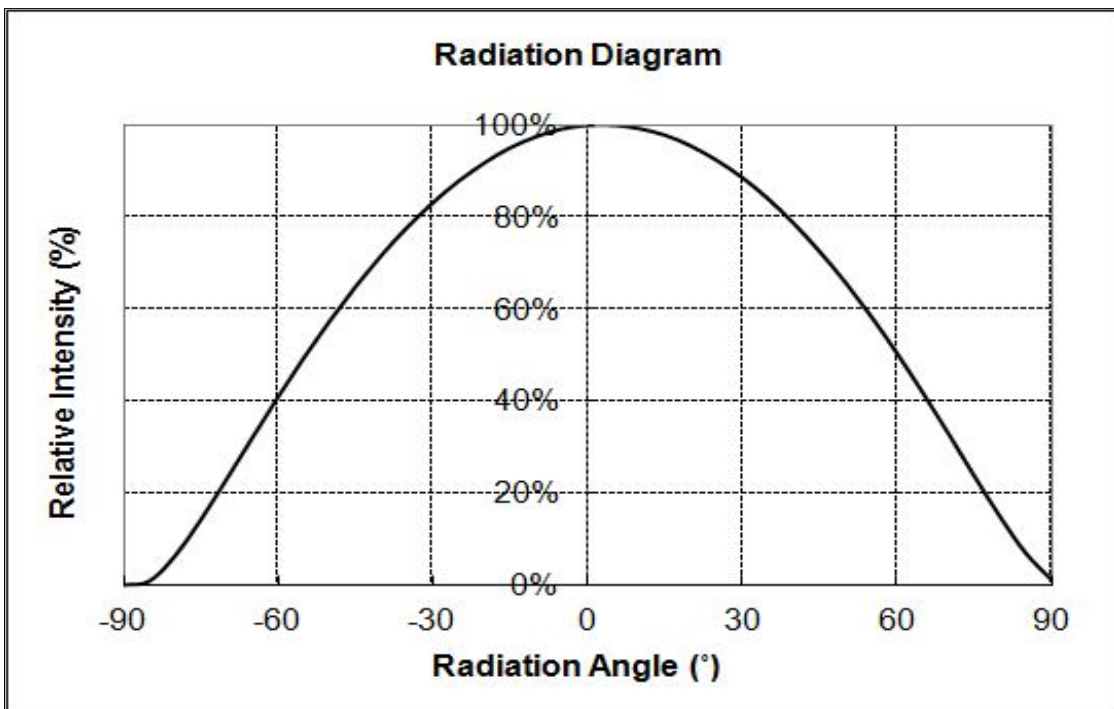
5) Derating Curve

$T_a = 25^\circ\text{C}$

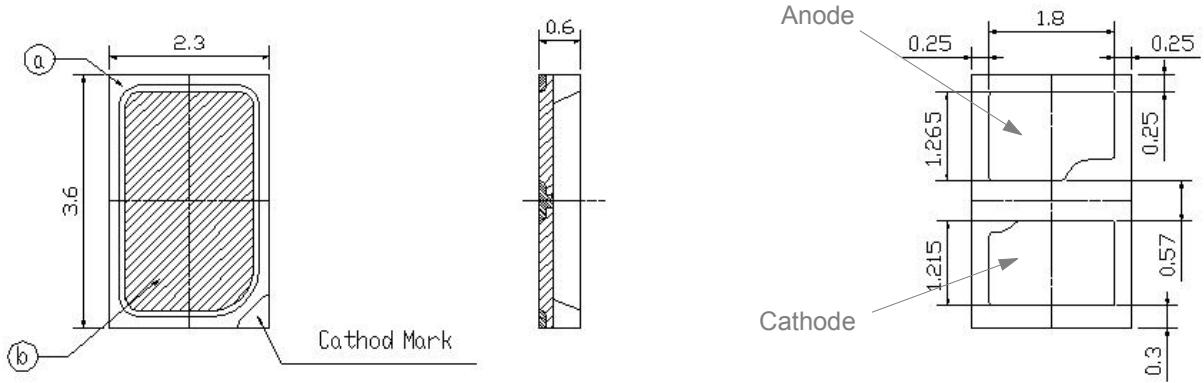


6) Viewing Angle Characteristics (@100mA)

$T_s = 25^\circ\text{C}$

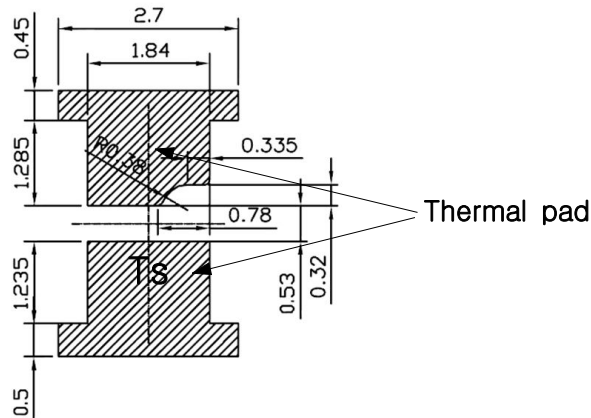


5. Outline Drawing and Dimension



1. Tolerance is ± 0.1 mm
2. The maximum compressing force is 15N on the silicone body ①
3. Do not place pressure on the encapsulation resin ②

Recommended Land Pattern



Notes:

- 1) This LED has built-in ESD protection device(s) connected in parallel to LED Chip(s).
- 2) Ts point & measurement method
 - ① Measure the nearest point to the thermal pad. If necessary, remove PSR of PCB to reach Ts point.
 - ② Thermal pad must be soldered to the PCB to dissipate heat properly. Otherwise, LED can be damaged.
- 3) The thermal pad is electrically connected to the cathode contact pads.
- 4) Precautions
 - ① The pressure on the LEDs will influence to the reliability of the LEDs. Precautions should be taken to avoid the 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.

6. Reliability Test Items and Conditions

1) Test Items and Results

| Test Item | Test Conditions | Test Hours/Cycles | Sample No | |
|-------------------------------------|--|---|-----------|----|
| MSL Test | 125 °C 24hrs drying → 60 °C, 60 %RH 120hrs → 260 °C 10sec 3 cycles | 1 cycle | 11 | |
| Room Temperature life test | 25 °C±3 °C, DC200mA | 1,000 hrs | 22 | |
| High Temperature life test | 85 °C±3 °C, DC200 mA | 1,000 hrs | 22 | |
| High Temperature humidity life test | 85°C±3 °C, 85 %±2 %RH, DC200 mA | 1,000 hrs | 22 | |
| Low Temperature life test | -40 °C±3 °C, DC200 mA | 1,000 hrs | 22 | |
| Power Temperature Cycle | -40 °C/20 min ↔ 85 °C/20 min, Temp. change within 100min, on/off 5 min | 100 cycles | 50 | |
| Thermal Shock | -45 °C/15 min ↔ 125 °C/15 min, Temp. change within 5min → Hot plate 180 °C | 200 cycles | 100 | |
| High Temperature Storage | Ta=120 °C±3 °C | 1000 hrs | 11 | |
| Low Temperature Storage | Ta=-40 °C±3 °C | 1000 hrs | 11 | |
| ESD(HBM) | | R1:10 MΩ, R2:1.5 kΩ, C:100 pF, V = ±5 kV | 5 times | 10 |
| ESD(MM) | | R1:10 MΩ, R2:0, C:200 pF, V = ±0.5 kV | 5 times | 10 |
| Vibration Test | 100~2000~100 Hz, 200 m/s ² , Sweep 4 min, X, Y, Z 3 direction, each 1 cycle | 4 cycles | 11 | |
| Mechanical Shock Test | 1500G, 0.5 ms | 5 cycles | 11 | |

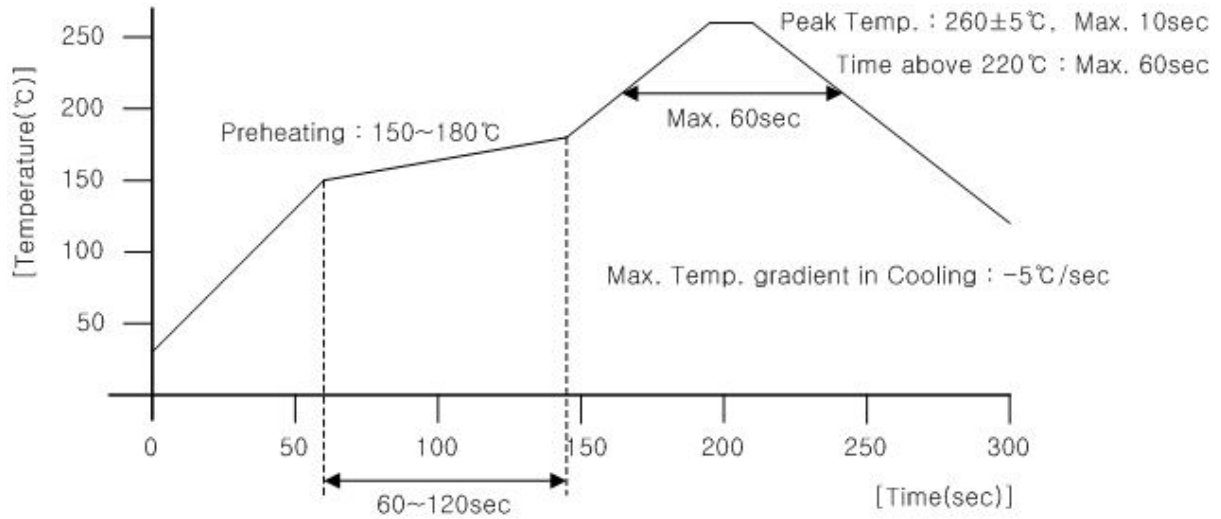
2) Criteria for Judging the Damage

| Item | Symbol | Test Condition | Limit | |
|-----------------|----------------|-------------------------|-----------------|-----------------|
| | | | Min | Max |
| Forward Voltage | V _F | I _F = 100 mA | Init. Value*0.9 | Init. Value*1.1 |
| Luminous Flux | Im | I _F = 100 mA | Init. Value*0.8 | Init. Value*1.2 |

7. Solder Conditions

1) Reflow Conditions (Pb Free)

Reflow Frequency : 2 times max.



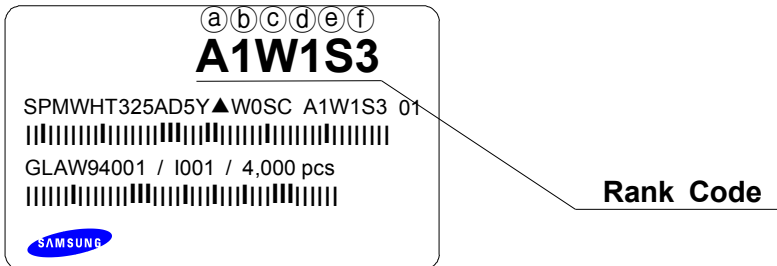
2) For Manual Soldering

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



9. Label Structure

1) Label Structure

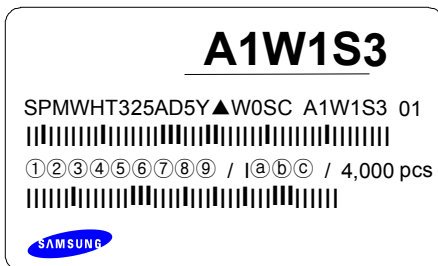


Rank Code

- ⒶⒷ : Forward Voltage Rank
- ⒸⒹ : Chromaticity Coordinate Rank
- ⒺⒻ : Luminous Intensity Rank

2) LOT Number

The Lot number is composed of the following characters



①②③④⑤⑥⑦⑧⑨ / IⒶⒷⒸ / 4,000 PCS

- ① : Production Site (S:SAMSUNG LED, G:GOSIN CHINA)
- ② : L (LED)
- ③ : Product State (A:Normality, B:Bulk, C:First Production, R:Reproduction, S:Sample)
- ④ : Year (V:2011, W:2012, X:2013...)
- ⑤ : Month (1 ~ 9, A, B, C)
- ⑥ : Day (1 ~ 9, A, B ~ V)
- ⑦⑧⑨ : SAMSUNG LED Product number (1 ~ 999)
- ⒶⒷⒸ : Reel Number (1 ~ 999)

11. Precaution for 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 3 months or more after being shipped from Samsung Electronics, they should be packed by a sealed container with nitrogen gas injected.(Shelf life of sealed bags: 12 months, temp. $\sim 40^{\circ}\text{C}$, $\sim 90\%RH$)
- 5) After storage bag is open, 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 $30^{\circ}\text{C}/60\%RH$,
 - b. Stored at $<10\%RH$.
- 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 $>60\%$ at $23\pm 5^{\circ}\text{C}$..
- 8) Devices must be baked for 1 hour at $65\pm 5^{\circ}\text{C}$, 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 light and heat. This phenomenon can cause a significant loss of light emitted(output) from the luminaires(fixture). In order to prevent these problems, we recommend you to know the physical properties of materials used in luminaires, They must be selected carefully.

11) Risk of Sulfurization(or Tarnishing)

The LED from Samsung Electronics 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 in a following list,

: Rubber, plain paper, lead solder cream and so on.

12. Hazard Substance Analysis Report



Test Report No. F690101/LF-CTSAYAA13-52929

Issued Date: 2013. 11. 27 Page 1 of 6

To: **SAMSUNG ELECTRONICS CO., LTD.**
San #24,Nongseo-dong
Giheung-gu
Yongin-si
Gyeonggi-do
Korea

The following merchandise was submitted and identified by the client as :

SGS File No. : AYAA13-52929
Product Name : 3623 White PKG
Item No./Part No. : N/A
Received Date : 2013. 11. 20
Test Period : 2013. 11. 21 to 2013. 11. 27
Test Results : For further details, please refer to following page(s)
Test Performed : SGS Korea tested the sample(s) selected by applicant with following results.
Job Comments : By the applicant's specific request, the sampling and testing was performed only for the part indicated in the photo without disassembly.

Timothy Jeon
Jinhee Kim
Cindy Park
Jerry Jung/ Testing Person

SGS Korea Co., Ltd.

Jeff Jang / Chemical Lab Mgr

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.


Test Report No. F690101/LF-CTSAYAA13-52929

Issued Date: 2013. 11. 27 Page 2 of 6

Sample No. : AYAA13-52929.001
Sample Description : 3623 White PKG
Item No./Part No. : N/A
Materials : N/A

Heavy Metals

| Test Items | Unit | Test Method | MDL | Results |
|-----------------------------|-------|--|-----|---------|
| Cadmium (Cd) | mg/kg | With reference to IEC 62321:2013, ICP | 0.5 | N.D. |
| Lead (Pb) | mg/kg | With reference to IEC 62321:2013, ICP | 5 | N.D. |
| Mercury (Hg) | mg/kg | With reference to IEC 62321:2013, ICP | 2 | N.D. |
| Hexavalent Chromium (Cr VI) | mg/kg | With reference to IEC 62321:2008, UV-VIS | 1 | N.D. |

Flame Retardants-PBBs/PBDEs

| Test Items | Unit | Test Method | MDL | Results |
|--------------------------|-------|---|-----|---------|
| Monobromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Dibromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Tribromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Tetrabromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Pentabromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Hexabromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Heptabromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Octabromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Nonabromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Decabromobiphenyl | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Monobromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Dibromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Tribromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Tetrabromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Pentabromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Hexabromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Heptabromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Octabromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Nonabromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |
| Decabromodiphenyl ether | mg/kg | With reference to IEC 62321:2008, GC-MS | 5 | N.D. |

NOTE:

- (1) N.D. = Not detected.(<MDL)
- (2) mg/kg = ppm
- (3) MDL = Method Detection Limit
- (4) - = No regulation
- (5) Negative = Undetectable / Positive = Detectable
- (6) ** = Qualitative analysis (No Unit)
- (7) * = Boiling-water-extraction:
 Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm² sample surface area.

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SGS Korea Co., Ltd.

 322, The O valley, 555-9, Hoge-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 T +82 (0)31 4808 000 F +82 (0)31 4808 050 <http://www.sgs.com/kr> www.kr.sgs.com/kr

F052 Version5

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Test Report No. F690101/LF-CTSAYAA13-52929

Issued Date: 2013. 11. 27 Page 3 of 6

Sample No. : AYAA13-52929.001
Sample Description : 3623 White PKG
Item No./Part No. : N/A
Materials : N/A

Halogen Content

| Test Items | Unit | Test Method | MDL | Results |
|--------------|-------|-----------------------|-----|---------|
| Bromine(Br) | mg/kg | BS EN 14582:2007 , IC | 30 | N.D. |
| Chlorine(Cl) | mg/kg | BS EN 14582:2007 , IC | 30 | N.D. |
| Fluorine(F) | mg/kg | BS EN 14582:2007 , IC | 30 | N.D. |
| Iodine(I) | mg/kg | BS EN 14582:2007 , IC | 50 | N.D. |

Other(s)

| Test Items | Unit | Test Method | MDL | Results |
|---|-------|---------------------------|-----|---------|
| PFOS (Perfluorooctane Sulfonates-Acid/Metal Salt/Amide) | mg/kg | US EPA 3540C/3550C, LC/MS | 1 | N.D. |

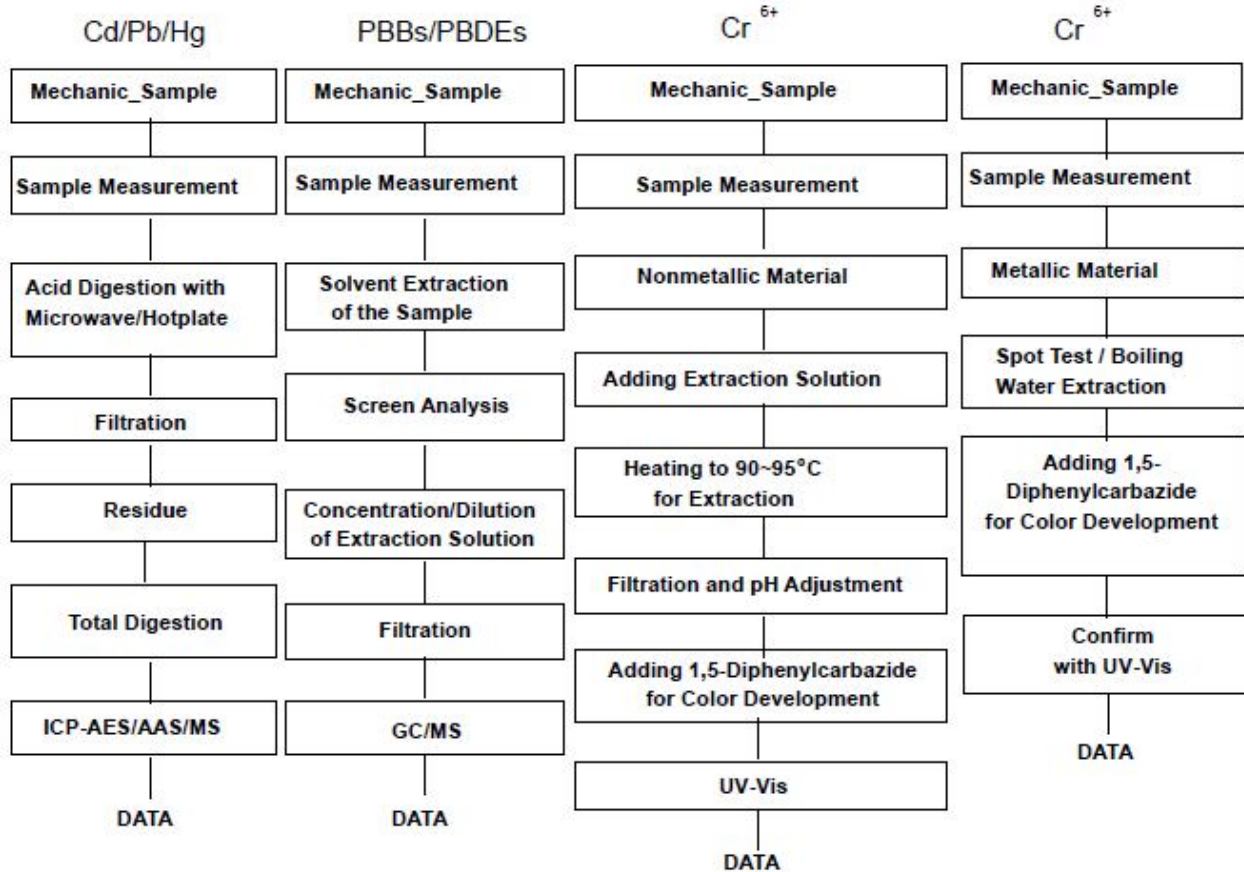
NOTE:

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- (5) Negative = Undetectable / Positive = Detectable
- (6) ** = Qualitative analysis (No Unit)
- (7) * = Boiling-water-extraction:
 Negative = Absence of Cr/VI coating
 Positive = Presence of Cr/VI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm² sample surface area.

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Testing Flow Chart for RoHS: Cd/Pb/Hg/Cr⁶⁺ /PBBs&PBDEs Testing



The samples were dissolved totally by pre-conditioning method according to above flow chart for Cd,Pb,Hg.
Section Chief : Gilsae Yi

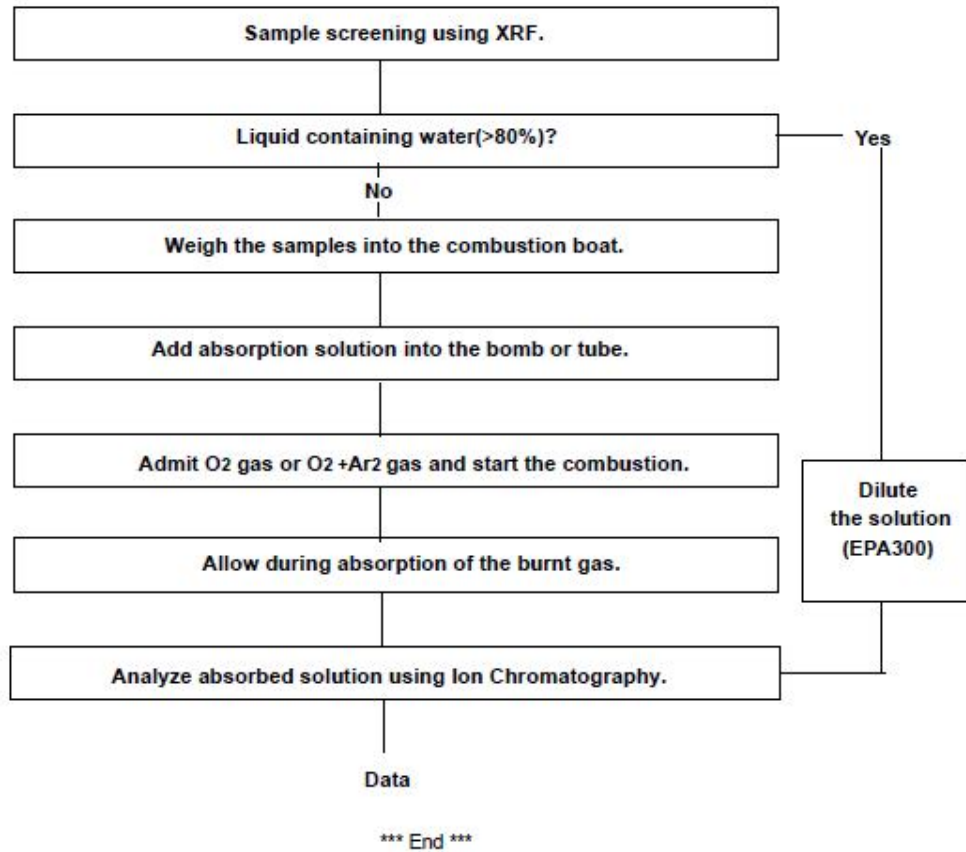
NOTE:

- (1) N.D. = Not detected. (<MDL)
- (2) mg/kg = ppm
- (3) MDL = Method Detection Limit
- (4) - = No regulation
- (5) Negative = Undetectable / Positive = Detectable
- (6) ** = Qualitative analysis (No Unit)
- (7) * = Boiling-water-extraction:
 Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm² sample surface area.

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Flow Chart for Halogen Test



NOTE:

- (1) N.D. = Not detected.(<MDL)
- (2) mg/kg = ppm
- (3) MDL = Method Detection Limit
- (4) - = No regulation
- (5) Negative = Undetectable / Positive = Detectable
- (6) ** = Qualitative analysis (No Unit)
- (7) * = Boiling-water-extraction:
 Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

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Test Report No. F690101/LF-CTSAYAA13-52928 Issued Date: 2013. 11. 27 Page 1 of 16

To: **SAMSUNG ELECTRONICS CO., LTD.**
95, Samsung 2-ro
Giheung-gu
Yongin-si
Gyeonggi-do
Korea

The following sample(s) was/were submitted and identified by/on behalf of the client as:-

| | |
|-----------------------|---|
| Product Name | : 3623 White PKG |
| Item/Part Name | : N/A |
| SGS File No. | : AYAA13-52928 |
| Received Date | : 2013. 11. 20 |
| Test Period | : 2013. 11. 21 ~ 2013. 11. 27 |
| Test Performed | : SGS Korea tested the sample(s) selected by applicant with following results |
| Test Requested | : One hundred-forty four (144) substances in the Candidate List of Substances of Very High Concern (SVHC) for authorization published by European Chemicals Agency (ECHA) on June 20, 2013 regarding Regulation (EC) No 1907/2006 concerning the REACH. Seven(7) substances in the Public Consultation List of potential Substances of Very High Concern (SVHC) published by European Chemicals Agency (ECHA) on September 02, 2013 regarding Regulation (EC) No 1907/2006 concerning the REACH. |
| Test Method | : Please refer to next page(s). |
| Test Result(s) | : Please refer to next page(s). |

Timothy Jeon
Cindy park
Jinhee Kim
Sophia Kim
/Testing Person

SGS Korea Co., Ltd

Jeff Jang / Chemical Lab Mgr

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322, The O valley, 555-9, Hoge-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
t +82 (0)31 4608 000 f +82 (0)31 4608 059 <http://www.sgs/lab.co.kr> www.kr.sgs.com/greenlab

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Test Method:

SGS In-House method - Analyzed by ICP-OES, PLM, UV/VIS, LC/MS ,GC/MS and colorimetric method

Remarks:

- The chemical analysis of specified SVHC is performed by means of currently available analytical techniques against the following SVHC related documents published by ECHA:
<http://echa.europa.eu/web/guest/candidate-list-table> (Candidate list)
http://echa.europa.eu/proposals-to-identify-substances-of-very-high-concern-previous-consultations?p_p_id=substancetypelist_WAR_substanceportlet&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_pos=2&p_p_col_count=4&substancetypelis
 (Proposals to identify SVHC consultations)
 This list is under evaluation by ECHA and may subject to change in the future.
- In accordance with Regulation (EC) No 1907/2006, any producer or importer of articles shall notify ECHA, in accordance with paragraph 2 of Article 7, if a substance meets the criteria in Article 57 and is identified in accordance with Article 59(1) of the Regulation, if (a) the substance is present in those articles in quantities totaling over one tonne per producer or importer per year; and (b) the substance is present in those articles above a concentration of **0.1 %** weight by weight (w/w).
- Article 33 of Regulation (EC) No 1907/2006 requires supplier of an article containing a substance meeting the criteria in Article 57 and identified in accordance with Article 59(1) in a concentration above **0.1 %** weight by weight (w/w) shall provide the recipient of the article with sufficient information, available to the supplier, to allow safe use of the article including, as a minimum, the name of that substance in the Candidate List.
- SGS adopts the interpretation of ECHA for SVHC in article unless indicated otherwise. Detail explanation is available at the following link:
http://webstage.contribute.sgs.net/corpreach/documents/SGS-CTS_SVHC-paper-EN-11.pdf
- Test results in this report are based on the tested sample. This report refers to testing result of composite material group by equal weight proportion. The material in each composite test group may come from one article.
- If a SVHC is found over the reporting limit, client is suggested to identify the component which contains the SVHC and the exact concentration of the SVHC by requesting further quantitative analysis from the laboratory.

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Test Result(s)

| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|--|--|------------------------|-------------------|---------------------|---|
| Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins) | 85535-84-8 | 287-476-5 | N.D. | 0.05 | PBT |
| Anthracene | 120-12-7 | 204-371-1 | N.D. | 0.05 | PBT |
| Benzyl butyl phthalate (BBP) | 85-68-7 | 201-622-7 | N.D. | 0.05 | Toxic for Reproduction |
| Bis(2-ethylhexyl)phthalate (DEHP) | 117-81-7 | 204-211-0 | N.D. | 0.05 | Toxic for Reproduction |
| Bis(tributyltin)oxide | 56-35-9 | 200-268-0 | N.D. | 0.05 | PBT |
| Cobalt dichloride* | 7646-79-9 | 231-589-4 | N.D. | 0.005 | Carcinogen Toxic for Reproduction |
| 4,4-Diaminodiphenylmethane | 101-77-9 | 202-974-4 | N.D. | 0.05 | Carcinogen |
| Diarsenic pentaoxide* | 1303-28-2 | 215-116-9 | N.D. | 0.005 | Carcinogen |
| Diarsenic trioxide* | 1327-53-3 | 215-481-4 | N.D. | 0.005 | Carcinogen |
| Dibutyl phthalate (DBP) | 84-74-2 | 201-557-4 | N.D. | 0.05 | Toxic for Reproduction |
| Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified (α -HBCDD, β -HBCDD, γ -HBCDD) | 25637-99-4 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8) | 247-148-4 221-695-9 | N.D. | 0.05 | PBT |
| Lead hydrogen arsenate* | 7784-40-9 | 232-064-2 | N.D. | 0.005 | Carcinogen Toxic for Reproduction |
| Sodium dichromate* (Sodium dichromate, dehydrate) | 10588-01-9 (7789-12-0) | 234-190-3 | N.D. | 0.005 | Carcinogen Mutagen Toxic for Reproduction |
| 5-tert-butyl-2,4,6-trinitro-m-xylene (musk xylene) | 81-15-2 | 201-329-4 | N.D. | 0.05 | vPvB |
| Triethyl arsenate* | 15606-95-8 | 427-700-2 | N.D. | 0.005 | Carcinogen |

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SGS Korea Co., Ltd.

322, The O valley, 555-9, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
T +82 (0)31 4608 000 F +82 (0)31 4608 059 <http://www.sgslab.co.kr> www.kr.sgs.com/greenlab

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|---|------------|-----------|-------------------|---------------------|--------------------------------------|
| Di-isobutyl phthalate(DIBP) | 84-69-5 | 201-553-2 | N.D. | 0.05 | Toxic for Reproduction |
| 2,4-Dinitrotoluene | 121-14-2 | 204-450-0 | N.D. | 0.05 | Carcinogen |
| Tris(2-chloroethyl) phosphate | 115-96-8 | 204-118-5 | N.D. | 0.05 | Toxic for Reproduction |
| Anthracene oil | 90640-80-5 | 292-602-7 | N.D. | 0.05 | PBT; vPvB Carcinogen |
| Anthracene oil, anthracene paste; distn. Lights | 91995-17-4 | 295-278-5 | N.D. | 0.05 | PBT; vPvB Carcinogen Mutagen |
| Anthracene oil, anthracene paste, anthracene fraction | 91995-15-2 | 295-275-9 | N.D. | 0.05 | PBT; vPvB Carcinogen Mutagen |
| Anthracene oil, anthracene-low | 90640-82-7 | 292-604-8 | N.D. | 0.05 | PBT; vPvB Carcinogen Mutagen |
| Anthracene oil, anthracene paste | 90640-81-6 | 292-603-2 | N.D. | 0.05 | PBT; vPvB Carcinogen Mutagen |
| Coal tar pitch, high temperature | 65996-93-2 | 266-028-2 | N.D. | 0.05 | PBT; vPvB Carcinogen |
| Lead sulfochromate yellow (C.I. Pigment Yellow 34)* | 1344-37-2 | 215-693-7 | N.D. | 0.005 | Carcinogen Toxic for Reproduction |
| Lead chromate molybdate sulfate red (C.I. Pigment Red 104)* | 12656-85-8 | 235-759-9 | N.D. | 0.005 | Carcinogen Toxic for Reproduction |
| Lead chromate* | 7758-97-6 | 231-846-0 | N.D. | 0.005 | Carcinogen Toxic for Reproduction |
| Acrylamide | 79-06-01 | 201-173-7 | N.D. | 0.05 | Carcinogen Mutagen |

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t +82 (0)31 4608 000 f +82 (0)31 4608 059 <http://www.sgslab.co.kr> www.kr.sgs.com/greenlab

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|--|--------------------------------------|------------------------|-------------------|---------------------|---|
| Boric acid* | 10043-35-3 11113-50-1 | 233-139-2 234-343-4 | N.A. | 0.005 | Toxic for Reproduction |
| Disodium tetraborate, anhydrous* | 1330-43-4 12179-04-3 1303-96-4 | 215-540-4 | N.A. | 0.005 | Toxic for Reproduction |
| Tetraboron disodium heptaoxide, hydrate* | 12267-73-1 | 235-541-3 | N.A. | 0.005 | Toxic for Reproduction |
| Trichloroethylene | 79-01-6 | 201-167-4 | N.D. | 0.05 | Carcinogen |
| Sodium chromate* | 7775-11-3 | 231-889-5 | N.D. | 0.005 | Carcinogen Mutagen Toxic for Reproduction |
| Ammonium dichromate* | 7789-09-5 | 232-143-1 | N.D. | 0.005 | Carcinogen Mutagen Toxic for Reproduction |
| Potassium dichromate* | 7778-50-9 | 231-906-6 | N.D. | 0.005 | Carcinogen Mutagen Toxic for Reproduction |
| Potassium chromate* | 7789-00-6 | 232-140-5 | N.D. | 0.005 | Carcinogen Mutagen |

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|---|-----------------------|-----------|-------------------|---------------------|--------------------------------------|
| Cobalt(II) sulphate* | 10124-43-3 | 233-334-2 | N.D. | 0.005 | Carcinogen Toxic for Reproduction |
| Cobalt(II) dinitrate* | 10141-05-6 | 233-402-1 | N.D. | 0.005 | Carcinogen Toxic for Reproduction |
| Cobalt(II) carbonate* | 513-79-1 | 208-169-4 | N.D. | 0.005 | Carcinogen Toxic for Reproduction |
| Cobalt(II) diacetate* | 71-48-7 | 200-755-8 | N.D. | 0.005 | Carcinogen Toxic for Reproduction |
| 2-Methoxyethanol | 109-86-4 | 203-713-7 | N.D. | 0.05 | Toxic for Reproduction |
| 2-Ethoxyethanol | 110-80-5 | 203-804-1 | N.D. | 0.05 | Toxic for Reproduction |
| Chromium trioxide* | 1333-82-0 | 215-607-8 | N.D. | 0.005 | Carcinogen Mutagen |
| Acids generated from chromium trioxide and their oligomers: | | | | | |
| Chromic acid | 7738-94-5 | 231-801-5 | N.D. | 0.005 | Carcinogen |
| Dichromic acid | 13530-68-2 | 236-881-5 | | | |
| Oligomers of chromic acid and dichromic acid | | | | | |
| 1-methyl-2-pyrrolidone | 872-50-4 | 212-828-1 | N.D. | 0.05 | Toxic for Reproduction |
| 2-ethoxyethyl acetate | 111-15-9 | 203-839-2 | N.D. | 0.05 | Toxic for Reproduction |
| 1,2-benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich | 71888-89-6 | 276-158-1 | N.D. | 0.05 | Toxic for Reproduction |
| 1,2-benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters | 68515-42-4 | 271-084-6 | N.D. | 0.05 | Toxic for Reproduction |
| 1,2,3-trichloropropane | 96-18-4 | 202-486-1 | N.D. | 0.05 | Carcinogen Toxic for Reproduction |
| Hydrazine | 7803-57-8 302-01-2 | 206-114-9 | N.D. | 0.05 | Carcinogen |
| Strontium chromate* | 7789-06-2 | 232-142-6 | N.D. | 0.005 | Carcinogen |

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|---|--------------------------|------------|-------------------|---------------------|--|
| 1,2-Dichloroethane | 107-06-2 | 203-458-1 | N.D. | 0.05 | Carcinogenic |
| 2,2'-dichloro-4,4'-methylenedianiline (MOCA) | 101-14-4 | 202-918-9 | N.D. | 0.05 | Carcinogenic |
| 2-Methoxyaniline o-Anisidine | 90-04-0 | 201-963-1 | N.D. | 0.05 | Carcinogenic |
| 4-(1,1,3,3-tetramethylbutyl) phenol, (4-tert-Octylphenol) | 140-66-9 | 205-426-2 | N.D. | 0.05 | Equivalent level of concern having probable serious effects to the environment |
| Aluminosilicate Refractory Ceramic Fibres* (RCF) | 650-017-00-8 (Index no.) | - | N.D. | 0.005 | Carcinogenic |
| Arsenic acid* | 7778-39-4 | 231-901-9 | N.D. | 0.005 | Carcinogenic |
| Bis(2-methoxyethyl) ether | 111-96-6 | 203-924-4 | N.D. | 0.05 | Toxic for reproduction |
| Bis(2-methoxyethyl) phthalate | 117-82-8 | 204-212-6- | N.D. | 0.05 | Toxic for reproduction |
| Calcium arsenate* | 7778-44-1 | 231-904-5 | N.D. | 0.005 | Carcinogenic |
| Dichromium tris(chromate)* | 24613-89-6 | 246-356-2 | N.D. | 0.005 | Carcinogenic |
| Formaldehyde, oligomeric reaction products with aniline (technical MDA) | 25214-70-4 | 500-036-1 | N.D. | 0.05 | Carcinogenic |
| Lead diazide* | 13424-46-9 | 236-542-1 | N.D. | 0.005 | Toxic for reproduction |
| Lead dipicrate* | 6477-64-1 | 229-335-2 | N.D. | 0.005 | Toxic for reproduction |
| Lead styphnate* | 15245-44-0 | 239-290-2 | N.D. | 0.005 | Toxic for reproduction |
| N,N-dimethylacetamide (DMAC) | 127-19-5 | 204-826-4 | N.D. | 0.05 | Toxic for reproduction |
| Pentazinc chromate octahydroxide* | 49663-84-5 | 256-418-0 | N.D. | 0.005 | Carcinogenic |
| Phenolphthalein | 77-09-8 | 201-004-7 | N.D. | 0.05 | Carcinogenic |
| Potassium hydroxyocta-oxodizincatedichromate* | 11103-86-9 | 234-329-8 | N.D. | 0.005 | Carcinogenic |
| Trilead diarsenate* | 3687-31-8 | 222-979-5 | N.D. | 0.005 | Carcinogenic Toxic for reproduction |
| Zirconia Aluminosilicate Refractory Ceramic Fibres (Zr-RCF)* | 650-017-00-8 (Index no.) | - | N.D. | 0.005 | Carcinogenic |

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T +82 (0)31 4608 000 F +82 (0)31 4608 058 <http://www.sgslab.co.kr> www.kr.sgs.com/sgslab

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|--|------------|-----------|-------------------|---------------------|------------------------|
| 1,2-bis(2-methoxyethoxy) ethane (TEGDME; triglyme) | 112-49-2 | 203-977-3 | N.D. | 0.05 | Toxic for reproduction |
| 1,2-dimethoxyethane; ethylene glycol dimethyl ether (EGDME) | 110-71-4 | 203-794-9 | N.D. | 0.05 | Toxic for reproduction |
| Diboron trioxide* | 1303-86-2 | 215-125-8 | N.A. | 0.005 | Toxic for reproduction |
| Formamide | 75-12-7 | 200-842-0 | N.D. | 0.05 | Toxic for reproduction |
| Lead(II) bis(methanesulfonate)* | 17570-76-2 | 401-750-5 | N.D. | 0.005 | Toxic for reproduction |
| TGIC(1,3,5-tris (oxiranyl methyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione) | 2451-62-9 | 219-514-3 | N.D. | 0.05 | Mutagenic |
| β -TGIC (1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione)** | 59653-74-6 | 423-400-0 | N.D. | 0.05 | Mutagenic |
| 4,4'-bis(dimethylamino) benzophenone (Michler's ketone) | 90-94-8 | 202-027-5 | N.D. | 0.05 | Carcinogenic |
| N,N,N',N'-tetramethyl-4,4'-methylenedianiline (Michler's base) | 101-61-1 | 202-959-2 | N.D. | 0.05 | Carcinogenic |
| [4-[4,4'-bis(dimethylamino) benzhydrylidene]cyclohexa-2,5-dien-1-ylidene] dimethylammonium chloride (C.I. Basic Violet 3) | 548-62-9 | 208-953-6 | N.D. | 0.05 | Carcinogenic |
| [4-[[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]meth ylene]cyclohexa-2,5-dien-1-ylidene] dimethylammonium chloride (C.I. Basic Blue 26) | 2580-56-5 | 219-943-6 | N.D. | 0.05 | Carcinogenic |
| α,α -Bis[4-(dimethylamino) phenyl]-4 (phenylamino) naphthalene-1-methanol (C.I. Solvent Blue 4) | 6786-83-0 | 229-851-8 | N.D. | 0.05 | Carcinogenic |
| 4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol | 561-41-1 | 209-218-2 | N.D. | 0.05 | Carcinogenic |

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SGS Korea Co., Ltd.

322, The O valley, 555-B, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
T +82 (0)31 4608 000 F +82 (0)31 4608 058 <http://www.sgslab.co.kr> www.kr.sgs.com/greenlab

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|--|------------|-----------|-------------------|---------------------|---|
| Bis(pentabromophenyl) ether (DecaBDE) | 1163-19-5 | 214-604-9 | N.D. | 0.05 | PBT vPvB |
| Pentacosafuorotridecanoic acid | 72629-94-8 | 276-745-2 | N.D. | 0.05 | vPvB |
| Tricosafuorododecanoic acid | 307-55-1 | 206-203-2 | N.D. | 0.05 | vPvB |
| Henicosafuoroundecanoic acid | 2058-94-8 | 218-165-4 | N.D. | 0.05 | vPvB |
| Heptacosafuorotetradecanoic acid | 376-06-7 | 206-803-4 | N.D. | 0.05 | vPvB |
| 4-(1,1,3,3-tetramethylbutyl) phenol, ethoxylated - covering well-defined substances and UVCB substances, polymers and homologues | - | - | N.D. | 0.05 | Equivalent level of concern - probable serious effects on the environment |
| 4-Nonylphenol, branched and linear - substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 to phenol, covering also UVCB- and well-defined substances which include any of the individual isomers or a combination thereof | - | - | N.D. | 0.05 | Equivalent level of concern - probable serious effects on the environment |
| Diazene-1,2-dicarboxamide (C,C'-azodi(formamide)) | 123-77-3 | 204-650-8 | N.D. | 0.05 | Equivalent level of concern - probable serious effects on human health |
| Cyclohexane-1,2-dicarboxylic anhydride (Hexahydrophthalic anhydride - HHPA) | 85-42-7 | 201-604-9 | N.D. | 0.05 | Equivalent level of concern - probable serious effects on human health |

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SGS Korea Co., Ltd.

322, The O valley, 555-B, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
t +82 (0)31 4608 000 f +82 (0)31 4608 059 <http://www.sgslab.co.kr> www.kr.sgs.com/gtse/lab

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|---|--|--|-------------------|---------------------|--|
| Hexahydromethylphthalic anhydride, Hexahydro-4-methylphthalic anhydride, Hexahydro-1-methylphthalic anhydride, Hexahydro-3-methylphthalic anhydride | 25550-51-0, 19438-60-9, 48122-14-1, 57110-29-9 | 247-094-1, 243-072-0, 256-356-4, 260-566-1 | N.D. | 0.05 | Equivalent level of concern - probable serious effects on human health |
| Methoxy acetic acid | 625-45-6 | 210-894-6 | N.D. | 0.05 | Toxic for reproduction equivalent level of concern -probable serious effects on human health and the environment |
| 1,2-Benzenedicarboxylic acid, dipentylester, branched and linear | 84777-06-0 | 284-032-2 | N.D. | 0.05 | Toxic for reproduction |
| Diisopentylphthalate (DIPP) | 605-50-5 | 210-088-4 | N.D. | 0.05 | Toxic for reproduction |
| N-pentyl-isopentylphthalate | - | - | N.D. | 0.05 | Toxic for reproduction |
| 1,2-Diethoxyethane | 629-14-1 | 211-076-1 | N.D. | 0.05 | Toxic for reproduction |
| N,N-dimethylformamide; dimethyl formamide | 68-12-2 | 200-679-5 | N.D. | 0.05 | Toxic for reproduction |
| Dibutyltin dichloride (DBT) | 683-18-1 | 211-670-0 | N.D. | 0.05 | Toxic for reproduction |
| Acetic acid, lead salt, basic* | 51404-69-4 | 257-175-3 | N.D. | 0.005 | Toxic for reproduction |
| Basic lead carbonate (trilead bis(carbonate)dihydroxide)* | 1319-46-6 | 215-290-6 | N.D. | 0.005 | Toxic for reproduction |
| Lead oxide sulfate (basic lead sulfate)* | 12036-76-9 | 234-853-7 | N.D. | 0.005 | Toxic for reproduction |
| [Phthalato(2-)]dioxotrilead (dibasic lead phthalate)* | 69011-06-9 | 273-688-5 | N.D. | 0.005 | Toxic for reproduction |

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322, The O valley, 505-9, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
t +82 (0)31 4608 000 f +82 (0)31 4608 059 <http://www.sgslab.co.kr> www.kr.sgs.com/groenlab

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|--|------------|-----------|-------------------|---------------------|------------------------|
| Dioxobis(stearato)trilead* | 12578-12-0 | 235-702-8 | N.D. | 0.005 | Toxic for reproduction |
| Fatty acids, C16-18, lead salts* | 91031-62-8 | 292-966-7 | N.D. | 0.005 | Toxic for reproduction |
| Lead bis(tetrafluoroborate)* | 13814-96-5 | 237-486-0 | N.D. | 0.005 | Toxic for reproduction |
| Lead cyanamidate* | 20837-86-9 | 244-073-9 | N.D. | 0.005 | Toxic for reproduction |
| Lead dinitrate* | 10099-74-8 | 233-245-9 | N.D. | 0.005 | Toxic for reproduction |
| Lead oxide (lead monoxide)* | 1317-36-8 | 215-267-0 | N.D. | 0.005 | Toxic for reproduction |
| Lead tetroxide (orange lead)* | 1314-41-6 | 215-235-6 | N.D. | 0.005 | Toxic for reproduction |
| Lead titanium trioxide* | 12060-00-3 | 235-038-9 | N.D. | 0.005 | Toxic for reproduction |
| Lead Titanium Zirconium Oxide* | 12626-81-2 | 235-727-4 | N.D. | 0.005 | Toxic for reproduction |
| Pentalead tetraoxide sulphate* | 12065-90-6 | 235-067-7 | N.D. | 0.005 | Toxic for reproduction |
| Pyrochlore, antimony lead yellow* | 8012-00-8 | 232-382-1 | N.D. | 0.005 | Toxic for reproduction |
| Silicic acid, barium salt, lead-doped* | 68784-75-8 | 272-271-5 | N.D. | 0.005 | Toxic for reproduction |
| Silicic acid, lead salt* | 11120-22-2 | 234-363-3 | N.D. | 0.005 | Toxic for reproduction |
| Sulfurous acid, lead salt, dibasic* | 62229-08-7 | 263-467-1 | N.D. | 0.005 | Toxic for reproduction |
| Tetraethyllead* | 78-00-2 | 201-075-4 | N.D. | 0.005 | Toxic for reproduction |
| Tetralead trioxide sulphate* | 12202-17-4 | 235-380-9 | N.D. | 0.005 | Toxic for reproduction |

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322, The O valley, 555-9, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
t +82 (0)31 4606 000 f +82 (0)31 4606 059 <http://www.sgslab.co.kr> www.kr.sgs.com/greenlab

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|--|-------------|-----------|-------------------|---------------------|---------------------------|
| Trilead dioxide phosphonate* | 12141-20-7 | 235-252-2 | N.D. | 0.005 | Toxic for reproduction |
| Furan | 110-00-9 | 203-727-3 | N.D. | 0.05 | Carcinogenic |
| Propylene oxide; 1,2-epoxypropane; methyloxirane | 75-56-9 | 200-879-2 | N.D. | 0.05 | Carcinogenic Mutagenic |
| Diethyl sulphate | 64-67-5 | 200-589-6 | N.D. | 0.05 | Carcinogenic Mutagenic |
| Dimethyl sulphate | 77-78-1 | 201-058-1 | N.D. | 0.05 | Carcinogenic |
| 3-ethyl-2-methyl-2-(3-methylbutyl)-1,3-oxazolidine | 143860-04-2 | 421-150-7 | N.D. | 0.05 | Toxic for reproduction |
| Dinoseb | 88-85-7 | 201-861-7 | N.D. | 0.05 | Toxic for reproduction |
| 4,4'-methylenedi-o-toluidine | 838-88-0 | 212-658-8 | N.D. | 0.05 | Carcinogenic |
| 4,4'-oxydianiline and its salts | 101-80-4 | 202-977-0 | N.D. | 0.05 | Carcinogenic Mutagenic |
| 4-Aminoazobenzene; 4-Phenylazoaniline | 60-09-3 | 200-453-6 | N.D. | 0.05 | Carcinogenic |
| 4-methyl-m-phenylenediamine (2,4-toluene-diamine) | 95-80-7 | 202-453-1 | N.D. | 0.05 | Carcinogenic |
| 6-methoxy-m-toluidine (p-cresidine) | 120-71-8 | 204-419-1 | N.D. | 0.05 | Carcinogenic |
| Biphenyl-4-ylamine | 92-67-1 | 202-177-1 | N.D. | 0.05 | Carcinogenic |
| o-aminoazotoluene | 97-56-3 | 202-591-2 | N.D. | 0.05 | Carcinogenic |
| o-Toluidine; 2-Aminotoluene | 95-53-4 | 202-429-0 | N.D. | 0.05 | Carcinogenic |
| N-methylacetamide | 79-16-3 | 201-182-6 | N.D. | 0.05 | Toxic for reproduction |
| 1-bromopropane; n-propyl bromide | 106-94-5 | 203-445-0 | N.D. | 0.05 | Toxic for reproduction |

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322, The O valley, 555-9, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-090
t +82 (0)31 4608 000 f +82 (0)31 4608 059 <http://www.sgslab.co.kr> www.kr.sgs.com/greenlab

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|---|------------|-----------|-------------------|---------------------|--|
| Cadmium | 7440-43-9 | 231-152-8 | N.D. | 0.005 | Carcinogenic |
| Cadmium oxide | 1306-19-0 | 215-146-2 | N.D. | 0.005 | Carcinogenic |
| Dipentyl phthalate (DPP) | 131-18-0 | 205-017-9 | N.D. | 0.05 | Toxic for reproduction |
| 4-Nonylphenol, branched and linear, ethoxylated [substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 to phenol, ethoxylated covering UVCB- and well-defined substances, polymers and homologues, which include any of the individual isomers and/or combinations thereof] | - | - | N.D. | 0.05 | Equivalent level of concern having probable serious effects to the environment |
| Ammonium pentadecafluorooctanoate (APFO) | 3825-26-1 | 223-320-4 | N.D. | 0.05 | Toxic for reproduction |
| Pentadecafluorooctanoic acid (PFOA) | 335-67-1 | 206-397-9 | N.D. | 0.05 | Toxic for reproduction |

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| Substance Name | CAS number | EC number | Concentration (%) | Reporting Limit (%) | Classification |
|--|------------|-----------|-------------------|---------------------|---|
| Dihexyl phthalate | 84-75-3 | 201-559-5 | N.D. | 0.05 | Toxic for reproduction |
| Trixylyl phosphate | 25155-23-1 | 246-677-8 | N.D. | 0.05 | Toxic for reproduction |
| Imidazolidine-2-thione; 2-imidazoline-2-thiol | 96-45-7 | 202-506-9 | N.D. | 0.05 | Toxic for reproduction |
| Disodium 4-amino-3-[[[4'-(2,4-diaminophenyl)azo][1,1'-biphenyl]-4-yl]azo]-5-hydroxy-6-(phenylazo)naphthalene-2,7-disulphonate (C.I. Direct Black 38) | 1937-37-7 | 217-710-3 | N.D. | 0.05 | Carcinogenic |
| Disodium 3,3'-[[[1,1'-biphenyl]-4,4'-diyl]bis(azo)]bis(4-aminonaphthalene-1-sulphonate) (C.I. Direct Red 28) | 573-58-0 | 209-358-4 | N.D. | 0.05 | Carcinogenic |
| Cadmium sulphide | 1306-23-6 | 215-147-8 | N.D. | 0.005 | Carcinogenic Equivalent level of concern having probable serious effects to human health |
| Lead di(acetate) | 301-04-2 | 206-104-4 | N.D. | 0.005 | Toxic for reproduction |

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322, The O valley, 555-8, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-090
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Note:

1. RL = Reporting Limit
2. N.D. = Not detected (lower than RL)

N.A. = Not applicable for respective material type.

The submitted sample was found to contain significant amount of specific element(s) of SVHC. Upon further test verification and also information provided from client, the possibility that the element(s) content originate from SVHC is very unlikely, even though their presence cannot be exclude entirely. It may be assumed that the detected element(s) have a non-SVHC source.

3. Definition of classification is listed in Appendix A of this report in accordance with 67/548/EEC and Regulation (EC) No 1907/2006. For detail information, Detail explanation is available at the following link:
<http://echa.europa.eu/web/guest/candidate-list-table> (Candidate list)
http://echa.europa.eu/proposals-to-identify-substances-of-very-high-concern-previous-consultations?p_p_id=substancetypelist_WAR_substanceportlet&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_pos=2&p_p_col_count=4&substancetypelist
 (Proposals to identify SVHC consultations)
4. *.The test result is based on the calculation of selected element(s) / marker(s) and to the worst-case scenario. For detail information, please refer to the SGS REACH website: www.reach.sgs.com/substance-of-very-high-concern-analysis-information-page.htm

The client is advised to review the chemical formulation to ascertain above metal substances present in the article.
 RL = 0.005% is evaluated for element (i.e. cobalt, arsenic, lead, sodium, chromium, chromium(VI), silicon, aluminum, zirconium, boron, and potassium respectively), except molybdenum RL=0.0005%

0.1% (w/w) = 1,000 ppm = 1,000 mg/kg

5. **.β-TGIC is one of the isomers for TGIC compounds and hence, tested together. The reported test result is based the proposed ratio as according to ECHA dossier.



*** End of Report ***

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Appendix A

Classification Definition under 67/548/EEC and Regulation (EC) No 1907/2006

| | |
|---|---|
| Carcinogen Category 1: | <u>Substances known to be carcinogenic to man.</u> There is sufficient evidence to establish a causal association between human exposure to a substance and the development of cancer. |
| Carcinogen Category 2: | <u>Substances which should be regarded as if they are carcinogenic to man.</u> There is sufficient evidence to provide a strong presumption that human exposure to a substance may result in the development of cancer. Generally on the basis of: - appropriate long-term animal studies - other relevant information. |
| Mutagen Category 1: | <u>Substances known to be mutagenic to man.</u> There is sufficient evidence to establish a causal association between human exposure to a substance and heritable genetic damage. |
| Mutagen Category 2: | <u>Substances which should be regarded as if they are mutagenic to man.</u> There is sufficient evidence to provide a strong presumption that human exposure to the substance may result in the development of heritable genetic damage, generally on the basis of: - appropriate animal studies, - other relevant information. |
| Toxic to Reproduction Category 1: | <u>Substances known to impair fertility in humans.</u> There is sufficient evidence to establish a causal relationship between human exposure to the substance and impaired fertility. <u>Substances known to cause developmental toxicity in humans.</u> There is sufficient evidence to establish a causal relationship between human exposure to the substance and subsequent developmental toxic effects in the progeny. |
| Toxic to Reproduction Category 2: | <u>Substances which should be regarded as if they impair fertility in humans.</u> There is sufficient evidence to provide a strong presumption that human exposure to the substance may result in impaired fertility on the basis of: - clear evidence in animal studies of impaired fertility in the absence of toxic effects, or, evidence of impaired fertility occurring at around the same dose levels as other toxic effects but which is not a secondary nonspecific consequence of the other toxic effects, - other relevant information. <u>Substances which should be regarded as if they cause developmental toxicity to humans.</u> There is sufficient evidence to provide a strong presumption that human exposure to the substance may result in developmental toxicity, generally on the basis of: - clear results in appropriate animal studies where effects have been observed in the absence of signs of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not a secondary non-specific consequence of the other toxic effects, - other relevant information. |
| PBT & vPvB: | Substances which are persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) pose a particular challenge to the chemicals safety management. For these substances a "safe" concentration in the environment cannot be established with sufficient reliability. |

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|------------------|
| Revision History |
|------------------|

| Date | No. | Revision History | Writer | |
|------------|-----|-----------------------------|---------|----------|
| | | | Drawn | Approved |
| 2014.03.03 | 001 | New version | N.R.KIM | S.B.YUN |
| 2014.03.19 | 002 | Addition of R, U model code | N.R.KIM | S.B.YUN |
| 2014.05.07 | 003 | Addition of Y6 model code | N.R.KIM | S.B.YUN |
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