SPECIFICATION

Product : STW#A2PD-GxNR

Seoul Semiconductor			Customer
Drawn by	**Checked by**	**Approved by**	**Approved by**
X.Y.Liu		Z.H.Lee	

Mid-Power LED – 3528 G Series

STW#A2PD-GxNR

(Cool, Neutral, Warm)

Product Brief

Description

- This White Colored surface-mount LED comes in standard package dimension.
- It has a substrate made up of a molded plastic reflector sitting on top of a lead frame.
- The die is attached within the reflector cavity and the cavity is encapsulated by silicone.
- The package design coupled with careful selection of component materials allow these products to perform with high reliability.

Features and Benefits

- Market Standard 3528 Package Size
- High efficacy with NPR Potassium Fluorosilicate (PFS or KSF) phosphor
- Hot binning(60degree standard) product
- RoHS compliant
- Package Size: 3.5x2.8

Key Applications

- Interior lighting
- General lighting
- Indoor displays
- Architectural / Decorative lighting

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Product Performance & Characterization Guide

Table 1. Product Selection Guide, I_F = 65mA, RH30%

CRI min	CCT	Performance	Typ. Flux & Lm/w IF=65mA, VF=2.72V @25℃		
			G3	G5	G7
80	6500K	Flux	34.6	35.8	37.1
		lm/w	195.6	202.5	210.0
	5700K	Flux	34.8	36.0	37.3
		lm/w	196.7	203.7	211.2
	5000K	Flux	35.3	36.5	37.8
		lm/w	199.6	206.5	214.0
	4500K	Flux	35.3	36.5	37.8
		lm/w	199.6	206.5	214.0
	4000K	Flux	35.3	36.5	37.8
		lm/w	199.6	206.5	214.0
	3500K	Flux	33.9	35.1	36.4
		lm/w	191.5	198.5	206.0
	3000K	Flux	33.6	34.8	36.0
		lm/w	189.8	196.7	203.7
	2700K	Flux	32.5	33.7	34.9
		lm/w	184.0	190.4	197.3
90	6500K	Flux	33.5	34.6	36.0
		lm/w	189.4	195.9	203.5
	5700K	Flux	33.7	34.8	36.2
		lm/w	190.6	197.1	204.7
	5000K	Flux	34.1	35.4	36.6
		lm/w	192.9	200.0	207.1
	4500K	Flux	34.1	35.4	36.6
		lm/w	192.9	200.0	207.1
	4000K	Flux	34.1	35.4	36.6
		lm/w	192.9	200.0	207.1
	3500K	Flux	32.8	34.0	35.3
		lm/w	185.3	192.4	199.4
	3000K	Flux	32.4	33.7	34.8
		lm/w	183.5	190.6	197.1
	2700K	Flux	31.5	32.6	33.8
		lm/w	178.2	184.1	191.2

Notes :

(1) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

(2) Seoul Semiconductor maintains a tolerance of ±5% on Flux and power measurements. The luminous Flux was measured at the peak of the spatial pattern which may not be aligned with the mechanical axis of the LED package.

Product Performance & Characterization Guide

Table 2. Characteristics, I_F=65mA, Tj=25ºC

Parameter	Symbol	Bin	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	GxA	2.60	-	2.70	V
		GxB	2.70	-	2.80	
Forward Current	I_F		-	65	-	mA
CRI [3]	R_a	-	80	82	-	
			90	92	-	
Viewing Angle	$2\Theta_{1/2}$		-	120	-	Deg.
Thermal resistance (J to S) [4]	$R\theta_{J-S}$		-	13	-	℃/W
ESD Sensitivity(HBM)	-		Class 2 JESD22-A114-E			

Table 3. Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Forward Current	I_F	200	mA
Junction Temperature	T_j	125	ºC
Operating Temperature	T_{opr}	-40 ~ + 85	ºC
Storage Temperature	T_{stg}	-40 ~ + 100	ºC

Notes :

(1) Seoul Semiconductor maintains a tolerance of ±5% on Flux and power measurements.

(2) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

Color coordinate : ±0.005, CCT ±5% tolerance.

(3) Tolerance is ±2.0 on CRI, ±0.1V on VF measurements.

(4) Thermal resistance is junction to Solder.

(5) The products are sensitive to static electricity and must be carefully taken when handling products

(6) It is recommended minimum currrent 5mA in order to avoid unstable brightness, and may vary depending on circuit configuration

(7) It is recommended to use it in the condition that the reliability is secured within the Max value.

- **Calculated performance values are for reference only.**
- **All measurements were made under the standardized environment of Seoul Semiconductor.**

Characteristics Graph

Fig 1. Color Spectrum

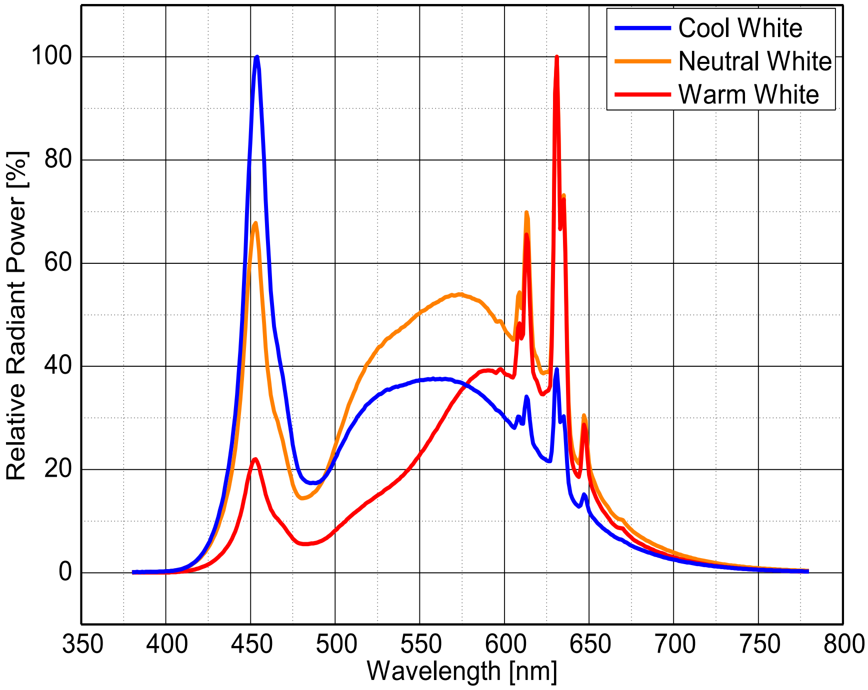
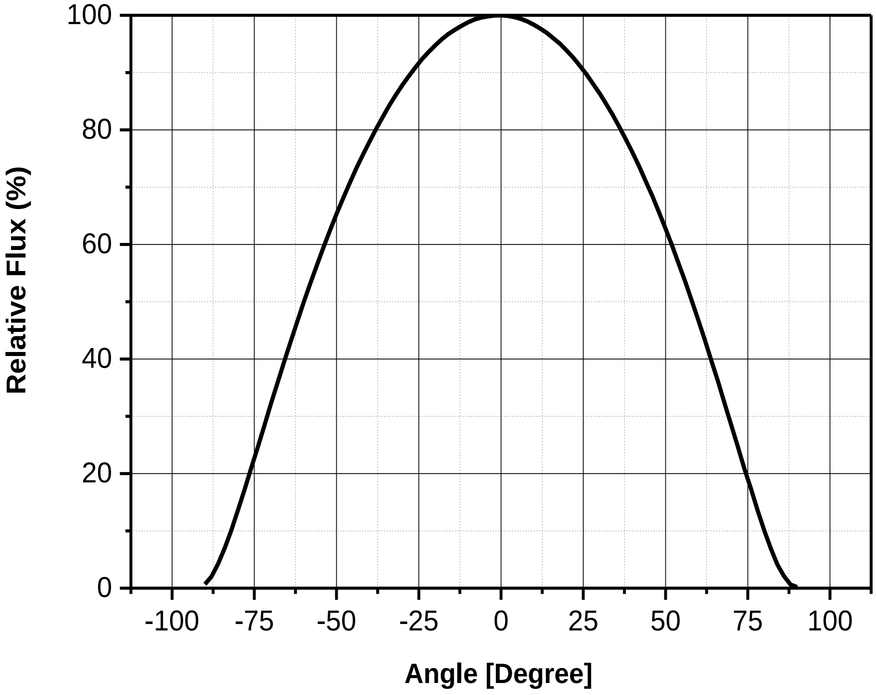


Fig 2. Typical Spatial Distribution



Characteristics Graph

Fig 3. Forward Voltage vs. Forward Current

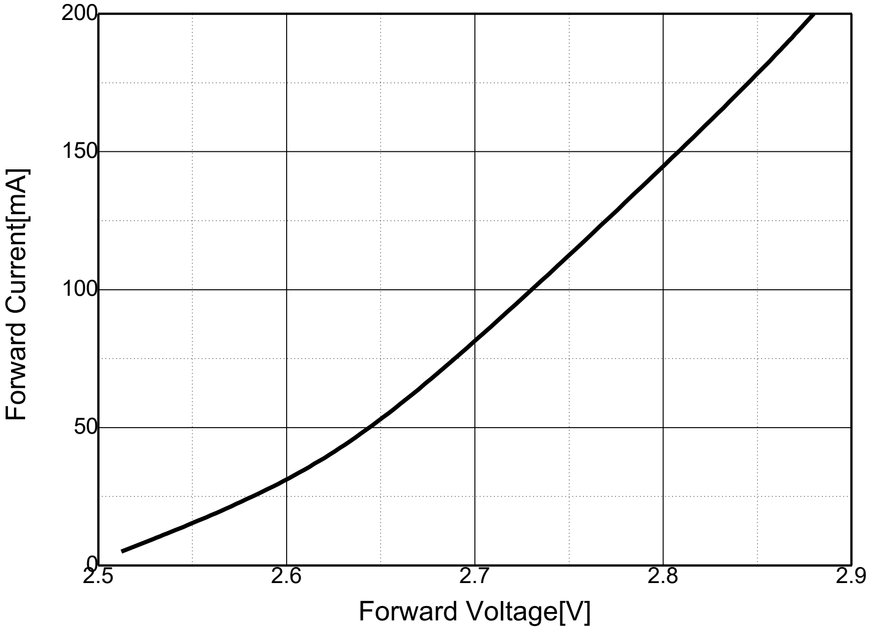
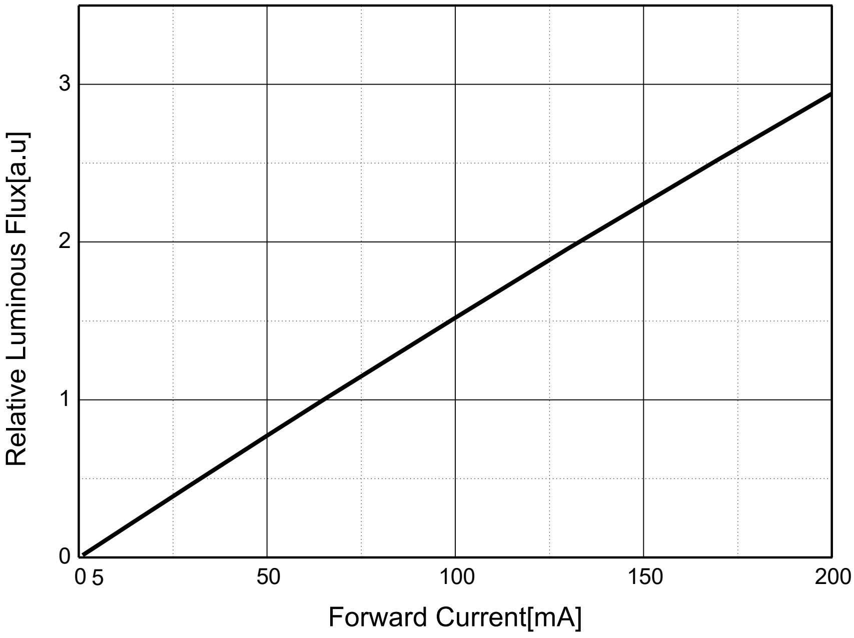


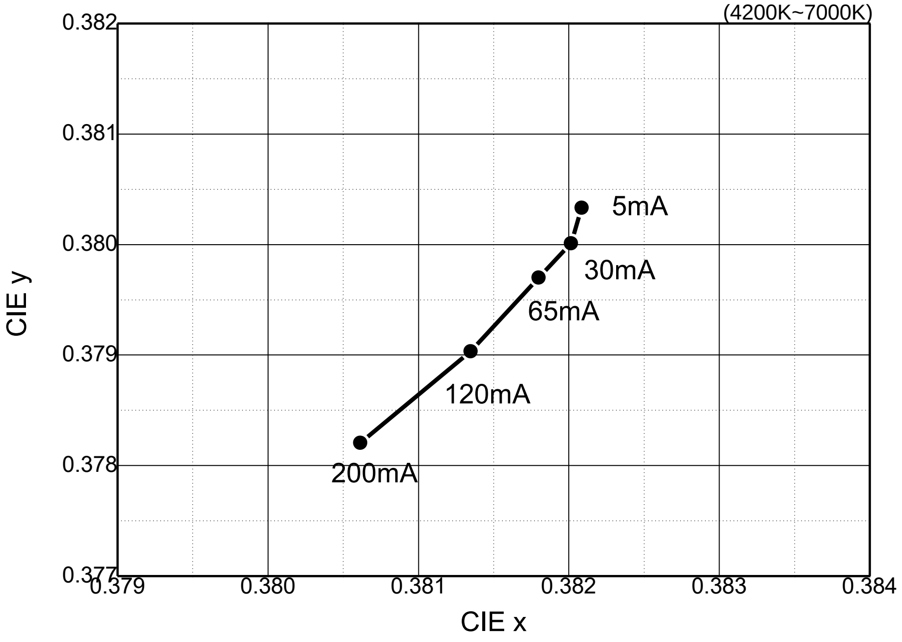
Fig 4. Forward Current vs. Relative Luminous Flux

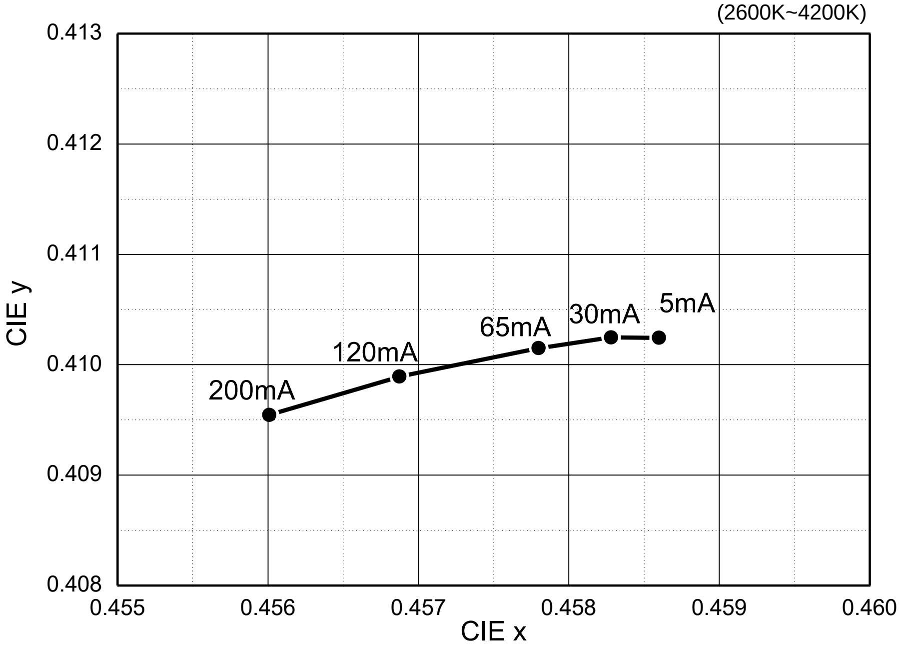


- Use of less than 5mA is not recommended

Characteristics Graph

Fig 5. Forward Current vs. CIE x, y Shift





- Use of less than 5mA is not recommended

Characteristics Graph

Fig 6. Junction Temperature vs. Relative Luminous Flux, I_F=65mA

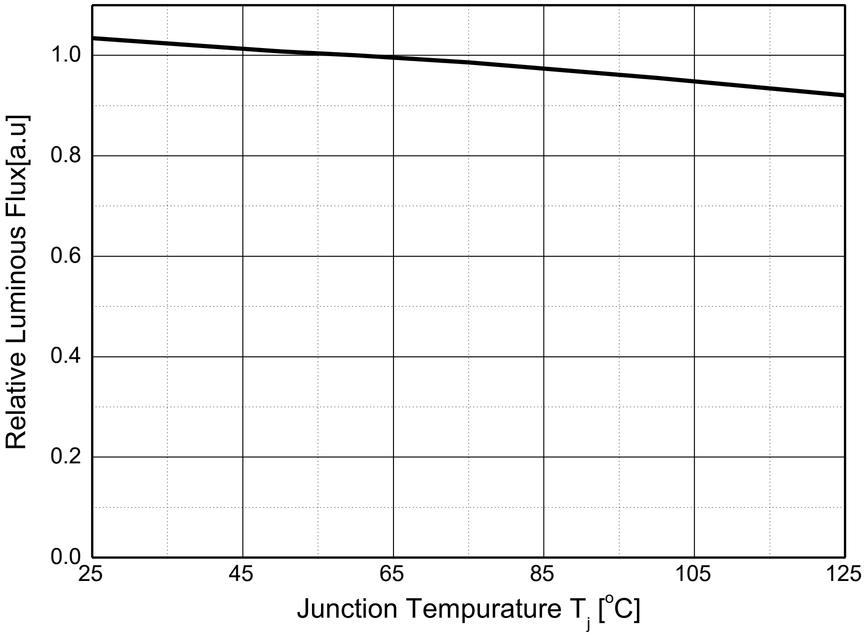
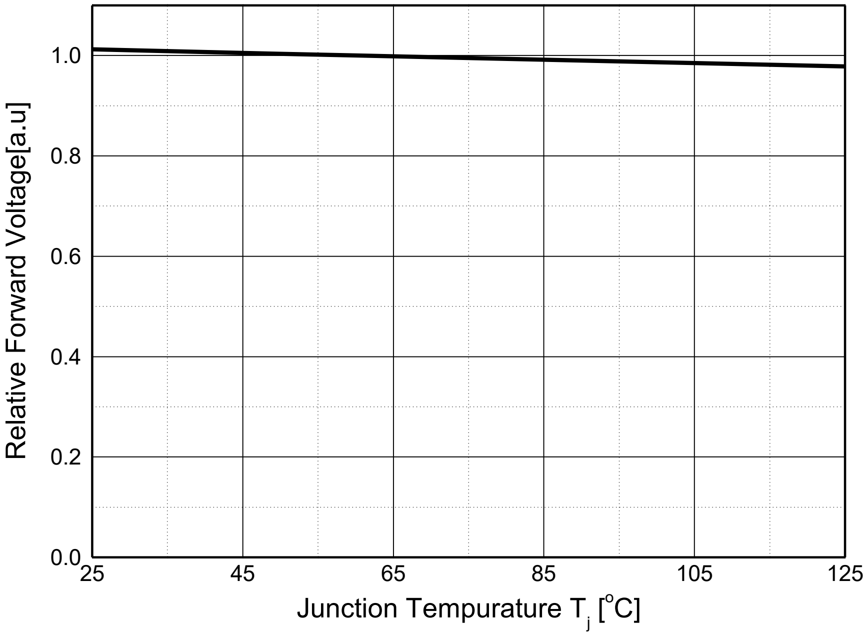
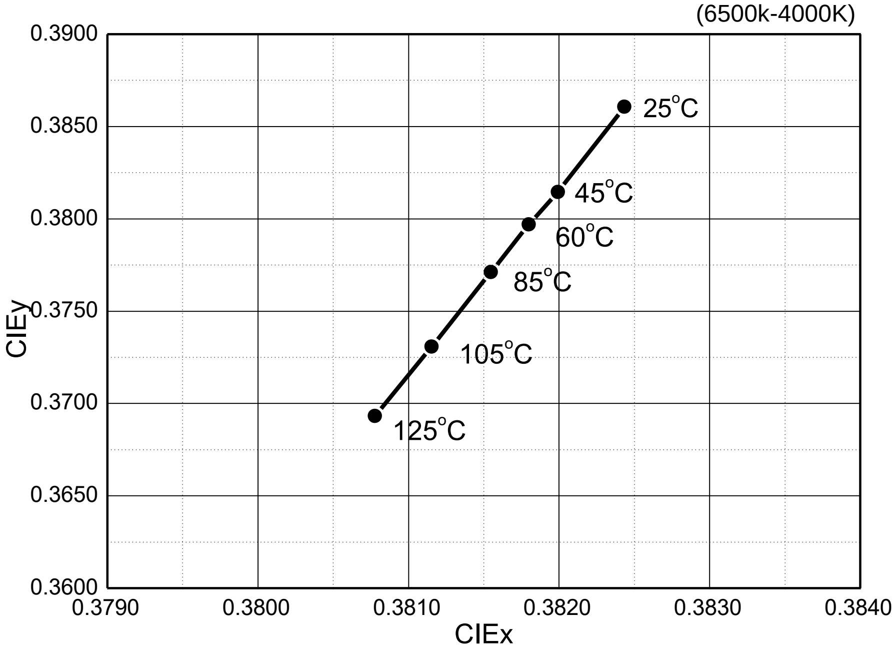


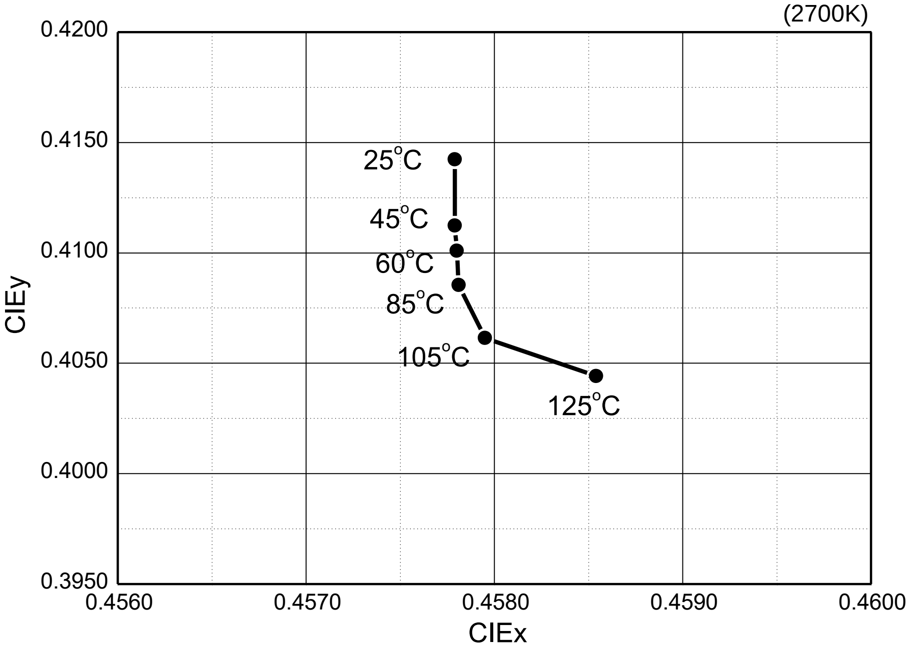
Fig 7. Junction Temperature vs. Relative Forward Voltage, I_F=65mA



Characteristics Graph

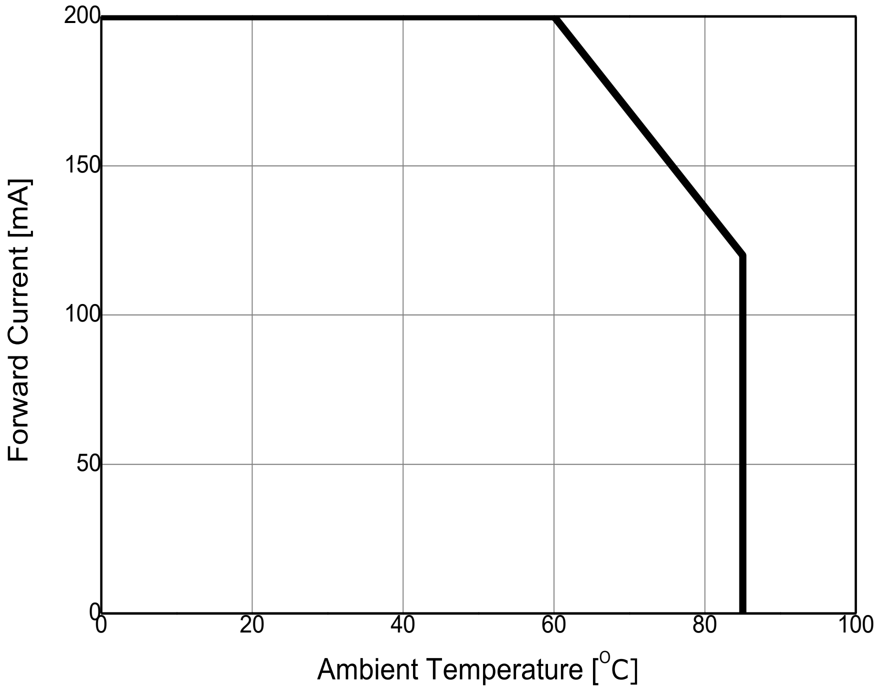
Fig 8. Chromaticity Coordinate vs. Junction Temperature, I_F=65mA





Characteristics Graph

Fig 9. Ambient Temperature vs. Maximum Forward Current, T_{j_max} = 125℃



Color Bin Structure

Table 5. Available Flux Rank ,T_j=25℃, I_F=65mA

CRI	Flux Bin	8G3		8G5		8G7	
	CCT	min	max	min	max	min	max
80	6500K	33.1	36.1	34.3	37.3	35.6	38.6
	5700K	33.3	36.3	34.5	37.5	35.8	38.8
	5000K	33.8	36.8	35.0	38.0	36.3	39.3
	4500K	33.8	36.8	35.0	38.0	36.3	39.3
	4000K	33.8	36.8	35.0	38.0	36.3	39.3
	3500K	32.4	35.4	33.6	36.6	34.9	37.9
	3000K	32.1	35.1	33.3	36.3	34.5	37.5
	2700K	31.0	34.0	32.2	35.2	33.4	36.4
CRI	Flux Bin	9G3		9G5		9G7	
	CCT	min	max	min	max	min	max
90	6500K	32.0	35.0	33.1	36.1	34.5	37.5
	5700K	32.2	35.2	33.3	36.3	34.7	37.7
	5000K	32.6	35.6	33.9	36.9	35.1	38.1
	4500K	32.6	35.6	33.9	36.9	35.1	38.1
	4000K	32.6	35.6	33.9	36.9	35.1	38.1
	3500K	31.3	34.3	32.5	35.5	33.8	36.8
	3000K	30.9	33.9	32.2	35.2	33.3	36.3
	2700K	30.0	33.0	31.1	34.1	32.3	35.3

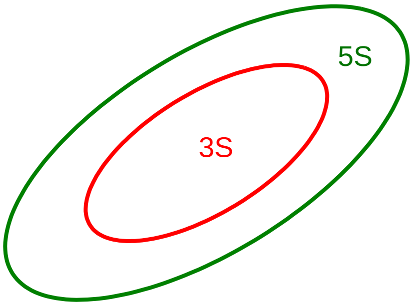
Table 6. Available VF Rank ,Tj=25ºC, I_F=65mA

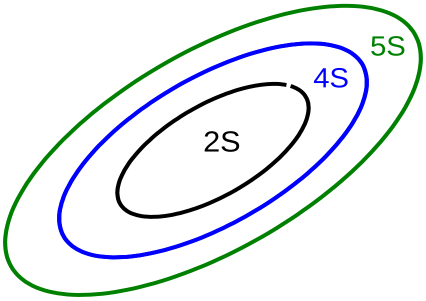
Item	Unit	Bin Code	GxA		GxB	
			Min.	Max.	Min.	Max.
Forward Voltage (VF)	V	G3	2.68	2.78	2.78	2.83
		G5	2.66	2.76	2.76	2.81
		G7	2.64	2.74	2.74	2.79

- All measurements were made under the standardized environment of Seoul Semiconductor.
- Typ value is according to 4000K

Color Bin Structure

CIE Chromaticity Diagram Tj=25ºC, I_F=65mA





Order	Box Packing Method
xx3S	3S(3step) Single
xx4M	3S(3step) & 5S (5step) Mixing

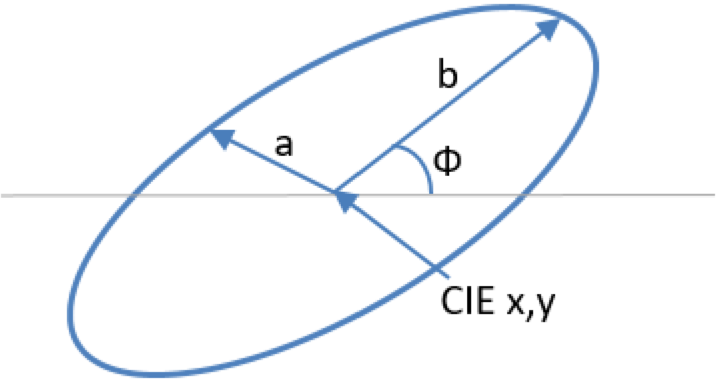
Order	Box Packing Method
xx2S	2S(2.3 step) Single
xx3M	2S(2.3step) & 4S(3.7step) Mixing
xx4M	2S(2.3step) & 5S(5step) Mixing

***Notes :**
1. xx2S Order will ship 2S only
2. xx3S Order will ship 3S (=also include 2S)
3. xx3M Order will ship 2S & 4S Mixing(=also include 2S and 3S)
4. xx4M Order will ship 3S & 5S Or 2S & 5S Mixing(=also include 2S, 3S and 3M)
5. Doughnut Bin will not ship alone(=Will ship with mixing bin)

* ’xx’ can be 65=6500K, 56=5600K, 50=5000K, 40=4000K, 30=3000K, 27= 2700K

Color Bin Structure

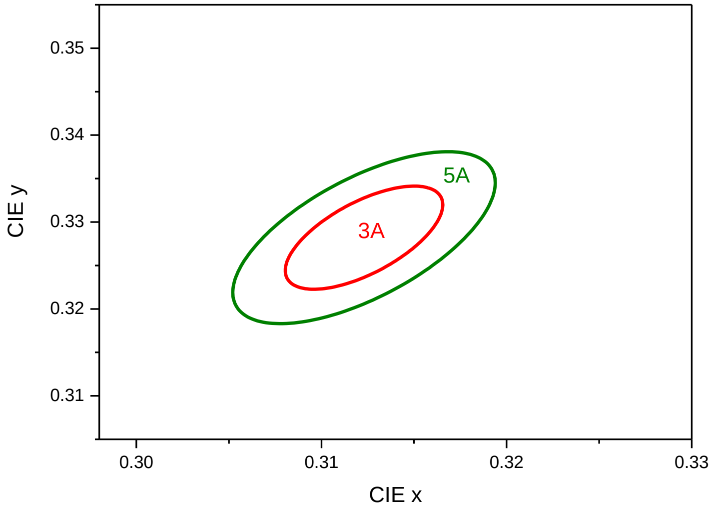
CIE Chromaticity Diagram Tj=25ºC, I_F=65mA

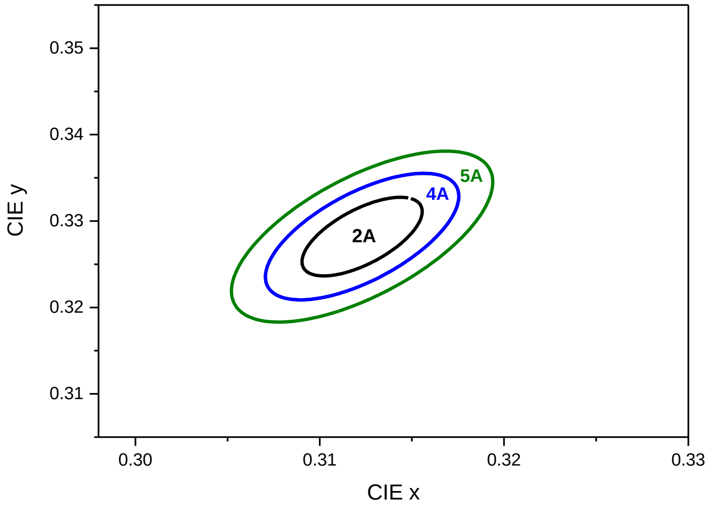


Macadam	CCT	Center Point		Major Axis	Minor Axis	Rotation Angle
	(K)	CIE x	CIE y	a	b	Φ
3 step	2700	0.4578	0.4101	0.0081	0.0042	54
	3000	0.4338	0.403	0.0083	0.0040	53
	3500	0.4073	0.3917	0.0093	0.0042	54
	4000	0.3818	0.3797	0.0094	0.0040	54
	4500	0.3611	0.3658	0.0090	0.0039	55
	5000	0.3447	0.3553	0.0082	0.0035	60
	5700	0.3287	0.3417	0.0076	0.0033	59
	6500	0.3123	0.3282	0.0067	0.0029	59
5 step	2700	0.4578	0.4101	0.0135	0.0070	54
	3000	0.4338	0.403	0.0140	0.0068	53
	3500	0.4073	0.3917	0.0155	0.0069	54
	4000	0.3818	0.3797	0.0156	0.0068	54
	4500	0.3611	0.3658	0.0150	0.0065	55
	5000	0.3447	0.3553	0.0137	0.0058	60
	5700	0.3287	0.3417	0.0125	0.0053	59
	6500	0.3123	0.3282	0.0112	0.0048	59

Color Bin Structure

CIE Chromaticity Diagram Tj=25ºC, I_F=65mA, CCT=6500K



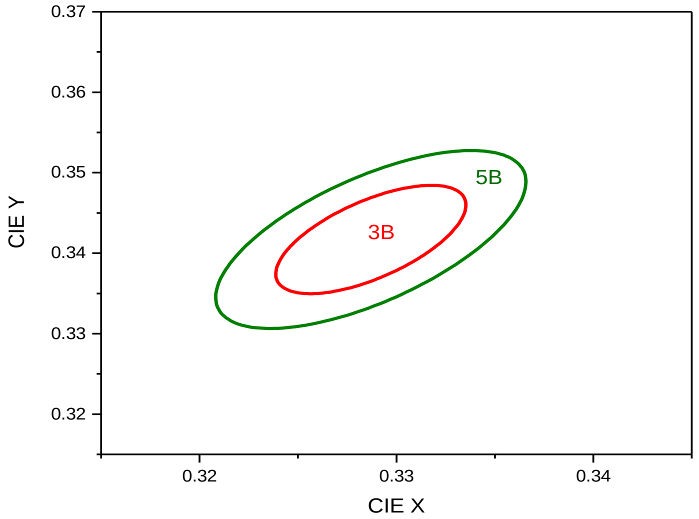


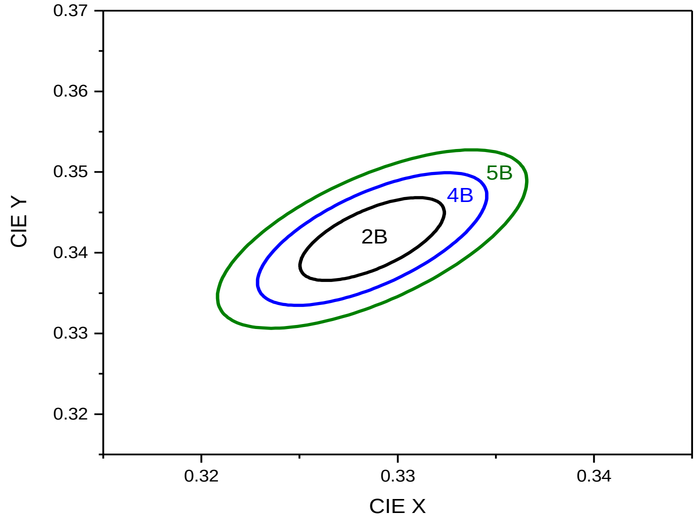
2A（2.3Step)		3A (3.0step)	
Center point	0.3123 :0.3282	Center point	0.3123 : 0.3282
Major Axis a	0.0051	Major Axis a	0.0067
Minor Axis b	0.0022	Minor Axis b	0.0029
Ellipse Rotation Angle	59	Ellipse Rotation Angle	59

4A (3.7step)		5A (5.0Step)	
Center point	0.3123 : 0.3282	Center point	0.3123 : 0.3282
Major Axis a	0.0083	Major Axis a	0.0112
Minor Axis b	0.0036	Minor Axis b	0.0048
Ellipse Rotation Angle	59	Ellipse Rotation Angle	59

Color Bin Structure

CIE Chromaticity Diagram Tj=25ºC, I_F=65mA, CCT=5700K

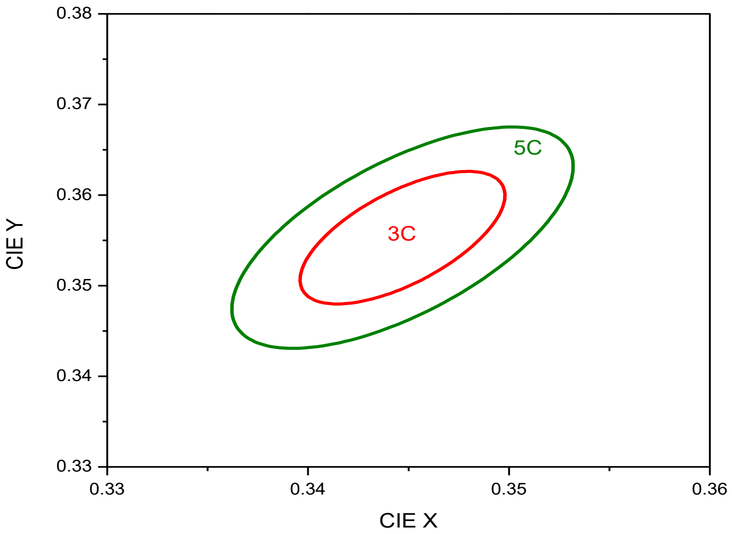


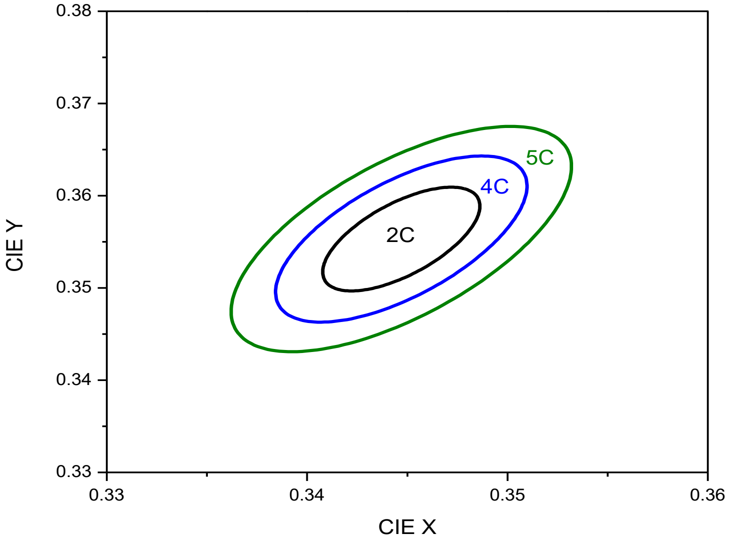


2B（2.3Step)		3B (3.0step)	
Center point	0.3287 : 0.3417	Center point	0.3287 : 0.3417
Major Axis a	0.0058	Major Axis a	0.0076
Minor Axis b	0.0025	Minor Axis b	0.0033
Ellipse Rotation Angle	59	Ellipse Rotation Angle	59
4B (3.7step)		**5B (5.0Step)**	
Center point	0.3287 : 0.3417	Center point	0.3287 : 0.3417
Major Axis a	0.0093	Major Axis a	0.0125
Minor Axis b	0.0039	Minor Axis b	0.0053
Ellipse Rotation Angle	59	Ellipse Rotation Angle	59

Color Bin Structure

CIE Chromaticity Diagram Tj=25ºC, I_F=65mA, CCT=5000K

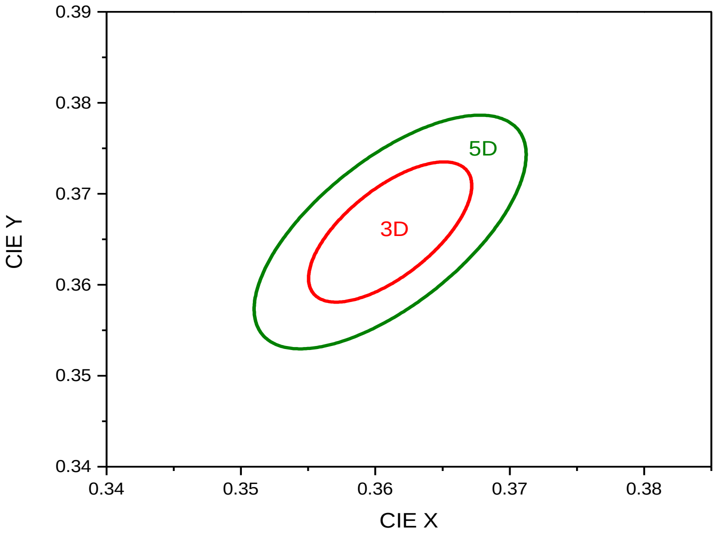


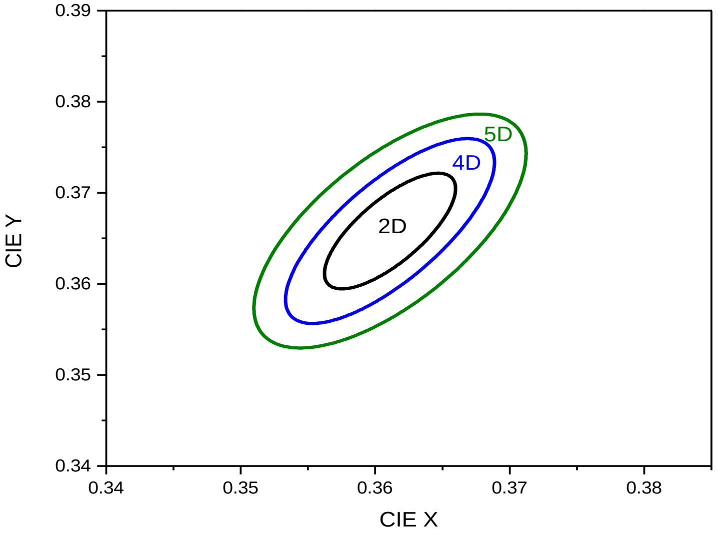


2C（2.3Step)		3C(3.0step)	
Center point	0.3447 : 0.3553	Center point	0.3447 : 0.3553
Major Axis a	0.0063	Major Axis a	0.0082
Minor Axis b	0.0027	Minor Axis b	0.0035
Ellipse Rotation Angle	60	Ellipse Rotation Angle	60
4C (3.7step)		**5C (5.0Step)**	
Center point	0.3447 : 0.3553	Center point	0.3447 : 0.3553
Major Axis a	0.0101	Major Axis a	0.0137
Minor Axis b	0.0043	Minor Axis b	0.0058
Ellipse Rotation Angle	60	Ellipse Rotation Angle	60

Color Bin Structure

CIE Chromaticity Diagram, Ta=25℃, I_F=65mA, CCT=4500K

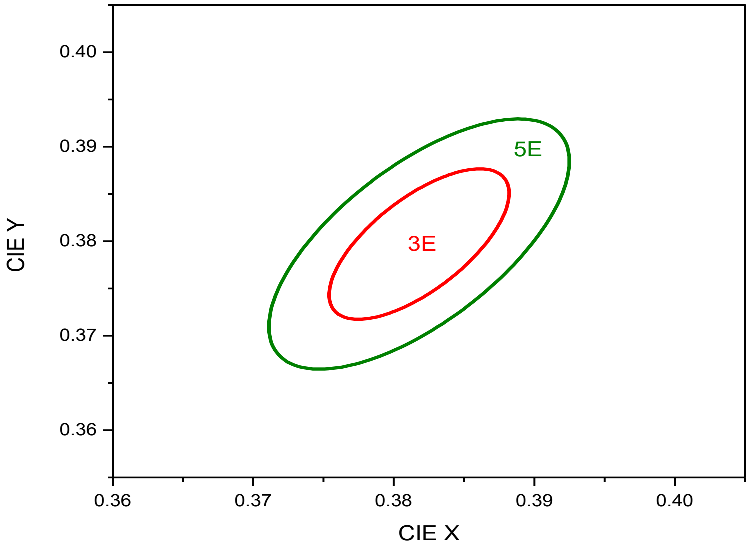


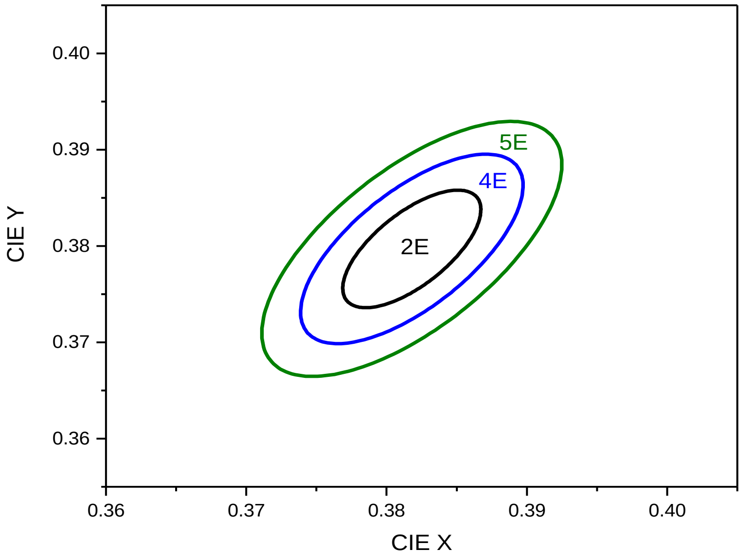


2D（2.3Step)		3D(3.0step)	
Center point	0.3611 : 0.3658	Center point	0.3611 : 0.3658
Major Axis a	0.0075	Major Axis a	0.009
Minor Axis b	0.0028	Minor Axis b	0.0039
Ellipse Rotation Angle	55	Ellipse Rotation Angle	55
4D (3.7step)		**5D (5.0Step)**	
Center point	0.3611 : 0.3658	Center point	0.3611 : 0.3658
Major Axis a	0.0120	Major Axis a	0.015
Minor Axis b	0.0044	Minor Axis b	0.0065
Ellipse Rotation Angle	55	Ellipse Rotation Angle	55

Color Bin Structure

CIE Chromaticity Diagram Tj=25ºC, I_F=65mA, CCT=4000K

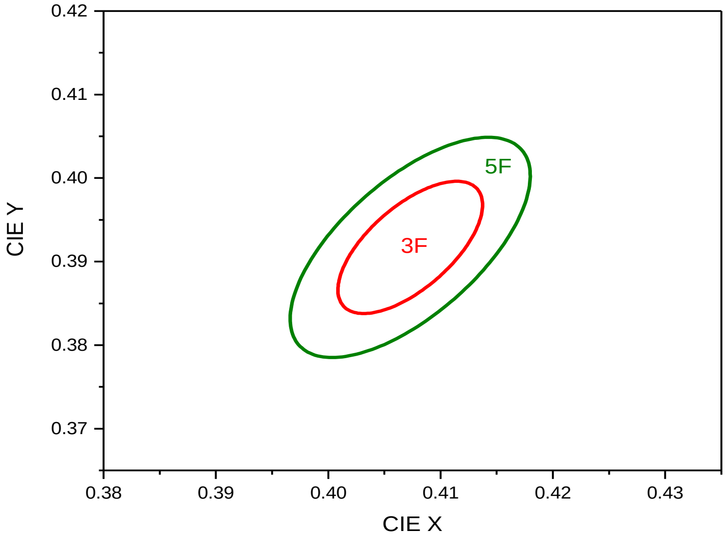


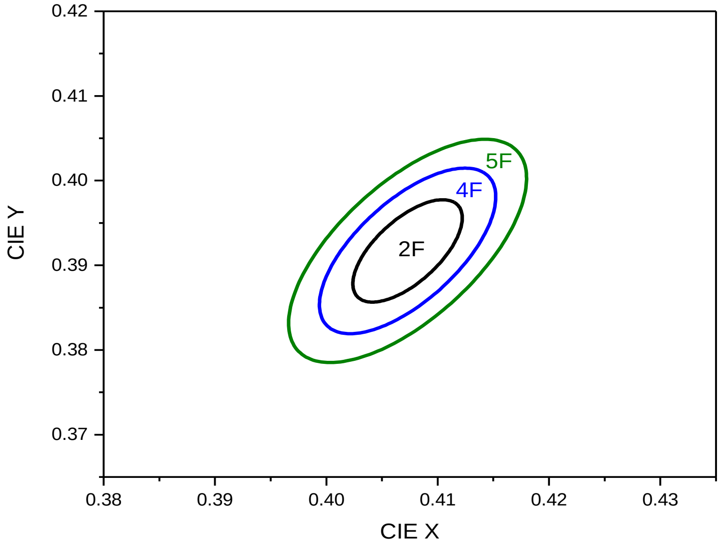


2E（2.3Step)		3E(3.0step)	
Center point	0.3818 : 0.3797	Center point	0.3818 : 0.3797
Major Axis a	0.0072	Major Axis a	0.0094
Minor Axis b	0.0031	Minor Axis b	0.0040
Ellipse Rotation Angle	54	Ellipse Rotation Angle	54
4E(3.7step)		**5E (5.0Step)**	
Center point	0.3818 : 0.3797	Center point	0.3818 : 0.3797
Major Axis a	0.0116	Major Axis a	0.0156
Minor Axis b	0.0050	Minor Axis b	0.0068
Ellipse Rotation Angle	54	Ellipse Rotation Angle	54

Color Bin Structure

CIE Chromaticity Diagram Tj=25ºC, I_F=65mA, CCT=3500K

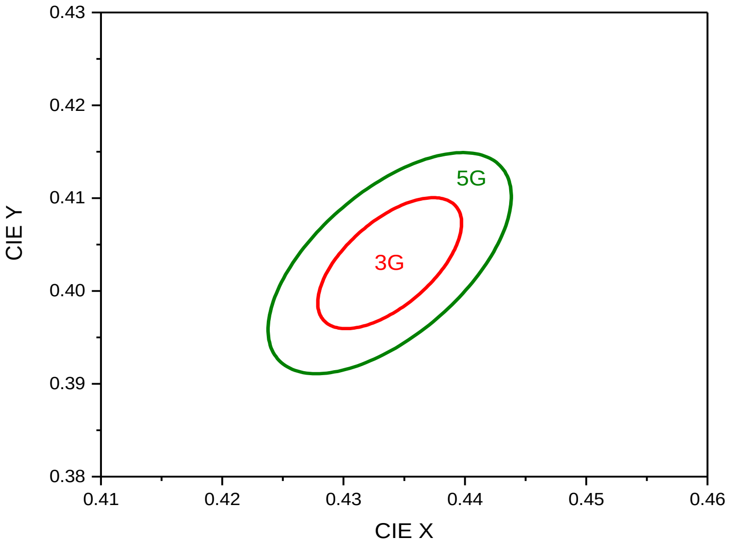


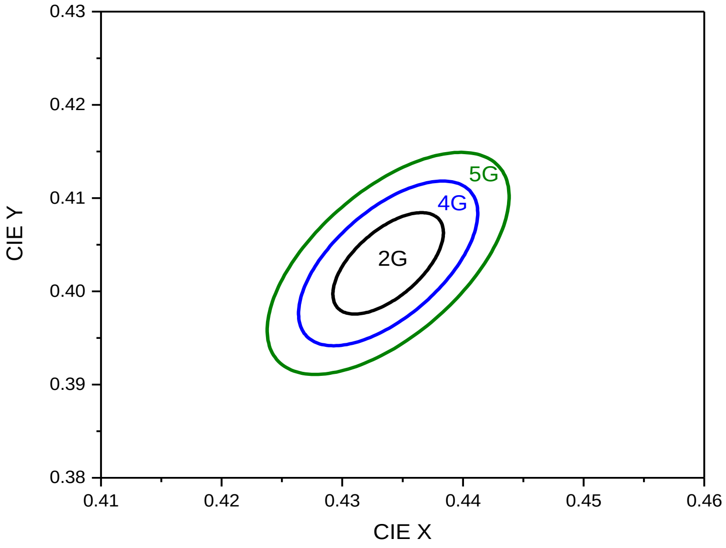


2F（2.3Step)		3F (3.0step)	
Center point	0.4073 : 0.3917	Center point	0.4073 : 0.3917
Major Axis a	0.0071	Major Axis a	0.0093
Minor Axis b	0.0032	Minor Axis b	0.0042
Ellipse Rotation Angle	54	Ellipse Rotation Angle	54
4F (3.7step)		**5F (5.0Step)**	
Center point	0.4073 : 0.3917	Center point	0.4073 : 0.3917
Major Axis a	0.0115	Major Axis a	0.0155
Minor Axis b	0.0051	Minor Axis b	0.0069
Ellipse Rotation Angle	54	Ellipse Rotation Angle	54

Color Bin Structure

CIE Chromaticity Diagram Tj=25ºC, I_F=65mA, CCT=3000K

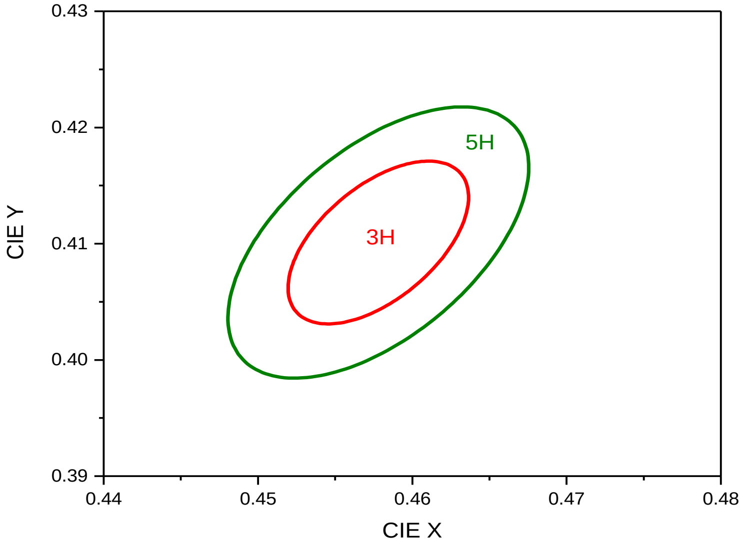


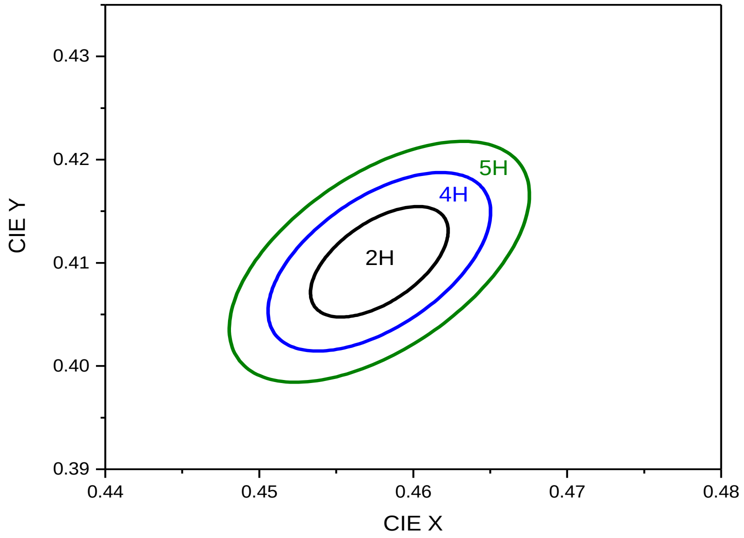


2G（2.3Step)		3G (3.0step)	
Center point	0.4338 : 0.4030	Center point	0.4338 : 0.4030
Major Axis a	0.0064	Major Axis a	0.0083
Minor Axis b	0.0031	Minor Axis b	0.0040
Ellipse Rotation Angle	53	Ellipse Rotation Angle	53
4G 3.7step)		**5G (5.0Step)**	
Center point	0.4338 : 0.4030	Center point	0.4338 : 0.4030
Major Axis a	0.0104	Major Axis a	0.0140
Minor Axis b	0.0050	Minor Axis b	0.0068
Ellipse Rotation Angle	53	Ellipse Rotation Angle	53

Color Bin Structure

CIE Chromaticity Diagram Tj=25ºC, I_F=65mA, CCT=2700K





2H（2.3Step)		3H (3.0step)	
Center point	0.4578 : 0.4101	Center point	0.4578 : 0.4101
Major Axis a	0.0062	Major Axis a	0.0081
Minor Axis b	0.0032	Minor Axis b	0.0042
Ellipse Rotation Angle	54	Ellipse Rotation Angle	54
4H (3.7step)		**5H (5.0Step)**	
Center point	0.4578 : 0.4101	Center point	0.4578 : 0.4101
Major Axis a	0.0100	Major Axis a	0.0135
Minor Axis b	0.0052	Minor Axis b	0.0070
Ellipse Rotation Angle	54	Ellipse Rotation Angle	54

Mixing order kiting combination

1. Kiting Combination with xx3M

Combination	Reel	FLUX	VF	CIE	Qty
Kiting_a	Reel 1	8Gx	GxA	2S	16,000pcs
	Reel 2	8Gx	GxA	2S	16,000pcs
Kiting_b	Reel 1	8Gx	GxA	2S	16,000pcs
	Reel 2	8Gx	GxA	4S	16,000pcs
Kiting_c	Reel 1	8Gx	GxA	2S	16,000pcs
	Reel 2	8Gx	GxB	2S	16,000pcs
Kiting_d	Reel 1	8Gx	GxA	2S	16,000pcs
	Reel 2	8Gx	GxB	4S	16,000pcs

* Gx can be G1~G7

2. Kiting Combination with xx4M

Combination	Reel	FLUX	VF	CIE	Qty
Kiting_a	Reel 1	8Gx	GxA	2S	16,000pcs
	Reel 2	8Gx	GxA	2S	16,000pcs
Kiting_b	Reel 1	8Gx	GxA	2S	16,000pcs
	Reel 2	8Gx	GxA	5S	16,000pcs
Kiting_c	Reel 1	8Gx	GxA	2S	16,000pcs
	Reel 2	8Gx	GxB	2S	16,000pcs
Kiting_d	Reel 1	8Gx	GxA	2S	16,000pcs
	Reel 2	8Gx	GxB	5S	16,000pcs
Kiting_e	Reel 1	8Gx	GxA	3S	16,000pcs
	Reel 2	8Gx	GxA	3S	16,000pcs
Kiting_f	Reel 1	8Gx	GxA	3S	16,000pcs
	Reel 2	8Gx	GxA	5S	16,000pcs
Kiting_g	Reel 1	8Gx	GxA	3S	16,000pcs
	Reel 2	8Gx	GxB	3S	16,000pcs
Kiting_h	Reel 1	8Gx	GxA	3S	16,000pcs
	Reel 2	8Gx	GxB	5S	16,000pcs

* Gx can be G1~G7

Product Nomenclature

Table 6. Nomenclature example

S	T	W	#	A	2	P	D	-	G	x	0	0	0	0	0	P	0	0	0	a	b	b	c	c	d	d	e	e	e
X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	X_{20}	X_{21}	X_{22}	X_{23}	X_{24}	X_{25}	X_{26}	X_{27}	X_{28}	X_{29}	X_{30}

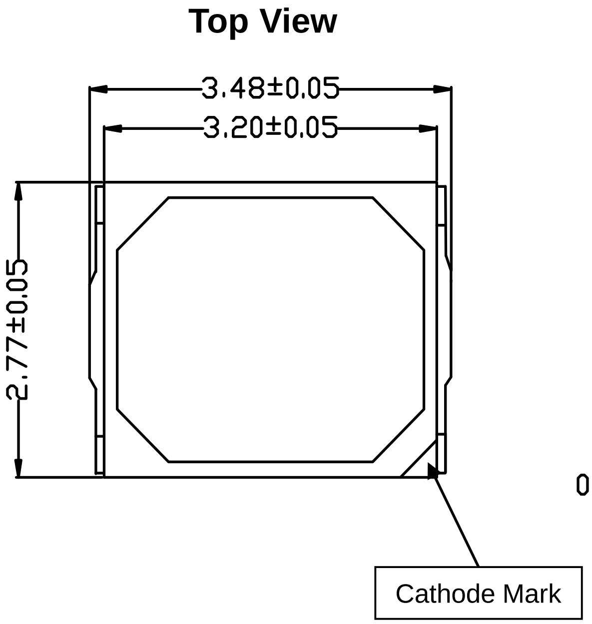
Part Number Code	Value	References	Description
X_1	S	Seoul Semiconductor	Company
X_2	T	Top lighting	Top View LED series
X_3	W	White	
X_4	#	CRI	8 : CRI 80 / 9: CRI90
X_5	A	3528	Package series
X_6X_7	2P	Characteristic code	S: Series / P: Parallel
X_8	D		Version
X_9	-		
$X_{10}X_{11}$	Gx	internal code	G3,G5,G7
X_{12}~X_{20}	NR000P000	internal code	
$X_{21}X_{22}X_{23}$	abb	Flux Bin	a: 8=CRI80, 9=CRI90 bb: G3,G5,G7
$X_{24}X_{25}$	cc	Color Temp.	65=6500K, 56=5600K, 50=5000K, 45=4500K,40=4000K, 30=3000K, 27= 2700K
$X_{26}X_{27}$	dd	step	2S-2step single /3S: 3step single / 3M: 3step Mixing / 4M: 4step Mixing
$X_{28}X_{29}X_{30}$	eee	VF Bin	000: All bin

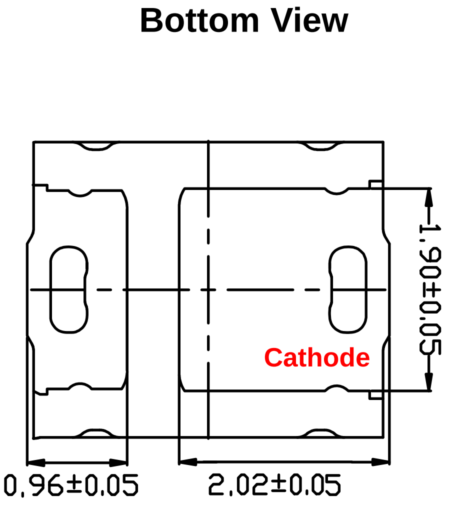
Table 7. Product Selection Table

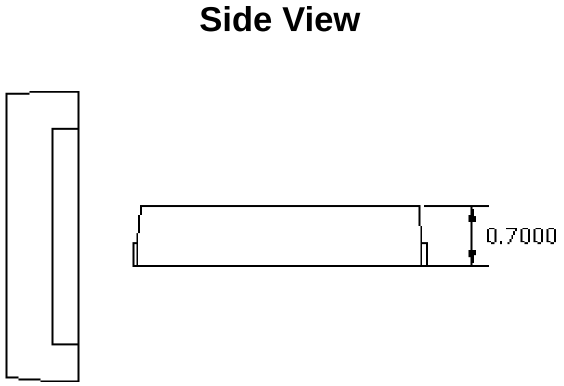
Reference P/N	Order code	Flux bin	CCT	Step	VF bin
STW8A2PD-Gx00000P000	8Gx652SGxA	8Gx:8G1~8G7	65:6500K	2S: 2step 3S: 3step	GxA
	8Gx572SGxA	8Gx:8G1~8G7	57:5700K		GxA
	8Gx502SGxA	8Gx:8G1~8G7	50:5000K		GxA
	8Gx452SGxA	8Gx:8G1~8G7	45:4500K		GxA
	8Gx402SGxA	8Gx:8G1~8G7	40:4000K		GxA
	8Gx352SGxA	8Gx:8G1~8G7	35:3500K		GxA
	8Gx302SGxA	8Gx:8G1~8G7	30:3000K		GxA
	8Gx272SGxA	8Gx:8G1~8G7	27:2700K		GxA
STW9A2PD-Gx00000P000	9Gx652SGxA	9Gx:9G1~9G7	65:6500K	2S: 2step 3S: 3step	GxA
	9Gx572SGxA	9Gx:9G1~9G7	57:5700K		GxA
	9Gx502SGxA	9Gx:9G1~9G7	50:5000K		GxA
	9Gx452SGxA	9Gx:9G1~9G7	45:4500K		GxA
	9Gx402SGxA	9Gx:9G1~9G7	40:4000K		GxA
	9Gx352SGxA	9Gx:9G1~9G7	35:3500K		GxA
	9Gx302SGxA	9Gx:9G1~9G7	30:3000K		GxA
	9Gx272SGxA	9Gx:9G1~9G7	27:2700K		GxA

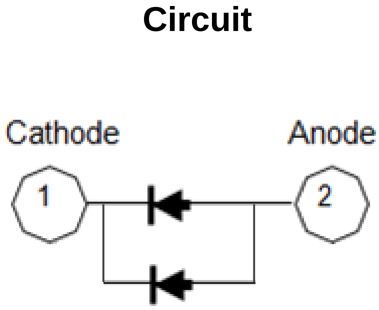
Reference P/N	Order code	Flux bin	CCT	Step	VF bin
STW8A2PD-Gx00000P000	8Gx653M000	8Gx:8G1~8G7	65:6500K	3M: 3step Mixing 4M: 4step Mixing	ALL
	8Gx573M000	8Gx:8G1~8G7	57:5700K		ALL
	8Gx503M000	8Gx:8G1~8G7	50:5000K		ALL
	8Gx453M000	8Gx:8G1~8G7	45:4500K		ALL
	8Gx403M000	8Gx:8G1~8G7	40:4000K		ALL
	8Gx353M000	8Gx:8G1~8G7	35:3500K		ALL
	8Gx303M000	8Gx:8G1~8G7	30:3000K		ALL
	8Gx273M000	8Gx:8G1~8G7	27:2700K		ALL
STW9A2PD-Gx00000P000	9Gx653M000	9Gx:9G1~9G7	65:6500K	3M: 3step Mixing 4M: 4step Mixing	ALL
	9Gx573M000	9Gx:9G1~9G7	57:5700K		ALL
	9Gx503M000	9Gx:9G1~9G7	50:5000K		ALL
	9Gx453M000	9Gx:9G1~9G7	45:4500K		ALL
	9Gx403M000	9Gx:9G1~9G7	40:4000K		ALL
	9Gx353M000	9Gx:9G1~9G7	35:3500K		ALL
	9Gx303M000	9Gx:9G1~9G7	30:3000K		ALL
	9Gx273M000	9Gx:9G1~9G7	27:2700K		ALL

Mechanical Dimensions





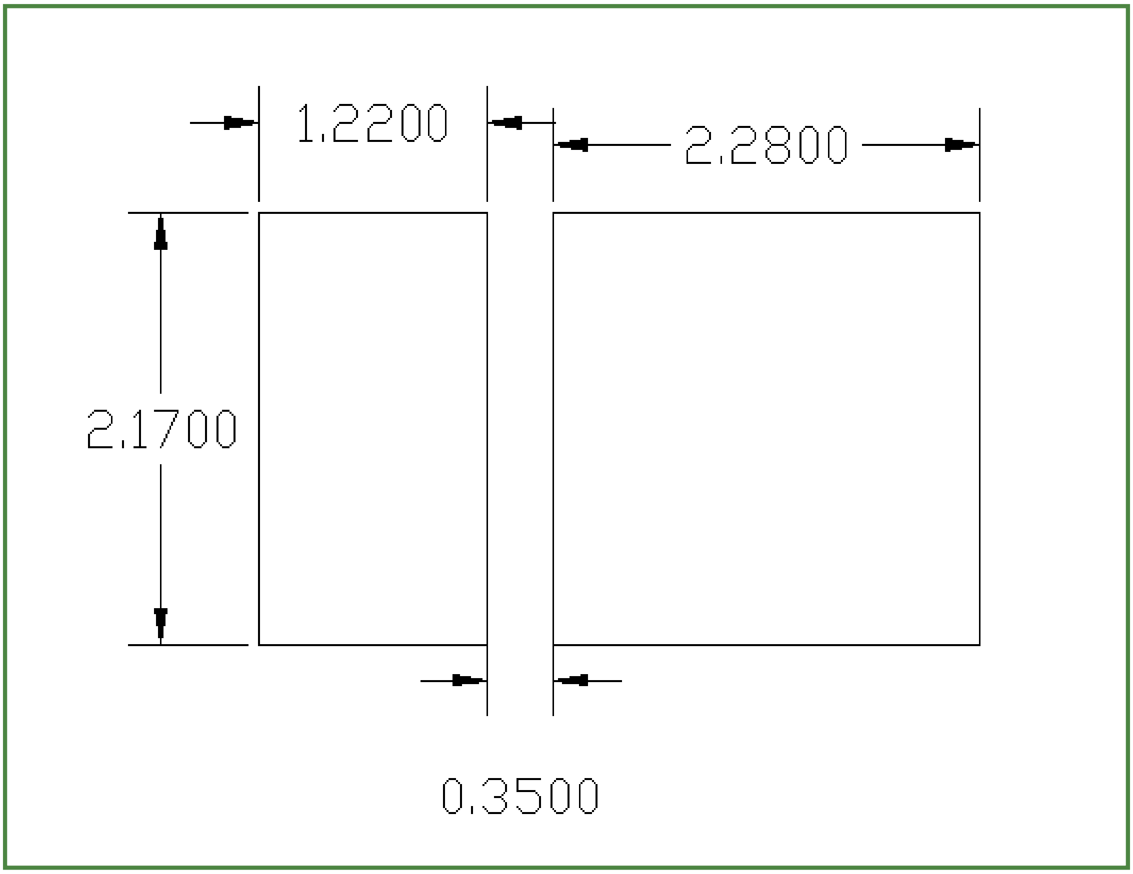




Notes :

(1) All dimensions are in millimeters.
(2) Scale : none
(3) Undefined tolerance is ±0.2mm

Recommended Solder Pad



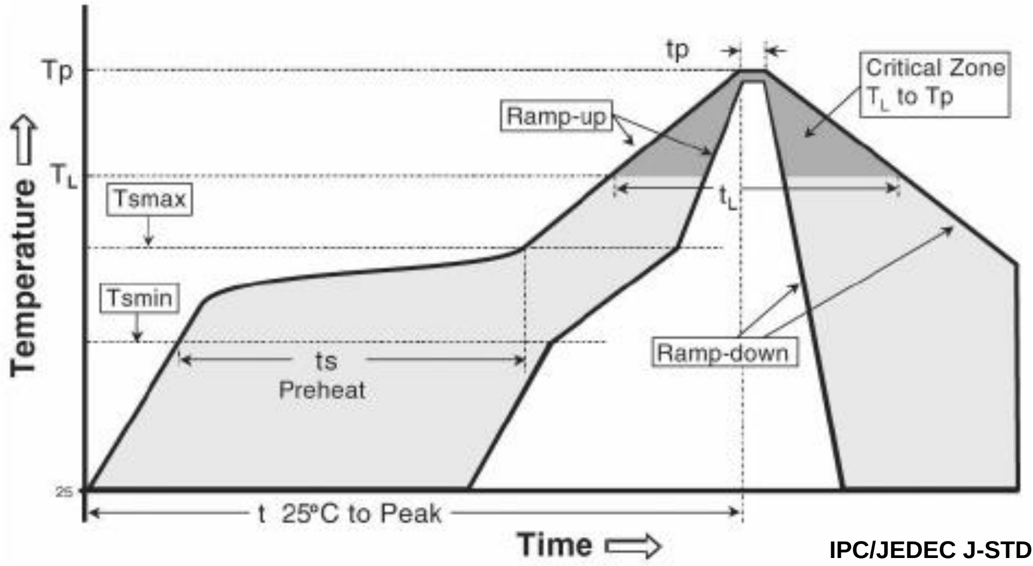
Note:

(1) All dimensions are in millimeters.
(2) Scale : none
(3) This drawing without tolerances are for reference only
(4) Undefined tolerance is ±0.1mm
(5) The appearance and specifications of the product may be changed for improvement without notice.

Reliability Test Item & Condition

Test Item	Test conditions	Time/cycle	Q’ty
High Temperature Operating Life	Ta = 85℃	1000	20
Low Temperature Operating Life	T_{amb} -40 °C. or -20 °C with On/Off (5min/5min)	1000	20
Temperature Shock	Ta = -40 ˚C ↔ 120 ˚C, Dwell time : 30 min (on PCB)	600	40
High Temperature High Humidity	Ta=85℃, RH=85%	1000	10
H2S corrosion	40℃ / 80%, H2S 15ppm	504	10
ESD	HBM, 2KV, 1.5kΩ, 100pF, Alternately positive or negative	-	20

Reflow Soldering Characteristics



IPC/JEDEC J-STD-020

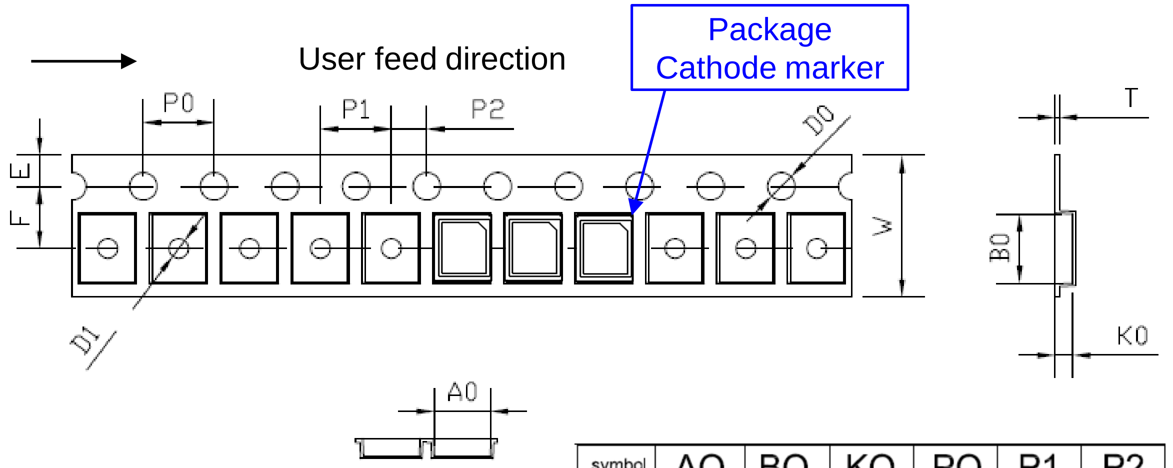
Table 7.

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_{smax} to T_p)	3° C/second max.	3° C/second max.
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (T_{smin} to T_{smax}) (t_s)	 100 °C 150 °C 60-120 seconds	 150 °C 200 °C 60-180 seconds
Time maintained above: - Temperature (T_L) - Time (t_L)	 183 °C 60-150 seconds	 217 °C 60-150 seconds
Peak Temperature (T_p)	215℃	260℃
Time within 5°C of actual Peak Temperature (t_p)2	10-30 seconds	20-40 seconds
Ramp-down Rate	6 °C/second max.	6 °C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

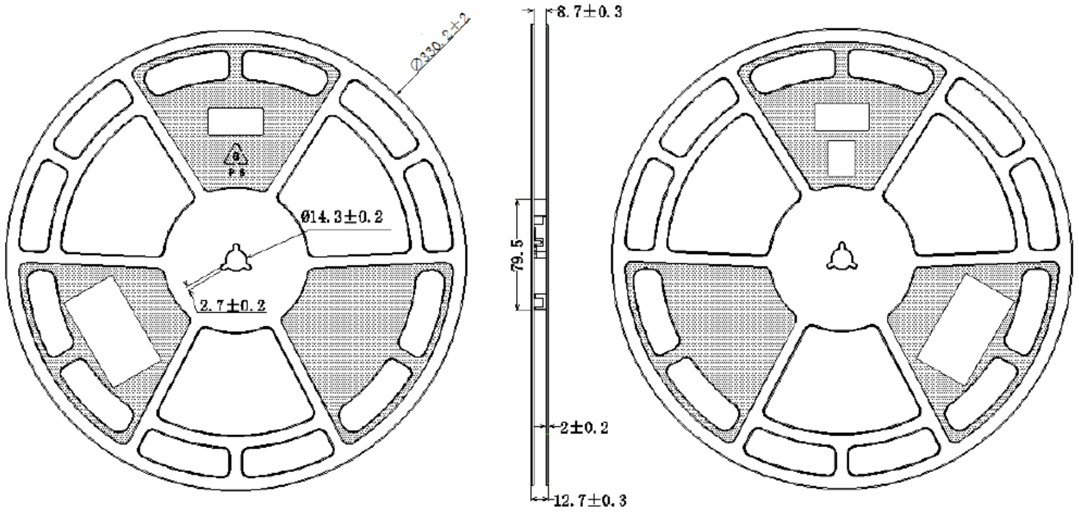
Caution

(1) Reflow soldering is recommended not to be done more than two times. In the case of more than 24 hours passed soldering after first, LEDs will be damaged.
(2) Repairs should not be done after the LEDs have been soldered. When repair is unavoidable, suitable tools must be used.
(3) Die slug is to be soldered.
(4) When soldering, do not put stress on the LEDs during heating.
(5) After soldering, do not warp the circuit board.

Emitter Tape & Reel Packaging



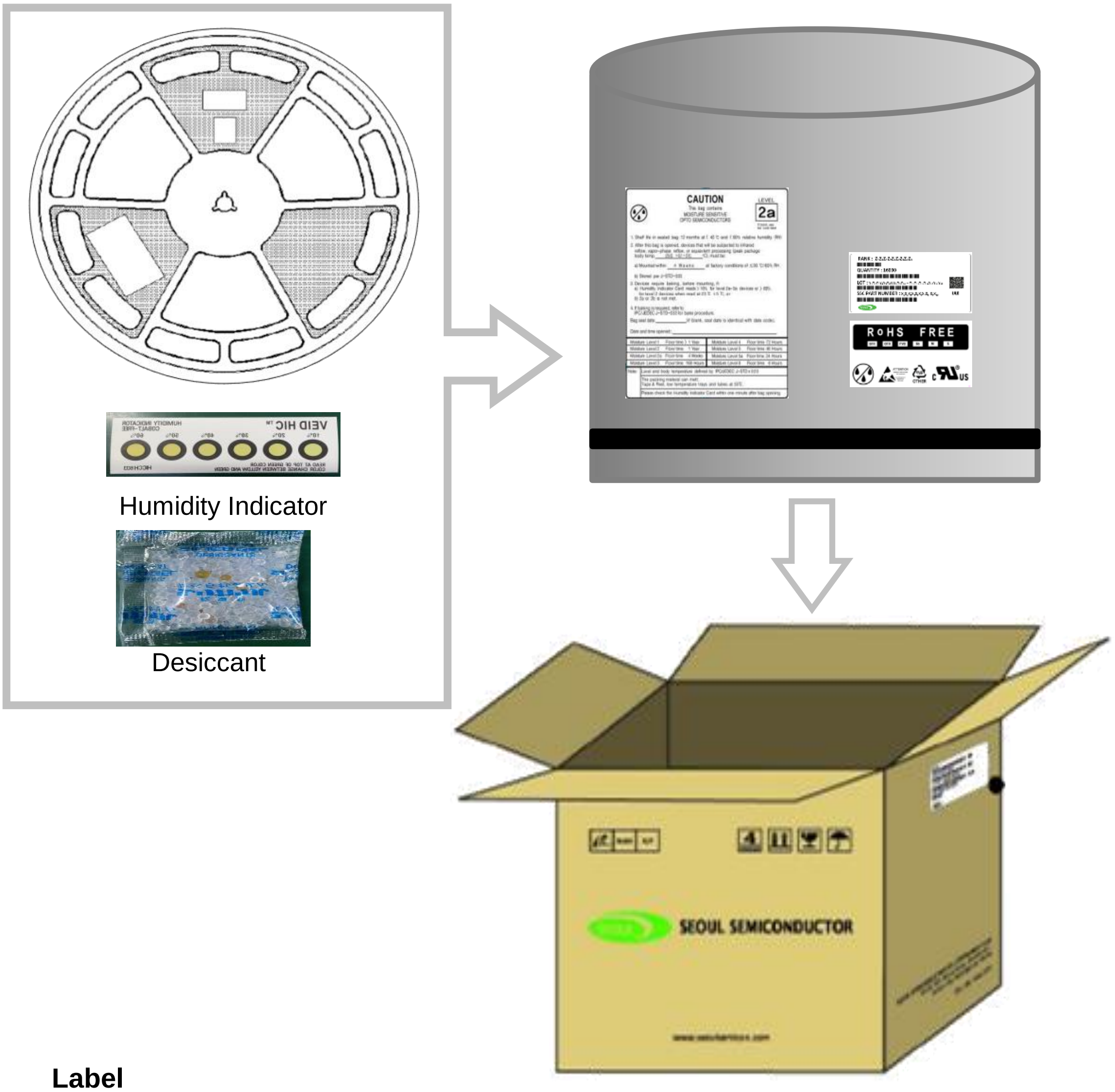
symbol	AO	BO	KO	PO	P1	P2
Spec	3.0±0.10	3.75±0.15	1.05±0.15	4.0±0.10	4.0±0.10	2.0±0.10
symbol	W	T	E	F	DO	D1
Spec	8.00±0.10	0.20±0.05	1.75±0.10	3.5±0.10	1.5±0.05	1.10±0.10



Notes :

(1) Quantity : Max 16,000pcs/Reel
(2) Cumulative Tolerance : Cumulative Tolerance/10 pitches to be ±0.2mm
(3) Adhesion Strength of Cover Tape
Adhesion strength to be 0.1-0.7N when the cover tape is turned off from the carrier tape at the angle of 10˚ to the carrier tape.
(4) Package : P/N, Manufacturing data Code No. and Quantity to be indicated on a damp proof Package.

Emitter Tape & Reel Packaging



Label

RANK : $Z_1Z_1Z_1Z_2Z_2Z_2Z_3Z_3Z_3$

QUANTITY : 16000

LOT : $Y_1Y_2Y_3Y_4Y_5Y_6Y_7Y_8Y_9Y_{10}$ – $Y_{11}Y_{12}Y_{13}Y_{14}Y_{15}Y_{16}Y_{17}$

SSC PART NUMBER : $X_1X_2X_3X_4X_5X_6X_7X_8$-X_9X_{10}

ULB

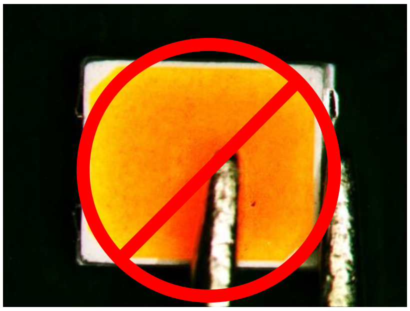
SEOUL

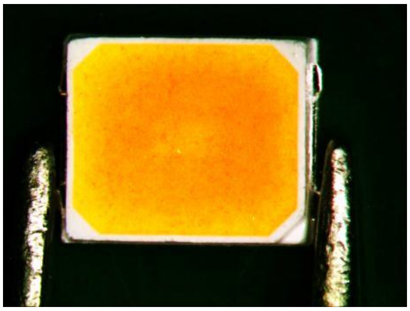
Notes :

(1) Rank : Flux: $Z_1Z_1Z_1$,CIE: $Z_2Z_2Z_2$, VF: $Z_3Z_3Z_3$
(2) Quantity : Max 16,000pcs/Reel
(3) Lot no.: $Y_1Y_2Y_3Y_4Y_5Y_6Y_7Y_8Y_9Y_{10}$ – SSC code -$Z_1Z_1Z_1Z_2Z_2Z_2Z_3Z_3Z_3$
(4) SSC part Number : $X_1X_2X_3X_4X_5X_6X_7X_8$-X_9X_{10}

Handling of Silicone Resin for LEDs

(1) During processing, mechanical stress on the surface should be minimized as much as possible. Sharp objects of all types should not be used to pierce the sealing compound.





(2) In general, LEDs should only be handled from the side. By the way, this also applies to LEDs without a silicone sealant, since the surface can also become scratched.

(3) When populating boards in SMT production, there are basically no restrictions regarding the form of the pick and place nozzle, except that mechanical pressure on the surface of the resin must be prevented. This is assured by choosing a pick and place nozzle which is larger than the LED's reflector area.

(4) Silicone differs from materials conventionally used for the manufacturing of LEDs. These conditions must be considered during the handling of such devices. Compared to standard encapsulants, silicone is generally softer, and the surface is more likely to attract dust.

As mentioned previously, the increased sensitivity to dust requires special care during processing. In cases where a minimal level of dirt and dust particles cannot be guaranteed, a suitable cleaning solution must be applied to the surface after the soldering of components.

(5) SSC suggests using isopropyl alcohol for cleaning. In case other solvents are used, it must be assured that these solvents do not dissolve the package or resin.
Ultrasonic cleaning is not recommended. Ultrasonic cleaning may cause damage to the LED.

(6) Please do not mold this product into another resin (epoxy, urethane, etc) and do not handle this. product with acid or sulfur material in sealed space.

Precaution for Use

(1) Storage

To avoid the moisture penetration, we recommend store in a dry box with a desiccant.

The maximum storage temperature range is 40℃ and a maximum humidity of RH90%.

(2) Use Precaution after Opening the Packaging

Use SMT techniques properly when the LED is to be soldered dipped as separation of the lens may affect the light output efficiency.

Pay attention to the following:

a. Recommend conditions after opening the package
  - Sealing
  - Temperature : 30℃ Humidity : less than RH60%

b. If the package has been opened more than 4 week(MSL_2a) or the color of the desiccant changes, components should be dried for 10-24hr at 65±5℃

(3) Do not apply mechanical force or excess vibration during the cooling process to normal temperature after soldering.

(4) Do not rapidly cool device after soldering.

(5) Components should not be mounted on warped (non coplanar) portion of PCB.

(6) Radioactive exposure is not considered for the products listed here in.

(7) Gallium arsenide is used in some of the products listed in this publication.
These products are dangerous if they are burned or shredded in the process of disposal.
It is also dangerous to drink the liquid or inhale the gas generated by such products when chemically disposed of.

(8) This device should not be used in any type of fluid such as water, oil, organic solvent and etc.
When washing is required, IPA (Isopropyl Alcohol) should be used.

(9) When the LEDs are in operation the maximum current should be decided after measuring the package temperature.

Precaution for Use

(10) The appearance and specifications of the product may be modified for improvement without notice.

(11) Long time exposure of sunlight or occasional UV exposure will cause lens discoloration.

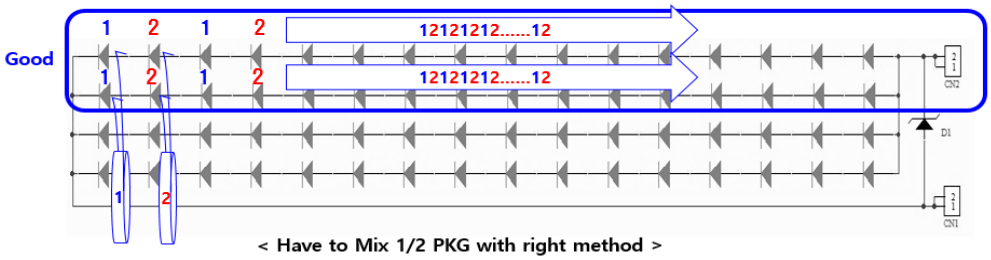
(12) VOCs (Volatile organic compounds) emitted from materials used in the construction of fixtures can penetrate silicone encapsulants of LEDs and discolor when exposed to heat and photonic energy. The result can be a significant loss of light output from the fixture. Knowledge of the properties of the materials selected to be used in the construction of fixtures can help prevent these issues.

(13) Attaching LEDs, do not use adhesives that outgas organic vapor.

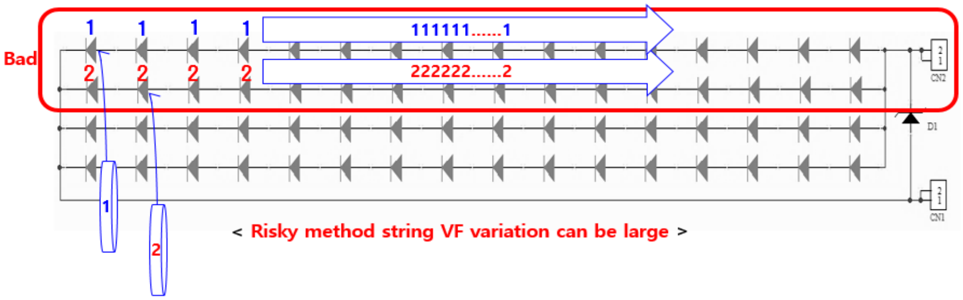
(14) The driving circuit must be designed to allow forward voltage only when it is ON or OFF.
If the reverse voltage is applied to LED, migration can be generated resulting in LED damage.

(15) Similar to most Solid state devices;
LEDs are sensitive to Electro-Static Discharge (ESD) and Electrical Over Stress (EOS).
Below is a list of suggestions that Seoul Semiconductor purposes to minimize these effects.

(16) Voltage Variation Mixing
If Module circuit series and parallel many PKG, voltage variation problem coming out seriously.
To avoid this issue we recommend mixing Vf bin at the SMD Module Program level. Even though using Single bin only.
For example, when configuring a module with two reels (reel1 and Reel2), SMT should be as follows Good below.



< Have to Mix 1/2 PKG with right method >



< Risky method string VF variation can be large >

Precaution for Use

a. ESD (Electro Static Discharge)

Electrostatic discharge (ESD) is the defined as the release of static electricity when two objects come into contact. While most ESD events are considered harmless, it can be an expensive problem in many industrial environments during production and storage. The damage from ESD to an LEDs may cause the product to demonstrate unusual characteristics such as:

- Increase in reverse leakage current lowered turn-on voltage
- Abnormal emissions from the LED at low current

The following recommendations are suggested to help minimize the potential for an ESD event.

One or more recommended work area suggestions:

- Ionizing fan setup
- ESD table/shelf mat made of conductive materials
- ESD safe storage containers

One or more personnel suggestion options:

- Antistatic wrist-strap
- Antistatic material shoes
- Antistatic clothes

Environmental controls:

- Humidity control (ESD gets worse in a dry environment)

b. EOS (Electrical Over Stress)

Electrical Over-Stress (EOS) is defined as damage that may occur when an electronic device is subjected to a current or voltage that is beyond the maximum specification limits of the device. The effects from an EOS event can be noticed through product performance like:

- Changes to the performance of the LED package
  (If the damage is around the bond pad area and since the package is completely encapsulated the package may turn on but flicker show severe performance degradation.)
- Changes to the light output of the luminaire from component failure
- Components on the board not operating at determined drive power

Failure of performance from entire fixture due to changes in circuit voltage and current across total circuit causing trickle down failures. It is impossible to predict the failure mode of every LED exposed to electrical overstress as the failure modes have been investigated to vary, but there are some common signs that will indicate an EOS event has occurred:

- Damaged may be noticed to the bond wires (appearing similar to a blown fuse)
- Damage to the bond pads located on the emission surface of the LED package
  (shadowing can be noticed around the bond pads while viewing through a microscope)
- Anomalies noticed in the encapsulation and phosphor around the bond wires.
- This damage usually appears due to the thermal stress produced during the EOS event.

c. To help minimize the damage from an EOS event Seoul Semiconductor recommends utilizing:

- A surge protection circuit
- An appropriately rated over voltage protection device
- A current limiting device

Company Information

Published by

Company Information

Seoul Semiconductor (www.SeoulSemicon.com) manufacturers and packages a wide selection of light emitting diodes (LEDs) for the automotive, general illumination/lighting, Home appliance, signage and back lighting markets. The company is the world's fifth largest LED supplier, holding more than 10,000 patents globally, while offering a wide range of LED technology and production capacity in areas such as “nPola”, "Acrich", the world's first commercially produced AC LED, and "Acrich MJT - Multi-Junction Technology" a proprietary family of high-voltage LEDs.

The company's broad product portfolio includes a wide array of package and device choices such as Acrich and Acirch2, high-brightness LEDs, mid-power LEDs, side-view LEDs, and through-hole type LEDs as well as custom modules, displays, and sensors.

Legal Disclaimer

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