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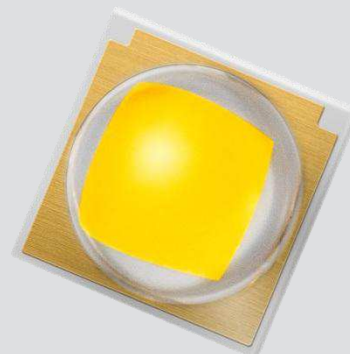
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High Power LED Series
3535 Ceramic Hot Binning

LH351B



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

Features & Benefits

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

Applications

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



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1. Characteristics

a) Absolute Maximum Rating

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

Notes:

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

b) Electro-optical Characteristics

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

Notes:

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

c) Luminous Flux Characteristics (T_j = 85 °C)

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

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

Notes:

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

c) Luminous Flux Characteristics (T_j = 85 °C)

Nominal CCT (K)	CRI (R _a) Min. ¹⁾	Sorting @ 350 mA (lm)		Calculated Minimum Flux ²⁾ (lm)		
		Flux Rank	Flux Min. ¹⁾	@ 700 mA	@ 1000 mA	@ 1500 mA
4000	70	N3	150	270	359	489
		(P3)	(164)	(295)	(392)	(534)
		P3	160	288	382	518
	80	(Q3)	(174)	(312)	(415)	(562)
		K3	130	235	310	418
		(M3)	(143)	(258)	(340)	(460)
90	M3	140	252	335	457	
	(N3)	(153)	(276)	(366)	(499)	
	J3	120	217	286	386	
5000	70	(K3)	(132)	(238)	(314)	(424)
		M3	140	252	335	457
		(N3)	(153)	(276)	(366)	(499)
		N3	150	270	359	489
		(P3)	(164)	(295)	(392)	(534)
		P3	160	288	382	518
	80	(Q3)	(174)	(312)	(415)	(562)
		Q2	170	306	405	545
		(R2)	(184)	(329)	(437)	(590)
		M3	140	252	335	457
		(N3)	(153)	(276)	(366)	(499)
		N3	150	270	359	489
90	(P3)	(164)	(295)	(392)	(534)	
	K3	130	234	311	424	
	(M3)	(142)	(256)	(340)	(463)	
	N3	150	270	359	489	
	(P3)	(164)	(295)	(392)	(534)	
	P3	160	288	382	518	
5700	70	(Q3)	(174)	(312)	(415)	(562)
		M3	140	252	335	457
		(N3)	(153)	(276)	(366)	(499)
	80	K3	130	234	311	424
		(M3)	(142)	(256)	(340)	(463)
		M3	140	252	335	457
6000K	80	(N3)	(153)	(276)	(366)	(499)
		N3	150	270	359	489
		(P3)	(164)	(295)	(392)	(534)
	70	P3	160	288	382	518
		(Q3)	(174)	(312)	(415)	(562)
		M3	140	252	335	457
6500	80	(N3)	(153)	(276)	(366)	(499)
		N3	150	270	359	489
		(P3)	(164)	(295)	(392)	(534)
	70	P3	160	288	382	518
		(Q3)	(174)	(312)	(415)	(562)
		K3	130	234	311	424
80	(M3)	(142)	(256)	(340)	(463)	
	M3	140	252	335	457	
	(N3)	(153)	(276)	(366)	(499)	

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

Notes:

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

2. Product Code Information

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

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WH	White
6	Product Version	2	
7 8	Product	L3	LH351 Series
9	Lens Type	D	Dome lens
10	Internal Code	3	
11	Not Defined	0	Default
12	CRI & Sorting Temperature	C D E F G	Min. 70 Min. 75 Min. 80 85°C Min. 85 Min. 90
13 14	Forward Voltage (V)	D4	2.6~3.0 Bin Code: D2 2.6~2.8 F2 2.8~3.0
15 16	CCT (K)	Y★ W★ V★ U★ T★ RT QT PQ PT	2200 Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8, Y9, YA, YB, YC, YD, YE, YF, YG, YM 2700 W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG, WM 3000 V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG, VM 3500 U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG, UM 4000 T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG, TM 5000 Bin Code: R1, R2, R3, R4 5700 Q1, Q2, Q3, Q4 6000 P2, Q1, P4, Q3 6500 P1, P2, P3, P4 ★ : "0" (Whole bin), "P" (Quarter bin), or "M" (MacAdam 3-step ellipse bin)
17 18	Luminous Flux (lm)	F3 G3 H3 J3 K3 M3 N3 P3 Q2	90~120 F1 90~100 100~130 G1 100~110 F3 110~140 H1 110~120 G3 120~150 J1 120~130 H3 130~160 K1 130~140 J3 140~170 M1 140~150 K3 150~180 N1 150~160 M3 160~190 P1 160~170 N3 170~190 Q1 170~180 R1 180~190 Digit 17: Min. spec. Digit 18: The number of higher bin(s) from min. spec. e.g.: K1 = 130~140 lm, K3 = 130~160 lm

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

Nominal CCT (K)	CRI (R _a) Min.	Product Code	Flux Rank	Flux Bin	Flux Range (Φ _v , lm)	
2200	80	SPHWH2L3D30ED4Y ☆ G3	G3	G1	100 ~ 110	
				H1	110 ~ 120	
				J1	120 ~ 130	
	70	80	SPHWH2L3D30CD4W ☆ K3	K3	K1	130 ~ 140
					M1	140 ~ 150
		70	SPHWH2L3D30CD4W ☆ M3	M3	N1	150 ~ 160
					M1	140 ~ 150
					N1	150 ~ 160
					P1	160 ~ 170
					N1	150 ~ 160
2700	80	SPHWH2L3D30CD4W ☆ N3	N3	P1	160 ~ 170	
				Q1	170 ~ 180	
				J1	120 ~ 130	
	90	SPHWH2L3D30ED4W ☆ J3	J3	K1	130 ~ 140	
				M1	140 ~ 150	
				K1	130 ~ 140	
				M1	140 ~ 150	
				N1	150 ~ 160	
				F1	90 ~ 100	
	3000	90	SPHWH2L3D30GD4W ☆ F3	F3	G1	100 ~ 110
H1					110 ~ 120	
G1					100 ~ 110	
70		SPHWH2L3D30GD4W ☆ G3	G3	H1	110 ~ 120	
				J1	120 ~ 130	
				M1	140 ~ 150	
				N1	150 ~ 160	
				P1	160 ~ 170	
				N1	150 ~ 160	
				Q1	170 ~ 180	
80	SPHWH2L3D30CD4V ☆ M3	M3	N1	150 ~ 160		
			P1	160 ~ 170		
			N1	150 ~ 160		
			P1	160 ~ 170		
	80	SPHWH2L3D30CD4V ☆ N3	N3	Q1	170 ~ 180	
				J1	120 ~ 130	
				K1	130 ~ 140	
				M1	140 ~ 150	
80	SPHWH2L3D30ED4V ☆ J3	J3	M1	140 ~ 150		
			K1	130 ~ 140		
			M1	140 ~ 150		
	80	SPHWH2L3D30ED4V ☆ K3	K3	N1	150 ~ 160	
				M1	140 ~ 150	
				N1	150 ~ 160	
80	SPHWH2L3D30ED4V ☆ M3	M3	N1	150 ~ 160		
			P1	160 ~ 170		

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

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

Nominal CCT (K)	CRI (R _a) Min.	Product Code	Flux Rank	Flux Bin	Flux Range (Φ _v , lm)
3000	90	SPHWH2L3D30GD4V☆G3	G3	G1	100 ~ 110
				H1	110 ~ 120
				J1	120 ~ 130
	70	SPHWH2L3D30GD4V☆H3	H3	H1	110 ~ 120
				J1	120 ~ 130
				K1	130 ~ 140
3500	80	SPHWH2L3D30CD4U☆K3	K3	K1	130 ~ 140
				M1	140 ~ 150
				N1	150 ~ 160
	70	SPHWH2L3D30CD4U☆M3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
4000	90	SPHWH2L3D30CD4U☆N3	N3	N1	150 ~ 160
				P1	160 ~ 170
				Q1	170 ~ 180
	80	SPHWH2L3D30ED4U☆K3	K3	K1	130 ~ 140
				M1	140 ~ 150
				N1	150 ~ 160
4000	70	SPHWH2L3D30ED4U☆M3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
	90	SPHWH2L3D30GD4U☆G3	G3	G1	100 ~ 110
				H1	110 ~ 120
				J1	120 ~ 130
4000	70	SPHWH2L3D30GD4U☆H3	H3	H1	110 ~ 120
				J1	120 ~ 130
				K1	130 ~ 140
	70	SPHWH2L3D30CD4T☆N3	N3	N1	150 ~ 160
				P1	160 ~ 170
				Q1	170 ~ 180
70	SPHWH2L3D30CD4T☆P3	P3	P1	160 ~ 170	
			Q1	170 ~ 180	
				R1	180 ~ 190

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

a) Luminous Flux Bins ($I_f = 350 \text{ mA}$, $T_j = 85 \text{ °C}$)

Nominal CCT (K)	CRI (R _a) Min.	Product Code	Flux Rank	Flux Bin	Flux Range (Φ _v , lm)
4000	80	SPHWH2L3D30ED4T☆K3	K3	K1	130 ~ 140
				M1	140 ~ 150
				N1	150 ~ 160
		SPHWH2L3D30ED4T☆M3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
	90	SPHWH2L3D30GD4T0J3	J3	J1	120 ~ 130
				K1	130 ~ 140
				M1	140 ~ 150
		SPHWH2L3D30GD4TPJ3	J3	J1	120 ~ 130
				K1	130 ~ 140
				M1	140 ~ 150
5000	70	SPHWH2L3D30CD4RTM3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
		SPHWH2L3D30CD4RTN3	N3	N1	150 ~ 160
				P1	160 ~ 170
				Q1	170 ~ 180
	SPHWH2L3D30CD4RTP3	P3	P1	160 ~ 170	
			Q1	170 ~ 180	
			R1	180 ~ 190	
	80	SPHWH2L3D30CD4RTQ2	Q2	Q1	170 ~ 180
				R1	180 ~ 190
				M1	140 ~ 150
SPHWH2L3D30ED4RTM3		M3	N1	150 ~ 160	
			P1	160 ~ 170	
			N1	150 ~ 160	
SPHWH2L3D30ED4RTN3	N3	P1	160 ~ 170		
		Q1	170 ~ 180		
		90	SPHWH2L3D30GD4RTK3	K3	K1
M1	140 ~ 150				
				N1	150 ~ 160

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

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

Nominal CCT (K)	CRI (R _a) Min.	Product Code	Flux Rank	Flux Bin	Flux Range (Φ _v , lm)	
5700	70	SPHWH2L3D30CD4QTN3	N3	N1	150 ~ 160	
				P1	160 ~ 170	
				Q1	170 ~ 180	
	80	SPHWH2L3D30CD4QTP3	P3	P1	160 ~ 170	
				Q1	170 ~ 180	
				R1	180 ~ 190	
6000	80	SPHWH2L3D30ED4QTM3	M3	M1	140 ~ 150	
				N1	150 ~ 160	
				P1	160 ~ 170	
		70	SPHWH2L3D30ED4PQK3	K3	K1	130 ~ 140
					M1	140 ~ 150
					N1	150 ~ 160
	6500	80	SPHWH2L3D30ED4PQM3	M3	M1	140 ~ 150
					N1	150 ~ 160
					P1	160 ~ 170
		70	SPHWH2L3D30CD4PTM3	M3	N1	150 ~ 160
					P1	160 ~ 170
					N1	150 ~ 160
80	SPHWH2L3D30CD4PTN3		N3	P1	160 ~ 170	
				Q1	170 ~ 180	
				P1	160 ~ 170	
6500	70	SPHWH2L3D30CD4PTNP3	P3	Q1	170 ~ 180	
				R1	180 ~ 190	
				K1	130 ~ 140	
	80	SPHWH2L3D30ED4PTK3	K3	M1	140 ~ 150	
				N1	150 ~ 160	
				M1	140 ~ 150	
80	SPHWH2L3D30ED4PTM3	M3	N1	150 ~ 160		
			P1	160 ~ 170		

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

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

Nominal CCT (K)	CRI (R _a) Min.	Product Code	Color Rank	Chromaticity Bins		
2200	80	SPHWH2L3D30ED4Y0G3	Y0 (Whole bin)	Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8, Y9, YA, YB, YC, YD, YE, YF, YG		
		SPHWH2L3D30ED4YPG3	YP (Quarter bin)	Y6, Y7, YA, YB		
		SPHWH2L3D30ED4YMG3	YM (MacAdam 3-step)	YM		
2700	70	SPHWH2L3D30CD4W0K3	W0 (Whole bin)	W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG		
		SPHWH2L3D30CD4W0M3				
		SPHWH2L3D30CD4W0N3				
		SPHWH2L3D30CD4WPK3	WP (Quarter bin)	W6, W7, WA, WB		
		SPHWH2L3D30CD4WPM3				
		SPHWH2L3D30CD4WPN3	WM (MacAdam 3-step)	WM		
		SPHWH2L3D30CD4WMK3				
		SPHWH2L3D30CD4WMM3				
		2700	80	SPHWH2L3D30ED4W0J3	W0 (Whole bin)	W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG
				SPHWH2L3D30ED4W0K3		
SPHWH2L3D30ED4W0L3						
SPHWH2L3D30ED4WPK3	WP (Quarter bin)			W6, W7, WA, WB		
SPHWH2L3D30ED4WPM3						
SPHWH2L3D30ED4WMM3	WM (MacAdam 3-step)			WM		
SPHWH2L3D30ED4WML3						
SPHWH2L3D30ED4W0F3						
2700	90			SPHWH2L3D30GD4W0G3	W0 (Whole bin)	W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG
				SPHWH2L3D30GD4W0J3		
		SPHWH2L3D30GD4W0K3				
		SPHWH2L3D30GD4WPF3	WP (Quarter bin)	W6, W7, WA, WB		
		SPHWH2L3D30GD4WPG3				
		SPHWH2L3D30GD4WMF3	WM (MacAdam 3-step)	WM		
		SPHWH2L3D30GD4WMM3				
		SPHWH2L3D30GD4W0M3				
		3000	70	SPHWH2L3D30CD4V0N3	V0 (Whole bin)	V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG
				SPHWH2L3D30CD4V0M3		
SPHWH2L3D30CD4V0J3						
SPHWH2L3D30CD4VPM3	VP (Quarter bin)			V6, V7, VA, VB		
SPHWH2L3D30CD4VPN3						
SPHWH2L3D30CD4VMM3	VM (MacAdam 3-step)			VM		
SPHWH2L3D30CD4VMN3						
SPHWH2L3D30ED4V0J3						
3000	80			SPHWH2L3D30ED4V0K3	V0 (Whole bin)	V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG
				SPHWH2L3D30ED4V0M3		
		SPHWH2L3D30ED4V0L3				
		SPHWH2L3D30ED4VPJ3	VP (Quarter bin)	V6, V7, VA, VB		
		SPHWH2L3D30ED4VPK3				
		SPHWH2L3D30ED4VPM3	VM (MacAdam 3-step)	VM		
		SPHWH2L3D30ED4VMJ3				
		SPHWH2L3D30ED4VMK3				
SPHWH2L3D30ED4VMM3						

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

Nominal CCT (K)	CRI (R_a) Min.	Product Code	Color Rank	Chromaticity Bins		
3000	90	SPHWH2L3D30GD4V0G3	V0 (Whole bin)	V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG		
		SPHWH2L3D30GD4V0H3				
		SPHWH2L3D30GD4VPG3	VP (Quarter bin)			
		SPHWH2L3D30GD4VPH3				
		SPHWH2L3D30GD4VMG3	VM (MacAdam 3-step)		VM	
		SPHWH2L3D30GD4VMH3				
	SPHWH2L3D30CD4U0K3	U0 (Whole bin)	U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG			
	SPHWH2L3D30CD4U0M3					
	SPHWH2L3D30CD4U0N3	UP (Quarter bin)				
	SPHWH2L3D30CD4UPK3					
	SPHWH2L3D30CD4UPM3					
	SPHWH2L3D30CD4UPN3					
SPHWH2L3D30CD4UMK3	UM (MacAdam 3-step)			UM		
SPHWH2L3D30CD4UMM3						
SPHWH2L3D30CD4UMN3						
3500	80	SPHWH2L3D30ED4U0K3			U0 (Whole bin)	U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG
		SPHWH2L3D30ED4U0M3				
		SPHWH2L3D30ED4UPK3			UP (Quarter bin)	
		SPHWH2L3D30ED4UPM3				
		SPHWH2L3D30ED4UMK3	UM (MacAdam 3-step)	UM		
		SPHWH2L3D30ED4UMM3				
	SPHWH2L3D30GD4U0G3	U0 (Whole bin)	U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG			
	SPHWH2L3D30GD4U0H3					
	SPHWH2L3D30GD4UPG3	UP (Quarter bin)				
	SPHWH2L3D30GD4UPH3					
	SPHWH2L3D30GD4UMG3	UM (MacAdam 3-step)		UM		
	SPHWH2L3D30GD4UMH3					
4000	70	SPHWH2L3D30CD4T0N3			T0 (Whole bin)	T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG
		SPHWH2L3D30CD4T0P3				
		SPHWH2L3D30CD4TPN3			TP (Quarter bin)	
		SPHWH2L3D30CD4TPP3				
		SPHWH2L3D30CD4TMN3		TM (MacAdam 3-step)	TM	
		SPHWH2L3D30CD4TMP3				
	SPHWH2L3D30ED4T0K3	T0 (Whole bin)	T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG			
	SPHWH2L3D30ED4T0M3					
	SPHWH2L3D30ED4TPK3	TP (Quarter bin)				
	SPHWH2L3D30ED4TPM3					
	SPHWH2L3D30ED4TMK3	TM (MacAdam 3-step)		TM		
	SPHWH2L3D30ED4TMM3					

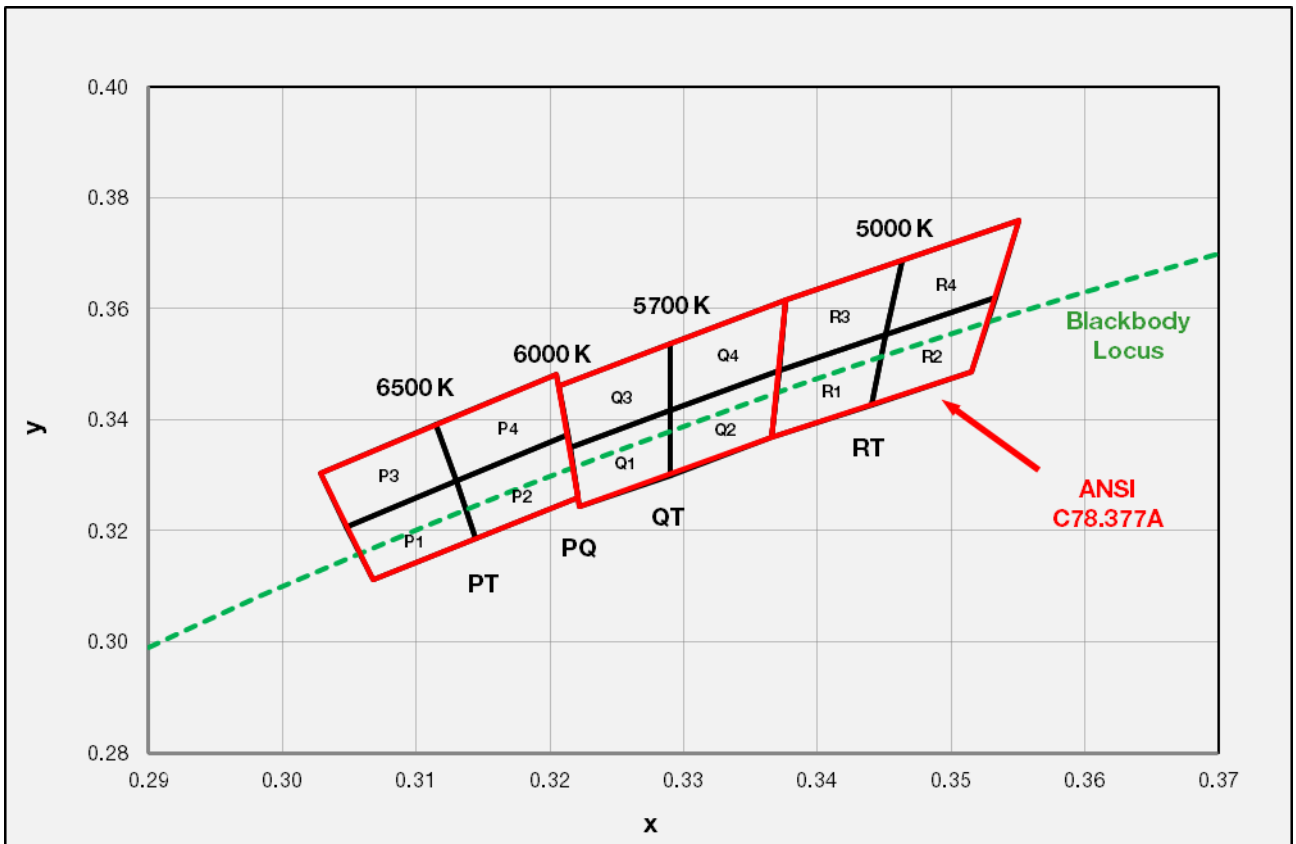
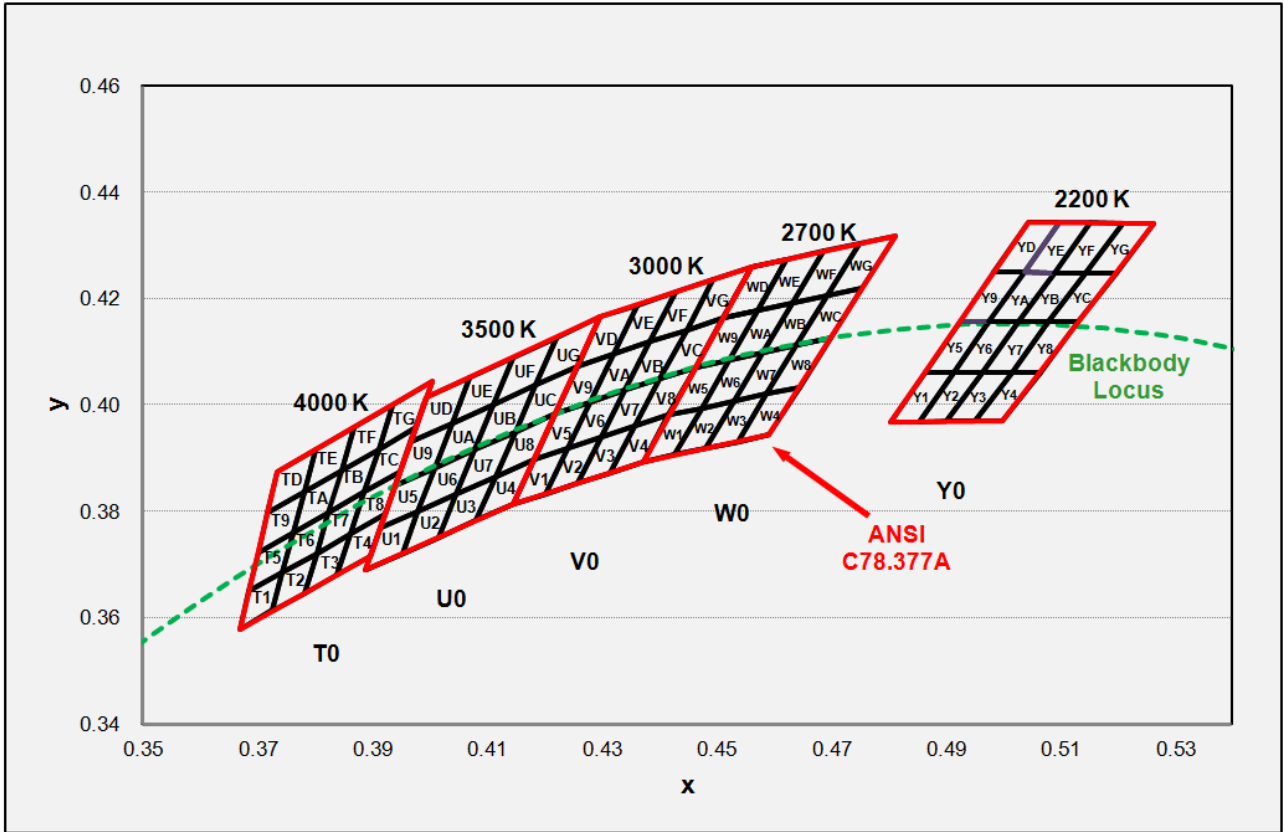
b) Color Bins ($I_f = 350 \text{ mA}$, $T_j = 85 \text{ °C}$)

Nominal CCT (K)	CRI (R _a) Min.	Product Code	Color Rank	Chromaticity Bins
4000	90	SPHWH2L3D30GD4T0J3	T0 (Whole bin)	T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG
		SPHWH2L3D30GD4TPJ3	TP (Quarter bin)	T6, T7, TA, TB
5000	70	SPHWH2L3D30CD4RTM3	RT (Half bin)	R1, R2, R3, R4
		SPHWH2L3D30CD4RTN3		
		SPHWH2L3D30CD4RTP3		
	80	SPHWH2L3D30CD4RTQ2		
	SPHWH2L3D30ED4RTM3			
	SPHWH2L3D30ED4RTN3			
5700	90	SPHWH2L3D30GD4RTK3	QT (Half bin)	Q1, Q2, Q3, Q4
	70	SPHWH2L3D30CD4QTN3		
	SPHWH2L3D30CD4QTP3			
6000	80	SPHWH2L3D30ED4QTM3	PQ (Half bin)	Q1, Q3, P2, P4
		SPHWH2L3D30ED4PQM3		
6500	70	SPHWH2L3D30CD4PTM3	PT (Half bin)	P1, P2, P3, P4
		SPHWH2L3D30CD4PTN3		
	SPHWH2L3D30CD4PTP3			
	80	SPHWH2L3D30ED4PTK3		
		SPHWH2L3D30ED4PTM3		

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

Nominal CCT (K)	CRI (R _a) Min.	Product Code	Voltage Rank	Voltage Bin	Voltage Range (V)
-	-	-	D4	D2	2.6 ~ 2.8
				F2	2.8 ~ 3.0

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



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

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

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

d) Chromaticity Region & Coordinates

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

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

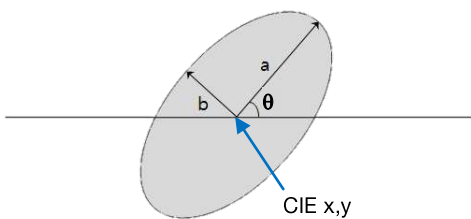
d) Chromaticity Region & Coordinates

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

d) Chromaticity Region & Coordinates

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

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



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

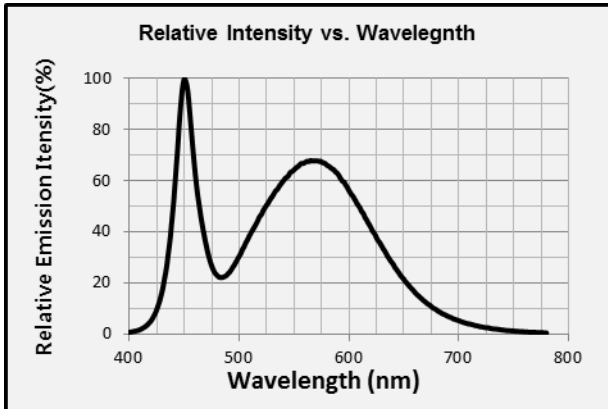
Note:

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

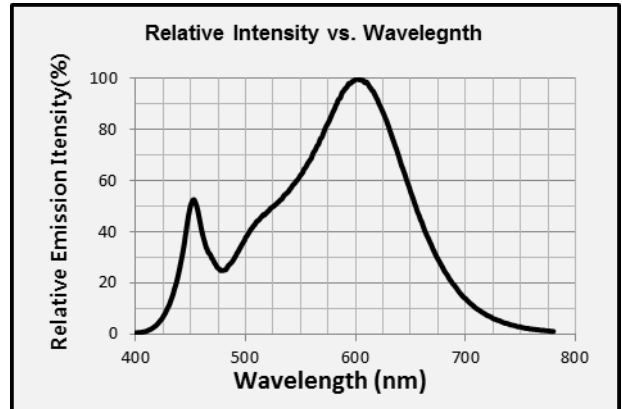
3. Typical Characteristics Graphs

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

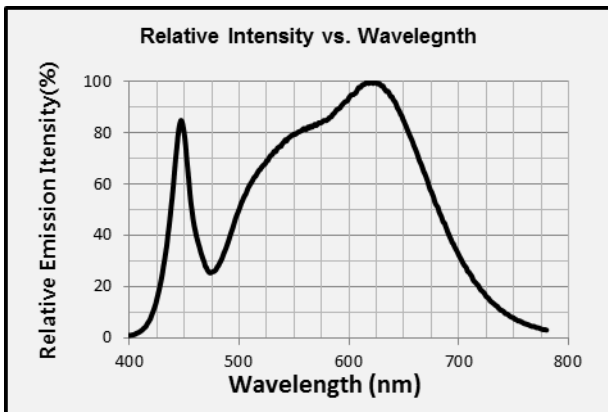
Cool White (CRI70)



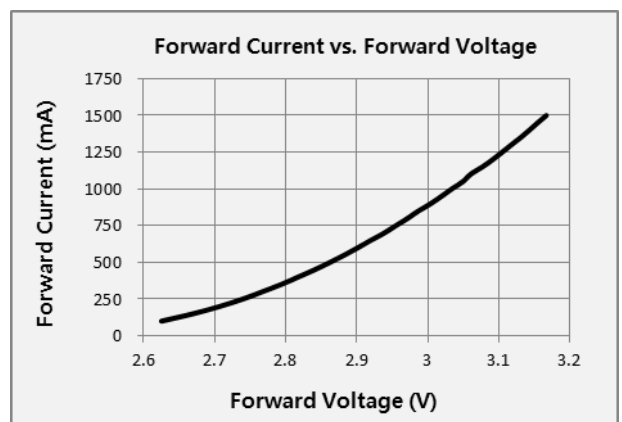
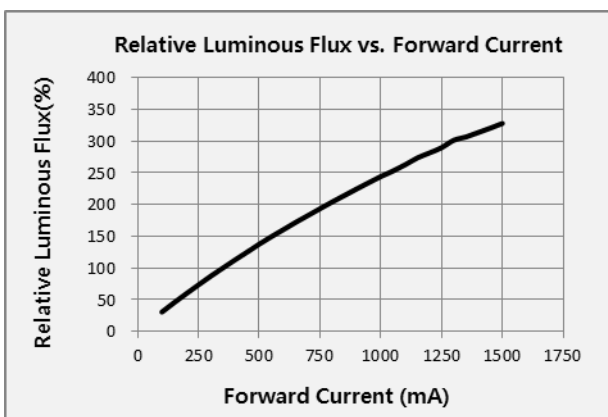
Warm White (CRI80)



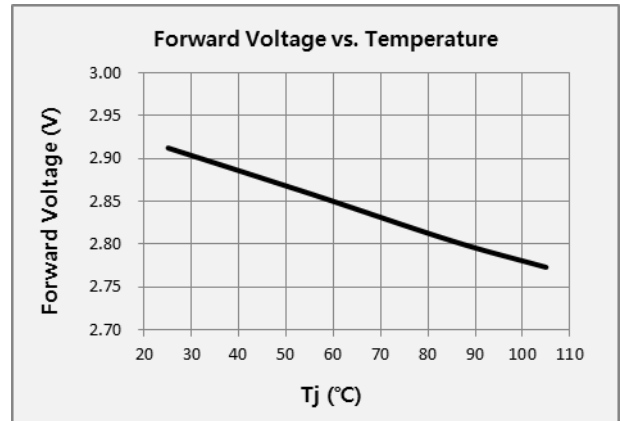
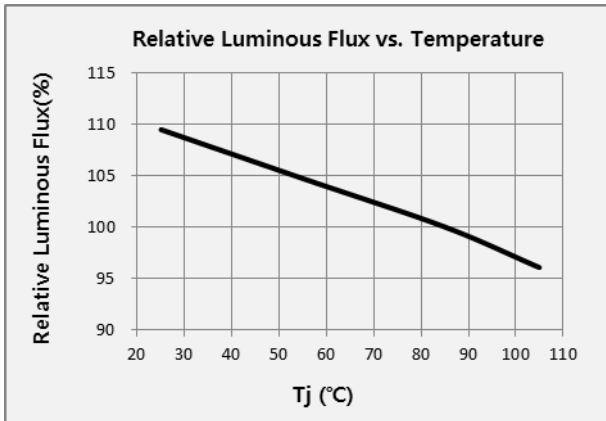
Warm White (CRI90)



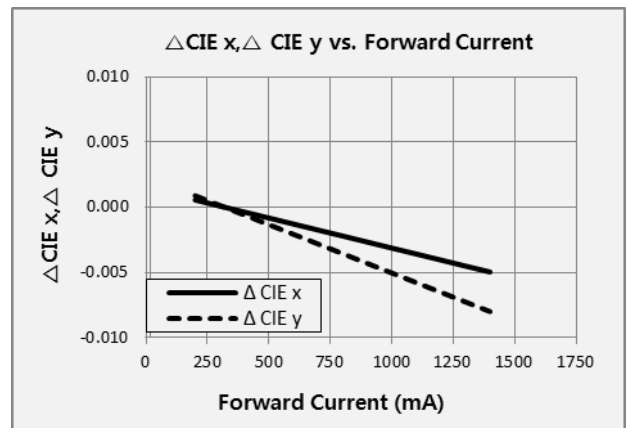
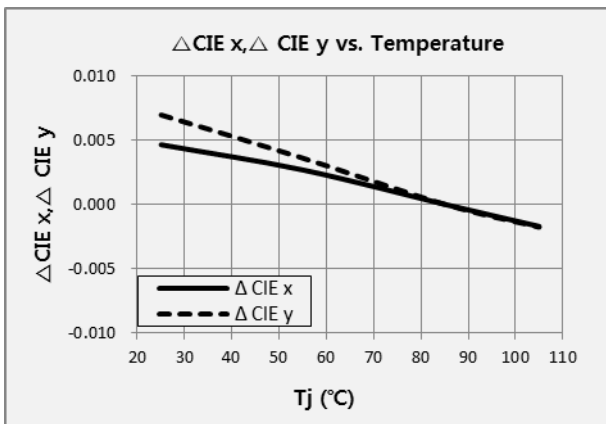
b) Forward Current Characteristics ($T_j = 85 \text{ }^\circ\text{C}$)



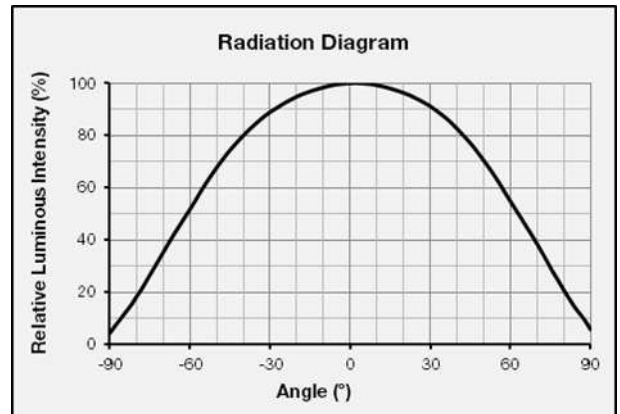
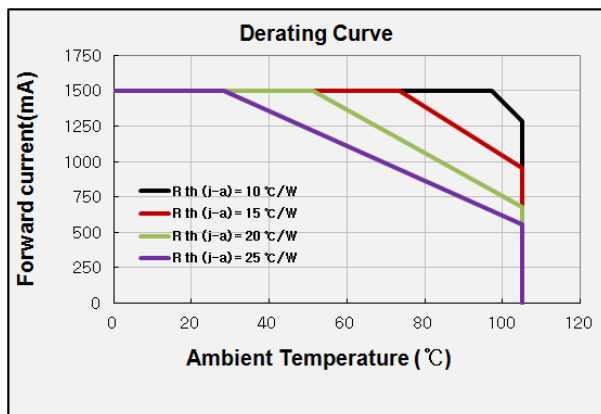
c) Temperature Characteristics ($I_f = 350 \text{ mA}$)



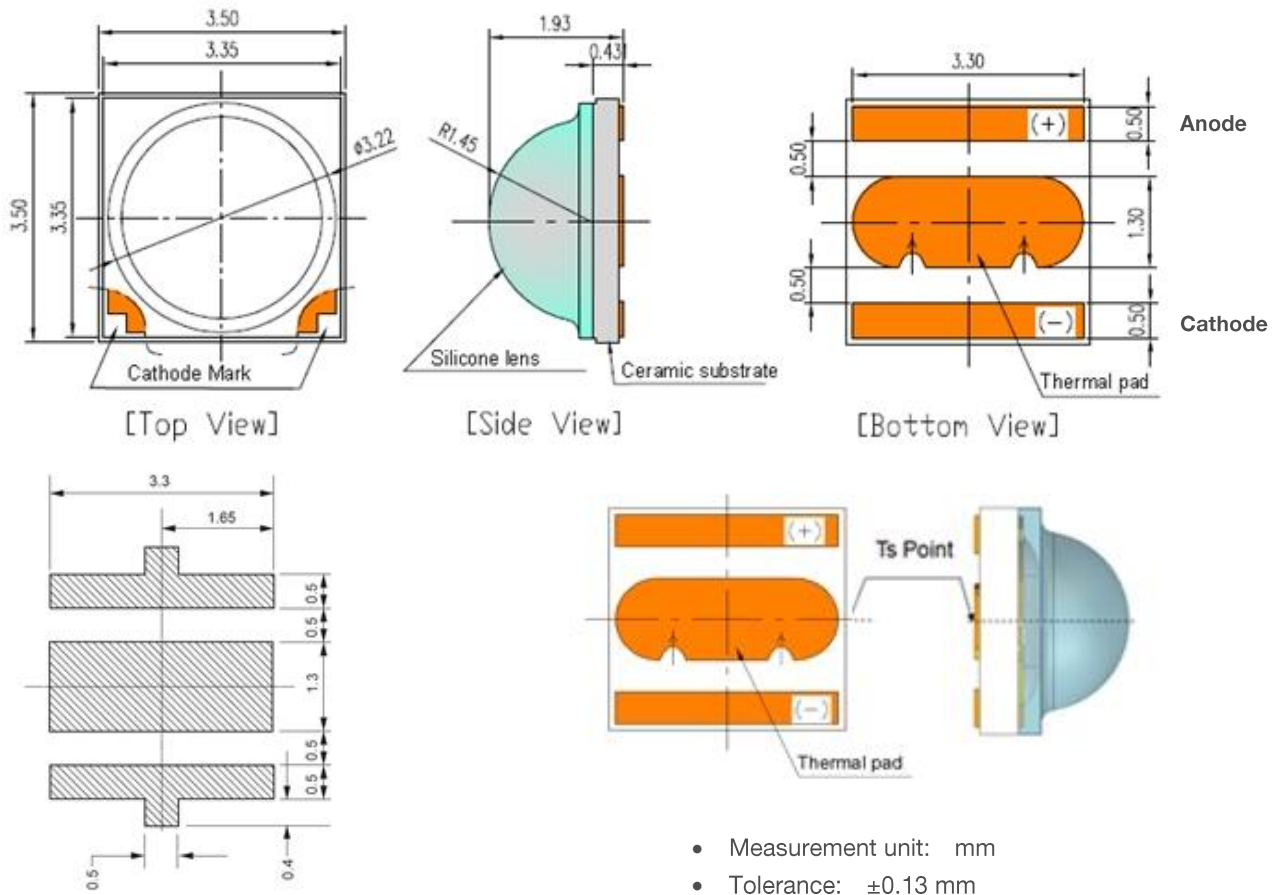
d) Color Shift Characteristics ($I_f = 350 \text{ mA}$, $T_j = 85 \text{ °C}$)



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



4. Outline Drawing & Dimension



Recommended Soldering Pattern

Notes:

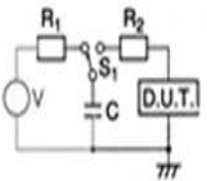
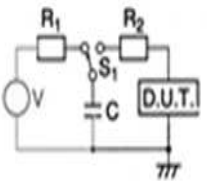
- 1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
- 2) The thermal pad is electrically isolated from the anode and cathode contact pads.
- 3) T_s point and measurement method:
 - ① Measure the nearest point to thermal pad as shown above. If necessary, remove PSR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

Precautions:

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

5. Reliability Test Items & Conditions

a) Test Items

Test Item	Test Condition	Test Hour / Cycle	Sample Size	
Room Temperature Life Test	25 °C, DC Derating I_F	1000 h	22	
High Temperature Life Test	85 °C, DC Derating I_F	1000 h	22	
High Temperature Humidity Life Test	85 °C, 85 % RH, DC Derating I_F	1000 h	22	
Low Temperature Life Test	-40 °C, DC Derating I_F	1000 h	22	
Damp Heat Cycling	-10 °C ↔ 25 °C 95 % RH ↔ 65 °C 95 % RH DC Derating I_F , 24 h / 1 cycle	10 cycles	11	
Powered Temperature Cycle	-40 °C / 85 °C each 20 min, 100 min transfer power on/off each 5 min, DC Derating I_F	100 cycles	11	
Temperature Cycling	-45 °C / 15 min ↔ 125 °C / 15 min temperature change within 5 min	500 cycles	100	
High Temperature Storage	120 °C	1000 h	11	
Low Temperature Storage	-40 °C	1000 h	11	
ESD (HBM)		R_1 : 10 M Ω R_2 : 1.5 k Ω C : 100 pF V : ± 8 kV	5 times	30
ESD (MM)		R_1 : 10 M Ω R_2 : 0 C : 200 pF V : ± 0.5 kV	5 times	30
Vibration Test	20~2000~20 Hz, 200 m/s ² , sweep 4 min X, Y, Z 3 direction, each 1 cycle	4 cycles	11	
Mechanical Shock Test	1500 g, 0.5 ms 3 shocks each X-Y-Z axis	5 cycles	11	

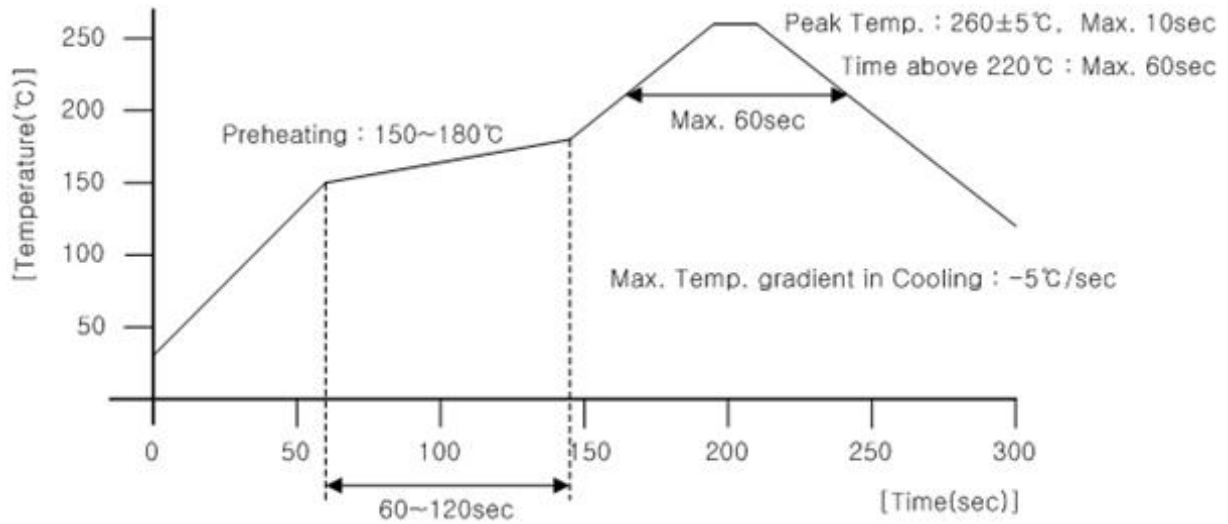
b) Criteria for Judging the Damage

Item	Symbol	Test Condition ($T_j = 25$ °C)	Limit	
			Min.	Max.
Forward Voltage	V_F	$I_F = 350$ mA	Init. Value * 0.9	Init. Value * 1.1
Luminous Flux	Φ_v	$I_F = 350$ mA	Init. Value * 0.7	Init. Value * 1.1

6. Soldering Conditions

a) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



b) Manual Soldering Conditions

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

7. Tape & Reel

a) Taping Dimension

(unit: mm)

