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	ºC	Note 1)*
Storage Temperature	T_{stg}	-40 ~ +120	ºC	-
LED Junction Temperature	T_j	150	ºC	-
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	ºC s	-
ESD (HBM)	-	±5	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
2700	80	H3 *(J3)*	110 *(121)*	199 *(218)*	262 *(288)*	354 *(389)*
		J3 *(K3)*	120 *(132)*	217 *(238)*	286 *(314)*	386 *(424)*
3000	70	K3 *(M3)*	130 *(143)*	235 *(258)*	310 *(340)*	418 *(460)*
		M3 *(N3)*	140 *(153)*	252 *(276)*	335 *(366)*	457 *(499)*
	80	H3 *(J3)*	110 *(121)*	199 *(218)*	262 *(288)*	354 *(389)*
		J3 *(K3)*	120 *(132)*	217 *(238)*	286 *(314)*	386 *(424)*
		K3 *(M3)*	130 *(142)*	234 *(256)*	311 *(340)*	424 *(463)*
3500	70	K3 *(M3)*	130 *(142)*	234 *(256)*	311 *(340)*	424 *(463)*
		M3 *(N3)*	140 *(153)*	252 *(276)*	335 *(366)*	457 *(499)*
	80	J3 *(K3)*	120 *(132)*	217 *(238)*	286 *(314)*	386 *(424)*
		K3 *(M3)*	130 *(142)*	234 *(256)*	311 *(340)*	424 *(463)*
	90	G3 *(H3)*	100 *(110)*	181 *(199)*	238 *(262)*	322 *(353)*
		H3 *(J3)*	110 *(121)*	199 *(218)*	262 *(288)*	354 *(389)*
4000	70	M3 *(N3)*	140 *(153)*	252 *(276)*	335 *(366)*	457 *(499)*
		N3 (P3)	150 *(164)*	270 *(295)*	359 *(392)*	489 *(534)*
	80	J3 *(K3)*	120 *(132)*	217 *(238)*	286 *(314)*	386 *(424)*
		K3 (M3)	130 *(143)*	235 *(258)*	310 *(340)*	418 *(460)*
		M3 *(N3)*	140 *(153)*	252 *(276)*	335 *(366)*	457 *(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

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
5000	70	M3 *(N3)*	140 *(153)*	252 *(276)*	335 *(366)*	457 *(499)*
		N3 *(P3)*	150 *(164)*	270 *(295)*	359 *(392)*	489 *(534)*
		P3 *(Q3)*	160 *(174)*	288 *(312)*	382 *(415)*	518 *(562)*
	80	K3 *(M3)*	130 *(142)*	234 *(256)*	311 *(340)*	424 *(463)*
		M3 *(N3)*	140 *(153)*	252 *(276)*	335 *(366)*	457 *(499)*
5700	70	M3 *(N3)*	140 *(153)*	252 *(276)*	335 *(366)*	457 *(499)*
		N3 *(P3)*	150 *(164)*	270 *(295)*	359 *(392)*	489 *(534)*
	75	M3 *(N3)*	140 *(153)*	252 *(276)*	335 *(366)*	457 *(499)*
		N3 *(P3)*	150 *(164)*	270 *(295)*	359 *(392)*	489 *(534)*
6500	70	M3 *(N3)*	140 *(153)*	252 *(276)*	335 *(366)*	457 *(499)*
		N3 *(P3)*	150 *(164)*	270 *(295)*	359 *(392)*	489 *(534)*

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

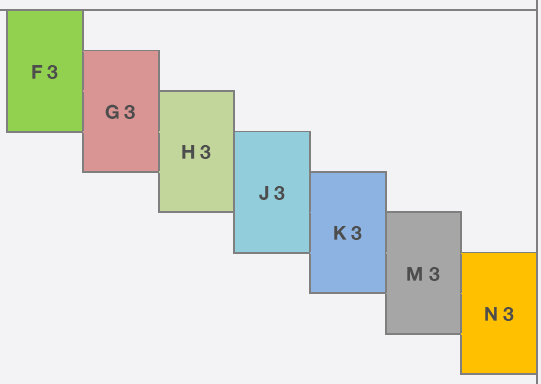
Notes:

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	Min. 70
		D	Min. 75
		E	Min. 80 85℃
		F	Min. 50
		G	Min. 90
13 14	Forward Voltage (V)	D 4	2.6~3.0 Bin Code: D2 2.6~2.8 / F2 2.8~3.0
15 16	CCT (K)	W☆	2700 — W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG, WM
		V☆	3000 — V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG, VM
		U☆	3500 — U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG, UM
		T☆	4000 — T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG, TM
		R T	5000 — R1, R2, R3, R4
		Q T	5700 — Q1, Q2, Q3, Q4
		P T	6500 — P1, P2, P3, P4
			☆ : "0" (Whole bin), "P" (Quarter bin), or "M" (MacAdam 3-step ellipse bin)
17 18	Luminous Flux (lm)	F 3	90~120 — F1 90~100
		G 3	100~130 — G1 100~110
		H 3	110~140 — H1 110~120
		J 3	120~150 — J1 120~130
		K 3	130~160 — K1 130~140
		M 3	140~170 — M1 140~150
		N 3	150~180 — N1 150~160
		P 3	160-190 — P1 160~170
			Q1 170~180
			R1 180-190
			Digit 17: Min. spec. 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 mA, T_j = 85 °C)

Nominal CCT (K)	CRI (R_a) Min.	Product Code	Flux Rank	Flux Bin	Flux Range (Φ_v, lm)
2700	80	SPHWH2L3D30ED4W☆H3	H3	H1	110 ~ 120
				J1	120 ~ 130
				K1	130 ~ 140
		SPHWH2L3D30ED4W☆J3	J3	J1	120 ~ 130
				K1	130 ~ 140
				M1	140 ~ 150
3000	70	SPHWH2L3D30CD4V☆K3	K3	K1	130 ~ 140
				M1	140 ~ 150
				N1	150 ~ 160
		SPHWH2L3D30CD4V☆M3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
	80	SPHWH2L3D30ED4V☆H3	H3	H1	110 ~ 120
				J1	120 ~ 130
				K1	130 ~ 140
		SPHWH2L3D30ED4V☆J3	J3	J1	120 ~ 130
				K1	130 ~ 140
				M1	140 ~ 150
		SPHWH2L3D30ED4V☆K3	K3	K1	130 ~ 140
				M1	140 ~ 150
				N1	150 ~ 160
3500	70	SPHWH2L3D30CD4U☆K3	K3	K1	130 ~ 140
				M1	140 ~ 150
				N1	150 ~ 160
		SPHWH2L3D30CD4U☆M3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
	80	SPHWH2L3D30ED4U☆J3	J3	J1	120 ~ 130
				K1	130 ~ 140
				M1	140 ~ 150
		SPHWH2L3D30ED4U☆K3	K3	K1	130 ~ 140
				M1	140 ~ 150
				N1	150 ~ 160
	90	SPHWH2L3D30GD4U☆G3	G3	G1	100 ~ 110
				H1	110 ~ 120
				J1	120 ~ 130
		SPHWH2L3D30GD4U☆H3	H3	H1	110 ~ 120
				J1	120 ~ 130
				K1	130 ~ 140

"☆" 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 mA, T_j = 85 °C)

Nominal CCT (K)	CRI (R_a) Min.	Product Code	Flux Rank	Flux Bin	Flux Range (Φ_v, lm)
4000	70	SPHWH2L3D30CD4T☆M3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
		SPHWH2L3D30CD4T☆N3	N3	N1	150 ~ 160
				P1	160 ~ 170
				Q1	170 ~ 180
	80	SPHWH2L3D30ED4T☆J3	J3	J1	120 ~ 130
				K1	130 ~ 140
				M1	140 ~ 150
		SPHWH2L3D30ED4T☆K3	K3	K1	130 ~ 140
				M1	140 ~ 150
				N1	150 ~ 160
		SPHWH2L3D30ED4T☆M3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
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	SPHWH2L3D30ED4RTK3	K3	K1	130 ~ 140
				M1	140 ~ 150
				N1	150 ~ 160
		SPHWH2L3D30ED4RTM3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170

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

a) Luminous Flux Bins (I_F = 350 mA, T_j = 85 °C)

Nominal CCT (K)	CRI (R_a) Min.	Product Code	Flux Rank	Flux Bin	Flux Range (Φ_v, lm)
5700	70	SPHWH2L3D30CD4QTM3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
		SPHWH2L3D30CD4QTN3	N3	N1	150 ~ 160
				P1	160 ~ 170
				Q1	170 ~ 180
	75	SPHWH2L3D30DD4QTM3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
		SPHWH2L3D30DD4QTN3	N3	N1	150 ~ 160
				P1	160 ~ 170
				Q1	170 ~ 180
6500	70	SPHWH2L3D30CD4PTM3	M3	M1	140 ~ 150
				N1	150 ~ 160
				P1	160 ~ 170
		SPHWH2L3D30CD4PTN3	N3	N1	150 ~ 160
				P1	160 ~ 170
				Q1	170 ~ 180

b) Color Bins (I_F = 350 mA, T_j = 85 °C)

Nominal CCT (K)	CRI (R_a) Min.	Product Code	Color Rank	Chromaticity Bins
2700	80	SPHWH2L3D30ED4W0H3	W0 (Whole bin)	W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG
		SPHWH2L3D30ED4W0J3		
		SPHWH2L3D30ED4WPH3	WP (Quarter bin)	W6, W7, WA, WB
		SPHWH2L3D30ED4WPJ3		
		SPHWH2L3D30ED4WMH3	WM (MacAdam 3-step)	WM
		SPHWH2L3D30ED4WMJ3		
3000	70	SPHWH2L3D30CD4V0K3	V0 (Whole bin)	V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG
		SPHWH2L3D30CD4V0M3		
		SPHWH2L3D30CD4VPK3	VP (Quarter bin)	V6, V7, VA, VB
		SPHWH2L3D30CD4VPM3		
		SPHWH2L3D30CD4VMK3	VM (MacAdam 3-step)	VM
		SPHWH2L3D30CD4VMM3		
	80	SPHWH2L3D30ED4V0H3	V0 (Whole bin)	V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG
		SPHWH2L3D30ED4V0J3		
		SPHWH2L3D30ED4V0K3		
		SPHWH2L3D30ED4VPH3	VP (Quarter bin)	V6, V7, VA, VB
		SPHWH2L3D30ED4VPJ3		
		SPHWH2L3D30ED4VPK3		
		SPHWH2L3D30ED4VMH3	VM (MacAdam 3-step)	VM
		SPHWH2L3D30ED4VMJ3		
		SPHWH2L3D30ED4VMK3		
3500	70	SPHWH2L3D30CD4U0K3	U0 (Whole bin)	U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG
		SPHWH2L3D30CD4U0M3		
		SPHWH2L3D30CD4UPK3	UP (Quarter bin)	U6, U7, UA, UB
		SPHWH2L3D30CD4UPM3		
		SPHWH2L3D30CD4UMK3	UM (MacAdam 3-step)	UM
		SPHWH2L3D30CD4UMM3		
	80	SPHWH2L3D30ED4U0J3	U0 (Whole bin)	U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG
		SPHWH2L3D30ED4U0K3		
		SPHWH2L3D30ED4UPJ3	UP (Quarter bin)	U6, U7, UA, UB
		SPHWH2L3D30ED4UPK3		
		SPHWH2L3D30ED4UMJ3	UM (MacAdam 3-step)	UM
		SPHWH2L3D30ED4UMK3		
	90	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)	U6, U7, UA, UB
		SPHWH2L3D30GD4UPH3		
		SPHWH2L3D30GD4UMG3	UM (MacAdam 3-step)	UM
		SPHWH2L3D30GD4UMH3		

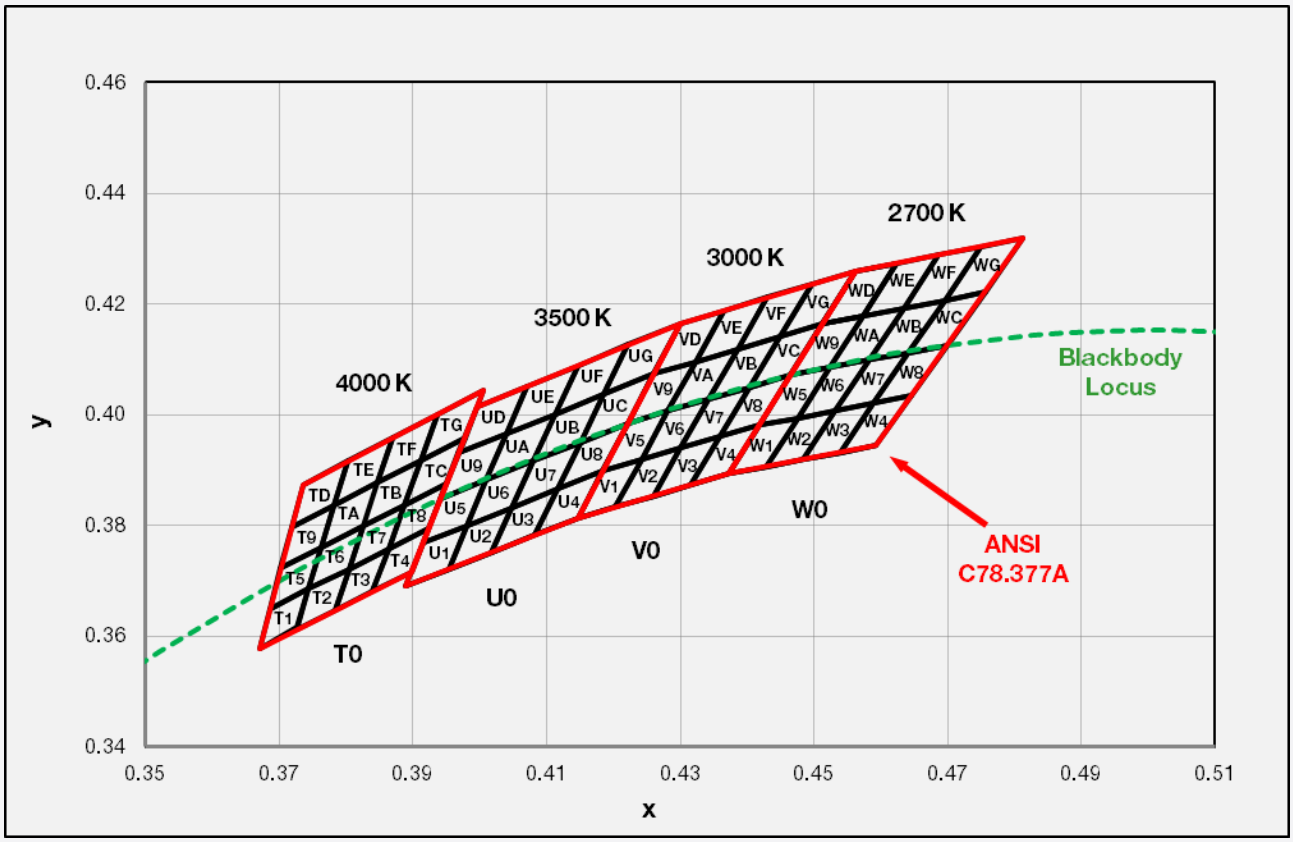
b) Color Bins (I_F = 350 mA, T_j = 85 °C)

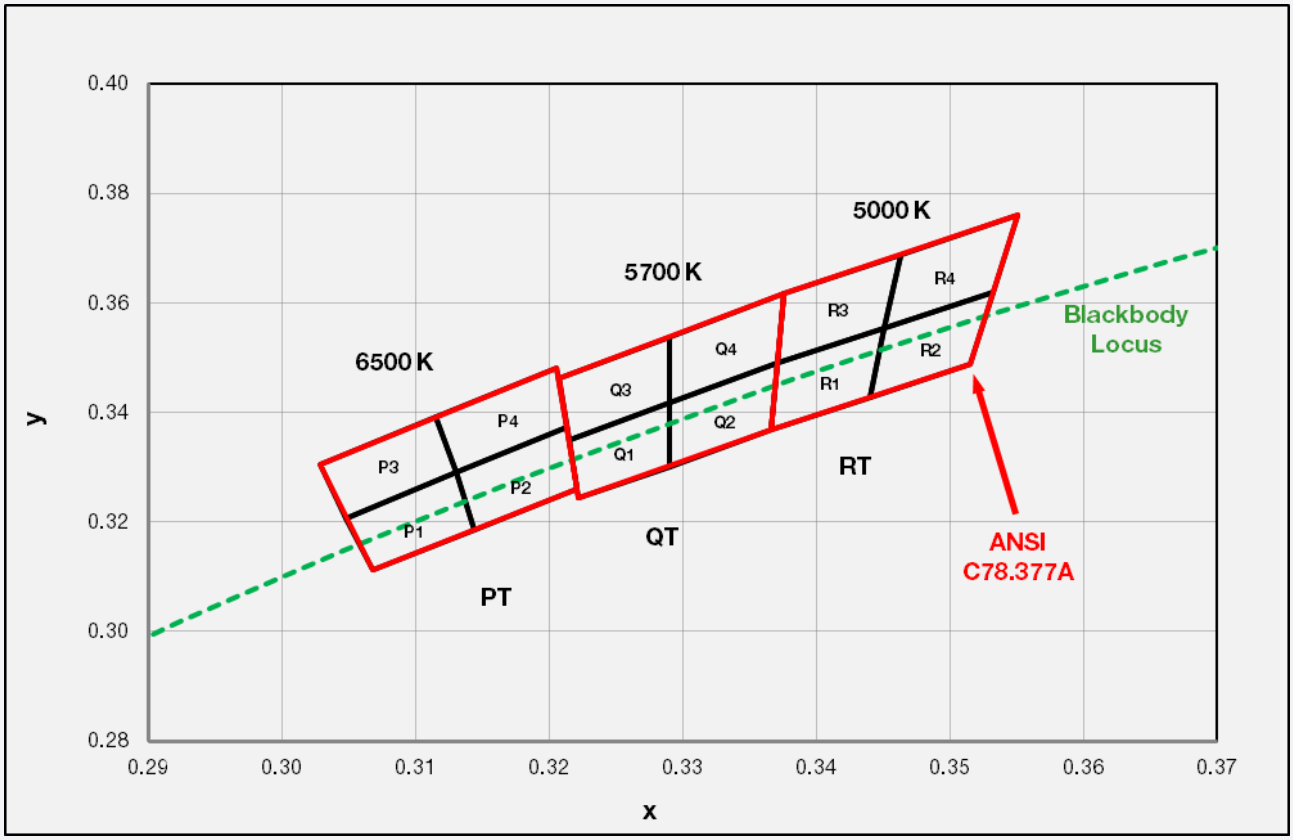
Nominal CCT (K)	CRI (R_a) Min.	Product Code	Color Rank	Chromaticity Bins
4000	70	SPHWH2L3D30CD4T0M3	T0 (Whole bin)	T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG
		SPHWH2L3D30CD4T0N3		
		SPHWH2L3D30CD4TPM3	TP (Quarter bin)	T6, T7, TA, TB
		SPHWH2L3D30CD4TPN3		
		SPHWH2L3D30CD4TMM3	TM (MacAdam 3-step)	TM
		SPHWH2L3D30CD4TMN3		
	80	SPHWH2L3D30ED4T0J3	T0 (Whole bin)	T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG
		SPHWH2L3D30ED4T0K3		
		SPHWH2L3D30ED4T0M3		
		SPHWH2L3D30ED4TPJ3	TP (Quarter bin)	T6, T7, TA, TB
		SPHWH2L3D30ED4TPK3		
		SPHWH2L3D30ED4TPM3		
		SPHWH2L3D30ED4TMJ3	TM (MacAdam 3-step)	TM
		SPHWH2L3D30ED4TMK3		
		SPHWH2L3D30ED4TMM3		
5000	70	SPHWH2L3D30CD4RTM3	RT (Half bin)	R1, R2, R3, R4
		SPHWH2L3D30CD4RTN3		
		SPHWH2L3D30CD4RTP3		
	80	SPHWH2L3D30ED4RTK3		
		SPHWH2L3D30ED4RTM3		
5700	70	SPHWH2L3D30CD4QTM3	QT (Half bin)	Q1, Q2, Q3, Q4
		SPHWH2L3D30CD4QTN3		
	75	SPHWH2L3D30DD4QTM3		
		SPHWH2L3D30DD4QTN3		
6500	70	SPHWH2L3D30CD4PTM3	PT (Half bin)	P1, P2, P3, P4
		SPHWH2L3D30CD4PTN3		

c) Voltage Bins (I_F = 350 mA, T_j = 85 °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 mA, T_j = 85 °C)





d) Chromaticity Region & Coordinates (I_F = 350 mA, T_j = 85 °C)

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

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

d) Chromaticity Region & Coordinates

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

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

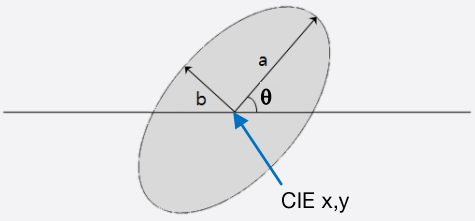
d) Chromaticity Region & Coordinates

Region	CIE x	CIE y
R rank (5000 K)		
R1	0.3371	0.3490
	0.3451	0.3554
	0.3440	0.3427
	0.3366	0.3369
R2	0.3451	0.3554
	0.3533	0.3620
	0.3515	0.3487
	0.3440	0.3427
R3	0.3376	0.3616
	0.3463	0.3687
	0.3451	0.3554
	0.3371	0.3490
R4	0.3463	0.3687
	0.3551	0.3760
	0.3533	0.3620
	0.3451	0.3554

Region	CIE x	CIE y
Q rank (5700 K)		
Q1	0.3215	0.3350
	0.3290	0.3417
	0.3290	0.3300
	0.3222	0.3243
Q2	0.3290	0.3417
	0.3371	0.3490
	0.3366	0.3369
	0.3290	0.3300
Q3	0.3207	0.3462
	0.3290	0.3538
	0.3290	0.3417
	0.3215	0.3350
Q4	0.3290	0.3538
	0.3376	0.3616
	0.3371	0.3490
	0.3290	0.3417

Region	CIE x	CIE y
P rank (6500 K)		
P1	0.3068	0.3113
	0.3144	0.3186
	0.3130	0.3290
	0.3048	0.3207
P2	0.3144	0.3186
	0.3221	0.3261
	0.3213	0.3373
	0.3130	0.3290
P3	0.3048	0.3207
	0.3130	0.3290
	0.3115	0.3391
	0.3028	0.3304
P4	0.3130	0.3290
	0.3213	0.3373
	0.3205	0.3481
	0.3115	0.3391

e) MacAdam 3-step Ellipse (I_F = 350 mA, T_j = 85 °C)



Nom. CCT (K)	Color Rank	Center		Rotation Angle θ (°)	a	b
		CIE x	CIE y			
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

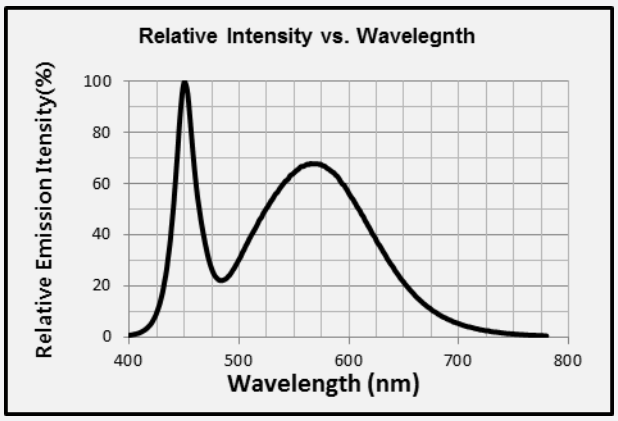
Note:

Samsung maintains measurement tolerance of: Cx, Cy = ±0.005

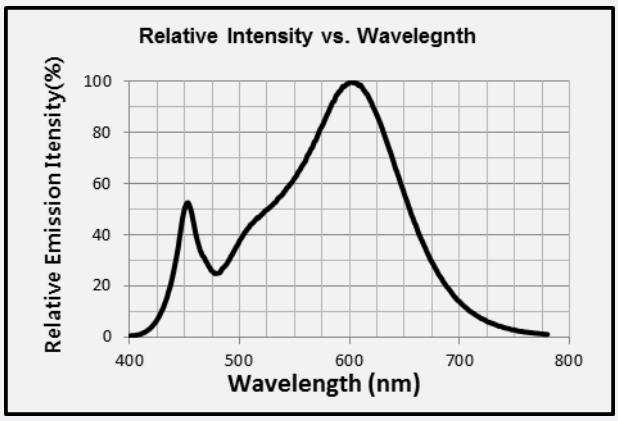
3. Typical Characteristics Graphs

a) Spectrum Distribution (I_F = 350 mA, T_j = 85 °C)

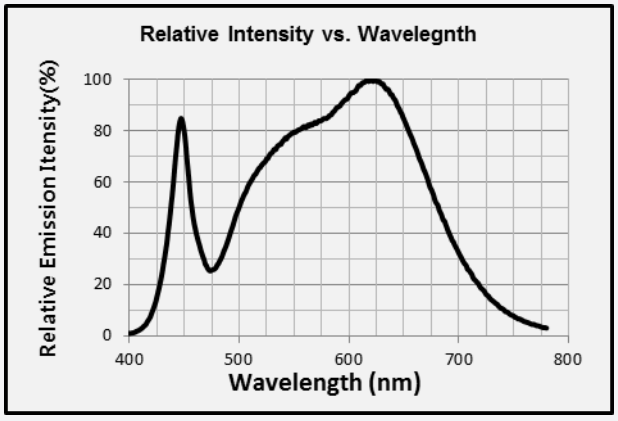
Cool White (CRI70)



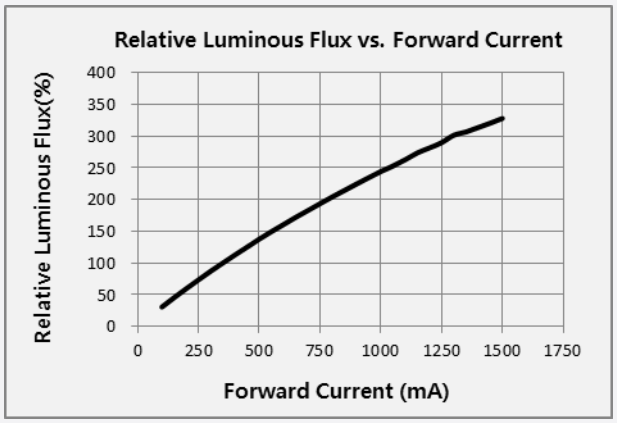
Warm White (CRI80)

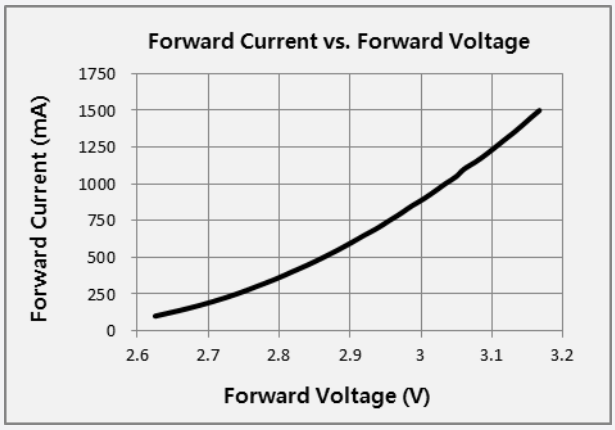


Warm White (CRI90)

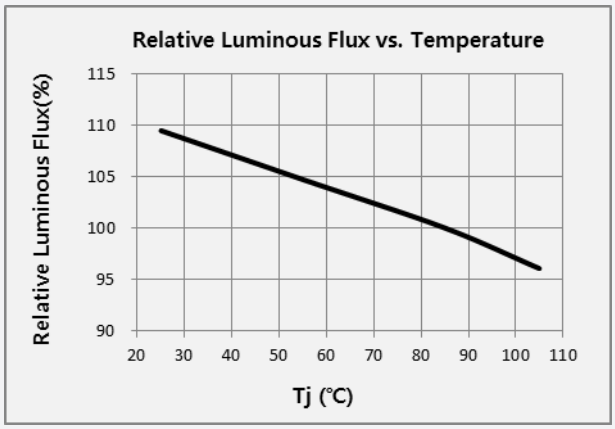


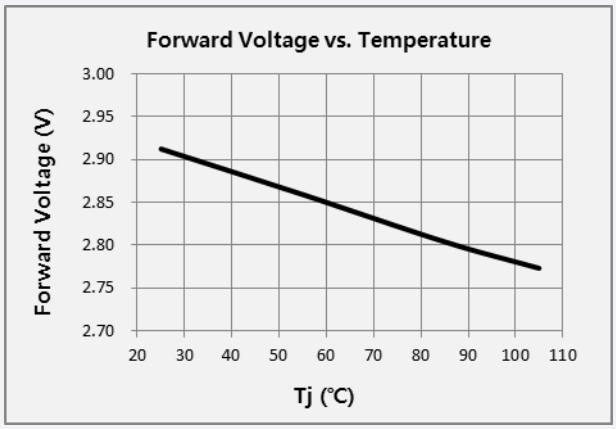
b) Forward Current Characteristics (T_j = 85 °C)



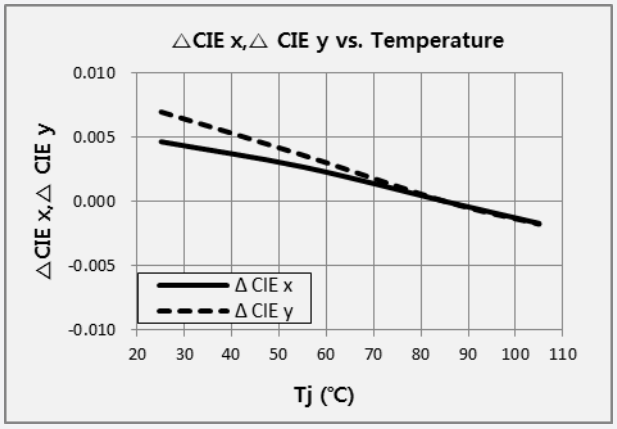


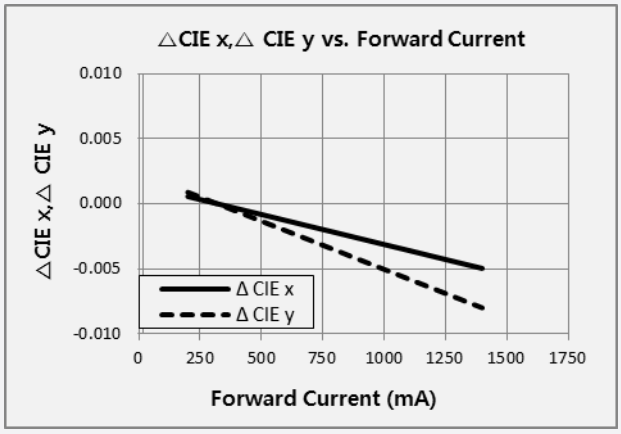
c) Temperature Characteristics (I_F = 350 mA)



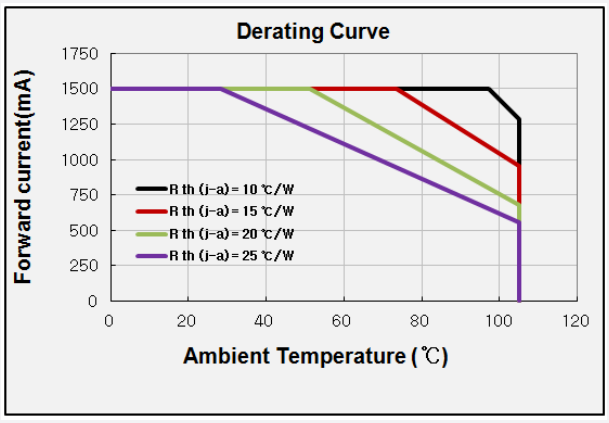


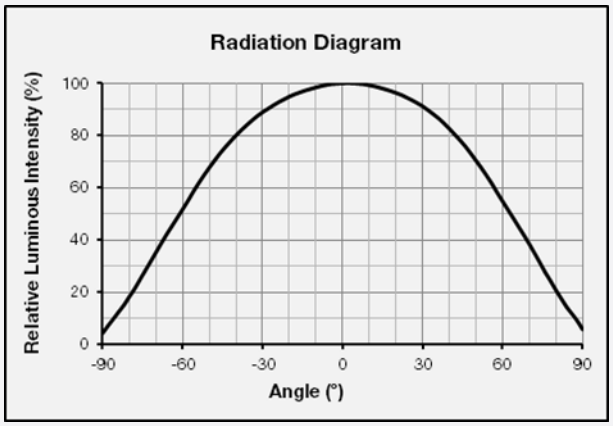
d) Color Shift Characteristics (I_F = 350 mA, T_j = 85 °C)



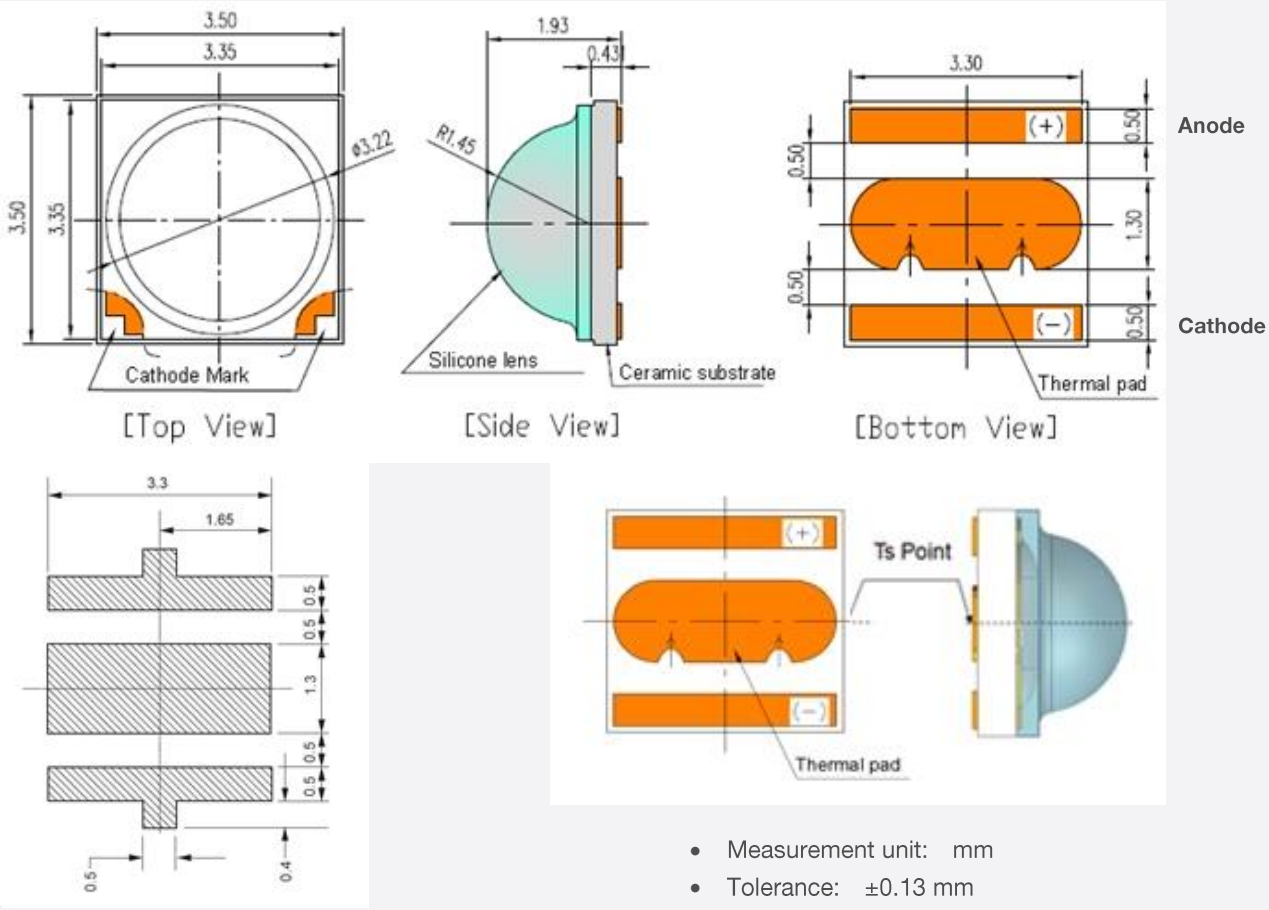


e) Derating Curve and Beam Angle Characteristics (I_F = 350 mA, T_j = 25 °C)





4. Outline Drawing & Dimension



- Measurement unit: mm
- Tolerance: ±0.13 mm

Recommended Soldering Pattern

Notes:

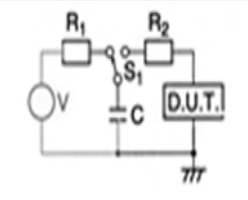
1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
2) The thermal pad is electrically isolated from the anode and cathode contact pads.
3) T_s point and measurement method:
   ① Measure the nearest point to thermal pad as shown above. If necessary, remove PSR of PCB 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 1000 mA	1000 h	22
High Temperature Life Test	85 °C, DC 1000 mA	1000 h	22
High Temperature Humidity Life Test	85 °C, 85 % RH, DC 1000 mA	1000 h	22
Low Temperature Life Test	-40 °C, DC 1000 mA	1000 h	22
Temperature Humidity Cycle Test	-10 °C ↔ 25 °C 95 % RH ↔ 65 °C 95 % RH DC 1000 mA, 24 h / 1 cycle	10 cycles	11
Powered Temperature Cycle Test	-40 °C / 85 °C each 20 min, 100 min transfer power on/off each 5 min, DC 1000 mA	100 cycles	11
Thermal Shock	-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 MΩ R_2: 1.5 kΩ C: 100 pF V: ±5 kV	5 times	30
ESD (MM)	R_1: 10 MΩ 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

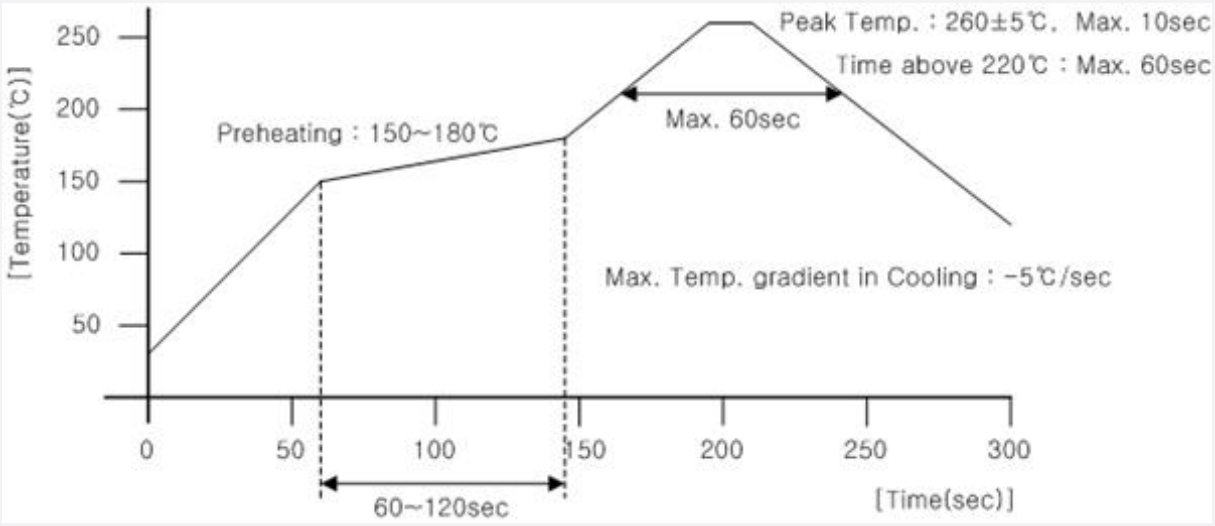
b) Criteria for Judging the Damage

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.



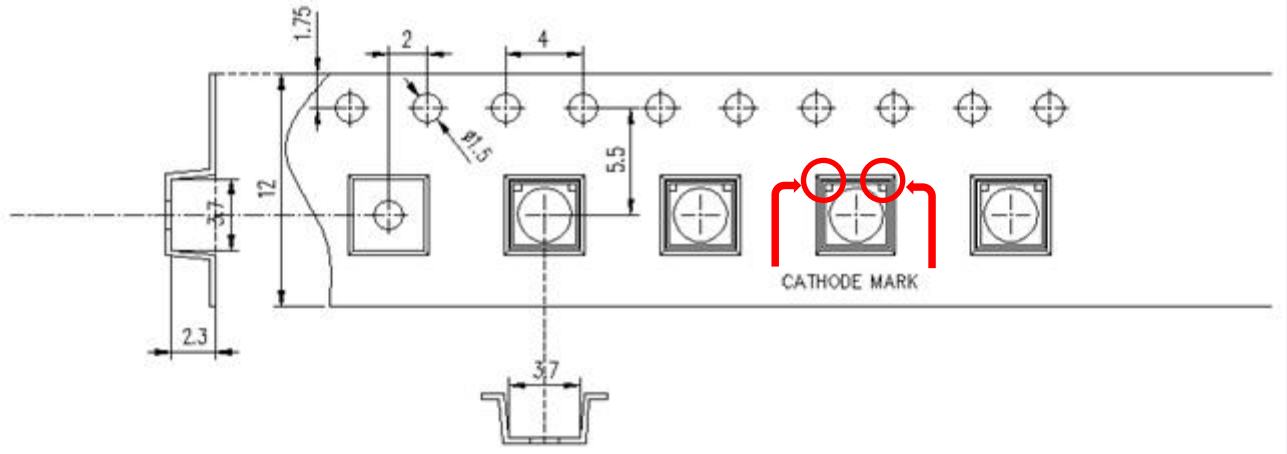
b) Manual Soldering Conditions

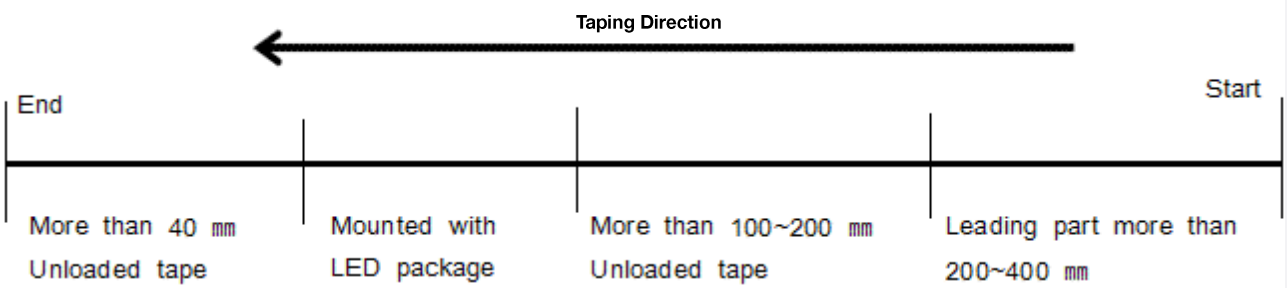
Not more than 5 seconds @ max. 300 °C, under soldering iron.

7. Tape & Reel

a) Taping Dimension

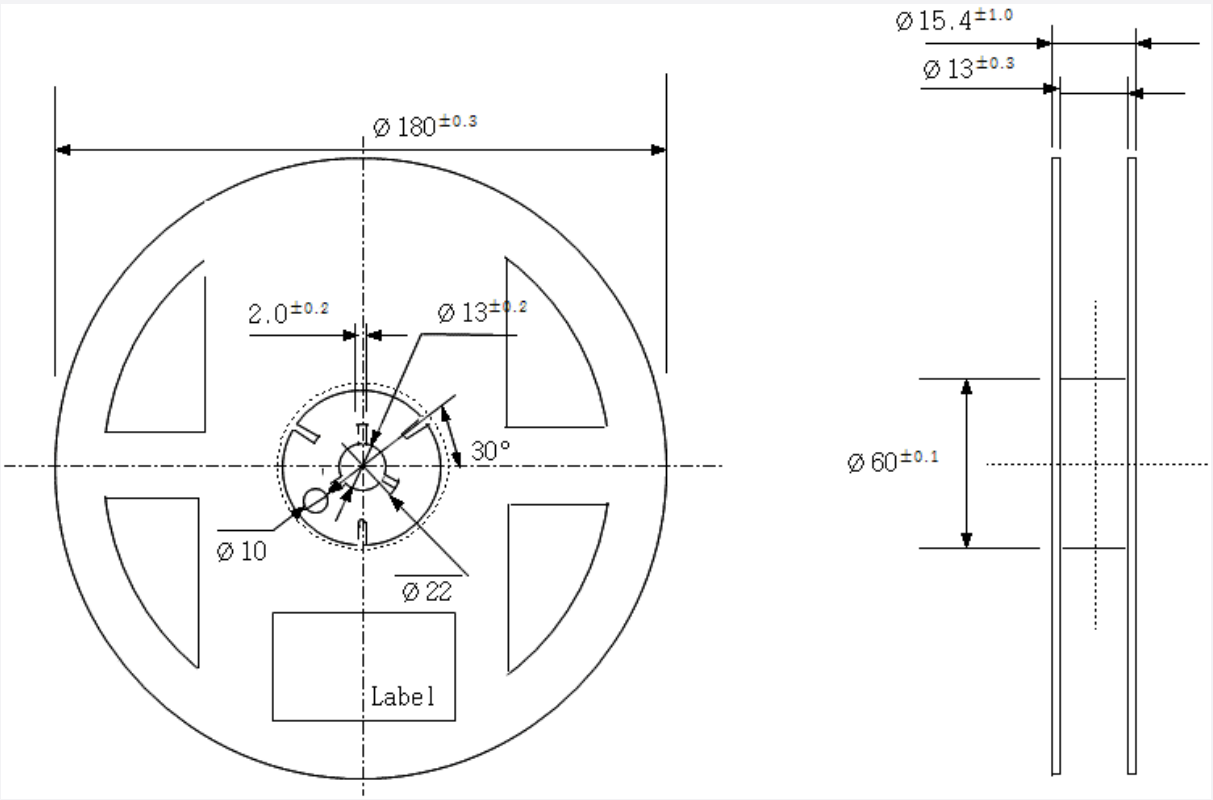
(unit: mm)





b) Reel Dimension

(unit: mm)

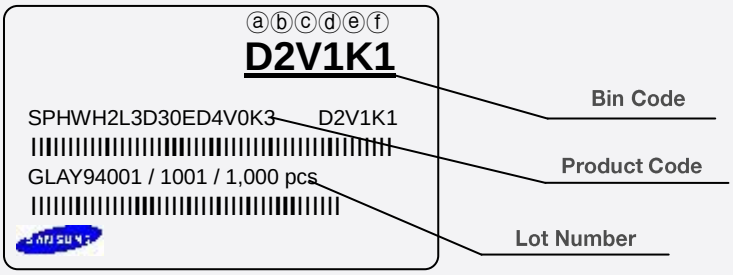


Notes:

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

8. Label Structure

a) Label Structure



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

Bin Code:

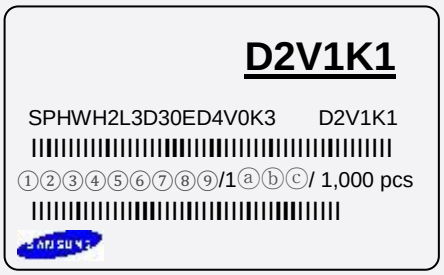
ⓐⓑ: Forward Voltage bin (refer to page 13)

ⓒⓓ: Chromaticity bin (refer to page 14-17)

ⓔⓕ: Luminous Flux bin (refer to page 8-10)

b) Lot Number

The lot number is composed of the following characters:



①②③④⑤⑥⑦⑧⑨ / 1ⓐⓑⓒ / 1,000 pcs

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

9. Packing Structure

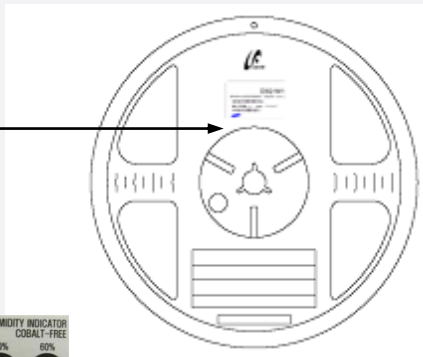
a) Packing Process

Reel

D2V1K1

SPHWH2L3D30ED4V0K3 D2V1K1

GLAY94001 / 1001 / 1,000 pcs



Aluminum Vinyl Packing Bag

D2V1K1

SPHWH2L3D30ED4V0K3 D2V1K1

GLAY94001 / 1001 / 1,000 pcs

Outer Box

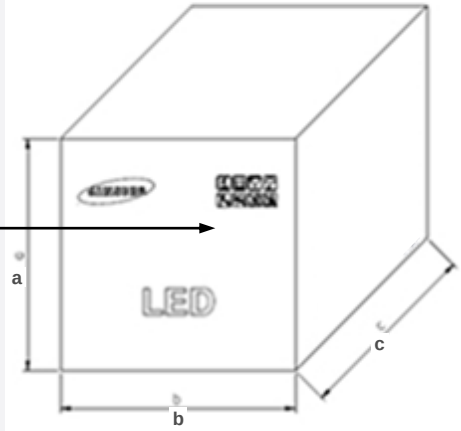
Material: Paper SW(B)

Type	Size (mm)			Note
	(a)	(b)	(c)	
7 inch	245 ± 5	220 ± 5	182 ± 5	Up to 7 reels

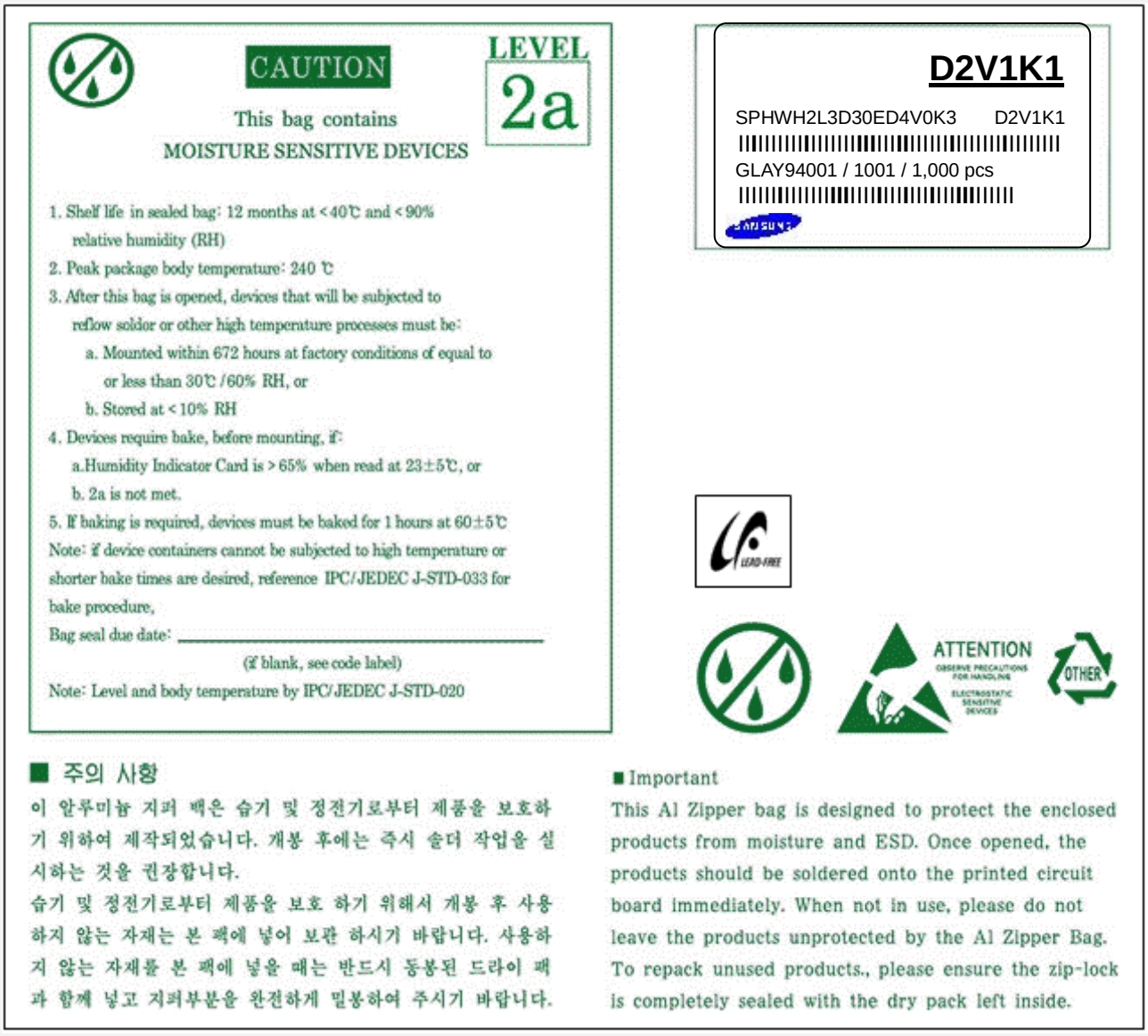
D2V1K1

SPHWH2L3D30ED4V0K3 D2V1K1

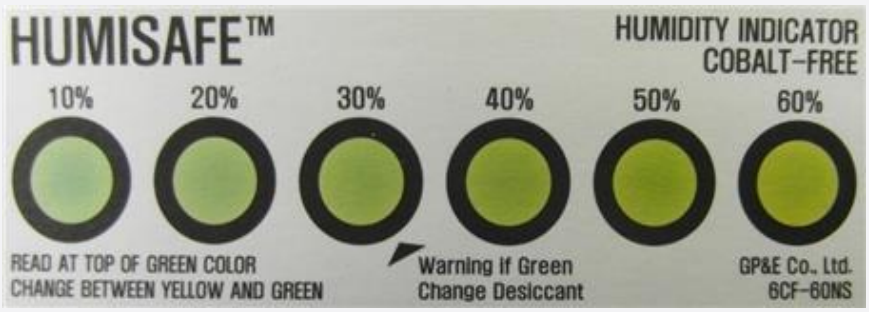
GLAY94001 / 1001 / 7,000 pcs



b) Aluminum Vinyl Packing Bag



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



10. Precautions in Handling & Use

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

Legal and additional information.

About Samsung Electronics Co., Ltd.

Samsung Electronics Co., Ltd. inspires the world and shapes the future with transformative ideas and technologies, redefining the worlds of TVs, smartphones, wearable devices, tablets, cameras, digital appliances, printers, medical equipment, network systems and semiconductors. We are also leading in the Internet of Things space through, among others, our Digital Health and Smart Home initiatives. We employ 307,000 people across 84 countries. To discover more, please visit our official website at www.samsung.com and our official blog at global.samsungtomorrow.com.

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