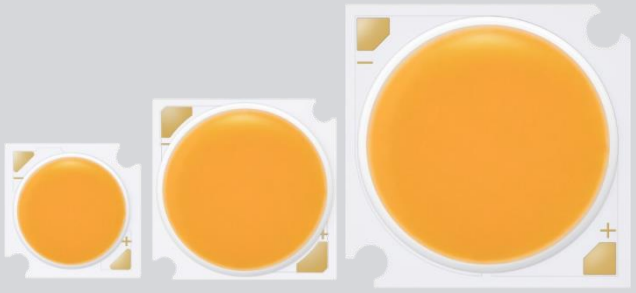
High Voltage LED Series
Chip on Board

COB D-Gen.3



High efficacy COB LED package well-suited for use in spotlight applications

Features & Benefits

- Chip on Board (COB) solution makes it easy to design in
- Simple assembly reduces manufacturing cost
- Low thermal resistance
- InGaN/GaN MQW LED with long time reliability

Applications

- Spotlight / Downlight
- LED Retrofit Bulbs
- Outdoor Illumination

SAMSUNG

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1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Model	Rating	Unit	Condition
Ambient / Operating Temperature	T_a	-	-40 ~ +105	ºC	-
Storage Temperature	T_{stg}	-	-40 ~ +120	ºC	-
LED Junction Temperature	T_J	-	150	ºC	-
Case Temperature	Tc	-	115	ºC	-
Forward Current / Power Dissipation	I_F / P_D	LC003D	230 / 8.8	mA / W	-
		LC006D	460 / 17.5		-
		LC009D	690 / 26.3		-
		LC013D	920 / 35.0		-
		LC016D	1150 / 43.8		-
		LC019D	1380 / 52.6		-
		LC026D	1840 / 70.1		-
		LC033D	2300 / 87.6		-
		LC040D	2760 / 105.1		-
		LC060D	2760 / 157.7		-
		LC080D	4140 / 236.5		-
ESD (HBM)	-	-	±2	kV	-
ESD (MM)	-	-	±0.5	kV	-

b) Electro-optical Characteristics (I_F = Sorting Current, T_J = 85 ºC)

Item	Unit	Model	Rank	Min.	Typ.	Max.
Forward Voltage (V_F)	V	All model	YZ	31.0	34.0	37.0
			1Z	46.8	51.0	55.2
Color Rendering Index (R_a)	-	All model	3	70	-	
			5	80	-	-
			7	90	-	-
Beam Angle	º	-	-	-	115	-
Nominal Power / Sorting Current	W / mA	LC003D	-	-	3.1 / 90	-
		LC006D	-	-	6.1 / 180	-
		LC009D	-	-	9.2 / 270	-
		LC013D	-	-	12.2 / 360	-
		LC016D	-	-	15.3 / 450	-
		LC019D	-	-	18.4 / 540	-
		LC026D	-	-	24.5 / 720	-
		LC033D	-	-	30.6 / 900	-
		LC040D	-	-	36.7 / 1080	-
		LC060D	-	-	55.1 / 1080	-
		LC080D	-	-	82.6 / 1620	-
Thermal Resistance (Junction to chip case)	℃/W	LC003D	-	-	2.43	-
		LC006D	-	-	1.41	-
		LC009D	-	-	0.94	-
		LC013D	-	-	0.81	-
		LC016D	-	-	0.64	-
		LC019D	-	-	0.57	-
		LC026D	-	-	0.45	-
		LC033D	-	-	0.38	-
		LC040D	-	-	0.30	-
		LC060D	-	-	0.23	-
		LC080D	-	-	0.15	-

Notes:

1) The COB is tested in pulsed condition at rated test current (10 ms pulse width) and rated temperature (T_J = T_C = T_a = 85 °C)
2) Samsungmaintains measurement tolerance of: forward voltage = ±5 %, CRI = ±1
3) Refer to the derating curve, ‘3. Typical Characteristics Graph’designed within the range.

c) Luminous Flux Characteristics (I_F = Sorting Current)

Model	CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux@ T_J = 85 °C (lm)		
				Min.	Typ.	Max.
LC003D	80	2700	D3	451	475	-
		3000	D3	474	499	-
		3500	D3	488	514	-
		4000	D3	498	524	-
		5000	D3	502	529	-
		5700	D3	502	529	-
		6500	D3	498	524	-
	90	2700	D3	386	407	-
		3000	D3	406	428	-
		3500	D3	419	441	-
		4000	D3	427	450	-
		5000	D3	431	453	-
LC006D	80	2700	D3	898	946	-
		3000	D3	944	994	-
		3500	D3	972	1023	-
		4000	D3	991	1043	-
		5000	D3	1000	1052	-
		5700	D3	1000	1052	-
		6500	D3	991	1043	-
	90	2700	D3	769	809	-
		3000	D3	809	851	-
		3500	D3	833	877	-
		4000	D3	850	895	-
		5000	D3	857	902	-

Notes:

1) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature (T_J = T_C = 85 °C).
2) Samsungmaintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

Model	CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux@ T_J = 85 °C (lm)		
				Min.	Typ.	Max.
LC009D	70	3000	D3	1515	1594	-
		4000	D3	1543	1624	-
		5000	D3	1571	1653	-
	80	2700	D3	1334	1405	-
		3000	D3	1402	1476	-
		3500	D3	1443	1519	-
		4000	D3	1472	1550	-
		5000	D3	1485	1563	-
		5700	D3	1485	1563	-
		6500	D3	1472	1550	-
	90	2700	D3	1142	1202	-
		3000	D3	1201	1264	-
		3500	D3	1237	1302	-
		4000	D3	1263	1329	-
		5000	D3	1273	1340	-
LC013D	70	3000	D3	1989	2094	-
		4000	D3	2026	2133	-
		5000	D3	2063	2171	-
	80	2700	D3	1753	1845	-
		3000	D3	1842	1939	-
		3500	D3	1896	1996	-
		4000	D3	1934	2036	-
		5000	D3	1950	2053	-
		5700	D3	1950	2053	-
		6500	D3	1934	2036	-
	90	2700	D3	1500	1579	-
		3000	D3	1578	1661	-
		3500	D3	1625	1710	-
		4000	D3	1658	1745	-
		5000	D3	1672	1760	-

Notes:

2) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature (T_J = T_C = 85 °C).

2) Samsungmaintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

Model	CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux@ T_J = 85 °C (lm)		
				Min.	Typ.	Max.
LC016D	70	3000	D3	2562	2697	-
		4000	D3	2609	2747	-
		5000	D3	2657	2797	-
	80	2700	D3	2257	2376	-
		3000	D3	2372	2497	-
		3500	D3	2442	2570	-
		4000	D3	2490	2622	-
		5000	D3	2511	2644	-
		5700	D3	2511	2644	-
		6500	D3	2490	2622	-
	90	2700	D3	1932	2033	-
		3000	D3	2032	2139	-
		3500	D3	2093	2203	-
		4000	D3	2136	2248	-
		5000	D3	2154	2267	-
LC019D	70	3000	D3	3059	3220	-
		4000	D3	3116	3280	-
		5000	D3	3172	3339	-
	80	2700	D3	2695	2837	-
		3000	D3	2833	2982	-
		3500	D3	2916	3069	-
		4000	D3	2974	3130	-
		5000	D3	2999	3157	-
		5700	D3	2999	3157	-
		6500	D3	2974	3130	-
	90	2700	D3	2307	2428	-
		3000	D3	2426	2554	-
		3500	D3	2499	2630	-
		4000	D3	2550	2684	-
		5000	D3	2572	2707	-

Notes:

3) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature (T_J = T_C = 85 °C).

2) Samsungmaintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

Model	CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux@ T_J = 85 °C (lm)		
				Min.	Typ.	Max.
LC026D	70	3000	D3	4019	4230	-
		4000	D3	4093	4308	-
		5000	D3	4167	4387	-
	80	2700	D3	3541	3727	-
		3000	D3	3721	3917	-
		3500	D3	3830	4032	-
		4000	D3	3907	4112	-
		5000	D3	3939	4147	-
		5700	D3	3939	4147	-
		6500	D3	3907	4112	-
	90	2700	D3	3030	3190	-
		3000	D3	3187	3355	-
		3500	D3	3282	3455	-
		4000	D3	3350	3526	-
		5000	D3	3379	3556	-
LC033D	70	3000	D3	4973	5235	-
		4000	D3	5065	5332	-
		5000	D3	5157	5429	-
	80	2700	D3	4382	4612	-
		3000	D3	4605	4847	-
		3500	D3	4740	4989	-
		4000	D3	4834	5089	-
		5000	D3	4875	5132	-
		5700	D3	4875	5132	-
		6500	D3	4834	5089	-
	90	2700	D3	3750	3947	-
		3000	D3	3944	4152	-
		3500	D3	4062	4276	-
		4000	D3	4146	4364	-
		5000	D3	4181	4401	-

Notes:

4) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature (T_J = T_C = 85 °C).

2) Samsungmaintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

Model	CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux@ T_J = 85 °C (lm)		
				Min.	Typ.	Max.
LC040D	70	3000	D3	6118	6440	-
		4000	D3	6232	6560	-
		5000	D3	6345	6679	-
	80	2700	D3	5391	5675	-
		3000	D3	5665	5963	-
		3500	D3	5831	6138	-
		4000	D3	5948	6261	-
		5000	D3	5998	6313	-
		5700	D3	5998	6313	-
		6500	D3	5948	6261	-
	90	2700	D3	4614	4856	-
		3000	D3	4853	5108	-
		3500	D3	4997	5260	-
		4000	D3	5100	5369	-
		5000	D3	5144	5415	-
LC060D	70	3000	D3	9042	9518	-
		4000	D3	9209	9694	-
		5000	D3	9377	9870	-
	80	2700	D3	7967	8386	-
		3000	D3	8372	8813	-
		3500	D3	8617	9071	-
		4000	D3	8790	9253	-
		5000	D3	8864	9330	-
		5700	D3	8864	9330	-
		6500	D3	8790	9253	-
	90	2700	D3	6818	7177	-
		3000	D3	7172	7549	-
		3500	D3	7385	7774	-
		4000	D3	7537	7934	-
		5000	D3	7602	8002	-

Notes:

5) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature (T_J = T_C = 85 °C).

2) Samsungmaintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

Model	CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux@ T_J = 85 °C (lm)		
				Min.	Typ.	Max.
LC080D	70	3000	D3	13409	14115	-
		4000	D3	13657	14376	-
		5000	D3	13906	14637	-
	80	2700	D3	11815	12437	-
		3000	D3	12416	13069	-
		3500	D3	12779	13452	-
		4000	D3	13035	13721	-
		5000	D3	13144	13836	-
		5700	D3	13144	13836	-
		6500	D3	13035	13721	-
	90	2700	D3	10111	10643	-
		3000	D3	10635	11195	-
		3500	D3	10952	11529	-
		4000	D3	11178	11766	-
		5000	D3	11273	11867	-

Notes:

6) The COB is tested in pulsed operating condition at rated test current (10 ms pulse width) and rated temperature (T_J = T_C = 85 °C).

2) Samsungmaintains measurement tolerance of: Luminous flux = ±7 %, CRI = ±1

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	A	H	D	N	G	2	5	Y	Z	W	3	D	3

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WH	White
6	Product Version	A	
7 8	Form Factor	HD	COB
9	Lens Type	N	No lens
10	Wattage or Model	A	LC003D
		B	LC006D
		C	LC009D
		D	LC013D
		E	LC016D
		F	LC019D
		G	LC026D
		H	LC033D
		K	LC040D
		L	LC060D
		M	LC080D
11	Internal Code	2	
12	CRI & Sorting Temperature	3	Min. 70 (85℃)
		5	Min. 80 (85℃)
		7	Min. 90 (85℃)
13 14	Forward Voltage (V)	YZ	31.0~37.0
		1Z	46.8~55.2
15	CCT (K)	W	2700K
		V	3000K
		U	3500K
		T	4000K
		R	5000K
		Q	5700K
		P	6500K
16	MacAdam Step	2	MacAdam 2-step
		3	MacAdam 3-step
17 18	Luminous Flux (Lm)	D3	COB D-series Gen.3 level

a) Binning Structure

※ LCoo3D(I_F = 90 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
80	2700	SPHWHAHDNA25YZW2D3	YZ	W2	D3	451 ~
		SPHWHAHDNA25YZW3D3		W3		
	3000	SPHWHAHDNA25YZV2D3	YZ	V2	D3	474 ~
		SPHWHAHDNA25YZV3D3		V3		
	3500	SPHWHAHDNA25YZU2D3	YZ	U2	D3	488 ~
		SPHWHAHDNA25YZU3D3		U3		
	4000	SPHWHAHDNA25YZT2D3	YZ	T2	D3	498 ~
		SPHWHAHDNA25YZT3D3		T3		
	5000	SPHWHAHDNA25YZR3D3	YZ	R3	D3	502 ~
	5700	SPHWHAHDNA25YZQ3D3	YZ	Q3	D3	502 ~
	6500	SPHWHAHDNA25YZP3D3	YZ	P3	D3	498 ~
90	2700	SPHWHAHDNA27YZW2D3	YZ	W2	D3	386 ~
		SPHWHAHDNA27YZW3D3		W3		
	3000	SPHWHAHDNA27YZV2D3	YZ	V2	D3	406 ~
		SPHWHAHDNA27YZV3D3		V3		
	3500	SPHWHAHDNA27YZU2D3	YZ	U2	D3	419 ~
		SPHWHAHDNA27YZU3D3		U3		
	4000	SPHWHAHDNA27YZT2D3	YZ	T2	D3	427 ~
		SPHWHAHDNA27YZT3D3		T3		
	5000	SPHWHAHDNA27YZR3D3	YZ	R3	D3	431 ~

※ LCoo6D(I_F = 180 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
80	2700	SPHWHAHDNB25YZW2D3	YZ	W2	D3	898 ~
		SPHWHAHDNB25YZW3D3		W3		
	3000	SPHWHAHDNB25YZV2D3	YZ	V2	D3	944 ~
		SPHWHAHDNB25YZV3D3		V3		
	3500	SPHWHAHDNB25YZU2D3	YZ	U2	D3	972 ~
		SPHWHAHDNB25YZU3D3		U3		
	4000	SPHWHAHDNB25YZT2D3	YZ	T2	D3	991 ~
		SPHWHAHDNB25YZT3D3		T3		
	5000	SPHWHAHDNB25YZR3D3	YZ	R2	D3	1000 ~
	5700	SPHWHAHDNB25YZQ3D3	YZ	Q2	D3	1000 ~
	6500	SPHWHAHDNB25YZP3D3	YZ	P2	D3	991 ~
90	2700	SPHWHAHDNB27YZW2D3	YZ	W2	D3	769 ~
		SPHWHAHDNB27YZW3D3		W3		
	3000	SPHWHAHDNB27YZV2D3	YZ	V2	D3	809 ~
		SPHWHAHDNB27YZV3D3		V3		
	3500	SPHWHAHDNB27YZU2D3	YZ	U2	D3	833 ~
		SPHWHAHDNB27YZU3D3		U3		
	4000	SPHWHAHDNB27YZT2D3	YZ	T2	D3	850 ~
		SPHWHAHDNB27YZT3D3		T3		
	5000	SPHWHAHDNB27YZR3D3	YZ	R3	D3	857 ~

※ LCoo9D(I_F = 270 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
70	3000	SPHWHAHDNC23YZV3D3	YZ	V3	D3	1515 ~
	4000	SPHWHAHDNC23YZT3D3	YZ	T3	D3	1543 ~
	5000	SPHWHAHDNC23YZR3D3	YZ	R3	D3	1571 ~
80	2700	SPHWHAHDNC25YZW2D3	YZ	W2	D3	1334 ~
		SPHWHAHDNC25YZW3D3		W3		
	3000	SPHWHAHDNC25YZV2D3	YZ	V2	D3	1402 ~
		SPHWHAHDNC25YZV3D3		V3		
	3500	SPHWHAHDNC25YZU2D3	YZ	U2	D3	1443 ~
		SPHWHAHDNC25YZU3D3		U3		
	4000	SPHWHAHDNC25YZT2D3	YZ	T2	D3	1472 ~
		SPHWHAHDNC25YZT3D3		T3		
	5000	SPHWHAHDNC25YZR3D3	YZ	R3	D3	1485 ~
	5700	SPHWHAHDNC25YZQ3D3	YZ	Q3	D3	1485 ~
	6500	SPHWHAHDNC25YZP3D3	YZ	P3	D3	1472 ~
90	2700	SPHWHAHDNC27YZW2D3	YZ	W2	D3	1142 ~
		SPHWHAHDNC27YZW3D3		W3		
	3000	SPHWHAHDNC27YZV2D3	YZ	V2	D3	1201 ~
		SPHWHAHDNC27YZV3D3		V3		
	3500	SPHWHAHDNC27YZU2D3	YZ	U2	D3	1237 ~
		SPHWHAHDNC27YZU3D3		U3		
	4000	SPHWHAHDNC27YZT2D3	YZ	T2	D3	1263 ~
		SPHWHAHDNC27YZT3D3		T3		
	5000	SPHWHAHDNC27YZR3D3	YZ	R3	D3	1273 ~

※ LC013D(I_F = 360 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
70	3000	SPHWHAHDND23YZV3D3	YZ	V3	D3	1989 ~
	4000	SPHWHAHDND23YZT3D3	YZ	T3	D3	2026 ~
	5000	SPHWHAHDND23YZR3D3	YZ	R3	D3	2063 ~
80	2700	SPHWHAHDND25YZW2D3	YZ	W2	D3	1753 ~
		SPHWHAHDND25YZW3D3		W3		
	3000	SPHWHAHDND25YZV2D3	YZ	V2	D3	1842 ~
		SPHWHAHDND25YZV3D3		V3		
	3500	SPHWHAHDND25YZU2D3	YZ	U2	D3	1896 ~
		SPHWHAHDND25YZU3D3		U3		
	4000	SPHWHAHDND25YZT2D3	YZ	T2	D3	1934 ~
		SPHWHAHDND25YZT3D3		T3		
	5000	SPHWHAHDND25YZR3D3	YZ	R3	D3	1950 ~
	5700	SPHWHAHDND25YZQ3D3	YZ	Q3	D3	1950 ~
	6500	SPHWHAHDND25YZP3D3	YZ	P3	D3	1934 ~
90	2700	SPHWHAHDND27YZW2D3	YZ	W2	D3	1500 ~
		SPHWHAHDND27YZW3D3		W3		
	3000	SPHWHAHDND27YZV2D3	YZ	V2	D3	1578 ~
		SPHWHAHDND27YZV3D3		V3		
	3500	SPHWHAHDND27YZU2D3	YZ	U2	D3	1625 ~
		SPHWHAHDND27YZU3D3		U3		
	4000	SPHWHAHDND27YZT2D3	YZ	T2	D3	1658 ~
		SPHWHAHDND27YZT3D3		T3		
	5000	SPHWHAHDND27YZR3D3	YZ	R3	D3	1672 ~

※ LC016D(I_F = 450 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
70	3000	SPHWHAHDNE23YZV3D3	YZ	V3	D3	2562 ~
	4000	SPHWHAHDNE23YZT3D3	YZ	T3	D3	2609 ~
	5000	SPHWHAHDNE23YZR3D3	YZ	R3	D3	2657 ~
80	2700	SPHWHAHDNE25YZW2D3	YZ	W2	D3	2257 ~
		SPHWHAHDNE25YZW3D3		W3		
	3000	SPHWHAHDNE25YZV2D3	YZ	V2	D3	2372 ~
		SPHWHAHDNE25YZV3D3		V3		
	3500	SPHWHAHDNE25YZU2D3	YZ	U2	D3	2442 ~
		SPHWHAHDNE25YZU3D3		U3		
	4000	SPHWHAHDNE25YZT2D3	YZ	T2	D3	2490 ~
		SPHWHAHDNE25YZT3D3		T3		
	5000	SPHWHAHDNE25YZR3D3	YZ	R3	D3	2511 ~
	5700	SPHWHAHDNE25YZQ3D3	YZ	Q3	D3	2511 ~
	6500	SPHWHAHDNE25YZP3D3	YZ	P3	D3	2490 ~
90	2700	SPHWHAHDNE27YZW2D3	YZ	W2	D3	1932 ~
		SPHWHAHDNE27YZW3D3		W3		
	3000	SPHWHAHDNE27YZV2D3	YZ	V2	D3	2032 ~
		SPHWHAHDNE27YZV3D3		V3		
	3500	SPHWHAHDNE27YZU2D3	YZ	U2	D3	2093 ~
		SPHWHAHDNE27YZU3D3		U3		
	4000	SPHWHAHDNE27YZT2D3	YZ	T2	D3	2136 ~
		SPHWHAHDNE27YZT3D3		T3		
	5000	SPHWHAHDNE27YZR3D3	YZ	R3	D3	2154 ~

※ LC019D(I_F = 540 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
70	3000	SPHWHAHDNF23YZV3D3	YZ	V3	D3	3059 ~
	4000	SPHWHAHDNF23YZT3D3	YZ	T3	D3	3116 ~
	5000	SPHWHAHDNF23YZR3D3	YZ	R3	D3	3172 ~
80	2700	SPHWHAHDNF25YZW2D3	YZ	W2	D3	2695 ~
		SPHWHAHDNF25YZW3D3		W3		
	3000	SPHWHAHDNF25YZV2D3	YZ	V2	D3	2833 ~
		SPHWHAHDNF25YZV3D3		V3		
	3500	SPHWHAHDNF25YZU2D3	YZ	U2	D3	2916 ~
		SPHWHAHDNF25YZU3D3		U3		
	4000	SPHWHAHDNF25YZT2D3	YZ	T2	D3	2974 ~
		SPHWHAHDNF25YZT3D3		T3		
	5000	SPHWHAHDNF25YZR3D3	YZ	R3	D3	2999 ~
	5700	SPHWHAHDNF25YZQ3D3	YZ	Q3	D3	2999 ~
	6500	SPHWHAHDNF25YZP3D3	YZ	P3	D3	2974 ~
90	2700	SPHWHAHDNF27YZW2D3	YZ	W2	D3	2307 ~
		SPHWHAHDNF27YZW3D3		W3		
	3000	SPHWHAHDNF27YZV2D3	YZ	V2	D3	2426 ~
		SPHWHAHDNF27YZV3D3		V3		
	3500	SPHWHAHDNF27YZU2D3	YZ	U2	D3	2499 ~
		SPHWHAHDNF27YZU3D3		U3		
	4000	SPHWHAHDNF27YZT2D3	YZ	T2	D3	2550 ~
		SPHWHAHDNF27YZT3D3		T3		
	5000	SPHWHAHDNF27YZR3D3	YZ	R3	D3	2572 ~

※ LC026D(I_F = 720 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
70	3000	SPHWHAHDNG23YZV3D3	YZ	V3	D3	4019 ~
	4000	SPHWHAHDNG23YZT3D3	YZ	T3	D3	4093 ~
	5000	SPHWHAHDNG23YZR3D3	YZ	R3	D3	4167 ~
80	2700	SPHWHAHDNG25YZW2D3	YZ	W2	D3	3541 ~
		SPHWHAHDNG25YZW3D3		W3		
	3000	SPHWHAHDNG25YZV2D3	YZ	V2	D3	3721 ~
		SPHWHAHDNG25YZV3D3		V3		
	3500	SPHWHAHDNG25YZU2D3	YZ	U2	D3	3830 ~
		SPHWHAHDNG25YZU3D3		U3		
	4000	SPHWHAHDNG25YZT2D3	YZ	T2	D3	3907 ~
		SPHWHAHDNG25YZT3D3		T3		
	5000	SPHWHAHDNG25YZR3D3	YZ	R3	D3	3939 ~
	5700	SPHWHAHDNG25YZQ3D3	YZ	Q3	D3	3939 ~
	6500	SPHWHAHDNG25YZP3D3	YZ	P3	D3	3907 ~
90	2700	SPHWHAHDNG27YZW2D3	YZ	W2	D3	3030 ~
		SPHWHAHDNG27YZW3D3		W3		
	3000	SPHWHAHDNG27YZV2D3	YZ	V2	D3	3187 ~
		SPHWHAHDNG27YZV3D3		V3		
	3500	SPHWHAHDNG27YZU2D3	YZ	U2	D3	3282 ~
		SPHWHAHDNG27YZU3D3		U3		
	4000	SPHWHAHDNG27YZT2D3	YZ	T2	D3	3350 ~
		SPHWHAHDNG27YZT3D3		T3		
	5000	SPHWHAHDNG27YZR3D3	YZ	R3	D3	3379 ~

※ LC033D(I_F = 900 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v, lm)
70	3000	SPHWHAHDNH23YZV3D3	YZ	V3	D3	4973 ~
	4000	SPHWHAHDNH23YZT3D3	YZ	T3	D3	5065 ~
	5000	SPHWHAHDNH23YZR3D3	YZ	R3	D3	5157 ~
80	2700	SPHWHAHDNH25YZW2D3	YZ	W2	D3	4382 ~
		SPHWHAHDNH25YZW3D3		W3		
	3000	SPHWHAHDNH25YZV2D3	YZ	V2	D3	4605 ~
		SPHWHAHDNH25YZV3D3		V3		
	3500	SPHWHAHDNH25YZU2D3	YZ	U2	D3	4740 ~
		SPHWHAHDNH25YZU3D3		U3		
	4000	SPHWHAHDNH25YZT2D3	YZ	T2	D3	4834~
		SPHWHAHDNH25YZT3D3		T3		
	5000	SPHWHAHDNH25YZR3D3	YZ	R3	D3	4875 ~
	5700	SPHWHAHDNH25YZQ3D3	YZ	Q3	D3	4875 ~
	6500	SPHWHAHDNH25YZP3D3	YZ	P3	D3	4834 ~
90	2700	SPHWHAHDNH27YZW2D3	YZ	W2	D3	3750 ~
		SPHWHAHDNH27YZW3D3		W3		
	3000	SPHWHAHDNH27YZV2D3	YZ	V2	D3	3944 ~
		SPHWHAHDNH27YZV3D3		V3		
	3500	SPHWHAHDNH27YZU2D3	YZ	U2	D3	4062 ~
		SPHWHAHDNH27YZU3D3		U3		
	4000	SPHWHAHDNH27YZT2D3	YZ	T2	D3	4146 ~
		SPHWHAHDNH27YZT3D3		T3		
	5000	SPHWHAHDNH27YZR3D3	YZ	R3	D3	4181 ~

※ LC040D(I_F = 1080 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Color Rank	Flux Rank	Flux Range (Φ_v lm)
70	3000	SPHWHAHDNK23YZV3D3	YZ	V3	D3	6118 ~
	4000	SPHWHAHDNK23YZT3D3	YZ	T3	D3	6232 ~
	5000	SPHWHAHDNK23YZR3D3	YZ	R3	D3	6345 ~
80	2700	SPHWHAHDNK25YZW2D3	YZ	W2	D3	5391 ~
		SPHWHAHDNK25YZW3D3		W3		
	3000	SPHWHAHDNK25YZV2D3	YZ	V2	D3	5665 ~
		SPHWHAHDNK25YZV3D3		V3		
	3500	SPHWHAHDNK25YZU2D3	YZ	U2	D3	5831 ~
		SPHWHAHDNK25YZU3D3		U3		
	4000	SPHWHAHDNK25YZT2D3	YZ	T2	D3	5948 ~
		SPHWHAHDNK25YZT3D3		T3		
	5000	SPHWHAHDNK25YZR3D3	YZ	R3	D3	5998 ~
	5700	SPHWHAHDNK25YZQ3D3	YZ	Q3	D3	5998 ~
	6500	SPHWHAHDNK25YZP3D3	YZ	P3	D3	5948 ~
90	2700	SPHWHAHDNK27YZW2D3	YZ	W2	D3	4614 ~
		SPHWHAHDNK27YZW3D3		W3		
	3000	SPHWHAHDNK27YZV2D3	YZ	V2	D3	4853 ~
		SPHWHAHDNK27YZV3D3		V3		
	3500	SPHWHAHDNK27YZU2D3	YZ	U2	D3	4997 ~
		SPHWHAHDNK27YZU3D3		U3		
	4000	SPHWHAHDNK27YZT2D3	YZ	T2	D3	5100 ~
		SPHWHAHDNK27YZT3D3		T3		
	5000	SPHWHAHDNK27YZR3D3	YZ	R3	D3	5144 ~

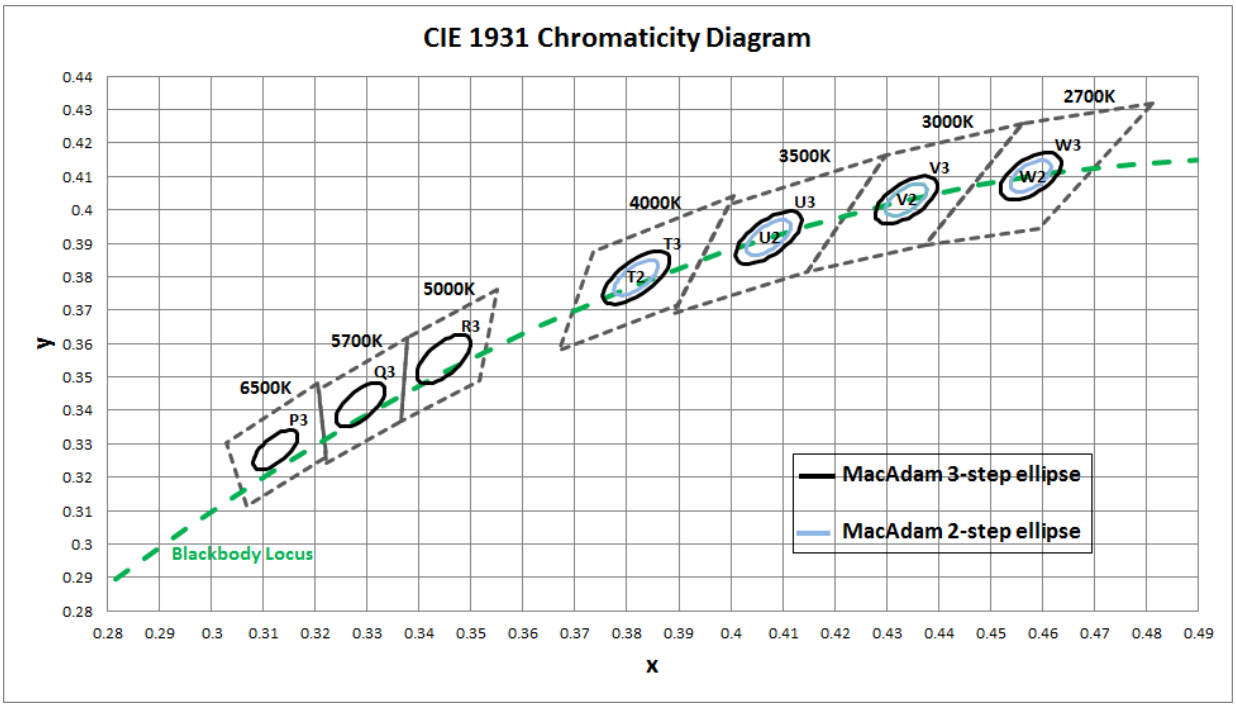
※ LC060D(I_F = 1080 mA, T_J = 85 °C)

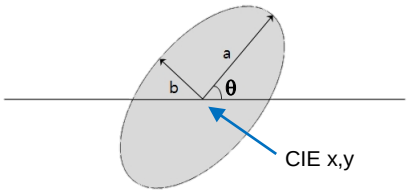
CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Chrom. Bin	Flux Rank	Flux Range (Φ_v, lm)
70	3000	SPHWHAHDNL231ZV3D3	1Z	V3	D3	9042 ~
	4000	SPHWHAHDNL231ZT3D3	1Z	T3	D3	9209 ~
	5000	SPHWHAHDNL231ZR3D3	1Z	R3	D3	9377 ~
80	2700	SPHWHAHDNL251ZW2D3	1Z	W2	D3	7967 ~
		SPHWHAHDNL251ZW3D3		W3		
	3000	SPHWHAHDNL251ZV2D3	1Z	V2	D3	8372 ~
		SPHWHAHDNL251ZV3D3		V3		
	3500	SPHWHAHDNL251ZU2D3	1Z	U2	D3	8617 ~
		SPHWHAHDNL251ZU3D3		U3		
	4000	SPHWHAHDNL251ZT2D3	1Z	T2	D3	8790 ~
		SPHWHAHDNL251ZT3D3		T3		
	5000	SPHWHAHDNL251ZR3D3	1Z	R3	D3	8864 ~
	5700	SPHWHAHDNL251ZQ3D3	1Z	Q3	D3	8864 ~
	6500	SPHWHAHDNL251ZP3D3	1Z	P3	D3	8790 ~
90	2700	SPHWHAHDNL271ZW2D3	1Z	W2	D3	6818 ~
		SPHWHAHDNL271ZW3D3		W3		
	3000	SPHWHAHDNL271ZV2D3	1Z	V2	D3	7172 ~
		SPHWHAHDNL271ZV3D3		V3		
	3500	SPHWHAHDNL271ZU2D3	1Z	U2	D3	7385 ~
		SPHWHAHDNL271ZU3D3		U3		
	4000	SPHWHAHDNL271ZT2D3	1Z	T2	D3	7537 ~
		SPHWHAHDNL271ZT3D3		T3		
	5000	SPHWHAHDNL271ZR3D3	1Z	R3	D3	7602 ~

※ LCo8oD(I_F = 1620 mA, T_J = 85 °C)

CRI(R_a) Min.	Nominal CCT(K)	Product Code	V_F Rank	Chrom. Bin	Flux Rank	Flux Range (Φ_v, lm)
70	3000	SPHWHAHDNM231ZV3D3	1Z	V3	D3	13409 ~
	4000	SPHWHAHDNM231ZT3D3	1Z	T3	D3	13657 ~
	5000	SPHWHAHDNM231ZR3D3	1Z	R3	D3	13906 ~
80	2700	SPHWHAHDNM251ZW2D3 SPHWHAHDNM251ZW3D3	1Z	W2 W3	D3	11815 ~
	3000	SPHWHAHDNM251ZV2D3 SPHWHAHDNM251ZV3D3	1Z	V2 V3	D3	12416 ~
	3500	SPHWHAHDNM251ZU2D3 SPHWHAHDNM251ZU3D3	1Z	U2 U3	D3	12779 ~
	4000	SPHWHAHDNM251ZT2D3 SPHWHAHDNM251ZT3D3	1Z	T2 T3	D3	13035 ~
	5000	SPHWHAHDNM251ZR3D3	1Z	R3	D3	13144 ~
	5700	SPHWHAHDNM251ZQ3D3	1Z	Q3	D3	13144 ~
	6500	SPHWHAHDNM251ZP3D3	1Z	P3	D3	13035 ~
90	2700	SPHWHAHDNM271ZW2D3 SPHWHAHDNM271ZW3D3	1Z	W2 W3	D3	10111 ~
	3000	SPHWHAHDNM271ZV2D3 SPHWHAHDNM271ZV3D3	1Z	V2 V3	D3	10635 ~
	3500	SPHWHAHDNM271ZU2D3 SPHWHAHDNM271ZU3D3	1Z	U2 U3	D3	10952 ~
	4000	SPHWHAHDNM271ZT2D3 SPHWHAHDNM271ZT3D3	1Z	T2 T3	D3	11178 ~
	5000	SPHWHAHDNM271ZR3D3	1Z	R3	D3	11273 ~

b) Chromaticity Region & Coordinates (I_F = Sorting Current, T_J = 85 ºC)





MacAdam Ellipse (W2, W3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4578	0.4101	53.70	0.0054	0.0028
3-step	0.4578	0.4101	53.70	0.0081	0.0042

MacAdam Ellipse (V2, V3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4338	0.403	53.22	0.0056	0.0027
3-step	0.4338	0.4030	53.22	0.0083	0.0041

MacAdam Ellipse (U2, U3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.4073	0.3917	54.00	0.0062	0.0028
3-step	0.4073	0.3917	54.00	0.0093	0.0041

MacAdam Ellipse (T2, T3)					
Step	CIE x	CIE y	θ	a	b
2-step	0.3818	0.3797	53.72	0.0063	0.0027
3-step	0.3818	0.3797	53.72	0.0094	0.0040

MacAdam Ellipse (R3)					
Step	CIE x	CIE y	θ	a	b
3-step	0.3447	0.3553	59.62	0.0082	0.0035

MacAdam Ellipse (Q3)					
Step	CIE x	CIE y	θ	a	b
3-step	0.3287	0.3417	59.0950	0.0075	0.0032

MacAdam Ellipse (P3)					
Step	CIE x	CIE y	θ	a	b
3-step	0.3123	0.3282	58.5700	0.0067	0.0029

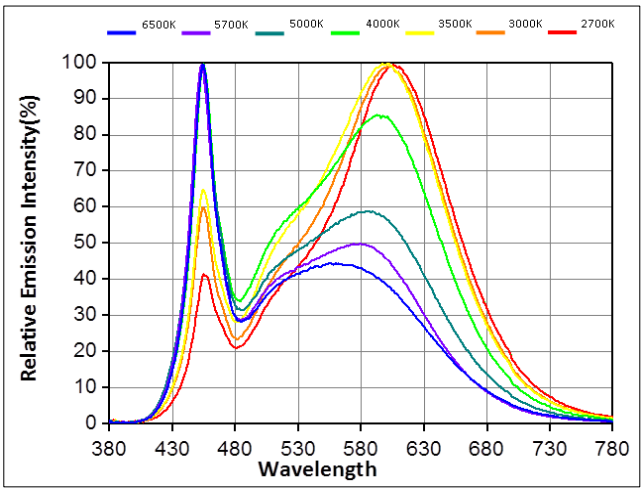
Note:

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

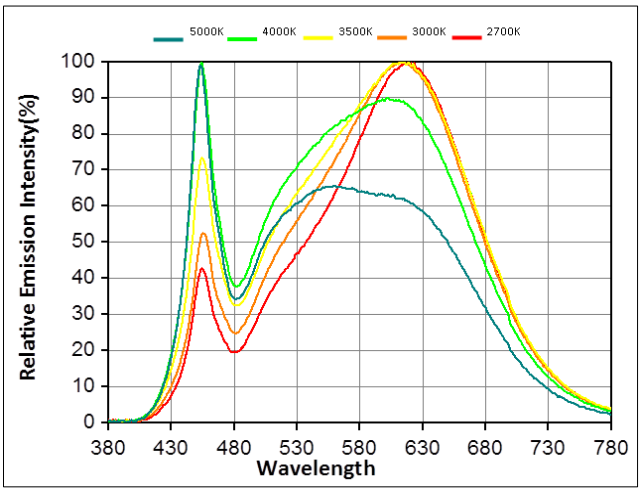
3. Typical Characteristics Graphs

a) Spectrum Distribution (I_F = Sorting Current, T_J = 85 °C)

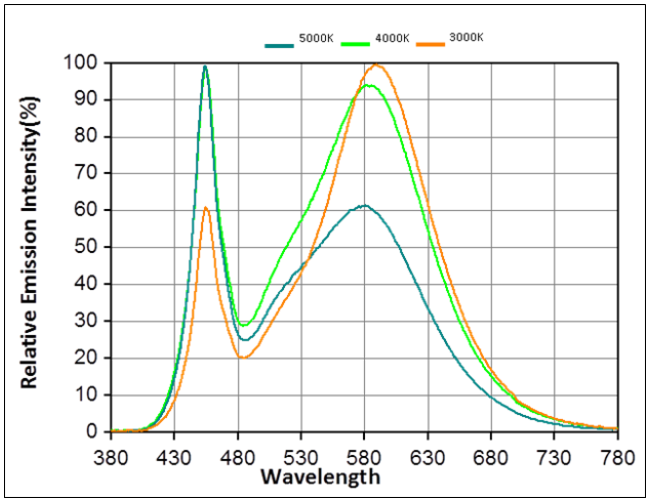
CRI Ra 80+



CRI Ra 90+

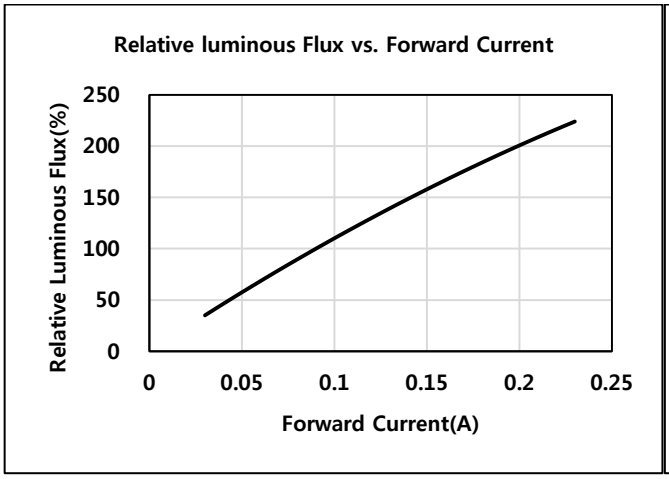


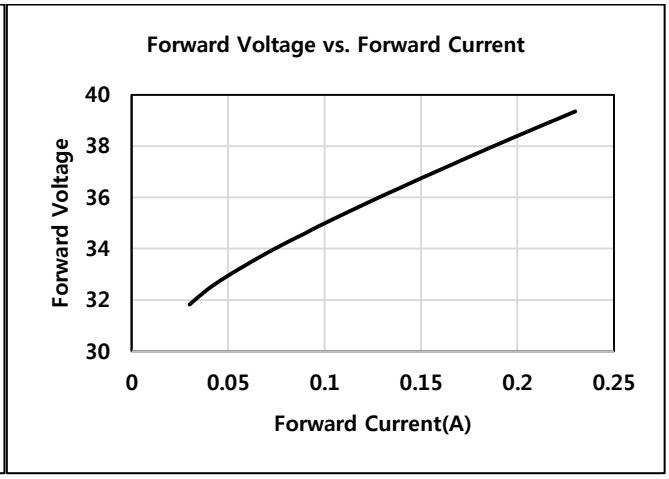
CRI Ra 70+



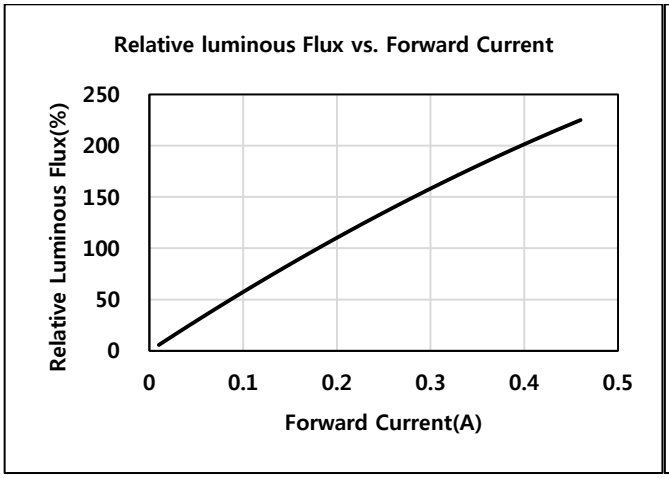
b) Forward Current Characteristics (T_J = 85 ºC)

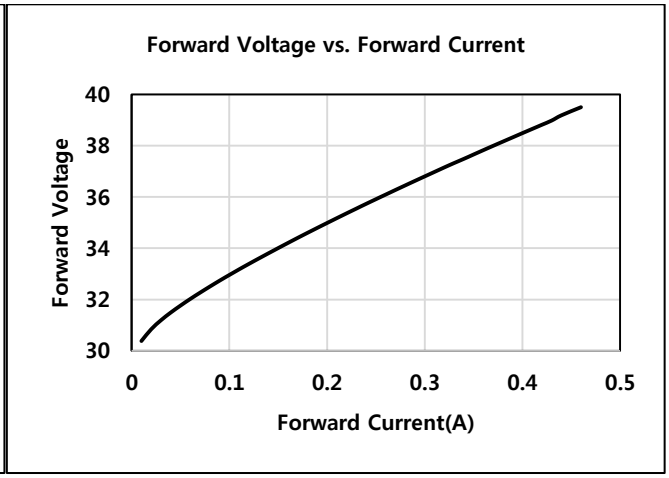
1)LC003D



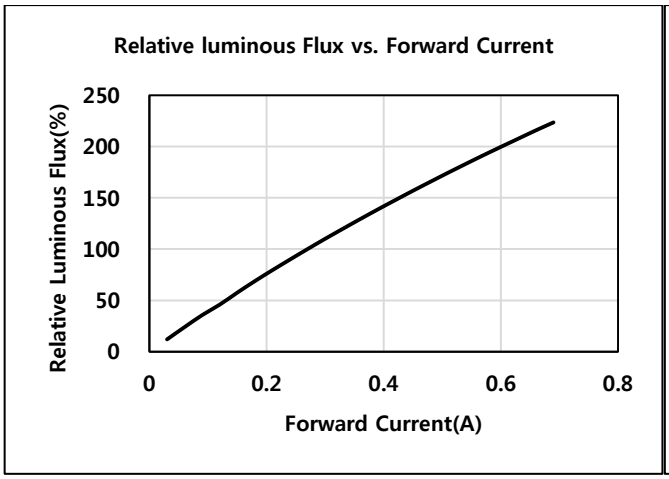


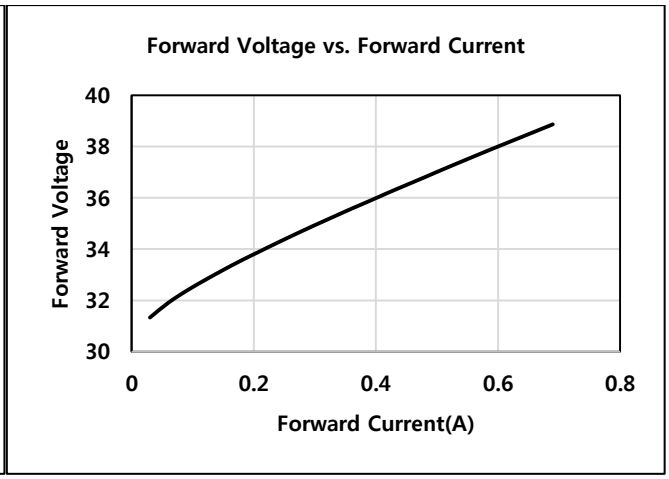
2) LC006D



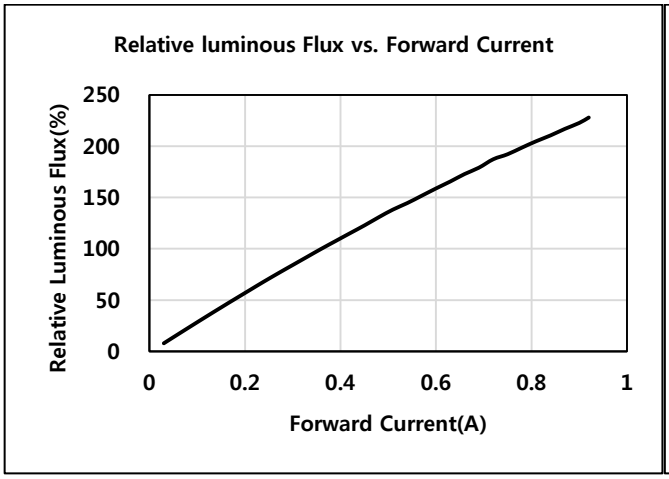


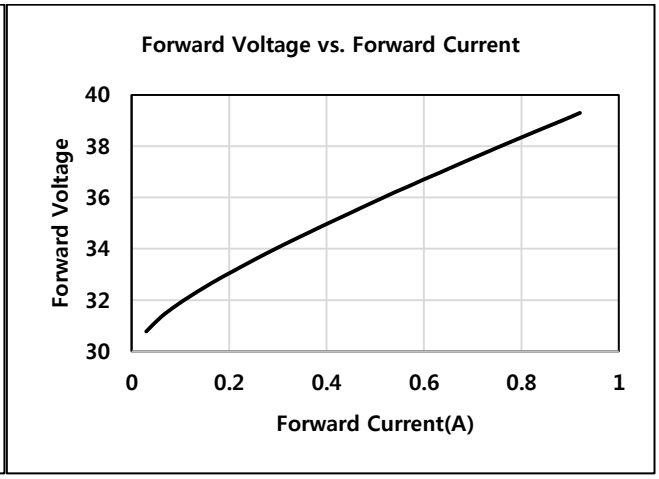
3) LC009D



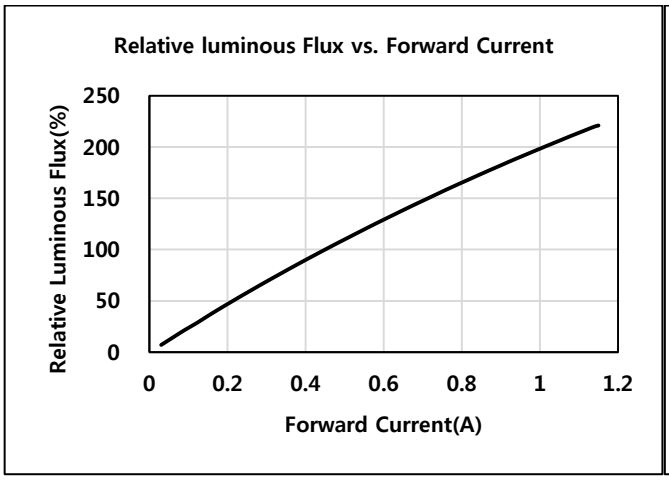


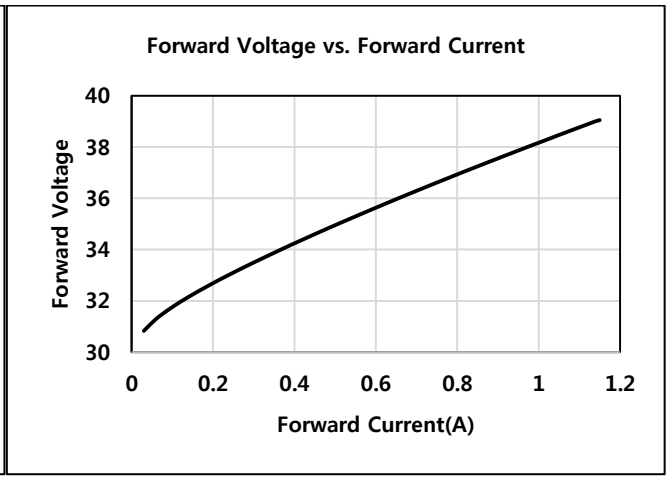
4) LC013D



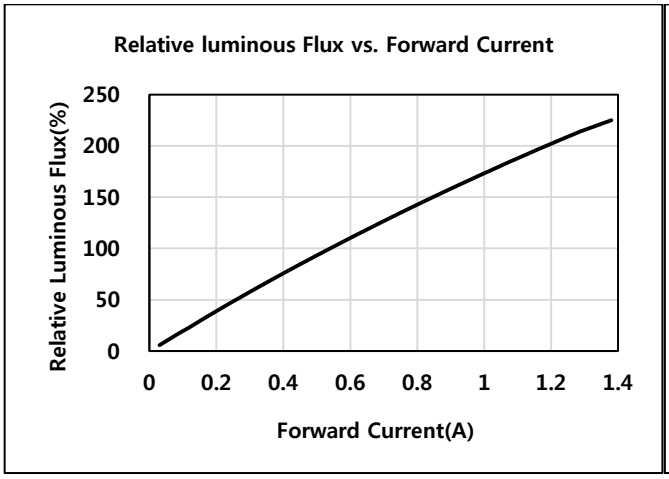


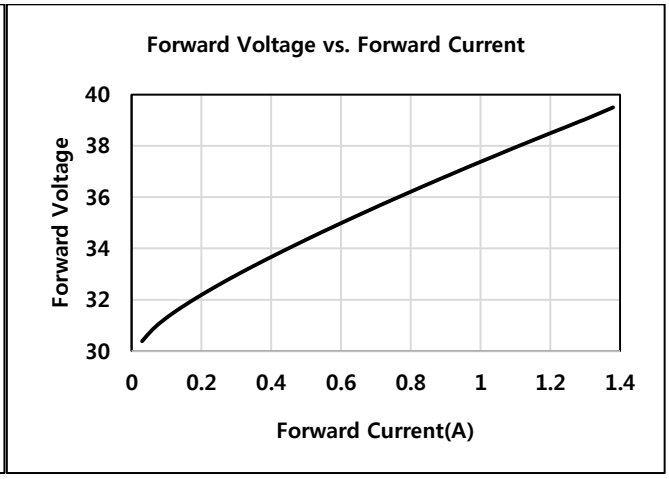
5) LC016D



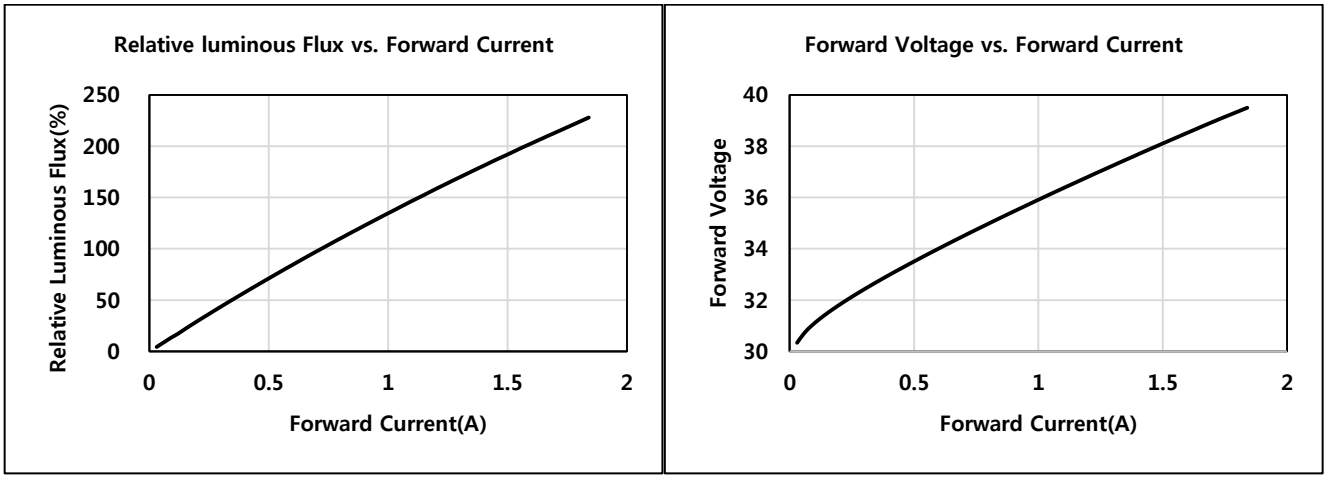


6) LC019D

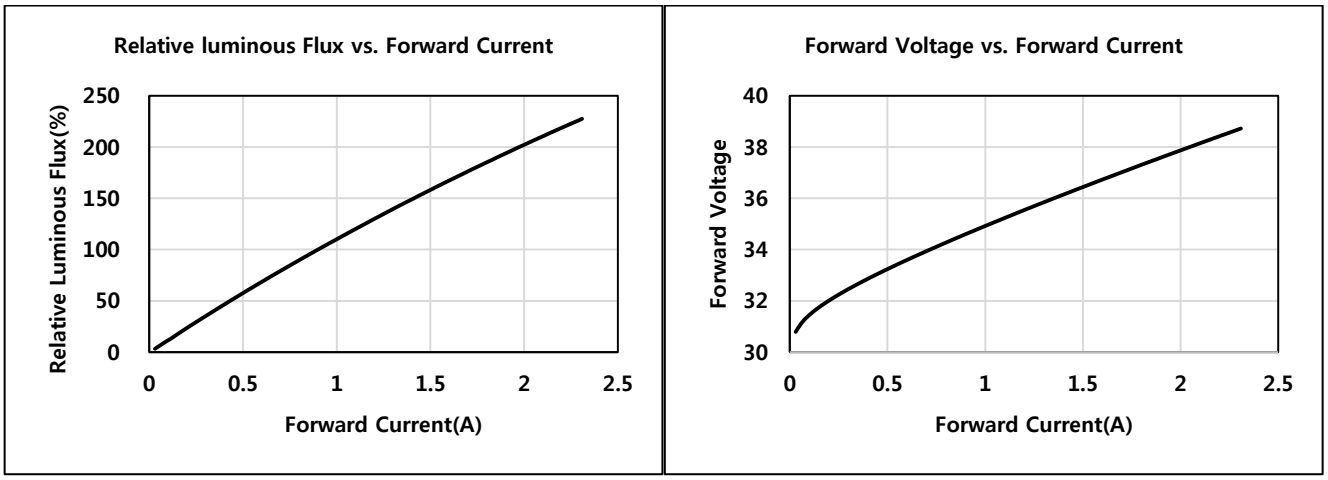




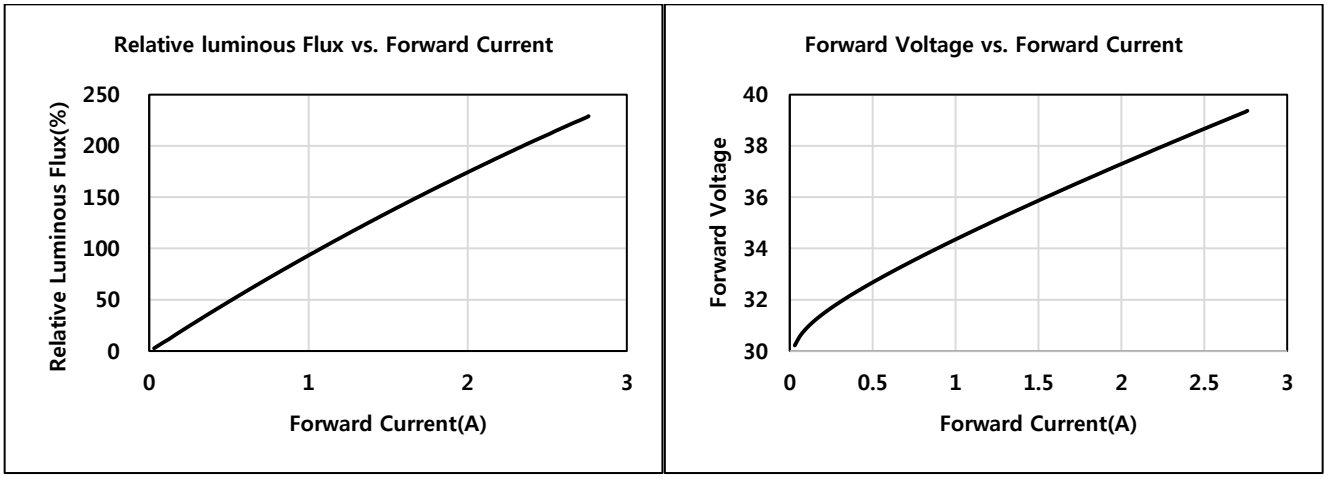
7) LC026D



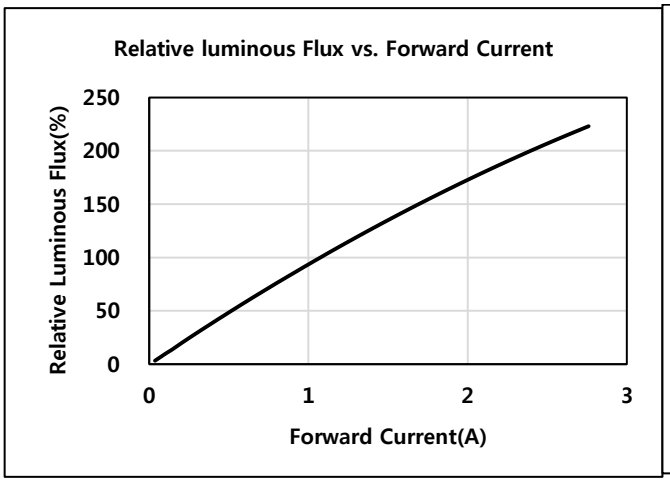
8) LC033D

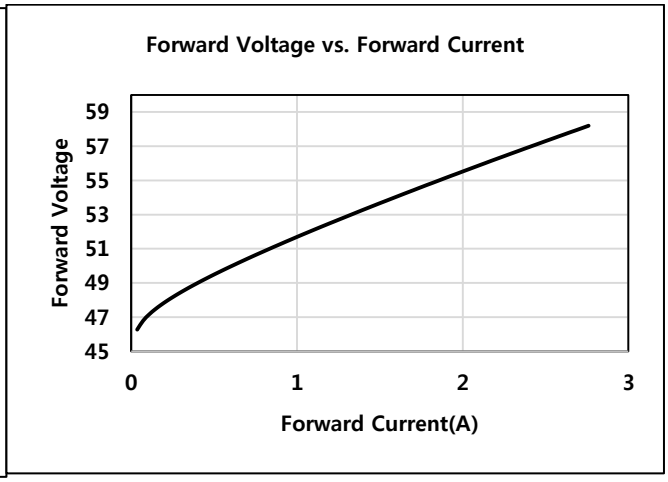


9) LC040D

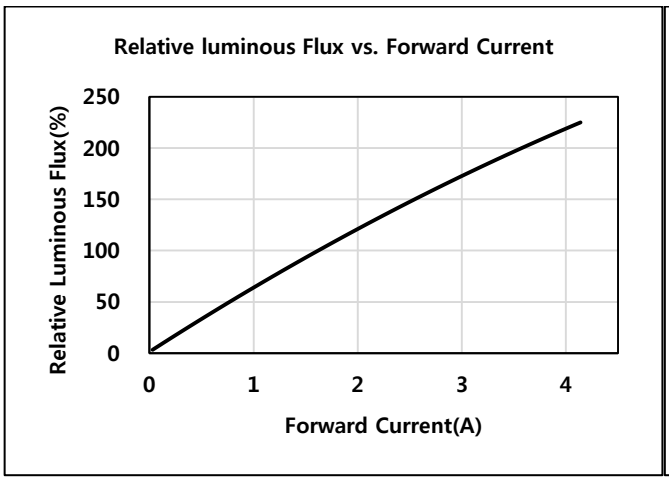


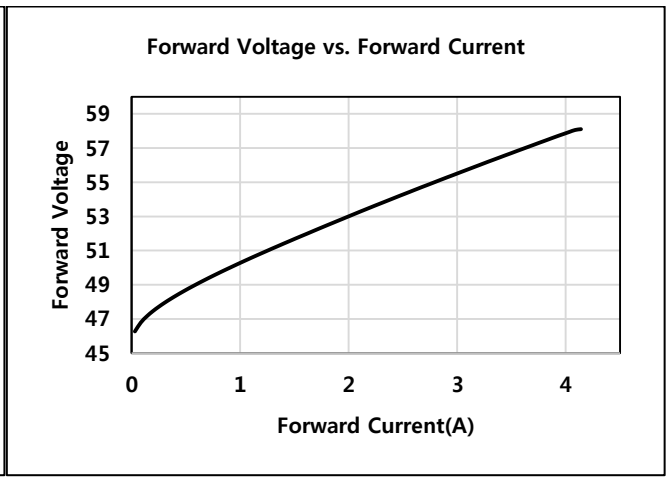
10) LC060D



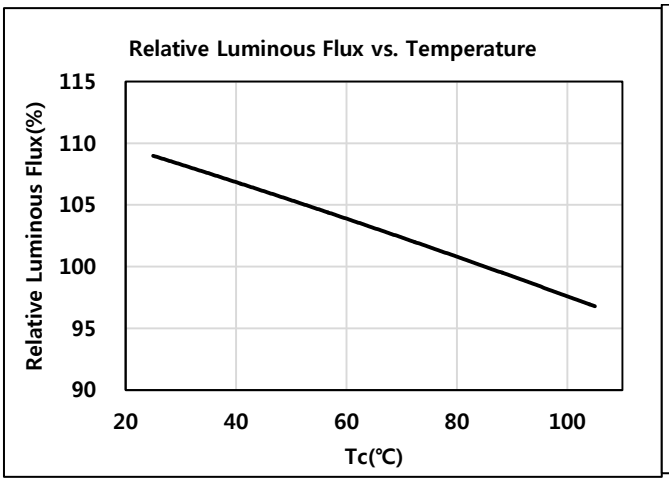


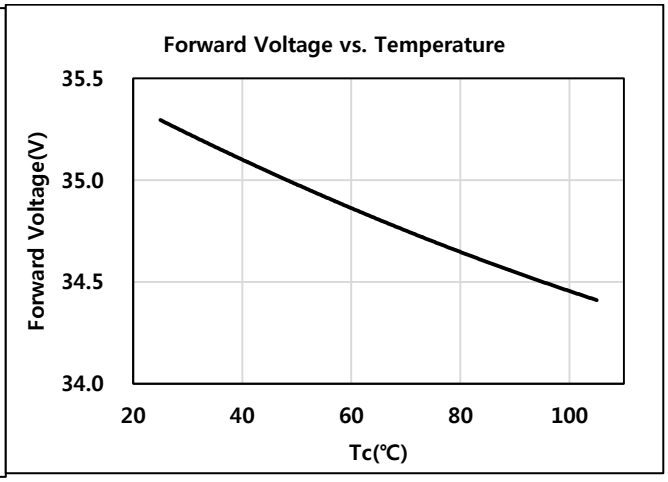
11) LC080D



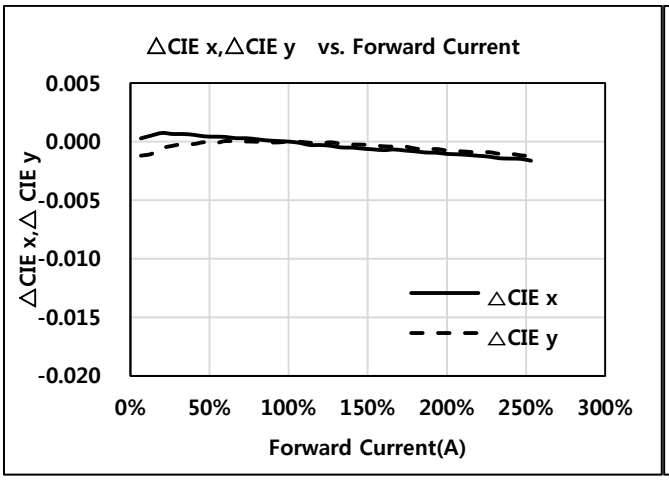


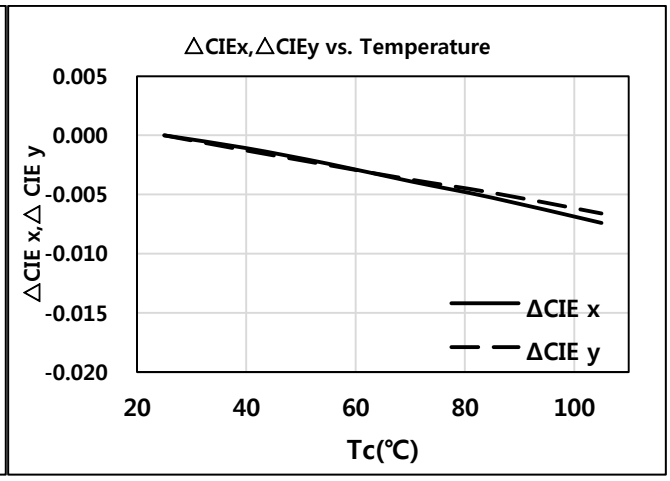
c) Temperature Characteristics(I_F = Sorting Current)



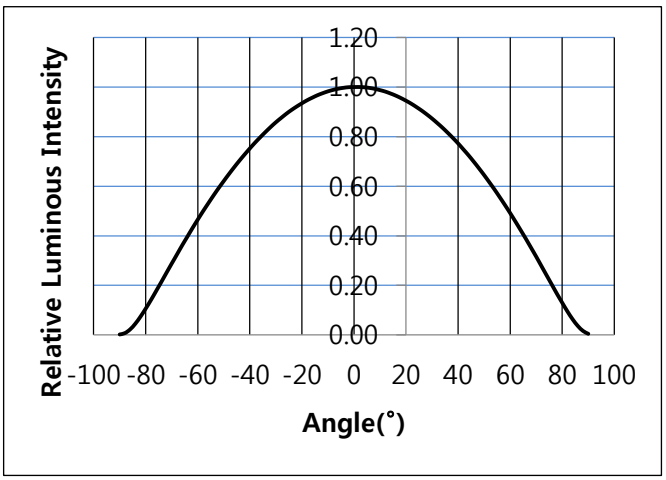


d) Color Shift Characteristics (T_J = 85 ºC, I_F =Sorting Current, CRI = 80+)



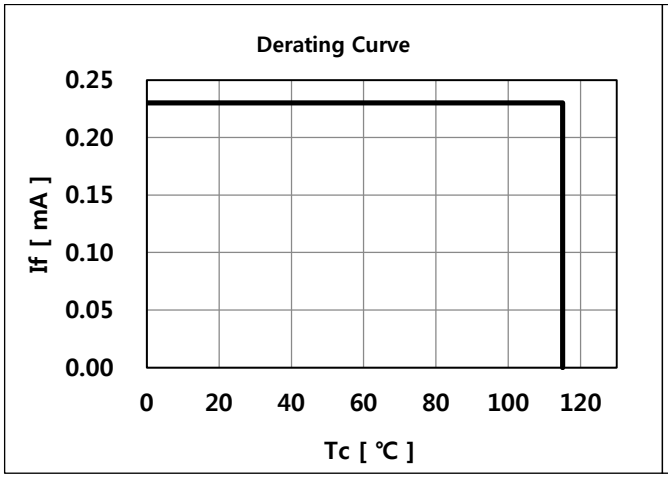


e) Beam Angle Characteristics (I_F = Sorting Current, T_J = 85 ºC)

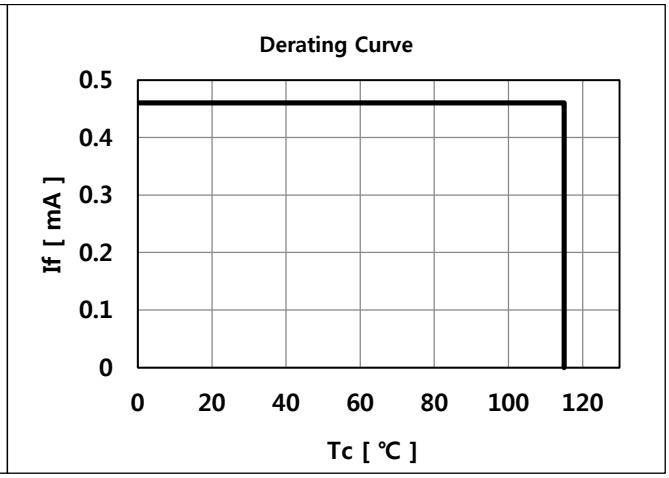


f) Derating Characteristics

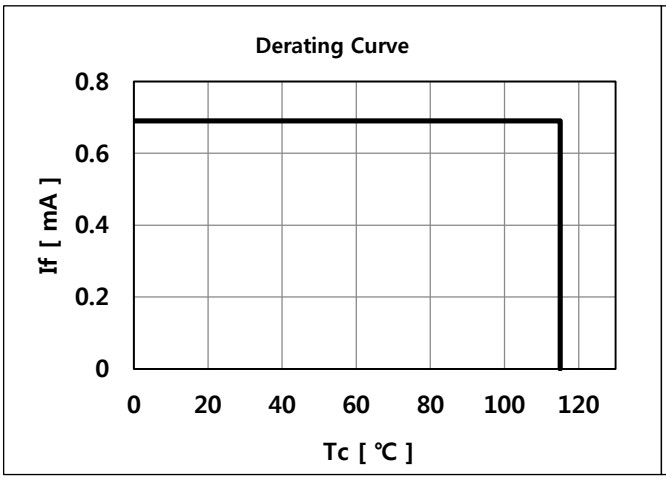
1) LC003D

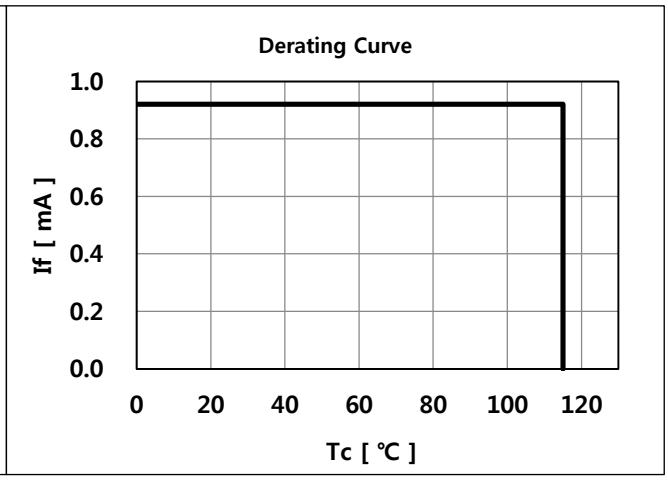


2) LC006D

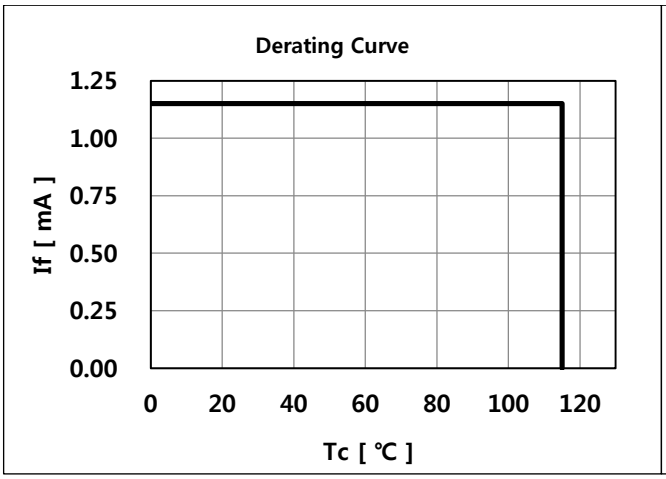


3) LC009D4) LC0013D

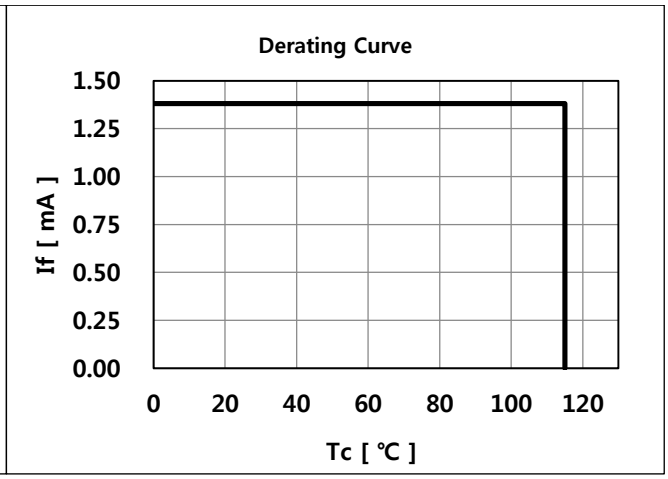




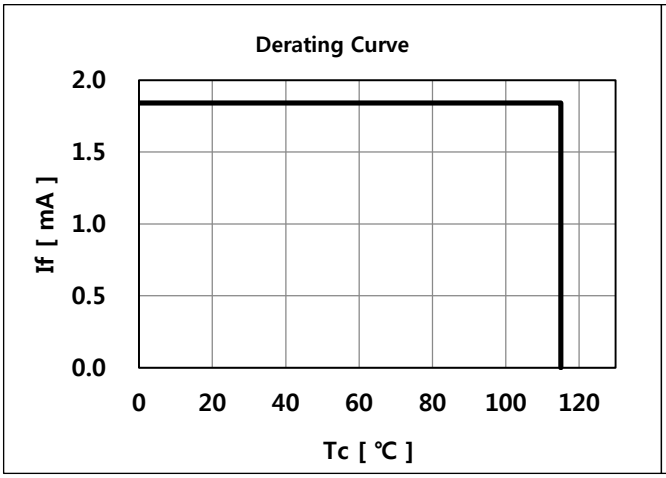
5) LC016D



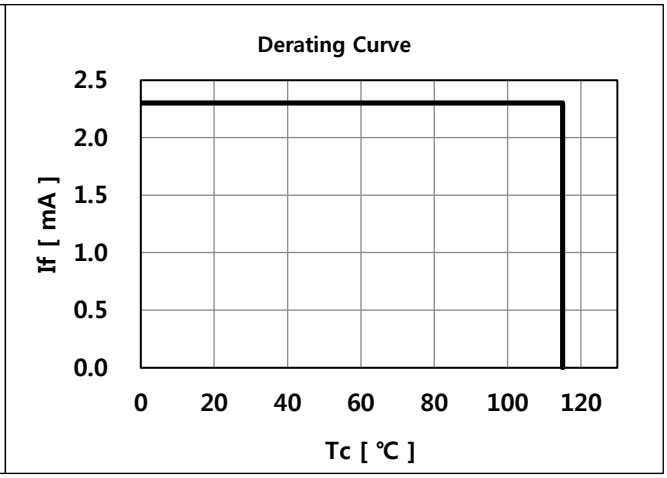
6) LC0019D



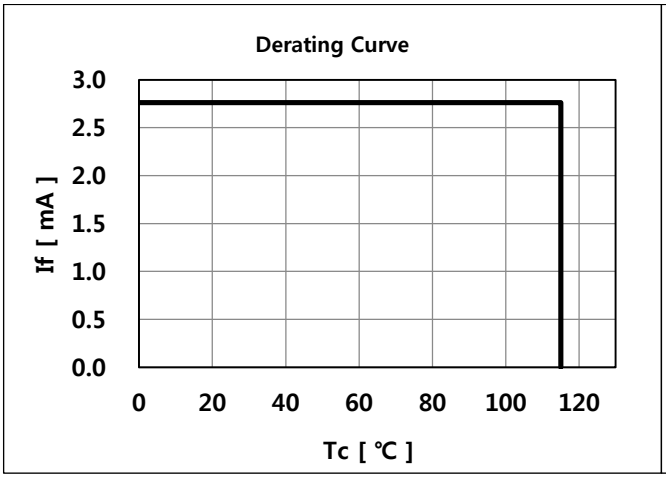
7) LC026D



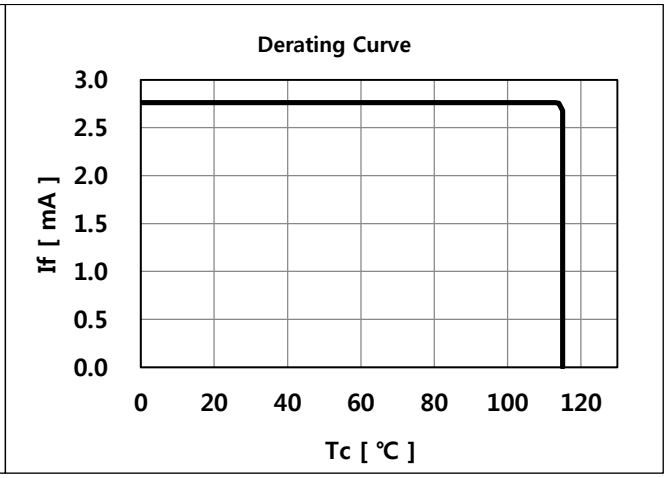
8) LC0033D



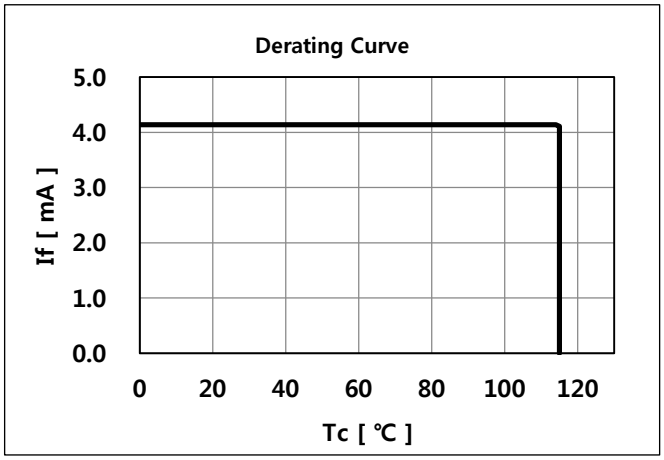
9) LC040D



10) LC060D

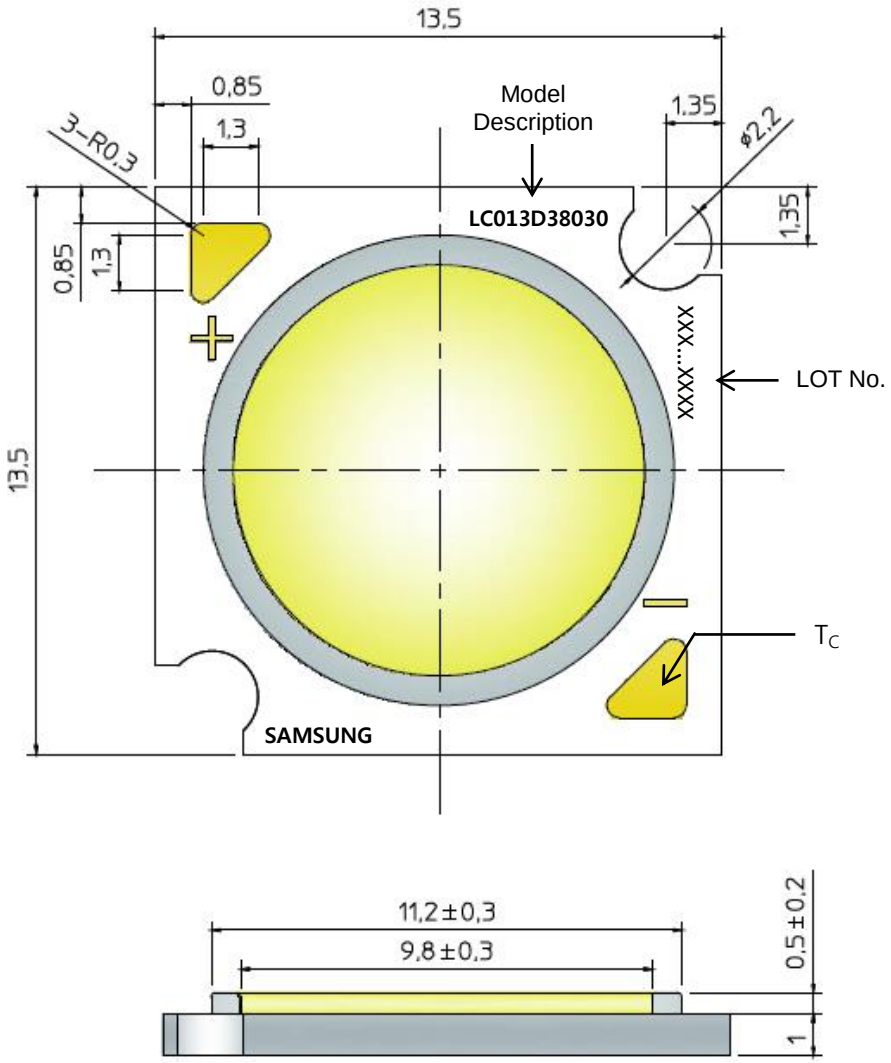


11) LC080D



4. Outline Drawing & Dimension

※ Model : LC003D, LC006D, LC009D, LC013D

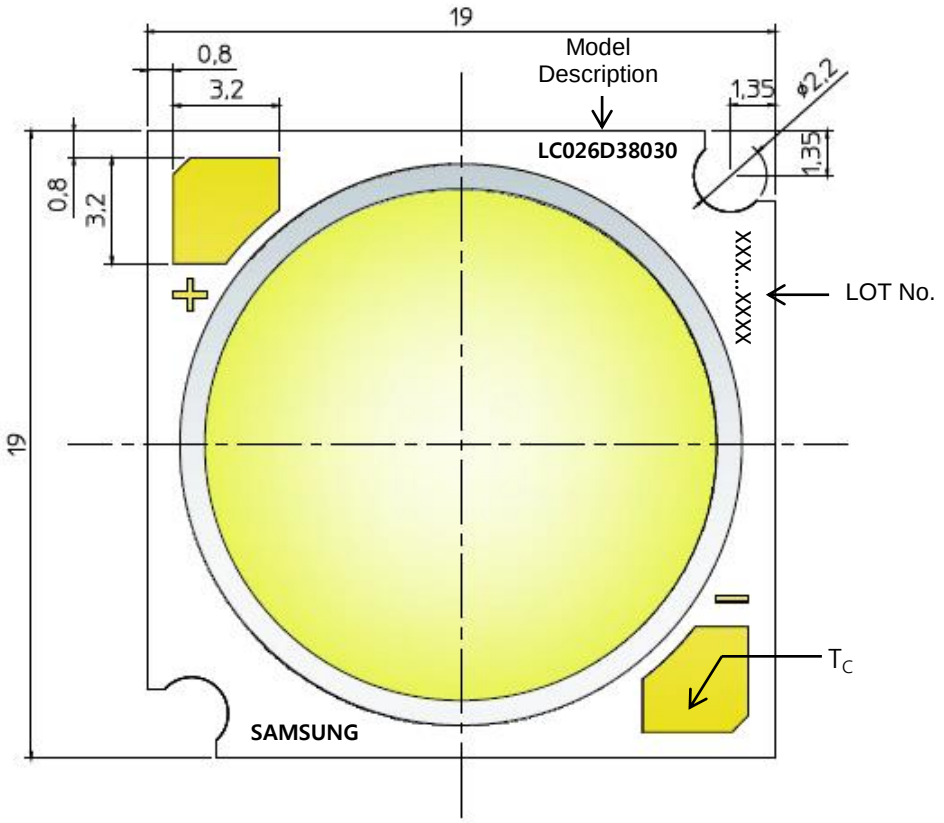


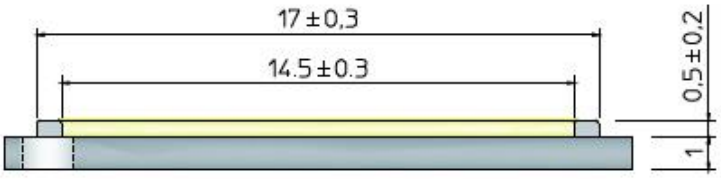
1. Unit: mm
2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	13.5	±0.30	mm
Width	13.5	±0.30	mm
Height	1.50	±0.20	mm
Light Emitting Surface (LES) Diameter	9.8	±0.30	mm

Note: Denoted product information above is only an example
(LC013D38030 :LC013D, Gen3, Ra80, 3000K)

※ Model : LC016D, LC019D, LC026D, LC033D



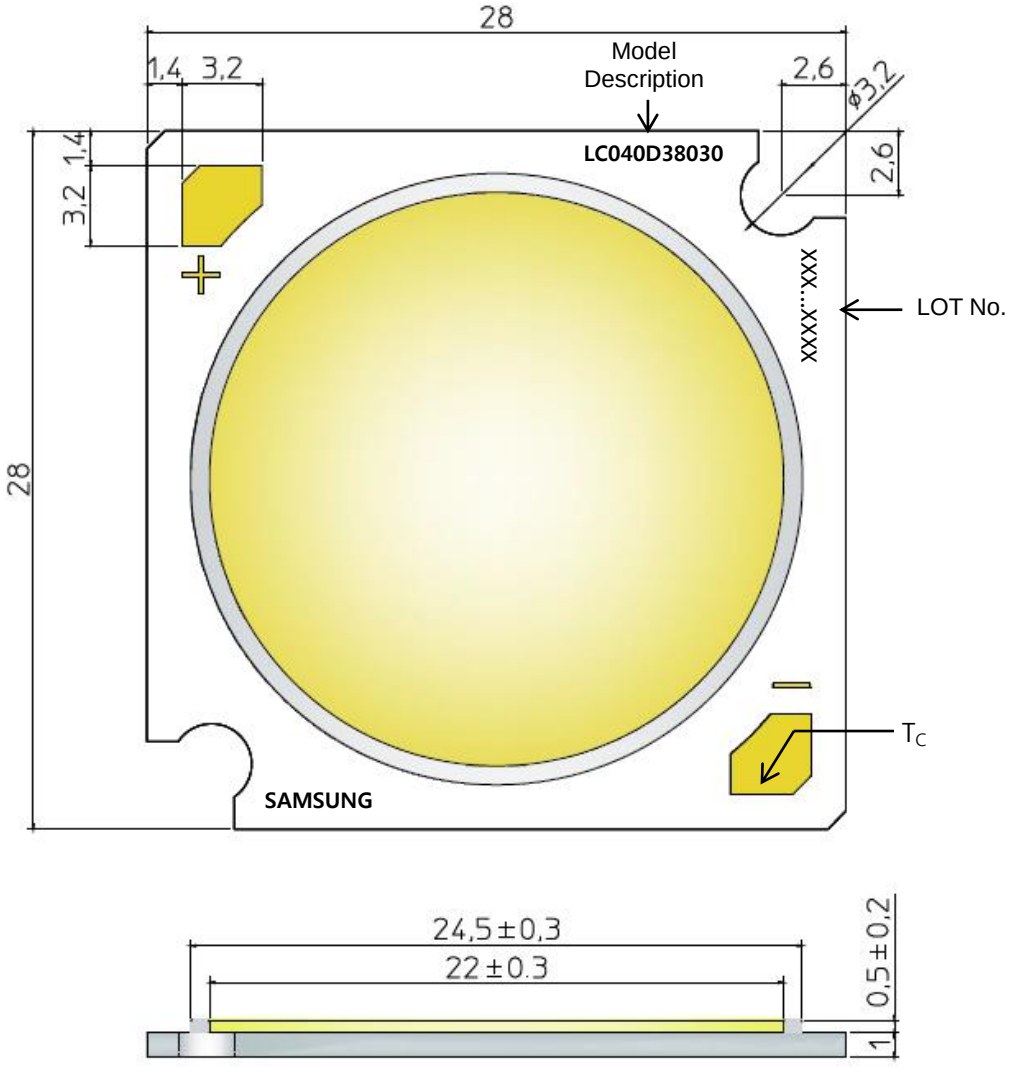


1. Unit: mm
2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	19.0	±0.30	mm
Width	19.0	±0.30	mm
Height	1.50	±0.20	mm
Light Emitting Surface (LES) Diameter	14.5	±0.30	mm

Note: Denoted product information above is only an example
(LC026D38030 : LC026D, Gen3, CRI80+, 3000K)

※ Model : LC040D, LC060D, LC080D



1. Unit: mm
2. Tolerance: ± 0.3 mm

Item	Dimension	Tolerance	Unit
Length	28.0	±0.30	mm
Width	28.0	±0.30	mm
Height	1.50	±0.20	mm
Light Emitting Surface (LES) Diameter	22.0	±0.30	mm

Note: Denoted product information above is only an example
(LC040D38030 : LC040D, Gen3, CRI80+, 3000K)

5. Reliability Test Items & Conditions

a) Test Items

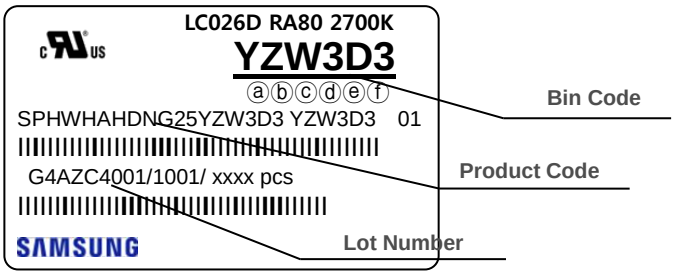
Test Item	Test Condition	Test Hour / Cycle
Wet High Temperature Operating Life Test (WHTOL)	60 ºC, 90 % RH,, DC Derating, I_F	1000 h
High Temperature Operating Life Test (HTOL)	85 ºC, DC Derating, I_F	1000 h
Low Temperature Operating Life Test (LTOL)	-40 ºC, DC,DeratingI_F	1000 h
High Temperature Storage	110 ºC	1000 h
Low Temperature Storage	-40 ºC	1000 h
Wet High Temperature Storage Test	85ºC, 85% RH	1000h
Temperature Cycling	-45 ˚C / 15min ~ 125 ˚C / 15min Temperature change within 5min	500 cycle
Powered Temperature Cycle (PTC)	-40 ºC/ 85 ºC each 10 min, 20 min transfer power on/off each 5 min, DC Derating, I_F = max	100 cycles
ESD (HBM)	R_1: 10 MΩ R_2: 1.5 kΩ C: 100 pF V: ±2 kV	5 times
ESD (MM)	R_1: 10 MΩ R_2: 0 kΩ C: 200 pF V: ±0.5 kV	5 times
Vibrations Variable Frequency	20~ 80 Hz (displacement: 0.06 inch, max. 20 g) 80 ~ 2 kHz (max. 20 g) min. frequency ↔max. frequency 4 min transfer	4 times
Mechanical Shock Test	1500g, 0.5 ms each of the 6 surfaces (3 axis x 2 sides)	5 times
Hydrogen Sulphide(H2S)	25 ˚C 75%R.H. H_2S concentration 15ppm	504h

b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T_c = 25 ºC)	Limit	
			Min.	Max.
Forward Voltage	V_F	I_F = **Sorting Current**	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ_v	I_F =**Sorting Current**	L.S.L * 0.7	U.S.L * 1.3

6. Label Structure

a) Label Structure



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

Bin Code:

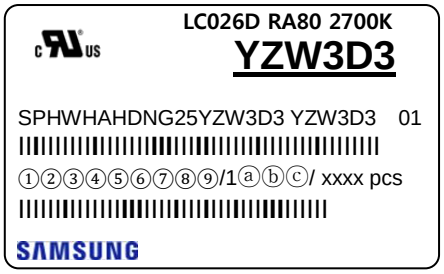
ⓐⓑ: Forward Voltage bin (refer to page 9)

ⓒⓓ: Chromaticity bin (refer to page 21)

ⓔⓕ: Luminous Flux bin (refer to page 5-8)

b) Lot Number

The lot number is composed of the following characters:



① ③④⑤⑥⑦⑧⑨ / 1ⓐⓑⓒ / xxxx pcs

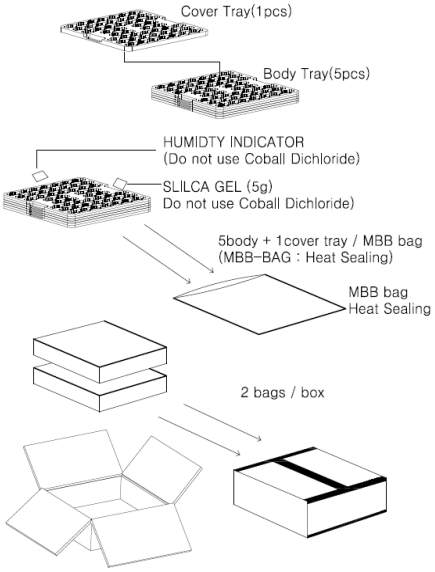
①	:	Production site (S: Giheung, Korea, G: Tianjin, China)
②	:	4(LED)
③	:	Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
④	:	Year (Z: 2015, A: 2016, B: 2017…)
⑤	:	Month (1~9, A, B, C)
⑥⑦⑧⑨	:	Day (1~9, A, B~V)
ⓐⓑⓒ	:	Product serial number (001 ~ 999)

7. Packing Structure

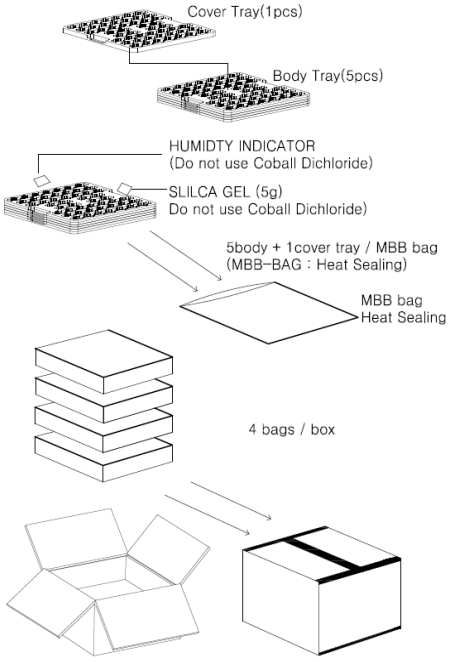
※ Model : L003D, LC006D, LC009D, LC013D

Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		Length	Width	Height	Tolerance
Tray	50	200	200	8	1
Anti-Static Bag	250 (5 trays)	320	270	-	+/- 0.5
Outer Box (Small)	500 (2 bags)	225	225	65	5
Outer Box (Middle)	1000 (4 bags)	225	225	130	5

a) Packing Structure

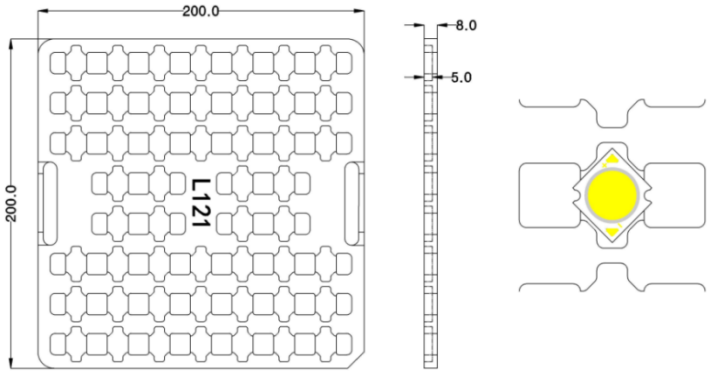


※ Small Box



※ Middle Box

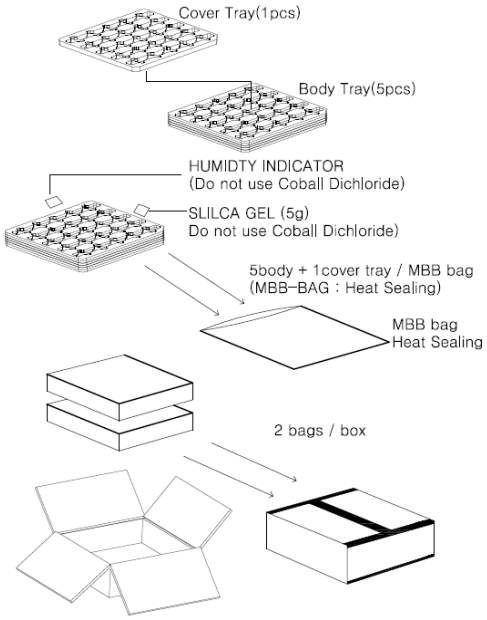
b) Tray



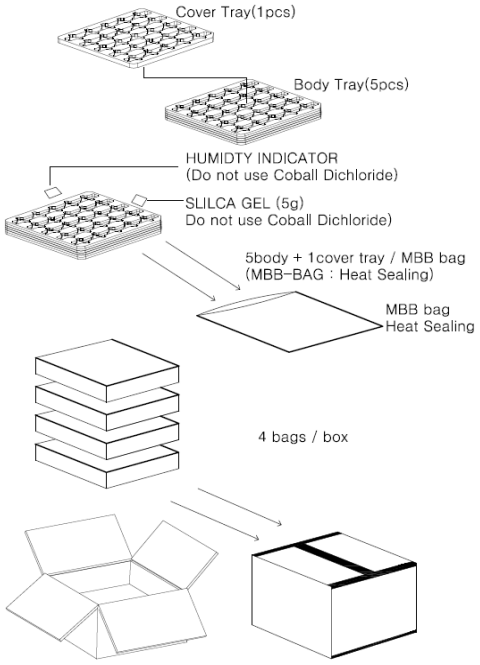
※ Model : LC016D. LC019D, LC026D, LC033D

Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		Length	Width	Height	Tolerance
Tray	25	200	200	8	1
Anti-Static Bag	125 (5 trays)	320	270	-	+/- 0.5
Outer Box (Small)	250 (2 bags)	225	225	65	5
Outer Box (Middle)	500 (4 bags)	225	225	130	5

a) Packing Structure

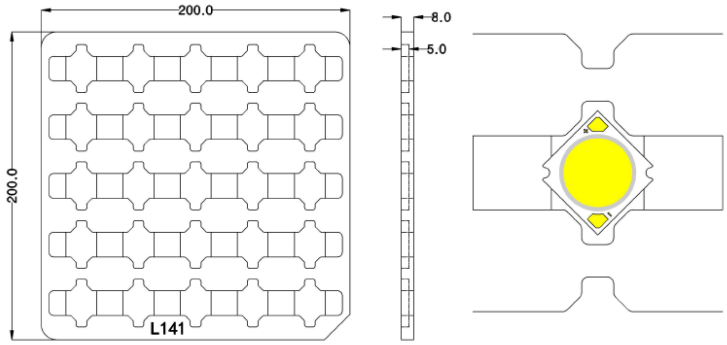


※ Small Box



※ Middle Box

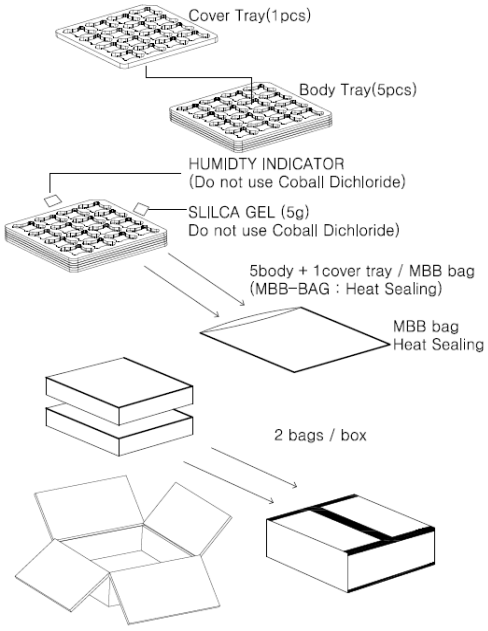
b) Tray



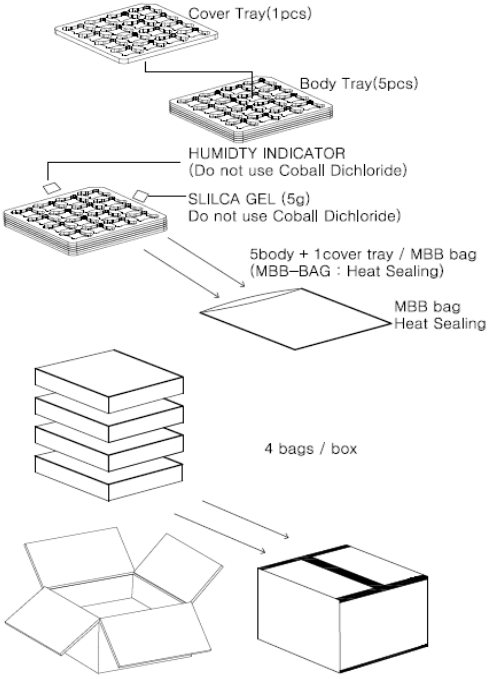
※ Model : LC040D, LC060D, LC080D

Packing material	Max. quantity in pcs of COB	Dimension(mm)			
		Length	Width	Height	Tolerance
Tray	16	200	200	8	1
Anti-Static Bag	80 (5 trays)	320	270	-	+/- 0.5
Outer Box (Small)	160 (2 bags)	225	225	65	5
Outer Box (Middle)	320 (4 bags)	225	225	130	5

a) Packing Structure

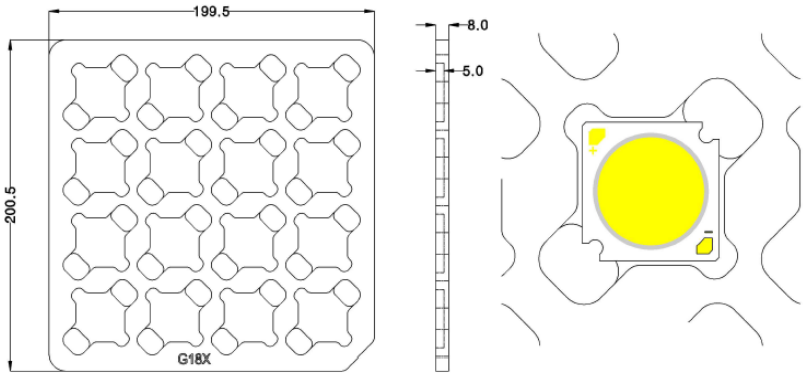


※ Small Box



※ Middle Box

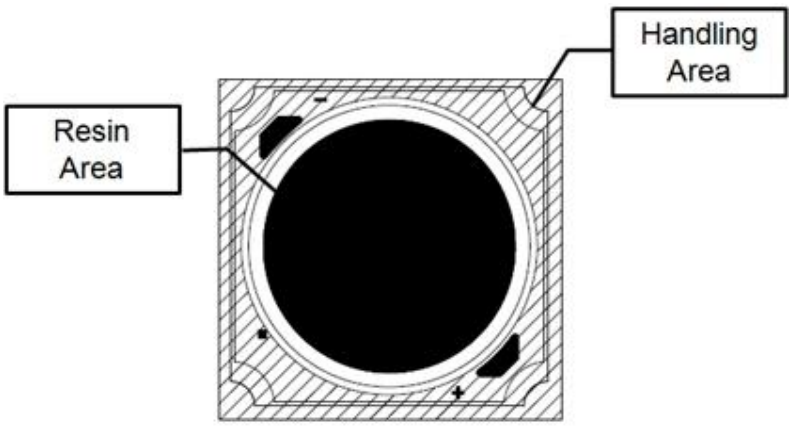
b) Tray



8. Precautions in Handling & Use

1) 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.
2) 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).
3) 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
4) Repack unused products with anti-moisture packing, fold to close any opening and then store in a dry place.
5) Devices require baking before mounting, if humidity card reading is >60 % at 23 ± 5 ºC.
6) Devices must be baked for 1 hour at 60 ± 5 ºC, if baking is required.
7) 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.
8) The thermal management is one of the most critical factors for the LED lighting system. Especially the LED junction temperature should not exceed the absolute maximum rating while operation of LED lighting system.

   For more information, please refer to Application Note ‘Mechanical & Thermal Guide for COB’.
9) In case of driving LEDsaround the minimum current level (If_min), chips might exhibit different brightness due to the variation in I-V characteristics of each one. This is normal and does not adversely affect the performance of product.
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.
11) The resin area is very sensitive, please do not handle, press, touch, rub, clean, or pick by with tweezers on it. Instead, please pick at the handling area as indicated below.



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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