Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

High Voltage LED Series
Chip on Board

LC013B Gen.2

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
- Completed 6,000 hours of LM-80 Testing
- ENEC certified: Integral LED Module

Applications

- Spotlight / Downlight
- LED Retrofit Bulbs
- Outdoor Illumination

Table of Contents

1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	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	105	ºC	*Note
Forward Current	I_F	660	mA	-
Power Dissipation	P_D	24.4	W	-
ESD (HBM)	-	±2	kV	-
ESD (MM)	-	±0.5	kV	-

b) Electro-optical Characteristics (I_F = 360 mA, T_c = 25 ºC)

Item	Unit	Rank	Min.	Typ.	Max.
Forward Voltage (V_F)	V	YH	32.5	35.5	38.5
Color Rendering Index (R_a)	-	3	70	-	-
		5	80	-	-
		7	90	-	-
		8	95		
Thermal Resistance (junction to chip point)	ºC/W		-	1.6	-
Beam Angle	º		-	115	-
Nominal Power	W			12.8	
Eye Protection		Risk 1	-		-

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 = 25 °C)
2) Samsung maintains measurement tolerance of: forward voltage = ±5 %, CRI = ±1
3) Max Tc=105 ºC (1) is for ENEC condition. Refer to the derating curve, '3. Typical Characteristics Graph' Tj is max 150 designed within the range.

c) Luminous Flux Characteristics (I_F = 360 mA)

CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux Bin	Sorting[1] @ T_c = 25 °C (lm)		Calculated Flux[2] @ T_c = 85 °C (lm)	
				Min.	Max.	Min.	Max.
70	3000	1F	11	1633	1856	1470	1670
			12	1856	2078	1670	1871
	4000	1F	11	1715	1948	1543	1754
			12	1948	2182	1754	1964
	5000	1F	11	1731	1967	1558	1770
			12	1967	2203	1770	1983
80	2700	1D	17	1700	1800	1547	1638
			18	1800	1900	1638	1729
		1E	18	1800	1900	1638	1729
			19	1900	2000	1729	1820
	3000	1D	17	1750	1850	1593	1684
			18	1850	1950	1684	1775
		1E	18	1850	1950	1684	1775
			19	1950	2050	1775	1866
	3500	1D	18	1840	1950	1674	1775
			19	1950	2060	1775	1875
		1E	19	1950	2060	1775	1875
	4000	1D	18	1760	1870	1602	1702
			19	1870	1980	1702	1802
		1E	19	1870	1980	1702	1802
			20	1980	2090	1802	1902
	5000	1D	17	1680	1800	1529	1638
			18	1800	1920	1638	1747
		1E	18	1800	1920	1638	1747
			19	1920	2040	1747	1856
	5700	1D	17	1680	1800	1529	1638
			18	1800	1920	1638	1747
		1E	18	1800	1920	1638	1747
			19	1920	2040	1747	1856

c) Luminous Flux Characteristics (I_F = 360 mA)

CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux Bin	Sorting[1] @ T_c = 25 °C (lm)		Calculated Flux[2] @ T_c = 85 °C (lm)	
				Min.	Max.	Min.	Max.
90	2700	1G	14	1405	1520	1279	1383
			15	1520	1670	1383	1520
	3000	1G	14	1440	1560	1310	1420
			15	1560	1710	1420	1556
	3500	1G	14	1475	1595	1342	1451
			15	1595	1745	1451	1588
	4000	1G	14	1520	1645	1383	1497
			15	16454	1795	1497	1633
95	2700	1E	11	1160	1289	1056	1173
			12	1289	1418	1173	1291
	3000	1E	11	1196	1329	1089	1209
			12	1329	1462	1209	1330
	3500	1E	11	1232	1369	1121	1246
			12	1369	1506	1246	1370

Notes:

1) The COB is tested in pulsed condition at rated test current (10 ms pulse width) and rated temperature ($T_j = T_c = T_a$ = 25 °C)
2) Calculated flux values are for reference only
3) Samsung maintains 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	C	W	1	H	D	N	A	2	5	Y	H	R	T	1	F

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WW	Warm White (T/U/V/W Ranks)
		CW	Cool White (Q/R Ranks)
6	Product Version	1	
7 8	Form Factor	HD	COB
9	Lens Type	N	No lens
10	Internal Code	A	LC013
11	Chip Type	2	
12	CRI & Sorting Temperature	3	Min. 70
		5	Min. 80
		7	Min. 90
		8	Min 95
13 14	Forward Voltage (V)	YH	32.5~38.5
15	CCT (K)	W	2700 K, Bin Code: WA,WB (MacAdam Ellipse)
		V	3000 K, Bin Code: VA, VB (MacAdam Ellipse), VW, VX, VY, VZ (ANSI bin)
		U	3500 K, Bin Code: UA, UB (MacAdam Ellipse)
		T	4000 K, Bin Code: TA, TB (MacAdam Ellipse), TW, TX, TY, TZ (ANSI bin)
		R	5000 K, Bin Code: RA (MacAdam Ellipse), RW, RX, RY, RZ (ANSI bin)
		Q	5700 K, QW, QX, QY, QZ (ANSI bin)
16	MacAdam / ANSI	2	MacAdam 2-step
		3	MacAdam 3-step
		T	ANSI bin
17 18	Luminous Flux	1D	Bin Code: 17, 18, 19 (80 CR)I
		1E	18, 19, 20 (80 CRI) 11, 12 (95 CRI)
		1F	11, 12 (70 CRI)
		1G	14, 15 (80 CRI)

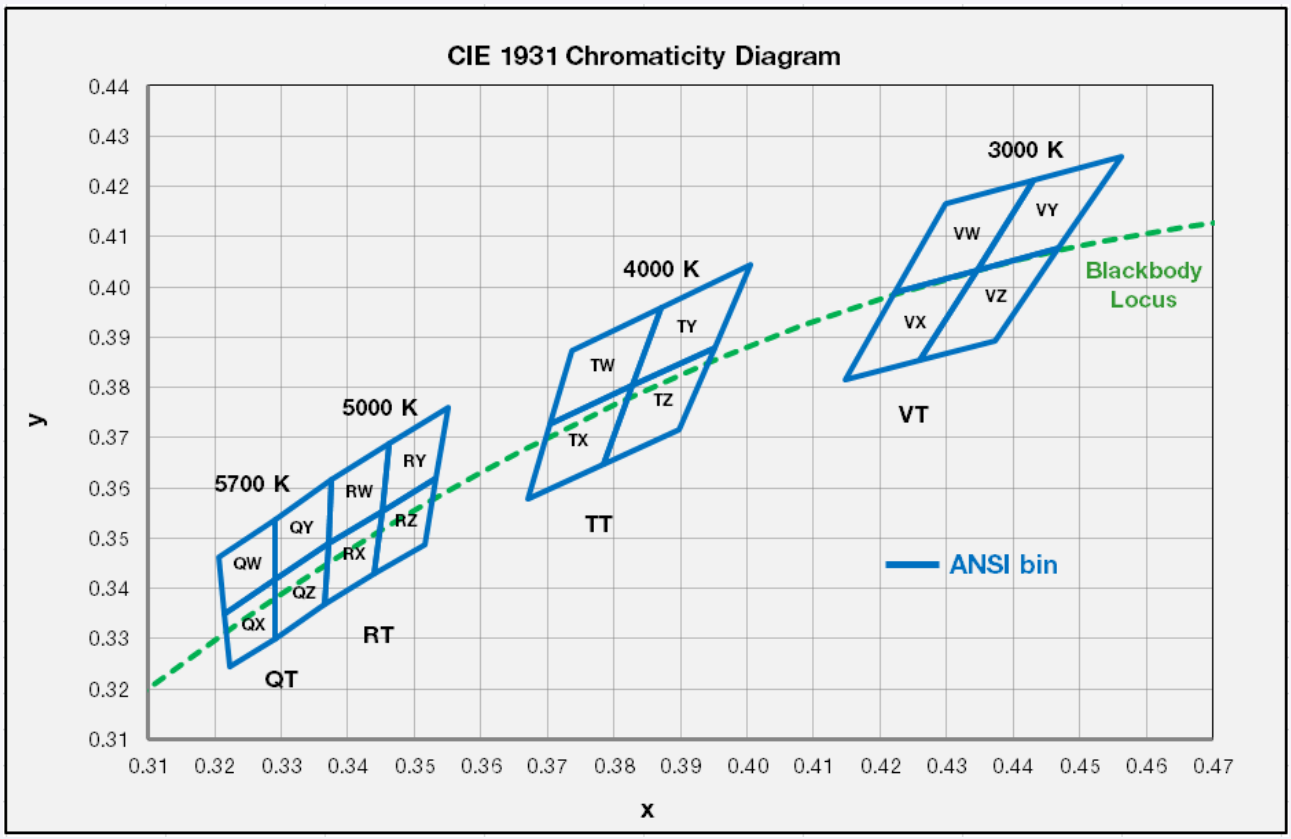
a) Binning Structure (I_F = 360 mA, T_c = 25 ºC)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	V_F Rank	Color Rank	Chrom. Bin	Flux Rank	Flux Bin	Flux Range (Φ_v, lm)
70	3000	SPHWW1HDNA23YHVT1F	YH	VT	VW, VX VY, VZ	1F	11	1633 ~ 1856
							12	1856 ~ 2078
	4000	SPHWW1HDNA23YHTT1F	YH	TT	TW, TX TY, TZ	1F	11	1715 ~ 1948
							12	1948 ~ 2182
	5000	SPHCW1HDNA23YHRT1F	YH	RT	RW, RX RY, RZ	1F	11	1731 ~ 1967
							12	1967 ~ 2203
80	2700	SPHWW1HDNA25YHW21D	YH	W2	WB	1D	17	1700 ~ 1800
							18	1800 ~ 1900
		SPHWW1HDNA25YHW31D	YH	W3	WA, WB	1D	17	1700 ~ 1800
							18	1800 ~ 1900
		SPHWW1HDNA25YHW21E	YH	W2	WB	1E	18	1800 ~ 1900
							19	1900 ~ 2000
		SPHWW1HDNA25YHW31E	YH	W3	WA, WB	1E	18	1800 ~ 1900
							19	1900 ~ 2000
	3000	SPHWW1HDNA25YHV21D	YH	V2	VB	1D	17	1750 ~ 1850
							18	1850 ~ 1950
		SPHWW1HDNA25YHV31D	YH	V3	VA, VB	1D	17	1750 ~ 1850
							18	1850 ~ 1950
		SPHWW1HDNA25YHV21E	YH	V2	VB	1E	18	1850 ~ 1950
							19	1950 ~ 2050
		SPHWW1HDNA25YHV31E	YH	V3	VA, VB	1E	18	1850 ~ 1950
							19	1950 ~ 2050
	3500	SPHWW1HDNA25YHU21D	YH	U2	UB	1D	18	1840 ~ 1950
							19	1950 ~ 2060
		SPHWW1HDNA25YHU31D	YH	U3	UA, UB	1D	18	1840 ~ 1950
							19	1950 ~ 2060
		SPHWW1HDNA25YHU21E	YH	U2	UB	1E	19	1950 ~ 2060
		SPHWW1HDNA25YHU31E	YH	U3	UA. UB	1E	19	1950 ~ 2060
	4000	SPHWW1HDNA25YHT21D	YH	T2	TB	1D	18	1760 ~ 1870
							19	1870 ~ 1980
		SPHWW1HDNA25YHT31D	YH	T3	TA, TB	1D	18	1760 ~ 1870
							19	1870 ~ 1980
		SPHWW1HDNA25YHT21E	YH	T2	TB	1E	19	1870 ~ 1980
							20	1980 ~ 2090
		SPHWW1HDNA25YHT31E	YH	T3	TA, TB	1E	19	1870 ~ 1980
							20	1980 ~ 2090
	5000	SPHCW1HDNA25YHR31D	YH	R3	RA	1D	17	1680 ~ 1800
							18	1800 ~ 1920
		SPHCW1HDNA25YHRT1D	YH	RT	RW, RX, RY, RZ	1D	17	1680 ~ 1800
							18	1800 ~ 1920
		SPHCW1HDNA25YHR31E	YH	R3	RA	1E	18	1800 ~ 1920
							19	1920 ~ 2040
		SPHCW1HDNA25YHRT1E	YH	RT	RW, RX, RY, RZ	1E	18	1800 ~ 1920
							19	1920 ~ 2040
	5700	SPHCW1HDNA25YHQT1D	YH	QT	QW, QX, QY, QZ	1D	17	1680 ~ 1800
							18	1800 ~ 1920
		SPHCW1HDNA25YHQT1E	YH	QT	QW, QX, QY, QZ	1E	18	1800 ~ 1920
							19	1920 ~ 2040

a) Binning Structure (I_F = 360 mA, T_c = 25 ºC)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	V_F Rank	Color Rank	Chrom. Bin	Flux Rank	Flux Bin	Flux Range (Φ_v, lm)
90	2700	SPHWW1HDNA27YHW31G	YH	W3	WB	1G	14	1405 ~ 1520
							15	1520 ~ 1670
		SPHWW1HDNA27YHW21G	YH	W2	WA, WB	1G	14	1405 ~ 1520
							15	1520 ~ 1670
	3000	SPHWW1HDNA27YHV21G	YH	V2	VB	1G	14	1440 ~ 1560
							15	1560 ~ 1710
		SPHWW1HDNA27YHV31G	YH	V3	VA, VB	1G	14	1440 ~ 1560
							15	1560 ~ 1710
	3500	SPHWW1HDNA27YHU21G	YH	U2	UB	1G	14	1475 ~ 1595
							15	1595 ~ 1745
		SPHWW1HDNA27YHU31G	YH	U3	UA, UB	1G	14	1475 ~ 1595
							15	1595 ~ 1745
	4000	SPHWW1HDNA27YHT21G	YH	T2	TB	1G	14	1520 ~ 1645
							15	1645 ~ 1795
		SPHWW1HDNA27YHT31G	YH	T3	TA, TB	1G	14	1520 ~ 1645
							15	1645 ~ 1795
95	2700	SPHWW1HDNA28YHW21E	YH	W2	WB	1E	11	1160 ~ 1289
							12	1289 ~ 1418
		SPHWW1HDNA28YHW31E	YH	W3	WA,WB	1E	11	1160 ~ 1289
							12	1289 ~ 1418
	3000	SPHWW1HDNA28YHV21E	YH	V2	VB	1E	11	1169 ~ 1329
							12	1329 ~ 1462
		SPHWW1HDNA28YHV31E	YH	V3	VA,VB	1E	11	1169 ~ 1329
							12	1329 ~ 1462
	3500	SPHWW1HDNA28YHU21E	YH	U2	UB	1E	11	1232 ~ 1369
							12	1369 ~ 1506
		SPHWW1HDNA28YHU31E	YH	U3	UA,UB	1E	11	1232 ~ 1369
							12	1369 ~ 1506

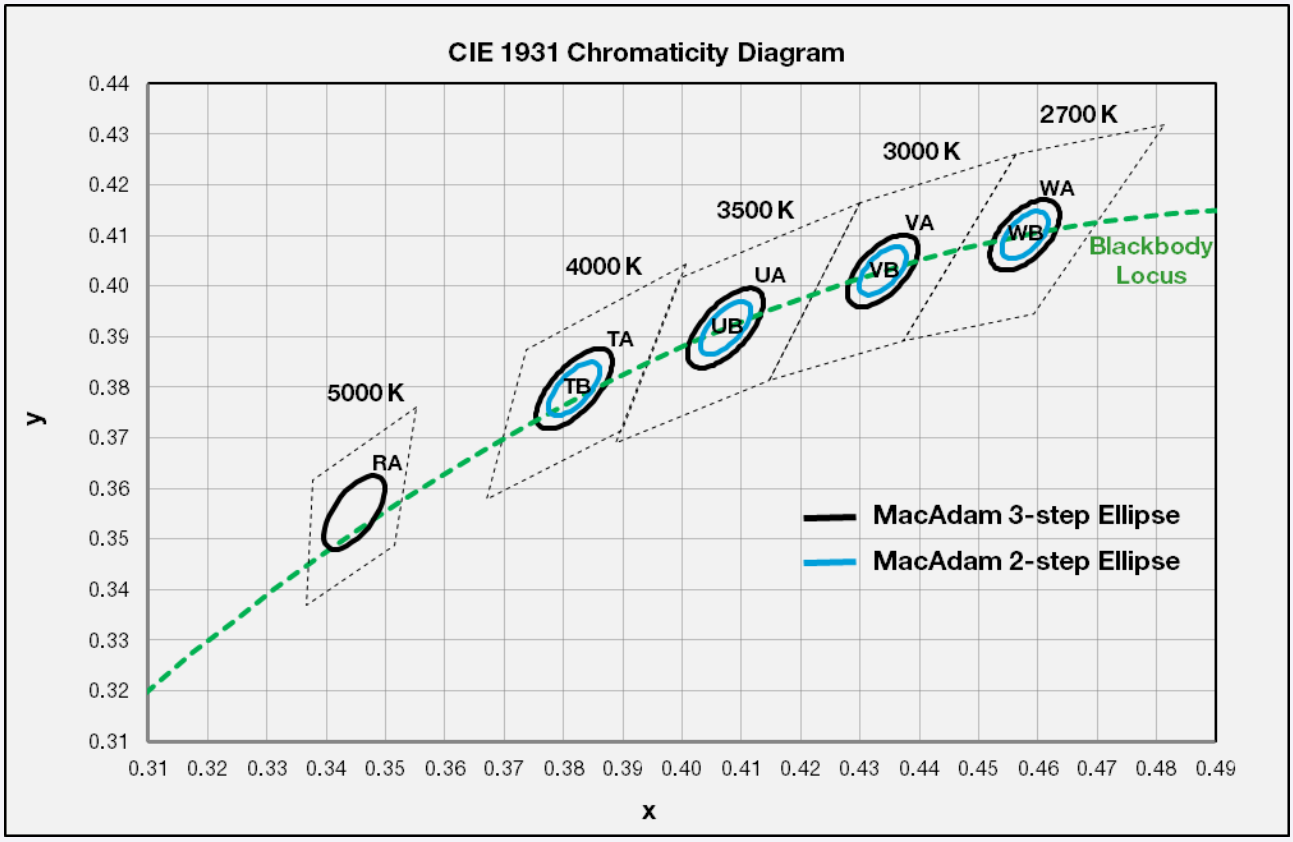
b) Chromaticity Region & Coordinates (I_F = 360 mA, T_a = 25 ºC)

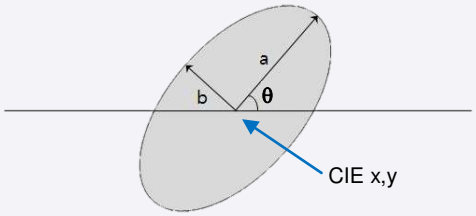


Region	CIE x	CIE y	Region	CIE x	CIE y
V rank (3000 K)					
VW	0.4223	0.399	VY	0.4345	0.4033
	0.4345	0.4033		0.4468	0.4077
	0.4431	0.4213		0.4562	0.4260
	0.4299	0.4165		0.4431	0.4213
VX	0.4223	0.399	VZ	0.4260	0.3854
	0.4147	0.3814		0.4373	0.3893
	0.4260	0.3854		0.4468	0.4077
	0.4345	0.4033		0.4345	0.4033
R rank (5000 K)					
RW	0.3376	0.3616	RY	0.3463	0.3687
	0.3463	0.3687		0.3551	0.3760
	0.3451	0.3554		0.3533	0.3620
	0.3371	0.3490		0.3451	0.3554
RX	0.3371	0.3490	RZ	0.3451	0.3554
	0.3451	0.3554		0.3533	0.3620
	0.3440	0.3428		0.3515	0.3487
	0.3366	0.3369		0.3440	0.3428

Region	CIE x	CIE y	Region	CIE x	CIE y
T rank (4000 K)					
TW	0.3736	0.3874	TY	0.3871	0.3959
	0.3871	0.3959		0.4006	0.4044
	0.3828	0.3803		0.3952	0.388
	0.3703	0.3726		0.3828	0.3803
TX	0.3703	0.3726	TZ	0.3828	0.3803
	0.3828	0.3803		0.3952	0.388
	0.3784	0.3647		0.3898	0.3716
	0.367	0.3578		0.3784	0.3647
Q rank (5700 K)					
QW	0.3207	0.3462	QY	0.3290	0.3538
	0.3290	0.3538		0.3376	0.3616
	0.3290	0.3417		0.3371	0.3490
	0.3215	0.3350		0.3290	0.3417
QX	0.3215	0.3350	QZ	0.3290	0.3417
	0.3290	0.3417		0.3371	0.3490
	0.3290	0.3300		0.3366	0.3369
	0.3222	0.3243		0.3290	0.3300

b) Chromaticity Region & Coordinates (I_F = 360 mA, T_a = 25 ºC)





MacAdam Ellipse (WA, WB)					
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 (VA, VB)					
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 (UA, UB)					
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 (TA, TB)					
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 (RA)					
Step	CIE x	CIE y	θ	a	b
3-step	0.3447	0.3553	59.62	0.0082	0.0035

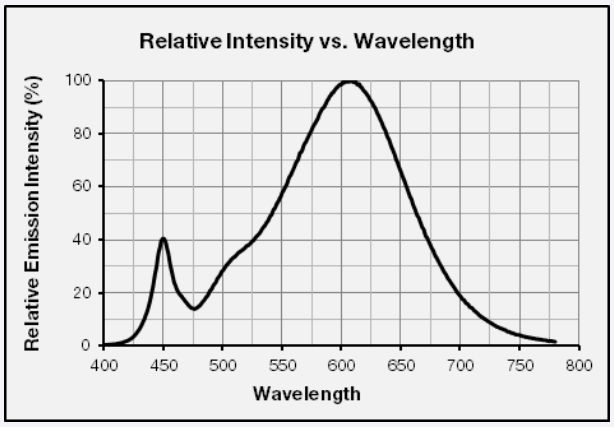
Note:

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

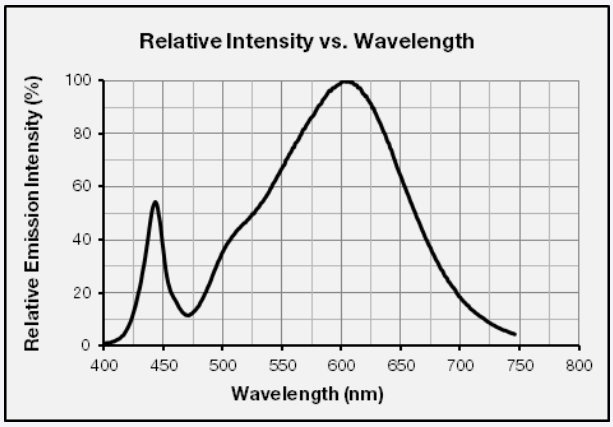
3. Typical Characteristics Graphs

a) Spectrum Distribution (I_F = 360 mA, T_c = 25 ºC)

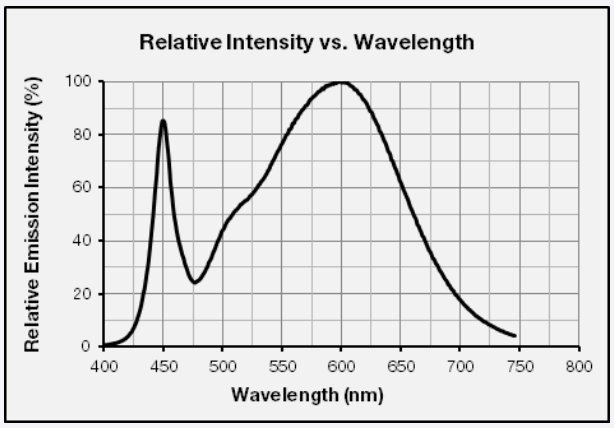
CCT: 2700 K (80 CRI)



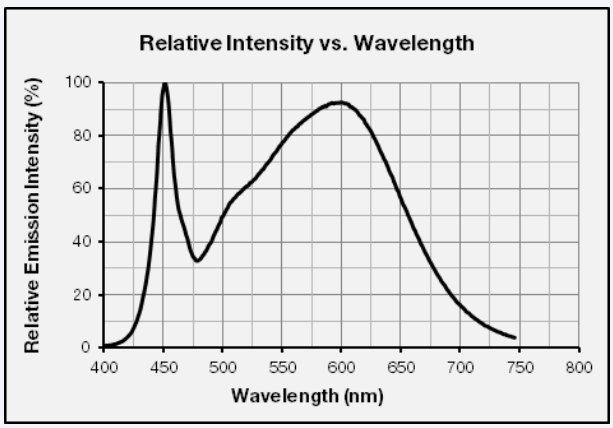
CCT: 3000 K (80 CRI)



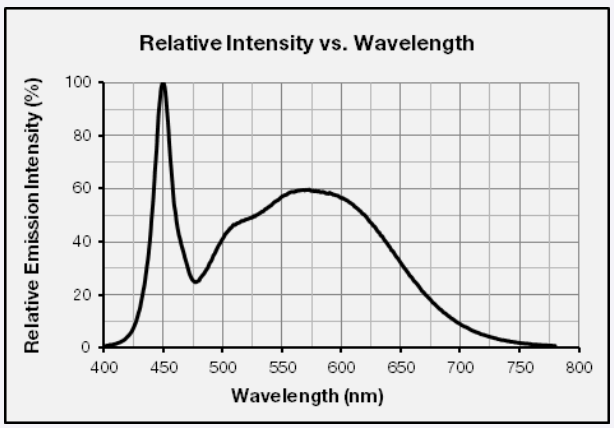
CCT: 3500 K (80 CRI)



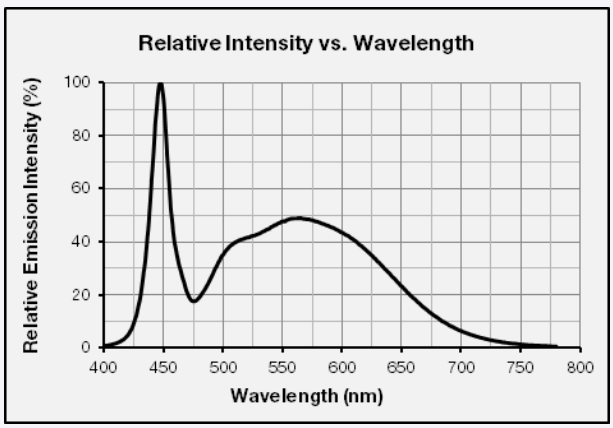
CCT: 4000 K (80 CRI)



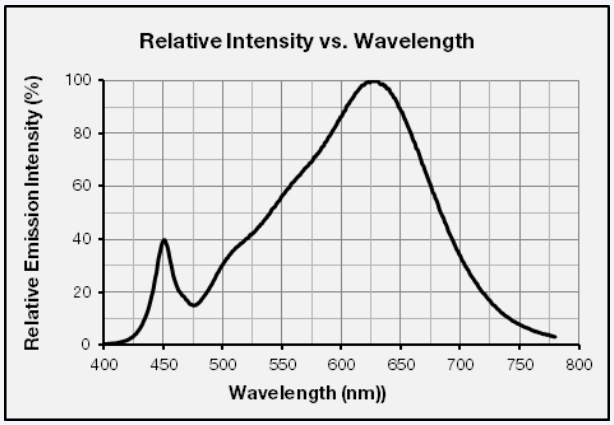
CCT: 5000 K (80 CRI)



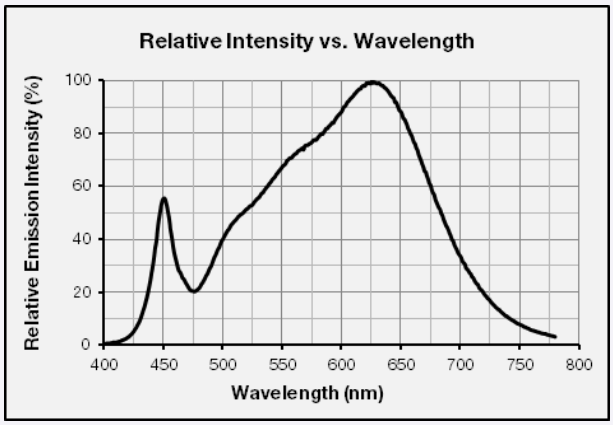
CCT: 5700 K (80 CRI)



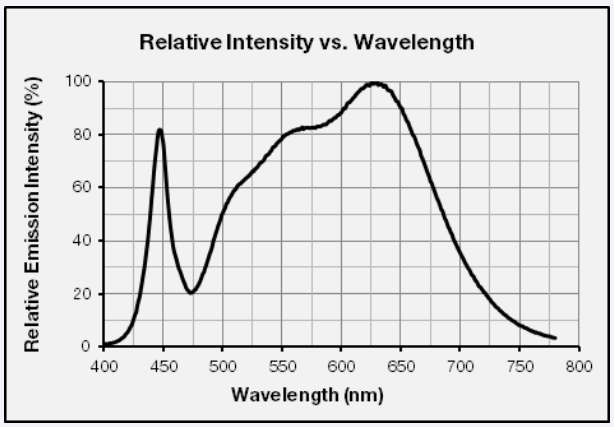
CCT: 2700 K (90 CRI)



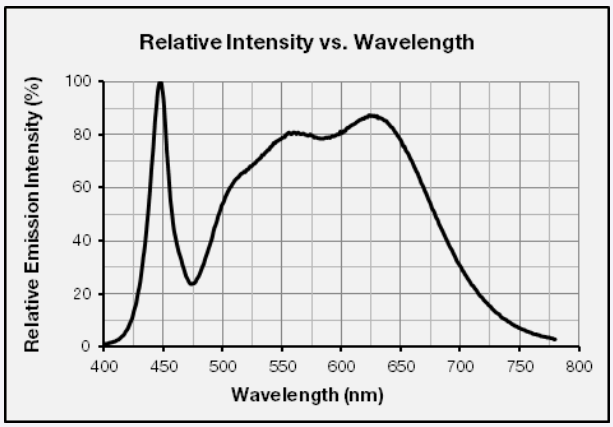
CCT: 3000 K (90 CRI)



CCT: 3500 K (90 CRI)

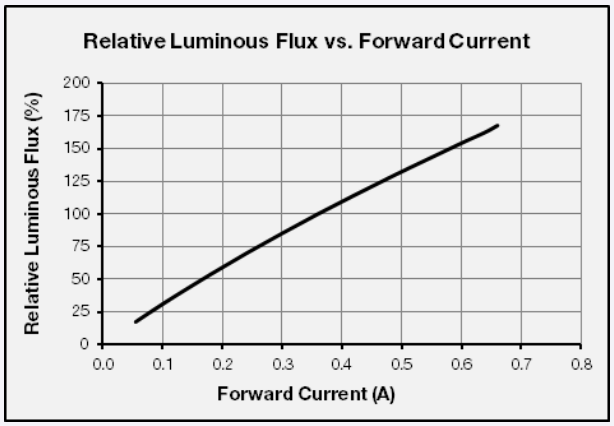


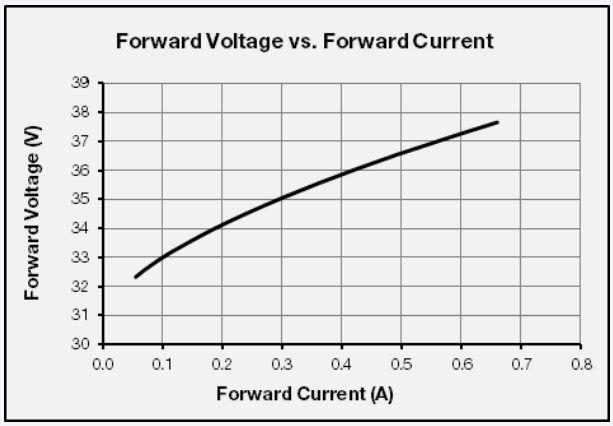
CCT: 4000 K (90 CRI)



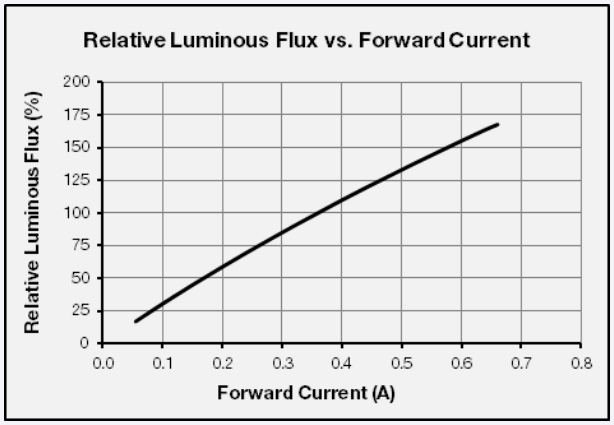
b) Forward Current Characteristics (T_c = 25 ºC)

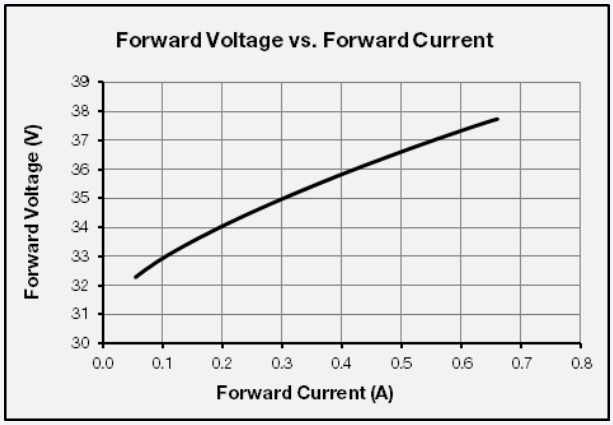
80 CRI





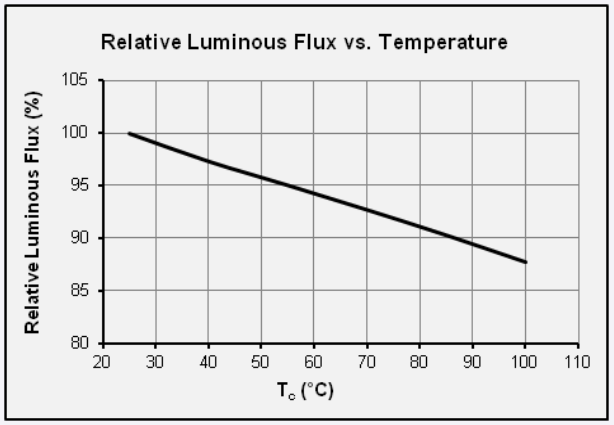
90 CRI

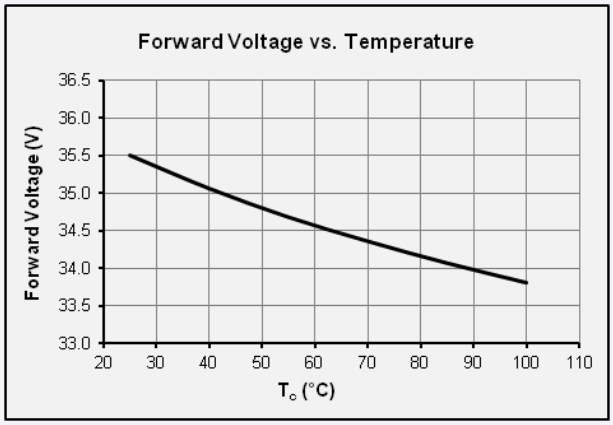




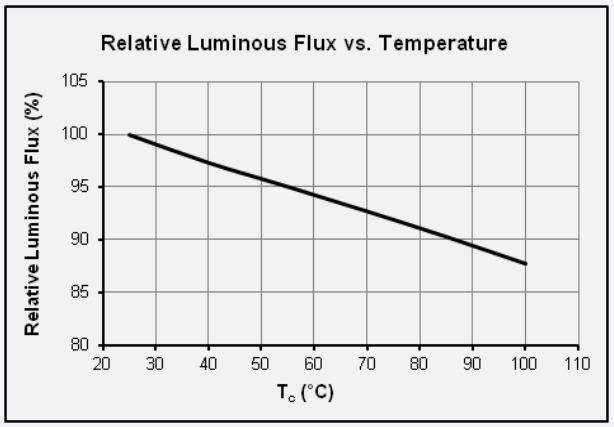
c) Temperature Characteristics (I_F = 360 mA)

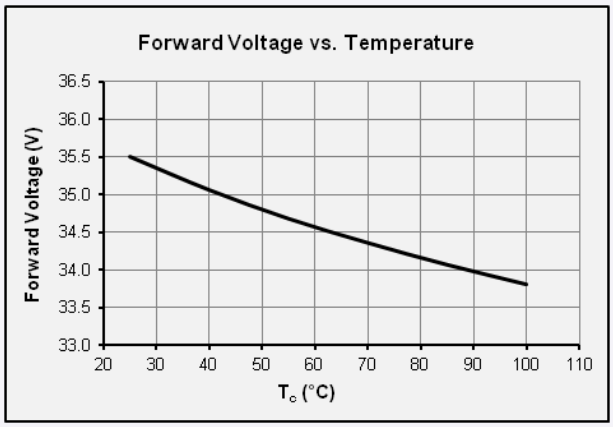
80 CRI





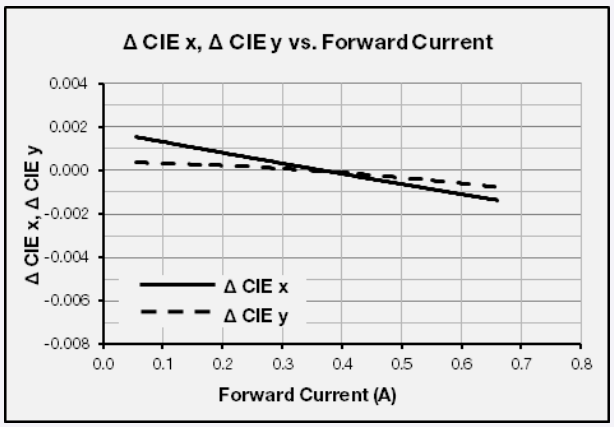
90 CRI

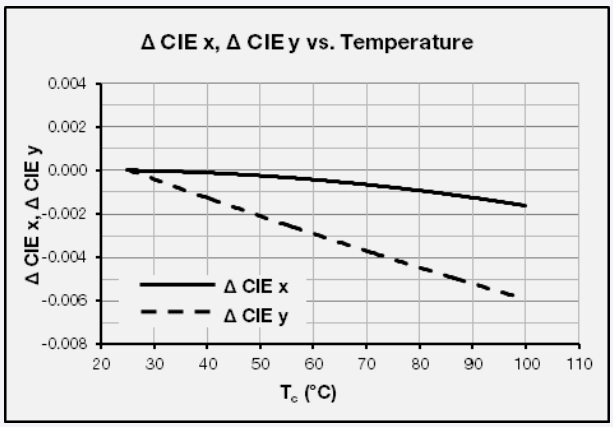




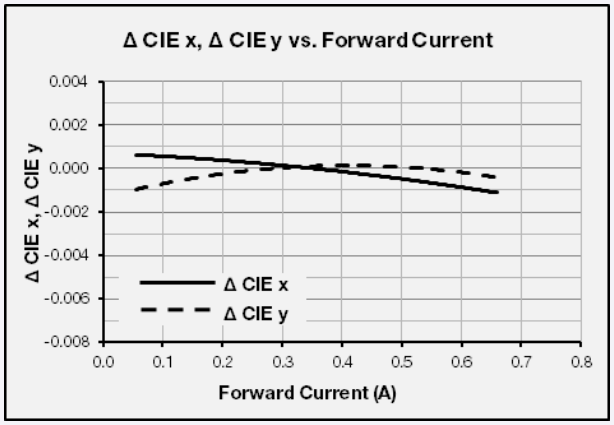
d) Color Shift Characteristics T_c = 25 ºC I_F = 360 mA

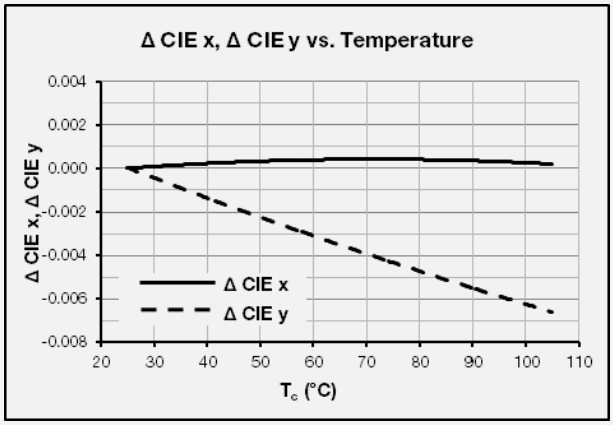
80 CRI



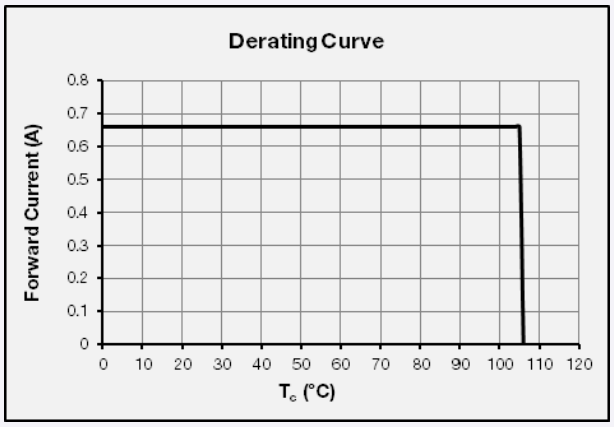


90 CRI



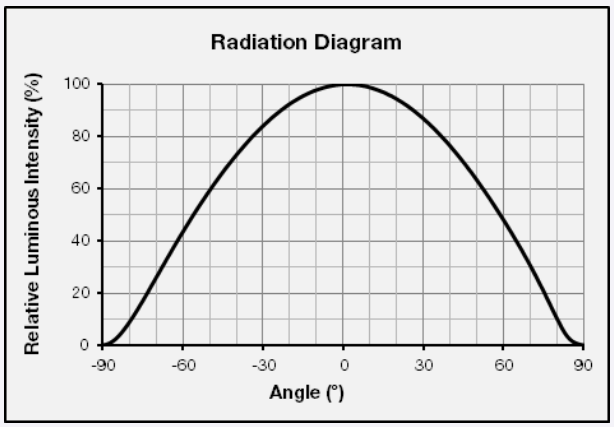


e) Derating Curve

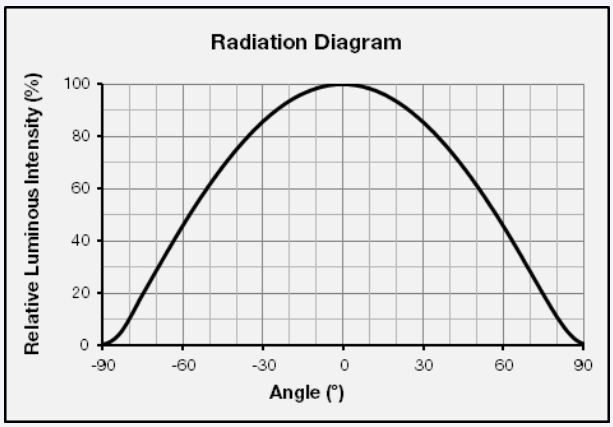


f) Beam Angle Characteristics (I_F = 360 mA, T_c = 25 ºC)

80 CRI

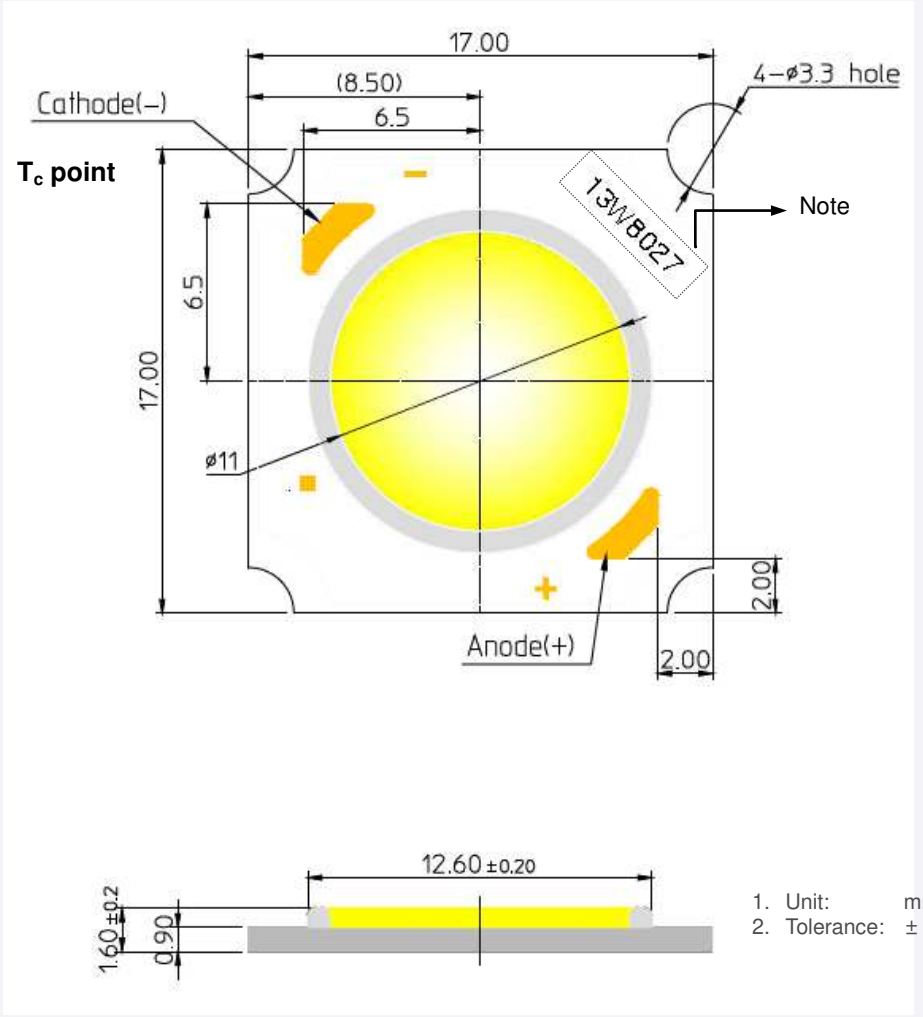


90 CRI



4. Outline Drawing & Dimension

1. Unit: mm
2. Tolerance: ± 0.15 mm



1. Unit: mm
2. Tolerance: ± 0.2 mm

Item	Dimension	Tolerance	Unit
Length	17.0	±0.15	mm
Width	17.0	±0.15	mm
Height	1.50	±0.20	mm
Light Emitting Surface (LES) Diameter	11	±0.15	mm

Note: Denoted product information above is only an example
(13W8027 : 13W, CRI80+, 2700K)

5. Reliability Test Items & Conditions

a) Test Items

Test Item	Test Condition	Test Hour / Cycle
Room Temperature Life Test	25 ºC, I_F = max	1000 h
High Temperature Humidity Life Test	85 ºC, 85 % RH, DC Derating, I_F = max	1000 h
High Temperature Life Test	105 ºC, DC Derating, I_F = max	1000 h
Low Temperature Life Test	-40 ºC, DC 660 mA	1000 h
High Temperature Storage	120 ºC	1000 h
Low Temperature Storage	-40 ºC	1000 h
Thermal Shock	-45 ºC / 15 min ↔ 125 ºC / 15 min temperature change in 5 min	200 cycles
Temperature Cycle On/Off Test	-40 ºC / 85 ºC each 20 min, 100 min transfer power on/off each 5 min, DC 360 mA	100 cycles
Temperature Humidity Storage Test	-10 ºC ↔ 25 ºC, 95 % RH ↔ 85 ºC, 95 % RH (24 h / cycle)	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
Vibration Test	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	1500 g, 0.5 ms each of the 6 surfaces (3 axis x 2 sides)	5 times
Salt Spray Test	35 ºC, 5 % salt water 8 h spray, 16 h dwell	2 cycles

b) Criteria for Judging the Damage

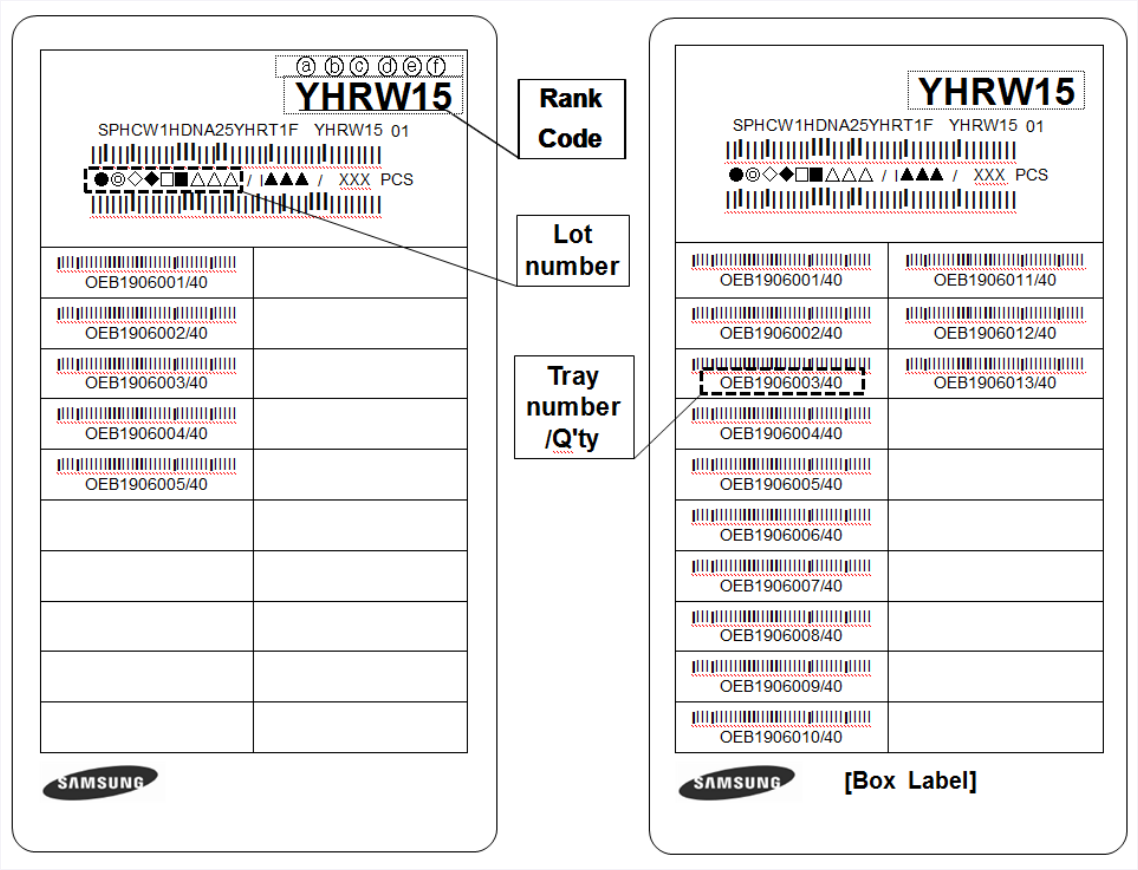
Item	Symbol	Test Condition (T_c = 25 ºC)	Limit	
			Min.	Max.
Forward Voltage	V_F	I_F = 360 mA	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ_v	I_F = 360 mA	L.S.L * 0.7	U.S.L * 1.3

6. Label Structure

a) Label Structure

Aluminum Bag & Inner Box

Outer Box



Note: Denoted rank code and product code above is only an example (see description on page 6)

Rank Code:

ⓐⓑ: Forward Voltage rank (refer to page 7-10)

ⓒⓓ: Chromaticity bin (refer to page 11-12)

ⓔⓕ: Luminous Flux bin (refer to page 7-10)

b) Lot Number

The lot number is composed of the following characters:

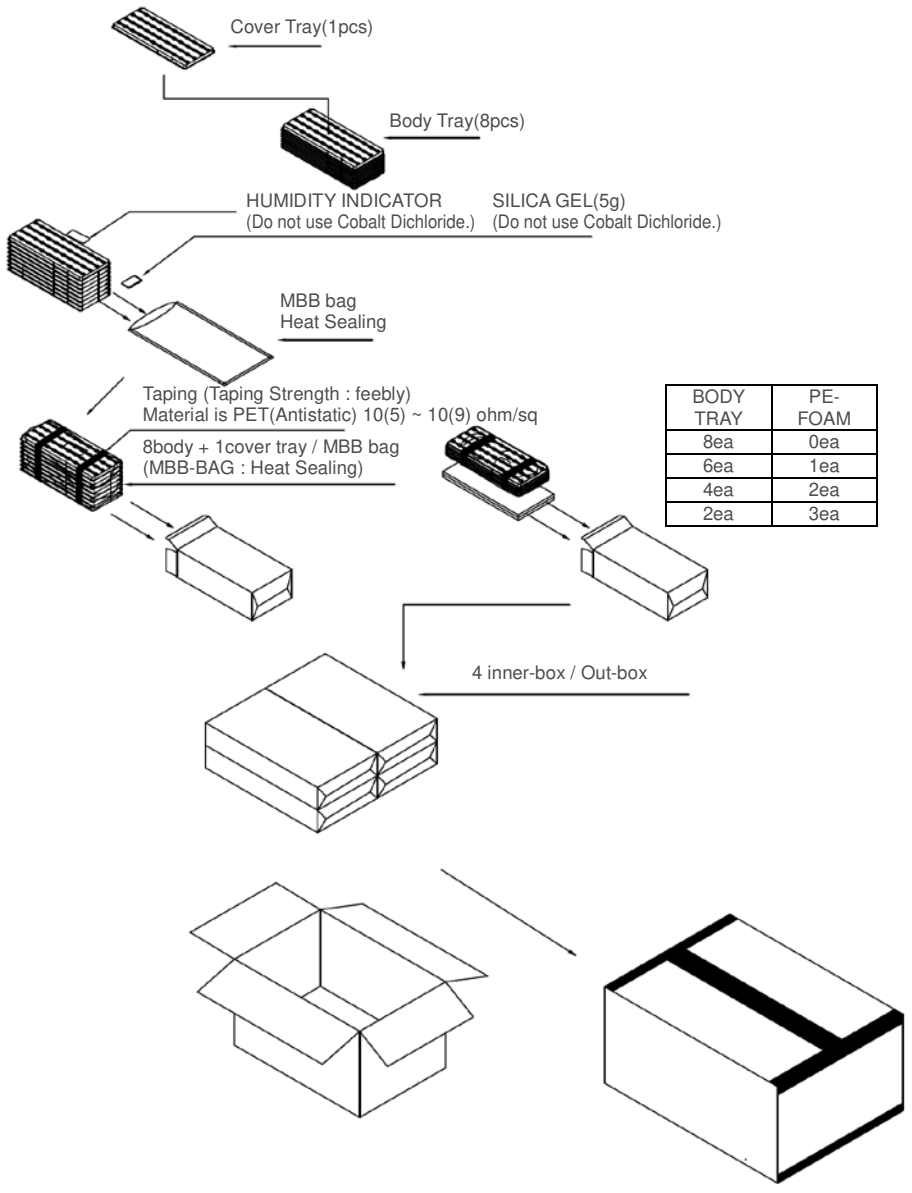
●◎◇◆□■△△△ / 1▲▲▲ / xxx PCS

●	:	Production site (S: Korea, G: Tianjin, China)
◎	:	L (LED)
◇	:	Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
◆	:	Year (Y: 2014, Z: 2015, A: 2016, …)
□	:	Month (1~9, A, B, C)
■	:	Day (1~9, A, B~V)
△△△	:	Product serial number (001 ~ 009)
▲▲▲	:	Tray number (001 ~ 999)

7. Packing Structure

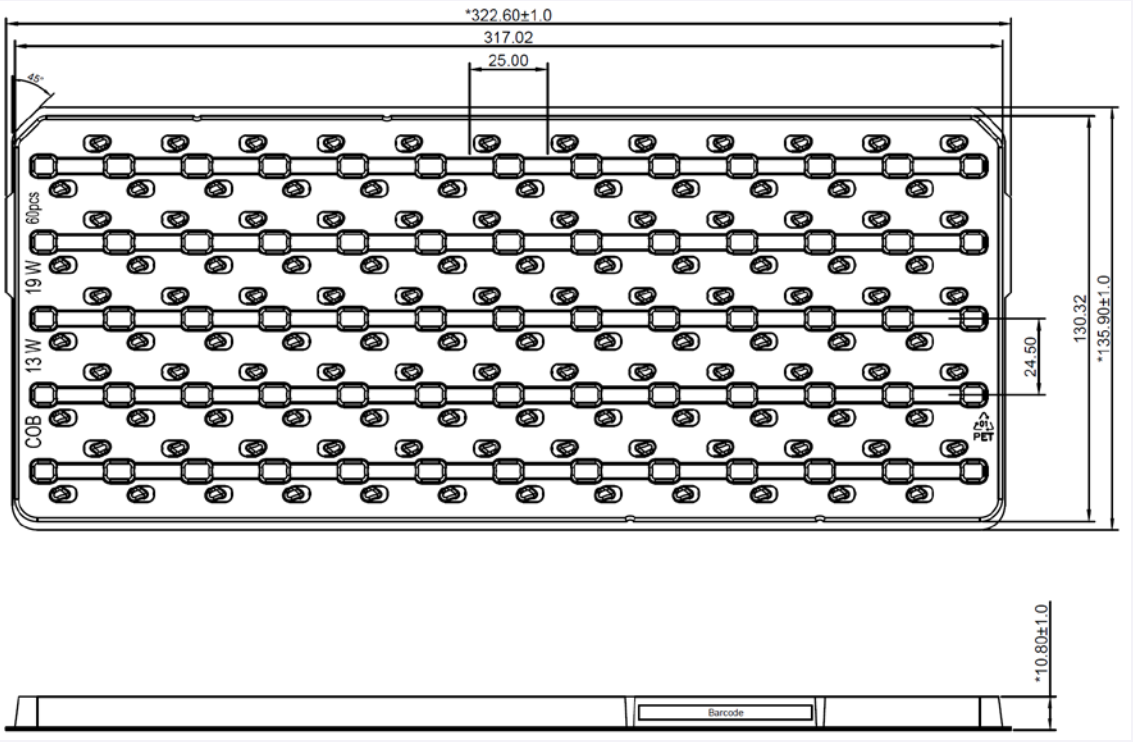
Packing material	Max. quantity in pcs of COB	Dimension (mm)			
		Length	Width	Height	Tolerance
Tray	60	322.6	135.9	10.8	1.0
Aluminum Bag	480 (8 trays)	450	230	-	10
PE Foam Pad	-	280	130	10	2
Inner Box	480 (1 aluminum bag)	338	148	55	2
Outer Box	1,920 (4 inner boxes)	351	308	120	5
Pallet	107,520 (56 outer boxes)	1000	1000	130	10

a) Packing Structure

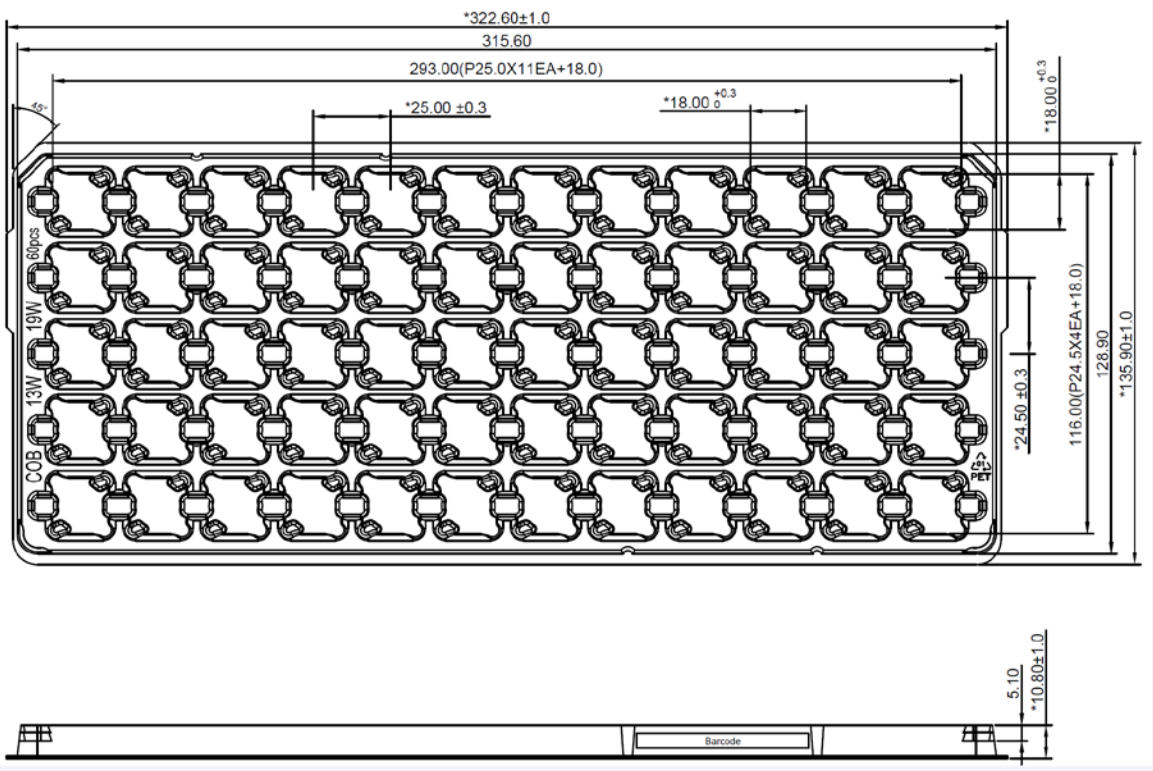


b) Tray

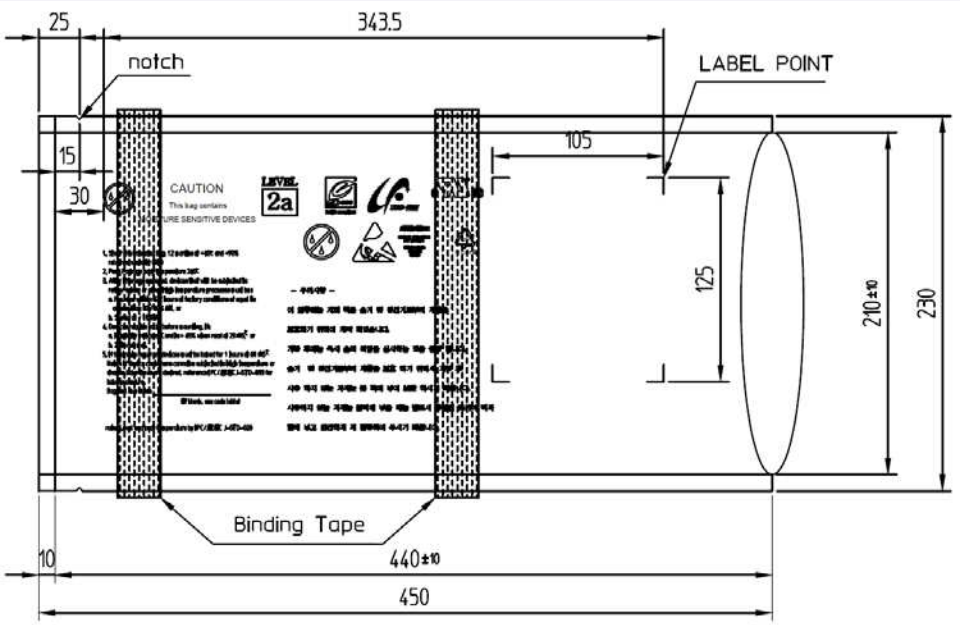
① COVER



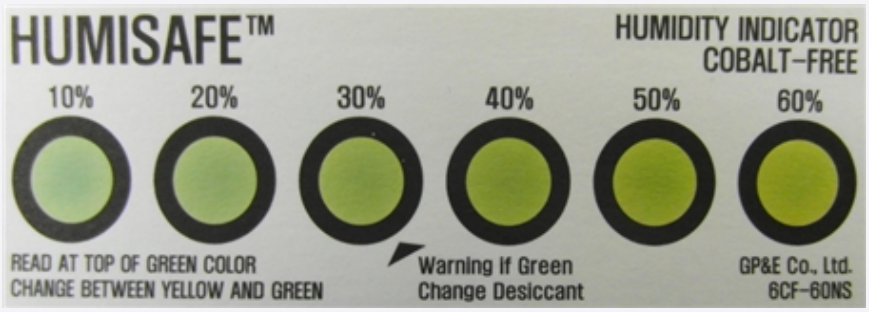
② BODY



c) Aluminum Vinyl Packing Bag

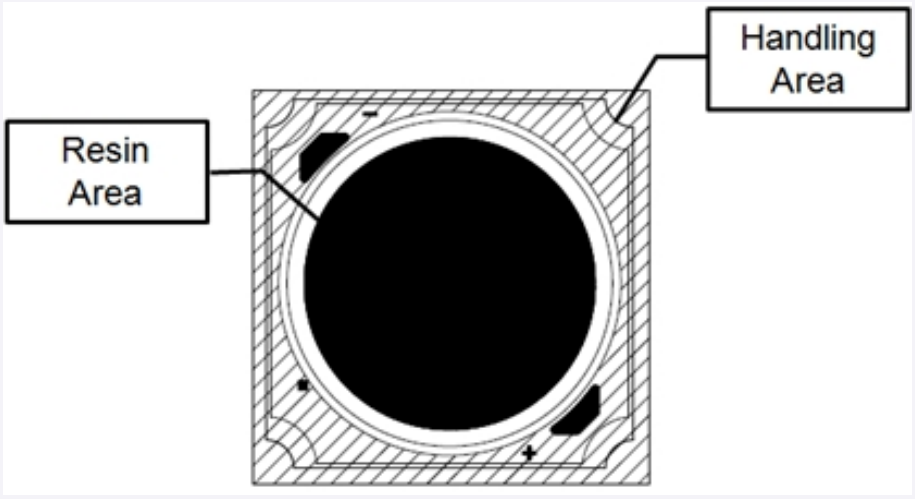


d) Silica Gel & Humidity Indicator Card inside Aluminum Vinyl Packing Bag



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) 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.
9) 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.

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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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