



**THE DATASHEET OF
SPHWW1HDND25YHT2B3**



High Power LED Series Chip on Board

LC033B - Gen3



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

Applications

- Spotlight / Downlight
- LED Retrofit Bulbs
- Outdoor Illumination



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1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Ambient / Operating Temperature	T_a	-40 ~ +105	°C	-
Storage Temperature	T_{stg}	-40 ~ +120	°C	-
LED Junction Temperature	T_j	150	°C	-
Case Temperature	T_c	105	°C	*Note
Forward Current	I_F	1620	mA	-
Power Dissipation	P_D	59.9	W	-
ESD (HBM)	-	±2	kV	-
ESD (MM)	-	±0.5	kV	-

b) Electro-optical Characteristics ($I_F = 900 \text{ mA}$, $T_c = 25 \text{ °C}$)

Item	Unit	Rank	Min.	Typ.	Max.
Forward Voltage (V_F)	V	YH	32.5	35.5	38.5
Color Rendering Index (R_a)	-	5	80	-	-
		7	90	-	-
Thermal Resistance (junction to chip point)	°C/W		-	0.9	-
Beam Angle	°		-	115	-
Nominal Power	W			32.0	
Eye Protection	°	Risk 1	-		-

Notes:

- 1) The COB is tested in pulsed condition at rated test current (10 ms pulse width) and rated temperature ($T_j = T_c = T_a = 25 \text{ °C}$)
- 2) Samsung maintains 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 ($I_F = 900 \text{ mA}$)

CRI (R_a) Min.	Nominal CCT (K)	Flux Rank	Flux Bin	Sorting ¹⁾ @ $T_c = 25 \text{ }^\circ\text{C}$ (lm)		Calculated Flux ²⁾ @ $T_c = 85 \text{ }^\circ\text{C}$ (lm)		
				Min.	Max.	Min.	Max.	
80	2700	3H	42	4485	4761	4081	4332	
			43	4761	5141	4332	4678	
	3000	3H	42	4771	5064	4342	4609	
			43	5064	5467	4608	4975	
	3500	3H	42	4915	5216	4472	4747	
			43	5216	5630	4746	5123	
	4000	3H	41	4747	5058	4320	4603	
			42	5058	5487	4602	4993	
	5000	3H	41	4792	5105	4361	4646	
			42	5105	5528	4645	5030	
	5700	3H	41	4792	5105	4361	4646	
			42	5105	5528	4645	5030	
	90	2700	3Q	33	3527	3810	3210	3467
				34	3810	4200	3467	3822
35				4200	4571	3822	4160	
3000		3Q	33	3599	3887	3276	3538	
			34	3887	4277	3538	3892	
			35	4277	4662	3892	4242	
3500		3Q	33	3707	4004	3374	3644	
			34	4004	4394	3644	3999	
			35	4394	4795	3998	4363	
4000		3Q	33	3815	4121	3472	3750	
			34	4121	4511	3750	4105	
			35	4511	4917	4105	4474	

Notes:

- 1) The COB is tested in pulsed condition at rated test current (10 ms pulse width) and rated temperature ($T_j = T_c = T_a = 25 \text{ }^\circ\text{C}$)
- 2) Calculated flux values are for reference only
- 3) Samsung maintains measurement tolerance of: luminous flux = $\pm 7 \%$, 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	D	2	5	Y	H	R	T	B	3

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package High Power	SPH	
4 5	Color	WW CW	Warm White (T/U/V/W Ranks) Cool White (Q/R Ranks)
6	Product Version	1	
7 8	Form Factor	HD	COB
9	Lens Type	N	No lens
10	Internal Code	D	LC033
11	Chip Type	2	
12	CRI & Sorting Temperature	5 7	Min. 80 25 °C Min. 90
13 14	Forward Voltage (V)	YH	32.5~38.5
15	CCT (K)	W V U T R Q	2700 K WA, WB (MacAdam Ellipse) 3000 K VA, VB (MacAdam Ellipse) VW, VX, VY, VZ (ANSI bin) 3500 K UA, UB (MacAdam Ellipse) 4000 K TA, TB (MacAdam Ellipse) TW, TX, TY, TZ (ANSI bin) 5000 K RA (MacAdam Ellipse) RW, RX, RY, RZ (ANSI bin) 5700 K QW, QX, QY, QZ (ANSI bin)
16	MacAdam / ANSI	2 3 T	MacAdam 2-step MacAdam 3-step ANSI bin
17 18	Luminous Flux	B3	Bin Code: 41, 42, 43 (80 CRI) 33, 34, 35 (90 CRI)

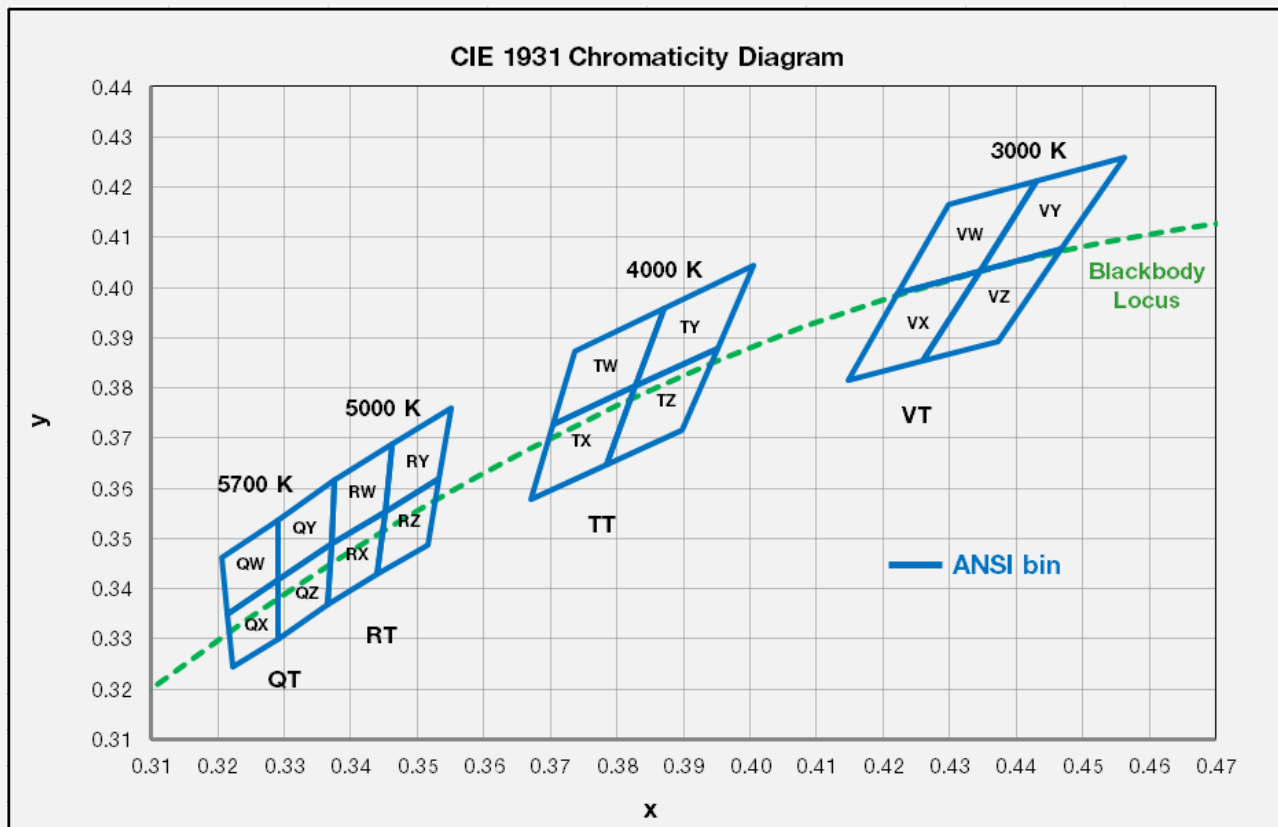
a) Binning Structure ($I_F = 900 \text{ mA}$, $T_c = 25 \text{ }^\circ\text{C}$)

CRI (Ra) Min.	Nominal CCT (K)	Product Code	V _F Rank	Color Rank	Chrom. Bin	Flux Rank	Flux Bin	Flux Range (Φ_v , lm)
80	2700	SPHWW1HDND25YHW2B3	YH	W2	WB	B3	42	4485 ~ 4761
							43	4761 ~ 5141
		SPHWW1HDND25YHW3B3	YH	W3	WA, WB	B3	42	4485 ~ 4761
							43	4761 ~ 5141
	3000	SPHWW1HDND25YHV2B3	YH	V2	VB	B3	42	4771 ~ 5064
							43	5064 ~ 5467
		SPHWW1HDND25YHV3B3	YH	V3	VA, VB	B3	42	4771 ~ 5064
							43	5064 ~ 5467
	3500	SPHWW1HDND25YHU2B3	YH	U2	UB	B3	42	4915 ~ 5216
							43	5216 ~ 5630
		SPHWW1HDND25YHU3B3	YH	U3	UA, UB	B3	42	4915 ~ 5216
							43	5216 ~ 5630
	4000	SPHWW1HDND25YHT2B3	YH	T2	TB	B3	41	4747 ~ 5058
							42	5058 ~ 5487
		SPHWW1HDND25YHT3B3	YH	T3	TA, TB	B3	41	4747 ~ 5058
							42	5058 ~ 5487
	5000	SPHCW1HDND25YHR3B3	YH	R3	RA	B3	41	4792 ~ 5105
							42	5105 ~ 5528
		SPHCW1HDND25YHRTB3	YH	RT	RW, RX, RY, RZ	B3	41	4792 ~ 5105
							42	5105 ~ 5528
	5700	SPHCW1HDND25YHQT B3	YH	QT	QW, QX QY, QZ	B3	41	4792 ~ 5105
							42	5105 ~ 5528

a) Binning Structure ($I_F = 900 \text{ mA}$, $T_c = 25 \text{ }^\circ\text{C}$)

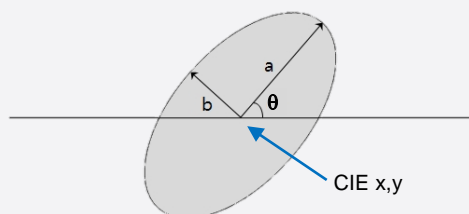
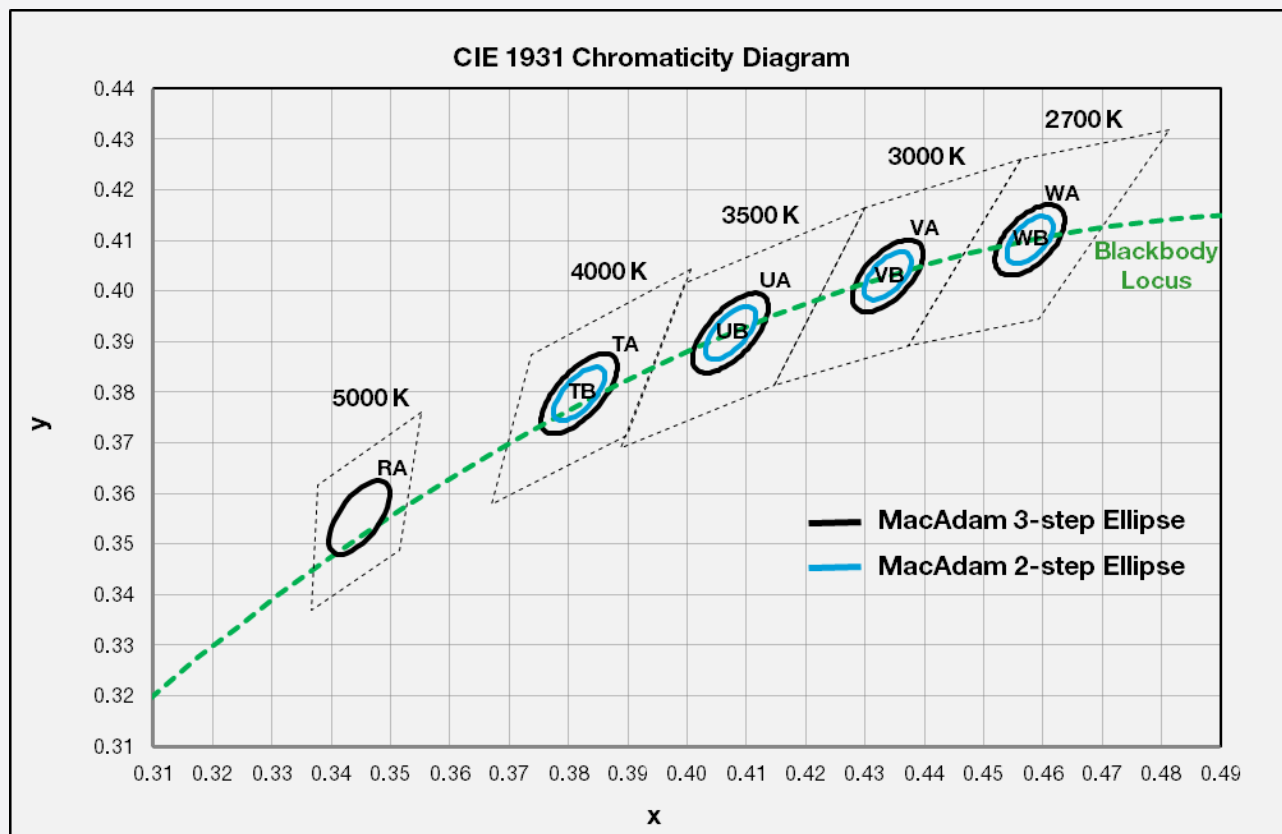
CRI (Ra) Min.	Nominal CCT (K)	Product Code	V _F Rank	Color Rank	Chrom. Bin	Flux Rank	Flux Bin	Flux Range (Φ _v , lm)
90	2700	SPHWW1HDND27YHW2B3	YH	W2	WB	B3	33	3527 ~ 3810
							34	3810 ~ 4200
							35	4200 ~ 4571
		SPHWW1HDND27YHW3B3	YH	W3	WA, WB	B3	33	3527 ~ 3810
							34	3810 ~ 4200
							35	4200 ~ 4571
	3000	SPHWW1HDND27YHV2B3	YH	V2	VB	B3	33	3599 ~ 3887
							34	3887 ~ 4277
							35	4277 ~ 4662
		SPHWW1HDND27YHV3B3	YH	V3	VA, VB	B3	33	3599 ~ 3887
							34	3887 ~ 4277
							35	4277 ~ 4662
	3500	SPHWW1HDND27YHU2B3	YH	U2	UB	B3	33	3707 ~ 4004
							34	4004 ~ 4394
							35	4394 ~ 4795
		SPHWW1HDND27YHU3B3	YH	U3	UA, UB	B3	33	3707 ~ 4004
							34	4004 ~ 4394
							35	4394 ~ 4795
	4000	SPHWW1HDND27YHT2B3	YH	T2	TB	B3	33	3815 ~ 4121
							34	4121 ~ 4511
							35	4511 ~ 4917
		SPHWW1HDND27YHT3B3	YH	T3	TA, TB	B3	33	3815 ~ 4121
							34	4121 ~ 4511
							35	4511 ~ 4917

b) Chromaticity Region & Coordinates ($I_F = 900 \text{ mA}$, $T_c = 25 \text{ }^\circ\text{C}$)



Region	CIE x	CIE y	Region	CIE x	CIE y
V rank (3000 K)					
VW	0.4223	0.3990	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	0.3990	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	0.3880
	0.3703	0.3726		0.3828	0.3803
TX	0.3703	0.3726	TZ	0.3828	0.3803
	0.3828	0.3803		0.3952	0.3880
	0.3784	0.3647		0.3898	0.3716
	0.3670	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 ($I_F = 900 \text{ mA}$, $T_c = 25 \text{ }^\circ\text{C}$)


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	0.4030	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

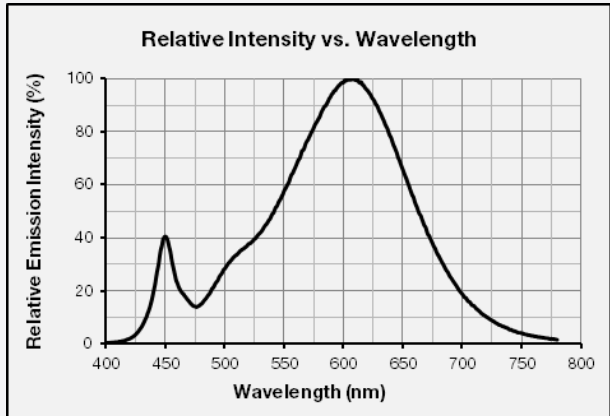
Note:

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

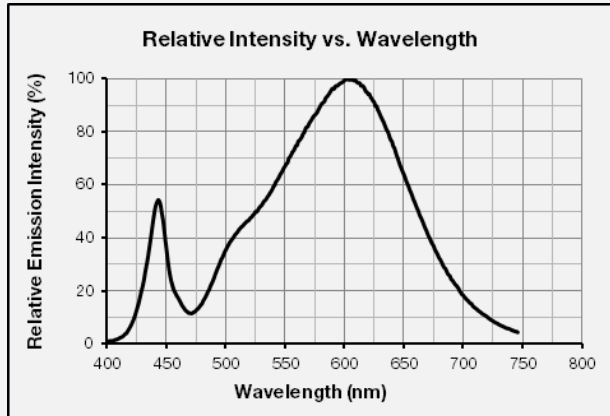
3. Typical Characteristics Graphs

a) Spectrum Distribution ($I_f = 900 \text{ mA}$, $T_c = 25 \text{ }^\circ\text{C}$)

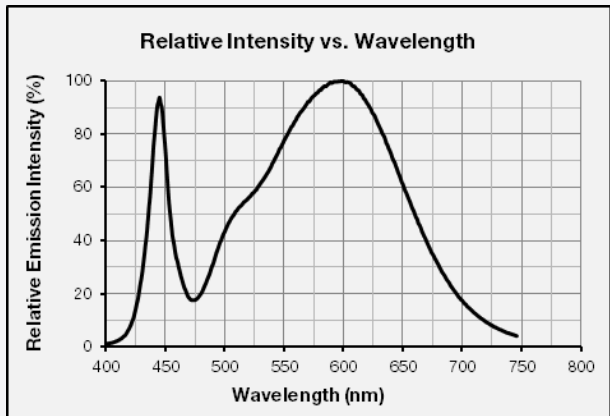
CCT: 2700 K



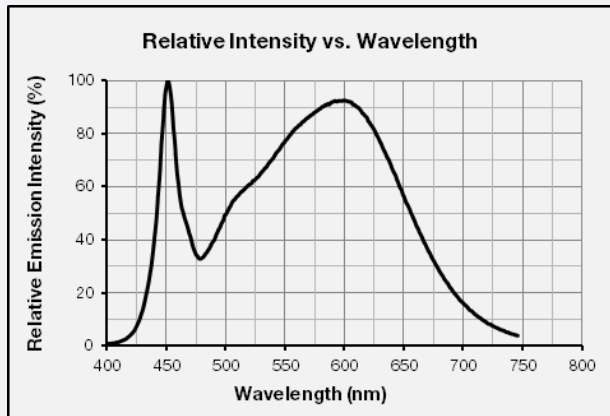
CCT: 3000 K



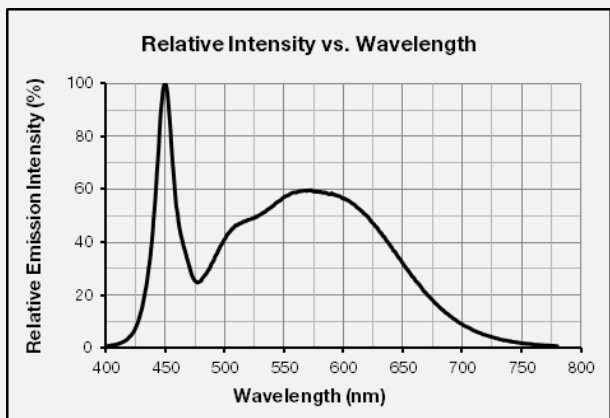
CCT: 3500 K



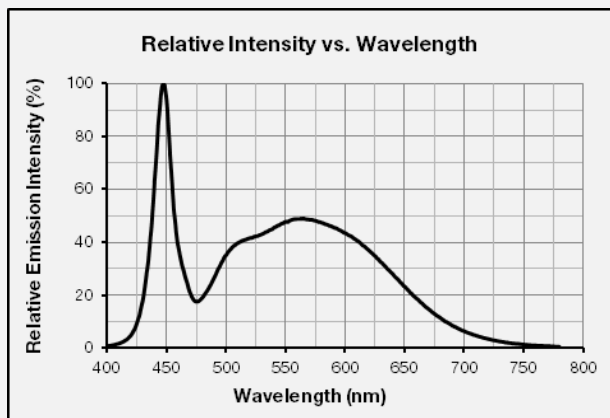
CCT: 4000 K



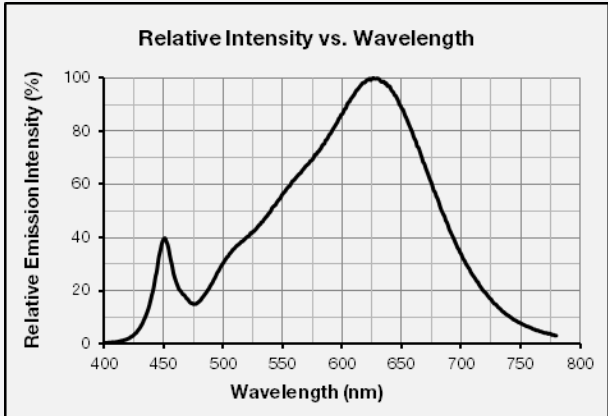
CCT: 5000 K



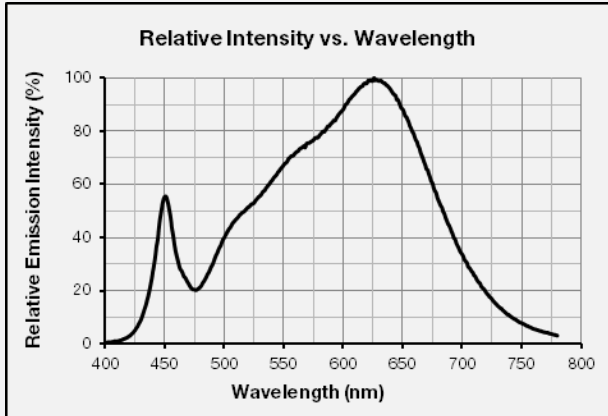
CCT: 5700 K



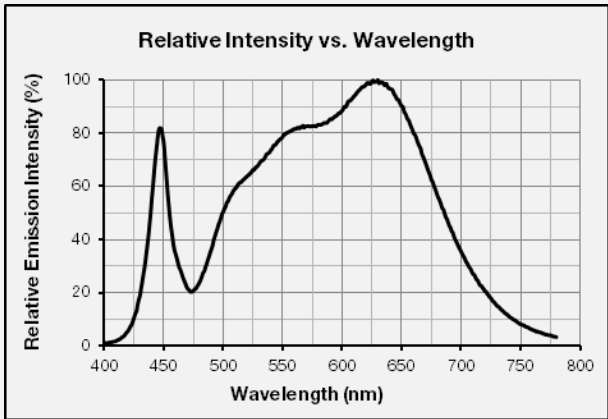
CCT: 2700 K (90 CRI)



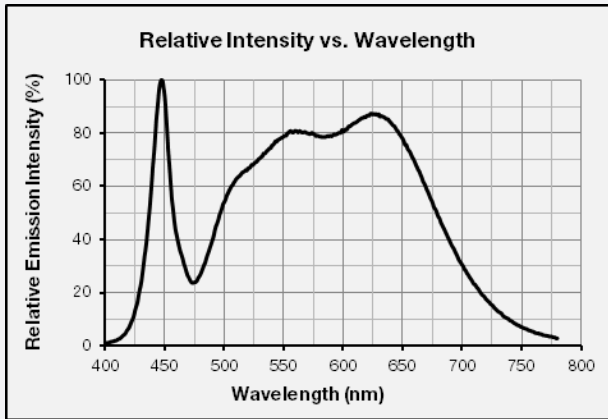
CCT: 3000 K (90 CRI)



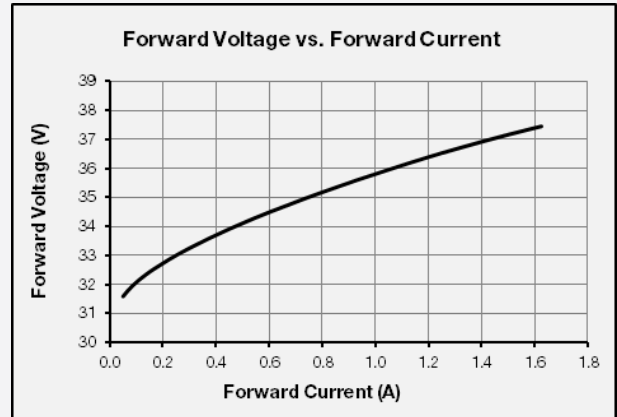
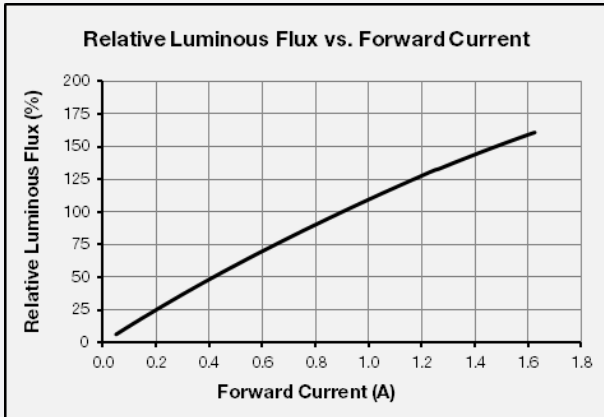
CCT: 3500 K (90 CRI)



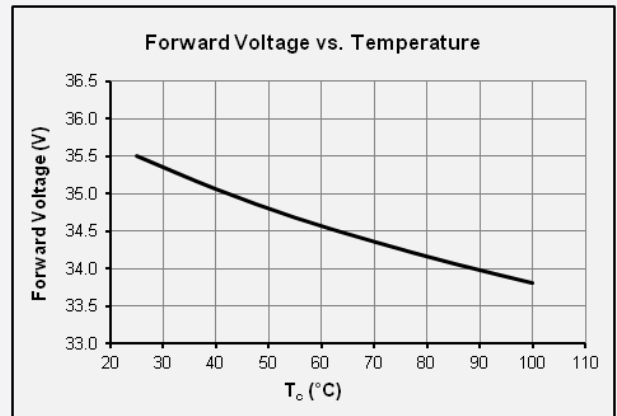
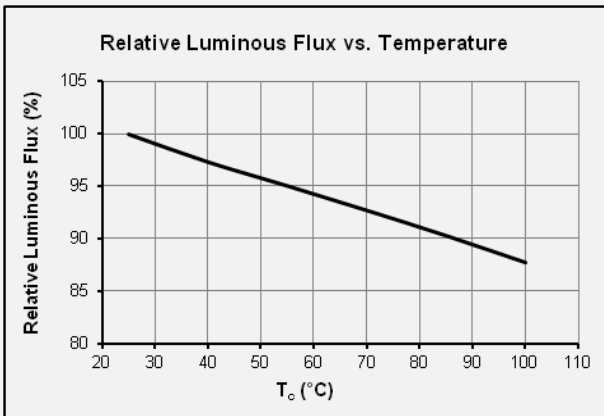
CCT: 4000 K (90 CRI)



b) Forward Current Characteristics ($T_c = 25\text{ }^\circ\text{C}$)

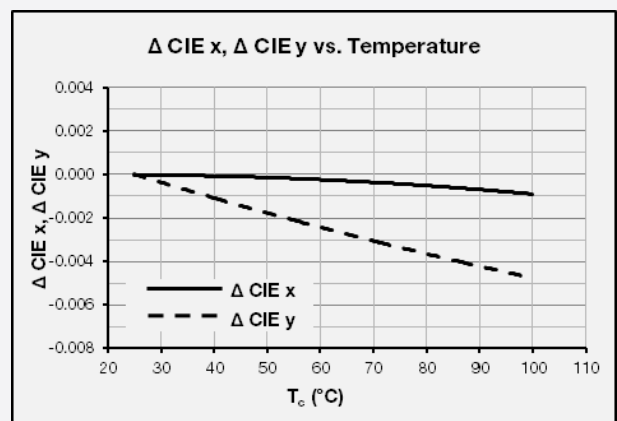
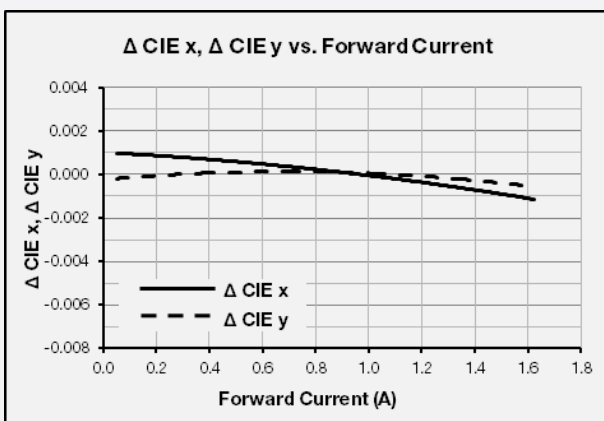


c) Temperature Characteristics ($I_F = 900\text{ mA}$)

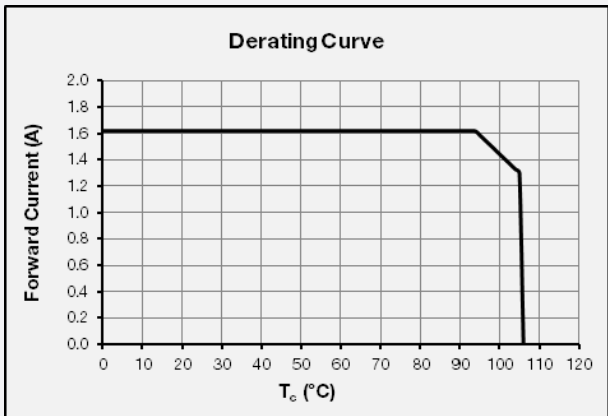


d) Color Shift Characteristics $T_c = 25\text{ }^\circ\text{C}$

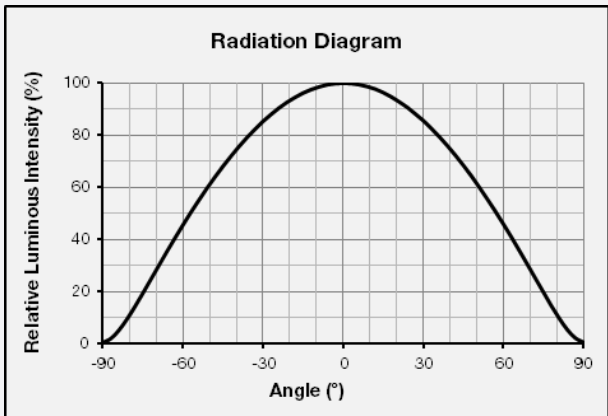
$I_F = 900\text{ mA}$



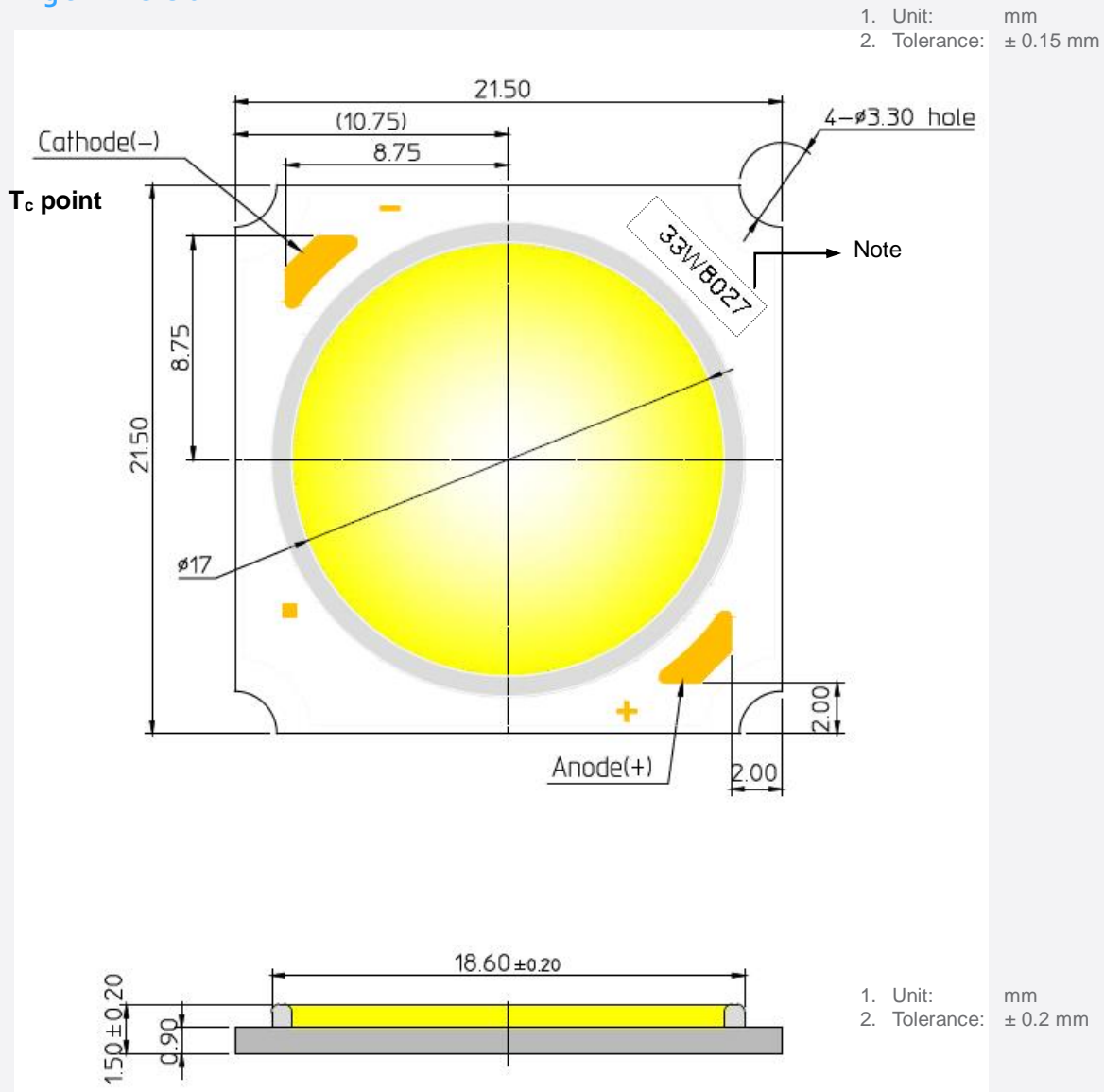
e) Derating Curve



f) Beam Angle Characteristics ($I_F = 900$ mA, $T_c = 25$ °C)



4. Outline Drawing & Dimension



Item	Dimension	Tolerance	Unit
Length	21.50	± 0.15	mm
Width	21.50	± 0.15	mm
Height	1.50	± 0.20	mm
Light Emitting Surface (LES) Diameter	17	± 0.15	mm

Note: Denoted product information above is only an example
(33W8027 : 33W, CRI80+, 2700K)

5. Reliability Test Items & Conditions

a) Test Items

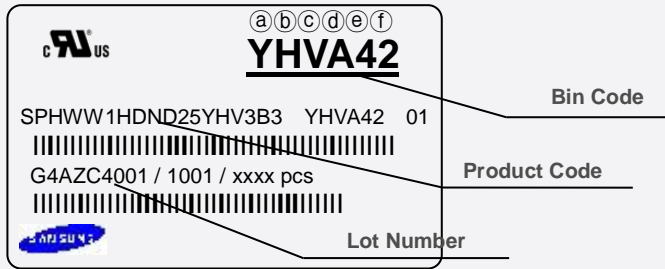
Test Item	Test Condition	Test Hour / Cycle
Room Temperature Life Test	25 °C, I _F = max	1000 h
High Temperature Humidity Life Test	85 °C, 85 % RH, DC Derating, I _F = max	1000 h
High Temperature Life Test	105 °C, DC Derating, I _F = max	1000 h
Low Temperature Life Test	-40 °C, DC 1620 mA	1000 h
High Temperature Storage	120 °C	1000 h
Low Temperature Storage	-40 °C	1000 h
Thermal Shock	-45 °C / 15 min ↔ 125 °C / 15 min temperature change in 5 min	200 cycles
Temperature Cycle On/Off Test	-40 °C / 85 °C each 20 min, 100 min transfer power on/off each 5 min, DC 900 mA	100 cycles
Temperature Humidity Storage Test	-10 °C ↔ 25 °C, 95 % RH ↔ 85 °C, 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 °C, 5 % salt water 8 h spray, 16 h dwell	2 cycles

b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T _c = 25 °C)	Limit	
			Min.	Max.
Forward Voltage	V _F	I _F = 900 mA	L.S.L. * 0.9	U.S.L. * 1.1
Luminous Flux	Φ _v	I _F = 900 mA	L.S.L. * 0.7	U.S.L. * 1.3

6. Label Structure

a) Label Structure



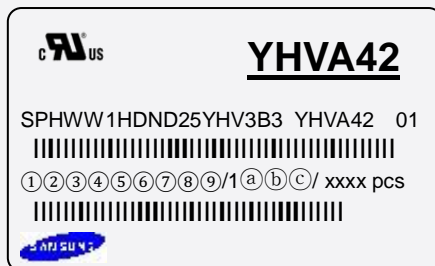
Note: Denoted bin code and product code above is only an example (see description on page 5)

Bin Code:

- ⒶⒷ: Forward Voltage bin (refer to page 11)
- ⒸⒹ: Chromaticity bin (refer to page 9-10)
- ⒺⒻ: Luminous Flux bin (refer to page 6)

b) Lot Number

The lot number is composed of the following characters:



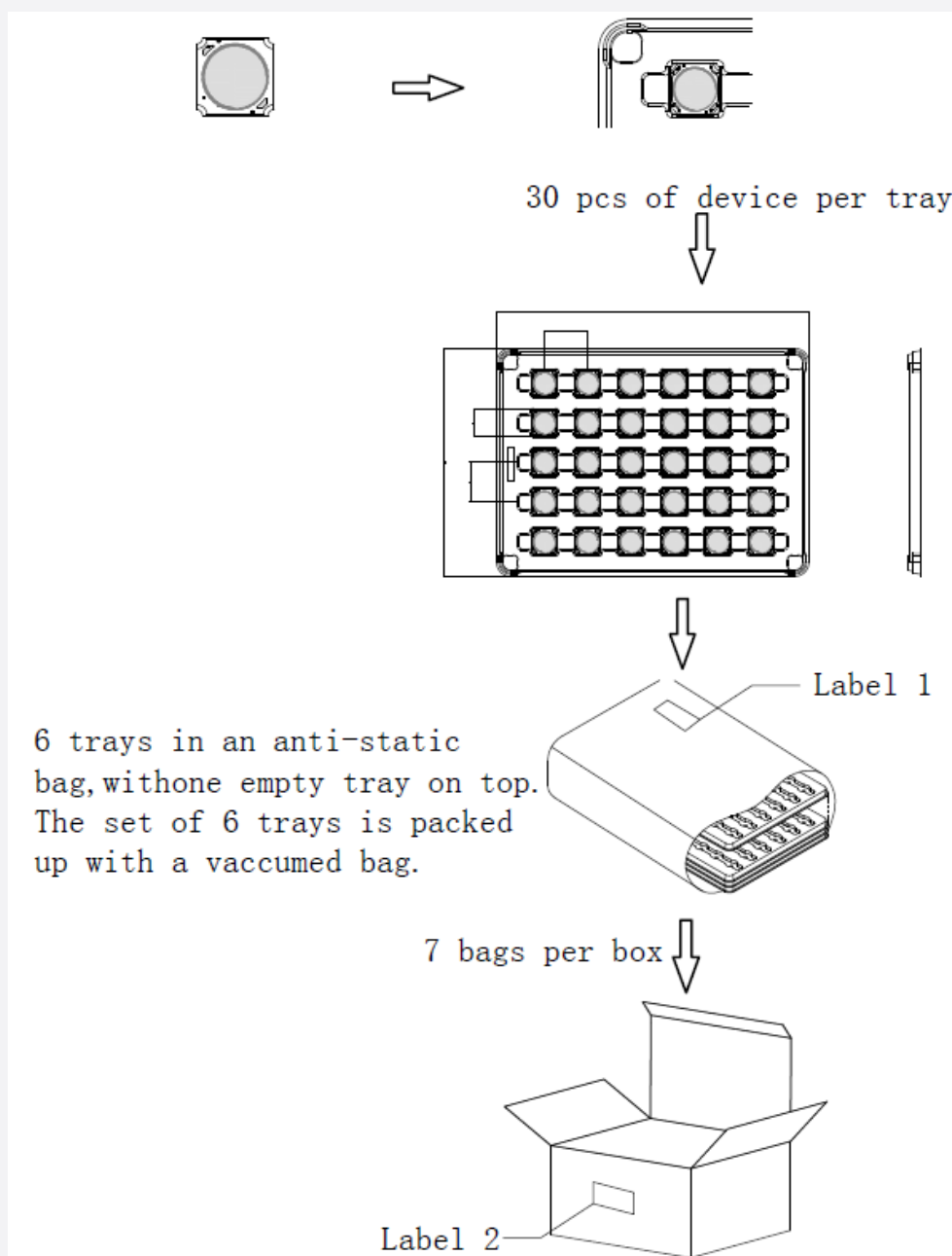
① ③④⑤⑥⑦⑧⑨ / 1ⒶⒷⒸ / xxxx pcs

- 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)

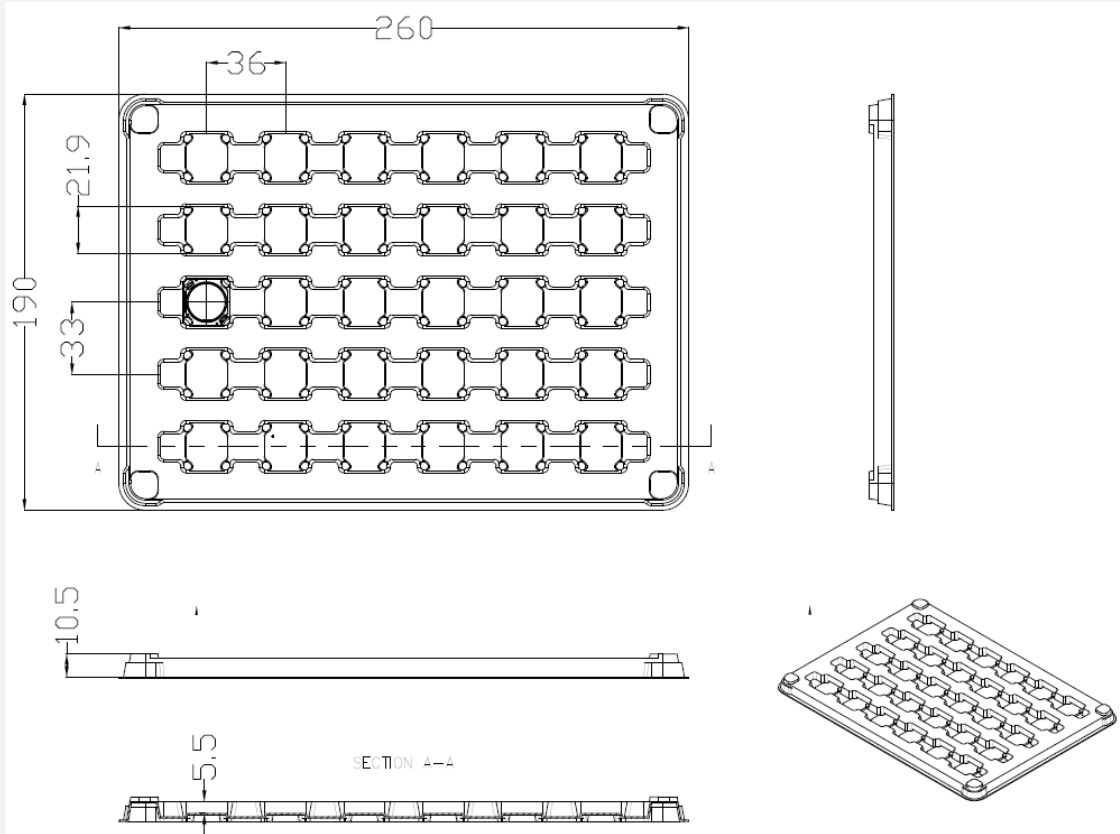
7. Packing Structure

Packing material	Max. quantity in pcs of COB	Dimension (mm)			
		Length	Width	Height	Tolerance
Tray	30	260	190	11.5	1.0
Anti-static Bag	150 (6 trays)	387	350	-	10
Box	1,050 (7 anti-static bag)	270	200	255	10

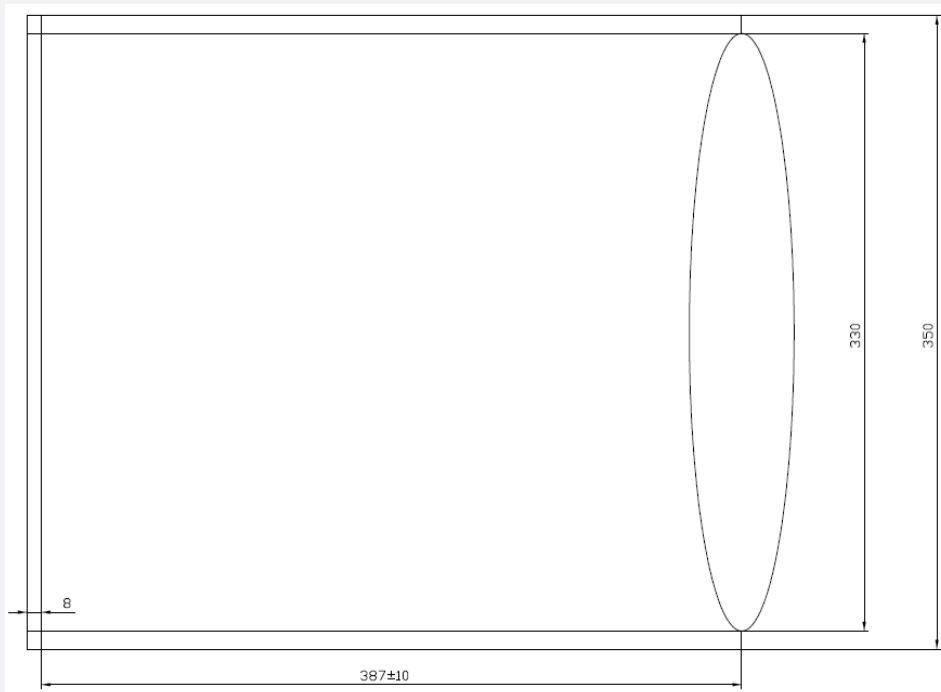
a) Packing Structure



b) Tray

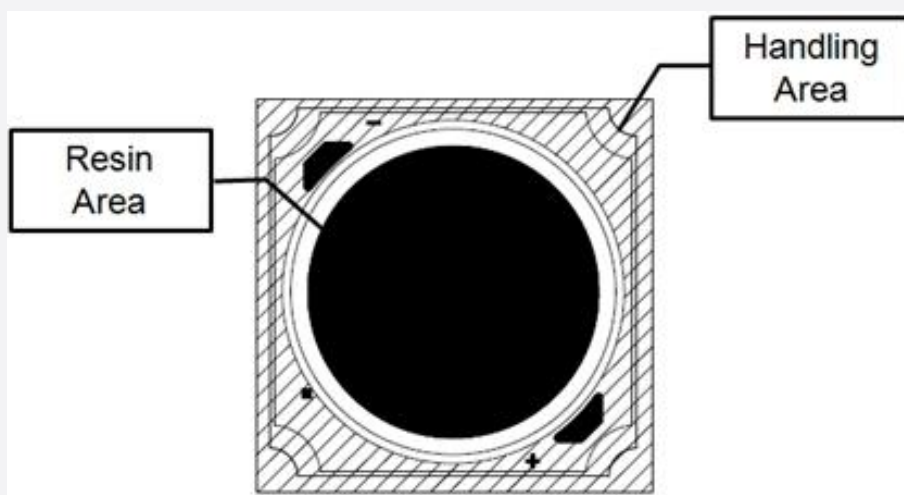


c) Anti-static Bag



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 °C, 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 °C / 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 °C.
- 6) Devices must be baked for 1 hour at 60 ± 5 °C, 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) In case of driving the LC033B around the extremely low current level, 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.
- 9) 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.
- 10) 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.



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