

High Voltage LED Series Chip on Board

LC033B



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



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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)	-	3	70	-	-
		5	80 ($R_9 > 0$)	-	-
		7	90	-	-
Thermal Resistance (junction to chip point)	°C/W		-	0.9	-
Beam Angle	°		-	115	-
Working Voltage for Insulation	V				50
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 = $\pm 5 \%$, CRI = ± 1
- 3) Max $T_c = 105 \text{ °C}$ (at max current) is for ENEC condition. Refer to the derating curve, '3. Typical Characteristics Graph' designed within the range.

c) Luminous Flux Characteristics (I_F = 900 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	4P	41	4021	4570	3619	4113
			42	4570	5118	4113	4606
	4000	4P	41	4222	4798	3800	4318
			42	4798	5374	4318	4836
	5000	4P	41	4262	4844	3836	4359
			42	4844	5425	4359	4882
	2700	3P	38	3384	3659	3079	3330
			39	3659	3934	3330	3580
			40	3934	4210	3580	3831
			41	4210	4485	3831	4081
		3G	40	3934	4210	3580	3831
			41	4210	4485	3831	4081
	3000	3P	38	3599	3892	3276	3542
			39	3892	4185	3542	3809
			40	4185	4478	3809	4075
			41	4478	4771	4075	4342
		3G	40	4185	4478	3809	4075
			41	4478	4771	4075	4342
80	3500	3P	38	3707	4009	3374	3648
			39	4009	4311	3648	3923
			40	4311	4613	3923	4198
			41	4613	4915	4198	4472
		3G	40	4311	4613	3923	4198
			41	4613	4915	4198	4472
	4000	3P	38	3815	4126	3472	3755
			39	4126	4437	3755	4037
			40	4437	4747	4037	4320
			41	4747	5058	4320	4603
		3G	40	4437	4747	4037	4320
			41	4747	5058	4320	4603
	5000	3P	38	3851	4165	3505	3790
			39	4165	4478	3790	4075
			40	4478	4792	4075	4361
			41	4792	5105	4361	4646
		3G	40	4478	4792	4075	4361
			41	4792	5105	4361	4646
	5700	3P	38	3851	4165	3505	3790
			39	4165	4478	3790	4075
			40	4478	4792	4075	4361
			41	4792	5105	4361	4646
		3G	40	4478	4792	4075	4361
			41	4792	5105	4361	4646

c) Luminous Flux Characteristics (I_F = 900 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	3P	31	2963	3245	2696	2953
			32	3245	3527	2953	3210
			33	3527	3810	3210	3467
	3000	3P	31	3024	3312	2751	3013
			32	3312	3599	3013	3276
			33	3599	3887	3276	3538
	3500	3P	31	3114	3411	2834	3104
			32	3411	3707	3104	3374
			33	3707	4004	3374	3644
	4000	3P	31	3205	3510	2917	3194
			32	3510	3815	3194	3472
			33	3815	4121	3472	3750
95	2700	3J	31	2857	3175	2600	2889
			32	3175	3492	2889	3178
	3000	3J	31	2946	3273	2681	2978
			32	3273	3600	2978	3276
	3500	3J	31	3034	3371	2761	3068
			32	3371	3708	3068	3375

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	D	2	5	Y	H	R	T	3	P

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	3 5 7 8	Min. 70 Min. 80 Min. 90 Min 95 25 °C				
13 14	Forward Voltage (V)	YH	32.5~38.5				
15	CCT (K)	W V U T R Q	2700 K 3000 K 3500 K 4000 K 5000 K 5700 K	WA, WB VA, VB UA, UB TA, TB RA	(MacAdam Ellipse) (MacAdam Ellipse) (MacAdam Ellipse) (MacAdam Ellipse) (MacAdam Ellipse)	VW, VX, VY, VZ TW, TX, TY, TZ RW, RX, RY, RZ QW, QX, QY, QZ	(ANSI bin) (ANSI bin) (ANSI bin) (ANSI bin)
16	MacAdam / ANSI	2 3 T	MacAdam 2-step MacAdam 3-step ANSI bin				
17 18	Luminous Flux	3J 3P 3G 4P	Bin Code: 31, 32 (95 CRI) 31, 32, 33 (90 CRI); 38, 39, 40, 41 (80 CRI) 40, 41 (80 CRI) 41, 42 (70 CRI)				

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

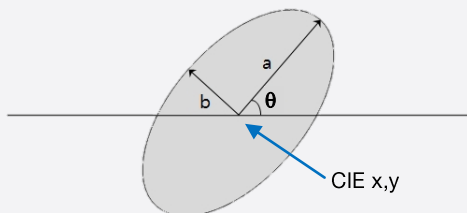
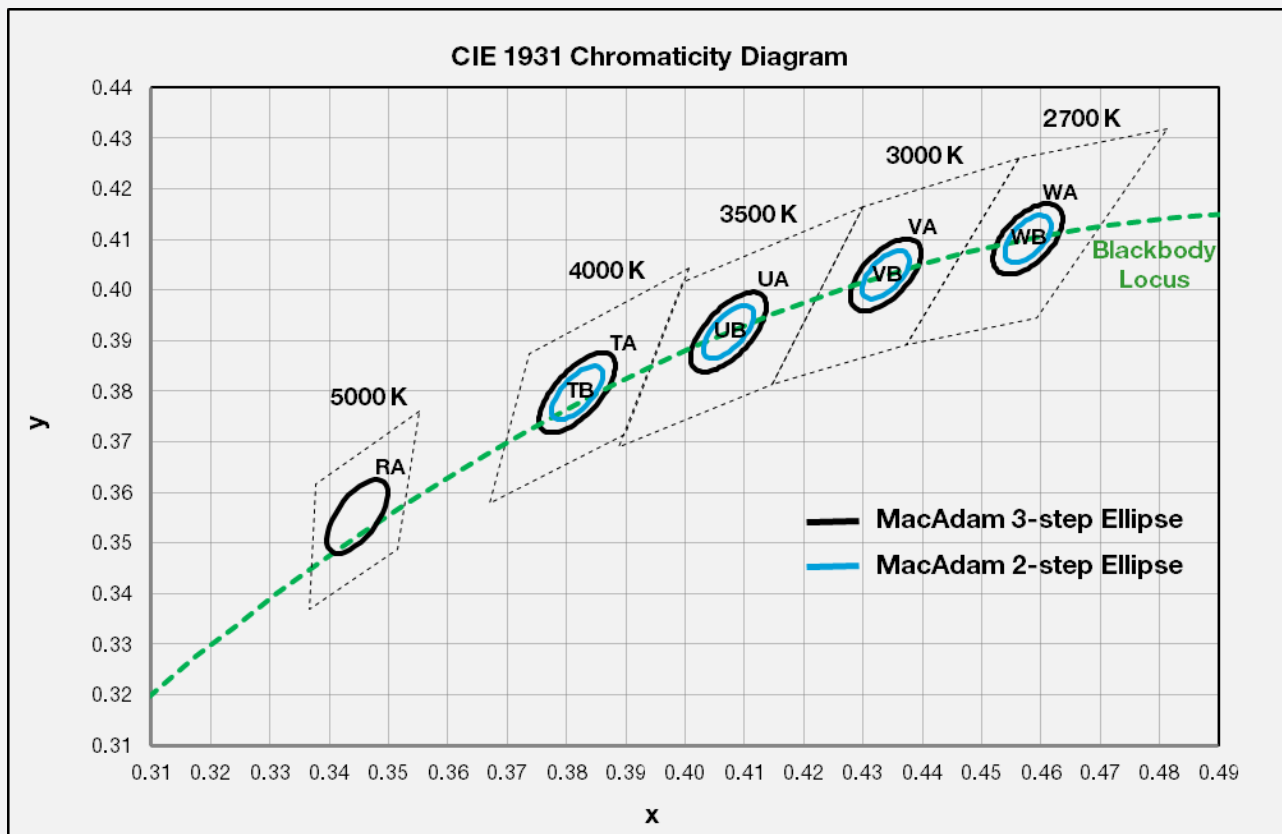
CRI (R_a) Min.	Nominal CCT (K)	Product Code	V_f Rank	Color Rank	Chrom. Bin	Flux Rank	Flux Bin	Flux Range (Φ_v , lm)
70	3000	SPHWW1HDND23YHVT4P	YH	VT	VW, VX VY, VZ	4P	41	4021 ~ 4570
							42	4570 ~ 5118
	4000	SPHWW1HDND23YHTT4P	YH	TT	TW, TX TY, TZ	4P	41	4222 ~ 4798
							42	4798 ~ 5374
	5000	SPHCW1HDND23YHRT4P	YH	RT	RW, RX RY, RZ	4P	41	4262 ~ 4844
							42	4844 ~ 5425
	2700	SPHWW1HDND25YHW23P	YH	W2	WB	3P	38	3384 ~ 3659
							39	3659 ~ 3934
							40	3934 ~ 4210
							41	4210 ~ 4485
		SPHWW1HDND25YHW33P	YH	W3	WA, WB	3P	38	3384 ~ 3659
							39	3659 ~ 3934
							40	3934 ~ 4210
							41	4210 ~ 4485
		SPHWW1HDND25YHW23G	YH	W2	WB	3G	40	3934 ~ 4210
							41	4210 ~ 4485
		SPHWW1HDND25YHW33G	YH	W3	WA, WB	3G	40	3934 ~ 4210
							41	4210 ~ 4485
80	3000	SPHWW1HDND25YHV23P	YH	V2	VB	3P	38	3599 ~ 3892
							39	3892 ~ 4185
							40	4185 ~ 4478
							41	4478 ~ 4771
		SPHWW1HDND25YHV33P	YH	V3	VA, VB	3P	38	3599 ~ 3892
							39	3892 ~ 4185
							40	4185 ~ 4478
							41	4478 ~ 4771
		SPHWW1HDND25YHV23G	YH	V2	VB	3G	40	4185 ~ 4478
							41	4478 ~ 4771
		SPHWW1HDND25YHV33G	YH	V3	VA, VB	3G	40	4185 ~ 4478
							41	4478 ~ 4771
	3500	SPHWW1HDND25YHU23P	YH	U2	UB	3P	38	3707 ~ 4009
							39	4009 ~ 4311
							40	4311 ~ 4613
		SPHWW1HDND25YHU33P	YH	U3	UA, UB	3P	41	4613 ~ 4915
							38	3707 ~ 4009
							39	4009 ~ 4311
		SPHWW1HDND25YHU33P	YH	U3	UA, UB	3P	40	4311 ~ 4613
							41	4613 ~ 4915

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

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)
80	3500	SPHWW1HDND25YHU23G	YH	U2	UB	3G	40	4311 ~ 4613
							41	4613 ~ 4915
		SPHWW1HDND25YHU33G	YH	U3	UA, UB	3G	40	4311 ~ 4613
							41	4613 ~ 4915
		SPHWW1HDND25YHT23P	YH	T2	TB	3P	38	3815 ~ 4126
							39	4126 ~ 4437
							40	4437 ~ 4747
							41	4747 ~ 5058
							38	3815 ~ 4126
							39	4126 ~ 4437
	4000	SPHWW1HDND25YHT33P	YH	T3	TA, TB	3P	40	4437 ~ 4747
							41	4747 ~ 5058
							41	4747 ~ 5058
		SPHWW1HDND25YHT23G	YH	T2	TB	3G	40	4437 ~ 4747
							41	4747 ~ 5058
		SPHWW1HDND25YHT33G	YH	T3	TA, TB	3G	40	4437 ~ 4747
							41	4747 ~ 5058
							41	4747 ~ 5058
		SPHWW1HDND25YHT33G	YH	T3	TA, TB	3G	40	4437 ~ 4747
							41	4747 ~ 5058
							41	4747 ~ 5058
	5000	SPHCW1HDND25YHR33P	YH	R3	RA	3P	38	3851 ~ 4165
							39	4165 ~ 4478
							40	4478 ~ 4792
		SPHCW1HDND25YHR33G	YH	R3	RA	3G	41	4792 ~ 5105
							41	4792 ~ 5105
							41	4792 ~ 5105
		SPHCW1HDND25YHRT3P	YH	RT	RW, RX, RY, RZ	3P	38	3851 ~ 4165
							39	4165 ~ 4478
							40	4478 ~ 4792
		SPHCW1HDND25YHRT3G	YH	RT	RW, RX, RY, RZ	3G	41	4792 ~ 5105
							41	4792 ~ 5105
							41	4792 ~ 5105
	5700	SPHCW1HDND25YHQT3P	YH	QT	QW, QX QY, QZ	3P	38	3851 ~ 4165
							39	4165 ~ 4478
							40	4478 ~ 4792
		SPHCW1HDND25YHQT3G	YH	QT	QW, QX QY, QZ	3G	41	4792 ~ 5105
							41	4792 ~ 5105
							41	4792 ~ 5105

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

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	SPHWW1HDND27YHW23P	YH	W2	WB	3P	31	2963 ~ 3245
							32	3245 ~ 3527
							33	3527 ~ 3810
		SPHWW1HDND27YHW33P	YH	W3	WA, WB	3P	31	2963 ~ 3245
							32	3245 ~ 3527
							33	3527 ~ 3810
	3000	SPHWW1HDND27YHV23P	YH	V2	VB	3P	31	3024 ~ 3312
							32	3312 ~ 3599
							33	3599 ~ 3887
		SPHWW1HDND27YHV33P	YH	V3	VA, VB	3P	31	3024 ~ 3312
							32	3312 ~ 3599
							33	3599 ~ 3887
	3500	SPHWW1HDND27YHU23P	YH	U2	UB	3P	31	3114 ~ 3411
							32	3411 ~ 3707
							33	3707 ~ 4004
		SPHWW1HDND27YHU33P	YH	U3	UA, UB	3P	31	3114 ~ 3411
							32	3411 ~ 3707
							33	3707 ~ 4004
	4000	SPHWW1HDND27YHT23P	YH	T2	TB	3P	31	3205 ~ 3510
							32	3510 ~ 3815
							33	3815 ~ 4121
		SPHWW1HDND27YHT33P	YH	T3	TA, TB	3P	31	3205 ~ 3510
							32	3510 ~ 3815
							33	3815 ~ 4121
95	2700	SPHWW1HDND28YHW23J	YH	W2	WB	3J	31	2857 ~ 3175
							32	3175 ~ 3492
		SPHWW1HDND28YHW33J	YH	W3	WA, WB	3J	31	2857 ~ 3175
							32	3175 ~ 3492
	3000	SPHWW1HDND28YHV23J	YH	V2	VB	3J	31	2946 ~ 3273
							32	3273 ~ 3600
		SPHWW1HDND28YHV33J	YH	V3	VA, VB	3J	31	2946 ~ 3273
							32	3273 ~ 3600
	3500	SPHWW1HDND28YHU23J	YH	U2	UB	3J	31	3034 ~ 3371
							32	3371 ~ 3708
		SPHWW1HDND28YHU33J	YH	U3	UA, UB	3J	31	3034 ~ 3371
							32	3371 ~ 3708

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


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

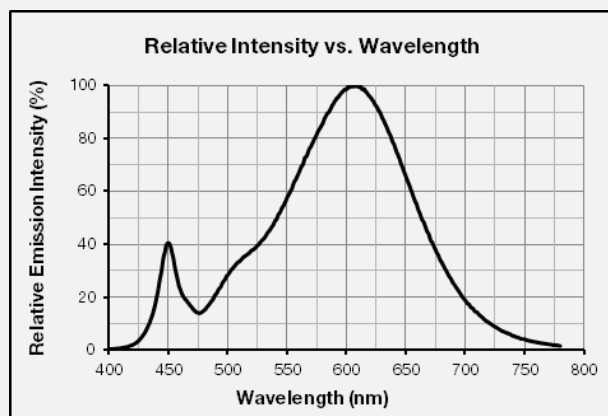
Note:

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

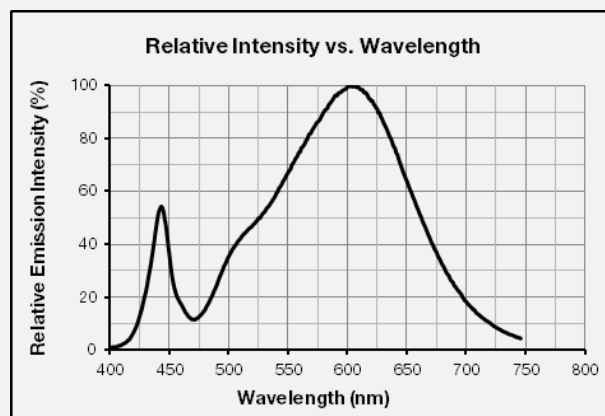
3. Typical Characteristics Graphs

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

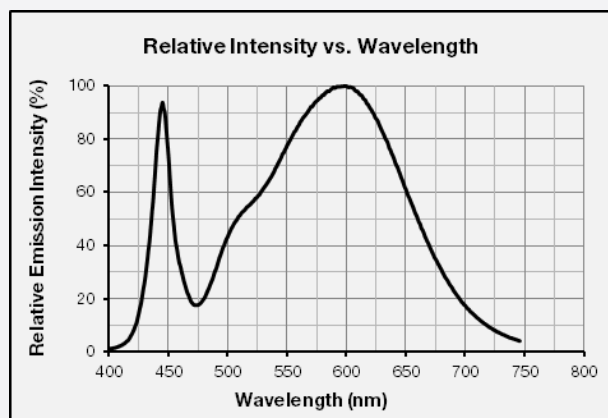
CCT: 2700 K



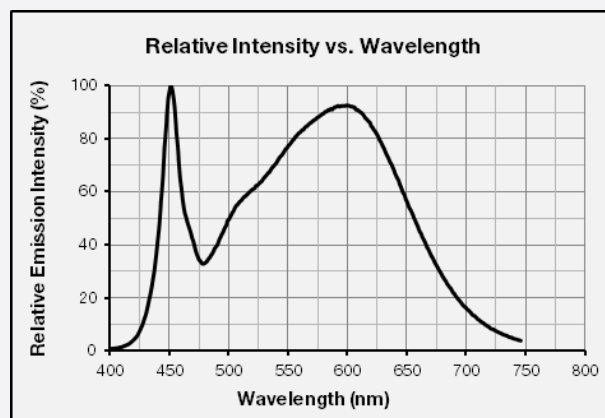
CCT: 3000 K



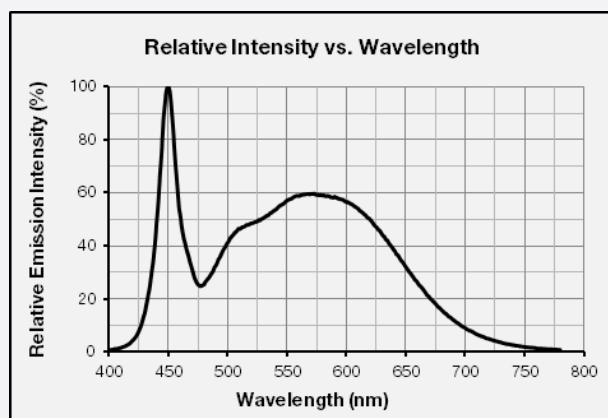
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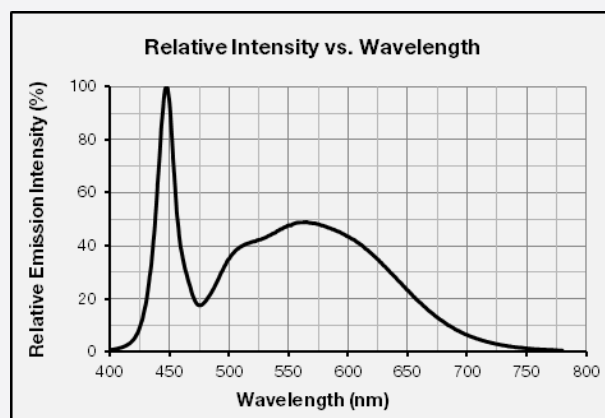
CCT: 4000 K

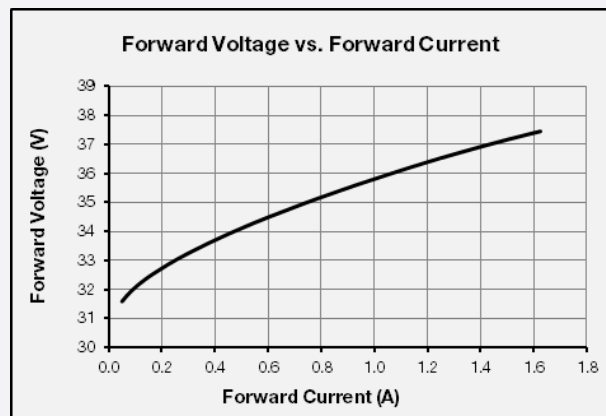
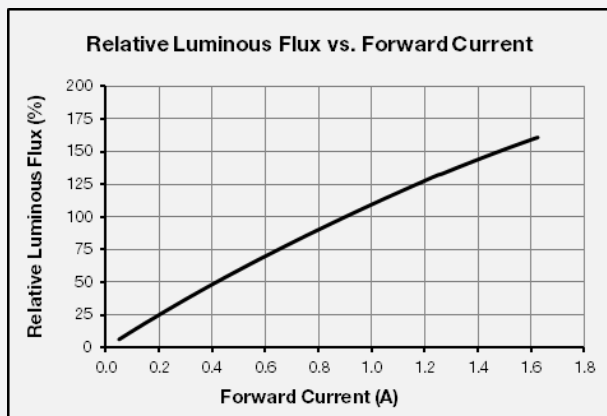
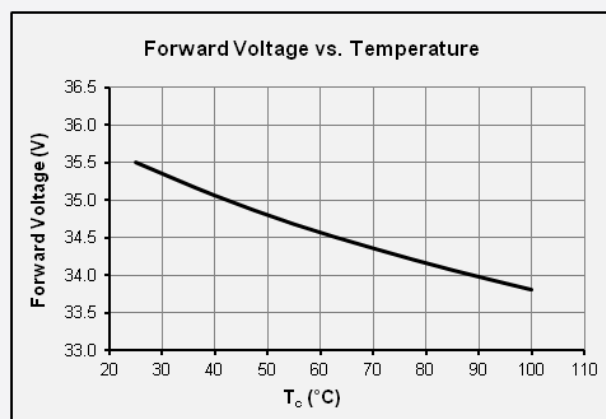
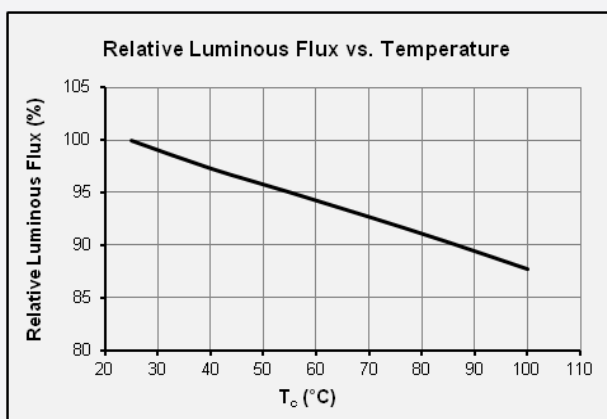
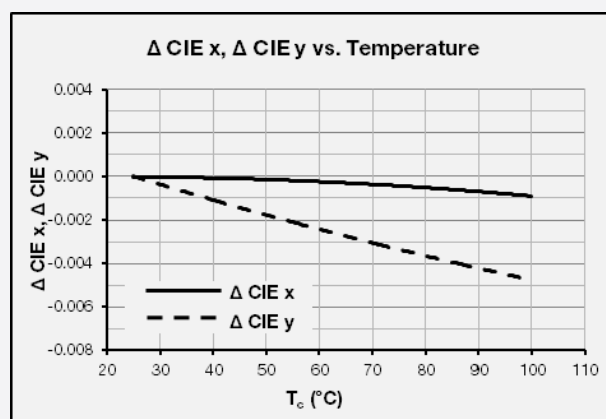
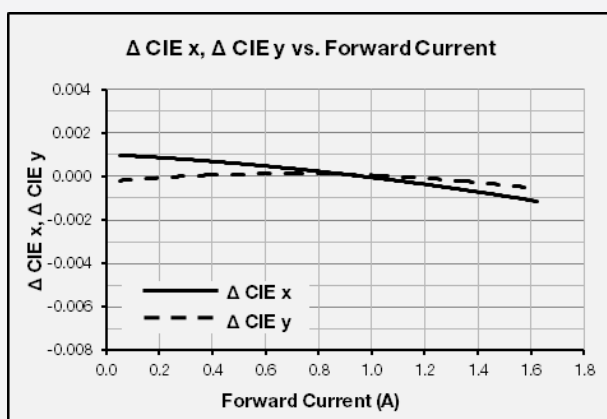


CCT: 5000 K

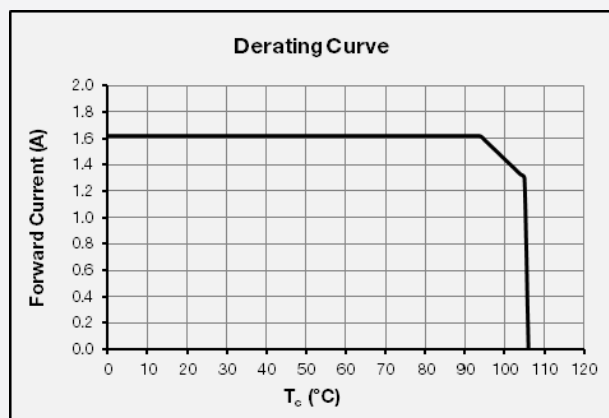
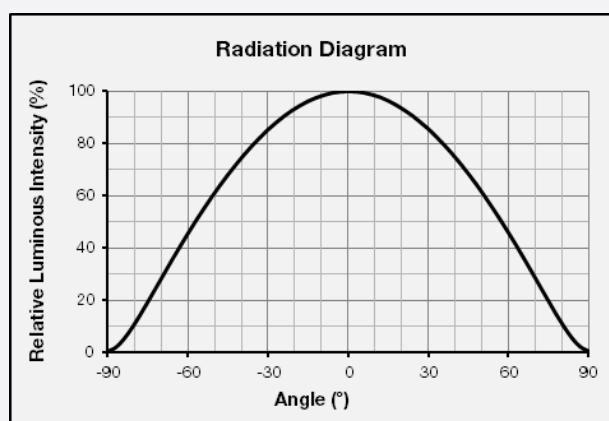


CCT: 5700 K

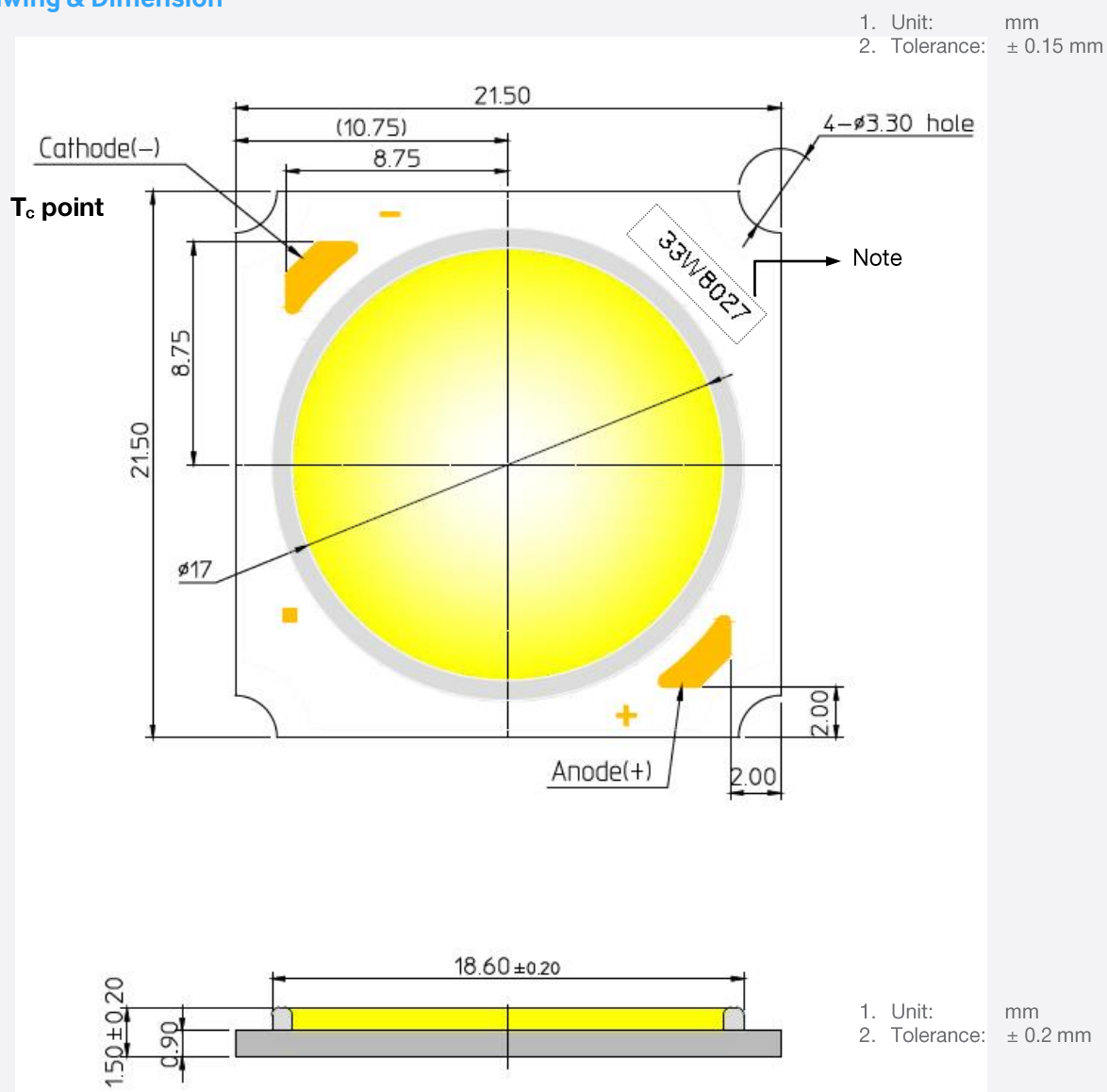


b) Forward Current Characteristics ($T_c = 25^\circ\text{C}$)

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

d) Color Shift Characteristics
 $T_c = 25^\circ\text{C}$
 $I_f = 900\text{ mA}$


e) Derating Curve

f) Beam Angle Characteristics ($I_F = 900 \text{ mA}$, $T_c = 25^{\circ}\text{C}$)

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

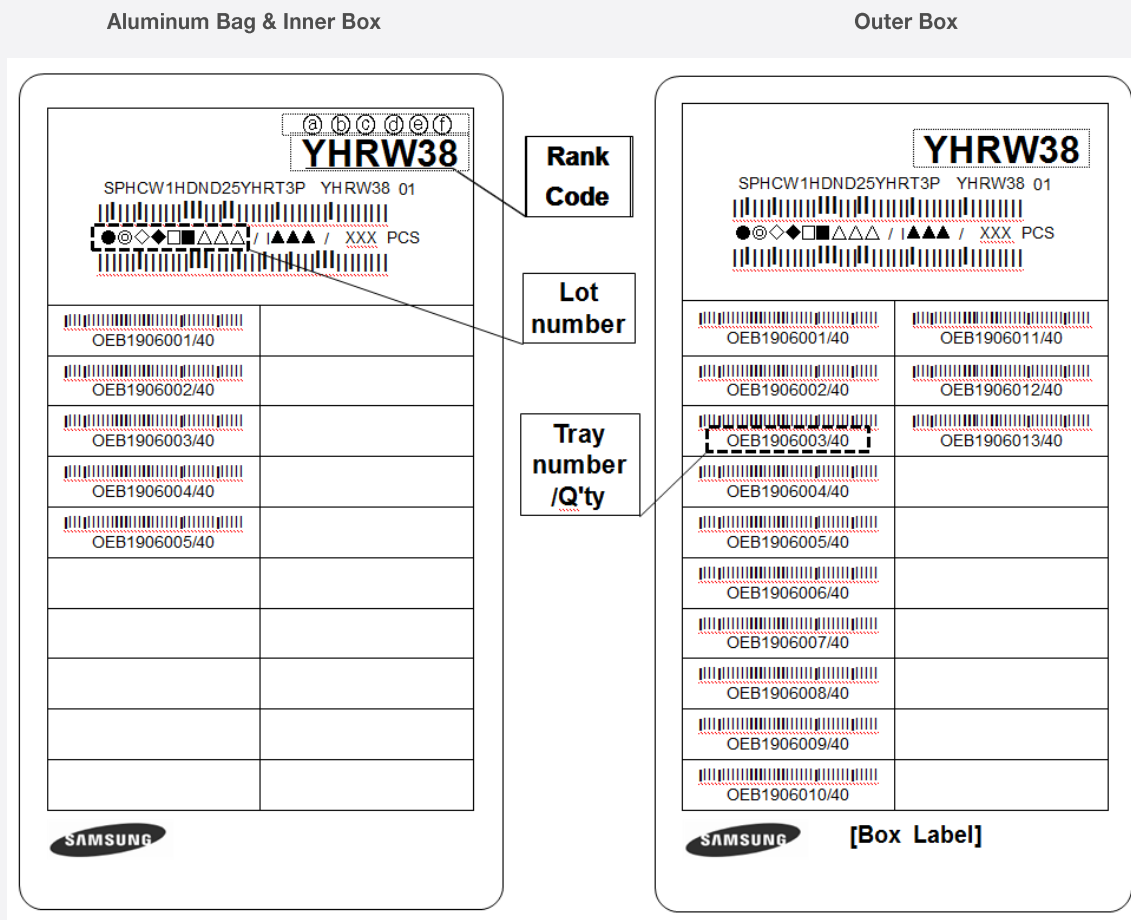
Test Item	Test Condition	Test Hour / Cycle
Room Temperature Life Test	25 °C, $I_F = \max$	1000 h
High Temperature Humidity Life Test	85 °C, 85 % RH, DC Derating, $I_F = \max$	1000 h
High Temperature Life Test	105 °C, DC Derating, $I_F = \max$	1000 h
Low Temperature Life Test	-40 °C, DC 1620 mA	1000 h
High Temperature Storage	120 °C	1000 h
Low Temperature Storage	-40 °C	1000 h
Thermal Shock	-45 °C / 15 min $\leftrightarrow$ 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 $\leftrightarrow$ 25 °C, 95 % RH $\leftrightarrow$ 85 °C, 95 % RH (24 h / cycle)	100 cycles
ESD (HBM)	R_1 : 10 M Ω R_2 : 1.5 k Ω C: 100 pF V: ± 2 kV	5 times
ESD (MM)	R_1 : 10 M Ω R_2 : 0 k Ω 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 $\leftrightarrow$ 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 rank code and product code above is only an example (see description on page 5)

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:

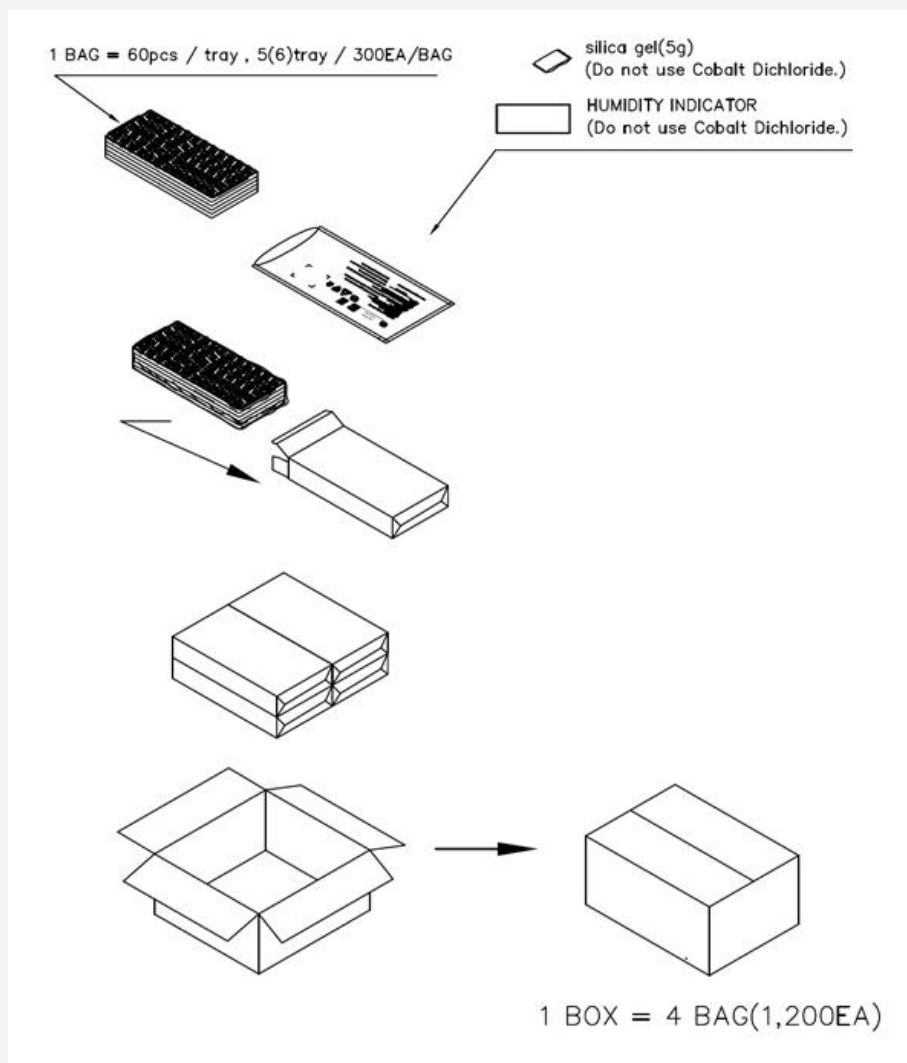
● ◎ ◇ ◆ □ ■ △ △ △ / 1 ▲ ▲ ▲ / xxx PCS

- : Production site (S: Giheung, 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)

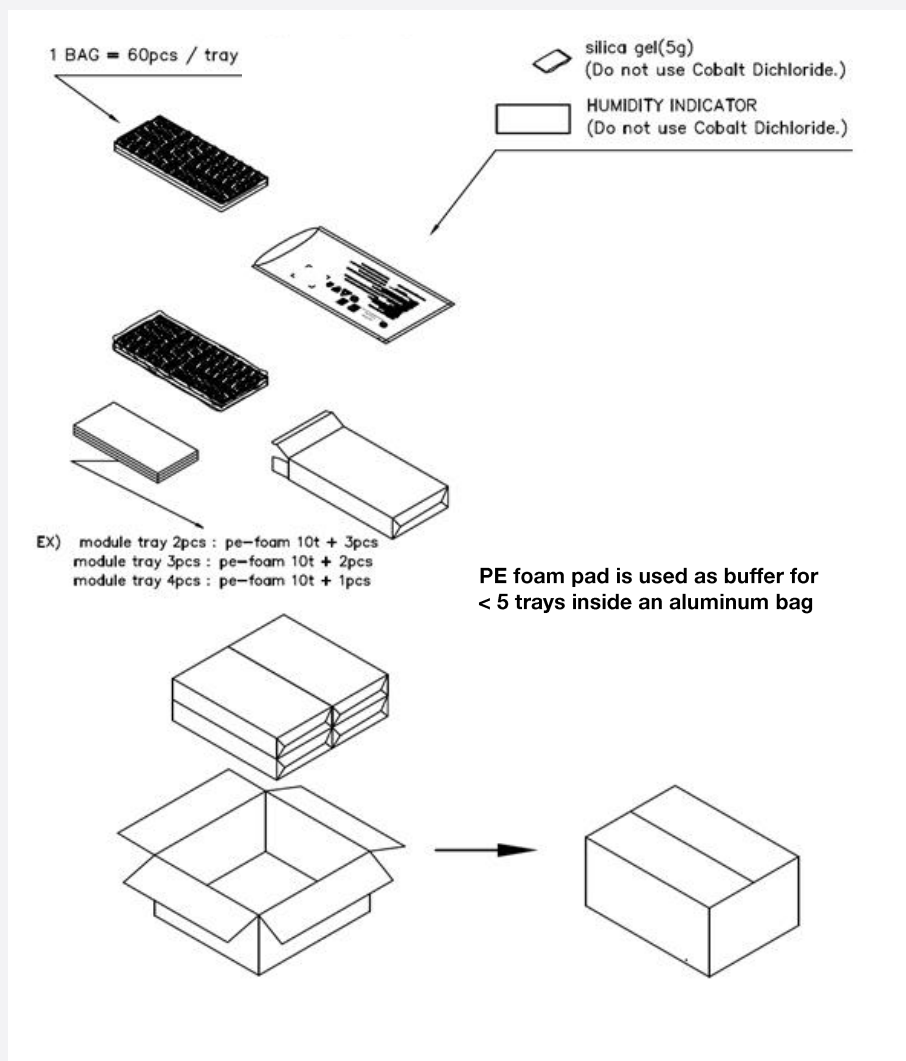
7. Packing Structure

Packing material	Max. quantity in pcs of COB	Dimension (mm)			
		Length	Width	Height	Tolerance
Tray	60	322.6	135.9	11	0.25
Aluminum Bag	300 (5 trays)	450	230	-	10
PE Foam Pad	-	280	130	10	2
Inner Box	300 (1 aluminum bag)	338	148	55	2
Outer Box	1200 (4 inner boxes)	351	308	120	5
Pallet	67,200 (56 outer boxes)	1000	1000	970	10

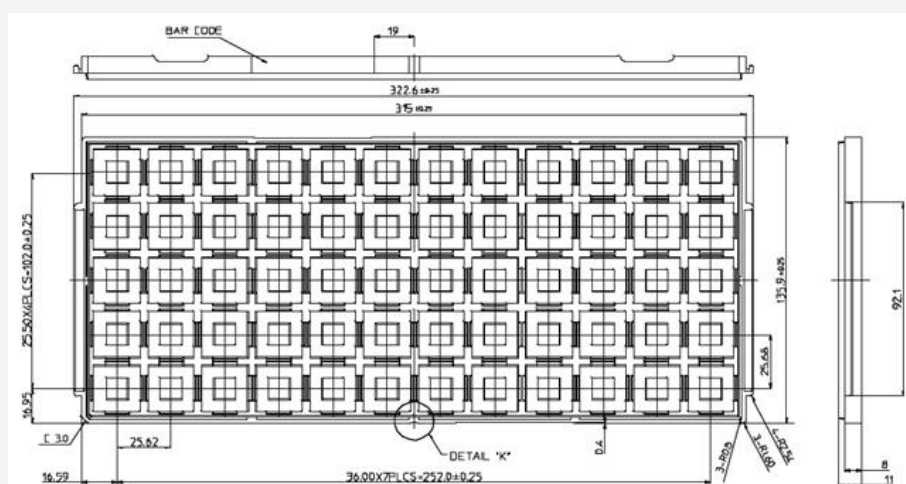
a) Packing Structure for 5 trays inside Aluminum Bag



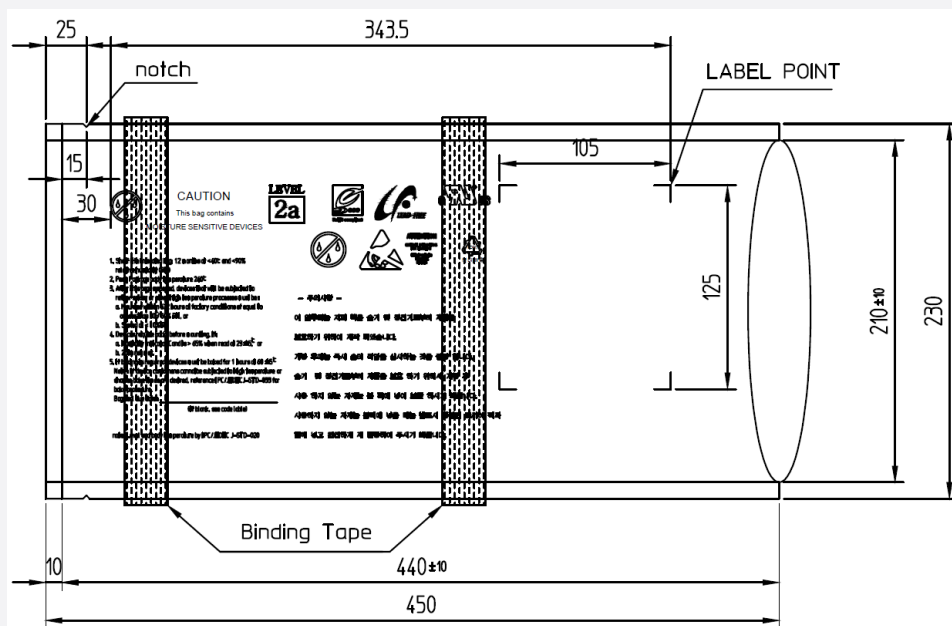
b) Packing Structure for <5 trays inside Aluminum Bag



c) Tray



d) Aluminum Vinyl Packing Bag

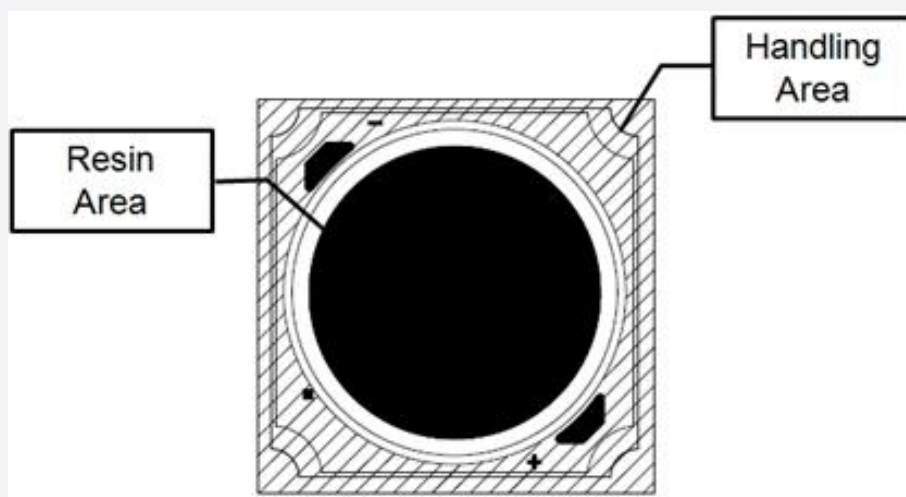


e) Silica Gel & Humidity Indicator Card inside Aluminum Vinyl Packing Bag



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 °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) 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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