港 照 照 明 科 技 有 限 公 司
KONG LIGHTING TECHNOLOGY LTD

Flat 24, 8/F., BLOCK A, Hoi Luen Industrial Centre, 55 Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong

E-mail : info@konglighting.com.

Website :http://www.Konglighting.com

HK Tel: (852) 21857600 Dongguan Tel: (769)81273588

HK Fax: (852) 21857608 Dongguan Fax: (769)81082986

Dongguang Factory : LiJiaFang Industrial Area, Shi Pai Town, Dongguan, Guang Dong,China.

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Web site :http://www.Konglighting.com

C35XXX XX X-000000

SPECIFICATION

CHIP-ON-CERAMIC TYPE LED

Document No.: SPC/ C35XXX XX X-000000

Model No.: C35XXX XX X-000000

Description: 3.45x3.45x2.0mm Ceramic Type High Power LED with Lens

Material: InGaN or AlInGaP Chip Inside

Rev. No.: 01

Date: 2012-03-09

Formal Specification

ELECTROSTATIC SENSITIVE DEVICES

RoHS

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SPECIFICATION OF CHIP ON CERAMIC TYPE LED

Chip on Ceramic LED Light Source

Model: C35XXX XX X-000000

C3535 provides the leading Chip on Ceramic type of LED technology for high efficiency solid-state lighting solutions. It offers excellent uniformity, flexibility and cost efficiency along with compact size and wide range of color selections. All components are produced by packing high-performance LED chips and silicon resin with proprietary phosphors.

1. Features and Benefits

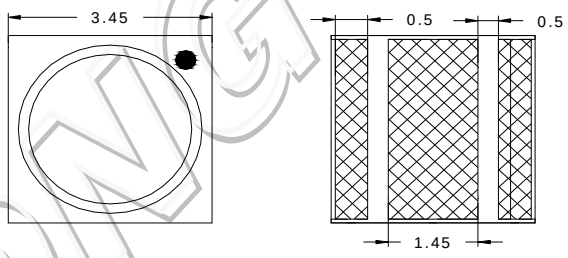
. Ideal for LED lighting application to avoid multi-shadows
. Higher heat conductivity for better thermal management
. Provide variable and innovative array LED layout designs and combinations
. Reduce the initial development cost and time
. High lumen-performance per dollar cost
. Lead free reflow solder compatible with RoHS compliant

2. Applications

. Solid State Lighting
. Indoor/Outdoor/Decoration
. Signal Light Engine
. Commercial Display
. Industrial Light Engine

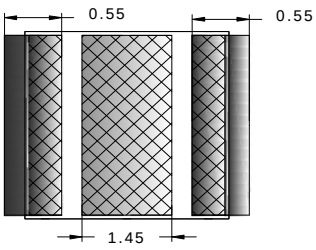
3. Dimensions and Materials

. Dimensions: 3.45 mm x 3.45 mm x 0.50 mm
. Packages: Ceramics
. Capsulated Resin: Silicone Resin with Silicate Phosphor
. Electrodes: Ag Plating
. Chips: 1 chip packed in a cavity in single cup

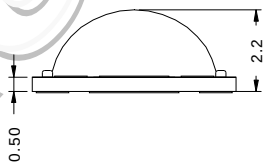


Side View

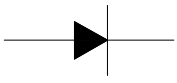
Back View



Solder Pad



Top View



Internal Circuit

Notes:
1. All dimensions are in millimeters.
2. Tolerance is ±0.1mm unless otherwise noted

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3. General Information

C35 xxx xx[1] x[2]-000000

000: Internal code

X[2]: A CRI≥70
B CRI≥75
C CRI≥80
D CRI≥85
E CRI≥90

XX[1]: VA 1.6-2.6V
VB 2.6-4.2V

C50: 3.5x3.5x2.2mm Ceramic

XXX: F27 2700K
F30 3000K
F40 4000K
F50 5000K
F60 6000K
RED RED
REO RED ORANGE
AMR AMBER
YEL YELLOW
GRE GREEN
BLU BLUE
WHT WHITE

XX[1]:Tolerance for each bin limit is±0.1V

X[2] : Color Rendering Index

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4. Absolute Maximum Ratings

(Thermal Pad Temperature @25℃)

ITEM		SYMBOL	ABSOLUTE MAXIMUM RATING	UNIT
Power Dissipation	Cool White(F50/F60)	Pd	1.5	W
	Neutral White(F40)		1.5	
	Warm White(F27/F30)		1.5	
	Red		1.05	
	Orange		1.05	
	Amber		1.05	
	Yellow		1.05	
	Green		1.5	
	Blue		1.5	
D.C Forward Current		If	350	mA
Pulse Forward Current (*1)		Ifp	500	mA
Thermal Resistance , Junction-Case (*2)		$R_{\theta j\text{-}c}$	10	℃/W
Reverse Voltage		Vr	5	V
Operating Temperature		Topr	- 20~+65	℃
Storage Temperature		Tstg	- 40~+100	℃
Soldering Temperature (Reflow) (*3)		Tsld	max.240 < 5sec	℃

*1: Ifp conditions: 1/10 Duty Cycle & 0.1ms for pulse width.
*2: Reference for typical thermal resistance junction to thermal pad ($R\theta j\text{-}c \leqq 10$℃/W)
*3: Reflow method: 1.2mm MCPCB from body for 5 seconds not exceeding the recommended maximum temperature.

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5. Electrical/Optical Characteristics

. Forward Voltage

(Thermal Pad Temperature @25℃)

Color	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Cool White(F50/F60)	Vf	If=350 mA	2.6	3.5	4.2	V
Neutral White(F40)		If=350 mA	2.6	3.5	4.2	V
Warm White(F27/F30)		If=350 mA	2.6	3.5	4.2	V
Red		If=350 mA	1.6	2.2	2.6	V
Orange		If=350 mA	1.6	2.2	2.6	V
Amber		If=350 mA	1.6	2.2	2.6	V
Green		If=350 mA	2.6	3.5	4.2	V
Blue		If=350 mA	2.6	3.5	4.2	V

. Reverse Current

(Thermal Pad Temperature @25℃)

Color	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Cool White(F50/F60)	IR	VR=5 V	--	--	100	μA
Neutral White(F40)		VR=5 V	--	--	100	μA
Warm White(F27/F30)		VR=5 V	--	--	100	μA
Red		VR=5 V	--	--	100	μA
Orange		VR=5 V	--	--	100	μA
Amber		VR=5 V	--	--	100	μA
Green		VR=5 V	--	--	100	μA
Blue		VR=5 V	--	--	100	μA

. Luminous Flux

(Thermal Pad Temperature @25℃)

Color	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Red		If=350 mA	--	50	--	lm
Orange		If=350 mA	--	50	--	lm
Amber		If=350 mA	--	50	--	lm
Green		If=350 mA	--	80	--	lm
Blue		If=350 mA	--	17	--	lm

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. Color Temperature or Dominate Wavelength

(Thermal Pad Temperature @25℃)

Color	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Red	λ d	If=350 mA	--	625	--	nm
Orange	λ d	If=350 mA	--	605	--	nm
Amber	λ d	If=350 mA	--	590	--	nm
Green	λ d	If=350 mA	--	525	--	nm
Blue	λ d	If=350 mA	--	465	--	nm

. Bin Code List For Reference

(Thermal Pad Temperature @25℃)

Item	Bin Code		SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
Forward Voltage	VA	A1	Vf	If=350 mA	1.6	1.8	V
		A2			1.8	2.0	
		A3			2.0	2.2	
		A4			2.2	2.4	
		A5			2.4	2.6	
	VB	B1	Vf	If=350 mA	2.6	2.8	
		B2			2.8	3.0	
		B3			3.0	3.2	
		B4			3.2	3.4	
		B5			3.4	3.6	
		B6			3.6	3.8	
		B7			3.8	4.0	
		B8			4.0	4.2	

Note: Measurement tolerance of the forward voltage: ±0.1V

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. Luminous Flux Rank

(Thermal Pad Temperature @25℃)

Color	CCT Range		Base Order Codes Luminous Flux @350 Ma (lm)			Order Code
	MIN.	MAX.	Group	MIN.	MAX.	
90 CRI White(F27/F30)	2600 K	3200 K	J1	61.9	67.5	C35F27VBE-J1KFOM
			J2	67.5	73.6	C35F27VBE-J2KFOM
			J3	73.6	80.9	C35F27VBE-J3KFOM
			K1	80.9	88.2	C35F27VBE-K1KFOM
85 CRI White(F27/F30)	2600 K	3200 K	J1	61.9	67.5	C35F27VBD-J1KFOM
			J2	67.5	73.6	C35F27VBD-J2KFOM
			J3	73.6	80.9	C35F27VBD-J3KFOM
			K1	80.9	88.2	C35F27VBD-K1KFOM
			K2	88.2	96.2	C35F27VBD-K2KFFOM
Warm White(F27/F30) 80 CRI	2600 K	3500 K	K1	80.9	88.2	C35F27VBC-K1KFOM
			K2	88.2	96.2	C35F27VBC-K2KFOM
			K3	96.2	104.8	C35F27VBC-K3KFOM
			L1	104.8	113.2	C35F27VBC-L1KFOM
Neutral White(F40/F50) 75 CRI	3500 K	4500 K	K3	96.2	104.8	C35F40VBB-K3KFOM
			L1	104.8	113.2	C35F40VBB-L1KFOM
			L2	113.2	122.3	C35F40VBB-L2KFOM
Cool White(F50/F60) 70 CRI	5000 K	7300 K	L2	113.2	122.3	C35F60VBA-L2KFOM
			L3	122.3	132.0	C35F60VBA-L3KFOM
			M1	132.0	142.6	C35F60VBA-M1KFOM

Notes:

*** : Measurement tolerance of the luminous flux: ±10%.**

1 : Typical CRI for F50/F60 Cool White (5000 K – 7300 K CCT) is 70.

2 : Typical CRI for F40/F50 Neutral White (3500 K – 4500 K CCT) is 75.

3 : Typical CRI for F27/F30 Warm White (2600 K – 3500 K CCT) is 80.

4 : Typical CRI for Warm White (2600 K – 3200 K CCT) is 85.

5 : Typical CRI for Warm White (2600 K – 3200 K CCT) is 90.

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6. Hue Bin Specification for Red、 Green、Blue、Amber、Orange

Name	Code	λ d MIN (nm)	λ d MAX (nm)	Name	Code	λ d MIN (nm)	λ d MAX (nm)
BLUE	BL3	450	455	YELLOW	YL1	580	585
	BL4	455	460		YL2	585	590
	BL5	460	465	AMBER	AB1	590	592.5
	BL6	465	470		AB2	592.5	595
	BL7	470	475		AB3	595	597.5
	BL8	475	480		AB4	597.5	600
GREEN	PG1	510	515	ORANGE	OG1	600	605
	PG2	515	520		OG2	605	610
	PG3	520	525	RED ORANGE	RO1	610	615
	PG4	525	530		RO2	615	620
	PG5	530	535	RED	HR1	620	625
	PG6	535	540		HR2	625	630
	PG7	540	545		HR3	630	635
	PG8	545	550		HR4	635	640
	PG9	550	555		HR5	640	645

7. White Color Temperature Ranks & CIE Color Rank (Refer to CIE 1931 chromaticity diagram)

CIE chromaticity coordinates (ANSI Cool White)

C. A	X	Y	C. A	X	Y	C. A	X	Y	C. A	X	Y
C1	0.3048	0.3207	C2	0.3028	0.3304	C3	0.3115	0.3391	C4	0.3130	0.3290
	0.3130	0.3290		0.3115	0.3391		0.3205	0.3481		0.3213	0.3373
	0.3144	0.3186		0.3130	0.3290		0.3213	0.3373		0.3221	0.3261
	0.3068	0.3113		0.3048	0.3207		0.3130	0.3290		0.3144	0.3186
C5	0.3068	0.3113	C6	0.3005	0.3415	C7	0.3099	0.3509	C8	0.3144	0.3186
	0.3144	0.3186		0.3099	0.3509		0.3196	0.3602		0.3221	0.3261
	0.3161	0.3059		0.3115	0.3391		0.3205	0.3481		0.3231	0.3120
	0.3093	0.2993		0.3028	0.3304		0.3115	0.3391		0.3161	0.3059
D1	0.3215	0.3350	D2	0.3207	0.3462	D3	0.3290	0.3538	D4	0.3290	0.3417
	0.3290	0.3417		0.3290	0.3538		0.3376	0.3616		0.3371	0.3490
	0.3290	0.3300		0.3290	0.3417		0.3371	0.3490		0.3366	0.3369
	0.3222	0.3243		0.3215	0.3350		0.3290	0.3417		0.3290	0.3300
D5	0.3222	0.3243	D6	0.3196	0.3602	D7	0.3290	0.3690	D8	0.3290	0.3300
	0.3290	0.3300		0.3290	0.3690		0.3381	0.3762		0.3366	0.3369
	0.3290	0.3180		0.3290	0.3538		0.3376	0.3616		0.3361	0.3245
	0.3231	0.3120		0.3207	0.3462		0.3290	0.3538		0.3290	0.3180
E1	0.3371	0.3490	E2	0.3376	0.3616	E3	0.3463	0.3687	E4	0.3451	0.3554
	0.3451	0.3554		0.3463	0.3687		0.3551	0.3760		0.3533	0.3620
	0.3440	0.3427		0.3451	0.3554		0.3533	0.3620		0.3515	0.3487
	0.3366	0.3369		0.3371	0.3490		0.3451	0.3554		0.3440	0.3427
E5	0.3366	0.3369	E6	0.3381	0.3762	E7	0.3480	0.3840	E8	0.3440	0.3428
	0.3440	0.3428		0.3480	0.3840		0.3571	0.3907		0.3515	0.3487
	0.3429	0.3307		0.3463	0.3687		0.3551	0.3760		0.3495	0.3339
	0.3361	0.3245		0.3376	0.3616		0.3463	0.3687		0.3429	0.3307

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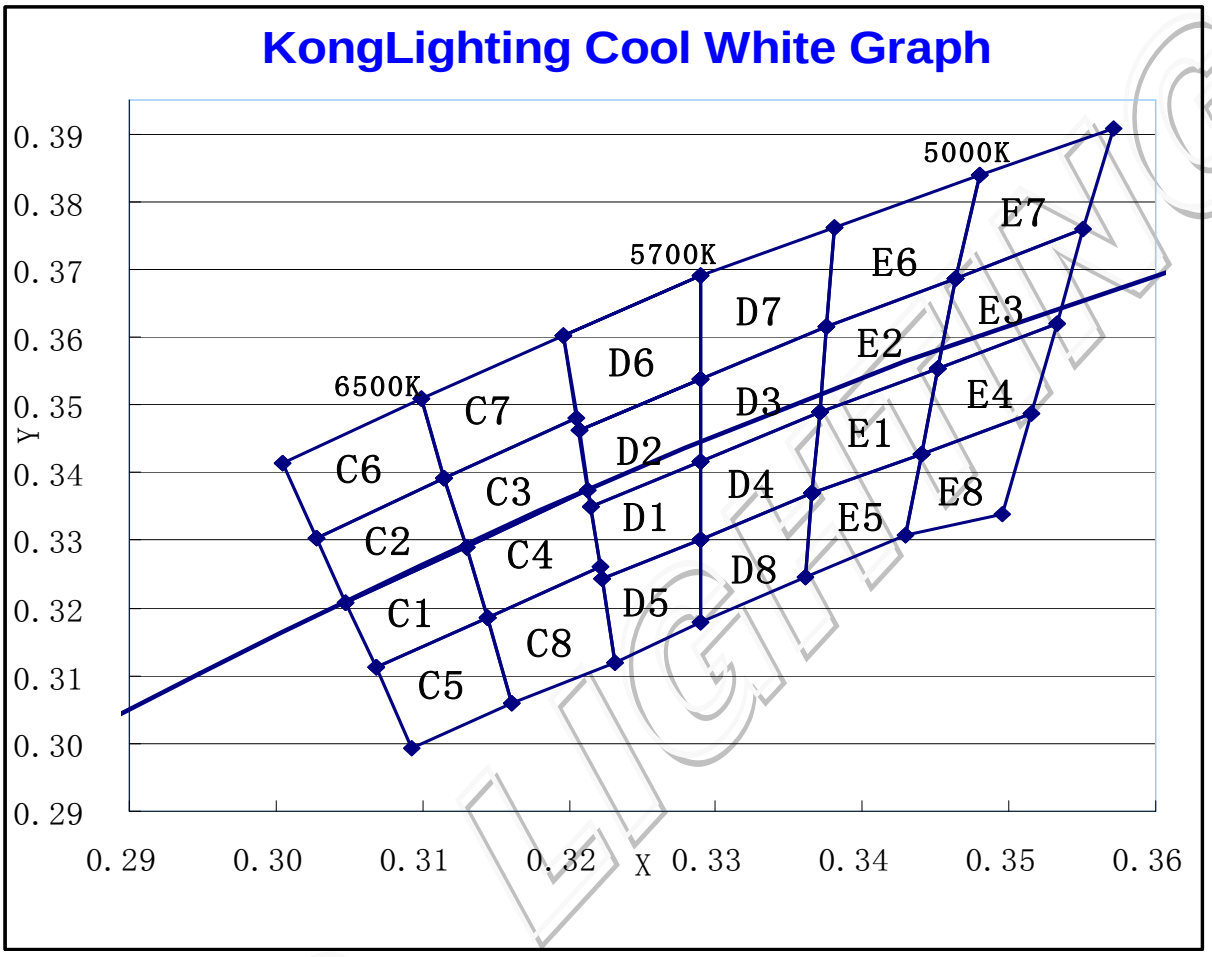
ANSI Cool White Color bin structures



CIE chromaticity coordinates (ANSI Natural white)

C. A	X	Y	C. A	X	Y	C. A	X	Y	C. A	X	Y
F1	0.3530	0.3597	F2	0.3548	0.3736	F3	0.3641	0.3804	F4	0.3615	0.3659
	0.3615	0.3659		0.3641	0.3804		0.3736	0.3874		0.3702	0.3722
	0.3590	0.3521		0.3615	0.3659		0.3702	0.3722		0.3670	0.3578
	0.3512	0.3465		0.3530	0.3597		0.3615	0.3659		0.3590	0.3521
F5	0.3512	0.3465	F6	0.3571	0.3907	F7	0.3668	0.3957	F8	0.359	0.3521
	0.359	0.3521		0.3668	0.3957		0.3771	0.4034		0.367	0.3578
	0.3567	0.3389		0.3641	0.3804		0.3736	0.3874		0.364	0.344
	0.3495	0.3339		0.3548	0.3736		0.3641	0.3804		0.3567	0.3389
G1	0.367	0.3578	G2	0.3702	0.3722	G3	0.3825	0.3798	G4	0.3783	0.3646
	0.3702	0.3722		0.3736	0.3874		0.3869	0.3958		0.3825	0.3798
	0.3825	0.3798		0.3869	0.3958		0.4006	0.4044		0.395	0.3875
	0.3783	0.3646		0.3825	0.3798		0.395	0.3875		0.3898	0.3716
G5	0.367	0.3578	G6	0.3771	0.4034	G7	0.3916	0.4127	G8	0.3783	0.3646
	0.3783	0.3646		0.3916	0.4127		0.4064	0.4221		0.3898	0.3716
	0.3743	0.3502		0.3869	0.3958		0.4006	0.4044		0.3848	0.3565
	0.364	0.344		0.3736	0.3874		0.3869	0.3958		0.3743	0.3502
H6	0.4054	0.4191	H2	0.3941	0.3848	H1	0.3889	0.369	H5	0.3889	0.369
	0.4217	0.4273		0.3996	0.4015		0.3941	0.3848		0.4017	0.3751
	0.4146	0.4089		0.4146	0.4089		0.408	0.3916		0.3957	0.3596
	0.3996	0.4015		0.408	0.3916		0.4017	0.3751		0.384	0.354

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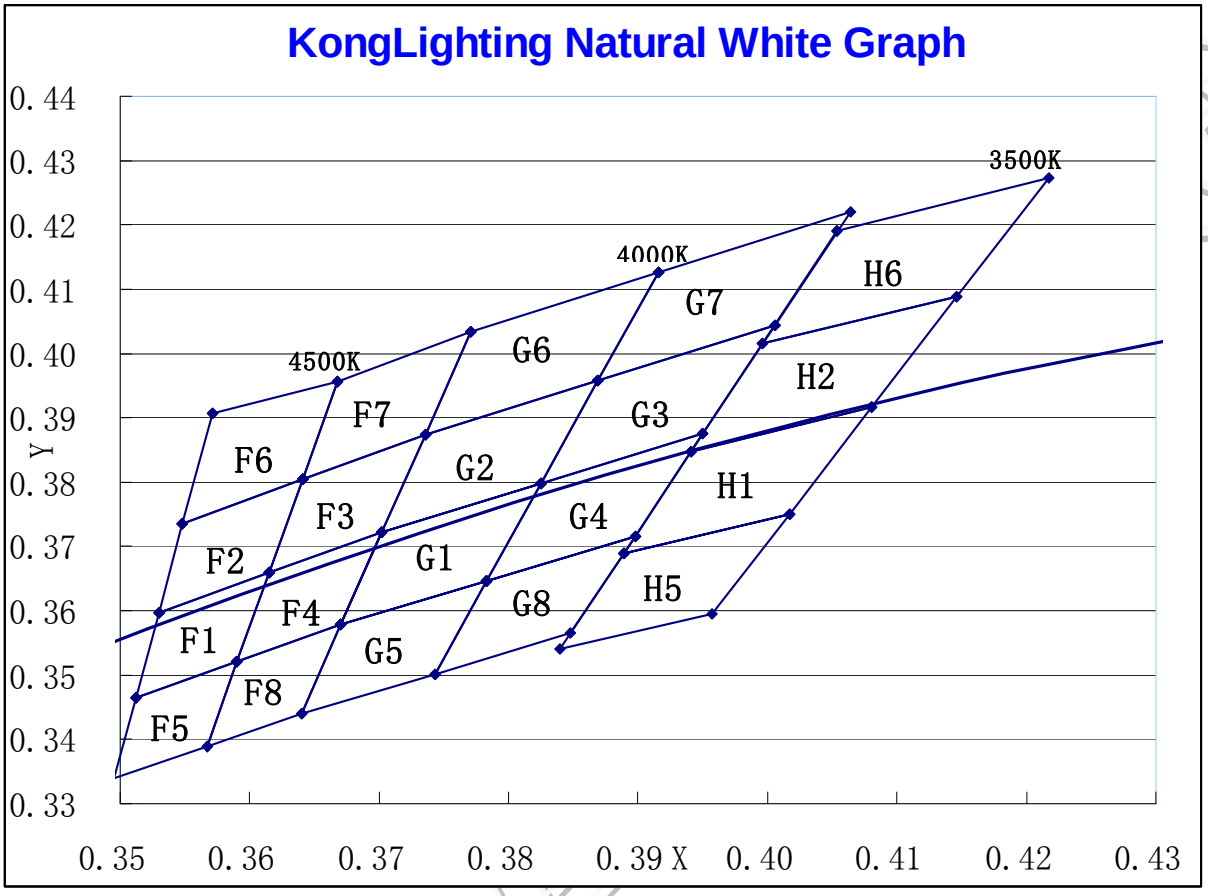
ANSI Natural White Color bin structures



CIE chromaticity coordinates (ANSI Warm White)

C.A	X	Y	C.A	X	Y	C.A	X	Y	C.A	X	Y
H1	0.4082	0.3922	H2	0.4146	0.4089	H3	0.4299	0.4165	H4	0.4221	0.3984
	0.3941	0.3848		0.3996	0.4015		0.4146	0.4089		0.4082	0.3922
	0.3889	0.3690		0.3941	0.3848		0.4082	0.3922		0.4017	0.3752
	0.4017	0.3752		0.4082	0.3922		0.4221	0.3984		0.4147	0.3814
K1	0.4344	0.4032	K2	0.4430	0.4212	K3	0.4562	0.4260	K4	0.4465	0.4071
	0.4221	0.3984		0.4299	0.4165		0.4430	0.4212		0.4344	0.4032
	0.4147	0.3814		0.4221	0.3984		0.4344	0.4032		0.4260	0.3853
	0.4260	0.3853		0.4344	0.4032		0.4465	0.4071		0.4373	0.3893
L1	0.4586	0.4103	L2	0.4687	0.4289	L3	0.4813	0.4319	L4	0.4700	0.4126
	0.4465	0.4071		0.4562	0.4260		0.4687	0.4289		0.4586	0.4103
	0.4373	0.3893		0.4465	0.4071		0.4586	0.4103		0.4483	0.3918
	0.4483	0.3918		0.4586	0.4103		0.4700	0.4126		0.4593	0.3944

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KONG LIGHTING TECHNOLOGY LTD

Flat 24, 8/F., BLOCK A, Hoi Luen Industrial Centre, 55 Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong

E-mail : info@konglighting.com.

Website :http://www.Konglighting.com

HK Tel: (852) 21857600 Dongguan Tel: (769)81273588

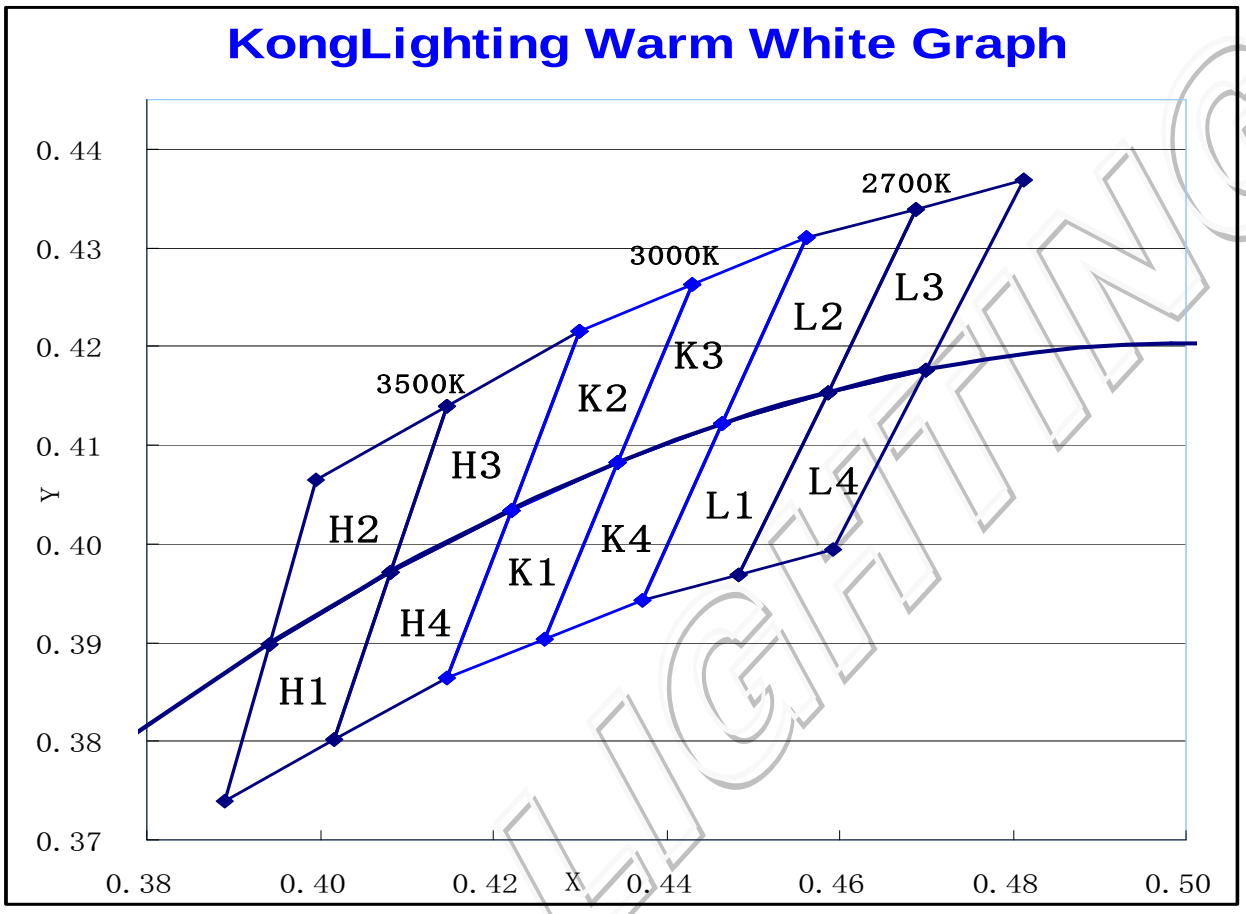
HK Fax: (852) 21857608 Dongguan Fax: (769)81082986

Dongguang Factory : LiJiaFang Industrial Area, Shi Pai Town, Dongguan, Guang Dong,China.

E-mail : info@konglighting.com.

Web site :http://www.Konglighting.com

ANSI Warm White Color bin structures



- Color coordinates measurement allowance is ± 0.005
- To order specify color temperature ranks, please contact Konglighting Lighting Holdings LTD. for further information.
- Thermal Pad Temperature @25℃ @ 350mA

HK Tel: (852) 21857600 Dongguan Tel: (769)81273588
HK Fax: (852) 21857608 Dongguan Fax: (769)81082986
Flat 24, 8/F., BLOCK A, Hoi Luen Industrial Centre, 55 Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong
E-mail : info@konglighting.com.
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9.1 OPERATING LIFE TESTS

Test	Applicable Standards	Test Conditions & Failure Criteria
Room Temperature Operating Life Test (RTOL)	**JESD22 Method A108-C**	**Test Conditions:** ·Ambient Temperature : 45℃ ·Forward Current : Maximum in datasheet ·Test Period : 1008 hours Failure Criteria [1]: ·Forward Voltage shift [2] : >200 mV ·Luminous Flux degradation [2] -InGaN LEDs [3] : >15% -AlInGaP LEDs [4] : >25% ·Forward or Reverse Leakage[5] : > 10μA ·Catastrophic failure[6]
Room Temperature Operating Life Test (RTOL)	**JESD22 Method A108-C**	**Test Conditions:** ·Ambient Temperature : 85℃ ·Forward Current : Maximum in datasheet ·Test Period : 1008 hours Failure Criteria [1]: ·Forward Voltage shift [2] : >200 mV ·Luminous Flux degradation [2] -InGaN LEDs [3] : >15% -AlInGaP LEDs [4] : >25% ·Forward or Reverse Leakage[5] : > 10μA ·Catastrophic failure[6]
Low Temperature Operating Life Test (LTOL)	**JESD22 Method A108-C**	**Test Conditions:** ·Ambient Temperature : 85℃ ·Forward Current : Maximum in datasheet ·Test Period : 1008 hours Failure Criteria [1]: ·Forward Voltage shift [2] : >200 mV ·Luminous Flux degradation [2] -InGaN LEDs [3] : >15% -AlInGaP LEDs [4] : >25% ·Forward or Reverse Leakage[5] : > 10μA ·Catastrophic failure[6]

Notes:

1. **The entire test has failed if one LED (or more) from the sample set satisfy the listed failure criteria. If no LED satisfies the listed failure criteria , the test is successful .**
2. **Comparison is made between [value at time 0] and [value at the end of the test period]**
3. **InGaN LEDs are white , blue , green LEDs**
4. **AlInGaP LEDs are red , red-orange and amber LEDs**
5. **Criteria applies to leakage of the LED die and not to leakage due to the LED package**
6. **A catastrophic failure is a failure that caused the LED to become non-functional (LED open or short)**

HK Tel: (852) 21857600 Dongguan Tel: (769)81273588
HK Fax: (852) 21857608 Dongguan Fax: (769)81082986
Flat 24, 8/F., BLOCK A, Hoi Luen Industrial Centre, 55 Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong
E-mail : info@konglighting.com.
Website :http://www.Konglighting.com
Dongguang Factory : LiJiaFang Industrial Area, Shi Pai Town, Dongguan, Guang Dong,China.
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9.2 NON-OPERATING LIFE TESTS

Test	Applicable Standards	Test Conditions & Failure Criteria
Thermal Shock	**MIL-STD-202G Method 107G**	**Test Conditions:** ·Temperature Range : -40℃ to 125 ℃ ·Dwell Time : 15 minutes ·Transfer Time : <20 seconds ·Cycles : 200 cycles Failure Criteria [1]: ·LED no longer lights up after test
Salt Atmosphere (Corrosion Test)	**JESD22 Method A107-B Condition B**	**Test Conditions:** ·Ambient Temperature : 35℃ ·Salt deposit : 30 g/ m^2 / day ·Test Period : 48 hours Failure Criteria [1]: ·LED no longer lights up after test

Notes:

1. The entire test has failed if one LED (of more) from the sample set satisfy the listed failure criteria. If on LED satisfies the listed failure criteria , the test is successful .

港 照 照 明 科 技 有 限 公 司
KONG LIGHTING TECHNOLOGY LTD

HK Tel: (852) 21857600 Dongguan Tel: (769)81273588
HK Fax: (852) 21857608 Dongguan Fax: (769)81082986

Flat 24, 8/F., BLOCK A, Hoi Luen Industrial Centre, 55 Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong

Dongguang Factory : LiJiaFang Industrial Area, Shi Pai Town, Dongguan, Guang Dong,China.

E-mail : info@konglighting.com.

Website :http://www.Konglighting.com

E-mail : info@konglighting.com.

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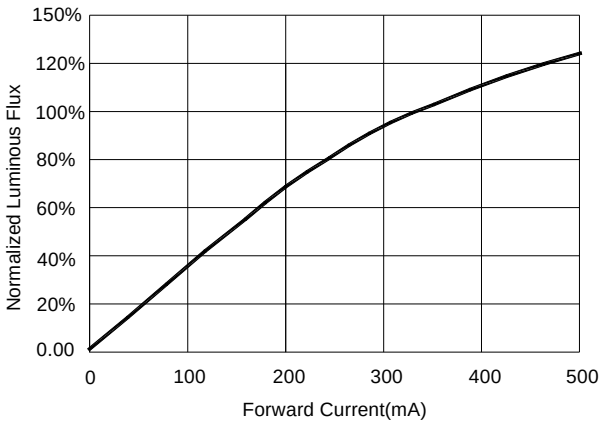
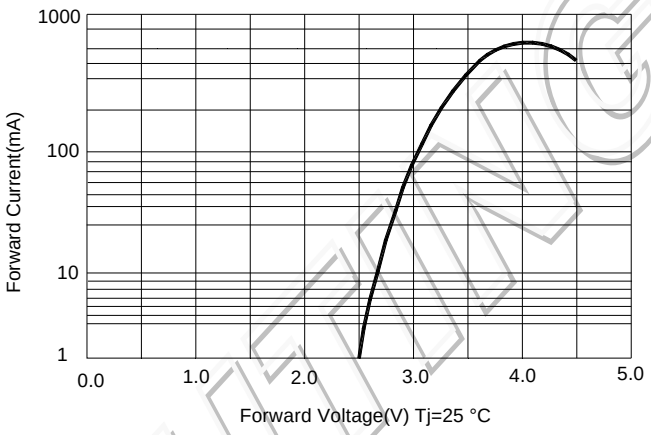
10. 1 Optical-Electrical Characteristic Graphs (InGaN)

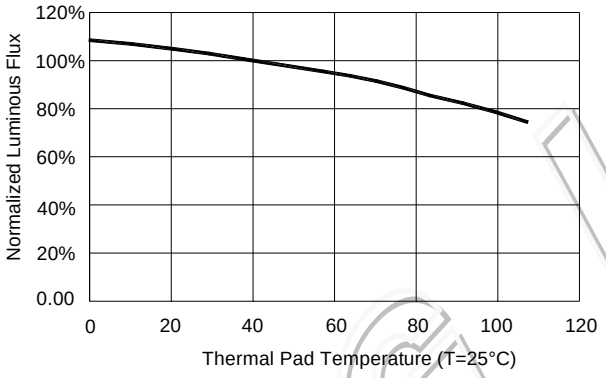
Typical Relative Luminous Flux vs. Forward Current



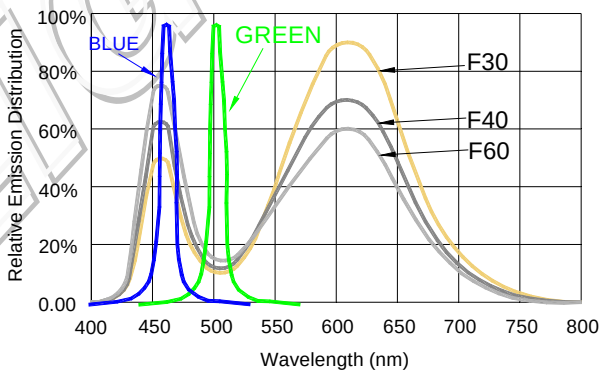
Forward Voltage vs. Forward Current



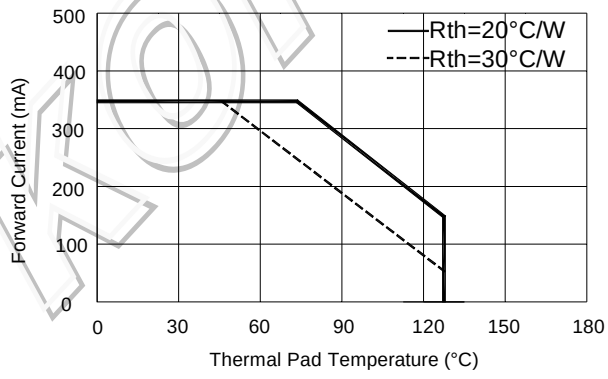
Thermal Pad Temperature vs. Relative Light Output



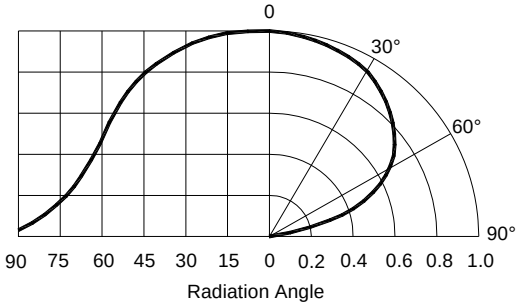
Wavelength Characteristics



Thermal Pad Temperature vs. Forward Current



Typical Radiation Pattern 140°



HK Tel: (852) 21857600 Dongguan Tel: (769)81273588
HK Fax: (852) 21857608 Dongguan Fax: (769)81082986
Flat 24, 8/F., BLOCK A, Hoi Luen Industrial Centre, 55 Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong
Dongguang Factory : LiJiaFang Industrial Area, Shi Pai Town, Dongguan, Guang Dong,China.
E-mail : info@konglighting.com.
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Website :http://www.Konglighting.com
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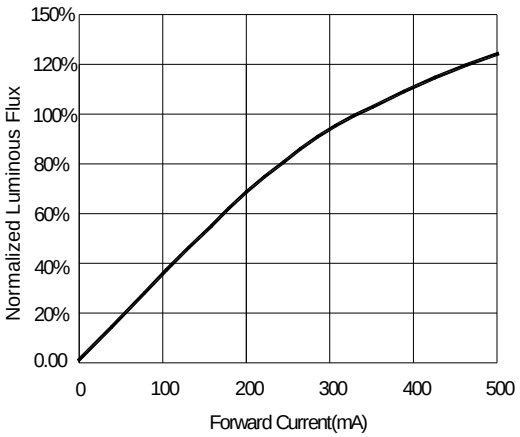
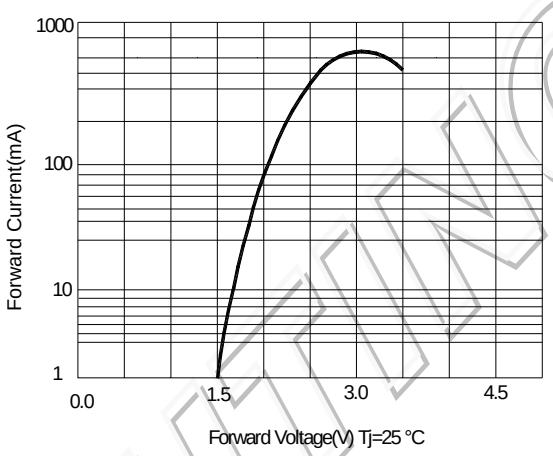
10.2 Optical-Electrical Characteristic Graphs (AlInGaP)

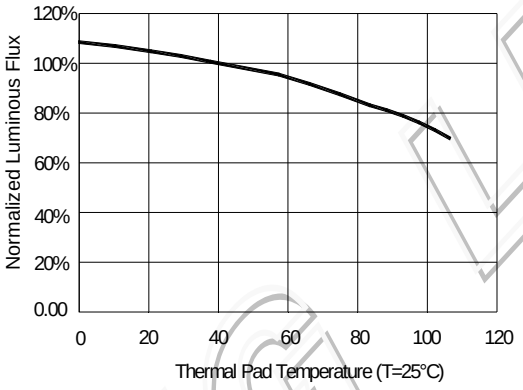
Typical Relative Luminous Flux vs. Forward Current



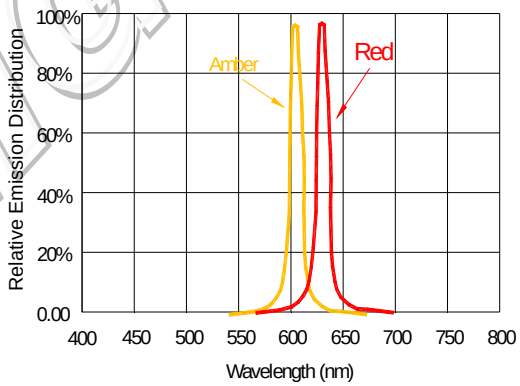
Forward Voltage vs. Forward Current



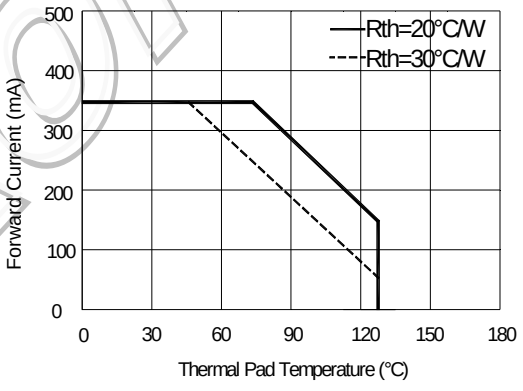
Thermal Pad Temperature vs. Relative Light Output



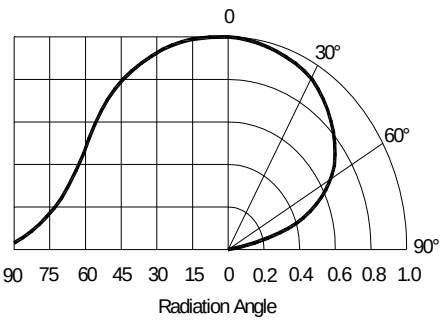
Wavelength Characteristics



Thermal Pad Temperature vs. Forward Current



Typical Radiation Pattern 140°



HK Tel: (852) 21857600 Dongguan Tel: (769)81273588
HK Fax: (852) 21857608 Dongguan Fax: (769)81082986
Flat 24, 8/F., BLOCK A, Hoi Luen Industrial Centre, 55 Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong
E-mail : info@konglighting.com.
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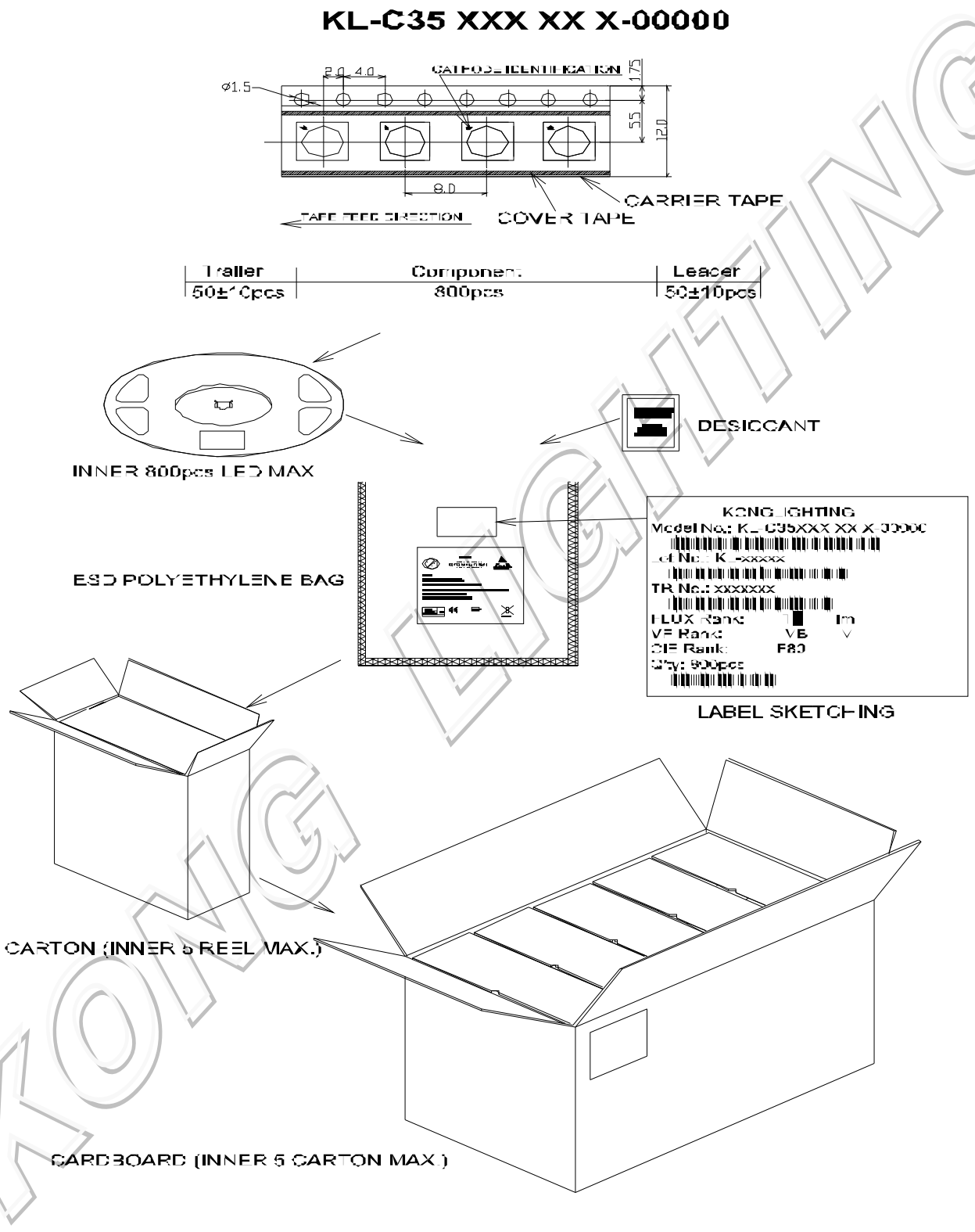
11. Packaging Standard:



Tape and Reel in 12 mm tapes. According to the total delivery amount, cardboard boxes will be used to protect the LEDs from mechanical shocks during transportation. The boxes are not water resistant and therefore must be kept away from water and moisture.

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KONG LIGHTING TECHNOLOGY LTD
Flat 24, 8/F., BLOCK A, Hoi Luen Industrial Centre, 55 Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong
E-mail : info@konglighting.com.
Website :http://www.Konglighting.com
HK Tel: (852) 21857600 Dongguan Tel: (769)81273588
HK Fax: (852) 21857608 Dongguan Fax: (769)81082986
Dongguang Factory : LiJiaFang Industrial Area, Shi Pai Town, Dongguan, Guang Dong,China.
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High Power LED Application Notes

1. Features

The Purposes of making KONGLIGHTING's customers and users to have a clear understanding on the ways how to use the LED.

2. Description

Generally. The LED can be used the same way as other general purposed semiconductors. When using KONGLIGHTING's high power LED, the following precautions must be taken to protect the LED.

3. Cautions

3.1. Dust & Cleaning

This emitter has a silicone surface, There are many benefits to the silicone surface in terms of optical properties and improved reliability. However, silicone is a softer material and prone to attract dust. While a minimal amount of dust and debris on the LED will not cause significant reduction in illumination, steps should be taken to keep the emitter free of dust.

These include keeping the LEDs in the manufacturer's package prior to assembly and storing assemblies in an enclosed area after installing the emitters.

Surface condition of this device may change when organic solvents such as trichloroethylene or acetone were applied.

Avoid using organic solvent, it is recommended that isopropyl be used as a solvent for cleaning the LEDs. When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the package and the resin of not.

Do not clean the LEDs by the ultrasonic. When it is absolutely necessary, the influence as ultrasonic cleaning on the LEDs depends on factors such as ultrasonic power. Baking time and assembled condition. Before cleaning, a pre-test should be done to confirm whether any damage to the LEDs will occur.

3.2. Moisture Proof Package

In order to avoid the absorption of moisture during transportation and storage, LED are packed in the aluminum envelop, A desiccant is included in the aluminum envelop as it absorbs moisture. When moisture is absorbed into the AMT package it may vaporize and expand during soldering. There is a possibility that this can cause exfoliation of the contacts and damage to the optical characteristics of the LEDs. For this reason, the moisture proof package is used to keep moisture to a minimum in the package.

3.3. Storage

In order to avoid the absorption of moisture, It is recommended to store SMD LED (in bulk or taped) in the dry box (or the desiccator) with a desiccant, Otherwise to store them in the following environment as recommended.

a. Temperature: 5℃~30℃ b. Humidity: 60% RH Max

It is recommended to solder the LED as soon as possible after unpacking the aluminum envelop, But in case that the LED have to be left unused after unpacking envelop again is requested.

The LED should be soldering within 48 hours (2 days) after opening the package.

If baking is required, A baking treatment should be performed as follows:

60℃±5℃ for more than 24 hours.

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E-mail : info@konglighting.com.

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HK Tel: (852) 21857600 Dongguan Tel: (769)81273588

HK Fax: (852) 21857608 Dongguan Fax: (769)81082986

Dongguang Factory : LiJiaFang Industrial Area, Shi Pai Town, Dongguan, Guang Dong,China.

E-mail : info@konglighting.com.

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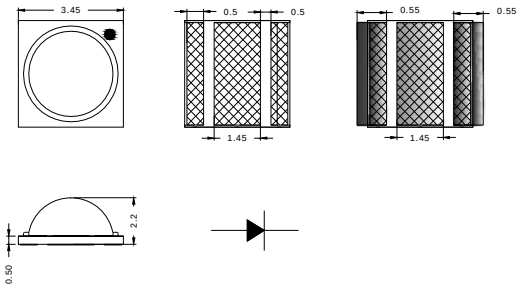
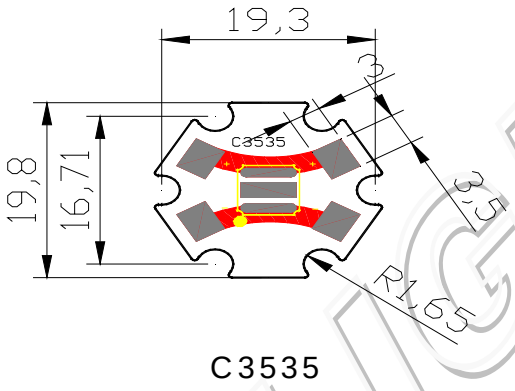
3.4. Recommended PCB Layout

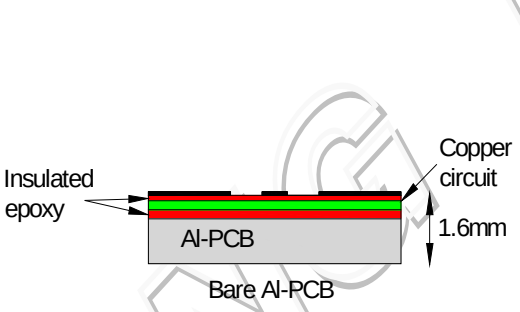


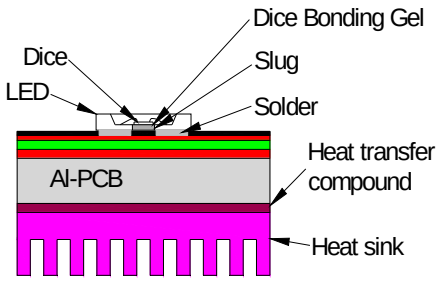
3.5. Recommended installation AL-PCB pattern



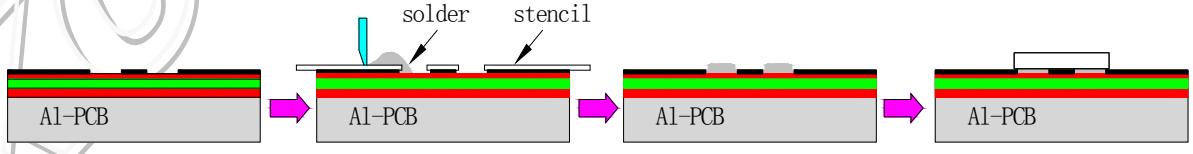
C3535

3.6. Assembly to Al-PCB





Cross-sectional view of adding heat sink for enhancing the heat transfer



Bare Al-PCB

Place stencil on top of Al-PCB add on-clean solder paste into window

Remove stencil

Place LED on Al-PCB and go through reflow process

* Using SMT mounting adhesive can help for fixing the package when reflow.

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HK Fax: (852) 21857608 Dongguan Fax: (769)81082986
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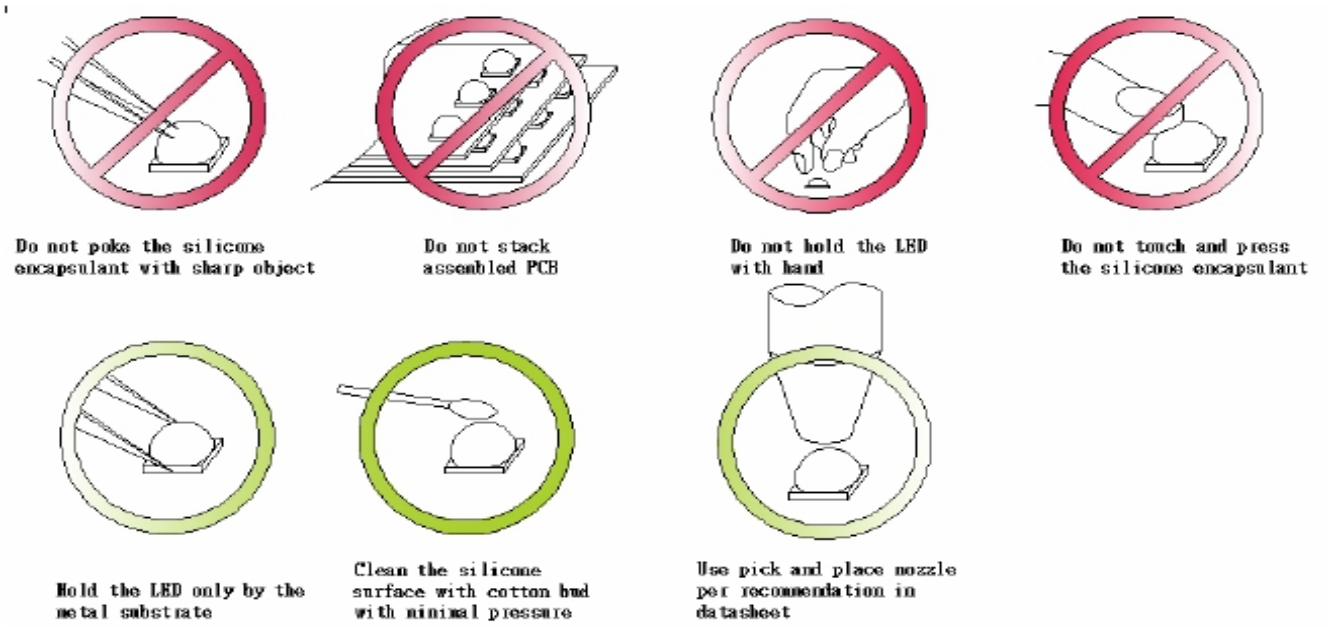
3.7. Handling Instructions of Silicone Resin LEDs



During processing mechanical stress on the surface should be minimized as much as possible. Sharp objects of all types should not be used to pierce the sealing compound. Do not touching sealant with bare hands. When utilizing a pick and place machine, ensure the pick and place nozzle does not place pressure onto the surface of the LED.

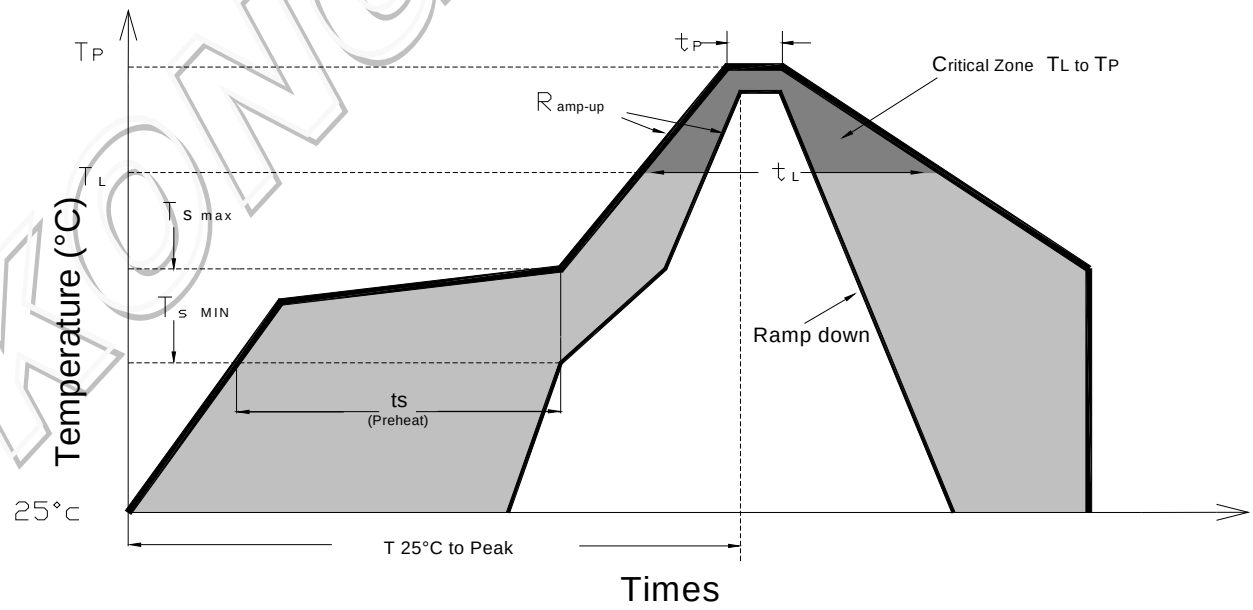
3.8. PCM assembled placement

Do not use the PCBs overlap placement, Since silicone is a soft material, It might cause to damage LED encapsulation.

3.10. Reflow Soldering Characteristics

In testing, Konglighting has found C35 LEDs to be compatible with JEDEC J-STD-020C,using the parameters listed below. As a general guideline, Konglighting recommends that users follow the recommended soldering profile provided by the manufacturer of solder paste used.

Note that this general guideline is offered as a starting point and may require adjustment for certain PCB designs and Configurations of reflow soldering equipment.



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Profile Feature	Lead-Based Solder	Lead-Free Solder
Average Ramp-Up Rate (Ts_{max} to Tp)	3℃/second max.	3℃/second max.
Preheat: Temperature Min (Ts_{min})	100℃	150℃
Preheat: Temperature Min (Ts_{max})	150℃	200℃
Preheat: Time (ts_{min} to ts_{max})	60-120 seconds	60-180 seconds
Time Maintained Above: Temperature (T_L)	183 ℃	217 ℃
Time Maintained Above: Time (t_L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (T_P)	215 ℃	260 ℃
Time Within 5℃ of Actual Peak Temperature (tp)	10-30 seconds	20-40 seconds
Ramp-Down Rate	6℃/second max.	6℃/second max.
Time 25 ℃ to Peak Temperature	6 minutes max.	8 minutes max.

Note: All temperatures refer to topside of the package, measured on the package body surface.

3.12. Heat Generation

Thermal design of the end product is of paramount importance. Please consider the heat generation of the LED when making the system design. The coefficient of temperature increase per input electric power is affected by the thermal resistance of the circuit board and density of LED placement on the board, as well as components. It is necessary to avoid in tense heat generation and operate within the maximum rating given in this specification. The operating current should be decided after considering the ambient maximum temperature of LEDs

3.13. Electrostatic Discharge & Surge Current

Electrostatic discharge (ESD) or surge current (EOS) may damage LED.

Precautions such as ESD wrist strap, ESD shoe strap or antistatic gloves must be worn whenever handling of LED.

All devices, equipment and machinery must be properly grounded.

It is recommended to per form electrical test to screen out ESD failures at final inspection.

It is important to eliminate the possibility of surge current during circuitry design.

3.14. Other

Can not take any responsibility for any trouble that are caused by using the LEDs at conditions exceeding our specifications.

These LEDs are designed and manufactured for standard applications such as electric home appliances, communication equipment, office equipment, electronic equipment and so on.

It is recommended to consult us in advance if user's application requires any particular quality or reliability which concerns human life. Examples would be medical equipment, aerospace applications, traffic signals, safety system equipment and so on.

Care must be taken to ensure that the reverse voltage will not exceed the absolute maximum rating when using the LEDs with matrix drive.

The LED light output is strong enough to injure human eyes. Precautions must be taken to prevent looking directly at the LEDs with unaided eyes for more than a few seconds.

The formal specification must be exchanged and signed by both parties before large volume purchase begins.

The appearance and specifications of the product may be modified for improvement without notice.

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HK Tel: (852) 21857600 Dongguan Tel: (769)81273588
HK Fax: (852) 21857608 Dongguan Fax: (769)81082986

Flat 24, 8/F., BLOCK A, Hoi Luen Industrial Centre, 55 Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong

E-mail : info@konglighting.com.

Website :http://www.Konglighting.com

Dongguang Factory : LiJiaFang Industrial Area, Shi Pai Town, Dongguan, Guang Dong,China.

E-mail : info@konglighting.com.

Web site :http://www.Konglighting.com

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