

Kingbright

Optoelectronic Components

TECHNICAL NOTES

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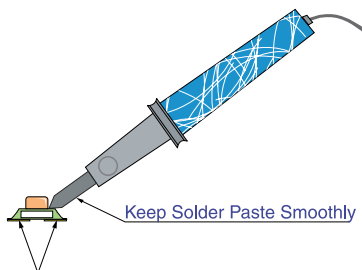
■ Quality ■ Efficiency ■ Service ■ Innovation

2013-2015

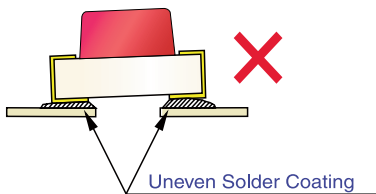
APPLICATION NOTES

General Notes

1. We recommend manual soldering operations only for repair and rework purposes. The soldering iron should not exceed 30W in power. The maximum soldering temperature is 300°C for Pb-Sn solder and 350°C for lead-free solder for normal lamps and displays. For blue (typical λ_d 465nm), blue-green (typical λ_d 525nm), and all white LEDs, the maximum soldering iron temperature is 280°C. Do not place the soldering iron on the component for more than 3 seconds.



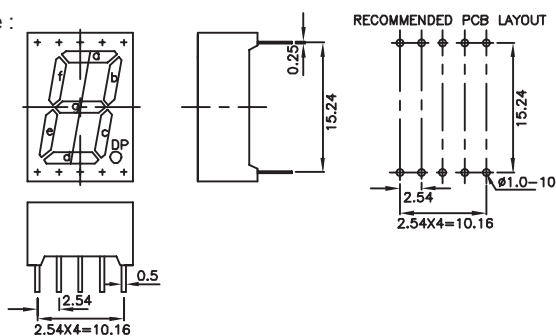
2. The tip of the soldering iron should never touch the epoxy lens.
3. Do not apply stress to the leads when the component is heated above 85°C, otherwise internal wire bonds may be damaged.
4. Through-Hole LEDs are incompatible with reflow soldering.
5. If the LED will undergo multiple soldering passes or face other processes where the part may be subjected to intense heat, please check with Kingbright for compatibility.
6. SMD products must be mounted according to specified soldering pad patterns. Refer to the product datasheet for details. Solder paste must be evenly applied to each soldering pad to insure proper bonding and positioning of the component.



7. After soldering, allow at least three minutes for the component to cool down to room temperature before further operations.
8. Recommended PCB pin hole diameters for display products are listed below :

Round pin type : 2 x pin diameters

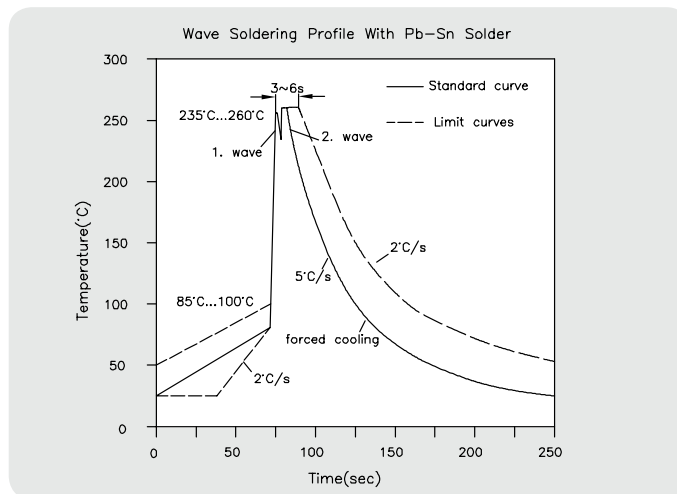
Square pin type :



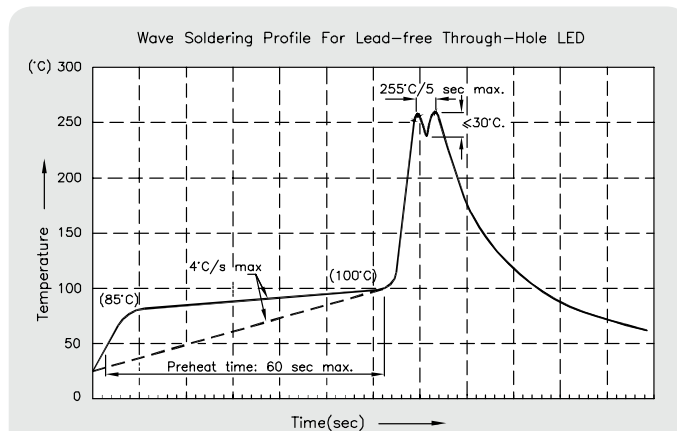
9. Data subject to change without notice. For additional detail of application notes, product information, and disclaimers, please visit our website at http://www.kingbright.com/application_notes.

Recommended Wave Soldering Profiles For Kingbright Through-Hole Products

1. Wave Soldering Profile With Pb-Sn Solder



2. Lead-Free Wave Soldering Profile



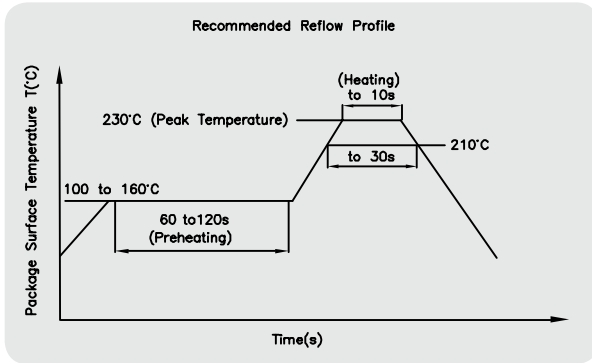
Notes:

1. Recommend pre-heat temperature of 105°C or less (as measured with a thermocouple attached to the LED pins) prior to immersion in the solder wave with a maximum solder bath temperature of 260°C.
2. Peak wave soldering temperature between 245°C ~ 255°C for 3 sec (5 sec max).
3. Do not apply stress to the epoxy resin while the temperature is above 85°C.
4. Fixtures should not incur stress on the component when mounting and during soldering process.
5. SAC 305 solder alloy is recommended.
6. No more than one wave soldering pass.

Recommended Reflow Soldering Profiles For Kingbright SMD Products

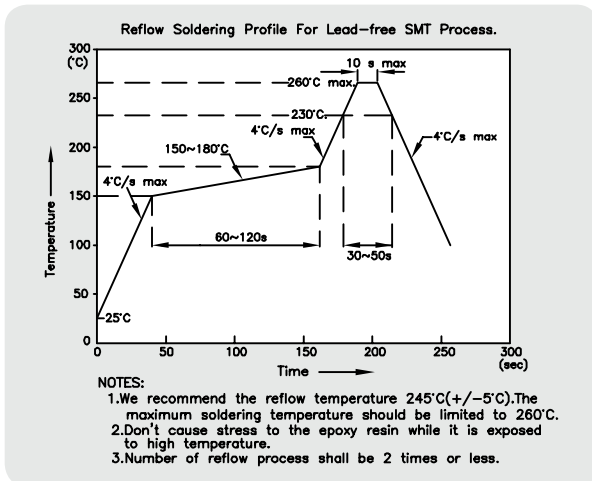
1. Reflow Soldering Profiles With Pb-Sn Solder

No more than two soldering passes with the recommended profile.



2. Lead-Free Reflow Soldering Profile

No more than two soldering passes with the recommended profile.



Static Electricity and Voltage Spikes in InGaN/GaN Products

InGaN/GaN products are sensitive to electrostatic discharge (ESD) and other transient voltage spikes. ESD and voltage spikes can affect the component's reliability, increase reverse current, and decrease forward voltage. This may result in reduced light intensity or cause component failure.

Kingbright InGaN/GaN products are stored in anti-static packaging for protection during transport and storage. Please note the anti-static measures below when handling Kingbright InGaN/GaN products.

Design Precautions

Products using InGaN/GaN components must incorporate protection circuitry to prevent ESD and voltage spikes from reaching the vulnerable component.

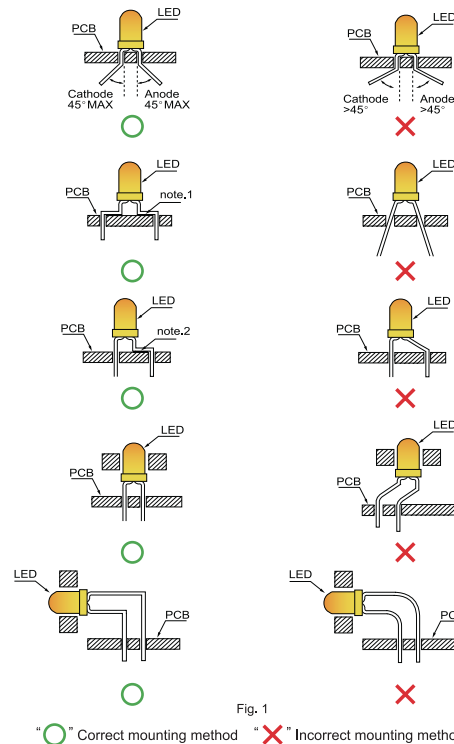
ESD Protection During Production

Static discharge can result when static-sensitive products come in contact with the operator or other conductors. The following procedures may decrease the possibility of ESD damage:

1. Minimize friction between the product and surroundings to avoid static buildup.
2. All production machinery and test instruments must be electrically grounded.
3. Operators must wear anti-static bracelets.
4. Wear anti-static suit when entering work areas with conductive machinery.
5. Set up ESD protection areas using grounded metal plating for component handling.
6. All workstations that handle IC and ESD-sensitive components must maintain an electrostatic potential of 150V or less.
7. Maintain a humidity level of 50% or higher in production areas.
8. Use anti-static packaging for transport and storage.
9. All anti-static equipment and procedures should be periodically inspected and evaluated for proper functionality.

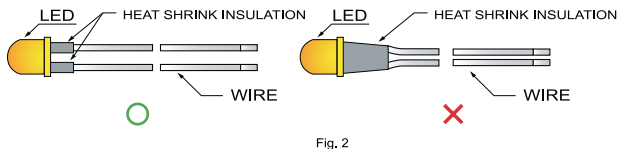
LED Mounting Method

1. The lead pitch of the LED must match the pitch of the mounting holes on the PCB during component placement. Lead-forming may be required to insure the lead pitch matches the hole pitch. Refer to (Fig.1) for proper lead forming procedures.

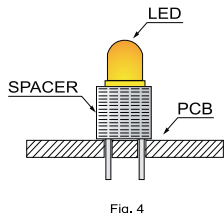
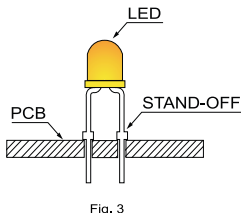


Note 1-2 : Do not route PCB trace in the contact area between the leadframe and the PCB to prevent short-circuits.

- When soldering wire to the LED, use individual heat-shrink tubing to insulate the exposed leads to prevent accidental contact short-circuit. (Fig.2)

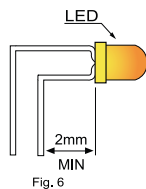
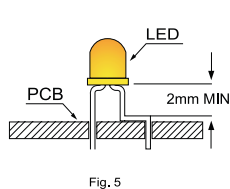


- Use stand-offs (Fig.3) or spacers (Fig.4) to securely position the LED above the PCB.



Lead Forming Procedures

- Maintain a minimum of 2mm clearance between the base of the LED lens and the first lead bend. (Fig. 5 and 6)



- Lead forming or bending must be performed before soldering, never during or after soldering.
- Do not stress the LED lens during lead-forming in order to prevent fractures in the epoxy lens and damage the internal structures.
- During soldering, component covers and holders should leave clearance to avoid placing damaging stress on the LED during soldering. (Fig. 7)

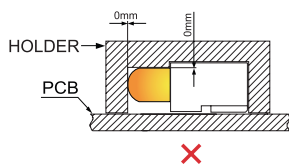
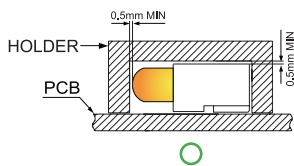
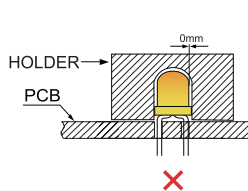
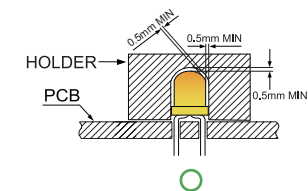


Fig. 7

- During lead forming, use tools or jigs to hold the leads securely so that the bending force will not be transmitted to the LED lens and its internal structures. Do not perform lead forming once the component has been mounted onto the PCB. (Fig. 8)

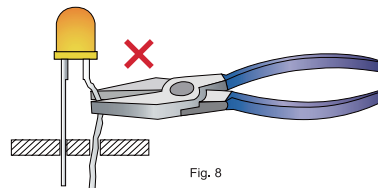


Fig. 8

- Do not bend the leads more than twice. (Fig. 9)

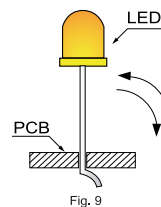


Fig. 9

- After soldering or other high-temperature assembly, allow the LED to cool down to 50°C before applying outside force (Fig. 10). In general, avoid placing excess force on the LED to avoid damage. For any questions please consult with Kingbright representative for proper handling procedures.

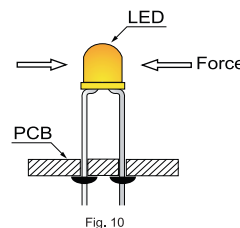


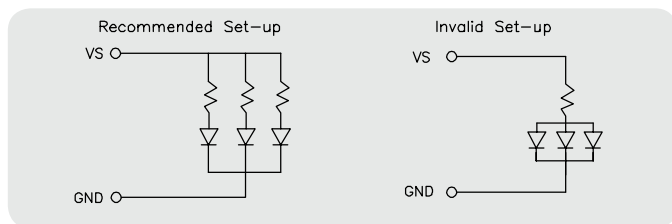
Fig. 10

Cleaning

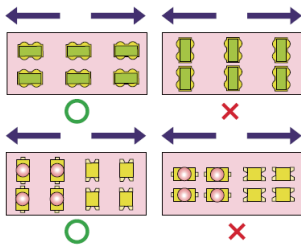
- Do not use harsh organic solvents such as trichloroethylene, acetone, Chlorosen, and Diflon S3MC for cleaning because they may cloud or damage the LED lens.
- Isopropyl alcohol or deionized water are recommended solvents for cleaning.
- Special attention should be taken if other chemicals are used for cleaning because other solvents may damage the epoxy in the lens or housing.
- The cleaning process should take place at room temperature and the devices should not be washed for more than one minute.
- When water is used for cleaning, immediately use forced-air drying to remove excess moisture from the LED.

Miscellaneous Design Notes

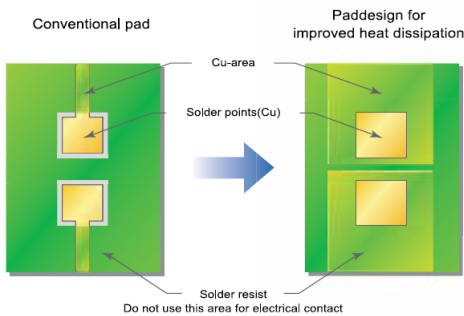
- Protective current-limiting resistors may be necessary to operate the LEDs within the specified range.
- LEDs mounted in parallel should each be placed in series with its own current-limiting resistor.



- The driving circuit should be designed to avoid reverse voltages and transient voltage spikes when the circuit is powered up or shut down.
- During soldering, SMD components should be mounted such that the leads are placed perpendicular to the direction of PCB travel to ensure the solder on each lead melts simultaneously during reflow.



- Optimal usage of high-power LED devices requires careful design by the end-user to optimize heat dissipation, such as increasing the size of the metal backing around the soldering pad. Refer to the product datasheet for specific design recommendations regarding heat dissipation.

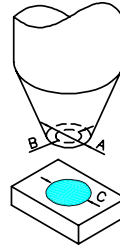


- High temperatures can reduce device performance and reliability. Keep LED devices away from heat source for best performance.
- The safe operation current should be chosen after considering the maximum ambient temperature of the operating environment.

Restrictions on Product Use

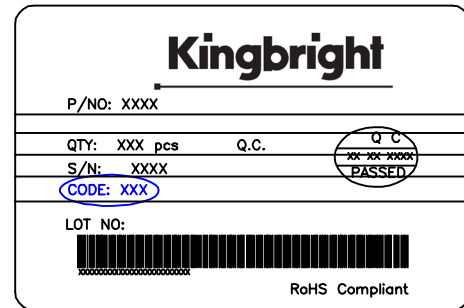
- Not all devices and product families are available in every country.
- The light output from UV, blue, white, and other high-power LEDs may cause injury to the human eye when viewed directly.
- LED devices may contain gallium arsenide (GaAs) material. GaAs is harmful if ingested. GaAs dust and fumes are toxic. Do not break, cut, or pulverize LED devices. Do not dissolve LEDs in chemical solvents.
- Semiconductor devices can fail or malfunction due to their sensitivity to electrical fluctuation and physical stress. It is the responsibility of the user to observe all safety standards when using Kingbright products, in order to avoid situations in which the malfunction or failure of a Kingbright product could cause injury, property damage, or the loss of human life. In developing designs, please ensure that Kingbright products are used within specified operating conditions as set forth in the most recent product specification datasheet.

- For LEDs with silicone encapsulation such as the KA and KT series, the outer diameter of the pick-up nozzle must be larger than that of the LED's light emitting area. i. e. $A > C$, and B shall be smaller than the width of the LED.



A is the outer diameter pick-up nozzle
B is the inner diameter of the nozzle
C is the diameter of lens.

- The size of the nozzle should be as large as possible if the tape is not involved.
- It is not recommended to assemble LEDs with different color bins or intensity bins together as there may be perceivable color or intensity variation. Each bag contains parts from the same bin code. The bin code is printed on the bag's label as shown below.



Storage Control

For SMD Products

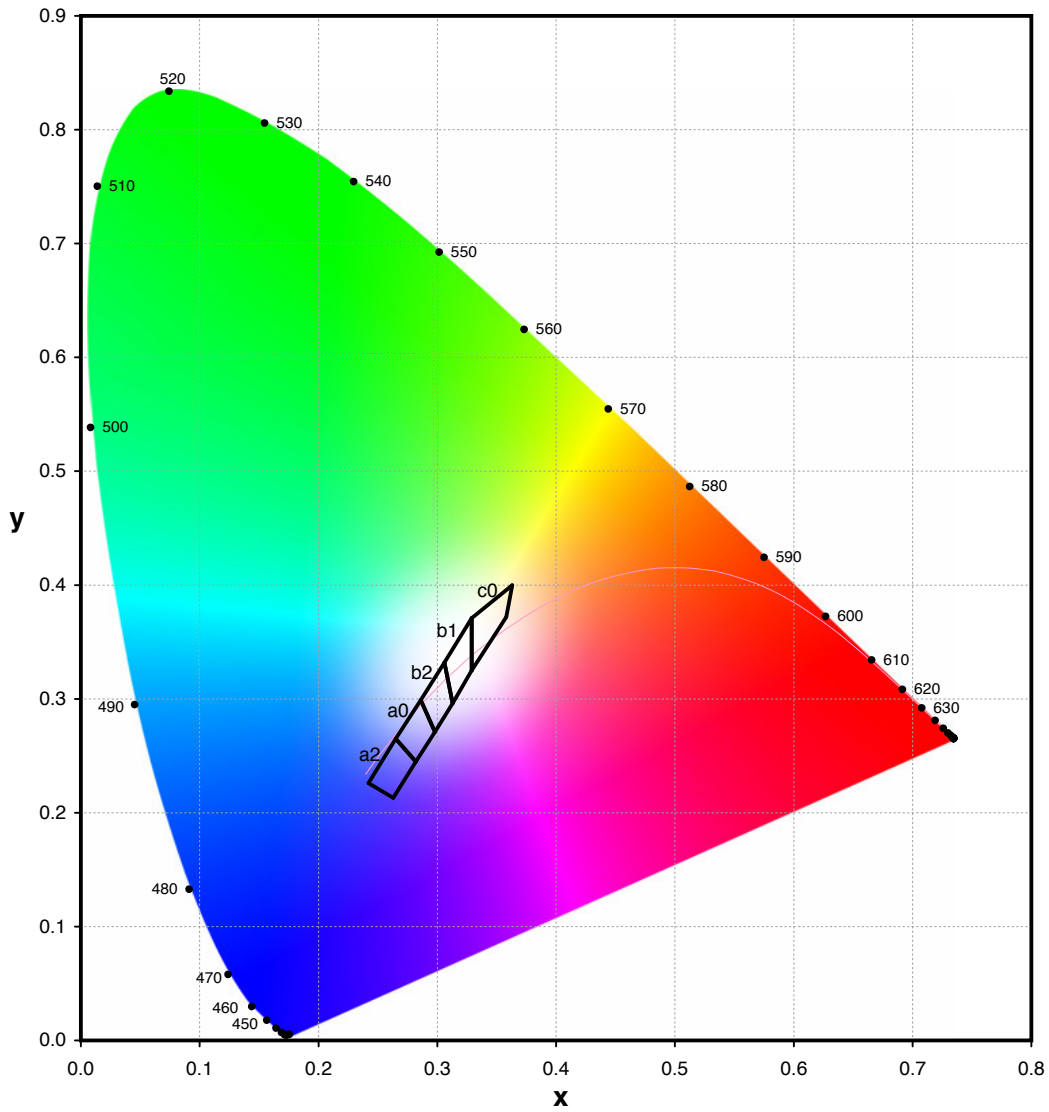
- Before a sealed moisture barrier bag (MBB) is opened, contained LEDs shall be kept in an environment with temperature below 40°C and humidity below 90% RH. MBB shall be kept sealed until LEDs contained in the bag are ready to be used. Once MBB is opened, it shall be stored in an environment with temperature range of 5°C~30°C and humidity below 60% RH.
- Once MBB is opened, all contained LEDs shall complete soldering process within the specified time frame according to the conditions labeled on Kingbright MBB.
- When the 10% spot of a humidity indicator card (HIC) from MBB indicates wet, the contained LEDs shall be baked according to the baking conditions labeled on Kingbright MBB before mounting.

For Through-Hole Products

- Avoid continued exposure to the condensing moisture environment and keep the product away from rapid transitions in ambient temperature.
- LEDs should be stored with temperature $\leq 30^\circ\text{C}$ and relative humidity $< 60\%$.
- Product in the original sealed package is recommended to be assembled within 72 hours of opening. Product in opened package for more than a week should be baked for 30 (+10/-0) hours at 85°C ~ 100°C.

CIE CHROMATICITY DIAGRAM

White Bin Code



Bin	x	y
a2	0.263	0.213
	0.282	0.245
	0.265	0.265
	0.242	0.226
CCT: 15000K~		

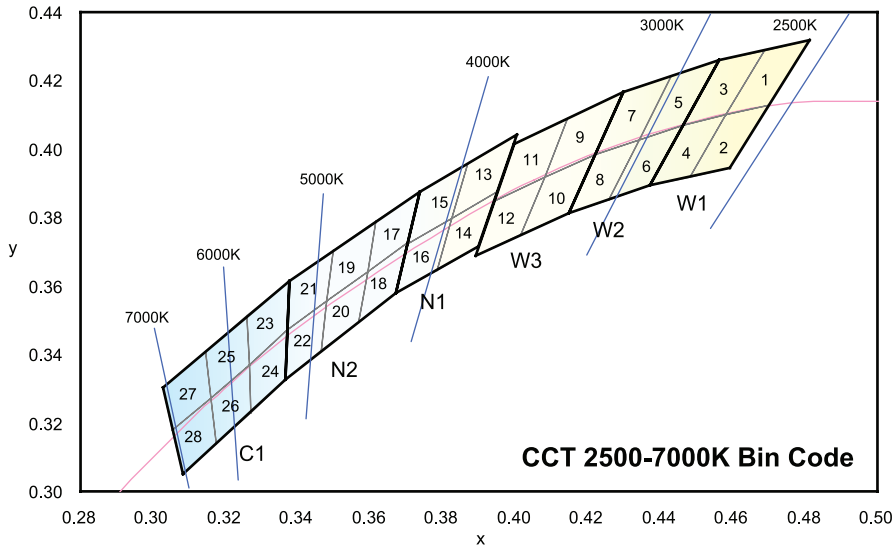
Bin	x	y
a0	0.282	0.245
	0.298	0.271
	0.286	0.299
	0.265	0.265
CCT: 9000~15000K		

Bin	x	y
b2	0.298	0.271
	0.313	0.296
	0.306	0.332
	0.286	0.299
	0.286	0.299
CCT: 6800~9000K		

Bin	x	y
b1	0.313	0.296
	0.329	0.325
	0.329	0.371
	0.306	0.332
CCT: 5600~6800K		

Bin	x	y
c0	0.329	0.325
	0.358	0.372
	0.363	0.400
	0.329	0.371
	0.329	0.371
CCT: 4600~5600K		

CIE CHROMATICITY DIAGRAM



Group	Chromaticity Regions	CCT (K)		
		Min.	Typ.	Max.
W1	1, 2, 3, 4	2580	2700	2870
W2	5, 6, 7, 8	2870	3000	3220
W3	9, 10, 11, 12	3220	3500	3710

Group	Chromaticity Regions	CCT (K)		
		Min.	Typ.	Max.
N1	13, 14, 15, 16	3710	4000	4260
N2	17, 18, 19, 20, 21, 22	4260	4700	5310
C1	23, 24, 25, 26, 27, 28	5310	6000	7040

	x	y		x	y		x	y		x	y
1	0.4582	0.4099	8	0.4147	0.3814	15	0.3702	0.3722	22	0.3481	0.3557
	0.4687	0.4289		0.4221	0.3984		0.3736	0.3874		0.3370	0.3472
	0.4813	0.4319		0.4342	0.4028		0.3869	0.3958		0.3364	0.3328
	0.4700	0.4126		0.4259	0.3853		0.3825	0.3798		0.3466	0.3411
2	0.4483	0.3919	9	0.4080	0.3916	16	0.3670	0.3578	23	0.3376	0.3616
	0.4582	0.4099		0.4146	0.4089		0.3702	0.3722		0.3260	0.3512
	0.4700	0.4126		0.4299	0.4165		0.3825	0.3798		0.3265	0.3371
	0.4593	0.3944		0.4221	0.3984		0.3783	0.3646		0.3370	0.3472
3	0.4465	0.4071	10	0.4017	0.3751	17	0.3736	0.3874	24	0.3370	0.3472
	0.4562	0.4260		0.4080	0.3916		0.3616	0.3788		0.3265	0.3371
	0.4687	0.4289		0.4221	0.3984		0.3592	0.3641		0.3270	0.3230
	0.4582	0.4099		0.4147	0.3814		0.3703	0.3726		0.3364	0.3328
4	0.4373	0.3893	11	0.3941	0.3848	18	0.3703	0.3726	25	0.3260	0.3512
	0.4465	0.4071		0.3996	0.4015		0.3592	0.3641		0.3144	0.3408
	0.4582	0.4099		0.4146	0.4089		0.3568	0.3495		0.3160	0.3274
	0.4483	0.3919		0.4080	0.3916		0.3670	0.3578		0.3265	0.3371
5	0.4342	0.4028	12	0.3889	0.3690	19	0.3616	0.3788	26	0.3265	0.3371
	0.4430	0.4212		0.3941	0.3848		0.3496	0.3702		0.3160	0.3274
	0.4562	0.4260		0.4080	0.3916		0.3481	0.3557		0.3175	0.3139
	0.4465	0.4071		0.4017	0.3751		0.3592	0.3641		0.3270	0.3230
6	0.4259	0.3853	13	0.3825	0.3798	20	0.3592	0.3641	27	0.3144	0.3408
	0.4342	0.4028		0.3869	0.3958		0.3481	0.3557		0.3028	0.3304
	0.4465	0.4071		0.4006	0.4044		0.3466	0.3411		0.3055	0.3177
	0.4373	0.3893		0.3950	0.3875		0.3568	0.3495		0.3160	0.3274
7	0.4221	0.3984	14	0.3783	0.3646	21	0.3496	0.3702	28	0.3160	0.3274
	0.4299	0.4165		0.3825	0.3798		0.3376	0.3616		0.3055	0.3177
	0.4430	0.4212		0.3950	0.3875		0.3370	0.3472		0.3081	0.3049
	0.4342	0.4028		0.3898	0.3716		0.3481	0.3557		0.3175	0.3139

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