

SMD ■ Low Power LED

45-21S/XK2D-HXXXXXXXXXB2Z6/2T



Features

- LM-80 Certified
- PLCC-2 package
- Top view white LED
- High luminous intensity output
- Wide viewing angle
- Pb-free
- RoHS compliant

Description

The Everlight 45-21S package has high efficacy, high CRI, low power consumption, wide viewing angle and a compact form factor. These features make this package an ideal LED for all lighting applications.

Applications

- General lighting
- Decorative and Entertainment Lighting
- Indicators
- Illumination
- Switch lights

CONFIDENTIAL

Product Number Explanation

45-21S / X K 2 D – H XX XX XX XX XX / 2T

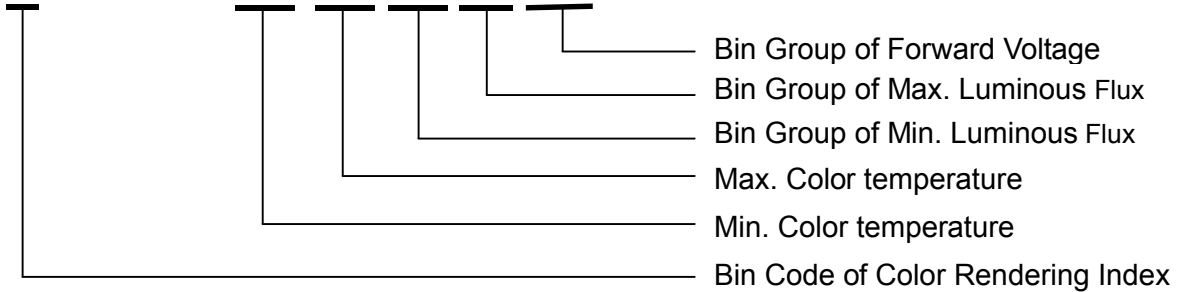


Table of Color Rendering Index

Symbol	Description
M	CRI(Min.) : 60
N	CRI(Min.) : 65
L	CRI(Min.) : 70
Q	CRI(Min.) : 75
K	CRI(Min.) : 80
H	CRI(Min.) : 90

Note:
 Tolerance of Color Rendering Index: ±2

Example:
 45-21S/KK2D-H3030M31N4B2Z6/2T

CRI	80(Min.)
CCT	3000K
Flux	20~33lm
V _F	2.9~3.6V
I _F	60mA

CONFIDENTIAL

Mass Production List for CRI>80

Product	CRI Min. (1)	CCT(K)	Φ(lm) Min. (2)	Φ(lm) Max. (2)
45-21S/KK2D-H2727M3N4B2Z6/2T	80	2700K	19	33
45-21S/KK2D-H3030M31N4B2Z6/2T	80	3000K	20	33
45-21S/KK2D-H4040M4N4B2Z6/2T	80	4000K	21	33
45-21S/KK2D-H5050M4N4B2Z6/2T	80	5000K	21	33
45-21S/KK2D-H5757M4N4B2Z6/2T	80	5700K	21	33
45-21S/KK2D-H6565M4N4B2Z6/2T	80	6500K	21	33

Note:

1. Tolerance of Color Rendering Index: ±2
2. Tolerance of Luminous flux: ±11%.

CONFIDENTIAL

Device Selection Guide

Chip Materials	Emitted Color	Resin Color
InGaN	Cool White Natural White Warm White	Water Clear

Absolute Maximum Ratings (T_{Soldering}=25)

Parameter	Symbol	Rating	Unit
Forward Current	I _F	75	mA
Peak Forward Current (Duty 1/10 @10ms)	I _{FP}	100	mA
Power Dissipation	P _d	270	mW
Operating Temperature	T _{opr}	-40 ~ +85	
Storage Temperature	T _{stg}	-40 ~ +100	
Thermal Resistance (Junction / Soldering point)	R _{th J-S}	50	/W
Junction Temperature	T _j	125	
Soldering Temperature	T _{sol}	Reflow Soldering : 260 Hand Soldering : 350	for 10 sec. for 3 sec.

Note:

The products are sensitive to static electricity and must be carefully taken when handling products

Electro-Optical Characteristics (T_{Soldering}=25)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Luminous Flux ₍₁₎	Φ	19	-----	33	lm	I _F =60mA
Forward Voltage ₍₂₎	V _F	2.9	-----	3.6	V	I _F =60mA
Color Rendering Index ₍₃₎	R _a	80	-----	-----		I _F =60mA
Viewing Angle	2θ _{1/2}	-----	120	-----	deg	I _F =60mA
Reverse Current	I _R	-----	-----	50	μA	V _R =5V

Notes:

1. Tolerance of Luminous flux: ±11%.
2. Tolerance of Forward Voltage : ±0.1V.
3. Tolerance of Color Rendering Index: ±2

Bin Range of Luminous Flux

Bin Code	Min.	Max.	Unit	Condition
M3	19	21	lm	I _F =60mA
M4	21	24		
N3	24	27		
N4	27	33		

Note:
 Tolerance of Luminous flux: ±11%.

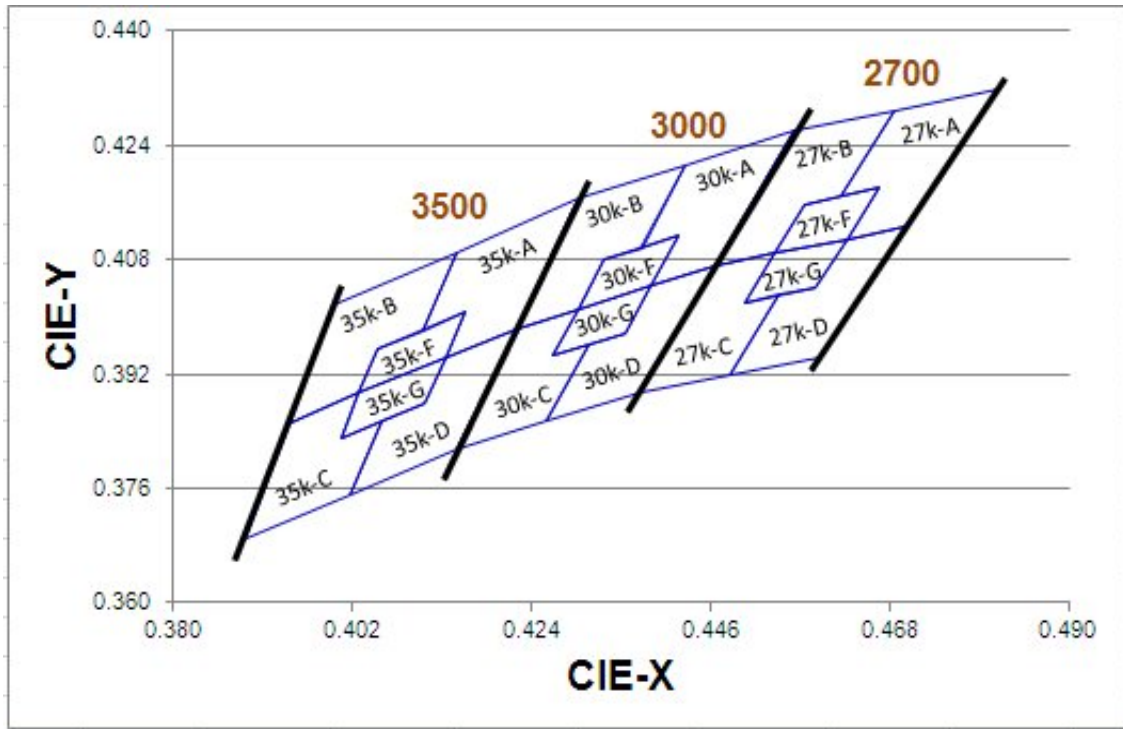
Bin Range of Forward Voltage

Group	Bin Code	Min.	Max.	Unit	Condition
B2	36	2.9	3.0	V	I _F =60mA
	37	3.0	3.1		
	38	3.1	3.2		
	39	3.2	3.3		
	40	3.3	3.4		
	41	3.4	3.5		
	42	3.5	3.6		

Note:
 Tolerance of Forward Voltage: ±0.1V.

CONFIDENTIAL

The C.I.E. 1931 Chromaticity Diagram



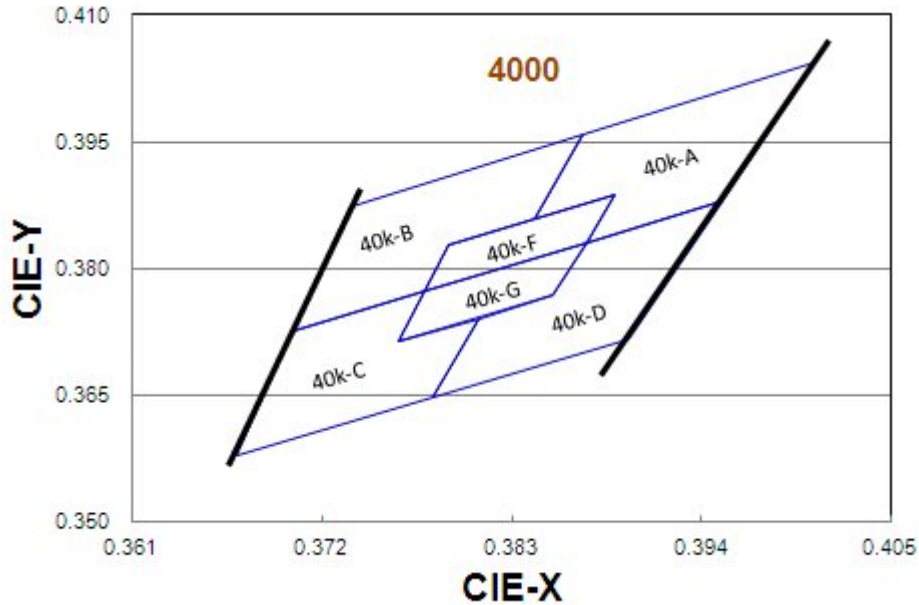
Bin Range of Chromaticity Coordinates

CCT	Bin Code	CIE_x	CIE_y	Bin Code	CIE_x	CIE_y	
2700K	27K-A	0.4813	0.4319	27K-D	0.4700	0.4126	
		0.4687	0.4289		0.4627	0.4109	
		0.4621	0.4169		0.4588	0.4041	
		0.4667	0.4180		0.4544	0.4030	
		0.4627	0.4109		0.4483	0.3919	
		0.4700	0.4126		0.4593	0.3944	
	Reference Range:2580K~2700K						
	27K-B	0.4687	0.4289	27K-C	0.4465	0.4071	
		0.4562	0.4260		0.4373	0.3893	
		0.4465	0.4071		0.4483	0.3919	
		0.4539	0.4088		0.4544	0.4030	
		0.4576	0.4158		0.4502	0.4020	
		0.4621	0.4169		0.4539	0.4088	
	Reference Range:2700K~2870K						
	27K-F	0.4667	0.4180	27K-G	0.4627	0.4109	
		0.4576	0.4158		0.4539	0.4088	
		0.4539	0.4088		0.4502	0.4020	
		0.4627	0.4109		0.4588	0.4041	
Reference Range: 2665K~2770K							

CCT	Bin Code	CIE_x	CIE_y	Bin Code	CIE_x	CIE_y	
3000K	30K-A	0.4562	0.4260	30K-D	0.4465	0.4071	
		0.4430	0.4212		0.4388	0.4043	
		0.4375	0.4096		0.4355	0.3977	
		0.4422	0.4113		0.4311	0.3962	
		0.4388	0.4043		0.4259	0.3853	
		0.4465	0.4071		0.4373	0.3893	
	Reference Range:2870K~3000K						
	30K-B	0.4430	0.4212	30K-C	0.4221	0.3984	
		0.4299	0.4165		0.4147	0.3814	
		0.4221	0.3984		0.4259	0.3853	
		0.4297	0.4011		0.4311	0.3962	
		0.4328	0.4079		0.4267	0.3946	
		0.4375	0.4096		0.4297	0.4011	
	Reference Range:3000K~3220K						
	30K-F	0.4422	0.4113	30K-G	0.4388	0.4043	
		0.4328	0.4079		0.4297	0.4011	
		0.4297	0.4011		0.4267	0.3946	
		0.4388	0.4043		0.4355	0.3977	
	Reference Range:2960K~3080K						

CONFIDENTIAL

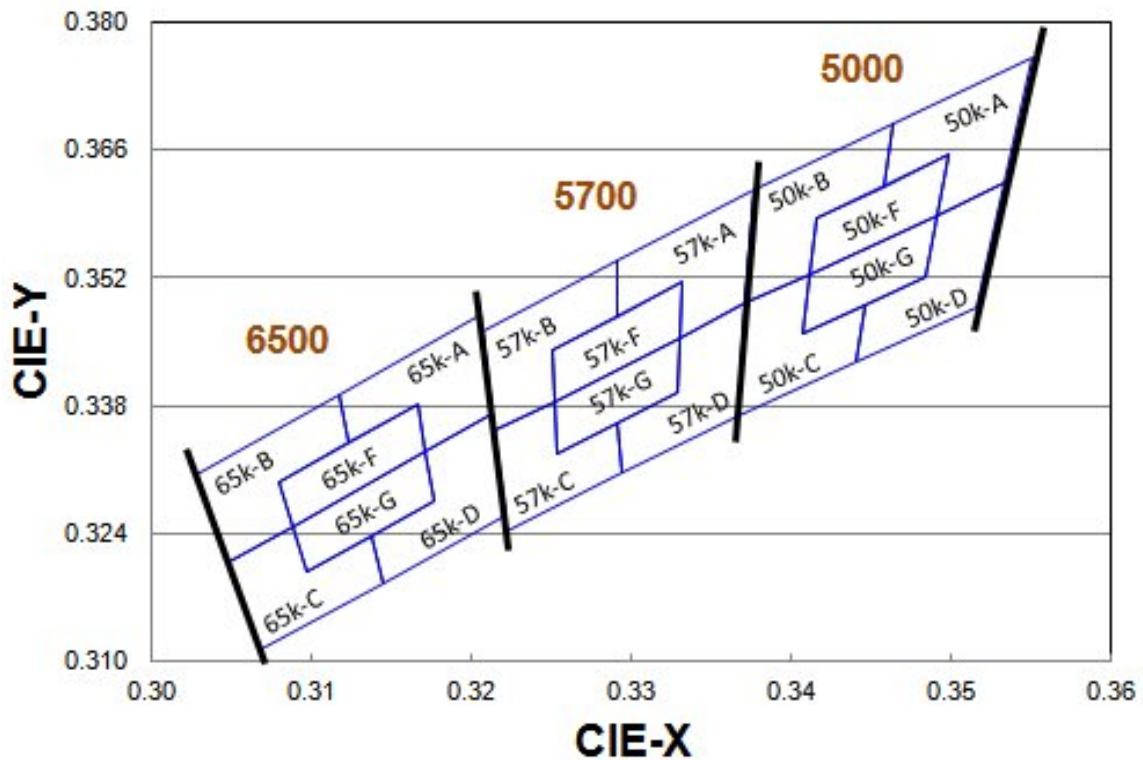
The C.I.E. 1931 Chromaticity Diagram



Bin Range of Chromaticity Coordinates

CCT	Bin Code	CIE_x	CIE_y	Bin Code	CIE_x	CIE_y	
4000K	40K-A	0.4006	0.4044	40K-D	0.3952	0.3880	
		0.3871	0.3959		0.3873	0.3831	
		0.3843	0.3858		0.3854	0.3768	
		0.3890	0.3887		0.3810	0.3741	
		0.3873	0.3831		0.3784	0.3647	
		0.3952	0.3880		0.3898	0.3716	
	Reference Range:3700K~3970K						
	40K-B	0.3871	0.3959	40K-C	0.3703	0.3726	
		0.3736	0.3874		0.3670	0.3578	
		0.3703	0.3726		0.3784	0.3647	
		0.3779	0.3773		0.3810	0.3741	
		0.3793	0.3828		0.3764	0.3713	
		0.3843	0.3858		0.3779	0.3773	
	Reference Range:3970K~4270K						
	40K-F	0.3890	0.3887	40K-G	0.3873	0.3831	
		0.3793	0.3828		0.3779	0.3773	
		0.3779	0.3773		0.3764	0.3713	
		0.3873	0.3831		0.3854	0.3768	
	Reference Range:3870K~4080K						

The C.I.E. 1931 Chromaticity Diagram



Bin Range of Chromaticity Coordinates

CCT	Bin Code	CIE_x	CIE_y	Bin Code	CIE_x	CIE_y	
5000K	50K-A	0.3551	0.3760	50K-D	0.3533	0.3624	
		0.3464	0.3688		0.3482	0.3583	
		0.3456	0.3604		0.3477	0.3530	
		0.3487	0.3629		0.3448	0.3507	
		0.3482	0.3583		0.3441	0.3428	
		0.3533	0.3624		0.3515	0.3487	
	Reference Range:4745K~5000K						
	50K-B	0.3464	0.3688	50K-C	0.3371	0.3493	
		0.3376	0.3616		0.3366	0.3369	
		0.3371	0.3493		0.3441	0.3428	
		0.3422	0.3533		0.3448	0.3507	
		0.3425	0.3579		0.3418	0.3483	
0.3456		0.3604	0.3422		0.3533		
Reference Range:5000K~5310K							
50K-F	0.3487	0.3629	50K-G	0.3482	0.3583		
	0.3425	0.3579		0.3422	0.3533		
	0.3422	0.3533		0.3418	0.3483		
	0.3482	0.3583		0.3477	0.3530		
Reference Range:4910K~5120K							

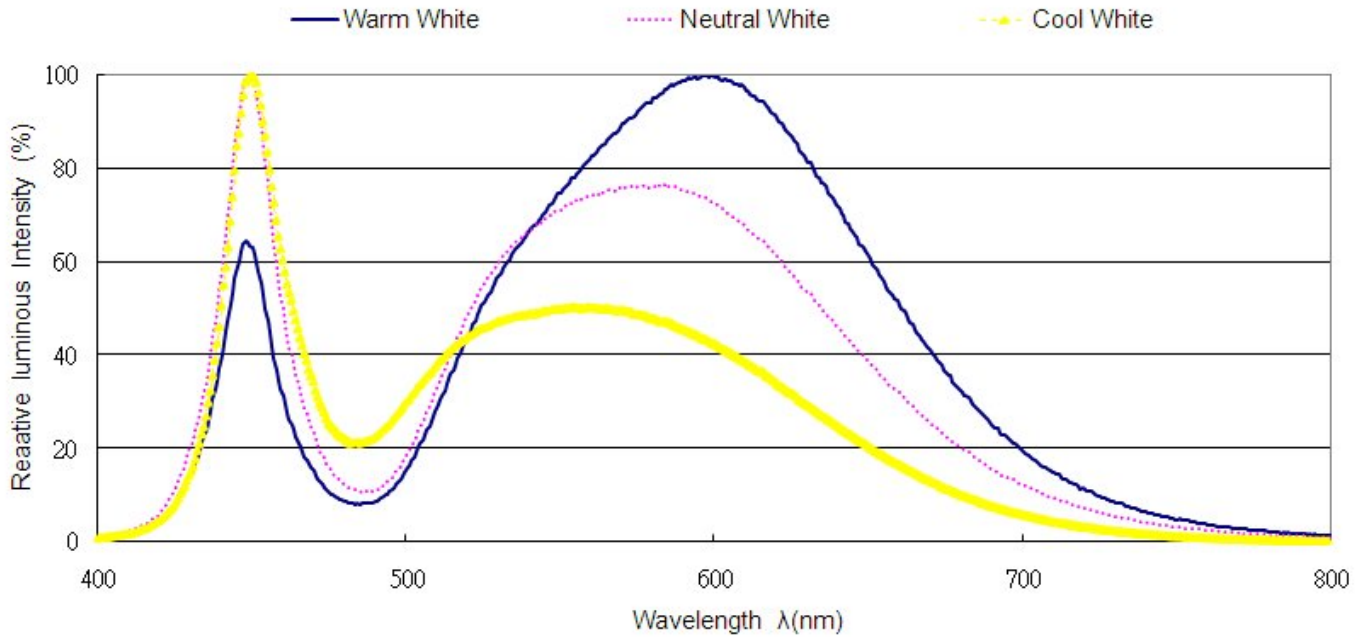
CCT	Bin Code	CIE_x	CIE_y	Bin Code	CIE_x	CIE_y	
5700K	57K-A	0.3376	0.3616	57K-D	0.3371	0.3493	
		0.3292	0.3539		0.3321	0.3447	
		0.3292	0.3464		0.3320	0.3401	
		0.3321	0.3490		0.3293	0.3377	
		0.3321	0.3447		0.3294	0.3306	
		0.3371	0.3493		0.3366	0.3369	
	Reference Range:5310K~5700K						
	57K-B	0.3292	0.3539	57K-C	0.3215	0.3353	
		0.3207	0.3462		0.3222	0.3243	
		0.3215	0.3353		0.3294	0.3306	
		0.3262	0.3395		0.3293	0.3377	
		0.3261	0.3436		0.3263	0.335	
		0.3292	0.3464		0.3262	0.3395	
	Reference Range:5700K~6020K						
	57K-F	0.3321	0.3490	57K-G	0.3321	0.3447	
		0.3261	0.3436		0.3262	0.3395	
		0.3262	0.3395		0.3263	0.3350	
		0.3321	0.3447		0.3320	0.3401	
	Reference Range:5520K~5780K						

CCT	Bin Code	CIE_x	CIE_y	Bin Code	CIE_x	CIE_y	
6500K	65K-A	0.3205	0.3481	65K-D	0.3213	0.3371	
		0.3117	0.3393		0.3161	0.3320	
		0.3125	0.3328		0.3166	0.3281	
		0.3157	0.3360		0.3136	0.3251	
		0.3161	0.3320		0.3145	0.3187	
		0.3213	0.3371		0.3221	0.3261	
	Reference Range:6020K~6500K						
	65K-B	0.3117	0.3393	65K-C	0.3048	0.3209	
		0.3028	0.3304		0.3068	0.3113	
		0.3048	0.3209		0.3145	0.3187	
		0.3100	0.3259		0.3136	0.3251	
		0.3093	0.3297		0.3106	0.3222	
		0.3125	0.3328		0.31	0.3259	
	Reference Range:6500K~7050K						
	65K-F	0.3157	0.3360	65K-G	0.3161	0.3320	
		0.3093	0.3297		0.3100	0.3259	
		0.3100	0.3259		0.3106	0.3222	
		0.3161	0.3320		0.3166	0.3281	
	Reference Range:6300K~6690K						

Note:

1. The value is based on driving current by 60mA.
2. Tolerance of Chromaticity Coordinates: ± 0.01 .

Spectrum Distribution



Typical Electro-Optical Characteristics Curves

Fig.1 – Forward Voltage Shift vs. Junction Temperature

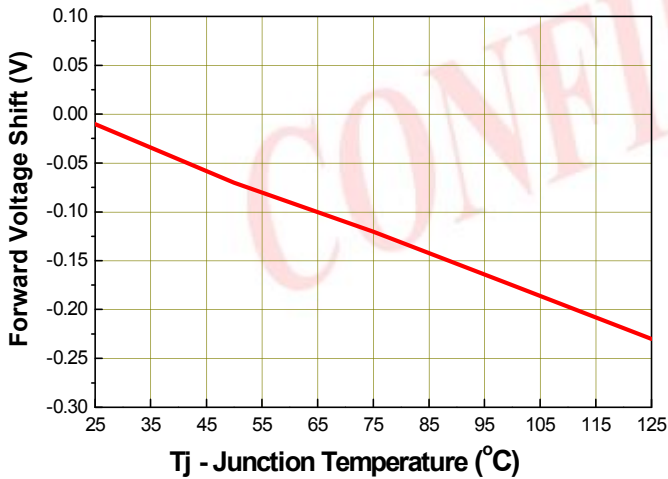
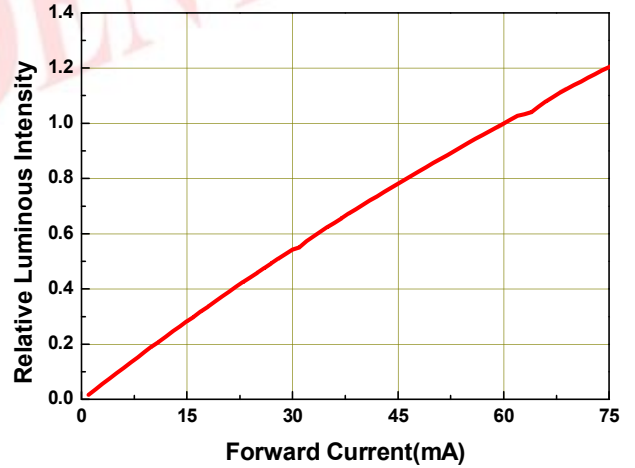


Fig.2 - Relative Luminous Intensity vs. Forward Current



Typical Electro-Optical Characteristics Curves

Fig.3 - Relative Luminous Intensity vs. Junction Temperature

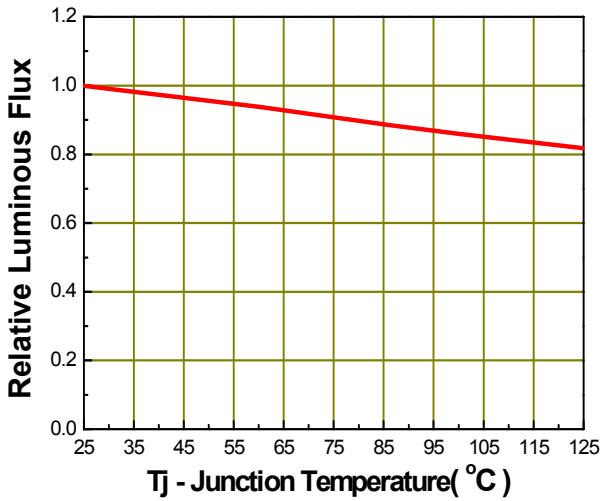


Fig.4 - Forward Current vs. Forward Voltage

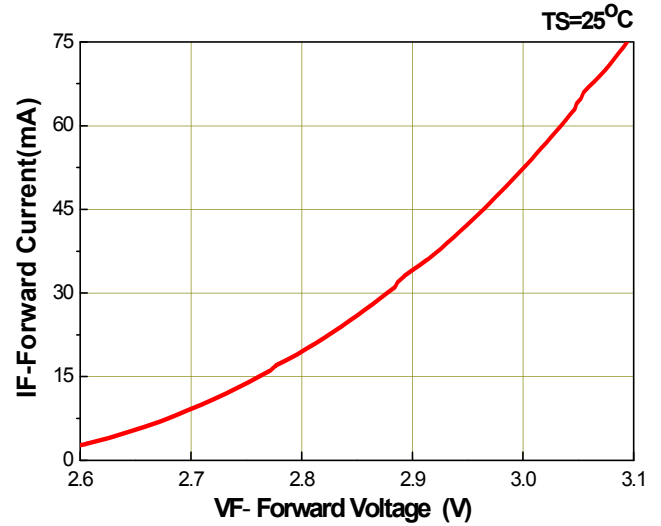


Fig.5 - Max. Driving Forward Current vs. Soldering Temperature

R_{th j-s}=50° C/W

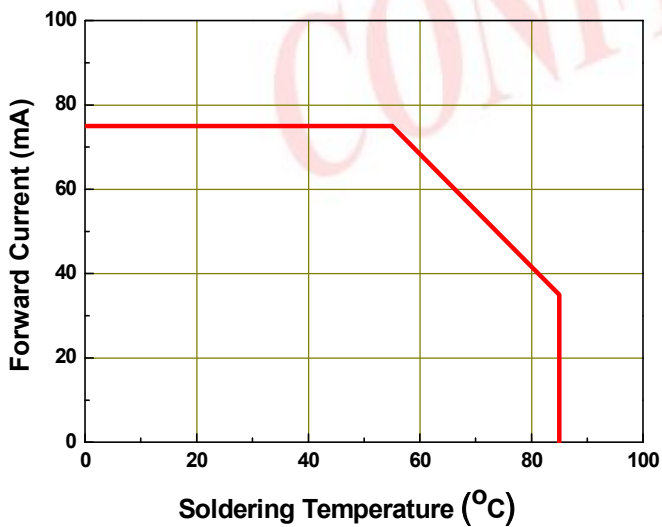
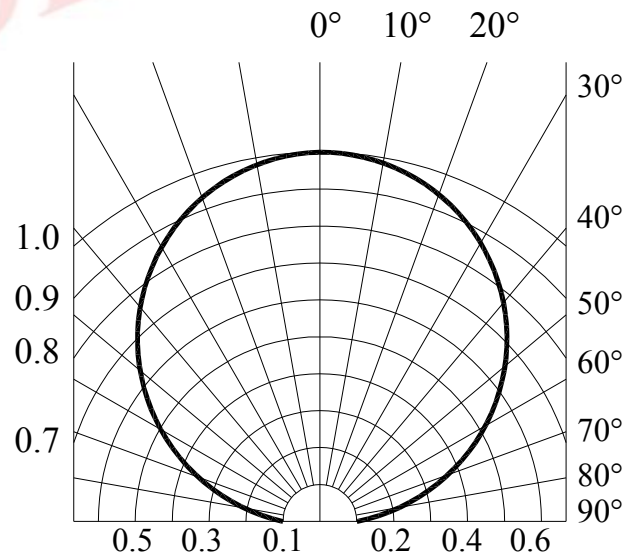
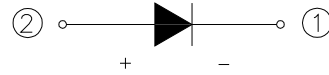
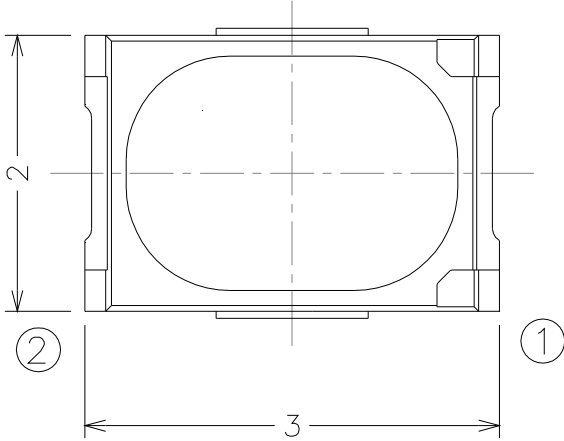


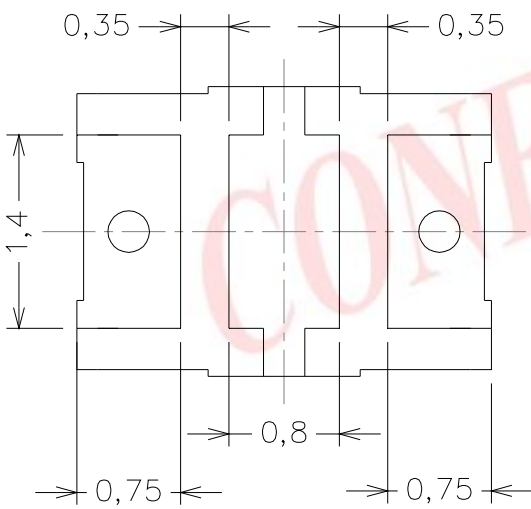
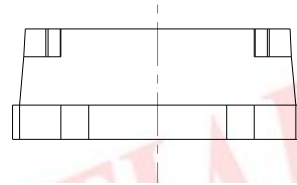
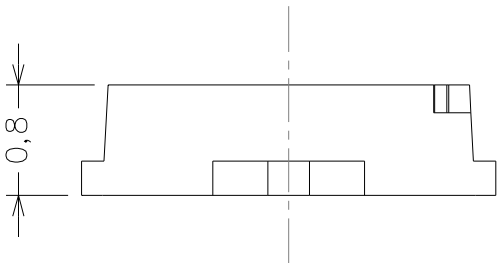
Fig.6 - Radiation Diagram



Package Dimension

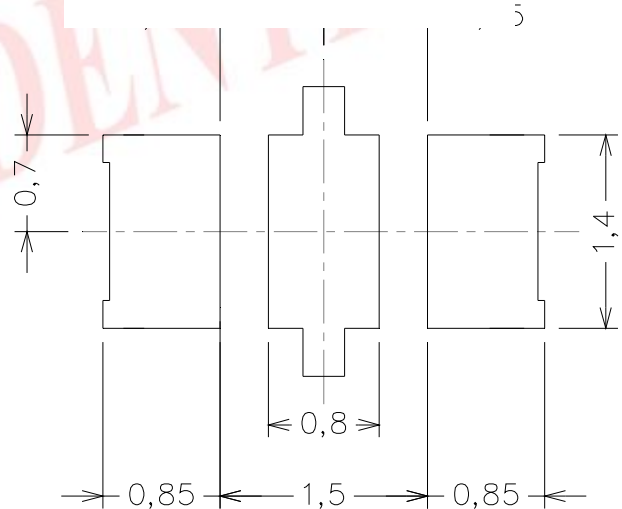


Polarity



Bot. view

Recommended Solde Pad



Soldering patterns

Note:
 Tolerance unless mentioned is $\pm 0.2\text{mm}$; Unit = mm

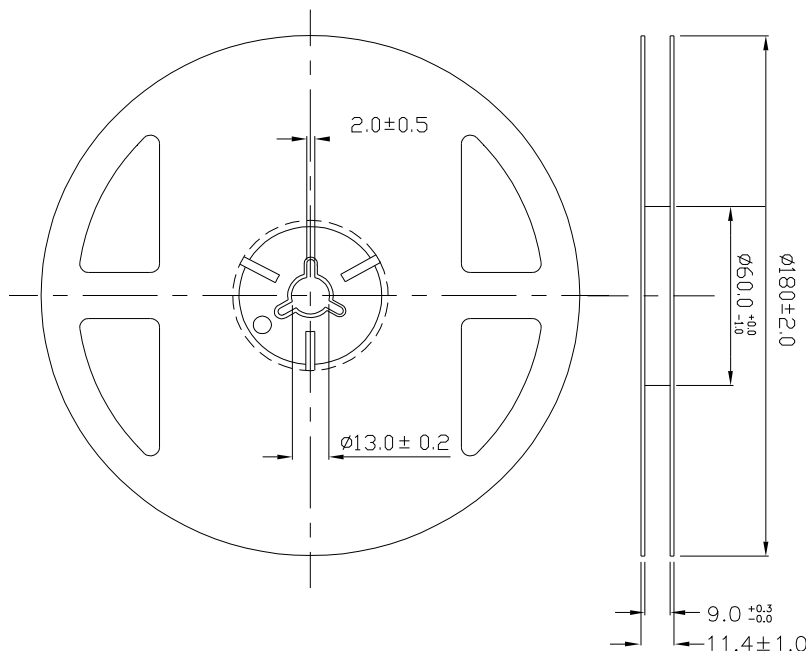
Moisture Resistant Packing Materials

Label Explanation



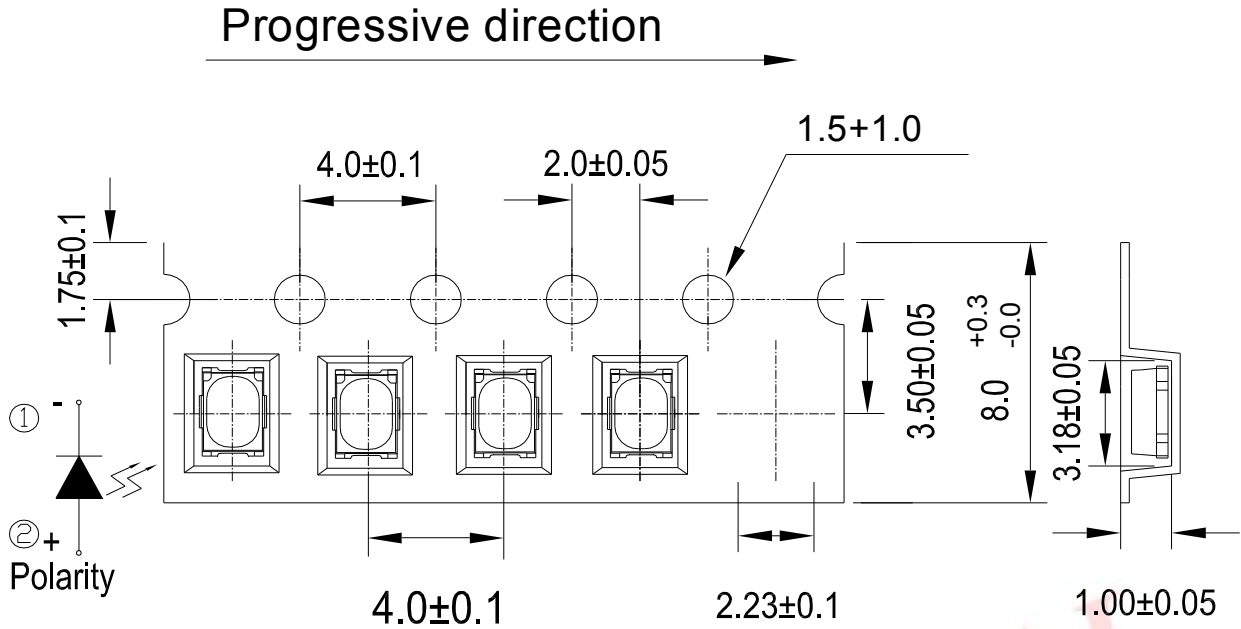
- CPN: Customer's Product Number
- P/N: Product Number
- QTY: Packing Quantity
- CAT: Luminous Intensity Rank
- HUE: Dom. Wavelength Rank
- REF: Forward Voltage Rank
- LOT No: Lot Number

Reel Dimensions



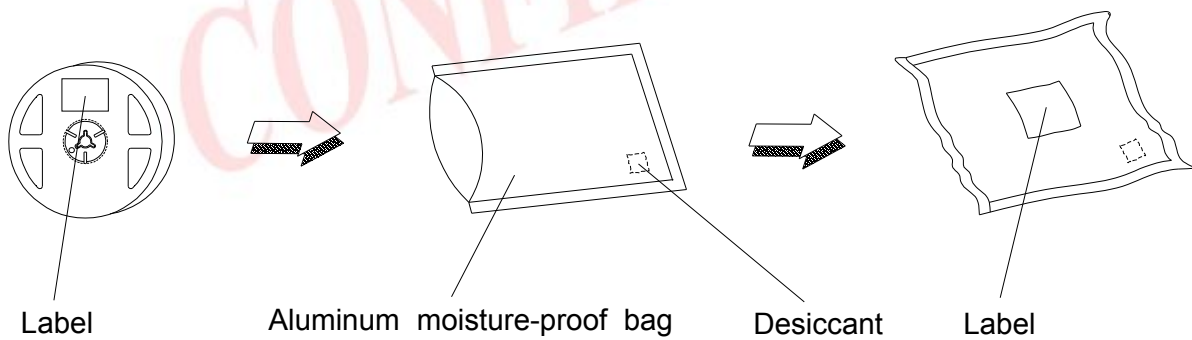
Note:
 Tolerances unless mentioned ± 0.1 mm. Unit = mm

Carrier Tape Dimensions: Loaded Quantity 250 /500/1000/2000 pcs. Per Reel



Note:
 Tolerances unless mentioned ± 0.1 mm. Unit = mm

Moisture Resistant Packing Process



Reliability Test Items and Conditions

The reliability of products shall be satisfied with items listed below.

Confidence level : 90%

LTPD : 10%

No.	Items	Test Condition	Test Hours/Cycles	Sample Size	Ac/Re
1	Reflow Soldering	Temp. : 260 /10sec.	6 Min.	22 PCS.	0/1
2	Thermal Shock	H : +100 20min 10 sec L : -10 20min	500 Cycles	22 PCS.	0/1
3	Temperature Cycle	H : +100 30min 5 min L : -40 30min	500 Cycles	22 PCS.	0/1
4	High Temperature/Humidity Reverse Bias	Ta=85 ,85%RH	1000 Hrs.	22 PCS.	0/1
5	High Temperature/Humidity Operation	Ta=85 ,85%RH, I _F = 40 mA	1000 Hrs.	22 PCS.	0/1
6	Low Temperature Storage	Ta=-40	1000 Hrs.	22 PCS.	0/1
7	High Temperature Storage	Ta=85	1000 Hrs.	22 PCS.	0/1
8	Low Temperature Operation Life	Ta=-40 , I _F = 75 mA	1000 Hrs.	22 PCS.	0/1
9	High Temperature Operation/ Life#1	Ta=25 , I _F = 75 mA	1000 Hrs.	22 PCS.	0/1
10	High Temperature Operation/ Life#2	Ta=55 , I _F =75 mA	1000 Hrs.	22 PCS.	0/1
11	High Temperature Operation/ Life#3	Ta=85 , I _F = 40 mA	1000 Hrs.	22 PCS.	0/1

CONFIDENTIAL

Precautions for Use

1. Over-current-proof

Customer must apply resistors for protection; otherwise slight voltage shift will cause big current change (Burn out will happen).

2. Storage

2.1 Do not open moisture proof bag before the products are ready to use.

2.2 Before opening the package: The LEDs should be kept at 30 °C or less and 90%RH or less.

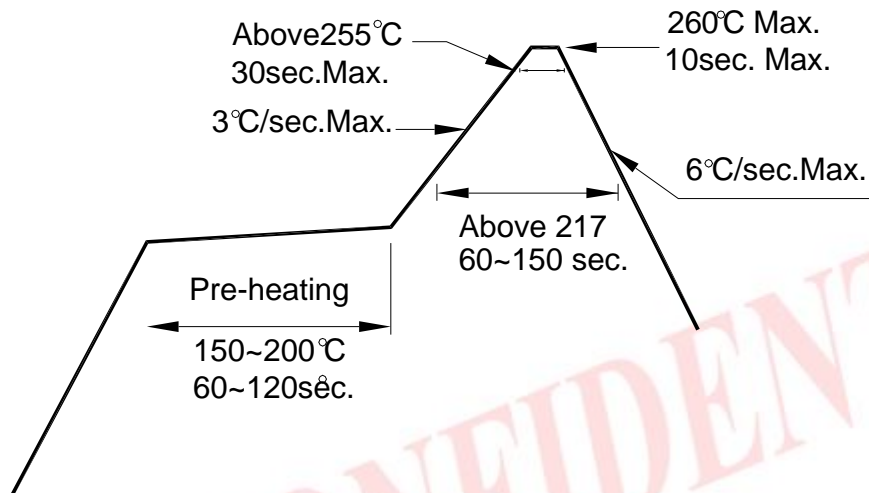
2.3 After opening the package: The LED's floor life is 168 Hrs under 30 °C or less and 60% RH or less. If unused LEDs remain, it should be stored in moisture proof packages.

2.4 If the moisture absorbent material (silica gel) has faded away or the LEDs have exceeded the storage time, baking treatment should be performed using the following conditions.

Baking treatment: 60±5 °C for 24 hours.

3. Soldering Condition

3.1 Pb-free solder temperature profile



3.2 Reflow soldering should not be done more than two times.

3.3 When soldering, do not put stress on the LEDs during heating.

3.4 After soldering, do not warp the circuit board.

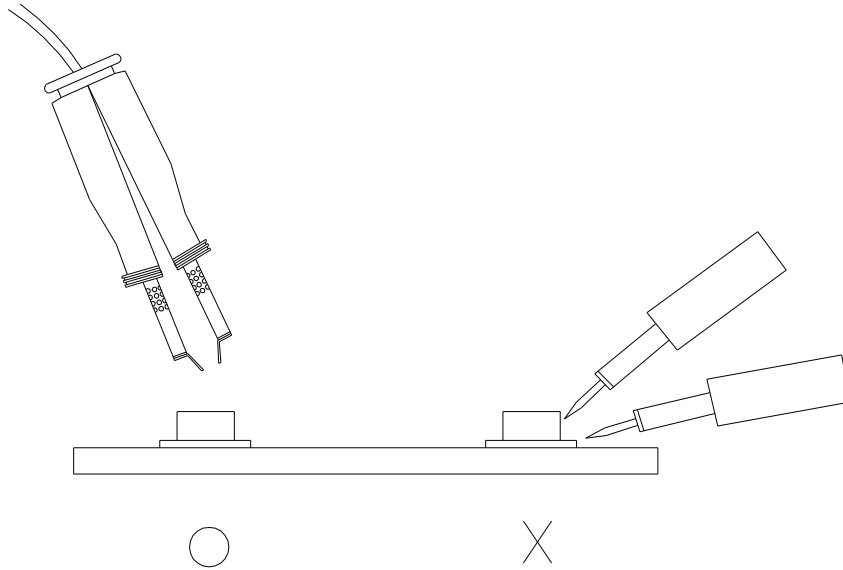
CONFIDENTIAL

4. Soldering Iron

Each terminal is to go to the tip of soldering iron temperature less than 350 for 3 seconds within once in less than the soldering iron capacity 25W. Leave two seconds and more intervals, and do soldering of each terminal. Be careful because the damage of the product is often started at the time of the hand solder.

5. Repairing

Repair should not be done after the LEDs have been soldered. When repairing is unavoidable, a double-head soldering iron should be used (as below figure). It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.





Report No.: OA-2012-90031

Page 1 of 25

Issued: Jul. 23, 2013

TEST REPORT

The following tested product(s) were submitted and identified by the vendor as:

Applicant : EVERLIGHT ELECTRONICS CO., LTD.
Address of Applicant : No.6-8, Zhonghua Rd., Shulin Dist, New Taipei City
23860, Taiwan, R.O.C.
Testing Laboratory : SGS Taiwan Ltd., Optics Laboratory
Laboratory Address : 33, Wu Chyuan Rd., New Taipei Industrial Park, New
Taipei City, Taiwan 24886
Product Name : SMD C type Low Power LED 3020 Series
Model / Serial Number : SMD 45-21S (3020, 5700K)
Manufacturer : EVERLIGHT ELECTRONICS CO., LTD.
Rating : DC 60 mA, 0.2 W (Typical)
Tested Condition : DC 60 mA (Constant Current)
Test Standard/Method : IES LM-80-08 Approved Method: Measuring Lumen
Maintenance of LED Light Sources
Date of Issue : Jul. 23, 2013

The submitted products have been tested as requested and the following results were obtained, and the report, not applicable for lawsuit, refers only to the unit(s) submitted for test.

Test Results : -PLEASE SEE ATTACHED SHEETS-

Signed for and on behalf of
SGS TAIWAN Ltd.

Calvin Tzou
Technical Manager

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This test report cannot be reproduced, except in full, without prior written permission of the Company. 除非另有說明，此報告結果僅針對測試之樣品負責。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms_and_conditions.htm and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/en/Terms-and-Conditions/Terms-e-Document. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. | 33, Wu Chuan Road, Wu Ku District, New Taipei City, Taiwan / 新北市五權區五權路 33 號
台灣檢驗科技股份有限公司 | (886-2) 2250-3039 | (886-2) 2256-3055 | www.sgs.tw

Member of SGS Group



Report No.: OA-2012-90031

Page 2 of 25

Issued: Jul. 23, 2013

1 SAMPLING DESCRIPTION

No sampling action and method employed

2 DATE OF RECEIPT OF SAMPLES

Sep. 27, 2012

3 DATE(S) OF PERFORMANCE OF THE TEST

Oct. 22, 2012 ~ Jul.10, 2013

4 IDENTITY OF SAMPLES

Quantity	Model	Serial Number
25	SMD 45-21S (3020, 5700K)	# A01 - # A25 (55 ℃)
25	SMD 45-21S (3020, 5700K)	# B01 - # B25 (85 ℃)
25	SMD 45-21S (3020, 5700K)	# C01 - # C25 (95 ℃)

5 TEST ITEMS

5.1 Data Summary of Lumen and Color Maintenance

Test results were concluded by different Case Temperatures (Ts).

5.2 Lumen Maintenance and Color Maintenance Test

Testing specifications by different case temperatures according to IES LM-80-08 Approved Method: Measuring Lumen Maintenance of LED Light Sources and client's requirements were implemented per the following items.

5.2.1 Total Luminous Flux (Φ_v)

The test results of total luminous flux were implemented referring to Clause 2 PROPERTIES OF LEDS & Clause 6 MEASUREMENT OF LUMINOUS FLUX of CIE 127: 2007 2nd edition MEASUREMENT OF LEDS and IES LM-80-08 Approved Method: Measuring Lumen Maintenance of LED Light Sources, when the UUTs were powered with constant current of I_p .

5.2.2 Correlated Color Temperature (CCT), CIE Color Coordinate (CIE_x, CIE_y) & Chromaticity Shift ($\Delta u'v'$)

The test results of correlated color temperature were implemented referring to CIE 127:2007 2nd edition MEASUREMENT OF LEDS, CIE 15: 2004 COLORIMETRY. The test results of color coordinate were implemented referring to CIE 127: 2007 2nd edition MEASUREMENT OF LEDS, CIE 15:2004 COLORIMETRY.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This test report cannot be reproduced, except in full, without prior written permission of the Company. 除非另有說明，此報告結果僅針對測試之樣品負責。本報告未經本公司書面許可，不可部分複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms_and_conditions.htm and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. 33, Wu Chuan Road, Wu Ku District, New Taipei City, Taiwan / 新北市五股區五權路 33 號
台灣檢驗科技股份有限公司 t (886-2) 2259-3239 f (886-2) 2258-3255 www.sgs.tw

Member of SGS Group



Report No.: OA-2012-90031

Page 3 of 25

Issued: Jul. 23, 2013

6 TEST CONDITIONS

Main Test Equipment:

Name	Brand	Model	S/N	Traceability
Standard Light Source / Spectroradiometer	Labsphere	SCL-600 / CDS 2100	D112 / 0811118355	NIST
Source Meter	Keithley	2400	1321218	NMI
Digital Multimeter	Agilent	U1242A	MY48490144	NMI

Environmental Conditions:

Temperature: (25 ± 1) °C
 Relative Humidity: < 65 % RH

UUT Conditions:

LED Light source: LED Package
 Drive Current: DC 60 mA (Typical)
 Forward Voltage: DC 3.2 V (Typical)
 Power Consumption: 0.2 W
 CCT: 5700 K
 Package Dimension: L 3.0 mm x W 2.0 mm x H 0.8 mm
 Prior operation: 0 hour
 Total Operation Duration: 6000 hours
 Target CCT: 5700 K
 Sample Size: 75 pcs (25 pcs for each temperature)
 Failed Quantity: 0 pcs

Measurement Conditions:

Interval Time: 0, 1000, 2000, 3000, 4000, 5000, 6000 hours
 Warm up Time: < 1 minute (Initial)
 Relative measurement uncertainty: 2.8 % (95 % Confidence Level)

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This test report cannot be reproduced, except in full, without prior written permission of the Company. 除非另有說明，此報告結果僅對測試之樣品負責。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms_and_conditions.htm and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. 33, Wu Chuan Road, Wu Ku District, New Taipei City, Taiwan / 新北市五股區五權路 33 號
 台灣檢驗科技股份有限公司 (886-2) 2250-3939 f (886-2) 2256-3956 www.sgs.tw
 Member of SGS Group

Lumen maintenance life projection

Table 1: Report at each LM-80 Test Condition					
Description of LED Light Source Tested (manufacturer, model, catalog number)					
Test Condition 1 - 55°C Case Temp		Test Condition 2 - 85°C Case Temp		Test Condition 3 - 95°C Case Temp	
Sample size	25	Sample size	25	Sample size	25
Number of failures	0	Number of failures	0	Number of failures	0
DUT drive current used in the test (mA)	60	DUT drive current used in the test (mA)	60	DUT drive current used in the test (mA)	60
Test duration (hours)	6,000	Test duration (hours)	6,000	Test duration (hours)	6,000
Test duration used for projection (hour to hour)	1,000 - 6,000	Test duration used for projection (hour to hour)	1,000 - 6,000	Test duration used for projection (hour to hour)	1,000 - 6,000
Tested case temperature (°C)	55	Tested case temperature (°C)	85	Tested case temperature (°C)	95
α	9.435E-06	α	1.223E-05	α	1.330E-05
B	1.017	B	1.023	B	1.024
Calculated L70(6k) (hours)	40,000	Calculated L70(6k) (hours)	31,000	Calculated L70(6k) (hours)	29,000
Reported L70(6k) (hours)	>36000	Reported L70(6k) (hours)	31,000	Reported L70(6k) (hours)	29,000

CONFIDENTIAL