

Certificate of Test



SEOUL SEMICONDUCTOR
 97-11, Sandanro 163 beon-gil, Danwon-gu, Ansan-city,
 Kyunggi-do, Korea, 425-851
 TEL : +82-70-4391-8725, FAX : +82-31-500-7520

Certificate No : I-121216-8-K-01

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1. Client

- Name : Seoul Semiconductor Co.,Ltd
- Address : 97-11, Sandanro 163 beon-gil, Danwon-gu, Ansan-city, Kyunggi-do, Korea, 425-851
- Date of Receipt : Dec 16, 2012

2. Use of Report : Submission to customer

3. Test Sample : Middle Power LED 5630 Series (P/N : STWxQ14x)

4. Date of Test : Dec. 16, 2012 ~ Sep. 17, 2013

5. Test method : According to LM-80-08 guide book (Case temperature: 55 ℃, 85 ℃, 105 ℃)

6. Test Environment : Temperature:(24 ± 1) ℃ , Relative Humidity: (38 ± 8) % R.H.

7. Test Results

Items	Case Temperature of LM-80-08		Case Temperature of customer
	55 ℃	85 ℃	105 ℃
Number of LED light sources tested	25	25	25
Total Test Time (h)	6 000	6 000	6 000
Average Luminous Flux (lm) [*]	40.4	40.4	40.4
Average Voltage (V) [*]	3.05	3.05	3.05
Average Color Temperature (K) [*]	2 707	2 706	2 706
DC Constant Current (mA)	120	120	120
Actual Case Temperature[Ts] (℃) [∇]	54.1	83.9	103.7
Actual Ambient Temperature[Ta] (℃) [∇]	52.9	82.5	103.3
Air flow velocity (m/s)	0.8	0.8	0.9
Average Lumen maintenance at 7 000 h (%)	94.9	92.7	93.3
Average Chromaticity shift at 7 000 h	0.006	0.004	0.004

(Note : Mark ^{*} is initial value, Mark [∇] is minimum value)

※ The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by	Approved by
	Tester Name : Yun hyuk, Kim (Signature)	Technical Manager Name : Kwang Il, Park (Signature)

The above test certificate is the accredited test results by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2013. 9. 24.

SEOUL SEMICONDUCTOR Co.,Ltd
 Accredited by KOLAS, Republic of KOREA



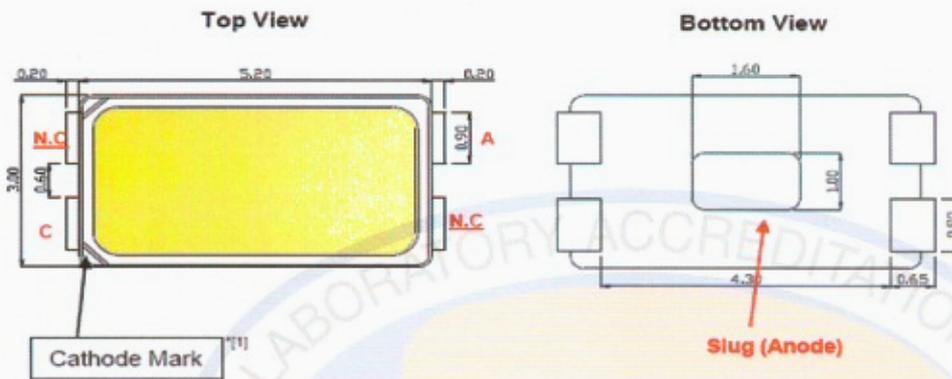
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1. Information of samples

Part Number : 5630(STWxQ14x)
 Part Name : Seoul semiconductor chip type warm white LED(2 700 K)
 Package Dimension



2. Equipments used for testing

Equipment Name	Model Name	Manufacturer	Serial Number	Calibration Laboratory	The due date of next calibration
Spectroradiometer	CAS-140CT	Instrument Systems	SC-RL-ME-1-1	KRISS	2014.3.26
DC Source meter	2602A	Keithley	SC-RL-ME-1-15	HCT	2014.1.11
Temperature OVEN	TM-6350V	ZEMOS	SC-RL-TE-1-87	HCT	2014.7.2
Temperature OVEN	TM-6350V	ZEMOS	SC-RL-TE-1-93	HCT	2014.7.3
Temperature OVEN	TM-6350V	ZEMOS	SC-RL-TE-1-99	HCT	2014.7.2
Data Logger	FX-112	YOKOGAWA	SC-RL-ME-1-7	HCT	2014.4.5
Data Logger	FX-112	YOKOGAWA	SC-RL-ME-1-8	HCT	2014.4.5
Data Logger	FX-112	YOKOGAWA	SC-RL-ME-1-6	HCT	2014.4.5
DC Source meter	OPS-3001	ODA Tech	SC-RL-TE-1-124	HCT	2014.1.9
DC Source meter	OPS-3001	ODA Tech	SC-RL-TE-1-66	HCT	2013.11.15
DC Source meter	OPS-3001	ODA Tech	SC-RL-TE-1-108	HCT	2014.1.9

3. Uncertainty of Measurement

Uncertainty of Chromaticity : $u' = 0.004$, $v' = 0.003$ (The confidence level is about 95 %, $k = 2$)



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4. Test Results : 55 ℃

4.1 Lumen maintenance results

No	Vf(V)	Flux(lm)	CCT(K)	Lumen maintenance (%)					
				0 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h
1	3.05	39.6	2 718	96.6	95.2	94.2	94.3	94.3	94.2
2	3.05	40.6	2 714	97.1	96.9	96.2	96.3	96.2	95.7
3	3.05	41.0	2 735	96.8	95.3	95.1	95.2	95.5	97.2
4	3.05	40.1	2 692	96.7	96.8	95.6	95.5	95.5	95.2
5	3.04	40.5	2 707	96.7	95.7	94.4	94.5	94.1	93.4
6	3.05	40.3	2 682	97.8	98.6	98.3	97.8	97.6	97.7
7	3.04	40.5	2 699	98.3	99.4	99.4	98.8	100.0	100.3
8	3.05	40.9	2 734	97.9	99.2	99.2	99.1	99.4	99.4
9	3.05	40.1	2 700	97.8	98.0	97.4	97.1	96.7	96.5
10	3.06	40.3	2 674	97.3	97.4	96.7	96.9	96.7	96.7
11	3.05	40.1	2 693	94.9	92.8	90.9	90.1	89.5	87.4
12	3.04	40.0	2 716	97.5	96.0	94.6	94.1	93.6	94.2
13	3.05	40.9	2 709	97.4	96.8	95.5	95.6	95.5	95.1
14	3.05	40.2	2 714	97.3	96.1	94.7	94.7	94.1	94.0
15	3.07	40.6	2 702	95.6	93.6	91.6	90.8	90.3	87.9
16	3.04	40.6	2 710	96.7	95.5	94.0	93.4	93.1	92.6
17	3.09	40.3	2 697	97.6	97.7	97.1	97.6	97.0	97.2
18	3.05	41.1	2 701	97.4	97.4	97.2	96.5	96.2	95.5
19	3.05	40.2	2 714	97.2	97.0	96.1	96.2	96.3	95.9
20	3.04	41.0	2 695	97.0	96.3	95.5	95.2	95.3	95.0
21	3.06	41.1	2 696	96.5	94.8	92.8	92.9	92.6	90.4
22	3.04	40.3	2 706	96.8	96.3	95.4	94.9	94.5	93.9
23	3.05	39.6	2 687	98.2	97.8	96.9	97.0	97.1	96.1
24	3.05	40.2	2 732	97.4	96.2	95.2	95.1	94.3	93.7
25	3.05	40.2	2 746	97.4	96.3	95.1	94.8	93.5	96.9
Max.	3.09	41.1	2 746	98.3	99.4	99.4	99.1	100.0	100.3
Ave.	3.05	40.4	2 707	97.1	96.5	95.6	95.4	95.1	94.9
Min.	3.04	39.6	2 674	94.9	92.8	90.9	90.1	89.5	87.4
Med.	3.05	40.3	2 706	97.3	96.3	95.5	95.2	95.5	95.2

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4.2 Chromaticity shift results

No	u'	v'	Chromaticity shift [$\Delta u'v'$]					
	0 h		1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	0.261	0.533	0.002	0.005	0.005	0.006	0.008	0.007
2	0.261	0.533	0.002	0.005	0.004	0.005	0.006	0.006
3	0.259	0.535	0.002	0.004	0.004	0.005	0.006	0.005
4	0.262	0.533	0.002	0.005	0.005	0.006	0.007	0.006
5	0.261	0.533	0.002	0.004	0.005	0.006	0.007	0.007
6	0.262	0.533	0.002	0.004	0.004	0.005	0.006	0.005
7	0.261	0.534	0.002	0.004	0.003	0.004	0.005	0.004
8	0.260	0.532	0.002	0.004	0.004	0.004	0.005	0.004
9	0.261	0.533	0.002	0.004	0.004	0.005	0.006	0.006
10	0.262	0.535	0.002	0.004	0.004	0.005	0.006	0.005
11	0.261	0.534	0.002	0.006	0.006	0.008	0.009	0.010
12	0.261	0.533	0.002	0.005	0.005	0.006	0.007	0.007
13	0.261	0.534	0.002	0.005	0.005	0.006	0.007	0.007
14	0.260	0.534	0.002	0.006	0.006	0.007	0.008	0.008
15	0.261	0.533	0.002	0.005	0.006	0.007	0.009	0.009
16	0.261	0.533	0.002	0.005	0.005	0.006	0.007	0.007
17	0.261	0.533	0.002	0.004	0.004	0.005	0.006	0.006
18	0.261	0.533	0.001	0.004	0.004	0.005	0.006	0.005
19	0.261	0.534	0.002	0.005	0.004	0.006	0.006	0.006
20	0.262	0.533	0.001	0.004	0.004	0.005	0.006	0.005
21	0.261	0.534	0.002	0.005	0.005	0.006	0.008	0.008
22	0.261	0.533	0.002	0.005	0.005	0.006	0.007	0.006
23	0.262	0.533	0.002	0.004	0.004	0.005	0.007	0.006
24	0.260	0.532	0.002	0.005	0.005	0.006	0.007	0.007
25	0.259	0.533	0.001	0.005	0.005	0.006	0.007	0.004
Max.	0.262	0.535	0.002	0.006	0.006	0.008	0.009	0.010
Ave.	0.261	0.533	0.002	0.005	0.005	0.006	0.007	0.006
Min.	0.259	0.532	0.001	0.004	0.003	0.004	0.005	0.004
Med.	0.261	0.533	0.002	0.005	0.005	0.006	0.007	0.006



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5. Test Results : 85 ℃

5.1 Lumen maintenance results

No	Vf(V)	Flux(lm)	CCT(K)	Lumen maintenance (%)					
				0 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h
26	3.06	40.6	2 714	97.7	97.9	100.8	99.3	98.5	98.3
27	3.04	40.4	2 702	97.1	96.9	98.6	97.5	97.9	99.0
28	3.06	40.9	2 706	98.8	99.3	100.7	99.9	100.3	99.9
29	3.05	40.7	2 718	98.4	98.7	98.0	96.7	97.4	97.6
30	3.05	40.3	2 671	98.0	97.5	96.3	94.7	94.8	94.6
31	3.04	40.5	2 713	97.3	97.1	95.9	94.6	94.2	94.2
32	3.04	40.5	2 724	93.9	92.6	91.6	90.5	90.5	89.4
33	3.05	40.0	2 692	95.7	94.9	93.7	92.5	92.4	92.6
34	3.05	40.4	2 707	95.5	94.4	92.5	91.2	91.0	90.7
35	3.04	40.5	2 716	96.5	95.5	93.5	91.8	91.9	91.7
36	3.05	40.5	2 687	93.9	93.2	91.3	90.3	90.3	90.0
37	3.05	40.1	2 673	97.4	98.0	95.8	94.4	92.9	92.3
38	3.05	40.7	2 713	96.7	96.2	93.3	91.9	91.8	91.2
39	3.05	40.6	2 706	98.0	99.4	96.3	95.4	95.4	94.3
40	3.05	40.0	2 683	97.6	97.0	95.2	93.5	93.1	92.6
41	3.06	39.9	2 698	96.6	97.0	94.8	93.2	92.6	92.2
42	3.04	40.6	2 733	92.3	91.5	88.4	87.1	86.8	85.9
43	3.03	40.7	2 720	94.4	94.0	91.9	90.1	89.5	89.2
44	3.05	40.4	2 705	94.0	93.5	91.8	89.1	89.1	89.0
45	3.04	39.9	2 718	96.2	96.5	94.6	93.2	93.0	92.6
46	3.05	40.4	2 730	91.9	91.7	93.7	92.3	91.3	89.8
47	3.04	40.5	2 688	95.3	95.9	95.2	93.9	93.6	92.9
48	3.04	40.0	2 681	96.7	97.4	97.0	95.7	95.4	93.2
49	3.04	40.6	2 722	96.8	96.4	96.9	96.0	95.7	94.2
50	3.04	40.5	2 727	97.0	96.4	96.8	95.4	95.2	90.6
Max.	3.06	40.9	2 733	98.8	99.4	100.8	99.9	100.3	99.9
Ave.	3.05	40.4	2 706	96.1	95.9	95.0	93.6	93.4	92.7
Min.	3.03	39.9	2 671	91.9	91.5	88.4	87.1	86.8	85.9
Med.	3.05	40.5	2 707	96.7	96.4	95.2	93.5	93.0	92.6

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5.2 Chromaticity shift results

No	u'	v'	Chromaticity shift [$\Delta u'v'$]					
			0 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h
26	0.260	0.534	0.002	0.004	0.003	0.003	0.004	0.004
27	0.261	0.534	0.002	0.004	0.003	0.003	0.003	0.003
28	0.261	0.533	0.002	0.003	0.003	0.003	0.003	0.003
29	0.260	0.533	0.002	0.003	0.003	0.003	0.003	0.003
30	0.262	0.535	0.002	0.004	0.003	0.003	0.003	0.003
31	0.261	0.533	0.002	0.004	0.003	0.003	0.004	0.004
32	0.260	0.533	0.003	0.005	0.004	0.005	0.005	0.005
33	0.262	0.533	0.002	0.004	0.003	0.004	0.004	0.004
34	0.261	0.533	0.002	0.005	0.004	0.004	0.004	0.004
35	0.261	0.533	0.002	0.004	0.003	0.004	0.004	0.004
36	0.262	0.534	0.003	0.005	0.004	0.004	0.004	0.005
37	0.262	0.534	0.002	0.003	0.003	0.003	0.004	0.004
38	0.261	0.533	0.002	0.004	0.003	0.004	0.004	0.004
39	0.261	0.534	0.002	0.004	0.003	0.003	0.003	0.003
40	0.262	0.533	0.002	0.004	0.003	0.003	0.004	0.004
41	0.261	0.534	0.002	0.004	0.003	0.004	0.004	0.004
42	0.260	0.533	0.003	0.006	0.005	0.005	0.006	0.006
43	0.261	0.532	0.002	0.004	0.004	0.004	0.004	0.004
44	0.261	0.533	0.002	0.005	0.004	0.004	0.004	0.005
45	0.261	0.533	0.002	0.004	0.003	0.004	0.004	0.004
46	0.260	0.532	0.003	0.005	0.004	0.005	0.005	0.006
47	0.262	0.535	0.002	0.004	0.003	0.004	0.004	0.004
48	0.262	0.534	0.002	0.004	0.003	0.003	0.004	0.004
49	0.260	0.534	0.002	0.004	0.003	0.003	0.003	0.003
50	0.260	0.534	0.002	0.004	0.003	0.003	0.003	0.004
Max.	0.262	0.535	0.003	0.006	0.005	0.005	0.006	0.006
Ave.	0.261	0.533	0.002	0.004	0.003	0.004	0.004	0.004
Min.	0.260	0.532	0.002	0.003	0.003	0.003	0.003	0.003
Med.	0.261	0.533	0.002	0.004	0.003	0.004	0.004	0.004

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6. Test Results : 105 °C

6.1 Lumen maintenance results

No	Vf(V)	Flux(lm)	CCT(K)	Lumen maintenance (%)					
				0 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h
51	3.04	40.4	2 692	96.9	96.4	96.0	94.8	94.9	94.1
52	3.06	40.5	2 708	98.1	98.7	97.0	95.5	95.3	94.6
53	3.05	40.7	2 726	98.6	98.4	96.8	94.9	95.0	93.5
54	3.05	40.7	2 696	97.1	98.3	96.5	95.2	94.9	93.9
55	3.06	40.4	2 706	98.9	99.3	97.7	96.5	96.5	95.6
56	3.05	40.0	2 698	98.2	99.1	96.9	95.3	95.5	94.7
57	3.05	40.0	2 703	97.1	96.9	95.9	94.3	94.4	93.2
58	3.04	39.9	2 720	96.9	98.0	96.3	94.7	93.2	92.3
59	3.05	40.7	2 711	98.8	99.5	97.8	96.2	96.0	95.3
60	3.05	40.5	2 698	98.3	98.6	97.4	96.0	95.4	94.7
61	3.06	40.6	2 686	98.3	99.7	97.5	95.6	95.5	94.4
62	3.05	40.5	2 683	98.4	97.9	97.2	95.4	94.6	93.5
63	3.04	40.2	2 735	97.6	97.3	96.4	94.7	94.1	93.6
64	3.06	40.7	2 712	99.0	98.3	97.6	96.1	95.8	94.9
65	3.04	39.8	2 683	99.3	98.2	98.0	96.7	96.4	95.2
66	3.04	40.3	2 687	98.2	96.7	97.0	95.4	94.6	93.7
67	3.05	40.2	2 718	97.9	97.1	93.3	92.0	91.8	91.2
68	3.07	40.4	2 723	97.9	96.7	94.0	92.6	91.9	91.0
69	3.05	40.8	2 682	94.5	93.6	92.6	90.8	90.4	89.5
70	3.05	40.2	2 719	98.1	99.6	96.8	95.3	94.6	93.4
71	3.06	40.5	2 733	98.7	98.7	96.2	94.3	93.8	93.0
72	3.06	40.2	2 676	98.7	98.5	96.3	94.6	94.1	93.2
73	3.04	40.6	2 724	97.0	96.6	92.7	90.9	90.6	89.7
74	3.05	40.4	2 709	98.7	98.5	94.4	93.4	92.6	91.7
75	3.05	40.3	2 714	98.8	98.6	94.5	92.7	92.8	93.1
Max.	3.07	40.8	2 735	99.3	99.7	98.0	96.7	96.5	95.6
Ave.	3.05	40.4	2 706	98.0	98.0	96.1	94.5	94.2	93.3
Min.	3.04	39.8	2 676	94.5	93.6	92.6	90.8	90.4	89.5
Med.	3.05	40.4	2 708	98.2	98.3	96.5	94.9	94.6	93.5

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6.2 Chromaticity shift results

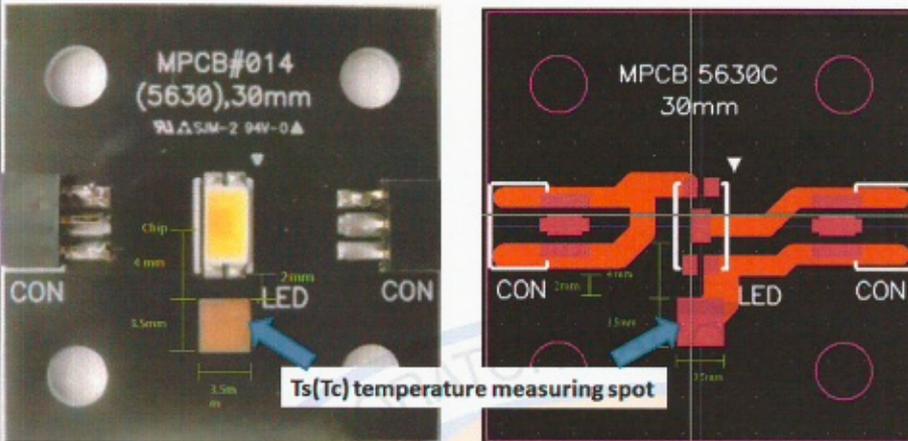
No	u'	v'	Chromaticity shift [$\Delta u'v'$]					
	0 h		1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
51	0.261	0.535	0.003	0.004	0.003	0.004	0.004	0.004
52	0.261	0.533	0.002	0.004	0.003	0.003	0.004	0.004
53	0.260	0.533	0.002	0.004	0.003	0.003	0.003	0.004
54	0.262	0.533	0.002	0.004	0.003	0.003	0.004	0.004
55	0.261	0.534	0.002	0.004	0.003	0.003	0.003	0.003
56	0.261	0.534	0.002	0.004	0.003	0.003	0.003	0.004
57	0.261	0.533	0.002	0.004	0.003	0.003	0.004	0.004
58	0.260	0.533	0.002	0.004	0.003	0.004	0.004	0.004
59	0.261	0.534	0.002	0.004	0.003	0.003	0.003	0.003
60	0.261	0.534	0.002	0.004	0.003	0.003	0.003	0.003
61	0.262	0.534	0.002	0.003	0.003	0.003	0.003	0.003
62	0.262	0.534	0.002	0.004	0.003	0.003	0.003	0.004
63	0.260	0.533	0.002	0.004	0.003	0.003	0.004	0.004
64	0.261	0.532	0.002	0.003	0.003	0.003	0.003	0.003
65	0.262	0.533	0.002	0.004	0.003	0.003	0.003	0.003
66	0.262	0.534	0.002	0.004	0.003	0.003	0.004	0.004
67	0.260	0.534	0.002	0.004	0.003	0.004	0.004	0.004
68	0.260	0.533	0.002	0.004	0.003	0.004	0.004	0.004
69	0.262	0.535	0.002	0.004	0.003	0.004	0.004	0.004
70	0.261	0.533	0.002	0.004	0.003	0.003	0.003	0.003
71	0.260	0.532	0.002	0.003	0.003	0.003	0.003	0.003
72	0.262	0.535	0.002	0.004	0.003	0.003	0.003	0.003
73	0.260	0.534	0.002	0.004	0.003	0.003	0.004	0.004
74	0.261	0.534	0.002	0.004	0.003	0.003	0.003	0.004
75	0.261	0.533	0.002	0.004	0.002	0.003	0.003	0.004
Max.	0.262	0.535	0.003	0.004	0.003	0.004	0.004	0.004
Ave.	0.261	0.533	0.002	0.004	0.003	0.003	0.004	0.004
Min.	0.260	0.532	0.002	0.003	0.002	0.003	0.003	0.003
Med.	0.261	0.534	0.002	0.004	0.003	0.003	0.003	0.004

Certificate of Test



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7. Photograph



- The End -

