

# Certificate of Test



<b>SEOUL SEMICONDUCTOR</b> 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-130702-20-K-04  Page( 1 ) / ( 10 )Pages
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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 : July. 02, 2013
2. Use of Report : Submission to customer
3. Test Sample : 3030 (P/N : STWxC2SA)
  - Model covered; STWxC2PA\_200mA
4. Date of Test : July. 09, 2013 ~ Sep. 30, 2014
5. Test method : IES LM-80-08 Approved Method for Measuring Lumen Maintenance  
of LED Light Sources (Case temperature: 55 °C, 85 °C, 105 °C)
6. Test Environment : Temperature: ( 25 ± 2 ) °C , Relative Humidity: ( 40 ± 10 ) % R.H.

7. Test Results

Items	Case Temperature of LM-80-08		Case Temperature of customer
	55 °C	85 °C	105 °C
Number of LED light sources tested	26	26	26
Total Test Time (h)	9 000	9 000	9 000
Average Luminous Flux (lm) <sup>*</sup>	115.598	115.177	116.737
Average Voltage (V) <sup>*</sup>	7.02	7.07	7.03
Average Color Temperature (K) <sup>*</sup>	2 813	2 809	2 759
DC Constant Current (mA)	200	200	200
Actual Case Temperature[Ts] (°C) <sup>∇</sup>	54.6	84.5	104.4
Actual Ambient Temperature[Ta] (°C) <sup>∇</sup>	53.9	84.1	103.8
Air flow velocity (m/s)	0.8	0.9	0.8
Average Lumen maintenance at 9 000 h (%)	96.21	94.60	86.13
Average Chromaticity shift at 9 000 h	0.003	0.004	0.004

(Note : Mark <sup>\*</sup> is initial value, Mark <sup>∇</sup> 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.

	Tested by Tester Name : In Hoi, Sim      (Signature)	Approved by Technical Manager Name : Jung Hee, Lee      (Signature)
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The above test certificate is the accredited test results by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2014. 10. 13.

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



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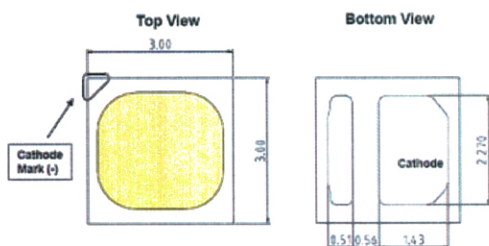
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## 1. Information of samples

Part Number : 3030(STWxC2SA)

Part Name : Seoul semiconductor chip type warm white LED(2 700 K)

Package Dimension



## 2. Equipments used for testing

Equipment Name	Model Name	Manufacturer	Calibration Laboratory	Calibration Date
Spectroradiometer	JCS-350W	J&C	KTL	2014.02.05
Temperature chamber	LM-80 Chamber1	Vektrex	HCT	2013.12.19
Temperature chamber	LM-80 Chamber2	Vektrex	HCT	2013.12.19
Temperature chamber	LM-80 Chamber3	Vektrex	HCT	2013.12.19
DC Source meter	2612A	Keithley	HCT	2013.12.18
DC Source meter	LM-80 Source9	Vektrex	HCT	2014.07.10
DC Source meter	LM-80 Source10	Vektrex	HCT	2014.07.10
DC Source meter	LM-80 Source11	Vektrex	HCT	2014.07.10
Anemometer	T9535	TSI	HCT	2014.01.08

## 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 Result of Case Temperature 55 °C

### 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	6 000 h	7 000 h	8 000 h
1	6.98	112.790	2 784	97.87	99.81	100.41	96.05	95.65	95.18	95.00	94.72	94.83
2	7.01	116.230	2 789	100.91	99.78	99.30	99.03	98.01	97.66	97.78	96.85	96.36
3	7.03	116.530	2 846	101.13	99.91	99.32	99.37	98.09	97.75	97.99	97.56	97.54
4	7.01	116.420	2 843	101.06	99.88	99.36	99.17	98.06	98.02	98.11	97.31	96.65
5	7.02	115.560	2 810	101.08	99.74	99.16	98.93	97.86	97.59	97.80	97.04	96.56
6	6.99	115.960	2 850	101.17	99.92	99.56	99.56	98.45	98.15	98.20	97.23	96.62
7	7.02	116.250	2 776	101.17	99.95	99.49	99.45	98.20	97.84	97.80	96.74	95.54
8	7.00	114.140	2 811	101.29	100.07	99.67	99.64	98.54	98.14	98.26	97.31	96.71
9	6.95	115.490	2 800	101.15	100.03	99.34	99.18	97.87	97.52	97.26	96.11	95.14
10	7.00	115.110	2 811	101.45	100.43	99.77	99.77	98.56	98.18	98.17	97.20	96.58
11	6.97	115.260	2 810	101.23	100.25	99.80	99.81	98.47	98.23	98.41	97.88	97.30
12	7.03	116.020	2 776	101.12	100.03	99.62	99.51	98.21	97.99	97.97	97.12	96.19
13	7.06	115.130	2 784	100.75	98.85	99.18	98.79	97.80	97.11	69.69	89.43	87.87
14	7.00	115.350	2 835	100.86	100.51	99.20	98.74	98.45	98.17	98.22	96.91	96.72
15	7.05	116.150	2 799	100.86	100.64	99.16	98.64	98.53	98.20	98.33	97.00	97.03
16	7.05	116.960	2 831	100.50	100.28	98.67	98.25	98.04	97.77	97.56	95.68	95.40
17	7.06	116.400	2 845	101.15	100.69	99.40	98.91	98.79	98.54	98.56	96.93	96.74
18	7.03	115.690	2 800	100.85	100.51	99.13	98.72	98.45	98.25	98.12	96.09	95.89
19	7.01	115.070	2 857	101.16	100.96	99.50	99.30	99.08	98.62	98.78	97.00	96.56
20	7.03	115.330	2 810	101.25	101.04	99.65	99.28	99.00	98.90	98.91	97.21	97.14
21	7.03	115.940	2 805	101.68	101.47	99.92	99.51	97.30	97.09	98.93	97.29	97.21
22	6.98	118.300	2 848	101.32	101.04	99.73	99.12	98.97	98.60	98.64	96.95	96.66
23	7.03	115.990	2 803	101.37	101.32	99.69	99.29	98.09	97.78	98.61	96.60	96.24
24	6.98	115.460	2 800	101.36	101.31	99.33	99.08	98.78	98.65	98.63	97.01	96.77
25	7.06	113.930	2 821	101.23	101.07	99.39	98.84	98.63	98.41	98.64	97.15	97.12
26	7.10	114.090	2 795	100.86	100.82	99.27	98.89	98.96	98.74	96.97	97.51	98.06
Max.	7.10	118.300	2 857	101.68	101.47	100.41	99.81	99.08	98.90	98.93	97.88	98.06
Ave.	7.02	115.598	2 813	100.99	100.40	99.46	99.03	98.26	97.96	96.97	96.61	96.21
Min.	6.95	112.790	2 776	97.87	98.85	98.67	96.05	95.65	95.18	69.69	89.43	87.87
Med.	7.02	115.625	2 810	101.15	100.36	99.39	99.15	98.45	98.14	98.18	97.01	96.63



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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	7 000 h	8 000 h	9 000 h
1	0.259	0.530	0.002	0.000	0.000	0.003	0.004	0.005	0.005	0.005	0.005
2	0.259	0.529	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.002
3	0.257	0.524	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.002
4	0.257	0.526	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.002
5	0.258	0.526	0.001	0.000	0.000	0.001	0.002	0.003	0.003	0.003	0.004
6	0.257	0.525	0.001	0.000	0.000	0.000	0.001	0.002	0.002	0.002	0.002
7	0.259	0.529	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002
8	0.258	0.527	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001
9	0.259	0.526	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001
10	0.258	0.526	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001
11	0.258	0.526	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.002
12	0.259	0.529	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.002
13	0.259	0.529	0.000	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.003
14	0.257	0.526	0.000	0.000	0.001	0.002	0.002	0.002	0.002	0.003	0.003
15	0.258	0.529	0.000	0.000	0.001	0.002	0.002	0.002	0.002	0.003	0.003
16	0.257	0.529	0.000	0.000	0.001	0.001	0.002	0.002	0.002	0.003	0.003
17	0.257	0.526	0.001	0.000	0.001	0.002	0.003	0.003	0.004	0.004	0.004
18	0.258	0.529	0.000	0.000	0.001	0.001	0.002	0.002	0.003	0.003	0.004
19	0.256	0.527	0.001	0.000	0.001	0.001	0.001	0.001	0.002	0.002	0.003
20	0.259	0.525	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003
21	0.258	0.529	0.001	0.001	0.001	0.001	0.002	0.003	0.004	0.004	0.004
22	0.256	0.527	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003
23	0.259	0.527	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003
24	0.259	0.527	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003
25	0.258	0.527	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004	0.004
26	0.259	0.526	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.003	0.003
Max.	0.259	0.530	0.002	0.001	0.001	0.003	0.004	0.005	0.005	0.005	0.005
Ave.	0.258	0.527	0.001	0.000	0.000	0.001	0.001	0.002	0.002	0.003	0.003
Min.	0.256	0.524	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001
Med.	0.258	0.527	0.001	0.000	0.000	0.001	0.001	0.002	0.002	0.003	0.003





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## 5. Test Result of Case Temperature 85 °C

### 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	6 000 h	7 000 h	8 000 h
27	7.05	115.260	2 798	100.95	98.90	98.36	97.61	96.01	96.48	95.25	95.12	93.55
28	7.05	114.100	2 777	101.05	99.20	98.77	98.45	97.48	98.56	97.86	97.69	96.55
29	7.08	115.540	2 789	101.58	99.42	98.51	97.57	95.70	95.74	94.02	93.87	93.17
30	7.01	115.620	2 798	100.96	98.67	97.80	96.85	94.92	94.71	92.98	92.98	92.39
31	7.01	116.570	2 845	101.10	99.00	98.12	97.13	95.16	94.76	93.05	92.56	91.18
32	7.03	116.020	2 819	101.50	99.34	98.18	96.95	94.65	94.35	92.58	91.77	89.07
33	7.08	117.040	2 850	101.12	98.99	98.26	97.60	96.08	96.64	95.61	95.65	94.71
34	7.00	116.710	2 786	101.73	98.77	97.81	96.58	95.92	94.65	93.17	92.84	91.30
35	7.15	116.050	2 820	101.13	99.18	98.08	97.55	96.91	96.35	95.72	96.12	95.31
36	7.13	115.930	2 788	101.24	99.18	98.29	97.45	96.59	95.74	94.14	93.76	92.73
37	7.11	116.940	2 796	101.08	98.98	97.91	97.19	96.25	95.13	93.47	93.05	90.92
38	7.04	114.040	2 799	101.36	99.31	98.52	98.09	97.73	96.95	95.48	95.56	93.10
39	6.97	113.460	2 796	101.93	100.47	99.78	99.03	98.27	98.69	98.83	97.82	97.72
40	6.98	114.760	2 802	101.97	100.16	98.89	97.79	96.78	96.24	95.50	94.69	94.00
41	7.07	116.420	2 830	101.98	100.54	99.26	98.29	97.50	96.87	95.95	95.01	94.17
42	7.04	114.830	2 822	102.05	100.44	99.40	98.71	97.76	97.67	97.57	96.98	96.24
43	7.04	113.840	2 787	101.83	100.35	99.26	98.31	97.24	97.00	96.49	95.89	94.99
44	7.07	115.360	2 817	102.02	100.56	99.45	98.81	97.91	97.60	96.89	96.12	94.20
45	7.01	114.960	2 847	101.89	100.56	99.72	99.41	98.90	99.02	98.80	98.72	98.07
46	7.18	115.460	2 814	101.92	100.33	99.52	98.66	98.16	98.36	98.29	97.99	97.48
47	7.02	114.540	2 804	101.95	100.50	99.58	98.92	98.34	98.55	98.41	98.15	97.16
48	7.15	114.900	2 805	101.79	100.40	99.36	98.53	97.22	97.14	96.82	96.47	96.14
49	7.14	115.320	2 816	100.88	99.70	98.75	98.12	97.46	97.73	97.74	97.58	97.24
50	7.11	114.930	2 843	101.00	97.92	97.49	96.91	96.71	96.52	96.05	95.59	95.11
51	7.18	114.000	2 789	102.08	100.77	99.10	98.01	97.50	97.06	96.38	95.56	94.84
52	7.05	112.010	2 804	102.21	101.29	100.30	99.40	99.12	99.35	99.13	98.56	98.27
Max.	7.18	117.040	2 850	102.21	101.29	100.30	99.41	99.12	99.35	99.13	98.72	98.27
Ave.	7.07	115.177	2 809	101.55	99.73	98.79	98.00	97.01	96.84	96.01	95.62	94.60
Min.	6.97	112.010	2 777	100.88	97.92	97.49	96.58	94.65	94.35	92.58	91.77	89.07
Med.	7.05	115.290	2 804	101.65	99.56	98.76	98.05	97.23	96.91	96.00	95.62	94.77

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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	6 000 h	7 000 h	8 000 h	9 000 h
27	0.259	0.528	0.000	0.001	0.002	0.002	0.003	0.003	0.003	0.003	0.003
28	0.260	0.526	0.000	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.003
29	0.259	0.527	0.001	0.000	0.001	0.003	0.004	0.003	0.004	0.004	0.004
30	0.259	0.526	0.000	0.001	0.002	0.002	0.003	0.003	0.004	0.004	0.004
31	0.257	0.525	0.001	0.001	0.002	0.002	0.003	0.003	0.004	0.004	0.004
32	0.258	0.527	0.001	0.001	0.002	0.003	0.004	0.004	0.004	0.004	0.004
33	0.257	0.526	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004	0.004
34	0.259	0.530	0.001	0.001	0.001	0.002	0.002	0.004	0.004	0.004	0.004
35	0.258	0.525	0.001	0.001	0.002	0.002	0.002	0.004	0.004	0.004	0.004
36	0.259	0.526	0.001	0.001	0.001	0.003	0.003	0.004	0.004	0.004	0.005
37	0.258	0.529	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.004	0.004
38	0.259	0.525	0.001	0.001	0.002	0.002	0.002	0.003	0.004	0.004	0.004
39	0.259	0.526	0.001	0.000	0.001	0.002	0.002	0.002	0.003	0.003	0.004
40	0.258	0.529	0.001	0.000	0.001	0.002	0.002	0.003	0.003	0.004	0.004
41	0.257	0.526	0.001	0.000	0.001	0.002	0.002	0.003	0.004	0.004	0.004
42	0.258	0.525	0.002	0.000	0.001	0.002	0.002	0.003	0.003	0.004	0.004
43	0.259	0.526	0.002	0.000	0.001	0.003	0.004	0.003	0.004	0.004	0.005
44	0.258	0.528	0.002	0.000	0.001	0.002	0.002	0.003	0.003	0.004	0.004
45	0.257	0.526	0.002	0.000	0.001	0.002	0.003	0.002	0.003	0.003	0.004
46	0.258	0.525	0.002	0.000	0.001	0.002	0.002	0.003	0.003	0.004	0.004
47	0.258	0.529	0.002	0.000	0.001	0.002	0.003	0.002	0.003	0.003	0.004
48	0.259	0.526	0.002	0.000	0.001	0.002	0.002	0.003	0.004	0.004	0.004
49	0.258	0.526	0.000	0.000	0.001	0.002	0.002	0.003	0.004	0.004	0.004
50	0.257	0.527	0.001	0.002	0.002	0.003	0.004	0.003	0.004	0.004	0.004
51	0.259	0.529	0.002	0.000	0.001	0.002	0.002	0.003	0.003	0.004	0.004
52	0.258	0.527	0.002	0.001	0.002	0.002	0.002	0.003	0.003	0.004	0.004
Max.	0.260	0.530	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.005
Ave.	0.258	0.527	0.001	0.001	0.001	0.002	0.003	0.003	0.003	0.004	0.004
Min.	0.257	0.525	0.000	0.000	0.001	0.002	0.002	0.002	0.003	0.003	0.003
Med.	0.258	0.526	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.004	0.004



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## 6. Test Result of Case Temperature 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	6 000 h	7 000 h	8 000 h
53	7.00	115.920	2 761	100.29	99.95	99.30	99.07	98.13	97.68	89.14	88.06	83.24
54	7.00	117.430	2 754	99.79	97.81	96.66	95.60	94.53	94.44	93.40	92.70	87.62
55	7.02	116.570	2 758	99.30	98.08	97.00	96.06	95.04	94.66	93.65	93.45	88.34
56	7.01	117.690	2 760	100.34	99.73	99.35	98.77	97.48	96.66	92.71	91.46	86.45
57	7.03	118.040	2 761	99.06	96.51	94.71	93.70	92.72	91.90	92.75	91.22	86.23
58	6.96	118.370	2 772	98.83	96.22	94.52	93.29	93.31	92.60	93.28	92.54	87.47
59	7.02	114.030	2 771	102.72	99.42	96.17	95.35	95.22	94.48	95.84	95.29	90.07
60	7.00	114.380	2 754	97.42	91.27	88.10	87.60	87.16	86.44	95.53	94.01	88.87
61	7.06	117.940	2 757	99.71	97.02	94.92	93.43	93.95	92.96	92.17	89.79	84.87
62	7.00	117.840	2 773	100.13	100.42	100.09	98.85	97.52	96.49	91.91	89.76	84.85
63	7.12	117.430	2 771	99.44	99.43	99.62	98.46	97.89	96.86	92.18	90.03	85.10
64	7.00	116.700	2 785	99.65	99.34	98.36	96.10	95.04	94.61	92.53	91.34	86.34
65	7.03	115.590	2 737	99.49	98.88	98.70	97.70	96.18	96.25	93.30	92.96	87.87
66	7.17	117.580	2 754	99.72	100.20	98.32	97.91	97.05	96.73	93.88	92.07	87.03
67	7.03	116.300	2 735	100.41	100.83	99.00	98.49	98.40	98.23	95.61	94.18	89.03
68	7.06	117.650	2 746	100.93	101.85	100.49	97.90	96.52	95.92	93.04	90.72	85.75
69	6.93	117.910	2 750	99.31	99.89	98.39	97.26	96.25	95.91	88.62	86.86	82.10
70	7.03	116.280	2 760	100.44	100.76	98.49	96.97	96.03	95.47	94.37	92.28	87.22
71	7.06	117.080	2 763	100.32	100.22	98.32	97.17	96.21	95.79	94.50	92.72	87.64
72	7.06	116.880	2 733	99.97	99.50	96.91	95.48	96.56	96.38	95.63	93.71	88.57
73	7.02	116.800	2 762	99.55	100.34	99.85	98.59	96.64	96.37	94.71	92.95	87.86
74	7.06	117.570	2 771	99.75	99.91	97.87	96.11	94.38	94.05	93.14	91.34	86.34
75	7.02	115.600	2 737	100.43	100.35	98.48	97.43	97.69	97.67	96.22	94.17	89.02
76	7.05	118.270	2 774	99.99	100.51	98.34	96.96	95.45	95.11	90.96	88.46	83.62
77	7.02	115.140	2 759	99.83	99.37	96.95	96.00	96.95	96.79	96.04	93.81	88.67
78	7.09	114.180	2 778	100.16	100.14	97.65	96.30	95.63	94.20	72.99	73.22	69.21
Max.	7.17	118.370	2 785	102.72	101.85	100.49	99.07	98.40	98.23	96.22	95.29	90.07
Ave.	7.03	116.737	2 759	99.89	99.15	97.56	96.41	95.69	95.18	92.62	91.12	86.13
Min.	6.93	114.030	2 733	97.42	91.27	88.10	87.60	87.16	86.44	72.99	73.22	69.21
Med.	7.02	116.980	2 760	99.81	99.81	98.33	96.97	96.20	95.85	93.29	92.17	87.12



# Certificate of Test



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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	7 000 h	8 000 h
53	0.260	0.531	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.002	0.002
54	0.260	0.533	0.000	0.002	0.003	0.003	0.003	0.004	0.004	0.005	0.005
55	0.260	0.531	0.001	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.004
56	0.260	0.532	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.002
57	0.260	0.532	0.001	0.002	0.003	0.003	0.003	0.004	0.004	0.004	0.005
58	0.259	0.532	0.001	0.003	0.004	0.004	0.004	0.004	0.004	0.004	0.005
59	0.259	0.532	0.002	0.000	0.003	0.004	0.004	0.004	0.004	0.004	0.005
60	0.260	0.532	0.002	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.008
61	0.260	0.533	0.000	0.002	0.004	0.004	0.004	0.005	0.005	0.006	0.006
62	0.259	0.533	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.002	0.002
63	0.259	0.531	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.002
64	0.258	0.532	0.000	0.000	0.001	0.001	0.001	0.001	0.002	0.002	0.002
65	0.261	0.532	0.000	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.003
66	0.260	0.531	0.000	0.000	0.001	0.001	0.001	0.001	0.002	0.002	0.002
67	0.261	0.531	0.000	0.000	0.001	0.001	0.001	0.001	0.002	0.002	0.002
68	0.260	0.533	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.002	0.002
69	0.260	0.531	0.000	0.000	0.002	0.002	0.003	0.003	0.004	0.004	0.004
70	0.260	0.531	0.000	0.000	0.002	0.002	0.003	0.003	0.004	0.004	0.004
71	0.260	0.531	0.000	0.000	0.002	0.002	0.003	0.004	0.005	0.005	0.005
72	0.261	0.531	0.000	0.000	0.003	0.003	0.004	0.004	0.005	0.005	0.005
73	0.260	0.531	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.002	0.002
74	0.259	0.531	0.000	0.000	0.002	0.002	0.002	0.002	0.003	0.003	0.003
75	0.261	0.532	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.002	0.002
76	0.259	0.531	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.002	0.002
77	0.260	0.531	0.000	0.000	0.002	0.002	0.002	0.003	0.003	0.004	0.004
78	0.259	0.531	0.000	0.000	0.002	0.002	0.002	0.002	0.003	0.003	0.003
Max.	0.261	0.533	0.002	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Ave.	0.260	0.532	0.000	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.004
Min.	0.258	0.531	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002
Med.	0.260	0.531	0.000	0.000	0.002	0.002	0.002	0.002	0.003	0.003	0.003



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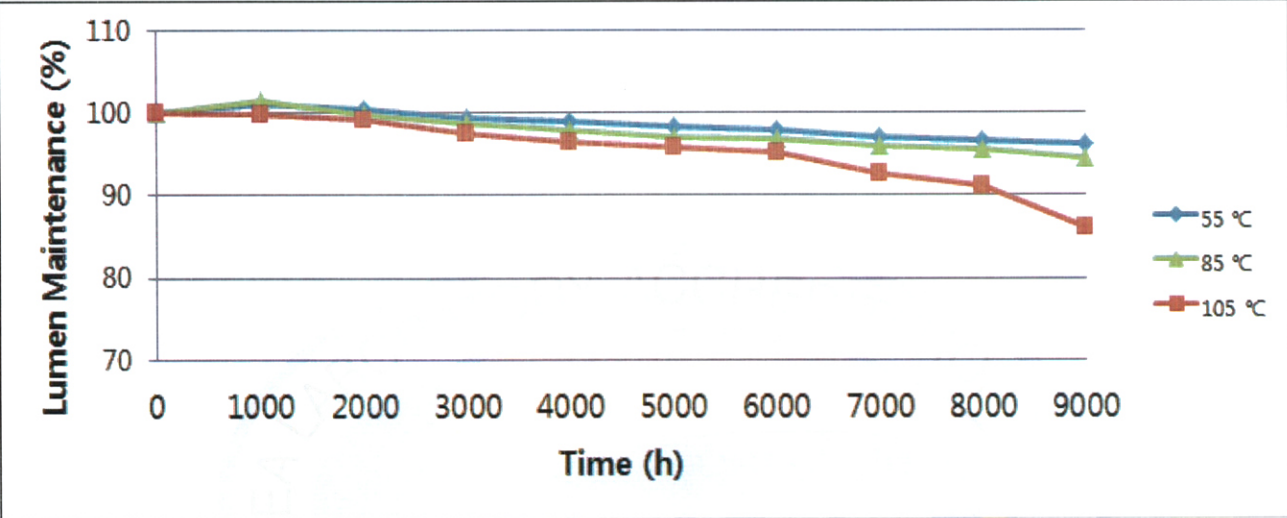


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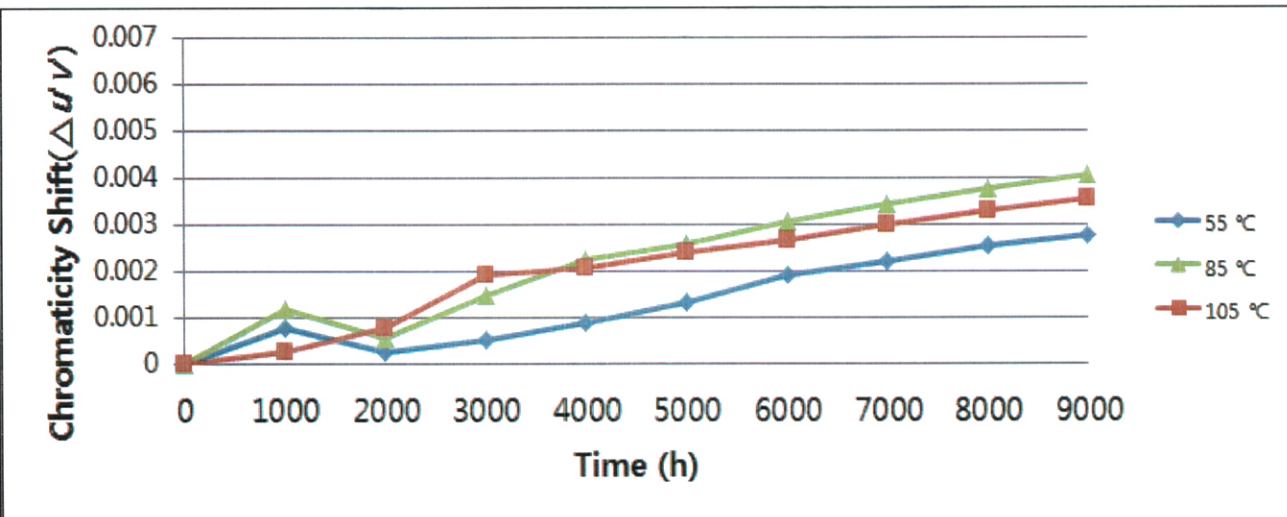
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7. Charts for average lumen maintenance and chromaticity shift

7.1 Average lumen maintenance chart



7.2 Average chromaticity shift



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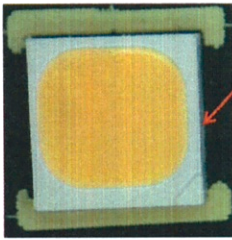


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## 8. Photograph



Ts point

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