



## Verification Services

Project No: 6012-000060

Report No: 6011-000060-03

Test Initiated Date: 2011-07-13

Report Issued Date: 2012-05-04

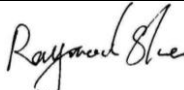
# Test Report

Customer Company & Address:			
LG Innotek Co., LTD. 1633, Naepo-ri, Munsan-eup, Paju-si, Gyeonggi-do, Korea			
<b>Contact Person:</b>	Sungyun Yun		
<b>Telephone:</b>	82319371496	<b>Fax:</b>	82319371009

<b>Manufacturer:</b>	LG Innotek Co., LTD.
<b>Country of Origin:</b>	South Korea
<b>Country of Export:</b>	South Korea
<b>Product Description:</b>	LED Package
<b>Model Number:</b>	LGIT-6030-3000K-150mA
<b>Electrical Specification:</b>	150mA

Test Laboratory & Address:			
UL Verification Services (Guangzhou) Co., Ltd.  ADD: Building A1, 1F & 2F, Nansha Science and Technology Innovation Center, No. 25, South Huanshi Avenue, Nansha District, Guangzhou 511458, China			
<b>Telephone:</b>	+86 20 28667188	<b>Fax:</b>	+86 20 83486605

<b>Receipt of Test Samples :</b>	75	<b>Test Period:</b>	2011-07-13 to 2012-04-25
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Tested By	Approved By
 / Jackson Zeng	 / Raymond Shen
<b>Test Personnel Name &amp; Signatory</b>	<b>Approval Name &amp; Signatory</b>

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.

Doc No: 10-CT-F0059

Issue No: 1.0

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## Verification Services

Project No: 6012-000060  
Report No: 6011-000060-03  
Test Initiated Date: 2011-07-13  
Report Issued Date: 2012-05-04

# Test Report

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## Statement of Results

Test Flow	Test Method	Sample ID (Lab)	Sample Serial No	Pass/Fail/N A
1	IES LM-80-08	000668S1~S75	N/A	N/A

## Deviation from Test Method (if any)

N/A

## Remark (if any)

The reason for insufficiency of sampling size is that one sample was damaged, which was probably caused by the current fluctuation of  $\pm 3\%$  occurred in test circuit.



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# Test Report

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### Number of LED light sources tested

See individual test reports

### Description of LED light sources

LED Package(25mmx25mm), warm white

### Description of auxiliary equipment

1. Everfine 0.5m\_LED\_R98\_V3 Integrating Sphere
2. HAAS 2000 Spectrum Analyzer
3. Keithley 2430 Sourcemeter

### Operating cycle

The samples were driven with a constant direct current throughout the life test.

### Ambient conditions

LED packages are operated in environmental control chambers. The temperature of the ambient air around the LED packages is actively controlled by air flowing through the chamber.

Ta : See individual test reports

RH : < 65%

Air flow : < 0.8 m/s

### Case and ambient temperatures

See individual test reports

### LED light source monitoring interval

See individual test reports

### Photometric measurement uncertainty

The uncertainty of measuring lumen is  $U=1.5\%(K=2)$

### Observation of LED light source failures including the failure conditions and time of failure

No early failure to produce light.

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## Verification Services

Project No: 6012-000060  
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# Test Report

### Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
GVS-LE-PE005	Integrating Sphere	Before Use	Before Use
GVS-LE-FS011	Measurement Standard Lamp	08/12/2011	08/12/2012

### Test Results Summary

Test Item	Lm-80 Required Temperature		Specified Temperature
	55°C	85°C	25°C
Number of LED tested	25	25	25
Drive Current (If)	150mA	150mA	150mA
Actual Case Temp. (Ts)	53.8°C	83.8°C	24.5°C
Actual Ambient Temp. (Ta)	52.7°C	82.1°C	23.9°C
$\Delta(TS-TA)$	1.1°C	1.7°C	0.6°C
Actual relative humidity	15.8%RH	10.1%RH	50.7%RH
Average Lumen Maintenance at 6,000 hours	96.2%	95.8%	98.8%
Average Chromaticity Shift ( $\Delta u'v'$ ) at 6,000 hours	0.0026	0.0028	0.0019

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# Test Report

### Test Result:

**Case temperature: 25°C**

**Actual case temperature: 24.5°C**

**Actual ambient temperature: 23.9°C**

**Drive current: If = 150mA**

**Measurement current: If = 150mA**

No.	Φ (Im)		Vf (V)		Φ (Im) & maintenance (%)									
	Oh (Initial)		1000h	%	2000h	%	3000h	%	4000h	%	5000h	%	6000h	%
1	52.47	3.171	52.39	99.8%	51.51	98.2%	51.46	98.1%	51.21	97.6%	50.98	97.2%	50.93	97.1%
2	51.40	3.15	51.61	100.4%	51.47	100.1%	51.34	99.9%	51.69	100.6%	51.57	100.3%	51.51	100.2%
3	50.81	3.149	52.10	102.5%	51.09	100.6%	50.67	99.7%	50.58	99.5%	50.59	99.6%	50.41	99.2%
4	52.16	3.147	51.85	99.4%	51.80	99.3%	51.31	98.4%	51.16	98.1%	50.83	97.5%	50.47	96.8%
5	51.73	3.152	52.23	101.0%	51.73	100.0%	51.47	99.5%	51.51	99.6%	51.43	99.4%	51.37	99.3%
6	51.55	3.137	51.39	99.7%	51.02	99.0%	50.80	98.5%	51.14	99.2%	50.75	98.4%	50.81	98.6%
7	50.29	3.152	51.06	101.5%	50.77	101.0%	50.25	99.9%	50.29	100.0%	50.14	99.7%	50.20	99.8%
8	49.29	3.157	50.24	101.9%	49.33	100.1%	49.04	99.5%	48.19	97.8%	48.04	97.5%	47.92	97.2%
9	50.85	3.153	52.21	102.7%	51.76	101.8%	51.01	100.3%	50.61	99.5%	50.37	99.1%	50.22	98.8%
10	51.79	3.146	52.55	101.5%	51.56	99.6%	51.16	98.8%	50.67	97.8%	50.51	97.5%	50.57	97.6%
11	50.81	3.14	52.20	102.7%	51.11	100.6%	51.08	100.5%	51.44	101.2%	51.13	100.6%	51.14	100.6%
12	52.20	3.145	52.27	100.1%	51.59	98.8%	51.16	98.0%	51.24	98.2%	50.94	97.6%	50.85	97.4%
13	52.54	3.146	53.59	102.0%	52.31	99.6%	52.09	99.1%	51.93	98.8%	51.81	98.6%	51.79	98.6%
14	51.61	3.146	52.04	100.8%	51.68	100.1%	51.27	99.3%	51.72	100.2%	51.80	100.4%	51.72	100.2%
15	52.31	3.148	51.87	99.2%	51.41	98.3%	51.26	98.0%	51.27	98.0%	51.04	97.6%	50.91	97.3%
16	50.15	3.152	51.08	101.9%	50.61	100.9%	50.11	99.9%	49.91	99.5%	49.78	99.3%	49.73	99.2%
17	50.82	3.145	51.60	101.5%	51.50	101.3%	50.68	99.7%	50.92	100.2%	50.70	99.8%	50.81	100.0%
18	52.46	3.144	52.20	99.5%	51.83	98.8%	51.76	98.7%	52.25	99.6%	52.01	99.1%	52.03	99.2%
19	51.60	3.143	51.62	100.0%	51.28	99.4%	51.12	99.1%	51.94	100.7%	51.50	99.8%	51.20	99.2%
20	51.66	3.143	52.19	101.0%	51.92	100.5%	51.61	99.9%	51.49	99.7%	51.20	99.1%	51.28	99.3%
21	50.91	3.137	51.29	100.7%	51.01	100.2%	50.68	99.5%	51.37	100.9%	50.93	100.0%	51.09	100.4%
22	52.17	3.145	52.20	100.1%	51.49	98.7%	50.45	96.7%	51.56	98.8%	51.10	97.9%	50.92	97.6%
23	51.78	3.141	52.53	101.4%	51.67	99.8%	51.32	99.1%	51.79	100.0%	51.30	99.1%	51.50	99.5%
24	51.45	3.162	51.68	100.4%	51.16	99.4%	50.75	98.6%	51.02	99.2%	50.79	98.7%	50.79	98.7%
25	50.75	3.163	51.27	101.0%	50.46	99.4%	49.84	98.2%	50.22	99.0%	50.01	98.5%	49.88	98.3%
Average	51.42	3.1486	51.89	100.9%	51.32	99.8%	50.95	99.1%	51.08	99.3%	50.85	98.9%	50.80	98.8%
Median	51.60	3.146	52.04	101.0%	51.49	99.8%	51.12	99.1%	51.24	99.5%	50.94	99.1%	50.91	99.2%
σ	0.82	0.0081	0.65	1.0%	0.60	0.9%	0.65	0.9%	0.84	1.0%	0.81	1.0%	0.83	1.1%
Max.	52.54	3.171	53.59	102.7%	52.31	101.8%	52.09	100.5%	52.25	101.2%	52.01	100.6%	52.03	100.6%
Min.	49.29	3.137	50.24	99.2%	49.33	98.2%	49.04	96.7%	48.19	97.6%	48.04	97.2%	47.92	96.8%

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NVLAP Lab Code: 200952-0

**Verification Services**

Project No: 6012-000060

Report No: 6011-000060-03

Test Initiated Date: 2011-07-13

Report Issued Date: 2012-05-04

# Test Report

No.	u'	v	u'	v	u'	v	u'	v	u'	v	u'	v	u'	v
	0h (Initial)	1000h	2000h	3000h	4000h	5000h	6000h							
1	0.2499	0.5254	0.2491	0.5251	0.2478	0.5267	0.2478	0.5268	0.2474	0.5262	0.2472	0.5260	0.2469	0.5258
2	0.2496	0.5267	0.2491	0.5267	0.2493	0.5270	0.2489	0.5269	0.2488	0.5265	0.2485	0.5262	0.2484	0.5262
3	0.2501	0.5253	0.2492	0.5251	0.2491	0.5259	0.2489	0.5258	0.2486	0.5252	0.2485	0.5251	0.2484	0.5250
4	0.2484	0.5234	0.2477	0.5233	0.2476	0.5241	0.2475	0.5241	0.2470	0.5233	0.2469	0.5231	0.2467	0.5230
5	0.2497	0.5242	0.2490	0.5240	0.2488	0.5248	0.2486	0.5245	0.2482	0.5239	0.2480	0.5237	0.2478	0.5236
6	0.2497	0.5260	0.2491	0.5259	0.2489	0.5267	0.2486	0.5264	0.2484	0.5259	0.2482	0.5257	0.2479	0.5255
7	0.2494	0.5260	0.2487	0.5258	0.2484	0.5266	0.2482	0.5266	0.2480	0.5260	0.2478	0.5258	0.2477	0.5257
8	0.2503	0.5254	0.2496	0.5252	0.2480	0.5259	0.2478	0.5258	0.2472	0.5249	0.2471	0.5248	0.2469	0.5246
9	0.2477	0.5228	0.2471	0.5226	0.2469	0.5234	0.2467	0.5232	0.2463	0.5225	0.2461	0.5223	0.2459	0.5222
10	0.2500	0.5258	0.2494	0.5256	0.2492	0.5263	0.2490	0.5262	0.2486	0.5255	0.2485	0.5254	0.2482	0.5252
11	0.2501	0.5268	0.2495	0.5266	0.2493	0.5274	0.2491	0.5272	0.2488	0.5266	0.2487	0.5265	0.2485	0.5263
12	0.2476	0.5223	0.2471	0.5222	0.2469	0.5230	0.2466	0.5227	0.2464	0.5222	0.2462	0.5219	0.2460	0.5217
13	0.2497	0.5238	0.2493	0.5237	0.2489	0.5246	0.2489	0.5246	0.2486	0.5240	0.2485	0.5239	0.2483	0.5237
14	0.2485	0.5223	0.2481	0.5222	0.2479	0.5231	0.2479	0.5231	0.2475	0.5224	0.2474	0.5222	0.2473	0.5221
15	0.2499	0.5270	0.2494	0.5269	0.2487	0.5271	0.2482	0.5269	0.2480	0.5264	0.2478	0.5263	0.2477	0.5261
16	0.2478	0.5216	0.2473	0.5214	0.2469	0.5221	0.2467	0.5218	0.2462	0.5210	0.2461	0.5209	0.2459	0.5207
17	0.2497	0.5272	0.2491	0.5270	0.2489	0.5269	0.2486	0.5268	0.2481	0.5261	0.2479	0.5259	0.2476	0.5257
18	0.2501	0.5244	0.2495	0.5243	0.2493	0.5251	0.2492	0.5251	0.2490	0.5245	0.2489	0.5244	0.2487	0.5242
19	0.2502	0.5248	0.2493	0.5246	0.2486	0.5261	0.2481	0.5258	0.2480	0.5253	0.2478	0.5252	0.2476	0.5250
20	0.2482	0.5258	0.2476	0.5258	0.2480	0.5257	0.2477	0.5256	0.2473	0.5250	0.2471	0.5248	0.2469	0.5247
21	0.2499	0.5251	0.2492	0.5251	0.2489	0.5258	0.2488	0.5258	0.2486	0.5253	0.2485	0.5252	0.2484	0.5251
22	0.2491	0.5262	0.2485	0.5260	0.2482	0.5268	0.2476	0.5265	0.2475	0.5260	0.2474	0.5259	0.2472	0.5257
23	0.2489	0.5232	0.2482	0.5230	0.2479	0.5239	0.2478	0.5238	0.2474	0.5231	0.2474	0.5230	0.2472	0.5228
24	0.2496	0.5234	0.2489	0.5233	0.2488	0.5243	0.2487	0.5243	0.2485	0.5238	0.2484	0.5236	0.2482	0.5234
25	0.2489	0.5248	0.2484	0.5247	0.2479	0.5254	0.2479	0.5254	0.2475	0.5248	0.2474	0.5247	0.2473	0.5245
Average	0.2493	0.5248	0.2487	0.5246	0.2484	0.5254	0.2482	0.5253	0.2478	0.5247	0.2477	0.5245	0.2475	0.5243
Median	0.2497	0.5251	0.2491	0.5251	0.2486	0.5258	0.2482	0.5258	0.2480	0.5250	0.2478	0.5248	0.2476	0.5247
σ	0.0008	0.0016	0.0008	0.0016	0.0008	0.0015	0.0008	0.0015	0.0008	0.0015	0.0008	0.0016	0.0008	0.0016
Max.	0.2503	0.5272	0.2496	0.5270	0.2493	0.5274	0.2492	0.5272	0.2490	0.5266	0.2489	0.5265	0.2487	0.5263
Min.	0.2476	0.5216	0.2471	0.5214	0.2469	0.5221	0.2466	0.5218	0.2462	0.5210	0.2461	0.5209	0.2459	0.5207

No.	ΔuV	ΔuV	ΔuV	ΔuV	ΔuV	ΔuV
	1000h	2000h	3000h	4000h	5000h	6000h
1	0.0009	0.0025	0.0025	0.0026	0.0028	0.0030
2	0.0005	0.0004	0.0007	0.0008	0.0012	0.0013
3	0.0009	0.0012	0.0013	0.0015	0.0016	0.0017
4	0.0007	0.0011	0.0011	0.0014	0.0015	0.0017
5	0.0007	0.0011	0.0011	0.0015	0.0018	0.0020
6	0.0006	0.0011	0.0012	0.0013	0.0015	0.0019
7	0.0007	0.0012	0.0013	0.0014	0.0016	0.0017
8	0.0007	0.0024	0.0025	0.0031	0.0033	0.0035
9	0.0006	0.0010	0.0011	0.0014	0.0017	0.0019
10	0.0006	0.0009	0.0011	0.0014	0.0016	0.0019
11	0.0006	0.0010	0.0011	0.0013	0.0014	0.0017
12	0.0005	0.0010	0.0011	0.0012	0.0015	0.0017
13	0.0004	0.0011	0.0011	0.0011	0.0012	0.0014
14	0.0004	0.0010	0.0010	0.0010	0.0011	0.0012
15	0.0005	0.0012	0.0017	0.0020	0.0022	0.0024
16	0.0005	0.0010	0.0011	0.0017	0.0018	0.0021
17	0.0006	0.0009	0.0012	0.0019	0.0022	0.0026
18	0.0006	0.0011	0.0011	0.0011	0.0012	0.0014
19	0.0009	0.0021	0.0023	0.0023	0.0024	0.0026
20	0.0006	0.0002	0.0005	0.0012	0.0015	0.0017
21	0.0007	0.0012	0.0013	0.0013	0.0014	0.0015
22	0.0006	0.0011	0.0015	0.0016	0.0017	0.0020
23	0.0007	0.0012	0.0013	0.0015	0.0015	0.0017
24	0.0007	0.0012	0.0013	0.0012	0.0012	0.0014
25	0.0005	0.0012	0.0012	0.0014	0.0015	0.0016
Average	0.0006	0.0012	0.0013	0.0015	0.0017	0.0019
Median	0.0006	0.0011	0.0012	0.0014	0.0015	0.0017
σ	0.0001	0.0005	0.0005	0.0005	0.0005	0.0005
Max.	0.0009	0.0025	0.0025	0.0031	0.0033	0.0035
Min.	0.0004	0.0002	0.0005	0.0008	0.0011	0.0012

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# Test Report

**Case temperature: 55°C**

**Actual case temperature: 53.8°C**  
**Actual ambient temperature: 52.7°C**  
**Drive current: If = 150mA**  
**Measurement current: If = 150mA**

No.	Φ (lm) Vf (V)		Φ (lm) & maintenance (%)											
	Oh (Initial)		1000h	%	2000h	%	3000h	%	4000h	%	5000h	%	6000h	%
26	50.08	3.151	50.61	101.1%	50.02	99.9%	49.58	99.0%	49.04	97.9%	48.46	96.8%	48.26	96.4%
27	52.53	3.139	51.81	98.6%	51.72	98.5%	51.23	97.5%	51.52	98.1%	51.14	97.4%	50.60	96.3%
28	52.89	3.146	52.53	99.3%	51.98	98.3%	51.70	97.8%	51.37	97.1%	51.50	97.4%	51.27	96.9%
29	52.17	3.145	51.55	98.8%	51.05	97.9%	50.81	97.4%	51.01	97.8%	50.98	97.7%	50.30	96.4%
30	50.08	3.151	50.49	100.8%	49.66	99.2%	49.36	98.6%	48.84	97.5%	49.15	98.1%	48.78	97.4%
31	50.82	3.166	50.31	99.0%	49.54	97.5%	49.08	96.6%	48.62	95.7%	48.13	94.7%	47.69	93.8%
32	50.55	3.143	51.19	101.3%	50.44	99.8%	50.20	99.3%	50.04	99.0%	49.40	97.7%	49.20	97.3%
33	50.70	3.168	49.71	98.0%	49.21	97.1%	48.65	96.0%	49.57	97.8%	49.62	97.9%	49.40	97.4%
34	49.47	3.158	49.83	100.7%	49.27	99.6%	49.16	99.4%	48.65	98.3%	47.81	96.6%	47.39	95.8%
35	51.63	3.152	50.03	96.9%	49.55	96.0%	49.38	95.6%	49.74	96.3%	49.00	94.9%	48.68	94.3%
36	51.84	3.134	51.12	98.6%	49.58	95.6%	49.49	95.5%	49.21	94.9%	49.35	95.2%	49.12	94.8%
37	50.36	3.153	49.24	97.8%	48.89	97.1%	48.81	96.9%	49.29	97.9%	48.92	97.1%	48.49	96.3%
38	51.48	3.144	50.32	97.7%	49.73	96.6%	49.55	96.3%	49.30	95.8%	48.89	95.0%	48.49	94.2%
39	52.13	3.144	50.84	97.5%	50.43	96.7%	49.88	95.7%	49.45	94.9%	49.30	94.6%	49.01	94.0%
40	50.37	3.250	50.53	100.3%	50.03	99.3%	49.59	98.5%	48.59	96.5%	48.50	96.3%	48.67	96.6%
41	49.83	3.170	48.78	97.9%	48.17	96.7%	47.81	95.9%	47.45	95.2%	47.67	95.7%	47.27	94.9%
42	49.39	3.141	49.93	101.1%	49.31	99.8%	49.27	99.8%	49.76	100.7%	49.44	100.1%	48.84	98.9%
43	49.60	3.164	50.45	101.7%	49.46	99.7%	49.29	99.4%	49.92	100.6%	49.12	99.0%	48.82	98.4%
44	50.93	3.144	51.68	101.5%	50.87	99.9%	50.37	98.9%	50.47	99.1%	49.92	98.0%	49.47	97.1%
45	49.93	3.150	50.27	100.7%	49.82	99.8%	49.20	98.5%	49.91	100.0%	49.27	98.7%	48.73	97.6%
46	52.69	3.145	52.74	100.1%	52.18	99.0%	51.47	97.7%	50.84	96.5%	50.29	95.4%	49.91	94.7%
47	50.99	3.152	49.91	97.9%	49.79	97.6%	49.48	97.0%	50.04	98.1%	49.39	96.9%	49.12	96.3%
48	52.22	3.145	52.16	99.9%	51.77	99.1%	51.05	97.8%	51.57	98.8%	50.94	97.5%	50.38	96.5%
49	51.86	3.176	49.95	96.3%	49.88	96.2%	49.76	96.0%	50.09	96.6%	49.53	95.5%	49.21	94.9%
50	51.52	3.162	50.61	98.2%	50.42	97.9%	50.39	97.8%	50.96	98.9%	50.29	97.6%	49.79	96.6%
Average	51.04	3.156	50.66	99.3%	50.11	98.2%	49.78	97.5%	49.81	97.6%	49.44	96.9%	49.08	96.2%
Median	50.93	3.151	50.49	99.0%	49.82	98.3%	49.55	97.7%	49.76	97.8%	49.35	97.1%	49.01	96.4%
σ	1.07	0.022	0.99	1.6%	1.01	1.4%	0.93	1.4%	1.03	1.7%	1.00	1.5%	0.95	1.4%
Max.	52.89	3.250	52.74	101.7%	52.18	99.9%	51.70	99.8%	51.57	100.7%	51.50	100.1%	51.27	98.9%
Min.	49.39	3.134	48.78	96.3%	48.17	95.6%	47.81	95.5%	47.45	94.9%	47.67	94.6%	47.27	93.8%

Doc No: 10-CT-F0059

Issue No: 1.0

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### Verification Services

Project No: 6012-000060

Report No: 6011-000060-03

Test Initiated Date: 2011-07-13

Report Issued Date: 2012-05-04

# Test Report

No.	u'	v	u'	v	u'	v	u'	v	u'	v	u'	v	u'	v	u'	v
	0h (Initial)		1000h		2000h		3000h		4000h		5000h		6000h			
26	0.2488	0.5255	0.2480	0.5253	0.2477	0.5261	0.2473	0.5259	0.2467	0.5251	0.2465	0.5248	0.2463	0.5246		
27	0.2494	0.5247	0.2487	0.5247	0.2484	0.5254	0.2478	0.5250	0.2472	0.5242	0.2473	0.5241	0.2469	0.5236		
28	0.2487	0.5257	0.2481	0.5256	0.2477	0.5263	0.2472	0.5260	0.2464	0.5251	0.2467	0.5251	0.2463	0.5247		
29	0.2495	0.5255	0.2491	0.5255	0.2488	0.5263	0.2481	0.5259	0.2475	0.5250	0.2477	0.5250	0.2474	0.5246		
30	0.2490	0.5246	0.2482	0.5243	0.2479	0.5251	0.2471	0.5245	0.2460	0.5232	0.2468	0.5237	0.2464	0.5233		
31	0.2499	0.5264	0.2491	0.5262	0.2488	0.5268	0.2469	0.5249	0.2479	0.5258	0.2479	0.5257	0.2476	0.5254		
32	0.2482	0.5240	0.2476	0.5237	0.2471	0.5249	0.2485	0.5272	0.2462	0.5239	0.2461	0.5239	0.2458	0.5236		
33	0.2497	0.5256	0.2490	0.5255	0.2489	0.5273	0.2484	0.5265	0.2476	0.5262	0.2477	0.5262	0.2473	0.5259		
34	0.2486	0.5236	0.2478	0.5234	0.2471	0.5244	0.2464	0.5239	0.2457	0.5230	0.2456	0.5229	0.2452	0.5225		
35	0.2485	0.5235	0.2478	0.5233	0.2475	0.5241	0.2468	0.5235	0.2462	0.5227	0.2462	0.5226	0.2458	0.5222		
36	0.2493	0.5240	0.2486	0.5239	0.2483	0.5247	0.2495	0.5264	0.2466	0.5232	0.2474	0.5237	0.2471	0.5234		
37	0.2496	0.5230	0.2485	0.5228	0.2482	0.5236	0.2480	0.5235	0.2475	0.5228	0.2476	0.5227	0.2474	0.5225		
38	0.2490	0.5253	0.2483	0.5251	0.2478	0.5258	0.2476	0.5257	0.2468	0.5248	0.2469	0.5247	0.2466	0.5244		
39	0.2483	0.5234	0.2475	0.5232	0.2472	0.5240	0.2467	0.5236	0.2461	0.5227	0.2463	0.5227	0.2460	0.5223		
40	0.2488	0.5232	0.2480	0.5230	0.2477	0.5238	0.2470	0.5232	0.2463	0.5223	0.2469	0.5226	0.2465	0.5222		
41	0.2493	0.5248	0.2485	0.5247	0.2483	0.5255	0.2477	0.5251	0.2470	0.5242	0.2473	0.5243	0.2470	0.5240		
42	0.2493	0.5274	0.2483	0.5268	0.2481	0.5277	0.2478	0.5276	0.2475	0.5270	0.2475	0.5269	0.2472	0.5266		
43	0.2496	0.5254	0.2489	0.5269	0.2488	0.5278	0.2485	0.5276	0.2481	0.5270	0.2481	0.5270	0.2479	0.5267		
44	0.2467	0.5215	0.2456	0.5210	0.2454	0.5219	0.2449	0.5215	0.2444	0.5207	0.2445	0.5207	0.2443	0.5204		
45	0.2485	0.5242	0.2475	0.5238	0.2474	0.5247	0.2469	0.5244	0.2465	0.5237	0.2465	0.5236	0.2462	0.5233		
46	0.2495	0.5270	0.2491	0.5270	0.2484	0.5277	0.2480	0.5274	0.2475	0.5267	0.2475	0.5266	0.2474	0.5263		
47	0.2499	0.5272	0.2491	0.5271	0.2488	0.5279	0.2483	0.5275	0.2480	0.5270	0.2480	0.5269	0.2477	0.5266		
48	0.2502	0.5258	0.2492	0.5256	0.2489	0.5264	0.2487	0.5262	0.2482	0.5255	0.2482	0.5253	0.2479	0.5251		
49	0.2485	0.5252	0.2478	0.5252	0.2474	0.5258	0.2472	0.5257	0.2466	0.5249	0.2466	0.5248	0.2463	0.5244		
50	0.2486	0.5253	0.2477	0.5250	0.2471	0.5235	0.2467	0.5233	0.2460	0.5223	0.2458	0.5220	0.2455	0.5217		
Average	0.2490	0.5249	0.2482	0.5247	0.2479	0.5255	0.2475	0.5253	0.2468	0.5244	0.2469	0.5243	0.2466	0.5240		
Median	0.2490	0.5252	0.2483	0.5250	0.2479	0.5255	0.2476	0.5257	0.2467	0.5242	0.2469	0.5243	0.2466	0.5240		
σ	0.0007	0.0014	0.0008	0.0015	0.0008	0.0016	0.0009	0.0016	0.0009	0.0017	0.0009	0.0017	0.0009	0.0017		
Max.	0.2502	0.5274	0.2492	0.5271	0.2489	0.5279	0.2495	0.5276	0.2482	0.5270	0.2482	0.5270	0.2479	0.5267		
Min.	0.2467	0.5215	0.2456	0.5210	0.2454	0.5219	0.2449	0.5215	0.2444	0.5207	0.2445	0.5207	0.2443	0.5204		

No.	ΔuV	ΔuV	ΔuV	ΔuV	ΔuV	ΔuV
	1000h	2000h	3000h	4000h	5000h	6000h
26	0.0008	0.0013	0.0016	0.0021	0.0024	0.0027
27	0.0007	0.0012	0.0016	0.0023	0.0022	0.0027
28	0.0006	0.0012	0.0015	0.0024	0.0021	0.0026
29	0.0004	0.0011	0.0015	0.0021	0.0019	0.0023
30	0.0009	0.0012	0.0019	0.0033	0.0024	0.0029
31	0.0008	0.0012	0.0034	0.0021	0.0021	0.0025
32	0.0007	0.0014	0.0032	0.0020	0.0021	0.0024
33	0.0007	0.0019	0.0016	0.0022	0.0021	0.0024
34	0.0008	0.0017	0.0022	0.0030	0.0031	0.0036
35	0.0007	0.0012	0.0017	0.0024	0.0025	0.0030
36	0.0007	0.0012	0.0024	0.0028	0.0019	0.0023
37	0.0011	0.0015	0.0017	0.0021	0.0020	0.0023
38	0.0007	0.0013	0.0015	0.0023	0.0022	0.0026
39	0.0008	0.0013	0.0016	0.0023	0.0021	0.0025
40	0.0008	0.0013	0.0018	0.0027	0.0020	0.0025
41	0.0008	0.0012	0.0016	0.0024	0.0021	0.0024
42	0.0012	0.0012	0.0015	0.0018	0.0019	0.0022
43	0.0017	0.0025	0.0025	0.0022	0.0022	0.0021
44	0.0012	0.0014	0.0018	0.0024	0.0023	0.0026
45	0.0011	0.0012	0.0016	0.0021	0.0021	0.0025
46	0.0004	0.0013	0.0016	0.0020	0.0020	0.0022
47	0.0008	0.0013	0.0016	0.0019	0.0019	0.0023
48	0.0010	0.0014	0.0016	0.0020	0.0021	0.0024
49	0.0007	0.0013	0.0014	0.0019	0.0019	0.0023
50	0.0009	0.0023	0.0028	0.0040	0.0043	0.0048
Average	0.0008	0.0014	0.0019	0.0023	0.0022	0.0026
Median	0.0008	0.0013	0.0016	0.0022	0.0021	0.0025
σ	0.0003	0.0004	0.0005	0.0005	0.0005	0.0005
Max.	0.0017	0.0025	0.0034	0.0040	0.0043	0.0048
Min.	0.0004	0.0011	0.0014	0.0018	0.0019	0.0021

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## Verification Services

Project No: 6012-000060

Report No: 6011-000060-03

Test Initiated Date: 2011-07-13

Report Issued Date: 2012-05-04

# Test Report

**Case temperature: 85°C**

**Actual case temperature: 83.8°C**  
**Actual ambient temperature: 82.1°C**  
**Drive current: If = 150mA**  
**Measurement current: If = 150mA**

No.	Φ (Im)		Φ (Im) & maintenance (%)											
	Oh (Initial)	Vf (V)	1000h	%	2000h	%	3000h	%	4000h	%	5000h	%	6000h	%
51	53.14	3.147	51.55	97.0%	50.96	95.9%	50.59	95.2%	51.33	96.6%	50.97	95.9%	50.25	94.6%
52	49.78	3.164	49.50	99.4%	49.11	98.7%	48.93	98.3%	50.05	100.5%	49.42	99.3%	48.62	97.7%
53	52.16	3.146	50.90	97.6%	50.44	96.7%	50.37	96.6%	51.23	98.2%	50.90	97.6%	50.34	96.5%
54	51.60	3.139	50.57	98.0%	50.10	97.1%	50.01	96.9%	50.42	97.7%	50.19	97.3%	49.59	96.1%
55	52.00	3.137	51.51	99.1%	51.10	98.3%	50.83	97.8%	51.01	98.1%	50.35	96.8%	49.67	95.5%
56	52.15	3.145	51.03	97.9%	50.22	96.3%	49.88	95.6%	50.37	96.6%	49.67	95.2%	49.02	94.0%
57	52.05	3.144	50.64	97.3%	49.97	96.0%	49.90	95.9%	50.16	96.4%	49.39	94.9%	48.45	93.1%
58	51.46	3.152	50.88	98.9%	49.91	97.0%	49.24	95.7%	49.44	96.1%	48.64	94.5%	47.60	92.5%
59	50.71	3.147	50.40	99.4%	50.11	98.8%	50.09	98.8%	50.27	99.1%	49.92	98.4%	49.02	96.7%
60	50.79	3.138	50.65	99.7%	50.08	98.6%	49.99	98.4%	50.38	99.2%	50.11	98.7%	49.24	96.9%
61	50.04	3.138	50.23	100.4%	49.68	99.3%	49.60	99.1%	49.50	98.9%	48.95	97.8%	48.18	96.3%
62	51.88	3.147	51.70	99.7%	50.64	97.6%	50.09	96.5%	50.51	97.4%	50.36	97.1%	49.49	95.4%
63	50.38	3.143	50.76	100.8%	50.25	99.7%	50.05	99.3%	49.92	99.1%	49.81	98.9%	49.42	98.1%
64	51.72	3.149	50.79	98.2%	50.71	98.0%	50.48	97.6%	50.15	97.0%	49.44	95.6%	48.73	94.2%
65	50.19	3.145	49.77	99.2%	49.60	98.8%	49.11	97.8%	49.27	98.2%	48.55	96.7%	47.90	95.4%
66	52.00	3.14	51.59	99.2%	51.28	98.6%	51.02	98.1%	52.10	100.2%	51.80	99.6%	51.17	98.4%
67	49.97	3.141	50.64	101.3%	50.07	100.2%	49.56	99.2%	49.95	100.0%	49.17	98.4%	48.57	97.2%
68	51.90	3.145	51.34	98.9%	50.28	96.9%	49.85	96.1%	50.25	96.8%	49.92	96.2%	49.18	94.8%
69	50.58	3.143	50.83	100.5%	50.45	99.7%	49.79	98.4%	50.00	98.9%	49.54	97.9%	48.80	96.5%
70	50.34	3.139	51.14	101.6%	50.23	99.8%	49.72	98.8%	49.89	99.1%	49.18	97.7%	49.01	97.4%
71	52.16	3.156	51.49	98.7%	50.52	96.9%	49.86	95.6%	50.21	96.3%	49.72	95.3%	49.24	94.4%
72	50.18	3.145	49.74	99.1%	49.64	98.9%	49.47	98.6%	49.63	98.9%	49.10	97.8%	48.62	96.9%
73	52.21	3.149	51.70	99.0%	51.27	98.2%	51.08	97.8%	51.97	99.5%	51.24	98.1%	50.61	96.9%
74	52.33	3.156	52.23	99.8%	51.01	97.5%	50.89	97.2%	50.81	97.1%	50.19	95.9%	49.65	94.9%
Average	51.32	3.1456	50.90	99.2%	50.32	98.1%	50.02	97.5%	50.37	98.2%	49.86	97.2%	49.18	95.8%
Median	51.66	3.145	50.86	99.1%	50.24	98.2%	49.95	97.8%	50.23	98.2%	49.77	97.4%	49.10	96.2%
σ	0.96	0.0065	0.68	1.2%	0.55	1.3%	0.58	1.3%	0.73	1.3%	0.81	1.4%	0.84	1.6%
Max.	53.14	3.164	52.23	101.6%	51.28	100.2%	51.08	99.3%	52.10	100.5%	51.80	99.6%	51.17	98.4%
Min.	49.78	3.137	49.50	97.0%	49.11	95.9%	48.93	95.2%	49.27	96.1%	48.55	94.5%	47.60	92.5%

Doc No: 10-CT-F0059

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# Test Report

No.	u'	v	u'	v	u'	v	u'	v	u'	v	u'	v	u'	v
	0h (Initial)		1000h		2000h		3000h		4000h		5000h		6000h	
51	0.2492	0.5240	0.2485	0.5241	0.2470	0.5257	0.2462	0.5252	0.2460	0.5247	0.2460	0.5247	0.2459	0.5244
52	0.2495	0.5254	0.2487	0.5251	0.2488	0.5254	0.2483	0.5251	0.2480	0.5245	0.2480	0.5245	0.2475	0.5240
53	0.2497	0.5245	0.2487	0.5243	0.2486	0.5254	0.2481	0.5251	0.2478	0.5246	0.2481	0.5247	0.2477	0.5243
54	0.2495	0.5273	0.2487	0.5271	0.2492	0.5279	0.2488	0.5277	0.2484	0.5271	0.2485	0.5271	0.2481	0.5268
55	0.2498	0.5235	0.2491	0.5233	0.2486	0.5243	0.2479	0.5238	0.2477	0.5233	0.2477	0.5233	0.2473	0.5227
56	0.2485	0.5242	0.2479	0.5240	0.2482	0.5248	0.2471	0.5240	0.2471	0.5237	0.2471	0.5236	0.2466	0.5231
57	0.2498	0.5262	0.2493	0.5261	0.2490	0.5267	0.2480	0.5260	0.2478	0.5255	0.2475	0.5252	0.2470	0.5247
58	0.2494	0.5271	0.2487	0.5269	0.2483	0.5275	0.2476	0.5271	0.2472	0.5265	0.2470	0.5263	0.2465	0.5258
59	0.2500	0.5262	0.2494	0.5261	0.2497	0.5260	0.2492	0.5258	0.2489	0.5252	0.2489	0.5251	0.2484	0.5247
60	0.2494	0.5264	0.2488	0.5262	0.2488	0.5265	0.2483	0.5263	0.2480	0.5257	0.2479	0.5256	0.2476	0.5254
61	0.2499	0.5268	0.2493	0.5266	0.2493	0.5284	0.2486	0.5281	0.2482	0.5274	0.2481	0.5274	0.2476	0.5268
62	0.2472	0.5217	0.2466	0.5214	0.2462	0.5223	0.2455	0.5219	0.2452	0.5211	0.2452	0.5211	0.2448	0.5206
63	0.2503	0.5228	0.2495	0.5226	0.2476	0.5234	0.2468	0.5229	0.2464	0.5221	0.2465	0.5221	0.2461	0.5217
64	0.2499	0.5249	0.2491	0.5246	0.2485	0.5249	0.2476	0.5243	0.2475	0.5238	0.2474	0.5237	0.2468	0.5230
65	0.2495	0.5258	0.2485	0.5252	0.2481	0.5262	0.2476	0.5260	0.2473	0.5253	0.2472	0.5252	0.2466	0.5247
66	0.2495	0.5252	0.2486	0.5249	0.2488	0.5257	0.2483	0.5256	0.2480	0.5249	0.2479	0.5248	0.2476	0.5244
67	0.2493	0.5251	0.2483	0.5247	0.2487	0.5244	0.2480	0.5241	0.2477	0.5234	0.2477	0.5233	0.2472	0.5228
68	0.2482	0.5254	0.2474	0.5252	0.2474	0.5235	0.2467	0.5231	0.2463	0.5223	0.2462	0.5222	0.2458	0.5219
69	0.2478	0.5232	0.2469	0.5228	0.2486	0.5234	0.2476	0.5227	0.2476	0.5223	0.2475	0.5221	0.2472	0.5217
70	0.2489	0.5225	0.2481	0.5222	0.2464	0.5231	0.2451	0.5222	0.2451	0.5218	0.2450	0.5216	0.2447	0.5212
71	0.2496	0.5245	0.2487	0.5243	0.2491	0.5241	0.2481	0.5235	0.2480	0.5230	0.2481	0.5230	0.2477	0.5225
72	0.2495	0.5226	0.2485	0.5221	0.2483	0.5224	0.2477	0.5221	0.2475	0.5216	0.2474	0.5214	0.2469	0.5207
73	0.2500	0.5257	0.2490	0.5254	0.2490	0.5280	0.2479	0.5274	0.2485	0.5273	0.2484	0.5272	0.2477	0.5268
74	0.2495	0.5233	0.2484	0.5230	0.2482	0.5239	0.2477	0.5236	0.2475	0.5230	0.2472	0.5227	0.2465	0.5220
Average	0.2493	0.5248	0.2485	0.5245	0.2484	0.5252	0.2476	0.5247	0.2474	0.5242	0.2474	0.5241	0.2469	0.5236
Median	0.2495	0.5250	0.2487	0.5247	0.2486	0.5252	0.2478	0.5247	0.2477	0.5242	0.2475	0.5241	0.2471	0.5236
σ	0.0007	0.0016	0.0007	0.0016	0.0009	0.0018	0.0010	0.0018	0.0010	0.0019	0.0010	0.0019	0.0009	0.0019
Max.	0.2503	0.5273	0.2495	0.5271	0.2497	0.5284	0.2492	0.5281	0.2489	0.5274	0.2489	0.5274	0.2484	0.5268
Min.	0.2472	0.5217	0.2466	0.5214	0.2462	0.5223	0.2451	0.5219	0.2451	0.5211	0.2450	0.5211	0.2447	0.5206

No.	ΔuV	ΔuV	ΔuV	ΔuV	ΔuV	ΔuV
	1000h	2000h	3000h	4000h	5000h	6000h
51	0.0007	0.0028	0.0032	0.0033	0.0033	0.0033
52	0.0009	0.0007	0.0012	0.0017	0.0017	0.0024
53	0.0010	0.0014	0.0017	0.0019	0.0016	0.0020
54	0.0008	0.0007	0.0008	0.0011	0.0010	0.0015
55	0.0007	0.0014	0.0019	0.0021	0.0021	0.0026
56	0.0006	0.0007	0.0014	0.0015	0.0015	0.0022
57	0.0005	0.0009	0.0018	0.0021	0.0025	0.0032
58	0.0007	0.0012	0.0018	0.0023	0.0025	0.0032
59	0.0006	0.0004	0.0009	0.0015	0.0016	0.0022
60	0.0006	0.0006	0.0011	0.0016	0.0017	0.0021
61	0.0006	0.0017	0.0018	0.0018	0.0019	0.0023
62	0.0007	0.0012	0.0017	0.0021	0.0021	0.0026
63	0.0008	0.0028	0.0035	0.0040	0.0039	0.0043
64	0.0009	0.0014	0.0024	0.0026	0.0028	0.0036
65	0.0012	0.0015	0.0019	0.0023	0.0024	0.0031
66	0.0009	0.0009	0.0013	0.0015	0.0016	0.0021
67	0.0011	0.0009	0.0016	0.0023	0.0024	0.0031
68	0.0008	0.0021	0.0027	0.0036	0.0038	0.0042
69	0.0010	0.0008	0.0005	0.0009	0.0011	0.0016
70	0.0009	0.0026	0.0038	0.0039	0.0040	0.0044
71	0.0009	0.0006	0.0018	0.0022	0.0021	0.0028
72	0.0011	0.0012	0.0019	0.0022	0.0024	0.0032
73	0.0010	0.0025	0.0027	0.0022	0.0022	0.0025
74	0.0011	0.0014	0.0018	0.0020	0.0024	0.0033
Average	0.0008	0.0013	0.0019	0.0022	0.0023	0.0028
Median	0.0008	0.0012	0.0018	0.0021	0.0022	0.0027
σ	0.0002	0.0007	0.0008	0.0008	0.0008	0.0008
Max.	0.0012	0.0028	0.0038	0.0040	0.0040	0.0044
Min.	0.0005	0.0004	0.0005	0.0009	0.0010	0.0015



## Verification Services

Project No: 6012-000060

Report No: 6011-000060-03

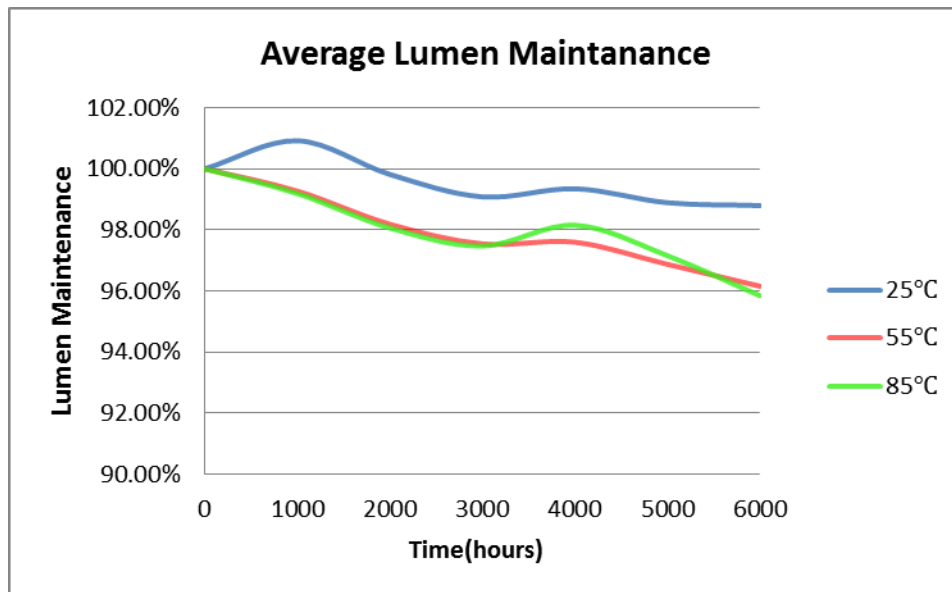
Test Initiated Date: 2011-07-13

Report Issued Date: 2012-05-04

# Test Report

## TM-21 Report:

Test Condition 1- 25°C Case Temp		Test Condition 2- 55°C Case Temp		Test Condition 3 - 85°C Case Temp	
Sample size	25	Sample size	25	Sample size	25
Number of failures	0	Number of failures	0	Number of failures	1
DUT drive current used in the test (mA)	150	DUT drive current used in the test (mA)	150	DUT drive current used in the test (mA)	150
Test duration (hours)	6,000	Test duration (hours)	6,000	Test duration (hours)	6,000
Test duration used for projection (hour to hour)	1000 - 6000	Test duration used for projection (hour to hour)	1000 - 6000	Test duration used for projection (hour to hour)	1000 - 6000
Tested case temperature (°C)	25	Tested case temperature (°C)	55	Tested case temperature (°C)	85
$\alpha$	3.756E-06	$\alpha$	5.690E-06	$\alpha$	5.498E-06
B	1.008	B	0.996	B	0.995
Calculated L70(Dk) (hours)	97,000	Calculated L70(Dk) (hours)	62,000	Calculated L70(Dk) (hours)	64,000
Reported L70(Dk) (hours)	>36,000	Reported L70(Dk) (hours)	>36,000	Reported L70(Dk) (hours)	>36,000





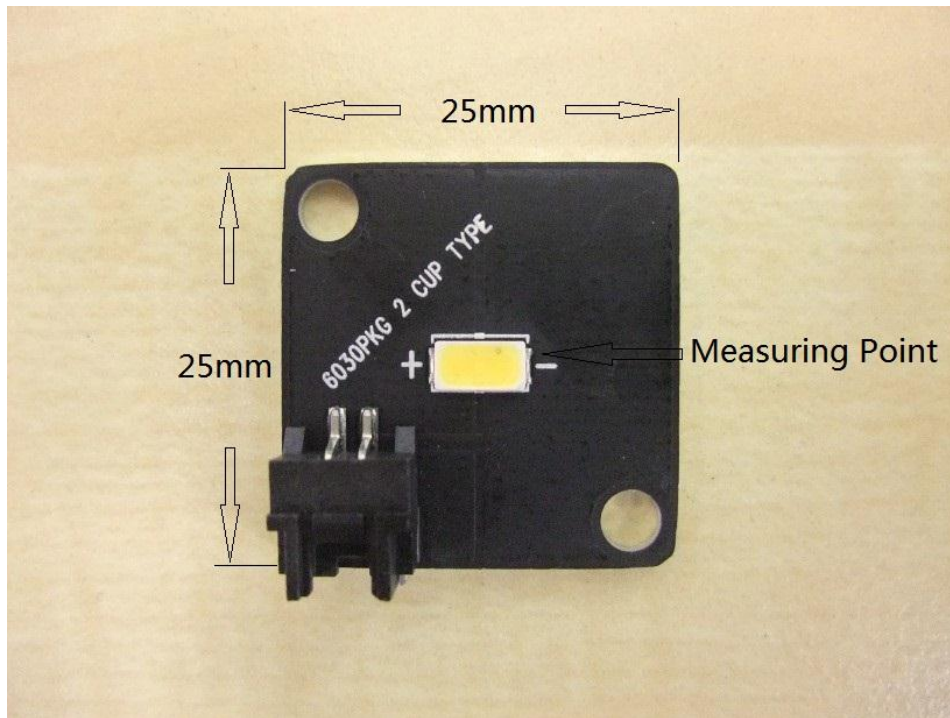
**Verification Services**

Project No: 6012-000060  
Report No: 6011-000060-03  
Test Initiated Date: 2011-07-13  
Report Issued Date: 2012-05-04

# Test Report

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Photo of Sample:



\*\*\*\*\***END OF TEST REPORT**\*\*\*\*\*