

# Test Report

Report No.: EASZD10270005

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## APPLICATION FOR LUMEN MAINTENANCE TESTING ACCORDING TO THE IESNA LM-80 TEST STANDARD

Prepared for: **Shen zhen Runlite Technology Co., Ltd**  
5F east, 3 building, Tian Fu An Industry Zone, Le ZhuJiao, Xi Xiang,  
BaoAn District, ShenZhen, GuangDong Province, CHINA

### Description of the submitted sample(s):

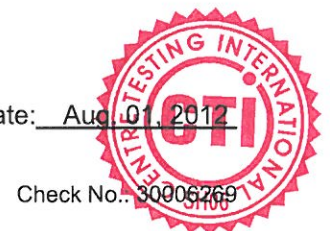
Sample Name : White SMD LED  
Sample Model : T5730  
Ratings : 150mA, 0.5W  
State of Sample(s) : Normal  
Sample Quantity : 60pcs  
Manufacturer : Shen zhen Runlite Technology Co., Ltd  
Reference Standard : IESNA LM-80-2008 Approved Method: Measuring Lumen Maintenance of LED Light Sources

Sample Received Date : Oct. 22, 2011  
Sample Tested Date : Oct. 22, 2011 to Jul. 26, 2012  
Tested by : Kaiser Lee

Prepared by: **Centre Testing International Corporation**  
NO.1996, Xin jin qiao Road, Pudong New District, Shanghai, 201206, China

Note: The laboratory that conducted the testing items in this report has been accredited by the National Voluntary Laboratory Accreditation Program (NVLAP LAB CODE: 200889-0), for LM-80 testing of LED Light Sources.

Reviewed by: Hesen Lin, Approved by: Spring Peng, Approved date: Aug. 01, 2012  
Engineer Supervisor



CENTRE TESTING INTERNATIONAL CORPORATION  
NO.1996, Xin jin qiao Road, Pudong New District, Shanghai, 201206, China

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## 1 SUMMARY

	LM-80 Required Temperature		Specified Temperature of the manufacturer
	55°C	85°C	70°C
Number of LED tested	20	20	20
Drive Current [ $I_F$ ]	150 mA	150 mA	150 mA
Measurement Current [ $I_F$ ]	150 mA	150 mA	150 mA
Actual Case Temp. [ $T_s$ ]	54.5°C	84.9°C	70.0°C
Actual Ambient Temp. [ $T_A$ ]	54.3°C	83.3°C	68.5°C
$\Delta[T_s - T_A]$	0.2°C	1.6°C	1.5°C
Average Lumen Maintenance at 6000 hours	94.05%	87.68%	92.89%
Ave. Chromaticity Shift ( $\Delta u'v'$ ) at 6000 hours	0.0039	0.0056	0.0050
Failures observed	None	None	None

## 2 EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due Date
Spectroradiometer	CDS 2100	ATTEELSH00111	Oct. 11, 2011	Oct. 10, 2012
Integrating Sphere	LMS-200	ATTEELSH00115	Oct. 11, 2011	Oct. 10, 2012
Digital Recorder	HIOKI LR8400-21	TTE20100242	Aug. 02, 2011	Aug. 01, 2012
Digital CC&CV DC Power Supply	GPD-3303S	TTE20110239	Aug. 02, 2011	Aug. 01, 2012
High Temperature Chamber	NMT-1001	ATTEELSH00149	--	--
High Temperature Chamber	NMT-1200	TTE20100237	--	--
High Temperature Chamber	NMT-1200	TTE20100240	--	--
Digital Power Meter	WT-210	ATTEELSH00150	Sept. 14, 2011	Sept. 13, 2012
Digital CC&CV DC Power Supply	GPR-30H10D	TTF20110389	Feb. 10, 2012	Feb. 09, 2013

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## 3 TEST METHODS

### 3.1 Requirements of Environmental Conditions

Operation of the LED light sources between photometric measurements shall be at a minimum of three case temperatures,  $T_s$ , using the same drive current. The three case temperatures,  $T_s$ , shall be  $55^{\circ}\text{C}$  and  $85^{\circ}\text{C}$  with a third temperature selected by the manufacturer. Case temperatures shall be controlled to  $-2^{\circ}\text{C}$  during life testing. The temperature of the surrounding air should be maintained to within  $-5^{\circ}\text{C}$  of the case temperature during testing. The surrounding air temperature should be monitored within the test chamber. Humidity shall be maintained to less than 65%RH throughout the life test.

The case temperature  $T_s$  is the cathode lead temperature of the LED mounted on a reliability test board. The ambient temperature  $T_A$  is the temperature of the air at a distance of 50mm above the reliability test board.

The ambient temperature during lumen and chromaticity measurements shall be set to  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . The LED light source shall be required to cool to room temperature prior to measurement.

Airflow shall be minimized for proper light source starting and operation.

The operating orientation of the LED light sources under test should be as specified by the manufacturer.

### 3.2 Lumen Maintenance Testing Method

Samples under test shall be driven for at least 6,000 hours with data collection at a minimum of every 1000 hours. 10,000 hours are preferred for the purposes of improved predictive modeling.

LED light sources are driven at constant current.

Checking for LED light source failures either by visual observation or automatic monitoring shall be done at a minimum of every measurement interval. Catastrophic LED light source failure shall be reported and included in the test report.

The chromaticity shift shall be measured and reported over the course of the lumen maintenance test time by measuring chromaticity at each photometric test interval.

### 3.3 Photometric and Electrical Measurements

A Labsphere Model CDS 2100 CCD Spectroradiometer and 50cm Integrating Sphere was used to measure total luminous flux, correlated color temperature, color rendering index, and chromaticity coordinates for each sample.

Ambient temperature was measured at a position inside the integrating sphere. Electrical measurements including voltage, current, and power were measured using the Digital Power Meter.

The uncertainty of the light output measurement is  $U=1.5\%$  ( $K=2$ ), at the 95% confidence level. The uncertainty of the correlated color temperature measurement is  $U=14\text{K}$  ( $K=2$ ), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

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## 4 TEST RESULTS

### 4.1 55°C, 150mA

Case Temperature [T<sub>s</sub>] : 54.5°C  
 Ambient Temperature [T<sub>A</sub>] : 54.3°C  
 Drive Current [I<sub>F</sub>] : 150 mA  
 Measurement Current : 150 mA  
 Failures Observed : None

No.	Φ <sub>v</sub> [lm]	V <sub>F</sub> [V]	Lumen Maintenance [%]					
	0 h (Initial)		1000 h	2000 h	3000 h	4000 h	5000 h	6000 h
1	52.900	3.352	103.36	99.55	98.03	97.50	94.39	94.57
2	50.660	3.315	102.41	100.14	98.80	98.78	97.65	97.91
3	50.610	3.361	102.33	99.88	98.16	97.61	95.91	94.84
4	50.940	3.333	102.53	99.53	97.53	96.92	93.56	92.97
5	52.390	3.344	102.35	99.18	97.84	96.64	94.16	92.10
6	52.270	3.341	102.22	99.22	97.84	97.17	94.18	93.86
7	52.040	3.350	102.61	99.90	98.79	97.81	94.00	94.62
8	52.210	3.365	102.49	99.52	97.87	96.48	92.55	91.50
9	51.240	3.266	101.52	97.19	95.94	93.72	91.86	93.15
10	51.450	3.347	102.08	99.55	98.50	98.29	97.57	98.45
11	50.130	3.364	103.43	100.76	99.08	98.54	97.25	97.83
12	50.460	3.320	101.68	99.60	98.04	97.50	97.36	96.57
13	53.370	3.358	102.32	99.72	98.28	96.85	93.74	92.24
14	51.880	3.335	102.99	100.37	98.61	97.28	93.62	91.63
15	48.070	3.350	104.85	102.64	100.92	99.06	95.13	93.97
16	50.780	3.338	103.31	101.20	99.84	98.01	93.99	92.32
17	50.500	3.362	103.09	100.83	99.31	98.51	95.90	93.62
18	51.740	3.346	102.67	100.52	99.54	98.01	94.03	92.33
19	51.700	3.379	102.46	100.00	98.49	96.73	93.31	91.28
20	52.810	3.303	101.48	99.05	98.01	97.08	95.00	95.32
n	20	20	20	20	20	20	20	20
Mean	51.408	3.341	102.61	99.92	98.47	97.43	94.76	94.05
Median	51.575	3.347	102.47	99.80	98.38	97.50	94.17	93.74
St. dev.	1.2041	0.025	0.77	1.06	1.01	1.15	1.68	2.21
Min.	48.07	3.266	101.48	97.19	95.94	93.72	91.86	91.28
Max.	53.37	3.379	104.85	102.64	100.92	99.06	97.65	98.45

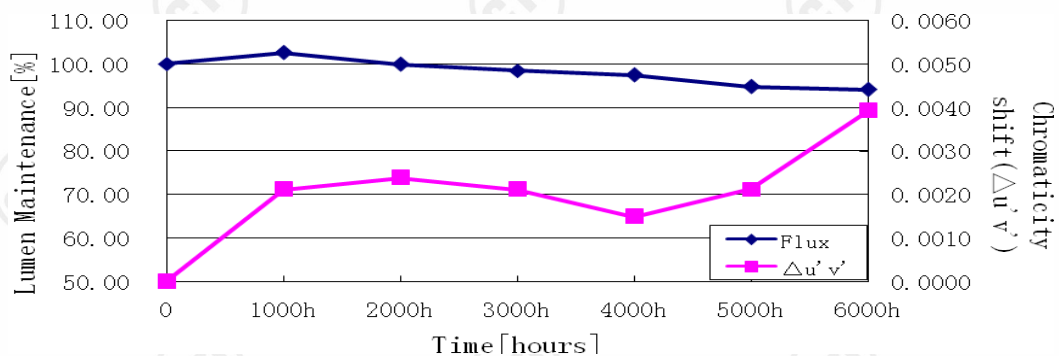


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No.	u'	v'	Chromaticity Shift $\Delta u'v'$					
	0 h (Initial)		1000 h	2000 h	3000 h	4000 h	5000 h	6000 h
1	0.1982	0.4922	0.0014	0.0018	0.0018	0.0014	0.0020	0.0042
2	0.1982	0.4873	0.0021	0.0027	0.0024	0.0019	0.0010	0.0025
3	0.1987	0.4890	0.0020	0.0025	0.0023	0.0017	0.0013	0.0031
4	0.1989	0.4922	0.0011	0.0019	0.0014	0.0010	0.0025	0.0047
5	0.1989	0.4899	0.0019	0.0018	0.0015	0.0010	0.0030	0.0055
6	0.1987	0.4905	0.0020	0.0017	0.0021	0.0011	0.0028	0.0049
7	0.1986	0.4879	0.0024	0.0025	0.0024	0.0016	0.0007	0.0044
8	0.1985	0.4899	0.0022	0.0021	0.0019	0.0011	0.0029	0.0052
9	0.1988	0.4908	0.0015	0.0017	0.0013	0.0009	0.0023	0.0028
10	0.1987	0.4914	0.0019	0.0021	0.0019	0.0016	0.0013	0.0017
11	0.1985	0.4904	0.0024	0.0025	0.0021	0.0017	0.0016	0.0019
12	0.1981	0.4932	0.0021	0.0025	0.0020	0.0015	0.0012	0.0023
13	0.1983	0.4926	0.0021	0.0024	0.0020	0.0012	0.0024	0.0043
14	0.1985	0.4870	0.0024	0.0028	0.0023	0.0015	0.0027	0.0049
15	0.1986	0.4856	0.0029	0.0033	0.0030	0.0020	0.0024	0.0047
16	0.1986	0.4885	0.0022	0.0025	0.0023	0.0018	0.0031	0.0052
17	0.1989	0.4859	0.0024	0.0028	0.0025	0.0019	0.0020	0.0044
18	0.1983	0.4865	0.0025	0.0027	0.0027	0.0017	0.0028	0.0049
19	0.1986	0.4862	0.0023	0.0026	0.0020	0.0012	0.0028	0.0050
20	0.1984	0.4927	0.0022	0.0025	0.0023	0.0017	0.0018	0.0022
n	20	20	20	20	20	20	20	20
Mean	0.1986	0.4895	0.0021	0.0024	0.0021	0.0015	0.0021	0.0039
Median	0.1986	0.4899	0.0022	0.0025	0.0021	0.0015	0.0024	0.0044
St. dev.	0.0002	0.0025	0.0004	0.0004	0.0004	0.0003	0.0007	0.0013
Min.	0.1981	0.4856	0.0011	0.0017	0.0013	0.0009	0.0007	0.0017
Max.	0.1989	0.4932	0.0029	0.0033	0.0030	0.0020	0.0031	0.0055



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## 4.2 85°C, 150mA

Case Temperature [T<sub>s</sub>] : 84.9°C  
 Ambient Temperature [T<sub>A</sub>] : 83.3°C  
 Drive Current [I<sub>F</sub>] : 150 mA  
 Measurement Current : 150 mA  
 Failures Observed : None

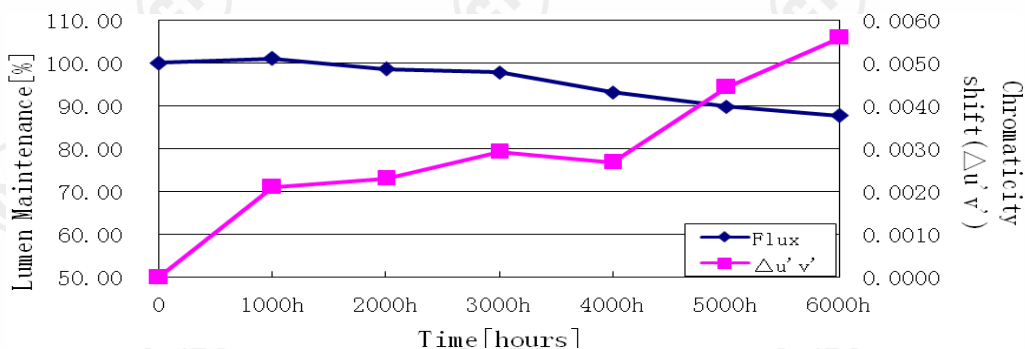
No.	Φ <sub>v</sub> [lm]	V <sub>F</sub> [V]	Lumen Maintenance [%]					
	0 h (Initial)		1000 h	2000 h	3000 h	4000 h	5000 h	6000 h
1	49.380	3.323	101.54	99.59	97.33	96.70	92.22	88.84
2	49.630	3.352	101.83	99.56	96.47	94.68	92.75	89.95
3	51.360	3.343	101.89	100.25	94.16	93.96	89.27	87.29
4	48.740	3.352	101.81	98.75	98.56	92.59	88.28	86.66
5	50.150	3.296	101.00	98.58	98.34	92.20	88.43	86.48
6	51.780	3.346	100.42	97.89	98.82	92.37	88.34	86.50
7	51.220	3.355	101.11	97.85	98.97	92.21	88.70	86.82
8	48.820	3.345	102.46	99.24	100.33	99.65	89.92	86.67
9	48.950	3.315	101.43	98.90	96.24	95.16	92.09	90.05
10	52.390	3.350	101.41	98.89	99.14	91.74	87.90	85.32
11	52.080	3.370	101.00	98.25	98.96	92.36	89.65	87.50
12	52.640	3.359	101.52	99.73	99.92	92.99	90.50	88.28
13	52.450	3.282	100.78	98.19	97.73	93.42	91.92	90.33
14	52.150	3.333	100.73	98.26	97.68	91.87	88.59	86.37
15	50.110	3.348	99.54	96.57	95.23	87.79	84.97	85.09
16	49.250	3.305	101.69	99.03	99.15	92.83	91.29	88.95
17	49.150	3.364	101.49	97.38	97.76	93.92	92.33	91.25
18	51.180	3.395	100.20	98.03	97.52	92.18	89.96	87.83
19	51.410	3.388	99.22	98.48	97.65	93.39	90.70	87.55
20	52.000	3.381	99.87	97.83	96.60	91.58	88.00	85.85
n	20	20	20	20	20	20	20	20
Mean	50.742	3.345	101.05	98.56	97.83	93.18	89.79	87.68
Median	51.200	3.349	101.26	98.53	97.75	92.71	89.79	87.39
St. dev.	1.3847	0.030	0.84	0.88	1.54	2.32	1.97	1.73
Min.	48.74	3.282	99.22	96.57	94.16	87.79	84.97	85.09
Max.	52.64	3.395	102.46	100.25	100.33	99.65	92.75	91.25

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No.	u'	v'	Chromaticity Shift $\Delta u'v'$					
	0 h (Initial)		1000 h	2000 h	3000 h	4000 h	5000 h	6000 h
1	0.1988	0.4880	0.0021	0.0024	0.0015	0.0015	0.0032	0.0042
2	0.1991	0.4868	0.0024	0.0026	0.0015	0.0018	0.0032	0.0041
3	0.1987	0.4883	0.0021	0.0020	0.0009	0.0033	0.0054	0.0062
4	0.1994	0.4861	0.0020	0.0017	0.0042	0.0036	0.0053	0.0059
5	0.1991	0.4892	0.0019	0.0019	0.0042	0.0033	0.0049	0.0057
6	0.1988	0.4878	0.0020	0.0022	0.0034	0.0028	0.0052	0.0063
7	0.1985	0.4861	0.0020	0.0023	0.0035	0.0031	0.0055	0.0069
8	0.1985	0.4872	0.0021	0.0019	0.0031	0.0043	0.0051	0.0067
9	0.1988	0.4901	0.0019	0.0018	0.0011	0.0022	0.0041	0.0052
10	0.1986	0.4911	0.0028	0.0029	0.0028	0.0027	0.0046	0.0061
11	0.1986	0.4884	0.0024	0.0022	0.0035	0.0029	0.0038	0.0047
12	0.1986	0.4857	0.0028	0.0029	0.0029	0.0018	0.0029	0.0039
13	0.1976	0.4894	0.0023	0.0025	0.0023	0.0016	0.0037	0.0047
14	0.1984	0.4908	0.0022	0.0023	0.0036	0.0025	0.0049	0.0064
15	0.1991	0.4860	0.0020	0.0018	0.0065	0.0050	0.0074	0.0077
16	0.1986	0.4869	0.0025	0.0026	0.0037	0.0025	0.0043	0.0060
17	0.1990	0.4887	0.0008	0.0018	0.0020	0.0014	0.0040	0.0052
18	0.1988	0.4876	0.0019	0.0017	0.0041	0.0029	0.0049	0.0063
19	0.1989	0.4874	0.0018	0.0041	0.0001	0.0008	0.0010	0.0031
20	0.1987	0.4872	0.0020	0.0020	0.0036	0.0034	0.0051	0.0061
n	20	20	20	20	20	20	20	20
Mean	0.1987	0.4879	0.0021	0.0023	0.0029	0.0027	0.0044	0.0056
Median	0.1988	0.4877	0.0021	0.0022	0.0033	0.0028	0.0048	0.0060
St. dev.	0.0004	0.0016	0.0004	0.0006	0.0015	0.0010	0.0013	0.0011
Min.	0.1976	0.4857	0.0008	0.0017	0.0001	0.0008	0.0010	0.0031
Max.	0.1994	0.4911	0.0028	0.0041	0.0065	0.0050	0.0074	0.0077



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## 4.3 70°C, 150mA

Case Temperature [T<sub>s</sub>] : 70.0°C  
 Ambient Temperature [T<sub>A</sub>] : 68.5°C  
 Drive Current [I<sub>F</sub>] : 150 mA  
 Measurement Current : 150 mA  
 Failures Observed : None

No.	Φ <sub>v</sub> [lm]	V <sub>F</sub> [V]	Lumen Maintenance [%]					
			0 h (Initial)	1000 h	2000 h	3000 h	4000 h	5000 h
1	50.310	3.340	101.31	98.11	96.82	90.90	88.41	87.28
2	47.790	3.412	103.58	100.06	99.14	94.39	92.17	91.78
3	50.870	3.346	102.61	99.78	99.63	94.63	92.35	91.08
4	51.250	3.336	102.17	99.16	97.09	92.64	90.77	89.68
5	51.680	3.323	101.01	98.08	97.19	93.05	91.78	91.80
6	52.140	3.333	101.21	98.79	97.10	92.37	90.99	89.95
7	49.910	3.301	101.68	99.22	98.90	96.43	93.27	93.09
8	52.080	3.335	101.34	98.77	97.41	92.84	91.51	90.44
9	49.430	3.313	101.36	99.66	98.91	98.75	97.82	100.77
10	49.450	3.336	102.18	100.00	98.95	98.42	96.76	97.37
11	48.570	3.347	103.56	101.79	100.64	100.41	98.72	99.98
12	47.020	3.306	102.57	100.87	100.09	98.87	103.34	93.64
13	50.560	3.346	102.59	100.57	99.11	95.31	92.74	92.54
14	52.130	3.351	102.03	100.19	97.51	93.52	92.02	91.58
15	50.580	3.317	101.80	99.31	96.92	92.86	91.14	90.67
16	52.050	3.363	101.21	99.00	97.27	93.26	91.26	91.10
17	51.690	3.365	100.27	96.87	96.09	92.30	90.44	90.58
18	49.160	3.370	101.73	100.16	98.88	97.82	94.41	94.89
19	51.700	3.335	101.51	100.02	97.89	93.35	91.20	90.68
20	51.870	3.341	100.93	99.31	98.15	98.11	96.61	99.00
n	20	20	20	20	20	20	20	20
Mean	50.512	3.341	101.83	99.49	98.18	95.01	93.39	92.89
Median	50.725	3.338	101.71	99.48	98.02	93.95	92.10	91.68
St. dev.	1.5336	0.025	0.85	1.09	1.23	2.79	3.56	3.68
Min.	47.02	3.301	100.27	96.87	96.09	90.90	88.41	87.28
Max.	52.14	3.412	103.58	101.79	100.64	100.41	103.34	100.77

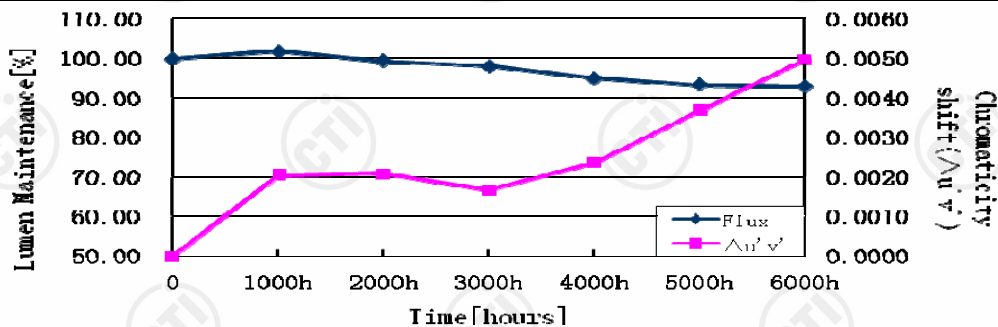


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No.	u'	v'	Chromaticity Shift $\Delta u'v'$					
	0 h (Initial)		1000 h	2000 h	3000 h	4000 h	5000 h	6000 h
1	0.1991	0.4932	0.0016	0.0011	0.0004	0.0044	0.0062	0.0076
2	0.1992	0.4876	0.0009	0.0001	0.0005	0.0051	0.0070	0.0084
3	0.1990	0.4881	0.0020	0.0019	0.0014	0.0032	0.0050	0.0066
4	0.1989	0.4874	0.0021	0.0021	0.0011	0.0038	0.0053	0.0066
5	0.1989	0.4919	0.0021	0.0023	0.0018	0.0026	0.0038	0.0045
6	0.1984	0.4873	0.0024	0.0026	0.0018	0.0029	0.0041	0.0055
7	0.1982	0.4917	0.0019	0.0022	0.0020	0.0015	0.0036	0.0047
8	0.1985	0.4886	0.0022	0.0024	0.0018	0.0029	0.0041	0.0055
9	0.1985	0.4901	0.0018	0.0019	0.0017	0.0007	0.0009	0.0014
10	0.1989	0.4873	0.0023	0.0025	0.0023	0.0004	0.0008	0.0020
11	0.1988	0.4907	0.0019	0.0021	0.0018	0.0007	0.0011	0.0020
12	0.1986	0.4875	0.0022	0.0026	0.0021	0.0009	0.0004	0.0052
13	0.1990	0.4848	0.0025	0.0027	0.0023	0.0021	0.0043	0.0053
14	0.1986	0.4868	0.0022	0.0022	0.0013	0.0033	0.0046	0.0060
15	0.1989	0.4916	0.0016	0.0016	0.0009	0.0035	0.0049	0.0062
16	0.1990	0.4873	0.0022	0.0024	0.0018	0.0026	0.0044	0.0055
17	0.1988	0.4883	0.0021	0.0010	0.0016	0.0027	0.0043	0.0052
18	0.1988	0.4886	0.0022	0.0025	0.0022	0.0007	0.0031	0.0040
19	0.1985	0.4863	0.0023	0.0026	0.0021	0.0026	0.0046	0.0059
20	0.1981	0.4911	0.0021	0.0024	0.0021	0.0003	0.0007	0.0014
n	20	20	20	20	20	20	20	20
Mean	0.1987	0.4888	0.0020	0.0021	0.0017	0.0023	0.0037	0.0050
Median	0.1988	0.4882	0.0021	0.0022	0.0018	0.0026	0.0042	0.0054
St. dev.	0.0003	0.0022	0.0004	0.0007	0.0006	0.0014	0.0019	0.0020
Min.	0.1981	0.4848	0.0009	0.0001	0.0004	0.0003	0.0004	0.0014
Max.	0.1992	0.4932	0.0025	0.0027	0.0023	0.0051	0.0070	0.0084



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## Photos of the sample

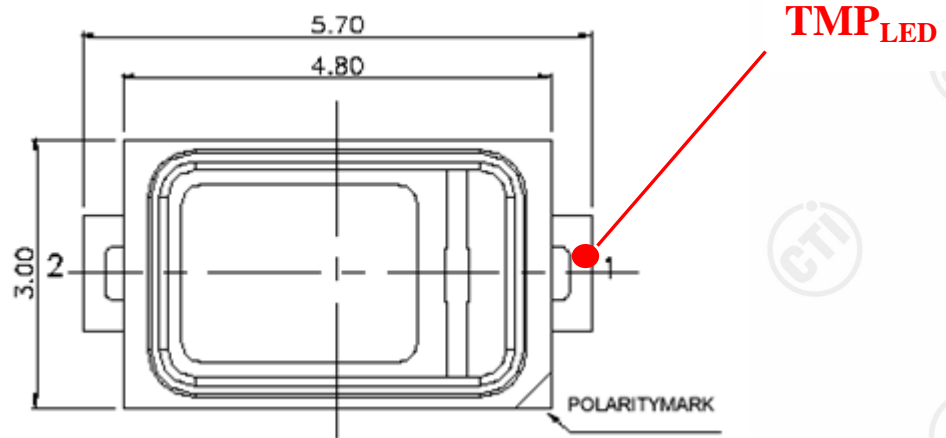


Fig.1- Mechanical Dimensions

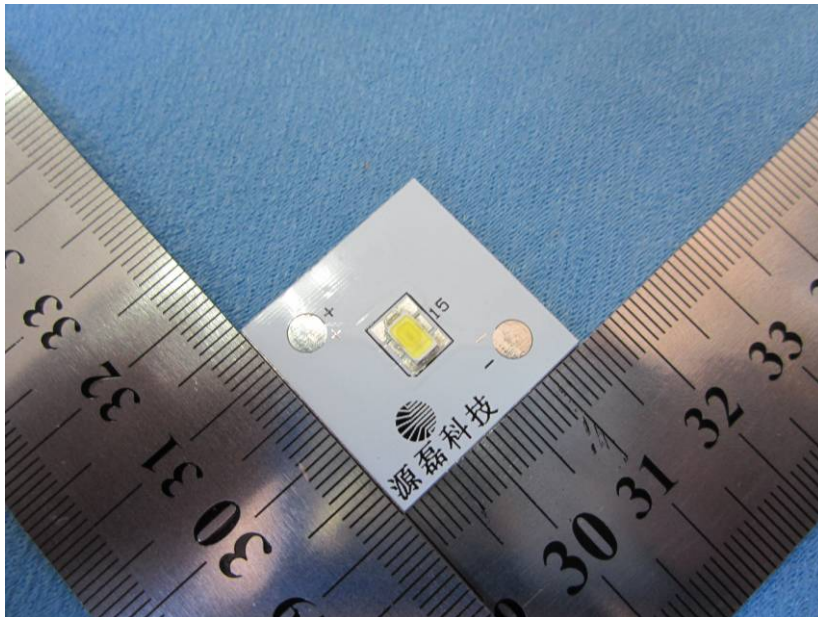


Fig.2- Overall view

**\*\* End of Report \*\***

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