TEST REPORT

According to IES LM-80-2015
For

Samsung Electronics Co., LTD.

1,Samsung-Ro,Giheung-Gu,Yongin-City,Gyeongg i-Do 17113, Korea

Model: SPMWHX228FD5WAW0XX

Report Type: 10000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	Pote Wang
Report Number:	RSZ170905514-10
Test Date:	2016-08-27 to 2017-10-17
Report Date:	2017-11-03
Reviewed By:	Daniel Duan / EE Manager
Test Facility:	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.

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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

75 PCS samples were received on 2016-08-27. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75.

Manufacturer:	Samsung Electronics Co., LTD.
Part Number:	SPMWHX228FD5WAW0XX
Part Type:	LED Package
Drive Level:	DC 160mA
Nominal CCT:	2700K
Power:	0.48W
Current Density per LED die:	$0.49*10^3$mA/mm^2
Power Density per LED die:	1.47 W/mm^2
CRI:	80
Die Spacing:	400um

Sampling Method:

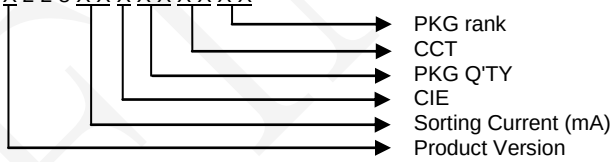
LED samples for IESNA LM-80 testing consist of units built from a minimum of three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days.
These manufacturing lots are picked to represent a wide parametric distribution.

Family products covered by this report:

According to ENERGY STAR® Requirements for the Use of LM-80 Data, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of ENERGY STAR® Requirements for the Use of LM-80 Data (September 28, 2017)
This report covers the following models:

Covered models and nomenclature:

Multiple Models: S P M W H X 2 2 8 X X X X X X X X



Disclaimer:

The truthfulness and accuracy of all the technical information above for the covered LED products is ensured by manufacturer of LED light source. Bay Area Compliance Laboratories Corp. (Dongguan) isn't responsible or gives any guarantees for the truthfulness of the technical information.

Note:

1. The applicant Samsung Electronics Co., LTD. declare that their products with model SPMWHX228FD5WAW0XX are the same to the products in report# RSZ160827502 -10 and is authorized by original applicant to use their test data.

2. All the data in previous report (RSZ160827502 -10) is shared in this report.

1.2 Standards Used:

- IESNA LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs (This standard was not accredited by IAS)
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by IAS)

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	0.3m	2017-03-09	2018-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2017-03-03	2018-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2017-03-09	2018-03-09
Standard Light Source	EVERFINE	D062	1011093	3000K	2017-09-13	2018-09-13
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	300VA	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060010	(50/15A)	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090008	(50/15A)	2017-07-07	2018-07-07
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	(50/15A)	2017-07-07	2018-07-07
Multilayer aging machine	BACL	B2-270	20015	25°C~130°C	2017-03-03	2018-03-03

1.4 Drive Level

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within ±3% of the specified value of the manufacturer during maintenance test, and was within ±0.5% during photometric and electrical measurement test.

1.5 Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case (TMP_{LED}) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP_{LED} of the coldest LEDs were maintained at a temperature that was greater than or equal to 2°C below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to 5°C below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 "Special Limits".

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within ±3% of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

For photometry measurement, the ambient temperature during test was set to 25°C ± 2°C, RH <65%.

1.6 Photometric Measurement Method and Uncertainty

Integrating sphere and spectroradiometer is used to measure luminous flux and chromaticity coordinate u'v'. 2π measurement was used and sample was drived by DC power supply. The forward current was regulated to within ±0.5% of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to 25°C ± 2°C, RH <65%. The temperature measurement point was located in the sphere and the temperature was detected by a temperature probe.

The uncertainty of the light output measurements is U=1.59% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=21K (K=2), at the 95% confidence level.

The uncertainty of the temperature is U=0.8671°C (K=2), at the 95% confidence level.

1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

1.8 Sample Set

Data Set 1: 55°C, 160mA

Part Number:	SPMWHX228FD5WAW0XX
Number of Units:	25
Case Temperature:	>53°C
Ambient Temperature:	>50°C
Life Test Drive Current:	160mA
Measurement Current:	160mA

Data Set 2: 85°C, 160mA

Part Number:	SPMWHX228FD5WAW0XX
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	160mA
Measurement Current:	160mA

Data Set 3: 105°C, 160mA

Part Number:	SPMWHX228FD5WAW0XX
Number of Units:	25
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	160mA
Measurement Current:	160mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	α:	β:	Reported TM-21 L_{70} Lifetime
1	25	0	1000hrs	10000hrs	2.000E-06	1.003	>60000 hours
2	25	0	1000hrs	10000hrs	2.330E-06	1.002	>60000 hours
3	25	0	1000hrs	10000hrs	2.681E-06	1.001	>60000 hours

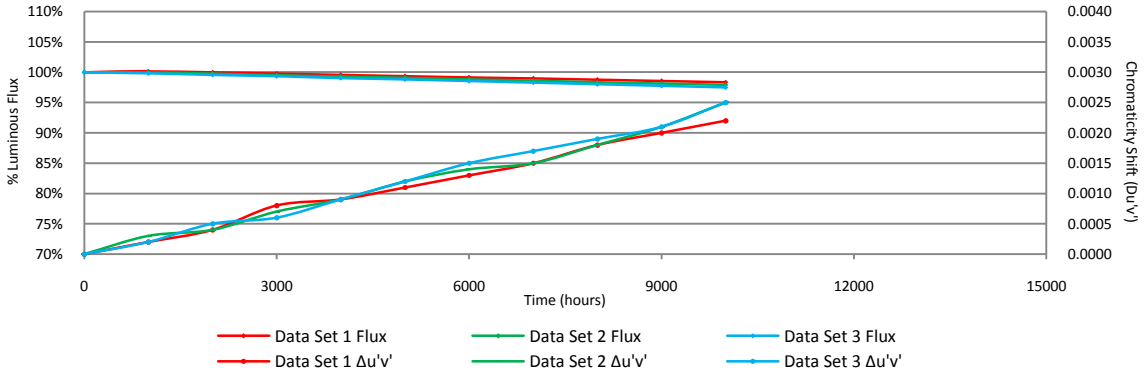
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	100.16%	99.96%	99.77%	99.56%	99.35%	99.14%	98.95%	98.75%	98.55%	98.36%
2	99.99%	99.75%	99.52%	99.28%	99.06%	98.82%	98.60%	98.36%	98.14%	97.91%
3	99.82%	99.57%	99.32%	99.05%	98.81%	98.54%	98.29%	98.02%	97.76%	97.49%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.0002	0.0004	0.0008	0.0009	0.0011	0.0013	0.0015	0.0018	0.002	0.0022
2	0.0003	0.0004	0.0007	0.0009	0.0012	0.0014	0.0015	0.0018	0.0021	0.0025
3	0.0002	0.0005	0.0006	0.0009	0.0012	0.0015	0.0017	0.0019	0.0021	0.0025

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 55°C, 160mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	72.62	100.12	99.99	99.85	99.60	99.49	99.44	99.37	99.26	98.90	98.75
2	71.79	100.14	99.82	99.58	99.46	99.19	98.93	98.58	98.24	97.90	97.63
3	71.52	100.08	99.87	99.64	99.41	99.26	98.94	98.71	98.66	98.38	98.24
4	72.18	100.06	99.86	99.64	99.56	99.35	99.07	98.89	98.67	98.39	98.14
5	72.42	100.17	99.90	99.61	99.52	99.43	99.17	98.88	98.59	98.43	98.05
6	72.61	100.01	99.93	99.90	99.49	99.34	99.13	98.90	98.58	98.40	98.31
7	72.35	100.21	100.01	99.81	99.60	99.39	99.21	98.99	98.85	98.70	98.44
8	70.43	100.27	100.10	99.90	99.72	99.55	99.32	99.13	99.08	98.92	98.58
9	72.46	100.37	99.96	99.85	99.70	99.42	99.30	99.02	98.84	98.70	98.45
10	71.73	100.22	100.04	99.82	99.61	99.41	99.33	99.01	98.84	98.66	98.54
11	72.06	100.15	100.03	99.76	99.67	99.40	99.06	98.95	98.78	98.57	98.39
12	72.41	100.21	100.12	99.92	99.81	99.54	99.23	99.17	98.95	98.78	98.54
13	72.18	100.11	100.04	99.86	99.61	99.38	99.24	99.09	98.89	98.73	98.48
14	71.79	100.07	99.89	99.67	99.53	99.22	99.08	99.00	98.86	98.54	98.30
15	72.77	100.05	100.01	99.78	99.66	99.42	99.19	99.11	98.86	98.68	98.50
16	72.07	100.21	100.04	99.78	99.61	99.49	99.24	99.14	98.95	98.83	98.70
17	72.00	100.06	99.96	99.89	99.69	99.39	99.25	99.01	98.79	98.71	98.61
18	71.76	100.14	99.93	99.69	99.46	99.39	99.16	98.89	98.61	98.26	97.94
19	72.23	100.15	99.97	99.79	99.53	99.24	98.92	98.71	98.42	98.23	98.13
20	72.37	100.03	99.81	99.67	99.36	99.13	98.91	98.60	98.54	98.40	98.23
21	71.51	100.10	99.94	99.78	99.54	99.38	99.09	98.76	98.46	98.22	98.03
22	71.51	100.22	99.97	99.73	99.44	99.34	99.20	99.05	98.77	98.64	98.53
23	72.38	100.33	99.99	99.77	99.52	99.46	99.27	99.17	98.84	98.67	98.62
24	72.12	100.24	99.81	99.72	99.42	99.13	98.96	98.77	98.71	98.57	98.53
25	73.31	100.27	99.90	99.73	99.43	99.10	98.95	98.84	98.76	98.60	98.46
Ave.	72.10	100.16	99.96	99.77	99.56	99.35	99.14	98.95	98.75	98.55	98.36
Med.	72.18	100.15	99.96	99.78	99.54	99.39	99.17	98.99	98.78	98.60	98.45
st dev	0.55	0.0945	0.0856	0.0962	0.1114	0.1260	0.1475	0.1913	0.2147	0.2407	0.2638
Min.	70.43	100.01	99.81	99.58	99.36	99.10	98.91	98.58	98.24	97.90	97.63
Max.	73.31	100.37	100.12	99.92	99.81	99.55	99.44	99.37	99.26	98.92	98.75

3.2 Data Set 1, 55°C, 160mA (Forward Voltage)

No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2.872	2.895	2.871	2.890	2.865	2.864	2.868	2.875	2.868	2.869	2.883
2	2.847	2.857	2.865	2.869	2.857	2.846	2.862	2.860	2.850	2.848	2.861
3	2.847	2.857	2.854	2.860	2.843	2.846	2.863	2.857	2.850	2.854	2.929
4	2.847	2.855	2.851	2.868	2.842	2.856	2.842	2.854	2.852	2.860	2.890
5	2.863	2.860	2.850	2.865	2.847	2.849	2.850	2.861	2.850	2.851	2.870
6	2.861	2.886	2.913	2.859	2.852	2.852	2.857	2.859	2.861	2.858	2.926
7	2.850	2.858	2.878	2.855	2.848	2.852	2.853	2.857	2.851	2.852	2.907
8	2.869	2.867	2.875	2.868	2.857	2.854	2.876	2.860	2.877	2.899	2.870
9	2.859	2.871	2.853	2.861	2.850	2.850	2.854	2.866	2.851	2.857	2.910
10	2.850	2.854	2.848	2.868	2.848	2.845	2.855	2.861	2.852	2.850	2.865
11	2.849	2.860	2.846	2.867	2.851	2.850	2.859	2.853	2.854	2.848	2.868
12	2.863	2.927	2.869	2.854	2.851	2.854	2.853	2.854	2.860	2.854	2.879
13	2.849	2.862	2.857	2.855	2.853	2.851	2.848	2.868	2.853	2.851	2.894
14	2.858	2.860	2.884	2.867	2.847	2.848	2.847	2.853	2.873	2.849	2.869
15	2.859	2.866	2.860	2.880	2.861	2.856	2.854	2.865	2.857	2.856	2.868
16	2.849	2.859	2.855	2.856	2.849	2.855	2.857	2.857	2.853	2.850	2.873
17	2.857	2.915	2.862	2.855	2.852	2.859	2.856	2.860	2.855	2.855	3.023
18	2.847	2.865	2.853	2.867	2.847	2.859	2.851	2.848	2.857	2.850	2.894
19	2.850	2.864	2.856	2.852	2.852	2.850	2.848	2.852	2.863	2.853	2.873
20	2.850	2.883	2.850	2.847	2.849	2.850	2.848	2.850	2.854	2.856	2.892
21	2.900	2.864	2.849	2.844	2.847	2.843	2.847	2.847	2.851	2.850	2.882
22	2.859	2.852	2.846	2.850	2.841	2.844	2.846	2.850	2.850	2.853	2.909
23	2.856	2.876	2.848	2.851	2.846	2.850	2.898	2.853	2.852	2.848	3.111
24	2.852	2.871	2.846	2.875	2.848	2.849	2.851	2.859	2.855	2.852	3.263
25	2.865	2.868	2.850	2.852	2.853	2.855	2.861	2.860	2.854	2.861	3.088
Ave.	2.857	2.870	2.860	2.861	2.850	2.851	2.856	2.858	2.856	2.855	2.924
Med.	2.856	2.864	2.854	2.860	2.849	2.850	2.854	2.857	2.854	2.853	2.890
st dev	0.012	0.019	0.015	0.011	0.006	0.005	0.012	0.007	0.007	0.010	0.097
Min.	2.847	2.852	2.846	2.844	2.841	2.843	2.842	2.847	2.850	2.848	2.861
Max.	2.900	2.927	2.913	2.890	2.865	2.864	2.898	2.875	2.877	2.899	3.263

3.3 Data Set 1, 55°C, 160mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.2636	0.5248	2688	0.0001	0.0005	0.0007	0.0007	0.0008	0.0012	0.0016	0.0016	0.0016	0.0018
2	0.2623	0.5251	2713	0.0004	0.0008	0.0009	0.0009	0.0010	0.0014	0.0019	0.0020	0.0020	0.0021
3	0.2630	0.5264	2693	0.0002	0.0006	0.0008	0.0008	0.0010	0.0011	0.0015	0.0017	0.0017	0.0019
4	0.2623	0.5261	2710	0.0002	0.0005	0.0008	0.0008	0.0010	0.0013	0.0015	0.0018	0.0018	0.0019
5	0.2624	0.5263	2707	0.0003	0.0007	0.0010	0.0011	0.0012	0.0013	0.0016	0.0018	0.0020	0.0018
6	0.2622	0.5261	2711	0.0001	0.0005	0.0008	0.0011	0.0012	0.0013	0.0016	0.0018	0.0018	0.0018
7	0.2627	0.5256	2703	0.0002	0.0004	0.0008	0.0012	0.0014	0.0013	0.0016	0.0019	0.0021	0.0021
8	0.2638	0.5264	2677	0.0004	0.0004	0.0008	0.0009	0.0011	0.0012	0.0015	0.0018	0.0021	0.0021
9	0.2620	0.5258	2716	0.0001	0.0005	0.0008	0.0010	0.0012	0.0013	0.0014	0.0018	0.0020	0.0022
10	0.2638	0.5263	2677	0.0003	0.0006	0.0008	0.0009	0.0012	0.0013	0.0015	0.0018	0.0021	0.0023
11	0.2636	0.5267	2680	0.0002	0.0003	0.0006	0.0008	0.0011	0.0013	0.0015	0.0019	0.0022	0.0024
12	0.2624	0.5259	2709	0.0003	0.0004	0.0008	0.0009	0.0012	0.0014	0.0016	0.0019	0.0021	0.0024
13	0.2634	0.5275	2680	0.0003	0.0005	0.0008	0.0010	0.0012	0.0013	0.0016	0.0018	0.0021	0.0025
14	0.2641	0.5256	2673	0.0003	0.0004	0.0007	0.0009	0.0012	0.0015	0.0015	0.0018	0.0021	0.0025
15	0.2619	0.5273	2713	0.0002	0.0005	0.0007	0.0009	0.0012	0.0013	0.0016	0.0018	0.0021	0.0023
16	0.2628	0.5248	2703	0.0002	0.0003	0.0005	0.0008	0.0010	0.0011	0.0013	0.0017	0.0019	0.0023
17	0.2625	0.5252	2708	0.0002	0.0004	0.0007	0.0009	0.0011	0.0012	0.0015	0.0018	0.0021	0.0024
18	0.2630	0.5247	2700	0.0002	0.0003	0.0008	0.0009	0.0011	0.0013	0.0013	0.0018	0.0019	0.0023
19	0.2630	0.5269	2692	0.0004	0.0004	0.0007	0.0009	0.0012	0.0013	0.0014	0.0018	0.0018	0.0023
20	0.2626	0.5269	2699	0.0004	0.0003	0.0007	0.0009	0.0012	0.0012	0.0014	0.0019	0.0021	0.0024
21	0.2628	0.5239	2709	0.0003	0.0002	0.0007	0.0008	0.0011	0.0012	0.0015	0.0018	0.0021	0.0024
22	0.2624	0.5249	2713	0.0002	0.0003	0.0006	0.0008	0.0011	0.0012	0.0014	0.0019	0.0021	0.0024
23	0.2545	0.5168	2932	0.0001	0.0002	0.0006	0.0008	0.0011	0.0013	0.0015	0.0019	0.0021	0.0025
24	0.2624	0.5249	2713	0.0001	0.0005	0.0007	0.0009	0.0013	0.0013	0.0016	0.0019	0.0021	0.0025
25	0.2615	0.5270	2723	0.0002	0.0004	0.0007	0.0009	0.0012	0.0012	0.0013	0.0018	0.0020	0.0024
Ave.	0.2624	0.5255	2710	0.0002	0.0004	0.0008	0.0009	0.0011	0.0013	0.0015	0.0018	0.0020	0.0022
Med.	0.2626	0.5259	2707	0.0002	0.0004	0.0007	0.0009	0.0012	0.0013	0.0015	0.0018	0.0021	0.0023
st dev	0.0018	0.0020	48	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
Min.	0.2545	0.5168	2673	0.0001	0.0002	0.0005	0.0007	0.0008	0.0011	0.0013	0.0016	0.0016	0.0018
Max.	0.2641	0.5275	2932	0.0004	0.0008	0.0010	0.0012	0.0014	0.0015	0.0019	0.0020	0.0022	0.0025

3.4 Data Set 2, 85°C, 160mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	72.07	99.88	99.60	99.31	99.11	98.92	98.60	98.47	98.24	97.93	97.59
27	71.70	99.85	99.48	99.27	99.07	98.74	98.59	98.38	98.19	97.89	97.67
28	71.94	99.75	99.49	99.11	98.83	98.54	98.39	98.21	98.01	97.72	97.46
29	72.15	99.92	99.72	99.58	99.40	99.21	98.97	98.81	98.50	98.46	98.27
30	72.21	100.07	99.76	99.58	99.47	99.27	99.07	98.82	98.57	98.32	97.96
31	71.06	100.13	99.79	99.63	99.52	99.30	99.03	98.80	98.52	98.35	98.20
32	72.07	100.12	99.78	99.63	99.24	98.95	98.54	98.11	97.89	97.53	97.21
33	72.27	100.03	99.70	99.45	99.17	99.02	98.89	98.70	98.59	98.34	98.15
34	71.76	100.13	99.78	99.61	99.25	99.15	99.01	98.87	98.73	98.59	98.30
35	72.16	100.12	100.01	99.65	99.49	99.31	99.11	98.92	98.60	98.36	98.18
36	72.52	100.14	99.97	99.79	99.37	99.27	99.01	98.86	98.48	98.23	98.10
37	71.88	100.22	100.04	99.79	99.51	99.32	99.07	98.72	98.51	98.26	97.98
38	72.54	100.18	100.08	99.82	99.49	99.04	98.90	98.72	98.55	98.32	97.97
39	72.10	99.99	99.72	99.56	99.24	98.99	98.68	98.36	98.13	98.22	98.03
40	72.05	100.10	99.85	99.67	99.53	99.38	98.99	98.82	98.47	98.31	97.99
41	72.60	100.01	99.79	99.46	99.39	98.95	98.83	98.76	98.48	98.32	98.03
42	69.74	100.09	99.96	99.80	99.44	99.14	98.95	98.62	98.26	97.83	97.56
43	70.88	99.93	99.51	99.31	99.01	98.67	98.34	98.04	97.81	97.63	97.50
44	72.71	99.97	99.79	99.35	99.05	98.84	98.57	98.39	98.18	97.96	97.63
45	72.31	99.85	99.72	99.56	99.34	99.11	99.05	98.80	98.55	98.31	98.15
46	71.71	99.89	99.46	99.12	98.93	98.74	98.38	98.03	97.62	97.57	97.45
47	71.71	99.78	99.36	99.02	98.88	98.66	98.38	98.26	98.02	97.88	97.77
48	71.93	99.93	99.76	99.50	99.39	99.29	99.11	98.92	98.85	98.53	98.47
49	71.31	99.92	99.83	99.76	99.57	99.27	99.05	98.88	98.82	98.47	98.35
50	72.67	99.90	99.83	99.67	99.41	99.34	99.11	98.75	98.36	98.14	97.85
Ave.	71.92	99.99	99.75	99.52	99.28	99.06	98.82	98.60	98.36	98.14	97.91
Med.	72.07	99.99	99.78	99.58	99.37	99.11	98.95	98.72	98.48	98.26	97.98
st dev	0.65	0.1302	0.1889	0.2273	0.2208	0.2467	0.2692	0.2911	0.3148	0.3105	0.3286
Min.	69.74	99.75	99.36	99.02	98.83	98.54	98.34	98.03	97.62	97.53	97.21
Max.	72.71	100.22	100.08	99.82	99.57	99.38	99.11	98.92	98.85	98.59	98.47

3.5 Data Set 2, 85°C, 160mA (Forward Voltage)

No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	2.872	2.897	2.866	2.866	2.863	2.863	2.874	2.867	2.866	2.871	3.047
27	2.850	2.864	2.844	2.853	2.845	2.845	2.847	2.849	2.847	2.848	2.972
28	2.855	2.874	2.848	2.851	2.846	2.845	2.848	2.847	2.851	2.858	2.988
29	2.871	2.926	2.862	2.852	2.852	2.849	2.854	2.856	2.853	2.857	3.006
30	2.869	2.877	2.862	2.855	2.852	2.856	2.853	2.855	2.861	2.861	3.256
31	2.865	2.882	2.863	2.857	2.854	2.857	2.882	2.863	2.861	2.863	2.972
32	2.856	2.857	2.855	2.847	2.850	2.846	2.852	2.848	2.851	2.855	2.873
33	2.871	2.878	2.882	2.857	2.849	2.850	2.852	2.851	2.860	2.868	2.885
34	2.867	2.864	2.869	2.850	2.860	2.847	2.856	2.848	2.852	2.860	2.965
35	2.874	2.855	2.850	2.857	2.852	2.845	2.853	2.862	2.861	2.852	2.891
36	2.855	2.858	2.855	2.851	2.847	2.848	2.857	2.849	2.854	2.854	2.864
37	2.856	2.865	2.850	2.864	2.855	2.850	2.857	2.852	2.880	2.853	2.907
38	2.858	2.880	2.852	2.852	2.849	2.858	2.856	2.876	2.871	2.859	2.926
39	2.854	2.882	2.853	2.853	2.849	2.849	2.857	2.850	2.892	2.853	2.949
40	2.851	2.863	2.860	2.852	2.857	2.857	2.858	2.852	2.876	2.854	2.908
41	2.851	2.871	2.870	2.850	2.853	2.851	2.856	2.860	2.874	2.852	2.892
42	2.854	2.869	2.869	2.856	2.858	2.857	2.860	2.862	2.862	2.859	2.958
43	2.853	2.858	2.865	2.858	2.856	2.844	2.855	2.848	2.849	2.848	3.126
44	2.881	2.865	2.886	2.866	2.850	2.849	2.856	2.853	2.856	2.853	2.904
45	2.873	2.858	2.860	2.857	2.850	2.846	2.853	2.856	2.850	2.853	2.866
46	2.865	2.868	2.849	2.846	2.845	2.845	2.851	2.846	2.850	2.853	2.905
47	2.870	2.865	2.859	2.857	2.847	2.856	2.856	2.849	2.855	2.869	2.899
48	2.863	2.861	2.854	2.855	2.852	2.850	2.854	2.860	2.852	2.852	3.178
49	2.868	2.860	2.855	2.866	2.849	2.848	2.854	2.866	2.846	2.849	2.890
50	2.872	2.864	2.877	2.855	2.851	2.848	2.857	2.856	2.850	2.856	2.870
Ave.	2.863	2.870	2.861	2.855	2.852	2.850	2.856	2.855	2.859	2.856	2.956
Med.	2.865	2.865	2.860	2.855	2.851	2.849	2.856	2.853	2.855	2.854	2.908
st dev	0.009	0.015	0.011	0.006	0.005	0.005	0.007	0.008	0.012	0.006	0.101
Min.	2.850	2.855	2.844	2.846	2.845	2.844	2.847	2.846	2.846	2.848	2.864
Max.	2.881	2.926	2.886	2.866	2.863	2.863	2.882	2.876	2.892	2.871	3.256

3.6 Data Set 2, 85°C, 160mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	0.2647	0.5265	2657	0.0002	0.0003	0.0007	0.0009	0.0011	0.0012	0.0014	0.0018	0.0018	0.0023
27	0.2623	0.5239	2717	0.0003	0.0005	0.0007	0.0009	0.0013	0.0014	0.0015	0.0018	0.0020	0.0023
28	0.2628	0.5259	2699	0.0003	0.0006	0.0009	0.0010	0.0012	0.0014	0.0016	0.0023	0.0039	0.0044
29	0.2638	0.5249	2682	0.0002	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0018	0.0020	0.0024
30	0.2627	0.5251	2705	0.0004	0.0006	0.0009	0.0010	0.0013	0.0016	0.0016	0.0018	0.0021	0.0025
31	0.2638	0.5248	2683	0.0004	0.0005	0.0007	0.0009	0.0011	0.0014	0.0015	0.0018	0.0020	0.0024
32	0.2618	0.5260	2721	0.0004	0.0003	0.0006	0.0008	0.0012	0.0013	0.0015	0.0018	0.0021	0.0025
33	0.2629	0.5248	2702	0.0003	0.0004	0.0007	0.0009	0.0011	0.0013	0.0015	0.0018	0.0020	0.0023
34	0.2635	0.5263	2684	0.0002	0.0004	0.0006	0.0010	0.0011	0.0014	0.0015	0.0018	0.0020	0.0024
35	0.2634	0.5254	2688	0.0002	0.0002	0.0005	0.0007	0.0011	0.0013	0.0014	0.0018	0.0020	0.0025
36	0.2627	0.5259	2702	0.0003	0.0005	0.0008	0.0010	0.0014	0.0015	0.0016	0.0018	0.0021	0.0025
37	0.2619	0.5250	2722	0.0002	0.0003	0.0006	0.0009	0.0011	0.0013	0.0013	0.0018	0.0019	0.0023
38	0.2630	0.5265	2694	0.0002	0.0005	0.0009	0.0009	0.0012	0.0013	0.0015	0.0018	0.0021	0.0024
39	0.2624	0.5247	2713	0.0002	0.0005	0.0007	0.0010	0.0012	0.0014	0.0014	0.0017	0.0020	0.0024
40	0.2637	0.5267	2678	0.0003	0.0003	0.0007	0.0008	0.0011	0.0013	0.0014	0.0018	0.0019	0.0022
41	0.2627	0.5268	2698	0.0003	0.0005	0.0008	0.0009	0.0012	0.0014	0.0015	0.0018	0.0021	0.0024
42	0.2619	0.5249	2722	0.0003	0.0003	0.0007	0.0009	0.0012	0.0014	0.0015	0.0018	0.0019	0.0023
43	0.2623	0.5262	2709	0.0003	0.0002	0.0006	0.0011	0.0013	0.0014	0.0016	0.0018	0.0021	0.0025
44	0.2635	0.5277	2678	0.0003	0.0005	0.0006	0.0010	0.0013	0.0014	0.0016	0.0018	0.0021	0.0024
45	0.2627	0.5246	2708	0.0004	0.0006	0.0006	0.0011	0.0014	0.0014	0.0016	0.0020	0.0021	0.0026
46	0.2640	0.5253	2676	0.0003	0.0005	0.0005	0.0010	0.0012	0.0013	0.0015	0.0019	0.0021	0.0025
47	0.2636	0.5240	2691	0.0003	0.0005	0.0006	0.0010	0.0012	0.0013	0.0014	0.0018	0.0020	0.0024
48	0.2623	0.5244	2717	0.0004	0.0006	0.0006	0.0010	0.0013	0.0014	0.0016	0.0019	0.0021	0.0024
49	0.2641	0.5260	2672	0.0003	0.0003	0.0003	0.0006	0.0011	0.0013	0.0014	0.0016	0.0019	0.0023
50	0.2620	0.5256	2718	0.0004	0.0005	0.0006	0.0008	0.0012	0.0015	0.0016	0.0019	0.0021	0.0024
Ave.	0.2630	0.5255	2697	0.0003	0.0004	0.0007	0.0009	0.0012	0.0014	0.0015	0.0018	0.0021	0.0025
Med.	0.2628	0.5254	2699	0.0003	0.0005	0.0007	0.0009	0.0012	0.0014	0.0015	0.0018	0.0020	0.0024
st dev	0.0008	0.0009	18	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0004	0.0004
Min.	0.2618	0.5239	2657	0.0002	0.0002	0.0003	0.0006	0.0011	0.0012	0.0013	0.0016	0.0018	0.0022
Max.	0.2647	0.5277	2722	0.0004	0.0006	0.0009	0.0011	0.0014	0.0016	0.0016	0.0023	0.0039	0.0044

3.7 Data Set 3, 105°C, 160mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
51	71.91	99.96	99.58	99.28	99.03	98.73	98.40	98.12	97.79	97.46	97.16
52	72.24	99.94	99.65	99.42	99.03	98.66	98.27	98.13	97.90	97.52	97.30
53	72.22	99.78	99.65	99.38	98.99	98.77	98.52	98.10	97.90	97.51	97.16
54	72.28	99.63	99.20	98.87	98.64	98.38	98.06	97.74	97.34	96.98	96.86
55	72.31	99.85	99.57	99.34	99.03	98.77	98.48	98.19	97.90	97.58	97.11
56	72.83	99.77	99.57	99.37	99.12	98.78	98.57	98.27	98.01	97.84	97.67
57	71.96	99.83	99.61	99.37	99.07	98.78	98.62	98.30	98.12	98.07	97.90
58	71.93	99.85	99.58	99.30	99.04	98.83	98.60	98.32	98.14	97.82	97.57
59	71.74	99.82	99.53	99.09	98.95	98.66	98.44	98.20	98.01	97.69	97.37
60	70.56	99.87	99.60	99.35	99.12	98.77	98.48	98.34	98.16	97.96	97.53
61	71.23	99.85	99.62	99.41	98.96	98.74	98.54	98.33	98.19	97.87	97.44
62	72.49	99.77	99.52	99.16	98.95	98.72	98.43	98.15	97.77	97.38	97.10
63	71.78	99.75	99.53	99.19	98.79	98.55	98.24	97.80	97.66	97.45	97.39
64	72.10	99.81	99.54	99.39	99.08	99.00	98.67	98.40	98.10	97.98	97.84
65	72.25	99.76	99.63	99.42	99.11	99.04	98.69	98.37	97.98	97.85	97.62
66	72.33	99.76	99.38	99.05	98.73	98.56	98.22	97.93	97.47	97.18	96.89
67	72.19	99.86	99.68	99.50	99.31	98.96	98.82	98.70	98.48	98.17	97.96
68	72.30	99.79	99.43	99.13	98.87	98.67	98.34	98.08	97.68	97.59	97.33
69	72.12	99.74	99.47	99.15	99.07	99.00	98.70	98.52	98.32	98.14	97.89
70	72.07	99.64	99.36	99.22	98.97	98.67	98.53	98.20	97.93	97.79	97.59
71	72.63	99.82	99.53	99.41	99.27	99.16	98.94	98.79	98.53	98.16	97.74
72	72.15	99.85	99.78	99.53	99.35	99.09	98.88	98.84	98.68	98.53	98.39
73	70.77	99.83	99.72	99.63	99.29	99.12	98.84	98.70	98.53	98.18	97.81
74	71.96	100.11	99.85	99.53	99.22	98.89	98.83	98.72	98.29	97.90	97.47
75	73.01	99.90	99.71	99.63	99.26	98.88	98.49	98.06	97.71	97.48	97.15
Ave.	72.05	99.82	99.57	99.32	99.05	98.81	98.54	98.29	98.02	97.76	97.49
Med.	72.15	99.82	99.58	99.37	99.04	98.77	98.53	98.27	98.01	97.82	97.47
st dev	0.55	0.0981	0.1375	0.1841	0.1782	0.1918	0.2224	0.2921	0.3345	0.3541	0.3646
Min.	70.56	99.63	99.20	98.87	98.64	98.38	98.06	97.74	97.34	96.98	96.86
Max.	73.01	100.11	99.85	99.63	99.35	99.16	98.94	98.84	98.68	98.53	98.39

3.8 Data Set 3, 105°C, 160mA (Forward Voltage)

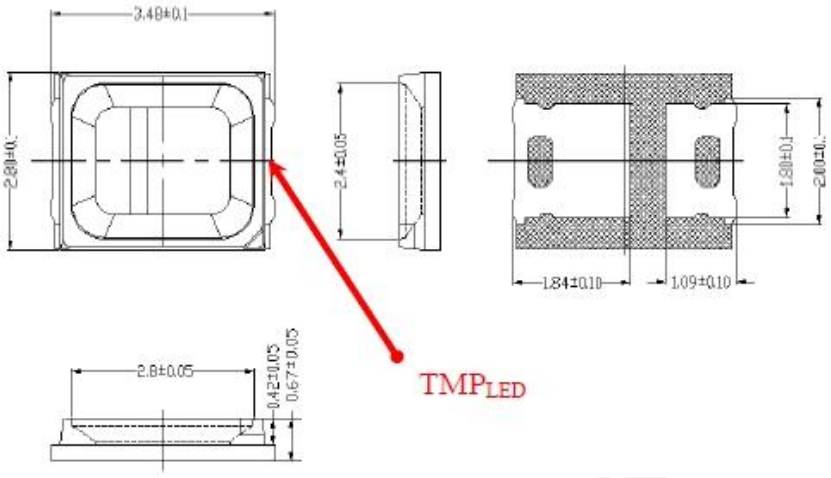
No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
51	2.872	2.867	2.854	2.844	2.846	2.843	2.856	2.850	2.850	2.847	2.884
52	2.868	2.863	2.865	2.855	2.850	2.847	2.863	2.853	2.851	2.851	2.897
53	2.877	2.884	2.868	2.865	2.853	2.850	2.861	2.853	2.852	2.856	2.877
54	2.894	2.868	2.858	2.856	2.852	2.851	2.874	2.852	2.855	2.854	2.896
55	2.906	2.855	2.850	2.854	2.849	2.842	2.848	2.844	2.847	2.846	2.907
56	2.871	2.887	2.895	2.865	2.863	2.858	2.864	2.868	2.866	2.863	2.944
57	2.862	2.858	2.850	2.851	2.848	2.852	2.855	2.857	2.850	2.860	2.858
58	2.857	2.855	2.917	2.851	2.845	2.857	2.857	2.931	2.847	2.852	2.851
59	2.861	2.860	2.914	2.845	2.843	2.844	2.851	2.869	2.846	2.850	2.863
60	2.865	2.887	2.914	2.858	2.862	2.853	2.856	2.928	2.879	2.861	2.934
61	2.861	2.864	2.854	2.851	2.850	2.848	2.853	2.858	2.855	2.906	2.889
62	2.873	2.870	2.852	2.848	2.882	2.852	2.851	2.857	2.852	2.851	2.887
63	2.869	2.865	2.907	2.849	2.847	2.845	2.854	2.858	2.850	2.850	2.862
64	2.863	2.866	2.900	2.850	2.855	2.849	2.856	2.853	2.853	2.864	2.863
65	2.866	2.860	2.906	2.860	2.860	2.852	2.850	2.852	2.849	2.851	2.863
66	2.868	2.870	2.907	2.859	2.846	2.853	2.848	2.846	2.847	2.849	2.855
67	2.857	2.855	2.857	2.855	2.845	2.853	2.850	2.858	2.856	2.852	2.867
68	2.865	2.862	2.871	2.861	2.855	2.852	2.857	2.874	2.852	2.852	2.869
69	2.873	2.861	2.894	2.855	2.862	2.845	2.852	2.863	2.854	2.848	2.870
70	2.866	2.853	2.894	2.860	2.846	2.845	2.851	2.862	2.852	2.851	2.862
71	2.859	2.856	2.885	2.859	2.850	2.850	2.856	2.860	2.864	2.859	2.858
72	2.859	2.858	2.881	2.851	2.849	2.853	2.858	2.855	2.852	2.853	2.875
73	2.861	2.859	2.910	2.858	2.850	2.850	2.853	2.866	2.861	2.853	2.877
74	2.857	2.856	2.885	2.848	2.843	2.845	2.854	2.859	2.846	2.846	2.870
75	2.862	2.860	2.877	2.849	2.850	2.851	2.859	2.858	2.853	2.856	2.862
Ave.	2.868	2.864	2.883	2.854	2.852	2.850	2.855	2.863	2.854	2.855	2.878
Med.	2.865	2.861	2.885	2.855	2.850	2.850	2.855	2.858	2.852	2.852	2.870
st dev	0.011	0.010	0.023	0.006	0.009	0.004	0.006	0.021	0.007	0.012	0.023
Min.	2.857	2.853	2.850	2.844	2.843	2.842	2.848	2.844	2.846	2.846	2.851
Max.	2.906	2.887	2.917	2.865	2.882	2.858	2.874	2.931	2.879	2.906	2.944

3.9 Data Set 3, 105°C, 160mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
51	0.2625	0.5254	2708	0.0002	0.0006	0.0007	0.0010	0.0013	0.0016	0.0016	0.0021	0.0022	0.0026
52	0.2626	0.5259	2704	0.0002	0.0004	0.0006	0.0009	0.0011	0.0013	0.0015	0.0017	0.0020	0.0024
53	0.2639	0.5253	2679	0.0001	0.0004	0.0006	0.0009	0.0012	0.0016	0.0017	0.0019	0.0022	0.0027
54	0.2631	0.5257	2694	0.0003	0.0003	0.0005	0.0009	0.0014	0.0015	0.0015	0.0018	0.0021	0.0025
55	0.2624	0.5274	2701	0.0002	0.0002	0.0004	0.0008	0.0012	0.0013	0.0015	0.0018	0.0019	0.0023
56	0.2623	0.5255	2712	0.0001	0.0002	0.0005	0.0009	0.0013	0.0016	0.0017	0.0021	0.0022	0.0025
57	0.2628	0.5251	2703	0.0002	0.0003	0.0005	0.0007	0.0011	0.0015	0.0016	0.0019	0.0021	0.0025
58	0.2633	0.5262	2689	0.0004	0.0005	0.0006	0.0009	0.0012	0.0016	0.0016	0.0021	0.0022	0.0026
59	0.2631	0.5251	2696	0.0002	0.0002	0.0007	0.0009	0.0013	0.0016	0.0019	0.0019	0.0021	0.0026
60	0.2637	0.5251	2684	0.0003	0.0004	0.0004	0.0009	0.0013	0.0014	0.0017	0.0018	0.0021	0.0026
61	0.2640	0.5267	2673	0.0003	0.0005	0.0007	0.0009	0.0013	0.0016	0.0018	0.0020	0.0021	0.0025
62	0.2634	0.5264	2685	0.0004	0.0003	0.0004	0.0008	0.0013	0.0017	0.0015	0.0019	0.0021	0.0024
63	0.2638	0.5269	2675	0.0003	0.0002	0.0007	0.0009	0.0013	0.0015	0.0016	0.0018	0.0021	0.0022
64	0.2629	0.5269	2693	0.0004	0.0004	0.0006	0.0008	0.0012	0.0016	0.0016	0.0019	0.0021	0.0025
65	0.2627	0.5263	2700	0.0002	0.0002	0.0005	0.0008	0.0012	0.0015	0.0015	0.0018	0.0021	0.0025
66	0.2627	0.5261	2702	0.0003	0.0006	0.0005	0.0008	0.0012	0.0016	0.0018	0.0019	0.0022	0.0026
67	0.2618	0.5251	2723	0.0002	0.0006	0.0006	0.0007	0.0009	0.0013	0.0015	0.0016	0.0019	0.0021
68	0.2624	0.5261	2708	0.0003	0.0007	0.0008	0.0009	0.0010	0.0016	0.0016	0.0019	0.0021	0.0024
69	0.2625	0.5252	2710	0.0003	0.0007	0.0010	0.0010	0.0011	0.0016	0.0016	0.0019	0.0021	0.0024
70	0.2623	0.5271	2706	0.0002	0.0005	0.0006	0.0010	0.0010	0.0015	0.0017	0.0017	0.0020	0.0022
71	0.2625	0.5255	2706	0.0001	0.0005	0.0006	0.0007	0.0009	0.0013	0.0017	0.0017	0.0020	0.0023
72	0.2630	0.5255	2696	0.0002	0.0008	0.0008	0.0009	0.0011	0.0016	0.0018	0.0018	0.0021	0.0026
73	0.2630	0.5255	2698	0.0003	0.0007	0.0009	0.0009	0.0011	0.0014	0.0018	0.0018	0.0020	0.0024
74	0.2623	0.5253	2713	0.0002	0.0006	0.0008	0.0007	0.0010	0.0014	0.0017	0.0016	0.0019	0.0024
75	0.2624	0.5270	2704	0.0001	0.0006	0.0008	0.0008	0.0011	0.0014	0.0018	0.0018	0.0018	0.0023
Ave.	0.2629	0.5259	2698	0.0002	0.0005	0.0006	0.0009	0.0012	0.0015	0.0017	0.0019	0.0021	0.0025
Med.	0.2627	0.5257	2701	0.0002	0.0005	0.0006	0.0009	0.0012	0.0015	0.0016	0.0018	0.0021	0.0025
st dev	0.0006	0.0007	12	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2618	0.5251	2673	0.0001	0.0002	0.0004	0.0007	0.0009	0.0013	0.0015	0.0016	0.0018	0.0021
Max.	0.2640	0.5274	2723	0.0004	0.0008	0.0010	0.0010	0.0014	0.0017	0.0019	0.0021	0.0022	0.0027

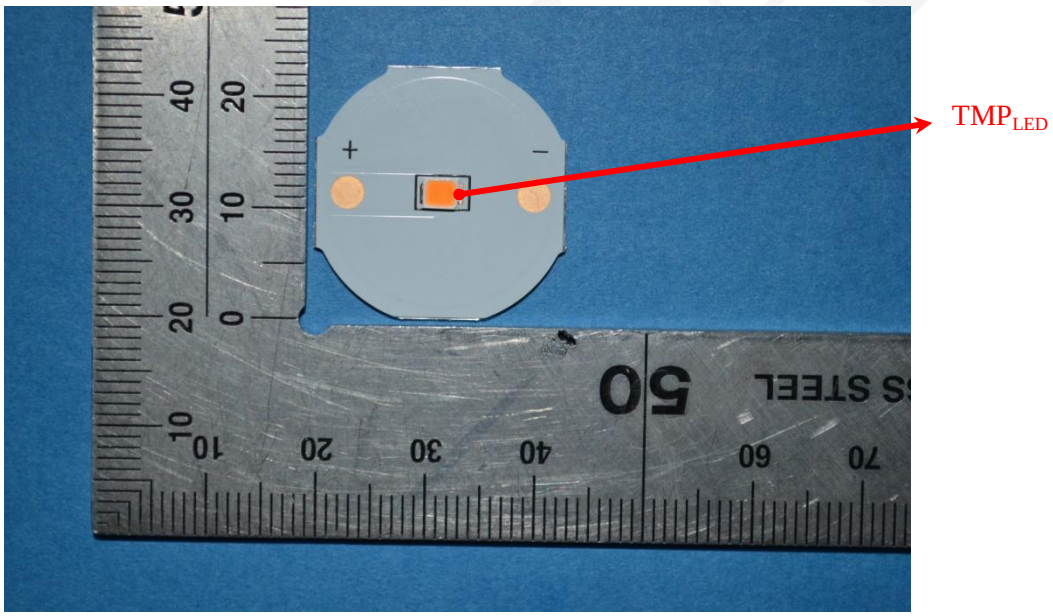
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo



**********END OF REPORT**********