TEST REPORT

According to ANSI/IES LM-80-15
For

Lumileds Holding B.V.

370 W. Trimble Road, San Jose, CA 95131, USA

Model: L128-2780RA35000P1

Report Type: 17000 Hours Test Report	**Product Type:** LED Package
Reviewed By:	Pote Wang
Report Number:	DG3230222-07979E-EE
Test Date:	2020-11-10 to 2022-12-20
Report Date:	2023-02-24
Approved by:	Bill Xiong / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 5/F(B-West) -7/F, the 3rd Phase of Wan Li Industrial Building D, Shihua Road, Futian Free Trade Zone Shenzhen, Guangdong, China. Tel: +86-755-33320018 Fax: +86-755-33320008
Test Facility:	Test facility was located at No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

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1 - General Information

1.1 Description of LED Light Sources#

Sample Size:

50 PCS test samples were in good condition and received on 2020-11-09. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer:	Lumileds Holding B.V.
Part Number:	L128-2780RA35000P1
Part Type:	LED Package
Drive Level:	DC 150mA
Nominal CCT:	2700K
Power:	0.5W
Average Current Density per LED die:	258.34mA/mm^2
Average Power Density per LED die:	0.775W/mm^2
CRI:	80
Die Spacing:	0.15mm

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:

Tested model	Multiple model	Total Input Current(mA)	Power(W)	CCT(K)	Current Density per Die(mA/mm^2)	Power Density per PCB (W/mm^2)	Die Spacing (mm)
L128-2780RA35000P1	L128-xxxxRA35xxxxx	150	0.5	2200-6500	258.34	0.051	0.15

NOTES:
1. The first and second x denote designates nominal CCT (22=2200K,27=2700K, 30=3000K, 35=3500K, 40=4000K, 45=4500K, 50=5000K, 57=5700K, 60=6000K, 65=6500K).
2. The three and four x is a different product solution (Color coordinate and applications and special solution etc…).
3. The last five x denote designates= Lumileds internal codes (000A1, 000B1, 000C1, etc.=shares the same base part).
4. The materials and workmanship of all series models are consistent with the test model.

Note:
1、The applicant Lumileds Holding B.V. declare that their products with model L128-2780RA35000P1 are the same to the products in report# DG3201109-19898E-10-17000 and is authorized by original applicant to use their test data.
2、All the data in previous report (DG3201109-19898E-10-17000) is shared in this report.

1.2 Standards and Reference Documentations

- ANSI/IES 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 NVLAP)
- *ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by NVLAP)

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
High Accuracy Array Spectroradiometer	EVERFINE	HAAS 2000	P600674CM5391140	2022-09-27	2023-09-26
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2022-09-27	2023-09-26
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2022-11-18	2023-11-17
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2023-10-14
Multilayer aging machine	BACL	B2-270	20023	2022-11-18	2023-11-17
Programmable D.C. power supply	Xinnuoer	ATP-5005	N/A	2022-11-18	2023-11-17

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. (Shenzhen) 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: 85°C, 150mA

Part Number:	L128-2780RA35000P1
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	150mA
Measurement Current:	150mA

Data Set 2: 105°C, 150mA

Part Number:	L128-2780RA35000P1
Number of Units:	25
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	150mA
Measurement Current:	150mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	α	β	Reported TM-21 L_{70} Lifetime	Reported TM-21 L_{90} Lifetime
1	25	0	1000hrs	17000hrs	2.073E-06	1.003	>102000 hours	52,000 hours
2	25	0	1000hrs	17000hrs	2.522E-06	1.003	>102000 hours	43,000 hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	100.14%	99.94%	99.73%	99.52%	99.31%	99.08%	98.86%	98.65%	98.44%	98.23%	98.03%	97.83%
2	100.14%	99.90%	99.66%	99.40%	99.12%	98.86%	98.59%	98.32%	98.05%	97.79%	97.52%	97.25%

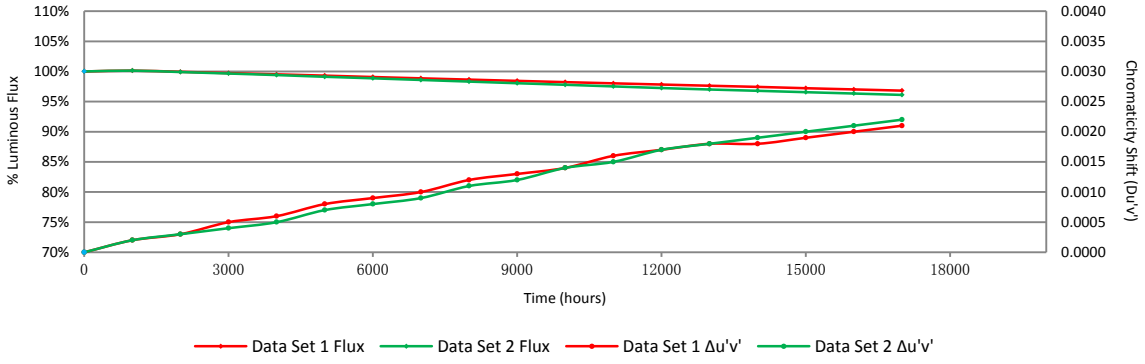
13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
97.63%	97.44%	97.22%	97.02%	96.82%
97.01%	96.79%	96.56%	96.34%	96.11%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	0.0002	0.0003	0.0005	0.0006	0.0008	0.0009	0.0010	0.0012	0.0013	0.0014	0.0016	0.0017
2	0.0002	0.0003	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011	0.0012	0.0014	0.0015	0.0017

13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
0.0018	0.0018	0.0019	0.0020	0.0021
0.0018	0.0019	0.0020	0.0021	0.0022

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 85°C, 150mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)											
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	74.33	100.27	100.17	99.95	99.83	99.70	99.49	99.33	99.18	98.95	98.74	98.53	98.28
2	73.91	100.18	100.04	99.82	99.62	99.35	99.08	98.84	98.61	98.40	98.15	97.92	97.78
3	72.56	100.32	100.07	99.94	99.81	99.53	99.19	98.97	98.79	98.54	98.26	98.13	97.91
4	72.03	100.07	99.81	99.60	99.47	99.33	99.11	98.90	98.72	98.51	98.38	98.15	97.85
5	73.56	100.18	100.01	99.71	99.58	99.36	99.05	98.82	98.53	98.26	97.96	97.69	97.46
6	73.57	100.20	100.07	99.90	99.65	99.43	99.25	99.03	98.91	98.60	98.31	97.97	97.74
7	72.72	100.14	99.96	99.85	99.72	99.48	99.24	99.06	98.94	98.82	98.61	98.31	98.06
8	74.57	99.93	99.68	99.54	99.32	99.02	98.71	98.38	98.10	97.87	97.67	97.52	97.39
9	72.93	99.96	99.67	99.49	99.29	98.97	98.70	98.40	98.12	98.03	97.85	97.66	97.46
10	73.72	100.11	99.88	99.59	99.19	99.00	98.85	98.67	98.59	98.44	98.24	98.13	97.91
11	73.55	100.08	99.86	99.71	99.46	99.31	99.02	98.78	98.56	98.29	98.18	97.99	97.82
12	73.20	100.03	99.69	99.60	99.29	99.07	98.72	98.48	98.20	97.99	97.80	97.68	97.46
13	73.72	100.03	99.88	99.73	99.61	99.44	99.20	98.98	98.81	98.60	98.43	98.22	97.92
14	73.29	100.31	100.23	100.05	99.92	99.74	99.51	99.22	98.96	98.80	98.51	98.32	98.06
15	72.84	100.37	100.25	100.08	99.89	99.75	99.44	99.22	99.00	98.83	98.48	98.31	97.97
16	72.32	100.22	100.15	99.93	99.81	99.63	99.39	99.17	98.99	98.71	98.56	98.41	98.23
17	73.20	100.15	100.04	99.88	99.60	99.39	99.13	98.83	98.62	98.47	98.22	98.07	97.94
18	74.48	100.03	99.93	99.69	99.41	99.05	98.82	98.56	98.23	97.91	97.77	97.54	97.41
19	74.42	100.11	100.03	99.79	99.54	99.37	99.11	98.84	98.63	98.36	98.12	97.98	97.65
20	73.61	100.19	100.10	99.76	99.55	99.29	99.20	98.97	98.79	98.64	98.49	98.36	98.19
21	73.14	100.14	100.01	99.90	99.71	99.34	99.25	99.08	98.93	98.70	98.52	98.36	98.25
22	72.93	100.10	99.70	99.41	99.22	99.10	98.86	98.74	98.46	98.20	98.09	97.92	97.74
23	73.28	100.19	99.71	99.48	99.26	99.13	98.96	98.76	98.34	98.25	97.95	97.69	97.52
24	74.03	100.16	99.80	99.46	99.30	99.18	99.03	98.87	98.68	98.34	98.11	97.83	97.65
25	73.80	100.01	99.80	99.43	99.02	98.89	98.78	98.69	98.52	98.36	98.27	98.13	97.99
Avg.	73.43	100.14	99.94	99.73	99.52	99.31	99.08	98.86	98.65	98.44	98.23	98.03	97.83
Med.	73.55	100.14	99.96	99.73	99.55	99.34	99.11	98.84	98.63	98.44	98.24	98.07	97.85
st dev	0.67	0.11	0.18	0.20	0.24	0.25	0.24	0.25	0.29	0.30	0.28	0.29	0.28
Min.	72.03	99.93	99.67	99.41	99.02	98.89	98.70	98.38	98.10	97.87	97.67	97.52	97.39
Max.	74.57	100.37	100.25	100.08	99.92	99.75	99.51	99.33	99.18	98.95	98.74	98.53	98.28

No.	Lumen Maintenance (%)				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
1	98.08	97.91	97.77	97.50	97.34
2	97.61	97.47	97.27	97.12	96.90
3	97.64	97.42	97.12	96.90	96.65
4	97.74	97.60	97.49	97.38	97.18
5	97.23	97.02	96.81	96.62	96.45
6	97.54	97.38	97.09	96.82	96.56
7	97.87	97.68	97.41	97.17	96.95
8	97.18	96.96	96.85	96.74	96.59
9	97.29	97.15	96.97	96.83	96.70
10	97.75	97.46	97.18	96.89	96.74
11	97.57	97.40	97.27	97.05	96.79
12	97.23	97.06	96.79	96.61	96.34
13	97.76	97.50	97.25	97.02	96.77
14	97.80	97.54	97.37	97.11	96.93
15	97.86	97.60	97.32	97.05	96.79
16	98.02	97.83	97.65	97.51	97.33
17	97.76	97.51	97.30	97.05	96.95
18	97.33	97.21	97.03	96.91	96.80
19	97.49	97.31	97.18	96.98	96.75
20	97.98	97.77	97.60	97.47	97.28
21	98.03	97.87	97.59	97.36	97.14
22	97.53	97.24	97.00	96.81	96.64
23	97.28	97.13	96.86	96.66	96.51
24	97.46	97.30	97.11	96.97	96.70
25	97.82	97.63	97.37	97.09	96.80
Avg.	97.63	97.44	97.22	97.02	96.82
Med.	97.64	97.46	97.25	97.02	96.79
st dev	0.2733	0.2659	0.2702	0.2639	0.2676
Min.	97.18	96.96	96.79	96.61	96.34
Max.	98.08	97.91	97.77	97.51	97.34

3.2 Data Set 1, 85°C, 150mA (Forward Voltage)

No.	Forward Voltage (V)												
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	2.919	2.921	2.936	2.936	2.931	2.933	2.935	2.934	2.934	2.933	2.940	2.938	2.932
2	2.917	2.920	2.908	2.907	2.904	2.908	2.907	2.906	2.904	2.905	2.908	2.913	2.916
3	2.923	2.924	2.909	2.909	2.907	2.907	2.910	2.906	2.908	2.907	2.913	2.911	2.945
4	2.915	2.904	2.900	2.899	2.897	2.899	2.900	2.900	2.898	2.900	2.908	2.903	2.913
5	2.902	2.910	2.902	2.903	2.899	2.901	2.902	2.901	2.899	2.901	2.913	2.905	2.909
6	2.914	2.912	2.909	2.910	2.908	2.908	2.911	2.909	2.908	2.909	2.914	2.914	2.917
7	2.902	2.903	2.901	2.902	2.899	2.900	2.903	2.904	2.900	2.901	2.920	2.906	2.910
8	2.922	2.923	2.920	2.924	2.917	2.919	2.921	2.921	2.919	2.919	2.914	2.923	2.950
9	2.913	2.915	2.910	2.913	2.909	2.911	2.914	2.911	2.912	2.912	2.935	2.920	2.923
10	2.915	2.913	2.915	2.912	2.910	2.909	2.915	2.912	2.913	2.912	2.933	2.919	2.919
11	2.935	2.934	2.933	2.934	2.931	2.933	2.937	2.933	2.932	2.932	2.934	2.938	2.951
12	2.910	2.933	2.917	2.908	2.906	2.909	2.921	2.908	2.910	2.909	2.919	2.911	2.939
13	2.914	2.913	2.933	2.915	2.914	2.915	2.921	2.912	2.916	2.916	2.938	2.922	2.926
14	2.932	2.934	2.931	2.930	2.932	2.930	2.931	2.931	2.929	2.930	2.943	2.937	2.932
15	2.907	2.913	2.906	2.908	2.907	2.908	2.909	2.908	2.906	2.908	2.911	2.912	2.922
16	2.899	2.901	2.898	2.895	2.895	2.897	2.895	2.898	2.896	2.897	2.903	2.907	2.911
17	2.910	2.912	2.908	2.909	2.910	2.909	2.910	2.909	2.908	2.910	2.934	2.924	2.917
18	2.908	2.925	2.908	2.906	2.908	2.905	2.907	2.908	2.905	2.907	2.909	2.914	2.938
19	2.936	2.940	2.934	2.934	2.933	2.933	2.934	2.937	2.934	2.937	2.940	2.941	2.944
20	2.900	2.912	2.899	2.898	2.897	2.897	2.898	2.908	2.898	2.901	2.911	2.907	2.915
21	2.929	2.925	2.931	2.928	2.928	2.929	2.932	2.930	2.930	2.930	2.929	2.936	2.950
22	2.908	2.936	2.911	2.907	2.908	2.909	2.929	2.908	2.908	2.909	2.906	2.920	2.935
23	2.896	2.912	2.898	2.897	2.898	2.898	2.899	2.899	2.897	2.897	2.897	2.904	2.902
24	2.908	2.907	2.908	2.907	2.908	2.907	2.911	2.906	2.907	2.907	2.907	2.914	2.917
25	2.907	2.910	2.910	2.909	2.909	2.908	2.918	2.907	2.908	2.910	2.909	2.915	2.919
Avg.	2.914	2.918	2.913	2.912	2.911	2.911	2.915	2.912	2.911	2.912	2.920	2.918	2.926
Med.	2.913	2.913	2.909	2.909	2.908	2.908	2.911	2.908	2.908	2.909	2.914	2.914	2.922
st dev	0.011	0.011	0.013	0.012	0.012	0.012	0.013	0.012	0.012	0.012	0.014	0.012	0.014
Min.	2.896	2.901	2.898	2.895	2.895	2.897	2.895	2.898	2.896	2.897	2.897	2.903	2.902
Max.	2.936	2.940	2.936	2.936	2.933	2.933	2.937	2.937	2.934	2.937	2.943	2.941	2.951

No.	Forward Voltage (V)				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
1	2.939	2.941	2.935	2.945	2.952
2	2.911	2.914	2.907	2.915	2.921
3	2.914	2.913	2.910	2.920	2.930
4	2.905	2.901	2.900	2.910	2.916
5	2.905	2.904	2.902	2.912	2.924
6	2.915	2.914	2.911	2.920	2.934
7	2.910	2.904	2.901	2.908	2.921
8	2.927	2.922	2.922	2.929	2.946
9	2.922	2.916	2.914	2.921	2.935
10	2.922	2.914	2.913	2.919	2.938
11	2.946	2.943	2.936	2.944	2.960
12	2.917	2.922	2.912	2.917	2.931
13	2.928	2.934	2.919	2.919	2.940
14	2.938	2.938	2.934	2.938	2.934
15	2.916	2.917	2.910	2.913	2.953
16	2.903	2.907	2.900	2.903	2.912
17	2.917	2.915	2.913	2.915	2.928
18	2.914	2.910	2.909	2.914	2.924
19	2.943	2.941	2.944	2.947	2.960
20	2.904	2.928	2.905	2.906	2.914
21	2.936	2.933	2.935	2.933	2.947
22	2.912	2.910	2.916	2.912	2.932
23	2.906	2.900	2.902	2.905	2.929
24	2.913	2.909	2.912	2.915	2.946
25	2.917	2.910	2.911	2.920	2.928
Avg.	2.919	2.918	2.915	2.920	2.934
Med.	2.916	2.914	2.912	2.917	2.932
st dev	0.013	0.013	0.013	0.013	0.014
Min.	2.903	2.900	2.900	2.903	2.912
Max.	2.946	2.943	2.944	2.947	2.960

3.3 Data Set 1, 85°C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')											
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	0.2635	0.5274	2680	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0013	0.0015	0.0017	0.0018
2	0.2636	0.5284	2672	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012
3	0.2633	0.5280	2681	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012	0.0014	0.0015
4	0.2631	0.5284	2684	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0010	0.0012	0.0013	0.0014	0.0015
5	0.2630	0.5291	2683	0.0001	0.0003	0.0005	0.0007	0.0009	0.0010	0.0012	0.0013	0.0015	0.0017	0.0018	0.0020
6	0.2627	0.5264	2700	0.0001	0.0002	0.0003	0.0004	0.0006	0.0007	0.0009	0.0010	0.0012	0.0013	0.0015	0.0017
7	0.2632	0.5284	2681	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014
8	0.2614	0.5288	2716	0.0002	0.0004	0.0005	0.0007	0.0009	0.0011	0.0012	0.0013	0.0014	0.0016	0.0017	0.0018
9	0.2614	0.5273	2723	0.0002	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014	0.0016	0.0017
10	0.2632	0.5279	2683	0.0002	0.0003	0.0004	0.0006	0.0008	0.0010	0.0011	0.0012	0.0013	0.0014	0.0016	0.0017
11	0.2637	0.5279	2674	0.0002	0.0004	0.0005	0.0006	0.0008	0.0010	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021
12	0.2625	0.5293	2693	0.0002	0.0004	0.0005	0.0006	0.0008	0.0010	0.0011	0.0012	0.0014	0.0016	0.0017	0.0018
13	0.2611	0.5279	2726	0.0001	0.0003	0.0004	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014	0.0016	0.0018
14	0.2633	0.5279	2681	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0010	0.0011	0.0012	0.0014	0.0016	0.0017
15	0.2645	0.5276	2659	0.0002	0.0004	0.0006	0.0007	0.0009	0.0010	0.0012	0.0013	0.0014	0.0016	0.0017	0.0019
16	0.2619	0.5267	2714	0.0001	0.0003	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0014	0.0016	0.0018	0.0020
17	0.2617	0.5271	2718	0.0001	0.0004	0.0005	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013	0.0015	0.0017
18	0.2612	0.5290	2720	0.0002	0.0004	0.0006	0.0007	0.0009	0.0009	0.0010	0.0011	0.0013	0.0014	0.0016	0.0018
19	0.2621	0.5265	2712	0.0003	0.0004	0.0006	0.0007	0.0009	0.0010	0.0012	0.0013	0.0014	0.0015	0.0016	0.0018
20	0.2636	0.5284	2673	0.0001	0.0002	0.0004	0.0005	0.0007	0.0009	0.0010	0.0011	0.0013	0.0015	0.0016	0.0018
21	0.2623	0.5265	2708	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014	0.0015	0.0017
22	0.2629	0.5270	2692	0.0001	0.0002	0.0004	0.0006	0.0007	0.0008	0.0010	0.0011	0.0012	0.0013	0.0014	0.0015
23	0.2635	0.5271	2681	0.0002	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0014	0.0015	0.0016	0.0017	0.0019
24	0.2611	0.5295	2720	0.0001	0.0002	0.0004	0.0006	0.0008	0.0010	0.0011	0.0013	0.0014	0.0015	0.0016	0.0018
25	0.2632	0.5272	2686	0.0002	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011	0.0012	0.0014	0.0015	0.0017	0.0020
Avg.	0.2627	0.5278	2694	0.0002	0.0003	0.0005	0.0006	0.0008	0.0009	0.0010	0.0012	0.0013	0.0014	0.0016	0.0017
Med.	0.2630	0.5279	2686	0.0002	0.0003	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014	0.0016	0.0018
st dev	0.0010	0.0009	19	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002
Min.	0.2611	0.5264	2659	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012
Max.	0.2645	0.5295	2726	0.0003	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0014	0.0015	0.0017	0.0019	0.0021

No.	Chromaticity Shift (Δu'v')				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
1	0.0018	0.0020	0.0020	0.0022	0.0022
2	0.0017	0.0017	0.0019	0.0019	0.0021
3	0.0016	0.0017	0.0019	0.0020	0.0020
4	0.0015	0.0016	0.0017	0.0017	0.0019
5	0.0020	0.0020	0.0022	0.0022	0.0023
6	0.0020	0.0019	0.0020	0.0022	0.0022
7	0.0015	0.0015	0.0013	0.0014	0.0015
8	0.0017	0.0020	0.0018	0.0019	0.0021
9	0.0017	0.0020	0.0018	0.0018	0.0021
10	0.0016	0.0019	0.0017	0.0019	0.0020
11	0.0018	0.0021	0.0020	0.0020	0.0021
12	0.0018	0.0019	0.0019	0.0022	0.0024
13	0.0014	0.0013	0.0013	0.0015	0.0017
14	0.0019	0.0017	0.0018	0.0019	0.0021
15	0.0021	0.0018	0.0019	0.0021	0.0023
16	0.0019	0.0018	0.0018	0.0018	0.0020
17	0.0018	0.0018	0.0020	0.0022	0.0023
18	0.0019	0.0019	0.0020	0.0021	0.0023
19	0.0019	0.0019	0.0021	0.0021	0.0022
20	0.0017	0.0017	0.0018	0.0019	0.0021
21	0.0017	0.0017	0.0019	0.0020	0.0020
22	0.0016	0.0016	0.0017	0.0020	0.0020
23	0.0016	0.0016	0.0019	0.0019	0.0019
24	0.0018	0.0017	0.0020	0.0021	0.0022
25	0.0018	0.0019	0.0022	0.0023	0.0022
Avg.	0.0018	0.0018	0.0019	0.0020	0.0021
Med.	0.0018	0.0018	0.0019	0.0020	0.0021
st dev	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.0014	0.0013	0.0013	0.0014	0.0015
Max.	0.0021	0.0021	0.0022	0.0023	0.0024

3.4 Data Set 2, 105°C, 150mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)											
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
26	73.06	100.11	99.99	99.81	99.66	99.45	99.17	98.78	98.49	98.17	97.97	97.60	97.43
27	73.35	99.84	99.73	99.60	99.45	99.35	99.13	98.91	98.69	98.40	98.10	97.82	97.55
28	74.01	100.12	99.95	99.77	99.59	99.43	99.20	98.82	98.49	98.20	97.87	97.54	97.18
29	74.17	100.23	99.95	99.68	99.49	99.18	98.93	98.62	98.37	98.06	97.71	97.34	97.01
30	73.31	100.10	99.99	99.69	99.48	99.21	98.94	98.76	98.58	98.31	98.08	97.87	97.60
31	73.05	100.08	99.99	99.79	99.56	99.25	99.00	98.80	98.54	98.26	98.08	97.82	97.59
32	72.14	100.18	100.01	99.81	99.47	99.14	98.78	98.50	98.28	98.05	97.81	97.71	97.50
33	73.55	100.20	99.97	99.76	99.43	99.13	98.89	98.60	98.44	98.25	98.01	97.77	97.48
34	73.75	100.14	99.84	99.62	99.32	99.06	98.77	98.52	98.17	97.90	97.60	97.26	96.98
35	73.77	100.20	99.92	99.80	99.61	99.32	98.94	98.75	98.48	98.20	97.93	97.72	97.52
36	73.31	100.12	99.96	99.85	99.70	99.44	99.15	98.84	98.58	98.36	97.99	97.69	97.44
37	73.74	100.09	99.81	99.40	99.24	99.12	98.85	98.58	98.33	98.14	97.75	97.37	97.07
38	73.42	100.25	99.97	99.66	99.41	99.09	98.75	98.38	98.07	97.77	97.49	97.17	96.91
39	73.52	100.20	99.99	99.88	99.59	99.31	99.10	98.80	98.41	98.19	97.92	97.70	97.59
40	72.84	100.22	99.99	99.86	99.57	99.24	98.97	98.76	98.42	98.22	98.04	97.80	97.65
41	73.25	100.11	100.07	99.84	99.59	99.33	99.10	98.87	98.54	98.32	98.13	97.95	97.61
42	73.81	100.16	99.84	99.61	99.38	99.09	98.86	98.70	98.28	98.04	97.74	97.52	97.22
43	72.89	100.01	99.90	99.63	99.29	99.00	98.85	98.66	98.29	97.96	97.63	97.17	96.93
44	72.98	100.19	99.93	99.53	99.42	99.03	98.77	98.44	98.22	97.96	97.68	97.31	97.03
45	73.23	100.16	99.80	99.43	99.07	98.72	98.32	97.98	97.72	97.34	97.15	96.86	96.64
46	73.10	100.07	99.67	99.33	99.02	98.62	98.32	98.00	97.91	97.63	97.40	97.24	97.00
47	73.64	100.10	99.69	99.31	98.98	98.64	98.29	97.90	97.80	97.56	97.31	97.16	96.85
48	72.49	100.17	99.74	99.42	99.05	98.73	98.54	98.15	97.92	97.75	97.59	97.30	97.03
49	73.68	100.19	99.81	99.46	99.09	98.98	98.74	98.62	98.37	98.03	97.86	97.64	97.22
50	73.90	100.18	99.99	99.88	99.47	99.26	99.05	98.90	98.53	98.32	97.93	97.70	97.31
Avg.	73.36	100.14	99.90	99.66	99.40	99.12	98.86	98.59	98.32	98.05	97.79	97.52	97.25
Med.	73.35	100.16	99.95	99.68	99.45	99.14	98.89	98.66	98.37	98.14	97.86	97.60	97.22
st dev	0.48	0.08	0.11	0.18	0.21	0.24	0.26	0.30	0.26	0.27	0.26	0.28	0.29
Min.	72.14	99.84	99.67	99.31	98.98	98.62	98.29	97.90	97.72	97.34	97.15	96.86	96.64
Max.	74.17	100.25	100.07	99.88	99.70	99.45	99.20	98.91	98.69	98.40	98.13	97.95	97.65

No.	Lumen Maintenance (%)				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
26	97.29	97.08	96.89	96.63	96.45
27	97.23	96.95	96.65	96.31	96.05
28	96.93	96.62	96.43	96.19	95.91
29	96.78	96.53	96.25	95.97	95.67
30	97.31	97.16	97.00	96.86	96.71
31	97.25	96.97	96.67	96.32	96.04
32	97.32	97.19	97.03	96.91	96.78
33	97.23	96.97	96.68	96.37	96.06
34	96.73	96.58	96.34	96.12	95.81
35	97.30	97.02	96.76	96.46	96.14
36	97.14	96.92	96.66	96.52	96.28
37	96.79	96.51	96.22	96.00	95.80
38	96.73	96.59	96.43	96.25	96.04
39	97.37	97.10	96.83	96.53	96.25
40	97.38	97.03	96.75	96.61	96.39
41	97.38	97.20	97.00	96.75	96.55
42	96.95	96.71	96.53	96.30	95.99
43	96.69	96.43	96.30	96.16	96.04
44	96.73	96.45	96.23	95.93	95.72
45	96.50	96.35	96.24	96.14	95.96
46	96.88	96.70	96.53	96.37	96.25
47	96.61	96.41	96.25	96.03	95.80
48	96.84	96.72	96.59	96.37	96.18
49	96.88	96.58	96.29	96.08	95.85
50	97.10	96.87	96.56	96.28	96.05
Avg.	97.01	96.79	96.56	96.34	96.11
Med.	96.95	96.72	96.56	96.31	96.05
st dev	0.2790	0.2709	0.2622	0.2703	0.2939
Min.	96.50	96.35	96.22	95.93	95.67
Max.	97.38	97.20	97.03	96.91	96.78

3.5 Data Set 2, 105°C, 150mA (Forward Voltage)

No.	Forward Voltage (V)												
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
26	2.915	2.913	2.916	2.913	2.914	2.923	2.921	2.914	2.912	2.915	2.915	2.920	2.926
27	2.931	2.938	2.934	2.933	2.932	2.936	2.937	2.933	2.932	2.934	2.935	2.938	2.947
28	2.899	2.899	2.904	2.900	2.899	2.902	2.904	2.901	2.898	2.900	2.898	2.903	2.922
29	2.914	2.919	2.920	2.917	2.916	2.922	2.920	2.921	2.915	2.917	2.916	2.920	2.929
30	2.896	2.901	2.904	2.900	2.904	2.900	2.899	2.898	2.898	2.900	2.897	2.903	2.916
31	2.926	2.932	2.929	2.925	2.922	2.926	2.925	2.927	2.923	2.925	2.924	2.930	2.939
32	2.911	2.921	2.920	2.911	2.909	2.913	2.912	2.915	2.911	2.913	2.912	2.917	2.926
33	2.904	2.913	2.910	2.908	2.909	2.913	2.912	2.916	2.906	2.913	2.909	2.911	2.917
34	2.917	2.922	2.916	2.915	2.914	2.916	2.919	2.915	2.914	2.935	2.915	2.919	2.934
35	2.903	2.910	2.907	2.905	2.906	2.907	2.906	2.904	2.904	2.913	2.905	2.908	2.910
36	2.919	2.923	2.925	2.922	2.923	2.926	2.920	2.922	2.939	2.931	2.923	2.926	2.935
37	2.906	2.906	2.908	2.905	2.905	2.906	2.906	2.906	2.905	2.911	2.904	2.914	2.910
38	2.895	2.898	2.900	2.897	2.898	2.898	2.898	2.899	2.897	2.903	2.898	2.902	2.901
39	2.919	2.923	2.925	2.923	2.922	2.925	2.920	2.921	2.921	2.929	2.923	2.933	2.928
40	2.900	2.907	2.906	2.904	2.903	2.904	2.903	2.902	2.902	2.915	2.902	2.912	2.910
41	2.910	2.910	2.919	2.907	2.907	2.908	2.905	2.905	2.907	2.923	2.907	2.913	2.909
42	2.923	2.931	2.932	2.927	2.929	2.929	2.926	2.926	2.927	2.933	2.930	2.938	2.932
43	2.919	2.928	2.925	2.922	2.922	2.924	2.919	2.919	2.921	2.929	2.922	2.938	2.924
44	2.908	2.922	2.913	2.909	2.912	2.911	2.907	2.907	2.911	2.913	2.910	2.921	2.910
45	2.904	2.911	2.910	2.905	2.909	2.909	2.905	2.905	2.909	2.914	2.905	2.930	2.910
46	2.899	2.902	2.901	2.898	2.901	2.936	2.899	2.896	2.901	2.900	2.899	2.907	2.903
47	2.921	2.917	2.921	2.915	2.921	2.920	2.913	2.914	2.938	2.919	2.917	2.934	2.924
48	2.913	2.915	2.917	2.911	2.915	2.913	2.911	2.910	2.914	2.916	2.915	2.924	2.917
49	2.928	2.929	2.929	2.925	2.929	2.928	2.924	2.925	2.928	2.929	2.926	2.935	2.931
50	2.932	2.933	2.936	2.931	2.934	2.936	2.930	2.929	2.933	2.937	2.935	2.945	2.938
Avg.	2.912	2.917	2.917	2.913	2.914	2.917	2.914	2.913	2.915	2.919	2.914	2.922	2.922
Med.	2.913	2.917	2.917	2.911	2.914	2.916	2.912	2.914	2.912	2.916	2.915	2.920	2.924
st dev	0.011	0.011	0.011	0.011	0.010	0.012	0.010	0.011	0.013	0.011	0.011	0.013	0.012
Min.	2.895	2.898	2.900	2.897	2.898	2.898	2.898	2.896	2.897	2.900	2.897	2.902	2.901
Max.	2.932	2.938	2.936	2.933	2.934	2.936	2.937	2.933	2.939	2.937	2.935	2.945	2.947

No.	Forward Voltage (V)				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
26	2.923	2.915	2.927	2.937	2.940
27	2.943	2.935	2.936	2.929	2.937
28	2.909	2.899	2.907	2.929	2.946
29	2.930	2.919	2.924	2.920	2.924
30	2.905	2.900	2.915	2.928	2.925
31	2.935	2.926	2.935	2.948	2.943
32	2.921	2.912	2.936	2.934	2.934
33	2.915	2.910	2.915	2.924	2.923
34	2.926	2.917	2.925	2.933	2.931
35	2.915	2.908	2.910	2.921	2.936
36	2.935	2.924	2.924	2.936	2.939
37	2.915	2.909	2.913	2.927	2.923
38	2.908	2.900	2.909	2.919	2.921
39	2.929	2.925	2.927	2.943	2.937
40	2.912	2.907	2.920	2.934	2.939
41	2.912	2.908	2.916	2.933	2.939
42	2.934	2.929	2.938	2.952	2.925
43	2.925	2.923	2.939	2.924	2.927
44	2.913	2.912	2.923	2.920	2.929
45	2.907	2.907	2.919	2.930	2.920
46	2.905	2.900	2.917	2.922	2.939
47	2.921	2.917	2.928	2.935	2.934
48	2.917	2.914	2.926	2.937	2.939
49	2.931	2.928	2.930	2.925	2.936
50	2.940	2.936	2.944	2.952	2.933
Avg.	2.921	2.915	2.924	2.932	2.933
Med.	2.921	2.914	2.924	2.930	2.934
st dev	0.011	0.011	0.010	0.010	0.007
Min.	2.905	2.899	2.907	2.919	2.920
Max.	2.943	2.936	2.944	2.952	2.946

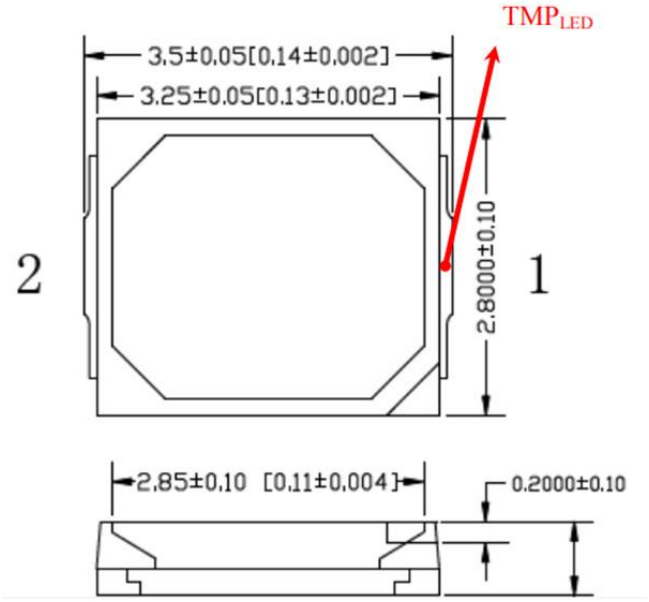
3.6 Data Set 2, 105°C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')											
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
26	0.2646	0.5276	2655	0.0003	0.0004	0.0006	0.0007	0.0008	0.0010	0.0011	0.0012	0.0013	0.0014	0.0015	0.0017
27	0.2629	0.5274	2691	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009	0.0010	0.0012	0.0014	0.0016	0.0017	0.0019
28	0.2630	0.5308	2676	0.0001	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0010	0.0011	0.0012	0.0014	0.0016
29	0.2634	0.5296	2673	0.0001	0.0002	0.0004	0.0005	0.0007	0.0009	0.0010	0.0011	0.0013	0.0015	0.0016	0.0019
30	0.2638	0.5272	2673	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013	0.0015	0.0018
31	0.2616	0.5270	2721	0.0001	0.0002	0.0003	0.0005	0.0006	0.0008	0.0010	0.0011	0.0013	0.0014	0.0015	0.0017
32	0.2642	0.5291	2659	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0010	0.0012	0.0013	0.0014	0.0015	0.0018
33	0.2610	0.5265	2734	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0010	0.0012	0.0013	0.0015
34	0.2628	0.5286	2689	0.0001	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0012	0.0013	0.0015
35	0.2642	0.5284	2662	0.0002	0.0003	0.0004	0.0005	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013	0.0015
36	0.2636	0.5265	2681	0.0001	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0013	0.0015	0.0017
37	0.2623	0.5275	2704	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013
38	0.2606	0.5266	2743	0.0001	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013	0.0015
39	0.2619	0.5271	2713	0.0001	0.0002	0.0003	0.0005	0.0007	0.0009	0.0010	0.0011	0.0012	0.0013	0.0014	0.0016
40	0.2621	0.5284	2704	0.0002	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011	0.0012	0.0013	0.0014	0.0015	0.0016
41	0.2622	0.5279	2704	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009	0.0011	0.0013	0.0015	0.0016	0.0017	0.0018
42	0.2629	0.5289	2686	0.0001	0.0001	0.0003	0.0005	0.0006	0.0007	0.0009	0.0011	0.0012	0.0013	0.0015	0.0018
43	0.2635	0.5270	2680	0.0001	0.0001	0.0002	0.0004	0.0005	0.0006	0.0007	0.0009	0.0010	0.0011	0.0012	0.0014
44	0.2622	0.5264	2711	0.0001	0.0002	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014	0.0016
45	0.2633	0.5286	2679	0.0002	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0013	0.0015	0.0016	0.0018	0.0019
46	0.2644	0.5287	2657	0.0001	0.0003	0.0005	0.0007	0.0009	0.0011	0.0012	0.0014	0.0016	0.0018	0.0019	0.0021
47	0.2636	0.5284	2674	0.0002	0.0003	0.0004	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017	0.0018	0.0020
48	0.2633	0.5256	2691	0.0001	0.0003	0.0005	0.0006	0.0007	0.0009	0.0010	0.0012	0.0014	0.0016	0.0018	0.0020
49	0.2622	0.5259	2712	0.0001	0.0002	0.0004	0.0005	0.0006	0.0008	0.0010	0.0011	0.0012	0.0014	0.0016	0.0018
50	0.2618	0.5281	2711	0.0001	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0012	0.0013	0.0015
Avg.	0.2629	0.5278	2691	0.0002	0.0003	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011	0.0012	0.0014	0.0015	0.0017
Med.	0.2629	0.5276	2689	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0010	0.0011	0.0012	0.0013	0.0015	0.0017
st dev	0.0011	0.0012	24	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2606	0.5256	2655	0.0001	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013
Max.	0.2646	0.5308	2743	0.0003	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0014	0.0016	0.0018	0.0019	0.0021

No.	Chromaticity Shift (Δu'v')				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
26	0.0018	0.0018	0.0021	0.0019	0.0020
27	0.0019	0.0020	0.0022	0.0020	0.0022
28	0.0017	0.0018	0.0018	0.0019	0.0019
29	0.0017	0.0020	0.0022	0.0022	0.0023
30	0.0018	0.0020	0.0021	0.0021	0.0022
31	0.0016	0.0018	0.0019	0.0020	0.0021
32	0.0021	0.0022	0.0022	0.0023	0.0024
33	0.0019	0.0020	0.0021	0.0021	0.0023
34	0.0019	0.0019	0.0022	0.0023	0.0024
35	0.0019	0.0019	0.0022	0.0023	0.0022
36	0.0017	0.0016	0.0017	0.0018	0.0021
37	0.0018	0.0016	0.0018	0.0019	0.0021
38	0.0019	0.0019	0.0020	0.0021	0.0022
39	0.0018	0.0020	0.0020	0.0021	0.0024
40	0.0018	0.0021	0.0020	0.0019	0.0022
41	0.0017	0.0019	0.0020	0.0020	0.0021
42	0.0017	0.0020	0.0020	0.0021	0.0022
43	0.0016	0.0016	0.0016	0.0017	0.0019
44	0.0017	0.0016	0.0016	0.0017	0.0018
45	0.0021	0.0020	0.0020	0.0021	0.0021
46	0.0020	0.0020	0.0020	0.0023	0.0024
47	0.0020	0.0019	0.0019	0.0021	0.0022
48	0.0019	0.0019	0.0020	0.0022	0.0022
49	0.0018	0.0018	0.0018	0.0020	0.0021
50	0.0016	0.0016	0.0016	0.0020	0.0017
Avg.	0.0018	0.0019	0.0020	0.0021	0.0022
Med.	0.0018	0.0019	0.0020	0.0021	0.0022
st dev	0.0001	0.0002	0.0002	0.0002	0.0002
Min.	0.0016	0.0016	0.0016	0.0017	0.0017
Max.	0.0021	0.0022	0.0022	0.0023	0.0024

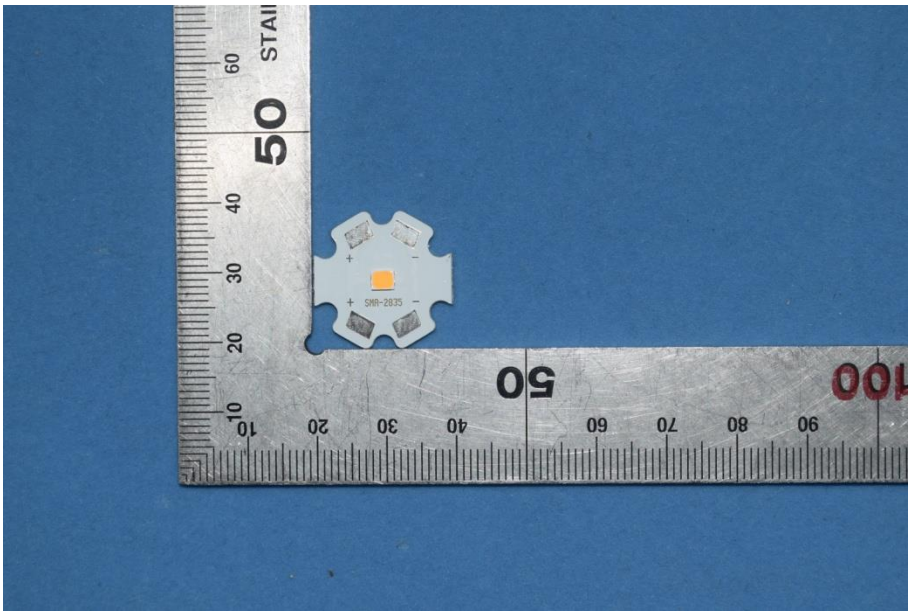
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo



Directions

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