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Laboratory of Shineon Innovation Technology Co., Ltd.

ANSI/IES LM-80-08

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Everstar OPTO Electronics Pvt. LTD

#1011,loth Floor, FILIX Tlower, LBS Marg, Bhandup (west), Mumbai-400 078

Model: ES-2835-106V

Report Type: 9000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	LEIYAN
Report Number:	LS1903301
Test Date:	2016-09-10 to 2017-10-07
Report Date:	2020-03-30
Reviewed By:	GUOXISUN
Prepared By:	Laboratory of Shineon Innovation Technology Co., Ltd. 3/F, Building 3, Digital Plant, No.58, Jinghai 5th Road, BDA, Beijing, China

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Laboratory of Shineon Innovation Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Description of LED Light Sources

Devices tested:

Part Number:	ES-2835-106V
Part Type:	LED Package
Nominal CCT:	2700K
Power:	1.0W
CRI:	80
Die Spacing:	0.1mm
Current Density per LED die:	482.3mA/mm^2
Power Density per LED die:	1.340W/mm^2

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)

Note:

1. The applicant EVERSTAR OPTOELECTRONICS PVT declare that their products with model ES-2835 are the same to the products in reports #LS1609071-A1 Shineon SSH2835 LM-80 9000h FINAL and is authorized by original applicant to use their test data.
2. All the data in previous reports (#LS1609071 –A1 Shineon SSH2835 LM-80 9000h FINAL) are shared in this report.

1.2 Standards Used:

- ANSI/IES LM-80-08: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- ENERGY STAR® Program Guidance Regarding LED Package, LED

Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products.

1.3 Test Facility

The testing facility used by Laboratory of Shineon Innovation Technology Co., Ltd. is located at 3/F, Building 3, Digital Plant, No.58, 5th Jinghai Road, BDA, Beijing, China.

1.4 Description of Auxiliary Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Programmable Test Power for LEDs	EVERFINE	LED300E-P	912019 /912020	15V/2000mA	2017.6	2018.6
Standard Light Source	EVERFINE	D062	20151024/20151025	-	2017.9	2018.9
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	912005-127	380-780nm	2017.4	2018.4
LM-80 Aging equipment	UCRD	UFS-8036C	#21/#22	-	2017.4	2018.4
Multi-channel DC source	ITECH	ITECH6720	P-95,P96P-97, P-98	60V/5000mA	2017.4	2018.4

1.5 Operating Cycle

Samples are driven with a constant direct current (DC)

1.6 Ambient Conditions

For lumen maintenance test, samples were operated in thermal chambers with minimal ambient airflow. For long term reliability test, the case temperature was controlled by mounting several thermocouples on a

sample reliability stress board at the designated thermal measurement point, as shown in APPENDIX. The ambient temperature Ta was measured by several thermocouples at a distance of 5 mm above the reliability test board. The relative humidity within chamber was less than 65%.

For photometry measurement, temperature was set to 25°C ± 2°C, RH <65%

1.7 Photometry Measurement Uncertainty

The uncertainty of the light output measurements is U=1.89% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=20.4K (K=2), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

1.8 Sample Set

Sampling Method: LED samples for ANSI/IES 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. Each Sample is soldered to all of the reliability stress boards for a given set of ANSI/IES LM-80 tests.

Sample Size

Total 50Pcs;

Each Ts test condition 25Pcs

The 50Pcs samples tested at Ts 85°C and Ts 105°C were received at 2016-09-08 and tested during 2016-09-10 to 2017-10-07. The samples were numbered from 1 to 25 each temperature(Ts)

Data Set 1: 105°C, 180mA
Part Number ES-2835-106V
Number of Units: 25
Actual Case Temperature(Ts): 104.3°C
Actual Ambient Temperature(Ta): 105.2°C
Life Test Drive Current: IF = 180mA
Measurement Current: IF = 180mA

Data Set 2: 85°C, 180mA
Part Number ES-2835-106V
Number of Units: 25
Actual Case Temperature(Ts): 84.7°C
Actual Ambient Temperature(Ta): 84.6 °C
Life Test Drive Current: IF = 180mA
Measurement Current: IF = 180mA

2 - SUMMARY OF TEST RESULT

Data Set: Data Set 1, 105°C, 180mA
Number of Units: 25
Failures Observed: 0
Test Interval and Test Duration:0h, 1000h, 2000h, 3000h, 4000h, 5000h,6000h, 7000h, 8000h, 9000h
Average. Lumen Maintenance at 9000 hours:96.73%
Average Chromaticity Shift at 9000 hours (Δu'v'):0.0017
Reported TM-21 L_{70} Lifetime: >54,000 hours
Reported TM-21 L_{90} Lifetime: 27000hours

Data Set: Data Set 2, 85°C, 180mA
Number of Units: 25
Failures Observed: 0
Test Interval and Test Duration:0h, 1000h, 2000h, 3000h, 4000h, 5000h,6000h, 7000h, 8000h, 9000h
Average. Lumen Maintenance at 9000 hours:97.59%
Average Chromaticity Shift at 9000 hours (Δu'v'):0.0011
Reported TM-21 L_{70} Lifetime:> 54,000 hours
Reported TM-21 L_{90} Lifetime:41000hours

3 - Test Data

3.1 Data Set 1, 105°C, 180 mA (Lumen Maintenance)

	VF(V)	Φ (lm)	Lumen Maintenance (%)								
NO	0hr(Initial)		1000H	2000H	3000H	4000H	5000H	6000H	7000H	8000H	9000H
1	6.478	135.3	99.93	99.26	99.41	99.11	98.60	97.71	97.71	97.41	96.90
2	6.569	136.4	99.63	99.19	98.39	98.31	97.95	97.51	97.21	96.70	96.33
3	6.562	136	99.63	99.41	99.34	99.12	98.68	98.24	97.94	97.50	97.06
4	6.509	136.4	99.49	99.12	99.05	98.90	98.31	97.95	97.65	97.21	96.70
5	6.48	135.6	99.34	99.04	99.12	98.60	98.23	97.79	97.49	97.05	96.61
6	6.465	133.7	98.95	98.80	98.73	98.65	98.28	98.06	97.68	97.16	96.63
7	6.574	133.5	99.55	99.03	98.88	98.65	98.35	97.90	97.75	97.23	96.70
8	6.476	132.7	99.55	99.02	98.94	98.57	98.34	98.12	97.81	97.29	96.83
9	6.454	135.5	99.48	99.04	99.11	98.52	98.38	98.01	97.64	97.12	96.68
10	6.605	133.8	99.63	99.33	99.33	98.80	98.51	98.06	97.83	97.23	96.64
11	6.576	135.2	99.48	99.26	99.56	99.04	98.37	98.37	98.00	97.56	96.89
12	6.581	134.2	99.55	99.25	99.18	98.73	98.51	97.99	97.69	97.17	96.65
13	6.538	135.1	99.63	99.19	99.26	98.67	98.52	98.15	97.71	97.19	96.67
14	6.601	134.7	99.48	99.55	99.26	98.89	98.66	98.14	97.85	97.25	96.88
15	6.546	135.4	99.41	99.41	98.82	98.74	98.45	97.86	97.56	96.97	96.82
16	6.619	134.3	99.48	99.26	99.48	98.96	98.88	98.51	98.14	97.54	96.95
17	6.553	136.2	99.41	99.05	99.12	98.46	98.38	98.09	97.80	97.14	96.70
18	6.526	134.2	99.55	99.18	99.18	98.58	98.51	98.14	97.76	97.24	96.65
19	6.594	134.4	99.48	99.03	99.03	98.51	98.44	98.07	97.69	96.95	96.43
20	6.489	133.7	99.48	99.78	100.00	99.48	99.33	98.20	97.68	98.35	98.06
21	6.559	135.9	99.48	98.90	99.04	98.45	98.45	97.72	97.35	96.54	95.44
22	6.472	135.4	99.56	99.19	99.11	98.52	98.45	98.15	97.78	97.05	96.60
23	6.481	133.9	99.70	99.33	99.55	98.95	98.95	98.66	98.28	97.61	97.01
24	6.476	136	99.49	99.26	99.26	98.75	98.68	98.24	97.87	97.21	96.62
25	6.485	134.7	99.33	99.26	99.41	98.81	98.66	98.37	98.00	97.33	96.81
Ave	6.53	134.89	99.51	99.21	99.18	98.75	98.51	98.08	97.76	97.24	96.73
Med	6.54	135.10	99.49	99.19	99.18	98.73	98.45	98.09	97.75	97.21	96.70
st dev	0.0519	1.0167	0.1678	0.2062	0.3160	0.2616	0.2678	0.2552	0.2256	0.3373	0.4131
Min.	6.45	132.70	98.95	98.80	98.39	98.31	97.95	97.51	97.21	96.54	95.44
Max.	6.62	136.40	99.93	99.78	100.00	99.48	99.33	98.66	98.28	98.35	98.06

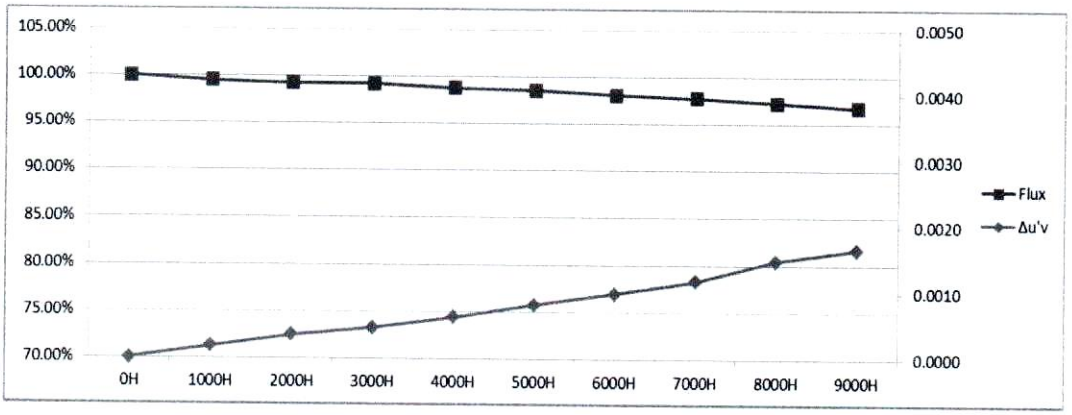
TM-21 Projection:
Test Duration: 9000 hours
Failures Observed: 0
α: 4.158*E-06
β: 1.005

Reported L_{70}: >54,000 hours

Reported L_{90}: 27000 hours

3.2 Data Set 1, 105°C, 180mA (Chromaticity Shift)

NO	u'	v'	CCT(K)	Chromaticity Shift (Δ u' v')								
	0hr(Initial)			1000H	2000H	3000H	4000H	5000H	6000H	7000H	8000H	9000H
1	0.2616	0.5306	2705	0.0004	0.0003	0.0007	0.0006	0.0010	0.0011	0.0013	0.0015	0.0017
2	0.2629	0.5314	2677	0.0003	0.0004	0.0008	0.0009	0.0012	0.0013	0.0015	0.0016	0.0018
3	0.2618	0.5312	2699	0.0002	0.0003	0.0004	0.0006	0.0009	0.0009	0.0013	0.0014	0.0017
4	0.2625	0.5304	2688	0.0001	0.0003	0.0004	0.0006	0.0008	0.0009	0.0011	0.0013	0.0016
5	0.2643	0.5322	2645	0.0002	0.0004	0.0004	0.0007	0.0008	0.0010	0.0012	0.0014	0.0016
6	0.2626	0.5303	2686	0.0002	0.0003	0.0005	0.0007	0.0009	0.0010	0.0013	0.0015	0.0017
7	0.2638	0.5317	2657	0.0003	0.0005	0.0006	0.0008	0.0009	0.0012	0.0013	0.0017	0.0017
8	0.2622	0.5311	2692	0.0002	0.0003	0.0006	0.0007	0.0009	0.0011	0.0013	0.0014	0.0015
9	0.2625	0.5292	2692	0.0002	0.0002	0.0005	0.0006	0.0009	0.0010	0.0013	0.0013	0.0016
10	0.261	0.5289	2725	0.0002	0.0002	0.0004	0.0006	0.0008	0.0009	0.0012	0.0014	0.0015
11	0.2609	0.53	2722	0.0002	0.0004	0.0004	0.0007	0.0008	0.0010	0.0011	0.0015	0.0016
12	0.2621	0.5313	2694	0.0002	0.0004	0.0005	0.0007	0.0009	0.0011	0.0013	0.0014	0.0016
13	0.2648	0.5296	2645	0.0002	0.0004	0.0005	0.0006	0.0008	0.0010	0.0013	0.0014	0.0017
14	0.2618	0.5307	2701	0.0002	0.0004	0.0005	0.0007	0.0009	0.0010	0.0012	0.0015	0.0017
15	0.263	0.5301	2679	0.0001	0.0003	0.0003	0.0006	0.0008	0.0009	0.0010	0.0013	0.0016
16	0.2628	0.5315	2677	0.0000	0.0003	0.0004	0.0005	0.0008	0.0009	0.0011	0.0013	0.0015
17	0.2646	0.5306	2645	0.0001	0.0004	0.0003	0.0005	0.0008	0.0009	0.0011	0.0013	0.0015
18	0.264	0.5319	2652	0.0002	0.0004	0.0004	0.0006	0.0007	0.0009	0.0012	0.0014	0.0016
19	0.2612	0.5301	2715	0.0002	0.0004	0.0004	0.0006	0.0008	0.0009	0.0011	0.0014	0.0016
20	0.2644	0.5314	2646	0.0001	0.0004	0.0004	0.0006	0.0009	0.0009	0.0012	0.0036	0.0038
21	0.2627	0.5296	2687	0.0001	0.0004	0.0004	0.0006	0.0008	0.0009	0.0011	0.0013	0.0012
22	0.2636	0.5321	2659	0.0002	0.0004	0.0005	0.0006	0.0009	0.0009	0.0012	0.0014	0.0016
23	0.2648	0.531	2641	0.0001	0.0003	0.0004	0.0004	0.0007	0.0009	0.0011	0.0013	0.0015
24	0.2619	0.5309	2698	0.0000	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0012	0.0014
25	0.2616	0.5308	2704	0.0000	0.0002	0.0003	0.0005	0.0007	0.0009	0.0010	0.0013	0.0014
Ave	0.2628	0.5307	2681	0.0002	0.0004	0.0005	0.0006	0.0008	0.0010	0.0012	0.0015	0.0017
Med	0.2626	0.5308	2687	0.0002	0.0004	0.0004	0.0006	0.0008	0.0009	0.0012	0.0014	0.0016
st dev	0.0012	0.0009	26	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0004	0.0005
Min.	0.2609	0.5289	2641	0.0000	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0012	0.0012
Max.	0.2648	0.5322	2725	0.0004	0.0005	0.0008	0.0009	0.0012	0.0013	0.0015	0.0036	0.0038



3.3 Data Set 2, 85°C, 180 mA (Lumen Maintenance)

NO	VF(V)	Φ (lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000H	2000H	3000H	4000H	5000H	6000H	7000H	8000H	9000H
1	6.481	134.4	99.63	98.59	98.14	98.21	97.84	97.62	96.95	97.40	96.95
2	6.454	134.1	99.40	99.11	98.66	98.51	98.36	97.99	97.32	97.76	97.32
3	6.567	135.2	99.41	99.26	98.59	98.59	98.52	98.22	97.78	97.71	97.19
4	6.483	134.9	99.70	99.56	99.04	98.96	98.74	98.44	97.70	98.15	97.85
5	6.48	134.9	99.63	99.41	98.96	98.81	98.52	98.15	98.00	98.07	97.63
6	6.454	133.7	99.85	99.85	99.40	98.95	98.80	98.35	98.06	98.35	98.06
7	6.508	134.2	99.93	99.93	99.93	99.63	99.40	98.88	98.51	98.73	98.44
8	6.422	134.1	99.85	99.63	99.18	98.96	98.73	98.43	98.06	97.99	97.76
9	6.546	134.6	99.78	99.63	99.18	99.03	98.81	98.44	98.14	97.99	97.77
10	6.497	132.1	99.77	99.55	99.24	98.94	98.56	98.71	98.33	98.03	97.73
11	6.427	133.6	99.93	99.93	99.40	99.18	98.88	98.58	98.13	98.28	97.90
12	6.594	134.6	99.85	99.63	99.33	99.18	98.96	98.66	98.22	98.14	97.85
13	6.425	134.4	99.18	98.81	98.44	98.29	97.92	97.62	97.32	97.47	97.02
14	6.479	134.4	100.00	99.93	99.55	99.33	99.03	98.74	98.36	98.51	97.92
15	6.523	134.8	99.41	99.18	98.89	98.66	98.37	97.92	97.55	97.55	97.18
16	6.48	134.8	99.70	99.48	99.18	98.96	98.44	98.29	97.77	97.92	97.55
17	6.589	135.3	99.41	99.26	98.82	98.52	98.30	97.93	97.63	97.49	97.19
18	6.576	135.9	99.78	99.71	99.34	98.97	98.68	98.45	97.94	98.01	97.72
19	6.465	133.7	99.70	99.63	99.25	98.65	98.73	98.43	98.06	97.68	97.61
20	6.511	133.7	99.55	99.25	98.88	98.65	98.28	98.13	97.68	97.23	97.23
21	6.475	133.6	99.70	99.48	99.03	98.80	98.43	98.28	97.75	97.53	97.23
22	6.473	132.8	99.70	99.55	99.17	98.95	98.64	98.42	98.04	97.67	97.44
23	6.472	132.8	99.70	99.47	99.02	98.64	98.12	97.89	97.67	98.12	97.67
24	6.505	134	99.78	99.63	99.40	99.25	98.73	98.66	98.28	98.43	98.13
25	6.649	134.4	99.18	99.18	98.74	98.44	98.21	97.84	97.32	97.62	97.32
Ave	6.50	134.20	99.66	99.46	99.07	98.84	98.56	98.28	97.86	97.91	97.59
Med	6.48	134.40	99.70	99.55	99.17	98.94	98.56	98.35	97.94	97.99	97.63
st dev	0.0572	0.8451	0.2197	0.3303	0.3803	0.3331	0.3512	0.3466	0.3822	0.3815	0.3718
Min.	6.42	132.10	99.18	98.59	98.14	98.21	97.84	97.62	96.95	97.23	96.95
Max.	6.65	135.90	100.00	99.93	99.93	99.63	99.40	98.88	98.51	98.73	98.44

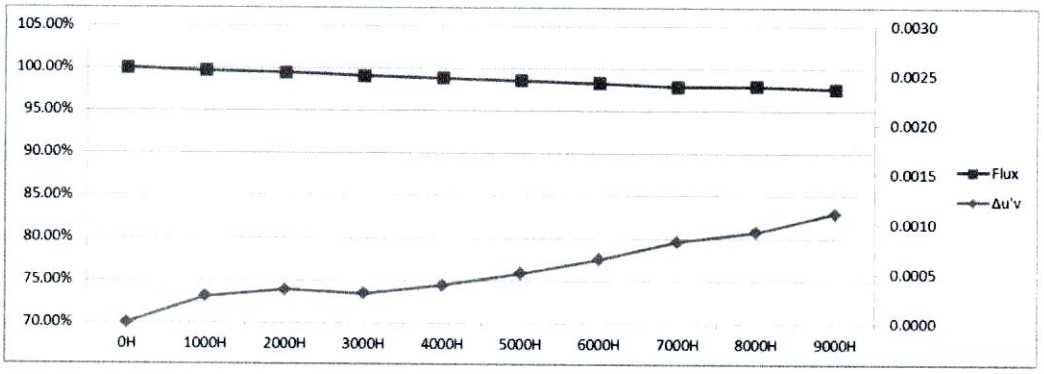
TM-21 Projection:
Test Duration: 9000 hours
Failures Observed: 0
α: 2.508*E-6
β: 0.998

Reported L_{70}: >54,000 hours

Reported L_{90}: 41000 hours

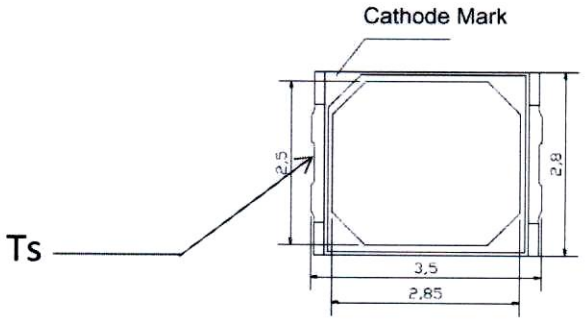
3.4 Data Set 2, 85°C,180 mA (Chromaticity Shift)

NO	u'	v'	CCT(K)	Chromaticity Shift (Δu' v')								
	0hr(Initial)			1000H	2000H	3000H	4000H	5000H	6000H	7000H	8000H	9000H
1	0.2639	0.5311	2658	0.0004	0.0007	0.0007	0.0009	0.0011	0.0012	0.0015	0.0013	0.0015
2	0.26	0.5299	2741	0.0003	0.0005	0.0004	0.0006	0.0008	0.0010	0.0013	0.0013	0.0014
3	0.2609	0.5299	2723	0.0004	0.0004	0.0005	0.0006	0.0008	0.0008	0.0011	0.0013	0.0014
4	0.2625	0.5303	2689	0.0004	0.0003	0.0004	0.0004	0.0006	0.0008	0.0009	0.0010	0.0012
5	0.2604	0.5292	2736	0.0003	0.0004	0.0006	0.0008	0.0008	0.0010	0.0012	0.0013	0.0014
6	0.2622	0.5304	2694	0.0001	0.0003	0.0000	0.0002	0.0003	0.0004	0.0005	0.0008	0.0009
7	0.2616	0.5308	2706	0.0004	0.0001	0.0003	0.0004	0.0006	0.0009	0.0009	0.0010	0.0012
8	0.2607	0.5301	2725	0.0002	0.0002	0.0002	0.0004	0.0005	0.0007	0.0008	0.0010	0.0011
9	0.2595	0.5289	2756	0.0003	0.0003	0.0004	0.0006	0.0006	0.0009	0.0010	0.0011	0.0013
10	0.264	0.5298	2661	0.0005	0.0003	0.0005	0.0006	0.0008	0.0010	0.0011	0.0012	0.0014
11	0.2635	0.5308	2667	0.0003	0.0002	0.0002	0.0005	0.0006	0.0008	0.0010	0.0010	0.0012
12	0.2622	0.5296	2697	0.0004	0.0001	0.0001	0.0004	0.0004	0.0006	0.0008	0.0009	0.0013
13	0.2631	0.5304	2676	0.0001	0.0003	0.0002	0.0003	0.0004	0.0005	0.0008	0.0009	0.0012
14	0.263	0.5307	2677	0.0001	0.0003	0.0002	0.0001	0.0001	0.0003	0.0005	0.0007	0.0009
15	0.2622	0.5291	2699	0.0002	0.0003	0.0001	0.0003	0.0003	0.0005	0.0007	0.0007	0.0008
16	0.2622	0.5301	2696	0.0004	0.0004	0.0001	0.0001	0.0002	0.0004	0.0004	0.0007	0.0009
17	0.2628	0.5305	2681	0.0001	0.0002	0.0002	0.0003	0.0004	0.0006	0.0008	0.0008	0.0009
18	0.2614	0.5296	2715	0.0003	0.0004	0.0003	0.0001	0.0001	0.0002	0.0004	0.0007	0.0008
19	0.2616	0.5303	2707	0.0002	0.0003	0.0001	0.0001	0.0004	0.0006	0.0007	0.0009	0.0011
20	0.2648	0.5308	2641	0.0002	0.0003	0.0002	0.0002	0.0006	0.0006	0.0007	0.0007	0.0011
21	0.2638	0.5299	2664	0.0003	0.0004	0.0003	0.0004	0.0006	0.0007	0.0009	0.0009	0.0013
22	0.2608	0.5285	2730	0.0001	0.0001	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0011
23	0.2628	0.5301	2684	0.0003	0.0007	0.0005	0.0004	0.0001	0.0001	0.0003	0.0004	0.0006
24	0.2602	0.5299	2738	0.0003	0.0002	0.0002	0.0003	0.0004	0.0005	0.0007	0.0007	0.0009
25	0.2633	0.5306	2670	0.0001	0.0004	0.0003	0.0003	0.0005	0.0005	0.0007	0.0006	0.0008
Ave	0.2621	0.5301	2697	0.0003	0.0003	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011
Med	0.2622	0.5301	2696	0.0003	0.0003	0.0002	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011
st dev	0.0014	0.0006	30	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002	0.0002
Min.	0.2595	0.5285	2641	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0003	0.0004	0.0006
Max.	0.2648	0.5311	2756	0.0005	0.0007	0.0007	0.0009	0.0011	0.0012	0.0015	0.0013	0.0015



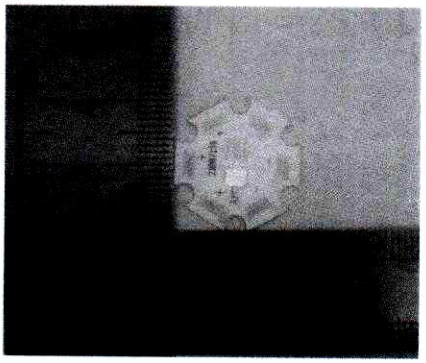
Appendix A – DUT PHOTO

A.1 Mechanical Dimensions (Ta = 25°C)



All dimensions are in millimeters.

A.2 DUT Photo



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