

TEST REPORT

According to ANSI/IES LM-80-15
For

#Shenzhen Zhongshun Semiconductor Lighting Co.,Ltd.

#Meixun digital technology park, 19 jinxiu middle road, pingshan district, shenzhen, China

#Model: PCT2835 9V 1W

Report Type: 9000 Hours Test Report		Product Type: LED Package
Reviewed By:	Pote Wang <i>Pote Wang</i>	
Report Number:	DG3210516-04420E-10-9000-M1	
Test Date:	2021-05-18 to 2022-06-04	
Report Date:	2022-08-31	
Approved by:	Blake Zhang / EE Engineer	
Revised Note:	The previous report DG3210516-04420E-10-9000 is replaced by this report on 2022-08-31	
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Test Facility:	Test facility was located at No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China.	

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TABLE OF CONTENTS

1 - General Information.....	3
1.1 Description of LED Light Sources [#]	3
1.2 Standards and Reference Documentations	3
1.3 Testing Equipment	3
1.4 Drive Level	3
1.5 Ambient Conditions for Maintenance Test	4
1.6 Photometric Measurement Method and Uncertainty.....	4
1.7 Statement of Traceability	4
1.8 Sample Set.....	5
2 - Summary of Test Result.....	6
3 - Test Data.....	7
3.1 Data Set 1, 55°C, 100mA (Lumen Maintenance).....	7
3.2 Data Set 1, 55°C, 100mA (Forward Voltage).....	8
3.3 Data Set 1, 55°C, 100mA (Chromaticity Shift)	9
3.4 Data Set 2, 85°C, 100mA (Lumen Maintenance).....	10
3.5 Data Set 2, 85°C, 100mA (Forward Voltage).....	11
3.6 Data Set 2, 85°C, 100mA (Chromaticity Shift)	12
3.7 Data Set 3, 105°C, 100mA (Lumen Maintenance)	13
3.8 Data Set 3, 105°C, 100mA (Forward Voltage).....	14
3.9 Data Set 3, 105°C, 100mA (Chromaticity Shift).....	15
4 - DUT Photo	16
4.1 Mechanical Dimensions	16
4.2 DUT Photo.....	16
5 - Report Revision	17
Directions.....	18

1 - General Information

1.1 Description of LED Light Sources[#]

Sample Size:

75 PCS test samples were in good condition and received on 2021-05-16. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75.

Manufacturer:	Shenzhen Zhongshun Semiconductor Lighting Co.,Ltd.
Part Number:	PCT2835 9V 1W
Part Type:	LED Package
Drive Level:	DC 100mA
Nominal CCT:	2700K
Power:	1W
Average Current Density per LED die:	14.58mA/mm ²
Average Power Density per LED die:	0.044W/mm ²
CRI:	80
Die Spacing:	0.45mm

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.

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	2021-09-27	2022-09-26
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2021-09-27	2022-09-26
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2022-01-05	2023-01-04
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2022-10-14
Multilayer aging machine	BACL	B2-270	20023	2022-01-04	2023-01-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090005	2022-01-05	2023-01-04

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 driven 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: 55°C, 100mA

Part Number: PCT2835 9V 1W
Number of Units: 25
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 100mA
Measurement Current: 100mA

Data Set 2: 85°C, 100mA

Part Number: PCT2835 9V 1W
Number of Units: 25
Case Temperature: >83°C
Ambient Temperature: >80°C
Life Test Drive Current: 100mA
Measurement Current: 100mA

Data Set 3: 105°C, 100mA

Part Number: PCT2835 9V 1W
Number of Units: 25
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 100mA
Measurement Current: 100mA

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	9000hrs	2.121E-06	1.004	>54000 hours	52000 hours
2	25	0	1000hrs	9000hrs	2.491E-06	1.003	>54000 hours	44000 hours
3	25	0	1000hrs	9000hrs	2.985E-06	1.003	>54000 hours	36000 hours

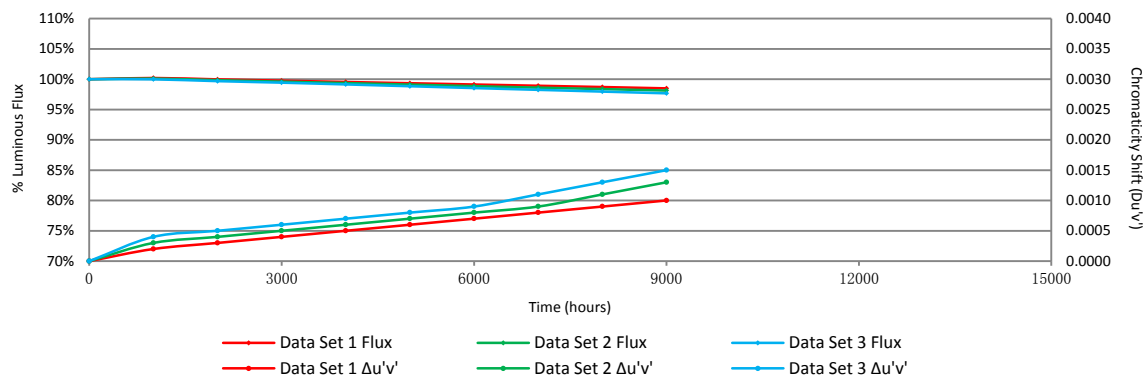
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	100.20%	99.97%	99.76%	99.54%	99.34%	99.13%	98.92%	98.71%	98.49%
2	100.10%	99.84%	99.60%	99.36%	99.11%	98.85%	98.61%	98.37%	98.13%
3	99.98%	99.68%	99.43%	99.14%	98.84%	98.54%	98.25%	97.96%	97.67%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
2	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013
3	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013	0.0015

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 55°C, 100mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	126.40	100.16	99.92	99.76	99.60	99.37	99.21	99.05	98.89	98.73
2	125.10	100.24	100.08	99.92	99.68	99.52	99.36	99.12	98.96	98.72
3	129.20	100.15	99.92	99.69	99.54	99.38	99.15	98.92	98.68	98.45
4	124.90	100.16	99.92	99.84	99.68	99.52	99.28	99.12	98.96	98.80
5	130.60	100.08	99.92	99.77	99.54	99.39	99.23	99.08	98.85	98.62
6	130.60	100.23	99.92	99.69	99.54	99.39	99.23	99.00	98.77	98.55
7	124.30	100.24	100.08	99.84	99.60	99.36	99.12	98.87	98.63	98.39
8	125.00	100.32	100.08	99.84	99.68	99.52	99.28	99.12	98.96	98.72
9	130.80	100.38	100.08	99.77	99.62	99.39	99.24	99.08	98.93	98.85
10	128.40	100.23	99.92	99.61	99.30	98.99	98.68	98.36	98.05	97.74
11	128.90	100.23	100.08	99.84	99.61	99.46	99.22	99.15	98.91	98.68
12	129.10	100.08	99.92	99.77	99.54	99.30	99.07	98.84	98.68	98.45
13	126.40	100.16	100.00	99.84	99.53	99.29	99.13	99.05	98.81	98.58
14	128.40	100.08	99.92	99.77	99.53	99.38	99.14	98.91	98.68	98.44
15	128.30	100.23	100.08	99.84	99.53	99.45	99.30	99.06	98.91	98.75
16	128.10	100.08	99.92	99.69	99.53	99.38	99.14	98.91	98.75	98.52
17	128.70	100.08	99.77	99.46	99.15	98.83	98.52	98.21	97.90	97.59
18	124.60	100.16	99.84	99.52	99.20	98.88	98.56	98.23	97.91	97.67
19	124.60	100.08	99.84	99.68	99.44	99.20	99.04	98.80	98.56	98.31
20	124.30	100.16	99.92	99.76	99.52	99.28	99.12	98.95	98.79	98.63
21	128.00	100.23	100.08	99.77	99.53	99.30	99.06	98.83	98.59	98.44
22	126.70	100.32	100.08	99.84	99.68	99.45	99.21	99.05	98.90	98.74
23	127.30	100.24	99.92	99.76	99.53	99.37	99.21	99.06	98.90	98.66
24	125.30	100.32	100.08	99.92	99.84	99.60	99.36	99.04	98.88	98.64
25	127.10	100.31	100.08	99.92	99.69	99.53	99.37	99.13	98.90	98.66
Avg.	127.24	100.20	99.97	99.76	99.54	99.34	99.13	98.92	98.71	98.49
Med.	127.30	100.23	99.92	99.77	99.54	99.38	99.21	99.04	98.81	98.62
st dev	2.09	0.09	0.10	0.12	0.15	0.19	0.23	0.27	0.31	0.34
Min.	124.30	100.08	99.77	99.46	99.15	98.83	98.52	98.21	97.90	97.59
Max.	130.80	100.38	100.08	99.92	99.84	99.60	99.37	99.15	98.96	98.85

3.2 Data Set 1, 55°C, 100mA (Forward Voltage)

No.	Forward Voltage (V)									
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	9.023	8.964	8.920	8.985	9.010	8.900	8.968	8.970	8.958	8.968
2	9.001	8.975	8.954	8.986	8.940	8.947	8.970	8.942	8.961	8.965
3	8.911	8.960	8.956	9.001	8.921	9.007	8.902	8.948	8.941	9.006
4	9.048	8.991	8.942	9.005	8.979	8.978	8.908	8.908	8.943	8.966
5	8.920	9.008	9.043	9.001	8.906	8.907	8.937	8.958	9.006	9.048
6	8.905	9.051	8.912	8.984	9.037	8.901	9.039	9.038	9.004	9.038
7	9.026	8.996	8.944	8.972	8.986	8.981	8.907	8.914	8.937	8.940
8	9.001	8.950	8.930	8.936	8.957	8.968	8.908	8.985	8.911	8.936
9	8.878	9.023	8.973	9.002	8.912	9.009	8.981	9.008	9.047	9.023
10	8.969	9.007	8.987	9.007	8.943	8.968	8.914	8.980	8.936	8.938
11	8.920	8.934	8.957	8.976	8.906	8.983	8.991	9.013	8.922	8.928
12	8.971	8.902	9.005	8.922	9.027	8.980	8.915	8.925	8.937	8.956
13	9.002	8.933	8.916	8.925	8.937	8.975	9.005	8.910	8.908	8.977
14	8.944	8.915	8.921	8.940	8.980	8.909	9.013	8.939	8.990	8.995
15	8.904	9.004	8.991	9.008	9.024	8.926	9.030	9.009	9.001	8.915
16	8.889	9.002	8.956	9.008	8.909	8.998	8.938	8.906	9.024	9.004
17	8.932	8.910	9.005	8.926	9.009	9.026	9.037	9.009	9.037	8.907
18	9.007	8.949	8.946	8.954	8.923	8.970	8.995	8.949	8.916	8.980
19	8.999	8.918	8.927	8.939	8.946	8.917	8.921	8.949	8.938	8.928
20	9.020	8.971	8.936	8.942	8.997	8.939	8.959	8.905	8.950	8.999
21	9.010	8.970	8.936	8.919	8.911	8.907	8.962	8.996	8.921	8.961
22	9.009	8.950	8.948	8.979	8.945	8.924	8.984	8.961	8.902	8.961
23	8.893	8.998	9.006	9.005	8.912	8.913	9.002	9.007	9.028	8.959
24	8.986	8.998	8.932	8.978	8.934	8.930	8.903	8.996	8.943	8.999
25	9.021	8.974	8.969	8.910	8.978	8.918	8.928	8.951	8.972	8.940
Avg.	8.968	8.970	8.956	8.968	8.957	8.951	8.961	8.963	8.961	8.969
Med.	8.986	8.971	8.948	8.978	8.945	8.947	8.962	8.958	8.943	8.965
st dev	0.052	0.038	0.034	0.034	0.042	0.039	0.045	0.039	0.044	0.037
Min.	8.878	8.902	8.912	8.910	8.906	8.900	8.902	8.905	8.902	8.907
Max.	9.048	9.051	9.043	9.008	9.037	9.026	9.039	9.038	9.047	9.048

3.3 Data Set 1, 55°C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2604	0.5311	2729	0.0001	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013
2	0.2606	0.5311	2725	0.0001	0.0003	0.0004	0.0006	0.0007	0.0007	0.0008	0.0010	0.0011
3	0.2599	0.5289	2747	0.0001	0.0003	0.0004	0.0004	0.0005	0.0006	0.0006	0.0008	0.0010
4	0.2598	0.5291	2748	0.0001	0.0002	0.0004	0.0004	0.0005	0.0005	0.0005	0.0007	0.0009
5	0.2604	0.5296	2734	0.0003	0.0004	0.0004	0.0005	0.0006	0.0006	0.0007	0.0008	0.0009
6	0.2579	0.5302	2785	0.0001	0.0002	0.0003	0.0005	0.0006	0.0007	0.0007	0.0007	0.0007
7	0.2594	0.5288	2758	0.0001	0.0001	0.0002	0.0004	0.0005	0.0006	0.0006	0.0006	0.0009
8	0.2603	0.5270	2748	0.0003	0.0003	0.0004	0.0005	0.0007	0.0007	0.0007	0.0008	0.0011
9	0.2594	0.5297	2755	0.0001	0.0004	0.0004	0.0005	0.0005	0.0006	0.0008	0.0008	0.0009
10	0.2617	0.5289	2711	0.0002	0.0003	0.0004	0.0004	0.0005	0.0006	0.0008	0.0009	0.0009
11	0.2581	0.5279	2791	0.0003	0.0004	0.0005	0.0006	0.0006	0.0007	0.0008	0.0010	0.0011
12	0.2590	0.5284	2769	0.0001	0.0003	0.0004	0.0004	0.0004	0.0004	0.0006	0.0008	0.0008
13	0.2588	0.5310	2761	0.0001	0.0002	0.0002	0.0004	0.0004	0.0005	0.0007	0.0010	0.0010
14	0.2609	0.5298	2724	0.0001	0.0004	0.0005	0.0006	0.0007	0.0007	0.0008	0.0009	0.0011
15	0.2617	0.5298	2706	0.0001	0.0004	0.0004	0.0006	0.0007	0.0007	0.0008	0.0009	0.0011
16	0.2592	0.5301	2759	0.0001	0.0004	0.0004	0.0004	0.0004	0.0006	0.0007	0.0009	0.0011
17	0.2599	0.5284	2750	0.0002	0.0005	0.0006	0.0006	0.0006	0.0007	0.0008	0.0009	0.0011
18	0.2599	0.5300	2743	0.0002	0.0004	0.0004	0.0005	0.0006	0.0007	0.0007	0.0007	0.0008
19	0.2612	0.5291	2719	0.0001	0.0004	0.0004	0.0005	0.0006	0.0006	0.0007	0.0008	0.0010
20	0.2609	0.5320	2715	0.0001	0.0003	0.0004	0.0006	0.0006	0.0008	0.0010	0.0010	0.0012
21	0.2588	0.5311	2762	0.0001	0.0001	0.0002	0.0002	0.0003	0.0005	0.0007	0.0007	0.0009
22	0.2616	0.5322	2700	0.0002	0.0003	0.0004	0.0006	0.0006	0.0008	0.0009	0.0012	0.0013
23	0.2598	0.5287	2752	0.0002	0.0002	0.0002	0.0004	0.0005	0.0006	0.0006	0.0007	0.0009
24	0.2601	0.5308	2736	0.0001	0.0002	0.0003	0.0003	0.0004	0.0006	0.0006	0.0008	0.0009
25	0.2603	0.5317	2727	0.0001	0.0003	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0012
Avg.	0.2600	0.5298	2742	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
Med.	0.2599	0.5298	2747	0.0001	0.0003	0.0004	0.0005	0.0006	0.0006	0.0007	0.0008	0.0010
st dev	0.0010	0.0013	23	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001
Min.	0.2579	0.5270	2700	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007
Max.	0.2617	0.5322	2791	0.0003	0.0005	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013

3.4 Data Set 2, 85°C, 100mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	124.70	100.08	99.84	99.60	99.44	99.28	98.96	98.64	98.48	98.32
27	124.10	100.16	99.92	99.60	99.36	99.03	98.79	98.63	98.23	97.99
28	129.30	100.08	99.85	99.61	99.38	99.23	98.99	98.84	98.69	98.38
29	126.20	100.08	99.76	99.45	99.21	98.97	98.65	98.42	98.26	98.10
30	128.10	100.08	99.84	99.53	99.22	99.06	98.83	98.67	98.36	98.13
31	127.20	99.92	99.76	99.61	99.37	99.14	98.98	98.74	98.51	98.27
32	129.10	100.15	99.92	99.61	99.23	98.99	98.76	98.53	98.37	98.14
33	130.50	99.92	99.69	99.54	99.23	99.00	98.70	98.54	98.24	98.01
34	128.00	100.23	100.08	99.77	99.61	99.30	98.98	98.67	98.44	98.28
35	125.80	100.08	99.84	99.68	99.44	99.21	98.97	98.81	98.57	98.41
36	129.10	100.23	99.92	99.77	99.54	99.38	99.15	98.84	98.61	98.30
37	124.30	100.24	99.92	99.76	99.60	99.36	99.03	98.79	98.47	98.23
38	128.90	99.92	99.69	99.46	99.22	98.99	98.76	98.45	98.14	97.91
39	127.10	100.24	99.92	99.69	99.53	99.21	98.90	98.74	98.58	98.43
40	124.90	100.08	99.68	99.44	99.28	98.96	98.72	98.48	98.24	98.08
41	128.00	100.16	99.92	99.61	99.30	99.06	98.83	98.67	98.52	98.20
42	123.50	100.16	99.84	99.60	99.35	99.11	98.79	98.54	98.30	97.98
43	131.00	100.23	100.08	99.85	99.62	99.39	99.08	98.85	98.63	98.32
44	124.80	100.24	99.92	99.76	99.60	99.36	99.04	98.80	98.56	98.40
45	127.10	100.08	99.76	99.53	99.29	98.98	98.74	98.43	98.11	97.95
46	126.40	99.92	99.68	99.45	99.21	98.89	98.66	98.42	98.18	97.86
47	126.50	99.92	99.60	99.37	99.05	98.81	98.58	98.26	98.02	97.63
48	125.40	100.08	99.84	99.60	99.28	98.96	98.80	98.48	98.25	98.01
49	129.30	99.92	99.61	99.30	98.99	98.76	98.61	98.38	98.14	97.83
50	124.00	100.32	100.08	99.92	99.60	99.35	99.03	98.71	98.39	98.06
Avg.	126.93	100.10	99.84	99.60	99.36	99.11	98.85	98.61	98.37	98.13
Med.	127.10	100.08	99.84	99.60	99.35	99.06	98.83	98.64	98.37	98.13
st dev	2.15	0.12	0.13	0.15	0.18	0.18	0.16	0.17	0.19	0.21
Min.	123.50	99.92	99.60	99.30	98.99	98.76	98.58	98.26	98.02	97.63
Max.	131.00	100.32	100.08	99.92	99.62	99.39	99.15	98.85	98.69	98.43

3.5 Data Set 2, 85°C, 100mA (Forward Voltage)

No.	Forward Voltage (V)									
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	9.037	8.963	8.910	8.997	8.927	8.949	8.975	8.990	8.918	9.027
27	9.039	8.958	8.913	9.042	8.935	8.911	8.961	8.928	8.993	8.927
28	8.925	8.954	9.031	9.004	9.018	8.952	9.016	8.957	8.917	8.940
29	8.996	8.936	8.976	8.910	8.940	9.017	9.008	8.970	8.945	8.932
30	8.982	8.938	8.972	8.909	8.995	8.902	8.997	8.935	8.967	8.916
31	8.956	8.935	9.006	8.944	8.937	8.925	8.955	8.906	8.924	8.914
32	9.009	8.932	8.954	8.934	8.984	8.984	8.943	8.944	8.945	8.927
33	8.999	8.987	8.953	8.950	8.948	8.987	8.902	8.998	8.952	8.903
34	8.910	9.006	8.996	9.026	9.043	9.009	9.015	8.997	8.911	9.009
35	9.027	8.956	8.984	8.938	8.951	8.934	8.989	8.920	8.998	9.007
36	8.999	8.967	8.956	8.938	8.988	9.004	8.975	8.974	8.922	8.967
37	9.007	8.992	8.903	8.901	8.986	8.922	8.949	8.902	8.979	8.928
38	8.932	8.926	8.924	8.917	8.951	8.924	9.045	8.984	9.018	8.955
39	8.878	8.944	9.018	9.002	8.974	9.006	9.037	9.018	8.976	8.991
40	9.010	8.963	8.918	8.930	8.991	8.911	8.944	8.920	8.918	8.938
41	8.995	8.973	8.977	8.970	8.918	8.930	8.973	8.942	8.916	8.947
42	9.004	9.003	8.924	8.943	8.965	8.980	8.916	8.969	8.917	8.999
43	8.972	8.919	8.958	8.952	8.902	8.903	8.911	8.914	8.982	8.987
44	9.012	9.058	8.970	8.943	8.916	8.987	8.930	8.964	8.953	8.957
45	8.831	8.961	9.038	9.009	8.991	8.927	8.971	8.987	9.033	9.023
46	9.004	9.017	8.948	8.941	8.975	8.925	8.962	8.941	8.980	8.929
47	8.985	8.998	8.913	8.938	8.968	8.938	8.922	8.977	8.996	8.955
48	9.030	9.026	8.981	8.997	8.985	8.927	8.922	8.918	8.980	8.930
49	8.911	9.028	8.932	8.918	8.910	9.042	8.948	9.008	8.944	9.009
50	9.008	9.045	8.927	8.986	8.928	8.918	8.972	8.906	8.920	8.929
Avg.	8.978	8.975	8.959	8.958	8.961	8.953	8.966	8.955	8.956	8.958
Med.	8.999	8.963	8.956	8.943	8.965	8.934	8.962	8.957	8.952	8.947
st dev	0.053	0.039	0.039	0.039	0.035	0.041	0.039	0.035	0.036	0.038
Min.	8.831	8.919	8.903	8.901	8.902	8.902	8.902	8.902	8.911	8.903
Max.	9.039	9.058	9.038	9.042	9.043	9.042	9.045	9.018	9.033	9.027

3.6 Data Set 2, 85°C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	Ohr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2603	0.5312	2730	0.0002	0.0002	0.0003	0.0006	0.0007	0.0007	0.0008	0.0011	0.0012
27	0.2611	0.5311	2713	0.0002	0.0003	0.0004	0.0004	0.0004	0.0005	0.0007	0.0009	0.0012
28	0.2597	0.5291	2752	0.0002	0.0006	0.0006	0.0007	0.0008	0.0009	0.0009	0.0010	0.0012
29	0.2604	0.5273	2745	0.0003	0.0004	0.0005	0.0007	0.0008	0.0008	0.0008	0.0011	0.0013
30	0.2632	0.5306	2673	0.0002	0.0002	0.0002	0.0002	0.0003	0.0005	0.0006	0.0010	0.0015
31	0.2599	0.5285	2750	0.0001	0.0001	0.0002	0.0003	0.0004	0.0004	0.0004	0.0004	0.0010
32	0.2599	0.5295	2746	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0010
33	0.2615	0.5295	2712	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0004	0.0009
34	0.2609	0.5285	2728	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0007
35	0.2597	0.5297	2748	0.0004	0.0004	0.0004	0.0006	0.0006	0.0006	0.0006	0.0006	0.0009
36	0.2588	0.5289	2772	0.0004	0.0004	0.0005	0.0006	0.0007	0.0009	0.0009	0.0011	0.0011
37	0.2605	0.5300	2730	0.0004	0.0006	0.0006	0.0006	0.0008	0.0008	0.0008	0.0011	0.0011
38	0.2588	0.5285	2774	0.0004	0.0005	0.0006	0.0006	0.0007	0.0008	0.0008	0.0010	0.0010
39	0.2595	0.5301	2750	0.0004	0.0005	0.0006	0.0008	0.0008	0.0009	0.0010	0.0011	0.0011
40	0.2596	0.5311	2745	0.0003	0.0004	0.0004	0.0005	0.0005	0.0006	0.0008	0.0011	0.0011
41	0.2617	0.5279	2715	0.0003	0.0004	0.0006	0.0006	0.0007	0.0007	0.0007	0.0011	0.0011
42	0.2597	0.5301	2747	0.0004	0.0004	0.0006	0.0008	0.0008	0.0009	0.0009	0.0011	0.0012
43	0.2578	0.5278	2797	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0012	0.0012
44	0.2587	0.5296	2769	0.0004	0.0004	0.0007	0.0009	0.0010	0.0011	0.0013	0.0016	0.0018
45	0.2605	0.5292	2734	0.0003	0.0004	0.0005	0.0007	0.0008	0.0008	0.0011	0.0013	0.0015
46	0.2603	0.5307	2733	0.0003	0.0004	0.0007	0.0007	0.0008	0.0010	0.0013	0.0015	0.0016
47	0.2599	0.5299	2743	0.0003	0.0004	0.0006	0.0006	0.0009	0.0009	0.0012	0.0014	0.0016
48	0.2614	0.5315	2705	0.0004	0.0004	0.0005	0.0006	0.0009	0.0010	0.0011	0.0014	0.0017
49	0.2603	0.5297	2735	0.0004	0.0005	0.0006	0.0006	0.0008	0.0011	0.0012	0.0014	0.0017
50	0.2603	0.5306	2733	0.0002	0.0004	0.0006	0.0008	0.0009	0.0009	0.0013	0.0016	0.0019
Avg.	0.2602	0.5296	2739	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013
Med.	0.2603	0.5297	2743	0.0003	0.0004	0.0005	0.0006	0.0008	0.0008	0.0008	0.0011	0.0012
st dev	0.0011	0.0011	25	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003
Min.	0.2578	0.5273	2673	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0007
Max.	0.2632	0.5315	2797	0.0004	0.0006	0.0007	0.0009	0.0010	0.0011	0.0013	0.0016	0.0019

3.7 Data Set 3, 105°C, 100mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	124.90	100.16	99.92	99.60	99.36	99.12	98.72	98.48	98.16	97.84
52	130.00	99.92	99.62	99.31	99.08	98.69	98.31	98.00	97.77	97.46
53	127.50	99.84	99.53	99.29	98.90	98.59	98.35	97.96	97.57	97.25
54	124.10	99.92	99.68	99.44	99.11	98.87	98.55	98.23	97.90	97.66
55	125.50	100.16	99.84	99.68	99.44	99.12	98.88	98.57	98.33	98.01
56	123.70	99.84	99.60	99.27	99.03	98.71	98.46	98.06	97.74	97.49
57	131.20	99.85	99.62	99.39	99.09	98.78	98.55	98.25	98.02	97.71
58	127.30	99.92	99.76	99.53	99.21	98.90	98.51	98.19	97.88	97.64
59	125.60	100.16	99.84	99.60	99.20	98.96	98.57	98.17	97.77	97.37
60	125.60	100.08	99.84	99.44	99.20	99.04	98.81	98.65	98.33	97.93
61	127.90	99.92	99.69	99.30	98.91	98.51	98.20	97.89	97.65	97.50
62	129.30	100.08	99.85	99.54	99.30	98.99	98.76	98.45	98.22	97.99
63	128.40	100.16	99.92	99.61	99.30	98.99	98.60	98.36	98.05	97.74
64	123.50	100.08	99.76	99.43	99.19	98.79	98.54	98.30	97.98	97.65
65	127.20	99.84	99.69	99.45	99.21	98.98	98.74	98.43	98.11	97.80
66	126.10	99.92	99.52	99.21	98.97	98.65	98.41	98.18	97.78	97.46
67	123.50	99.92	99.51	99.19	98.95	98.62	98.30	98.14	97.98	97.81
68	122.50	99.92	98.86	99.43	99.18	98.94	98.69	98.45	98.20	97.96
69	128.20	100.08	99.84	99.61	99.38	99.06	98.75	98.36	98.13	97.82
70	125.00	99.92	99.68	99.52	99.20	98.96	98.64	98.40	98.08	97.84
71	125.70	99.92	99.52	99.20	98.89	98.49	98.17	97.93	97.61	97.37
72	128.80	100.16	99.92	99.53	99.22	98.84	98.45	98.06	97.67	97.36
73	126.20	99.84	99.45	99.21	98.97	98.73	98.49	98.18	97.86	97.54
74	128.30	99.84	99.69	99.30	98.99	98.75	98.52	98.21	98.05	97.74
75	123.60	100.08	99.92	99.60	99.27	98.95	98.62	98.30	98.06	97.73
Avg.	126.38	99.98	99.68	99.43	99.14	98.84	98.54	98.25	97.96	97.67
Med.	126.10	99.92	99.69	99.44	99.19	98.87	98.55	98.23	97.98	97.71
st dev	2.28	0.12	0.23	0.15	0.16	0.18	0.19	0.20	0.22	0.21
Min.	122.50	99.84	98.86	99.19	98.89	98.49	98.17	97.89	97.57	97.25
Max.	131.20	100.16	99.92	99.68	99.44	99.12	98.88	98.65	98.33	98.01

3.8 Data Set 3, 105°C, 100mA (Forward Voltage)

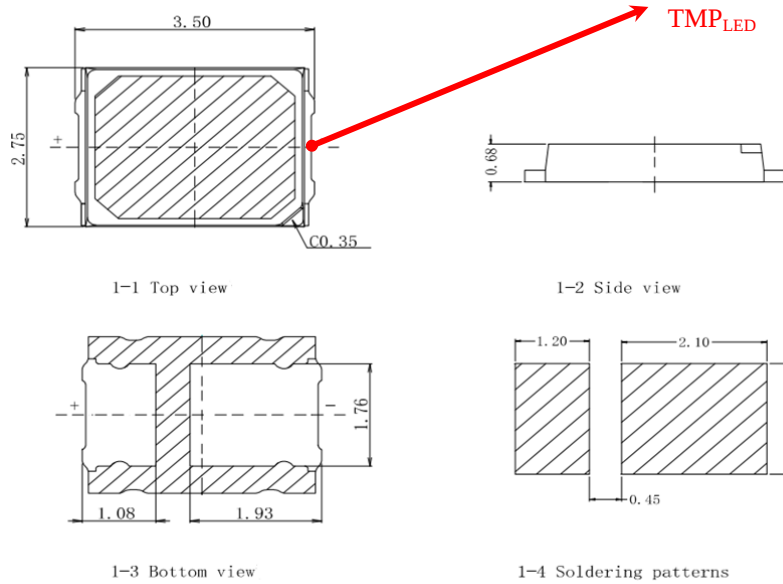
No.	Forward Voltage (V)									
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	9.010	8.910	8.976	8.973	8.997	8.905	8.965	8.959	9.005	9.004
52	8.958	8.902	8.981	8.939	8.911	8.953	8.966	8.904	8.937	8.938
53	9.000	8.991	8.959	8.971	8.963	8.982	8.915	8.965	8.902	8.915
54	9.007	9.001	8.969	8.962	8.917	8.943	9.012	8.983	8.992	8.943
55	9.033	8.983	8.983	8.983	8.978	8.955	8.998	8.934	8.958	8.946
56	8.894	9.007	9.043	8.923	9.009	9.018	8.942	8.906	8.902	9.049
57	9.002	8.938	9.013	8.933	8.984	8.931	8.921	8.916	8.973	8.986
58	8.951	9.004	9.030	8.915	8.943	8.920	8.954	9.012	9.031	8.961
59	8.968	9.054	8.912	8.988	8.992	8.979	8.906	8.903	8.931	8.900
60	9.066	8.930	8.940	8.955	8.974	8.923	8.998	8.917	8.935	8.946
61	8.945	8.910	8.992	8.952	9.015	8.981	9.016	9.018	9.019	8.933
62	8.960	8.911	8.912	8.939	8.906	9.012	8.941	9.015	8.908	9.017
63	9.002	8.926	8.973	9.011	8.938	8.943	8.911	8.933	8.915	8.999
64	9.036	8.947	8.946	8.928	8.961	8.932	8.966	8.909	8.952	8.911
65	8.951	8.988	9.007	9.004	8.935	8.906	8.948	8.913	9.012	9.017
66	9.007	8.951	8.927	8.971	8.929	8.900	8.939	8.948	8.976	8.927
67	9.030	8.932	8.912	8.906	8.986	8.909	8.929	8.904	8.949	8.917
68	8.921	8.990	9.012	9.050	8.913	8.927	8.993	9.012	9.053	9.044
69	8.979	9.016	8.924	8.906	8.958	8.927	8.957	9.014	8.932	8.953
70	9.028	9.053	8.955	9.009	8.909	8.978	9.049	8.913	9.009	8.962
71	8.864	8.973	9.002	9.003	8.977	9.016	8.996	8.986	8.999	8.943
72	8.928	9.050	8.904	9.002	9.044	8.941	9.011	9.012	8.978	8.910
73	8.958	8.945	8.984	9.016	8.991	8.984	8.998	8.934	9.048	9.016
74	9.007	8.993	8.915	8.930	8.921	9.016	8.901	9.018	8.987	9.007
75	9.003	8.907	8.954	8.940	8.991	8.974	8.995	8.976	8.923	8.906
Avg.	8.980	8.968	8.965	8.964	8.962	8.954	8.965	8.956	8.969	8.962
Med.	9.000	8.973	8.969	8.962	8.963	8.943	8.965	8.948	8.973	8.946
st dev	0.048	0.048	0.040	0.039	0.038	0.038	0.040	0.044	0.046	0.045
Min.	8.864	8.902	8.904	8.906	8.906	8.900	8.901	8.903	8.902	8.900
Max.	9.066	9.054	9.043	9.050	9.044	9.018	9.049	9.018	9.053	9.049

3.9 Data Set 3, 105°C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	Ohr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2597	0.5301	2746	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0014
52	0.2592	0.5308	2754	0.0003	0.0005	0.0006	0.0006	0.0007	0.0008	0.0009	0.0011	0.0014
53	0.2590	0.5312	2758	0.0002	0.0005	0.0005	0.0006	0.0007	0.0009	0.0010	0.0011	0.0014
54	0.2635	0.5305	2668	0.0003	0.0006	0.0006	0.0006	0.0008	0.0009	0.0012	0.0014	0.0016
55	0.2619	0.5303	2700	0.0002	0.0004	0.0007	0.0009	0.0009	0.0009	0.0010	0.0012	0.0014
56	0.2612	0.5312	2712	0.0002	0.0005	0.0007	0.0009	0.0009	0.0010	0.0011	0.0011	0.0014
57	0.2578	0.5298	2790	0.0004	0.0005	0.0007	0.0009	0.0010	0.0011	0.0011	0.0012	0.0016
58	0.2609	0.5283	2730	0.0003	0.0004	0.0004	0.0004	0.0005	0.0007	0.0010	0.0011	0.0013
59	0.2627	0.5300	2685	0.0004	0.0006	0.0007	0.0007	0.0007	0.0008	0.0011	0.0013	0.0015
60	0.2583	0.5306	2775	0.0006	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013	0.0016
61	0.2612	0.5285	2722	0.0007	0.0008	0.0009	0.0009	0.0010	0.0011	0.0012	0.0015	0.0017
62	0.2584	0.5297	2777	0.0007	0.0008	0.0009	0.0010	0.0011	0.0011	0.0014	0.0016	0.0017
63	0.2618	0.5302	2703	0.0005	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013	0.0016	0.0018
64	0.2621	0.5302	2698	0.0003	0.0004	0.0005	0.0006	0.0006	0.0008	0.0010	0.0011	0.0015
65	0.2638	0.5309	2659	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0009	0.0013	0.0014
66	0.2598	0.5291	2749	0.0003	0.0003	0.0003	0.0003	0.0004	0.0006	0.0009	0.0012	0.0015
67	0.2607	0.5308	2724	0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0009	0.0012	0.0015
68	0.2605	0.5314	2725	0.0004	0.0005	0.0005	0.0006	0.0006	0.0008	0.0009	0.0013	0.0015
69	0.2595	0.5282	2759	0.0004	0.0006	0.0006	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013
70	0.2622	0.5303	2695	0.0001	0.0002	0.0003	0.0004	0.0006	0.0009	0.0009	0.0011	0.0014
71	0.2596	0.5305	2746	0.0002	0.0004	0.0004	0.0004	0.0004	0.0006	0.0009	0.0011	0.0012
72	0.2596	0.5289	2754	0.0004	0.0007	0.0007	0.0007	0.0007	0.0008	0.0012	0.0013	0.0016
73	0.2626	0.5283	2694	0.0002	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0013	0.0013
74	0.2618	0.5301	2703	0.0002	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0015	0.0015
75	0.2594	0.5295	2756	0.0007	0.0007	0.0007	0.0007	0.0009	0.0010	0.0014	0.0016	0.0017
Avg.	0.2607	0.5300	2727	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013	0.0015
Med.	0.2607	0.5302	2725	0.0003	0.0005	0.0006	0.0006	0.0007	0.0009	0.0010	0.0012	0.0015
st dev	0.0017	0.0010	35	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001
Min.	0.2578	0.5282	2659	0.0001	0.0002	0.0003	0.0003	0.0004	0.0006	0.0009	0.0010	0.0012
Max.	0.2638	0.5314	2790	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012	0.0014	0.0016	0.0018

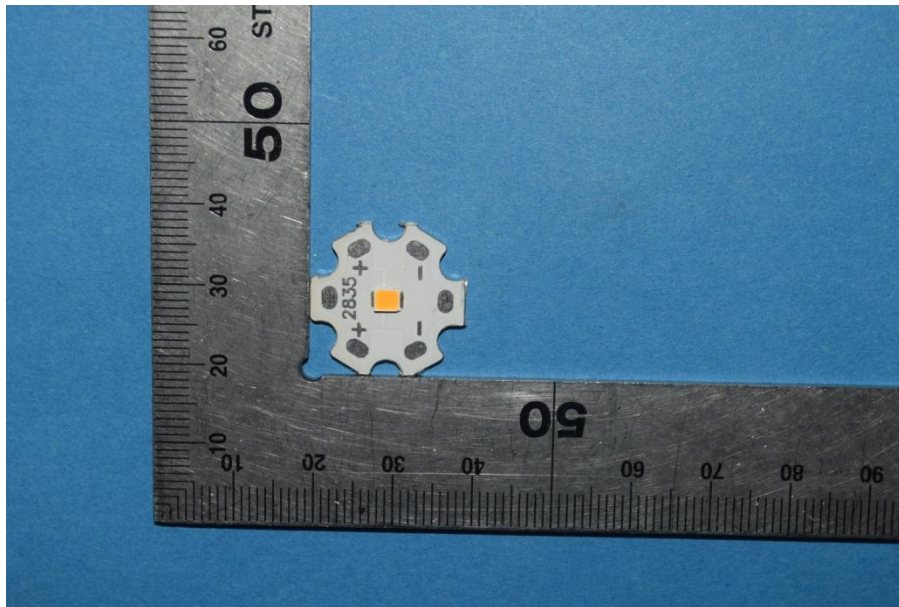
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo





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The NVLAP Lab Code is 200707-0

5 - Report Revision

Report Number	Report Date	Contents
DG3210516-04420E-10-9000	2022-07-27	Original report.
DG3210516-04420E-10-9000-M1	2022-08-31	Add the Reported TM-21 L ₉₀ Lifetime.

Directions

1. The information marked “superscript #” is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. This report includes some test methods are not in NVLAP accreditation scope marked *.
3. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
4. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
5. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor $K=2$ with the 95% confidence interval.
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*****END OF REPORT*****