TEST REPORT

According to ANSI/IES LM-80-15
For

Hongli Zhihui Group Co.,Ltd. Guangzhou Branch

Room 316, Building 2, No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China

#Model: HL-AS-2835HW-3C-S1-08L-PCT-HR5

Report Type: 9000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	Pote Wang
Report Number:	RSZ181103501-10-9000
Test Date:	2018-11-05 to 2019-11-30
Report Date:	2019-12-09
Reviewed By:	Bill Xiong / EE Engineer
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:

50 PCS samples were received on 2018-11-03. The samples were numbered from 1 to 25 and 26 to 50.

#Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
#Part Number:	HL-AS-2835HW-3C-S1-08L-PCT-HR5
#Part Type:	LED Package
#Drive Level:	DC 100mA
#Nominal CCT:	2700K
#Power:	1 W
#Average Current Density per LED die:	620.001mA/mm2
#Average Power Density per LED die:	2.067 W/mm2
#CRI:	90
#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:

Model name	CRI	CCT (K)	Series	Parallel	Power density (W/mm^2)	Current density per LED die (mA/mm^2)	Current per die (mA)	Distance between of dies(mm)	Current (mA)
HL-AS-2835HW-3C-S1-08L-PCT-HR5	90	2700K	3	1	0.1021	620.00	100	0.15	100
HL-AS-2835HW-3C-S1-08L-PCT-HR5(R9)	90	2700K	3	1	0.1021	620.00	100	0.15	100
HL-AS-2835HW-3C-S1-08-PCT-HR5	90	2700K	3	1	0.1021	620.00	100	0.15	100
HL-AS-2835HW-3C-S1-08-PCT-HR5(R9)	90	2700K	3	1	0.1021	620.00	100	0.15	100
HL-AS-2835DW-3C-S1-08L-PCT-HR5	90	2700K	3	1	0.1021	620.00	100	0.15	100
HL-AS-2835DW-3C-S1-08L-PCT-HR5(R9)	90	2700K	3	1	0.1021	620.00	100	0.15	100
HL-AS-2835DW-3C-S1-08-PCT-HR5	90	2700K	3	1	0.1021	620.00	100	0.15	100
HL-AS-2835DW-3C-S1-08-PCT-HR5(R9)	90	2700K	3	1	0.1021	620.00	100	0.15	100
HL-AS-2835HW-2C-S1-08L-PCT-HR5	90	2700K	2	1	0.1021	605.47	150	0.15	150
HL-AS-2835HW-2C-S1-08L-PCT-HR5(R9)	90	2700K	2	1	0.1021	605.47	150	0.15	150

Model name	CRI	CCT (K)	Series	Parallel	Power density (W/mm^2)	Current density per LED die (mA/mm^2)	Current per die (mA)	Distance between of dies(mm)	Current (mA)
HL-AS-2835HW-2C-S1-08-PCT-HR5	90	2700K	2	1	0.1021	605.47	150	0.15	150
HL-AS-2835HW-2C-S1-08-PCT-HR5(R9)	90	2700K	2	1	0.1021	605.47	150	0.15	150
HL-AS-2835DW-2C-S1-08L-PCT-HR5	90	2700K	2	1	0.1021	605.47	150	0.15	150
HL-AS-2835DW-2C-S1-08L-PCT-HR5(R9)	90	2700K	2	1	0.1021	605.47	150	0.15	150
HL-AS-2835DW-2C-S1-08-PCT-HR5	90	2700K	2	1	0.1021	605.47	150	0.15	150
HL-AS-2835DW-2C-S1-08-PCT-HR5(R9)	90	2700K	2	1	0.1021	605.47	150	0.15	150
HL-AS-2835HW-S1-08L-PCT-HR5	90	2700K	1	1	0.0204	620.00	60	/	60
HL-AS-2835HW-S1-08L-PCT-HR5(R9)	90	2700K	1	1	0.0204	620.00	60	/	60
HL-AS-2835HW-S1-08-PCT-HR5	90	2700K	1	1	0.0204	620.00	60	/	60
HL-AS-2835HW-S1-08-PCT-HR5(R9)	90	2700K	1	1	0.0204	620.00	60	/	60
HL-AS-2835DW-S1-08L-PCT-HR5	90	2700K	1	1	0.0510	605.47	150	/	150
HL-AS-2835DW-S1-08L-PCT-HR5(R9)	90	2700K	1	1	0.0510	605.47	150	/	150
HL-AS-2835DW-S1-08-PCT-HR5	90	2700K	1	1	0.0510	605.47	150	/	150
HL-AS-2835DW-S1-08-PCT-HR5(R9)	90	2700K	1	1	0.0510	605.47	150	/	150
HL-A-2835DW-2-S1-08L-HR5	90	2700K	1	2	0.0510	445.40	75	0.15	150
HL-A-2835DW-2-S1-08L-HR5(R9)	90	2700K	1	2	0.0510	445.40	75	0.15	150
HL-A-2835DW-2-S1-08-HR5	90	2700K	1	2	0.0510	445.40	75	0.15	150
HL-A-2835DW-2-S1-08-HR5(R9)	90	2700K	1	2	0.0510	445.40	75	0.15	150
HL-A-2835DW-2-S1-08L-HR5	90	2700K	1	2	0.0204	178.16	30	0.15	60
HL-A-2835DW-2-S1-08L-HR5(R9)	90	2700K	1	2	0.0204	178.16	30	0.15	60
HL-A-2835DW-2-S1-08-HR5	90	2700K	1	2	0.0204	178.16	30	0.15	60
HL-A-2835DW-2-S1-08-HR5(R9)	90	2700K	1	2	0.0204	178.16	30	0.15	60
HL-A-2835HW-2-S1-08L-HR5	90	2700K	1	2	0.0204	387.50	30	0.15	60
HL-A-2835HW-2-S1-08L-HR5(R9)	90	2700K	1	2	0.0204	387.50	30	0.15	60
HL-A-2835HW-2-S1-08-HR5	90	2700K	1	2	0.0204	387.50	30	0.15	60
HL-A-2835HW-2-S1-08-HR5(R9)	90	2700K	1	2	0.0204	387.50	30	0.15	60
HL-A-2835DW-S1-08L-HR5	90	2700K	1	1	0.0510	620.00	150	/	150

Model name	CRI	CCT (K)	Series	Parallel	Power density (W/mm^2)	Current density per LED die (mA/mm^2)	Current per die (mA)	Distance between of dies(mm)	Current (mA)
HL-A-2835DW-S1-08L-HR5(R9)	90	2700K	1	1	0.0510	620.00	150	/	150
HL-A-2835DW-S1-08-HR5	90	2700K	1	1	0.0510	620.00	150	/	150
HL-A-2835DW-S1-08-HR5(R9)	90	2700K	1	1	0.0510	620.00	150	/	150
HL-A-2835HW-S1-08L-HR5	90	2700K	1	1	0.0204	620.00	60	/	60
HL-A-2835HW-S1-08L-HR5(R9)	90	2700K	1	1	0.0204	620.00	60	/	60
HL-A-2835HW-S1-08-HR5	90	2700K	1	1	0.0204	620.00	60	/	60
HL-A-2835HW-S1-08-HR5(R9)	90	2700K	1	1	0.0204	620.00	60	/	60
SL-*D2835FTA-31KA*	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-31KA*H	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-31KA*-**	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-31KA*-***	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-31KA*-*	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-31KA*H-*	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-31KA*H-**	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-31KA*H-***	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-31KA*/*	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-31KA*H/*	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-**D2835FTA-31KA****-APH***	90	2700K	3	1	0.1021	620.00	100	0.15	100
SL-*D2835FTA-21EA*	90	2700K	2	1	0.1021	605.47	150	0.15	150
SL-*D2835FTA-21EA*H	90	2700K	2	1	0.1021	605.47	150	0.15	150
SL-*D2835FTA-11KC*	90	2700K	1	1	0.1021	469.7	100	/	100
SL-*D2835FTA-11KC*H	90	2700K	1	1	0.1021	469.7	100	/	100
SL-*D2835FTA-11CA*	90	2700K	1	1	0.0204	620.00	60	/	60
SL-*D2835FTA-11CA*H	90	2700K	1	1	0.0204	620.00	60	/	60
SL-*D2835FTA-11EA*	90	2700K	1	1	0.0510	605.47	150	/	150
SL-*D2835FTA-11EA*H	90	2700K	1	1	0.0510	605.47	150	/	150

Note:

a. The testes model has the greatest number of LED dies. and,

b. Minimum die edge of die edge spacing of the family models is greater than or equal to that of the tested LED package; and,

c. the family models' electrical power density (i.e. W/mm^2 of PCB or substrate total area, or equivalent calculation) less than or equal to the tested LED package; and,

d. average current density per LED die (i.e. mA/mm2 of epitaxial structures) less than or equal to the tested LED package; and,

e. identical materials used (note: this does not constrain phosphor quantity and/or dimensional adjustments); and,

f. identical construction processes used;

g. The first * is the letters I, N, W representing CCT. I means less than 3700K; N means 3700-4700K;

W For more than 4700K. The second * is different product solutions (color coordination and application, special solutions, etc.).The third * and the fourth * and the fifth * are different version numbers.

h. The first and second * of SL-**D2835FTA-31KA****-APH*** is a numbers 27, 30,40,50,65, which stand for CCT. Number. From three to six * is a different product solution (Color coordinate and applications and special solution etc…). From seven to nine * is different version numbers.

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
- 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	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	2019-03-18	2020-03-17
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2019-03-26	2020-03-25
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2019-03-18	2020-03-17
Standard Light Source	EVERFINE	D062	G100278CJ7351206	2018-12-24	2019-12-24
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2019-03-26	2020-03-25
Multilayer aging machine	BACL	B2-270	20023	2019-03-13	2020-03-12
DC Power Supply	BACL	B12001-12	90023	2018-12-17	2019-12-17

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. (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: 85°C, 100mA

Part Number:	HL-AS-2835HW-3C-S1-08L-PCT-HR5
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	100mA
Measurement Current:	100mA

Data Set 2: 105°C, 100mA

Part Number:	HL-AS-2835HW-3C-S1-08L-PCT-HR5
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
1	25	0	1000hrs	9000hrs	2.595E-06	1.004	>54000hrs
2	25	0	1000hrs	9000hrs	3.572E-06	1.005	>54000hrs

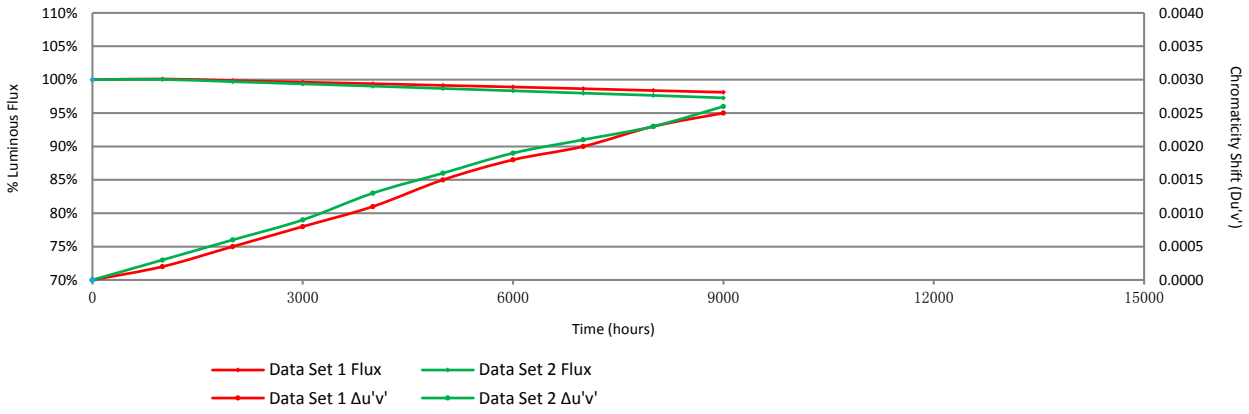
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	100.11%	99.87%	99.63%	99.40%	99.15%	98.91%	98.65%	98.38%	98.12%
2	100.03%	99.70%	99.37%	99.03%	98.68%	98.33%	97.98%	97.64%	97.27%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.0002	0.0005	0.0008	0.0011	0.0015	0.0018	0.0020	0.0023	0.0025
2	0.0003	0.0006	0.0009	0.0013	0.0016	0.0019	0.0021	0.0023	0.0026

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 85°C, 100mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	112.1	100.09	99.82	99.55	99.29	99.11	98.93	98.57	98.31	98.13
2	111.9	100.09	99.73	99.29	99.20	98.93	98.66	98.48	98.12	97.77
3	111.1	100.09	99.82	99.55	99.28	98.92	98.56	98.20	97.84	97.66
4	114.1	100.18	99.74	99.39	99.30	98.95	98.69	98.25	97.72	97.46
5	110.9	100.09	99.73	99.55	99.37	99.19	98.83	98.56	98.20	97.84
6	111.4	100.09	99.91	99.64	99.37	99.10	98.83	98.74	98.56	98.38
7	112.3	100.09	99.82	99.73	99.29	99.11	98.93	98.58	98.13	97.77
8	106.0	100.19	100.00	99.72	99.43	99.15	99.06	98.87	98.58	98.30
9	109.1	99.82	99.54	99.27	99.18	98.72	98.53	98.08	97.89	97.80
10	108.3	100.28	100.09	99.82	99.54	99.35	99.17	98.89	98.71	98.34
11	116.6	100.09	100.00	99.83	99.57	99.40	98.97	98.63	98.28	97.86
12	113.7	100.26	100.09	99.91	99.74	99.56	99.38	99.30	99.12	99.03
13	111.3	100.09	99.73	99.64	99.46	99.28	99.01	98.83	98.56	98.29
14	111.1	100.00	99.73	99.55	99.28	99.01	98.74	98.29	97.84	97.57
15	115.1	99.83	99.74	99.39	99.13	98.96	98.70	98.61	98.35	98.09
16	105.6	100.19	99.91	99.72	99.43	99.15	98.86	98.58	98.30	97.92
17	108.9	100.18	100.09	99.72	99.36	99.17	98.90	98.62	98.35	98.16
18	108.4	100.37	100.18	100.09	100.00	99.82	99.63	99.45	99.26	98.99
19	110.5	100.18	99.82	99.55	99.37	99.19	99.00	98.91	98.73	98.46
20	108.5	100.28	100.00	99.72	99.63	99.54	99.45	99.26	98.89	98.71
21	117.0	100.17	100.09	100.00	99.57	99.32	99.15	98.89	98.63	98.29
22	115.8	100.09	99.83	99.57	99.31	99.05	98.88	98.53	98.36	98.19
23	111.6	100.00	99.82	99.55	99.28	98.84	98.48	98.30	98.21	97.85
24	113.1	100.09	99.91	99.73	99.47	99.20	98.94	98.67	98.59	98.32
25	113.3	100.00	99.65	99.29	99.12	98.76	98.41	98.15	98.06	97.88
Avg.	111.5	100.11	99.87	99.63	99.40	99.15	98.91	98.65	98.38	98.12
Med.	111.4	100.09	99.82	99.64	99.37	99.15	98.90	98.61	98.35	98.13
st dev	3.0	0.13	0.16	0.21	0.20	0.26	0.30	0.35	0.39	0.40
Min.	105.6	99.82	99.54	99.27	99.12	98.72	98.41	98.08	97.72	97.46
Max.	117.0	100.37	100.18	100.09	100.00	99.82	99.63	99.45	99.26	99.03

3.2 Data Set 1, 85°C, 100mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	9.313	9.264	9.256	9.252	9.255	9.254	9.273	9.268	9.264	9.257
2	9.260	9.223	9.217	9.217	9.220	9.212	9.231	9.220	9.224	9.219
3	9.259	9.226	9.219	9.219	9.220	9.215	9.226	9.226	9.220	9.220
4	9.268	9.246	9.247	9.240	9.239	9.229	9.266	9.247	9.245	9.247
5	9.252	9.225	9.219	9.220	9.221	9.214	9.236	9.226	9.228	9.224
6	9.276	9.243	9.244	9.238	9.232	9.230	9.246	9.243	9.246	9.240
7	9.260	9.247	9.243	9.238	9.246	9.230	9.254	9.245	9.259	9.251
8	9.134	9.108	9.114	9.108	9.106	9.100	9.116	9.107	9.111	9.110
9	9.234	9.218	9.217	9.213	9.216	9.207	9.214	9.220	9.221	9.213
10	9.302	9.290	9.289	9.308	9.287	9.278	9.301	9.288	9.294	9.287
11	9.265	9.248	9.246	9.254	9.244	9.236	9.245	9.243	9.241	9.242
12	9.318	9.304	9.298	9.306	9.301	9.290	9.300	9.306	9.309	9.297
13	9.300	9.279	9.282	9.282	9.287	9.267	9.296	9.278	9.284	9.277
14	9.318	9.302	9.299	9.299	9.294	9.286	9.294	9.303	9.300	9.296
15	9.290	9.275	9.271	9.269	9.270	9.261	9.284	9.275	9.278	9.271
16	9.117	9.097	9.088	9.102	9.092	9.087	9.099	9.100	9.099	9.093
17	9.250	9.237	9.229	9.238	9.238	9.223	9.234	9.239	9.239	9.230
18	9.158	9.143	9.134	9.140	9.143	9.137	9.153	9.144	9.144	9.142
19	9.132	9.127	9.126	9.129	9.130	9.131	9.131	9.130	9.130	9.124
20	9.166	9.162	9.168	9.174	9.170	9.162	9.171	9.159	9.168	9.157
21	9.260	9.296	9.291	9.295	9.291	9.290	9.295	9.297	9.297	9.295
22	9.268	9.250	9.247	9.257	9.247	9.246	9.253	9.253	9.248	9.250
23	9.260	9.238	9.230	9.232	9.231	9.229	9.228	9.233	9.230	9.227
24	9.287	9.282	9.262	9.267	9.271	9.259	9.268	9.272	9.265	9.257
25	9.300	9.274	9.265	9.270	9.273	9.267	9.273	9.276	9.265	9.271
Avg.	9.250	9.232	9.228	9.231	9.229	9.222	9.235	9.232	9.232	9.228
Med.	9.260	9.246	9.244	9.238	9.239	9.230	9.246	9.243	9.245	9.242
st dev	0.060	0.060	0.059	0.059	0.058	0.057	0.059	0.059	0.059	0.059
Min.	9.117	9.097	9.088	9.102	9.092	9.087	9.099	9.100	9.099	9.093
Max.	9.318	9.304	9.299	9.308	9.301	9.290	9.301	9.306	9.309	9.297

3.3 Data Set 1, 85°C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2620	0.5239	2726	0.0001	0.0004	0.0007	0.0011	0.0017	0.0019	0.0023	0.0025	0.0028
2	0.2612	0.5207	2757	0.0001	0.0002	0.0009	0.0012	0.0013	0.0016	0.0017	0.0022	0.0028
3	0.2624	0.5213	2728	0.0002	0.0004	0.0005	0.0008	0.0013	0.0015	0.0017	0.0021	0.0025
4	0.2606	0.5238	2755	0.0001	0.0003	0.0003	0.0007	0.0011	0.0013	0.0016	0.0021	0.0023
5	0.2580	0.5210	2826	0.0001	0.0002	0.0003	0.0004	0.0009	0.0011	0.0013	0.0016	0.0017
6	0.2617	0.5224	2738	0.0006	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017	0.0019	0.0020
7	0.2626	0.5262	2703	0.0002	0.0004	0.0008	0.0011	0.0013	0.0016	0.0019	0.0021	0.0024
8	0.2599	0.5206	2786	0.0002	0.0001	0.0004	0.0006	0.0009	0.0015	0.0021	0.0022	0.0025
9	0.2622	0.5218	2730	0.0004	0.0007	0.0008	0.0010	0.0011	0.0013	0.0016	0.0021	0.0026
10	0.2631	0.5230	2706	0.0003	0.0004	0.0010	0.0013	0.0015	0.0018	0.0019	0.0023	0.0026
11	0.2563	0.5236	2851	0.0002	0.0006	0.0013	0.0017	0.0023	0.0026	0.0029	0.0032	0.0033
12	0.2628	0.5281	2691	0.0002	0.0005	0.0009	0.0013	0.0018	0.0021	0.0023	0.0027	0.0027
13	0.2648	0.5239	2666	0.0002	0.0004	0.0009	0.0014	0.0016	0.0019	0.0022	0.0026	0.0028
14	0.2627	0.5218	2719	0.0002	0.0004	0.0008	0.0011	0.0017	0.0020	0.0023	0.0026	0.0029
15	0.2582	0.5264	2796	0.0002	0.0002	0.0006	0.0009	0.0011	0.0015	0.0018	0.0022	0.0025
16	0.2605	0.5194	2778	0.0001	0.0001	0.0001	0.0002	0.0004	0.0005	0.0006	0.0005	0.0006
17	0.2599	0.5213	2782	0.0003	0.0006	0.0009	0.0010	0.0011	0.0012	0.0014	0.0015	0.0016
18	0.2606	0.5225	2760	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017	0.0019	0.0020	0.0021
19	0.2614	0.5242	2737	0.0003	0.0006	0.0010	0.0016	0.0020	0.0027	0.0029	0.0034	0.0036
20	0.2601	0.5237	2767	0.0001	0.0002	0.0002	0.0004	0.0009	0.0011	0.0013	0.0015	0.0017
21	0.2580	0.5250	2806	0.0003	0.0009	0.0014	0.0020	0.0027	0.0031	0.0026	0.0028	0.0034
22	0.2592	0.5244	2782	0.0004	0.0008	0.0012	0.0016	0.0017	0.0018	0.0019	0.0021	0.0023
23	0.2625	0.5232	2716	0.0002	0.0005	0.0011	0.0015	0.0019	0.0022	0.0024	0.0027	0.0030
24	0.2615	0.5263	2726	0.0004	0.0008	0.0009	0.0015	0.0019	0.0023	0.0026	0.0030	0.0036
25	0.2594	0.5229	2786	0.0002	0.0007	0.0013	0.0017	0.0018	0.0021	0.0026	0.0028	0.0032
Avg.	0.2609	0.5233	2753	0.0002	0.0005	0.0008	0.0011	0.0015	0.0018	0.0020	0.0023	0.0025
Med.	0.2612	0.5232	2755	0.0002	0.0004	0.0009	0.0011	0.0014	0.0017	0.0019	0.0022	0.0026
st dev	0.0020	0.0021	44	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0006	0.0006	0.0007
Min.	0.2563	0.5194	2666	0.0001	0.0001	0.0001	0.0002	0.0004	0.0005	0.0006	0.0005	0.0006
Max.	0.2648	0.5281	2851	0.0006	0.0009	0.0014	0.0020	0.0027	0.0031	0.0029	0.0034	0.0036

3.4 Data Set 2, 105°C, 100mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	109.3	100.09	100.00	99.73	99.54	99.09	98.90	98.63	98.17	97.80
27	103.7	100.10	99.81	99.52	99.13	98.75	98.46	98.07	97.59	97.20
28	110.1	100.00	99.64	99.18	98.82	98.37	98.00	97.73	97.37	97.00
29	98.9	100.15	99.73	99.25	99.02	98.75	98.55	98.28	97.99	97.69
30	106.6	99.91	99.62	99.44	99.06	98.69	98.50	98.22	97.94	97.56
31	111.6	99.91	99.55	99.28	98.92	98.48	98.03	97.67	97.31	96.95
32	112.4	100.18	99.73	99.38	99.11	98.84	98.40	97.78	97.60	97.06
33	111.8	99.82	99.55	99.46	99.11	98.84	98.57	98.30	97.94	97.76
34	111.5	100.09	99.91	99.46	99.10	98.92	98.65	98.30	98.03	97.76
35	113.7	99.82	99.30	98.86	98.68	98.24	97.80	97.45	97.10	96.57
36	109.5	100.18	99.82	99.54	99.27	99.00	98.81	98.72	98.54	98.17
37	108.6	99.91	99.54	99.17	98.80	98.34	97.97	97.61	97.24	96.96
38	109.5	100.18	99.82	99.45	99.00	98.63	98.17	97.81	97.35	96.99
39	111.3	100.18	99.73	99.46	99.19	98.74	98.20	97.84	97.39	96.86
40	111.2	100.18	99.64	99.28	98.83	98.56	98.20	97.66	97.48	97.12
41	112.5	100.00	99.91	99.82	99.47	99.20	98.93	98.84	98.49	98.22
42	109.0	99.82	99.45	99.08	98.72	98.35	97.98	97.61	97.34	96.97
43	109.6	99.91	99.54	99.00	98.81	98.45	97.99	97.72	97.35	96.90
44	114.3	100.17	99.65	99.21	98.78	98.34	97.99	97.64	97.20	96.85
45	117.0	100.26	99.91	99.57	99.15	98.89	98.46	97.95	97.78	97.35
46	105.2	100.19	99.90	99.71	99.43	99.24	98.86	98.57	98.10	98.00
47	109.3	99.91	99.36	98.90	98.35	97.99	97.62	97.07	96.71	96.34
48	107.7	100.09	100.00	99.72	99.26	98.89	98.42	97.96	97.59	97.21
49	110.7	99.73	99.64	99.37	99.01	98.64	98.28	97.92	97.56	97.20
50	110.3	100.00	99.64	99.27	99.09	98.73	98.55	98.10	97.82	97.28
Avg.	109.8	100.03	99.70	99.37	99.03	98.68	98.33	97.98	97.64	97.27
Med.	110.1	100.09	99.65	99.38	99.06	98.73	98.40	97.92	97.59	97.20
st dev	3.6	0.15	0.19	0.25	0.27	0.31	0.36	0.43	0.44	0.49
Min.	98.9	99.73	99.30	98.86	98.35	97.99	97.62	97.07	96.71	96.34
Max.	117.0	100.26	100.00	99.82	99.54	99.24	98.93	98.84	98.54	98.22

3.5 Data Set 2, 105°C, 100mA (Forward Voltage)

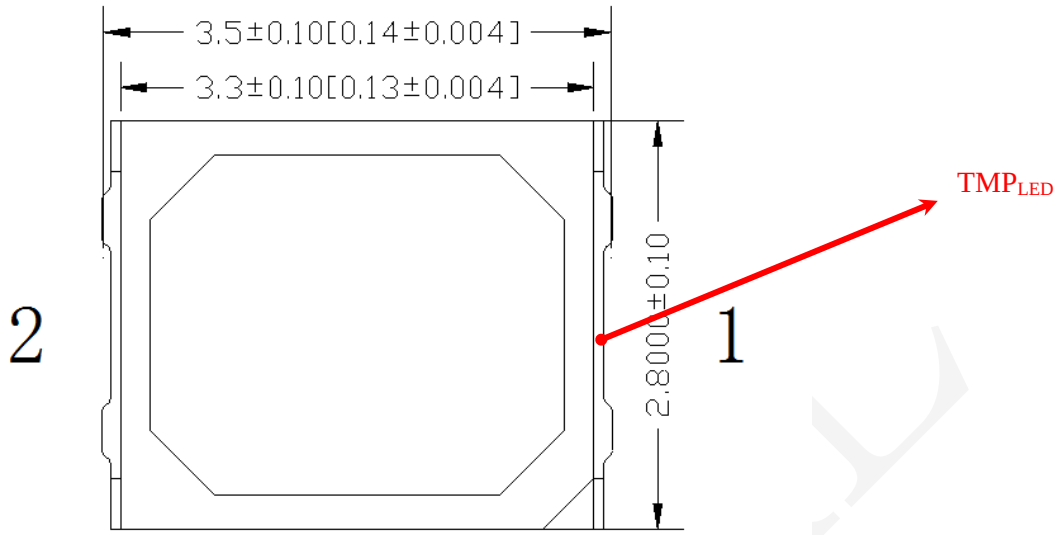
No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	9.289	9.276	9.267	9.269	9.269	9.267	9.276	9.262	9.270	9.273
27	9.133	9.120	9.109	9.112	9.116	9.114	9.119	9.112	9.111	9.115
28	9.262	9.254	9.248	9.254	9.249	9.249	9.257	9.262	9.254	9.262
29	8.992	8.995	9.005	9.012	9.025	9.030	9.037	9.034	9.034	9.041
30	9.139	9.132	9.112	9.107	9.107	9.114	9.114	9.106	9.105	9.111
31	9.260	9.224	9.239	9.226	9.222	9.224	9.225	9.225	9.220	9.225
32	9.328	9.304	9.300	9.299	9.294	9.297	9.311	9.296	9.296	9.297
33	9.264	9.236	9.241	9.233	9.228	9.233	9.241	9.239	9.236	9.240
34	9.266	9.253	9.261	9.261	9.255	9.260	9.276	9.262	9.255	9.273
35	9.292	9.257	9.263	9.259	9.264	9.260	9.268	9.264	9.264	9.267
36	9.209	9.182	9.180	9.178	9.181	9.173	9.184	9.183	9.189	9.185
37	9.219	9.193	9.192	9.194	9.196	9.193	9.203	9.202	9.198	9.212
38	9.193	9.168	9.171	9.167	9.169	9.165	9.183	9.175	9.178	9.181
39	9.267	9.249	9.253	9.245	9.244	9.240	9.252	9.243	9.247	9.274
40	9.240	9.245	9.227	9.225	9.216	9.222	9.232	9.223	9.224	9.264
41	9.198	9.180	9.179	9.182	9.172	9.178	9.183	9.161	9.162	9.178
42	9.260	9.233	9.236	9.234	9.233	9.226	9.233	9.237	9.233	9.249
43	9.275	9.259	9.255	9.254	9.248	9.247	9.251	9.253	9.253	9.254
44	9.198	9.180	9.179	9.175	9.173	9.172	9.175	9.180	9.177	9.220
45	9.266	9.237	9.243	9.246	9.238	9.234	9.242	9.241	9.243	9.259
46	9.195	9.182	9.181	9.186	9.183	9.179	9.178	9.176	9.171	9.193
47	9.220	9.175	9.180	9.179	9.173	9.175	9.171	9.181	9.178	9.312
48	9.156	9.121	9.127	9.128	9.124	9.125	9.125	9.124	9.129	9.163
49	9.334	9.311	9.313	9.309	9.313	9.304	9.317	9.318	9.310	9.381
50	9.316	9.285	9.286	9.288	9.287	9.284	9.292	9.293	9.289	9.308
Avg.	9.231	9.210	9.210	9.209	9.207	9.207	9.214	9.210	9.209	9.229
Med.	9.260	9.233	9.236	9.226	9.222	9.224	9.232	9.225	9.224	9.249
st dev	0.074	0.070	0.070	0.069	0.067	0.065	0.068	0.067	0.066	0.073
Min.	8.992	8.995	9.005	9.012	9.025	9.030	9.037	9.034	9.034	9.041
Max.	9.334	9.311	9.313	9.309	9.313	9.304	9.317	9.318	9.310	9.381

3.6 Data Set 2, 105°C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2617	0.5234	2734	0.0001	0.0003	0.0007	0.0011	0.0011	0.0014	0.0016	0.0019	0.0021
27	0.2603	0.5191	2784	0.0001	0.0004	0.0004	0.0005	0.0004	0.0005	0.0006	0.0007	0.0009
28	0.2579	0.5229	2819	0.0005	0.0009	0.0012	0.0013	0.0014	0.0015	0.0016	0.0017	0.0019
29	0.2589	0.5171	2826	0.0002	0.0004	0.0005	0.0008	0.0010	0.0012	0.0015	0.0016	0.0017
30	0.2629	0.5215	2716	0.0004	0.0006	0.0013	0.0017	0.0024	0.0032	0.0029	0.0031	0.0035
31	0.2605	0.5240	2757	0.0004	0.0006	0.0012	0.0019	0.0027	0.0033	0.0027	0.0030	0.0033
32	0.2608	0.5242	2749	0.0002	0.0007	0.0011	0.0018	0.0021	0.0028	0.0032	0.0034	0.0036
33	0.2599	0.5245	2767	0.0004	0.0007	0.0011	0.0016	0.0019	0.0025	0.0030	0.0033	0.0036
34	0.2603	0.5235	2763	0.0003	0.0007	0.0011	0.0014	0.0024	0.0031	0.0027	0.0029	0.0032
35	0.2597	0.5216	2786	0.0002	0.0003	0.0005	0.0009	0.0011	0.0016	0.0019	0.0022	0.0025
36	0.2596	0.5195	2798	0.0002	0.0004	0.0006	0.0011	0.0011	0.0013	0.0015	0.0018	0.0021
37	0.2612	0.5207	2756	0.0004	0.0006	0.0008	0.0008	0.0011	0.0012	0.0014	0.0016	0.0017
38	0.2601	0.5229	2771	0.0005	0.0010	0.0012	0.0015	0.0019	0.0021	0.0022	0.0024	0.0025
39	0.2581	0.5231	2813	0.0002	0.0009	0.0010	0.0015	0.0019	0.0019	0.0021	0.0023	0.0028
40	0.2591	0.5207	2801	0.0003	0.0007	0.0013	0.0016	0.0021	0.0023	0.0025	0.0026	0.0027
41	0.2610	0.5217	2756	0.0003	0.0001	0.0009	0.0016	0.0022	0.0025	0.0027	0.0030	0.0032
42	0.2655	0.5232	2655	0.0002	0.0004	0.0003	0.0006	0.0009	0.0016	0.0017	0.0017	0.0019
43	0.2611	0.5235	2745	0.0001	0.0006	0.0007	0.0008	0.0010	0.0011	0.0012	0.0013	0.0016
44	0.2575	0.5195	2845	0.0004	0.0010	0.0015	0.0018	0.0021	0.0025	0.0028	0.0030	0.0032
45	0.2552	0.5198	2898	0.0002	0.0008	0.0014	0.0018	0.0023	0.0026	0.0029	0.0032	0.0035
46	0.2627	0.5234	2712	0.0002	0.0004	0.0008	0.0012	0.0015	0.0019	0.0025	0.0027	0.0036
47	0.2620	0.5209	2737	0.0001	0.0003	0.0005	0.0006	0.0005	0.0007	0.0011	0.0015	0.0020
48	0.2643	0.5247	2674	0.0002	0.0006	0.0011	0.0013	0.0015	0.0019	0.0020	0.0021	0.0023
49	0.2596	0.5224	2785	0.0001	0.0005	0.0008	0.0012	0.0016	0.0019	0.0022	0.0023	0.0025
50	0.2597	0.5209	2787	0.0003	0.0006	0.0007	0.0009	0.0013	0.0017	0.0020	0.0024	0.0028
Avg.	0.2604	0.5219	2769	0.0003	0.0006	0.0009	0.0013	0.0016	0.0019	0.0021	0.0023	0.0026
Med.	0.2603	0.5224	2767	0.0002	0.0006	0.0009	0.0013	0.0015	0.0019	0.0021	0.0023	0.0025
st dev	0.0022	0.0019	52	0.0001	0.0002	0.0003	0.0004	0.0006	0.0008	0.0007	0.0007	0.0008
Min.	0.2552	0.5171	2655	0.0001	0.0001	0.0003	0.0005	0.0004	0.0005	0.0006	0.0007	0.0009
Max.	0.2655	0.5247	2898	0.0005	0.0010	0.0015	0.0019	0.0027	0.0033	0.0032	0.0034	0.0036

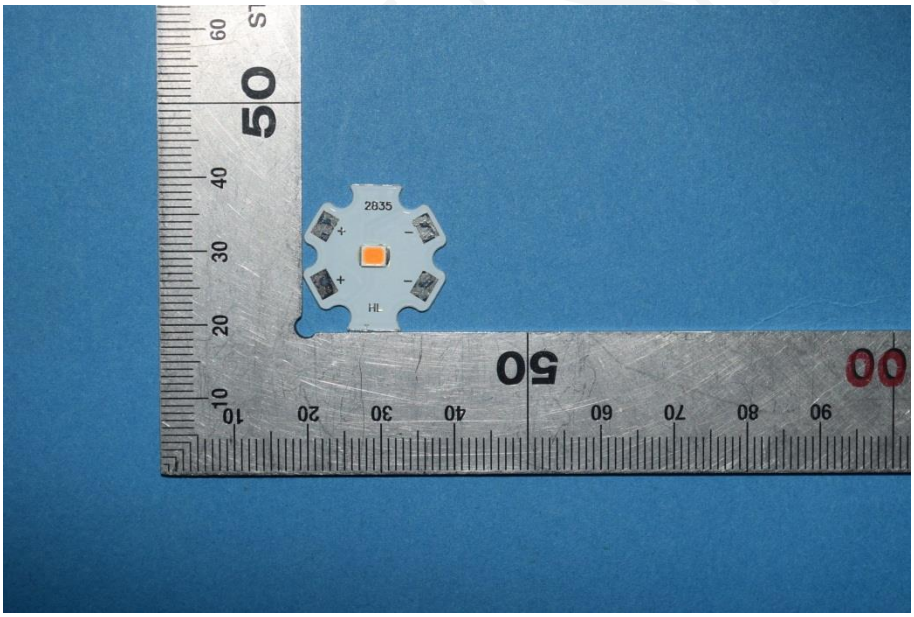
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo



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