



TEST REPORT

ACCORDING TO IES LM-80-2015
For

Hongli Zhihui Group Co.,Ltd.

No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China

Model: HL-LM003H384W-20B10C12(Ra5)

Report Type: 7000 Hours Test Report		Product Type: LED Array	
Test Engineer:	Pote Wang <i>Pote Wang</i>		
Report Number:	RSZ160329510-10-7000		
Test Date:	2016-04-05 to 2017-01-21		
Report Date:	2017-02-10		
Reviewed By:	Daniel Duan / EE Manager <i>Daniel Duan</i>		
Test Facility:	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.		
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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 Bay Area Compliance Laboratories Corp. (Dongguan).

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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

40 PCS samples were received on 2016-03-29. The samples were numbered from 1 to 20 and 21 to 40.

Manufacturer: Hongli Zhihui Group Co.,Ltd.
Part Number: HL-LM003H384W-20B10C12(Ra5)
Part Type: LED Array
Drive Level: DC 1200mA
Nominal CCT: 2700K

Family products covered by this report:

According to ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products, the following products can be covered by this report base on the declaration letter of manufacturer. The information of these models shows that the covered products meet all section 3 item 7 requirements of ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products (September 9, 2011)

Model name	CCT (typ.)	Series	Parallel	Number of Dies	Power density (W/mm ²)	Distance between of dies (mm)	Current per die (mA)
HL-LM003H384W-20B10C12(Ra5)	2700K	12	10	120	0.1245	0.24	120
	3000K	12	10	120	0.1245	0.24	120
	3500K	12	10	120	0.1245	0.24	120
	4000K	12	10	120	0.1245	0.24	120
	5000K	12	10	120	0.1245	0.24	120
	5700K	12	10	120	0.1245	0.24	120
	6000K	12	10	120	0.1245	0.24	120
	6500K	12	10	120	0.1245	0.24	120
HL-LM003H384W-17B8C12(Ra5)	2700K	12	8	96	0.0998	0.45	120
	3000K	12	8	96	0.0998	0.45	120
	3500K	12	8	96	0.0998	0.45	120
	4000K	12	8	96	0.0998	0.45	120
	5000K	12	8	96	0.0998	0.45	120
	5700K	12	8	96	0.0998	0.45	120
	6000K	12	8	96	0.0998	0.45	120
	6500K	12	8	96	0.0998	0.45	120
HL-LM003H384W-15B7C12(Ra5)	2700K	12	7	84	0.0873	0.57	120
	3000K	12	7	84	0.0873	0.57	120
	3500K	12	7	84	0.0873	0.57	120
	4000K	12	7	84	0.0873	0.57	120
	5000K	12	7	84	0.0873	0.57	120
	5700K	12	7	84	0.0873	0.57	120
	6000K	12	7	84	0.0873	0.57	120
	6500K	12	7	84	0.0873	0.57	120

Model name	CCT (typ.)	Series	Parallel	Number of Dies	Power density (W/mm ²)	Distance between of dies (mm)	Current per die (mA)
HL-LM003H384W-13B6C12(Ra5)	2700K	12	6	72	0.0748	0.84	120
	3000K	12	6	72	0.0748	0.84	120
	3500K	12	6	72	0.0748	0.84	120
	4000K	12	6	72	0.0748	0.84	120
	5000K	12	6	72	0.0748	0.84	120
	5700K	12	6	72	0.0748	0.84	120
	6000K	12	6	72	0.0748	0.84	120
	6500K	12	6	72	0.0748	0.84	120
HL-LM003H384W-11B5C12(Ra5)	2700K	12	5	60	0.0624	0.93	120
	3000K	12	5	60	0.0624	0.93	120
	3500K	12	5	60	0.0624	0.93	120
	4000K	12	5	60	0.0624	0.93	120
	5000K	12	5	60	0.0624	0.93	120
	5700K	12	5	60	0.0624	0.93	120
	6000K	12	5	60	0.0624	0.93	120
	6500K	12	5	60	0.0624	0.93	120
HL-LM003H384W-9B4C12(Ra5)	2700K	12	4	48	0.0499	0.93	120
	3000K	12	4	48	0.0499	0.93	120
	3500K	12	4	48	0.0499	0.93	120
	4000K	12	4	48	0.0499	0.93	120
	5000K	12	4	48	0.0499	0.93	120
	5700K	12	4	48	0.0499	0.93	120
	6000K	12	4	48	0.0499	0.93	120
	6500K	12	4	48	0.0499	0.93	120
HL-LM003H384W-15B3C24(Ra5)	2700K	24	3	72	0.0748	0.76	120
	3000K	24	3	72	0.0748	0.76	120
	3500K	24	3	72	0.0748	0.76	120
	4000K	24	3	72	0.0748	0.76	120
	5000K	24	3	72	0.0748	0.76	120
	5700K	24	3	72	0.0748	0.76	120
	6000K	24	3	72	0.0748	0.76	120
	6500K	24	3	72	0.0748	0.76	120
HL-LM003H384W-18B3C28(Ra5)	2700K	28	3	84	0.0873	0.57	120
	3000K	28	3	84	0.0873	0.57	120
	3500K	28	3	84	0.0873	0.57	120
	4000K	28	3	84	0.0873	0.57	120
	5000K	28	3	84	0.0873	0.57	120
	5700K	28	3	84	0.0873	0.57	120
	6000K	28	3	84	0.0873	0.57	120
	6500K	28	3	84	0.0873	0.57	120
HL-LM003H384W-20B1C40(Ra5)	2700K	40	1	40	0.0416	0.89	120
	3000K	40	1	40	0.0416	0.89	120

Model name	CCT (typ.)	Series	Parallel	Number of Dies	Power density (W/mm ²)	Distance between of dies (mm)	Current per die (mA)
	3500K	40	1	40	0.0416	0.89	120
	4000K	40	1	40	0.0416	0.89	120
	5000K	40	1	40	0.0416	0.89	120
	5700K	40	1	40	0.0416	0.89	120
	6000K	40	1	40	0.0416	0.89	120
	6500K	40	1	40	0.0416	0.89	120
HL-LM003H384W-20B2C20(Ra5)	2700K	20	2	40	0.0416	0.89	120
	3000K	20	2	40	0.0416	0.89	120
	3500K	20	2	40	0.0416	0.89	120
	4000K	20	2	40	0.0416	0.89	120
	5000K	20	2	40	0.0416	0.89	120
	5700K	20	2	40	0.0416	0.89	120
	6000K	20	2	40	0.0416	0.89	120
	6500K	20	2	40	0.0416	0.89	120
HL-LM003H384W-24B2C24(Ra5)	2700K	24	2	48	0.0499	1.02	120
	3000K	24	2	48	0.0499	1.02	120
	3500K	24	2	48	0.0499	1.02	120
	4000K	24	2	48	0.0499	1.02	120
	5000K	24	2	48	0.0499	1.02	120
	5700K	24	2	48	0.0499	1.02	120
	6000K	24	2	48	0.0499	1.02	120
	6500K	24	2	48	0.0499	1.02	120
HL-LM003H384W-24B2C25(Ra5)	2700K	25	2	50	0.0520	1.02	120
	3000K	25	2	50	0.0520	1.02	120
	3500K	25	2	50	0.0520	1.02	120
	4000K	25	2	50	0.0520	1.02	120
	5000K	25	2	50	0.0520	1.02	120
	5700K	25	2	50	0.0520	1.02	120
	6000K	25	2	50	0.0520	1.02	120
	6500K	25	2	50	0.0520	1.02	120
HL-LM003H384W-30B2C30(Ra5)	2700K	30	2	60	0.0624	0.83	120
	3000K	30	2	60	0.0624	0.83	120
	3500K	30	2	60	0.0624	0.83	120
	4000K	30	2	60	0.0624	0.83	120
	5000K	30	2	60	0.0624	0.83	120
	5700K	30	2	60	0.0624	0.83	120
	6000K	30	2	60	0.0624	0.83	120
	6500K	30	2	60	0.0624	0.83	120
HL-LM003H384W-30B2C32(Ra5)	2700K	32	2	64	0.0665	0.50	120
	3000K	32	2	64	0.0665	0.50	120
	3500K	32	2	64	0.0665	0.50	120
	4000K	32	2	64	0.0665	0.50	120

Model name	CCT (typ.)	Series	Parallel	Number of Dies	Power density (W/mm ²)	Distance between of dies (mm)	Current per die (mA)
	5000K	32	2	64	0.0665	0.50	120
	5700K	32	2	64	0.0665	0.50	120
	6000K	32	2	64	0.0665	0.50	120
	6500K	32	2	64	0.0665	0.50	120
HL-LM003H384W-35B2C35(Ra5)	2700K	35	2	70	0.0728	0.81	120
	3000K	35	2	70	0.0728	0.81	120
	3500K	35	2	70	0.0728	0.81	120
	4000K	35	2	70	0.0728	0.81	120
	5000K	35	2	70	0.0728	0.81	120
	5700K	35	2	70	0.0728	0.81	120
	6000K	35	2	70	0.0728	0.81	120
HL-LM003H384W-36B2C36(Ra5)	2700K	36	2	72	0.0748	0.79	120
	3000K	36	2	72	0.0748	0.79	120
	3500K	36	2	72	0.0748	0.79	120
	4000K	36	2	72	0.0748	0.79	120
	5000K	36	2	72	0.0748	0.79	120
	5700K	36	2	72	0.0748	0.79	120
	6000K	36	2	72	0.0748	0.79	120
HL-LM003H384W-40B2C40(Ra5)	2700K	40	2	80	0.0832	0.68	120
	3000K	40	2	80	0.0832	0.68	120
	3500K	40	2	80	0.0832	0.68	120
	4000K	40	2	80	0.0832	0.68	120
	5000K	40	2	80	0.0832	0.68	120
	5700K	40	2	80	0.0832	0.68	120
	6000K	40	2	80	0.0832	0.68	120
HL-LM003D87W-16B12C8(Ra5)	2700K	8	12	96	0.0998	0.24	120
	3000K	8	12	96	0.0998	0.24	120
	3500K	8	12	96	0.0998	0.24	120
	4000K	8	12	96	0.0998	0.24	120
	5000K	8	12	96	0.0998	0.24	120
	5700K	8	12	96	0.0998	0.24	120
	6000K	8	12	96	0.0998	0.24	120
HL-LM003D94W-24B10C12(Ra5)	2700K	12	10	120	0.1245	0.24	120
	3000K	12	10	120	0.1245	0.24	120
	3500K	12	10	120	0.1245	0.24	120
	4000K	12	10	120	0.1245	0.24	120
	5000K	12	10	120	0.1245	0.24	120
	5700K	12	10	120	0.1245	0.24	120

Model name	CCT (typ.)	Series	Parallel	Number of Dies	Power density (W/mm ²)	Distance between of dies (mm)	Current per die (mA)
	6000K	12	10	120	0.1245	0.24	120
	6500K	12	10	120	0.1245	0.24	120
HL-LM066D42W-12B3C12(Ra5)	2700K	12	3	36	0.0427	0.37	120
	3000K	12	3	36	0.0427	0.37	120
	3500K	12	3	36	0.0427	0.37	120
	4000K	12	3	36	0.0427	0.37	120
	5000K	12	3	36	0.0427	0.37	120
	5700K	12	3	36	0.0427	0.37	120
	6000K	12	3	36	0.0427	0.37	120
	6500K	12	3	36	0.0427	0.36	120
HL-LM066D94W-12B3C12(Ra5)	2700K	12	3	36	0.0427	0.36	120
	3000K	12	3	36	0.0427	0.36	120
	3500K	12	3	36	0.0427	0.36	120
	4000K	12	3	36	0.0427	0.36	120
	5000K	12	3	36	0.0427	0.36	120
	5700K	12	3	36	0.0427	0.36	120
	6000K	12	3	36	0.0427	0.36	120
	6500K	12	3	36	0.0427	0.36	120
HL-LM066D42W-18B4C12(Ra5)	2700K	12	4	48	0.0569	0.27	120
	3000K	12	4	48	0.0569	0.27	120
	3500K	12	4	48	0.0569	0.27	120
	4000K	12	4	48	0.0569	0.27	120
	5000K	12	4	48	0.0569	0.27	120
	5700K	12	4	48	0.0569	0.27	120
	6000K	12	4	48	0.0569	0.27	120
	6500K	12	4	48	0.0569	0.27	120
HL-LM066D94W-18B4C12(Ra5)	2700K	12	4	48	0.0569	0.26	120
	3000K	12	4	48	0.0569	0.26	120
	3500K	12	4	48	0.0569	0.26	120
	4000K	12	4	48	0.0569	0.26	120
	5000K	12	4	48	0.0569	0.26	120
	5700K	12	4	48	0.0569	0.26	120
	6000K	12	4	48	0.0569	0.26	120
	6500K	12	4	48	0.0569	0.26	120
HL-LM067D42W-24B5C12(Ra5)	2700K	12	5	60	0.0711	0.31	120
	3000K	12	5	60	0.0711	0.31	120
	3500K	12	5	60	0.0711	0.31	120
	4000K	12	5	60	0.0711	0.31	120
	5000K	12	5	60	0.0711	0.31	120
	5700K	12	5	60	0.0711	0.31	120
	6000K	12	5	60	0.0711	0.31	120
	6500K	12	5	60	0.0711	0.31	120

Model name	CCT (typ.)	Series	Parallel	Number of Dies	Power density (W/mm ²)	Distance between of dies (mm)	Current per die (mA)
HL-LM067D94W-24B5C12(Ra5)	2700K	12	5	60	0.0711	0.30	120
	3000K	12	5	60	0.0711	0.30	120
	3500K	12	5	60	0.0711	0.30	120
	4000K	12	5	60	0.0711	0.30	120
	5000K	12	5	60	0.0711	0.30	120
	5700K	12	5	60	0.0711	0.30	120
	6000K	12	5	60	0.0711	0.30	120
	6500K	12	5	60	0.0711	0.30	120
HL-LM068D42W-24B5C12(Ra5)	2700K	12	5	60	0.0450	0.50	120
	3000K	12	5	60	0.0450	0.50	120
	3500K	12	5	60	0.0450	0.50	120
	4000K	12	5	60	0.0450	0.50	120
	5000K	12	5	60	0.0450	0.50	120
	5700K	12	5	60	0.0450	0.50	120
	6000K	12	5	60	0.0450	0.50	120
	6500K	12	5	60	0.0450	0.50	120
HL-LM068D94W-24B5C12(Ra5)	2700K	12	5	60	0.0450	0.49	120
	3000K	12	5	60	0.0450	0.49	120
	3500K	12	5	60	0.0450	0.49	120
	4000K	12	5	60	0.0450	0.49	120
	5000K	12	5	60	0.0450	0.49	120
	5700K	12	5	60	0.0450	0.49	120
	6000K	12	5	60	0.0450	0.49	120
	6500K	12	5	60	0.0450	0.49	120
HL-LM068D42W-32B8C12(Ra5)	2700K	12	8	96	0.0720	0.27	120
	3000K	12	8	96	0.0720	0.27	120
	3500K	12	8	96	0.0720	0.27	120
	4000K	12	8	96	0.0720	0.27	120
	5000K	12	8	96	0.0720	0.27	120
	5700K	12	8	96	0.0720	0.27	120
	6000K	12	8	96	0.0720	0.27	120
	6500K	12	8	96	0.0720	0.27	120
HL-LM068D94W-32B8C12(Ra5)	2700K	12	8	96	0.0720	0.26	120
	3000K	12	8	96	0.0720	0.26	120
	3500K	12	8	96	0.0720	0.26	120
	4000K	12	8	96	0.0720	0.26	120
	5000K	12	8	96	0.0720	0.26	120
	5700K	12	8	96	0.0720	0.26	120
	6000K	12	8	96	0.0720	0.26	120
	6500K	12	8	96	0.0720	0.26	120
HL-LM069D42W-32B8C12(Ra5)	2700K	12	8	96	0.0720	0.40	120
	3000K	12	8	96	0.0720	0.40	120

Model name	CCT (typ.)	Series	Parallel	Number of Dies	Power density (W/mm ²)	Distance between of dies (mm)	Current per die (mA)
	3500K	12	8	96	0.0720	0.40	120
	4000K	12	8	96	0.0720	0.40	120
	5000K	12	8	96	0.0720	0.40	120
	5700K	12	8	96	0.0720	0.40	120
	6000K	12	8	96	0.0720	0.40	120
	6500K	12	8	96	0.0720	0.40	120
HL-LM069D94W-32B8C12(Ra5)	2700K	12	8	96	0.0720	0.39	120
	3000K	12	8	96	0.0720	0.39	120
	3500K	12	8	96	0.0720	0.39	120
	4000K	12	8	96	0.0720	0.39	120
	5000K	12	8	96	0.0720	0.39	120
	5700K	12	8	96	0.0720	0.39	120
	6000K	12	8	96	0.0720	0.39	120
	6500K	12	8	96	0.0720	0.39	120

Disclaimer:

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

1.2 Standards Used:

- IESNA LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- ENERGY STAR® Program Guidance Regarding LED Array, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products(This test method was not accredited by IAS)

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
1.0m integrating sphere	SENSING	SCD-20008	N/A	N/A	2016-07-11	2017-07-10
spectroradiometer	SENSING	SCD-20008	N/A	N/A	2016-07-11	2017-07-10
DC Power Supply	Hanshenpuyan	HSPY-100-05	2013010210003	N/A	2016-05-18	2017-05-17
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-12
Multilayer aging machine	BACL	B2-270	20015	25°C~110°C	2016-03-04	2017-03-03
Adjustable constant-current DC switching power supply	GUTE	DK-60V20A	120 5036	1200W	2016-08-29	2017-08-29
DC Power Supply	BACL	B12001-12	90023	0~120V	2016-12-21	2017-12-20

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 $\pm 3\%$ of the specified value of the manufacturer during maintenance test, and was within $\pm 0.5\%$ 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 $\pm 3\%$ 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 $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, RH $< 65\%$.

1.6 Measurement Uncertainty

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 $U=21\text{K}$ ($K=2$), at the 95% confidence level.

The uncertainty of the temperature is $U=0.8671^{\circ}\text{C}$ ($K=2$), 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 , 1200mA

Part Number: HL-LM003H384W-20B10C12(Ra5)

Number of Units: 20

Case Temperature: $> 83^{\circ}\text{C}$

Ambient Temperature: >80°C
Life Test Drive Current: 1200mA
Measurement Current: 1200mA

Data Set 2: 105°C,1200mA

Part Number: HL-LM003H384W-20B10C12(Ra5)
Number of Units: 20
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 1200mA
Measurement Current: 1200mA

FINAL

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	Reported TM-21 L ₇₀ Lifetime
1	20	0	1000	7000	>42000 hours
2	20	0	1000	7000	>42000 hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000
1	99.61%	99.18%	98.78%	98.30%	97.93%	97.55%	96.90%
2	99.45%	98.92%	98.37%	97.81%	97.36%	96.89%	96.06%

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000
1	0.0012	0.0014	0.0017	0.0020	0.0021	0.0022	0.0024
2	0.0012	0.0016	0.0019	0.0023	0.0023	0.0026	0.0028

3 - Test Data

3.1 Data Set 1, 85°C, 1200mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	3914.64	99.37	99.23	98.83	98.47	98.22	97.73	97.02
2	3898.70	99.77	99.21	98.97	98.36	97.86	97.41	96.73
3	3935.88	99.68	99.24	98.59	98.10	97.64	97.34	96.63
4	3946.51	99.61	99.32	98.96	98.50	98.10	97.64	97.00
5	3925.26	99.61	99.31	99.00	98.56	98.16	97.69	97.03
6	3919.95	99.47	99.00	98.49	98.13	97.73	97.25	96.67
7	3882.77	99.72	99.36	98.94	98.43	98.07	98.04	97.32
8	3904.01	99.46	98.92	98.40	97.96	97.68	97.08	96.44
9	3909.33	99.85	99.37	99.01	98.49	98.24	98.03	97.43
10	3925.26	99.75	99.11	98.60	98.11	97.60	97.04	96.33
11	3872.14	99.91	99.22	98.77	98.24	97.85	97.22	96.58
12	3957.13	99.61	98.97	98.46	97.94	97.69	97.29	96.61
13	3909.33	99.58	99.42	99.07	98.71	98.40	98.18	97.60
14	3909.33	99.34	98.89	98.34	97.89	97.44	97.01	96.39
15	3893.39	99.60	99.06	98.59	98.19	97.81	97.69	97.07
16	3930.57	99.49	99.12	98.63	98.13	97.76	97.65	97.07
17	3824.34	99.88	99.42	99.23	98.55	98.27	98.15	97.56
18	3930.57	99.78	99.31	99.07	98.52	98.07	97.79	97.17
19	3930.57	99.24	99.12	98.87	98.34	97.91	97.50	96.79
20	3930.57	99.51	99.07	98.68	98.31	98.02	97.36	96.59
Ave.	3912.51	99.61	99.18	98.78	98.30	97.93	97.55	96.90
Med.	3917.30	99.61	99.21	98.80	98.32	97.89	97.57	96.90
st dev	29.3166	0.1857	0.1636	0.2549	0.2335	0.2613	0.3644	0.3843
Min.	3824.34	99.24	98.89	98.34	97.89	97.44	97.01	96.33
Max.	3957.13	99.91	99.42	99.23	98.71	98.40	98.18	97.60

TM-21 Projection:

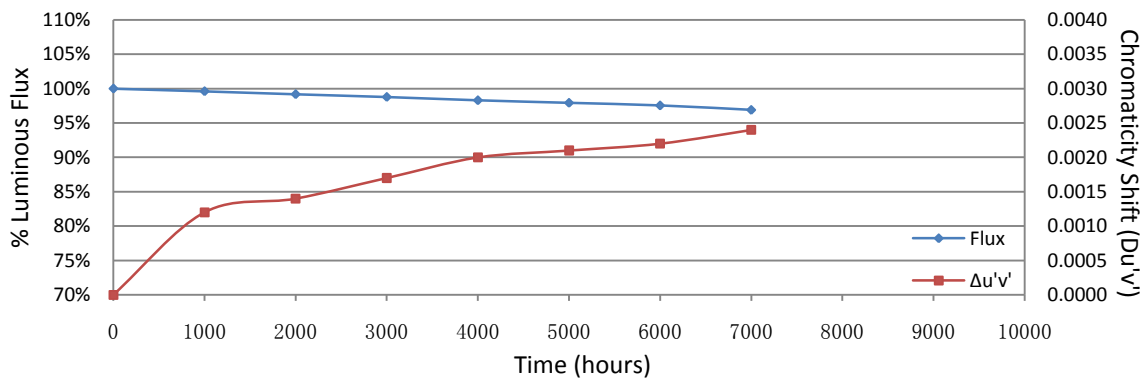
Test Duration: 7000 hours
Failures Observed: 0
 α : 4.504E-06
 β : 1.001
Reported L₇₀: >42000 hours

3.2 Data Set 1, 85°C, 1200mA (Forward Voltage)

No.	Forward Voltage (V)							
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	36.65	37.03	36.70	36.98	36.75	36.34	36.94	36.96
2	36.72	36.87	36.59	37.00	36.46	36.32	37.68	36.76
3	36.35	36.82	36.47	36.70	36.59	36.14	36.96	36.56
4	36.91	36.81	36.48	37.24	36.05	36.68	37.04	36.41
5	36.70	36.80	36.47	37.03	36.24	36.52	37.05	36.26
6	36.67	36.76	36.47	36.96	36.27	36.28	37.02	36.14
7	36.69	36.70	36.45	36.94	36.21	36.52	37.38	36.02
8	36.71	36.72	36.45	36.98	36.19	36.58	37.29	35.90
9	36.60	36.73	36.47	36.86	36.34	36.39	37.40	35.80
10	36.69	36.80	36.47	37.02	36.25	36.57	37.47	37.59
11	36.58	36.66	36.47	36.77	36.36	36.51	37.25	37.50
12	36.69	36.80	36.46	37.03	36.23	37.02	37.31	36.79
13	36.45	36.68	36.41	36.72	36.37	36.25	36.73	36.56
14	36.50	36.68	36.37	36.81	36.24	36.72	37.13	36.40
15	36.56	36.66	36.36	36.86	36.16	36.45	37.36	36.25
16	36.69	36.74	36.36	37.07	36.03	36.81	37.00	36.12
17	36.58	36.63	36.35	36.86	36.12	36.29	37.35	35.99
18	36.49	36.87	36.37	36.99	36.25	36.24	36.93	35.88
19	36.84	36.83	36.37	37.30	35.90	36.58	37.16	35.80
20	36.48	36.83	36.37	36.94	36.26	36.30	37.16	35.77
Ave.	36.63	36.77	36.45	36.95	36.26	36.48	37.18	36.37
Med.	36.66	36.78	36.46	36.97	36.25	36.48	37.16	36.26
st dev	0.1335	0.0950	0.0854	0.1516	0.1896	0.2199	0.2279	0.5329
Min.	36.35	36.63	36.35	36.70	35.90	36.14	36.73	35.77
Max.	36.91	37.03	36.70	37.30	36.75	37.02	37.68	37.59

3.3 Data Set 1, 85°C, 1200mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)						
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2605	0.5261	2748	0.0013	0.0016	0.0018	0.0020	0.0017	0.0015	0.0017
2	0.2610	0.5268	2734	0.0008	0.0010	0.0011	0.0013	0.0018	0.0022	0.0028
3	0.2598	0.5267	2760	0.0010	0.0013	0.0016	0.0018	0.0019	0.0021	0.0025
4	0.2602	0.5254	2756	0.0014	0.0016	0.0018	0.0021	0.0018	0.0022	0.0028
5	0.2601	0.5263	2754	0.0009	0.0014	0.0017	0.0021	0.0017	0.0020	0.0018
6	0.2605	0.5262	2746	0.0012	0.0015	0.0016	0.0017	0.0017	0.0020	0.0019
7	0.2617	0.5263	2720	0.0010	0.0014	0.0018	0.0022	0.0028	0.0021	0.0023
8	0.2629	0.5286	2688	0.0008	0.0010	0.0015	0.0019	0.0025	0.0027	0.0026
9	0.2609	0.5263	2738	0.0018	0.0022	0.0026	0.0030	0.0024	0.0025	0.0024
10	0.2600	0.5266	2756	0.0009	0.0010	0.0011	0.0012	0.0015	0.0023	0.0024
11	0.2620	0.5267	2714	0.0013	0.0016	0.0020	0.0024	0.0027	0.0031	0.0036
12	0.2594	0.5263	2770	0.0012	0.0015	0.0018	0.0021	0.0026	0.0001	0.0002
13	0.2612	0.5277	2726	0.0008	0.0011	0.0014	0.0017	0.0020	0.0025	0.0028
14	0.2602	0.5259	2754	0.0016	0.0019	0.0020	0.0021	0.0025	0.0030	0.0034
15	0.2609	0.5262	2738	0.0013	0.0014	0.0019	0.0024	0.0027	0.0035	0.0034
16	0.2605	0.5264	2746	0.0014	0.0018	0.0020	0.0022	0.0028	0.0009	0.0014
17	0.2637	0.5267	2678	0.0006	0.0008	0.0011	0.0015	0.0016	0.0021	0.0023
18	0.2605	0.5267	2746	0.0012	0.0013	0.0012	0.0012	0.0017	0.0020	0.0025
19	0.2596	0.5254	2770	0.0015	0.0018	0.0018	0.0019	0.0016	0.0021	0.0024
20	0.2602	0.5264	2752	0.0011	0.0014	0.0018	0.0023	0.0028	0.0029	0.0032
Ave.	0.2608	0.5265	2740	0.0012	0.0014	0.0017	0.0020	0.0021	0.0022	0.0024
Med.	0.2605	0.5264	2746	0.0012	0.0014	0.0018	0.0021	0.0019	0.0022	0.0025
st dev	0.0011	0.0007	24.3680	0.0003	0.0004	0.0004	0.0004	0.0005	0.0008	0.0008
Min.	0.2594	0.5254	2678	0.0006	0.0008	0.0011	0.0012	0.0015	0.0001	0.0002
Max.	0.2637	0.5286	2770	0.0018	0.0022	0.0026	0.0030	0.0028	0.0035	0.0036



3.4 Data Set 2, 105°C, 1200mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
21	3925.26	99.39	98.82	98.14	97.60	97.11	96.69	95.92
22	3909.33	98.82	98.36	97.83	97.47	96.96	96.37	95.48
23	3866.83	99.48	98.90	98.26	97.55	97.09	96.72	95.85
24	3872.14	99.63	99.20	98.63	98.01	97.79	97.16	96.29
25	3957.13	99.65	99.16	98.65	98.13	97.82	97.10	96.40
26	3893.39	99.59	99.04	98.54	98.10	97.69	96.97	96.10
27	3893.39	99.58	98.82	98.34	97.67	97.25	96.55	95.66
28	3888.08	99.43	98.76	98.18	97.57	97.19	96.82	95.87
29	3919.95	99.18	98.67	98.11	97.54	97.12	96.88	96.23
30	3893.39	99.44	99.06	98.58	98.01	97.43	97.28	96.47
31	3919.95	99.32	98.77	98.29	97.79	97.38	97.05	96.33
32	3935.88	99.48	99.03	98.67	98.12	97.72	97.67	96.84
33	3904.01	99.73	99.36	98.90	98.23	97.82	97.79	96.97
34	3888.08	99.57	99.10	98.51	97.92	97.34	97.05	96.22
35	3877.46	99.01	98.31	97.69	97.08	96.62	96.16	95.20
36	3909.33	99.32	98.78	98.18	97.68	97.25	96.80	95.99
37	3877.46	99.86	99.32	98.94	98.40	98.05	97.17	96.32
38	3909.33	99.74	99.13	98.57	97.98	97.38	96.66	95.70
39	3925.26	99.53	98.78	98.13	97.59	97.11	96.41	95.59
40	3872.14	99.35	98.98	98.33	97.73	97.14	96.52	95.75
Ave.	3901.89	99.45	98.92	98.37	97.81	97.36	96.89	96.06
Med.	3898.70	99.48	98.94	98.34	97.76	97.30	96.85	96.05
st dev	23.9661	0.2481	0.2792	0.3229	0.3173	0.3554	0.4129	0.4435
Min.	3866.83	98.82	98.31	97.69	97.08	96.62	96.16	95.20
Max.	3957.13	99.86	99.36	98.94	98.40	98.05	97.79	96.97

TM-21 Projection:

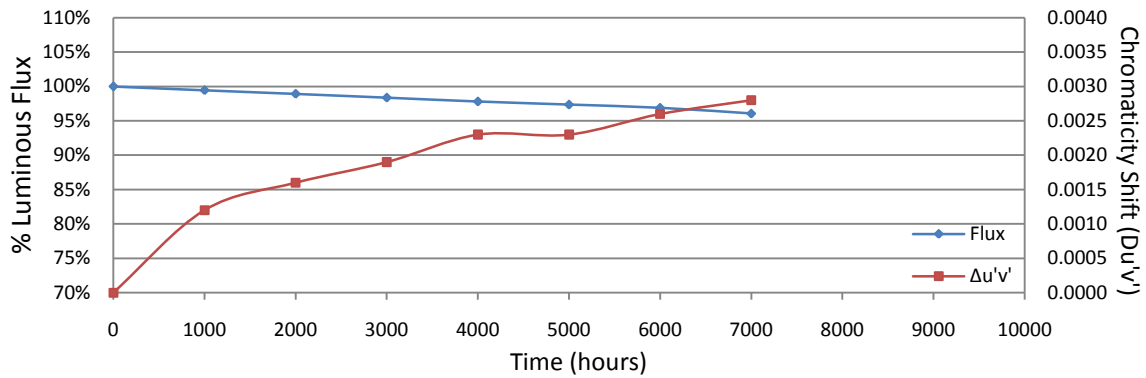
Test Duration: 7000 hours
Failures Observed: 0
 α : 5.622E-06
 β : 1.001
Reported L₇₀: >42000 hours

3.5 Data Set 2, 105°C, 1200mA (Forward Voltage)

No.	Forward Voltage (V)							
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
21	36.94	36.52	36.81	36.65	36.78	36.79	37.58	37.49
22	36.32	36.47	36.58	36.21	35.95	36.05	36.80	37.49
23	36.59	36.42	36.56	36.45	36.48	36.51	37.40	37.31
24	36.60	36.45	36.57	36.48	36.51	36.78	36.86	37.11
25	36.72	36.56	36.56	36.72	36.88	36.51	37.46	36.90
26	36.58	36.41	36.56	36.43	36.45	36.69	36.95	36.67
27	36.68	36.43	36.55	36.56	36.69	36.76	37.09	36.51
28	36.54	36.41	36.54	36.41	36.41	36.46	37.04	36.51
29	36.70	36.45	36.56	36.59	36.73	36.39	37.53	36.39
30	36.68	36.43	36.54	36.57	36.71	36.50	37.38	36.28
31	36.72	36.47	36.60	36.59	36.71	36.58	37.22	36.98
32	36.64	36.52	36.62	36.54	36.56	36.55	37.41	36.70
33	36.55	36.47	36.58	36.44	36.41	36.34	37.22	36.47
34	36.70	36.41	36.55	36.56	36.71	36.64	37.20	36.26
35	36.29	36.32	36.54	36.07	35.82	36.02	36.81	36.26
36	36.56	36.42	36.52	36.46	36.50	36.49	37.32	36.16
37	36.44	36.40	36.54	36.30	36.20	36.44	37.13	35.99
38	36.70	36.45	36.54	36.61	36.77	36.28	37.55	35.85
39	36.31	36.52	36.51	36.32	36.12	36.23	36.73	35.74
40	36.55	36.39	36.49	36.45	36.51	36.41	37.11	35.68
Ave.	36.59	36.45	36.57	36.47	36.50	36.47	37.19	36.54
Med.	36.60	36.44	36.56	36.47	36.51	36.50	37.21	36.49
st dev	0.1593	0.0553	0.0645	0.1557	0.2846	0.2156	0.2650	0.5451
Min.	36.29	36.32	36.49	36.07	35.82	36.02	36.73	35.68
Max.	36.94	36.56	36.81	36.72	36.88	36.79	37.58	37.49

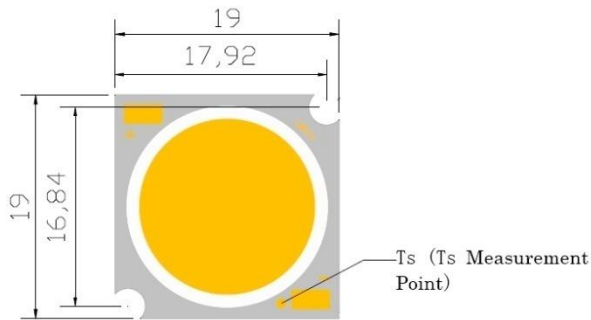
3.6 Data Set 2, 105°C, 1200mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)						
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
21	0.2603	0.5269	2748	0.0009	0.0012	0.0016	0.0020	0.0017	0.0018	0.0024
22	0.2618	0.5281	2712	0.0014	0.0017	0.0020	0.0024	0.0025	0.0019	0.0019
23	0.2632	0.5287	2682	0.0010	0.0013	0.0017	0.0020	0.0025	0.0029	0.0032
24	0.2625	0.5281	2696	0.0014	0.0018	0.0021	0.0023	0.0026	0.0030	0.0031
25	0.2607	0.5263	2742	0.0009	0.0009	0.0013	0.0017	0.0017	0.0021	0.0024
26	0.2607	0.5263	2744	0.0010	0.0017	0.0020	0.0024	0.0023	0.0025	0.0028
27	0.2615	0.5264	2726	0.0014	0.0018	0.0019	0.0021	0.0021	0.0028	0.0031
28	0.2618	0.5271	2716	0.0014	0.0018	0.0020	0.0022	0.0017	0.0019	0.0022
29	0.2607	0.5270	2738	0.0012	0.0015	0.0017	0.0019	0.0014	0.0017	0.0020
30	0.2620	0.5275	2710	0.0011	0.0016	0.0021	0.0026	0.0025	0.0028	0.0031
31	0.2601	0.5263	2756	0.0013	0.0015	0.0022	0.0029	0.0027	0.0028	0.0031
32	0.2598	0.5259	2762	0.0013	0.0018	0.0022	0.0026	0.0030	0.0031	0.0031
33	0.2608	0.5264	2740	0.0016	0.0019	0.0021	0.0024	0.0026	0.0034	0.0037
34	0.2623	0.5280	2702	0.0013	0.0018	0.0022	0.0026	0.0028	0.0031	0.0028
35	0.2621	0.5287	2702	0.0012	0.0016	0.0019	0.0023	0.0026	0.0029	0.0033
36	0.2603	0.5264	2750	0.0008	0.0011	0.0014	0.0017	0.0022	0.0025	0.0026
37	0.2618	0.5268	2718	0.0008	0.0013	0.0016	0.0018	0.0020	0.0029	0.0030
38	0.2613	0.5265	2728	0.0012	0.0016	0.0019	0.0023	0.0023	0.0028	0.0030
39	0.2604	0.5272	2744	0.0015	0.0020	0.0024	0.0028	0.0030	0.0034	0.0035
40	0.2630	0.5285	2686	0.0009	0.0012	0.0016	0.0020	0.0019	0.0023	0.0026
Ave.	0.2614	0.5272	2725	0.0012	0.0016	0.0019	0.0023	0.0023	0.0026	0.0028
Med.	0.2614	0.5270	2727	0.0012	0.0016	0.0020	0.0023	0.0024	0.0028	0.0030
st dev	0.0010	0.0009	23.7219	0.0002	0.0003	0.0003	0.0003	0.0005	0.0005	0.0005
Min.	0.2598	0.5259	2682	0.0008	0.0009	0.0013	0.0017	0.0014	0.0017	0.0019
Max.	0.2632	0.5287	2762	0.0016	0.0020	0.0024	0.0029	0.0030	0.0034	0.0037



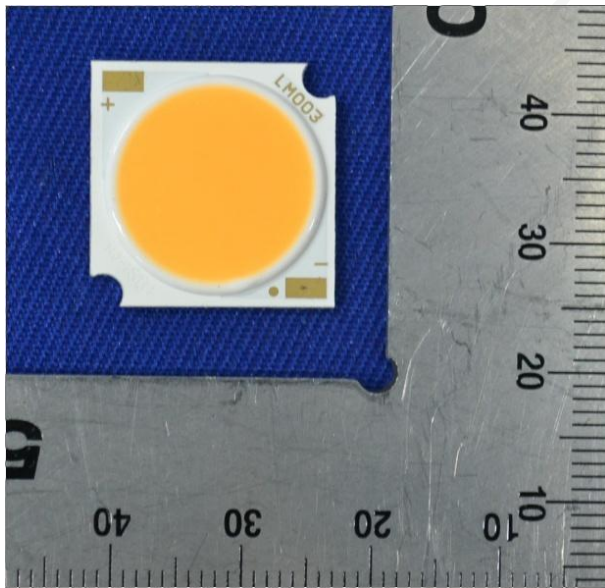
4 - EUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



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