



# 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-LM002H384W-9B4C12(Ra5)**

<b>Report Type:</b> 10000 Hours Test Report		<b>Product Type:</b> LED Array	
<b>Test Engineer:</b>	Pote Wang <i>Pote Wang</i>		
<b>Report Number:</b>	RSZ160329509-10-10000-M5		
<b>Test Date:</b>	2016-04-05 to 2017-05-27		
<b>Report Date:</b>	2019-03-11		
<b>Revised Note:</b>	The previous report RSZ160329509-10-10000-M4 is replaced by this report on 2019-03-11		
<b>Reviewed By:</b>	Daniel Duan / EE Manager <i>Daniel</i>		
<b>Test Facility:</b>	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, 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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Model type	Model name	CRI (typ.)	CCT (typ.)	Series	Parallel	Power density (W/mm <sup>2</sup> )	Current density per LED die (mA/mm <sup>2</sup> )	Current per die (mA)	Distance between of dies (mm)	Current (mA)
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Model type	Model name	CRI (typ.)	Series	Power density (W/mm <sup>2</sup> )	Current density per LED die (mA/mm <sup>2</sup> )	Current per die (mA)	Distance between of dies (mm)	Current (mA)
		95	8	0.0400	301.95	150	0.38	300
Multiple models	HL-LM065D42W-10B3C8(Ra5)	95	8	0.0600	301.95	150	0.29	450
		95	8	0.0600	301.95	150	0.29	450
		95	8	0.0600	301.95	150	0.29	450
		95	8	0.0600	301.95	150	0.29	450
		95	8	0.0600	301.95	150	0.29	450
		95	8	0.0600	301.95	150	0.29	450
		95	8	0.0600	301.95	150	0.29	450
		95	8	0.0600	301.95	150	0.29	450
Multiple models	HL-LM065D42W-10B2C12(Ra5)	95	12	0.0600	301.95	150	0.29	300
		95	12	0.0600	301.95	150	0.29	300
		95	12	0.0600	301.95	150	0.29	300
		95	12	0.0600	301.95	150	0.29	300
		95	12	0.0600	301.95	150	0.29	300
		95	12	0.0600	301.95	150	0.29	300
		95	12	0.0600	301.95	150	0.29	300
		95	12	0.0600	301.95	150	0.29	300
Multiple models	HL-LM002D42W-10B3C12(Ra5)	95	12	0.0895	301.95	150	0.43	450
		95	12	0.0895	301.95	150	0.43	450
		95	12	0.0895	301.95	150	0.43	450
		95	12	0.0895	301.95	150	0.43	450
		95	12	0.0895	301.95	150	0.43	450
		95	12	0.0895	301.95	150	0.43	450
		95	12	0.0895	301.95	150	0.43	450
		95	12	0.0895	301.95	150	0.43	450
				0.1202	325.63	150	0.28	600
				0.1202	325.63	150	0.28	600
				0.1202	325.63	150	0.28	600
				0.1202	325.63	150	0.28	600
				0.1202	325.63	150	0.28	600
				0.1202	325.63	150	0.28	600
				0.1202	325.63	150	0.28	600
			4	0.1202	325.63	150	0.28	600
			3	0.0901	325.63	150		

Multiple models HL-LMH02D90W-7B3C12(Ra5)







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Model type	Model name	CRI (typ.)	CCT (typ.)	Series	Parallel	Power density (W/mm <sup>2</sup> )	Current density per LED die (mA/mm <sup>2</sup> )	Current per die (mA)	Distance between of dies (mm)	Current (mA)
		95	4000K	12	3	0.0901	301.95	150	0.5	450
		95	5000K	12	3	0.0901	301.95	150	0.5	450
		95	5700K	12	3	0.0901	301.95	150	0.5	450
		95	6000K	12	3	0.0901	301.95	150	0.5	450
		95	6500K	12	3	0.0901	301.95	150	0.5	450
Multiple models	HL-LM002D42W-5B2C12(Ra5)	95	2700K	12	2	0.0601	301.95	150	0.75	300
		95	3000K	12	2	0.0601	301.95	150	0.75	300
		95	3500K	12	2	0.0601	301.95	150	0.75	300
		95	4000K	12	2	0.0601	301.95	150	0.75	300
		95	5000K	12	2	0.0601	301.95	150	0.75	300
		95	5700K	12	2	0.0601	301.95	150	0.75	300
		95	6000K	12	2	0.0601	301.95	150	0.75	300
Multiple models	HL-LM002D42W-3B1C12(Ra5)	95	2700K	12	1	0.0300	301.95	150	1.33	150
		95	3000K	12	1	0.0300	301.95	150	1.33	150
		95	3500K	12	1	0.0300	301.95	150	1.33	150
		95	4000K	12	1	0.0300	301.95	150	1.33	150
		95	5000K	12	1	0.0300	301.95	150	1.33	150
		95	5700K	12	1	0.0300	301.95	150	1.33	150
		95	6000K	12	1	0.0300	301.95	150	1.33	150
		95	6500K	12	1	0.0300	301.95	150	1.33	150
Multiple models	HL-LML02H421W-9B4C12(Ra5)	95	2700K	12	4	0.0731	516.67	90	0.57	360
		95	3000K	12	4	0.0731	516.67	90	0.57	360
		95	3500K	12	4	0.0731	516.67	90	0.57	360
		95	4000K	12	4	0.0731	516.67	90	0.57	360
		95	5000K	12	4	0.0731	516.67	90	0.57	360
		95	5700K	12	4	0.0731	516.67	90	0.57	360
		95	6000K	12	4	0.0731	516.67	90	0.57	360
		95	6500K	12	4	0.0731	516.67	90	0.57	360
Multiple models	HL-LML02H421W-7B3C12(Ra5)	95	2700K	12	3	0.0548	516.67	90	0.77	270
		95	3000K	12	3	0.0548	516.67	90	0.77	270
		95	3500K	12	3	0.0548	516.67	90	0.77	270
		95	4000K	12	3	0.0548	516.67	90	0.77	270
		95	5000K	12	3	0.0548	516.67	90	0.77	270
		95	5700K	12	3	0.0548	516.67	90	0.77	270
		95	6000K	12	3	0.0548	516.67	90	0.77	270
		95	6500K	12	3	0.0548	516.67	90	0.77	270
Multiple models	HL-LML02H421W-5B2C12(Ra5)	95	2700K	12	2	0.0365	516.67	90	1.04	180
		95	3000K	12	2	0.0365	516.67	90	1.04	180
		95	3500K	12	2	0.0365	516.67	90	1.04	180
		95	4000K	12	2	0.0365	516.67	90	1.04	180
		95	5000K	12	2	0.0365	516.67	90	1.04	180

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Model type	Model name	CRI (typ.)	CCT (typ.)	Series	Parallel	Power density (W/mm <sup>2</sup> )	Current density per LED die (mA/mm <sup>2</sup> )	Current per die (mA)	Distance between of dies (mm)	Current (mA)
models	7B2C7(Ra5)	95	3000K	7	2	0.0346	316.33	150	0.37	300
		95	3500K	7	2	0.0346	316.33	150	0.37	300
		95	4000K	7	2	0.0346	316.33	150	0.37	300
		95	5000K	7	2	0.0346	316.33	150	0.37	300
		95	5700K	7	2	0.0346	316.33	150	0.37	300
		95	6000K	7	2	0.0346	316.33	150	0.37	300
		95	6500K	7	2	0.0346	316.33	150	0.37	300
Multiple models	HL-LM021D90W-10B2C10(Ra5)	95	2700K	10	2	0.0494	316.33	150	0.27	300
		95	3000K	10	2	0.0494	316.33	150	0.27	300
		95	3500K	10	2	0.0494	316.33	150	0.27	300
		95	4000K	10	2	0.0494	316.33	150	0.27	300
		95	5000K	10	2	0.0494	316.33	150	0.27	300
		95	5700K	10	2	0.0494	316.33	150	0.27	300
		95	6000K	10	2	0.0494		150	0.27	300

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		95	4000K	18	2	0.0593	426.20	100	0.59	200
		95	5000K	18	2	0.0593	426.20	100	0.59	200
		95	5700K	18	2	0.0593	426.20	100	0.59	200
		95	6000K	18	2	0.0593	426.20	100	0.59	200
		95	6500K	18	2	0.0593	426.20	100	0.59	200
Multiple models	HL-LM079H384W-7B3C12(Ra5)	95	2700K	12	3	0.0939	553.57	150	0.43	450
		95	3000K	12	3	0.0939	553.57	150	0.43	450
		95	3500K	12	3	0.0939	553.57	150	0.43	450
		95	4000K	12	3	0.0939	553.57	150	0.43	450
		95	5000K	12	3	0.0939	553.57	150	0.43	450
		95	5700K	12	3	0.0939	553.57	150	0.43	450
		95	6000K	12	3	0.0939	553.57	150	0.43	450
Multiple models	HL-LM079H384W-9B4C12(Ra5)	95	2700K	12	4	0.1251	553.57	150	0.26	600
		95	3000K	12	4	0.1251	553.57	150	0.26	600
		95	3500K	12	4	0.1251	553.57	150	0.26	600
		95	4000K	12	4	0.1251	553.57	150	0.26	600
		95	5000K	12	4	0.1251	553.57	150	0.26	600
		95	5700K	12	4	0.1251	553.57	150	0.26	600
		95	6000K	12	4	0.1251	553.57	150	0.26	600
Multiple models	HL-LM093H384W-7B3C12(Ra5)	95	2700K	12	3	0.0939	553.57	150	0.43	450
		95	3000K	12	3	0.0939	553.57	150	0.43	450
		95	3500K	12	3	0.0939	553.57	150	0.43	450
		95	4000K	12	3	0.0939	553.57	150	0.43	450
		95	5000K	12	3	0.0939	553.57	150	0.43	450
		95	5700K	12	3	0.0939	553.57	150	0.43	450
		95	6000K	12	3	0.0939	553.57	150	0.43	450
Multiple models	HL-LM093H384W-9B4C12(Ra5)	95	2700K	12	4	0.1251	553.57	150	0.26	600
		95	3000K	12	4	0.1251	553.57	150	0.26	600
		95	3500K	12	4	0.1251	553.57	150	0.26	600
		95	4000K	12	4	0.1251	553.57	150	0.26	600
		95	5000K	12	4	0.1251	553.57	150	0.26	600
		95	5700K	12	4	0.1251	553.57	150	0.26	600
		95	6000K	12	4	0.1251	553.57	150	0.26	600
Multiple models	HL-LM093H384W-7B2C18(Ra5)	95	2700K	18	2	0.0593	426.20	100	0.59	200
		95	3000K	18	2	0.0593	426.20	100	0.59	200
		95	3500K	18	2	0.0593	426.20	100	0.59	200
		95	4000K	18	2	0.0593	426.20	100	0.59	200
		95	5000K	18	2	0.0593	426.20	100	0.59	200
		95	5700K	18	2	0.0593	426.20	100	0.59	200
		95	6000K	18	2	0.0593	426.20	100	0.59	200
Multiple models	HL-LM021D46W-6B1C12(Ra5)	95	2700K	12	1	0.0292	435.54	150	0.48	150
		95	3000K	12	1	0.0292	435.54	150	0.48	150
		95	3500K	12	1	0.0292	435.54	150	0.48	150
		95	4000K	12	1	0.0292	435.54	150	0.48	150
		95	5000K	12	1	0.0292	435.54	150	0.48	150

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## 1.2 Standards Used:

- 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 IAS)
- 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	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	Hanshenpuyuan	HSPY-100-05	2013010210003	N/A	2017-05-05	2018-05-04
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-12
Multilayer aging machine	BACL	B2-270	20005	25°C~110°C	2016-09-01	2017-09-01
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	(50/15A)	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090009	(50/15A)	2016-12-15	2017-12-14

## 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  $T_{MP,LED}$  location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing,  $T_{MP,LED}$  of the coldest LEDs were maintained at a temperature that was greater than or equal to  $2^{\circ}\text{C}$  below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to  $5^{\circ}\text{C}$  below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and







## 2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	Reported TM-21 L <sub>70</sub> Lifetime
1	20	0	1000	10000	>60,000hours
2	20	0	1000	10000	52,000hours

### Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
1	99.58%	99.13%	98.72%	98.30%	97.94%	97.48%	96.97%	96.37%	95.87%	95.44%
2	99.24%	98.65%	98.15%	97.62%	97.20%	96.65%	95.93%	95.19%	94.53%	93.90%

### Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
1	0.0011	0.0014	0.0016	0.0019	0.0021	0.0025	0.0029	0.0031	0.0036	0.0041
2	0.0010	0.0015	0.0019	0.0023	0.0021	0.0025	0.0028	0.0030	0.0034	0.0039



### 3 - Test Data

#### 3.1 Data Set 1, 85°C, 600mA (Lumen Maintenance)

No.	Ohr(Initial)	Lumen Maintenance (%)									
		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	1859.05	99.84	99.46	99.21	98.98	98.66	98.09	97.43	96.44	95.99	95.55
2	1853.74	99.83	99.64	98.99	98.73	98.20	98.05	97.61	96.89	96.47	96.04
3	1859.05	99.74	99.34	99.01	98.63	98.23	98.12	97.65	97.10	96.67	96.20
4	1859.05	99.65	99.43	99.21	98.71	98.57	98.44	97.78	97.28	96.62	96.25
5	1864.37	99.66	99.15	98.57	98.39	98.07	97.52	96.99	96.31	95.92	95.49
6	1853.74	99.44	98.82	98.60	98.18	98.02	97.29	96.63	96.03	95.61	95.32
7	1853.74	99.54	99.11	98.57	98.21	97.85	97.23	96.54	96.05	95.56	95.24
8	1859.05	99.24	98.52	98.29	97.74	97.26	96.86	96.35	95.75	95.23	94.75
9	1864.37	99.76	99.41	98.99	98.71	98.24	97.59	97.10	96.33	95.72	95.23
10	1853.74	99.43	99.08	98.66	98.04	97.57	96.88	96.63	96.26	95.85	95.34
11	1874.99	99.49	99.00	98.36	97.92	97.58	97.07	96.60	96.05	95.50	94.97
12	1864.37	99.76	99.27	98.91	98.48	97.95	97.36	96.68	96.23	95.90	95.49
13	1853.74	99.73	99.14	98.67	98.03	97.58	97.13	96.49	96.05	95.48	95.01
14	1864.37	99.46	98.96	98.41	97.87	97.64	97.10	96.60	96.10	95.54	95.05
15	1853.74	99.24	98.64	98.20	97.75	97.18	96.69	96.26	95.82	95.39	94.99
16	1843.12	99.81	99.35	98.86	98.52	98.36	97.72	97.30	96.64	96.16	95.73
17	1864.37	99.27	98.84	98.63	98.07	97.67	97.52	97.28	96.77	96.08	95.77
18	1859.05	99.65	99.12	98.90	98.56	98.45	98.02	97.59	96.88	96.29	95.79
19	1853.74	99.13	98.80	98.28	97.89	97.49	97.45	96.99	96.17	95.68	95.29
20	1859.05	99.84	99.51	99.01	98.51	98.14	97.45	96.97	96.27	95.76	95.39
Ave.	1858.52	99.58	99.13	98.72	98.30	97.94	97.48	96.97	96.37	95.87	95.44
Med.	1859.05	99.65	99.13	98.66	98.30	97.98	97.45	96.98	96.27	95.80	95.36
st dev	6.65	0.2263	0.3033	0.3106	0.3717	0.4275	0.4768	0.4723	0.4227	0.4084	0.4165
Min.	1843.12	99.13	98.52	98.20	97.74	97.18	96.69	96.26	95.75	95.23	94.75
Max.	1874.99	99.84	99.64	99.21	98.98	98.66	98.44	97.78	97.28	96.67	96.25

TM-21 Projection:

**Test Duration:** 10000 hours  
**Failures Observed:** 0  
 5.299E-06  
 1.006  
**Reported L<sub>70</sub>:** >60,000 hours



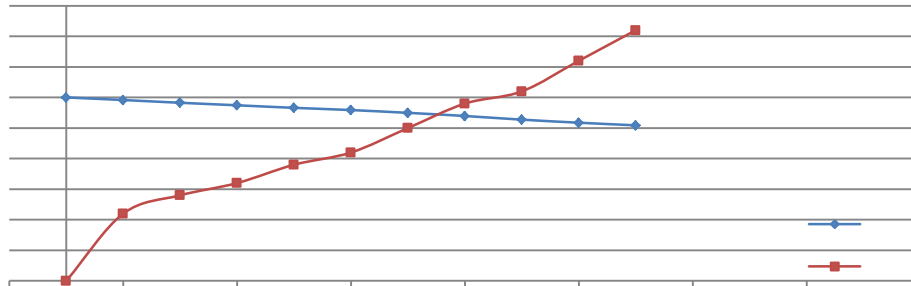
### 3.2 Data Set 1, 85°C, 600mA (Forward Voltage)

No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	38.10	38.16	38.22	38.17	38.18	37.69	38.25	38.72	38.03	37.73	37.88
2	38.04	38.10	38.16	38.17	38.24	37.83	38.20	38.72	38.33	37.50	37.82
3	38.00	38.10	38.08	38.14	38.18	37.33	38.08	38.57	38.33	37.58	37.71
4	38.06	38.09	38.08	38.13	38.17	38.04	38.11	38.53	38.35	37.59	37.71
5	37.99	38.14	38.08	38.10	38.06	37.67	38.04	38.48	38.26	37.59	37.71
6	38.00	38.09	38.06	38.15	38.21	37.49	37.80	38.65	38.31	37.66	37.70
7	38.03	38.07	38.06	38.19	38.31	37.88	38.02	38.49	38.31	37.69	37.71
8	38.04	38.05	38.05	38.21	38.37	37.74	38.15	38.44	38.32	37.61	37.68
9	38.07	38.12	38.11	38.19	38.26	37.80	38.23	38.39	38.36	37.59	37.88
10	38.02	38.06	38.05	38.18	38.30	37.91	38.11	38.39	38.33	37.60	37.78
11	38.06	38.15	38.06	37.84	37.53	37.95	38.08	38.41	38.35	37.60	37.73
12	38.10	38.19	38.02	37.99	37.79	38.21	37.80	38.37	38.33	37.57	37.72
13	38.04	38.09	37.96	37.95	37.81	38.07	37.95	38.35	38.25	37.38	37.67
14	37.99	38.20	37.97	37.97	37.74	37.97	38.23	38.35	38.13	37.54	37.65
15	38.04	38.09	37.89	38.02	37.95	37.95	38.00	38.39	38.33	37.52	37.66
16	37.85	38.08	37.82	38.01	37.94	37.93	38.04	38.43	38.10	37.51	37.75
17	38.06	38.15	37.82	38.02	37.89	38.04	38.01	38.44	38.33	37.46	37.97
18	38.09	38.19	37.83	37.97	37.75	37.96	38.00	38.41	38.32	37.42	37.79
19	37.97	38.08	37.77	37.97	37.86	37.96	37.96	38.38	38.35	37.46	37.80
20	37.95	38.14	37.84	38.00	37.86	38.06	37.72	38.35	38.33	37.52	37.75
Ave.	38.03	38.12	38.00	38.07	38.02	37.87	38.04	38.46	38.29	37.56	37.75
Med.	38.04	38.10	38.05	38.06	38.01	37.94	38.04	38.42	38.33	37.58	37.73
st dev	0.06	0.05	0.13	0.11	0.24	0.21	0.15	0.12	0.09	0.09	0.08
Min.	37.85	38.05	37.77	37.84	37.53	37.33	37.72	38.35	38.03	37.38	37.65
Max.	38.10	38.20	38.22	38.21	38.37	38.21	38.25	38.72	38.36	37.73	37.97



### 3.3 Data Set 1, 85°C, 600mA (Chromaticity Shift)

No.			CCT(K)										
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.2600	0.5289	2746	0.0010	0.0014	0.0017	0.0021	0.0027	0.0028	0.0028	0.0030	0.0034	0.0035
2	0.2596	0.5286	2756	0.0008	0.0011	0.0017	0.0022	0.0020	0.0023	0.0025	0.0027	0.0033	0.0038
3	0.2600	0.5286	2748	0.0011	0.0012	0.0014	0.0016	0.0022	0.0024	0.0023	0.0024	0.0028	0.0031
4	0.2598	0.5288	2752	0.0014	0.0016	0.0018	0.0021	0.0028	0.0033	0.0035	0.0037	0.0044	0.0051
5	0.2606	0.5288	2734	0.0012	0.0013	0.0015	0.0018	0.0021	0.0025	0.0031	0.0034	0.0040	0.0044
6	0.2602	0.5285	2742	0.0007	0.0011	0.0015	0.0018	0.0020	0.0023	0.0024	0.0028	0.0031	0.0037
7	0.2607	0.5289	2732	0.0017	0.0017	0.0022	0.0026	0.0021	0.0025	0.0030	0.0032	0.0034	0.0038
8	0.2604	0.5285	2740	0.0014	0.0018	0.0019	0.0021	0.0018	0.0024	0.0024	0.0024	0.0026	0.0032
9	0.2594	0.5288	2760	0.0009	0.0009	0.0011	0.0013	0.0018	0.0021	0.0025	0.0028	0.0032	0.0034
10	0.2597	0.5285	2752	0.0008	0.0010	0.0011	0.0013	0.0021	0.0025	0.0031	0.0034	0.0039	0.0044
11	0.2592	0.5284	2764	0.0013	0.0016	0.0020	0.0024	0.0021	0.0026	0.0028	0.0027	0.0033	0.0039
12	0.2601	0.5288	2744	0.0011	0.0013	0.0014	0.0016	0.0021	0.0022	0.0027	0.0030	0.0034	0.0041
13	0.2612	0.5292	2718	0.0009	0.0013	0.0017	0.0021	0.0022	0.0028	0.0036	0.0037	0.0038	0.0043
14	0.2600	0.5283	2748	0.0008	0.0013	0.0017	0.0021	0.0021	0.0023	0.0031	0.0034	0.0040	0.0045
15	0.2599	0.5287	2748	0.0010	0.0011	0.0014	0.0016	0.0020	0.0021	0.0024	0.0026	0.0029	0.0031
16	0.2609	0.5289	2726	0.0010	0.0014	0.0019	0.0025	0.0023	0.0027	0.0035	0.0035	0.0040	0.0043
17	0.2598	0.5285	2752	0.0017	0.0021	0.0023	0.0025	0.0018	0.0023	0.0025	0.0028	0.0032	0.0046
18	0.2604	0.5285	2738	0.0017	0.0019	0.0020	0.0022	0.0023	0.0031	0.0038	0.0040	0.0047	0.0052
19	0.2606	0.5287	2734	0.0007	0.0009	0.0010	0.0012	0.0019	0.0026	0.0036	0.0038	0.0045	0.0051
20	0.2592	0.5281	2766	0.0009	0.0011	0.0012	0.0014	0.0020	0.0022	0.0024	0.0026	0.0032	0.0036
Ave.	0.2601	0.5287	2745	0.0011	0.0014	0.0016	0.0019	0.0021	0.0025	0.0029	0.0031	0.0036	0.0041
Med.	0.2600	0.5287	2747	0.0010	0.0013	0.0017	0.0021	0.0021	0.0025	0.0028	0.0030	0.0034	0.0040
st dev	0.0005	0.0003	12	0.0003	0.0003	0.0004	0.0004	0.0003	0.0003	0.0005	0.0005	0.0006	0.0007
Min.	0.2592	0.5281	2718	0.0007	0.0009	0.0010	0.0012	0.0018	0.0021	0.0023	0.0024	0.0026	0.0031
Max.	0.2612	0.5292	2766	0.0017	0.0021	0.0023	0.0026	0.0028	0.0033	0.0038	0.0040	0.0047	0.0052





**3.4 Data Set 2, 105°C, 600mA (Lumen Maintenance)**

No.	Ohr(Initial)	Lumen Maintenance (%)									
		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
21	1853.74	98.93	98.27	97.90	97.56	97.46	97.04	96.31	95.35	94.53	93.89
22	1853.74	99.06	98.46	97.78	97.20	96.66	96.12	95.45	94.48	93.89	93.33
23	1853.74	98.76	98.17	97.48	97.11	96.52	95.70	95.06	94.54	94.03	93.50
24	1864.37	98.95	98.29	97.83	97.11	96.25	95.79	95.01	94.32	93.50	92.76
25	1859.05	98.77	98.27	97.71	97.04	96.88	96.51	95.74	94.86	94.20	93.61
26	1848.43	99.24	98.74	98.16	97.61	97.25	96.80	96.12	95.33	94.72	94.13
27	1859.05	99.26	98.64	98.09	97.51	96.88	96.50	95.78	95.20	94.40	93.73
28	1853.74	99.35	98.62	98.29	97.89	97.46	96.72	95.91	95.34	94.68	94.06
29	1864.37	99.18	98.76	98.22	97.70	97.21	96.89	96.10	95.22	94.63	94.22
30	1874.99	99.39	98.68	98.05	97.28	96.97	96.43	95.87	95.43	94.73	93.89
31	1848.43	99.73	99.04	98.37	97.78	97.13	96.75	95.94	95.24	94.34	93.77
32	1853.74	98.95	98.46	98.07	97.54	97.46	96.88	96.16	95.55	94.94	94.23
33	1853.74	99.55	98.84	98.36	97.91	97.77	97.22	96.63	95.57	94.85	94.06
34	1874.99	99.00	98.49	98.04	97.45	97.41	96.72	96.03	95.05	94.42	94.00
35	1816.56	99.29	98.69	98.37	98.00	97.37	96.79	96.15	95.52	94.93	94.26
36	1890.92	99.33	98.56	98.12	97.68	96.89	96.43	95.75	95.27	94.67	94.15
37	1853.74	99.74	99.34	98.89	98.33	97.59	96.72	95.94	95.06	94.47	93.98
38	1869.68	99.62	98.99	98.62	98.21	97.99	97.59	96.84	96.20	95.55	94.79
39	1869.68	99.38	98.89	98.30	97.63	97.38	96.85	96.06	95.44	94.86	94.14
40	1853.74	99.33	98.75	98.36	97.91	97.49	96.50	95.67	94.85	94.25	93.44
Ave.	1858.52	99.24	98.65	98.15	97.62	97.20	96.65	95.93	95.19	94.53	93.90
Med.	1853.74	99.28	98.66	98.14	97.62	97.31	96.72	95.94	95.26	94.58	93.99
st dev	14.61	0.2907	0.2930	0.3222	0.3611	0.4308	0.4389	0.4381	0.4307	0.4401	0.4293
Min.	1816.56	98.76	98.17	97.48	97.04	96.25	95.70	95.01	94.32	93.50	92.76
Max.	1890.92	99.74	99.34	98.89	98.33	97.99	97.59	96.84	96.20	95.55	94.79

TM-21 Projection:

**Test Duration:** 10000 hours  
**Failures Observed:** 0  
7.057E-06  
1.008  
**Reported L<sub>70</sub>:** 52,000 hours



### 3.5 Data Set 2, 105°C, 600mA (Forward Voltage)

No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
21	38.08	38.05	38.48	38.13	38.21	38.04	38.11	38.05	38.45	37.95	38.15
22	37.97	38.19	38.45	38.00	37.81	38.00	37.91	38.19	38.33	38.11	38.10
23	37.86	38.21	38.38	37.98	37.75	37.66	37.83	38.21	38.33	37.91	38.00
24	37.91	38.02	38.39	38.04	38.06	37.97	37.86	38.02	38.28	37.84	38.07
25	38.13	38.16	38.36	38.00	37.84	37.95	37.80	38.16	38.35	37.82	37.97
26	38.00	38.09	38.24	37.98	37.87	37.94	37.57	38.09	38.28	37.84	38.06
27	37.93	38.17	38.19	37.98	37.79	37.93	37.49	38.17	38.30	37.83	38.04
28	37.93	38.13	38.16	38.04	37.95	37.77	37.66	38.13	38.34	37.82	37.97
29	38.01	38.13	38.22	38.02	37.91	38.22	37.75	38.13	38.32	37.82	38.11
30	38.02	38.16	38.22	38.00	37.84	38.00	37.78	38.16	38.32	37.80	38.11
31	37.95	38.09	37.93	37.86	37.63	37.97	37.77	37.93	38.12	37.76	38.07
32	37.95	38.07	37.93	37.82	37.57	38.04	37.85	37.93	38.33	37.77	37.97
33	37.80	38.10	37.93	37.81	37.52	37.84	37.77	37.93	38.22	37.84	37.97
34	38.09	38.10	37.91	37.82	37.54	38.21	37.57	37.91	38.32	37.83	38.04
35	38.17	38.06	37.88	37.91	37.76	37.82	37.78	37.88	38.28	38.08	37.95
36	38.06	38.16	38.11	37.88	37.60	37.99	37.57	38.11	38.29	37.88	37.95
37	37.97	38.08	38.11	37.86	37.64	38.09	37.66	38.11	38.37	37.81	37.95
38	38.12	38.10	38.12	37.84	37.58	38.23	37.69	38.12	38.22	37.84	38.00
39	37.98	38.06	38.10	37.80	37.54	37.93	37.51	38.10	38.23	37.84	37.94
40	37.80	37.99	38.10	37.80	37.61	37.77	37.67	38.10	38.36	37.82	37.93
Ave.	37.99	38.11	38.16	37.93	37.75	37.97	37.73	38.07	38.30	37.86	38.02
Med.	37.98	38.10	38.14	37.95	37.76	37.97	37.76	38.11	38.32	37.84	38.00
st dev	0.10	0.06	0.19	0.10	0.19	0.15	0.15	0.10			



### 3.6 Data Set 2, 105°C, 600mA (Chromaticity Shift)

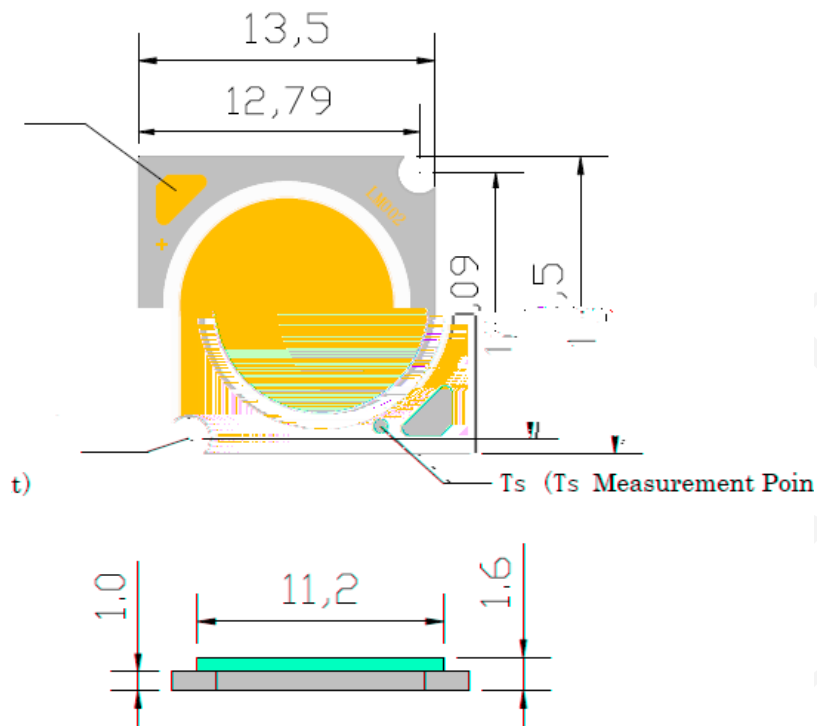
No.		CCT(K)	

FINAL



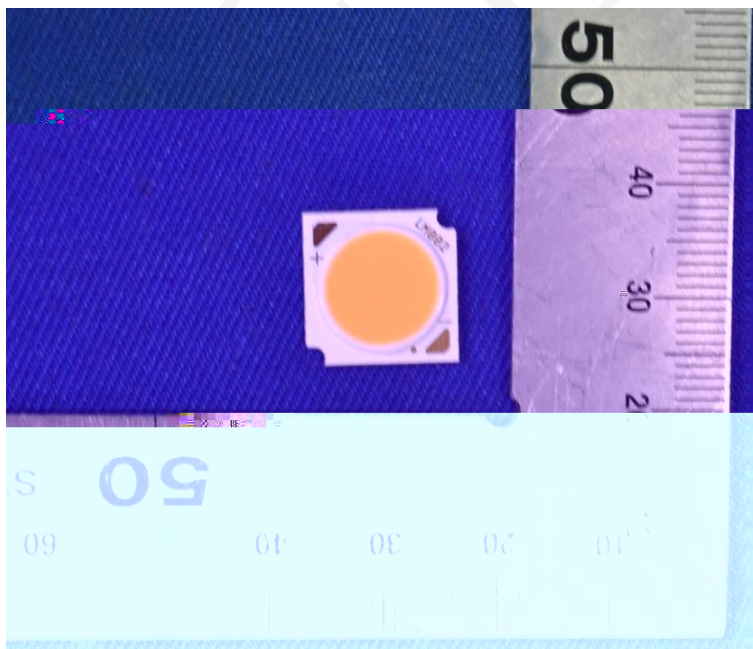
## 4 - EUT Photo

### 4.1 Mechanical Dimensions



All dimensions are in millimeter

### 4.2 EUT Photo





## 5 - Report Revision

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Report Number	Report Date	Contents
RSZ160329509-10-10000	2017-06-14	Original report.
RSZ160329509-10-10000-M1	2017-12-05	Update the Reported TM-21 L70 Lifetime in page 21.
RSZ160329509-10-10000-M2	2017-12-11	Update the Family Declaration in page 3 to 22.
RSZ160329509-10-10000-M3	2018-01-29	Update the Description of LED Light Sources in page 3. Update the Standards Used in page 13. Update the Mechanical Dimensions Photo in page 23. Update the Logo of lab on the Page1
RSZ160329509-10-10000-M4	2019-01-14	Update Company name and address on page 1. Update the Family products on page 3 according to ENERGY STAR requirements
RSZ160329509-10-10000-M5	2019-03-11	Update the Family Declaration in page 3 to 15.

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