



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Shenzhen Refond Optoelectronic Co., Ltd.

6th wing, 2nd block of Baiwangxin Industry Park, Songbai Road, Nanshan District, Shenzhen, China

Model: RT-27HI32DS-EF-N-Y

Report Type: 9000 Hours Test Report	Product Type: LED Package
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Report Number:	R2DG141222053-10
Test Date:	2014-12-23 to 2016-01-02
Report Date:	2016-04-08
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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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TABLE OF CONTENTS

1 - General Information	3
1.1 Description of LED Light Sources	3
1.2 Standards Used:.....	3
1.3 Test Facility.....	4
1.4 Description of Auxiliary Equipment	4
1.5 Operating Cycle.....	4
1.6 Ambient Conditions	4
1.7 Photometry Measurement Uncertainty	5
1.8 Sample Set.....	6
2 - Summary of Test Result.....	7
3 - Test Data	8
3.1 Data Set 1, 55 °C, 60mA (Lumen Maintenance).....	8
3.2 Data Set 1, 55 °C, 60mA (Chromaticity Shift).....	9
3.3 Data Set 2, 85 °C, 60mA (Lumen Maintenance).....	10
3.4 Data Set 2, 85 °C, 60mA (Chromaticity Shift).....	11
3.5 Data Set 3, 105 °C, 60mA (Lumen Maintenance).....	12
3.6 Data Set 3, 105 °C, 60mA (Chromaticity Shift).....	13
Attachment A – EUT Photo	14
A.1 Mechanical Dimensions (Ta = 25 °C).....	14
A.2 EUT Photo.....	14
Attachment B – Family declaration Letter.....	15

1 - General Information

1.1 Description of LED Light Sources

Devices tested

Part Number: RT-27HI32DS-EF-N-Y
 Part Type: LED Package
 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 (see attachment B for more information). 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)

Testing Model	Multiple Model	Difference	Details
RT-27HI32DS-EF-N-Y	RT-27HI32DS-EF-N-Y	2700K	Test model is 2700K, Multiple Model have 2700K/3000K/3500K/4000K/ 5000K/5700K/6500K
	RT-30HI32DS-EF-N-Y	3000K	
	RT-35HI32DS-EF-N-Y	3500K	
	RT-40HI32DS-EF-N-Y	4000K	
	RT-50HI32DS-EF-N-Y	5000K	
	RT-57HI32DS-EF-N-Y	5700K	
	RT-65HI32DS-EF-N-Y	6500K	

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

Lumen Maintenance Performance Data Supporting Qualification of Lighting Products(This test method was not accredited by IAS)

1.3 Test Facility

The testing facility used by Bay Area Compliance Laboratories Corp. (Dongguan). is located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.

1.4 Description of Auxiliary Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integral Sphere	EVERFINE	Diameter 0.3m	1011119	0.3m	2016-03-10	2017-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2016-03-04	2017-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2016-03-10	2017-03-09
Standard Light Source	EVERFINE	D062	1011093	3000K	2015-09-17	2016-09-16
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987C J7321114	300VA	2016-03-04	2017-03-03
Multilayer aging machine	BACL	B2-270	20022	25 °C~110 °C	2015-11-23	2016-11-22
DC Power Supply	Taishan Xingguang	T0150E8.5-80	ST06607	0~5V,0~40A	2015-10-30	2016-10-29
DC Power Supply	Taishan Xingguang	T0150E8.5-80	ST06606	0~5V,0~40A	2015-10-30	2016-10-29
DC Power Supply	Taishan Xingguang	T0150E8.5-80	ST06605	0~5V,0~40A	2015-10-30	2016-10-29

1.5 Operating Cycle

Samples are driven with a constant direct current (DC)

1.6 Ambient Conditions

For lumen maintenance test, samples were operated in thermal chambers with minimal ambient airflow. For long term reliability test, the case temperature was controlled by mounting several thermocouples on a sample reliability stress board at the designated thermal measurement point, as shown in APPENDIX. The ambient temperature T_A was measured by several thermocouples at a distance of 5 mm above the reliability test board. The relative humidity within chamber was less than 65%.

For photometry measurement, temperature was set to $25\text{ °C} \pm 2\text{ °C}$, RH <65%.

1.7 Photometry 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 $U=21K$ ($K=2$), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

FINAL

1.8 Sample Set

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.

Each Sample is soldered to all of the reliability stress boards for a given set of IESNA LM-80 tests.

Sample Size:

Total 75Pcs;

Each Ts test condition 25Pcs

The samples tested at Ts 55 °C, Ts 85 °C and Ts 105 °C were received at 2014-12-22 and tested during 2014-12-23 to 2016-01-02. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75

Data Set 1: 55 °C, 60mA

Part Number:	RT-27HI32DS-EF-N-Y
Number of Units:	25
Actual Case Temperature(T _S):	T _S =54.6 °C
Actual Ambient Temperature(T _A):	T _A =52.8 °C
Life Test Drive Current:	I _F = 60mA
Measurement Current:	I _F = 60mA

Data Set 2: 85 °C,60mA

Part Number:	RT-27HI32DS-EF-N-Y
Number of Units:	25
Actual Case Temperature(T _S):	T _S =83.3 °C
Actual Ambient Temperature(T _A):	T _A =82.7 °C
Life Test Drive Current:	I _F =60mA
Measurement Current:	I _F = 60mA

Data Set 3: 105 °C, 60mA

Part Number:	RT-27HI32DS-EF-N-Y
Number of Units:	25
Actual Case Temperature(T _S):	T _S =103.3 °C
Actual Ambient Temperature(T _A):	T _A =102.1 °C
Life Test Drive Current:	I _F = 60mA
Measurement Current:	I _F = 60mA

2 - Summary of Test Result

Data Set:	Data Set 1, 55 °C, 60mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h
Average. Lumen Maintenance at 9000 hours:	97.90%
Average Chromaticity Shift at 9000 hours ($\Delta u'v'$):	0.0023
Reported TM-21 L ₇₀ Lifetime:	>54000 hours

Data Set:	Data Set 2, 85 °C, 60mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h
Average. Lumen Maintenance at 9000 hours:	97.01%
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0025
Reported TM-21 L ₇₀ Lifetime:	>54000 hours

Data Set:	Data Set 3, 105 °C, 60mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h
Average. Lumen Maintenance at 9000 hours:	96.12%
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0027
Reported TM-21 L ₇₀ Lifetime:	>54000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 60mA (Lumen Maintenance)

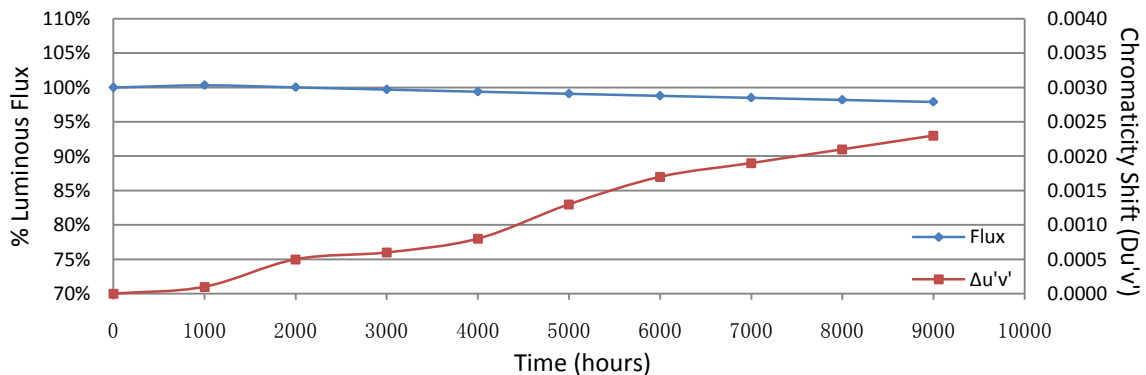
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
			0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
1	2.896	29.82	100.40	100.03	99.77	99.46	99.09	98.89	98.52	97.99	97.62
2	2.885	29.56	100.27	99.93	99.63	99.42	99.22	98.95	98.61	98.34	97.83
3	2.900	29.72	100.24	99.80	99.53	99.33	99.02	98.86	98.45	98.18	97.85
4	2.924	28.26	100.28	99.93	99.43	99.12	98.76	98.51	98.37	98.12	97.70
5	2.925	28.48	100.25	99.96	99.54	99.09	98.77	98.42	98.24	97.96	97.65
6	2.899	29.48	100.20	99.97	99.86	99.56	99.05	98.85	98.61	98.34	98.24
7	2.928	28.53	100.14	99.79	99.61	99.30	99.16	98.91	98.60	98.39	98.21
8	2.931	29.75	100.37	100.10	99.80	99.39	99.19	98.89	98.52	98.05	97.88
9	2.930	29.59	100.07	99.83	99.66	99.32	98.99	98.75	98.55	98.21	97.80
10	2.919	29.82	100.34	100.07	99.70	99.43	99.26	98.93	98.66	98.46	98.36
11	2.919	29.98	100.33	100.10	99.73	99.33	99.07	98.63	98.20	97.93	97.83
12	2.915	29.84	100.34	100.10	99.83	99.40	99.23	98.79	98.46	98.12	97.89
13	2.904	29.85	100.27	99.90	99.70	99.50	99.13	98.93	98.66	98.22	97.72
14	2.929	30.12	100.37	100.03	99.70	99.54	99.24	98.87	98.77	98.34	97.81
15	2.900	30.09	100.40	100.10	99.93	99.73	99.50	99.14	98.80	98.64	98.34
16	2.933	28.38	100.53	100.25	99.82	99.33	99.19	98.77	98.24	98.10	97.78
17	2.907	28.53	100.46	100.21	99.79	99.44	99.16	98.88	98.42	98.25	97.97
18	2.912	30.06	100.30	100.20	100.07	99.77	99.27	98.90	98.50	98.00	97.87
19	2.900	30.28	100.36	100.10	99.67	99.34	99.14	98.84	98.35	97.99	97.66
20	2.929	29.40	100.27	99.97	99.49	98.98	98.71	98.54	98.30	98.13	97.93
21	2.907	30.11	100.40	100.20	99.77	99.44	99.17	98.77	98.34	98.01	97.74
22	2.930	28.88	100.52	100.21	99.69	99.34	98.93	98.72	98.55	98.23	97.82
23	2.880	29.76	100.27	99.97	99.70	99.56	99.19	98.86	98.79	98.56	98.35
24	2.906	28.36	100.35	99.89	99.37	99.12	98.84	98.45	98.27	97.99	97.64
25	2.903	28.42	100.35	99.93	99.79	99.44	99.05	98.70	98.63	98.31	97.92
Ave.	2.912	29.40	100.32	100.02	99.70	99.39	99.09	98.79	98.50	98.19	97.90
Med.	2.912	29.72	100.34	100.03	99.70	99.40	99.14	98.85	98.52	98.18	97.83
st dev	0.015	0.68	0.1049	0.1332	0.1554	0.1830	0.1832	0.1703	0.1766	0.1917	0.2275
Min.	2.880	28.26	100.07	99.79	99.37	98.98	98.71	98.42	98.20	97.93	97.62
Max.	2.933	30.28	100.53	100.25	100.07	99.77	99.50	99.14	98.80	98.64	98.36

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 3.024E-06
 β : 1.006
Calculated L₇₀: 120000 hours
Reported L₇₀: >54000 hours

3.2 Data Set 1, 55 °C, 60mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
1	0.2613	0.5228	2744	0.0000	0.0003	0.0004	0.0007	0.0012	0.0015	0.0017	0.0020	0.0022
2	0.2626	0.5251	2708	0.0002	0.0003	0.0006	0.0007	0.0012	0.0016	0.0018	0.0020	0.0024
3	0.2605	0.5225	2764	0.0001	0.0003	0.0003	0.0005	0.0010	0.0013	0.0016	0.0017	0.0020
4	0.2618	0.5263	2718	0.0000	0.0003	0.0004	0.0007	0.0011	0.0015	0.0016	0.0017	0.0022
5	0.2590	0.5221	2799	0.0001	0.0004	0.0006	0.0008	0.0013	0.0016	0.0017	0.0020	0.0022
6	0.2628	0.5264	2697	0.0001	0.0004	0.0006	0.0008	0.0013	0.0016	0.0018	0.0020	0.0022
7	0.2604	0.5246	2756	0.0001	0.0004	0.0008	0.0011	0.0015	0.0019	0.0021	0.0023	0.0025
8	0.2597	0.5216	2785	0.0001	0.0002	0.0003	0.0004	0.0008	0.0015	0.0017	0.0019	0.0022
9	0.2611	0.5242	2742	0.0003	0.0006	0.0006	0.0010	0.0014	0.0018	0.0020	0.0022	0.0024
10	0.2588	0.5244	2792	0.0001	0.0002	0.0006	0.0010	0.0014	0.0017	0.0020	0.0021	0.0024
11	0.2606	0.5249	2751	0.0003	0.0006	0.0006	0.0008	0.0013	0.0016	0.0018	0.0020	0.0022
12	0.2595	0.5238	2778	0.0001	0.0004	0.0005	0.0008	0.0012	0.0016	0.0019	0.0020	0.0022
13	0.2630	0.5284	2685	0.0002	0.0006	0.0007	0.0010	0.0014	0.0019	0.0020	0.0022	0.0025
14	0.2607	0.5242	2752	0.0001	0.0005	0.0005	0.0008	0.0013	0.0017	0.0018	0.0020	0.0022
15	0.2594	0.5261	2772	0.0001	0.0005	0.0006	0.0009	0.0013	0.0017	0.0020	0.0021	0.0023
16	0.2629	0.5273	2691	0.0001	0.0010	0.0011	0.0014	0.0018	0.0020	0.0023	0.0026	0.0028
17	0.2610	0.5241	2745	0.0001	0.0004	0.0004	0.0007	0.0010	0.0016	0.0017	0.0019	0.0021
18	0.2613	0.5226	2746	0.0002	0.0005	0.0005	0.0008	0.0012	0.0016	0.0018	0.0021	0.0021
19	0.2604	0.5240	2759	0.0001	0.0007	0.0007	0.0010	0.0014	0.0017	0.0019	0.0018	0.0018
20	0.2609	0.5241	2748	0.0002	0.0006	0.0006	0.0005	0.0013	0.0021	0.0028	0.0029	0.0031
21	0.2593	0.5234	2784	0.0002	0.0006	0.0009	0.0009	0.0016	0.0019	0.0021	0.0023	0.0026
22	0.2605	0.5246	2753	0.0002	0.0003	0.0005	0.0007	0.0012	0.0019	0.0020	0.0021	0.0024
23	0.2607	0.5223	2761	0.0001	0.0006	0.0008	0.0009	0.0015	0.0018	0.0021	0.0023	0.0025
24	0.2625	0.5248	2710	0.0001	0.0002	0.0003	0.0007	0.0013	0.0016	0.0019	0.0019	0.0021
25	0.2617	0.5241	2730	0.0000	0.0004	0.0006	0.0009	0.0014	0.0017	0.0018	0.0020	0.0022
Ave.	0.2609	0.5243	2747	0.0001	0.0005	0.0006	0.0008	0.0013	0.0017	0.0019	0.0021	0.0023
Med.	0.2607	0.5242	2751	0.0001	0.0004	0.0006	0.0008	0.0013	0.0017	0.0019	0.0020	0.0022
st dev	0.0012	0.0016	31	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003
Min.	0.2588	0.5216	2685	0.0000	0.0002	0.0003	0.0004	0.0008	0.0013	0.0016	0.0017	0.0018
Max.	0.2630	0.5284	2799	0.0003	0.0010	0.0011	0.0014	0.0018	0.0021	0.0028	0.0029	0.0031



3.3 Data Set 2, 85 °C, 60mA (Lumen Maintenance)

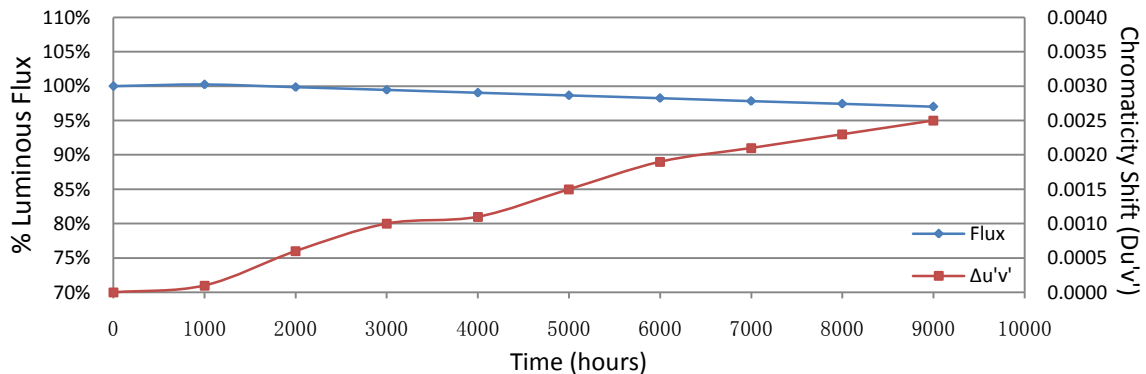
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	2.930	28.91	100.17	99.76	99.41	99.00	98.65	98.31	97.82	97.54	97.13
27	2.915	30.01	100.20	99.87	99.57	99.20	98.97	98.50	98.20	98.00	97.60
28	2.910	29.54	100.51	100.20	99.93	99.49	99.09	98.78	98.48	98.24	97.94
29	2.914	29.78	100.20	99.70	99.40	99.03	98.59	98.29	98.05	97.88	97.58
30	2.879	29.71	100.17	99.76	99.36	98.99	98.59	98.25	97.88	97.41	97.14
31	2.921	28.72	100.35	99.90	99.23	98.92	98.64	98.15	97.70	97.32	96.87
32	2.965	28.52	100.21	99.82	99.37	98.95	98.49	98.07	97.69	97.27	96.88
33	2.917	29.05	100.03	99.62	99.10	98.52	97.93	97.42	96.87	96.45	96.08
34	2.889	29.66	100.34	99.97	99.73	99.29	98.69	98.18	97.61	97.20	96.86
35	2.923	30.10	100.13	99.80	99.47	99.14	98.54	98.14	97.57	97.18	96.84
36	2.889	30.37	100.26	99.70	99.24	98.81	98.49	98.06	97.60	96.97	96.64
37	2.918	28.20	100.39	99.96	99.54	99.29	98.87	98.44	97.87	97.41	96.95
38	2.924	28.51	100.42	99.89	99.44	99.19	98.77	98.28	97.76	97.33	96.84
39	2.920	28.58	100.07	99.55	99.16	98.64	98.25	97.83	97.31	96.89	96.40
40	2.925	29.70	100.17	99.87	99.36	99.06	98.75	98.42	97.95	97.61	97.10
41	2.922	29.71	100.27	99.76	99.26	98.75	98.32	97.98	97.68	97.34	96.74
42	2.897	29.92	100.10	99.93	99.47	98.93	98.46	98.13	97.79	97.36	96.89
43	2.937	29.83	100.17	99.93	99.63	99.20	98.86	98.42	97.96	97.39	96.95
44	2.932	29.48	100.20	99.86	99.59	99.22	99.05	98.58	98.34	98.17	97.93
45	2.920	29.87	100.10	99.77	99.36	98.73	98.43	97.99	97.56	97.22	96.99
46	2.895	29.81	100.44	99.90	99.60	99.16	98.69	98.29	97.69	97.45	97.28
47	2.920	27.89	100.39	99.93	99.57	99.28	98.92	98.49	97.85	97.42	96.99
48	2.926	28.41	100.28	99.93	99.54	99.23	98.80	98.49	97.99	97.43	96.87
49	2.925	29.48	100.20	99.93	99.42	99.12	98.91	98.51	98.17	97.69	96.95
50	2.954	29.39	100.31	99.86	99.39	98.98	98.60	98.23	98.03	97.48	96.80
Ave.	2.919	29.33	100.24	99.85	99.45	99.04	98.65	98.25	97.82	97.43	97.01
Med.	2.920	29.54	100.20	99.87	99.42	99.06	98.65	98.28	97.82	97.41	96.95
st dev	0.019	0.67	0.1235	0.1315	0.1825	0.2297	0.2646	0.2778	0.3295	0.3837	0.4163
Min.	2.879	27.89	100.03	99.55	99.10	98.52	97.93	97.42	96.87	96.45	96.08
Max.	2.965	30.37	100.51	100.20	99.93	99.49	99.09	98.78	98.48	98.24	97.94

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
α: 4.150E-06
β: 1.007
Calculated L₇₀: 88000 hours
Reported L₇₀: >54000 hours

3.4 Data Set 2, 85 °C, 60mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	0.2605	0.5243	2755	0.0002	0.0006	0.0009	0.0011	0.0015	0.0018	0.0021	0.0023	0.0025
27	0.2598	0.5254	2765	0.0001	0.0004	0.0008	0.0010	0.0014	0.0017	0.0019	0.0021	0.0025
28	0.2599	0.5203	2787	0.0004	0.0013	0.0017	0.0019	0.0023	0.0026	0.0029	0.0031	0.0033
29	0.2599	0.5232	2773	0.0001	0.0005	0.0009	0.0010	0.0015	0.0017	0.0020	0.0022	0.0025
30	0.2631	0.5259	2693	0.0001	0.0005	0.0009	0.0010	0.0015	0.0018	0.0021	0.0024	0.0025
31	0.2602	0.5253	2757	0.0000	0.0006	0.0009	0.0010	0.0015	0.0018	0.0020	0.0023	0.0025
32	0.2636	0.5287	2673	0.0001	0.0006	0.0009	0.0011	0.0015	0.0018	0.0021	0.0023	0.0026
33	0.2597	0.5232	2777	0.0002	0.0008	0.0010	0.0012	0.0017	0.0020	0.0022	0.0025	0.0026
34	0.2616	0.5260	2724	0.0001	0.0006	0.0010	0.0011	0.0016	0.0019	0.0023	0.0024	0.0026
35	0.2594	0.5235	2783	0.0001	0.0004	0.0009	0.0009	0.0014	0.0017	0.0019	0.0021	0.0023
36	0.2594	0.5240	2781	0.0001	0.0010	0.0019	0.0022	0.0025	0.0029	0.0031	0.0034	0.0036
37	0.2599	0.5252	2764	0.0001	0.0007	0.0010	0.0012	0.0016	0.0019	0.0023	0.0025	0.0026
38	0.2605	0.5250	2752	0.0001	0.0006	0.0009	0.0010	0.0014	0.0018	0.0021	0.0021	0.0025
39	0.2627	0.5270	2698	0.0002	0.0005	0.0008	0.0009	0.0014	0.0017	0.0020	0.0022	0.0024
40	0.2607	0.5222	2761	0.0001	0.0004	0.0007	0.0008	0.0013	0.0016	0.0019	0.0021	0.0022
41	0.2628	0.5269	2696	0.0002	0.0008	0.0011	0.0012	0.0017	0.0021	0.0023	0.0026	0.0028
42	0.2590	0.5238	2789	0.0001	0.0004	0.0007	0.0009	0.0014	0.0016	0.0019	0.0021	0.0023
43	0.2604	0.5236	2760	0.0001	0.0006	0.0009	0.0010	0.0015	0.0019	0.0022	0.0024	0.0025
44	0.2604	0.5234	2762	0.0001	0.0009	0.0012	0.0012	0.0017	0.0021	0.0024	0.0026	0.0029
45	0.2589	0.5234	2795	0.0001	0.0005	0.0009	0.0009	0.0014	0.0018	0.0019	0.0021	0.0024
46	0.2599	0.5219	2779	0.0002	0.0004	0.0008	0.0009	0.0014	0.0017	0.0019	0.0022	0.0025
47	0.2617	0.5262	2721	0.0001	0.0004	0.0008	0.0009	0.0014	0.0017	0.0018	0.0021	0.0023
48	0.2623	0.5256	2711	0.0000	0.0004	0.0008	0.0009	0.0012	0.0016	0.0018	0.0021	0.0022
49	0.2618	0.5230	2732	0.0001	0.0004	0.0008	0.0009	0.0013	0.0016	0.0018	0.0020	0.0022
50	0.2590	0.5239	2789	0.0000	0.0005	0.0009	0.0010	0.0015	0.0017	0.0020	0.0022	0.0024
Ave.	0.2607	0.5244	2751	0.0001	0.0006	0.0010	0.0011	0.0015	0.0019	0.0021	0.0023	0.0025
Med.	0.2604	0.5240	2761	0.0001	0.0005	0.0009	0.0010	0.0015	0.0018	0.0020	0.0022	0.0025
st dev	0.0014	0.0018	35	0.0001	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Min.	0.2589	0.5203	2673	0.0000	0.0004	0.0007	0.0008	0.0012	0.0016	0.0018	0.0020	0.0022
Max.	0.2636	0.5287	2795	0.0004	0.0013	0.0019	0.0022	0.0025	0.0029	0.0031	0.0034	0.0036



3.5 Data Set 3, 105 °C, 60mA (Lumen Maintenance)

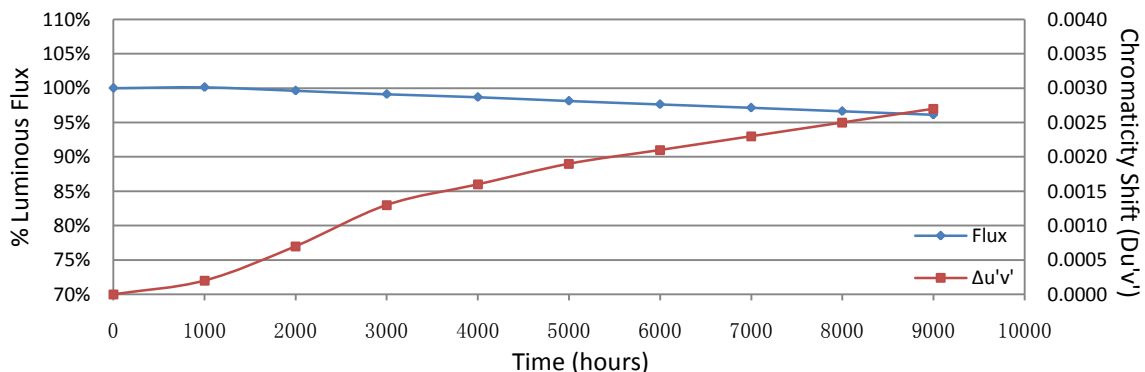
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	2.928	29.41	100.07	99.52	98.98	98.47	97.89	97.45	97.08	96.60	96.09
52	2.925	28.61	100.28	99.72	99.27	98.85	98.22	97.76	97.06	96.47	95.98
53	2.919	28.38	100.14	99.75	99.26	99.15	98.56	98.10	97.46	96.97	96.34
54	2.881	29.15	100.10	99.59	99.01	98.87	98.42	98.11	97.67	97.36	97.05
55	2.915	29.70	99.90	99.36	98.72	98.25	97.47	96.90	96.57	95.99	95.66
56	2.899	28.69	100.17	99.48	98.95	98.47	97.77	97.28	96.65	96.06	95.61
57	2.924	29.84	100.03	99.36	98.83	98.26	97.55	96.92	96.21	95.64	95.11
58	2.901	29.57	100.10	99.53	98.95	98.71	98.11	97.67	97.16	96.58	95.98
59	2.897	29.83	100.37	99.77	99.13	98.66	98.39	97.89	97.32	96.71	96.11
60	2.894	29.89	99.97	99.50	98.83	98.56	98.13	97.72	97.36	96.65	96.02
61	2.924	29.79	99.90	99.60	99.09	98.52	98.05	97.55	97.18	96.48	95.87
62	2.921	28.24	100.25	99.65	99.19	98.69	98.19	97.84	97.45	97.06	96.39
63	2.911	28.81	99.97	99.48	98.99	98.40	97.74	97.19	96.81	96.42	95.80
64	2.925	28.57	100.18	99.65	99.23	98.60	97.93	97.58	97.02	96.53	95.97
65	2.919	28.57	100.21	99.61	99.12	98.67	98.07	97.55	97.02	96.53	95.97
66	2.907	29.92	100.10	99.80	99.33	98.83	98.36	97.86	97.33	96.96	96.26
67	2.896	29.64	99.97	99.60	99.19	98.92	98.45	98.01	97.54	97.13	96.52
68	2.931	28.30	100.39	99.75	99.22	98.69	98.09	97.56	97.07	96.64	96.08
69	2.902	29.93	100.27	99.87	99.40	99.16	98.66	98.00	97.46	96.89	96.53
70	2.920	29.54	99.93	99.46	99.09	98.48	98.00	97.66	97.26	96.92	96.58
71	2.912	28.28	100.39	99.82	99.40	98.97	98.30	97.74	97.17	96.71	96.46
72	2.914	28.37	99.89	99.19	98.55	97.71	97.18	96.62	96.30	95.56	94.99
73	2.916	29.89	100.27	99.83	99.36	99.10	98.63	97.99	97.49	96.96	96.49
74	2.887	29.28	100.07	99.83	99.42	99.25	98.87	98.16	97.61	97.10	96.62
75	2.912	29.52	100.14	99.70	99.15	98.81	98.31	97.70	97.19	96.75	96.41
Ave.	2.911	29.19	100.12	99.62	99.11	98.68	98.13	97.63	97.14	96.63	96.12
Med.	2.914	29.41	100.10	99.61	99.13	98.69	98.13	97.70	97.18	96.65	96.09
st dev	0.013	0.63	0.1548	0.1728	0.2213	0.3396	0.3932	0.3969	0.3819	0.4406	0.4635
Min.	2.881	28.24	99.89	99.19	98.55	97.71	97.18	96.62	96.21	95.56	94.99
Max.	2.931	29.93	100.39	99.87	99.42	99.25	98.87	98.16	97.67	97.36	97.05

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
α: 5.219E-06
β: 1.007
Calculated L₇₀: 70000 hours
Reported L₇₀: >54000 hours

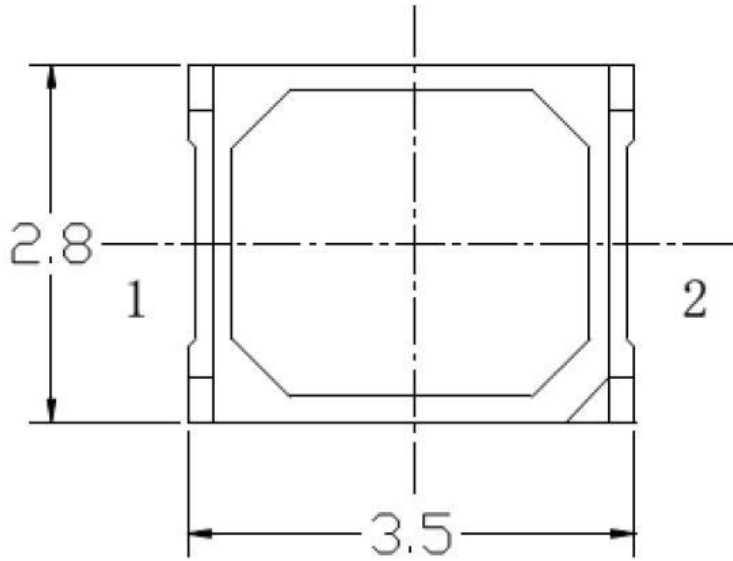
3.6 Data Set 3, 105 °C, 60mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
51	0.2631	0.5260	2693	0.0001	0.0006	0.0012	0.0015	0.0018	0.0020	0.0022	0.0024	0.0026
52	0.2599	0.5245	2766	0.0001	0.0006	0.0011	0.0015	0.0017	0.0018	0.0020	0.0022	0.0025
53	0.2613	0.5269	2727	0.0001	0.0007	0.0013	0.0016	0.0019	0.0021	0.0023	0.0024	0.0026
54	0.2641	0.5275	2666	0.0001	0.0010	0.0018	0.0026	0.0029	0.0031	0.0034	0.0036	0.0038
55	0.2609	0.5220	2756	0.0001	0.0007	0.0013	0.0016	0.0019	0.0021	0.0022	0.0025	0.0027
56	0.2606	0.5239	2755	0.0002	0.0007	0.0013	0.0016	0.0019	0.0021	0.0023	0.0024	0.0026
57	0.2600	0.5237	2768	0.0001	0.0008	0.0014	0.0017	0.0020	0.0023	0.0024	0.0026	0.0028
58	0.2604	0.5225	2764	0.0001	0.0005	0.0014	0.0017	0.0020	0.0021	0.0024	0.0026	0.0027
59	0.2601	0.5255	2758	0.0004	0.0007	0.0014	0.0017	0.0020	0.0021	0.0023	0.0025	0.0027
60	0.2601	0.5253	2759	0.0001	0.0006	0.0012	0.0013	0.0017	0.0019	0.0021	0.0022	0.0025
61	0.2600	0.5233	2771	0.0002	0.0008	0.0013	0.0018	0.0021	0.0023	0.0024	0.0025	0.0028
62	0.2593	0.5244	2781	0.0001	0.0007	0.0013	0.0016	0.0019	0.0021	0.0023	0.0024	0.0026
63	0.2631	0.5254	2695	0.0002	0.0007	0.0013	0.0017	0.0020	0.0022	0.0024	0.0026	0.0028
64	0.2595	0.5228	2784	0.0002	0.0006	0.0013	0.0015	0.0018	0.0020	0.0021	0.0024	0.0025
65	0.2615	0.5255	2729	0.0002	0.0007	0.0013	0.0015	0.0019	0.0021	0.0023	0.0024	0.0026
66	0.2612	0.5230	2746	0.0002	0.0007	0.0013	0.0016	0.0019	0.0020	0.0021	0.0024	0.0026
67	0.2617	0.5245	2729	0.0001	0.0006	0.0013	0.0016	0.0018	0.0020	0.0022	0.0023	0.0025
68	0.2603	0.5257	2754	0.0001	0.0007	0.0013	0.0018	0.0020	0.0021	0.0023	0.0025	0.0027
69	0.2591	0.5239	2788	0.0003	0.0007	0.0013	0.0016	0.0018	0.0021	0.0022	0.0025	0.0027
70	0.2602	0.5213	2776	0.0001	0.0006	0.0013	0.0012	0.0019	0.0020	0.0021	0.0024	0.0025
71	0.2615	0.5261	2726	0.0002	0.0007	0.0013	0.0015	0.0018	0.0019	0.0021	0.0023	0.0025
72	0.2612	0.5258	2734	0.0002	0.0007	0.0012	0.0016	0.0020	0.0021	0.0022	0.0025	0.0026
73	0.2610	0.5231	2750	0.0001	0.0007	0.0012	0.0016	0.0018	0.0020	0.0021	0.0023	0.0025
74	0.2644	0.5271	2662	0.0002	0.0007	0.0012	0.0016	0.0019	0.0020	0.0021	0.0023	0.0025
75	0.2641	0.5256	2675	0.0002	0.0007	0.0012	0.0017	0.0020	0.0022	0.0023	0.0025	0.0027
Ave.	0.2611	0.5246	2740	0.0002	0.0007	0.0013	0.0016	0.0019	0.0021	0.0023	0.0025	0.0027
Med.	0.2609	0.5245	2754	0.0001	0.0007	0.0013	0.0016	0.0019	0.0021	0.0022	0.0024	0.0026
st dev	0.0015	0.0016	37	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003
Min.	0.2591	0.5213	2662	0.0001	0.0005	0.0011	0.0012	0.0017	0.0018	0.0020	0.0022	0.0025
Max.	0.2644	0.5275	2788	0.0004	0.0010	0.0018	0.0026	0.0029	0.0031	0.0034	0.0036	0.0038



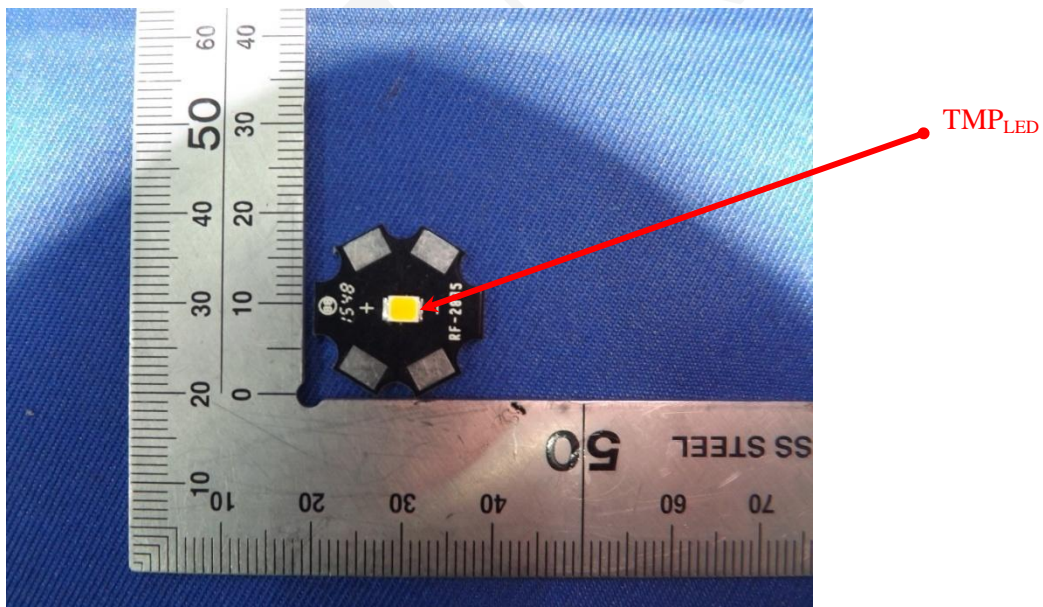
Attachment A – EUT Photo

A.1 Mechanical Dimensions (Ta = 25 °C)



All dimensions are in millimeter

A.2 EUT Photo



Attachment B – Family declaration Letter

To Whom It May Concern,

We, SHENZHEN REFOND OPTOELECTRONICS CO., LTD. , hereby declare that the following models are the same except the CCT, Details as below:

Products Description	Name	SMD LED	
	Brand		
	Project No.	R2DG141 222053-10	
Differences Description			
Testing Model	Multiple Model	Difference	Details
RT-27HI32DS-EF-N-Y	RT-27HI32DS-EF-N-Y	2700K	Testmodel is 2700K, Multiple Model have 2700K/3000K/3500K/4000K/ 5000K/5700K/6500K
	RT-30HI32DS-EF-N-Y	3000K	
	RT-35HI32DS-EF-N-Y	3500K	
	RT-40HI32DS-EF-N-Y	4000K	
	RT-50HI32DS-EF-N-Y	5000K	
	RT-57HI32DS-EF-N-Y	5700K	
	RT-65HI32DS-EF-N-Y	6500K	

Besides the differences in the table above, we declare the products are identical
We guarantee all the information provided above is true, and notice that we'll bear all the consequences caused by any false information or concealing

Best Regards

Signature:

Print Name: Yu Tongwen

Title: Engineer

[Company name: SHENZHEN REFOND OPTOELECTRONICS CO., LTD
Mail: tongwen.yu@refond.com Tel: 0755-29675000 Fax: 0755- 29675111]

QPDG004R32 Version1.0 (20140717)

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