



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: RF-27RI32DS-BF-01-J-Y

Report Type: 9000 Hours Test Report		Product Type: LED Package
Test Engineer:	Daniel Duan	<i>Daniel Duan</i>
Report Number:	R2DG151225056-10-9000	
Test Date:	2015-02-04 to 2016-02-14	
Report Date:	2016-05-27	
Reviewed By:	Jeanne Han /EE Manager	<i>Jeanne . Han</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China. Tel: +86-0769-86858888 Fax: +86-0769-86858588	

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).

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

1 - GENERAL INFORMATION.....	3
1.1 DESCRIPTION OF LED LIGHT SOURCES	3
1.2 STANDARDS USED:.....	4
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	5
2 - SUMMARY OF TEST RESULT	6
3 - TEST DATA	7
3.1 DATA SET 1, 55 °C, 150mA (LUMEN MAINTENANCE)	7
3.2 DATA SET 1, 55 °C, 150mA (CHROMATICITY SHIFT)	8
3.3 DATA SET 2, 85 °C, 150mA (LUMEN MAINTENANCE)	9
3.4 DATA SET 2, 85 °C, 150mA (CHROMATICITY SHIFT)	10
3.5 DATA SET 3, 105 °C, 150mA (LUMEN MAINTENANCE)	11
3.6 DATA SET 3, 105 °C, 150mA (CHROMATICITY SHIFT)	12
ATTACHMENT A – EUT PHOTO	13
A.1 MECHANICAL DIMENSIONS (TA = 25 °C)	13
A.2 EUT PHOTO	13
ATTACHMENT B – FAMILY DECLARATION LETTER	14

1 - GENERAL INFORMATION

1.1 Description of LED Light Sources

Devices tested

Part Number: RF-27RI32DS-BF-01-J-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)

Model Number Format:

RF - * * * I32DS - * * - J (-Y)

A1 A2 A3 A4 A5 A6 A7

A1 A2 A3 A4 A5 A6 A7

Fixed Code CCT Workshop Code Fixed Code Internal Code Fixed Code Internal Code

Note::

A1: Letter RF can be RF or RT. It is an internal Market code which does not affect product property.

A2: Letter * * represent CCT, it can be 27, 30, 35, 40, 50, 57, 60, 65, W2, W3, W4, W5, W6. The CCT are listed in the follow form. 27, 30, 35, 40, 50, 57, 60, 65 which representative the chromaticity specification are referred to ANSI standard, W2 (=2700K), W3 (=3000K), W4 (=4000K), W5 (=5000K), W6 (=6000K) which representative the chromaticity specification are referred to IEC standard.

A3: Letter * represent workshop code, it can be R, M, H, T or Q&S which does not affect product property.

A4: Letter I32DS is a fixed code.

A5: Letter * * can be BF, CF, DF, EF, FF or FH, It is an internal Market code which does not affect product property.

A6: Letter J is a fixed code.

A7: A (Y) on behalf of the centrifugal power equipment is not used, No (-Y) on behalf of using centrifugal power equipment,;

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 ℃~110 ℃	2015-11-23	2016-11-22
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	(50/15A)	2016-03-04	2017-03-03

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 $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, RH <65%.

1.7 Photometry Measurement Uncertainty

The uncertainty of the light output (luminous flux) 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 CRI is $U=1.7$ ($K=2$), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

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 90Pcs;

Each T_s test condition 30Pcs

The samples tested at T_s 55 °C, T_s 85 °C and T_s 105 °C were received at 2014-12-17 and tested during 2015-02-04 to 2016-02-14. The samples were numbered from 1 to 30, 31 to 60 and 61 to 90

Data Set 1: 55 °C, 150mA

Part Number:	RF-27RI32DS-BF-01-J-Y
Number of Units:	30
Actual Case Temperature(T_s):	$T_s=54.6\text{ °C}$
Actual Ambient Temperature(T_A):	$T_A=53.1\text{ °C}$
Life Test Drive Current:	$I_F=150\text{mA}$
Measurement Current:	$I_F=150\text{mA}$

Data Set 2: 85 °C,150mA

Part Number:	RF-27RI32DS-BF-01-J-Y
Number of Units:	30
Actual Case Temperature(T_s):	$T_s=84.2\text{ °C}$
Actual Ambient Temperature(T_A):	$T_A=82.6\text{ °C}$
Life Test Drive Current:	$I_F=150\text{mA}$
Measurement Current:	$I_F=150\text{mA}$

Data Set 3: 105 °C, 150mA

Part Number:	RF-27RI32DS-BF-01-J-Y
Number of Units:	30
Actual Case Temperature(T_s):	$T_s=104.1\text{ °C}$
Actual Ambient Temperature(T_A):	$T_A=102.9\text{ °C}$
Life Test Drive Current:	$I_F=150\text{mA}$
Measurement Current:	$I_F=150\text{mA}$

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 150mA
Number of Units:	30
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h
Average. Lumen Maintenance at 6000 hours:	97.14%
Average. Lumen Maintenance at 9000 hours:	96.27%
Average Chromaticity Shift at 6000 hours (Δu^*v^*):	0.0028
Average Chromaticity Shift at 9000 hours (Δu^*v^*):	0.0035
Reported TM-21 L ₇₀ Lifetime:	>54000 hours

Data Set:	Data Set 2, 85 °C, 150mA
Number of Units:	30
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h
Average. Lumen Maintenance at 6000 hours:	96.34%
Average. Lumen Maintenance at 9000 hours:	95.11%
Average Chromaticity Shift at 6000 hours(Δu^*v^*):	0.0024
Average Chromaticity Shift at 9000 hours(Δu^*v^*):	0.0035
Reported TM-21 L ₇₀ Lifetime:	>54000 hours

Data Set:	Data Set 3, 105 °C, 150mA
Number of Units:	30
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h
Average. Lumen Maintenance at 6000 hours:	95.77%
Average. Lumen Maintenance at 9000 hours:	94.30%
Average Chromaticity Shift at 6000 hours(Δu^*v^*):	0.0024
Average. Lumen Maintenance at 9000 hours:	0.0037
Reported TM-21 L ₇₀ Lifetime:	>54000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 150mA (Lumen Maintenance)

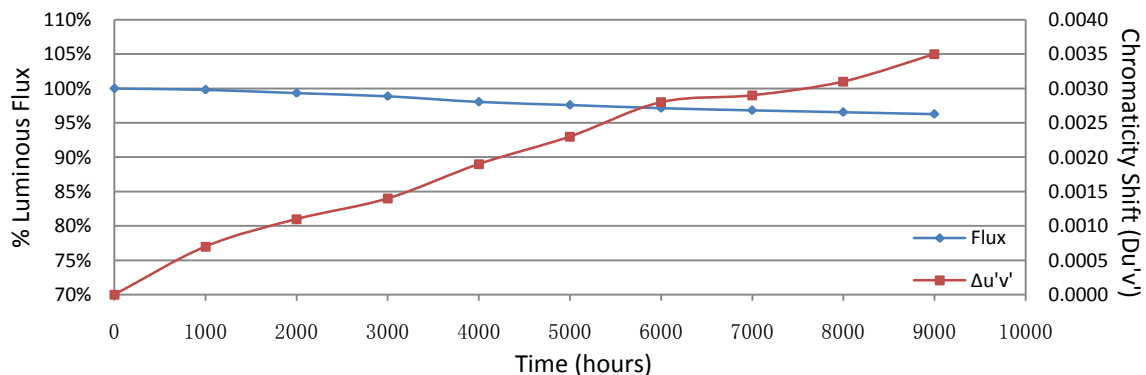
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.090	57.24	99.60	99.13	98.64	97.57	97.13	96.80	96.44	96.14	95.89
2	3.086	57.04	99.63	99.26	98.62	97.41	96.65	96.13	95.76	95.27	95.13
3	3.079	56.71	99.82	99.33	98.92	97.80	97.34	96.67	96.49	96.16	95.89
4	3.087	57.47	99.93	99.37	98.90	97.76	97.34	96.71	96.49	95.82	95.53
5	3.088	56.76	99.68	99.14	98.38	97.52	97.20	96.56	96.39	96.11	96.00
6	3.087	57.28	99.74	99.35	98.90	98.32	97.54	96.88	96.56	96.02	95.76
7	3.079	56.93	99.60	99.16	98.63	98.45	97.65	97.00	96.56	96.35	96.07
8	3.094	55.06	100.35	99.71	99.42	98.62	98.35	98.06	97.75	97.57	97.06
9	3.093	54.86	100.16	99.69	99.16	98.63	98.14	97.67	97.54	97.21	96.96
10	3.093	57.40	99.65	99.25	98.83	98.45	97.91	97.02	96.81	96.59	96.27
11	3.088	58.00	99.66	99.03	98.47	98.03	97.55	96.71	96.38	96.19	95.79
12	3.084	57.74	99.93	99.43	99.05	98.41	97.66	96.93	96.74	96.62	96.36
13	3.080	57.25	100.14	99.72	99.30	99.27	99.00	98.03	97.75	97.61	97.36
14	3.079	56.84	99.58	99.03	98.84	98.03	97.73	97.54	97.26	96.97	96.57
15	3.080	58.19	99.48	98.99	98.76	97.87	97.75	97.35	97.13	96.68	96.37
16	3.084	57.01	99.67	99.30	99.00	98.33	98.21	98.02	97.70	97.47	97.12
17	3.088	56.58	99.47	99.20	98.71	97.37	96.94	96.52	96.04	95.81	95.33
18	3.086	57.99	99.67	99.17	98.52	97.03	96.62	96.57	96.10	95.86	95.62
19	3.087	57.88	99.67	99.10	98.67	97.98	97.13	96.60	96.30	95.97	95.80
20	3.074	56.65	99.79	99.49	99.01	98.38	97.83	96.91	96.72	96.56	96.43
21	3.083	57.63	99.74	99.22	98.79	98.18	97.69	97.31	96.81	96.65	96.48
22	3.086	56.38	100.09	99.86	99.38	98.76	98.14	97.77	97.37	96.98	96.72
23	3.092	56.12	100.11	99.55	99.22	98.15	97.97	97.68	97.40	97.36	97.18
24	3.093	57.07	99.30	98.98	98.46	97.28	96.92	96.65	96.34	96.09	95.99
25	3.086	57.62	99.65	99.18	98.75	96.95	96.79	96.67	96.22	96.10	95.89
26	3.089	55.78	99.87	99.28	98.64	97.85	97.28	97.15	96.86	96.74	96.52
27	3.080	54.60	100.24	99.73	99.32	98.02	97.93	97.71	97.40	97.22	96.83
28	3.089	56.99	100.18	99.44	98.95	98.32	97.77	97.40	96.98	96.75	96.42
29	3.083	54.55	100.05	99.63	99.12	98.26	97.91	97.36	97.05	96.79	96.22
30	3.075	57.03	99.74	99.07	98.74	98.39	97.95	97.88	97.33	96.88	96.41
Ave.	3.085	56.82	99.81	99.33	98.87	98.05	97.60	97.14	96.82	96.55	96.27
Med.	3.086	57.02	99.74	99.27	98.84	98.09	97.68	97.01	96.78	96.60	96.32
st dev	0.0054	0.9888	0.2573	0.2479	0.2844	0.5278	0.5395	0.5356	0.5458	0.5904	0.5615
Min.	3.074	54.55	99.30	98.98	98.38	96.95	96.62	96.13	95.76	95.27	95.13
Max.	3.094	58.19	100.35	99.86	99.42	99.27	99.00	98.06	97.75	97.61	97.36

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 3.639E-06
 β : 0.994
Calculated L₇₀: 96000 hours
Reported L₇₀: >54000 hours

3.2 Data Set 1, 55 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2610	0.5291	2725	0.0007	0.0012	0.0015	0.0019	0.0022	0.0026	0.0027	0.0032	0.0033
2	0.2592	0.5269	2771	0.0007	0.0009	0.0014	0.0020	0.0023	0.0027	0.0028	0.0031	0.0035
3	0.2619	0.5305	2700	0.0007	0.0011	0.0015	0.0019	0.0024	0.0025	0.0029	0.0033	0.0037
4	0.2611	0.5294	2720	0.0007	0.0011	0.0014	0.0021	0.0024	0.0027	0.0029	0.0032	0.0033
5	0.2617	0.5300	2706	0.0007	0.0012	0.0014	0.0021	0.0025	0.0027	0.0031	0.0032	0.0034
6	0.2613	0.5285	2719	0.0006	0.0009	0.0012	0.0017	0.0022	0.0024	0.0022	0.0025	0.0029
7	0.2606	0.5290	2733	0.0007	0.0011	0.0015	0.0020	0.0026	0.0028	0.0030	0.0032	0.0035
8	0.2614	0.5288	2716	0.0009	0.0014	0.0018	0.0024	0.0029	0.0034	0.0036	0.0038	0.0042
9	0.2606	0.5303	2727	0.0009	0.0014	0.0016	0.0021	0.0025	0.0030	0.0031	0.0033	0.0038
10	0.2622	0.5307	2693	0.0005	0.0010	0.0013	0.0018	0.0019	0.0025	0.0024	0.0029	0.0031
11	0.2599	0.5277	2754	0.0006	0.0011	0.0012	0.0017	0.0020	0.0025	0.0025	0.0026	0.0028
12	0.2613	0.5292	2717	0.0009	0.0014	0.0017	0.0023	0.0025	0.0031	0.0034	0.0036	0.0038
13	0.2604	0.5273	2745	0.0008	0.0012	0.0015	0.0022	0.0026	0.0030	0.0033	0.0035	0.0036
14	0.2608	0.5280	2733	0.0008	0.0012	0.0013	0.0017	0.0022	0.0026	0.0026	0.0029	0.0032
15	0.2592	0.5272	2771	0.0007	0.0011	0.0014	0.0017	0.0021	0.0024	0.0027	0.0029	0.0032
16	0.2605	0.5266	2745	0.0009	0.0012	0.0014	0.0018	0.0022	0.0026	0.0026	0.0030	0.0035
17	0.2602	0.5293	2740	0.0006	0.0012	0.0014	0.0017	0.0021	0.0026	0.0023	0.0026	0.0028
18	0.2619	0.5302	2702	0.0008	0.0013	0.0016	0.0019	0.0023	0.0028	0.0029	0.0031	0.0033
19	0.2612	0.5298	2716	0.0004	0.0009	0.0012	0.0016	0.0020	0.0024	0.0023	0.0024	0.0030
20	0.2594	0.5261	2771	0.0005	0.0010	0.0015	0.0019	0.0022	0.0028	0.0028	0.0032	0.0034
21	0.2596	0.5280	2759	0.0008	0.0011	0.0015	0.0019	0.0022	0.0027	0.0024	0.0027	0.0031
22	0.2608	0.5273	2736	0.0009	0.0016	0.0020	0.0025	0.0029	0.0034	0.0036	0.0039	0.0042
23	0.2603	0.5282	2743	0.0008	0.0014	0.0018	0.0023	0.0026	0.0031	0.0038	0.0038	0.0042
24	0.2606	0.5308	2725	0.0002	0.0007	0.0010	0.0015	0.0019	0.0024	0.0026	0.0028	0.0031
25	0.2609	0.5303	2722	0.0004	0.0009	0.0013	0.0017	0.0020	0.0025	0.0027	0.0028	0.0031
26	0.2620	0.5303	2698	0.0005	0.0011	0.0015	0.0020	0.0024	0.0029	0.0029	0.0034	0.0038
27	0.2615	0.5293	2713	0.0007	0.0011	0.0017	0.0022	0.0027	0.0032	0.0036	0.0037	0.0041
28	0.2611	0.5293	2721	0.0006	0.0007	0.0012	0.0017	0.0022	0.0026	0.0027	0.0030	0.0035
29	0.2614	0.5304	2711	0.0005	0.0012	0.0017	0.0023	0.0028	0.0034	0.0034	0.0036	0.0040
30	0.2611	0.5284	2724	0.0004	0.0006	0.0009	0.0018	0.0022	0.0027	0.0028	0.0029	0.0033
Ave.	0.2608	0.5289	2729	0.0007	0.0011	0.0014	0.0019	0.0023	0.0028	0.0029	0.0031	0.0035
Med.	0.2610	0.5292	2725	0.0007	0.0011	0.0015	0.0019	0.0023	0.0027	0.0028	0.0031	0.0034
st dev	0.0008	0.0013	21.5706	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004
Min.	0.2592	0.5261	2693	0.0002	0.0006	0.0009	0.0015	0.0019	0.0024	0.0022	0.0024	0.0028
Max.	0.2622	0.5308	2771	0.0009	0.0016	0.0020	0.0025	0.0029	0.0034	0.0038	0.0039	0.0042



3.3 Data Set 2, 85 °C, 150mA (Lumen Maintenance)

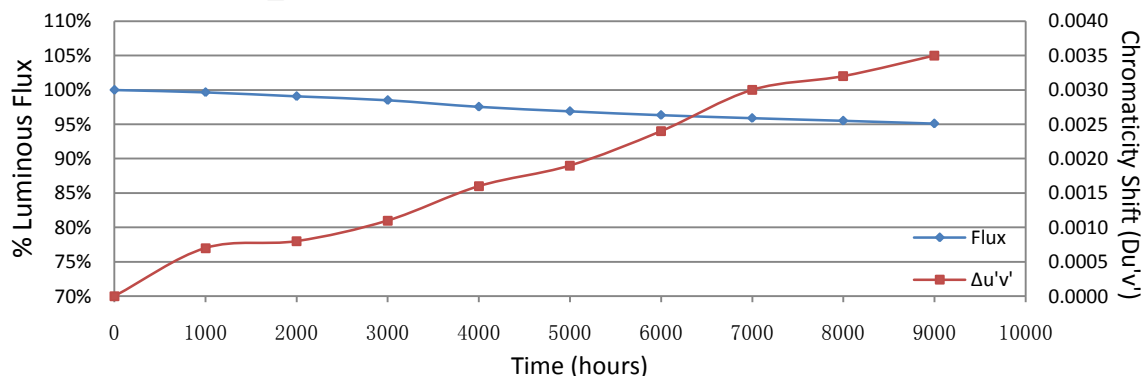
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
31	3.078	56.02	100.02	99.43	98.82	97.86	97.30	96.39	96.05	95.61	95.00
32	3.069	57.68	99.55	98.96	98.28	97.75	97.17	96.29	95.96	95.63	95.27
33	3.085	57.10	99.56	98.91	98.16	97.23	96.94	96.25	95.83	95.52	95.11
34	3.084	55.93	100.13	99.57	98.27	97.23	96.78	95.96	95.55	95.01	94.58
35	3.068	56.41	99.98	99.47	98.23	97.16	96.56	96.21	95.64	94.98	94.45
36	3.080	53.77	99.94	99.40	98.79	97.64	96.97	96.80	96.56	96.43	96.15
37	3.082	57.54	99.60	99.13	98.45	97.43	96.54	95.52	95.20	94.96	94.60
38	3.075	57.10	99.61	99.00	98.37	97.39	96.50	95.69	94.96	94.69	94.33
39	3.093	56.24	100.25	99.75	99.06	98.13	97.40	96.60	96.27	96.23	95.93
40	3.088	57.30	99.69	99.02	98.38	97.52	96.68	96.02	95.43	95.31	95.06
41	3.115	56.00	99.55	98.89	98.50	97.21	96.70	95.89	95.59	94.82	94.36
42	3.082	57.13	100.04	99.63	99.04	97.78	97.36	96.52	96.29	95.92	95.69
43	3.091	57.50	99.69	98.99	98.56	97.53	97.13	96.37	95.98	95.39	94.92
44	3.094	57.43	99.79	99.08	99.27	98.21	97.86	97.25	96.94	96.50	96.10
45	3.093	55.54	99.98	99.33	98.87	97.80	97.70	97.43	96.98	96.72	96.36
46	3.099	57.91	99.08	98.51	98.22	96.22	95.96	95.86	95.61	94.99	94.42
47	3.088	57.52	99.13	98.61	98.40	97.46	96.14	96.05	95.48	95.34	94.94
48	3.098	56.95	99.65	98.98	98.33	97.30	96.54	96.47	96.01	95.72	95.26
49	3.137	56.83	99.67	99.12	98.56	97.06	96.48	96.16	95.53	95.06	94.58
50	3.123	55.87	99.50	99.02	98.50	98.21	97.19	96.46	96.15	96.04	95.54
51	3.098	56.27	99.56	98.88	98.47	98.19	97.09	96.32	95.66	95.29	94.99
52	3.110	56.66	99.21	98.66	97.90	97.44	96.35	95.80	95.46	95.25	94.78
53	3.114	56.97	99.37	98.93	98.42	97.70	97.09	96.65	95.98	95.35	94.87
54	3.113	56.31	99.47	98.77	98.33	97.82	97.03	96.41	95.84	95.12	94.58
55	3.121	55.60	99.55	98.97	98.40	97.90	97.21	96.91	96.65	96.04	95.61
56	3.080	56.50	99.45	98.85	98.41	98.05	97.52	97.22	96.65	96.35	95.89
57	3.081	56.83	99.51	98.98	98.50	97.62	96.96	96.53	95.92	95.88	95.57
58	3.089	55.37	100.05	99.55	99.04	98.05	97.13	96.91	96.42	96.15	95.67
59	3.093	55.86	99.79	99.09	98.37	96.35	95.95	94.97	94.61	93.91	93.47
60	3.086	57.21	99.44	98.97	98.32	97.26	96.92	96.26	95.80	95.46	95.07
Ave.	3.094	56.58	99.66	99.08	98.51	97.55	96.90	96.34	95.90	95.52	95.11
Med.	3.090	56.75	99.61	99.00	98.41	97.58	96.96	96.34	95.88	95.42	95.03
st dev	0.0167	0.8779	0.2908	0.3069	0.3060	0.4816	0.4733	0.5256	0.5473	0.6231	0.6542
Min.	3.068	53.77	99.08	98.51	97.90	96.22	95.95	94.97	94.61	93.91	93.47
Max.	3.137	57.91	100.25	99.75	99.27	98.21	97.86	97.43	96.98	96.72	96.36

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 4.979E-06
 β : 0.994
Calculated L₇₀: 70000 hours
Reported L₇₀: >54000 hours

3.4 Data Set 2, 85 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
31	0.2614	0.5293	2716	0.0008	0.0010	0.0012	0.0020	0.0024	0.0028	0.0031	0.0032	0.0036
32	0.2606	0.5296	2730	0.0005	0.0008	0.0012	0.0019	0.0023	0.0027	0.0033	0.0032	0.0035
33	0.2608	0.5301	2724	0.0004	0.0006	0.0008	0.0014	0.0017	0.0023	0.0029	0.0030	0.0031
34	0.2606	0.5288	2734	0.0003	0.0007	0.0011	0.0016	0.0021	0.0025	0.0031	0.0031	0.0035
35	0.2606	0.5280	2737	0.0004	0.0006	0.0010	0.0016	0.0019	0.0024	0.0033	0.0034	0.0035
36	0.2615	0.5305	2709	0.0005	0.0006	0.0009	0.0015	0.0019	0.0024	0.0031	0.0033	0.0035
37	0.2608	0.5283	2732	0.0006	0.0007	0.0009	0.0014	0.0018	0.0023	0.0029	0.0031	0.0033
38	0.2605	0.5284	2738	0.0006	0.0006	0.0009	0.0016	0.0019	0.0025	0.0033	0.0033	0.0034
39	0.2612	0.5293	2719	0.0010	0.0010	0.0013	0.0018	0.0022	0.0026	0.0033	0.0036	0.0037
40	0.2597	0.5280	2756	0.0006	0.0007	0.0011	0.0017	0.0021	0.0026	0.0028	0.0031	0.0034
41	0.2594	0.5276	2765	0.0006	0.0008	0.0009	0.0015	0.0020	0.0024	0.0026	0.0029	0.0030
42	0.2605	0.5289	2735	0.0007	0.0008	0.0010	0.0016	0.0019	0.0024	0.0029	0.0028	0.0033
43	0.2616	0.5302	2708	0.0005	0.0006	0.0008	0.0014	0.0017	0.0022	0.0026	0.0028	0.0030
44	0.2599	0.5284	2750	0.0005	0.0006	0.0007	0.0014	0.0017	0.0022	0.0026	0.0027	0.0027
45	0.2621	0.5287	2704	0.0008	0.0010	0.0012	0.0017	0.0021	0.0025	0.0032	0.0036	0.0035
46	0.2602	0.5294	2740	0.0005	0.0006	0.0007	0.0013	0.0016	0.0021	0.0026	0.0028	0.0027
47	0.2607	0.5284	2733	0.0007	0.0007	0.0009	0.0015	0.0018	0.0022	0.0028	0.0033	0.0033
48	0.2605	0.5280	2740	0.0007	0.0006	0.0008	0.0013	0.0017	0.0022	0.0024	0.0029	0.0029
49	0.2593	0.5278	2766	0.0010	0.0010	0.0013	0.0016	0.0020	0.0024	0.0031	0.0034	0.0034
50	0.2618	0.5304	2703	0.0009	0.0009	0.0013	0.0018	0.0020	0.0025	0.0031	0.0032	0.0036
51	0.2617	0.5307	2704	0.0009	0.0011	0.0013	0.0018	0.0021	0.0025	0.0031	0.0032	0.0038
52	0.2617	0.5278	2715	0.0008	0.0009	0.0011	0.0016	0.0019	0.0024	0.0028	0.0030	0.0037
53	0.2593	0.5266	2770	0.0008	0.0008	0.0013	0.0016	0.0018	0.0023	0.0029	0.0030	0.0037
54	0.2617	0.5298	2707	0.0008	0.0012	0.0015	0.0017	0.0019	0.0027	0.0030	0.0032	0.0038
55	0.2602	0.5289	2741	0.0006	0.0007	0.0009	0.0013	0.0017	0.0019	0.0027	0.0029	0.0037
56	0.2601	0.5278	2749	0.0007	0.0007	0.0011	0.0014	0.0019	0.0021	0.0029	0.0032	0.0038
57	0.2596	0.5273	2761	0.0008	0.0008	0.0009	0.0014	0.0018	0.0020	0.0029	0.0032	0.0037
58	0.2612	0.5294	2720	0.0008	0.0008	0.0012	0.0015	0.0018	0.0022	0.0029	0.0033	0.0042
59	0.2588	0.5273	2779	0.0004	0.0010	0.0016	0.0027	0.0030	0.0037	0.0042	0.0043	0.0050
60	0.2613	0.5290	2718	0.0007	0.0006	0.0012	0.0015	0.0016	0.0020	0.0026	0.0029	0.0038
Ave.	0.2606	0.5288	2733	0.0007	0.0008	0.0011	0.0016	0.0019	0.0024	0.0030	0.0032	0.0035
Med.	0.2606	0.5288	2734	0.0007	0.0008	0.0011	0.0016	0.0019	0.0024	0.0029	0.0032	0.0035
st dev	0.0009	0.0011	21.5049	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0004
Min.	0.2588	0.5266	2703	0.0003	0.0006	0.0007	0.0013	0.0016	0.0019	0.0024	0.0027	0.0027
Max.	0.2621	0.5307	2779	0.0010	0.0012	0.0016	0.0027	0.0030	0.0037	0.0042	0.0043	0.0050



3.5 Data Set 3, 105 °C, 150mA (Lumen Maintenance)

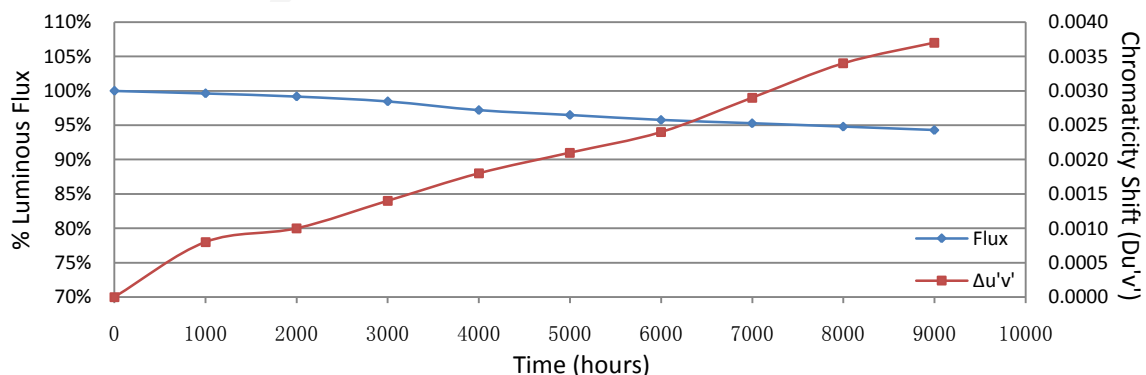
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
61	3.086	58.02	99.62	99.12	98.43	97.48	96.60	96.10	95.66	95.33	94.85
62	3.101	56.28	99.91	101.76	100.11	100.00	99.68	99.15	98.69	98.21	97.74
63	3.101	57.79	99.62	99.22	98.55	97.89	96.94	96.02	95.45	95.12	94.45
64	3.095	55.86	99.57	99.03	98.42	97.15	96.60	96.24	96.85	96.33	95.92
65	3.122	56.91	99.81	99.14	98.37	97.35	96.80	96.47	95.84	95.24	94.55
66	3.102	56.94	99.77	99.26	98.37	96.91	96.28	96.12	95.86	95.40	95.15
67	3.098	57.94	99.62	99.21	98.58	97.15	96.58	95.10	94.58	94.06	93.51
68	3.088	56.81	99.67	99.10	98.38	95.56	94.77	94.24	93.49	92.69	92.06
69	3.089	57.33	99.63	99.20	98.43	97.56	96.23	95.24	94.68	94.12	93.70
70	3.092	56.09	99.96	99.27	98.57	97.15	96.52	96.31	95.90	95.69	95.24
71	3.084	56.14	99.86	99.41	98.88	96.72	96.03	95.69	95.17	94.60	94.01
72	3.077	55.35	99.33	98.81	98.23	96.80	96.13	95.50	94.92	94.33	93.69
73	3.087	56.73	98.50	98.17	97.41	96.26	96.02	94.32	93.78	93.28	92.90
74	3.091	57.14	99.46	99.02	98.48	96.18	95.31	94.59	94.31	93.79	93.21
75	3.092	53.56	99.79	99.33	98.64	96.51	95.95	95.37	95.03	94.68	94.31
76	3.092	56.71	99.38	98.85	98.13	97.30	96.60	94.83	94.16	93.99	93.37
77	3.082	56.85	99.56	98.84	98.14	97.24	96.50	95.25	94.81	94.25	93.84
78	3.077	57.10	99.74	99.09	98.35	97.53	96.71	96.01	95.46	94.97	94.47
79	3.086	57.91	99.90	99.45	98.69	97.32	96.68	95.99	95.30	94.73	94.04
80	3.080	56.95	99.72	99.37	98.61	96.35	95.82	95.22	94.73	94.49	94.08
81	3.085	56.94	99.98	99.26	98.38	97.28	96.77	96.21	95.61	95.15	94.87
82	3.088	57.26	99.86	99.48	98.67	97.14	96.75	96.12	95.69	95.08	94.52
83	3.084	57.77	99.57	98.82	98.22	96.71	95.91	95.24	94.91	94.11	93.51
84	3.092	55.71	99.28	98.73	98.99	97.42	96.91	96.16	95.64	95.03	94.61
85	3.091	56.72	99.45	98.96	98.15	97.88	97.21	96.91	96.42	95.68	95.24
86	3.096	57.99	99.72	99.28	98.31	97.28	96.46	95.90	95.45	95.09	94.45
87	3.095	56.77	99.67	99.12	98.34	97.15	96.44	95.75	95.07	94.49	93.92
88	3.104	57.77	99.46	99.05	98.36	97.07	96.17	95.31	94.74	94.34	93.79
89	3.086	56.79	99.56	98.87	98.24	97.90	96.97	95.95	95.39	94.95	94.31
90	3.077	57.47	99.88	99.29	98.69	97.60	96.31	95.79	95.21	94.88	94.57
Ave.	3.091	56.85	99.63	99.18	98.47	97.20	96.49	95.77	95.29	94.80	94.30
Med.	3.090	56.93	99.65	99.13	98.40	97.20	96.51	95.84	95.26	94.81	94.31
st dev	0.0095	0.9347	0.2824	0.5546	0.4185	0.7518	0.7860	0.8973	0.9600	0.9775	1.0132
Min.	3.077	53.56	98.50	98.17	97.41	95.56	94.77	94.24	93.49	92.69	92.06
Max.	3.122	58.02	99.98	101.76	100.11	100.00	99.68	99.15	98.69	98.21	97.74

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 5.985E-06
 β : 0.994
Calculated L₇₀: 59000 hours
Reported L₇₀: >54000 hours

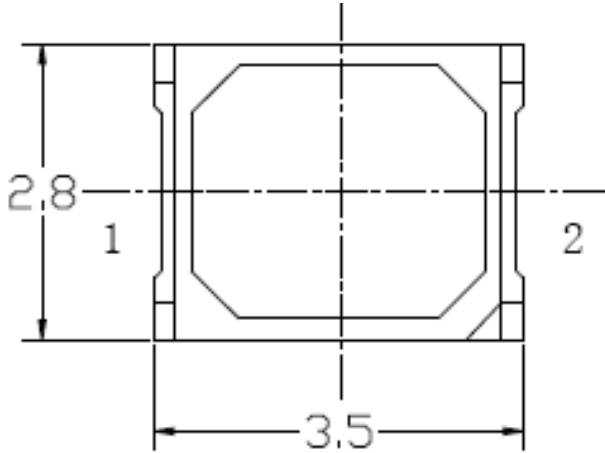
3.6 Data Set 3, 105 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
61	0.2592	0.5271	2771	0.0007	0.0008	0.0012	0.0015	0.0018	0.0022	0.0030	0.0031	0.0036
62	0.2601	0.5266	2754	0.0008	0.0008	0.0012	0.0016	0.0020	0.0024	0.0032	0.0034	0.0039
63	0.2598	0.5277	2755	0.0007	0.0006	0.0011	0.0015	0.0021	0.0027	0.0036	0.0040	0.0044
64	0.2600	0.5286	2747	0.0007	0.0009	0.0011	0.0016	0.0017	0.0022	0.0030	0.0033	0.0036
65	0.2600	0.5274	2752	0.0008	0.0008	0.0011	0.0015	0.0016	0.0021	0.0027	0.0030	0.0034
66	0.2607	0.5282	2733	0.0006	0.0006	0.0010	0.0013	0.0015	0.0019	0.0026	0.0030	0.0033
67	0.2586	0.5251	2793	0.0009	0.0009	0.0013	0.0016	0.0016	0.0022	0.0029	0.0032	0.0035
68	0.2591	0.5293	2763	0.0006	0.0009	0.0013	0.0021	0.0030	0.0039	0.0040	0.0040	0.0047
69	0.2611	0.5298	2720	0.0007	0.0009	0.0011	0.0014	0.0015	0.0020	0.0028	0.0035	0.0037
70	0.2605	0.5292	2734	0.0008	0.0010	0.0013	0.0015	0.0016	0.0019	0.0028	0.0035	0.0037
71	0.2619	0.5303	2700	0.0008	0.0010	0.0014	0.0016	0.0017	0.0020	0.0029	0.0034	0.0037
72	0.2581	0.5268	2797	0.0008	0.0009	0.0011	0.0014	0.0015	0.0017	0.0024	0.0029	0.0034
73	0.2588	0.5266	2781	0.0009	0.0011	0.0013	0.0014	0.0019	0.0021	0.0028	0.0034	0.0038
74	0.2609	0.5285	2729	0.0008	0.0011	0.0014	0.0014	0.0016	0.0019	0.0025	0.0032	0.0035
75	0.2611	0.5290	2723	0.0008	0.0010	0.0015	0.0014	0.0015	0.0018	0.0024	0.0031	0.0035
76	0.2620	0.5301	2700	0.0010	0.0013	0.0018	0.0020	0.0017	0.0021	0.0029	0.0035	0.0038
77	0.2612	0.5290	2720	0.0008	0.0010	0.0015	0.0017	0.0018	0.0019	0.0025	0.0031	0.0034
78	0.2603	0.5278	2744	0.0009	0.0011	0.0017	0.0020	0.0021	0.0023	0.0029	0.0036	0.0040
79	0.2597	0.5274	2758	0.0007	0.0010	0.0012	0.0016	0.0018	0.0019	0.0021	0.0028	0.0031
80	0.2612	0.5284	2723	0.0010	0.0014	0.0018	0.0022	0.0023	0.0030	0.0031	0.0037	0.0039
81	0.2620	0.5301	2700	0.0009	0.0011	0.0017	0.0022	0.0025	0.0027	0.0028	0.0034	0.0037
82	0.2589	0.5266	2779	0.0008	0.0011	0.0017	0.0021	0.0025	0.0027	0.0028	0.0033	0.0036
83	0.2592	0.5272	2770	0.0009	0.0009	0.0016	0.0021	0.0024	0.0026	0.0030	0.0036	0.0039
84	0.2620	0.5299	2700	0.0011	0.0013	0.0017	0.0021	0.0025	0.0028	0.0030	0.0036	0.0040
85	0.2616	0.5299	2709	0.0007	0.0016	0.0023	0.0028	0.0033	0.0034	0.0035	0.0042	0.0046
86	0.2592	0.5274	2770	0.0007	0.0008	0.0018	0.0022	0.0025	0.0027	0.0028	0.0034	0.0037
87	0.2609	0.5288	2728	0.0004	0.0006	0.0013	0.0021	0.0024	0.0025	0.0026	0.0034	0.0037
88	0.2590	0.5273	2773	0.0007	0.0006	0.0013	0.0020	0.0023	0.0025	0.0026	0.0032	0.0035
89	0.2610	0.5285	2726	0.0009	0.0009	0.0013	0.0021	0.0025	0.0026	0.0027	0.0033	0.0037
90	0.2606	0.5302	2727	0.0007	0.0008	0.0012	0.0018	0.0024	0.0025	0.0030	0.0031	0.0033
Ave.	0.2603	0.5283	2743	0.0008	0.0010	0.0014	0.0018	0.0021	0.0024	0.0029	0.0034	0.0037
Med.	0.2604	0.5285	2739	0.0008	0.0009	0.0013	0.0017	0.0020	0.0023	0.0028	0.0034	0.0037
st dev	0.0011	0.0013	28.6711	0.0001	0.0002	0.0003	0.0004	0.0005	0.0005	0.0004	0.0003	0.0004
Min.	0.2581	0.5251	2700	0.0004	0.0006	0.0010	0.0013	0.0015	0.0017	0.0021	0.0028	0.0031
Max.	0.2620	0.5303	2797	0.0011	0.0016	0.0023	0.0028	0.0033	0.0039	0.0040	0.0042	0.0047



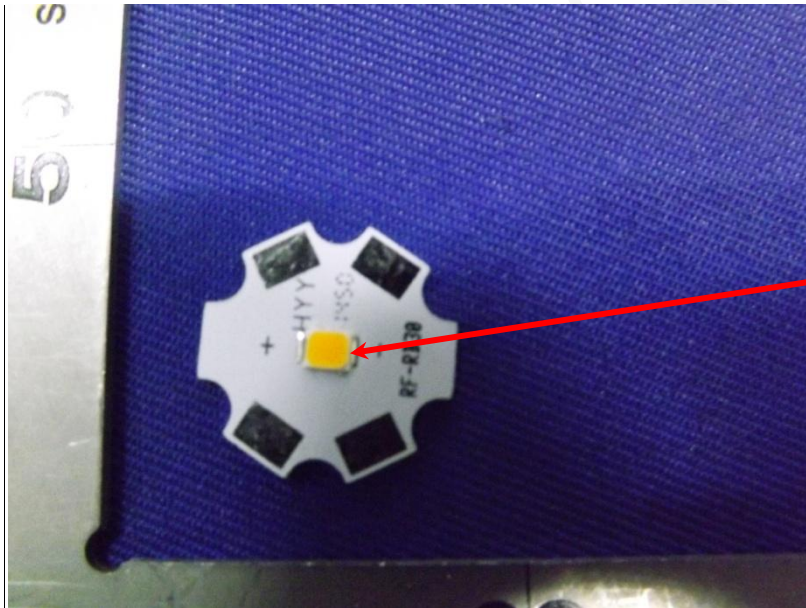
Attachment A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



TMP_{LED}

Attachment B – Family declaration Letter



SHENZHEN REFOND OPTOELECTRONICS CO., LTD.

ATTESTATION OF SIMILARITY

To Whom It May Concern,

We, [SHENZHEN REFOND OPTOELECTRONICS CO., LTD] hereby attests the series model **RF-***I32DS-**-J(-Y)** and the series model **RT-***32DS-**-J(-Y)** are designed with identical material and construction processes. only different in expressions between the two series. And the model **RF-27RI32DS-BF-J-Y** is tested by BACL. The results of which are featured in BACL project No.R2DG150415051-10-9000.

The tested model **RF-27RI32DS-BF-J-Y** and the other LED package model which attest similarity are designed with identical material and identical construction processes. The differences between the tested model and the other LED package which attest similarity are only CCT. Their differences are listed in the following table

Details as below:

Series name	Model name	CCT (K)	Current (mA)	Volt (v)
2835	RF-***I32DS-**-J(-Y) (Test model: RF-27RI32DS-BF-J-Y)	2700/3000/4000/ 5000/5700/6000/6500	150	3
2835	RT-***32DS-**-J(-Y)	2700/3000/4000/ 5000/5700/6000/6500	150	3

Model Number Format:

RF - * * * I32DS - * * - J (-Y)

A1 A2 A3 A4 A5 A6 A7

A1 A2 A3 A4 A5 A6 A7
Fixed Code CCT Workshop Code Fixed Code Internal Code Fixed Code Internal Code

Note::

- A1: Letter RF can be RF or RT. It is an internal Market code which does not affect product property.
- A2: Letter * * represent CCT, it can be 27, 30, 35, 40, 50, 57, 60, 65, W2, W3, W4, W5, W6. The CCT are listed in the follow form. 27, 30, 35, 40, 50, 57, 60, 65 which representative the chromaticity specification are referred to ANSI standard. W2 (=2700K), W3 (=3000K), W4 (=4000K), W5 (=5000K), W6 (=6000K) which representative the chromaticity specification are referred to IEC standard.
- A3: Letter * represent workshop code, it can be R, M, H, T or Q&S which does not affect product property.
- A4: Letter I32DS is a fixed code.
- A5: Letter * * can be BF, CF, DF, EF, FF or FH. It is an internal Market code which does not affect product property.
- A6: Letter J is a fixed code.

[SHENZHEN REFOND OPTOELECTRONICS CO., LTD
Mail: tongwen.yu@refond.com Tel: 0755-29673000 Fax: 0755-29673111]



SHENZHEN REFOND OPTOELECTRONICS CO., LTD.

A7: A (Y) on behalf of the centrifugal power equipment is not used, No (-Y) on behalf of using centrifugal power equipment,;

Model description as below is part of items according to the two cases, It can be further described by other model number if the new item follows above regulation.

Notes: Product model with different production workshop, according to different buyers, lead to changes in the name of product, but the product at the same process and materials.

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:

Title:

俞航文 2015.5.31
实验室工程师

SHENZHEN REFOND OPTOELECTRONICS CO., LTD
Mail: tougwen.yu@refond.com Tel: 0755-29675000 Fax: 0755-29675111

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