

# TEST REPORT

## IES LM-80-15

For

Shenzhen Refond Optoelectronic Co., Ltd.

1 to 8th Floor, Building #1, 10th Industrial Zone, Tian Liao Community, Gong Ming Area,  
Guang Ming New District, SHENZHEN, CHINA.

**Report No.:** SZANL181106008-01-M1

**Product Description:** 2835

**Model No.:** RF-W2HV32DS-FF-F2

**Test Initiation Date:** 2017-11-09

**Test Completion Date:** 2018-11-21

**Report Issue Date:** 2018-12-05

**Test Standard:** IES LM-80-15

**Test Laboratory:** Shenzhen Anbotek Pengcheng Compliance Laboratory Limited

**Tested by**

**Reviewed by**

Dick Xiao



Helen Li



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Note: The report (#SZANL181106008-01-M1) replaced the previous report (#SZANL181106008-01).

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# 1 General Information

## 1.1 Description of LED Light Sources

Tested Model:

Part Number: RF-W2HV32DS-FF-F2

Part Type: 2835

Nominal CCT: 2700K

Family products covered by this report:

According to ENERGY STAR® Requirements for the Use of LM-80 Data, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of ENERGY STAR® Requirements for the Use of LM-80 Data (September 28, 2017).

This report covers the following models:

Testing Model	Multiple Model	Difference	Details
RF-W2HV32DS-FF-F2	R*- * * * 32DS-**-** (-Y)-**	1. CCT:2200-8200 2. Internal management code.	See below

Note:

1. The first \* can be F or T, It is an internal Market code which does not affect property.
2. The second \* represent customer name, it can be C, D, H, K, L, M, P, S, T, W, Y, which also can be excluded.
3. The third to fourth \* represent CCT, it can be 22, 24, 27, 30, 35, 40, 45, 50, 57, 60, 62, 65, 82; \*\* don't mean only two numbers, it maybe also as mentioned 2, 3, 4, 5, 6, 7, 8.
4. The fifth \* represent Chromogenic index, it can be R, M, H, T, or Q&S which does not affect product property.
5. The sixth \* it can be V, I or P, it is an internal Market code of Leadframe.
6. The seventh to eighth \* can be AF, BF, CF, DF, EF, FF, FD or FH, it is an internal Market code which does not affect product property.
7. The ninth to tenth \*\* can be N, J, T, N2, F2, 2J, or 2N, it is an internal Market code which does not affect product property.
8. The letter "Y" on behalf of the centrifugal power equipment is not used, No "Y" on behalf of using centrifugal power equipment.
9. The last letter -\*\* represent project code, not specified, it can be blank, \* or \*\* and number or letter.

Disclaimer:

The truthfulness and accuracy of all the technical information above for the covered LED products is ensured by manufacturer of LED light source. Shenzhen Anbotek Pengcheng Compliance Laboratory Limited isn't responsible or gives any guarantees for the truthfulness of the technical information.

## 1.2 Product Description for Device under Test (DUT)

**Manufacturer:** Shenzhen Refond Optoelectronic Co., Ltd.

**Tested Model:** RF-W2HV32DS-FF-F2

**Part Type:** 2835

**Nominal CCT:** 2700K

**Nominal Ra:** 80

**Number of LED tested:** See tables

**Case Temperature (Test Point Temperature):** See tables

**Drive Current of the LED During Lifetime Test:** See tables

**Initial luminous flux and forward voltage at photometric measurement current:** See tables

**Lumen maintenance data for each individual LED along with median value, standard deviation, minimum and maximum lumen maintenance value for all of the LED:** See tables

**Observation of LED failure including the failure conditions and time of failure:** See tables

**LED monitoring interval:** The LED light source is inspected at regular interval (24 hours) throughout the 9000 hours test.

**Photometric measurement uncertainty:** 1.5% on flux measurements for LM-80 testing.

**Chromaticity shift reported over the Measurement time:** See tables

**LED Test interval:** At regular intervals (1000 hours) throughout the 9000 hours test.

**Date of Receiving Sample:** 2017-11-08

**Test Duration:** 2017-11-09 to 2018-11-21

### 1.3 Standards Used

IESNA LM-80-15: IES Approved Method for Measuring Luminous Flux and Color Maintenance of LED, Arrays and Modules.

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)

### 1.4 Test Facility Description

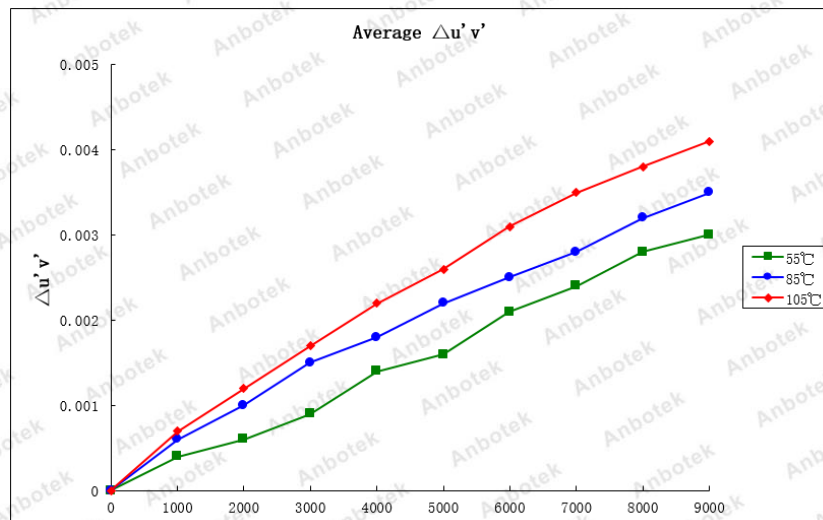
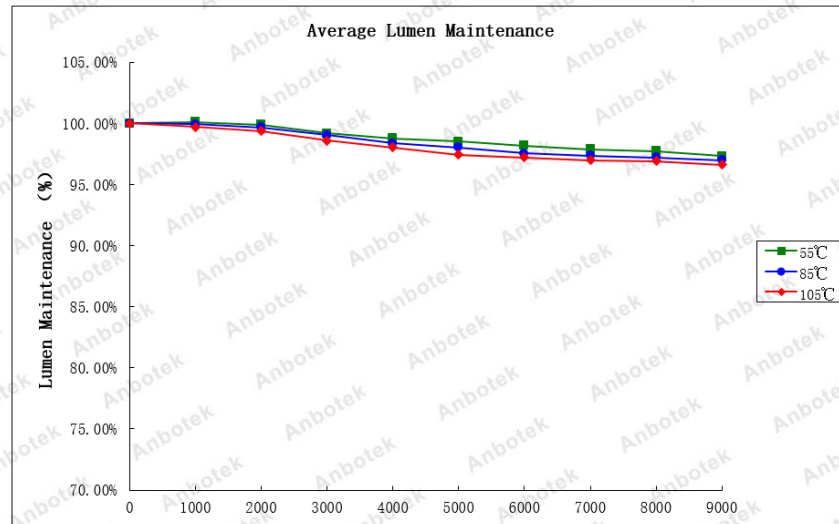
The test facility used by Shenzhen Anbotek Pengcheng Compliance Laboratory Limited is located at Floor 1, Building C, Gold Power Industrial Park, Julongshan Grand Industrial Zone, Pingshan District, Shenzhen, Guangdong, China.

### 1.5 Test Equipment List

Device	Manufacture	Model No.	Serial No.	Calibration Date	Calibration Due Date
Digital Power Meter	YOKOGAWA	WT210	SE-074	2018-06-06	2019-06-05
LM-80 Aging Test System	KEYI	KY-3X-LH60	SE-564	2018-06-06	2019-06-05
DC Power Supply	EVERFINE	WY605	SE-605	2018-06-06	2019-06-05
Standard Lamp	EVERFINE	D062	SE-606	2018-06-06	2019-06-05
Spectrum Analyzer	EVERFINE	HAAS-2000	SE-607	2018-06-06	2019-06-05
Integrating Sphere (0.5m)	EVERFINE	AIS-2	SE-608	Before use	Before use

## 2 Summary of Test Result

Data Set	1	2	3
Nominal case temperatures	55°C	85°C	105°C
Drive Current	30 mA	30 mA	30 mA
Condition	Ts=54.5°C Ta=53.6°C R.H. < 65% IF=29.9 mA	Ts=84.6°C Ta=83.5°C R.H. < 65% IF=29.9 mA	Ts=104.5°C Ta=103.6°C R.H. < 65% IF=29.9 mA
sample size	30	30	30
Duration (in Hours)	9000	9000	9000
Intervals (in Hours)	1000	1000	1000
Failure	0	0	0
L <sub>70</sub> (9000h)	>54000	>54000	>54000
L <sub>90</sub> (9000h)	>36000	>36000	>36000



## 3 Test Method

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### 3.1 Photometric and Electrical Measurement

Total light output (luminous flux) for the  $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$  ambient temperature conditions is measured using an integrating sphere. Each LED is operated at rated drive current (CC Mode).

The total uncertainty of the light output measurements is estimated, at the 95% confidence level, not to exceed  $\pm 1.6\%$  over the wavelength range 380-800nm.

### 3.2 Season the LED from 0 hours to 9000 hours

Three LM-80 aging measurement system Temperature Chambers are using for Seasoning, and the temperature is set to  $55^{\circ}\text{C}$ ,  $85^{\circ}\text{C}$ ,  $105^{\circ}\text{C}$  (manufacture defined), the airflow is minimum to keep the uniformity to temperature. LED are operated steady state (no cycling) for a period of 9000 hours, checked the lumen flux and Chromaticity Shift every 1000 hours. The samples are inspected at regular intervals (24 hours) throughout the 9000 hours. The time and date of failure of each lamp is recorded. The actual elapsed time for each light LED is in hour.

**4 Data Set 1: 55°C, 30 mA**

Description of Light Sources Tested:	RF-W2HV32DS-FF-F2
Case Temperature:	54.5°C
Ambient Temperature:	53.6°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

**Lumen Maintenance (%)**

Sample No.	VF(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L1	37.21	146.4	100.05%	99.78%	99.00%	98.77%	98.65%	98.59%	98.23%	98.00%	96.69%
L2	37.06	148.3	100.02%	99.93%	99.55%	98.73%	98.36%	98.20%	98.11%	97.86%	97.64%
L3	37.71	151.5	100.10%	99.96%	99.10%	98.71%	98.43%	98.10%	97.87%	97.59%	97.35%
L4	37.19	149.5	100.17%	99.85%	98.96%	98.46%	98.23%	97.75%	97.55%	97.47%	96.94%
L5	37.43	151.6	100.04%	99.75%	99.05%	98.89%	98.49%	97.79%	97.52%	97.39%	97.28%
L6	37.34	146.8	100.12%	99.93%	99.26%	98.97%	98.69%	98.42%	98.06%	97.87%	97.68%
L7	37.36	147.1	100.00%	99.76%	99.03%	98.93%	98.62%	98.31%	98.00%	97.91%	97.31%
L8	37.13	148.9	100.15%	99.97%	99.13%	98.85%	98.68%	98.56%	97.80%	97.58%	97.32%
L9	37.31	153.3	100.01%	99.84%	99.00%	98.58%	98.19%	97.85%	97.78%	97.63%	97.50%
L10	37.03	148.6	100.27%	100.06%	99.26%	99.01%	98.73%	98.25%	97.80%	97.66%	97.12%
L11	37.46	151.5	100.15%	99.75%	99.11%	98.88%	98.64%	97.53%	97.72%	97.65%	97.66%
L12	37.50	152.0	100.00%	99.75%	99.21%	98.60%	98.36%	98.27%	98.11%	98.00%	97.28%
L13	37.10	149.2	100.25%	99.77%	99.04%	98.75%	98.51%	98.22%	97.59%	97.28%	97.08%
L14	37.08	149.0	100.10%	99.93%	99.41%	99.08%	98.81%	98.45%	97.80%	97.66%	97.42%
L15	37.56	153.9	100.15%	100.02%	99.37%	98.58%	98.35%	97.89%	97.76%	97.63%	97.34%
L16	37.22	146.2	100.04%	99.76%	98.95%	98.76%	98.50%	98.31%	97.66%	97.58%	96.89%
L17	37.52	152.2	100.03%	99.80%	99.40%	98.85%	98.62%	98.49%	98.03%	97.90%	97.33%
L18	37.05	150.8	100.06%	99.94%	99.35%	98.59%	98.24%	98.10%	98.00%	97.93%	97.58%
L19	37.81	151.8	100.16%	99.92%	99.06%	98.80%	98.66%	98.37%	98.22%	98.00%	97.35%
L20	37.04	150.0	100.08%	99.89%	99.00%	98.88%	98.50%	98.05%	97.74%	97.68%	97.18%
L21	37.15	145.9	100.07%	99.83%	99.22%	98.66%	98.48%	98.22%	98.01%	97.89%	97.66%
L22	37.17	150.8	100.12%	99.83%	99.12%	98.80%	98.36%	98.03%	97.89%	97.72%	97.51%
L23	37.50	152.8	100.10%	99.96%	99.11%	98.77%	98.63%	98.45%	97.76%	97.52%	97.44%
L24	37.50	153.2	100.06%	99.93%	99.03%	98.68%	98.25%	98.15%	97.88%	97.78%	97.61%
L25	37.13	147.7	100.21%	99.84%	99.18%	98.79%	98.64%	98.20%	97.82%	97.75%	97.52%
L26	37.52	151.5	100.12%	99.85%	99.41%	99.00%	98.83%	98.39%	98.02%	97.69%	97.34%
L27	37.08	149.9	100.26%	100.00%	99.41%	98.81%	98.70%	98.49%	98.34%	98.20%	97.13%
L28	37.20	146.2	100.01%	99.89%	99.44%	98.77%	98.39%	98.19%	97.97%	97.80%	97.41%
L29	37.07	147.8	100.06%	99.91%	99.06%	98.75%	98.45%	97.98%	97.69%	97.54%	97.34%
L30	37.58	152.9	100.07%	99.85%	99.04%	98.69%	98.33%	98.02%	97.75%	97.66%	96.88%
AV	37.30	149.9	<b>100.10%</b>	<b>99.88%</b>	<b>99.18%</b>	<b>98.78%</b>	<b>98.51%</b>	<b>98.19%</b>	<b>97.88%</b>	<b>97.73%</b>	<b>97.33%</b>
Median	37.22	150.0	100.09%	99.87%	99.11%	98.77%	98.50%	98.21%	97.85%	97.69%	97.34%
MIN	37.03	145.9	100.00%	99.75%	98.95%	98.46%	98.19%	97.53%	97.52%	97.28%	96.69%
MAX	37.81	153.9	100.27%	100.06%	99.55%	99.08%	98.83%	98.59%	98.34%	98.20%	97.68%
STDEV	0.2215	2.4241	0.0008	0.0009	0.0017	0.0014	0.0018	0.0026	0.0020	0.0020	0.0025
N	30	30	30	30	30	30	30	30	30	30	30



Description of Light Sources Tested:	RF-W2HV32DS-FF-F2
Case Temperature:	54.5°C
Ambient Temperature:	53.6°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

**Chromaticity Shift ( $\Delta u'v'$ )**

Sample No.	$u'$	$v'$	CCT(K)	1000 hrs	2000 hrs	3000 hrs	4000 hrs	5000 hrs	6000 hrs	7000 hrs	8000 hrs	9000 hrs
L1	0.2615	0.5360	2687	0.0006	0.0007	0.0013	0.0017	0.0018	0.0018	0.0027	0.0029	0.0031
L2	0.2617	0.5344	2689	0.0004	0.0003	0.0012	0.0018	0.0017	0.0026	0.0026	0.0030	0.0026
L3	0.2596	0.5358	2725	0.0007	0.0007	0.0010	0.0019	0.0014	0.0020	0.0023	0.0029	0.0033
L4	0.2626	0.5366	2663	0.0003	0.0003	0.0008	0.0014	0.0012	0.0026	0.0023	0.0023	0.0030
L5	0.2615	0.5377	2680	0.0004	0.0004	0.0010	0.0012	0.0016	0.0024	0.0024	0.0027	0.0032
L6	0.2535	0.5232	2918	0.0005	0.0005	0.0006	0.0017	0.0021	0.0023	0.0018	0.0024	0.0026
L7	0.2535	0.5233	2918	0.0004	0.0008	0.0007	0.0013	0.0014	0.0023	0.0028	0.0029	0.0027
L8	0.2625	0.5364	2666	0.0005	0.0010	0.0009	0.0015	0.0014	0.0021	0.0026	0.0028	0.0033
L9	0.2603	0.5372	2706	0.0003	0.0008	0.0006	0.0009	0.0015	0.0021	0.0028	0.0030	0.0025
L10	0.2610	0.5351	2700	0.0003	0.0005	0.0012	0.0017	0.0022	0.0015	0.0025	0.0029	0.0032
L11	0.2619	0.5387	2668	0.0002	0.0006	0.0012	0.0009	0.0013	0.0016	0.0019	0.0024	0.0028
L12	0.2607	0.5384	2694	0.0004	0.0008	0.0012	0.0017	0.0018	0.0020	0.0026	0.0029	0.0028
L13	0.2633	0.5361	2652	0.0007	0.0006	0.0012	0.0019	0.0014	0.0020	0.0025	0.0029	0.0033
L14	0.2631	0.5357	2657	0.0006	0.0005	0.0009	0.0016	0.0012	0.0023	0.0023	0.0026	0.0030
L15	0.2616	0.5391	2674	0.0003	0.0007	0.0009	0.0012	0.0015	0.0024	0.0023	0.0024	0.0030
L16	0.2604	0.5350	2712	0.0005	0.0005	0.0007	0.0015	0.0012	0.0024	0.0024	0.0025	0.0032
L17	0.2621	0.5368	2672	0.0005	0.0006	0.0006	0.0014	0.0021	0.0023	0.0018	0.0025	0.0026
L18	0.2607	0.5366	2700	0.0004	0.0009	0.0008	0.0013	0.0020	0.0022	0.0021	0.0028	0.0027
L19	0.2611	0.5371	2691	0.0005	0.0009	0.0009	0.0013	0.0014	0.0021	0.0026	0.0029	0.0029
L20	0.2618	0.5367	2678	0.0003	0.0008	0.0006	0.0014	0.0015	0.0019	0.0028	0.0029	0.0029
L21	0.2626	0.5361	2665	0.0007	0.0006	0.0007	0.0011	0.0017	0.0025	0.0026	0.0027	0.0032
L22	0.2598	0.5353	2723	0.0006	0.0006	0.0013	0.0013	0.0017	0.0019	0.0020	0.0028	0.0034
L23	0.2623	0.5379	2664	0.0003	0.0005	0.0014	0.0008	0.0015	0.0017	0.0018	0.0028	0.0028
L24	0.2595	0.5371	2722	0.0004	0.0005	0.0008	0.0012	0.0018	0.0023	0.0020	0.0028	0.0025
L25	0.2616	0.5365	2682	0.0005	0.0005	0.0008	0.0014	0.0015	0.0025	0.0023	0.0029	0.0034
L26	0.2616	0.5378	2677	0.0005	0.0005	0.0013	0.0018	0.0015	0.0022	0.0026	0.0030	0.0029
L27	0.2602	0.5354	2715	0.0002	0.0005	0.0009	0.0013	0.0023	0.0022	0.0020	0.0025	0.0033
L28	0.2614	0.5363	2687	0.0006	0.0003	0.0009	0.0017	0.0015	0.0025	0.0026	0.0030	0.0032
L29	0.2616	0.5341	2693	0.0003	0.0005	0.0012	0.0013	0.0021	0.0017	0.0026	0.0023	0.0032
L30	0.2610	0.5379	2690	0.0005	0.0007	0.0007	0.0011	0.0016	0.0016	0.0022	0.0031	0.0034
AV	0.2609	0.5357	2702	<b>0.0004</b>	<b>0.0006</b>	<b>0.0009</b>	<b>0.0014</b>	<b>0.0016</b>	<b>0.0021</b>	<b>0.0024</b>	<b>0.0028</b>	<b>0.0030</b>
Median	0.2615	0.5365	2688	0.0005	0.0006	0.0009	0.0014	0.0015	0.0022	0.0024	0.0028	0.0030
MIN	0.2535	0.5232	2652	0.0002	0.0003	0.0006	0.0008	0.0012	0.0015	0.0018	0.0023	0.0025
MAX	0.2633	0.5391	2918	<b>0.0007</b>	<b>0.0010</b>	<b>0.0014</b>	<b>0.0019</b>	<b>0.0023</b>	<b>0.0026</b>	<b>0.0028</b>	<b>0.0031</b>	<b>0.0034</b>
STDEV	0.0022	0.0036	62	0.0001	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0002	0.0003
N	30	30	30	30	30	30	30	30	30	30	30	30

**5 Data Set 2: 85°C, 30 mA**

Description of Light Sources Tested:	RF-W2HV32DS-FF-F2
Case Temperature:	84.6°C
Ambient Temperature:	83.5°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

**Lumen Maintenance (%)**

Sample No.	VF(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L31	37.54	151.4	99.92%	99.48%	99.47%	98.60%	97.97%	97.34%	97.58%	96.88%	96.95%
L32	37.20	148.5	99.89%	99.65%	99.41%	98.27%	97.91%	97.16%	97.78%	97.58%	97.11%
L33	37.63	153.7	99.89%	99.78%	98.83%	98.80%	97.67%	97.35%	96.79%	97.59%	96.84%
L34	37.23	150.5	99.93%	99.74%	99.49%	98.00%	97.72%	97.56%	97.45%	97.29%	96.82%
L35	37.62	152.5	99.86%	99.69%	98.65%	98.73%	97.74%	97.60%	97.49%	96.75%	96.70%
L36	37.22	147.1	99.90%	99.50%	99.20%	98.75%	98.47%	97.20%	97.08%	97.00%	96.88%
L37	37.18	147.4	100.00%	99.79%	98.99%	98.02%	98.26%	97.74%	97.50%	97.29%	97.08%
L38	37.23	148.6	99.93%	99.78%	99.00%	98.60%	97.97%	97.39%	97.28%	97.16%	96.90%
L39	37.57	152.2	100.00%	99.72%	99.00%	98.21%	98.19%	97.90%	97.45%	97.30%	97.18%
L40	37.66	153.0	100.00%	99.79%	99.07%	98.17%	97.97%	97.22%	97.76%	97.67%	97.46%
L41	37.57	152.5	99.90%	99.47%	98.82%	98.55%	97.91%	97.21%	97.00%	96.93%	96.92%
L42	37.09	148.8	99.91%	99.55%	99.42%	98.59%	97.91%	97.16%	97.11%	97.02%	96.96%
L43	37.17	147.5	99.89%	99.77%	99.31%	98.69%	97.80%	97.27%	97.07%	96.99%	96.85%
L44	37.83	150.5	99.91%	99.74%	98.93%	98.02%	97.69%	97.53%	97.39%	97.28%	97.09%
L45	37.59	151.5	99.86%	99.73%	98.97%	98.30%	97.74%	97.56%	97.30%	97.10%	97.07%
L46	37.51	151.8	99.85%	99.51%	98.74%	98.30%	98.14%	97.56%	97.49%	97.20%	96.97%
L47	37.17	145.8	99.93%	99.77%	99.04%	98.02%	98.44%	97.61%	97.43%	97.34%	97.15%
L48	37.14	149.7	99.94%	99.84%	98.99%	98.36%	98.19%	97.56%	97.45%	97.29%	97.08%
L49	37.52	150.1	99.97%	99.75%	99.00%	98.41%	98.03%	97.65%	97.40%	97.33%	97.20%
L50	37.21	148.9	99.85%	99.71%	99.06%	98.21%	97.99%	97.48%	97.35%	97.19%	97.06%
L51	37.37	151.1	99.90%	99.57%	99.21%	98.56%	97.86%	97.19%	97.00%	96.95%	96.88%
L52	37.22	149.6	99.91%	99.69%	98.68%	97.87%	97.75%	97.66%	96.90%	96.83%	96.75%
L53	37.09	150.1	100.02%	99.72%	99.32%	98.36%	97.80%	97.74%	97.36%	97.16%	96.96%
L54	37.18	146.7	99.99%	99.71%	99.07%	98.11%	98.13%	97.51%	97.30%	97.25%	96.95%
L55	37.05	146.9	99.95%	99.49%	99.07%	98.48%	98.20%	97.41%	97.34%	97.09%	97.00%
L56	37.56	151.9	99.86%	99.66%	98.63%	98.44%	98.00%	98.04%	96.81%	96.73%	96.65%
L57	37.18	150.5	99.85%	99.49%	98.79%	98.35%	98.14%	97.43%	97.68%	97.43%	97.29%
L58	37.12	146.1	99.99%	99.64%	98.78%	97.86%	98.46%	97.65%	97.77%	97.59%	97.33%
L59	37.16	149.6	100.04%	99.74%	99.06%	98.69%	98.13%	98.04%	97.85%	97.69%	96.81%
L60	37.37	153.1	100.02%	99.88%	99.46%	98.25%	98.17%	98.07%	97.74%	97.62%	96.70%
AV	37.34	149.9	<b>99.93%</b>	<b>99.68%</b>	<b>99.05%</b>	<b>98.35%</b>	<b>98.01%</b>	<b>97.53%</b>	<b>97.36%</b>	<b>97.22%</b>	<b>96.99%</b>
Median	37.23	150.1	99.92%	99.71%	99.02%	98.35%	97.98%	97.54%	97.39%	97.23%	96.96%
MIN	37.05	145.8	99.85%	99.47%	98.63%	97.86%	97.67%	97.16%	96.79%	96.73%	96.65%
MAX	37.83	153.7	100.04%	99.88%	99.49%	98.80%	98.47%	98.07%	97.85%	97.69%	97.46%
STDEV	0.2180	2.2324	0.0006	0.0012	0.0025	0.0027	0.0023	0.0026	0.0029	0.0027	0.0019
N	30	30	30	30	30	30	30	30	30	30	30

Description of Light Sources Tested:	RF-W2HV32DS-FF-F2
Case Temperature:	84.6°C
Ambient Temperature:	83.5°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

**Chromaticity Shift ( $\Delta u'v'$ )**

Sample No.	$u'$	$v'$	CCT(K)	1000 hrs	2000 hrs	3000 hrs	4000 hrs	5000 hrs	6000 hrs	7000 hrs	8000 hrs	9000 hrs
L31	0.2619	0.5382	2670	0.0006	0.0006	0.0018	0.0015	0.0024	0.0029	0.0025	0.0031	0.0040
L32	0.2618	0.5378	2675	0.0005	0.0010	0.0020	0.0018	0.0024	0.0025	0.0024	0.0035	0.0033
L33	0.2587	0.5374	2737	0.0007	0.0006	0.0015	0.0018	0.0017	0.0027	0.0027	0.0030	0.0033
L34	0.2606	0.5364	2702	0.0008	0.0007	0.0020	0.0017	0.0023	0.0021	0.0029	0.0035	0.0036
L35	0.2610	0.5376	2692	0.0006	0.0011	0.0014	0.0012	0.0025	0.0030	0.0029	0.0026	0.0037
L36	0.2633	0.5363	2650	0.0004	0.0011	0.0013	0.0020	0.0024	0.0022	0.0031	0.0031	0.0035
L37	0.2602	0.5363	2712	0.0009	0.0008	0.0010	0.0014	0.0023	0.0022	0.0028	0.0034	0.0034
L38	0.2604	0.5356	2710	0.0007	0.0013	0.0014	0.0021	0.0021	0.0026	0.0026	0.0026	0.0034
L39	0.2601	0.5370	2711	0.0004	0.0007	0.0018	0.0019	0.0025	0.0026	0.0030	0.0036	0.0031
L40	0.2608	0.5386	2691	0.0004	0.0014	0.0017	0.0019	0.0020	0.0026	0.0033	0.0035	0.0032
L41	0.2604	0.5377	2701	0.0005	0.0006	0.0014	0.0014	0.0021	0.0022	0.0024	0.0030	0.0028
L42	0.2599	0.5363	2718	0.0006	0.0009	0.0019	0.0015	0.0024	0.0028	0.0025	0.0031	0.0037
L43	0.2624	0.5366	2667	0.0005	0.0009	0.0020	0.0018	0.0025	0.0027	0.0026	0.0034	0.0033
L44	0.2621	0.5377	2668	0.0007	0.0007	0.0018	0.0017	0.0025	0.0022	0.0028	0.0036	0.0035
L45	0.2631	0.5375	2651	0.0007	0.0008	0.0013	0.0014	0.0024	0.0028	0.0029	0.0031	0.0040
L46	0.2625	0.5388	2658	0.0005	0.0011	0.0014	0.0018	0.0024	0.0027	0.0031	0.0028	0.0035
L47	0.2604	0.5350	2713	0.0008	0.0009	0.0010	0.0017	0.0023	0.0022	0.0030	0.0033	0.0034
L48	0.2609	0.5368	2696	0.0008	0.0011	0.0012	0.0015	0.0022	0.0025	0.0026	0.0029	0.0034
L49	0.2615	0.5362	2686	0.0005	0.0012	0.0019	0.0020	0.0024	0.0026	0.0027	0.0032	0.0032
L50	0.2616	0.5366	2683	0.0004	0.0011	0.0015	0.0019	0.0022	0.0026	0.0032	0.0035	0.0040
L51	0.2601	0.5388	2704	0.0005	0.0013	0.0007	0.0016	0.0027	0.0030	0.0024	0.0025	0.0032
L52	0.2617	0.5357	2683	0.0009	0.0012	0.0009	0.0014	0.0017	0.0027	0.0031	0.0036	0.0035
L53	0.2603	0.5359	2711	0.0006	0.0010	0.0017	0.0020	0.0023	0.0022	0.0028	0.0024	0.0035
L54	0.2623	0.5361	2670	0.0008	0.0009	0.0015	0.0015	0.0019	0.0024	0.0026	0.0036	0.0034
L55	0.2629	0.5370	2655	0.0006	0.0006	0.0017	0.0020	0.0026	0.0027	0.0029	0.0035	0.0039
L56	0.2615	0.5383	2679	0.0008	0.0005	0.0008	0.0018	0.0018	0.0021	0.0031	0.0032	0.0036
L57	0.2580	0.5350	2761	0.0004	0.0011	0.0019	0.0019	0.0023	0.0029	0.0032	0.0032	0.0035
L58	0.2623	0.5367	2669	0.0005	0.0006	0.0009	0.0022	0.0018	0.0022	0.0026	0.0030	0.0039
L59	0.2618	0.5357	2683	0.0007	0.0013	0.0010	0.0021	0.0021	0.0025	0.0033	0.0032	0.0031
L60	0.2595	0.5374	2721	0.0004	0.0015	0.0011	0.0022	0.0019	0.0029	0.0029	0.0028	0.0038
AV	0.2611	0.5369	2691	<b>0.0006</b>	<b>0.0010</b>	<b>0.0015</b>	<b>0.0018</b>	<b>0.0022</b>	<b>0.0025</b>	<b>0.0028</b>	<b>0.0032</b>	<b>0.0035</b>
Median	0.2613	0.5368	2689	0.0006	0.0010	0.0015	0.0018	0.0023	0.0026	0.0029	0.0032	0.0035
MIN	0.2580	0.5350	2650	0.0004	0.0005	0.0007	0.0012	0.0017	0.0021	0.0024	0.0024	0.0028
MAX	0.2633	0.5388	2761	<b>0.0009</b>	<b>0.0015</b>	<b>0.0020</b>	<b>0.0022</b>	<b>0.0027</b>	<b>0.0030</b>	<b>0.0033</b>	<b>0.0036</b>	<b>0.0040</b>
STDEV	0.0013	0.0011	26	0.0002	0.0003	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
N	30	30	30	30	30	30	30	30	30	30	30	30

**6 Data Set 3: 105°C, 30 mA**

Description of Light Sources Tested:	RF-W2HV32DS-FF-F2
Case Temperature:	104.5°C
Ambient Temperature:	103.6°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

**Lumen Maintenance (%)**

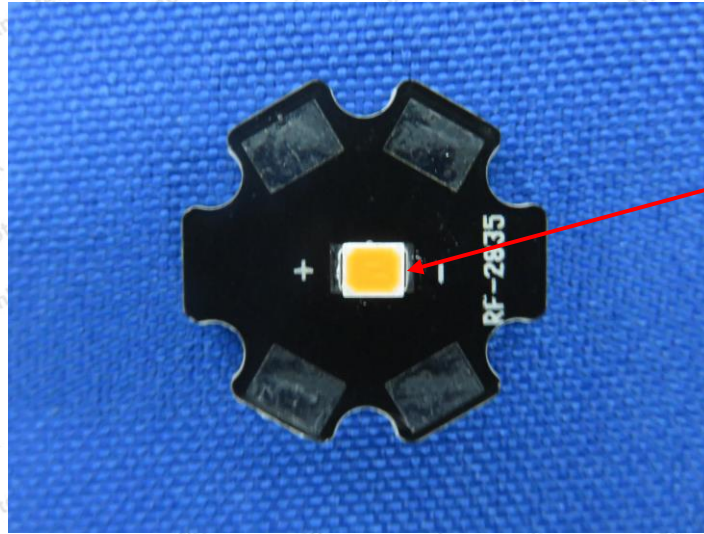
Sample No.	VF(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L61	37.24	146.1	99.76%	99.04%	98.51%	98.07%	97.44%	97.19%	96.83%	96.72%	96.66%
L62	37.35	150.6	99.66%	99.55%	98.43%	97.77%	97.15%	97.11%	97.01%	96.95%	96.82%
L63	37.26	148.1	99.58%	99.39%	98.53%	98.15%	97.66%	97.21%	97.15%	97.03%	96.76%
L64	37.26	149.0	99.55%	99.13%	98.40%	97.95%	97.44%	97.28%	97.10%	97.00%	96.69%
L65	37.17	149.9	99.69%	99.32%	98.71%	98.39%	97.87%	97.00%	96.95%	96.83%	96.59%
L66	37.15	148.9	99.60%	99.58%	98.71%	98.55%	97.17%	97.02%	96.82%	96.72%	96.65%
L67	37.11	149.4	99.68%	99.46%	98.38%	98.00%	97.22%	97.24%	97.09%	97.00%	96.73%
L68	37.35	151.0	99.85%	99.40%	98.78%	98.11%	97.47%	97.32%	97.18%	96.56%	96.50%
L69	37.33	149.8	99.63%	99.32%	98.43%	97.86%	97.17%	97.09%	96.89%	96.75%	96.36%
L70	37.41	152.9	99.72%	99.03%	98.42%	97.72%	97.42%	97.23%	96.72%	96.63%	96.47%
L71	37.28	147.0	99.71%	99.56%	98.44%	97.81%	97.43%	97.18%	97.15%	97.01%	96.85%
L72	37.28	150.2	99.65%	99.25%	98.51%	97.90%	97.58%	97.36%	97.16%	97.12%	97.00%
L73	37.33	151.8	99.66%	99.33%	98.42%	97.96%	97.37%	97.35%	97.23%	97.11%	96.69%
L74	37.50	152.4	99.69%	99.51%	98.41%	97.96%	97.32%	97.16%	97.08%	97.00%	96.66%
L75	37.20	147.6	99.62%	99.58%	98.71%	98.17%	97.76%	97.11%	97.10%	97.07%	96.70%
L76	37.49	151.4	99.77%	99.51%	98.47%	97.91%	97.19%	97.20%	96.88%	96.81%	96.67%
L77	37.08	147.9	99.83%	99.32%	98.53%	97.97%	97.43%	97.30%	97.11%	96.98%	96.85%
L78	37.23	145.4	99.68%	99.39%	98.59%	98.01%	97.41%	97.25%	96.99%	96.86%	96.45%
L79	37.41	151.7	99.71%	99.09%	98.42%	97.75%	97.18%	97.06%	96.72%	96.59%	96.47%
L80	37.20	146.0	99.72%	99.13%	98.43%	97.76%	97.42%	97.02%	96.92%	96.80%	96.54%
L81	37.12	145.4	99.65%	99.29%	98.77%	98.18%	97.53%	97.39%	96.65%	96.60%	96.22%
L82	37.55	151.4	99.79%	99.40%	98.85%	98.10%	97.55%	97.43%	97.32%	97.19%	96.79%
L83	37.47	153.0	99.84%	99.37%	98.78%	97.92%	97.26%	97.40%	97.37%	97.28%	96.61%
L84	37.07	149.9	99.75%	99.43%	98.28%	98.34%	97.49%	97.26%	97.01%	97.89%	96.42%
L85	37.10	151.9	99.76%	99.53%	98.78%	98.00%	97.61%	97.04%	97.00%	96.85%	96.66%
L86	37.06	151.6	99.82%	99.59%	98.79%	98.38%	97.18%	97.40%	97.33%	97.17%	96.85%
L87	37.10	144.9	99.66%	99.37%	98.72%	97.85%	97.67%	97.15%	96.99%	96.78%	96.34%
L88	37.52	151.5	99.69%	99.35%	98.49%	97.81%	97.68%	97.42%	96.65%	96.51%	96.15%
L89	37.56	152.3	99.81%	99.12%	98.83%	98.33%	97.42%	97.27%	96.78%	96.65%	96.46%
L90	37.16	145.2	99.85%	99.08%	98.73%	97.98%	97.47%	97.04%	96.92%	96.78%	96.58%
AV	37.28	149.5	<b>99.71%</b>	<b>99.35%</b>	<b>98.57%</b>	<b>98.02%</b>	<b>97.43%</b>	<b>97.22%</b>	<b>97.00%</b>	<b>96.91%</b>	<b>96.61%</b>
Median	37.26	149.9	99.70%	99.37%	98.52%	97.98%	97.43%	97.22%	97.01%	96.86%	96.65%
MIN	37.06	144.9	99.55%	99.03%	98.28%	97.72%	97.15%	97.00%	96.65%	96.51%	96.15%
MAX	37.56	153.0	99.85%	99.59%	98.85%	98.55%	97.87%	97.43%	97.37%	97.89%	97.00%
STDEV	0.1552	2.5461	0.0008	0.0017	0.0017	0.0021	0.0019	0.0013	0.0020	0.0028	0.0020
N	30	30	30	30	30	30	30	30	30	30	30

Description of Light Sources Tested:	RF-W2HV32DS-FF-F2
Case Temperature:	104.5°C
Ambient Temperature:	103.6°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

**Chromaticity Shift ( $\Delta u'v'$ )**

Sample No.	$u'$	$v'$	CCT(K)	1000 hrs	2000 hrs	3000 hrs	4000 hrs	5000 hrs	6000 hrs	7000 hrs	8000 hrs	9000 hrs
L61	0.2603	0.5354	2713	0.0007	0.0012	0.0017	0.0028	0.0023	0.0033	0.0031	0.0042	0.0035
L62	0.2624	0.5371	2664	0.0006	0.0008	0.0017	0.0023	0.0029	0.0027	0.0033	0.0040	0.0042
L63	0.2616	0.5368	2681	0.0002	0.0013	0.0016	0.0028	0.0033	0.0028	0.0033	0.0033	0.0039
L64	0.2621	0.5356	2677	0.0006	0.0014	0.0018	0.0021	0.0019	0.0034	0.0038	0.0039	0.0047
L65	0.2602	0.5355	2715	0.0009	0.0015	0.0015	0.0021	0.0027	0.0033	0.0034	0.0039	0.0040
L66	0.2628	0.5366	2659	0.0004	0.0009	0.0014	0.0017	0.0020	0.0027	0.0032	0.0039	0.0034
L67	0.2623	0.5366	2668	0.0002	0.0012	0.0016	0.0017	0.0026	0.0032	0.0035	0.0036	0.0046
L68	0.2615	0.5372	2681	0.0005	0.0015	0.0011	0.0021	0.0028	0.0033	0.0037	0.0036	0.0040
L69	0.2615	0.5374	2682	0.0003	0.0005	0.0018	0.0017	0.0029	0.0031	0.0037	0.0037	0.0037
L70	0.2607	0.5381	2695	0.0010	0.0013	0.0013	0.0016	0.0028	0.0031	0.0034	0.0040	0.0035
L71	0.2613	0.5351	2695	0.0003	0.0008	0.0017	0.0025	0.0023	0.0029	0.0030	0.0036	0.0035
L72	0.2624	0.5377	2662	0.0007	0.0010	0.0017	0.0027	0.0028	0.0032	0.0035	0.0042	0.0040
L73	0.2598	0.5378	2715	0.0005	0.0013	0.0016	0.0028	0.0031	0.0027	0.0033	0.0040	0.0042
L74	0.2602	0.5376	2707	0.0005	0.0014	0.0017	0.0028	0.0026	0.0033	0.0036	0.0037	0.0044
L75	0.2610	0.5361	2696	0.0009	0.0015	0.0018	0.0021	0.0025	0.0033	0.0038	0.0039	0.0046
L76	0.2606	0.5378	2697	0.0007	0.0012	0.0014	0.0019	0.0020	0.0031	0.0033	0.0039	0.0038
L77	0.2623	0.5356	2673	0.0004	0.0012	0.0014	0.0017	0.0025	0.0028	0.0032	0.0037	0.0037
L78	0.2626	0.5357	2666	0.0005	0.0012	0.0014	0.0020	0.0027	0.0033	0.0036	0.0036	0.0041
L79	0.2612	0.5371	2689	0.0004	0.0011	0.0014	0.0019	0.0028	0.0033	0.0037	0.0037	0.0039
L80	0.2618	0.5364	2680	0.0010	0.0011	0.0018	0.0017	0.0029	0.0031	0.0035	0.0039	0.0047
L81	0.2617	0.5351	2686	0.0009	0.0014	0.0013	0.0017	0.0032	0.0027	0.0039	0.0041	0.0044
L82	0.2610	0.5383	2688	0.0010	0.0017	0.0021	0.0021	0.0021	0.0033	0.0033	0.0038	0.0036
L83	0.2605	0.5384	2697	0.0003	0.0014	0.0021	0.0015	0.0025	0.0032	0.0028	0.0035	0.0041
L84	0.2610	0.5356	2698	0.0010	0.0007	0.0020	0.0019	0.0023	0.0031	0.0039	0.0039	0.0038
L85	0.2582	0.5369	2750	0.0012	0.0006	0.0014	0.0028	0.0025	0.0035	0.0036	0.0033	0.0042
L86	0.2581	0.5369	2751	0.0005	0.0018	0.0021	0.0026	0.0025	0.0030	0.0032	0.0034	0.0047
L87	0.2626	0.5357	2666	0.0006	0.0015	0.0017	0.0027	0.0020	0.0036	0.0036	0.0041	0.0046
L88	0.2605	0.5381	2699	0.0011	0.0008	0.0022	0.0021	0.0018	0.0035	0.0038	0.0037	0.0036
L89	0.2603	0.5377	2703	0.0010	0.0010	0.0016	0.0026	0.0024	0.0031	0.0039	0.0041	0.0043
L90	0.2607	0.5359	2703	0.0009	0.0009	0.0021	0.0026	0.0031	0.0033	0.0028	0.0033	0.0043
AV	0.2611	0.5367	2692	<b>0.0007</b>	<b>0.0012</b>	<b>0.0017</b>	<b>0.0022</b>	<b>0.0026</b>	<b>0.0031</b>	<b>0.0035</b>	<b>0.0038</b>	<b>0.0041</b>
Median	0.2611	0.5369	2692	0.0006	0.0012	0.0017	0.0021	0.0026	0.0032	0.0035	0.0039	0.0041
MIN	0.2581	0.5351	2659	0.0002	0.0005	0.0011	0.0015	0.0018	0.0027	0.0028	0.0033	0.0034
MAX	0.2628	0.5384	2751	<b>0.0012</b>	<b>0.0018</b>	<b>0.0022</b>	<b>0.0028</b>	<b>0.0033</b>	<b>0.0036</b>	<b>0.0039</b>	<b>0.0042</b>	<b>0.0047</b>
STDEV	0.0012	0.0010	23	0.0003	0.0003	0.0003	0.0004	0.0004	0.0003	0.0003	0.0003	0.0004
N	30	30	30	30	30	30	30	30	30	30	30	30

## 7 Product Photo



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