NVLAP CODE 201045-0

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.:	SZANL190102004-01
Product Description:	2110
Model No.:	RF-18TK10DS-EC-F-Y
Test Initiation Date:	2018-03-12
Test Completion Date:	2019-03-25
Report Issue Date:	2019-03-26
Test Standard:	IES LM-80-15
Test Laboratory:	Shenzhen Anbotek Pengcheng Compliance Laboratory Limited

Tested by **Reviewed by**

Dick Xiao / Dick Xiao Helen Li / Helen Li

Anbotek (PC) Compliance Laboratory Limited * Approved *

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1 General Information

1.1 Product Description for Device under Test (DUT)

Manufacturer:	Shenzhen Refond Optoelectronic Co., Ltd.
Tested Model:	RF-18TK10DS-EC-F-Y
Part Type:	2110
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:	2018-03-12
Test Duration:	2018-03-12 to 2019-03-25

Additional Information Required by EPA ENERGY STAR 2017 Guidelines:

Nominal ANSI CCT Target	1800K
Nominal Color Rendering Index(Ra)	90
Mean Initial Forward Voltage(V)	3.05
Average Input Power(W)	0.09
Nominal LED Die Area(mm)	0.072
Average Current per LED Die(mA)	30
Average current density per LED Die(mA/mm^2)	415.18
Average power per LED Die(W)	0.09
Average power density per LED Die(W/mm^2)	1.25
Minimum Spacing from Die Edge to Die Edge(mm)	/

1.2 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)

1.3 Test Facility Description

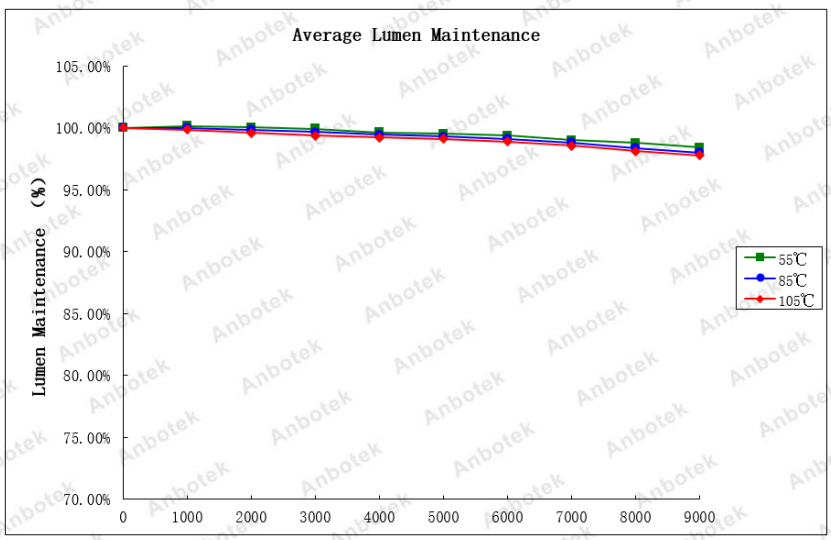
The test facility used by Shenzhen Anbotek Pengcheng Compliance Laboratory Limited is located at Floor 1, Building C, Gold Power Industrial Park, Julongshan Grand Industrial Zone, Pingshan District, Shenzhen, Guangdong, China.

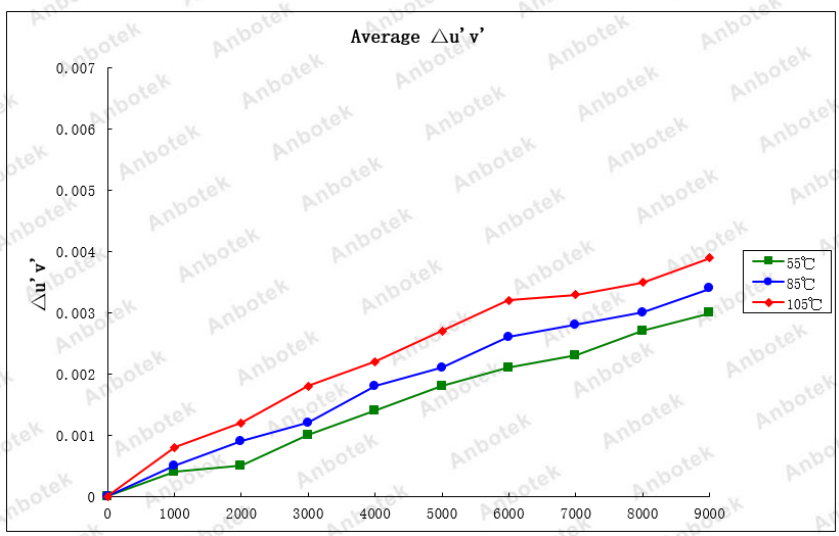
1.4 Test Equipment List

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	25°C	55°C	85°C
Drive Current	30 mA	30 mA	30 mA
Condition	Ts=24.7°C Ta=24.9°C R.H.＜65% IF=29.9 mA	Ts=54.7°C Ta=54.3°C R.H.＜65% IF=29.9 mA	Ts=84.8°C Ta=83.7°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_{70}(9000h)	>54000	>54000	>54000
L_{90}(9000h)	>36000	>36000	>36000





3 Test Method

3.1 Photometric and Electrical Measurement

Total light output (luminous flux) for the 25°C±1°C ambient temperature conditions is measured using a 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±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 25°C, 55°C, 85°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: 25°C, 30 mA

Description of Light Sources Tested:	RF-18TK10DS-EC-F-Y
Case Temperature:	24.7°C
Ambient Temperature:	24.9°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	3.03	6.3	100.23%	100.10%	100.04%	99.69%	99.57%	99.40%	98.97%	98.68%	98.36%
L2	3.21	6.5	100.27%	99.96%	99.83%	99.61%	99.55%	99.35%	98.97%	98.68%	98.25%
L3	3.16	6.4	100.18%	99.92%	99.88%	99.65%	99.51%	99.26%	98.96%	98.70%	98.35%
L4	3.05	6.4	99.99%	99.98%	99.88%	99.65%	99.48%	99.38%	99.02%	98.73%	98.33%
L5	3.01	6.8	100.25%	100.06%	99.96%	99.62%	99.53%	99.39%	98.98%	98.69%	98.33%
L6	3.20	6.5	100.26%	100.12%	100.02%	99.60%	99.43%	99.28%	98.92%	98.72%	98.39%
L7	3.13	6.5	100.23%	100.13%	99.89%	99.59%	99.38%	99.25%	98.97%	98.72%	98.32%
L8	3.13	6.6	100.15%	99.92%	99.98%	99.62%	99.54%	99.32%	99.00%	98.80%	98.44%
L9	3.13	6.4	100.19%	100.10%	99.99%	99.58%	99.45%	99.31%	98.88%	98.65%	98.28%
L10	2.98	6.6	100.18%	100.05%	99.94%	99.62%	99.47%	99.37%	98.92%	98.62%	98.20%
L11	3.04	6.9	100.10%	99.93%	99.97%	99.68%	99.51%	99.33%	99.06%	98.88%	98.53%
L12	3.01	6.9	100.05%	100.08%	99.95%	99.65%	99.51%	99.40%	99.12%	98.90%	98.50%
L13	3.01	6.4	100.19%	99.89%	99.92%	99.64%	99.59%	99.51%	99.09%	98.89%	98.51%
L14	3.15	6.8	100.15%	100.06%	99.79%	99.62%	99.50%	99.36%	99.02%	98.76%	98.39%
L15	3.07	6.5	100.06%	100.12%	99.96%	99.60%	99.51%	99.38%	99.08%	98.89%	98.58%
L16	3.00	6.6	100.20%	100.01%	99.86%	99.61%	99.50%	99.29%	98.84%	98.55%	98.21%
L17	3.13	6.3	100.25%	100.04%	99.96%	99.64%	99.54%	99.27%	98.96%	98.68%	98.29%
L18	3.02	6.2	100.24%	100.03%	99.87%	99.64%	99.49%	99.34%	98.87%	98.62%	98.21%
L19	3.11	6.4	100.05%	99.97%	99.91%	99.65%	99.44%	99.24%	99.02%	98.78%	98.40%
L20	3.03	6.5	100.12%	100.03%	99.81%	99.65%	99.54%	99.42%	99.17%	98.98%	98.67%
L21	3.10	6.2	100.18%	100.11%	100.06%	99.61%	99.47%	99.28%	98.86%	98.57%	98.15%
L22	3.02	6.3	100.17%	100.12%	99.96%	99.75%	99.60%	99.49%	99.18%	98.92%	98.52%
L23	3.03	6.5	100.16%	100.07%	99.92%	99.59%	99.53%	99.41%	99.10%	98.84%	98.46%
L24	3.05	6.2	100.15%	100.04%	99.92%	99.60%	99.43%	99.30%	99.07%	98.79%	98.42%
L25	3.12	6.3	100.16%	100.06%	99.92%	99.81%	99.71%	99.56%	99.17%	98.90%	98.57%
L26	2.98	6.5	100.10%	100.06%	99.94%	99.66%	99.55%	99.41%	99.08%	98.88%	98.53%
L27	3.13	6.3	99.99%	100.09%	99.79%	99.63%	99.47%	99.38%	99.10%	98.88%	98.51%
L28	3.15	6.4	100.06%	100.06%	99.93%	99.78%	99.63%	99.49%	99.08%	98.86%	98.49%
L29	3.09	6.4	100.00%	100.11%	99.85%	99.64%	99.58%	99.46%	99.02%	98.79%	98.38%
L30	3.02	6.6	100.11%	100.07%	100.05%	99.88%	99.76%	99.66%	99.37%	99.15%	98.76%
AV	3.08	6.5	**100.15%**	**100.04%**	**99.93%**	**99.65%**	**99.53%**	**99.38%**	**99.03%**	**98.78%**	**98.41%**
Median	3.06	6.4	100.16%	100.06%	99.93%	99.64%	99.51%	99.38%	99.02%	98.79%	98.40%
MIN	2.98	6.2	99.99%	99.89%	99.79%	99.58%	99.38%	99.24%	98.84%	98.55%	98.15%
MAX	3.21	6.9	100.27%	100.13%	100.06%	99.88%	99.76%	99.66%	99.37%	99.15%	98.76%
STDEV	0.0662	0.1893	0.0008	0.0007	0.0007	0.0007	0.0008	0.0010	0.0011	0.0013	0.0014
N	30	30	30	30	30	30	30	30	30	30	30

Description of Light Sources Tested:	RF-18TK10DS-EC-F-Y
Case Temperature:	24.7°C
Ambient Temperature:	24.9°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

Chromaticity Shift (Δ 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	0.3197	0.5393	1834	0.0007	0.0005	0.0008	0.0009	0.0018	0.0025	0.0029	0.0029	0.0034
L2	0.3193	0.5386	1840	0.0004	0.0009	0.0013	0.0017	0.0017	0.0023	0.0026	0.0030	0.0033
L3	0.3225	0.5390	1806	0.0001	0.0006	0.0011	0.0010	0.0022	0.0028	0.0029	0.0023	0.0033
L4	0.3211	0.5399	1821	0.0003	0.0003	0.0015	0.0014	0.0019	0.0017	0.0028	0.0024	0.0031
L5	0.3161	0.5390	1873	0.0002	0.0007	0.0010	0.0018	0.0014	0.0027	0.0016	0.0032	0.0027
L6	0.3186	0.5395	1847	0.0005	0.0006	0.0006	0.0014	0.0015	0.0027	0.0024	0.0022	0.0033
L7	0.3180	0.5390	1853	0.0007	0.0002	0.0007	0.0009	0.0018	0.0019	0.0020	0.0023	0.0035
L8	0.3209	0.5404	1822	0.0004	0.0004	0.0010	0.0008	0.0017	0.0021	0.0020	0.0022	0.0026
L9	0.3227	0.5408	1804	0.0001	0.0003	0.0007	0.0010	0.0021	0.0022	0.0027	0.0028	0.0026
L10	0.3278	0.5396	1753	0.0006	0.0005	0.0009	0.0016	0.0015	0.0016	0.0016	0.0032	0.0029
L11	0.3171	0.5405	1862	0.0005	0.0004	0.0006	0.0008	0.0016	0.0017	0.0027	0.0032	0.0029
L12	0.3169	0.5406	1864	0.0005	0.0008	0.0013	0.0014	0.0017	0.0015	0.0015	0.0029	0.0034
L13	0.3164	0.5385	1870	0.0006	0.0003	0.0012	0.0014	0.0018	0.0024	0.0028	0.0029	0.0033
L14	0.3165	0.5393	1869	0.0003	0.0007	0.0014	0.0019	0.0021	0.0018	0.0029	0.0033	0.0033
L15	0.3190	0.5389	1843	0.0004	0.0007	0.0012	0.0015	0.0018	0.0017	0.0021	0.0025	0.0031
L16	0.3234	0.5400	1797	0.0005	0.0006	0.0009	0.0015	0.0014	0.0027	0.0017	0.0028	0.0031
L17	0.3237	0.5394	1794	0.0005	0.0006	0.0006	0.0012	0.0015	0.0024	0.0020	0.0023	0.0033
L18	0.3197	0.5385	1836	0.0004	0.0005	0.0009	0.0018	0.0018	0.0021	0.0020	0.0032	0.0032
L19	0.3228	0.5386	1803	0.0004	0.0009	0.0007	0.0009	0.0017	0.0021	0.0022	0.0025	0.0025
L20	0.3199	0.5391	1832	0.0007	0.0003	0.0007	0.0013	0.0019	0.0018	0.0027	0.0029	0.0029
L21	0.3238	0.5394	1793	0.0006	0.0006	0.0015	0.0019	0.0020	0.0023	0.0027	0.0020	0.0033
L22	0.3208	0.5389	1823	0.0005	0.0004	0.0012	0.0012	0.0014	0.0023	0.0021	0.0032	0.0031
L23	0.3249	0.5401	1782	0.0002	0.0007	0.0007	0.0010	0.0022	0.0022	0.0018	0.0027	0.0025
L24	0.3263	0.5405	1768	0.0002	0.0005	0.0006	0.0014	0.0021	0.0023	0.0017	0.0024	0.0032
L25	0.3261	0.5394	1771	0.0005	0.0008	0.0010	0.0013	0.0022	0.0015	0.0026	0.0022	0.0031
L26	0.3224	0.5406	1807	0.0004	0.0006	0.0015	0.0017	0.0018	0.0023	0.0028	0.0026	0.0030
L27	0.3234	0.5395	1797	0.0004	0.0009	0.0012	0.0016	0.0021	0.0019	0.0024	0.0029	0.0026
L28	0.3221	0.5391	1811	0.0005	0.0003	0.0012	0.0017	0.0018	0.0019	0.0025	0.0027	0.0027
L29	0.3191	0.5397	1841	0.0002	0.0005	0.0007	0.0017	0.0017	0.0017	0.0028	0.0022	0.0027
L30	0.3196	0.5394	1836	0.0005	0.0003	0.0016	0.0013	0.0023	0.0029	0.0023	0.0024	0.0034
AV	0.3210	0.5395	1822	**0.0004**	**0.0005**	**0.0010**	**0.0014**	**0.0018**	**0.0021**	**0.0023**	**0.0027**	**0.0030**
Median	0.3209	0.5394	1823	0.0005	0.0006	0.0010	0.0014	0.0018	0.0022	0.0024	0.0027	0.0031
MIN	0.3161	0.5385	1753	0.0001	0.0002	0.0006	0.0008	0.0014	0.0015	0.0015	0.0020	0.0025
MAX	0.3278	0.5408	1873	**0.0007**	**0.0009**	**0.0016**	**0.0019**	**0.0023**	**0.0029**	**0.0029**	**0.0033**	**0.0035**
STDEV	0.0031	0.0007	32	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005	0.0004	0.0003
N	30	30	30	30	30	30	30	30	30	30	30	30

5 Data Set 2: 55°C, 30 mA

Description of Light Sources Tested:	RF-18TK10DS-EC-F-Y
Case Temperature:	54.7°C
Ambient Temperature:	54.3°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	2.99	6.5	99.87%	99.80%	99.63%	99.63%	99.48%	99.29%	98.98%	98.55%	98.22%
L32	3.14	6.4	100.05%	99.90%	99.71%	99.46%	99.29%	99.05%	98.72%	98.31%	98.00%
L33	3.09	6.3	100.10%	99.91%	99.78%	99.35%	99.15%	99.02%	98.75%	98.33%	97.95%
L34	3.02	6.7	100.09%	99.98%	99.81%	99.43%	99.30%	99.19%	98.86%	98.36%	98.03%
L35	3.11	6.7	100.05%	99.85%	99.60%	99.41%	99.20%	99.05%	98.77%	98.36%	98.01%
L36	3.15	6.5	100.09%	99.92%	99.80%	99.77%	99.58%	99.41%	99.14%	98.76%	98.41%
L37	3.06	6.4	99.97%	99.88%	99.68%	99.41%	99.22%	99.02%	98.76%	98.30%	97.91%
L38	3.04	6.7	100.07%	99.89%	99.75%	99.31%	99.15%	98.95%	98.61%	98.22%	97.85%
L39	3.00	6.4	100.12%	99.97%	99.86%	99.86%	99.71%	99.51%	99.26%	98.79%	98.39%
L40	3.05	6.5	99.84%	99.73%	99.56%	99.55%	99.41%	99.25%	98.92%	98.51%	98.12%
L41	3.00	6.4	99.86%	99.76%	99.60%	99.39%	99.20%	99.08%	98.77%	98.33%	97.98%
L42	3.00	6.6	99.93%	99.81%	99.57%	99.49%	99.30%	99.09%	98.77%	98.30%	97.90%
L43	3.04	6.3	100.05%	99.97%	99.85%	99.39%	99.23%	98.99%	98.69%	98.29%	97.91%
L44	2.99	6.4	100.09%	99.99%	99.87%	99.40%	99.20%	99.04%	98.76%	98.29%	97.90%
L45	3.00	6.6	100.07%	99.94%	99.69%	99.42%	99.19%	98.93%	98.60%	98.15%	97.81%
L46	3.03	6.5	99.95%	99.75%	99.60%	99.45%	99.27%	99.11%	98.76%	98.26%	97.83%
L47	3.00	6.4	100.02%	99.90%	99.68%	99.59%	99.51%	99.32%	99.06%	98.54%	98.12%
L48	2.98	6.4	99.97%	99.90%	99.74%	99.38%	99.20%	99.00%	98.68%	98.13%	97.73%
L49	3.03	6.6	100.11%	100.01%	99.75%	99.66%	99.55%	99.41%	99.07%	98.67%	98.25%
L50	3.09	6.3	99.86%	99.79%	99.64%	99.79%	99.65%	99.49%	99.18%	98.76%	98.43%
L51	3.01	6.4	100.00%	99.88%	99.70%	99.16%	99.10%	98.99%	98.67%	98.09%	97.77%
L52	3.07	6.8	100.11%	99.93%	99.68%	99.62%	99.44%	99.24%	98.93%	98.51%	98.16%
L53	2.97	6.4	99.89%	99.71%	99.57%	99.25%	99.04%	98.92%	98.62%	98.03%	97.69%
L54	2.98	6.4	99.97%	99.80%	99.60%	99.18%	98.97%	98.85%	98.54%	98.10%	97.76%
L55	3.03	6.6	100.06%	99.88%	99.73%	99.87%	99.68%	99.53%	99.25%	98.65%	98.30%
L56	3.04	6.4	99.88%	99.72%	99.54%	99.52%	99.33%	99.14%	98.88%	98.49%	98.14%
L57	3.06	6.5	100.09%	99.92%	99.64%	99.17%	99.00%	98.80%	98.54%	98.20%	97.83%
L58	2.99	6.4	99.99%	99.82%	99.71%	99.55%	99.39%	99.19%	98.88%	98.44%	98.05%
L59	2.99	6.3	99.93%	99.81%	99.55%	99.23%	99.08%	98.90%	98.58%	98.12%	97.73%
L60	2.99	6.4	100.14%	100.04%	99.87%	99.30%	99.13%	98.97%	98.66%	98.25%	97.86%
AV	3.03	6.5	**100.01%**	**99.87%**	**99.69%**	**99.47%**	**99.30%**	**99.12%**	**98.82%**	**98.37%**	**98.00%**
Median	3.02	6.4	100.04%	99.89%	99.69%	99.43%	99.25%	99.07%	98.77%	98.32%	97.97%
MIN	2.97	6.3	99.84%	99.71%	99.54%	99.16%	98.97%	98.80%	98.54%	98.03%	97.69%
MAX	3.15	6.8	100.14%	100.04%	99.87%	99.87%	99.71%	99.53%	99.26%	98.79%	98.43%
STDEV	0.0481	0.1352	0.0009	0.0009	0.0010	0.0019	0.0020	0.0020	0.0021	0.0021	0.0021
N	30	30	30	30	30	30	30	30	30	30	30

Description of Light Sources Tested:	RF-18TK10DS-EC-F-Y
Case Temperature:	54.7°C
Ambient Temperature:	54.3°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

Chromaticity Shift (Δ 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	0.3183	0.5394	1849	0.0003	0.0010	0.0010	0.0016	0.0018	0.0031	0.0030	0.0032	0.0031
L32	0.3242	0.5406	1789	0.0004	0.0013	0.0009	0.0019	0.0022	0.0021	0.0028	0.0030	0.0031
L33	0.3232	0.5397	1799	0.0008	0.0011	0.0008	0.0018	0.0017	0.0031	0.0029	0.0028	0.0032
L34	0.3231	0.5400	1800	0.0009	0.0009	0.0015	0.0016	0.0024	0.0022	0.0028	0.0030	0.0037
L35	0.3222	0.5403	1809	0.0006	0.0010	0.0015	0.0011	0.0015	0.0027	0.0027	0.0033	0.0035
L36	0.3219	0.5397	1812	0.0003	0.0012	0.0011	0.0020	0.0023	0.0029	0.0029	0.0028	0.0034
L37	0.3203	0.5390	1829	0.0006	0.0009	0.0011	0.0022	0.0015	0.0029	0.0029	0.0030	0.0031
L38	0.3164	0.5400	1870	0.0007	0.0013	0.0018	0.0013	0.0021	0.0029	0.0025	0.0030	0.0035
L39	0.3247	0.5407	1784	0.0004	0.0008	0.0017	0.0015	0.0018	0.0025	0.0023	0.0032	0.0032
L40	0.3165	0.5390	1869	0.0003	0.0005	0.0016	0.0019	0.0021	0.0021	0.0031	0.0027	0.0033
L41	0.3193	0.5397	1839	0.0003	0.0008	0.0007	0.0011	0.0014	0.0023	0.0027	0.0027	0.0029
L42	0.3149	0.5387	1886	0.0004	0.0010	0.0010	0.0018	0.0018	0.0024	0.0028	0.0031	0.0031
L43	0.3249	0.5392	1782	0.0007	0.0013	0.0009	0.0018	0.0021	0.0024	0.0029	0.0028	0.0031
L44	0.3203	0.5391	1829	0.0002	0.0005	0.0011	0.0017	0.0022	0.0029	0.0029	0.0028	0.0037
L45	0.3190	0.5397	1843	0.0006	0.0010	0.0015	0.0013	0.0023	0.0026	0.0027	0.0033	0.0036
L46	0.3198	0.5400	1834	0.0004	0.0006	0.0013	0.0023	0.0019	0.0028	0.0028	0.0029	0.0034
L47	0.3231	0.5389	1800	0.0006	0.0012	0.0011	0.0021	0.0022	0.0029	0.0026	0.0029	0.0034
L48	0.3206	0.5392	1825	0.0007	0.0010	0.0014	0.0018	0.0019	0.0029	0.0023	0.0030	0.0035
L49	0.3181	0.5396	1852	0.0007	0.0009	0.0018	0.0013	0.0020	0.0029	0.0028	0.0031	0.0034
L50	0.3195	0.5397	1837	0.0004	0.0007	0.0017	0.0018	0.0018	0.0023	0.0025	0.0028	0.0032
L51	0.3239	0.5397	1792	0.0007	0.0011	0.0006	0.0018	0.0026	0.0026	0.0034	0.0026	0.0037
L52	0.3222	0.5396	1809	0.0008	0.0006	0.0012	0.0021	0.0024	0.0028	0.0032	0.0031	0.0032
L53	0.3220	0.5400	1811	0.0003	0.0006	0.0008	0.0017	0.0025	0.0025	0.0031	0.0026	0.0036
L54	0.3235	0.5386	1796	0.0007	0.0012	0.0017	0.0012	0.0022	0.0024	0.0032	0.0034	0.0030
L55	0.3173	0.5391	1860	0.0006	0.0005	0.0017	0.0021	0.0025	0.0029	0.0025	0.0035	0.0036
L56	0.3209	0.5396	1822	0.0008	0.0015	0.0011	0.0020	0.0025	0.0023	0.0029	0.0033	0.0034
L57	0.3171	0.5391	1863	0.0002	0.0014	0.0006	0.0019	0.0015	0.0020	0.0035	0.0032	0.0035
L58	0.3225	0.5390	1806	0.0009	0.0007	0.0014	0.0023	0.0026	0.0024	0.0026	0.0027	0.0038
L59	0.3245	0.5401	1786	0.0004	0.0010	0.0009	0.0018	0.0022	0.0026	0.0029	0.0035	0.0033
L60	0.3229	0.5396	1802	0.0005	0.0007	0.0005	0.0017	0.0022	0.0032	0.0028	0.0032	0.0030
AV	0.3209	0.5396	1823	**0.0005**	**0.0009**	**0.0012**	**0.0018**	**0.0021**	**0.0026**	**0.0028**	**0.0030**	**0.0034**
Median	0.3214	0.5396	1817	0.0006	0.0010	0.0011	0.0018	0.0022	0.0026	0.0028	0.0030	0.0034
MIN	0.3149	0.5386	1782	0.0002	0.0005	0.0005	0.0011	0.0014	0.0020	0.0023	0.0026	0.0029
MAX	0.3249	0.5407	1886	**0.0009**	**0.0015**	**0.0018**	**0.0023**	**0.0026**	**0.0032**	**0.0035**	**0.0035**	**0.0038**
STDEV	0.0028	0.0005	29	0.0002	0.0003	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
N	30	30	30	30	30	30	30	30	30	30	30	30

6 Data Set 3: 85°C, 30 mA

Description of Light Sources Tested:	RF-18TK10DS-EC-F-Y
Case Temperature:	84.8°C
Ambient Temperature:	83.7°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

Lumen Maintenance (%)

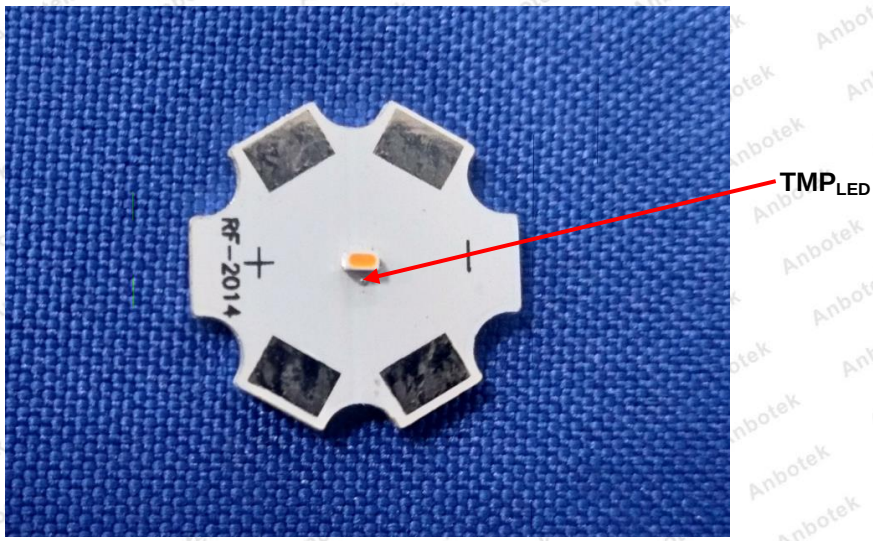
Sample No.	VF(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L61	3.00	6.4	99.95%	99.81%	99.62%	99.52%	99.42%	99.14%	98.76%	98.29%	97.95%
L62	3.02	6.6	99.89%	99.64%	99.34%	99.28%	99.17%	99.00%	98.70%	98.33%	98.03%
L63	3.01	6.5	99.86%	99.60%	99.40%	99.32%	99.22%	99.04%	98.78%	98.36%	98.05%
L64	3.00	6.4	99.92%	99.73%	99.51%	99.42%	99.32%	99.11%	98.84%	98.38%	97.99%
L65	3.00	6.5	99.82%	99.69%	99.53%	99.31%	99.19%	98.93%	98.55%	98.08%	97.79%
L66	3.12	6.6	99.83%	99.68%	99.50%	99.29%	99.13%	98.92%	98.63%	98.21%	97.85%
L67	3.14	6.5	99.87%	99.64%	99.46%	99.39%	99.20%	98.98%	98.65%	98.31%	97.94%
L68	3.15	6.4	99.94%	99.67%	99.36%	99.13%	98.98%	98.81%	98.47%	98.12%	97.73%
L69	3.09	6.7	99.93%	99.52%	99.24%	99.19%	99.06%	98.73%	98.48%	98.10%	97.82%
L70	3.03	6.7	99.94%	99.65%	99.31%	99.26%	99.06%	98.84%	98.48%	98.05%	97.71%
L71	3.03	6.5	99.95%	99.67%	99.48%	99.33%	99.24%	98.92%	98.57%	98.14%	97.83%
L72	3.22	6.4	99.88%	99.52%	99.23%	99.06%	98.86%	98.66%	98.34%	97.86%	97.55%
L73	3.13	6.4	99.87%	99.56%	99.29%	99.23%	99.11%	98.90%	98.64%	98.18%	97.86%
L74	3.05	6.6	99.86%	99.50%	99.20%	99.05%	98.85%	98.69%	98.44%	98.11%	97.69%
L75	3.04	6.3	99.83%	99.45%	99.16%	99.01%	98.93%	98.61%	98.23%	97.82%	97.53%
L76	3.00	6.6	99.84%	99.64%	99.31%	99.17%	98.97%	98.76%	98.36%	97.88%	97.56%
L77	3.00	6.4	99.80%	99.60%	99.29%	99.17%	99.04%	98.79%	98.45%	97.98%	97.70%
L78	2.97	6.8	99.94%	99.80%	99.50%	99.44%	99.35%	99.12%	98.78%	98.43%	98.00%
L79	3.00	6.8	99.94%	99.74%	99.54%	99.42%	99.37%	99.04%	98.66%	98.18%	97.93%
L80	3.01	6.5	99.94%	99.68%	99.52%	99.42%	99.34%	99.06%	98.72%	98.27%	97.94%
L81	3.06	6.3	99.81%	99.62%	99.34%	99.26%	99.15%	98.95%	98.58%	98.03%	97.73%
L82	3.00	4.4	99.88%	99.50%	99.28%	99.20%	99.10%	98.92%	98.64%	98.24%	97.93%
L83	3.04	6.4	99.84%	99.62%	99.42%	99.34%	99.24%	99.03%	98.76%	98.20%	97.86%
L84	3.22	6.6	99.84%	99.70%	99.49%	99.31%	99.21%	98.96%	98.64%	98.17%	97.81%
L85	3.00	6.3	99.88%	99.74%	99.57%	99.35%	99.21%	98.99%	98.64%	98.21%	97.86%
L86	2.98	6.3	99.83%	99.48%	99.30%	99.15%	99.09%	98.87%	98.55%	98.18%	97.82%
L87	3.01	6.7	99.90%	99.64%	99.34%	99.16%	98.98%	98.80%	98.47%	97.90%	97.53%
L88	2.98	6.2	99.80%	99.51%	99.23%	99.09%	98.95%	98.66%	98.32%	97.97%	97.60%
L89	3.01	6.6	99.85%	99.56%	99.25%	99.19%	99.03%	98.74%	98.44%	98.04%	97.74%
L90	3.00	6.4	99.80%	99.51%	99.19%	99.13%	99.00%	98.73%	98.37%	97.94%	97.61%
AV	3.04	6.4	**99.87%**	**99.62%**	**99.37%**	**99.25%**	**99.13%**	**98.89%**	**98.56%**	**98.13%**	**97.80%**
Median	3.01	6.5	99.87%	99.64%	99.34%	99.26%	99.12%	98.92%	98.58%	98.16%	97.82%
MIN	2.97	4.4	99.80%	99.45%	99.16%	99.01%	98.85%	98.61%	98.23%	97.82%	97.53%
MAX	3.22	6.8	99.95%	99.81%	99.62%	99.52%	99.42%	99.14%	98.84%	98.43%	98.05%
STDEV	0.0682	0.4059	0.0005	0.0010	0.0013	0.0013	0.0015	0.0015	0.0016	0.0016	0.0015
N	30	30	30	30	30	30	30	30	30	30	30

Description of Light Sources Tested:	RF-18TK10DS-EC-F-Y
Case Temperature:	84.8°C
Ambient Temperature:	83.7°C
Drive Current:	30 mA
Measure Current:	29.9 mA
Failures Observed:	None

Chromaticity Shift (Δ 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	0.3224	0.5394	1807	0.0011	0.0015	0.0012	0.0023	0.0025	0.0033	0.0030	0.0034	0.0040
L62	0.3138	0.5388	1898	0.0011	0.0014	0.0013	0.0023	0.0032	0.0027	0.0033	0.0038	0.0035
L63	0.3185	0.5392	1848	0.0012	0.0018	0.0022	0.0017	0.0029	0.0037	0.0034	0.0039	0.0040
L64	0.3200	0.5396	1832	0.0007	0.0013	0.0016	0.0027	0.0025	0.0030	0.0037	0.0034	0.0042
L65	0.3191	0.5391	1841	0.0011	0.0011	0.0017	0.0021	0.0032	0.0033	0.0035	0.0032	0.0040
L66	0.3211	0.5398	1820	0.0008	0.0010	0.0016	0.0023	0.0021	0.0034	0.0034	0.0031	0.0040
L67	0.3236	0.5406	1795	0.0003	0.0016	0.0019	0.0026	0.0021	0.0029	0.0031	0.0035	0.0040
L68	0.3245	0.5398	1786	0.0004	0.0006	0.0021	0.0021	0.0028	0.0028	0.0035	0.0034	0.0035
L69	0.3188	0.5390	1844	0.0004	0.0017	0.0020	0.0019	0.0025	0.0032	0.0029	0.0034	0.0043
L70	0.3144	0.5397	1891	0.0005	0.0006	0.0020	0.0018	0.0033	0.0028	0.0035	0.0035	0.0042
L71	0.3203	0.5393	1828	0.0008	0.0012	0.0019	0.0017	0.0021	0.0033	0.0028	0.0032	0.0038
L72	0.3206	0.5394	1825	0.0011	0.0015	0.0012	0.0023	0.0026	0.0032	0.0032	0.0037	0.0035
L73	0.3225	0.5396	1806	0.0012	0.0014	0.0019	0.0023	0.0032	0.0029	0.0033	0.0039	0.0040
L74	0.3148	0.5387	1887	0.0008	0.0014	0.0018	0.0023	0.0028	0.0036	0.0035	0.0037	0.0040
L75	0.3232	0.5396	1799	0.0010	0.0012	0.0017	0.0022	0.0032	0.0031	0.0035	0.0034	0.0040
L76	0.3160	0.5391	1875	0.0009	0.0010	0.0016	0.0023	0.0026	0.0033	0.0034	0.0032	0.0040
L77	0.3234	0.5397	1797	0.0004	0.0013	0.0017	0.0024	0.0021	0.0031	0.0031	0.0032	0.0040
L78	0.3171	0.5392	1862	0.0011	0.0016	0.0021	0.0022	0.0024	0.0028	0.0032	0.0034	0.0038
L79	0.3180	0.5405	1852	0.0004	0.0015	0.0020	0.0019	0.0026	0.0029	0.0034	0.0034	0.0039
L80	0.3218	0.5394	1813	0.0004	0.0016	0.0020	0.0018	0.0032	0.0032	0.0034	0.0035	0.0042
L81	0.3245	0.5392	1786	0.0009	0.0016	0.0022	0.0024	0.0022	0.0037	0.0031	0.0040	0.0035
L82	0.2574	0.5451	2732	0.0004	0.0007	0.0012	0.0024	0.0030	0.0035	0.0028	0.0037	0.0039
L83	0.3222	0.5403	1809	0.0009	0.0015	0.0015	0.0020	0.0031	0.0034	0.0036	0.0033	0.0040
L84	0.3181	0.5393	1852	0.0010	0.0007	0.0020	0.0024	0.0028	0.0032	0.0036	0.0037	0.0039
L85	0.3234	0.5393	1797	0.0009	0.0011	0.0018	0.0027	0.0029	0.0030	0.0035	0.0040	0.0039
L86	0.3245	0.5402	1786	0.0008	0.0013	0.0022	0.0027	0.0021	0.0033	0.0035	0.0041	0.0038
L87	0.3166	0.5395	1867	0.0004	0.0013	0.0014	0.0026	0.0027	0.0029	0.0038	0.0033	0.0038
L88	0.3221	0.5403	1810	0.0006	0.0006	0.0018	0.0018	0.0031	0.0032	0.0031	0.0039	0.0040
L89	0.3170	0.5390	1863	0.0005	0.0015	0.0021	0.0027	0.0024	0.0034	0.0038	0.0034	0.0036
L90	0.3237	0.5392	1794	0.0010	0.0007	0.0011	0.0020	0.0029	0.0032	0.0031	0.0036	0.0035
AV	0.3181	0.5397	1860	**0.0008**	**0.0012**	**0.0018**	**0.0022**	**0.0027**	**0.0032**	**0.0033**	**0.0035**	**0.0039**
Median	0.3205	0.5394	1827	0.0008	0.0013	0.0018	0.0023	0.0028	0.0032	0.0034	0.0035	0.0040
MIN	0.2574	0.5387	1786	0.0003	0.0006	0.0011	0.0017	0.0021	0.0027	0.0028	0.0031	0.0035
MAX	0.3245	0.5451	2732	**0.0012**	**0.0018**	**0.0022**	**0.0027**	**0.0033**	**0.0037**	**0.0038**	**0.0041**	**0.0043**
STDEV	0.0119	0.0011	168	0.0003	0.0004	0.0003	0.0003	0.0004	0.0003	0.0003	0.0003	0.0002
N	30	30	30	30	30	30	30	30	30	30	30	30

7 Product Photo



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