

# Test Report

Client Name : SHENZHEN REFOND OPTOELECTRONICS CO.,LTD

Address : Bright new district of shenzhen tian Lao 10 industrial zone 1

Product Name : SMD3014-C13

Date : 2021-04-06

**Shenzhen Anbotek Pengcheng Compliance  
Laboratory Limited**



**Report No.:** 68260LC10007901

**Product Description:** SMD3014-C13

**Model No.:** RF-27TC13DS-EC-N-Y

**Test Initiation Date:** 2020-02-07

**Test Completion Date:** 2021-02-26

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

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

**Testing location:** Zone B, 1/F., Building 2, Phase III, Huangtian Yangbei Industrial Zone, Huangtian Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.

**Tested by**

**Reviewed by**

Lenin Ye /

*Lenin Ye*

Flora Zhang /

*Flora Zhang*

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or use in part without prior written consent from Shenzhen Anbotek Pengcheng Compliance Laboratory Limited. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

**TABLE OF CONTENTS**

<b>1 General Information</b> .....	<b>3</b>
<b>2 Summary of Test Result</b> .....	<b>5</b>
<b>3 Test Method</b> .....	<b>7</b>
3.1 Photometric and Electrical Measurement.....	7
3.2 Season the LED from 0 hours to 9000 hours.....	7
<b>4 Test Data</b> .....	<b>8</b>
4.1 Data Set 1: 55°C, 60 mA (Lumen Maintenance).....	8
4.2 Data Set 1: 55°C, 60 mA (Chromaticity Shift).....	10
4.3 Data Set 2: 85°C, 60 mA (Lumen Maintenance).....	12
4.4 Data Set 2: 85°C, 60 mA (Chromaticity Shift).....	14
4.5 Data Set 3: 105°C, 60 mA (Lumen Maintenance).....	16
4.6 Data Set 3: 105°C, 60 mA (Chromaticity Shift).....	18
<b>5 EUT Photo</b> .....	<b>20</b>

## 1 General Information

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

Part Number: SMD3014-C13

Part type: RF-27TC13DS-EC-N-Y

Nominal CCT: 2700K

Nominal CRI: 90

Nominal Input Power(W): 0.18W

Mean Initial Forward Voltage(V): 3V

Nominal LED Die Area(mm<sup>2</sup>): 0.07mm<sup>2</sup>

Average Current per LED Die(mA): 60mA

Average current density per LED Die(mA/mm<sup>2</sup>): 830.24mA/mm<sup>2</sup>

Average power per LED Die(W): 0.18W

Average power density per LED Die(W/mm<sup>2</sup>): 2.49W/mm<sup>2</sup>

#### 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:

Series Name	Model name	Number of dies	Average current density per LED die (mA/mm <sup>2</sup> )	Current (mA)	power intensity (W/m <sup>2</sup> )	Power (W)	distance between of dies (mm)	Series	Parallel	Driver current of die
SMD3014-C13	RF-27TC13DS-EC-N-Y	1	830.24	60	2.49	0.18	0	0	0	60
SMD3014-C13	R*-****C13DS-EC-N-Y	1	830.24	60	2.49	0.18	0	0	0	60
SMD3014-C13	R*-****C13DS-EC-F-Y	1	415.12	30	1.25	0.09	0	0	0	30
SMD3014-C13	R*-****C13DS-EC-Y	1	276.75	20	0.83	0.06	0	0	0	20
SMD3014-C13	R*-****C13DS-EE-N-Y	1	830.24	60	2.49	0.18	0	0	0	60
SMD3014-C13	R*-****C13DS-EE-F-Y	1	415.12	30	1.25	0.09	0	0	0	30
SMD3014-C13	R*-****C13DS-EE-Y	1	276.75	20	0.83	0.06	0	0	0	20
SMD3014-C13	R*-****C13DS-BF-N-Y	1	737.59	60	2.21	0.18	0	0	0	60
SMD3014-C13	R*-****C13DS-BF-F-Y	1	368.80	30	1.11	0.09	0	0	0	30
SMD3014-C13	R*-****C13DS-BF-Y	1	245.86	20	0.74	0.06	0	0	0	20
SMD3014-C13	R*-****C13DS-CF-N-Y	1	465.00	60	1.40	0.18	0	0	0	60
SMD3014-C13	R*-****C13DS-CF-F-Y	1	232.50	30	0.70	0.09	0	0	0	30
SMD3014-C13	R*-****C13DS-CF-Y	1	155.00	20	0.47	0.06	0	0	0	20
SMD3014-C13	R*-****C13DS-HH-N-Y	1	410.26	60	1.23	0.18	0	0	0	60
SMD3014-C13	R*-****C13DS-HH-F-Y	1	205.13	30	0.62	0.09	0	0	0	30
SMD3014-C13	R*-****C13DS-HH-Y	1	136.75	20	0.41	0.06	0	0	0	20
SMD3014-C13	R*-****C13DS-DF-N-Y	1	368.51	60	1.11	0.18	0	0	0	60
SMD3014-C13	R*-****C13DS-DF-F-Y	1	184.25	30	0.55	0.09	0	0	0	30
SMD3014-C13	R*-****C13DS-DF-Y	1	122.84	20	0.37	0.06	0	0	0	20

Note:

R<sup>\*</sup> - \*<sup>\*\*</sup> \*\*<sup>\*</sup> \*<sup>\*\*</sup> C13DS - \*\*<sup>\*\*</sup> \*\*<sup>\*\*</sup> (-Y)

A1    A2    A3    A4    A5    A6    A7    A8

Identifiers Information (if any):

A1: Letter R\* can be RF or RT, RG, It is an internal Market code which does not affect property.

A2: Letter \* represent customer name, It can be C, D, H, K, L, M, P, S, T, W, Y; And so on or empty;

A3: Letter \*\* represent CCT, It can be 27, 30, 35, 40, 45, 50, 57, 60, 62, 65; \*\* does not just refer to two numbers, it may also be like the previous mentioned 2, 3, 4, 5, 6, 7, etc.

A4: Letter \* represent workshop code, it can be R,M,H,T or Q&S which does not affect product property;

A5: Letter C13DS is a fixed code;

A6: Letter \*\* represent chip type, it can be EC,HH,BF,CF,DF,EF,FF or FH Code, etc., the models with code EC use the smallest size chip.

A7: Letter \*\* represent current, it can be E(20mA), F(30mA) or N(60mA). Code E is a general rule and may be omitted; As the voltage of above models is always 3V, Code N represents the max power.

A8: A (-Y) means the centrifugal power equipment is not used, No (-Y) means the equipment is used.

## 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 NVLAP)

## 1.3 Test Facility Description

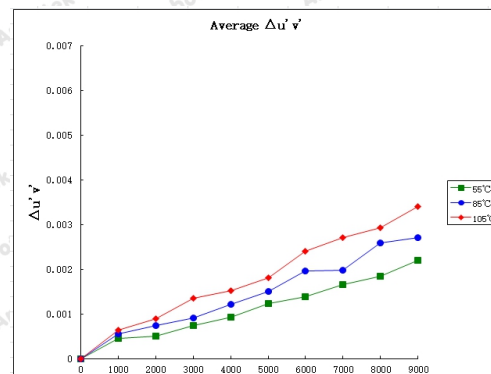
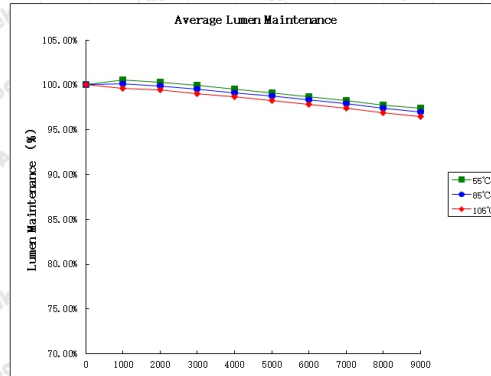
The test facility used by Shenzhen Anbotek Pengcheng Compliance Laboratory Limited is located at Zone B, 1/F., Building 2, Phase III, Huangtian Yangbei Industrial Zone, Huangtian Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.

## 1.4 Test Equipment List

Device	Manufacture	Model No.	Serial No.	Calibration Date	Calibration Due Date
Digital Power Meter	YOKOGAWA	WT210	SE-074	2020-05-06	2021-05-05
LM-80 Aging Test System	KEYI	KY-3X-LH60	SE-564	2020-05-06	2021-05-05
DC Power Supply	EVERFINE	WY605	SE-605	2020-05-06	2021-05-05
Standard Lamp	OSRAM	12V/10W	SE-2243	2020-09-25	2021-09-24
Spectrum Analyzer	EVERFINE	HAAS-2000	SE-607	2020-05-06	2021-05-05
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	60 mA	60 mA	60 mA
Condition	Ts=54.9°C Ta=54.7°C R.H.<65% IF=60 mA	Ts=84.7°C Ta=84.3°C R.H.<65% IF=60 mA	Ts=104.8°C Ta=103.7°C R.H.<65% IF=60 mA
sample size	25	25	25
Duration (in Hours)	9000	9000	9000
Intervals (in Hours)	1000	1000	1000
Failures Observed	0	0	0
Average Lumen Maintenance at 9000h	97.37%	96.98%	96.48%
Average Chromaticity Shift at 9000h	0.0022	0.0027	0.0034
$\alpha$	4.417E-06	4.473E-06	4.510E-06
$\beta$	1.013	1.010	1.005
Reported L <sub>70</sub> (9000h) TM-21 Lifetime	>54000	>54000	>54000
Reported L <sub>80</sub> (9000h) TM-21 Lifetime	53000	52000	51000
Reported L <sub>90</sub> (9000h) TM-21 Lifetime	27000	26000	24000





### 3 Test Method

#### 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 (DC 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 Test Data

### 4.1 Data Set 1: 55°C, 60 mA (Lumen Maintenance)

Description of Light Sources Tested:	RF-27TC13DS-EC-N-Y
Case Temperature:	54.9°C
Ambient Temperature:	54.7°C
Drive Current:	60 mA
Measure Current:	60 mA
Failures Observed:	None

### Lumen Maintenance (%)

Sample No.	VF(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L1	3.08	17.1	100.59%	100.31%	99.94%	99.53%	99.24%	98.74%	98.22%	97.82%	97.36%
L2	3.14	17.1	100.57%	100.30%	99.88%	99.58%	99.13%	98.64%	98.37%	97.82%	97.44%
L3	3.11	16.9	100.50%	100.32%	99.87%	99.57%	99.21%	98.60%	98.19%	97.78%	97.30%
L4	3.06	16.0	100.51%	100.28%	99.82%	99.54%	99.13%	98.67%	98.28%	97.78%	97.42%
L5	3.06	16.1	100.50%	100.31%	100.02%	99.52%	99.10%	98.68%	98.31%	97.79%	97.28%
L6	3.06	16.1	100.54%	100.34%	99.94%	99.49%	99.06%	98.65%	98.20%	97.72%	97.40%
L7	3.09	16.0	100.59%	100.33%	99.96%	99.52%	99.20%	98.69%	98.48%	97.77%	97.44%
L8	3.08	16.0	100.55%	100.29%	99.93%	99.53%	99.08%	98.62%	98.18%	97.76%	97.42%
L9	3.08	16.0	100.59%	100.30%	99.92%	99.50%	99.23%	98.77%	98.42%	97.74%	97.46%
L10	3.09	17.1	100.55%	100.28%	99.92%	99.49%	99.19%	98.64%	98.18%	97.81%	97.30%
L11	3.09	17.1	100.54%	100.27%	100.01%	99.49%	99.09%	98.74%	98.30%	97.75%	97.28%
L12	3.09	17.1	100.51%	100.28%	99.91%	99.51%	99.19%	98.64%	98.39%	97.80%	97.38%
L13	3.09	17.1	100.55%	100.32%	99.89%	99.52%	99.05%	98.67%	98.28%	97.72%	97.35%
L14	3.06	17.0	100.52%	100.31%	99.85%	99.48%	99.20%	98.71%	98.26%	97.74%	97.28%
L15	3.06	17.0	100.52%	100.28%	99.97%	99.56%	99.07%	98.65%	98.37%	97.78%	97.38%
L16	3.06	17.0	100.51%	100.29%	99.90%	99.49%	99.05%	98.60%	98.17%	97.77%	97.33%
L17	3.07	17.0	100.58%	100.30%	99.92%	99.55%	99.17%	98.65%	98.29%	97.82%	97.41%
L18	3.07	17.0	100.52%	100.30%	99.87%	99.57%	99.16%	98.61%	98.27%	97.81%	97.34%
L19	3.07	17.0	100.50%	100.31%	99.83%	99.56%	99.14%	98.61%	98.23%	97.78%	97.36%
L20	3.07	17.0	100.50%	100.28%	99.85%	99.53%	99.13%	98.68%	98.30%	97.78%	97.37%
L21	3.07	15.1	100.53%	100.32%	99.99%	99.49%	99.07%	98.68%	98.31%	97.76%	97.31%
L22	3.07	15.1	100.54%	100.34%	99.95%	99.52%	99.12%	98.68%	98.46%	97.73%	97.43%
L23	3.07	15.1	100.59%	100.33%	99.95%	99.52%	99.08%	98.67%	98.20%	97.77%	97.44%
L24	3.06	17.1	100.58%	100.30%	99.93%	99.52%	99.09%	98.62%	98.36%	97.75%	97.44%
L25	3.06	17.1	100.57%	100.30%	99.92%	99.50%	99.20%	98.71%	98.18%	97.75%	97.40%
AV	<b>3.08</b>	<b>16.57</b>	<b>100.54%</b>	<b>100.30%</b>	<b>99.92%</b>	<b>99.52%</b>	<b>99.14%</b>	<b>98.67%</b>	<b>98.29%</b>	<b>97.77%</b>	<b>97.37%</b>
Median	3.07	16.98	100.54%	100.30%	99.92%	99.52%	99.13%	98.67%	98.28%	97.77%	97.38%
MIN	3.06	15.08	100.50%	100.27%	99.82%	99.48%	99.05%	98.60%	98.17%	97.72%	97.28%
MAX	3.14	17.13	100.59%	100.34%	100.02%	99.58%	99.24%	98.77%	98.48%	97.82%	97.46%
STDEV	0.02	0.71	0.0003	0.0002	0.0005	0.0003	0.0006	0.0004	0.0009	0.0003	0.0006
N	25	25	25	25	25	25	25	25	25	25	25

### 4.2 Data Set 1: 55°C, 60 mA (Chromaticity Shift)

Description of Light Sources Tested:	RF-27TC13DS-EC-N-Y
Case Temperature:	54.9°C
Ambient Temperature:	54.7°C
Drive Current:	60 mA
Measure Current:	60 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	0.2599	0.5347	2724	0.0004	0.0007	0.0005	0.0010	0.0014	0.0014	0.0017	0.0019	0.0021
L2	0.2569	0.5335	2792	0.0005	0.0004	0.0004	0.0010	0.0013	0.0011	0.0012	0.0017	0.0020
L3	0.2631	0.5366	2653	0.0003	0.0003	0.0009	0.0009	0.0012	0.0016	0.0016	0.0020	0.0018
L4	0.2606	0.5353	2708	0.0005	0.0008	0.0007	0.0012	0.0009	0.0012	0.0019	0.0015	0.0017
L5	0.2594	0.5350	2733	0.0003	0.0003	0.0010	0.0009	0.0016	0.0017	0.0019	0.0023	0.0022
L6	0.2601	0.5355	2716	0.0004	0.0005	0.0006	0.0011	0.0016	0.0016	0.0021	0.0014	0.0023
L7	0.2575	0.5341	2776	0.0007	0.0004	0.0009	0.0009	0.0011	0.0012	0.0014	0.0023	0.0027
L8	0.2588	0.5348	2746	0.0005	0.0006	0.0005	0.0012	0.0010	0.0012	0.0020	0.0020	0.0018
L9	0.2605	0.5356	2708	0.0006	0.0007	0.0008	0.0007	0.0013	0.0014	0.0020	0.0019	0.0023
L10	0.2590	0.5338	2746	0.0002	0.0004	0.0008	0.0006	0.0010	0.0018	0.0013	0.0022	0.0027
L11	0.2584	0.5336	2759	0.0003	0.0003	0.0005	0.0007	0.0012	0.0011	0.0015	0.0018	0.0019
L12	0.2571	0.5326	2791	0.0004	0.0008	0.0005	0.0010	0.0014	0.0011	0.0015	0.0019	0.0020
L13	0.2576	0.5341	2773	0.0004	0.0003	0.0008	0.0009	0.0013	0.0015	0.0015	0.0017	0.0019
L14	0.2619	0.5357	2680	0.0004	0.0005	0.0008	0.0011	0.0010	0.0014	0.0017	0.0015	0.0018
L15	0.2599	0.5353	2722	0.0004	0.0007	0.0008	0.0010	0.0011	0.0016	0.0019	0.0016	0.0021
L16	0.2609	0.5351	2702	0.0003	0.0004	0.0009	0.0010	0.0016	0.0016	0.0020	0.0020	0.0023
L17	0.2586	0.5337	2754	0.0004	0.0005	0.0006	0.0010	0.0013	0.0012	0.0016	0.0021	0.0024
L18	0.2607	0.5345	2709	0.0006	0.0005	0.0009	0.0011	0.0010	0.0012	0.0019	0.0023	0.0027
L19	0.2577	0.5342	2771	0.0006	0.0007	0.0008	0.0011	0.0012	0.0013	0.0020	0.0020	0.0018
L20	0.2620	0.5358	2677	0.0003	0.0005	0.0008	0.0007	0.0012	0.0017	0.0015	0.0021	0.0026
L21	0.2588	0.5348	2745	0.0003	0.0003	0.0010	0.0009	0.0012	0.0011	0.0014	0.0018	0.0022
L22	0.2598	0.5346	2726	0.0007	0.0004	0.0008	0.0007	0.0009	0.0013	0.0016	0.0015	0.0030
L23	0.2567	0.5333	2795	0.0006	0.0004	0.0008	0.0007	0.0014	0.0018	0.0015	0.0017	0.0024
L24	0.2575	0.5340	2777	0.0007	0.0005	0.0010	0.0011	0.0011	0.0013	0.0014	0.0016	0.0024
L25	0.2606	0.5357	2706	0.0004	0.0005	0.0005	0.0010	0.0014	0.0012	0.0016	0.0017	0.0021
<b>AV</b>	<b>0.2594</b>	<b>0.5346</b>	<b>2736</b>	<b>0.0004</b>	<b>0.0005</b>	<b>0.0007</b>	<b>0.0009</b>	<b>0.0012</b>	<b>0.0014</b>	<b>0.0017</b>	<b>0.0019</b>	<b>0.0022</b>
Median	0.2594	0.5347	2733	0.0004	0.0005	0.0008	0.0010	0.0012	0.0013	0.0016	0.0019	0.0022
MIN	0.2567	0.5326	2653	0.0002	0.0003	0.0004	0.0006	0.0009	0.0011	0.0012	0.0014	0.0017
MAX	0.2631	0.5366	2795	0.0007	0.0008	0.0010	0.0012	0.0016	0.0018	0.0021	0.0023	0.0030
STDEV	0.0017	0.0009	38.38	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003
N	25	25	25	25	25	25	25	25	25	25	25	25

### 4.3 Data Set 2: 85°C, 60 mA (Lumen Maintenance)

Description of Light Sources Tested:	RF-27TC13DS-EC-N-Y
Case Temperature:	84.7°C
Ambient Temperature:	84.3°C
Drive Current:	60 mA
Measure Current:	60 mA
Failures Observed:	None

### Lumen Maintenance (%)

Sample No.	VF(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L26	3.06	17.1	100.16%	99.86%	99.48%	99.17%	98.76%	98.30%	98.04%	97.40%	96.96%
L27	3.06	17.2	100.19%	99.87%	99.59%	99.09%	98.74%	98.25%	98.04%	97.34%	96.99%
L28	3.06	16.7	100.15%	99.88%	99.58%	99.08%	98.76%	98.28%	98.03%	97.35%	97.00%
L29	3.06	16.8	100.08%	99.89%	99.51%	99.19%	98.82%	98.35%	98.02%	97.42%	97.00%
L30	3.06	16.8	100.12%	99.87%	99.53%	99.14%	98.68%	98.38%	97.84%	97.31%	96.98%
L31	3.04	16.7	100.18%	99.93%	99.46%	99.21%	98.80%	98.41%	97.85%	97.32%	97.02%
L32	3.04	16.7	100.13%	99.97%	99.58%	99.17%	98.80%	98.37%	97.90%	97.34%	96.90%
L33	3.04	16.7	100.12%	99.87%	99.54%	99.13%	98.82%	98.35%	97.83%	97.34%	96.99%
L34	3.04	16.7	100.08%	99.88%	99.54%	99.09%	98.69%	98.27%	98.00%	97.36%	96.99%
L35	3.04	16.8	100.18%	99.92%	99.46%	99.13%	98.79%	98.33%	98.00%	97.40%	97.08%
L36	3.04	16.8	100.11%	99.86%	99.43%	99.09%	98.69%	98.22%	97.90%	97.40%	96.92%
L37	3.04	16.8	100.19%	99.86%	99.52%	99.10%	98.75%	98.27%	98.04%	97.39%	96.97%
L38	3.04	16.8	100.18%	99.87%	99.59%	99.09%	98.74%	98.26%	98.03%	97.34%	96.99%
L39	3.04	16.3	100.08%	99.88%	99.53%	99.18%	98.80%	98.34%	98.02%	97.39%	97.00%
L40	3.04	16.3	100.09%	99.88%	99.53%	99.19%	98.70%	98.37%	97.94%	97.34%	97.00%
L41	3.04	16.3	100.17%	99.89%	99.48%	99.18%	98.69%	98.40%	97.85%	97.31%	97.00%
L42	3.04	16.3	100.14%	99.97%	99.54%	99.20%	98.80%	98.38%	97.88%	97.33%	96.91%
L43	3.04	16.3	100.13%	99.89%	99.56%	99.15%	98.81%	98.36%	97.88%	97.34%	96.96%
L44	3.07	17.0	100.09%	99.87%	99.54%	99.11%	98.75%	98.32%	97.95%	97.36%	96.99%
L45	3.07	17.0	100.08%	99.89%	99.53%	99.11%	98.73%	98.32%	98.00%	97.38%	97.02%
L46	3.08	17.0	100.11%	99.89%	99.46%	99.09%	98.72%	98.31%	98.06%	97.40%	96.94%
L47	3.08	16.4	100.14%	99.88%	99.48%	99.17%	98.76%	98.26%	97.90%	97.40%	97.06%
L48	3.07	16.4	100.16%	99.89%	99.61%	99.12%	98.84%	98.24%	97.97%	97.34%	96.86%
L49	3.07	16.4	100.19%	99.90%	99.48%	99.19%	98.65%	98.41%	97.82%	97.38%	96.94%
L50	3.05	17.0	100.08%	99.91%	99.63%	99.15%	98.79%	98.37%	98.01%	97.34%	97.05%
<b>AV</b>	<b>3.05</b>	<b>16.69</b>	<b>100.13%</b>	<b>99.89%</b>	<b>99.53%</b>	<b>99.14%</b>	<b>98.75%</b>	<b>98.33%</b>	<b>97.95%</b>	<b>97.36%</b>	<b>96.98%</b>
Median	3.04	16.74	100.13%	99.88%	99.53%	99.14%	98.76%	98.33%	97.97%	97.35%	96.99%
MIN	3.04	16.27	100.08%	99.86%	99.43%	99.08%	98.65%	98.22%	97.82%	97.31%	96.86%
MAX	3.08	17.15	100.19%	99.97%	99.63%	99.21%	98.84%	98.41%	98.06%	97.42%	97.08%
STDEV	0.01	0.29	0.0004	0.0003	0.0005	0.0004	0.0005	0.0006	0.0008	0.0003	0.0005
N	25	25	25	25	25	25	25	25	25	25	25

### 4.4 Data Set 2: 85°C, 60 mA (Chromaticity Shift)

Description of Light Sources Tested:	RF-27TC13DS-EC-N-Y
Case Temperature:	84.7°C
Ambient Temperature:	84.3°C
Drive Current:	60 mA
Measure Current:	60 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
L26	0.2609	0.5351	2702	0.0006	0.0005	0.0005	0.0010	0.0019	0.0022	0.0018	0.0019	0.0034
L27	0.2607	0.5350	2706	0.0002	0.0009	0.0010	0.0009	0.0012	0.0022	0.0022	0.0027	0.0030
L28	0.2599	0.5354	2720	0.0002	0.0009	0.0007	0.0014	0.0019	0.0016	0.0022	0.0029	0.0024
L29	0.2599	0.5353	2721	0.0007	0.0009	0.0009	0.0014	0.0017	0.0013	0.0024	0.0027	0.0026
L30	0.2570	0.5326	2794	0.0008	0.0009	0.0007	0.0016	0.0019	0.0022	0.0025	0.0031	0.0022
L31	0.2597	0.5352	2725	0.0007	0.0010	0.0006	0.0013	0.0012	0.0021	0.0016	0.0027	0.0031
L32	0.2589	0.5338	2747	0.0007	0.0004	0.0009	0.0009	0.0011	0.0018	0.0020	0.0027	0.0021
L33	0.2589	0.5338	2748	0.0005	0.0009	0.0013	0.0009	0.0011	0.0018	0.0015	0.0018	0.0021
L34	0.2629	0.5365	2657	0.0008	0.0007	0.0012	0.0012	0.0018	0.0025	0.0015	0.0024	0.0038
L35	0.2595	0.5346	2731	0.0003	0.0009	0.0012	0.0016	0.0013	0.0019	0.0016	0.0032	0.0028
L36	0.2585	0.5336	2758	0.0003	0.0004	0.0005	0.0007	0.0019	0.0020	0.0016	0.0018	0.0025
L37	0.2603	0.5352	2714	0.0003	0.0007	0.0008	0.0010	0.0015	0.0022	0.0019	0.0025	0.0031
L38	0.2593	0.5349	2736	0.0002	0.0009	0.0009	0.0014	0.0013	0.0018	0.0022	0.0028	0.0030
L39	0.2592	0.5349	2737	0.0007	0.0009	0.0008	0.0014	0.0017	0.0015	0.0022	0.0029	0.0024
L40	0.2592	0.5349	2738	0.0008	0.0009	0.0009	0.0015	0.0019	0.0019	0.0024	0.0028	0.0024
L41	0.2604	0.5356	2709	0.0007	0.0009	0.0006	0.0015	0.0015	0.0022	0.0025	0.0031	0.0023
L42	0.2628	0.5365	2659	0.0007	0.0006	0.0008	0.0012	0.0012	0.0019	0.0019	0.0027	0.0022
L43	0.2628	0.5365	2659	0.0006	0.0004	0.0011	0.0009	0.0011	0.0018	0.0017	0.0021	0.0021
L44	0.2585	0.5336	2757	0.0007	0.0008	0.0013	0.0012	0.0017	0.0023	0.0015	0.0022	0.0027
L45	0.2596	0.5347	2731	0.0004	0.0009	0.0012	0.0014	0.0017	0.0021	0.0015	0.0026	0.0032
L46	0.2587	0.5348	2749	0.0008	0.0006	0.0008	0.0012	0.0015	0.0014	0.0025	0.0029	0.0027
L47	0.2577	0.5341	2773	0.0003	0.0010	0.0011	0.0017	0.0015	0.0022	0.0020	0.0031	0.0027
L48	0.2575	0.5340	2777	0.0004	0.0008	0.0009	0.0007	0.0010	0.0016	0.0020	0.0016	0.0027
L49	0.2575	0.5340	2777	0.0007	0.0004	0.0012	0.0012	0.0013	0.0023	0.0029	0.0020	0.0029
L50	0.2629	0.5365	2657	0.0006	0.0007	0.0009	0.0013	0.0020	0.0025	0.0017	0.0034	0.0033
<b>AV</b>	<b>0.2597</b>	<b>0.5348</b>	<b>2727</b>	<b>0.0006</b>	<b>0.0008</b>	<b>0.0009</b>	<b>0.0012</b>	<b>0.0015</b>	<b>0.0020</b>	<b>0.0020</b>	<b>0.0026</b>	<b>0.0027</b>
Median	0.2595	0.5349	2731	0.0006	0.0009	0.0009	0.0012	0.0015	0.0020	0.0020	0.0027	0.0027
MIN	0.2570	0.5326	2657	0.0002	0.0004	0.0005	0.0007	0.0010	0.0013	0.0015	0.0016	0.0021
MAX	0.2629	0.5365	2794	0.0008	0.0010	0.0013	0.0017	0.0020	0.0025	0.0029	0.0034	0.0038
STDEV	0.0017	0.0010	38.63	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005	0.0005
N	25	25	25	25	25	25	25	25	25	25	25	25

**4.5 Data Set 3: 105°C, 60 mA (Lumen Maintenance)**

Description of Light Sources Tested:	RF-27TC13DS-EC-N-Y
Case Temperature:	104.8°C
Ambient Temperature:	103.7°C
Drive Current:	60 mA
Measure Current:	60 mA
Failures Observed:	None

**Lumen Maintenance (%)**

Sample No.	VF(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L51	3.05	16.9	99.62%	99.42%	99.02%	98.67%	98.14%	97.72%	97.52%	96.87%	96.51%
L52	3.05	17.0	99.70%	99.44%	99.06%	98.60%	98.16%	97.90%	97.46%	96.83%	96.49%
L53	3.07	16.8	99.66%	99.43%	99.07%	98.70%	98.20%	97.83%	97.42%	96.82%	96.47%
L54	3.07	16.8	99.70%	99.41%	99.02%	98.62%	98.34%	97.92%	97.38%	96.87%	96.43%
L55	3.07	16.8	99.60%	99.43%	98.96%	98.66%	98.32%	97.87%	97.52%	96.86%	96.40%
L56	3.11	14.9	99.59%	99.44%	98.95%	98.65%	98.21%	97.72%	97.49%	96.92%	96.45%
L57	3.10	14.9	99.68%	99.44%	99.09%	98.71%	98.34%	97.77%	97.41%	96.85%	96.44%
L58	3.10	14.9	99.59%	99.38%	99.03%	98.70%	98.24%	97.82%	97.48%	96.81%	96.47%
L59	3.06	16.6	99.63%	99.37%	99.07%	98.67%	98.14%	97.90%	97.27%	96.84%	96.54%
L60	3.06	16.6	99.62%	99.37%	99.02%	98.58%	98.14%	97.71%	97.44%	96.87%	96.49%
L61	3.06	16.6	99.64%	99.42%	99.02%	98.66%	98.15%	97.73%	97.48%	96.86%	96.50%
L62	3.05	16.8	99.67%	99.43%	99.07%	98.65%	98.16%	97.86%	97.42%	96.83%	96.48%
L63	3.05	16.8	99.66%	99.41%	99.05%	98.69%	98.32%	97.83%	97.42%	96.83%	96.44%
L64	3.05	16.8	99.66%	99.43%	98.96%	98.63%	98.34%	97.90%	97.45%	96.86%	96.43%
L65	3.06	16.8	99.59%	99.44%	98.95%	98.66%	98.29%	97.80%	97.50%	96.90%	96.44%
L66	3.06	16.9	99.68%	99.44%	99.08%	98.66%	98.23%	97.74%	97.48%	96.86%	96.45%
L67	3.06	16.9	99.61%	99.42%	99.03%	98.71%	98.32%	97.81%	97.42%	96.85%	96.47%
L68	3.05	16.8	99.61%	99.38%	99.05%	98.69%	98.17%	97.89%	97.35%	96.82%	96.53%
L69	3.05	16.8	99.62%	99.37%	99.07%	98.61%	98.14%	97.90%	97.34%	96.84%	96.54%
L70	3.05	16.8	99.62%	99.37%	99.02%	98.66%	98.14%	97.72%	97.46%	96.87%	96.50%
L71	3.07	16.8	99.68%	99.39%	99.05%	98.59%	98.32%	97.74%	97.39%	96.85%	96.47%
L72	3.07	16.8	99.64%	99.39%	99.12%	98.70%	98.25%	97.78%	97.31%	96.89%	96.53%
L73	3.07	16.8	99.68%	99.38%	98.95%	98.71%	98.18%	97.72%	97.37%	96.91%	96.49%
L74	3.06	16.6	99.68%	99.38%	98.93%	98.70%	98.25%	97.74%	97.49%	96.91%	96.52%
L75	3.07	16.8	99.69%	99.46%	98.97%	98.70%	98.30%	97.72%	97.40%	96.81%	96.56%
<b>AV</b>	<b>3.06</b>	<b>16.55</b>	<b>99.65%</b>	<b>99.41%</b>	<b>99.02%</b>	<b>98.66%</b>	<b>98.23%</b>	<b>97.80%</b>	<b>97.43%</b>	<b>96.86%</b>	<b>96.48%</b>
Median	3.06	16.76	99.64%	99.42%	99.03%	98.66%	98.23%	97.80%	97.42%	96.86%	96.48%
MIN	3.05	14.86	99.59%	99.37%	98.93%	98.58%	98.14%	97.71%	97.27%	96.81%	96.40%
MAX	3.11	16.95	99.70%	99.46%	99.12%	98.71%	98.34%	97.92%	97.52%	96.92%	96.56%
STDEV	0.02	0.64	0.0004	0.0003	0.0005	0.0004	0.0008	0.0007	0.0007	0.0003	0.0004
N	25	25	25	25	25	25	25	25	25	25	25

**4.6 Data Set 3: 105°C, 60 mA (Chromaticity Shift)**

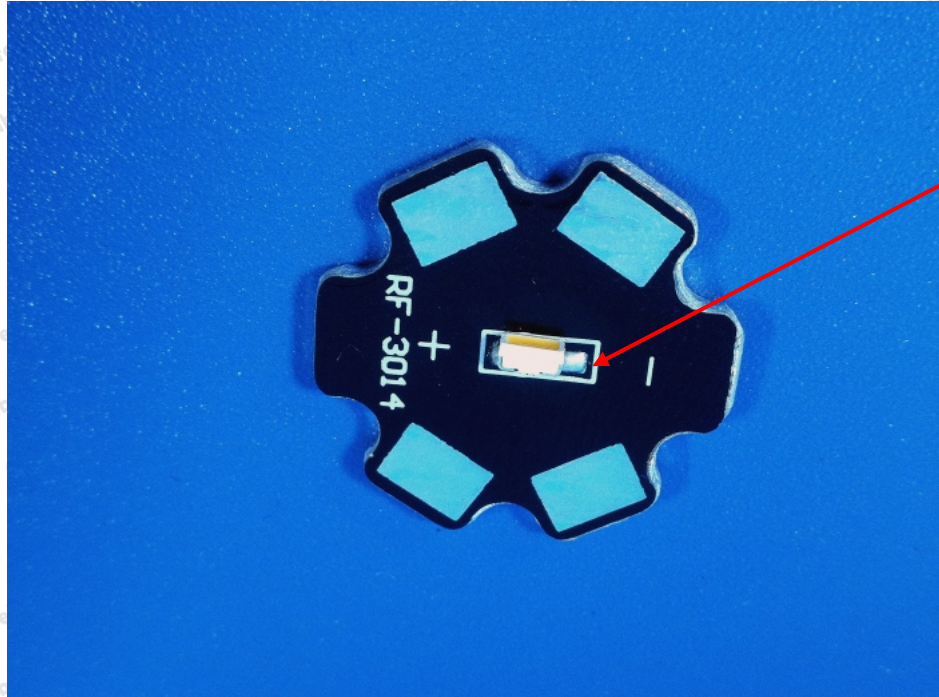
Description of Light Sources Tested:	RF-27TC13DS-EC-N-Y
Case Temperature:	104.8°C
Ambient Temperature:	103.7°C
Drive Current:	60 mA
Measure Current:	60 mA
Failures Observed:	None

**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
L51	0.2629	0.5365	2658	0.0010	0.0007	0.0015	0.0014	0.0024	0.0029	0.0025	0.0028	0.0035
L52	0.2597	0.5352	2726	0.0008	0.0011	0.0014	0.0019	0.0022	0.0019	0.0025	0.0030	0.0039
L53	0.2597	0.5352	2726	0.0009	0.0007	0.0017	0.0010	0.0019	0.0029	0.0025	0.0028	0.0028
L54	0.2590	0.5338	2747	0.0005	0.0008	0.0015	0.0011	0.0014	0.0020	0.0033	0.0028	0.0034
L55	0.2589	0.5338	2747	0.0007	0.0009	0.0014	0.0015	0.0014	0.0018	0.0032	0.0025	0.0038
L56	0.2597	0.5346	2728	0.0003	0.0015	0.0010	0.0018	0.0020	0.0024	0.0028	0.0029	0.0034
L57	0.2597	0.5345	2729	0.0009	0.0006	0.0019	0.0017	0.0015	0.0024	0.0033	0.0028	0.0035
L58	0.2576	0.5341	2773	0.0003	0.0012	0.0011	0.0010	0.0017	0.0018	0.0023	0.0033	0.0033
L59	0.2585	0.5336	2756	0.0009	0.0010	0.0016	0.0014	0.0018	0.0029	0.0024	0.0033	0.0027
L60	0.2585	0.5336	2757	0.0007	0.0009	0.0010	0.0015	0.0014	0.0028	0.0030	0.0029	0.0032
L61	0.2587	0.5348	2747	0.0004	0.0006	0.0009	0.0011	0.0018	0.0028	0.0023	0.0026	0.0034
L62	0.2587	0.5348	2747	0.0009	0.0009	0.0014	0.0015	0.0023	0.0022	0.0025	0.0029	0.0037
L63	0.2608	0.5351	2705	0.0008	0.0007	0.0015	0.0014	0.0020	0.0026	0.0025	0.0028	0.0030
L64	0.2595	0.5347	2732	0.0009	0.0008	0.0015	0.0010	0.0016	0.0022	0.0025	0.0028	0.0029
L65	0.2595	0.5346	2732	0.0007	0.0008	0.0014	0.0014	0.0014	0.0020	0.0033	0.0027	0.0035
L66	0.2567	0.5325	2801	0.0003	0.0014	0.0012	0.0017	0.0015	0.0018	0.0029	0.0027	0.0034
L67	0.2575	0.5340	2776	0.0007	0.0007	0.0016	0.0017	0.0016	0.0024	0.0029	0.0029	0.0034
L68	0.2574	0.5340	2779	0.0004	0.0008	0.0013	0.0011	0.0016	0.0020	0.0026	0.0032	0.0034
L69	0.2594	0.5346	2734	0.0004	0.0012	0.0011	0.0013	0.0017	0.0028	0.0023	0.0033	0.0032
L70	0.2575	0.5341	2776	0.0008	0.0010	0.0015	0.0015	0.0016	0.0029	0.0026	0.0032	0.0032
L71	0.2568	0.5325	2798	0.0003	0.0006	0.0015	0.0022	0.0016	0.0027	0.0024	0.0030	0.0040
L72	0.2584	0.5336	2760	0.0005	0.0006	0.0010	0.0018	0.0024	0.0023	0.0031	0.0026	0.0040
L73	0.2627	0.5365	2662	0.0003	0.0011	0.0014	0.0019	0.0022	0.0023	0.0026	0.0030	0.0032
L74	0.2590	0.5339	2746	0.0008	0.0005	0.0009	0.0020	0.0017	0.0025	0.0032	0.0036	0.0038
L75	0.2607	0.5351	2707	0.0003	0.0011	0.0017	0.0019	0.0024	0.0030	0.0026	0.0028	0.0035
<b>AV</b>	<b>0.2591</b>	<b>0.5344</b>	<b>2742</b>	<b>0.0006</b>	<b>0.0009</b>	<b>0.0014</b>	<b>0.0015</b>	<b>0.0018</b>	<b>0.0024</b>	<b>0.0027</b>	<b>0.0029</b>	<b>0.0034</b>
Median	0.2590	0.5345	2747	0.0007	0.0008	0.0014	0.0015	0.0017	0.0024	0.0026	0.0029	0.0034
MIN	0.2567	0.5325	2658	0.0003	0.0005	0.0009	0.0010	0.0014	0.0018	0.0023	0.0025	0.0027
MAX	0.2629	0.5365	2801	0.0010	0.0015	0.0019	0.0022	0.0024	0.0030	0.0033	0.0036	0.0040
STDEV	0.0015	0.0010	34.95	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003	0.0003
N	25	25	25	25	25	25	25	25	25	25	25	25

## 5 EUT Photo

### 5.1 EUT PHOTO



TMP LED

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