



Underwriters Laboratories Taiwan Co., Ltd.

優力國際安全認證有限公司

台北市北投區大業路 260 號 1, 2, 3, 4, 5, 6 樓

1st, 2nd, 3rd, 4th, 5th, 6th, Fl., 260, Da-Yeh Road, Peitou,

Taipei City 112, Taiwan

Phone: 02-7737-3000, Fax: 02-2891-7644, E-mail: customerservice.tw@tw.ul.com

Report Number: 4786297166-1a

LM-80 Test Report

| | |
|--|---|
| Applicant | Edison Opto Corporation |
| Address of Applicant | 4F No 800, Zhongzheng Rd., Zhonghe, New Taipei, 235, Taiwan (R.O.C.) |
| Subcontract Testing Laboratory | Great One Global Certification Co., Ltd. |
| Testing Address | 9F-2, No. 120, Qiaoh Rd., Zhonghe Dist., New Taipei City, 235, Taiwan (R.O.C.) |
| Tested by | Kevin Wang, Matt Hsieh |
| Testing Laboratory Accreditation | This laboratory is accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communique dated January 2009) |
| Product Name | LED Package |
| Tested Model No. | 2T0402WW23000014 (XTH-5041FWRG-AN) |
| Series Model No. | 2T0402xWxx000xxx series (XTH-50XXFXXX-AN series) Note: See page 4 for description of model series. |
| Manufacturer | Edison Opto Corporation |
| Rating | 65 Vdc, 30 mA, 2 W |
| Standard | IES LM-80-08 IES Approved Method for Measuring Lumen Maintenance of LED Light Sources |
| Date of Test | 2014-03-11 to 2014-11-27 |
| Date of Issue | 2015-03-11 |
| General Information: Test results are valid only for the tested items. This report shall not be reproduced except in full without the written approval of the testing laboratory. | |
| Reported by : <u>Key Hung</u> Project Engineer | Approved by : <u>Michael H. Lai</u> Senior Project Engineer |



Number of LED light sources tested

25 pieces for each case temperature

Description of LED light sources

| | | | |
|-----------------|-----------------|----------------|--------|
| Test Model No.: | XTH-5041FWRG-AN | Rated CCT: | 2700 K |
| Rated Voltage: | 65 Vdc | Rated Current: | 30 mA |

Operating cycle

The samples were driven with a constant direct current throughout the life test.

Ambient conditions including airflow and relative humidity

Airflow has been minimized. Humidity was maintained to less than 65 RH throughout the life test.

Case and ambient temperatures

Case temperatures (T_s) were 55°C and 85°C with 105°C selected by the manufacturer, and they were controlled to $\pm 2^\circ\text{C}$ during life testing. The temperature of the surrounding air was maintained to within $\pm 5^\circ\text{C}$ of the case temperature during testing. The case temperature and surrounding air temperature were monitored within the test chamber.

Drive current of the LED light source during lifetime test

The samples were operated at 30 mA DC. The input current was monitored and regulated to within $\pm 3\%$ of the rated rms value during life testing and to $\pm 0.5\%$ of the rated rms value during photometric measurements. The drive currents were maintained over the entire period of the operation of the LED light source.

LED light source monitoring interval

0 h, 1000 h, 2000 h, 3000 h, 4000 h, 5000 h, 6000 h

Observation of LED light source failures including the failure conditions and time of failure

None

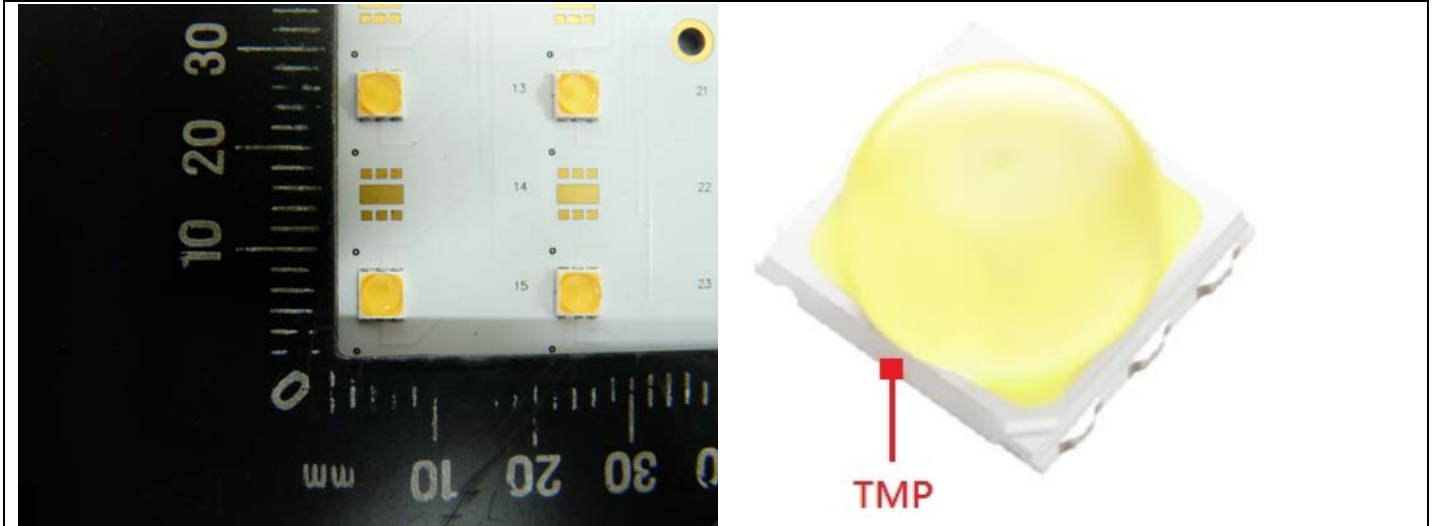
Photometric Measurement uncertainty

Flux measurement: 2.2 % ($k=2$)

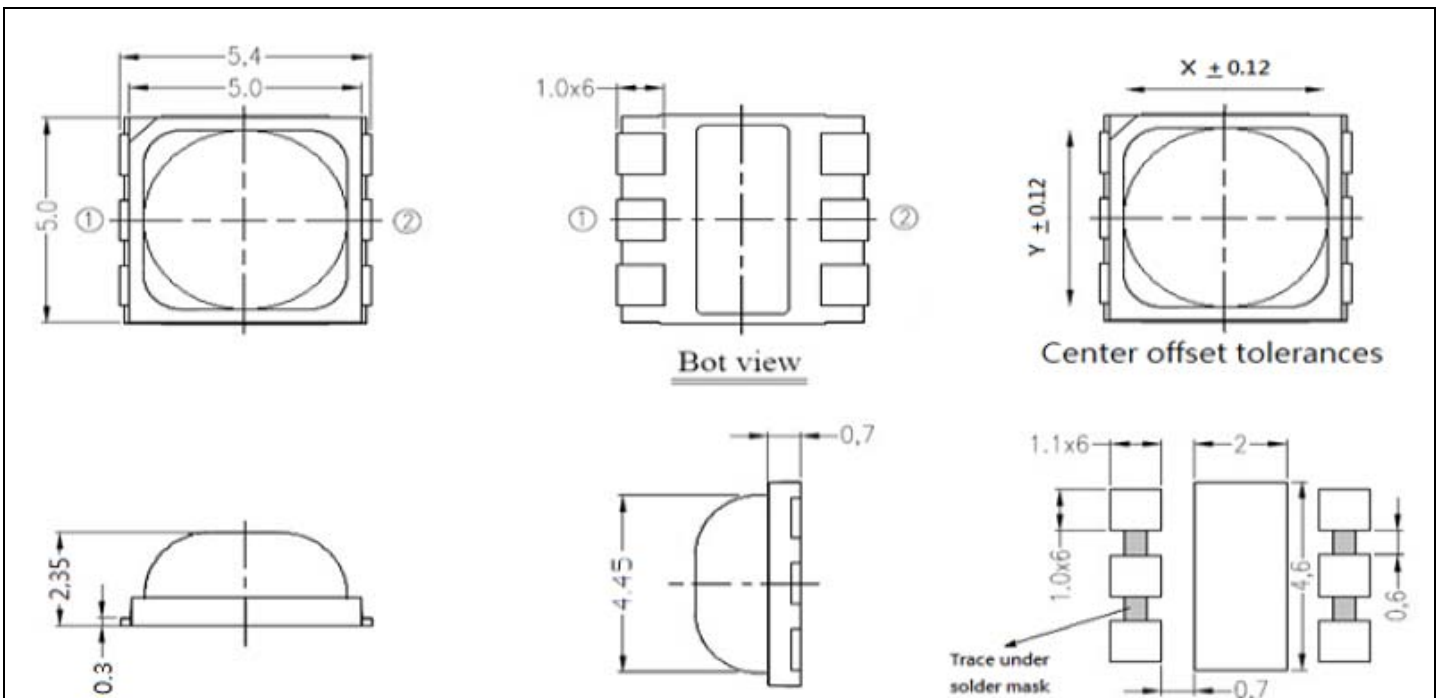
CCT measurement: 0.48 % ($k=2$)



Temperature Measurement Point (TMP)



Dimensions



- Note:
1. Dimensions are in millimeters.
 2. Tolerances for fixed dimensions are ± 0.1 mm.
 3. Polar illustration is the only symbol for circuit design.



Description of Model Series

| <u>2</u> | <u>T</u> | <u>04</u> | <u>02</u> | <u>xW</u> | <u>xx</u> | <u>000</u> | <u>xxx</u> |
|----------|----------|-----------|-----------|-----------|-----------|------------|------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Where:

Group 1 (Type) : 2 – Emitter

Group 2 (Component) : T – PLCC

Group 3 (Series) : 04 – 5050

Group 4 (Wattage) : 02 – 2 W

Group 5 (Color) : CW – Cool White
NW – Neutral White
WW – Warm White

Group 6 (Internal code) : Any letters, no technical differences.

Group 7 (PCB Board) : 000

Group 8 (Serial Number) : Any letters, no technical differences.

| <u>XTH</u> | <u>-</u> | <u>50XX</u> | <u>FXX</u> | <u>X</u> | <u>-</u> | <u>AN</u> |
|------------|----------|-------------|------------|----------|----------|-----------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Where:

Group 1 (XTH) : LTH or XTH - LumenMax PLCC Batman B (High Voltage) Family

Group 2 (50XX) : 5050 or 5041 – Package size 5.0 mm x 5.0 mm (4 series connect in 1 Parallel)

Group 3 (FXX) : FC0 – Cool White / CRI 70 up
FN0 – Natural White / CRI 70 up
FW0 – Warm White / CRI 70 up
FCM – Cool White / CRI 75 up
FNM – Natural White / CRI 75 up
FWM – Warm White / CRI 75 up
FCR – Cool White / CRI 80 up
FNR – Natural White / CRI 80 up
FWR – Warm White / CRI 80 up
FCH – Cool White / CRI 90 up
FNH – Natural White / CRI 90 up
FWH – Warm White / CRI 90 up

Group 4 (X) : G or Y – Intellectual patent, G is IP series, Y is Non-IP series

Group 5 (AN) : Operating current 30 mA, NO Zener chip



Equipment List

| Inst. ID No. | Instrument Type | Function /Range | Cal. Date | Due Date |
|--------------|---|-----------------------------|------------|------------|
| L421 | LED current source 1 (20 channel) | 0~75 V dc, 0~5 A | 2014-03-13 | 2015-03-12 |
| L403 | Thermal Plate Controller | 0°C to 95°C | - | - |
| L404 | Environment Oven | - | - | - |
| L405 | PC Controller | - | - | - |
| L406 to L411 | Temperature Data Recorder | 0°C to 300°C | 2014-02-27 | 2015-02-26 |
| L412 to L418 | Temperature Controller | 0°C to 300°C | 2014-02-27 | 2015-02-26 |
| L419 to L420 | Auxiliary Thermal Plate Controller 1 to 2 | 0°C to 95°C | - | - |
| L238 | Thermal Plate Cooler | 0°C to 95°C | - | - |
| L240 | Integrating Sphere | 0.5 M | - | - |
| L210 | Standard Lamp | - | 2014-01-03 | 2015-01-02 |
| L247 | Digital CC & CV DC Power Supply | V : 0~300 Vdc, A : 0~5 A | 2013-12-12 | 2014-12-11 |

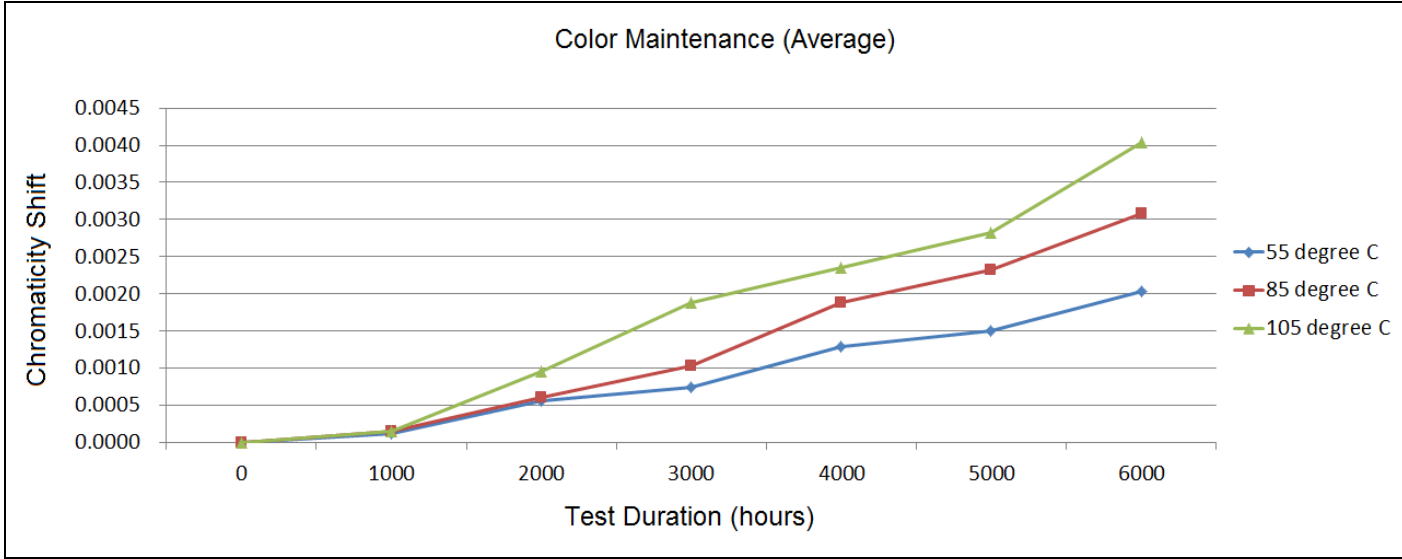
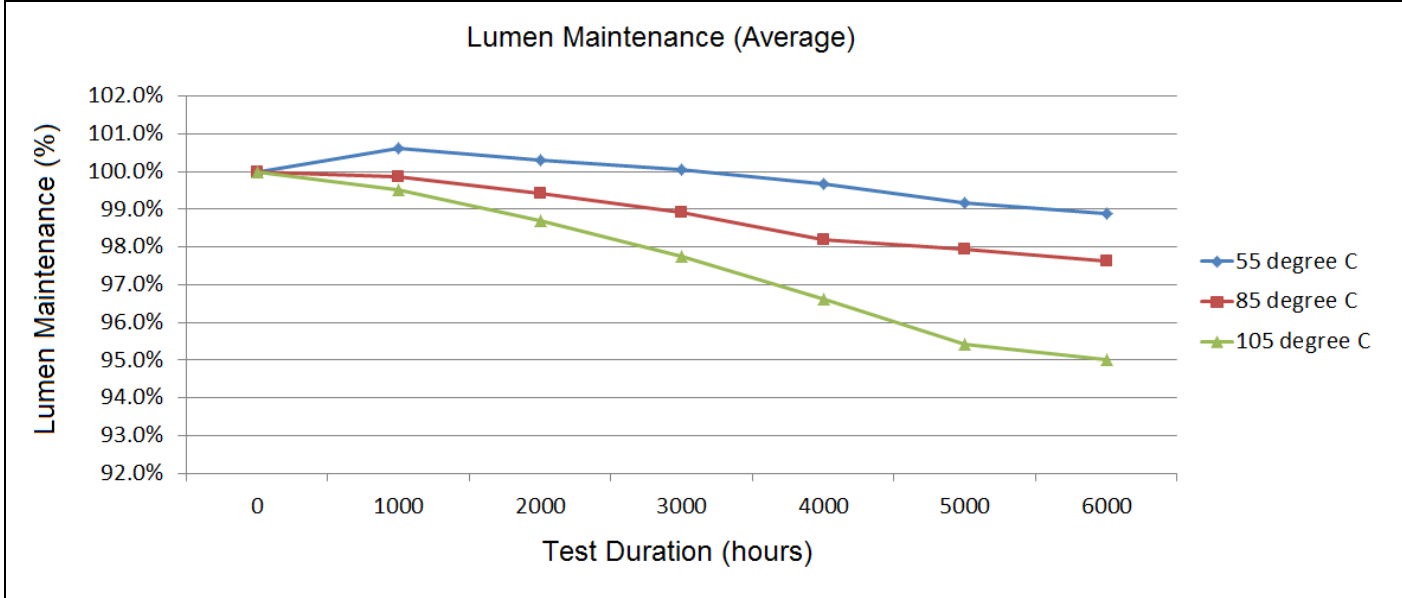
Test Sample Identification

| Data Set No. | Date Received | Sample No. |
|--------------|---------------|----------------------------|
| 1 | 2014-03-10 | 14030301-1 to 14030301-25 |
| 2 | 2014-03-10 | 14030301-26 to 14030301-50 |
| 3 | 2014-03-10 | 14030301-51 to 14030301-75 |



Test Summary

| Test Item | Case Temperature [T _s] | | |
|---|------------------------------------|------------|------------|
| | 55 °C | 85 °C | 105 °C |
| Number of LED tested | 25 | 25 | 25 |
| Drive Current [I _F] | 30 mA | 30 mA | 30 mA |
| Actual Case Temp. [T _s] | >53 °C | >83 °C | >103 °C |
| Actual Ambient Temp. [T _a] | >50 °C | >80 °C | >100 °C |
| Actual relative humidity | <65% | <65% | <65% |
| Average Lumen Maintenance at 6,000 hours | 98.9 % | 97.6 % | 95.0 % |
| Average Chromaticity Shift (Δu'v') at 6,000 hours | 0.0020 | 0.0031 | 0.0040 |
| TM-21 Projection Calculated L ₇₀ (6K) | 106,000 hrs | 74,000 hrs | 37,000 hrs |
| TM-21 Projection Reported L ₇₀ (6K) | ≥ 36,000 hrs | ≥ 36,000 | ≥ 36,000 |





Appendix A

| | |
|---------------------|-------|
| Data Set No. 1 | |
| Case Temperature | 55 °C |
| Measurement Current | 30 mA |

Table 1-1
Initial Characteristics

| Sample No. | Luminous Flux (lm) | Forward Voltage | CCT(K) | CIE-1931 | | CIE-1976 | |
|-------------|--------------------|-----------------|--------|----------|--------|----------|--------|
| | | | | x | y | u' | v' |
| 14030301-1 | 172.1 | 58.75 | 2712 | 0.4646 | 0.4091 | 0.2652 | 0.5274 |
| 14030301-2 | 170.3 | 58.77 | 2702 | 0.4642 | 0.4091 | 0.2653 | 0.5272 |
| 14030301-3 | 169.3 | 58.76 | 2705 | 0.4645 | 0.4095 | 0.2657 | 0.5276 |
| 14030301-4 | 173.2 | 58.77 | 2713 | 0.4643 | 0.4093 | 0.2651 | 0.5276 |
| 14030301-5 | 171.0 | 58.77 | 2712 | 0.4647 | 0.4093 | 0.2657 | 0.5272 |
| 14030301-6 | 172.9 | 58.67 | 2701 | 0.4642 | 0.4091 | 0.2656 | 0.5277 |
| 14030301-7 | 169.7 | 58.75 | 2719 | 0.4644 | 0.4094 | 0.2653 | 0.5270 |
| 14030301-8 | 177.4 | 58.70 | 2712 | 0.4642 | 0.4093 | 0.2658 | 0.5270 |
| 14030301-9 | 176.8 | 58.52 | 2704 | 0.4641 | 0.4097 | 0.2653 | 0.5275 |
| 14030301-10 | 170.9 | 58.54 | 2703 | 0.4645 | 0.4092 | 0.2656 | 0.5272 |
| 14030301-11 | 170.7 | 58.55 | 2713 | 0.4645 | 0.4098 | 0.2652 | 0.5271 |
| 14030301-12 | 172.8 | 58.80 | 2717 | 0.4646 | 0.4094 | 0.2651 | 0.5273 |
| 14030301-13 | 172.4 | 58.80 | 2709 | 0.4644 | 0.4090 | 0.2654 | 0.5273 |
| 14030301-14 | 172.4 | 58.79 | 2718 | 0.4643 | 0.4097 | 0.2654 | 0.5275 |
| 14030301-15 | 171.3 | 58.76 | 2715 | 0.4644 | 0.4094 | 0.2650 | 0.5277 |
| 14030301-16 | 178.9 | 58.77 | 2710 | 0.4643 | 0.4094 | 0.2653 | 0.5276 |
| 14030301-17 | 178.8 | 58.77 | 2717 | 0.4645 | 0.4095 | 0.2656 | 0.5276 |
| 14030301-18 | 172.3 | 58.76 | 2704 | 0.4643 | 0.4095 | 0.2656 | 0.5275 |
| 14030301-19 | 178.7 | 58.77 | 2713 | 0.4647 | 0.4095 | 0.2650 | 0.5271 |
| 14030301-20 | 169.1 | 58.77 | 2711 | 0.4645 | 0.4092 | 0.2657 | 0.5275 |
| 14030301-21 | 173.5 | 58.67 | 2712 | 0.4641 | 0.4093 | 0.2658 | 0.5274 |
| 14030301-22 | 173.5 | 58.75 | 2708 | 0.4641 | 0.4091 | 0.2658 | 0.5274 |
| 14030301-23 | 172.9 | 58.70 | 2712 | 0.4642 | 0.4094 | 0.2655 | 0.5277 |
| 14030301-24 | 176.4 | 58.52 | 2711 | 0.4647 | 0.4093 | 0.2657 | 0.5277 |
| 14030301-25 | 169.2 | 58.54 | 2717 | 0.4641 | 0.4097 | 0.2653 | 0.5274 |
| Avg. | 173.1 | 58.71 | 2711 | 0.4644 | 0.4094 | 0.2654 | 0.5274 |
| Med. | 172.4 | 58.76 | 2712 | 0.4644 | 0.4094 | 0.2654 | 0.5274 |
| σ | 3.08 | 0.10 | 5.19 | 0.0002 | 0.0002 | 0.0003 | 0.0002 |
| Min. | 169.1 | 58.52 | 2701 | 0.4641 | 0.4090 | 0.2650 | 0.5270 |
| Max. | 178.9 | 58.80 | 2719 | 0.4647 | 0.4098 | 0.2658 | 0.5277 |



Table 1-2
Lumen Maintenance

| Sample No. | Lumen Maintenance % (Normalized to 100% at Initial) | | | | | | |
|-------------|---|--------|--------|--------|--------|--------|--------|
| | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
| 14030301-1 | 100.0% | 100.9% | 100.7% | 100.6% | 99.9% | 99.0% | 98.7% |
| 14030301-2 | 100.0% | 100.5% | 100.1% | 99.8% | 99.7% | 99.5% | 99.3% |
| 14030301-3 | 100.0% | 100.3% | 100.2% | 99.8% | 99.2% | 98.7% | 98.4% |
| 14030301-4 | 100.0% | 100.4% | 100.0% | 99.5% | 99.0% | 98.2% | 98.1% |
| 14030301-5 | 100.0% | 100.5% | 100.0% | 99.7% | 99.3% | 98.5% | 98.3% |
| 14030301-6 | 100.0% | 100.4% | 100.4% | 100.2% | 100.1% | 99.5% | 99.1% |
| 14030301-7 | 100.0% | 100.6% | 100.3% | 99.8% | 99.7% | 98.9% | 98.4% |
| 14030301-8 | 100.0% | 101.0% | 100.8% | 100.4% | 100.3% | 99.9% | 99.6% |
| 14030301-9 | 100.0% | 100.4% | 99.9% | 99.6% | 99.5% | 98.9% | 98.6% |
| 14030301-10 | 100.0% | 100.5% | 100.0% | 99.9% | 99.8% | 99.3% | 99.2% |
| 14030301-11 | 100.0% | 100.4% | 100.3% | 99.9% | 99.9% | 99.9% | 99.8% |
| 14030301-12 | 100.0% | 100.5% | 100.2% | 99.9% | 99.2% | 98.7% | 98.2% |
| 14030301-13 | 100.0% | 100.9% | 100.5% | 100.4% | 99.6% | 99.3% | 98.8% |
| 14030301-14 | 100.0% | 101.0% | 100.9% | 100.8% | 100.1% | 99.2% | 99.2% |
| 14030301-15 | 100.0% | 100.6% | 100.5% | 100.4% | 99.9% | 99.4% | 99.3% |
| 14030301-16 | 100.0% | 100.9% | 100.6% | 100.2% | 99.5% | 99.4% | 99.2% |
| 14030301-17 | 100.0% | 100.3% | 100.0% | 99.9% | 99.8% | 99.1% | 98.9% |
| 14030301-18 | 100.0% | 100.5% | 100.2% | 100.1% | 100.1% | 99.4% | 99.0% |
| 14030301-19 | 100.0% | 100.1% | 99.7% | 99.3% | 99.0% | 98.4% | 98.3% |
| 14030301-20 | 100.0% | 100.8% | 100.5% | 100.2% | 100.0% | 99.6% | 99.2% |
| 14030301-21 | 100.0% | 101.1% | 100.8% | 100.4% | 99.5% | 99.1% | 99.0% |
| 14030301-22 | 100.0% | 100.9% | 100.6% | 100.3% | 99.9% | 99.3% | 99.0% |
| 14030301-23 | 100.0% | 100.4% | 100.0% | 100.0% | 99.7% | 98.8% | 98.4% |
| 14030301-24 | 100.0% | 100.4% | 100.0% | 99.7% | 99.4% | 99.0% | 98.7% |
| 14030301-25 | 100.0% | 100.8% | 100.6% | 100.4% | 100.1% | 99.8% | 99.6% |
| Avg. | 100.0% | 100.6% | 100.3% | 100.0% | 99.7% | 99.2% | 98.9% |
| Med. | 100.0% | 100.5% | 100.3% | 100.0% | 99.7% | 99.2% | 99.0% |
| σ | 0.0000 | 0.0027 | 0.0033 | 0.0037 | 0.0036 | 0.0045 | 0.0047 |
| Min. | 100.0% | 100.1% | 99.7% | 99.3% | 99.0% | 98.2% | 98.1% |
| Max. | 100.0% | 101.1% | 100.9% | 100.8% | 100.3% | 99.9% | 99.8% |

TM-21 Projection

| Time | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
|-----------|--------|--------|--------|--------|---------|---------|---------|
| ln (Avg.) | 0.0000 | 0.0060 | 0.0031 | 0.0005 | -0.0031 | -0.0085 | -0.0111 |

| | | | |
|--------------------|-----------|--------------------------|-------------------|
| Test duration used | 6,000 hrs | Calculated L_{70} (6K) | 106,000 hrs |
| B | 1.010 | Reported L_{70} (6K) | \geq 36,000 hrs |
| α | 3.466E-06 | | |



Table 1-3
Forward Voltage

| Sample No. | Relative Forward Voltage % (Normalized to 100% at Initial) | | | | | | |
|-------------|--|--------|--------|--------|--------|--------|--------|
| | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
| 14030301-1 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.1% |
| 14030301-2 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-3 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-4 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-5 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-6 | 100.0% | 100.0% | 100.1% | 100.0% | 100.1% | 100.0% | 100.0% |
| 14030301-7 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-8 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-9 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.1% |
| 14030301-10 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-11 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-12 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-13 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-14 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-15 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-16 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-17 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-18 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.1% |
| 14030301-19 | 100.0% | 100.0% | 100.0% | 100.1% | 100.1% | 100.0% | 100.0% |
| 14030301-20 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-21 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-22 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-23 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-24 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.1% |
| 14030301-25 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Avg. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Med. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| σ | 0.0000 | 0.0000 | 0.0002 | 0.0002 | 0.0003 | 0.0000 | 0.0004 |
| Min. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Max. | 100.0% | 100.0% | 100.1% | 100.1% | 100.1% | 100.0% | 100.1% |



Table 1-4
Chromaticity Shift

| Sample No. | Chromaticity Shift $\Delta u'v'$ | | | | | | |
|-------------|----------------------------------|--------|--------|--------|--------|--------|--------|
| | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
| 14030301-1 | 0.0000 | 0.0002 | 0.0008 | 0.0011 | 0.0014 | 0.0016 | 0.0021 |
| 14030301-2 | 0.0000 | 0.0000 | 0.0005 | 0.0009 | 0.0014 | 0.0015 | 0.0026 |
| 14030301-3 | 0.0000 | 0.0001 | 0.0003 | 0.0006 | 0.0012 | 0.0013 | 0.0017 |
| 14030301-4 | 0.0000 | 0.0001 | 0.0003 | 0.0001 | 0.0007 | 0.0009 | 0.0016 |
| 14030301-5 | 0.0000 | 0.0003 | 0.0006 | 0.0008 | 0.0013 | 0.0017 | 0.0026 |
| 14030301-6 | 0.0000 | 0.0001 | 0.0005 | 0.0005 | 0.0012 | 0.0015 | 0.0019 |
| 14030301-7 | 0.0000 | 0.0002 | 0.0005 | 0.0004 | 0.0006 | 0.0008 | 0.0011 |
| 14030301-8 | 0.0000 | 0.0001 | 0.0006 | 0.0009 | 0.0014 | 0.0018 | 0.0023 |
| 14030301-9 | 0.0000 | 0.0001 | 0.0008 | 0.0012 | 0.0019 | 0.0019 | 0.0022 |
| 14030301-10 | 0.0000 | 0.0001 | 0.0010 | 0.0012 | 0.0020 | 0.0020 | 0.0024 |
| 14030301-11 | 0.0000 | 0.0001 | 0.0008 | 0.0006 | 0.0015 | 0.0018 | 0.0028 |
| 14030301-12 | 0.0000 | 0.0001 | 0.0003 | 0.0004 | 0.0011 | 0.0013 | 0.0016 |
| 14030301-13 | 0.0000 | 0.0003 | 0.0004 | 0.0005 | 0.0012 | 0.0014 | 0.0017 |
| 14030301-14 | 0.0000 | 0.0001 | 0.0009 | 0.0013 | 0.0022 | 0.0027 | 0.0031 |
| 14030301-15 | 0.0000 | 0.0001 | 0.0004 | 0.0007 | 0.0015 | 0.0016 | 0.0026 |
| 14030301-16 | 0.0000 | 0.0000 | 0.0008 | 0.0013 | 0.0015 | 0.0016 | 0.0020 |
| 14030301-17 | 0.0000 | 0.0001 | 0.0003 | 0.0005 | 0.0009 | 0.0012 | 0.0019 |
| 14030301-18 | 0.0000 | 0.0001 | 0.0001 | 0.0003 | 0.0006 | 0.0009 | 0.0016 |
| 14030301-19 | 0.0000 | 0.0001 | 0.0011 | 0.0011 | 0.0021 | 0.0025 | 0.0033 |
| 14030301-20 | 0.0000 | 0.0001 | 0.0007 | 0.0009 | 0.0017 | 0.0021 | 0.0024 |
| 14030301-21 | 0.0000 | 0.0001 | 0.0006 | 0.0009 | 0.0014 | 0.0014 | 0.0016 |
| 14030301-22 | 0.0000 | 0.0001 | 0.0009 | 0.0010 | 0.0010 | 0.0012 | 0.0015 |
| 14030301-23 | 0.0000 | 0.0001 | 0.0003 | 0.0004 | 0.0007 | 0.0010 | 0.0019 |
| 14030301-24 | 0.0000 | 0.0001 | 0.0004 | 0.0007 | 0.0011 | 0.0013 | 0.0019 |
| 14030301-25 | 0.0000 | 0.0002 | 0.0003 | 0.0004 | 0.0005 | 0.0005 | 0.0008 |
| Avg. | 0.0000 | 0.0001 | 0.0006 | 0.0007 | 0.0013 | 0.0015 | 0.0020 |
| Med. | 0.0000 | 0.0001 | 0.0005 | 0.0007 | 0.0013 | 0.0015 | 0.0019 |
| σ | 0.0000 | 0.0001 | 0.0003 | 0.0003 | 0.0005 | 0.0005 | 0.0006 |
| Min. | 0.0000 | 0.0000 | 0.0001 | 0.0001 | 0.0005 | 0.0005 | 0.0008 |
| Max. | 0.0000 | 0.0003 | 0.0011 | 0.0013 | 0.0022 | 0.0027 | 0.0033 |



| | |
|---------------------|-------|
| Data Set No. 2 | |
| Case Temperature | 85 °C |
| Measurement Current | 30 mA |

Table 2-1
Initial Characteristics

| Sample No. | Luminous Flux (lm) | Forward Voltage | CCT(K) | CIE-1931 | | CIE-1976 | |
|-------------|--------------------|-----------------|--------|----------|--------|----------|--------|
| | | | | x | y | u' | v' |
| 14030301-26 | 173.1 | 58.67 | 2703 | 0.4644 | 0.4095 | 0.2654 | 0.5277 |
| 14030301-27 | 171.3 | 58.75 | 2706 | 0.4645 | 0.4091 | 0.2650 | 0.5276 |
| 14030301-28 | 169.3 | 58.70 | 2712 | 0.4647 | 0.4096 | 0.2656 | 0.5271 |
| 14030301-29 | 172.9 | 58.52 | 2714 | 0.4640 | 0.4090 | 0.2655 | 0.5274 |
| 14030301-30 | 173.7 | 58.54 | 2705 | 0.4641 | 0.4096 | 0.2654 | 0.5274 |
| 14030301-31 | 176.4 | 58.55 | 2705 | 0.4646 | 0.4095 | 0.2658 | 0.5271 |
| 14030301-32 | 173.4 | 58.80 | 2707 | 0.4645 | 0.4096 | 0.2653 | 0.5270 |
| 14030301-33 | 171.0 | 58.80 | 2714 | 0.4643 | 0.4094 | 0.2653 | 0.5275 |
| 14030301-34 | 171.2 | 58.79 | 2715 | 0.4646 | 0.4097 | 0.2656 | 0.5277 |
| 14030301-35 | 172.4 | 58.76 | 2707 | 0.4642 | 0.4094 | 0.2651 | 0.5272 |
| 14030301-36 | 178.1 | 58.77 | 2710 | 0.4640 | 0.4097 | 0.2657 | 0.5277 |
| 14030301-37 | 172.2 | 58.77 | 2704 | 0.4641 | 0.4094 | 0.2654 | 0.5277 |
| 14030301-38 | 169.4 | 58.75 | 2718 | 0.4641 | 0.4094 | 0.2651 | 0.5272 |
| 14030301-39 | 171.2 | 58.77 | 2706 | 0.4646 | 0.4093 | 0.2654 | 0.5276 |
| 14030301-40 | 170.6 | 58.76 | 2718 | 0.4642 | 0.4096 | 0.2656 | 0.5273 |
| 14030301-41 | 178.7 | 58.77 | 2703 | 0.4647 | 0.4097 | 0.2655 | 0.5274 |
| 14030301-42 | 176.2 | 58.76 | 2707 | 0.4644 | 0.4092 | 0.2653 | 0.5273 |
| 14030301-43 | 173.5 | 58.77 | 2717 | 0.4648 | 0.4098 | 0.2655 | 0.5273 |
| 14030301-44 | 175.3 | 58.77 | 2712 | 0.4647 | 0.4091 | 0.2651 | 0.5274 |
| 14030301-45 | 176.5 | 58.76 | 2717 | 0.4644 | 0.4094 | 0.2652 | 0.5275 |
| 14030301-46 | 176.5 | 58.77 | 2710 | 0.4646 | 0.4098 | 0.2655 | 0.5270 |
| 14030301-47 | 171.7 | 58.77 | 2714 | 0.4643 | 0.4095 | 0.2653 | 0.5275 |
| 14030301-48 | 172.6 | 58.75 | 2718 | 0.4647 | 0.4098 | 0.2655 | 0.5274 |
| 14030301-49 | 173.6 | 58.77 | 2705 | 0.4646 | 0.4092 | 0.2655 | 0.5273 |
| 14030301-50 | 175.5 | 58.67 | 2718 | 0.4644 | 0.4092 | 0.2650 | 0.5274 |
| Avg. | 173.5 | 58.73 | 2711 | 0.4644 | 0.4095 | 0.2654 | 0.5274 |
| Med. | 173.1 | 58.76 | 2710 | 0.4644 | 0.4095 | 0.2654 | 0.5274 |
| σ | 2.59 | 0.08 | 5.38 | 0.0002 | 0.0002 | 0.0002 | 0.0002 |
| Min. | 169.3 | 58.52 | 2703 | 0.4640 | 0.4090 | 0.2650 | 0.5270 |
| Max. | 178.7 | 58.80 | 2718 | 0.4648 | 0.4098 | 0.2658 | 0.5277 |



Table 2-2
Lumen Maintenance

| Sample No. | Lumen Maintenance % (Normalized to 100% at Initial) | | | | | | |
|-------------|---|--------|--------|--------|--------|--------|--------|
| | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
| 14030301-26 | 100.0% | 99.8% | 99.7% | 99.2% | 98.1% | 98.0% | 98.0% |
| 14030301-27 | 100.0% | 100.3% | 100.1% | 99.6% | 99.4% | 99.1% | 98.5% |
| 14030301-28 | 100.0% | 99.7% | 99.1% | 98.4% | 97.4% | 97.0% | 96.8% |
| 14030301-29 | 100.0% | 100.4% | 100.1% | 99.5% | 98.3% | 97.9% | 97.6% |
| 14030301-30 | 100.0% | 99.6% | 99.4% | 99.1% | 98.3% | 98.2% | 97.9% |
| 14030301-31 | 100.0% | 99.7% | 98.9% | 98.8% | 98.7% | 98.7% | 98.2% |
| 14030301-32 | 100.0% | 99.8% | 99.5% | 99.5% | 98.3% | 97.9% | 97.4% |
| 14030301-33 | 100.0% | 99.9% | 99.9% | 99.1% | 98.5% | 98.2% | 98.0% |
| 14030301-34 | 100.0% | 100.3% | 100.2% | 100.1% | 99.2% | 99.1% | 98.7% |
| 14030301-35 | 100.0% | 99.6% | 99.1% | 98.3% | 97.4% | 97.0% | 96.4% |
| 14030301-36 | 100.0% | 100.1% | 99.9% | 99.0% | 98.9% | 98.4% | 98.3% |
| 14030301-37 | 100.0% | 99.8% | 99.2% | 98.5% | 97.8% | 97.6% | 97.5% |
| 14030301-38 | 100.0% | 99.7% | 99.1% | 98.9% | 98.8% | 98.3% | 98.2% |
| 14030301-39 | 100.0% | 100.0% | 99.3% | 98.7% | 97.8% | 97.3% | 96.9% |
| 14030301-40 | 100.0% | 99.9% | 99.2% | 99.1% | 99.0% | 98.9% | 98.8% |
| 14030301-41 | 100.0% | 99.6% | 99.2% | 99.1% | 98.8% | 98.4% | 98.1% |
| 14030301-42 | 100.0% | 99.8% | 99.0% | 98.2% | 97.1% | 96.9% | 96.6% |
| 14030301-43 | 100.0% | 99.6% | 99.2% | 98.4% | 97.3% | 97.1% | 96.7% |
| 14030301-44 | 100.0% | 100.0% | 99.7% | 98.8% | 98.2% | 98.1% | 97.7% |
| 14030301-45 | 100.0% | 99.7% | 99.1% | 98.4% | 97.4% | 97.0% | 96.9% |
| 14030301-46 | 100.0% | 100.3% | 99.8% | 99.6% | 99.0% | 98.5% | 98.5% |
| 14030301-47 | 100.0% | 99.8% | 99.0% | 98.3% | 97.3% | 96.9% | 96.6% |
| 14030301-48 | 100.0% | 100.3% | 99.7% | 98.9% | 98.4% | 98.3% | 98.0% |
| 14030301-49 | 100.0% | 99.7% | 99.1% | 98.7% | 98.0% | 97.9% | 97.6% |
| 14030301-50 | 100.0% | 99.8% | 99.3% | 98.8% | 97.7% | 97.7% | 97.1% |
| Avg. | 100.0% | 99.9% | 99.4% | 98.9% | 98.2% | 97.9% | 97.6% |
| Med. | 100.0% | 99.8% | 99.3% | 98.9% | 98.3% | 98.0% | 97.7% |
| σ | 0.0000 | 0.0026 | 0.0039 | 0.0048 | 0.0067 | 0.0069 | 0.0072 |
| Min. | 100.0% | 99.6% | 98.9% | 98.2% | 97.1% | 96.9% | 96.4% |
| Max. | 100.0% | 100.4% | 100.2% | 100.1% | 99.4% | 99.1% | 98.8% |

TM-21 Projection

| Time | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
|-----------|--------|---------|---------|---------|---------|---------|---------|
| ln (Avg.) | 0.0000 | -0.0011 | -0.0057 | -0.0109 | -0.0181 | -0.0209 | -0.0239 |

| | | | |
|--------------------|-----------|---------------------------------|--------------|
| Test duration used | 6,000 hrs | Calculated L ₇₀ (6K) | 74,000 hrs |
| B | 1.003 | Reported L ₇₀ (6K) | ≥ 36,000 hrs |
| α | 4.834E-06 | | |



Table 2-3
Forward Voltage

| Sample No. | Relative Forward Voltage % (Normalized to 100% at Initial) | | | | | | |
|-------------|--|--------|--------|--------|--------|--------|--------|
| | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
| 14030301-26 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-27 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-28 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-29 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-30 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-31 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-32 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-33 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-34 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-35 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-36 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-37 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-38 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-39 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-40 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-41 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-42 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-43 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-44 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-45 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-46 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-47 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-48 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-49 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-50 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Avg. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| Med. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| σ | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0005 |
| Min. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| Max. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |



Table 2-4
Chromaticity Shift

| Sample No. | Chromaticity Shift $\Delta u'v'$ | | | | | | |
|-------------|----------------------------------|--------|--------|--------|--------|--------|--------|
| | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
| 14030301-26 | 0.0000 | 0.0002 | 0.0003 | 0.0010 | 0.0026 | 0.0033 | 0.0034 |
| 14030301-27 | 0.0000 | 0.0001 | 0.0005 | 0.0010 | 0.0014 | 0.0021 | 0.0027 |
| 14030301-28 | 0.0000 | 0.0002 | 0.0007 | 0.0013 | 0.0019 | 0.0021 | 0.0026 |
| 14030301-29 | 0.0000 | 0.0001 | 0.0003 | 0.0009 | 0.0014 | 0.0019 | 0.0028 |
| 14030301-30 | 0.0000 | 0.0002 | 0.0007 | 0.0007 | 0.0014 | 0.0018 | 0.0020 |
| 14030301-31 | 0.0000 | 0.0002 | 0.0006 | 0.0004 | 0.0010 | 0.0010 | 0.0017 |
| 14030301-32 | 0.0000 | 0.0002 | 0.0005 | 0.0009 | 0.0015 | 0.0019 | 0.0023 |
| 14030301-33 | 0.0000 | 0.0002 | 0.0007 | 0.0015 | 0.0016 | 0.0024 | 0.0036 |
| 14030301-34 | 0.0000 | 0.0001 | 0.0003 | 0.0002 | 0.0005 | 0.0007 | 0.0019 |
| 14030301-35 | 0.0000 | 0.0002 | 0.0009 | 0.0018 | 0.0033 | 0.0036 | 0.0037 |
| 14030301-36 | 0.0000 | 0.0001 | 0.0005 | 0.0013 | 0.0025 | 0.0024 | 0.0037 |
| 14030301-37 | 0.0000 | 0.0001 | 0.0003 | 0.0007 | 0.0013 | 0.0017 | 0.0024 |
| 14030301-38 | 0.0000 | 0.0002 | 0.0005 | 0.0005 | 0.0009 | 0.0010 | 0.0014 |
| 14030301-39 | 0.0000 | 0.0002 | 0.0006 | 0.0007 | 0.0010 | 0.0012 | 0.0019 |
| 14030301-40 | 0.0000 | 0.0002 | 0.0007 | 0.0017 | 0.0024 | 0.0028 | 0.0042 |
| 14030301-41 | 0.0000 | 0.0001 | 0.0007 | 0.0015 | 0.0020 | 0.0028 | 0.0037 |
| 14030301-42 | 0.0000 | 0.0002 | 0.0006 | 0.0009 | 0.0021 | 0.0024 | 0.0024 |
| 14030301-43 | 0.0000 | 0.0002 | 0.0002 | 0.0006 | 0.0022 | 0.0030 | 0.0033 |
| 14030301-44 | 0.0000 | 0.0003 | 0.0007 | 0.0011 | 0.0023 | 0.0027 | 0.0038 |
| 14030301-45 | 0.0000 | 0.0000 | 0.0009 | 0.0014 | 0.0030 | 0.0032 | 0.0045 |
| 14030301-46 | 0.0000 | 0.0002 | 0.0009 | 0.0010 | 0.0017 | 0.0026 | 0.0041 |
| 14030301-47 | 0.0000 | 0.0001 | 0.0011 | 0.0010 | 0.0019 | 0.0023 | 0.0033 |
| 14030301-48 | 0.0000 | 0.0001 | 0.0005 | 0.0009 | 0.0025 | 0.0033 | 0.0035 |
| 14030301-49 | 0.0000 | 0.0002 | 0.0005 | 0.0011 | 0.0018 | 0.0024 | 0.0033 |
| 14030301-50 | 0.0000 | 0.0001 | 0.0007 | 0.0017 | 0.0030 | 0.0034 | 0.0049 |
| Avg. | 0.0000 | 0.0002 | 0.0006 | 0.0010 | 0.0019 | 0.0023 | 0.0031 |
| Med. | 0.0000 | 0.0002 | 0.0006 | 0.0010 | 0.0019 | 0.0024 | 0.0033 |
| σ | 0.0000 | 0.0001 | 0.0002 | 0.0004 | 0.0007 | 0.0008 | 0.0009 |
| Min. | 0.0000 | 0.0000 | 0.0002 | 0.0002 | 0.0005 | 0.0007 | 0.0014 |
| Max. | 0.0000 | 0.0003 | 0.0011 | 0.0018 | 0.0033 | 0.0036 | 0.0049 |



| | |
|---------------------|--------|
| Data Set No. 3 | |
| Case Temperature | 105 °C |
| Measurement Current | 30 mA |

Table 3-1
Initial Characteristics

| Sample No. | Luminous Flux (lm) | Forward Voltage | CCT(K) | CIE-1931 | | CIE-1976 | |
|-------------|--------------------|-----------------|--------|----------|--------|----------|--------|
| | | | | x | y | u' | v' |
| 14030301-51 | 174.0 | 58.77 | 2703 | 0.4644 | 0.4093 | 0.2658 | 0.5271 |
| 14030301-52 | 173.8 | 58.77 | 2712 | 0.4643 | 0.4094 | 0.2656 | 0.5276 |
| 14030301-53 | 175.8 | 58.75 | 2710 | 0.4641 | 0.4097 | 0.2652 | 0.5275 |
| 14030301-54 | 177.9 | 58.77 | 2719 | 0.4641 | 0.4091 | 0.2652 | 0.5276 |
| 14030301-55 | 178.8 | 58.76 | 2715 | 0.4643 | 0.4094 | 0.2657 | 0.5271 |
| 14030301-56 | 171.7 | 58.77 | 2711 | 0.4642 | 0.4097 | 0.2651 | 0.5274 |
| 14030301-57 | 173.8 | 58.75 | 2711 | 0.4643 | 0.4090 | 0.2657 | 0.5272 |
| 14030301-58 | 169.6 | 58.77 | 2704 | 0.4648 | 0.4097 | 0.2656 | 0.5271 |
| 14030301-59 | 172.4 | 58.76 | 2712 | 0.4641 | 0.4092 | 0.2654 | 0.5271 |
| 14030301-60 | 176.9 | 58.77 | 2719 | 0.4646 | 0.4090 | 0.2657 | 0.5275 |
| 14030301-61 | 175.8 | 58.77 | 2708 | 0.4644 | 0.4095 | 0.2656 | 0.5275 |
| 14030301-62 | 173.8 | 58.76 | 2712 | 0.4643 | 0.4091 | 0.2653 | 0.5270 |
| 14030301-63 | 171.4 | 58.77 | 2717 | 0.4641 | 0.4092 | 0.2654 | 0.5272 |
| 14030301-64 | 175.6 | 58.77 | 2706 | 0.4643 | 0.4092 | 0.2656 | 0.5275 |
| 14030301-65 | 169.4 | 58.77 | 2716 | 0.4640 | 0.4097 | 0.2658 | 0.5277 |
| 14030301-66 | 172.9 | 58.77 | 2704 | 0.4645 | 0.4092 | 0.2657 | 0.5276 |
| 14030301-67 | 172.1 | 58.77 | 2703 | 0.4648 | 0.4097 | 0.2654 | 0.5271 |
| 14030301-68 | 168.8 | 58.77 | 2708 | 0.4648 | 0.4098 | 0.2655 | 0.5278 |
| 14030301-69 | 175.3 | 58.76 | 2720 | 0.4644 | 0.4091 | 0.2657 | 0.5271 |
| 14030301-70 | 177.5 | 58.77 | 2717 | 0.4642 | 0.4098 | 0.2657 | 0.5273 |
| 14030301-71 | 177.6 | 58.77 | 2701 | 0.4647 | 0.4097 | 0.2657 | 0.5276 |
| 14030301-72 | 169.7 | 58.76 | 2704 | 0.4647 | 0.4098 | 0.2651 | 0.5272 |
| 14030301-73 | 170.7 | 58.77 | 2703 | 0.4646 | 0.4094 | 0.2656 | 0.5273 |
| 14030301-74 | 170.8 | 58.67 | 2720 | 0.4644 | 0.4094 | 0.2654 | 0.5271 |
| 14030301-75 | 176.1 | 58.75 | 2716 | 0.4640 | 0.4090 | 0.2650 | 0.5278 |
| Avg. | 173.7 | 58.76 | 2711 | 0.4644 | 0.4094 | 0.2655 | 0.5274 |
| Med. | 173.8 | 58.77 | 2711 | 0.4643 | 0.4094 | 0.2656 | 0.5273 |
| σ | 2.97 | 0.02 | 6.17 | 0.0003 | 0.0003 | 0.0002 | 0.0002 |
| Min. | 168.8 | 58.67 | 2701 | 0.4640 | 0.4090 | 0.2650 | 0.5270 |
| Max. | 178.8 | 58.77 | 2720 | 0.4648 | 0.4098 | 0.2658 | 0.5278 |



Table 3-2
Lumen Maintenance

| Sample No. | Lumen Maintenance % (Normalized to 100% at Initial) | | | | | | |
|-------------|---|--------|--------|--------|--------|--------|--------|
| | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
| 14030301-51 | 100.0% | 99.3% | 99.2% | 99.2% | 98.6% | 97.7% | 97.4% |
| 14030301-52 | 100.0% | 99.0% | 97.6% | 97.0% | 96.3% | 94.2% | 93.7% |
| 14030301-53 | 100.0% | 99.7% | 99.3% | 98.9% | 97.0% | 96.1% | 95.5% |
| 14030301-54 | 100.0% | 99.9% | 98.6% | 97.9% | 95.9% | 95.9% | 95.5% |
| 14030301-55 | 100.0% | 99.4% | 98.2% | 96.7% | 95.3% | 94.0% | 93.6% |
| 14030301-56 | 100.0% | 99.0% | 98.2% | 97.6% | 97.5% | 96.8% | 96.0% |
| 14030301-57 | 100.0% | 99.1% | 98.9% | 97.1% | 95.0% | 94.3% | 94.2% |
| 14030301-58 | 100.0% | 99.7% | 98.5% | 97.9% | 97.6% | 95.3% | 95.0% |
| 14030301-59 | 100.0% | 99.3% | 97.9% | 96.5% | 95.4% | 94.3% | 93.8% |
| 14030301-60 | 100.0% | 99.9% | 99.6% | 98.6% | 96.4% | 95.8% | 95.0% |
| 14030301-61 | 100.0% | 99.9% | 98.9% | 97.4% | 95.9% | 93.9% | 93.8% |
| 14030301-62 | 100.0% | 99.4% | 98.7% | 98.1% | 97.5% | 96.2% | 95.8% |
| 14030301-63 | 100.0% | 99.7% | 99.5% | 98.5% | 97.6% | 96.2% | 95.5% |
| 14030301-64 | 100.0% | 99.1% | 98.3% | 97.3% | 96.1% | 95.2% | 94.7% |
| 14030301-65 | 100.0% | 99.3% | 98.2% | 96.4% | 95.9% | 95.1% | 95.0% |
| 14030301-66 | 100.0% | 99.5% | 98.2% | 97.7% | 95.7% | 93.6% | 93.5% |
| 14030301-67 | 100.0% | 99.8% | 98.3% | 97.7% | 96.7% | 94.4% | 93.8% |
| 14030301-68 | 100.0% | 99.7% | 98.7% | 97.3% | 96.7% | 95.9% | 95.8% |
| 14030301-69 | 100.0% | 98.9% | 98.1% | 96.4% | 95.4% | 93.5% | 92.9% |
| 14030301-70 | 100.0% | 99.9% | 98.8% | 98.3% | 96.1% | 95.2% | 94.5% |
| 14030301-71 | 100.0% | 99.7% | 99.4% | 98.0% | 97.7% | 95.8% | 95.4% |
| 14030301-72 | 100.0% | 99.9% | 99.8% | 98.0% | 97.0% | 95.2% | 95.1% |
| 14030301-73 | 100.0% | 99.4% | 98.9% | 98.6% | 97.5% | 97.5% | 96.9% |
| 14030301-74 | 100.0% | 99.6% | 98.9% | 98.8% | 97.4% | 96.8% | 96.5% |
| 14030301-75 | 100.0% | 99.5% | 98.5% | 98.3% | 97.0% | 96.5% | 96.2% |
| Avg. | 100.0% | 99.5% | 98.7% | 97.8% | 96.6% | 95.4% | 95.0% |
| Med. | 100.0% | 99.5% | 98.7% | 97.9% | 96.7% | 95.3% | 95.0% |
| σ | 0.0000 | 0.0032 | 0.0056 | 0.0080 | 0.0093 | 0.0118 | 0.0115 |
| Min. | 100.0% | 98.9% | 97.6% | 96.4% | 95.0% | 93.5% | 92.9% |
| Max. | 100.0% | 99.9% | 99.8% | 99.2% | 98.6% | 97.7% | 97.4% |

TM-21 Projection

| Time | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
|-----------|--------|---------|---------|---------|---------|---------|---------|
| ln (Avg.) | 0.0000 | -0.0050 | -0.0132 | -0.0226 | -0.0345 | -0.0469 | -0.0513 |

| | | | |
|--------------------|-----------|---------------------------------|--------------|
| Test duration used | 6,000 hrs | Calculated L ₇₀ (6K) | 37,000 hrs |
| B | 1.006 | Reported L ₇₀ (6K) | ≥ 36,000 hrs |
| α | 9.879E-06 | | |



Table 3-3
Forward Voltage

| Sample No. | Relative Forward Voltage % (Normalized to 100% at Initial) | | | | | | |
|-------------|--|--------|--------|--------|--------|--------|--------|
| | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
| 14030301-51 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-52 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-53 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-54 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-55 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-56 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-57 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-58 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-59 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-60 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-61 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-62 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-63 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-64 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-65 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-66 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-67 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-68 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-69 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-70 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-71 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-72 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 14030301-73 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-74 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| 14030301-75 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Avg. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| Med. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| σ | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0005 |
| Min. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 99.9% |
| Max. | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |



Table 3-4
Chromaticity Shift

| Sample No. | Chromaticity Shift $\Delta u'v'$ | | | | | | |
|-------------|----------------------------------|--------|--------|--------|--------|--------|--------|
| | 0 h | 1000 h | 2000 h | 3000 h | 4000 h | 5000 h | 6000 h |
| 14030301-51 | 0.0000 | 0.0001 | 0.0008 | 0.0009 | 0.0012 | 0.0013 | 0.0033 |
| 14030301-52 | 0.0000 | 0.0002 | 0.0012 | 0.0025 | 0.0030 | 0.0036 | 0.0058 |
| 14030301-53 | 0.0000 | 0.0001 | 0.0014 | 0.0022 | 0.0023 | 0.0029 | 0.0035 |
| 14030301-54 | 0.0000 | 0.0001 | 0.0002 | 0.0010 | 0.0012 | 0.0023 | 0.0027 |
| 14030301-55 | 0.0000 | 0.0001 | 0.0009 | 0.0020 | 0.0021 | 0.0023 | 0.0038 |
| 14030301-56 | 0.0000 | 0.0002 | 0.0008 | 0.0015 | 0.0018 | 0.0024 | 0.0028 |
| 14030301-57 | 0.0000 | 0.0001 | 0.0005 | 0.0008 | 0.0011 | 0.0013 | 0.0016 |
| 14030301-58 | 0.0000 | 0.0002 | 0.0014 | 0.0026 | 0.0030 | 0.0033 | 0.0049 |
| 14030301-59 | 0.0000 | 0.0001 | 0.0014 | 0.0026 | 0.0031 | 0.0032 | 0.0045 |
| 14030301-60 | 0.0000 | 0.0001 | 0.0012 | 0.0022 | 0.0030 | 0.0036 | 0.0055 |
| 14030301-61 | 0.0000 | 0.0001 | 0.0010 | 0.0018 | 0.0027 | 0.0033 | 0.0033 |
| 14030301-62 | 0.0000 | 0.0001 | 0.0014 | 0.0022 | 0.0028 | 0.0032 | 0.0046 |
| 14030301-63 | 0.0000 | 0.0001 | 0.0009 | 0.0023 | 0.0028 | 0.0037 | 0.0053 |
| 14030301-64 | 0.0000 | 0.0001 | 0.0015 | 0.0019 | 0.0023 | 0.0027 | 0.0053 |
| 14030301-65 | 0.0000 | 0.0002 | 0.0011 | 0.0024 | 0.0024 | 0.0030 | 0.0033 |
| 14030301-66 | 0.0000 | 0.0003 | 0.0008 | 0.0022 | 0.0025 | 0.0026 | 0.0049 |
| 14030301-67 | 0.0000 | 0.0001 | 0.0013 | 0.0028 | 0.0034 | 0.0039 | 0.0043 |
| 14030301-68 | 0.0000 | 0.0000 | 0.0008 | 0.0010 | 0.0020 | 0.0021 | 0.0046 |
| 14030301-69 | 0.0000 | 0.0002 | 0.0012 | 0.0019 | 0.0024 | 0.0029 | 0.0049 |
| 14030301-70 | 0.0000 | 0.0001 | 0.0004 | 0.0006 | 0.0007 | 0.0014 | 0.0036 |
| 14030301-71 | 0.0000 | 0.0002 | 0.0007 | 0.0021 | 0.0031 | 0.0038 | 0.0046 |
| 14030301-72 | 0.0000 | 0.0001 | 0.0012 | 0.0026 | 0.0036 | 0.0045 | 0.0045 |
| 14030301-73 | 0.0000 | 0.0002 | 0.0007 | 0.0019 | 0.0022 | 0.0031 | 0.0036 |
| 14030301-74 | 0.0000 | 0.0002 | 0.0003 | 0.0013 | 0.0016 | 0.0019 | 0.0021 |
| 14030301-75 | 0.0000 | 0.0002 | 0.0009 | 0.0019 | 0.0023 | 0.0023 | 0.0039 |
| Avg. | 0.0000 | 0.0001 | 0.0010 | 0.0019 | 0.0023 | 0.0028 | 0.0040 |
| Med. | 0.0000 | 0.0001 | 0.0009 | 0.0020 | 0.0024 | 0.0029 | 0.0043 |
| σ | 0.0000 | 0.0001 | 0.0004 | 0.0006 | 0.0008 | 0.0008 | 0.0011 |
| Min. | 0.0000 | 0.0000 | 0.0002 | 0.0006 | 0.0007 | 0.0013 | 0.0016 |
| Max. | 0.0000 | 0.0003 | 0.0015 | 0.0028 | 0.0036 | 0.0045 | 0.0058 |