



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

ShenZhen Getian Opto-electronics co.,ltd

Bldg 55,East Of Baotian Third Road,XiXiang Town,BaoAn District,ShenZhen

Model: GT-P100WW5316008010A

| | |
|---|---|
| Report Type: 6000 Hours Test Report | Product Type: LED Array |
| Test Engineer: Daniel Duan | <i>Daniel Duan</i> |
| Report Number: RSZ141112504-10 | |
| Test Date: 2014-11-14 to 2015-07-22 | |
| Report Date: 2015-07-27 | |
| Reviewed By: Jeanne Han /EE Manager | <i>Jeanne Han</i> |
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Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

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

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1 - GENERAL INFORMATION

1.1 Description of LED Light Sources

Devices tested

Part Number: GT-P100WW5316008010A
 Part name: COB
 Part Type: LED Array
 Nominal CCT: 6500K

Family products covered by this report:

According to ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products, the following products can be covered by this report base on the declaration letter of manufacturer (see attachment B for more information). The information of these models shows that the covered products meet all section 3 item 7 requirements of ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products (September 9, 2011)

| Model type | Model name | CCT(K) | Number of dies | current intensity (mA/mm ²) | power intensity (W/mm ²) | distance between of dies (mm) | Driver current of die(mA) |
|---------------|----------------------|--------|----------------|---|--------------------------------------|-------------------------------|---------------------------|
| Test model | GT-P100WW5316008010A | 6500K | 160 | 6.75 | 0.20 | 0.67 | 170 |
| Covered model | GT-P100WW531000506A | 6500K | 100 | 4.25 | 0.13 | 1.42 | 170 |
| | GT-P100WW53600303B | 6500K | 60 | 2.5 | 0.08 | 2.75 | 170 |

Disclaimer:

The truthfulness and accuracy of all the technical information above for the covered LED products is ensured by manufacturer of LED light source. Bay Area Compliance Laboratories Corp. (Dongguan) isn't responsible or gives any guarantees for the truthfulness of the technical information.

1.2 Standards Used:

- IESNA LM-80-08: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products(This test method was not accredited by IAS)

1.3 Test Facility

The testing facility used by Bay Area Compliance Laboratories Corp. (Dongguan). is located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.

1.4 Description of Auxiliary Equipment

| Device | Manufacture | Model No | Serial No | Test Range | Calibration date | Calibration due date |
|--------------------------------|-------------|--------------|---------------|-----------------|------------------|----------------------|
| 1.0m integrating sphere | SENSING | SCD-20008 | N/A | 1.0 m | 2015-05-04 | 2016-05-04 |
| spectroradiometer | SENSING | SCD-20008 | N/A | 380-780 nm | 2015-05-04 | 2016-05-04 |
| DC Power Supply | XINGPU | HSPY-100-05 | 2013010210003 | 0~100V, 0~5A | 2015-05-15 | 2016-05-15 |
| Standard Light Source | EVERFINE | D062 | 1011093 | N/A | 2014-08-05 | 2015-08-05 |
| Multilayer aging machine | BACL | B2-270 | 20005 | 25°C~110°C | 2014-08-11 | 2015-08-11 |
| High-frequency DC power supply | GUTE | WYG-30100 | 20060111 | 0v~30v,10A~100A | 2014-08-11 | 2015-08-11 |
| DC Power Supply | GUTE | LLA1200112-U | 2012082001 | 0~120V,0~10A | 2014-12-30 | 2015-12-30 |

1.5 Operating Cycle

Samples are driven with a constant direct current (DC)

1.6 Ambient Conditions

For lumen maintenance test, samples were operated in thermal chambers with minimal ambient airflow. For long term reliability test, the case temperature was controlled by mounting several thermocouples on a sample reliability stress board at the designated thermal measurement point, as shown in APPENDIX. The ambient temperature T_A was measured by several thermocouples at a distance of 5 mm above the reliability test board. The relative humidity within chamber was less than 65%.

For photometry measurement, temperature was set to $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, RH <65%.

1.7 Photometry Measurement Uncertainty

The uncertainty of the light output measurements is $U=1.59\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=21\text{K}$ ($K=2$), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

1.8 Sample Set

Sampling Method:

LED samples for IESNA LM-80 testing consist of units built from a minimum of three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days.

These manufacturing lots are picked to represent a wide parametric distribution.

Each Sample is soldered to all of the reliability stress boards for a given set of IESNA LM-80 tests.

Sample Size:

Total 20Pcs;

Each Ts test condition 10Pcs

The samples tested at Ts 55 °C and Ts 85 °C were received at 2014-11-12 and tested during 2014-11-14 to 2015-07-22. The samples were numbered from 1 to 10, 11 to 20.

Data Set 1: 55 °C, 2400mA

| | |
|--|-------------------------|
| Part Number: | GT-P100WW5316008010A |
| Number of Units: | 10 |
| Actual Case Temperature(T _S): | T _S =54.1 °C |
| Actual Ambient Temperature(T _A): | T _A =51.4 °C |
| Life Test Drive Current: | I _F = 2400mA |
| Measurement Current: | I _F = 2400mA |

Data Set 2: 85 °C,2400mA

| | |
|--|-------------------------|
| Part Number: | GT-P100WW5316008010A |
| Number of Units: | 10 |
| Actual Case Temperature(T _S): | T _S =84.2 °C |
| Actual Ambient Temperature(T _A): | T _A =82.3 °C |
| Life Test Drive Current: | I _F =2400mA |
| Measurement Current: | I _F = 2400mA |

2 - SUMMARY OF TEST RESULT

| Data Set: | Data Set 1, 55 °C, 2400mA |
|---|--|
| Number of Units: | 10 |
| Failures Observed: | 0 |
| Test Interval and Test Duration: | 0h,1000h,2000h,3000h,4000h,5000h,6000h |
| Average. Lumen Maintenance at 6000 hours: | 97.25% |
| Average Chromaticity Shift at 6000 hours ($\Delta u'v'$): | 0.0016 |
| Reported TM-21 L ₇₀ Lifetime: | >33,000 hours |

| Data Set: | Data Set 2, 85 °C, 2400mA |
|--|--|
| Number of Units: | 10 |
| Failures Observed: | 0 |
| Test Interval and Test Duration: | 0h,1000h,2000h,3000h,4000h,5000h,6000h |
| Average. Lumen Maintenance at 6000 hours: | 96.06% |
| Average Chromaticity Shift at 6000 hours($\Delta u'v'$): | 0.0021 |
| Reported TM-21 L ₇₀ Lifetime: | >33,000 hours |

3 - Test Data

3.1 Data Set 1, 55 °C, 2400mA (Lumen Maintenance)

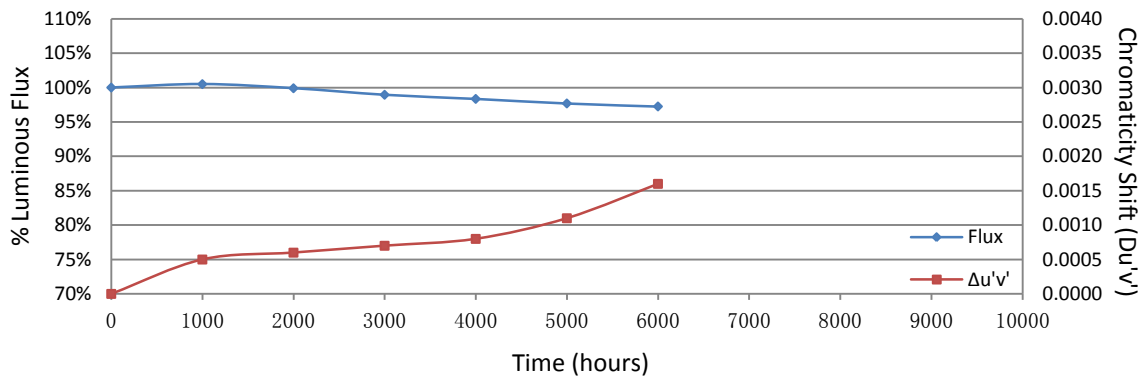
| No. | V _F (V) | Φ(lm) | Lumen Maintenance (%) | | | | | |
|--------|--------------------|----------|-----------------------|---------|---------|---------|---------|---------|
| | 0hr(Initial) | | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
| 1 | 32.84 | 9026 | 100.88 | 100.23 | 98.83 | 98.25 | 97.53 | 97.07 |
| 2 | 32.79 | 9089 | 100.97 | 100.12 | 99.21 | 98.51 | 97.90 | 97.13 |
| 3 | 33.08 | 8983 | 101.14 | 100.91 | 100.25 | 99.57 | 98.96 | 98.64 |
| 4 | 32.80 | 9164 | 100.28 | 99.87 | 99.41 | 98.83 | 98.08 | 97.28 |
| 5 | 33.05 | 9283 | 100.31 | 99.90 | 99.18 | 98.47 | 97.94 | 97.44 |
| 6 | 32.82 | 9195 | 100.12 | 99.49 | 98.50 | 97.87 | 97.29 | 97.21 |
| 7 | 32.81 | 9084 | 100.39 | 99.59 | 98.69 | 98.22 | 97.55 | 96.91 |
| 8 | 32.80 | 9143 | 100.84 | 99.95 | 98.53 | 97.91 | 97.17 | 96.84 |
| 9 | 32.83 | 9350 | 100.01 | 99.18 | 98.33 | 97.70 | 97.03 | 96.95 |
| 10 | 33.09 | 8973 | 100.03 | 99.73 | 98.58 | 98.14 | 97.46 | 97.03 |
| Ave. | 32.89 | 9129.00 | 100.50 | 99.90 | 98.95 | 98.35 | 97.69 | 97.25 |
| Med. | 32.83 | 9116.00 | 100.35 | 99.88 | 98.76 | 98.24 | 97.54 | 97.10 |
| st dev | 0.13 | 123.9265 | 0.4187 | 0.4694 | 0.5778 | 0.5450 | 0.5629 | 0.5201 |
| Min. | 32.79 | 8973.00 | 100.01 | 99.18 | 98.33 | 97.70 | 97.03 | 96.84 |
| Max. | 33.09 | 9350.00 | 101.14 | 100.91 | 100.25 | 99.57 | 98.96 | 98.64 |

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
α: 6.787E-06
β: 1.011
Calculated L₇₀: 54,000hours
Reported L₇₀: >33,000hours

3.2 Data Set 1, 55 °C, 2400 mA (Chromaticity Shift)

| No. | u' | v' | CCT(K) | Chromaticity Shift ($\Delta u'v'$) | | | | | |
|--------|--------------|--------|---------|--------------------------------------|---------|---------|---------|---------|---------|
| | 0hr(Initial) | | | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
| 1 | 0.1971 | 0.4760 | 6124 | 0.0004 | 0.0008 | 0.0010 | 0.0008 | 0.0012 | 0.0016 |
| 2 | 0.1981 | 0.4749 | 6121 | 0.0007 | 0.0008 | 0.0008 | 0.0004 | 0.0006 | 0.0013 |
| 3 | 0.1970 | 0.4764 | 6112 | 0.0004 | 0.0009 | 0.0003 | 0.0002 | 0.0006 | 0.0008 |
| 4 | 0.1960 | 0.4782 | 6080 | 0.0005 | 0.0007 | 0.0007 | 0.0005 | 0.0009 | 0.0008 |
| 5 | 0.1985 | 0.4754 | 6076 | 0.0008 | 0.0011 | 0.0008 | 0.0004 | 0.0007 | 0.0011 |
| 6 | 0.1972 | 0.4754 | 6154 | 0.0005 | 0.0002 | 0.0006 | 0.0012 | 0.0016 | 0.0045 |
| 7 | 0.1983 | 0.4752 | 6097 | 0.0005 | 0.0002 | 0.0005 | 0.0009 | 0.0011 | 0.0021 |
| 8 | 0.1977 | 0.4752 | 6134 | 0.0006 | 0.0003 | 0.0005 | 0.0004 | 0.0006 | 0.0010 |
| 9 | 0.1991 | 0.4747 | 6078 | 0.0006 | 0.0003 | 0.0007 | 0.0013 | 0.0015 | 0.0018 |
| 10 | 0.1970 | 0.4773 | 6067 | 0.0004 | 0.0007 | 0.0010 | 0.0016 | 0.0019 | 0.0012 |
| Ave. | 0.1976 | 0.4759 | 6104 | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0011 | 0.0016 |
| Med. | 0.1975 | 0.4754 | 6105 | 0.0005 | 0.0007 | 0.0007 | 0.0007 | 0.0010 | 0.0013 |
| st dev | 0.0009 | 0.0011 | 29.0710 | 0.0001 | 0.0003 | 0.0002 | 0.0005 | 0.0005 | 0.0011 |
| Min. | 0.1960 | 0.4747 | 6067 | 0.0004 | 0.0002 | 0.0003 | 0.0002 | 0.0006 | 0.0008 |
| Max. | 0.1991 | 0.4782 | 6154 | 0.0008 | 0.0011 | 0.0010 | 0.0016 | 0.0019 | 0.0045 |



3.3 Data Set 2, 85 °C, 2400 mA (Lumen Maintenance)

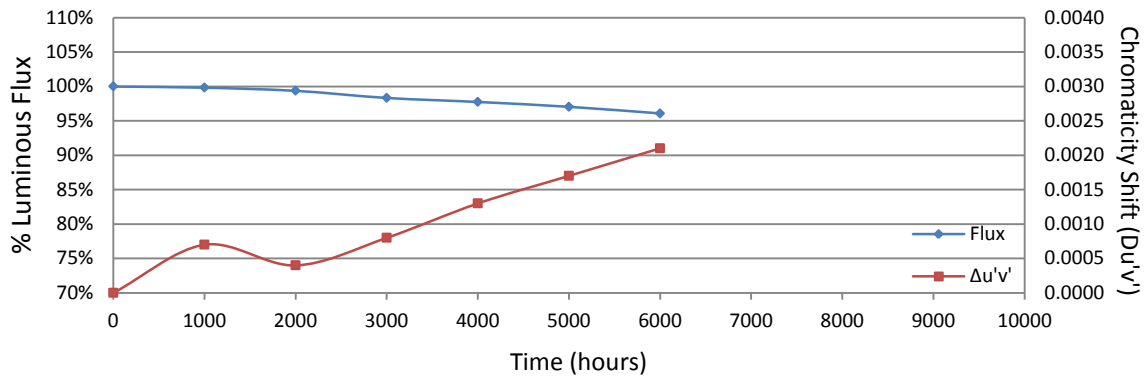
| No. | V _F (V) | Φ(lm) | Lumen Maintenance (%) | | | | | |
|--------|--------------------|----------|-----------------------|---------|---------|---------|---------|---------|
| | 0hr(Initial) | | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
| 11 | 32.99 | 9035 | 99.94 | 99.53 | 98.52 | 97.85 | 97.17 | 96.04 |
| 12 | 32.94 | 9222 | 99.05 | 98.86 | 97.62 | 96.99 | 96.24 | 95.52 |
| 13 | 32.76 | 9306 | 99.84 | 99.31 | 98.50 | 97.96 | 97.35 | 96.35 |
| 14 | 32.97 | 9158 | 99.39 | 98.82 | 97.86 | 97.24 | 96.57 | 95.66 |
| 15 | 32.97 | 9407 | 100.04 | 99.54 | 98.38 | 97.91 | 97.13 | 96.36 |
| 16 | 33.00 | 9288 | 100.18 | 99.78 | 99.17 | 98.53 | 97.73 | 96.77 |
| 17 | 33.10 | 9157 | 100.04 | 99.63 | 98.25 | 97.68 | 96.87 | 95.93 |
| 18 | 32.97 | 9130 | 99.52 | 99.05 | 98.00 | 97.54 | 96.93 | 95.76 |
| 19 | 32.93 | 9343 | 100.03 | 99.52 | 98.54 | 97.95 | 97.14 | 96.04 |
| 20 | 32.84 | 9148 | 100.25 | 99.64 | 98.49 | 97.78 | 97.18 | 96.21 |
| Ave. | 32.95 | 9219.40 | 99.83 | 99.37 | 98.33 | 97.74 | 97.03 | 96.06 |
| Med. | 32.97 | 9190.00 | 99.99 | 99.53 | 98.43 | 97.82 | 97.14 | 96.04 |
| st dev | 0.09 | 114.2319 | 0.3879 | 0.3422 | 0.4318 | 0.4233 | 0.4112 | 0.3747 |
| Min. | 32.76 | 9035.00 | 99.05 | 98.82 | 97.62 | 96.99 | 96.24 | 95.52 |
| Max. | 33.10 | 9407.00 | 100.25 | 99.78 | 99.17 | 98.53 | 97.73 | 96.77 |

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 7.714E-06
 β : 1.007
Calculated L₇₀: 47,000hours
Reported L₇₀: >33,000hours

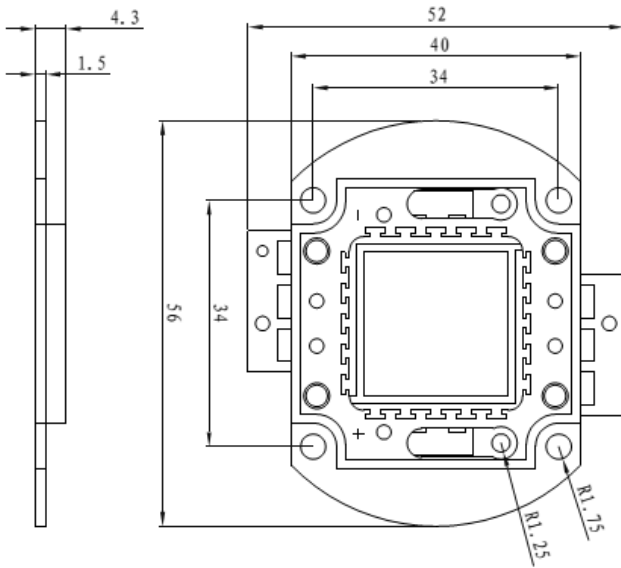
3.4 Data Set 2, 85 °C, 2400 mA (Chromaticity Shift)

| No. | u' | v' | CCT(K) | Chromaticity Shift ($\Delta u'v'$) | | | | | |
|--------|--------------|--------|---------|--------------------------------------|---------|---------|---------|---------|---------|
| | 0hr(Initial) | | | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
| 11 | 0.1972 | 0.4761 | 6117 | 0.0003 | 0.0004 | 0.0009 | 0.0016 | 0.0018 | 0.0021 |
| 12 | 0.1985 | 0.4754 | 6076 | 0.0011 | 0.0001 | 0.0004 | 0.0009 | 0.0015 | 0.0020 |
| 13 | 0.1973 | 0.4754 | 6148 | 0.0004 | 0.0006 | 0.0011 | 0.0012 | 0.0015 | 0.0026 |
| 14 | 0.1967 | 0.4759 | 6161 | 0.0012 | 0.0009 | 0.0012 | 0.0016 | 0.0020 | 0.0022 |
| 15 | 0.1982 | 0.4764 | 6043 | 0.0003 | 0.0001 | 0.0001 | 0.0010 | 0.0014 | 0.0023 |
| 16 | 0.1984 | 0.4760 | 6056 | 0.0010 | 0.0011 | 0.0010 | 0.0013 | 0.0018 | 0.0020 |
| 17 | 0.1987 | 0.4746 | 6105 | 0.0004 | 0.0003 | 0.0016 | 0.0020 | 0.0023 | 0.0023 |
| 18 | 0.1983 | 0.4753 | 6092 | 0.0008 | 0.0004 | 0.0010 | 0.0023 | 0.0027 | 0.0030 |
| 19 | 0.1983 | 0.4760 | 6060 | 0.0007 | 0.0001 | 0.0002 | 0.0005 | 0.0009 | 0.0015 |
| 20 | 0.1975 | 0.4745 | 6178 | 0.0007 | 0.0003 | 0.0001 | 0.0009 | 0.0012 | 0.0014 |
| Ave. | 0.1979 | 0.4756 | 6104 | 0.0007 | 0.0004 | 0.0008 | 0.0013 | 0.0017 | 0.0021 |
| Med. | 0.1983 | 0.4757 | 6099 | 0.0007 | 0.0003 | 0.0010 | 0.0013 | 0.0017 | 0.0022 |
| st dev | 0.0007 | 0.0006 | 46.8074 | 0.0003 | 0.0003 | 0.0005 | 0.0006 | 0.0005 | 0.0005 |
| Min. | 0.1967 | 0.4745 | 6043 | 0.0003 | 0.0001 | 0.0001 | 0.0005 | 0.0009 | 0.0014 |
| Max. | 0.1987 | 0.4764 | 6178 | 0.0012 | 0.0011 | 0.0016 | 0.0023 | 0.0027 | 0.0030 |



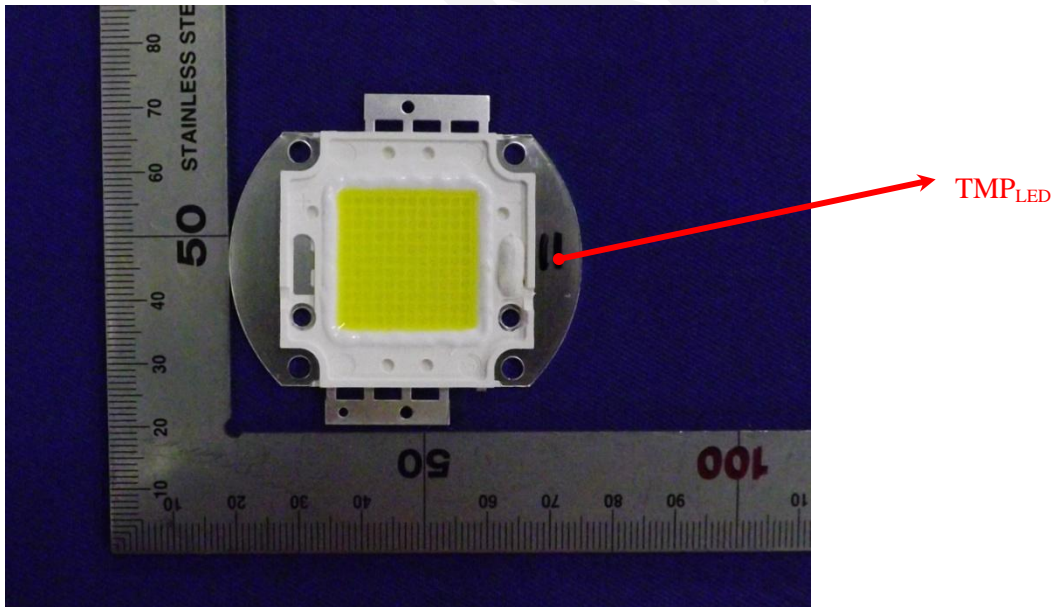
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



Attachment B—Declaration Letter

ShenZhen Getian Opto-electronics co.,ltd
 Bldg 55,East Of Baotian Third Road,XiXiang Town,BaoAn District,ShenZhen
 T: 0755-29656850 F: 0755-29656880 E-mail: zhuzhg@gt-led.com

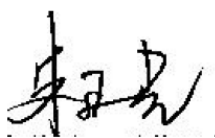
Declaration of Identical

To Whom It May Concern,

I, an officer of ShenZhen Getian Opto-electronics co.,ltd, do hereby attest, that our led array with the model number GT-P100WW5316008010A was tested by BACL, and the models in the below list can be covered by the tested model GT-P100WW5316008010A.

| Model type | Model name | CCT (K) | Number of dies | current intensity (mA/mm ²) | power intensity (W/mm ²) | distance between of dies (mm) | Driver current of die |
|---------------|----------------------|---------|----------------|---|--------------------------------------|-------------------------------|-----------------------|
| Test model | GT-P100WW5316008010A | 6500K | 160 | 6.75 | 0.20 | 0.67 | 170 |
| Covered model | GT-P100WW531000506A | 6500K | 100 | 4.25 | 0.13 | 1.42 | 170 |
| | GT-P100WW53600303B | 6500K | 60 | 2.5 | 0.08 | 2.75 | 170 |

Best Regards,

Signature: 

Print Name: Zhu Zhengguang

Title: Vice president

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