



# TEST REPORT

ACCORDING TO IES LM-80-2015  
For

## Hongli Zhihui Group Co., Ltd.

No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China

**Model: PU2835DW-S1-08-PCT-HR3**

|   |   |                                     |  |
|---|---|-------------------------------------|--|
| <b>Report Type:</b><br>6000 Hours Test Report |   | <b>Product Type:</b><br>LED Package |  |
| <b>Test Engineer:</b>                         | Pote Wang   | <i>Pote Wang</i>                    |  |
| <b>Report Number:</b>                         | RSZ160221508-10   |                                     |  |
| <b>Test Date:</b>                             | 2016-02-15 to 2016-10-22  |                                     |  |
| <b>Report Date:</b>                           | 2016-11-08  |                                     |  |
| <b>Reviewed By:</b>                           | Daniel Duan / EE Manager  | <i>Daniel Duan</i>                  |  |
| <b>Test Facility:</b>                         | Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.  |                                     |  |
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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).

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## 1 - General Information

### 1.1 Description of LED Light Sources

#### Sample Size:

50 PCS samples were received on 2016-02-15. The samples were numbered from 1 to 50.

Manufacturer: Hongli Zhihui Group Co.,Ltd.  
Part Number: PU2835DW-S1-08-PCT-HR3  
Part Type: LED Package  
Drive Level: DC 150mA  
Nominal CCT: 3000K

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)

| Testing Model Number   | Multiple listed Model Number | Difference   |
|------------------------|------------------------------|--|
| PU2835DW-S1-08-PCT-HR3 | 2835DW-S1-08-PCT-HR3         | The products are same, except the different model numbers. |

#### 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-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- ENERGY STAR® Program Guidance Regarding LED Array, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products(This test method was not accredited by IAS)

### 1.3 Testing Equipment

| Device          | Manufacture | Model No      | Serial No | Test Range | Calibration date | Calibration due date |
|-----------------|-------------|---------------|-----------|------------|------------------|----------------------|
| Integral Sphere | EVERFINE    | Diameter 0.3m | 1011119   | 0.3m       | 2016-03-10       | 2017-03-09           |

| Device  | Manufacture | Model No   | Serial No            | Test Range | Calibration date | Calibration due date |
|---|-------------|------------|----------------------|------------|------------------|----------------------|
| Programmable Test Power for LEDs                      | EVERFINE    | LED300E    | 1008002              | 15V/2000mA | 2016-03-04       | 2017-03-03           |
| High accuracy array spectroradiometer                 | EVERFINE    | HAAS-2000  | 1012016T             | 380-780nm  | 2016-03-10       | 2017-03-09           |
| Standard Light Source                                 | EVERFINE    | D062       | 1011093              | 3000K      | 2016-09-13       | 2017-09-12           |
| Precision digital stabilized DC power supply          | EVERFINE    | WY605-V110 | G115987C<br>J7321114 | 300VA      | 2016-03-04       | 2017-03-03           |
| Multilayer aging machine                              | BACL        | B2-270     | 20022                | 25°C~110°C | 2015-11-23       | 2016-11-22           |
| Adjustable constant-current DC switching power supply | GUTE        | WYG-5V40A  | 2#                   | 0~5V,0~40A | 2016-03-04       | 2017-03-03           |
| DC Power Supply                                       | GUTE        | MYG-5V40A  | N/A                  | 0~5V,0~40A | 2016-10-27       | 2017-10-26           |

#### 1.4 Drive Level

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within  $\pm 3\%$  of the specified value of the manufacturer during maintenance test, and was within  $\pm 0.5\%$  during photometric and electrical measurement test.

#### 1.5 Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case ( $TMP_{LED}$ ) location, while the other is mounted at a distance of 5 mm above the  $TMP$  location.

During life testing,  $TMP_{LED}$  of the coldest LEDs were maintained at a temperature that was greater than or equal to  $2^{\circ}\text{C}$  below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to  $5^{\circ}\text{C}$  below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 "Special Limits".

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within  $\pm 3\%$  of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

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

## 1.6 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  $U=21K$  ( $K=2$ ), at the 95% confidence level.

The uncertainty of the temperature is  $U=0.8671^{\circ}C$  ( $K=2$ ), at the 95% confidence level.

## 1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

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## 1.8 Sample Set

### Data Set 1: 85°C, 150mA

Part Number: PU2835DW-S1-08-PCT-HR3  
Number of Units: 25  
Case Temperature: >84°C  
Ambient Temperature: >80°C  
Life Test Drive Current: 150mA  
Measurement Current: 150mA

### Data Set 2: 115°C, 150mA

Part Number: PU2835DW-S1-08-PCT-HR3  
Number of Units: 25  
Case Temperature: >113°C  
Ambient Temperature: >110°C  
Life Test Drive Current: 150mA  
Measurement Current: 150mA

## 2 - Summary of Test Result

| Data Set: | Sample Size | Failures Observed: | Test Interval | Test Duration | Reported TM-21 L <sub>70</sub> Lifetime | Reported TM-21 L <sub>90</sub> Lifetime |
|-----------|-------------|--------------------|---------------|---------------|---|---|
| 1         | 25          | 0                  | 1000          | 6000          | >36000 hours                            | >36000 hours                            |
| 2         | 25          | 0                  | 1000          | 6000          | >36000 hours                            | >36000 hours                            |

### Average Lumen Maintenance (Percentage of Initial Luminous Flux)

| Data Set: | 1000    | 2000    | 3000    | 4000    | 5000   | 6000   |
|-----------|---------|---------|---------|---------|--------|--------|
| 1         | 100.63% | 100.45% | 100.27% | 100.11% | 99.96% | 99.77% |
| 2         | 100.18% | 99.86%  | 99.65%  | 99.44%  | 99.18% | 98.90% |

### Average Color Maintenance

| Data Set: | 1000   | 2000   | 3000   | 4000   | 5000   | 6000   |
|-----------|--------|--------|--------|--------|--------|--------|
| 1         | 0.0009 | 0.0011 | 0.0012 | 0.0013 | 0.0014 | 0.0016 |
| 2         | 0.0024 | 0.0025 | 0.0026 | 0.0026 | 0.0025 | 0.0026 |

### 3 - Test Data

#### 3.1 Data Set 1, 85°C, 150mA (Lumen Maintenance)

| No.    | Φ(lm)        | Lumen Maintenance (%) |         |         |         |         |         |
|--------|--------------|-----------------------|---------|---------|---------|---------|---------|
|        | 0hr(Initial) | 1000hrs               | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
| 1      | 64.95        | 100.11                | 99.97   | 99.86   | 99.62   | 99.45   | 99.34   |
| 2      | 64.66        | 100.06                | 99.89   | 99.78   | 99.57   | 99.35   | 99.32   |
| 3      | 65.98        | 100.05                | 99.86   | 99.76   | 99.56   | 99.24   | 99.20   |
| 4      | 65.32        | 100.02                | 99.97   | 99.68   | 99.49   | 99.30   | 99.02   |
| 5      | 65.94        | 100.24                | 100.08  | 99.71   | 99.62   | 99.44   | 99.21   |
| 6      | 65.63        | 100.21                | 99.95   | 99.85   | 99.68   | 99.65   | 99.41   |
| 7      | 65.79        | 100.03                | 99.86   | 99.62   | 99.50   | 99.36   | 99.15   |
| 8      | 66.06        | 100.14                | 99.98   | 99.76   | 99.67   | 99.47   | 99.18   |
| 9      | 64.88        | 100.18                | 100.05  | 99.83   | 99.71   | 99.63   | 99.24   |
| 10     | 65.55        | 100.12                | 99.98   | 99.82   | 99.71   | 99.57   | 99.25   |
| 11     | 66.11        | 100.15                | 99.94   | 99.83   | 99.73   | 99.59   | 99.32   |
| 12     | 65.15        | 100.17                | 99.97   | 99.88   | 99.74   | 99.59   | 99.39   |
| 13     | 65.87        | 100.27                | 99.98   | 99.76   | 99.68   | 99.54   | 99.45   |
| 14     | 66.44        | 100.12                | 100.02  | 99.80   | 99.64   | 99.55   | 99.32   |
| 15     | 65.27        | 100.17                | 100.03  | 99.71   | 99.63   | 99.46   | 99.37   |
| 16     | 65.21        | 100.23                | 100.03  | 99.82   | 99.63   | 99.62   | 99.48   |
| 17     | 65.42        | 99.53                 | 99.51   | 99.21   | 99.05   | 99.04   | 98.99   |
| 18     | 64.98        | 99.66                 | 99.62   | 99.54   | 99.38   | 99.23   | 99.18   |
| 19     | 64.69        | 101.31                | 101.07  | 101.00  | 100.74  | 100.57  | 100.39  |
| 20     | 64.28        | 102.85                | 102.63  | 102.47  | 102.15  | 101.77  | 101.76  |
| 21     | 65.44        | 100.35                | 100.29  | 100.03  | 99.97   | 99.86   | 99.71   |
| 22     | 65.96        | 98.92                 | 98.64   | 98.51   | 98.48   | 98.44   | 98.23   |
| 23     | 61.27        | 107.69                | 107.38  | 107.05  | 107.00  | 106.76  | 106.50  |
| 24     | 65.57        | 100.76                | 100.69  | 100.47  | 100.12  | 99.98   | 99.77   |
| 25     | 65.13        | 102.30                | 101.97  | 101.95  | 101.55  | 101.49  | 101.15  |
| Ave.   | 65.26        | 100.63                | 100.45  | 100.27  | 100.11  | 99.96   | 99.77   |
| Med.   | 65.42        | 100.17                | 99.98   | 99.82   | 99.67   | 99.55   | 99.32   |
| st dev | 0.9826       | 1.6715                | 1.6337  | 1.6200  | 1.6087  | 1.5773  | 1.5640  |
| Min.   | 61.27        | 98.92                 | 98.64   | 98.51   | 98.48   | 98.44   | 98.23   |
| Max.   | 66.44        | 107.69                | 107.38  | 107.05  | 107.00  | 106.76  | 106.50  |

TM-21 Projection:

**Test Duration:** 6000 hours

**Failures Observed:** 0

**α:** 1.691E-06

**β:** 1.008

**Reported L<sub>70</sub>:** >36000 hours

**Reported L<sub>90</sub>:** >36000 hours

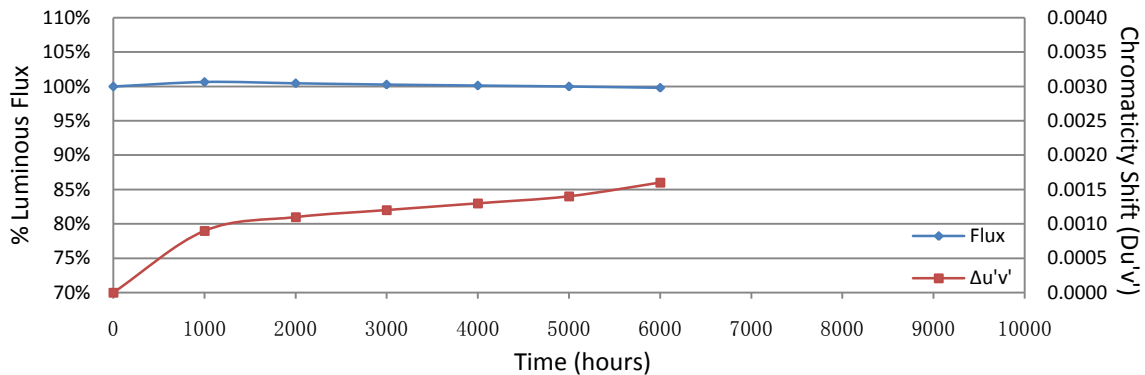


### 3.2 Data Set 1, 85°C, 150mA (Forward Voltage)

| No.    | Forward Voltage (V) |         |         |         |         |         |         |
|--------|---------------------|---------|---------|---------|---------|---------|---------|
|        | 0hr(Initial)        | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
| 1      | 3.106               | 3.106   | 3.108   | 3.106   | 3.115   | 3.110   | 3.112   |
| 2      | 3.102               | 3.103   | 3.103   | 3.103   | 3.113   | 3.109   | 3.108   |
| 3      | 3.115               | 3.112   | 3.114   | 3.113   | 3.120   | 3.117   | 3.124   |
| 4      | 3.106               | 3.107   | 3.109   | 3.105   | 3.124   | 3.110   | 3.111   |
| 5      | 3.086               | 3.090   | 3.093   | 3.089   | 3.094   | 3.093   | 3.094   |
| 6      | 3.111               | 3.114   | 3.119   | 3.111   | 3.118   | 3.116   | 3.117   |
| 7      | 3.089               | 3.089   | 3.092   | 3.086   | 3.094   | 3.091   | 3.092   |
| 8      | 3.101               | 3.103   | 3.102   | 3.099   | 3.108   | 3.104   | 3.110   |
| 9      | 3.083               | 3.082   | 3.087   | 3.080   | 3.091   | 3.086   | 3.097   |
| 10     | 3.123               | 3.126   | 3.125   | 3.123   | 3.127   | 3.127   | 3.141   |
| 11     | 3.093               | 3.092   | 3.093   | 3.090   | 3.093   | 3.094   | 3.098   |
| 12     | 3.077               | 3.079   | 3.083   | 3.079   | 3.081   | 3.082   | 3.082   |
| 13     | 3.122               | 3.122   | 3.124   | 3.124   | 3.124   | 3.959   | 3.126   |
| 14     | 3.090               | 3.091   | 3.090   | 3.088   | 3.096   | 3.098   | 3.094   |
| 15     | 3.101               | 3.100   | 3.102   | 3.101   | 3.987   | 3.106   | 3.105   |
| 16     | 3.112               | 3.116   | 3.118   | 3.115   | 3.123   | 3.122   | 3.122   |
| 17     | 3.098               | 3.149   | 3.150   | 3.149   | 3.155   | 3.171   | 3.158   |
| 18     | 3.148               | 3.108   | 3.109   | 3.111   | 3.117   | 3.120   | 3.120   |
| 19     | 3.106               | 3.114   | 3.113   | 3.117   | 3.124   | 3.123   | 3.118   |
| 20     | 3.127               | 3.085   | 3.086   | 3.089   | 3.091   | 3.091   | 3.095   |
| 21     | 3.133               | 3.138   | 3.142   | 3.142   | 3.172   | 3.151   | 3.144   |
| 22     | 3.087               | 3.094   | 3.096   | 3.096   | 3.122   | 3.106   | 3.100   |
| 23     | 3.128               | 3.100   | 3.103   | 3.102   | 3.117   | 3.120   | 3.107   |
| 24     | 3.153               | 3.123   | 3.125   | 3.125   | 3.125   | 3.132   | 3.127   |
| 25     | 3.095               | 3.129   | 3.130   | 3.153   | 3.129   | 3.140   | 3.135   |
| Ave.   | 3.108               | 3.107   | 3.109   | 3.108   | 3.150   | 3.147   | 3.113   |
| Med.   | 3.106               | 3.106   | 3.108   | 3.105   | 3.118   | 3.110   | 3.111   |
| st dev | 0.0197              | 0.0177  | 0.0175  | 0.0201  | 0.1755  | 0.1704  | 0.0184  |
| Min.   | 3.077               | 3.079   | 3.083   | 3.079   | 3.081   | 3.082   | 3.082   |
| Max.   | 3.153               | 3.149   | 3.150   | 3.153   | 3.987   | 3.959   | 3.158   |

### 3.3 Data Set 1, 85°C, 150mA (Chromaticity Shift)

| No.    | u'     | v'     | CCT(K)  | Chromaticity Shift ( $\Delta u'v'$ ) |         |         |         |         |         |
|--------|--------|--------|---------|--------------------------------------|---------|---------|---------|---------|---------|
|        |        |        |         | 0hr(Initial)                         | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs |
| 1      | 0.2506 | 0.5204 | 3006    | 0.0002                               | 0.0005  | 0.0009  | 0.0009  | 0.0011  | 0.0012  |
| 2      | 0.2509 | 0.5194 | 3004    | 0.0001                               | 0.0006  | 0.0008  | 0.0009  | 0.0012  | 0.0012  |
| 3      | 0.2510 | 0.5194 | 3003    | 0.0002                               | 0.0006  | 0.0009  | 0.0010  | 0.0012  | 0.0013  |
| 4      | 0.2506 | 0.5209 | 3003    | 0.0001                               | 0.0005  | 0.0008  | 0.0009  | 0.0011  | 0.0013  |
| 5      | 0.2523 | 0.5186 | 2976    | 0.0002                               | 0.0005  | 0.0007  | 0.0009  | 0.0011  | 0.0013  |
| 6      | 0.2514 | 0.5210 | 2982    | 0.0003                               | 0.0006  | 0.0006  | 0.0008  | 0.0012  | 0.0013  |
| 7      | 0.2518 | 0.5191 | 2984    | 0.0002                               | 0.0005  | 0.0008  | 0.0010  | 0.0011  | 0.0014  |
| 8      | 0.2508 | 0.5206 | 2999    | 0.0001                               | 0.0005  | 0.0007  | 0.0010  | 0.0011  | 0.0013  |
| 9      | 0.2492 | 0.5209 | 3038    | 0.0002                               | 0.0005  | 0.0007  | 0.0009  | 0.0012  | 0.0014  |
| 10     | 0.2536 | 0.5190 | 2940    | 0.0002                               | 0.0006  | 0.0007  | 0.0009  | 0.0012  | 0.0014  |
| 11     | 0.2521 | 0.5186 | 2981    | 0.0002                               | 0.0006  | 0.0007  | 0.0009  | 0.0011  | 0.0013  |
| 12     | 0.2496 | 0.5209 | 3027    | 0.0002                               | 0.0004  | 0.0006  | 0.0009  | 0.0012  | 0.0013  |
| 13     | 0.2485 | 0.5229 | 3043    | 0.0002                               | 0.0006  | 0.0005  | 0.0007  | 0.0011  | 0.0014  |
| 14     | 0.2494 | 0.5196 | 3041    | 0.0002                               | 0.0005  | 0.0006  | 0.0007  | 0.0012  | 0.0014  |
| 15     | 0.2503 | 0.5200 | 3016    | 0.0002                               | 0.0005  | 0.0006  | 0.0009  | 0.0012  | 0.0014  |
| 16     | 0.2509 | 0.5206 | 2997    | 0.0002                               | 0.0005  | 0.0006  | 0.0007  | 0.0012  | 0.0014  |
| 17     | 0.2513 | 0.5183 | 3002    | 0.0018                               | 0.0015  | 0.0014  | 0.0013  | 0.0010  | 0.0007  |
| 18     | 0.2522 | 0.5202 | 2969    | 0.0006                               | 0.0005  | 0.0004  | 0.0005  | 0.0007  | 0.0010  |
| 19     | 0.2520 | 0.5208 | 2969    | 0.0021                               | 0.0024  | 0.0025  | 0.0026  | 0.0029  | 0.0033  |
| 20     | 0.2521 | 0.5190 | 2977    | 0.0012                               | 0.0012  | 0.0011  | 0.0012  | 0.0012  | 0.0016  |
| 21     | 0.2513 | 0.5190 | 2998    | 0.0022                               | 0.0019  | 0.0017  | 0.0016  | 0.0014  | 0.0010  |
| 22     | 0.2512 | 0.5198 | 2993    | 0.0006                               | 0.0003  | 0.0003  | 0.0003  | 0.0004  | 0.0006  |
| 23     | 0.2484 | 0.5174 | 3082    | 0.0042                               | 0.0039  | 0.0037  | 0.0037  | 0.0036  | 0.0032  |
| 24     | 0.2521 | 0.5212 | 2964    | 0.0023                               | 0.0024  | 0.0024  | 0.0025  | 0.0026  | 0.0029  |
| 25     | 0.2517 | 0.5203 | 2980    | 0.0045                               | 0.0044  | 0.0042  | 0.0041  | 0.0038  | 0.0039  |
| Ave.   | 0.2510 | 0.5199 | 2999    | 0.0009                               | 0.0011  | 0.0012  | 0.0013  | 0.0014  | 0.0016  |
| Med.   | 0.2512 | 0.5200 | 2998    | 0.0002                               | 0.0006  | 0.0007  | 0.0009  | 0.0012  | 0.0013  |
| st dev | 0.0013 | 0.0012 | 30.3157 | 0.0013                               | 0.0011  | 0.0010  | 0.0010  | 0.0008  | 0.0008  |
| Min.   | 0.2484 | 0.5174 | 2940    | 0.0001                               | 0.0003  | 0.0003  | 0.0003  | 0.0004  | 0.0006  |
| Max.   | 0.2536 | 0.5229 | 3082    | 0.0045                               | 0.0044  | 0.0042  | 0.0041  | 0.0038  | 0.0039  |



### 3.4 Data Set 2, 115°C, 150mA (Lumen Maintenance)

| No.    | Φ(lm)        | Lumen Maintenance (%) |         |         |         |         |         |
|--------|--------------|-----------------------|---------|---------|---------|---------|---------|
|        | 0hr(Initial) | 1000hrs               | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
| 26     | 62.73        | 104.13                | 103.86  | 103.67  | 103.59  | 103.33  | 103.17  |
| 27     | 65.38        | 99.45                 | 99.04   | 98.81   | 98.59   | 98.52   | 98.35   |
| 28     | 65.86        | 97.13                 | 96.87   | 96.60   | 96.39   | 96.28   | 96.17   |
| 29     | 65.94        | 96.54                 | 96.25   | 96.04   | 95.88   | 95.78   | 95.62   |
| 30     | 66.52        | 97.01                 | 96.57   | 96.33   | 96.14   | 95.90   | 95.52   |
| 31     | 65.26        | 97.04                 | 96.71   | 96.38   | 96.31   | 96.12   | 95.76   |
| 32     | 64.97        | 100.09                | 99.82   | 99.60   | 99.14   | 98.80   | 98.51   |
| 33     | 63.91        | 102.11                | 101.80  | 101.44  | 101.16  | 100.78  | 100.45  |
| 34     | 63.62        | 100.64                | 100.57  | 100.20  | 99.87   | 99.45   | 99.18   |
| 35     | 64.23        | 98.93                 | 98.55   | 98.47   | 98.16   | 97.76   | 97.48   |
| 36     | 64.08        | 99.70                 | 99.44   | 99.31   | 99.11   | 98.88   | 98.58   |
| 37     | 64.50        | 99.84                 | 99.50   | 99.44   | 99.16   | 98.93   | 98.59   |
| 38     | 63.32        | 101.48                | 101.18  | 101.01  | 100.82  | 100.54  | 100.21  |
| 39     | 65.06        | 97.57                 | 97.31   | 97.14   | 97.00   | 96.68   | 96.46   |
| 40     | 60.18        | 105.25                | 104.92  | 104.70  | 104.59  | 104.29  | 104.04  |
| 41     | 65.14        | 97.96                 | 97.70   | 97.51   | 97.28   | 97.08   | 96.78   |
| 42     | 64.01        | 100.05                | 99.73   | 99.50   | 99.36   | 99.11   | 98.91   |
| 43     | 63.46        | 100.79                | 100.39  | 100.27  | 100.09  | 99.94   | 99.61   |
| 44     | 63.93        | 100.94                | 100.56  | 100.39  | 100.19  | 99.92   | 99.66   |
| 45     | 64.41        | 99.67                 | 99.25   | 99.08   | 98.84   | 98.53   | 98.14   |
| 46     | 64.24        | 101.09                | 100.79  | 100.59  | 100.45  | 100.06  | 99.75   |
| 47     | 63.41        | 102.21                | 101.89  | 101.61  | 101.42  | 101.25  | 100.87  |
| 48     | 63.20        | 103.05                | 102.63  | 102.31  | 102.09  | 101.82  | 101.46  |
| 49     | 63.72        | 101.07                | 100.67  | 100.42  | 100.13  | 99.92   | 99.48   |
| 50     | 64.01        | 100.81                | 100.53  | 100.33  | 100.17  | 99.91   | 99.69   |
| Ave.   | 64.20        | 100.18                | 99.86   | 99.65   | 99.44   | 99.18   | 98.90   |
| Med.   | 64.08        | 100.09                | 99.82   | 99.60   | 99.36   | 99.11   | 98.91   |
| st dev | 1.2602       | 2.2285                | 2.2275  | 2.2199  | 2.2270  | 2.1978  | 2.1912  |
| Min.   | 60.18        | 96.54                 | 96.25   | 96.04   | 95.88   | 95.78   | 95.52   |
| Max.   | 66.52        | 105.25                | 104.92  | 104.70  | 104.59  | 104.29  | 104.04  |

TM-21 Projection:

**Test Duration:** 6000 hours

**Failures Observed:** 0

**α:** 2.483E-06

**β:** 1.004

**Reported L<sub>70</sub>:** >36000 hours

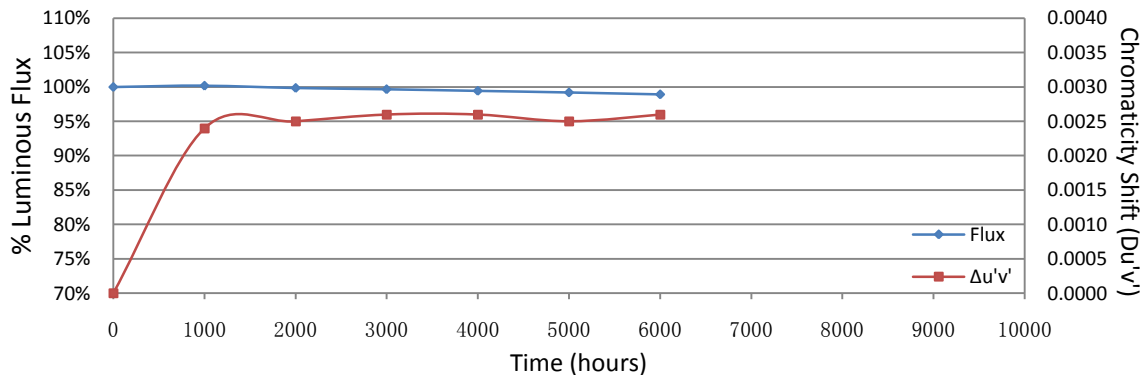
**Reported L<sub>90</sub>:** >36000 hours

### 3.5 Data Set 2, 115°C, 150mA (Forward Voltage)

| No.    | Forward Voltage (V) |         |         |         |         |         |         |
|--------|---------------------|---------|---------|---------|---------|---------|---------|
|        | 0hr(Initial)        | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
| 26     | 3.105               | 3.093   | 3.094   | 3.095   | 3.095   | 3.096   | 3.098   |
| 27     | 3.118               | 3.093   | 3.093   | 3.093   | 3.094   | 3.103   | 3.096   |
| 28     | 3.106               | 3.075   | 3.076   | 3.104   | 3.077   | 3.084   | 3.080   |
| 29     | 3.127               | 3.108   | 3.110   | 3.119   | 3.107   | 3.117   | 3.115   |
| 30     | 3.128               | 3.112   | 3.112   | 3.121   | 3.113   | 3.112   | 3.117   |
| 31     | 3.089               | 3.062   | 3.063   | 3.067   | 3.065   | 3.746   | 3.070   |
| 32     | 3.091               | 3.096   | 3.098   | 3.097   | 3.099   | 3.097   | 3.101   |
| 33     | 3.074               | 3.118   | 3.113   | 3.112   | 3.112   | 3.113   | 3.121   |
| 34     | 3.105               | 3.102   | 3.102   | 3.099   | 3.104   | 3.100   | 3.106   |
| 35     | 3.139               | 3.124   | 3.124   | 3.127   | 3.124   | 3.123   | 3.128   |
| 36     | 3.062               | 3.108   | 3.108   | 3.104   | 3.109   | 3.108   | 3.114   |
| 37     | 3.107               | 3.120   | 3.118   | 3.115   | 3.121   | 3.122   | 3.124   |
| 38     | 3.060               | 3.094   | 3.095   | 3.092   | 3.095   | 3.096   | 3.098   |
| 39     | 3.094               | 3.132   | 3.129   | 3.130   | 3.136   | 3.134   | 3.136   |
| 40     | 3.108               | 3.068   | 3.069   | 3.068   | 3.071   | 3.071   | 3.075   |
| 41     | 3.110               | 3.129   | 3.130   | 3.128   | 3.131   | 3.130   | 3.133   |
| 42     | 3.098               | 3.089   | 3.089   | 3.091   | 3.092   | 3.089   | 3.097   |
| 43     | 3.123               | 3.086   | 3.086   | 3.086   | 3.091   | 3.087   | 3.089   |
| 44     | 3.105               | 3.092   | 3.092   | 3.093   | 3.885   | 3.096   | 3.095   |
| 45     | 3.115               | 3.106   | 3.106   | 3.108   | 3.110   | 3.113   | 3.112   |
| 46     | 3.091               | 3.096   | 3.093   | 3.092   | 3.094   | 3.105   | 3.094   |
| 47     | 3.130               | 3.067   | 3.064   | 3.062   | 3.066   | 3.068   | 3.067   |
| 48     | 3.069               | 3.098   | 3.100   | 3.099   | 3.103   | 3.102   | 3.102   |
| 49     | 3.126               | 3.098   | 3.099   | 3.096   | 3.103   | 3.101   | 3.103   |
| 50     | 3.086               | 3.096   | 3.091   | 3.089   | 3.093   | 3.093   | 3.095   |
| Ave.   | 3.103               | 3.098   | 3.098   | 3.099   | 3.132   | 3.128   | 3.103   |
| Med.   | 3.105               | 3.096   | 3.098   | 3.097   | 3.103   | 3.102   | 3.101   |
| st dev | 0.0214              | 0.0185  | 0.0181  | 0.0182  | 0.1580  | 0.1297  | 0.0185  |
| Min.   | 3.060               | 3.062   | 3.063   | 3.062   | 3.065   | 3.068   | 3.067   |
| Max.   | 3.139               | 3.132   | 3.130   | 3.130   | 3.885   | 3.746   | 3.136   |

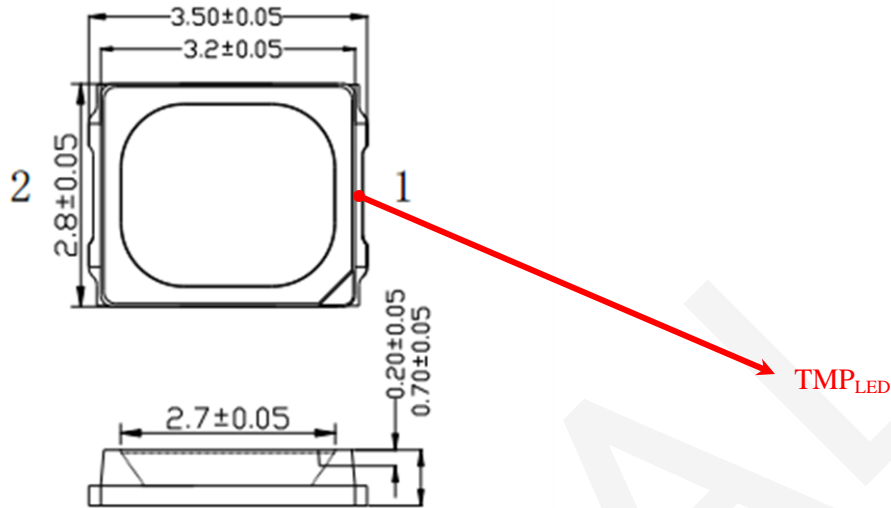
### 3.6 Data Set 2, 115°C, 150mA (Chromaticity Shift)

| No.    | u'     | v'     | CCT(K)  | Chromaticity Shift ( $\Delta u'v'$ ) |         |         |         |         |         |
|--------|--------|--------|---------|--------------------------------------|---------|---------|---------|---------|---------|
|        |        |        |         | 0hr(Initial)                         | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs |
| 26     | 0.2504 | 0.5185 | 3023    | 0.0004                               | 0.0002  | 0.0004  | 0.0004  | 0.0001  | 0.0002  |
| 27     | 0.2508 | 0.5192 | 3008    | 0.0021                               | 0.0024  | 0.0024  | 0.0023  | 0.0025  | 0.0026  |
| 28     | 0.2517 | 0.5200 | 2980    | 0.0007                               | 0.0008  | 0.0008  | 0.0009  | 0.0009  | 0.0009  |
| 29     | 0.2499 | 0.5214 | 3017    | 0.0032                               | 0.0034  | 0.0036  | 0.0035  | 0.0036  | 0.0038  |
| 30     | 0.2505 | 0.5247 | 2982    | 0.0046                               | 0.0049  | 0.0050  | 0.0050  | 0.0050  | 0.0053  |
| 31     | 0.2508 | 0.5193 | 3007    | 0.0014                               | 0.0015  | 0.0017  | 0.0017  | 0.0016  | 0.0017  |
| 32     | 0.2492 | 0.5185 | 3053    | 0.0012                               | 0.0011  | 0.0011  | 0.0011  | 0.0010  | 0.0010  |
| 33     | 0.2526 | 0.5202 | 2958    | 0.0032                               | 0.0034  | 0.0035  | 0.0036  | 0.0036  | 0.0039  |
| 34     | 0.2507 | 0.5186 | 3014    | 0.0019                               | 0.0020  | 0.0020  | 0.0021  | 0.0022  | 0.0023  |
| 35     | 0.2493 | 0.5192 | 3047    | 0.0022                               | 0.0024  | 0.0025  | 0.0025  | 0.0025  | 0.0026  |
| 36     | 0.2522 | 0.5188 | 2977    | 0.0031                               | 0.0033  | 0.0035  | 0.0035  | 0.0034  | 0.0037  |
| 37     | 0.2502 | 0.5204 | 3014    | 0.0016                               | 0.0018  | 0.0019  | 0.0020  | 0.0020  | 0.0020  |
| 38     | 0.2520 | 0.5188 | 2981    | 0.0034                               | 0.0036  | 0.0037  | 0.0038  | 0.0038  | 0.0039  |
| 39     | 0.2507 | 0.5190 | 3012    | 0.0017                               | 0.0020  | 0.0020  | 0.0022  | 0.0022  | 0.0023  |
| 40     | 0.2482 | 0.5171 | 3089    | 0.0031                               | 0.0029  | 0.0029  | 0.0027  | 0.0027  | 0.0026  |
| 41     | 0.2501 | 0.5188 | 3027    | 0.0035                               | 0.0034  | 0.0035  | 0.0034  | 0.0034  | 0.0033  |
| 42     | 0.2490 | 0.5194 | 3052    | 0.0012                               | 0.0015  | 0.0016  | 0.0017  | 0.0017  | 0.0018  |
| 43     | 0.2506 | 0.5177 | 3024    | 0.0021                               | 0.0020  | 0.0020  | 0.0019  | 0.0018  | 0.0019  |
| 44     | 0.2506 | 0.5168 | 3029    | 0.0018                               | 0.0016  | 0.0015  | 0.0013  | 0.0011  | 0.0011  |
| 45     | 0.2511 | 0.5194 | 2999    | 0.0014                               | 0.0017  | 0.0017  | 0.0019  | 0.0019  | 0.0019  |
| 46     | 0.2490 | 0.5179 | 3063    | 0.0049                               | 0.0047  | 0.0046  | 0.0043  | 0.0042  | 0.0041  |
| 47     | 0.2492 | 0.5188 | 3051    | 0.0033                               | 0.0032  | 0.0033  | 0.0032  | 0.0032  | 0.0031  |
| 48     | 0.2515 | 0.5184 | 2995    | 0.0018                               | 0.0021  | 0.0021  | 0.0022  | 0.0024  | 0.0025  |
| 49     | 0.2539 | 0.5188 | 2935    | 0.0040                               | 0.0041  | 0.0042  | 0.0043  | 0.0046  | 0.0046  |
| 50     | 0.2492 | 0.5186 | 3051    | 0.0028                               | 0.0026  | 0.0025  | 0.0023  | 0.0021  | 0.0020  |
| Ave.   | 0.2505 | 0.5191 | 3016    | 0.0024                               | 0.0025  | 0.0026  | 0.0026  | 0.0025  | 0.0026  |
| Med.   | 0.2506 | 0.5188 | 3014    | 0.0021                               | 0.0024  | 0.0024  | 0.0023  | 0.0024  | 0.0025  |
| st dev | 0.0013 | 0.0015 | 35.3755 | 0.0012                               | 0.0012  | 0.0012  | 0.0012  | 0.0012  | 0.0012  |
| Min.   | 0.2482 | 0.5168 | 2935    | 0.0004                               | 0.0002  | 0.0004  | 0.0004  | 0.0001  | 0.0002  |
| Max.   | 0.2539 | 0.5247 | 3089    | 0.0049                               | 0.0049  | 0.0050  | 0.0050  | 0.0050  | 0.0053  |



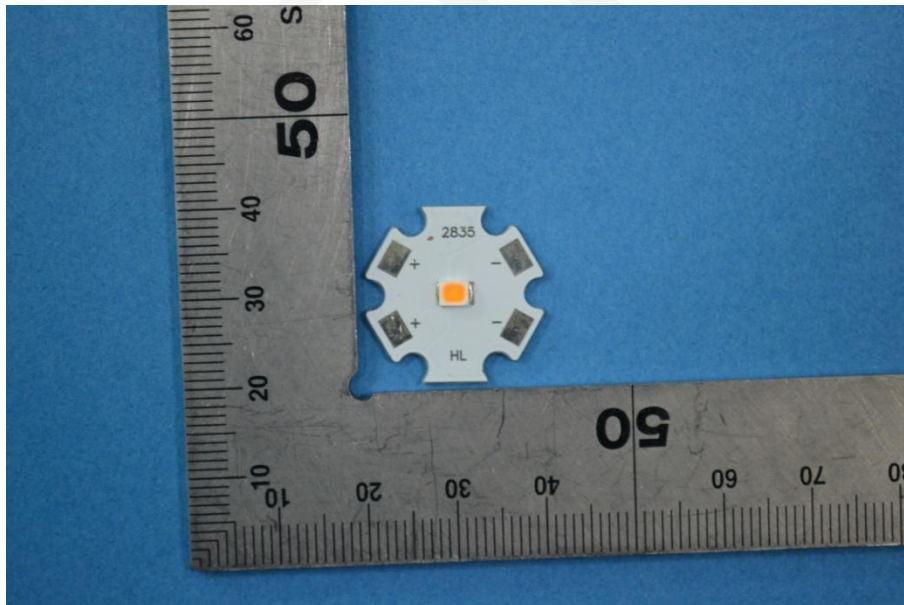
## 4 - EUT Photo

### 4.1 Mechanical Dimensions



All dimensions are in millimeter

### 4.2 EUT Photo



**Attachment B – Family declaration Letter**

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

F I N A L