



# TEST REPORT

According to ANSI/IES LM-80-15  
For

## Hongli Zhihui Group Co.,Ltd. Guangzhou Branch

Room 316, Building 2, No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China

**#Model: HL-AS-PU2835DW-S1-08-PCT-HR3**

<b>Report Type:</b> 9000 Hours Test Report	<b>Product Type:</b> LED Package
<b>Test Engineer:</b>	Pote Wang <i>Pote Wang</i>
<b>Report Number:</b>	RSZ170118517-10-9000-M3
<b>Test Date:</b>	2017-01-18 to 2018-01-31
<b>Report Date:</b>	2020-02-25
<b>Revised Note:</b>	The previous report RSZ170118517-10-9000-M2 is replaced by this report on 2020-02-25
<b>Reviewed By:</b>	Daniel Duan / EE Manager <i>Daniel Duan</i>
<b>Test Facility:</b>	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
<b>Accreditation:</b>	The IAS Accreditation Number TL-460.

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## 1 - General Information

### 1.1 Description of LED Light Sources

#### Sample Size:

50 PCS test samples were in good condition and received on 2017-01-18. The samples were numbered from 1 to 25 and 26 to 50.

#Manufacturer:	Hongli Zihui Group Co.,Ltd. Guangzhou Branch
#Part Number:	HL-AS-PU2835DW-S1-08-PCT-HR3
#Part Type:	LED Package
#Drive Level:	DC 150mA
#Nominal CCT:	2700K
#Power:	0.5W
#Current Density per LED die:	402.25mA/mm <sup>2</sup>
#Power Density per LED die:	1.34W/mm <sup>2</sup>
#CRI:	80
#Die Spacing:	N/A

#### 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.

#### #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:

Test Model Number	Multiple Models	Details
HL-AS-PU2835DW-S1-08-PCT-HR3	HL-AS-PU2835DW-S1-08-PCT-HR3(R9)	Only different Model name for different market
	HL-A-PU2835DW-S1-08-PCT-HR3	
	HL-A-PU2835DW-S1-08-PCT-HR3(R9)	
	HL-A-PU2835DW-S1-08-HR3	
	HL-A-PU2835DW-S1-08-HR3(R9)	
	HL-AS-2835DW-S1-08-PCT-HR3	
	HL-AS-2835DW-S1-08-PCT-HR3(R9)	
	HL-A-2835DW-S1-08-PCT-HR3	
	HL-A-2835DW-S1-08-HR3(R9)	
	HL-A-2835DW-S1-08-HR3	
	HL-A-2835DW-S1-08-HR3(R9)	
	HL-**-PU2835D***W-S1-08*-PCT-HR3-***	1. Only different Model name for different market 2. The "****" is a letter A or AS which stand for the process type. 3. First "****" is a number from 1 to 999 which stand for the brightness level. 4. The "**" is a letter L or None which stand for the bonding wire style. 5. Second "****" is the letter, which stand for the customer code.
	HL-**-PU2835D***W-S1-08*-PCT-HR3(R9)-***	
	HL-**-2835D***W-S1-08*-PCT-HR3-***	
	HL-**-2835D***W-S1-08*-PCT-HR3(R9)-***	
HL-**-PU2835H***W-S1-08*-PCT-HR3-***		
HL-**-PU2835H***W-S1-08*-PCT-HR3(R9)-***		

Test Model Number	Multiple Models	Details
	HL-**-2835H***W-S1-08*-PCT-HR3-***	
	HL-**-2835H***W-S1-08*-PCT-HR3(R9)-***	
	HL-**-PU2835D***W-S1-08*-HR3-***	
	HL-**-PU2835D***W-S1-08*-HR3(R9)-***	
	HL-**-2835D***W-S1-08*-HR3-***	
	HL-**-2835D***W-S1-08*-HR3(R9)-***	
	HL-**-PU2835H***W-S1-08*-HR3-***	
	HL-**-PU2835H***W-S1-08*-HR3(R9)-***	
	HL-**-2835H***W-S1-08*-HR3-***	
	HL-**-2835H***W-S1-08*-HR3(R9)-***	
	SL-*B2835FTA-11EAI	1. Different Model name for different market.
	SL-*B2835FTA-11EAJ	2. "***" is the letter I, N, W which stand for CCT.
	SL-*B2835FTA-11EAK	I means 2200-3700K, N means 3700-4700K, W means above 4700K.
	P*2835W*F5-D01-8D2A*	1. Different Model name for different market 2. First "***" is a letter which stand for special code which do not affect product performance. 3. Second "***" is a number from 1 to 9 which stand for CCT. 1 means 2600-2800K, 2 means 2800-3100K, 3 means 3800-4250K, 4 means 4750-5300K, 5 means 5700-6500K, 6 means 6000-7000K, 8 means 3200-3800K, 9 means 5050-5650K. 4. Third "***" is a serial number from 1 to 9

## 1.2 Standards Used:

- ANSI/IES LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs (This standard was not accredited by IAS)
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by IAS)

## 1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	2017-03-09	2018-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2017-03-03	2018-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2017-03-09	2018-03-09
Standard Light Source	EVERFINE	D062	1011093	2017-09-13	2018-09-13

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2017-03-03	2018-03-03
Multilayer aging machine	BACL	B2-270	20015	2017-03-03	2018-03-03
Multilayer aging machine	BACL	B2-270	20005	2017-09-01	2018-09-01
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	2017-07-07	2018-07-07
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	2017-03-03	2018-03-03

#### 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  $2^{\circ}C$  below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to  $5^{\circ}C$  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  $25^{\circ}C \pm 2^{\circ}C$ , RH <65%.

#### 1.6 Photometric Measurement Method and Uncertainty

Integrating sphere and spectroradiometer is used to measure luminous flux and chromaticity coordinate  $u'v'$ .  $2\pi$  measurement was used and sample was driven by DC power supply. The forward current was regulated to within  $\pm 0.5\%$  of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to  $25^{\circ}C \pm 2^{\circ}C$ , RH <65%. The temperature measurement point was located in the sphere and the temperature was detected by a temperature probe.

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).

## 1.8 Sample Set

### Data Set 1: 85°C, 150mA

Part Number: HL-AS-PU2835DW-S1-08-PCT-HR3  
Number of Units: 25  
Case Temperature: >83°C  
Ambient Temperature: >80°C  
Life Test Drive Current: 150mA  
Measurement Current: 150mA

### Data Set 2: 115°C, 150mA

Part Number: HL-AS-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	$\alpha$ :	$\beta$ :	Reported TM-21 L <sub>70</sub> Lifetime	Reported TM-21 L <sub>90</sub> Lifetime
1	25	0	1000hrs	9000hrs	2.055E-06	1.000	>54000 hours	51000 hours
2	25	0	1000hrs	9000hrs	2.824E-06	1.000	>54000 hours	37000 hours

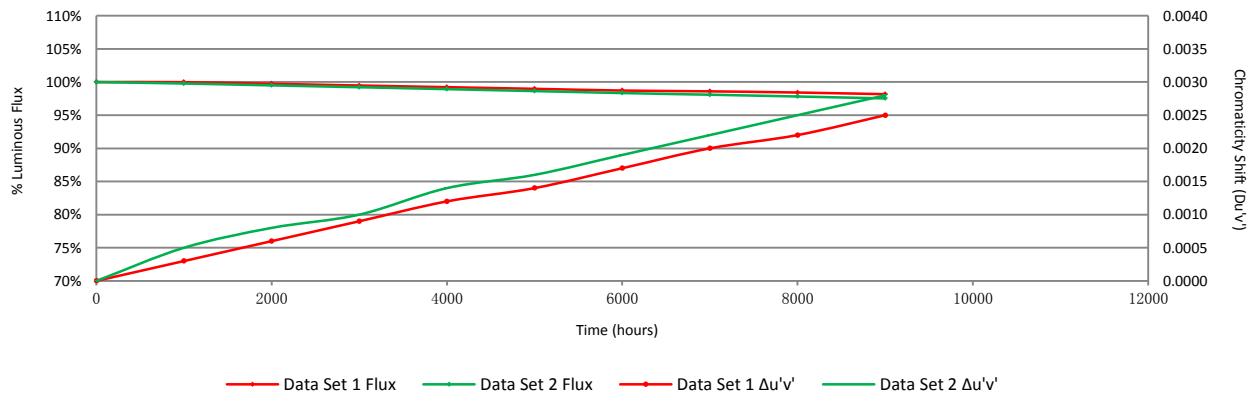
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	99.98%	99.74%	99.48%	99.23%	98.98%	98.72%	98.60%	98.42%	98.17%
2	99.78%	99.50%	99.22%	98.93%	98.64%	98.34%	98.09%	97.82%	97.53%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.0003	0.0006	0.0009	0.0012	0.0014	0.0017	0.0020	0.0022	0.0025
2	0.0005	0.0008	0.0010	0.0014	0.0016	0.0019	0.0022	0.0025	0.0028

Average Lumen Maintenance and Chromaticity Shift VS. Time



### 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	7000hrs	8000hrs	9000hrs
1	71.63	99.93	99.64	99.41	99.25	99.11	98.95	98.79	98.62	98.49
2	70.86	99.75	99.52	99.29	98.96	98.70	98.48	98.39	98.21	98.01
3	70.66	100.04	99.75	99.41	99.19	98.98	98.74	98.71	98.47	98.23
4	70.61	99.99	99.67	99.49	99.16	99.01	98.80	98.67	98.46	98.16
5	71.91	99.90	99.67	99.26	98.87	98.69	98.47	98.23	98.18	98.05
6	71.61	100.04	99.92	99.48	99.15	98.84	98.70	98.59	98.39	98.20
7	72.54	99.96	99.85	99.72	99.53	99.23	98.91	98.70	98.51	98.33
8	70.90	100.17	99.84	99.70	99.61	99.37	98.96	98.83	98.62	98.41
9	72.38	100.01	99.93	99.75	99.49	99.12	98.94	98.88	98.65	98.40
10	70.64	99.94	99.73	99.35	99.11	98.88	98.67	98.49	98.43	98.20
11	70.43	99.96	99.70	99.45	99.19	98.86	98.62	98.44	98.24	97.88
12	71.87	100.04	99.72	99.25	99.04	98.83	98.55	98.51	98.27	98.01
13	70.87	100.07	99.73	99.37	99.20	98.96	98.65	98.50	98.48	98.15
14	70.96	100.03	99.72	99.52	99.21	99.00	98.73	98.68	98.45	98.22
15	71.16	100.07	99.86	99.59	99.26	99.11	98.78	98.59	98.38	98.07
16	72.02	99.89	99.60	99.42	99.24	99.00	98.78	98.56	98.31	98.07
17	71.44	100.04	99.75	99.59	99.43	99.24	98.92	98.87	98.42	98.08
18	71.04	99.97	99.80	99.55	99.28	99.03	98.80	98.65	98.56	98.11
19	71.93	99.96	99.69	99.47	99.10	98.82	98.58	98.44	98.26	97.96
20	70.41	100.03	99.82	99.62	99.29	99.02	98.76	98.69	98.62	98.34
21	70.68	100.06	99.79	99.53	99.12	98.87	98.51	98.49	98.34	98.02
22	70.85	100.10	99.94	99.72	99.48	99.07	98.76	98.66	98.63	98.35
23	72.11	99.82	99.61	99.42	99.36	99.18	98.90	98.67	98.47	98.17
24	71.90	99.92	99.75	99.36	99.10	98.80	98.60	98.55	98.41	98.18
25	72.19	99.82	99.50	99.27	99.07	98.74	98.56	98.30	98.21	98.09
Ave.	71.34	99.98	99.74	99.48	99.23	98.98	98.72	98.60	98.42	98.17
Med.	71.16	99.99	99.73	99.47	99.20	99.00	98.74	98.59	98.43	98.16
st dev	0.6614	0.0964	0.1164	0.1498	0.1784	0.1755	0.1530	0.1655	0.1444	0.1525
Min.	70.41	99.75	99.50	99.25	98.87	98.69	98.47	98.23	98.18	97.88
Max.	72.54	100.17	99.94	99.75	99.61	99.37	98.96	98.88	98.65	98.49



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

No.	Forward Voltage (V)									
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.049	3.037	3.036	3.040	3.040	3.204	3.040	3.050	3.045	3.051
2	3.066	3.045	3.042	3.050	3.046	3.073	3.043	3.057	3.050	3.059
3	3.039	3.036	3.037	3.047	3.033	3.043	3.036	3.038	3.042	3.048
4	3.042	3.033	3.039	3.054	3.035	3.043	3.036	3.039	3.044	3.047
5	3.043	3.032	3.037	3.069	3.033	3.044	3.033	3.037	3.045	3.046
6	3.049	3.043	3.037	3.046	3.038	3.048	3.038	3.047	3.049	3.111
7	3.061	3.060	3.048	3.063	3.047	3.061	3.048	3.060	3.060	3.066
8	3.042	3.042	3.036	3.044	3.036	3.043	3.034	3.055	3.046	3.078
9	3.044	3.044	3.038	3.044	3.038	3.074	3.039	3.049	3.049	3.053
10	3.035	3.031	3.027	3.046	3.027	3.034	3.026	3.039	3.036	3.040
11	3.047	3.046	3.042	3.046	3.041	3.065	3.040	3.048	3.050	3.053
12	3.052	3.062	3.047	3.055	3.054	3.082	3.046	3.051	3.058	3.061
13	3.080	3.037	3.032	3.031	3.031	3.040	3.029	3.035	3.040	3.042
14	3.046	3.054	3.045	3.045	3.042	3.048	3.044	3.100	3.054	3.055
15	3.037	3.036	3.031	3.035	3.033	3.037	3.031	3.095	3.040	3.045
16	3.048	3.043	3.044	3.045	3.047	3.052	3.043	3.051	3.051	3.056
17	3.055	3.049	3.048	3.052	3.065	3.062	3.050	3.055	3.057	3.061
18	3.043	3.039	3.039	3.039	3.056	3.049	3.043	3.043	3.048	3.052
19	3.048	3.048	3.044	3.046	3.053	3.072	3.052	3.053	3.051	3.055
20	3.034	3.028	3.032	3.029	3.036	3.030	3.031	3.033	3.037	3.042
21	3.060	3.081	3.064	3.056	3.056	3.058	3.067	3.063	3.068	3.069
22	3.041	3.050	3.041	3.039	3.044	3.041	3.053	3.045	3.049	3.051
23	3.039	3.045	3.045	3.039	3.033	3.060	3.036	3.040	3.046	3.046
24	3.039	3.056	3.039	3.034	3.031	3.040	3.041	3.037	3.043	3.043
25	3.059	3.071	3.042	3.041	3.037	3.062	3.046	3.043	3.049	3.049
Ave.	3.048	3.046	3.040	3.045	3.041	3.059	3.041	3.051	3.048	3.055
Med.	3.046	3.044	3.039	3.045	3.038	3.049	3.040	3.048	3.049	3.052
st dev	0.0107	0.0127	0.0073	0.0094	0.0096	0.0333	0.0089	0.0163	0.0073	0.0148
Min.	3.034	3.028	3.027	3.029	3.027	3.030	3.026	3.033	3.036	3.040
Max.	3.080	3.081	3.064	3.069	3.065	3.204	3.067	3.100	3.068	3.111

**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	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2610	0.5249	2743	0.0004	0.0006	0.0009	0.0013	0.0015	0.0017	0.0020	0.0024	0.0025
2	0.2609	0.5246	2745	0.0002	0.0006	0.0010	0.0013	0.0014	0.0018	0.0021	0.0024	0.0026
3	0.2626	0.5261	2703	0.0001	0.0005	0.0007	0.0010	0.0012	0.0015	0.0018	0.0020	0.0023
4	0.2604	0.5242	2759	0.0002	0.0006	0.0008	0.0011	0.0014	0.0016	0.0019	0.0022	0.0024
5	0.2620	0.5289	2704	0.0004	0.0008	0.0011	0.0014	0.0016	0.0019	0.0022	0.0024	0.0027
6	0.2619	0.5290	2705	0.0002	0.0006	0.0008	0.0011	0.0013	0.0016	0.0019	0.0021	0.0023
7	0.2599	0.5293	2746	0.0001	0.0006	0.0007	0.0010	0.0013	0.0015	0.0017	0.0019	0.0023
8	0.2613	0.5257	2731	0.0001	0.0005	0.0007	0.0010	0.0013	0.0015	0.0017	0.0020	0.0023
9	0.2598	0.5258	2762	0.0002	0.0005	0.0007	0.0011	0.0013	0.0016	0.0018	0.0020	0.0023
10	0.2616	0.5285	2715	0.0004	0.0006	0.0009	0.0012	0.0014	0.0017	0.0019	0.0021	0.0023
11	0.2598	0.5269	2759	0.0003	0.0006	0.0008	0.0011	0.0013	0.0016	0.0019	0.0021	0.0024
12	0.2585	0.5275	2785	0.0004	0.0008	0.0010	0.0014	0.0016	0.0018	0.0021	0.0023	0.0026
13	0.2609	0.5245	2745	0.0003	0.0004	0.0008	0.0011	0.0013	0.0014	0.0018	0.0022	0.0024
14	0.2597	0.5255	2767	0.0003	0.0006	0.0009	0.0011	0.0013	0.0016	0.0019	0.0022	0.0025
15	0.2625	0.5289	2694	0.0003	0.0005	0.0009	0.0011	0.0013	0.0016	0.0018	0.0021	0.0023
16	0.2585	0.5245	2799	0.0004	0.0009	0.0012	0.0015	0.0018	0.0021	0.0024	0.0026	0.0028
17	0.2605	0.5264	2746	0.0004	0.0007	0.0010	0.0012	0.0015	0.0018	0.0021	0.0023	0.0025
18	0.2617	0.5258	2724	0.0004	0.0006	0.0009	0.0012	0.0014	0.0018	0.0020	0.0022	0.0025
19	0.2633	0.5316	2667	0.0004	0.0008	0.0012	0.0015	0.0017	0.0020	0.0023	0.0025	0.0028
20	0.2606	0.5251	2749	0.0003	0.0005	0.0008	0.0011	0.0013	0.0016	0.0020	0.0021	0.0023
21	0.2583	0.5288	2783	0.0005	0.0011	0.0013	0.0016	0.0019	0.0021	0.0026	0.0028	0.0029
22	0.2613	0.5262	2731	0.0003	0.0006	0.0008	0.0011	0.0013	0.0016	0.0020	0.0022	0.0024
23	0.2611	0.5247	2740	0.0004	0.0006	0.0009	0.0012	0.0013	0.0017	0.0022	0.0022	0.0024
24	0.2593	0.5263	2772	0.0003	0.0006	0.0009	0.0013	0.0014	0.0017	0.0020	0.0023	0.0024
25	0.2612	0.5263	2732	0.0003	0.0006	0.0007	0.0012	0.0013	0.0016	0.0020	0.0022	0.0024
Ave.	0.2607	0.5266	2740	0.0003	0.0006	0.0009	0.0012	0.0014	0.0017	0.0020	0.0022	0.0025
Med.	0.2609	0.5262	2745	0.0003	0.0006	0.0009	0.0012	0.0013	0.0016	0.0020	0.0022	0.0024
st dev	0.0013	0.0019	30.9344	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2583	0.5242	2667	0.0001	0.0004	0.0007	0.0010	0.0012	0.0014	0.0017	0.0019	0.0023
Max.	0.2633	0.5316	2799	0.0005	0.0011	0.0013	0.0016	0.0019	0.0021	0.0026	0.0028	0.0029

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

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	72.99	99.82	99.49	99.14	98.86	98.58	98.31	98.05	97.79	97.52
27	71.52	99.92	99.65	99.34	99.11	98.78	98.59	98.42	98.08	97.85
28	71.29	99.78	99.47	99.21	98.92	98.56	98.32	98.12	97.81	97.46
29	71.75	99.80	99.61	99.29	99.00	98.72	98.47	98.22	97.97	97.73
30	71.32	99.64	99.38	99.10	98.82	98.50	98.18	98.04	97.78	97.53
31	71.12	99.73	99.56	99.30	98.90	98.50	98.14	97.79	97.68	97.48
32	72.28	99.72	99.39	99.13	98.95	98.56	98.17	97.84	97.57	97.25
33	69.57	99.86	99.67	99.35	99.14	98.81	98.36	98.06	97.79	97.31
34	71.17	99.76	99.55	99.20	98.86	98.67	98.29	98.08	97.68	97.29
35	71.38	99.65	99.34	99.13	98.84	98.63	98.30	98.07	97.62	97.31
36	72.05	99.58	99.21	98.96	98.72	98.40	98.17	97.97	97.74	97.64
37	71.45	99.68	99.27	98.92	98.57	98.40	98.17	97.80	97.66	97.54
38	72.40	99.67	99.35	99.13	98.73	98.45	98.14	97.82	97.49	97.11
39	72.07	99.89	99.54	99.39	99.08	98.83	98.56	98.38	98.18	98.04
40	72.26	99.72	99.50	99.31	99.11	98.91	98.53	98.19	97.94	97.70
41	72.45	99.71	99.48	99.21	98.92	98.66	98.26	98.01	97.79	97.52
42	72.33	99.59	99.32	99.06	98.84	98.59	98.40	98.05	97.69	97.37
43	72.29	99.72	99.28	98.89	98.49	98.30	98.08	97.76	97.37	97.05
44	71.01	99.97	99.63	99.35	99.01	98.75	98.51	98.27	98.07	97.68
45	70.33	99.94	99.80	99.46	99.22	98.86	98.64	98.54	98.35	98.01
46	70.85	99.77	99.49	99.28	98.96	98.59	98.31	98.08	97.78	97.56
47	71.50	99.90	99.61	99.36	99.01	98.81	98.45	98.21	97.99	97.64
48	70.92	99.93	99.72	99.42	99.11	98.82	98.49	98.28	98.03	97.67
49	70.74	99.87	99.63	99.18	98.98	98.63	98.23	98.09	97.84	97.60
50	72.30	99.99	99.65	99.42	99.07	98.71	98.38	98.13	97.86	97.39
Ave.	71.57	99.78	99.50	99.22	98.93	98.64	98.34	98.09	97.82	97.53
Med.	71.50	99.77	99.50	99.21	98.95	98.63	98.31	98.08	97.79	97.53
st dev	0.7811	0.1197	0.1543	0.1573	0.1744	0.1604	0.1586	0.1982	0.2201	0.2434
Min.	69.57	99.58	99.21	98.89	98.49	98.30	98.08	97.76	97.37	97.05
Max.	72.99	99.99	99.80	99.46	99.22	98.91	98.64	98.54	98.35	98.04

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

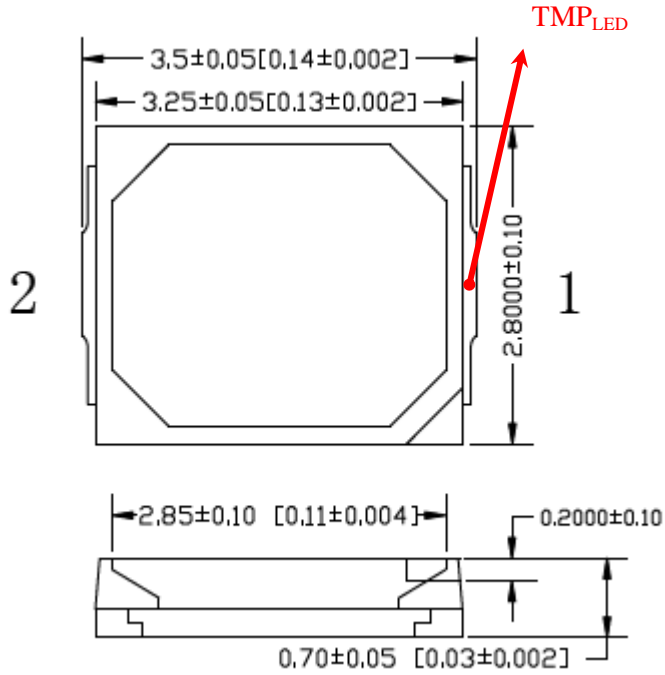
No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	3.040	3.049	3.048	3.035	3.046	3.090	3.038	3.035	3.041	3.045
27	3.051	3.053	3.074	3.048	3.053	3.073	3.043	3.059	3.055	3.055
28	3.046	3.032	3.029	3.035	3.035	3.048	3.027	3.037	3.038	3.041
29	3.093	3.031	3.030	3.036	3.033	3.097	3.029	3.053	3.041	3.043
30	3.178	3.043	3.068	3.043	3.039	3.063	3.042	3.049	3.049	3.050
31	3.049	3.044	3.041	3.045	3.062	3.042	3.043	3.093	3.049	3.052
32	3.048	3.037	3.040	3.043	3.037	3.037	3.039	3.065	3.049	3.049
33	3.045	3.048	3.039	3.043	3.039	3.044	3.046	3.059	3.052	3.052
34	3.042	3.049	3.045	3.083	3.042	3.044	3.058	3.089	3.051	3.053
35	3.049	3.049	3.049	3.074	3.044	3.045	3.047	3.198	3.055	3.059
36	3.045	3.041	3.041	3.042	3.040	3.041	3.040	3.058	3.049	3.052
37	3.044	3.060	3.067	3.043	3.037	3.043	3.036	3.053	3.048	3.050
38	3.037	3.036	3.031	3.039	3.030	3.043	3.033	3.040	3.043	3.046
39	3.040	3.040	3.036	3.075	3.035	3.043	3.038	3.039	3.047	3.050
40	3.045	3.042	3.043	3.048	3.041	3.051	3.049	3.045	3.051	3.056
41	3.042	3.037	3.051	3.043	3.041	3.043	3.037	3.042	3.048	3.054
42	3.036	3.031	3.038	3.037	3.055	3.034	3.032	3.035	3.042	3.046
43	3.035	3.029	3.038	3.042	3.045	3.032	3.033	3.036	3.041	3.046
44	3.065	3.049	3.055	3.045	3.081	3.039	3.049	3.045	3.050	3.055
45	3.042	3.037	3.042	3.037	3.083	3.032	3.067	3.037	3.042	3.045
46	3.058	3.038	3.039	3.048	3.138	3.035	3.101	3.039	3.045	3.049
47	3.047	3.038	3.052	3.052	3.180	3.038	3.046	3.053	3.047	3.053
48	3.049	3.056	3.056	3.049	3.150	3.046	3.057	3.049	3.053	3.068
49	3.049	3.045	3.033	3.040	3.062	3.036	3.041	3.045	3.040	3.044
50	3.051	3.056	3.049	3.050	3.142	3.046	3.059	3.060	3.055	3.059
Ave.	3.053	3.043	3.045	3.047	3.064	3.047	3.045	3.057	3.047	3.051
Med.	3.046	3.042	3.042	3.043	3.044	3.043	3.042	3.049	3.048	3.050
st dev	0.0284	0.0085	0.0118	0.0124	0.0423	0.0165	0.0152	0.0331	0.0051	0.0060
Min.	3.035	3.029	3.029	3.035	3.030	3.032	3.027	3.035	3.038	3.041
Max.	3.178	3.060	3.074	3.083	3.180	3.097	3.101	3.198	3.055	3.068

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

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )								
	Ohr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2592	0.5261	2776	0.0005	0.0009	0.0012	0.0016	0.0017	0.0021	0.0025	0.0027	0.0030
27	0.2601	0.5263	2756	0.0006	0.0009	0.0009	0.0013	0.0015	0.0018	0.0021	0.0024	0.0027
28	0.2617	0.5267	2719	0.0005	0.0008	0.0011	0.0015	0.0017	0.0019	0.0022	0.0025	0.0029
29	0.2622	0.5295	2698	0.0005	0.0007	0.0009	0.0011	0.0014	0.0017	0.0020	0.0023	0.0026
30	0.2611	0.5282	2725	0.0004	0.0007	0.0010	0.0013	0.0014	0.0019	0.0021	0.0024	0.0027
31	0.2630	0.5284	2686	0.0004	0.0007	0.0011	0.0013	0.0016	0.0019	0.0022	0.0024	0.0028
32	0.2600	0.5247	2765	0.0005	0.0009	0.0011	0.0013	0.0016	0.0019	0.0022	0.0025	0.0029
33	0.2628	0.5263	2697	0.0005	0.0007	0.0011	0.0013	0.0016	0.0018	0.0021	0.0022	0.0025
34	0.2625	0.5274	2700	0.0005	0.0008	0.0012	0.0015	0.0016	0.0019	0.0022	0.0026	0.0028
35	0.2591	0.5278	2769	0.0004	0.0007	0.0009	0.0012	0.0016	0.0017	0.0021	0.0024	0.0026
36	0.2612	0.5265	2732	0.0008	0.0011	0.0014	0.0017	0.0020	0.0021	0.0024	0.0029	0.0031
37	0.2628	0.5280	2691	0.0007	0.0009	0.0011	0.0015	0.0017	0.0019	0.0022	0.0026	0.0028
38	0.2599	0.5247	2766	0.0005	0.0008	0.0011	0.0014	0.0017	0.0019	0.0022	0.0025	0.0029
39	0.2624	0.5307	2688	0.0005	0.0008	0.0010	0.0014	0.0016	0.0019	0.0022	0.0025	0.0028
40	0.2615	0.5301	2709	0.0004	0.0007	0.0010	0.0013	0.0016	0.0018	0.0022	0.0025	0.0027
41	0.2605	0.5282	2738	0.0004	0.0007	0.0011	0.0013	0.0016	0.0018	0.0021	0.0025	0.0026
42	0.2625	0.5290	2694	0.0006	0.0009	0.0011	0.0014	0.0017	0.0019	0.0023	0.0025	0.0028
43	0.2625	0.5287	2695	0.0007	0.0009	0.0011	0.0015	0.0018	0.0021	0.0023	0.0027	0.0029
44	0.2611	0.5282	2725	0.0004	0.0007	0.0007	0.0013	0.0016	0.0019	0.0021	0.0025	0.0026
45	0.2623	0.5267	2707	0.0005	0.0008	0.0011	0.0012	0.0017	0.0019	0.0021	0.0025	0.0028
46	0.2611	0.5288	2723	0.0005	0.0008	0.0010	0.0013	0.0016	0.0019	0.0021	0.0026	0.0027
47	0.2616	0.5273	2719	0.0004	0.0007	0.0010	0.0013	0.0016	0.0019	0.0022	0.0027	0.0028
48	0.2614	0.5265	2725	0.0004	0.0008	0.0010	0.0013	0.0016	0.0018	0.0021	0.0025	0.0027
49	0.2649	0.5276	2649	0.0004	0.0007	0.0010	0.0013	0.0015	0.0019	0.0021	0.0023	0.0026
50	0.2601	0.5274	2750	0.0004	0.0007	0.0010	0.0013	0.0019	0.0021	0.0022	0.0026	0.0028
Ave.	0.2615	0.5276	2720	0.0005	0.0008	0.0010	0.0014	0.0016	0.0019	0.0022	0.0025	0.0028
Med.	0.2615	0.5276	2719	0.0005	0.0008	0.0011	0.0013	0.0016	0.0019	0.0022	0.0025	0.0028
st dev	0.0013	0.0015	31.2875	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2591	0.5247	2649	0.0004	0.0007	0.0007	0.0011	0.0014	0.0017	0.0020	0.0022	0.0025
Max.	0.2649	0.5307	2776	0.0008	0.0011	0.0014	0.0017	0.0020	0.0021	0.0025	0.0029	0.0031

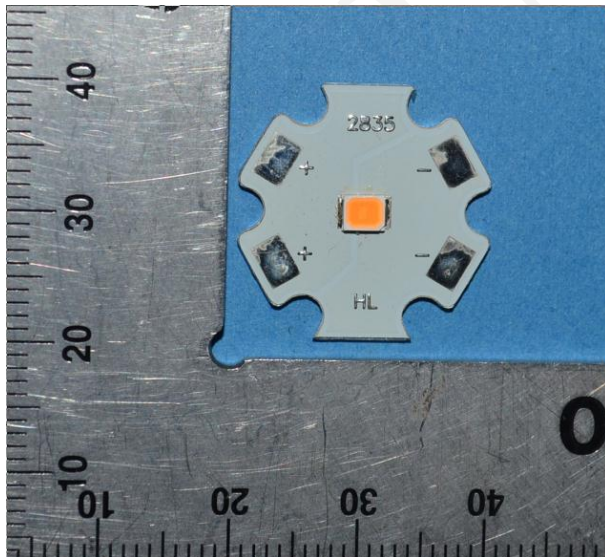
#### 4 - DUT Photo

##### 4.1 Mechanical Dimensions



All dimensions are in millimeter

##### 4.2 DUT Photo



### 4.3 Report Revision

Report Number	Report Date	Contents
RSZ170118517-10-9000	2018-02-09	Original report.
RSZ170118517-10-9000-M1	2019-01-14	Update the Logo of lab on the Page1 Update Company name and address on page 1.
RSZ170118517-10-9000-M2	2019-04-15	Update the Family cover model.
RSZ170118517-10-9000-M3	2020-02-25	Update the Family cover model.

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## Directions

1. The information marked “superscript #” is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
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\*\*\*\*\*END OF REPORT\*\*\*\*\*