TEST REPORT

ACCORDING TO IES LM-80-2015
For

Shenzhen Runlite Technology Co.,Ltd

Building A15, Tantou the 4th Industrial Estate, SongGang Town, BaoAn District, ShenZhen, China.

Model: 26mm Filament LED

Report Type: 6000 Hours Test Report	**Product Type:** LED Array
Test Engineer:	Pote Wang
Report Number:	RSZ161221556-10
Test Date:	2017-01-04 to 2017-09-12
Report Date:	2017-09-23
Reviewed By:	Daniel Duan / EE Manager
Test Facility:	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588

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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

24 PCS samples were received on 2016-12-21. The samples were numbered from 1 to 12 , and 13 to 24.

Manufacturer:	Shenzhen Runlite Technology Co.,Ltd
Part Number:	26mm Filament LED
Part Type:	LED Array
Drive Level:	DC 15mA
Nominal CCT:	2700K

1.2 Standards Used:

- IESNA LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs(This test method was not accredited by IAS)
- 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 Testing Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	0.3m	2017-03-09	2018-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2017-03-03	2018-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2017-03-09	2018-03-09
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-13
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	300VA	2017-03-03	2018-03-03
Multilayer aging machine	BACL	B2-270	20013	25°C~130°C	2017-09-01	2018-09-01
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	(50/15A)	2016-07-07	2017-07-06
DC Power Supply	BACL	B25001	90020	250V,0~1A	2016-12-21	2017-12-21

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Adjustable constant-current DC switching power supply	GUTE	DK-60V20A	120 5036	1200W	2017-08-28	2018-08-28

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 ±3% of the specified value of the manufacturer during maintenance test, and was within ±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°C below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to 5°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 ±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°C ± 2°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'*. 2π measurement was used and sample was drived by DC power supply. Luminous flux and chromaticity coordinate was scaled by halogen reference lamp. The ambient temperature during test was set to 25°C ± 2°C, RH <65%.

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°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,15mA

Part Number:	26mm Filament LED
Number of Units:	12
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	15mA
Measurement Current:	15mA

Data Set 2: 105°C,15mA

Part Number:	26mm Filament LED
Number of Units:	12
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	15mA
Measurement Current:	15mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval(hours)	Test Duration(hours)	Reported TM-21 L_{70} Lifetime
1	12	0	1000	6000	>33,000hours
2	12	0	1000	6000	>33,000hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000
1	99.80%	99.58%	99.05%	98.48%	97.67%	97.16%
2	99.62%	99.32%	98.60%	97.82%	96.92%	96.19%

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000
1	0.0003	0.0006	0.0009	0.0010	0.0012	0.0015
2	0.0005	0.0006	0.0008	0.0009	0.0011	0.0013

3 - Test Data

3.1 Data Set 1, 85°C, 15mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	118.71	99.79	99.53	98.94	98.41	97.68	97.16
2	119.23	99.82	99.57	99.07	98.45	97.53	97.17
3	118.45	99.83	99.58	99.07	98.54	97.93	97.26
4	116.62	99.77	99.49	99.00	98.57	97.74	97.14
5	121.84	99.84	99.52	98.95	98.29	97.37	96.86
6	117.41	99.80	99.63	99.06	98.47	97.80	97.18
7	120.02	99.80	99.58	99.06	98.42	97.67	97.14
8	118.71	99.81	99.61	99.00	98.43	97.67	97.19
9	125.23	99.80	99.64	99.11	98.59	97.77	97.40
10	120.28	99.73	99.53	99.04	98.49	97.86	97.31
11	118.32	99.81	99.66	99.15	98.53	97.31	96.98
12	116.49	99.79	99.59	99.11	98.61	97.70	97.16
Ave.	119.28	99.80	99.58	99.05	98.48	97.67	97.16
Med.	118.71	99.80	99.58	99.06	98.48	97.69	97.17
st dev	2.41	0.0305	0.0512	0.0650	0.0910	0.1838	0.1402
Min.	116.49	99.73	99.49	98.94	98.29	97.31	96.86
Max.	125.23	99.84	99.66	99.15	98.61	97.93	97.40

TM-21 Projection:

Test Duration: 6000 hours

Failures Observed: 0

α: 5.655E-06

β: 1.006

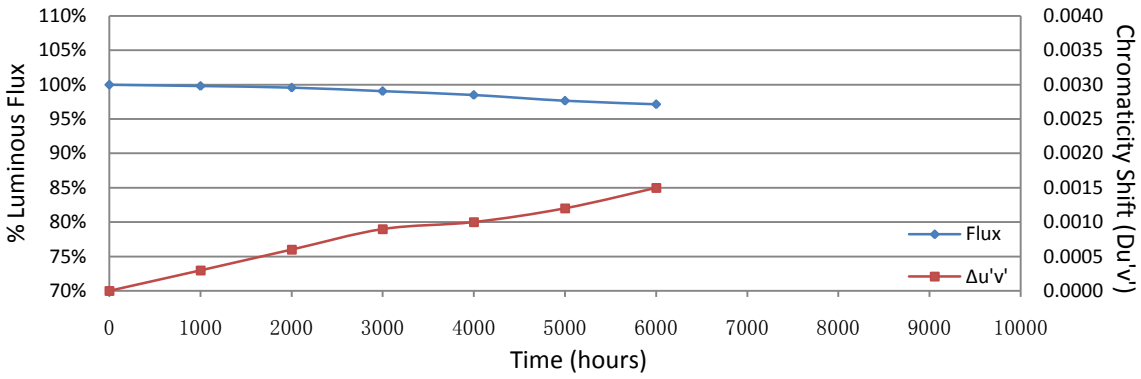
Reported L_{70}: >33000 hours

3.2 Data Set 1, 85°C, 15mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	54.85	55.13	55.37	55.02	54.91	55.14	54.86
2	55.06	55.34	55.33	55.01	54.85	55.07	54.86
3	55.09	55.35	55.27	54.99	54.79	55.02	54.80
4	55.17	55.34	55.27	55.02	54.77	55.07	54.81
5	55.36	55.27	55.28	54.99	54.76	55.08	54.77
6	55.16	55.33	55.26	54.98	54.75	54.86	54.86
7	55.15	55.41	55.25	54.96	54.76	55.01	54.84
8	55.09	55.31	55.25	54.97	54.74	54.81	54.76
9	55.97	55.31	55.33	54.97	54.71	54.76	54.77
10	55.07	55.31	55.30	54.94	54.78	54.98	54.84
11	55.08	55.28	55.31	54.94	54.73	55.15	54.82
12	55.06	55.26	55.30	54.93	54.71	55.10	54.78
Ave.	55.18	55.30	55.29	54.98	54.77	55.00	54.81
Med.	55.09	55.31	55.29	54.98	54.76	55.05	54.82
st dev	0.28	0.07	0.04	0.03	0.06	0.13	0.04
Min.	54.85	55.13	55.25	54.93	54.71	54.76	54.76
Max.	55.97	55.41	55.37	55.02	54.91	55.15	54.86

3.3 Data Set 1, 85°C, 15mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2585	0.5287	2780	0.0006	0.0009	0.0011	0.0013	0.0017	0.0024
2	0.2576	0.5273	2804	0.0005	0.0010	0.0011	0.0014	0.0015	0.0016
3	0.2595	0.5288	2758	0.0004	0.0008	0.0009	0.0014	0.0016	0.0020
4	0.2601	0.5298	2740	0.0005	0.0007	0.0011	0.0013	0.0014	0.0015
5	0.2594	0.5286	2760	0.0001	0.0003	0.0008	0.0009	0.0005	0.0012
6	0.2605	0.5300	2732	0.0005	0.0006	0.0011	0.0013	0.0018	0.0018
7	0.2595	0.5291	2756	0.0004	0.0006	0.0011	0.0010	0.0013	0.0017
8	0.2576	0.5281	2800	0.0000	0.0005	0.0004	0.0003	0.0007	0.0005
9	0.2594	0.5293	2758	0.0006	0.0007	0.0006	0.0005	0.0008	0.0009
10	0.2591	0.5290	2764	0.0002	0.0004	0.0007	0.0008	0.0009	0.0011
11	0.2595	0.5293	2756	0.0003	0.0004	0.0009	0.0010	0.0013	0.0015
12	0.2593	0.5299	2756	0.0001	0.0001	0.0006	0.0009	0.0014	0.0016
Ave.	0.2592	0.5290	2764	0.0003	0.0006	0.0009	0.0010	0.0012	0.0015
Med.	0.2594	0.5291	2758	0.0004	0.0006	0.0009	0.0010	0.0013	0.0016
st dev	0.0009	0.0008	21	0.0002	0.0002	0.0002	0.0004	0.0004	0.0005
Min.	0.2576	0.5273	2732	0.0000	0.0001	0.0004	0.0003	0.0005	0.0005
Max.	0.2605	0.5300	2804	0.0006	0.0010	0.0011	0.0014	0.0018	0.0024



3.4 Data Set 2, 105°C, 15mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
13	118.58	99.60	99.33	98.57	97.73	96.96	96.15
14	117.01	99.62	99.27	98.56	97.74	97.30	96.56
15	125.10	99.66	99.30	98.57	97.77	96.95	96.02
16	122.89	99.56	99.21	98.37	97.63	96.57	95.91
17	118.45	99.64	99.32	98.67	97.84	96.98	96.34
18	123.67	99.66	99.36	98.67	97.96	97.00	96.26
19	118.58	99.61	99.33	98.57	97.73	97.23	96.45
20	125.89	99.65	99.43	98.77	98.03	96.82	96.00
21	125.23	99.56	99.27	98.58	97.83	96.78	96.16
22	118.97	99.65	99.33	98.55	97.81	96.60	95.97
23	120.15	99.59	99.32	98.68	97.84	96.84	96.31
24	125.13	99.70	99.42	98.66	97.86	96.97	96.08
Ave.	121.64	99.62	99.32	98.60	97.82	96.92	96.19
Med.	121.52	99.63	99.32	98.58	97.82	96.96	96.15
st dev	3.31	0.0423	0.0615	0.0981	0.1070	0.2159	0.2041
Min.	117.01	99.56	99.21	98.37	97.63	96.57	95.91
Max.	125.89	99.70	99.43	98.77	98.03	97.30	96.56

TM-21 Projection:

Test Duration: 6000 hours

Failures Observed: 0

α: 7.329E-06

β: 1.006

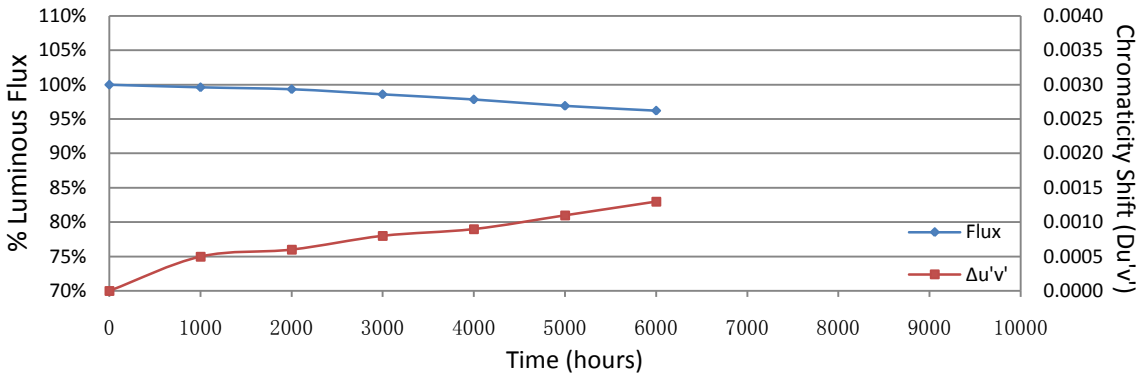
Reported L_{70}: >33000 hours

3.5 Data Set 2, 105°C, 15mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
13	55.17	55.18	55.37	54.98	54.77	54.87	54.98
14	55.13	55.27	55.31	54.95	54.75	54.87	54.89
15	55.45	55.19	55.30	54.96	54.75	54.80	54.89
16	55.40	55.17	55.26	54.94	54.74	54.90	54.94
17	54.99	55.14	55.31	54.95	54.74	54.87	54.89
18	55.38	55.19	55.28	54.95	54.75	54.59	54.95
19	55.12	55.11	55.28	54.97	54.72	54.84	54.91
20	55.35	55.26	55.28	54.98	54.73	54.62	54.87
21	55.41	55.15	55.30	54.96	54.71	54.78	54.91
22	55.08	55.12	55.31	54.97	54.70	54.83	54.91
23	55.04	55.10	55.25	54.83	54.67	54.86	54.89
24	55.35	55.19	55.26	54.89	54.65	54.90	54.92
Ave.	55.24	55.17	55.29	54.94	54.72	54.81	54.91
Med.	55.26	55.18	55.29	54.96	54.74	54.85	54.91
st dev	0.17	0.05	0.03	0.04	0.04	0.10	0.03
Min.	54.99	55.10	55.25	54.83	54.65	54.59	54.87
Max.	55.45	55.27	55.37	54.98	54.77	54.90	54.98

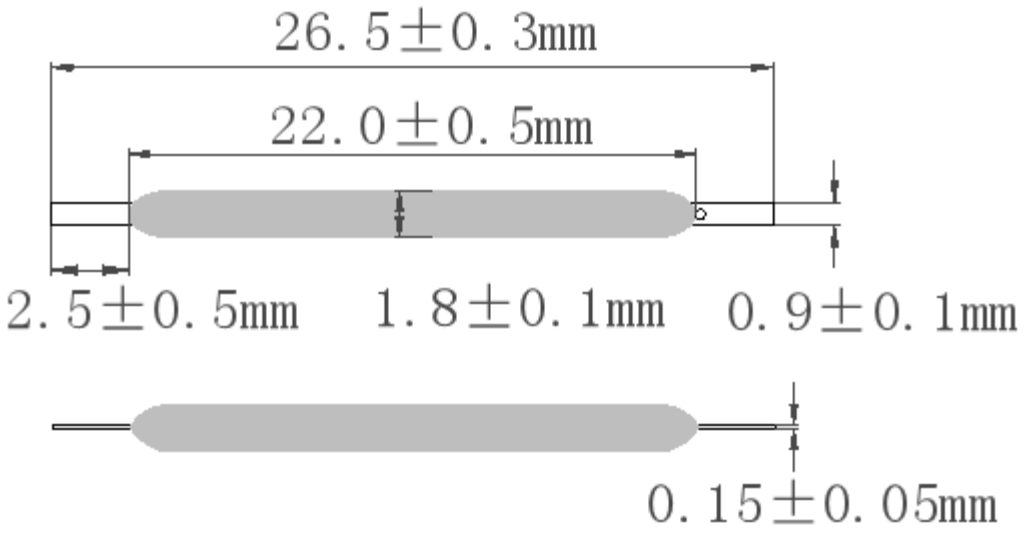
3.6 Data Set 2, 105°C, 15mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
13	0.2586	0.5289	2776	0.0002	0.0004	0.0003	0.0003	0.0009	0.0011
14	0.2596	0.5294	2752	0.0002	0.0004	0.0007	0.0007	0.0010	0.0012
15	0.2597	0.5294	2750	0.0005	0.0008	0.0005	0.0008	0.0011	0.0013
16	0.2579	0.5270	2798	0.0006	0.0008	0.0010	0.0012	0.0014	0.0015
17	0.2598	0.5293	2748	0.0004	0.0003	0.0007	0.0010	0.0009	0.0015
18	0.2581	0.5281	2790	0.0006	0.0009	0.0009	0.0011	0.0012	0.0015
19	0.2600	0.5300	2742	0.0004	0.0004	0.0006	0.0006	0.0010	0.0004
20	0.2586	0.5293	2774	0.0005	0.0004	0.0007	0.0011	0.0015	0.0013
21	0.2580	0.5272	2798	0.0005	0.0005	0.0010	0.0009	0.0007	0.0014
22	0.2588	0.5286	2774	0.0002	0.0006	0.0010	0.0009	0.0013	0.0014
23	0.2584	0.5278	2784	0.0006	0.0010	0.0008	0.0013	0.0014	0.0017
24	0.2595	0.5294	2751	0.0006	0.0010	0.0013	0.0012	0.0011	0.0011
Ave.	0.2589	0.5287	2770	0.0005	0.0006	0.0008	0.0009	0.0011	0.0013
Med.	0.2587	0.5291	2774	0.0005	0.0006	0.0008	0.0010	0.0011	0.0013
st dev	0.0008	0.0010	20	0.0002	0.0003	0.0003	0.0003	0.0002	0.0003
Min.	0.2579	0.5270	2742	0.0002	0.0003	0.0003	0.0003	0.0007	0.0004
Max.	0.2600	0.5300	2798	0.0006	0.0010	0.0013	0.0013	0.0015	0.0017



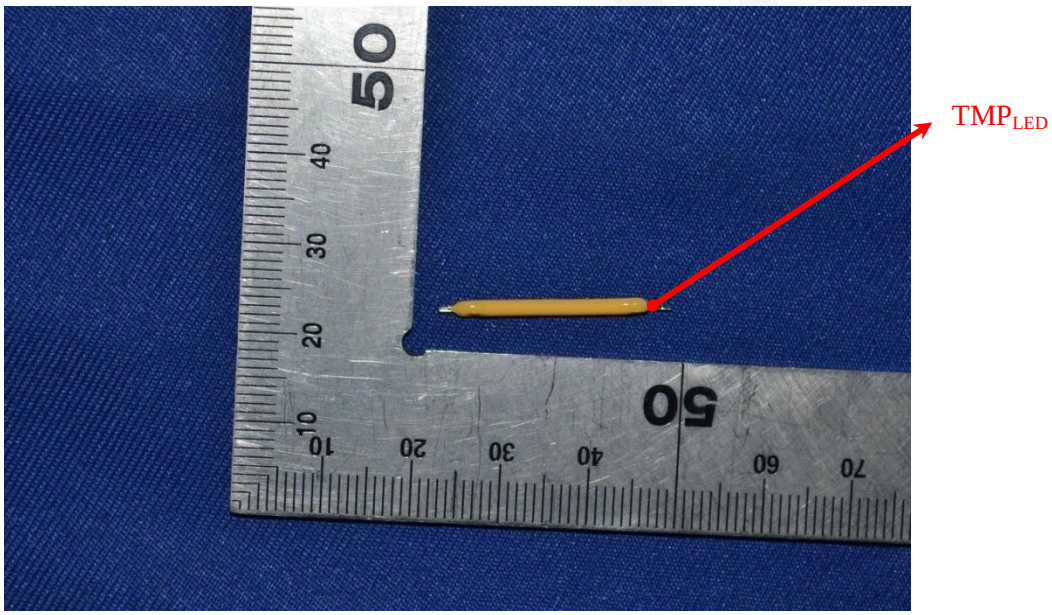
4 - EUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



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