



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-C3535F4IR3EA-ZW


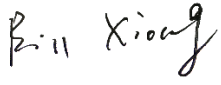
Report Type: 10000 Hours Test Report	Product Type: LED Package
Reviewed By:	Pote Wang 
Report Number:	SZ2210118-62419E-10-10000
Test Date:	2021-01-18 to 2022-03-20
Report Date:	2022-04-20
Approved by:	Bill Xiong / EE Engineer 
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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

60 PCS test samples were in good condition and received on 2021-01-18. The samples were numbered from 1 to 30 and 31 to 60.

Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Part Number:	HL-C3535F4IR3EA-ZW
Part Type:	LED Package
#Drive Level:	DC 700mA
#Wavelength:	735nm
#Power:	1.645W
#Average Current Density per LED die:	622.998mA/mm ²
#Average Power Density per LED die:	1.464W/mm ²
#CRI:	/
#Die Spacing:	/

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:

Model Name	Total Input Current (mA)	Power (W)	Wavelength (nm)	Number of dies	Driver current per die (mA)	Current Density per Die (mA/mm ²)	Power Density per PCB (W/mm ²)	Die Spacing (mm)
HL-C3535F4IR3EA-ZW	700	1.645	735	1	700	622.998	0.138	/
HL-C3535F**IR**A-ZW	700	1.645	735	1	700	622.998	0.138	/
HL-C3535F**IR**A-ZW-**	700	1.645	735	1	700	622.998	0.138	/
HL-C3535F**IR**A-****-ZW	700	1.645	735	1	700	622.998	0.138	/
HL-C3535F**IR**A-****-ZW-**	700	1.645	735	1	700	622.998	0.138	/

-C3535F**IR**A-****-ZW-

- 1.
2. e power level.
- 3.
4. the electrostatic capacity.
5. letter, which stands for the customer code.

1.2 Standards and Reference Documentations

- ANSI/IES LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs
- ANSI/ASABE S640 JUL2017 Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms) (This standard was not accredited by IAS)
- ANSI/ASABE S642 SEP2018: Recommended Methods for Measurement and Testing of LED Products for Plant Growth and Development (This standard was not ac4(d)4(s)-6()9(f)-4<0rd



1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
High Accuracy Array Spectroradiometer	EVERFINE	HAAS 2000	P600674CM5391140	2021-10-21	2022-10-20
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2021-09-27	2022-09-26
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2022-01-05	2023-01-04
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2022-10-14
Multilayer aging machine	BACL	B2-270	20013	2022-01-04	2023-01-03
Program-controlled D.C. Stabilized Voltage Supply	Hanshenpuyuan	HSPY-60-03	N/A	2022-01-05	2023-01-04

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 (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

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 spectral power distribution and photon flux. 2nd 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.

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: 55°C, 700mA

Part Number: HL-C3535F4IR3EA-ZW
Number of Units: 30
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 700mA
Measurement Current: 700mA

Data Set 2: 105°C, 700mA

Part Number: HL-C3535F4IR3EA-ZW
Number of Units: 30
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 700mA
Measurement Current: 700mA



2 - Summary of Test Result

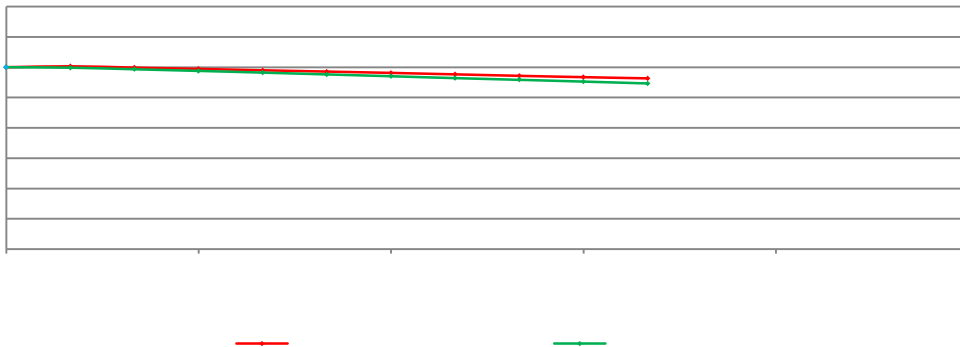
Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration			Reported TM-21 Q ₇₀ Lifetime	Reported TM-21 Q ₉₀ Lifetime
1	30	0	1000hrs	10000hrs	2.298E-06	1.004	>60000 hours	48000 hours
2	30	0	1000hrs	10000hrs	3.021E-06	1.003	>60000 hours	36000 hours

Average Photon Flux Maintenance, Photosynthetic 700-800nm (PFM_p) (Percentage of Initial)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	100.15%	99.93%	99.72%	99.49%	99.28%	99.06%	98.82%	98.58%	98.36%	98.16%
2	99.92%	99.66%	99.39%	99.11%	98.81%	98.51%	98.20%	97.92%	97.63%	97.32%

Average Wavelength

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	730.6	730.6	730.5	730.5	730.5	730.5	730.5	730.5	730.5	730.6
2	730.3	730.4	730.3	730.3	730.4	730.3	730.4	730.3	730.4	730.3





3 - Test Data

3.1 Data Set 1, 55°C, 700mA (700-800nm Photon Flux Maintenance)

No.	ρ ($\mu\text{mol} \times \text{s}^{-1}$)	700-800nm Photon Flux Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	3.8220	100.18	100.05	99.84	99.61	99.45	99.22	98.93	98.64	98.53	98.38
2	3.8980	100.23	99.90	99.44	99.20	98.77	98.51	98.36	98.23	98.08	97.90
3	3.9080	100.10	99.85	99.69	99.56	99.41	99.33	99.05	98.85	98.64	98.54
4	3.8800	100.10	99.97	99.66	99.28	98.87	98.43	98.27	97.96	97.78	97.47
5	3.8940	100.10	99.90	99.72	99.51	99.28	99.15	98.82	98.69	98.48	98.41
6	3.8170	100.29	99.95	99.69	99.42	99.24	98.77	98.64	98.51	98.32	98.11
7	3.8700	100.28	100.10	99.87	99.72	99.61	99.35	99.12	98.91	98.45	98.24
8	3.7910	100.21	100.08	99.95	99.68	99.53	99.31	99.10	98.81	98.63	98.52
9	3.8890	100.28	99.95	99.64	99.36	98.92	98.53	98.30	97.97	97.74	97.40



3.2 Data Set 1, 55°C, 700mA (Forward Voltage) 2.358

No.	Forward Voltage (V)										
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2.342	2.367	2.368	2.358	2.367	2.355	2.354	2.352	2.341	2.349	2.358
2	2.357	2.358	2.352	2.370	2.355	2.362	2.365	2.354	2.375	2.346	2.385
3	2.358	2.362	2.362	2.339	2.369	2.354	2.355	2.369	2.361	2.364	2.367
4	2.369	2.360	2.369	2.362	2.364	2.364	2.350	2.366	2.360	2.368	2.352
5	2.346	2.356	2.363	2.340	2.357	2.350	2.351	2.360	2.345	2.370	2.359
6	2.360	2.363	2.348	2.330	2.361	2.355	2.363	2.368	2.365	2.375	2.367
7	2.343	2.359	2.357	2.351	2.357	2.356	2.357	2.361	2.357	2.366	2.357
8	2.342	2.356	2.365	2.369	2.357	2.359	2.360	2.349	2.363	2.339	2.366
9	2.357	2.360	2.356	2.349	2.357	2.367	2.351	2.355	2.345	2.353	2.359
10	2.351	2.359	2.347	2.374	2.353	2.348	2.349	2.352	2.345	2.346	2.351
11	2.358	2.355	2.364	2.351	2.357	2.358	2.358	2.365	2.359	2.372	2.360
12	2.368	2.345	2.358	2.330	2.352	2.358	2.365	2.366	2.378	2.374	2.371
13	2.356	2.344	2.364	2.361	2.352	2.356	2.361	2.351	2.370	2.346	2.379
14	2.360	2.361	2.360	2.348	2.347	2.354	2.351	2.360	2.355	2.366	2.359
15	2.351	2.367	2.358	2.355	2.362	2.356	2.355	2.357	2.348	2.358	2.361
16	2.351	2.338	2.353	2.355	2.351	2.355	2.354	2.355	2.357	2.355	2.360
17	2.357	2.356	2.351	2.357	2.342	2.356	2.358	2.355	2.374	2.354	2.359
18	2.340	2.365	2.357	2.357	2.347	2.359	2.359	2.361	2.371	2.363	2.383
19	2.356	2.356	2.340	2.353	2.357	2.360	2.355	2.367	2.353	2.374	2.351
20	2.353	2.342	2.353	2.353	2.352	2.355	2.365	2.357	2.378	2.359	2.361
21	2.362	2.370	2.355	2.352	2.360	2.356	2.365	2.360	2.370	2.364	2.375
22	2.339	2.342	2.361	2.348	2.350	2.352	2.355	2.356	2.360	2.360	2.365
23	2.358	2.375	2.350	2.361	2.347	2.360	2.353	2.359	2.359	2.358	2.365
24	2.354	2.333	2.357	2.372	2.353	2.352	2.353	2.352	2.353	2.362	2.353
25	2.342	2.362	2.360	2.361	2.347	2.358	2.360	2.355	2.373	2.352	2.386
26	2.358	2.356	2.352	2.354	2.347	2.340	2.358	2.356	2.369	2.352	2.368
27	2.332	2.342	2.369	2.331	2.337	2.347	2.350	2.363	2.363	2.379	2.376
28	2.331	2.340	2.343	2.350	2.344	2.345	2.352	2.340	2.360	2.365	2.368
29	2.336	2.333	2.354	2.342	2.346	2.348	2.348	2.354	2.350	2.360	2.352
30	2.365	2.379	2.357	2.370	2.375	2.362	2.365	2.354	2.355	2.346	2.345
Avg.	2.352	2.355	2.357	2.353	2.354	2.355	2.357	2.358	2.360		2.364
Med.	2.355	2.357	2.357	2.354	2.353						



3.4 Data Set 2, 105°C, 700mA (700-800nm Photon Flux Maintenance)

No.	P_p ($\mu\text{mol} \times \text{s}^{-1}$)	700-800nm Photon Flux Maintenance (%)							
		0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs



3.5 Data Set 2, 105°C, 700mA (Forward Voltage)

No.	Forward Voltage (V)										
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
31	2.358	2.356	2.368	2.351	2.354	2.353	2.357	2.355	2.360	2.357	2.363
32	2.360	2.370	2.370	2.349	2.365	2.358	2.345	2.367	2.365	2.376	2.375
33	2.350	2.369	2.355	2.354	2.354	2.360	2.358	2.366	2.362	2.372	2.366
34	2.355	2.363	2.357	2.351	2.360	2.360	2.354	2.369	2.348	2.378	2.342
35	2.358	2.370	2.350	2.373	2.371	2.365	2.355	2.357	2.339	2.349	2.363
36	2.362	2.358	2.352	2.351	2.351	2.355	2.350	2.359	2.349	2.363	2.348
37	2.350	2.369	2.353	2.379	2.373	2.369	2.356	2.359	2.339	2.349	2.352
38	2.322	2.365	2.350	2.356	2.353	2.353	2.352	2.350	2.351	2.347	2.350
39	2.359	2.351	2.345	2.368	2.345	2.356	2.347	2.344	2.349	2.352	2.351
40	2.347	2.348	2.357	2.342	2.355	2.358	2.358	2.374	2.361	2.359	2.364
41	2.351	2.370	2.343	2.364	2.347	2.350	2.352	2.336	2.357	2.352	2.362
42	2.344	2.351	2.352	2.380	2.358	2.355	2.347	2.353	2.336	2.355	2.355
43	2.355	2.376	2.350	2.368	2.359	2.357	2.354	2.346	2.349	2.355	2.344
44	2.351	2.362	2.359	2.354	2.356	2.360	2.356	2.366	2.356	2.372	2.356
45	2.352	2.356	2.362	2.358	2.352	2.362	2.358	2.366	2.364	2.370	2.370
46	2.358	2.351	2.353	2.373	2.367	2.357	2.349	2.341	2.331	2.345	2.343
47	2.368	2.352	2.375	2.366	2.346	2.354	2.350	2.342	2.354	2.353	2.358
48	2.347	2.350	2.355	2.349	2.356	2.381	2.352	2.353	2.348	2.345	2.344
49	2.368	2.362	2.360	2.370	2.360	2.353	2.356	2.336	2.352	2.359	2.348
50	2.359	2.360	2.357	2.355	2.358	2.365	2.364	2.375	2.370	2.365	2.366
51	2.354	2.356	2.359	2.352	2.354	2.357	2.352	2.362	2.350	2.367	2.348
52	2.367	2.345	2.349	2.347	2.343	2.345	2.341	2.343	2.339	2.341	2.337
53	2.366	2.356	2.360	2.355	2.353	2.363	2.357	2.371	2.361	2.379	2.365
54	2.341	2.352	2.348	2.359	2.348	2.350	2.350	2.341	2.352	2.362	2.354
55	2.351	2.355	2.365	2.361	2.371	2.356	2.351	2.351	2.331	2.346	2.341
56	2.355	2.364	2.362	2.354	2.364	2.368	2.364	2.362	2.364	2.366	2.364

Bay Area Compliance Laboratories Corp. (Dongguan)

No.12, Pulong East 1st Road, Tangxia Town,
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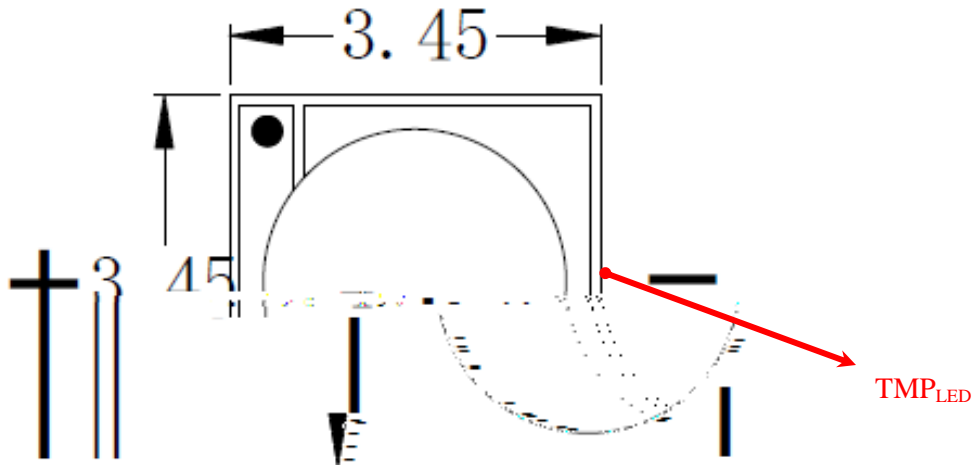
gth)

rs	Wavelength (nm)										
	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs				
7	729.3	729.3	729.3	728.9	729.3	728.5	729.3				
2	729.3	729.4	729.7	729.6	730.1	729.8	730.5				
4	729.4	729.6	729.7	729.8	730.0	730.0	730.3				
4	729.3	729.1	729.2	728.8	729.1	728.5	729.0				
3	729.2	729.5	729.2	729.2	729.2	728.9	729.2				
4	733.7	733.7	733.4	734.0	733.1	734.3	732.8				
3	729.4	729.3	729.3	729.3	729.2	729.3	729.1				
4	729.5	729.4	729.1	729.4	728.7	729.4	728.3				
	731.2	731.3	731.4	731.5	731.6	731.7	731.8				
4	729.5	729.6	729.4	729.8	729.3	730.0	729.2				
3	729.0	729.5	729.3	729.7	729.6	729.9	729.9				
4	731.4	731.5	731.5	731.6	731.6	731.7	731.7				
43	732.8	729.8	729.5	729.6	729.2	729.3	729.3	729.0	729.4	728.7	729.5
44	730.0	729.3	729.3	729.2	729.4	729.5	729.3	729.8	729.2	730.1	729.1
45	732.1	733.4	733.7	733.3	733.1	733.2	733.3	733.1	733.5	733.0	733.7
46	729.3	729.3	729.6	729.6	729.2	729.2	729.3	728.8	729.4	728.4	729.5
47	733.7	729.5	729.8	729.4	729.6	729.7	729.3	730.0	729.0	730.3	728.7
48	729.8	729.1	729.3	729.4	729.4	729.6	729.2	729.8	729.0	730.0	728.8
49	732.5	732.4	732.7	732.3	732.3	732.4	732.2	732.5	732.1	732.6	732.0
50	733.0	729.5	729.5	729.3	729.4	729.6	729.2	729.9	729.0	730.2	728.8
51	731.7	731.8	731.5	731.3	731.3	731.5	731.2	731.7	731.1	731.9	731.0
52	730.8	729.3	729.3	729.3	729.2	729.5	729.4	729.7	729.6	729.9	729.8
53	730.2	729.4	729.3	729.1	729.3	729.2	729.4	729.3	729.5	729.4	729.6
54	732.9	729.4	729.5	729.7	729.4	729.6	729.4	729.5	729.4	729.4	729.4
55	731.8	731.6	731.6	731.1	731.3	731.2	731.6	731.3	731.9	731.4	732.2
56	730.5	729.4	729.5	729.3	729.3	729.4	729.3	729.5	729.3	729.6	729.3
57	732.9	729.4	729.5	729.4	729.3	729.5	729.3	729.6	729.3	729.7	729.3
58	730.9	731.2	731.1	731.1	731.1	731.1	731.1	731.1	731.1	731.1	731.1
59	733.7	733.1	733.3	733.1	733.0	733.1	733.1	733.1	733.2	733.1	733.3
60	732.8	732.9	732.8	732.8	732.7	732.7	732.7	732.6	732.7	732.5	732.7
Avg.	731.2	730.3	730.4	730.3	730.3	730.4	730.3	730.4	730.3	730.4	730.3
Med.	731.0	729.5	729.7	729.5	729.4	729.6	729.4	729.8	729.5	730.0	729.6
st dev	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5
Min.	728.6	729.1	729.3	729.1	729.0	729.1	729.1	728.8	728.7	728.4	728.3
Max.	733.7	733.4	733.7	733.4	733.7	733.7	733.4	734.0			



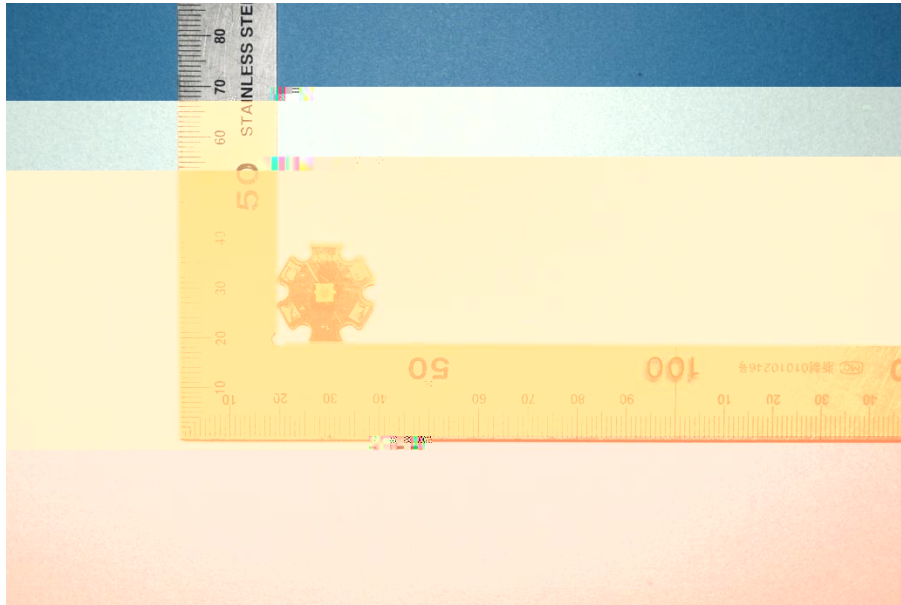
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo





Bay Area Compliance Laboratories Corp. (Dongguan)

No.12, Pulong East 1st Road, Tangxia Town,
Dongguan, Guangdong, China.

Directions

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