TEST REPORT

According to ANSI/IES LM-80-15
For

Shenzhen Refond Optoelectronic Co., Ltd.

C 5th Floor, Konka R&D Building, No. 28 of Street 12, South Tech Area, Nanshan District, Shenzhen, China.

Model: 5050

Report Type: 6000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	Pote Wang
Report Number:	R2DG170425053-10
Test Date:	2017-05-03

	Blake Zhang / EE Engineer
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
Accreditation:	The IAS Accreditation Number TL-460.

1 - General Information

1.1 Description of LED Light Sources

Sample Size:

75 PCS sagQ72.024 707.5 472.39 4(t So) 80.904 622.78 Tm 0 Tc[ )]TT1 0 0 1 8464]TJETBT0.904 622.78 Tm 0 Tc(Si)10Si

1.8 Sample Set

Data Set 1: 55°C, 20mA

Part Number:	5050
Number of Units:	25
Case Temperature:	>53°C
Ambient Temperature:	>50°C
Life Test Drive Current:	20mA
Measurement Current:	20mA

Data Set 2: 85°C, 20mA

Part Number:	5050
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	20mA
Measurement Current:	20mA

Data Set 3: 105°C, 20mA

Part Number:	5050
Number of Units:	25
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	20mA
Measurement Current:	20mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	α:	β:	Reported TM-21 L_{70} Lifetime	Reported TM-21 L_{90} Lifetime
1	25	0	1000hrs	6000hrs	2.118E-06	1.003	>36000hrs	>36000hrs
2	25	0	1000hrs	6000hrs	2.388E-06	1.002	>36000hrs	>36000hrs
3	25	0	1000hrs	6000hrs	2.773E-06	1.001	>36000hrs	>36000hrs

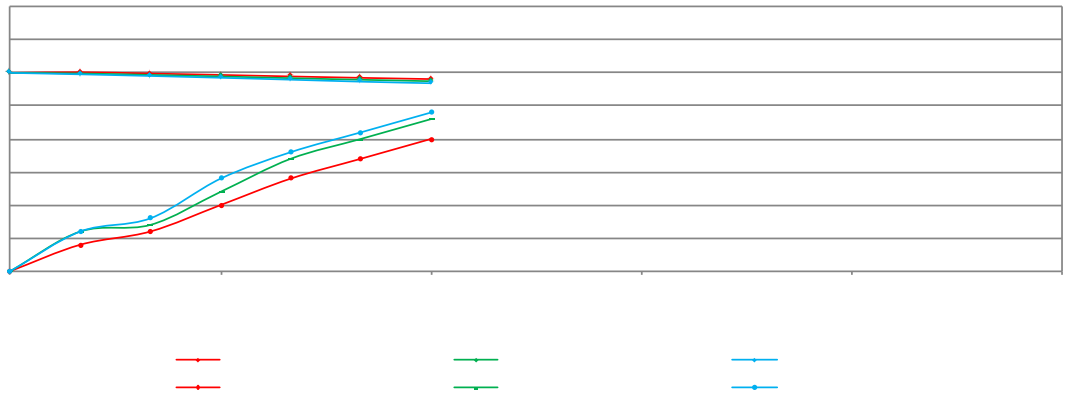
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	100.10%	99.90%	99.69%	99.46%	99.25%	99.06%
2	99.91%	99.69%	99.46%	99.20%	98.96%	98.74%
3	99.78%	99.53%	99.26%	98.97%	98.67%	98.43%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.0004	0.0006	0.0010	0.0014	0.0017	0.0020
2	0.0006	0.0007	0.0012	0.0017	0.0020	0.0023
3	0.0006	0.0008	0.0014	0.0018	0.0021	0.0024

Average Lumen Maintenance and Chromaticity Shift VS. Time



3.2 Data Set 1, 55°C, 20mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	7.506	7.524	7.496	7.521	7.516	7.515	7.511
2	7.487	7.504	7.484	7.501	7.497	7.485	7.502
3	7.498	7.517	7.490	7.513	7.509	7.498	7.515
4	7.504	7.522	7.495	7.519	7.514	7.513	7.513
5	7.507	7.521	7.500	7.524	7.518	7.517	7.528
6	7.517	7.535	7.517	7.532	7.527	7.521	7.536
7	7.518	7.529	7.514	7.531	7.526	7.520	7.527
8	7.521	7.539	7.517	7.536	7.531	7.528	7.533
9	7.530	7.547	7.522	7.544	7.539	7.527	7.541
10	7.515	7.533	7.514	7.529	7.524	7.512	7.533
11	7.507	7.535	7.516	7.532	7.531	7.515	7.533
12	7.485	7.504	7.477	7.500	7.499	7.485	7.507
13	7.481	7.493	7.480	7.496	7.494	7.480	7.493
14	7.507	7.517	7.503	7.521	7.518	7.513	7.527
15	7.472	7.491	7.479	7.496	7.492	7.488	7.498
16	7.490	7.503	7.482	7.502	7.497	7.483	7.507
17	7.501	7.520	7.494	7.519	7.514	7.510	7.520
18	7.496	7.515	7.493	7.513	7.513	7.496	7.519
19	7.476	7.488	7.469	7.492	7.493	7.476	7.498
20	7.477	7.499	7.479	7.502	7.502	7.486	7.506
21	7.509	7.530	7.502	7.527	7.527	7.518	7.527
22	7.475	7.498	7.480	7.496	7.494	7.489	7.494
23	7.511	7.532	7.526	7.537	7.536	7.520	7.545
24	7.495	7.516	7.502	7.521	7.520	7.514	7.527
25	7.510	7.524	7.516	7.527	7.526	7.519	7.535
Avg.	7.500	7.517	7.498	7.517	7.514	7.505	7.519
Med.	7.504	7.520	7.496	7.521	7.516	7.513	7.520
st dev	0.0159	0.0162	0.0165	0.0152	0.0147	0.0165	0.0154
Min.	7.472	7.488	7.469	7.492	7.492	7.476	7.493
Max.	7.530	7.547	7.526	7.544	7.539	7.528	7.545

3.3 Data Set 1, 55°C, 20mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.1838	0.4199	17239	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
2	0.1850	0.4157	19568	0.0005	0.0004	0.0006	0.0010	0.0011	0.0014
3	0.1825	0.4172	19339	0.0005	0.0010	0.0007	0.0008	0.0013	0.0017
4	0.1832	0.4203	17164	0.0006	0.0008	0.0012	0.0013	0.0016	0.0017
5	0.1821	0.4183	18763	0.0003	0.0003	0.0009	0.0011	0.0013	0.0020
6	0.1812	0.4121	24861	0.0004	0.0007	0.0010	0.0011	0.0015	0.0017
7	0.1830	0.4178	18756	0.0001	0.0001	0.0010	0.0012	0.0014	0.0021
8	0.1822	0.4182	18777	0.0002	0.0003	0.0009	0.0014	0.0016	0.0022
9	0.1832	0.4133	22387	0.0003	0.0006	0.0010	0.0014	0.0017	0.0022
10	0.1820	0.4173	19454	0.0004	0.0007	0.0010	0.0015	0.0017	0.0023
11	0.1815	0.4178	19271	0.0002	0.0004	0.0009	0.0014	0.0016	0.0019
12	0.1843	0.4140	21216	0.0006	0.0012	0.0009	0.0015	0.0016	0.0019
13	0.1830	0.4138	21975	0.0006	0.0013	0.0012	0.0016	0.0018	0.0019
14	0.1829	0.4167	19602	0.0004	0.0006	0.0010	0.0016	0.0018	0.0022
15	0.1825	0.4175	19197	0.0003	0.0006	0.0013	0.0016	0.0017	0.0020
16	0.1839	0.4156	20084	0.0002	0.0005	0.0018	0.0023	0.0027	0.0030
17	0.1826	0.4163	19989	0.0002	0.0006	0.0008	0.0011	0.0013	0.0020
18	0.1847	0.4145	20632	0.0002	0.0006	0.0009	0.0013	0.0014	0.0016
19	0.1843	0.4143	21012	0.0004	0.0006	0.0010	0.0015	0.0018	0.0020
20	0.1835	0.4140	21554	0.0005	0.0005	0.0010	0.0015	0.0017	0.0020
21	0.1814	0.4212							

[redacted]

3.4 Data Set 2, 85°C, 20mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	13.25	99.85	99.77	99.47	99.17	98.87	98.72
27	13.44	99.93	99.55	99.48	99.33	99.18	98.88
28	13.27	99.77	99.70	99.40	99.10	98.87	98.72
29	13.33	99.55	99.32	99.10	98.87	98.80	98.65
30	13.36	99.85	99.40	99.18	98.95	98.65	98.43
31	13.45	99.93	99.55	99.33	98.96	98.66	98.36
32	13.27	99.77	99.70	99.40	99.17	99.02	98.79
33	13.30	100.15	99.92	99.77	99.47	99.17	98.87
34	13.18	99.70	99.54	99.24	99.17	98.94	98.71
35	13.41	99.85	99.48	99.11	98.81	98.58	98.43
36	13.22	99.92	99.77	99.62	99.24	98.87	98.64
37	13.25	100.15	99.92	99.77	99.47	99.17	98.72
38	13.50	99.93	99.70	99.63	99.26	99.04	98.67
39	13.40	99.78	99.55	99.33	99.18	98.88	98.73
40	13.55	99.93	99.70	99.34	99.11	98.97	98.89
41	13.25	100.08	99.85	99.55	99.17	98.94	98.72
42	13.20	99.92	99.77	99.39	99.32	99.09	98.94
43	13.42	99.85	99.63	99.33	99.18	98.96	98.88
44	13.43	99.93	99.78	99.48	99.26	98.96	98.88
45	13.39	100.15	99.85	99.70	99.48	99.25	99.10
46	13.44	100.07	99.85	99.63	99.48	99.11	98.66
47	13.30	99.92	99.77	99.55	99.32	99.10	98.72
48	13.48	100.15	99.85	99.63	99.33	99.18	98.89
49	13.38	99.93	99.93	99.70	99.33	99.03	98.95
50	13.45	99.78	99.48	99.33	98.96	98.66	98.51
Avg.	13.36	99.91	99.69	99.46	99.20	98.96	98.74
Med.	13.38	99.92	99.70	99.47	99.18	98.96	98.72
st dev	0.1023	0.1512	0.1697	0.1959	0.1885	0.1848	0.1782
Min.	13.18	99.55	99.32	99.10	98.81	98.58	98.36
Max.	13.55	100.15	99.93	99.77	99.48	99.25	99.10

3.5 Data Set 2, 85°C, 20mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	7.490	7.522	7.498	7.518	7.520	7.501	7.519
27	7.497	7.515	7.497	7.511	7.513	7.503	7.510
28	7.491	7.505	7.488	7.508	7.508	7.500	7.509
29	7.468	7.499	7.483	7.495	7.496	7.488	7.502
30	7.490	7.505	7.483	7.501	7.505	7.493	7.509
31	7.485	7.508	7.498	7.511	7.514	7.494	7.519
32	7.498	7.529	7.512	7.525	7.527	7.509	7.524
33	7.492	7.507	7.490	7.507	7.510	7.503	7.510
34	7.500	7.527	7.504	7.521	7.523	7.516	7.530
35	7.499	7.515	7.498	7.510	7.512	7.505	7.511
36	7.521	7.543	7.521	7.541	7.544	7.526	7.543
37	7.508	7.520	7.504	7.520	7.521	7.505	7.522
38	7.478	7.503	7.481	7.498	7.499	7.483	7.508
39	7.472	7.499	7.481	7.493	7.494	7.487	7.494
40	7.483	7.499	7.482	7.494	7.494	7.483	7.495
41	7.470	7.489	7.479	7.492	7.491	7.475	7.501
42	7.471	7.482	7.472	7.483	7.483	7.467	7.484
43	7.522	7.542	7.516	7.535	7.535	7.529	7.547
44	7.480	7.503	7.488	7.499	7.499	7.493	7.509
45	7.474	7.491	7.468	7.486	7.486	7.480	7.496
46	7.487	7.498	7.489	7.500	7.500	7.495	7.510
47	7.478	7.505	7.490	7.501	7.500	7.492	7.504
48	7.474	7.492	7.470	7.488	7.488	7.472	7.489
49	7.478	7.496	7.472	7.491	7.491	7.485	7.501
50	7.469	7.486	7.478	7.489	7.490	7.475	7.498
Avg.	7.487	7.507	7.490	7.505	7.506	7.494	7.510
Med.	7.485	7.505	7.488	7.501	7.500	7.493	7.509
st dev	0.0152	0.0161	0.0143	0.0153	0.0160	0.0158	0.0152
Min.	7.468	7.482	7.468	7.483	7.483	7.467	7.484
Max.	7.522	7.543	7.521	7.541	7.544	7.529	7.547

3.6 Data Set 2, 85°C, 20mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.1838	0.4160	19812	0.0005	0.0004	0.0010	0.0016	0.0017	0.0023
27	0.1818	0.4158	20693	0.0006	0.0006	0.0013	0.0016	0.0020	0.0023
28	0.1829	0.4140	21914	0.0004	0.0007	0.0009	0.0015	0.0019	0.0022
29	0.1842	0.4140	21310	0.0007	0.0005	0.0017	0.0022	0.0026	0.0028
30	0.1847	0.4145	20652	0.0004	0.0004	0.0009	0.0014	0.0019	0.0022
31	0.1823	0.4162	20186	0.0007	0.0011	0.0012	0.0016	0.0020	0.0023
32	0.1844	0.4136	21554	0.0006	0.0008	0.0015	0.0019	0.0024	0.0027
33	0.1847	0.4162	19292	0.0006	0.0004	0.0009	0.0014	0.0019	0.0022
34	0.1860	0.4135	20958	0.0005	0.0007	0.0013	0.0017	0.0022	0.0025
35	0.1824	0.4161	20219	0.0002	0.0003	0.0011	0.0017	0.0020	0.0022
36	0.1842	0.4129	22327	0.0004	0.0003	0.0011	0.0014	0.0018	0.0022
37	0.1827	0.4152	20869	0.0008	0.0008	0.0013	0.0016	0.0022	0.0025
38	0.1858	0.4153	19568	0.0006	0.0004	0.0010	0.0013	0.0016	0.0019
39	0.1825	0.4146	21439	0.0006	0.0008	0.0014	0.0015	0.0020	0.0025
40	0.1849	0.4160	19406	0.0005	0.0009	0.0016	0.0020	0.0025	0.0027
41	0.1845	0.4147	20551	0.0004	0.0005	0.0011	0.0016	0.0018	0.0022
42	0.1850	0.4137	21249	0.0006	0.0008	0.0013	0.0019	0.0021	0.0026
43	0.1845	0.4165	19162	0.0006	0.0004	0.0013	0.0018	0.0021	0.0023
44	0.1839	0.4146	20890	0.0007	0.0012	0.0010	0.0015	0.0017	0.0019

3.7 Data Set 3, 105°C, 20mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
51	13.35	99.93	99.48	99.18	98.95	98.80	98.50
52	13.35	100.07	99.85	99.48	99.18	98.73	98.50
53	13.19	99.92	99.77	99.39	99.01	98.71	98.48
54	13.40	99.78	99.70	99.40	99.10	98.73	98.58
55	13.45	99.70	99.26	99.03	98.88	98.59	98.29
56	13.33	99.55	99.17	99.10	98.80	98.50	98.27
57	13.47	99.48	99.18	98.89	98.74	98.29	98.07
58	13.16	99.54	99.39	99.16	98.94	98.71	98.18
59	13.39	99.70	99.55	99.18	98.81	98.58	98.36
60	13.33	99.92	99.55	99.17	98.87	98.65	98.42
61	13.24	99.77	99.40	99.09	98.79	98.49	98.34
62	13.35	99.85	99.63	99.48	99.25	98.95	98.80
63	13.47	99.78	99.63	99.55	99.18	98.96	98.89
64	13.41	99.70	99.55	99.33	99.11	98.73	98.36
65	13.23	99.85	99.77	99.40	99.09	98.72	98.19
66	13.38	99.78	99.48	99.25	98.88	98.51	98.13
67	13.53	99.93	99.63	99.33	99.04	98.82	98.60
68	13.47	99.78	99.55	99.18	98.66	98.37	98.29
69	13.35	99.93	99.70	99.40	99.10	98.73	98.50
70	13.46	99.85	99.55	99.41	99.03	98.74	98.37
71	13.36	99.78	99.33	99.03	98.80	98.43	98.35
72	13.50	99.70	99.33	99.11	98.67	98.37	98.15
73	13.43	99.85	99.78	99.40	99.11	99.03	98.88
74	13.22	99.70	99.39	99.24	98.94	98.71	98.56
75	13.58	99.78	99.63	99.34	99.19	98.90	98.75
Avg.	13.38	99.78	99.53	99.26	98.97	98.67	98.43
Med.	13.38	99.78	99.55	99.25	98.95	98.71	98.37
st dev	0.1075	0.1356	0.1875	0.1673	0.1703	0.1933	0.2285
Min.	13.16	99.48	99.17	98.89	98.66	98.29	98.07
Max.	13.58	100.07	99.85	99.55	99.25	99.03	98.89

3.8 Data Set 3, 105°C, 20mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
51	7.487	7.508	7.485	7.504	7.508	7.501	7.502
52	7.477	7.496	7.478	7.492	7.495	7.481	7.490
53	7.503	7.532	7.507	7.527	7.529	7.524	7.535
54	7.480	7.501	7.490	7.504	7.506	7.498	7.512
55	7.479	7.491	7.473	7.493	7.495	7.480	7.492
56	7.484	7.508	7.496	7.508	7.510	7.504	7.508
57	7.480	7.493	7.481	7.495	7.496	7.491	7.503
58	7.486	7.504	7.479	7.500	7.501	7.496	7.508
59	7.471	7.489	7.465	7.484	7.484	7.479	7.483
60	7.503	7.528	7.510	7.530	7.530	7.518	7.538
61	7.487	7.500	7.480	7.502	7.502	7.497	7.500
62	7.475	7.496	7.478	7.498	7.499	7.486	7.502
63	7.493	7.505	7.490	7.508	7.508	7.494	7.514
64	7.497	7.517	7.490	7.512	7.512	7.497	7.519
65	7.491	7.509	7.490	7.505	7.505	7.491	7.512
66	7.491	7.518	7.491	7.513	7.513	7.502	7.519
67	7.489	7.518	7.491	7.513	7.513	7.507	7.519
68	7.473	7.502	7.483	7.498	7.502	7.492	7.502
69	7.477	7.501	7.480	7.496	7.496	7.488	7.502
70	7.495	7.519	7.498	7.521	7.521	7.513	7.527
71	7.467	7.486	7.466	7.487	7.548	7.481	7.494
72	7.487	7.500	7.480	7.501	7.500	7.495	7.500
73	7.512	7.528	7.509	7.530	7.530	7.524	7.536
74	7.494	7.523	7.503	7.519	7.517	7.502	7.524
75	7.482	7.501	7.480	7.496	7.495	7.482	7.502
Avg.	7.486	7.507	7.487	7.505	7.509	7.497	7.510
Med.	7.487	7.504	7.485	7.504	7.506	7.496	7.508
st dev	0.0108	0.0128	0.0121	0.0127	0.0144	0.0130	0.0146
Min.	7.467	7.486	7.465	7.484	7.484	7.479	7.483
Max.	7.512	7.532	7.510	7.530	7.548	7.524	7.538

3.9 Data Set 3, 105°C, 20mA (Chromaticity Shift)

No.	u'	v'

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