

LM-80 Test Report NVSL219C

Issue Date:	June 6, 2016	Revision Date:	-
Test Initiation Date:	September 26, 2014	Test Completion Date:	January 26, 2016
Test Duration:	10,000 hours	Report Number:	SQETMOJ75601

Customer Information:

Company Name: Nichia Corporation
Address: 491-100, Oka, Kaminaka-cho, Anan-shi, Tokushima, 774-8601, JAPAN

Description of Test Samples:

Classification: LED Package
Model Name: Warm White LED
Model Number: NVSL219C (Nominal CCT: 2700 K)

Test Summary:

Data Set	Case Temperature [T _s]	Ambient Temperature [T _A]	Drive Current [I _F]	Lumen Maintenance at 10,000 hours	Chromaticity Shift ($\Delta u'v'$) at 10,000 hours	TM-21 Projection L ₇₀ (10K)	TM-21 Projection L ₈₀ (10K)	TM-21 Projection L ₉₀ (10K)
1	55 °C	> 50 °C	700 mA	99.8 %	0.0016	> 60000 hours	> 60000 hours	> 60000 hours
2	55 °C	> 50 °C	1500 mA	99.1 %	0.0019	> 60000 hours	> 60000 hours	> 60000 hours
3	85 °C	> 80 °C	700 mA	99.4 %	0.0019	> 60000 hours	> 60000 hours	> 60000 hours
4	85 °C	> 80 °C	1200 mA	97.0 %	0.0018	> 60000 hours	> 60000 hours	38400 hours
5	85 °C	> 80 °C	1500 mA	99.4 %	0.0021	> 60000 hours	> 60000 hours	> 60000 hours
6	105 °C	> 100 °C	700 mA	94.4 %	0.0014	> 60000 hours	47900 hours	20600 hours
7	105 °C	> 100 °C	1200 mA	91.8 %	0.0017	54100 hours	32200 hours	13000 hours
8	105 °C	> 100 °C	1500 mA	90.1 %	0.0022	46500 hours	27100 hours	9880 hours
9	120 °C	> 115 °C	700 mA	94.4 %	0.0018	> 60000 hours	> 60000 hours	25200 hours
10	120 °C	> 115 °C	1200 mA	94.5 %	0.0029	> 60000 hours	57900 hours	23900 hours
11	120 °C	> 115 °C	1500 mA	89.1 %	0.0037	49100 hours	27300 hours	8180 hours



Approved Signatory:

Hitoshi TOHYAMA, Lab Manager

Nichia Corporation LED Testing Laboratory

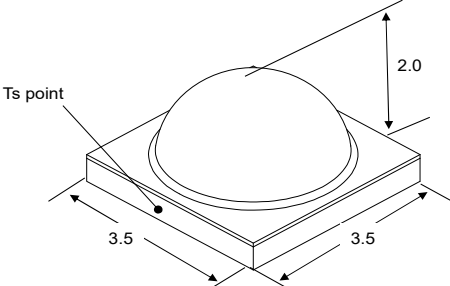
1-1, Tatsumi-Cho, Anan-Shi, TOKUSHIMA 774-0001, JAPAN

Applicable Model Numbers:

This LM-80 test report applies to the following models:

Series	Model Number	Case Temperature [°C]	Forward Current [mA]	Nominal CCT [K]	Data Set Number
219	NVSL219CT	55	700	≥ 2700	1
		55	1500	≥ 2700	2
		85	700	≥ 2700	3
		85	1200	≥ 2700	4
		85	1500	≥ 2700	5
		105	700	≥ 2700	6
		105	1200	≥ 2700	7
		105	1500	≥ 2700	8
		120	700	≥ 2700	9
		120	1200	≥ 2700	10
		120	1500	≥ 2700	11
219	NVSW219C NVSW219CT	55	700	≥ 5000	1
		55	1500	≥ 5000	2
		85	700	≥ 5000	3
		85	1200	≥ 5000	4
		85	1500	≥ 5000	5
		105	700	≥ 5000	6
		105	1200	≥ 5000	7
		105	1500	≥ 5000	8
		120	700	≥ 5000	9
		120	1200	≥ 5000	10
		120	1500	≥ 5000	11

IES LM-80-08 Test Report Requirement :

1. **Number of LED light sources tested**
See tables.
 2. **Description of LED light sources**
See Description of Test Samples
 3. **Description of auxiliary equipment**
Active cooling life test system
Consisting of small boxes, in which each box contains a reliability test board, and a water-cooled heat sink or a heater to control device temperature.
LED Tester
Consisting of an integrating sphere, a programmable current-source meter, and a spectroradiometer.
 4. **Operating cycle**
Constant direct current (DC).
 5. **Ambient conditions including airflow, temperature, and relative humidity**
Ambient Temperature (T_A) : See tables
Ambient temperature is the temperature of the air at a distance of 1.5 mm above the reliability test board.
Air flow : < 0.1 m/s
Relative Humidity : < 45 %
 6. **Case temperature (test point temperature)**
See tables.
For the case temperature (T_S) measurement point, see the figure below.
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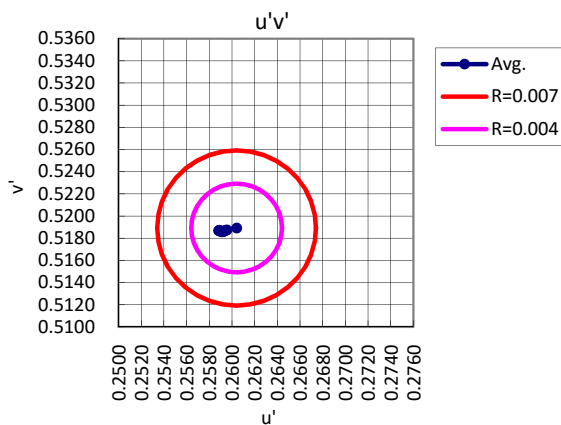
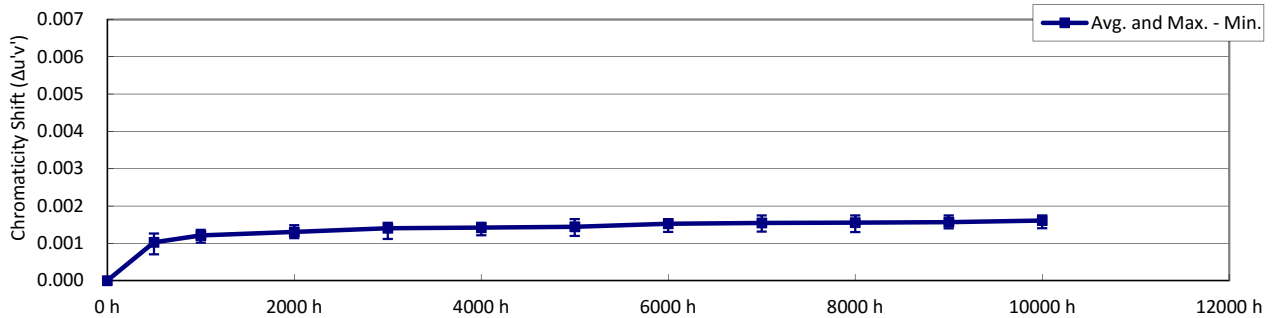
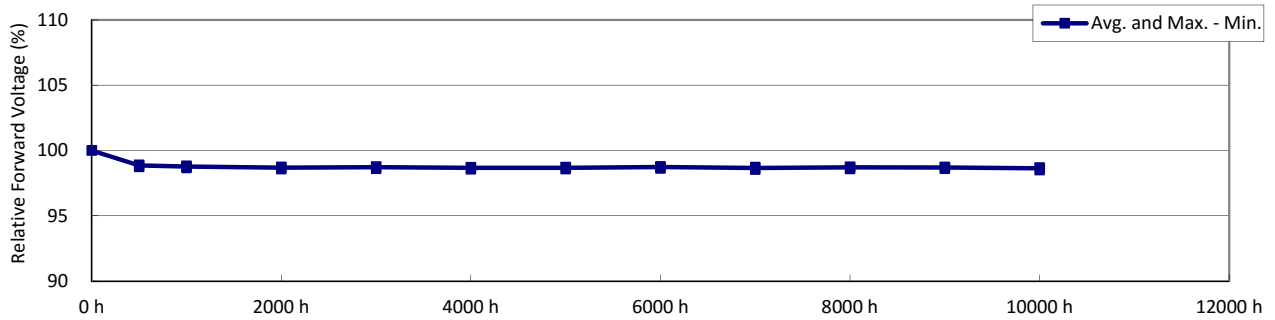
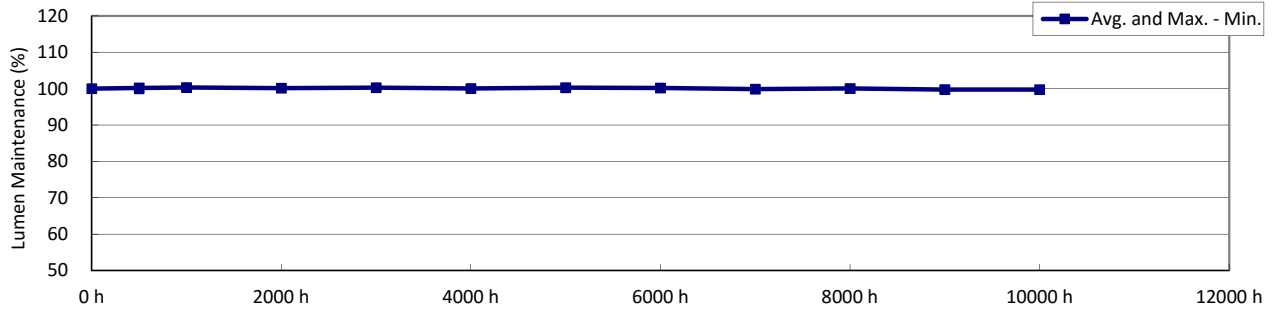
The diagram shows a square test board with side lengths of 3.5 units. A circular LED chip is mounted on the board, with a diameter of 2.0 units. A point on the board is labeled 'Ts point'.
7. **Drive current of the LED light sources during lifetime test**
See tables.
 8. **Initial luminous flux and forward voltage at photometric measurement current**
See tables.
 9. **Lumen maintenance data for each individual LED light source along with median value, standard deviation, minimum and maximum lumen maintenance value for all of the LED light sources.**
See tables.
 10. **Observation of LED light sources failures including the failure conditions and time of failure.**
No failure observed
 11. **LED light source monitoring interval**
See tables.
 12. **Photometric measurement uncertainty**
Flux measurement: 2.4 % ($k=2$)
Lumen maintenance: 1.8 % ($k=2$)
 13. **Chromaticity shift reported over the measurement time.**
See tables.

Data Set 1 : 55 °C, 700 mA

Actual Case Temperature [T_S]	56.8 °C
Actual Ambient Temperature [T_A]	55.6 °C
Drive Current [I_F]	700 mA
Measurement Current	700 mA

NOTES:

T_S and T_A were measured during initial setup.



Data Set 1 : 55 °C, 700 mA

Actual Case Temperature [T _S]	56.8 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 1-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _V [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	246	2.96	2714	0.454	0.401	0.263	0.523						
2	249	2.95	2784	0.445	0.395	0.260	0.519						
3	250	2.95	2810	0.443	0.392	0.259	0.518						
4	247	2.95	2793	0.444	0.393	0.260	0.518						
5	247	2.96	2743	0.450	0.398	0.262	0.521						
6	250	2.95	2802	0.443	0.392	0.260	0.517						
7	250	2.95	2819	0.442	0.393	0.259	0.518						
8	247	2.95	2748	0.449	0.396	0.262	0.520						
9	246	2.95	2761	0.448	0.396	0.261	0.520						
10	249	2.95	2748	0.449	0.397	0.262	0.520						
11	249	2.95	2789	0.445	0.395	0.260	0.519						
12	248	2.95	2783	0.445	0.394	0.260	0.519						
13	246	2.95	2743	0.451	0.399	0.262	0.522						
14	249	2.99	2807	0.443	0.393	0.260	0.518						
15	248	2.99	2807	0.444	0.394	0.259	0.519						
16	251	3.00	2820	0.441	0.391	0.259	0.517						
17	248	2.99	2774	0.446	0.394	0.261	0.519						
18	248	2.99	2791	0.446	0.396	0.260	0.519						
19	249	2.99	2831	0.441	0.392	0.259	0.517						
20	247	2.99	2781	0.445	0.393	0.261	0.518						
21	245	2.99	2760	0.446	0.394	0.262	0.519						
22	250	2.99	2801	0.445	0.395	0.260	0.519						
23	249	2.99	2810	0.443	0.393	0.259	0.518						
24	246	2.99	2749	0.448	0.395	0.262	0.519						
n	24	24	24	24	24	24	24						
Avg.	248	2.97	2782	0.446	0.395	0.260	0.519						
Med.	248	2.96	2786	0.445	0.394	0.260	0.519						
σ	1.5	0.020	30.4	0.0031	0.0024	0.0011	0.0014						
Min.	245	2.95	2714	0.441	0.391	0.259	0.517						
Max.	251	3.00	2831	0.454	0.401	0.263	0.523						

Data Set 1 : 55 °C, 700 mA

Actual Case Temperature [T _s]	56.8 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 1-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)											
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
1	100.0	99.6	100.2	99.9	100.1	100.0	100.1	99.6	99.8	100.1	99.7	99.8
2	100.0	99.8	99.7	99.5	99.6	99.7	99.6	99.8	99.3	99.5	99.3	99.3
3	100.0	98.8	99.6	99.5	99.7	99.5	99.9	99.7	99.4	99.6	99.2	99.3
4	100.0	100.9	101.0	100.8	100.8	100.8	101.0	101.0	100.6	100.8	99.5	100.5
5	100.0	100.0	100.6	100.4	100.8	100.4	100.7	100.7	100.3	100.6	100.5	100.3
6	100.0	100.2	99.8	99.6	99.8	99.6	100.0	99.7	99.3	99.7	99.4	99.3
7	100.0	100.8	100.9	100.6	100.8	100.6	100.8	100.6	100.4	100.6	100.3	100.4
8	100.0	99.2	100.3	100.5	100.7	100.4	100.5	100.7	100.2	100.5	100.5	100.2
9	100.0	99.7	100.8	100.9	101.0	100.8	101.3	101.0	100.7	100.9	100.8	100.6
10	100.0	99.5	99.9	99.9	100.1	99.9	100.2	100.0	99.9	99.9	99.2	99.3
11	100.0	100.0	99.7	99.7	99.8	99.6	100.0	100.1	99.6	99.9	99.7	99.6
12	100.0	99.3	100.3	100.6	100.9	100.7	101.2	100.8	100.5	100.8	100.5	100.4
13	100.0	100.6	100.6	100.3	100.5	100.2	100.6	100.5	100.2	100.5	100.4	100.2
14	100.0	101.2	100.7	100.6	100.6	100.5	100.5	100.3	100.1	100.3	100.0	100.0
15	100.0	101.3	101.0	100.8	100.8	100.6	100.7	100.6	100.2	100.6	100.2	100.2
16	100.0	100.0	100.0	99.6	99.7	99.6	99.8	99.8	99.2	99.3	99.1	99.0
17	100.0	100.4	100.3	100.1	100.2	99.8	100.2	100.1	99.8	100.1	99.6	99.6
18	100.0	100.6	100.5	100.3	100.4	100.1	100.4	100.2	99.9	100.0	99.1	99.6
19	100.0	100.9	100.7	100.4	100.4	100.1	100.2	100.0	99.8	99.9	99.7	99.5
20	100.0	100.3	100.5	100.2	100.2	100.1	100.3	100.3	99.9	100.0	99.7	99.7
21	100.0	100.2	100.2	99.9	100.0	99.8	100.2	100.1	99.7	99.8	99.6	99.5
22	100.0	100.0	99.9	99.5	99.4	99.3	99.1	99.3	98.8	98.9	98.9	98.7
23	100.0	100.5	100.3	100.0	100.0	99.8	99.7	99.9	99.7	99.8	99.4	99.5
24	100.0	100.3	100.1	100.0	100.0	99.8	99.5	99.8	99.5	99.8	99.4	99.3
n	24	24	24	24	24	24	24	24	24	24	24	24
Avg.	100.0	100.2	100.3	100.2	100.3	100.1	100.3	100.2	99.9	100.1	99.7	99.8
Med.	100.0	100.2	100.3	100.2	100.2	100.0	100.2	100.1	99.8	100.0	99.6	99.6
σ	0.00	0.64	0.42	0.45	0.46	0.44	0.53	0.46	0.47	0.51	0.53	0.51
Min.	100.0	98.8	99.6	99.5	99.4	99.3	99.1	99.3	98.8	98.9	98.9	98.7
Max.	100.0	101.3	101.0	100.9	101.0	100.8	101.3	101.0	100.7	100.9	100.8	100.6

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	0.0027	0.0019	-0.0013	0.0007	-0.0026	-0.0025

Test duration used	5000 h to 10000 h
B	1.0079
α	1.0732E-06
R ²	0.7821
Calculated L ₇₀ (10K)	340000 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	215000 hours
Reported L ₈₀ (10K)	> 60000 hours
Calculated L ₉₀ (10K)	106000 hours
Reported L ₉₀ (10K)	> 60000 hours

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7) / \alpha$$

$$L_{80} = \ln(B/0.8) / \alpha$$

$$L_{90} = \ln(B/0.9) / \alpha$$

Data Set 1 : 55 °C, 700 mA

Actual Case Temperature [T _s]	56.8 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 1-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	100.0	98.9	98.8	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7			
2	100.0	98.9	98.8	98.7	98.8	98.7	98.7	98.8	98.7	98.7	98.7	98.7			
3	100.0	98.8	98.7	98.6	98.6	98.6	98.6	98.7	98.6	98.6	98.6	98.6			
4	100.0	99.0	98.9	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.7			
5	100.0	99.0	98.9	98.9	98.9	98.8	98.8	98.9	98.8	98.8	98.8	98.8			
6	100.0	99.0	98.9	98.9	98.9	98.8	98.9	98.9	98.8	98.8	98.8	98.8			
7	100.0	99.1	99.1	99.0	99.0	99.0	99.0	99.0	98.9	99.0	99.0	98.9			
8	100.0	99.1	99.0	98.9	99.0	98.9	98.9	98.9	98.9	98.9	98.9	98.8			
9	100.0	99.0	99.0	98.9	98.9	98.9	98.9	98.9	98.8	98.9	98.9	98.8			
10	100.0	99.2	99.1	99.0	99.0	99.0	99.0	99.1	99.0	99.0	99.0	98.9			
11	100.0	99.1	99.0	98.9	98.9	98.9	98.9	98.9	98.8	98.9	98.9	98.8			
12	100.0	99.2	99.1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	98.9			
13	100.0	99.2	99.2	99.1	99.1	99.0	99.1	99.1	99.1	99.1	99.1	99.0			
14	100.0	98.7	98.6	98.5	98.6	98.5	98.6	98.6	98.5	98.6	98.6	98.5			
15	100.0	98.7	98.6	98.5	98.6	98.5	98.5	98.6	98.5	98.6	98.6	98.5			
16	100.0	98.4	98.3	98.3	98.3	98.2	98.3	98.3	98.2	98.3	98.3	98.2			
17	100.0	98.6	98.6	98.5	98.5	98.5	98.5	98.6	98.5	98.5	98.5	98.5			
18	100.0	98.6	98.6	98.5	98.5	98.5	98.5	98.6	98.5	98.6	98.6	98.5			
19	100.0	98.6	98.5	98.4	98.5	98.4	98.5	98.5	98.4	98.5	98.5	98.4			
20	100.0	98.6	98.5	98.4	98.5	98.4	98.4	98.5	98.4	98.5	98.5	98.4			
21	100.0	98.7	98.6	98.5	98.6	98.5	98.6	98.6	98.5	98.6	98.6	98.5			
22	100.0	98.7	98.6	98.5	98.6	98.5	98.5	98.6	98.5	98.6	98.5	98.5			
23	100.0	98.6	98.5	98.5	98.5	98.5	98.4	98.5	98.5	98.5	98.5	98.4			
24	100.0	98.6	98.6	98.5	98.5	98.5	98.4	98.6	98.5	98.5	98.5	98.5			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	100.0	98.9	98.8	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.6			
Med.	100.0	98.9	98.8	98.7	98.7	98.7	98.7	98.7	98.6	98.7	98.6	98.6			
σ	0.00	0.24	0.23	0.23	0.23	0.22	0.23	0.21	0.22	0.21	0.21	0.22			
Min.	100.0	98.4	98.3	98.3	98.3	98.2	98.3	98.3	98.2	98.3	98.3	98.2			
Max.	100.0	99.2	99.2	99.1	99.1	99.0	99.1	99.1	99.1	99.1	99.1	99.0			

Data Set 1 : 55 °C, 700 mA

Actual Case Temperature [T _s]	56.8 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 1-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0009	0.0012	0.0012	0.0013	0.0014	0.0014	0.0015	0.0015	0.0016	0.0015	0.0016			
2	0.0000	0.0008	0.0010	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013	0.0014	0.0014			
3	0.0000	0.0008	0.0011	0.0012	0.0013	0.0013	0.0013	0.0014	0.0014	0.0014	0.0014	0.0015			
4	0.0000	0.0011	0.0014	0.0015	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0015	0.0017			
5	0.0000	0.0009	0.0012	0.0013	0.0015	0.0015	0.0016	0.0016	0.0017	0.0017	0.0017	0.0017			
6	0.0000	0.0009	0.0011	0.0012	0.0012	0.0013	0.0012	0.0014	0.0014	0.0013	0.0014	0.0015			
7	0.0000	0.0011	0.0013	0.0014	0.0015	0.0014	0.0015	0.0016	0.0016	0.0016	0.0016	0.0017			
8	0.0000	0.0007	0.0012	0.0014	0.0015	0.0015	0.0015	0.0016	0.0016	0.0016	0.0017	0.0017			
9	0.0000	0.0008	0.0013	0.0014	0.0016	0.0016	0.0015	0.0016	0.0016	0.0017	0.0017	0.0017			
10	0.0000	0.0008	0.0011	0.0012	0.0013	0.0013	0.0014	0.0015	0.0015	0.0015	0.0014	0.0015			
11	0.0000	0.0010	0.0012	0.0012	0.0014	0.0013	0.0014	0.0015	0.0015	0.0015	0.0016	0.0015			
12	0.0000	0.0010	0.0013	0.0015	0.0016	0.0016	0.0015	0.0016	0.0017	0.0016	0.0017	0.0017			
13	0.0000	0.0011	0.0012	0.0013	0.0014	0.0015	0.0015	0.0015	0.0016	0.0016	0.0016	0.0017			
14	0.0000	0.0012	0.0012	0.0013	0.0015	0.0014	0.0015	0.0015	0.0016	0.0016	0.0016	0.0016			
15	0.0000	0.0012	0.0012	0.0014	0.0015	0.0014	0.0014	0.0016	0.0016	0.0015	0.0016	0.0017			
16	0.0000	0.0011	0.0012	0.0013	0.0014	0.0014	0.0015	0.0015	0.0015	0.0016	0.0015	0.0016			
17	0.0000	0.0010	0.0011	0.0012	0.0013	0.0013	0.0014	0.0014	0.0014	0.0015	0.0015	0.0015			
18	0.0000	0.0013	0.0013	0.0014	0.0015	0.0015	0.0014	0.0015	0.0015	0.0016	0.0014	0.0016			
19	0.0000	0.0012	0.0012	0.0013	0.0015	0.0015	0.0015	0.0014	0.0015	0.0015	0.0016	0.0015			
20	0.0000	0.0010	0.0013	0.0014	0.0015	0.0015	0.0016	0.0016	0.0016	0.0017	0.0016	0.0016			
21	0.0000	0.0011	0.0013	0.0013	0.0013	0.0014	0.0014	0.0015	0.0015	0.0015	0.0016	0.0015			
22	0.0000	0.0010	0.0011	0.0012	0.0014	0.0013	0.0013	0.0014	0.0014	0.0015	0.0015	0.0015			
23	0.0000	0.0011	0.0012	0.0013	0.0014	0.0014	0.0014	0.0015	0.0015	0.0015	0.0015	0.0016			
24	0.0000	0.0011	0.0012	0.0014	0.0014	0.0014	0.0012	0.0015	0.0015	0.0014	0.0016	0.0016			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0010	0.0012	0.0013	0.0014	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0016			
Med.	0.0000	0.0010	0.0012	0.0013	0.0014	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0016			
σ	0.0000	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			
Min.	0.0000	0.0007	0.0010	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013	0.0014	0.0014			
Max.	0.0000	0.0013	0.0014	0.0015	0.0016	0.0016	0.0016	0.0016	0.0017	0.0017	0.0017	0.0017			

Data Set 1 : 55 °C, 700 mA

Actual Case Temperature [T _s]	56.8 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _f]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 1-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2614	0.2605	0.2602	0.2602	0.2601	0.2600	0.2600	0.2599	0.2599	0.2598	0.2599	0.2598			
2	0.2591	0.2583	0.2581	0.2580	0.2580	0.2579	0.2579	0.2578	0.2578	0.2578	0.2577	0.2577			
3	0.2586	0.2578	0.2575	0.2574	0.2573	0.2573	0.2573	0.2572	0.2572	0.2572	0.2572	0.2571			
4	0.2589	0.2578	0.2576	0.2575	0.2574	0.2574	0.2573	0.2573	0.2573	0.2573	0.2574	0.2572			
5	0.2606	0.2597	0.2594	0.2593	0.2591	0.2591	0.2590	0.2590	0.2589	0.2589	0.2589	0.2589			
6	0.2591	0.2582	0.2580	0.2579	0.2579	0.2578	0.2579	0.2577	0.2577	0.2578	0.2577	0.2576			
7	0.2580	0.2569	0.2568	0.2567	0.2566	0.2566	0.2565	0.2564	0.2564	0.2564	0.2564	0.2563			
8	0.2605	0.2598	0.2593	0.2592	0.2590	0.2591	0.2590	0.2589	0.2589	0.2589	0.2588	0.2588			
9	0.2603	0.2595	0.2591	0.2590	0.2588	0.2588	0.2588	0.2587	0.2587	0.2586	0.2586	0.2586			
10	0.2604	0.2596	0.2593	0.2592	0.2591	0.2591	0.2590	0.2589	0.2589	0.2589	0.2590	0.2589			
11	0.2589	0.2579	0.2578	0.2577	0.2575	0.2576	0.2575	0.2574	0.2574	0.2574	0.2573	0.2574			
12	0.2596	0.2586	0.2584	0.2582	0.2581	0.2581	0.2581	0.2580	0.2579	0.2580	0.2579	0.2579			
13	0.2603	0.2592	0.2591	0.2590	0.2589	0.2588	0.2588	0.2588	0.2587	0.2587	0.2587	0.2586			
14	0.2585	0.2573	0.2573	0.2572	0.2571	0.2571	0.2570	0.2570	0.2569	0.2569	0.2569	0.2569			
15	0.2583	0.2571	0.2571	0.2570	0.2569	0.2569	0.2569	0.2567	0.2567	0.2568	0.2567	0.2566			
16	0.2580	0.2569	0.2568	0.2567	0.2566	0.2566	0.2565	0.2565	0.2565	0.2564	0.2565	0.2564			
17	0.2594	0.2584	0.2583	0.2582	0.2581	0.2581	0.2580	0.2580	0.2580	0.2579	0.2579	0.2579			
18	0.2589	0.2577	0.2577	0.2576	0.2575	0.2575	0.2575	0.2574	0.2574	0.2573	0.2575	0.2573			
19	0.2574	0.2563	0.2563	0.2562	0.2560	0.2560	0.2560	0.2560	0.2559	0.2559	0.2558	0.2559			
20	0.2594	0.2584	0.2582	0.2581	0.2580	0.2580	0.2579	0.2578	0.2578	0.2577	0.2578	0.2578			
21	0.2607	0.2596	0.2595	0.2595	0.2594	0.2593	0.2593	0.2592	0.2592	0.2592	0.2591	0.2592			
22	0.2584	0.2574	0.2573	0.2572	0.2571	0.2571	0.2571	0.2570	0.2570	0.2569	0.2569	0.2569			
23	0.2581	0.2570	0.2569	0.2569	0.2568	0.2567	0.2567	0.2566	0.2566	0.2566	0.2566	0.2565			
24	0.2605	0.2594	0.2593	0.2592	0.2592	0.2591	0.2593	0.2590	0.2590	0.2591	0.2589	0.2589			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2593	0.2583	0.2581	0.2580	0.2579	0.2579	0.2579	0.2578	0.2578	0.2578	0.2578	0.2577			
Med.	0.2591	0.2583	0.2581	0.2580	0.2580	0.2579	0.2579	0.2578	0.2578	0.2578	0.2577	0.2577			
σ	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0010	0.0011	0.0011	0.0010	0.0011			
Min.	0.2574	0.2563	0.2563	0.2562	0.2560	0.2560	0.2560	0.2560	0.2559	0.2559	0.2558	0.2559			
Max.	0.2614	0.2605	0.2602	0.2602	0.2601	0.2600	0.2600	0.2599	0.2599	0.2598	0.2599	0.2598			

Data Set 1 : 55 °C, 700 mA

Actual Case Temperature [T _s]	56.8 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _f]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 1-6
Chromaticity

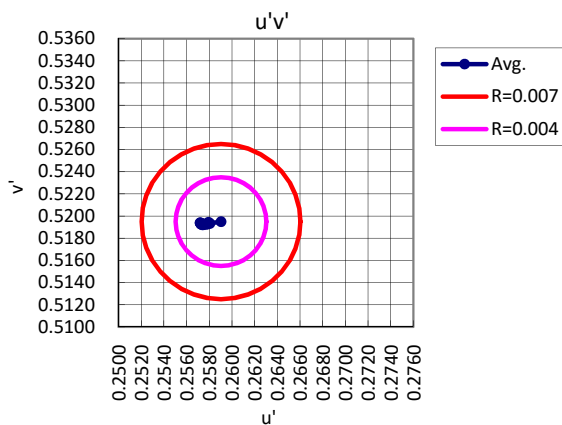
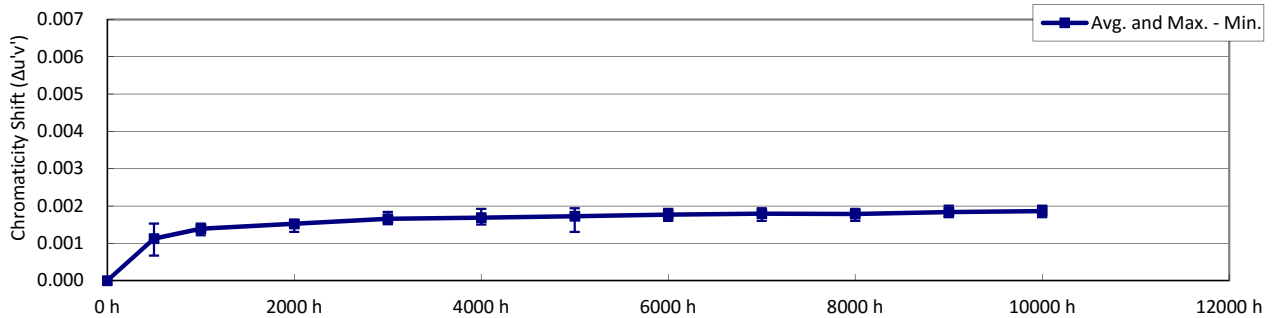
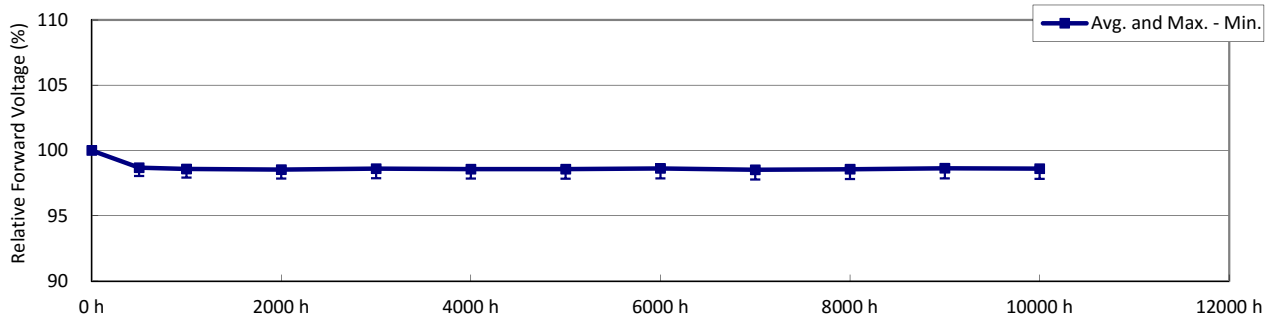
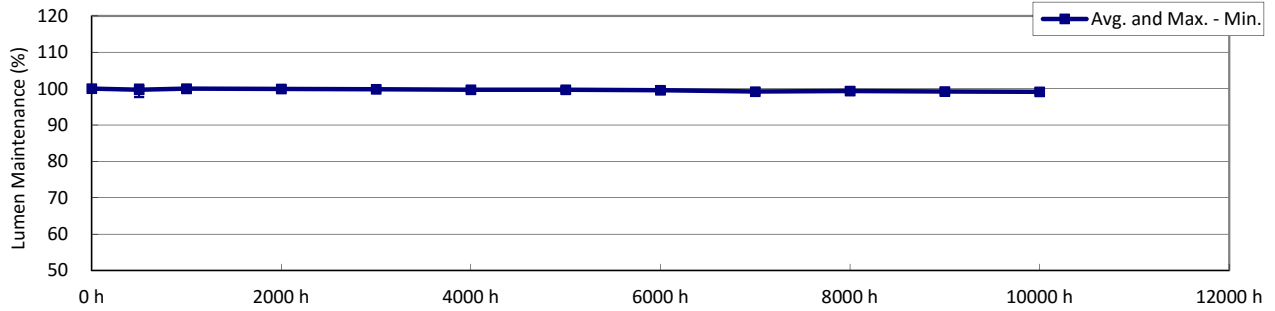
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5216	0.5215	0.5214	0.5214	0.5214	0.5214	0.5214	0.5215	0.5214	0.5215	0.5215	0.5215			
2	0.5177	0.5176	0.5175	0.5174	0.5175	0.5175	0.5175	0.5176	0.5175	0.5176	0.5176	0.5176			
3	0.5167	0.5166	0.5164	0.5164	0.5165	0.5165	0.5165	0.5166	0.5165	0.5166	0.5166	0.5166			
4	0.5169	0.5166	0.5165	0.5165	0.5165	0.5165	0.5165	0.5166	0.5166	0.5166	0.5169	0.5166			
5	0.5196	0.5196	0.5194	0.5193	0.5193	0.5193	0.5193	0.5194	0.5193	0.5194	0.5194	0.5194			
6	0.5162	0.5161	0.5160	0.5161	0.5160	0.5161	0.5162	0.5162	0.5161	0.5162	0.5162	0.5162			
7	0.5167	0.5164	0.5163	0.5163	0.5163	0.5164	0.5164	0.5165	0.5164	0.5164	0.5165	0.5165			
8	0.5188	0.5189	0.5185	0.5184	0.5185	0.5184	0.5185	0.5185	0.5185	0.5185	0.5185	0.5185			
9	0.5188	0.5188	0.5184	0.5184	0.5184	0.5184	0.5185	0.5185	0.5185	0.5185	0.5186	0.5185			
10	0.5190	0.5190	0.5189	0.5189	0.5189	0.5189	0.5189	0.5189	0.5189	0.5189	0.5191	0.5190			
11	0.5179	0.5176	0.5175	0.5176	0.5176	0.5176	0.5176	0.5177	0.5177	0.5177	0.5177	0.5177			
12	0.5177	0.5175	0.5173	0.5172	0.5173	0.5173	0.5174	0.5173	0.5173	0.5174	0.5173	0.5173			
13	0.5204	0.5202	0.5201	0.5201	0.5201	0.5201	0.5202	0.5202	0.5202	0.5202	0.5202	0.5203			
14	0.5166	0.5163	0.5163	0.5163	0.5162	0.5163	0.5163	0.5163	0.5164	0.5164	0.5163	0.5163			
15	0.5173	0.5170	0.5170	0.5169	0.5169	0.5170	0.5170	0.5170	0.5170	0.5170	0.5170	0.5170			
16	0.5154	0.5152	0.5152	0.5152	0.5152	0.5152	0.5152	0.5153	0.5153	0.5153	0.5153	0.5153			
17	0.5174	0.5172	0.5171	0.5171	0.5171	0.5172	0.5171	0.5172	0.5172	0.5172	0.5172	0.5172			
18	0.5181	0.5177	0.5177	0.5177	0.5177	0.5177	0.5178	0.5178	0.5178	0.5178	0.5179	0.5178			
19	0.5158	0.5154	0.5154	0.5154	0.5154	0.5154	0.5154	0.5155	0.5155	0.5155	0.5155	0.5155			
20	0.5167	0.5164	0.5163	0.5163	0.5163	0.5163	0.5163	0.5163	0.5163	0.5163	0.5163	0.5163			
21	0.5186	0.5183	0.5182	0.5182	0.5183	0.5183	0.5183	0.5183	0.5183	0.5183	0.5183	0.5183			
22	0.5175	0.5172	0.5172	0.5172	0.5171	0.5172	0.5172	0.5172	0.5172	0.5173	0.5173	0.5173			
23	0.5164	0.5161	0.5161	0.5160	0.5160	0.5161	0.5161	0.5161	0.5161	0.5161	0.5161	0.5161			
24	0.5181	0.5178	0.5178	0.5177	0.5177	0.5178	0.5179	0.5178	0.5178	0.5179	0.5179	0.5178			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5177	0.5175	0.5174	0.5174	0.5174	0.5175	0.5175	0.5175	0.5175	0.5175	0.5176	0.5175			
Med.	0.5176	0.5174	0.5173	0.5172	0.5172	0.5173	0.5173	0.5173	0.5173	0.5174	0.5173	0.5173			
σ	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015			
Min.	0.5154	0.5152	0.5152	0.5152	0.5152	0.5152	0.5152	0.5153	0.5153	0.5153	0.5153	0.5153			
Max.	0.5216	0.5215	0.5214	0.5214	0.5214	0.5214	0.5214	0.5215	0.5214	0.5215	0.5215	0.5215			

Data Set 2 : 55 °C, 1500 mA

Actual Case Temperature [T_S]	59.8 °C
Actual Ambient Temperature [T_A]	58.1 °C
Drive Current [I_f]	1500 mA
Measurement Current	1500 mA

NOTES:

T_S and T_A were measured during initial setup.



Data Set 2 : 55 °C, 1500 mA

Actual Case Temperature [T _S]	59.8 °C
Actual Ambient Temperature [T _A]	58.1 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 2-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _V [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	476	3.24	2827	0.444	0.397	0.258	0.520						
2	478	3.25	2815	0.444	0.396	0.259	0.519						
3	480	3.25	2806	0.445	0.397	0.259	0.520						
4	479	3.24	2813	0.445	0.397	0.259	0.520						
5	481	3.24	2866	0.440	0.394	0.257	0.518						
6	481	3.24	2829	0.445	0.400	0.258	0.521						
7	484	3.24	2845	0.445	0.401	0.257	0.521						
8	477	3.24	2815	0.444	0.395	0.259	0.519						
9	476	3.24	2774	0.448	0.399	0.260	0.521						
10	480	3.24	2814	0.445	0.398	0.259	0.520						
11	478	3.24	2788	0.448	0.400	0.260	0.521						
12	479	3.24	2797	0.448	0.400	0.259	0.522						
13	477	3.24	2767	0.451	0.404	0.260	0.523						
14	480	3.25	2841	0.442	0.395	0.258	0.519						
15	473	3.24	2826	0.442	0.393	0.259	0.518						
16	473	3.24	2808	0.444	0.396	0.259	0.519						
17	471	3.24	2783	0.448	0.398	0.260	0.521						
18	478	3.25	2831	0.442	0.394	0.258	0.518						
19	477	3.25	2839	0.440	0.392	0.258	0.517						
20	475	3.25	2856	0.439	0.391	0.258	0.517						
21	468	3.25	2726	0.452	0.399	0.262	0.522						
22	480	3.18	2802	0.444	0.393	0.260	0.518						
23	478	3.18	2794	0.443	0.392	0.260	0.518						
24	469	3.19	2789	0.444	0.392	0.260	0.518						
n	24	24	24	24	24	24	24						
Avg.	477	3.24	2810	0.445	0.396	0.259	0.520						
Med.	478	3.24	2813	0.444	0.396	0.259	0.519						
σ	3.9	0.021	31.1	0.0032	0.0033	0.0012	0.0017						
Min.	468	3.18	2726	0.439	0.391	0.257	0.517						
Max.	484	3.25	2866	0.452	0.404	0.262	0.523						

Data Set 2 : 55 °C, 1500 mA

Actual Case Temperature [T _s]	59.8 °C
Actual Ambient Temperature [T _A]	58.1 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 2-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)													
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h		
1	100.0	98.7	99.6	99.5	99.4	99.2	99.4	99.1	98.8	98.9	98.8	98.7		
2	100.0	99.1	99.5	99.6	99.4	99.2	99.2	99.3	98.9	98.9	98.8	98.8		
3	100.0	99.3	99.8	100.0	99.7	99.7	99.8	99.4	99.0	99.2	99.0	99.0		
4	100.0	99.1	99.8	99.7	99.5	99.2	99.5	99.3	99.0	98.9	98.9	98.8		
5	100.0	99.1	99.3	99.3	99.3	99.1	99.0	98.9	98.5	98.9	98.6	98.5		
6	100.0	98.3	99.5	99.6	99.4	99.3	99.5	99.3	98.9	99.1	98.9	98.9		
7	100.0	100.2	100.1	99.7	99.6	99.6	99.8	99.4	99.1	99.2	99.2	98.9		
8	100.0	97.7	98.8	99.3	99.3	99.1	99.1	99.2	98.7	98.8	98.7	98.8		
9	100.0	100.3	100.1	99.9	99.9	99.9	99.5	99.3	98.9	99.0	98.9	98.8		
10	100.0	99.4	100.1	99.7	99.6	99.4	99.7	99.4	99.1	99.2	99.0	99.2		
11	100.0	98.3	99.5	99.3	99.2	99.3	99.3	99.2	98.7	98.8	98.9	98.6		
12	100.0	100.0	100.2	100.0	100.0	100.2	99.0	99.4	99.3	99.7	99.4	99.3		
13	100.0	101.0	100.8	100.5	100.5	100.2	100.2	100.2	99.7	99.6	99.7	99.4		
14	100.0	99.8	99.8	99.9	99.9	99.6	99.5	99.4	99.1	99.4	99.1	99.2		
15	100.0	100.3	100.4	100.3	100.4	100.2	100.4	100.1	99.8	100.0	99.8	99.7		
16	100.0	100.7	100.9	100.7	100.7	100.3	100.3	100.4	100.1	100.1	100.1	99.9		
17	100.0	100.4	100.2	100.0	100.0	99.9	100.1	99.7	99.3	99.6	99.4	99.5		
18	100.0	98.7	99.5	99.8	99.9	99.7	99.9	99.6	99.2	99.5	99.3	99.2		
19	100.0	100.5	100.6	100.3	100.3	100.2	100.2	100.2	99.6	99.9	99.9	99.8		
20	100.0	99.5	99.8	99.9	99.9	99.6	99.8	99.6	99.4	99.4	99.3	99.2		
21	100.0	100.7	100.8	100.6	100.6	100.4	100.5	100.4	100.1	100.3	100.1	100.0		
22	100.0	100.5	100.2	99.8	99.8	99.6	99.5	99.3	99.0	98.9	99.0	98.9		
23	100.0	100.2	99.9	99.8	99.6	99.4	99.4	99.4	98.7	99.1	98.9	98.6		
24	100.0	101.1	100.9	100.6	100.5	100.3	100.1	100.1	99.7	99.9	99.8	99.7		
n	24	24	24	24	24	24	24	24	24	24	24	24		
Avg.	100.0	99.7	100.0	99.9	99.8	99.7	99.7	99.6	99.2	99.4	99.2	99.1		
Med.	100.0	99.9	100.0	99.9	99.8	99.6	99.6	99.4	99.1	99.2	99.1	99.1		
σ	0.00	0.93	0.54	0.41	0.45	0.44	0.44	0.43	0.44	0.45	0.45	0.43		
Min.	100.0	97.7	98.8	99.3	99.2	99.1	99.0	98.9	98.5	98.8	98.6	98.5		
Max.	100.0	101.1	100.9	100.7	100.7	100.4	100.5	100.4	100.1	100.3	100.1	100.0		

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h								
ln(Avg.)	-0.0031	-0.0044	-0.0081	-0.0065	-0.0078	-0.0086								

Test duration used	5000 h	to	10000 h
B	1.0013		
α	1.0300E-06		
R ²	0.7623		
Calculated L ₇₀ (10K)	348000	hours	
Reported L ₇₀ (10K)	> 60000	hours	
Calculated L ₈₀ (10K)	218000	hours	
Reported L ₈₀ (10K)	> 60000	hours	
Calculated L ₉₀ (10K)	104000	hours	
Reported L ₉₀ (10K)	> 60000	hours	

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7) / \alpha$$

$$L_{80} = \ln(B/0.8) / \alpha$$

$$L_{90} = \ln(B/0.9) / \alpha$$

Data Set 2 : 55 °C, 1500 mA

Actual Case Temperature [T _s]	59.8 °C
Actual Ambient Temperature [T _A]	58.1 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 2-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	100.0	98.8	98.7	98.7	98.7	98.7	98.7	98.7	98.6	98.7	98.7	98.7			
2	100.0	98.7	98.6	98.6	98.6	98.6	98.6	98.7	98.6	98.6	98.7	98.6			
3	100.0	98.7	98.6	98.6	98.6	98.6	98.6	98.6	98.5	98.6	98.7	98.6			
4	100.0	98.8	98.7	98.6	98.7	98.7	98.7	98.7	98.6	98.7	98.7	98.7			
5	100.0	98.8	98.7	98.6	98.7	98.7	98.7	98.7	98.6	98.7	98.8	98.7			
6	100.0	98.7	98.7	98.6	98.7	98.6	98.7	98.7	98.6	98.7	98.7	98.7			
7	100.0	98.8	98.7	98.6	98.7	98.7	98.7	98.7	98.6	98.7	98.8	98.7			
8	100.0	98.8	98.7	98.6	98.7	98.7	98.7	98.7	98.6	98.7	98.8	98.7			
9	100.0	98.7	98.7	98.6	98.7	98.6	98.7	98.7	98.6	98.7	98.7	98.7			
10	100.0	98.8	98.7	98.7	98.7	98.7	98.7	98.8	98.7	98.7	98.8	98.7			
11	100.0	98.8	98.7	98.6	98.7	98.7	98.7	98.8	98.6	98.7	98.8	98.7			
12	100.0	98.8	98.7	98.7	98.7	98.7	98.7	98.8	98.7	98.7	98.8	98.7			
13	100.0	98.8	98.6	98.6	98.7	98.7	98.6	98.7	98.6	98.7	98.7	98.7			
14	100.0	98.6	98.5	98.5	98.6	98.5	98.5	98.6	98.5	98.5	98.6	98.5			
15	100.0	98.8	98.7	98.6	98.7	98.7	98.6	98.7	98.6	98.7	98.7	98.7			
16	100.0	98.8	98.7	98.6	98.7	98.7	98.6	98.7	98.6	98.6	98.7	98.7			
17	100.0	98.7	98.6	98.6	98.7	98.7	98.7	98.7	98.6	98.6	98.7	98.7			
18	100.0	98.6	98.5	98.4	98.5	98.5	98.5	98.5	98.4	98.4	98.5	98.5			
19	100.0	98.6	98.5	98.4	98.5	98.5	98.5	98.5	98.4	98.5	98.5	98.5			
20	100.0	98.6	98.5	98.5	98.6	98.5	98.5	98.6	98.5	98.5	98.6	98.6			
21	100.0	98.6	98.5	98.4	98.5	98.5	98.5	98.5	98.4	98.5	98.5	98.5			
22	100.0	98.7	98.6	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5			
23	100.0	98.7	98.5	98.5	98.5	98.5	98.5	98.5	98.4	98.4	98.5	98.5			
24	100.0	98.1	97.9	97.8	97.9	97.9	97.9	97.8	97.9	97.8	97.9	97.8			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	100.0	98.7	98.6	98.5	98.6	98.6	98.6	98.6	98.5	98.6	98.6	98.6			
Med.	100.0	98.7	98.7	98.6	98.7	98.6	98.6	98.7	98.6	98.6	98.7	98.7			
σ	0.00	0.15	0.16	0.17	0.18	0.17	0.18	0.19	0.18	0.18	0.19	0.19			
Min.	100.0	98.1	97.9	97.8	97.9	97.9	97.8	97.9	97.8	97.8	97.9	97.8			
Max.	100.0	98.8	98.7	98.7	98.7	98.7	98.7	98.8	98.7	98.7	98.8	98.7			

Data Set 2 : 55 °C, 1500 mA

Actual Case Temperature [T _s]	59.8 °C
Actual Ambient Temperature [T _A]	58.1 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 2-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0008	0.0012	0.0014	0.0015	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018			
2	0.0000	0.0009	0.0013	0.0014	0.0015	0.0015	0.0016	0.0016	0.0016	0.0017	0.0017	0.0017			
3	0.0000	0.0010	0.0013	0.0013	0.0015	0.0015	0.0015	0.0016	0.0016	0.0016	0.0017	0.0017			
4	0.0000	0.0010	0.0014	0.0015	0.0016	0.0016	0.0017	0.0017	0.0017	0.0017	0.0018	0.0018			
5	0.0000	0.0011	0.0013	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0018	0.0019	0.0019			
6	0.0000	0.0010	0.0014	0.0016	0.0017	0.0017	0.0017	0.0019	0.0019	0.0018	0.0019	0.0019			
7	0.0000	0.0013	0.0014	0.0015	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0019			
8	0.0000	0.0007	0.0012	0.0014	0.0016	0.0017	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018			
9	0.0000	0.0012	0.0014	0.0015	0.0016	0.0015	0.0016	0.0017	0.0018	0.0017	0.0018	0.0018			
10	0.0000	0.0011	0.0015	0.0015	0.0017	0.0018	0.0019	0.0019	0.0019	0.0019	0.0020	0.0020			
11	0.0000	0.0008	0.0013	0.0014	0.0016	0.0016	0.0016	0.0016	0.0016	0.0017	0.0017	0.0017			
12	0.0000	0.0011	0.0013	0.0014	0.0016	0.0015	0.0013	0.0016	0.0017	0.0017	0.0018	0.0018			
13	0.0000	0.0013	0.0014	0.0016	0.0016	0.0017	0.0018	0.0017	0.0018	0.0018	0.0018	0.0019			
14	0.0000	0.0010	0.0013	0.0015	0.0016	0.0016	0.0017	0.0017	0.0017	0.0017	0.0018	0.0018			
15	0.0000	0.0012	0.0015	0.0016	0.0017	0.0018	0.0018	0.0019	0.0019	0.0018	0.0019	0.0020			
16	0.0000	0.0013	0.0015	0.0016	0.0018	0.0018	0.0019	0.0019	0.0019	0.0019	0.0020	0.0020			
17	0.0000	0.0012	0.0014	0.0015	0.0017	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018	0.0019			
18	0.0000	0.0010	0.0013	0.0015	0.0016	0.0017	0.0017	0.0018	0.0018	0.0017	0.0018	0.0019			
19	0.0000	0.0013	0.0014	0.0016	0.0016	0.0018	0.0018	0.0018	0.0019	0.0019	0.0019	0.0019			
20	0.0000	0.0012	0.0013	0.0016	0.0017	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018	0.0019			
21	0.0000	0.0013	0.0015	0.0016	0.0018	0.0018	0.0018	0.0019	0.0019	0.0018	0.0020	0.0020			
22	0.0000	0.0013	0.0014	0.0015	0.0016	0.0017	0.0017	0.0017	0.0018	0.0017	0.0018	0.0018			
23	0.0000	0.0012	0.0014	0.0015	0.0016	0.0017	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018			
24	0.0000	0.0015	0.0015	0.0016	0.0018	0.0019	0.0018	0.0019	0.0019	0.0019	0.0019	0.0019			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0011	0.0014	0.0015	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0018	0.0019			
Med.	0.0000	0.0012	0.0014	0.0015	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0019			
σ	0.0000	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			
Min.	0.0000	0.0007	0.0012	0.0013	0.0015	0.0015	0.0013	0.0016	0.0016	0.0016	0.0017	0.0017			
Max.	0.0000	0.0015	0.0015	0.0016	0.0018	0.0019	0.0019	0.0019	0.0019	0.0019	0.0020	0.0020			

Data Set 2 : 55 °C, 1500 mA

Actual Case Temperature [T _s]	59.8 °C
Actual Ambient Temperature [T _A]	58.1 °C
Drive Current [I _f]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 2-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2572	0.2564	0.2560	0.2558	0.2557	0.2556	0.2555	0.2555	0.2555	0.2554	0.2554	0.2554			
2	0.2579	0.2570	0.2566	0.2565	0.2564	0.2564	0.2563	0.2563	0.2563	0.2562	0.2562	0.2562			
3	0.2585	0.2575	0.2572	0.2572	0.2570	0.2570	0.2570	0.2569	0.2569	0.2569	0.2568	0.2568			
4	0.2580	0.2570	0.2566	0.2565	0.2564	0.2564	0.2563	0.2563	0.2563	0.2563	0.2562	0.2562			
5	0.2560	0.2549	0.2547	0.2545	0.2544	0.2544	0.2543	0.2542	0.2542	0.2542	0.2541	0.2541			
6	0.2574	0.2564	0.2560	0.2558	0.2557	0.2557	0.2557	0.2555	0.2555	0.2556	0.2555	0.2555			
7	0.2562	0.2549	0.2548	0.2547	0.2546	0.2545	0.2545	0.2545	0.2544	0.2544	0.2544	0.2543			
8	0.2580	0.2574	0.2568	0.2566	0.2565	0.2563	0.2563	0.2563	0.2563	0.2562	0.2562	0.2562			
9	0.2597	0.2585	0.2583	0.2582	0.2581	0.2582	0.2581	0.2580	0.2579	0.2580	0.2579	0.2579			
10	0.2578	0.2567	0.2563	0.2563	0.2561	0.2560	0.2559	0.2559	0.2559	0.2559	0.2558	0.2558			
11	0.2585	0.2577	0.2572	0.2571	0.2569	0.2569	0.2569	0.2569	0.2569	0.2568	0.2568	0.2568			
12	0.2583	0.2572	0.2570	0.2569	0.2567	0.2568	0.2570	0.2567	0.2566	0.2566	0.2565	0.2565			
13	0.2592	0.2579	0.2578	0.2576	0.2576	0.2575	0.2574	0.2575	0.2574	0.2574	0.2574	0.2573			
14	0.2568	0.2558	0.2555	0.2553	0.2552	0.2552	0.2551	0.2551	0.2551	0.2551	0.2550	0.2550			
15	0.2579	0.2567	0.2564	0.2563	0.2562	0.2561	0.2561	0.2560	0.2560	0.2561	0.2560	0.2559			
16	0.2581	0.2568	0.2566	0.2565	0.2563	0.2563	0.2562	0.2562	0.2562	0.2562	0.2561	0.2561			
17	0.2587	0.2575	0.2573	0.2572	0.2570	0.2570	0.2569	0.2569	0.2569	0.2569	0.2569	0.2568			
18	0.2577	0.2567	0.2564	0.2562	0.2561	0.2560	0.2560	0.2559	0.2559	0.2560	0.2559	0.2558			
19	0.2573	0.2560	0.2559	0.2557	0.2557	0.2555	0.2555	0.2555	0.2554	0.2554	0.2554	0.2554			
20	0.2565	0.2553	0.2552	0.2549	0.2548	0.2548	0.2547	0.2547	0.2547	0.2547	0.2547	0.2546			
21	0.2614	0.2601	0.2599	0.2598	0.2596	0.2596	0.2596	0.2595	0.2595	0.2596	0.2594	0.2594			
22	0.2588	0.2575	0.2574	0.2573	0.2572	0.2571	0.2571	0.2571	0.2570	0.2571	0.2570	0.2570			
23	0.2592	0.2580	0.2578	0.2577	0.2576	0.2575	0.2575	0.2575	0.2575	0.2574	0.2574	0.2574			
24	0.2596	0.2581	0.2581	0.2580	0.2578	0.2577	0.2578	0.2577	0.2577	0.2577	0.2577	0.2577			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2581	0.2570	0.2567	0.2566	0.2565	0.2564	0.2564	0.2564	0.2563	0.2563	0.2563	0.2563			
Med.	0.2580	0.2570	0.2566	0.2565	0.2564	0.2564	0.2563	0.2563	0.2563	0.2562	0.2562	0.2562			
σ	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012			
Min.	0.2560	0.2549	0.2547	0.2545	0.2544	0.2544	0.2543	0.2542	0.2542	0.2542	0.2541	0.2541			
Max.	0.2614	0.2601	0.2599	0.2598	0.2596	0.2596	0.2596	0.2595	0.2595	0.2596	0.2594	0.2594			

Data Set 2 : 55 °C, 1500 mA

Actual Case Temperature [T _s]	59.8 °C
Actual Ambient Temperature [T _A]	58.1 °C
Drive Current [I _f]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 2-6
Chromaticity

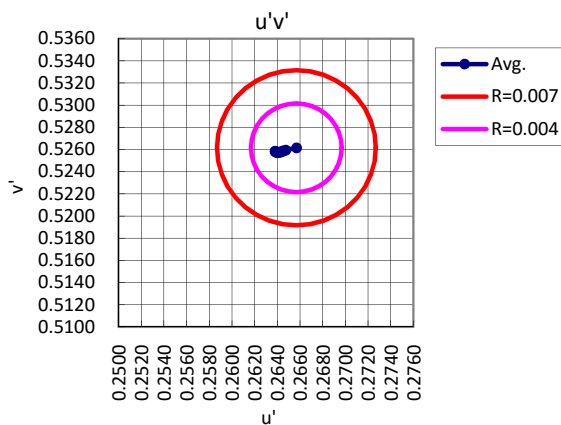
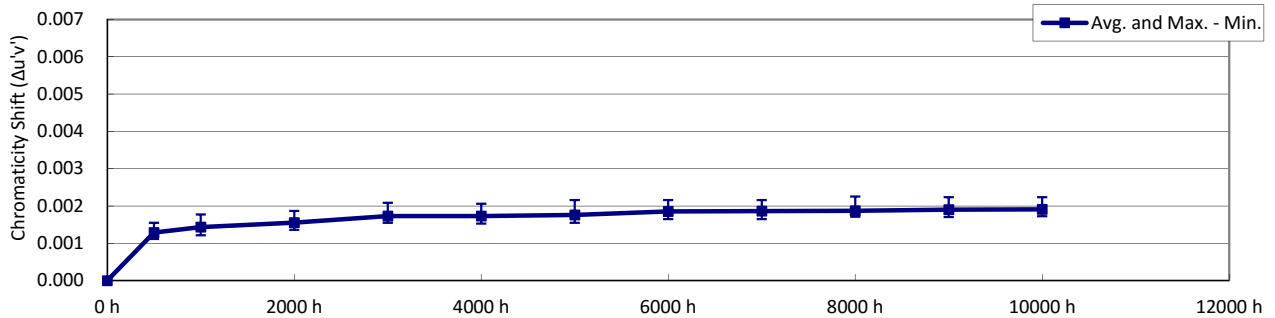
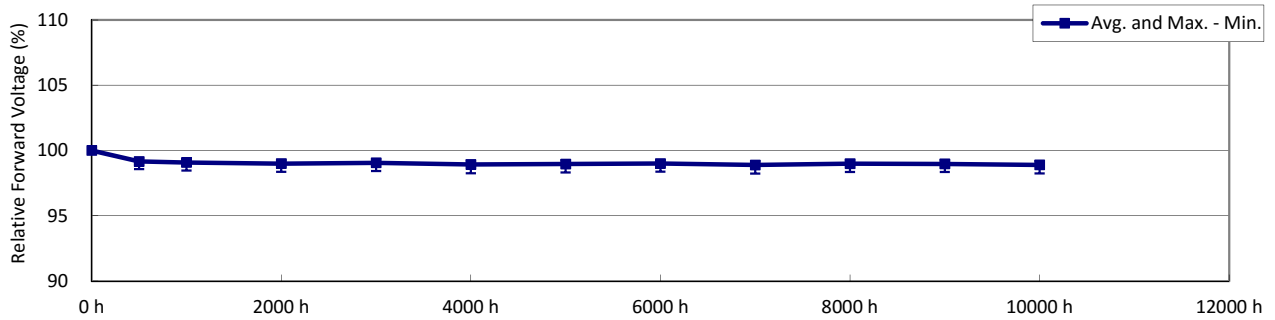
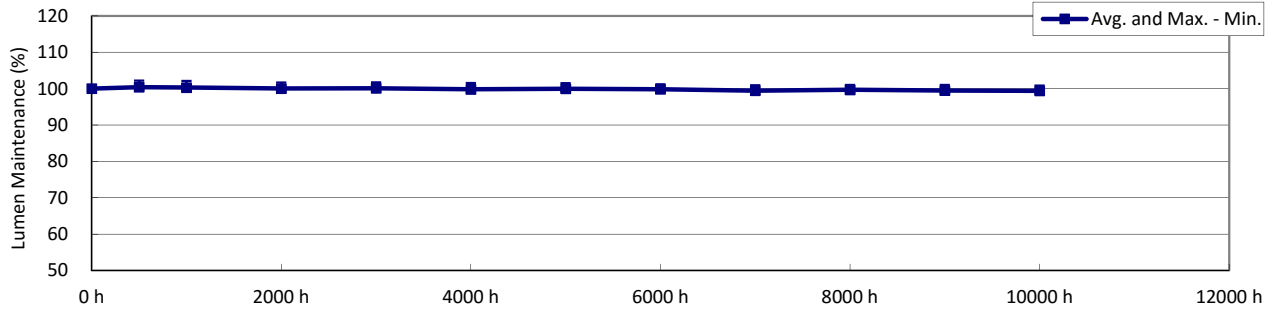
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5186	0.5187	0.5184	0.5184	0.5183	0.5184	0.5183	0.5183	0.5183	0.5184	0.5185	0.5185			
2	0.5178	0.5180	0.5176	0.5177	0.5176	0.5177	0.5177	0.5177	0.5177	0.5177	0.5178	0.5178			
3	0.5188	0.5188	0.5186	0.5187	0.5186	0.5187	0.5187	0.5187	0.5187	0.5187	0.5187	0.5187			
4	0.5185	0.5185	0.5183	0.5183	0.5183	0.5184	0.5183	0.5184	0.5184	0.5184	0.5185	0.5185			
5	0.5169	0.5168	0.5166	0.5166	0.5165	0.5166	0.5166	0.5166	0.5166	0.5166	0.5167	0.5167			
6	0.5202	0.5202	0.5199	0.5199	0.5198	0.5199	0.5199	0.5199	0.5199	0.5200	0.5200	0.5201			
7	0.5202	0.5201	0.5200	0.5200	0.5200	0.5200	0.5200	0.5200	0.5200	0.5201	0.5201	0.5201			
8	0.5178	0.5181	0.5176	0.5175	0.5174	0.5175	0.5174	0.5175	0.5175	0.5175	0.5176	0.5176			
9	0.5204	0.5202	0.5202	0.5203	0.5202	0.5203	0.5202	0.5202	0.5203	0.5203	0.5203	0.5204			
10	0.5192	0.5191	0.5189	0.5189	0.5189	0.5189	0.5189	0.5189	0.5189	0.5189	0.5190	0.5190			
11	0.5200	0.5202	0.5198	0.5198	0.5198	0.5199	0.5198	0.5198	0.5199	0.5199	0.5200	0.5199			
12	0.5207	0.5206	0.5204	0.5205	0.5204	0.5206	0.5208	0.5206	0.5205	0.5206	0.5206	0.5206			
13	0.5224	0.5224	0.5223	0.5224	0.5223	0.5224	0.5223	0.5224	0.5224	0.5224	0.5225	0.5225			
14	0.5173	0.5173	0.5171	0.5171	0.5170	0.5171	0.5171	0.5171	0.5171	0.5171	0.5172	0.5172			
15	0.5170	0.5168	0.5167	0.5167	0.5167	0.5167	0.5167	0.5168	0.5168	0.5168	0.5169	0.5169			
16	0.5179	0.5177	0.5176	0.5176	0.5175	0.5176	0.5175	0.5176	0.5176	0.5176	0.5177	0.5177			
17	0.5195	0.5194	0.5192	0.5193	0.5192	0.5193	0.5193	0.5193	0.5193	0.5193	0.5194	0.5194			
18	0.5172	0.5173	0.5171	0.5170	0.5169	0.5170	0.5171	0.5170	0.5170	0.5172	0.5172	0.5172			
19	0.5158	0.5156	0.5155	0.5155	0.5154	0.5155	0.5155	0.5155	0.5155	0.5154	0.5155	0.5156			
20	0.5152	0.5151	0.5149	0.5149	0.5148	0.5150	0.5149	0.5149	0.5149	0.5150	0.5151	0.5151			
21	0.5208	0.5207	0.5206	0.5207	0.5206	0.5206	0.5207	0.5206	0.5207	0.5207	0.5207	0.5208			
22	0.5171	0.5168	0.5168	0.5168	0.5168	0.5169	0.5168	0.5168	0.5169	0.5169	0.5169	0.5170			
23	0.5165	0.5163	0.5162	0.5162	0.5161	0.5162	0.5162	0.5162	0.5162	0.5163	0.5163	0.5163			
24	0.5170	0.5167	0.5167	0.5167	0.5167	0.5167	0.5168	0.5167	0.5168	0.5168	0.5168	0.5169			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5185	0.5184	0.5182	0.5182	0.5182	0.5182	0.5182	0.5182	0.5182	0.5183	0.5183	0.5184			
Med.	0.5182	0.5183	0.5180	0.5180	0.5180	0.5181	0.5180	0.5180	0.5180	0.5181	0.5182	0.5182			
σ	0.0018	0.0018	0.0018	0.0019	0.0019	0.0018	0.0019	0.0019	0.0019	0.0018	0.0018	0.0018			
Min.	0.5152	0.5151	0.5149	0.5149	0.5148	0.5150	0.5149	0.5149	0.5149	0.5150	0.5151	0.5151			
Max.	0.5224	0.5224	0.5223	0.5224	0.5223	0.5224	0.5223	0.5224	0.5224	0.5224	0.5225	0.5225			

Data Set 3 : 85 °C, 700 mA

Actual Case Temperature [T _S]	87.6 °C
Actual Ambient Temperature [T _A]	84.9 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_S and T_A were measured during initial setup.



Data Set 3 : 85 °C, 700 mA

Actual Case Temperature [T _S]	87.6 °C
Actual Ambient Temperature [T _A]	84.9 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 3-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _V [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	243	3.04	2639	0.461	0.405	0.266	0.526						
2	246	3.05	2679	0.459	0.406	0.264	0.526						
3	244	3.04	2649	0.461	0.406	0.265	0.526						
4	245	3.03	2640	0.462	0.407	0.266	0.526						
5	244	3.04	2629	0.464	0.409	0.266	0.527						
6	241	3.05	2578	0.470	0.413	0.268	0.530						
7	237	2.95	2589	0.467	0.408	0.268	0.528						
8	240	2.95	2609	0.464	0.406	0.267	0.526						
9	243	2.95	2685	0.458	0.406	0.264	0.525						
10	243	2.95	2670	0.458	0.404	0.264	0.525						
11	243	2.95	2662	0.459	0.405	0.265	0.525						
12	243	2.95	2638	0.462	0.406	0.266	0.526						
13	244	2.95	2659	0.461	0.407	0.265	0.526						
14	246	2.95	2671	0.459	0.405	0.264	0.525						
15	243	2.95	2634	0.462	0.406	0.266	0.526						
16	242	2.95	2624	0.464	0.409	0.266	0.527						
17	240	2.95	2590	0.469	0.412	0.268	0.529						
18	243	2.97	2639	0.461	0.405	0.266	0.526						
19	244	2.96	2629	0.462	0.405	0.266	0.526						
20	243	2.95	2633	0.462	0.406	0.266	0.526						
21	245	2.95	2667	0.460	0.406	0.264	0.526						
22	243	2.95	2634	0.461	0.405	0.266	0.525						
23	246	2.95	2657	0.461	0.407	0.265	0.526						
24	247	2.97	2646	0.462	0.407	0.265	0.526						
n	24	24	24	24	24	24	24						
Avg.	243	2.97	2640	0.462	0.407	0.266	0.526						
Med.	243	2.95	2639	0.461	0.406	0.266	0.526						
σ	2.2	0.040	27.9	0.0031	0.0021	0.0012	0.0012						
Min.	237	2.95	2578	0.458	0.404	0.264	0.525						
Max.	247	3.05	2685	0.470	0.413	0.268	0.530						

Data Set 3 : 85 °C, 700 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.9 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 3-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)													
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h		
1	100.0	100.5	100.4	100.3	100.3	100.0	100.3	100.1	99.7	99.9	99.7	99.7		
2	100.0	100.5	100.0	100.1	100.2	99.9	99.9	100.1	99.8	100.0	99.7	99.6		
3	100.0	100.0	99.9	99.8	100.0	99.6	100.0	99.9	99.7	99.8	99.6	99.6		
4	100.0	100.4	100.3	100.1	100.1	100.0	100.1	100.1	99.7	99.8	99.8	99.8		
5	100.0	100.2	100.3	100.1	100.3	100.0	100.2	100.0	99.7	100.1	99.8	99.8		
6	100.0	101.2	101.2	101.0	101.1	100.8	101.2	100.9	100.6	100.8	100.5	100.5		
7	100.0	102.2	102.1	101.7	101.7	101.5	101.5	101.2	100.9	101.0	101.0	100.9		
8	100.0	100.1	100.1	99.9	100.0	99.5	99.6	99.7	99.1	99.5	99.1	99.1		
9	100.0	100.7	100.5	100.2	100.4	100.0	100.5	100.0	99.6	100.0	99.6	99.5		
10	100.0	100.6	100.5	100.1	100.1	99.8	99.8	99.7	99.3	99.6	99.2	99.3		
11	100.0	100.2	99.8	99.5	99.6	99.3	99.2	99.2	98.9	99.0	99.0	98.8		
12	100.0	100.5	100.3	100.1	100.3	99.9	100.4	100.0	99.5	99.8	99.6	99.5		
13	100.0	99.6	99.6	99.2	99.3	98.9	99.3	99.1	98.8	99.0	98.7	98.9		
14	100.0	99.9	99.5	99.3	99.4	99.3	99.2	99.1	98.6	98.8	98.8	98.5		
15	100.0	100.2	100.0	99.7	99.8	99.5	99.7	99.5	99.1	99.5	99.1	99.1		
16	100.0	99.8	99.8	99.7	99.6	99.5	99.5	99.5	99.1	99.3	99.2	99.1		
17	100.0	100.6	100.6	100.1	100.4	99.9	100.0	99.7	99.3	99.7	99.3	99.3		
18	100.0	101.3	101.2	100.8	100.9	100.6	100.8	100.6	100.1	100.4	100.3	100.2		
19	100.0	101.1	101.0	100.5	100.5	100.2	100.2	99.9	99.5	99.7	99.7	99.6		
20	100.0	99.6	99.8	99.6	99.5	99.2	99.6	99.6	98.8	99.3	98.9	98.8		
21	100.0	100.6	100.5	100.2	100.3	100.0	100.2	99.9	99.5	99.8	99.6	99.5		
22	100.0	100.4	100.3	99.8	100.0	99.7	99.5	99.6	99.3	99.4	99.2	99.2		
23	100.0	99.6	99.4	99.3	99.1	99.0	99.1	99.1	98.7	98.9	98.7	98.5		
24	100.0	100.0	99.8	99.6	99.7	99.4	99.6	99.3	99.0	99.2	99.0	98.9		
n	24	24	24	24	24	24	24	24	24	24	24	24		
Avg.	100.0	100.4	100.3	100.0	100.1	99.8	100.0	99.8	99.4	99.7	99.5	99.4		
Med.	100.0	100.4	100.3	100.1	100.1	99.8	99.9	99.8	99.4	99.7	99.5	99.4		
σ	0.00	0.61	0.62	0.56	0.59	0.59	0.61	0.53	0.56	0.55	0.57	0.57		
Min.	100.0	99.6	99.4	99.2	99.1	98.9	99.1	99.1	98.6	98.8	98.7	98.5		
Max.	100.0	102.2	102.1	101.7	101.7	101.5	101.5	101.2	100.9	101.0	101.0	100.9		

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h								
ln(Avg.)	-0.0003	-0.0018	-0.0057	-0.0032	-0.0054	-0.0060								

Test duration used	5000 h to 10000 h
B	1.0041
α	1.0405E-06
R ²	0.6961
Calculated L ₇₀ (10K)	347000 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	218000 hours
Reported L ₈₀ (10K)	> 60000 hours
Calculated L ₉₀ (10K)	105000 hours
Reported L ₉₀ (10K)	> 60000 hours

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7)/\alpha$$

$$L_{80} = \ln(B/0.8)/\alpha$$

$$L_{90} = \ln(B/0.9)/\alpha$$

Data Set 3 : 85 °C, 700 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.9 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 3-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	100.0	98.7	98.6	98.5	98.6	98.3	98.4	98.5	98.4	98.5	98.4	98.4			
2	100.0	98.7	98.6	98.5	98.5	98.3	98.4	98.5	98.4	98.5	98.4	98.3			
3	100.0	98.7	98.7	98.6	98.6	98.4	98.5	98.6	98.5	98.6	98.5	98.5			
4	100.0	98.8	98.7	98.6	98.7	98.6	98.6	98.7	98.5	98.7	98.6	98.5			
5	100.0	98.8	98.7	98.6	98.6	98.5	98.5	98.6	98.4	98.6	98.5	98.4			
6	100.0	98.6	98.5	98.4	98.4	98.3	98.3	98.4	98.2	98.4	98.4	98.2			
7	100.0	99.3	99.3	99.2	99.2	99.1	99.1	99.2	99.1	99.1	99.1	99.1			
8	100.0	99.3	99.2	99.1	99.2	99.1	99.1	99.1	99.0	99.1	99.1	99.0			
9	100.0	99.2	99.1	99.1	99.1	99.0	99.0	99.1	98.9	99.0	99.1	99.0			
10	100.0	99.3	99.2	99.1	99.2	99.0	99.1	99.1	99.0	99.1	99.1	99.0			
11	100.0	99.3	99.2	99.1	99.2	99.1	99.1	99.1	99.0	99.1	99.1	99.0			
12	100.0	99.4	99.3	99.2	99.3	99.2	99.2	99.3	99.1	99.3	99.3	99.1			
13	100.0	99.3	99.3	99.2	99.2	99.1	99.2	99.2	99.1	99.2	99.2	99.1			
14	100.0	99.4	99.3	99.3	99.3	99.2	99.2	99.3	99.2	99.3	99.3	99.2			
15	100.0	99.3	99.2	99.1	99.2	99.0	99.1	99.1	99.0	99.1	99.1	99.0			
16	100.0	99.3	99.2	99.1	99.1	99.0	99.1	99.1	99.0	99.1	99.1	99.0			
17	100.0	99.3	99.3	99.2	99.2	99.1	99.1	99.2	99.0	99.2	99.1	99.1			
18	100.0	99.3	99.2	99.1	99.2	99.1	99.1	99.1	99.1	99.2	99.1	99.1			
19	100.0	99.3	99.3	99.2	99.3	99.2	99.2	99.2	99.1	99.3	99.2	99.2			
20	100.0	99.4	99.3	99.2	99.3	99.2	99.2	99.2	99.1	99.2	99.2	99.1			
21	100.0	99.4	99.4	99.3	99.3	99.2	99.2	99.3	99.2	99.3	99.3	99.2			
22	100.0	99.4	99.3	99.3	99.3	99.2	99.2	99.3	99.2	99.2	99.2	99.2			
23	100.0	99.3	99.3	99.2	99.2	99.1	99.2	99.2	99.1	99.2	99.1	99.1			
24	100.0	99.1	99.0	98.9	99.0	98.9	98.9	98.9	98.8	98.9	98.9	98.8			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	100.0	99.2	99.1	99.0	99.1	98.9	99.0	99.0	98.9	99.0	99.0	98.9			
Med.	100.0	99.3	99.2	99.1	99.2	99.1	99.1	99.1	99.0	99.1	99.1	99.0			
σ	0.00	0.28	0.29	0.30	0.29	0.34	0.31	0.29	0.30	0.30	0.31	0.31			
Min.	100.0	98.6	98.5	98.4	98.4	98.3	98.3	98.4	98.2	98.4	98.4	98.2			
Max.	100.0	99.4	99.4	99.3	99.3	99.2	99.2	99.3	99.2	99.3	99.3	99.2			

Data Set 3 : 85 °C, 700 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.9 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 3-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0012	0.0015	0.0016	0.0017	0.0017	0.0017	0.0019	0.0019	0.0019	0.0019	0.0019			
2	0.0000	0.0012	0.0012	0.0014	0.0016	0.0015	0.0016	0.0017	0.0017	0.0017	0.0017	0.0018			
3	0.0000	0.0012	0.0014	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0018	0.0019			
4	0.0000	0.0014	0.0015	0.0017	0.0018	0.0018	0.0019	0.0019	0.0019	0.0019	0.0020	0.0020			
5	0.0000	0.0012	0.0015	0.0016	0.0018	0.0018	0.0019	0.0020	0.0020	0.0020	0.0020	0.0020			
6	0.0000	0.0016	0.0016	0.0017	0.0019	0.0019	0.0019	0.0021	0.0021	0.0021	0.0022	0.0021			
7	0.0000	0.0016	0.0018	0.0019	0.0021	0.0021	0.0022	0.0022	0.0022	0.0023	0.0022	0.0022			
8	0.0000	0.0012	0.0015	0.0016	0.0018	0.0017	0.0018	0.0018	0.0019	0.0019	0.0019	0.0019			
9	0.0000	0.0014	0.0014	0.0016	0.0016	0.0017	0.0016	0.0017	0.0018	0.0017	0.0018	0.0018			
10	0.0000	0.0014	0.0015	0.0016	0.0017	0.0018	0.0018	0.0019	0.0018	0.0018	0.0019	0.0019			
11	0.0000	0.0012	0.0014	0.0015	0.0016	0.0016	0.0016	0.0017	0.0017	0.0018	0.0018	0.0018			
12	0.0000	0.0012	0.0014	0.0015	0.0016	0.0016	0.0016	0.0017	0.0017	0.0018	0.0018	0.0018			
13	0.0000	0.0011	0.0013	0.0014	0.0016	0.0015	0.0017	0.0018	0.0017	0.0017	0.0017	0.0018			
14	0.0000	0.0011	0.0013	0.0014	0.0016	0.0016	0.0016	0.0017	0.0016	0.0017	0.0017	0.0017			
15	0.0000	0.0013	0.0015	0.0015	0.0016	0.0017	0.0016	0.0017	0.0018	0.0017	0.0018	0.0018			
16	0.0000	0.0011	0.0013	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0018	0.0019	0.0019			
17	0.0000	0.0012	0.0014	0.0015	0.0017	0.0017	0.0017	0.0018	0.0018	0.0019	0.0019	0.0019			
18	0.0000	0.0015	0.0016	0.0017	0.0018	0.0018	0.0018	0.0018	0.0020	0.0020	0.0019	0.0019			
19	0.0000	0.0013	0.0015	0.0016	0.0017	0.0018	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018			
20	0.0000	0.0013	0.0015	0.0016	0.0018	0.0018	0.0018	0.0019	0.0019	0.0019	0.0020	0.0020			
21	0.0000	0.0014	0.0015	0.0016	0.0018	0.0018	0.0018	0.0018	0.0019	0.0018	0.0019	0.0018			
22	0.0000	0.0013	0.0015	0.0016	0.0017	0.0018	0.0017	0.0018	0.0018	0.0018	0.0018	0.0019			
23	0.0000	0.0012	0.0015	0.0016	0.0016	0.0016	0.0017	0.0018	0.0018	0.0018	0.0019	0.0019			
24	0.0000	0.0012	0.0014	0.0015	0.0017	0.0016	0.0016	0.0016	0.0017	0.0017	0.0017	0.0017			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0013	0.0014	0.0016	0.0017	0.0017	0.0018	0.0019	0.0019	0.0019	0.0019	0.0019			
Med.	0.0000	0.0012	0.0015	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0019	0.0019			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			
Min.	0.0000	0.0011	0.0012	0.0014	0.0016	0.0015	0.0016	0.0016	0.0016	0.0017	0.0017	0.0017			
Max.	0.0000	0.0016	0.0018	0.0019	0.0021	0.0021	0.0022	0.0022	0.0022	0.0023	0.0022	0.0022			

Data Set 3 : 85 °C, 700 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.9 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 3-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2645	0.2633	0.2631	0.2630	0.2628	0.2628	0.2628	0.2626	0.2626	0.2626	0.2626	0.2626			
2	0.2623	0.2611	0.2611	0.2609	0.2607	0.2608	0.2607	0.2606	0.2606	0.2606	0.2606	0.2605			
3	0.2642	0.2630	0.2628	0.2627	0.2625	0.2625	0.2625	0.2624	0.2624	0.2624	0.2624	0.2623			
4	0.2643	0.2630	0.2629	0.2627	0.2626	0.2626	0.2624	0.2624	0.2624	0.2624	0.2624	0.2623			
5	0.2646	0.2634	0.2632	0.2630	0.2628	0.2628	0.2627	0.2626	0.2626	0.2626	0.2626	0.2626			
6	0.2668	0.2653	0.2652	0.2651	0.2649	0.2649	0.2649	0.2647	0.2647	0.2647	0.2646	0.2647			
7	0.2663	0.2648	0.2646	0.2645	0.2643	0.2643	0.2642	0.2642	0.2642	0.2641	0.2641	0.2641			
8	0.2657	0.2645	0.2643	0.2642	0.2640	0.2640	0.2639	0.2639	0.2638	0.2638	0.2638	0.2638			
9	0.2624	0.2611	0.2611	0.2609	0.2608	0.2607	0.2608	0.2607	0.2606	0.2607	0.2606	0.2606			
10	0.2631	0.2618	0.2617	0.2616	0.2615	0.2614	0.2614	0.2612	0.2613	0.2613	0.2612	0.2612			
11	0.2634	0.2622	0.2621	0.2620	0.2618	0.2618	0.2618	0.2617	0.2617	0.2616	0.2616	0.2616			
12	0.2648	0.2636	0.2635	0.2634	0.2632	0.2632	0.2632	0.2631	0.2631	0.2630	0.2630	0.2630			
13	0.2634	0.2623	0.2621	0.2620	0.2618	0.2619	0.2617	0.2616	0.2617	0.2617	0.2617	0.2616			
14	0.2629	0.2618	0.2617	0.2616	0.2614	0.2614	0.2613	0.2612	0.2613	0.2612	0.2612	0.2612			
15	0.2649	0.2637	0.2635	0.2635	0.2633	0.2632	0.2633	0.2632	0.2631	0.2632	0.2631	0.2631			
16	0.2648	0.2637	0.2635	0.2633	0.2632	0.2632	0.2631	0.2630	0.2630	0.2630	0.2629	0.2629			
17	0.2659	0.2647	0.2645	0.2644	0.2642	0.2642	0.2642	0.2641	0.2641	0.2640	0.2640	0.2640			
18	0.2645	0.2631	0.2630	0.2629	0.2628	0.2628	0.2628	0.2627	0.2626	0.2626	0.2626	0.2626			
19	0.2650	0.2637	0.2636	0.2635	0.2633	0.2633	0.2633	0.2632	0.2632	0.2632	0.2632	0.2632			
20	0.2646	0.2633	0.2632	0.2630	0.2629	0.2629	0.2628	0.2627	0.2627	0.2627	0.2626	0.2626			
21	0.2634	0.2621	0.2620	0.2619	0.2617	0.2617	0.2617	0.2616	0.2616	0.2616	0.2615	0.2616			
22	0.2648	0.2635	0.2634	0.2633	0.2631	0.2630	0.2631	0.2630	0.2630	0.2630	0.2630	0.2629			
23	0.2637	0.2625	0.2623	0.2622	0.2621	0.2621	0.2620	0.2619	0.2619	0.2619	0.2618	0.2618			
24	0.2643	0.2631	0.2630	0.2629	0.2627	0.2628	0.2628	0.2627	0.2626	0.2626	0.2626	0.2626			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2644	0.2631	0.2630	0.2629	0.2627	0.2627	0.2626	0.2625	0.2625	0.2625	0.2625	0.2625			
Med.	0.2645	0.2632	0.2631	0.2630	0.2628	0.2628	0.2628	0.2627	0.2626	0.2626	0.2626	0.2626			
σ	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011			
Min.	0.2623	0.2611	0.2611	0.2609	0.2607	0.2607	0.2607	0.2606	0.2606	0.2606	0.2606	0.2605			
Max.	0.2668	0.2653	0.2652	0.2651	0.2649	0.2649	0.2649	0.2647	0.2647	0.2647	0.2646	0.2647			

Data Set 3 : 85 °C, 700 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.9 °C
Drive Current [I _f]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

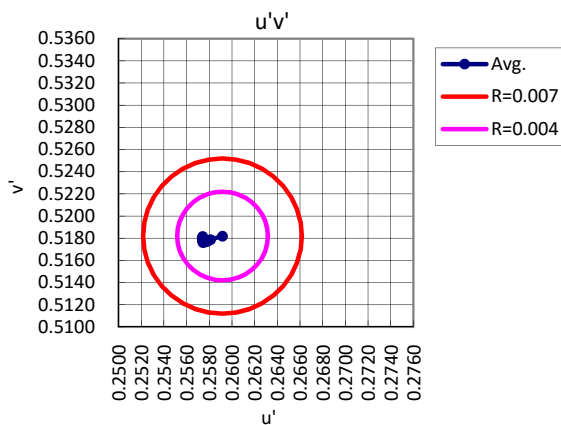
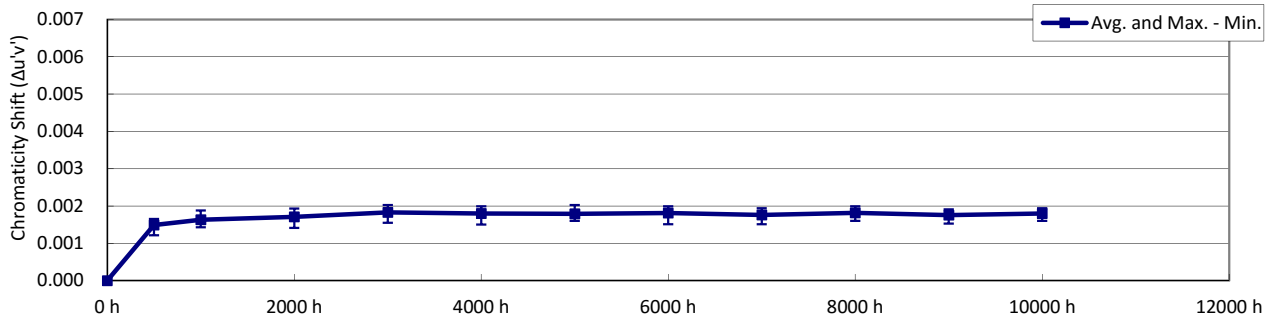
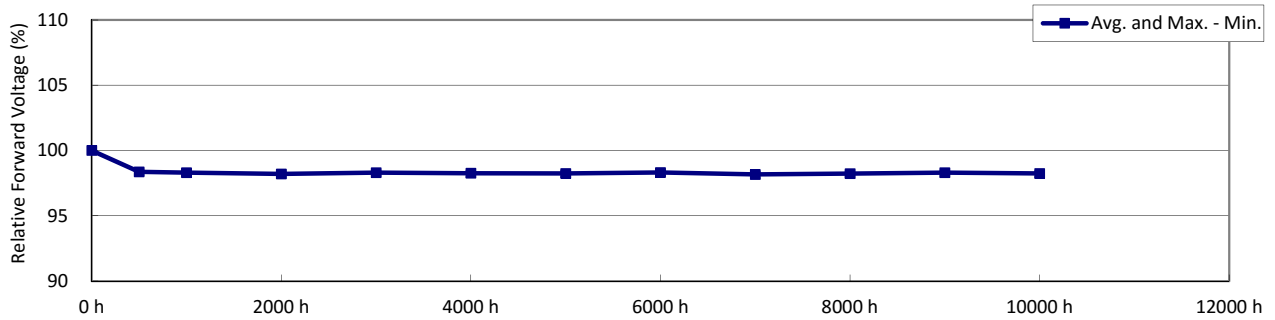
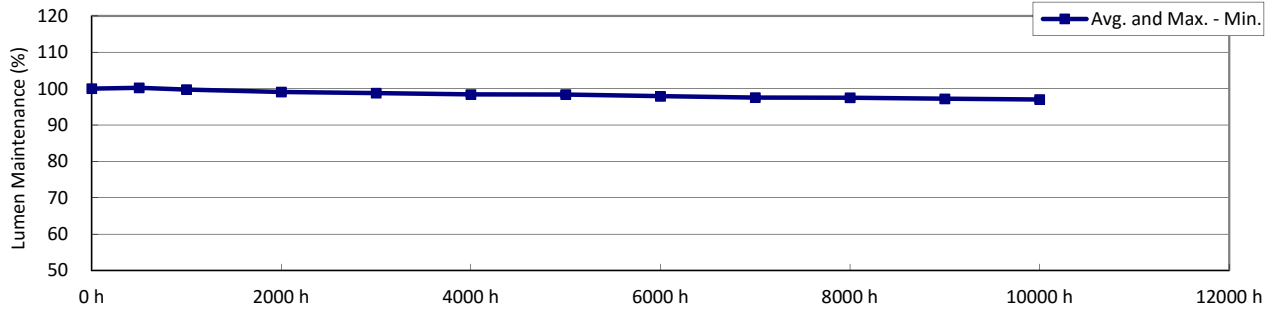
TABLE 3-6
Chromaticity

LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5242	0.5239	0.5238	0.5238	0.5238	0.5238	0.5238	0.5238	0.5239	0.5239	0.5239	0.5240			
2	0.5241	0.5239	0.5239	0.5239	0.5238	0.5238	0.5238	0.5239	0.5239	0.5239	0.5240	0.5239			
3	0.5243	0.5240	0.5240	0.5239	0.5239	0.5239	0.5240	0.5240	0.5240	0.5240	0.5241	0.5241			
4	0.5248	0.5244	0.5244	0.5243	0.5243	0.5243	0.5244	0.5244	0.5244	0.5244	0.5245	0.5245			
5	0.5260	0.5258	0.5256	0.5256	0.5256	0.5256	0.5256	0.5256	0.5256	0.5256	0.5257	0.5257			
6	0.5285	0.5281	0.5281	0.5281	0.5281	0.5281	0.5281	0.5281	0.5281	0.5281	0.5282	0.5282			
7	0.5262	0.5258	0.5257	0.5257	0.5256	0.5257	0.5257	0.5257	0.5257	0.5257	0.5258	0.5258			
8	0.5247	0.5244	0.5243	0.5243	0.5242	0.5243	0.5243	0.5243	0.5243	0.5243	0.5244	0.5244			
9	0.5242	0.5238	0.5238	0.5238	0.5238	0.5238	0.5238	0.5238	0.5238	0.5239	0.5239	0.5239			
10	0.5235	0.5231	0.5230	0.5230	0.5230	0.5230	0.5230	0.5231	0.5231	0.5231	0.5231	0.5231			
11	0.5239	0.5236	0.5235	0.5235	0.5235	0.5235	0.5235	0.5235	0.5235	0.5236	0.5236	0.5236			
12	0.5248	0.5245	0.5244	0.5244	0.5244	0.5244	0.5245	0.5245	0.5245	0.5245	0.5245	0.5245			
13	0.5246	0.5244	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243	0.5244			
14	0.5234	0.5231	0.5230	0.5230	0.5230	0.5230	0.5230	0.5230	0.5230	0.5230	0.5231	0.5231			
15	0.5250	0.5246	0.5246	0.5246	0.5246	0.5246	0.5246	0.5246	0.5247	0.5247	0.5247	0.5247			
16	0.5261	0.5259	0.5258	0.5258	0.5257	0.5258	0.5258	0.5258	0.5258	0.5258	0.5258	0.5258			
17	0.5280	0.5278	0.5277	0.5277	0.5276	0.5277	0.5277	0.5277	0.5277	0.5277	0.5278	0.5278			
18	0.5244	0.5240	0.5240	0.5239	0.5239	0.5239	0.5239	0.5240	0.5239	0.5239	0.5240	0.5240			
19	0.5243	0.5240	0.5239	0.5239	0.5239	0.5238	0.5239	0.5239	0.5239	0.5239	0.5239	0.5239			
20	0.5247	0.5244	0.5243	0.5243	0.5242	0.5242	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243			
21	0.5248	0.5244	0.5244	0.5244	0.5243	0.5243	0.5243	0.5244	0.5243	0.5244	0.5244	0.5244			
22	0.5239	0.5236	0.5235	0.5235	0.5235	0.5235	0.5235	0.5235	0.5235	0.5236	0.5236	0.5236			
23	0.5248	0.5245	0.5244	0.5244	0.5244	0.5244	0.5244	0.5245	0.5244	0.5245	0.5245	0.5245			
24	0.5252	0.5249	0.5248	0.5248	0.5247	0.5248	0.5248	0.5248	0.5248	0.5248	0.5249	0.5248			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5249	0.5246	0.5246	0.5245	0.5245	0.5245	0.5245	0.5246	0.5246	0.5246	0.5246	0.5246			
Med.	0.5247	0.5244	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243	0.5244	0.5244			
σ	0.0013	0.0013	0.0013	0.0013	0.0012	0.0013	0.0013	0.0013	0.0013	0.0012	0.0013	0.0013			
Min.	0.5234	0.5231	0.5230	0.5230	0.5230	0.5230	0.5230	0.5230	0.5230	0.5230	0.5231	0.5231			
Max.	0.5285	0.5281	0.5281	0.5281	0.5281	0.5281	0.5281	0.5281	0.5281	0.5281	0.5282	0.5282			

Data Set 4 : 85 °C, 1200 mA

Actual Case Temperature [T_S]	87.6 °C
Actual Ambient Temperature [T_A]	84.7 °C
Drive Current [I_F]	1200 mA
Measurement Current	1200 mA

NOTES:
 T_S and T_A were measured during initial setup.



Data Set 4 : 85 °C, 1200 mA

Actual Case Temperature [T _S]	87.6 °C
Actual Ambient Temperature [T _A]	84.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 4-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _V [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	389	3.15	2725	0.453	0.401	0.262	0.523						
2	398	3.14	2813	0.444	0.396	0.259	0.519						
3	399	3.15	2828	0.441	0.391	0.259	0.517						
4	397	3.15	2846	0.439	0.390	0.258	0.516						
5	390	3.15	2818	0.442	0.393	0.259	0.518						
6	389	3.14	2775	0.448	0.399	0.260	0.521						
7	390	3.16	2795	0.445	0.396	0.260	0.519						
8	395	3.15	2837	0.441	0.392	0.258	0.517						
9	389	3.14	2757	0.450	0.400	0.261	0.522						
10	390	3.15	2805	0.444	0.394	0.259	0.519						
11	396	3.15	2854	0.438	0.390	0.258	0.516						
12	392	3.15	2834	0.440	0.391	0.259	0.517						
13	386	3.15	2787	0.445	0.395	0.260	0.519						
14	386	3.16	2767	0.448	0.398	0.261	0.521						
15	392	3.15	2812	0.444	0.395	0.259	0.519						
16	391	3.15	2836	0.440	0.391	0.259	0.517						
17	388	3.15	2801	0.444	0.395	0.260	0.519						
18	391	3.14	2774	0.449	0.399	0.260	0.521						
19	393	3.15	2848	0.441	0.395	0.258	0.518						
20	393	3.15	2852	0.439	0.390	0.258	0.516						
21	396	3.14	2840	0.439	0.390	0.259	0.516						
22	393	3.14	2843	0.440	0.390	0.258	0.516						
23	394	3.15	2852	0.439	0.391	0.258	0.516						
24	388	3.15	2831	0.440	0.391	0.259	0.516						
n	24	24	24	24	24	24	24						
Avg.	392	3.15	2814	0.443	0.394	0.259	0.518						
Med.	391	3.15	2823	0.442	0.393	0.259	0.518						
σ	3.6	0.004	34.8	0.0041	0.0036	0.0011	0.0021						
Min.	386	3.14	2725	0.438	0.390	0.258	0.516						
Max.	399	3.16	2854	0.453	0.401	0.262	0.523						

Data Set 4 : 85 °C, 1200 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 4-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)											
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
1	100.0	99.8	99.5	98.7	98.4	97.8	97.8	97.2	96.9	96.9	96.5	96.3
2	100.0	100.0	99.4	98.6	98.3	98.1	97.7	97.4	97.0	96.8	96.7	96.6
3	100.0	99.7	99.1	98.5	98.2	97.8	97.9	97.2	96.9	97.0	96.5	96.3
4	100.0	99.9	99.4	98.6	98.5	98.2	98.0	97.7	97.2	97.2	97.1	96.8
5	100.0	100.5	100.0	99.4	98.9	98.6	98.4	97.8	97.7	97.6	97.2	97.1
6	100.0	100.6	100.1	99.2	98.8	98.6	98.6	98.1	97.7	97.7	97.4	97.2
7	100.0	99.7	99.5	99.0	98.7	98.3	98.4	98.0	97.6	97.5	97.2	97.1
8	100.0	99.9	99.2	98.5	98.2	97.9	97.7	97.3	97.0	96.9	96.8	96.4
9	100.0	100.9	100.4	99.5	99.4	98.9	99.0	98.4	98.0	98.1	97.7	97.5
10	100.0	100.4	99.9	99.1	98.9	98.6	98.5	98.2	97.8	97.7	97.4	97.3
11	100.0	99.7	99.2	98.6	98.1	97.8	98.0	97.5	97.2	97.1	96.8	96.7
12	100.0	100.7	100.2	99.5	99.3	98.9	99.0	98.4	97.9	98.1	97.5	97.3
13	100.0	100.6	100.2	99.4	99.3	98.8	98.8	98.4	98.2	98.1	97.7	97.7
14	100.0	99.5	99.2	98.7	98.3	97.9	98.1	97.8	97.3	97.3	96.9	96.8
15	100.0	101.0	100.5	99.9	99.5	99.1	99.2	98.6	98.2	98.2	97.9	97.7
16	100.0	100.4	100.1	99.7	99.3	98.9	98.5	98.4	98.0	97.8	97.7	97.5
17	100.0	101.0	100.4	99.6	99.3	98.8	99.1	98.5	98.1	98.2	97.7	97.5
18	100.0	100.5	100.2	99.5	99.2	98.8	99.1	98.4	98.0	98.1	97.7	97.5
19	100.0	100.8	100.3	99.4	99.0	98.8	98.6	98.3	97.9	97.7	97.5	97.3
20	100.0	99.9	99.4	98.9	98.6	98.1	98.0	97.5	97.0	97.1	96.7	96.6
21	100.0	100.2	99.7	99.1	98.9	98.5	98.7	98.0	97.6	97.6	97.3	97.1
22	100.0	99.6	99.2	98.7	98.5	98.2	98.3	97.9	97.6	97.2	97.3	97.0
23	100.0	100.0	99.5	98.8	98.3	97.9	97.8	97.4	97.0	97.1	96.7	96.5
24	100.0	100.0	99.6	98.9	98.5	98.5	98.2	97.7	97.3	97.2	97.0	96.8
n	24	24	24	24	24	24	24	24	24	24	24	24
Avg.	100.0	100.2	99.8	99.1	98.8	98.4	98.4	97.9	97.6	97.5	97.2	97.0
Med.	100.0	100.1	99.6	99.0	98.8	98.5	98.4	97.9	97.6	97.6	97.2	97.1
σ	0.00	0.48	0.46	0.42	0.44	0.43	0.48	0.45	0.44	0.46	0.43	0.44
Min.	100.0	99.5	99.1	98.5	98.1	97.8	97.7	97.2	96.9	96.8	96.5	96.3
Max.	100.0	101.0	100.5	99.9	99.5	99.1	99.2	98.6	98.2	98.2	97.9	97.7

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0162	-0.0210	-0.0248	-0.0253	-0.0283	-0.0301

Test duration used	5000 h to 10000 h
B	0.9954
α	2.6253E-06
R ²	0.9474
Calculated L ₇₀ (10K)	134000 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	83200 hours
Reported L ₈₀ (10K)	> 60000 hours
Calculated L ₉₀ (10K)	38400 hours
Reported L ₉₀ (10K)	38400 hours

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7) / \alpha$$

$$L_{80} = \ln(B/0.8) / \alpha$$

$$L_{90} = \ln(B/0.9) / \alpha$$

Data Set 4 : 85 °C, 1200 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 4-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	100.0	98.5	98.4	98.3	98.4	98.3	98.3	98.4	98.3	98.3	98.4	98.4			
2	100.0	98.4	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3			
3	100.0	98.4	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3			
4	100.0	98.4	98.4	98.3	98.4	98.3	98.3	98.4	98.2	98.3	98.4	98.3			
5	100.0	98.4	98.3	98.2	98.3	98.3	98.3	98.3	98.2	98.2	98.3	98.3			
6	100.0	98.4	98.3	98.2	98.3	98.3	98.3	98.3	98.2	98.3	98.3	98.3			
7	100.0	98.1	98.1	97.9	98.0	98.0	98.0	98.0	97.9	98.0	98.0	98.0			
8	100.0	98.3	98.3	98.2	98.3	98.2	98.2	98.3	98.1	98.2	98.3	98.2			
9	100.0	98.4	98.3	98.3	98.4	98.3	98.3	98.4	98.2	98.3	98.4	98.3			
10	100.0	98.4	98.3	98.2	98.3	98.3	98.2	98.3	98.2	98.2	98.3	98.3			
11	100.0	98.4	98.3	98.2	98.3	98.2	98.2	98.3	98.1	98.2	98.3	98.2			
12	100.0	98.3	98.3	98.1	98.3	98.2	98.2	98.3	98.1	98.2	98.3	98.2			
13	100.0	98.4	98.3	98.2	98.3	98.3	98.3	98.3	98.2	98.2	98.3	98.3			
14	100.0	98.2	98.1	98.0	98.1	98.1	98.0	98.1	97.9	98.0	98.1	98.0			
15	100.0	98.4	98.3	98.2	98.3	98.3	98.3	98.3	98.2	98.2	98.3	98.3			
16	100.0	98.3	98.3	98.2	98.3	98.3	98.2	98.3	98.2	98.2	98.3	98.2			
17	100.0	98.3	98.3	98.2	98.3	98.2	98.2	98.3	98.1	98.2	98.3	98.2			
18	100.0	98.4	98.4	98.3	98.4	98.3	98.3	98.4	98.2	98.3	98.4	98.3			
19	100.0	98.4	98.3	98.2	98.3	98.3	98.3	98.4	98.2	98.3	98.3	98.3			
20	100.0	98.4	98.3	98.2	98.3	98.3	98.2	98.3	98.2	98.2	98.3	98.2			
21	100.0	98.5	98.5	98.4	98.5	98.4	98.4	98.5	98.3	98.4	98.5	98.4			
22	100.0	98.5	98.4	98.3	98.4	98.3	98.3	98.4	98.3	98.3	98.4	98.3			
23	100.0	98.4	98.3	98.2	98.3	98.3	98.3	98.3	98.2	98.2	98.3	98.3			
24	100.0	98.3	98.3	98.2	98.3	98.2	98.2	98.3	98.1	98.2	98.3	98.2			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	100.0	98.4	98.3	98.2	98.3	98.3	98.2	98.3	98.2	98.2	98.3	98.2			
Med.	100.0	98.4	98.3	98.2	98.3	98.3	98.3	98.3	98.2	98.2	98.3	98.3			
σ	0.00	0.08	0.08	0.09	0.08	0.09	0.09	0.09	0.10	0.09	0.09	0.09			
Min.	100.0	98.1	98.1	97.9	98.0	98.0	98.0	98.0	97.9	98.0	98.0	98.0			
Max.	100.0	98.5	98.5	98.4	98.5	98.4	98.4	98.5	98.3	98.4	98.5	98.4			

Data Set 4 : 85 °C, 1200 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 4-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0014	0.0015	0.0017	0.0018	0.0018	0.0017	0.0018	0.0017	0.0018	0.0018	0.0018			
2	0.0000	0.0012	0.0014	0.0014	0.0016	0.0015	0.0016	0.0015	0.0015	0.0016	0.0015	0.0016			
3	0.0000	0.0015	0.0015	0.0016	0.0018	0.0017	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016			
4	0.0000	0.0016	0.0017	0.0018	0.0019	0.0019	0.0019	0.0019	0.0018	0.0019	0.0018	0.0019			
5	0.0000	0.0017	0.0019	0.0019	0.0020	0.0020	0.0020	0.0020	0.0019	0.0020	0.0019	0.0019			
6	0.0000	0.0015	0.0016	0.0017	0.0019	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018			
7	0.0000	0.0015	0.0017	0.0018	0.0019	0.0018	0.0018	0.0018	0.0018	0.0019	0.0018	0.0018			
8	0.0000	0.0015	0.0016	0.0017	0.0018	0.0017	0.0017	0.0017	0.0017	0.0018	0.0017	0.0018			
9	0.0000	0.0016	0.0018	0.0017	0.0019	0.0019	0.0018	0.0019	0.0018	0.0019	0.0019	0.0019			
10	0.0000	0.0015	0.0016	0.0017	0.0018	0.0017	0.0018	0.0018	0.0018	0.0018	0.0017	0.0018			
11	0.0000	0.0014	0.0015	0.0016	0.0017	0.0016	0.0017	0.0018	0.0016	0.0017	0.0017	0.0017			
12	0.0000	0.0015	0.0017	0.0017	0.0018	0.0018	0.0016	0.0018	0.0017	0.0016	0.0017	0.0017			
13	0.0000	0.0014	0.0016	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018			
14	0.0000	0.0014	0.0016	0.0017	0.0019	0.0017	0.0018	0.0018	0.0017	0.0018	0.0017	0.0018			
15	0.0000	0.0016	0.0017	0.0018	0.0019	0.0019	0.0017	0.0019	0.0018	0.0018	0.0018	0.0019			
16	0.0000	0.0015	0.0016	0.0017	0.0018	0.0019	0.0019	0.0019	0.0018	0.0019	0.0018	0.0018			
17	0.0000	0.0015	0.0016	0.0017	0.0018	0.0018	0.0019	0.0019	0.0018	0.0019	0.0018	0.0018			
18	0.0000	0.0015	0.0016	0.0017	0.0018	0.0018	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018			
19	0.0000	0.0016	0.0018	0.0019	0.0020	0.0020	0.0020	0.0020	0.0018	0.0019	0.0018	0.0019			
20	0.0000	0.0015	0.0016	0.0017	0.0018	0.0018	0.0018	0.0017	0.0017	0.0017	0.0017	0.0017			
21	0.0000	0.0015	0.0016	0.0017	0.0018	0.0018	0.0016	0.0017	0.0017	0.0017	0.0017	0.0017			
22	0.0000	0.0015	0.0016	0.0017	0.0018	0.0019	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018			
23	0.0000	0.0015	0.0016	0.0017	0.0018	0.0018	0.0018	0.0018	0.0017	0.0018	0.0017	0.0018			
24	0.0000	0.0015	0.0017	0.0017	0.0018	0.0016	0.0017	0.0017	0.0017	0.0018	0.0017	0.0018			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0015	0.0016	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018			
Med.	0.0000	0.0015	0.0016	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			
Min.	0.0000	0.0012	0.0014	0.0014	0.0016	0.0015	0.0016	0.0015	0.0015	0.0016	0.0015	0.0016			
Max.	0.0000	0.0017	0.0019	0.0019	0.0020	0.0020	0.0020	0.0020	0.0019	0.0020	0.0019	0.0019			

Data Set 4 : 85 °C, 1200 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.7 °C
Drive Current [I _f]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 4-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2610	0.2596	0.2595	0.2593	0.2592	0.2592	0.2593	0.2592	0.2593	0.2592	0.2592	0.2592			
2	0.2579	0.2567	0.2565	0.2565	0.2564	0.2564	0.2563	0.2564	0.2564	0.2563	0.2564	0.2563			
3	0.2582	0.2568	0.2568	0.2567	0.2565	0.2565	0.2566	0.2566	0.2566	0.2566	0.2566	0.2566			
4	0.2573	0.2558	0.2557	0.2556	0.2555	0.2555	0.2555	0.2555	0.2555	0.2555	0.2555	0.2554			
5	0.2578	0.2563	0.2561	0.2560	0.2560	0.2559	0.2559	0.2559	0.2559	0.2559	0.2559	0.2559			
6	0.2590	0.2576	0.2574	0.2573	0.2572	0.2572	0.2572	0.2572	0.2572	0.2572	0.2572	0.2572			
7	0.2585	0.2571	0.2569	0.2568	0.2567	0.2567	0.2567	0.2567	0.2567	0.2566	0.2567	0.2567			
8	0.2572	0.2558	0.2557	0.2556	0.2555	0.2555	0.2555	0.2555	0.2555	0.2554	0.2555	0.2554			
9	0.2600	0.2584	0.2583	0.2583	0.2582	0.2581	0.2582	0.2581	0.2582	0.2581	0.2581	0.2581			
10	0.2582	0.2568	0.2567	0.2566	0.2565	0.2565	0.2564	0.2564	0.2564	0.2564	0.2565	0.2564			
11	0.2567	0.2554	0.2553	0.2552	0.2551	0.2551	0.2550	0.2550	0.2551	0.2550	0.2550	0.2550			
12	0.2576	0.2562	0.2561	0.2560	0.2559	0.2559	0.2560	0.2559	0.2559	0.2560	0.2559	0.2559			
13	0.2587	0.2573	0.2572	0.2570	0.2570	0.2569	0.2569	0.2569	0.2569	0.2569	0.2569	0.2569			
14	0.2592	0.2579	0.2577	0.2576	0.2574	0.2575	0.2574	0.2574	0.2575	0.2574	0.2575	0.2574			
15	0.2579	0.2564	0.2563	0.2562	0.2561	0.2561	0.2562	0.2561	0.2561	0.2561	0.2561	0.2560			
16	0.2572	0.2558	0.2557	0.2556	0.2555	0.2554	0.2554	0.2554	0.2554	0.2554	0.2554	0.2554			
17	0.2582	0.2568	0.2567	0.2566	0.2565	0.2565	0.2564	0.2564	0.2564	0.2564	0.2564	0.2564			
18	0.2593	0.2579	0.2577	0.2576	0.2575	0.2575	0.2576	0.2575	0.2575	0.2575	0.2575	0.2575			
19	0.2562	0.2547	0.2545	0.2544	0.2543	0.2543	0.2543	0.2543	0.2544	0.2543	0.2544	0.2543			
20	0.2568	0.2554	0.2553	0.2552	0.2551	0.2551	0.2551	0.2551	0.2551	0.2551	0.2551	0.2551			
21	0.2577	0.2563	0.2562	0.2561	0.2560	0.2560	0.2561	0.2560	0.2560	0.2560	0.2560	0.2560			
22	0.2571	0.2557	0.2556	0.2555	0.2554	0.2553	0.2553	0.2553	0.2553	0.2553	0.2553	0.2553			
23	0.2566	0.2552	0.2551	0.2550	0.2549	0.2549	0.2549	0.2549	0.2549	0.2548	0.2549	0.2548			
24	0.2576	0.2562	0.2560	0.2560	0.2559	0.2560	0.2559	0.2559	0.2559	0.2558	0.2559	0.2558			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2580	0.2566	0.2565	0.2564	0.2563	0.2563	0.2563	0.2562	0.2563	0.2562	0.2562	0.2562			
Med.	0.2579	0.2564	0.2563	0.2562	0.2561	0.2561	0.2562	0.2561	0.2561	0.2561	0.2561	0.2560			
σ	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011			
Min.	0.2562	0.2547	0.2545	0.2544	0.2543	0.2543	0.2543	0.2543	0.2544	0.2543	0.2544	0.2543			
Max.	0.2610	0.2596	0.2595	0.2593	0.2592	0.2592	0.2593	0.2592	0.2593	0.2592	0.2592	0.2592			

Data Set 4 : 85 °C, 1200 mA

Actual Case Temperature [T _s]	87.6 °C
Actual Ambient Temperature [T _A]	84.7 °C
Drive Current [I _f]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 4-6
Chromaticity

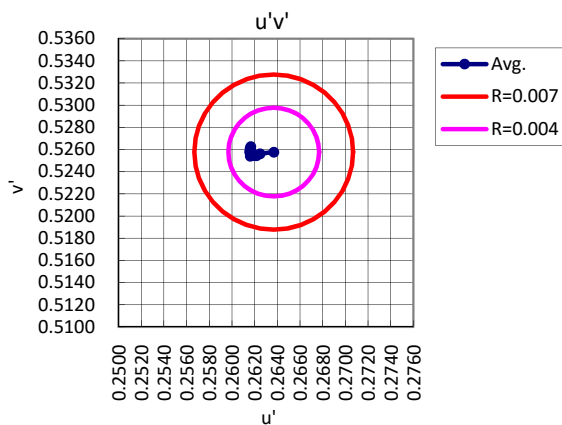
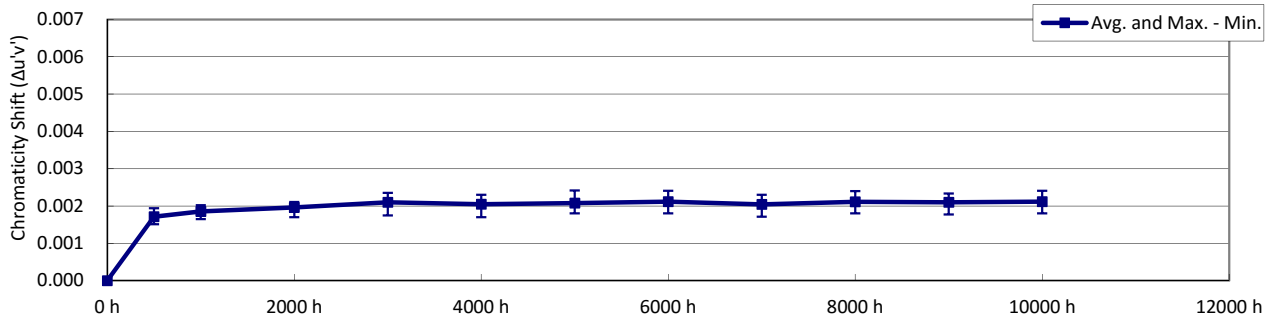
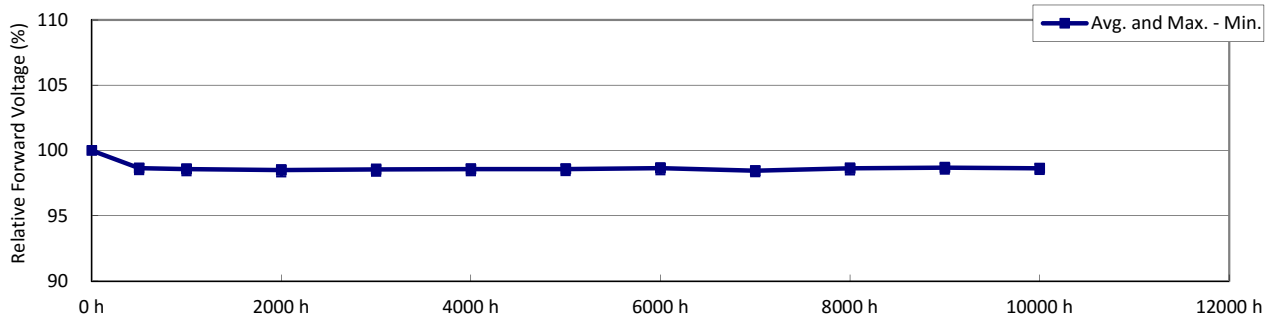
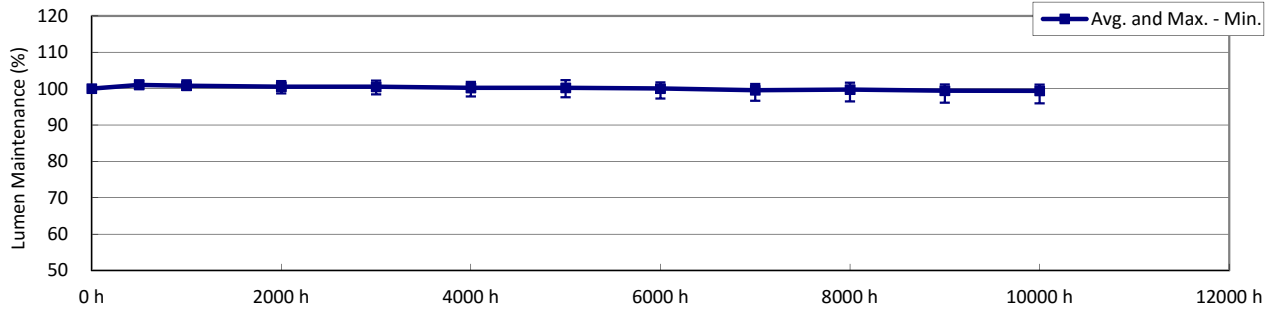
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5212	0.5210	0.5209	0.5210	0.5208	0.5211	0.5210	0.5210	0.5214	0.5211	0.5215	0.5213			
2	0.5176	0.5174	0.5173	0.5174	0.5172	0.5175	0.5175	0.5174	0.5178	0.5175	0.5179	0.5178			
3	0.5154	0.5149	0.5148	0.5150	0.5149	0.5150	0.5151	0.5150	0.5153	0.5152	0.5154	0.5153			
4	0.5146	0.5140	0.5140	0.5140	0.5140	0.5141	0.5141	0.5141	0.5143	0.5141	0.5144	0.5143			
5	0.5162	0.5155	0.5154	0.5155	0.5154	0.5156	0.5155	0.5156	0.5158	0.5156	0.5160	0.5158			
6	0.5199	0.5195	0.5195	0.5196	0.5194	0.5196	0.5196	0.5196	0.5199	0.5197	0.5200	0.5199			
7	0.5179	0.5174	0.5174	0.5174	0.5173	0.5175	0.5175	0.5175	0.5177	0.5176	0.5179	0.5177			
8	0.5159	0.5154	0.5154	0.5154	0.5153	0.5155	0.5155	0.5155	0.5157	0.5156	0.5159	0.5157			
9	0.5206	0.5202	0.5201	0.5202	0.5200	0.5202	0.5203	0.5202	0.5205	0.5203	0.5207	0.5205			
10	0.5171	0.5166	0.5166	0.5166	0.5166	0.5167	0.5167	0.5167	0.5169	0.5168	0.5171	0.5170			
11	0.5144	0.5139	0.5139	0.5139	0.5139	0.5140	0.5140	0.5139	0.5141	0.5140	0.5143	0.5142			
12	0.5157	0.5151	0.5150	0.5151	0.5150	0.5151	0.5153	0.5151	0.5153	0.5153	0.5155	0.5154			
13	0.5176	0.5173	0.5172	0.5172	0.5171	0.5173	0.5173	0.5173	0.5174	0.5174	0.5177	0.5176			
14	0.5193	0.5188	0.5187	0.5188	0.5187	0.5189	0.5189	0.5189	0.5191	0.5189	0.5193	0.5191			
15	0.5177	0.5171	0.5171	0.5171	0.5170	0.5172	0.5173	0.5172	0.5174	0.5173	0.5176	0.5175			
16	0.5152	0.5147	0.5146	0.5146	0.5145	0.5146	0.5146	0.5146	0.5148	0.5147	0.5150	0.5149			
17	0.5174	0.5168	0.5168	0.5168	0.5167	0.5169	0.5168	0.5169	0.5170	0.5169	0.5173	0.5171			
18	0.5202	0.5198	0.5198	0.5198	0.5198	0.5199	0.5200	0.5199	0.5202	0.5200	0.5203	0.5202			
19	0.5167	0.5161	0.5161	0.5161	0.5160	0.5162	0.5162	0.5162	0.5164	0.5163	0.5166	0.5165			
20	0.5144	0.5140	0.5138	0.5139	0.5138	0.5139	0.5139	0.5140	0.5141	0.5140	0.5143	0.5142			
21	0.5148	0.5143	0.5142	0.5142	0.5142	0.5143	0.5145	0.5144	0.5145	0.5144	0.5147	0.5146			
22	0.5148	0.5143	0.5143	0.5143	0.5142	0.5143	0.5144	0.5144	0.5145	0.5144	0.5147	0.5146			
23	0.5147	0.5142	0.5141	0.5141	0.5141	0.5142	0.5142	0.5142	0.5144	0.5143	0.5145	0.5145			
24	0.5150	0.5146	0.5145	0.5145	0.5145	0.5147	0.5146	0.5147	0.5147	0.5147	0.5150	0.5149			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5168	0.5164	0.5163	0.5164	0.5163	0.5164	0.5165	0.5164	0.5166	0.5165	0.5168	0.5167			
Med.	0.5165	0.5158	0.5158	0.5158	0.5157	0.5159	0.5159	0.5159	0.5161	0.5160	0.5163	0.5162			
σ	0.0021	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022			
Min.	0.5144	0.5139	0.5138	0.5139	0.5138	0.5139	0.5139	0.5139	0.5141	0.5140	0.5143	0.5142			
Max.	0.5212	0.5210	0.5209	0.5210	0.5208	0.5211	0.5210	0.5210	0.5214	0.5211	0.5215	0.5213			

Data Set 5 : 85 °C, 1500 mA

Actual Case Temperature [T_S]	88.2 °C
Actual Ambient Temperature [T_A]	86.3 °C
Drive Current [I_F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_S and T_A were measured during initial setup.



Data Set 5 : 85 °C, 1500 mA

Actual Case Temperature [T _S]	88.2 °C
Actual Ambient Temperature [T _A]	86.3 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 5-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _V [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	461	3.23	2794	0.444	0.394	0.260	0.518						
2	462	3.23	2739	0.451	0.400	0.262	0.522						
3	456	3.25	2606	0.468	0.413	0.267	0.530						
4	460	3.25	2653	0.464	0.411	0.265	0.528						
5	463	3.25	2716	0.456	0.406	0.262	0.525						
6	461	3.25	2777	0.449	0.401	0.260	0.522						
7	460	3.25	2680	0.460	0.409	0.264	0.527						
8	462	3.24	2720	0.458	0.409	0.262	0.526						
9	460	3.24	2687	0.461	0.411	0.263	0.528						
10	455	3.24	2623	0.466	0.412	0.266	0.529						
11	458	3.24	2619	0.468	0.414	0.266	0.530						
12	455	3.28	2643	0.463	0.409	0.265	0.527						
13	455	3.28	2693	0.458	0.406	0.263	0.525						
14	461	3.28	2761	0.451	0.403	0.261	0.523						
15	459	3.29	2717	0.454	0.403	0.262	0.524						
16	461	3.27	2666	0.460	0.407	0.264	0.526						
17	464	3.26	2658	0.462	0.409	0.265	0.527						
18	464	3.26	2663	0.462	0.410	0.264	0.527						
19	453	3.26	2610	0.467	0.412	0.267	0.529						
20	451	3.27	2630	0.464	0.409	0.266	0.527						
21	454	3.28	2666	0.460	0.406	0.265	0.526						
22	455	3.28	2677	0.458	0.404	0.264	0.524						
23	459	3.28	2701	0.456	0.403	0.263	0.524						
24	460	3.30	2693	0.457	0.404	0.263	0.524						
n	24	24	24	24	24	24	24						
Avg.	459	3.26	2683	0.459	0.407	0.264	0.526						
Med.	460	3.26	2679	0.460	0.408	0.264	0.526						
σ	3.6	0.020	51.3	0.0061	0.0048	0.0020	0.0028						
Min.	451	3.23	2606	0.444	0.394	0.260	0.518						
Max.	464	3.30	2794	0.468	0.414	0.267	0.530						

Data Set 5 : 85 °C, 1500 mA

Actual Case Temperature [T _s]	88.2 °C
Actual Ambient Temperature [T _A]	86.3 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 5-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)											
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
1	100.0	100.3	99.7	98.7	98.4	97.8	97.6	97.3	96.7	96.5	96.2	96.0
2	100.0	100.9	99.9	99.1	98.7	98.2	97.7	97.3	96.8	96.8	96.2	96.0
3	100.0	101.7	101.4	101.2	101.3	101.0	101.1	100.9	100.4	100.7	100.4	100.6
4	100.0	100.6	100.2	100.0	100.0	99.6	99.8	99.6	99.2	99.2	99.1	99.1
5	100.0	100.5	100.3	100.1	100.1	99.8	99.8	99.7	99.2	99.6	99.2	99.1
6	100.0	101.6	101.2	101.0	100.9	100.7	101.0	100.6	100.2	100.6	100.2	100.2
7	100.0	100.9	100.8	100.3	100.3	100.2	100.1	99.8	99.5	99.6	99.4	99.4
8	100.0	100.3	99.9	99.7	99.7	99.2	99.4	99.3	98.6	98.9	98.6	98.5
9	100.0	101.5	101.4	101.1	101.2	100.8	101.0	100.7	100.2	100.5	100.3	100.2
10	100.0	100.7	100.4	100.1	100.2	99.8	99.8	99.7	99.2	99.3	99.1	99.1
11	100.0	100.1	99.8	99.5	99.5	99.3	99.2	99.0	98.5	98.6	98.4	98.4
12	100.0	101.7	101.7	101.5	101.5	101.1	101.2	101.1	100.6	100.9	100.5	100.5
13	100.0	101.1	101.0	100.7	100.8	100.6	100.5	100.4	100.0	100.1	100.0	100.0
14	100.0	101.3	101.0	101.0	100.9	100.7	100.8	100.7	100.3	100.4	100.1	100.0
15	100.0	101.7	101.7	101.5	101.6	101.4	101.5	101.3	100.8	101.1	100.8	100.7
16	100.0	100.4	100.6	100.3	100.3	100.1	100.0	99.9	99.3	99.4	99.3	99.3
17	100.0	100.1	99.9	99.7	99.6	99.3	99.2	99.1	98.8	98.9	98.5	98.4
18	100.0	100.7	100.4	100.2	100.2	99.9	100.2	99.8	99.3	99.6	99.1	99.1
19	100.0	101.4	101.2	100.8	100.9	100.6	100.2	100.3	99.8	100.0	99.6	99.6
20	100.0	101.7	101.6	101.5	101.4	101.1	101.1	100.9	100.4	100.6	100.5	100.4
21	100.0	102.3	102.3	102.1	102.2	101.9	102.3	101.7	101.3	101.6	101.1	101.1
22	100.0	101.0	101.1	100.8	101.0	100.8	100.5	100.5	100.0	100.2	100.0	100.0
23	100.0	101.3	101.0	101.0	100.9	100.6	100.6	100.4	100.2	100.2	99.9	99.5
24	100.0	101.2	101.1	100.9	100.9	100.7	100.9	100.7	100.2	100.6	100.3	100.2
n	24	24	24	24	24	24	24	24	24	24	24	24
Avg.	100.0	101.0	100.8	100.5	100.5	100.2	100.2	100.0	99.6	99.7	99.5	99.4
Med.	100.0	101.0	101.0	100.8	100.8	100.6	100.4	100.3	99.9	100.0	99.8	99.5
σ	0.00	0.59	0.71	0.82	0.91	0.97	1.09	1.09	1.12	1.23	1.24	1.27
Min.	100.0	100.1	99.7	98.7	98.4	97.8	97.6	97.3	96.7	96.5	96.2	96.0
Max.	100.0	102.3	102.3	102.1	102.2	101.9	102.3	101.7	101.3	101.6	101.1	101.1

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	0.0024	0.0003	-0.0044	-0.0026	-0.0055	-0.0062

Test duration used	5000 h to 10000 h
B	1.0099
α	1.6666E-06
R ²	0.8448
Calculated L ₇₀ (10K)	220000 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	140000 hours
Reported L ₈₀ (10K)	> 60000 hours
Calculated L ₉₀ (10K)	69100 hours
Reported L ₉₀ (10K)	> 60000 hours

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7) / \alpha$$

$$L_{80} = \ln(B/0.8) / \alpha$$

$$L_{90} = \ln(B/0.9) / \alpha$$

Data Set 5 : 85 °C, 1500 mA

Actual Case Temperature [T _s]	88.2 °C
Actual Ambient Temperature [T _A]	86.3 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 5-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	100.0	98.3	98.2	98.2	98.2	98.2	98.2	98.3	98.1	98.3	98.3	98.2			
2	100.0	98.3	98.2	98.1	98.2	98.2	98.2	98.2	98.1	98.3	98.3	98.2			
3	100.0	98.9	98.8	98.7	98.8	98.8	98.8	98.9	98.7	98.9	98.9	98.8			
4	100.0	98.8	98.8	98.7	98.7	98.7	98.8	98.8	98.6	98.8	98.9	98.8			
5	100.0	98.8	98.8	98.7	98.7	98.8	98.8	98.8	98.6	98.8	98.9	98.8			
6	100.0	98.9	98.8	98.7	98.8	98.8	98.8	98.9	98.7	98.9	98.9	98.9			
7	100.0	99.0	98.9	98.9	98.9	98.9	98.9	99.0	98.8	99.0	99.0	99.0			
8	100.0	99.0	98.9	98.9	98.9	98.9	98.9	99.0	98.8	99.0	99.0	99.0			
9	100.0	99.0	98.9	98.8	98.9	98.9	98.9	99.0	98.7	99.0	99.0	98.9			
10	100.0	99.0	98.9	98.9	98.9	98.9	98.9	99.0	98.8	99.0	99.0	99.0			
11	100.0	98.9	98.9	98.8	98.9	98.9	98.9	99.0	98.7	98.9	99.0	98.9			
12	100.0	98.5	98.4	98.3	98.4	98.4	98.5	98.5	98.3	98.5	98.6	98.5			
13	100.0	98.5	98.4	98.3	98.4	98.4	98.4	98.5	98.3	98.4	98.5	98.5			
14	100.0	98.4	98.3	98.3	98.3	98.4	98.4	98.4	98.2	98.4	98.5	98.4			
15	100.0	98.3	98.2	98.1	98.1	98.2	98.2	98.3	98.0	98.3	98.3	98.3			
16	100.0	98.7	98.6	98.6	98.6	98.6	98.6	98.7	98.5	98.7	98.8	98.7			
17	100.0	98.7	98.7	98.6	98.6	98.6	98.7	98.7	98.5	98.7	98.8	98.7			
18	100.0	98.8	98.8	98.7	98.7	98.7	98.7	98.8	98.6	98.8	98.9	98.8			
19	100.0	98.8	98.7	98.6	98.6	98.6	98.6	98.7	98.5	98.7	98.8	98.7			
20	100.0	98.6	98.5	98.5	98.5	98.5	98.5	98.6	98.4	98.6	98.7	98.6			
21	100.0	98.4	98.3	98.2	98.3	98.3	98.3	98.4	98.2	98.3	98.4	98.4			
22	100.0	98.5	98.4	98.4	98.4	98.4	98.4	98.5	98.3	98.5	98.5	98.5			
23	100.0	98.4	98.3	98.3	98.3	98.3	98.3	98.4	98.2	98.4	98.5	98.4			
24	100.0	98.2	98.1	98.0	98.1	98.1	98.1	98.2	98.0	98.2	98.2	98.2			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	100.0	98.7	98.6	98.5	98.6	98.6	98.6	98.7	98.5	98.6	98.7	98.6			
Med.	100.0	98.7	98.6	98.6	98.6	98.6	98.6	98.7	98.5	98.7	98.8	98.7			
σ	0.00	0.26	0.27	0.27	0.28	0.27	0.27	0.28	0.26	0.28	0.28	0.27			
Min.	100.0	98.2	98.1	98.0	98.1	98.1	98.1	98.2	98.0	98.2	98.2	98.2			
Max.	100.0	99.0	98.9	98.9	98.9	98.9	98.9	99.0	98.8	99.0	99.0	99.0			

Data Set 5 : 85 °C, 1500 mA

Actual Case Temperature [T _s]	88.2 °C
Actual Ambient Temperature [T _A]	86.3 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 5-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0016	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0017	0.0018	0.0018	0.0018			
2	0.0000	0.0015	0.0017	0.0017	0.0018	0.0018	0.0018	0.0018	0.0017	0.0018	0.0018	0.0018			
3	0.0000	0.0017	0.0019	0.0020	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0022	0.0022			
4	0.0000	0.0017	0.0018	0.0019	0.0020	0.0020	0.0021	0.0021	0.0021	0.0020	0.0021	0.0021			
5	0.0000	0.0016	0.0018	0.0019	0.0021	0.0020	0.0020	0.0020	0.0019	0.0020	0.0020	0.0020			
6	0.0000	0.0019	0.0020	0.0020	0.0022	0.0022	0.0022	0.0022	0.0021	0.0022	0.0021	0.0022			
7	0.0000	0.0017	0.0019	0.0019	0.0020	0.0020	0.0021	0.0021	0.0020	0.0021	0.0021	0.0021			
8	0.0000	0.0015	0.0017	0.0018	0.0019	0.0019	0.0019	0.0019	0.0019	0.0020	0.0020	0.0019			
9	0.0000	0.0017	0.0019	0.0020	0.0021	0.0021	0.0020	0.0021	0.0020	0.0021	0.0022	0.0021			
10	0.0000	0.0017	0.0018	0.0020	0.0021	0.0020	0.0020	0.0021	0.0021	0.0022	0.0021	0.0021			
11	0.0000	0.0016	0.0017	0.0018	0.0020	0.0019	0.0020	0.0020	0.0019	0.0020	0.0021	0.0021			
12	0.0000	0.0018	0.0019	0.0021	0.0022	0.0022	0.0021	0.0022	0.0021	0.0023	0.0023	0.0022			
13	0.0000	0.0017	0.0018	0.0020	0.0020	0.0020	0.0020	0.0021	0.0020	0.0021	0.0021	0.0021			
14	0.0000	0.0018	0.0020	0.0021	0.0024	0.0022	0.0023	0.0023	0.0022	0.0023	0.0023	0.0023			
15	0.0000	0.0018	0.0020	0.0021	0.0023	0.0022	0.0022	0.0023	0.0022	0.0022	0.0023	0.0022			
16	0.0000	0.0016	0.0018	0.0020	0.0022	0.0020	0.0021	0.0022	0.0021	0.0022	0.0021	0.0021			
17	0.0000	0.0015	0.0017	0.0018	0.0019	0.0019	0.0020	0.0020	0.0019	0.0019	0.0019	0.0019			
18	0.0000	0.0016	0.0017	0.0018	0.0019	0.0019	0.0019	0.0020	0.0019	0.0019	0.0019	0.0019			
19	0.0000	0.0018	0.0019	0.0021	0.0022	0.0022	0.0023	0.0022	0.0021	0.0023	0.0023	0.0023			
20	0.0000	0.0018	0.0020	0.0021	0.0024	0.0023	0.0024	0.0024	0.0023	0.0024	0.0023	0.0024			
21	0.0000	0.0019	0.0020	0.0021	0.0023	0.0022	0.0021	0.0023	0.0022	0.0022	0.0022	0.0023			
22	0.0000	0.0017	0.0019	0.0021	0.0021	0.0021	0.0022	0.0022	0.0021	0.0022	0.0022	0.0022			
23	0.0000	0.0017	0.0019	0.0020	0.0021	0.0020	0.0021	0.0021	0.0021	0.0021	0.0021	0.0020			
24	0.0000	0.0017	0.0019	0.0020	0.0021	0.0021	0.0021	0.0022	0.0021	0.0021	0.0022	0.0021			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0017	0.0019	0.0020	0.0021	0.0020	0.0021	0.0021	0.0020	0.0021	0.0021	0.0021			
Med.	0.0000	0.0017	0.0019	0.0020	0.0021	0.0020	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021			
σ	0.0000	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002			
Min.	0.0000	0.0015	0.0016	0.0017	0.0017	0.0017	0.0018	0.0018	0.0017	0.0018	0.0018	0.0018			
Max.	0.0000	0.0019	0.0020	0.0021	0.0024	0.0023	0.0024	0.0024	0.0023	0.0024	0.0023	0.0024			

Data Set 5 : 85 °C, 1500 mA

Actual Case Temperature [T _s]	88.2 °C
Actual Ambient Temperature [T _A]	86.3 °C
Drive Current [I _f]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 5-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2588	0.2573	0.2572	0.2571	0.2571	0.2571	0.2570	0.2570	0.2571	0.2570	0.2571	0.2570			
2	0.2607	0.2592	0.2590	0.2590	0.2589	0.2589	0.2589	0.2589	0.2590	0.2589	0.2590	0.2590			
3	0.2658	0.2641	0.2639	0.2638	0.2637	0.2637	0.2637	0.2637	0.2637	0.2637	0.2637	0.2637			
4	0.2632	0.2615	0.2614	0.2613	0.2612	0.2612	0.2611	0.2611	0.2612	0.2611	0.2613	0.2612			
5	0.2606	0.2590	0.2588	0.2587	0.2586	0.2586	0.2586	0.2586	0.2587	0.2586	0.2587	0.2586			
6	0.2588	0.2570	0.2569	0.2568	0.2567	0.2566	0.2566	0.2566	0.2567	0.2566	0.2567	0.2566			
7	0.2621	0.2604	0.2602	0.2602	0.2601	0.2601	0.2600	0.2600	0.2601	0.2600	0.2601	0.2600			
8	0.2599	0.2584	0.2582	0.2581	0.2580	0.2580	0.2580	0.2580	0.2580	0.2579	0.2580	0.2580			
9	0.2616	0.2599	0.2597	0.2596	0.2595	0.2595	0.2596	0.2595	0.2596	0.2595	0.2595	0.2595			
10	0.2642	0.2625	0.2624	0.2622	0.2621	0.2622	0.2622	0.2621	0.2621	0.2620	0.2622	0.2621			
11	0.2642	0.2626	0.2625	0.2624	0.2622	0.2623	0.2622	0.2622	0.2623	0.2622	0.2622	0.2622			
12	0.2641	0.2623	0.2622	0.2620	0.2619	0.2619	0.2620	0.2619	0.2620	0.2618	0.2619	0.2619			
13	0.2616	0.2599	0.2598	0.2596	0.2596	0.2596	0.2596	0.2596	0.2596	0.2595	0.2596	0.2595			
14	0.2590	0.2572	0.2570	0.2569	0.2567	0.2568	0.2567	0.2567	0.2568	0.2567	0.2567	0.2567			
15	0.2613	0.2595	0.2593	0.2592	0.2590	0.2591	0.2591	0.2590	0.2591	0.2591	0.2591	0.2591			
16	0.2631	0.2615	0.2613	0.2611	0.2610	0.2611	0.2610	0.2609	0.2610	0.2609	0.2610	0.2610			
17	0.2633	0.2618	0.2616	0.2615	0.2614	0.2614	0.2613	0.2613	0.2614	0.2614	0.2615	0.2614			
18	0.2633	0.2617	0.2616	0.2615	0.2614	0.2614	0.2614	0.2613	0.2614	0.2614	0.2615	0.2614			
19	0.2653	0.2635	0.2634	0.2632	0.2631	0.2631	0.2630	0.2631	0.2632	0.2630	0.2631	0.2630			
20	0.2643	0.2625	0.2623	0.2622	0.2620	0.2620	0.2619	0.2619	0.2620	0.2619	0.2620	0.2619			
21	0.2632	0.2613	0.2612	0.2611	0.2609	0.2610	0.2611	0.2609	0.2610	0.2610	0.2610	0.2609			
22	0.2628	0.2611	0.2609	0.2607	0.2607	0.2607	0.2606	0.2606	0.2607	0.2606	0.2607	0.2606			
23	0.2618	0.2601	0.2599	0.2598	0.2597	0.2598	0.2597	0.2597	0.2597	0.2597	0.2597	0.2598			
24	0.2624	0.2607	0.2605	0.2604	0.2603	0.2603	0.2603	0.2602	0.2603	0.2603	0.2603	0.2603			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2623	0.2606	0.2605	0.2604	0.2602	0.2603	0.2602	0.2602	0.2603	0.2602	0.2603	0.2602			
Med.	0.2626	0.2609	0.2607	0.2606	0.2605	0.2605	0.2605	0.2604	0.2605	0.2605	0.2605	0.2605			
σ	0.0020	0.0019	0.0020	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019			
Min.	0.2588	0.2570	0.2569	0.2568	0.2567	0.2566	0.2566	0.2566	0.2567	0.2566	0.2567	0.2566			
Max.	0.2658	0.2641	0.2639	0.2638	0.2637	0.2637	0.2637	0.2637	0.2637	0.2637	0.2637	0.2637			

Data Set 5 : 85 °C, 1500 mA

Actual Case Temperature [T _s]	88.2 °C
Actual Ambient Temperature [T _A]	86.3 °C
Drive Current [I _f]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 5-6
Chromaticity

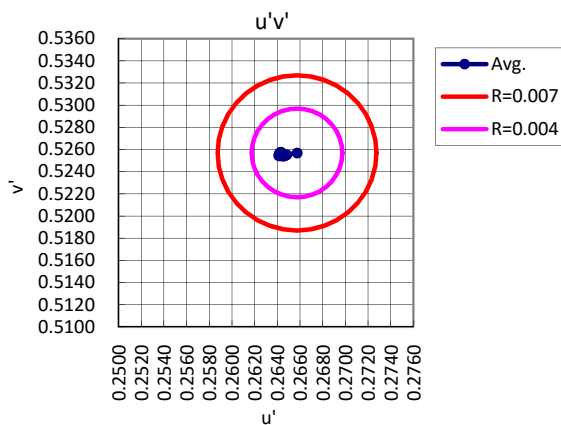
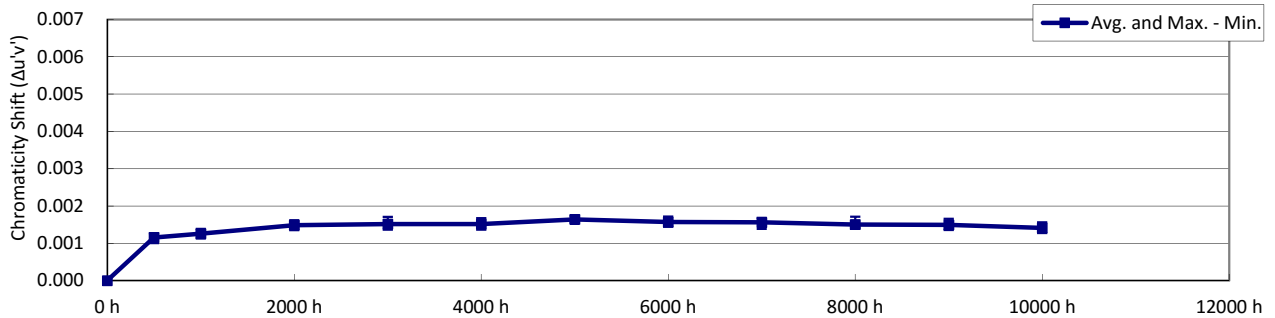
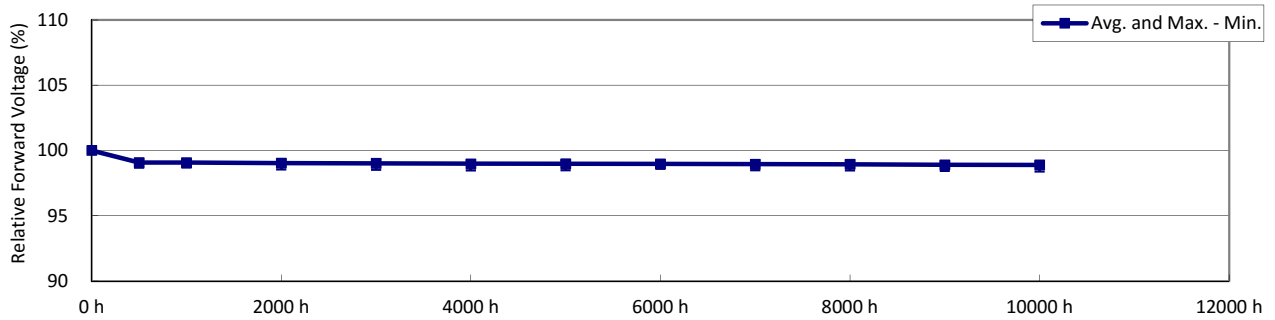
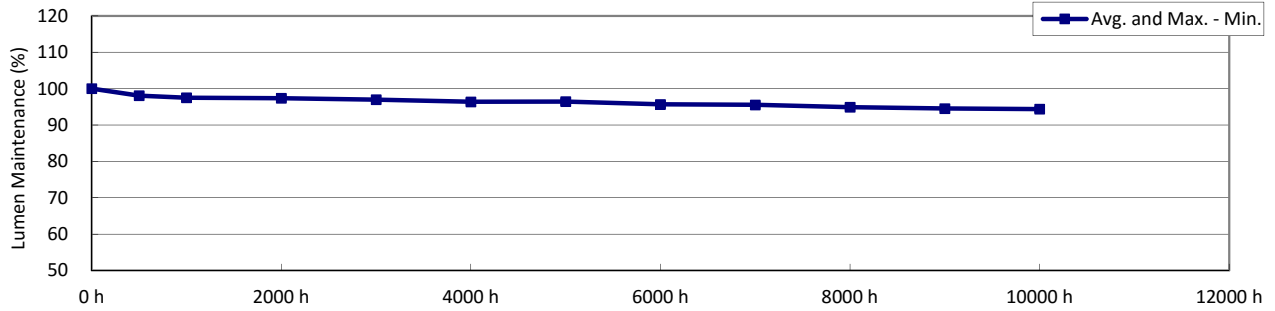
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5170	0.5166	0.5166	0.5168	0.5166	0.5170	0.5169	0.5169	0.5172	0.5171	0.5175	0.5173			
2	0.5208	0.5205	0.5206	0.5208	0.5205	0.5210	0.5209	0.5209	0.5212	0.5211	0.5215	0.5214			
3	0.5289	0.5288	0.5289	0.5290	0.5287	0.5292	0.5291	0.5291	0.5293	0.5292	0.5295	0.5295			
4	0.5271	0.5269	0.5271	0.5272	0.5269	0.5273	0.5272	0.5272	0.5275	0.5273	0.5277	0.5276			
5	0.5241	0.5237	0.5238	0.5240	0.5236	0.5241	0.5240	0.5240	0.5242	0.5241	0.5246	0.5243			
6	0.5206	0.5200	0.5201	0.5202	0.5200	0.5204	0.5203	0.5203	0.5205	0.5205	0.5208	0.5206			
7	0.5256	0.5252	0.5254	0.5255	0.5252	0.5257	0.5255	0.5255	0.5258	0.5257	0.5261	0.5259			
8	0.5249	0.5246	0.5247	0.5248	0.5245	0.5249	0.5248	0.5248	0.5251	0.5250	0.5254	0.5252			
9	0.5266	0.5263	0.5264	0.5265	0.5262	0.5267	0.5265	0.5266	0.5268	0.5267	0.5271	0.5269			
10	0.5274	0.5272	0.5273	0.5275	0.5271	0.5276	0.5274	0.5274	0.5276	0.5274	0.5280	0.5278			
11	0.5286	0.5286	0.5287	0.5288	0.5284	0.5289	0.5288	0.5288	0.5290	0.5287	0.5293	0.5291			
12	0.5265	0.5262	0.5263	0.5265	0.5261	0.5266	0.5265	0.5265	0.5267	0.5265	0.5270	0.5268			
13	0.5241	0.5238	0.5239	0.5241	0.5238	0.5242	0.5241	0.5241	0.5243	0.5242	0.5246	0.5245			
14	0.5218	0.5214	0.5215	0.5217	0.5213	0.5218	0.5216	0.5216	0.5219	0.5218	0.5222	0.5220			
15	0.5224	0.5221	0.5223	0.5224	0.5221	0.5226	0.5224	0.5224	0.5227	0.5226	0.5230	0.5228			
16	0.5248	0.5245	0.5245	0.5246	0.5243	0.5247	0.5246	0.5246	0.5248	0.5247	0.5251	0.5250			
17	0.5257	0.5255	0.5256	0.5257	0.5254	0.5259	0.5258	0.5258	0.5261	0.5259	0.5263	0.5261			
18	0.5264	0.5261	0.5263	0.5264	0.5261	0.5266	0.5266	0.5264	0.5267	0.5266	0.5270	0.5268			
19	0.5277	0.5275	0.5276	0.5277	0.5274	0.5278	0.5276	0.5277	0.5279	0.5278	0.5283	0.5281			
20	0.5263	0.5259	0.5260	0.5261	0.5258	0.5262	0.5260	0.5261	0.5264	0.5263	0.5266	0.5265			
21	0.5247	0.5243	0.5244	0.5245	0.5243	0.5246	0.5245	0.5246	0.5248	0.5248	0.5251	0.5250			
22	0.5230	0.5226	0.5228	0.5229	0.5226	0.5231	0.5229	0.5229	0.5232	0.5231	0.5235	0.5233			
23	0.5227	0.5224	0.5225	0.5226	0.5223	0.5227	0.5226	0.5226	0.5229	0.5228	0.5231	0.5231			
24	0.5234	0.5231	0.5232	0.5233	0.5231	0.5235	0.5234	0.5233	0.5236	0.5235	0.5239	0.5238			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5246	0.5243	0.5244	0.5246	0.5243	0.5247	0.5246	0.5246	0.5248	0.5247	0.5251	0.5250			
Med.	0.5249	0.5246	0.5246	0.5247	0.5244	0.5248	0.5247	0.5247	0.5250	0.5249	0.5253	0.5251			
σ	0.0028	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0028	0.0029	0.0029			
Min.	0.5170	0.5166	0.5166	0.5168	0.5166	0.5170	0.5169	0.5169	0.5172	0.5171	0.5175	0.5173			
Max.	0.5289	0.5288	0.5289	0.5290	0.5287	0.5292	0.5291	0.5291	0.5293	0.5292	0.5295	0.5295			

Data Set 6 : 105 °C, 700 mA

Actual Case Temperature [T _S]	105.7 °C
Actual Ambient Temperature [T _A]	102.3 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_S and T_A were measured during initial setup.



Data Set 6 : 105 °C, 700 mA

Actual Case Temperature [T _S]	105.7 °C
Actual Ambient Temperature [T _A]	102.3 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

 T_S and T_A were measured during initial setup.

TABLE 6-1
 Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _V [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	246	2.98	2589	0.469	0.412	0.268	0.529						
2	249	2.97	2698	0.455	0.401	0.263	0.523						
3	247	2.97	2674	0.457	0.403	0.264	0.524						
4	246	2.98	2671	0.459	0.405	0.264	0.525						
5	246	2.98	2646	0.461	0.405	0.266	0.525						
6	246	2.97	2627	0.461	0.403	0.267	0.524						
7	248	2.97	2652	0.460	0.405	0.265	0.525						
8	248	2.97	2654	0.460	0.404	0.265	0.525						
9	248	2.97	2631	0.462	0.405	0.266	0.525						
10	247	2.97	2591	0.467	0.408	0.268	0.527						
11	250	2.97	2659	0.460	0.405	0.265	0.525						
12	251	2.97	2688	0.457	0.404	0.264	0.524						
13	250	2.97	2661	0.459	0.404	0.265	0.525						
14	250	2.97	2662	0.460	0.405	0.265	0.525						
15	249	2.97	2661	0.460	0.406	0.265	0.525						
16	246	2.97	2621	0.463	0.407	0.267	0.526						
17	249	2.98	2628	0.463	0.408	0.266	0.527						
18	249	2.97	2621	0.465	0.409	0.266	0.528						
19	248	2.97	2603	0.465	0.408	0.267	0.527						
20	246	2.97	2601	0.464	0.406	0.268	0.526						
21	246	2.98	2625	0.462	0.405	0.266	0.526						
22	245	2.98	2605	0.465	0.408	0.267	0.527						
23	246	2.98	2631	0.463	0.407	0.266	0.526						
24	250	2.98	2675	0.458	0.404	0.264	0.525						
n	24	24	24	24	24	24	24						
Avg.	248	2.97	2641	0.461	0.406	0.266	0.526						
Med.	248	2.97	2638	0.461	0.405	0.266	0.525						
σ	1.6	0.003	30.6	0.0034	0.0024	0.0013	0.0014						
Min.	245	2.97	2589	0.455	0.401	0.263	0.523						
Max.	251	2.98	2698	0.469	0.412	0.268	0.529						

Data Set 6 : 105 °C, 700 mA

Actual Case Temperature [T _s]	105.7 °C
Actual Ambient Temperature [T _A]	102.3 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 6-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)													
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h		
1	100.0	98.1	97.6	97.5	96.9	96.6	96.5	95.9	95.7	95.1	94.8	94.6		
2	100.0	97.8	97.3	97.1	96.8	96.3	96.2	95.6	95.5	94.9	94.6	94.4		
3	100.0	98.4	97.8	98.0	97.3	96.8	96.7	96.0	95.7	95.1	94.7	94.3		
4	100.0	97.4	96.9	96.6	96.2	95.6	95.6	95.0	94.8	94.2	93.9	93.6		
5	100.0	97.6	97.1	96.9	96.5	95.9	95.9	95.3	95.1	94.5	94.2	93.9		
6	100.0	98.3	98.0	97.6	97.3	96.9	96.7	95.9	95.8	95.0	94.7	94.3		
7	100.0	97.8	97.3	97.0	96.6	96.1	96.1	95.4	95.4	94.8	94.5	94.3		
8	100.0	97.8	97.2	97.2	96.8	96.2	96.3	95.7	95.6	94.9	94.6	94.5		
9	100.0	98.8	98.3	97.9	97.4	96.7	97.0	96.2	96.0	95.4	94.8	94.6		
10	100.0	98.0	97.4	97.2	96.7	96.2	96.2	95.5	95.3	94.8	94.5	94.5		
11	100.0	98.1	97.5	97.4	97.0	96.5	96.5	95.9	95.7	95.1	94.9	94.8		
12	100.0	99.0	98.3	98.1	97.9	97.1	97.2	96.4	96.2	95.6	95.1	94.9		
13	100.0	98.2	97.6	97.4	97.2	96.5	96.6	95.9	95.7	95.2	94.9	94.7		
14	100.0	98.3	97.7	97.6	97.2	96.5	96.7	95.9	95.8	95.2	94.9	94.8		
15	100.0	98.5	97.8	97.7	97.7	96.9	96.8	95.9	95.8	95.0	94.6	94.4		
16	100.0	97.6	97.1	96.9	96.6	96.0	96.0	95.2	95.2	94.6	94.2	94.1		
17	100.0	98.2	97.6	97.4	97.1	96.6	96.6	95.8	95.8	95.2	94.9	94.7		
18	100.0	98.5	97.9	97.6	97.4	96.8	96.8	95.9	95.7	95.2	94.6	94.5		
19	100.0	97.9	97.4	97.4	96.8	96.2	96.5	95.6	95.4	94.9	94.5	94.5		
20	100.0	97.8	97.2	97.3	96.7	96.1	96.3	95.5	95.3	94.8	94.4	94.3		
21	100.0	98.1	97.7	97.5	97.1	96.3	96.7	95.5	95.4	94.8	94.1	94.0		
22	100.0	97.6	97.0	97.0	96.5	95.8	96.0	95.0	95.0	94.3	94.0	93.8		
23	100.0	97.5	97.0	96.9	96.4	95.8	96.0	95.1	95.1	94.5	94.1	93.9		
24	100.0	98.4	97.8	97.8	97.5	96.6	96.9	95.8	95.8	95.0	94.4	94.4		
n	24	24	24	24	24	24	24	24	24	24	24	24		
Avg.	100.0	98.1	97.5	97.4	97.0	96.4	96.5	95.7	95.5	94.9	94.5	94.4		
Med.	100.0	98.1	97.5	97.4	97.0	96.4	96.5	95.7	95.6	95.0	94.6	94.4		
σ	0.00	0.40	0.39	0.38	0.43	0.39	0.38	0.37	0.34	0.33	0.33	0.34		
Min.	100.0	97.4	96.9	96.6	96.2	95.6	95.6	95.0	94.8	94.2	93.9	93.6		
Max.	100.0	99.0	98.3	98.1	97.9	97.1	97.2	96.4	96.2	95.6	95.1	94.9		

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h								
ln(Avg.)	-0.0361	-0.0443	-0.0456	-0.0521	-0.0562	-0.0580								

Test duration used	5000 h	to	10000 h
B	0.9838		
α	4.3223E-06		
R ²	0.9617		
Calculated L ₇₀ (10K)	78700	hours	
Reported L ₇₀ (10K)	> 60000	hours	
Calculated L ₈₀ (10K)	47900	hours	
Reported L ₈₀ (10K)	47900	hours	
Calculated L ₉₀ (10K)	20600	hours	
Reported L ₉₀ (10K)	20600	hours	

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7)/\alpha$$

$$L_{80} = \ln(B/0.8)/\alpha$$

$$L_{90} = \ln(B/0.9)/\alpha$$

Data Set 6 : 105 °C, 700 mA

Actual Case Temperature [T _s]	105.7 °C
Actual Ambient Temperature [T _A]	102.3 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 6-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)											
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
1	100.0	99.0	99.1	99.0	99.1	99.1	99.1	99.0	98.9	99.0	98.9	99.0
2	100.0	99.2	99.0	99.1	99.0	99.0	99.0	99.0	98.9	99.0	98.9	98.9
3	100.0	98.8	98.9	98.8	98.9	98.7	98.8	98.7	98.8	98.7	98.8	98.7
4	100.0	98.7	98.7	98.6	98.5	98.5	98.5	98.6	98.5	98.5	98.4	98.4
5	100.0	99.0	98.9	98.9	98.9	98.7	98.7	99.0	98.7	98.7	98.7	98.6
6	100.0	99.0	99.1	99.0	99.0	99.0	99.0	98.8	98.8	98.9	98.8	98.8
7	100.0	99.1	99.0	99.0	99.0	98.9	98.9	99.0	99.0	98.9	98.8	98.8
8	100.0	99.1	99.1	99.1	98.9	99.0	99.0	99.0	98.8	99.0	98.9	98.9
9	100.0	99.2	99.2	99.3	99.3	99.2	99.2	99.1	99.3	99.1	99.1	99.1
10	100.0	99.3	99.3	99.2	99.3	99.2	99.2	99.2	99.2	99.2	99.1	99.1
11	100.0	99.4	99.2	99.3	99.2	99.1	99.2	99.1	99.2	99.1	99.2	99.1
12	100.0	99.1	99.2	99.1	99.1	99.2	99.1	99.1	98.9	99.0	99.0	99.0
13	100.0	99.0	99.2	99.2	99.1	99.1	99.1	99.1	98.9	99.1	99.1	99.1
14	100.0	98.9	99.1	99.2	99.0	99.0	99.0	99.0	99.0	99.0	99.0	98.9
15	100.0	99.1	99.1	99.1	99.0	99.0	99.0	99.0	98.9	98.9	99.0	98.9
16	100.0	99.2	99.2	99.1	99.0	99.0	99.0	99.1	99.0	99.0	99.0	99.0
17	100.0	99.3	99.1	99.0	99.2	99.1	99.0	98.9	99.2	99.1	99.0	99.0
18	100.0	99.1	99.2	99.2	99.1	99.1	99.2	99.1	99.1	99.1	99.0	99.1
19	100.0	99.3	99.2	99.1	99.1	99.3	99.2	99.2	99.2	99.2	99.1	99.1
20	100.0	99.2	99.1	99.2	99.2	99.0	99.2	99.1	99.1	99.0	98.9	99.0
21	100.0	98.9	99.0	98.9	98.8	98.8	98.8	98.7	98.8	98.8	98.7	98.7
22	100.0	98.9	98.8	98.7	98.8	98.5	98.8	98.7	98.7	98.6	98.6	98.6
23	100.0	98.9	99.0	98.9	98.9	98.9	98.9	98.9	98.9	98.8	98.7	98.7
24	100.0	99.2	99.1	99.1	99.1	99.0	99.0	99.0	98.9	98.9	98.9	98.9
n	24	24	24	24	24	24	24	24	24	24	24	24
Avg.	100.0	99.1	99.1	99.0	99.0	99.0	99.0	99.0	99.0	98.9	98.9	98.9
Med.	100.0	99.1	99.1	99.1	99.0	99.0	99.0	99.0	98.9	99.0	98.9	98.9
σ	0.00	0.17	0.14	0.18	0.18	0.21	0.18	0.16	0.18	0.19	0.18	0.19
Min.	100.0	98.7	98.7	98.6	98.5	98.5	98.5	98.6	98.5	98.5	98.4	98.4
Max.	100.0	99.4	99.3	99.3	99.3	99.3	99.2	99.2	99.3	99.2	99.2	99.1

Data Set 6 : 105 °C, 700 mA

Actual Case Temperature [T _s]	105.7 °C
Actual Ambient Temperature [T _A]	102.3 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 6-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0012	0.0013	0.0015	0.0015	0.0016	0.0016	0.0016	0.0015	0.0015	0.0014	0.0013			
2	0.0000	0.0011	0.0011	0.0015	0.0014	0.0014	0.0016	0.0015	0.0016	0.0015	0.0016	0.0013			
3	0.0000	0.0011	0.0012	0.0014	0.0015	0.0014	0.0016	0.0015	0.0015	0.0015	0.0016	0.0014			
4	0.0000	0.0011	0.0013	0.0015	0.0016	0.0015	0.0017	0.0016	0.0016	0.0016	0.0015	0.0014			
5	0.0000	0.0012	0.0013	0.0015	0.0017	0.0017	0.0016	0.0017	0.0017	0.0017	0.0017	0.0015			
6	0.0000	0.0011	0.0012	0.0014	0.0015	0.0015	0.0016	0.0016	0.0016	0.0015	0.0015	0.0014			
7	0.0000	0.0011	0.0012	0.0014	0.0015	0.0014	0.0016	0.0016	0.0016	0.0015	0.0015	0.0014			
8	0.0000	0.0012	0.0014	0.0016	0.0016	0.0016	0.0017	0.0017	0.0017	0.0016	0.0016	0.0015			
9	0.0000	0.0012	0.0014	0.0016	0.0016	0.0015	0.0017	0.0017	0.0017	0.0016	0.0016	0.0015			
10	0.0000	0.0012	0.0013	0.0015	0.0015	0.0016	0.0016	0.0016	0.0016	0.0014	0.0015	0.0014			
11	0.0000	0.0012	0.0012	0.0016	0.0016	0.0015	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014			
12	0.0000	0.0012	0.0012	0.0014	0.0015	0.0015	0.0017	0.0014	0.0015	0.0014	0.0014	0.0013			
13	0.0000	0.0010	0.0012	0.0014	0.0014	0.0014	0.0016	0.0014	0.0014	0.0014	0.0014	0.0013			
14	0.0000	0.0012	0.0014	0.0015	0.0016	0.0016	0.0017	0.0016	0.0016	0.0015	0.0016	0.0014			
15	0.0000	0.0011	0.0012	0.0014	0.0014	0.0014	0.0016	0.0014	0.0015	0.0014	0.0014	0.0013			
16	0.0000	0.0011	0.0012	0.0015	0.0015	0.0016	0.0017	0.0016	0.0016	0.0014	0.0015	0.0014			
17	0.0000	0.0011	0.0013	0.0016	0.0015	0.0016	0.0017	0.0015	0.0016	0.0015	0.0015	0.0015			
18	0.0000	0.0012	0.0013	0.0014	0.0015	0.0016	0.0016	0.0016	0.0015	0.0015	0.0014	0.0015			
19	0.0000	0.0012	0.0013	0.0016	0.0016	0.0015	0.0016	0.0015	0.0016	0.0015	0.0015	0.0013			
20	0.0000	0.0013	0.0014	0.0015	0.0015	0.0016	0.0016	0.0016	0.0015	0.0015	0.0015	0.0015			
21	0.0000	0.0012	0.0012	0.0014	0.0016	0.0014	0.0016	0.0016	0.0016	0.0015	0.0015	0.0015			
22	0.0000	0.0011	0.0012	0.0014	0.0014	0.0014	0.0017	0.0015	0.0015	0.0014	0.0015	0.0014			
23	0.0000	0.0012	0.0012	0.0015	0.0014	0.0015	0.0017	0.0015	0.0016	0.0014	0.0015	0.0015			
24	0.0000	0.0012	0.0013	0.0016	0.0016	0.0016	0.0016	0.0017	0.0016	0.0017	0.0016	0.0016			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0012	0.0013	0.0015	0.0015	0.0015	0.0016	0.0016	0.0016	0.0015	0.0015	0.0014			
Med.	0.0000	0.0012	0.0013	0.0015	0.0015	0.0015	0.0016	0.0016	0.0016	0.0015	0.0015	0.0014			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			
Min.	0.0000	0.0010	0.0011	0.0014	0.0014	0.0014	0.0016	0.0014	0.0014	0.0014	0.0014	0.0013			
Max.	0.0000	0.0013	0.0014	0.0016	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0016			

Data Set 6 : 105 °C, 700 mA

Actual Case Temperature [T _s]	105.7 °C
Actual Ambient Temperature [T _A]	102.3 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 6-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2681	0.2669	0.2668	0.2666	0.2666	0.2665	0.2665	0.2665	0.2666	0.2666	0.2667	0.2669			
2	0.2639	0.2628	0.2628	0.2624	0.2625	0.2625	0.2623	0.2623	0.2623	0.2624	0.2623	0.2625			
3	0.2646	0.2636	0.2635	0.2633	0.2632	0.2633	0.2630	0.2631	0.2632	0.2632	0.2631	0.2633			
4	0.2647	0.2636	0.2634	0.2632	0.2631	0.2632	0.2630	0.2631	0.2631	0.2631	0.2632	0.2632			
5	0.2658	0.2647	0.2646	0.2643	0.2642	0.2642	0.2642	0.2641	0.2642	0.2642	0.2642	0.2643			
6	0.2668	0.2657	0.2656	0.2654	0.2653	0.2653	0.2652	0.2652	0.2652	0.2653	0.2653	0.2654			
7	0.2655	0.2645	0.2643	0.2641	0.2640	0.2641	0.2640	0.2639	0.2640	0.2640	0.2640	0.2642			
8	0.2655	0.2644	0.2642	0.2640	0.2640	0.2639	0.2638	0.2639	0.2639	0.2639	0.2639	0.2641			
9	0.2665	0.2654	0.2652	0.2650	0.2650	0.2650	0.2648	0.2648	0.2649	0.2650	0.2650	0.2650			
10	0.2682	0.2670	0.2670	0.2668	0.2668	0.2667	0.2666	0.2666	0.2667	0.2668	0.2668	0.2668			
11	0.2652	0.2640	0.2640	0.2637	0.2637	0.2637	0.2636	0.2637	0.2636	0.2638	0.2638	0.2639			
12	0.2638	0.2626	0.2626	0.2624	0.2623	0.2623	0.2621	0.2624	0.2623	0.2624	0.2624	0.2625			
13	0.2651	0.2641	0.2639	0.2637	0.2637	0.2637	0.2635	0.2636	0.2637	0.2636	0.2637	0.2638			
14	0.2651	0.2639	0.2638	0.2636	0.2635	0.2635	0.2634	0.2634	0.2635	0.2636	0.2635	0.2637			
15	0.2650	0.2640	0.2638	0.2637	0.2636	0.2636	0.2635	0.2636	0.2636	0.2636	0.2636	0.2637			
16	0.2669	0.2658	0.2658	0.2654	0.2654	0.2653	0.2652	0.2653	0.2654	0.2654	0.2654	0.2654			
17	0.2665	0.2654	0.2652	0.2649	0.2649	0.2649	0.2648	0.2649	0.2649	0.2650	0.2650	0.2649			
18	0.2666	0.2654	0.2654	0.2652	0.2651	0.2650	0.2650	0.2650	0.2651	0.2650	0.2652	0.2651			
19	0.2676	0.2665	0.2664	0.2661	0.2661	0.2661	0.2660	0.2661	0.2661	0.2662	0.2662	0.2663			
20	0.2679	0.2667	0.2666	0.2664	0.2664	0.2663	0.2663	0.2663	0.2664	0.2664	0.2664	0.2664			
21	0.2667	0.2655	0.2655	0.2653	0.2651	0.2652	0.2651	0.2650	0.2651	0.2651	0.2652	0.2651			
22	0.2676	0.2665	0.2664	0.2661	0.2662	0.2661	0.2659	0.2661	0.2661	0.2662	0.2661	0.2662			
23	0.2663	0.2652	0.2651	0.2649	0.2650	0.2648	0.2647	0.2649	0.2648	0.2649	0.2648	0.2649			
24	0.2645	0.2633	0.2632	0.2629	0.2629	0.2629	0.2629	0.2628	0.2629	0.2628	0.2629	0.2629			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2660	0.2649	0.2648	0.2645	0.2645	0.2645	0.2644	0.2644	0.2645	0.2645	0.2645	0.2646			
Med.	0.2661	0.2650	0.2649	0.2646	0.2646	0.2645	0.2644	0.2645	0.2645	0.2645	0.2645	0.2646			
σ	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013			
Min.	0.2638	0.2626	0.2626	0.2624	0.2623	0.2623	0.2621	0.2623	0.2623	0.2624	0.2623	0.2625			
Max.	0.2682	0.2670	0.2670	0.2668	0.2668	0.2667	0.2666	0.2666	0.2667	0.2668	0.2668	0.2669			

Data Set 6 : 105 °C, 700 mA

Actual Case Temperature [T _s]	105.7 °C
Actual Ambient Temperature [T _A]	102.3 °C
Drive Current [I _f]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 6-6
Chromaticity

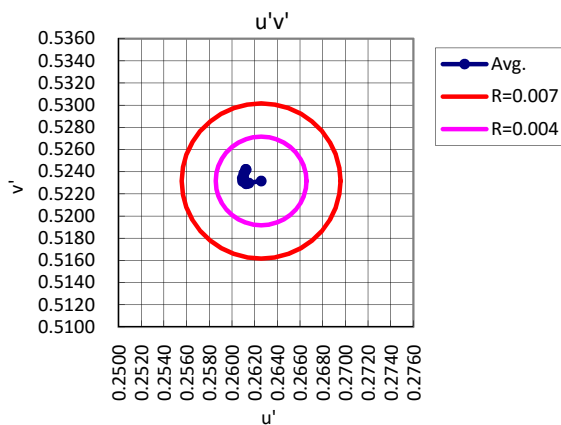
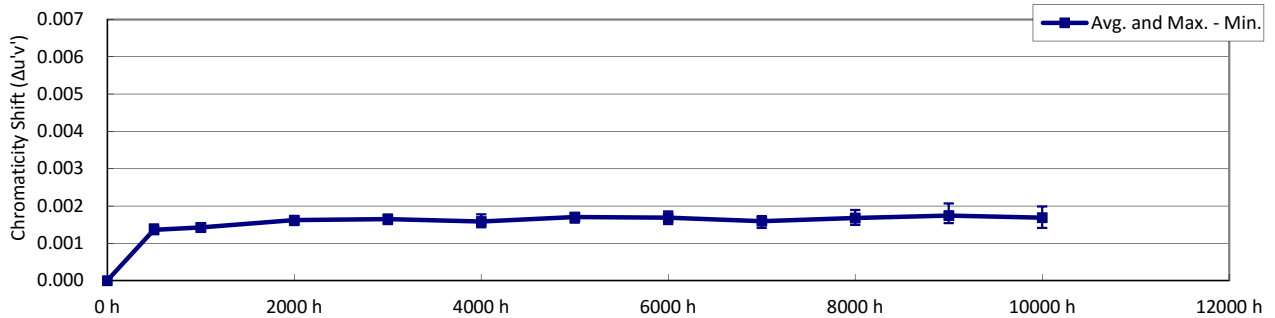
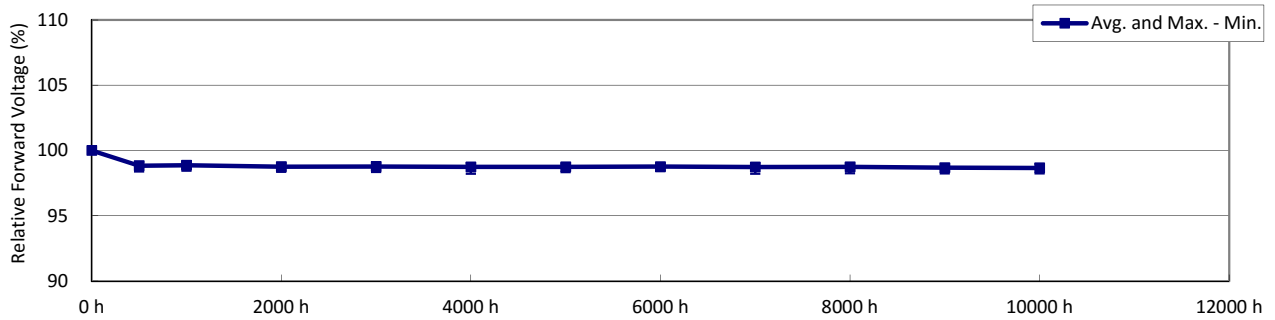
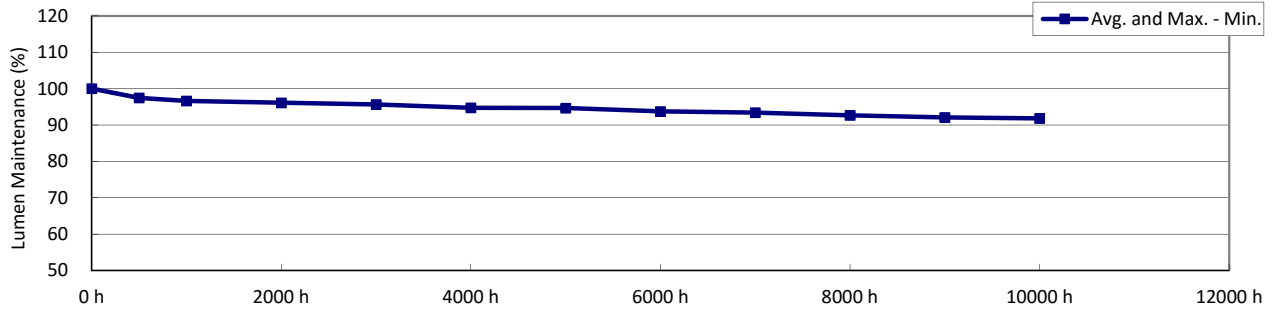
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5290	0.5289	0.5289	0.5290	0.5291	0.5291	0.5291	0.5293	0.5290	0.5293	0.5293	0.5294			
2	0.5225	0.5223	0.5222	0.5223	0.5223	0.5223	0.5223	0.5224	0.5222	0.5225	0.5225	0.5226			
3	0.5232	0.5229	0.5230	0.5231	0.5230	0.5230	0.5230	0.5232	0.5230	0.5232	0.5234	0.5233			
4	0.5248	0.5245	0.5245	0.5245	0.5245	0.5246	0.5246	0.5247	0.5245	0.5249	0.5248	0.5248			
5	0.5251	0.5247	0.5247	0.5247	0.5248	0.5248	0.5248	0.5249	0.5248	0.5250	0.5250	0.5250			
6	0.5238	0.5235	0.5236	0.5236	0.5235	0.5235	0.5235	0.5237	0.5235	0.5237	0.5238	0.5238			
7	0.5249	0.5246	0.5246	0.5246	0.5246	0.5246	0.5246	0.5248	0.5246	0.5248	0.5249	0.5249			
8	0.5246	0.5244	0.5243	0.5244	0.5243	0.5244	0.5243	0.5245	0.5243	0.5246	0.5245	0.5246			
9	0.5248	0.5246	0.5245	0.5246	0.5246	0.5246	0.5245	0.5247	0.5245	0.5247	0.5248	0.5247			
10	0.5272	0.5270	0.5269	0.5269	0.5269	0.5270	0.5270	0.5272	0.5269	0.5273	0.5274	0.5273			
11	0.5250	0.5248	0.5247	0.5248	0.5248	0.5249	0.5248	0.5250	0.5248	0.5252	0.5252	0.5252			
12	0.5237	0.5236	0.5235	0.5234	0.5235	0.5235	0.5234	0.5236	0.5234	0.5237	0.5237	0.5238			
13	0.5243	0.5241	0.5241	0.5241	0.5242	0.5241	0.5241	0.5243	0.5240	0.5243	0.5243	0.5244			
14	0.5250	0.5246	0.5246	0.5247	0.5247	0.5247	0.5247	0.5249	0.5246	0.5249	0.5250	0.5249			
15	0.5247	0.5245	0.5245	0.5245	0.5245	0.5245	0.5245	0.5247	0.5244	0.5248	0.5248	0.5248			
16	0.5260	0.5257	0.5256	0.5258	0.5257	0.5258	0.5257	0.5258	0.5256	0.5259	0.5260	0.5261			
17	0.5264	0.5261	0.5261	0.5261	0.5262	0.5262	0.5262	0.5264	0.5262	0.5265	0.5265	0.5264			
18	0.5270	0.5268	0.5267	0.5268	0.5268	0.5269	0.5268	0.5270	0.5268	0.5271	0.5270	0.5271			
19	0.5268	0.5265	0.5265	0.5266	0.5265	0.5266	0.5266	0.5267	0.5265	0.5269	0.5268	0.5269			
20	0.5258	0.5255	0.5255	0.5256	0.5255	0.5256	0.5256	0.5258	0.5255	0.5259	0.5258	0.5259			
21	0.5251	0.5249	0.5247	0.5249	0.5248	0.5249	0.5249	0.5251	0.5248	0.5251	0.5251	0.5252			
22	0.5268	0.5265	0.5266	0.5266	0.5267	0.5267	0.5267	0.5269	0.5267	0.5270	0.5270	0.5270			
23	0.5259	0.5256	0.5255	0.5256	0.5256	0.5256	0.5258	0.5258	0.5256	0.5260	0.5260	0.5260			
24	0.5239	0.5237	0.5236	0.5237	0.5236	0.5237	0.5237	0.5238	0.5236	0.5239	0.5239	0.5240			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5253	0.5250	0.5250	0.5250	0.5250	0.5251	0.5250	0.5252	0.5250	0.5253	0.5253	0.5253			
Med.	0.5250	0.5247	0.5247	0.5247	0.5247	0.5248	0.5247	0.5249	0.5247	0.5250	0.5250	0.5250			
σ	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015			
Min.	0.5225	0.5223	0.5222	0.5223	0.5223	0.5223	0.5223	0.5224	0.5222	0.5225	0.5225	0.5226			
Max.	0.5290	0.5289	0.5289	0.5290	0.5291	0.5291	0.5291	0.5293	0.5290	0.5293	0.5293	0.5294			

Data Set 7 : 105 °C, 1200 mA

Actual Case Temperature [T_S]	105.8 °C
Actual Ambient Temperature [T_A]	103.1 °C
Drive Current [I_F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_S and T_A were measured during initial setup.



Data Set 7 : 105 °C, 1200 mA

Actual Case Temperature [T _S]	105.8 °C
Actual Ambient Temperature [T _A]	103.1 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 7-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _v [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	394	3.13	2634	0.463	0.407	0.266	0.526						
2	395	3.13	2664	0.458	0.402	0.265	0.524						
3	395	3.13	2642	0.460	0.404	0.266	0.525						
4	402	3.12	2754	0.451	0.401	0.261	0.522						
5	399	3.12	2735	0.451	0.399	0.262	0.522						
6	402	3.12	2760	0.451	0.401	0.261	0.522						
7	400	3.12	2745	0.452	0.402	0.261	0.523						
8	397	3.12	2731	0.452	0.401	0.262	0.523						
9	396	3.13	2737	0.453	0.402	0.262	0.523						
10	390	3.14	2678	0.458	0.404	0.264	0.524						
11	390	3.13	2639	0.462	0.406	0.266	0.526						
12	392	3.12	2665	0.460	0.407	0.264	0.526						
13	392	3.13	2695	0.457	0.405	0.263	0.525						
14	402	3.13	2752	0.450	0.400	0.261	0.522						
15	404	3.13	2783	0.448	0.399	0.260	0.521						
16	401	3.13	2745	0.451	0.399	0.262	0.522						
17	401	3.12	2748	0.450	0.399	0.261	0.521						
18	401	3.12	2735	0.452	0.400	0.262	0.522						
19	401	3.12	2746	0.452	0.401	0.261	0.522						
20	399	3.12	2709	0.455	0.402	0.263	0.523						
21	396	3.12	2696	0.457	0.406	0.263	0.525						
22	395	3.13	2718	0.454	0.403	0.262	0.524						
23	392	3.13	2719	0.452	0.399	0.263	0.522						
24	397	3.13	2761	0.449	0.399	0.261	0.521						
n	24	24	24	24	24	24	24						
Avg.	397	3.13	2716	0.454	0.402	0.263	0.523						
Med.	397	3.13	2733	0.452	0.402	0.262	0.523						
σ	4.2	0.005	42.7	0.0042	0.0026	0.0017	0.0016						
Min.	390	3.12	2634	0.448	0.399	0.260	0.521						
Max.	404	3.14	2783	0.463	0.407	0.266	0.526						

Data Set 7 : 105 °C, 1200 mA

Actual Case Temperature [T _s]	105.8 °C
Actual Ambient Temperature [T _A]	103.1 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 7-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)													
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h		
1	100.0	97.5	96.8	96.2	96.0	95.0	95.0	94.1	93.9	93.3	92.6	92.5		
2	100.0	97.5	96.7	96.3	95.7	94.8	94.9	94.0	93.8	93.1	92.6	92.4		
3	100.0	98.1	97.2	96.9	96.4	95.2	95.2	94.3	94.0	93.3	92.4	92.5		
4	100.0	97.4	96.6	96.1	95.6	94.6	94.5	93.7	93.5	92.8	92.2	91.9		
5	100.0	97.3	96.5	95.9	95.4	94.4	94.3	93.5	93.3	92.6	92.0	91.8		
6	100.0	98.4	97.3	96.6	96.2	95.1	95.1	94.0	94.0	92.9	92.3	92.1		
7	100.0	97.1	96.4	95.8	95.4	94.4	94.3	93.4	93.1	92.4	92.0	91.6		
8	100.0	97.0	96.4	95.8	95.2	94.5	94.4	93.6	93.1	92.5	92.1	91.6		
9	100.0	97.9	96.9	96.2	95.9	94.7	94.6	93.7	93.3	92.6	91.7	91.4		
10	100.0	96.7	96.0	95.4	94.8	93.9	93.8	92.8	92.4	91.7	91.1	90.7		
11	100.0	96.8	96.0	95.5	95.0	94.1	94.0	93.1	92.7	91.9	91.5	91.2		
12	100.0	97.8	96.7	96.1	95.7	94.6	94.6	93.4	93.0	92.2	91.4	91.0		
13	100.0	96.9	96.2	95.6	95.2	94.3	94.3	93.3	92.9	92.2	91.7	91.4		
14	100.0	97.5	96.5	96.3	95.9	95.0	95.2	94.3	93.9	93.3	92.9	92.7		
15	100.0	98.3	97.1	96.6	96.5	95.5	95.5	94.4	94.0	93.2	92.5	92.3		
16	100.0	97.3	96.7	96.2	95.6	94.9	94.8	94.0	93.7	92.9	92.4	92.2		
17	100.0	97.3	96.6	96.1	95.5	94.7	94.6	93.8	93.5	92.7	92.3	91.9		
18	100.0	97.8	97.1	96.3	96.0	95.1	94.9	93.9	93.6	92.7	92.0	91.9		
19	100.0	97.3	96.5	96.0	95.5	94.6	94.4	93.7	93.4	92.5	92.1	91.7		
20	100.0	97.1	96.2	95.8	95.2	94.4	94.2	93.5	93.1	92.3	91.9	91.6		
21	100.0	98.1	96.9	96.5	96.1	95.0	95.0	94.0	93.6	92.8	92.2	91.8		
22	100.0	97.0	96.4	95.9	95.4	94.6	94.5	93.6	93.2	92.4	92.0	91.7		
23	100.0	97.0	96.3	96.0	95.3	94.5	94.5	93.5	93.1	92.3	91.9	91.7		
24	100.0	97.7	97.1	96.7	96.5	95.3	95.3	94.2	93.9	93.0	92.3	92.1		
n	24	24	24	24	24	24	24	24	24	24	24	24		
Avg.	100.0	97.5	96.6	96.1	95.7	94.7	94.7	93.7	93.4	92.6	92.1	91.8		
Med.	100.0	97.4	96.6	96.1	95.6	94.7	94.6	93.7	93.4	92.6	92.1	91.8		
σ	0.00	0.47	0.36	0.38	0.46	0.38	0.42	0.40	0.45	0.43	0.41	0.48		
Min.	100.0	96.7	96.0	95.4	94.8	93.9	93.8	92.8	92.4	91.7	91.1	90.7		
Max.	100.0	98.4	97.3	96.9	96.5	95.5	95.5	94.4	94.0	93.3	92.9	92.7		

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h								
ln(Avg.)	-0.0549	-0.0647	-0.0680	-0.0763	-0.0824	-0.0854								

Test duration used	5000 h	to	10000 h
B	0.9742		
α	6.1099E-06		
R ²	0.9784		
Calculated L ₇₀ (10K)	54100	hours	
Reported L ₇₀ (10K)	54100	hours	
Calculated L ₈₀ (10K)	32200	hours	
Reported L ₈₀ (10K)	32200	hours	
Calculated L ₉₀ (10K)	13000	hours	
Reported L ₉₀ (10K)	13000	hours	

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7)/\alpha$$

$$L_{80} = \ln(B/0.8)/\alpha$$

$$L_{90} = \ln(B/0.9)/\alpha$$

Data Set 7 : 105 °C, 1200 mA

Actual Case Temperature [T _s]	105.8 °C
Actual Ambient Temperature [T _A]	103.1 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 7-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)											
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
1	100.0	99.1	99.1	99.0	98.9	98.8	99.0	99.0	99.0	98.9	98.9	98.8
2	100.0	98.9	99.0	98.9	99.0	98.9	98.9	98.9	98.9	98.9	98.8	98.8
3	100.0	98.9	99.0	98.9	99.0	98.9	98.9	98.9	98.9	98.9	98.9	98.8
4	100.0	99.1	99.1	99.0	99.0	99.0	98.9	99.0	98.9	99.0	98.9	98.9
5	100.0	99.1	99.1	99.1	99.1	99.0	98.9	99.0	99.0	99.0	99.0	99.0
6	100.0	99.1	99.1	99.0	99.0	98.9	99.0	99.0	99.0	98.9	98.9	98.9
7	100.0	98.9	99.0	98.9	99.0	98.9	98.9	98.9	98.8	98.9	98.8	98.9
8	100.0	98.8	99.0	98.8	98.8	98.7	98.8	98.8	98.8	98.7	98.7	98.7
9	100.0	98.7	98.7	98.6	98.7	98.7	98.5	98.5	98.6	98.6	98.5	98.5
10	100.0	98.5	98.5	98.4	98.4	98.4	98.3	98.4	98.3	98.4	98.4	98.3
11	100.0	98.7	98.7	98.5	98.5	98.5	98.6	98.5	98.6	98.5	98.4	98.3
12	100.0	98.8	98.8	98.6	98.6	98.7	98.7	98.6	98.6	98.7	98.6	98.5
13	100.0	98.7	98.8	98.6	98.5	98.5	98.5	98.5	98.5	98.6	98.5	98.4
14	100.0	98.8	98.8	98.8	98.7	98.8	98.9	98.7	98.7	98.7	98.7	98.7
15	100.0	98.8	98.9	98.8	98.9	98.8	98.8	98.8	98.8	98.9	98.7	98.6
16	100.0	99.1	99.1	99.0	99.1	98.9	99.0	99.0	98.9	98.9	98.9	98.9
17	100.0	98.9	99.0	99.0	98.9	98.9	98.9	98.9	99.0	98.9	98.9	98.9
18	100.0	98.9	98.9	98.8	98.9	99.0	98.9	98.9	98.8	98.9	98.7	98.8
19	100.0	99.0	99.0	98.9	98.9	98.9	98.9	98.9	99.0	98.9	98.8	98.8
20	100.0	98.9	99.0	98.9	99.0	98.9	98.9	98.9	98.9	99.0	98.8	98.8
21	100.0	98.8	98.8	98.7	98.6	98.7	98.7	98.8	98.7	98.7	98.6	98.6
22	100.0	98.7	98.6	98.4	98.6	98.5	98.5	98.6	98.5	98.5	98.4	98.4
23	100.0	98.6	98.6	98.4	98.4	98.4	98.4	98.4	98.3	98.4	98.5	98.4
24	100.0	98.4	98.5	98.4	98.4	98.2	98.4	98.4	98.2	98.3	98.2	98.2
n	24	24	24	24	24	24	24	24	24	24	24	24
Avg.	100.0	98.8	98.9	98.8	98.8	98.7	98.8	98.8	98.7	98.8	98.7	98.7
Med.	100.0	98.9	98.9	98.8	98.9	98.8	98.9	98.8	98.8	98.9	98.7	98.7
σ	0.00	0.19	0.21	0.22	0.23	0.23	0.21	0.20	0.23	0.22	0.21	0.22
Min.	100.0	98.4	98.5	98.4	98.4	98.2	98.3	98.4	98.2	98.3	98.2	98.2
Max.	100.0	99.1	99.1	99.1	99.1	99.0	99.0	99.0	99.0	99.0	99.0	99.0

Data Set 7 : 105 °C, 1200 mA

Actual Case Temperature [T _s]	105.8 °C
Actual Ambient Temperature [T _A]	103.1 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 7-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0014	0.0014	0.0017	0.0015	0.0015	0.0017	0.0017	0.0016	0.0017	0.0018	0.0016			
2	0.0000	0.0014	0.0014	0.0017	0.0017	0.0016	0.0017	0.0017	0.0016	0.0016	0.0018	0.0017			
3	0.0000	0.0014	0.0015	0.0017	0.0017	0.0016	0.0018	0.0017	0.0017	0.0018	0.0018	0.0018			
4	0.0000	0.0015	0.0015	0.0016	0.0017	0.0016	0.0018	0.0018	0.0016	0.0017	0.0018	0.0018			
5	0.0000	0.0013	0.0014	0.0015	0.0016	0.0015	0.0017	0.0016	0.0015	0.0016	0.0016	0.0016			
6	0.0000	0.0014	0.0013	0.0016	0.0017	0.0015	0.0016	0.0017	0.0015	0.0017	0.0018	0.0018			
7	0.0000	0.0013	0.0013	0.0016	0.0015	0.0014	0.0016	0.0015	0.0014	0.0016	0.0018	0.0017			
8	0.0000	0.0014	0.0015	0.0016	0.0015	0.0015	0.0017	0.0017	0.0016	0.0017	0.0019	0.0018			
9	0.0000	0.0014	0.0014	0.0016	0.0018	0.0016	0.0018	0.0018	0.0016	0.0019	0.0020	0.0019			
10	0.0000	0.0014	0.0015	0.0016	0.0018	0.0016	0.0017	0.0018	0.0017	0.0018	0.0018	0.0017			
11	0.0000	0.0014	0.0015	0.0017	0.0017	0.0017	0.0017	0.0017	0.0016	0.0016	0.0018	0.0018			
12	0.0000	0.0014	0.0015	0.0017	0.0017	0.0018	0.0018	0.0019	0.0017	0.0019	0.0021	0.0020			
13	0.0000	0.0014	0.0015	0.0017	0.0017	0.0017	0.0017	0.0018	0.0016	0.0018	0.0018	0.0018			
14	0.0000	0.0013	0.0013	0.0015	0.0016	0.0015	0.0016	0.0015	0.0015	0.0015	0.0015	0.0014			
15	0.0000	0.0015	0.0015	0.0016	0.0017	0.0016	0.0018	0.0017	0.0017	0.0017	0.0016	0.0016			
16	0.0000	0.0014	0.0015	0.0015	0.0017	0.0016	0.0017	0.0016	0.0015	0.0016	0.0016	0.0016			
17	0.0000	0.0013	0.0014	0.0016	0.0016	0.0016	0.0017	0.0016	0.0016	0.0016	0.0016	0.0015			
18	0.0000	0.0014	0.0015	0.0016	0.0016	0.0016	0.0017	0.0016	0.0015	0.0017	0.0018	0.0017			
19	0.0000	0.0013	0.0014	0.0016	0.0015	0.0016	0.0016	0.0017	0.0015	0.0015	0.0017	0.0016			
20	0.0000	0.0013	0.0014	0.0015	0.0016	0.0015	0.0017	0.0016	0.0015	0.0015	0.0016	0.0015			
21	0.0000	0.0013	0.0014	0.0016	0.0017	0.0016	0.0018	0.0018	0.0017	0.0018	0.0018	0.0017			
22	0.0000	0.0013	0.0014	0.0017	0.0017	0.0017	0.0017	0.0017	0.0016	0.0017	0.0017	0.0016			
23	0.0000	0.0013	0.0015	0.0017	0.0017	0.0017	0.0018	0.0018	0.0017	0.0018	0.0017	0.0017			
24	0.0000	0.0013	0.0014	0.0016	0.0017	0.0016	0.0017	0.0017	0.0016	0.0017	0.0017	0.0016			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0014	0.0014	0.0016	0.0017	0.0016	0.0017	0.0017	0.0016	0.0017	0.0017	0.0017			
Med.	0.0000	0.0014	0.0014	0.0016	0.0017	0.0016	0.0017	0.0017	0.0016	0.0017	0.0018	0.0017			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			
Min.	0.0000	0.0013	0.0013	0.0015	0.0015	0.0014	0.0016	0.0015	0.0014	0.0015	0.0015	0.0014			
Max.	0.0000	0.0015	0.0015	0.0017	0.0018	0.0018	0.0018	0.0019	0.0017	0.0019	0.0021	0.0020			

Data Set 7 : 105 °C, 1200 mA

Actual Case Temperature [T _s]	105.8 °C
Actual Ambient Temperature [T _A]	103.1 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 7-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2664	0.2650	0.2650	0.2648	0.2648	0.2649	0.2648	0.2649	0.2648	0.2650	0.2651	0.2652			
2	0.2655	0.2641	0.2640	0.2638	0.2638	0.2639	0.2638	0.2639	0.2639	0.2641	0.2641	0.2641			
3	0.2662	0.2648	0.2647	0.2645	0.2645	0.2646	0.2645	0.2647	0.2645	0.2646	0.2648	0.2648			
4	0.2615	0.2600	0.2600	0.2598	0.2598	0.2599	0.2597	0.2598	0.2598	0.2600	0.2601	0.2600			
5	0.2624	0.2611	0.2611	0.2609	0.2608	0.2610	0.2607	0.2609	0.2610	0.2610	0.2612	0.2611			
6	0.2610	0.2596	0.2597	0.2593	0.2593	0.2595	0.2594	0.2595	0.2595	0.2597	0.2597	0.2597			
7	0.2616	0.2603	0.2603	0.2600	0.2600	0.2602	0.2600	0.2602	0.2602	0.2602	0.2604	0.2604			
8	0.2623	0.2610	0.2609	0.2607	0.2608	0.2608	0.2607	0.2608	0.2608	0.2608	0.2609	0.2610			
9	0.2619	0.2605	0.2606	0.2603	0.2602	0.2604	0.2602	0.2604	0.2604	0.2604	0.2605	0.2606			
10	0.2645	0.2631	0.2630	0.2629	0.2628	0.2629	0.2628	0.2629	0.2629	0.2630	0.2631	0.2633			
11	0.2662	0.2648	0.2647	0.2646	0.2645	0.2646	0.2646	0.2647	0.2647	0.2649	0.2649	0.2649			
12	0.2648	0.2634	0.2634	0.2631	0.2631	0.2632	0.2631	0.2633	0.2632	0.2634	0.2635	0.2635			
13	0.2636	0.2622	0.2621	0.2619	0.2618	0.2619	0.2619	0.2619	0.2620	0.2620	0.2622	0.2622			
14	0.2614	0.2602	0.2602	0.2599	0.2599	0.2600	0.2599	0.2600	0.2599	0.2600	0.2601	0.2603			
15	0.2603	0.2589	0.2588	0.2587	0.2586	0.2587	0.2585	0.2586	0.2586	0.2587	0.2589	0.2589			
16	0.2619	0.2606	0.2605	0.2603	0.2602	0.2603	0.2602	0.2603	0.2603	0.2604	0.2605	0.2605			
17	0.2618	0.2605	0.2604	0.2602	0.2602	0.2602	0.2601	0.2602	0.2602	0.2603	0.2604	0.2605			
18	0.2622	0.2608	0.2607	0.2606	0.2606	0.2606	0.2605	0.2607	0.2607	0.2607	0.2608	0.2608			
19	0.2617	0.2604	0.2603	0.2600	0.2601	0.2601	0.2601	0.2601	0.2601	0.2603	0.2603	0.2604			
20	0.2631	0.2619	0.2617	0.2616	0.2615	0.2616	0.2614	0.2617	0.2616	0.2618	0.2618	0.2618			
21	0.2634	0.2621	0.2619	0.2618	0.2617	0.2618	0.2617	0.2618	0.2618	0.2619	0.2620	0.2621			
22	0.2627	0.2614	0.2613	0.2610	0.2610	0.2610	0.2610	0.2611	0.2611	0.2612	0.2612	0.2613			
23	0.2629	0.2617	0.2615	0.2612	0.2613	0.2613	0.2612	0.2613	0.2613	0.2613	0.2615	0.2614			
24	0.2610	0.2597	0.2596	0.2594	0.2593	0.2594	0.2593	0.2593	0.2594	0.2594	0.2595	0.2596			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2629	0.2616	0.2615	0.2613	0.2613	0.2614	0.2613	0.2614	0.2614	0.2615	0.2616	0.2616			
Med.	0.2624	0.2611	0.2610	0.2608	0.2608	0.2609	0.2607	0.2609	0.2609	0.2609	0.2610	0.2611			
σ	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018			
Min.	0.2603	0.2589	0.2588	0.2587	0.2586	0.2587	0.2585	0.2586	0.2586	0.2587	0.2589	0.2589			
Max.	0.2664	0.2650	0.2650	0.2648	0.2648	0.2649	0.2648	0.2649	0.2648	0.2650	0.2651	0.2652			

Data Set 7 : 105 °C, 1200 mA

Actual Case Temperature [T _s]	105.8 °C
Actual Ambient Temperature [T _A]	103.1 °C
Drive Current [I _f]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 7-6
Chromaticity

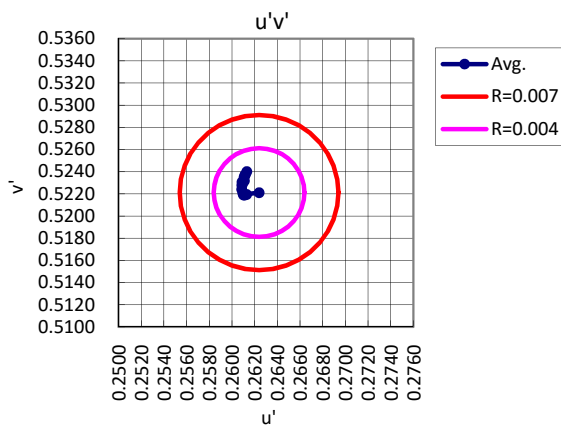
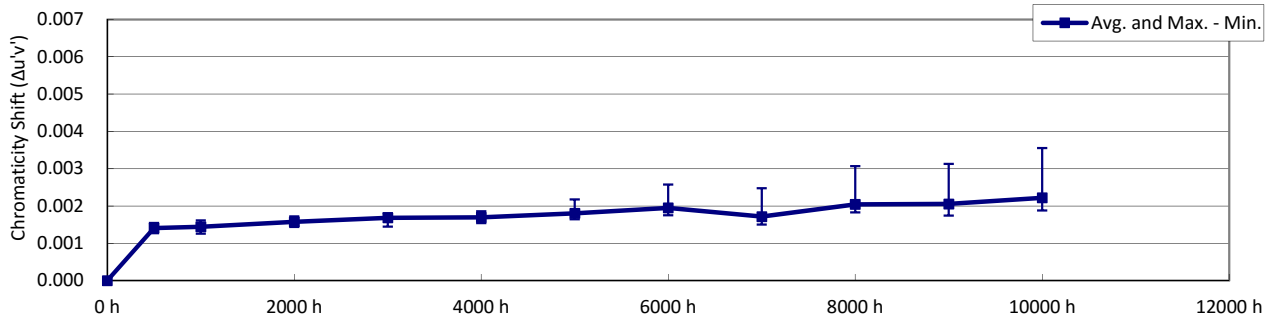
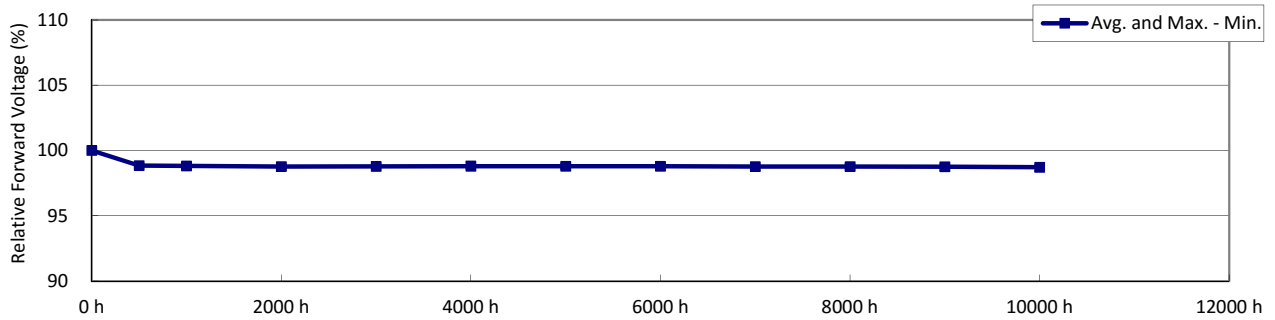
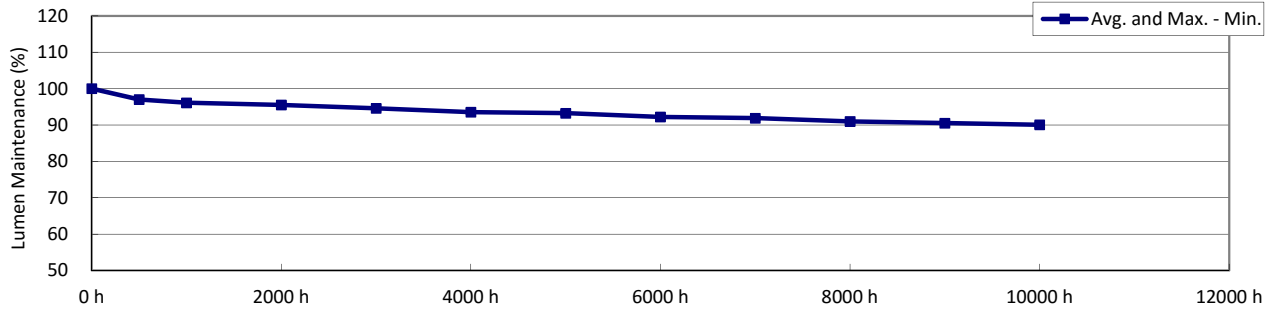
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5262	0.5260	0.5262	0.5265	0.5263	0.5265	0.5266	0.5270	0.5265	0.5271	0.5274	0.5272			
2	0.5234	0.5232	0.5234	0.5237	0.5235	0.5237	0.5238	0.5242	0.5237	0.5243	0.5246	0.5245			
3	0.5242	0.5241	0.5243	0.5245	0.5242	0.5245	0.5246	0.5249	0.5245	0.5251	0.5253	0.5253			
4	0.5221	0.5219	0.5220	0.5222	0.5221	0.5224	0.5224	0.5229	0.5225	0.5230	0.5233	0.5232			
5	0.5213	0.5210	0.5211	0.5213	0.5212	0.5214	0.5215	0.5218	0.5215	0.5220	0.5223	0.5223			
6	0.5217	0.5215	0.5216	0.5218	0.5217	0.5220	0.5220	0.5225	0.5221	0.5227	0.5230	0.5230			
7	0.5225	0.5222	0.5225	0.5226	0.5226	0.5228	0.5229	0.5233	0.5229	0.5235	0.5238	0.5238			
8	0.5222	0.5219	0.5222	0.5223	0.5223	0.5225	0.5226	0.5230	0.5225	0.5231	0.5235	0.5234			
9	0.5223	0.5221	0.5223	0.5225	0.5224	0.5228	0.5228	0.5232	0.5228	0.5234	0.5237	0.5236			
10	0.5242	0.5239	0.5241	0.5243	0.5242	0.5245	0.5246	0.5249	0.5245	0.5250	0.5254	0.5253			
11	0.5255	0.5253	0.5256	0.5258	0.5257	0.5260	0.5259	0.5263	0.5260	0.5264	0.5267	0.5267			
12	0.5254	0.5253	0.5256	0.5258	0.5257	0.5260	0.5260	0.5264	0.5261	0.5266	0.5269	0.5269			
13	0.5246	0.5243	0.5245	0.5248	0.5246	0.5248	0.5249	0.5253	0.5249	0.5254	0.5256	0.5257			
14	0.5214	0.5210	0.5212	0.5214	0.5212	0.5214	0.5215	0.5218	0.5215	0.5220	0.5222	0.5222			
15	0.5201	0.5198	0.5197	0.5199	0.5198	0.5201	0.5201	0.5204	0.5201	0.5207	0.5209	0.5209			
16	0.5212	0.5209	0.5209	0.5211	0.5210	0.5213	0.5212	0.5216	0.5212	0.5217	0.5220	0.5220			
17	0.5210	0.5208	0.5208	0.5211	0.5209	0.5211	0.5211	0.5215	0.5211	0.5216	0.5219	0.5219			
18	0.5215	0.5212	0.5214	0.5216	0.5214	0.5217	0.5217	0.5221	0.5217	0.5222	0.5225	0.5225			
19	0.5221	0.5219	0.5220	0.5222	0.5221	0.5224	0.5224	0.5228	0.5224	0.5228	0.5231	0.5231			
20	0.5231	0.5228	0.5230	0.5232	0.5230	0.5233	0.5233	0.5237	0.5233	0.5238	0.5240	0.5240			
21	0.5245	0.5244	0.5246	0.5248	0.5246	0.5249	0.5250	0.5253	0.5249	0.5254	0.5257	0.5256			
22	0.5233	0.5230	0.5232	0.5233	0.5232	0.5235	0.5235	0.5239	0.5234	0.5240	0.5242	0.5241			
23	0.5214	0.5212	0.5213	0.5215	0.5213	0.5216	0.5216	0.5220	0.5215	0.5220	0.5222	0.5222			
24	0.5206	0.5204	0.5205	0.5207	0.5205	0.5208	0.5208	0.5211	0.5207	0.5212	0.5214	0.5214			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5227	0.5225	0.5227	0.5229	0.5227	0.5230	0.5230	0.5234	0.5230	0.5235	0.5238	0.5238			
Med.	0.5223	0.5220	0.5223	0.5224	0.5224	0.5226	0.5227	0.5231	0.5227	0.5233	0.5236	0.5235			
σ	0.0017	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018			
Min.	0.5201	0.5198	0.5197	0.5199	0.5198	0.5201	0.5201	0.5204	0.5201	0.5207	0.5209	0.5209			
Max.	0.5262	0.5260	0.5262	0.5265	0.5263	0.5265	0.5266	0.5270	0.5265	0.5271	0.5274	0.5272			

Data Set 8 : 105 °C, 1500 mA

Actual Case Temperature [T_S]	106.0 °C
Actual Ambient Temperature [T_A]	102.7 °C
Drive Current [I_F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_S and T_A were measured during initial setup.



Data Set 8 : 105 °C, 1500 mA

Actual Case Temperature [T _S]	106.0 °C
Actual Ambient Temperature [T _A]	102.7 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 8-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _V [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	479	3.20	2757	0.449	0.397	0.261	0.521						
2	483	3.20	2787	0.447	0.397	0.260	0.520						
3	482	3.20	2759	0.448	0.397	0.261	0.520						
4	483	3.21	2762	0.448	0.398	0.261	0.521						
5	483	3.20	2763	0.448	0.397	0.261	0.520						
6	482	3.21	2750	0.450	0.399	0.261	0.521						
7	480	3.21	2756	0.449	0.399	0.261	0.521						
8	479	3.21	2743	0.450	0.398	0.262	0.521						
9	473	3.20	2675	0.456	0.401	0.265	0.523						
10	477	3.20	2686	0.457	0.405	0.264	0.525						
11	478	3.21	2703	0.455	0.403	0.263	0.524						
12	481	3.21	2725	0.452	0.399	0.262	0.522						
13	482	3.21	2741	0.450	0.399	0.262	0.521						
14	483	3.21	2760	0.449	0.399	0.261	0.521						
15	482	3.21	2738	0.451	0.399	0.262	0.521						
16	480	3.21	2727	0.452	0.399	0.262	0.522						
17	478	3.21	2717	0.453	0.400	0.263	0.522						
18	476	3.21	2705	0.454	0.402	0.263	0.523						
19	479	3.20	2711	0.454	0.401	0.263	0.522						
20	477	3.20	2701	0.454	0.400	0.263	0.522						
21	478	3.21	2686	0.457	0.403	0.264	0.524						
22	474	3.21	2644	0.461	0.406	0.266	0.526						
23	477	3.21	2674	0.460	0.407	0.264	0.526						
24	478	3.20	2714	0.453	0.400	0.263	0.522						
n	24	24	24	24	24	24	24						
Avg.	479	3.21	2724	0.452	0.400	0.262	0.522						
Med.	479	3.21	2726	0.452	0.399	0.262	0.522						
σ	2.9	0.002	35.6	0.0038	0.0027	0.0014	0.0016						
Min.	473	3.20	2644	0.447	0.397	0.260	0.520						
Max.	483	3.21	2787	0.461	0.407	0.266	0.526						

Data Set 8 : 105 °C, 1500 mA

Actual Case Temperature [T _s]	106.0 °C
Actual Ambient Temperature [T _A]	102.7 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 8-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)													
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h		
1	100.0	96.8	96.0	95.5	94.4	93.4	93.2	92.2	91.9	91.1	90.6	90.1		
2	100.0	96.8	95.8	94.9	94.3	93.2	93.0	92.0	91.6	90.8	90.3	90.0		
3	100.0	97.8	96.9	96.3	95.0	93.8	93.8	92.5	92.3	91.2	90.5	90.3		
4	100.0	96.9	96.1	95.5	94.6	93.5	93.2	92.3	92.1	91.1	90.9	90.3		
5	100.0	97.0	96.0	95.4	94.5	93.4	93.1	92.1	91.9	91.1	90.8	90.1		
6	100.0	97.6	96.4	95.8	94.8	93.6	93.1	92.1	91.9	90.7	90.1	89.3		
7	100.0	96.7	95.9	95.4	94.4	93.2	93.1	92.1	91.7	91.0	90.5	90.0		
8	100.0	96.7	95.8	95.3	94.3	93.1	93.0	92.0	91.6	90.9	90.3	90.0		
9	100.0	97.3	96.4	95.7	95.2	93.4	93.4	92.2	92.0	90.8	90.2	89.8		
10	100.0	96.5	95.6	95.1	94.0	93.1	92.7	91.6	91.4	90.5	90.3	89.7		
11	100.0	96.6	95.7	95.2	94.0	93.1	92.9	92.0	91.7	90.8	90.7	90.0		
12	100.0	97.4	96.7	95.9	94.7	93.7	93.5	92.4	91.7	90.2	90.2	89.4		
13	100.0	97.0	96.1	95.5	94.6	94.0	93.3	92.4	92.1	91.3	91.0	90.4		
14	100.0	97.0	96.1	95.5	94.5	94.0	93.3	92.5	92.2	91.3	91.1	90.5		
15	100.0	97.6	96.7	96.3	95.2	94.4	93.7	92.6	92.3	91.2	90.7	90.3		
16	100.0	96.9	96.0	95.6	94.6	93.6	93.4	92.3	92.0	91.2	90.7	90.3		
17	100.0	96.9	96.0	95.3	94.4	93.6	93.3	92.3	91.8	91.2	90.6	90.2		
18	100.0	97.5	96.6	96.0	95.5	94.2	94.0	92.9	92.4	91.5	90.7	90.7		
19	100.0	96.8	96.0	95.4	94.4	93.3	93.0	92.2	91.8	90.9	90.5	90.0		
20	100.0	96.7	95.8	95.3	94.3	93.3	93.0	92.0	91.6	90.8	90.4	90.0		
21	100.0	97.5	96.4	95.8	95.3	93.8	93.7	92.5	91.9	91.2	90.3	90.1		
22	100.0	96.6	95.7	95.1	94.1	93.2	92.7	91.6	91.5	90.8	90.3	89.8		
23	100.0	96.6	95.8	95.2	94.3	93.3	93.1	92.2	91.9	91.0	90.6	90.3		
24	100.0	97.2	96.3	95.7	94.8	93.8	93.4	92.5	92.0	91.0	90.3	90.0		
n	24	24	24	24	24	24	24	24	24	24	24	24		
Avg.	100.0	97.0	96.1	95.5	94.6	93.5	93.3	92.2	91.9	91.0	90.5	90.1		
Med.	100.0	96.9	96.0	95.5	94.5	93.5	93.2	92.2	91.9	91.0	90.5	90.1		
σ	0.00	0.38	0.37	0.36	0.40	0.37	0.32	0.29	0.25	0.28	0.27	0.33		
Min.	100.0	96.5	95.6	94.9	94.0	93.1	92.7	91.6	91.4	90.2	90.1	89.3		
Max.	100.0	97.8	96.9	96.3	95.5	94.4	94.0	92.9	92.4	91.5	91.1	90.7		

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h								
ln(Avg.)	-0.0699	-0.0809	-0.0846	-0.0945	-0.0995	-0.1047								

Test duration used	5000 h	to	10000 h
B	0.9631		
α	6.8570E-06		
R ²	0.9807		
Calculated L ₇₀ (10K)	46500	hours	
Reported L ₇₀ (10K)	46500	hours	
Calculated L ₈₀ (10K)	27100	hours	
Reported L ₈₀ (10K)	27100	hours	
Calculated L ₉₀ (10K)	9880	hours	
Reported L ₉₀ (10K)	9880	hours	

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7) / \alpha$$

$$L_{80} = \ln(B/0.8) / \alpha$$

$$L_{90} = \ln(B/0.9) / \alpha$$

Data Set 8 : 105 °C, 1500 mA

Actual Case Temperature [T _s]	106.0 °C
Actual Ambient Temperature [T _A]	102.7 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 8-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	100.0	98.8	98.7	98.6	98.7	98.7	98.6	98.6	98.6	98.5	98.6	98.6			
2	100.0	98.8	98.9	98.8	98.9	98.8	99.0	98.9	98.9	98.9	98.8	98.9			
3	100.0	98.9	99.0	99.0	99.0	98.9	98.9	98.9	98.9	98.9	98.8	98.8			
4	100.0	98.9	98.9	98.9	98.8	98.9	98.9	98.9	98.9	98.9	98.9	98.8			
5	100.0	98.8	98.8	98.7	98.9	98.8	98.8	98.7	98.8	98.7	98.7	98.7			
6	100.0	99.0	98.9	98.9	98.9	98.8	98.8	98.8	98.8	98.8	98.8	98.8			
7	100.0	98.7	98.7	98.6	98.7	98.7	98.7	98.6	98.7	98.7	98.7	98.5			
8	100.0	98.7	98.7	98.6	98.6	98.6	98.6	98.6	98.5	98.7	98.5	98.6			
9	100.0	98.7	98.7	98.7	98.6	98.6	98.6	98.7	98.6	98.6	98.7	98.6			
10	100.0	98.8	98.9	98.9	98.8	98.8	98.8	98.9	98.8	98.8	98.8	98.7			
11	100.0	98.9	98.9	98.9	98.7	98.8	98.9	99.0	98.8	98.8	98.8	98.9			
12	100.0	98.9	98.8	98.8	98.8	98.8	98.9	98.8	98.8	98.7	98.9	98.7			
13	100.0	98.9	98.9	98.9	99.0	99.0	98.9	99.0	98.9	98.9	98.9	98.7			
14	100.0	99.0	99.0	98.9	99.0	99.1	99.0	98.9	98.9	99.0	98.9	98.9			
15	100.0	98.9	98.9	98.8	98.8	99.0	98.8	98.8	98.8	98.8	98.9	98.8			
16	100.0	98.9	98.9	98.8	98.8	98.8	98.8	98.9	98.9	98.9	98.7	98.7			
17	100.0	98.8	98.8	98.8	98.7	98.8	98.7	98.7	98.7	98.7	98.7	98.6			
18	100.0	98.7	98.6	98.6	98.5	98.7	98.6	98.6	98.6	98.6	98.5	98.4			
19	100.0	98.9	98.9	98.8	98.8	98.8	98.9	98.9	98.7	98.8	98.8	98.8			
20	100.0	98.7	98.8	98.8	98.7	98.7	98.7	98.7	98.7	98.8	98.7	98.7			
21	100.0	98.9	98.8	98.9	98.8	98.9	98.9	98.9	98.9	98.8	98.8	98.9			
22	100.0	98.9	98.9	98.8	98.8	98.8	98.8	98.8	98.8	98.9	98.8	98.8			
23	100.0	98.9	98.8	98.7	98.8	98.8	98.8	98.9	98.7	98.8	98.7	98.7			
24	100.0	98.8	98.7	98.7	98.7	98.7	98.7	98.7	98.6	98.7	98.7	98.6			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	100.0	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.7			
Med.	100.0	98.9	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.7			
σ	0.00	0.09	0.10	0.10	0.12	0.13	0.12	0.12	0.12	0.11	0.12	0.12			
Min.	100.0	98.7	98.6	98.6	98.5	98.6	98.6	98.6	98.5	98.5	98.5	98.4			
Max.	100.0	99.0	99.0	99.0	99.0	99.1	99.0	99.0	98.9	99.0	98.9	98.9			

Data Set 8 : 105 °C, 1500 mA

Actual Case Temperature [T _s]	106.0 °C
Actual Ambient Temperature [T _A]	102.7 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 8-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0014	0.0015	0.0015	0.0018	0.0017	0.0019	0.0019	0.0016	0.0021	0.0020	0.0021			
2	0.0000	0.0014	0.0013	0.0015	0.0018	0.0017	0.0018	0.0019	0.0016	0.0021	0.0021	0.0021			
3	0.0000	0.0015	0.0015	0.0017	0.0018	0.0017	0.0019	0.0020	0.0017	0.0020	0.0020	0.0020			
4	0.0000	0.0015	0.0015	0.0016	0.0017	0.0016	0.0017	0.0019	0.0016	0.0019	0.0019	0.0022			
5	0.0000	0.0015	0.0015	0.0016	0.0016	0.0016	0.0018	0.0018	0.0016	0.0018	0.0017	0.0019			
6	0.0000	0.0013	0.0015	0.0016	0.0017	0.0018	0.0019	0.0023	0.0020	0.0024	0.0024	0.0030			
7	0.0000	0.0014	0.0014	0.0017	0.0018	0.0017	0.0019	0.0019	0.0017	0.0020	0.0021	0.0022			
8	0.0000	0.0015	0.0016	0.0017	0.0018	0.0018	0.0019	0.0020	0.0017	0.0019	0.0021	0.0021			
9	0.0000	0.0013	0.0015	0.0015	0.0018	0.0017	0.0019	0.0019	0.0018	0.0020	0.0022	0.0023			
10	0.0000	0.0013	0.0014	0.0016	0.0017	0.0017	0.0019	0.0020	0.0018	0.0022	0.0021	0.0024			
11	0.0000	0.0015	0.0014	0.0016	0.0017	0.0018	0.0018	0.0020	0.0017	0.0020	0.0019	0.0022			
12	0.0000	0.0014	0.0014	0.0015	0.0017	0.0019	0.0022	0.0026	0.0025	0.0031	0.0031	0.0036			
13	0.0000	0.0013	0.0014	0.0014	0.0014	0.0015	0.0017	0.0019	0.0016	0.0020	0.0019	0.0022			
14	0.0000	0.0015	0.0016	0.0015	0.0016	0.0017	0.0018	0.0018	0.0016	0.0019	0.0019	0.0021			
15	0.0000	0.0014	0.0015	0.0015	0.0016	0.0016	0.0019	0.0021	0.0019	0.0023	0.0023	0.0027			
16	0.0000	0.0015	0.0015	0.0017	0.0017	0.0017	0.0017	0.0018	0.0017	0.0019	0.0020	0.0021			
17	0.0000	0.0014	0.0013	0.0015	0.0016	0.0016	0.0017	0.0018	0.0016	0.0020	0.0019	0.0020			
18	0.0000	0.0013	0.0014	0.0017	0.0017	0.0017	0.0018	0.0019	0.0017	0.0020	0.0019	0.0020			
19	0.0000	0.0014	0.0015	0.0015	0.0016	0.0017	0.0017	0.0018	0.0016	0.0019	0.0020	0.0020			
20	0.0000	0.0014	0.0014	0.0015	0.0016	0.0016	0.0016	0.0018	0.0016	0.0019	0.0021	0.0021			
21	0.0000	0.0014	0.0014	0.0015	0.0017	0.0017	0.0018	0.0019	0.0017	0.0021	0.0020	0.0022			
22	0.0000	0.0014	0.0014	0.0016	0.0017	0.0018	0.0018	0.0019	0.0017	0.0020	0.0021	0.0020			
23	0.0000	0.0015	0.0015	0.0017	0.0017	0.0018	0.0018	0.0019	0.0017	0.0019	0.0019	0.0019			
24	0.0000	0.0013	0.0013	0.0015	0.0016	0.0016	0.0017	0.0018	0.0015	0.0018	0.0018	0.0019			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0014	0.0014	0.0016	0.0017	0.0017	0.0018	0.0020	0.0017	0.0020	0.0021	0.0022			
Med.	0.0000	0.0014	0.0014	0.0015	0.0017	0.0017	0.0018	0.0019	0.0017	0.0020	0.0020	0.0021			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004			
Min.	0.0000	0.0013	0.0013	0.0014	0.0014	0.0015	0.0016	0.0018	0.0015	0.0018	0.0017	0.0019			
Max.	0.0000	0.0015	0.0016	0.0017	0.0018	0.0019	0.0022	0.0026	0.0025	0.0031	0.0031	0.0036			

Data Set 8 : 105 °C, 1500 mA

Actual Case Temperature [T _s]	106.0 °C
Actual Ambient Temperature [T _A]	102.7 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 8-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2615	0.2602	0.2601	0.2600	0.2599	0.2600	0.2599	0.2602	0.2601	0.2601	0.2603	0.2603			
2	0.2602	0.2589	0.2589	0.2587	0.2586	0.2587	0.2587	0.2588	0.2589	0.2589	0.2590	0.2591			
3	0.2614	0.2599	0.2599	0.2597	0.2597	0.2598	0.2597	0.2599	0.2599	0.2601	0.2600	0.2601			
4	0.2613	0.2599	0.2598	0.2596	0.2597	0.2598	0.2597	0.2599	0.2600	0.2599	0.2598	0.2600			
5	0.2613	0.2599	0.2599	0.2597	0.2598	0.2598	0.2597	0.2599	0.2599	0.2599	0.2599	0.2601			
6	0.2616	0.2603	0.2601	0.2600	0.2602	0.2602	0.2602	0.2604	0.2605	0.2605	0.2606	0.2608			
7	0.2613	0.2599	0.2599	0.2597	0.2597	0.2598	0.2597	0.2600	0.2600	0.2600	0.2601	0.2602			
8	0.2620	0.2605	0.2604	0.2604	0.2604	0.2604	0.2604	0.2606	0.2606	0.2607	0.2608	0.2608			
9	0.2647	0.2634	0.2633	0.2633	0.2632	0.2633	0.2632	0.2635	0.2634	0.2636	0.2636	0.2637			
10	0.2641	0.2627	0.2626	0.2625	0.2626	0.2627	0.2627	0.2629	0.2628	0.2628	0.2629	0.2631			
11	0.2634	0.2619	0.2620	0.2619	0.2620	0.2620	0.2620	0.2621	0.2622	0.2621	0.2622	0.2624			
12	0.2626	0.2612	0.2612	0.2611	0.2613	0.2614	0.2614	0.2617	0.2618	0.2617	0.2619	0.2621			
13	0.2619	0.2607	0.2605	0.2605	0.2605	0.2604	0.2605	0.2607	0.2607	0.2608	0.2608	0.2610			
14	0.2612	0.2598	0.2597	0.2597	0.2596	0.2596	0.2596	0.2600	0.2599	0.2600	0.2599	0.2601			
15	0.2621	0.2607	0.2606	0.2606	0.2606	0.2606	0.2607	0.2608	0.2609	0.2610	0.2610	0.2612			
16	0.2627	0.2613	0.2612	0.2610	0.2611	0.2612	0.2611	0.2611	0.2612	0.2614	0.2614	0.2615			
17	0.2629	0.2615	0.2615	0.2614	0.2614	0.2614	0.2613	0.2614	0.2615	0.2615	0.2616	0.2617			
18	0.2633	0.2619	0.2618	0.2616	0.2616	0.2617	0.2617	0.2617	0.2617	0.2618	0.2620	0.2620			
19	0.2632	0.2619	0.2618	0.2617	0.2618	0.2618	0.2618	0.2619	0.2619	0.2620	0.2620	0.2621			
20	0.2637	0.2623	0.2623	0.2622	0.2623	0.2623	0.2623	0.2624	0.2625	0.2626	0.2626	0.2627			
21	0.2641	0.2627	0.2627	0.2626	0.2626	0.2627	0.2626	0.2628	0.2628	0.2628	0.2630	0.2629			
22	0.2659	0.2645	0.2645	0.2644	0.2645	0.2645	0.2644	0.2647	0.2646	0.2647	0.2646	0.2648			
23	0.2643	0.2628	0.2628	0.2627	0.2628	0.2627	0.2627	0.2628	0.2628	0.2629	0.2629	0.2630			
24	0.2630	0.2617	0.2617	0.2615	0.2615	0.2616	0.2615	0.2616	0.2617	0.2618	0.2618	0.2618			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2627	0.2613	0.2612	0.2611	0.2611	0.2612	0.2611	0.2613	0.2613	0.2614	0.2614	0.2616			
Med.	0.2626	0.2612	0.2612	0.2611	0.2612	0.2613	0.2612	0.2613	0.2613	0.2615	0.2615	0.2616			
σ	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014			
Min.	0.2602	0.2589	0.2589	0.2587	0.2586	0.2587	0.2587	0.2588	0.2589	0.2589	0.2590	0.2591			
Max.	0.2659	0.2645	0.2645	0.2644	0.2645	0.2645	0.2644	0.2647	0.2646	0.2647	0.2646	0.2648			

Data Set 8 : 105 °C, 1500 mA

Actual Case Temperature [T _s]	106.0 °C
Actual Ambient Temperature [T _A]	102.7 °C
Drive Current [I _f]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

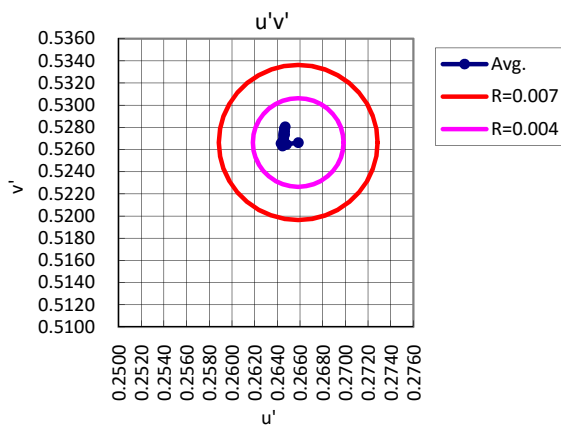
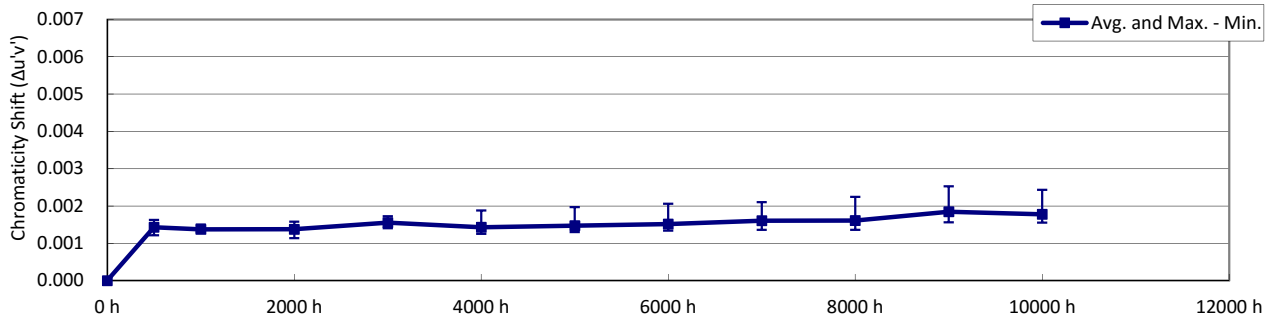
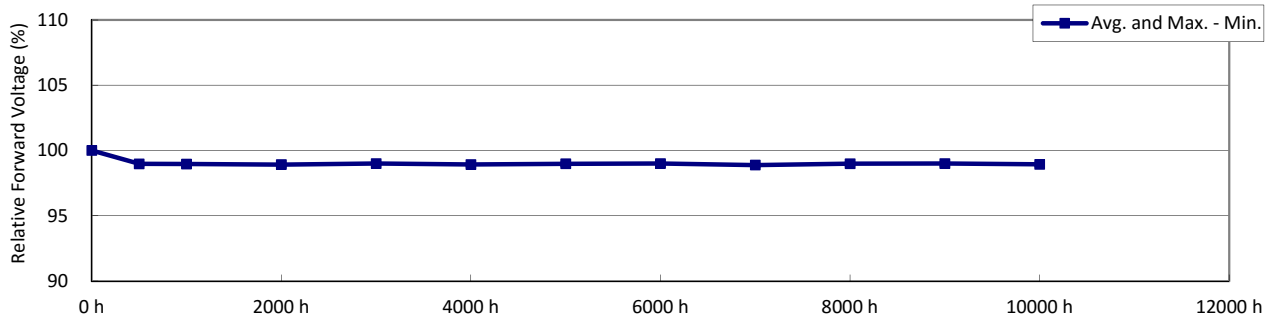
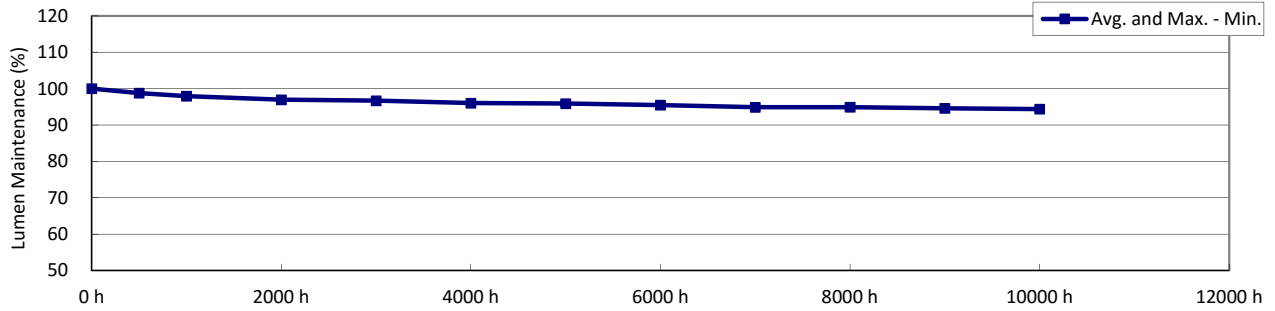
TABLE 8-6
Chromaticity

LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5202	0.5200	0.5202	0.5204	0.5209	0.5210	0.5211	0.5216	0.5210	0.5217	0.5217	0.5219			
2	0.5199	0.5197	0.5199	0.5200	0.5206	0.5207	0.5208	0.5212	0.5209	0.5215	0.5216	0.5217			
3	0.5197	0.5194	0.5196	0.5199	0.5204	0.5205	0.5206	0.5210	0.5205	0.5212	0.5212	0.5213			
4	0.5203	0.5199	0.5201	0.5204	0.5209	0.5210	0.5211	0.5215	0.5212	0.5215	0.5214	0.5221			
5	0.5198	0.5195	0.5196	0.5200	0.5203	0.5204	0.5204	0.5209	0.5205	0.5209	0.5208	0.5213			
6	0.5204	0.5203	0.5204	0.5208	0.5213	0.5215	0.5217	0.5224	0.5222	0.5226	0.5226	0.5234			
7	0.5208	0.5205	0.5207	0.5211	0.5215	0.5216	0.5217	0.5221	0.5218	0.5222	0.5225	0.5227			
8	0.5207	0.5205	0.5207	0.5210	0.5215	0.5215	0.5216	0.5221	0.5217	0.5221	0.5223	0.5224			
9	0.5224	0.5223	0.5225	0.5229	0.5233	0.5233	0.5235	0.5239	0.5236	0.5240	0.5242	0.5244			
10	0.5243	0.5243	0.5245	0.5249	0.5253	0.5254	0.5256	0.5260	0.5257	0.5261	0.5261	0.5266			
11	0.5232	0.5231	0.5232	0.5236	0.5241	0.5242	0.5243	0.5247	0.5243	0.5247	0.5247	0.5252			
12	0.5208	0.5206	0.5208	0.5212	0.5219	0.5222	0.5226	0.5232	0.5232	0.5238	0.5239	0.5243			
13	0.5209	0.5206	0.5207	0.5210	0.5210	0.5211	0.5218	0.5222	0.5219	0.5225	0.5224	0.5228			
14	0.5207	0.5204	0.5205	0.5208	0.5207	0.5208	0.5215	0.5219	0.5215	0.5221	0.5221	0.5225			
15	0.5206	0.5204	0.5205	0.5208	0.5208	0.5211	0.5218	0.5223	0.5221	0.5226	0.5226	0.5231			
16	0.5215	0.5212	0.5213	0.5216	0.5220	0.5222	0.5222	0.5225	0.5223	0.5229	0.5230	0.5232			
17	0.5220	0.5218	0.5218	0.5222	0.5225	0.5227	0.5227	0.5231	0.5229	0.5234	0.5234	0.5236			
18	0.5224	0.5222	0.5223	0.5226	0.5230	0.5231	0.5232	0.5234	0.5232	0.5238	0.5238	0.5239			
19	0.5222	0.5220	0.5221	0.5224	0.5228	0.5230	0.5230	0.5234	0.5231	0.5236	0.5237	0.5238			
20	0.5218	0.5216	0.5217	0.5221	0.5225	0.5226	0.5226	0.5231	0.5228	0.5233	0.5235	0.5236			
21	0.5232	0.5231	0.5232	0.5236	0.5240	0.5241	0.5242	0.5246	0.5243	0.5248	0.5248	0.5251			
22	0.5253	0.5254	0.5256	0.5259	0.5263	0.5264	0.5264	0.5268	0.5263	0.5270	0.5270	0.5270			
23	0.5255	0.5253	0.5254	0.5258	0.5261	0.5262	0.5262	0.5266	0.5261	0.5267	0.5268	0.5269			
24	0.5214	0.5212	0.5213	0.5217	0.5221	0.5222	0.5222	0.5226	0.5222	0.5228	0.5229	0.5229			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5217	0.5215	0.5216	0.5220	0.5223	0.5225	0.5226	0.5231	0.5227	0.5232	0.5233	0.5236			
Med.	0.5211	0.5209	0.5210	0.5214	0.5220	0.5222	0.5222	0.5226	0.5223	0.5228	0.5229	0.5233			
σ	0.0016	0.0017	0.0017	0.0018	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0016			
Min.	0.5197	0.5194	0.5196	0.5199	0.5203	0.5204	0.5204	0.5209	0.5205	0.5209	0.5208	0.5213			
Max.	0.5255	0.5254	0.5256	0.5259	0.5263	0.5264	0.5264	0.5268	0.5263	0.5270	0.5270	0.5270			

Data Set 9 : 120 °C, 700 mA

Actual Case Temperature [T_S]	121.5 °C
Actual Ambient Temperature [T_A]	117.8 °C
Drive Current [I_F]	700 mA
Measurement Current	700 mA

NOTES:
 T_S and T_A were measured during initial setup.



Data Set 9 : 120 °C, 700 mA

Actual Case Temperature [T _S]	121.5 °C
Actual Ambient Temperature [T _A]	117.8 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 9-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _V [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	246	2.99	2667	0.457	0.401	0.265	0.523						
2	247	2.99	2644	0.461	0.406	0.266	0.526						
3	246	2.99	2612	0.467	0.412	0.267	0.529						
4	242	2.99	2600	0.469	0.414	0.267	0.530						
5	245	2.99	2674	0.457	0.403	0.264	0.524						
6	244	2.98	2627	0.465	0.410	0.266	0.528						
7	246	2.99	2648	0.462	0.408	0.265	0.527						
8	247	2.98	2670	0.460	0.407	0.264	0.526						
9	247	2.99	2671	0.460	0.406	0.264	0.526						
10	246	2.99	2639	0.461	0.405	0.266	0.526						
11	244	2.99	2621	0.463	0.406	0.267	0.526						
12	247	2.98	2653	0.461	0.406	0.265	0.526						
13	246	2.98	2650	0.461	0.407	0.265	0.526						
14	246	2.98	2638	0.463	0.408	0.266	0.527						
15	246	2.98	2633	0.464	0.410	0.266	0.528						
16	242	2.99	2589	0.468	0.410	0.268	0.528						
17	244	2.99	2633	0.462	0.405	0.266	0.526						
18	244	2.99	2609	0.466	0.410	0.267	0.528						
19	245	2.99	2619	0.465	0.409	0.267	0.528						
20	245	2.99	2620	0.465	0.409	0.267	0.527						
21	247	2.99	2646	0.463	0.409	0.265	0.527						
22	244	2.99	2601	0.465	0.407	0.268	0.527						
23	248	2.99	2640	0.462	0.407	0.266	0.526						
24	246	3.00	2637	0.463	0.407	0.266	0.526						
n	24	24	24	24	24	24	24						
Avg.	245	2.99	2635	0.463	0.408	0.266	0.527						
Med.	246	2.99	2637	0.463	0.407	0.266	0.527						
σ	1.4	0.004	23.3	0.0030	0.0027	0.0010	0.0014						
Min.	242	2.98	2589	0.457	0.401	0.264	0.523						
Max.	248	3.00	2674	0.469	0.414	0.268	0.530						

Data Set 9 : 120 °C, 700 mA

Actual Case Temperature [T _s]	121.5 °C
Actual Ambient Temperature [T _A]	117.8 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 9-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)											
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
1	100.0	98.5	98.0	97.1	96.7	96.1	95.9	95.4	95.0	94.8	94.6	94.3
2	100.0	98.9	97.9	97.0	96.8	95.8	95.7	95.4	94.8	94.8	94.4	94.2
3	100.0	99.4	97.6	96.7	96.4	95.5	95.5	95.0	94.4	94.4	94.1	93.8
4	100.0	98.7	98.0	97.0	96.6	96.1	95.9	95.5	95.0	94.8	94.7	94.5
5	100.0	98.9	97.8	96.9	96.8	95.9	95.7	95.5	94.8	95.1	94.6	94.4
6	100.0	98.7	97.8	96.9	96.6	96.0	96.0	95.4	94.9	95.0	94.6	94.3
7	100.0	98.9	98.1	97.1	96.9	96.3	96.0	95.7	95.1	95.1	94.8	94.6
8	100.0	98.7	97.8	96.9	96.6	95.8	95.8	95.4	94.7	94.8	94.4	94.3
9	100.0	99.0	98.3	97.4	97.1	96.5	96.7	95.9	95.3	95.5	95.0	94.8
10	100.0	98.9	98.0	97.0	96.8	96.2	95.8	95.5	94.8	94.9	94.6	94.4
11	100.0	98.6	98.1	97.2	96.9	96.2	96.1	95.8	95.2	95.1	94.7	94.5
12	100.0	98.9	98.1	97.2	97.0	96.3	96.4	95.7	95.1	95.3	94.8	94.6
13	100.0	98.6	97.7	96.8	96.4	95.8	95.5	95.0	94.6	94.4	94.2	94.1
14	100.0	99.0	98.0	96.8	96.6	95.9	95.8	95.4	94.9	94.9	94.5	94.3
15	100.0	98.9	97.9	97.0	96.7	96.0	95.9	95.4	94.9	94.9	94.6	94.4
16	100.0	98.9	98.1	97.1	96.7	96.2	96.1	95.6	95.1	94.9	94.8	94.6
17	100.0	98.6	98.1	97.0	96.9	96.0	95.8	95.5	94.9	95.1	94.6	94.4
18	100.0	99.0	98.2	97.2	97.0	96.2	96.1	95.7	95.1	95.1	94.8	94.6
19	100.0	98.8	98.0	97.0	96.7	96.1	95.9	95.6	94.9	94.9	94.7	94.5
20	100.0	98.6	97.8	96.9	96.7	95.9	95.8	95.3	94.9	95.0	94.5	94.3
21	100.0	98.6	97.7	96.6	96.5	95.9	96.0	95.5	94.9	95.0	94.6	94.4
22	100.0	98.5	97.7	96.5	96.4	95.6	95.3	95.0	94.5	94.4	94.3	94.1
23	100.0	98.7	97.8	96.9	96.5	95.9	95.6	95.4	94.6	94.8	94.4	94.2
24	100.0	98.7	97.8	96.9	96.6	96.0	96.1	95.5	94.9	95.1	94.6	94.5
n	24	24	24	24	24	24	24	24	24	24	24	24
Avg.	100.0	98.8	97.9	97.0	96.7	96.0	95.9	95.5	94.9	94.9	94.6	94.4
Med.	100.0	98.8	97.9	97.0	96.7	96.0	95.9	95.5	94.9	94.9	94.6	94.4
σ	0.00	0.21	0.18	0.20	0.19	0.22	0.28	0.22	0.21	0.26	0.21	0.21
Min.	100.0	98.5	97.6	96.5	96.4	95.5	95.3	95.0	94.4	94.4	94.1	93.8
Max.	100.0	99.4	98.3	97.4	97.1	96.5	96.7	95.9	95.3	95.5	95.0	94.8

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0419	-0.0463	-0.0525	-0.0522	-0.0556	-0.0578

Test duration used	5000 h	to	10000 h
B	0.9723		
α	3.0645E-06		
R ²	0.9312		
Calculated L ₇₀ (10K)	107000	hours	
Reported L ₇₀ (10K)	> 60000	hours	
Calculated L ₈₀ (10K)	63700	hours	
Reported L ₈₀ (10K)	> 60000	hours	
Calculated L ₉₀ (10K)	25200	hours	
Reported L ₉₀ (10K)	25200	hours	

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7)/\alpha$$

$$L_{80} = \ln(B/0.8)/\alpha$$

$$L_{90} = \ln(B/0.9)/\alpha$$

Data Set 9 : 120 °C, 700 mA

Actual Case Temperature [T _s]	121.5 °C
Actual Ambient Temperature [T _A]	117.8 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 9-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	100.0	99.1	99.1	99.0	99.1	98.9	99.0	99.1	99.0	99.0	99.1	99.0			
2	100.0	99.0	99.0	99.0	99.0	98.9	99.0	99.0	98.9	99.0	99.0	98.9			
3	100.0	99.0	99.0	98.9	98.9	98.8	99.0	99.0	98.9	99.0	99.0	98.9			
4	100.0	99.0	99.0	98.9	99.0	98.9	99.0	99.0	98.9	98.9	99.0	98.9			
5	100.0	99.1	99.0	99.0	99.1	99.0	99.1	99.1	99.0	99.0	99.1	99.0			
6	100.0	99.1	99.0	99.0	99.1	99.0	99.1	99.1	99.0	99.0	99.1	99.0			
7	100.0	99.0	99.0	99.0	99.1	99.0	99.0	99.1	99.0	99.1	99.1	99.0			
8	100.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	98.9	99.0	99.0	99.0			
9	100.0	99.0	99.0	98.9	99.0	99.0	99.0	99.0	98.9	99.0	99.0	99.0			
10	100.0	99.0	99.0	98.9	99.0	99.0	99.1	99.0	98.9	99.0	99.0	99.0			
11	100.0	99.0	99.0	98.9	99.0	99.0	99.0	99.0	98.9	99.0	99.0	99.0			
12	100.0	99.0	99.0	99.0	99.1	99.0	99.1	99.1	98.9	99.1	99.1	99.0			
13	100.0	99.0	99.0	99.0	99.1	99.0	99.1	99.1	98.9	99.1	99.1	99.0			
14	100.0	99.0	99.1	99.0	99.1	99.0	99.1	99.1	99.0	99.1	99.1	99.0			
15	100.0	99.0	99.0	99.0	99.1	99.0	99.1	99.1	99.0	99.1	99.1	99.0			
16	100.0	98.9	98.9	98.9	99.0	98.9	99.0	99.0	98.8	98.9	99.0	98.9			
17	100.0	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.8	98.9	98.9	98.9			
18	100.0	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.8	98.9	98.9	98.9			
19	100.0	98.9	98.9	98.9	99.0	98.9	99.0	99.0	98.8	99.0	99.0	98.9			
20	100.0	98.9	98.9	98.9	99.0	98.9	98.9	99.0	98.8	99.0	99.0	98.9			
21	100.0	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.8	98.9	98.9	98.9			
22	100.0	98.9	98.9	98.8	98.9	98.9	98.9	98.9	98.8	98.9	98.9	98.9			
23	100.0	98.8	98.9	98.8	98.9	98.8	98.9	98.9	98.8	98.9	98.9	98.8			
24	100.0	98.8	98.8	98.8	98.9	98.8	98.8	98.9	98.7	98.9	98.8	98.8			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	100.0	99.0	99.0	98.9	99.0	98.9	99.0	99.0	98.9	99.0	99.0	98.9			
Med.	100.0	99.0	99.0	98.9	99.0	98.9	99.0	99.0	98.9	99.0	99.0	99.0			
σ	0.00	0.07	0.07	0.07	0.06	0.07	0.07	0.07	0.08	0.07	0.07	0.07			
Min.	100.0	98.8	98.8	98.8	98.9	98.8	98.8	98.9	98.7	98.9	98.8	98.8			
Max.	100.0	99.1	99.1	99.0	99.1	99.0	99.1	99.1	99.0	99.1	99.1	99.0			

Data Set 9 : 120 °C, 700 mA

Actual Case Temperature [T _s]	121.5 °C
Actual Ambient Temperature [T _A]	117.8 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 9-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0012	0.0013	0.0013	0.0014	0.0014	0.0014	0.0014	0.0017	0.0016	0.0019	0.0018			
2	0.0000	0.0013	0.0013	0.0013	0.0014	0.0014	0.0015	0.0016	0.0018	0.0017	0.0020	0.0020			
3	0.0000	0.0016	0.0014	0.0014	0.0014	0.0014	0.0014	0.0015	0.0016	0.0016	0.0019	0.0019			
4	0.0000	0.0014	0.0015	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0017	0.0020	0.0018			
5	0.0000	0.0016	0.0015	0.0015	0.0017	0.0014	0.0016	0.0015	0.0016	0.0016	0.0018	0.0017			
6	0.0000	0.0012	0.0014	0.0016	0.0016	0.0019	0.0020	0.0021	0.0021	0.0022	0.0025	0.0024			
7	0.0000	0.0014	0.0014	0.0014	0.0016	0.0014	0.0015	0.0015	0.0016	0.0016	0.0018	0.0018			
8	0.0000	0.0015	0.0014	0.0013	0.0016	0.0014	0.0015	0.0015	0.0016	0.0016	0.0018	0.0017			
9	0.0000	0.0014	0.0013	0.0013	0.0015	0.0013	0.0013	0.0015	0.0015	0.0015	0.0018	0.0017			
10	0.0000	0.0014	0.0013	0.0013	0.0015	0.0015	0.0014	0.0015	0.0016	0.0016	0.0019	0.0018			
11	0.0000	0.0014	0.0015	0.0015	0.0017	0.0015	0.0016	0.0016	0.0016	0.0016	0.0019	0.0018			
12	0.0000	0.0016	0.0014	0.0014	0.0016	0.0014	0.0014	0.0016	0.0016	0.0016	0.0018	0.0017			
13	0.0000	0.0013	0.0013	0.0014	0.0015	0.0014	0.0014	0.0015	0.0016	0.0016	0.0019	0.0019			
14	0.0000	0.0014	0.0013	0.0014	0.0015	0.0014	0.0015	0.0014	0.0017	0.0016	0.0019	0.0018			
15	0.0000	0.0014	0.0014	0.0015	0.0016	0.0015	0.0015	0.0016	0.0017	0.0017	0.0020	0.0018			
16	0.0000	0.0015	0.0013	0.0013	0.0015	0.0013	0.0014	0.0014	0.0015	0.0015	0.0017	0.0016			
17	0.0000	0.0015	0.0015	0.0014	0.0017	0.0015	0.0016	0.0015	0.0015	0.0017	0.0018	0.0018			
18	0.0000	0.0016	0.0014	0.0014	0.0016	0.0014	0.0015	0.0015	0.0016	0.0015	0.0018	0.0017			
19	0.0000	0.0015	0.0013	0.0013	0.0015	0.0013	0.0015	0.0015	0.0015	0.0016	0.0017	0.0016			
20	0.0000	0.0015	0.0014	0.0013	0.0016	0.0013	0.0015	0.0014	0.0015	0.0015	0.0017	0.0016			
21	0.0000	0.0014	0.0013	0.0011	0.0014	0.0013	0.0013	0.0013	0.0014	0.0014	0.0016	0.0016			
22	0.0000	0.0014	0.0013	0.0013	0.0015	0.0013	0.0014	0.0014	0.0015	0.0015	0.0018	0.0017			
23	0.0000	0.0016	0.0014	0.0013	0.0016	0.0015	0.0015	0.0014	0.0016	0.0015	0.0017	0.0017			
24	0.0000	0.0013	0.0013	0.0014	0.0015	0.0014	0.0013	0.0015	0.0015	0.0015	0.0018	0.0017			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0014	0.0014	0.0014	0.0016	0.0014	0.0015	0.0015	0.0016	0.0016	0.0018	0.0018			
Med.	0.0000	0.0014	0.0014	0.0014	0.0015	0.0014	0.0015	0.0015	0.0016	0.0016	0.0018	0.0017			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002			
Min.	0.0000	0.0012	0.0013	0.0011	0.0014	0.0013	0.0013	0.0013	0.0014	0.0014	0.0016	0.0016			
Max.	0.0000	0.0016	0.0015	0.0016	0.0017	0.0019	0.0020	0.0021	0.0021	0.0022	0.0025	0.0024			

Data Set 9 : 120 °C, 700 mA

Actual Case Temperature [T _s]	121.5 °C
Actual Ambient Temperature [T _A]	117.8 °C
Drive Current [I _F]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 9-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2637	0.2625	0.2624	0.2625	0.2623	0.2625	0.2625	0.2626	0.2625	0.2625	0.2626	0.2626			
2	0.2643	0.2630	0.2630	0.2631	0.2629	0.2632	0.2631	0.2632	0.2632	0.2631	0.2633	0.2632			
3	0.2656	0.2640	0.2643	0.2644	0.2642	0.2645	0.2645	0.2646	0.2645	0.2645	0.2646	0.2645			
4	0.2655	0.2641	0.2641	0.2642	0.2640	0.2643	0.2642	0.2642	0.2643	0.2642	0.2643	0.2643			
5	0.2636	0.2621	0.2621	0.2621	0.2619	0.2623	0.2621	0.2622	0.2622	0.2622	0.2623	0.2622			
6	0.2650	0.2638	0.2639	0.2641	0.2640	0.2642	0.2642	0.2642	0.2641	0.2642	0.2642	0.2642			
7	0.2639	0.2625	0.2625	0.2625	0.2623	0.2626	0.2625	0.2625	0.2626	0.2625	0.2626	0.2625			
8	0.2630	0.2616	0.2616	0.2617	0.2614	0.2617	0.2616	0.2616	0.2617	0.2616	0.2618	0.2617			
9	0.2634	0.2621	0.2621	0.2621	0.2619	0.2622	0.2622	0.2621	0.2622	0.2622	0.2623	0.2622			
10	0.2647	0.2633	0.2634	0.2634	0.2632	0.2634	0.2634	0.2634	0.2635	0.2634	0.2636	0.2635			
11	0.2655	0.2641	0.2640	0.2640	0.2638	0.2641	0.2640	0.2640	0.2642	0.2641	0.2642	0.2641			
12	0.2641	0.2626	0.2627	0.2627	0.2625	0.2628	0.2628	0.2627	0.2628	0.2628	0.2629	0.2629			
13	0.2639	0.2626	0.2626	0.2626	0.2624	0.2627	0.2627	0.2627	0.2627	0.2627	0.2628	0.2628			
14	0.2644	0.2630	0.2631	0.2631	0.2629	0.2632	0.2631	0.2632	0.2632	0.2631	0.2632	0.2632			
15	0.2648	0.2634	0.2634	0.2634	0.2632	0.2635	0.2635	0.2635	0.2636	0.2635	0.2636	0.2636			
16	0.2665	0.2651	0.2652	0.2652	0.2650	0.2654	0.2652	0.2652	0.2653	0.2652	0.2654	0.2653			
17	0.2650	0.2636	0.2635	0.2636	0.2633	0.2636	0.2635	0.2636	0.2637	0.2635	0.2637	0.2636			
18	0.2660	0.2645	0.2646	0.2646	0.2644	0.2647	0.2646	0.2646	0.2647	0.2647	0.2648	0.2647			
19	0.2652	0.2638	0.2639	0.2639	0.2637	0.2640	0.2638	0.2638	0.2639	0.2638	0.2640	0.2639			
20	0.2652	0.2638	0.2638	0.2639	0.2636	0.2640	0.2638	0.2639	0.2639	0.2639	0.2640	0.2639			
21	0.2642	0.2629	0.2629	0.2631	0.2628	0.2631	0.2630	0.2630	0.2631	0.2631	0.2632	0.2631			
22	0.2662	0.2648	0.2649	0.2649	0.2647	0.2650	0.2649	0.2649	0.2650	0.2649	0.2650	0.2649			
23	0.2645	0.2630	0.2631	0.2632	0.2629	0.2632	0.2631	0.2632	0.2632	0.2632	0.2633	0.2632			
24	0.2648	0.2635	0.2635	0.2635	0.2633	0.2636	0.2636	0.2635	0.2636	0.2636	0.2636	0.2636			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2647	0.2633	0.2634	0.2634	0.2632	0.2635	0.2634	0.2634	0.2635	0.2634	0.2636	0.2635			
Med.	0.2648	0.2634	0.2634	0.2634	0.2632	0.2635	0.2635	0.2635	0.2636	0.2635	0.2636	0.2636			
σ	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009			
Min.	0.2630	0.2616	0.2616	0.2617	0.2614	0.2617	0.2616	0.2616	0.2617	0.2616	0.2618	0.2617			
Max.	0.2665	0.2651	0.2652	0.2652	0.2650	0.2654	0.2652	0.2652	0.2653	0.2652	0.2654	0.2653			

Data Set 9 : 120 °C, 700 mA

Actual Case Temperature [T _s]	121.5 °C
Actual Ambient Temperature [T _A]	117.8 °C
Drive Current [I _f]	700 mA
Measurement Current	700 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 9-6
Chromaticity

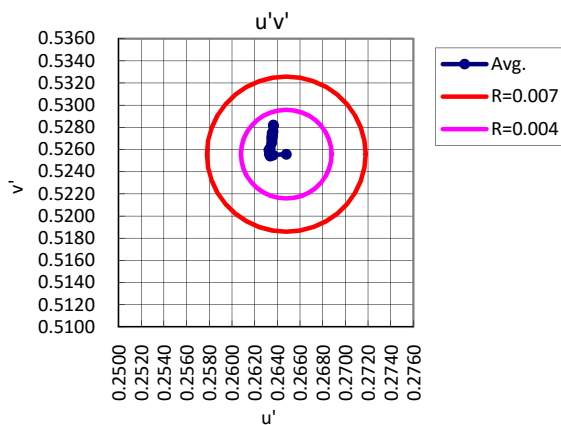
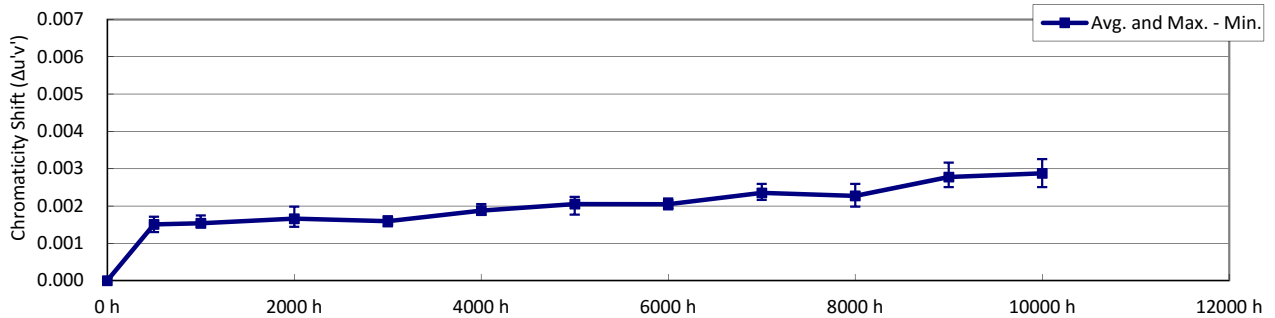
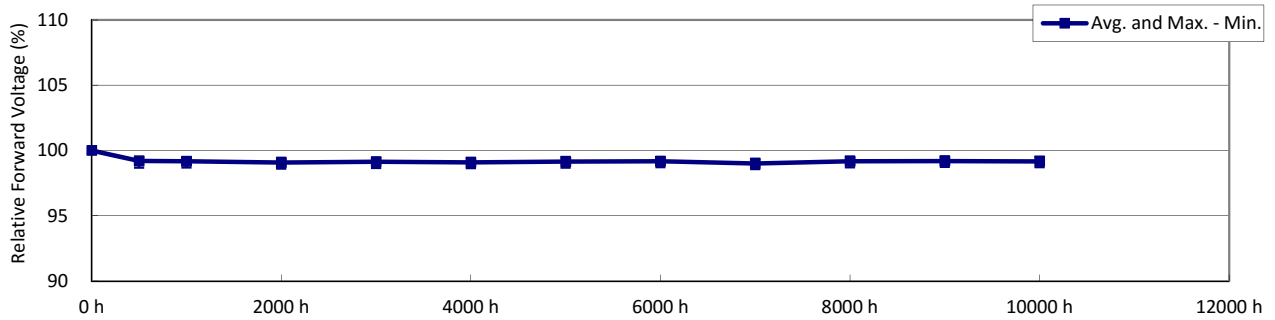
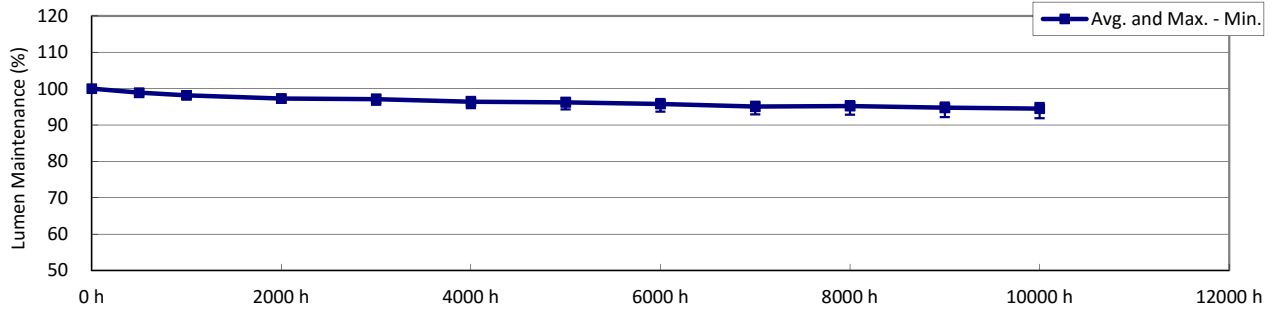
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5226	0.5224	0.5228	0.5230	0.5225	0.5233	0.5233	0.5235	0.5238	0.5236	0.5241	0.5240			
2	0.5244	0.5241	0.5247	0.5250	0.5245	0.5253	0.5253	0.5255	0.5258	0.5256	0.5261	0.5261			
3	0.5279	0.5276	0.5284	0.5286	0.5281	0.5288	0.5288	0.5289	0.5292	0.5291	0.5295	0.5294			
4	0.5288	0.5286	0.5292	0.5294	0.5290	0.5297	0.5297	0.5298	0.5300	0.5299	0.5304	0.5302			
5	0.5237	0.5232	0.5236	0.5239	0.5234	0.5242	0.5241	0.5242	0.5245	0.5244	0.5249	0.5247			
6	0.5266	0.5269	0.5275	0.5279	0.5279	0.5283	0.5284	0.5285	0.5285	0.5287	0.5290	0.5289			
7	0.5255	0.5252	0.5255	0.5257	0.5253	0.5261	0.5259	0.5261	0.5264	0.5263	0.5268	0.5266			
8	0.5249	0.5245	0.5249	0.5251	0.5247	0.5255	0.5254	0.5255	0.5258	0.5257	0.5263	0.5260			
9	0.5247	0.5243	0.5247	0.5249	0.5245	0.5253	0.5253	0.5254	0.5256	0.5256	0.5261	0.5259			
10	0.5243	0.5240	0.5244	0.5246	0.5242	0.5250	0.5249	0.5250	0.5253	0.5253	0.5258	0.5256			
11	0.5248	0.5245	0.5248	0.5250	0.5246	0.5254	0.5253	0.5254	0.5257	0.5256	0.5262	0.5259			
12	0.5247	0.5243	0.5247	0.5249	0.5245	0.5253	0.5253	0.5254	0.5257	0.5257	0.5261	0.5259			
13	0.5249	0.5246	0.5251	0.5254	0.5248	0.5257	0.5256	0.5258	0.5260	0.5259	0.5264	0.5264			
14	0.5255	0.5252	0.5257	0.5259	0.5254	0.5263	0.5262	0.5263	0.5267	0.5265	0.5270	0.5269			
15	0.5269	0.5267	0.5272	0.5274	0.5268	0.5277	0.5276	0.5278	0.5281	0.5280	0.5285	0.5283			
16	0.5273	0.5269	0.5274	0.5276	0.5271	0.5279	0.5278	0.5279	0.5282	0.5281	0.5286	0.5284			
17	0.5244	0.5240	0.5244	0.5246	0.5241	0.5249	0.5248	0.5249	0.5252	0.5251	0.5256	0.5255			
18	0.5270	0.5266	0.5270	0.5273	0.5268	0.5276	0.5275	0.5276	0.5279	0.5278	0.5283	0.5281			
19	0.5265	0.5261	0.5265	0.5267	0.5263	0.5271	0.5269	0.5271	0.5273	0.5273	0.5277	0.5275			
20	0.5263	0.5259	0.5263	0.5265	0.5261	0.5268	0.5267	0.5268	0.5270	0.5270	0.5275	0.5273			
21	0.5262	0.5258	0.5262	0.5265	0.5260	0.5268	0.5267	0.5268	0.5270	0.5270	0.5274	0.5273			
22	0.5255	0.5252	0.5256	0.5258	0.5254	0.5261	0.5260	0.5261	0.5264	0.5263	0.5268	0.5266			
23	0.5251	0.5247	0.5251	0.5254	0.5249	0.5258	0.5256	0.5257	0.5260	0.5259	0.5263	0.5262			
24	0.5254	0.5251	0.5255	0.5258	0.5252	0.5261	0.5260	0.5261	0.5263	0.5263	0.5267	0.5266			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5256	0.5253	0.5257	0.5260	0.5255	0.5263	0.5262	0.5263	0.5266	0.5265	0.5270	0.5268			
Med.	0.5255	0.5252	0.5255	0.5258	0.5253	0.5261	0.5260	0.5261	0.5264	0.5263	0.5268	0.5266			
σ	0.0014	0.0014	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015			
Min.	0.5226	0.5224	0.5228	0.5230	0.5225	0.5233	0.5233	0.5235	0.5238	0.5236	0.5241	0.5240			
Max.	0.5288	0.5286	0.5292	0.5294	0.5290	0.5297	0.5297	0.5298	0.5300	0.5299	0.5304	0.5302			

Data Set 10 : 120 °C, 1200 mA

Actual Case Temperature [T _S]	121.1 °C
Actual Ambient Temperature [T _A]	117.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_S and T_A were measured during initial setup.



Data Set 10 : 120 °C, 1200 mA

Actual Case Temperature [T _S]	121.1 °C
Actual Ambient Temperature [T _A]	117.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 10-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _V [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	384	3.12	2615	0.464	0.407	0.267	0.527						
2	387	3.11	2633	0.465	0.410	0.266	0.528						
3	377	3.10	2631	0.463	0.407	0.266	0.526						
4	388	3.11	2643	0.461	0.405	0.266	0.525						
5	392	3.11	2677	0.458	0.404	0.264	0.525						
6	395	3.11	2687	0.458	0.405	0.264	0.525						
7	393	3.11	2683	0.459	0.406	0.264	0.526						
8	394	3.11	2693	0.457	0.405	0.263	0.525						
9	393	3.11	2668	0.458	0.404	0.265	0.524						
10	394	3.11	2677	0.459	0.405	0.264	0.525						
11	387	3.11	2599	0.467	0.410	0.267	0.528						
12	390	3.12	2653	0.460	0.405	0.265	0.525						
13	386	3.09	2662	0.459	0.405	0.265	0.525						
14	389	3.09	2670	0.459	0.404	0.265	0.525						
15	393	3.10	2695	0.457	0.405	0.263	0.525						
16	389	3.09	2668	0.459	0.404	0.265	0.525						
17	390	3.09	2636	0.464	0.410	0.266	0.528						
18	394	3.09	2728	0.452	0.400	0.262	0.522						
19	392	3.09	2683	0.457	0.403	0.264	0.524						
20	393	3.10	2674	0.459	0.406	0.264	0.525						
21	383	3.14	2608	0.468	0.412	0.267	0.529						
22	381	3.14	2619	0.465	0.409	0.267	0.527						
23	387	3.14	2661	0.460	0.405	0.265	0.525						
24	389	3.14	2685	0.458	0.405	0.264	0.525						
n	24	24	24	24	24	24	24						
Avg.	389	3.11	2660	0.460	0.406	0.265	0.526						
Med.	390	3.11	2668	0.459	0.405	0.265	0.525						
σ	4.5	0.016	31.5	0.0037	0.0027	0.0013	0.0016						
Min.	377	3.09	2599	0.452	0.400	0.262	0.522						
Max.	395	3.14	2728	0.468	0.412	0.267	0.529						

Data Set 10 : 120 °C, 1200 mA

Actual Case Temperature [T _s]	121.1 °C
Actual Ambient Temperature [T _A]	117.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 10-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)													
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h		
1	100.0	98.3	97.7	96.9	96.8	96.1	95.6	95.4	94.8	94.7	94.5	94.1		
2	100.0	99.2	98.3	97.6	97.3	96.6	96.4	96.0	95.4	95.6	95.0	95.0		
3	100.0	99.1	98.6	98.1	97.9	97.1	97.2	96.5	95.8	96.1	95.5	95.2		
4	100.0	98.8	98.4	97.4	97.4	96.7	96.8	96.4	95.6	95.9	95.6	95.3		
5	100.0	99.1	98.2	97.6	97.4	96.7	96.7	96.4	95.7	95.7	95.3	95.0		
6	100.0	98.6	97.9	97.1	97.1	96.4	96.6	96.0	95.3	95.7	95.1	94.9		
7	100.0	98.9	98.2	97.4	97.2	96.6	96.4	96.0	95.2	95.6	95.2	95.1		
8	100.0	98.9	98.1	97.3	97.3	96.6	96.4	96.1	95.5	95.8	95.4	95.2		
9	100.0	99.6	98.9	97.9	97.9	97.2	97.3	96.6	95.9	96.1	95.7	95.5		
10	100.0	99.3	98.4	97.7	97.4	96.7	96.6	96.2	95.7	95.8	95.4	95.2		
11	100.0	99.1	98.4	97.3	97.5	96.8	96.4	96.2	95.3	95.5	95.3	95.0		
12	100.0	100.0	99.3	98.4	98.4	97.7	97.5	97.1	96.4	96.6	96.2	96.0		
13	100.0	99.6	99.2	98.4	98.3	97.5	97.3	96.8	96.2	96.2	95.9	95.7		
14	100.0	99.2	98.5	97.8	97.7	97.2	96.8	96.6	95.8	96.1	95.5	95.2		
15	100.0	99.3	98.7	97.9	98.0	97.3	97.3	96.9	96.1	96.3	95.8	95.7		
16	100.0	98.4	98.0	97.1	97.0	96.2	95.9	95.8	94.9	95.1	94.8	94.5		
17	100.0	99.3	98.2	97.5	97.2	96.7	96.6	96.1	95.5	95.6	95.1	94.8		
18	100.0	98.5	98.0	97.2	97.1	96.4	96.4	95.8	95.1	95.3	94.7	94.5		
19	100.0	98.3	97.7	96.9	96.5	96.0	95.7	95.3	94.6	94.6	94.0	93.9		
20	100.0	98.3	97.7	96.9	96.9	96.1	95.9	95.6	94.8	95.0	94.8	94.3		
21	100.0	98.3	97.3	96.1	95.6	94.7	94.5	93.8	93.0	92.9	92.4	92.1		
22	100.0	98.4	97.7	96.4	95.8	95.0	94.5	94.0	93.3	93.0	92.5	92.3		
23	100.0	98.4	97.4	96.2	95.7	94.8	94.3	93.8	93.0	93.1	92.4	92.0		
24	100.0	98.3	97.3	96.1	95.6	94.6	94.4	93.7	92.9	92.8	92.2	91.9		
n	24	24	24	24	24	24	24	24	24	24	24	24		
Avg.	100.0	98.9	98.2	97.3	97.1	96.4	96.2	95.8	95.1	95.2	94.8	94.5		
Med.	100.0	98.9	98.2	97.4	97.2	96.6	96.4	96.1	95.3	95.6	95.2	95.0		
σ	0.00	0.50	0.54	0.66	0.79	0.86	0.97	1.01	1.03	1.13	1.19	1.24		
Min.	100.0	98.3	97.3	96.1	95.6	94.6	94.3	93.7	92.9	92.8	92.2	91.9		
Max.	100.0	100.0	99.3	98.4	98.4	97.7	97.5	97.1	96.4	96.6	96.2	96.0		

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h								
ln(Avg.)	-0.0385	-0.0429	-0.0506	-0.0490	-0.0539	-0.0565								

Test duration used	5000 h	to	10000 h
B	0.9777		
α	3.4618E-06		
R ²	0.9182		
Calculated L ₇₀ (10K)	96500	hours	
Reported L ₇₀ (10K)	> 60000	hours	
Calculated L ₈₀ (10K)	57900	hours	
Reported L ₈₀ (10K)	57900	hours	
Calculated L ₉₀ (10K)	23900	hours	
Reported L ₉₀ (10K)	23900	hours	

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7)/\alpha$$

$$L_{80} = \ln(B/0.8)/\alpha$$

$$L_{90} = \ln(B/0.9)/\alpha$$

Data Set 10 : 120 °C, 1200 mA

Actual Case Temperature [T _s]	121.1 °C
Actual Ambient Temperature [T _A]	117.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 10-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	100.0	98.9	98.9	98.8	98.8	98.7	98.8	98.8	98.7	98.8	98.8	98.8			
2	100.0	99.3	99.3	99.2	99.2	99.2	99.3	99.3	99.1	99.3	99.3	99.3			
3	100.0	98.9	98.8	98.7	98.8	98.7	98.8	98.8	98.7	98.8	98.8	98.9			
4	100.0	99.3	99.3	99.2	99.3	99.3	99.3	99.3	99.2	99.3	99.4	99.3			
5	100.0	99.3	99.3	99.2	99.3	99.2	99.3	99.3	99.1	99.3	99.3	99.3			
6	100.0	99.3	99.2	99.2	99.2	99.2	99.2	99.2	99.1	99.2	99.2	99.2			
7	100.0	99.3	99.3	99.2	99.3	99.2	99.3	99.3	99.1	99.3	99.4	99.3			
8	100.0	99.4	99.4	99.3	99.3	99.3	99.3	99.3	99.2	99.4	99.4	99.3			
9	100.0	99.3	99.3	99.2	99.3	99.2	99.3	99.3	99.1	99.3	99.3	99.3			
10	100.0	99.3	99.3	99.2	99.3	99.2	99.3	99.3	99.1	99.3	99.4	99.3			
11	100.0	99.3	99.3	99.2	99.3	99.2	99.3	99.3	99.1	99.3	99.3	99.3			
12	100.0	99.2	99.1	99.0	99.1	99.1	99.1	99.2	98.9	99.1	99.2	99.1			
13	100.0	99.3	99.2	99.1	99.2	99.1	99.2	99.2	99.1	99.2	99.2	99.2			
14	100.0	99.3	99.3	99.2	99.2	99.2	99.2	99.3	99.1	99.3	99.3	99.3			
15	100.0	99.4	99.4	99.3	99.3	99.3	99.3	99.3	99.2	99.3	99.3	99.3			
16	100.0	99.3	99.3	99.2	99.2	99.2	99.2	99.2	99.1	99.2	99.3	99.2			
17	100.0	99.5	99.5	99.4	99.5	99.4	99.5	99.5	99.4	99.5	99.6	99.5			
18	100.0	99.3	99.3	99.1	99.2	99.1	99.2	99.2	99.1	99.2	99.3	99.2			
19	100.0	99.3	99.2	99.2	99.2	99.2	99.2	99.2	99.1	99.2	99.3	99.2			
20	100.0	99.4	99.4	99.3	99.3	99.3	99.3	99.3	99.2	99.3	99.4	99.3			
21	100.0	98.8	98.8	98.7	98.8	98.7	98.8	98.8	98.6	98.8	98.8	98.8			
22	100.0	98.7	98.7	98.7	98.7	98.7	98.7	98.8	98.6	98.8	98.8	98.8			
23	100.0	98.7	98.7	98.6	98.7	98.7	98.7	98.8	98.6	98.8	98.8	98.7			
24	100.0	98.7	98.7	98.6	98.7	98.6	98.7	98.7	98.6	98.7	98.7	98.7			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	100.0	99.2	99.2	99.1	99.1	99.1	99.2	99.2	99.0	99.2	99.2	99.2			
Med.	100.0	99.3	99.3	99.2	99.2	99.2	99.2	99.3	99.1	99.3	99.3	99.3			
σ	0.00	0.25	0.24	0.24	0.25	0.23	0.24	0.24	0.23	0.23	0.24	0.23			
Min.	100.0	98.7	98.7	98.6	98.7	98.6	98.7	98.7	98.6	98.7	98.7	98.7			
Max.	100.0	99.5	99.5	99.4	99.5	99.4	99.5	99.5	99.4	99.5	99.6	99.5			

Data Set 10 : 120 °C, 1200 mA

Actual Case Temperature [T _s]	121.1 °C
Actual Ambient Temperature [T _A]	117.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 10-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0015	0.0017	0.0018	0.0017	0.0020	0.0022	0.0021	0.0025	0.0024	0.0029	0.0030			
2	0.0000	0.0015	0.0015	0.0018	0.0016	0.0019	0.0022	0.0021	0.0025	0.0023	0.0029	0.0029			
3	0.0000	0.0016	0.0017	0.0020	0.0017	0.0021	0.0022	0.0022	0.0025	0.0023	0.0028	0.0029			
4	0.0000	0.0015	0.0015	0.0016	0.0016	0.0018	0.0018	0.0020	0.0022	0.0022	0.0027	0.0028			
5	0.0000	0.0015	0.0016	0.0017	0.0015	0.0018	0.0018	0.0020	0.0023	0.0022	0.0028	0.0030			
6	0.0000	0.0014	0.0015	0.0016	0.0015	0.0018	0.0018	0.0021	0.0024	0.0023	0.0028	0.0029			
7	0.0000	0.0015	0.0015	0.0016	0.0016	0.0018	0.0020	0.0021	0.0023	0.0023	0.0027	0.0028			
8	0.0000	0.0014	0.0015	0.0016	0.0015	0.0018	0.0020	0.0019	0.0022	0.0022	0.0026	0.0028			
9	0.0000	0.0015	0.0015	0.0014	0.0015	0.0018	0.0020	0.0020	0.0023	0.0023	0.0028	0.0030			
10	0.0000	0.0016	0.0015	0.0016	0.0015	0.0018	0.0019	0.0019	0.0022	0.0022	0.0027	0.0028			
11	0.0000	0.0016	0.0016	0.0016	0.0017	0.0019	0.0021	0.0021	0.0023	0.0022	0.0028	0.0029			
12	0.0000	0.0017	0.0016	0.0017	0.0017	0.0018	0.0021	0.0020	0.0022	0.0022	0.0027	0.0028			
13	0.0000	0.0016	0.0017	0.0018	0.0017	0.0020	0.0022	0.0022	0.0024	0.0023	0.0028	0.0030			
14	0.0000	0.0015	0.0015	0.0017	0.0016	0.0020	0.0022	0.0021	0.0025	0.0024	0.0029	0.0030			
15	0.0000	0.0015	0.0016	0.0016	0.0016	0.0018	0.0021	0.0021	0.0023	0.0023	0.0028	0.0030			
16	0.0000	0.0015	0.0015	0.0016	0.0016	0.0019	0.0021	0.0021	0.0023	0.0023	0.0029	0.0029			
17	0.0000	0.0014	0.0015	0.0016	0.0016	0.0018	0.0021	0.0020	0.0023	0.0022	0.0027	0.0028			
18	0.0000	0.0015	0.0016	0.0017	0.0016	0.0020	0.0022	0.0021	0.0026	0.0025	0.0030	0.0031			
19	0.0000	0.0014	0.0014	0.0016	0.0015	0.0019	0.0022	0.0022	0.0025	0.0026	0.0032	0.0033			
20	0.0000	0.0013	0.0014	0.0016	0.0015	0.0018	0.0020	0.0020	0.0024	0.0024	0.0029	0.0030			
21	0.0000	0.0016	0.0015	0.0016	0.0016	0.0018	0.0019	0.0019	0.0022	0.0021	0.0025	0.0025			
22	0.0000	0.0016	0.0016	0.0017	0.0017	0.0018	0.0019	0.0019	0.0022	0.0020	0.0025	0.0025			
23	0.0000	0.0015	0.0015	0.0016	0.0015	0.0019	0.0020	0.0020	0.0023	0.0021	0.0027	0.0027			
24	0.0000	0.0015	0.0015	0.0016	0.0015	0.0018	0.0020	0.0020	0.0024	0.0021	0.0027	0.0028			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0015	0.0015	0.0017	0.0016	0.0019	0.0021	0.0020	0.0024	0.0023	0.0028	0.0029			
Med.	0.0000	0.0015	0.0015	0.0016	0.0016	0.0018	0.0020	0.0020	0.0023	0.0023	0.0028	0.0029			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002			
Min.	0.0000	0.0013	0.0014	0.0014	0.0015	0.0018	0.0018	0.0019	0.0022	0.0020	0.0025	0.0025			
Max.	0.0000	0.0017	0.0017	0.0020	0.0017	0.0021	0.0022	0.0022	0.0026	0.0026	0.0032	0.0033			

Data Set 10 : 120 °C, 1200 mA

Actual Case Temperature [T _s]	121.1 °C
Actual Ambient Temperature [T _A]	117.7 °C
Drive Current [I _F]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 10-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2653	0.2638	0.2638	0.2639	0.2637	0.2640	0.2641	0.2640	0.2641	0.2640	0.2641	0.2641			
2	0.2639	0.2625	0.2626	0.2628	0.2625	0.2628	0.2629	0.2629	0.2629	0.2629	0.2629	0.2630			
3	0.2648	0.2632	0.2632	0.2633	0.2632	0.2634	0.2636	0.2634	0.2636	0.2635	0.2636	0.2636			
4	0.2641	0.2626	0.2627	0.2628	0.2625	0.2628	0.2627	0.2627	0.2628	0.2627	0.2628	0.2628			
5	0.2628	0.2613	0.2614	0.2615	0.2613	0.2615	0.2615	0.2615	0.2616	0.2615	0.2616	0.2616			
6	0.2624	0.2610	0.2611	0.2613	0.2610	0.2612	0.2613	0.2612	0.2613	0.2613	0.2614	0.2614			
7	0.2623	0.2608	0.2609	0.2610	0.2608	0.2610	0.2611	0.2610	0.2611	0.2610	0.2612	0.2612			
8	0.2619	0.2605	0.2605	0.2606	0.2604	0.2606	0.2607	0.2607	0.2608	0.2607	0.2608	0.2608			
9	0.2636	0.2621	0.2622	0.2624	0.2622	0.2624	0.2626	0.2624	0.2625	0.2624	0.2626	0.2625			
10	0.2628	0.2612	0.2614	0.2615	0.2613	0.2615	0.2616	0.2615	0.2616	0.2615	0.2616	0.2616			
11	0.2657	0.2641	0.2642	0.2644	0.2641	0.2643	0.2644	0.2644	0.2645	0.2644	0.2645	0.2645			
12	0.2642	0.2625	0.2626	0.2627	0.2625	0.2628	0.2628	0.2628	0.2629	0.2628	0.2630	0.2630			
13	0.2636	0.2620	0.2620	0.2621	0.2619	0.2621	0.2621	0.2621	0.2622	0.2621	0.2623	0.2622			
14	0.2632	0.2617	0.2618	0.2618	0.2616	0.2618	0.2618	0.2618	0.2619	0.2618	0.2619	0.2620			
15	0.2624	0.2609	0.2609	0.2611	0.2608	0.2611	0.2611	0.2610	0.2612	0.2611	0.2612	0.2612			
16	0.2634	0.2619	0.2620	0.2621	0.2618	0.2621	0.2621	0.2621	0.2622	0.2621	0.2622	0.2623			
17	0.2642	0.2628	0.2629	0.2630	0.2627	0.2630	0.2630	0.2630	0.2631	0.2630	0.2631	0.2631			
18	0.2613	0.2598	0.2598	0.2599	0.2597	0.2600	0.2601	0.2600	0.2601	0.2600	0.2601	0.2601			
19	0.2628	0.2614	0.2615	0.2616	0.2614	0.2616	0.2616	0.2616	0.2617	0.2616	0.2618	0.2618			
20	0.2627	0.2614	0.2614	0.2615	0.2613	0.2615	0.2616	0.2616	0.2617	0.2616	0.2617	0.2617			
21	0.2654	0.2638	0.2640	0.2641	0.2639	0.2642	0.2643	0.2642	0.2643	0.2642	0.2643	0.2643			
22	0.2649	0.2633	0.2634	0.2635	0.2632	0.2635	0.2636	0.2635	0.2637	0.2636	0.2637	0.2637			
23	0.2634	0.2619	0.2620	0.2621	0.2619	0.2621	0.2622	0.2621	0.2623	0.2621	0.2623	0.2623			
24	0.2626	0.2611	0.2612	0.2613	0.2611	0.2614	0.2615	0.2614	0.2615	0.2615	0.2616	0.2615			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2635	0.2620	0.2621	0.2622	0.2620	0.2622	0.2623	0.2622	0.2623	0.2622	0.2623	0.2623			
Med.	0.2634	0.2619	0.2620	0.2621	0.2619	0.2621	0.2621	0.2621	0.2622	0.2621	0.2623	0.2623			
σ	0.0012	0.0011	0.0011	0.0011	0.0011	0.0011	0.0012	0.0012	0.0012	0.0012	0.0011	0.0011			
Min.	0.2613	0.2598	0.2598	0.2599	0.2597	0.2600	0.2601	0.2600	0.2601	0.2600	0.2601	0.2601			
Max.	0.2657	0.2641	0.2642	0.2644	0.2641	0.2643	0.2644	0.2644	0.2645	0.2644	0.2645	0.2645			

Data Set 10 : 120 °C, 1200 mA

Actual Case Temperature [T _s]	121.1 °C
Actual Ambient Temperature [T _A]	117.7 °C
Drive Current [I _f]	1200 mA
Measurement Current	1200 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 10-6
Chromaticity

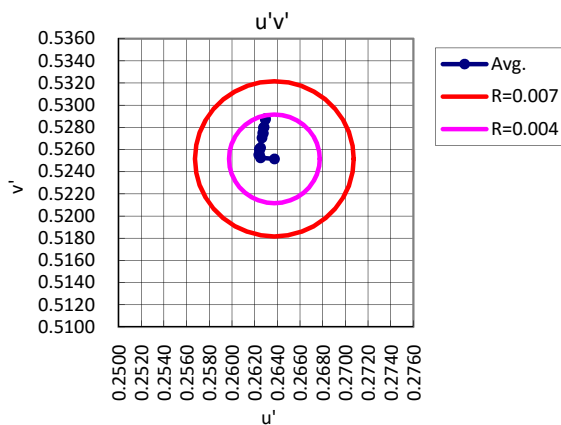
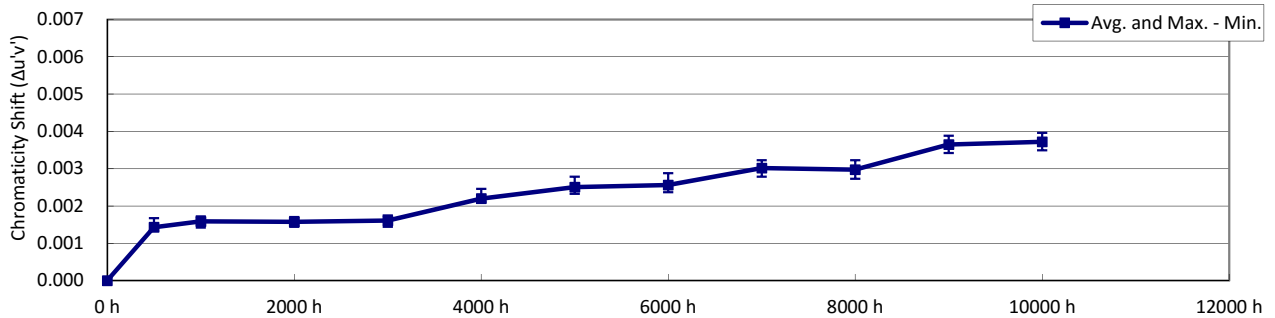
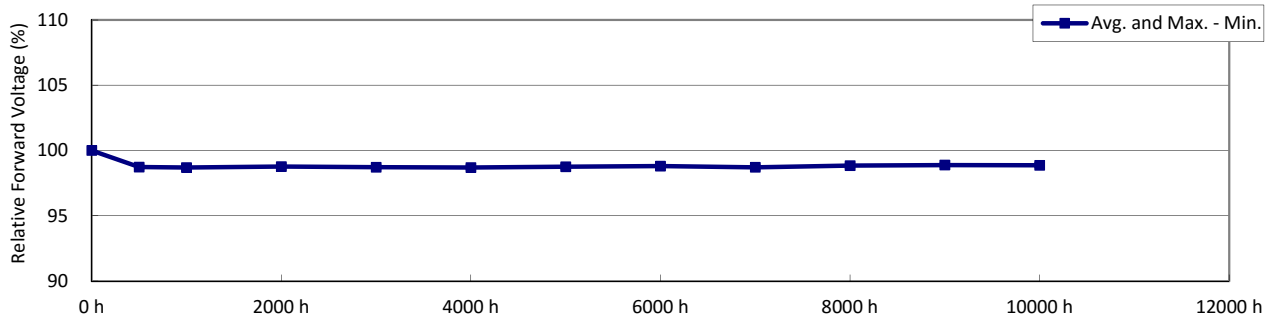
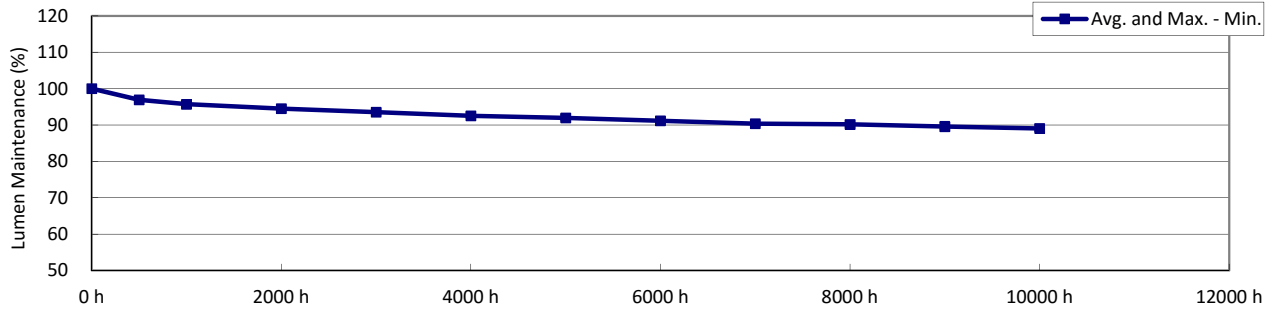
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5252	0.5254	0.5259	0.5264	0.5257	0.5267	0.5271	0.5269	0.5274	0.5272	0.5278	0.5279			
2	0.5266	0.5270	0.5274	0.5280	0.5273	0.5282	0.5286	0.5285	0.5289	0.5287	0.5293	0.5294			
3	0.5251	0.5253	0.5258	0.5264	0.5256	0.5266	0.5270	0.5268	0.5273	0.5270	0.5276	0.5277			
4	0.5240	0.5240	0.5246	0.5250	0.5243	0.5252	0.5251	0.5254	0.5258	0.5257	0.5264	0.5265			
5	0.5232	0.5233	0.5239	0.5243	0.5235	0.5245	0.5244	0.5247	0.5252	0.5250	0.5257	0.5259			
6	0.5239	0.5240	0.5247	0.5250	0.5244	0.5253	0.5253	0.5256	0.5260	0.5259	0.5265	0.5266			
7	0.5242	0.5242	0.5247	0.5251	0.5246	0.5255	0.5258	0.5258	0.5262	0.5261	0.5267	0.5268			
8	0.5237	0.5236	0.5241	0.5246	0.5240	0.5249	0.5253	0.5252	0.5256	0.5255	0.5261	0.5263			
9	0.5234	0.5233	0.5238	0.5242	0.5238	0.5247	0.5251	0.5250	0.5254	0.5254	0.5260	0.5262			
10	0.5239	0.5238	0.5243	0.5248	0.5241	0.5251	0.5254	0.5253	0.5258	0.5257	0.5263	0.5264			
11	0.5270	0.5271	0.5276	0.5280	0.5275	0.5283	0.5287	0.5286	0.5290	0.5288	0.5295	0.5296			
12	0.5243	0.5241	0.5247	0.5251	0.5245	0.5255	0.5258	0.5257	0.5261	0.5260	0.5267	0.5268			
13	0.5239	0.5238	0.5244	0.5249	0.5242	0.5252	0.5255	0.5255	0.5259	0.5257	0.5264	0.5265			
14	0.5236	0.5236	0.5241	0.5246	0.5239	0.5250	0.5253	0.5252	0.5257	0.5255	0.5262	0.5263			
15	0.5241	0.5240	0.5245	0.5250	0.5244	0.5254	0.5258	0.5257	0.5261	0.5260	0.5266	0.5268			
16	0.5235	0.5234	0.5240	0.5245	0.5239	0.5249	0.5252	0.5251	0.5255	0.5254	0.5261	0.5262			
17	0.5265	0.5266	0.5272	0.5276	0.5270	0.5279	0.5282	0.5281	0.5285	0.5284	0.5290	0.5291			
18	0.5209	0.5208	0.5214	0.5219	0.5213	0.5224	0.5228	0.5226	0.5232	0.5230	0.5236	0.5238			
19	0.5227	0.5227	0.5233	0.5237	0.5232	0.5242	0.5246	0.5245	0.5250	0.5250	0.5257	0.5258			
20	0.5242	0.5242	0.5248	0.5253	0.5247	0.5256	0.5259	0.5259	0.5264	0.5263	0.5269	0.5270			
21	0.5282	0.5282	0.5288	0.5291	0.5287	0.5295	0.5298	0.5297	0.5301	0.5299	0.5305	0.5305			
22	0.5261	0.5261	0.5266	0.5270	0.5263	0.5273	0.5275	0.5274	0.5279	0.5276	0.5283	0.5283			
23	0.5240	0.5240	0.5246	0.5250	0.5243	0.5254	0.5256	0.5255	0.5260	0.5257	0.5265	0.5265			
24	0.5237	0.5237	0.5242	0.5247	0.5240	0.5251	0.5254	0.5253	0.5258	0.5255	0.5262	0.5263			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5244	0.5244	0.5250	0.5254	0.5248	0.5258	0.5261	0.5260	0.5265	0.5263	0.5269	0.5271			
Med.	0.5240	0.5240	0.5246	0.5250	0.5244	0.5254	0.5256	0.5256	0.5260	0.5258	0.5265	0.5266			
σ	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0015	0.0015	0.0015	0.0015			
Min.	0.5209	0.5208	0.5214	0.5219	0.5213	0.5224	0.5228	0.5226	0.5232	0.5230	0.5236	0.5238			
Max.	0.5282	0.5282	0.5288	0.5291	0.5287	0.5295	0.5298	0.5297	0.5301	0.5299	0.5305	0.5305			

Data Set 11 : 120 °C, 1500 mA

Actual Case Temperature [T_S]	120.5 °C
Actual Ambient Temperature [T_A]	117.5 °C
Drive Current [I_F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_S and T_A were measured during initial setup.



Data Set 11 : 120 °C, 1500 mA

Actual Case Temperature [T _s]	120.5 °C
Actual Ambient Temperature [T _A]	117.5 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 11-1
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ _v [lm]	V _F [V]	T _{CP} [K]	x	y	u'	v'						
1	465	3.22	2694	0.457	0.404	0.263	0.524						
2	471	3.22	2723	0.455	0.405	0.262	0.524						
3	469	3.22	2683	0.457	0.404	0.264	0.524						
4	469	3.22	2702	0.455	0.403	0.263	0.524						
5	475	3.22	2749	0.452	0.403	0.261	0.523						
6	466	3.22	2686	0.458	0.405	0.264	0.525						
7	461	3.23	2630	0.464	0.409	0.266	0.528						
8	459	3.22	2617	0.467	0.412	0.266	0.529						
9	460	3.22	2666	0.460	0.407	0.264	0.526						
10	461	3.22	2641	0.461	0.406	0.266	0.526						
11	469	3.22	2724	0.453	0.402	0.262	0.523						
12	471	3.22	2713	0.455	0.404	0.263	0.524						
13	472	3.22	2702	0.456	0.404	0.263	0.524						
14	468	3.22	2700	0.456	0.404	0.263	0.524						
15	467	3.22	2698	0.456	0.404	0.263	0.524						
16	467	3.22	2666	0.460	0.406	0.265	0.526						
17	469	3.22	2686	0.461	0.410	0.263	0.527						
18	460	3.22	2629	0.462	0.406	0.266	0.526						
19	464	3.21	2634	0.463	0.408	0.266	0.527						
20	468	3.21	2686	0.458	0.406	0.264	0.525						
21	470	3.21	2693	0.458	0.407	0.263	0.526						
22	468	3.21	2673	0.459	0.406	0.264	0.526						
23	472	3.21	2708	0.456	0.405	0.263	0.525						
24	470	3.21	2696	0.457	0.404	0.263	0.524						
n	24	24	24	24	24	24	24						
Avg.	467	3.22	2683	0.458	0.406	0.264	0.525						
Med.	468	3.22	2690	0.458	0.405	0.263	0.525						
σ	4.3	0.005	33.5	0.0035	0.0024	0.0014	0.0014						
Min.	459	3.21	2617	0.452	0.402	0.261	0.523						
Max.	475	3.23	2749	0.467	0.412	0.266	0.529						

Data Set 11 : 120 °C, 1500 mA

Actual Case Temperature [T _s]	120.5 °C
Actual Ambient Temperature [T _A]	117.5 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 11-2
Lumen Maintenance

LED No.	Lumen Maintenance % (Normalized to 100 % at 0 hours)													
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h		
1	100.0	96.9	95.7	94.4	93.4	92.5	91.8	91.1	90.3	89.9	89.4	88.8		
2	100.0	97.1	95.7	94.6	93.5	92.4	91.6	91.0	90.3	90.0	89.3	88.9		
3	100.0	96.9	95.6	94.6	93.7	92.6	92.1	91.4	90.6	90.4	89.8	89.2		
4	100.0	97.4	96.3	95.1	94.0	93.0	92.2	91.5	90.6	90.4	89.9	89.5		
5	100.0	96.6	95.3	94.1	93.0	92.0	91.5	90.8	90.0	89.9	88.9	88.5		
6	100.0	97.1	95.9	94.3	93.6	92.6	92.1	91.1	90.4	90.2	89.8	89.0		
7	100.0	96.7	95.5	94.4	93.2	92.4	91.5	90.9	90.2	89.9	89.3	88.8		
8	100.0	97.2	95.8	94.7	93.9	92.6	92.1	91.5	90.7	90.5	89.8	89.5		
9	100.0	97.5	96.4	95.3	94.3	93.4	92.8	92.1	91.2	91.1	90.8	90.0		
10	100.0	96.8	95.8	94.7	93.8	92.8	92.2	91.5	90.7	90.5	90.0	89.5		
11	100.0	96.9	95.5	94.4	93.4	92.5	91.9	91.0	90.3	90.2	89.5	89.1		
12	100.0	96.9	95.7	94.5	93.5	92.5	92.1	91.2	90.4	90.4	89.8	89.1		
13	100.0	96.4	95.4	94.2	93.3	92.3	91.5	90.9	90.1	89.7	89.2	88.8		
14	100.0	97.1	95.9	94.8	93.7	92.8	92.4	91.5	90.7	90.6	89.9	89.4		
15	100.0	96.7	95.7	94.6	93.7	92.7	92.4	91.3	90.5	90.4	89.9	89.2		
16	100.0	97.0	95.8	94.6	93.6	92.4	91.7	91.0	90.2	89.8	89.3	88.8		
17	100.0	96.8	95.4	94.2	93.1	92.2	91.6	90.6	89.8	89.4	88.9	88.4		
18	100.0	96.9	95.7	94.6	93.7	92.7	92.2	91.4	90.6	90.4	89.7	89.2		
19	100.0	96.9	95.8	94.7	93.6	92.6	92.0	91.3	90.5	90.3	89.7	89.2		
20	100.0	97.0	95.6	94.5	93.6	92.6	92.0	91.2	90.3	90.2	89.5	89.0		
21	100.0	97.0	95.7	94.5	93.7	92.6	92.0	91.3	90.5	90.4	89.7	89.2		
22	100.0	96.5	95.5	94.2	93.1	92.1	91.3	90.6	89.8	89.5	88.9	88.4		
23	100.0	97.0	95.6	94.3	93.3	92.1	91.7	90.9	90.1	89.8	89.2	88.7		
24	100.0	96.9	95.7	94.6	93.5	92.5	92.0	91.1	90.4	90.1	89.5	88.9		
n	24	24	24	24	24	24	24	24	24	24	24	24		
Avg.	100.0	96.9	95.7	94.5	93.6	92.5	91.9	91.2	90.4	90.2	89.6	89.1		
Med.	100.0	96.9	95.7	94.5	93.6	92.5	92.0	91.2	90.4	90.2	89.6	89.1		
σ	0.00	0.25	0.26	0.28	0.30	0.30	0.35	0.33	0.33	0.39	0.43	0.38		
Min.	100.0	96.4	95.3	94.1	93.0	92.0	91.3	90.6	89.8	89.4	88.9	88.4		
Max.	100.0	97.5	96.4	95.3	94.3	93.4	92.8	92.1	91.2	91.1	90.8	90.0		

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h								
ln(Avg.)	-0.0840	-0.0924	-0.1011	-0.1035	-0.1102	-0.1159								

Test duration used	5000 h	to	10000 h
B	0.9464		
α	6.1468E-06		
R ²	0.9799		
Calculated L ₇₀ (10K)	49100	hours	
Reported L ₇₀ (10K)	49100	hours	
Calculated L ₈₀ (10K)	27300	hours	
Reported L ₈₀ (10K)	27300	hours	
Calculated L ₉₀ (10K)	8180	hours	
Reported L ₉₀ (10K)	8180	hours	

Curve-fit equation:

$$\Phi(t) = B \exp(-\alpha t)$$

Lumen maintenance life equation:

$$L_{70} = \ln(B/0.7)/\alpha$$

$$L_{80} = \ln(B/0.8)/\alpha$$

$$L_{90} = \ln(B/0.9)/\alpha$$

Data Set 11 : 120 °C, 1500 mA

Actual Case Temperature [T _s]	120.5 °C
Actual Ambient Temperature [T _A]	117.5 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 11-3
Forward Voltage

LED No.	Relative Forward Voltage % (Normalized to 100 % at 0 hours)														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	100.0	98.6	98.6	98.7	98.6	98.6	98.7	98.7	98.7	98.8	98.8	98.8			
2	100.0	98.6	98.6	98.7	98.6	98.6	98.7	98.7	98.6	98.8	98.8	98.8			
3	100.0	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.7	98.8	98.7			
4	100.0	98.7	98.6	98.7	98.6	98.6	98.7	98.7	98.6	98.8	98.8	98.8			
5	100.0	98.6	98.6	98.7	98.7	98.6	98.7	98.7	98.6	98.8	98.8	98.8			
6	100.0	98.6	98.6	98.6	98.6	98.6	98.7	98.7	98.6	98.7	98.8	98.7			
7	100.0	98.6	98.6	98.6	98.6	98.6	98.6	98.7	98.6	98.7	98.8	98.7			
8	100.0	98.8	98.7	98.8	98.8	98.7	98.8	98.8	98.7	98.9	99.0	98.9			
9	100.0	98.8	98.7	98.8	98.7	98.7	98.8	98.8	98.7	98.9	98.9	98.9			
10	100.0	98.8	98.7	98.8	98.7	98.7	98.8	98.8	98.7	98.9	98.9	98.9			
11	100.0	98.7	98.7	98.7	98.7	98.7	98.7	98.8	98.7	98.8	98.9	98.9			
12	100.0	98.7	98.6	98.7	98.6	98.6	98.7	98.7	98.6	98.8	98.8	98.8			
13	100.0	98.7	98.6	98.7	98.6	98.7	98.7	98.7	98.7	98.8	98.8	98.8			
14	100.0	98.7	98.7	98.8	98.7	98.7	98.7	98.8	98.7	98.8	98.8	98.8			
15	100.0	98.6	98.6	98.6	98.6	98.6	98.6	98.7	98.6	98.7	98.7	98.7			
16	100.0	98.7	98.7	98.7	98.7	98.7	98.7	98.8	98.7	98.8	98.8	98.8			
17	100.0	98.8	98.7	98.8	98.8	98.7	98.8	98.9	98.8	98.9	98.9	98.9			
18	100.0	98.8	98.8	98.9	98.8	98.8	98.8	98.9	98.8	98.9	99.0	99.0			
19	100.0	98.9	98.9	98.9	98.9	98.8	98.9	99.0	98.9	99.0	99.0	99.0			
20	100.0	98.9	98.8	98.9	98.8	98.8	98.9	99.0	98.9	99.0	99.0	99.0			
21	100.0	98.9	98.8	98.9	98.9	98.8	98.9	98.9	98.8	98.9	99.0	99.0			
22	100.0	98.9	98.9	98.9	98.9	98.9	98.9	99.0	98.9	99.0	99.0	99.0			
23	100.0	98.9	98.9	98.9	98.9	98.9	98.9	99.0	98.9	99.0	99.0	99.0			
24	100.0	98.9	98.9	98.9	98.9	98.9	98.9	99.0	98.9	99.0	99.0	99.0			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	100.0	98.7	98.7	98.8	98.7	98.7	98.8	98.8	98.7	98.8	98.9	98.9			
Med.	100.0	98.7	98.7	98.8	98.7	98.7	98.7	98.8	98.7	98.8	98.9	98.8			
σ	0.00	0.11	0.10	0.10	0.11	0.10	0.10	0.11	0.11	0.10	0.10	0.11			
Min.	100.0	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.7	98.6	98.7	98.7			
Max.	100.0	98.9	98.9	98.9	98.9	98.9	98.9	99.0	98.9	99.0	99.0	99.0			

Data Set 11 : 120 °C, 1500 mA

Actual Case Temperature [T _s]	120.5 °C
Actual Ambient Temperature [T _A]	117.5 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 11-4
Chromaticity Shift

LED No.	Chromaticity Shift Δu'v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.0000	0.0015	0.0016	0.0016	0.0016	0.0022	0.0025	0.0026	0.0031	0.0030	0.0036	0.0037			
2	0.0000	0.0014	0.0017	0.0016	0.0017	0.0025	0.0028	0.0029	0.0032	0.0032	0.0039	0.0040			
3	0.0000	0.0015	0.0016	0.0016	0.0016	0.0022	0.0026	0.0025	0.0030	0.0030	0.0036	0.0037			
4	0.0000	0.0014	0.0017	0.0017	0.0017	0.0022	0.0025	0.0026	0.0030	0.0030	0.0037	0.0038			
5	0.0000	0.0013	0.0016	0.0015	0.0015	0.0022	0.0026	0.0026	0.0032	0.0031	0.0038	0.0039			
6	0.0000	0.0015	0.0016	0.0015	0.0016	0.0022	0.0026	0.0026	0.0030	0.0031	0.0038	0.0038			
7	0.0000	0.0017	0.0017	0.0017	0.0017	0.0022	0.0025	0.0025	0.0029	0.0028	0.0034	0.0035			
8	0.0000	0.0015	0.0017	0.0017	0.0017	0.0022	0.0025	0.0025	0.0029	0.0029	0.0035	0.0035			
9	0.0000	0.0015	0.0016	0.0016	0.0016	0.0021	0.0023	0.0024	0.0028	0.0027	0.0035	0.0035			
10	0.0000	0.0015	0.0017	0.0017	0.0017	0.0022	0.0025	0.0025	0.0030	0.0030	0.0036	0.0037			
11	0.0000	0.0014	0.0015	0.0015	0.0015	0.0021	0.0025	0.0025	0.0030	0.0030	0.0036	0.0038			
12	0.0000	0.0014	0.0016	0.0016	0.0016	0.0022	0.0026	0.0026	0.0030	0.0030	0.0038	0.0038			
13	0.0000	0.0014	0.0015	0.0015	0.0015	0.0021	0.0024	0.0025	0.0030	0.0029	0.0036	0.0037			
14	0.0000	0.0013	0.0016	0.0015	0.0015	0.0022	0.0024	0.0025	0.0030	0.0029	0.0036	0.0037			
15	0.0000	0.0014	0.0016	0.0014	0.0014	0.0021	0.0025	0.0026	0.0031	0.0030	0.0037	0.0038			
16	0.0000	0.0014	0.0016	0.0016	0.0017	0.0024	0.0027	0.0028	0.0032	0.0032	0.0039	0.0040			
17	0.0000	0.0014	0.0016	0.0016	0.0017	0.0022	0.0026	0.0027	0.0031	0.0031	0.0038	0.0039			
18	0.0000	0.0014	0.0016	0.0016	0.0016	0.0021	0.0025	0.0025	0.0028	0.0028	0.0035	0.0036			
19	0.0000	0.0014	0.0016	0.0015	0.0016	0.0021	0.0024	0.0025	0.0029	0.0028	0.0036	0.0036			
20	0.0000	0.0014	0.0016	0.0016	0.0016	0.0021	0.0025	0.0025	0.0030	0.0029	0.0036	0.0037			
21	0.0000	0.0014	0.0015	0.0015	0.0015	0.0022	0.0024	0.0025	0.0029	0.0029	0.0036	0.0036			
22	0.0000	0.0014	0.0016	0.0016	0.0016	0.0023	0.0025	0.0026	0.0030	0.0029	0.0036	0.0037			
23	0.0000	0.0013	0.0014	0.0015	0.0016	0.0021	0.0025	0.0025	0.0030	0.0029	0.0036	0.0037			
24	0.0000	0.0013	0.0015	0.0015	0.0017	0.0023	0.0025	0.0026	0.0030	0.0030	0.0037	0.0038			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.0000	0.0014	0.0016	0.0016	0.0016	0.0022	0.0025	0.0026	0.0030	0.0030	0.0036	0.0037			
Med.	0.0000	0.0014	0.0016	0.0016	0.0016	0.0022	0.0025	0.0025	0.0030	0.0030	0.0036	0.0037			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			
Min.	0.0000	0.0013	0.0014	0.0014	0.0014	0.0021	0.0023	0.0024	0.0028	0.0027	0.0034	0.0035			
Max.	0.0000	0.0017	0.0017	0.0017	0.0017	0.0025	0.0028	0.0029	0.0032	0.0032	0.0039	0.0040			

Data Set 11 : 120 °C, 1500 mA

Actual Case Temperature [T _s]	120.5 °C
Actual Ambient Temperature [T _A]	117.5 °C
Drive Current [I _F]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 11-5
Chromaticity

LED No.	Chromaticity u'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.2622	0.2608	0.2609	0.2608	0.2608	0.2610	0.2612	0.2611	0.2612	0.2612	0.2612	0.2613			
2	0.2609	0.2596	0.2597	0.2597	0.2597	0.2598	0.2599	0.2599	0.2600	0.2600	0.2601	0.2602			
3	0.2631	0.2617	0.2619	0.2618	0.2618	0.2620	0.2622	0.2620	0.2622	0.2621	0.2623	0.2623			
4	0.2620	0.2606	0.2606	0.2605	0.2605	0.2608	0.2609	0.2608	0.2610	0.2609	0.2611	0.2611			
5	0.2599	0.2586	0.2587	0.2586	0.2586	0.2588	0.2589	0.2588	0.2589	0.2589	0.2591	0.2591			
6	0.2625	0.2611	0.2613	0.2613	0.2612	0.2614	0.2616	0.2615	0.2616	0.2615	0.2618	0.2617			
7	0.2647	0.2631	0.2634	0.2633	0.2632	0.2635	0.2636	0.2635	0.2637	0.2636	0.2638	0.2637			
8	0.2647	0.2633	0.2635	0.2634	0.2634	0.2636	0.2638	0.2637	0.2638	0.2637	0.2639	0.2639			
9	0.2632	0.2617	0.2619	0.2618	0.2618	0.2619	0.2622	0.2621	0.2622	0.2621	0.2624	0.2623			
10	0.2645	0.2630	0.2631	0.2630	0.2630	0.2633	0.2633	0.2633	0.2634	0.2633	0.2635	0.2635			
11	0.2611	0.2597	0.2599	0.2598	0.2598	0.2600	0.2600	0.2601	0.2602	0.2601	0.2602	0.2603			
12	0.2616	0.2602	0.2603	0.2602	0.2603	0.2605	0.2607	0.2607	0.2607	0.2607	0.2609	0.2608			
13	0.2619	0.2605	0.2607	0.2606	0.2606	0.2609	0.2609	0.2609	0.2610	0.2610	0.2611	0.2611			
14	0.2618	0.2605	0.2606	0.2605	0.2605	0.2607	0.2608	0.2608	0.2609	0.2609	0.2610	0.2610			
15	0.2622	0.2609	0.2610	0.2610	0.2610	0.2612	0.2614	0.2613	0.2614	0.2614	0.2616	0.2616			
16	0.2631	0.2618	0.2620	0.2619	0.2618	0.2620	0.2622	0.2621	0.2622	0.2622	0.2624	0.2624			
17	0.2618	0.2605	0.2607	0.2606	0.2606	0.2608	0.2609	0.2609	0.2610	0.2609	0.2611	0.2611			
18	0.2652	0.2639	0.2640	0.2639	0.2639	0.2642	0.2643	0.2642	0.2644	0.2643	0.2644	0.2645			
19	0.2645	0.2632	0.2633	0.2633	0.2632	0.2635	0.2635	0.2635	0.2637	0.2636	0.2637	0.2638			
20	0.2623	0.2609	0.2610	0.2609	0.2609	0.2612	0.2612	0.2612	0.2613	0.2612	0.2615	0.2615			
21	0.2622	0.2608	0.2610	0.2609	0.2609	0.2610	0.2612	0.2612	0.2613	0.2612	0.2614	0.2614			
22	0.2629	0.2615	0.2617	0.2616	0.2616	0.2618	0.2619	0.2619	0.2620	0.2620	0.2621	0.2621			
23	0.2615	0.2602	0.2604	0.2602	0.2602	0.2605	0.2606	0.2606	0.2607	0.2606	0.2607	0.2608			
24	0.2625	0.2612	0.2613	0.2612	0.2611	0.2614	0.2616	0.2615	0.2616	0.2616	0.2616	0.2617			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.2626	0.2612	0.2614	0.2613	0.2613	0.2615	0.2616	0.2616	0.2617	0.2616	0.2618	0.2618			
Med.	0.2623	0.2609	0.2610	0.2610	0.2610	0.2612	0.2613	0.2613	0.2614	0.2613	0.2616	0.2616			
σ	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013			
Min.	0.2599	0.2586	0.2587	0.2586	0.2586	0.2588	0.2589	0.2588	0.2589	0.2589	0.2591	0.2591			
Max.	0.2652	0.2639	0.2640	0.2639	0.2639	0.2642	0.2643	0.2642	0.2644	0.2643	0.2644	0.2645			

Data Set 11 : 120 °C, 1500 mA

Actual Case Temperature [T _s]	120.5 °C
Actual Ambient Temperature [T _A]	117.5 °C
Drive Current [I _f]	1500 mA
Measurement Current	1500 mA

NOTES:

T_s and T_A were measured during initial setup.

TABLE 11-6
Chromaticity

LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5231	0.5235	0.5241	0.5239	0.5239	0.5250	0.5254	0.5255	0.5260	0.5259	0.5266	0.5267			
2	0.5232	0.5238	0.5244	0.5243	0.5244	0.5254	0.5258	0.5259	0.5263	0.5263	0.5270	0.5271			
3	0.5236	0.5240	0.5246	0.5245	0.5245	0.5255	0.5260	0.5259	0.5265	0.5264	0.5271	0.5272			
4	0.5223	0.5226	0.5232	0.5231	0.5231	0.5241	0.5246	0.5246	0.5251	0.5251	0.5259	0.5260			
5	0.5221	0.5224	0.5231	0.5229	0.5229	0.5240	0.5245	0.5245	0.5251	0.5250	0.5258	0.5259			
6	0.5239	0.5243	0.5249	0.5248	0.5248	0.5258	0.5263	0.5263	0.5268	0.5268	0.5276	0.5276			
7	0.5264	0.5269	0.5275	0.5273	0.5273	0.5282	0.5286	0.5286	0.5291	0.5290	0.5297	0.5298			
8	0.5277	0.5283	0.5289	0.5288	0.5288	0.5296	0.5300	0.5300	0.5305	0.5304	0.5311	0.5311			
9	0.5248	0.5250	0.5257	0.5255	0.5255	0.5265	0.5269	0.5269	0.5274	0.5273	0.5282	0.5282			
10	0.5245	0.5248	0.5255	0.5253	0.5253	0.5263	0.5267	0.5267	0.5273	0.5272	0.5280	0.5281			
11	0.5223	0.5225	0.5232	0.5230	0.5231	0.5241	0.5245	0.5246	0.5252	0.5251	0.5258	0.5260			
12	0.5233	0.5236	0.5242	0.5241	0.5242	0.5252	0.5257	0.5257	0.5262	0.5262	0.5270	0.5270			
13	0.5232	0.5235	0.5241	0.5240	0.5240	0.5251	0.5254	0.5255	0.5261	0.5260	0.5267	0.5268			
14	0.5230	0.5233	0.5240	0.5238	0.5238	0.5249	0.5252	0.5253	0.5259	0.5258	0.5265	0.5266			
15	0.5233	0.5237	0.5243	0.5241	0.5241	0.5252	0.5257	0.5257	0.5263	0.5262	0.5270	0.5271			
16	0.5242	0.5248	0.5253	0.5252	0.5253	0.5263	0.5267	0.5268	0.5273	0.5273	0.5280	0.5281			
17	0.5261	0.5267	0.5273	0.5272	0.5273	0.5281	0.5285	0.5286	0.5291	0.5291	0.5298	0.5299			
18	0.5250	0.5254	0.5261	0.5259	0.5259	0.5269	0.5273	0.5273	0.5277	0.5277	0.5284	0.5285			
19	0.5258	0.5262	0.5269	0.5267	0.5268	0.5277	0.5280	0.5281	0.5286	0.5285	0.5293	0.5293			
20	0.5240	0.5243	0.5249	0.5248	0.5248	0.5258	0.5262	0.5262	0.5268	0.5267	0.5275	0.5276			
21	0.5248	0.5251	0.5257	0.5256	0.5256	0.5266	0.5270	0.5271	0.5276	0.5275	0.5283	0.5283			
22	0.5244	0.5247	0.5254	0.5253	0.5253	0.5264	0.5267	0.5268	0.5273	0.5272	0.5279	0.5280			
23	0.5236	0.5239	0.5245	0.5244	0.5245	0.5255	0.5259	0.5259	0.5265	0.5264	0.5271	0.5272			
24	0.5234	0.5237	0.5243	0.5242	0.5243	0.5254	0.5257	0.5258	0.5263	0.5263	0.5270	0.5271			
n	24	24	24	24	24	24	24	24	24	24	24	24			
Avg.	0.5241	0.5245	0.5251	0.5249	0.5250	0.5260	0.5264	0.5264	0.5270	0.5269	0.5276	0.5277			
Med.	0.5238	0.5242	0.5248	0.5247	0.5247	0.5257	0.5261	0.5261	0.5267	0.5266	0.5273	0.5274			
σ	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0013	0.0013	0.0013	0.0013			
Min.	0.5221	0.5224	0.5231	0.5229	0.5229	0.5240	0.5245	0.5245	0.5251	0.5250	0.5258	0.5259			
Max.	0.5277	0.5283	0.5289	0.5288	0.5288	0.5296	0.5300	0.5300	0.5305	0.5304	0.5311	0.5311			