

LM-80 Test Report

NFSL757G

Issue Date: April 12, 2016	Revision Date: -
Test Initiation Date: January 30, 2015	Test Completion Date: April 8, 2016
Test Duration: 10,000 hours	Report Number: SQETMP098101

Customer Information:

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

Description of Test Samples:

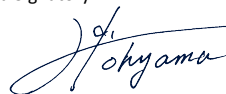
Classification: LED Package
 Model Name: Warm White LED
 Model Number: NFSL757G (Nominal CCT: 2700 K)

Test Summary:

Data Set	Case Temperature [T _s]	Ambient Temperature [T _a]	Drive Current [I _d]	Lumen Maintenance at 10,000 hours	Chromaticity Shift (Δu'v')	TM-21 Projection L ₇₀ (10K)	TM-21 Projection L ₈₀ (10K)	TM-21 Projection L ₉₀ (10K)
1	55 °C	> 50 °C	65 mA	97.9 %	0.0009	> 60000 hours	> 60000 hours	55400 hours
2	55 °C	> 50 °C	150 mA	97.7 %	0.0013	> 60000 hours	> 60000 hours	41800 hours
3	55 °C	> 50 °C	180 mA	97.5 %	0.0015	> 60000 hours	> 60000 hours	38600 hours
4	85 °C	> 80 °C	65 mA	97.5 %	0.0008	> 60000 hours	> 60000 hours	43900 hours
5	85 °C	> 80 °C	150 mA	96.5 %	0.0017	> 60000 hours	> 60000 hours	31300 hours
6	85 °C	> 80 °C	180 mA	96.0 %	0.0018	> 60000 hours	56100 hours	26600 hours
7	105 °C	> 100 °C	65 mA	94.9 %	0.0016	> 60000 hours	40600 hours	19700 hours
8	105 °C	> 100 °C	150 mA	91.9 %	0.0029	39500 hours	25000 hours	12200 hours
9	105 °C	> 100 °C	180 mA	91.4 %	0.0030	36400 hours	23200 hours	11600 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
757	NFSL757GT	55	65	≥ 2700	1
		55	150	≥ 2700	2
		55	180	≥ 2700	3
		85	65	≥ 2700	4
		85	150	≥ 2700	5
		85	180	≥ 2700	6
		105	65	≥ 2700	7
		105	150	≥ 2700	8
		105	180	≥ 2700	9
757	NFSW757G NFSW757GT	55	65	≥ 5000	1
		55	150	≥ 5000	2
		55	180	≥ 5000	3
		85	65	≥ 5000	4
		85	150	≥ 5000	5
		85	180	≥ 5000	6
		105	65	≥ 5000	7
		105	150	≥ 5000	8
		105	180	≥ 5000	9
757	NFSL757G-V1 NFSL757GT-V1	55	65	≥ 2700	1
		55	150	≥ 2700	2
		55	180	≥ 2700	3
		85	65	≥ 2700	4
		85	150	≥ 2700	5
		85	180	≥ 2700	6
		105	65	≥ 2700	7
		105	150	≥ 2700	8
		105	180	≥ 2700	9
757	NFSW757G-V1 NFSW757GT-V1	55	65	≥ 5000	1
		55	150	≥ 5000	2
		55	180	≥ 5000	3
		85	65	≥ 5000	4
		85	150	≥ 5000	5
		85	180	≥ 5000	6
		105	65	≥ 5000	7
		105	150	≥ 5000	8
		105	180	≥ 5000	9

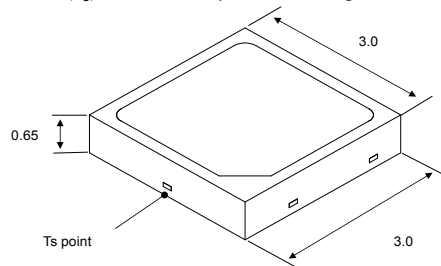
IES LM-80-08 Test Report Requirement :

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.

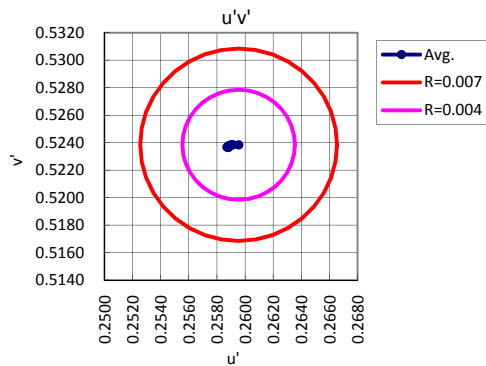
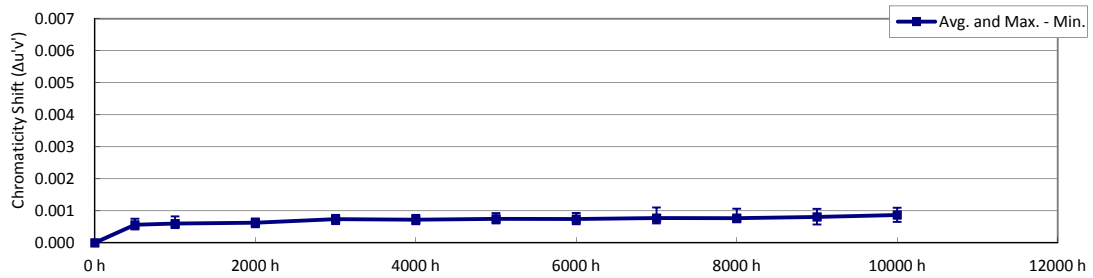
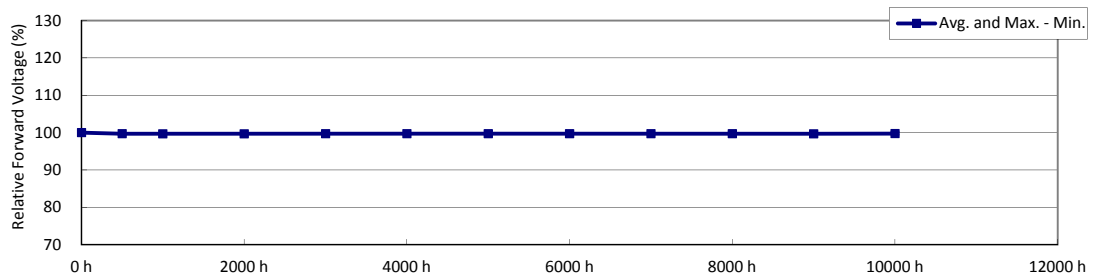
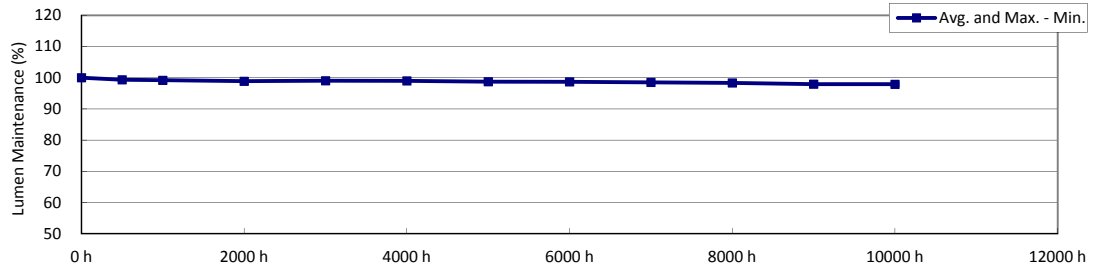


7. **Drive current of the LED light sources during lifetime test**
See tables.
8. **Initial luminous flux and forward voltage at photometric measurement current**
See tables.
9. **Lumen maintenance data for each individual LED light source along with median value, standard deviation, minimum and maximum 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, 65 mA

Actual Case Temperature [T _S]	55.0 °C
Actual Ambient Temperature [T _A]	54.2 °C
Drive Current [I _F]	65 mA
Measurement Current	65 mA

NOTES:
T_S and T_A were measured during initial setup.



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Data Set 1 : 55 °C, 65 mA

Actual Case Temperature [T _S]	55.0 °C
Actual Ambient Temperature [T _A]	54.2 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	29.9	2.89	2834	0.449	0.407	0.257	0.524					
2	29.6	2.88	2798	0.449	0.403	0.259	0.523					
3	29.4	2.88	2741	0.455	0.407	0.261	0.525					
4	29.3	2.88	2733	0.456	0.408	0.261	0.526					
5	29.8	2.89	2806	0.451	0.408	0.258	0.525					
6	29.2	2.88	2725	0.454	0.402	0.262	0.523					
7	29.0	2.89	2738	0.453	0.403	0.261	0.523					
8	29.0	2.88	2716	0.455	0.403	0.262	0.524					
9	29.3	2.88	2783	0.452	0.406	0.259	0.524					
10	29.6	2.89	2789	0.452	0.408	0.259	0.525					
11	29.5	2.88	2802	0.450	0.405	0.258	0.524					
12	29.3	2.88	2810	0.450	0.407	0.258	0.524					
13	29.2	2.88	2753	0.451	0.401	0.261	0.522					
14	29.5	2.88	2815	0.448	0.404	0.258	0.523					
15	29.3	2.88	2804	0.448	0.402	0.259	0.522					
16	29.2	2.88	2743	0.453	0.404	0.261	0.524					
17	29.1	2.88	2766	0.450	0.401	0.260	0.522					
18	29.6	2.89	2758	0.455	0.410	0.260	0.526					
19	29.2	2.88	2790	0.449	0.401	0.259	0.522					
20	29.2	2.88	2761	0.451	0.402	0.261	0.523					
21	29.4	2.89	2769	0.451	0.404	0.260	0.523					
22	30.0	2.88	2859	0.449	0.411	0.256	0.526					
23	29.6	2.89	2797	0.450	0.405	0.259	0.524					
24	30.0	2.88	2859	0.449	0.410	0.256	0.525					
25	29.3	2.88	2786	0.449	0.402	0.260	0.522					
n	25	25	25	25	25	25	25					
Avg.	29.4	2.88	2781	0.451	0.405	0.259	0.524					
Med.	29.3	2.88	2786	0.451	0.404	0.259	0.524					
σ	0.27	0.002	38.7	0.0024	0.0030	0.0018	0.0013					
Min.	29.0	2.88	2716	0.448	0.401	0.256	0.522					
Max.	30.0	2.89	2859	0.456	0.411	0.262	0.526					

Data Set 1 : 55 °C, 65 mA

Actual Case Temperature [T _s]	55.0 °C
Actual Ambient Temperature [T _A]	54.2 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	99.5	99.3	98.9	99.1	98.9	98.7	98.6	98.4	98.3	97.9	97.8
2	100.0	99.5	99.3	99.0	99.1	99.0	98.8	98.8	98.7	98.4	97.9	97.9
3	100.0	99.1	98.9	98.7	98.9	98.7	98.5	98.5	98.4	98.2	97.8	97.8
4	100.0	99.6	99.5	99.2	99.3	99.0	99.0	98.9	98.8	98.6	98.2	98.3
5	100.0	99.5	99.3	99.0	99.1	99.0	98.9	98.8	98.7	98.4	98.0	98.0
6	100.0	99.5	99.4	99.0	99.3	99.1	98.9	98.8	98.4	98.2	97.8	97.7
7	100.0	99.6	99.4	98.9	99.3	99.1	99.0	98.8	98.4	98.3	97.8	97.8
8	100.0	99.2	99.0	98.7	98.9	98.7	98.5	98.5	98.4	98.2	97.8	97.8
9	100.0	99.3	99.2	98.9	99.1	98.9	98.7	98.7	98.6	98.5	98.1	98.2
10	100.0	99.2	99.1	98.8	99.0	98.7	98.6	98.5	98.4	98.3	97.9	98.0
11	100.0	99.2	99.2	98.8	99.0	99.0	98.7	98.6	98.5	98.3	98.0	97.9
12	100.0	99.2	99.0	98.8	99.0	99.0	98.7	98.7	98.6	98.5	98.1	98.1
13	100.0	99.4	99.3	99.0	99.2	99.2	98.8	98.7	98.5	98.4	98.1	98.0
14	100.0	99.3	99.2	98.9	99.1	99.0	98.7	98.7	98.6	98.4	98.0	98.0
15	100.0	99.2	99.0	98.8	98.9	98.9	98.5	98.6	98.4	98.2	97.9	97.8
16	100.0	99.1	99.0	98.8	98.8	98.8	98.6	98.5	98.3	98.1	97.6	97.5
17	100.0	99.5	99.2	99.0	99.1	99.0	98.8	98.9	98.5	98.4	97.8	97.7
18	100.0	99.5	99.3	99.1	99.2	99.2	98.9	98.9	98.7	98.6	98.2	98.2
19	100.0	99.3	99.1	98.9	99.1	99.1	98.9	98.7	98.6	98.5	98.1	98.1
20	100.0	99.3	99.2	98.9	99.1	99.2	98.8	98.8	98.6	98.6	98.2	98.1
21	100.0	99.3	99.2	98.8	98.9	99.0	98.6	98.5	98.3	98.2	97.8	97.7
22	100.0	99.2	99.1	98.7	98.9	99.0	98.6	98.5	98.4	98.2	97.9	97.9
23	100.0	99.4	99.3	99.0	99.1	99.2	98.8	98.7	98.6	98.4	98.1	98.0
24	100.0	99.2	99.1	98.7	98.8	98.9	98.5	98.5	98.3	98.2	97.9	97.9
25	100.0	99.4	99.2	98.9	99.0	99.1	98.7	98.8	98.5	98.3	98.0	97.9
n	25	25	25	25	25	25	25	25	25	25	25	25
Avg.	100.0	99.3	99.2	98.9	99.1	99.0	98.7	98.7	98.5	98.3	98.0	97.9
Med.	100.0	99.3	99.2	98.9	99.1	99.0	98.7	98.7	98.5	98.3	97.9	97.9
σ	0.00	0.15	0.14	0.13	0.14	0.15	0.15	0.13	0.14	0.14	0.16	0.18
Min.	100.0	99.1	98.9	98.7	98.8	98.7	98.5	98.5	98.3	98.1	97.6	97.5
Max.	100.0	99.6	99.5	99.2	99.3	99.2	99.0	98.9	98.8	98.6	98.2	98.3

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0128	-0.0134	-0.0150	-0.0167	-0.0206	-0.0210

Test duration used	5000 h to 10000 h
B	0.9973
α	1.8532E-06
R ²	0.9424
Calculated L ₇₀ (10K)	191000 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	119000 hours
Reported L ₈₀ (10K)	> 60000 hours
Calculated L ₉₀ (10K)	55400 hours
Reported L ₉₀ (10K)	55400 hours

Curve-fit equation:

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

Lumen maintenance life equation:

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

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

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

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Data Set 1 : 55 °C, 65 mA

Actual Case Temperature [T _S]	55.0 °C
Actual Ambient Temperature [T _A]	54.2 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	99.7	99.7	99.8	100.0	99.9	99.8	99.8	99.8	99.8	99.8	99.8			
2	100.0	99.7	99.6	99.6	99.9	99.6	99.8	99.7	99.7	99.7	99.7	99.7			
3	100.0	99.9	99.7	99.9	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.9			
4	100.0	99.8	99.9	99.7	99.9	99.8	99.8	99.8	99.8	99.9	99.8	99.9			
5	100.0	99.8	99.9	99.9	99.8	99.9	99.9	99.9	100.0	99.9	100.0	99.8			
6	100.0	99.7	99.7	99.7	100.0	99.7	99.8	99.7	99.8	99.7	99.7	99.8			
7	100.0	99.9	99.8	99.8	99.8	99.8	99.8	99.8	99.9	100.0	100.0	100.1			
8	100.0	99.6	99.7	99.6	99.6	99.7	99.6	99.6	99.6	99.7	99.6	99.7			
9	100.0	99.8	99.6	99.7	99.6	99.7	99.7	99.7	99.8	99.7	99.8	99.8			
10	100.0	99.8	99.8	99.8	99.9	99.7	99.8	99.8	99.8	99.8	99.7	99.8			
11	100.0	99.7	99.7	99.6	99.6	99.5	99.7	99.7	99.7	99.7	99.7	99.7			
12	100.0	99.6	99.5	99.5	99.5	99.5	99.6	99.5	99.5	99.5	99.5	99.5			
13	100.0	99.7	99.7	99.7	99.7	99.7	99.8	99.8	99.7	99.7	99.7	99.8			
14	100.0	99.5	99.5	99.6	99.7	99.7	99.6	99.6	99.6	99.6	99.6	99.6			
15	100.0	99.6	99.6	99.6	99.7	99.6	99.6	99.6	99.6	99.6	99.5	99.6			
16	100.0	99.5	99.6	99.6	99.5	99.6	99.6	99.6	99.6	99.7	99.6	99.6			
17	100.0	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7			
18	100.0	99.7	99.6	99.7	99.6	99.7	99.7	99.8	99.6	99.7	99.6	99.7			
19	100.0	99.7	99.8	99.8	99.8	99.7	99.7	99.8	99.7	99.8	99.7	99.8			
20	100.0	99.4	99.6	99.6	99.6	99.6	99.6	99.6	99.6	99.5	99.5	99.5			
21	100.0	99.9	99.7	99.8	99.7	99.9	99.7	99.8	99.7	99.8	99.7	99.8			
22	100.0	99.5	99.8	99.6	99.7	99.8	99.7	99.7	99.6	99.7	99.6	99.7			
23	100.0	99.7	99.9	99.8	99.9	99.8	99.8	99.8	99.8	99.8	99.8	99.9			
24	100.0	99.8	99.8	99.6	99.7	99.7	99.7	99.7	99.7	99.7	99.6	99.7			
25	100.0	99.7	99.6	99.6	99.7	99.6	99.7	99.7	99.6	99.7	99.7	99.7			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	100.0	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7			
Med.	100.0	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7			
σ	0.00	0.12	0.11	0.10	0.13	0.11	0.10	0.09	0.12	0.11	0.13	0.13			
Min.	100.0	99.4	99.5	99.5	99.5	99.5	99.6	99.5	99.5	99.5	99.5	99.5			
Max.	100.0	99.9	99.9	99.9	100.0	99.9	99.9	99.9	100.0	100.0	100.0	100.1			

Data Set 1 : 55 °C, 65 mA

Actual Case Temperature [T _S]	55.0 °C
Actual Ambient Temperature [T _A]	54.2 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	0.0006	0.0006	0.0006	0.0006	0.0008	0.0007	0.0007	0.0008	0.0007	0.0008	0.0009			
2	0.0000	0.0006	0.0006	0.0007	0.0009	0.0008	0.0008	0.0008	0.0009	0.0008	0.0009	0.0010			
3	0.0000	0.0005	0.0006	0.0006	0.0008	0.0007	0.0007	0.0007	0.0008	0.0007	0.0008	0.0008			
4	0.0000	0.0007	0.0006	0.0006	0.0009	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0008			
5	0.0000	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008			
6	0.0000	0.0008	0.0008	0.0007	0.0009	0.0009	0.0009	0.0009	0.0009	0.0008	0.0010	0.0010			
7	0.0000	0.0006	0.0007	0.0007	0.0008	0.0007	0.0008	0.0008	0.0007	0.0008	0.0008	0.0009			
8	0.0000	0.0006	0.0007	0.0005	0.0007	0.0008	0.0007	0.0008	0.0007	0.0007	0.0008	0.0008			
9	0.0000	0.0005	0.0006	0.0006	0.0006	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007	0.0009			
10	0.0000	0.0005	0.0007	0.0007	0.0008	0.0007	0.0008	0.0007	0.0007	0.0008	0.0008	0.0009			
11	0.0000	0.0006	0.0006	0.0008	0.0008	0.0008	0.0008	0.0009	0.0010	0.0009	0.0010	0.0011			
12	0.0000	0.0005	0.0005	0.0005	0.0006	0.0006	0.0007	0.0006	0.0007	0.0007	0.0007	0.0008			
13	0.0000	0.0005	0.0006	0.0006	0.0008	0.0007	0.0008	0.0008	0.0009	0.0009	0.0008	0.0009			
14	0.0000	0.0005	0.0005	0.0006	0.0007	0.0007	0.0006	0.0007	0.0007	0.0008	0.0008	0.0008			
15	0.0000	0.0007	0.0006	0.0006	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0008	0.0009			
16	0.0000	0.0005	0.0005	0.0007	0.0007	0.0007	0.0008	0.0006	0.0008	0.0007	0.0007	0.0008			
17	0.0000	0.0005	0.0005	0.0007	0.0007	0.0006	0.0007	0.0006	0.0007	0.0007	0.0007	0.0007			
18	0.0000	0.0005	0.0005	0.0006	0.0006	0.0006	0.0007	0.0006	0.0007	0.0007	0.0006	0.0008			
19	0.0000	0.0004	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007			
20	0.0000	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008			
21	0.0000	0.0005	0.0007	0.0007	0.0009	0.0009	0.0009	0.0009	0.0011	0.0011	0.0011	0.0011			
22	0.0000	0.0005	0.0006	0.0007	0.0008	0.0007	0.0008	0.0008	0.0007	0.0008	0.0008	0.0009			
23	0.0000	0.0005	0.0006	0.0006	0.0007	0.0008	0.0008	0.0007	0.0008	0.0008	0.0008	0.0009			
24	0.0000	0.0006	0.0006	0.0006	0.0007	0.0008	0.0007	0.0007	0.0007	0.0008	0.0008	0.0008			
25	0.0000	0.0005	0.0005	0.0006	0.0008	0.0008	0.0008	0.0007	0.0007	0.0008	0.0008	0.0009			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.0000	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008	0.0008	0.0009			
Med.	0.0000	0.0005	0.0006	0.0006	0.0007	0.0007	0.0008	0.0007	0.0007	0.0008	0.0008	0.0009			
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	0.0004	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007			
Max.	0.0000	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0009	0.0011	0.0011	0.0011	0.0011			

Data Set 1 : 55 °C, 65 mA

Actual Case Temperature [T _s]	55.0 °C
Actual Ambient Temperature [T _A]	54.2 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	0.2574	0.2568	0.2568	0.2568	0.2567	0.2566	0.2567	0.2567	0.2566	0.2567	0.2566	0.2565			
2	0.2594	0.2588	0.2588	0.2587	0.2586	0.2587	0.2586	0.2586	0.2586	0.2586	0.2585	0.2585			
3	0.2614	0.2608	0.2608	0.2608	0.2606	0.2607	0.2607	0.2607	0.2607	0.2607	0.2606	0.2605			
4	0.2618	0.2612	0.2612	0.2612	0.2610	0.2612	0.2611	0.2611	0.2611	0.2611	0.2610	0.2610			
5	0.2586	0.2580	0.2580	0.2580	0.2578	0.2578	0.2578	0.2579	0.2579	0.2579	0.2578	0.2578			
6	0.2630	0.2623	0.2622	0.2623	0.2622	0.2621	0.2622	0.2621	0.2622	0.2622	0.2620	0.2620			
7	0.2622	0.2616	0.2615	0.2615	0.2614	0.2615	0.2614	0.2614	0.2615	0.2614	0.2613	0.2613			
8	0.2631	0.2624	0.2624	0.2625	0.2624	0.2623	0.2624	0.2623	0.2624	0.2624	0.2623	0.2623			
9	0.2599	0.2594	0.2593	0.2593	0.2592	0.2592	0.2592	0.2593	0.2592	0.2592	0.2592	0.2590			
10	0.2594	0.2589	0.2587	0.2587	0.2586	0.2587	0.2587	0.2587	0.2587	0.2587	0.2586	0.2585			
11	0.2590	0.2584	0.2583	0.2582	0.2582	0.2582	0.2582	0.2581	0.2580	0.2581	0.2580	0.2579			
12	0.2585	0.2579	0.2580	0.2580	0.2579	0.2579	0.2578	0.2579	0.2578	0.2578	0.2578	0.2577			
13	0.2615	0.2609	0.2608	0.2608	0.2607	0.2607	0.2607	0.2607	0.2606	0.2606	0.2607	0.2605			
14	0.2585	0.2579	0.2580	0.2579	0.2578	0.2578	0.2579	0.2577	0.2578	0.2577	0.2577	0.2577			
15	0.2593	0.2586	0.2587	0.2587	0.2586	0.2587	0.2585	0.2585	0.2585	0.2586	0.2586	0.2584			
16	0.2618	0.2612	0.2613	0.2611	0.2611	0.2611	0.2610	0.2612	0.2610	0.2611	0.2610	0.2610			
17	0.2610	0.2605	0.2605	0.2603	0.2603	0.2604	0.2603	0.2604	0.2603	0.2603	0.2603	0.2603			
18	0.2604	0.2599	0.2599	0.2598	0.2599	0.2599	0.2598	0.2598	0.2598	0.2597	0.2598	0.2597			
19	0.2599	0.2594	0.2594	0.2594	0.2593	0.2593	0.2593	0.2593	0.2593	0.2592	0.2593	0.2592			
20	0.2611	0.2605	0.2604	0.2605	0.2604	0.2604	0.2604	0.2604	0.2603	0.2604	0.2604	0.2604			
21	0.2605	0.2600	0.2599	0.2599	0.2597	0.2597	0.2596	0.2596	0.2595	0.2595	0.2595	0.2595			
22	0.2559	0.2555	0.2554	0.2553	0.2552	0.2552	0.2552	0.2551	0.2552	0.2551	0.2551	0.2550			
23	0.2591	0.2586	0.2585	0.2585	0.2584	0.2584	0.2583	0.2584	0.2584	0.2583	0.2583	0.2583			
24	0.2561	0.2555	0.2555	0.2555	0.2554	0.2554	0.2554	0.2554	0.2555	0.2553	0.2554	0.2553			
25	0.2601	0.2596	0.2596	0.2595	0.2593	0.2593	0.2593	0.2594	0.2594	0.2594	0.2594	0.2592			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.2600	0.2594	0.2594	0.2593	0.2592	0.2592	0.2592	0.2592	0.2592	0.2592	0.2592	0.2591			
Med.	0.2599	0.2594	0.2594	0.2594	0.2593	0.2593	0.2593	0.2593	0.2593	0.2592	0.2593	0.2592			
σ	0.0019	0.0018	0.0018	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019			
Min.	0.2559	0.2555	0.2554	0.2553	0.2552	0.2552	0.2552	0.2551	0.2552	0.2551	0.2551	0.2550			
Max.	0.2631	0.2624	0.2624	0.2625	0.2624	0.2623	0.2624	0.2623	0.2624	0.2624	0.2623	0.2623			

Data Set 1 : 55 °C, 65 mA

Actual Case Temperature [T _S]	55.0 °C
Actual Ambient Temperature [T _A]	54.2 °C
Drive Current [I _F]	65 mA
Measurement Current	65 mA

NOTES:

T_S and T_A were measured during initial setup.

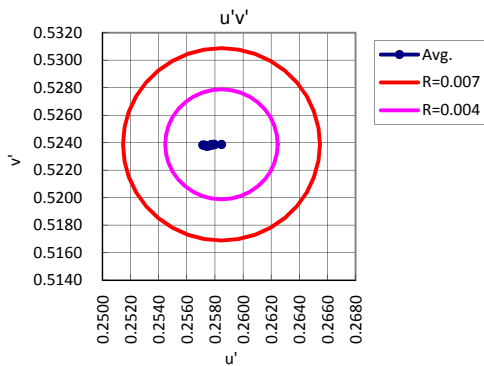
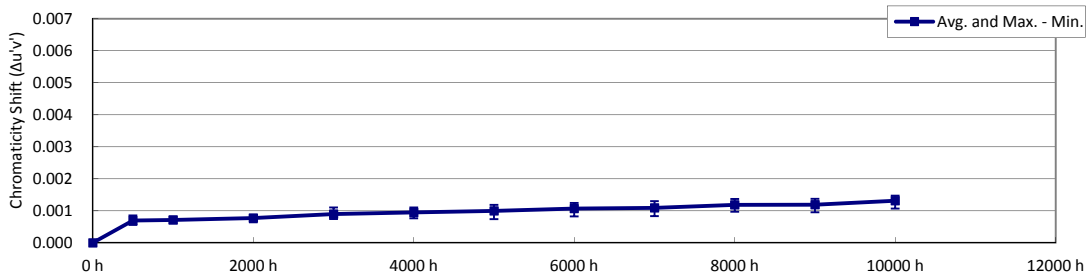
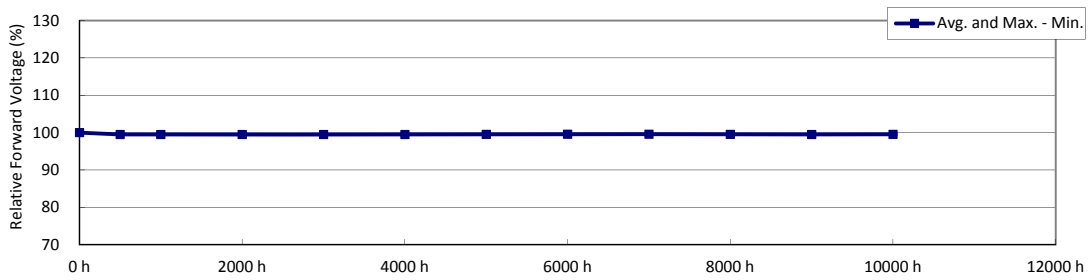
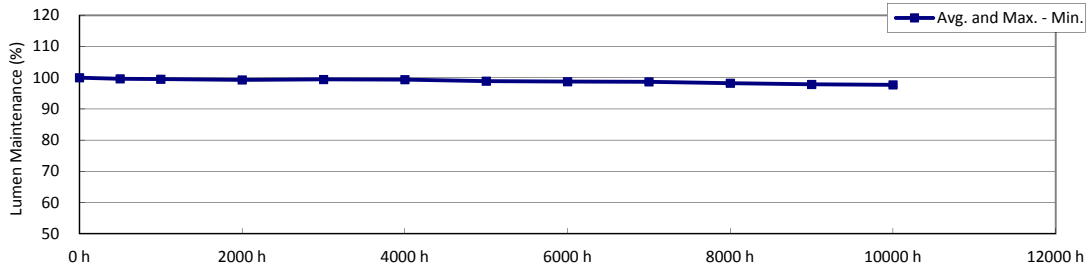
TABLE 1-6
Chromaticity

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	0.5242	0.5242	0.5241	0.5242	0.5241	0.5241	0.5240	0.5241	0.5240	0.5241	0.5240	0.5240			
2	0.5224	0.5224	0.5223	0.5223	0.5224	0.5222	0.5223	0.5222	0.5222	0.5222	0.5222	0.5222			
3	0.5252	0.5252	0.5252	0.5251	0.5252	0.5251	0.5251	0.5252	0.5250	0.5251	0.5251	0.5251			
4	0.5257	0.5258	0.5257	0.5257	0.5257	0.5257	0.5257	0.5257	0.5257	0.5256	0.5256	0.5257			
5	0.5249	0.5249	0.5248	0.5249	0.5248	0.5248	0.5248	0.5248	0.5248	0.5248	0.5248	0.5248			
6	0.5231	0.5231	0.5231	0.5230	0.5230	0.5230	0.5230	0.5229	0.5229	0.5229	0.5229	0.5229			
7	0.5232	0.5233	0.5232	0.5233	0.5232	0.5232	0.5232	0.5232	0.5231	0.5232	0.5231	0.5230			
8	0.5235	0.5236	0.5235	0.5236	0.5235	0.5235	0.5235	0.5235	0.5235	0.5234	0.5235	0.5235			
9	0.5242	0.5242	0.5242	0.5242	0.5242	0.5241	0.5241	0.5241	0.5241	0.5242	0.5241	0.5241			
10	0.5248	0.5248	0.5248	0.5248	0.5248	0.5247	0.5247	0.5248	0.5247	0.5247	0.5247	0.5248			
11	0.5235	0.5235	0.5235	0.5235	0.5234	0.5234	0.5234	0.5234	0.5233	0.5233	0.5234	0.5232			
12	0.5244	0.5244	0.5243	0.5243	0.5242	0.5242	0.5242	0.5243	0.5242	0.5243	0.5242	0.5242			
13	0.5223	0.5222	0.5223	0.5222	0.5222	0.5222	0.5222	0.5222	0.5221	0.5222	0.5221	0.5221			
14	0.5229	0.5229	0.5228	0.5228	0.5227	0.5227	0.5227	0.5227	0.5226	0.5227	0.5227	0.5226			
15	0.5223	0.5223	0.5222	0.5221	0.5221	0.5222	0.5221	0.5221	0.5220	0.5221	0.5221	0.5221			
16	0.5236	0.5235	0.5235	0.5235	0.5235	0.5234	0.5235	0.5234	0.5233	0.5235	0.5234	0.5234			
17	0.5221	0.5221	0.5221	0.5220	0.5220	0.5220	0.5220	0.5220	0.5219	0.5220	0.5219	0.5219			
18	0.5260	0.5260	0.5260	0.5260	0.5260	0.5259	0.5260	0.5259	0.5259	0.5260	0.5259	0.5260			
19	0.5218	0.5219	0.5218	0.5218	0.5217	0.5218	0.5218	0.5218	0.5217	0.5217	0.5217	0.5217			
20	0.5225	0.5225	0.5225	0.5225	0.5225	0.5225	0.5224	0.5225	0.5224	0.5225	0.5225	0.5224			
21	0.5232	0.5231	0.5230	0.5230	0.5230	0.5229	0.5229	0.5229	0.5228	0.5229	0.5228	0.5228			
22	0.5255	0.5256	0.5256	0.5255	0.5255	0.5254	0.5254	0.5254	0.5254	0.5254	0.5254	0.5254			
23	0.5235	0.5234	0.5234	0.5235	0.5234	0.5232	0.5234	0.5234	0.5232	0.5233	0.5233	0.5233			
24	0.5251	0.5251	0.5251	0.5251	0.5251	0.5251	0.5250	0.5250	0.5249	0.5250	0.5250	0.5250			
25	0.5221	0.5221	0.5220	0.5221	0.5220	0.5219	0.5219	0.5220	0.5219	0.5219	0.5219	0.5218			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.5237	0.5237	0.5236	0.5236	0.5236	0.5236	0.5236	0.5236	0.5235	0.5236	0.5235	0.5235			
Med.	0.5235	0.5235	0.5235	0.5235	0.5234	0.5234	0.5234	0.5234	0.5233	0.5233	0.5234	0.5233			
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.	0.5218	0.5219	0.5218	0.5218	0.5217	0.5218	0.5218	0.5218	0.5217	0.5217	0.5217	0.5217			
Max.	0.5260	0.5260	0.5260	0.5260	0.5260	0.5259	0.5260	0.5259	0.5259	0.5260	0.5259	0.5260			

Data Set 2 : 55 °C, 150 mA

Actual Case Temperature [T _S]	56.4 °C
Actual Ambient Temperature [T _A]	55.1 °C
Drive Current [I _F]	150 mA
Measurement Current	150 mA

NOTES:
T_S and T_A were measured during initial setup.



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Data Set 2 : 55 °C, 150 mA

Actual Case Temperature [T _s]	56.4 °C
Actual Ambient Temperature [T _A]	55.1 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	64.0	3.12	2856	0.448	0.407	0.256	0.524					
2	64.0	3.12	2825	0.450	0.409	0.257	0.525					
3	63.3	3.11	2781	0.454	0.410	0.259	0.526					
4	63.6	3.12	2811	0.450	0.406	0.258	0.524					
5	63.6	3.12	2800	0.451	0.408	0.258	0.525					
6	63.0	3.11	2771	0.451	0.403	0.260	0.523					
7	63.0	3.11	2795	0.449	0.403	0.259	0.523					
8	62.7	3.11	2788	0.449	0.401	0.259	0.522					
9	63.3	3.12	2791	0.452	0.408	0.259	0.525					
10	63.6	3.11	2830	0.447	0.403	0.258	0.522					
11	63.5	3.12	2801	0.452	0.408	0.258	0.525					
12	63.2	3.12	2737	0.456	0.408	0.261	0.526					
13	63.7	3.12	2816	0.450	0.407	0.258	0.524					
14	63.5	3.12	2778	0.451	0.405	0.260	0.524					
15	63.0	3.12	2805	0.446	0.399	0.259	0.521					
16	63.5	3.12	2807	0.450	0.405	0.258	0.524					
17	63.7	3.12	2838	0.446	0.402	0.257	0.522					
18	62.9	3.11	2773	0.450	0.402	0.260	0.523					
19	63.3	3.12	2761	0.454	0.408	0.260	0.526					
20	64.0	3.12	2813	0.450	0.407	0.258	0.525					
21	63.8	3.12	2845	0.447	0.405	0.257	0.523					
22	63.2	3.12	2842	0.446	0.402	0.257	0.522					
23	63.8	3.11	2797	0.454	0.412	0.258	0.527					
24	64.1	3.12	2839	0.448	0.406	0.257	0.524					
25	63.0	3.12	2811	0.447	0.401	0.259	0.522					
n	25	25	25	25	25	25	25					
Avg.	63.5	3.12	2804	0.450	0.405	0.258	0.524					
Med.	63.5	3.12	2805	0.450	0.406	0.258	0.524					
σ	0.38	0.004	28.7	0.0027	0.0032	0.0012	0.0016					
Min.	62.7	3.11	2737	0.446	0.399	0.256	0.521					
Max.	64.1	3.12	2856	0.456	0.412	0.261	0.527					

Data Set 2 : 55 °C, 150 mA

Actual Case Temperature [T _S]	56.4 °C
Actual Ambient Temperature [T _A]	55.1 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	99.5	99.4	99.2	99.4	99.3	98.8	98.6	98.6	98.1	97.7	97.5
2	100.0	99.6	99.6	99.3	99.5	99.4	98.9	98.7	98.7	98.3	98.0	97.9
3	100.0	99.6	99.5	99.2	99.4	99.5	98.9	98.8	98.9	98.4	98.0	97.9
4	100.0	99.5	99.5	99.1	99.3	99.4	98.9	98.7	98.7	98.3	97.9	97.7
5	100.0	99.7	99.6	99.3	99.6	99.5	99.0	98.9	98.8	98.3	98.1	97.8
6	100.0	99.6	99.6	99.2	99.5	99.5	98.8	98.6	98.5	98.0	97.6	97.4
7	100.0	99.6	99.6	99.3	99.6	99.5	98.8	98.7	98.4	98.0	97.5	97.3
8	100.0	99.4	99.3	99.0	99.2	99.1	98.6	98.5	98.5	98.0	97.6	97.4
9	100.0	99.7	99.6	99.4	99.6	99.6	99.0	98.8	98.8	98.3	98.0	97.8
10	100.0	99.8	99.7	99.4	99.4	99.4	98.9	98.7	98.6	98.3	97.9	97.8
11	100.0	99.6	99.4	99.2	99.3	99.3	98.8	98.6	98.6	98.2	97.8	97.8
12	100.0	99.6	99.5	99.2	99.4	99.3	98.9	98.7	98.7	98.3	98.0	97.9
13	100.0	99.4	99.3	99.1	99.2	99.1	98.7	98.6	98.6	98.2	97.7	97.7
14	100.0	99.7	99.5	99.4	99.4	99.4	98.9	98.8	98.8	98.4	98.0	97.9
15	100.0	99.7	99.5	99.3	99.4	99.4	98.8	98.7	98.7	98.3	97.8	97.7
16	100.0	99.8	99.7	99.4	99.6	99.4	99.0	98.8	98.6	98.2	97.7	97.4
17	100.0	99.7	99.5	99.2	99.5	99.1	98.7	98.6	98.2	97.8	97.4	97.1
18	100.0	99.7	99.6	99.3	99.4	99.3	98.9	98.8	98.6	98.3	97.9	97.8
19	100.0	99.7	99.6	99.5	99.5	99.4	99.0	98.8	98.8	98.4	98.0	98.0
20	100.0	99.6	99.5	99.3	99.5	99.4	98.9	98.8	98.6	98.3	98.0	97.8
21	100.0	99.7	99.6	99.4	99.5	99.5	99.0	98.9	98.8	98.3	98.0	97.8
22	100.0	100.1	100.0	99.7	99.8	99.7	99.2	99.1	99.1	98.7	98.4	98.1
23	100.0	99.5	99.4	99.3	99.4	99.4	98.9	98.9	98.8	98.3	98.0	97.8
24	100.0	99.8	99.7	99.5	99.6	99.6	99.2	99.0	99.0	98.6	98.1	98.0
25	100.0	99.6	99.6	99.3	99.5	99.4	99.0	98.8	98.7	98.3	97.9	97.8
n	25	25	25	25	25	25	25	25	25	25	25	25
Avg.	100.0	99.6	99.5	99.3	99.5	99.4	98.9	98.8	98.7	98.3	97.9	97.7
Med.	100.0	99.6	99.6	99.3	99.5	99.4	98.9	98.8	98.7	98.3	97.9	97.8
σ	0.00	0.15	0.14	0.15	0.14	0.14	0.13	0.14	0.18	0.19	0.22	0.24
Min.	100.0	99.4	99.3	99.0	99.2	99.1	98.6	98.5	98.2	97.8	97.4	97.1
Max.	100.0	100.1	100.0	99.7	99.8	99.7	99.2	99.1	99.1	98.7	98.4	98.1

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0111	-0.0125	-0.0133	-0.0176	-0.0214	-0.0231

Test duration used	5000 h to 10000 h
B	1.0029
α	2.5929E-06
R ²	0.9530
Calculated L ₇₀ (10K)	139000 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	87200 hours
Reported L ₈₀ (10K)	> 60000 hours
Calculated L ₉₀ (10K)	41800 hours
Reported L ₉₀ (10K)	41800 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, 150 mA

Actual Case Temperature [T _S]	56.4 °C
Actual Ambient Temperature [T _A]	55.1 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	99.4	99.5	99.3	99.4	99.3	99.4	99.4	99.4	99.4	99.3	99.4			
2	100.0	99.6	99.7	99.5	99.4	99.6	99.7	99.6	99.7	99.7	99.6	99.7			
3	100.0	99.5	99.5	99.5	99.5	99.5	99.6	99.6	99.6	99.6	99.6	99.5			
4	100.0	99.7	99.6	99.6	99.4	99.6	99.6	99.7	99.7	99.6	99.5	99.6			
5	100.0	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.6	99.5	99.4	99.5			
6	100.0	99.7	99.7	99.7	99.6	99.6	99.7	99.7	99.8	99.8	99.7	99.7			
7	100.0	99.5	99.6	99.4	99.4	99.5	99.4	99.4	99.5	99.4	99.4	99.4			
8	100.0	99.3	99.5	99.4	99.5	99.5	99.5	99.5	99.6	99.5	99.5	99.5			
9	100.0	99.4	99.5	99.5	99.4	99.3	99.5	99.6	99.6	99.5	99.4	99.5			
10	100.0	99.5	99.5	99.4	99.7	99.6	99.5	99.5	99.5	99.5	99.4	99.5			
11	100.0	99.7	99.6	99.5	99.5	99.5	99.5	99.6	99.6	99.5	99.5	99.6			
12	100.0	99.7	99.4	99.7	99.6	99.6	99.6	99.7	99.7	99.7	99.6	99.7			
13	100.0	99.4	99.5	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.5			
14	100.0	99.5	99.3	99.6	99.5	99.5	99.5	99.6	99.5	99.5	99.5	99.6			
15	100.0	99.5	99.6	99.5	99.5	99.3	99.6	99.5	99.5	99.5	99.5	99.5			
16	100.0	99.5	99.4	99.5	99.5	99.5	99.6	99.6	99.6	99.6	99.5	99.6			
17	100.0	99.4	99.2	99.5	99.4	99.6	99.4	99.6	99.5	99.4	99.4	99.5			
18	100.0	99.5	99.4	99.5	99.5	99.6	99.5	99.6	99.6	99.5	99.5	99.5			
19	100.0	99.4	99.5	99.4	99.5	99.5	99.6	99.6	99.6	99.5	99.5	99.6			
20	100.0	99.7	99.7	99.6	99.6	99.5	99.6	99.7	99.7	99.6	99.6	99.6			
21	100.0	99.5	99.4	99.5	99.3	99.5	99.5	99.6	99.6	99.5	99.4	99.6			
22	100.0	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.8	99.7	99.7	99.7			
23	100.0	99.4	99.6	99.3	99.4	99.4	99.4	99.5	99.5	99.4	99.4	99.5			
24	100.0	99.4	99.3	99.4	99.5	99.3	99.5	99.6	99.6	99.4	99.4	99.5			
25	100.0	99.4	99.5	99.3	99.6	99.3	99.4	99.5	99.5	99.5	99.4	99.5			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	100.0	99.5	99.5	99.5	99.5	99.5	99.5	99.6	99.6	99.5	99.5	99.6			
Med.	100.0	99.5	99.5	99.5	99.5	99.5	99.5	99.6	99.6	99.5	99.5	99.5			
σ	0.00	0.11	0.13	0.10	0.10	0.11	0.08	0.08	0.09	0.09	0.10	0.09			
Min.	100.0	99.3	99.2	99.3	99.3	99.3	99.4	99.4	99.4	99.4	99.3	99.4			
Max.	100.0	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.8	99.8	99.7	99.7			

Data Set 2 : 55 °C, 150 mA

Actual Case Temperature [T _S]	56.4 °C
Actual Ambient Temperature [T _A]	55.1 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012	0.0012	0.0013	0.0014	0.0014	0.0014				
2	0.0000	0.0007	0.0006	0.0009	0.0009	0.0009	0.0010	0.0011	0.0011	0.0012	0.0012	0.0012	0.0013			
3	0.0000	0.0008	0.0008	0.0008	0.0009	0.0011	0.0010	0.0011	0.0011	0.0013	0.0011	0.0013				
4	0.0000	0.0008	0.0008	0.0008	0.0010	0.0010	0.0012	0.0011	0.0011	0.0013	0.0011	0.0013				
5	0.0000	0.0008	0.0007	0.0008	0.0009	0.0009	0.0010	0.0011	0.0012	0.0012	0.0012	0.0012	0.0013			
6	0.0000	0.0008	0.0007	0.0009	0.0010	0.0010	0.0011	0.0011	0.0012	0.0012	0.0014	0.0014				
7	0.0000	0.0007	0.0008	0.0008	0.0010	0.0011	0.0012	0.0011	0.0011	0.0012	0.0013	0.0014				
8	0.0000	0.0007	0.0008	0.0008	0.0010	0.0009	0.0010	0.0009	0.0011	0.0011	0.0011	0.0012				
9	0.0000	0.0007	0.0008	0.0008	0.0009	0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0014				
10	0.0000	0.0009	0.0007	0.0008	0.0008	0.0009	0.0009	0.0011	0.0010	0.0012	0.0012	0.0013				
11	0.0000	0.0006	0.0007	0.0007	0.0009	0.0009	0.0011	0.0011	0.0011	0.0013	0.0013	0.0014				
12	0.0000	0.0006	0.0007	0.0007	0.0009	0.0010	0.0009	0.0011	0.0011	0.0012	0.0011	0.0012				
13	0.0000	0.0007	0.0007	0.0008	0.0010	0.0009	0.0010	0.0011	0.0011	0.0013	0.0012	0.0014				
14	0.0000	0.0008	0.0008	0.0008	0.0009	0.0009	0.0010	0.0011	0.0011	0.0012	0.0011	0.0013				
15	0.0000	0.0007	0.0007	0.0008	0.0009	0.0010	0.0010	0.0010	0.0011	0.0012	0.0013	0.0014				
16	0.0000	0.0007	0.0008	0.0008	0.0010	0.0010	0.0010	0.0012	0.0011	0.0012	0.0012	0.0013				
17	0.0000	0.0006	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0011	0.0011	0.0011	0.0012				
18	0.0000	0.0006	0.0006	0.0006	0.0007	0.0009	0.0010	0.0010	0.0010	0.0011	0.0012	0.0013				
19	0.0000	0.0006	0.0006	0.0008	0.0008	0.0010	0.0009	0.0010	0.0011	0.0012	0.0011	0.0014				
20	0.0000	0.0007	0.0007	0.0008	0.0008	0.0008	0.0007	0.0008	0.0008	0.0010	0.0010	0.0011				
21	0.0000	0.0006	0.0007	0.0007	0.0008	0.0009	0.0009	0.0011	0.0011	0.0012	0.0012	0.0013				
22	0.0000	0.0007	0.0008	0.0008	0.0011	0.0010	0.0011	0.0012	0.0012	0.0013	0.0014	0.0015				
23	0.0000	0.0006	0.0006	0.0007	0.0008	0.0008	0.0009	0.0010	0.0010	0.0011	0.0010	0.0011				
24	0.0000	0.0006	0.0007	0.0008	0.0009	0.0010	0.0007	0.0011	0.0011	0.0011	0.0012	0.0013				
25	0.0000	0.0007	0.0006	0.0008	0.0008	0.0009	0.0010	0.0010	0.0010	0.0011	0.0011	0.0012				
n	25	25	25	25	25	25	25	25	25	25	25	25				
Avg.	0.0000	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0011	0.0011	0.0012	0.0012	0.0013				
Med.	0.0000	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0011	0.0011	0.0012	0.0012	0.0013				
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	0.0006	0.0006	0.0006	0.0007	0.0008	0.0007	0.0008	0.0008	0.0010	0.0010	0.0011				
Max.	0.0000	0.0009	0.0008	0.0009	0.0011	0.0011	0.0012	0.0012	0.0013	0.0014	0.0014	0.0015				

Data Set 2 : 55 °C, 150 mA

Actual Case Temperature [T _s]	56.4 °C
Actual Ambient Temperature [T _A]	55.1 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	0.2566	0.2558	0.2558	0.2557	0.2556	0.2555	0.2554	0.2553	0.2553	0.2552	0.2552	0.2552			
2	0.2577	0.2570	0.2571	0.2568	0.2568	0.2568	0.2567	0.2566	0.2566	0.2565	0.2565	0.2564			
3	0.2595	0.2588	0.2587	0.2588	0.2586	0.2585	0.2585	0.2584	0.2585	0.2583	0.2584	0.2582			
4	0.2586	0.2578	0.2578	0.2578	0.2576	0.2576	0.2574	0.2575	0.2575	0.2573	0.2575	0.2573			
5	0.2590	0.2582	0.2582	0.2582	0.2581	0.2580	0.2579	0.2579	0.2578	0.2577	0.2577	0.2577			
6	0.2608	0.2600	0.2601	0.2599	0.2598	0.2598	0.2596	0.2597	0.2596	0.2596	0.2594	0.2594			
7	0.2597	0.2589	0.2589	0.2588	0.2587	0.2586	0.2585	0.2585	0.2585	0.2584	0.2584	0.2583			
8	0.2600	0.2594	0.2592	0.2592	0.2591	0.2591	0.2591	0.2591	0.2590	0.2590	0.2589	0.2588			
9	0.2593	0.2586	0.2586	0.2586	0.2584	0.2583	0.2583	0.2582	0.2582	0.2582	0.2581	0.2580			
10	0.2581	0.2572	0.2574	0.2573	0.2573	0.2572	0.2572	0.2570	0.2570	0.2569	0.2569	0.2568			
11	0.2586	0.2580	0.2579	0.2579	0.2577	0.2577	0.2575	0.2575	0.2575	0.2573	0.2574	0.2573			
12	0.2615	0.2609	0.2608	0.2608	0.2606	0.2605	0.2606	0.2604	0.2604	0.2603	0.2604	0.2602			
13	0.2583	0.2575	0.2576	0.2575	0.2573	0.2574	0.2572	0.2571	0.2572	0.2570	0.2571	0.2568			
14	0.2601	0.2593	0.2593	0.2593	0.2592	0.2592	0.2591	0.2590	0.2590	0.2589	0.2590	0.2588			
15	0.2594	0.2587	0.2588	0.2586	0.2586	0.2584	0.2584	0.2584	0.2583	0.2582	0.2581	0.2581			
16	0.2589	0.2582	0.2581	0.2581	0.2579	0.2579	0.2579	0.2577	0.2578	0.2577	0.2577	0.2576			
17	0.2577	0.2572	0.2571	0.2570	0.2569	0.2569	0.2567	0.2566	0.2566	0.2566	0.2567	0.2565			
18	0.2604	0.2598	0.2598	0.2598	0.2597	0.2595	0.2594	0.2594	0.2594	0.2593	0.2592	0.2591			
19	0.2604	0.2598	0.2598	0.2597	0.2596	0.2594	0.2595	0.2594	0.2593	0.2592	0.2593	0.2591			
20	0.2584	0.2577	0.2577	0.2577	0.2576	0.2576	0.2577	0.2576	0.2576	0.2574	0.2574	0.2573			
21	0.2571	0.2565	0.2565	0.2564	0.2563	0.2563	0.2562	0.2560	0.2560	0.2560	0.2559	0.2558			
22	0.2577	0.2570	0.2569	0.2569	0.2566	0.2567	0.2566	0.2565	0.2565	0.2564	0.2563	0.2562			
23	0.2584	0.2578	0.2578	0.2577	0.2576	0.2577	0.2576	0.2575	0.2575	0.2574	0.2574	0.2573			
24	0.2573	0.2567	0.2567	0.2566	0.2565	0.2564	0.2566	0.2563	0.2562	0.2563	0.2562	0.2561			
25	0.2590	0.2584	0.2584	0.2583	0.2582	0.2581	0.2580	0.2581	0.2580	0.2579	0.2580	0.2578			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.2589	0.2582	0.2582	0.2581	0.2580	0.2580	0.2579	0.2578	0.2578	0.2577	0.2577	0.2576			
Med.	0.2589	0.2582	0.2581	0.2581	0.2579	0.2579	0.2579	0.2577	0.2578	0.2577	0.2577	0.2576			
σ	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0013	0.0012	0.0012	0.0012	0.0012			
Min.	0.2566	0.2558	0.2558	0.2557	0.2556	0.2555	0.2554	0.2553	0.2553	0.2552	0.2552	0.2552			
Max.	0.2615	0.2609	0.2608	0.2608	0.2606	0.2605	0.2606	0.2604	0.2604	0.2603	0.2604	0.2602			

Data Set 2 : 55 °C, 150 mA

Actual Case Temperature [T _S]	56.4 °C
Actual Ambient Temperature [T _A]	55.1 °C
Drive Current [I _F]	150 mA
Measurement Current	150 mA

NOTES:

T_S and T_A were measured during initial setup.

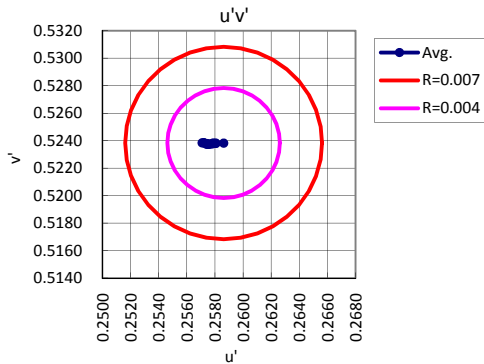
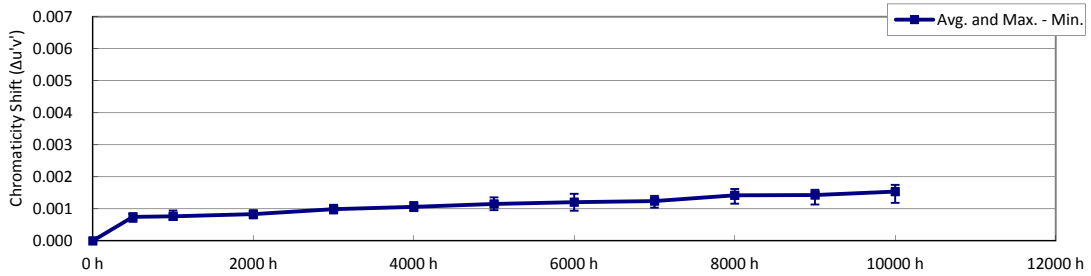
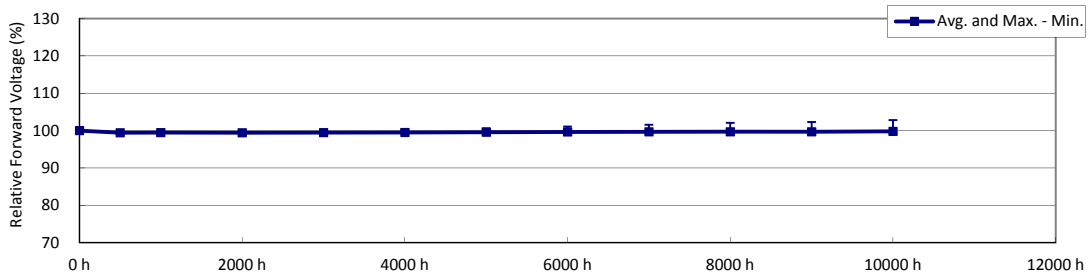
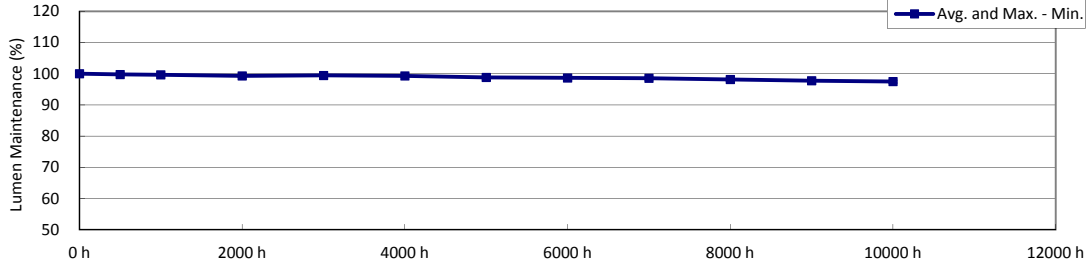
TABLE 2-6
Chromaticity

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	0.5241	0.5241	0.5241	0.5241	0.5241	0.5240	0.5240	0.5240	0.5240	0.5240	0.5240	0.5240			
2	0.5251	0.5251	0.5250	0.5250	0.5249	0.5249	0.5249	0.5250	0.5249	0.5250	0.5250	0.5250			
3	0.5260	0.5260	0.5261	0.5260	0.5260	0.5260	0.5260	0.5260	0.5260	0.5260	0.5260	0.5260			
4	0.5239	0.5239	0.5239	0.5237	0.5238	0.5238	0.5238	0.5238	0.5237	0.5238	0.5238	0.5238			
5	0.5247	0.5248	0.5247	0.5246	0.5247	0.5247	0.5246	0.5247	0.5247	0.5246	0.5247	0.5247			
6	0.5230	0.5231	0.5230	0.5230	0.5229	0.5229	0.5230	0.5229	0.5229	0.5229	0.5230	0.5230			
7	0.5226	0.5227	0.5226	0.5227	0.5226	0.5225	0.5226	0.5226	0.5226	0.5226	0.5226	0.5226			
8	0.5218	0.5219	0.5219	0.5218	0.5218	0.5219	0.5217	0.5218	0.5218	0.5218	0.5219	0.5218			
9	0.5251	0.5250	0.5250	0.5250	0.5250	0.5249	0.5249	0.5249	0.5249	0.5250	0.5250	0.5250			
10	0.5222	0.5222	0.5222	0.5222	0.5221	0.5221	0.5222	0.5222	0.5221	0.5222	0.5222	0.5222			
11	0.5249	0.5250	0.5248	0.5248	0.5248	0.5248	0.5248	0.5248	0.5247	0.5248	0.5248	0.5248			
12	0.5256	0.5255	0.5255	0.5255	0.5254	0.5254	0.5254	0.5254	0.5254	0.5255	0.5255	0.5256			
13	0.5241	0.5240	0.5240	0.5240	0.5240	0.5239	0.5240	0.5240	0.5240	0.5240	0.5240	0.5241			
14	0.5236	0.5235	0.5235	0.5235	0.5234	0.5234	0.5234	0.5235	0.5234	0.5235	0.5235	0.5235			
15	0.5207	0.5205	0.5204	0.5205	0.5203	0.5204	0.5204	0.5204	0.5203	0.5204	0.5204	0.5205			
16	0.5236	0.5236	0.5236	0.5236	0.5235	0.5235	0.5235	0.5236	0.5235	0.5236	0.5237	0.5236			
17	0.5219	0.5219	0.5218	0.5219	0.5219	0.5218	0.5218	0.5218	0.5218	0.5220	0.5219	0.5219			
18	0.5224	0.5224	0.5224	0.5223	0.5223	0.5223	0.5223	0.5224	0.5223	0.5223	0.5223	0.5224			
19	0.5253	0.5253	0.5253	0.5254	0.5253	0.5253	0.5253	0.5253	0.5253	0.5253	0.5253	0.5253			
20	0.5244	0.5245	0.5244	0.5244	0.5243	0.5244	0.5244	0.5245	0.5244	0.5245	0.5244	0.5244			
21	0.5229	0.5230	0.5228	0.5229	0.5228	0.5228	0.5228	0.5229	0.5228	0.5229	0.5228	0.5229			
22	0.5216	0.5216	0.5216	0.5216	0.5216	0.5215	0.5214	0.5215	0.5215	0.5216	0.5216	0.5215			
23	0.5270	0.5270	0.5270	0.5270	0.5270	0.5270	0.5269	0.5270	0.5270	0.5270	0.5269	0.5270			
24	0.5239	0.5239	0.5238	0.5238	0.5238	0.5238	0.5238	0.5237	0.5238	0.5238	0.5238	0.5239			
25	0.5216	0.5216	0.5215	0.5215	0.5214	0.5214	0.5215	0.5215	0.5215	0.5216	0.5215	0.5216			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.5237	0.5237	0.5236	0.5236	0.5236	0.5236	0.5236	0.5236	0.5236	0.5236	0.5236	0.5237			
Med.	0.5239	0.5239	0.5238	0.5237	0.5238	0.5238	0.5238	0.5237	0.5238	0.5238	0.5238	0.5238			
σ	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016			
Min.	0.5207	0.5205	0.5204	0.5205	0.5203	0.5204	0.5204	0.5204	0.5203	0.5204	0.5204	0.5205			
Max.	0.5270	0.5270	0.5270	0.5270	0.5270	0.5270	0.5269	0.5270	0.5270	0.5270	0.5269	0.5270			

Data Set 3 : 55 °C, 180 mA

Actual Case Temperature [T _S]	56.5 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	180 mA
Measurement Current	180 mA

NOTES:
T_S and T_A were measured during initial setup.



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Data Set 3 : 55 °C, 180 mA

Actual Case Temperature [T _s]	56.5 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	75.1	3.19	2808	0.451	0.409	0.258	0.525					
2	74.3	3.19	2804	0.450	0.406	0.258	0.524					
3	74.4	3.18	2792	0.452	0.407	0.259	0.525					
4	73.3	3.19	2803	0.447	0.400	0.259	0.521					
5	74.2	3.19	2789	0.451	0.405	0.259	0.524					
6	74.6	3.18	2850	0.446	0.404	0.257	0.523					
7	74.8	3.19	2836	0.448	0.406	0.257	0.524					
8	74.7	3.19	2809	0.451	0.407	0.258	0.525					
9	74.8	3.19	2803	0.451	0.408	0.258	0.525					
10	74.5	3.19	2809	0.451	0.408	0.258	0.525					
11	74.0	3.19	2786	0.449	0.402	0.259	0.523					
12	74.5	3.19	2786	0.452	0.407	0.259	0.525					
13	74.4	3.19	2759	0.454	0.408	0.260	0.526					
14	74.7	3.18	2800	0.451	0.406	0.258	0.524					
15	74.6	3.19	2810	0.450	0.406	0.258	0.524					
16	73.5	3.19	2773	0.450	0.401	0.260	0.522					
17	73.9	3.19	2798	0.448	0.400	0.259	0.522					
18	74.6	3.19	2794	0.450	0.405	0.259	0.524					
19	74.5	3.18	2774	0.454	0.410	0.259	0.526					
20	74.2	3.18	2776	0.454	0.410	0.259	0.526					
21	73.8	3.19	2805	0.449	0.403	0.259	0.523					
22	74.8	3.19	2807	0.450	0.407	0.258	0.524					
23	74.8	3.18	2779	0.453	0.409	0.259	0.526					
24	73.8	3.19	2758	0.452	0.404	0.260	0.524					
25	73.6	3.19	2767	0.451	0.403	0.260	0.523					
n	25	25	25	25	25	25	25					
Avg.	74.3	3.19	2795	0.451	0.406	0.259	0.524					
Med.	74.5	3.19	2798	0.451	0.406	0.259	0.524					
σ	0.47	0.003	21.6	0.0021	0.0028	0.0010	0.0013					
Min.	73.3	3.18	2758	0.446	0.400	0.257	0.521					
Max.	75.1	3.19	2850	0.454	0.410	0.260	0.526					

Data Set 3 : 55 °C, 180 mA

Actual Case Temperature [T _s]	56.5 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	99.8	99.7	99.5	99.6	99.4	98.8	98.7	98.7	98.3	97.8	97.6
2	100.0	99.7	99.7	99.4	99.5	99.3	98.8	98.6	98.6	98.2	97.9	97.7
3	100.0	99.7	99.6	99.3	99.4	99.3	98.6	98.4	98.2	97.7	97.3	97.0
4	100.0	99.8	99.7	99.4	99.6	99.5	98.9	98.8	98.7	98.2	97.8	97.7
5	100.0	100.0	99.9	99.6	99.8	99.6	99.1	99.0	98.9	98.5	98.1	97.8
6	100.0	99.6	99.6	99.3	99.6	99.3	98.9	98.9	98.6	97.9	97.6	97.2
7	100.0	99.7	99.8	99.5	99.6	99.4	98.9	98.8	98.5	98.0	97.6	97.3
8	100.0	99.8	99.6	99.4	99.5	99.4	98.8	98.9	98.7	98.3	98.0	97.8
9	100.0	99.7	99.6	99.4	99.4	99.4	98.9	98.8	98.8	98.4	98.0	97.7
10	100.0	99.7	99.6	99.4	99.5	99.4	98.8	98.7	98.8	98.3	98.0	97.7
11	100.0	99.5	99.5	99.1	99.1	99.0	98.6	98.4	98.2	97.9	97.5	97.3
12	100.0	99.7	99.6	99.1	99.3	99.2	98.8	98.7	98.5	98.1	97.8	97.5
13	100.0	99.7	99.5	99.1	99.3	99.2	98.8	98.6	98.6	98.1	97.8	97.8
14	100.0	100.0	99.9	99.4	99.6	99.4	99.0	98.8	98.7	98.4	97.9	97.7
15	100.0	100.0	99.8	99.4	99.5	99.4	98.9	98.8	98.7	98.4	97.9	97.6
16	100.0	99.7	99.4	99.0	99.3	99.1	98.7	98.5	98.3	97.8	97.4	97.1
17	100.0	100.1	99.8	99.3	99.5	99.3	98.8	98.7	98.4	98.1	97.6	97.2
18	100.0	99.8	99.7	99.1	99.3	99.2	98.7	98.5	98.5	98.1	97.7	97.2
19	100.0	99.7	99.6	99.3	99.4	99.4	98.8	98.6	98.6	98.2	97.7	97.5
20	100.0	99.7	99.6	99.3	99.5	99.4	99.0	98.8	98.5	98.0	97.6	97.2
21	100.0	99.6	99.4	99.1	99.3	99.0	98.7	98.4	98.4	98.0	97.6	97.4
22	100.0	99.7	99.6	99.1	99.3	99.1	98.9	98.5	98.6	98.2	97.8	97.6
23	100.0	99.9	99.7	99.4	99.7	99.4	99.0	98.8	98.8	98.5	98.2	97.8
24	100.0	99.9	99.8	99.3	99.5	99.2	98.8	98.6	98.6	98.3	97.9	97.6
25	100.0	99.6	99.6	99.1	99.3	99.1	98.7	98.6	98.4	98.1	97.7	97.6
n	25	25	25	25	25	25	25	25	25	25	25	25
Avg.	100.0	99.8	99.6	99.3	99.5	99.3	98.8	98.7	98.6	98.2	97.8	97.5
Med.	100.0	99.7	99.6	99.3	99.5	99.3	98.8	98.7	98.6	98.2	97.8	97.6
σ	0.00	0.14	0.13	0.17	0.15	0.15	0.13	0.16	0.19	0.21	0.21	0.24
Min.	100.0	99.5	99.4	99.0	99.1	99.0	98.6	98.4	98.2	97.7	97.3	97.0
Max.	100.0	100.1	99.9	99.6	99.8	99.6	99.1	99.0	98.9	98.5	98.2	97.8

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0119	-0.0134	-0.0145	-0.0185	-0.0226	-0.0253

Test duration used	5000 h to 10000 h
B	1.0035
α	2.8189E-06
R ²	0.9591
Calculated L ₇₀ (10K)	128000 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	80400 hours
Reported L ₈₀ (10K)	> 60000 hours
Calculated L ₉₀ (10K)	38600 hours
Reported L ₉₀ (10K)	38600 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 : 55 °C, 180 mA

Actual Case Temperature [T _s]	56.5 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	99.5	99.5	99.5	99.5	99.6	99.6	99.6	99.7	99.6	99.6	99.7			
2	100.0	99.4	99.4	99.3	99.6	99.4	99.6	99.6	99.7	99.6	99.5	99.6			
3	100.0	99.7	99.5	99.7	99.7	100.3	100.6	101.1	101.6	102.1	102.3	102.8			
4	100.0	99.4	99.5	99.3	99.5	99.4	99.6	99.5	99.6	99.5	99.6	99.6			
5	100.0	99.4	99.5	99.4	99.6	99.6	99.7	99.7	99.7	99.7	99.7	99.8			
6	100.0	99.3	99.3	99.3	99.1	99.2	99.3	99.3	99.2	99.2	99.3	99.3			
7	100.0	99.4	99.5	99.6	99.6	99.6	99.6	99.8	99.7	99.7	99.6	99.7			
8	100.0	99.3	99.6	99.3	99.5	99.5	99.6	99.5	99.6	99.5	99.6	99.5			
9	100.0	99.3	99.5	99.4	99.6	99.5	99.6	99.5	99.6	99.5	99.5	99.6			
10	100.0	99.5	99.5	99.6	99.5	99.5	99.6	99.6	99.6	99.5	99.5	99.6			
11	100.0	99.6	99.3	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.4	99.5			
12	100.0	99.4	99.4	99.5	99.4	99.3	99.5	99.6	99.5	99.5	99.5	99.6			
13	100.0	99.5	99.5	99.4	99.5	99.5	99.5	99.5	99.5	99.5	99.4	99.5			
14	100.0	99.5	99.6	99.4	99.3	99.4	99.5	99.6	99.6	99.5	99.5	99.5			
15	100.0	99.4	99.5	99.5	99.5	99.6	99.5	99.7	99.8	99.9	100.1	100.5			
16	100.0	99.4	99.2	99.4	99.3	99.4	99.4	99.5	99.4	99.4	99.4	99.4			
17	100.0	99.6	99.5	99.5	99.4	99.5	99.5	99.6	99.5	99.5	99.5	99.5			
18	100.0	99.5	99.5	99.5	99.4	99.5	99.6	99.6	99.6	99.5	99.5	99.6			
19	100.0	99.4	99.5	99.5	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5			
20	100.0	99.4	99.5	99.4	99.4	99.5	99.8	100.1	100.4	100.5	100.8	101.1			
21	100.0	99.2	99.3	99.3	99.4	99.2	99.3	99.3	99.3	99.4	99.3	99.4			
22	100.0	99.5	99.5	99.5	99.6	99.5	99.6	99.6	99.6	99.6	99.6	99.7			
23	100.0	99.6	99.6	99.5	99.5	99.5	99.6	99.7	99.6	99.6	99.6	99.6			
24	100.0	99.5	99.5	99.5	99.6	99.7	99.6	99.6	99.6	99.6	99.6	99.7			
25	100.0	99.4	99.4	99.4	99.5	99.6	99.5	99.5	99.5	99.5	99.5	99.6			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	100.0	99.4	99.5	99.4	99.5	99.5	99.6	99.6	99.7	99.7	99.7	99.8			
Med.	100.0	99.4	99.5	99.4	99.5	99.5	99.6	99.6	99.6	99.5	99.5	99.6			
σ	0.00	0.10	0.10	0.11	0.13	0.20	0.24	0.34	0.44	0.55	0.61	0.73			
Min.	100.0	99.2	99.2	99.3	99.1	99.2	99.3	99.3	99.2	99.2	99.3	99.3			
Max.	100.0	99.7	99.6	99.7	99.7	100.3	100.6	101.1	101.6	102.1	102.3	102.8			

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Data Set 3 : 55 °C, 180 mA

Actual Case Temperature [T _s]	56.5 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	0.0008	0.0007	0.0009	0.0011	0.0012	0.0012	0.0012	0.0014	0.0015	0.0016	0.0016			
2	0.0000	0.0008	0.0008	0.0009	0.0011	0.0011	0.0013	0.0013	0.0015	0.0016	0.0016	0.0017			
3	0.0000	0.0008	0.0007	0.0007	0.0009	0.0010	0.0011	0.0012	0.0011	0.0014	0.0013	0.0014			
4	0.0000	0.0006	0.0007	0.0008	0.0010	0.0011	0.0013	0.0012	0.0013	0.0014	0.0014	0.0016			
5	0.0000	0.0007	0.0007	0.0007	0.0009	0.0010	0.0011	0.0010	0.0012	0.0014	0.0014	0.0014			
6	0.0000	0.0006	0.0006	0.0007	0.0009	0.0009	0.0011	0.0011	0.0012	0.0013	0.0014	0.0015			
7	0.0000	0.0007	0.0007	0.0008	0.0009	0.0010	0.0011	0.0010	0.0012	0.0014	0.0014	0.0015			
8	0.0000	0.0008	0.0007	0.0009	0.0011	0.0011	0.0011	0.0012	0.0013	0.0014	0.0014	0.0015			
9	0.0000	0.0008	0.0007	0.0008	0.0009	0.0011	0.0011	0.0011	0.0011	0.0013	0.0013	0.0015			
10	0.0000	0.0008	0.0007	0.0008	0.0009	0.0010	0.0011	0.0011	0.0012	0.0014	0.0013	0.0015			
11	0.0000	0.0008	0.0008	0.0009	0.0011	0.0012	0.0014	0.0015	0.0014	0.0016	0.0016	0.0017			
12	0.0000	0.0008	0.0009	0.0010	0.0011	0.0012	0.0012	0.0014	0.0014	0.0015	0.0016	0.0017			
13	0.0000	0.0008	0.0008	0.0008	0.0010	0.0010	0.0011	0.0012	0.0012	0.0012	0.0013	0.0015			
14	0.0000	0.0008	0.0008	0.0009	0.0011	0.0011	0.0012	0.0013	0.0013	0.0016	0.0015	0.0015			
15	0.0000	0.0007	0.0008	0.0008	0.0010	0.0010	0.0011	0.0012	0.0013	0.0015	0.0015	0.0016			
16	0.0000	0.0008	0.0008	0.0008	0.0010	0.0011	0.0012	0.0013	0.0013	0.0015	0.0015	0.0017			
17	0.0000	0.0008	0.0008	0.0009	0.0010	0.0010	0.0012	0.0012	0.0013	0.0015	0.0015	0.0017			
18	0.0000	0.0007	0.0009	0.0009	0.0010	0.0011	0.0012	0.0013	0.0014	0.0015	0.0016	0.0015			
19	0.0000	0.0007	0.0007	0.0009	0.0010	0.0011	0.0012	0.0013	0.0013	0.0016	0.0016	0.0016			
20	0.0000	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0009	0.0010	0.0012	0.0011	0.0012			
21	0.0000	0.0007	0.0008	0.0008	0.0010	0.0011	0.0012	0.0013	0.0013	0.0015	0.0016	0.0016			
22	0.0000	0.0007	0.0008	0.0008	0.0009	0.0010	0.0011	0.0012	0.0012	0.0014	0.0014	0.0016			
23	0.0000	0.0009	0.0008	0.0009	0.0010	0.0010	0.0010	0.0012	0.0011	0.0014	0.0014	0.0013			
24	0.0000	0.0007	0.0008	0.0009	0.0009	0.0011	0.0011	0.0012	0.0012	0.0015	0.0014	0.0016			
25	0.0000	0.0008	0.0009	0.0009	0.0010	0.0011	0.0012	0.0012	0.0012	0.0013	0.0013	0.0015			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.0000	0.0007	0.0008	0.0008	0.0010	0.0011	0.0012	0.0012	0.0012	0.0014	0.0014	0.0015			
Med.	0.0000	0.0008	0.0008	0.0008	0.0010	0.0011	0.0011	0.0012	0.0013	0.0014	0.0014	0.0015			
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	0.0006	0.0006	0.0007	0.0009	0.0009	0.0010	0.0009	0.0010	0.0012	0.0011	0.0012			
Max.	0.0000	0.0009	0.0009	0.0010	0.0011	0.0012	0.0014	0.0015	0.0014	0.0016	0.0016	0.0017			

Data Set 3 : 55 °C, 180 mA

Actual Case Temperature [T _s]	56.5 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	0.2584	0.2576	0.2577	0.2575	0.2573	0.2572	0.2572	0.2572	0.2570	0.2568	0.2568	0.2568			
2	0.2590	0.2582	0.2581	0.2581	0.2579	0.2579	0.2577	0.2577	0.2576	0.2575	0.2574	0.2573			
3	0.2592	0.2584	0.2585	0.2585	0.2583	0.2582	0.2582	0.2580	0.2581	0.2578	0.2579	0.2578			
4	0.2594	0.2588	0.2587	0.2587	0.2584	0.2583	0.2582	0.2582	0.2582	0.2580	0.2581	0.2579			
5	0.2595	0.2588	0.2588	0.2588	0.2586	0.2586	0.2584	0.2585	0.2584	0.2582	0.2582	0.2581			
6	0.2570	0.2565	0.2564	0.2563	0.2561	0.2561	0.2560	0.2559	0.2559	0.2558	0.2557	0.2556			
7	0.2575	0.2568	0.2568	0.2567	0.2566	0.2565	0.2564	0.2565	0.2563	0.2561	0.2561	0.2560			
8	0.2586	0.2577	0.2579	0.2577	0.2575	0.2574	0.2574	0.2574	0.2573	0.2571	0.2571	0.2570			
9	0.2588	0.2579	0.2580	0.2579	0.2578	0.2577	0.2577	0.2577	0.2576	0.2575	0.2574	0.2573			
10	0.2585	0.2577	0.2577	0.2577	0.2576	0.2575	0.2574	0.2574	0.2573	0.2571	0.2571	0.2570			
11	0.2599	0.2592	0.2591	0.2590	0.2589	0.2587	0.2586	0.2585	0.2586	0.2583	0.2584	0.2582			
12	0.2595	0.2587	0.2586	0.2586	0.2584	0.2584	0.2583	0.2582	0.2581	0.2580	0.2579	0.2578			
13	0.2605	0.2597	0.2598	0.2597	0.2595	0.2596	0.2594	0.2594	0.2593	0.2594	0.2593	0.2591			
14	0.2588	0.2581	0.2580	0.2580	0.2578	0.2578	0.2576	0.2575	0.2575	0.2573	0.2574	0.2573			
15	0.2586	0.2579	0.2578	0.2578	0.2576	0.2576	0.2575	0.2573	0.2573	0.2571	0.2571	0.2570			
16	0.2607	0.2599	0.2599	0.2599	0.2597	0.2596	0.2594	0.2594	0.2594	0.2592	0.2592	0.2590			
17	0.2597	0.2589	0.2589	0.2588	0.2588	0.2587	0.2585	0.2585	0.2584	0.2582	0.2582	0.2581			
18	0.2593	0.2586	0.2585	0.2585	0.2583	0.2582	0.2582	0.2581	0.2580	0.2579	0.2578	0.2578			
19	0.2587	0.2580	0.2581	0.2579	0.2578	0.2576	0.2576	0.2575	0.2575	0.2572	0.2572	0.2572			
20	0.2596	0.2588	0.2589	0.2588	0.2587	0.2586	0.2586	0.2586	0.2585	0.2584	0.2584	0.2584			
21	0.2588	0.2581	0.2580	0.2580	0.2578	0.2577	0.2576	0.2575	0.2575	0.2574	0.2573	0.2572			
22	0.2585	0.2578	0.2577	0.2577	0.2577	0.2575	0.2574	0.2573	0.2573	0.2571	0.2571	0.2569			
23	0.2596	0.2587	0.2588	0.2586	0.2586	0.2586	0.2585	0.2584	0.2585	0.2582	0.2582	0.2582			
24	0.2610	0.2602	0.2602	0.2601	0.2600	0.2599	0.2598	0.2597	0.2597	0.2595	0.2595	0.2594			
25	0.2607	0.2600	0.2599	0.2599	0.2597	0.2596	0.2596	0.2595	0.2596	0.2594	0.2594	0.2593			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.2592	0.2584	0.2584	0.2584	0.2582	0.2581	0.2581	0.2580	0.2580	0.2578	0.2578	0.2577			
Med.	0.2592	0.2584	0.2585	0.2585	0.2583	0.2582	0.2582	0.2580	0.2580	0.2578	0.2578	0.2578			
σ	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0010	0.0010	0.0010			
Min.	0.2570	0.2565	0.2564	0.2563	0.2561	0.2561	0.2560	0.2559	0.2559	0.2558	0.2557	0.2556			
Max.	0.2610	0.2602	0.2602	0.2601	0.2600	0.2599	0.2598	0.2597	0.2597	0.2595	0.2595	0.2594			

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Data Set 3 : 55 °C, 180 mA

Actual Case Temperature [T _s]	56.5 °C
Actual Ambient Temperature [T _A]	55.6 °C
Drive Current [I _F]	180 mA
Measurement Current	180 mA

NOTES:
T_s and T_A were measured during initial setup.

TABLE 3-6
Chromaticity

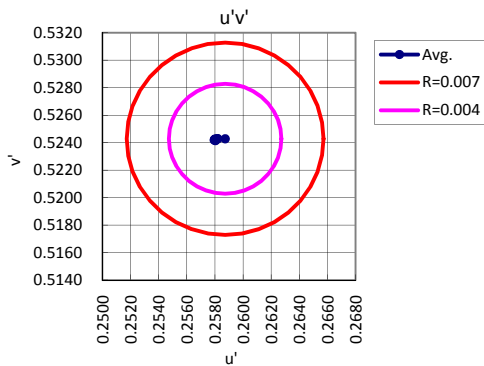
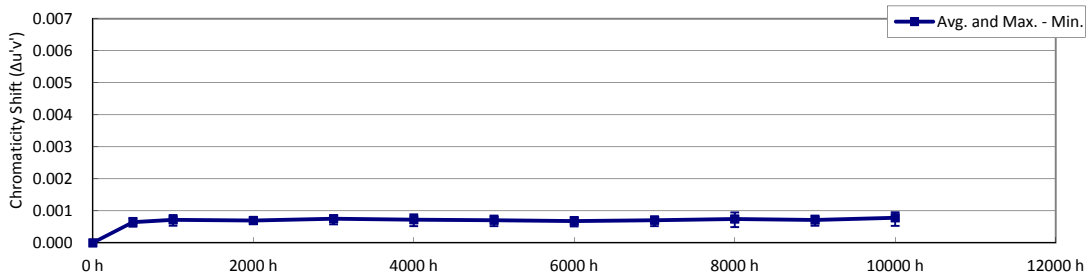
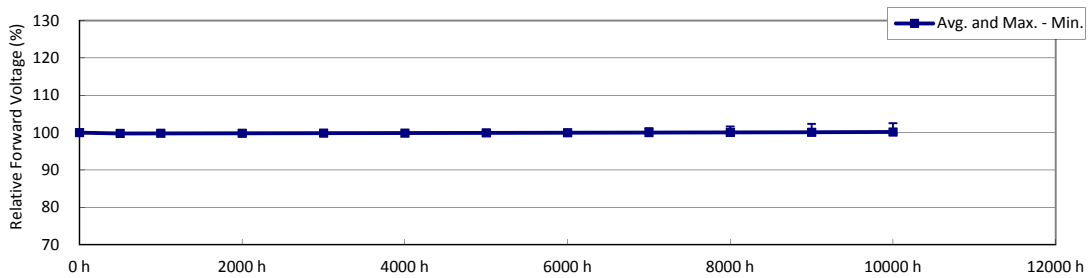
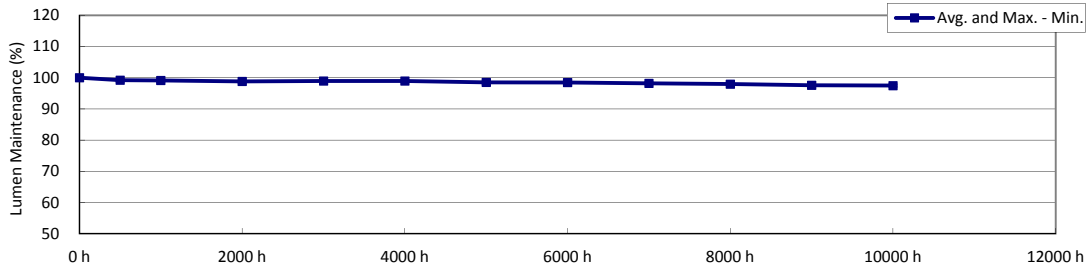
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5252	0.5251	0.5251	0.5251	0.5251	0.5250	0.5251	0.5252	0.5251	0.5252	0.5252	0.5252			
2	0.5240	0.5241	0.5240	0.5240	0.5241	0.5240	0.5240	0.5240	0.5240	0.5240	0.5240	0.5240	0.5242		
3	0.5246	0.5247	0.5246	0.5245	0.5245	0.5245	0.5244	0.5245	0.5244	0.5245	0.5246	0.5245			
4	0.5212	0.5213	0.5213	0.5212	0.5212	0.5212	0.5212	0.5213	0.5212	0.5213	0.5213	0.5213	0.5213		
5	0.5237	0.5237	0.5237	0.5236	0.5237	0.5236	0.5237	0.5237	0.5237	0.5237	0.5238	0.5238	0.5237		
6	0.5227	0.5228	0.5227	0.5227	0.5227	0.5227	0.5227	0.5227	0.5227	0.5228	0.5227	0.5227	0.5227		
7	0.5237	0.5237	0.5237	0.5237	0.5237	0.5236	0.5237	0.5237	0.5237	0.5238	0.5238	0.5238	0.5238		
8	0.5246	0.5246	0.5245	0.5245	0.5245	0.5245	0.5245	0.5246	0.5246	0.5246	0.5246	0.5246	0.5247		
9	0.5248	0.5248	0.5248	0.5249	0.5247	0.5249	0.5248	0.5249	0.5248	0.5249	0.5250	0.5249	0.5249		
10	0.5247	0.5247	0.5247	0.5246	0.5246	0.5246	0.5246	0.5247	0.5246	0.5248	0.5248	0.5248	0.5248		
11	0.5224	0.5223	0.5224	0.5223	0.5222	0.5223	0.5222	0.5223	0.5222	0.5223	0.5223	0.5223	0.5223		
12	0.5244	0.5244	0.5244	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243	0.5244	0.5244	0.5244	0.5244		
13	0.5253	0.5255	0.5253	0.5254	0.5253	0.5253	0.5254	0.5254	0.5253	0.5255	0.5255	0.5255	0.5255		
14	0.5240	0.5241	0.5240	0.5239	0.5240	0.5239	0.5240	0.5239	0.5241	0.5240	0.5240	0.5241	0.5241		
15	0.5240	0.5240	0.5240	0.5240	0.5239	0.5239	0.5239	0.5239	0.5240	0.5239	0.5239	0.5238	0.5238		
16	0.5221	0.5221	0.5220	0.5220	0.5220	0.5220	0.5220	0.5220	0.5221	0.5221	0.5221	0.5221	0.5221		
17	0.5214	0.5214	0.5214	0.5214	0.5213	0.5213	0.5213	0.5214	0.5214	0.5214	0.5215	0.5215	0.5215		
18	0.5234	0.5234	0.5233	0.5233	0.5233	0.5233	0.5232	0.5233	0.5233	0.5234	0.5234	0.5233	0.5233		
19	0.5256	0.5254	0.5254	0.5254	0.5254	0.5254	0.5253	0.5254	0.5253	0.5254	0.5254	0.5254	0.5254		
20	0.5260	0.5260	0.5260	0.5260	0.5260	0.5259	0.5260	0.5260	0.5259	0.5260	0.5260	0.5260	0.5260		
21	0.5226	0.5225	0.5225	0.5225	0.5225	0.5224	0.5224	0.5225	0.5224	0.5225	0.5225	0.5225	0.5225		
22	0.5243	0.5243	0.5242	0.5242	0.5241	0.5241	0.5241	0.5241	0.5241	0.5242	0.5242	0.5242	0.5242		
23	0.5255	0.5256	0.5256	0.5256	0.5256	0.5255	0.5256	0.5257	0.5256	0.5256	0.5257	0.5257	0.5257		
24	0.5234	0.5234	0.5234	0.5234	0.5233	0.5234	0.5233	0.5233	0.5233	0.5235	0.5235	0.5235	0.5235		
25	0.5229	0.5228	0.5229	0.5228	0.5228	0.5228	0.5228	0.5228	0.5228	0.5229	0.5229	0.5229	0.5229		
n	25	25	25	25	25	25	25	25	25	25	25	25	25		
Avg.	0.5239	0.5239	0.5238	0.5238	0.5238	0.5238	0.5238	0.5238	0.5238	0.5239	0.5239	0.5239	0.5239		
Med.	0.5240	0.5241	0.5240	0.5240	0.5240	0.5239	0.5240	0.5240	0.5239	0.5240	0.5240	0.5240	0.5241		
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	0.0013		
Min.	0.5212	0.5213	0.5213	0.5212	0.5212	0.5212	0.5212	0.5213	0.5212	0.5213	0.5213	0.5213	0.5213		
Max.	0.5260	0.5260	0.5260	0.5260	0.5260	0.5259	0.5260	0.5260	0.5259	0.5260	0.5260	0.5260	0.5260		

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Data Set 4 : 85 °C, 65 mA

Actual Case Temperature [T _S]	85.1 °C
Actual Ambient Temperature [T _A]	83.8 °C
Drive Current [I _F]	65 mA
Measurement Current	65 mA

NOTES:
T_S and T_A were measured during initial setup.



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Data Set 4 : 85 °C, 65 mA

Actual Case Temperature [T _s]	85.1 °C
Actual Ambient Temperature [T _A]	83.8 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	29.7	2.88	2796	0.453	0.411	0.258	0.526					
2	29.6	2.88	2799	0.451	0.407	0.258	0.525					
3	29.4	2.88	2783	0.451	0.406	0.259	0.524					
4	29.8	2.89	2836	0.447	0.405	0.257	0.523					
5	29.1	2.88	2758	0.452	0.404	0.260	0.524					
6	29.6	2.88	2843	0.445	0.401	0.257	0.521					
7	29.4	2.88	2756	0.454	0.406	0.260	0.525					
8	30.0	2.88	2844	0.449	0.408	0.256	0.525					
9	29.5	2.88	2807	0.450	0.405	0.258	0.524					
10	29.7	2.88	2772	0.454	0.410	0.259	0.526					
11	29.8	2.89	2842	0.449	0.408	0.257	0.524					
12	29.3	2.88	2805	0.448	0.402	0.259	0.522					
13	29.7	2.88	2854	0.447	0.406	0.256	0.524					
14	29.6	2.88	2811	0.450	0.407	0.258	0.525					
15	29.7	2.88	2831	0.450	0.410	0.257	0.526					
16	29.5	2.88	2806	0.449	0.404	0.258	0.523					
17	29.4	2.88	2764	0.452	0.404	0.260	0.523					
18	29.3	2.88	2754	0.453	0.405	0.261	0.524					
19	29.6	2.89	2790	0.451	0.405	0.259	0.524					
20	29.7	2.88	2800	0.452	0.408	0.258	0.525					
21	29.5	2.89	2770	0.453	0.408	0.260	0.525					
22	29.3	2.87	2755	0.457	0.412	0.260	0.527					
23	29.4	2.89	2763	0.451	0.403	0.260	0.523					
24	29.3	2.88	2763	0.454	0.408	0.260	0.525					
25	29.5	2.89	2772	0.453	0.407	0.260	0.525					
n	25	25	25	25	25	25	25					
Avg.	29.5	2.88	2795	0.451	0.406	0.259	0.524					
Med.	29.5	2.88	2796	0.451	0.406	0.259	0.524					
σ	0.20	0.003	32.3	0.0026	0.0026	0.0014	0.0013					
Min.	29.1	2.87	2754	0.445	0.401	0.256	0.521					
Max.	30.0	2.89	2854	0.457	0.412	0.261	0.527					

Data Set 4 : 85 °C, 65 mA

Actual Case Temperature [T _S]	85.1 °C
Actual Ambient Temperature [T _A]	83.8 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	99.3	99.2	98.8	99.0	98.9	98.6	98.5	98.2	98.0	97.6	97.5
2	100.0	99.1	99.0	98.7	98.9	98.9	98.5	98.4	98.2	97.9	97.7	97.6
3	100.0	99.2	99.0	98.8	99.0	99.0	98.6	98.5	98.3	98.1	97.8	97.7
4	100.0	99.2	99.1	98.8	99.0	99.0	98.6	98.5	98.2	98.0	97.7	97.6
5	100.0	99.3	99.2	98.9	99.1	98.9	98.6	98.5	98.4	98.1	97.8	97.7
6	100.0	99.2	99.1	98.9	99.1	99.0	98.6	98.5	98.1	97.7	97.3	97.3
7	100.0	99.2	99.1	98.9	99.0	99.0	98.6	98.6	98.0	97.7	97.4	97.1
8	100.0	99.3	99.2	98.9	99.0	99.0	98.6	98.5	98.3	98.1	97.8	97.6
9	100.0	99.2	99.1	98.9	99.0	98.9	98.5	98.4	98.2	98.0	97.6	97.6
10	100.0	98.8	98.7	98.5	98.6	98.6	98.1	98.1	97.9	97.7	97.3	97.2
11	100.0	99.3	99.2	98.9	99.0	99.0	98.6	98.5	98.3	98.1	97.7	97.5
12	100.0	99.2	99.1	98.8	98.9	99.0	98.5	98.4	98.2	98.0	97.7	97.5
13	100.0	99.5	99.5	99.0	99.2	99.3	98.7	98.7	98.5	98.4	97.9	97.8
14	100.0	99.1	99.1	98.8	98.9	99.0	98.6	98.5	98.3	98.1	97.7	97.6
15	100.0	99.2	99.1	98.7	98.8	98.9	98.4	98.4	98.2	98.0	97.6	97.5
16	100.0	99.2	99.3	99.0	98.9	99.1	98.6	98.6	98.0	97.8	97.4	97.3
17	100.0	99.2	99.2	98.9	98.8	99.1	98.6	98.6	97.9	97.7	97.5	97.2
18	100.0	99.2	99.1	98.9	98.9	99.0	98.5	98.5	98.2	98.0	97.6	97.5
19	100.0	99.3	99.2	98.8	98.9	98.9	98.5	98.4	98.3	98.0	97.7	97.5
20	100.0	99.4	99.3	98.9	99.1	99.2	98.6	98.6	98.4	98.2	97.9	97.7
21	100.0	99.1	99.0	98.7	98.8	98.8	98.3	98.3	98.2	98.0	97.6	97.5
22	100.0	99.2	99.0	98.7	98.9	98.8	98.4	98.2	98.0	97.7	97.2	97.1
23	100.0	99.4	99.3	99.0	99.2	99.1	98.6	98.5	98.3	98.2	97.8	97.7
24	100.0	98.9	98.9	98.6	98.7	98.7	98.2	98.3	98.0	97.8	97.4	97.4
25	100.0	99.3	99.2	99.0	99.0	99.0	98.6	98.5	98.2	97.9	97.4	97.4
n	25	25	25	25	25	25	25	25	25	25	25	25
Avg.	100.0	99.2	99.1	98.8	99.0	99.0	98.5	98.5	98.2	98.0	97.6	97.5
Med.	100.0	99.2	99.1	98.9	99.0	99.0	98.6	98.5	98.2	98.0	97.6	97.5
σ	0.00	0.15	0.15	0.12	0.13	0.15	0.13	0.14	0.17	0.18	0.18	0.19
Min.	100.0	98.8	98.7	98.5	98.6	98.6	98.1	98.1	97.9	97.7	97.2	97.1
Max.	100.0	99.5	99.5	99.0	99.2	99.3	98.7	98.7	98.5	98.4	97.9	97.8

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0148	-0.0155	-0.0182	-0.0205	-0.0243	-0.0255

Test duration used	5000 h to 10000 h
B	0.9978
α	2.3485E-06
R ²	0.9717
Calculated L ₇₀ (10K)	151000 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	94100 hours
Reported L ₈₀ (10K)	> 60000 hours
Calculated L ₉₀ (10K)	43900 hours
Reported L ₉₀ (10K)	43900 hours

Curve-fit equation:

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

Lumen maintenance life equation:

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

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

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

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Data Set 4 : 85 °C, 65 mA

Actual Case Temperature [T _S]	85.1 °C
Actual Ambient Temperature [T _A]	83.8 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	99.8	99.9	99.8	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0			
2	100.0	99.8	99.9	99.9	99.8	99.9	99.9	100.0	99.8	100.0	99.9	100.0			
3	100.0	99.8	99.7	99.9	99.9	99.8	100.0	99.9	99.9	99.9	100.0	100.1			
4	100.0	99.9	99.8	99.9	100.0	99.9	100.0	100.0	99.9	100.0	100.0	100.1			
5	100.0	99.7	99.8	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	100.0			
6	100.0	99.6	99.9	99.9	99.8	99.8	99.9	99.9	99.9	99.9	99.9	100.0			
7	100.0	99.8	100.0	99.8	99.9	100.0	100.0	100.0	100.0	100.1	100.0	100.1			
8	100.0	99.8	99.9	99.9	100.0	99.8	100.0	99.9	99.9	99.9	99.9	100.0			
9	100.0	99.7	99.8	99.9	99.8	99.8	99.8	99.9	99.9	100.0	100.0	100.0			
10	100.0	99.7	99.7	99.8	99.6	99.7	99.9	99.9	99.9	100.0	99.9	99.9			
11	100.0	99.8	100.0	99.8	99.7	99.8	99.9	99.8	99.9	99.8	100.0	99.9			
12	100.0	99.8	99.9	99.8	99.8	99.8	99.9	100.0	99.9	99.9	100.0	99.9			
13	100.0	99.7	99.8	99.8	99.8	99.8	99.9	100.0	99.8	99.9	100.0	100.1			
14	100.0	99.8	100.0	99.9	99.8	99.8	99.9	100.0	99.9	99.9	99.9	100.0			
15	100.0	99.8	99.6	99.8	100.0	99.8	99.9	99.9	99.9	99.9	99.9	100.0			
16	100.0	99.8	99.9	99.9	100.1	100.0	99.9	99.9	99.9	100.0	99.9	100.0			
17	100.0	100.0	99.9	99.7	99.8	100.0	99.9	100.0	99.9	99.9	99.9	100.0			
18	100.0	99.9	99.9	99.9	99.9	100.1	100.0	100.0	100.0	100.0	99.9	100.0			
19	100.0	99.8	99.9	99.8	100.0	100.0	100.0	100.0	100.0	99.9	99.9	100.0			
20	100.0	99.8	99.7	99.8	99.8	99.9	100.0	99.9	99.9	99.9	99.9	99.9			
21	100.0	99.8	99.7	99.8	99.7	99.8	99.8	99.8	99.8	99.8	99.8	99.9			
22	100.0	99.7	99.8	99.8	99.9	100.1	100.3	100.6	101.2	101.5	101.9	102.1			
23	100.0	99.8	99.8	99.7	99.8	99.9	99.8	99.9	99.9	99.9	99.9	100.0			
24	100.0	99.7	99.6	99.7	99.8	99.9	99.7	99.8	99.8	99.7	99.8	99.7			
25	100.0	99.7	99.8	99.8	99.9	99.9	100.4	100.7	101.2	101.6	102.3	102.5			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	100.0	99.8	99.8	99.8	99.9	99.9	99.9	100.0	100.0	100.1	100.1	100.2			
Med.	100.0	99.8	99.8	99.8	99.8	99.9	99.9	99.9	99.9	99.9	99.9	100.0			
σ	0.00	0.07	0.10	0.06	0.11	0.10	0.14	0.22	0.36	0.46	0.62	0.66			
Min.	100.0	99.6	99.6	99.7	99.6	99.7	99.7	99.8	99.8	99.7	99.8	99.7			
Max.	100.0	100.0	100.0	99.9	100.1	100.1	100.4	100.7	101.2	101.6	102.3	102.5			

Data Set 4 : 85 °C, 65 mA

Actual Case Temperature [T _S]	85.1 °C
Actual Ambient Temperature [T _A]	83.8 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	0.0008	0.0007	0.0008	0.0009	0.0008	0.0008	0.0007	0.0008	0.0008	0.0008	0.0009			
2	0.0000	0.0008	0.0009	0.0007	0.0007	0.0008	0.0008	0.0008	0.0007	0.0008	0.0008	0.0010			
3	0.0000	0.0007	0.0007	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0008	0.0007	0.0008			
4	0.0000	0.0007	0.0008	0.0007	0.0008	0.0008	0.0008	0.0007	0.0008	0.0008	0.0009	0.0009			
5	0.0000	0.0007	0.0008	0.0008	0.0008	0.0007	0.0006	0.0007	0.0008	0.0006	0.0006	0.0008			
6	0.0000	0.0006	0.0007	0.0008	0.0008	0.0009	0.0008	0.0008	0.0008	0.0009	0.0008	0.0010			
7	0.0000	0.0006	0.0008	0.0007	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008			
8	0.0000	0.0007	0.0007	0.0006	0.0007	0.0006	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007			
9	0.0000	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008	0.0008	0.0007			
10	0.0000	0.0006	0.0007	0.0007	0.0007	0.0008	0.0007	0.0007	0.0007	0.0008	0.0007	0.0007			
11	0.0000	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007	0.0008			
12	0.0000	0.0007	0.0007	0.0007	0.0008	0.0008	0.0008	0.0007	0.0007	0.0008	0.0007	0.0008			
13	0.0000	0.0006	0.0007	0.0006	0.0008	0.0008	0.0007	0.0005	0.0008	0.0007	0.0007	0.0008			
14	0.0000	0.0007	0.0007	0.0007	0.0008	0.0007	0.0008	0.0006	0.0007	0.0008	0.0008	0.0008			
15	0.0000	0.0005	0.0005	0.0006	0.0006	0.0006	0.0005	0.0005	0.0006	0.0006	0.0007	0.0006			
16	0.0000	0.0007	0.0007	0.0007	0.0008	0.0008	0.0007	0.0007	0.0007	0.0008	0.0007	0.0007			
17	0.0000	0.0006	0.0007	0.0008	0.0008	0.0008	0.0007	0.0008	0.0008	0.0008	0.0008	0.0008			
18	0.0000	0.0006	0.0008	0.0007	0.0007	0.0008	0.0007	0.0007	0.0007	0.0007	0.0006	0.0009			
19	0.0000	0.0006	0.0007	0.0006	0.0006	0.0005	0.0006	0.0005	0.0006	0.0005	0.0006	0.0005			
20	0.0000	0.0005	0.0006	0.0006	0.0008	0.0006	0.0006	0.0006	0.0006	0.0006	0.0008	0.0007			
21	0.0000	0.0008	0.0007	0.0007	0.0009	0.0008	0.0008	0.0007	0.0008	0.0008	0.0008	0.0009			
22	0.0000	0.0007	0.0008	0.0007	0.0007	0.0007	0.0007	0.0008	0.0007	0.0008	0.0007	0.0007			
23	0.0000	0.0007	0.0008	0.0007	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0007			
24	0.0000	0.0006	0.0007	0.0006	0.0007	0.0006	0.0006	0.0006	0.0005	0.0005	0.0006	0.0007			
25	0.0000	0.0006	0.0008	0.0008	0.0008	0.0007	0.0006	0.0006	0.0005	0.0005	0.0005	0.0007			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.0000	0.0006	0.0007	0.0007	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0008			
Med.	0.0000	0.0006	0.0007	0.0007	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0008	0.0007			
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	0.0005	0.0005	0.0006	0.0006	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005			
Max.	0.0000	0.0008	0.0009	0.0008	0.0009	0.0009	0.0008	0.0008	0.0008	0.0009	0.0009	0.0010			

Data Set 4 : 85 °C, 65 mA

Actual Case Temperature [T _s]	85.1 °C
Actual Ambient Temperature [T _A]	83.8 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	0.2587	0.2579	0.2579	0.2579	0.2578	0.2579	0.2578	0.2579	0.2578	0.2579	0.2578	0.2579			
2	0.2590	0.2582	0.2581	0.2582	0.2582	0.2582	0.2582	0.2582	0.2583	0.2582	0.2582	0.2580			
3	0.2597	0.2590	0.2590	0.2589	0.2589	0.2590	0.2590	0.2590	0.2590	0.2589	0.2590	0.2589			
4	0.2576	0.2569	0.2568	0.2569	0.2568	0.2568	0.2568	0.2568	0.2568	0.2568	0.2567	0.2567			
5	0.2610	0.2603	0.2603	0.2602	0.2602	0.2604	0.2605	0.2604	0.2603	0.2603	0.2604	0.2602			
6	0.2577	0.2571	0.2570	0.2569	0.2569	0.2568	0.2569	0.2569	0.2569	0.2568	0.2569	0.2568			
7	0.2610	0.2605	0.2603	0.2604	0.2602	0.2602	0.2602	0.2603	0.2602	0.2602	0.2602	0.2602			
8	0.2569	0.2562	0.2562	0.2562	0.2562	0.2563	0.2562	0.2561	0.2563	0.2561	0.2562	0.2562			
9	0.2588	0.2582	0.2580	0.2581	0.2581	0.2581	0.2581	0.2581	0.2580	0.2580	0.2580	0.2580			
10	0.2598	0.2591	0.2590	0.2591	0.2590	0.2590	0.2590	0.2590	0.2590	0.2590	0.2590	0.2591			
11	0.2570	0.2564	0.2564	0.2563	0.2563	0.2564	0.2563	0.2564	0.2563	0.2563	0.2563	0.2562			
12	0.2591	0.2584	0.2584	0.2584	0.2583	0.2583	0.2583	0.2584	0.2584	0.2583	0.2583	0.2582			
13	0.2565	0.2560	0.2558	0.2559	0.2558	0.2558	0.2558	0.2560	0.2558	0.2558	0.2558	0.2557			
14	0.2583	0.2576	0.2576	0.2576	0.2575	0.2575	0.2575	0.2577	0.2575	0.2575	0.2575	0.2575			
15	0.2571	0.2566	0.2566	0.2565	0.2565	0.2565	0.2566	0.2566	0.2566	0.2565	0.2565	0.2566			
16	0.2590	0.2584	0.2584	0.2583	0.2583	0.2583	0.2583	0.2583	0.2584	0.2583	0.2584	0.2583			
17	0.2608	0.2601	0.2601	0.2600	0.2600	0.2600	0.2601	0.2600	0.2600	0.2600	0.2600	0.2599			
18	0.2610	0.2604	0.2602	0.2604	0.2604	0.2602	0.2603	0.2603	0.2604	0.2603	0.2604	0.2602			
19	0.2594	0.2588	0.2588	0.2588	0.2588	0.2589	0.2589	0.2589	0.2588	0.2589	0.2588	0.2589			
20	0.2586	0.2581	0.2580	0.2580	0.2578	0.2580	0.2580	0.2580	0.2581	0.2580	0.2579	0.2579			
21	0.2600	0.2592	0.2593	0.2593	0.2592	0.2592	0.2592	0.2593	0.2592	0.2592	0.2592	0.2591			
22	0.2604	0.2597	0.2596	0.2597	0.2597	0.2597	0.2597	0.2596	0.2597	0.2596	0.2598	0.2598			
23	0.2609	0.2602	0.2601	0.2602	0.2601	0.2601	0.2601	0.2602	0.2601	0.2601	0.2602	0.2600			
24	0.2603	0.2598	0.2597	0.2598	0.2596	0.2597	0.2597	0.2597	0.2598	0.2598	0.2598	0.2596			
25	0.2600	0.2594	0.2592	0.2592	0.2592	0.2593	0.2595	0.2594	0.2595	0.2595	0.2595	0.2593			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.2591	0.2585	0.2584	0.2585	0.2584	0.2584	0.2584	0.2585	0.2585	0.2584	0.2584	0.2584			
Med.	0.2591	0.2584	0.2584	0.2584	0.2583	0.2583	0.2583	0.2584	0.2584	0.2583	0.2584	0.2583			
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.	0.2565	0.2560	0.2558	0.2559	0.2558	0.2558	0.2558	0.2560	0.2558	0.2558	0.2558	0.2557			
Max.	0.2610	0.2605	0.2603	0.2604	0.2604	0.2604	0.2605	0.2604	0.2604	0.2603	0.2604	0.2602			

Data Set 4 : 85 °C, 65 mA

Actual Case Temperature [T _S]	85.1 °C
Actual Ambient Temperature [T _A]	83.8 °C
Drive Current [I _F]	65 mA
Measurement Current	65 mA

NOTES:

T_S and T_A were measured during initial setup.

TABLE 4-6
Chromaticity

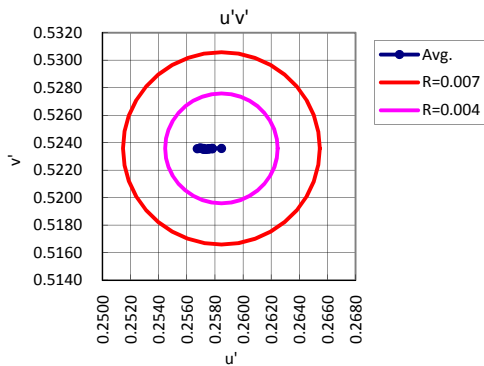
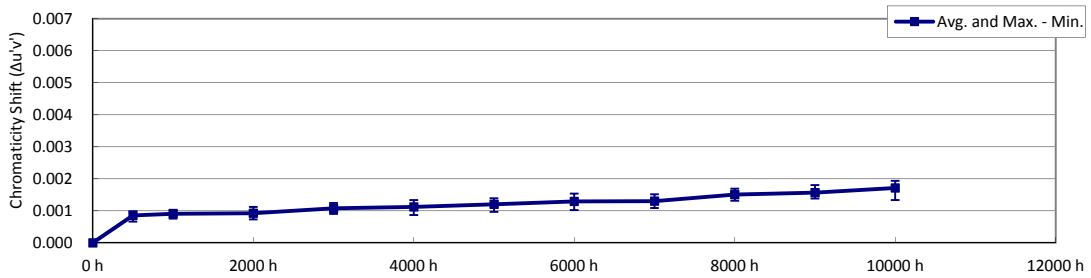
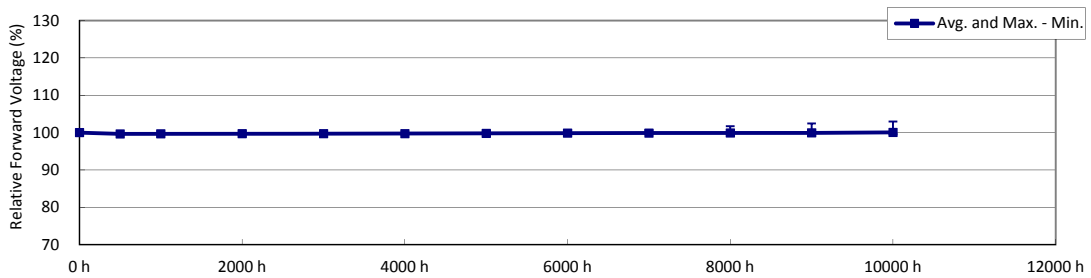
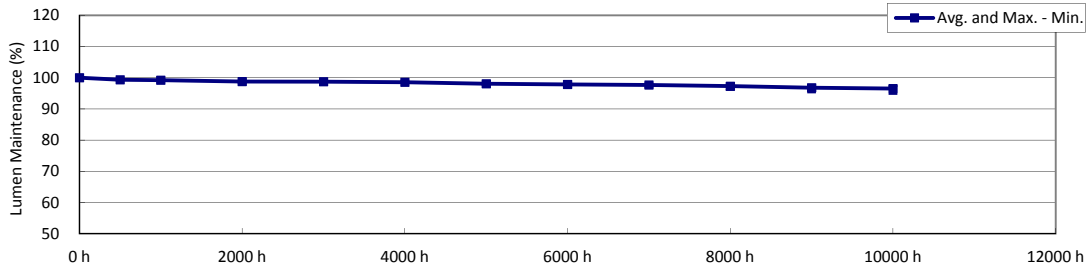
LED No.	Chromaticity v'														
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h			
1	0.5262	0.5262	0.5261	0.5262	0.5262	0.5262	0.5262	0.5262	0.5261	0.5261	0.5261	0.5261			
2	0.5244	0.5244	0.5243	0.5243	0.5244	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243	0.5243			
3	0.5241	0.5242	0.5240	0.5241	0.5240	0.5240	0.5240	0.5240	0.5240	0.5241	0.5240	0.5240			
4	0.5231	0.5231	0.5230	0.5230	0.5231	0.5231	0.5230	0.5230	0.5229	0.5231	0.5230	0.5230			
5	0.5238	0.5237	0.5238	0.5237	0.5237	0.5237	0.5237	0.5237	0.5236	0.5237	0.5237	0.5237			
6	0.5213	0.5213	0.5212	0.5212	0.5213	0.5213	0.5212	0.5212	0.5211	0.5212	0.5212	0.5212			
7	0.5247	0.5246	0.5246	0.5246	0.5246	0.5246	0.5246	0.5246	0.5246	0.5246	0.5246	0.5246			
8	0.5245	0.5245	0.5244	0.5244	0.5244	0.5244	0.5245	0.5245	0.5244	0.5245	0.5244	0.5244			
9	0.5235	0.5235	0.5234	0.5234	0.5235	0.5234	0.5234	0.5234	0.5234	0.5234	0.5233	0.5234			
10	0.5260	0.5260	0.5259	0.5260	0.5260	0.5259	0.5259	0.5259	0.5258	0.5259	0.5259	0.5259			
11	0.5243	0.5242	0.5242	0.5241	0.5242	0.5241	0.5242	0.5241	0.5241	0.5242	0.5241	0.5241			
12	0.5219	0.5219	0.5218	0.5218	0.5219	0.5219	0.5219	0.5218	0.5218	0.5218	0.5218	0.5218			
13	0.5236	0.5236	0.5235	0.5236	0.5235	0.5235	0.5235	0.5236	0.5235	0.5236	0.5235	0.5234			
14	0.5245	0.5245	0.5244	0.5244	0.5245	0.5244	0.5245	0.5245	0.5244	0.5245	0.5244	0.5244			
15	0.5253	0.5253	0.5252	0.5252	0.5252	0.5252	0.5252	0.5252	0.5251	0.5253	0.5252	0.5252			
16	0.5229	0.5230	0.5230	0.5230	0.5230	0.5230	0.5229	0.5230	0.5229	0.5229	0.5229	0.5229			
17	0.5234	0.5233	0.5233	0.5233	0.5234	0.5233	0.5232	0.5233	0.5232	0.5233	0.5233	0.5233			
18	0.5239	0.5239	0.5238	0.5239	0.5238	0.5239	0.5239	0.5239	0.5238	0.5239	0.5238	0.5239			
19	0.5235	0.5235	0.5235	0.5235	0.5235	0.5234	0.5235	0.5235	0.5234	0.5235	0.5235	0.5234			
20	0.5248	0.5248	0.5248	0.5248	0.5248	0.5249	0.5249	0.5249	0.5248	0.5249	0.5248	0.5248			
21	0.5251	0.5252	0.5251	0.5251	0.5251	0.5251	0.5250	0.5251	0.5250	0.5251	0.5250	0.5251			
22	0.5271	0.5271	0.5271	0.5270	0.5270	0.5270	0.5269	0.5269	0.5268	0.5268	0.5269	0.5268			
23	0.5227	0.5227	0.5226	0.5226	0.5227	0.5227	0.5227	0.5227	0.5226	0.5226	0.5227	0.5226			
24	0.5250	0.5250	0.5250	0.5250	0.5251	0.5250	0.5250	0.5250	0.5250	0.5250	0.5250	0.5250			
25	0.5248	0.5247	0.5247	0.5247	0.5247	0.5248	0.5246	0.5247	0.5246	0.5246	0.5246	0.5247			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.5242	0.5242	0.5241	0.5241	0.5241	0.5241	0.5241	0.5241	0.5240	0.5241	0.5241	0.5241			
Med.	0.5243	0.5242	0.5242	0.5241	0.5242	0.5241	0.5242	0.5241	0.5241	0.5242	0.5241	0.5241			
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.	0.5213	0.5213	0.5212	0.5212	0.5213	0.5213	0.5212	0.5212	0.5211	0.5212	0.5212	0.5212			
Max.	0.5271	0.5271	0.5271	0.5270	0.5270	0.5270	0.5269	0.5269	0.5268	0.5268	0.5269	0.5268			

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Data Set 5 : 85 °C, 150 mA

Actual Case Temperature [T _S]	85.4 °C
Actual Ambient Temperature [T _A]	83.0 °C
Drive Current [I _F]	150 mA
Measurement Current	150 mA

NOTES:
T_S and T_A were measured during initial setup.



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Data Set 5 : 85 °C, 150 mA

Actual Case Temperature [T _s]	85.4 °C
Actual Ambient Temperature [T _A]	83.0 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	63.6	3.12	2840	0.446	0.402	0.257	0.522						
2	63.4	3.12	2831	0.446	0.401	0.258	0.521						
3	63.5	3.12	2795	0.452	0.407	0.259	0.525						
4	63.4	3.11	2808	0.451	0.408	0.258	0.525						
5	63.6	3.12	2788	0.452	0.407	0.259	0.525						
6	62.9	3.12	2782	0.451	0.404	0.259	0.524						
7	63.2	3.12	2787	0.451	0.405	0.259	0.524						
8	63.7	3.11	2834	0.447	0.403	0.257	0.522						
9	63.2	3.11	2774	0.450	0.403	0.260	0.523						
10	62.8	3.12	2834	0.446	0.403	0.257	0.522						
11	62.9	3.10	2794	0.450	0.405	0.259	0.524						
12	63.5	3.12	2835	0.447	0.405	0.257	0.523						
13	63.4	3.11	2784	0.452	0.407	0.259	0.525						
14	63.2	3.11	2859	0.442	0.397	0.257	0.519						
15	63.6	3.11	2812	0.450	0.407	0.258	0.524						
16	62.9	3.12	2793	0.449	0.403	0.259	0.523						
17	62.7	3.11	2755	0.453	0.404	0.261	0.524						
18	63.1	3.12	2793	0.451	0.405	0.259	0.524						
19	63.0	3.12	2809	0.447	0.400	0.259	0.521						
20	63.6	3.12	2802	0.450	0.406	0.258	0.524						
21	63.5	3.12	2795	0.452	0.409	0.258	0.526						
22	63.2	3.10	2755	0.457	0.413	0.260	0.528						
23	63.4	3.12	2762	0.454	0.409	0.260	0.526						
24	63.8	3.12	2796	0.452	0.408	0.258	0.525						
25	63.8	3.12	2840	0.447	0.404	0.257	0.523						
n	25	25	25	25	25	25	25						
Avg.	63.3	3.11	2802	0.450	0.405	0.258	0.524						
Med.	63.4	3.12	2795	0.450	0.405	0.259	0.524						
σ	0.31	0.004	27.9	0.0033	0.0033	0.0010	0.0018						
Min.	62.7	3.10	2755	0.442	0.397	0.257	0.519						
Max.	63.8	3.12	2859	0.457	0.413	0.261	0.528						

Data Set 5 : 85 °C, 150 mA

Actual Case Temperature [T _s]	85.4 °C
Actual Ambient Temperature [T _A]	83.0 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	99.3	99.2	98.8	98.7	98.4	97.9	97.7	97.5	97.0	96.4	96.0
2	100.0	99.3	99.2	98.8	98.6	98.5	98.0	97.7	97.6	97.1	96.5	96.3
3	100.0	99.4	99.3	98.9	98.9	98.7	98.1	98.0	97.9	97.6	97.2	97.0
4	100.0	99.4	99.4	99.0	98.8	98.6	98.0	98.0	97.8	97.5	97.1	96.9
5	100.0	99.7	99.6	99.0	99.0	98.8	98.3	98.1	97.7	97.5	96.9	96.6
6	100.0	99.5	99.4	99.0	99.0	98.8	98.3	98.0	97.6	97.3	96.8	96.7
7	100.0	99.5	99.4	99.0	99.0	98.9	98.3	98.2	98.1	97.8	97.4	97.2
8	100.0	99.4	99.3	98.9	98.8	98.6	98.2	98.0	97.7	97.3	96.8	96.2
9	100.0	99.4	99.2	98.9	98.7	98.6	98.0	97.9	97.7	97.4	97.0	96.8
10	100.0	99.4	99.3	98.7	98.7	98.6	98.0	97.8	97.7	97.1	96.5	96.2
11	100.0	99.1	99.0	98.6	98.6	98.4	97.9	97.7	97.8	97.4	97.1	96.9
12	100.0	99.4	99.2	98.7	98.9	98.6	98.1	98.1	98.0	97.6	97.2	96.9
13	100.0	99.5	99.3	98.9	98.9	98.7	98.2	98.1	98.0	97.7	97.2	96.9
14	100.0	99.3	99.1	98.6	98.5	98.3	97.8	97.6	97.1	96.7	96.2	95.8
15	100.0	99.5	99.3	98.9	98.8	98.7	98.3	98.1	97.7	97.4	96.8	96.6
16	100.0	99.2	99.1	98.6	98.6	98.3	97.8	97.7	97.4	97.0	96.2	95.9
17	100.0	99.1	98.9	98.4	98.5	98.3	97.9	97.7	97.6	97.3	96.9	96.7
18	100.0	99.4	99.3	98.8	98.9	98.9	98.4	98.1	98.1	97.8	97.4	97.3
19	100.0	99.2	99.2	98.7	98.7	98.6	98.0	97.8	97.7	97.4	97.1	96.9
20	100.0	99.3	99.1	98.6	98.7	98.6	98.2	97.9	97.9	97.7	97.2	97.2
21	100.0	99.4	99.3	98.8	98.7	98.4	97.8	97.7	97.5	97.1	96.5	96.1
22	100.0	99.1	99.1	98.7	98.5	98.3	97.6	97.2	96.8	96.1	95.3	94.8
23	100.0	99.1	99.0	98.6	98.6	98.5	98.1	97.7	97.7	97.4	97.0	96.8
24	100.0	99.3	99.2	98.8	98.8	98.6	98.2	97.9	97.7	97.4	96.8	96.7
25	100.0	99.3	99.1	98.7	98.7	98.5	98.0	97.6	97.3	96.8	96.2	95.7
n	25	25	25	25	25	25	25	25	25	25	25	25
Avg.	100.0	99.4	99.2	98.8	98.7	98.6	98.1	97.9	97.7	97.3	96.8	96.5
Med.	100.0	99.4	99.2	98.8	98.7	98.6	98.0	97.9	97.7	97.4	96.9	96.7
σ	0.00	0.14	0.15	0.16	0.16	0.17	0.19	0.23	0.30	0.37	0.47	0.58
Min.	100.0	99.1	98.9	98.4	98.5	98.3	97.6	97.2	96.8	96.1	95.3	94.8
Max.	100.0	99.7	99.6	99.0	99.0	98.9	98.4	98.2	98.1	97.8	97.4	97.3

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0195	-0.0217	-0.0236	-0.0273	-0.0327	-0.0353

Test duration used	5000 h to 10000 h
B	0.9980
α	3.2986E-06
R ²	0.9722
Calculated L ₇₀ (10K)	108000 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	67100 hours
Reported L ₈₀ (10K)	> 60000 hours
Calculated L ₉₀ (10K)	31300 hours
Reported L ₉₀ (10K)	31300 hours

Curve-fit equation:

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

Lumen maintenance life equation:

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

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

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

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Data Set 5 : 85 °C, 150 mA

Actual Case Temperature [T _s]	85.4 °C
Actual Ambient Temperature [T _A]	83.0 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	99.7	99.7	99.8	99.7	99.9	99.8	100.0	99.9	99.8	99.8	99.9			
2	100.0	99.6	99.6	99.8	99.8	99.8	99.9	100.1	100.7	101.7	102.4	103.0			
3	100.0	99.7	99.7	99.7	99.7	99.6	99.8	99.9	99.9	99.9	99.9	100.0			
4	100.0	99.7	99.6	99.7	99.8	99.7	99.7	99.8	99.8	99.7	99.7	99.8			
5	100.0	99.7	99.7	99.8	99.8	99.9	99.9	100.1	100.0	100.0	100.0	100.1			
6	100.0	99.6	99.7	99.8	99.7	99.8	99.9	99.9	99.9	99.9	99.9	100.0			
7	100.0	99.7	99.6	99.8	99.8	99.7	99.8	99.8	99.9	99.8	99.8	100.0			
8	100.0	99.7	99.8	99.7	99.8	99.9	99.8	99.9	99.9	99.8	99.9	99.8			
9	100.0	99.8	99.8	99.8	99.9	99.9	100.0	100.1	100.2	100.3	100.4	100.7			
10	100.0	99.7	99.9	99.8	99.8	99.7	99.9	99.9	99.8	99.8	99.8	99.9			
11	100.0	99.8	99.6	99.7	99.7	99.6	99.7	99.7	99.7	99.7	99.6	99.7			
12	100.0	99.5	99.5	99.6	99.6	99.5	99.6	99.6	99.6	99.7	99.6	99.6			
13	100.0	99.5	99.4	99.5	99.7	99.5	99.7	99.6	99.7	99.6	99.6	99.7			
14	100.0	99.6	99.7	99.6	99.7	99.7	99.8	99.7	99.8	99.8	99.8	99.9			
15	100.0	99.6	99.8	99.8	99.8	99.9	100.0	100.2	100.1	100.1	100.1	100.2			
16	100.0	99.5	99.7	99.7	99.9	99.7	99.7	99.7	99.8	99.8	99.7	99.9			
17	100.0	99.6	99.6	99.7	99.8	99.7	99.8	100.0	99.7	99.7	99.6	99.7			
18	100.0	99.7	99.6	99.6	99.7	99.7	99.8	99.6	99.7	99.7	99.7	99.8			
19	100.0	99.6	99.7	99.6	99.8	99.7	99.8	99.7	99.8	99.8	99.7	99.8			
20	100.0	99.7	99.7	99.8	99.8	99.6	99.8	99.9	99.8	99.8	99.7	99.8			
21	100.0	99.7	99.7	99.9	99.7	99.9	99.9	99.9	99.9	99.8	99.8	100.0			
22	100.0	99.7	99.7	99.7	99.7	99.7	99.8	99.8	99.8	99.8	99.8	99.9			
23	100.0	99.6	99.6	99.6	99.6	99.8	99.8	99.8	99.8	99.8	99.8	99.9			
24	100.0	99.7	99.8	99.8	99.8	99.6	99.9	100.0	100.0	100.1	100.1	100.3			
25	100.0	99.7	99.7	99.7	99.6	99.8	99.8	99.9	99.8	99.8	99.9	100.0			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	100.0	99.7	99.7	99.7	99.7	99.7	99.8	99.9	99.9	99.9	99.9	100.1			
Med.	100.0	99.7	99.7	99.7	99.8	99.7	99.8	99.9	99.8	99.8	99.8	99.9			
σ	0.00	0.07	0.10	0.10	0.08	0.12	0.10	0.17	0.21	0.40	0.56	0.64			
Min.	100.0	99.5	99.4	99.5	99.6	99.5	99.6	99.6	99.6	99.6	99.6	99.6			
Max.	100.0	99.8	99.9	99.9	99.9	99.9	100.0	100.2	100.7	101.7	102.4	103.0			

Data Set 5 : 85 °C, 150 mA

Actual Case Temperature [T _S]	85.4 °C
Actual Ambient Temperature [T _A]	83.0 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	0.0008	0.0009	0.0009	0.0012	0.0012	0.0013	0.0014	0.0013	0.0016	0.0018	0.0019			
2	0.0000	0.0009	0.0009	0.0008	0.0010	0.0011	0.0012	0.0013	0.0013	0.0015	0.0015	0.0017			
3	0.0000	0.0008	0.0009	0.0008	0.0010	0.0011	0.0011	0.0012	0.0013	0.0014	0.0015	0.0017			
4	0.0000	0.0008	0.0009	0.0009	0.0010	0.0010	0.0010	0.0010	0.0012	0.0013	0.0014	0.0016			
5	0.0000	0.0009	0.0008	0.0009	0.0009	0.0011	0.0012	0.0012	0.0012	0.0015	0.0015	0.0018			
6	0.0000	0.0008	0.0009	0.0009	0.0009	0.0010	0.0011	0.0011	0.0011	0.0013	0.0014	0.0016			
7	0.0000	0.0008	0.0009	0.0007	0.0010	0.0010	0.0011	0.0011	0.0011	0.0014	0.0014	0.0016			
8	0.0000	0.0007	0.0008	0.0008	0.0009	0.0009	0.0010	0.0012	0.0011	0.0014	0.0014	0.0013			
9	0.0000	0.0009	0.0010	0.0009	0.0011	0.0011	0.0012	0.0014	0.0013	0.0015	0.0016	0.0017			
10	0.0000	0.0008	0.0009	0.0009	0.0011	0.0012	0.0014	0.0014	0.0014	0.0015	0.0016	0.0019			
11	0.0000	0.0009	0.0009	0.0010	0.0011	0.0011	0.0012	0.0014	0.0014	0.0016	0.0016	0.0017			
12	0.0000	0.0009	0.0008	0.0008	0.0011	0.0010	0.0012	0.0013	0.0012	0.0015	0.0015	0.0017			
13	0.0000	0.0009	0.0009	0.0009	0.0011	0.0011	0.0012	0.0013	0.0013	0.0016	0.0016	0.0017			
14	0.0000	0.0009	0.0009	0.0010	0.0011	0.0013	0.0014	0.0015	0.0015	0.0017	0.0018	0.0019			
15	0.0000	0.0009	0.0009	0.0010	0.0012	0.0011	0.0012	0.0013	0.0013	0.0016	0.0016	0.0018			
16	0.0000	0.0009	0.0008	0.0009	0.0010	0.0012	0.0012	0.0013	0.0013	0.0015	0.0016	0.0018			
17	0.0000	0.0009	0.0009	0.0009	0.0011	0.0011	0.0012	0.0014	0.0014	0.0015	0.0017	0.0018			
18	0.0000	0.0007	0.0009	0.0010	0.0010	0.0012	0.0012	0.0011	0.0012	0.0016	0.0015	0.0017			
19	0.0000	0.0009	0.0010	0.0010	0.0011	0.0013	0.0013	0.0014	0.0014	0.0016	0.0017	0.0019			
20	0.0000	0.0010	0.0010	0.0011	0.0012	0.0013	0.0014	0.0015	0.0015	0.0016	0.0017	0.0019			
21	0.0000	0.0009	0.0010	0.0009	0.0011	0.0011	0.0012	0.0014	0.0013	0.0015	0.0015	0.0017			
22	0.0000	0.0010	0.0010	0.0010	0.0012	0.0012	0.0012	0.0013	0.0014	0.0015	0.0016	0.0017			
23	0.0000	0.0009	0.0009	0.0009	0.0010	0.0011	0.0012	0.0011	0.0012	0.0014	0.0015	0.0015			
24	0.0000	0.0008	0.0009	0.0010	0.0011	0.0011	0.0012	0.0013	0.0013	0.0015	0.0015	0.0016			
25	0.0000	0.0009	0.0010	0.0011	0.0012	0.0013	0.0013	0.0014	0.0015	0.0016	0.0017	0.0018			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.0000	0.0009	0.0009	0.0009	0.0011	0.0011	0.0012	0.0013	0.0013	0.0015	0.0016	0.0017			
Med.	0.0000	0.0009	0.0009	0.0009	0.0011	0.0011	0.0012	0.0013	0.0013	0.0015	0.0016	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	0.0007	0.0008	0.0007	0.0009	0.0009	0.0010	0.0010	0.0011	0.0013	0.0014	0.0013			
Max.	0.0000	0.0010	0.0010	0.0011	0.0012	0.0013	0.0014	0.0015	0.0015	0.0017	0.0018	0.0019			

Data Set 5 : 85 °C, 150 mA

Actual Case Temperature [T _s]	85.4 °C
Actual Ambient Temperature [T _A]	83.0 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	0.2578	0.2570	0.2570	0.2569	0.2566	0.2566	0.2565	0.2564	0.2565	0.2562	0.2560	0.2560			
2	0.2582	0.2574	0.2574	0.2574	0.2572	0.2571	0.2570	0.2570	0.2570	0.2567	0.2567	0.2565			
3	0.2592	0.2583	0.2583	0.2583	0.2581	0.2580	0.2580	0.2579	0.2578	0.2577	0.2577	0.2575			
4	0.2586	0.2578	0.2577	0.2577	0.2576	0.2576	0.2576	0.2576	0.2575	0.2573	0.2572	0.2570			
5	0.2597	0.2588	0.2589	0.2588	0.2587	0.2586	0.2585	0.2584	0.2584	0.2582	0.2582	0.2579			
6	0.2601	0.2593	0.2592	0.2592	0.2591	0.2591	0.2590	0.2590	0.2590	0.2588	0.2587	0.2585			
7	0.2598	0.2590	0.2588	0.2590	0.2588	0.2588	0.2587	0.2586	0.2587	0.2584	0.2584	0.2582			
8	0.2579	0.2572	0.2571	0.2571	0.2570	0.2570	0.2569	0.2567	0.2568	0.2565	0.2565	0.2566			
9	0.2605	0.2596	0.2596	0.2596	0.2594	0.2594	0.2593	0.2592	0.2592	0.2590	0.2589	0.2588			
10	0.2580	0.2572	0.2571	0.2570	0.2569	0.2567	0.2566	0.2566	0.2565	0.2564	0.2564	0.2560			
11	0.2595	0.2586	0.2585	0.2585	0.2584	0.2583	0.2583	0.2581	0.2581	0.2579	0.2579	0.2578			
12	0.2577	0.2568	0.2569	0.2569	0.2566	0.2566	0.2565	0.2564	0.2564	0.2562	0.2561	0.2560			
13	0.2596	0.2587	0.2587	0.2587	0.2585	0.2585	0.2584	0.2583	0.2583	0.2580	0.2580	0.2579			
14	0.2576	0.2568	0.2567	0.2567	0.2566	0.2563	0.2562	0.2561	0.2561	0.2559	0.2558	0.2557			
15	0.2585	0.2576	0.2576	0.2576	0.2574	0.2575	0.2573	0.2572	0.2572	0.2569	0.2569	0.2567			
16	0.2597	0.2588	0.2588	0.2588	0.2587	0.2585	0.2585	0.2584	0.2584	0.2582	0.2581	0.2579			
17	0.2612	0.2603	0.2602	0.2602	0.2600	0.2601	0.2600	0.2598	0.2598	0.2596	0.2594	0.2594			
18	0.2595	0.2588	0.2586	0.2585	0.2585	0.2583	0.2583	0.2583	0.2582	0.2579	0.2580	0.2578			
19	0.2591	0.2582	0.2581	0.2581	0.2579	0.2578	0.2578	0.2577	0.2577	0.2575	0.2574	0.2572			
20	0.2589	0.2580	0.2579	0.2578	0.2577	0.2576	0.2576	0.2574	0.2575	0.2573	0.2572	0.2570			
21	0.2590	0.2582	0.2581	0.2581	0.2579	0.2580	0.2579	0.2577	0.2578	0.2576	0.2575	0.2574			
22	0.2604	0.2595	0.2594	0.2594	0.2592	0.2593	0.2592	0.2591	0.2591	0.2590	0.2588	0.2588			
23	0.2605	0.2596	0.2596	0.2596	0.2594	0.2594	0.2593	0.2593	0.2592	0.2590	0.2590	0.2589			
24	0.2591	0.2583	0.2583	0.2582	0.2581	0.2581	0.2580	0.2578	0.2578	0.2576	0.2576	0.2575			
25	0.2576	0.2567	0.2567	0.2566	0.2564	0.2564	0.2563	0.2563	0.2562	0.2560	0.2559	0.2559			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.2591	0.2582	0.2582	0.2582	0.2580	0.2580	0.2579	0.2578	0.2578	0.2576	0.2575	0.2574			
Med.	0.2591	0.2583	0.2583	0.2582	0.2581	0.2580	0.2580	0.2578	0.2578	0.2576	0.2576	0.2575			
σ	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0011	0.0010	0.0011	0.0010	0.0011			
Min.	0.2576	0.2567	0.2567	0.2566	0.2564	0.2563	0.2562	0.2561	0.2561	0.2559	0.2558	0.2557			
Max.	0.2612	0.2603	0.2602	0.2602	0.2600	0.2601	0.2600	0.2598	0.2598	0.2596	0.2594	0.2594			

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Data Set 5 : 85 °C, 150 mA

Actual Case Temperature [T _S]	85.4 °C
Actual Ambient Temperature [T _A]	83.0 °C
Drive Current [I _F]	150 mA
Measurement Current	150 mA

NOTES:

T_S and T_A were measured during initial setup.

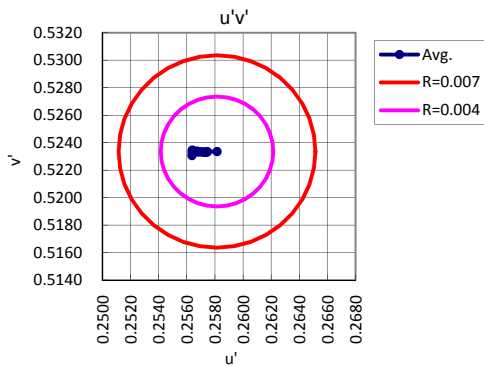
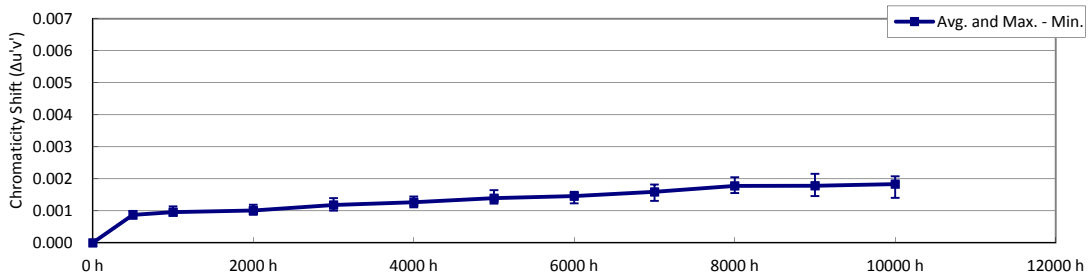
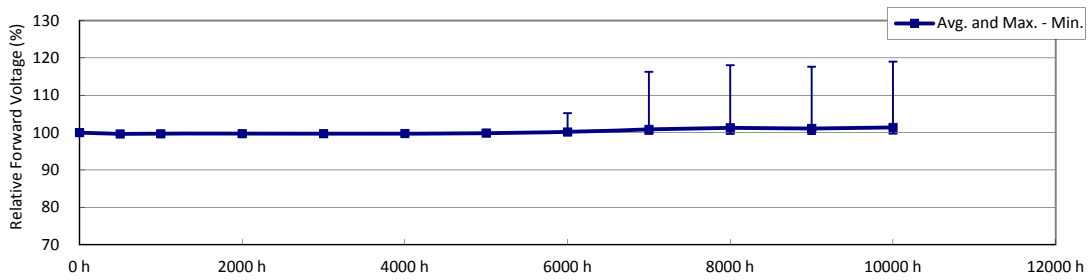
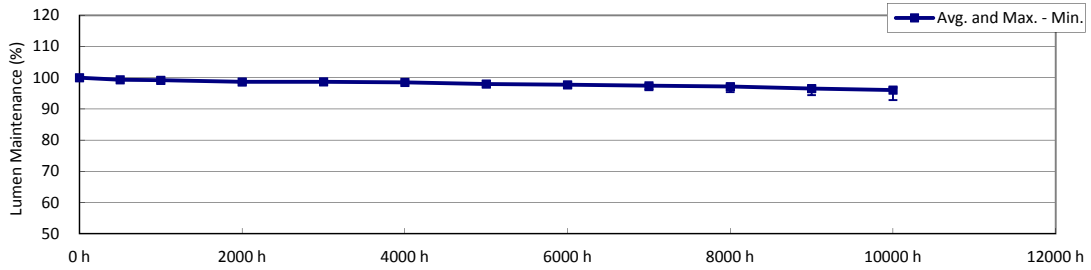
TABLE 5-6
Chromaticity

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	0.5215	0.5214	0.5214	0.5214	0.5214	0.5213	0.5214	0.5214	0.5213	0.5214	0.5214	0.5214			
2	0.5213	0.5213	0.5212	0.5211	0.5212	0.5212	0.5212	0.5212	0.5212	0.5212	0.5212	0.5212			
3	0.5247	0.5246	0.5246	0.5247	0.5246	0.5246	0.5246	0.5247	0.5246	0.5247	0.5247	0.5247			
4	0.5247	0.5247	0.5247	0.5247	0.5247	0.5247	0.5247	0.5248	0.5248	0.5248	0.5248	0.5249			
5	0.5245	0.5246	0.5245	0.5246	0.5246	0.5245	0.5246	0.5246	0.5246	0.5247	0.5246	0.5246			
6	0.5235	0.5234	0.5234	0.5234	0.5234	0.5234	0.5235	0.5235	0.5235	0.5235	0.5235	0.5235			
7	0.5235	0.5235	0.5236	0.5235	0.5235	0.5235	0.5235	0.5235	0.5235	0.5236	0.5236	0.5236			
8	0.5223	0.5223	0.5222	0.5223	0.5222	0.5223	0.5223	0.5223	0.5222	0.5223	0.5223	0.5224			
9	0.5226	0.5226	0.5225	0.5226	0.5226	0.5225	0.5225	0.5226	0.5225	0.5227	0.5225	0.5226			
10	0.5221	0.5221	0.5220	0.5220	0.5219	0.5220	0.5220	0.5220	0.5220	0.5221	0.5221	0.5219			
11	0.5236	0.5235	0.5235	0.5236	0.5235	0.5235	0.5236	0.5236	0.5236	0.5237	0.5237	0.5236			
12	0.5229	0.5230	0.5229	0.5229	0.5229	0.5229	0.5230	0.5230	0.5229	0.5230	0.5230	0.5229			
13	0.5249	0.5248	0.5248	0.5248	0.5248	0.5248	0.5248	0.5249	0.5248	0.5249	0.5249	0.5249			
14	0.5190	0.5189	0.5189	0.5188	0.5187	0.5188	0.5188	0.5188	0.5188	0.5190	0.5189	0.5188			
15	0.5243	0.5244	0.5244	0.5244	0.5244	0.5243	0.5244	0.5244	0.5244	0.5245	0.5244	0.5243			
16	0.5226	0.5225	0.5225	0.5225	0.5225	0.5224	0.5224	0.5225	0.5224	0.5225	0.5224	0.5224			
17	0.5238	0.5237	0.5238	0.5237	0.5238	0.5237	0.5237	0.5238	0.5237	0.5238	0.5237	0.5237			
18	0.5237	0.5238	0.5238	0.5238	0.5238	0.5238	0.5238	0.5239	0.5238	0.5238	0.5238	0.5238			
19	0.5211	0.5212	0.5211	0.5211	0.5210	0.5211	0.5210	0.5211	0.5210	0.5211	0.5211	0.5211			
20	0.5241	0.5241	0.5239	0.5240	0.5240	0.5240	0.5240	0.5241	0.5240	0.5241	0.5241	0.5242			
21	0.5254	0.5255	0.5255	0.5254	0.5254	0.5254	0.5254	0.5255	0.5254	0.5255	0.5254	0.5254			
22	0.5276	0.5277	0.5276	0.5277	0.5276	0.5276	0.5276	0.5276	0.5276	0.5277	0.5276	0.5276			
23	0.5256	0.5256	0.5255	0.5254	0.5255	0.5255	0.5255	0.5255	0.5255	0.5256	0.5256	0.5256			
24	0.5250	0.5249	0.5249	0.5249	0.5249	0.5250	0.5250	0.5250	0.5249	0.5250	0.5250	0.5249			
25	0.5229	0.5229	0.5229	0.5229	0.5229	0.5228	0.5229	0.5228	0.5229	0.5229	0.5228	0.5228			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.5235	0.5235	0.5235	0.5235	0.5234	0.5234	0.5234	0.5235	0.5234	0.5235	0.5235	0.5235			
Med.	0.5236	0.5235	0.5236	0.5236	0.5235	0.5235	0.5236	0.5236	0.5236	0.5237	0.5237	0.5236			
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.	0.5190	0.5189	0.5189	0.5188	0.5187	0.5188	0.5188	0.5188	0.5188	0.5190	0.5189	0.5188			
Max.	0.5276	0.5277	0.5276	0.5277	0.5276	0.5276	0.5276	0.5276	0.5276	0.5277	0.5276	0.5276			

Data Set 6 : 85 °C, 180 mA

Actual Case Temperature [T _S]	85.9 °C
Actual Ambient Temperature [T _A]	83.2 °C
Drive Current [I _F]	180 mA
Measurement Current	180 mA

NOTES:
T_S and T_A were measured during initial setup.



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Data Set 6 : 85 °C, 180 mA

Actual Case Temperature [T _s]	85.9 °C
Actual Ambient Temperature [T _A]	83.2 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	74.8	3.19	2822	0.448	0.404	0.258	0.523						
2	74.3	3.19	2792	0.451	0.405	0.259	0.524						
3	75.2	3.19	2852	0.446	0.405	0.256	0.523						
4	74.9	3.19	2799	0.451	0.407	0.258	0.525						
5	74.5	3.19	2825	0.448	0.405	0.258	0.523						
6	74.3	3.19	2815	0.448	0.403	0.258	0.523						
7	75.0	3.19	2828	0.448	0.405	0.257	0.523						
8	75.1	3.19	2829	0.449	0.406	0.257	0.524						
9	74.9	3.19	2839	0.447	0.404	0.257	0.523						
10	73.8	3.19	2744	0.455	0.407	0.261	0.525						
11	74.0	3.19	2795	0.451	0.406	0.259	0.524						
12	73.8	3.18	2802	0.447	0.400	0.259	0.521						
13	74.1	3.19	2805	0.448	0.401	0.259	0.522						
14	75.5	3.19	2845	0.449	0.408	0.256	0.525						
15	73.8	3.19	2808	0.446	0.399	0.259	0.521						
16	74.4	3.19	2835	0.447	0.403	0.257	0.523						
17	75.5	3.19	2866	0.447	0.407	0.256	0.524						
18	73.5	3.18	2748	0.452	0.402	0.261	0.523						
19	75.2	3.19	2851	0.447	0.406	0.256	0.524						
20	74.4	3.19	2795	0.450	0.405	0.259	0.524						
21	74.0	3.19	2795	0.448	0.401	0.259	0.522						
22	74.3	3.19	2788	0.452	0.407	0.259	0.525						
23	74.5	3.19	2795	0.450	0.405	0.259	0.524						
24	74.3	3.18	2783	0.452	0.408	0.259	0.525						
25	74.5	3.19	2829	0.449	0.406	0.257	0.524						
n	25	25	25	25	25	25	25						
Avg.	74.5	3.19	2812	0.449	0.405	0.258	0.523						
Med.	74.4	3.19	2808	0.448	0.405	0.258	0.524						
σ	0.55	0.002	30.0	0.0022	0.0025	0.0013	0.0012						
Min.	73.5	3.18	2744	0.446	0.399	0.256	0.521						
Max.	75.5	3.19	2866	0.455	0.408	0.261	0.525						

Data Set 6 : 85 °C, 180 mA

Actual Case Temperature [T _s]	85.9 °C
Actual Ambient Temperature [T _A]	83.2 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	99.3	99.2	98.6	98.7	98.5	97.9	97.7	97.5	97.2	96.4	96.0
2	100.0	99.5	99.4	98.9	98.9	98.8	98.3	98.1	97.9	97.6	97.1	96.7
3	100.0	99.4	99.2	98.7	98.6	98.5	97.9	97.6	97.4	97.2	96.4	95.9
4	100.0	99.3	99.1	98.6	98.7	98.5	98.0	97.8	97.5	97.2	96.6	95.8
5	100.0	99.6	99.3	98.8	98.8	98.6	98.1	97.9	97.7	97.6	97.0	96.6
6	100.0	99.2	99.1	98.4	98.5	98.4	97.8	97.3	96.0	95.4	94.4	93.8
7	100.0	99.3	99.2	98.6	98.6	98.5	97.9	97.6	97.2	97.1	96.3	96.0
8	100.0	99.4	99.2	98.8	98.8	98.8	98.1	98.0	97.9	97.8	97.2	96.8
9	100.0	99.4	99.2	98.6	98.6	98.4	98.0	97.7	97.5	97.3	96.6	96.2
10	100.0	99.4	99.3	98.9	98.8	98.7	98.2	98.0	97.8	97.6	97.0	96.7
11	100.0	99.2	99.1	98.6	98.6	98.4	97.8	97.7	97.6	97.5	96.9	96.5
12	100.0	99.5	99.3	98.7	98.6	98.4	97.9	97.7	97.5	97.3	96.9	96.5
13	100.0	99.3	99.1	98.7	98.5	98.4	97.9	97.7	97.5	97.3	96.8	96.3
14	100.0	99.3	99.2	98.8	98.8	98.6	98.0	97.8	97.3	96.8	95.9	95.2
15	100.0	99.3	99.2	98.7	98.6	98.4	97.8	97.7	97.3	97.2	96.6	96.1
16	100.0	99.1	99.0	98.6	98.5	98.3	97.7	97.4	97.2	97.1	96.6	96.0
17	100.0	99.3	99.2	98.7	98.6	98.4	97.9	97.7	97.4	97.3	96.7	96.3
18	100.0	99.4	99.2	98.7	98.6	98.5	98.1	97.8	97.7	97.5	96.9	96.5
19	100.0	99.5	99.3	98.7	98.7	98.5	97.9	97.7	97.5	97.2	96.4	95.9
20	100.0	99.2	99.1	98.5	98.6	98.4	97.9	97.8	97.6	97.3	96.8	96.5
21	100.0	99.5	99.3	98.8	98.9	98.7	98.1	97.9	97.7	97.5	96.8	96.5
22	100.0	99.2	99.1	98.6	98.7	98.6	98.1	97.9	97.8	97.5	97.0	96.8
23	100.0	99.2	99.0	98.5	98.6	98.6	98.0	97.8	97.5	97.0	96.4	95.9
24	100.0	99.3	99.2	98.5	98.6	98.4	97.8	97.1	96.2	95.4	94.5	92.8
25	100.0	99.2	99.1	98.7	98.8	98.7	98.1	98.0	97.8	97.6	97.1	96.8
n	25	25	25	25	25	25	25	25	25	25	25	25
Avg.	100.0	99.3	99.2	98.7	98.7	98.5	98.0	97.7	97.4	97.2	96.5	96.0
Med.	100.0	99.3	99.2	98.7	98.6	98.5	97.9	97.7	97.5	97.3	96.7	96.3
σ	0.00	0.12	0.10	0.11	0.11	0.13	0.14	0.22	0.44	0.59	0.70	0.92
Min.	100.0	99.1	99.0	98.4	98.5	98.3	97.7	97.1	96.0	95.4	94.4	92.8
Max.	100.0	99.6	99.4	98.9	98.9	98.8	98.3	98.1	97.9	97.8	97.2	96.8

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0204	-0.0229	-0.0259	-0.0286	-0.0353	-0.0404

Test duration used	5000 h to 10000 h
B	1.0010
α	3.9950E-06
R ²	0.9630
Calculated L ₇₀ (10K)	89500 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	56100 hours
Reported L ₈₀ (10K)	56100 hours
Calculated L ₉₀ (10K)	26600 hours
Reported L ₉₀ (10K)	26600 hours

Curve-fit equation:

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

Lumen maintenance life equation:

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

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

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

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Data Set 6 : 85 °C, 180 mA

Actual Case Temperature [T _s]	85.9 °C
Actual Ambient Temperature [T _A]	83.2 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	99.7	99.7	99.7	99.7	99.7	99.8	99.8	99.9	99.8	99.9	99.9			
2	100.0	99.7	99.7	99.7	99.9	99.8	99.9	99.9	100.0	100.0	100.0	100.2			
3	100.0	99.7	99.7	99.7	99.6	99.6	99.8	99.8	99.9	99.8	99.7	99.9			
4	100.0	99.6	99.7	99.8	99.7	99.9	99.8	99.8	99.8	99.8	99.7	99.8			
5	100.0	99.7	99.7	99.7	99.6	99.7	99.8	99.9	99.8	99.8	99.7	99.8			
6	100.0	99.7	99.6	99.8	99.6	99.7	100.1	101.8	108.5	118.1	117.7	119.0			
7	100.0	99.7	99.7	99.7	99.8	99.8	99.9	99.8	99.8	99.8	99.7	99.8			
8	100.0	99.7	99.7	99.7	99.8	99.7	99.9	99.9	99.8	99.8	99.7	99.8			
9	100.0	99.8	99.7	99.7	99.6	99.7	99.8	99.8	99.8	99.7	99.7	99.8			
10	100.0	99.7	99.7	99.7	99.7	99.7	99.8	99.9	99.9	99.8	99.8	99.9			
11	100.0	99.7	99.6	99.7	99.7	99.7	99.7	99.7	99.7	99.6	99.6	99.7			
12	100.0	99.7	99.7	99.7	99.7	99.7	99.9	100.0	99.9	99.9	100.0	100.1			
13	100.0	99.7	99.8	99.7	99.9	99.8	99.9	99.7	99.9	99.8	99.8	99.8			
14	100.0	99.6	99.7	99.8	99.7	99.6	99.8	99.7	99.8	99.7	99.8	99.8			
15	100.0	99.6	99.7	99.8	99.7	99.6	99.7	99.8	99.7	99.7	99.7	99.8			
16	100.0	99.6	99.8	99.8	99.8	99.9	100.0	100.2	100.4	100.6	101.2	101.8			
17	100.0	99.6	99.7	99.6	99.6	99.8	99.8	99.9	99.8	99.8	99.8	99.9			
18	100.0	99.7	99.7	99.9	99.7	99.6	99.8	99.9	99.8	99.8	99.7	99.8			
19	100.0	99.7	99.8	99.8	100.0	99.9	100.1	100.4	100.4	100.6	100.8	100.9			
20	100.0	99.6	99.6	99.6	99.6	99.6	99.7	99.8	99.8	99.8	99.9	99.9			
21	100.0	99.7	99.6	99.6	99.6	99.7	99.7	99.7	99.7	99.7	99.7	99.8			
22	100.0	99.6	99.7	99.7	99.8	99.7	99.8	99.8	99.9	99.8	99.9	100.0			
23	100.0	99.5	99.8	99.8	99.7	99.9	99.8	99.8	99.8	99.8	99.8	99.9			
24	100.0	99.7	99.8	99.8	99.9	100.1	100.8	105.2	116.3	117.4	112.6	115.2			
25	100.0	99.7	99.7	99.7	99.8	99.9	99.9	100.0	99.9	99.9	99.9	100.0			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	100.0	99.7	99.7	99.7	99.7	99.8	99.9	100.2	100.9	101.3	101.1	101.4			
Med.	100.0	99.7	99.7	99.7	99.7	99.7	99.8	99.8	99.8	99.8	99.8	99.9			
σ	0.00	0.06	0.06	0.08	0.10	0.12	0.22	1.13	3.65	4.96	4.29	4.78			
Min.	100.0	99.5	99.6	99.6	99.6	99.6	99.7	99.7	99.7	99.6	99.6	99.7			
Max.	100.0	99.8	99.8	99.9	100.0	100.1	100.8	105.2	116.3	118.1	117.7	119.0			

Data Set 6 : 85 °C, 180 mA

Actual Case Temperature [T _s]	85.9 °C
Actual Ambient Temperature [T _A]	83.2 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	0.0009	0.0010	0.0010	0.0011	0.0013	0.0014	0.0015	0.0017	0.0020	0.0020	0.0020			
2	0.0000	0.0009	0.0010	0.0011	0.0012	0.0013	0.0014	0.0016	0.0016	0.0019	0.0018	0.0019			
3	0.0000	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014	0.0015	0.0017	0.0017	0.0017	0.0018			
4	0.0000	0.0009	0.0010	0.0010	0.0011	0.0012	0.0013	0.0014	0.0015	0.0018	0.0017	0.0019			
5	0.0000	0.0009	0.0009	0.0010	0.0010	0.0011	0.0012	0.0015	0.0015	0.0017	0.0018	0.0018			
6	0.0000	0.0009	0.0010	0.0012	0.0012	0.0013	0.0015	0.0015	0.0016	0.0016	0.0015	0.0014			
7	0.0000	0.0009	0.0009	0.0011	0.0012	0.0013	0.0013	0.0015	0.0016	0.0018	0.0018	0.0018			
8	0.0000	0.0008	0.0009	0.0010	0.0010	0.0011	0.0013	0.0013	0.0015	0.0016	0.0016	0.0016			
9	0.0000	0.0009	0.0010	0.0010	0.0012	0.0013	0.0016	0.0016	0.0018	0.0018	0.0019	0.0019			
10	0.0000	0.0008	0.0010	0.0010	0.0013	0.0013	0.0015	0.0015	0.0017	0.0017	0.0017	0.0016			
11	0.0000	0.0009	0.0011	0.0010	0.0012	0.0013	0.0014	0.0015	0.0016	0.0017	0.0017	0.0017			
12	0.0000	0.0010	0.0010	0.0009	0.0012	0.0012	0.0014	0.0015	0.0016	0.0018	0.0019	0.0020			
13	0.0000	0.0008	0.0009	0.0009	0.0012	0.0013	0.0013	0.0016	0.0016	0.0017	0.0018	0.0019			
14	0.0000	0.0009	0.0008	0.0010	0.0012	0.0013	0.0013	0.0014	0.0014	0.0016	0.0017	0.0017			
15	0.0000	0.0010	0.0010	0.0010	0.0013	0.0014	0.0016	0.0015	0.0018	0.0020	0.0022	0.0021			
16	0.0000	0.0009	0.0009	0.0009	0.0012	0.0013	0.0014	0.0014	0.0015	0.0019	0.0019	0.0020			
17	0.0000	0.0009	0.0009	0.0010	0.0013	0.0013	0.0014	0.0014	0.0016	0.0019	0.0019	0.0020			
18	0.0000	0.0010	0.0011	0.0012	0.0014	0.0014	0.0016	0.0016	0.0017	0.0019	0.0019	0.0019			
19	0.0000	0.0008	0.0010	0.0011	0.0012	0.0014	0.0015	0.0016	0.0017	0.0017	0.0019	0.0019			
20	0.0000	0.0009	0.0009	0.0010	0.0012	0.0012	0.0014	0.0015	0.0015	0.0017	0.0019	0.0019			
21	0.0000	0.0008	0.0010	0.0010	0.0012	0.0013	0.0015	0.0015	0.0016	0.0018	0.0018	0.0019			
22	0.0000	0.0009	0.0009	0.0011	0.0011	0.0012	0.0012	0.0012	0.0013	0.0016	0.0016	0.0018			
23	0.0000	0.0009	0.0009	0.0009	0.0010	0.0012	0.0013	0.0014	0.0015	0.0018	0.0016	0.0017			
24	0.0000	0.0009	0.0009	0.0009	0.0010	0.0012	0.0013	0.0014	0.0015	0.0018	0.0017	0.0017			
25	0.0000	0.0009	0.0010	0.0010	0.0012	0.0013	0.0013	0.0014	0.0016	0.0018	0.0018	0.0020			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.0000	0.0009	0.0010	0.0010	0.0012	0.0013	0.0014	0.0015	0.0016	0.0018	0.0018	0.0018			
Med.	0.0000	0.0009	0.0010	0.0010	0.0012	0.0013	0.0014	0.0015	0.0016	0.0018	0.0018	0.0019			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002			
Min.	0.0000	0.0008	0.0008	0.0009	0.0010	0.0011	0.0012	0.0012	0.0013	0.0016	0.0015	0.0014			
Max.	0.0000	0.0010	0.0011	0.0012	0.0014	0.0014	0.0016	0.0016	0.0018	0.0020	0.0022	0.0021			

Data Set 6 : 85 °C, 180 mA

Actual Case Temperature [T _s]	85.9 °C
Actual Ambient Temperature [T _A]	83.2 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	0.2583	0.2574	0.2573	0.2572	0.2571	0.2570	0.2569	0.2568	0.2565	0.2562	0.2562	0.2563			
2	0.2595	0.2586	0.2585	0.2584	0.2583	0.2583	0.2581	0.2580	0.2579	0.2577	0.2577	0.2577			
3	0.2569	0.2561	0.2560	0.2558	0.2557	0.2556	0.2555	0.2554	0.2552	0.2551	0.2552	0.2551			
4	0.2589	0.2580	0.2579	0.2579	0.2577	0.2577	0.2576	0.2575	0.2574	0.2571	0.2572	0.2570			
5	0.2580	0.2572	0.2571	0.2570	0.2570	0.2569	0.2568	0.2566	0.2566	0.2564	0.2562	0.2563			
6	0.2587	0.2578	0.2577	0.2575	0.2575	0.2574	0.2572	0.2572	0.2572	0.2573	0.2573	0.2573			
7	0.2580	0.2571	0.2571	0.2570	0.2569	0.2568	0.2567	0.2566	0.2565	0.2563	0.2563	0.2563			
8	0.2576	0.2568	0.2567	0.2566	0.2566	0.2565	0.2564	0.2563	0.2561	0.2561	0.2560	0.2561			
9	0.2576	0.2568	0.2566	0.2566	0.2564	0.2563	0.2560	0.2560	0.2558	0.2558	0.2557	0.2557			
10	0.2612	0.2604	0.2602	0.2602	0.2599	0.2599	0.2597	0.2597	0.2595	0.2594	0.2595	0.2596			
11	0.2593	0.2584	0.2582	0.2583	0.2581	0.2580	0.2579	0.2578	0.2577	0.2576	0.2576	0.2576			
12	0.2595	0.2585	0.2584	0.2586	0.2583	0.2583	0.2581	0.2580	0.2579	0.2576	0.2576	0.2575			
13	0.2592	0.2584	0.2583	0.2582	0.2580	0.2579	0.2578	0.2576	0.2576	0.2574	0.2574	0.2573			
14	0.2568	0.2560	0.2560	0.2559	0.2557	0.2556	0.2555	0.2555	0.2554	0.2552	0.2552	0.2552			
15	0.2595	0.2585	0.2585	0.2584	0.2582	0.2581	0.2578	0.2579	0.2576	0.2574	0.2573	0.2574			
16	0.2578	0.2569	0.2568	0.2569	0.2566	0.2565	0.2564	0.2564	0.2563	0.2559	0.2559	0.2559			
17	0.2560	0.2552	0.2551	0.2551	0.2547	0.2547	0.2546	0.2546	0.2544	0.2541	0.2542	0.2541			
18	0.2617	0.2607	0.2605	0.2605	0.2603	0.2602	0.2601	0.2601	0.2599	0.2598	0.2597	0.2598			
19	0.2568	0.2559	0.2558	0.2557	0.2556	0.2554	0.2553	0.2552	0.2551	0.2550	0.2549	0.2549			
20	0.2591	0.2582	0.2582	0.2582	0.2580	0.2579	0.2578	0.2577	0.2576	0.2574	0.2573	0.2573			
21	0.2597	0.2589	0.2587	0.2588	0.2585	0.2584	0.2582	0.2582	0.2581	0.2579	0.2579	0.2579			
22	0.2594	0.2585	0.2585	0.2583	0.2582	0.2582	0.2581	0.2581	0.2581	0.2578	0.2578	0.2575			
23	0.2593	0.2585	0.2584	0.2584	0.2583	0.2581	0.2580	0.2579	0.2578	0.2576	0.2578	0.2576			
24	0.2596	0.2587	0.2587	0.2587	0.2586	0.2584	0.2583	0.2582	0.2581	0.2578	0.2579	0.2580			
25	0.2577	0.2569	0.2568	0.2567	0.2565	0.2564	0.2564	0.2564	0.2561	0.2559	0.2559	0.2557			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.2586	0.2578	0.2577	0.2576	0.2575	0.2574	0.2573	0.2572	0.2571	0.2569	0.2569	0.2568			
Med.	0.2589	0.2580	0.2579	0.2579	0.2577	0.2577	0.2576	0.2575	0.2574	0.2573	0.2573	0.2573			
σ	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0014			
Min.	0.2560	0.2552	0.2551	0.2551	0.2547	0.2547	0.2546	0.2546	0.2544	0.2541	0.2542	0.2541			
Max.	0.2617	0.2607	0.2605	0.2605	0.2603	0.2602	0.2601	0.2601	0.2599	0.2598	0.2597	0.2598			

Data Set 6 : 85 °C, 180 mA

Actual Case Temperature [T _S]	85.9 °C
Actual Ambient Temperature [T _A]	83.2 °C
Drive Current [I _F]	180 mA
Measurement Current	180 mA

NOTES:

T_S and T_A were measured during initial setup.

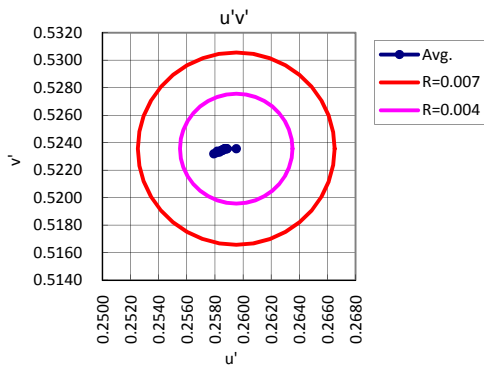
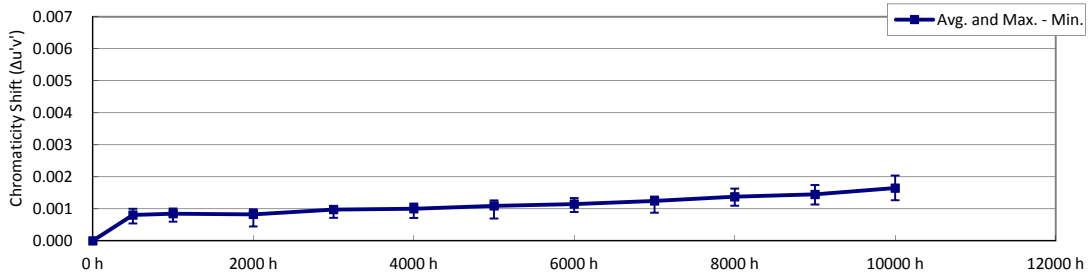
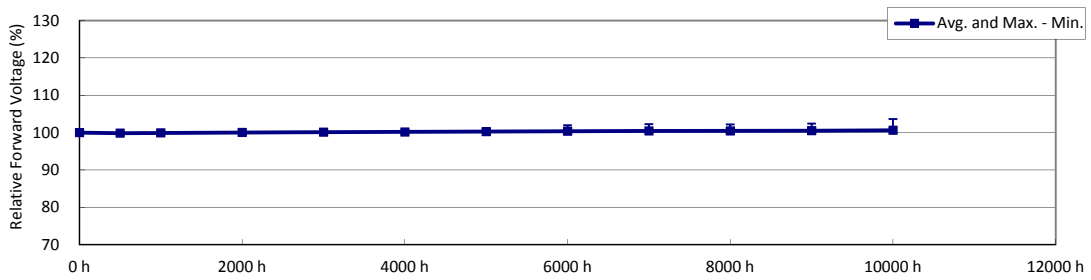
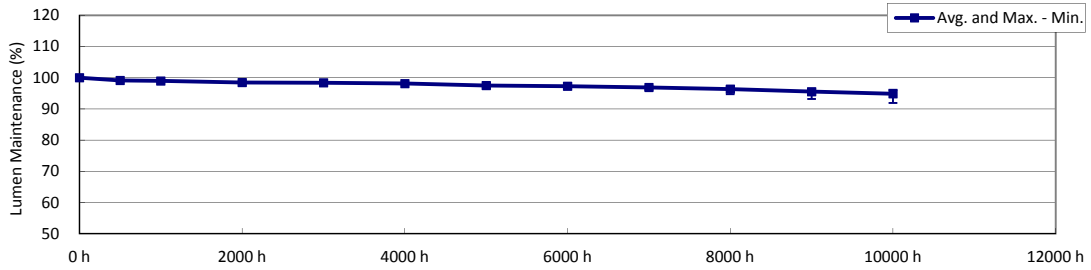
TABLE 6-6
Chromaticity

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	0.5228	0.5227	0.5227	0.5227	0.5227	0.5227	0.5227	0.5228	0.5228	0.5228	0.5226	0.5224			
2	0.5237	0.5237	0.5238	0.5238	0.5237	0.5239	0.5238	0.5240	0.5238	0.5239	0.5238	0.5236			
3	0.5229	0.5228	0.5228	0.5228	0.5228	0.5228	0.5229	0.5230	0.5229	0.5230	0.5228	0.5226			
4	0.5245	0.5245	0.5246	0.5246	0.5246	0.5245	0.5246	0.5246	0.5245	0.5247	0.5246	0.5243			
5	0.5230	0.5231	0.5231	0.5231	0.5232	0.5232	0.5232	0.5233	0.5232	0.5233	0.5231	0.5229			
6	0.5226	0.5225	0.5225	0.5225	0.5226	0.5226	0.5226	0.5226	0.5224	0.5233	0.5230	0.5223			
7	0.5230	0.5230	0.5230	0.5230	0.5230	0.5230	0.5230	0.5231	0.5230	0.5232	0.5230	0.5228			
8	0.5239	0.5239	0.5239	0.5238	0.5239	0.5240	0.5239	0.5240	0.5240	0.5240	0.5239	0.5237			
9	0.5226	0.5224	0.5225	0.5225	0.5225	0.5226	0.5226	0.5225	0.5225	0.5226	0.5224	0.5222			
10	0.5252	0.5252	0.5251	0.5251	0.5252	0.5251	0.5252	0.5253	0.5252	0.5252	0.5251	0.5249			
11	0.5240	0.5238	0.5239	0.5239	0.5239	0.5240	0.5239	0.5240	0.5239	0.5241	0.5240	0.5238			
12	0.5213	0.5214	0.5213	0.5213	0.5213	0.5214	0.5214	0.5214	0.5213	0.5214	0.5213	0.5210			
13	0.5218	0.5216	0.5216	0.5216	0.5215	0.5216	0.5216	0.5216	0.5216	0.5217	0.5215	0.5213			
14	0.5247	0.5247	0.5247	0.5247	0.5247	0.5248	0.5247	0.5248	0.5247	0.5247	0.5246	0.5242			
15	0.5206	0.5206	0.5206	0.5206	0.5206	0.5206	0.5205	0.5206	0.5206	0.5206	0.5205	0.5203			
16	0.5224	0.5223	0.5223	0.5223	0.5223	0.5223	0.5224	0.5224	0.5223	0.5225	0.5223	0.5220			
17	0.5239	0.5239	0.5238	0.5239	0.5239	0.5238	0.5239	0.5239	0.5238	0.5239	0.5238	0.5237			
18	0.5225	0.5224	0.5224	0.5223	0.5224	0.5223	0.5223	0.5224	0.5224	0.5225	0.5223	0.5221			
19	0.5233	0.5233	0.5232	0.5233	0.5232	0.5232	0.5233	0.5233	0.5233	0.5234	0.5232	0.5229			
20	0.5237	0.5237	0.5237	0.5237	0.5237	0.5237	0.5237	0.5238	0.5237	0.5238	0.5237	0.5235			
21	0.5216	0.5214	0.5215	0.5214	0.5215	0.5215	0.5214	0.5215	0.5214	0.5214	0.5212	0.5210			
22	0.5246	0.5245	0.5245	0.5245	0.5245	0.5246	0.5245	0.5246	0.5246	0.5247	0.5246	0.5244			
23	0.5238	0.5238	0.5238	0.5238	0.5239	0.5238	0.5239	0.5240	0.5239	0.5240	0.5239	0.5238			
24	0.5249	0.5249	0.5249	0.5249	0.5249	0.5249	0.5249	0.5248	0.5250	0.5250	0.5247	0.5243			
25	0.5238	0.5238	0.5239	0.5238	0.5239	0.5238	0.5238	0.5241	0.5239	0.5240	0.5239	0.5238			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.5232	0.5232	0.5232	0.5232	0.5232	0.5232	0.5232	0.5233	0.5232	0.5233	0.5232	0.5230			
Med.	0.5233	0.5233	0.5232	0.5233	0.5232	0.5232	0.5233	0.5233	0.5233	0.5234	0.5232	0.5229			
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.	0.5206	0.5206	0.5206	0.5206	0.5206	0.5206	0.5205	0.5206	0.5206	0.5206	0.5205	0.5203			
Max.	0.5252	0.5252	0.5251	0.5251	0.5252	0.5251	0.5252	0.5253	0.5252	0.5252	0.5251	0.5249			

Data Set 7 : 105 °C, 65 mA

Actual Case Temperature [T _s]	105.4 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	65 mA
Measurement Current	65 mA

NOTES:
T_s and T_A were measured during initial setup.



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Data Set 7 : 105 °C, 65 mA

Actual Case Temperature [T _s]	105.4 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	29.3	2.89	2754	0.455	0.408	0.260	0.526					
2	29.0	2.87	2763	0.450	0.401	0.261	0.522					
3	29.4	2.88	2773	0.452	0.405	0.260	0.524					
4	29.5	2.89	2780	0.452	0.407	0.259	0.525					
5	29.5	2.88	2794	0.451	0.405	0.259	0.524					
6	29.4	2.88	2738	0.455	0.407	0.261	0.525					
7	29.3	2.88	2749	0.455	0.408	0.260	0.526					
8	29.1	2.88	2746	0.452	0.402	0.261	0.523					
9	29.4	2.87	2822	0.448	0.404	0.258	0.523					
10	29.5	2.88	2836	0.445	0.400	0.258	0.521					
11	29.5	2.88	2765	0.451	0.403	0.260	0.523					
12	29.4	2.88	2806	0.448	0.402	0.259	0.522					
13	29.5	2.88	2768	0.453	0.407	0.260	0.525					
14	29.5	2.88	2803	0.448	0.402	0.259	0.522					
15	29.6	2.88	2804	0.450	0.405	0.258	0.524					
16	29.5	2.88	2768	0.453	0.407	0.260	0.525					
17	29.2	2.87	2778	0.451	0.404	0.260	0.523					
18	29.5	2.88	2803	0.449	0.403	0.259	0.523					
19	29.4	2.88	2778	0.452	0.405	0.259	0.524					
20	29.5	2.88	2802	0.450	0.405	0.258	0.524					
21	29.3	2.88	2749	0.454	0.407	0.261	0.525					
22	29.2	2.88	2819	0.444	0.396	0.259	0.519					
23	29.4	2.88	2787	0.450	0.403	0.259	0.523					
24	29.5	2.88	2792	0.449	0.403	0.259	0.523					
25	29.1	2.88	2727	0.456	0.406	0.262	0.525					
n	25	25	25	25	25	25	25					
Avg.	29.4	2.88	2780	0.451	0.404	0.260	0.524					
Med.	29.4	2.88	2778	0.451	0.405	0.259	0.524					
σ	0.15	0.004	27.9	0.0030	0.0028	0.0011	0.0015					
Min.	29.0	2.87	2727	0.444	0.396	0.258	0.519					
Max.	29.6	2.89	2836	0.456	0.408	0.262	0.526					

Data Set 7 : 105 °C, 65 mA

Actual Case Temperature [T _s]	105.4 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	99.2	99.0	98.5	98.4	98.2	97.6	97.4	97.2	96.7	96.4	96.1
2	100.0	99.0	98.9	98.4	98.3	98.1	97.5	97.3	96.9	96.7	96.2	96.0
3	100.0	99.1	99.0	98.5	98.4	98.2	97.6	97.2	96.8	95.8	94.6	93.6
4	100.0	99.1	98.9	98.4	98.3	98.1	97.5	97.3	96.4	95.1	93.4	92.3
5	100.0	98.9	98.8	98.3	98.2	97.9	97.3	96.9	96.1	94.7	93.2	91.9
6	100.0	99.4	99.3	98.8	98.7	98.4	97.7	97.6	96.8	96.0	94.5	93.5
7	100.0	99.0	98.8	98.3	98.3	98.1	97.4	97.4	96.7	96.2	95.4	94.5
8	100.0	98.9	98.8	98.3	98.2	98.0	97.4	97.2	96.8	96.6	95.9	95.4
9	100.0	98.8	98.8	98.3	98.2	98.0	97.4	97.2	97.0	96.7	96.2	96.0
10	100.0	99.3	99.1	98.5	98.3	98.0	97.3	97.1	96.5	95.5	94.4	93.4
11	100.0	99.3	99.0	98.6	98.5	98.4	97.7	97.5	97.3	96.9	96.5	96.0
12	100.0	99.0	98.9	98.4	98.3	98.0	97.4	97.3	97.0	96.8	96.3	96.1
13	100.0	99.0	98.8	98.4	98.4	98.0	97.3	97.2	96.4	96.1	95.1	94.4
14	100.0	99.2	98.9	98.4	98.4	98.1	97.5	97.3	96.9	96.6	95.9	95.4
15	100.0	99.1	98.9	98.4	98.2	98.0	97.4	97.2	96.9	96.5	96.0	95.4
16	100.0	99.2	99.0	98.5	98.4	98.2	97.5	97.3	97.1	96.6	95.9	95.2
17	100.0	99.0	98.9	98.3	98.3	98.0	97.5	97.2	96.8	96.4	95.4	94.6
18	100.0	99.2	99.1	98.6	98.5	98.3	97.7	97.4	97.2	96.7	95.9	95.2
19	100.0	99.3	99.1	98.6	98.5	98.2	97.7	97.5	97.2	96.7	95.8	95.0
20	100.0	99.3	99.1	98.5	98.4	98.2	97.5	97.2	97.0	96.8	96.3	95.8
21	100.0	99.2	99.0	98.5	98.6	98.3	97.6	97.4	97.0	96.6	96.0	95.8
22	100.0	99.5	99.3	98.6	98.6	98.3	97.6	97.3	96.9	96.7	96.2	95.9
23	100.0	99.3	99.1	98.6	98.4	98.2	97.5	97.2	96.9	96.3	95.3	94.2
24	100.0	99.3	99.1	98.5	98.4	98.1	97.5	97.3	96.9	96.6	95.8	95.1
25	100.0	98.9	98.8	98.4	98.4	98.2	97.6	97.4	97.1	96.6	95.9	95.0
n	25	25	25	25	25	25	25	25	25	25	25	25
Avg.	100.0	99.1	99.0	98.5	98.4	98.1	97.5	97.3	96.9	96.4	95.5	94.9
Med.	100.0	99.2	99.0	98.5	98.4	98.1	97.5	97.3	96.9	96.6	95.9	95.2
σ	0.00	0.17	0.14	0.12	0.13	0.13	0.13	0.15	0.28	0.55	0.89	1.16
Min.	100.0	98.8	98.8	98.3	98.2	97.9	97.3	96.9	96.1	94.7	93.2	91.9
Max.	100.0	99.5	99.3	98.8	98.7	98.4	97.7	97.6	97.3	96.9	96.5	96.1

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0253	-0.0274	-0.0317	-0.0372	-0.0456	-0.0527

Test duration used	5000 h to 10000 h
B	1.0056
α	5.6282E-06
R ²	0.9624
Calculated L ₇₀ (10K)	64400 hours
Reported L ₇₀ (10K)	> 60000 hours
Calculated L ₈₀ (10K)	40600 hours
Reported L ₈₀ (10K)	40600 hours
Calculated L ₉₀ (10K)	19700 hours
Reported L ₉₀ (10K)	19700 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, 65 mA

Actual Case Temperature [T _s]	105.4 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	99.9	100.0	100.1	100.1	100.2	100.3	100.2	100.3	100.3	100.3	100.4			
2	100.0	100.1	100.1	100.2	100.2	100.2	100.4	100.6	100.4	100.4	100.5	100.5			
3	100.0	100.0	100.1	100.2	100.1	100.1	100.3	100.4	100.3	100.4	100.4	100.4			
4	100.0	99.9	100.1	100.2	100.3	100.2	100.4	100.6	100.7	100.9	101.4	101.8			
5	100.0	99.9	99.9	100.0	100.2	100.5	100.8	101.4	101.8	102.2	102.2	103.6			
6	100.0	99.9	99.9	100.1	100.2	100.3	100.6	101.2	101.2	101.1	101.2	101.4			
7	100.0	99.7	100.0	100.0	100.1	100.2	100.2	100.3	100.4	100.3	100.3	100.4			
8	100.0	99.6	99.9	100.0	100.1	100.0	100.2	100.3	100.2	100.3	100.2	100.4			
9	100.0	99.8	99.9	100.0	100.0	100.1	100.1	100.3	100.2	100.2	100.2	100.3			
10	100.0	100.0	100.0	100.1	100.1	100.0	100.2	100.3	100.3	100.3	100.3	100.3			
11	100.0	100.0	100.0	100.1	100.2	100.3	100.2	100.2	100.3	100.3	100.3	100.3			
12	100.0	99.7	99.8	99.9	99.8	100.0	100.0	100.0	100.2	100.0	100.1	100.1			
13	100.0	99.6	99.7	99.9	100.0	99.8	99.9	100.0	100.1	100.1	100.0	100.1			
14	100.0	100.1	100.2	100.3	100.1	100.2	100.4	100.3	100.4	100.4	100.4	100.5			
15	100.0	99.8	99.9	100.0	100.1	100.2	100.1	100.2	100.2	100.1	100.2	100.2			
16	100.0	99.9	100.1	100.1	100.2	100.3	100.3	100.3	100.3	100.3	100.3	100.3			
17	100.0	99.8	99.9	99.9	100.0	100.2	100.2	100.1	100.1	100.2	100.2	100.1			
18	100.0	99.8	99.9	100.0	100.2	100.1	100.2	100.1	100.2	100.2	100.2	100.3			
19	100.0	99.8	99.8	100.1	100.1	100.1	100.2	100.2	100.3	100.2	100.3	100.3			
20	100.0	99.9	100.0	100.0	100.2	100.5	101.1	102.0	102.3	102.1	102.4	102.4			
21	100.0	99.8	99.9	100.0	100.1	100.2	100.2	100.2	100.3	100.2	100.3	100.2			
22	100.0	99.9	99.9	100.2	100.1	100.1	100.2	100.2	100.3	100.3	100.3	100.3			
23	100.0	99.8	100.0	100.0	100.0	100.2	100.1	100.2	100.2	100.2	100.2	100.2			
24	100.0	99.9	99.9	100.1	100.0	100.1	100.3	100.2	100.4	100.4	100.5	100.7			
25	100.0	99.7	100.0	100.1	100.2	100.2	100.3	100.3	100.3	100.3	100.3	100.2			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	100.0	99.9	99.9	100.1	100.1	100.2	100.3	100.4	100.5	100.5	100.5	100.6			
Med.	100.0	99.9	99.9	100.1	100.1	100.2	100.2	100.3	100.3	100.3	100.3	100.3			
σ	0.00	0.11	0.10	0.10	0.10	0.14	0.24	0.46	0.52	0.56	0.62	0.83			
Min.	100.0	99.6	99.7	99.9	99.8	99.8	99.9	100.0	100.1	100.0	100.0	100.1			
Max.	100.0	100.1	100.2	100.3	100.3	100.5	101.1	102.0	102.3	102.2	102.4	103.6			

Data Set 7 : 105 °C, 65 mA

Actual Case Temperature [T _s]	105.4 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	0.0009	0.0009	0.0009	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0014	0.0016			
2	0.0000	0.0009	0.0009	0.0009	0.0011	0.0011	0.0013	0.0013	0.0013	0.0015	0.0015	0.0017			
3	0.0000	0.0008	0.0008	0.0007	0.0009	0.0010	0.0011	0.0010	0.0013	0.0014	0.0016	0.0018			
4	0.0000	0.0007	0.0009	0.0008	0.0010	0.0010	0.0011	0.0011	0.0014	0.0016	0.0016	0.0020			
5	0.0000	0.0008	0.0010	0.0009	0.0011	0.0011	0.0012	0.0012	0.0013	0.0016	0.0017	0.0020			
6	0.0000	0.0006	0.0007	0.0007	0.0009	0.0008	0.0009	0.0010	0.0011	0.0013	0.0013	0.0017			
7	0.0000	0.0008	0.0009	0.0008	0.0009	0.0010	0.0010	0.0012	0.0012	0.0013	0.0014	0.0015			
8	0.0000	0.0010	0.0009	0.0009	0.0011	0.0011	0.0012	0.0013	0.0013	0.0014	0.0015	0.0017			
9	0.0000	0.0009	0.0009	0.0009	0.0010	0.0011	0.0013	0.0013	0.0013	0.0014	0.0015	0.0016			
10	0.0000	0.0007	0.0009	0.0009	0.0010	0.0011	0.0012	0.0013	0.0012	0.0015	0.0017	0.0020			
11	0.0000	0.0009	0.0010	0.0009	0.0011	0.0010	0.0012	0.0012	0.0012	0.0015	0.0015	0.0017			
12	0.0000	0.0009	0.0010	0.0009	0.0010	0.0009	0.0011	0.0012	0.0013	0.0013	0.0013	0.0015			
13	0.0000	0.0007	0.0007	0.0007	0.0009	0.0010	0.0011	0.0011	0.0012	0.0014	0.0014	0.0016			
14	0.0000	0.0009	0.0010	0.0009	0.0011	0.0012	0.0012	0.0012	0.0014	0.0015	0.0016	0.0017			
15	0.0000	0.0008	0.0008	0.0009	0.0009	0.0010	0.0011	0.0011	0.0013	0.0014	0.0013	0.0015			
16	0.0000	0.0010	0.0009	0.0010	0.0011	0.0011	0.0011	0.0012	0.0013	0.0013	0.0014	0.0016			
17	0.0000	0.0008	0.0009	0.0009	0.0009	0.0011	0.0011	0.0012	0.0012	0.0014	0.0015	0.0018			
18	0.0000	0.0009	0.0009	0.0009	0.0011	0.0010	0.0011	0.0012	0.0014	0.0015	0.0016	0.0018			
19	0.0000	0.0008	0.0007	0.0008	0.0009	0.0009	0.0010	0.0011	0.0011	0.0013	0.0013	0.0016			
20	0.0000	0.0006	0.0008	0.0007	0.0009	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013	0.0014			
21	0.0000	0.0008	0.0008	0.0008	0.0009	0.0010	0.0010	0.0010	0.0011	0.0012	0.0013	0.0014			
22	0.0000	0.0006	0.0007	0.0007	0.0009	0.0010	0.0010	0.0011	0.0012	0.0012	0.0013	0.0014			
23	0.0000	0.0010	0.0009	0.0009	0.0010	0.0011	0.0012	0.0013	0.0013	0.0014	0.0016	0.0017			
24	0.0000	0.0008	0.0008	0.0008	0.0010	0.0009	0.0011	0.0012	0.0012	0.0014	0.0014	0.0016			
25	0.0000	0.0005	0.0006	0.0004	0.0007	0.0007	0.0007	0.0009	0.0009	0.0011	0.0011	0.0013			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.0000	0.0008	0.0008	0.0008	0.0010	0.0010	0.0011	0.0011	0.0012	0.0014	0.0014	0.0016			
Med.	0.0000	0.0008	0.0009	0.0009	0.0010	0.0010	0.0011	0.0012	0.0013	0.0014	0.0014	0.0016			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002			
Min.	0.0000	0.0005	0.0006	0.0004	0.0007	0.0007	0.0007	0.0009	0.0009	0.0011	0.0011	0.0013			
Max.	0.0000	0.0010	0.0010	0.0010	0.0011	0.0012	0.0013	0.0013	0.0014	0.0016	0.0017	0.0020			

Data Set 7 : 105 °C, 65 mA

Actual Case Temperature [T _S]	105.4 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	65 mA
Measurement Current	65 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	0.2609	0.2599	0.2600	0.2599	0.2598	0.2598	0.2597	0.2597	0.2596	0.2596	0.2594	0.2593			
2	0.2611	0.2602	0.2601	0.2602	0.2600	0.2600	0.2598	0.2597	0.2598	0.2596	0.2596	0.2594			
3	0.2603	0.2595	0.2595	0.2596	0.2594	0.2594	0.2593	0.2593	0.2590	0.2589	0.2588	0.2586			
4	0.2597	0.2590	0.2589	0.2589	0.2588	0.2588	0.2586	0.2587	0.2584	0.2582	0.2582	0.2578			
5	0.2594	0.2586	0.2584	0.2585	0.2583	0.2583	0.2582	0.2582	0.2581	0.2578	0.2577	0.2574			
6	0.2617	0.2611	0.2609	0.2609	0.2608	0.2609	0.2607	0.2607	0.2606	0.2604	0.2604	0.2601			
7	0.2611	0.2604	0.2603	0.2604	0.2602	0.2601	0.2601	0.2600	0.2600	0.2598	0.2598	0.2597			
8	0.2619	0.2609	0.2609	0.2610	0.2608	0.2608	0.2607	0.2606	0.2606	0.2605	0.2604	0.2602			
9	0.2582	0.2573	0.2573	0.2573	0.2572	0.2571	0.2570	0.2570	0.2569	0.2568	0.2568	0.2566			
10	0.2581	0.2573	0.2572	0.2571	0.2571	0.2570	0.2569	0.2568	0.2568	0.2566	0.2565	0.2562			
11	0.2608	0.2599	0.2598	0.2599	0.2597	0.2597	0.2596	0.2596	0.2595	0.2593	0.2593	0.2591			
12	0.2591	0.2583	0.2582	0.2583	0.2581	0.2583	0.2581	0.2580	0.2579	0.2579	0.2578	0.2577			
13	0.2602	0.2595	0.2595	0.2595	0.2593	0.2592	0.2592	0.2592	0.2590	0.2588	0.2588	0.2586			
14	0.2593	0.2585	0.2584	0.2584	0.2583	0.2582	0.2581	0.2581	0.2580	0.2579	0.2578	0.2577			
15	0.2589	0.2581	0.2581	0.2580	0.2580	0.2579	0.2578	0.2578	0.2577	0.2576	0.2576	0.2574			
16	0.2603	0.2593	0.2594	0.2593	0.2592	0.2593	0.2592	0.2591	0.2590	0.2590	0.2589	0.2588			
17	0.2599	0.2592	0.2590	0.2591	0.2590	0.2588	0.2588	0.2587	0.2588	0.2586	0.2584	0.2581			
18	0.2591	0.2583	0.2583	0.2583	0.2581	0.2582	0.2581	0.2579	0.2578	0.2577	0.2576	0.2574			
19	0.2599	0.2591	0.2592	0.2591	0.2590	0.2590	0.2589	0.2588	0.2588	0.2586	0.2586	0.2584			
20	0.2590	0.2584	0.2582	0.2583	0.2581	0.2582	0.2582	0.2580	0.2579	0.2579	0.2577	0.2577			
21	0.2613	0.2604	0.2605	0.2605	0.2603	0.2602	0.2603	0.2603	0.2602	0.2601	0.2599	0.2599			
22	0.2591	0.2585	0.2585	0.2585	0.2583	0.2582	0.2581	0.2580	0.2580	0.2579	0.2578	0.2577			
23	0.2598	0.2589	0.2590	0.2589	0.2588	0.2588	0.2586	0.2585	0.2585	0.2584	0.2583	0.2582			
24	0.2595	0.2587	0.2587	0.2587	0.2585	0.2586	0.2584	0.2583	0.2583	0.2581	0.2581	0.2579			
25	0.2621	0.2615	0.2615	0.2616	0.2614	0.2614	0.2614	0.2612	0.2612	0.2610	0.2609	0.2608			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.2600	0.2592	0.2592	0.2592	0.2591	0.2590	0.2589	0.2589	0.2588	0.2587	0.2586	0.2584			
Med.	0.2599	0.2591	0.2590	0.2591	0.2590	0.2588	0.2588	0.2587	0.2588	0.2586	0.2584	0.2582			
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.	0.2581	0.2573	0.2572	0.2571	0.2571	0.2570	0.2569	0.2568	0.2568	0.2566	0.2565	0.2562			
Max.	0.2621	0.2615	0.2615	0.2616	0.2614	0.2614	0.2614	0.2612	0.2612	0.2610	0.2609	0.2608			

Data Set 7 : 105 °C, 65 mA

Actual Case Temperature [T _S]	105.4 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	65 mA
Measurement Current	65 mA

NOTES:
T_S and T_A were measured during initial setup.

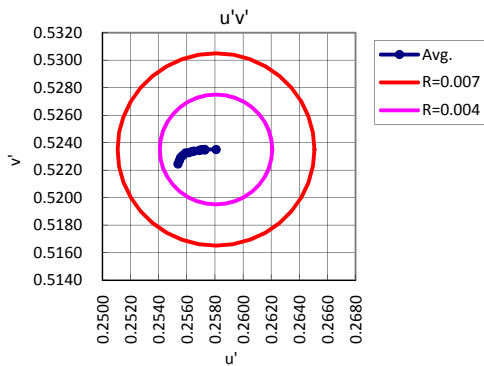
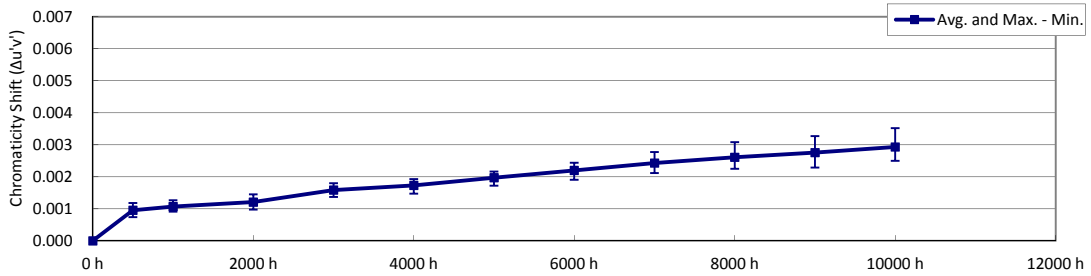
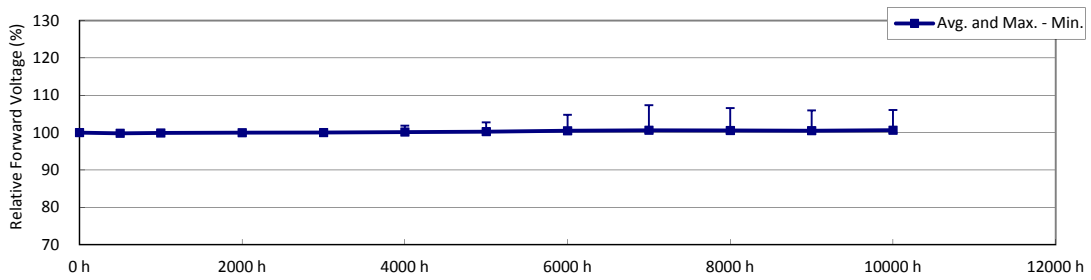
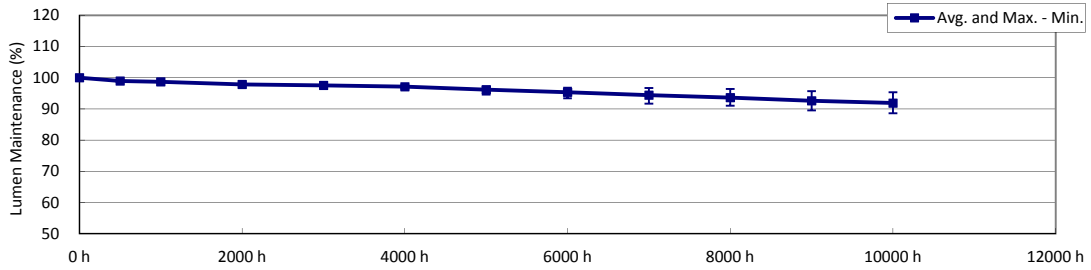
TABLE 7-6
Chromaticity

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	0.5256	0.5256	0.5256	0.5256	0.5256	0.5255	0.5255	0.5255	0.5254	0.5255	0.5254	0.5254			
2	0.5221	0.5222	0.5222	0.5221	0.5222	0.5220	0.5220	0.5221	0.5219	0.5220	0.5220	0.5219			
3	0.5237	0.5237	0.5237	0.5236	0.5236	0.5235	0.5235	0.5235	0.5234	0.5234	0.5232	0.5231			
4	0.5248	0.5247	0.5247	0.5247	0.5247	0.5246	0.5246	0.5245	0.5244	0.5244	0.5241	0.5241			
5	0.5237	0.5238	0.5238	0.5238	0.5237	0.5236	0.5237	0.5236	0.5235	0.5236	0.5233	0.5232			
6	0.5249	0.5251	0.5251	0.5251	0.5250	0.5250	0.5249	0.5247	0.5246	0.5247	0.5245	0.5244			
7	0.5256	0.5257	0.5256	0.5257	0.5256	0.5255	0.5256	0.5256	0.5255	0.5255	0.5253	0.5253			
8	0.5226	0.5226	0.5226	0.5226	0.5225	0.5225	0.5224	0.5224	0.5223	0.5224	0.5223	0.5222			
9	0.5230	0.5229	0.5229	0.5229	0.5229	0.5227	0.5228	0.5228	0.5227	0.5228	0.5226	0.5228			
10	0.5209	0.5209	0.5209	0.5208	0.5208	0.5206	0.5206	0.5207	0.5206	0.5205	0.5203	0.5202			
11	0.5231	0.5231	0.5231	0.5231	0.5231	0.5230	0.5230	0.5230	0.5229	0.5230	0.5229	0.5228			
12	0.5221	0.5220	0.5221	0.5221	0.5219	0.5220	0.5220	0.5221	0.5220	0.5220	0.5220	0.5219			
13	0.5250	0.5250	0.5250	0.5250	0.5249	0.5249	0.5248	0.5249	0.5247	0.5248	0.5249	0.5247			
14	0.5223	0.5223	0.5223	0.5222	0.5222	0.5221	0.5220	0.5221	0.5220	0.5221	0.5220	0.5219			
15	0.5234	0.5234	0.5232	0.5233	0.5232	0.5232	0.5232	0.5231	0.5231	0.5231	0.5231	0.5230			
16	0.5246	0.5246	0.5246	0.5246	0.5245	0.5245	0.5244	0.5244	0.5244	0.5244	0.5243	0.5243			
17	0.5233	0.5233	0.5233	0.5232	0.5232	0.5232	0.5232	0.5231	0.5230	0.5231	0.5230	0.5228			
18	0.5227	0.5226	0.5227	0.5226	0.5225	0.5225	0.5225	0.5225	0.5224	0.5224	0.5223	0.5222			
19	0.5239	0.5240	0.5239	0.5239	0.5239	0.5238	0.5239	0.5239	0.5238	0.5239	0.5238	0.5237			
20	0.5237	0.5237	0.5237	0.5237	0.5236	0.5236	0.5235	0.5234	0.5234	0.5235	0.5236	0.5235			
21	0.5250	0.5251	0.5251	0.5250	0.5250	0.5250	0.5249	0.5249	0.5249	0.5250	0.5249	0.5248			
22	0.5191	0.5192	0.5191	0.5191	0.5191	0.5190	0.5189	0.5189	0.5188	0.5191	0.5189	0.5188			
23	0.5227	0.5227	0.5227	0.5227	0.5227	0.5226	0.5225	0.5226	0.5224	0.5226	0.5224	0.5224			
24	0.5225	0.5226	0.5225	0.5225	0.5224	0.5224	0.5223	0.5223	0.5222	0.5223	0.5222	0.5221			
25	0.5249	0.5250	0.5250	0.5250	0.5250	0.5249	0.5249	0.5249	0.5248	0.5249	0.5248	0.5247			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.5234	0.5234	0.5234	0.5234	0.5234	0.5233	0.5233	0.5233	0.5232	0.5232	0.5231	0.5230			
Med.	0.5234	0.5234	0.5233	0.5233	0.5232	0.5232	0.5232	0.5231	0.5231	0.5231	0.5231	0.5230			
σ	0.0015	0.0015	0.0015	0.0015	0.0015	0.0016	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015			
Min.	0.5191	0.5192	0.5191	0.5191	0.5191	0.5190	0.5189	0.5189	0.5188	0.5191	0.5189	0.5188			
Max.	0.5256	0.5257	0.5256	0.5257	0.5256	0.5255	0.5256	0.5256	0.5255	0.5255	0.5254	0.5254			

Data Set 8 : 105 °C, 150 mA

Actual Case Temperature [T _s]	106.7 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	150 mA
Measurement Current	150 mA

NOTES:
T_s and T_A were measured during initial setup.



Data Set 8 : 105 °C, 150 mA

Actual Case Temperature [T _s]	106.7 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	62.8	3.12	2784	0.448	0.400	0.260	0.521						
2	62.9	3.12	2786	0.448	0.401	0.260	0.522						
3	63.2	3.12	2794	0.450	0.405	0.259	0.524						
4	63.3	3.12	2804	0.449	0.404	0.258	0.523						
5	63.1	3.11	2825	0.447	0.402	0.258	0.522						
6	63.6	3.11	2793	0.451	0.407	0.259	0.525						
7	63.1	3.11	2773	0.452	0.406	0.260	0.525						
8	63.8	3.11	2840	0.447	0.404	0.257	0.523						
9	63.4	3.11	2780	0.453	0.408	0.259	0.525						
10	63.2	3.11	2832	0.445	0.400	0.258	0.521						
11	63.6	3.12	2812	0.450	0.407	0.258	0.525						
12	63.6	3.12	2826	0.448	0.404	0.258	0.523						
13	63.7	3.12	2803	0.451	0.407	0.258	0.525						
14	64.1	3.12	2846	0.449	0.409	0.256	0.525						
15	63.5	3.11	2810	0.450	0.406	0.258	0.524						
16	63.0	3.12	2826	0.445	0.400	0.258	0.521						
17	63.9	3.12	2856	0.447	0.406	0.256	0.524						
18	64.1	3.12	2863	0.446	0.406	0.256	0.523						
19	63.3	3.12	2784	0.453	0.408	0.259	0.525						
20	63.2	3.11	2788	0.451	0.406	0.259	0.524						
21	63.8	3.11	2837	0.447	0.404	0.257	0.523						
22	63.8	3.12	2826	0.449	0.406	0.257	0.524						
23	63.7	3.12	2816	0.450	0.406	0.258	0.524						
24	63.4	3.12	2818	0.449	0.405	0.258	0.523						
25	63.2	3.12	2784	0.450	0.403	0.259	0.523						
n	25	25	25	25	25	25	25						
Avg.	63.4	3.12	2812	0.449	0.405	0.258	0.524						
Med.	63.4	3.12	2812	0.449	0.406	0.258	0.524						
σ	0.36	0.003	25.2	0.0022	0.0027	0.0011	0.0013						
Min.	62.8	3.11	2773	0.445	0.400	0.256	0.521						
Max.	64.1	3.12	2863	0.453	0.409	0.260	0.525						

Data Set 8 : 105 °C, 150 mA

Actual Case Temperature [T _s]	106.7 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	99.1	98.8	98.0	97.7	97.3	96.3	95.1	93.9	92.7	91.6	90.8
2	100.0	98.9	98.6	97.8	97.6	97.2	96.5	95.7	95.0	94.3	93.5	92.9
3	100.0	99.1	98.6	97.9	97.7	97.4	96.9	96.7	96.2	95.5	94.8	94.2
4	100.0	99.1	98.7	97.8	97.5	97.1	95.9	94.5	93.2	92.1	91.0	90.2
5	100.0	98.9	98.6	97.8	97.5	97.0	95.8	93.9	91.7	91.5	89.9	89.2
6	100.0	99.1	98.9	98.1	97.8	97.5	96.9	96.7	96.1	95.7	94.8	94.1
7	100.0	98.9	98.8	97.9	97.7	97.3	96.7	96.0	94.7	94.1	93.0	92.0
8	100.0	99.2	98.8	98.0	97.8	97.6	97.1	96.8	96.7	96.4	95.7	95.3
9	100.0	98.6	98.5	97.7	97.4	97.2	96.6	96.2	95.7	95.0	94.1	93.6
10	100.0	98.9	98.5	97.8	97.3	97.1	96.1	95.0	94.0	92.8	91.7	91.0
11	100.0	98.9	98.6	97.9	97.7	97.3	96.7	96.4	95.9	95.4	94.5	93.9
12	100.0	98.8	98.6	97.8	97.5	97.2	96.5	96.2	95.7	95.2	94.5	93.9
13	100.0	99.0	98.8	98.0	97.6	97.4	96.8	96.6	96.1	95.6	94.9	94.3
14	100.0	98.9	98.7	97.9	97.5	96.9	96.1	95.0	93.6	92.2	91.3	90.2
15	100.0	98.8	98.6	97.9	97.4	97.1	96.0	94.8	93.4	91.9	90.9	89.9
16	100.0	99.0	98.7	97.9	97.6	97.2	96.4	95.8	95.1	94.3	93.5	92.9
17	100.0	98.7	98.5	97.7	97.4	97.2	96.6	96.3	96.0	95.7	95.0	94.6
18	100.0	99.0	98.7	97.8	97.6	97.3	96.6	96.2	95.7	95.0	94.1	93.5
19	100.0	99.1	98.9	98.0	97.9	97.6	96.8	96.2	95.4	94.7	93.8	93.1
20	100.0	99.0	98.7	97.7	97.5	96.6	94.8	93.4	92.2	91.1	89.8	88.8
21	100.0	99.0	98.8	97.8	97.5	97.0	95.5	94.7	93.5	92.7	91.3	90.6
22	100.0	99.0	98.7	97.8	97.4	96.4	94.6	93.4	92.0	91.0	89.5	88.6
23	100.0	98.8	98.6	97.7	97.4	96.8	95.2	94.3	93.3	92.3	91.1	90.3
24	100.0	98.9	98.6	97.6	97.3	96.7	95.0	93.8	92.6	91.6	90.5	89.7
25	100.0	99.1	98.9	97.8	97.5	97.0	95.4	94.1	93.0	92.0	90.7	89.9
n	25	25	25	25	25	25	25	25	25	25	25	25
Avg.	100.0	99.0	98.7	97.8	97.6	97.1	96.2	95.3	94.4	93.6	92.6	91.9
Med.	100.0	99.0	98.7	97.8	97.5	97.2	96.4	95.7	94.7	94.1	93.0	92.0
σ	0.00	0.13	0.12	0.12	0.15	0.29	0.71	1.10	1.51	1.72	1.94	2.09
Min.	100.0	98.6	98.5	97.6	97.3	96.4	94.6	93.4	91.7	91.0	89.5	88.6
Max.	100.0	99.2	98.9	98.1	97.9	97.6	97.1	96.8	96.7	96.4	95.7	95.3

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0391	-0.0477	-0.0573	-0.0657	-0.0766	-0.0845

Test duration used	5000 h to 10000 h
B	1.0073
α	9.2143E-06
R ²	0.9988
Calculated L ₇₀ (10K)	39500 hours
Reported L ₇₀ (10K)	39500 hours
Calculated L ₈₀ (10K)	25000 hours
Reported L ₈₀ (10K)	25000 hours
Calculated L ₉₀ (10K)	12200 hours
Reported L ₉₀ (10K)	12200 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, 150 mA

Actual Case Temperature [T _S]	106.7 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	99.9	99.9	100.0	100.0	100.1	100.2	100.2	100.2	100.2	100.2	100.2	100.4			
2	100.0	99.9	100.0	100.1	100.1	100.2	100.3	100.4	100.4	100.4	100.5	100.6				
3	100.0	100.0	99.9	100.0	100.0	100.1	100.2	100.2	100.2	100.2	100.2	100.2				
4	100.0	99.9	99.9	100.1	100.1	100.3	100.3	100.3	100.3	100.3	100.3	100.4				
5	100.0	99.9	100.0	100.0	100.1	100.3	101.5	104.8	107.3	104.7	105.9	105.5				
6	100.0	99.7	100.0	100.1	100.0	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1			
7	100.0	100.0	99.9	100.1	100.1	100.2	100.2	100.5	100.4	100.4	100.4	100.6				
8	100.0	99.9	99.9	100.0	100.0	99.9	100.1	100.1	100.1	100.1	100.1	100.0	100.2			
9	100.0	99.7	99.9	100.0	99.8	99.9	100.0	100.0	100.0	99.9	99.9	100.0				
10	100.0	99.8	100.1	100.0	100.0	100.2	100.3	100.4	100.4	100.4	100.4	100.7				
11	100.0	99.7	99.8	99.8	100.0	99.9	99.9	100.0	100.0	100.0	99.9	100.1				
12	100.0	99.9	99.8	100.0	100.0	100.0	100.0	100.1	100.1	100.0	100.0	100.1				
13	100.0	99.8	100.0	100.0	100.1	100.0	100.1	100.1	100.1	100.1	100.1	100.1				
14	100.0	99.8	99.9	100.1	100.2	101.9	102.8	104.1	105.0	106.6	104.6	106.1				
15	100.0	99.7	99.9	100.0	100.1	100.1	100.1	100.2	100.2	100.1	100.1	100.2				
16	100.0	99.8	100.0	100.0	100.2	100.1	100.1	100.1	100.1	100.1	100.1	100.1				
17	100.0	99.8	99.9	99.8	100.1	100.0	99.9	100.0	100.0	99.9	99.9	100.0				
18	100.0	99.8	99.8	100.0	100.1	100.1	100.0	100.1	100.1	100.1	100.0	100.1				
19	100.0	99.8	100.0	100.0	100.1	100.1	100.1	100.2	100.1	100.1	100.1	100.1				
20	100.0	99.7	99.8	99.9	99.9	100.0	100.0	100.0	100.1	100.0	100.0	100.1				
21	100.0	99.8	100.0	100.0	100.1	100.2	100.2	100.1	100.2	100.2	100.1	100.2				
22	100.0	99.8	99.8	99.9	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.1				
23	100.0	99.8	99.9	99.9	99.9	100.1	100.2	100.3	100.3	100.2	100.3	100.5				
24	100.0	99.8	100.0	99.9	99.9	100.1	100.0	100.1	100.1	100.0	100.0	100.1				
25	100.0	99.8	99.9	99.9	100.1	100.1	100.0	100.1	100.1	100.0	100.0	100.1				
n	25	25	25	25	25	25	25	25	25	25	25	25				
Avg.	100.0	99.8	99.9	100.0	100.0	100.2	100.3	100.5	100.6	100.6	100.5	100.7				
Med.	100.0	99.8	99.9	100.0	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1				
σ	0.00	0.10	0.08	0.07	0.10	0.38	0.60	1.19	1.70	1.56	1.45	1.55				
Min.	100.0	99.7	99.8	99.8	99.8	99.9	99.9	100.0	100.0	99.9	99.9	100.0				
Max.	100.0	100.0	100.1	100.1	100.2	101.9	102.8	104.8	107.3	106.6	105.9	106.1				

Data Set 8 : 105 °C, 150 mA

Actual Case Temperature [T _s]	106.7 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	0.0009	0.0011	0.0013	0.0016	0.0018	0.0020	0.0022	0.0026	0.0030	0.0031	0.0032			
2	0.0000	0.0010	0.0011	0.0013	0.0017	0.0019	0.0022	0.0024	0.0026	0.0028	0.0031	0.0032			
3	0.0000	0.0010	0.0010	0.0012	0.0015	0.0016	0.0018	0.0019	0.0021	0.0023	0.0024	0.0026			
4	0.0000	0.0012	0.0012	0.0014	0.0018	0.0019	0.0021	0.0022	0.0027	0.0027	0.0029	0.0030			
5	0.0000	0.0010	0.0012	0.0013	0.0017	0.0018	0.0020	0.0023	0.0027	0.0028	0.0028	0.0029			
6	0.0000	0.0012	0.0013	0.0013	0.0016	0.0018	0.0019	0.0021	0.0022	0.0024	0.0025	0.0026			
7	0.0000	0.0011	0.0011	0.0012	0.0015	0.0017	0.0019	0.0021	0.0023	0.0025	0.0028	0.0030			
8	0.0000	0.0009	0.0011	0.0012	0.0016	0.0016	0.0019	0.0020	0.0022	0.0023	0.0023	0.0025			
9	0.0000	0.0009	0.0012	0.0013	0.0017	0.0018	0.0020	0.0021	0.0023	0.0026	0.0026	0.0028			
10	0.0000	0.0011	0.0012	0.0015	0.0018	0.0019	0.0021	0.0024	0.0028	0.0031	0.0033	0.0035			
11	0.0000	0.0009	0.0010	0.0011	0.0015	0.0016	0.0019	0.0020	0.0022	0.0023	0.0024	0.0026			
12	0.0000	0.0010	0.0012	0.0013	0.0016	0.0018	0.0020	0.0021	0.0023	0.0024	0.0026	0.0028			
13	0.0000	0.0008	0.0009	0.0010	0.0015	0.0017	0.0017	0.0020	0.0021	0.0023	0.0026	0.0026			
14	0.0000	0.0008	0.0009	0.0010	0.0014	0.0015	0.0017	0.0020	0.0022	0.0024	0.0026	0.0028			
15	0.0000	0.0011	0.0011	0.0012	0.0016	0.0017	0.0020	0.0023	0.0026	0.0028	0.0028	0.0031			
16	0.0000	0.0009	0.0011	0.0012	0.0016	0.0018	0.0020	0.0023	0.0025	0.0028	0.0028	0.0030			
17	0.0000	0.0009	0.0010	0.0011	0.0015	0.0016	0.0018	0.0021	0.0022	0.0023	0.0025	0.0027			
18	0.0000	0.0009	0.0011	0.0013	0.0016	0.0017	0.0018	0.0021	0.0023	0.0024	0.0025	0.0028			
19	0.0000	0.0009	0.0011	0.0011	0.0015	0.0017	0.0018	0.0021	0.0023	0.0024	0.0025	0.0027			
20	0.0000	0.0007	0.0010	0.0010	0.0015	0.0016	0.0020	0.0024	0.0026	0.0028	0.0029	0.0031			
21	0.0000	0.0009	0.0011	0.0012	0.0017	0.0018	0.0021	0.0024	0.0026	0.0030	0.0032	0.0033			
22	0.0000	0.0009	0.0010	0.0011	0.0016	0.0017	0.0022	0.0024	0.0026	0.0026	0.0028	0.0029			
23	0.0000	0.0009	0.0010	0.0012	0.0016	0.0018	0.0022	0.0024	0.0026	0.0029	0.0031	0.0034			
24	0.0000	0.0008	0.0009	0.0011	0.0014	0.0016	0.0019	0.0022	0.0025	0.0028	0.0030	0.0031			
25	0.0000	0.0010	0.0009	0.0013	0.0016	0.0018	0.0021	0.0024	0.0025	0.0027	0.0029	0.0030			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.0000	0.0010	0.0011	0.0012	0.0016	0.0017	0.0020	0.0022	0.0024	0.0026	0.0028	0.0029			
Med.	0.0000	0.0009	0.0011	0.0012	0.0016	0.0017	0.0020	0.0022	0.0025	0.0026	0.0028	0.0029			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003			
Min.	0.0000	0.0007	0.0009	0.0010	0.0014	0.0015	0.0017	0.0019	0.0021	0.0023	0.0023	0.0025			
Max.	0.0000	0.0012	0.0013	0.0015	0.0018	0.0019	0.0022	0.0024	0.0028	0.0031	0.0033	0.0035			

Data Set 8 : 105 °C, 150 mA

Actual Case Temperature [T _s]	106.7 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	150 mA
Measurement Current	150 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	0.2603	0.2594	0.2593	0.2591	0.2587	0.2586	0.2583	0.2582	0.2578	0.2575	0.2575	0.2574			
2	0.2602	0.2591	0.2590	0.2588	0.2585	0.2583	0.2580	0.2578	0.2576	0.2575	0.2572	0.2572			
3	0.2593	0.2583	0.2583	0.2581	0.2578	0.2577	0.2575	0.2574	0.2572	0.2570	0.2570	0.2568			
4	0.2591	0.2579	0.2579	0.2577	0.2574	0.2572	0.2570	0.2569	0.2565	0.2565	0.2563	0.2562			
5	0.2586	0.2576	0.2574	0.2573	0.2569	0.2568	0.2566	0.2563	0.2560	0.2559	0.2558	0.2558			
6	0.2595	0.2584	0.2583	0.2583	0.2579	0.2577	0.2576	0.2574	0.2573	0.2572	0.2570	0.2570			
7	0.2603	0.2592	0.2592	0.2591	0.2588	0.2586	0.2584	0.2582	0.2580	0.2578	0.2576	0.2575			
8	0.2575	0.2567	0.2565	0.2564	0.2560	0.2560	0.2557	0.2555	0.2554	0.2553	0.2553	0.2551			
9	0.2597	0.2589	0.2586	0.2584	0.2581	0.2579	0.2578	0.2576	0.2574	0.2572	0.2572	0.2571			
10	0.2583	0.2572	0.2572	0.2569	0.2566	0.2564	0.2562	0.2560	0.2557	0.2554	0.2554	0.2552			
11	0.2583	0.2573	0.2573	0.2572	0.2568	0.2567	0.2564	0.2563	0.2561	0.2560	0.2559	0.2558			
12	0.2581	0.2571	0.2569	0.2568	0.2565	0.2562	0.2560	0.2559	0.2557	0.2557	0.2555	0.2554			
13	0.2586	0.2578	0.2576	0.2575	0.2570	0.2569	0.2568	0.2566	0.2564	0.2562	0.2560	0.2561			
14	0.2567	0.2559	0.2558	0.2557	0.2554	0.2553	0.2550	0.2548	0.2546	0.2544	0.2543	0.2543			
15	0.2587	0.2576	0.2575	0.2574	0.2570	0.2569	0.2567	0.2564	0.2561	0.2559	0.2559	0.2558			
16	0.2585	0.2576	0.2574	0.2574	0.2569	0.2568	0.2565	0.2562	0.2560	0.2558	0.2558	0.2557			
17	0.2566	0.2557	0.2556	0.2555	0.2552	0.2550	0.2549	0.2545	0.2544	0.2543	0.2542	0.2540			
18	0.2564	0.2554	0.2553	0.2551	0.2548	0.2546	0.2546	0.2542	0.2541	0.2540	0.2540	0.2538			
19	0.2597	0.2588	0.2587	0.2586	0.2582	0.2580	0.2579	0.2576	0.2574	0.2573	0.2572	0.2570			
20	0.2594	0.2587	0.2585	0.2584	0.2580	0.2579	0.2575	0.2571	0.2570	0.2569	0.2569	0.2568			
21	0.2577	0.2568	0.2566	0.2565	0.2561	0.2560	0.2556	0.2553	0.2552	0.2549	0.2548	0.2547			
22	0.2581	0.2572	0.2571	0.2569	0.2565	0.2563	0.2559	0.2557	0.2555	0.2555	0.2554	0.2554			
23	0.2582	0.2573	0.2572	0.2570	0.2565	0.2564	0.2560	0.2559	0.2557	0.2555	0.2554	0.2553			
24	0.2583	0.2574	0.2574	0.2572	0.2569	0.2566	0.2564	0.2561	0.2559	0.2557	0.2556	0.2556			
25	0.2598	0.2588	0.2589	0.2585	0.2582	0.2580	0.2577	0.2575	0.2574	0.2573	0.2572	0.2572			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.2586	0.2577	0.2576	0.2574	0.2571	0.2569	0.2567	0.2565	0.2563	0.2561	0.2560	0.2559			
Med.	0.2586	0.2576	0.2574	0.2574	0.2569	0.2568	0.2566	0.2563	0.2561	0.2559	0.2559	0.2558			
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.	0.2564	0.2554	0.2553	0.2551	0.2548	0.2546	0.2546	0.2542	0.2541	0.2540	0.2540	0.2538			
Max.	0.2603	0.2594	0.2593	0.2591	0.2588	0.2586	0.2584	0.2582	0.2580	0.2578	0.2576	0.2575			

Data Set 8 : 105 °C, 150 mA

Actual Case Temperature [T _s]	106.7 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	150 mA
Measurement Current	150 mA

NOTES:

T_s and T_A were measured during initial setup.

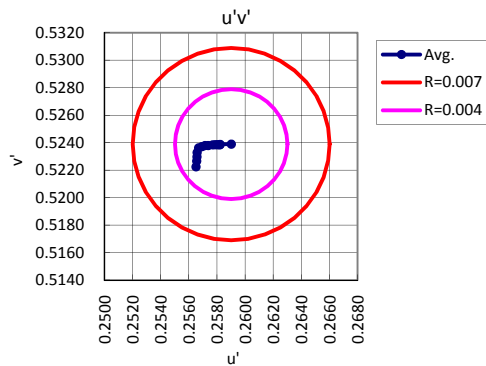
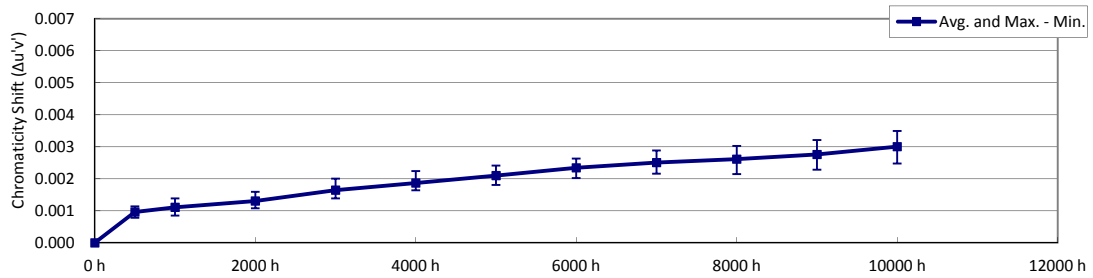
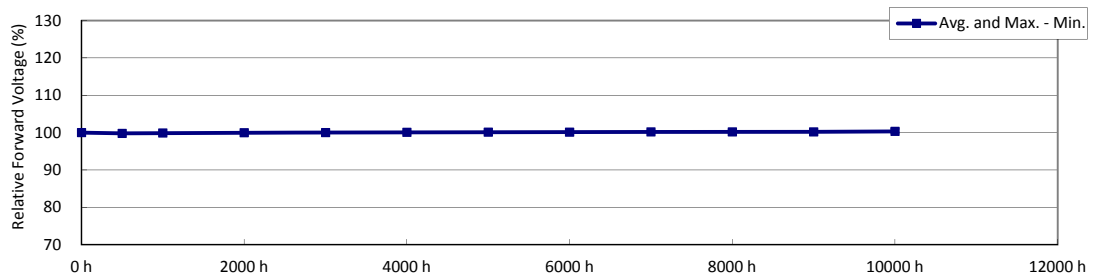
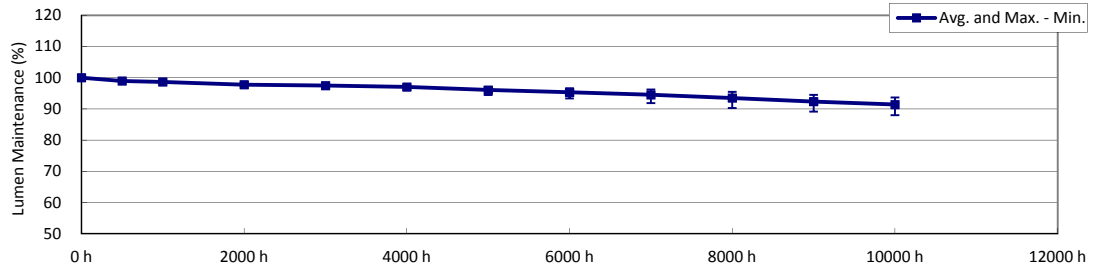
TABLE 8-6
Chromaticity

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	0.5212	0.5212	0.5212	0.5211	0.5210	0.5210	0.5209	0.5209	0.5206	0.5202	0.5201	0.5199			
2	0.5215	0.5215	0.5215	0.5214	0.5214	0.5213	0.5213	0.5213	0.5210	0.5210	0.5207	0.5205			
3	0.5236	0.5236	0.5235	0.5235	0.5235	0.5234	0.5235	0.5235	0.5234	0.5232	0.5230	0.5228			
4	0.5231	0.5232	0.5231	0.5231	0.5231	0.5230	0.5229	0.5228	0.5227	0.5226	0.5223	0.5222			
5	0.5217	0.5217	0.5218	0.5217	0.5216	0.5216	0.5214	0.5218	0.5221	0.5218	0.5217	0.5213			
6	0.5245	0.5245	0.5245	0.5245	0.5244	0.5245	0.5244	0.5245	0.5245	0.5242	0.5242	0.5240			
7	0.5244	0.5244	0.5243	0.5243	0.5244	0.5243	0.5243	0.5243	0.5240	0.5239	0.5237	0.5234			
8	0.5228	0.5228	0.5228	0.5228	0.5227	0.5227	0.5227	0.5228	0.5227	0.5226	0.5224	0.5222			
9	0.5252	0.5254	0.5253	0.5252	0.5252	0.5252	0.5252	0.5252	0.5250	0.5248	0.5245	0.5243			
10	0.5211	0.5209	0.5209	0.5209	0.5207	0.5208	0.5207	0.5206	0.5203	0.5201	0.5198	0.5195			
11	0.5245	0.5245	0.5245	0.5245	0.5244	0.5244	0.5245	0.5244	0.5244	0.5244	0.5242	0.5239			
12	0.5227	0.5226	0.5227	0.5226	0.5225	0.5226	0.5226	0.5226	0.5224	0.5223	0.5221	0.5218			
13	0.5244	0.5243	0.5243	0.5243	0.5242	0.5242	0.5242	0.5243	0.5241	0.5242	0.5240	0.5238			
14	0.5250	0.5249	0.5249	0.5249	0.5247	0.5246	0.5245	0.5244	0.5243	0.5242	0.5239	0.5235			
15	0.5240	0.5240	0.5240	0.5239	0.5239	0.5239	0.5238	0.5238	0.5235	0.5233	0.5232	0.5229			
16	0.5207	0.5206	0.5207	0.5206	0.5206	0.5205	0.5204	0.5204	0.5202	0.5201	0.5199	0.5197			
17	0.5235	0.5234	0.5235	0.5235	0.5235	0.5234	0.5234	0.5234	0.5232	0.5232	0.5230	0.5228			
18	0.5233	0.5233	0.5233	0.5232	0.5232	0.5231	0.5231	0.5230	0.5228	0.5225	0.5224	0.5221			
19	0.5252	0.5251	0.5252	0.5251	0.5251	0.5251	0.5251	0.5250	0.5250	0.5249	0.5249	0.5247			
20	0.5239	0.5240	0.5240	0.5239	0.5239	0.5238	0.5236	0.5234	0.5231	0.5229	0.5226	0.5224			
21	0.5228	0.5228	0.5227	0.5227	0.5227	0.5226	0.5224	0.5224	0.5221	0.5218	0.5215	0.5213			
22	0.5236	0.5236	0.5236	0.5235	0.5234	0.5234	0.5232	0.5232	0.5229	0.5230	0.5226	0.5224			
23	0.5241	0.5241	0.5240	0.5239	0.5239	0.5238	0.5237	0.5235	0.5232	0.5228	0.5226	0.5223			
24	0.5233	0.5234	0.5233	0.5233	0.5233	0.5232	0.5229	0.5229	0.5225	0.5222	0.5220	0.5217			
25	0.5228	0.5229	0.5229	0.5228	0.5227	0.5227	0.5225	0.5224	0.5222	0.5220	0.5216	0.5213			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.5233	0.5233	0.5233	0.5233	0.5232	0.5232	0.5231	0.5231	0.5229	0.5227	0.5225	0.5223			
Med.	0.5235	0.5234	0.5235	0.5235	0.5234	0.5234	0.5232	0.5232	0.5229	0.5228	0.5226	0.5223			
σ	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0014	0.0014	0.0014	0.0014			
Min.	0.5207	0.5206	0.5207	0.5206	0.5206	0.5205	0.5204	0.5204	0.5202	0.5201	0.5198	0.5195			
Max.	0.5252	0.5254	0.5253	0.5252	0.5252	0.5252	0.5252	0.5252	0.5250	0.5249	0.5249	0.5247			

Data Set 9 : 105 °C, 180 mA

Actual Case Temperature [T _s]	106.1 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	180 mA
Measurement Current	180 mA

NOTES:
T_s and T_A were measured during initial setup.



Data Set 9 : 105 °C, 180 mA

Actual Case Temperature [T _s]	106.1 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	74.3	3.18	2802	0.451	0.408	0.258	0.525					
2	74.5	3.19	2816	0.448	0.403	0.258	0.523					
3	74.8	3.19	2837	0.447	0.404	0.257	0.523					
4	74.7	3.19	2800	0.451	0.407	0.258	0.525					
5	73.7	3.19	2739	0.456	0.409	0.261	0.526					
6	74.3	3.18	2841	0.448	0.406	0.257	0.524					
7	72.9	3.18	2706	0.454	0.401	0.263	0.523					
8	74.9	3.19	2862	0.445	0.403	0.256	0.522					
9	74.7	3.18	2787	0.453	0.409	0.259	0.526					
10	73.5	3.19	2751	0.452	0.404	0.261	0.524					
11	74.8	3.19	2848	0.446	0.404	0.257	0.523					
12	74.1	3.19	2784	0.451	0.406	0.259	0.524					
13	73.6	3.19	2751	0.453	0.404	0.261	0.524					
14	73.7	3.19	2767	0.451	0.403	0.260	0.523					
15	74.2	3.19	2798	0.449	0.404	0.259	0.523					
16	74.8	3.19	2829	0.448	0.406	0.257	0.524					
17	73.4	3.19	2752	0.452	0.403	0.261	0.523					
18	73.6	3.19	2750	0.453	0.405	0.261	0.524					
19	74.6	3.19	2801	0.451	0.406	0.258	0.524					
20	73.7	3.19	2735	0.456	0.407	0.261	0.526					
21	74.8	3.18	2824	0.449	0.406	0.257	0.524					
22	74.9	3.19	2803	0.451	0.407	0.258	0.525					
23	74.6	3.19	2791	0.451	0.406	0.259	0.524					
24	73.9	3.19	2777	0.451	0.404	0.260	0.523					
25	74.4	3.19	2798	0.451	0.406	0.259	0.524					
n	25	25	25	25	25	25	25					
Avg.	74.2	3.19	2790	0.451	0.405	0.259	0.524					
Med.	74.3	3.19	2798	0.451	0.406	0.259	0.524					
σ	0.58	0.003	39.3	0.0027	0.0021	0.0017	0.0010					
Min.	72.9	3.18	2706	0.445	0.401	0.256	0.522					
Max.	74.9	3.19	2862	0.456	0.409	0.263	0.526					

Data Set 9 : 105 °C, 180 mA

Actual Case Temperature [T _s]	106.1 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	98.9	98.4	97.7	97.4	96.8	95.4	94.3	93.3	92.2	91.0	89.9
2	100.0	99.0	98.6	97.8	97.5	97.3	96.6	96.3	95.6	94.8	93.8	93.0
3	100.0	99.1	98.6	97.8	97.4	96.4	94.8	93.7	92.6	91.4	90.1	89.0
4	100.0	99.1	98.7	98.0	97.8	97.5	96.9	96.5	96.0	95.4	94.5	93.7
5	100.0	99.0	98.6	97.9	97.6	97.1	96.1	95.2	94.1	92.9	91.8	90.8
6	100.0	98.9	98.3	97.6	97.1	96.1	94.5	93.4	91.9	90.3	89.1	88.0
7	100.0	99.0	98.6	97.8	97.5	97.0	96.2	95.5	94.8	93.8	92.6	91.6
8	100.0	99.6	99.0	98.3	97.9	97.8	97.0	96.6	96.0	95.2	94.2	93.3
9	100.0	99.0	98.8	97.9	97.5	96.8	95.3	94.0	93.0	91.7	90.3	89.3
10	100.0	98.9	98.7	97.7	97.5	97.1	96.5	96.2	95.6	95.1	94.1	93.4
11	100.0	99.1	98.9	98.0	97.8	97.5	96.7	96.1	95.5	94.6	93.5	92.7
12	100.0	98.9	98.6	97.6	97.5	97.2	96.5	96.0	95.3	94.1	92.8	91.8
13	100.0	98.7	98.6	97.6	97.4	96.9	95.7	94.4	93.3	92.0	90.7	89.7
14	100.0	98.8	98.5	97.6	97.4	97.0	96.3	95.8	95.3	94.1	93.0	92.1
15	100.0	99.0	98.7	97.8	97.5	97.3	96.6	96.3	95.9	95.3	94.2	93.5
16	100.0	98.8	98.5	97.5	97.2	96.4	94.6	93.3	92.3	91.1	89.7	88.6
17	100.0	98.8	98.6	97.5	97.2	96.5	95.1	93.7	92.6	91.2	89.9	88.9
18	100.0	98.8	98.5	97.7	97.5	97.3	96.6	96.3	96.0	95.1	94.2	93.5
19	100.0	98.8	98.5	97.5	97.1	96.7	95.7	94.4	93.2	91.5	90.3	89.3
20	100.0	99.0	98.8	97.9	97.6	97.5	96.9	96.6	96.2	95.5	94.5	93.6
21	100.0	99.1	98.9	97.9	97.6	97.2	96.2	95.1	94.1	92.8	91.7	90.5
22	100.0	99.0	98.7	97.8	97.5	97.2	96.7	96.3	95.5	94.7	93.6	92.5
23	100.0	99.0	98.8	97.8	97.5	97.3	96.7	96.5	95.9	95.2	94.2	93.4
24	100.0	98.9	98.5	97.7	97.3	96.8	95.5	94.3	93.1	91.7	90.5	89.5
25	100.0	98.9	98.7	97.8	97.6	97.4	96.8	96.5	96.2	95.4	94.5	93.6
n	25	25	25	25	25	25	25	25	25	25	25	25
Avg.	100.0	99.0	98.6	97.8	97.5	97.0	96.1	95.3	94.5	93.5	92.4	91.4
Med.	100.0	99.0	98.6	97.8	97.5	97.1	96.3	95.8	95.3	94.1	92.8	91.8
σ	0.00	0.17	0.17	0.19	0.20	0.40	0.77	1.15	1.44	1.71	1.85	1.95
Min.	100.0	98.7	98.3	97.5	97.1	96.1	94.5	93.3	91.9	90.3	89.1	88.0
Max.	100.0	99.6	99.0	98.3	97.9	97.8	97.0	96.6	96.2	95.5	94.5	93.7

TM-21 Projection

Time	5000 h	6000 h	7000 h	8000 h	9000 h	10000 h
ln(Avg.)	-0.0400	-0.0479	-0.0562	-0.0674	-0.0795	-0.0898

Test duration used	5000 h to 10000 h
B	1.0126
α	1.0138E-05
R ²	0.9936
Calculated L ₇₀ (10K)	36400 hours
Reported L ₇₀ (10K)	36400 hours
Calculated L ₈₀ (10K)	23200 hours
Reported L ₈₀ (10K)	23200 hours
Calculated L ₉₀ (10K)	11600 hours
Reported L ₉₀ (10K)	11600 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 : 105 °C, 180 mA

Actual Case Temperature [T _s]	106.1 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	99.8	100.0	100.0	100.0	100.1	100.2	100.2	100.3	100.3	100.5	100.7			
2	100.0	99.9	100.1	100.0	100.2	100.3	100.4	100.5	100.5	100.6	100.7	100.9			
3	100.0	99.9	100.0	99.9	100.0	100.0	100.1	100.1	100.1	100.1	100.0	100.2			
4	100.0	99.8	100.0	100.1	100.0	100.1	100.1	100.2	100.1	100.1	100.1	100.2			
5	100.0	99.9	100.0	100.1	100.1	99.9	100.1	100.2	100.1	100.1	100.1	100.2			
6	100.0	99.9	99.9	100.0	99.9	100.1	100.0	99.9	100.0	100.0	100.0	100.0			
7	100.0	99.9	99.9	100.2	100.1	100.0	100.2	100.2	100.4	100.4	100.4	100.5			
8	100.0	100.0	100.1	100.2	100.1	100.1	100.2	100.1	100.2	100.2	100.2	100.2			
9	100.0	99.8	100.0	100.0	100.0	100.2	100.3	100.3	100.5	100.6	100.7	100.8			
10	100.0	99.6	99.8	99.9	100.0	100.0	100.0	100.1	100.1	100.0	100.0	100.0			
11	100.0	99.9	100.0	100.0	100.1	100.3	100.2	100.2	100.3	100.3	100.3	100.4			
12	100.0	99.7	99.9	99.9	100.0	99.9	100.0	100.0	100.1	100.0	100.0	100.1			
13	100.0	99.8	99.8	99.9	99.9	100.0	100.0	100.1	100.2	100.2	100.1	100.3			
14	100.0	99.8	100.0	100.1	100.1	100.1	100.2	100.3	100.3	100.3	100.3	100.5			
15	100.0	99.8	99.9	99.9	100.0	100.1	100.1	100.2	100.2	100.2	100.2	100.4			
16	100.0	99.8	99.9	100.0	100.0	100.0	100.0	99.9	100.1	100.0	100.0	100.1			
17	100.0	99.8	99.9	100.0	100.0	100.2	100.1	100.1	100.3	100.2	100.3	100.3			
18	100.0	99.7	99.8	99.9	100.0	99.8	100.0	100.0	100.1	100.0	100.0	100.1			
19	100.0	99.8	100.0	99.9	100.0	100.1	100.1	100.1	100.1	100.1	100.1	100.1			
20	100.0	99.8	100.0	100.0	100.0	100.3	100.1	100.1	100.2	100.1	100.1	100.2			
21	100.0	99.7	99.7	99.8	100.0	100.0	100.1	100.3	100.5	100.6	100.8	101.0			
22	100.0	99.9	100.0	100.0	100.1	100.2	100.3	100.3	100.5	100.4	100.4	100.6			
23	100.0	99.8	99.8	100.0	99.9	100.0	100.1	100.2	100.4	100.3	100.4	100.5			
24	100.0	99.7	99.8	99.8	99.9	99.9	100.0	100.0	100.1	100.0	100.0	100.2			
25	100.0	99.8	99.9	99.9	100.0	100.0	100.0	100.0	100.1	100.0	99.9	100.1			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	100.0	99.8	99.9	100.0	100.0	100.1	100.1	100.1	100.2	100.2	100.2	100.3			
Med.	100.0	99.8	99.9	100.0	100.0	100.1	100.1	100.1	100.2	100.2	100.1	100.2			
σ	0.00	0.09	0.10	0.09	0.08	0.11	0.11	0.13	0.16	0.19	0.24	0.29			
Min.	100.0	99.6	99.7	99.8	99.9	99.8	100.0	99.9	100.0	100.0	99.9	100.0			
Max.	100.0	100.0	100.1	100.2	100.2	100.3	100.4	100.5	100.5	100.6	100.8	101.0			

Data Set 9 : 105 °C, 180 mA

Actual Case Temperature [T _S]	106.1 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	0.0009	0.0011	0.0012	0.0015	0.0018	0.0020	0.0024	0.0026	0.0028	0.0028	0.0031			
2	0.0000	0.0011	0.0012	0.0014	0.0018	0.0020	0.0022	0.0024	0.0027	0.0029	0.0029	0.0034			
3	0.0000	0.0009	0.0011	0.0012	0.0017	0.0020	0.0022	0.0026	0.0028	0.0030	0.0032	0.0035			
4	0.0000	0.0011	0.0012	0.0014	0.0017	0.0018	0.0021	0.0023	0.0024	0.0024	0.0024	0.0027			
5	0.0000	0.0008	0.0009	0.0011	0.0014	0.0016	0.0018	0.0022	0.0025	0.0027	0.0029	0.0032			
6	0.0000	0.0009	0.0010	0.0013	0.0016	0.0019	0.0022	0.0025	0.0026	0.0027	0.0029	0.0031			
7	0.0000	0.0011	0.0012	0.0015	0.0017	0.0020	0.0023	0.0024	0.0026	0.0029	0.0029	0.0033			
8	0.0000	0.0009	0.0010	0.0013	0.0017	0.0020	0.0022	0.0024	0.0025	0.0026	0.0028	0.0031			
9	0.0000	0.0009	0.0010	0.0012	0.0015	0.0018	0.0021	0.0024	0.0026	0.0025	0.0027	0.0030			
10	0.0000	0.0011	0.0012	0.0014	0.0017	0.0020	0.0023	0.0024	0.0025	0.0027	0.0027	0.0030			
11	0.0000	0.0009	0.0011	0.0012	0.0016	0.0017	0.0019	0.0021	0.0023	0.0023	0.0025	0.0027			
12	0.0000	0.0010	0.0012	0.0013	0.0015	0.0018	0.0019	0.0022	0.0022	0.0021	0.0023	0.0025			
13	0.0000	0.0010	0.0014	0.0016	0.0020	0.0022	0.0024	0.0026	0.0029	0.0029	0.0032	0.0035			
14	0.0000	0.0010	0.0012	0.0014	0.0018	0.0020	0.0022	0.0025	0.0025	0.0027	0.0028	0.0029			
15	0.0000	0.0011	0.0011	0.0014	0.0018	0.0019	0.0022	0.0024	0.0027	0.0029	0.0031	0.0034			
16	0.0000	0.0009	0.0010	0.0012	0.0015	0.0017	0.0021	0.0024	0.0026	0.0026	0.0029	0.0031			
17	0.0000	0.0009	0.0012	0.0013	0.0016	0.0018	0.0021	0.0024	0.0026	0.0026	0.0029	0.0031			
18	0.0000	0.0010	0.0011	0.0014	0.0019	0.0020	0.0022	0.0024	0.0025	0.0025	0.0027	0.0029			
19	0.0000	0.0008	0.0011	0.0013	0.0015	0.0018	0.0020	0.0023	0.0025	0.0027	0.0030	0.0032			
20	0.0000	0.0011	0.0012	0.0014	0.0018	0.0018	0.0020	0.0022	0.0023	0.0023	0.0024	0.0026			
21	0.0000	0.0009	0.0011	0.0012	0.0016	0.0018	0.0021	0.0023	0.0026	0.0028	0.0029	0.0030			
22	0.0000	0.0009	0.0011	0.0013	0.0016	0.0018	0.0020	0.0022	0.0022	0.0023	0.0024	0.0029			
23	0.0000	0.0009	0.0011	0.0012	0.0015	0.0018	0.0020	0.0023	0.0023	0.0023	0.0024	0.0025			
24	0.0000	0.0009	0.0010	0.0013	0.0017	0.0018	0.0020	0.0023	0.0025	0.0028	0.0028	0.0031			
25	0.0000	0.0009	0.0010	0.0011	0.0015	0.0017	0.0019	0.0020	0.0022	0.0024	0.0023	0.0025			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.0000	0.0010	0.0011	0.0013	0.0016	0.0019	0.0021	0.0023	0.0025	0.0026	0.0028	0.0030			
Med.	0.0000	0.0009	0.0011	0.0013	0.0016	0.0018	0.0021	0.0024	0.0025	0.0027	0.0028	0.0031			
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003			
Min.	0.0000	0.0008	0.0009	0.0011	0.0014	0.0016	0.0018	0.0020	0.0022	0.0021	0.0023	0.0025			
Max.	0.0000	0.0011	0.0014	0.0016	0.0020	0.0022	0.0024	0.0026	0.0029	0.0030	0.0032	0.0035			

Data Set 9 : 105 °C, 180 mA

Actual Case Temperature [T _s]	106.1 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	0.2588	0.2579	0.2578	0.2576	0.2573	0.2570	0.2568	0.2564	0.2563	0.2562	0.2563	0.2561			
2	0.2586	0.2575	0.2574	0.2572	0.2568	0.2566	0.2564	0.2562	0.2560	0.2560	0.2561	0.2559			
3	0.2577	0.2568	0.2566	0.2565	0.2560	0.2557	0.2555	0.2552	0.2551	0.2550	0.2550	0.2550			
4	0.2591	0.2580	0.2579	0.2577	0.2574	0.2573	0.2570	0.2568	0.2567	0.2568	0.2568	0.2568			
5	0.2616	0.2608	0.2607	0.2605	0.2602	0.2599	0.2598	0.2594	0.2591	0.2591	0.2590	0.2590			
6	0.2575	0.2566	0.2565	0.2562	0.2560	0.2556	0.2554	0.2551	0.2550	0.2551	0.2550	0.2551			
7	0.2639	0.2629	0.2627	0.2625	0.2622	0.2619	0.2617	0.2616	0.2614	0.2614	0.2615	0.2614			
8	0.2567	0.2558	0.2557	0.2553	0.2550	0.2547	0.2545	0.2542	0.2543	0.2542	0.2541	0.2541			
9	0.2592	0.2583	0.2581	0.2579	0.2577	0.2574	0.2571	0.2568	0.2567	0.2569	0.2567	0.2567			
10	0.2614	0.2603	0.2602	0.2600	0.2597	0.2594	0.2591	0.2590	0.2590	0.2589	0.2589	0.2588			
11	0.2571	0.2562	0.2560	0.2559	0.2555	0.2553	0.2552	0.2550	0.2548	0.2550	0.2549	0.2549			
12	0.2598	0.2588	0.2586	0.2585	0.2583	0.2580	0.2579	0.2576	0.2577	0.2577	0.2576	0.2577			
13	0.2618	0.2608	0.2604	0.2602	0.2598	0.2596	0.2594	0.2593	0.2591	0.2592	0.2592	0.2591			
14	0.2609	0.2599	0.2597	0.2594	0.2591	0.2589	0.2587	0.2584	0.2584	0.2584	0.2584	0.2584			
15	0.2593	0.2582	0.2582	0.2579	0.2576	0.2574	0.2571	0.2570	0.2568	0.2568	0.2567	0.2567			
16	0.2577	0.2569	0.2567	0.2565	0.2562	0.2561	0.2556	0.2553	0.2552	0.2553	0.2552	0.2551			
17	0.2614	0.2604	0.2602	0.2601	0.2598	0.2596	0.2592	0.2590	0.2589	0.2589	0.2588	0.2587			
18	0.2612	0.2601	0.2600	0.2598	0.2592	0.2592	0.2590	0.2588	0.2587	0.2587	0.2586	0.2586			
19	0.2589	0.2581	0.2578	0.2576	0.2574	0.2571	0.2569	0.2566	0.2565	0.2563	0.2562	0.2562			
20	0.2618	0.2607	0.2606	0.2605	0.2600	0.2600	0.2598	0.2596	0.2595	0.2595	0.2595	0.2595			
21	0.2580	0.2571	0.2569	0.2568	0.2564	0.2563	0.2560	0.2558	0.2556	0.2554	0.2554	0.2555			
22	0.2588	0.2579	0.2577	0.2576	0.2572	0.2570	0.2568	0.2567	0.2567	0.2567	0.2567	0.2565			
23	0.2593	0.2583	0.2581	0.2580	0.2577	0.2574	0.2572	0.2570	0.2570	0.2570	0.2570	0.2570			
24	0.2602	0.2594	0.2592	0.2589	0.2586	0.2584	0.2582	0.2580	0.2578	0.2577	0.2577	0.2576			
25	0.2589	0.2580	0.2579	0.2578	0.2574	0.2572	0.2570	0.2569	0.2568	0.2566	0.2567	0.2565			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.2596	0.2586	0.2585	0.2583	0.2579	0.2577	0.2575	0.2573	0.2572	0.2571	0.2571	0.2571			
Med.	0.2592	0.2582	0.2581	0.2579	0.2576	0.2574	0.2571	0.2569	0.2568	0.2568	0.2567	0.2567			
σ	0.0018	0.0017	0.0017	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018			
Min.	0.2567	0.2558	0.2557	0.2553	0.2550	0.2547	0.2545	0.2542	0.2543	0.2542	0.2541	0.2541			
Max.	0.2639	0.2629	0.2627	0.2625	0.2622	0.2619	0.2617	0.2616	0.2614	0.2614	0.2615	0.2614			

Data Set 9 : 105 °C, 180 mA

Actual Case Temperature [T _S]	106.1 °C
Actual Ambient Temperature [T _A]	103.5 °C
Drive Current [I _F]	180 mA
Measurement Current	180 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	0.5247	0.5247	0.5247	0.5247	0.5246	0.5246	0.5245	0.5243	0.5240	0.5239	0.5235	0.5231			
2	0.5225	0.5223	0.5225	0.5224	0.5223	0.5223	0.5223	0.5222	0.5218	0.5213	0.5210	0.5205			
3	0.5228	0.5227	0.5227	0.5227	0.5227	0.5225	0.5224	0.5222	0.5219	0.5215	0.5211	0.5207			
4	0.5246	0.5246	0.5246	0.5246	0.5246	0.5245	0.5245	0.5246	0.5243	0.5241	0.5238	0.5232			
5	0.5260	0.5261	0.5261	0.5261	0.5261	0.5261	0.5261	0.5260	0.5257	0.5251	0.5247	0.5242			
6	0.5236	0.5237	0.5236	0.5236	0.5235	0.5235	0.5232	0.5230	0.5227	0.5224	0.5221	0.5217			
7	0.5224	0.5224	0.5224	0.5223	0.5223	0.5222	0.5222	0.5221	0.5217	0.5212	0.5208	0.5203			
8	0.5221	0.5221	0.5221	0.5221	0.5220	0.5221	0.5220	0.5219	0.5214	0.5211	0.5208	0.5204			
9	0.5254	0.5253	0.5254	0.5254	0.5253	0.5253	0.5252	0.5249	0.5247	0.5244	0.5242	0.5238			
10	0.5233	0.5233	0.5233	0.5232	0.5232	0.5232	0.5232	0.5231	0.5227	0.5225	0.5222	0.5218			
11	0.5224	0.5224	0.5223	0.5223	0.5222	0.5223	0.5222	0.5221	0.5217	0.5215	0.5212	0.5208			
12	0.5241	0.5241	0.5241	0.5241	0.5241	0.5241	0.5241	0.5241	0.5238	0.5235	0.5232	0.5228			
13	0.5237	0.5236	0.5236	0.5235	0.5234	0.5235	0.5234	0.5231	0.5228	0.5224	0.5220	0.5215			
14	0.5227	0.5226	0.5226	0.5226	0.5226	0.5225	0.5225	0.5224	0.5221	0.5217	0.5215	0.5212			
15	0.5229	0.5229	0.5229	0.5229	0.5228	0.5229	0.5228	0.5227	0.5220	0.5216	0.5212	0.5207			
16	0.5235	0.5235	0.5235	0.5234	0.5233	0.5233	0.5230	0.5230	0.5228	0.5226	0.5222	0.5218			
17	0.5230	0.5230	0.5229	0.5230	0.5229	0.5228	0.5228	0.5226	0.5222	0.5221	0.5218	0.5214			
18	0.5241	0.5240	0.5240	0.5240	0.5239	0.5240	0.5239	0.5239	0.5238	0.5235	0.5231	0.5228			
19	0.5241	0.5240	0.5240	0.5241	0.5240	0.5240	0.5240	0.5239	0.5236	0.5232	0.5229	0.5225			
20	0.5252	0.5252	0.5252	0.5253	0.5253	0.5253	0.5253	0.5253	0.5250	0.5247	0.5245	0.5241			
21	0.5240	0.5239	0.5239	0.5239	0.5239	0.5238	0.5238	0.5235	0.5232	0.5231	0.5228	0.5224			
22	0.5246	0.5245	0.5245	0.5245	0.5245	0.5246	0.5244	0.5244	0.5241	0.5237	0.5233	0.5228			
23	0.5243	0.5243	0.5243	0.5242	0.5242	0.5242	0.5242	0.5242	0.5238	0.5237	0.5235	0.5232			
24	0.5231	0.5231	0.5230	0.5230	0.5229	0.5230	0.5229	0.5228	0.5225	0.5220	0.5218	0.5215			
25	0.5239	0.5240	0.5240	0.5241	0.5240	0.5240	0.5240	0.5240	0.5237	0.5235	0.5234	0.5230			
n	25	25	25	25	25	25	25	25	25	25	25	25			
Avg.	0.5237	0.5237	0.5237	0.5237	0.5236	0.5236	0.5235	0.5235	0.5231	0.5228	0.5225	0.5221			
Med.	0.5237	0.5237	0.5236	0.5236	0.5235	0.5235	0.5234	0.5231	0.5228	0.5226	0.5222	0.5218			
σ	0.0010	0.0010	0.0010	0.0011	0.0011	0.0011	0.0011	0.0011	0.0012	0.0012	0.0012	0.0012			
Min.	0.5221	0.5221	0.5221	0.5221	0.5220	0.5221	0.5220	0.5219	0.5214	0.5211	0.5208	0.5203			
Max.	0.5260	0.5261	0.5261	0.5261	0.5261	0.5261	0.5261	0.5260	0.5257	0.5251	0.5247	0.5242			