

## LM-80 Test Report

### NT2L757GR

<b>Issue Date:</b>	April 25, 2016	<b>Revision Date:</b>	-
<b>Test Initiation Date:</b>	July 7, 2015	<b>Test Completion Date:</b>	-
<b>Test Duration:</b>	6,000 hours	<b>Report Number:</b>	SQETMPF08101

#### Customer Information:

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

#### Description of Test Samples:

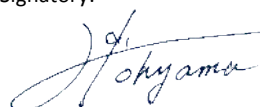
Classification: LED Package  
 Model Name: Warm White LED  
 Model Number: NT2L757GR (Nominal CCT: 2700 K)

#### Test Summary:

Data Set	Case Temperature [T <sub>s</sub> ]	Ambient Temperature [T <sub>A</sub> ]	Drive Current [I <sub>F</sub> ]	Lumen Maintenance at 6,000 hours	Chromaticity Shift ( $\Delta u'v'$ ) at 6,000 hours	TM-21 Projection L <sub>70</sub> (6K)	TM-21 Projection L <sub>80</sub> (6K)	TM-21 Projection L <sub>90</sub> (6K)
1	55 °C	> 50 °C	75 mA	98.0 %	0.0014	> 36000 hours	> 36000 hours	> 36000 hours
2	55 °C	> 50 °C	150 mA	95.7 %	0.0021	> 36000 hours	27800 hours	13700 hours
3	85 °C	> 80 °C	75 mA	94.2 %	0.0020	35900 hours	22200 hours	10100 hours
4	85 °C	> 80 °C	150 mA	94.1 %	0.0029	> 36000 hours	25500 hours	11300 hours
5	105 °C	> 100 °C	75 mA	93.4 %	0.0030	> 36000 hours	22500 hours	9880 hours
6	105 °C	> 100 °C	150 mA	92.9 %	0.0034	> 36000 hours	21900 hours	9260 hours



Approved Signatory:



Hitoshi TOHYAMA, Lab Manager

**Nichia Corporation LED Testing Laboratory**

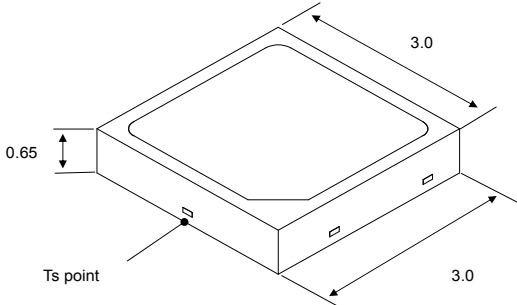
1-1, Tatsumi-Cho, Anan-Shi, TOKUSHIMA 774-0001, JAPAN

### 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	NT2L757GRT	55	75	$\geq 2700$	1
		55	150	$\geq 2700$	2
		85	75	$\geq 2700$	3
		85	150	$\geq 2700$	4
		105	75	$\geq 2700$	5
		105	150	$\geq 2700$	6
757	NT2W757GR NT2W757GRT	55	75	$\geq 5000$	1
		55	150	$\geq 5000$	2
		85	75	$\geq 5000$	3
		85	150	$\geq 5000$	4
		105	75	$\geq 5000$	5
		105	150	$\geq 5000$	6

## IES LM-80-08 Test Report Requirement :

1. **Number of LED light sources tested**  
See tables.
  2. **Description of LED light sources**  
See Description of Test Samples
  3. **Description of auxiliary equipment**  
Active cooling life test system  
Consisting of small boxes, in which each box contains a reliability test board, and a water-cooled heat sink or a heater to control device temperature.  
LED Tester  
Consisting of an integrating sphere, a programmable current-source meter, and a spectroradiometer.
  4. **Operating cycle**  
Constant direct current (DC).
  5. **Ambient conditions including airflow, temperature, and relative humidity**  
Ambient Temperature ( $T_A$ ) : See tables  
Ambient temperature is the temperature of the air at a distance of 1.5 mm above the reliability test board.  
Air flow : < 0.1 m/s  
Relative Humidity : < 45 %
  6. **Case temperature (test point temperature)**  
See tables.  
For the case temperature ( $T_S$ ) measurement point, see the figure below.
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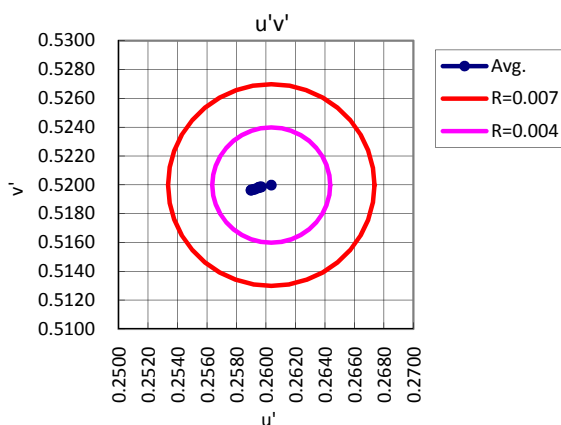
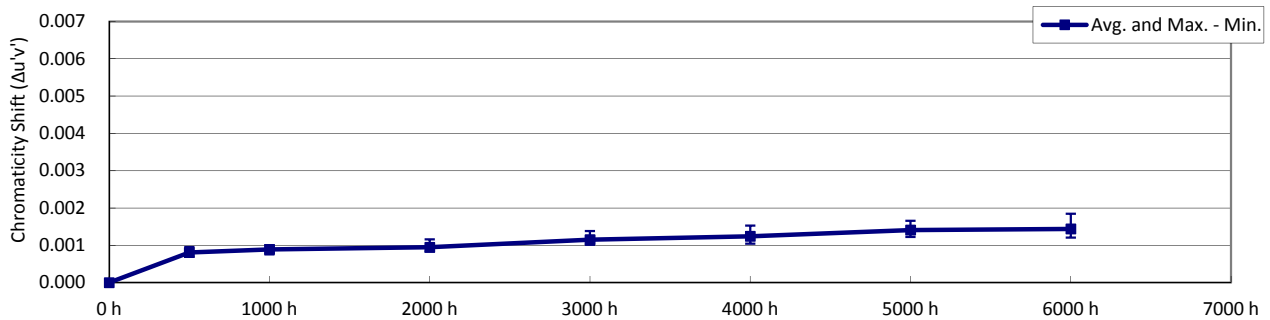
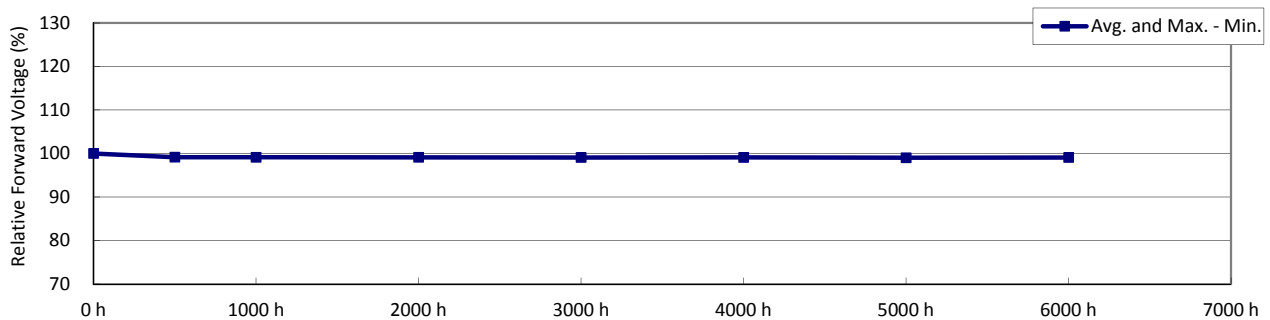
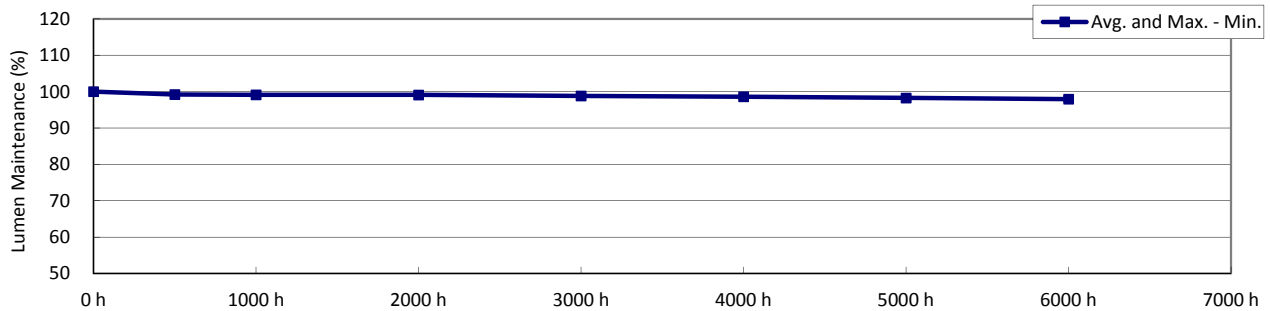
The diagram shows a square test board with a side length of 3.0 units and a height of 0.65 units. A measurement point labeled 'Ts point' is indicated on the side of the board.
7. **Drive current of the LED light sources during lifetime test**  
See tables.
  8. **Initial luminous flux and forward voltage 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, 75 mA

Actual Case Temperature [ $T_S$ ]	55.9 °C
Actual Ambient Temperature [ $T_A$ ]	55.2 °C
Drive Current [ $I_F$ ]	75 mA
Measurement Current	75 mA

NOTES:

$T_S$  and  $T_A$  were measured during initial setup.



**Data Set 1 : 55 °C, 75 mA**

Actual Case Temperature [T <sub>S</sub> ]	55.9 °C
Actual Ambient Temperature [T <sub>A</sub> ]	55.2 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>S</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 1-1**  
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ <sub>V</sub> [lm]	V <sub>F</sub> [V]	T <sub>CP</sub> [K]	x	y	u'	v'						
1	64.9	5.96	2821	0.443	0.395	0.259	0.519						
2	64.7	5.93	2771	0.448	0.398	0.261	0.520						
3	64.7	5.97	2756	0.449	0.397	0.261	0.520						
4	64.3	5.97	2790	0.443	0.391	0.260	0.517						
5	65.2	5.96	2785	0.448	0.400	0.260	0.521						
6	64.9	5.95	2757	0.448	0.396	0.261	0.520						
7	64.8	5.97	2796	0.445	0.396	0.260	0.519						
8	64.9	5.96	2783	0.447	0.398	0.260	0.521						
9	65.1	5.95	2778	0.448	0.399	0.260	0.521						
10	63.6	5.97	2674	0.453	0.396	0.265	0.520						
11	64.7	5.96	2745	0.449	0.396	0.262	0.520						
12	64.7	5.94	2779	0.447	0.397	0.260	0.520						
13	65.0	5.97	2826	0.443	0.396	0.258	0.519						
14	65.0	5.93	2802	0.446	0.397	0.259	0.520						
15	64.6	5.97	2745	0.450	0.398	0.262	0.521						
16	65.1	5.97	2832	0.441	0.393	0.258	0.518						
17	64.2	5.96	2737	0.450	0.397	0.262	0.520						
18	65.2	5.98	2780	0.447	0.398	0.260	0.520						
19	65.0	5.97	2809	0.445	0.397	0.259	0.520						
20	64.9	5.96	2756	0.449	0.398	0.261	0.521						
21	64.9	5.93	2835	0.441	0.392	0.258	0.517						
22	65.3	5.94	2819	0.444	0.396	0.259	0.519						
23	64.8	5.97	2766	0.450	0.400	0.261	0.522						
24	64.3	5.95	2713	0.452	0.399	0.263	0.522						
25	65.4	5.94	2833	0.444	0.397	0.258	0.520						
n	25	25	25	25	25	25	25						
Avg.	64.8	5.96	2780	0.447	0.397	0.260	0.520						
Med.	64.9	5.96	2780	0.447	0.397	0.260	0.520						
σ	0.39	0.015	39.5	0.0031	0.0021	0.0016	0.0012						
Min.	63.6	5.93	2674	0.441	0.391	0.258	0.517						
Max.	65.4	5.98	2835	0.453	0.400	0.265	0.522						

**Data Set 1 : 55 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	55.9 °C
Actual Ambient Temperature [T <sub>A</sub> ]	55.2 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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							
1	100.0	99.2	99.2	99.1	98.9	98.7	98.4	98.0							
2	100.0	99.2	99.1	99.1	98.9	98.7	98.4	98.2							
3	100.0	99.2	99.0	98.9	98.7	98.5	98.1	97.8							
4	100.0	99.2	99.1	99.0	98.7	98.5	98.1	97.9							
5	100.0	99.4	99.3	99.3	99.1	98.9	98.6	98.4							
6	100.0	99.1	99.0	98.8	98.4	98.1	97.6	97.4							
7	100.0	99.2	99.0	98.9	98.6	98.3	97.8	97.6							
8	100.0	99.4	99.2	99.2	99.0	98.8	98.5	98.3							
9	100.0	99.4	99.4	99.4	99.2	99.0	98.7	98.5							
10	100.0	99.5	99.3	99.2	99.0	98.9	98.6	98.3							
11	100.0	99.3	99.2	99.3	99.0	98.8	98.6	98.4							
12	100.0	99.2	99.2	99.4	99.2	99.1	98.9	98.7							
13	100.0	99.1	99.0	99.1	98.7	98.5	98.1	97.7							
14	100.0	99.2	99.1	99.1	98.8	98.5	98.1	97.7							
15	100.0	99.2	99.1	99.0	98.8	98.7	98.3	98.0							
16	100.0	99.0	99.1	98.9	98.6	98.4	97.9	97.4							
17	100.0	99.3	99.1	99.1	98.7	98.5	98.0	97.4							
18	100.0	99.1	99.0	98.9	98.6	98.4	98.1	97.8							
19	100.0	99.0	98.8	98.9	98.5	98.3	98.0	97.7							
20	100.0	99.2	99.1	99.1	98.9	98.8	98.5	98.2							
21	100.0	99.5	99.5	99.5	99.2	98.8	98.5	98.0							
22	100.0	99.0	99.0	99.0	98.6	98.3	98.1	97.7							
23	100.0	99.3	99.3	99.2	98.9	98.7	98.5	98.2							
24	100.0	99.2	99.1	99.2	98.8	98.6	98.2	97.8							
25	100.0	99.2	99.2	99.1	98.8	98.6	98.2	97.9							
n	25	25	25	25	25	25	25	25							
Avg.	100.0	99.2	99.1	99.1	98.8	98.6	98.3	98.0							
Med.	100.0	99.2	99.1	99.1	98.8	98.6	98.2	97.9							
σ	0.00	0.14	0.14	0.18	0.22	0.24	0.31	0.36							
Min.	100.0	99.0	98.8	98.8	98.4	98.1	97.6	97.4							
Max.	100.0	99.5	99.5	99.5	99.2	99.1	98.9	98.7							

**TM-21 Projection**

Time	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h									
ln(Avg.)	-0.0087	-0.0089	-0.0118	-0.0140	-0.0174	-0.0207									

Test duration used	1000 h	to	6000 h
B	0.9952		
α	2.5079E-06		
R <sup>2</sup>	0.9622		
Calculated L <sub>70</sub> (6K)	140000	hours	
Reported L <sub>70</sub> (6K)	> 36000	hours	
Calculated L <sub>80</sub> (6K)	87100	hours	
Reported L <sub>80</sub> (6K)	> 36000	hours	
Calculated L <sub>90</sub> (6K)	40100	hours	
Reported L <sub>90</sub> (6K)	> 36000	hours	

Curve-fit equation:

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

Lumen maintenance life equation:

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

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

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

**Data Set 1 : 55 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	55.9 °C
Actual Ambient Temperature [T <sub>A</sub> ]	55.2 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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						
1	100.0	99.1	99.1	99.1	99.0	99.0	98.9	99.0						
2	100.0	99.3	99.2	99.3	99.2	99.3	99.2	99.3						
3	100.0	99.2	99.0	99.1	99.1	99.0	99.0	99.0						
4	100.0	99.1	99.0	99.0	99.0	99.0	98.9	99.0						
5	100.0	99.1	99.2	99.2	99.1	99.1	99.1	99.1						
6	100.0	99.1	99.2	99.0	99.1	99.1	99.0	99.1						
7	100.0	99.1	99.0	99.0	99.0	99.0	99.0	99.0						
8	100.0	99.2	99.2	99.3	99.1	99.2	99.1	99.2						
9	100.0	99.2	99.2	99.2	99.2	99.2	99.1	99.2						
10	100.0	99.2	99.1	99.2	99.1	99.1	99.0	99.1						
11	100.0	99.2	99.2	99.1	99.1	99.1	99.1	99.1						
12	100.0	99.3	99.3	99.1	99.1	99.2	99.1	99.2						
13	100.0	99.0	99.1	99.0	99.0	99.0	99.0	99.0						
14	100.0	99.2	99.2	99.1	99.0	99.1	99.1	99.1						
15	100.0	99.2	99.2	99.1	99.1	99.1	99.1	99.1						
16	100.0	99.1	99.1	99.1	99.0	99.0	99.0	99.0						
17	100.0	99.1	99.2	99.2	99.1	99.1	99.1	99.1						
18	100.0	99.1	99.2	99.1	99.0	99.0	99.0	99.0						
19	100.0	99.2	99.1	99.0	99.0	99.0	99.0	99.1						
20	100.0	99.1	99.1	99.0	99.0	99.0	99.0	99.0						
21	100.0	99.3	99.2	99.2	99.2	99.2	99.1	99.2						
22	100.0	99.3	99.1	99.2	99.1	99.1	99.1	99.1						
23	100.0	99.0	99.0	99.1	99.0	99.0	99.0	99.0						
24	100.0	99.1	99.2	99.0	99.1	99.1	99.0	99.1						
25	100.0	99.2	99.3	99.2	99.2	99.2	99.2	99.2						
n	25	25	25	25	25	25	25	25						
Avg.	100.0	99.2	99.1	99.1	99.1	99.1	99.0	99.1						
Med.	100.0	99.2	99.2	99.1	99.1	99.1	99.0	99.1						
σ	0.00	0.07	0.08	0.09	0.07	0.08	0.07	0.07						
Min.	100.0	99.0	99.0	99.0	99.0	99.0	98.9	99.0						
Max.	100.0	99.3	99.3	99.3	99.2	99.3	99.2	99.3						

**Data Set 1 : 55 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	55.9 °C
Actual Ambient Temperature [T <sub>A</sub> ]	55.2 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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		
1	0.0000	0.0008	0.0009	0.0010	0.0012	0.0013	0.0014	0.0014		
2	0.0000	0.0008	0.0008	0.0009	0.0010	0.0012	0.0013	0.0013		
3	0.0000	0.0008	0.0009	0.0010	0.0012	0.0013	0.0015	0.0015		
4	0.0000	0.0009	0.0009	0.0010	0.0013	0.0014	0.0016	0.0016		
5	0.0000	0.0007	0.0008	0.0009	0.0011	0.0011	0.0013	0.0013		
6	0.0000	0.0008	0.0010	0.0010	0.0012	0.0014	0.0016	0.0016		
7	0.0000	0.0007	0.0008	0.0009	0.0011	0.0012	0.0013	0.0013		
8	0.0000	0.0008	0.0008	0.0009	0.0011	0.0010	0.0012	0.0012		
9	0.0000	0.0007	0.0008	0.0009	0.0011	0.0011	0.0013	0.0013		
10	0.0000	0.0008	0.0009	0.0008	0.0011	0.0011	0.0013	0.0014		
11	0.0000	0.0009	0.0009	0.0010	0.0011	0.0012	0.0014	0.0013		
12	0.0000	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013	0.0014		
13	0.0000	0.0008	0.0010	0.0010	0.0012	0.0013	0.0015	0.0015		
14	0.0000	0.0009	0.0009	0.0011	0.0013	0.0014	0.0015	0.0017		
15	0.0000	0.0007	0.0008	0.0009	0.0011	0.0011	0.0012	0.0013		
16	0.0000	0.0008	0.0008	0.0010	0.0012	0.0011	0.0014	0.0015		
17	0.0000	0.0009	0.0009	0.0011	0.0012	0.0014	0.0015	0.0015		
18	0.0000	0.0007	0.0009	0.0009	0.0011	0.0011	0.0014	0.0014		
19	0.0000	0.0008	0.0010	0.0010	0.0012	0.0013	0.0015	0.0014		
20	0.0000	0.0007	0.0008	0.0009	0.0011	0.0011	0.0013	0.0012		
21	0.0000	0.0010	0.0010	0.0012	0.0014	0.0015	0.0017	0.0017		
22	0.0000	0.0009	0.0009	0.0009	0.0011	0.0012	0.0014	0.0014		
23	0.0000	0.0008	0.0009	0.0009	0.0010	0.0012	0.0014	0.0014		
24	0.0000	0.0008	0.0009	0.0009	0.0011	0.0013	0.0015	0.0016		
25	0.0000	0.0008	0.0010	0.0010	0.0013	0.0015	0.0016	0.0018		
n	25	25	25	25	25	25	25	25		
Avg.	0.0000	0.0008	0.0009	0.0009	0.0012	0.0012	0.0014	0.0014		
Med.	0.0000	0.0008	0.0009	0.0010	0.0011	0.0012	0.0014	0.0014		
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002		
Min.	0.0000	0.0007	0.0008	0.0008	0.0010	0.0010	0.0012	0.0012		
Max.	0.0000	0.0010	0.0010	0.0012	0.0014	0.0015	0.0017	0.0018		



**Data Set 1 : 55 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	55.9 °C
Actual Ambient Temperature [T <sub>A</sub> ]	55.2 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.2593	0.2585	0.2584	0.2583	0.2582	0.2580	0.2579	0.2579	
2	0.2612	0.2604	0.2603	0.2603	0.2602	0.2600	0.2599	0.2599	
3	0.2619	0.2611	0.2610	0.2609	0.2608	0.2606	0.2605	0.2605	
4	0.2611	0.2602	0.2602	0.2601	0.2598	0.2597	0.2596	0.2595	
5	0.2605	0.2598	0.2597	0.2597	0.2595	0.2595	0.2592	0.2593	
6	0.2621	0.2613	0.2612	0.2611	0.2609	0.2608	0.2606	0.2606	
7	0.2603	0.2596	0.2596	0.2595	0.2593	0.2592	0.2591	0.2591	
8	0.2606	0.2599	0.2598	0.2598	0.2596	0.2596	0.2594	0.2594	
9	0.2608	0.2601	0.2599	0.2599	0.2597	0.2597	0.2595	0.2595	
10	0.2656	0.2648	0.2648	0.2648	0.2646	0.2646	0.2644	0.2643	
11	0.2624	0.2616	0.2615	0.2615	0.2614	0.2613	0.2611	0.2611	
12	0.2607	0.2599	0.2599	0.2598	0.2596	0.2596	0.2595	0.2594	
13	0.2591	0.2582	0.2581	0.2581	0.2579	0.2578	0.2576	0.2576	
14	0.2598	0.2589	0.2589	0.2587	0.2585	0.2584	0.2583	0.2581	
15	0.2622	0.2614	0.2614	0.2613	0.2611	0.2611	0.2609	0.2609	
16	0.2591	0.2583	0.2583	0.2582	0.2579	0.2580	0.2578	0.2577	
17	0.2629	0.2621	0.2621	0.2619	0.2618	0.2616	0.2615	0.2615	
18	0.2607	0.2599	0.2598	0.2598	0.2596	0.2596	0.2594	0.2594	
19	0.2595	0.2587	0.2586	0.2586	0.2584	0.2583	0.2581	0.2582	
20	0.2618	0.2611	0.2611	0.2609	0.2607	0.2607	0.2606	0.2606	
21	0.2591	0.2581	0.2581	0.2579	0.2577	0.2576	0.2574	0.2574	
22	0.2592	0.2583	0.2583	0.2583	0.2581	0.2580	0.2578	0.2578	
23	0.2611	0.2603	0.2602	0.2603	0.2601	0.2600	0.2598	0.2598	
24	0.2636	0.2628	0.2627	0.2627	0.2625	0.2623	0.2622	0.2621	
25	0.2585	0.2577	0.2576	0.2576	0.2573	0.2570	0.2569	0.2567	
n	25	25	25	25	25	25	25	25	
Avg.	0.2609	0.2601	0.2601	0.2600	0.2598	0.2597	0.2596	0.2595	
Med.	0.2607	0.2599	0.2599	0.2598	0.2596	0.2596	0.2595	0.2594	
σ	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	
Min.	0.2585	0.2577	0.2576	0.2576	0.2573	0.2570	0.2569	0.2567	
Max.	0.2656	0.2648	0.2648	0.2648	0.2646	0.2646	0.2644	0.2643	

**Data Set 1 : 55 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	55.9 °C
Actual Ambient Temperature [T <sub>A</sub> ]	55.2 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 1-6**  
Chromaticity

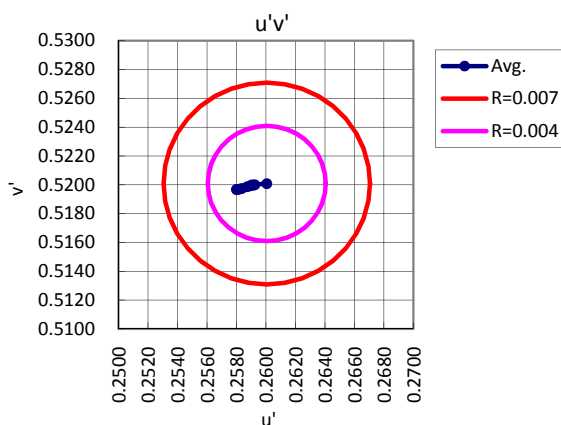
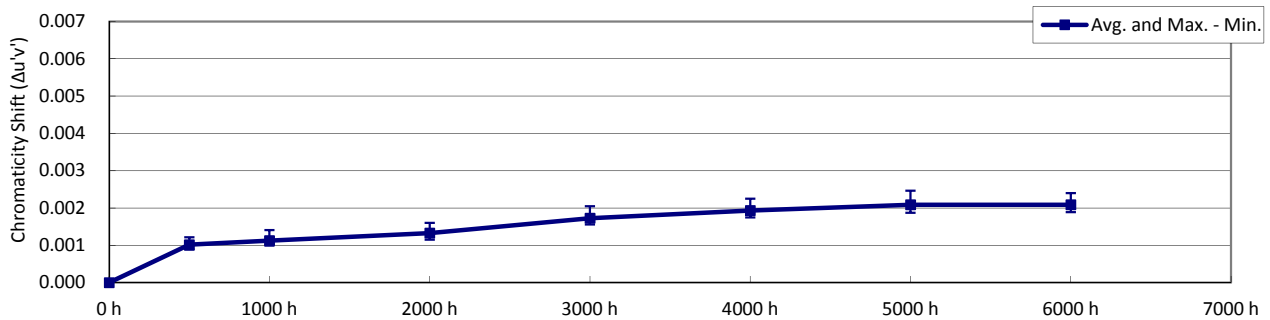
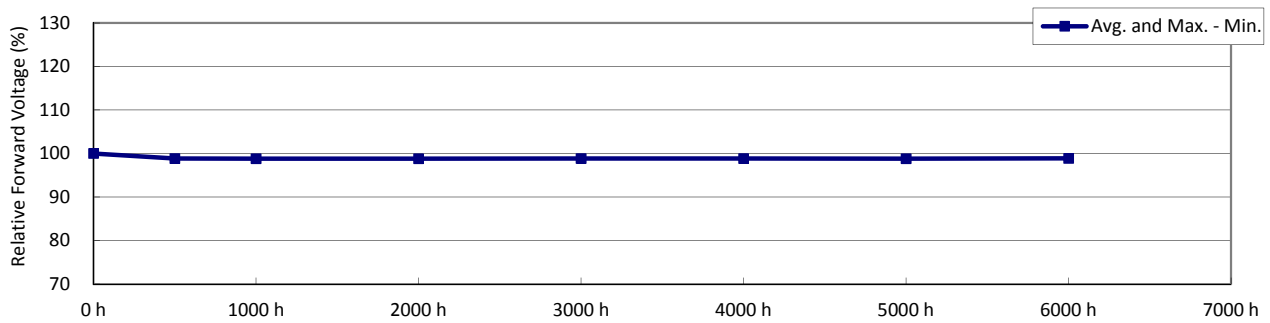
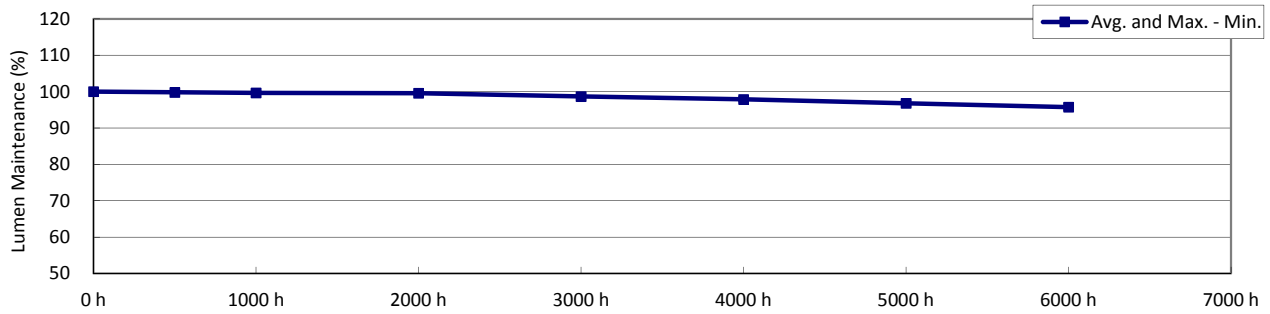
LED No.	Chromaticity v'								
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	
1	0.5187	0.5186	0.5186	0.5186	0.5185	0.5185	0.5184	0.5184	
2	0.5207	0.5207	0.5206	0.5206	0.5205	0.5204	0.5204	0.5205	
3	0.5204	0.5202	0.5201	0.5201	0.5200	0.5200	0.5199	0.5199	
4	0.5173	0.5171	0.5170	0.5170	0.5169	0.5169	0.5167	0.5167	
5	0.5214	0.5214	0.5213	0.5213	0.5211	0.5212	0.5211	0.5211	
6	0.5198	0.5197	0.5196	0.5195	0.5195	0.5194	0.5194	0.5194	
7	0.5195	0.5194	0.5194	0.5193	0.5192	0.5192	0.5192	0.5192	
8	0.5208	0.5207	0.5206	0.5206	0.5205	0.5205	0.5205	0.5204	
9	0.5211	0.5209	0.5209	0.5208	0.5208	0.5208	0.5208	0.5207	
10	0.5206	0.5205	0.5204	0.5204	0.5203	0.5203	0.5202	0.5202	
11	0.5201	0.5200	0.5200	0.5199	0.5199	0.5198	0.5198	0.5198	
12	0.5202	0.5202	0.5202	0.5202	0.5202	0.5201	0.5202	0.5202	
13	0.5191	0.5190	0.5189	0.5189	0.5188	0.5188	0.5187	0.5187	
14	0.5200	0.5199	0.5200	0.5199	0.5199	0.5199	0.5198	0.5198	
15	0.5207	0.5206	0.5206	0.5206	0.5205	0.5205	0.5205	0.5204	
16	0.5176	0.5174	0.5174	0.5173	0.5173	0.5172	0.5172	0.5171	
17	0.5206	0.5205	0.5204	0.5204	0.5203	0.5202	0.5203	0.5202	
18	0.5205	0.5203	0.5202	0.5202	0.5201	0.5201	0.5200	0.5200	
19	0.5196	0.5194	0.5193	0.5193	0.5193	0.5193	0.5192	0.5191	
20	0.5210	0.5208	0.5208	0.5207	0.5207	0.5207	0.5207	0.5207	
21	0.5174	0.5172	0.5172	0.5173	0.5172	0.5171	0.5171	0.5171	
22	0.5194	0.5193	0.5193	0.5193	0.5192	0.5191	0.5191	0.5191	
23	0.5219	0.5217	0.5217	0.5216	0.5216	0.5215	0.5215	0.5215	
24	0.5217	0.5215	0.5215	0.5214	0.5213	0.5214	0.5213	0.5212	
25	0.5198	0.5198	0.5197	0.5198	0.5197	0.5196	0.5197	0.5197	
n	25	25	25	25	25	25	25	25	
Avg.	0.5200	0.5199	0.5198	0.5198	0.5197	0.5197	0.5197	0.5196	
Med.	0.5202	0.5202	0.5201	0.5201	0.5200	0.5200	0.5199	0.5199	
σ	0.0012	0.0013	0.0012	0.0012	0.0012	0.0012	0.0013	0.0013	
Min.	0.5173	0.5171	0.5170	0.5170	0.5169	0.5169	0.5167	0.5167	
Max.	0.5219	0.5217	0.5217	0.5216	0.5216	0.5215	0.5215	0.5215	

### Data Set 2 : 55 °C, 150 mA

Actual Case Temperature [ $T_S$ ]	58.2 °C
Actual Ambient Temperature [ $T_A$ ]	56.6 °C
Drive Current [ $I_F$ ]	150 mA
Measurement Current	150 mA

NOTES:

$T_S$  and  $T_A$  were measured during initial setup.



**Data Set 2 : 55 °C, 150 mA**

Actual Case Temperature [T <sub>S</sub> ]	58.2 °C
Actual Ambient Temperature [T <sub>A</sub> ]	56.6 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>S</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 2-1**  
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ <sub>v</sub> [lm]	V <sub>F</sub> [V]	T <sub>CP</sub> [K]	x	y	u'	v'						
1	119.4	6.46	2817	0.444	0.396	0.259	0.519						
2	118.7	6.44	2722	0.452	0.398	0.263	0.521						
3	119.9	6.43	2833	0.442	0.394	0.258	0.518						
4	119.3	6.43	2758	0.448	0.396	0.261	0.520						
5	118.0	6.44	2712	0.452	0.398	0.263	0.521						
6	120.0	6.50	2802	0.445	0.397	0.259	0.520						
7	119.2	6.43	2738	0.450	0.398	0.262	0.521						
8	119.1	6.45	2759	0.449	0.399	0.261	0.521						
9	119.9	6.44	2794	0.445	0.396	0.260	0.519						
10	119.2	6.46	2781	0.447	0.398	0.260	0.520						
11	120.9	6.42	2831	0.444	0.397	0.258	0.520						
12	118.2	6.47	2754	0.448	0.395	0.262	0.519						
13	118.0	6.43	2767	0.446	0.394	0.261	0.519						
14	120.5	6.43	2785	0.449	0.401	0.260	0.522						
15	118.1	6.44	2717	0.451	0.397	0.263	0.521						
16	119.4	6.46	2798	0.446	0.397	0.259	0.520						
17	119.4	6.47	2818	0.442	0.393	0.259	0.518						
18	119.7	6.46	2766	0.449	0.399	0.261	0.521						
19	120.0	6.43	2806	0.446	0.399	0.259	0.521						
20	119.8	6.44	2767	0.449	0.400	0.261	0.522						
21	120.1	6.58	2836	0.443	0.397	0.258	0.519						
22	119.8	6.43	2745	0.450	0.398	0.262	0.521						
23	120.9	6.42	2792	0.448	0.400	0.259	0.522						
24	118.8	6.47	2776	0.447	0.397	0.260	0.520						
25	120.3	6.42	2828	0.444	0.398	0.258	0.520						
n	25	25	25	25	25	25	25						
Avg.	119.5	6.45	2780	0.447	0.397	0.260	0.520						
Med.	119.4	6.44	2781	0.447	0.397	0.260	0.520						
σ	0.83	0.033	36.8	0.0029	0.0020	0.0015	0.0011						
Min.	118.0	6.42	2712	0.442	0.393	0.258	0.518						
Max.	120.9	6.58	2836	0.452	0.401	0.263	0.522						

**Data Set 2 : 55 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	58.2 °C
Actual Ambient Temperature [T <sub>A</sub> ]	56.6 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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						
1	100.0	99.7	99.6	99.5	98.6	97.8	96.6	95.6						
2	100.0	99.8	99.6	99.7	98.8	98.1	97.1	96.1						
3	100.0	99.7	99.7	99.5	98.5	97.7	96.5	95.3						
4	100.0	99.8	99.6	99.6	98.7	97.9	96.7	95.7						
5	100.0	99.7	99.7	99.7	98.8	98.3	97.5	96.7						
6	100.0	99.8	99.7	99.6	98.5	97.7	96.5	95.4						
7	100.0	99.8	99.6	99.5	98.5	97.8	96.6	95.5						
8	100.0	99.9	99.7	99.7	98.7	97.8	96.7	95.6						
9	100.0	99.6	99.4	99.3	98.2	97.4	96.1	94.9						
10	100.0	99.9	99.8	99.7	98.8	98.2	97.1	96.1						
11	100.0	99.7	99.5	99.4	98.5	97.6	96.6	95.6						
12	100.0	99.9	99.7	99.7	98.9	98.2	97.2	96.2						
13	100.0	100.0	99.9	99.9	99.0	97.9	96.7	95.6						
14	100.0	99.8	99.7	99.7	98.8	98.1	97.2	96.3						
15	100.0	99.8	99.7	99.7	99.0	98.4	97.6	96.7						
16	100.0	99.7	99.4	99.5	98.5	97.7	96.6	95.4						
17	100.0	99.7	99.4	99.3	98.2	97.4	96.2	95.0						
18	100.0	99.8	99.7	99.6	98.7	98.1	97.1	96.0						
19	100.0	99.8	99.6	99.5	98.6	97.7	96.5	95.5						
20	100.0	99.7	99.6	99.5	98.6	97.9	97.0	96.0						
21	100.0	99.8	99.7	99.3	98.7	97.8	96.9	95.9						
22	100.0	99.9	99.6	99.4	98.6	97.8	96.5	95.3						
23	100.0	99.9	99.7	99.4	98.6	97.6	96.4	95.1						
24	100.0	100.1	100.1	99.9	99.2	98.5	97.5	96.5						
25	100.0	99.9	99.6	99.5	98.6	97.7	96.5	95.4						
n	25	25	25	25	25	25	25	25						
Avg.	100.0	99.8	99.7	99.6	98.7	97.9	96.8	95.7						
Med.	100.0	99.8	99.7	99.5	98.6	97.8	96.7	95.6						
σ	0.00	0.10	0.15	0.17	0.23	0.28	0.41	0.49						
Min.	100.0	99.6	99.4	99.3	98.2	97.4	96.1	94.9						
Max.	100.0	100.1	100.1	99.9	99.2	98.5	97.6	96.7						

**TM-21 Projection**

Time	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h								
ln(Avg.)	-0.0035	-0.0043	-0.0134	-0.0214	-0.0326	-0.0435								

Test duration used	1000 h	to	6000 h
B	1.0096		
α	8.3681E-06		
R <sup>2</sup>	0.9615		
Calculated L <sub>70</sub> (6K)	43800	hours	
Reported L <sub>70</sub> (6K)	> 36000	hours	
Calculated L <sub>80</sub> (6K)	27800	hours	
Reported L <sub>80</sub> (6K)	27800	hours	
Calculated L <sub>90</sub> (6K)	13700	hours	
Reported L <sub>90</sub> (6K)	13700	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 <sub>s</sub> ]	58.2 °C
Actual Ambient Temperature [T <sub>A</sub> ]	56.6 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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							
1	100.0	98.7	98.7	98.7	98.7	98.7	98.7	98.7							
2	100.0	98.8	98.8	98.8	98.8	98.8	98.8	98.8							
3	100.0	98.9	98.8	98.8	98.8	98.9	98.8	98.9							
4	100.0	98.9	98.8	98.8	98.8	98.9	98.8	98.9							
5	100.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0							
6	100.0	98.7	98.6	98.6	98.6	98.7	98.6	98.7							
7	100.0	99.0	98.9	99.0	98.9	98.9	98.9	98.9							
8	100.0	98.7	98.8	98.7	98.7	98.8	98.7	98.7							
9	100.0	98.8	98.7	98.7	98.7	98.8	98.7	98.8							
10	100.0	98.9	98.8	98.9	98.9	98.9	98.9	99.0							
11	100.0	99.0	98.9	98.9	99.0	99.0	98.9	99.0							
12	100.0	98.8	98.8	98.8	98.9	98.8	98.8	98.9							
13	100.0	98.9	98.9	99.0	99.0	99.0	98.9	99.0							
14	100.0	99.0	98.9	98.9	98.9	98.9	98.9	99.0							
15	100.0	98.9	98.9	99.0	98.9	99.0	98.9	99.0							
16	100.0	98.8	98.7	98.7	98.8	98.7	98.7	98.8							
17	100.0	98.7	98.7	98.7	98.7	98.7	98.7	98.8							
18	100.0	98.9	98.8	98.8	98.9	98.9	98.8	98.9							
19	100.0	98.9	98.8	98.9	98.9	98.9	98.9	98.9							
20	100.0	98.9	98.9	98.8	98.9	98.9	98.8	98.9							
21	100.0	98.7	98.6	98.5	98.7	98.6	98.5	98.6							
22	100.0	98.9	98.8	98.8	98.9	98.9	98.8	98.9							
23	100.0	98.8	98.8	98.8	98.8	98.8	98.8	98.9							
24	100.0	98.9	98.8	98.8	98.8	98.8	98.8	98.9							
25	100.0	98.9	98.9	98.9	98.9	98.9	98.9	99.0							
n	25	25	25	25	25	25	25	25							
Avg.	100.0	98.9	98.8	98.8	98.8	98.8	98.8	98.9							
Med.	100.0	98.9	98.8	98.8	98.9	98.9	98.8	98.9							
σ	0.00	0.10	0.10	0.11	0.10	0.10	0.11	0.11							
Min.	100.0	98.7	98.6	98.5	98.6	98.6	98.5	98.6							
Max.	100.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0							

**Data Set 2 : 55 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	58.2 °C
Actual Ambient Temperature [T <sub>A</sub> ]	56.6 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.0000	0.0011	0.0011	0.0014	0.0018	0.0020	0.0022	0.0022	
2	0.0000	0.0009	0.0010	0.0012	0.0017	0.0017	0.0020	0.0019	
3	0.0000	0.0011	0.0013	0.0014	0.0018	0.0020	0.0022	0.0021	
4	0.0000	0.0011	0.0012	0.0014	0.0019	0.0020	0.0022	0.0022	
5	0.0000	0.0010	0.0010	0.0013	0.0017	0.0020	0.0021	0.0021	
6	0.0000	0.0009	0.0011	0.0012	0.0016	0.0018	0.0021	0.0020	
7	0.0000	0.0012	0.0014	0.0015	0.0019	0.0022	0.0025	0.0024	
8	0.0000	0.0009	0.0010	0.0012	0.0016	0.0019	0.0020	0.0021	
9	0.0000	0.0009	0.0011	0.0011	0.0016	0.0018	0.0021	0.0020	
10	0.0000	0.0010	0.0010	0.0012	0.0016	0.0019	0.0020	0.0020	
11	0.0000	0.0011	0.0012	0.0014	0.0018	0.0020	0.0020	0.0022	
12	0.0000	0.0009	0.0010	0.0012	0.0016	0.0018	0.0019	0.0020	
13	0.0000	0.0011	0.0012	0.0013	0.0017	0.0018	0.0019	0.0020	
14	0.0000	0.0010	0.0011	0.0014	0.0017	0.0019	0.0020	0.0021	
15	0.0000	0.0011	0.0012	0.0014	0.0017	0.0019	0.0021	0.0022	
16	0.0000	0.0009	0.0010	0.0014	0.0017	0.0019	0.0020	0.0021	
17	0.0000	0.0009	0.0010	0.0014	0.0017	0.0020	0.0021	0.0022	
18	0.0000	0.0010	0.0012	0.0013	0.0018	0.0019	0.0020	0.0020	
19	0.0000	0.0011	0.0011	0.0013	0.0017	0.0019	0.0020	0.0020	
20	0.0000	0.0011	0.0012	0.0014	0.0016	0.0019	0.0020	0.0021	
21	0.0000	0.0010	0.0011	0.0014	0.0017	0.0019	0.0021	0.0021	
22	0.0000	0.0011	0.0011	0.0014	0.0017	0.0020	0.0021	0.0020	
23	0.0000	0.0009	0.0010	0.0013	0.0018	0.0019	0.0020	0.0019	
24	0.0000	0.0009	0.0011	0.0012	0.0017	0.0018	0.0021	0.0020	
25	0.0000	0.0012	0.0014	0.0016	0.0020	0.0023	0.0024	0.0024	
n	25	25	25	25	25	25	25	25	
Avg.	0.0000	0.0010	0.0011	0.0013	0.0017	0.0019	0.0021	0.0021	
Med.	0.0000	0.0010	0.0011	0.0014	0.0017	0.0019	0.0021	0.0021	
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Min.	0.0000	0.0009	0.0010	0.0011	0.0016	0.0017	0.0019	0.0019	
Max.	0.0000	0.0012	0.0014	0.0016	0.0020	0.0023	0.0025	0.0024	

**Data Set 2 : 55 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	58.2 °C
Actual Ambient Temperature [T <sub>A</sub> ]	56.6 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.2594	0.2583	0.2583	0.2581	0.2577	0.2575	0.2573	0.2573	
2	0.2632	0.2623	0.2622	0.2620	0.2616	0.2615	0.2613	0.2613	
3	0.2590	0.2579	0.2577	0.2576	0.2572	0.2570	0.2568	0.2569	
4	0.2618	0.2607	0.2606	0.2605	0.2600	0.2598	0.2596	0.2596	
5	0.2638	0.2628	0.2628	0.2625	0.2621	0.2619	0.2617	0.2618	
6	0.2600	0.2590	0.2589	0.2588	0.2584	0.2582	0.2580	0.2580	
7	0.2628	0.2616	0.2614	0.2612	0.2608	0.2606	0.2603	0.2604	
8	0.2616	0.2607	0.2606	0.2604	0.2600	0.2598	0.2596	0.2596	
9	0.2603	0.2594	0.2593	0.2592	0.2587	0.2586	0.2583	0.2584	
10	0.2608	0.2599	0.2598	0.2596	0.2592	0.2590	0.2588	0.2589	
11	0.2586	0.2575	0.2574	0.2571	0.2567	0.2566	0.2565	0.2564	
12	0.2620	0.2611	0.2611	0.2608	0.2605	0.2602	0.2602	0.2601	
13	0.2617	0.2606	0.2605	0.2604	0.2601	0.2599	0.2598	0.2597	
14	0.2603	0.2592	0.2592	0.2589	0.2586	0.2584	0.2583	0.2582	
15	0.2635	0.2625	0.2623	0.2622	0.2618	0.2616	0.2614	0.2614	
16	0.2601	0.2592	0.2591	0.2588	0.2584	0.2583	0.2581	0.2581	
17	0.2597	0.2588	0.2587	0.2584	0.2581	0.2578	0.2577	0.2576	
18	0.2613	0.2603	0.2601	0.2600	0.2595	0.2594	0.2594	0.2593	
19	0.2594	0.2583	0.2583	0.2580	0.2577	0.2575	0.2574	0.2574	
20	0.2611	0.2601	0.2600	0.2598	0.2596	0.2593	0.2591	0.2591	
21	0.2585	0.2575	0.2574	0.2571	0.2568	0.2566	0.2564	0.2564	
22	0.2622	0.2611	0.2611	0.2608	0.2605	0.2602	0.2601	0.2602	
23	0.2599	0.2589	0.2588	0.2586	0.2581	0.2580	0.2579	0.2580	
24	0.2609	0.2600	0.2598	0.2598	0.2593	0.2591	0.2588	0.2589	
25	0.2588	0.2576	0.2574	0.2572	0.2567	0.2565	0.2564	0.2564	
n	25	25	25	25	25	25	25	25	
Avg.	0.2608	0.2598	0.2597	0.2595	0.2591	0.2589	0.2588	0.2588	
Med.	0.2608	0.2599	0.2598	0.2596	0.2592	0.2590	0.2588	0.2589	
σ	0.0015	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	
Min.	0.2585	0.2575	0.2574	0.2571	0.2567	0.2565	0.2564	0.2564	
Max.	0.2638	0.2628	0.2628	0.2625	0.2621	0.2619	0.2617	0.2618	



**Data Set 2 : 55 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	58.2 °C
Actual Ambient Temperature [T <sub>A</sub> ]	56.6 °C
Drive Current [I <sub>f</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 2-6**  
Chromaticity

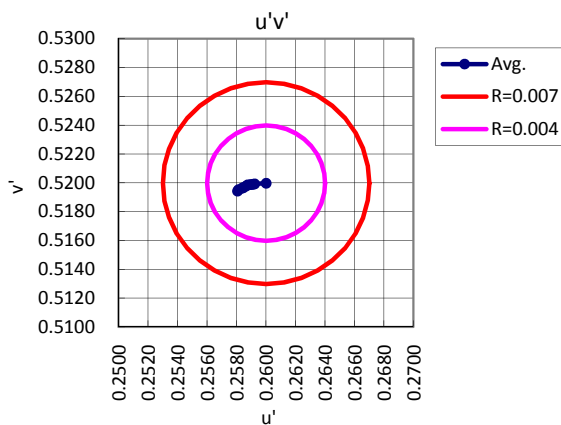
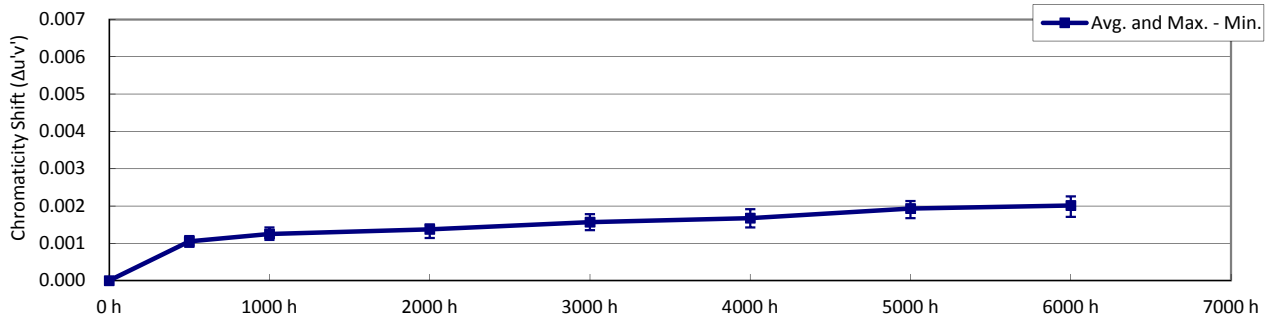
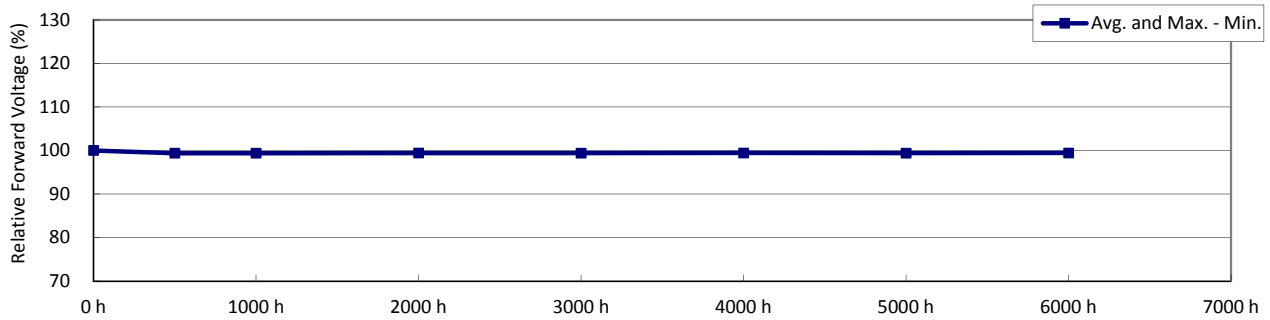
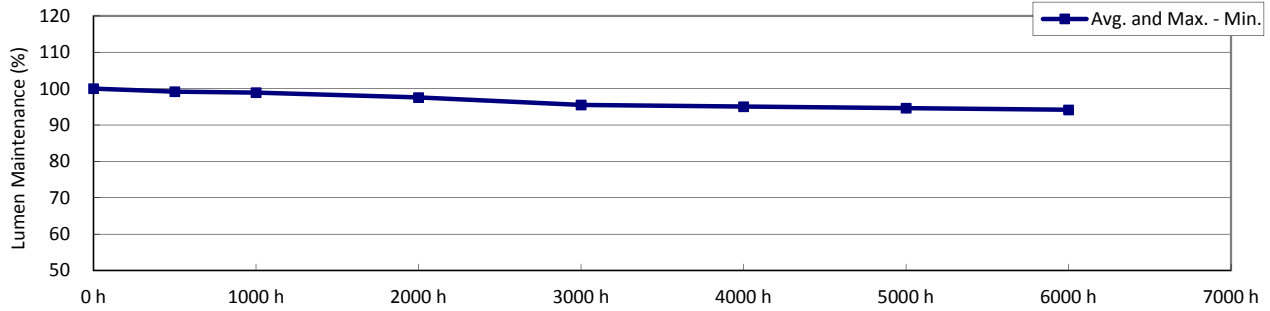
LED No.	Chromaticity v'								
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	
1	0.5192	0.5189	0.5188	0.5187	0.5186	0.5186	0.5185	0.5185	
2	0.5214	0.5212	0.5211	0.5211	0.5209	0.5210	0.5209	0.5209	
3	0.5181	0.5181	0.5181	0.5180	0.5178	0.5177	0.5177	0.5177	
4	0.5201	0.5201	0.5200	0.5199	0.5199	0.5197	0.5197	0.5197	
5	0.5215	0.5214	0.5214	0.5213	0.5212	0.5211	0.5211	0.5211	
6	0.5198	0.5197	0.5196	0.5196	0.5193	0.5194	0.5193	0.5193	
7	0.5209	0.5211	0.5211	0.5210	0.5209	0.5208	0.5208	0.5208	
8	0.5213	0.5211	0.5210	0.5210	0.5209	0.5209	0.5208	0.5209	
9	0.5194	0.5192	0.5192	0.5191	0.5190	0.5189	0.5188	0.5189	
10	0.5203	0.5202	0.5201	0.5201	0.5200	0.5200	0.5200	0.5200	
11	0.5197	0.5197	0.5196	0.5196	0.5195	0.5195	0.5194	0.5194	
12	0.5195	0.5193	0.5192	0.5191	0.5191	0.5190	0.5190	0.5190	
13	0.5187	0.5186	0.5187	0.5186	0.5185	0.5184	0.5184	0.5184	
14	0.5220	0.5218	0.5217	0.5217	0.5217	0.5216	0.5216	0.5216	
15	0.5207	0.5208	0.5207	0.5207	0.5206	0.5205	0.5206	0.5206	
16	0.5201	0.5199	0.5199	0.5198	0.5197	0.5196	0.5196	0.5195	
17	0.5180	0.5178	0.5177	0.5176	0.5174	0.5174	0.5174	0.5174	
18	0.5211	0.5208	0.5208	0.5208	0.5206	0.5206	0.5206	0.5206	
19	0.5209	0.5208	0.5208	0.5207	0.5205	0.5205	0.5204	0.5205	
20	0.5216	0.5214	0.5214	0.5213	0.5212	0.5212	0.5212	0.5212	
21	0.5193	0.5192	0.5191	0.5190	0.5188	0.5188	0.5188	0.5189	
22	0.5209	0.5208	0.5208	0.5207	0.5206	0.5205	0.5205	0.5205	
23	0.5216	0.5215	0.5214	0.5213	0.5212	0.5211	0.5211	0.5211	
24	0.5203	0.5202	0.5201	0.5201	0.5200	0.5199	0.5199	0.5199	
25	0.5202	0.5203	0.5203	0.5202	0.5201	0.5200	0.5200	0.5200	
n	25	25	25	25	25	25	25	25	
Avg.	0.5203	0.5202	0.5201	0.5200	0.5199	0.5199	0.5198	0.5199	
Med.	0.5203	0.5202	0.5201	0.5201	0.5200	0.5200	0.5200	0.5200	
σ	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	
Min.	0.5180	0.5178	0.5177	0.5176	0.5174	0.5174	0.5174	0.5174	
Max.	0.5220	0.5218	0.5217	0.5217	0.5217	0.5216	0.5216	0.5216	

### Data Set 3 : 85 °C, 75 mA

Actual Case Temperature [ $T_S$ ]	86.4 °C
Actual Ambient Temperature [ $T_A$ ]	84.3 °C
Drive Current [ $I_F$ ]	75 mA
Measurement Current	75 mA

NOTES:

$T_S$  and  $T_A$  were measured during initial setup.



**Data Set 3 : 85 °C, 75 mA**

Actual Case Temperature [T <sub>S</sub> ]	86.4 °C
Actual Ambient Temperature [T <sub>A</sub> ]	84.3 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>S</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 3-1**  
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ <sub>V</sub> [lm]	V <sub>F</sub> [V]	T <sub>CP</sub> [K]	x	y	u'	v'						
1	64.5	5.96	2734	0.449	0.396	0.262	0.520						
2	64.6	5.96	2796	0.445	0.394	0.260	0.519						
3	64.9	5.95	2788	0.446	0.397	0.260	0.520						
4	65.3	5.96	2821	0.445	0.398	0.258	0.520						
5	65.1	5.94	2796	0.447	0.399	0.259	0.521						
6	64.9	5.96	2764	0.449	0.398	0.261	0.521						
7	64.7	5.93	2742	0.449	0.397	0.262	0.520						
8	65.0	5.96	2799	0.446	0.397	0.259	0.520						
9	65.3	5.93	2811	0.444	0.396	0.259	0.519						
10	64.8	5.94	2757	0.451	0.401	0.261	0.522						
11	64.7	5.96	2749	0.450	0.398	0.261	0.521						
12	64.6	6.02	2784	0.445	0.395	0.260	0.519						
13	64.9	5.95	2769	0.448	0.398	0.261	0.521						
14	65.4	5.94	2850	0.441	0.395	0.258	0.518						
15	64.4	5.96	2796	0.443	0.391	0.260	0.517						
16	64.8	5.93	2794	0.444	0.393	0.260	0.518						
17	64.9	5.95	2759	0.449	0.398	0.261	0.521						
18	65.2	5.93	2820	0.443	0.395	0.259	0.519						
19	64.9	5.94	2752	0.451	0.401	0.261	0.522						
20	65.2	5.93	2823	0.443	0.395	0.259	0.519						
21	65.3	5.96	2793	0.447	0.399	0.260	0.521						
22	64.7	5.96	2810	0.444	0.396	0.259	0.519						
23	64.4	5.97	2753	0.448	0.396	0.262	0.520						
24	65.0	5.94	2825	0.443	0.395	0.259	0.519						
25	64.9	5.96	2797	0.446	0.398	0.259	0.520						
n	25	25	25	25	25	25	25						
Avg.	64.9	5.95	2787	0.446	0.397	0.260	0.520						
Med.	64.9	5.95	2794	0.446	0.397	0.260	0.520						
σ	0.29	0.019	30.1	0.0027	0.0022	0.0012	0.0012						
Min.	64.4	5.93	2734	0.441	0.391	0.258	0.517						
Max.	65.4	6.02	2850	0.451	0.401	0.262	0.522						

**Data Set 3 : 85 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	86.4 °C
Actual Ambient Temperature [T <sub>A</sub> ]	84.3 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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							
1	100.0	99.3	98.9	97.6	95.3	94.8	94.5	94.1							
2	100.0	99.3	98.9	97.8	95.7	95.3	94.9	94.5							
3	100.0	99.3	98.8	97.7	95.3	94.7	94.5	94.0							
4	100.0	99.1	98.7	97.7	95.6	95.1	95.0	94.4							
5	100.0	99.4	99.1	98.5	96.6	95.8	95.4	94.9							
6	100.0	99.0	98.7	97.2	95.2	94.8	94.5	94.0							
7	100.0	99.4	98.9	97.5	95.1	94.6	94.2	93.7							
8	100.0	99.1	98.8	97.6	95.7	95.1	94.9	94.4							
9	100.0	99.3	98.8	97.5	95.4	95.0	94.7	94.2							
10	100.0	99.3	99.0	98.2	96.6	96.0	95.5	95.1							
11	100.0	99.1	98.9	97.7	95.4	94.9	94.5	94.0							
12	100.0	98.8	98.7	97.2	95.0	94.6	94.2	93.7							
13	100.0	99.2	99.0	97.9	95.8	95.3	94.9	94.4							
14	100.0	99.0	98.8	97.6	95.6	95.1	94.5	93.8							
15	100.0	99.1	99.0	98.1	96.0	95.3	94.8	94.3							
16	100.0	99.2	98.7	97.2	94.8	94.4	93.9	93.3							
17	100.0	99.2	98.9	97.4	95.3	94.9	94.6	94.3							
18	100.0	98.9	98.7	97.4	95.3	94.7	94.3	93.9							
19	100.0	99.2	99.1	97.2	95.3	94.9	94.6	94.1							
20	100.0	99.1	99.0	97.4	95.3	94.8	94.3	93.7							
21	100.0	99.3	99.1	97.9	95.8	95.4	94.8	94.2							
22	100.0	99.1	98.8	96.5	94.9	94.9	94.5	94.2							
23	100.0	99.1	98.9	97.0	95.2	95.1	94.6	94.4							
24	100.0	99.1	98.9	97.4	95.3	95.0	94.5	94.1							
25	100.0	99.5	99.2	98.2	96.4	95.9	95.4	94.9							
n	25	25	25	25	25	25	25	25							
Avg.	100.0	99.2	98.9	97.6	95.5	95.1	94.7	94.2							
Med.	100.0	99.2	98.9	97.6	95.3	95.0	94.6	94.2							
σ	0.00	0.15	0.14	0.43	0.47	0.39	0.38	0.42							
Min.	100.0	98.8	98.7	96.5	94.8	94.4	93.9	93.3							
Max.	100.0	99.5	99.2	98.5	96.6	96.0	95.5	95.1							

**TM-21 Projection**

Time	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h									
ln(Avg.)	-0.0110	-0.0246	-0.0459	-0.0507	-0.0549	-0.0600									

Test duration used	1000 h	to	6000 h
B	0.9929		
α	9.7335E-06		
R <sup>2</sup>	0.9008		
Calculated L <sub>70</sub> (6K)	35900	hours	
Reported L <sub>70</sub> (6K)	35900	hours	
Calculated L <sub>80</sub> (6K)	22200	hours	
Reported L <sub>80</sub> (6K)	22200	hours	
Calculated L <sub>90</sub> (6K)	10100	hours	
Reported L <sub>90</sub> (6K)	10100	hours	

Curve-fit equation:

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

Lumen maintenance life equation:

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

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

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

**Data Set 3 : 85 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	86.4 °C
Actual Ambient Temperature [T <sub>A</sub> ]	84.3 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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						
1	100.0	99.5	99.4	99.5	99.5	99.6	99.5	99.6						
2	100.0	99.4	99.4	99.4	99.4	99.4	99.4	99.5						
3	100.0	99.5	99.5	99.5	99.5	99.5	99.5	99.6						
4	100.0	99.3	99.3	99.4	99.3	99.3	99.3	99.3						
5	100.0	99.4	99.5	99.6	99.5	99.6	99.5	99.6						
6	100.0	99.5	99.4	99.5	99.4	99.4	99.4	99.5						
7	100.0	99.3	99.2	99.3	99.3	99.3	99.3	99.3						
8	100.0	99.4	99.4	99.5	99.4	99.5	99.4	99.5						
9	100.0	99.3	99.3	99.4	99.3	99.4	99.3	99.4						
10	100.0	99.5	99.5	99.7	99.5	99.6	99.5	99.6						
11	100.0	99.4	99.3	99.4	99.4	99.4	99.4	99.4						
12	100.0	99.2	99.3	99.3	99.2	99.2	99.3	99.2						
13	100.0	99.3	99.4	99.4	99.3	99.4	99.3	99.4						
14	100.0	99.4	99.3	99.4	99.4	99.4	99.4	99.4						
15	100.0	99.4	99.3	99.4	99.4	99.4	99.4	99.4						
16	100.0	99.5	99.5	99.4	99.4	99.4	99.4	99.4						
17	100.0	99.5	99.5	99.5	99.5	99.5	99.5	99.5						
18	100.0	99.5	99.5	99.5	99.5	99.5	99.5	99.5						
19	100.0	99.5	99.4	99.5	99.4	99.5	99.4	99.5						
20	100.0	99.4	99.3	99.4	99.4	99.4	99.4	99.4						
21	100.0	99.3	99.4	99.4	99.4	99.4	99.4	99.4						
22	100.0	99.4	99.4	99.3	99.3	99.3	99.3	99.3						
23	100.0	99.3	99.3	99.3	99.3	99.3	99.3	99.3						
24	100.0	99.4	99.5	99.5	99.4	99.4	99.4	99.5						
25	100.0	99.4	99.4	99.4	99.4	99.4	99.4	99.4						
n	25	25	25	25	25	25	25	25						
Avg.	100.0	99.4	99.4	99.4	99.4	99.4	99.4	99.4						
Med.	100.0	99.4	99.4	99.4	99.4	99.4	99.4	99.4						
σ	0.00	0.08	0.09	0.09	0.08	0.09	0.08	0.09						
Min.	100.0	99.2	99.2	99.3	99.2	99.2	99.3	99.2						
Max.	100.0	99.5	99.5	99.7	99.5	99.6	99.5	99.6						

**Data Set 3 : 85 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	86.4 °C
Actual Ambient Temperature [T <sub>A</sub> ]	84.3 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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						
1	0.0000	0.0012	0.0013	0.0014	0.0015	0.0017	0.0019	0.0020						
2	0.0000	0.0010	0.0012	0.0014	0.0015	0.0017	0.0018	0.0020						
3	0.0000	0.0011	0.0013	0.0014	0.0017	0.0018	0.0021	0.0021						
4	0.0000	0.0011	0.0013	0.0014	0.0016	0.0018	0.0020	0.0021						
5	0.0000	0.0011	0.0012	0.0014	0.0015	0.0016	0.0019	0.0021						
6	0.0000	0.0009	0.0011	0.0012	0.0014	0.0015	0.0017	0.0018						
7	0.0000	0.0010	0.0013	0.0013	0.0016	0.0017	0.0021	0.0023						
8	0.0000	0.0012	0.0013	0.0015	0.0016	0.0017	0.0021	0.0021						
9	0.0000	0.0010	0.0013	0.0014	0.0016	0.0017	0.0019	0.0020						
10	0.0000	0.0011	0.0012	0.0014	0.0016	0.0017	0.0020	0.0020						
11	0.0000	0.0010	0.0012	0.0014	0.0016	0.0017	0.0020	0.0020						
12	0.0000	0.0012	0.0014	0.0015	0.0017	0.0018	0.0019	0.0020						
13	0.0000	0.0010	0.0012	0.0014	0.0017	0.0017	0.0020	0.0020						
14	0.0000	0.0010	0.0012	0.0013	0.0015	0.0016	0.0018	0.0019						
15	0.0000	0.0009	0.0011	0.0013	0.0016	0.0017	0.0021	0.0023						
16	0.0000	0.0012	0.0014	0.0015	0.0017	0.0017	0.0021	0.0021						
17	0.0000	0.0009	0.0011	0.0012	0.0014	0.0014	0.0017	0.0017						
18	0.0000	0.0011	0.0013	0.0014	0.0015	0.0016	0.0019	0.0019						
19	0.0000	0.0009	0.0011	0.0013	0.0014	0.0015	0.0017	0.0018						
20	0.0000	0.0011	0.0013	0.0015	0.0016	0.0018	0.0020	0.0021						
21	0.0000	0.0009	0.0011	0.0011	0.0014	0.0015	0.0018	0.0019						
22	0.0000	0.0012	0.0014	0.0014	0.0016	0.0016	0.0019	0.0020						
23	0.0000	0.0010	0.0013	0.0014	0.0015	0.0017	0.0019	0.0019						
24	0.0000	0.0011	0.0013	0.0014	0.0016	0.0018	0.0020	0.0021						
25	0.0000	0.0011	0.0013	0.0015	0.0018	0.0019	0.0021	0.0023						
n	25	25	25	25	25	25	25	25						
Avg.	0.0000	0.0011	0.0013	0.0014	0.0016	0.0017	0.0019	0.0020						
Med.	0.0000	0.0011	0.0013	0.0014	0.0016	0.0017	0.0019	0.0020						
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001						
Min.	0.0000	0.0009	0.0011	0.0011	0.0014	0.0014	0.0017	0.0017						
Max.	0.0000	0.0012	0.0014	0.0015	0.0018	0.0019	0.0021	0.0023						

**Data Set 3 : 85 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	86.4 °C
Actual Ambient Temperature [T <sub>A</sub> ]	84.3 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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						
1	0.2630	0.2618	0.2617	0.2616	0.2615	0.2614	0.2611	0.2611						
2	0.2605	0.2595	0.2593	0.2591	0.2590	0.2589	0.2587	0.2586						
3	0.2606	0.2595	0.2593	0.2592	0.2589	0.2588	0.2585	0.2585						
4	0.2591	0.2580	0.2578	0.2577	0.2575	0.2573	0.2571	0.2571						
5	0.2600	0.2589	0.2588	0.2586	0.2585	0.2584	0.2581	0.2580						
6	0.2614	0.2605	0.2603	0.2603	0.2601	0.2600	0.2597	0.2597						
7	0.2626	0.2616	0.2613	0.2613	0.2610	0.2609	0.2606	0.2604						
8	0.2600	0.2588	0.2587	0.2585	0.2584	0.2583	0.2580	0.2580						
9	0.2596	0.2586	0.2583	0.2582	0.2580	0.2580	0.2578	0.2577						
10	0.2614	0.2603	0.2602	0.2600	0.2598	0.2597	0.2594	0.2594						
11	0.2620	0.2610	0.2609	0.2606	0.2605	0.2604	0.2602	0.2601						
12	0.2609	0.2597	0.2596	0.2594	0.2593	0.2592	0.2591	0.2590						
13	0.2611	0.2602	0.2600	0.2598	0.2595	0.2595	0.2592	0.2593						
14	0.2581	0.2570	0.2569	0.2568	0.2566	0.2565	0.2563	0.2562						
15	0.2608	0.2599	0.2597	0.2595	0.2593	0.2592	0.2588	0.2587						
16	0.2605	0.2594	0.2592	0.2591	0.2589	0.2588	0.2585	0.2585						
17	0.2616	0.2606	0.2605	0.2604	0.2602	0.2602	0.2599	0.2599						
18	0.2593	0.2581	0.2579	0.2579	0.2578	0.2577	0.2574	0.2574						
19	0.2616	0.2607	0.2605	0.2604	0.2602	0.2602	0.2599	0.2599						
20	0.2591	0.2580	0.2578	0.2576	0.2575	0.2574	0.2572	0.2571						
21	0.2601	0.2592	0.2590	0.2590	0.2587	0.2587	0.2584	0.2583						
22	0.2597	0.2585	0.2583	0.2583	0.2582	0.2581	0.2579	0.2578						
23	0.2621	0.2611	0.2608	0.2607	0.2606	0.2604	0.2602	0.2602						
24	0.2590	0.2579	0.2577	0.2576	0.2574	0.2572	0.2571	0.2570						
25	0.2602	0.2591	0.2588	0.2587	0.2584	0.2583	0.2581	0.2580						
n	25	25	25	25	25	25	25	25						
Avg.	0.2606	0.2595	0.2593	0.2592	0.2590	0.2589	0.2587	0.2586						
Med.	0.2605	0.2595	0.2593	0.2591	0.2589	0.2588	0.2585	0.2585						
σ	0.0012	0.0013	0.0012	0.0012	0.0012	0.0013	0.0012	0.0012						
Min.	0.2581	0.2570	0.2569	0.2568	0.2566	0.2565	0.2563	0.2562						
Max.	0.2630	0.2618	0.2617	0.2616	0.2615	0.2614	0.2611	0.2611						

**Data Set 3 : 85 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	86.4 °C
Actual Ambient Temperature [T <sub>A</sub> ]	84.3 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.5202	0.5200	0.5199	0.5200	0.5198	0.5198	0.5197	0.5196	
2	0.5186	0.5185	0.5185	0.5183	0.5182	0.5183	0.5181	0.5181	
3	0.5198	0.5198	0.5197	0.5197	0.5195	0.5195	0.5194	0.5193	
4	0.5203	0.5201	0.5201	0.5201	0.5199	0.5199	0.5198	0.5197	
5	0.5208	0.5208	0.5208	0.5208	0.5206	0.5206	0.5205	0.5204	
6	0.5211	0.5210	0.5209	0.5209	0.5208	0.5208	0.5207	0.5207	
7	0.5205	0.5205	0.5205	0.5202	0.5202	0.5201	0.5200	0.5200	
8	0.5199	0.5197	0.5197	0.5195	0.5195	0.5194	0.5193	0.5192	
9	0.5194	0.5193	0.5193	0.5192	0.5191	0.5190	0.5189	0.5189	
10	0.5223	0.5224	0.5224	0.5224	0.5222	0.5222	0.5222	0.5220	
11	0.5210	0.5209	0.5208	0.5207	0.5206	0.5206	0.5204	0.5203	
12	0.5189	0.5186	0.5186	0.5186	0.5184	0.5184	0.5183	0.5182	
13	0.5208	0.5206	0.5206	0.5205	0.5204	0.5203	0.5203	0.5202	
14	0.5183	0.5182	0.5182	0.5182	0.5180	0.5181	0.5180	0.5179	
15	0.5173	0.5171	0.5170	0.5169	0.5168	0.5167	0.5165	0.5164	
16	0.5183	0.5184	0.5183	0.5182	0.5180	0.5179	0.5178	0.5177	
17	0.5211	0.5209	0.5209	0.5208	0.5209	0.5208	0.5207	0.5206	
18	0.5186	0.5186	0.5186	0.5185	0.5184	0.5183	0.5182	0.5182	
19	0.5223	0.5221	0.5222	0.5221	0.5220	0.5220	0.5220	0.5219	
20	0.5189	0.5190	0.5189	0.5188	0.5188	0.5186	0.5185	0.5184	
21	0.5210	0.5209	0.5208	0.5208	0.5207	0.5206	0.5205	0.5204	
22	0.5192	0.5190	0.5190	0.5190	0.5190	0.5190	0.5189	0.5188	
23	0.5200	0.5198	0.5197	0.5197	0.5196	0.5196	0.5195	0.5195	
24	0.5189	0.5189	0.5189	0.5187	0.5186	0.5186	0.5184	0.5183	
25	0.5203	0.5202	0.5202	0.5201	0.5200	0.5199	0.5198	0.5197	
n	25	25	25	25	25	25	25	25	
Avg.	0.5199	0.5198	0.5198	0.5197	0.5196	0.5196	0.5195	0.5194	
Med.	0.5200	0.5198	0.5197	0.5197	0.5196	0.5196	0.5195	0.5195	
σ	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	
Min.	0.5173	0.5171	0.5170	0.5169	0.5168	0.5167	0.5165	0.5164	
Max.	0.5223	0.5224	0.5224	0.5224	0.5222	0.5222	0.5222	0.5220	

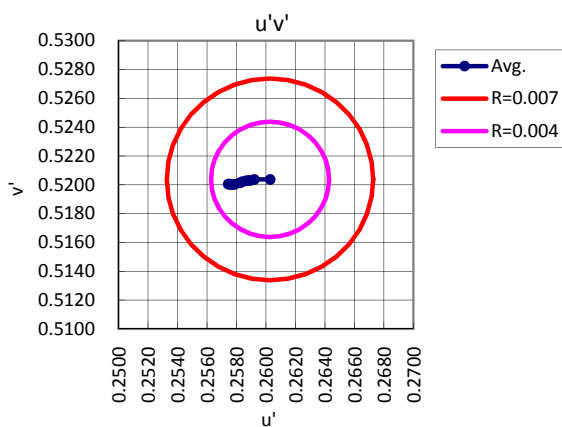
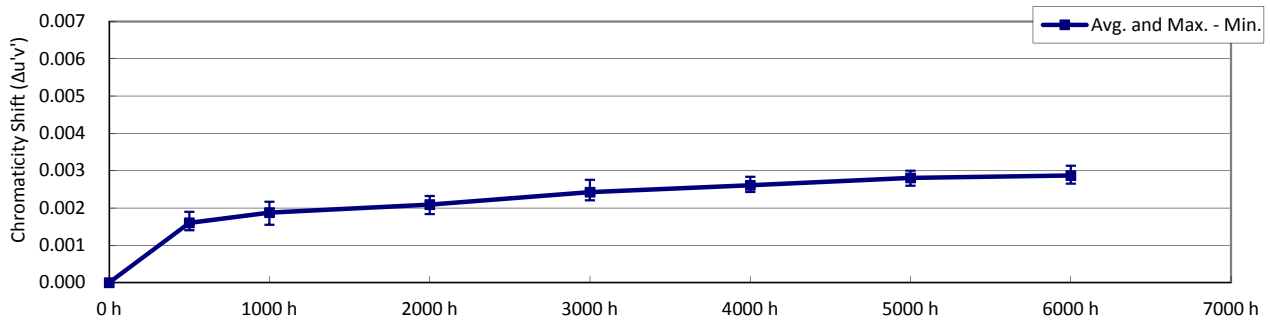
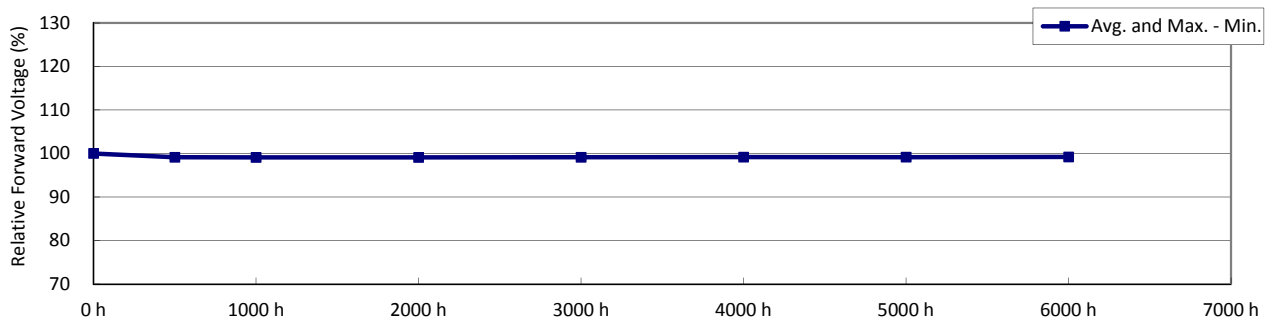
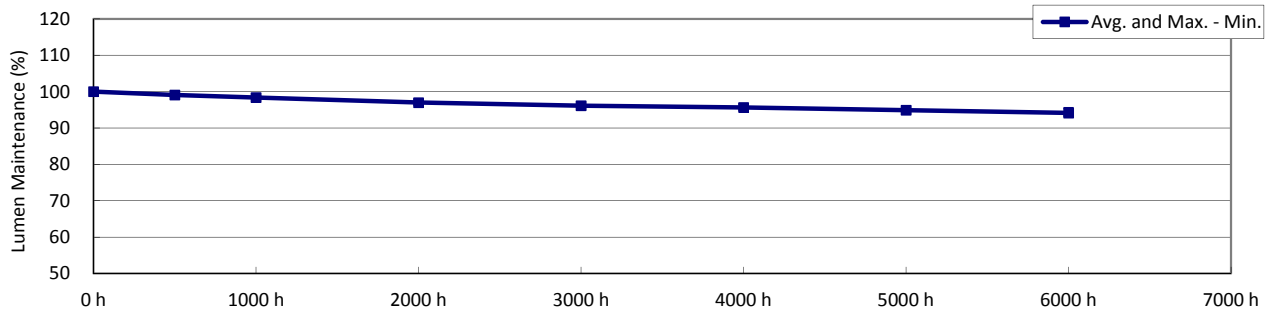


### Data Set 4 : 85 °C, 150 mA

Actual Case Temperature [ $T_S$ ]	87.3 °C
Actual Ambient Temperature [ $T_A$ ]	83.7 °C
Drive Current [ $I_F$ ]	150 mA
Measurement Current	150 mA

NOTES:

$T_S$  and  $T_A$  were measured during initial setup.



**Data Set 4 : 85 °C, 150 mA**

Actual Case Temperature [T <sub>S</sub> ]	87.3 °C
Actual Ambient Temperature [T <sub>A</sub> ]	83.7 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>S</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 4-1**  
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ <sub>V</sub> [lm]	V <sub>F</sub> [V]	T <sub>CP</sub> [K]	x	y	u'	v'						
1	119.0	6.47	2792	0.448	0.400	0.259	0.521						
2	119.5	6.47	2770	0.449	0.399	0.260	0.521						
3	118.7	6.45	2757	0.447	0.394	0.262	0.519						
4	119.9	6.44	2827	0.442	0.394	0.259	0.518						
5	121.1	6.43	2841	0.444	0.398	0.258	0.520						
6	118.8	6.42	2740	0.449	0.395	0.262	0.520						
7	119.8	6.44	2777	0.449	0.401	0.260	0.522						
8	118.7	6.47	2770	0.447	0.395	0.261	0.519						
9	120.0	6.42	2793	0.446	0.397	0.260	0.520						
10	121.1	6.42	2852	0.442	0.396	0.257	0.519						
11	120.3	6.43	2777	0.448	0.398	0.260	0.521						
12	119.0	6.46	2781	0.447	0.397	0.260	0.520						
13	119.7	6.42	2769	0.449	0.399	0.260	0.521						
14	120.5	6.59	2814	0.446	0.399	0.259	0.521						
15	119.0	6.44	2763	0.450	0.400	0.261	0.522						
16	119.8	6.44	2776	0.448	0.399	0.260	0.521						
17	119.9	6.43	2773	0.448	0.398	0.260	0.521						
18	118.5	6.46	2706	0.453	0.400	0.263	0.522						
19	119.2	6.43	2786	0.447	0.397	0.260	0.520						
20	118.4	6.45	2769	0.446	0.394	0.261	0.519						
21	119.4	6.43	2808	0.444	0.395	0.259	0.519						
22	119.0	6.42	2790	0.445	0.395	0.260	0.519						
23	120.2	6.43	2802	0.447	0.399	0.259	0.521						
24	119.8	6.42	2766	0.449	0.399	0.261	0.521						
25	118.4	6.44	2757	0.448	0.397	0.261	0.520						
n	25	25	25	25	25	25	25						
Avg.	119.5	6.44	2782	0.447	0.397	0.260	0.520						
Med.	119.5	6.44	2777	0.447	0.398	0.260	0.520						
σ	0.77	0.034	30.8	0.0025	0.0020	0.0013	0.0011						
Min.	118.4	6.42	2706	0.442	0.394	0.257	0.518						
Max.	121.1	6.59	2852	0.453	0.401	0.263	0.522						

**Data Set 4 : 85 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	87.3 °C
Actual Ambient Temperature [T <sub>A</sub> ]	83.7 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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							
1	100.0	99.1	98.4	96.9	95.9	95.4	94.7	93.7							
2	100.0	99.1	98.5	97.2	96.3	95.9	95.3	94.4							
3	100.0	98.9	98.2	96.7	96.0	95.5	94.9	94.0							
4	100.0	98.8	98.1	96.6	95.7	95.3	94.7	94.0							
5	100.0	99.0	98.3	96.9	96.1	95.6	95.0	94.4							
6	100.0	99.1	98.3	96.7	95.7	95.2	94.2	93.4							
7	100.0	99.2	98.7	97.6	96.4	95.9	95.1	94.4							
8	100.0	98.9	98.2	96.9	96.0	95.6	94.8	93.9							
9	100.0	99.0	98.0	96.7	95.9	95.5	94.7	93.8							
10	100.0	98.9	98.2	96.4	95.3	94.9	94.2	93.4							
11	100.0	99.0	98.4	96.9	96.1	95.6	94.9	94.0							
12	100.0	98.9	98.1	96.9	96.3	95.6	94.8	94.0							
13	100.0	99.1	98.6	97.4	96.5	95.8	95.1	94.3							
14	100.0	99.0	98.2	96.7	96.0	95.5	94.9	94.1							
15	100.0	99.2	98.7	97.9	97.0	96.6	95.9	95.5							
16	100.0	99.2	98.5	96.9	95.9	95.3	94.5	93.7							
17	100.0	98.9	98.2	97.1	96.2	95.7	94.9	94.3							
18	100.0	99.1	98.6	97.3	96.5	95.9	95.1	94.4							
19	100.0	99.2	98.8	97.1	96.4	95.8	95.1	94.4							
20	100.0	99.1	98.3	97.0	96.0	95.5	94.7	94.0							
21	100.0	99.1	98.1	96.9	96.1	95.6	95.0	94.2							
22	100.0	99.1	98.3	96.6	95.7	95.4	94.6	93.7							
23	100.0	99.2	98.7	97.2	96.4	96.0	95.2	94.5							
24	100.0	99.3	98.6	97.0	96.3	95.8	95.2	94.4							
25	100.0	99.2	98.6	97.4	96.6	96.1	95.4	94.7							
n	25	25	25	25	25	25	25	25							
Avg.	100.0	99.1	98.4	97.0	96.1	95.6	94.9	94.1							
Med.	100.0	99.1	98.3	96.9	96.1	95.6	94.9	94.1							
σ	0.00	0.12	0.22	0.34	0.35	0.33	0.36	0.44							
Min.	100.0	98.8	98.0	96.4	95.3	94.9	94.2	93.4							
Max.	100.0	99.3	98.8	97.9	97.0	96.6	95.9	95.5							

**TM-21 Projection**

Time	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h									
ln(Avg.)	-0.0164	-0.0305	-0.0395	-0.0446	-0.0521	-0.0604									

Test duration used	1000 h to 6000 h
B	0.9885
α	8.2847E-06
R <sup>2</sup>	0.9766
Calculated L <sub>70</sub> (6K)	41700 hours
Reported L <sub>70</sub> (6K)	> 36000 hours
Calculated L <sub>80</sub> (6K)	25500 hours
Reported L <sub>80</sub> (6K)	25500 hours
Calculated L <sub>90</sub> (6K)	11300 hours
Reported L <sub>90</sub> (6K)	11300 hours

Curve-fit equation:

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

Lumen maintenance life equation:

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

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

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

**Data Set 4 : 85 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	87.3 °C
Actual Ambient Temperature [T <sub>A</sub> ]	83.7 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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						
1	100.0	99.1	99.1	99.1	99.1	99.1	99.1	99.2						
2	100.0	99.1	98.9	99.0	99.0	99.1	99.1	99.1						
3	100.0	99.1	99.1	99.0	99.1	99.1	99.1	99.1						
4	100.0	99.2	99.0	99.1	99.1	99.1	99.2	99.2						
5	100.0	99.1	99.1	99.1	99.1	99.1	99.1	99.2						
6	100.0	99.2	99.2	99.2	99.2	99.3	99.2	99.3						
7	100.0	99.3	99.3	99.3	99.3	99.3	99.3	99.4						
8	100.0	99.2	99.0	99.1	99.1	99.2	99.1	99.2						
9	100.0	99.1	99.1	99.2	99.2	99.2	99.2	99.3						
10	100.0	99.1	99.1	99.1	99.1	99.1	99.1	99.2						
11	100.0	99.1	99.0	99.0	99.0	99.1	99.1	99.1						
12	100.0	99.0	98.9	99.0	99.1	99.1	99.1	99.2						
13	100.0	99.3	99.2	99.3	99.3	99.4	99.3	99.4						
14	100.0	98.8	98.9	98.8	98.8	98.8	98.8	98.9						
15	100.0	99.2	99.2	99.2	99.3	99.3	99.3	99.4						
16	100.0	99.1	99.2	99.1	99.2	99.1	99.2	99.2						
17	100.0	99.2	99.3	99.2	99.2	99.3	99.3	99.3						
18	100.0	99.1	99.1	99.0	99.1	99.1	99.1	99.2						
19	100.0	99.2	99.1	99.2	99.2	99.2	99.2	99.3						
20	100.0	99.1	99.1	99.1	99.1	99.2	99.1	99.2						
21	100.0	99.2	99.1	99.2	99.1	99.2	99.2	99.3						
22	100.0	99.1	99.1	99.1	99.2	99.2	99.2	99.3						
23	100.0	99.2	99.2	99.1	99.2	99.2	99.2	99.3						
24	100.0	99.1	99.1	99.1	99.1	99.2	99.1	99.2						
25	100.0	99.2	99.3	99.2	99.3	99.3	99.3	99.4						
n	25	25	25	25	25	25	25	25						
Avg.	100.0	99.1	99.1	99.1	99.1	99.2	99.2	99.2						
Med.	100.0	99.1	99.1	99.1	99.1	99.2	99.2	99.2						
σ	0.00	0.09	0.11	0.10	0.11	0.11	0.11	0.11						
Min.	100.0	98.8	98.9	98.8	98.8	98.8	98.8	98.9						
Max.	100.0	99.3	99.3	99.3	99.3	99.4	99.3	99.4						

**Data Set 4 : 85 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	87.3 °C
Actual Ambient Temperature [T <sub>A</sub> ]	83.7 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.0000	0.0015	0.0018	0.0021	0.0023	0.0025	0.0026	0.0027	
2	0.0000	0.0016	0.0018	0.0021	0.0023	0.0025	0.0027	0.0028	
3	0.0000	0.0016	0.0019	0.0022	0.0025	0.0026	0.0028	0.0028	
4	0.0000	0.0018	0.0021	0.0022	0.0025	0.0027	0.0028	0.0028	
5	0.0000	0.0016	0.0019	0.0021	0.0024	0.0027	0.0028	0.0027	
6	0.0000	0.0018	0.0020	0.0023	0.0025	0.0027	0.0029	0.0031	
7	0.0000	0.0015	0.0018	0.0020	0.0024	0.0026	0.0028	0.0028	
8	0.0000	0.0018	0.0019	0.0022	0.0024	0.0025	0.0028	0.0028	
9	0.0000	0.0017	0.0019	0.0021	0.0023	0.0025	0.0027	0.0028	
10	0.0000	0.0015	0.0017	0.0018	0.0022	0.0024	0.0026	0.0027	
11	0.0000	0.0016	0.0019	0.0020	0.0023	0.0025	0.0028	0.0029	
12	0.0000	0.0017	0.0019	0.0020	0.0023	0.0025	0.0027	0.0028	
13	0.0000	0.0016	0.0019	0.0022	0.0025	0.0027	0.0030	0.0031	
14	0.0000	0.0015	0.0018	0.0020	0.0022	0.0025	0.0027	0.0029	
15	0.0000	0.0015	0.0018	0.0021	0.0023	0.0026	0.0028	0.0029	
16	0.0000	0.0015	0.0018	0.0020	0.0025	0.0026	0.0029	0.0030	
17	0.0000	0.0015	0.0018	0.0020	0.0024	0.0026	0.0028	0.0028	
18	0.0000	0.0015	0.0018	0.0020	0.0024	0.0026	0.0027	0.0029	
19	0.0000	0.0015	0.0018	0.0021	0.0025	0.0025	0.0029	0.0029	
20	0.0000	0.0014	0.0015	0.0019	0.0023	0.0025	0.0027	0.0027	
21	0.0000	0.0019	0.0021	0.0023	0.0027	0.0028	0.0030	0.0031	
22	0.0000	0.0018	0.0022	0.0023	0.0028	0.0028	0.0030	0.0030	
23	0.0000	0.0016	0.0019	0.0021	0.0025	0.0026	0.0028	0.0029	
24	0.0000	0.0018	0.0020	0.0022	0.0026	0.0028	0.0030	0.0031	
25	0.0000	0.0016	0.0019	0.0021	0.0025	0.0026	0.0029	0.0030	
n	25	25	25	25	25	25	25	25	
Avg.	0.0000	0.0016	0.0019	0.0021	0.0024	0.0026	0.0028	0.0029	
Med.	0.0000	0.0016	0.0019	0.0021	0.0024	0.0026	0.0028	0.0029	
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Min.	0.0000	0.0014	0.0015	0.0018	0.0022	0.0024	0.0026	0.0027	
Max.	0.0000	0.0019	0.0022	0.0023	0.0028	0.0028	0.0030	0.0031	

**Data Set 4 : 85 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	87.3 °C
Actual Ambient Temperature [T <sub>A</sub> ]	83.7 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.2601	0.2586	0.2583	0.2581	0.2578	0.2576	0.2575	0.2575	
2	0.2611	0.2596	0.2593	0.2591	0.2588	0.2586	0.2584	0.2583	
3	0.2620	0.2604	0.2601	0.2598	0.2596	0.2594	0.2592	0.2592	
4	0.2592	0.2574	0.2571	0.2570	0.2567	0.2565	0.2564	0.2564	
5	0.2582	0.2566	0.2563	0.2561	0.2558	0.2556	0.2554	0.2555	
6	0.2627	0.2609	0.2607	0.2605	0.2602	0.2600	0.2598	0.2596	
7	0.2606	0.2591	0.2588	0.2586	0.2582	0.2580	0.2579	0.2579	
8	0.2615	0.2598	0.2596	0.2594	0.2592	0.2590	0.2588	0.2587	
9	0.2600	0.2584	0.2582	0.2580	0.2577	0.2575	0.2573	0.2573	
10	0.2579	0.2564	0.2562	0.2561	0.2557	0.2555	0.2553	0.2553	
11	0.2607	0.2591	0.2589	0.2588	0.2585	0.2583	0.2580	0.2579	
12	0.2608	0.2591	0.2589	0.2587	0.2585	0.2582	0.2581	0.2580	
13	0.2611	0.2595	0.2592	0.2590	0.2586	0.2585	0.2582	0.2581	
14	0.2592	0.2577	0.2574	0.2572	0.2570	0.2567	0.2564	0.2563	
15	0.2612	0.2597	0.2593	0.2591	0.2589	0.2586	0.2584	0.2583	
16	0.2609	0.2594	0.2591	0.2589	0.2584	0.2583	0.2580	0.2579	
17	0.2611	0.2596	0.2593	0.2590	0.2587	0.2585	0.2583	0.2583	
18	0.2638	0.2623	0.2620	0.2618	0.2614	0.2613	0.2611	0.2610	
19	0.2606	0.2591	0.2588	0.2586	0.2581	0.2581	0.2577	0.2578	
20	0.2616	0.2602	0.2600	0.2597	0.2593	0.2591	0.2589	0.2589	
21	0.2598	0.2579	0.2576	0.2574	0.2571	0.2569	0.2568	0.2567	
22	0.2606	0.2588	0.2584	0.2583	0.2579	0.2578	0.2576	0.2576	
23	0.2597	0.2582	0.2579	0.2577	0.2573	0.2572	0.2569	0.2569	
24	0.2612	0.2594	0.2592	0.2590	0.2585	0.2584	0.2582	0.2581	
25	0.2619	0.2604	0.2601	0.2599	0.2595	0.2593	0.2591	0.2590	
n	25	25	25	25	25	25	25	25	
Avg.	0.2607	0.2591	0.2588	0.2586	0.2583	0.2581	0.2579	0.2579	
Med.	0.2608	0.2591	0.2589	0.2588	0.2585	0.2583	0.2580	0.2579	
σ	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	
Min.	0.2579	0.2564	0.2562	0.2561	0.2557	0.2555	0.2553	0.2553	
Max.	0.2638	0.2623	0.2620	0.2618	0.2614	0.2613	0.2611	0.2610	

**Data Set 4 : 85 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	87.3 °C
Actual Ambient Temperature [T <sub>A</sub> ]	83.7 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 4-6**  
Chromaticity

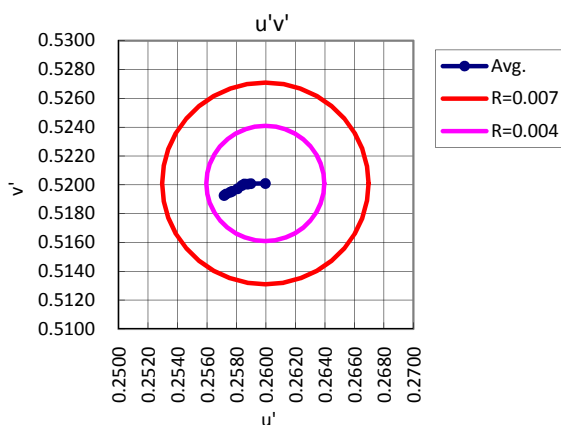
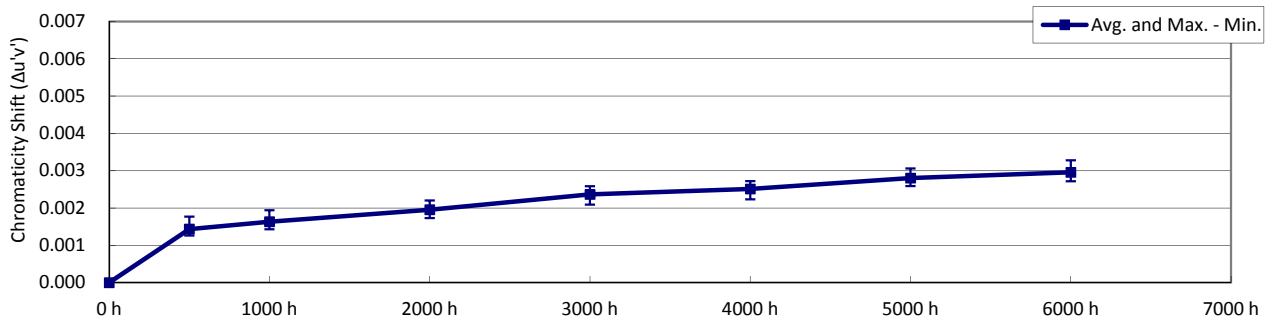
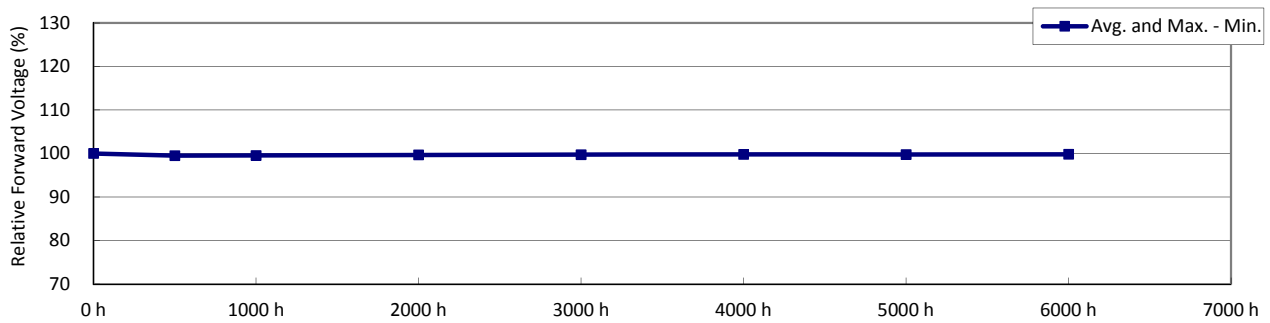
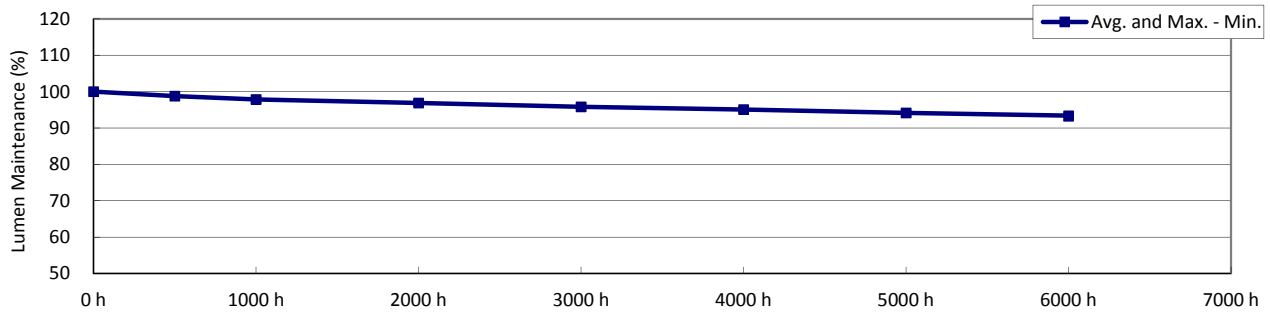
LED No.	Chromaticity v'								
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	
1	0.5213	0.5212	0.5212	0.5209	0.5209	0.5209	0.5210	0.5210	
2	0.5212	0.5211	0.5210	0.5209	0.5209	0.5209	0.5209	0.5209	
3	0.5189	0.5188	0.5187	0.5185	0.5185	0.5185	0.5185	0.5184	
4	0.5183	0.5182	0.5181	0.5180	0.5179	0.5180	0.5180	0.5180	
5	0.5202	0.5201	0.5200	0.5199	0.5198	0.5198	0.5200	0.5199	
6	0.5198	0.5200	0.5199	0.5198	0.5198	0.5196	0.5197	0.5197	
7	0.5221	0.5221	0.5220	0.5220	0.5219	0.5218	0.5218	0.5219	
8	0.5195	0.5194	0.5192	0.5192	0.5191	0.5191	0.5191	0.5192	
9	0.5198	0.5197	0.5196	0.5196	0.5194	0.5194	0.5194	0.5194	
10	0.5187	0.5185	0.5184	0.5183	0.5182	0.5182	0.5182	0.5182	
11	0.5209	0.5206	0.5205	0.5206	0.5203	0.5203	0.5203	0.5203	
12	0.5201	0.5199	0.5198	0.5198	0.5197	0.5197	0.5198	0.5198	
13	0.5213	0.5212	0.5212	0.5210	0.5209	0.5208	0.5208	0.5208	
14	0.5205	0.5204	0.5204	0.5203	0.5202	0.5202	0.5204	0.5203	
15	0.5218	0.5219	0.5217	0.5217	0.5215	0.5215	0.5214	0.5215	
16	0.5211	0.5210	0.5210	0.5209	0.5208	0.5208	0.5208	0.5208	
17	0.5207	0.5206	0.5206	0.5205	0.5205	0.5204	0.5205	0.5205	
18	0.5222	0.5221	0.5219	0.5219	0.5217	0.5217	0.5217	0.5217	
19	0.5202	0.5202	0.5201	0.5200	0.5199	0.5199	0.5199	0.5199	
20	0.5186	0.5185	0.5186	0.5183	0.5183	0.5183	0.5183	0.5182	
21	0.5189	0.5191	0.5191	0.5190	0.5190	0.5189	0.5190	0.5190	
22	0.5191	0.5192	0.5191	0.5189	0.5189	0.5189	0.5189	0.5189	
23	0.5209	0.5207	0.5207	0.5205	0.5203	0.5204	0.5204	0.5204	
24	0.5212	0.5213	0.5213	0.5212	0.5211	0.5211	0.5212	0.5211	
25	0.5203	0.5201	0.5200	0.5200	0.5198	0.5199	0.5199	0.5199	
n	25	25	25	25	25	25	25	25	
Avg.	0.5203	0.5202	0.5202	0.5201	0.5200	0.5200	0.5200	0.5200	
Med.	0.5203	0.5202	0.5201	0.5200	0.5199	0.5199	0.5200	0.5199	
σ	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	
Min.	0.5183	0.5182	0.5181	0.5180	0.5179	0.5180	0.5180	0.5180	
Max.	0.5222	0.5221	0.5220	0.5220	0.5219	0.5218	0.5218	0.5219	

### Data Set 5 : 105 °C, 75 mA

Actual Case Temperature [ $T_S$ ]	105.6 °C
Actual Ambient Temperature [ $T_A$ ]	102.5 °C
Drive Current [ $I_F$ ]	75 mA
Measurement Current	75 mA

NOTES:

$T_S$  and  $T_A$  were measured during initial setup.





**Data Set 5 : 105 °C, 75 mA**

Actual Case Temperature [T <sub>S</sub> ]	105.6 °C
Actual Ambient Temperature [T <sub>A</sub> ]	102.5 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>S</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 5-1**  
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976						
	Φ <sub>V</sub> [lm]	V <sub>F</sub> [V]	T <sub>CP</sub> [K]	x	y	u'	v'					
1	65.2	5.95	2755	0.450	0.400	0.261	0.522					
2	65.0	5.95	2774	0.448	0.398	0.260	0.521					
3	64.9	5.93	2748	0.449	0.397	0.262	0.520					
4	65.2	5.93	2788	0.447	0.398	0.260	0.521					
5	64.9	5.96	2778	0.449	0.401	0.260	0.522					
6	64.7	5.97	2748	0.451	0.400	0.261	0.522					
7	64.9	5.97	2824	0.443	0.395	0.259	0.519					
8	64.6	5.95	2817	0.443	0.394	0.259	0.518					
9	64.9	5.94	2777	0.448	0.398	0.260	0.520					
10	64.9	5.96	2836	0.442	0.395	0.258	0.519					
11	64.7	5.94	2787	0.446	0.397	0.260	0.520					
12	64.8	5.92	2786	0.445	0.393	0.260	0.518					
13	64.8	5.94	2800	0.445	0.396	0.259	0.520					
14	65.1	5.94	2766	0.449	0.400	0.261	0.521					
15	64.4	5.96	2730	0.450	0.397	0.262	0.521					
16	64.8	5.96	2778	0.447	0.398	0.260	0.520					
17	65.0	5.96	2815	0.443	0.395	0.259	0.519					
18	64.6	5.96	2736	0.450	0.398	0.262	0.521					
19	65.5	5.94	2789	0.448	0.399	0.260	0.521					
20	65.1	5.93	2835	0.443	0.396	0.258	0.519					
21	65.1	5.93	2843	0.441	0.394	0.258	0.518					
22	65.4	5.95	2780	0.448	0.399	0.260	0.521					
23	64.4	5.96	2750	0.450	0.398	0.261	0.521					
24	65.0	5.93	2781	0.449	0.401	0.260	0.522					
25	65.4	5.94	2833	0.442	0.395	0.258	0.518					
n	25	25	25	25	25	25	25					
Avg.	64.9	5.95	2786	0.447	0.397	0.260	0.520					
Med.	64.9	5.95	2781	0.448	0.398	0.260	0.520					
σ	0.29	0.014	32.5	0.0030	0.0023	0.0012	0.0013					
Min.	64.4	5.92	2730	0.441	0.393	0.258	0.518					
Max.	65.5	5.97	2843	0.451	0.401	0.262	0.522					

**Data Set 5 : 105 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.6 °C
Actual Ambient Temperature [T <sub>A</sub> ]	102.5 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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							
1	100.0	98.8	97.3	96.5	95.4	94.7	93.9	93.2							
2	100.0	99.1	98.3	97.3	96.1	95.4	94.5	93.9							
3	100.0	98.7	97.1	96.4	95.2	94.5	93.6	92.8							
4	100.0	98.7	97.5	96.5	95.2	94.3	93.6	93.0							
5	100.0	98.8	98.3	97.3	96.1	95.3	94.3	93.6							
6	100.0	98.8	97.7	96.7	95.4	94.3	93.1	92.1							
7	100.0	98.6	98.2	97.0	95.8	94.9	94.2	93.4							
8	100.0	99.0	98.0	96.9	95.8	95.0	93.8	92.8							
9	100.0	98.6	98.0	97.0	95.9	95.1	94.2	93.4							
10	100.0	98.6	97.5	96.6	95.5	94.6	93.7	92.9							
11	100.0	98.8	98.4	97.2	96.2	95.5	94.8	94.2							
12	100.0	98.9	97.7	96.6	95.8	95.2	94.1	93.3							
13	100.0	99.1	98.5	97.3	96.4	95.7	94.9	94.2							
14	100.0	98.8	98.0	96.9	96.0	95.4	94.6	93.9							
15	100.0	98.9	98.3	97.2	96.3	95.6	94.7	93.9							
16	100.0	98.9	97.9	96.9	95.8	95.1	94.2	93.4							
17	100.0	98.7	97.7	96.6	95.3	94.7	93.7	92.9							
18	100.0	98.6	97.9	96.7	95.8	95.1	94.3	93.7							
19	100.0	98.6	97.5	96.4	95.4	94.6	93.6	92.7							
20	100.0	98.8	97.6	96.6	95.8	95.0	94.0	93.2							
21	100.0	98.8	97.5	96.9	95.8	95.1	93.9	92.9							
22	100.0	98.8	97.8	97.3	96.2	95.6	94.7	94.0							
23	100.0	98.9	97.8	97.3	96.2	95.5	94.7	94.0							
24	100.0	98.9	98.4	97.7	96.5	95.7	94.6	93.7							
25	100.0	98.6	97.1	96.7	95.8	95.2	94.3	93.6							
n	25	25	25	25	25	25	25	25							
Avg.	100.0	98.8	97.8	96.9	95.8	95.1	94.2	93.4							
Med.	100.0	98.8	97.8	96.9	95.8	95.1	94.2	93.4							
σ	0.00	0.14	0.39	0.36	0.38	0.43	0.46	0.53							
Min.	100.0	98.6	97.1	96.4	95.2	94.3	93.1	92.1							
Max.	100.0	99.1	98.5	97.7	96.5	95.7	94.9	94.2							

**TM-21 Projection**

Time	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h									
ln(Avg.)	-0.0218	-0.0315	-0.0427	-0.0504	-0.0602	-0.0684									

Test duration used	1000 h	to	6000 h
B	0.9869		
α	9.3278E-06		
R <sup>2</sup>	0.9977		
Calculated L <sub>70</sub> (6K)	36800	hours	
Reported L <sub>70</sub> (6K)	> 36000	hours	
Calculated L <sub>80</sub> (6K)	22500	hours	
Reported L <sub>80</sub> (6K)	22500	hours	
Calculated L <sub>90</sub> (6K)	9880	hours	
Reported L <sub>90</sub> (6K)	9880	hours	

Curve-fit equation:

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

Lumen maintenance life equation:

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

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

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

**Data Set 5 : 105 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.6 °C
Actual Ambient Temperature [T <sub>A</sub> ]	102.5 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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						
1	100.0	99.4	99.4	99.6	99.7	99.7	99.7	99.8						
2	100.0	99.5	99.6	99.7	99.8	99.8	99.8	99.9						
3	100.0	99.5	99.5	99.7	99.6	99.8	99.7	99.8						
4	100.0	99.5	99.5	99.7	99.7	99.8	99.8	99.9						
5	100.0	99.5	99.5	99.7	99.7	99.8	99.8	99.9						
6	100.0	99.4	99.5	99.7	99.7	99.8	99.7	99.8						
7	100.0	99.4	99.4	99.7	99.7	99.8	99.7	99.8						
8	100.0	99.6	99.5	99.7	99.9	99.9	99.8	99.9						
9	100.0	99.5	99.5	99.7	99.7	99.8	99.8	99.9						
10	100.0	99.4	99.5	99.6	99.6	99.8	99.7	99.8						
11	100.0	99.6	99.7	99.8	99.8	99.9	99.9	99.9						
12	100.0	99.6	99.5	99.6	99.7	99.8	99.8	99.8						
13	100.0	99.6	99.6	99.8	99.7	99.9	99.8	99.9						
14	100.0	99.5	99.6	99.7	99.7	99.8	99.8	99.8						
15	100.0	99.5	99.5	99.7	99.7	99.8	99.8	99.8						
16	100.0	99.5	99.6	99.6	99.7	99.8	99.8	99.9						
17	100.0	99.5	99.5	99.6	99.7	99.8	99.7	99.7						
18	100.0	99.5	99.5	99.7	99.7	99.8	99.8	99.8						
19	100.0	99.6	99.6	99.8	99.7	99.8	99.8	99.8						
20	100.0	99.5	99.5	99.6	99.6	99.7	99.7	99.7						
21	100.0	99.6	99.5	99.6	99.7	99.8	99.7	99.8						
22	100.0	99.6	99.5	99.7	99.9	99.8	99.8	99.9						
23	100.0	99.6	99.6	99.7	99.8	99.9	99.8	99.9						
24	100.0	99.5	99.6	99.7	99.8	99.8	99.8	99.8						
25	100.0	99.6	99.5	99.6	99.7	99.8	99.7	99.8						
n	25	25	25	25	25	25	25	25						
Avg.	100.0	99.5	99.5	99.7	99.7	99.8	99.8	99.8						
Med.	100.0	99.5	99.5	99.7	99.7	99.8	99.8	99.8						
σ	0.00	0.07	0.07	0.06	0.06	0.04	0.05	0.05						
Min.	100.0	99.4	99.4	99.6	99.6	99.7	99.7	99.7						
Max.	100.0	99.6	99.7	99.8	99.9	99.9	99.9	99.9						

**Data Set 5 : 105 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.6 °C
Actual Ambient Temperature [T <sub>A</sub> ]	102.5 °C
Drive Current [I <sub>F</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.0000	0.0015	0.0017	0.0021	0.0026	0.0027	0.0031	0.0032	
2	0.0000	0.0013	0.0016	0.0020	0.0024	0.0026	0.0028	0.0029	
3	0.0000	0.0014	0.0018	0.0020	0.0025	0.0026	0.0029	0.0031	
4	0.0000	0.0014	0.0017	0.0021	0.0022	0.0024	0.0028	0.0031	
5	0.0000	0.0015	0.0017	0.0020	0.0023	0.0025	0.0028	0.0029	
6	0.0000	0.0015	0.0018	0.0021	0.0025	0.0027	0.0030	0.0033	
7	0.0000	0.0015	0.0016	0.0018	0.0024	0.0026	0.0029	0.0030	
8	0.0000	0.0013	0.0015	0.0019	0.0023	0.0026	0.0028	0.0030	
9	0.0000	0.0015	0.0016	0.0020	0.0024	0.0026	0.0028	0.0030	
10	0.0000	0.0015	0.0016	0.0020	0.0024	0.0027	0.0029	0.0031	
11	0.0000	0.0015	0.0016	0.0020	0.0023	0.0024	0.0027	0.0029	
12	0.0000	0.0018	0.0019	0.0022	0.0025	0.0027	0.0029	0.0030	
13	0.0000	0.0014	0.0015	0.0019	0.0023	0.0024	0.0026	0.0028	
14	0.0000	0.0014	0.0016	0.0019	0.0024	0.0025	0.0028	0.0029	
15	0.0000	0.0013	0.0014	0.0018	0.0021	0.0022	0.0026	0.0027	
16	0.0000	0.0013	0.0016	0.0018	0.0023	0.0024	0.0028	0.0030	
17	0.0000	0.0015	0.0017	0.0020	0.0023	0.0025	0.0028	0.0030	
18	0.0000	0.0014	0.0015	0.0019	0.0024	0.0024	0.0027	0.0028	
19	0.0000	0.0013	0.0015	0.0020	0.0024	0.0026	0.0028	0.0029	
20	0.0000	0.0015	0.0017	0.0020	0.0024	0.0025	0.0028	0.0028	
21	0.0000	0.0014	0.0016	0.0020	0.0023	0.0025	0.0028	0.0029	
22	0.0000	0.0013	0.0015	0.0017	0.0021	0.0023	0.0027	0.0027	
23	0.0000	0.0013	0.0016	0.0019	0.0024	0.0024	0.0028	0.0029	
24	0.0000	0.0016	0.0018	0.0020	0.0025	0.0026	0.0029	0.0030	
25	0.0000	0.0015	0.0015	0.0018	0.0022	0.0023	0.0026	0.0029	
n	25	25	25	25	25	25	25	25	
Avg.	0.0000	0.0014	0.0016	0.0020	0.0024	0.0025	0.0028	0.0030	
Med.	0.0000	0.0014	0.0016	0.0020	0.0024	0.0025	0.0028	0.0029	
σ	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Min.	0.0000	0.0013	0.0014	0.0017	0.0021	0.0022	0.0026	0.0027	
Max.	0.0000	0.0018	0.0019	0.0022	0.0026	0.0027	0.0031	0.0033	

**Data Set 5 : 105 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.6 °C
Actual Ambient Temperature [T <sub>A</sub> ]	102.5 °C
Drive Current [I <sub>f</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.2617	0.2602	0.2600	0.2596	0.2592	0.2591	0.2587	0.2586	
2	0.2610	0.2597	0.2594	0.2591	0.2587	0.2586	0.2583	0.2582	
3	0.2622	0.2608	0.2604	0.2602	0.2598	0.2596	0.2594	0.2593	
4	0.2604	0.2590	0.2587	0.2584	0.2583	0.2582	0.2578	0.2575	
5	0.2606	0.2592	0.2589	0.2587	0.2584	0.2583	0.2580	0.2578	
6	0.2621	0.2606	0.2603	0.2601	0.2597	0.2595	0.2592	0.2590	
7	0.2593	0.2578	0.2577	0.2576	0.2571	0.2568	0.2566	0.2565	
8	0.2597	0.2583	0.2582	0.2578	0.2575	0.2572	0.2571	0.2569	
9	0.2610	0.2595	0.2594	0.2591	0.2587	0.2585	0.2583	0.2581	
10	0.2587	0.2572	0.2571	0.2568	0.2564	0.2562	0.2560	0.2558	
11	0.2606	0.2591	0.2590	0.2586	0.2583	0.2582	0.2579	0.2578	
12	0.2609	0.2592	0.2590	0.2587	0.2584	0.2582	0.2580	0.2580	
13	0.2601	0.2586	0.2586	0.2582	0.2579	0.2577	0.2575	0.2574	
14	0.2612	0.2598	0.2595	0.2593	0.2589	0.2587	0.2584	0.2584	
15	0.2630	0.2617	0.2616	0.2612	0.2609	0.2608	0.2604	0.2603	
16	0.2609	0.2596	0.2593	0.2591	0.2586	0.2586	0.2583	0.2580	
17	0.2597	0.2582	0.2580	0.2577	0.2574	0.2573	0.2570	0.2568	
18	0.2627	0.2613	0.2612	0.2609	0.2604	0.2604	0.2601	0.2600	
19	0.2600	0.2587	0.2585	0.2581	0.2577	0.2575	0.2573	0.2573	
20	0.2586	0.2571	0.2569	0.2567	0.2562	0.2561	0.2559	0.2559	
21	0.2584	0.2570	0.2568	0.2564	0.2561	0.2559	0.2557	0.2556	
22	0.2604	0.2591	0.2589	0.2587	0.2584	0.2582	0.2578	0.2578	
23	0.2620	0.2607	0.2604	0.2601	0.2597	0.2597	0.2593	0.2592	
24	0.2605	0.2589	0.2587	0.2584	0.2580	0.2579	0.2576	0.2575	
25	0.2588	0.2573	0.2573	0.2570	0.2567	0.2565	0.2563	0.2561	
n	25	25	25	25	25	25	25	25	
Avg.	0.2606	0.2591	0.2590	0.2587	0.2583	0.2582	0.2579	0.2578	
Med.	0.2606	0.2591	0.2589	0.2587	0.2584	0.2582	0.2579	0.2578	
σ	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	
Min.	0.2584	0.2570	0.2568	0.2564	0.2561	0.2559	0.2557	0.2556	
Max.	0.2630	0.2617	0.2616	0.2612	0.2609	0.2608	0.2604	0.2603	

**Data Set 5 : 105 °C, 75 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.6 °C
Actual Ambient Temperature [T <sub>A</sub> ]	102.5 °C
Drive Current [I <sub>f</sub> ]	75 mA
Measurement Current	75 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 5-6**  
Chromaticity

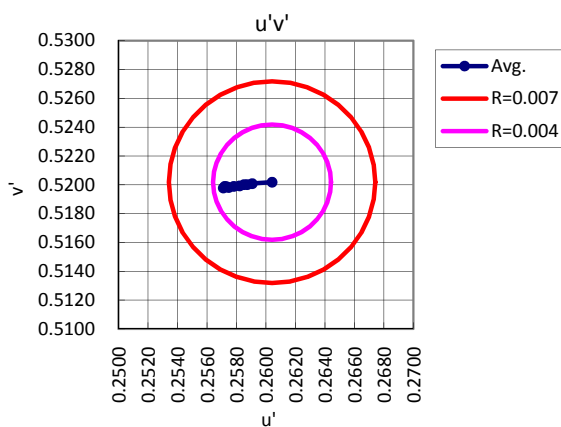
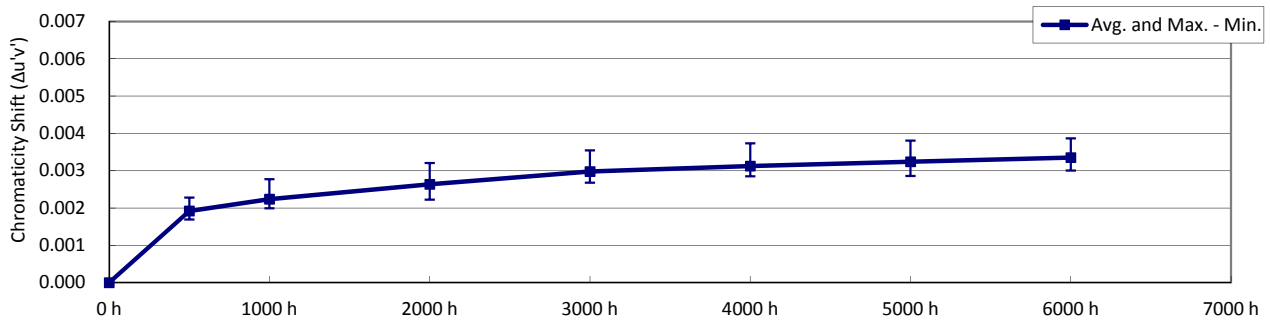
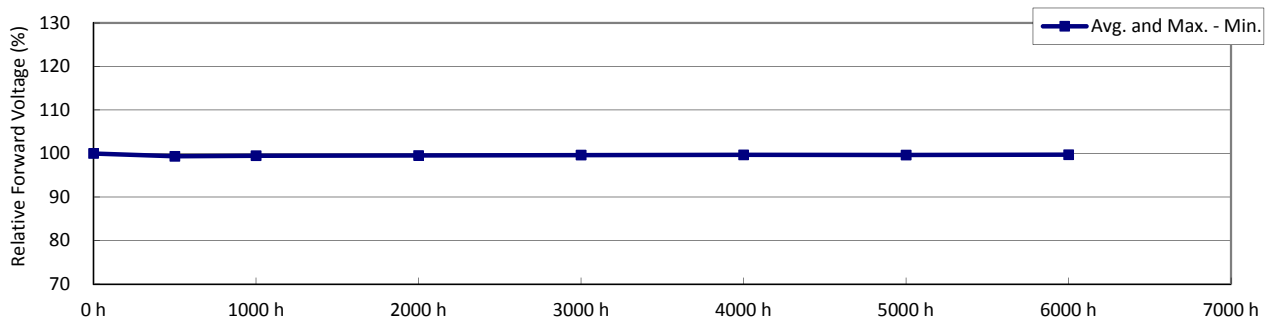
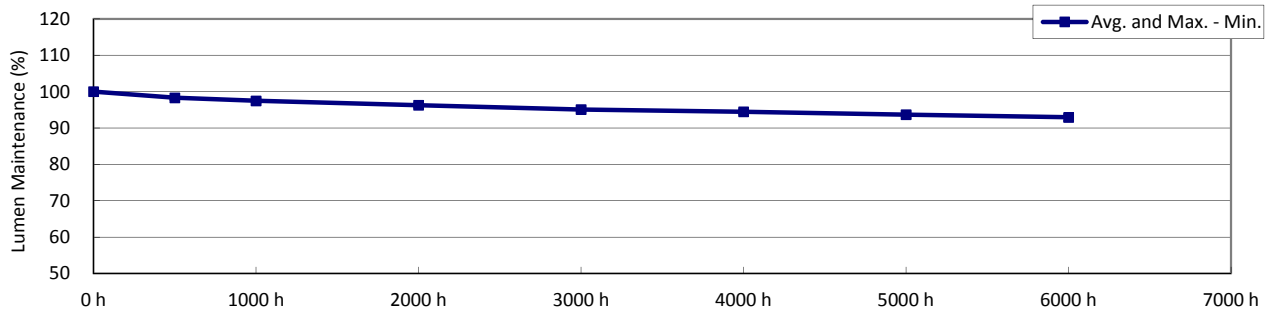
LED No.	Chromaticity v'								
	0 h	500 h	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	
1	0.5217	0.5216	0.5215	0.5212	0.5210	0.5210	0.5208	0.5208	
2	0.5208	0.5208	0.5206	0.5204	0.5202	0.5201	0.5200	0.5199	
3	0.5206	0.5206	0.5205	0.5202	0.5199	0.5199	0.5198	0.5197	
4	0.5207	0.5207	0.5206	0.5202	0.5201	0.5200	0.5199	0.5198	
5	0.5224	0.5222	0.5222	0.5220	0.5219	0.5217	0.5217	0.5216	
6	0.5218	0.5217	0.5216	0.5213	0.5211	0.5210	0.5209	0.5208	
7	0.5187	0.5186	0.5186	0.5182	0.5179	0.5179	0.5178	0.5177	
8	0.5183	0.5182	0.5180	0.5178	0.5176	0.5175	0.5172	0.5171	
9	0.5206	0.5205	0.5204	0.5201	0.5199	0.5198	0.5197	0.5196	
10	0.5186	0.5185	0.5184	0.5181	0.5179	0.5178	0.5176	0.5175	
11	0.5199	0.5198	0.5197	0.5195	0.5193	0.5193	0.5192	0.5191	
12	0.5183	0.5187	0.5185	0.5183	0.5181	0.5180	0.5179	0.5177	
13	0.5197	0.5195	0.5194	0.5192	0.5190	0.5190	0.5189	0.5187	
14	0.5215	0.5214	0.5213	0.5210	0.5208	0.5207	0.5207	0.5206	
15	0.5208	0.5208	0.5207	0.5206	0.5204	0.5204	0.5203	0.5202	
16	0.5205	0.5204	0.5203	0.5201	0.5199	0.5199	0.5197	0.5197	
17	0.5188	0.5188	0.5186	0.5184	0.5181	0.5181	0.5179	0.5178	
18	0.5211	0.5209	0.5208	0.5206	0.5204	0.5204	0.5203	0.5202	
19	0.5211	0.5210	0.5209	0.5205	0.5204	0.5203	0.5202	0.5200	
20	0.5190	0.5190	0.5189	0.5187	0.5185	0.5185	0.5184	0.5182	
21	0.5179	0.5182	0.5180	0.5179	0.5176	0.5175	0.5174	0.5172	
22	0.5213	0.5213	0.5211	0.5210	0.5208	0.5208	0.5207	0.5207	
23	0.5212	0.5211	0.5209	0.5208	0.5206	0.5206	0.5204	0.5204	
24	0.5219	0.5221	0.5220	0.5218	0.5217	0.5216	0.5214	0.5214	
25	0.5185	0.5184	0.5183	0.5181	0.5180	0.5179	0.5177	0.5176	
n	25	25	25	25	25	25	25	25	
Avg.	0.5202	0.5202	0.5201	0.5198	0.5196	0.5196	0.5195	0.5194	
Med.	0.5206	0.5206	0.5205	0.5202	0.5199	0.5199	0.5198	0.5197	
σ	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0014	0.0014	
Min.	0.5179	0.5182	0.5180	0.5178	0.5176	0.5175	0.5172	0.5171	
Max.	0.5224	0.5222	0.5222	0.5220	0.5219	0.5217	0.5217	0.5216	

### Data Set 6 : 105 °C, 150 mA

Actual Case Temperature [ $T_S$ ]	105.8 °C
Actual Ambient Temperature [ $T_A$ ]	103.3 °C
Drive Current [ $I_F$ ]	150 mA
Measurement Current	150 mA

NOTES:

$T_S$  and  $T_A$  were measured during initial setup.



**Data Set 6 : 105 °C, 150 mA**

Actual Case Temperature [T <sub>S</sub> ]	105.8 °C
Actual Ambient Temperature [T <sub>A</sub> ]	103.3 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>S</sub> and T<sub>A</sub> were measured during initial setup.

**TABLE 6-1**  
Initial Characteristics

LED No.	Luminous flux	Forward voltage	CCT	CIE1931		CIE1976							
	Φ <sub>V</sub> [lm]	V <sub>F</sub> [V]	T <sub>CP</sub> [K]	x	y	u'	v'						
1	118.8	6.47	2762	0.448	0.397	0.261	0.520						
2	118.7	6.45	2774	0.446	0.394	0.261	0.519						
3	119.4	6.44	2779	0.448	0.398	0.260	0.521						
4	119.7	6.42	2851	0.441	0.394	0.258	0.518						
5	118.6	6.46	2722	0.451	0.398	0.263	0.521						
6	119.4	6.43	2796	0.446	0.396	0.260	0.520						
7	119.1	6.44	2745	0.450	0.398	0.262	0.521						
8	119.9	6.44	2772	0.449	0.400	0.260	0.522						
9	118.6	6.44	2732	0.451	0.398	0.262	0.521						
10	119.1	6.46	2822	0.443	0.394	0.259	0.518						
11	118.1	6.44	2746	0.449	0.397	0.262	0.520						
12	120.5	6.45	2843	0.442	0.395	0.258	0.519						
13	119.8	6.46	2786	0.448	0.399	0.260	0.521						
14	120.5	6.45	2785	0.449	0.400	0.260	0.522						
15	119.1	6.47	2783	0.446	0.396	0.260	0.520						
16	118.9	6.48	2770	0.447	0.395	0.261	0.519						
17	118.6	6.47	2744	0.449	0.396	0.262	0.520						
18	119.3	6.44	2774	0.448	0.398	0.260	0.521						
19	119.0	6.45	2767	0.449	0.399	0.261	0.521						
20	119.8	6.44	2752	0.450	0.398	0.261	0.521						
21	119.7	6.45	2783	0.448	0.400	0.260	0.522						
22	119.4	6.45	2794	0.446	0.397	0.260	0.520						
23	118.7	6.47	2767	0.449	0.399	0.261	0.521						
24	118.5	6.47	2747	0.449	0.397	0.262	0.521						
25	119.8	6.46	2769	0.450	0.401	0.260	0.522						
n	25	25	25	25	25	25	25						
Avg.	119.2	6.45	2775	0.448	0.397	0.260	0.520						
Med.	119.1	6.45	2772	0.448	0.398	0.260	0.521						
σ	0.62	0.015	30.9	0.0026	0.0020	0.0012	0.0011						
Min.	118.1	6.42	2722	0.441	0.394	0.258	0.518						
Max.	120.5	6.48	2851	0.451	0.401	0.263	0.522						



**Data Set 6 : 105 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.8 °C
Actual Ambient Temperature [T <sub>A</sub> ]	103.3 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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							
1	100.0	98.2	97.7	96.6	95.3	94.6	93.8	92.9							
2	100.0	98.1	97.1	96.0	94.8	94.3	93.5	92.7							
3	100.0	98.4	97.5	96.5	95.2	94.6	93.7	92.8							
4	100.0	97.8	96.9	95.9	94.6	94.0	93.3	92.6							
5	100.0	98.1	97.3	96.4	95.2	94.7	93.9	93.2							
6	100.0	98.4	97.7	96.7	95.3	94.7	94.1	93.2							
7	100.0	98.5	97.7	96.6	95.4	94.7	93.8	92.9							
8	100.0	98.1	97.3	96.2	95.0	94.3	93.6	92.7							
9	100.0	97.9	97.0	95.8	94.6	93.8	92.9	92.1							
10	100.0	97.8	97.1	96.0	94.9	94.6	94.1	93.5							
11	100.0	98.8	97.7	96.4	95.1	94.6	93.8	93.2							
12	100.0	98.4	97.5	96.1	95.0	94.5	93.8	93.2							
13	100.0	98.5	97.7	96.4	95.3	94.8	93.9	93.2							
14	100.0	98.5	97.7	96.6	95.6	95.1	94.3	93.6							
15	100.0	98.0	97.1	95.7	94.6	94.1	93.4	92.9							
16	100.0	98.2	97.4	96.0	94.6	94.1	93.2	92.4							
17	100.0	98.3	97.5	96.3	94.8	94.1	93.2	92.5							
18	100.0	98.4	97.2	95.7	94.5	93.8	92.7	91.9							
19	100.0	98.6	97.7	96.5	95.4	94.7	93.8	93.1							
20	100.0	98.3	97.4	96.2	94.9	94.2	93.2	92.4							
21	100.0	98.6	97.7	96.3	95.1	94.5	93.9	93.2							
22	100.0	98.3	97.3	96.1	94.9	94.2	93.5	93.0							
23	100.0	98.7	98.0	96.7	95.6	94.9	94.1	93.4							
24	100.0	98.5	97.7	96.5	95.3	94.8	94.1	93.3							
25	100.0	98.7	97.9	96.7	95.7	95.1	94.4	93.7							
n	25	25	25	25	25	25	25	25							
Avg.	100.0	98.3	97.5	96.3	95.1	94.5	93.7	92.9							
Med.	100.0	98.4	97.5	96.3	95.1	94.6	93.8	93.0							
σ	0.00	0.28	0.30	0.31	0.35	0.36	0.42	0.46							
Min.	100.0	97.8	96.9	95.7	94.5	93.8	92.7	91.9							
Max.	100.0	98.8	98.0	96.7	95.7	95.1	94.4	93.7							

**TM-21 Projection**

Time	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h									
ln(Avg.)	-0.0255	-0.0379	-0.0505	-0.0570	-0.0653	-0.0731									

Test duration used	1000 h	to	6000 h
B	0.9813		
α	9.3396E-06		
R <sup>2</sup>	0.9841		
Calculated L <sub>70</sub> (6K)	36200	hours	
Reported L <sub>70</sub> (6K)	> 36000	hours	
Calculated L <sub>80</sub> (6K)	21900	hours	
Reported L <sub>80</sub> (6K)	21900	hours	
Calculated L <sub>90</sub> (6K)	9260	hours	
Reported L <sub>90</sub> (6K)	9260	hours	

Curve-fit equation:

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

Lumen maintenance life equation:

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

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

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

**Data Set 6 : 105 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.8 °C
Actual Ambient Temperature [T <sub>A</sub> ]	103.3 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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						
1	100.0	99.3	99.5	99.6	99.6	99.7	99.7	99.8						
2	100.0	99.3	99.4	99.4	99.5	99.6	99.6	99.6						
3	100.0	99.3	99.4	99.5	99.6	99.6	99.6	99.6						
4	100.0	99.3	99.5	99.5	99.5	99.6	99.6	99.7						
5	100.0	99.3	99.4	99.5	99.7	99.6	99.6	99.6						
6	100.0	99.4	99.5	99.6	99.7	99.7	99.7	99.7						
7	100.0	99.4	99.5	99.6	99.7	99.7	99.7	99.8						
8	100.0	99.4	99.5	99.6	99.7	99.7	99.7	99.8						
9	100.0	99.3	99.4	99.6	99.6	99.6	99.6	99.7						
10	100.0	99.4	99.5	99.6	99.7	99.7	99.7	99.7						
11	100.0	99.5	99.7	99.7	99.8	99.9	99.8	99.9						
12	100.0	99.2	99.4	99.4	99.5	99.6	99.5	99.7						
13	100.0	99.3	99.5	99.5	99.6	99.7	99.6	99.7						
14	100.0	99.3	99.5	99.5	99.6	99.7	99.7	99.8						
15	100.0	99.4	99.5	99.5	99.6	99.7	99.6	99.7						
16	100.0	99.3	99.5	99.5	99.6	99.6	99.6	99.7						
17	100.0	99.4	99.4	99.5	99.6	99.7	99.6	99.7						
18	100.0	99.2	99.4	99.5	99.5	99.6	99.5	99.6						
19	100.0	99.6	99.6	99.6	99.8	99.8	99.8	99.9						
20	100.0	99.3	99.5	99.6	99.6	99.7	99.6	99.7						
21	100.0	99.4	99.5	99.6	99.6	99.7	99.7	99.8						
22	100.0	99.3	99.5	99.5	99.6	99.7	99.7	99.8						
23	100.0	99.5	99.5	99.5	99.7	99.8	99.7	99.8						
24	100.0	99.4	99.6	99.7	99.7	99.8	99.7	99.8						
25	100.0	99.4	99.6	99.6	99.7	99.8	99.7	99.9						
n	25	25	25	25	25	25	25	25						
Avg.	100.0	99.4	99.5	99.5	99.6	99.7	99.7	99.7						
Med.	100.0	99.3	99.5	99.5	99.6	99.7	99.7	99.7						
σ	0.00	0.08	0.07	0.08	0.08	0.08	0.07	0.08						
Min.	100.0	99.2	99.4	99.4	99.5	99.6	99.5	99.6						
Max.	100.0	99.6	99.7	99.7	99.8	99.9	99.8	99.9						

**Data Set 6 : 105 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.8 °C
Actual Ambient Temperature [T <sub>A</sub> ]	103.3 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.0000	0.0019	0.0023	0.0026	0.0030	0.0031	0.0032	0.0034	
2	0.0000	0.0020	0.0023	0.0028	0.0031	0.0033	0.0034	0.0035	
3	0.0000	0.0018	0.0021	0.0024	0.0028	0.0030	0.0031	0.0032	
4	0.0000	0.0020	0.0022	0.0025	0.0029	0.0030	0.0031	0.0033	
5	0.0000	0.0021	0.0023	0.0028	0.0030	0.0032	0.0033	0.0033	
6	0.0000	0.0023	0.0028	0.0032	0.0035	0.0037	0.0038	0.0039	
7	0.0000	0.0019	0.0022	0.0025	0.0030	0.0031	0.0032	0.0033	
8	0.0000	0.0019	0.0023	0.0027	0.0030	0.0030	0.0032	0.0032	
9	0.0000	0.0020	0.0023	0.0027	0.0031	0.0032	0.0032	0.0033	
10	0.0000	0.0021	0.0024	0.0028	0.0032	0.0032	0.0033	0.0034	
11	0.0000	0.0018	0.0021	0.0026	0.0031	0.0033	0.0034	0.0035	
12	0.0000	0.0019	0.0021	0.0027	0.0031	0.0031	0.0033	0.0035	
13	0.0000	0.0018	0.0022	0.0026	0.0030	0.0031	0.0032	0.0033	
14	0.0000	0.0019	0.0022	0.0024	0.0028	0.0030	0.0032	0.0033	
15	0.0000	0.0021	0.0025	0.0028	0.0031	0.0033	0.0034	0.0035	
16	0.0000	0.0017	0.0020	0.0025	0.0028	0.0030	0.0032	0.0033	
17	0.0000	0.0017	0.0021	0.0024	0.0028	0.0029	0.0030	0.0032	
18	0.0000	0.0019	0.0022	0.0027	0.0029	0.0031	0.0032	0.0033	
19	0.0000	0.0020	0.0023	0.0026	0.0029	0.0031	0.0032	0.0033	
20	0.0000	0.0020	0.0022	0.0026	0.0031	0.0032	0.0034	0.0035	
21	0.0000	0.0018	0.0021	0.0026	0.0030	0.0031	0.0032	0.0033	
22	0.0000	0.0021	0.0024	0.0028	0.0031	0.0033	0.0033	0.0035	
23	0.0000	0.0018	0.0021	0.0026	0.0029	0.0030	0.0032	0.0033	
24	0.0000	0.0018	0.0021	0.0026	0.0028	0.0030	0.0031	0.0032	
25	0.0000	0.0017	0.0020	0.0022	0.0027	0.0029	0.0029	0.0030	
n	25	25	25	25	25	25	25	25	
Avg.	0.0000	0.0019	0.0022	0.0026	0.0030	0.0031	0.0032	0.0034	
Med.	0.0000	0.0019	0.0022	0.0026	0.0030	0.0031	0.0032	0.0033	
σ	0.0000	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Min.	0.0000	0.0017	0.0020	0.0022	0.0027	0.0029	0.0029	0.0030	
Max.	0.0000	0.0023	0.0028	0.0032	0.0035	0.0037	0.0038	0.0039	

**Data Set 6 : 105 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.8 °C
Actual Ambient Temperature [T <sub>A</sub> ]	103.3 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.2616	0.2597	0.2594	0.2590	0.2587	0.2585	0.2584	0.2582	
2	0.2616	0.2596	0.2592	0.2588	0.2585	0.2583	0.2582	0.2581	
3	0.2607	0.2590	0.2586	0.2584	0.2579	0.2578	0.2576	0.2575	
4	0.2581	0.2561	0.2560	0.2556	0.2552	0.2551	0.2550	0.2548	
5	0.2634	0.2613	0.2611	0.2606	0.2604	0.2602	0.2601	0.2601	
6	0.2608	0.2585	0.2580	0.2576	0.2572	0.2571	0.2570	0.2569	
7	0.2624	0.2606	0.2603	0.2599	0.2595	0.2594	0.2592	0.2592	
8	0.2609	0.2590	0.2587	0.2582	0.2579	0.2579	0.2578	0.2577	
9	0.2629	0.2609	0.2607	0.2602	0.2599	0.2598	0.2598	0.2597	
10	0.2594	0.2573	0.2570	0.2566	0.2563	0.2562	0.2561	0.2561	
11	0.2622	0.2603	0.2600	0.2595	0.2591	0.2589	0.2588	0.2587	
12	0.2583	0.2564	0.2562	0.2556	0.2553	0.2552	0.2550	0.2549	
13	0.2603	0.2585	0.2581	0.2577	0.2574	0.2572	0.2572	0.2571	
14	0.2602	0.2584	0.2581	0.2578	0.2574	0.2573	0.2571	0.2570	
15	0.2608	0.2588	0.2584	0.2581	0.2577	0.2576	0.2574	0.2573	
16	0.2614	0.2597	0.2594	0.2589	0.2586	0.2584	0.2582	0.2581	
17	0.2624	0.2606	0.2603	0.2600	0.2596	0.2595	0.2593	0.2591	
18	0.2610	0.2591	0.2588	0.2583	0.2581	0.2580	0.2578	0.2577	
19	0.2612	0.2592	0.2588	0.2586	0.2583	0.2580	0.2580	0.2578	
20	0.2618	0.2598	0.2596	0.2592	0.2588	0.2587	0.2584	0.2584	
21	0.2605	0.2587	0.2584	0.2579	0.2575	0.2574	0.2573	0.2572	
22	0.2602	0.2580	0.2577	0.2574	0.2571	0.2569	0.2569	0.2567	
23	0.2612	0.2594	0.2591	0.2586	0.2584	0.2582	0.2580	0.2579	
24	0.2621	0.2603	0.2600	0.2595	0.2594	0.2591	0.2591	0.2589	
25	0.2608	0.2591	0.2588	0.2586	0.2581	0.2579	0.2579	0.2578	
n	25	25	25	25	25	25	25	25	
Avg.	0.2610	0.2591	0.2588	0.2584	0.2581	0.2579	0.2578	0.2577	
Med.	0.2610	0.2591	0.2588	0.2586	0.2581	0.2580	0.2579	0.2578	
σ	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	
Min.	0.2581	0.2561	0.2560	0.2556	0.2552	0.2551	0.2550	0.2548	
Max.	0.2634	0.2613	0.2611	0.2606	0.2604	0.2602	0.2601	0.2601	

**Data Set 6 : 105 °C, 150 mA**

Actual Case Temperature [T <sub>s</sub> ]	105.8 °C
Actual Ambient Temperature [T <sub>A</sub> ]	103.3 °C
Drive Current [I <sub>F</sub> ]	150 mA
Measurement Current	150 mA

NOTES:

T<sub>s</sub> and T<sub>A</sub> 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	
1	0.5203	0.5201	0.5200	0.5201	0.5200	0.5200	0.5200	0.5199	
2	0.5186	0.5183	0.5182	0.5182	0.5181	0.5181	0.5181	0.5180	
3	0.5206	0.5206	0.5204	0.5205	0.5204	0.5204	0.5203	0.5202	
4	0.5181	0.5184	0.5183	0.5182	0.5182	0.5183	0.5184	0.5184	
5	0.5213	0.5211	0.5210	0.5210	0.5210	0.5210	0.5211	0.5210	
6	0.5201	0.5199	0.5197	0.5197	0.5197	0.5198	0.5198	0.5197	
7	0.5210	0.5209	0.5207	0.5208	0.5207	0.5208	0.5207	0.5206	
8	0.5216	0.5216	0.5215	0.5214	0.5214	0.5215	0.5215	0.5214	
9	0.5210	0.5207	0.5206	0.5205	0.5204	0.5205	0.5204	0.5203	
10	0.5182	0.5179	0.5178	0.5178	0.5177	0.5179	0.5179	0.5178	
11	0.5205	0.5204	0.5202	0.5201	0.5200	0.5202	0.5202	0.5201	
12	0.5187	0.5184	0.5183	0.5183	0.5182	0.5183	0.5183	0.5181	
13	0.5211	0.5209	0.5208	0.5208	0.5207	0.5207	0.5207	0.5205	
14	0.5217	0.5215	0.5215	0.5214	0.5214	0.5215	0.5215	0.5213	
15	0.5196	0.5194	0.5193	0.5192	0.5192	0.5192	0.5193	0.5192	
16	0.5194	0.5193	0.5192	0.5190	0.5189	0.5190	0.5189	0.5188	
17	0.5202	0.5200	0.5200	0.5199	0.5199	0.5199	0.5199	0.5198	
18	0.5208	0.5205	0.5204	0.5202	0.5202	0.5202	0.5203	0.5201	
19	0.5213	0.5213	0.5211	0.5212	0.5211	0.5211	0.5212	0.5210	
20	0.5210	0.5210	0.5209	0.5208	0.5207	0.5207	0.5207	0.5206	
21	0.5215	0.5214	0.5214	0.5213	0.5212	0.5212	0.5213	0.5212	
22	0.5199	0.5200	0.5199	0.5199	0.5198	0.5199	0.5199	0.5199	
23	0.5209	0.5208	0.5208	0.5208	0.5207	0.5208	0.5207	0.5206	
24	0.5206	0.5204	0.5203	0.5203	0.5203	0.5203	0.5204	0.5203	
25	0.5224	0.5222	0.5222	0.5222	0.5221	0.5223	0.5223	0.5222	
n	25	25	25	25	25	25	25	25	
Avg.	0.5204	0.5203	0.5202	0.5201	0.5201	0.5201	0.5202	0.5200	
Med.	0.5206	0.5205	0.5204	0.5203	0.5203	0.5203	0.5203	0.5202	
σ	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	
Min.	0.5181	0.5179	0.5178	0.5178	0.5177	0.5179	0.5179	0.5178	
Max.	0.5224	0.5222	0.5222	0.5222	0.5221	0.5223	0.5223	0.5222	