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DURIS® S 8
White (CCT 2700 K – 6500 K)

IES LM-80-08 Test Report

Test Documentation No.: 160544W4 (Document No.: QAV-1115-1985) – 3rd April 2017

QAV Technologies Sdn. Bhd. (616788-U)
116, Lintang Kg Jawa, NFIZ 3,
Taman Perindustrian Bayan Lepas,
Mk 12, 11900, Penang. MALAYSIA.
Tel No: 604 - 6438317 Fax No: 604 - 6438597

PRELIMINARY TEST REPORT

IESNA LM-80-08

Customer	:	OSRAM Opto Semiconductors (Malaysia) Sdn. Bhd.
Address	:	Bayan Lepas Free Industrial Zone Phase 1, 11900 Bayan Lepas, Penang, Malaysia.
Requestor Name	:	Jacqueline Yeap Sang Yee
Product	:	LED Light Source
Test Prime	:	Samantha Clarice
Received Date	:	23 September 2015
Test Perform Date	:	20 November 2015
Report Number	:	QAV-1115-1985
Test Location	:	116, LintangKg.Jawa, FIZ 3, Taman Perindustrian Bayan Lepas, Mk. 12, 11900 Pulau Pinang.

ABSTRACT: This report contains **IESNA LM-80 test result** of **GW P9LTS31.EM** provided by **OSRAM Opto Semiconductors (Malaysia) Sdn Bhd.**

Prepared by: Samantha Clarice Date: 22 December 2016

Contents:

1.0 Number of LED light sources tested

- 22 units/board/test tested at actual case temperature 55ºC (nominal 55ºC)
- 22 units/board/test tested at actual case temperature 85ºC (nominal 85ºC)
- 22 units/board/test tested at actual case temperature 105ºC (nominal 105ºC)
- 22 units/board/test tested at actual case temperature 115ºC (nominal 115ºC)

2.0 Description of LED light sources

- GW P9LT31.EM
- CRI 80
- CCT 3500K

3.0 Package Pictures

Figure 1: GW P9LT31.EM

4.0 Mechanical Drawing

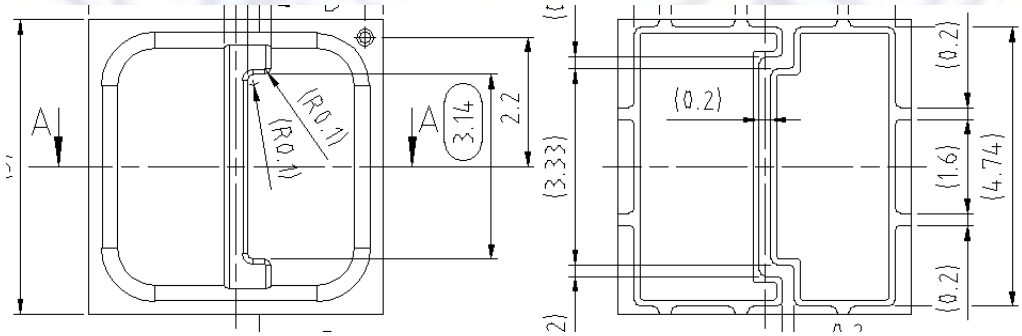


Figure 2: Mechanical drawing for GW P9LT31.EM

5.0 Test Board

Figure 3: Test Board

6.0 T_s and T_{air} Measurement Point

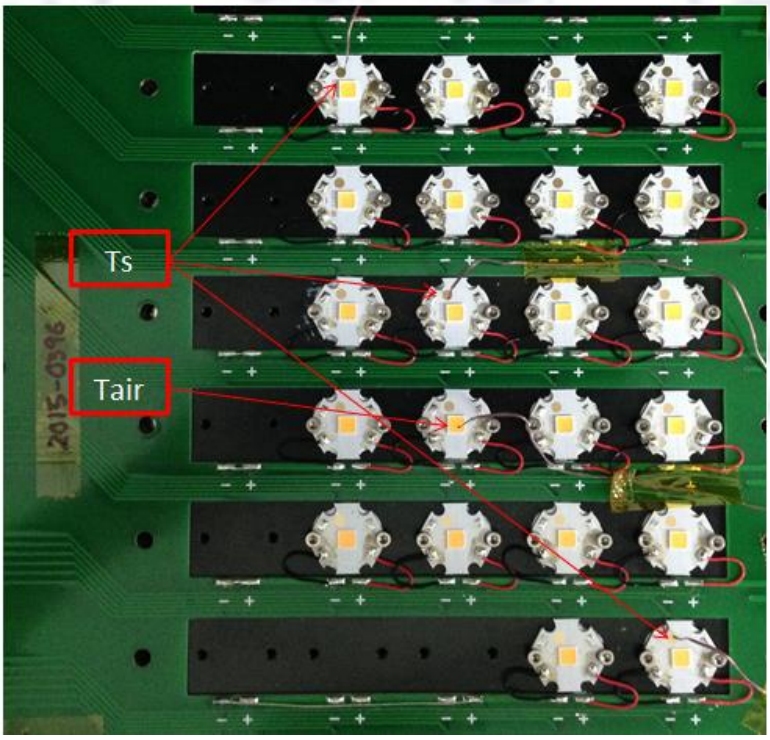


Figure 4: T_s and T_{air} Measurement Point

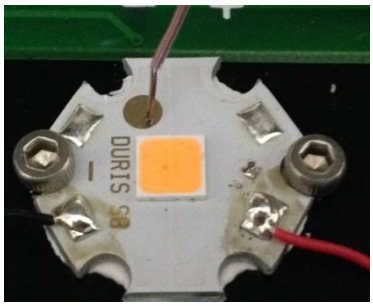


Figure 5: Ts Measurement Point

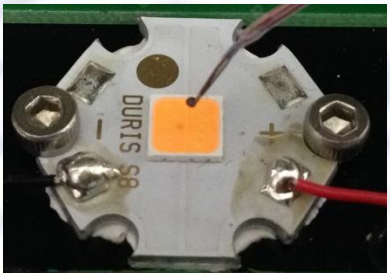


Figure 6: T_{air} Measurement Point (approximately 3mm above LED light source)

7.0 Description of Auxiliary Equipment

- Tester: Automatic LED array tester
- Temperature controlled ovens to create the necessary test conditions
- Arrays driven using constant current driver

Array tester: The tester is capable of testing an entire board with up to 22 samples. The tester consists of a spectrometer, handler, power supplies and a computer.

Sample preparation: Devices under Test (DUT) are soldered to PCBs which are mounted on metallic plates. These plates are mounted on heat sinks to maintain the test temperatures required by LM80 test procedure.

All necessary steps are taken to ensure the uniformity of temperature and environmental conditions to meet LM80 test criteria.

8.0 Operating Cycle
8.1 Test Condition

Number of units: 22 units at 55ºC, 22 units at 85ºC, 22 units at 105ºC and 22 units at 115ºC.
Drive current: 200 mA
Typical Voltage: 32V

9.0 Ambient conditions

Summary of temperature and humidity conditions:

Table 1: Test Environment

Surrounding Temperature	Actual Case Temperature	Nominal Case Temperature	Relative Humidity
53ºC	55ºC	55ºC	<60%
83ºC	85ºC	85ºC	<60%
103ºC	105ºC	105ºC	<60%
113ºC	115 ºC	115 ºC	<60%

9.1 Airflow

Note: Airflow is kept to minimum required to maintain the required temperature uniformity as defined in the LM80 requirements document.

The temperature of the air surrounding DUTs is controlled to be less than 5ºC below the case temperature as required by LM80 specification.

10.0 Case Temperature (Test Point Temperature)

Refer to Table 1 (Test Environment)

11.0 Drive Current of the LED light source during lifetime test

A drive current of 200mA per diode was used during lifetime test.

12.0 Initial luminous flux and forward voltage at photometric measurement current

Please refer to section 17.

13.0 Lumen maintenance data for each individual LED light source

Please refer to section 17.

14.0 Observation of Failures

No optical, electrical or mechanical failure of any LED light source was seen during the lifetime testing.

15.0 LED Light Source monitoring interval

Measurements have been taken after the following durations:

Ts = 55ºC:
24, 48, 168, 500, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hour.

Ts = 85ºC:
24, 48, 168, 500, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hour.

Ts = 105ºC:
24, 48, 168, 500, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hour.

Ts = 115ºC:
24, 48, 168, 500, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hour.

16.0 Chromaticity shift reported over the measurement time

Please refer to section 17.

17.0 Test results
17.1 Graphic charts

Lumen maintenance (I_F = 200mA) – Normalized to 0 h

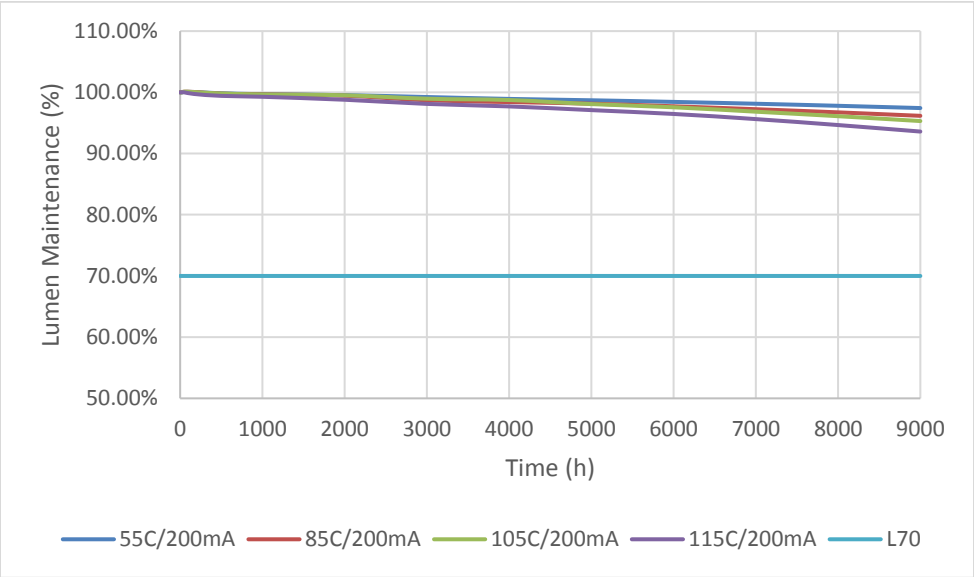


Figure 7: Lumen maintenance

Chromaticity shift Du'v' (I_F = 200mA) – Normalize to 0 h

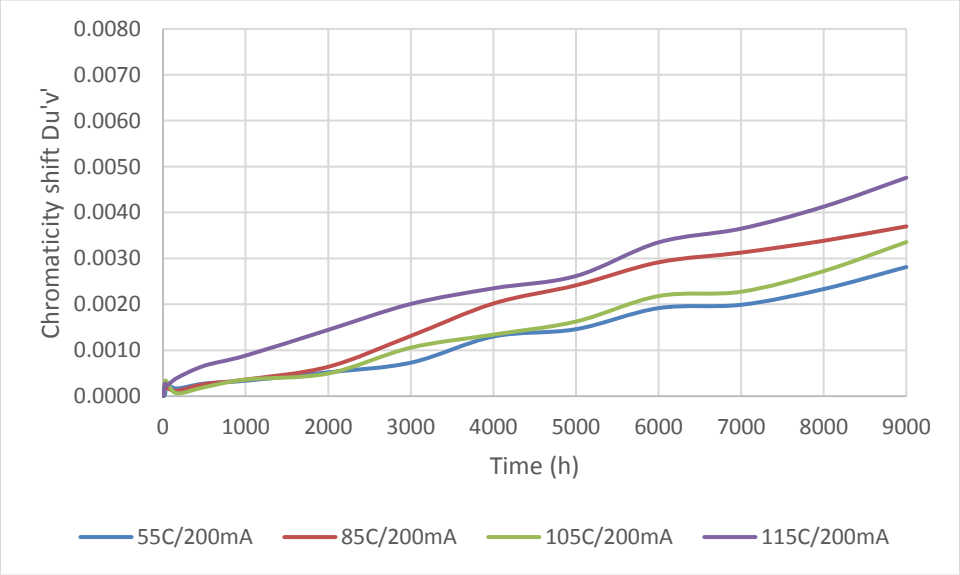


Figure 8: Chromaticity shift Du'v'

17.2 Tables

$T_s = T_{air} = 55℃$, $I_f = 200mA$; $T_s \geq 53℃$ and $T_{air} \geq 50℃$ in compliance with LM-80
Table 2: Lumen maintenance data – normalized to 0 h for tested units

Unit	VF [V]	Flux [lm]	Measurement Time of Lumen Maintenance													
	0h	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	31.88	502.70	100.00%	100.02%	100.07%	100.03%	99.79%	99.64%	99.46%	99.18%	99.00%	98.70%	98.41%	98.13%	97.83%	97.47%
2	31.89	503.25	100.00%	99.99%	100.03%	100.03%	99.78%	99.65%	99.58%	99.35%	99.23%	99.13%	98.92%	98.63%	98.32%	97.94%
3	31.72	505.52	100.00%	99.98%	100.02%	100.01%	99.75%	99.62%	99.56%	99.40%	99.23%	99.11%	98.80%	98.47%	98.10%	97.70%
4	31.51	502.28	100.00%	100.00%	100.07%	100.14%	99.93%	99.78%	99.69%	99.49%	99.22%	98.93%	98.69%	98.39%	98.10%	97.74%
5	31.87	506.32	100.00%	100.00%	100.04%	100.09%	99.87%	99.68%	99.37%	98.79%	98.25%	98.09%	97.86%	97.59%	97.26%	96.89%
6	31.85	507.35	100.00%	99.98%	100.01%	100.05%	99.80%	99.61%	99.41%	99.04%	98.56%	98.43%	98.14%	97.81%	97.46%	97.04%
7	31.82	505.77	100.00%	99.98%	100.02%	100.04%	99.78%	99.56%	99.33%	99.02%	98.62%	98.35%	98.07%	97.78%	97.42%	97.02%
8	32.14	502.22	100.00%	99.98%	100.02%	100.06%	99.86%	99.68%	99.55%	99.20%	98.54%	98.19%	97.87%	97.51%	97.19%	96.83%
9	31.64	500.54	100.00%	100.02%	100.09%	100.10%	99.93%	99.82%	99.73%	99.48%	99.32%	99.07%	98.76%	98.45%	98.07%	97.71%
10	31.72	503.06	100.00%	99.99%	100.04%	100.04%	100.02%	99.94%	99.91%	99.65%	99.56%	99.41%	99.15%	98.88%	98.60%	98.24%
11	31.37	508.49	100.00%	100.01%	100.08%	100.05%	99.82%	99.71%	99.63%	99.30%	99.27%	99.10%	98.89%	98.64%	98.34%	98.01%
12	31.71	501.65	100.00%	99.99%	100.07%	100.08%	99.91%	99.81%	99.70%	99.52%	99.26%	99.00%	98.74%	98.47%	98.12%	97.77%
13	31.57	505.70	100.00%	99.97%	100.03%	100.00%	99.77%	99.56%	99.24%	98.63%	98.03%	97.75%	97.47%	97.18%	96.84%	96.44%
14	31.99	502.32	100.00%	99.97%	100.02%	99.96%	99.64%	99.41%	99.08%	99.04%	98.82%	98.57%	98.32%	98.04%	97.63%	97.30%
15	31.87	508.24	100.00%	100.01%	100.08%	100.07%	99.87%	99.72%	99.52%	98.97%	98.61%	98.42%	98.25%	98.02%	97.76%	97.40%
16	31.93	502.36	100.00%	99.97%	100.05%	100.03%	99.81%	99.63%	99.33%	98.67%	97.61%	97.30%	97.08%	96.78%	96.46%	96.09%
17	31.69	504.92	100.00%	100.00%	100.06%	100.07%	99.86%	99.71%	99.60%	99.33%	99.20%	99.08%	98.80%	98.53%	98.24%	97.89%
18	31.64	504.43	100.00%	100.00%	100.06%	100.06%	99.86%	99.73%	99.59%	99.37%	99.17%	98.98%	98.69%	98.38%	98.00%	97.62%
19	31.53	502.28	100.00%	100.00%	100.06%	100.09%	99.94%	99.80%	99.73%	99.47%	99.40%	99.34%	99.01%	98.73%	98.38%	98.00%
20	31.86	503.20	100.00%	100.00%	100.07%	100.05%	99.88%	99.77%	99.67%	99.47%	99.30%	99.15%	98.84%	98.52%	98.16%	97.77%
21	32.20	503.09	100.00%	100.05%	100.13%	100.04%	99.79%	99.69%	99.57%	99.35%	99.01%	98.69%	98.36%	97.99%	97.63%	97.25%
22	32.04	504.52	100.00%	100.02%	100.12%	100.07%	99.88%	99.79%	99.64%	99.44%	99.09%	98.68%	98.40%	98.00%	97.65%	97.28%
median	31.84	503.22	100.00%	100.00%	100.06%	100.05%	99.86%	99.70%	99.58%	99.34%	99.13%	98.81%	98.55%	98.26%	97.92%	97.55%
average	31.79	504.10	100.00%	100.00%	100.06%	100.05%	99.84%	99.70%	99.54%	99.23%	98.92%	98.70%	98.43%	98.13%	97.80%	97.43%
std. dev.	0.21	2.19	0.00%	0.02%	0.03%	0.04%	0.08%	0.11%	0.19%	0.28%	0.49%	0.53%	0.52%	0.53%	0.53%	0.54%
min	31.37	500.54	100.00%	99.97%	100.01%	99.96%	99.64%	99.41%	99.08%	98.63%	97.61%	97.30%	97.08%	96.78%	96.46%	96.09%
max	32.20	508.49	100.00%	100.05%	100.13%	100.14%	100.02%	99.94%	99.91%	99.65%	99.56%	99.41%	99.15%	98.88%	98.60%	98.24%

$T_s = T_{air}$ = 55℃, I_f = 200mA; $T_s \geq$ 53℃ and $T_{air} \geq$ 50℃ in compliance with LM-80
Table 3: Chromaticity shift Du'v' data – normalized to 0 h for tested units

Unit	CCT [k]	u'	v'	Measurement Time of Chromaticity Shift Du'v'												
	0h	0h	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	3533	0.2319	0.5188	0.0000	0.0001	0.0003	0.0001	0.0003	0.0005	0.0007	0.0009	0.0013	0.0016	0.0021	0.0023	0.0027	0.0031
2	3547	0.2316	0.5184	0.0000	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0010	0.0012	0.0016	0.0015	0.0019	0.0023
3	3538	0.2311	0.5206	0.0000	0.0001	0.0002	0.0001	0.0002	0.0004	0.0004	0.0004	0.0008	0.0010	0.0015	0.0015	0.0019	0.0023
4	3537	0.2320	0.5181	0.0000	0.0001	0.0003	0.0002	0.0003	0.0003	0.0004	0.0005	0.0011	0.0013	0.0018	0.0020	0.0023	0.0027
5	3569	0.2305	0.5194	0.0000	0.0001	0.0002	0.0002	0.0003	0.0003	0.0006	0.0012	0.0020	0.0022	0.0026	0.0025	0.0028	0.0033
6	3590	0.2301	0.5185	0.0000	0.0000	0.0002	0.0002	0.0003	0.0004	0.0006	0.0008	0.0016	0.0018	0.0023	0.0023	0.0028	0.0033
7	3594	0.2305	0.5171	0.0000	0.0000	0.0002	0.0002	0.0003	0.0005	0.0008	0.0010	0.0017	0.0020	0.0024	0.0024	0.0027	0.0032
8	3535	0.2322	0.5179	0.0000	0.0000	0.0002	0.0002	0.0003	0.0004	0.0006	0.0009	0.0018	0.0021	0.0026	0.0028	0.0032	0.0036
9	3461	0.2333	0.5217	0.0000	0.0001	0.0003	0.0002	0.0003	0.0002	0.0003	0.0005	0.0010	0.0012	0.0017	0.0019	0.0023	0.0028
10	3484	0.2326	0.5213	0.0000	0.0000	0.0002	0.0002	0.0006	0.0003	0.0003	0.0002	0.0008	0.0006	0.0010	0.0011	0.0015	0.0020
11	3608	0.2296	0.5184	0.0000	0.0001	0.0003	0.0002	0.0002	0.0003	0.0003	0.0006	0.0007	0.0009	0.0014	0.0015	0.0018	0.0021
12	3502	0.2326	0.5197	0.0000	0.0000	0.0003	0.0002	0.0003	0.0002	0.0004	0.0004	0.0011	0.0013	0.0018	0.0020	0.0024	0.0029
13	3569	0.2307	0.5188	0.0000	0.0000	0.0002	0.0002	0.0003	0.0005	0.0009	0.0015	0.0023	0.0022	0.0024	0.0024	0.0027	0.0033
14	3531	0.2323	0.5180	0.0000	0.0000	0.0003	0.0001	0.0004	0.0009	0.0014	0.0012	0.0015	0.0013	0.0016	0.0017	0.0019	0.0023
15	3563	0.2302	0.5206	0.0000	0.0001	0.0003	0.0002	0.0003	0.0002	0.0004	0.0009	0.0014	0.0014	0.0018	0.0017	0.0020	0.0024
16	3533	0.2321	0.5183	0.0000	0.0001	0.0002	0.0002	0.0003	0.0005	0.0009	0.0015	0.0026	0.0024	0.0025	0.0023	0.0026	0.0032
17	3524	0.2312	0.5217	0.0000	0.0000	0.0003	0.0002	0.0003	0.0003	0.0004	0.0006	0.0009	0.0011	0.0016	0.0015	0.0019	0.0024
18	3538	0.2315	0.5194	0.0000	0.0000	0.0003	0.0002	0.0003	0.0003	0.0004	0.0006	0.0010	0.0012	0.0017	0.0018	0.0022	0.0029
19	3499	0.2324	0.5205	0.0000	0.0000	0.0002	0.0002	0.0003	0.0002	0.0003	0.0005	0.0008	0.0009	0.0013	0.0013	0.0017	0.0022
20	3545	0.2315	0.5187	0.0000	0.0000	0.0003	0.0002	0.0003	0.0003	0.0004	0.0005	0.0010	0.0011	0.0017	0.0017	0.0021	0.0026
21	3534	0.2320	0.5185	0.0000	0.0001	0.0003	0.0002	0.0003	0.0004	0.0006	0.0007	0.0013	0.0019	0.0027	0.0029	0.0031	0.0037
22	3560	0.2311	0.5186	0.0000	0.0000	0.0003	0.0002	0.0003	0.0002	0.0005	0.0006	0.0012	0.0016	0.0023	0.0028	0.0030	0.0036
median	3537	0.2316	0.5188	0.0000	0.0000	0.0003	0.0002	0.0003	0.0003	0.0004	0.0006	0.0012	0.0013	0.0018	0.0019	0.0023	0.0028
average	3541	0.2315	0.5192	0.0000	0.0001	0.0003	0.0002	0.0003	0.0004	0.0005	0.0007	0.0013	0.0015	0.0019	0.0020	0.0023	0.0028
std. dev.	35	0.0009	0.0013	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
min	3461	0.2296	0.5171	0.0000	0.0000	0.0002	0.0001	0.0002	0.0002	0.0003	0.0002	0.0007	0.0006	0.0010	0.0011	0.0015	0.0020
max	3608	0.2333	0.5217	0.0000	0.0001	0.0003	0.0002	0.0006	0.0009	0.0014	0.0015	0.0026	0.0024	0.0027	0.0029	0.0032	0.0037

$T_s = T_{air}$ = 55℃, I_f = 200mA; $T_s \geq$ 53℃ and $T_{air} \geq$ 50℃ in compliance with LM-80
Table 4: Forward voltage data – normalized to 0 h for tested units

Unit	VF [V]	Measurement Time of VF													
	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	31.88	100.00%	100.01%	99.97%	100.04%	100.08%	100.24%	100.00%	100.07%	100.04%	100.09%	100.07%	100.11%	100.13%	100.16%
2	31.89	100.00%	100.01%	99.87%	99.95%	99.84%	99.93%	99.91%	99.94%	99.87%	99.92%	99.97%	99.90%	99.86%	99.89%
3	31.72	100.00%	99.87%	99.89%	99.91%	99.94%	99.92%	100.09%	100.04%	99.97%	99.99%	100.04%	100.08%	100.03%	100.08%
4	31.51	100.00%	99.81%	100.01%	100.07%	99.98%	99.92%	100.02%	99.90%	99.99%	100.03%	99.97%	100.04%	100.09%	100.12%
5	31.87	100.00%	100.03%	100.02%	100.10%	100.02%	99.95%	99.99%	99.97%	100.03%	99.99%	99.90%	99.94%	99.99%	100.01%
6	31.85	100.00%	99.88%	99.85%	100.04%	100.14%	100.05%	100.05%	100.10%	100.08%	100.05%	100.03%	100.06%	100.09%	100.12%
7	31.82	100.00%	99.93%	99.99%	99.94%	100.04%	99.96%	100.03%	99.99%	100.02%	99.97%	99.93%	99.97%	99.94%	99.96%
8	32.14	100.00%	100.03%	99.98%	99.93%	99.89%	99.91%	99.90%	99.88%	99.92%	99.95%	99.97%	99.94%	99.90%	99.86%
9	31.64	100.00%	99.95%	99.90%	99.87%	99.81%	99.87%	99.76%	99.80%	99.94%	99.98%	99.94%	99.98%	100.04%	100.07%
10	31.72	100.00%	100.02%	99.96%	99.91%	99.86%	99.91%	99.86%	99.89%	99.95%	99.98%	100.01%	100.03%	100.01%	100.03%
11	31.37	100.00%	100.00%	99.80%	99.72%	99.80%	99.95%	99.79%	99.93%	99.86%	99.93%	99.97%	100.03%	99.96%	100.00%
12	31.71	100.00%	100.00%	99.94%	99.94%	100.07%	99.99%	99.93%	99.97%	100.00%	99.95%	100.00%	100.04%	100.07%	100.04%
13	31.57	100.00%	99.71%	99.76%	99.84%	99.93%	99.98%	99.96%	99.98%	100.01%	100.05%	100.00%	99.98%	99.94%	99.92%
14	31.99	100.00%	99.79%	99.74%	99.70%	99.78%	99.91%	99.87%	99.85%	99.91%	99.97%	99.93%	100.00%	100.04%	100.02%
15	31.87	100.00%	100.11%	100.07%	100.04%	99.88%	99.95%	99.87%	99.88%	99.95%	99.99%	99.95%	99.92%	99.97%	100.01%
16	31.93	100.00%	100.03%	100.11%	100.04%	99.84%	99.93%	99.98%	99.91%	99.94%	99.98%	99.94%	99.98%	100.03%	100.08%
17	31.69	100.00%	100.04%	100.06%	100.11%	100.15%	100.07%	100.18%	100.13%	100.05%	100.01%	100.07%	100.03%	100.07%	100.04%
18	31.64	100.00%	100.15%	100.06%	99.93%	99.98%	99.93%	99.75%	99.83%	99.95%	99.99%	100.02%	100.08%	100.13%	100.16%
19	31.53	100.00%	100.12%	100.25%	100.30%	100.26%	100.18%	100.15%	100.11%	100.06%	100.09%	100.05%	100.11%	100.17%	100.19%
20	31.86	100.00%	100.10%	99.94%	99.83%	99.92%	99.93%	99.83%	99.89%	99.77%	99.87%	99.92%	99.92%	99.89%	99.85%
21	32.20	100.00%	99.90%	100.01%	99.99%	99.91%	99.88%	99.89%	99.86%	99.94%	99.99%	99.93%	100.00%	100.05%	100.01%
22	32.04	100.00%	99.97%	99.98%	99.91%	99.97%	100.00%	100.00%	99.98%	100.08%	100.11%	100.02%	100.07%	100.14%	100.09%
median	31.84	100.00%	100.01%	99.97%	99.94%	99.94%	99.94%	99.94%	99.94%	99.96%	99.99%	99.97%	100.01%	100.04%	100.03%
average	31.79	100.00%	99.97%	99.96%	99.96%	99.96%	99.97%	99.95%	99.95%	99.97%	99.99%	99.98%	100.01%	100.02%	100.03%
std. dev.	0.21	0.00%	0.11%	0.12%	0.13%	0.13%	0.09%	0.12%	0.09%	0.08%	0.06%	0.05%	0.06%	0.09%	0.09%
min	31.37	100.00%	99.71%	99.74%	99.70%	99.78%	99.87%	99.75%	99.80%	99.77%	99.87%	99.90%	99.90%	99.86%	99.85%
max	32.20	100.00%	100.15%	100.25%	100.30%	100.26%	100.24%	100.18%	100.13%	100.08%	100.11%	100.07%	100.11%	100.17%	100.19%

$T_s = T_{air}$ = 85℃, I_f = 200mA; $T_s \geq$ 83℃ and $T_{air} \geq$ 80℃ in compliance with LM-80
Table 5: Lumen maintenance data – normalized to 0 h for tested units

Unit	VF [V]	Flux [lm]	Measurement Time of Lumen Maintenance													
	0h	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	31.75	503.46	100.00%	99.98%	100.00%	100.15%	99.95%	99.88%	99.61%	98.96%	98.87%	98.56%	98.07%	97.56%	97.00%	96.54%
2	31.85	503.62	100.00%	100.03%	100.09%	100.10%	99.85%	99.76%	99.45%	98.61%	98.48%	98.34%	97.89%	97.40%	96.86%	96.35%
3	31.92	502.36	100.00%	100.02%	100.09%	99.98%	99.73%	99.67%	99.39%	98.33%	98.02%	97.72%	97.23%	96.75%	96.22%	95.62%
4	31.63	501.19	100.00%	100.03%	100.12%	100.09%	99.84%	99.80%	99.64%	99.10%	98.84%	98.68%	98.17%	97.57%	96.99%	96.38%
5	31.78	504.28	100.00%	100.02%	100.09%	99.97%	99.65%	99.50%	99.37%	98.92%	98.73%	98.54%	98.17%	97.73%	97.19%	96.60%
6	31.68	504.80	100.00%	100.04%	100.10%	99.98%	99.69%	99.60%	99.44%	98.99%	98.55%	98.31%	97.95%	97.55%	97.14%	96.68%
7	31.74	506.00	100.00%	100.03%	100.11%	100.12%	99.86%	99.80%	99.52%	98.81%	98.62%	98.42%	98.02%	97.54%	97.02%	96.52%
8	31.72	501.96	100.00%	100.02%	100.08%	99.96%	99.72%	99.63%	99.38%	98.65%	98.30%	97.98%	97.57%	97.10%	96.57%	95.99%
9	31.95	503.36	100.00%	100.06%	100.09%	100.04%	99.69%	99.60%	99.41%	98.77%	98.50%	98.17%	97.80%	97.35%	96.83%	96.23%
10	31.69	505.61	100.00%	100.03%	100.05%	99.90%	99.60%	99.46%	99.37%	98.93%	98.77%	98.63%	98.27%	97.78%	97.36%	96.84%
11	31.70	509.09	100.00%	100.03%	100.07%	100.09%	99.85%	99.75%	99.60%	99.02%	98.69%	98.41%	98.04%	97.61%	97.22%	96.83%
12	31.73	505.33	100.00%	100.07%	100.11%	100.10%	99.82%	99.72%	99.56%	98.90%	98.61%	98.34%	97.99%	97.52%	96.99%	96.40%
13	31.54	507.79	100.00%	100.05%	100.08%	100.03%	99.67%	99.49%	99.37%	98.92%	98.61%	98.21%	97.75%	97.30%	96.67%	95.93%
14	31.49	505.95	100.00%	100.07%	100.09%	100.12%	99.84%	99.68%	99.44%	98.82%	98.53%	98.43%	97.85%	97.22%	96.61%	95.90%
15	32.18	506.97	100.00%	100.03%	100.07%	100.04%	99.69%	99.49%	99.38%	98.92%	98.69%	98.31%	97.84%	97.34%	96.79%	96.12%
16	31.61	504.30	100.00%	100.08%	100.12%	100.10%	99.85%	99.73%	99.46%	98.62%	98.34%	98.08%	97.66%	97.19%	96.66%	96.10%
17	31.68	504.46	100.00%	100.08%	100.13%	100.08%	99.82%	99.68%	99.37%	98.42%	97.97%	97.64%	97.23%	96.76%	96.26%	95.76%
18	31.85	504.15	100.00%	100.07%	100.09%	100.04%	99.76%	99.64%	99.38%	98.62%	98.25%	98.01%	97.62%	97.15%	96.70%	96.10%
19	31.63	505.64	100.00%	100.06%	100.09%	100.04%	99.75%	99.64%	99.45%	98.90%	98.50%	98.30%	97.91%	97.48%	96.98%	96.44%
20	31.84	501.53	100.00%	100.08%	100.11%	100.06%	99.80%	99.69%	99.43%	98.36%	98.05%	97.75%	97.31%	96.76%	96.20%	95.55%
21	31.72	507.39	100.00%	100.09%	100.08%	100.06%	99.74%	99.63%	99.25%	98.13%	97.72%	97.38%	96.96%	96.54%	96.12%	95.60%
22	31.73	503.56	100.00%	100.06%	100.06%	100.18%	99.92%	99.80%	99.56%	97.71%	97.36%	96.94%	96.51%	96.07%	95.55%	94.99%
median	31.73	504.38	100.00%	100.05%	100.09%	100.06%	99.78%	99.67%	99.43%	98.81%	98.52%	98.30%	97.85%	97.34%	96.81%	96.17%
average	31.75	504.67	100.00%	100.05%	100.09%	100.06%	99.78%	99.66%	99.45%	98.70%	98.41%	98.14%	97.72%	97.24%	96.73%	96.16%
std. dev.	0.15	2.05	0.00%	0.03%	0.03%	0.07%	0.09%	0.11%	0.10%	0.34%	0.38%	0.43%	0.43%	0.43%	0.43%	0.46%
min	31.49	501.19	100.00%	99.98%	100.00%	99.90%	99.60%	99.46%	99.25%	97.71%	97.36%	96.94%	96.51%	96.07%	95.55%	94.99%
max	32.18	509.09	100.00%	100.09%	100.13%	100.18%	99.95%	99.88%	99.64%	99.10%	98.87%	98.68%	98.27%	97.78%	97.36%	96.84%

$T_s = T_{air}$ = 85℃, I_f = 200mA; $T_s \geq$ 83℃ and $T_{air} \geq$ 80℃ in compliance with LM-80
Table 6: Chromaticity shift Du'v' data – normalized to 0 h for tested units

Unit	CCT [k]	u'	v'	Measurement Time of Chromaticity Shift Du'v'												
	0h	0h	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	3561	0.2312	0.5182	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005	0.0011	0.0019	0.0023	0.0028	0.0029	0.0031	0.0034
2	3512	0.2320	0.5204	0.0000	0.0002	0.0002	0.0001	0.0002	0.0003	0.0006	0.0015	0.0025	0.0027	0.0031	0.0031	0.0033	0.0036
3	3548	0.2320	0.5172	0.0000	0.0002	0.0002	0.0001	0.0003	0.0005	0.0008	0.0017	0.0023	0.0024	0.0028	0.0029	0.0031	0.0033
4	3452	0.2330	0.5235	0.0000	0.0002	0.0002	0.0002	0.0003	0.0002	0.0005	0.0010	0.0019	0.0023	0.0027	0.0030	0.0033	0.0036
5	3574	0.2310	0.5175	0.0000	0.0002	0.0002	0.0001	0.0004	0.0006	0.0008	0.0012	0.0019	0.0025	0.0032	0.0035	0.0038	0.0041
6	3569	0.2310	0.5180	0.0000	0.0002	0.0002	0.0001	0.0003	0.0005	0.0007	0.0011	0.0020	0.0025	0.0030	0.0032	0.0035	0.0039
7	3550	0.2308	0.5202	0.0000	0.0002	0.0002	0.0001	0.0001	0.0003	0.0005	0.0012	0.0022	0.0027	0.0032	0.0033	0.0035	0.0038
8	3505	0.2325	0.5198	0.0000	0.0001	0.0001	0.0001	0.0003	0.0005	0.0009	0.0015	0.0024	0.0026	0.0029	0.0030	0.0032	0.0034
9	3480	0.2321	0.5232	0.0000	0.0002	0.0002	0.0001	0.0003	0.0004	0.0007	0.0014	0.0022	0.0027	0.0032	0.0033	0.0036	0.0038
10	3567	0.2307	0.5189	0.0000	0.0002	0.0002	0.0002	0.0004	0.0005	0.0007	0.0011	0.0016	0.0023	0.0030	0.0034	0.0038	0.0043
11	3570	0.2300	0.5206	0.0000	0.0002	0.0002	0.0002	0.0003	0.0002	0.0004	0.0006	0.0016	0.0022	0.0030	0.0033	0.0037	0.0040
12	3520	0.2312	0.5219	0.0000	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0011	0.0018	0.0024	0.0029	0.0031	0.0034	0.0037
13	3609	0.2296	0.5182	0.0000	0.0002	0.0002	0.0002	0.0003	0.0004	0.0006	0.0010	0.0014	0.0021	0.0028	0.0032	0.0037	0.0043
14	3580	0.2305	0.5184	0.0000	0.0002	0.0002	0.0003	0.0003	0.0003	0.0006	0.0012	0.0020	0.0023	0.0028	0.0030	0.0032	0.0035
15	3543	0.2306	0.5214	0.0000	0.0002	0.0002	0.0002	0.0003	0.0003	0.0005	0.0009	0.0013	0.0019	0.0026	0.0031	0.0036	0.0042
16	3540	0.2314	0.5194	0.0000	0.0002	0.0002	0.0001	0.0002	0.0004	0.0006	0.0014	0.0023	0.0025	0.0029	0.0031	0.0033	0.0035
17	3526	0.2316	0.5204	0.0000	0.0002	0.0002	0.0001	0.0002	0.0003	0.0007	0.0017	0.0025	0.0026	0.0029	0.0031	0.0033	0.0035
18	3572	0.2313	0.5169	0.0000	0.0002	0.0002	0.0001	0.0003	0.0005	0.0008	0.0015	0.0025	0.0028	0.0033	0.0033	0.0035	0.0038
19	3542	0.2310	0.5204	0.0000	0.0002	0.0002	0.0002	0.0003	0.0003	0.0006	0.0011	0.0017	0.0023	0.0029	0.0033	0.0036	0.0039
20	3515	0.2326	0.5184	0.0000	0.0002	0.0002	0.0001	0.0003	0.0004	0.0008	0.0017	0.0024	0.0025	0.0029	0.0030	0.0032	0.0034
21	3557	0.2305	0.5206	0.0000	0.0002	0.0002	0.0001	0.0002	0.0003	0.0006	0.0018	0.0022	0.0026	0.0030	0.0031	0.0033	0.0036
22	3558	0.2313	0.5181	0.0000	0.0002	0.0001	0.0002	0.0002	0.0003	0.0006	0.0022	0.0021	0.0024	0.0028	0.0029	0.0031	0.0034
median	3549	0.2312	0.5196	0.0000	0.0002	0.0002	0.0001	0.0003	0.0003	0.0006	0.0012	0.0020	0.0024	0.0029	0.0031	0.0034	0.0037
average	3543	0.2313	0.5196	0.0000	0.0002	0.0002	0.0001	0.0003	0.0004	0.0006	0.0013	0.0020	0.0024	0.0029	0.0031	0.0034	0.0037
std. dev.	36	0.0008	0.0018	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0004	0.0004	0.0002	0.0002	0.0002	0.0002	0.0003
min	3452	0.2296	0.5169	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004	0.0006	0.0013	0.0019	0.0026	0.0029	0.0031	0.0033
max	3609	0.2330	0.5235	0.0000	0.0002	0.0002	0.0003	0.0004	0.0006	0.0009	0.0022	0.0025	0.0028	0.0033	0.0035	0.0038	0.0043

$T_s = T_{air}$ = 85℃, I_f = 200mA; $T_s \geq$ 83℃ and $T_{air} \geq$ 80℃ in compliance with LM-80
Table 7: Forward voltage data – normalized to 0 h for tested units

Unit	VF [V]	Measurement Time of VF													
	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	31.75	100.00%	100.05%	99.99%	100.07%	100.03%	99.97%	100.03%	100.00%	100.07%	100.02%	100.05%	100.12%	100.17%	100.14%
2	31.85	100.00%	99.95%	99.92%	100.08%	100.08%	99.90%	99.99%	99.96%	99.93%	100.00%	99.96%	100.01%	99.97%	100.01%
3	31.92	100.00%	99.92%	100.02%	99.74%	99.89%	99.98%	99.87%	99.93%	100.01%	99.95%	99.98%	100.01%	99.98%	100.01%
4	31.63	100.00%	100.14%	100.12%	100.22%	100.05%	99.97%	99.86%	99.98%	100.05%	100.03%	100.01%	100.06%	100.10%	100.07%
5	31.78	100.00%	99.85%	99.96%	99.86%	100.02%	99.91%	99.94%	99.97%	100.03%	99.98%	100.00%	99.97%	100.02%	99.97%
6	31.68	100.00%	99.81%	99.98%	99.93%	100.13%	100.06%	99.83%	99.99%	100.03%	100.05%	100.02%	100.00%	100.03%	99.98%
7	31.74	100.00%	99.83%	99.80%	99.98%	99.73%	99.94%	99.92%	99.86%	100.01%	99.95%	99.96%	100.00%	99.95%	99.93%
8	31.72	100.00%	99.99%	99.79%	99.83%	100.07%	99.97%	99.90%	99.92%	99.99%	99.96%	100.01%	100.05%	100.01%	100.03%
9	31.95	100.00%	100.12%	99.98%	100.07%	99.90%	99.93%	100.09%	99.96%	100.04%	99.98%	100.01%	99.95%	100.01%	100.04%
10	31.69	100.00%	100.02%	99.92%	100.10%	100.02%	99.98%	100.01%	99.98%	100.04%	100.02%	100.05%	100.01%	99.97%	99.95%
11	31.70	100.00%	99.98%	100.09%	99.93%	99.93%	99.95%	99.87%	99.90%	99.98%	99.94%	99.99%	99.93%	99.88%	99.93%
12	31.73	100.00%	100.08%	100.00%	100.01%	99.81%	99.92%	99.88%	99.92%	99.96%	100.02%	99.99%	99.95%	99.98%	100.03%
13	31.54	100.00%	99.92%	99.88%	99.97%	99.92%	99.99%	99.93%	99.97%	100.06%	100.02%	100.01%	100.03%	100.01%	100.03%
14	31.49	100.00%	99.85%	99.84%	99.80%	100.06%	100.01%	100.00%	100.05%	99.97%	99.99%	99.96%	100.00%	100.03%	100.04%
15	32.18	100.00%	99.88%	99.94%	99.87%	99.90%	99.93%	99.89%	99.95%	100.02%	100.05%	100.09%	100.12%	100.07%	100.09%
16	31.61	100.00%	99.89%	100.11%	100.08%	100.01%	100.05%	100.08%	100.03%	100.06%	100.03%	100.02%	100.01%	100.03%	99.99%
17	31.68	100.00%	100.18%	100.00%	100.24%	100.16%	100.08%	100.07%	100.11%	100.04%	100.08%	100.05%	100.10%	100.06%	100.03%
18	31.85	100.00%	99.84%	99.88%	99.76%	99.85%	99.95%	99.83%	99.94%	100.01%	99.97%	100.01%	100.08%	100.12%	100.07%
19	31.63	100.00%	100.18%	99.97%	100.10%	100.11%	100.06%	99.97%	100.04%	99.95%	100.02%	100.01%	100.06%	100.09%	100.04%
20	31.84	100.00%	99.98%	100.06%	99.97%	100.07%	99.92%	99.76%	99.87%	99.94%	99.98%	100.02%	99.97%	99.91%	99.95%
21	31.72	100.00%	100.18%	100.11%	100.04%	100.03%	99.96%	99.93%	99.99%	100.03%	99.97%	100.03%	99.97%	100.01%	100.04%
22	31.73	100.00%	100.00%	100.02%	100.17%	99.96%	99.91%	99.94%	99.96%	100.00%	100.03%	99.99%	100.04%	100.09%	100.12%
median	31.73	100.00%	99.98%	99.98%	100.00%	100.02%	99.97%	99.93%	99.97%	100.02%	100.01%	100.01%	100.01%	100.02%	100.03%
average	31.75	100.00%	99.98%	99.97%	99.99%	99.99%	99.97%	99.94%	99.97%	100.01%	100.00%	100.01%	100.02%	100.02%	100.02%
std. dev.	0.15	0.00%	0.12%	0.10%	0.14%	0.11%	0.05%	0.09%	0.06%	0.04%	0.04%	0.03%	0.05%	0.07%	0.06%
min	31.49	100.00%	99.81%	99.79%	99.74%	99.73%	99.90%	99.76%	99.86%	99.93%	99.94%	99.96%	99.93%	99.88%	99.93%
max	32.18	100.00%	100.18%	100.12%	100.24%	100.16%	100.08%	100.09%	100.11%	100.07%	100.08%	100.09%	100.12%	100.17%	100.14%

$T_s = T_{air} = 105℃$, $I_f = 200mA$; $T_s \geq 103℃$ and $T_{air} \geq 100℃$ in compliance with LM-80
Table 8: Lumen maintenance data – normalized to 0 h for tested units

Unit	VF [V]	Flux [lm]	Measurement Time of Lumen Maintenance													
	0h	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	32.25	505.88	100.00%	100.02%	100.13%	100.22%	100.02%	99.85%	99.49%	98.79%	98.67%	98.10%	97.51%	96.80%	96.04%	95.24%
2	31.63	502.91	100.00%	99.99%	100.10%	99.96%	99.76%	99.64%	99.48%	98.89%	98.64%	97.98%	97.51%	96.85%	96.17%	95.40%
3	31.92	506.36	100.00%	100.00%	100.14%	100.11%	99.83%	99.73%	99.62%	99.12%	98.92%	98.30%	97.83%	97.18%	96.47%	95.72%
4	31.62	501.92	100.00%	100.00%	100.13%	100.05%	99.79%	99.70%	99.64%	99.11%	98.90%	98.26%	97.73%	97.04%	96.37%	95.58%
5	31.87	507.61	100.00%	99.94%	100.09%	100.05%	99.82%	99.71%	99.61%	99.11%	98.98%	98.37%	97.91%	97.14%	96.27%	95.50%
6	31.92	504.48	100.00%	100.01%	100.16%	100.02%	99.69%	99.53%	99.10%	98.27%	98.13%	97.46%	96.87%	96.12%	95.33%	94.50%
7	31.86	505.01	100.00%	100.02%	100.15%	100.11%	99.88%	99.75%	99.60%	99.02%	98.82%	98.26%	97.74%	97.07%	96.37%	95.57%
8	31.73	510.38	100.00%	100.01%	100.14%	100.09%	99.90%	99.80%	99.71%	99.20%	99.03%	98.45%	97.97%	97.32%	96.61%	95.82%
9	31.91	504.75	100.00%	99.98%	100.11%	100.09%	99.87%	99.64%	99.39%	98.87%	98.61%	97.92%	97.34%	96.62%	95.88%	95.06%
10	31.95	504.45	100.00%	99.97%	100.10%	100.11%	99.89%	99.76%	99.73%	99.15%	98.86%	98.19%	97.70%	97.04%	96.27%	95.53%
11	31.67	509.80	100.00%	99.98%	100.11%	100.04%	99.77%	99.61%	99.58%	99.22%	98.97%	98.38%	97.83%	97.13%	96.44%	95.70%
12	32.24	504.06	100.00%	99.96%	100.09%	99.98%	99.75%	99.45%	99.03%	98.14%	97.88%	97.28%	96.65%	95.96%	95.22%	94.43%
13	32.10	506.41	100.00%	99.96%	100.07%	99.98%	99.77%	99.60%	99.45%	98.82%	98.62%	97.90%	97.29%	96.53%	95.65%	94.82%
14	31.89	510.02	100.00%	100.02%	100.11%	100.06%	99.80%	99.69%	99.72%	98.88%	98.67%	97.95%	97.48%	96.80%	96.21%	95.51%
15	31.81	506.70	100.00%	99.98%	100.13%	100.03%	99.75%	99.56%	99.41%	98.88%	98.62%	97.95%	97.49%	96.80%	96.13%	95.30%
16	31.72	501.81	100.00%	99.98%	100.09%	100.17%	99.96%	99.76%	99.68%	99.20%	98.94%	98.26%	97.78%	97.03%	96.35%	95.57%
17	31.95	503.13	100.00%	100.01%	100.12%	99.99%	99.79%	99.66%	99.54%	99.06%	98.84%	98.09%	97.51%	96.75%	96.10%	95.38%
18	31.90	505.06	100.00%	99.97%	100.08%	99.95%	99.79%	99.60%	99.56%	99.04%	98.87%	98.20%	97.67%	96.89%	96.07%	95.10%
19	31.81	506.27	100.00%	99.98%	100.11%	100.02%	99.77%	99.63%	99.70%	99.32%	99.15%	98.46%	97.91%	97.18%	96.35%	95.47%
20	31.58	502.32	100.00%	100.01%	100.17%	100.11%	99.91%	99.76%	99.68%	99.20%	98.94%	98.24%	97.69%	97.00%	96.32%	95.59%
21	31.88	506.68	100.00%	100.00%	100.03%	99.84%	99.63%	99.43%	99.26%	98.90%	98.62%	97.89%	97.43%	96.52%	95.71%	94.82%
22	32.11	504.06	100.00%	99.99%	100.07%	99.88%	99.70%	99.54%	99.42%	98.87%	98.59%	97.86%	97.37%	96.62%	95.89%	95.08%
median	31.88	505.04	100.00%	99.99%	100.11%	100.04%	99.79%	99.65%	99.57%	99.03%	98.83%	98.14%	97.59%	96.87%	96.19%	95.43%
average	31.88	505.46	100.00%	99.99%	100.11%	100.04%	99.81%	99.65%	99.52%	98.96%	98.74%	98.08%	97.56%	96.84%	96.10%	95.30%
std. dev.	0.18	2.47	0.00%	0.02%	0.03%	0.09%	0.09%	0.11%	0.19%	0.29%	0.29%	0.30%	0.32%	0.34%	0.36%	0.39%
min	31.58	501.81	100.00%	99.94%	100.03%	99.84%	99.63%	99.43%	99.03%	98.14%	97.88%	97.28%	96.65%	95.96%	95.22%	94.43%
max	32.25	510.38	100.00%	100.02%	100.17%	100.22%	100.02%	99.85%	99.73%	99.32%	99.15%	98.46%	97.97%	97.32%	96.61%	95.82%

$T_s = T_{air}$ = 105℃, I_f = 200mA; $T_s \geq$ 103℃ and $T_{air} \geq$ 100℃ in compliance with LM-80
Table 9: Chromaticity shift Du'v' data – normalized to 0 h for tested units

Unit	CCT [k]	u'	v'	Measurement Time of Chromaticity Shift Du'v'												
	0h	0h	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	3534	0.2311	0.5209	0.0000	0.0003	0.0003	0.0002	0.0001	0.0003	0.0005	0.0013	0.0014	0.0016	0.0022	0.0024	0.0029	0.0035
2	3549	0.2316	0.5182	0.0000	0.0003	0.0003	0.0001	0.0003	0.0005	0.0007	0.0013	0.0016	0.0019	0.0024	0.0025	0.0029	0.0035
3	3555	0.2308	0.5200	0.0000	0.0003	0.0003	0.0000	0.0002	0.0004	0.0004	0.0009	0.0012	0.0015	0.0021	0.0021	0.0025	0.0031
4	3543	0.2321	0.5172	0.0000	0.0003	0.0003	0.0001	0.0003	0.0006	0.0006	0.0012	0.0014	0.0016	0.0022	0.0022	0.0026	0.0032
5	3610	0.2295	0.5184	0.0000	0.0003	0.0003	0.0001	0.0002	0.0003	0.0004	0.0010	0.0013	0.0015	0.0021	0.0021	0.0026	0.0031
6	3572	0.2312	0.5173	0.0000	0.0003	0.0004	0.0001	0.0004	0.0006	0.0011	0.0019	0.0021	0.0024	0.0029	0.0031	0.0035	0.0041
7	3541	0.2311	0.5203	0.0000	0.0003	0.0003	0.0000	0.0001	0.0004	0.0005	0.0012	0.0014	0.0017	0.0023	0.0024	0.0028	0.0035
8	3655	0.2285	0.5172	0.0000	0.0003	0.0003	0.0002	0.0003	0.0002	0.0002	0.0007	0.0010	0.0012	0.0018	0.0018	0.0022	0.0028
9	3578	0.2309	0.5175	0.0000	0.0003	0.0003	0.0002	0.0002	0.0004	0.0007	0.0014	0.0017	0.0020	0.0025	0.0027	0.0031	0.0038
10	3517	0.2317	0.5208	0.0000	0.0003	0.0003	0.0001	0.0002	0.0002	0.0003	0.0009	0.0013	0.0017	0.0023	0.0024	0.0029	0.0035
11	3628	0.2291	0.5180	0.0000	0.0003	0.0003	0.0000	0.0002	0.0005	0.0005	0.0008	0.0009	0.0013	0.0019	0.0018	0.0023	0.0029
12	3550	0.2313	0.5188	0.0000	0.0003	0.0003	0.0001	0.0003	0.0006	0.0012	0.0020	0.0022	0.0024	0.0029	0.0030	0.0034	0.0040
13	3533	0.2308	0.5219	0.0000	0.0003	0.0003	0.0001	0.0002	0.0004	0.0005	0.0012	0.0015	0.0018	0.0025	0.0026	0.0031	0.0038
14	3591	0.2293	0.5206	0.0000	0.0004	0.0003	0.0000	0.0002	0.0004	0.0004	0.0010	0.0012	0.0017	0.0022	0.0023	0.0029	0.0033
15	3546	0.2310	0.5200	0.0000	0.0003	0.0003	0.0001	0.0002	0.0004	0.0005	0.0010	0.0014	0.0017	0.0023	0.0024	0.0029	0.0036
16	3505	0.2324	0.5200	0.0000	0.0003	0.0003	0.0002	0.0002	0.0003	0.0004	0.0010	0.0013	0.0016	0.0020	0.0022	0.0026	0.0034
17	3553	0.2316	0.5177	0.0000	0.0004	0.0004	0.0001	0.0003	0.0004	0.0006	0.0012	0.0015	0.0018	0.0024	0.0025	0.0030	0.0037
18	3572	0.2309	0.5179	0.0000	0.0004	0.0003	0.0001	0.0003	0.0004	0.0005	0.0011	0.0014	0.0017	0.0023	0.0024	0.0028	0.0036
19	3507	0.2312	0.5231	0.0000	0.0003	0.0003	0.0001	0.0002	0.0003	0.0003	0.0005	0.0008	0.0012	0.0018	0.0018	0.0023	0.0029
20	3528	0.2320	0.5190	0.0000	0.0004	0.0004	0.0002	0.0003	0.0002	0.0004	0.0010	0.0014	0.0016	0.0021	0.0022	0.0026	0.0035
21	3547	0.2305	0.5212	0.0000	0.0003	0.0002	0.0001	0.0003	0.0002	0.0001	0.0006	0.0008	0.0011	0.0016	0.0016	0.0019	0.0026
22	3566	0.2313	0.5176	0.0000	0.0004	0.0004	0.0002	0.0002	0.0001	0.0001	0.0004	0.0007	0.0009	0.0016	0.0017	0.0021	0.0027
median	3550	0.2311	0.5189	0.0000	0.0003	0.0003	0.0001	0.0002	0.0004	0.0005	0.0010	0.0014	0.0017	0.0022	0.0023	0.0028	0.0035
average	3558	0.2309	0.5192	0.0000	0.0003	0.0003	0.0001	0.0002	0.0004	0.0005	0.0011	0.0013	0.0016	0.0022	0.0023	0.0027	0.0034
std. dev.	37	0.0010	0.0017	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0003	0.0004	0.0004	0.0004	0.0003	0.0004	0.0004	0.0004
min	3505	0.2285	0.5172	0.0000	0.0003	0.0002	0.0000	0.0001	0.0001	0.0001	0.0004	0.0007	0.0009	0.0016	0.0016	0.0019	0.0026
max	3655	0.2324	0.5231	0.0000	0.0004	0.0004	0.0002	0.0004	0.0006	0.0012	0.0020	0.0022	0.0024	0.0029	0.0031	0.0035	0.0041

$T_s = T_{air}$ = 105℃, I_f = 200mA; $T_s \geq$ 103℃ and $T_{air} \geq$ 100℃ in compliance with LM-80
Table 10: Forward voltage data – normalized to 0 h for tested units

Unit	VF [V]	Measurement Time of VF													
	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	32.25	100.00%	99.93%	99.98%	100.03%	99.91%	100.12%	99.97%	100.03%	100.07%	100.02%	100.06%	100.09%	100.12%	100.08%
2	31.63	100.00%	99.95%	99.99%	99.81%	99.90%	99.91%	99.69%	99.82%	99.89%	99.95%	99.97%	100.00%	100.04%	99.99%
3	31.92	100.00%	99.82%	99.95%	99.91%	99.94%	99.80%	99.74%	99.79%	99.83%	99.88%	99.92%	99.88%	99.93%	99.88%
4	31.62	100.00%	100.20%	100.12%	100.15%	100.06%	100.13%	100.18%	100.16%	100.09%	100.12%	100.09%	100.12%	100.08%	100.11%
5	31.87	100.00%	99.89%	100.08%	99.92%	99.90%	100.01%	99.88%	99.96%	99.94%	99.98%	100.01%	99.96%	100.00%	99.95%
6	31.92	100.00%	100.08%	100.21%	100.29%	100.20%	100.12%	100.10%	100.15%	100.07%	100.04%	100.06%	100.11%	100.07%	100.05%
7	31.86	100.00%	99.87%	100.02%	99.97%	99.93%	100.04%	100.03%	100.01%	99.89%	99.93%	99.95%	100.00%	100.05%	100.02%
8	31.73	100.00%	100.16%	100.05%	100.06%	100.04%	100.14%	100.19%	100.11%	100.05%	99.98%	100.01%	100.06%	100.03%	100.00%
9	31.91	100.00%	100.19%	100.10%	100.11%	100.04%	100.15%	99.88%	100.08%	99.99%	100.03%	100.06%	100.02%	100.07%	100.04%
10	31.95	100.00%	99.91%	100.19%	100.19%	99.96%	100.07%	100.15%	100.09%	100.11%	100.06%	100.01%	100.05%	100.08%	100.10%
11	31.67	100.00%	100.17%	100.01%	100.09%	99.96%	99.98%	99.99%	100.03%	100.05%	100.01%	99.98%	100.00%	100.03%	99.99%
12	32.24	100.00%	100.24%	100.19%	100.06%	99.99%	99.97%	100.14%	100.03%	100.07%	100.03%	100.00%	100.01%	100.03%	100.08%
13	32.10	100.00%	99.77%	99.77%	99.76%	99.92%	100.00%	100.01%	99.95%	100.00%	100.04%	100.00%	100.02%	100.04%	100.09%
14	31.89	100.00%	100.00%	99.99%	100.05%	99.96%	99.92%	99.98%	99.87%	99.95%	99.99%	99.95%	100.00%	100.04%	100.09%
15	31.81	100.00%	100.16%	100.07%	100.00%	99.91%	99.98%	100.10%	100.01%	100.04%	100.02%	99.99%	100.02%	100.06%	100.01%
16	31.72	100.00%	99.89%	99.95%	99.93%	100.05%	99.95%	99.84%	99.86%	99.95%	99.97%	99.99%	100.01%	100.02%	100.00%
17	31.95	100.00%	99.89%	100.03%	100.09%	100.01%	99.90%	100.02%	100.05%	99.98%	100.00%	99.98%	100.02%	99.99%	100.02%
18	31.90	100.00%	99.75%	100.01%	100.04%	99.90%	99.95%	100.02%	99.97%	100.02%	100.03%	100.02%	100.05%	100.07%	100.09%
19	31.81	100.00%	100.10%	100.10%	99.93%	99.97%	99.98%	99.87%	99.98%	100.01%	100.04%	100.01%	100.04%	100.08%	100.11%
20	31.58	100.00%	99.73%	99.79%	100.04%	99.91%	100.02%	99.83%	99.93%	100.02%	99.97%	99.99%	99.96%	99.91%	99.94%
21	31.88	100.00%	100.13%	100.11%	100.06%	99.99%	99.84%	99.72%	99.80%	99.89%	99.92%	99.98%	99.96%	99.92%	99.97%
22	32.11	100.00%	99.86%	100.07%	99.97%	99.91%	100.02%	99.94%	100.00%	100.06%	100.04%	100.01%	100.06%	100.10%	100.11%
median	31.88	100.00%	99.94%	100.04%	100.04%	99.96%	99.99%	99.99%	100.00%	100.01%	100.02%	100.00%	100.02%	100.04%	100.03%
average	31.88	100.00%	99.99%	100.04%	100.02%	99.97%	100.00%	99.97%	99.99%	100.00%	100.00%	100.00%	100.02%	100.03%	100.03%
std. dev.	0.18	0.00%	0.16%	0.11%	0.12%	0.07%	0.10%	0.15%	0.11%	0.08%	0.05%	0.04%	0.05%	0.06%	0.06%
min	31.58	100.00%	99.73%	99.77%	99.76%	99.90%	99.80%	99.69%	99.79%	99.83%	99.88%	99.92%	99.88%	99.91%	99.88%
max	32.25	100.00%	100.24%	100.21%	100.29%	100.20%	100.15%	100.19%	100.16%	100.11%	100.12%	100.09%	100.12%	100.12%	100.11%

$T_s = T_{air} = 115℃$, $I_f = 200mA$; $T_s \geq 113℃$ and $T_{air} \geq 110℃$ in compliance with LM-80
Table 11: Lumen maintenance data – normalized to 0 h for tested units

Unit	VF [V]	Flux [lm]	Measurement Time of Lumen Maintenance													
	0h	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	31.83	502.61	100.00%	99.97%	99.87%	99.49%	99.04%	98.74%	98.30%	97.52%	97.03%	96.28%	95.66%	94.89%	94.05%	93.00%
2	31.98	502.68	100.00%	99.98%	99.93%	99.64%	99.38%	99.28%	99.02%	98.42%	98.00%	97.41%	96.65%	95.74%	94.78%	93.73%
3	31.62	503.43	100.00%	99.95%	99.86%	99.47%	99.14%	98.98%	98.73%	98.16%	97.70%	97.14%	96.60%	95.76%	94.73%	93.68%
4	31.82	502.16	100.00%	99.98%	99.94%	99.67%	99.43%	99.34%	99.18%	98.69%	98.30%	97.56%	96.93%	95.93%	94.84%	93.64%
5	31.61	503.23	100.00%	99.98%	99.99%	99.78%	99.55%	99.46%	99.17%	98.48%	97.39%	96.73%	95.99%	95.00%	93.86%	92.70%
6	31.72	511.07	100.00%	99.96%	99.94%	99.56%	99.30%	99.23%	99.06%	98.62%	98.26%	97.57%	96.88%	96.10%	95.08%	94.02%
7	31.85	505.67	100.00%	100.00%	100.00%	99.69%	99.45%	99.35%	99.16%	98.71%	98.32%	97.70%	97.11%	96.27%	95.22%	93.99%
8	31.71	499.94	100.00%	100.00%	99.94%	99.67%	99.41%	99.30%	99.02%	98.43%	98.10%	97.56%	96.92%	96.09%	95.09%	94.00%
9	31.61	504.53	100.00%	100.03%	99.99%	99.80%	99.51%	99.37%	98.70%	97.76%	97.23%	96.65%	96.06%	95.38%	94.60%	93.65%
10	31.73	510.39	100.00%	100.02%	100.03%	99.80%	99.49%	99.37%	98.78%	98.21%	97.88%	97.40%	96.78%	95.93%	94.90%	93.84%
11	31.65	508.20	100.00%	100.02%	100.03%	99.75%	99.50%	99.37%	98.78%	98.18%	97.93%	97.26%	96.63%	95.74%	94.76%	93.69%
12	31.80	506.56	100.00%	100.05%	100.04%	99.74%	99.38%	99.14%	98.47%	97.47%	96.91%	96.28%	95.66%	94.87%	93.85%	92.77%
13	31.93	501.28	100.00%	99.90%	99.90%	99.85%	99.57%	99.52%	98.89%	97.92%	97.32%	96.72%	96.16%	95.29%	94.31%	93.22%
14	31.80	504.73	100.00%	100.02%	100.05%	99.82%	99.15%	98.70%	97.52%	96.57%	96.26%	95.58%	94.93%	94.11%	93.18%	92.13%
15	32.09	505.63	100.00%	100.03%	100.00%	99.80%	99.49%	99.40%	98.92%	98.24%	97.46%	96.80%	96.22%	95.35%	94.37%	93.36%
16	31.83	504.96	100.00%	100.07%	100.07%	99.77%	99.18%	98.73%	97.55%	96.33%	95.68%	94.94%	94.36%	93.55%	92.53%	91.53%
17	31.61	508.38	100.00%	100.02%	100.03%	99.80%	99.48%	99.38%	98.93%	98.46%	98.38%	97.94%	97.32%	96.52%	95.62%	94.58%
18	31.69	505.42	100.00%	100.02%	100.06%	99.74%	99.59%	99.50%	99.06%	98.49%	98.38%	97.85%	97.29%	96.54%	95.72%	94.72%
19	31.82	504.21	100.00%	100.09%	100.15%	99.88%	99.51%	99.30%	98.70%	97.94%	97.78%	97.12%	96.43%	95.60%	94.67%	93.65%
20	31.44	503.31	100.00%	100.03%	100.03%	99.79%	99.57%	99.51%	99.13%	98.64%	98.56%	98.02%	97.48%	96.58%	95.58%	94.56%
21	31.54	502.56	100.00%	100.06%	100.12%	99.99%	99.63%	99.51%	99.12%	98.64%	98.24%	97.76%	97.08%	96.27%	95.32%	94.28%
22	31.72	504.20	100.00%	100.06%	100.13%	99.66%	99.46%	99.48%	99.14%	98.51%	98.30%	97.72%	97.08%	96.25%	95.27%	94.18%
median	31.73	504.37	100.00%	100.02%	100.01%	99.76%	99.47%	99.36%	98.93%	98.33%	97.90%	97.33%	96.64%	95.75%	94.77%	93.68%
average	31.75	504.78	100.00%	100.01%	100.00%	99.73%	99.42%	99.27%	98.79%	98.11%	97.70%	97.09%	96.46%	95.63%	94.65%	93.59%
std. dev.	0.15	2.80	0.00%	0.04%	0.08%	0.12%	0.16%	0.26%	0.47%	0.65%	0.74%	0.79%	0.79%	0.78%	0.79%	0.79%
min	31.44	499.94	100.00%	99.90%	99.86%	99.47%	99.04%	98.70%	97.52%	96.33%	95.68%	94.94%	94.36%	93.55%	92.53%	91.53%
max	32.09	511.07	100.00%	100.09%	100.15%	99.99%	99.63%	99.52%	99.18%	98.71%	98.56%	98.02%	97.48%	96.58%	95.72%	94.72%

$T_s = T_{air}$ = 115℃, I_f = 200mA; $T_s \geq$ 113℃ and $T_{air} \geq$ 110℃ in compliance with LM-80
Table 12: Chromaticity shift Du'v' data – normalized to 0 h for tested units

Unit	CCT [k]	u'	v'	Measurement Time of Chromaticity Shift du'dv'												
	0h	0h	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	3539	0.2317	0.5188	0.0000	0.0003	0.0003	0.0007	0.0012	0.0016	0.0021	0.0027	0.0030	0.0024	0.0031	0.0033	0.0038	0.0044
2	3513	0.2321	0.5202	0.0000	0.0003	0.0003	0.0005	0.0008	0.0010	0.0014	0.0019	0.0023	0.0026	0.0033	0.0036	0.0039	0.0045
3	3498	0.2319	0.5222	0.0000	0.0003	0.0003	0.0007	0.0010	0.0013	0.0017	0.0022	0.0027	0.0022	0.0028	0.0031	0.0036	0.0043
4	3473	0.2326	0.5227	0.0000	0.0002	0.0002	0.0005	0.0007	0.0009	0.0011	0.0016	0.0019	0.0020	0.0027	0.0029	0.0035	0.0042
5	3541	0.2317	0.5186	0.0000	0.0003	0.0002	0.0004	0.0006	0.0008	0.0013	0.0019	0.0027	0.0030	0.0037	0.0040	0.0042	0.0046
6	3689	0.2282	0.5154	0.0000	0.0003	0.0002	0.0004	0.0006	0.0008	0.0010	0.0014	0.0014	0.0016	0.0025	0.0027	0.0033	0.0041
7	3543	0.2312	0.5197	0.0000	0.0003	0.0002	0.0004	0.0005	0.0007	0.0010	0.0015	0.0018	0.0024	0.0033	0.0036	0.0042	0.0049
8	3444	0.2336	0.5225	0.0000	0.0003	0.0003	0.0005	0.0008	0.0010	0.0013	0.0018	0.0022	0.0024	0.0031	0.0035	0.0038	0.0044
9	3553	0.2311	0.5192	0.0000	0.0003	0.0003	0.0003	0.0006	0.0008	0.0016	0.0024	0.0029	0.0032	0.0039	0.0043	0.0047	0.0052
10	3616	0.2291	0.5189	0.0000	0.0003	0.0002	0.0002	0.0004	0.0006	0.0012	0.0017	0.0021	0.0025	0.0035	0.0038	0.0045	0.0052
11	3615	0.2298	0.5173	0.0000	0.0003	0.0003	0.0003	0.0004	0.0006	0.0013	0.0019	0.0022	0.0027	0.0034	0.0037	0.0043	0.0053
12	3570	0.2304	0.5195	0.0000	0.0003	0.0003	0.0003	0.0006	0.0010	0.0018	0.0025	0.0031	0.0034	0.0039	0.0043	0.0047	0.0052
13	3472	0.2330	0.5216	0.0000	0.0002	0.0003	0.0003	0.0006	0.0007	0.0014	0.0022	0.0028	0.0031	0.0036	0.0040	0.0044	0.0049
14	3540	0.2314	0.5195	0.0000	0.0002	0.0002	0.0003	0.0010	0.0015	0.0025	0.0030	0.0032	0.0035	0.0040	0.0043	0.0047	0.0052
15	3576	0.2306	0.5185	0.0000	0.0003	0.0003	0.0003	0.0006	0.0007	0.0014	0.0020	0.0028	0.0033	0.0039	0.0044	0.0049	0.0054
16	3554	0.2310	0.5192	0.0000	0.0003	0.0003	0.0003	0.0010	0.0015	0.0025	0.0031	0.0034	0.0035	0.0038	0.0042	0.0044	0.0048
17	3580	0.2299	0.5201	0.0000	0.0003	0.0002	0.0003	0.0005	0.0007	0.0012	0.0016	0.0017	0.0022	0.0031	0.0033	0.0039	0.0047
18	3525	0.2313	0.5212	0.0000	0.0002	0.0002	0.0004	0.0004	0.0005	0.0011	0.0016	0.0018	0.0022	0.0031	0.0033	0.0039	0.0047
19	3499	0.2319	0.5219	0.0000	0.0003	0.0003	0.0002	0.0005	0.0008	0.0015	0.0021	0.0023	0.0028	0.0037	0.0039	0.0044	0.0050
20	3535	0.2317	0.5192	0.0000	0.0003	0.0003	0.0003	0.0006	0.0007	0.0012	0.0016	0.0017	0.0021	0.0030	0.0031	0.0037	0.0044
21	3551	0.2317	0.5178	0.0000	0.0003	0.0002	0.0006	0.0007	0.0008	0.0014	0.0018	0.0022	0.0028	0.0038	0.0039	0.0043	0.0050
22	3574	0.2310	0.5174	0.0000	0.0003	0.0003	0.0005	0.0006	0.0006	0.0012	0.0017	0.0020	0.0024	0.0033	0.0037	0.0041	0.0049
median	3542	0.2313	0.5193	0.0000	0.0003	0.0003	0.0003	0.0006	0.0008	0.0014	0.0019	0.0022	0.0026	0.0034	0.0037	0.0042	0.0048
average	3545	0.2312	0.5196	0.0000	0.0003	0.0002	0.0004	0.0007	0.0009	0.0015	0.0020	0.0024	0.0026	0.0034	0.0037	0.0042	0.0048
std. dev.	54	0.0012	0.0019	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0005	0.0004	0.0005	0.0004	0.0004
min	3444	0.2282	0.5154	0.0000	0.0002	0.0002	0.0002	0.0004	0.0005	0.0010	0.0014	0.0014	0.0016	0.0025	0.0027	0.0033	0.0041
max	3689	0.2336	0.5227	0.0000	0.0003	0.0003	0.0007	0.0012	0.0016	0.0025	0.0031	0.0034	0.0035	0.0040	0.0044	0.0049	0.0054

$T_s = T_{air}$ = 115℃, I_f = 200mA; $T_s \geq$ 113℃ and $T_{air} \geq$ 110℃ in compliance with LM-80
Table 13: Forward voltage data – normalized to 0 h for tested units

Unit	VF [V]	Measurement Time of VF													
	0h	0h	24h	48h	168h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	31.83	100.00%	99.94%	99.80%	99.92%	100.00%	99.95%	100.03%	99.98%	100.04%	100.01%	100.03%	99.99%	99.96%	99.9146%
2	31.98	100.00%	100.08%	99.96%	99.94%	99.94%	99.98%	99.99%	99.96%	100.03%	100.01%	100.04%	100.08%	100.05%	100.0272%
3	31.62	100.00%	100.09%	100.15%	100.14%	100.17%	100.06%	100.20%	100.10%	100.02%	100.07%	100.04%	100.09%	100.13%	100.1642%
4	31.82	100.00%	99.94%	100.13%	100.11%	100.00%	99.94%	99.92%	99.98%	100.01%	99.98%	100.03%	100.06%	100.11%	100.1355%
5	31.61	100.00%	99.79%	99.64%	99.94%	100.06%	99.87%	99.79%	99.82%	99.84%	99.86%	99.90%	99.88%	99.93%	99.8913%
6	31.72	100.00%	99.90%	100.07%	100.15%	100.09%	99.97%	100.09%	100.04%	100.02%	100.05%	100.03%	100.06%	100.11%	100.1494%
7	31.85	100.00%	100.00%	99.95%	99.96%	100.04%	99.99%	100.05%	100.01%	100.09%	100.04%	100.00%	100.03%	99.99%	100.0129%
8	31.71	100.00%	99.79%	99.74%	100.01%	99.94%	100.02%	100.04%	99.98%	99.82%	99.89%	99.97%	100.01%	100.06%	100.0310%
9	31.61	100.00%	100.16%	100.03%	100.05%	99.93%	100.10%	100.08%	100.14%	100.03%	100.01%	99.97%	100.00%	99.96%	99.9239%
10	31.73	100.00%	100.08%	100.20%	99.95%	100.01%	99.95%	100.11%	100.02%	100.04%	100.00%	100.04%	100.00%	99.94%	99.9922%
11	31.65	100.00%	100.18%	99.92%	100.03%	100.00%	100.07%	99.93%	100.01%	100.05%	100.03%	99.99%	100.05%	100.01%	99.9821%
12	31.80	100.00%	99.90%	100.03%	99.99%	99.89%	99.92%	100.17%	100.00%	100.08%	100.04%	100.01%	100.06%	100.03%	99.9919%
13	31.93	100.00%	99.82%	99.99%	99.87%	99.81%	99.85%	100.01%	99.93%	99.98%	99.97%	100.01%	100.05%	100.11%	100.0606%
14	31.80	100.00%	100.09%	100.09%	100.03%	100.09%	100.06%	100.22%	100.11%	100.16%	100.08%	100.05%	100.11%	100.15%	100.1889%
15	32.09	100.00%	100.05%	100.11%	100.00%	99.94%	100.06%	100.04%	100.15%	100.07%	100.03%	100.03%	100.08%	100.14%	100.0994%
16	31.83	100.00%	100.13%	100.16%	100.00%	99.90%	99.93%	99.95%	99.99%	99.89%	99.94%	99.97%	99.91%	99.87%	99.8239%
17	31.61	100.00%	100.06%	99.93%	99.89%	99.96%	100.03%	99.97%	99.96%	100.05%	100.03%	99.98%	100.03%	100.06%	100.0838%
18	31.69	100.00%	100.02%	99.96%	99.81%	99.89%	99.97%	99.84%	99.91%	100.01%	99.97%	99.99%	100.05%	100.11%	100.1416%
19	31.82	100.00%	100.06%	100.14%	99.88%	99.98%	100.06%	100.02%	100.05%	100.11%	100.05%	100.09%	100.14%	100.10%	100.1487%
20	31.44	100.00%	100.03%	100.04%	100.01%	100.03%	99.97%	100.01%	99.99%	100.03%	100.07%	100.02%	100.01%	99.96%	100.0125%
21	31.54	100.00%	100.07%	100.03%	100.17%	100.09%	100.03%	99.94%	99.98%	100.02%	100.06%	100.02%	100.05%	100.11%	100.0676%
22	31.72	100.00%	100.06%	100.13%	99.92%	99.87%	99.96%	100.07%	100.01%	100.10%	100.05%	100.01%	100.08%	100.12%	100.0894%
median	31.73	100.00%	100.05%	100.03%	100.00%	99.99%	99.98%	100.03%	100.00%	100.03%	100.03%	100.01%	100.05%	100.06%	100.05%
average	31.75	100.00%	100.01%	100.01%	99.99%	99.98%	99.99%	100.02%	100.01%	100.02%	100.01%	100.01%	100.04%	100.05%	100.04%
std. dev.	0.15	0.00%	0.11%	0.14%	0.09%	0.09%	0.07%	0.11%	0.07%	0.08%	0.06%	0.04%	0.06%	0.08%	0.10%
min	31.44	100.00%	99.79%	99.64%	99.81%	99.81%	99.85%	99.79%	99.82%	99.82%	99.86%	99.90%	99.88%	99.87%	99.82%
max	32.09	100.00%	100.18%	100.20%	100.17%	100.17%	100.10%	100.22%	100.15%	100.16%	100.08%	100.09%	100.14%	100.15%	100.19%

END OF REPORT

Appendix A:
Lumen Maintenance Projection (IES TM-21-11)

For Information Only!

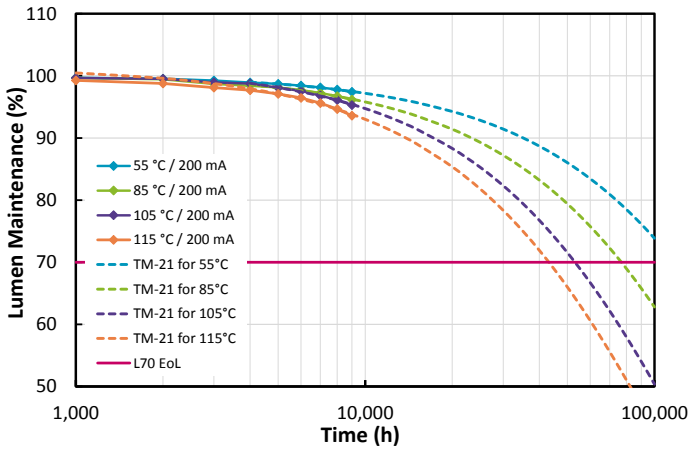
1. General Information

Description of LED light source tested	DURIS® S 8 GW P9LT31.EM
Sample size per temperature	22
LED drive current used in the test	200 mA
Current per die	200 mA
Test duration	9,000 hours
Test duration used for projection	4,000 hours to 9,000 hours

2. Projection Data

	I	II	III	IV
Case temperature (solder point)	T_S = 55°C	T_S = 85°C	T_S = 105°C	T_S = 115°C
α	3.051E-06	4.693E-06	7.015E-06	8.572E-06
B	1.002E+00	1.004E+00	1.016E+00	1.013E+00
Reported L70	> 54,000 hours	> 54,000 hours	53,141 hours	43,155 hours

3. Graphic chart



OSRAM Opto Semiconductors

Appendix B:
Additional Models Covered By Testing

The 9 September 2011 ENERGY STAR® *Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products* defines conditons for which a LM-80 report may be applied to cover models that have not been directly tested.

The following list of models may be covered by the test results in this report:

- DURIS® S 8 GW P9LT31.EM with CCT 2700 K – 6500 K up to 200mA
- DURIS® S 8 GW P9LT32.EM with CCT 2700 K – 6500 K up to 1000mA
- DURIS® S 8 GW P9LT31.CM with CCT 2700 K – 4000 K up to 200mA
- DURIS® S 8 GW P9LT31.PM with CCT 4000 K – 6500 K up to 200mA
- DURIS® S 8 GW P9LT32.PM with CCT 3000 K – 6500 K up to 1000mA
- DURIS® S 8 GW P9LR31.EM with CCT 2700 K – 6500 K up to 200mA
- DURIS® S 8 GW P9LR33.CM with CCT 2700 K – 4000 K up to 200mA
- DURIS® S 8 GW P9LR31.PM with CCT 4000 K – 6500 K up to 200mA
- DURIS® S 8 GW P9LR32.EM with CCT 2700 K – 6500 K up to 800mA
- DURIS® S 8 GW P9LM31.EM with CCT 2700 K – 6500 K up to 200mA

Note: For resulting current-per-die of 200mA, device has to be used at maximum driving current as shown respectively.

Disclaimer

Please carefully read the below terms and conditions before using the Information.
If you do not agree with any of these terms and conditions, do not use the Information.

The Information contained in this document does not constitute an independent warranty. The committed behavior is described in the Product data sheet.

Further explanations:
Data: The Data used in this Document consider the reliability test results under the mentioned driving conditions only. For Product information on the maximum operating conditions please refer to the Product data sheet or contact your local sales partner.
Conditions: The conditions for the generation of the data are as follows:
1. The Data and curves shown in this Document are based on experiments carried out under laboratory conditions on a random sample size of LED with readouts at discrete readout times (where applicable). Thus, the Data above represent a limited number of production lots only and may differ between different assembly lots over time (including chip or package changes). Thus, the behavior of the LED in the final application may differ from the Data. The behavior of the LED at conditions or readout times deviating from those stated above may not be deduced from the Data.
2. For long term operation additional failure modes of the chip or package can occur which are not shown in this Document.
3. Possible differences in the thermal management of OSRAM OS and customer's setup may lead to a different aging behavior.
4. The lifetime projection data presented in this Document has been evaluated in accordance with the lifetime extrapolation method described and defined in IES TM-21-11. The lifetime projection is based on the Data shown in this Document. The Data had been collected and assembled according to IES LM-80-08.

END OF DOCUMENT

OSRAM Opto Semiconductors
GmbH

Head Office:

Leibnizstrasse 4
93055 Regensburg, Germany
Phone +49 941 850-5
Fax +49 941 850-1002
www.osram-os.com

OSRAM
Opto Semiconductors