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DURIS[®] S 8 White (CCT 4000 K – 6500 K)

IES LM-80-15 Test Report

Test Documentation No.: 180260W2 (Document No.: OSRM020-03-140) – 10th Oct 2018



LM80 9000 Hour Interval Test Report

IES LM-80-15 Approved Method for Measuring Lumen Maintenance of LED Light Sources

CSA Group Report: OSRM020-03-140

September 7, 2018

Manufacturer: **OSRAM**

Models tested: **GW P9LT31.PM**

Test conditions: 24 devices @ 55.0 C, 0.150 A
24 devices @ 85.0 C, 0.150 A
24 devices @ 105.0 C, 0.150 A

Prepared for:

OSRAM Opto Semiconductors (Malaysia) Sdn.
Bayan Lepas Free Industrial Zone Phase 1,
11900 Bayan Lepas, Penang, Malaysia

Attn:

Test report prepared by:



Project Engineer,
Test and Measurement Services

Testing performed by:

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Redmond, WA 98052
425-605-8500

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Test report approved by:



Project Manager,
Test and Measurement Services

1.0 Statement of test conditions, summary of results, and reporting requirements:

Part number: GW P9LT31.PM					
Life test conditions				Summary of results	
Test condition	Drive current (A)	Case temperature (°C)	Elapsed life test time (hrs)	Average lumen maintenance (%)	Average chromaticity shift ($\Delta u'v'$)
TC1	0.150	55	9000	100.1	0.0003
TC2	0.150	85	9000	98.4	0.0009
TC3	0.150	105	9000	94.8	0.0027
LM80-15 Reporting requirements					
1. Number of samples tested:			24 per test condition		
2. Description of LED light sources			LED Package ¹		
3. Description of auxiliary equipment			see section 6.1 below		
4. Operating cycle			LED packages are driven at constant current for life test and are pulsed for photometric test.		
5. Ambient conditions, airflow, relative humidity			LED's are operated on controlled thermal plates in an environment that complies with the requirements given in Section 4.4 of LM80-15. Case temperature (Ts): controlled to within -2°C, Surrounding air temp: controlled to within -5°C of Ts, Humidity: < 65 RH, No forced air flow		
6. Case temperature (test point temperature)			See summary table above for test conditions. The temperature measurement point is shown in Sec. 6.3.		
7. Drive current during life test			see summary table above		
8. Initial luminous flux and forward voltage			see data tables for individual test conditions		
9. Lumen maintenance data for each individual LED light source			see data tables for individual test conditions		
10. Observation of LED light source failures			see data tables for individual test conditions		
11. LED light source monitoring intervals			see data tables for individual test conditions		
12. Photometric measurement uncertainty			k=2 expanded measurement uncertainty for relative luminous flux measurements is $\pm 2.0\%$		
13. Chromaticity shift reported over the measurement time			see data tables for individual test conditions		
14. Test start date			August 11, 2017		
15. ANSI target and calculated CCT values			see data tables		

Notes:

- per ANSI/IESNA RP-16-05 Addendum b, *Nomenclature and Definitions for Illuminating Engineering*

TABLE 1.1 - Initial ANSI Target & Calculated CCT Results

GW P9LT31.PM

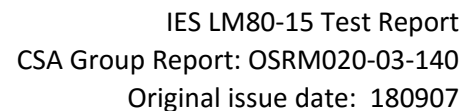
Load board ID	Device number	Zero hour measurements		Load board ID	Device number	Zero hour measurements		Load board ID	Device number	Zero hour measurements	
		ANSI Target* CCT (K)	Initial Calculated CCT (K)			ANSI Target* CCT (K)	Initial Calculated CCT (K)			ANSI Target* CCT (K)	Initial Calculated CCT (K)
4F00001072F3031C	D1	3985±275	3960	1E00001072F4031C	D1	3985±275	3948	380000108FC7031C	D1	3985±275	3987
	D3	3985±275	3981		D2	3985±275	3960		D2	3985±275	3978
	D4	3985±275	3963		D3	3985±275	3944		D3	3985±275	4000
	D6	3985±275	3981		D4	3985±275	3991		D4	3985±275	3963
	D7	3985±275	3973		D5	3985±275	3974		D5	3985±275	3949
					D7	3985±275	3976		D7	3985±275	3994
					D8	3985±275	3945				
950000109222031C	D1	3985±275	3981	990000109239031C	D1	3985±275	3944	8900001076BF031C	D2	3985±275	3986
	D2	3985±275	3987		D2	3985±275	3973		D3	3985±275	3972
	D3	3985±275	3987		D3	3985±275	3961		D4	3985±275	3972
	D4	3985±275	3932		D4	3985±275	3951				
	D5	3985±275	3971		D5	3985±275	4011				
	D6	3985±275	3948		D6	3985±275	3984				
	D7	3985±275	3985		D7	3985±275	3988				
E800001096E5031C	D8	3985±275	3944	B200001075D1031C	D8	3985±275	3977	B80000107779031C			
	D2	3985±275	3963		D1	3985±275	3962		D1	3985±275	3985
	D4	3985±275	3994		D2	3985±275	3970		D2	3985±275	3984
	D6	3985±275	3984		D3	3985±275	3976		D3	3985±275	3973
	D7	3985±275	3968		D4	3985±275	3965		D4	3985±275	3967
	D8	3985±275	3987		D8	3985±275	3973		D5	3985±275	3989
									D6	3985±275	3990
									D7	3985±275	3997
									D8	3985±275	3983

* target CCT as defined in ANSI C78.377-2008

Load board ID	Device number	Zero hour measurements	
		ANSI Target* CCT (K)	Initial Calculated CCT (K)
EE0000109664031C	D1	3985±275	3945
	D2	3985±275	3963
	D3	3985±275	3991
	D4	3985±275	3962
	D6	3985±275	3977
	D7	3985±275	3965
D80000109790031C	D1	3985±275	3985
	D3	3985±275	3972
	D6	3985±275	3969
	D8	3985±275	3994
FF0000109664031C	D1	3985±275	3942
	D2	3985±275	3980
	D4	3985±275	4013
	D5	3985±275	3990
	D6	3985±275	4020
	D7	3985±275	3948
	D8	3985±275	3980

* target CCT as defined in ANSI C78.377-2008

Test Condition 1 55 °C 0.150 A														
TABLE 2.0 - LUMEN MAINTENANCE RESULTS														
Test Condition 1 55 °C 0.150 A														
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Flux (lm)	Vf (V)	Lumen Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
4F00001072F3031C	D1	674.69	30.69	99.7	100.0	99.8	100.2	100.2	100.2	100.2	100.0	100.0	100.2	99.9
	D3	661.15	31.05	99.5	99.9	99.8	100.3	100.4	100.5	100.5	100.4	100.4	100.7	100.3
	D4	673.82	31.07	99.5	99.9	99.9	100.4	100.5	100.6	100.6	100.4	100.4	100.7	100.3
	D6	672.65	30.65	99.8	100.0	99.8	100.1	100.1	100.2	100.2	100.0	99.9	100.1	99.7
	D7	678.40	30.92	99.8	100.0	99.8	100.2	100.2	100.3	100.3	100.1	100.0	100.3	99.9
950000109222031C	D1	649.61	30.90	99.9	100.1	100.0	100.4	100.4	100.6	100.6	100.4	100.4	100.6	100.3
	D2	654.60	30.60	99.5	99.8	99.7	100.3	100.3	100.4	100.5	100.3	100.2	100.5	100.2
	D3	648.86	31.03	99.8	100.1	99.9	100.4	100.4	100.5	100.6	100.4	100.4	100.6	100.3
	D4	657.98	30.95	99.7	100.0	99.8	100.2	100.3	100.5	100.4	100.3	100.2	100.4	100.0
	D5	647.86	31.02	99.8	100.0	99.9	100.3	100.2	100.4	100.3	100.2	100.1	100.3	100.0
	D6	656.44	30.98	100.2	100.5	100.4	100.9	100.9	101.0	101.1	100.9	100.9	101.1	100.8
	D7	654.64	30.97	99.9	100.1	99.9	100.2	100.2	100.0	100.2	100.0	100.0	100.1	99.8
	D8	654.36	30.92	99.8	100.1	99.9	100.3	100.3	100.4	100.4	100.3	100.1	100.5	100.1
E800001096E5031C	D2	652.07	31.06	99.4	100.0	99.9	100.5	100.5	100.6	100.6	100.4	100.4	100.4	100.2
	D4	654.83	30.77	99.9	100.2	99.8	100.4	100.4	100.6	100.6	100.4	100.3	100.4	100.2
	D6	642.49	30.94	99.6	99.9	99.6	100.1	100.0	100.2	100.1	99.9	99.9	99.9	99.7
	D7	651.05	30.95	100.2	100.6	100.2	100.7	100.7	100.9	100.7	100.7	100.6	100.8	100.6
	D8	650.20	30.97	100.0	100.2	99.9	100.5	100.4	100.6	100.6	100.4	100.4	100.4	100.3



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Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Flux (lm)	Vf (V)	Lumen Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
EE0000109664031C	D1	643.23	30.92	99.6	99.8	99.4	100.1	99.9	100.0	100.0	99.8	99.8	99.9	99.7
	D2	651.21	30.96	100.2	100.4	100.0	100.6	100.6	100.7	100.8	100.6	100.6	100.7	100.5
	D3	658.46	30.83	99.8	100.1	99.7	100.3	100.3	100.5	100.5	100.3	100.3	100.4	100.2
	D4	647.87	30.80	99.8	100.4	99.9	100.5	100.6	100.7	100.7	100.5	100.5	100.6	100.4
	D6	650.33	30.97	99.6	99.8	99.4	99.9	99.9	100.0	100.0	99.8	99.8	99.8	99.6
	D7	654.06	30.96	99.4	99.7	99.3	99.9	99.8	99.8	99.6	99.4	99.3	99.4	99.2
n				24	24	24	24	24	24	24	24	24	24	24
				99.8	100.1	99.8	100.3	100.3	100.4	100.4	100.3	100.2	100.4	100.1
				99.8	100.0	99.9	100.3	100.3	100.5	100.5	100.3	100.3	100.4	100.2
				0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
				99.4	99.7	99.3	99.9	99.8	99.8	99.6	99.4	99.3	99.4	99.2
				100.2	100.6	100.4	100.9	100.9	101.0	101.1	100.9	100.9	101.1	100.8

Test Condition 1 55 °C 0.150 A															
TABLE 2.1 - CHROMATICITY SHIFT RESULTS															
Test Condition 1 55 °C 0.150 A															
Load board ID	Device number	Zero hour measurements			Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		u'	v'		Chromaticity shift ($\Delta u'v'$)										
					168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
4F00001072F3031C	D1	0.2251	0.5040		0.0003	0.0002	0.0004	0.0002	0.0001	0.0000	0.0001	0.0000	0.0001	0.0002	0.0003
	D3	0.2253	0.5024		0.0003	0.0001	0.0004	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0003
	D4	0.2248	0.5044		0.0003	0.0001	0.0004	0.0002	0.0001	0.0001	0.0000	0.0000	0.0002	0.0003	0.0003
	D6	0.2249	0.5032		0.0002	0.0001	0.0003	0.0001	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003
	D7	0.2251	0.5033		0.0003	0.0001	0.0004	0.0001	0.0000	0.0001	0.0000	0.0001	0.0002	0.0003	0.0003
950000109222031C	D1	0.2253	0.5024		0.0003	0.0002	0.0004	0.0002	0.0002	0.0001	0.0001	0.0000	0.0002	0.0002	0.0002
	D2	0.2253	0.5020		0.0003	0.0002	0.0005	0.0001	0.0001	0.0001	0.0000	0.0000	0.0002	0.0003	0.0003
	D3	0.2251	0.5023		0.0003	0.0002	0.0005	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0003
	D4	0.2258	0.5040		0.0002	0.0002	0.0004	0.0001	0.0000	0.0001	0.0000	0.0001	0.0003	0.0003	0.0004
	D5	0.2253	0.5030		0.0004	0.0002	0.0005	0.0002	0.0002	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002
	D6	0.2250	0.5050		0.0003	0.0002	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002
	D7	0.2250	0.5026		0.0003	0.0002	0.0005	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0002	0.0002
	D8	0.2260	0.5029		0.0002	0.0002	0.0004	0.0001	0.0001	0.0001	0.0000	0.0000	0.0006	0.0006	0.0005
E800001096E5031C	D2	0.2254	0.5030		0.0003	0.0001	0.0003	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003
	D4	0.2252	0.5017		0.0002	0.0001	0.0005	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002
	D6	0.2252	0.5024		0.0002	0.0001	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003
	D7	0.2253	0.5031		0.0003	0.0001	0.0005	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002
	D8	0.2248	0.5030		0.0002	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0003	0.0004

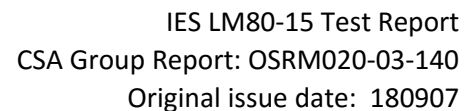
TABLE 2.1 - CHROMATICITY SHIFT RESULTS

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Test Condition 1 55 °C 0.150 A

Load board ID	Device number	Zero hour measurements			Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		u'	v'		Chromaticity shift ($\Delta u'v'$)										
					168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
EE0000109664031C	D1	0.2257	0.5035		0.0003	0.0003	0.0005	0.0002	0.0002	0.0001	0.0001	0.0000	0.0001	0.0002	0.0003
	D2	0.2252	0.5036		0.0003	0.0002	0.0005	0.0002	0.0002	0.0001	0.0000	0.0000	0.0001	0.0002	0.0001
	D3	0.2250	0.5023		0.0003	0.0002	0.0005	0.0002	0.0002	0.0001	0.0000	0.0000	0.0002	0.0002	0.0002
	D4	0.2256	0.5028		0.0003	0.0002	0.0004	0.0002	0.0001	0.0001	0.0000	0.0001	0.0001	0.0002	0.0002
	D6	0.2250	0.5033		0.0003	0.0002	0.0004	0.0002	0.0001	0.0001	0.0000	0.0001	0.0001	0.0002	0.0002
	D7	0.2254	0.5030		0.0003	0.0002	0.0004	0.0001	0.0002	0.0003	0.0002	0.0002	0.0002	0.0004	0.0005
n					24	24	24	24	24	24	24	24	24	24	24
mean					0.0003	0.0002	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0003
median					0.0003	0.0002	0.0004	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003
std. dev.					0.0000	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001
min					0.0002	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001
max					0.0004	0.0003	0.0005	0.0002	0.0002	0.0003	0.0002	0.0002	0.0006	0.0006	0.0005

Test Condition 1 55 °C 0.150 A														
TABLE 2.2 - FORWARD VOLTAGE MAINTENANCE RESULTS														
Test Condition 1 55 °C 0.150 A														
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Vf (V)		Forward Voltage Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
4F00001072F3031C	D1		30.69	99.78	99.86	99.88	100.01	100.06	100.10	100.13	100.17	100.20	100.27	100.29
	D3		31.05	99.93	99.98	99.98	100.06	100.09	100.13	100.13	100.15	100.16	100.19	100.20
	D4		31.07	100.02	100.12	100.14	100.29	100.35	100.41	100.44	100.49	100.50	100.55	100.57
	D6		30.65	99.80	99.88	99.92	100.07	100.14	100.20	100.25	100.29	100.33	100.39	100.43
	D7		30.92	99.76	99.79	99.81	99.92	99.97	100.01	100.05	100.08	100.11	100.15	100.20
950000109222031C	D1		30.90	100.11	100.22	100.27	100.42	100.48	100.50	100.53	100.57	100.59	100.64	100.67
	D2		30.60	99.89	99.94	99.94	100.03	100.08	100.10	100.13	100.15	100.18	100.20	100.22
	D3		31.03	100.01	100.09	100.13	100.24	100.31	100.32	100.35	100.38	100.40	100.43	100.45
	D4		30.95	99.98	100.05	100.08	100.17	100.22	100.23	100.24	100.26	100.28	100.31	100.35
	D5		31.02	100.12	100.20	100.25	100.36	100.40	100.44	100.46	100.48	100.50	100.54	100.56
	D6		30.98	99.95	100.00	100.03	100.13	100.16	100.19	100.21	100.23	100.25	100.28	100.31
	D7		30.97	99.89	100.00	100.06	100.24	100.33	100.38	100.46	100.51	100.55	100.61	100.66
	D8		30.92	99.92	99.97	100.00	100.08	100.12	100.14	100.17	100.19	100.21	100.23	100.25
E800001096E5031C	D2		31.06	99.85	99.87	99.88	99.95	99.98	100.01	100.03	100.04	100.06	100.08	100.10
	D4		30.77	99.92	99.98	100.01	100.13	100.19	100.23	100.26	100.31	100.32	100.34	100.38
	D6		30.94	100.13	100.22	100.28	100.38	100.43	100.47	100.49	100.52	100.54	100.57	100.60
	D7		30.95	99.95	100.00	100.03	100.12	100.16	100.20	100.21	100.24	100.26	100.29	100.32
	D8		30.97	100.02	100.09	100.13	100.26	100.31	100.36	100.38	100.41	100.44	100.47	100.50



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Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Vf (V)		Forward Voltage Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
EE0000109664031C	D1		30.92	100.13	100.22	100.25	100.40	100.43	100.44	100.47	100.50	100.50	100.57	100.57
	D2		30.96	99.97	99.99	100.01	100.11	100.15	100.18	100.20	100.22	100.25	100.27	100.29
	D3		30.83	99.92	99.97	99.99	100.08	100.11	100.13	100.15	100.17	100.22	100.21	100.23
	D4		30.80	99.91	99.98	100.02	100.12	100.18	100.22	100.26	100.31	100.33	100.36	100.39
	D6		30.97	100.10	100.17	100.21	100.32	100.37	100.40	100.43	100.45	100.47	100.50	100.52
	D7		30.96	99.79	99.78	99.78	99.85	99.84	99.85	99.86	99.87	99.87	99.88	99.89
	n			24	24	24	24	24	24	24	24	24	24	24
	mean			100.0	100.0	100.0	100.2	100.2	100.2	100.3	100.3	100.3	100.3	100.4
	median			99.9	100.0	100.0	100.1	100.2	100.2	100.2	100.3	100.3	100.3	100.4
	std. dev.			0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	min			99.8	99.8	99.8	99.8	99.8	99.9	99.9	99.9	99.9	99.9	99.9
	max			100.1	100.2	100.3	100.4	100.5	100.5	100.5	100.6	100.6	100.6	100.7

Test Condition 2 85 °C 0.150 A														
TABLE 3.0 - LUMEN MAINTENANCE RESULTS														
Test Condition 2 85 °C 0.150 A														
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Flux (lm)	Vf (V)	Lumen Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
1E00001072F4031C	D1	668.30	30.79	99.6	100.1	99.9	99.9	99.6	99.4	99.2	98.9	98.9	98.8	98.6
	D2	671.19	31.05	99.2	99.8	99.7	99.9	99.6	99.5	99.4	99.0	99.1	98.9	98.7
	D3	664.07	30.91	98.9	99.5	99.4	99.4	99.1	99.1	98.9	98.6	98.7	98.5	98.3
	D4	664.97	31.08	99.1	99.5	99.4	99.4	99.1	99.0	98.9	98.6	98.6	98.4	98.3
	D5	665.79	30.86	99.2	99.7	99.5	99.6	99.3	99.2	99.0	98.7	98.7	98.6	98.5
	D7	673.12	31.09	99.2	99.6	99.4	99.5	99.2	99.0	98.9	98.6	98.6	98.4	98.1
	D8	678.20	30.96	99.4	99.8	99.7	99.7	99.4	99.3	99.1	98.8	98.8	98.5	98.3
990000109239031C	D1	655.16	30.91	99.7	100.2	100.0	100.1	99.7	99.7	99.5	99.3	99.2	99.0	98.8
	D2	676.84	30.72	99.5	100.0	99.8	99.8	99.5	99.4	99.2	98.9	98.8	97.8	96.6
	D3	669.31	31.05	99.2	99.9	99.9	100.0	99.8	99.7	99.6	99.3	99.3	98.9	98.4
	D4	663.98	30.88	99.6	100.1	99.8	99.9	99.5	99.4	99.2	98.9	98.9	98.5	97.3
	D5	659.52	31.03	99.2	99.8	99.7	100.0	99.7	99.6	99.5	99.2	99.2	99.0	98.9
	D6	669.83	30.93	99.5	100.0	99.6	99.7	99.3	99.2	99.0	98.7	98.7	98.4	97.8
	D7	670.68	30.64	99.2	99.8	99.5	99.5	99.2	99.0	98.9	98.6	98.6	98.3	98.0
	D8	672.50	30.95	99.2	99.8	99.5	99.6	99.2	99.0	98.9	98.6	98.6	98.4	98.2
B200001075D1031C	D1	670.35	30.91	99.6	100.1	99.8	99.8	99.3	99.1	98.9	98.6	98.6	98.3	98.2
	D2	666.45	30.71	99.2	99.8	99.5	99.6	99.1	98.9	98.8	98.5	98.6	98.2	98.0
	D3	667.95	31.06	99.7	100.2	100.0	100.1	99.8	99.6	99.5	99.2	99.2	98.9	98.6
	D4	659.84	30.82	99.1	99.9	99.6	99.8	99.4	99.2	99.1	98.8	98.8	98.6	98.4
	D8	660.63	30.73	99.2	100.0	99.8	100.0	99.6	99.5	99.4	99.0	99.1	98.9	98.7

TABLE 3.0 - LUMEN MAINTENANCE RESULTS

GW P9LT31.PM

Test Condition 2 85 °C 0.150 A

Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Flux (lm)	Vf (V)	Lumen Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
D80000109790031C	D1	653.52	30.85	99.6	100.1	100.2	100.1	99.9	99.6	99.7	99.5	99.4	99.4	99.3
	D3	650.61	30.72	99.7	100.1	100.3	100.2	99.8	99.8	99.8	99.6	99.5	99.4	99.4
	D6	655.65	30.81	99.3	99.8	99.9	99.7	99.1	99.3	99.2	99.0	98.9	98.7	98.6
	D8	647.78	30.99	99.6	100.0	100.1	100.1	99.8	99.6	99.5	99.2	99.2	99.1	98.9
n				24	24	24	24	24	24	24	24	24	24	24
mean				99.4	99.9	99.7	99.8	99.5	99.3	99.2	98.9	98.9	98.7	98.4
median				99.3	99.9	99.7	99.8	99.5	99.3	99.2	98.9	98.9	98.6	98.4
std. dev.				0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.6
min				98.9	99.5	99.4	99.4	99.1	98.9	98.8	98.5	98.6	97.8	96.6
max				99.7	100.2	100.3	100.2	99.9	99.8	99.8	99.6	99.5	99.4	99.4

Test Condition 2 85 °C 0.150 A															
TABLE 3.1 - CHROMATICITY SHIFT RESULTS															
Test Condition 2 85 °C 0.150 A															
Load board ID	Device number	Zero hour measurements			Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		u'	v'		Chromaticity shift ($\Delta u'v'$)										
					168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
1E00001072F4031C	D1	0.2254	0.5041		0.0005	0.0003	0.0004	0.0004	0.0004	0.0005	0.0005	0.0006	0.0007	0.0007	0.0007
	D2	0.2249	0.5044		0.0006	0.0004	0.0005	0.0004	0.0004	0.0005	0.0006	0.0006	0.0007	0.0007	0.0008
	D3	0.2255	0.5041		0.0006	0.0004	0.0006	0.0004	0.0005	0.0006	0.0006	0.0007	0.0007	0.0008	0.0007
	D4	0.2250	0.5025		0.0005	0.0003	0.0005	0.0004	0.0004	0.0005	0.0006	0.0007	0.0007	0.0008	0.0008
	D5	0.2246	0.5042		0.0006	0.0004	0.0005	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007	0.0007
	D7	0.2246	0.5041		0.0006	0.0003	0.0005	0.0003	0.0004	0.0005	0.0005	0.0005	0.0006	0.0007	0.0007
	D8	0.2256	0.5037		0.0005	0.0003	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0007	0.0007	0.0007
990000109239031C	D1	0.2259	0.5031		0.0005	0.0003	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0006	0.0007	0.0007
	D2	0.2249	0.5037		0.0004	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0004	0.0006	0.0016	0.0033
	D3	0.2256	0.5028		0.0005	0.0003	0.0003	0.0003	0.0003	0.0003	0.0004	0.0004	0.0005	0.0008	0.0011
	D4	0.2249	0.5049		0.0004	0.0002	0.0003	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005	0.0007	0.0021
	D5	0.2247	0.5017		0.0004	0.0003	0.0003	0.0003	0.0003	0.0004	0.0005	0.0005	0.0007	0.0008	0.0008
	D6	0.2248	0.5033		0.0004	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0010
	D7	0.2247	0.5033		0.0006	0.0004	0.0005	0.0005	0.0006	0.0006	0.0006	0.0007	0.0007	0.0008	0.0010
	D8	0.2246	0.5040		0.0006	0.0004	0.0006	0.0005	0.0005	0.0006	0.0006	0.0007	0.0008	0.0008	0.0008
B200001075D1031C	D1	0.2247	0.5046		0.0004	0.0003	0.0004	0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0008	0.0008
	D2	0.2250	0.5037		0.0007	0.0005	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	0.0008	0.0009	0.0008
	D3	0.2247	0.5038		0.0005	0.0003	0.0005	0.0004	0.0004	0.0004	0.0006	0.0006	0.0007	0.0007	0.0008
	D4	0.2255	0.5028		0.0005	0.0004	0.0005	0.0004	0.0004	0.0004	0.0006	0.0006	0.0007	0.0007	0.0007
	D8	0.2255	0.5022		0.0005	0.0003	0.0004	0.0003	0.0003	0.0004	0.0004	0.0004	0.0005	0.0006	0.0006

TABLE 3.1 - CHROMATICITY SHIFT RESULTS

GW P9LT31.PM

Test Condition 2 85 °C 0.150 A

Load board ID	Device number	Zero hour measurements			Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		u'	v'		Chromaticity shift ($\Delta u'v'$)										
					168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
D80000109790031C	D1	0.2253	0.5020		0.0004	0.0003	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0005	0.0006	0.0006
	D3	0.2252	0.5031		0.0004	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	0.0006	0.0006	0.0006
	D6	0.2259	0.5017		0.0004	0.0002	0.0003	0.0002	0.0003	0.0004	0.0004	0.0004	0.0005	0.0006	0.0006
	D8	0.2252	0.5017		0.0005	0.0003	0.0005	0.0004	0.0004	0.0005	0.0005	0.0006	0.0008	0.0008	0.0008
n					24	24	24	24	24	24	24	24	24	24	24
mean					0.0005	0.0003	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0006	0.0007	0.0009
median					0.0005	0.0003	0.0004	0.0004	0.0004	0.0004	0.0005	0.0006	0.0007	0.0007	0.0008
std. dev.					0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0006
min					0.0004	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006
max					0.0007	0.0005	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	0.0008	0.0016	0.0033

Test Condition 2 85 °C 0.150 A														
TABLE 3.2 - FORWARD VOLTAGE MAINTENANCE RESULTS														
Test Condition 2 85 °C 0.150 A														
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Vf (V)		Forward Voltage Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
1E00001072F4031C	D1		30.79	99.96	100.16	100.32	100.58	100.83	100.92	101.06	101.19	101.31	101.51	101.59
	D2		31.05	100.07	100.21	100.29	100.45	100.55	100.62	100.67	100.71	100.78	100.82	100.85
	D3		30.91	99.92	99.97	100.01	100.10	100.16	100.20	100.24	100.27	100.30	100.33	100.40
	D4		31.08	99.92	100.00	100.07	100.20	100.27	100.34	100.41	100.43	100.48	100.51	100.59
	D5		30.86	99.93	99.98	100.00	100.11	100.15	100.20	100.22	100.25	100.29	100.32	100.35
	D7		31.09	100.00	100.08	100.15	100.30	100.33	100.42	100.43	100.46	100.50	100.53	100.56
	D8		30.96	99.83	99.93	100.02	100.24	100.33	100.46	100.53	100.57	100.65	100.72	100.79
990000109239031C	D1		30.91	99.98	100.05	100.13	100.21	100.27	100.35	100.34	100.37	100.42	100.45	100.49
	D2		30.72	99.83	99.96	100.06	100.24	100.37	100.50	100.54	100.61	100.70	100.77	100.83
	D3		31.05	100.08	100.22	100.30	100.45	100.54	100.60	100.65	100.68	100.74	100.78	100.82
	D4		30.88	99.84	99.98	100.08	100.28	100.41	100.52	100.60	100.67	100.77	100.84	100.91
	D5		31.03	99.97	100.03	100.07	100.17	100.22	100.26	100.29	100.31	100.36	100.39	100.43
	D6		30.93	100.04	100.12	100.16	100.28	100.33	100.36	100.38	100.40	100.44	100.47	100.51
	D7		30.64	99.99	100.07	100.13	100.27	100.35	100.41	100.45	100.49	100.56	100.59	100.64
	D8		30.95	99.97	100.05	100.11	100.24	100.31	100.38	100.41	100.44	100.49	100.53	100.57
B200001075D1031C	D1		30.91	100.00	100.07	100.12	100.45	100.30	100.30	100.33	100.36	100.40	100.41	100.45
	D2		30.71	99.99	100.08	100.15	100.29	100.39	100.43	100.48	100.51	100.57	100.59	100.63
	D3		31.06	100.12	100.21	100.26	100.38	100.41	100.47	100.49	100.53	100.56	100.58	100.62
	D4		30.82	100.00	100.14	100.23	100.41	100.49	100.57	100.62	100.67	100.74	100.77	100.83
	D8		30.73	99.92	100.00	100.09	100.18	100.24	100.34	100.34	100.38	100.44	100.45	100.49

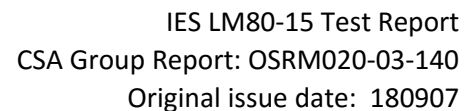
TABLE 3.2 - FORWARD VOLTAGE MAINTENANCE RESULTS

GW P9LT31.PM

Test Condition 2 85 °C 0.150 A

Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Vf (V)		Forward Voltage Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
D80000109790031C	D1		30.85	100.04	100.10	100.17	100.25	100.31	100.30	100.36	100.39	100.41	100.45	100.48
	D3		30.72	99.97	100.07	100.17	100.29	100.36	100.44	100.50	100.55	100.62	100.64	100.69
	D6		30.81	100.01	100.05	100.08	100.15	100.19	100.21	100.23	100.26	100.29	100.30	100.32
	D8		30.99	100.09	100.20	100.27	100.42	100.50	100.56	100.60	100.65	100.74	100.77	100.81
		n		24	24	24	24	24	24	24	24	24	24	24
		mean		100.0	100.1	100.1	100.3	100.4	100.4	100.5	100.5	100.6	100.6	100.7
		median		100.0	100.1	100.1	100.3	100.3	100.4	100.4	100.5	100.5	100.6	100.6
		std. dev.		0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3
		min		99.8	99.9	100.0	100.1	100.2	100.2	100.2	100.3	100.3	100.3	100.3
		max		100.1	100.2	100.3	100.6	100.8	100.9	101.1	101.2	101.3	101.5	101.6

Test Condition 3 105 °C 0.150 A														
TABLE 4.0 - LUMEN MAINTENANCE RESULTS														
Test Condition 3 105 °C 0.150 A														
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Flux (lm)	Vf (V)	Lumen Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
380000108FC7031C	D1	659.30	30.95	99.8	100.0	99.5	98.8	98.4	98.1	97.7	97.4	96.9	96.8	96.6
	D2	661.11	30.98	99.6	99.5	99.0	98.2	97.6	97.3	97.0	96.6	96.0	95.8	95.5
	D3	639.80	30.83	98.8	99.0	98.5	97.7	97.3	96.9	96.5	96.2	95.6	95.5	95.2
	D4	638.05	30.81	98.4	98.6	98.2	97.4	97.0	96.6	96.2	95.9	95.3	95.1	94.6
	D5	634.74	30.86	98.4	98.5	98.0	97.2	96.8	96.4	96.0	95.6	95.0	94.7	94.0
	D7	642.94	30.83	98.8	98.9	98.5	97.8	97.4	97.0	96.6	96.2	95.6	95.4	95.1
8900001076BF031C	D2	672.67	30.97	99.3	99.3	98.8	98.0	97.4	97.0	96.6	96.1	95.7	95.5	95.3
	D3	678.47	30.88	99.4	99.3	98.7	97.7	97.1	96.6	96.2	95.8	95.4	95.3	95.1
	D4	661.51	30.98	99.4	99.3	98.8	98.0	97.4	96.9	96.5	96.1	95.8	95.6	95.4
B80000107779031C	D1	676.34	30.70	99.2	99.2	98.8	98.0	97.4	97.0	96.4	95.9	95.0	93.8	92.6
	D2	668.44	30.99	99.7	99.7	99.3	98.4	97.7	97.2	96.7	96.3	95.9	95.7	95.5
	D3	673.22	30.88	99.5	99.4	99.0	98.1	97.3	96.9	96.4	96.0	95.7	95.5	95.2
	D4	678.03	30.87	99.3	99.2	98.8	98.0	97.4	96.9	96.5	96.0	95.1	93.6	92.3
	D5	658.40	31.02	99.5	99.4	99.0	98.3	97.6	97.2	96.7	96.2	95.5	94.4	93.1
	D6	667.91	30.99	99.1	99.1	98.7	97.9	97.3	96.8	96.4	96.0	95.6	95.4	95.1
	D7	674.55	30.69	99.1	99.1	98.7	97.9	97.3	96.9	96.4	96.0	95.7	95.5	95.1
	D8	666.78	31.07	99.3	99.3	98.9	98.1	97.4	97.0	96.5	96.2	95.8	95.6	95.2



GW P9LT31.PM

Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Flux (lm)	Vf (V)	Lumen Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
FF0000109604031C	D1	644.45	30.73	98.8	98.8	98.3	97.6	96.9	96.5	96.1	95.5	94.9	94.4	93.6
	D2	638.29	30.77	98.5	98.7	98.3	97.6	97.0	96.6	96.1	95.7	95.3	95.0	94.5
	D4	655.19	30.61	99.2	99.3	98.9	98.0	97.4	97.0	96.5	96.1	95.7	95.6	95.3
	D5	654.14	30.98	99.3	99.4	98.9	98.1	97.5	97.2	96.7	96.3	95.9	95.6	95.2
	D6	657.45	31.06	99.0	99.1	98.6	97.7	97.1	96.7	96.3	95.9	95.5	95.2	94.9
	D7	653.83	30.98	99.4	99.6	99.3	98.6	97.8	97.6	97.2	96.8	96.4	96.3	96.1
	D8	659.30	31.14	98.9	99.2	98.9	98.2	97.6	97.1	96.7	96.3	95.9	95.8	95.6
	n			24	24	24	24	24	24	24	24	24	24	24
	mean			99.1	99.2	98.8	98.0	97.4	97.0	96.5	96.1	95.6	95.3	94.8
	median			99.2	99.2	98.8	98.0	97.4	97.0	96.5	96.1	95.7	95.5	95.2
	std. dev.			0.4	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.4	0.7	1.0
	min			98.4	98.5	98.0	97.2	96.8	96.4	96.0	95.5	94.9	93.6	92.3
	max			99.8	100.0	99.5	98.8	98.4	98.1	97.7	97.4	96.9	96.8	96.6

Test Condition 3 105 °C 0.150 A															
TABLE 4.1 - CHROMATICITY SHIFT RESULTS															
Test Condition 3 105 °C 0.150 A															
Load board ID	Device number	Zero hour measurements			Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		u'	v'		Chromaticity shift ($\Delta u'v'$)										
					168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
380000108FC7031C	D1	0.2243	0.5041		0.0004	0.0004	0.0006	0.0010	0.0013	0.0014	0.0016	0.0017	0.0018	0.0019	0.0021
	D2	0.2249	0.5034		0.0005	0.0006	0.0008	0.0011	0.0013	0.0014	0.0016	0.0017	0.0019	0.0021	0.0024
	D3	0.2260	0.4998		0.0005	0.0006	0.0009	0.0012	0.0015	0.0016	0.0018	0.0020	0.0021	0.0022	0.0023
	D4	0.2274	0.4986		0.0006	0.0006	0.0009	0.0013	0.0015	0.0016	0.0018	0.0019	0.0020	0.0020	0.0023
	D5	0.2275	0.4992		0.0006	0.0006	0.0009	0.0013	0.0014	0.0016	0.0017	0.0018	0.0019	0.0020	0.0026
	D7	0.2263	0.4993		0.0006	0.0006	0.0009	0.0012	0.0014	0.0015	0.0018	0.0019	0.0020	0.0020	0.0022
8900001076BF031C	D2	0.2246	0.5035		0.0005	0.0006	0.0009	0.0012	0.0014	0.0016	0.0017	0.0019	0.0020	0.0021	0.0022
	D3	0.2253	0.5028		0.0006	0.0006	0.0010	0.0014	0.0016	0.0018	0.0019	0.0021	0.0021	0.0022	0.0023
	D4	0.2250	0.5036		0.0006	0.0006	0.0009	0.0012	0.0015	0.0016	0.0018	0.0020	0.0021	0.0022	0.0022
B80000107779031C	D1	0.2254	0.5019		0.0006	0.0006	0.0008	0.0011	0.0014	0.0016	0.0018	0.0020	0.0027	0.0043	0.0056
	D2	0.2250	0.5029		0.0005	0.0004	0.0007	0.0011	0.0014	0.0016	0.0018	0.0019	0.0021	0.0022	0.0021
	D3	0.2249	0.5036		0.0005	0.0006	0.0008	0.0012	0.0015	0.0017	0.0018	0.0019	0.0020	0.0021	0.0021
	D4	0.2250	0.5037		0.0005	0.0005	0.0007	0.0010	0.0013	0.0015	0.0016	0.0019	0.0027	0.0048	0.0063
	D5	0.2252	0.5019		0.0006	0.0006	0.0008	0.0011	0.0013	0.0015	0.0017	0.0020	0.0025	0.0041	0.0055
	D6	0.2253	0.5018		0.0005	0.0006	0.0009	0.0012	0.0015	0.0017	0.0019	0.0019	0.0021	0.0021	0.0022
	D7	0.2246	0.5029		0.0006	0.0006	0.0009	0.0012	0.0013	0.0015	0.0017	0.0018	0.0019	0.0020	0.0022
	D8	0.2248	0.5032		0.0006	0.0007	0.0009	0.0012	0.0015	0.0017	0.0019	0.0019	0.0021	0.0022	0.0023

TABLE 4.1 - CHROMATICITY SHIFT RESULTS

GW P9LT31.PM

Test Condition 3 105 °C 0.150 A

Load board ID	Device number	Zero hour measurements			Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		u'	v'		Chromaticity shift ($\Delta u'v'$)										
					168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
FF0000109604031C	D1	0.2275	0.4996		0.0005	0.0006	0.0008	0.0012	0.0014	0.0015	0.0017	0.0019	0.0021	0.0025	0.0031
	D2	0.2267	0.4992		0.0005	0.0005	0.0007	0.0011	0.0015	0.0016	0.0018	0.0019	0.0020	0.0020	0.0023
	D4	0.2252	0.5006		0.0005	0.0005	0.0009	0.0013	0.0015	0.0016	0.0019	0.0020	0.0022	0.0023	0.0024
	D5	0.2263	0.4997		0.0005	0.0006	0.0009	0.0012	0.0015	0.0016	0.0018	0.0019	0.0020	0.0020	0.0021
	D6	0.2255	0.4995		0.0005	0.0006	0.0009	0.0013	0.0016	0.0017	0.0019	0.0019	0.0021	0.0022	0.0022
	D7	0.2253	0.5042		0.0006	0.0005	0.0007	0.0011	0.0014	0.0015	0.0017	0.0017	0.0019	0.0020	0.0021
	D8	0.2251	0.5028		0.0005	0.0005	0.0008	0.0011	0.0014	0.0015	0.0017	0.0018	0.0020	0.0020	0.0021
n					24	24	24	24	24	24	24	24	24	24	24
mean					0.0005	0.0006	0.0008	0.0012	0.0014	0.0016	0.0018	0.0019	0.0021	0.0024	0.0027
median					0.0005	0.0006	0.0009	0.0012	0.0014	0.0016	0.0018	0.0019	0.0021	0.0021	0.0022
std. dev.					0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0008	0.0012
min					0.0004	0.0004	0.0006	0.0010	0.0013	0.0014	0.0016	0.0017	0.0018	0.0019	0.0021
max					0.0006	0.0007	0.0010	0.0014	0.0016	0.0018	0.0019	0.0021	0.0027	0.0048	0.0063

Test Condition 3 105 °C 0.150 A														
TABLE 4.2 - FORWARD VOLTAGE MAINTENANCE RESULTS														
Test Condition 3 105 °C 0.150 A														
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Vf (V)		Forward Voltage Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
380000108FC7031C	D1		30.95	100.24	100.41	100.52	100.74	100.88	100.98	101.08	101.17	101.29	101.36	101.45
	D2		30.98	99.90	99.97	100.06	100.22	100.33	100.43	100.49	100.55	100.62	100.69	100.76
	D3		30.83	100.01	100.03	100.05	100.13	100.15	100.21	100.21	100.23	100.26	100.28	100.31
	D4		30.81	99.98	100.00	100.02	100.09	100.10	100.13	100.15	100.18	100.19	100.20	100.23
	D5		30.86	99.99	99.99	100.02	100.06	100.09	100.16	100.18	100.18	100.20	100.23	100.22
	D7		30.83	100.00	100.01	100.05	100.11	100.12	100.21	100.21	100.22	100.26	100.26	100.31
8900001076BF031C	D2		30.97	99.88	99.94	100.01	100.15	100.27	100.32	100.37	100.43	100.47	100.52	100.56
	D3		30.88	100.05	100.12	100.19	100.31	100.38	100.45	100.49	100.53	100.57	100.62	100.66
	D4		30.98	100.08	100.19	100.31	100.47	100.59	100.69	100.77	100.84	100.92	101.02	101.07
B80000107779031C	D1		30.70	99.91	100.06	100.19	100.45	100.61	100.74	100.86	100.97	101.05	101.18	101.28
	D2		30.99	99.87	99.93	99.99	100.14	100.22	100.29	100.35	100.40	100.44	100.45	100.54
	D3		30.88	100.07	100.14	100.23	100.33	100.41	100.47	100.54	100.57	100.61	100.63	100.70
	D4		30.87	99.91	100.04	100.17	100.41	100.57	100.70	100.83	100.91	101.01	101.11	101.19
	D5		31.02	99.89	99.97	100.04	100.19	100.29	100.37	100.43	100.49	100.56	100.59	100.65
	D6		30.99	100.08	100.24	100.37	100.58	100.72	100.83	100.92	101.01	101.09	101.18	101.29
	D7		30.69	99.94	100.08	100.25	100.47	100.65	100.79	100.90	101.04	101.14	101.24	101.33
	D8		31.07	100.16	100.24	100.29	100.40	100.49	100.54	100.57	100.65	100.72	100.76	100.81

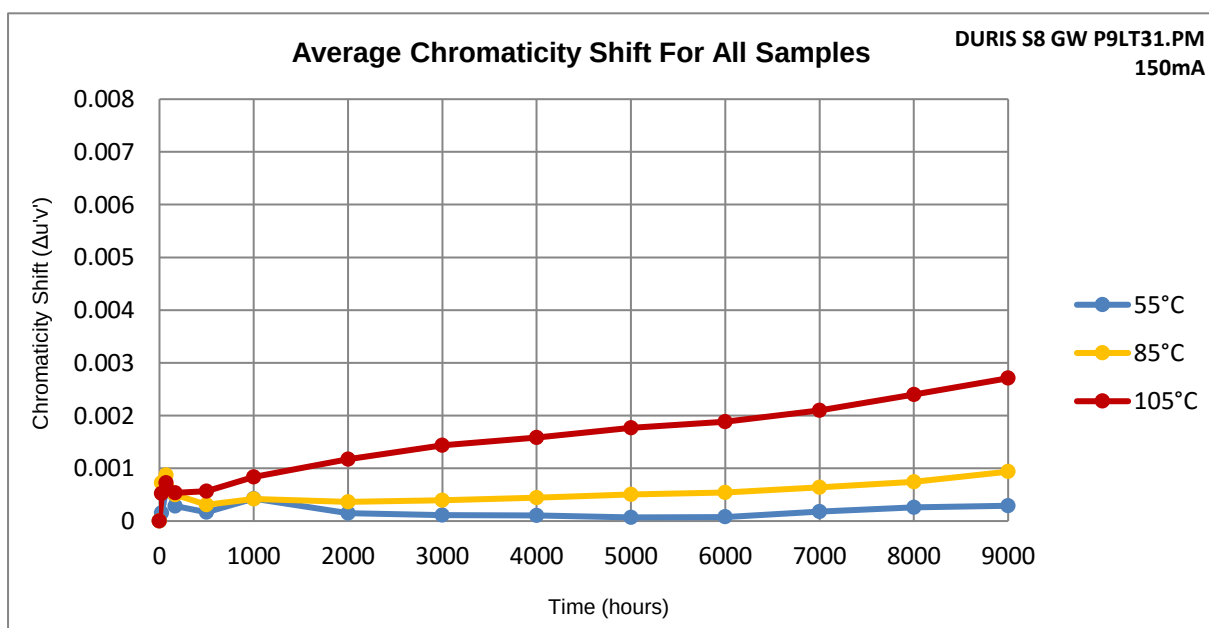
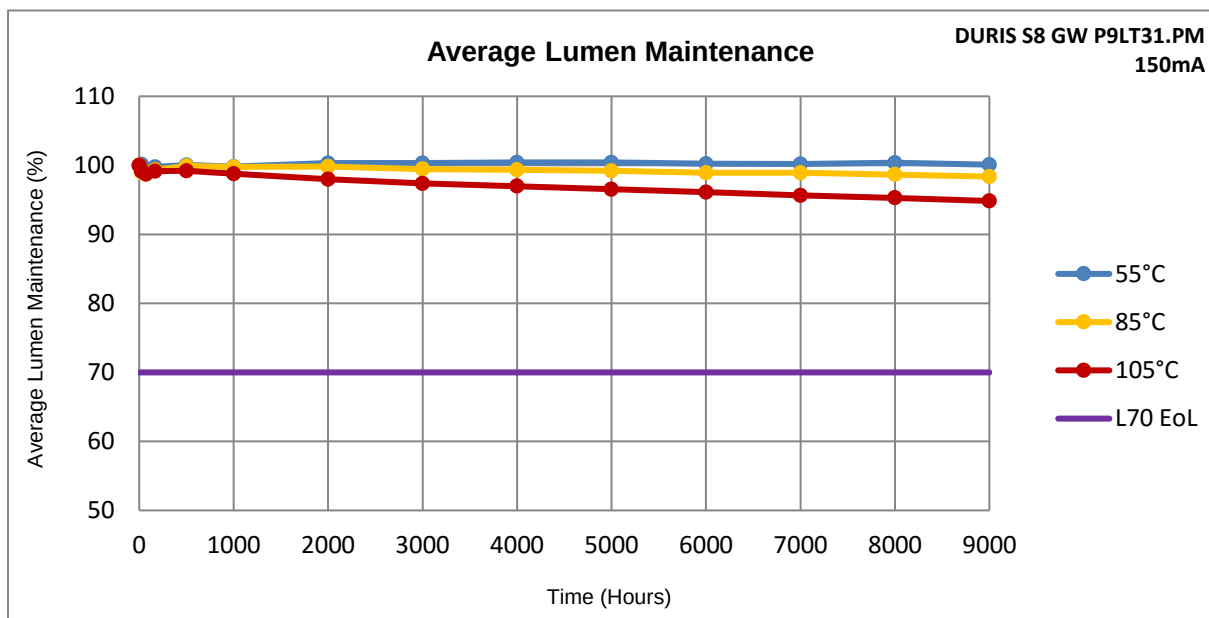
TABLE 4.2 - FORWARD VOLTAGE MAINTENANCE RESULTS

GW P9LT31.PM

Test Condition 3 105 °C 0.150 A

Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.150 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Vf (V)		Forward Voltage Maintenance (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
FF0000109604031C	D1		30.73	100.01	100.01	100.05	100.10	100.13	100.16	100.18	100.20	100.22	100.24	100.27
	D2		30.77	99.97	99.98	100.00	100.05	100.08	100.11	100.14	100.15	100.17	100.19	100.21
	D4		30.61	99.96	100.03	100.11	100.27	100.36	100.42	100.52	100.53	100.59	100.65	100.70
	D5		30.98	99.99	100.04	100.10	100.21	100.29	100.36	100.44	100.46	100.54	100.63	100.66
	D6		31.06	100.03	100.15	100.24	100.41	100.51	100.61	100.70	100.74	100.81	100.87	100.93
	D7		30.98	100.04	100.14	100.24	100.42	100.49	100.66	100.76	100.85	100.93	101.01	101.09
	D8		31.14	100.03	100.11	100.20	100.36	100.43	100.51	100.58	100.62	100.66	100.72	100.76
n				24	24	24	24	24	24	24	24	24	24	24
mean				100.0	100.1	100.2	100.3	100.4	100.5	100.5	100.6	100.6	100.7	100.8
median				100.0	100.0	100.1	100.3	100.4	100.4	100.5	100.5	100.6	100.6	100.7
std. dev.				0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
min				99.9	99.9	100.0	100.1	100.1	100.1	100.1	100.1	100.2	100.2	100.2
max				100.2	100.4	100.5	100.7	100.9	101.0	101.1	101.2	101.3	101.4	101.4

5.0 Charts:



6.0 Additional Information

6.1 Auxilliary Equipment

Lifetest thermal chamber:	Orb Optronix Thermal Platform - resistive heating, liquid cooling, no forced air flow
Lifetest current source:	Orb Optronix 40-100364-101
Photometric test current source:	Keithley 2425
Photometric test thermal control:	Orb Optronix TEC-100
Spectrometer:	Instrument Systems, CAS 140CT
Integrating Sphere:	Gamma Scientific 20"
Photometric reference standards:	LabSphere SCL-50

6.2 Additional Test Information

6.3 Photographs

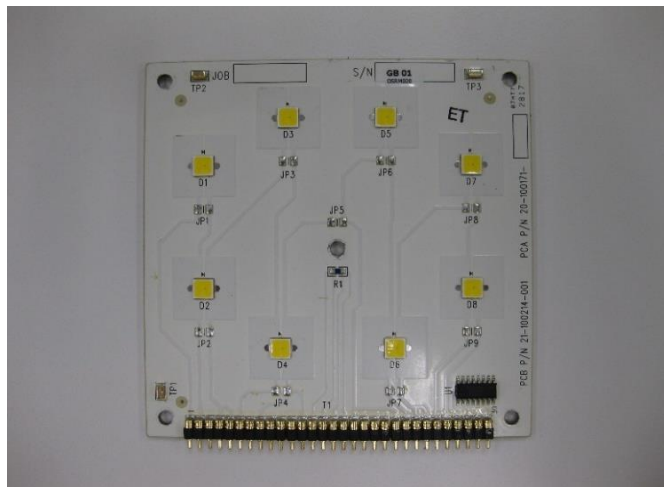


Fig. 1 DURIS S8 load board example.

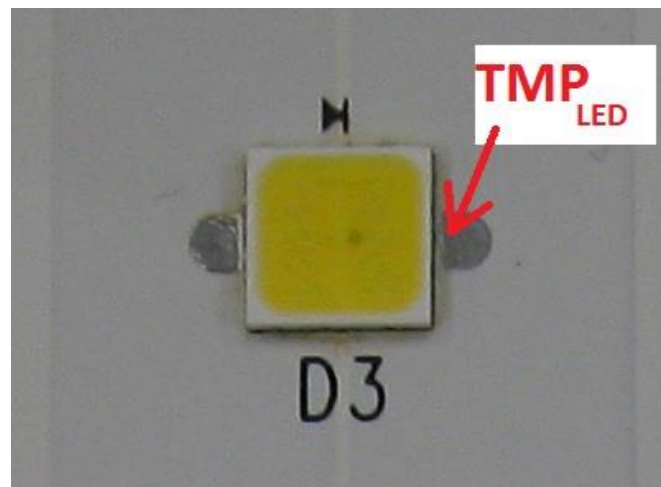


Fig. 2 DURIS S8 type LED model GW P9LT31.PM and temperature measurement point.

6.4 Dimensional Drawing*

* all dimension in millimeters

This report alone may not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- END OF REPORT -

Appendix A: Energy Star® LM-80 Application

ENERGY STAR® LM-80 Cover Page

Administrative Information

Tested subcomponent series	DURIS® S 8
Tested subcomponent model number	GW P9LT31.PM
Report issue date	10 th October 2018
Report revision date (if applicable)	Not Applicable
Testing start date	11 th August 2017
Testing completion date	7 th September 2018
DUT sampling method	According to ANSI/IES LM-80 Test Method

DUT Identification

DUT manufacturer's name	OSRAM Opto Semiconductors (Malaysia) Sdn Bhd
DUT identification	GW P9LT31.PM
Description of DUT	LED Package

DUT Characteristics

Total input power (W)	4.64
Average current density per LED die (mA/mm ²)	300
Average power density per LED Package (W/mm ²)	0.19
Representative CRI (Ra) of the tested sample set	70
Minimum die edge to die edge spacing (mm)	0.2

Appendix B:

Lumen Maintenance Projection (IES TM-21-11)

For Information Only!

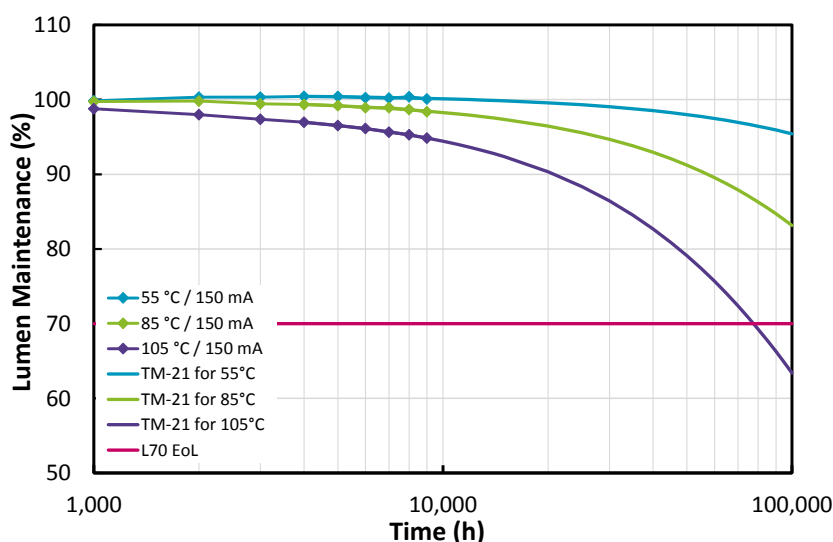
1. General Information

Description of LED light source tested	DURIS® S 8 GW P9LT31.PM
Sample size per temperature	24
LED drive current used in the test	150 mA
Current per die	150 mA
Test duration	9,000 hours
Test duration used for projection	4,000 hours to 9,000 hours

2. Projection Data

	I	II	III
Case temperature (solder point)	$T_S = 55\text{ °C}$	$T_S = 85\text{ °C}$	$T_S = 105\text{ °C}$
α	5.330E-07	1.857E-06	4.429E-06
B	1.006E+00	1.001E+00	9.870E-01
Reported L70	> 54,000 hours	> 54,000 hours	> 54,000 hours

3. Graphic chart



Appendix C: Additional Models Covered By Testing

The 28 September 2017 *ENERGY STAR® Requirements for the Use of LM-80 Data defines conditions for which a LM-80 report is applied to cover models that have not been directly tested.*

The test results in this report applies to the following list of models:

- | | |
|---------------------------|--------------------------------------|
| • DURIS® S 8 GW P9LT31.PM | with CCT 4000 K – 6500 K up to 150mA |
| • DURIS® S 8 GW P9LR31.PM | with CCT 4000 K – 6500 K up to 150mA |
| • DURIS® S 8 GW P9LT32.PM | with CCT 4000 K – 6500 K up to 750mA |
| • DURIS® S 8 GW P9LR34.PM | with CCT 4000 K – 5700 K up to 150mA |
| • DURIS® S 8 GW P9LR35.PM | with CCT 4000 K – 6500 K up to 600mA |

*Note: The devices are stressed and tested at current-per-die of 150mA.
This report can be referenced when the current employed in application is lower than the specified current of the respective devices as stated above.*

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-80-15.

END OF DOCUMENT

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