

OSRAM

IES LM-80-15 Test Report

220199W2 – 2025-Mar-17

DURIS[®] S 8

LM80 9000 Hour Interval Test Report

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

CSA Group Report: **OSRM053-A2-140**

July 23, 2020

Manufacturer: **OSRAM**
Models tested: **GW P9LR35.EM**
DURIS S 8
Test conditions: 24 devices @ 55.0 C, 0.800 A
24 devices @ 85.0 C, 0.800 A
24 devices @ 105.0 C, 0.800 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:

Gabriel Trippel

Project Engineer,
Test and Measurement Services

Testing performed by:
CSA Group Seattle
14833 NE 87th St
Redmond, WA 98052
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Test report approved by:

KC Fletcher

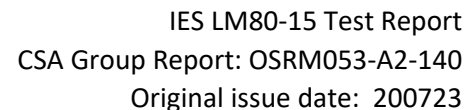
Project Manager,
Test and Measurement Services

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

Part number: GW P9LR35.EM					
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	0.800	55	9000	99.7	0.0007
TC2	0.800	85	9000	98.8	0.0011
TC3	0.800	105	9000	96.1	0.0015
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			July 8, 2019		
15. ANSI target and calculated CCT values			see data tables		

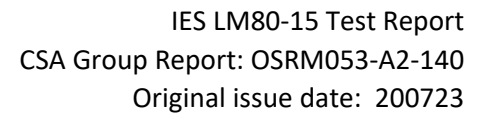
Notes:

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

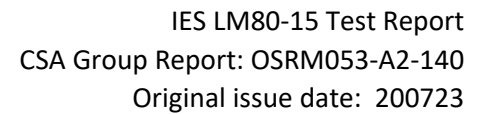


GW P9LR35.EM

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



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GW P9LR35.EM

Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 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
FB0000125214031C	D1	678.94	6.22	99.8	100.0	100.1	100.2	100.4	100.4	100.4	100.3	100.3	100.3	100.2
	D2	681.22	6.23	99.7	99.9	100.0	100.2	100.3	100.3	100.4	100.3	100.3	100.2	100.0
	D3	675.80	6.27	99.5	99.7	99.8	100.0	100.1	100.1	100.2	100.2	100.2	100.2	100.1
	D4	680.11	6.32	99.3	99.4	99.6	99.7	99.9	99.9	99.9	99.9	99.9	99.8	99.5
	D5	685.69	6.20	99.6	99.7	99.8	100.0	100.1	100.1	100.2	100.2	100.1	100.0	99.9
	D6	682.14	6.20	99.6	99.7	99.9	100.0	100.1	100.1	100.1	100.1	100.0	100.0	100.0
	D7	680.13	6.32	99.4	99.5	99.6	99.9	100.1	100.1	100.2	100.1	100.1	100.1	100.0
	D8	676.98	6.30	99.4	99.5	99.7	99.9	100.0	100.1	100.1	100.1	100.0	99.9	99.7
	D9	685.38	6.29	99.3	99.4	99.5	99.7	99.9	99.8	99.9	99.8	99.8	99.7	99.4
	D10	685.30	6.26	99.2	99.4	99.5	99.6	99.8	99.7	99.8	99.8	99.8	99.7	99.6
	D11	681.52	6.25	99.4	99.6	99.6	99.8	99.9	99.9	100.0	99.9	99.9	99.8	99.6
	D12	681.63	6.32	99.6	99.7	99.9	100.0	100.2	100.2	100.2	100.0	100.2	100.1	99.9
	D14	672.39	6.26	99.8	100.0	100.2	100.4	100.6	100.6	100.6	100.5	100.5	100.2	99.9
	D15	675.43	6.34	99.9	100.1	100.3	100.4	100.6	100.6	100.7	100.7	100.7	100.5	100.3
	n			24	24	24	24	24	24	24	24	24	24	24
	mean			99.5	99.7	99.8	99.9	100.1	100.1	100.1	100.1	100.0	99.9	99.7
	median			99.6	99.7	99.9	100.0	100.1	100.1	100.2	100.2	100.1	100.0	99.8
	std. dev.			0.2	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6
	min			98.8	98.6	98.5	98.4	98.4	98.3	98.3	98.1	97.9	97.7	97.4
	max			99.9	100.1	100.3	100.4	100.6	100.6	100.7	100.7	100.7	100.5	100.3

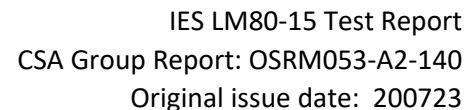
Test Condition 1 55 °C 0.800 A

TABLE 2.1 - CHROMATICITY SHIFT RESULTS

GW P9LR35.EM

Test Condition 1 55 °C 0.800 A

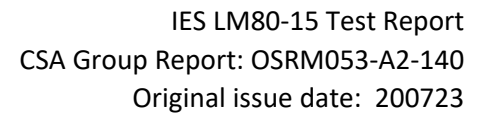
Load board ID	Device number	Zero hour measurements			Photometric test drive current: 0.800 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		u'	v'		Chromaticity shift ($\Delta u'v'$)										
					168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
DF0000116114031C	D1	0.2662	0.5319		0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007
	D4	0.2660	0.5306		0.0005	0.0006	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0006
	D5	0.2659	0.5321		0.0004	0.0005	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0006	0.0007	0.0007
	D7	0.2653	0.5320		0.0005	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0008	0.0007
	D8	0.2659	0.5323		0.0005	0.0007	0.0006	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0008	0.0007
	D9	0.2651	0.5305		0.0005	0.0005	0.0006	0.0006	0.0006	0.0007	0.0006	0.0006	0.0006	0.0007	0.0007
	D10	0.2665	0.5317		0.0004	0.0005	0.0004	0.0005	0.0004	0.0005	0.0004	0.0004	0.0004	0.0005	0.0004
	D11	0.2661	0.5323		0.0005	0.0006	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0008
	D13	0.2655	0.5316		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0004	0.0005	0.0004
	D15	0.2656	0.5310		0.0005	0.0005	0.0006	0.0007	0.0006	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007



GW P9LR35.EM

Load board ID	Device number	Zero hour measurements			Photometric test drive current: 0.800 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		u'	v'		Chromaticity shift (Δu'v')										
					168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
FB0000125214031C	D1	0.2664	0.5312		0.0005	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
	D2	0.2663	0.5321		0.0005	0.0006	0.0006	0.0005	0.0005	0.0006	0.0006	0.0005	0.0006	0.0006	0.0005
	D3	0.2653	0.5310		0.0005	0.0005	0.0006	0.0006	0.0006	0.0007	0.0006	0.0006	0.0006	0.0007	0.0006
	D4	0.2651	0.5306		0.0006	0.0006	0.0007	0.0007	0.0007	0.0008	0.0008	0.0007	0.0007	0.0008	0.0008
	D5	0.2656	0.5319		0.0004	0.0005	0.0005	0.0006	0.0005	0.0006	0.0006	0.0005	0.0005	0.0005	0.0005
	D6	0.2660	0.5319		0.0005	0.0006	0.0006	0.0007	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
	D7	0.2660	0.5307		0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007
	D8	0.2662	0.5323		0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0005	0.0006	0.0006	0.0006
	D9	0.2660	0.5322		0.0005	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007
	D10	0.2654	0.5324		0.0005	0.0005	0.0006	0.0006	0.0006	0.0007	0.0007	0.0006	0.0006	0.0007	0.0006
	D11	0.2655	0.5322		0.0006	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008	0.0007	0.0007	0.0008	0.0008
	D12	0.2662	0.5318		0.0005	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
	D14	0.2656	0.5320		0.0005	0.0005	0.0006	0.0006	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007
	D15	0.2659	0.5311		0.0004	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0006	0.0006
	n				24	24	24	24	24	24	24	24	24	24	24
	mean				0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007
	median				0.0005	0.0005	0.0006	0.0006	0.0006	0.0007	0.0006	0.0006	0.0006	0.0007	0.0007
	std. dev.				0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	min				0.0004	0.0004	0.0004	0.0005	0.0004	0.0005	0.0004	0.0004	0.0004	0.0005	0.0004
	max				0.0006	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0	

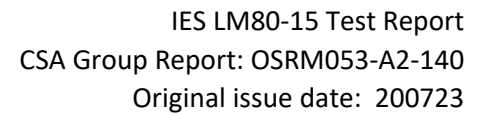
Test Condition 1 55 °C 0.800 A														
TABLE 2.2 - FORWARD VOLTAGE MAINTENANCE RESULTS														
Test Condition 1 55 °C 0.800 A														
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 A										
				Photometric test ambient temperature: 25 ± 2 °C										
				Failures observed: none										
		Vf (V)		Forward Voltage Maintainence (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
DF0000116114031C	D1		6.27	100.03	100.02	100.03	100.01	99.98	100.01	100.05	100.02	100.00	100.04	100.05
	D4		6.27	100.03	100.03	100.03	100.03	100.02	100.02	100.04	100.02	100.06	100.04	100.05
	D5		6.20	99.89	99.83	99.83	99.76	99.76	99.73	99.76	99.77	99.76	99.77	99.76
	D7		6.27	99.99	100.11	100.12	100.12	100.11	100.14	100.14	100.15	100.17	100.13	100.17
	D8		6.38	100.83	101.23	101.39	101.56	101.65	101.77	101.79	101.84	101.88	101.93	101.96
	D9		6.27	99.90	99.92	99.92	99.92	99.92	99.91	99.90	99.92	99.94	99.93	99.94
	D10		6.26	99.94	99.91	99.92	99.92	99.92	99.91	99.92	99.96	99.92	99.93	99.94
	D11		6.25	100.05	100.07	100.05	100.09	100.08	100.08	100.10	100.08	100.10	100.10	100.12
	D13		6.24	99.90	99.85	99.81	99.78	99.77	99.76	99.74	99.76	99.71	99.76	99.76
	D15		6.32	99.99	99.99	100.03	100.00	99.98	100.02	100.04	100.03	100.01	100.04	100.05



GW P9LR35.EM

Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
				Vf (V)	Forward Voltage Maintainence (%)									
		168	500		1000	2000	3000	4000	5000	6000	7000	8000	9000	
FB0000125214031C	D1		6.22	99.86	99.80	99.74	99.71	99.70	99.68	99.69	99.68	99.69	99.66	99.69
	D2		6.23	99.97	99.94	99.97	99.95	99.97	99.95	99.95	99.98	99.95	99.98	99.98
	D3		6.27	99.95	99.97	99.96	99.98	99.94	99.92	99.94	99.96	99.96	99.95	99.99
	D4		6.32	99.97	99.98	99.98	99.91	99.91	99.92	99.93	99.94	99.91	99.95	99.95
	D5		6.20	99.94	99.96	99.95	99.92	99.93	99.95	99.94	99.94	99.95	99.95	99.96
	D6		6.20	99.96	99.96	99.98	99.96	99.96	99.95	99.98	99.96	99.98	99.98	99.97
	D7		6.32	99.93	99.96	99.95	99.94	99.93	99.92	99.95	99.93	99.93	99.93	99.94
	D8		6.30	99.99	99.96	99.97	99.93	99.93	99.93	99.94	99.92	99.94	99.94	99.94
	D9		6.29	100.02	100.00	100.03	100.01	100.04	100.04	100.05	100.04	100.05	100.05	100.07
	D10		6.26	99.95	99.95	99.91	99.94	99.91	99.93	99.94	99.94	99.96	99.96	99.95
	D11		6.25	99.94	99.94	99.94	99.94	99.94	99.95	99.96	99.94	99.99	99.94	99.96
	D12		6.32	99.94	99.90	99.93	99.92	99.94	99.94	99.93	99.95	99.94	99.95	99.96
	D14		6.26	99.99	99.99	100.00	99.99	99.98	100.00	100.01	100.02	100.00	100.00	100.04
	D15		6.34	99.97	99.96	99.95	99.94	99.91	99.91	99.90	99.90	99.89	99.91	99.91
	n			24	24	24	24	24	24	24	24	24	24	24
	mean			100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	median			100.0	100.0	100.0	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.0
	std. dev.			0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	min			99.9	99.8	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7
	max			100.8	101.2	101.4	101.6	101.6	101.8	101.8	101.8	101.9	101.9	102.0

Test Condition 285 °C0.800 A														
TABLE 3.0 - LUMEN MAINTENANCE RESULTS														
Test Condition 285 °C0.800 A														
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 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
040000115C70031C	D1	670.19	6.21	100.0	100.2	100.5	100.6	100.7	100.5	100.5	100.2	100.0	99.6	99.1
	D2	677.66	6.29	99.8	100.0	100.2	100.4	100.5	100.4	100.5	100.3	100.2	100.0	99.7
	D3	682.05	6.27	99.4	99.7	100.0	100.2	100.4	100.2	100.3	100.0	99.9	99.6	99.2
	D4	666.47	6.25	99.7	100.0	100.3	100.4	100.5	100.4	100.5	100.2	100.1	99.8	99.4
	D5	681.16	6.27	99.6	99.9	100.2	100.2	100.2	100.1	100.1	99.8	99.6	99.2	98.6
	D6	685.75	6.32	99.5	99.6	99.8	99.9	100.0	99.7	99.8	99.4	99.2	98.8	98.2
	D7	681.58	6.24	99.5	99.6	99.8	99.8	99.8	99.5	99.6	99.3	99.1	98.8	98.4
	D8	683.68	6.26	99.2	99.4	99.6	99.7	99.7	99.5	99.4	99.1	98.9	98.5	98.0
	D9	679.46	6.25	99.7	100.1	100.3	100.5	100.7	100.5	100.6	100.3	100.1	99.8	99.3
	D10	678.69	6.30	98.8	99.1	99.5	99.7	99.9	99.8	99.8	99.6	99.3	99.0	98.4
	D11	685.93	6.26	99.3	99.5	99.6	99.8	99.8	99.7	99.7	99.4	99.2	98.9	98.4
	D12	685.06	6.33	99.4	99.7	100.0	100.2	100.4	100.3	100.4	100.2	100.0	99.7	99.1
	D13	684.78	6.24	99.9	100.2	100.4	100.4	100.6	100.4	100.5	100.3	100.1	99.9	99.4
	D15	686.14	6.27	100.2	100.6	100.7	100.7	100.7	100.5	100.4	100.0	99.8	99.3	98.6



GW P9LR35.EM

Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 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
50000011633F031C	D3	685.33	6.28	99.6	100.0	100.0	100.1	100.3	100.0	100.1	99.8	99.6	99.3	98.6
	D5	686.21	6.23	99.5	99.8	99.9	99.9	100.2	99.9	100.1	99.7	99.6	99.4	98.8
	D7	677.29	6.31	99.8	100.2	100.2	100.4	100.5	100.3	100.4	100.2	100.0	99.9	99.4
	D8	682.05	6.26	99.8	100.1	100.0	100.2	100.2	100.1	100.2	100.0	99.7	99.5	99.1
	D9	684.56	6.32	99.6	100.1	100.2	100.3	100.6	100.5	100.6	100.3	100.3	100.1	99.5
	D11	688.12	6.26	99.3	99.8	100.0	100.3	100.5	100.1	100.1	99.7	99.4	99.1	98.3
	D12	673.56	6.29	99.6	99.9	99.9	100.1	100.2	99.9	100.0	99.6	99.5	99.3	98.7
	D13	690.70	6.29	99.3	99.7	99.7	99.9	100.0	99.7	99.8	99.5	99.4	99.1	98.5
	D14	688.78	6.21	99.8	100.3	100.3	100.3	100.3	100.0	100.0	99.7	99.4	99.2	98.4
	D15	673.28	6.28	99.9	100.4	100.5	100.6	100.9	100.5	100.6	100.3	100.1	99.9	99.2
n				24	24	24	24	24	24	24	24	24	24	24
	mean			99.6	99.9	100.1	100.2	100.3	100.1	100.2	99.9	99.7	99.4	98.8
	median			99.6	99.9	100.0	100.2	100.4	100.1	100.2	99.9	99.7	99.4	98.8
	std. dev.			0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5
	min			98.8	99.1	99.5	99.7	99.7	99.5	99.4	99.1	98.9	98.5	98.0
	max			100.2	100.6	100.7	100.7	100.9	100.5	100.6	100.3	100.3	100.1	99.7

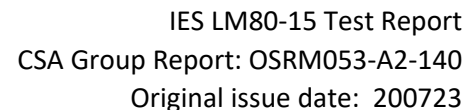
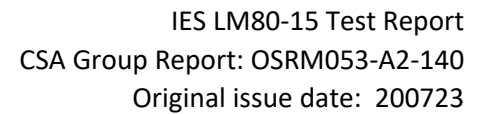


TABLE 3.1 - CHROMATICITY SHIFT RESULTS
GW P9LR35.EM
Test Condition 2 85 °C 0.800 A

Load board ID	Device number	Zero hour measurements			Photometric test drive current: 0.800 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
50000011633F031C	D3	0.2652	0.5334		0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0008	0.0008	0.0009	0.0010	0.0009
	D5	0.2653	0.5325		0.0005	0.0006	0.0007	0.0007	0.0008	0.0008	0.0008	0.0009	0.0010	0.0010	0.0010
	D7	0.2656	0.5329		0.0006	0.0007	0.0008	0.0009	0.0009	0.0010	0.0010	0.0010	0.0011	0.0011	0.0009
	D8	0.2657	0.5325		0.0006	0.0006	0.0007	0.0008	0.0009	0.0010	0.0010	0.0010	0.0010	0.0010	0.0009
	D9	0.2660	0.5329		0.0005	0.0005	0.0005	0.0005	0.0006	0.0007	0.0006	0.0007	0.0007	0.0009	0.0008
	D11	0.2664	0.5322		0.0005	0.0006	0.0006	0.0007	0.0008	0.0009	0.0009	0.0011	0.0012	0.0013	0.0014
	D12	0.2660	0.5319		0.0005	0.0006	0.0007	0.0008	0.0009	0.0009	0.0009	0.0010	0.0011	0.0012	0.0012
	D13	0.2657	0.5325		0.0006	0.0008	0.0008	0.0009	0.0010	0.0011	0.0011	0.0012	0.0012	0.0013	0.0012
	D14	0.2653	0.5322		0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0009	0.0010	0.0011	0.0012	0.0012
	D15	0.2660	0.5319		0.0002	0.0003	0.0002	0.0003	0.0004	0.0005	0.0005	0.0006	0.0006	0.0008	0.0008
n					24	24	24	24	24	24	24	24	24	24	24
mean					0.0006	0.0006	0.0007	0.0008	0.0008	0.0009	0.0009	0.0010	0.0011	0.0011	0.0011
median					0.0006	0.0006	0.0007	0.0008	0.0009	0.0009	0.0009	0.0010	0.0011	0.0011	0.0011
std. dev.					0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
min					0.0002	0.0003	0.0002	0.0003	0.0004	0.0005	0.0005	0.0006	0.0006	0.0008	0.0008
max					0.0008	0.0009	0.0010	0.0011	0.0011	0.0012	0.0012	0.0013	0.0014	0.0014	0.0014

Test Condition 2 85 °C 0.800 A														
TABLE 3.2 - FORWARD VOLTAGE MAINTENANCE RESULTS														GW P9LR35.EM
Test Condition 2 85 °C 0.800 A														
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Vf (V)	Forward Voltage Maintainence (%)											
			168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000	
040000115C70031C	D1		6.21	99.99	100.01	99.99	100.04	100.05	100.04	100.08	100.10	100.10	100.09	100.11
	D2		6.29	99.44	99.39	99.39	99.40	99.40	99.43	99.45	99.50	99.48	99.49	99.50
	D3		6.27	99.98	100.01	100.02	100.05	100.08	100.05	100.09	100.11	100.13	100.11	100.16
	D4		6.25	99.96	99.99	99.98	99.99	100.02	99.99	100.02	100.06	100.05	100.07	100.07
	D5		6.27	99.97	99.97	99.98	99.97	99.99	99.98	100.00	100.02	100.03	100.04	100.06
	D6		6.32	100.11	100.13	100.18	100.20	100.22	100.22	100.27	100.27	100.28	100.28	100.29
	D7		6.24	99.93	99.92	99.93	99.94	99.95	99.94	99.94	99.98	100.02	100.01	100.00
	D8		6.26	100.04	100.05	100.09	100.14	100.16	100.17	100.19	100.22	100.24	100.23	100.23
	D9		6.25	99.94	99.91	99.90	99.91	99.92	99.95	99.95	99.96	99.97	99.98	100.01
	D10		6.30	99.76	99.68	99.62	99.62	99.62	99.63	99.61	99.64	99.63	99.62	99.64
	D11		6.26	99.93	99.93	99.95	99.97	99.97	99.95	100.01	99.98	100.02	100.03	100.02
	D12		6.33	99.84	99.80	99.76	99.78	99.79	99.79	99.79	99.80	99.81	99.81	99.81
	D13		6.24	99.69	99.64	99.65	99.65	99.66	99.71	99.67	99.73	99.71	99.75	99.77
	D15		6.27	99.96	100.02	100.02	100.02	100.09	100.10	100.11	100.13	100.16	100.18	100.20



GW P9LR35.EM

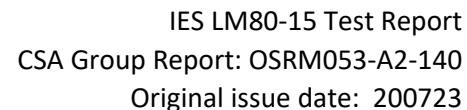
0.800 A

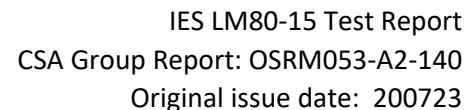
CSA Group Seattle
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org

Test Condition 3				105 °C		0.800 A									
TABLE 4.0 - LUMEN MAINTENANCE RESULTS													GW P9LR35.EM		
Test Condition 3				105 °C		0.800 A									
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 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	
1E0000125419031C	D2	690.99	6.28	99.2	99.6	99.9	99.9	100.0	99.3	99.0	98.4	97.8	96.9	95.4	
	D3	680.93	6.24	99.2	99.5	99.7	99.7	99.7	99.2	99.0	98.5	98.0	97.3	96.2	
	D4	667.35	6.26	99.6	100.1	100.3	100.2	100.3	99.7	99.5	99.1	98.6	98.0	97.0	
	D5	683.58	6.22	99.9	100.2	100.3	100.2	100.3	99.7	99.4	98.9	98.4	97.8	96.6	
	D6	684.38	6.26	99.5	99.8	100.0	99.9	100.0	99.4	99.1	98.5	97.9	97.0	95.5	
	D7	685.27	6.26	99.1	99.3	99.4	99.3	99.3	98.5	98.2	97.5	96.9	96.2	95.0	
	D8	684.86	6.27	99.2	99.4	99.5	99.6	99.6	98.9	98.7	98.2	97.7	97.1	96.0	
	D10	684.79	6.25	99.1	99.4	99.5	99.2	99.2	98.6	98.3	97.8	97.2	96.5	95.3	
	D11	687.61	6.27	98.8	99.1	99.2	98.9	98.7	98.0	97.7	97.1	96.5	95.7	94.5	
	D13	686.35	6.28	99.4	99.6	99.7	99.5	99.5	99.0	98.8	98.3	97.8	97.1	95.9	
	D14	685.21	6.23	99.3	99.5	99.5	99.5	99.5	99.0	98.8	98.3	97.8	97.2	96.1	
	D15	672.87	6.36	99.3	99.5	99.6	99.7	99.7	99.1	98.9	98.2	97.7	97.1	95.9	

TABLE 4.0 - LUMEN MAINTENANCE RESULTS
GW P9LR35.EM
Test Condition 3 105 °C 0.800 A

Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 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
B30000115CE0031C	D2	683.00	6.26	99.2	99.7	99.9	99.7	99.6	98.9	98.6	98.0	97.5	96.9	95.7
	D3	680.00	6.29	99.4	100.0	100.3	100.3	100.3	99.9	99.6	99.1	98.5	97.7	96.2
	D4	672.87	6.27	99.5	99.9	100.0	100.1	100.2	99.8	99.6	99.2	98.8	98.3	97.3
	D5	683.64	6.29	99.7	100.1	100.3	100.5	100.5	100.0	99.8	99.2	98.8	98.2	96.9
	D6	676.04	6.30	99.6	100.1	100.4	100.5	100.6	100.1	99.9	99.4	99.0	98.3	97.2
	D8	679.94	6.33	99.6	100.2	100.4	100.4	100.4	99.9	99.6	99.1	98.5	97.8	96.6
	D9	685.14	6.21	99.5	99.8	99.8	99.6	99.6	99.0	98.7	98.1	97.6	96.9	95.7
	D10	684.34	6.21	99.4	99.7	99.7	99.5	99.5	99.0	98.6	98.1	97.6	96.9	95.6
	D11	670.91	6.26	99.6	100.0	100.1	100.0	100.0	99.6	99.3	98.8	98.4	97.8	96.7
	D12	681.60	6.27	99.7	100.0	100.0	100.0	100.0	99.4	99.2	98.6	98.1	97.4	96.3
	D13	683.90	6.21	99.5	99.9	100.0	100.1	100.1	99.6	99.4	98.9	98.5	97.9	96.8
	D15	686.33	6.36	99.3	99.7	99.9	99.9	99.8	99.3	99.0	98.5	98.0	97.2	96.0
n				24	24	24	24	24	24	24	24	24	24	24
mean				99.4	99.8	99.9	99.8	99.8	99.3	99.0	98.5	98.0	97.3	96.1
median				99.4	99.8	99.9	99.9	99.9	99.3	99.0	98.5	97.9	97.2	96.1
std. dev.				0.2	0.3	0.3	0.4	0.5	0.5	0.5	0.6	0.6	0.7	0.7
min				98.8	99.1	99.2	98.9	98.7	98.0	97.7	97.1	96.5	95.7	94.5
max				99.9	100.2	100.4	100.5	100.6	100.1	99.9	99.4	99.0	98.3	97.3





GW P9LR35.EM

[illegible]

Test Condition 3				105 °C	0.800 A									
TABLE 4.2 - FORWARD VOLTAGE MAINTENANCE RESULTS													GW P9LR35.EM	
Test Condition 3				105 °C	0.800 A									
Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 A Photometric test ambient temperature: 25 ± 2 °C Failures observed: none										
		Vf (V)		Forward Voltage Maintainence (%)										
				168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
1E0000125419031C	D2		6.28	99.86	99.86	99.87	99.91	99.95	99.94	99.99	100.02	100.02	100.05	100.08
	D3		6.24	99.97	99.98	100.04	100.09	100.13	100.14	100.21	100.21	100.27	100.27	100.35
	D4		6.26	99.98	99.99	100.02	100.12	100.17	100.20	100.27	100.32	100.35	100.40	100.43
	D5		6.22	99.86	99.84	99.89	99.95	100.01	100.04	100.10	100.12	100.16	100.17	100.22
	D6		6.26	99.92	99.93	99.94	99.99	100.03	100.03	100.06	100.10	100.14	100.15	100.19
	D7		6.26	100.14	100.19	100.24	100.28	100.34	100.36	100.39	100.42	100.43	100.45	100.48
	D8		6.27	99.88	99.88	99.89	99.96	99.98	100.04	100.04	100.09	100.09	100.12	100.14
	D10		6.25	100.21	100.27	100.34	100.41	100.47	100.54	100.55	100.60	100.63	100.68	100.72
	D11		6.27	100.02	100.06	100.11	100.21	100.24	100.29	100.36	100.38	100.43	100.43	100.50
	D13		6.28	99.92	99.92	99.95	100.01	100.04	100.06	100.10	100.14	100.16	100.18	100.21
	D14		6.23	99.90	99.89	99.91	99.96	99.99	100.05	100.07	100.09	100.13	100.16	100.19
	D15		6.36	99.98	99.97	99.98	99.98	100.01	100.03	100.08	100.07	100.07	100.09	100.13

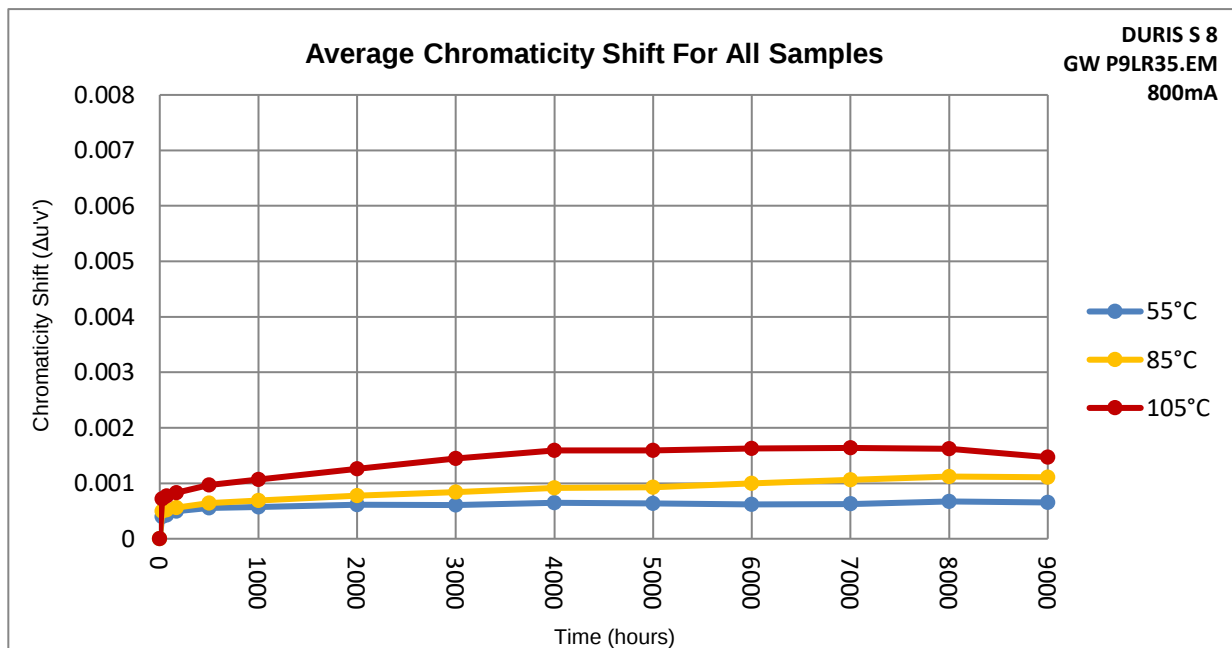
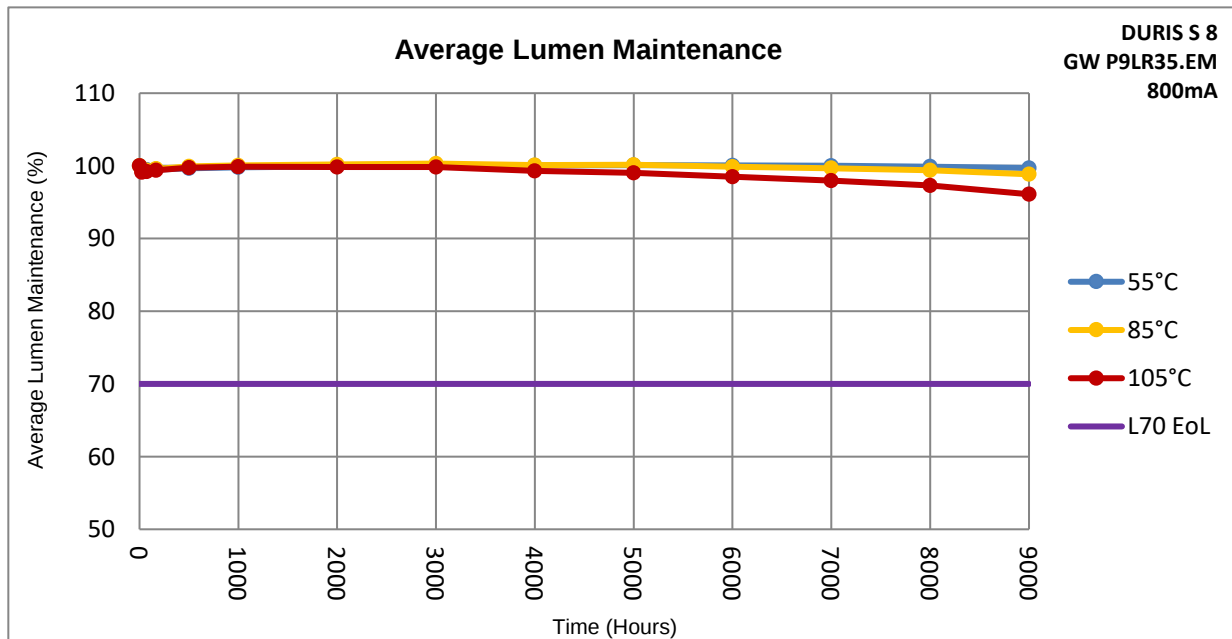
TABLE 4.2 - FORWARD VOLTAGE MAINTENANCE RESULTS

GW P9LR35.EM

Test Condition 3 105 °C 0.800 A

Load board ID	Device number	Zero hour measurements		Photometric test drive current: 0.800 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
B30000115CE0031C	D2		6.26	100.01	100.06	100.12	100.23	100.31	100.37	100.44	100.54	100.59	100.66	100.72
	D3		6.29	99.83	99.77	99.81	99.86	99.88	99.89	99.99	99.99	100.01	100.04	100.08
	D4		6.27	99.97	99.97	100.02	100.06	100.11	100.15	100.21	100.23	100.24	100.28	100.30
	D5		6.29	99.92	99.95	99.97	100.03	100.04	100.09	100.11	100.15	100.15	100.18	100.20
	D6		6.30	99.65	99.60	99.57	99.59	99.60	99.67	99.68	99.72	99.75	99.77	99.83
	D8		6.33	99.74	99.67	99.68	99.72	99.77	99.80	99.85	99.89	99.91	99.96	99.98
	D9		6.21	99.98	100.05	100.12	100.17	100.23	100.33	100.38	100.42	100.47	100.53	100.59
	D10		6.21	100.03	100.06	100.14	100.20	100.29	100.37	100.46	100.51	100.56	100.61	100.67
	D11		6.26	100.00	100.01	100.10	100.18	100.24	100.28	100.34	100.40	100.44	100.50	100.55
	D12		6.27	99.84	99.84	99.90	99.95	100.00	100.05	100.09	100.15	100.20	100.23	100.29
	D13		6.21	99.90	99.92	99.94	100.01	100.05	100.10	100.13	100.18	100.19	100.24	100.29
	D15		6.36	99.84	99.83	99.81	99.87	99.90	99.90	99.95	99.98	100.01	100.01	100.04
n				24	24	24	24	24	24	24	24	24	24	24
mean				99.9	99.9	100.0	100.0	100.1	100.1	100.2	100.2	100.2	100.3	100.3
median				99.9	99.9	100.0	100.0	100.0	100.1	100.1	100.2	100.2	100.2	100.3
std. dev.				0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
min				99.6	99.6	99.6	99.6	99.6	99.7	99.7	99.7	99.8	99.8	99.8
max				100.2	100.3	100.3	100.4	100.5	100.5	100.6	100.6	100.6	100.7	100.7

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 12-Channel Driver
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

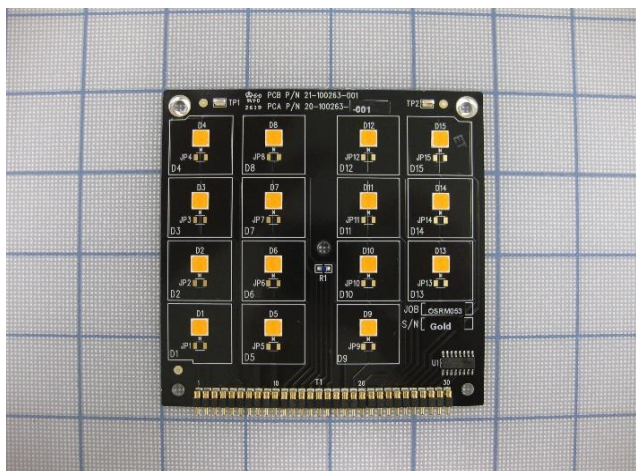


Fig. 1 DURIS S8 GW P9LR35.EM load board example.

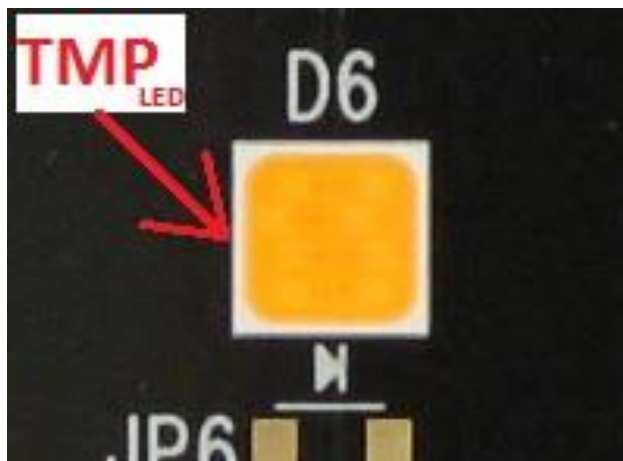


Fig. 2 DURIS S8 GW P9LR35.EM LED and temperature measurement point.

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 P9LR35.EM
Report issue date	2020-Jul-23
Report revision date (if applicable)	Not Applicable
Testing start date	2019-Jul-8
Testing completion date	2020-Jul-23
DUT sampling method	According to ANSI/IES LM-80 Test Method

DUT Identification

DUT manufacturer's name	ams-OSRAM international GmbH
DUT identification	GW P9LR35.EM
Description of DUT	LED Package

DUT Characteristics

Total input power (W)	5.02
Average current density per LED die (mA/mm ²)	351
Average power density per LED Package (W/mm ²)	0.20
Representative CRI (Ra) of the tested sample set	80
Minimum die edge to die edge spacing (mm)	0.30

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

For Information Only!

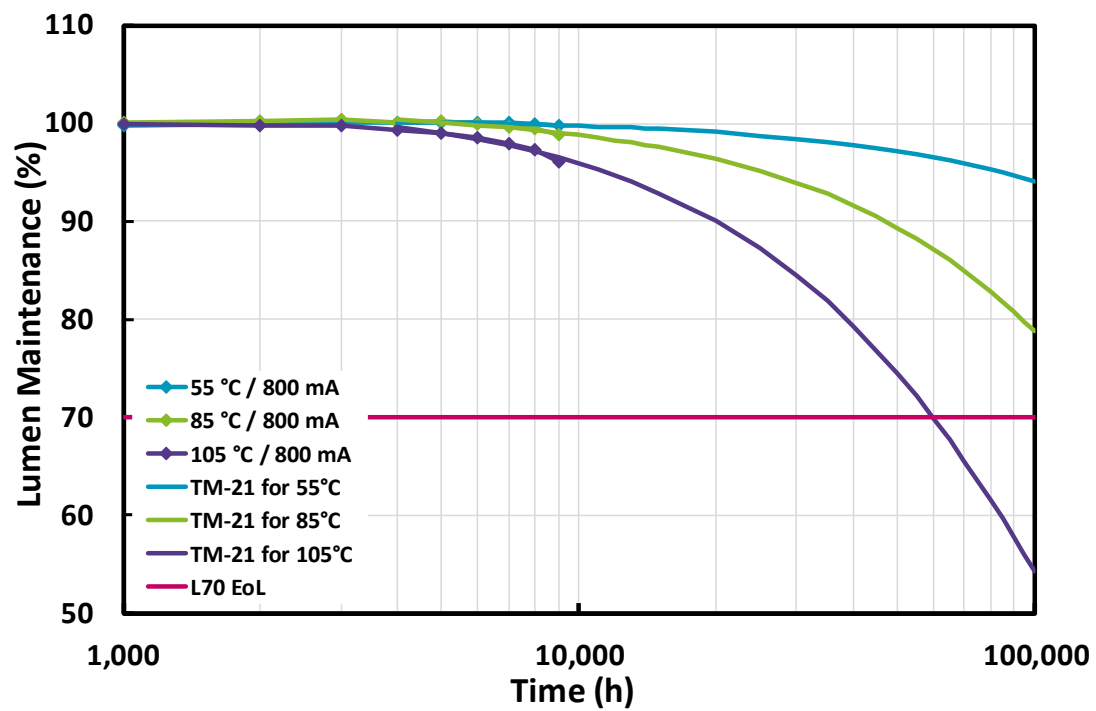
1. General Information

Description of LED light source tested	DURIS® S 8 GW P9LR35.EM
Test Documentation Number	220199W1 (Document No.: OSRM053-A2-140)
Sample size per temperature	24
LED drive current used in the test	800 mA
Current per die	800 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	6.584E-07	2.525E-06	6.328E-06
B	1.004E+00	1.013E+00	1.021E+00
Reported L70	>54,000 hours	>54,000 hours	>54,000 hours
Reported L90	>54,000 hours	46,963 hours	20,005 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 P9LR34.EM | with CCT 2200 K – 6500 K up to 200mA |
| • DURIS® S 8 GW P9LR34.PM | with CCT 2200 K – 6500 K up to 200mA |
| • DURIS® S 8 GW P9LR35.EM | with CCT 2200 K – 6500 K up to 800mA |
| • DURIS® S 8 GW P9LR35.PM | with CCT 2200 K – 6500 K up to 800mA |
| • DURIS® S 8 GW P9LR37.PM | with CCT 2200 K – 6500 K up to 800mA |
| • DURIS® S 8 GW P9LR37.EM | with CCT 2200 K – 6500 K up to 800mA |
| • DURIS® S 8 GW P9LR38.PM | with CCT 2200 K – 6500 K up to 200mA |
| • DURIS® S 8 GW P9LR38.EM | with CCT 2200 K – 6500 K up to 200mA |

Note: The devices are stressed and tested at average current density per LED die of 351mA/mm². 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

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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/IRED/Laser 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/IRED/Laser in the final application may differ from the Data. The behavior of the LED/IRED/Laser 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 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.

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