

Cree® XLamp® XH-G White LEDs



NVLAP Lab Code 500041-0

INFORMATION REQUIRED BY LM-80-08

Cree classifies these LEDs as "LED packages" per Sep 9, 2011 ENERGY STAR guidelines¹.

1. Number of LED light sources tested	See individual data sets on following pages.
2. Description of LED light sources	XLamp XH-G White LEDs (Series: XHGAWT) This LM-80 report is applicable to the following order codes: XHGAWT-00-CLLS-A0000HXCD XHGAWT-00-CLLS-A0000HXCK XHGAWT-00-CLLS-A0000SWCK XHGAWT-00-CLLS-A0000SWCM All measurements provided are LED package measurements.
3. Description of test and auxiliary equipment	Instrument Systems ISP-500 Integrating Sphere Instrument Systems CAS-140 Spectrometer Keithley 2420 Sourcemeter
4. Operating cycle	LED packages are driven at constant current.
5. Ambient conditions	LED packages are operated in environmental control chambers. The temperature of the ambient air around the LED packages is actively controlled by air flowing through the chamber. T_A : See individual data sets on following pages RH : < 45% Air flow : 800 CFM
6. Case temperature	See individual data sets on following pages.
7. Drive current of the LED light source during life-time test.	See individual data sets on following pages.
8. Initial luminous flux and forward voltage at photometric measurement current	See individual data sets on following pages.
9. Lumen maintenance data for each individual LED light source	See individual data sets on following pages. Ambient temperature during luminous flux testing set to 25°C ±2°C.
10. Observation of LED light source failures	No failures occurred during testing.
11. LED light source monitoring interval	See individual data sets on following pages.
12. Photometric measurement uncertainty	Cree maintains a tolerance of ±2.0% on flux measurements for LM-80 testing.
13. Chromaticity shift reported over the measurement time	See individual data sets on following pages. Ambient temperature during chromaticity testing set to 25°C ±2°C.
Test Report Authorization	Arthur Pun, Components Reliability Laboratory Manager

1 http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/luminaires/ENERGY_STAR_Final_Lumen_Maintenance_Guidance.pdf

REVISION HISTORY

Revision	Date	Change
0	December 8, 2015	Date of first issue
1	June 30, 2016	Extended data set A1 with additional test duration.

TEST RESULTS SUMMARY

Data Set	Case Temp. [T _s]	Ambient Temp. [T _A]	Drive Current [I _F]	ANSI CCT Target	Sample Count	Test Duration	Reported TM-21 Lifetimes
A1	85°C	85°C	175 mA	3500K	20	10,080 hrs	L90(10k) > 60,500 hrs L80(10k) > 60,500 hrs L70(10k) > 60,500 hrs

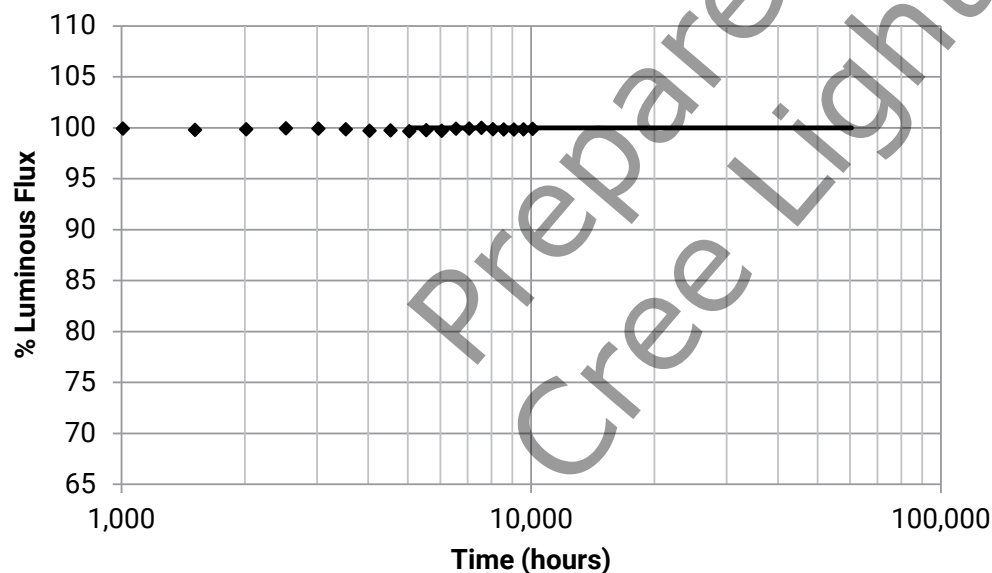
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Cree Lighting

DATA SET A1: 85°C; 175 mA

LED Package Series	XLamp XH-G White LEDs (Series: XHGAWT) This LM-80 report is applicable to the following order codes: XHGAWT-00-CLLS-A0000HXCD XHGAWT-00-CLLS-A0000HXCK XHGAWT-00-CLLS-A0000SWCK XHGAWT-00-CLLS-A0000SWCM
Drive Current [I_F]	175 mA
Testing Initiation Date	December 12, 2014
Case Temperature [T_s]	85°C
Ambient Temperature [T_A]	85°C
Failures observed	None

Projection Generated By Cree's Internal TM-21 Calculator:

Test duration	10,080 hours
Test duration used for projection	t=5,040 to t=10,080
α	-2.995E-07
β	9.961E-01
Reported Lifetimes	L90(10k) > 60,500 hours
	L80(10k) > 60,500 hours
	L70(10k) > 60,500 hours



LM-80 Data For The Official TM-21 Calculator*

Time (hours)	Lumen Maintenance
0	100.00%
1008	99.92%
1512	99.79%
2016	99.85%
2520	99.95%
3024	99.92%
3528	99.85%
4032	99.71%
4536	99.74%
5040	99.66%
5544	99.76%
6048	99.71%
6552	99.91%
7056	99.92%
7560	99.99%
8064	99.86%
8568	99.84%
9072	99.83%
9576	99.85%
10080	99.89%

* <http://www.energystar.gov/TM-21calculator>

Note: The data point t=168 hr is intentionally excluded from this table, since the ENERGY STAR tool has a 20 data point input limit. Per TM-21 methodology, the data point t=168 hr would be excluded, so the projection is unaffected.

DATA SET A1: 85°C; 175 mA

Lamp #	Initial (0 hrs)				Lumen Maintenance (%)											
	LF (lm)	V _F (V)	Calc. CCT	ANSI Target	168	1008	1512	2016	2520	3024	3528	4032	4536	5040	5544	6048
1	71.2	3.10	3229	3500	99.80	100.01	99.96	100.13	100.38	100.43	100.52	100.46	100.65	100.18	100.53	100.44
2	72.3	3.09	3276	3500	99.83	99.61	99.76	99.94	99.95	99.80	99.68	99.23	99.42	99.51	99.87	99.63
3	70.0	3.10	3695	3500	100.57	100.56	100.22	100.38	100.20	100.43	100.35	100.62	100.40	100.27	100.09	99.87
4	70.1	3.06	3247	3500	99.65	99.54	99.17	99.65	99.94	99.56	99.44	99.13	99.68	99.69	100.01	99.73
5	69.2	3.09	3282	3500	100.39	100.25	100.30	100.47	100.47	100.74	100.48	100.37	100.09	99.99	100.17	99.94
6	73.0	3.09	3680	3500	99.81	99.67	99.54	99.74	99.71	99.52	99.32	99.06	99.52	99.64	99.40	99.64
7	71.3	3.08	3249	3500	100.08	99.60	99.42	100.00	100.04	99.96	99.40	99.19	99.47	99.57	99.93	100.11
8	70.7	3.09	3333	3500	99.75	99.52	99.73	99.51	99.64	99.60	99.73	99.67	99.49	99.35	99.25	99.10
9	74.8	3.09	3699	3500	99.42	100.11	100.12	99.76	99.87	99.69	100.28	100.20	99.95	100.04	100.16	100.05
10	72.0	3.10	3301	3500	100.28	100.78	100.35	99.75	99.67	100.39	100.19	99.76	99.67	99.09	99.28	99.46
11	72.0	3.10	3657	3500	100.78	100.76	100.44	100.84	100.69	100.38	100.57	100.30	99.96	99.97	99.87	99.61
12	73.7	3.09	3671	3500	99.67	99.38	99.09	99.01	98.94	99.29	99.15	99.29	99.26	99.20	99.48	99.63
13	69.2	3.06	3690	3500	100.24	100.16	99.96	100.20	100.57	100.34	100.35	99.78	99.95	99.76	99.79	99.91
14	70.8	3.09	3244	3500	99.97	99.52	99.52	99.68	99.86	99.57	99.20	99.31	99.27	99.25	99.19	99.34
15	71.2	3.09	3319	3500	100.67	100.25	100.28	100.01	99.86	99.75	99.82	99.74	99.64	99.56	99.93	99.55
16	73.0	3.09	3665	3500	99.54	99.20	98.86	99.27	99.42	99.10	99.26	99.29	99.31	99.43	99.44	99.18
17	73.2	3.09	3685	3500	100.05	99.57	99.71	99.56	99.63	99.39	99.22	99.30	99.29	99.30	99.42	99.63
18	72.7	3.09	3701	3500	100.16	99.93	100.00	99.86	100.15	100.55	100.33	99.76	100.17	100.09	99.99	99.93
19	73.1	3.09	3703	3500	100.39	100.02	99.59	99.74	99.92	99.98	99.64	99.69	99.71	99.45	99.96	99.77
20	72.6	3.09	3320	3500	100.40	99.97	99.84	99.54	100.00	99.86	100.14	100.03	99.92	99.84	99.48	99.59
n	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mean	71.8	3.09			100.07	99.92	99.79	99.85	99.95	99.92	99.85	99.71	99.74	99.66	99.76	99.71
Median	72.0	3.09			100.07	99.95	99.80	99.75	99.93	99.83	99.77	99.72	99.68	99.60	99.87	99.64
σ	1.5	0.01			0.39	0.45	0.44	0.42	0.41	0.47	0.51	0.48	0.39	0.35	0.37	0.32
Min.	69.2	3.06			99.42	99.20	98.86	99.01	98.94	99.10	99.15	99.06	99.26	99.09	99.19	99.10
Max.	74.8	3.10			100.78	100.78	100.44	100.84	100.69	100.74	100.57	100.62	100.65	100.27	100.53	100.44

Lamp #	Initial (0 hrs)				Chromaticity Shift (Δuv)											
	CCx	CCy	Calc. CCT	ANSI Target	168	1008	1512	2016	2520	3024	3528	4032	4536	5040	5544	6048
1	0.4218	0.3978	3229	3500	0.0004	0.0005	0.0006	0.0006	0.0006	0.0006	0.0005	0.0006	0.0005	0.0004	0.0004	0.0004
2	0.4196	0.3984	3276	3500	0.0003	0.0003	0.0004	0.0005	0.0005	0.0006	0.0005	0.0005	0.0005	0.0003	0.0004	0.0005
3	0.3931	0.3783	3695	3500	0.0005	0.0004	0.0005	0.0004	0.0004	0.0005	0.0004	0.0003	0.0004	0.0004	0.0003	0.0005
4	0.4207	0.3974	3247	3500	0.0003	0.0004	0.0006	0.0005	0.0005	0.0006	0.0005	0.0004	0.0005	0.0003	0.0006	0.0004
5	0.4174	0.3938	3282	3500	0.0003	0.0003	0.0005	0.0004	0.0004	0.0005	0.0004	0.0007	0.0005	0.0005	0.0005	0.0004
6	0.3961	0.3857	3680	3500	0.0004	0.0007	0.0007	0.0007	0.0006	0.0006	0.0005	0.0004	0.0004	0.0005	0.0003	0.0003
7	0.4213	0.3991	3249	3500	0.0003	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0006	0.0005	0.0004	0.0004	0.0004
8	0.4147	0.3934	3333	3500	0.0003	0.0003	0.0004	0.0004	0.0004	0.0005	0.0004	0.0004	0.0005	0.0005	0.0005	0.0003
9	0.3952	0.3856	3699	3500	0.0001	0.0004	0.0006	0.0005	0.0005	0.0004	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003
10	0.4165	0.3938	3301	3500	0.0004	0.0003	0.0004	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0005	0.0006	0.0004
11	0.3970	0.3855	3657	3500	0.0004	0.0005	0.0005	0.0004	0.0003	0.0004	0.0004	0.0005	0.0006	0.0006	0.0007	0.0008
12	0.3938	0.3775	3671	3500	0.0003	0.0005	0.0007	0.0007	0.0006	0.0007	0.0007	0.0006	0.0007	0.0006	0.0008	0.0008
13	0.3954	0.3846	3690	3500	0.0004	0.0003	0.0003	0.0004	0.0004	0.0003	0.0004	0.0004	0.0003	0.0003	0.0003	0.0004
14	0.4206	0.3968	3244	3500	0.0003	0.0005	0.0006	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006	0.0005	0.0005	0.0005
15	0.4154	0.3933	3319	3500	0.0004	0.0005	0.0006	0.0006	0.0005	0.0005	0.0005	0.0004	0.0004	0.0003	0.0004	0.0004
16	0.3971	0.3867	3665	3500	0.0004	0.0006	0.0007	0.0007	0.0006	0.0005	0.0006	0.0005	0.0005	0.0003	0.0004	0.0003
17	0.3937	0.3788	3685	3500	0.0004	0.0007	0.0008	0.0008	0.0007	0.0007	0.0006	0.0006	0.0005	0.0005	0.0006	0.0007
18	0.3949	0.3846	3701	3500	0.0004	0.0004	0.0004	0.0005	0.0006	0.0004	0.0006	0.0005	0.0007	0.0006	0.0006	0.0007
19	0.3942	0.3828	3703	3500	0.0004	0.0005	0.0006	0.0006	0.0005	0.0006	0.0006	0.0005	0.0004	0.0005	0.0006	0.0005
20	0.4159	0.3948	3320	3500	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0004	0.0004	0.0005	0.0002	0.0004	0.0003
n	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mean					0.0003	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0004	0.0005	0.0005
Median					0.0004	0.0004	0.0006	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004
σ					0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
Min.					0.0001	0.0003	0.0003	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003	0.0002	0.0003	0.0003
Max.					0.0005	0.0007	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0006	0.0008	0.0008

DATA SET A1: 85°C; 175 mA

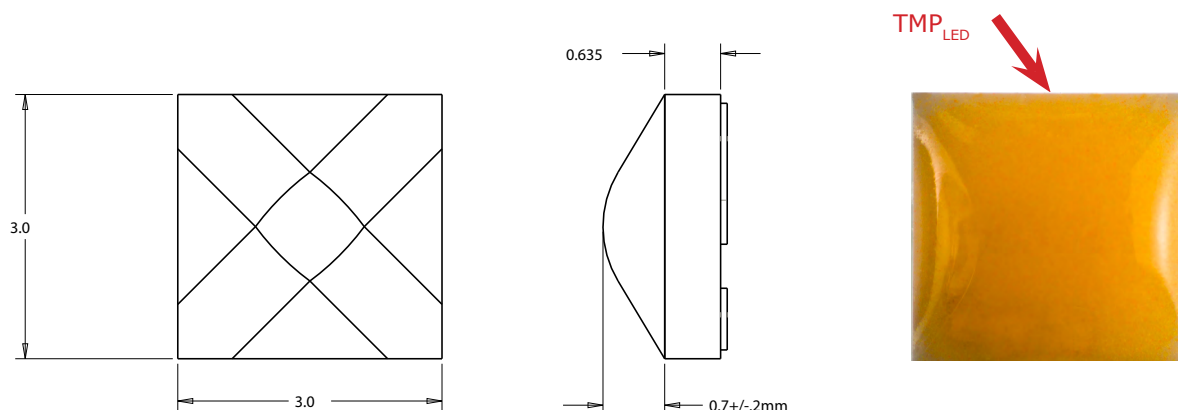
Lamp #	Initial (0 hrs)				Lumen Maintenance (%)							
	LF (lm)	V _F (V)	Calc. CCT	ANSI Target	6552	7056	7560	8064	8568	9072	9576	10080
1	71.2	3.10	3229	3500	100.59	100.35	100.56	100.28	100.28	100.42	100.42	100.42
2	72.3	3.09	3276	3500	99.93	100.05	100.14	99.72	99.72	100.28	100.41	99.86
3	70.0	3.10	3695	3500	99.89	99.92	100.14	99.86	100.29	100.00	100.00	100.29
4	70.1	3.06	3247	3500	99.67	99.79	100.14	99.71	99.71	99.57	100.14	100.43
5	69.2	3.09	3282	3500	100.57	100.33	100.14	100.29	100.58	100.43	99.71	100.14
6	73.0	3.09	3680	3500	99.80	99.81	100.14	99.86	99.86	100.00	100.00	100.41
7	71.3	3.08	3249	3500	99.92	100.27	100.14	99.72	99.72	99.30	98.88	99.02
8	70.7	3.09	3333	3500	99.66	99.73	99.43	99.72	99.58	99.72	99.72	99.58
9	74.8	3.09	3699	3500	100.09	100.06	100.27	99.87	99.87	99.73	100.27	99.87
10	72.0	3.10	3301	3500	99.64	100.02	100.00	100.28	100.14	100.28	100.00	100.00
11	72.0	3.10	3657	3500	99.50	99.82	100.00	99.86	99.44	99.44	99.86	100.00
12	73.7	3.09	3671	3500	100.05	99.66	99.73	99.59	99.59	100.00	99.73	100.00
13	69.2	3.06	3690	3500	100.16	99.98	99.86	100.14	100.29	100.00	99.71	100.00
14	70.8	3.09	3244	3500	99.60	99.45	99.86	99.58	99.72	100.00	99.58	99.58
15	71.2	3.09	3319	3500	99.73	99.48	99.72	99.72	99.72	99.72	99.86	99.86
16	73.0	3.09	3665	3500	99.25	99.70	99.73	99.45	99.32	99.18	99.59	99.04
17	73.2	3.09	3685	3500	99.98	99.65	99.73	99.59	99.45	99.32	99.59	99.59
18	72.7	3.09	3701	3500	99.90	99.93	100.14	100.28	99.86	100.00	100.00	100.14
19	73.1	3.09	3703	3500	100.09	100.07	100.14	99.86	99.73	99.45	99.18	99.45
20	72.6	3.09	3320	3500	100.12	100.32	99.86	99.86	99.86	99.72	100.28	100.14
n	20	20	20	20	20	20	20	20	20	20	20	20
Mean	71.8	3.09			99.91	99.92	99.99	99.86	99.84	99.83	99.85	99.89
Median	72.0	3.09			99.91	99.92	100.07	99.86	99.72	99.87	99.86	100.00
σ	1.5	0.01			0.33	0.27	0.25	0.26	0.33	0.37	0.39	0.41
Min.	69.2	3.06			99.25	99.45	99.43	99.45	99.32	99.18	98.88	99.02
Max.	74.8	3.10			100.59	100.35	100.56	100.29	100.58	100.43	100.42	100.43

Lamp #	Initial (0 hrs)				Chromaticity Shift (Δu'v')							
	CCx	CCy	Calc. CCT	ANSI Target	6552	7056	7560	8064	8568	9072	9576	10080
1	0.4218	0.3978	3229	3500	0.0006	0.0003	0.0002	0.0004	0.0005	0.0006	0.0007	0.0007
2	0.4196	0.3984	3276	3500	0.0003	0.0003	0.0003	0.0005	0.0005	0.0006	0.0007	0.0006
3	0.3931	0.3783	3695	3500	0.0005	0.0004	0.0003	0.0003	0.0005	0.0005	0.0005	0.0005
4	0.4207	0.3974	3247	3500	0.0005	0.0002	0.0002	0.0004	0.0007	0.0006	0.0006	0.0006
5	0.4174	0.3938	3282	3500	0.0004	0.0002	0.0003	0.0005	0.0007	0.0006	0.0007	0.0007
6	0.3961	0.3857	3680	3500	0.0003	0.0003	0.0004	0.0003	0.0004	0.0006	0.0003	0.0004
7	0.4213	0.3991	3249	3500	0.0004	0.0003	0.0003	0.0004	0.0005	0.0004	0.0004	0.0006
8	0.4147	0.3934	3333	3500	0.0004	0.0001	0.0002	0.0004	0.0006	0.0006	0.0005	0.0006
9	0.3952	0.3856	3699	3500	0.0003	0.0004	0.0004	0.0003	0.0004	0.0004	0.0003	0.0004
10	0.4165	0.3938	3301	3500	0.0004	0.0002	0.0003	0.0004	0.0005	0.0007	0.0007	0.0009
11	0.3970	0.3855	3657	3500	0.0008	0.0008	0.0006	0.0006	0.0007	0.0006	0.0006	0.0005
12	0.3938	0.3775	3671	3500	0.0009	0.0008	0.0006	0.0007	0.0008	0.0008	0.0009	0.0009
13	0.3954	0.3846	3690	3500	0.0004	0.0003	0.0002	0.0002	0.0005	0.0005	0.0004	0.0005
14	0.4206	0.3968	3244	3500	0.0005	0.0006	0.0007	0.0008	0.0008	0.0008	0.0007	0.0008
15	0.4154	0.3933	3319	3500	0.0004	0.0002	0.0002	0.0003	0.0004	0.0005	0.0005	0.0005
16	0.3971	0.3867	3665	3500	0.0004	0.0003	0.0003	0.0004	0.0005	0.0005	0.0006	0.0006
17	0.3937	0.3788	3685	3500	0.0006	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006	0.0008
18	0.3949	0.3846	3701	3500	0.0006	0.0007	0.0006	0.0006	0.0007	0.0006	0.0006	0.0005
19	0.3942	0.3828	3703	3500	0.0006	0.0005	0.0003	0.0003	0.0004	0.0004	0.0002	0.0004
20	0.4159	0.3948	3320	3500	0.0003	0.0003	0.0003	0.0004	0.0005	0.0007	0.0007	0.0007
n	20	20	20	20	20	20	20	20	20	20	20	20
Mean					0.0005	0.0004	0.0004	0.0004	0.0006	0.0006	0.0006	0.0006
Median					0.0004	0.0003	0.0003	0.0004	0.0005	0.0006	0.0006	0.0006
σ					0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0002	0.0001
Min.					0.0003	0.0001	0.0002	0.0002	0.0004	0.0004	0.0002	0.0004
Max.					0.0009	0.0008	0.0007	0.0008	0.0008	0.0008	0.0009	0.0009

MECHANICAL DIMENSIONS & TEMPERATURE MEASUREMENT POINT

All dimensions in mm.

Measurement tolerances unless indicated otherwise: .xx = .25 mm, .xxx = .125 mm



The LED temperature measurement point (TMP_{LED}) should be measured on the PCB surface, as close to the LED's cathode as possible (shown in the picture above). It is not required to use a solder footprint for the thermal pad that is larger than the LED itself. In testing, Cree has found such a solder pad to have insignificant impact on the resulting temperature measurement.