Cree® XLamp® XB-D White LEDs

INFORMATION REQUIRED BY LM-80-08

Cree classifies these LEDs as "LED packages" per Sep 9, 2011 ENERGY STAR guidelines[1].

1. Number of LED light sources tested	*See individual data sets on following pages.*
2. Description of LED light sources	XLamp XB-D White LEDs (Series: XBDAWT) This LM-80 report is applicable to the following order codes: XBDAWT-xx-xxxx-xxxxxxxxx All measurements provided are LED package measurements.
3. Description of 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 lifetime 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	Amber Abare, Components Reliability Laboratory Manager
Sampling method	Cree uses systematic sampling of production LEDs, with checks to ensure that the behavior of early samples are representative of the behavior of later samples.

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

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REVISION HISTORY

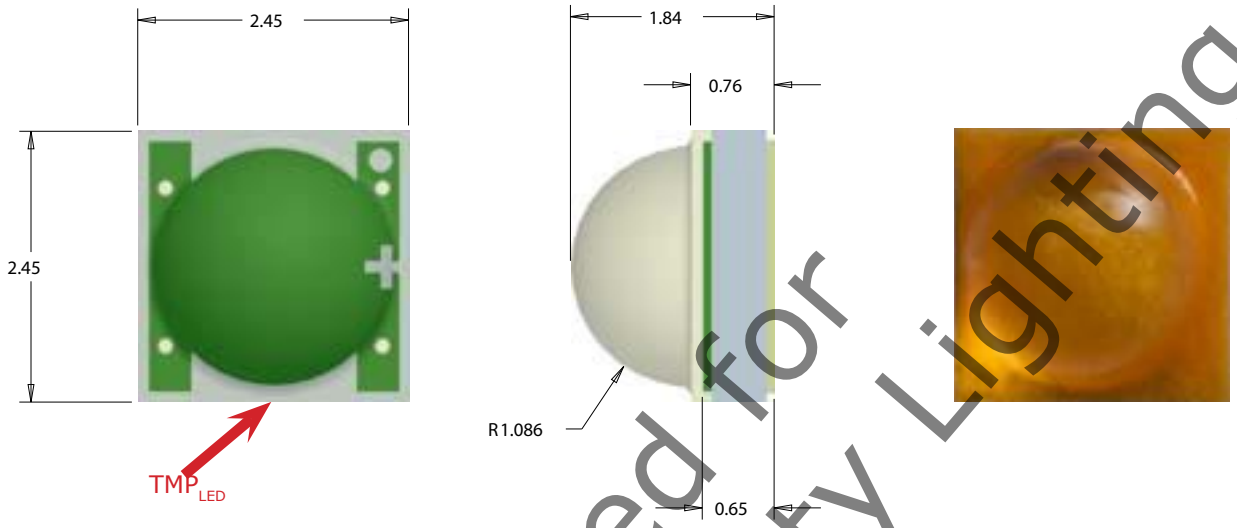
Revision	Date	Change
0	Sep 28, 2012	Date of first issue

TEST RESULTS SUMMARY

Data Set	Case Temp. [T_S]	Ambient Temp. [T_A]	Drive Current [I_F]	Average Lumen Maintenance at 6,000 hours	Average Chromaticity Shift ($\Delta u'v'$) at 6,000 hours	Reported TM-21 L70 Lifetime
1	85°C	85°C	700 mA	97.3%	0.0010	L70(6k) > 36,300 hrs

MECHANICAL DIMENSIONS & TEMPERATURE MEASUREMENT POINT

All measurements are ±.13 mm unless otherwise indicated.



The LED temperature measurement point (TMP_{LED}) should be measured on the PCB surface, as close to the LED's thermal pad 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.

DATA SET 1: 85°C; 700 mA

LED Package Series	XLamp XB-D White LEDs (Series: XBDAWT) This LM-80 report is applicable to the following order codes: XBDAWT-xx-xxxx-xxxxxxxxx
Tested Model Number	XBDAWT-00-0000-00000LAE7
Drive Current [I_F]	700 mA
Testing Initiation Date	November 4, 2011
Case Temperature [T_s]	85°C
Ambient Temperature [T_A]	85°C
Failures observed	None

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	187.3	3.45	3031	3000	99.8	98.3	101.0	101.6	100.1	99.3	98.3	97.2	96.5	98.2	96.8	97.3
2	189.5	3.33	3050	3000	98.9	98.0	99.5	99.7	99.0	97.8	97.7	97.0	96.4	97.0	97.6	96.8
3	186.7	3.33	2916	3000	98.5	97.5	97.9	98.5	98.2	98.0	97.4	97.2	96.3	97.1	96.5	96.8
4	177.6	3.32	3160	3000	98.8	99.3	99.7	100.6	99.4	99.5	98.9	98.7	97.4	97.7	98.9	97.1
5	180.2	3.30	3046	3000	99.2	100.2	101.6	101.3	101.9	101.1	98.5	98.3	97.9	99.9	98.4	99.5
6	191.8	3.28	3016	3000	100.3	100.4	101.7	100.3	100.2	99.6	99.4	98.5	98.7	99.1	98.4	99.1
7	187.5	3.31	3157	3000	99.7	101.1	101.2	101.7	101.9	101.1	99.0	97.6	96.6	99.2	98.0	98.8
8	183.3	3.28	3161	3000	99.8	102.1	101.5	101.1	100.5	100.0	100.5	97.8	97.1	99.8	99.9	98.3
9	192.7	3.27	3152	3000	99.8	100.4	100.2	99.2	98.9	98.5	98.2	97.6	98.4	98.3	98.0	97.9
10	184.0	3.30	2963	3000	99.4	100.8	101.5	102.0	101.7	101.1	101.4	98.7	98.2	100.0	100.0	99.3
11	187.5	3.31	3072	3000	100.5	100.3	98.6	97.1	97.0	97.8	97.5	98.8	96.4	97.4	98.7	97.7
12	188.2	3.30	3078	3000	100.2	100.2	99.1	98.4	97.9	96.6	97.8	98.3	97.3	97.3	97.3	97.6
13	192.1	3.30	3192	3000	99.5	100.1	98.7	97.0	97.3	96.9	96.9	98.8	96.6	97.4	98.6	98.0
14	192.3	3.29	3140	3000	99.6	100.2	99.9	98.6	98.5	98.0	98.4	98.9	97.8	98.2	98.1	98.0
15	180.3	3.23	2944	3000	99.9	100.9	99.4	99.1	98.4	96.4	97.8	99.4	97.9	98.4	99.0	99.3
16	196.3	3.23	3220	3000	99.5	101.0	100.1	98.9	98.8	98.3	98.7	99.2	98.3	98.5	98.3	98.5
17	190.5	3.25	2993	3000	99.0	100.1	100.3	99.3	97.9	96.9	97.2	98.5	97.4	97.7	98.0	98.7
18	190.8	3.31	3130	3000	99.1	98.9	98.5	97.8	97.2	96.7	95.4	95.1	96.4	97.0	96.4	96.3
19	199.9	3.28	3131	3000	97.5	97.0	94.2	93.6	94.5	93.8	93.6	93.8	93.8	94.7	94.3	94.8
20	184.9	3.29	3104	3000	100.0	97.9	98.7	98.1	97.0	96.3	94.9	95.4	95.8	96.6	95.8	95.7
21	196.5	3.27	3196	3000	99.4	99.2	98.1	98.1	96.8	96.4	95.9	95.9	96.4	97.0	96.5	96.7
22	196.5	3.29	3098	3000	97.4	97.3	96.8	95.0	95.4	95.0	94.6	94.2	94.9	95.3	94.9	95.2
23	199.3	3.29	3163	3000	97.4	97.6	96.7	93.9	95.2	94.6	94.4	94.3	94.4	95.0	94.6	94.5
24	186.1	3.32	3136	3000	99.4	99.7	98.8	98.4	96.5	96.2	96.1	96.1	96.1	95.8	95.2	94.9
25	196.7	3.25	3139	3000	99.2	98.6	98.0	96.4	95.7	95.2	95.2	95.1	95.9	96.0	95.6	95.8
n	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Mean	**189.5**	**3.30**			**99.3**	**99.5**	**99.3**	**98.6**	**98.2**	**97.6**	**97.3**	**97.2**	**96.8**	**97.5**	**97.4**	**97.3**
Median	189.5	3.29			99.4	100.1	99.4	98.6	98.2	97.8	97.7	97.6	96.6	97.4	98.0	97.6
σ	6.0	0.04			0.84	1.38	1.78	2.27	2.06	2.04	1.95	1.73	1.23	1.48	1.62	1.52
Min.	177.6	3.23			97.4	97.0	94.2	93.6	94.5	93.8	93.6	93.8	93.8	94.7	94.3	94.5
Max.	199.9	3.45			100.5	102.1	101.7	102.0	101.9	101.1	101.4	99.4	98.7	100.0	100.0	99.5

DATA SET 1: 85°C; 700 mA

LED Package Series	XLamp XB-D White LEDs (Series: XBDAWT) This LM-80 report is applicable to the following order codes: XBDAWT-xx-xxxx-xxxxxxxxx
Tested Model Number	XBDAWT-00-0000-00000LAE7
Drive Current [I_F]	700 mA
Testing Initiation Date	November 4, 2011
Case Temperature [T_s]	85°C
Ambient Temperature [T_A]	85°C
Failures observed	None

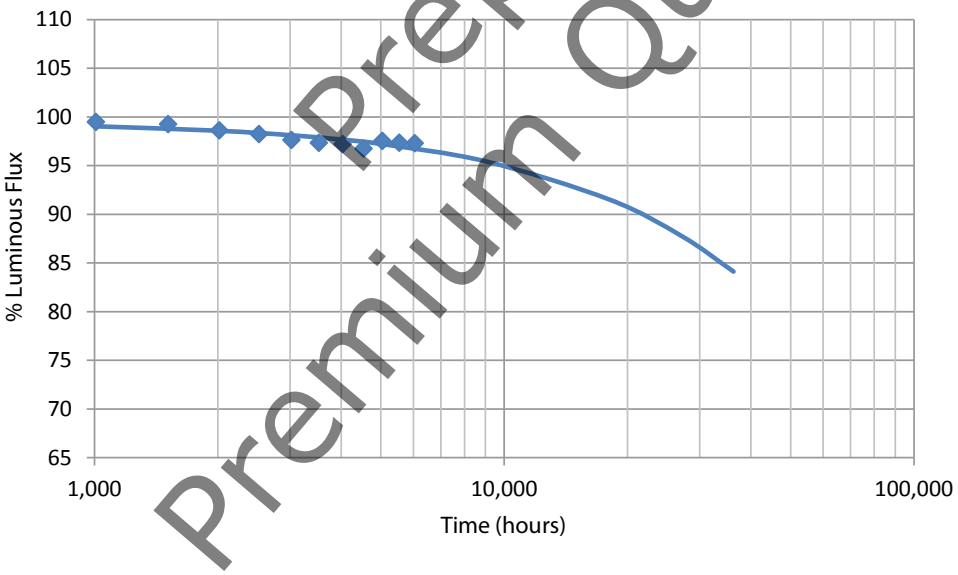
Lamp #	Initial (0 hrs)				Chromaticity Shift (Δu'v')											
	CCx	CCy	Calc. CCT	ANSI Target	168	1008	1512	2016	2520	3024	3528	4032	4536	5040	5544	6048
1	0.4347	0.4026	3031	3000	0.0008	0.0011	0.0011	0.0011	0.0011	0.0012	0.0011	0.0012	0.0011	0.0013	0.0009	0.0011
2	0.4299	0.3945	3050	3000	0.0016	0.0019	0.0016	0.0016	0.0015	0.0015	0.0013	0.0015	0.0016	0.0015	0.0018	0.0014
3	0.4428	0.4052	2916	3000	0.0012	0.0014	0.0016	0.0015	0.0017	0.0017	0.0016	0.0017	0.0018	0.0017	0.0021	0.0018
4	0.4272	0.4018	3160	3000	0.0009	0.0009	0.0012	0.0013	0.0013	0.0013	0.0014	0.0013	0.0013	0.0014	0.0015	0.0013
5	0.4298	0.3939	3046	3000	0.0005	0.0010	0.0010	0.0010	0.0011	0.0011	0.0009	0.0009	0.0010	0.0013	0.0011	0.0011
6	0.4349	0.4012	3016	3000	0.0005	0.0010	0.0011	0.0011	0.0012	0.0011	0.0011	0.0012	0.0010	0.0013	0.0012	0.0012
7	0.4192	0.3835	3157	3000	0.0007	0.0012	0.0012	0.0013	0.0014	0.0014	0.0013	0.0013	0.0012	0.0015	0.0015	0.0015
8	0.4208	0.3874	3161	3000	0.0005	0.0008	0.0010	0.0011	0.0010	0.0010	0.0012	0.0011	0.0012	0.0014	0.0014	0.0012
9	0.4211	0.3871	3152	3000	0.0007	0.0010	0.0011	0.0012	0.0012	0.0012	0.0011	0.0013	0.0014	0.0014	0.0013	0.0013
10	0.4369	0.3990	2963	3000	0.0007	0.0009	0.0010	0.0012	0.0011	0.0011	0.0013	0.0013	0.0014	0.0014	0.0014	0.0013
11	0.4303	0.3982	3072	3000	0.0004	0.0005	0.0003	0.0004	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0007	0.0006
12	0.4290	0.3961	3078	3000	0.0007	0.0009	0.0008	0.0007	0.0009	0.0008	0.0009	0.0008	0.0007	0.0007	0.0009	0.0008
13	0.4204	0.3902	3192	3000	0.0003	0.0005	0.0004	0.0006	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0004
14	0.4250	0.3946	3140	3000	0.0003	0.0006	0.0007	0.0006	0.0007	0.0008	0.0007	0.0007	0.0007	0.0008	0.0007	0.0007
15	0.4447	0.4124	2944	3000	0.0005	0.0005	0.0004	0.0006	0.0008	0.0007	0.0008	0.0008	0.0008	0.0009	0.0010	0.0010
16	0.4181	0.3881	3220	3000	0.0005	0.0006	0.0007	0.0006	0.0008	0.0007	0.0009	0.0008	0.0007	0.0008	0.0008	0.0008
17	0.4363	0.4014	2993	3000	0.0003	0.0003	0.0004	0.0002	0.0003	0.0002	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002
18	0.4246	0.3926	3130	3000	0.0004	0.0006	0.0008	0.0006	0.0006	0.0005	0.0007	0.0005	0.0006	0.0007	0.0008	0.0008
19	0.4247	0.3928	3131	3000	0.0002	0.0005	0.0005	0.0006	0.0008	0.0007	0.0008	0.0008	0.0008	0.0010	0.0009	0.0008
20	0.4281	0.3972	3104	3000	0.0005	0.0003	0.0007	0.0006	0.0006	0.0008	0.0009	0.0004	0.0007	0.0010	0.0009	0.0009
21	0.4194	0.3882	3196	3000	0.0005	0.0006	0.0006	0.0007	0.0009	0.0008	0.0009	0.0007	0.0009	0.0009	0.0010	0.0009
22	0.4287	0.3977	3098	3000	0.0002	0.0004	0.0004	0.0004	0.0006	0.0007	0.0008	0.0006	0.0008	0.0009	0.0009	0.0008
23	0.4225	0.3915	3163	3000	0.0002	0.0006	0.0006	0.0005	0.0008	0.0007	0.0009	0.0007	0.0008	0.0011	0.0010	0.0009
24	0.4233	0.3902	3136	3000	0.0003	0.0007	0.0008	0.0008	0.0008	0.0008	0.0010	0.0008	0.0009	0.0011	0.0012	0.0011
25	0.4251	0.3946	3139	3000	0.0001	0.0004	0.0004	0.0004	0.0003	0.0003	0.0003	0.0004	0.0002	0.0001	0.0002	0.0003
n	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Mean					**0.0005**	**0.0008**	**0.0008**	**0.0008**	**0.0009**	**0.0009**	**0.0009**	**0.0009**	**0.0009**	**0.0010**	**0.0010**	**0.0010**
Median					0.0005	0.0006	0.0008	0.0007	0.0008	0.0008	0.0009	0.0008	0.0008	0.0010	0.0010	0.0009
σ					0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004
Min.					0.0001	0.0003	0.0003	0.0002	0.0003	0.0002	0.0003	0.0003	0.0002	0.0001	0.0002	0.0002
Max.					0.0016	0.0019	0.0016	0.0016	0.0017	0.0017	0.0016	0.0017	0.0018	0.0017	0.0021	0.0018

DATA SET 1: 85°C; 700 mA

LED Package Series	XLamp XB-D White LEDs (Series: XBDAWT) This LM-80 report is applicable to the following order codes: XBDAWT-xx-xxxx-xxxxxxxxx
Tested Model Number	XBDAWT-00-0000-00000LAE7
Drive Current [I_F]	700 mA
Testing Initiation Date	November 4, 2011
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	6,048 hours
Test duration used for projection	t=1,008 to t=6,048
α	4.632E-06
β	9.950E-01
Calculated Lifetime	L70(6k) = 75,900 hours
Reported Lifetime	L70(6k) > 36,300 hours



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

Time (hours)	Lumen Maintenance
0	100.0000%
168	99.2710%
1008	99.4870%
1512	99.2610%
2016	98.6230%
2520	98.2390%
3024	97.6360%
3528	97.3430%
4032	97.2140%
4536	96.7520%
5040	97.5380%
5544	97.3520%
6048	97.3010%

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

Suggestion for exporting the LM-80 data:
1. Copy above table from PDF & paste into Microsoft Word.
2. Copy table out of Word & paste into Microsoft Excel (Match destination formatting)