

# Lumileds

## IESNA LM-80 Test Report

### 1. Description of LED light sources tested

LUXEON 2835E 9V: L128-2780EC3500001 (nominal CCT 2700K).

### 2. Package Pictures



Figure 1. Picture of the LUXEON 2835 series.

### 3a. Projected $L_{70}$ extrapolations per IESNA TM-21-11

	$I_f = 60\text{mA}$
$T_s = 85^\circ\text{C}$	98,540
$T_s = 55^\circ\text{C}$	343,625

### 3b. Reported $L_{70}$ extrapolations per IESNA TM-21-11

	$I_f = 60\text{mA}$
$T_s = 85^\circ\text{C}$	> 60,000
$T_s = 55^\circ\text{C}$	> 60,000

#### 4. Applicable LUXEON® Series part number(s)

This IESNA LM-80 Test Report applies to the following LUXEON part numbers:

Product Family	Part Number	Nominal CCT
LUXEON 2835E 3V	L128-2780EA3500001	2700K
LUXEON 2835E 3V	L128-2790EA3500001	2700K
LUXEON 2835E 3V	L128-3080EA3500001	3000K
LUXEON 2835E 3V	L128-3090EA3500001	3000K
LUXEON 2835E 3V	L128-3580EA3500001	3500K
LUXEON 2835E 3V	L128-3590EA3500001	3500K
LUXEON 2835E 3V	L128-4080EA3500001	4000K
LUXEON 2835E 3V	L128-4090EA3500001	4000K
LUXEON 2835E 3V	L128-5080EA3500001	5000K
LUXEON 2835E 3V	L128-5090EA3500001	5000K
LUXEON 2835E 3V	L128-5780EA3500001	5700K
LUXEON 2835E 3V	L128-5790EA3500001	5700K
LUXEON 2835E 3V	L128-6580EA3500001	6500K
LUXEON 2835E 3V	L128-6590EA3500001	6500K
LUXEON 2835E 6V	L128-2780EB3500001	2700K
LUXEON 2835E 6V	L128-3080EB3500001	3000K
LUXEON 2835E 6V	L128-3580EB3500001	3500K
LUXEON 2835E 6V	L128-4080EB3500001	4000K
LUXEON 2835E 6V	L128-5080EB3500001	5000K
LUXEON 2835E 6V	L128-5780EB3500001	5700K
LUXEON 2835E 6V	L128-6580EB3500001	6500K
LUXEON 2835E 9V	L128-2280EC3500001	2200K
LUXEON 2835E 9V	L128-2290EC3500001	2200K
LUXEON 2835E 9V	L128-2780EC3500001	2700K
LUXEON 2835E 9V	L128-2790EC3500001	2700K
LUXEON 2835E 9V	L128-3070EC3500001	3000K
LUXEON 2835E 9V	L128-3080EC3500001	3000K
LUXEON 2835E 9V	L128-3090EC3500001	3000K
LUXEON 2835E 9V	L128-3580EC3500001	3500K
LUXEON 2835E 9V	L128-3590EC3500001	3500K
LUXEON 2835E 9V	L128-4080EC3500001	4000K
LUXEON 2835E 9V	L128-4090EC3500001	4000K

LUXEON 2835E 9V	L128-5080EC3500001	5000K
LUXEON 2835E 9V	L128-5090EC3500001	5000K
LUXEON 2835E 9V	L128-5780EC3500001	5700K
LUXEON 2835E 9V	L128-6570EC3500001	6500K
LUXEON 2835E 9V	L128-6580EC3500001	6500K

### 5. Number of LED light sources tested

25 units.

### 6. Dates Tests Started

2016/08/06.

### 7. Date Report First Issued

2017/11/30.

### 8. Mechanical Drawing

For detailed mechanical drawings, please see individual product data sheets.

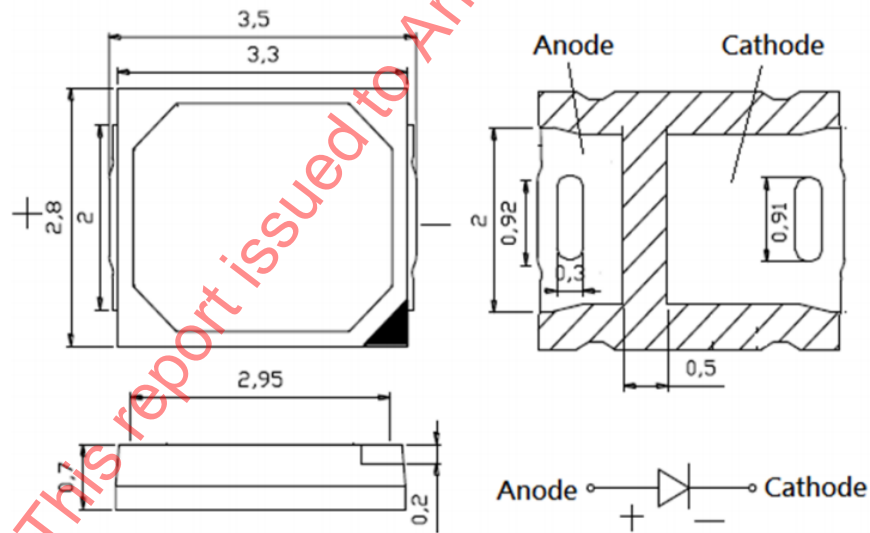
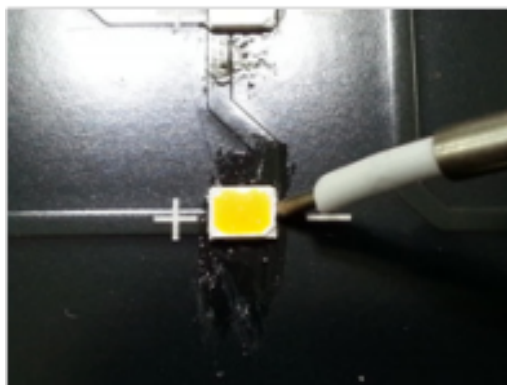


Figure 2: Mechanical Drawing for LUXEON 2835. All dimensions are in millimeters.

### 9. $T_s$ Measurement Point

The point below in the right side of the LUXEON 2835 corresponds to the recommended temperature measurement point  $T_s$ , see Figure 3.



**Figure 3: Preferred  $T_s$  measurement point for LUXEON 2835.**

For further information on measuring the in-situ  $T_s$ , please see the appropriate application Lumileds Application Brief which is available online at [www.lumileds.com](http://www.lumileds.com).

## 10. Description of auxiliary equipment

LUXEON LED devices are soldered to reliability stress boards..

Reliability stress boards are mounted in a chamber with minimal ambient airflow. The chamber temperature is controlled based on the temperature of a control  $T_s$  point, which is located on the stress board.

The reliability stress board is periodically removed from the thermal chamber, allowed to cool to room temperature, and then tested. After testing, the reliability stress board is returned to the thermal chamber for additional operation.

## 11. Operating Cycle

LUXEON LEDs are driven with a constant direct current (DC).

## 12. Ambient conditions including airflow, temperature, and relative humidity

The typical relative humidity within the chamber is < 65%.

## 13. $T_s$ and ambient temperatures (ambient temperature measured 5mm above reliability stress board)

In all cases, both  $T_s$  and  $T_{air}$  meet or exceed the IESNA LM-80-08 limits.

## 14. Drive current of the LED light source during lifetime test

See tables.

## 15. Initial luminous flux and forward voltage at photometric measurement current

See tables.

## 16. Lumen maintenance for data for each individual light source along with median value, standard deviation, minimum and maximum lumen maintenance value for all of the light sources

See tables.

## 17. Observation of LED light source failures including the failure conditions and time of failure

No failures observed in devices reported.

## 18. LED light source monitoring interval

Units were tested at 0 hour and at subsequent 1,000 hours intervals.

## 19. Measurement uncertainty

Long-term measurement uncertainty is based on reproducibility tests done over a period of one year, calculated to  $k = 1.97$  coverage (i.e. 95% coverage).

Long-term measurement uncertainty is based on reproducibility tests done over a period of one year, calculated to  $k = 2$  coverage (i.e. 95% coverage)

Luminous Flux ( $\Phi_v$ )  $\pm 2\%$

## 20. Chromaticity shift reported over the measurement time

See tables.

## 21. Sampling Method/Sample size

Tested samples are selected to be representative of the overall LED population. LED sample size is indicated in Section 5 of this report.

This report issued to Arrow Electronics

## 22. ISO 17025-2005 Accreditation

SINGAPORE LABORATORY  
ACCREDITATION SCHEME

SINGAPORE  
ACCREDITATION COUNCIL

Number : **LA-2016-0634-E**

Date of Issue : **14 December 2016**

Date of Expiry: **13 December 2020**

### Certificate of Accreditation

This certifies that

**Lumileds Malaysia Sdn. Bhd.**  
**Reliability Test Laboratory**  
**No. 3, Lintang Bayan Lepas 8,**  
**Phase 4, Bayan Lepas Industrial Park**  
**11900, Penang, Malaysia**

is accredited by the Singapore Accreditation Council to

**ISO / IEC 17025 : 2005**

for specific scope within the field of

**Electrical Testing**

as detailed in the attached schedule.

  
Chairman

This Certificate is awarded subject to the organisation's compliance with the stated criteria and terms and conditions laid down by the Singapore Accreditation Council.

This Certificate may not be reproduced except with the written permission of the Chairman.

*This report issued to Arrow Electronics*

### Notes

Data is for reference only and is not an endorsement to exceed the Data Sheet operating conditions.

The TM-21 extrapolations are based on IES TM-21-11 "Projecting Long Term Lumen Maintenance of LED Light Sources. The TM-21 lumen maintenance model is based on the flux data normalized to 1 at 0 hours and the use of an exponential model for flux(time):

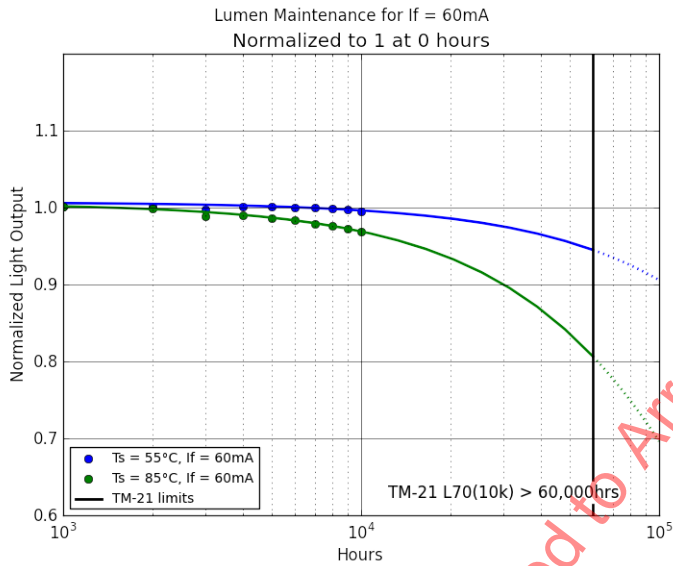
Flux(time) = B exp[-alpha\*time], where normally B ≅ 1, and alpha > 0.

An L70 extrapolation less than 0 means that the model predicts an increasing flux output with time, i.e.  $\alpha < 0$  (see graphs). Generally, this means that additional test time is needed to determine the long-term lumen maintenance behavior.

*This report issued to Arrow Electronics*

**Normalized Flux Statistics for  $I_f = 60\text{mA}$**

	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	alpha	B	L70
median =	1.0000	1.0015	1.0005	0.9915	0.9920	0.9894	0.9887	0.9838	0.9803	0.9765	0.9715			
Ts=Tair=85°C average =	1.0000	1.0008	0.9990	0.9883	0.9897	0.9866	0.9838	0.9793	0.9767	0.9730	0.9685	3.6729e-06	1.0053	98,540
st dev =	0.0000	0.0048	0.0056	0.0084	0.0089	0.0100	0.0103	0.0107	0.0104	0.0101	0.0102	TM-21 L70(10k) > 60,000hrs		
min =	1.0000	0.9897	0.9879	0.9689	0.9704	0.9662	0.9634	0.9580	0.9555	0.9519	0.9478			
max =	1.0000	1.0108	1.0103	1.0031	1.0031	1.0019	0.9991	0.9952	0.9924	0.9893	0.9866			
median =	1.0000	1.0013	1.0011	0.9978	1.0026	1.0030	1.0024	1.0000	1.0004	0.9990	0.9967			
Ts=Tair=55°C average =	1.0000	1.0013	1.0010	0.9979	1.0015	1.0011	1.0005	0.9996	0.9994	0.9974	0.9956	1.0579e-06	1.0069	343,625
st dev =	0.0000	0.0045	0.0048	0.0048	0.0053	0.0055	0.0056	0.0056	0.0053	0.0057	0.0056	TM-21 L70(10k) > 60,000hrs		
min =	1.0000	0.9913	0.9899	0.9881	0.9899	0.9894	0.9892	0.9886	0.9886	0.9871	0.9840			
max =	1.0000	1.0095	1.0096	1.0058	1.0102	1.0098	1.0098	1.0077	1.0075	1.0061	1.0039			



**Delta u'v' for  $I_f = 60\text{mA}$**

	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
median =	0.0000	0.0013	0.0013	0.0014	0.0013	0.0013	0.0014	0.0016	0.0016	0.0018	0.0017
Ts=Tair=85°C average =	0.0000	0.0013	0.0014	0.0014	0.0014	0.0015	0.0015	0.0017	0.0017	0.0019	0.0018
st dev =	0.0000	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0004
min =	0.0000	0.0010	0.0010	0.0012	0.0011	0.0011	0.0010	0.0012	0.0012	0.0015	0.0012
max =	0.0000	0.0017	0.0018	0.0019	0.0019	0.0022	0.0021	0.0023	0.0023	0.0024	0.0025
median =	0.0000	0.0011	0.0013	0.0012	0.0011	0.0012	0.0013	0.0014	0.0013	0.0014	0.0013
Ts=Tair=55°C average =	0.0000	0.0012	0.0013	0.0012	0.0011	0.0012	0.0013	0.0014	0.0013	0.0014	0.0014
st dev =	0.0000	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
min =	0.0000	0.0009	0.0010	0.0009	0.0008	0.0009	0.0010	0.0009	0.0010	0.0011	0.0011
max =	0.0000	0.0015	0.0015	0.0016	0.0015	0.0015	0.0018	0.0017	0.0018	0.0018	0.0019



**Luminous Flux [lm] data for tested units**  
 $T_s = T_{air} = 55^{\circ}\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 53^{\circ}\text{C}$  and  $T_{air} \geq 50^{\circ}\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2741K	70.487	70.417	70.548	70.268	70.493	70.446	70.493	70.452	70.464	70.270	70.210
2	2740K	71.963	71.735	71.727	71.385	71.638	71.549	71.489	71.389	71.384	71.123	71.096
3	2729K	71.193	70.996	70.978	70.736	70.989	71.019	70.862	70.761	70.826	70.685	70.520
4	2758K	70.895	70.956	71.084	70.955	71.233	71.271	71.207	71.198	71.119	70.956	70.812
5	2733K	70.652	70.955	70.922	70.719	70.957	70.973	70.821	70.808	70.830	70.578	70.474
6	2718K	71.619	71.405	71.287	71.030	71.231	71.210	71.198	71.027	71.077	70.870	70.778
7	2754K	71.362	71.884	71.872	71.662	71.908	71.938	71.934	71.859	71.841	71.737	71.637
8	2717K	70.838	71.060	71.116	70.853	71.137	71.110	71.034	71.114	71.031	70.947	70.748
9	2758K	70.507	70.550	70.627	70.438	70.690	70.748	70.676	70.639	70.561	70.470	70.218
10	2736K	69.988	69.909	69.826	69.575	69.870	69.857	69.786	69.737	69.780	69.480	69.510
11	2710K	69.920	70.206	70.102	69.886	70.200	70.140	70.111	70.123	70.101	70.002	69.821
12	2722K	70.783	70.708	70.799	70.488	70.533	70.434	70.357	70.347	70.259	70.092	69.982
13	2753K	72.194	71.570	71.464	71.337	71.466	71.432	71.411	71.370	71.372	71.262	71.038
14	2739K	69.713	69.882	70.008	69.779	70.084	70.009	69.980	69.954	69.978	69.856	69.791
15	2747K	70.539	70.320	70.217	70.069	70.290	70.194	70.187	70.109	70.159	69.964	69.814
16	2736K	69.948	69.611	69.653	69.409	69.588	69.572	69.474	69.512	69.502	69.344	69.216
17	2744K	71.425	72.006	72.002	71.719	71.956	71.940	71.878	71.823	71.766	71.615	71.456
18	2729K	71.290	71.762	71.841	71.669	71.864	71.907	71.833	71.793	71.652	71.598	71.367
19	2768K	68.844	69.006	69.041	68.909	69.218	69.108	69.221	69.214	69.145	69.047	69.001
20	2741K	71.917	71.871	71.803	71.727	71.973	72.036	71.923	71.912	71.944	71.791	71.681
21	2737K	72.174	72.267	72.150	71.959	72.144	72.203	72.175	72.086	72.077	71.968	71.858
22	2736K	72.187	72.281	72.001	71.726	72.004	71.901	71.840	71.699	71.661	71.604	71.446
23	2750K	69.758	69.927	69.838	69.606	70.027	69.968	69.961	69.771	69.746	69.626	69.626
24	2729K	71.662	72.344	72.349	72.078	72.391	72.363	72.366	72.212	72.196	72.099	71.880
25	2737K	71.121	71.680	71.554	71.326	71.671	71.607	71.553	71.287	71.324	71.282	71.129

**Normalized Luminous Flux data for tested units**  
 $T_s = T_{air} = 55^{\circ}\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 53^{\circ}\text{C}$  and  $T_{air} \geq 50^{\circ}\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2741K	1.0000	0.9990	1.0009	0.9969	1.0001	0.9994	1.0001	0.9995	0.9997	0.9969	0.9961
2	2740K	1.0000	0.9968	0.9967	0.9920	0.9955	0.9942	0.9934	0.9920	0.9920	0.9883	0.9880
3	2729K	1.0000	0.9972	0.9970	0.9936	0.9971	0.9976	0.9954	0.9939	0.9948	0.9929	0.9905
4	2758K	1.0000	1.0009	1.0027	1.0008	1.0048	1.0053	1.0044	1.0043	1.0032	1.0009	0.9988
5	2733K	1.0000	1.0043	1.0038	1.0009	1.0043	1.0045	1.0024	1.0022	1.0025	0.9990	0.9975
6	2718K	1.0000	0.9970	0.9954	0.9918	0.9946	0.9943	0.9941	0.9917	0.9924	0.9895	0.9883
7	2754K	1.0000	1.0073	1.0071	1.0042	1.0077	1.0081	1.0080	1.0070	1.0067	1.0053	1.0039
8	2717K	1.0000	1.0031	1.0039	1.0002	1.0042	1.0038	1.0028	1.0039	1.0027	1.0015	0.9987
9	2758K	1.0000	1.0006	1.0017	0.9990	1.0026	1.0034	1.0024	1.0019	1.0008	0.9995	0.9959
10	2736K	1.0000	0.9989	0.9977	0.9941	0.9983	0.9981	0.9971	0.9964	0.9970	0.9927	0.9932
11	2710K	1.0000	1.0041	1.0026	0.9995	1.0040	1.0031	1.0027	1.0029	1.0026	1.0012	0.9986
12	2722K	1.0000	0.9989	1.0002	0.9958	0.9965	0.9951	0.9940	0.9938	0.9926	0.9902	0.9887
13	2753K	1.0000	0.9913	0.9899	0.9881	0.9899	0.9894	0.9892	0.9886	0.9886	0.9871	0.9840
14	2739K	1.0000	1.0024	1.0042	1.0009	1.0053	1.0042	1.0038	1.0035	1.0038	1.0020	1.0011
15	2747K	1.0000	0.9969	0.9954	0.9933	0.9965	0.9951	0.9950	0.9939	0.9946	0.9918	0.9897
16	2736K	1.0000	0.9952	0.9958	0.9923	0.9949	0.9946	0.9932	0.9938	0.9936	0.9914	0.9895
17	2744K	1.0000	1.0081	1.0081	1.0041	1.0074	1.0072	1.0063	1.0056	1.0048	1.0027	1.0004
18	2729K	1.0000	1.0066	1.0077	1.0053	1.0080	1.0087	1.0076	1.0071	1.0051	1.0043	1.0011
19	2768K	1.0000	1.0024	1.0029	1.0010	1.0054	1.0038	1.0055	1.0054	1.0044	1.0030	1.0023
20	2741K	1.0000	0.9994	0.9984	0.9974	1.0008	1.0017	1.0001	0.9999	1.0004	0.9982	0.9967
21	2737K	1.0000	1.0013	0.9997	0.9970	0.9996	1.0004	1.0000	0.9988	0.9987	0.9972	0.9956
22	2736K	1.0000	1.0013	0.9974	0.9936	0.9975	0.9960	0.9952	0.9932	0.9927	0.9919	0.9897
23	2750K	1.0000	1.0024	1.0011	0.9978	1.0039	1.0030	1.0029	1.0000	1.0002	0.9998	0.9981
24	2729K	1.0000	1.0095	1.0096	1.0058	1.0102	1.0098	1.0098	1.0077	1.0075	1.0061	1.0030
25	2737K	1.0000	1.0079	1.0061	1.0029	1.0077	1.0068	1.0061	1.0023	1.0029	1.0023	1.0001

**CIE 1976 u' data for tested units**

$T_s = T_{air} = 55^\circ\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 53^\circ\text{C}$  and  $T_{air} \geq 50^\circ\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2741K	0.2599	0.2589	0.2587	0.2588	0.2591	0.2589	0.2586	0.2587	0.2587	0.2587	0.2586
2	2740K	0.2600	0.2587	0.2586	0.2586	0.2587	0.2585	0.2585	0.2584	0.2583	0.2584	0.2584
3	2729K	0.2604	0.2591	0.2590	0.2592	0.2592	0.2591	0.2591	0.2589	0.2589	0.2588	0.2588
4	2758K	0.2594	0.2582	0.2583	0.2584	0.2585	0.2584	0.2584	0.2583	0.2583	0.2584	0.2584
5	2733K	0.2606	0.2595	0.2594	0.2594	0.2595	0.2596	0.2597	0.2595	0.2595	0.2596	0.2595
6	2718K	0.2610	0.2597	0.2595	0.2595	0.2595	0.2595	0.2593	0.2593	0.2592	0.2592	0.2592
7	2754K	0.2594	0.2583	0.2583	0.2583	0.2585	0.2583	0.2581	0.2582	0.2583	0.2582	0.2582
8	2717K	0.2613	0.2603	0.2600	0.2603	0.2603	0.2603	0.2601	0.2601	0.2603	0.2601	0.2603
9	2758K	0.2593	0.2582	0.2582	0.2583	0.2585	0.2583	0.2584	0.2584	0.2584	0.2581	0.2583
10	2736K	0.2606	0.2597	0.2594	0.2595	0.2597	0.2595	0.2594	0.2595	0.2594	0.2594	0.2595
11	2710K	0.2618	0.2609	0.2608	0.2607	0.2609	0.2609	0.2606	0.2606	0.2606	0.2605	0.2606
12	2722K	0.2607	0.2597	0.2595	0.2595	0.2595	0.2593	0.2592	0.2591	0.2594	0.2591	0.2590
13	2753K	0.2596	0.2581	0.2583	0.2582	0.2585	0.2582	0.2580	0.2581	0.2581	0.2580	0.2579
14	2739K	0.2605	0.2594	0.2590	0.2592	0.2593	0.2592	0.2592	0.2590	0.2592	0.2592	0.2589
15	2747K	0.2599	0.2584	0.2584	0.2585	0.2585	0.2584	0.2580	0.2583	0.2583	0.2581	0.2581
16	2736K	0.2606	0.2595	0.2595	0.2595	0.2595	0.2594	0.2593	0.2592	0.2593	0.2592	0.2594
17	2744K	0.2598	0.2587	0.2587	0.2588	0.2588	0.2589	0.2586	0.2585	0.2587	0.2586	0.2587
18	2729K	0.2606	0.2597	0.2596	0.2595	0.2597	0.2596	0.2595	0.2595	0.2597	0.2596	0.2597
19	2768K	0.2593	0.2581	0.2580	0.2580	0.2582	0.2583	0.2580	0.2580	0.2581	0.2580	0.2581
20	2741K	0.2599	0.2586	0.2586	0.2587	0.2588	0.2587	0.2586	0.2584	0.2587	0.2585	0.2586
21	2737K	0.2605	0.2593	0.2591	0.2591	0.2593	0.2592	0.2591	0.2590	0.2591	0.2589	0.2591
22	2736K	0.2603	0.2592	0.2589	0.2590	0.2590	0.2588	0.2587	0.2586	0.2589	0.2586	0.2586
23	2750K	0.2599	0.2587	0.2587	0.2588	0.2587	0.2587	0.2586	0.2585	0.2587	0.2585	0.2586
24	2729K	0.2605	0.2594	0.2594	0.2595	0.2594	0.2595	0.2593	0.2592	0.2594	0.2591	0.2593
25	2737K	0.2603	0.2591	0.2591	0.2592	0.2591	0.2591	0.2589	0.2589	0.2590	0.2588	0.2589

**CIE 1976 v' data for tested units**

$T_s = T_{air} = 55^\circ\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 53^\circ\text{C}$  and  $T_{air} \geq 50^\circ\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2741K	0.5302	0.5304	0.5302	0.5302	0.5302	0.5303	0.5304	0.5304	0.5304	0.5304	0.5304
2	2740K	0.5301	0.5302	0.5301	0.5302	0.5302	0.5302	0.5302	0.5301	0.5303	0.5302	0.5305
3	2729K	0.5307	0.5307	0.5306	0.5308	0.5308	0.5307	0.5308	0.5306	0.5309	0.5308	0.5309
4	2758K	0.5291	0.5291	0.5290	0.5293	0.5292	0.5292	0.5295	0.5293	0.5294	0.5295	0.5297
5	2733K	0.5287	0.5288	0.5288	0.5288	0.5289	0.5288	0.5290	0.5289	0.5290	0.5289	0.5292
6	2718K	0.5305	0.5304	0.5303	0.5305	0.5304	0.5304	0.5304	0.5304	0.5307	0.5304	0.5306
7	2754K	0.5298	0.5300	0.5299	0.5300	0.5299	0.5300	0.5302	0.5300	0.5302	0.5301	0.5303
8	2717K	0.5295	0.5298	0.5298	0.5297	0.5298	0.5299	0.5299	0.5299	0.5299	0.5300	0.5301
9	2758K	0.5296	0.5298	0.5298	0.5300	0.5299	0.5300	0.5300	0.5299	0.5301	0.5301	0.5301
10	2736K	0.5280	0.5281	0.5281	0.5280	0.5281	0.5281	0.5283	0.5282	0.5283	0.5283	0.5284
11	2710K	0.5282	0.5283	0.5283	0.5284	0.5284	0.5285	0.5284	0.5285	0.5285	0.5285	0.5286
12	2722K	0.5307	0.5307	0.5309	0.5309	0.5308	0.5308	0.5308	0.5307	0.5308	0.5309	0.5309
13	2753K	0.5289	0.5289	0.5289	0.5289	0.5288	0.5289	0.5289	0.5288	0.5289	0.5289	0.5289
14	2739K	0.5281	0.5283	0.5283	0.5282	0.5283	0.5283	0.5284	0.5282	0.5282	0.5283	0.5284
15	2747K	0.5291	0.5292	0.5291	0.5291	0.5292	0.5292	0.5292	0.5292	0.5292	0.5292	0.5294
16	2736K	0.5282	0.5282	0.5285	0.5285	0.5285	0.5286	0.5285	0.5285	0.5286	0.5285	0.5286
17	2744K	0.5301	0.5303	0.5303	0.5304	0.5305	0.5304	0.5304	0.5304	0.5304	0.5305	0.5304
18	2729K	0.5297	0.5300	0.5301	0.5301	0.5302	0.5302	0.5302	0.5301	0.5302	0.5302	0.5303
19	2768K	0.5272	0.5273	0.5274	0.5274	0.5275	0.5274	0.5275	0.5274	0.5275	0.5275	0.5277
20	2741K	0.5308	0.5308	0.5309	0.5309	0.5309	0.5309	0.5310	0.5310	0.5310	0.5310	0.5311
21	2737K	0.5287	0.5286	0.5287	0.5287	0.5288	0.5288	0.5289	0.5288	0.5288	0.5289	0.5289
22	2736K	0.5294	0.5292	0.5293	0.5293	0.5295	0.5293	0.5295	0.5293	0.5295	0.5293	0.5293
23	2750K	0.5285	0.5286	0.5287	0.5287	0.5289	0.5287	0.5288	0.5288	0.5289	0.5287	0.5289
24	2729K	0.5302	0.5303	0.5303	0.5302	0.5304	0.5303	0.5304	0.5304	0.5305	0.5302	0.5303
25	2737K	0.5292	0.5293	0.5293	0.5293	0.5295	0.5294	0.5296	0.5295	0.5296	0.5296	0.5296

**Delta u'v' data for tested units**

**T<sub>s</sub> = T<sub>air</sub> = 55°C, I<sub>f</sub> = 60mA; T<sub>s</sub> ≥ 53°C and T<sub>air</sub> ≥ 50°C in compliance with LM-80-08**

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2741K	0.0000	0.0011	0.0013	0.0011	0.0008	0.0010	0.0013	0.0012	0.0013	0.0012	0.0014
2	2740K	0.0000	0.0013	0.0014	0.0014	0.0013	0.0015	0.0015	0.0016	0.0017	0.0016	0.0017
3	2729K	0.0000	0.0013	0.0014	0.0013	0.0012	0.0013	0.0014	0.0015	0.0015	0.0016	0.0017
4	2758K	0.0000	0.0011	0.0011	0.0010	0.0009	0.0010	0.0011	0.0011	0.0011	0.0011	0.0012
5	2733K	0.0000	0.0011	0.0013	0.0013	0.0012	0.0011	0.0010	0.0012	0.0012	0.0011	0.0012
6	2718K	0.0000	0.0013	0.0015	0.0016	0.0015	0.0015	0.0017	0.0017	0.0018	0.0018	0.0019
7	2754K	0.0000	0.0011	0.0011	0.0011	0.0009	0.0011	0.0013	0.0012	0.0012	0.0013	0.0013
8	2717K	0.0000	0.0010	0.0013	0.0009	0.0010	0.0011	0.0012	0.0012	0.0010	0.0012	0.0011
9	2758K	0.0000	0.0011	0.0011	0.0010	0.0008	0.0010	0.0010	0.0009	0.0010	0.0013	0.0011
10	2736K	0.0000	0.0010	0.0012	0.0011	0.0009	0.0012	0.0012	0.0012	0.0013	0.0013	0.0012
11	2710K	0.0000	0.0009	0.0010	0.0011	0.0009	0.0010	0.0013	0.0012	0.0013	0.0014	0.0013
12	2722K	0.0000	0.0011	0.0013	0.0012	0.0013	0.0014	0.0015	0.0016	0.0014	0.0016	0.0017
13	2753K	0.0000	0.0015	0.0014	0.0014	0.0011	0.0014	0.0016	0.0015	0.0015	0.0016	0.0017
14	2739K	0.0000	0.0011	0.0015	0.0012	0.0012	0.0013	0.0013	0.0014	0.0013	0.0013	0.0015
15	2747K	0.0000	0.0015	0.0015	0.0014	0.0013	0.0015	0.0018	0.0016	0.0016	0.0017	0.0018
16	2736K	0.0000	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0015	0.0014	0.0014	0.0013
17	2744K	0.0000	0.0012	0.0012	0.0011	0.0011	0.0010	0.0013	0.0013	0.0012	0.0013	0.0012
18	2729K	0.0000	0.0010	0.0011	0.0012	0.0011	0.0011	0.0012	0.0011	0.0010	0.0011	0.0011
19	2768K	0.0000	0.0011	0.0012	0.0013	0.0011	0.0009	0.0013	0.0012	0.0011	0.0013	0.0012
20	2741K	0.0000	0.0012	0.0013	0.0011	0.0011	0.0012	0.0013	0.0015	0.0012	0.0014	0.0013
21	2737K	0.0000	0.0011	0.0013	0.0014	0.0012	0.0012	0.0014	0.0015	0.0014	0.0015	0.0014
22	2736K	0.0000	0.0012	0.0015	0.0013	0.0013	0.0015	0.0016	0.0017	0.0014	0.0017	0.0017
23	2750K	0.0000	0.0012	0.0012	0.0011	0.0012	0.0012	0.0013	0.0013	0.0012	0.0014	0.0013
24	2729K	0.0000	0.0011	0.0011	0.0010	0.0011	0.0010	0.0012	0.0014	0.0012	0.0015	0.0012
25	2737K	0.0000	0.0012	0.0012	0.0011	0.0012	0.0012	0.0015	0.0015	0.0013	0.0016	0.0015

**Forward Voltage [V] data for tested units**

**T<sub>s</sub> = T<sub>air</sub> = 55°C, I<sub>f</sub> = 60mA; T<sub>s</sub> ≥ 53°C and T<sub>air</sub> ≥ 50°C in compliance with LM-80-08**

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2741K	9.342	9.330	9.332	9.330	9.335	9.337	9.337	9.335	9.340	9.341	9.341
2	2740K	9.290	9.289	9.290	9.293	9.293	9.295	9.299	9.302	9.305	9.306	9.304
3	2729K	9.405	9.329	9.329	9.330	9.332	9.334	9.339	9.337	9.342	9.342	9.345
4	2758K	9.435	9.414	9.411	9.413	9.414	9.419	9.413	9.414	9.414	9.416	9.417
5	2733K	9.353	9.323	9.327	9.328	9.331	9.335	9.333	9.337	9.339	9.336	9.339
6	2718K	9.511	9.409	9.412	9.412	9.414	9.414	9.421	9.421	9.426	9.427	9.425
7	2754K	9.298	9.259	9.261	9.264	9.265	9.270	9.270	9.269	9.274	9.271	9.276
8	2717K	9.429	9.416	9.419	9.426	9.430	9.432	9.434	9.437	9.442	9.443	9.443
9	2758K	9.432	9.407	9.407	9.410	9.411	9.411	9.408	9.410	9.410	9.412	9.411
10	2736K	9.289	9.272	9.275	9.279	9.279	9.279	9.280	9.281	9.283	9.284	9.289
11	2710K	9.328	9.298	9.301	9.309	9.307	9.307	9.310	9.311	9.315	9.312	9.316
12	2722K	9.435	9.366	9.371	9.374	9.377	9.379	9.379	9.381	9.384	9.386	9.385
13	2753K	9.301	9.271	9.279	9.283	9.285	9.288	9.290	9.291	9.296	9.294	9.296
14	2739K	9.282	9.268	9.269	9.274	9.274	9.274	9.273	9.275	9.279	9.276	9.281
15	2747K	9.427	9.367	9.368	9.374	9.373	9.374	9.378	9.381	9.384	9.382	9.387
16	2736K	9.474	9.409	9.410	9.414	9.421	9.420	9.423	9.421	9.430	9.431	9.430
17	2744K	9.275	9.241	9.240	9.249	9.250	9.252	9.254	9.254	9.259	9.260	9.260
18	2729K	9.420	9.408	9.407	9.415	9.419	9.422	9.426	9.426	9.431	9.432	9.434
19	2768K	9.287	9.294	9.294	9.299	9.300	9.302	9.303	9.300	9.303	9.305	9.303
20	2741K	9.423	9.351	9.354	9.359	9.353	9.365	9.360	9.360	9.368	9.365	9.370
21	2737K	9.299	9.267	9.270	9.277	9.281	9.281	9.282	9.285	9.289	9.293	9.289
22	2736K	9.300	9.273	9.274	9.281	9.285	9.285	9.288	9.284	9.292	9.293	9.293
23	2750K	9.289	9.292	9.298	9.303	9.307	9.309	9.311	9.312	9.316	9.314	9.317
24	2729K	9.317	9.273	9.276	9.279	9.282	9.279	9.283	9.286	9.291	9.287	9.289
25	2737K	9.289	9.255	9.257	9.262	9.263	9.270	9.266	9.270	9.270	9.274	9.273

**Luminous Flux [lm] data for tested units**

$T_s = T_{air} = 85^{\circ}\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 83^{\circ}\text{C}$  and  $T_{air} \geq 80^{\circ}\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2747K	71.808	72.272	72.155	70.835	70.776	70.407	70.262	69.647	69.570	69.330	69.128
2	2753K	72.208	72.507	72.347	71.610	71.938	71.777	71.741	71.211	71.125	70.641	70.319
3	2741K	71.062	71.331	71.227	70.612	70.662	70.611	70.414	70.091	69.839	69.429	69.094
4	2744K	71.355	71.121	70.729	69.139	69.243	68.943	68.745	68.359	68.182	67.922	67.631
5	2739K	71.619	72.028	71.729	70.706	70.667	70.390	70.173	69.813	69.534	69.236	68.903
6	2764K	71.064	71.261	71.118	70.587	70.820	70.572	70.357	70.189	69.972	69.724	69.488
7	2751K	72.243	71.804	71.586	70.538	70.734	70.460	70.247	69.998	69.932	69.783	69.485
8	2731K	70.870	70.956	70.830	70.071	70.215	69.776	69.454	69.156	68.874	68.760	68.391
9	2758K	71.998	71.989	71.687	70.559	70.619	70.221	70.025	69.773	69.659	69.399	69.016
10	2745K	69.270	69.450	69.415	68.872	69.094	68.855	68.676	68.366	68.133	67.788	67.417
11	2756K	69.551	69.241	69.121	68.120	67.931	67.599	67.424	67.068	66.855	66.618	66.238
12	2747K	71.590	71.636	71.578	71.011	71.260	71.013	70.823	70.429	70.182	69.878	69.435
13	2728K	71.840	71.950	71.842	71.228	71.303	71.278	71.229	70.908	70.760	70.511	70.192
14	2750K	72.272	72.427	72.414	71.820	72.071	71.992	71.778	71.500	71.253	70.993	70.456
15	2779K	70.377	70.607	70.643	70.133	69.185	68.598	68.181	67.773	67.669	67.460	67.085
16	2737K	72.002	71.795	71.600	70.884	71.108	71.095	70.858	70.579	70.411	70.311	70.044
17	2766K	68.948	69.692	69.661	69.160	69.162	69.050	68.774	68.545	68.425	68.211	68.023
18	2732K	69.407	69.681	69.559	68.949	69.178	68.991	68.819	68.541	68.350	68.114	67.854
19	2733K	71.055	71.561	71.527	71.068	71.266	71.192	70.992	70.714	70.491	70.200	69.914
20	2764K	69.256	69.264	69.402	69.005	69.200	69.013	68.880	68.687	68.451	68.102	67.756
21	2708K	70.566	69.837	69.716	68.822	68.977	68.788	68.541	68.210	67.996	67.622	67.311
22	2750K	69.809	69.558	69.353	68.592	68.772	68.582	68.450	68.207	67.990	67.816	67.619
23	2718K	71.811	71.752	71.644	70.963	71.238	71.051	70.998	70.706	70.615	70.320	69.971
24	2716K	70.766	70.969	70.804	70.250	70.435	70.388	70.102	69.766	69.453	69.162	68.749
25	2705K	72.058	71.546	71.288	70.501	70.540	70.293	70.035	69.800	69.696	69.472	69.246

**Normalized Luminous Flux data for tested units**

$T_s = T_{air} = 85^{\circ}\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 83^{\circ}\text{C}$  and  $T_{air} \geq 80^{\circ}\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2747K	1.0000	1.0065	1.0048	0.9865	0.9856	0.9805	0.9785	0.9699	0.9688	0.9655	0.9627
2	2753K	1.0000	1.0041	1.0019	0.9917	0.9963	0.9940	0.9935	0.9862	0.9850	0.9783	0.9739
3	2741K	1.0000	1.0038	1.0023	0.9937	0.9944	0.9937	0.9909	0.9863	0.9828	0.9770	0.9723
4	2744K	1.0000	0.9967	0.9912	0.9689	0.9704	0.9662	0.9634	0.9580	0.9555	0.9519	0.9478
5	2739K	1.0000	1.0057	1.0015	0.9873	0.9867	0.9828	0.9798	0.9748	0.9709	0.9667	0.9621
6	2764K	1.0000	1.0028	1.0008	0.9933	0.9966	0.9931	0.9900	0.9877	0.9846	0.9811	0.9778
7	2751K	1.0000	0.9939	0.9909	0.9764	0.9791	0.9753	0.9724	0.9689	0.9680	0.9660	0.9618
8	2731K	1.0000	1.0012	0.9994	0.9887	0.9908	0.9846	0.9800	0.9758	0.9718	0.9702	0.9650
9	2758K	1.0000	0.9999	0.9957	0.9800	0.9808	0.9753	0.9726	0.9691	0.9675	0.9639	0.9586
10	2745K	1.0000	1.0026	1.0021	0.9943	0.9975	0.9940	0.9914	0.9870	0.9836	0.9786	0.9733
11	2756K	1.0000	0.9955	0.9938	0.9794	0.9767	0.9719	0.9694	0.9643	0.9612	0.9578	0.9524
12	2747K	1.0000	1.0006	0.9998	0.9919	0.9954	0.9919	0.9893	0.9838	0.9803	0.9761	0.9699
13	2728K	1.0000	1.0015	1.0000	0.9915	0.9925	0.9922	0.9915	0.9870	0.9850	0.9815	0.9771
14	2750K	1.0000	1.0021	1.0020	0.9937	0.9972	0.9961	0.9932	0.9893	0.9859	0.9823	0.9749
15	2779K	1.0000	1.0033	1.0038	0.9965	0.9831	0.9747	0.9688	0.9630	0.9615	0.9585	0.9532
16	2737K	1.0000	0.9971	0.9944	0.9845	0.9876	0.9874	0.9841	0.9802	0.9779	0.9765	0.9728
17	2766K	1.0000	1.0108	1.0103	1.0031	1.0031	1.0015	0.9975	0.9942	0.9924	0.9893	0.9866
18	2732K	1.0000	1.0039	1.0022	0.9934	0.9967	0.9940	0.9915	0.9875	0.9848	0.9814	0.9776
19	2733K	1.0000	1.0071	1.0066	1.0002	1.0030	1.0019	0.9991	0.9952	0.9921	0.9880	0.9839
20	2764K	1.0000	1.0001	1.0021	0.9964	0.9992	0.9965	0.9946	0.9918	0.9884	0.9833	0.9783
21	2708K	1.0000	0.9897	0.9879	0.9753	0.9775	0.9748	0.9713	0.9666	0.9636	0.9583	0.9539
22	2750K	1.0000	0.9964	0.9935	0.9826	0.9851	0.9824	0.9805	0.9771	0.9739	0.9714	0.9686
23	2718K	1.0000	0.9992	0.9977	0.9882	0.9920	0.9894	0.9887	0.9846	0.9834	0.9792	0.9744
24	2716K	1.0000	1.0029	1.0005	0.9927	0.9953	0.9947	0.9906	0.9859	0.9814	0.9773	0.9715
25	2705K	1.0000	0.9929	0.9893	0.9784	0.9789	0.9755	0.9719	0.9687	0.9672	0.9641	0.9610

CIE 1976 u' data for tested units

$T_s = T_{air} = 85^\circ\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 83^\circ\text{C}$  and  $T_{air} \geq 80^\circ\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2747K	0.2598	0.2585	0.2586	0.2584	0.2583	0.2583	0.2581	0.2579	0.2579	0.2577	0.2578
2	2753K	0.2595	0.2581	0.2582	0.2584	0.2585	0.2583	0.2583	0.2582	0.2581	0.2580	0.2580
3	2741K	0.2605	0.2594	0.2593	0.2594	0.2594	0.2594	0.2593	0.2593	0.2591	0.2591	0.2590
4	2744K	0.2602	0.2587	0.2586	0.2583	0.2582	0.2581	0.2581	0.2580	0.2578	0.2578	0.2578
5	2739K	0.2600	0.2588	0.2587	0.2586	0.2586	0.2584	0.2583	0.2580	0.2579	0.2579	0.2578
6	2764K	0.2590	0.2577	0.2578	0.2579	0.2579	0.2578	0.2578	0.2577	0.2575	0.2575	0.2575
7	2751K	0.2599	0.2583	0.2583	0.2583	0.2583	0.2581	0.2581	0.2580	0.2578	0.2577	0.2578
8	2731K	0.2608	0.2596	0.2595	0.2595	0.2597	0.2599	0.2601	0.2598	0.2597	0.2593	0.2595
9	2758K	0.2591	0.2575	0.2577	0.2573	0.2573	0.2571	0.2570	0.2570	0.2570	0.2568	0.2567
10	2745K	0.2601	0.2588	0.2589	0.2589	0.2589	0.2587	0.2588	0.2588	0.2588	0.2585	0.2585
11	2756K	0.2594	0.2581	0.2580	0.2577	0.2576	0.2572	0.2573	0.2572	0.2572	0.2570	0.2569
12	2747K	0.2600	0.2587	0.2588	0.2585	0.2589	0.2587	0.2587	0.2585	0.2585	0.2584	0.2584
13	2728K	0.2606	0.2595	0.2593	0.2594	0.2594	0.2595	0.2593	0.2593	0.2593	0.2591	0.2592
14	2750K	0.2601	0.2591	0.2591	0.2590	0.2591	0.2590	0.2592	0.2589	0.2590	0.2587	0.2590
15	2779K	0.2587	0.2574	0.2575	0.2575	0.2572	0.2570	0.2569	0.2568	0.2568	0.2566	0.2567
16	2737K	0.2603	0.2590	0.2590	0.2591	0.2591	0.2590	0.2589	0.2589	0.2590	0.2587	0.2588
17	2766K	0.2589	0.2578	0.2577	0.2576	0.2578	0.2577	0.2576	0.2573	0.2576	0.2574	0.2576
18	2732K	0.2606	0.2594	0.2593	0.2592	0.2593	0.2593	0.2593	0.2591	0.2591	0.2590	0.2591
19	2733K	0.2606	0.2595	0.2593	0.2596	0.2596	0.2595	0.2597	0.2593	0.2593	0.2591	0.2593
20	2764K	0.2592	0.2582	0.2580	0.2580	0.2581	0.2580	0.2579	0.2577	0.2579	0.2575	0.2576
21	2708K	0.2617	0.2602	0.2599	0.2601	0.2601	0.2599	0.2599	0.2597	0.2599	0.2596	0.2597
22	2750K	0.2596	0.2582	0.2581	0.2580	0.2582	0.2582	0.2580	0.2578	0.2580	0.2579	0.2579
23	2718K	0.2614	0.2601	0.2600	0.2601	0.2603	0.2602	0.2599	0.2598	0.2598	0.2597	0.2598
24	2716K	0.2617	0.2603	0.2602	0.2602	0.2603	0.2603	0.2601	0.2601	0.2601	0.2599	0.2599
25	2705K	0.2616	0.2599	0.2599	0.2598	0.2599	0.2597	0.2596	0.2592	0.2594	0.2592	0.2592

CIE 1976 v' data for tested units

$T_s = T_{air} = 85^\circ\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 83^\circ\text{C}$  and  $T_{air} \geq 80^\circ\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2747K	0.5295	0.5296	0.5298	0.5298	0.5297	0.5295	0.5296	0.5295	0.5296	0.5297	0.5296
2	2753K	0.5296	0.5300	0.5302	0.5302	0.5302	0.5301	0.5303	0.5300	0.5301	0.5301	0.5302
3	2741K	0.5277	0.5278	0.5281	0.5282	0.5281	0.5281	0.5283	0.5280	0.5280	0.5281	0.5281
4	2744K	0.5282	0.5283	0.5284	0.5283	0.5282	0.5281	0.5284	0.5281	0.5281	0.5282	0.5282
5	2739K	0.5303	0.5306	0.5308	0.5307	0.5306	0.5306	0.5305	0.5305	0.5304	0.5305	0.5306
6	2764K	0.5295	0.5296	0.5297	0.5299	0.5298	0.5298	0.5299	0.5298	0.5297	0.5298	0.5298
7	2751K	0.5282	0.5282	0.5284	0.5283	0.5283	0.5283	0.5285	0.5282	0.5282	0.5283	0.5283
8	2731K	0.5281	0.5283	0.5286	0.5287	0.5286	0.5287	0.5288	0.5286	0.5286	0.5288	0.5288
9	2758K	0.5304	0.5305	0.5307	0.5305	0.5307	0.5306	0.5306	0.5306	0.5305	0.5305	0.5305
10	2745K	0.5286	0.5287	0.5288	0.5290	0.5290	0.5291	0.5289	0.5289	0.5289	0.5288	0.5288
11	2756K	0.5293	0.5294	0.5295	0.5295	0.5295	0.5294	0.5293	0.5293	0.5294	0.5294	0.5294
12	2747K	0.5288	0.5289	0.5290	0.5292	0.5291	0.5292	0.5291	0.5292	0.5291	0.5292	0.5291
13	2728K	0.5298	0.5299	0.5300	0.5300	0.5301	0.5301	0.5302	0.5301	0.5301	0.5302	0.5301
14	2750K	0.5274	0.5275	0.5278	0.5278	0.5278	0.5279	0.5279	0.5279	0.5280	0.5280	0.5279
15	2779K	0.5276	0.5277	0.5277	0.5279	0.5277	0.5277	0.5274	0.5274	0.5273	0.5275	0.5278
16	2737K	0.5292	0.5292	0.5294	0.5294	0.5295	0.5295	0.5293	0.5295	0.5295	0.5295	0.5296
17	2766K	0.5298	0.5299	0.5300	0.5302	0.5302	0.5302	0.5303	0.5302	0.5303	0.5304	0.5306
18	2732K	0.5291	0.5293	0.5295	0.5295	0.5296	0.5295	0.5296	0.5295	0.5295	0.5297	0.5298
19	2733K	0.5291	0.5294	0.5296	0.5298	0.5297	0.5297	0.5297	0.5298	0.5297	0.5297	0.5297
20	2764K	0.5283	0.5284	0.5283	0.5285	0.5286	0.5286	0.5286	0.5284	0.5285	0.5287	0.5287
21	2708K	0.5293	0.5292	0.5293	0.5294	0.5293	0.5293	0.5293	0.5292	0.5292	0.5293	0.5293
22	2750K	0.5296	0.5297	0.5297	0.5299	0.5298	0.5298	0.5299	0.5297	0.5297	0.5297	0.5299
23	2718K	0.5283	0.5285	0.5284	0.5287	0.5285	0.5285	0.5287	0.5285	0.5284	0.5287	0.5286
24	2716K	0.5276	0.5278	0.5279	0.5280	0.5280	0.5280	0.5281	0.5279	0.5279	0.5281	0.5280
25	2705K	0.5308	0.5308	0.5308	0.5309	0.5309	0.5309	0.5309	0.5308	0.5308	0.5309	0.5309

**Delta u'v' data for tested units**

$T_s = T_{air} = 85^{\circ}\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 83^{\circ}\text{C}$  and  $T_{air} \geq 80^{\circ}\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2747K	0.0000	0.0013	0.0012	0.0014	0.0015	0.0015	0.0017	0.0019	0.0019	0.0020	0.0020
2	2753K	0.0000	0.0014	0.0014	0.0013	0.0012	0.0013	0.0014	0.0014	0.0015	0.0016	0.0017
3	2741K	0.0000	0.0011	0.0013	0.0012	0.0012	0.0012	0.0014	0.0012	0.0014	0.0015	0.0016
4	2744K	0.0000	0.0015	0.0016	0.0019	0.0019	0.0021	0.0021	0.0022	0.0023	0.0024	0.0024
5	2739K	0.0000	0.0012	0.0014	0.0014	0.0015	0.0016	0.0017	0.0020	0.0021	0.0021	0.0022
6	2764K	0.0000	0.0012	0.0012	0.0012	0.0011	0.0012	0.0012	0.0014	0.0015	0.0015	0.0015
7	2751K	0.0000	0.0016	0.0016	0.0016	0.0016	0.0018	0.0018	0.0018	0.0021	0.0022	0.0020
8	2731K	0.0000	0.0012	0.0014	0.0015	0.0012	0.0011	0.0010	0.0012	0.0012	0.0017	0.0015
9	2758K	0.0000	0.0016	0.0014	0.0018	0.0018	0.0020	0.0021	0.0021	0.0021	0.0023	0.0024
10	2745K	0.0000	0.0013	0.0012	0.0012	0.0013	0.0014	0.0013	0.0014	0.0013	0.0016	0.0016
11	2756K	0.0000	0.0013	0.0014	0.0017	0.0018	0.0022	0.0021	0.0022	0.0022	0.0024	0.0025
12	2747K	0.0000	0.0013	0.0012	0.0015	0.0011	0.0013	0.0013	0.0015	0.0015	0.0016	0.0016
13	2728K	0.0000	0.0011	0.0013	0.0013	0.0012	0.0012	0.0014	0.0014	0.0014	0.0016	0.0014
14	2750K	0.0000	0.0010	0.0010	0.0012	0.0011	0.0012	0.0010	0.0012	0.0012	0.0015	0.0012
15	2779K	0.0000	0.0012	0.0011	0.0012	0.0015	0.0016	0.0018	0.0019	0.0019	0.0021	0.0020
16	2737K	0.0000	0.0014	0.0013	0.0013	0.0013	0.0013	0.0014	0.0015	0.0014	0.0017	0.0016
17	2766K	0.0000	0.0011	0.0012	0.0013	0.0012	0.0012	0.0014	0.0016	0.0014	0.0016	0.0015
18	2732K	0.0000	0.0012	0.0013	0.0014	0.0014	0.0013	0.0014	0.0016	0.0016	0.0017	0.0016
19	2733K	0.0000	0.0011	0.0013	0.0012	0.0011	0.0013	0.0011	0.0014	0.0014	0.0016	0.0014
20	2764K	0.0000	0.0011	0.0013	0.0012	0.0012	0.0013	0.0013	0.0016	0.0013	0.0018	0.0017
21	2708K	0.0000	0.0015	0.0018	0.0016	0.0016	0.0018	0.0018	0.0020	0.0018	0.0021	0.0020
22	2750K	0.0000	0.0014	0.0015	0.0017	0.0014	0.0015	0.0017	0.0018	0.0016	0.0018	0.0017
23	2718K	0.0000	0.0013	0.0014	0.0014	0.0012	0.0012	0.0016	0.0016	0.0016	0.0018	0.0016
24	2716K	0.0000	0.0014	0.0015	0.0015	0.0014	0.0015	0.0016	0.0017	0.0016	0.0019	0.0018
25	2705K	0.0000	0.0017	0.0017	0.0017	0.0017	0.0019	0.0020	0.0023	0.0022	0.0024	0.0023

**Forward Voltage [V] data for tested units**

$T_s = T_{air} = 85^{\circ}\text{C}$ ,  $I_f = 60\text{mA}$ ;  $T_s \geq 83^{\circ}\text{C}$  and  $T_{air} \geq 80^{\circ}\text{C}$  in compliance with LM-80-08

	CCT (t=0)	0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2747K	9.287	9.267	9.273	9.280	9.286	9.291	9.293	9.294	9.296	9.298	9.299
2	2753K	9.308	9.291	9.299	9.305	9.308	9.314	9.318	9.320	9.322	9.323	9.323
3	2741K	9.353	9.335	9.340	9.343	9.351	9.359	9.359	9.356	9.362	9.361	9.364
4	2744K	9.370	9.350	9.357	9.359	9.364	9.369	9.376	9.373	9.379	9.380	9.387
5	2739K	9.281	9.257	9.262	9.268	9.272	9.275	9.282	9.284	9.287	9.288	9.294
6	2764K	9.366	9.362	9.370	9.377	9.381	9.392	9.397	9.400	9.404	9.408	9.421
7	2751K	9.307	9.292	9.301	9.308	9.309	9.322	9.319	9.321	9.325	9.330	9.331
8	2731K	9.346	9.328	9.334	9.338	9.343	9.352	9.349	9.351	9.354	9.352	9.360
9	2758K	9.286	9.259	9.265	9.276	9.280	9.286	9.284	9.288	9.292	9.295	9.297
10	2745K	9.282	9.280	9.285	9.287	9.294	9.290	9.294	9.295	9.298	9.295	9.303
11	2756K	9.392	9.398	9.401	9.402	9.410	9.408	9.410	9.411	9.411	9.407	9.416
12	2747K	9.354	9.334	9.344	9.346	9.353	9.353	9.355	9.357	9.359	9.358	9.364
13	2728K	9.293	9.264	9.268	9.272	9.280	9.283	9.290	9.289	9.295	9.298	9.299
14	2750K	9.294	9.273	9.281	9.290	9.296	9.297	9.300	9.307	9.312	9.311	9.316
15	2779K	9.296	9.304	9.308	9.314	9.319	9.319	9.326	9.324	9.328	9.332	9.334
16	2737K	9.304	9.277	9.282	9.283	9.291	9.295	9.300	9.298	9.306	9.308	9.309
17	2766K	9.289	9.286	9.286	9.290	9.291	9.292	9.294	9.292	9.299	9.295	9.297
18	2732K	9.325	9.326	9.330	9.334	9.342	9.341	9.347	9.346	9.347	9.351	9.353
19	2733K	9.301	9.275	9.282	9.286	9.292	9.296	9.300	9.303	9.306	9.308	9.311
20	2764K	9.307	9.316	9.318	9.318	9.322	9.324	9.324	9.323	9.323	9.321	9.329
21	2708K	9.304	9.297	9.304	9.306	9.317	9.317	9.323	9.326	9.329	9.330	9.336
22	2750K	9.289	9.289	9.292	9.293	9.295	9.296	9.301	9.302	9.300	9.304	9.307
23	2718K	9.298	9.280	9.286	9.295	9.296	9.304	9.308	9.310	9.315	9.318	9.318
24	2716K	9.358	9.343	9.349	9.351	9.356	9.365	9.363	9.364	9.368	9.368	9.372
25	2705K	9.457	9.407	9.417	9.422	9.433	9.438	9.438	9.444	9.450	9.456	9.460

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## Company Information

Lumileds is a leading provider of power LEDs for everyday lighting applications. The company's records for light output, efficacy and thermal management are direct results of the ongoing commitment to advancing solid-state lighting technology and enabling lighting solutions that are more environmentally friendly, help reduce CO2 emissions and reduce the need for power plant expansion. Lumileds LUXEON LEDs are enabling never before possible applications in outdoor lighting, shop lighting, home lighting, digital imaging, display and automotive lighting.

Lumileds is a fully integrated supplier, producing core LED material in all three base colors, (red, green, blue) and white. Lumileds has R & D centers in San Jose, California and in the Netherlands, and production capabilities in San Jose, Singapore and Penang, Malaysia. Founded in 1999, Lumileds is the high flux LED technology leader and is dedicated to bridging the gap between solid-state technology and the lighting world. More information about the company's LUXEON LED products and solid-state lighting technologies can be found at [www.lumileds.com](http://www.lumileds.com).

This report issued to Arrow Electronics

Appendix: Additional Projected Extrapolations per IESNA TM-21-11

Projected  $L_{75}$  extrapolations per IESNA TM-21-11

If = 60mA	
Ts = 85°C	79,756
Ts = 55°C	278,409

Projected  $L_{80}$  extrapolations per IESNA TM-21-11

If = 60mA	
Ts = 85°C	62,184
Ts = 55°C	217,404

Projected  $L_{85}$  extrapolations per IESNA TM-21-11

If = 60mA	
Ts = 85°C	45,678
Ts = 55°C	160,098

Projected  $L_{90}$  extrapolations per IESNA TM-21-11

If = 60mA	
Ts = 85°C	30,116
Ts = 55°C	106,069

Projected  $L_{95}$  extrapolations per IESNA TM-21-11

If = 60mA	
Ts = 85°C	15,395
Ts = 55°C	54,962

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Projected  $L_{100}$  extrapolations per IESNA TM-21-11

$I_f = 60\text{mA}$

$T_s = 85^\circ\text{C}$	1,448
$T_s = 55^\circ\text{C}$	6,517

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