NVLAP CODE 201045-0

TEST REPORT

IES LM-80-15

For

Shenzhen Refond Optoelectronic Co., Ltd.

1 to 8th Floor, Building #1, 10th Industrial Zone, Tian Liao Community, Gong Ming Area, Guang Ming New District, SHENZHEN, CHINA.

Report No.:	R0417090022L
Product Description:	Filament
Model No.:	FT7A-W2CD48-J9
Test Initiation Date:	2017-09-18
Test Completion Date:	2018-10-08
Report Issue Date:	2018-10-08
Test Standard:	IES LM-80-15
Test Laboratory:	Shenzhen Anbotek Compliance Laboratory Limited

Tested by **Reviewed by Lab Director**

Dick Xiao / Dick Xiao Tom Chen / Tom Chen

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1 General Information

1.1 Description of LED Light Sources

Tested Model:

Part Number: FT7A-W2CD48-J9
Part Type: Filament
Nominal CCT: 2200K

Family products covered by this report:

According to ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products, the following products can be covered by this report. The information of these models shows that the covered products meet all section 4 item 5 requirements of ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products (September 28, 2017)

Model name** Representative CCT	CCT(K)	Numbers of dies	Current (mA)	power intensity (W/mm2)	Power (W)	Current intensity (A/mm2)	Distance between of dies(mm)
FT7A -W2CD48 -J9	2200K	48	25	0.029	3.233	0.155	0.506
GWT6L2F1.EM	2200K	38	30	0.019	3.190	0.151	0.618
RF-FT4A***6*-*M	2200-7000K	12	15	0.020	1.005	0.141	1.601
RF-FT4A***6*-*N	2200-7000K	12	15	0.020	1.005	0.118	1.343
RF-FT4E***6*-*M-B	2200-7000K	12	15	0.018	1.005	0.141	1.601
RF-FT4E***6*-*N-B	2200-7000K	12	15	0.018	1.005	0.118	1.343
RF-FT4F***6*-*M-B	2200-7000K	12	15	0.016	1.005	0.141	1.755
RF-FT4F***6*-*N-B	2200-7000K	12	15	0.016	1.005	0.118	1.497
RF-FT4F***1*-*M-B	2200-7000K	24	8	0.021	1.056	0.091	0.734
RF-FT4F***1*-*N-B	2200-7000K	24	8	0.021	1.056	0.063	0.555
RF-FT4A***1*-*P	2200-7000K	16	8	0.023	1.056	0.063	0.913
RF-FT4F***1*-*P-B	2200-7000K	16	8	0.021	1.056	0.063	1.038
RF-FT4A***6*-*3	2200-7000K	24	15	0.020	1.005	0.152	0.727
RF-FT4A***6*-*4	2200-7000K	24	15	0.020	1.005	0.148	0.727
RF-FT4A***6*-*5	2200-7000K	25	15	0.020	1.005	0.145	0.633
RF-FT4E***6*-*3-B	2200-7000K	24	15	0.022	1.005	0.152	0.727
RF-FT4E***6*-*4-B	2200-7000K	24	15	0.022	1.005	0.148	0.727
RF-FT4E***6*-*5-B	2200-7000K	25	20	0.029	1.340	0.152	0.633
RF-FT4E***6*-*6-B	2200-7000K	25	20	0.029	1.340	0.146	0.582
RF-FT4E***6*-*7-B	2200-7000K	25	20	0.029	1.340	0.138	0.582
RF-FT4E***6*-*8-B	2200-7000K	25	20	0.029	1.340	0.131	0.532
RF-FT4E***6*-*9-B	2200-7000K	25	20	0.029	1.340	0.120	0.508
RF-FT4F***6*-*3-B	2200-7000K	24	15	0.020	1.005	0.152	0.811
RF-FT4F***6*-*4-B	2200-7000K	24	15	0.020	1.005	0.148	0.811
RF-FT4F***6*-*5-B	2200-7000K	25	20	0.027	1.340	0.152	0.713
RF-FT4F***6*-*6-B	2200-7000K	25	20	0.027	1.340	0.146	0.662
RF-FT4F***6*-*7-B	2200-7000K	25	20	0.027	1.340	0.138	0.662
RF-FT4F***6*-*8-B	2200-7000K	25	20	0.027	1.340	0.131	0.551
RF-FT4F***6*-*9-B	2200-7000K	25	20	0.027	1.340	0.120	0.523
RF-FT4E***3*-*6-B	2200-7000K	12	30	0.022	1.020	0.151	1.577
RF-FT4E***3*-*7-B	2200-7000K	12	30	0.022	1.020	0.143	1.577
RF-FT4E***3*-*8-B	2200-7000K	12	30	0.022	1.020	0.137	1.340
RF-FT4E***3*-*9-B	2200-7000K	12	30	0.022	1.020	0.125	1.290
RF-FT4F***3*-*6-B	2200-7000K	12	30	0.020	1.020	0.151	1.800
RF-FT4F***3*-*7-B	2200-7000K	12	30	0.020	1.020	0.143	1.800
RF-FT4F***3*-*8-B	2200-7000K	12	30	0.020	1.020	0.137	1.570
RF-FT4F***3*-*9-B	2200-7000K	12	30	0.020	1.020	0.125	1.520
RF-FT4S***3*-*9-B	2200-7000K	12	30	0.010	1.020	0.125	1.520
RF-FT4S***6*-*3-B	2200-7000K	24	15	0.020	1.005	0.152	0.811
RF-FT4S***6*-*4-B	2200-7000K	24	15	0.020	1.005	0.148	0.811
RF-FT4S***6*-*5-B	2200-7000K	25	25	0.016	1.675	0.152	0.713
RF-FT4S***6*-*6-B	2200-7000K	25	25	0.016	1.675	0.146	0.662

RF-FT4S***6*-*7-B	2200-7000K	25	25	0.016	1.675	0.138	0.662
RF-FT4S***6*-*8-B	2200-7000K	25	25	0.016	1.675	0.131	0.551
RF-FT4S***6*-*9-B	2200-7000K	25	25	0.016	1.675	0.120	0.523
RF-FT4F***7*-*7-B	2200-7000K	27	15	0.022	1.125	0.143	0.616
RF-FT4F***7*-*8-B	2200-7000K	27	15	0.022	1.125	0.083	0.521
RF-FT4F***7*-*9-B	2200-7000K	27	15	0.022	1.125	0.077	0.507
RF-FT5F***6*-*3-B	2200-7000K	24	15	0.014	1.005	0.152	1.298
RF-FT5F***6*-*4-B	2200-7000K	24	15	0.014	1.005	0.148	1.298
RF-FT5F***6*-*5-B	2200-7000K	25	25	0.025	1.675	0.152	1.233
RF-FT5F***6*-*6-B	2200-7000K	25	25	0.025	1.675	0.146	1.182
RF-FT5F***6*-*7-B	2200-7000K	25	25	0.025	1.675	0.138	1.182
RF-FT5F***6*-*8-B	2200-7000K	25	25	0.025	1.675	0.131	0.928
RF-FT5F***6*-*9-B	2200-7000K	25	25	0.025	1.675	0.120	0.878
RF-FT5S***6*-*5-B	2200-7000K	25	25	0.012	1.675	0.152	1.233
RF-FT5S***6*-*6-B	2200-7000K	25	25	0.012	1.675	0.146	1.182
RF-FT5S***6*-*7-B	2200-7000K	25	25	0.012	1.675	0.138	1.182
RF-FT5S***6*-*8-B	2200-7000K	25	25	0.012	1.675	0.131	0.928
RF-FT5S***6*-*9-B	2200-7000K	25	25	0.012	1.675	0.120	0.878
RF-FT5S***9*-*5-B	2200-7000K	35	25	0.017	2.350	0.152	0.765
RF-FT5S***9*-*6-B	2200-7000K	35	25	0.017	2.350	0.146	0.714
RF-FT5S***9*-*7-B	2200-7000K	35	25	0.017	2.350	0.138	0.714
RF-FT5S***9*-*8-B	2200-7000K	35	25	0.017	2.350	0.131	0.521
RF-FT5S***9*-*9-B	2200-7000K	35	25	0.017	2.350	0.120	0.507
RF-FT6F***6*-*7-B	2200-7000K	25	25	0.022	1.675	0.138	1.342
RF-FT6F***6*-*8-B	2200-7000K	25	25	0.022	1.675	0.131	1.088
RF-FT6F***6*-*9-B	2200-7000K	25	25	0.022	1.675	0.120	1.038
RF-FT6S***6*-*5-B	2200-7000K	25	25	0.011	1.675	0.152	1.393
RF-FT6S***6*-*6-B	2200-7000K	25	25	0.011	1.675	0.146	1.342
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RF-FT6S***6*-*9-B	2200-7000K	25	25	0.011	1.675	0.120	1.038
RF-FT6S***1*-*A-B	2200-7000K	24	20	0.018	2.640	0.085	1.088
RF-FT6S***1*-*A-B	2200-7000K	48	20	0.018	2.640	0.085	1.088
RF-FT7S***1*-*7-B	2200-7000K	38	25	0.015	2.500	0.138	0.858
RF-FT7S***1*-*8-B	2200-7000K	38	25	0.015	2.500	0.131	0.604
RF-FT7S***1*-*9-B	2200-7000K	38	25	0.015	2.500	0.120	0.554
FT6A-W**G35-S8	2200-7000K	35	20	0.028	1.900	0.120	0.666
3008***6*-*M	2200-7000K	12	15	0.020	1.005	0.141	1.601
3008***6*-*N	2200-7000K	12	15	0.020	1.005	0.118	1.343
3015***6*-*M-B	2200-7000K	12	15	0.018	1.005	0.141	1.601
3015***6*-*N-B	2200-7000K	12	15	0.018	1.005	0.118	1.343
3315***6*-*M-B	2200-7000K	12	15	0.016	1.005	0.141	1.755
3315***6*-*N-B	2200-7000K	12	15	0.016	1.005	0.118	1.497
3315***1*-*M-B	2200-7000K	24	8	0.021	1.056	0.091	0.734
3315***1*-*N-B	2200-7000K	24	8	0.021	1.056	0.063	0.555
3008***1*-*P	2200-7000K	16	8	0.023	1.056	0.063	0.913
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3008***6*-*4	2200-7000K	24	15	0.020	1.005	0.148	0.727
3008***6*-*5	2200-7000K	25	15	0.020	1.005	0.145	0.633
3015***6*-*3-B	2200-7000K	24	15	0.022	1.005	0.152	0.727
3015***6*-*4-B	2200-7000K	24	15	0.022	1.005	0.148	0.727
3015***6*-*5-B	2200-7000K	25	20	0.029	1.340	0.152	0.633
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3015***3*-*8-B	2200-7000K	12	30	0.022	1.020	0.137	1.340
3015***3*-*9-B	2200-7000K	12	30	0.022	1.020	0.125	1.290
3315***3*-*6-B	2200-7000K	12	30	0.020	1.020	0.151	1.800
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3315***7*-*8-B	2200-7000K	27	15	0.022	1.125	0.083	0.521
3315***7*-*9-B	2200-7000K	27	15	0.022	1.125	0.077	0.507
4515***6*-*3-B	2200-7000K	24	15	0.014	1.005	0.152	1.298
4515***6*-*4-B	2200-7000K	24	15	0.014	1.005	0.148	1.298
4515***6*-*5-B	2200-7000K	25	25	0.025	1.675	0.152	1.233
4515***6*-*6-B	2200-7000K	25	25	0.025	1.675	0.146	1.182
4515***6*-*7-B	2200-7000K	25	25	0.025	1.675	0.138	1.182
4515***6*-*8-B	2200-7000K	25	25	0.025	1.675	0.131	0.928
4515***6*-*9-B	2200-7000K	25	25	0.025	1.675	0.120	0.878
4530***6*-*5-B	2200-7000K	25	25	0.012	1.675	0.152	1.233
4530***6*-*6-B	2200-7000K	25	25	0.012	1.675	0.146	1.182
4530***6*-*7-B	2200-7000K	25	25	0.012	1.675	0.138	1.182
4530***6*-*8-B	2200-7000K	25	25	0.012	1.675	0.131	0.928
4530***6*-*9-B	2200-7000K	25	25	0.012	1.675	0.120	0.878
4530***9*-*5-B	2200-7000K	35	25	0.017	2.350	0.152	0.765
4530***9*-*6-B	2200-7000K	35	25	0.017	2.350	0.146	0.714
4530***9*-*7-B	2200-7000K	35	25	0.017	2.350	0.138	0.714
4530***9*-*8-B	2200-7000K	35	25	0.017	2.350	0.131	0.551
4530***9*-*9-B	2200-7000K	35	25	0.017	2.350	0.120	0.523
5015***6*-*7-B	2200-7000K	25	25	0.022	1.675	0.138	1.342
5015***6*-*8-B	2200-7000K	25	25	0.022	1.675	0.131	1.088
5015***6*-*9-B	2200-7000K	25	25	0.022	1.675	0.120	1.038
5030***6*-*5-B	2200-7000K	25	25	0.011	1.675	0.152	1.393
5030***6*-*6-B	2200-7000K	25	25	0.011	1.675	0.146	1.342
5030***6*-*7-B	2200-7000K	25	25	0.011	1.675	0.138	1.342
5030***6*-*8-B	2200-7000K	25	25	0.011	1.675	0.131	1.088
5030***6*-*9-B	2200-7000K	25	25	0.011	1.675	0.120	1.038
5530***1*-*A-B	2200-7000K	24	20	0.018	2.640	0.085	1.088
5530***1*-*A-B	2200-7000K	48	20	0.018	2.640	0.085	1.088
5530***1*-*7-B	2200-7000K	38	25	0.015	2.500	0.138	0.858
5530***1*-*8-B	2200-7000K	38	25	0.015	2.500	0.131	0.604
5530***1*-*9-B	2200-7000K	38	25	0.015	2.500	0.120	0.554

Disclaimer:

The truthfulness and accuracy of all the technical information above for the covered LED products is ensured by manufacturer of LED light source. Shenzhen Anbotek Compliance Laboratory Limited isn't responsible or gives any guarantees for the truthfulness of the technical information.

1.2 Product Description for Device under Test (DUT)

Manufacturer:	Shenzhen Refond Optoelectronic Co., Ltd.
Tested Model:	FT7A-W2CD48-J9
Part Type:	Filament
Nominal CCT:	2200K
Nominal Ra:	91.5
Number of Filament tested:	See tables
Case Temperature (Test Point Temperature):	See tables
Drive Current of the Filament During Lifetime Test:	See tables
Initial luminous flux and forward voltage at photometric measurement current:	See tables
Lumen maintenance data for each individual Filament along with median value, standard deviation, minimum and maximum lumen maintenance value for all of the Filament:	See tables
Observation of Filament failure including the failure conditions and time of failure:	See tables
Filament monitoring interval:	The LED light source is inspected at regular interval (24 hours) throughout the 9000 hours test.
Photometric measurement uncertainty:	1.5% on flux measurements for LM-80 testing.
Chromaticity shift reported over the Measurement time:	See tables
Filament Test interval:	At regular intervals (1000 hours) throughout the 9000 hours test.
Date of Receiving Sample:	2017-09-12
Test Duration:	2017-09-18 to 2018-10-08

1.3 Standards Used

IESNA LM-80-15: IES Approved Method for Measuring Luminous Flux and Color Maintenance of Filaments, Arrays and Modules

1.4 Test Facility Description

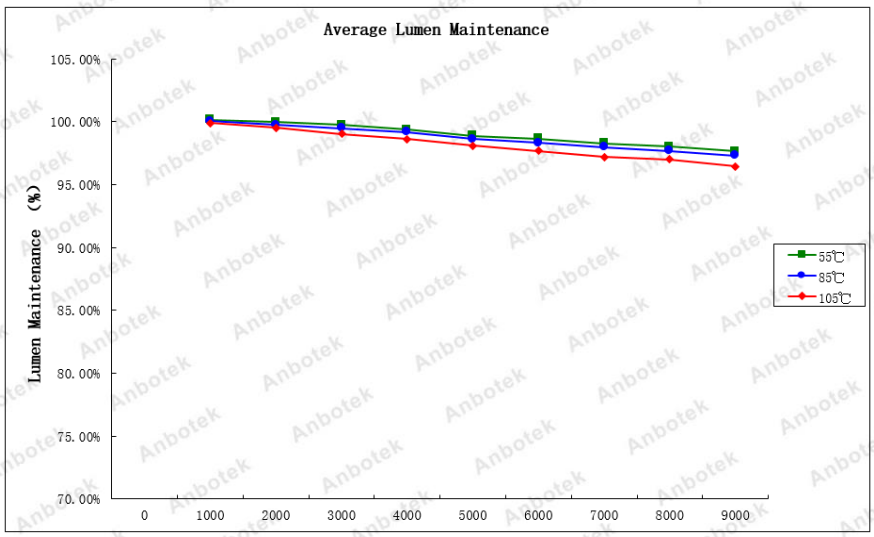
The test facility used by Shenzhen Anbotek Compliance Laboratory Limited is located at 1/F., Building C, Gold Power Industrial Park, Julongshan Grand Industrial Zone, Pingshan New District, Shenzhen, Guangdong, China.

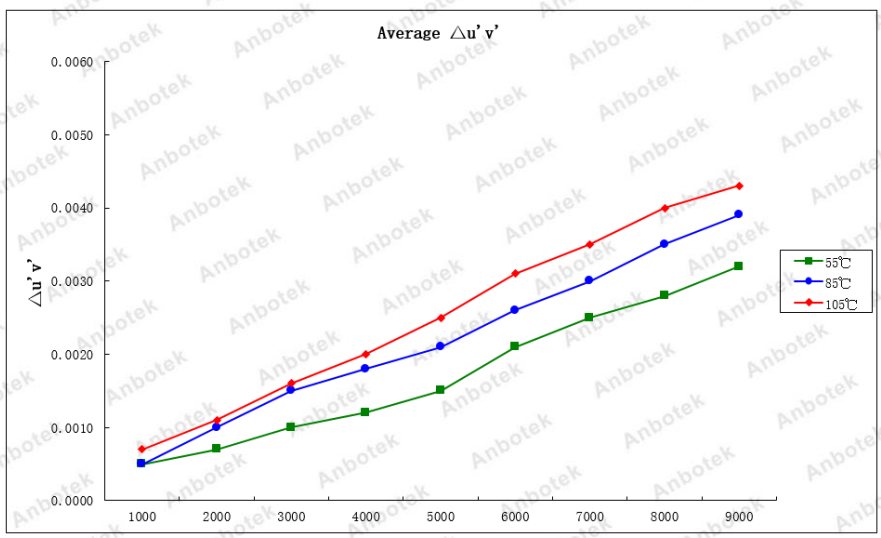
1.5 Test Equipment List

Device	Manufacture	Model No.	Serial No.	Calibration Date	Calibration Due Date
Digital Power Meter	YOKOGAWA	WT210	SE-074	2018-06-06	2019-06-05
LM-80 Aging Test System	KEYI	KY-3X-LH60	SE-564	2018-06-06	2019-06-05
DC Power Supply	EVERFINE	WY605	SE-605	2018-06-06	2019-06-05
Standard Lamp	EVERFINE	D062	SE-606	2018-06-06	2019-06-05
Spectrum Analyzer	EVERFINE	HAAS-2000	SE-607	2018-06-06	2019-06-05
Integrating Sphere (0.5m)	EVERFINE	AIS-2	SE-608	Before use	Before use

2 Summary of Test Result

Data Set	1	2	3
Nominal case temperatures	55℃	85℃	105℃
Drive Current	25 mA	25 mA	25 mA
Condition	Ts=54.5°C Ta=53.8°C R.H.＜65% IF=25 mA	Ts=84.6°C Ta=83.6°C R.H.＜65% IF=25 mA	Ts=104.5°C Ta=103.7°C R.H.＜65% IF=25 mA
sample size	20	20	20
Duration (in Hours)	9000	9000	9000
Intervals (in Hours)	1000	1000	1000
Failure	0	0	0
L_{70}(9000h)	>54000	>54000	>54000
L_{90}(9000h)	=33000	=30000	=25000





3 Test Method

3.1 Photometric and Electrical Measurement

Total light output (luminous flux) for the 25°C±1°C ambient temperature conditions is measured using a integrating sphere. Each Filament is operated at rated drive current (CC Mode).

The total uncertainty of the light output measurements is estimated, at the 95% confidence level, not to exceed±1.6% over the wavelength range 380-800nm.

3.2 Season the Filament from 0 hours to 9000 hours

Three LM-80 aging measurement system Temperature Chambers are using for Seasoning, and the temperature is set to 55°C, 85°C, 105°C (manufacture defined), the airflow is minimum to keep the uniformity to temperature. Filament are operated steady state (no cycling) for a period of 9000 hours, checked the lumen flux and Chromaticity Shift every 1000 hours. The samples are inspected at regular intervals (24 hours) throughout the 9000 hours. The time and date of failure of each lamp is recorded. The actual elapsed time for each light Filament is in hour.

4 Data Set 1: 55°C, 25 mA

Description of Light Sources Tested:	FT7A-W2CD48-J9
Case Temperature:	54.5°C
Ambient Temperature:	53.8°C
Drive Current:	25 mA
Measure Current:	25 mA
Failures Observed:	None

Lumen Maintenance (%)

Sample No.	VF(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L1	129.6	426.09	100.05%	99.96%	99.89%	99.37%	98.99%	98.55%	98.32%	98.14%	97.70%
L2	129.5	419.79	100.18%	100.01%	99.82%	99.48%	98.96%	98.72%	98.16%	97.90%	97.74%
L3	129.9	416.95	100.25%	100.00%	99.62%	99.51%	98.90%	98.61%	98.29%	98.13%	97.66%
L4	129.7	420.86	100.22%	99.96%	99.75%	99.37%	98.82%	98.79%	98.15%	98.12%	97.67%
L5	128.7	422.61	100.23%	99.85%	99.84%	99.35%	98.85%	98.68%	98.20%	97.90%	97.53%
L6	128.8	421.37	100.14%	99.92%	99.63%	99.55%	98.96%	98.61%	98.17%	98.05%	97.47%
L7	128.6	422.60	100.11%	99.93%	99.90%	99.48%	98.95%	98.82%	98.26%	97.86%	97.45%
L8	129.3	426.35	100.04%	99.97%	99.78%	99.27%	98.81%	98.55%	98.14%	98.13%	97.69%
L9	129.7	432.46	100.15%	100.04%	99.90%	99.25%	98.74%	98.75%	98.39%	97.90%	97.52%
L10	129.4	429.98	100.26%	100.05%	99.76%	99.38%	98.95%	98.80%	98.12%	97.95%	97.57%
L11	129.6	422.98	100.10%	99.97%	99.66%	99.42%	98.94%	98.45%	98.35%	98.11%	97.50%
L12	129.8	423.84	100.09%	100.08%	99.98%	99.41%	98.78%	98.48%	98.29%	97.95%	97.51%
L13	129.6	432.24	100.18%	99.99%	99.62%	99.54%	98.80%	98.75%	98.30%	98.01%	97.55%
L14	129.8	420.23	100.26%	99.89%	99.68%	99.35%	98.78%	98.68%	98.56%	98.17%	98.03%
L15	129.7	428.66	100.23%	100.04%	99.58%	99.53%	98.81%	98.65%	98.18%	98.05%	97.73%
L16	129.4	419.58	100.07%	99.95%	99.70%	99.27%	98.96%	98.58%	98.26%	97.87%	97.79%
L17	129.4	413.30	100.23%	99.97%	99.59%	99.15%	98.99%	98.42%	98.20%	98.05%	97.56%
L18	128.8	416.62	100.06%	99.86%	99.58%	99.17%	98.99%	98.79%	98.18%	98.00%	97.58%
L19	129.1	424.85	100.25%	99.99%	99.55%	99.28%	98.94%	98.73%	98.24%	97.85%	97.63%
L20	129.4	423.09	100.12%	99.95%	99.75%	99.35%	98.84%	98.60%	98.55%	98.05%	97.62%
AV	129.39	423.22	**100.16%**	**99.97%**	**99.73%**	**99.37%**	**98.89%**	**98.65%**	**98.27%**	**98.01%**	**97.63%**
Median	129.45	422.80	100.16%	99.97%	99.72%	99.37%	98.92%	98.67%	98.25%	98.03%	97.60%
MIN	128.60	413.30	100.04%	99.85%	99.55%	99.15%	98.74%	98.42%	98.12%	97.85%	97.45%
MAX	129.90	432.46	100.26%	100.08%	99.98%	99.55%	98.99%	98.82%	98.56%	98.17%	98.03%
STDEV	0.3919	5.07	0.0008	0.0006	0.0013	0.0012	0.0008	0.0012	0.0012	0.0011	0.0014
N	20	20	20	20	20	20	20	20	20	20	20

Description of Light Sources Tested:	FT7A-W2CD48-J9
Case Temperature:	54.5°C
Ambient Temperature:	53.8°C
Drive Current:	25 mA
Measure Current:	25 mA
Failures Observed:	None

Chromaticity Shift (Δ u'v')

Sample No.	u'	v'	CCT (K)	1000 hrs	2000 hrs	3000 hrs	4000 hrs	5000 hrs	6000 hrs	7000 hrs	8000 hrs	9000 hrs
L1	0.2879	0.5351	2234	0.0002	0.0005	0.0004	0.0008	0.0012	0.0018	0.0023	0.0028	0.0033
L2	0.2875	0.5350	2240	0.0003	0.0007	0.0008	0.0011	0.0011	0.0018	0.0022	0.0026	0.0029
L3	0.2875	0.5348	2241	0.0002	0.0004	0.0005	0.0006	0.0010	0.0016	0.0020	0.0023	0.0026
L4	0.2892	0.5358	2214	0.0011	0.0016	0.0016	0.0020	0.0023	0.0029	0.0033	0.0036	0.0040
L5	0.2881	0.5356	2230	0.0007	0.0011	0.0012	0.0014	0.0017	0.0023	0.0027	0.0030	0.0033
L6	0.2880	0.5351	2232	0.0003	0.0005	0.0008	0.0011	0.0014	0.0021	0.0023	0.0026	0.0030
L7	0.2886	0.5354	2224	0.0003	0.0006	0.0011	0.0012	0.0015	0.0021	0.0025	0.0028	0.0031
L8	0.2893	0.5358	2212	0.0006	0.0010	0.0013	0.0013	0.0014	0.0021	0.0024	0.0029	0.0033
L9	0.2868	0.5346	2251	0.0004	0.0004	0.0009	0.0011	0.0014	0.0021	0.0025	0.0027	0.0031
L10	0.2890	0.5355	2218	0.0004	0.0005	0.0011	0.0013	0.0013	0.0019	0.0023	0.0026	0.0028
L11	0.2891	0.5357	2215	0.0006	0.0008	0.0011	0.0013	0.0016	0.0023	0.0026	0.0030	0.0034
L12	0.2881	0.5356	2230	0.0003	0.0006	0.0009	0.0008	0.0011	0.0018	0.0022	0.0026	0.0030
L13	0.2891	0.5359	2214	0.0005	0.0008	0.0011	0.0014	0.0018	0.0024	0.0028	0.0032	0.0036
L14	0.2880	0.5357	2232	0.0006	0.0009	0.0010	0.0017	0.0019	0.0025	0.0030	0.0035	0.0036
L15	0.2867	0.5349	2252	0.0004	0.0004	0.0009	0.0010	0.0008	0.0015	0.0020	0.0023	0.0026
L16	0.2883	0.5353	2227	0.0005	0.0009	0.0008	0.0009	0.0014	0.0021	0.0025	0.0029	0.0032
L17	0.2892	0.5358	2214	0.0004	0.0006	0.0011	0.0013	0.0016	0.0022	0.0026	0.0029	0.0033
L18	0.2885	0.5353	2225	0.0006	0.0007	0.0011	0.0014	0.0020	0.0026	0.0030	0.0035	0.0038
L19	0.2883	0.5355	2227	0.0003	0.0007	0.0010	0.0011	0.0013	0.0019	0.0021	0.0022	0.0025
L20	0.2878	0.5350	2235	0.0003	0.0005	0.0006	0.0009	0.0013	0.0020	0.0023	0.0025	0.0029
AV	0.2883	0.5354	2228	**0.0005**	**0.0007**	**0.0010**	**0.0012**	**0.0015**	**0.0021**	**0.0025**	**0.0028**	**0.0032**
Median	0.2882	0.5355	2229	0.0004	0.0007	0.0010	0.0012	0.0014	0.0021	0.0024	0.0028	0.0031
MIN	0.2867	0.5346	2212	0.0002	0.0004	0.0004	0.0006	0.0008	0.0015	0.0020	0.0022	0.0025
MAX	0.2893	0.5359	2252	**0.0011**	**0.0016**	**0.0016**	**0.0020**	**0.0023**	**0.0029**	**0.0033**	**0.0036**	**0.0040**
STDEV	0.0008	0.0004	12	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0004	0.0004
N	20	20	20	20	20	20	20	20	20	20	20	20

5 Data Set 2: 85°C, 25 mA

Description of Light Sources Tested:	FT7A-W2CD48-J9
Case Temperature:	84.6°C
Ambient Temperature:	83.6°C
Drive Current:	25 mA
Measure Current:	25 mA
Failures Observed:	None

Lumen Maintenance (%)

Sample No.	V_F(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L21	129.3	429.59	100.07%	99.77%	99.46%	99.07%	98.85%	98.47%	98.09%	97.71%	97.43%
L22	129.4	425.31	99.94%	99.92%	99.60%	99.16%	98.45%	98.39%	97.98%	97.55%	96.94%
L23	128.7	423.32	100.20%	99.69%	99.47%	99.09%	98.73%	98.16%	97.82%	97.76%	97.47%
L24	128.9	417.46	99.96%	99.62%	99.41%	99.30%	98.47%	98.46%	98.05%	97.71%	97.20%
L25	129.3	420.59	100.15%	99.81%	99.58%	99.17%	98.64%	98.39%	97.87%	97.77%	97.35%
L26	128.9	423.88	100.19%	99.76%	99.46%	99.13%	98.63%	98.09%	98.06%	97.59%	97.15%
L27	128.8	423.51	100.07%	99.59%	99.62%	99.34%	98.59%	98.46%	97.98%	97.71%	97.18%
L28	129.8	434.39	100.04%	99.87%	99.41%	99.18%	98.48%	98.26%	97.99%	97.69%	97.31%
L29	129.8	425.33	99.95%	99.83%	99.55%	99.33%	98.57%	98.33%	98.00%	97.62%	97.30%
L30	129.1	420.58	100.17%	99.74%	99.40%	99.11%	98.85%	98.33%	98.10%	97.57%	97.19%
L31	129.3	427.65	99.97%	99.85%	99.46%	99.11%	98.63%	98.17%	97.84%	97.69%	97.46%
L32	128.9	427.67	100.16%	99.85%	99.61%	99.31%	98.44%	98.50%	97.84%	97.74%	97.10%
L33	129.7	424.08	100.00%	99.97%	99.34%	99.14%	98.53%	98.28%	98.02%	97.64%	97.33%
L34	128.7	414.84	100.10%	99.55%	99.49%	99.13%	98.75%	98.32%	97.91%	97.67%	97.35%
L35	129.5	418.42	99.89%	99.97%	99.43%	99.11%	98.56%	98.24%	97.98%	97.74%	97.37%
L36	129.2	430.01	99.90%	99.61%	99.35%	99.28%	98.72%	98.18%	98.06%	97.67%	97.41%
L37	129.6	430.54	100.08%	99.67%	99.59%	99.35%	98.51%	98.23%	97.86%	97.54%	97.41%
L38	129.4	424.47	99.91%	99.80%	99.52%	99.12%	98.83%	98.24%	98.03%	97.77%	97.28%
L39	129.2	421.42	100.17%	99.55%	99.37%	99.06%	98.69%	98.49%	97.98%	97.70%	97.33%
L40	129.4	424.36	100.12%	99.73%	99.57%	99.14%	98.70%	98.18%	98.05%	97.73%	97.29%
AV	129.25	424.37	**100.05%**	**99.76%**	**99.48%**	**99.18%**	**98.63%**	**98.31%**	**97.98%**	**97.68%**	**97.29%**
Median	129.30	424.22	100.07%	99.77%	99.47%	99.14%	98.63%	98.30%	97.99%	97.70%	97.32%
MIN	128.70	414.84	99.89%	99.55%	99.34%	99.06%	98.44%	98.09%	97.82%	97.54%	96.94%
MAX	129.80	434.39	100.20%	99.97%	99.62%	99.35%	98.85%	98.50%	98.10%	97.77%	97.47%
STDEV	0.3456	4.78	0.0010	0.0013	0.0009	0.0010	0.0013	0.0012	0.0009	0.0007	0.0013
N	20	20	20	20	20	20	20	20	20	20	20

Description of Light Sources Tested:	FT7A-W2CD48-J9
Case Temperature:	84.6°C
Ambient Temperature:	83.6°C
Drive Current:	25 mA
Measure Current:	25 mA
Failures Observed:	None

Chromaticity Shift (Δ u'v')

Sample No.	u'	v'	CCT (K)	1000 hrs	2000 hrs	3000 hrs	4000 hrs	5000 hrs	6000 hrs	7000 hrs	8000 hrs	9000 hrs
L21	0.2878	0.5350	2235	0.0006	0.0012	0.0017	0.0021	0.0022	0.0028	0.0032	0.0037	0.0041
L22	0.2882	0.5352	2230	0.0004	0.0009	0.0015	0.0018	0.0019	0.0025	0.0028	0.0032	0.0035
L23	0.2882	0.5350	2230	0.0005	0.0010	0.0016	0.0019	0.0023	0.0029	0.0033	0.0039	0.0045
L24	0.2881	0.5354	2230	0.0002	0.0006	0.0011	0.0013	0.0017	0.0016	0.0019	0.0023	0.0027
L25	0.2883	0.5354	2227	0.0004	0.0007	0.0013	0.0017	0.0022	0.0028	0.0032	0.0036	0.0040
L26	0.2877	0.5348	2238	0.0006	0.0011	0.0016	0.0020	0.0023	0.0029	0.0033	0.0037	0.0043
L27	0.2877	0.5346	2237	0.0008	0.0013	0.0016	0.0021	0.0024	0.0030	0.0035	0.0040	0.0045
L28	0.2885	0.5357	2225	0.0006	0.0011	0.0015	0.0019	0.0023	0.0027	0.0032	0.0037	0.0042
L29	0.2883	0.5354	2228	0.0003	0.0006	0.0011	0.0013	0.0012	0.0020	0.0024	0.0028	0.0032
L30	0.2885	0.5354	2225	0.0006	0.0011	0.0016	0.0020	0.0025	0.0028	0.0032	0.0035	0.0039
L31	0.2879	0.5351	2234	0.0004	0.0007	0.0011	0.0015	0.0018	0.0024	0.0027	0.0031	0.0034
L32	0.2880	0.5355	2232	0.0004	0.0008	0.0011	0.0016	0.0019	0.0024	0.0028	0.0033	0.0039
L33	0.2871	0.5352	2246	0.0005	0.0012	0.0018	0.0021	0.0023	0.0029	0.0033	0.0038	0.0043
L34	0.2895	0.5351	2211	0.0007	0.0009	0.0015	0.0019	0.0022	0.0035	0.0039	0.0043	0.0046
L35	0.2886	0.5360	2223	0.0005	0.0011	0.0016	0.0018	0.0020	0.0025	0.0030	0.0033	0.0037
L36	0.2879	0.5350	2234	0.0004	0.0009	0.0013	0.0014	0.0017	0.0023	0.0027	0.0031	0.0035
L37	0.2878	0.5355	2235	0.0006	0.0011	0.0018	0.0021	0.0024	0.0030	0.0035	0.0040	0.0045
L38	0.2882	0.5353	2229	0.0005	0.0009	0.0015	0.0019	0.0020	0.0025	0.0029	0.0034	0.0038
L39	0.2888	0.5357	2220	0.0004	0.0009	0.0013	0.0017	0.0019	0.0018	0.0023	0.0027	0.0032
L40	0.2881	0.5348	2231	0.0006	0.0011	0.0018	0.0021	0.0023	0.0033	0.0036	0.0040	0.0045
AV	0.2882	0.5350	2230	**0.0005**	**0.0010**	**0.0015**	**0.0018**	**0.0021**	**0.0026**	**0.0030**	**0.0035**	**0.0039**
Median	0.2882	0.5353	2230	0.0005	0.0010	0.0015	0.0019	0.0022	0.0027	0.0032	0.0036	0.0039
MIN	0.2871	0.5346	2211	0.0002	0.0006	0.0011	0.0013	0.0012	0.0016	0.0019	0.0023	0.0027
MAX	0.2895	0.5360	2246	**0.0008**	**0.0013**	**0.0018**	**0.0021**	**0.0025**	**0.0035**	**0.0039**	**0.0043**	**0.0046**
STDEV	0.0005	0.0003	7	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0005	0.0005	0.0005
N	20	20	20	20	20	20	20	20	20	20	20	20

6 Data Set 3: 105°C, 25 mA

Description of Light Sources Tested:	FT7A-W2CD48-J9
Case Temperature:	104.5°C
Ambient Temperature:	103.7°C
Drive Current:	25 mA
Measure Current:	25 mA
Failures Observed:	None

Lumen Maintenance (%)

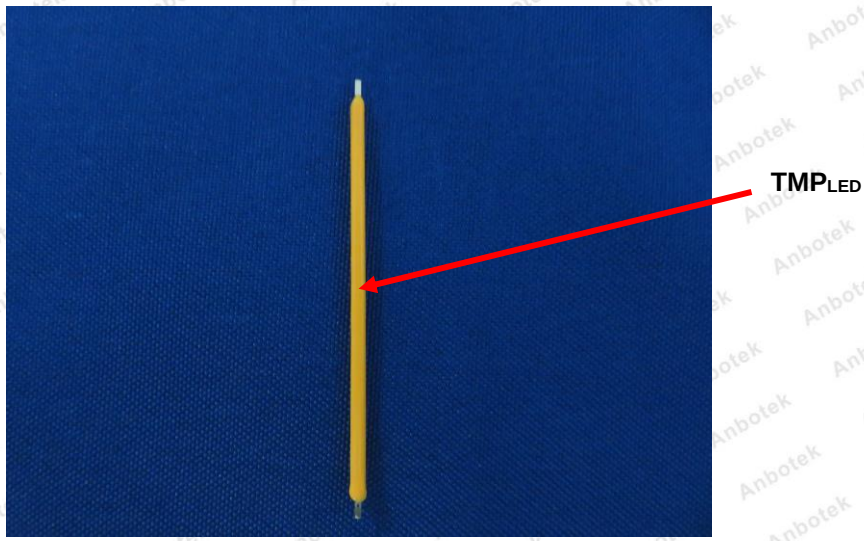
Sample No.	V_F(V)	Φ(lm)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
L41	129.6	433.92	99.89%	99.47%	99.05%	98.55%	98.18%	97.67%	97.25%	97.07%	96.80%
L42	129.5	424.73	99.85%	99.62%	99.18%	98.62%	97.98%	97.80%	97.27%	96.85%	96.53%
L43	128.9	421.05	99.85%	99.46%	99.15%	98.60%	98.08%	97.71%	97.20%	97.11%	96.56%
L44	129.4	422.13	99.92%	99.58%	99.13%	98.63%	97.96%	97.52%	97.06%	97.00%	96.68%
L45	129.1	423.25	99.97%	99.46%	99.05%	98.70%	98.15%	97.62%	97.19%	97.01%	96.48%
L46	128.8	422.22	99.88%	99.71%	99.06%	98.49%	98.23%	97.75%	97.05%	97.05%	96.52%
L47	129.7	427.50	99.89%	99.73%	99.03%	98.56%	98.03%	97.75%	97.22%	97.08%	96.62%
L48	129.6	430.85	99.99%	99.48%	99.02%	98.49%	98.23%	97.67%	97.28%	97.09%	96.45%
L49	128.9	416.77	99.93%	99.66%	98.94%	98.73%	98.19%	97.83%	97.24%	96.91%	96.24%
L50	129.3	428.15	99.79%	99.61%	98.94%	98.49%	98.04%	97.63%	97.13%	97.03%	96.28%
L51	129.5	429.75	99.95%	99.50%	98.94%	98.56%	98.21%	97.71%	97.21%	97.07%	96.48%
L52	129.1	423.40	99.85%	99.65%	98.96%	98.75%	98.16%	97.59%	97.17%	97.06%	96.53%
L53	129.3	422.47	99.85%	99.40%	99.01%	98.64%	98.25%	97.63%	97.18%	97.08%	96.27%
L54	128.7	423.64	99.96%	99.49%	99.16%	98.62%	98.09%	97.82%	97.10%	97.07%	96.40%
L55	129.5	422.41	99.97%	99.44%	99.04%	98.74%	97.98%	97.67%	97.03%	96.92%	96.32%
L56	129.8	426.34	99.94%	99.55%	99.08%	98.76%	97.99%	97.73%	97.26%	96.92%	96.48%
L57	129.3	419.46	99.92%	99.65%	99.20%	98.75%	97.96%	97.65%	97.34%	97.10%	96.28%
L58	128.6	419.25	99.98%	99.50%	99.00%	98.53%	97.98%	97.68%	97.28%	96.97%	96.49%
L59	129.6	421.46	99.91%	99.47%	99.03%	98.75%	98.23%	97.72%	97.29%	96.86%	96.37%
L60	129.3	414.08	99.90%	99.09%	99.09%	98.69%	98.21%	97.59%	97.30%	96.84%	96.44%
AV	129.28	423.64	**99.91%**	**99.53%**	**99.05%**	**98.63%**	**98.11%**	**97.69%**	**97.20%**	**97.00%**	**96.46%**
Median	129.30	422.86	99.92%	99.50%	99.05%	98.62%	98.12%	97.68%	97.22%	97.04%	96.48%
MIN	128.60	414.08	99.79%	99.09%	98.94%	98.49%	97.96%	97.52%	97.03%	96.84%	96.24%
MAX	129.80	433.92	99.99%	99.73%	99.20%	98.76%	98.25%	97.83%	97.34%	97.11%	96.80%
STDEV	0.3477	4.77	0.0005	0.0014	0.0008	0.0010	0.0011	0.0008	0.0009	0.0009	0.0014
N	20	20	20	20	20	20	20	20	20	20	20

Description of Light Sources Tested:	FT7A-W2CD48-J9
Case Temperature:	104.5°C
Ambient Temperature:	103.7°C
Drive Current:	25 mA
Measure Current:	25 mA
Failures Observed:	None

Chromaticity Shift (Δ u'v')

Sample No.	u'	v'	CCT (K)	1000 hrs	2000 hrs	3000 hrs	4000 hrs	5000 hrs	6000 hrs	7000 hrs	8000 hrs	9000 hrs
L41	0.2880	0.5353	2232	0.0005	0.0009	0.0013	0.0018	0.0022	0.0028	0.0032	0.0039	0.0044
L42	0.2881	0.5351	2231	0.0007	0.0011	0.0016	0.0021	0.0026	0.0033	0.0038	0.0042	0.0048
L43	0.2877	0.5349	2237	0.0007	0.0014	0.0018	0.0023	0.0028	0.0033	0.0039	0.0045	0.0049
L44	0.2878	0.5352	2235	0.0009	0.0009	0.0016	0.0019	0.0025	0.0030	0.0038	0.0042	0.0047
L45	0.2903	0.5360	2198	0.0004	0.0008	0.0012	0.0015	0.0016	0.0020	0.0026	0.0030	0.0034
L46	0.2870	0.5345	2248	0.0010	0.0013	0.0017	0.0018	0.0021	0.0027	0.0030	0.0037	0.0044
L47	0.2873	0.5355	2242	0.0007	0.0009	0.0015	0.0019	0.0026	0.0032	0.0037	0.0041	0.0046
L48	0.2876	0.5351	2239	0.0006	0.0008	0.0013	0.0018	0.0021	0.0027	0.0034	0.0039	0.0043
L49	0.2886	0.5350	2223	0.0007	0.0009	0.0015	0.0018	0.0024	0.0030	0.0034	0.0038	0.0042
L50	0.2884	0.5356	2226	0.0006	0.0011	0.0014	0.0017	0.0021	0.0024	0.0028	0.0031	0.0036
L51	0.2883	0.5349	2229	0.0004	0.0007	0.0011	0.0014	0.0017	0.0023	0.0027	0.0032	0.0035
L52	0.2892	0.5356	2214	0.0008	0.0012	0.0017	0.0018	0.0023	0.0030	0.0035	0.0043	0.0045
L53	0.2877	0.5349	2238	0.0006	0.0011	0.0013	0.0019	0.0025	0.0031	0.0037	0.0042	0.0047
L54	0.2880	0.5349	2233	0.0009	0.0012	0.0016	0.0020	0.0034	0.0040	0.0043	0.0048	0.0036
L55	0.2889	0.5353	2220	0.0004	0.0009	0.0017	0.0022	0.0030	0.0036	0.0040	0.0045	0.0048
L56	0.2872	0.5350	2245	0.0011	0.0018	0.0022	0.0026	0.0033	0.0039	0.0043	0.0046	0.0039
L57	0.2890	0.5354	2217	0.0006	0.0011	0.0013	0.0019	0.0023	0.0028	0.0032	0.0035	0.0042
L58	0.2874	0.5345	2242	0.0014	0.0017	0.0021	0.0026	0.0029	0.0033	0.0037	0.0041	0.0046
L59	0.2893	0.5357	2213	0.0009	0.0012	0.0016	0.0019	0.0022	0.0028	0.0030	0.0036	0.0042
L60	0.2885	0.5350	2224	0.0008	0.0015	0.0019	0.0023	0.0028	0.0038	0.0042	0.0045	0.0049
AV	0.2882	0.5352	2229	**0.0007**	**0.0011**	**0.0016**	**0.0020**	**0.0025**	**0.0031**	**0.0035**	**0.0040**	**0.0043**
Median	0.2881	0.5351	2232	0.0007	0.0011	0.0016	0.0019	0.0024	0.0030	0.0036	0.0041	0.0044
MIN	0.2870	0.5345	2198	0.0004	0.0007	0.0011	0.0014	0.0016	0.0020	0.0026	0.0030	0.0034
MAX	0.2903	0.5360	2248	**0.0014**	**0.0018**	**0.0022**	**0.0026**	**0.0034**	**0.0040**	**0.0043**	**0.0048**	**0.0049**
STDEV	0.0008	0.0004	13	0.0003	0.0003	0.0003	0.0003	0.0005	0.0005	0.0005	0.0005	0.0005
N	20	20	20	20	20	20	20	20	20	20	20	20

7 Product Photo



*****END OF TEST REPORT*****