TESTING
NVLAP LAB CODE 600106-0

Photometric Test Report

Relevant Standards

UL1598-2008
ANSI C82.77-10-2014
IES LM-79-2008

Prepared For

Keystone Technologies

1390 Welsh Road，North Wales, PA 19454
Stephanie DeLaurentis,267-656-2272,sdelaurentis@keystoneballast.com

Test Laboratory:
UL-CCIC Company Limited
Test Laboratory Address:

No.2, Chengwan Road, Suzhou Industrial Park, Suzhou 21522, China

Catalog Number
KT-CBLED24-22A-8XX-VDIM-P

Project Number
4788965897
Report Number
4788965897_3

Test Date
03/21/2019 - 03/26/2019
Issue Date
04/19/2019
Revision Date
N/A

Prepared By	Approved By
Xu, Jonathan	Yang, Duff

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Test Summary

DLC Technical Requirements v4.4- issued 2018-10-18

Requirement Category	Test Method	Requirements	Tolerance	Test Result
Minimum Light Output (lm)-Luminaires	**IES LM-79-2008**	≥2000	-10%	3205.0
Spacing Criteria (0-180°)	**IES LM-79-2008**	1.0-2.0	±0.1	1.30
Spacing Criteria (90-270°)	**IES LM-79-2008**	1.0-2.0	±0.1	1.22
Zonal Lumen Requirement 1(0°-60°)	**IES LM-79-2008**	≥75%	-3%	75.00%
Minimum Luminaire Efficacy (lm/W)-Luminaires	**IES LM-79-2008**	≥125	-3%	128.11
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3427.0
Allowable CCT (5000K)	**IES LM-79-2008/ANSI C78.377-2015**	5029±283	N/A	5023.0
Minimum CRI	**IES LM-79-2008/CIE 13.3-1995**	≥80	-2	81.87
L70 Lumen maintenance (Hours)	**N/A**	≥50000	N/A	≥50000
L90 Lumen maintenance (Hours)	**N/A**	≥36000	N/A	≥36000
Power Factor	**ANSI C82.77-10-2014**	≥0.9	-0.03	0.9403
Total Harmonic Distortion (A%)	**ANSI C82.77-10-2014**	≤20%	5%	9.40%
In-Situ Temperature Measurement Test for LED 1 (°C)	**UL1598-2008**	≤105	N/A	51.6
In-Situ Temperature Measurement Test for Driver 1 (°C)	**UL1598-2008**	≤90	N/A	55.7
Minimum Luminaire Warranty (Years)	**N/A**	≥5	N/A	≥5

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Test List

Sample Received Date: 03/13/2019

Test Item	Test Date	Model Number	Tests Conducted By
Integrating Sphere Test	03/26/2019	KT-CBLED24-22A-835-VDIM-P	Yang, Gavin X
Integrating Sphere Test	03/26/2019	KT-CBLED24-22A-850-VDIM-P	Yang, Gavin X
Goniophotometer Test	03/21/2019	KT-CBLED24-22A-835-VDIM-P	Yang, Gavin X
THD and PF Test	03/21/2019	KT-CBLED24-22A-835-VDIM-P	Yang, Gavin X
In-Situ Temperature Measurement Test	03/26/2019	KT-CBLED24-22A-835-VDIM-P	Yang, Gavin X

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL’ s Aurora database.

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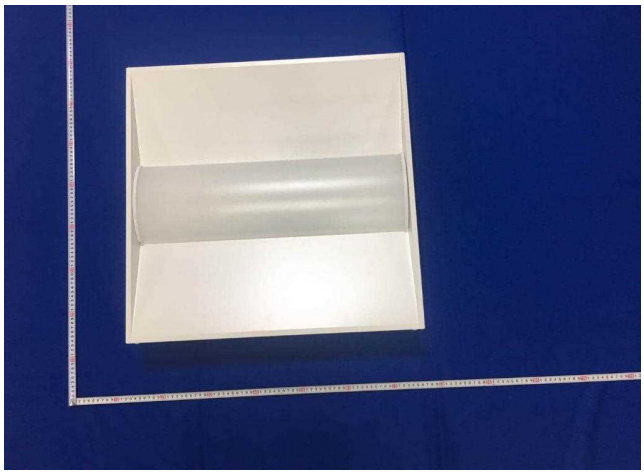
Product Description

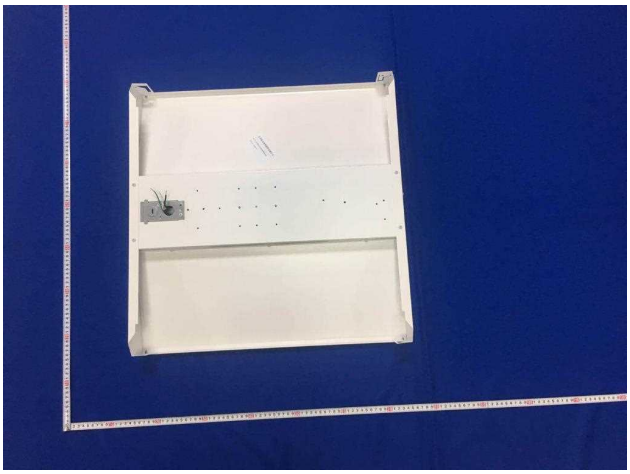
Luminaire Description: 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces
Model Number: KT-CBLED24-22A-835-VDIM-P
Rated Voltage: 120-277V
Frequency: 50/60Hz
LED Package: STW8A2PD-XX
Family Model and Variation: KT-CBLED24-22A-850-VDIM-P

Products Scaled Value

Model Number	CCT	Luminous Flux	Power	Luminous Efficacy
KT-CBLED24-22A-835-VDIM-P	3500	3150	25	126
KT-CBLED24-22A-840-VDIM-P	4000	3175	25	127
KT-CBLED24-22A-850-VDIM-P	4000	3200	25	128

Photos of Products Characteristics





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Integrating Sphere Test

Model No.	KT-CBLED24-22A-835-VDIM-P		Sample ID.	2125695
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

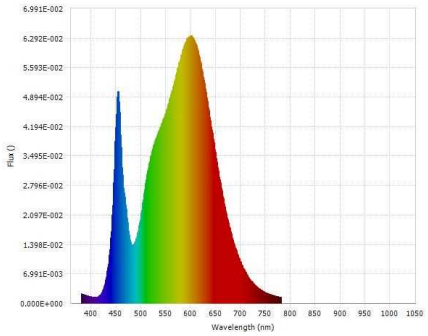
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by Labsphere, Inc., Optical Calibration Laboratory.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

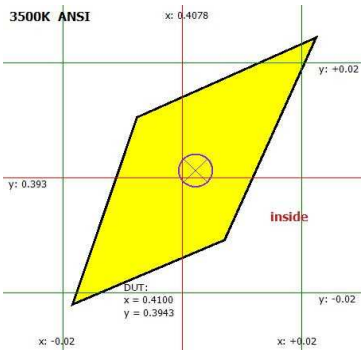
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.5	119.99	60	0.2098	24.972	0.9920	N/A	Horizontal

Test Results

CCT (K)	CRI (Ra)	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
3427.0	81.87	0.0006	3260	130.55	N/A





Luminous Flux (lm)	3260	Chrom x	0.4100
Chrom y	0.3943	Chrom u	0.2372
Chrom v	0.3423	Duv	0.0006
Chrom u’	0.2372	Chrom v’	0.5134
CCT (K)	3427.0	Luminous Efficacy (lm/W)	130.55
Ra	81.87	R1	80.1
R2	89.1	R3	95.6
R4	79.7	R5	79.6
R6	85.1	R7	84.6
R8	61.2	R9	6.0
R10	73.8	R11	77.8
R12	61.3	R13	82.3
R14	97.6	R15	73.7
Rf	81.4	Rg	95.2

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Integrating Sphere Test

Model No.	KT-CBLED24-22A-850-VDIM-P		Sample ID.	2125701
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

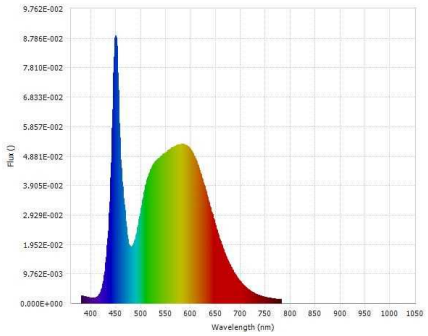
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by Labsphere, Inc., Optical Calibration Laboratory.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

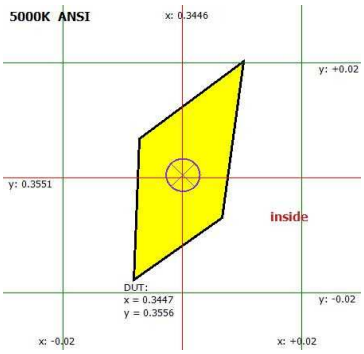
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.6	119.97	60	0.2118	25.209	0.9921	N/A	Horizontal

Test Results

CCT (K)	CRI (Ra)	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
5023.0	82.31	0.0021	3275.37	129.93	N/A





Luminous Flux (lm)	3275.37	Chrom x	0.3447
Chrom y	0.3556	Chrom u	0.2097
Chrom v	0.3244	Duv	0.0021
Chrom u’	0.2097	Chrom v’	0.4865
CCT (K)	5023.0	Luminous Efficacy (lm/W)	129.93
Ra	82.31	R1	80.9
R2	86.3	R3	90.2
R4	83.2	R5	81.7
R6	81.3	R7	86.6
R8	68.2	R9	8.4
R10	67.5	R11	82.8
R12	61.7	R13	82.0
R14	94.6	R15	75.9
Rf	81.3	Rg	96.7

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Goniophotometer Test

Model No.	KT-CBLED24-22A-835-VDIM-P		Sample ID.	2125695
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using a type C goniophotometer and software.
3.The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample. The reference standard lamp is rated current 3.8466A, 3.8601A, 3.8618A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology, China.
4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonallumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

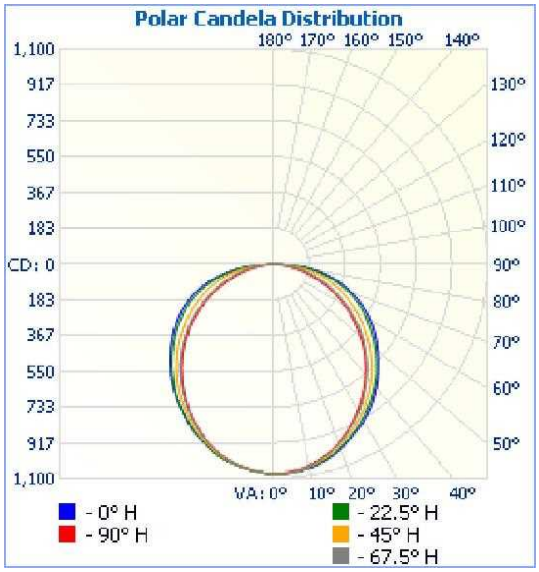
Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.3	120.08	60	0.2097	25.017	0.9937	7.78%	Horizontal

Test Results

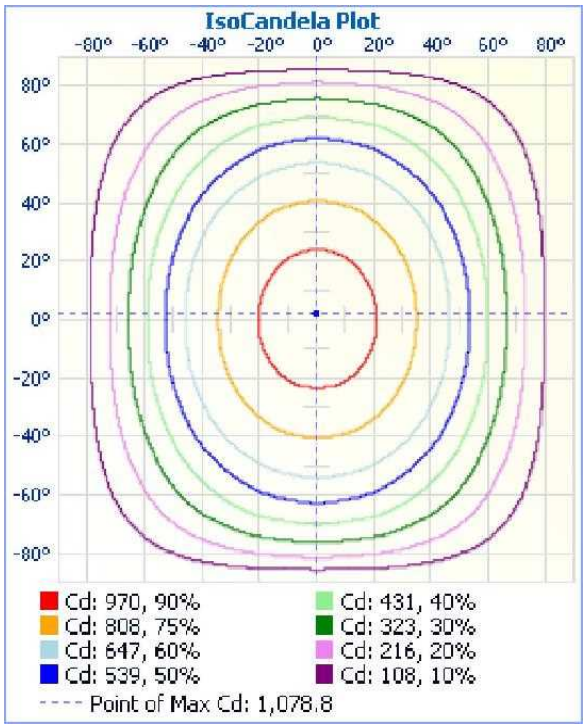
Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)	Spacing Criteria (0-180°)	Spacing Criteria (90°-270°)
	0°-60°	N/A	Horizontal Spread	Vertical Spread			
3205.0	75.00%	N/A	106.1	125.3	128.11	1.30	1.22

Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot



Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	825.4	25.80%
0-40	1349.1	42.10%
0-60	2407.2	75.10%
60-90	787.8	24.60%
70-100	372.3	11.60%
90-120	3.4	0.10%
0-90	3195.0	99.70%
90-180	10.0	0.30%
0-180	3205.0	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	25.6	0.80%	90-95	0.8	0.00%
5-10	75.8	2.40%	95-100	0.7	0.00%
10-15	123.2	3.80%	100-105	0.6	0.00%
15-20	166.1	5.20%	105-110	0.5	0.00%
20-25	202.5	6.30%	110-115	0.5	0.00%
25-30	232.3	7.20%	115-120	0.5	0.00%
30-35	254.6	7.90%	120-125	0.5	0.00%
35-40	269.1	8.40%	125-130	0.6	0.00%
40-45	275.3	8.60%	130-135	0.6	0.00%
45-50	273.2	8.50%	135-140	0.7	0.00%
50-55	263.4	8.20%	140-145	0.7	0.00%
55-60	246.2	7.70%	145-150	0.7	0.00%
60-65	223.0	7.00%	150-155	0.7	0.00%
65-70	194.0	6.10%	155-160	0.6	0.00%
70-75	159.3	5.00%	160-165	0.6	0.00%
75-80	118.7	3.70%	165-170	0.5	0.00%
80-85	72.9	2.30%	170-175	0.3	0.00%
85-90	20.1	0.60%	175-180	0.1	0.00%

Goniophotometer Test (Cont'd)

Intensity Data(cd)

Candela Table - Type C

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	1076	1076	1076	1076	1076	1076	1076	1076	1076	1076	1076	1076	1076	1076	1076	1076	1076
1	**1079**	**1079**	1076	1074	1073	1074	1074	1076	1075	1076	1074	1074	1073	1074	1076	**1079**	**1079**
2	**1079**	1077	1077	1074	1074	1073	1073	1074	1074	1074	1073	1073	1074	1074	1077	1077	**1079**
3	1077	1076	1075	1074	1071	1070	1071	1072	1069	1072	1071	1070	1071	1074	1075	1076	1077
4	1076	1073	1074	1072	1069	1068	1067	1068	1067	1068	1067	1068	1069	1072	1074	1073	1076
5	1073	1073	1072	1070	1065	1063	1064	1066	1065	1066	1064	1063	1065	1070	1072	1073	1073
6	1071	1070	1069	1067	1063	1062	1060	1064	1062	1064	1060	1062	1063	1067	1069	1070	1071
7	1070	1067	1066	1063	1060	1059	1057	1059	1056	1059	1057	1059	1060	1063	1066	1067	1070
8	1066	1064	1062	1060	1057	1055	1053	1056	1054	1056	1053	1055	1057	1060	1062	1064	1066
9	1063	1061	1058	1056	1053	1051	1050	1052	1050	1052	1050	1051	1053	1056	1058	1061	1063
10	1061	1057	1054	1051	1048	1047	1047	1050	1048	1050	1047	1047	1048	1051	1054	1057	1061
11	1058	1052	1050	1046	1043	1042	1043	1046	1044	1046	1043	1042	1043	1046	1050	1052	1058
12	1054	1050	1046	1040	1037	1037	1039	1043	1040	1043	1039	1037	1037	1040	1046	1050	1054
13	1050	1045	1040	1035	1031	1033	1034	1038	1039	1038	1034	1033	1031	1035	1040	1045	1050
14	1045	1042	1035	1028	1024	1026	1029	1035	1035	1035	1029	1026	1024	1028	1035	1042	1045
15	1042	1036	1029	1021	1018	1020	1024	1030	1030	1030	1024	1020	1018	1021	1029	1036	1042
16	1035	1030	1022	1014	1010	1012	1017	1024	1024	1024	1017	1012	1010	1014	1022	1030	1035
17	1030	1023	1015	1006	1003	1005	1010	1018	1015	1018	1010	1005	1003	1006	1015	1023	1030
18	1022	1016	1007	998	994	996	1003	1010	1010	1010	1003	996	994	998	1007	1016	1022
19	1014	1009	1000	990	985	989	995	1002	1001	1002	995	989	985	990	1000	1009	1014
20	1009	1001	990	980	977	980	986	994	993	994	986	980	977	980	990	1001	1009
25	967	962	946	931	924	928	941	953	955	953	941	928	924	931	946	962	967
30	929	917	897	876	866	872	888	906	909	906	888	872	866	876	897	917	929
35	880	865	840	815	804	812	834	857	860	857	834	812	804	815	840	865	880
40	823	811	780	749	735	746	774	801	810	801	774	746	735	749	780	811	823
45	764	749	714	679	664	675	707	741	754	741	707	675	664	679	714	749	764
50	701	685	644	603	587	602	638	679	695	679	638	602	587	603	644	685	701
55	638	619	569	524	506	523	566	615	635	615	566	523	506	524	569	619	638
60	575	552	494	442	423	441	492	549	571	549	492	441	423	442	494	552	575
65	505	483	421	361	338	360	420	483	506	483	420	360	338	361	421	483	505
70	427	409	349	281	254	281	348	406	431	406	348	281	254	281	349	409	427
75	346	326	271	204	173	203	269	322	345	322	269	203	173	204	271	326	346
80	251	234	187	130	97	129	181	225	242	225	181	129	97	130	187	234	251
85	139	128	98	59	35	56	86	109	113	109	86	56	35	59	98	128	139
90	2	2	2	1	1	1	1	2	2	2	1	1	1	1	2	2	2
95	2	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	2
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
105	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
115	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1
125	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1
130	2	1	2	1	1	1	2	1	2	1	2	1	1	1	2	1	2
135	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
140	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
145	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2
150	2	2	2	2	3	2	2	2	2	2	2	2	3	2	2	2	2
155	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
160	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
165	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
170	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
175	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
180	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

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THD and PF Test

Model No.	KT-CBLED24-22A-835-VDIM-P	Sample ID.	2125695
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25º C ± 1º C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.3	120.08	60	0.2097	25.017	0.9937	7.78%	Horizontal
24.3	277.05	60	0.0934	24.341	0.9403	9.40%	Horizontal

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In-Situ Temperature Measurement Test

Model No.	KT-CBLED24-22A-835-VDIM-P	Sample ID.	2125695

Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL 1598-2008, Section 14.
2. The testing was conducted in a room with ambient temperature of 25°C ± 5°C. The apparatus construction followed those described in UL1598-2008 for normal temperature testing. Thermocouples were placed on the LED package in the locations indicated by LM-80 report. Thermocouples were placed on the LED driver case in the locations specified by the manufacture if necessary. The temperature was recorded after the lamp was operated by 7.5 hours.

In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24	120.08	60	0.2097	25.017	0.9937	7.78%	Horizontal

Test Results (LEDs)

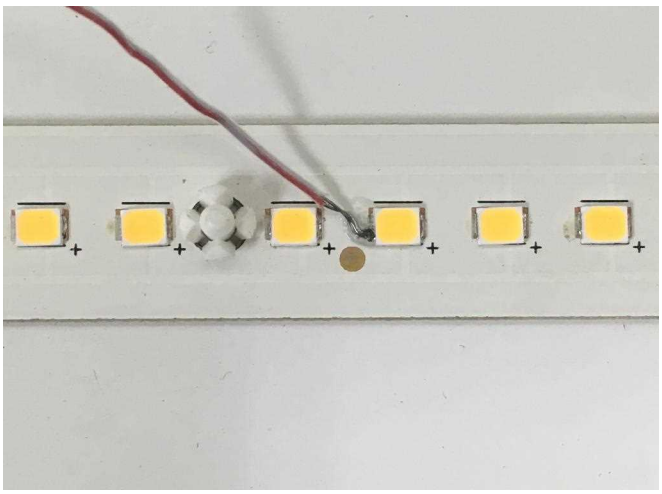
Thermocouple Location	Declared Light Source Current (mA)	Temperature for Light Source (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp (°C)
		Test Result	Test Result (Correct to 25 °C)			
Ambient TEMP	N/A	24	25.0			
TMP of Location 1	105	50.6	51.6	STW8A2PD-XX	200	105

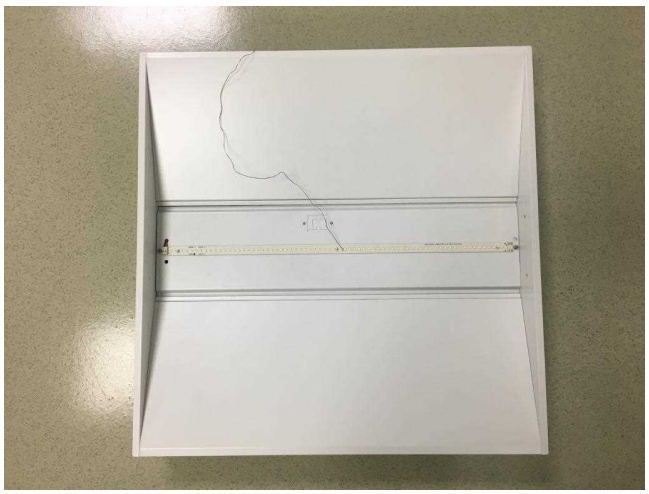
Test Results (Drivers)

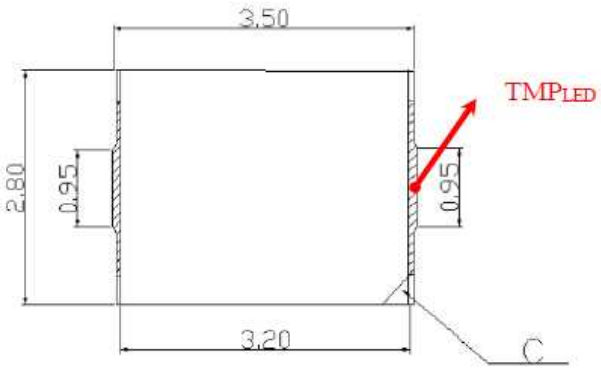
Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp (°C)
	Test Result	Test Result (Correct to 25 °C)		
Ambient TEMP	24	25.0		
TMP of Driver Location 1	54.7	55.7	KTLD-22-UV-540-VDIM-LA7	90

In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Ts Point of Light Sources & Tc Point of Drivers







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