



## Photometric Test Report

### Relevant Standards

- IES LM-79-2008
- ANSI C82.77-2002
- UL1598-2008/ UL1993-2012

### Prepared For

## Keystone Technologies

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### Test Laboratory & Address:

UL-CCIC Company Limited location

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### Catalog Number

**KT-RKIT32-4S-8XX-VDIM**

### Project Number

4788177624

### Report Number

4788177624\_3

### Test Date

7/26/2017-7/28/2017

### Issue Date

10/11/2017

Prepared By

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Approved By

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The results contained in this report pertain only to the tested sample.

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## 1.0 Test Summary

DLC Technical Requirements v4.2

Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Minimum Light Output (lm)	IES LM-79-2008	375lm/ft	972.53	Pass
Minimum Lamp Output (lm)	IES LM-79-2008	N/A	N/A	N/A
Spacing Criteria (0-180°)	IES LM-79-2008	N/A	N/A	N/A
Spacing Criteria (90-270°)	IES LM-79-2008	N/A	N/A	N/A
Zonal Lumen Requirement (0°-60°)	IES LM-79-2008	40%	64.50%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	126.1lm/W	130.85	Pass
Minimum Lamp Efficacy (lm/ft)	IES LM-79-2008	N/A	N/A	N/A
Allowable CCTs* (K)	IES LM-79-2008	≤5000	5136	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥80	82.81	Pass
L70 Lumen maintenance (hours)	IES LM-80-2015 IES TM-21-2011	≥50000	≥50000	Pass
L90 Lumen maintenance (hours)	IES LM-80-2015 IES TM-21-2011	≥36000	≥36000	Pass
Power Factor	ANSI C82.77-2002	≥0.9	0.9595	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-2002	≤20%	9.20%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	≤105	42.6	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	85	43.7	Pass
Minimum Luminaire Warranty (years)	N/A	5	5	Pass

\*Defined by ANSI C78.377-2011‡

‡ANSI C78.377-2015 also referred to for Duv and (x,y) chromaticity coordinates tolerances for indoor categories.



## 2.0 Test List

Test Item	Test	Test Date	Model Number	Tests Conducted By
1	Integrating Sphere Test for the Lower CCT	7/27/2017	KT-RKIT32-4S-835-VDIM	Gavin Yang
2	Integrating Sphere Test for the Higher CCT	7/26/2017	KT-RKIT32-4S-850-VDIM	Gavin Yang
3	Goniophotometer Test	7/26/2017	KT-RKIT32-4S-835-VDIM	Gavin Yang
4	THD and PF Test	7/27/2017	KT-RKIT32-4S-835-VDIM	Gavin Yang
5	In-Situ Temperature Measurement Test	7/28/2017	KT-RKIT32-4S-835-VDIM	Gavin Yang

### **Remark** (if any)

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



### 3.0 Production Description

**Luminaire Description:** Retrofit Kits for Direct Linear Ambient Luminaires

**Model Number:** KT-RKIT32-4S-835-VDIM

**Rated Voltage:** 120-277V

**Frequency:** 50/60Hz

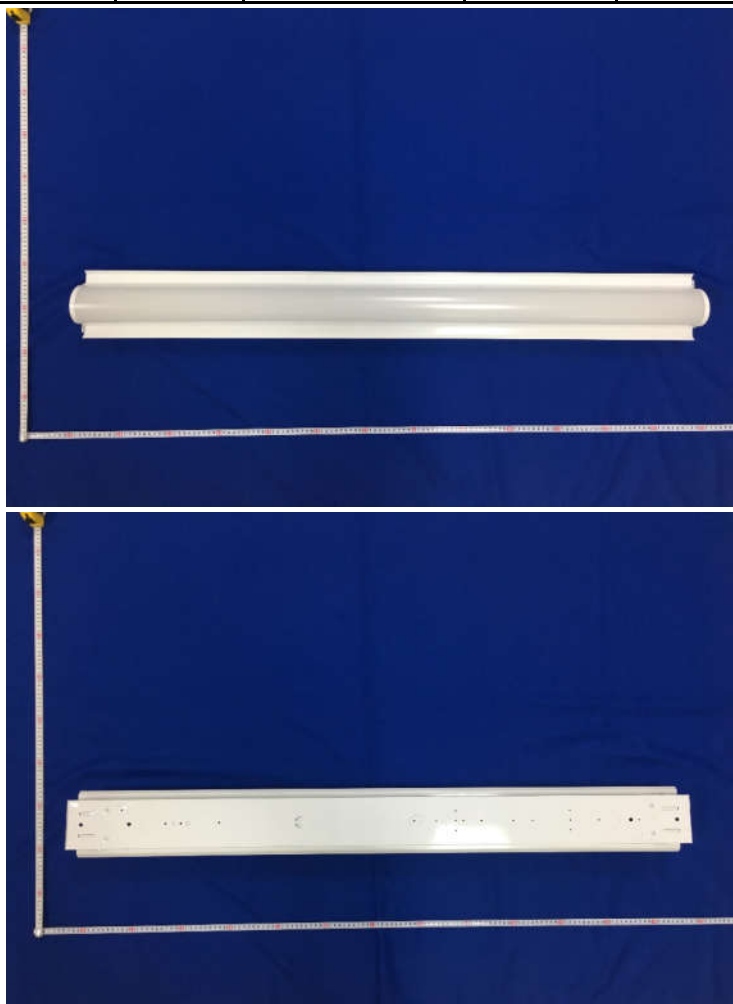
**LED Package:** STWxA2PD-xx

**Family Model and Variation:** KT-RKIT32-4S-850-VDIM

**Housing Model Number:** Lithonia C2 32 MVOLT GEB10IS

#### Photos of Luminaire Characteristics

Model Number	CCT	Light Output (lm)	Power (W)	Luminous efficacy (lm/W)
KT-RKIT32-4S-835-VDIM	3500K	4160	32	130
KT-RKIT32-4S-840-VDIM	4000K	4224	32	132
KT-RKIT32-4S-850-VDIM	5000K	4256	32	133





#### 4.0 LM-79 Measurement and Test Results

Model No.	KT-RKIT32-4S-835-VDIM	Sample ID.	1064544
Opreate time (Min.)	90	Stabilization time (Min.)	45

#### Test Method

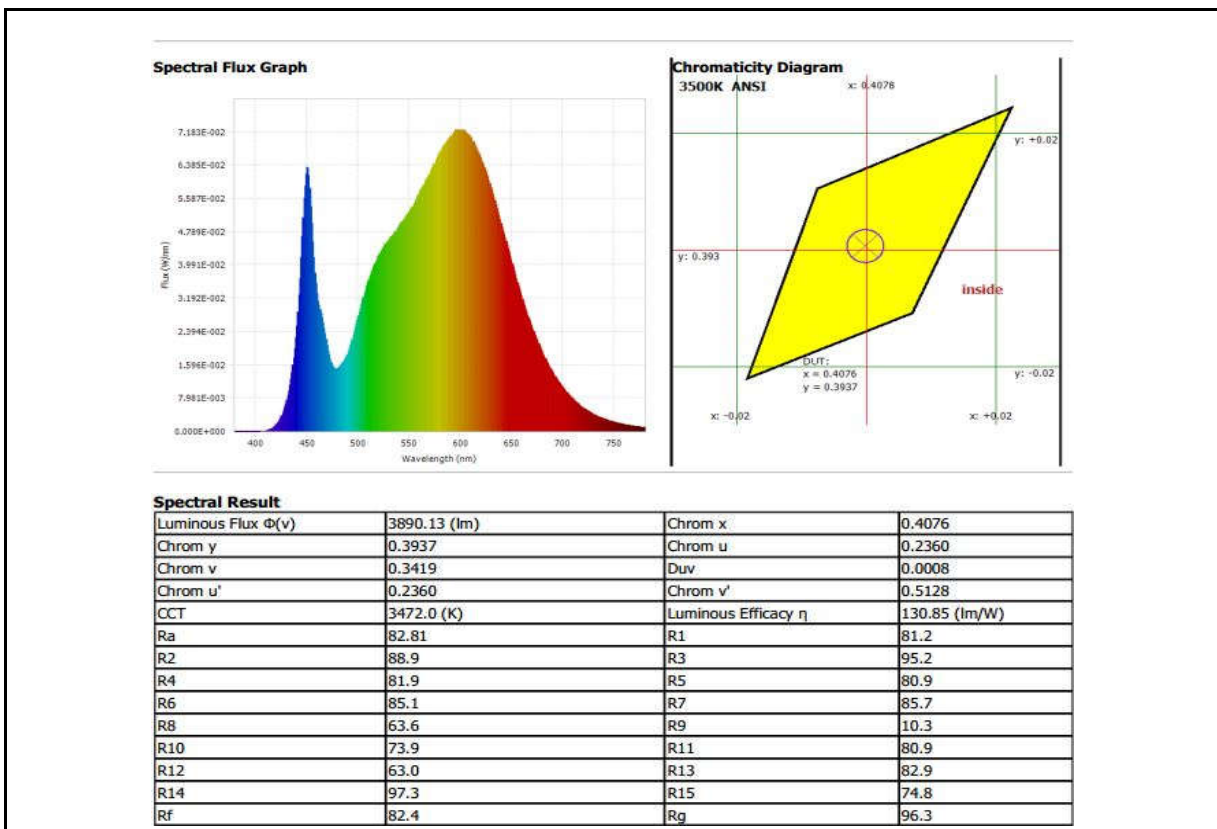
1.The sample was tested according to the IES LM-79-2008 in fixture Lithonia C2 32 MVOLT GEB10IS.  
 2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25° C ± 1° C.The reference standard lamp is rated current 2.6A omni-directional Incandescent lamp and was calibrated by china seprei 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
25.2	120.04	60	0.2489	29.73	0.9952	8.40%

#### Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
3472	82.81	0.0008	3890.13	130.85	972.53





## 4.0 LM-79 Measurement and Test Results

### 4.2 Integrating Sphere Test for the higher CCT

<b>Model No.</b>	KT-RKIT32-4S-850-VDIM	<b>Sample ID.</b>	1064532
<b>Operate time (Min.)</b>	90	<b>Stabilization time (Min.)</b>	45

#### Test Method

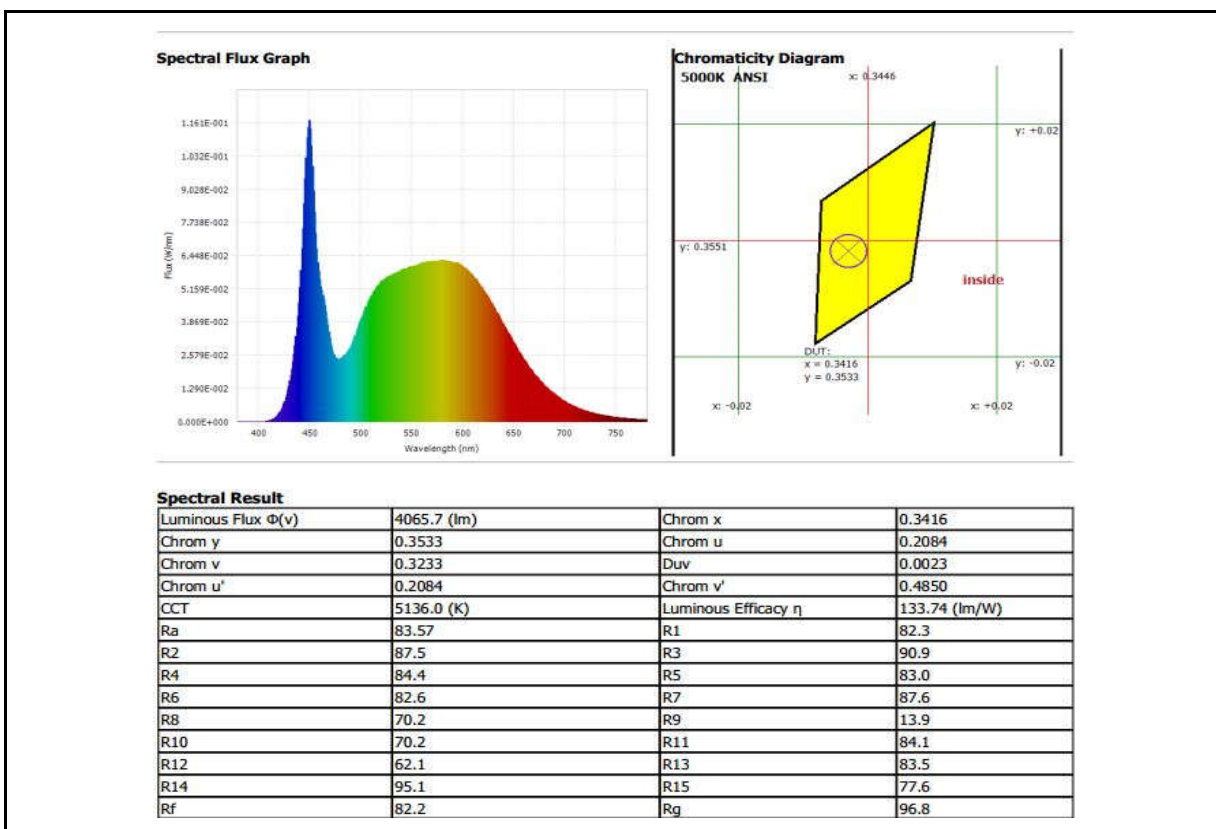
1. The sample was tested according to the IES LM-79-2008 in fixture Lithonia C2 32 MVOLT GEB10IS.  
 2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . The reference standard lamp is rated current 2.6A omni-directional Incandescent lamp and was calibrated by china seprei 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  $4\pi$  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
25.2	119.96	60	0.2551	30.4	0.9935	9.90%

#### Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
5136	83.57	0.0023	4065.7	133.74	1016.43





### 5.0 LM-79 Measurement and Test Results

<b>Model No.</b>	KT-RKIT32-4S-835-VDIM	<b>Sample ID.</b>	1064544
<b>Opreate time (Min.)</b>	90	<b>Stabilization time (Min.)</b>	45

#### Test Method

1.The sample was tested according to the IES LM-79-2008 in fixture Lithonia C2 32 MVOLT GEB10IS.  
 2.Photometric paramters 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 3.865A omni-directional Incandescent lamp and was calibrated by china seprei laboratory.  
 4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 0.5° 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	Orientation
25.2	119.96	60	0.24831	29.65	0.9954	Horizontal

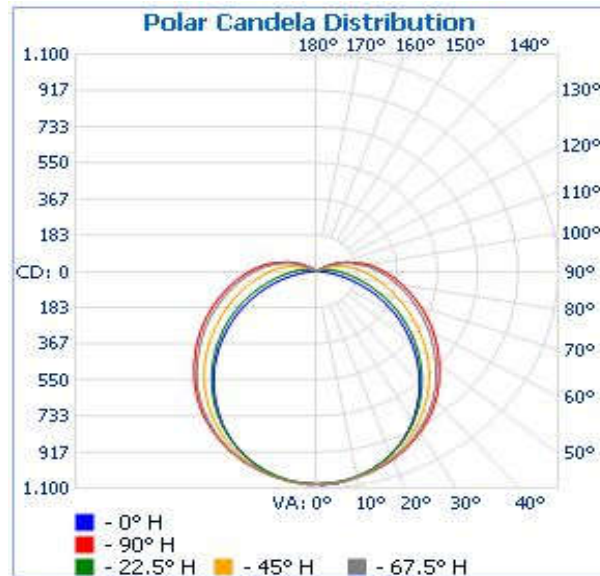
#### Test Result

Flux (lm)	Zonal Lumen Requirement (0°-60°)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
3791.1	64.5%	156.4	156.7	132.1	103.2	127.86
SC	SC					
0~180°	90°~270°					
N/A	N/A					

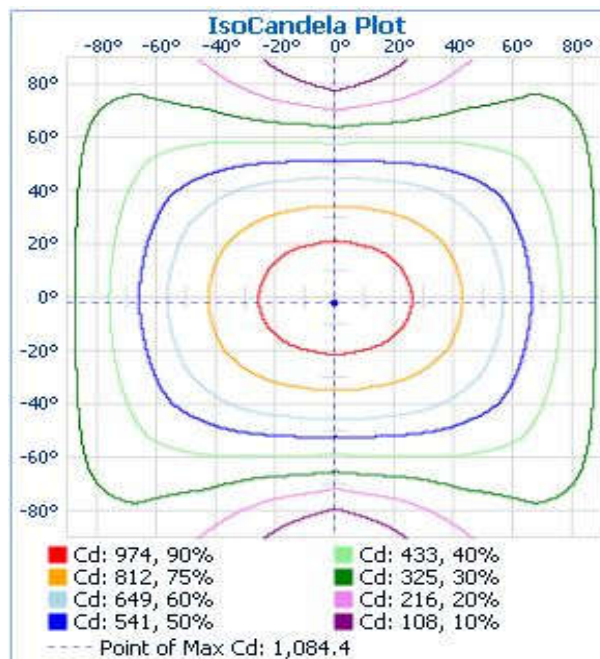


## 5.2 Goniophotometer Test (Cont'd)

### Light Distribution Curve



### IsoCandela Plot







## 5.2 Goniophotometer Test (Cont'd)

### Zonal Lumen Summary

#### **Zonal Lumen Summary**

Zone	Lumens	% Luminaire
0-30	835.0	22%
0-40	1,367.0	36.1%
0-60	2,444.3	64.5%
60-90	1,030.3	27.2%
70-100	755.3	19.9%
90-120	299.6	7.9%
0-90	3,474.5	91.7%
90-180	316.4	8.3%
0-180	3,791.0	100%

### Lumens Per Zone

#### **Lumens Per Zone**

Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	25.7	0.7%	90-95	93.0	2.5%
5-10	76.3	2.0%	95-100	74.5	2%
10-15	124.2	3.3%	100-105	55.5	1.5%
15-20	167.6	4.4%	105-110	38.3	1%
20-25	205.2	5.4%	110-115	24.6	0.6%
25-30	235.9	6.2%	115-120	13.7	0.4%
30-35	258.7	6.8%	120-125	6.4	0.2%
35-40	273.3	7.2%	125-130	2.4	0.1%
40-45	279.4	7.4%	130-135	1.2	0%
45-50	277.2	7.3%	135-140	1.2	0%
50-55	267.9	7.1%	140-145	1.1	0%
55-60	252.8	6.7%	145-150	1.0	0%
60-65	233.0	6.1%	150-155	0.9	0%
65-70	209.5	5.5%	155-160	0.8	0%
70-75	183.8	4.8%	160-165	0.7	0%
75-80	158.3	4.2%	165-170	0.5	0%
80-85	133.8	3.5%	170-175	0.3	0%
85-90	111.9	3.0%	175-180	0.1	0%



### 5.2 Goniophotometer Test (Cont'd)

#### Intensity Data(cd)

	0	22.5	45	67.5	90	113	135	158	180	203	225	247.5	270	293	315	338	360
0	1079	1079	1079	1079	1079	1079	1079	1079	1079	1079	1079	1079	1079	1079	1079	1079	1079
1	1084	1077	1082	1078	1077	1080	1082	1078	1082	1078	1082	1080	1077	1078	1082	1077	1084
2	1083	1077	1081	1078	1076	1078	1082	1075	1083	1075	1082	1078	1076	1078	1081	1077	1083
3	1081	1076	1079	1077	1076	1077	1080	1075	1082	1075	1080	1077	1076	1077	1079	1076	1081
4	1081	1074	1079	1076	1075	1075	1079	1073	1078	1073	1079	1075	1075	1076	1079	1074	1081
5	1079	1072	1076	1074	1073	1074	1077	1072	1076	1072	1077	1074	1073	1074	1076	1072	1079
6	1075	1070	1075	1073	1071	1072	1074	1069	1074	1069	1074	1072	1071	1073	1075	1070	1075
7	1073	1067	1072	1069	1070	1071	1072	1066	1071	1066	1072	1071	1070	1069	1072	1067	1073
8	1069	1063	1069	1068	1067	1068	1069	1061	1066	1061	1069	1068	1067	1068	1069	1063	1069
9	1064	1059	1066	1063	1064	1065	1065	1057	1063	1057	1065	1065	1064	1063	1066	1059	1064
10	1059	1056	1062	1060	1062	1062	1061	1054	1059	1054	1061	1062	1062	1060	1062	1056	1059
11	1055	1050	1057	1056	1058	1059	1058	1047	1053	1047	1058	1059	1058	1056	1057	1050	1055
12	1049	1045	1053	1054	1054	1054	1053	1042	1047	1042	1053	1054	1054	1054	1053	1045	1049
13	1045	1038	1047	1050	1051	1050	1047	1037	1040	1037	1047	1050	1051	1050	1047	1038	1045
14	1037	1035	1042	1045	1046	1047	1043	1030	1034	1030	1043	1047	1046	1045	1042	1035	1037
15	1028	1027	1036	1039	1042	1041	1036	1023	1027	1023	1036	1041	1042	1039	1036	1027	1028
16	1023	1020	1030	1034	1037	1036	1030	1016	1020	1016	1030	1036	1037	1034	1030	1020	1023
17	1014	1012	1024	1029	1032	1031	1023	1010	1012	1010	1023	1031	1032	1029	1024	1012	1014
18	1006	1004	1018	1023	1028	1024	1016	1002	1003	1002	1016	1024	1028	1023	1018	1004	1006
19	996	996	1010	1017	1021	1018	1009	993	995	993	1009	1018	1021	1017	1010	996	996
20	989	987	1002	1010	1015	1012	1001	984	985	984	1001	1012	1015	1010	1002	987	989
25	935	939	960	974	982	976	959	935	933	935	959	976	982	974	960	939	935
30	874	881	908	932	942	934	909	878	872	878	909	934	942	932	908	881	874
35	804	815	851	883	896	886	853	814	804	814	853	886	896	883	851	815	804
40	728	745	789	828	845	832	791	744	731	744	791	832	845	828	789	745	728
45	647	670	724	768	788	772	726	672	654	672	726	772	788	768	724	670	647
50	563	592	655	706	728	709	658	599	573	599	658	709	728	706	655	592	563
55	478	513	584	645	671	648	589	522	489	522	589	648	671	645	584	513	478
60	394	437	515	586	613	589	520	445	406	445	520	589	613	586	515	437	394
65	308	361	453	527	555	530	457	372	323	372	457	530	555	527	453	361	308
70	226	288	393	471	497	472	398	300	242	300	398	472	497	471	393	288	226
75	148	225	338	418	445	421	344	235	164	235	344	421	445	418	338	225	148
80	78	172	290	369	395	371	294	181	95	181	294	371	395	369	290	172	78
85	25	129	248	324	348	325	250	136	38	136	250	325	348	324	248	129	25
90	4	96	208	281	304	282	211	101	6	101	211	282	304	281	208	96	4
95	3	66	171	240	262	242	173	71	3	71	173	242	262	240	171	66	3
100	3	37	133	199	219	195	134	42	4	42	134	195	219	199	133	37	3
105	3	13	96	156	172	155	87	15	3	15	87	155	172	156	96	13	3
110	3	5	61	115	132	112	50	5	3	5	50	112	132	115	61	5	3
115	4	4	29	78	93	66	23	4	3	4	23	66	93	78	29	4	4
120	4	4	7	43	58	33	7	4	3	4	7	33	58	43	7	4	4
125	4	4	3	14	27	11	3	4	4	4	3	11	27	14	3	4	4
130	4	4	3	3	5	2	3	4	4	4	3	2	5	3	3	4	4
135	4	4	3	2	2	2	3	4	4	4	3	2	2	2	3	4	4
140	4	4	4	3	2	2	4	4	4	4	4	2	2	3	4	4	4
145	4	4	4	3	2	3	4	4	4	4	4	3	2	3	4	4	4
150	4	4	4	3	2	3	4	4	4	4	4	3	2	3	4	4	4
155	4	4	4	3	2	3	4	5	5	5	4	3	2	3	4	4	4
160	5	5	4	4	2	3	4	5	5	5	4	3	2	4	4	5	5
165	5	5	5	4	3	4	4	5	5	5	4	4	3	4	5	5	5
170	6	5	5	4	3	4	5	5	6	5	5	4	3	4	5	5	6
175	6	5	5	5	4	5	5	5	6	5	5	5	4	5	5	5	6
180	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5



## 6.0 THD and PF Test

<b>Model No.</b>	KT-RKIT32-4S-835-VDIM	<b>Sample ID.</b>	1064544
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### Test Method

1. The samples were tested according to the ANSI C82.77-2002 in fixture Lithonia C2 32 MVOLT GEB10IS.
2. The ambient temperature condition was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . 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
25.2	277.1	60	0.1102	29.302	0.9595	9.20%



## 7.0 In-Situ Temperature Measurement Test

<b>Model No.</b>	KT-RKIT32-4S-835-VDIM	<b>Sample ID.</b>	1064544
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### Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14 or UL1993-2012, Section 8.5 in fixture Lithonia C2 32 MVOLT GEB10IS.

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. The temperature was recorded after the lamp was operated by 3.5 hours in stability or by 7.5 hours.

### In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	120.04	60	0.2489	29.73	0.9952	Horizontal

### Test Results(LED)

Thermocouple Location	Manufacturer Declared Current (mA)	Temperature for Lighting source (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp. (°C)
		Test result column 1	Test result (Correct to 25 °C)			
TMP of LEDs	85	42.4	42.6	STWxA2PD-xx	300	85
Ambient temperature	N/A	24.8	25.0			

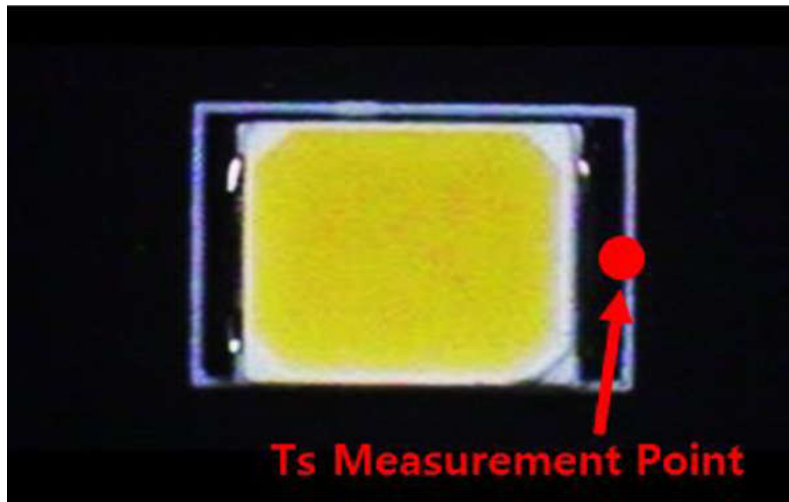
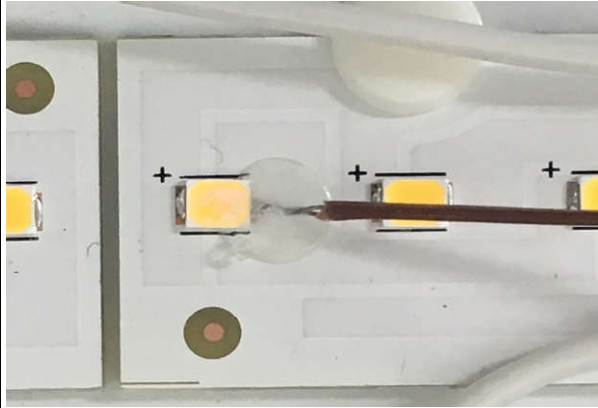
### Test Results(Driver)

Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp. (°C)
	Test result column 1	Test result (Correct to 25 °C)		
TMP of Driver	43.5	43.7	KTLD-30-UV-650-VDIM-LA2	85
Ambient temperature	24.8	25.0		



## 7.0 In-Situ Temperature Measurement Test (Cont'd)

### Test Photos for Tc Point of LED Packages





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