



Photometric Test Report

Relevant Standards

UL1598-2008

ANSI C82.77-10-2014

IES LM-79-2008

Prepared For

Keystone Technologies

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Catalog Number

KT-CBLED18-22A-8XX-VDIM-P

Project Number

4788965897

Report Number

4788965897_12

Test Date

03/21/2019 - 03/25/2019

Issue Date

05/07/2019

Revision Date

N/A

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Yang, Duff

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

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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% | 2331.0 |
| Spacing Criteria (0-180°) | IES LM-79-2008 | 1.0-2.0 | ±0.1 | 1.28 |
| 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% | 128.35 |
| Allowable CCT (3500K) | IES LM-79-2008/ANSI C78.377-2015 | 3465±245 | N/A | 3477.0 |
| Allowable CCT (5000K) | IES LM-79-2008/ANSI C78.377-2015 | 5029±283 | N/A | 5101.0 |
| Minimum CRI | IES LM-79-2008/CIE 13.3-1995 | ≥80 | -2 | 82.44 |
| 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 | 0.9428 |
| Total Harmonic Distortion (A%) | ANSI C82.77-10-2014 | ≤20% | 5% | 10.39% |
| In-Situ Temperature Measurement Test for LED 1 (°C) | UL1598-2008 | ≤105 | N/A | 46.5 |
| In-Situ Temperature Measurement Test for Driver 1 (°C) | UL1598-2008 | ≤90 | N/A | 48.9 |
| Minimum Luminaire Warranty (Years) | N/A | ≥5 | N/A | ≥5 |



Test List

Sample Received Date: 03/13/2019

| Test Item | Test Date | Model Number | Tests Conducted By |
|--------------------------------------|------------|---------------------------|--------------------|
| Integrating Sphere Test | 03/22/2019 | KT-CBLED18-22A-835-VDIM-P | Yang, Gavin X |
| Integrating Sphere Test | 03/22/2019 | KT-CBLED18-22A-850-VDIM-P | Yang, Gavin X |
| Goniophotometer Test | 03/21/2019 | KT-CBLED18-22A-835-VDIM-P | Yang, Gavin X |
| THD and PF Test | 03/21/2019 | KT-CBLED18-22A-835-VDIM-P | Yang, Gavin X |
| In-Situ Temperature Measurement Test | 03/25/2019 | KT-CBLED18-22A-835-VDIM-P | Yang, Gavin X |

Remark (if any)

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



Product Description

Luminaire Description: 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces

Model Number: KT-CBLED18-22A-835-VDIM-P

Rated Voltage: 120-277V

Frequency: 50/60Hz

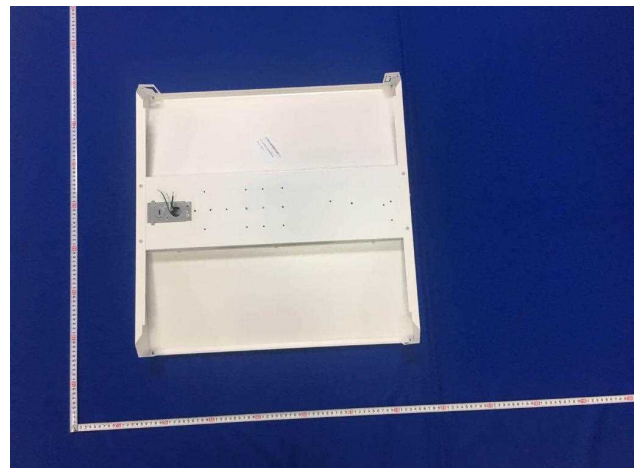
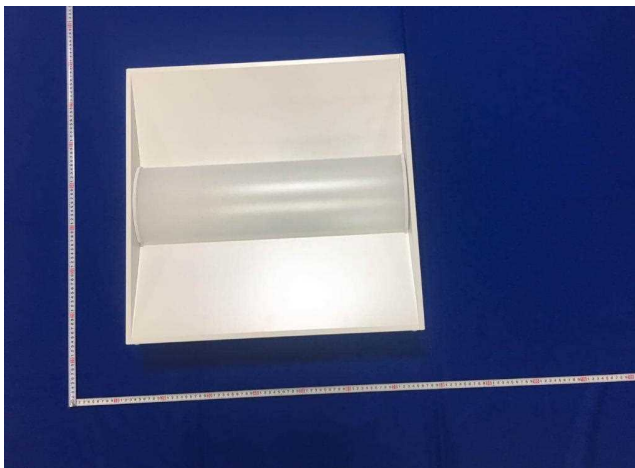
LED Package: STW8A2PD-XX

Family Model and Variation: KT-CBLED18-22A-850-VDIM-P

Products Scaled Value

| Model Number | CCT | Luminous Flux | Power | Luminous Efficacy |
|---------------------------|------|---------------|-------|-------------------|
| KT-CBLED18-22A-835-VDIM-P | 3500 | 2286 | 18 | 127 |
| KT-CBLED18-22A-840-VDIM-P | 4000 | 2304 | 18 | 128 |
| KT-CBLED18-22A-850-VDIM-P | 5000 | 2322 | 18 | 129 |

Photos of Products Characteristics





Integrating Sphere Test

| | | | | |
|---------------------|---------------------------|---------------------------|------------|---------|
| Model No. | KT-CBLED18-22A-835-VDIM-P | | Sample ID. | 2125684 |
| Operate time (Min.) | 90 | Stabilization time (Min.) | 45 | |

Test Method

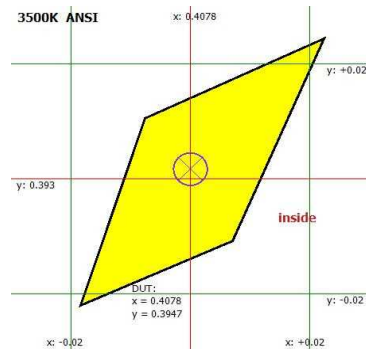
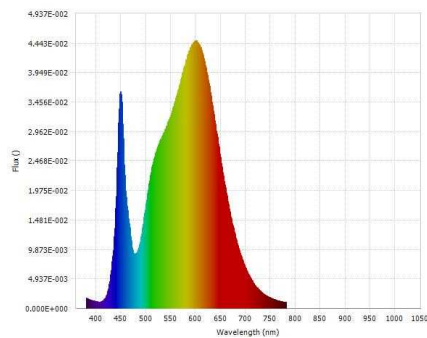
1. The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. 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 ($^{\circ}\text{C}$) | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Current THD | Orientation |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.5 | 120.06 | 60 | 0.1521 | 18.145 | 0.9937 | N/A | Horizontal |

Test Results

| CCT (K) | CRI (Ra) | Duv | Flux (lm) | Luminous Efficacy (lm/W) | Luminous Efficacy (lm/ft) |
|---------|----------|--------|-----------|--------------------------|---------------------------|
| 3477.0 | 82.44 | 0.0012 | 2355.09 | 129.79 | N/A |



| | | | |
|--------------------|---------|--------------------------|--------|
| Luminous Flux (lm) | 2355.09 | Chrom x | 0.4078 |
| Chrom y | 0.3947 | Chrom u | 0.2357 |
| Chrom v | 0.3422 | Duv | 0.0012 |
| Chrom u' | 0.2357 | Chrom v' | 0.5133 |
| CCT (K) | 3477.0 | Luminous Efficacy (lm/W) | 129.79 |
| Ra | 82.44 | R1 | 80.6 |
| R2 | 88.3 | R3 | 95.0 |
| R4 | 82.0 | R5 | 80.6 |
| R6 | 84.7 | R7 | 85.5 |
| R8 | 62.7 | R9 | 7.5 |
| R10 | 72.9 | R11 | 81.3 |
| R12 | 64.9 | R13 | 82.2 |
| R14 | 97.2 | R15 | 73.9 |
| Rf | 82.5 | Rg | 96.6 |



Integrating Sphere Test

| | | | | |
|----------------------------|---------------------------|----------------------------------|-------------------|---------|
| Model No. | KT-CBLED18-22A-850-VDIM-P | | Sample ID. | 2125691 |
| Operate time (Min.) | 90 | Stabilization time (Min.) | 45 | |

Test Method

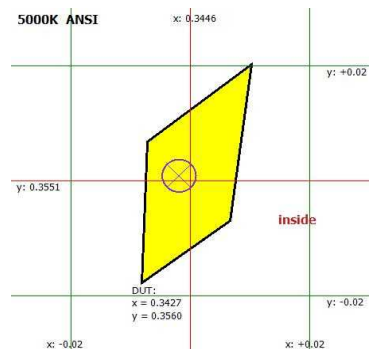
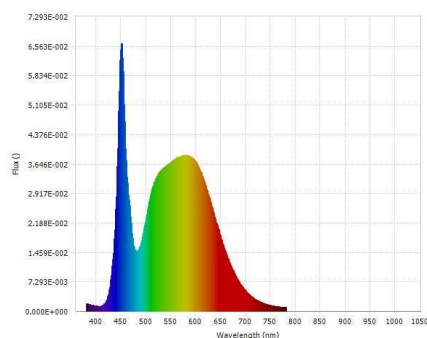
1. The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. 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 ($^{\circ}\text{C}$) | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Current THD | Orientation |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.4 | 120.04 | 60 | 0.1522 | 18.152 | 0.9936 | N/A | Horizontal |

Test Results

| CCT (K) | CRI (Ra) | Duv | Flux (lm) | Luminous Efficacy (lm/W) | Luminous Efficacy (lm/ft) |
|---------|----------|--------|-----------|--------------------------|---------------------------|
| 5101.0 | 82.65 | 0.0031 | 2411 | 132.82 | N/A |



| | | | |
|--------------------|--------|--------------------------|--------|
| Luminous Flux (lm) | 2411 | Chrom x | 0.3427 |
| Chrom y | 0.3560 | Chrom u | 0.2081 |
| Chrom v | 0.3243 | Duv | 0.0031 |
| Chrom u' | 0.2081 | Chrom v' | 0.4864 |
| CCT (K) | 5101.0 | Luminous Efficacy (lm/W) | 132.82 |
| Ra | 82.65 | R1 | 81.0 |
| R2 | 87.1 | R3 | 91.3 |
| R4 | 82.9 | R5 | 81.5 |
| R6 | 82.0 | R7 | 87.3 |
| R8 | 68.1 | R9 | 8.4 |
| R10 | 69.1 | R11 | 82.1 |
| R12 | 59.9 | R13 | 82.4 |
| R14 | 95.3 | R15 | 75.9 |
| Rf | 81.5 | Rg | 95.6 |



Goniophotometer Test

| | | | | |
|---------------------|---------------------------|---------------------------|------------|---------|
| Model No. | KT-CBLED18-22A-835-VDIM-P | | Sample ID. | 2125684 |
| 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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, 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 ($^{\circ}\text{C}$) | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Current THD | Orientation |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.0 | 120.11 | 60 | 0.1521 | 18.161 | 0.9940 | 8.01% | Horizontal |

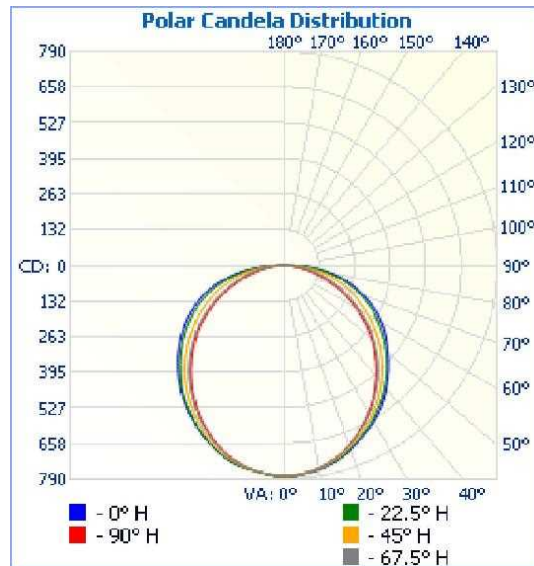
Test Results

| Luminous Flux (lm) | Zonal Lumen Requirement 1 | Zonal Lumen Requirement 2 | Beam Angle (50%) | | Luminous Efficacy (lm/W) | Spacing Criteria (0-180 $^{\circ}$) | Spacing Criteria (90 $^{\circ}$ -270 $^{\circ}$) |
|--------------------|-----------------------------|---------------------------|-------------------|-----------------|--------------------------|--------------------------------------|---|
| | 0 $^{\circ}$ -60 $^{\circ}$ | N/A | Horizontal Spread | Vertical Spread | | | |
| 2331.0 | 75.00% | N/A | 106.4 | 125.8 | 128.35 | 1.28 | 1.22 |

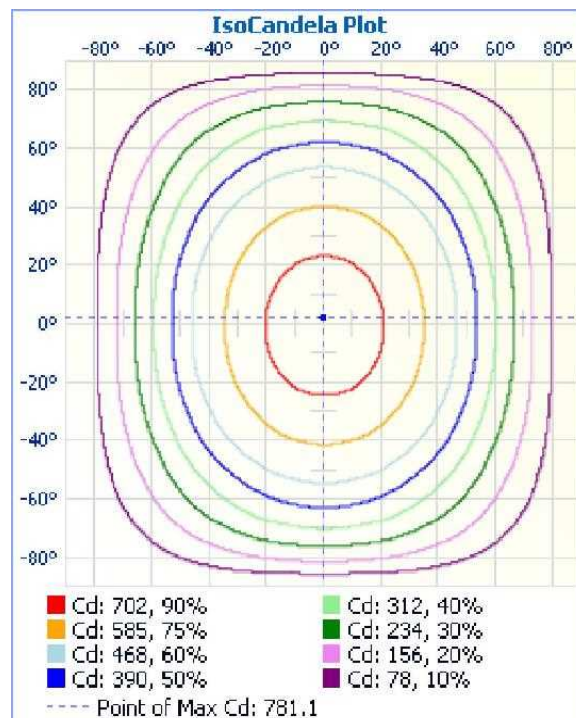


Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot





Goniophotometer Test (Cont'd)

Zonal Lumen Summary

| Zonal Lumen Summary | | |
|---------------------|--------|-------------|
| Zone | Lumens | % Luminaire |
| 0-30 | 598.2 | 25.70% |
| 0-40 | 978.2 | 42.00% |
| 0-60 | 1747.0 | 74.90% |
| 60-90 | 576.7 | 24.70% |
| 70-100 | 274.1 | 11.80% |
| 90-120 | 2.6 | 0.10% |
| 0-90 | 2323.7 | 99.70% |
| 90-180 | 7.3 | 0.30% |
| 0-180 | 2331.0 | 100.00% |

Lumens Per Zone

| Lumens Per Zone | | | | | |
|-----------------|--------|--------|---------|--------|--------|
| Zone | Lumens | %Total | Zone | Lumens | %Total |
| 0-5 | 18.6 | 0.80% | 90-95 | 0.6 | 0.00% |
| 5-10 | 54.9 | 2.40% | 95-100 | 0.5 | 0.00% |
| 10-15 | 89.3 | 3.80% | 100-105 | 0.4 | 0.00% |
| 15-20 | 120.3 | 5.20% | 105-110 | 0.4 | 0.00% |
| 20-25 | 146.8 | 6.30% | 110-115 | 0.4 | 0.00% |
| 25-30 | 168.4 | 7.20% | 115-120 | 0.4 | 0.00% |
| 30-35 | 184.7 | 7.90% | 120-125 | 0.4 | 0.00% |
| 35-40 | 195.3 | 8.40% | 125-130 | 0.4 | 0.00% |
| 40-45 | 199.9 | 8.60% | 130-135 | 0.5 | 0.00% |
| 45-50 | 198.5 | 8.50% | 135-140 | 0.5 | 0.00% |
| 50-55 | 191.4 | 8.20% | 140-145 | 0.5 | 0.00% |
| 55-60 | 179.0 | 7.70% | 145-150 | 0.5 | 0.00% |
| 60-65 | 162.3 | 7.00% | 150-155 | 0.5 | 0.00% |
| 65-70 | 141.4 | 6.10% | 155-160 | 0.4 | 0.00% |
| 70-75 | 116.5 | 5.00% | 160-165 | 0.4 | 0.00% |
| 75-80 | 87.1 | 3.70% | 165-170 | 0.3 | 0.00% |
| 80-85 | 53.9 | 2.30% | 170-175 | 0.2 | 0.00% |
| 85-90 | 15.5 | 0.70% | 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 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 | 779 |
| 1 | 781 | 781 | 779 | 779 | 778 | 777 | 778 | 780 | 780 | 780 | 778 | 777 | 778 | 779 | 779 | 781 | 781 |
| 2 | 781 | 780 | 779 | 778 | 777 | 776 | 778 | 779 | 779 | 778 | 776 | 777 | 778 | 779 | 780 | 780 | 781 |
| 3 | 780 | 779 | 778 | 778 | 776 | 776 | 776 | 777 | 777 | 777 | 776 | 776 | 776 | 778 | 778 | 779 | 780 |
| 4 | 778 | 777 | 777 | 776 | 775 | 774 | 774 | 776 | 774 | 776 | 774 | 774 | 775 | 776 | 777 | 777 | 778 |
| 5 | 777 | 775 | 775 | 774 | 773 | 772 | 772 | 774 | 773 | 774 | 772 | 772 | 773 | 774 | 775 | 775 | 777 |
| 6 | 774 | 772 | 773 | 772 | 771 | 769 | 770 | 772 | 771 | 772 | 770 | 769 | 771 | 772 | 773 | 772 | 774 |
| 7 | 772 | 771 | 771 | 770 | 768 | 767 | 768 | 769 | 768 | 769 | 768 | 767 | 768 | 770 | 771 | 771 | 772 |
| 8 | 770 | 768 | 768 | 767 | 765 | 765 | 765 | 767 | 765 | 767 | 765 | 765 | 765 | 767 | 768 | 768 | 770 |
| 9 | 768 | 765 | 765 | 764 | 762 | 762 | 763 | 765 | 764 | 765 | 763 | 762 | 762 | 764 | 765 | 765 | 768 |
| 10 | 766 | 763 | 762 | 760 | 759 | 759 | 761 | 764 | 762 | 764 | 761 | 759 | 759 | 760 | 762 | 763 | 766 |
| 11 | 762 | 760 | 758 | 756 | 755 | 756 | 758 | 761 | 761 | 761 | 758 | 756 | 755 | 756 | 758 | 760 | 762 |
| 12 | 759 | 757 | 755 | 753 | 752 | 753 | 756 | 759 | 759 | 759 | 756 | 753 | 752 | 753 | 755 | 757 | 759 |
| 13 | 756 | 754 | 751 | 748 | 748 | 749 | 752 | 756 | 756 | 756 | 752 | 749 | 748 | 748 | 751 | 754 | 756 |
| 14 | 753 | 750 | 746 | 743 | 742 | 744 | 749 | 753 | 754 | 753 | 749 | 744 | 742 | 743 | 746 | 750 | 753 |
| 15 | 750 | 747 | 742 | 739 | 737 | 740 | 745 | 750 | 751 | 750 | 745 | 740 | 737 | 739 | 742 | 747 | 750 |
| 16 | 745 | 742 | 737 | 733 | 732 | 736 | 740 | 746 | 747 | 746 | 740 | 736 | 732 | 733 | 737 | 742 | 745 |
| 17 | 740 | 737 | 732 | 728 | 726 | 730 | 736 | 742 | 743 | 742 | 736 | 730 | 726 | 728 | 732 | 737 | 740 |
| 18 | 736 | 732 | 726 | 722 | 720 | 723 | 730 | 736 | 736 | 736 | 730 | 723 | 720 | 722 | 726 | 732 | 736 |
| 19 | 731 | 726 | 720 | 715 | 714 | 718 | 725 | 731 | 732 | 731 | 725 | 718 | 714 | 715 | 720 | 726 | 731 |
| 20 | 725 | 721 | 714 | 708 | 707 | 711 | 718 | 725 | 725 | 725 | 718 | 711 | 707 | 708 | 714 | 721 | 725 |
| 25 | 696 | 691 | 682 | 673 | 669 | 675 | 686 | 696 | 698 | 696 | 686 | 675 | 669 | 673 | 682 | 691 | 696 |
| 30 | 667 | 659 | 647 | 634 | 628 | 635 | 648 | 663 | 665 | 663 | 648 | 635 | 628 | 634 | 647 | 659 | 667 |
| 35 | 632 | 622 | 606 | 589 | 584 | 591 | 609 | 627 | 630 | 627 | 609 | 591 | 584 | 589 | 606 | 622 | 632 |
| 40 | 591 | 583 | 563 | 542 | 534 | 543 | 564 | 587 | 594 | 587 | 564 | 543 | 534 | 542 | 563 | 583 | 591 |
| 45 | 550 | 539 | 516 | 492 | 482 | 492 | 516 | 542 | 552 | 542 | 516 | 492 | 482 | 492 | 516 | 539 | 550 |
| 50 | 504 | 494 | 466 | 438 | 427 | 438 | 466 | 496 | 510 | 496 | 466 | 438 | 427 | 438 | 466 | 494 | 504 |
| 55 | 462 | 447 | 413 | 381 | 369 | 380 | 413 | 448 | 464 | 448 | 413 | 380 | 369 | 381 | 413 | 447 | 462 |
| 60 | 417 | 400 | 360 | 322 | 308 | 322 | 358 | 400 | 417 | 400 | 358 | 322 | 308 | 322 | 360 | 400 | 417 |
| 65 | 369 | 353 | 307 | 264 | 247 | 262 | 304 | 350 | 368 | 350 | 304 | 262 | 247 | 264 | 307 | 353 | 369 |
| 70 | 313 | 299 | 256 | 206 | 186 | 204 | 252 | 294 | 314 | 294 | 252 | 204 | 186 | 206 | 256 | 299 | 313 |
| 75 | 254 | 240 | 200 | 152 | 128 | 148 | 194 | 234 | 251 | 234 | 194 | 148 | 128 | 152 | 200 | 240 | 254 |
| 80 | 187 | 174 | 140 | 97 | 72 | 94 | 132 | 164 | 177 | 164 | 132 | 94 | 72 | 97 | 140 | 174 | 187 |
| 85 | 105 | 97 | 73 | 45 | 26 | 41 | 63 | 80 | 84 | 80 | 63 | 41 | 26 | 45 | 73 | 97 | 105 |
| 90 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| 95 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 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 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 115 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| 120 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 125 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 130 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 135 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 140 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 2 |
| 145 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 150 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 155 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 160 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 165 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 170 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 175 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 180 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |



THD and PF Test

| | | | | |
|----------------------------|---------------------------|----------------------------------|-------------------|---------|
| Model No. | KT-CBLED18-22A-835-VDIM-P | | Sample ID. | 2125684 |
| 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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. 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 | Orientation |
|------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.0 | 120.11 | 60 | 0.1521 | 18.161 | 0.9940 | 8.01% | Horizontal |
| 24.0 | 277.07 | 60 | 0.7120 | 18.604 | 0.9428 | 10.39% | Horizontal |



In-Situ Temperature Measurement Test

| | | | |
|-----------|---------------------------|------------|---------|
| Model No. | KT-CBLED18-22A-835-VDIM-P | Sample ID. | 2125684 |
|-----------|---------------------------|------------|---------|

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 $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$. 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 ($^{\circ}\text{C}$) | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Current THD | Orientation |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24 | 120.11 | 60 | 0.1521 | 18.161 | 0.9940 | 8.01% | Horizontal |

Test Results (LEDs)

| Thermocouple Location | Declared Light Source Current (mA) | Temperature for Light Source ($^{\circ}\text{C}$) | | LED Model Number | LM-80 Limit Current (mA) | LM-80 Limit Temp ($^{\circ}\text{C}$) |
|-----------------------|------------------------------------|---|--|------------------|--------------------------|---|
| | | Test Result | Test Result (Correct to 25°C) | | | |
| Ambient TEMP | N/A | 24 | 25.0 | | | |
| TMP of Location 1 | 105 | 45.5 | 46.5 | STW8A2PD-XX | 200 | 105 |

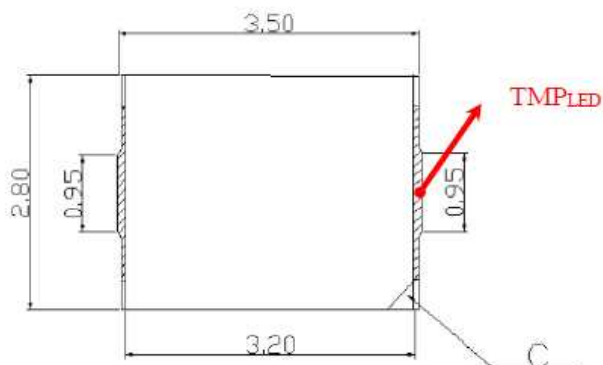
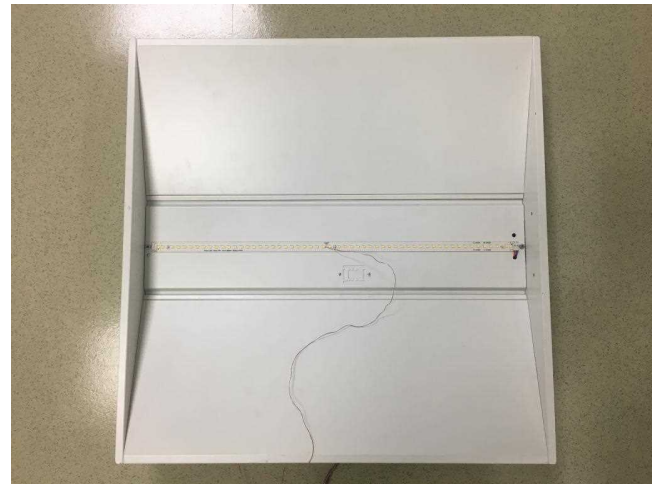
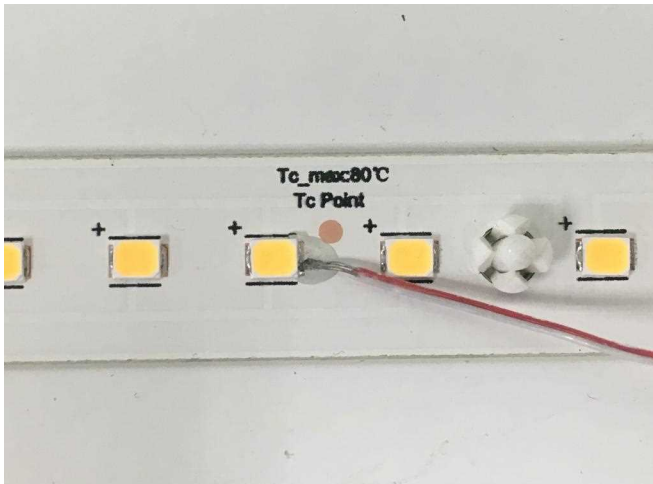
Test Results (Drivers)

| Thermocouple Location | Temperature for Driver ($^{\circ}\text{C}$) | | Driver Model Number | Driver Limit Temp ($^{\circ}\text{C}$) |
|--------------------------|---|--|-------------------------|--|
| | Test Result | Test Result (Correct to 25°C) | | |
| Ambient TEMP | 24 | 25.0 | | |
| TMP of Driver Location 1 | 47.9 | 48.9 | KTLD-16-UV-420-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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