Photometric Test Report

Relevant Standards

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

Prepared For

ESPEN TECHNOLOGY ,INC

12257 FLORENCE SANTA FE SPRINGS CA 90670-3805 USA
ERIC YU, 562-529-2938, eric@espentech.com

Test Laboratory: UL-CCIC Company Limited
Test Laboratory Address: 2, Chengwan Road, Suzhou Industrial Park, Suzhou 21522 China

Catalog Number
VEKT1X4L-8XX

Project Number
4788813688
Report Number
4788813688_1a

Test Date
4/13/2018-4/17/2018
Issue Date
2/20/2019
Revision Date
N/A

Prepared By	Approved By
Marcel Ma	Jonathan Xu
Marcel Ma	Jonathan Xu

1.0 Test Summary

☑ DLC Technical Requirements v4.3- issued 2018-03-12

Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Minimum Light Output (lm)	IES LM-79-2008	1500	2855.01	Pass
Minimum Lamp Output in luminaire (lm)	IES LM-79-2008	N/A	N/A	N/A
Spacing Criteria (0-180°)	IES LM-79-2008	1.0-2.0	1.28	Pass
Spacing Criteria (90-270°)	IES LM-79-2008	1.0-2.0	1.22	Pass
Zonal Lumen Requirement (0°-60°)	IES LM-79-2008	75%	77.3%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	121.25	124.96	Pass
Minimum Lamp Efficacy (lm/W)	IES LM-79-2008	N/A	N/A	N/A
Alowable CCTs* (K)	IES LM-79-2008 ANSI C78.377-2015	≤5000	4991	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥80	83.16	Pass
L70 Lumen maintenance (hours)	IES TM-21-2011	≥50000	≥50000	Pass
L90 Lumen maintenance (hours)	IES TM-21-2011	≥36000	≥36000	Pass
Power Factor	ANSI C82.77-10-2014	≥0.9	0.9952	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	≤20%	6.43%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008	≤85	39.5	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008	≤90	43.3	Pass
Minimum Luminaire Warranty (years)	N/A	5	5	Pass

2.0 Test List

Test Item	Test	Test Date	Model Number	Tests Conducted By
1	Integrating Sphere Test for the Lower CCT	2018/4/13	VEKT1X4L-835	Gavin Yang
2	Integrating Sphere Test for the Higher CCT	2018/4/13	VEKT1X4L-850	Gavin Yang
3	Goniophotometer Test	2018/4/13	VEKT1X4L-835	Gavin Yang
4	THD and PF Test	2018/4/13	VEKT1X4L-835	Gavin Yang
5	In-Situ Temperature Measurement Test	2018/4/17	VEKT1X4L-835	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: Integrated Retrofit Kits for 1x4 Luminaires

Model Number: VEKT1X4L-835

Rated Voltage: 120-277V

Frequency: 50/60Hz

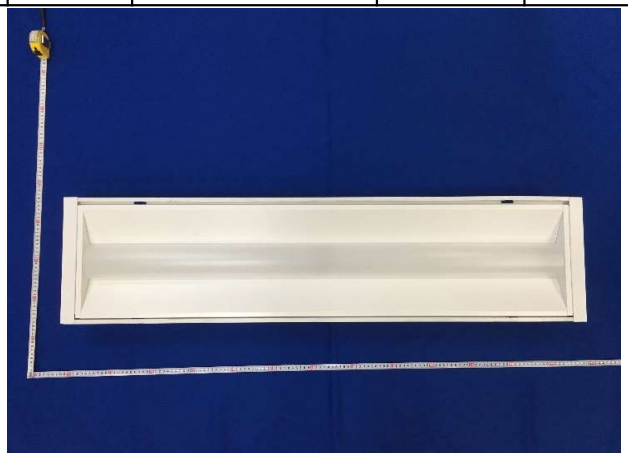
LED Package: STW8A2PD-XX

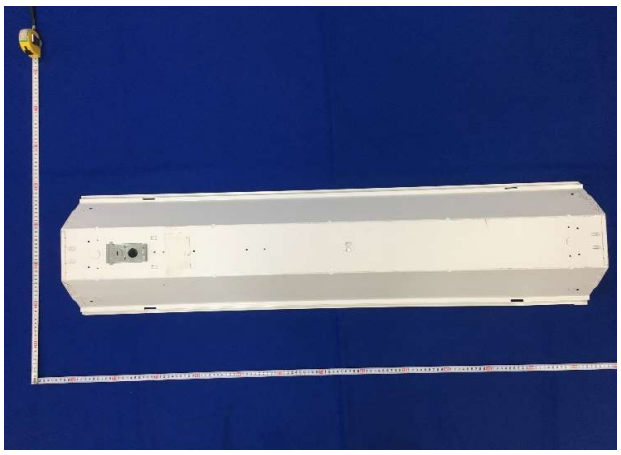
Family Model and Variation: VEKT1X4L-850

Housing Model: Lithonia GT8 2 32 A12 MVOLT GEB10IS

Photos of Luminaire Characteristics

Model Number	CCT (K)	Light Output (lm)	Power (W)	Luminious Efficacy (lm/W)
VEKT1X4L-835	3500	2875	23	125
VEKT1X4L-840	4000	2898	23	126
VEKT1X4L-850	5000	2921	23	127





4.0 LM-79 Measurement and Test Results

Model No.	VEKT1X4L-835	Sample ID.	1523262
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

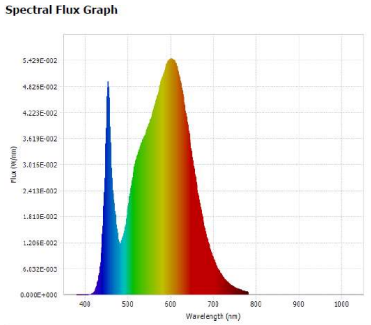
1.The sample was tested according to the IES LM-79-2008.
2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C.The reference standard lamp is rated current 2.6A omni-directional 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.

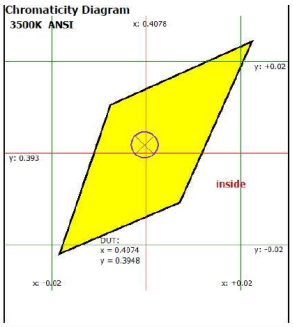
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
25.1	120.02	60	0.1897	22.657	0.9952

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
3486	83.16	0.0013	2855.01	126.01





Spectral Result

Luminous Flux Φ(v)	2855.01 (lm)	Chrom x	0.4074
Chrom y	0.3948	Chrom u	0.2354
Chrom v	0.3422	Duv	0.0013
Chrom u'	0.2354	Chrom v'	0.5132
CCT	3486.0 (K)	Luminous Efficacy η	126.01 (lm/W)
Ra	83.16	R1	81.5
R2	89.4	R3	95.6
R4	82.0	R5	81.2
R6	85.7	R7	85.9
R8	63.9	R9	11.4
R10	74.9	R11	80.9
R12	62.1	R13	83.4
R14	97.6	R15	75.1
Rf	82.6	Rg	95.7

4.0 LM-79 Measurement and Test Results

4.2 Integrating Sphere Test for the higher CCT

Model No.	VEKT1X4L-850	Sample ID.	1523269
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

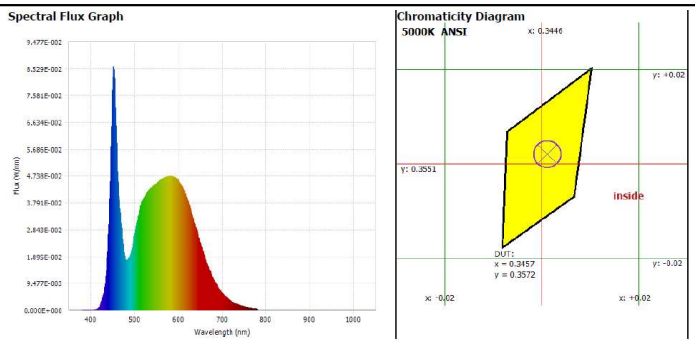
1.The sample was tested according to the IES LM-79-2008.
2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C.The reference standard lamp is rated current 2.6A omni-directional 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
25.1	120.01	60	0.1885	22.521	0.9953

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
4991	82.87	0.0025	2899.68	128.75



Spectral Result

Luminous Flux Φ(v)	2899.68 (lm)	Chrom x	0.3457
Chrom y	0.3572	Chrom u	0.2097
Chrom v	0.3250	Duv	0.0025
Chrom u'	0.2097	Chrom v'	0.4875
CCT	4991.0 (K)	Luminous Efficacy η	128.75 (lm/W)
Ra	82.87	R1	81.1
R2	87.7	R3	91.9
R4	82.0	R5	80.8
R6	81.9	R7	88.5
R8	69.0	R9	11.6
R10	70.2	R11	80.6
R12	53.6	R13	82.8
R14	95.7	R15	76.2
Rf	81.3	Rg	95.6

5.0 LM-79 Measurement and Test Results

Model No.	VEKT1X4L-835	Sample ID.	1523262
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1.The sample was tested according to the IES LM-79-2008.
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
25.3	120.04	60	0.1895	22.668	0.9968

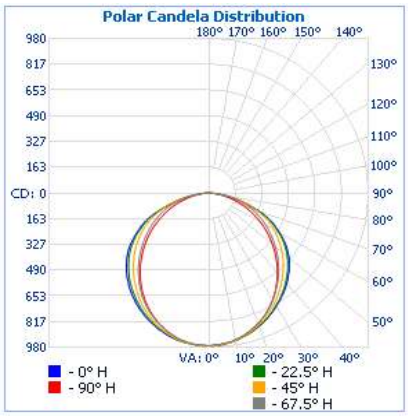
Test Result

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	
2832.6	77.3%	157.6	162	103.5	122.5	124.96

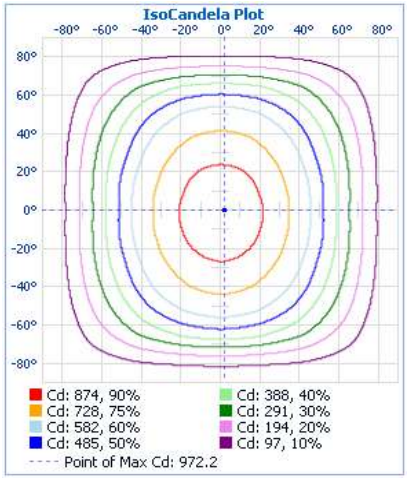
SC: 0-180°	SC: 90-270°
1.28	1.22

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	748.3	26.4%
0-40	1,224.3	43.2%
0-60	2,188.4	77.3%
60-90	635.9	22.4%
70-100	267.4	9.4%
90-120	2.8	0.1%
0-90	2,824.3	99.7%
90-180	8.3	0.3%
0-180	2,832.6	100%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	23.1	0.8%	90-95	0.6	0%
5-10	68.6	2.4%	95-100	0.5	0%
10-15	111.4	3.9%	100-105	0.4	0%
15-20	150.3	5.3%	105-110	0.4	0%
20-25	183.8	6.5%	110-115	0.4	0%
25-30	211.1	7.5%	115-120	0.4	0%
30-35	231.4	8.2%	120-125	0.5	0%
35-40	244.6	8.6%	125-130	0.5	0%
40-45	250.6	8.8%	130-135	0.6	0%
45-50	249.2	8.8%	135-140	0.6	0%
50-55	240.4	8.5%	140-145	0.6	0%
55-60	224.0	7.9%	145-150	0.6	0%
60-65	200.3	7.1%	150-155	0.6	0%
65-70	169.2	6.0%	155-160	0.5	0%
70-75	129.1	4.6%	160-165	0.4	0%
75-80	85.0	3.0%	165-170	0.3	0%
80-85	42.7	1.5%	170-175	0.2	0%
85-90	9.5	0.3%	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	292.5	315	338	360
0	970	970	970	970	970	970	970	970	970	970	970	970	970	970	970	970	970
1	971	970	972	968	972	967	972	970	970	970	972	967	972	968	972	970	971
2	966	968	971	966	972	967	971	970	968	970	971	967	972	966	971	968	966
3	967	968	970	965	970	966	971	969	969	969	971	966	970	965	970	968	967
4	966	968	967	964	969	964	970	969	969	969	970	964	969	964	967	968	966
5	963	965	967	962	967	964	968	968	967	968	968	964	967	962	967	965	963
6	961	962	963	960	965	960	966	964	966	964	966	960	965	960	963	962	961
7	959	960	961	955	962	958	964	963	963	963	964	958	962	955	961	960	959
8	956	958	958	953	959	955	962	961	961	961	962	955	959	953	958	958	956
9	953	955	955	949	954	952	958	959	960	959	958	952	954	949	955	955	953
10	948	950	951	944	950	950	955	956	956	956	955	950	950	944	951	950	948
11	947	947	947	940	945	944	951	953	955	953	951	944	945	940	947	947	947
12	942	942	942	936	940	939	947	950	952	950	947	939	940	936	942	942	942
13	937	938	938	930	935	932	941	945	947	945	941	932	935	930	938	938	937
14	933	933	931	924	928	928	938	941	945	941	938	928	928	924	931	933	933
15	928	929	926	918	922	923	933	937	940	937	933	923	922	918	926	929	928
16	923	924	921	911	915	916	927	931	936	931	927	916	915	911	921	924	923
17	918	919	914	905	908	911	921	927	931	927	921	911	908	905	914	919	918
18	911	914	907	897	900	902	914	922	925	922	914	902	900	897	907	914	911
19	907	907	901	889	893	895	909	915	921	915	909	895	893	889	901	907	907
20	901	900	894	881	885	888	901	910	917	910	901	888	885	881	894	900	901
25	869	866	853	837	839	844	862	877	885	877	862	844	839	837	853	866	869
30	830	826	808	787	784	793	818	839	850	839	818	793	784	787	808	826	830
35	790	783	757	728	722	734	767	794	808	794	767	734	722	728	757	783	790
40	746	736	703	667	655	671	712	748	765	748	712	671	655	667	703	736	746
45	699	687	647	602	584	606	654	696	713	696	654	606	584	602	647	687	699
50	643	630	588	536	510	537	595	639	657	639	595	537	510	536	588	630	643
55	578	567	526	467	438	469	532	574	592	574	532	469	438	467	526	567	578
60	500	494	461	402	363	402	465	501	512	501	465	402	363	402	461	494	500
65	422	417	389	336	289	335	391	419	433	419	391	335	289	336	389	417	422
70	311	320	312	269	216	267	312	321	320	321	312	267	216	269	312	320	311
75	204	213	223	198	146	197	222	212	209	212	222	197	146	198	223	213	204
80	111	118	129	126	82	124	128	116	115	116	128	124	82	126	129	118	111
85	38	41	47	50	31	49	45	40	41	40	45	49	31	50	47	41	38
90	1	1	2	4	3	3	2	1	1	1	2	3	3	4	2	1	1
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	0	1	1	1	1	1	1	1	1	1	0	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	1	1	1	1	1	1	1	1	1
125	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1
130	1	2	1	1	1	2	2	1	1	1	2	2	1	1	1	2	1
135	1	2	1	1	1	2	2	2	2	2	2	2	1	1	1	2	1
140	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	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	3	2	2	2	2	2	2	2	3	2	2	2	2
160	2	2	2	2	3	3	2	2	2	2	2	3	3	2	2	2	2
165	2	2	3	3	2	3	3	2	2	2	3	3	2	3	3	2	2
170	3	3	2	3	3	3	3	3	2	3	3	3	3	3	2	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

6.0 THD and PF Test

Model No.	VEKT1X4L-835	Sample ID.	1523262

Test Method

1. The samples were tested according to the ANSI C82.77-2002.
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 thedigital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.3	276.85	60	0.0863	22.937	0.9604	6.43%

7.0 In-Situ Temperature Measurement Test

Model No.	VEKT1X4L-835	Sample ID.	1523262

Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, 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. Thermocpuples 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
24	120.04	60	0.18945	22.668	0.9968

Test Results(LED)

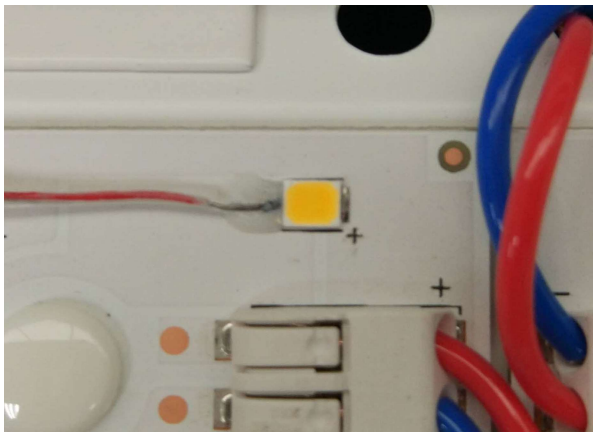
Thermocouple Location	Manufacturer Declared Current (mA)	Temperature for Lighting source (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp. (°C)
		Test result column 1	Test result (Correct to 25 °C)			
TMP of LEDs	65	38.5	39.5	STW8A2PD-XX	200	105
Ambient temperature	N/A	24	25.0			

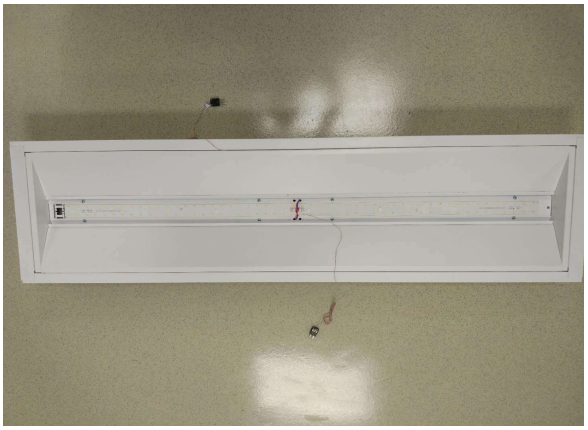
Test Results(Driver)

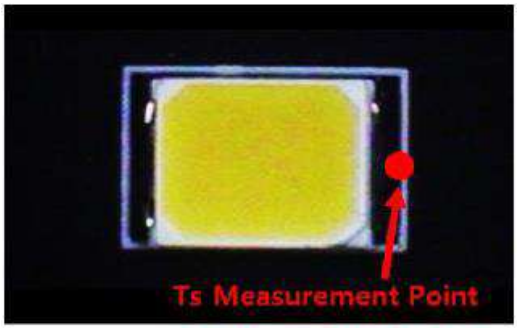
Thermocouple Location	Temperature for Lighting source (°C)		Driver Model Number	Driver Limit Temp (°C)
	Test result column 1	Test result (Correct to 25 °C)		
TMP of Driver	42.3	43.3	VEL30054MVHDA-10V-P-1	90
Ambient temperature	24	25.0		

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

Test Photos for Tc Point of LED Packages







TESTING
NVLAP LAB CODE 600106-0

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