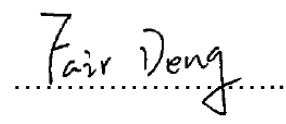
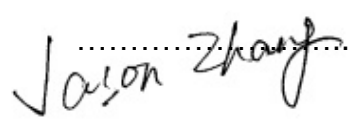



TEST REPORT	
Report Reference No.	: 4380928.64
Tested by (name + signature)	: Fair Deng 
Approved by (name + signature)	: Jason Zhang 
Date of issue	: 2021-11-11
Testing Laboratory	: DEKRA Testing and Certification (Shanghai) Ltd., Guangzhou Branch
Testing location / address	: Block 5, No. 3, Qiyun Road, Huangpu District, Guangzhou, Guangdong, China
Applicant	: AOK Industrial Company Limited
Address	: East Suite (2/F, Plant 4, St George's Science and Technology Industrial Park), 3/F, Building 1, St George's Science and Technology Industrial Park, North Side of Xinyu Road, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China
Test specification	:
Standard Reference	: ANSI/UL 1598:2008 (Secs. 19.7, 19.10- 19.16), IES TM-21-11
Test object description	: LED Streetlight
Trade Mark	: 
Manufacturer	: Same as applicant
Factory	: Same as applicant
Model/Type reference	: AOK-580WiNM-NV-S5-00-4070-120D-P
Ratings	: 220-240 Vac, 50/60 Hz, 580 W

Test item particulars	:
LED Packages/Modules type	: S1W0-5050xxxx06-00000000-00002
LED Packages/Modules number	: 468
LED Package/Modules supplier	: Seoul Semiconductor Co., LTD
Number of test objects	: 1 sample
Date of receipt of test item	: 2021-08-02
Date(s) of performance of tests	: 2021-08-02 to 2021-10-28

General remarks

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

The test results presented in this report relate only to the object tested.

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The tests were performed @Ta 25 °C, 35 °C and 55 °C according to customer's request.

The in-situ LED junction temperature was calculated according to customer's request.

L80B10 was calculated as the lifetime that 10% of 20 pcs LED package fail to meet 80% lumen maintenance by TM-21 calculator according to LM-80 data.

This report is basing on the original report 4379536.64(issued on 2021-10-13), it is issued as co-report.

TEST METHOD

Temperature Measurement Test

Maximum LED source operating temperature measurements were taken on one test sample per model with a thermocouple and temperature meter. The SSL sample was allowed to reach thermal equilibrium for at least 3 hours before measurements were taken. LED source temperature was measured at the point as indicated by the included diagram in accordance with manufacturers declared hot spot location. The maximum temperature was recorded for the sample. A simulated ceiling or other enclosure may be used in accordance to UL 1598 as applicable

Driver current Measurement Test

During the temperature measurement test, measure the forward current for each LED package/array/module.

Lumen maintenance projection

The calculation is based on the Illumination Engineering Society's TM-21-11. Input measured temperature and current into "Energy Star TM-21 calculator", using LM-80 data, to project long term lumen maintenance.

Equipment List

Equipment name	TYPE	Manufacturer	Equipment ID No.
Data Logger	34970A	Agilent	G/L 441
Digital Power Meter	PF1020	Weibo	G/L 674

Environmental Condition:

Temperature:	25,0°C
--------------	--------

Sample ID	Voltage (V ac)	Frequency (Hz)	Current (A)	Power Factor	Power (W)
004	230,0	50	2,510	0,994	573,8

Thermocouple Location	LED Package Current (mA)	Temperature (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp. (°C)
		Test result column 1	Test result column 2			
TMP1 (LED)	190	62,9	62,9	Seoul / S1W0-5050xxxx06-0 0000000-00002	750	105
TMP2 (LED)		62,2	62,2			
TMP3 (LED)		62,1	62,1			
TMP4 (Driver)	N/A	62,9	62,9		N/A	
Ambient Temperature	N/A	25,0	25,0		N/A	

Note –

- Test result column 1 displays actual stabilized temperatures.
- Test result column 2 displays these temperatures normalized to 25°C ambient (T_{AIR}) as per customer's request.

Environmental Condition:

Temperature:	35,0°C
--------------	--------

Sample ID	Voltage (V ac)	Frequency (Hz)	Current (A)	Power Factor	Power (W)
004	230,0	50	2,486	0,994	572,3

Thermocouple Location	LED Package Current (mA)	Temperature (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp. (°C)
		Test result column 1	Test result column 2			
TMP1 (LED)	190	69,9	69,9	Seoul / S1W0-5050xxxx06-0 0000000-00002	750	105
TMP2 (LED)		69,9	69,9			
TMP3 (LED)		69,7	69,7			
TMP4 (Driver)	N/A	67,9	67,9		N/A	
Ambient Temperature	N/A	35,0	35,0		N/A	

Note –

- Test result column 1 displays actual stabilized temperatures.
- Test result column 2 displays these temperatures normalized to 35°C ambient (T_{AIR}) as per customer's request.

Environmental Condition:

Temperature:	55,0°C
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Sample ID	Voltage (V ac)	Frequency (Hz)	Current (A)	Power Factor	Power (W)
004	230,0	50	2,475	0,994	569,6

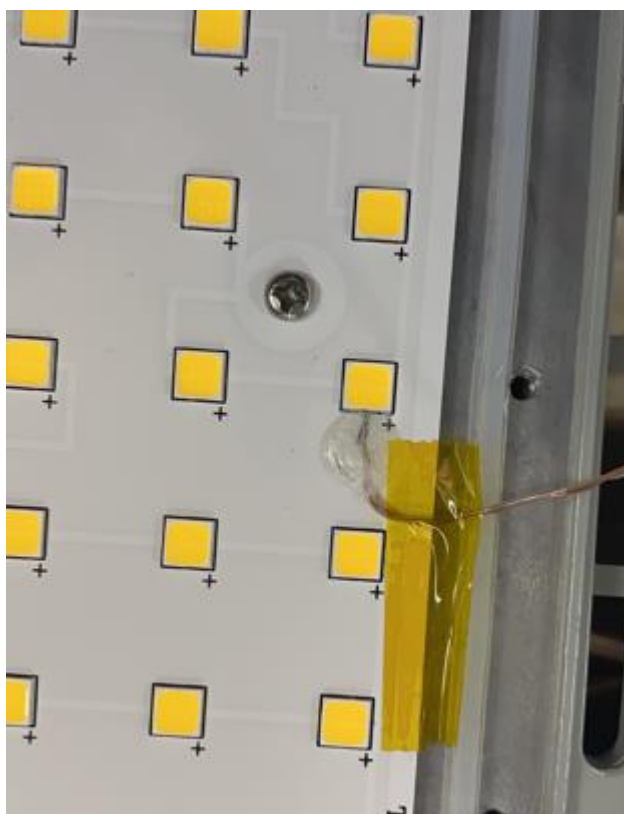
Thermocouple Location	LED Package Current (mA)	Temperature (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp. (°C)
		Test result column 1	Test result column 2			
TMP1 (LED)	190	89,6	89,6	Seoul / S1W0-5050xxxx06-0 0000000-00002	750	105
TMP2 (LED)		89,4	89,4			
TMP3 (LED)		89,3	89,3			
TMP4 (Driver)	N/A	87,8	87,8		N/A	
Ambient Temperature	N/A	55,0	55,0		N/A	

5. Test result column 1 displays actual stabilized temperatures.
6. Test result column 2 displays these temperatures normalized to 55°C ambient (T_{AIR}) as per customer's request.

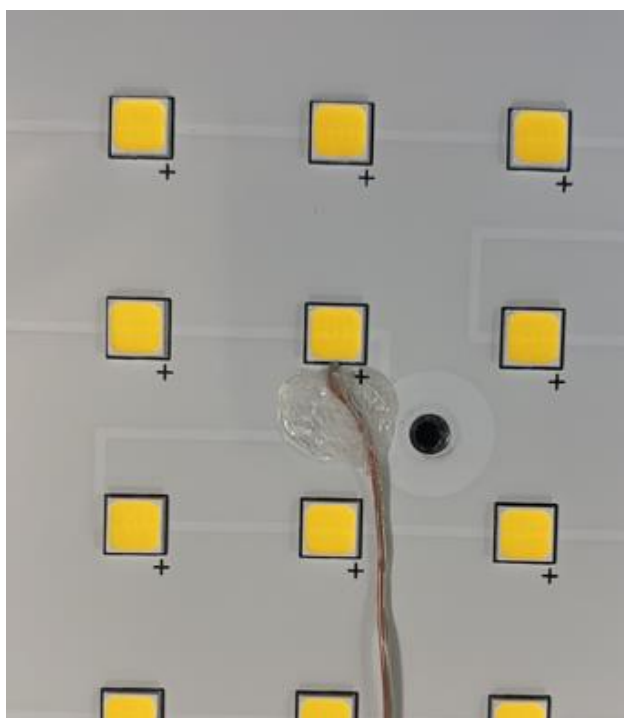
The hottest point from thermal infrared imager



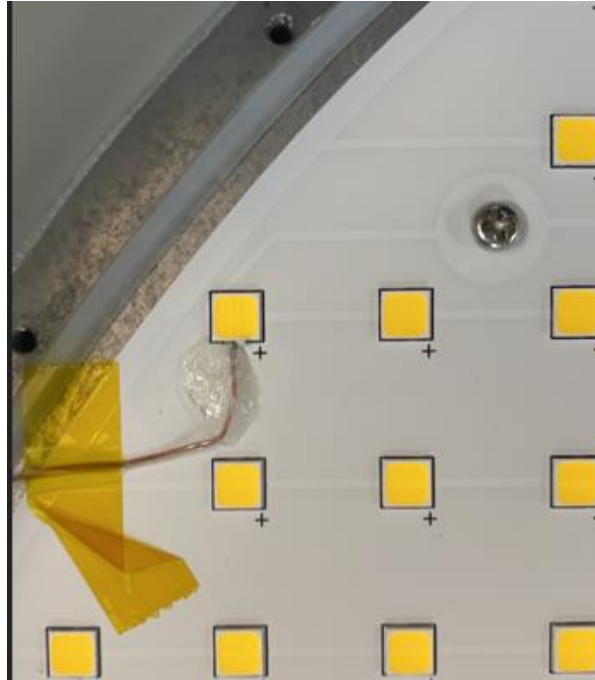
TMP1, TMP2, TMP3 location:



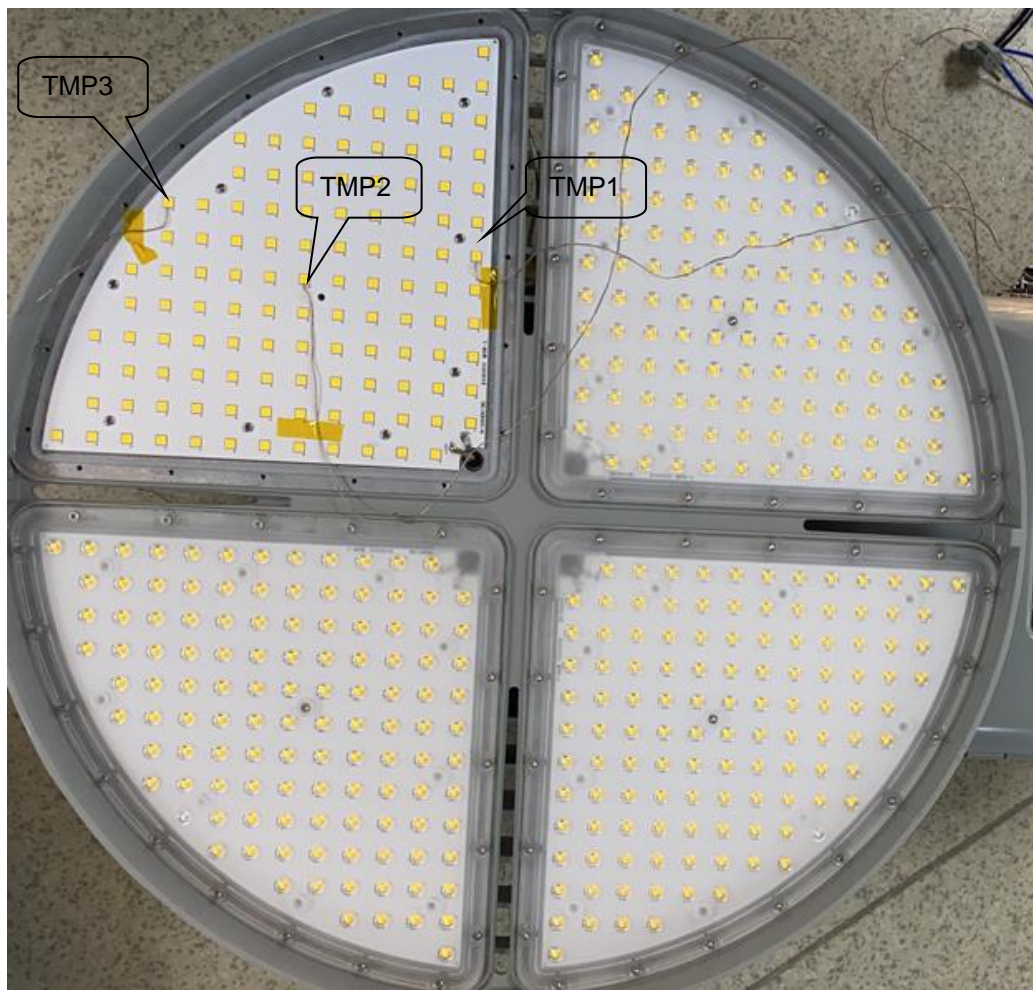
TMP 1 (Temperature measurement point of Tb1)



TMP 2 (Temperature measurement point of Tb2)



TMP 3 (Temperature measurement point of Tb3)



TMP4 location:



4. Lumen Maintenance Life Projection According to TM-21:

LM-80 Testing Details	
Total number of units tested per case temperature:	20
Number of failures:	0
Number of units measured:	20
Test duration (hours):	18000
Tested drive current (mA):	750
Tested case temperature 1 (T_c , °C):	85
Tested case temperature 2 (T_c , °C):	105
Tested case temperature 3 (T_c , °C):	

Test Data for 85°C Case Temperature		Test Data for 105°C Case Temperature	
Time (hours)	Lumen Maintenance (%)	Time (hours)	Lumen Maintenance (%)
9000	97.10%	9000	95.70%
10000	97.00%	10000	95.50%
11000	96.80%	11000	95.40%
12000	96.70%	12000	95.20%
13000	96.60%	13000	94.90%
14000	96.40%	14000	94.70%
15000	96.20%	15000	94.50%
16000	96.10%	16000	94.40%
17000	96.00%	17000	94.20%
18000	95.90%	18000	94.10%

In-Situ Inputs:

Drive current for each LED package/array/module (mA):	190
<i>In-situ</i> case temperature (T_c , °C):	89.6
Percentage of initial lumens to project to (e.g. for L_{70} , enter 70):	80

Results:

Time (t) at which to estimate lumen maintenance (hours):	50,000
Lumen maintenance at time (t) (%):	90.57%
Reported L80 (hours):	>108000

Sample No.	Calculated L80 (h)
1	>108000
2	>108000
3	>108000
4	>108000
5	>108000
6	>108000
7	>108000
8	>108000
9	>108000
10	>108000
11	>108000
12	>108000
13	>108000
14	>108000
15	>108000
16	>108000
17	>108000
18	>108000
19	>108000
20	>108000

Projected form calculated L80B10: > 108000 hours

5. Maximum Measured Manufacturer Designated Source Temperature

In-Situ Maximum Measured LED Source Point Temperature = 25°C

Maximum Junction Temperature from LED specification (T_j) = 125 °C

Thermal Resistance Formula from LED specification = 2 °C/W

Maximum Forward Voltage (V_f) from LED specification = 6,4 V

Measured LED drive current = 190 mA

Calculated LED Wattage= $V_f \times$ Measured LED Current = 1,22 W

Measured in-situ LED Junction Temperature (T_j) = $T_s + (\text{LED Wattage} \times \text{Thermal Resistance})$
= 65,3 °C

Maximum Measured Manufacturer Designated Source Temperature

DEKRA Sample No.	Model	Measurement Point	Measured Solder Point Temperature (T_s)	Measured in-situ LED Junction Temperature (T_j)	Maximum Rated LED Junction Temperature (Max. T_j)
1	Seoul S1W0-5050xxxx06-000 00000-00002	LED Module	62,9	65,3	125

In-Situ Maximum Measured LED Source Point Temperature = 35°C

Maximum Junction Temperature from LED specification (T_j) = 125 °C

Thermal Resistance Formula from LED specification = 2 °C/W

Maximum Forward Voltage (V_f) from LED specification = 6,4 V

Measured LED drive current = 190 mA

Calculated LED Wattage= $V_f \times$ Measured LED Current = 1,22 W

Measured in-situ LED Junction Temperature (T_j) = $T_s + (\text{LED Wattage} \times \text{Thermal Resistance})$
= 72,3 °C

Maximum Measured Manufacturer Designated Source Temperature

DEKRA Sample No.	Model	Measurement Point	Measured Solder Point Temperature (T_s)	Measured in-situ LED Junction Temperature (T_j)	Maximum Rated LED Junction Temperature (Max. T_j)
1	Seoul S1W0-5050xxxx06-000 00000-00002	LED Module	69,9	72,3	125

In-Situ Maximum Measured LED Source Point Temperature = 55°C

Maximum Junction Temperature from LED specification (Tj) = 125 °C

Thermal Resistance Formula from LED specification = 2 °C/W

Maximum Forward Voltage (Vf) from LED specification = 6,4 V

Measured LED drive current = 190 mA

Calculated LED Wattage= VF x Measured LED Current = 1,22 W

Measured in-situ LED Junction Temperature (Tj) =Ts + (LED Wattage x Thermal Resistance)
= 92,0 °C

Maximum Measured Manufacturer Designated Source Temperature

DEKRA Sample No.	Model	Measurement Point	Measured Solder Point Temperature (Ts)	Measured in-situ LED Junction Temperature (Tj)	Maximum Rated LED Junction Temperature (Max. Tj)
1	Seoul S1W0-5050xxxx06-000 00000-00002	LED Module	89,6	92,0	125

6. Information from LED specification

Table 3. Characteristics, $I_F=640\text{mA}$, $T_j=25^\circ\text{C}$

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Forward Voltage	V_F	5.8	-	6.4	V
Luminous Flux	$\Phi_v^{[2]}$	550	-	750	lm
Correlated Color Temperature ^[3]	CCT	2,700	-	7,000	K
CRI ^[4]	Ra	70	-	80	-
		80		90	
Viewing Angle	$2\Theta_{1/2}$	-	120	-	deg.
Thermal resistance (J to S) ^[5]	$R\theta_{j-s}$	-	2.0	-	K/W
ESD Sensitivity(HBM)	-	Class 2 JEDEC JS-001-2017			

Table 4. Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Forward Current	I_F	800	mA
Power Dissipation	P_D	5.0	W
Junction Temperature	T_j	125	$^\circ\text{C}$
Operating Temperature	T_{opr}	-40 ~ + 100	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 ~ + 100	$^\circ\text{C}$

Fig 6. Relative Light Output vs. Junction Temperature, $I_F=640\text{mA}$

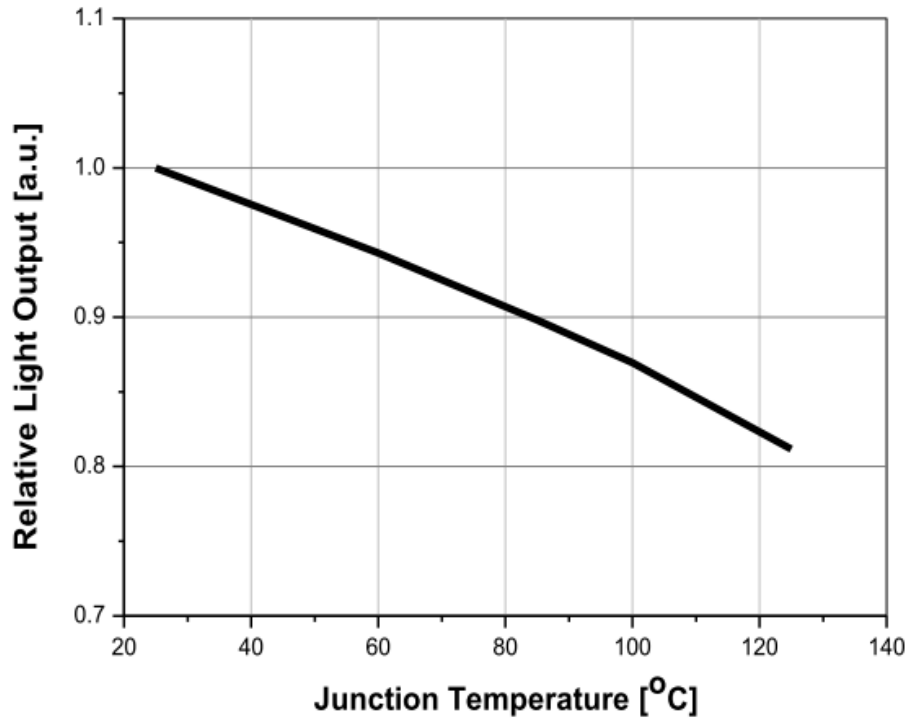
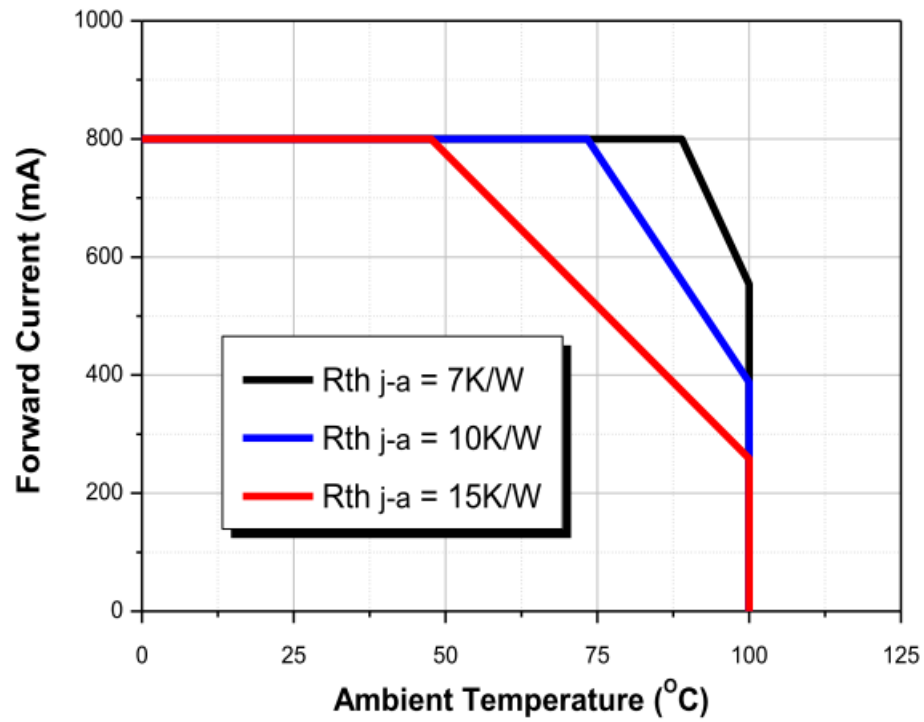
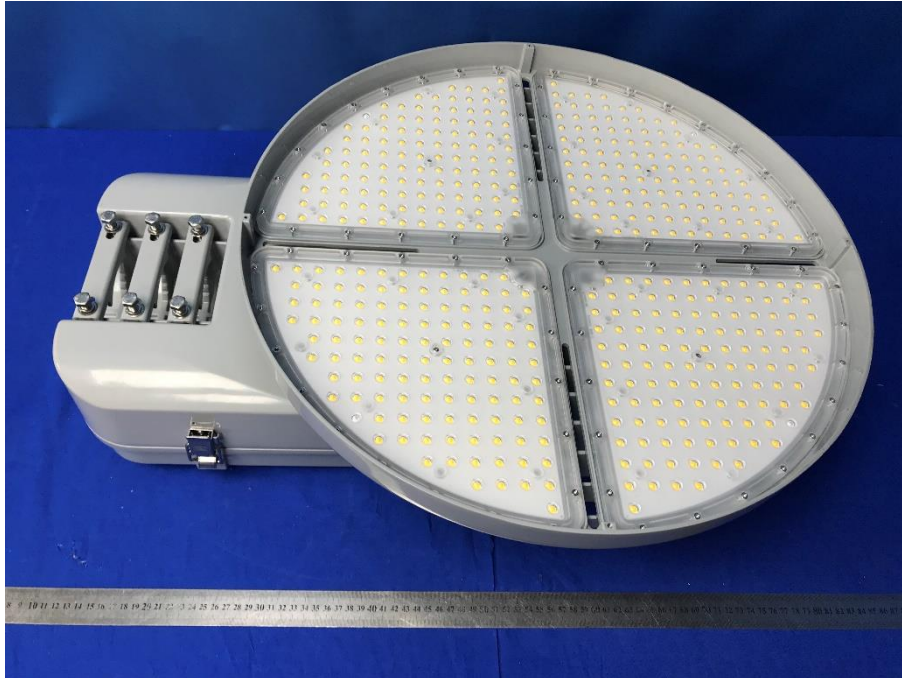


Fig 9. Maximum Forward Current vs. Ambient Temperature, $T_j(\text{max.})=125^\circ\text{C}$, $I_F=800\text{mA}$



Sample Photo



Overview



Overview

-END-