ShenZhen KHJ Semiconductor Lighting Co.,Ltd

Lab Test Report

Report number：TR-130701-20131112001

Product type : Ex-Saturn

Saturn Series test report

Made by	Zhao Xing	2013-11-12
Audit		
Ratify		

Catalogue

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Standard

IEC 60079-0： 2007,MOD Electrical apparatus for explosive gas atmospheres -- Part 0:General requirements
IEC 60079-1： 2007,MOD Electrical apparatus for explosive gas atmospheres -- Part 1: Equipment protection by flameproof enclosures "d"
IEC 60079-7：2006,IDT Electrical apparatus for explosive gas atmospheres – Part 7: Equipment protection by increased safety "e"
IEC60259：2001 Degrees of protection provided by enclosures （IP Code）
IEC68-2-1 Environmental testing for electric and electronic products Low temprature
IEC68-2-2 Environmental testing for electric and electronic products High temprature
IEC68-2-6 Environmental testing for electric and electronic products Vibration
IEC68-2-11 Environmental testing for electric and electronic products Salt spray
GD01-2006 Guidelines for Type Approval Test of Electric and Electronic Products
IES LM79-08
《Product specification》

Test Result

No.	Iterm	Standard	Result	Remark
1	Appearance, assembly quality	Product Specification	Qualified	
2	Explosion-proof test	IEC 60079-0：2007，MOD IEC 60079-1：2007，MOD IEC 60079-7：2006，IDT	Qualified	
3	Low temperature test	IEC68-2-1	Qualified	
4	High temperature test	IEC68-2-2	Qualified	
5	Shock test	IEC 60079-0：2007，MOD 26.4.2	Qualified	
6	Switch performance and dimming test	Product Specification	Qualified	
7	Temperature rise test	IEC 60079-0：2007，MOD 5.3.2	Qualified	
8	IP waterproof test	IEC60259：2001	Qualified	
9	Salty spray test	IEC68-2-11	Qualified	
10	Electrical Performance Test	IES LM79-08	Qualified	
11	Vibration test	IEC68-2-6	Qualified	
12	Battery capacity test	Product Specification	Qualified	
13	Seal heat and cold resistance test	IEC 60079-0：2007，MOD 26.8/26.9	Qualified	

01. Appearance, assembly, mark inspection

Test equipment: Visual, digital calipers, electronic scales, etc.

Test environment： Normal temperature and humidity, normal atmospheric environment

Test process:

1. Place the samples on the table, numbered the samples.
2. Check the surface finish, painting, all the parts and components.
3. Check the wiring, confirm if there are short circuit and open circuit.
4. Measure the weight of the light.
5. Measure the length, width and height.
6. Check the nameplate.

Test data：

<table>
<tr><td colspan="2">Inspection items / NO</td><td>1#</td><td>Test Environment</td></tr>
<tr><td colspan="2">Appearance inspection</td><td>OK</td><td rowspan="9">Normal temperature and humidity</td></tr>
<tr><td rowspan="3">Check the assembly</td><td>Parts and components Installation</td><td>OK</td></tr>
<tr><td>Structural safety</td><td>OK</td></tr>
<tr><td>Short circuit, open circuit and structure damage inspection</td><td>OK</td></tr>
<tr><td colspan="2">Weight (Kg)</td><td>21KG</td></tr>
<tr><td rowspan="3">Dimensions(mm)</td><td>Length</td><td>360mm</td></tr>
<tr><td>Width</td><td>24mm</td></tr>
<tr><td>Height</td><td>720mm</td></tr>
<tr><td colspan="2">Nameplate inspection
Battery box nameplate</td><td> 
</td></tr>
</table>

Lab Test Report

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	Light nameplate		

Standard： 《Product Specification》

Conclusion:

Qualified：■ Unqualified：□ No judgment：□

Abnormal description：

No

Approval		Audit		Test	Zhao Xing

02． Explosion-proof performance test

Test equipment: digital calipers, plug gauge, etc.；

Test environment: normal temperature and humidity, normal atmospheric environment；

Test process:

1. Measure flameproof joint gap and width.
2. Measure gland nuts size
3. Measure the creepage distance and electrical clearance in the battery box.
4. Measure the maximum surface temperature of the light and battery box.

Test data：

Number / Inspection items	1#	2#	Technical Requirements	Test result
Minimum flameproof joint width (front)(mm)	13.45	13.5	＞12.5mm	Qualified
Minimum flameproof joint width (back) (mm)	13.5	13.54	＞12.5mm	Qualified
Maximum flameproof joint gap (front) (mm)	0.1	0.1	＜0.15mm	Qualified
Maximum flameproof joint gap (back) (mm)	0.1	0.1	＜0.15mm	Qualified
Gland nuts size（mm）	G3/4	G3/4	/	
Serrated joints（mm）	20.7	20.5	＞12.5mm	Qualified
Threads engaged	11	11	＞5	Qualified
Minimum creepage distance of the battery box components（mm）	7.5	7.5	＞1.7	Qualified
Minimum electrical clearance of the battery box components（mm）	5.0	5.0	＞1.7	Qualified
Maximum surface temperature(light)（℃）	72	72	T6(85℃)	Qualified
Maximum surface temperature(battery box)（℃）	57.2	57.2	T6(85℃	Qualified
Hydrostatic test MPA）	1.0	1.0	Reference pressure： Hydrogen：514kpa； Acetylene：582kpa	Qualified

Standard：

IEC 60079-0：2007，MOD　5.3.2；

IEC 60079-1：2007，MOD　5.2.1/5.2.2/5.3/15.1.3/15.2；

IEC 60079-7：2006，IDT　4.3/4.4；

Conclusion:

Qualified：■ ubqualified：□ No judgment：□

Abnormal description：No

Approval		Audit		Test	Zhao Xing

03.Low temperature performance test

Test equipment：Constant temperature and humidity test chamber；

Test environment：-25℃；

Test process：

1. Before testing, each sample is fully charged to saturation, and records the charging time;
2. The test samples were placed in constant temperature and humidity test chamber (maintaining the temperature at -25 ℃), the sample was kept at low temperature for 2h, the respective parts of the sample temperature to stabilize.
3. Open the discharge switch, lighting dimmer button to 60W at (maximum power discharge) lamps extinguished until recording each sample discharge time;
4. The sample was connected to the charger for charging the sample and repeat the third step, the sample was recorded at the time of charge and discharge temperatures.
5. After testing, the samples were placed under normal temperature, 1h later check if function is normal;

Test data：

Parameter \ Number		2#	3#	4#	5#	Test environment
Checking before the test		OK	OK	OK	OK	25℃
Test process	Charging time H	6H	6H	6H	6H	
	Charging saturation voltage V	27.2V	27.1V	26.8V	27.2V	
	Low temperature discharge time H	3H25′	3H18′	3H07′	3H25′	-25℃
	Charging time to saturation at low temperatures	6H	6H	6H	6H	
	Low temperature discharge time H	3H30′	3H20′	3H05′	3H20′	
Checking after the test		OK	OK	OK	OK	Normal atmospheric temperature

Standard：

IEC68-2-1 in 5.3 Requirements: Lighting function properly at low temperatures。

Conclusion：

Qualified：■ Unqualified：□ No judgment：□

Abnormal description

No

Approval		Audit		Test	Zhao Xing

04.High temperature test

Test equipment: Constant temperature and humidity test chamber;
Test environment：+60℃；
Test process：
1. Before testing, each sample is fully charged to saturation, and records the charging time;
2. The test samples were placed in constant temperature and humidity test chamber (maintaining the temperature at -60 ℃), the sample was kept at low temperature for 2h, the respective parts of the sample temperature to stabilize.
3. Open the discharge switch, lighting dimmer button to 60W at (maximum power discharge) lamps extinguished until recording each sample discharge time;
4. The samples were connected to a charger for charging the sample, repeat the third step, the sample charge and discharge time recording at high temperatures.
5. After testing, the samples were placed under normothermic 1h after checking function is normal;
Test data：

Parameter \ Number		2#	3#	4#	5#	Test environment
Checking before the test		OK	OK	OK	OK	25℃
Test process	Charging time H	6H	6H	6H	6H	
	Charging saturation voltage V	27.2V	27.1V	26.8V	27.2V	
	High temperature discharge time H	4H50′	4H30′	4H20′	4H25′	60℃
	Charging time to saturation at high temperatures	6H	6H	6H	6H	
	High temperature discharge time H	4H45′	4H30′	4H25′	4H20′	
Checking after the test		OK	OK	OK	OK	Normal atmospheric temperature

Standard：

IEC68-2-2 in 5.3 Requirements: Lighting function normally in high temperature environments.

Conclusion：

Qualified：■ Unqualified：□ No judgment：□

Abnormal description：

No

Approval		Audit		Test	Zhao Xing

05.Shock test

Test equipment： Impact hammer (1Kg), ruler；

Test environment：Normal temperature；

Test process：

1. Check whether the impact head surface intact (quality of 1kg, 25mm diameter semi-circular impact head);

2. For the introduction of side lamps, battery box switch button, the button battery box dimmers, lighting 0.4m high impact transparent pieces performed once;

3. Select the lamp housing, battery box casing, battery junction box and lamps and other parts to 2.0m meters high impact once;

Test data：

Number / parameter		1#	2#	5#	Test environment
Checking before the test		OK	OK	OK	25℃
4J Impact	Cable entry	OK	OK	OK	
	Battery box switch	OK	OK	OK	
	Battery box dimmer	OK	OK	OK	
	Transparent parts	OK	OK	OK	
20J Impact	Lighting fixture enclosure	OK	OK	OK	
	Battery box enclosure	OK	OK	OK	
	Lighting fixture and battery box joint	OK	OK	OK	
Checking after the test		OK	OK	OK	

Standard：

IEC 60079-0：2007，MOD 6.4.2 Requirements: after the test there is no any damage affect the explosion-proof type.

Conclusion：

Qualified：■ Unqualified：□ No judgment：□

Abnormal description：

No

Approval		Audit		Test	Zhao Xing

06. Switch performance and dimming test

一、**Test equipment**： Hand work

二、**Test environment**： Normal temperature；

三、**Test process**：

1, Full charge the battery, check the performance of whole lighting fixture.

2, Keep switch NO and switch off the lights 1000 times;

3, Test the dimmer, when clockwise rotation, light output goes down. When counterclockwise rotation,light output goes up.

4, Check the switch and dimmer after test.

Test data：

Number / Test item		1#	2#	3#	Test environment
Checking before the test		OK	OK	OK	Normal atmospheric temperature
Switch Test	Checking before the test	OK	OK	OK	
	Checking during the test	OK	OK	OK	
	Checking after the test	OK	OK	OK	
Dimming test	Checking before the test	OK	OK	OK	
	Checking during the test	OK	OK	OK	
	Checking after the test	OK	OK	OK	

Standard：

Product specifications" provisions during the trial and after the test switch button and the button does not appear dimmer anomalies.

Concluson：

Qualified：■ Unqualified：□ No judgment：□

Abnormal description：

No

Approval		Audit		Test	Zhao Xing

07. Temperature rise test

Test equipment：Thermocouple, glue, digital thermometer；

Test environment：Normal temperature；

Test process：

1. Put the temperature line on the surface of lighting fixture,LED weld leg and LED driver components.
2. Put the temperature line on the surface of battery box and battery.
3. Charger the sample in a constant temperature, check the battery Temp. after 4 hours.
4. Full charge the battery , discharge the battery, check the Temp. after 2 hours.
5. Connect with constant current power suppy, adjust the power supply current to the maximum, check the maximum temperature .

Test data：

Temperature rise test：

Test Item		Working 1H	Working 2H	Working 3H	Working 4H	Maximum temperature rise
Light	Light sourceTS1	87.5	89.2	87.5	87.2	38.2
	Light sourceTS2	80	81.7	82.4	84	33
	LED PCB	74.5	77.2	75.6	76.5	26.2
Power supply	Electrolytic capacitor	77.2	77.3	76.5	77.1	26.3
	Electrolytic capacitor C8	79.4	81.2	81.4	83	32
	Transistor	84.5	88.6	92.3	92.5	41.5
	MOS Q1	88.5	94.2	95.3	95.5	44.5
	50V Electrolytic capacitor	73.8	75.1	74.6	75.1	24.1
	Transistor D1	69.3	71.4	71.6	71.6	20.6
	Transformer	84.2	90.1	92.1	92	41
	CY1	74.7	77.4	79	77.2	28
	IC	89.2	90.7	91.4	93.6	42.6
	Power supply PCB	69.8	71.5	72.4	70.6	21.4
	Light cavity	69.1	70.1	69	69.3	19.1
	Light housing	69.2	71	72	70	21
Battery box	Battery	58	59.4	57.4	57.5	4.4

	1#Surface 1					
	Battery 1#Surface 2	57.6	58.8	57.8	57.5	3.8
	Battery 2#Surface 1	59.1	60.2	59.6	59.1	5.2
	Battery 2#Surface 2	58.7	59.9	59.2	59.2	4.9
	Battery Box Case	56	57.2	57.2	56.8	2.2
Ambient temperature		55	55	55	55	0

Criteria：

Component maximum temperature is less than the calibration temperature components specifications。

Conclusion：

Qualified：■ Unqualified：□ No judgment：□

Abnormal description：

No

Approval		Audit		Test	Zhao Xing

08.IPX4 Waterproof test

Test equipment：IPX4 Spray Equipment；

Test environment：Normal Temperature and Humidity

Test process：

1. Check the appearance in normal Temp. Tight all the components.
2. Switch on the light, place it in raining environment, last 10 minutes.
3. Test performance of the light after testing.

.

Test data：

Number / Test item	1#	2#	3#	Test environment
Checking the appearance, structure before test	OK	OK	OK	Normal temperature
Check water ingress of the light	OK	OK	OK	
Check water ingress ofthe battery box	OK	OK	OK	
Whether affect the electrical performance	OK	OK	OK	

Standard：

Meet IEC60259: 2001 14.3 requirements for lamps have drainage holes, allowing water to enter inside but does not affect its electrical properties.

Conclusion：

Qualified：■ Unqualified：□ No judgment：□

Abnormal description：

No

Approval		Audit		Test	Zhao Xing

09.Salt spray test

Test equipment：Salt spray test chamber；

Test environment：35℃；

Test process：

1. Check the appearance in normal Temp;
2. Prepare 5%,PH 6.5~7.2 salt test solution,adjust the temperature to 35 ℃;
3. Put the light in salt spray chamber (sample not touch with each other, keep suitable distance, without effect the spray of the salt solution, salt solution on the sample should not fall on the other samples), spray volume is set at 1.0 96h;
4. After the test, wash the lights,let it dry in normal atmospheric conditions. After 1 ~ 2h, check the surface of the light.

Test data：

Test Description	Test result	Test environment
Check the appearance before test	OK	Normal temperature
Whether gland nuts, screws are rusty	OK	
Whether latch, battery box base other components are rusty	OK	
Any other rusty	OK	

Standard：

IEC68-2-11 in 6.5 Requirements: no external corrosion of fixtures.

Conclusion：

Qualified：■ Unqualified：□ ：No judgment□

Abnormal description：

No

Approval		Audit		Test	Zhao Xing

10. Electrical Performance Test

Test equipment：Electrical Parameter test equipment、Power supply、Integrating sphere
Test environment: Normal temperature and humidity and normal atmospheric conditions.
Test process：

1、Full charge the battery . Record the largest current and low floating charge current
2、Record time and voltage after the battery be full charged；
3、Turn on the light, adjust to the maximum brightness, record the discharge time and the voltage when the light turn off itself.
4、Record the current and the output in different voltage.

Test data：

4.1： Battery discharge test data：

Parameter \ Number		1#	2#	3#	4#	5#	Test environment
Checking the performance before test		OK	OK	OK	OK	OK	25℃
Test process	Maximum charging current	3.014	3.01	3.0	3.01	2.98	
	Low floating charge current A	0.042	0.042	0.044	0.043	0.043	
	Charging voltage V	28.0	27.8	27.8	28.0	27.8	
	Charging saturation voltage V	27.1	27.08	27.03	27.15	27.1	
	Discharging time H	4H45′	4H37′	4H40′	4H55′	4H45′	
	Battery discharge protection voltage V	20.1	19.8	19.8	19.8	19.8	
Checking the performance after test		OK	OK	OK	OK	OK	

4.2: Electrical test data：3#Lighting

	Input Voltage V	Input Current A	Input Power P	Output voltage V	Output Current A	Output Current B	Total output Current A	Output Power P	Power Efficiency %
DC	21	2.73	57.33	44.7	0.563	0.572	1.14	50.73	88.50%
	24	2.35	56.4	44.7	0.571	0.577	1.15	51.32	90.99%
	30	1.85	55.5	44.7	0.575	0.589	1.16	52.03	93.75%
Dimming test	Input Voltage V	Input Current A	Input Power P	Output voltage V	Output Current A	Output Current B	Total output Current	Output Power P	Power Efficiency %
Minimum data	24	0.12	2.9	40.1	0.034	0.031	0.065	2.61	90.50%
5W data	24	0.2	4.8	40.7	0.05	0.055	0.105	4.27	89.03%
15W data	24	0.62	14.9	42.1	0.169	0.164	0.333	14.02	94.22%
30W data	24	1.25	30.0	43.3	0.325	0.325	0.65	28.15	93.82%
45W data	24	1.87	44.9	44.1	0.474	0.481	0.955	42.12	93.84%
Max data	24	2.35	56.4	44.7	0.571	0.577	1.148	51.32	90.99%

4.3： Photometric test data：3#Lighting

Product type	Luminous (lm)	Optical efficiency (lm/W)	x	y	CCT(K)	Ra	Lighting U(V)	Lighting I(A)	Lighting P(W)
Maximum 60W data	4583	79.57	0.3296	0.3512	5619	69.6	24	2.4	57.6
Minimum data	341.4	101.6	0.3363	0.3604	5356	70.1	24	0.14	3.36
5W data	476.21	99.21	0.3362	0.3605	5361	69.9	24	0.2	4.8
15W data	1479.1	99.4	0.3345	0.3581	5423	69.7	24	0.62	14.88
30W data	2811	93.7	0.3325	0.3549	5501	69.7	24	1.25	30
45W data	3810.6	84.91	0.3305	0.3522	5585	69.7	24	1.87	44.88

Standard:

《Product data sheet》

Conclusion：

Qualified：■ Unqualified：□ No judgment：□

Abnormal description:

No

Approval		Audit		Test	Zhao Xing

11. Vibration Test

Test equipment：Vibration test stand；

Test environment：normal temperature and humidity；

Test process：

：

1. Check the performance and appearance in normal Temp;
2. Fasten the luminaire on the vibration test stand, then turn on the light
3. Setting the vibration condition: satrt the vibration test according GB/T2423.10(under the switch activity 10～60Hz, amplitude ±0.35mm; over the switch activity 60～150Hz, acceleration move at 50m/s²; when under the not energized status, frequency sweep 5 circles every axle.)
4. The test should be processed on 3 perpendicular axises.
5. Check performance after test, open they light,check the Fastening parts ,parts and components.

Test data：

No. / Parameter		2#	Test environment
Checking before test		OK	Normal temperature
Z axial direction (up and down direction)		Qualified	
X axial direction (front and rear direction)		Qualified	
Y axial direction (Left and right direction)		Qualified	
After test	Performance	Qualified	
	components and parts	Qualified	
	Fastening parts	Qualified	

Standard:

IEC68-2-6 ： the samples still functions normally after test, components and parts no damage and fasteners no loosen and exfoliate.

Conclusion：

Qualified：■ Unqualified：□ No judgment：□

. **Abnormal description:**

No

Approval		Audit		Test	Zhao xing

12. Battery capacity test

Test equipment：electronic load、timer；

Test environment：normal temperature and humidity；

Test process：

1.1 Full charge the battery in normal temperature；

1.2 Connect the battery to the electronic load，setting the electronic load at the constant current 2 A discharge；

1.3 Record the battery voltage values every 1 h, until the voltage values come to the battery voltage control values 21.5 V.

1.4 Record the battery discharge time and work out the battery capacity.

Test data：

Parameter / No.		1#	2#	3#	4#	Test environment
Full charge Voltage		27.2	27.08	27.14	27.22	Normal temperature
Steps of constant current 2A discharge	0 h Voltage(V)	25.5	25.3	25.4	25.5	
	2 h Voltage(V)	24.6	24.5	24.5	24.6	
	4 h Voltage(V)	23.4	23.4	23.35	23.45	
	6 h Voltage(V)	22.23	22.12	22.32	22.4	
	6 h 20′		Finish			
	6 h 25′	Finish				
	6 h 40′			Finish		
	6 h 45′				Finish	
setting the electronic load at the constant current 2 A discharge		6 h 25′	6 h 20′	6 h 40′	6 h 45′	
Battery capacity		12.8 Ah	12.6 Ah	13.3 Ah	13.4 Ah	

Standard:

《Product data sheet》:battery capacity more than 12 Ah

Conclusion：

Qualified：■ Unqualified：□ No judgment：□

Abnormal description:

No

Approval		Audit		Test	Zhao Xing

13.Seal heat and cold resistance

1. Test equipment：Constant Temperature and Humidity；

2. Test environment：-50℃~+120℃；

3. Test process：

1.1 Place sample in the 95℃, 90% humidity environment, last 2 weeks. Place the sample in temperature 100℃ environment ,last 2 weeks. Then place the sample in low temperature -50℃ environment , last 24 h. Place back to room temperature, check the sample.

1.2 Check the seal, make sure if be damaged and out of shape.

4. Test data：

Parameter / No.		1#	2#	3#	4#
Checking before the test		OK	OK	OK	OK
Heat and cold resistance test	95℃、90% humidity for 2 weeks	OK	OK	OK	OK
	100℃ for 2 weeks	OK	OK	OK	OK
	-50℃ for 24 h	OK	OK	OK	OK
Place back to room temperature		OK	OK	OK	OK

Standard:

IEC 60079：2006 : 26.8/26.9

Conclusion：

Qualified：■ Unqualified：□ No judgment：□

Abnormal description:

No

Approval		Audit		Test	Zhao Xing