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Reliability Test Report

for K18X001.00

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Revision Change History

Revision	Description of Change	Date
1.0	Initial Release	09/03/2021

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Purpose:

1. Provide a formal functional demonstration of the product design reliability.
2. Identify any design discrepancies.
3. Reliability assurance of trial samples which are designed and fabricated in accordance with the customer's product specifications.
4. Conduct robustness testing on early production samples in accordance to customer's product environmental testing specification.

Scope:

This document describes the performance requirements, validation criteria, and the validation tests which focus on K18X001.00 product.

The DUT H/W version is V125 and S/W revision is 19.524.23.

The summary of test items:

NO.	Item	Test Condition	Q'ty	Period	Pass Criteria	Test result
1	Cold Start Test	Power off, Storage, Ta = - 20°C Storage 48 hours then ramp the temperature to 0°C, power on operation test Power on/off 15 times	2 units	2 days	1. No functional failures both before and after the test. 2. No performance degradation during the functional test 3. No visual damage to the products during inspection, such as warpage, peeling, missing pixels, discoloration, etc.	PASS
2	Hot Start Test	Power off, Storage, Ta = 70°C Storage 48 hours then ramp the temperature to 50°C power on operation test Power on/off 15 times	2 units	2 days	1. No functional failures both before and after the test. 2. No performance degradation during the functional test 3. No visual damage to the products during inspection, such as warpage, peeling, missing pixels, discoloration, etc.	PASS
3	High Temperature & High humidity Test (storage)	1. Temperature 70°C 2. Humidity 90% R.H. 3. Test period 72 hours	2 units	3 days	1. No functional failures both before and after the test. 2. No performance degradation during the functional test 3. No visual damage to the products during inspection, such as warpage, peeling, missing pixels, discoloration, etc.	PASS
4	High Temperature & High Humidity Test (OP)	Power on, Operation Ta = 50°C, Humi.= 95%R.H for 72 hours	2 units	3 days	1. No functional failures both before and after the test 2. No performance degradation during the functional test 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS
5	Operational Temperature cycle test	1. Power on, Operation 2. 25°C & R.H. 65% for 1 hour 3. 25°C & R.H. 65% to - 5°C for 2 hours 4. - 5°C for 13 hours 5. - 5°C to 25°C & R.H. 65% for 2 hours. 6. 25°C to R.H. 65% for 1 hour 7. 25°C & R.H. 65% to 50°C & RH 95% for 2 hours 8. 50°C & R.H. 95% for 13 hours 9. 50°C & R.H. 95% to 25°C & RH 65% for 2 hours 10. Repeat 1~9 for 2 cycles 11. 25°C & R.H. 65% for 48 hours Total for 120 hours	2 units	5 days	1. No functional failures both during and after the test 2. No performance degradation during the functional test 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS
6	Thermal Shock Test (PCB only)	Power off , non-operation Ta= - 20°C (30min) ~ 70°C (30min) 60 cycles Transfer time: 5 min	2 units	3 days	1. No functional failures both before and after the test 2. No performance degradation during the functional test 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS
7	Power On/Off Test with Temperature	1. Power on: 50 sec 2. Power off: 10 sec 3. Temperature: - 5°C and 50°C 4. Cycle: 2,500 cycles per test condition 5. Total 5,000 cycles	2 units	5 days	1. No functional failures both before and after the test. 2. No performance degradation after the functional test. 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS

8	Salt Spray Test	1. Salt: 5% , Temp.: 35°C and Humidity: 85% 2. Sprayed amount: 0.6~30 ml/hour 3. Test duration: 48 hours	2 units	2 days	No physical defect, corrosion and function failure after this test.	PASS
9	Operational Random Vibration	1. Acceleration: 10m /4.4G/2.5G 2. Sweep range: 5~15Hz/10mm P-P, 16~30Hz/4.4G, 30~300Hz/2.5G 3. Sweep rate: 0.25 octave/min 4. Duration: 60 min/ axis	2 Units (T1)	2 days	1. No function failures both during and after the test 2. No performance degradation during the function test 3. No visual damage to the products after inspection, such as peeling, discoloration, etc.	PASS
10	Operational Shock Test	1. Acceleration: 30G 2. Test wave: Square Wave 3. Duration: 11ms 4. Direction: 6 faces 5. 3cycles/direction	2 units (T1)	1 day	No functional failures both during and after the test	PASS

Panel Drawing:

Front



Rear



Adapter

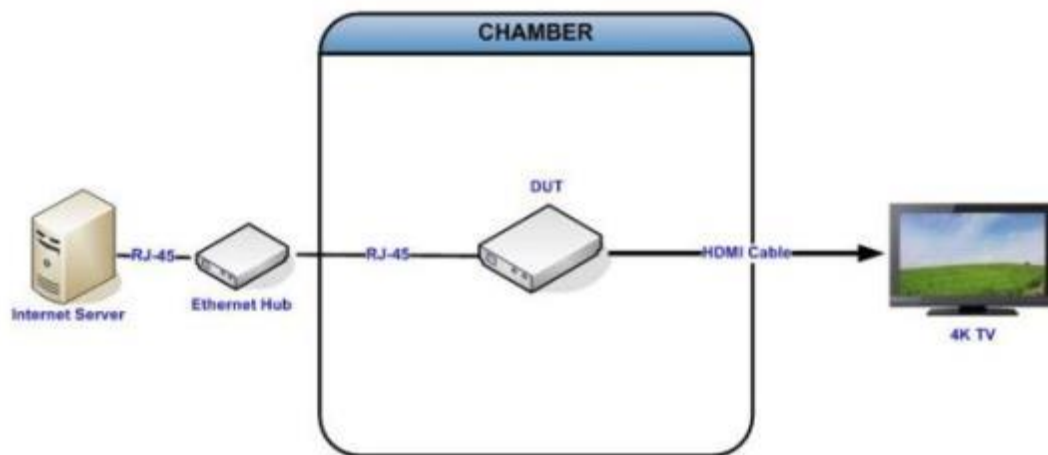
LA-A271KS
Input: 200-240V
50/60Hz, 1.5A
Output: DC 24V/4A



I/O Port



Test setup and function test:



HDMI connects to 4K TV for playing local 4K video.
Ethernet hub is for iperf 50Mbps.

1. Cold Start Test

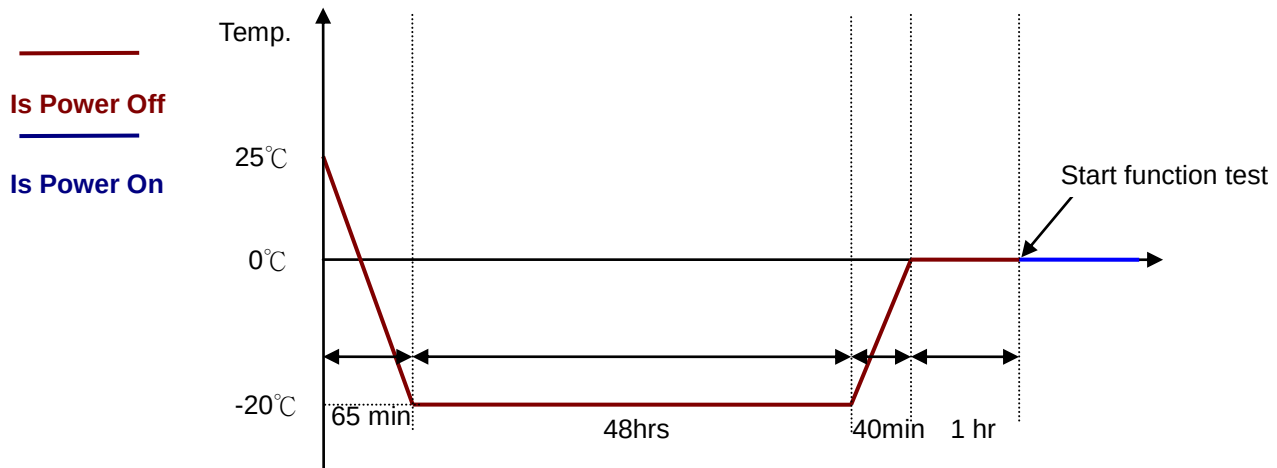
Purpose:

To demonstrate that the product can be stored at low temperature environment.

Quantity: 2 units.

Test Objective: Power off, and store at - 20°C. After 48 hours, ramp to 0°C and function test.

Test Profile:



Test Procedure:

1. Power off.
2. Start test at 25°C.
3. Ramp the temperature to - 20°C and hold for 48 hours.
4. Ramp the temperature to 0°C and hold for 1 hour.
5. Rate: 1°C/minute.
6. Repeat 3 times to power on and activated in full function and operation.

Pass Criteria:

1. No functional failures both before and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-01.

Test Result: **PASS**



2. Hot Start Test

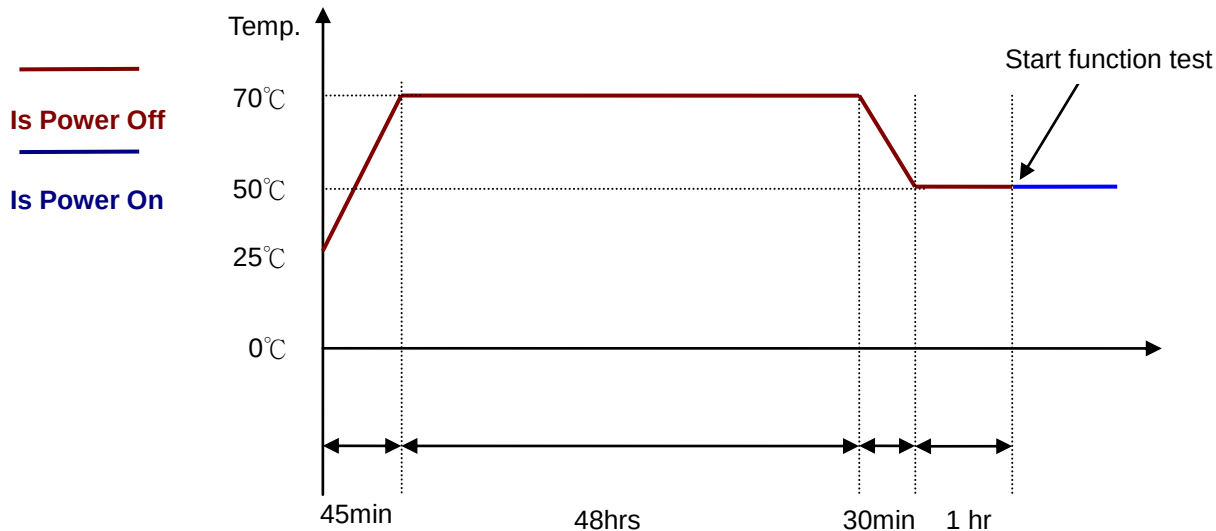
Purpose:

To demonstrate that the product can be stored at high temperature environment.

Quantity: 2 units.

Test Objective: Power off, and store at 70°C. After 48 hours, ramp to 50°C and function test.

Test Profile:



Test Procedure:

1. Power off.
2. Start test at 25°C.
3. Ramp the temperature to 70°C and hold for 48 hours.
4. Ramp the temperature to 50°C and hold for 1 hour.
5. Rate: 1°C/minute.
6. Repeat 3 times to power on and activated in full function and operation.

Pass Criteria:

1. No functional failures both before and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-02.

Test Result: **PASS**



3. High Temperature and High humidity Test (Storage)

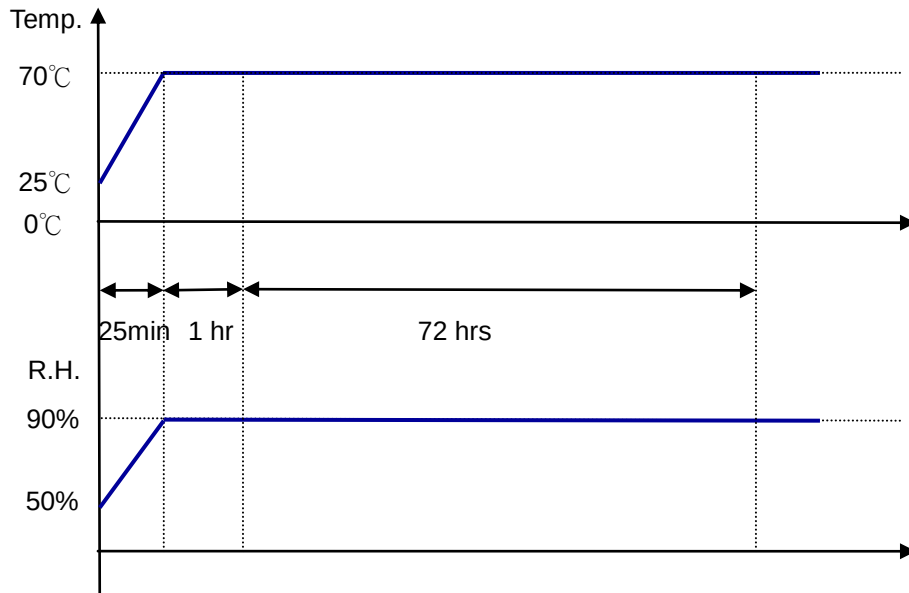
Purpose:

To demonstrate that products can withstand the high limit temperature and the high limit humidity of an operating environment.

Quantity: 2 units

Test Objective: Storage in High Temperature and High Humidity: Temp. + 70°C and R.H. 90%,
Duration: 3 days

Test Profile:



Test Procedure:

1. Power off storage.
2. Start test at 25°C and RH 50%.
3. Ramp the temperature to 70°C and R.H. 90% in 25 minutes, then hold for 1 hour.
4. Hold 70°C, RH 90% for 72 hours.

Pass Criteria:

1. No functional failures both during and after the test.
2. No performance degradation during the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-30

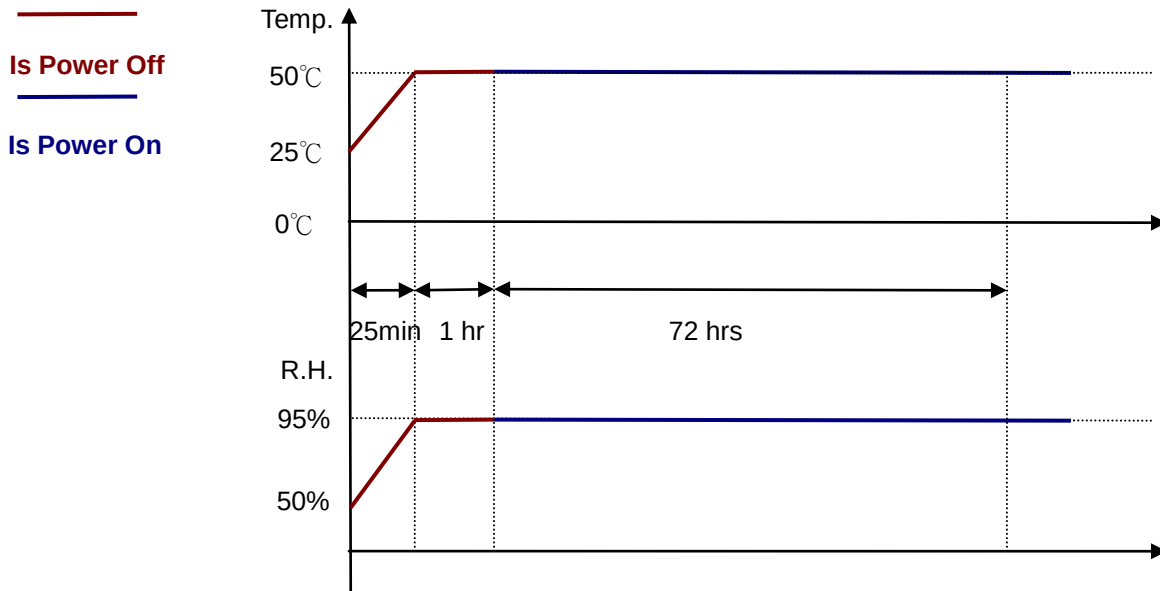
Test Result: **Pass**



4. High Temperature and High humidity Test (OP)

Purpose:

To demonstrate that products can withstand the high limit temperature and the high limit humidity of an operating environment.

Quantity: 2 units**Test Objective:** Operating Temperature and Humidity: Temp. + 50°C and R.H. 95%, Duration: 3 days**Test Profile:****Test Procedure:**

1. Power off.
2. Start test at 25°C and RH 50%.
3. Ramp the temperature to 50°C and R.H. 95% in 25 minutes, then hold for 1 hour.
4. Power on the test units.
5. Hold 50°C, RH 95% for 72 hours.

Pass Criteria:

1. No functional failures both during and after the test.
2. No performance degradation during the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-30**Test Result:** Pass

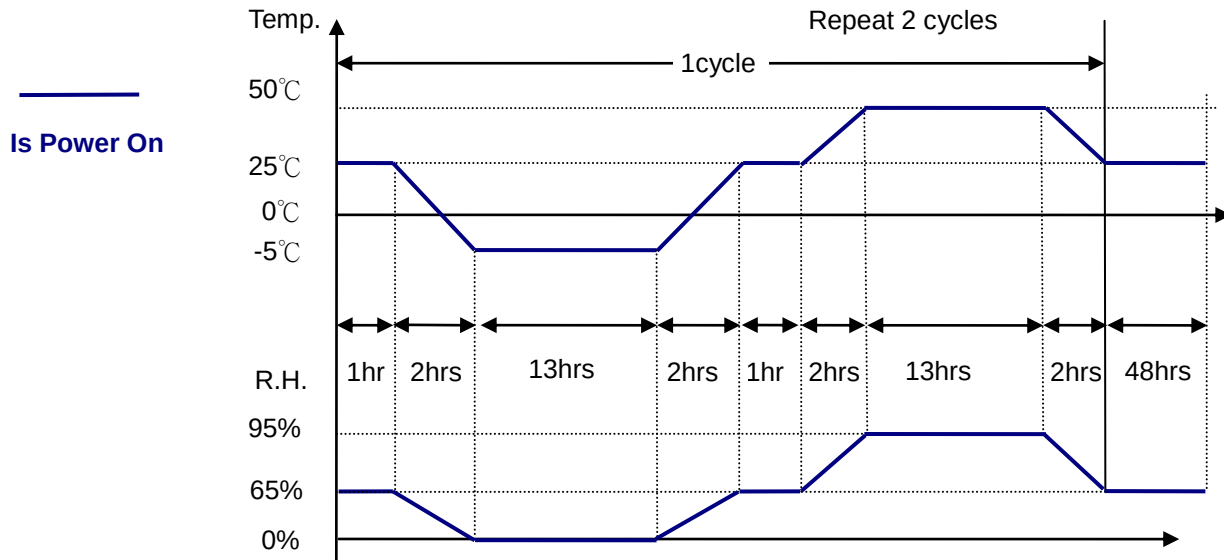
5. Operational Temperature cycle test

Purpose:

To demonstrate that products can operate in the high/low temperature and high humidity environment.

Quantity: 2 units.

Test Objective: Operating in high/low Temperature and Humidity.

Test Profile:**Test Procedure:**

1. Power on, then activated in full function and operation.
 2. 25°C & R.H. 65% for 1 hour
 3. 25°C & R.H. 65% to - 5°C for 2 hours
 4. - 5°C for 13 hours
 5. - 5°C to 25°C & R.H. 65% for 2 hours.
 6. 25°C to R.H. 65% for 1 hour
 7. 25°C & R.H. 65% to 50°C & R.H. 95% for 2 hours
 8. 50°C & R.H. 95% for 13 hours
 9. 50°C & R.H. 95% to 25°C & R.H. 65% for 2 hours
 10. Repeat 1~9 for 2 cycles
 11. 25°C & R.H. 65% for 48 hours
- Total for 120 hours

Pass Criteria:

1. No functional failures both during and after the test.
2. No performance degradation during the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: IEC 60068-2-30.

Test Result: **PASS**



6. Thermal Shock Test (PCB only)

Purpose:

To demonstrate that the product can be operated after high & low temperature shock environment.

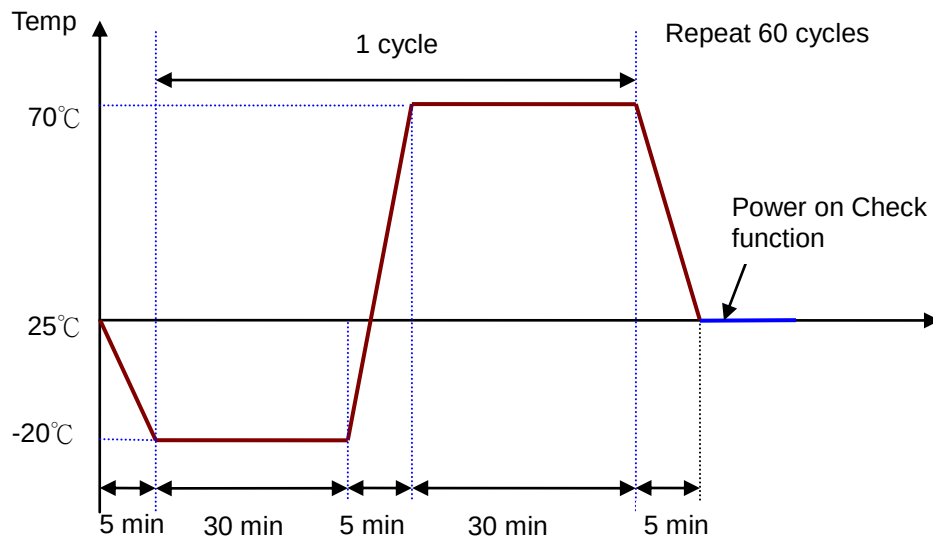
Quantity: 2 units

Test Objective: Ta= - 20°C (30minues) ~ 70°C (30minutes), Cycle: 60 cycles,
Transfer time: 5 minutes.

Test Profile:

Is Power Off

Is Power On



Test Procedure:

1. Power off.
2. Start test at 25°C.
3. Ramp the temperature to - 20°C and hold for 30 minutes.
4. Ramp the temperature to 70°C and hold for 30 minutes.
5. Transfer time: 5 minutes
6. After repeat 60 cycles. Power on, then activated in full function and operation.

Pass Criteria:

1. No functional failures both before and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Basis for Profile: MIL -STD-810F Method 503.4 Procedure I

Test Result: **PASS**



7. Power On/Off Test with Temperature

Purpose:

The purpose of this specification is to define the power on / off test. This test is to assure the product will meet customer's specification.

Quantity: 2 units.

Test Objective: 1. Power on: 50 sec.

2. Power off: 10 sec.

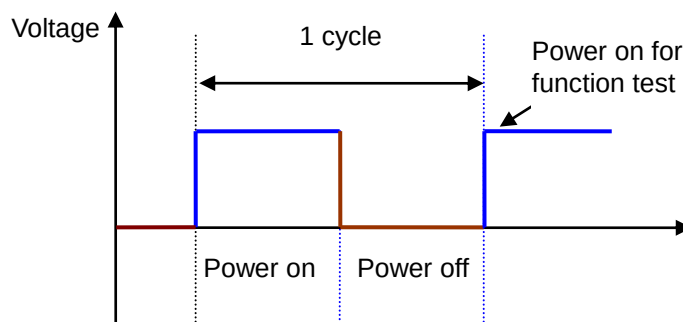
3. Temperature: - 5°C and 50°C .

4. AC Source Voltage: 220V, Frequent: 60Hz.

5. Cycle: 2,500 cycles per test condition.

6. Total 5,000 cycles.

Test Profile:



Test Procedure:

1. Temperature: - 5°C and 50°C .

2. Control the power on/off and input voltage as below.

Power on/off frequency: Power on: 50 seconds / Power off: 10 seconds.

AC Source Voltage: 220V, Frequent: 60Hz.

3. Cycle: 2,500 cycles per test condition.

4. Total: 5,000 cycles.

Pass Criteria:

1. No functional failures both during and after the test.

2. No performance degradation during the functional test.

3. No visual damage to the products after inspection, such as peeling, discoloration, etc.

Test Result: **PASS**



8. Salt Spray Test

Purpose:

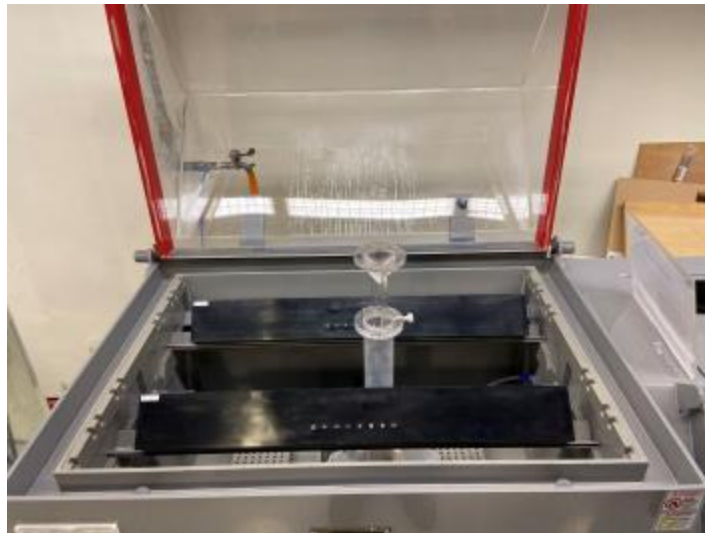
To ensure the DUT can operate properly after exposure in salt spray environment.

Quantity: 2 units

Test Objective:

1. Salt: 5%, Temp. : 35°C and Humidity: 85%.
2. Test duration: 48 hours salt spray exposure.

Test Profile:



Test Procedure:

1. Place the test samples into the salt spray chamber, after the visually inspected and function checked.
2. Ramp the chamber temperature to +35°C, humidity to 85%, salt to 5% and PH to 7.0, then storage the samples for 48 hours.
3. Remove the samples from the chamber for inspection.
4. Clean the samples with distilled water then dry the samples for 8 hours.
5. After the visually inspected and function checked.

Pass Criteria:

1. No failures or major degradation during the functional test.
2. No visual damage to the products during inspection.

Basis for Profile:

In developing this profile, the concepts and ideas expressed in the following sources have been reviewed: IEC 60068-2-11.

Test Result: **PASS**

9. Operational Random Vibration

Purpose:

To reveal the accumulated effects of stress induced by the random vibration and the resulting mechanical weakness and degradation in specified performance and to use this information, in conjunction with the relevant specification to assess the acceptability of specimens.

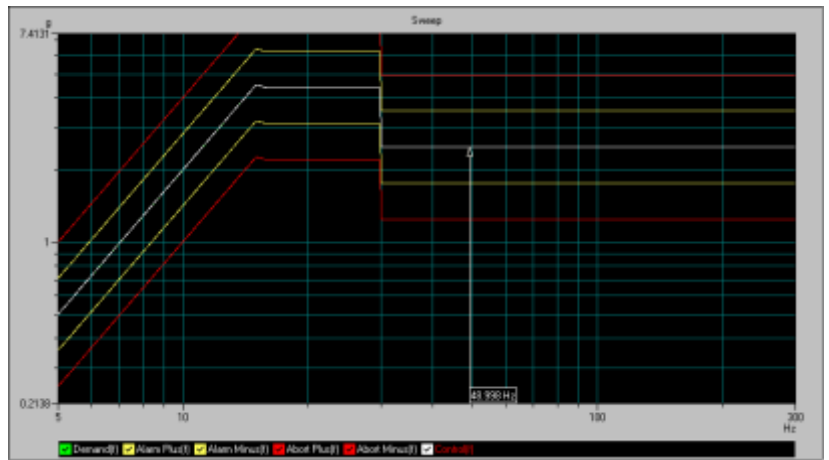
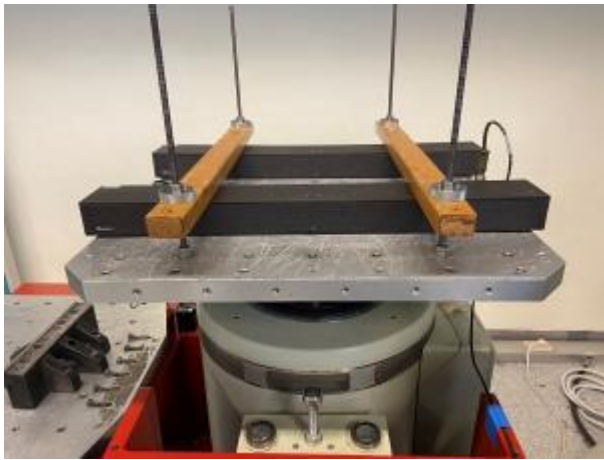
To demonstrate the mechanical robustness of specimens.

Quantity: 2 units (T1 housing)

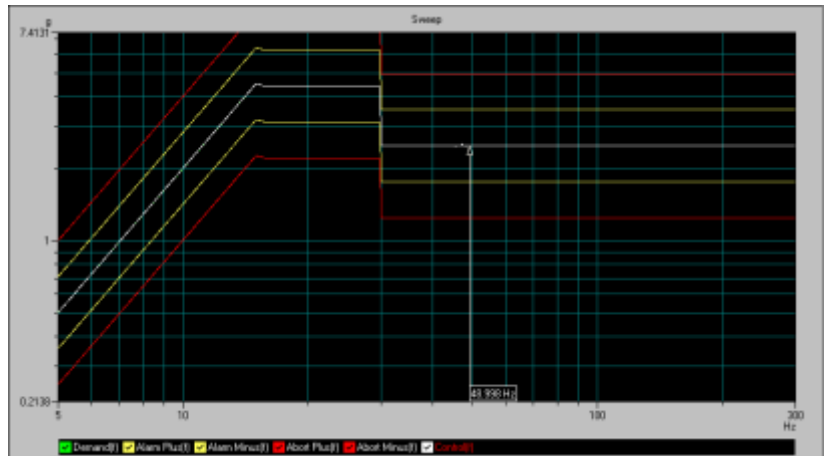
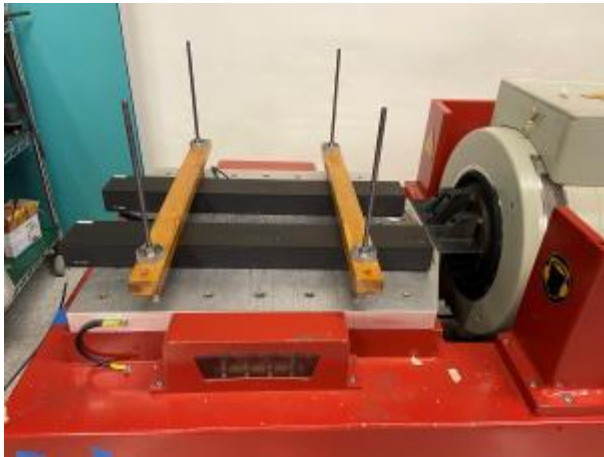
Test Objective:

1. Acceleration: 10mm /4.4G/2.5G,
2. Sweep range: 5~15Hz/10mm P-P, 16~30Hz/4.4G, 30~300Hz/2.5G
3. Sweep rate: 0.25 octave/min
4. Duration: 60 min/ axis

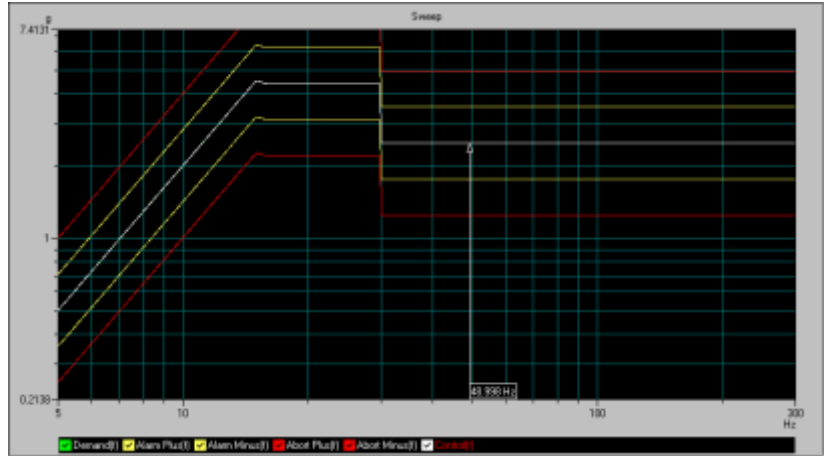
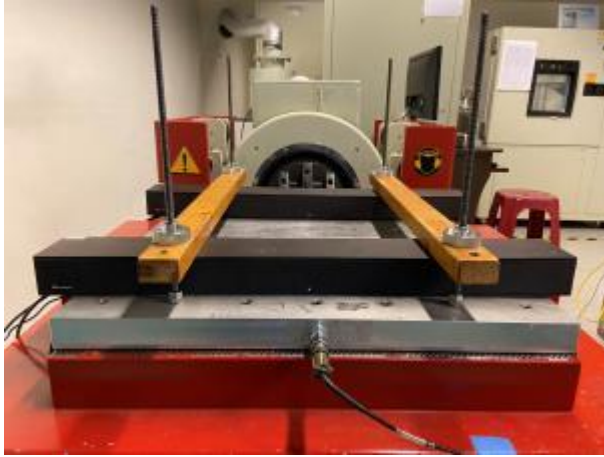
Test Profile:



X axis



Y axis



Z axis

Test Procedure:

Set the product fully function operating.

1. Fix the product on vibration mechanism.
2. Set the test program as above condition:

Acceleration: 10mm /4.4G/2.5G,

Sweep range: 5~15Hz/10mm P-P, 16~30Hz/4.4G, 30~300Hz/2.5G

Sweep rate: 0.25 octave/min, Axes: 3.

3. Check the mechanical and function during the test.

Pass Criteria:

1. No functional failures both during and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products during inspection, such as peeling, crack, missing pixels,

Basis for Profile: IEC 60068-2-64.

Test Result: **PASS**

10. Operation Shock Test

Purpose:

To reveal mechanical weakness and/or degradation in specified performance and to use this information, in conjunction with the relevant specification to decide whether a specimen is acceptable or not. To determine the structural integrity of specimens or as a means of quality control.

Quantity: 2 units (T1 housing)

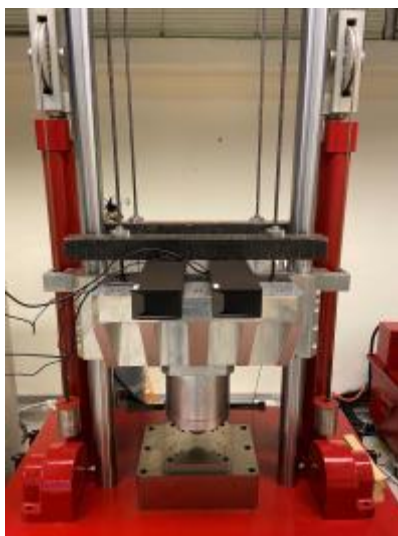
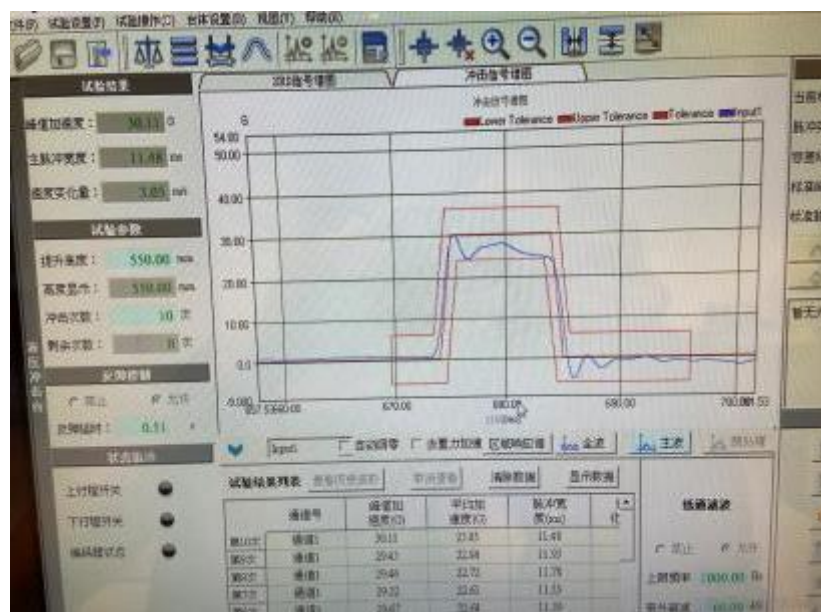
Test Objective: 1. Acceleration: 30G

2. Test wave: Square Wave

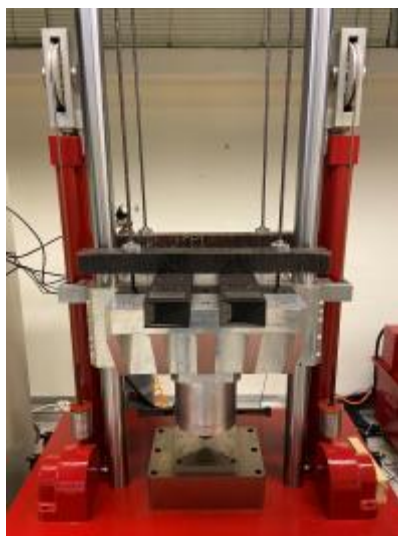
3. Duration: 11 ms

4. Direction: 6 faces

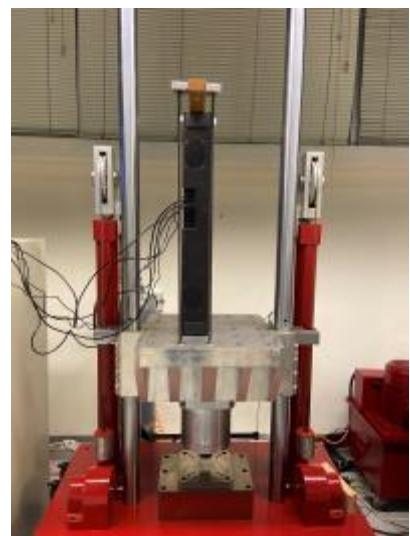
5. 3cycles/direction

Test Profile:

Bottom side



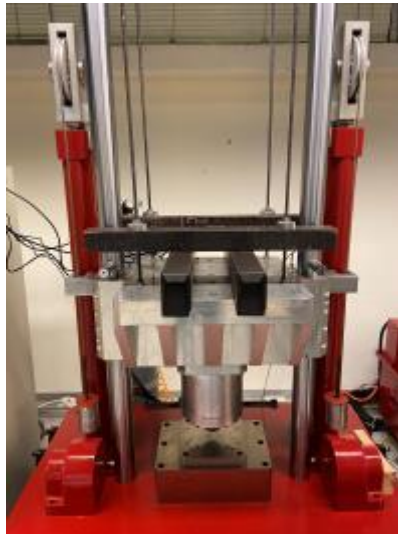
Top side



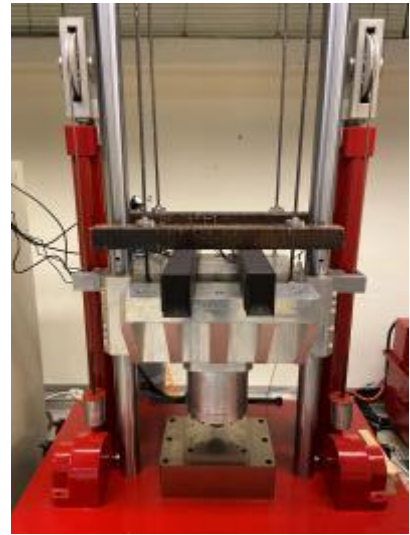
Right side



Left side



Front side



Back side

Test Procedure:

Set the product fully function operating.

1. Fix the product on shock mechanism.
2. Set the test program as above condition:

Acceleration: 30G,

Test wave: Square Wave

Duration: 11 ms

4. Test 6 faces, each direction test 3 times.
5. Check the mechanical and function during the test.

Pass Criteria:

1. No functional failures both during and after the test.
2. No performance degradation after the functional test.
3. No visual damage to the products during inspection, such as peeling, crack, missing pixels, discoloration, etc.

Basis for Profile: IEC 60068-2-27.

Test Result: **PASS**