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Reliability Test Report for

BFX-AT100

(Short term solution)

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Revision Change History

Revision	Description of Change	Date
1.0	Initial Release	07/27/2021

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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 BFX-AT100 product.

The DUT H/W version is 04L1 and S/W revision is v15.523.6.

The summary of test items:

No.	Item	Test Condition	Q'ty	Period	Pass Criteria
1	Continuation of temperature cycle	1. Operating in high and low temperature environment at 50/- 5°C 2. 50°C with 1°C/min, Dwell 12 hrs ; - 5°C with 1°C/min, Dwell 12 hrs, total 5 cycles	3	6 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.
2	High Temperature & Humidity Test	Power on, Operation Ta = 50°C, Humi. = 90%R.H. for 120 hours	Re-use item 1	6 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.
3	Thermal Shock Test	Power off , non-operation Ta= -20C (30min) ~ 70C (30min) 120 cycles Transfer time: 5 min	Re-use item 2	6 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.
4	MTBF Demonstration Test	1. System temperature (Tn): 25°C 2. Test environment (Ta) Temp.: 50°C 3. Activation Energy(EA): 0.7 4. Confidence level: 90% 5. Test day: 21 days 6. MTBF: 17520 Hours (2 years)	10	21 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.

Panel Drawing:

Front



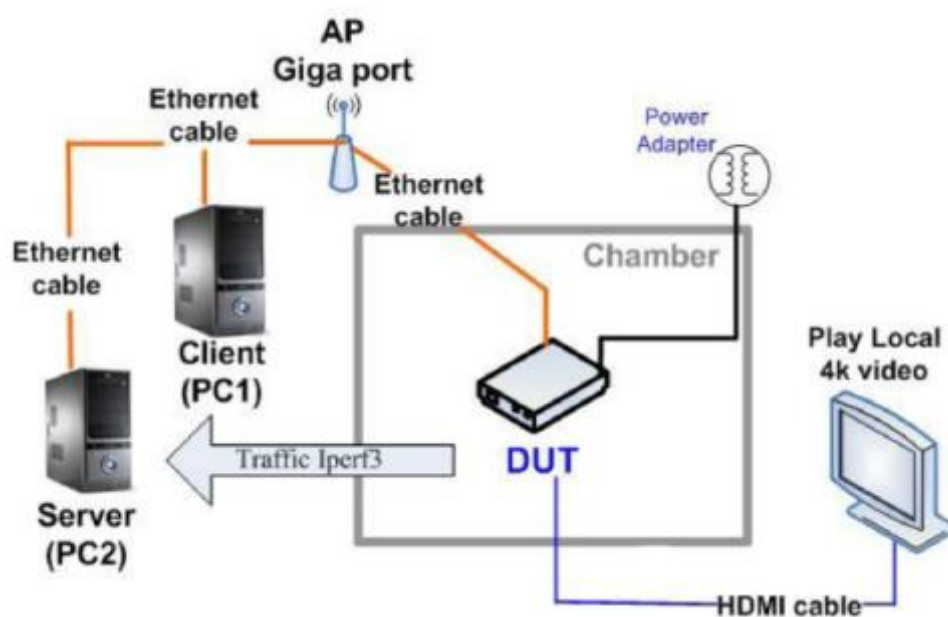
Rear



Adapter



Test setup and function test:



1. Continuation of temperature cycle

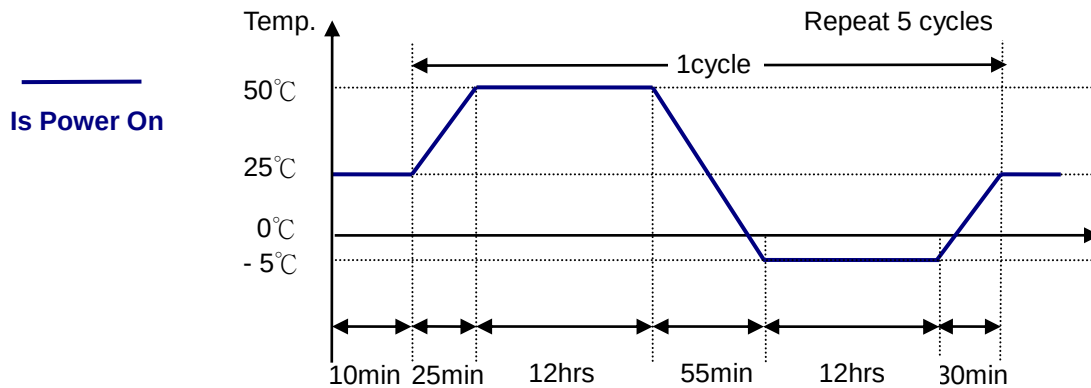
Purpose:

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

Quantity: 3 units.

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

Test Profile:



Test Procedure:

1. Power on, then activated in full function and operation.
2. Start test at 25°C for 10 min.
3. Ramp the temperature to 50°C for 12 hours.
4. Ramp the temperature to - 5°C for 12 hours.
5. Repeat item 3 ~ 4 for 5 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.

Basis for Profile: IEC 60068-2-30.



2. High Temperature and Humidity Test

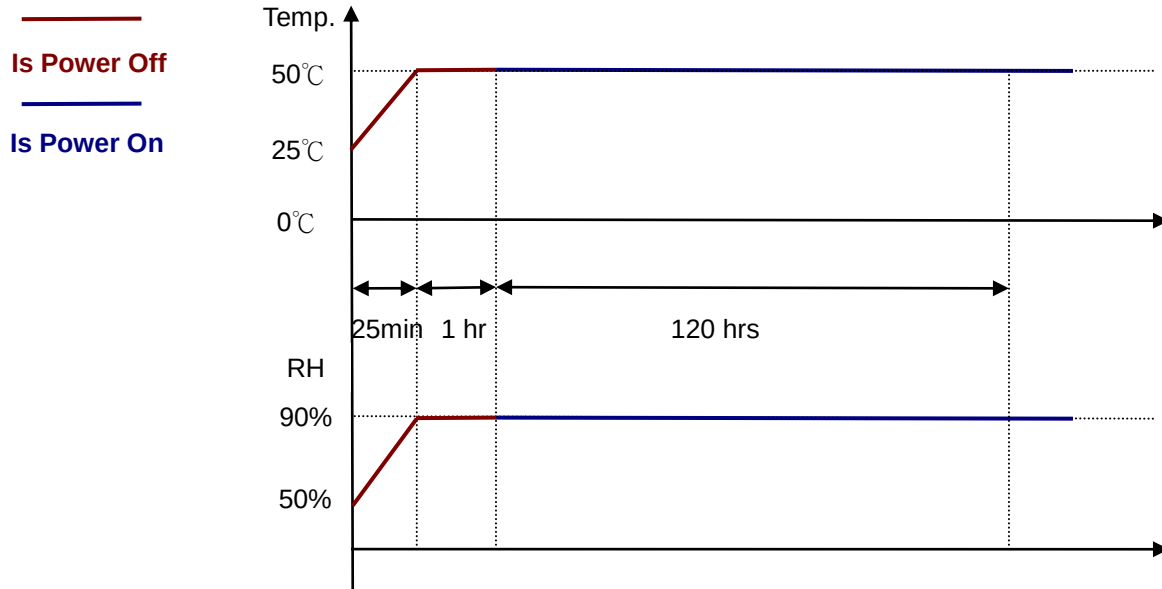
Purpose:

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

Quantity: Re-use item 1

Test Objective: Operating Temperature and Humidity: Temp. + 50°C and RH 90%, Duration: 5 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 RH 90% in 25 minutes, then hold for 1 hour.
4. Power on the test units.
5. Hold 50°C, RH 90% 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: MIL-STD-202F Method 103B



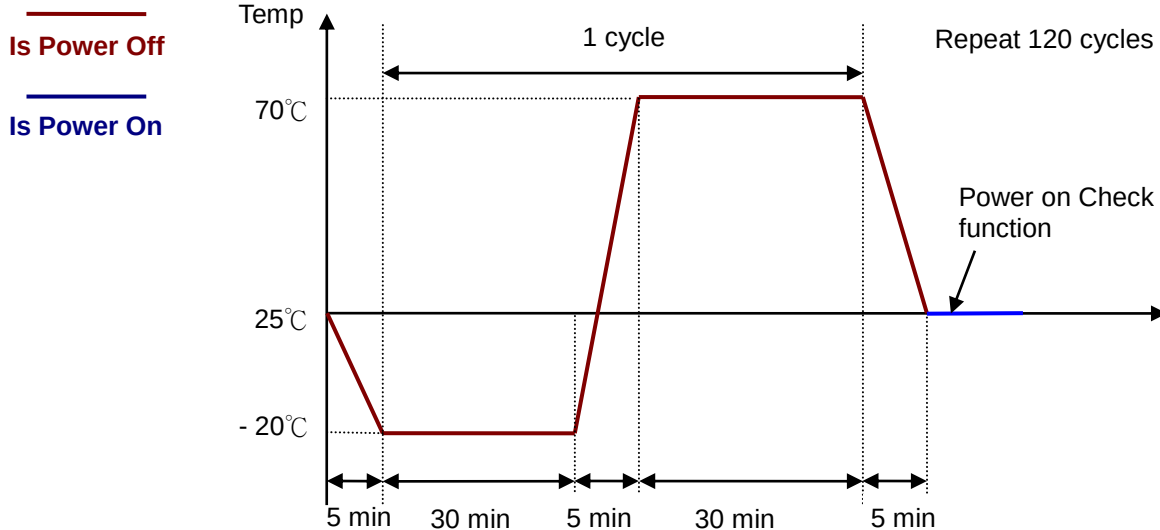
3. Thermal Shock Test

Purpose:

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

Quantity: Re-use item 2

Test Objective: $T_a = -20^{\circ}\text{C}$ (30minutes) $\sim 70^{\circ}\text{C}$ (30minutes), Cycle: 120 cycles,
Transfer time: 5 minutes.

Test Profile:**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 120 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:

No.	SN	Before	After	Result
1	214968810000000000000002			Visually no abnormalities
2	214968810000000000000003			Visually no abnormalities
3	214968810000000000000001			Visually no abnormalities

4. MTBF Demonstration Test

Purpose:

This document describes the RDT test.

Quantity: 10 units.

Test Objective: Operating in 50 deg C Temperature for 21 days.

Test Block Diagram:

The RDT (Reliability Demonstration Test) test is necessary to quantify the expected service life of a product. It specifies how the test is to be performed. Demonstrated MTBF (Mean Time Between Failure), the MTBF target is 17,520 hours.

If it based on the Foxconn standard MTBF calculation formula. Demonstrated MTBF (Mean Time Between Failure) will be based on the methods defined in MIL-STD-781D. The MTBF target is 17,520 hours. Based on 90 % confidence level, it will take **21 days with 10 pieces** of samples under 50 deg C. The formula below shows how the MTBF is defined.

$$\frac{(\text{Testing hours}) * (\text{Acceleration Factor}) * (\text{Number of U.U.T})}{(\text{Confidence Level Factor})}$$

Acceleration factor (A.F) = 8.246797274

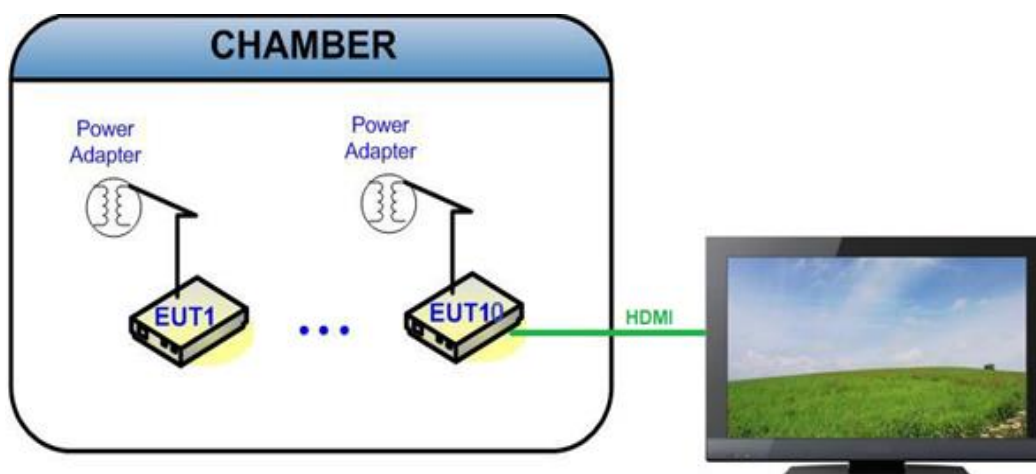
Ta = Acceleration Temperature=50 Deg.C

Tb = Ambient Temperature=25 Deg.C

$$e^{\frac{0.7}{8.6173324 \times 10^{-5}} * \left[\frac{1}{273+T_b} - \frac{1}{273+T_a} \right]} = 8.246797274$$

Confidence Level Factor = 2.30259 (based on Confidence Level 90% and 0 Defect)

It needs **21 days** to test with 0 defects to achieve the goal of **18,050.95429 hours** MTBF.



Test Procedure:

1. Power on, then activated in full function and operation.
2. Ramp the temperature to 50°C for 21days.

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: MIL-STD-781D.**Test Result:**

No.	SN	Before	After	Result
1	2149688100000000000014			Visually no abnormalities
2	2149688100000000000016			Visually no abnormalities
3	2149688100000000000019			Visually no abnormalities

4	21496881000000000000013			Visually no abnormalities
5	21496881000000000000012			Visually no abnormalities
6	21496881000000000000017			Visually no abnormalities
7	21496881000000000000018			Visually no abnormalities

8	214968810000000000000011			Visually no abnormalities
9	214968810000000000000015			Visually no abnormalities
10	214968810000000000000020			Visually no abnormalities