

HALT Test Report

for BFX-UA300 (K18X001T00)

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Revision Change History

Revision	Description of Change	Date
1.0	HALT Test	09/13/2021

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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-UA300 (K18X001T00) product.

The DUT H/W revision 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	Highly Accelerated Life Test (HALT)	1. Cold/Hot temperature step stress test. 2. Rapid thermal transitions stress test. 3. Vibration step stress test. 4. Combined environment stress test. 5. Power on/off cycles in conjunction with above conditions.	5	5 days	To be followed customer spec.	PASS

Panel Drawing:



Front

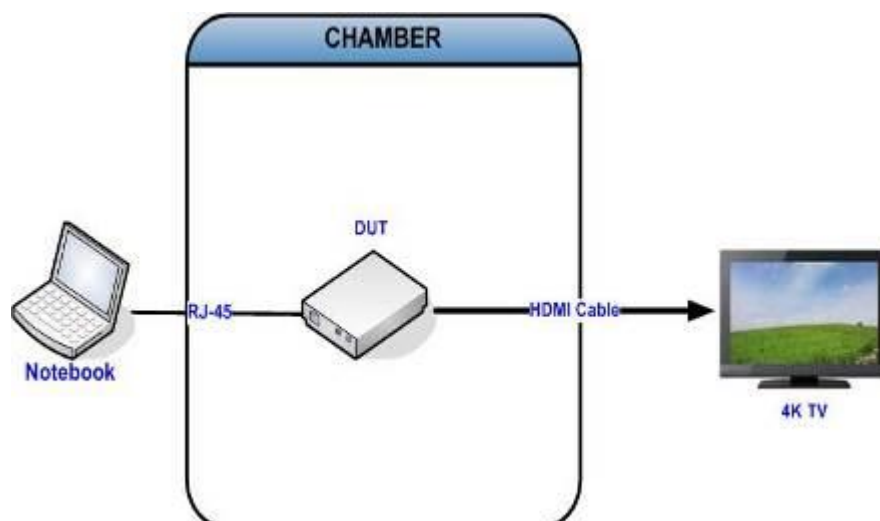


Rear



Adapter

Test setup and function test:



Highly Accelerated Lift Test (HALT)

Purpose:

To demonstrate that the product can be a step-stress process to isolate design weaknesses under temperature and vibration stresses.

Quantity: 5 units

Test Objective:

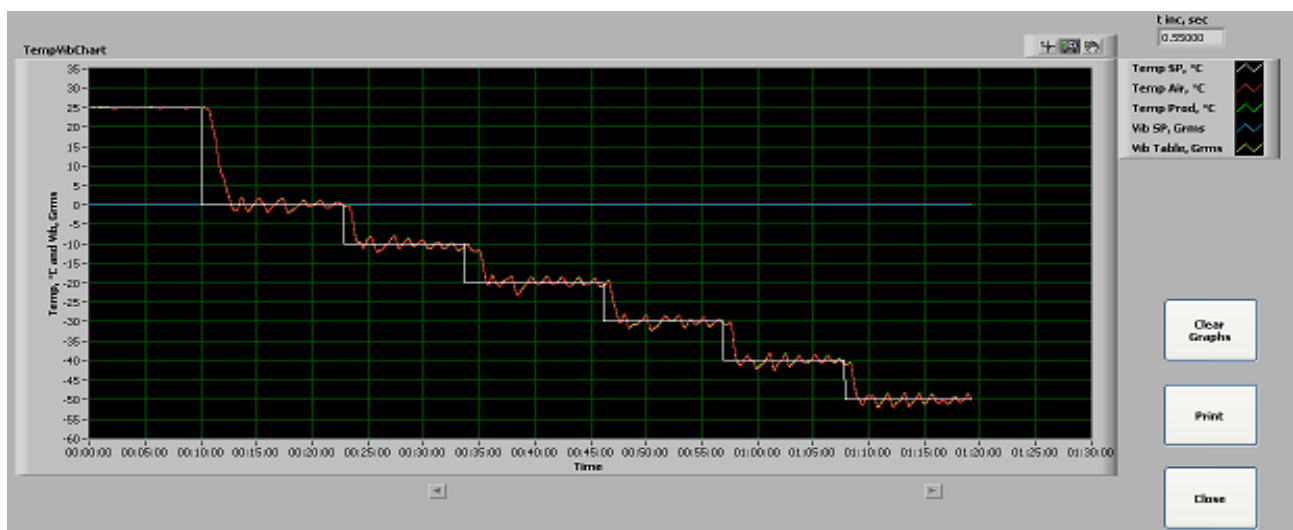
1. Cold/Hot temperature step stress test.
2. Rapid thermal transitions stress test.
3. Vibration step stress test.
4. Combined environment stress test.
5. Power on/off cycles in conjunction with above conditions.

Test Profile:

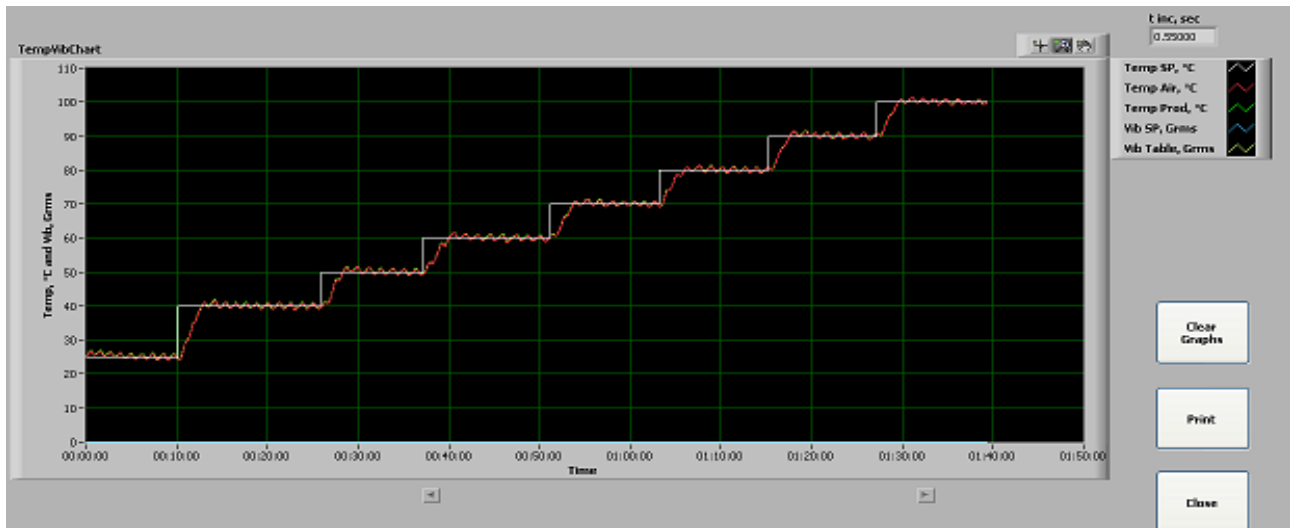


Function Test Setup

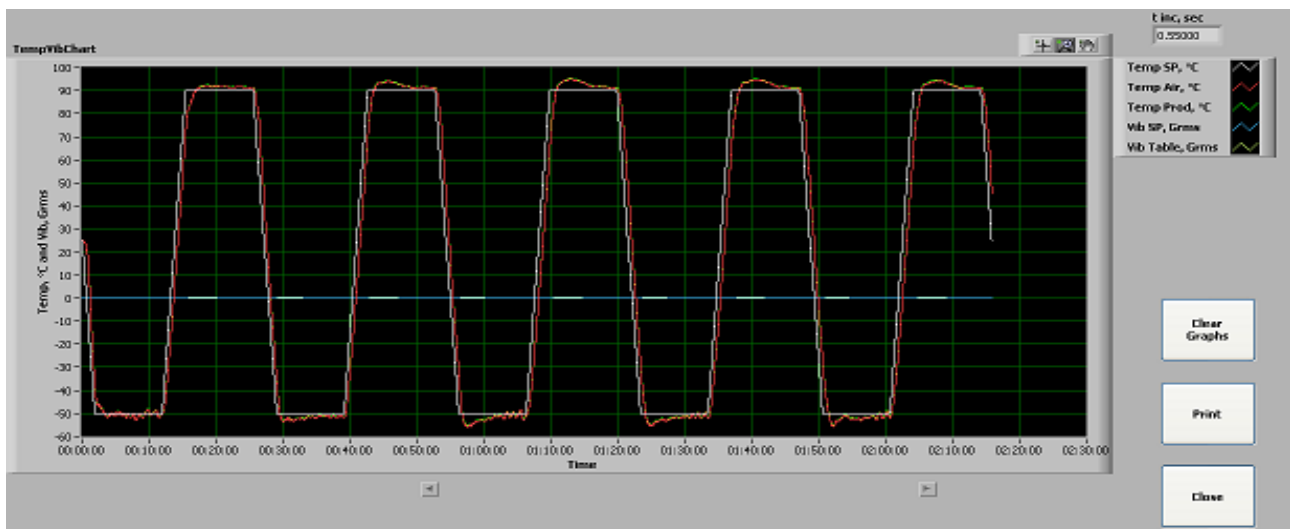
1. Thermal step stress (Cold):



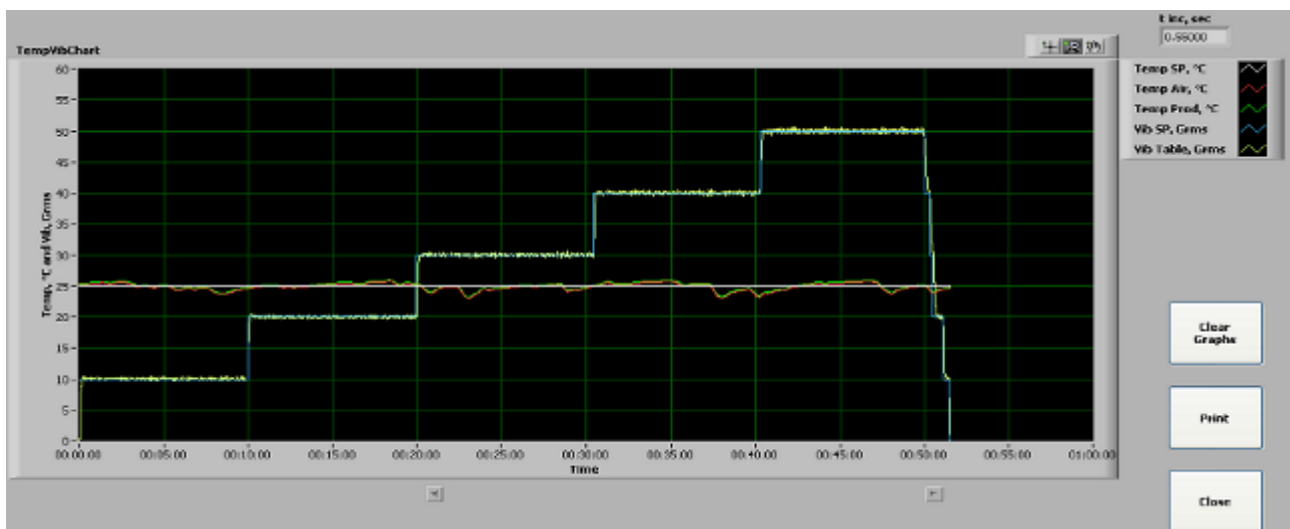
2. Thermal step stress (Hot):



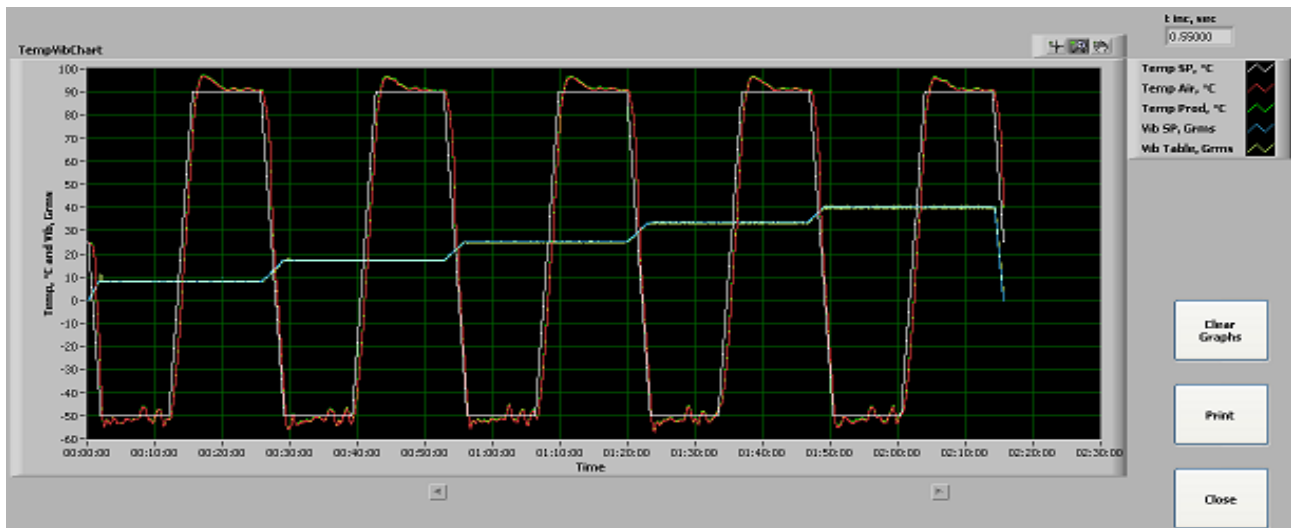
3. Rapid thermal transitions stress test:



4. Vibration step stress test:



5. Combined environment stress test:



Test Procedure:

1. Thermal step stress (Cold):

- 1.1 Perform cold temperature step stress. Start at ambient temperature and decrease by 10°C steps and dwell for 10 minutes at each temperature.
- 1.2 During each step, perform one AC power on-off cycle in addition to the specified functional test.
- 1.3 Check for fixable defects and weaknesses.
- 1.4 Continue until unit can no longer be repaired or chamber limit is reached.

2. Thermal step stress (Hot):

- 2.1 Perform cold temperature step stress. Start at ambient temperature and decrease by 10°C steps and dwell for 10 minutes at each temperature.
- 2.2 During each step, perform one AC power on-off cycle in addition to the specified functional test.
- 2.3 Check for fixable defects and weaknesses.
- 2.4 Continue until unit can no longer be repaired or chamber limit is reached.
- 2.5 At +90°C, Plastic started to deform
- 2.6 At +100°C, the beginning of 100°C, system shutdown.

3. Rapid thermal transitions stress test:

- 3.1 The minimum thermal cycling temperature range is within 5°C of both the lower thermal operating limit and the upper thermal operating limit as discovered in the temperature step stress test above.
- 3.2 The DUT failed at 90°C, setting the range of thermal cycling testing will be -50°C to +90°C.
- 3.3 The thermal ramp rate (temperature change rate) will be as fast as the chamber can go or no less than 40°C/minute on the product.
- 3.4 The dwell time is a minimum of 10 minutes following stabilization of the DUT at the set point temperature.

3.5 The system under test should be powered up continuously throughout the thermal cycling test and will be running five (5) thermal cycles.

4. Vibration step stress test:

- 4.1 Perform vibration step stress. Start at 10Grms and increase, dwell time for 10 minutes for each step.
- 4.2 During each step, perform one AC power on-off cycle in addition to the specified functional test.
- 4.3 Check for fixable defects and weaknesses.
- 4.4 Continue until unit can no longer be repaired or chamber limit (50G) is reached.

5. Combined environment stress test:

- 5.1 The combined test combines power cycle, vibration and temperature stresses
- 5.2 The temperature levels are determined to refer to "Thermal step stress Cold / Hot maximum temperature".
- 5.3 Maximum temperature transition rate by 40 °C per minute.
- 5.4 The vibration test profile is 10, 20, 30, 40, 50 Grms
- 5.5 Minimum dwell time at each combination condition is run one cycle of the diagnostics or 10 minutes.
- 5.6 5 cycles are required to complete the combined test.

Pass Criteria:

- 1. No performance degradation during the test functional verification
- 2. No damage such as cracks, gaps to the test unit, or loss of connectivity, etc.

Basis for Profile:

In developing this profile, the concepts and ideas expressed in the following sources have been reviewed: PRS (Pace Requirements Specification) Version 1.5

Test result: PASS

Test Step Stress:

- 1. System level cold thermal step stress results:

Temperature Set Point (°C)	Test Result	Notes
-10	Pass	
-20	Pass	
-30	Pass	
-40	Pass	
-50	Pass	

Notes: Cold thermal step stress test has reached HALT machine limit of -50(°C).

2. System level hot thermal step stress results:

Temperature Set Point (°C)	Test Result	Notes
50	Pass	
60	Pass	
70	Pass	
80	Pass	
90	Weakness(1)	Plastic started to deform System shutdown
100	Weakness(2)	

Notes: The DUT Upper Operating Limit (UOL) is 100°C.

Weakness (1): At +90°C, plastic started to deform.

Weakness (2): At +100°C, system shutdown. Back to 25°C, DUT function normally.

3. System level rapid thermal transition results:

Cycle	Temperature Set Point (°C)	Test Result	Notes
1	-50	Pass	
1	90	Pass	
2	-50	Pass	
2	90	Pass	
3	-50	Pass	
3	90	Pass	
4	-50	Pass	
4	90	Pass	
5	-50	Pass	
5	90	Pass	

Notes: Rapid thermal transition test result was passed.

4. System level vibration step stress result:

Set Point (Grms)	Test Result	Notes
10	Pass	
20	Pass	
30	Pass	
40	Pass	
50	Pass	

Notes: Vibration step stress test has reached HALT machine limit of 50 Grms.

5. System level combined environment results:

Cycle	Temperature Set Point (°C)	Vibration Set Point (Grms)	Test Result	Notes
1	-50	10	Pass	
1	90	10	Pass	
2	-50	20	Pass	
2	90	20	Pass	
3	-50	30	Pass	
3	90	30	Pass	
4	-50	40	Pass	
4	90	40	Pass	
5	-50	50	Pass	
5	90	50	Pass	

Notes:

1. Combined thermal cycling with vibration test result was passed.
2. Combined environment test result was passed.