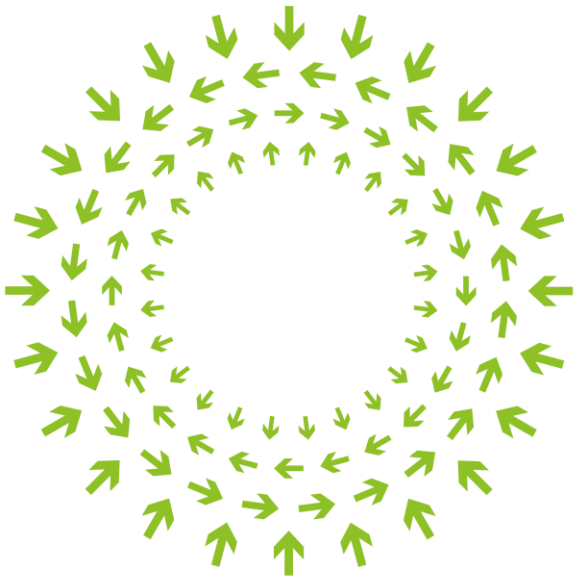


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Compute Project

Switch hardware platform validation test strategy

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1. Scope

This document provides an overview of switch hardware platform validation test strategy. System software feature and functional test are not discussed in this document.

Glossary of Terms

The following terms will be used at various parts of this document:

Term	Definition
EMC	Electromagnetic compatibility
FRU	Field-replaceable unit
SSD	Solid State Drive
UART	Universal Asynchronous Receiver/Transmitter
BMC	Baseboard management controller
TOR	Top-of-rack
CPLD	Complex Programmable Logic Device
DAC	Direct Attach Copper
VLAN	Virtual local area network
PSU	Power supply unit
PCI-e	Peripheral Component Interconnect Express
LPC	Low Pin Count
MAC	Media Access Control
RFC	Request For Comment

2. Objective

This document outlines a system level strategy for testing a switch hardware platform. The objective is to provide a guideline on how to validate hardware function and performance.

This document covers the topics in following categories:

- Hardware bring up
- Hardware functional test
- Four corner test
- Thermal test
- Signal integrity test
- EMC test
- Power test
- Environmental test
- Performance test

3. Hardware bring up

Hardware bring up consists of a list of testing items to verify the essential system function.

3.1 Mechanical check

- Physical inspection test
- FRU test

3.2 CPU Bring Up test

- Boot from BIOS Flash
- Boot OS from SSD

3.3 BMC Bring Up Test

- Boot from SPI Flash
- UART Interface Test

3.4 Power Bring Up Test

- I2C Interface Access Test
- Power-on sequence

3.5 Power supply function test

3.6 Ethernet management interface Test

3.7 Verify switch chip power up and configurations

3.8 Verify BMC power, initialization and console access.

3.9 Verify PCI-e interface

3.10 Verify DDR3 interface

3.11 Verify Debug interfaces

3.12 CPLD test

3.13 QSFP28 link test

4. Hardware functional test

Hardware functional test will cover switch hardware function and feature based on system specifications. Test will cover following categories:

4.1 Hardware interface test

- Management port test
- BMC console port test
- SSD
- USB interface
- RS485 port test
- Debug port test

4.2 Hardware function

- CPLD function
- BIOS test
- BMC sensor test
- BMC management port test
- BMC upgrade

4.3 Power

- Power supply test
- Power consumption measurement

4.4 FAN

- FAN speed test
- FAN operation

4.5 LED test

4.6 Optical interface test

- Optical transceivers test
- Interoperability test

4.7 DAC cable interconnect test

- Cable qualification test
- Interoperability test

4.8 Power cycle test

4.9 Switch port configuration

- Port configuration
- Forwarding function

4.10 Snake traffic test

- Switch is configured with VLAN to have layer 2 forwarding function on adjacent port. Ethernet traffic will go through from port 1 to port 32 with different line rate and data frames.
- The set up configuration on switch port has two options: loopback modules or external cable connection.

5. Four corner test

The objective of the test is to ensure that product is working under extreme temperature and voltage range.

5.1 Temperature range

Ambient temperature range is

Low Temperature = -5 °C

High Temperature = +45 °C

5.2 Voltage range

Voltage range is under ±5%

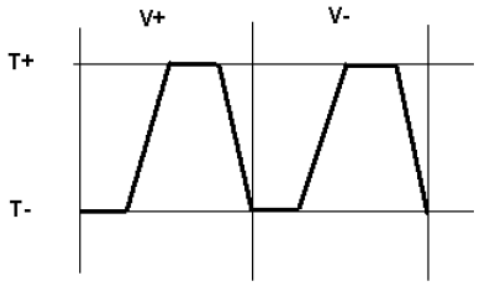
Exception:

VDD_CORE: +/-2%

VDD_ANLG: +/-3%

5.3 Temperature change slop for chamber

Set temperature change slope for chamber = 1.0 °C/min



5.4 Test cycle

4 hours test time for every corner or as defined in system requirement.

5.5 Test order

- High Temperature & High Voltage
- Low Temperature & High Voltage
- High Temperature & Low Voltage
- Low Temperature & Low Voltage

6. Thermal test

The objective of the test is to check all the components has enough margins in required operating temperature. Two steps are adapted to this test, IR thermal scanning and components thermal probing. IR thermal scanning is used to have a whole picture of thermal distribution inside the device and thermal probing is used to probe the actual case temperature of every critical components.

6.1 Operating Test condition:

- System Fan speed setting: System fan control algorithm.
- Environmental temperature setting: 5,15,25,35,45℃
- Air flow: Front to back.
- 2hrs for each test cycle time.
- Traffic setting: System is running line rate 100% traffic and packet size is 200.

6.2 Air-flow measurement condition:

- System Fan speed setting: 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%.
- Environmental temperature setting: Room temperature (about 25).
- Air flow: Front to back.

6.3 Key components

Thermal-couple need to be placed to monitor the temperature of key components during the test

The key components are listed:

- Aspeed AST1250
- Altera chip U6
- BCM5387
- Tomahawk BCM56960
- M.2 SATA module
- 32 QSFP28 100G Transceiver
- Intel Atom Processer
- SO-DIMM module

7. Signal integrity test

The objective of this test is to measure signal integrity of designed circuits to conform to product specification and the relevant industry standards.

The test items should cover following categories:

7.1 PSU

- Output voltage level
- Output ripple
- Output current consumption

7.2 Power measurement

- Output ripple
- Output current
- Power up sequence
- Power on reset

7.3 Source clock

- 50MHz
- 100MHz
- 156.25MHz
- External clock

7.4 Interface

- UART
- I2C
- PCIE
- LPC
- USB
- DDRIII
- FAN
- SGMII
- 40G XLPPI
- 100G CAUI-4

8. EMC test

The objective of this test is to verify product's electromagnetic compatibility conform to industrial regulatory and system requirement.

8.1 Regulatory requirements in radiated / conducted Emission

- EN 55022 : 2010 + AC : 2011 Class A
- FCC Title 47 CFR, Part 15 Subpart B
- EN 61000-3-2 : 2014
- EN 61000-3-3 : 2013 (Criteria A)
- EN 55024 : 2010
- IEC 61000-4-2:2008 (Criteria B)
- IEC 61000-4-3:2010 (Criteria A)
- IEC 61000-4-4:2012 (Criteria B)
- IEC 61000-4-5:2005 (Criteria B)
- IEC 61000-4-6:2013 (Criteria A)
- IEC 61000-4-8:2009 (Criteria A)
- IEC 61000-4-11:2004 (Criteria B/C)

8.2 The following items are covered in EMC test.

- FCC –Rad. & Cond.
- CE –Rad. & Cond.
- EN61000-4-2 ESD
- EN61000-4-3 RS
- EN61000-4-4 EFT
- EN61000-4-5 Surge
- EN61000-4-6 CS
- EN61000-4-8 PFMF
- EN61000-4-11 Power dip

9. Environmental test

The objective of this test is to verify system comply with international standard and system requirement.

9.1 The standards used for test are

- GR63-CORE issue 4
- ISTA 2A

9.2 Environment Test Matrix

GR63 Temperature, Humidity and Altitude Test Methods				
No.	Para.	Test Name	Test Severity	Duration
1	4.1.1.1	Low-Temperature Exposure and Thermal Shock (packaged)	23C to -40C 30C /Hr -40C 24 Hr -40C to 23 < 5 mins	27 hrs
2	4.1.1.2	High Relative Humidity Exposure (Packaged)	23C to 40C 50 % 30C /Hr 40C 50% to 93% < 2 Hr 40°C 93% soak 8 Hr 40C 93% to 50% <2Hr 40 to 23 50% 30C/Hr	27 hrs
3	4.1.1.3	High-Temperature Exposure and Thermal Shock (Packaged)	23C to 70C 30C /Hr 70C 24 Hr 70C to 23C < 5 mins	27 hrs
4	4.1.2	Operating Temperature and Relative Humidity (R4-6)	23C, 50% -> 5C, 5% (1Hrs) 5C, 5% -> 40C, 85% (2Hrs) 40C, 85% (dwell 16Hrs) 40C, 85% -> -5C (1.5 Hrs) -5C -> 45C, 93% (3 Hrs) 45C, 93% (dwell 16Hrs) 45C, 93% -> 23C, 93% (1 Hr) 23C, 93% (dwell 4 Hrs) 23C, 93% -> 40C, 93% (0.5 Hr) 40C, 93% (dwell 16 Hrs) 40C, 93% - > -5C (1.5 Hrs) -5C (dwell 16 Hrs) -5C -> 30C, 93% (2 Hrs) 30C, 93% (dwell 96 Hrs) 30C, 93% -> 40C, 47% (1 Hr) 40C, 47% -> 23C, 50% (0.5 Hr) 23C, 50% (dewll 4 Hrs)	182 hrs
5	4.1.3	Operating Altitude (04-10,)(O4-11)	25C, 101.3 KPa -> 45C, 101.3 KPa (50 mins) 45C, 101.3 KPa -> 45C, 81.2 KPa (1 hr 21 mins) 45C, 81.2 KPa (dwell 8 hrs) 45C, 81.2 KPa -> 40, 81.2 KPa (2 hrs) 40C, 81.2 KPa -> 40C, 61.9 KPa (1 hr 17 mins) 40C, 61.9 KPa (dwell 8 hrs) 40C, 61.9 KPa -> 40C, 101.3 KPa (2 hr 38 mins) 40C, 101.3 KPa -> 25C, 101.3 KPa (5 hrs)	30 hrs

Equipment Handling

No.	Para.	Test Name	Test Severity	Duration
1	ISTA 2A	Handling Drop Tests -Packaged Equipment	ISTA 2A	2 hrs
2	4.3.2	Unpackaged Equipment -Drop Tests (All Equipment)	100mm	2 hrs

Office Vibration ,Transportation Vibration and Acoustic

No.	Para.	Test Name	Test Severity	Duration
1	4.4.4	Office Vibration Test Procedure; 90 minutes/axis	5 ~ 100~ 5 Hz 0.1 octave/min approximately 90 mins	4 hrs
			5-10 +12dB/Octave 10-50 0.0042 g2/Hz(0.04m2/sec3) 50-100 -12dB/Octave 30 mins per axis	4 hrs
2	4.4.5	Transportation Vibration-Packaged Equipment	5-20 0.01g2/Hz(1.0 m2/sec3) 20-200 -3dB/octave , 30 mins in each axis	2 hrs
3	4.6	Acoustic noise	Sound Pressure	1 hrs

10. Performance test

The objective of this test is to measure the networking performance， such as throughput and latency using well-known benchmark testing.

10.1 RFC 2544

This test will test for Ethernet throughput, latency, and frame loss. (http://www.ietf.org/rfc/rfc2544.txt)

10.2 RCF 2889

This test is a series of dedicated performance tests for Ethernet switches. (http://www.ietf.org/rfc/rfc2899.txt). It includes tests for

- Forwarding performance
- Congestion control
- Latency
- MAC address handling and filtering