



Allion Storage Validation Service

Sen Chan, Director

2023/05/29

Agenda



- ☐ SD Test Fixture
- ☐ Storage Validation

SD Test Fixture

SD Test Fixture List

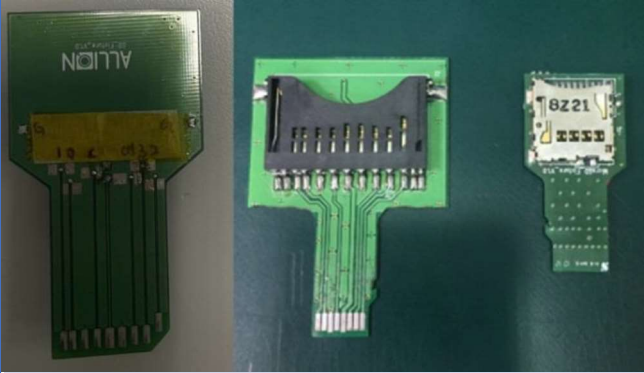


☐ Electrical Test

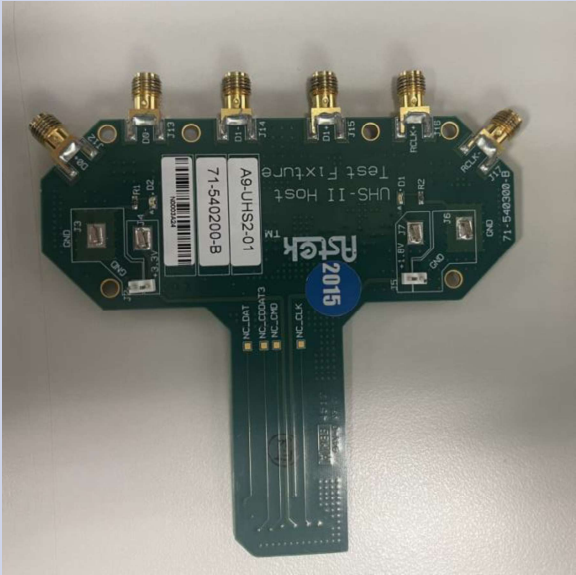
- Allion have the following test fixture can provide the measurement and debugging consultant service.

Program	Availability	Note
SD 3.0 Host	Yes	Designed by Allion
SD 4.0 Host	Yes	
SD 4.0 Device	Yes	
SD 7.0 Host	Yes	
SD 7.0 Device	Yes	
SD 8.0 Host	Yes	Covered SD 9.0 Host
SD 8.0 Device	Yes	Covered SD 9.0 Device
Micro SD 4.0 Host	Yes	


SD3.0 Host

Program	Test Fixture	Test item
SD 3.0 Host (Allion designed)		SD 3.0 Host electrical testing Default speed/high speed/SDR104


SD4.0 Host

Program	Test Fixture	Test item
SD 4.0 Host		SD 4.0 Host electrical testing UHS156/UHS624

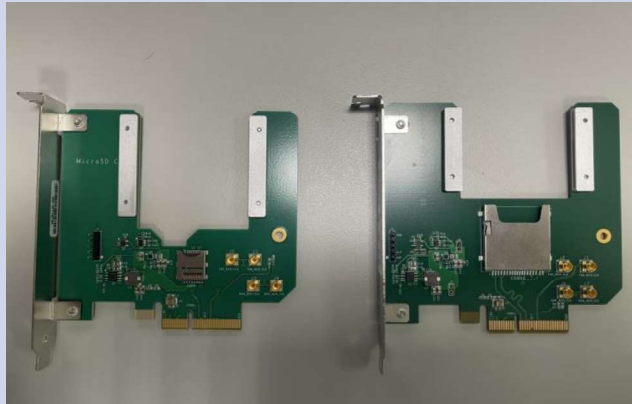
SD4.0 Device

Program	Test Fixture	Test item
SD 4.0 Device		SD 4.0 Device electrical testing UHS156/UHS624

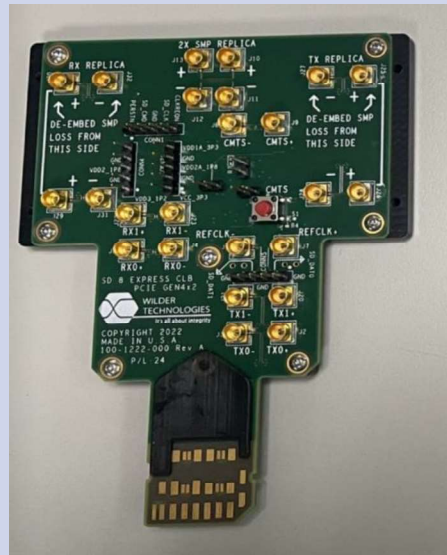
SD7.0 Host

Program	Test Fixture	Test item					
SD 7.0 Host		<div>SD 7.0 Host electrical testing (PCIe Gen3x1)</div> <table><tr><td>System Board Transmitter Signal Quality</td></tr><tr><td>System Board Transmitter Preset Test for 8.0GT/s</td></tr><tr><td>System Board Transmitter Link Equalization Response Test for 8.0GT/s</td></tr><tr><td>System Receive Jitter Tolerance Test</td></tr><tr><td>System Receiver Link Equalization Test for 8.0 GT/s</td></tr></table>	System Board Transmitter Signal Quality	System Board Transmitter Preset Test for 8.0GT/s	System Board Transmitter Link Equalization Response Test for 8.0GT/s	System Receive Jitter Tolerance Test	System Receiver Link Equalization Test for 8.0 GT/s
System Board Transmitter Signal Quality							
System Board Transmitter Preset Test for 8.0GT/s							
System Board Transmitter Link Equalization Response Test for 8.0GT/s							
System Receive Jitter Tolerance Test							
System Receiver Link Equalization Test for 8.0 GT/s							

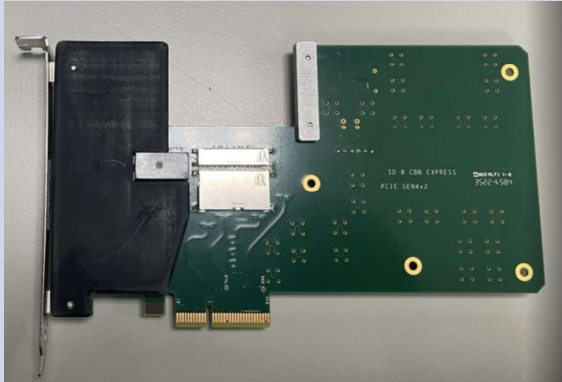
SD7.0 Device

Program	Test Fixture	Test item
SD 7.0 Device		SD 7.0 Device electrical testing (PCIe Gen3x1)
		Used in combination with PCIe CEM CBB3
		ADD-IN Card Transmitter Signal Quality (2.5G/5G and 8G)
		ADD-IN Card Transmitter Pre-Set Test for 8GT/S
		ADD-IN Card Transmitter Initial TX EQ Test for 8GT/S
		ADD-IN Card Transmitter LINK EQ Response Test for 8GT/S
		ADD-IN Card Receiver Jitter Tolerance Test
		ADD-IN Card Receiver Link Equalization Test for 8GT/S
ADD-IN Card PLL Bandwidth		

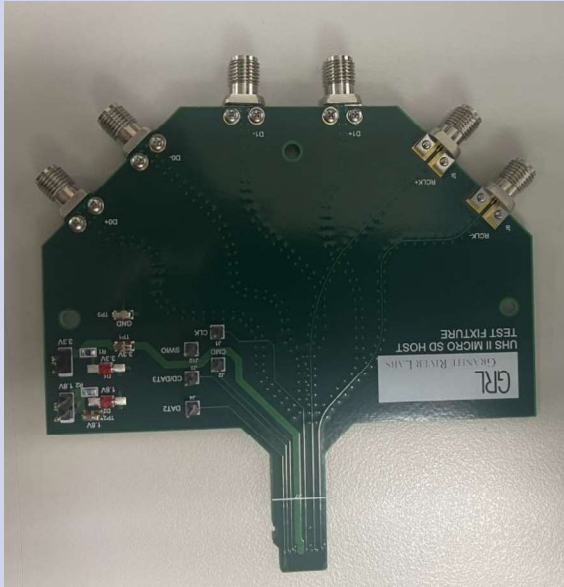
SD8.0 Host

Program	Test Fixture	Test item				
SD 8.0 Host		<p>SD 8.0/9.0 Host electrical testing (PCIe Gen4x2)</p> <table><tr><td>System Board Transmitter Signal Quality</td></tr><tr><td>System Board Transmitter Preset Test for 16.0GT/s</td></tr><tr><td>System Board Transmitter Link Equalization Response Test for 16.0GT/s</td></tr><tr><td>System Receiver Link Equalization Test for 16.0 GT/s</td></tr></table>	System Board Transmitter Signal Quality	System Board Transmitter Preset Test for 16.0GT/s	System Board Transmitter Link Equalization Response Test for 16.0GT/s	System Receiver Link Equalization Test for 16.0 GT/s
System Board Transmitter Signal Quality						
System Board Transmitter Preset Test for 16.0GT/s						
System Board Transmitter Link Equalization Response Test for 16.0GT/s						
System Receiver Link Equalization Test for 16.0 GT/s						

SD8.0 Device

Program	Test Fixture	Test item
SD 8.0 Device		SD 8.0/9.0 Device electrical testing (PCIe Gen4x2) Used in combination with PCIe CEM CBB4
		ADD-IN Card Transmitter Signal Quality (2.5G/5G/8G and 16G) test track
		ADD-IN Card Transmitter Pre-Set Test for 16GT/s
		ADD-IN Card Transmitter Initial TX EQ Test for 16GT/s
		ADD-IN Card Transmitter LINK EQ Response Test for 16GT/s
		ADD-IN Card Receiver Link Equalization Test for 16GT/s
		ADD-IN Card PLL Bandwidth

MicroSD 4.0 Host

Program	Test Fixture	Test item
MicroSD 4.0 Host		MicroSD 4.0 Host electrical testing UHS156/UHS624

Allion PCI Express Test Fixture



- In the era of high-speed transmission, Allion Labs commits to the development of PCIe high speed interfaces. We have corresponding high-frequency test fixtures for CEM, M.2, U.2/U.3, EDSFF E1/E3, and OCP NIC 3.0. Combined with our multi-party resource integration services and comprehensive validation planning, Allion simplifies and reduces your product development process.
- PCIe Compliance Electrical Testing

M.2 CLB5.0 Test Fixtures



U.2/U.3 CLB5.0 Test Fixture



OCP NIC3.0 CLB5.0 Test Fixtures



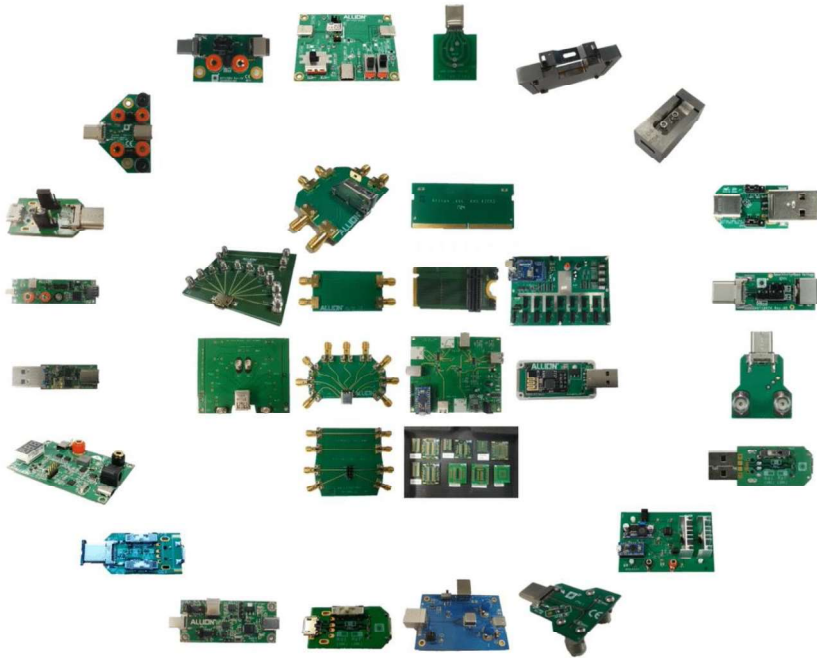
CEM CBB5.0 Test Fixture



OCP NIC3.0 CBB5.0 Test Fixture



Allion Test Fixture Design Capability



USB, HDMI, DP, PCIe, Interposer

- We can design test fixtures based on different standards and specifications and have conducted 100+ fixture design projects, involving high-frequency fixtures and other fixture designs. No matter what types of fixtures you are looking for, Allion is able to provide customizable fixtures that ensure product validation efficiency and cost-effectiveness.
 - Compliance/Certification Qualified Test Tool/Fixture
 - High Speed Measurement Test Fixture
 - Non-standard Test Fixture Design
 - Mechanical/Reliability/HALT Special Fixture Development
 - Automation Test Fixture Design
 - Mass Production QC Test Fixture Development

Storage Validation

Allion SD Memory Card and Flash Storage Services



Validation Category	Planning	Design	After Market
H/W	Key components Evolutions	SQ Tests	EMI/EMC
Driver/Software	OS File System Format	Windows(WHQL), Linux, Mac OS Based Testing	Evaluation Cycle on Updates
Logo Certification	Latest Spec Checking	USB, SATA, PCIe, SD, Thunderbolt,	Spec Update Testing
Benchmark	Competitor Analysis	Performance Tests	Mass Production Sampling
Reliability	Define Operation Condition	Environmental Test User Simulator Test (HALT)	Mass Production Checking
Marketing	Factor Targeting	Benchmark	Market Feedback Checking

Allion Flash Storage Test Service



□ We are providing several types of Flash Storage Test Services.

➤ **SSD**(Client/Retail/Enterprise)

1. Competitive Analysis
2. Interoperability Test
3. Power/Current Evaluation
4. Host Memory Buffer Performance
5. Endurance Cycle
6. Temperature
7. SNIA Based Latency Test
8. Chromebook AVL Test
9. SATA-Logo Test
10. PCIe-Logo Test
11. Protocol Test

➤ **SD Card**

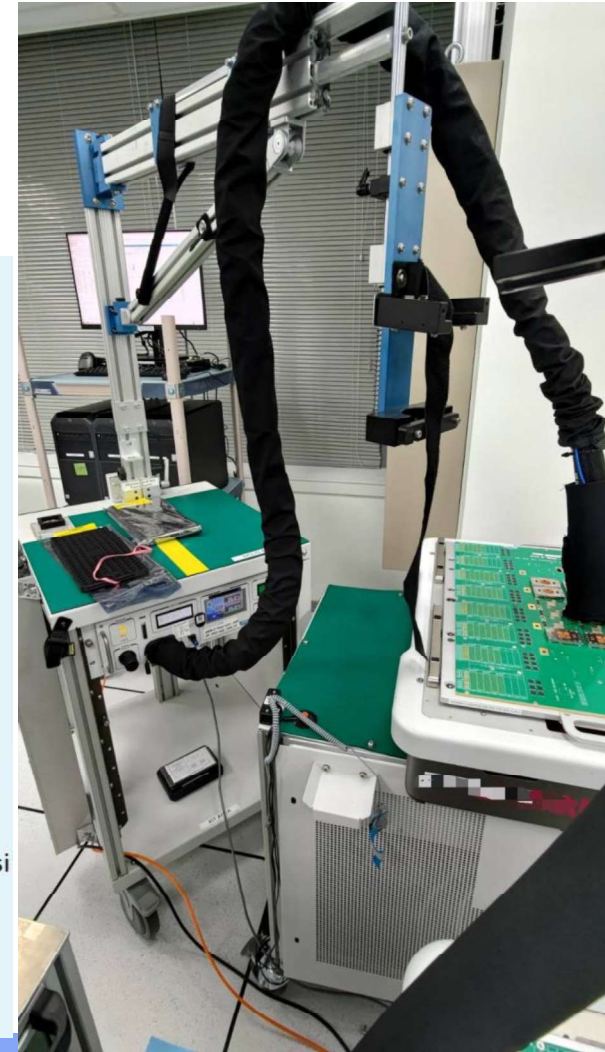
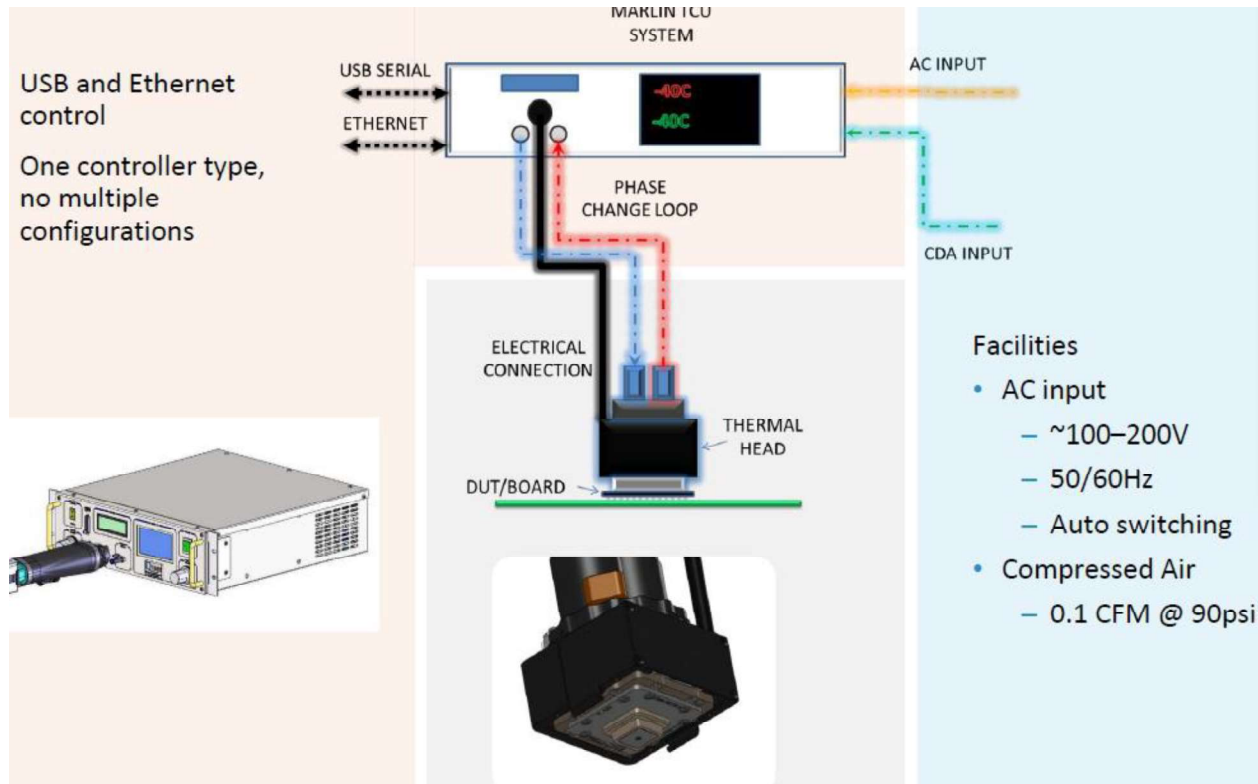
1. Competitive Analysis
2. Interoperability Test
3. Smart Phone IOP
4. Chromebook AVL Test
5. SDA based Tests
 - Mechanical
 - Environmental
 - SQ & Protocol
 - File Format
 - Power / Current
 - Combinations above

➤ **USB Memory**

1. Interoperability Test
2. Chromebook AVL Test
3. USB Logo Certification
4. WHQL Certification

Thermal Test on Chip (1/2)

- Heating or cooling the copper block, and directly contacting the IC for temperature changes



Thermal Test on Chip (2/2)

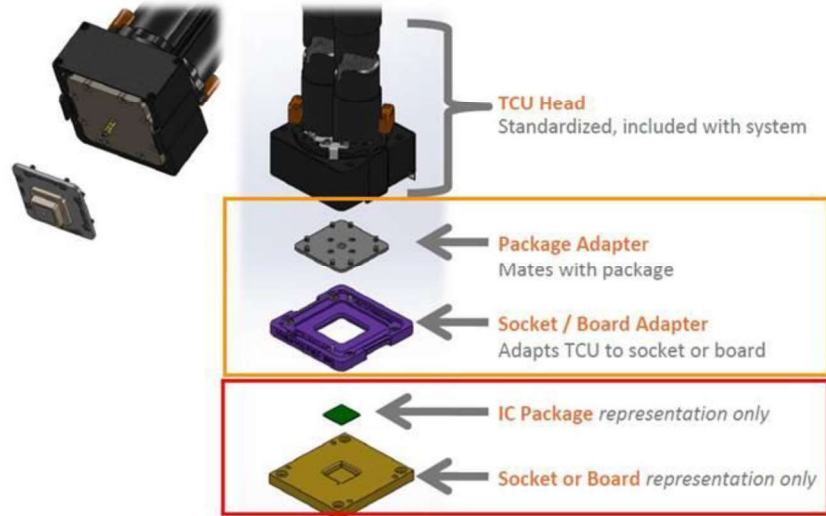
ALLION

SD Association

■ Sensata TCU-0554-05-SYSTEM-01

- -60°C~150°C Thermal Rang
- Up to 70°C / min

Flexible: TCU Head and Kit Components



Power Handling	Power Handling (Case Temp)	25 Watts @ -40C 60 Watts @ -10C 125 Watts @+50C
Operating	System - Temperature Range Accuracy Transition Rate TCU Head Actuation Actuation Force (max) Remote Sensor	-60C to +150C (std) ± 3°C Up To 70°C / min Pneumatic 45 kg 1- Type K, Thermal Diode
Mechanical	Controller Size (W X H X D) Thermal Head Dimensions (W X H X D) Controller to Thermal Head Distance Max Package Size Supported	480mm x 130mm x 400mm 59mm x 50mm x 59mm ~ 2.5m 35mm
Communication	USB Ethernet TCP/IP Touch Screen	Type B RJ45 4.3" Ruggedized LCD
Facilities	Operating Temperature Power Plug Compressed Dry Air	-10°C to +45°C (non condensing) 100V-240V AC 50-60Hz 6A Max (100V) 2.5A Max (240V) C14 <1cfm @ 90psi (-55°C dewpoint)

Storage Industry Standard Conformance Test



- Allion cooperate with well-known test verification tool developer, and use the test tools developed by it and the corresponding SATA/NVMe test scripts to provide relevant SATA/NVMe SSD Certification Test
 - Industry Standard Conformance Test
 - » SATA/SAS Compliance Test
 - » PCIe Compliance Test
 - » Microsoft HLK for storage test
 - » NVMe® Protocol Test
 - » NVMe® Regression Test
 - » NVMe® Management Interface (NVMe-MI™)
 - » NVMe® Open Compute Project (NVMe OCP 1.0)
 - » NVMe® Zoned Namespaces (NVMe ZNS)
 - » TCG Opal Protocol Test
 - » TCG Opal Certification Test

Storage Performance Competitive Analysis & Benchmark Test



- ❑ With our customized one-stop solution, your SSD will have a series of test, including numerous pre-defined workloads, NCQ depth, flush disable/enable and more. Furthermore, we are able to compare your SSD with other companies' SSDs through transparent charts and accurate data, which would pinpoint the advantages and differences between your product and others.

- **Identify and SMART Validation Test**

- **Oakgate Performance Test**

- ❑ Customize performance test or Use specific workload (e.g. 4K RND Read/Write or 128K SEQ Read/Write)
 - ✓ Random or Sequential Read/Write
 - ✓ QDs settings
 - ✓ IOPs & Throughput evaluation

- **SNIA Performance PTS**

- ❑ SNIA IOPS Test
- ❑ SNIA Throughput Test
- ❑ SNIA Latency Test

- **JetStress Test**

- **FIO/Iometer/VDBench Performance Test**

Storage Reliability Test (1/2)



- Allion collaborates with a well-known Japanese laboratory, Hirota Seisakusho Limited, to offer the “Hirota Smart Tester” and test scripts along with the programmable temperature and humidity test chamber.

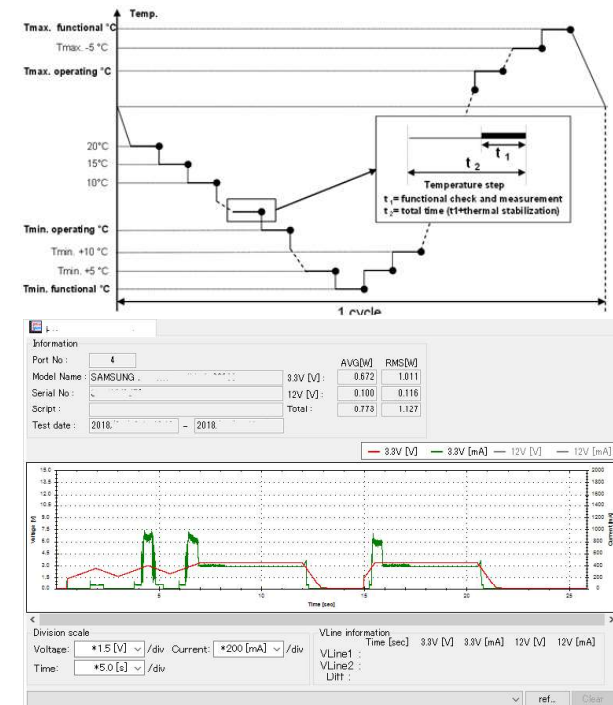
- Thermal Cycling test

Within the range of SSD operating temperature, the test temperature is steadily increased to observe how the performance changes and to find out weaknesses of the device.

- Four-Corner Test

The four-corner test integrates 4 quadrants of test conditions. Data-reading and data-writing will be repeated for a long time to verify the performance of HDD/SSD at different levels of temperature and voltage.

- ✓ High/low operating temperature
- ✓ +/- 5% of the operating voltage



Storage Reliability Test (2/2)

Retention test with High temp

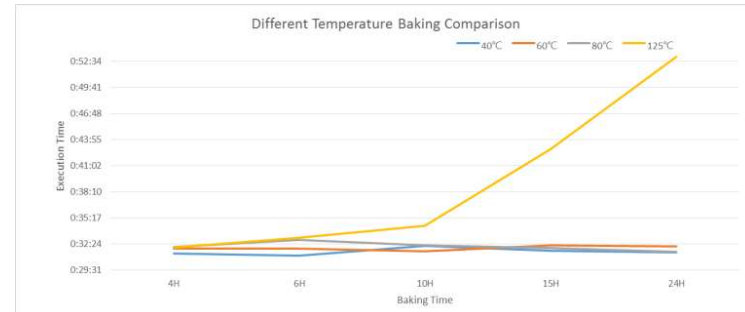
The data is written to a DUT according to the JEDEC specification.

Then power off the DUT and put it into a chamber for a thermal test that goes on for a while. Finally, the DUT will be put into the test equipment for a full disk check and SMART check.

Total Bytes Written (TBW) Test for Enterprise & Client SSD

Evaluation of write endurance by JEDEC 219.

- Endurance
- Data Retention
- Read Disturb









User Scenario Simulation Test

□ User Reliability

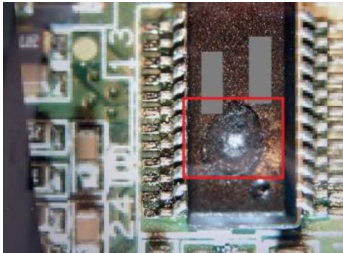
- Transportation



No.	Type	Descriptions
1	Typhoon 8.0	<ol style="list-style-type: none"> 1. Model Name: Typhoon 8.0 2. Thermal Range: -100 °C ~ +200°C 3. Thermal Ramp Rate: 70°C / mins average 4. 6 DoF (3 trial axial & 3 rotational) Repetitive Shock Vibration 5. Acceleration: 5 ~ 75 Grms 6. Table Size: 100" x 48" (W:120cm H:135cm D:240cm) <div>  X 6 ;  X 8 ~ 10 ;  X 4 </div> <ol style="list-style-type: none"> 7. Table Capacity: 1200 lbs(544 kg)
2	Typhoon 4.0	<ol style="list-style-type: none"> 1. Model Name: Typhoon 4.0 2. Thermal Range: -100 °C ~ +200°C 3. Thermal Ramp Rate: 70°C / mins average 4. 6 DoF (3 trial axial & 3 rotational) Repetitive Shock Vibration 5. Acceleration: 5 ~ 75Grms, 6. Table Size: 48" x 48" (W:120cm H:85cm D:120cm) <div>  X 2 ;  X 4 ~ 6 ;  X 2 </div> <ol style="list-style-type: none"> 7. Table Capacity: 600 lbs(272 kg)

Reference: Failures Identified via HALT Test

IC melt down



**Solder issue, check via
Red ink & Microscope**



**Audio issue, Check in
Acoustic chamber**



Metal case bent



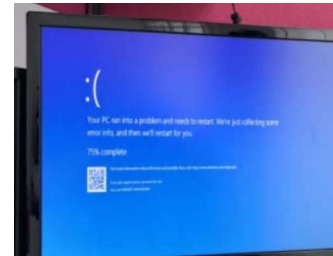
Parts tilt or spilt



Capacitor Burst



System crash



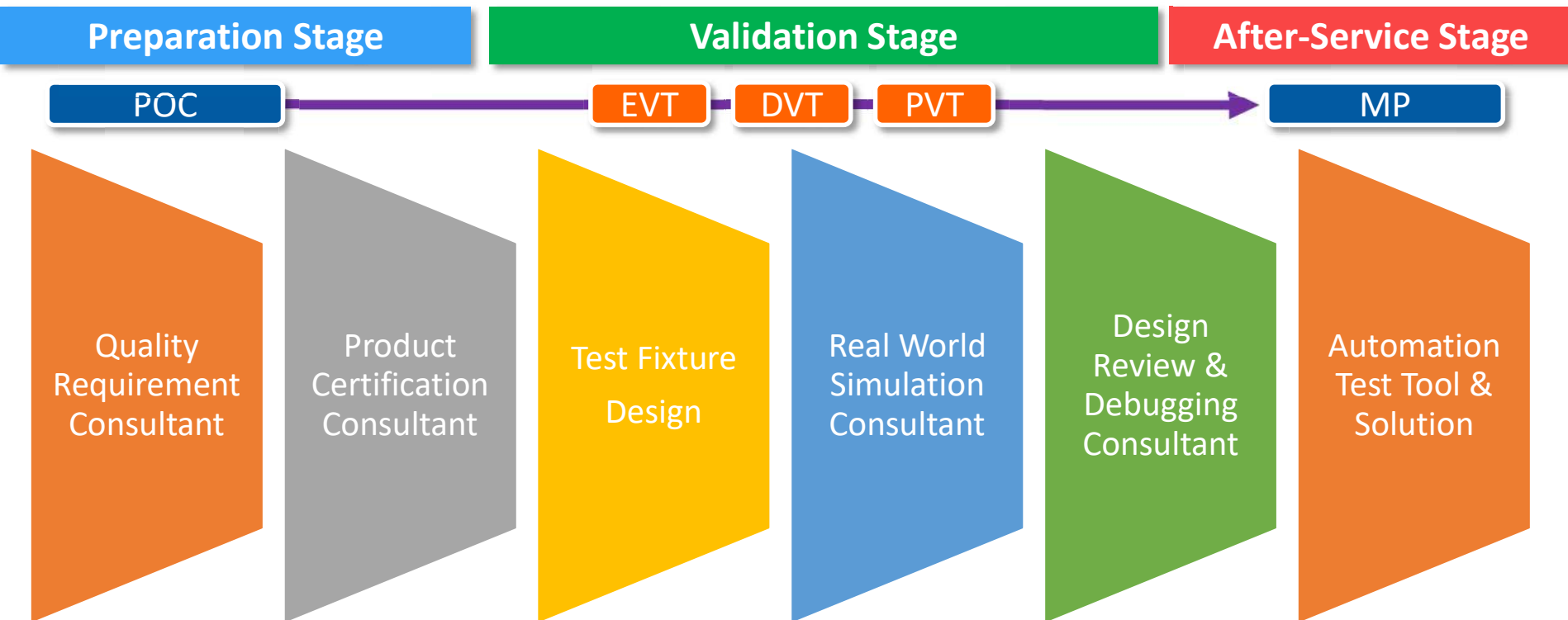
Fabric wrinkled



Allion Comprehensive Consulting Services



- Allion offers comprehensive consultant services in every stage of the product development process.



Allion is the premier resource for all of your third-party testing needs. Our services bring products to market more quickly, reliably, and cost-effectively to protect your brand quality and that of your suppliers.

Thank you

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