AV1000

Dual NVIDIA RTX6000 Liquid Cooled GPU Server

THERMAL TEST REPORT

Product Manager	H/W Leader	System Engineer	DQA Leader	DQA Engineer
Vinnie Yuan	James Chan	Darren Cheng	Jason Liu	Marc Liu

Date: 15/09/2021

Test Report

Revision Date: Sep. 15. 2021

INDEX

1. SYSTEM SPEC

1-1. PRODUCT PHOTOS

1-2. SYSTEM CONFIGURATION

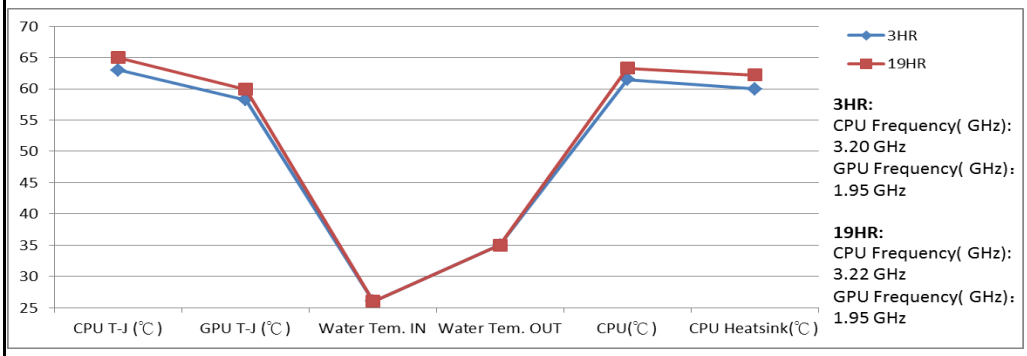
System Configuration		
Item	**Vendor**	**Description**
Motherboard	SUPERMICRO	X12SPZ-SPLN6F
CPU	Intel	ES SMP QUYUL/L0 ICX-SV 16C 2.6G 24MB FC-LGA16A 185w
Memory	Samsung	32GB RDIMM DDR4
GPU	NVIDIA	RTX 3070
SATA port	innodisk	SSD 64G
LAN1	Intel	Quad LAN with 1GbE with Intel® I350-AM4 Dual LAN with Broadcom BCM57414 25G SFP28

2. Test Plan

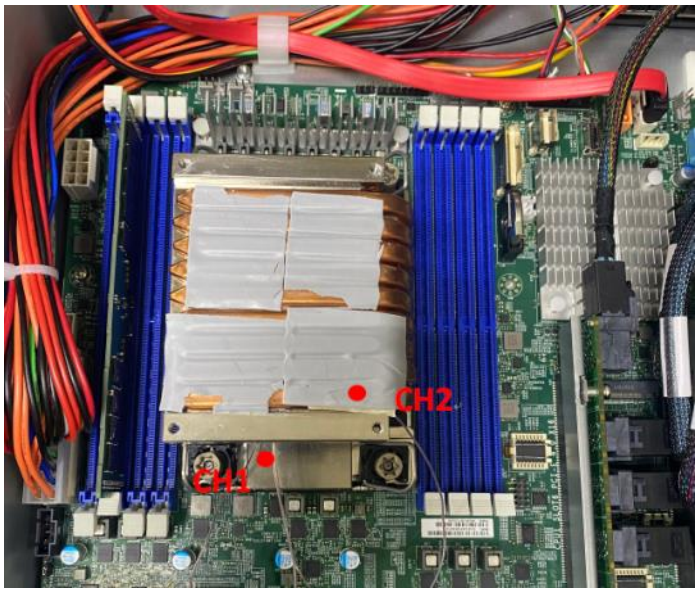
2.1 TESTING WITH LIQUID COOLED SYSTEM

2-1-1. Thermal Measurement Process

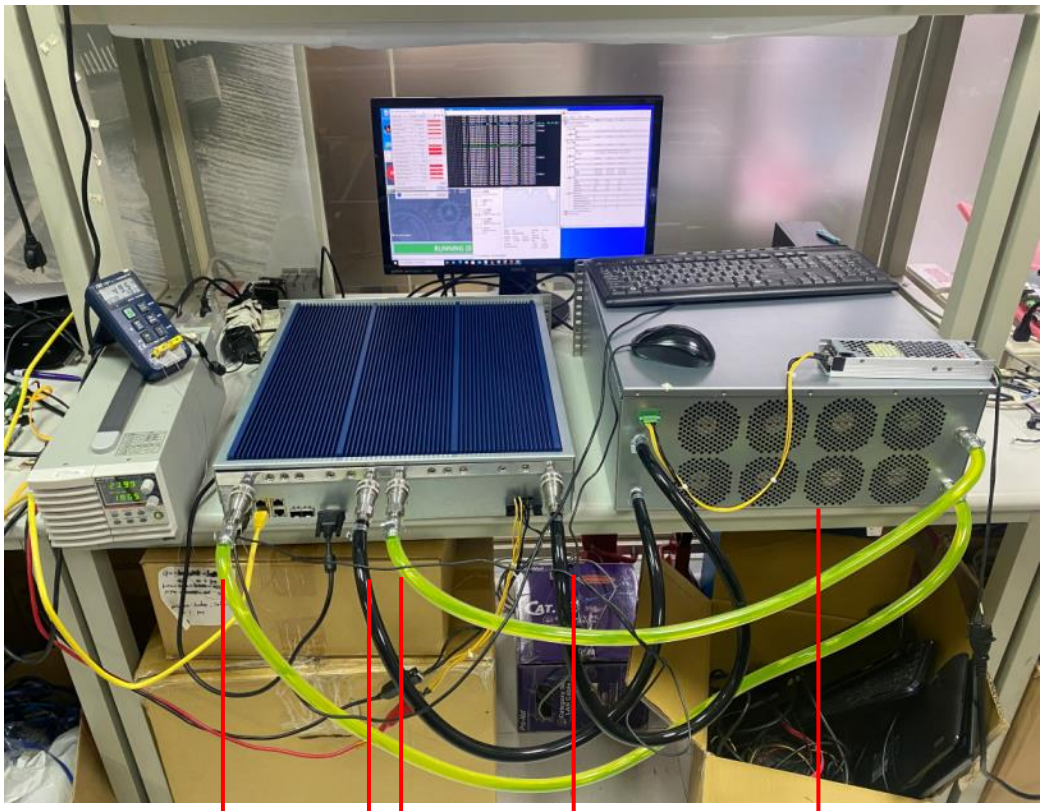
AV1000 liquid cooled system + EUT testing with 100% full loading of CPU @25℃.

Test Purpose	The purpose of performing thermal profile test is to identify potential thermal problem of the EUT. And it is to aid products in reliability assessment considering that semiconductor failure rates rise rapidly with increasing junction temperature In case of systems cooling, patterns will vary with stacking choices, temperature/thermal mapping can aid in the development of optimum tacking arrangements
Test Equipment	1. KSON THS-B4T-150 Chamber 2. YOKOGAWA MV1000, Thermometer (FLUKE50D K/J) 3. Infrared thermal imaging camera Model TVS-200EX
Quantity Tested	Minimum 1 Set
Test Software	Passmark Burn-In Test under Windows 10 NiceHashMiner For Graphic Card
Test Procecedure	1. Thermal pre-scan measurement: Temperature: 24~26℃/40~60%RH Capture thermal IR photo for whole boards after the EUT execute passmark burn-in test with 100% lading during 1 hour at least. 2. Thermal actual measurement: a. Select the test points according to the IR photo and attach thermocouples to the hot points b. Put the EUT in thermal chamber and set the temperature profile of as test specification c. Turn on the thermal chamber and power on the EUT to enter windows environment to run Max Power Test + 3DMARK 2003 application program d. After the EUT executing the test software for 4 hours, record thermal maximum value for each thermocouples point. e. Turn off the thermal chamber and EUT f. Verify and check recorded figure of each components to its' operating temperature range listed in specification/approval sheet of each measured component
Test diagram of curves	

2-1-2. THERMAL TESTING PHOTOS



CH1	CPU
CH2	CPU Heatsink



Water In Water Out Water In Water Out Water cooling system

2-1-3. TEST RESULT @25℃

Point		3HR	19HR
CPU Frequency(GHz)		3.20	3.22
CPU T-J (℃)		63	65
GPU Frequency(GHz)		1.95	1.95
GPU T-J (℃)		58.2	59.9
Water Tem. IN		26	26
Water Tem. OUT		35	35
Water Flow(L/H)		467	467
CH1	CPU(℃)	61.5	63.3
CH2	CPU Heatsink(℃)	60	62.2

Water flow

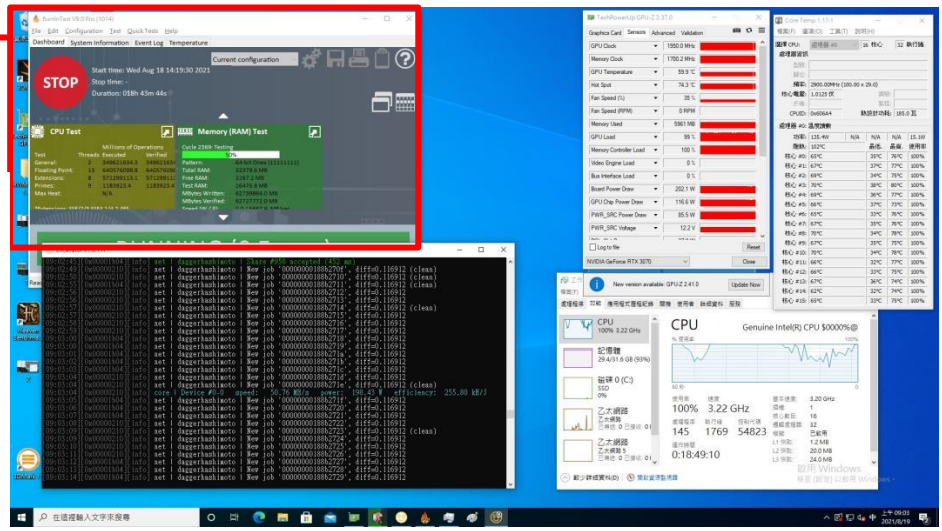
Water temp.

Fan speed

Water flow

Water temp.

Fan speed



Testing with liquid cooled system @25℃, @18h 43m, Water temp. In: 26℃, Water temp. Out: 35℃,

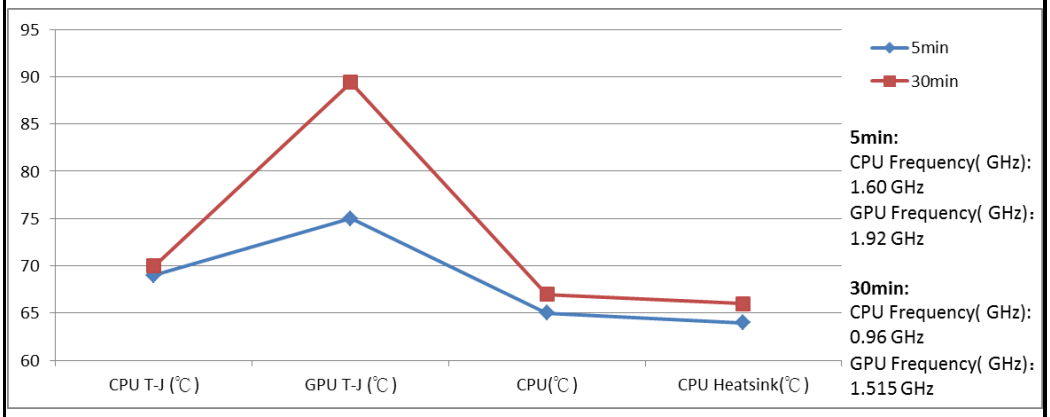
CPU Frequency: 3.22 GHz

GPU Frequency: 1.95 GHz

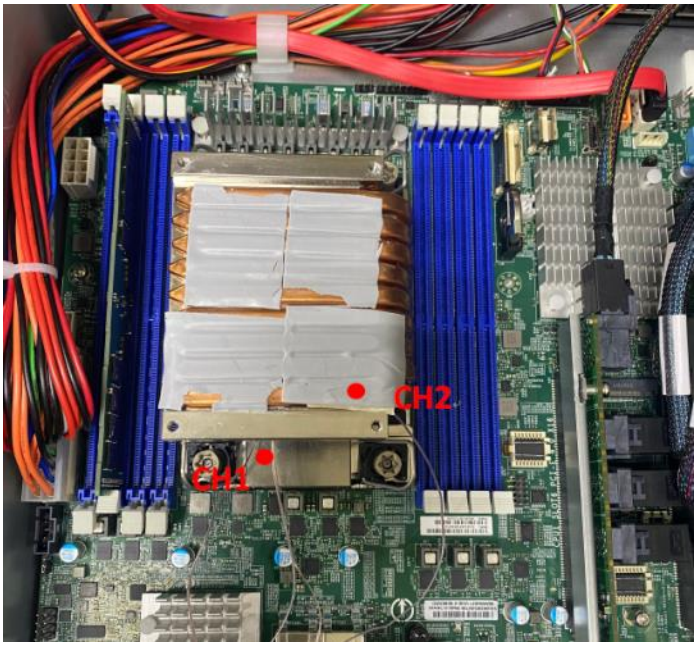
2.2 TESTING WITHOUT LIQUID COOLED SYSTEM AFTER USING LIQUID COOLED SYSTEM

2-2-1. Thermal Measurement Process

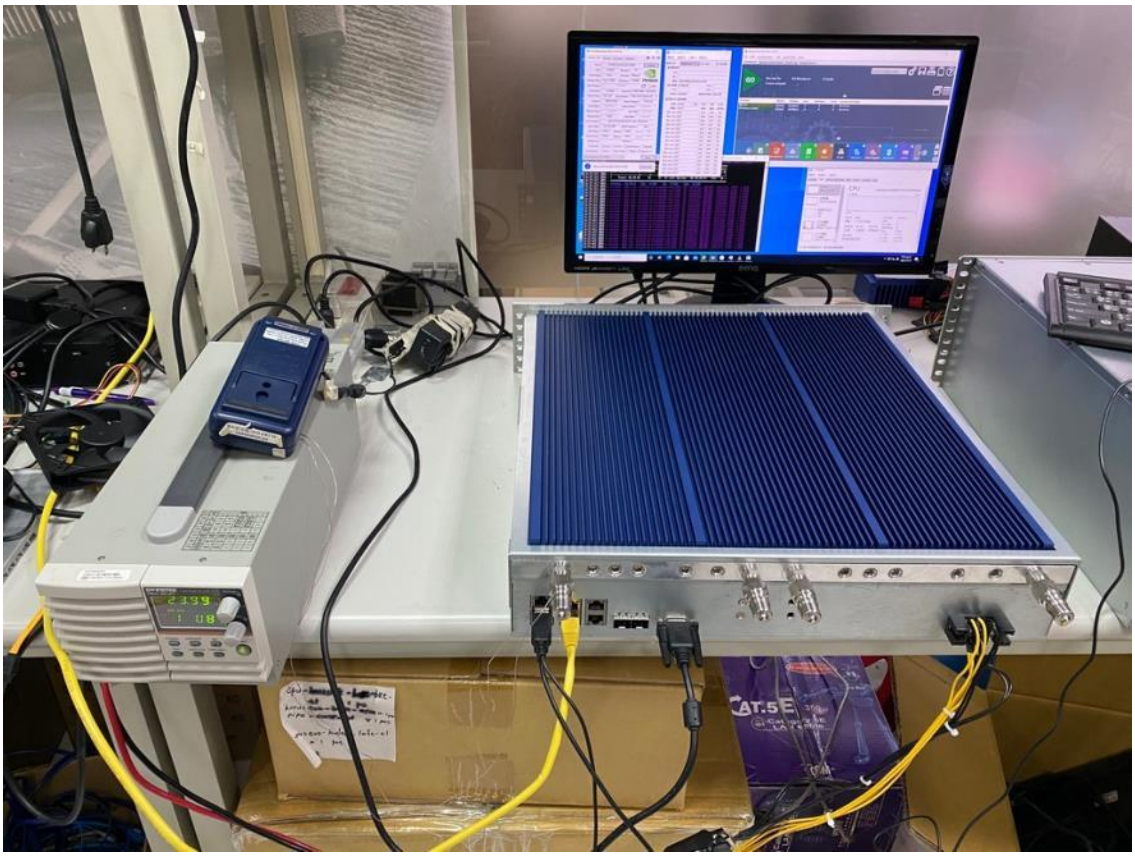
Stress Testing : Simulation with cooled system operation testing sudden failure status for AV1000 with 100% full loading of CPU @25℃.

Test Purpose	The purpose of performing thermal profile test is to identify potential thermal problem of the EUT. And it is to aid products in reliability assessment considering that semiconductor failure rates rise rapidly with increasing junction temperature In case of systems cooling, patterns will vary with stacking choices, temperature/thermal mapping can aid in the development of optimum tacking arrangements
Test Equipment	1. KSON THS-B4T-150 Chamber 2. YOKOGAWA MV1000, Thermometer (FLUKE50D K/J) 3. Infrared thermal imaging camera Model TVS-200EX
Quantity Tested	Minimum 1 Set
Test Software	Passmark Burn-In Test under Windows 10 NiceHashMiner For Graphic Card
Test Procecedure	1. Thermal pre-scan measurement: Temperature: 24~26℃/40~60%RH Capture thermal IR photo for whole boards after the EUT execute passmark burn-in test with 100% lading during 1 hour at least. 2. Thermal actual measurement: a. Select the test points according to the IR photo and attach thermocouples to the hot points b. Put the EUT in thermal chamber and set the temperature profile of as test specification c. Turn on the thermal chamber and power on the EUT to enter windows environment to run Max Power Test + 3DMARK 2003 application program d. After the EUT executing the test software for 4 hours, record thermal maximum value for each thermocouples point. e. Turn off the thermal chamber and EUT f. Verify and check recorded figure of each components to its' operating temperature range listed in specification/approval sheet of each measured component
Test diagram of curves	Environment defines for 8 hours
Test picture	

2-2-2. THERMAL TESTING PHOTOS



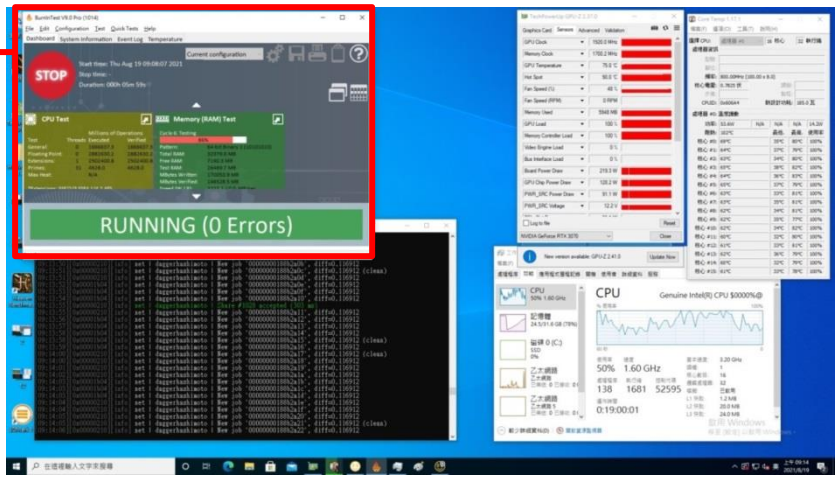
CH1	CPU
CH2	CPU Heatsink



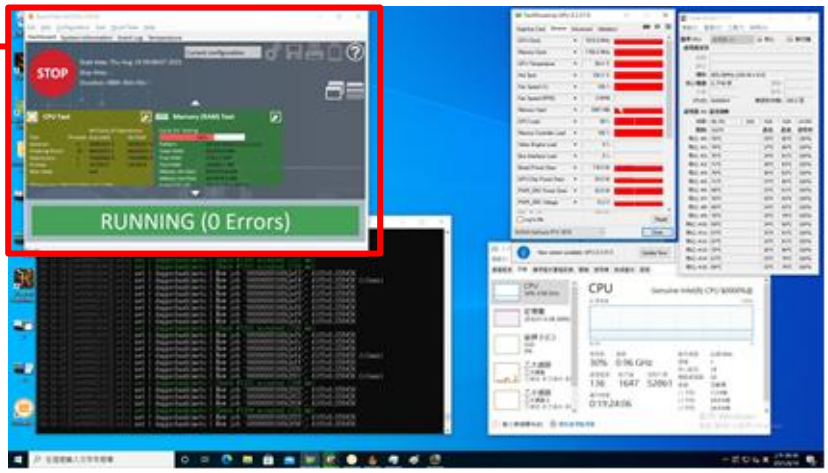
2-2-3. TEST RESULT @25℃

Point		5min	30min	1HR
CPU Frequency(GHz)		1.60	0.96	Error
CPU T-J (℃)		69	70	Error
GPU Frequency(GHz)		1.92	1.515	Error
GPU T-J (℃)		75	89.4	Error
CH1	CPU(℃)	65	67	Error
CH2	CPU Heatsink(℃)	64	66	Error

Testing without liquid cooled system after using liquid cooled system
@25℃, @15m,
CPU Frequency: 1.6 GHz
GPU Frequency: 1.92 GHz



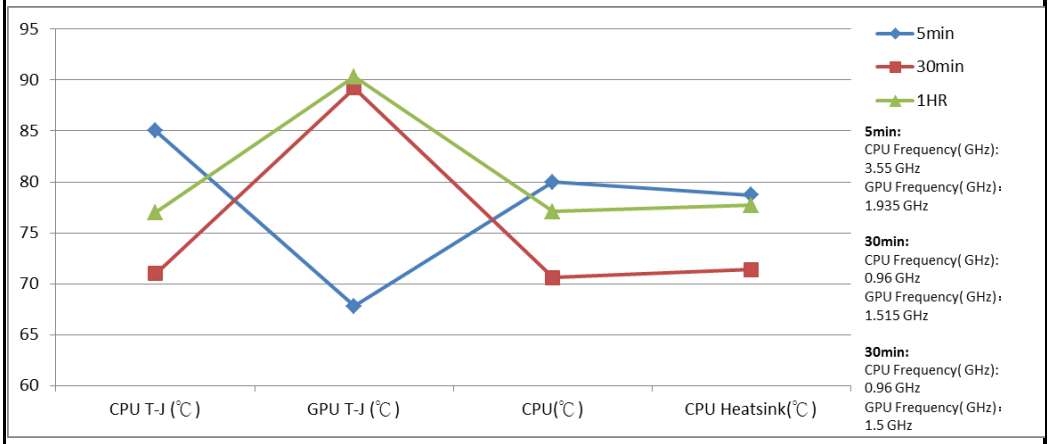
Testing without liquid cooled system after using liquid cooled system
@25℃, @30m,
CPU Frequency: 0.96 GHz
GPU Frequency: 1.515 GHz



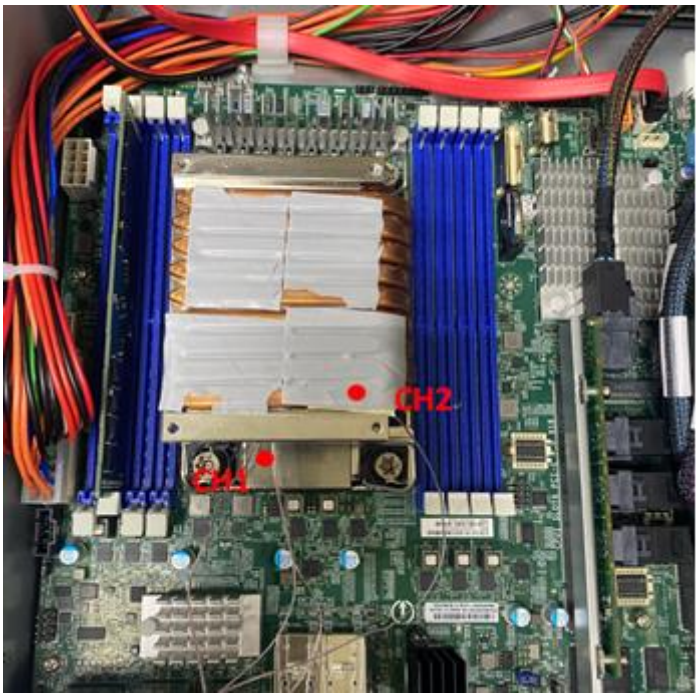
2-3. TESTING WITHOUT LIQUID COOLED SYSTEM

2-3-1. Thermal Measurement Process

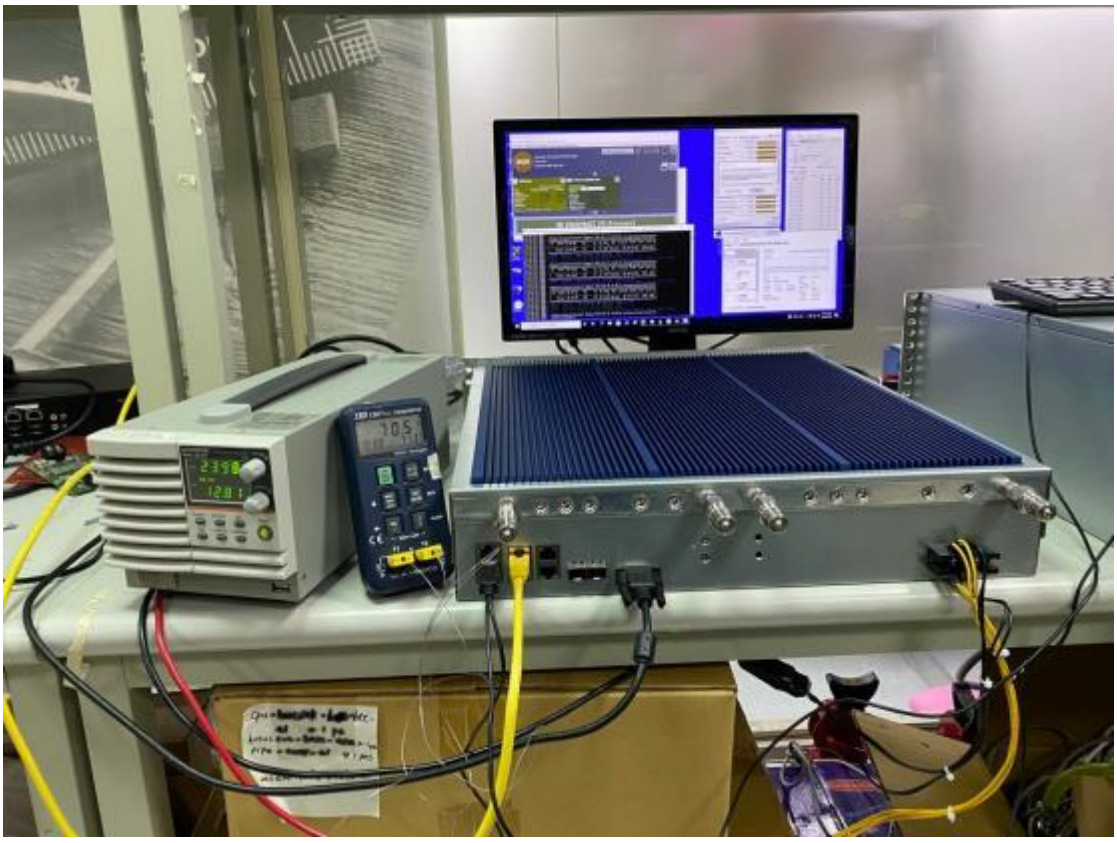
Stress Testing : Simulation without cooled system operation testing status for AV1000 with 100% full loading of CPU @25℃.

Test Purpose	The purpose of performing thermal profile test is to identify potential thermal problem of the EUT. And it is to aid products in reliability assessment considering that semiconductor failure rates rise rapidly with increasing junction temperature In case of systems cooling, patterns will vary with stacking choices, temperature/thermal mapping can aid in the development of optimum tacking arrangements
Test Equipment	1. KSON THS-B4T-150 Chamber 2. YOKOGAWA MV1000, Thermometer (FLUKE50D K/J) 3. Infrared thermal imaging camera Model TVS-200EX
Quantity Tested	Minimum 1 Set
Test Software	Passmark Burn-In Test under Windows 10 NiceHashMiner For Graphic Card
Test Procecedure	1. Thermal pre-scan measurement: Temperature: 24~26℃/40~60%RH Capture thermal IR photo for whole boards after the EUT execute passmark burn-in test with 100% lading during 1 hour at least. 2. Thermal actual measurement: a. Select the test points according to the IR photo and attach thermocouples to the hot points b. Put the EUT in thermal chamber and set the temperature profile of as test specification c. Turn on the thermal chamber and power on the EUT to enter windows environment to run Max Power Test + 3DMARK 2003 application program d. After the EUT executing the test software for 4 hours, record thermal maximum value for each thermocouples point. e. Turn off the thermal chamber and EUT f. Verify and check recorded figure of each components to its' operating temperature range listed in specification/approval sheet of each measured component
Test diagram of curves	

2-3-2. Thermal Testing Photos



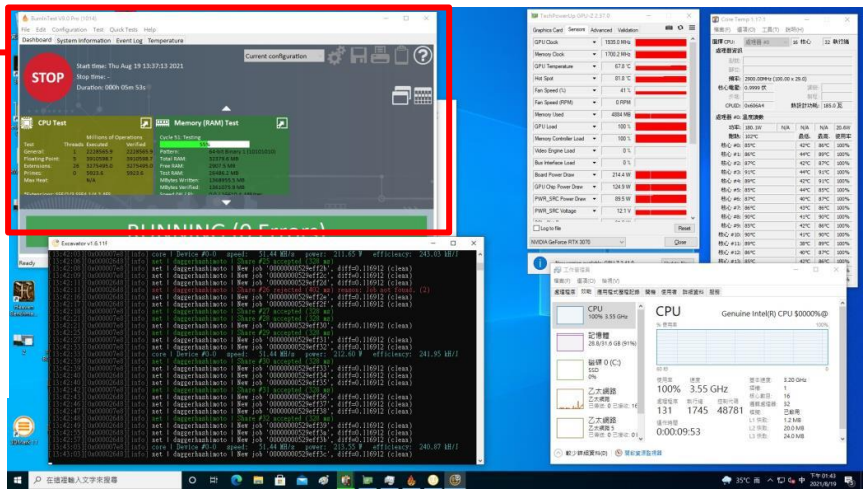
CH1	CPU
CH2	CPU Heatsink



2-3-3. TEST RESULT @25℃

Point		5min	30min	1HR	1.5HR
CPU Frequency(GHz)		3.55	0.96	0.96	Error
CPU T-J (℃)		85	71	77	Error
GPU Frequency(GHz)		1.935	1.515	1.5	Error
GPU T-J (℃)		67.8	89.2	90.3	Error
CH1	CPU(℃)	80	70.6	77.1	Error
CH2	CPU Heatsink(℃)	78.7	71.4	77.7	Error

Testing without liquid cooled system
@25℃, @5m,
CPU Frequency: 3.55 GHz
GPU Frequency: 1.935 GHz

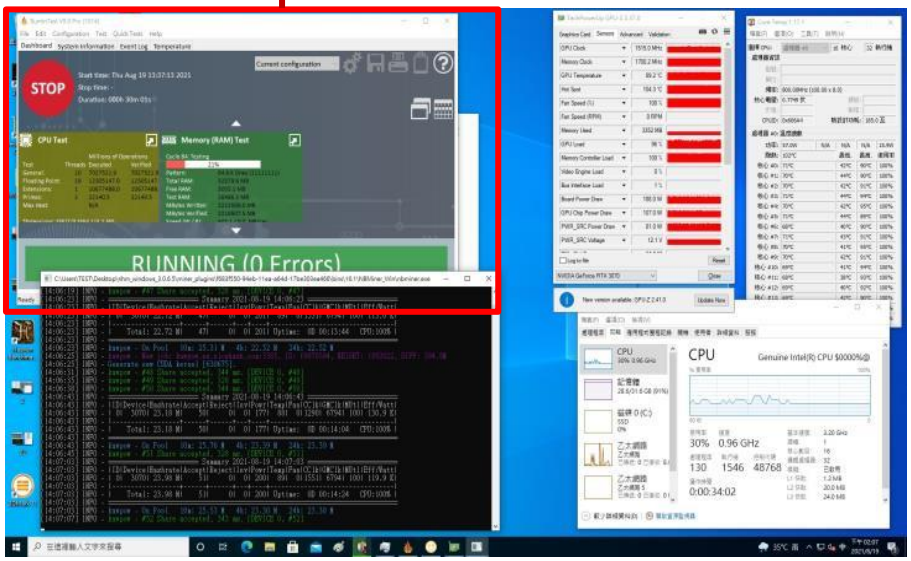


Testing without liquid cooled system

@25℃, @30m,

CPU Frequency: 0.96 GHz

GPU Frequency: 1.515 GHz



Testing without liquid cooled system

@25℃, @1h,

CPU Frequency: 0.96 GHz

GPU Frequency: 1.5 GHz