PERFORMANCE TEST REPORT

IV320-RH-KD5

S/N: SR202512180201

Product Manager	Mechanical Engineer	System Engineer	Test Engineer
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Date: March 24, 2026

X1
X2
X3
X8
X9
X10
HDD
DC IN 12~32V
X4
X5
SSD
SSD

3G-SDI
3G-SDI
3G-SDI
3G-SDI
3G-SDI
3G-SDI
3G-SDI
3G-SDI

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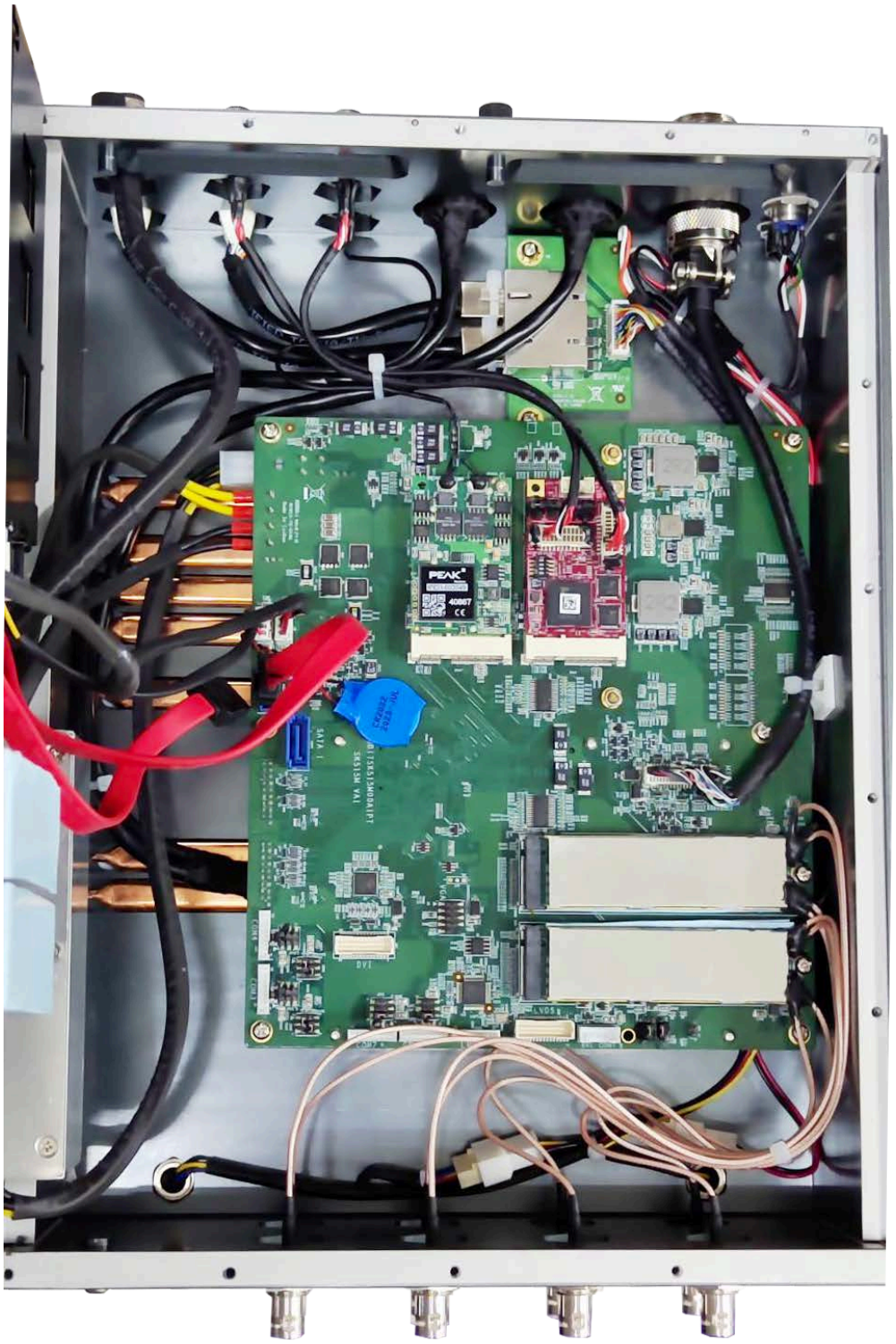
1. SPECIFICATION

1-1. System Configuration

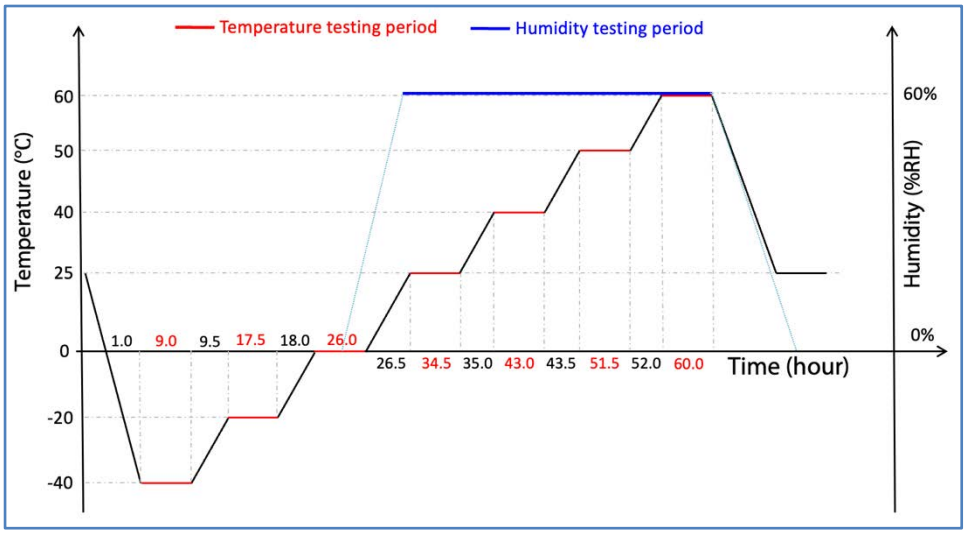
Motherboard	SK515M+COM Express CPU module BIOS Version/Date: 0.0.0 08/23/2023 SMBIOS Version: 3.5 Wide Range DC 9V~36V Input Extreme Temperature Support -40°C to 85°C
CPU	Intel® Core™ i7-13800HRE Processor Total Cores: 14 # of Performance-cores: 6 # of Efficient-cores: 8 Total Threads: 20 Max Turbo Frequency: 5.00 GHz Performance-core Max Turbo Frequency: 5.00 GHz Efficient-core Max Turbo Frequency: 4.00 GHz Processor Base Frequency: 2.50 GHz Cache 24 MB Intel® Smart Cache TDP: 45 W
Memory	64GB DDR5 SO-DIMM wide temp. (0C02AM425R4GD00L*2pcs)
Storage	2* 2TB SATA SSD wide temperature (2 x Swappable Tray) (0I05077SL02TB00L*2pcs)
GPU	NVIDIA Quadro RTX5000 Mobility BIOS Version: 95.03.39.00.16 GPU boost clock: 2115 MHz Max Power Consumption: 80 W
Power Module	7Starlake SK708 Wide Input Range: 9V to 36V 12V DC Output up to 33 Amp Extended Temperature -40°C to 85°C

1-2. Product Interior Photo



2. TEST PLAN

2-1. THERMAL MEASUREMENT PROCESS

Test Purpose	The purpose of conducting thermal profile testing is to identify potential thermal issues in the Equipment Under Test (EUT). Given that semiconductor failure rates increase significantly with rising junction temperatures, this testing contributes to the overall assessment of product reliability. As the system undergoes a cooling phase, operational modes may shift depending on stack configuration, temperature, and heat dissipation characteristics. Thermal mapping provides critical insight for optimizing thermal management strategies and determining the most effective component layout and monitoring arrangements.
Test Equipment	1. KSON THS-B4T-150 Chamber.
Quantity Tested	Minimum 1 Set
Test Software	CPU Stress: PassMark BurnIn Test v9.0 GPU Stress: AIDA64 Business v7.70 LAN Speed Test: iPerf3
Test Procedure	1. Thermal Pre-Scan Measurement: Temperature Range: **-40°C to 60°C** Humidity Condition: **60% RH** (when temperature exceeds 25°C) 2. Actual Thermal Measurement Procedure: 2.1. Identify the test points using the infrared thermal image and attach thermocouples to the identified hot spots. 2.2. Place the Equipment Under Test (EUT) in the thermal chamber and configure the test temperature profile according to the specified requirements. 2.3. Power on the EUT after closing the thermal chamber. Boot into Windows 10 Pro and initiate a maximum power consumption and stress test. 2.4. After running the test software continuously for 8 hours, record the peak temperature observed at each thermocouple measurement point. 2.5. Power off both the thermal chamber and the EUT. 2.6. Verify that the recorded temperature data for each component remains within its specified operating temperature range, as defined in the component specification or approval documents.
Test Diagram of Curves	Environment defines for 60 hours. 

2-2. Test Result

2-2-1. Temperature Cycle

Aging tests were performed on individual components across a range of temperature settings, under both maximum load and full load conditions, to evaluate thermal endurance and operational stability over time.

Test Temperature	Test Result
-40°C / 0%RH	PASS
-20°C / 0%RH	PASS
0°C / 0%RH	PASS
25°C / 60%RH	PASS
40°C / 60%RH	PASS
50°C / 60%RH	PASS
60°C / 60%RH	PASS

2-2-2. I/O Function

Confirm that the system specifications and all input/output (I/O) interfaces are correctly configured and functioning as intended, in accordance with the defined technical standards.

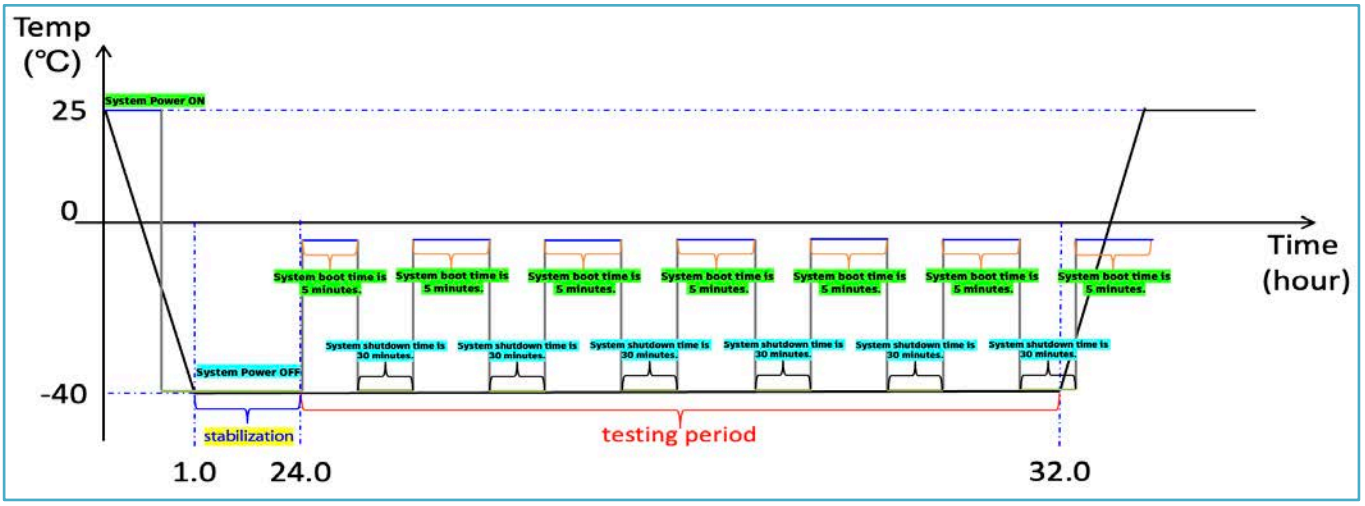
Item	Test Criteria	Result
X1 Port – 1GbE LAN	2-meter Cat.8 Ethernet cable shall be used to connect the Device Under Test (DUT) to another test computer equipped with a 1GbE network interface. The network connection shall be established and verified to ensure the link speed is negotiated at 1Gbps.	PASS
X2 Port – 1GbE LAN	2-meter Cat.8 Ethernet cable shall be used to connect the Device Under Test (DUT) to another test computer equipped with a 1GbE network interface. The network connection shall be established and verified to ensure the link speed is negotiated at 1Gbps.	PASS
X3 Port – CANBus	The CAN interface of the Device Under Test (DUT) shall be connected to a Loopback test fixture via the CANH and CANL signal lines. The loopback setup enables internal transmission and reception of CAN frames for communication verification without the need for an external CAN Bus analyzer or USB-to-CAN converter.	PASS
X3 Port – CANBus	The CAN interface of the Device Under Test (DUT) shall be connected to a Loopback test fixture via the CANH and CANL signal lines. The loopback setup enables internal transmission and reception of CAN frames for communication verification without the need for an external CAN Bus analyzer or USB-to-CAN converter.	PASS
X4 Port – RS485	The RS485 communication port of the Device Under Test(DUT) shall be connected to a USB-to-RS485 converter through the DB9 interface according to the defined pin assignment (D+ / D- / GND). A host PC is used to transmit and receive serial data through the RS485 interface.	PASS
X4 Port – RS485	The RS485 communication port of the Device Under Test(DUT) shall be connected to a USB-to-RS485 converter through the DB9 interface according to the defined pin assignment (D+ / D- / GND). A host PC is used to transmit and receive serial data through the RS485 interface.	PASS

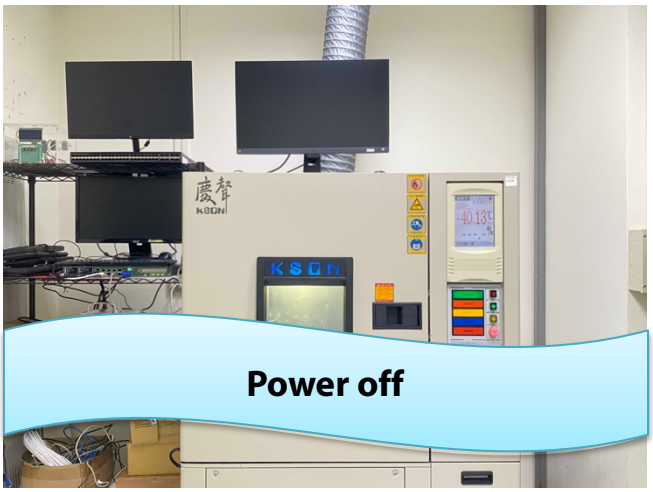
X5 Port – RS485	The RS485 communication port of the Device Under Test(DUT) shall be connected to a USB-to-RS485 converter through the DB9 interface according to the defined pin assignment (D+ / D- / GND). A host PC is used to transmit and receive serial data through the RS485 interface.	PASS
X5 Port – RS485	The RS485 communication port of the Device Under Test(DUT) shall be connected to a USB-to-RS485 converter through the DB9 interface according to the defined pin assignment (D+ / D- / GND). A host PC is used to transmit and receive serial data through the RS485 interface.	PASS
X8 Port – USB 3.0	A PassMark USB 3.0 Loopback plug shall be connected to each USB 3.0 port of the Device Under Test (DUT). The USB 3.0 Loopback Test software shall be executed on the host operating system to perform the loopback verification.	PASS
X9 Port – USB 3.0	A PassMark USB 3.0 Loopback plug shall be connected to each USB 3.0 port of the Device Under Test (DUT). The USB 3.0 Loopback Test software shall be executed on the host operating system to perform the loopback verification.	PASS
X10 Port – mDP	Check work well. (Max Resolution: 4K at 3840 x 2160)	PASS

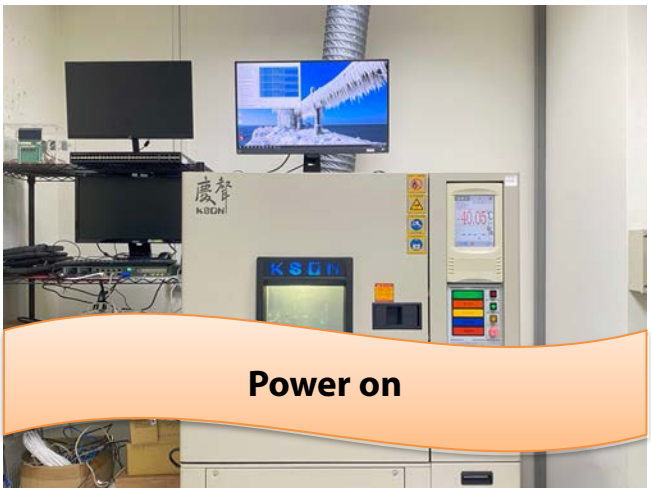
2-2-3.Low Temperature Power Cycle Test

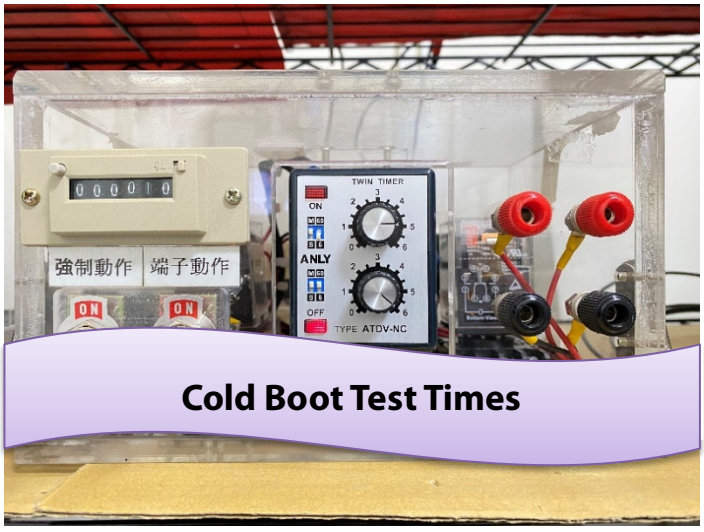
Apply power to the system under a -40°C ambient condition and confirm successful system boot-up, ensuring stable initialization and operation at low temperatures.

Ambient Temp.	Cold Boot Test Times	Test Result
-40°C	10 times	PASS





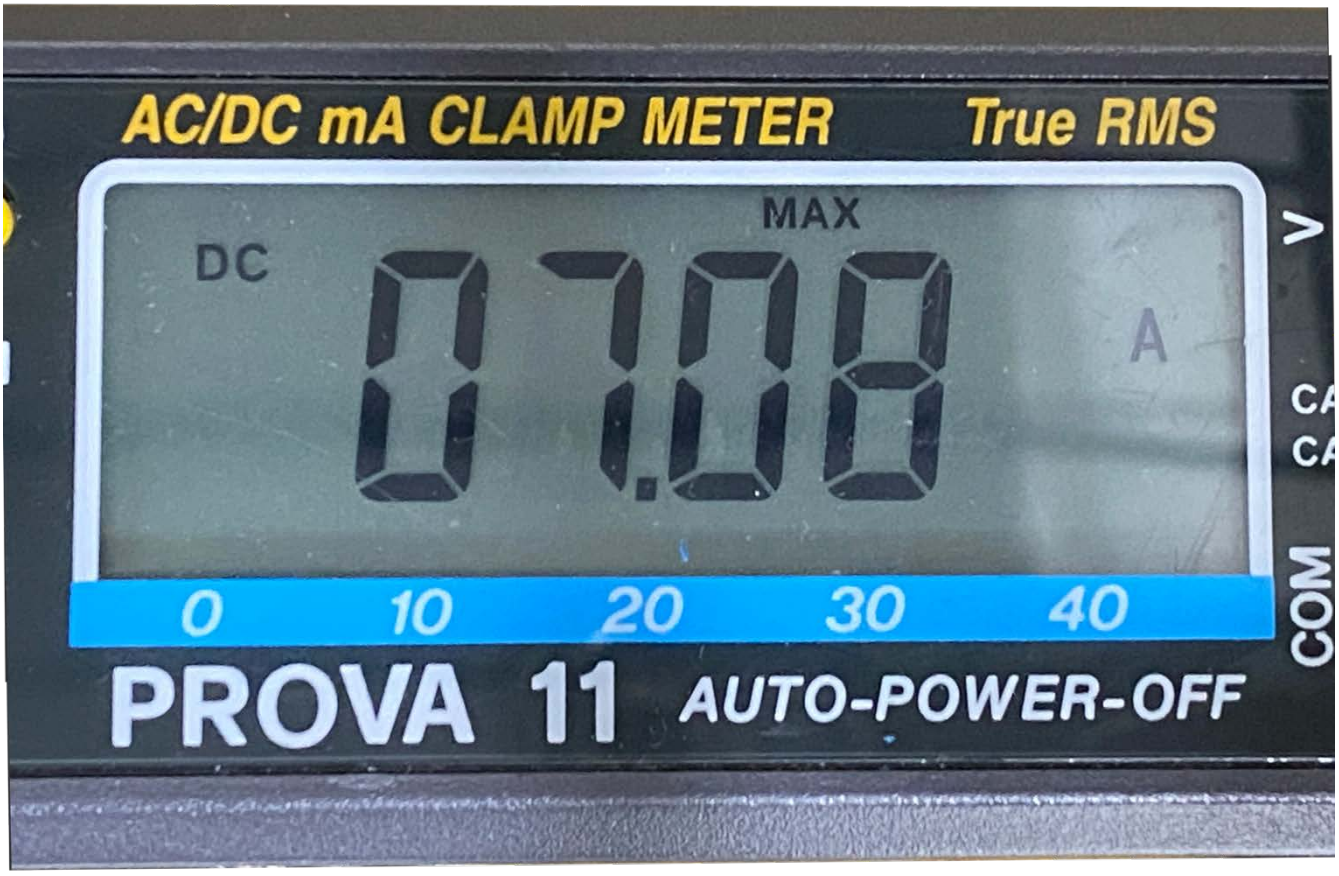




2-3. Peak Instantaneous Current and Power

Maximum instantaneous current and power measured during the entire period from system power-on to operating system initialization.

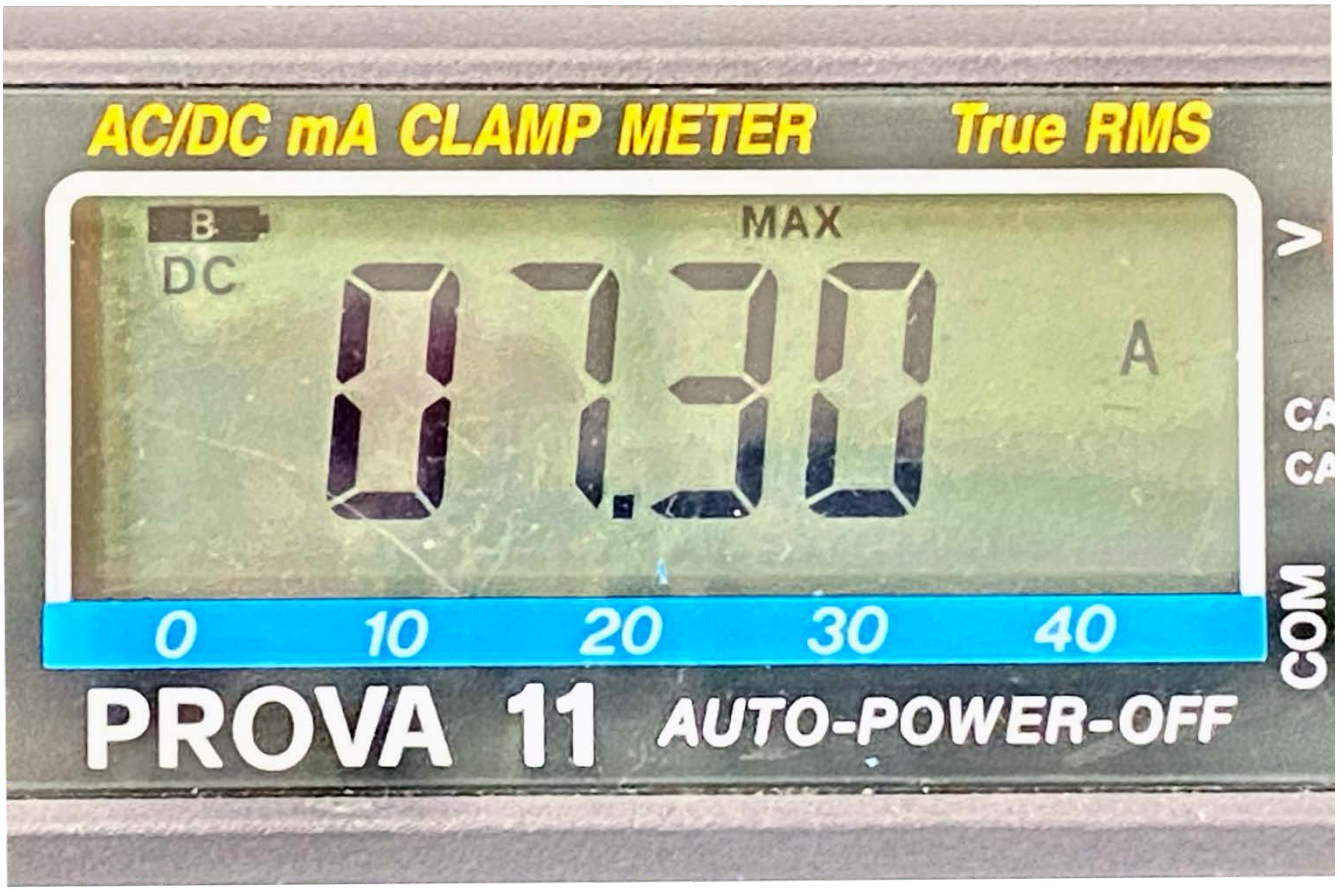
Voltage (V)	Peak Instantaneous Current (A)	Peak Instantaneous Power (W)
24.0	**7.08**	**169.92**



2-4. Power Consumption

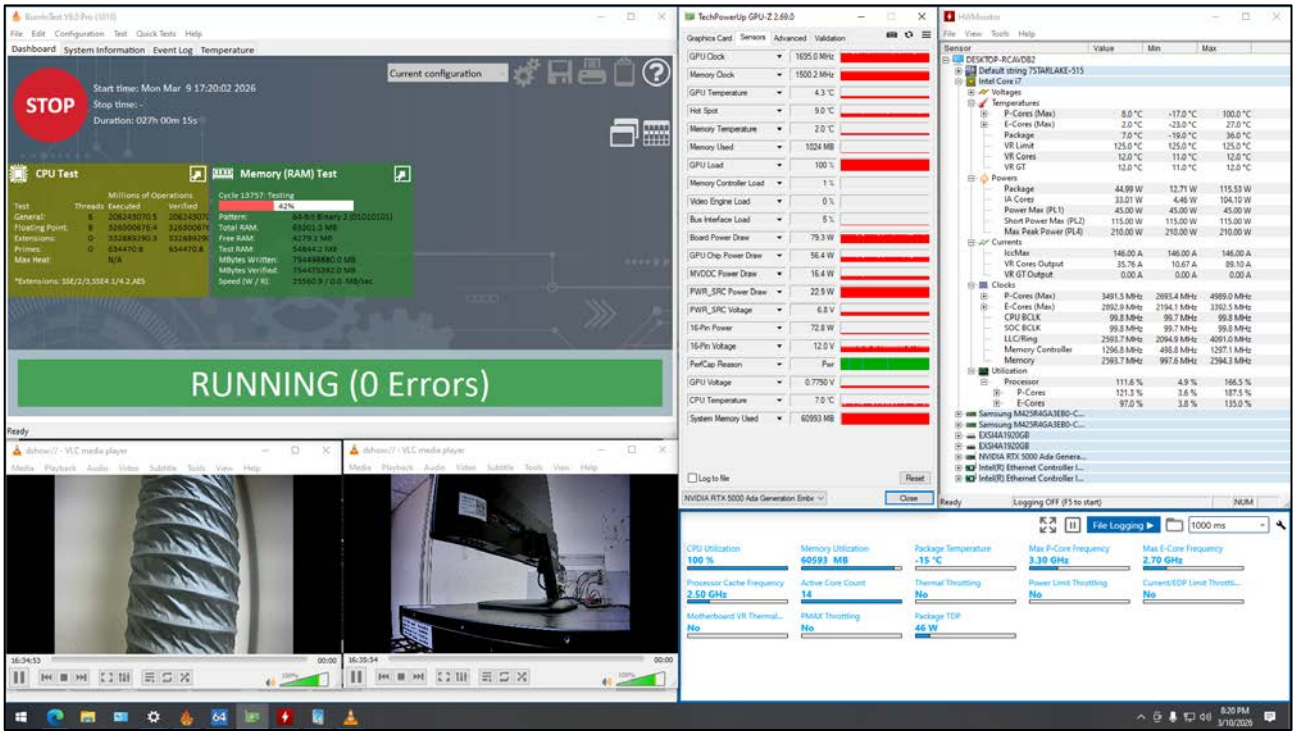
The total electrical power consumed by the system under defined workload and configuration, measured at the power supply input.

Voltage (V)	Current (A)	Wattage (W)
24.0	**7.30**	**175.20**

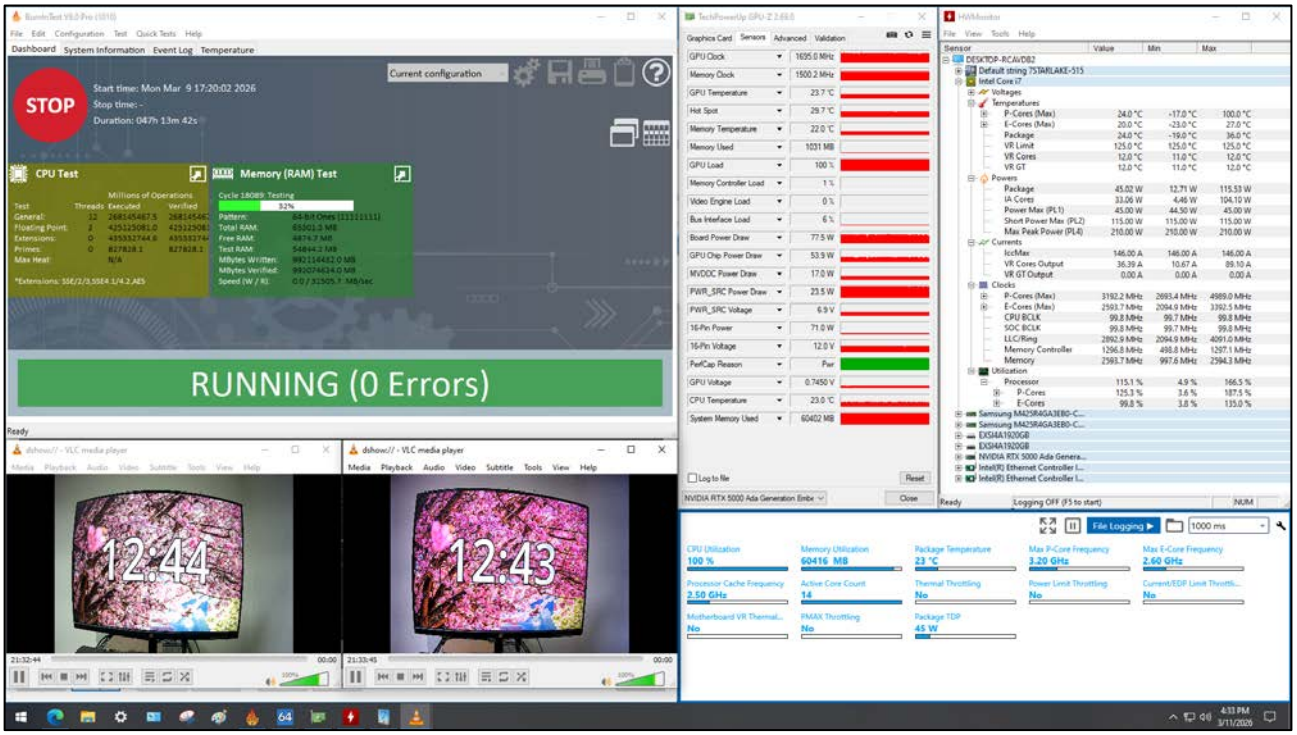


3. TEST PHOTO IN LAB

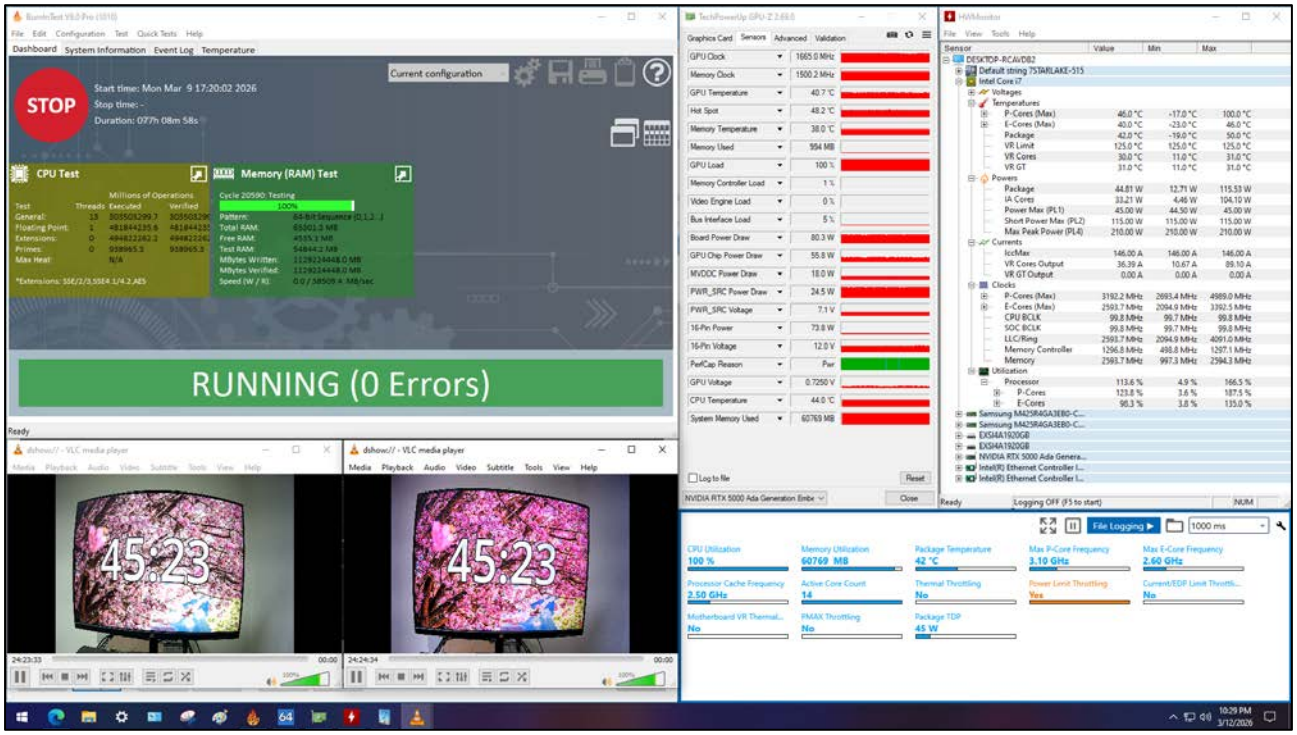
- Chamber in -40°C / 0%RH



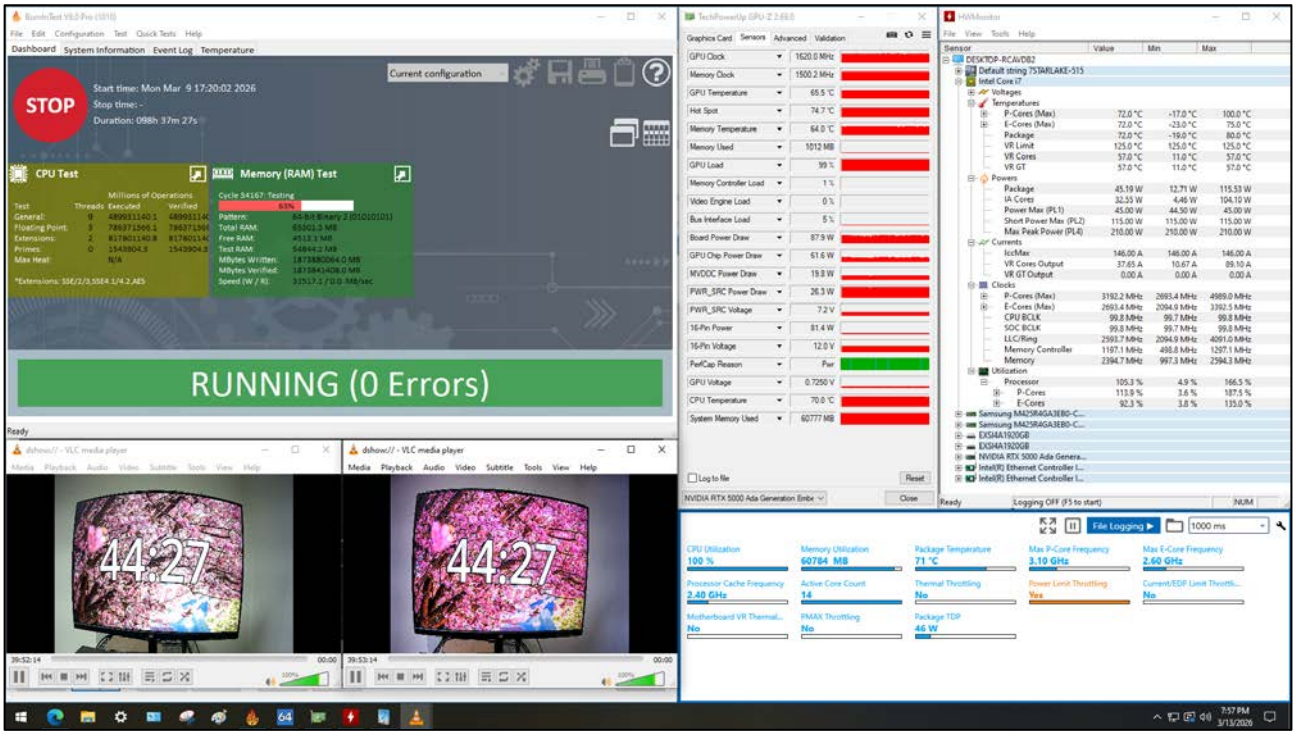
- Chamber in -20°C / 0%RH



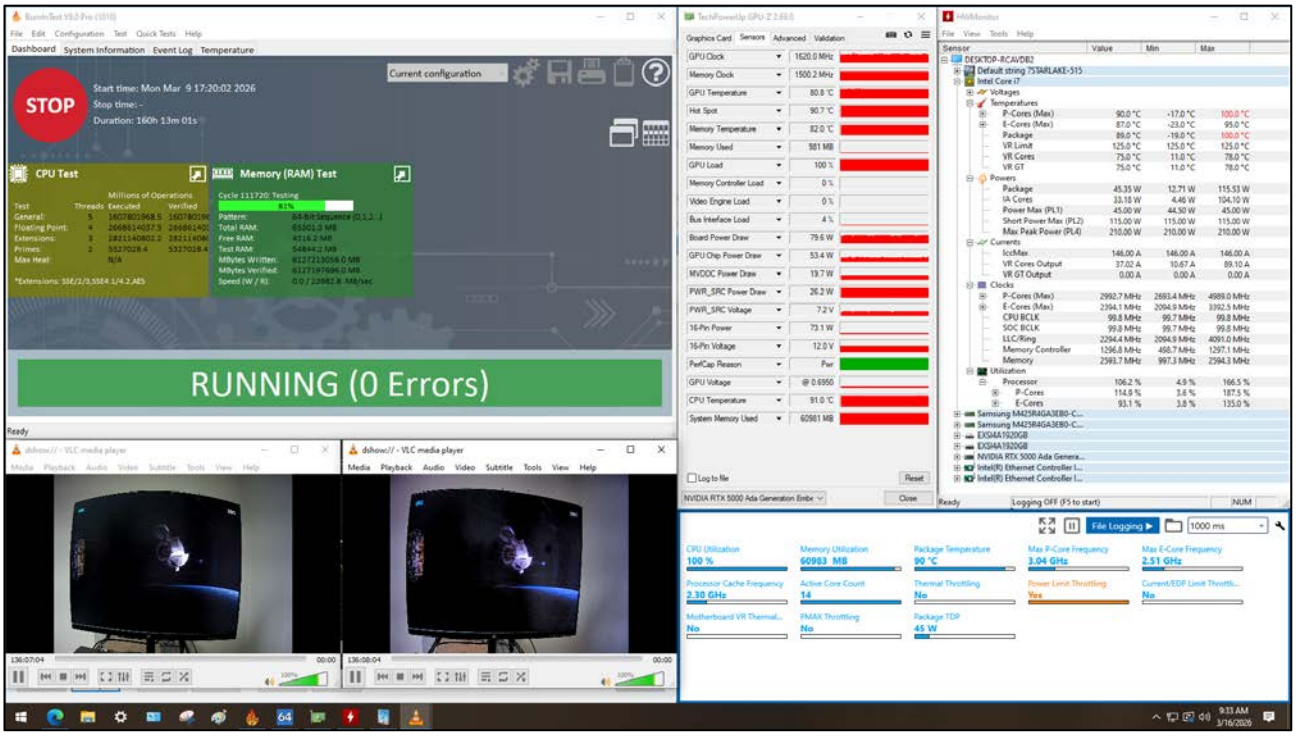
- Chamber in 0°C / 0%RH



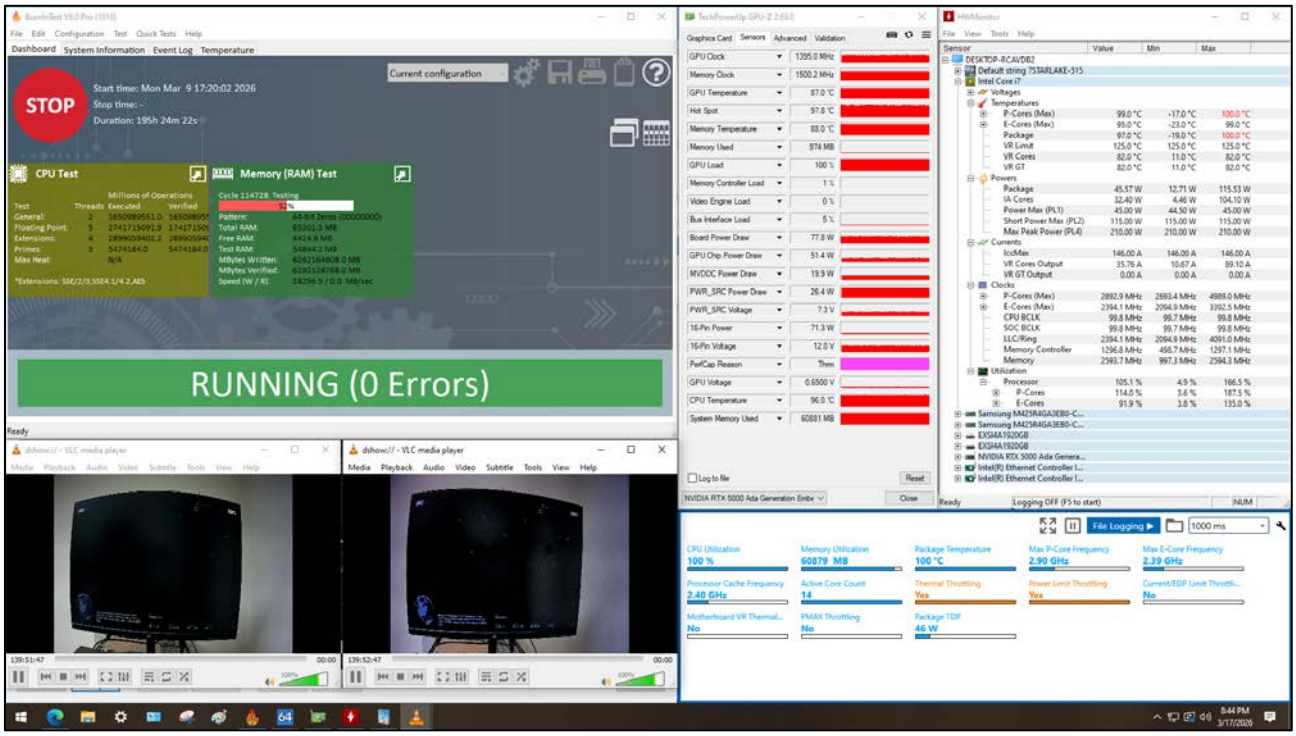
- Chamber in 25°C / 60%RH



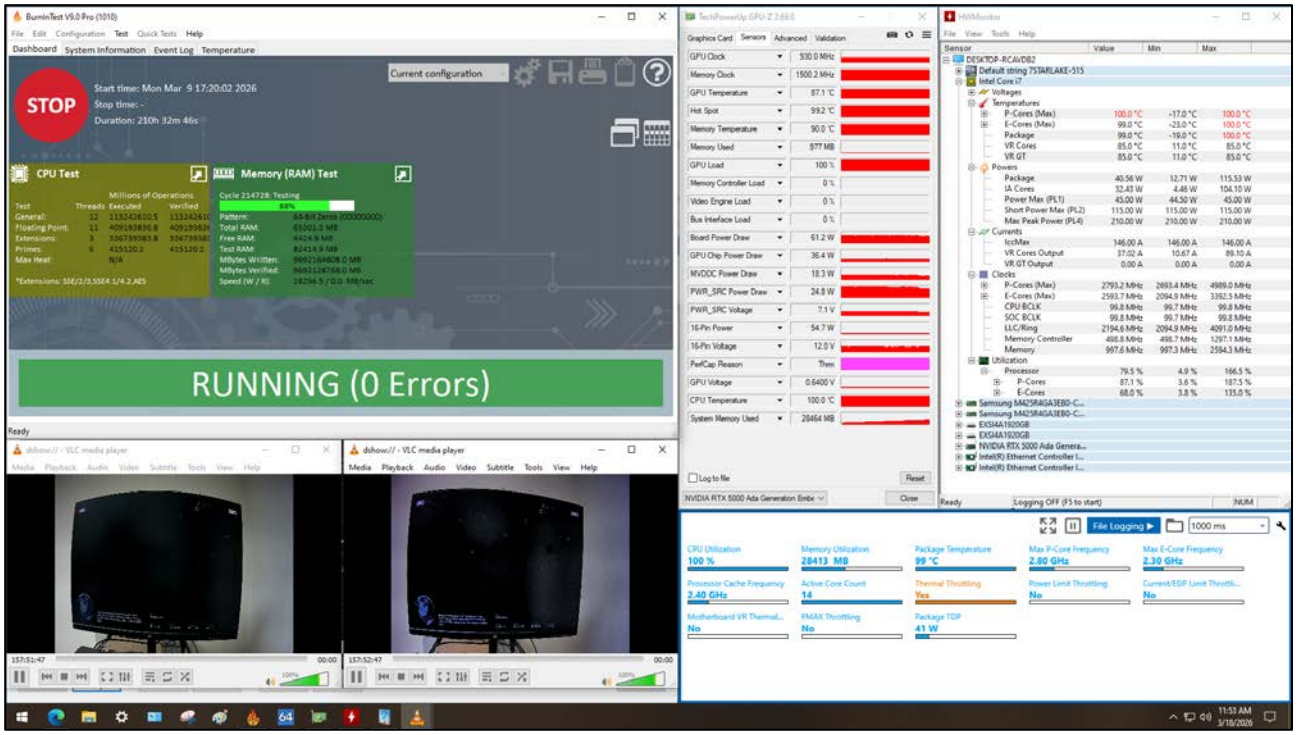
- Chamber in 40°C / 60%RH



- Chamber in 50°C / 60%RH



- Chamber in 60°C / 60%RH

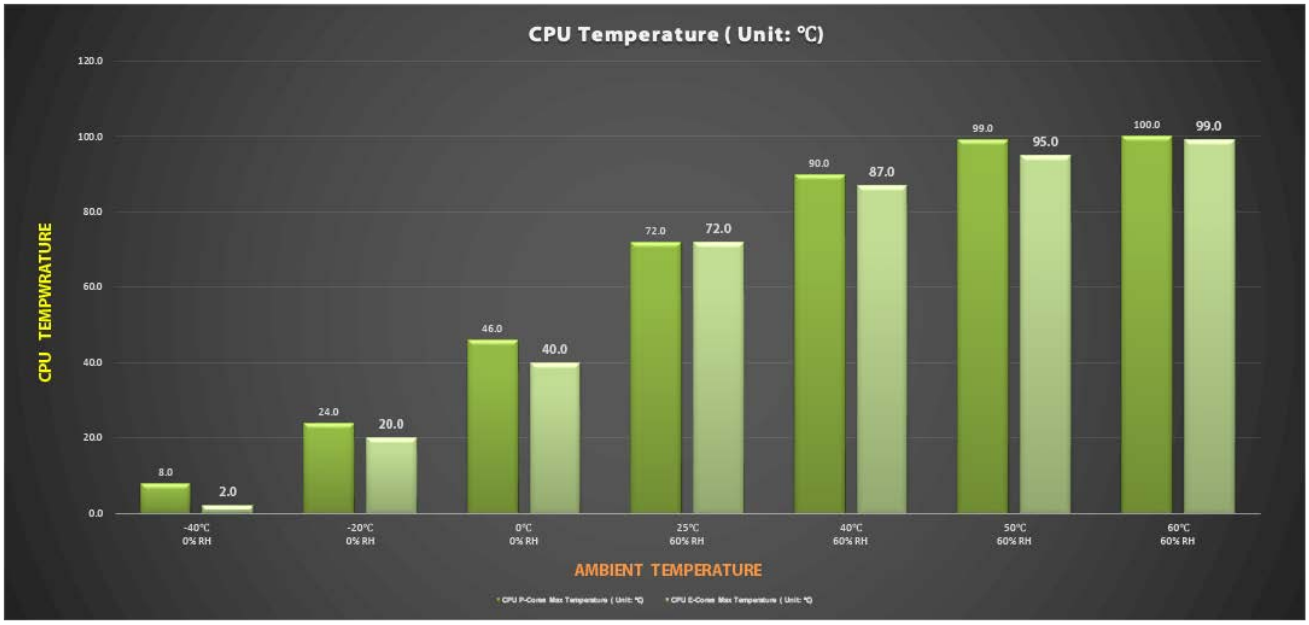


4. THERMAL TEST RESULT(-40°C ~ +60°C)

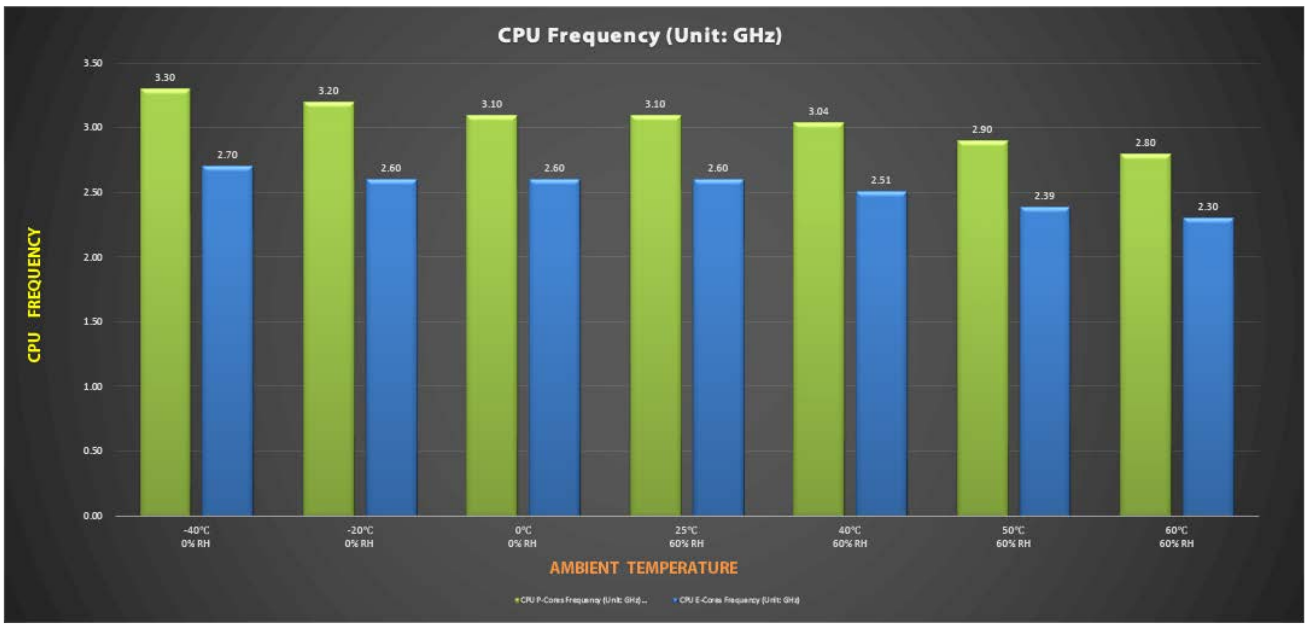
CPU & GPU Temperature and Frequency

Temperature / Ambient Temp. / Frequency	-40°C 0% RH	-20°C 0% RH	0°C 0% RH	25°C 60% RH	40°C 60% RH	50°C 60% RH	60°C 60% RH
CPU P-Cores Max Temperature (Unit: °C)	8.0	24.0	46.0	72.0	90.0	99.0	100.0
CPU E-Cores Max Temperature (Unit: °C)	2.0	20.0	40.0	72.0	87.0	95.0	99.0
CPU P-Cores Frequency (Unit: GHz) Processor Base Frequency: 2.50 GHz	3.30	3.20	3.10	3.10	3.04	2.90	2.80
CPU E-CoresFrequency (Unit: GHz)	2.70	2.60	2.60	2.60	2.51	2.39	2.30
GPU Temperature (Unit: °C)	4.3	23.7	40.7	65.5	80.8	87.0	87.1
GPU Hot Spot Temperature (Unit: °C)	9.0	29.7	48.2	74.7	90.7	97.8	99.2
GPU Frequency (Unit: MHz)	1695	1695	1665	1620	1620	1395	930

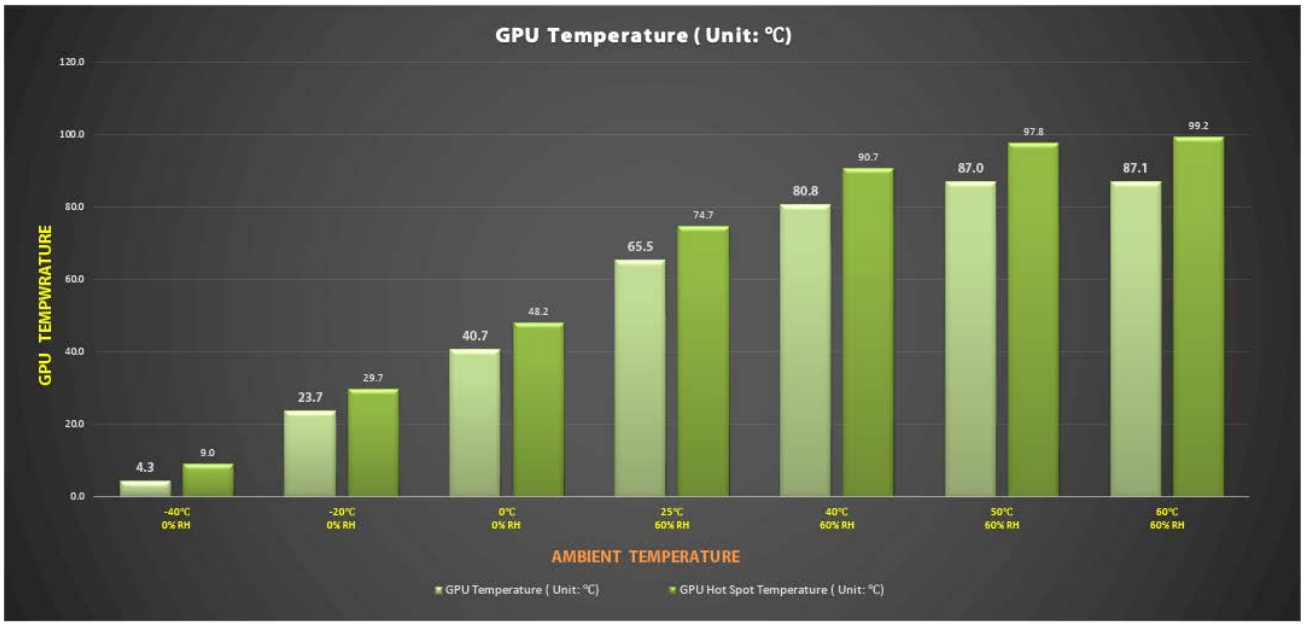
CPU Core Temprature / Ambient Temperature	-40°C 0% RH	-20°C 0% RH	0°C 0% RH	25°C 60% RH	40°C 60% RH	50°C 60% RH	60°C 60% RH
CPU P-Cores Max Temperature (Unit: ℃)	8.0	24.0	46.0	72.0	90.0	99.0	100.0
CPU E-Cores Max Temperature (Unit: ℃)	2.0	20.0	40.0	72.0	87.0	95.0	99.0



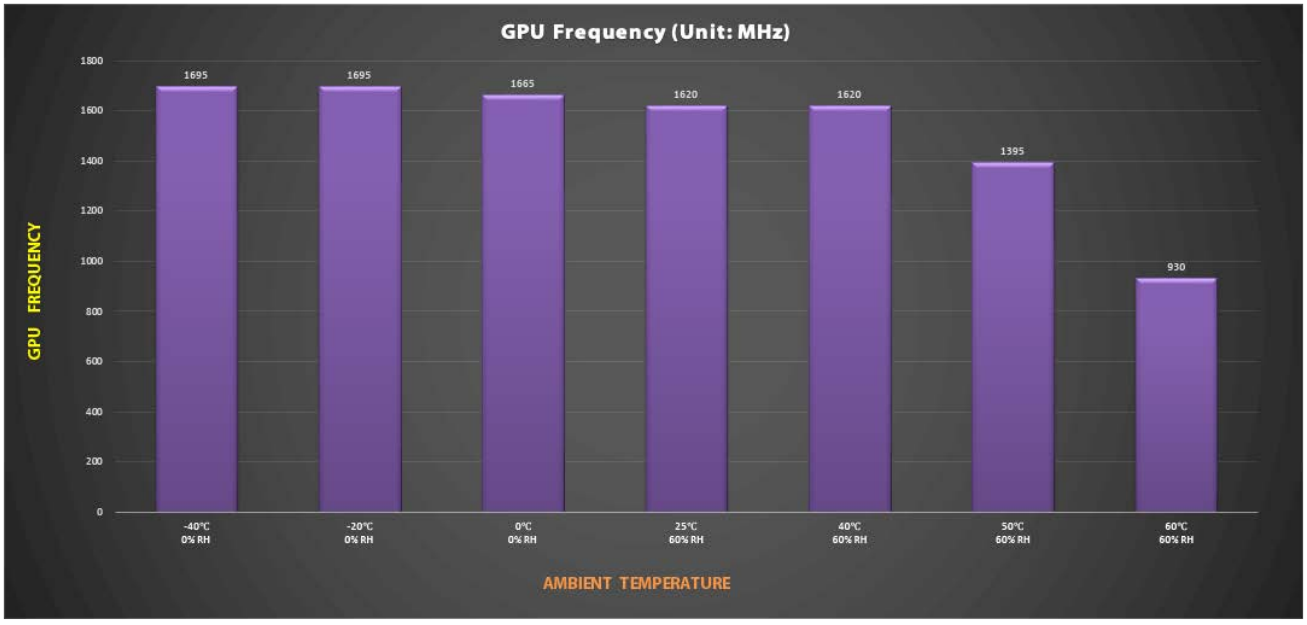
CPU Frequency / Ambient Temperature	-40°C 0% RH	-20°C 0% RH	0°C 0% RH	25°C 60% RH	40°C 60% RH	50°C 60% RH	60°C 60% RH
CPU P-Cores Frequency (Unit: GHz) Processor Base Frequency: 2.50 GHz	3.30	3.20	3.10	3.10	3.04	2.90	2.80
CPU E-Cores Frequency (Unit: GHz)	2.70	2.60	2.60	2.60	2.51	2.39	2.30



GPU Temperature / Ambient Temperature	-40°C 0% RH	-20°C 0% RH	0°C 0% RH	25°C 60% RH	40°C 60% RH	50°C 60% RH	60°C 60% RH
GPU Temperature (Unit: ℃)	4.3	23.7	40.7	65.5	80.8	87.0	87.1
GPU Hot Spot Temperature (Unit: ℃)	9.0	29.7	48.2	74.7	90.7	97.8	99.2



GPU Frequency / Ambient Temperature	-40°C 0% RH	-20°C 0% RH	0°C 0% RH	25°C 60% RH	40°C 60% RH	50°C 60% RH	60°C 60% RH
GPU Frequency (Unit: MHz)	1695	1695	1665	1620	1620	1395	930



5. I/O FUNCTION TEST

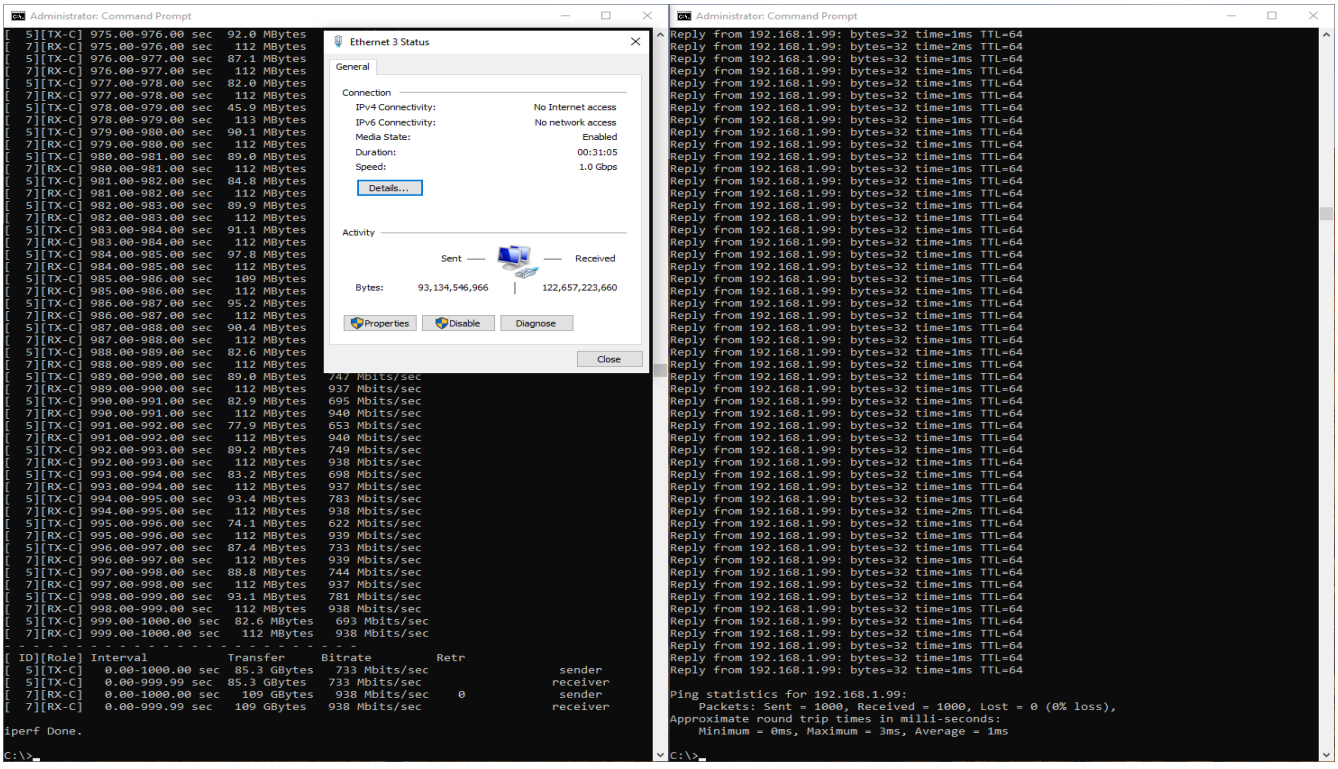
5-1. LAN PORT (1Gbps)

1GbE

LAN SPEED

LAN Data-Packet

X1-LAN 1

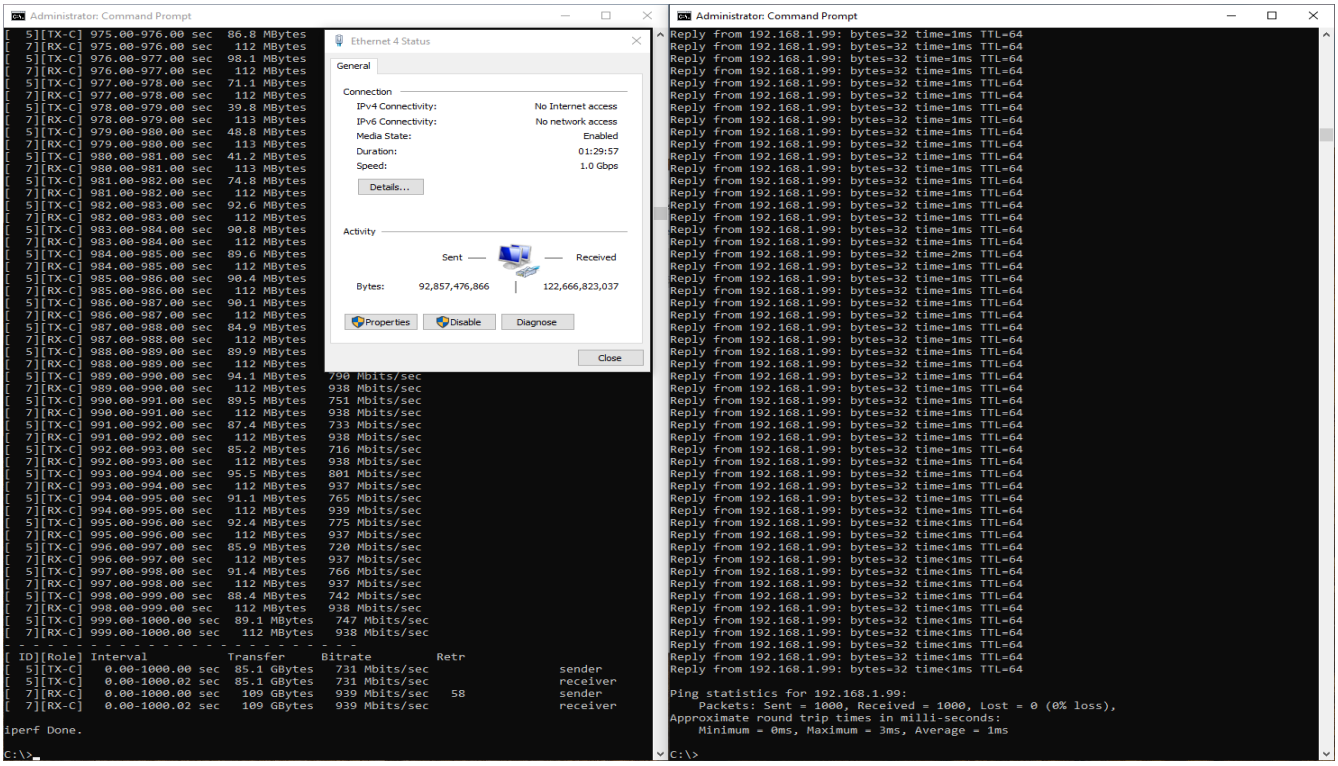


LAN Speed Test Result: Pass
LAN Data-Packet Test Result: 0 Lost (0% loss)

LAN SPEED

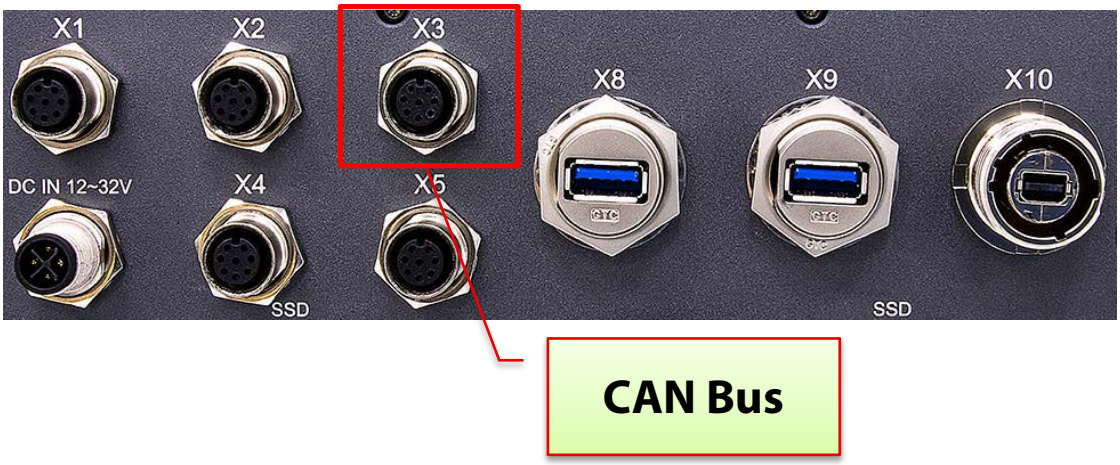
LAN Data-Packet

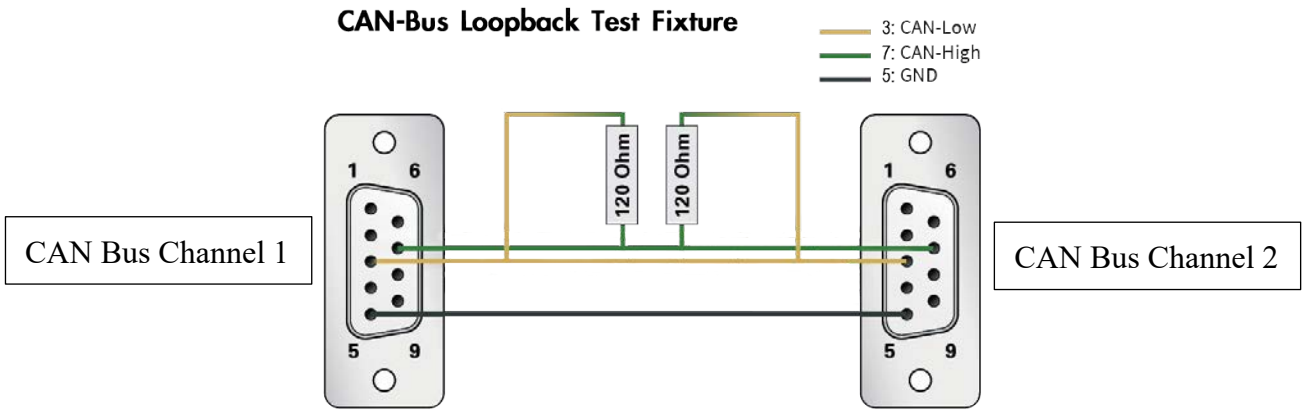
X2-LAN 2

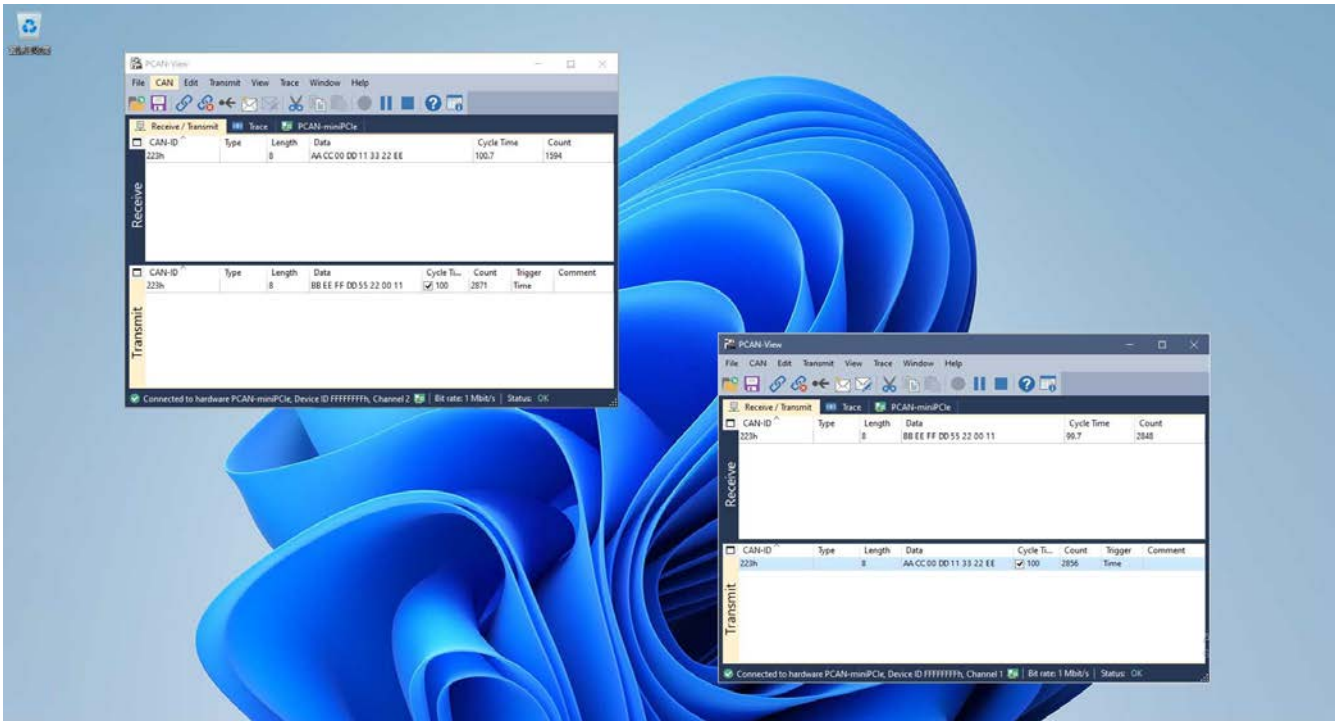


LAN Speed Test Result: Pass
LAN Data-Packet Test Result: 0 Lost (0% loss)

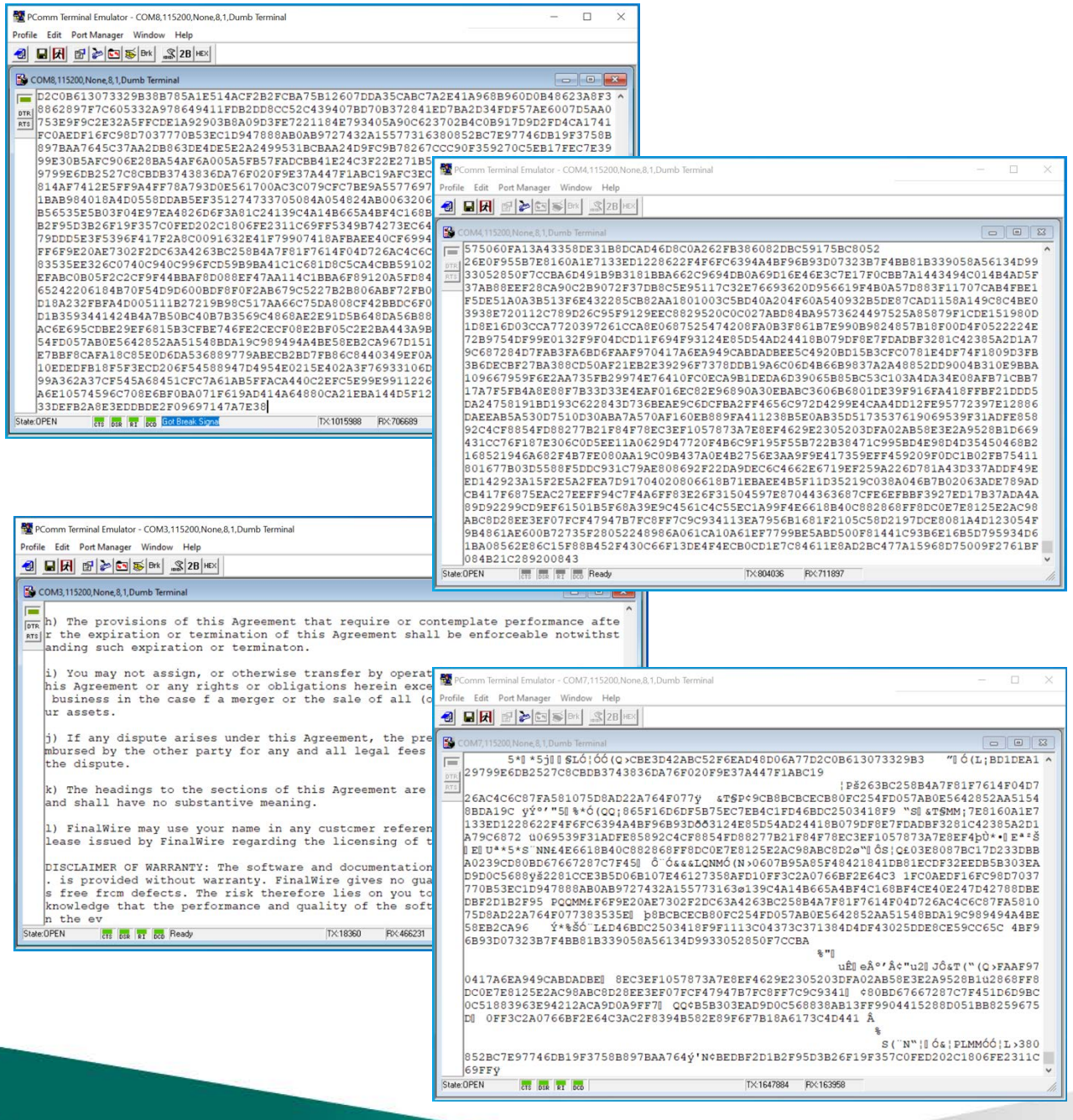
5-2. CAN Bus


X1
X2
X3
X8
X9
X10
DC IN 12~32V
X4
X5
SSD
SSD
CAN Bus


CAN-Bus Loopback Test Fixture
3: CAN-Low
7: CAN-High
5: GND
120 Ohm
120 Ohm
1
6
5
9
CAN Bus Channel 1
CAN Bus Channel 2

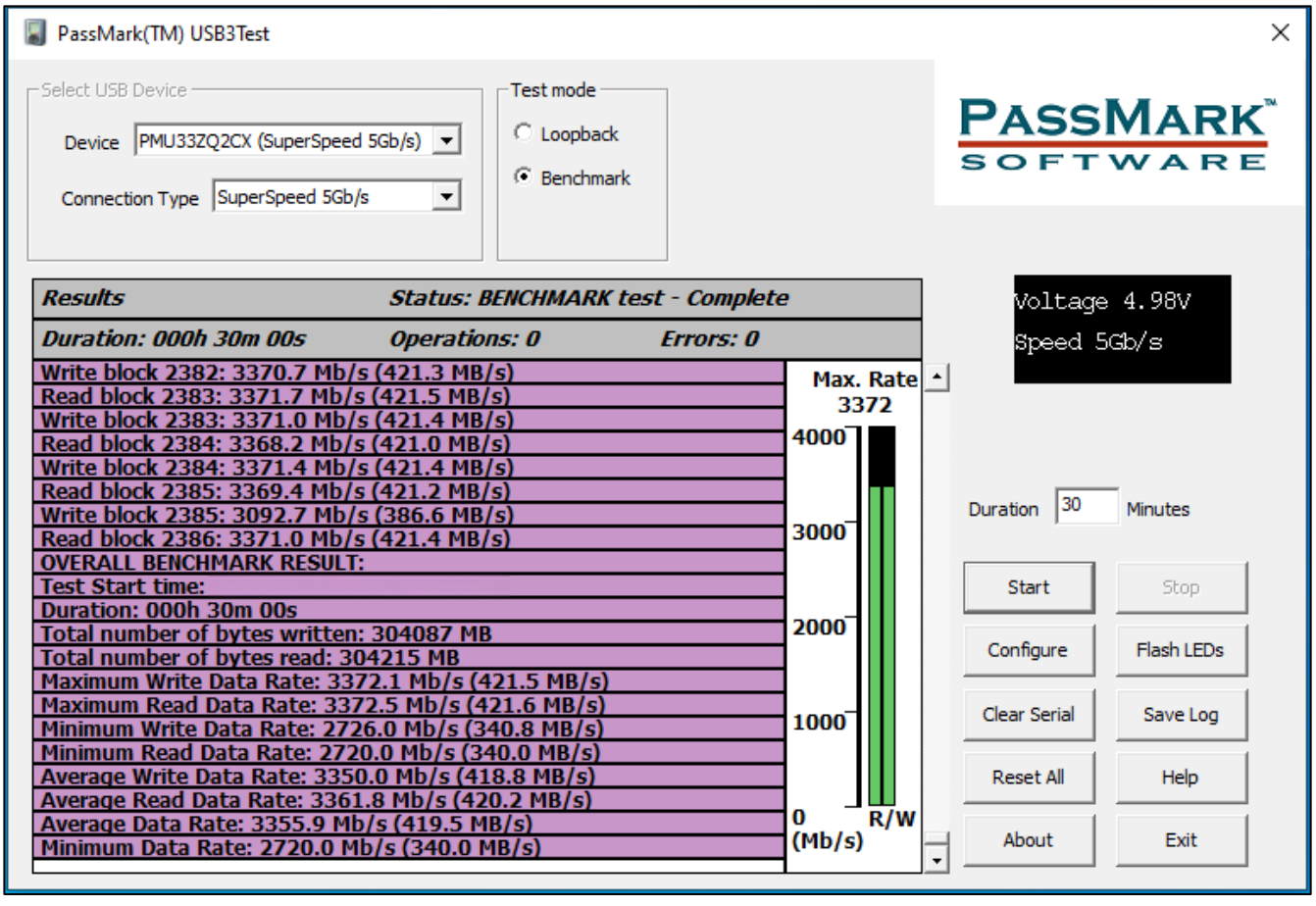

PCAN-View
Receive
Transmit
PCAN-View
Receive
Transmit

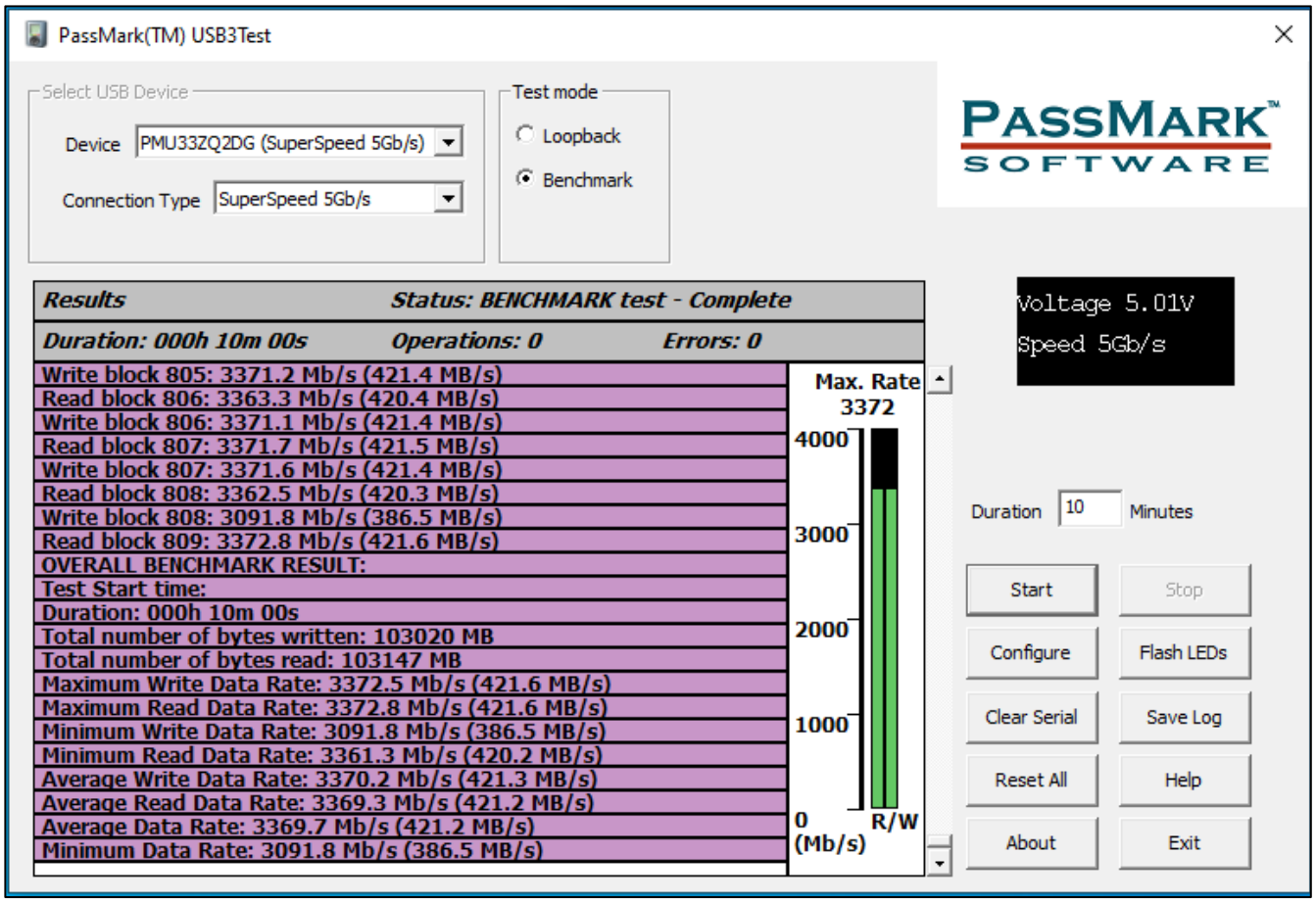
5-3. SERIES PORT (RS485)



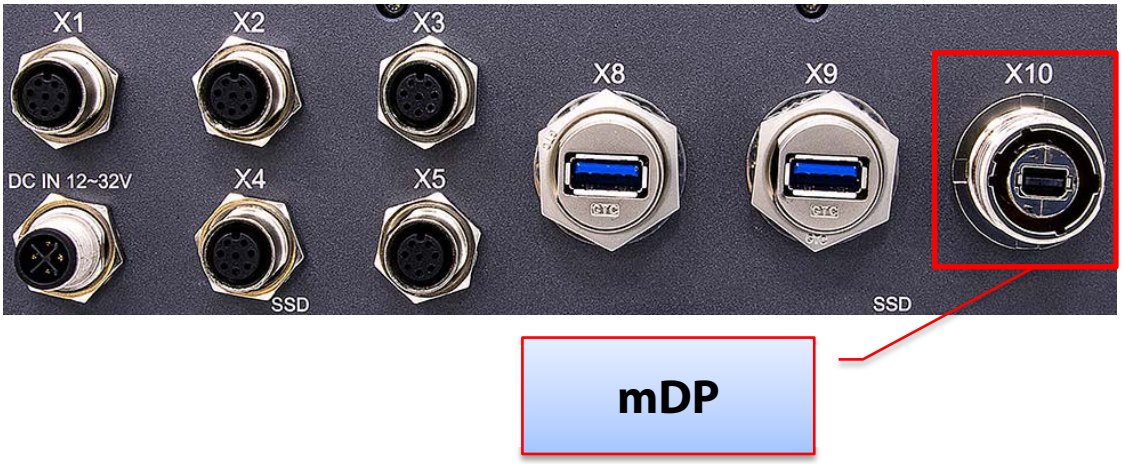
5-4. USB PORT

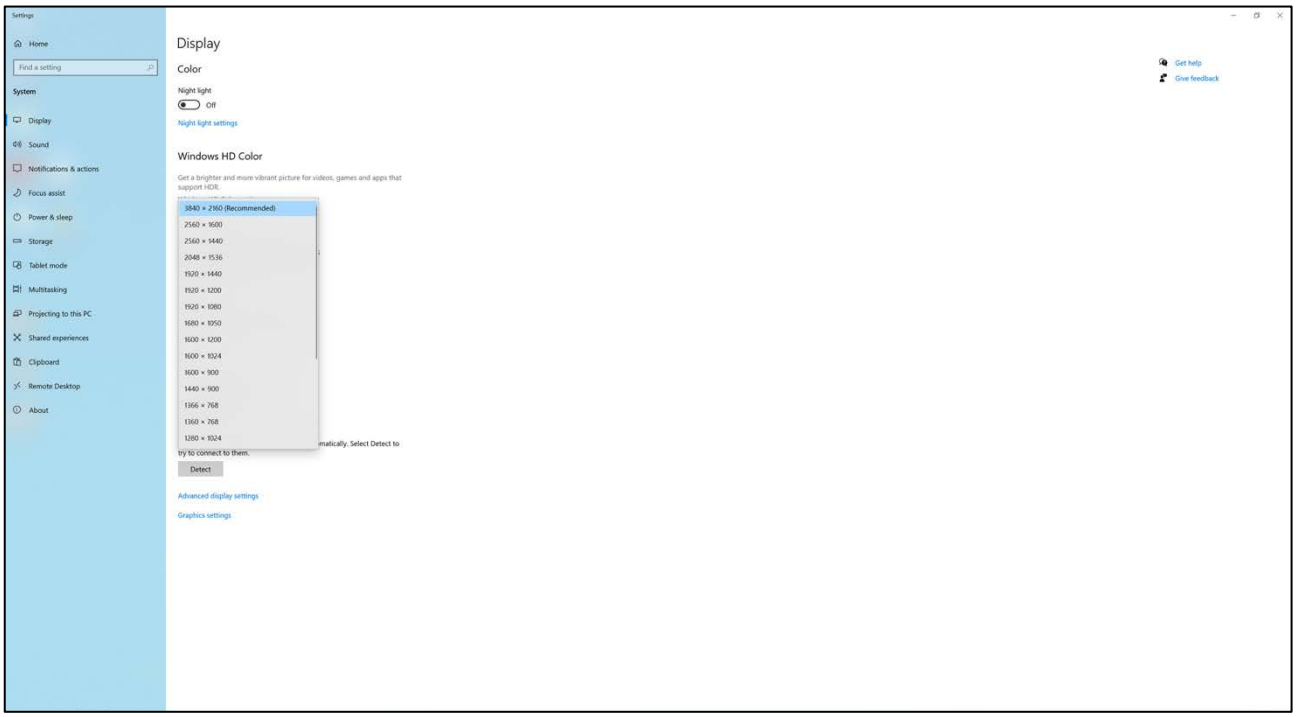
X1
X2
X3
X8
X9
X10
DC IN 12~32V
X4
X5
SSD
SSD
USB 3.0


PassMark(TM) USB3Test
Select USB Device
Device
PMU33ZQ2CX (SuperSpeed 5Gb/s)
Connection Type
SuperSpeed 5Gb/s
Test mode
Loopback
Benchmark
PASSMARK SOFTWARE
Results
Status: BENCHMARK test - Complete
Duration: 000h 30m 00s
Operations: 0
Errors: 0
Write block 2382: 3370.7 Mb/s (421.3 MB/s)
Read block 2383: 3371.7 Mb/s (421.5 MB/s)
Write block 2383: 3371.0 Mb/s (421.4 MB/s)
Read block 2384: 3368.2 Mb/s (421.0 MB/s)
Write block 2384: 3371.4 Mb/s (421.4 MB/s)
Read block 2385: 3369.4 Mb/s (421.2 MB/s)
Write block 2385: 3092.7 Mb/s (386.6 MB/s)
Read block 2386: 3371.0 Mb/s (421.4 MB/s)
OVERALL BENCHMARK RESULT:
Test Start time:
Duration: 000h 30m 00s
Total number of bytes written: 304087 MB
Total number of bytes read: 304215 MB
Maximum Write Data Rate: 3372.1 Mb/s (421.5 MB/s)
Maximum Read Data Rate: 3372.5 Mb/s (421.6 MB/s)
Minimum Write Data Rate: 2726.0 Mb/s (340.8 MB/s)
Minimum Read Data Rate: 2720.0 Mb/s (340.0 MB/s)
Average Write Data Rate: 3350.0 Mb/s (418.8 MB/s)
Average Read Data Rate: 3361.8 Mb/s (420.2 MB/s)
Average Data Rate: 3355.9 Mb/s (419.5 MB/s)
Minimum Data Rate: 2720.0 Mb/s (340.0 MB/s)
Max. Rate
3372
4000
3000
2000
1000
0
(Mb/s)
R/W
Voltage 4.98V
Speed 5Gb/s
Duration
30
Minutes
Start
Stop
Configure
Flash LEDs
Clear Serial
Save Log
Reset All
Help
About
Exit


PassMark(TM) USB3Test
Select USB Device
Device
PMU33ZQ2DG (SuperSpeed 5Gb/s)
Connection Type
SuperSpeed 5Gb/s
Test mode
Loopback
Benchmark
PASSMARK SOFTWARE
Results
Status: BENCHMARK test - Complete
Duration: 000h 10m 00s
Operations: 0
Errors: 0
Write block 805: 3371.2 Mb/s (421.4 MB/s)
Read block 806: 3363.3 Mb/s (420.4 MB/s)
Write block 806: 3371.1 Mb/s (421.4 MB/s)
Read block 807: 3371.7 Mb/s (421.5 MB/s)
Write block 807: 3371.6 Mb/s (421.4 MB/s)
Read block 808: 3362.5 Mb/s (420.3 MB/s)
Write block 808: 3091.8 Mb/s (386.5 MB/s)
Read block 809: 3372.8 Mb/s (421.6 MB/s)
OVERALL BENCHMARK RESULT:
Test Start time:
Duration: 000h 10m 00s
Total number of bytes written: 103020 MB
Total number of bytes read: 103147 MB
Maximum Write Data Rate: 3372.5 Mb/s (421.6 MB/s)
Maximum Read Data Rate: 3372.8 Mb/s (421.6 MB/s)
Minimum Write Data Rate: 3091.8 Mb/s (386.5 MB/s)
Minimum Read Data Rate: 3361.3 Mb/s (420.2 MB/s)
Average Write Data Rate: 3370.2 Mb/s (421.3 MB/s)
Average Read Data Rate: 3369.3 Mb/s (421.2 MB/s)
Average Data Rate: 3369.7 Mb/s (421.2 MB/s)
Minimum Data Rate: 3091.8 Mb/s (386.5 MB/s)
Max. Rate
3372
4000
3000
2000
1000
0
(Mb/s)
R/W
Voltage 5.01V
Speed 5Gb/s
Duration
10
Minutes
Start
Stop
Configure
Flash LEDs
Clear Serial
Save Log
Reset All
Help
About
Exit

5-5. MINI DISPLAY PORT





5-6. 3G-SDI

3G-SDI
Capture 1
3G-SDI
Capture 3
3G-SDI
Capture 5
3G-SDI
Capture 7
3G-SDI
Capture 2
3G-SDI
Capture 4
3G-SDI
Capture 6
3G-SDI
Capture 8

dshow:// - VLC media player
Media Playback Audio Video Subtitle Tools View Help
CH 1
CH 3
CH 5
CH 7

dshow:// - VLC media player
Media Playback Audio Video Subtitle Tools View Help
CH 2
08:03
00:00
dshow://
1.00x
08:03/--:--
CH 4
06:03
00:00
dshow://
1.00x
06:03/--:--
CH 6
04:01
00:00
dshow://
1.00x
04:01/--:--
CH 8
03:20
00:00
dshow://
1.00x
03:20/--:--

-----END-----