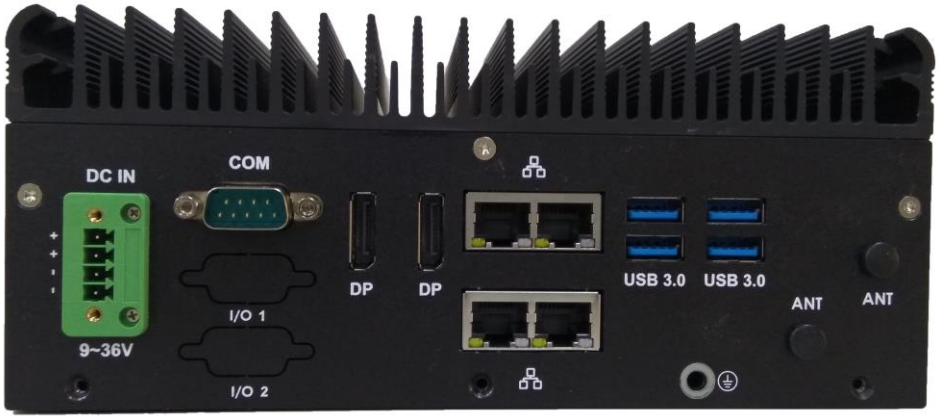
PER361A

7STARLAKE SYSTEM

RELIABILITY/ENVIRONMENT TEST PLAN

Product Manager	H/W Leader	System Engineer	Testing Engineer
Jack	Benjamin	James	Marc



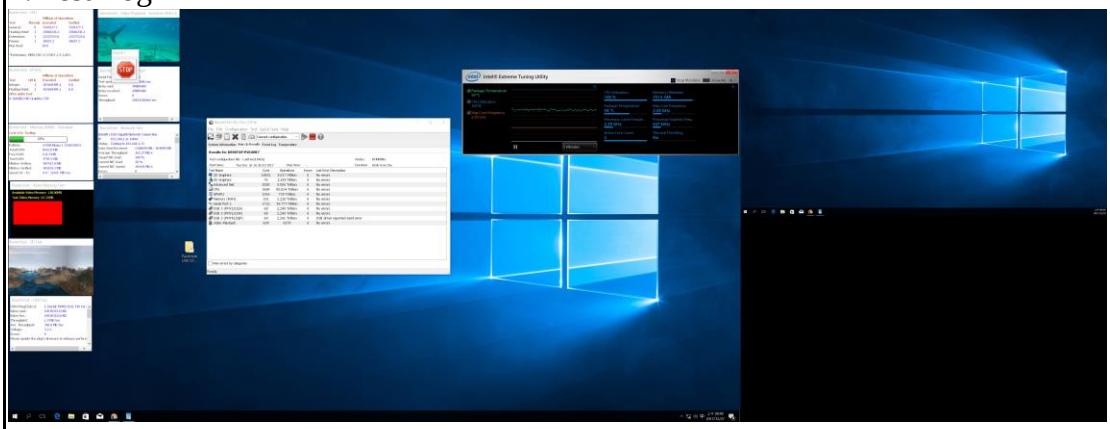
Version History			
Document Release	Date	Change Item	Remarks
V1.0	**1/10/2018**	**Preliminary release**	

System Configuration	
Motherboard	OXY5361A3
CPU	Intel® Core™ i3-6100U Processor 2.3 GHz
Memory	innodisk 8GB DDR4 2133 SODIMM M4S0-8GSSO5RG-D26
SATA port1	innodisk SATA SSD 3MG2-P ATA 64GB
LAN1	Intel® I219 GbE LAN
LAN2	Intel® I210 GbE LAN
LAN3	MT321_Intel® I210 GbE LAN
LAN4	MT321_Intel® I210 GbE LAN

System Test Items Configuration _ Test Results Definition				
No.	Test Item	Qty	System Sample	
			No.1	Remark
1.	DC Input Voltage Fluctuation Test	1	**PASS**	
2.	IO Function Test	1	**PASS**	
3.	Operation System & Drivers Test	1	**PASS**	
4.	Power Consumption	1	**PASS**	
5.	I/O Integrated Stress Test	1	**PASS**	
6.	Temperature Alternate Operation Test	1	**PASS**	
7.	High Temperature Operating Test	1	**PASS**	
8.	High Temperature and Humidity Operating Test	1	**PASS**	
9.	Low Temperature Operation Test	1	**PASS**	
10.	High Temperature Power ON/OFF Test	1	**PASS**	
11	Low Temperature Power ON/OFF Test	1	**PASS**	
12	Thermal Measurement	1	**PASS**	

System Reliability/Environment Test table of Contents

1. DC Input Voltage Fluctuation Test

Test Purpose	To evaluate the influence on the EUT under voltage fluctuation from the DC power Source	**Test Result**	**PASS**
Test Equipment	DC power source: GW INSTEK PSW 80-27 720W Passmark USB3.0 Plug、COM Loopback		
Quantity Tested	Minimum 1 Set		
Test Condition	Test Software: Passmark BURN-IN Test Program under Microsoft Windows 10 Test Procedure: 1. Adjust DC power source to upper limit (VDC+5%) 2. Turn on the system and perform the function test with 100% loading for a period of 1 hour at least 3. Check the functions of the system and record it 4. Change DC power source to lower limit (VDC-5%) 5. Repeat steps 2~3		
Test Criteria	All units must be pass 1 hour Burn-In test program, without any error occur. The EUT must be no damage or safety problem occurred.		
Test Log / Photo	1. DC power Adaptor  2. Test Log 		

2. IO Function Test

Item		Criteria	Result	Note
SATA Port 1		SATAIII Onboard SSD device Run PassMark 20 minutes with all disks	Pass	
COM1 (RS-232)		1. Physical Pin define testing (RS232/422/485) (Pcom pro V2.1\ SeaCOM_v030602) 2. Handshaking test (Pcom pro V2.1\ SeaCOM_v030602) 3. Baud rate testing (RS232/422/485) (BEAR UART card) 4. Cable Length testing (232: 15M)	Pass	
USB3.0 X4		can use any USB device	Pass	
		Loopback Plugs for USB 3.0 Trouble shooting and Testing	Pass	
USB2.0 X2		can use any USB device	Pass	
		Loopback Plugs for USB 2.0 Trouble shooting and Testing	Pass	
Display output	DP1	Connect Display port monitor , display function well	Pass	
	DP2		Pass	
LAN port1		Intel I219 LAN Function Test	Pass	
LAN port2		Intel I210 LAN Function Test	Pass	
LAN port3		Intel I210 LAN Function Test	Pass	
LAN port4		Intel I210 LAN Function Test	Pass	
Power button		Check work well	Pass	
Power Led		Check work well	Pass	
HDD Led		Check work well	Pass	
DC in		Check work well	Pass	

3.Operation System & Drivers Test

Publisher	Package & Version	DUT-1	**Note**
Microsoft OS	DOS6.22、DOS98	Pass	
Microsoft OS	Microsoft Windows 10 Professional 64Bit	Pass	

Driver and Application software	**Version / Details**	DUT-1	**Note**
INF	Intel INF 10.1.1.42	Pass	
VGA	Intel HD Graphics 520 ,21.20.16.4627 2017/3/9	Pass	
Audio	Realtek Audio :6.0.1.8036 2017/1/5	Pass	
LAN	I219:12.15.23.9 2016/10/26	Pass	
	I210:12.15.184.0 2016/12/8	Pass	

4. Power Consumption

Test Purpose	To measure power consumption of the EUT during operation/suspend mode/power off mode
Quantity Tested	Minimum 1 Set
Test Procedure	1. Turn on the power source and set the output voltage frequency following to the test specification 2. Connect the Power Meter between EUT and power source 3. Connect maximum quantity of external devices on all I/O (ex. USB, COM, etc…), and have the full loading status on each device 4. Turn on the EUT and set the EUT on each consumption mode 5. Measure and record the power consumption value shown on Power Meter as Watt
Test Criteria	1. The Max. power consumption value must not exceed the output ability of used power supply, the derating while in high temperature environment must also to be considered 2. By following the EuP LOT 6 requirement, the power consumption of the standby mode is limited 1.0 Watt (for w/o WOL model) and 1.7Watt (for w/ WOL model)

Item	**Device Information (Full load)**
CPU	Intel® Core™ i3-6100U Processor 2.3 GHz
Memory	innodisk 8GB DDR4 2133 SODIMM M4S0-8GSSO5RG-D26
SATA port 1	innodisk SATA SSD 3MG2-P 64GB
DP	Dell U2312
COM1	COM Loopback
LAN1 ~ LAN4	LAN (Loopback)
USB1、USB2	USB KB/Mouse
USB3~USB6	水泥電阻 1A
Operating System	Windows 10 Professional 64-bit
Test Equipment	GW INSTEK PSW 80-27 720W、PROVA 11_AC/DC mA clamp meter、Agilent U1252B
Test Software	Burnin test v8.0、AS SSD、IntelBurnTest 1.9 GaBench v1.32 、SeaCOM_v030602

Model	Test Voltage	Voltage	Current	Power consumption
i3-6100U	12 V	11.94 V	4.26 A	50.86 W
	9V	8.91V	5.91A	52.65 W
	36V	35.9V	1.49A	53.49 W

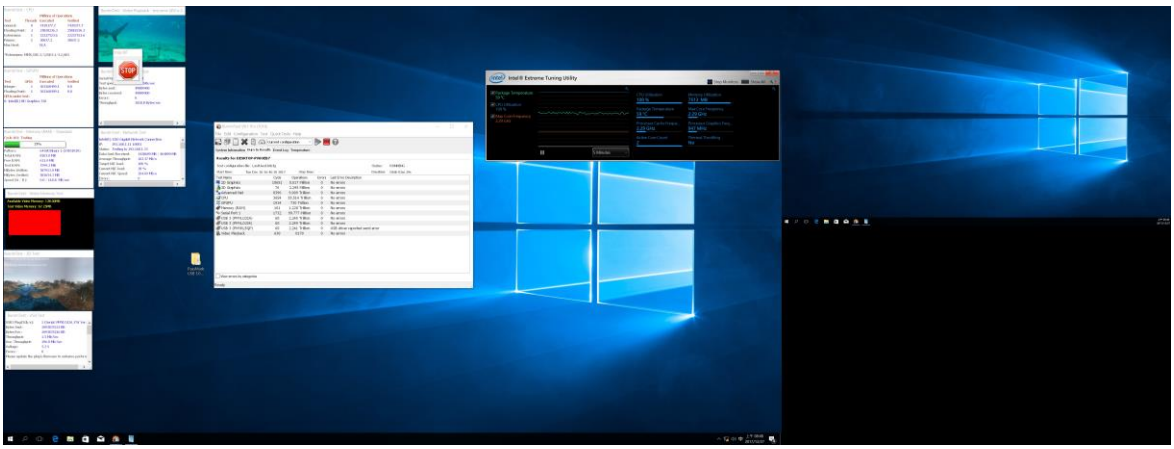
Item	Device Information (Heavy load)
CPU	Intel® Core™ i3-6100U Processor 2.3 GHz
Memory	innodisk 8GB DDR4 2133 SODIMM M4S0-8GSSO5RG-D26
SATA port 1	innodisk SATA SSD 3MG2-P ATA 64GB
DP	Dell U2312
COM1	N/A
LAN1 ~ LAN4	N/A
USB1、USB2	USB KB/Mouse
USB3~USB6	N/A
Operating System	Windows 10 Professional 64-bit
Test Equipment	GW INSTEK PSW 80-27 720W、PROVA 11_AC/DC mA clamp meter、Agilent U1252B
Test Software	Burnin test v8.0、

Power Measure (Heavy load)								
Model	Voltage	Voltage	Idle	S3	S4	S5	Current	Power consumption
i3-6100U	12 V	11.94 V	0.67A	0.41 A	0.35 A	0.34 A	2.2 A	26.268W

5. I/O Integrated Stress Test

System configuration					
CPU	Intel® Core™ i3-6100U Processor 2.3 GHz				
RAM1	innodisk 8GB DDR4 2133 SODIMM M4S0-8GSSO5RG-D26				
SATA port 1	innodisk SATA SSD 3MG2-P ATA 64GB				
O.S.	Windows 10 64bit				
Temperature	Room temperature				
Testing Utility and preference					
Test Software		**Test Preference**	**Test Time(Hours)**	**Result**	**Note**
PASSMARK BrunIn test (8.0)		Reference below setting	**12**	PASS	
Test item	**Loading (%)**	**Test preference**			
CPU	100	**Default preference:** **Select CPU test types:** General purpose instructions, Floating Point Unit instructions, Prime number test **Extension instructions:** MMX, 3DNow!, SSE, SSE2 **CPU affinity:** Normal task scheduling			
RAM	100	**Default preference:** **RAM test mode and test pattern:** Standard **Test:** Default(Cyclic)			
Com Port(s)	100	**Default preference:** **Detect and loopback test** **Send and receive timeout: 3500** **Port speed: 115200 Kbits/Sec**			
Video	100	**Default preference:** **Select video playback files:** C:\...\Clock.avi			
2D Graphics	100	**Default preference:** **2D Graphics Test:** All availiable Video Memory			
3D Graphics	100	**Default preference:** **Test window setup (Multiple monitorof testing): Number of:** 1(default) **Window placement:** Auto placement on primary monitor (default) **Window size:** 300x200 pixels (default)			
LAN port 1	100	LAN port Loopback			
LAN port 2	100	LAN port Loopback			
LAN port 3	100	LAN port Loopback			
LAN port 4	100	LAN port Loopback			

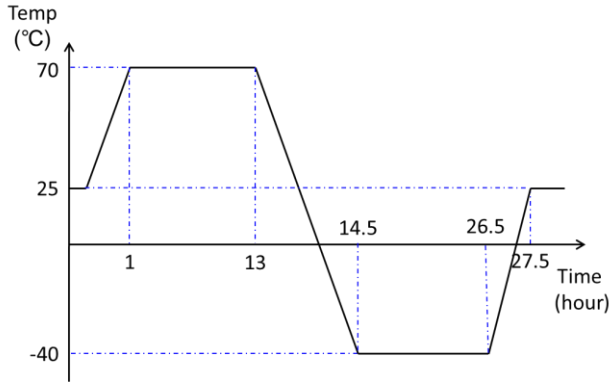
Test photo



6. Temperature Alternate Operation Test

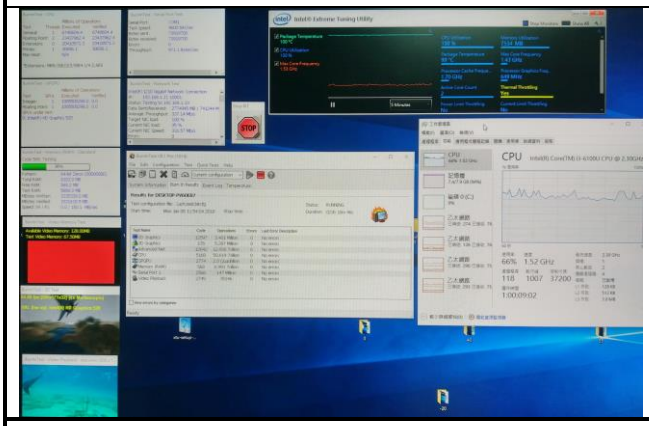
Device Model	PER361A	Test Result	PASS

Diagram of curves



Test Temperature		Test Time
High	70℃	12h
Low	-40℃	12h
Test Standard	Reference IEC60068-2	
Test Software	Burnin test v8.0	

Test picture



Test procedure

1. This operation test is under temperature range -40℃ ~ 70℃
2. Standards is referred to IEC60068-2-14 Change of temperature
3. Have the subject inside the chamber and set up related cables.
4. Set up the temperature
5. If it's OK then rise up temperature to 60℃ and run Burnin test v8.0 for stress test
6. Keep unpowered subject for 12 hours on -40℃
7. Power on test and Perform minimum 3 power on/off cycles (to be sure that subject can reboot)
8. Observe the temperature and the subject in the test execution
9. Check the damage on the subject by visual and do function test

Note:

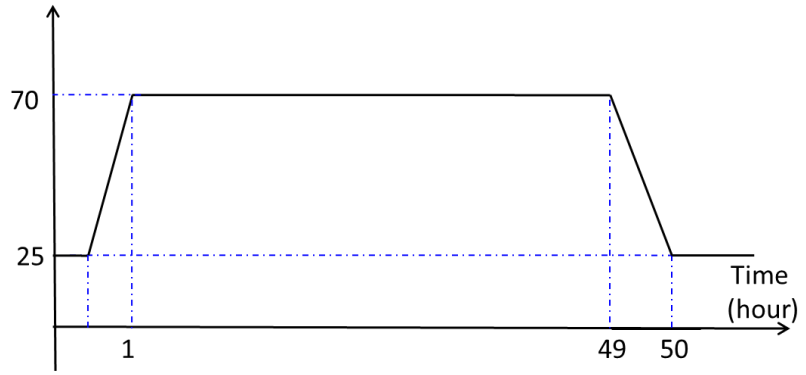
Electronic function check:
1. All system functions must be checked with appropriate testing programs and should pass the inspection.
2. Running Windows for OS, the system should not have degradation in its performance.

Mechanical function check:
1. The connectors and components should work properly without any interference.
2. All screws should be tightened up appropriately.

7. High Temperature Operating Test

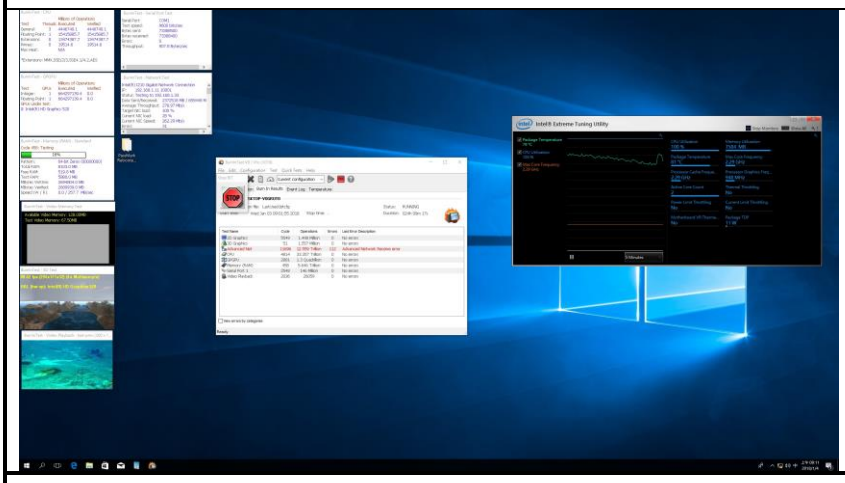
Device Model	PER361A	Test Result	PASS

Diagram of curves



Test Temperature		Test Time
High	70˚C	48Hours
Test Standard	Reference IEC-60068-2	
Test Software	Burnin test v8.0	

Test picture



Test procedure

10. This operation test is under temperature range 70℃
11. Standards is referred to IEC60068-2-14 Change of temperature
12. Have the subject inside the chamber and set up related cables.
13. Set up the temperature
14. If it's OK then rise up temperature to 60℃ and run Burnin test v8.0 for stress test
15. Power on test and Perform minimum 3 power on/off cycles (to be sure that subject can reboot)
16. Observe the temperature and the subject in the test execution
17. Check the damage on the subject by visual and do function test

Note:

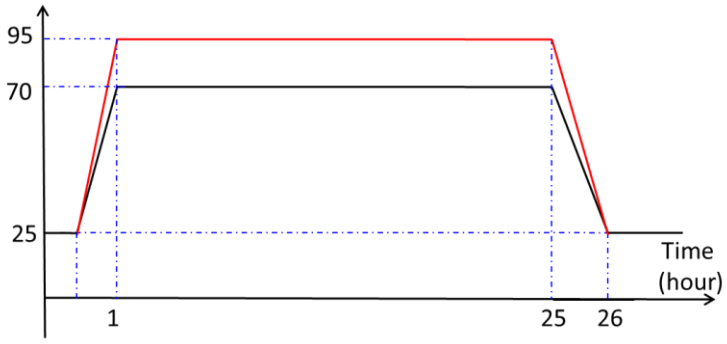
Electronic function check:
1. All system functions must be checked with appropriate testing programs and should pass the inspection.
2. Running Windows for OS, the system should not have degradation in its performance.

Mechanical function check:
1. The connectors and components should work properly without any interference.
2. All screws should be tightened up appropriately.

8. High Temperature and Humidity Operating Test

Device Model	PER361A	Test Result	PASS

Diagram of curves



Test Temperature		Test Time
High	70℃	24Hours
Humidity	95%	
Test Standard	Reference IEC60068-2	
Test Software	Burnin test v8.0	

Test picture

Test procedure

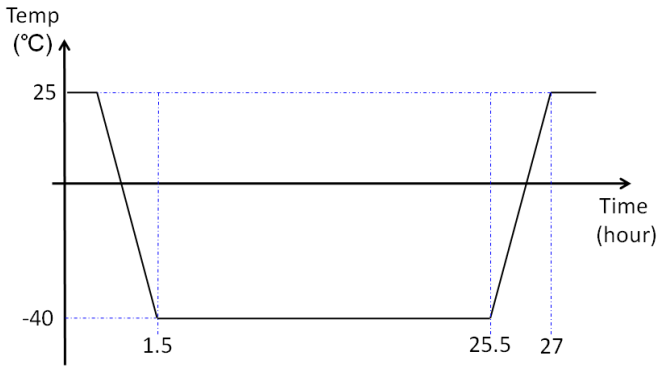
18. This operation test is under temperature range 25℃ ~ 60℃
19. Standards is referred to IEC60068-2-3 Change of temperature
20. Have the subject inside the chamber and set up related cables.
21. Set up the temperature
22. If it's OK then rise up temperature to 60℃ and run Burnin test v8.0 for stress test
23. Power on test and Perform minimum 3 power on/off cycles (to be sure that subject can reboot)
24. Observe the temperature and the subject in the test execution
25. Check the damage on the subject by visual and do function test
26. Humidity: 95%

Note:

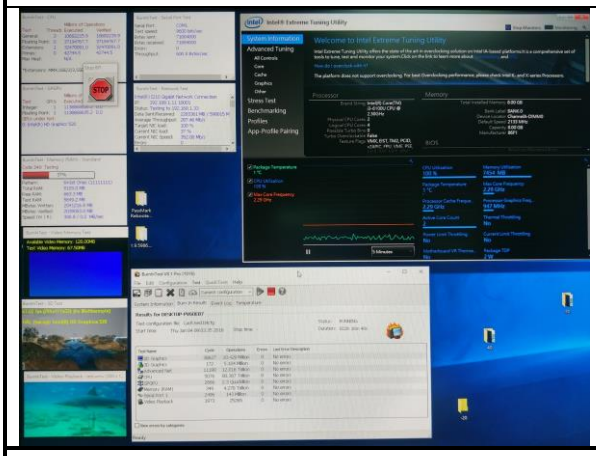
Electronic function check:
1. All system functions must be checked with appropriate testing programs and should pass the inspection.
2. Running Windows for OS, the system should not have degradation in its performance.

Mechanical function check:
1. The connectors and components should work properly without any interference.
2. All screws should be tightened up appropriately.

9. Low Temperature Operation Test

Device Model	PER361A	Test Result	PASS
Diagram of curves		Test Temperature	Test Time
		Low / -40	24Hours
		Test Standard	Reference IEC60068-2
		Test Software	Burnin test v8.0

Test picture



Test procedure

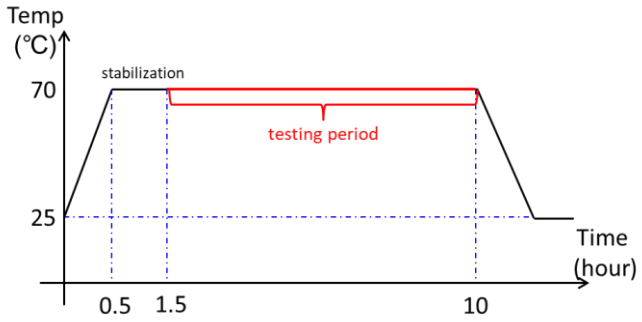
27. This operation test is under temperature range 25℃ ~ -40℃
28. Standards is referred to IEC60068-2-1 Change of temperature
29. Have the subject inside the chamber and set up related cables.
30. Set up the temperature
31. If it's OK then rise up temperature to -40℃ and run Burnin test v8.0 for stress test
32. Power on test and Perform minimum 3 power on/off cycles (to be sure that subject can reboot)
33. Observe the temperature and the subject in the test execution
34. Check the damage on the subject by visual and do function test

Note:

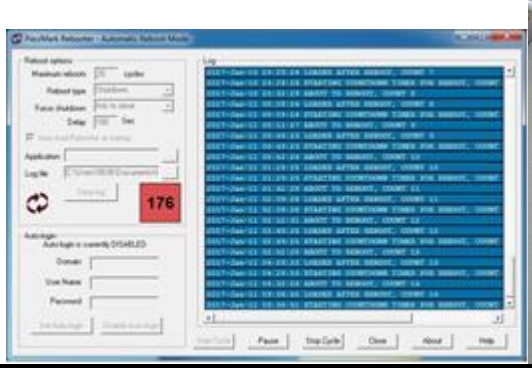
Electronic function check:
1. All system functions must be checked with appropriate testing programs and should pass the inspection.
2. Running Windows for OS, the system should not have degradation in its performance.

Mechanical function check:
1. The connectors and components should work properly without any interference.
2. All screws should be tightened up appropriately.

10. High Temperature Power ON/OFF Test

Device Model	PER361A	Test Result	PASS
Diagram of curves		Test Temperature	Test Time
		High	70℃ 8.33Hours
		Test Standard	Reference IEC60068-2
		criteria	System can power on 10 times under high temperature On/off rule On → 10 minute/time Off → 40 minute/time Total: 50 minute/cycle

Test picture



Test procedure

35. This operation test is under temperature range 25℃ ~ 60℃
36. Standards is referred to IEC60068-2-2 Change of temperature
37. Have the subject inside the chamber and set up related cables.
38. Set up the temperature
39. If it's OK then rise up temperature to 60℃ and DOS mode run counter.exe for test
40. Unpowered subject should be burn up to 70℃
41. Power on test and Perform minimum 3 power on/off cycles (to be sure that subject can reboot)
42. Observe the temperature and the subject in the test execution
43. Check the damage on the subject by visual and do function test

Note:

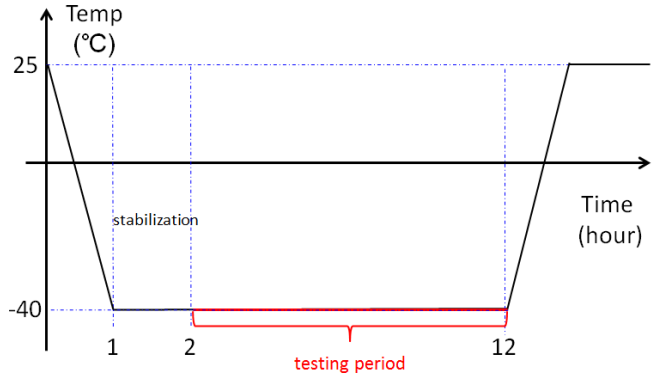
Electronic function check:
1. All system functions must be checked with appropriate testing programs and should pass the inspection.
2. Running Windows for OS, the system should not have degradation in its performance.

Mechanical function check:
1. The connectors and components should work properly without any interference.
2. All screws should be tightened up appropriately.

11. Low Temperature Power ON/OFF Test

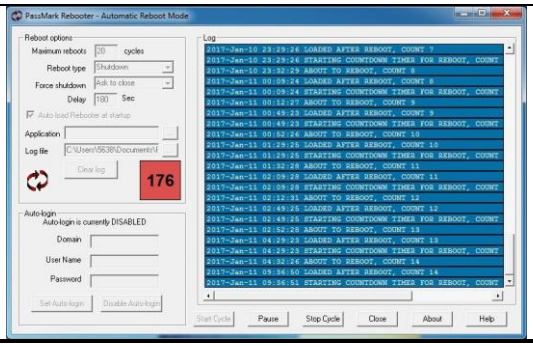
Device Model	PER361A	Test Result	PASS

Diagram of curves



Test Temperature		Test Time
Low	-40℃	7.5Hours
Test Standard	Reference IEC-60068-2	
Criteria	System can power on 10 times under low temperature On/off rule On → 10min/time Off → 40min/time Total: 50min/cycle	

Test picture



Test procedure

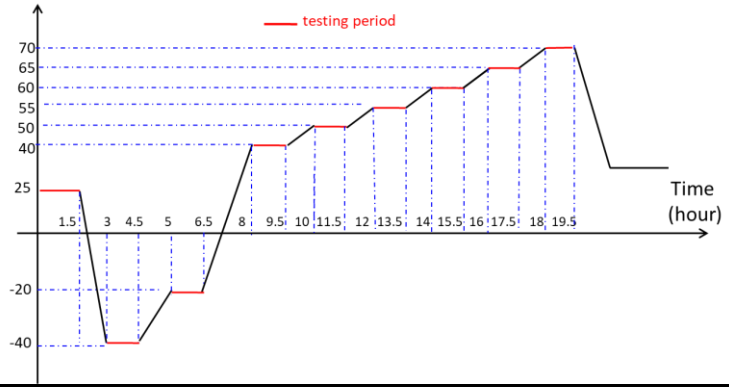
44. This operation test is under temperature range 25℃ ~ -40℃
45. Standards is referred to IEC60068-2-14 Change of temperature
46. Have the subject inside the chamber and set up related cables.
47. Set up the temperature
48. If it's OK then rise down temperature to -40℃ and DOS mode run counter.exe for test
49. Unpowered subject should be cool down to -40℃
50. Keep unpowered subject for four hours on -40℃
51. Power on test and Perform minimum 3 power on/off cycles (to be sure that subject can reboot)
52. Observe the temperature and the subject in the test execution
53. Check the damage on the subject by visual and do function test

Note:

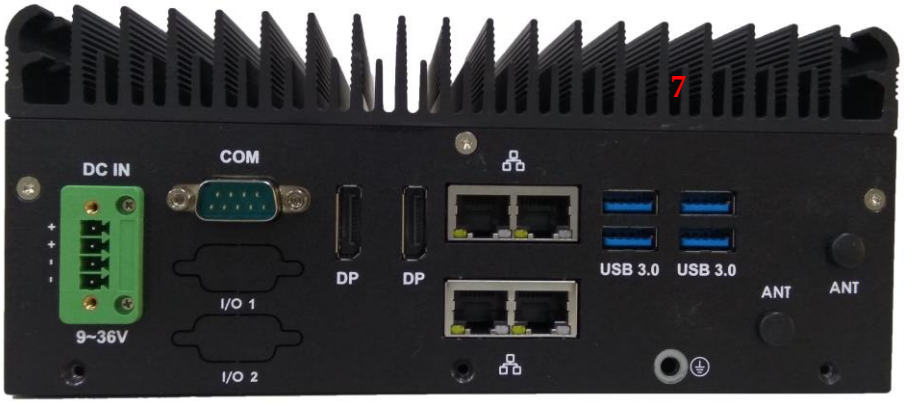
Electronic function check:
1. All system functions must be checked with appropriate testing programs and should pass the inspection.
2. Running Windows for OS, the system should not have degradation in its performance.

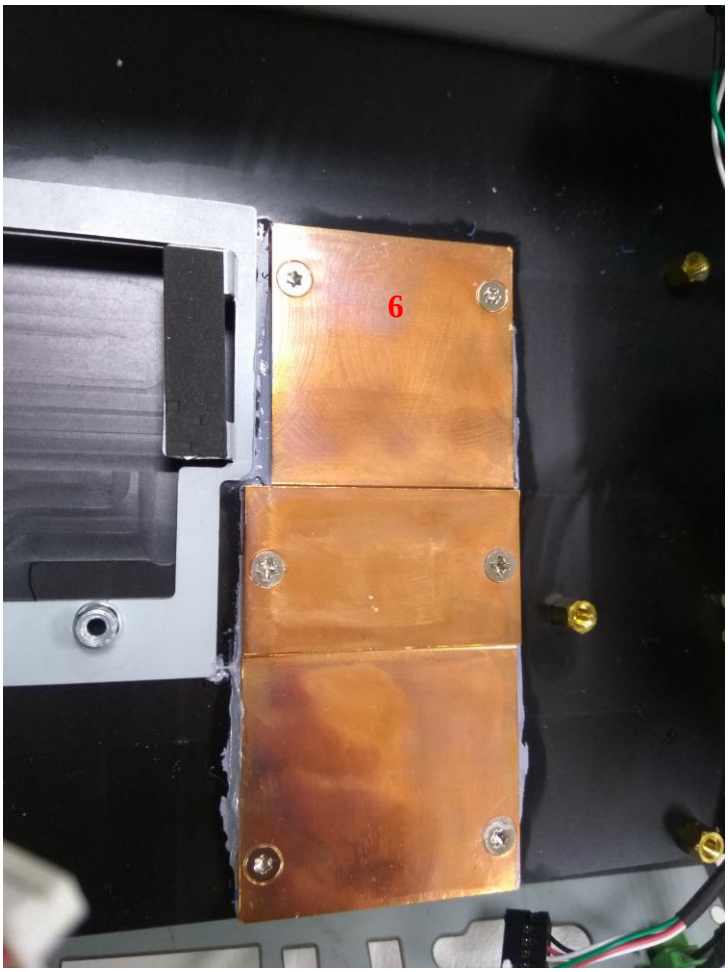
Mechanical function check:
1. The connectors and components should work properly without any interference.
2. All screws should be tightened up appropriately.

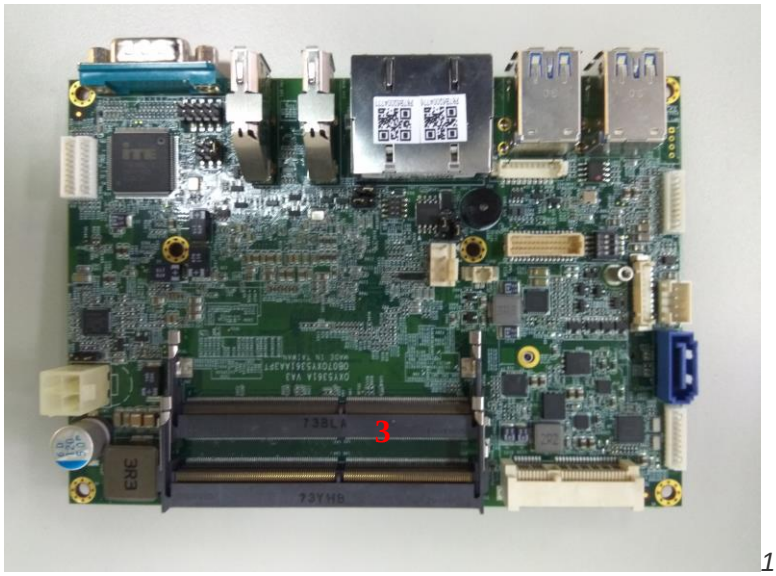
12. Thermal Measurement

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
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	

Thermal point







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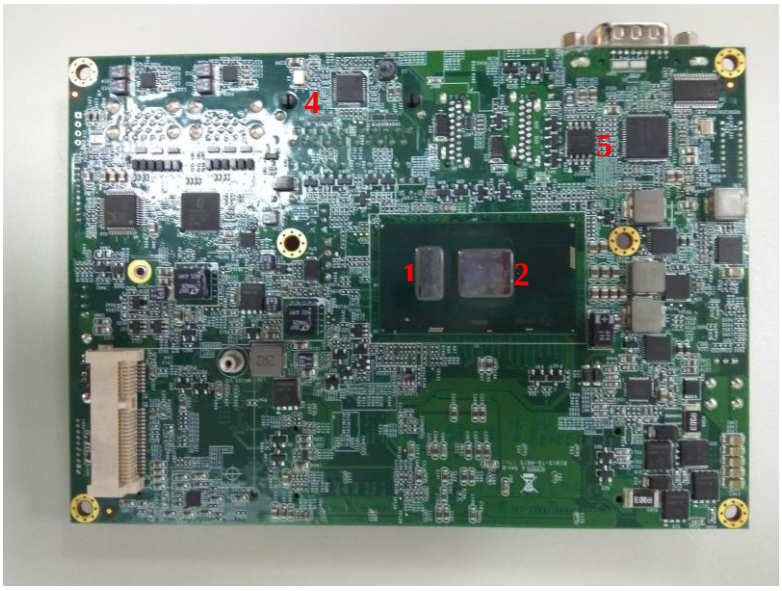

Test Result

Point	-40℃	-20℃	0℃	25℃ Room temperature	50℃	55℃	60℃	65℃	70℃
CPU Frequency	2.29GHz	2.0GHz	1.9GHz	2.29GHz	2GHz	1.7GHz	1.5GHz	1.5GHz	1.5GHz
CPU T-J	0	5	34	95	97	97	100	100	100
1.CPU Die 1	-35	-8.6	7.3	53.2	66.2	72	75.8	79.5	83.5
2.CPU Die 2	-21	-1.6	18.8	67.1	78	83.4	86.6	91.1	93
3.RAM	-20	2.3	21.7	73.7	86	91.5	96	100	102.8
4.I219	-27.2	-3.8	16.7	60.5	73.6	79	83.2	88	92
5.I210	-25	-2	15	65	80	86	91	94	98
6.CPU 銅片	-33	-12	6.7	53.1	66	71.3	76	80	84.8
7.sink	-40	-16	2.2	44.7	61.2	66.8	71.1	76.6	79
I219 LAN 1000M (Mb)	937	937	936	936	922	937	944	944	944
I219 LAN 100M (Mb)	94.1	94.2	94.1	94	94	94.2	94.2	94.2	94.2
I210-1 LAN 1000M (Mb)	920	923	920	922	926	922	944	944	944
I210-1 LAN 100M (Mb)	83.8	83.6	83.4	83.7	83.6	83	94.2	94.2	94.2
I210-2 LAN 1000M (Mb)	944	945	944	943	944	944	944	944	944
I210-2 LAN 100M (Mb)	90.6	82.9	82.5	90.6	84.6	90.6	82.2	90.6	90.6
I210-3 LAN 1000M (Mb)	945	944	944	943	943	944	944	944	944
I210-3 LAN 100M (Mb)	82.8	81.2	84.7	83.3	87.4	81.8	91.4	94.2	94.2
innodisk 64GB SSD (Read MB)	511MB/S	514MB/S	501MB/S	513MB/S	507MB/S	514MB/S	505MB/S	512/MB/S	516MB/S
innodisk 64GB SSD (Write MB)	193MB/S	193MB/S	194MB/S	196MB/S	196MB/S	196MB/S	197MB/S	197MB/S	196MB/S