Reliability Test Report

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Test Summary Table

Product Model	Ra-20H	**Hardware Version**	V1.0	**Sample Quantity**	6PCS
Test Date	2026.09.29–2026.10.13			**Tested by**	Dong Wenchao
Test Category	☑Climate Environment Test ☐Mechanical Environment Test ☐Comprehensive Environment Test ☐IP Protection Test ☐Physical Performance Test ☐Electrical Performance Test ☐Packaging & Transportation Test				

No.	Test Item	Test Result
1	Low Temperature Storage Test	PASS
2	High Temperature Storage Test	PASS
3	Low Temperature Operating Test	PASS
4	High Temperature Operating Test	PASS
5	AC Power On/Off Test	PASS
6	Cyclic Damp Heat Test	PASS
7	Thermal Shock Test	PASS

Test Conclusion	☑PASS ☐FAIL	**Reviewed by**	An Sanchao

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1 Test Objective

Verify the functional stability and long-term reliability of the Ra-20H module under harsh environmental conditions, such as extreme temperatures, humidity, and frequent power cycling, and assess whether the module meets the expected design requirements and complies with relevant standards.

2 Test Standard

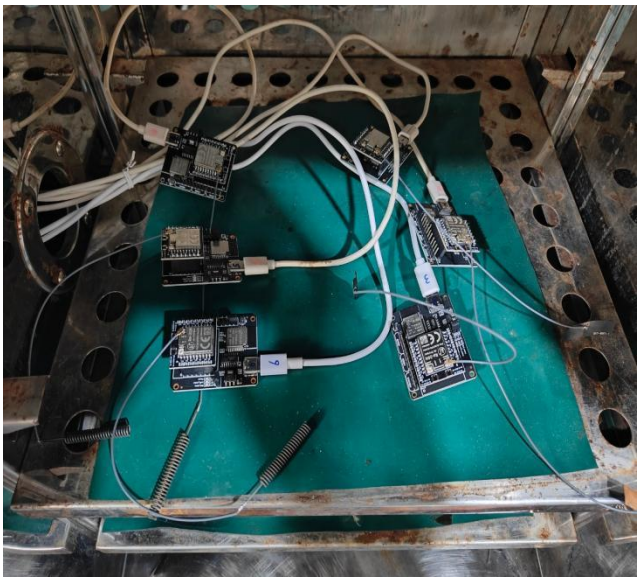
No.	Process Name	Inspection Item	Inspection Equipment	Sampling Level (Refer to GB/T 2828.1-2012)	Acceptable Quality Level		
					CR	MA	MI
1	Reliability test	High/low temperature storage, high/room/low temperature power on/off, high/low temperature operating, cyclic damp heat, thermal shock	Constant temperature and humidity chamber	Normal single sampling, special inspection level S-1	0 accept, 1 reject		
Note: CR- Critical defect; MA- Major defect; MI- Minor defect.							

3 Test Items

No.	Test Item	Test Conditions
1	Low temperature storage test	Test conditions: -40℃ Test duration: 8h After an 8-hour soak at -40℃, perform a cold start test.
2	High temperature storage test	Test conditions: 100℃/93% RH Test duration: 8h After a 1-hour soak at 85℃, perform a hot start test.
3	Low temperature operating test	Test conditions: -40℃ Test duration: 24h
4	High temperature operating test	Test conditions: 85℃/93% RH Test duration: 24h
5	AC power on/off test	Test conditions: A. -40℃; B. 25℃/93% RH; C. 85℃/93% RH Cycle each condition 200 times, with 30s ON and 30s OFF
6	Cyclic damp heat test	Test conditions: A. Operate at 85℃/93% RH for 4h; B. Operate at 25℃/93% RH for 4h Cycle steps A and B for a total of 2 cycles.
7	Thermal shock test	Test conditions: -40℃–100℃/93% RH, soak for 30min at each temperature Test duration: 5 cycles Temperature transition time: 50min for heating, 2h for cooling

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4 Test Preparation

No.	Item	Image/Attachment
1	Reliability documentation	Ra-20H可靠性测试说明20260920.(
2	Test equipment	
3	Sample placement	
4	Test reason	Reliability test for new product pilot production

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5 Low Temperature Storage Test

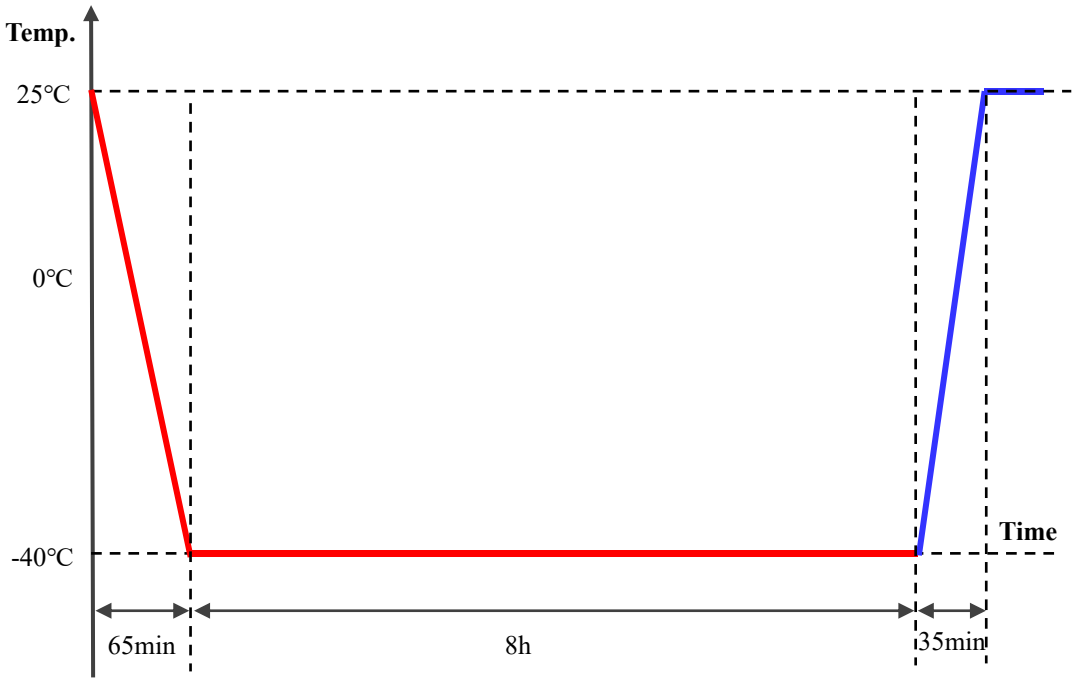
Test Objective: Verify the reliability of the product's electrical performance at room temperature after low-temperature storage under non-operating conditions.

Test Conditions: Power-off test. Store the product at -40℃ for 8h, then perform a cold start test.

Test Profile:

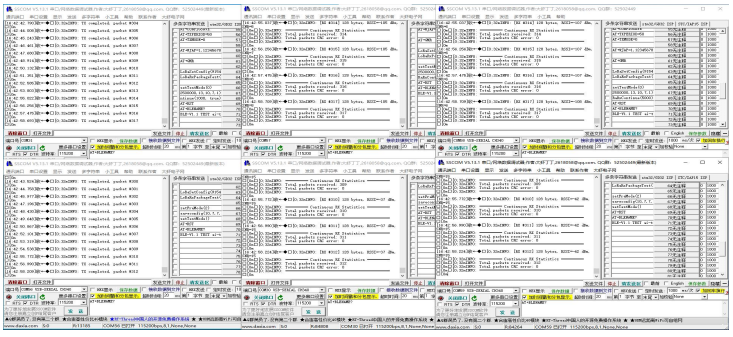
Power Off

Power On



Test Criteria:

1. During the cold start test, the module functions normally. After the module is properly connected, power on the module and start the test by sending commands. Observe the packet transmission and reception information; if the packet loss rate is less than 1%, the module is considered to be functional.
2. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

Sample Quantity	Test Data	Test Results
6PCS		PASS

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6 High Temperature Storage Test

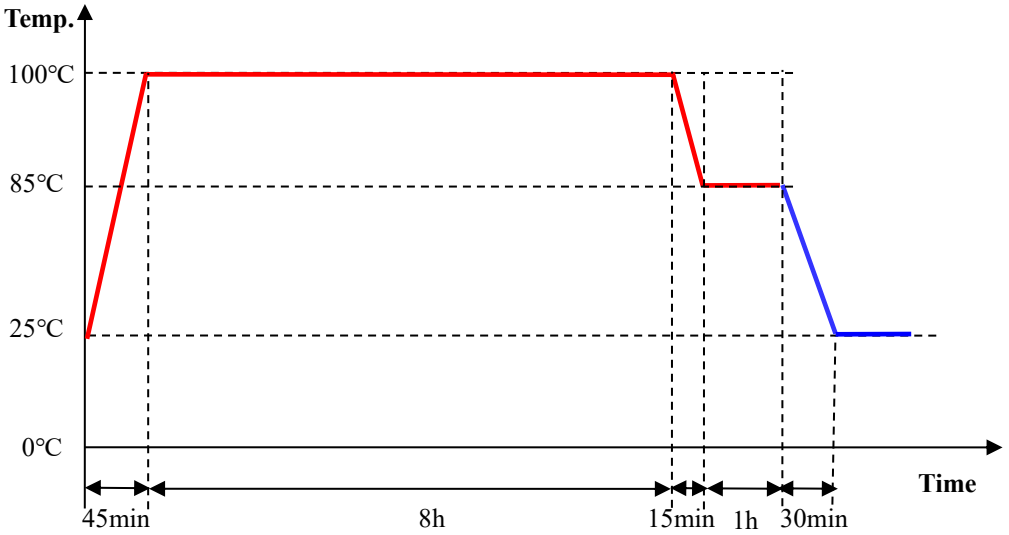
Test Objective: Verify the reliability of the product's electrical performance at room temperature after high-temperature storage under non-operating conditions.

Test Conditions: Power-off test. Store the product at 100℃/93% RH for 8h, then restore it to 85℃/93% RH for a 1-hour soak, and perform a hot start test.

Test Profile:

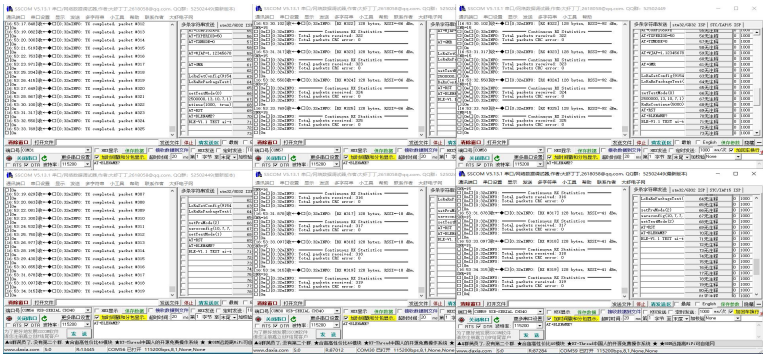
Power Off

Power On



Test Criteria:

1. During the hot start test, the module functions normally. After the module is properly connected, power on the module and start the test by sending commands. Observe the packet transmission and reception information; if the packet loss rate is less than 1%, the module is considered to be functional.
2. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

Sample Quantity	Test Data	Test Results
6PCS		PASS

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7 Low Temperature Operating Test

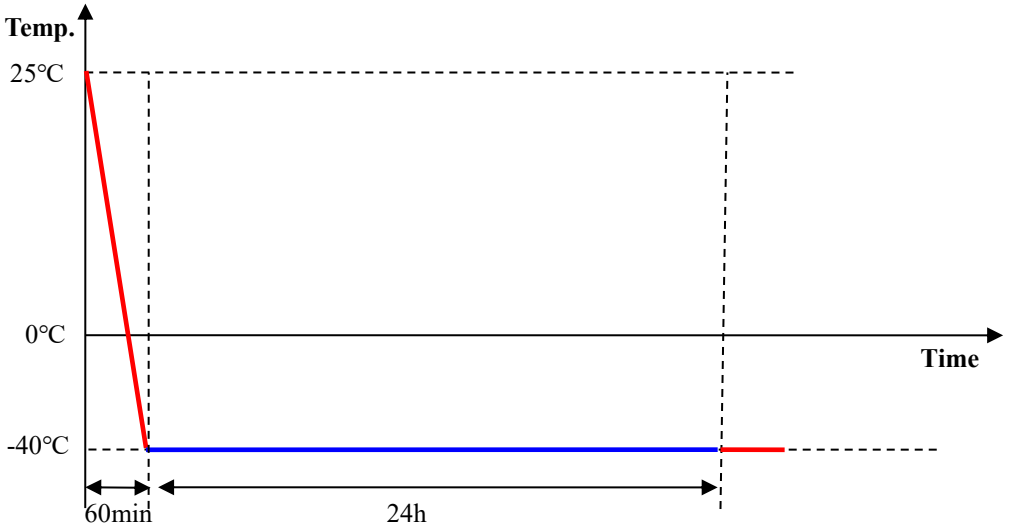
Test Objective: Verify the functional integrity and performance stability of the product under low-temperature operating conditions.

Test Conditions: Power-on test. Operate at -40℃ for 24h.

Test Profile:

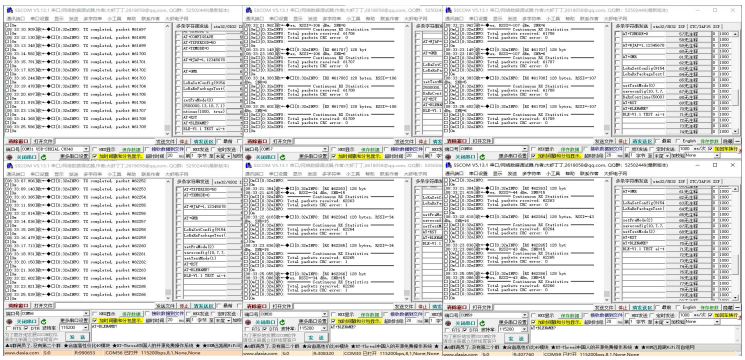
Power Off

Power On



Test Criteria:

1. After the module is properly connected, power on the module and start the test by sending commands. Observe the packet transmission and reception information; if the packet loss rate is less than 1%, the module is considered to be functional.
2. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

Sample Quantity	Test Data	Test Results
6PCS		PASS

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8 High Temperature Operating Test

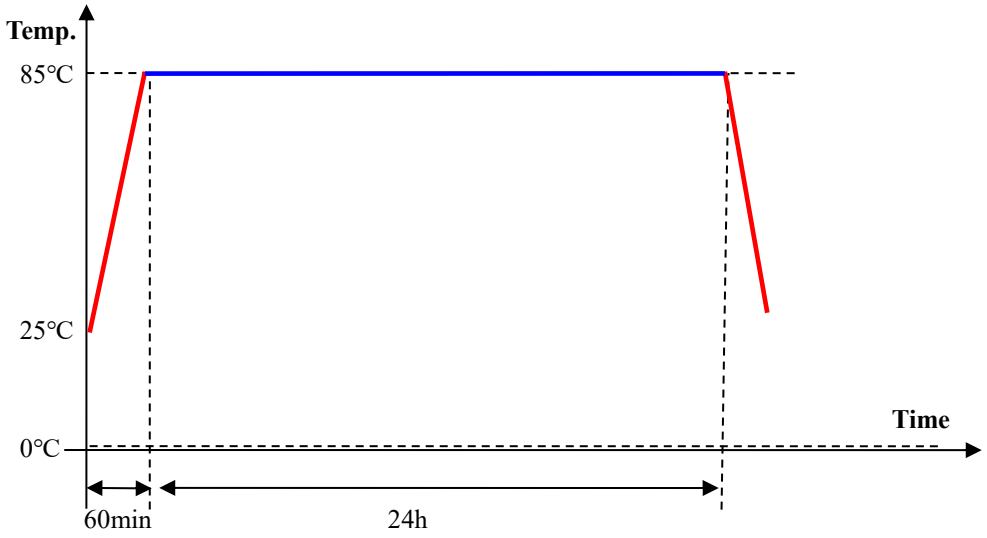
Test Objective: Verify the functional integrity and performance stability of the product under high-temperature operating conditions.

Test Conditions: Power-on test. Operate at 85℃/93% RH for 24h.

Test Profile:

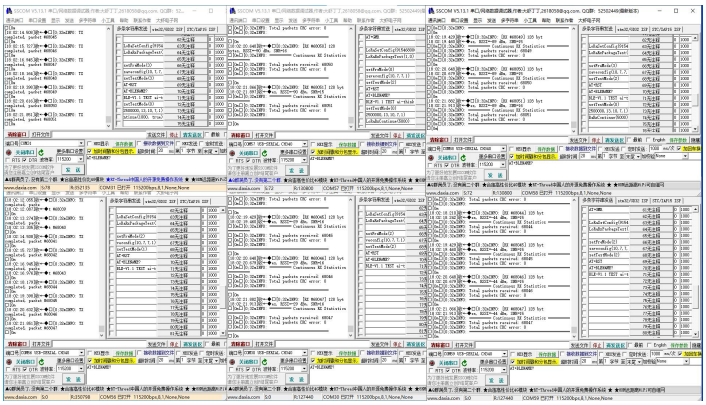
Power Off

Power On



Test Criteria:

1. After the module is properly connected, power on the module and start the test by sending commands. Observe the packet transmission and reception information; if the packet loss rate is less than 1%, the module is considered to be functional.
2. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

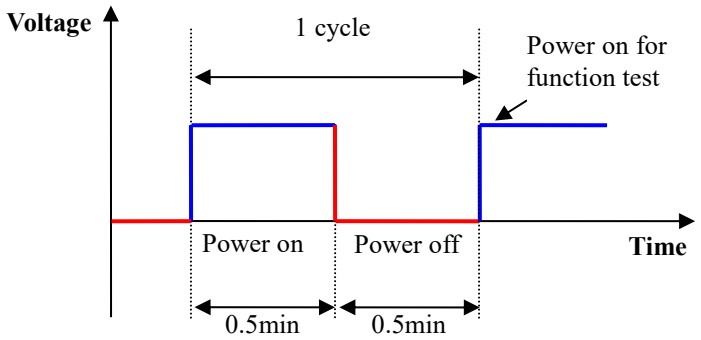
Sample Quantity	Test Data	Test Results
6PCS		PASS

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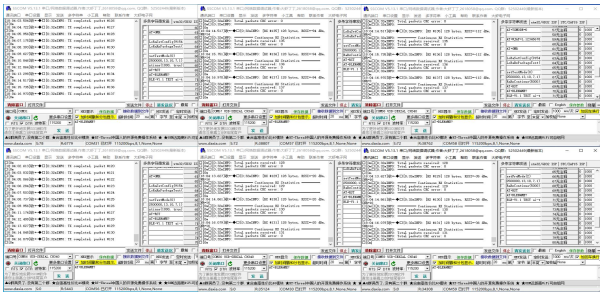
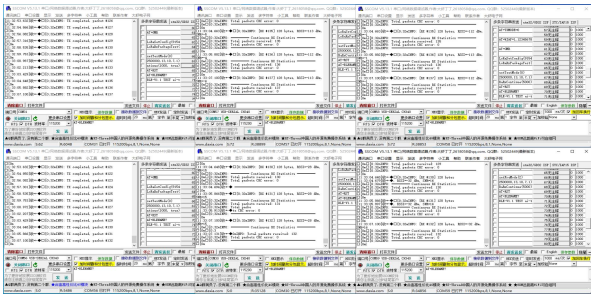
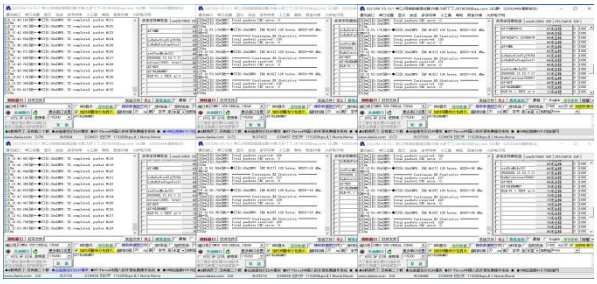
9 AC Power On/Off Test

Test Objective: Verify product reliability under frequent power-on/off in various operating environments.
Test Conditions: 1. Power on: 30s; power off: 30s; 2. Temperatures: -40℃; 25℃/93% RH; 85℃/93% RH; 3. Cycles: 200 cycles for each test condition.
Test Profile:

Power Off
Power On



Test Criteria:
1. After the module is properly connected, power on the module and start the test by sending commands. Observe the packet transmission and reception information; if the packet loss rate is less than 1%, the module is considered to be functional.
2. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

Item	Sample Quantity	Test Data	Test Results
Power on/off at room temperature	6PCS		PASS
Power on/off at low temperature	6PCS		PASS
Power on/off at high temperature	6PCS		PASS

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10 Cyclic Damp Heat Test

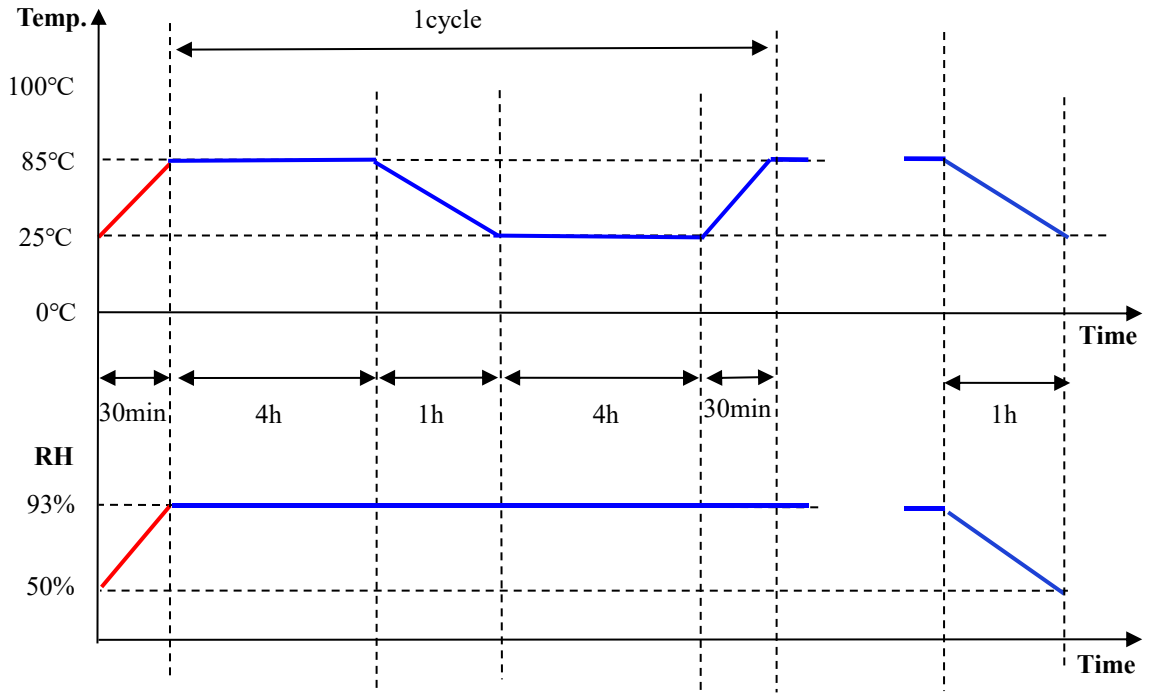
Test Objective: Verify the product's applicable reliability under high-humidity and alternating environmental conditions.

Test Conditions: 1. Operate at 85℃/93% RH for 4h;
2. Operate at 25℃/93% RH for 4h;
Cycle steps 1 and 2, for a total of 2 cycles.

Test Profile:

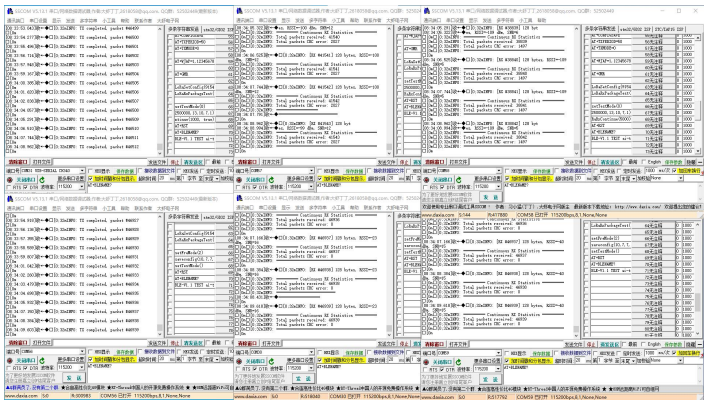
Power Off

Power On



Test Criteria:

1. After the module is properly connected, power on the module and start the test by sending commands. Observe the packet transmission and reception information; if the packet loss rate is less than 1%, the module is considered to be functional.
2. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

Sample Quantity	Test Data	Test Results
6PCS		PASS

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11 Thermal Shock Test

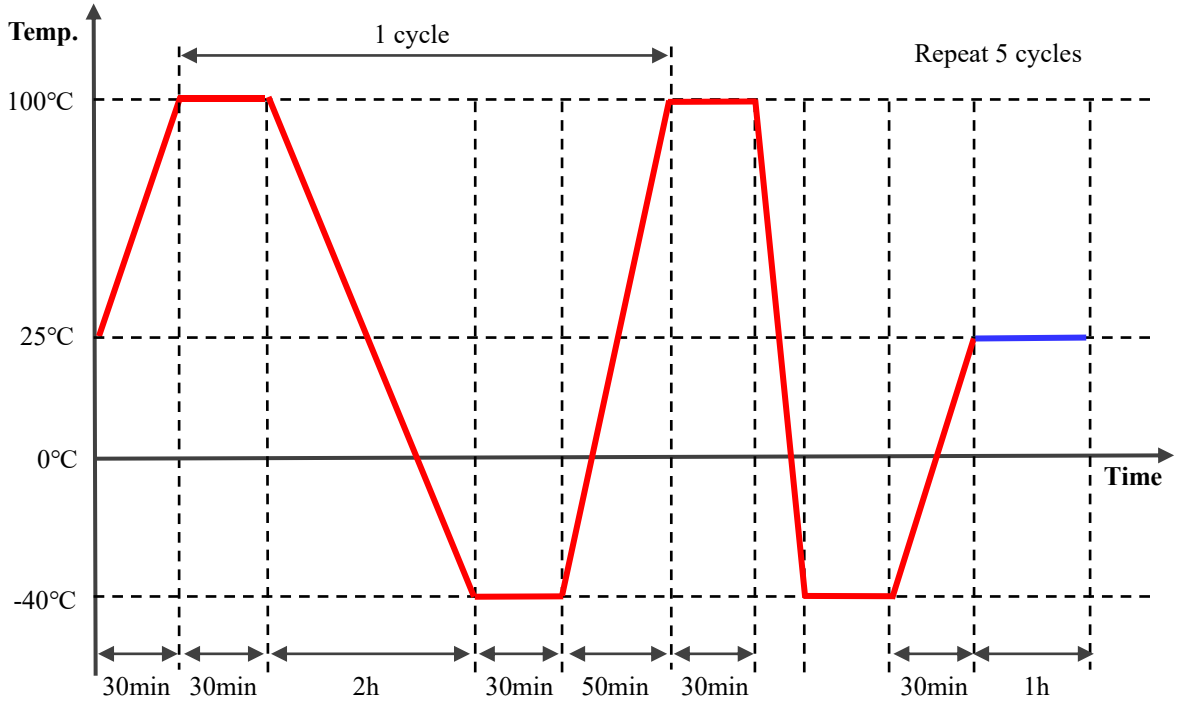
Test Objective: Verify the reliability of solder joints and materials when the product is subjected to rapid and severe changes in temperature and environmental conditions.

Test Conditions: Power-off test. Temperature cycling between -40–100℃/93% RH, with a heating time of 50min and a cooling time of 2h. Each stage is held for 30min, for a total of 5 cycles.

Test Profile:

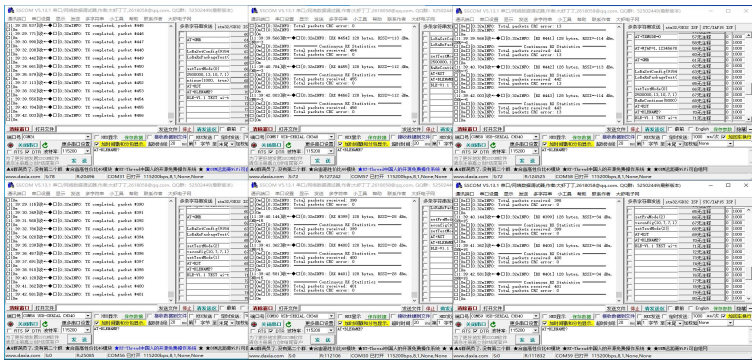
Power Off

Power On



Test Criteria:

1. After the module is properly connected, power on the module and start the test by sending commands. Observe the packet transmission and reception information; if the packet loss rate is less than 1%, the module is considered to be functional.
2. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

Sample Quantity	Test Data	Test Results
6PCS		PASS

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