

# Reliability Test Report

Product Name: Ai-WB2-M1

Product Model: WB2 Series

Test Date: 2022/09/27–2022/10/08

Tested by: Liu Qun

Reviewed by: Lu Xingui



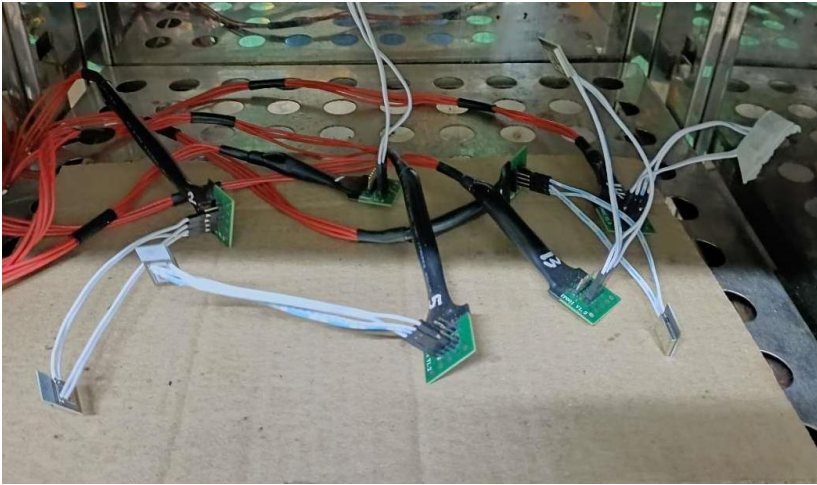
## 1. Inspection Plan

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

## 2. Test Items

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

### 3. Test Preparation

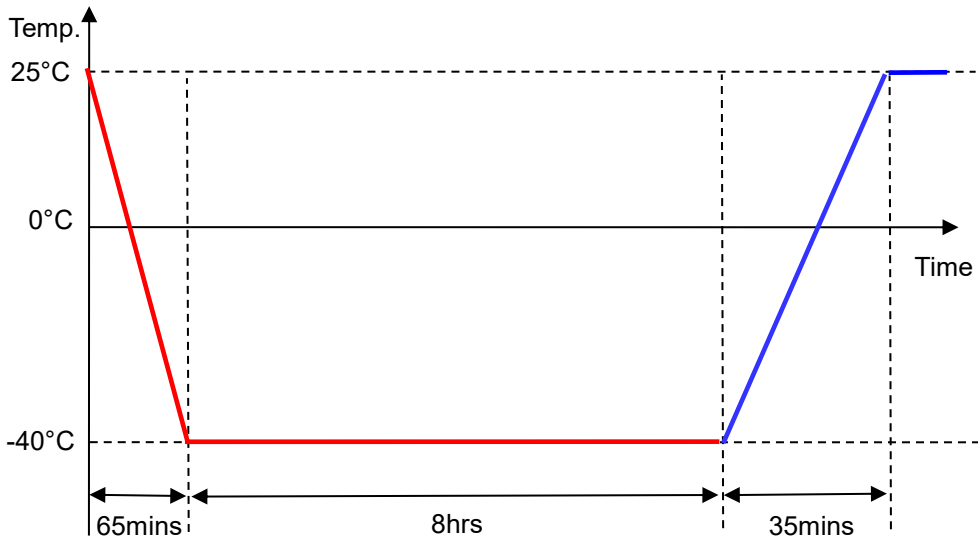
No.	Item	Image/Attachment
1	Reliability documentation	 WB2系列模组 可靠性WIFI&蓝牙
2	Test equipment	
3	Sample placement	
4	Test reason	New product

## 4. Low Temperature Storage Test

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

**Test Profile:**

Is Power Off —  
Is Power On —



### Test Criteria:

1. During the cold start test, the module functions normally. If ping packets are confirmed not to be lost, the module is considered to be functional.
2. Test the Bluetooth functionality. Send the command AT+BLEINIT=2 to enable Bluetooth and configure the Bluetooth application name. Then open the BLE debugging assistant to search for the Bluetooth name (e.g., BL-AT1/2/3/4/5). If the name is not found, the test is considered to be failed.
3. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

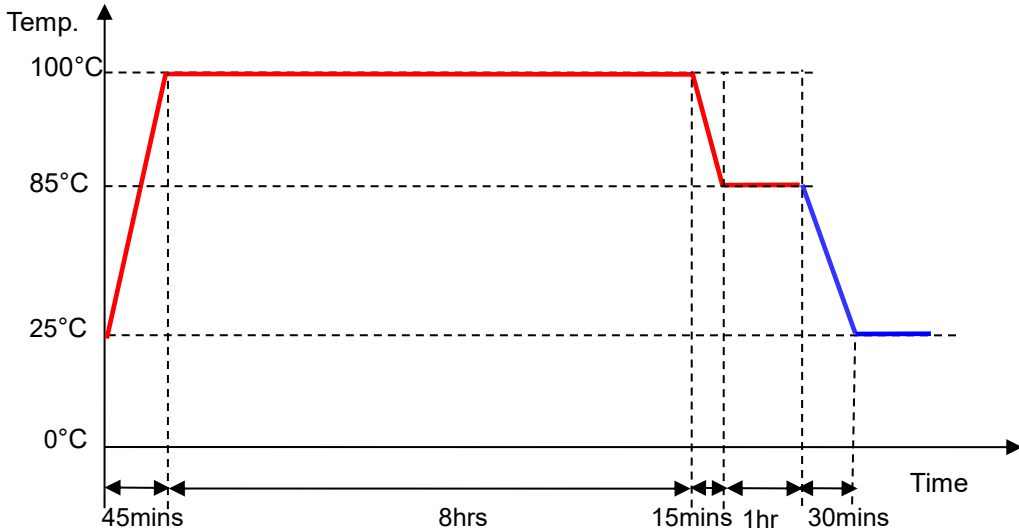
Sample Quantity	Test Data	Test Results
<p>5PCS (BL-AT1-BL-AT5)</p>	<p>The test data section contains three screenshots of the AT command interface. The first two show successful execution of AT+BLEINIT=2 and AT+BLENAME= commands for samples BL-AT1 and BL-AT2. The third screenshot shows the Bluetooth discovery results for all five samples (BL-AT1 to BL-AT5), listing their MAC addresses and signal strengths (e.g., -56 dBm for BL-AT4).</p>	<p>PASS</p>

## 5. High Temperature Storage Test

**Test Conditions:** Power-off test. Store the product at 100°C for 8h, then restore it to 85°C for a 1-hour soak, and perform a hot start test.

**Test Profile:**

Is Power Off —  
Is Power On —



### Test Criteria:

1. During the hot start test, the module functions normally. If ping packets are confirmed not to be lost, the module is considered to be functional.
2. Test the Bluetooth functionality. Send the command AT+BLEINIT=2 to enable Bluetooth and configure the Bluetooth application name. Then open the BLE debugging assistant to search for the Bluetooth name (e.g., BL-AT1/2/3/4/5). If the name is not found, the test is considered to be failed.
3. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

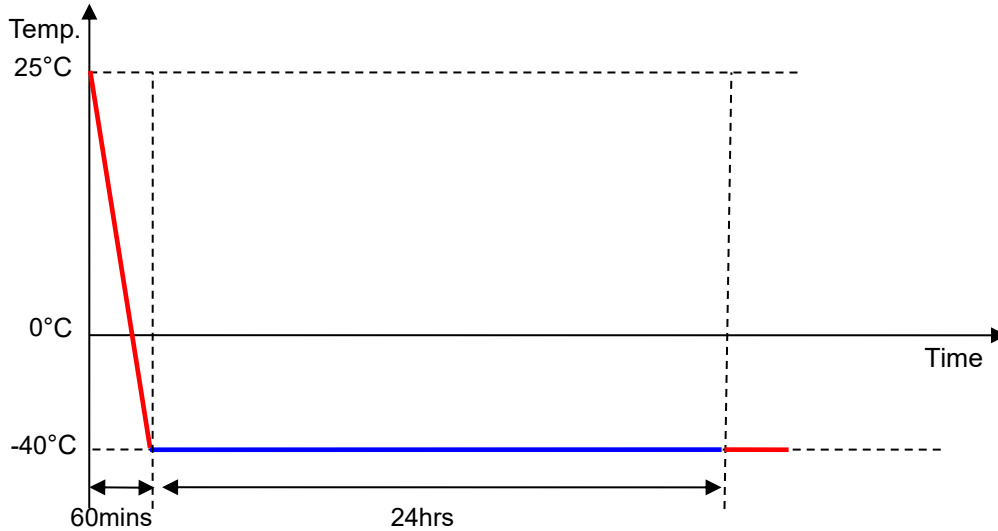
Sample Quantity	Test Data	Test Results
<p>5PCS (BL-AT1-BL-AT5)</p>	<p>The test data section contains screenshots of AT+PING test results for five samples (BL-AT1 to BL-AT5). Each screenshot shows a successful ping test with 0% packet loss and a completion time of 00:00:3. Below the screenshots is a list of Bluetooth devices discovered during the test. All five devices (BL-AT1 to BL-AT5) are listed as 'NOT BONDED' with signal strengths ranging from -51 dBm to -56 dBm. Each device entry includes a 'CONNECT' button.</p>	<p>PASS</p>

## 6. Low Temperature Operation Test

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

Test Profile:

Is Power Off —  
Is Power On —



### Test Criteria:

1. No network disconnections occurred during the test. If ping packets are confirmed not to be lost, the module is considered to be functional.
2. During the test, open the BLE debugging assistant to search for the Bluetooth name (e.g., BL-AT1/2/3/4/5). If the name is not found, the test is considered to be failed.
3. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

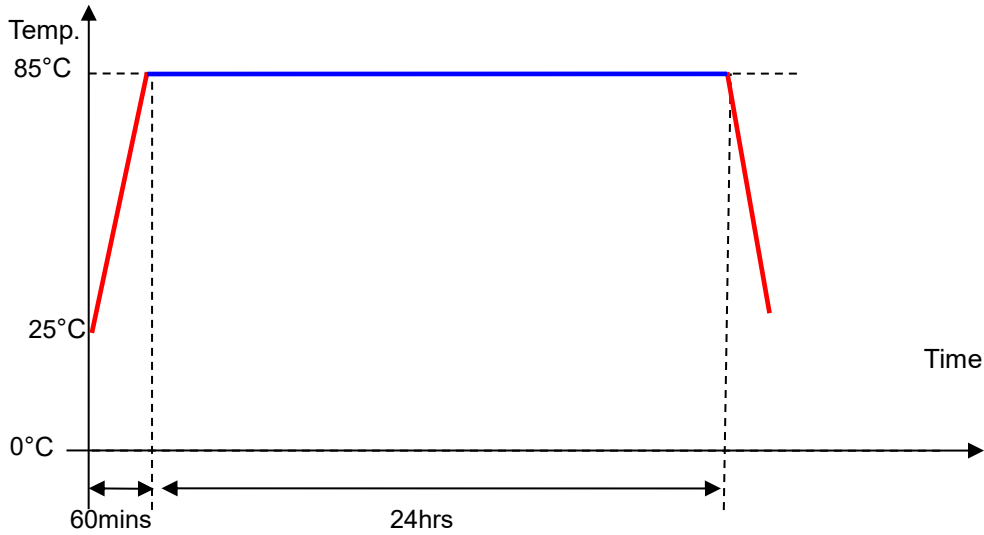
Sample Quantity	Test Data	Test Results
<p style="text-align: center;">5PCS (BL-AT1-BL-AT5)</p>	<p>The test data section contains two parts. The top part shows six screenshots of the ATKXPING application interface, displaying ping statistics for various target IP addresses (e.g., 192.168.3.3, 192.168.3.4, 192.168.3.5). The bottom part shows a screenshot of a Bluetooth scanning application with a list of five devices: BL-AT4, BL-AT1, BL-AT5, BL-AT2, and BL-AT3. Each device entry includes its MAC address (e.g., 7C:B9:4C:1D:E0:2E) and signal strength (-56 dBm).</p>	<p style="text-align: center;">PASS</p>

# 7. High Temperature Operation Test

Test Conditions: Operate at 85°C for 24h.

Test Profile:

Is Power Off —  
 Is Power On —



## Test Criteria:

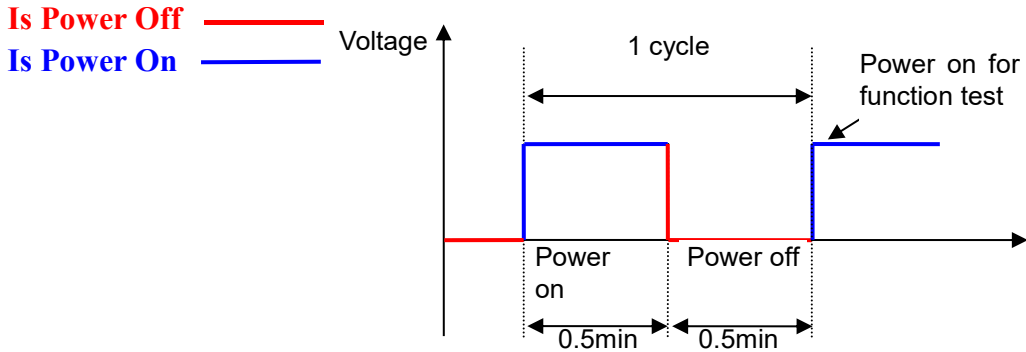
1. No network disconnections occurred during the test. If ping packets are confirmed not to be lost, the module is considered to be functional.
2. During the test, open the BLE debugging assistant to search for the Bluetooth name (e.g., BL-AT1/2/3/4/5). If the name is not found, the test is considered to be failed.
3. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

Sample Quantity	Test Data	Test Results																																																
<p style="text-align: center;">5PCS (BL-AT1-BL-AT5)</p>	<p>The screenshots show ping test results for five modules. The results are as follows:</p> <table border="1"> <thead> <tr> <th>Module</th> <th>Start Time</th> <th>End Time</th> <th>Ping Count</th> <th>Ping Min</th> <th>Ping Max</th> <th>Ping Avg</th> <th>Packet Loss</th> </tr> </thead> <tbody> <tr> <td>ATOKPING 1</td> <td>10:33:07</td> <td>04:13:11</td> <td>62</td> <td>67c</td> <td>894</td> <td>10.94</td> <td>0.00%</td> </tr> <tr> <td>ATOKPING 2</td> <td>10:33:08</td> <td>04:13:11</td> <td>67</td> <td>67c</td> <td>894</td> <td>11.07</td> <td>0.00%</td> </tr> <tr> <td>ATOKPING 3</td> <td>10:33:09</td> <td>04:13:09</td> <td>64</td> <td>67c</td> <td>894</td> <td>10.63</td> <td>0.00%</td> </tr> <tr> <td>ATOKPING 4</td> <td>10:33:11</td> <td>04:13:11</td> <td>66</td> <td>67c</td> <td>899</td> <td>10.07</td> <td>0.00%</td> </tr> <tr> <td>ATOKPING 5</td> <td>10:33:10</td> <td>04:13:09</td> <td>60</td> <td>67c</td> <td>870</td> <td>10.07</td> <td>0.00%</td> </tr> </tbody> </table> <p>Bluetooth Address List:</p> <ul style="list-style-type: none"> <li>BL-AT4: 7C:B9:4C:1D:E0:2E, -56 dBm</li> <li>BL-AT1: 7C:B9:4C:1D:E0:48, -55 dBm</li> <li>BL-AT5: 7C:B9:4C:1D:E0:26, -52 dBm</li> <li>BL-AT2: 7C:B9:4C:1D:E0:50, -51 dBm</li> <li>BL-AT3: 7C:B9:4C:1D:E0:4A, -53 dBm</li> </ul>	Module	Start Time	End Time	Ping Count	Ping Min	Ping Max	Ping Avg	Packet Loss	ATOKPING 1	10:33:07	04:13:11	62	67c	894	10.94	0.00%	ATOKPING 2	10:33:08	04:13:11	67	67c	894	11.07	0.00%	ATOKPING 3	10:33:09	04:13:09	64	67c	894	10.63	0.00%	ATOKPING 4	10:33:11	04:13:11	66	67c	899	10.07	0.00%	ATOKPING 5	10:33:10	04:13:09	60	67c	870	10.07	0.00%	<p style="text-align: center;">PASS</p>
Module	Start Time	End Time	Ping Count	Ping Min	Ping Max	Ping Avg	Packet Loss																																											
ATOKPING 1	10:33:07	04:13:11	62	67c	894	10.94	0.00%																																											
ATOKPING 2	10:33:08	04:13:11	67	67c	894	11.07	0.00%																																											
ATOKPING 3	10:33:09	04:13:09	64	67c	894	10.63	0.00%																																											
ATOKPING 4	10:33:11	04:13:11	66	67c	899	10.07	0.00%																																											
ATOKPING 5	10:33:10	04:13:09	60	67c	870	10.07	0.00%																																											

## 8. AC Power On/Off Test with Temperature

- Test Conditions:**
1. Power on: 30s; power off: 30s.
  2. Temperature: -40°C, 25°C, 85°C.
  3. Cycle: Each test condition cycles 200 times.

**Test Profile:**



**Test Criteria:**

1. After power-up, the module boots normally. During the test, if the module boots normally and there is connectivity for every ping packet, the module is considered to be functional.
2. Test the Bluetooth functionality. Send the command AT+BLEINIT=2 to enable Bluetooth and configure the Bluetooth application name. Then open the BLE debugging assistant to search for the Bluetooth name (e.g., BL-AT1/2/3/4/5). If the name is not found, the test is considered to be failed.
3. 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	5PCS (BL-AT1–BL-AT5)	<p>BL-AT4 ZC-B9-4C:1D:E0:2E NOT BONDED -56 dBm [CONNECT]</p> <p>BL-AT1 ZC-B9-4C:1D:E0:48 NOT BONDED -55 dBm [CONNECT]</p> <p>BL-AT5 ZC-B9-4C:1D:E0:26 NOT BONDED -52 dBm [CONNECT]</p> <p>BL-AT2 ZC-B9-4C:1D:E0:50 NOT BONDED -51 dBm [CONNECT]</p> <p>BL-AT3 ZC-B9-4C:1D:E0:4A NOT BONDED -53 dBm [CONNECT]</p>	PASS
Power on/off at low temperature	5PCS (BL-AT1–BL-AT5)	<p>BL-AT4 ZC-B9-4C:1D:E0:2E NOT BONDED -56 dBm [CONNECT]</p> <p>BL-AT1 ZC-B9-4C:1D:E0:48 NOT BONDED -55 dBm [CONNECT]</p> <p>BL-AT5 ZC-B9-4C:1D:E0:26 NOT BONDED -52 dBm [CONNECT]</p> <p>BL-AT2 ZC-B9-4C:1D:E0:50 NOT BONDED -51 dBm [CONNECT]</p> <p>BL-AT3 ZC-B9-4C:1D:E0:4A NOT BONDED -53 dBm [CONNECT]</p>	PASS
Power on/off at high temperature	5PCS (BL-AT1–BL-AT5)	<p>BL-AT4 ZC-B9-4C:1D:E0:2E NOT BONDED -56 dBm [CONNECT]</p> <p>BL-AT1 ZC-B9-4C:1D:E0:48 NOT BONDED -55 dBm [CONNECT]</p> <p>BL-AT5 ZC-B9-4C:1D:E0:26 NOT BONDED -52 dBm [CONNECT]</p> <p>BL-AT2 ZC-B9-4C:1D:E0:50 NOT BONDED -51 dBm [CONNECT]</p> <p>BL-AT3 ZC-B9-4C:1D:E0:4A NOT BONDED -53 dBm [CONNECT]</p>	PASS

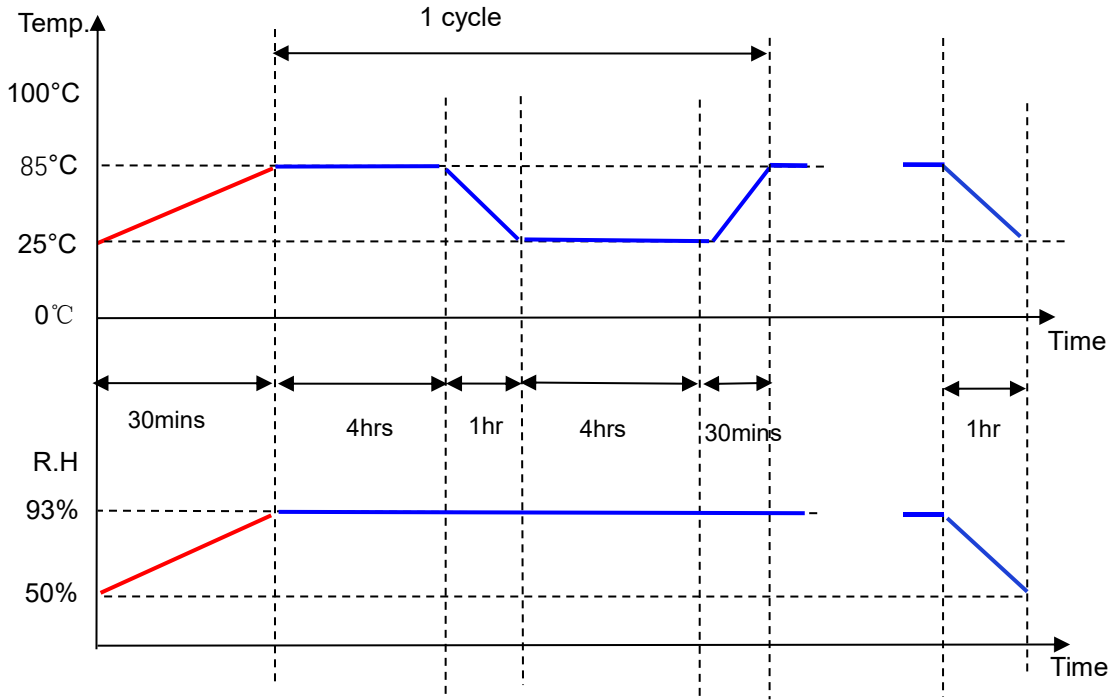
## 9. Alternating Hot and Humid Test

### Test Conditions:

1. Operate at 85°C + 93% RH for 4h;
  2. Operate at 25°C + 93% RH for 4h;
- Cycle step 1 and step 2, a total of 2 cycles.

### Test Profile:

Is Power Off —  
Is Power On —



### Test Criteria:

1. If the module operates normally and no ping packet loss is confirmed, the module is considered to be functional.
2. During the test, open the BLE debugging assistant to search for the Bluetooth name (e.g., BL-AT1/2/3/4/5). If the name is not found, the test is considered to be failed.
3. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

Sample Quantity	Test Data	Test Results
<p>5PCS (BL-AT1-BL-AT5)</p>		<p>PASS</p>

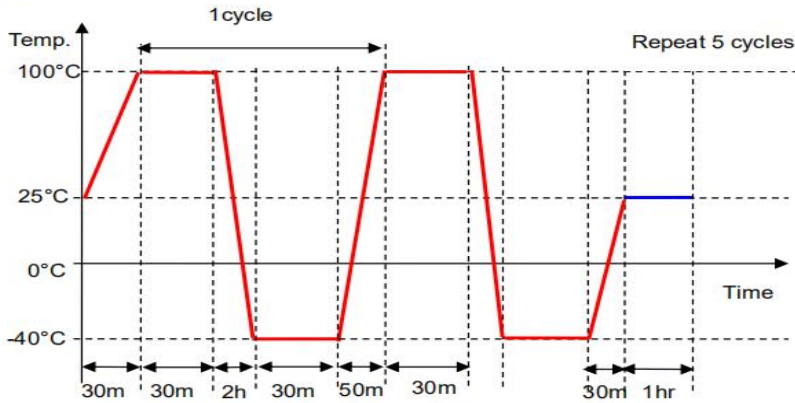
# 10. Thermal Shock Test

## Test Conditions:

Power-off test. Temperature cycling between -40~100°C, 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:

Is Power Off  
Is Power On



## Test Criteria:

1. If the module operates normally and no ping packet loss is confirmed, the module is considered to be functional.
2. During the test, open the BLE debugging assistant to search for the Bluetooth name (e.g., BL-AT1/2/3/4/5). If the name is not found, the test is considered to be failed.
3. After the test, the product shows no visible damage such as shrinkage, peeling, or discoloration.

Sample Quantity	Test Data	Test Results
<p>5PCS (BL-AT1-BL-AT5)</p>	<p>The test data shows five screenshots of the ATKOPING software interface. Each screenshot displays the results of a ping test for a specific module. The results are as follows:</p> <ul style="list-style-type: none"> <li><b>BL-AT4:</b> 1807 packets, 0% loss, 14.43s start time, 100.00% success rate.</li> <li><b>BL-AT1:</b> 1810 packets, 0% loss, 14.44s start time, 100.00% success rate.</li> <li><b>BL-AT5:</b> 1808 packets, 0% loss, 14.43s start time, 100.00% success rate.</li> <li><b>BL-AT2:</b> 1810 packets, 0% loss, 14.46s start time, 100.00% success rate.</li> <li><b>BL-AT3:</b> 1810 packets, 0% loss, 14.46s start time, 100.00% success rate.</li> </ul> <p>Below the screenshots, a list of Bluetooth modules is shown with their MAC addresses and signal strengths:</p> <ul style="list-style-type: none"> <li>BL-AT4: 7C:B9:4C:1D:E0:2E, NOT BONDED, -56 dBm</li> <li>BL-AT1: 7C:B9:4C:1D:E0:48, NOT BONDED, -55 dBm</li> <li>BL-AT5: 7C:B9:4C:1D:E0:26, NOT BONDED, -52 dBm</li> <li>BL-AT2: 7C:B9:4C:1D:E0:50, NOT BONDED, -51 dBm</li> <li>BL-AT3: 7C:B9:4C:1D:E0:4A, NOT BONDED, -53 dBm</li> </ul>	<p>PASS</p>