

可靠性测试报告

产品名称:	Ai-WS1 系列
产品型号:	Ai-WS1-CBE-Kit
测试日期:	2024.11.18-2024.11.26
测试人:	袁南南
审核人:	安三超

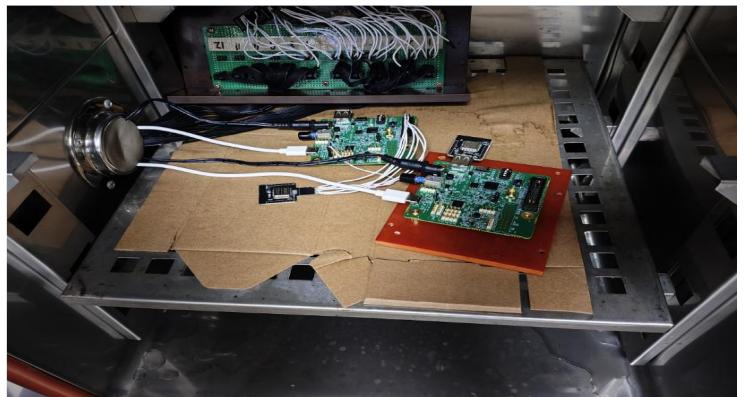
1. 检验标准

序号	工序名称	检验项目	检验工具	抽样水平(参考 GB/T 2828.1-2012)	允收水准		
					CR(致命缺陷)	MA(严重缺陷)	MI(轻微缺陷)
1	可靠性测试	高低温存储/高常低温开关机/高低温运行/交变湿热/冷热冲击	恒温恒湿试验机	正常一次抽样，特殊检验 S-1	0 收 1 退		

2. 试验项目

编号	项目	测试条件
1	低温存储测试 (Low temperature storage test)	测试条件: -40° C 测试时间: 8hrs 在-40° C下停留1hrs后, 做冷启动测试.
2	高温储存测试 (High temperature storage test)	测试条件: 100° C +93%RH 测试时间: 8hrs 恢复到85° C停留1hrs后, 做热启动测试。
3	低温运行测试 (Low temperature operation test)	测试条件: -40° C 测试时间: 24hrs
4	高温运行测试 (High temperature operation test)	测试条件: 85 ° C +93%RH 测试时间: 24hrs
5	开关机测试 (AC power on/off test with temperature)	A) 温度: -40° C. B) 温度: 25° C +93%RH C) 温度: 85° C. +93%RH 每个条件循环 200次, 开30sec, 关30sec
6	交变湿热测试 (Alternating hot and humid test)	A) 85 ° C+93%RH运行4hrs; B) 25 ° C+93%RH运行4hrs; 循环步骤A步骤B总共2个循环. 测试时间: 循环2cycles, 16hrs
7	冷热冲击测试 (Thermal shock test)	测试条件: -40° C~100° C+93%RH, 每个温度停留30mins, 温度变换时间为升温50mins, 降温2hrs. 测试时间: 循环5cycles, 16hrs

3. 试验准备

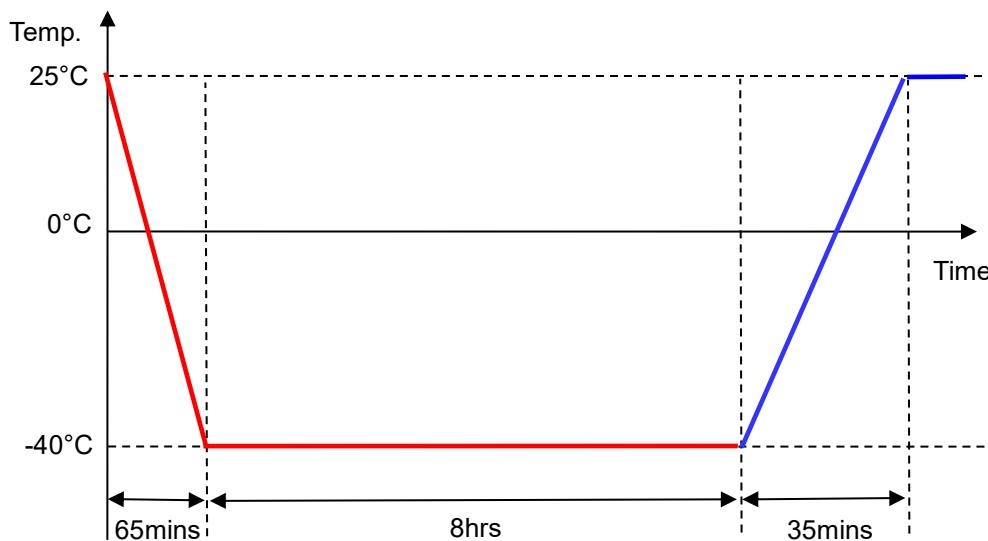
编号	项目	图片/附件
1	可靠性说明文档	参考Ai-WS1-CBS&CBE系列模组可靠性WIFI测试说明
2	实验设备	
3	样品摆放	
4	测试原因	新品可靠性测试 (90240004-NodeMCU-Ai-WS1-CBE-Kit)

4. 低温存储测试 (Low temperature storage test)

测试条件：关机测试，让产品储存在-40° C下保持8hrs，然后做冷启动测试。

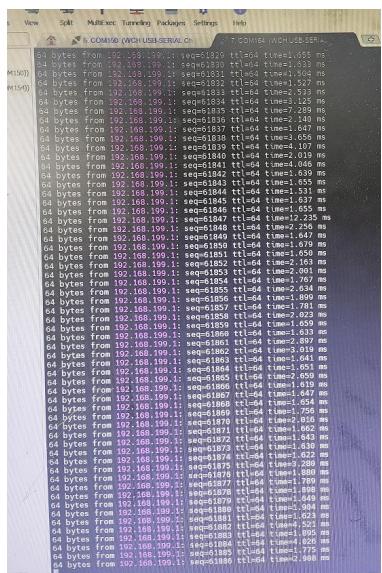
测试曲线：

Is Power Off ——————
Is Power Off ——————



测试标准:

1. 测试过程中无断网等现象，确认 ping 包不丢失，即判定模组功能正常。
2. 产品测试完后没有可见的损伤，如收缩、剥离、变色等现象。

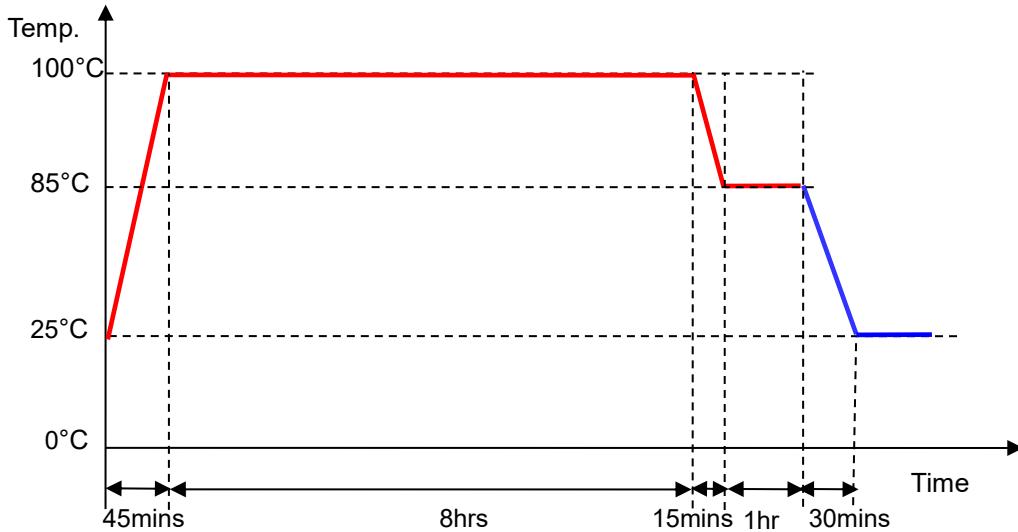
测试样机	测试数据	测试结果
1PCS	 	PASS

5. 高温存储测试 (High temperature storage test)

测试条件：关机测试，让产品储存在 100° C+93%RH 高温下 8hrs，然后恢复到 85° C+93%RH+93%RH 停留 1hr 后，做热启动测试。

测试曲线：

Is Power Off ——————
Is Power On ——————



测试标准：

1. 测试过程中无断网等现象，确认 ping 包不丢失，即判定模组功能正常。
2. 产品测试完后没有可见的损伤，如收缩、剥离、变色等现象。

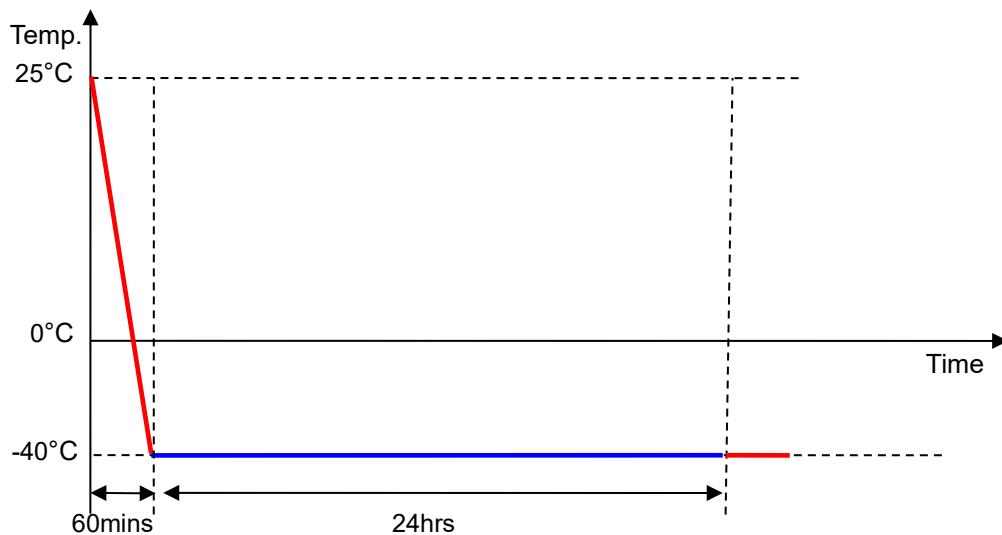
测试样机	测试数据	测试结果
1PCS	<pre> 64 bytes from 192.168.199.1: seq=29057 ttl=64 time=1.625 ms 64 bytes from 192.168.199.1: seq=29058 ttl=64 time=1.590 ms 64 bytes from 192.168.199.1: seq=29059 ttl=64 time=1.570 ms 64 bytes from 192.168.199.1: seq=29060 ttl=64 time=1.587 ms 64 bytes from 192.168.199.1: seq=29061 ttl=64 time=1.571 ms 64 bytes from 192.168.199.1: seq=29062 ttl=64 time=1.498 ms 64 bytes from 192.168.199.1: seq=29063 ttl=64 time=1.499 ms 64 bytes from 192.168.199.1: seq=29064 ttl=64 time=1.499 ms 64 bytes from 192.168.199.1: seq=29065 ttl=64 time=1.535 ms 64 bytes from 192.168.199.1: seq=29066 ttl=64 time=1.931 ms 64 bytes from 192.168.199.1: seq=29067 ttl=64 time=1.465 ms 64 bytes from 192.168.199.1: seq=29068 ttl=64 time=1.557 ms 64 bytes from 192.168.199.1: seq=29069 ttl=64 time=1.400 ms 64 bytes from 192.168.199.1: seq=29070 ttl=64 time=1.474 ms 64 bytes from 192.168.199.1: seq=29071 ttl=64 time=1.468 ms 64 bytes from 192.168.199.1: seq=29072 ttl=64 time=1.468 ms 64 bytes from 192.168.199.1: seq=29073 ttl=64 time=1.231 ms 64 bytes from 192.168.199.1: seq=29074 ttl=64 time=1.624 ms 64 bytes from 192.168.199.1: seq=29075 ttl=64 time=3.450 ms 64 bytes from 192.168.199.1: seq=29076 ttl=64 time=1.499 ms 64 bytes from 192.168.199.1: seq=29077 ttl=64 time=1.499 ms 64 bytes from 192.168.199.1: seq=29078 ttl=64 time=1.607 ms 64 bytes from 192.168.199.1: seq=29079 ttl=64 time=1.554 ms 64 bytes from 192.168.199.1: seq=29081 ttl=64 time=1.586 ms 64 bytes from 192.168.199.1: seq=29082 ttl=64 time=1.606 ms 64 bytes from 192.168.199.1: seq=29083 ttl=64 time=2.708 ms 64 bytes from 192.168.199.1: seq=29085 ttl=64 time=1.593 ms 64 bytes from 192.168.199.1: seq=29086 ttl=64 time=1.583 ms 64 bytes from 192.168.199.1: seq=29087 ttl=64 time=1.773 ms 64 bytes from 192.168.199.1: seq=29088 ttl=64 time=1.794 ms 64 bytes from 192.168.199.1: seq=29089 ttl=64 time=1.486 ms 64 bytes from 192.168.199.1: seq=29090 ttl=64 time=1.488 ms 64 bytes from 192.168.199.1: seq=29091 ttl=64 time=1.554 ms 64 bytes from 192.168.199.1: seq=29093 ttl=64 time=1.456 ms 64 bytes from 192.168.199.1: seq=29094 ttl=64 time=4.738 ms 64 bytes from 192.168.199.1: seq=29095 ttl=64 time=4.555 ms </pre>	PASS

6. 低温运行测试 (Low temperature operation test)

测试条件：开机测试，在-40° C下运行24hrs.

测试曲线：

Is Power Off ——————
Is Power On ——————



测试标准：

1. 测试过程中无断网等现象，确认 ping 包不丢失，即判定模组功能正常。
2. 产品测试完后没有可见的损伤，如收缩、剥离、变色等现象。

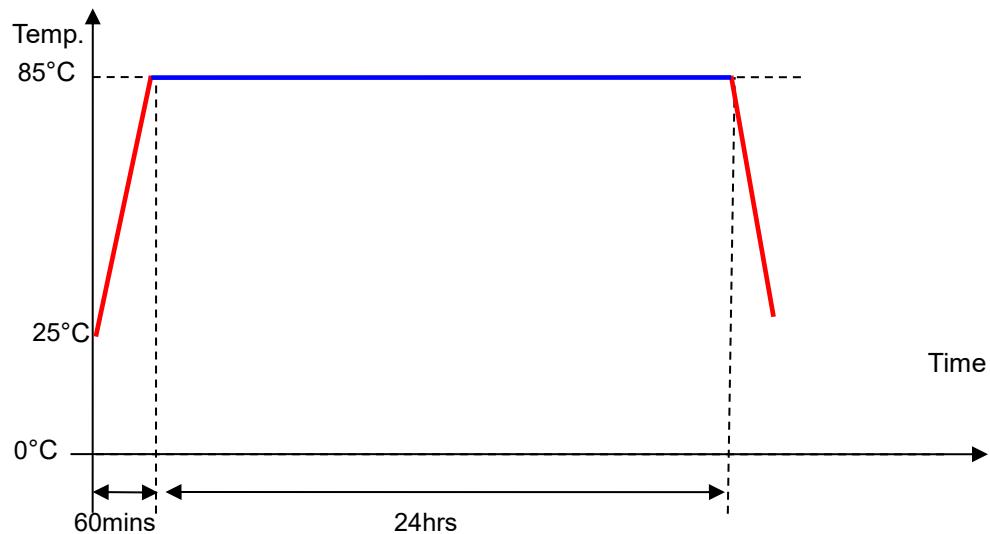
测试样机	测试数据	测试结果
1PCS	<pre> 64 bytes from 192.168.199.1: seq=01851 ttl=64 time=1.532 ms 64 bytes from 192.168.199.1: seq=01850 ttl=64 time=1.404 ms 64 bytes from 192.168.199.1: seq=01859 ttl=64 time=1.593 ms 64 bytes from 192.168.199.1: seq=01858 ttl=64 time=1.593 ms 64 bytes from 192.168.199.1: seq=01851 ttl=64 time=2.113 ms 64 bytes from 192.168.199.1: seq=01851 ttl=64 time=1.512 ms 64 bytes from 192.168.199.1: seq=01843 ttl=64 time=1.475 ms 64 bytes from 192.168.199.1: seq=01844 ttl=64 time=1.475 ms 64 bytes from 192.168.199.1: seq=01845 ttl=64 time=1.362 ms 64 bytes from 192.168.199.1: seq=01846 ttl=64 time=1.276 ms 64 bytes from 192.168.199.1: seq=01847 ttl=64 time=1.359 ms 64 bytes from 192.168.199.1: seq=01851 ttl=64 time=1.496 ms 64 bytes from 192.168.199.1: seq=01852 ttl=64 time=1.408 ms 64 bytes from 192.168.199.1: seq=01853 ttl=64 time=1.606 ms 64 bytes from 192.168.199.1: seq=01854 ttl=64 time=1.349 ms 64 bytes from 192.168.199.1: seq=01855 ttl=64 time=1.320 ms 64 bytes from 192.168.199.1: seq=01856 ttl=64 time=1.566 ms 64 bytes from 192.168.199.1: seq=01858 ttl=64 time=1.438 ms 64 bytes from 192.168.199.1: seq=01860 ttl=64 time=1.438 ms 64 bytes from 192.168.199.1: seq=01861 ttl=64 time=8.594 ms 64 bytes from 192.168.199.1: seq=01862 ttl=64 time=1.438 ms 64 bytes from 192.168.199.1: seq=01863 ttl=64 time=1.535 ms 64 bytes from 192.168.199.1: seq=01864 ttl=64 time=1.937 ms 64 bytes from 192.168.199.1: seq=01865 ttl=64 time=1.427 ms 64 bytes from 192.168.199.1: seq=01866 ttl=64 time=1.546 ms 64 bytes from 192.168.199.1: seq=01868 ttl=64 time=1.513 ms 64 bytes from 192.168.199.1: seq=01869 ttl=64 time=1.467 ms 64 bytes from 192.168.199.1: seq=01870 ttl=64 time=1.467 ms 64 bytes from 192.168.199.1: seq=01871 ttl=64 time=1.556 ms 64 bytes from 192.168.199.1: seq=01872 ttl=64 time=2.296 ms 64 bytes from 192.168.199.1: seq=01873 ttl=64 time=3.680 ms 64 bytes from 192.168.199.1: seq=01874 ttl=64 time=2.261 ms 64 bytes from 192.168.199.1: seq=01875 ttl=64 time=1.402 ms 64 bytes from 192.168.199.1: seq=01876 ttl=64 time=1.693 ms 64 bytes from 192.168.199.1: seq=01877 ttl=64 time=2.278 ms 64 bytes from 192.168.199.1: seq=01878 ttl=64 time=1.407 ms 64 bytes from 192.168.199.1: seq=01879 ttl=64 time=1.542 ms 64 bytes from 192.168.199.1: seq=01880 ttl=64 time=1.576 ms 64 bytes from 192.168.199.1: seq=01881 ttl=64 time=1.445 ms 64 bytes from 192.168.199.1: seq=01891 ttl=64 time=1.445 ms 64 bytes from 192.168.199.1: seq=01892 ttl=64 time=1.245 ms 64 bytes from 192.168.199.1: seq=01893 ttl=64 time=1.245 ms </pre>	PASS

7. 高温运行测试 (High temperature operation test)

测试条件：开机测试，85 °C+93%RH运行24H

测试曲线：

Is Power Off _____
 Is Power On _____



测试标准：

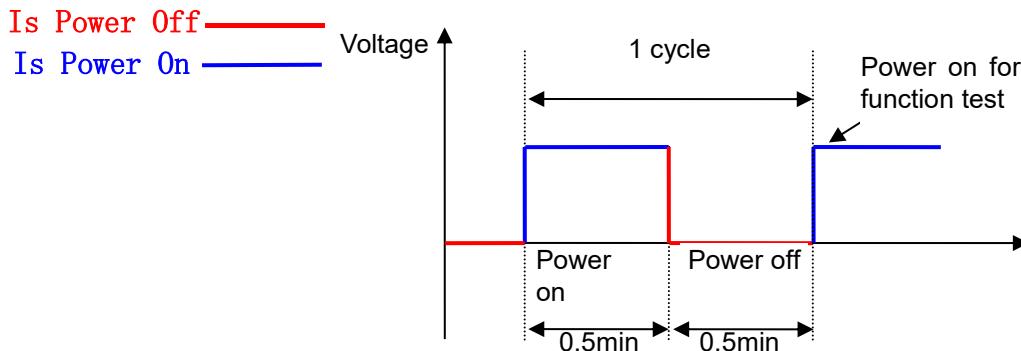
1. 测试过程中无断网等现象，确认 ping 包不丢失，即判定模组功能正常。
2. 产品测试完后没有可见的损伤，如收缩、剥离、变色等现象。

测试样机	测试数据	测试结果
1PCS		PASS

8. 开关机测试 (AC power on/off test with temperature)

- 测试条件:
- 开机: 30 秒; 关机: 30 秒。
 - 温度: -40°C, 25°C+93%RH, 85°C+93%RH。
 - 循环: 每组测试条件循环 200 次。

测试曲线:



测试标准:

- 连接好模组后上电发送指令即开始测试, 可以观察到模组打印 LOG 信息。观察网络 ping 包正常。
- 产品测试后没有可见的损伤, 如收缩、剥离、变色等。

项目	测试样机	测试数据	测试结果
常温开关机	1PCS	<pre> b'192.168.1.199:61974:seq=61974 ttl=64 time=1.477 ms 64 bytes from 192.168.1.199: seq=61974 ttl=64 time=1.477 ms 64 bytes from 192.168.1.199: seq=61975 ttl=64 time=1.522 ms 64 bytes from 192.168.1.199: seq=61976 ttl=64 time=1.522 ms 64 bytes from 192.168.1.199: seq=61977 ttl=64 time=1.522 ms 64 bytes from 192.168.1.199: seq=61978 ttl=64 time=2.062 ms 64 bytes from 192.168.1.199: seq=61979 ttl=64 time=1.491 ms 64 bytes from 192.168.1.199: seq=61980 ttl=64 time=1.544 ms 64 bytes from 192.168.1.199: seq=61981 ttl=64 time=1.611 ms 64 bytes from 192.168.1.199: seq=61982 ttl=64 time=2.078 ms 64 bytes from 192.168.1.199: seq=61983 ttl=64 time=1.841 ms 64 bytes from 192.168.1.199: seq=61984 ttl=64 time=1.581 ms 64 bytes from 192.168.1.199: seq=61985 ttl=64 time=1.529 ms 64 bytes from 192.168.1.199: seq=61986 ttl=64 time=1.425 ms 64 bytes from 192.168.1.199: seq=61987 ttl=64 time=4.335 ms 64 bytes from 192.168.1.199: seq=61988 ttl=64 time=2.591 ms 64 bytes from 192.168.1.199: seq=61989 ttl=64 time=1.461 ms 64 bytes from 192.168.1.199: seq=61990 ttl=64 time=1.251 ms 64 bytes from 192.168.1.199: seq=61991 ttl=64 time=1.656 ms 64 bytes from 192.168.1.199: seq=61992 ttl=64 time=1.525 ms 64 bytes from 192.168.1.199: seq=61993 ttl=64 time=1.984 ms 64 bytes from 192.168.1.199: seq=61994 ttl=64 time=2.849 ms 64 bytes from 192.168.1.199: seq=61995 ttl=64 time=1.471 ms 64 bytes from 192.168.1.199: seq=61996 ttl=64 time=2.991 ms 64 bytes from 192.168.1.199: seq=61997 ttl=64 time=1.491 ms 64 bytes from 192.168.1.199: seq=61998 ttl=64 time=2.991 ms 64 bytes from 192.168.1.199: seq=61999 ttl=64 time=1.467 ms 64 bytes from 192.168.1.199: seq=62000 ttl=64 time=1.481 ms 64 bytes from 192.168.1.199: seq=62001 ttl=64 time=1.737 ms 64 bytes from 192.168.1.199: seq=62002 ttl=64 time=3.837 ms 64 bytes from 192.168.1.199: seq=62003 ttl=64 time=5.609 ms 64 bytes from 192.168.1.199: seq=62004 ttl=64 time=2.741 ms 64 bytes from 192.168.1.199: seq=62005 ttl=64 time=1.720 ms 64 bytes from 192.168.1.199: seq=62006 ttl=64 time=1.727 ms 64 bytes from 192.168.1.199: seq=62007 ttl=64 time=1.727 ms 64 bytes from 192.168.1.199: seq=62008 ttl=64 time=1.804 ms 64 bytes from 192.168.1.199: seq=62009 ttl=64 time=5.355 ms 64 bytes from 192.168.1.199: seq=62010 ttl=64 time=1.543 ms 64 bytes from 192.168.1.199: seq=62011 ttl=64 time=3.801 ms 64 bytes from 192.168.1.199: seq=62012 ttl=64 time=1.525 ms </pre>	PASS

9. 交变湿热测试 (Alternating hot and humid test)

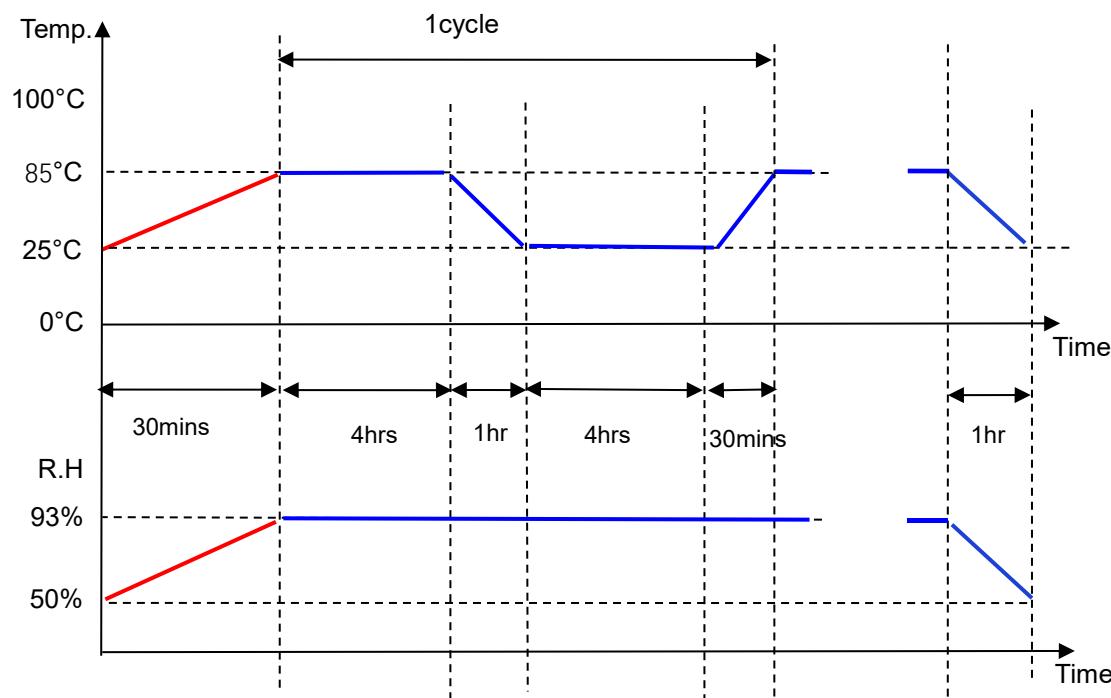
测试条件:

1. 85 ° C+93%RH 运行 4hrs;
 2. 25 ° C+93%RH 运行 4hrs;
- 循环步骤 1 步骤 2 总共 2 个循环.

测试曲线:

Is Power Off ——————

Is Power On ——————



测试标准:

1. 测试过程中无断网等现象，确认 ping 包不丢失，即判定模组功能正常。
2. 产品测试后没有可见的损伤，如收缩、剥离、变色等。

测试样机	测试数据	测试结果
1PCS	<pre> bytes from 192.168.109.1: seq=24347 ttl=64 time=1.830 ms bytes from 192.168.109.1: seq=24348 ttl=64 time=1.830 ms bytes from 192.168.109.1: seq=24349 ttl=64 time=1.830 ms bytes from 192.168.109.1: seq=24350 ttl=64 time=1.830 ms bytes from 192.168.109.1: seq=24351 ttl=64 time=1.962 ms bytes from 192.168.109.1: seq=24352 ttl=64 time=1.577 ms bytes from 192.168.109.1: seq=24353 ttl=64 time=1.593 ms bytes from 192.168.109.1: seq=24354 ttl=64 time=1.943 ms bytes from 192.168.109.1: seq=24355 ttl=64 time=3.740 ms bytes from 192.168.109.1: seq=24356 ttl=64 time=1.589 ms bytes from 192.168.109.1: seq=24357 ttl=64 time=3.909 ms bytes from 192.168.109.1: seq=24358 ttl=64 time=1.830 ms bytes from 192.168.109.1: seq=24359 ttl=64 time=1.830 ms bytes from 192.168.109.1: seq=24360 ttl=64 time=2.792 ms bytes from 192.168.109.1: seq=24361 ttl=64 time=2.324 ms bytes from 192.168.109.1: seq=24362 ttl=64 time=1.500 ms bytes from 192.168.109.1: seq=24363 ttl=64 time=1.500 ms bytes from 192.168.109.1: seq=24364 ttl=64 time=1.492 ms bytes from 192.168.109.1: seq=24365 ttl=64 time=1.568 ms bytes from 192.168.109.1: seq=24366 ttl=64 time=1.568 ms bytes from 192.168.109.1: seq=24367 ttl=64 time=5.105 ms bytes from 192.168.109.1: seq=24368 ttl=64 time=1.501 ms bytes from 192.168.109.1: seq=24369 ttl=64 time=1.501 ms bytes from 192.168.109.1: seq=24370 ttl=64 time=1.763 ms bytes from 192.168.109.1: seq=24371 ttl=64 time=1.500 ms bytes from 192.168.109.1: seq=24372 ttl=64 time=1.516 ms bytes from 192.168.109.1: seq=24373 ttl=64 time=1.487 ms bytes from 192.168.109.1: seq=24374 ttl=64 time=1.568 ms bytes from 192.168.109.1: seq=24375 ttl=64 time=1.500 ms bytes from 192.168.109.1: seq=24376 ttl=64 time=4.177 ms bytes from 192.168.109.1: seq=24377 ttl=64 time=1.895 ms bytes from 192.168.109.1: seq=24378 ttl=64 time=1.500 ms bytes from 192.168.109.1: seq=24379 ttl=64 time=1.569 ms bytes from 192.168.109.1: seq=24380 ttl=64 time=1.495 ms bytes from 192.168.109.1: seq=24381 ttl=64 time=1.495 ms bytes from 192.168.109.1: seq=24382 ttl=64 time=4.927 ms bytes from 192.168.109.1: seq=24383 ttl=64 time=1.548 ms bytes from 192.168.109.1: seq=24384 ttl=64 time=1.548 ms bytes from 192.168.109.1: seq=24385 ttl=64 time=1.548 ms bytes from 192.168.109.1: seq=24386 ttl=64 time=3.407 ms bytes from 192.168.109.1: seq=24387 ttl=64 time=1.567 ms bytes from 192.168.109.1: seq=24388 ttl=64 time=1.971 ms bytes from 192.168.109.1: seq=24389 ttl=64 time=1.604 ms </pre>	PASS

