Apacer Technology Inc. **Qual Report**

SV170-uSSD
Qualification and Reliability Test Report

Test Start : 2022,11,12
Test End : 2022,12,28

Tested by:

Chain Yang

Approved by:

Danny TC Chen

Ver 1.3

Dec. 28, 2022

Apacer Technology Inc.

Qual Report

Package Qualification

1. Pre-condition Test(PC)

1.1 Testing Objective

This Test Method establishes an industry standard preconditioning flow for non-thematic solid state SMDs (surface mount devices) that is representative of a typical industry multiple solder reflow operation. These SMDs should be subjected to the appropriate preconditioning sequence of this document by the semiconductor manufacturer prior to being submitted to specific in-house reliability testing (qualification and reliability monitoring) to evaluate long term reliability (which might be impacted by solder reflow).

1.2 Testing Condition(s)

Step1. External Visual & Function Test and SAT Inspection
Step2. Temperature Cycle Test (-65 ℃/150 ℃, 5 cycles)
Step3. High temperature Storage Baking (125 ℃, 24 hours)
Step4. Moisture soak (60℃/60% RH, 40hours)(MSL3)
Step5. IR Reflow * 3times(260℃)
Step6. External Visual & Function Test and SAT Inspection
Sample Size: 366ea
Test Reference: JESD22-A113

1.3 Testing Result

Product	Result	Remark
BGASSD PS5013	0 Fail / 366	NA

Criteria : Acc/Rej = 0/1

2. High Acceleration Stress Test (HAST/unbias)

2.1 Testing Objective

The Unbiased HAST is performed for the purpose of evaluating the reliability of non-hermetic packaged solid-state devices in humid environments. It is a highly accelerated test which employs temperature and humidity under non-condensing conditions to accelerate the penetration of moisture through the external protective material (encapsulant or seal) or along the interface between the external protective material and the metallic conductors which pass through it. Biasis not applied in this test to ensure the failure mechanisms potentially overshadowed by bias can be uncovered (e.g. galvanic corrosion). This test is is used to identify failure mechanisms internal to the package and is destructive.

2.2 Testing Condition(s)

1. Pre-condition
2. 130°C, 85%RH, 96hours
3. Each device test and all pass by VI and FT
4. Sample size: 3Lots, 45ea/Lot, total: 135ea
5. Test Reference: JEDS22-A118

2.3 Testing Result

Product	Result	Remark
BGASSD PS5013	0 Fail / 135	

Criteria : Acc/Rej = 0/1

3. Temperature Cycling Test (TCT)

3.1 Testing Objective

This standard provides a method for determining solid state devices capability to withstand extreme temperature cycling. Changes in this revision include requirements that the worst case load temperature must reach the specific extremes rather than just requiring that the chamber ambient temperature reach the exremes. This ensures that the test specimens will reach the specified temperature extremes regardless of chamber loading. Definitions are provided for Load, Monitoring Sensor, Worst-Case Load Temperature, and Working Zone. The transfer time has been tightened from 5 minutes to 1 minute. Five new test conditions have been added as well as a caution on test conditions which exceed the glass transition temperature of plastic package solid devices.

3.2 Testing Condition(s)

1. Pre condition
2. -65°C~150°C, Transition time: 10minutes, Dwell time=5 minutes
3. Test Duration: 200, 500 cycles
4. Each device test and all pass by VI and FT
5. Sample size: 3 Lots, 77ea /Lot, total: 231ea
6. Test Reference: JEDS 22 A104

3.3 Testing Result

Product	Result	Remark
BGASSD PS5013	0 Fail / 231	

Criteria : Acc/Rej = 0/1

4. High Temperature Storage Life Test (HTSL)

4.1 Testing Objective

The high temperature storage test is typically used to determine the effects of time and temperature, under storage conditions, for thermally activated failure mechanisms and time to failure distributions of solid state electronic devices, including non-volatile memory devices (data retention failure mechanisms). Thermally activated failure mechanisms are modeled using the Arrhenius Equation for acceleration. During the test, accelerated stress temperatures are used without electrical conditions applied. This test may be destructive, depending on time, temperature and packaging (if any).

4.2 Testing Condition(s)

1. High ambient temperature = 150 °C
2. Test Duration: 1000 hours
3. Sample size: 1 Lot, 45ea /Lot, total: 45ea
4. Test Reference: JESD22 A103

4.3 Testing Result

Product	Result	Remark
BGASSD PS5013	0 Fail / 45	

Criteria : Acc/Rej = 0/1

5. Solderability Test (SD)

5.1 Testing Objective

The purpose of this test method is to evaluate the solder abilityof terminations that are normally joined by a soldering operation

5.2 Testing Condition(s)

1. Pre-condition: Dry Bake 155°C/ 4 hours
2. Procedure 1：Substrate (The test substrate shall consist of an unmetallized (no tracks or lands) piece of ceramic board)
3. Procedure 2：Solder paste
4. Procedure 3：Stencil
5. Procedure 4：Printing
6. Procedure 5：Reflow condition
7. Procedure 6：Flux Removal
8. Test Reference: J-STD-002E Test Method S1
9. Sample size: 5ea

5.3 Testing Result

Product	Criteria	Result
BGASSD PS5013	Each solder sphere shall have incorporated the solder paste deposit	PASS

6. Physical Dimensions (PD)

6.1 Testing Objective

The test is to measure samples' coplanarity which follow the outline

6.2 Testing Condition(s)

1. Sample size: 5ea
2. Test reference: JESD22-B100

6.3 Testing Result

Product	Result	Remark
BGASSD PS5013	PASS	

7. Wire Bond Shear (WBS)

7.1 Testing Objective

This test establishes a procedure for determining the strength of the interface between a gold ball bond and a package bonding surface, or an aluminum wedge/stitch bond and a package bonding surface, on either pre-encapsulation or post-encapsulation devices. This strength measurement is extremely important in determining two features:1) The integrity of the metallurgical bond which has been formed.2) The reliability of gold and aluminum wire bonds to die or package bonding surfaces.

7.2 Testing Condition(s)

1. 30 bonds from minimum 5 units
2. Sample size: 5ea, 30 bonds/ea, Total: 150bonds
3. Test Reference: JESD22 B116

7.3 Testing Result

Product	Criteria	Result
BGASSD PS5013	Cpk>1.33	PASS

8. Wire Bond Pull (WBP)

8.1 Testing Objective

The test is to measure bond strengths, evaluate bond strength distributions, or determine compliance with specified bond strength requirements of the applicable acquisition document. This test may be applied to the wire-to-die bond, wire-to-substrate bond,or the wire-to-package lead bond inside the package of wire-connected microelectronic devices bonded by soldering, thermoscompression, ultrasonic, or related techniques. It may also be applied to bonds external to the device such as those from device terminals-to-substrate or wiring board or to internal bonds between die and substrate in non-wire-bonded device configurations such as beam lead or flip chip devices.

8.2 Testing Condition(s)

1. 30 bonds from minimum 5 units
2. Sample size: 5ea, 30 bonds/ea, Total: 150bonds
3. Test Reference: MIL-STD-883, Method 2011

8.3 Testing Result

Product	Criteria	Result
BGASSD PS5013	Cpk>1.33	PASS

9. Solder Ball Shear (SBS)

9.1 Testing Objective

The purpose of this test method is to define the procedure for measuring the shear strength of the interface between the barrier metal and solder ball. This method also establishes the minimum shear strength requirements for this interface.

9.2 Testing Condition(s)

1. 30 bonds from minimum 5 units
2. Sample size: 5ea, 30 balls/ea, Total: 150balls
3. Test Reference: JESD22 B117

9.3 Testing Result

Product	Criteria	Result
BGASSD PS5013	Cpk>1.33	PASS