PACKAGE QUALIFICATION REPORT

Apollo3 Blue Plus AMA3B2KK-KBR

Ultra-Low Power Apollo SoC Family

A-SOC3BP-QRGA01EN v1.0

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Revision History

Revision	Date	Description
1.0	July 12, 2023	Initial release

Reference Documents

Document ID	Description

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Product Information

1.1   Product Information

Table 1-1: Product Information

Product Type	Ultra-Low Power SoC
Part Number	AMA3B2KK-KBR
Process Technology	40nm
Foundry	TSMC
Package Type	5.3 x 4.3 mm 104-pin BGA
Assembly Site	SPIL
Date Code	223901/224301/224302

1.2   Qualification Results

Table 1-2: Qualification Results

Test Item	Conditions	Lot No	Sample Size	Results
Pre-SAT	C-Scan + T-Scan	3	75	Pass (No delamination phenomenon on die surface)
Pre-Conditioning (PC)	JESD22-A113; MSL-3	3	75	Pass
Post-SAT	C-Scan + T-Scan	3	75	Pass (No delamination phenomenon on die surface)

Table 1-2: Qualification Results *(Continued)*

Test Item	Conditions	Lot No	Sample Size	Results
Temperature Cycle (TC)	JESD22-A104, TC condition B (-55°C – 125°C) for 700 Cycles	3	25	Pass 700 Cycles
High Temperature Storage Life (HTSL)	JESD22-A103; 150°C, 1000 hrs	3	25	Pass 1000 hrs
Unbiased Highly Accelerated Stress Test (UHAST)	EIA/JESD22-A118, +130°C / 85%R.H. Unbiased for 96 hrs	3	25	Pass 96 hrs
Biased Highly Accelerated Stress Test (BHAST)	EIA/JESD22-A110, +130°C / 85%R.H. Biased for 96 hrs	3	25	Pass 96 hrs
Mechanical Qual Tests	JEDEC/MIL-STD-883	3	25	Pass

Pre-Conditioning (PC)

Table 2-1: Pre-Conditioning (PC)

Test:	Pre-Conditioning (PC)
Purpose:	The Preconditioning test stresses mechanical integrity by exposing a device to moisture soak conditions. Weakness and thermal expansion in die interconnections, die attach, and wire bonds are often detected with this acceleration test.
Conditions:	JESD22-A113; MSL-3 ■ Electrical Full Functional Test ■ External Visual Examination ■ Dry Bake at 125ºC for 24 hrs ■ Soak Devices to appropriate Moisture Level e.g., MSL 3 (30ºC/60%RH, 192hrs) ■ IR Reflow with JEDEC Standard Profile, 3 times ■ External Visual Examination
Lot No:	3 lot
Sample Size:	75 ea/lot
Pass/Fail Criteria:	Zero failure in function test.
Results	Pass

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Temperature Cycle (TC)

Table 3-1: Temperature Cycle (TC)

Test:	Temperature Cycle Test (TC)
Purpose:	Temperature Cycle Testing (TC), or simply temperature cycling or temp cycling, determines the ability of parts to resist extremely low and extremely high temperatures, as well as their ability to withstand cyclical exposures to these temperature extremes. A mechanical failure resulting from cyclical thermomechanical loading is known as a fatigue failure, so temperature cycling primarily accelerates fatigue failures.
Conditions:	JESD22-A104, -55°C to 125°C Air to Air (Pre-Conditioned units)
Duration:	700 Cycles
Lot No:	3 lot
Sample Size:	25 ea/ lot
Pass/Fail Criteria:	Zero failure in function test.
Results	Pass 700 Cycles

High Temperature Storage Life (HTSL)

Table 4-1: High Temperature Storage Life (HTSL)

Test:	High Temperature Storage Life (HTSL)
Purpose:	The 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 nonvolatile 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.
Conditions:	JESD22-A103; +150ºC for 1000 continuous hours
Duration:	1000 hrs
Lot No:	3 lot
Sample Size:	25 ea/ lot
Pass/Fail Criteria:	Zero failure in function test.
Results	Pass 1000 hrs

Unbiased Highly Accelerated Stress Test (UHAST)

Table 5-1: Unbiased Highly Accelerated Stress Test (UHAST)

Test:	Unbiased Highly Accelerated Stress Test (UHAST)
Purpose:	The test 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 that 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 that pass through it.
Conditions:	EIA/JESD22-A118, +130°C / 85%R.H. Unbiased (Pre-Conditioned units)
Duration:	96 hrs
Lot No:	3 lot
Sample Size:	25 ea/ lot
Pass/Fail Criteria:	Zero failure in function test
Results	Pass 96 hrs

Biased Highly Accelerated Stress Test (BHAST)

Table 6-1: Biased Highly Accelerated Stress Test (BHAST)

Test:	Biased Highly Accelerated Stress Test (BHAST)
Purpose:	The test is performed for the purpose of evaluating the reliability of non-hermetic packaged solid-state devices in humid environments. It employs severe conditions of temperature, humidity, and bias which 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.
Conditions:	EIA/JESD22-A110, +130°C / 85%R.H. Biased (Pre-Conditioned units)
Duration:	96 hrs
Lot No:	3 lot
Sample Size:	25 ea/ lot
Pass/Fail Criteria:	Zero failure in function test
Results	Pass 96 hrs

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Mechanical Qual Tests

Table 7-1: Mechanical Qual Tests

Test:	Mechanical Qual Tests
Purpose:	The test is to measure mechanical strength such as bond/ball strengths, evaluate bond/ball strength distributions, or determine compliance with specified bond/ball strength requirements of the applicable document.
Conditions:	JEDEC/MIL-STD-883
Duration:	96 hrs
Lot No:	3 lot
Sample Size:	25 ea/ lot
Pass/Fail Criteria:	Zero failure in function test
Results	Pass

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