



## AEC-Q100 Qualification Report

Product Series: CA-IF1044AX&1051AX-Q1

Report Version: V1.0

Reference Doc.: AEC-Q100-REV-H&Q006

| Prepare | Review | Approve |
|---------|--------|---------|
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## 1. Overview

Reliability testing of microelectronic products is a risk mitigation process designed to ensure the service life of device in customer applications. Semiconductor wafer manufacturing process and package-level reliability can be assessed in a variety of ways and may include accelerated environmental test conditions. Chipanalog evaluates manufacturability of the device to verify a robust silicon and assembly flow to ensure continuity of supply to customers. Chipanalog qualifies new devices, significant changes, and product families based on AEC-Q100&AEC-Q006.

## 2. Part Number List

| Package Type | Part Number                                                      |
|--------------|------------------------------------------------------------------|
| SOIC8        | CA-IF1044AVS-Q1, CA-IF1044AS-Q1, CA-IF1051AS-Q1, CA-IF1051AVS-Q1 |
| DFN8         | CA-IF1044AVD-Q1, CA-IF1044AD-Q1                                  |

**Note:** AECQ-100&AEC-Q006 provides the guideline for the use of generic data to accelerate and streamline the qualification process. Products sharing the same major product, process and materials elements may be categorized in a product qualification family.

## 3. Production Information

### 3.1. Wafer information

|             |             |
|-------------|-------------|
| Fab site    | SMIC        |
| Wafer       | Blackhole_Q |
| Fab Process | 18BCD       |

### 3.2. Package information

|                 |                        |                        |                        |
|-----------------|------------------------|------------------------|------------------------|
| Assembly site   | UNIMOS                 | JCET-B                 | JCET-A                 |
| FT site         | UNIMOS                 | JCET-B                 | JCET-A                 |
| Package         | SOIC8                  | DFN8                   | SOIC8                  |
| Lead Frame      | Cu                     | Cu                     | Cu                     |
| Bond wire       | 25um AuPdCu            | 20 um AuPdCu           | 25 um AuPdCu           |
| MSL level       | MSL1                   | MSL1                   | MSL1                   |
| Operation Temp. | Grade 1(-40°C - 125°C) | Grade 1(-40°C - 125°C) | Grade 1(-40°C - 125°C) |

#### 4. Reliability Qualification Plan

| Test Group A-Accelerated Environment Stress Tests  |       |                                        |                                                                                                                                 |                                   |        |
|----------------------------------------------------|-------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------|
| Group                                              | Item  | Refer.                                 | Test condition                                                                                                                  | QTY                               | Remark |
| A1                                                 | PC    | J-STD-020<br>JESD22-A113               | Test @ Rm, SMD only, Moisture Preconditioning before THB/BHAST, AC/UHAST, TC, and PTC stress, MSL = 1, Peak Reflow Temp = 260°C | 77 pcs*3 lots                     |        |
| A2                                                 | BHAST | JESD22-A110                            | BHAST: 130°C, 85% RH, V <sub>cc</sub> = 5.5V, 96,192 hrs (Test @ Rm/Hot)                                                        | 77 pcs*3 lots                     |        |
| A3                                                 | UHAST | JESD22-A118                            | UHAST: 130°C, 85% RH, 96 hrs (Test @ Rm)                                                                                        | 77 pcs*3 lots                     |        |
| A4                                                 | TC    | JESD22-A104                            | -65°C-150°C, 1000 cycles (Test @Rm/Hot)                                                                                         | 77 pcs*3 lots                     |        |
| A5                                                 | PTC   | JESD22-A105                            | -40°C-125°C, 1000 cycles (Test @ Rm/Hot)                                                                                        | NA                                |        |
| A6                                                 | HTSL  | JESD22-A103                            | T <sub>a</sub> = 150°C, 2000 hrs (Test @ Rm/Hot)                                                                                | 45 pcs*1 lot                      |        |
| Test Group B-Accelerated Lifetime Simulation Tests |       |                                        |                                                                                                                                 |                                   |        |
| Group                                              | Item  | Refer.                                 | Test condition                                                                                                                  | QTY                               | Remark |
| B1                                                 | HTOL  | JESD22-A108                            | T <sub>a</sub> = 125°C, V <sub>cc</sub> = 5.5V, 1000 hrs (Test @ Rm/Cold/Hot)                                                   | 77 pcs*3 lots                     |        |
| B2                                                 | ELFR  | AEC-Q100-008                           | T <sub>a</sub> = 125°C, V <sub>cc</sub> = 5.5V, 48 hrs (Test @ Rm/Hot)                                                          | 800 pcs*3 lots                    |        |
| B3                                                 | EDR   | AEC-Q100-005                           | Test @ Rm/Hot                                                                                                                   | NA                                |        |
| Group C-Package Assembly Integrity Tests           |       |                                        |                                                                                                                                 |                                   |        |
| Group                                              | Item  | Refer.                                 | Test condition                                                                                                                  | QTY                               | Remark |
| C1                                                 | WBS   | AEC-Q100-001<br>AEC-Q003               | Cpk > 1.67, T0 samples                                                                                                          | 30 bonds from 5 pcs               |        |
| C1                                                 | WBS   | AEC-Q100-001<br>AEC-Q003<br>AEC-Q006   | 0 fails, post-TC, UHAST, BHAST, HTS samples                                                                                     | 30 bonds from 3 pcs per test item |        |
| C2                                                 | WBP   | MIL-STD883<br>AEC-Q003                 | Cpk > 1.67, T0 samples                                                                                                          | 30 bonds from 5 pcs               |        |
| C2                                                 | WBP   | MIL-STD883<br>AEC-Q003<br>AEC-Q006     | 0 fails, post-TC, UHAST, BHAST samples                                                                                          | 30 bonds from 4 pcs per test item |        |
| C3                                                 | SD    | J-STD-002                              | > 95% coverage, 8hr steam aging prior to testing                                                                                | 15 pcs*1 lot                      |        |
| C4                                                 | PD    | JESD22-B100<br>JESD22-B108<br>AEC-Q003 | Cpk > 1.67                                                                                                                      | 10 pcs*3 lots                     |        |

| C5                                                    | SBS           | AEC-Q100-010<br>AEC-Q003 | Cpk > 1.67, 5 balls from min. of 10 devices        | NA            |             |
|-------------------------------------------------------|---------------|--------------------------|----------------------------------------------------|---------------|-------------|
| C6                                                    | LI            | JESD22-B105              | 10 leads from each of 5 devices                    | NA            |             |
| <b>Test Group D–Die Fabrication Reliability Tests</b> |               |                          |                                                    |               |             |
| Group                                                 | Item          | Refer.                   | Test condition                                     | QTY           | Remark      |
| D1                                                    | EM            | JESD61                   | ---                                                | ---           | Done by Fab |
| D2                                                    | TDDDB         | JESD35                   | ---                                                | ---           | Done by Fab |
| D3                                                    | HCI           | JESD60 & 28              | ---                                                | ---           | Done by Fab |
| D4                                                    | BTI           | JESD90                   | ---                                                | ---           | Done by Fab |
| D5                                                    | SM            | JESD61, 87, & 202        | ---                                                | ---           | Done by Fab |
| <b>Group E-Electrical Verification Tests</b>          |               |                          |                                                    |               |             |
| Group                                                 | Item          | Refer.                   | Test condition                                     | QTY           | Remark      |
| E1                                                    | TEST          | per datasheet            | Pre and Post Stress Electrical Test                | All           |             |
| E2                                                    | HBM           | AEC Q100-002             | ±500V, ±1KV, ±2KV, ±4KV, ±8KV (Test @ Rm/Hot)      | 3 pcs*1 lot   |             |
| E3                                                    | CDM           | AEC-Q100-011             | ±250V, ±500V, ±750V, ±2KV (Test @ Rm/Hot)          | 3 pcs*1 lot   |             |
| E4                                                    | LU            | AEC-Q100-004             | 125°C, I-trigger ±200mA(Test @ Rm/Hot)             | 3 pcs*1 lot   |             |
| E5                                                    | ED            | AEC-Q100-009             | CPK> 1.67(Test @ Rm/Cold/Hot)                      | 30 pcs*3 lots |             |
| E9                                                    | EMC           | SAE J1752/3              | Electromagnetic Compatibility (Radiated Emissions) | 1 pcs*1 lot   |             |
| E10                                                   | SC            | AEC-Q100-012             | /                                                  | NA            |             |
| E11                                                   | SER           | JESD89-1/-2/-3           | /                                                  | NA            |             |
| E12                                                   | LF            | AEC-Q005                 | /                                                  | 2 pcs*3 lots  |             |
| <b>Group S-Special Requirement Tests</b>              |               |                          |                                                    |               |             |
| S1                                                    | BLR-Bending   | JESD22-B113              | Align with customer                                | NA            |             |
| S2                                                    | BLR-Drop      | JESD22-B11               | Align with customer                                | NA            |             |
| S3                                                    | BLR-TC        | IPC-9701                 | Refer test requirement                             | NA            |             |
| S4                                                    | BLR-Vibration | JESD22-B103              | Refer test requirement                             | NA            |             |

**Note:** Group E6, E7 and Group F are not reliability related items. Group G are not applicable to non-hermetic packaged devices.

## Reliability Test Results

| Test Group A-Accelerated Environment Stress Test (SOIC8 JECT-A) |       |                                                                                                                 |                |         |        |
|-----------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------|----------------|---------|--------|
| Group                                                           | Item  | Test Condition                                                                                                  | QTY            | Lot NO. | Result |
| A1                                                              | PC    | Test @ Rm, SMD only, Moisture Preconditioning before BHAST, UHAST, TC stress, MSL = 1, Peak Reflow Temp = 260°C | 240 pcs*3 lots | 2513A   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2514A   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2515A   | Pass   |
| A2                                                              | BHAST | 130°C, 85% RH, 192 hrs, Vcc= 5.5V                                                                               | 80 pcs*3 lots  | 2513A   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2514A   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2515A   | Pass   |
| A3                                                              | UHAST | 130°C, 85% RH, 96 hrs                                                                                           | 80 pcs*3 lots  | 2513A   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2514A   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2515A   | Pass   |
| A4                                                              | TC    | -65°C-150°C, 1000 cycles                                                                                        | 80 pcs*3 lots  | 2513A   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2514A   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2515A   | Pass   |
| A6                                                              | HTSL  | Ta = 150°C, 2000 hrs                                                                                            | 45 pcs*1 lot   | 2515A   | Pass   |
| Test Group A-Accelerated Environment Stress Test (SOIC8 UNIMOS) |       |                                                                                                                 |                |         |        |
| Group                                                           | Item  | Test Condition                                                                                                  | QTY            | Lot NO. | Result |
| A1                                                              | PC    | Test @ Rm, SMD only, Moisture Preconditioning before BHAST, UHAST, TC stress, MSL = 1, Peak Reflow Temp = 260°C | 240 pcs*3 lots | 2513D   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2514D   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2515D   | Pass   |
| A2                                                              | BHAST | 130°C, 85% RH, 192 hrs, Vcc= 5.5V                                                                               | 80 pcs*3 lots  | 2513D   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2514D   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2515D   | Pass   |
| A3                                                              | UHAST | 130°C, 85% RH, 96 hrs                                                                                           | 80 pcs*3 lots  | 2513D   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2514D   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2515D   | Pass   |
| A4                                                              | TC    | -65°C-150°C, 1000 cycles                                                                                        | 80 pcs*3 lots  | 2513D   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2514D   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2515D   | Pass   |
| A6                                                              | HTSL  | Ta = 150°C, 2000 hrs                                                                                            | 45 pcs*1 lot   | 2513D   | Pass   |
| Test Group A-Accelerated Environment Stress Test (DFN8 JECT-B)  |       |                                                                                                                 |                |         |        |
| Group                                                           | Item  | Test Condition                                                                                                  | QTY            | Lot NO. | Result |
| A1                                                              | PC    | Test @ Rm, SMD only, Moisture Preconditioning before BHAST, UHAST, TC stress, MSL = 1, Peak Reflow Temp = 260°C | 240 pcs*3 lots | 2521B   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2522B   | Pass   |
|                                                                 |       |                                                                                                                 |                | 2523B   | Pass   |

|    |       |                                                |               |       |      |
|----|-------|------------------------------------------------|---------------|-------|------|
| A2 | BHAST | 130°C, 85% RH, 192 hrs, V <sub>cc</sub> = 5.5V | 80 pcs*3 lots | 2521B | Pass |
|    |       |                                                |               | 2522B | Pass |
|    |       |                                                |               | 2523B | Pass |
| A3 | UHASt | 130°C, 85% RH, 96 hrs                          | 80 pcs*3 lots | 2521B | Pass |
|    |       |                                                |               | 2522B | Pass |
|    |       |                                                |               | 2523B | Pass |
| A4 | TC    | -65°C-150°C, 1000 cycles                       | 80 pcs*3 lots | 2521B | Pass |
|    |       |                                                |               | 2522B | Pass |
|    |       |                                                |               | 2523B | Pass |
| A6 | HTSL  | T <sub>a</sub> = 150°C, 2000 hrs               | 45 pcs*1 lot  | 2523B | Pass |

### Test Group B-Accelerated Lifetime Simulation Tests

| Group | Item | Test Condition                                                                                | QTY            | LOT NO. | Result |
|-------|------|-----------------------------------------------------------------------------------------------|----------------|---------|--------|
| B1    | HTOL | T <sub>a</sub> = 125°C, V <sub>cc</sub> = 5.5V, 1000 hrs (Test @ Rm/Cold/Hot), input f = 1kHz | 77 pcs*3 lot   | 2514A   | Pass   |
|       |      |                                                                                               |                | 2513D   | Pass   |
|       |      |                                                                                               |                | 2514D   | Pass   |
| B2    | ELFR | T <sub>a</sub> = 125°C, V <sub>cc</sub> = 5.5V, 1000 hrs (Test @ Rm/Cold/Hot), input f = 1kHz | 800 pcs*3 lots | 2513D   | Pass   |
|       |      |                                                                                               |                | 2514D   | Pass   |
|       |      |                                                                                               |                | 2515D   | Pass   |

### Group C-Package Assembly Integrity Tests (SOIC8 UNIMOS)

| Group | Item | Test Condition                                    | QTY                               | Lot NO. | Result |
|-------|------|---------------------------------------------------|-----------------------------------|---------|--------|
| C1    | WBS  | Cpk > 1.67, T0 samples                            | 30 bonds from 5 pcs               | 2515D   | Pass   |
| C1    | WBS  | 0 fails, post-TC, UHASt, BHAST, HTS samples       | 30 bonds from 3 pcs per test Item | 2513D   | Pass   |
|       |      |                                                   |                                   | 2514D   | Pass   |
|       |      |                                                   |                                   | 2515D   | Pass   |
| C2    | WBP  | Cpk > 1.67, T0 samples                            | 30 bonds from 5 pcs               | 2515D   | Pass   |
| C2    | WBP  | 0 fails, post-TC, UHASt, BHAST samples            | 30 bonds from 4 pcs               | 2513D   | Pass   |
|       |      |                                                   |                                   | 2514D   | Pass   |
|       |      |                                                   |                                   | 2515D   | Pass   |
| C3    | SD   | >95% coverage, 8 hrs steam aging prior to testing | 15 pcs*1 lot                      | 2515D   | Pass   |
| C4    | PD   | Cpk > 1.67                                        | 10 pcs*3 lots                     | 2513D   | Pass   |
|       |      |                                                   |                                   | 2514D   | Pass   |
|       |      |                                                   |                                   | 2515D   | Pass   |

### Group C-Package Assembly Integrity Tests (SOIC8-JECT-A)

| Group | Item | Test Condition         | QTY                 | Lot NO. | Result |
|-------|------|------------------------|---------------------|---------|--------|
| C1    | WBS  | Cpk > 1.67, T0 samples | 30 bonds from 5 pcs | 2515A   | Pass   |

|    |     |                                                   |                                   |       |      |
|----|-----|---------------------------------------------------|-----------------------------------|-------|------|
| C1 | WBS | 0 fails, post-TC, UHAST, BHAST, HTS samples       | 30 bonds from 3 pcs Per Test Item | 2513A | Pass |
|    |     |                                                   |                                   | 2514A | Pass |
|    |     |                                                   |                                   | 2515A | Pass |
| C2 | WBP | Cpk > 1.67, T0 samples                            | 30 bonds from 5 pcs               | 2515A | Pass |
| C2 | WBP | 0 fails, post-TC, UHAST, BHAST samples            | 30 bonds from 4 pcs Per Test Item | 2513A | Pass |
|    |     |                                                   |                                   | 2514A | Pass |
|    |     |                                                   |                                   | 2515A | Pass |
| C3 | SD  | >95% coverage, 8 hrs steam aging prior to testing | 15 pcs*1 lot                      | 2515A | Pass |
| C4 | PD  | Cpk > 1.67                                        | 10 pcs*3 lots                     | 2513A | Pass |
|    |     |                                                   |                                   | 2514A | Pass |
|    |     |                                                   |                                   | 2515A | Pass |

### Group C-Package Assembly Integrity Tests (DFN8-JECT-B)

| Group | Item | Test Condition                                    | QTY                               | Lot NO. | Result |
|-------|------|---------------------------------------------------|-----------------------------------|---------|--------|
| C1    | WBS  | Cpk > 1.67, T0 samples                            | 30 bonds from 5 pcs               | 2521B   | Pass   |
| C1    | WBS  | 0 fails, post-TC, UHAST, BHAST, HTS samples       | 30 bonds from 3 pcs Per Test Item | 2521B   | Pass   |
|       |      |                                                   |                                   | 2522B   | Pass   |
|       |      |                                                   |                                   | 2523B   | Pass   |
| C2    | WBP  | Cpk > 1.67, T0 samples                            | 30 bonds from 5 pcs               | 2521B   | Pass   |
| C2    | WBP  | 0 fails, post-TC, UHAST, BHAST samples            | 30 bonds from 4 pcs Per Test Item | 2521B   | Pass   |
|       |      |                                                   |                                   | 2522B   | Pass   |
|       |      |                                                   |                                   | 2523B   | Pass   |
| C3    | SD   | >95% coverage, 8 hrs steam aging prior to testing | 15 pcs*1 lot                      | 2521B   | Pass   |
| C4    | PD   | Cpk > 1.67                                        | 10 pcs*3 lots                     | 2521B   | Pass   |
|       |      |                                                   |                                   | 2522B   | Pass   |
|       |      |                                                   |                                   | 2523B   | Pass   |

### TEST GROUP D-Die Fabrication Reliability Tests

| Group | Item | Test Condition | ADDITIONAL REQUIREMENTS                                                                                                                                                                |
|-------|------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D1    | EM   | ---            | The Die Fabrication Reliability Tests are carried out by every fabrication site. The data, test method, calculations and internal criteria are available to the customer upon request. |
| D2    | TDDB | ---            |                                                                                                                                                                                        |
| D3    | HCI  | ---            |                                                                                                                                                                                        |
| D4    | NBTI | ---            |                                                                                                                                                                                        |
| D5    | SM   | ---            |                                                                                                                                                                                        |

| Group E-Electrical Verification Tests |      |                                                                               |                                         |                         |            |
|---------------------------------------|------|-------------------------------------------------------------------------------|-----------------------------------------|-------------------------|------------|
| Group                                 | Item | Test Condition                                                                | QTY                                     | Lot NO.                 | Result     |
| E1                                    | TEST | Pre and Post Stress Electrical Test                                           | All                                     | All                     | Pass       |
| E2                                    | HBM  | $\pm 500V$ , $\pm 1KV$ , $\pm 2KV$ , $\pm 4KV$ , $\pm 8KV$ (Test @ Rm/Hot)    | 3 pcs*1 lot                             | 2509A                   | 3B         |
| E3                                    | CDM  | $\pm 250V$ , $\pm 500V$ , $\pm 750V$ , $\pm 2KV$ (Test @ Rm/Hot)              | 3 pcs*1 lot                             | 2509A                   | C3         |
| E4                                    | LU   | 125°C, I-trigger $\pm 200mA$ ; $1.5 \times V_{maxSUP}$ or MSV (Test @ Rm/Hot) | 6pcs*1 lot                              | 2509A                   | Class II A |
| E5                                    | ED   | CPK>1.67, test at room, hot, and cold temperature                             | 30pcs*3lot                              | 2513D<br>2514D<br>2515D | PASS       |
| E9                                    | EMC  | Electromagnetic Compatibility (Radiated Emissions)                            | NA                                      | NA                      | NA         |
| E12                                   | LF   | SOIC8 JCET-A                                                                  | Refer to JCET SOP8 Tin Whisker report   |                         |            |
|                                       |      | SOIC8 UNIMOS                                                                  | Refer to UNIMOS SOP8 Tin Whisker report |                         |            |
|                                       |      | DFN8 JCET-B                                                                   | Refer to UNIMOS DFN8 Tin Whisker report |                         |            |

## 5. MTTF&FIT

| Supporting Data (Ea = 0.7 eV, Confidence Level = 60%) |              |          |      |          |                 |                   | MTTF (hrs) | FIT   |
|-------------------------------------------------------|--------------|----------|------|----------|-----------------|-------------------|------------|-------|
| Test Temp.                                            | Test Voltage | Duration | QTY  | Fail QTY | Operation Temp. | Operation Voltage | 6.14E+07   | 16.27 |
| 125°C                                                 | 5.5V         | 1000 hrs | 200  | 0        | 55°C            | 5.5 V             |            |       |
| 125°C                                                 | 5.5V         | 48 hrs   | 2550 | 0        | 55°C            | 5.5 V             |            |       |
| 125°C                                                 | 5.5V         | 2000 hrs | 200  | 0        | 55°C            | 5.5 V             |            |       |

**Note:** The FIT data is generated based on Arrhenius model and voltage acceleration model.

## 6. Conclusion

CA-IF1044AX&1051AX-Q1 series products are qualified according to AEC-Q100&AEC-Q006 standard.

## Disclaimer

This information is provided to assist customers in design and development. It could change for technology innovation without notice.

The devices are shipped after passing final test. Customers are responsible to conduct sufficient engineering and additional qualification testing to determine whether a device is suitable for use in their applications.

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## Revision History

| Revision | Change Log      | Date      |
|----------|-----------------|-----------|
| V1.0     | Initial release | Oct, 2025 |