



# ***Alpha & Omega Semiconductor Product Reliability Report***

**AOZ2221QI**, rev A

**Plastic Encapsulated Device**

**ALPHA & OMEGA Semiconductor, Inc**

**[www.aosmd.com](http://www.aosmd.com)**

This AOS product reliability report summarizes the qualification results for AOZ2221QI in QFN4x4-23L package. Accelerated environmental tests are performed on a specific sample size and samples are electrically tested before and after each time point. Review of final electrical test results confirm that AOZ2221QI pass the AOS quality and reliability requirements. The released products will be categorized by its process family and routinely monitored for continuous improvement of product quality.

## I. Reliability Stress Test Summary and Results

| Test Item                   | Test Condition   | Time Point                 | Total Sample Size | Number of Failures | Reference Standard |
|-----------------------------|--|----------------------------|-------------------|--------------------|--------------------|
| HTOL                        | T <sub>J</sub> = 125°C,<br>V <sub>IN</sub> = V <sub>ccmax</sub>                            | 168 / 500 /<br>1000 hours  | 231 pcs           | 0                  | JESD22-A108        |
| Preconditioning<br>(Note A) | T <sub>A</sub> = 30°C, RH = 60% +<br>3 cycle reflow @ 260°C<br>(MSL 3)                     | 192 hours                  | 924 pcs           | 0                  | JESD22-A113        |
| HAST                        | T <sub>A</sub> = 130°C, RH = 85%,<br>P = 33.3psia,<br>V <sub>IN</sub> = V <sub>ccmax</sub> | 96 hours                   | 231 pcs           | 0                  | JESD22-A110        |
| Autoclave                   | T <sub>A</sub> = 121°C, RH = 100%,<br>P = 29.7psia   | 96 hours                   | 231 pcs           | 0                  | JESD22-A102        |
| Temperature<br>Cycle        | T <sub>A</sub> = -65°C to 150°C,<br>air to air   | 250 / 500 /<br>1000 cycles | 231 pcs           | 0                  | JESD22-A104        |
| HTSL                        | Temp = 150°C   | 168 / 500 /<br>1000 hours  | 231 pcs           | 0                  | JESD22-A103        |

**Note:** The reliability data presents total of available generic data up to the published date.

Note A: MSL (Moisture Sensitivity Level) 3 based on J-STD-020

## II. Reliability Evaluation

**FIT rate (per billion): 50.97**

**MTTF = 2240 years**

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size. Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

**Failure Rate** =  $\text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 50.97$

**MTTF** =  $10^9 / \text{FIT} = 2240$  years

**Chi<sup>2</sup>** = Chi Squared Distribution, determined by the number of failures and confidence interval

**N** = Total Number of units from burn-in tests

**H** = Duration of burn-in testing

**Af** = Acceleration Factor from Test to Use Conditions (E<sub>a</sub> = 0.7eV and T<sub>use</sub> = 55°C)

Acceleration Factor **[Af]** =  $\text{Exp} [E_a / k (1/T_{J u} - 1/T_{J s})]$

**Acceleration Factor ratio list:**

|           | 55 deg C  | 70 deg C  | 85 deg C   | 100 deg C  | 115 deg C  | 125 deg C |
|-----------|-----------|-----------|------------|------------|------------|-----------|
| <b>Af</b> | <b>77</b> | <b>26</b> | <b>9.8</b> | <b>3.9</b> | <b>1.7</b> | <b>1</b>  |

T<sub>J s</sub> = Stressed junction temperature in degree (Kelvin), K = C + 273.16

T<sub>J u</sub> = The use junction temperature in degree (Kelvin), K = C + 273.16

**k** = Boltzmann's constant, 8.617164 X 10<sup>-5</sup>eV / K

### III. ESD and Latch Up Test Results

| Test   | Test Conditions                      | Total Sample Size | Number of Failures | Reference Standard |
|--|--------------------------------------|-------------------|--------------------|--------------------|
| Electrostatic Discharge Human Body Model     | T <sub>A</sub> = 25°C, +/-2kV        | 3                 | 0                  | JESD-A114          |
| Electrostatic Discharge Charged Device Model | T <sub>A</sub> = 25°C, +/-1kV        | 3                 | 0                  | JESD-C101          |
| Latch Up                                     | T <sub>A</sub> = 25°C, +/-100 mA/40V | 6                 | 0                  | JESD78             |
| Latch Up                                     | T <sub>A</sub> = 85°C, +/-100 mA/40V | 6                 | 0                  | JESD78             |

(1) ATE results are used to determine PASS/FAIL. Parametric shift <10%.

