

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

**AOZ13987DI-04**, rev A

**Plastic Encapsulated Device**

**ALPHA & OMEGA Semiconductor, Inc**

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

This AOS product reliability report summarizes the qualification result for AOZ13987DI-04. Accelerated environmental tests are performed on a specific sample size, and then followed by electrical test at end point. Review of final electrical test result confirms that AOZ13987DI-04 using TP004K2 version meet requirements as extension qualification. The released product will be categorized by the process family and be routine monitored for continuously improving the product quality.

## I. Reliability Stress Test Summary and Results

Test Item	Test Condition	Time Point	Total Sample Size	Number of Failures	Reference Standard
HTOL	Temp = 125°C, Vcc=Vccmax	168 / 500 / 1000 hours and 168hours	240 pcs (3 lots) 80 pcs (1 lot)	0	JESD22-A108
Precondition (Note A)	168hr 85°C / 85%RH + 3 cycle reflow @260°C (MSL 1)	-	960 pcs (3 lots)	0	JESD22-A113
HAST	130°C, RH = 85%, 33.3 psia, Vcc= Vccmax	96 hours	240 pcs (3 lots)	0	JESD22-A110
Autoclave	121°C , 29.7psia, RH=100%	96 hours	240 pcs (3 lots)	0	JESD22-A102
Temperature Cycle	-65°C to 150°C, air to air	250 / 500 / 1000 cycles	240 pcs (3 lots)	0	JESD22-A104
High Temperature storage	T <sub>A</sub> = 150°C	1000 hours	240 pcs (3 lots)	0	JESD22-A103
HTGB (MOSFET)	T <sub>J</sub> = 150°C, V <sub>GS</sub> = 10V	168 / 500 / 1000 hours	231 (3 lots)	0	JESD22-A108
HTRB (MOSFET)	T <sub>J</sub> = 150°C, V <sub>DS</sub> = 30V	168 / 500 / 1000 hours	231 (3 lots)	0	JESD22-A108
HT3RB (MOSFET)	T <sub>A</sub> = 130°C, RH = 85%, P = 33.3psia, V <sub>DS</sub> = 30V	168 / 500 / 1000 hours	231 (3 lots)	0	JESD22-A101
Validation	3 cycle reflow @ 260°C + 250 cycles @ T <sub>A</sub> = -65°C to 150°C	250 cycles	3000 (3 lots)	0	AOS Standard
Mechanical Shock	Condition B a = 1500g; t = 0.5ms	5 shocks / side	30 (3 lots)	0	JESD22-B110B

**Note A:**

MSL (Moisture Sensitivity Level) 1 based on J-STD-020

## II. Reliability Evaluation

**FIT rate (per billion): 13.91**

**MTTF = 8206 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** =  $\text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 13.91$

**MTTF** =  $10^9 / \text{FIT} = 8206$  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 (Ea = 0.7eV and Tuse = 55°C)

Acceleration Factor [**Af**] = **Exp** [Ea / k (1/Tj u – 1/Tj s)]

### Acceleration Factor ratio list:

	55 deg C	70 deg C	85 deg C	100 deg C	115 deg C	125 deg C
Af	77	26	9.8	3.9	1.7	1

**Tj s** = Stressed junction temperature in degree (Kelvin), K = C+273.16

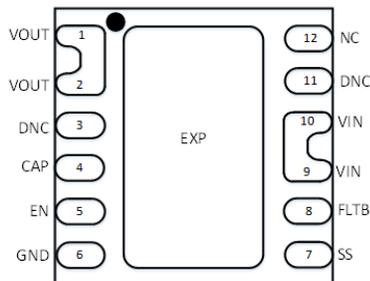
**Tj u** = The use junction temperature in degree (Kelvin), K = C+273.16

**k** = Boltzmann's constant,  $8.617164 \times 10^{-5} \text{eV} / \text{K}$

## 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, +/-4kV	3	0	JESD-A114
Electrostatic Discharge Charged Device Model	T <sub>A</sub> = 25°C, +/-1kV	3	0	JESD-C101
Electrostatic Discharge Immunity (only VIN pin)	T <sub>A</sub> = 25°C, +/-8kV	3	0	IEC61000-4-2
Electrostatic Discharge Surge test (only VIN pin)	T <sub>A</sub> = 25°C, 40V	3	0	IEC61000-4-5
Latch Up	T <sub>A</sub> = 25°C, +/-100mA, 1.5x OV	6	0	JESD78
Latch Up	T <sub>A</sub> = 125°C, +/-100mA, 1.5x OV	6	0	JESD78

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



3mm x 3mm DFN-12L  
(Top Transparent View)