



# ***AOS Semiconductor Product Reliability Report***

**AO4406A**, rev C

**Plastic Encapsulated Device**

**ALPHA & OMEGA Semiconductor, Inc**

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

This AOS product reliability report summarizes the qualification result for AO4406A. 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 AO4406A passes AOS quality and reliability requirements. The released product will be categorized by the process family and be routine monitored for continuously improving the product quality.

## **Table of Contents:**

- I. Product Description
- II. Package and Die information
- III. Reliability Stress Test Summary and Results
- IV. Reliability Evaluation

### **I. Product Description:**

The AO4406A uses advanced trench technology to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for high side switch in SMPS and general purpose applications.

Details refer to the datasheet.

### **II. Die / Package Information:**

	<b>AO4406A</b>
<b>Process</b>	Standard sub-micron 30V N-Channel MOSFET
<b>Package Type</b>	SO-8
<b>Lead Frame</b>	Bare Cu
<b>Die Attach</b>	Ag Epoxy
<b>Bond</b>	Cu Wire
<b>Mold Material</b>	Epoxy resin with silica filler
<b>Moisture Level</b>	Up to Level 1

### III. Reliability Stress Test Summary and Results

Test Item	Test Condition	Time Point	Total Sample Size	Number of Failures	Reference Standard
HTGB	Temp = 150°C , Vgs=100% of Vgsmax	168 / 500 / 1000 hours	924 pcs	0	JESD22-A108
HTRB	Temp = 150°C , Vds=80% of Vdsmax	168 / 500 / 1000 hours	924 pcs	0	JESD22-A108
MSL Precondition	168hr 85°C / 85%RH + 3 cycle reflow@260°C (MSL 1)	-	4620 pcs	0	JESD22-A113
HAST	130°C , 85%RH, 33.3 psi, Vds = 80% of Vdsmax	96 hours	924 pcs	0	JESD22-A110
H3TRB	85°C , 85%RH, Vds = 80% of Vdsmax	1000 hours	462 pcs	0	JESD22-A101
Autoclave	121°C , 29.7psi, RH=100%	96 hours	924 pcs	0	JESD22-A102
Temperature Cycle	-65°C to 150°C , air to air,	250 / 500 cycles	924 pcs	0	JESD22-A104
HTSL	Temp = 150°C	1000 hrs	924 pcs	0	JESD22-A103
Power Cycling	Δ Tj = 100°C	15000 cycles	462 pcs	0	AEC Q101

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

### IV. Reliability Evaluation

**FIT rate (per billion): 3.27**

**MTTF = 34926 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.

$$\text{Failure Rate} = \text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 3.27$$

$$\text{MTTF} = 10^9 / \text{FIT} = 34926 \text{ years}$$

**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)

$$\text{Acceleration Factor [Af]} = \text{Exp} [Ea / k (1/Tj u - 1/Tj s)]$$

**Acceleration Factor ratio list:**

	55 deg C	70 deg C	85 deg C	100 deg C	115 deg C	130 deg C	150 deg C
<b>Af</b>	<b>259</b>	<b>87</b>	<b>32</b>	<b>13</b>	<b>5.64</b>	<b>2.59</b>	<b>1</b>

**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 X 10<sup>-5</sup>eV / K