



**ALPHA & OMEGA**  
SEMICONDUCTOR

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

**AO3413,** rev E

**Plastic Encapsulated Device**

**ALPHA & OMEGA Semiconductor, Inc**

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

THIS AOS product reliability report summarizes the qualification result for AO3413. 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 AO3413 passes AOS quality and reliability requirements. The released product will be categorized by the process family and be monitored on a quarterly basis for continuously improving the product quality.

## Table of Contents:

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

## I. Product Description:

The AO3413 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

- RoHS Compliant
- Halogen Free

Detailed information refers to datasheet.

## II. Die / Package Information:

	<b>AO3413</b>
<b>Process</b>	Standard sub-micron 20V P-Channel MOSFET
<b>Package Type</b>	SOT23
<b>Lead Frame</b>	Cu
<b>Die Attach</b>	Ag Epoxy
<b>Bonding Wire</b>	Cu & Au wire
<b>Mold Material</b>	Epoxy resin with silica filler
<b>MSL (moisture sensitive level)</b>	Level 1 based on J-STD-020

**Note** \* based on information provided by assembler and mold compound supplier

### III. Result of Reliability Stress for AO3413

Test Item	Test Condition	Time Point	Lot Attribution	Total Sample size	Number of Failures	Standard
MSL Precondition	168hr 85°C /85%RH +3 cycle reflow@260°C	-	39 lots	6402 pcs	0	JESD22-A113
HTGB	Temp = 150 °C, Vgs=100% of Vgsmax	168hrs 500 hrs 1000 hrs	6 lots 5 lots (Note A*)	924pcs  77pcs / lot	0	JESD22-A108
HTRB	Temp = 150 °C, Vds=80% of Vdsmax	168hrs 500 hrs 1000 hrs	6 lots 5 lots (Note A*)	924pcs  77pcs / lot	0	JESD22-A108
HAST	130 +/- 2°C, 85%RH, 33.3 psi, Vgs = 100% of Vgs max	100 hrs	24 lots  (Note A*)	1320 pcs  55 pcs / lot	0	JESD22-A110
Pressure Pot	121°C, 29.7psi, RH=100%	96 hrs	27 lots  (Note A*)	2079 pcs  77 pcs / lot	0	JESD22-A102
Temperature Cycle	-65°C to 150°C, air to air	250 / 500 cycles	39 lots  (Note A*)	3003 pcs  77 pcs / lot	0	JESD22-A104

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

### IV. Reliability Evaluation

**FIT rate (per billion): 3**

**MTTF = 39656 years**

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AO3413). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

$$\begin{aligned} \text{Failure Rate} &= \text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] \\ &= 1.83 \times 10^9 / [2 \times (12 \times 77 \times 500 + 10 \times 77 \times 1000) \times 258] = 3 \\ \text{MTTF} &= 10^9 / \text{FIT} = 3.47 \times 10^8 \text{ hrs} = 39656 \text{ years} \end{aligned}$$

**Chi²** = Chi Squared Distribution, determined by the number of failures and confidence interval

**N** = Total Number of units from HTRB and HTGB tests

**H** = Duration of HTRB/HTGB 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	130 deg C	150 deg C
<b>Af</b>	<b>258</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