



AOS Semiconductor Product Reliability Report

AO7413, rev B

Plastic Encapsulated Device

ALPHA & OMEGA Semiconductor, Inc

www.aosmd.com

This AOS product reliability report summarizes the qualification result for AO7413. 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 AO7413 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.

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I. Product Description:

The AO7413 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge, and operation with gate voltages as low as 1.8V, in the small SC70 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters. It is ESD protected to 2KV HBM.

- RoHS Compliant
- Halogen Free

Detailed information refers to datasheet.

II. Die / Package Information:

| | AO7413 |
|---------------------------------------|--|
| Process | Standard sub-micron Low voltage P channel |
| Package Type | SC70 |
| Lead Frame | Copper |
| Die Attach | Ag epoxy |
| Bonding Wire | Au wire |
| Mold Material | Epoxy resin with silica filler |
| MSL (moisture sensitive level) | Level 1 based on J-STD-020 |

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

III. Result of Reliability Stress for AO7413

| 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 | - | 4 lots | 605pcs | 0 | JESD22-A113 |
| HTGB | Temp = 150 °c, Vgs=100% of Vgsmax | 168hrs 500 hrs 1000 hrs | 3 lots | 231pcs 77pcs / lot | 0 | JESD22-A108 |
| HTRB | Temp = 150 °c, Vds=80% of Vdsmax | 168hrs 500 hrs 1000 hrs | 3 lots | 231pcs 77pcs / lot | 0 | JESD22-A108 |
| HAST | 130 +/- 2°C, 85%RH, 33.3 psi, Vgs = 100% of Vgs max | 100 hrs | 4 lots (Note A*) | 220pcs 55 pcs / lot | 0 | JESD22-A110 |
| Pressure Pot | 121°C, 29.7psi, RH=100% | 96 hrs | 3 lots (Note A*) | 165pcs 55 pcs / lot | 0 | JESD22-A102 |
| Temperature Cycle | -65°C to 150°C, air to air | 250 / 500 cycles | 4 lots (Note A*) | 220pcs 55 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): 15
MTTF = 7435 years

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AO7413). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

Failure Rate = $\text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 1.83 \times 10^9 / [2 \times 3 \times 2 \times 77 \times 500 \times 258] = 15$
MTTF = $10^9 / \text{FIT} = 6.51 \times 10^7 \text{ hrs} = 7435 \text{ years}$

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

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 |
|----|------------|-----------|-----------|-----------|-------------|-------------|-----------|
| Af | 258 | 87 | 32 | 13 | 5.64 | 2.59 | 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 X 10⁻⁵eV / K