



AOS Semiconductor Product Reliability Report

AO4421, rev C

Plastic Encapsulated Device

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This AOS product reliability report summarizes the qualification result for AO4421. 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 AO4421 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 AO4421 combines advanced trench MOSFET -60V technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

- RoHS Compliant
- Halogen Free

Detailed information refers to datasheet.

II. Die / Package Information:

	AO4421
Process	Standard sub-micron Low voltage P channel
Package Type	SO8
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

III. Result of Reliability Stress for AO4421

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	-	33 lots	5929pcs	0	JESD22-A113
HTGB	Temp = 150 °c, Vgs=100% of Vgsmax	168hrs 500 hrs 1000 hrs	6 lots 4 lots (Note A*)	231pcs 77pcs / lot	0	JESD22-A108
HTRB	Temp = 150 °c, Vds=80% of Vdsmax	168hrs 500 hrs 1000 hrs	6 lots 4 lots (Note A*)	231pcs 77pcs / lot	0	JESD22-A108
HAST	130 +/- 2°C, 85%RH, 33.3 psi, Vgs = 80% of Vgsmax	96 hrs	20 lots (Note A*)	1540pcs 77 pcs / lot	0	JESD22-A110
Pressure Pot	121°C, 29.7psi, RH=100%	96 hrs	24lots (Note A*)	1848pcs 77 pcs / lot	0	JESD22-A102
Temperature Cycle	-65°C to 150°C, air to air	250 / 500 cycles	33 lots (Note A*)	2541pcs 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): 3.27
MTTF = 34906 years

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AO4421). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

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

$$= 1.83 \times 10^9 / [2 \times (2 \times 12 \times 77 \times 500 + 8 \times 77 \times 1000) \times 259] = 3.27$$

$$\text{MTTF} = 10^9 / \text{FIT} = 3.06 \times 10^8 \text{hrs} = 34906 \text{ years}$$

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] = **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	259	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