



AOS Semiconductor Product Reliability Report

AOTF409/L, rev B

Plastic Encapsulated Device

ALPHA & OMEGA Semiconductor, Inc

www.aosmd.com



This AOS product reliability report summarizes the qualification result for AOTF409/L. 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 AOTF409/L 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 AOTF409/L uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and low gate resistance. With the excellent thermal resistance of the TO220FL package, this device is well suited for high current load applications.

- RoHS Compliant
- AOTF409L is Halogen Free

Details refer to the datasheet.

II. Die / Package Information:

	AOTF409/L
Process	Standard sub-micron Low voltage P channel process
Package Type	TO220FL
Lead Frame	Bare Cu
Die Attach	Soft solder
Bonding	Al wire
Mold Material	Epoxy resin with silica filler
Moisture Level	Up to Level 1 *
Note	* based on info provided by assembler and mold compound supplier

III. Result of Reliability Stress for AOTF409/L

Test Item	Test Condition	Time Point	Lot Attribution	Total Sample size	Number of Failures	Reference Standard
MSL Precondition	168hr 85°c /85%RH +3 cycle reflow @250°c	-	11 lots	1815pcs	0	JESD22-A113
HTGB	Temp = 150°c , Vgs=100% of Vgsmax	168hrs 500 hrs 1000 hrs	2 lots 1 lot (Note A*)	231pcs 77 pcs / lot	0	JESD22-A108
HTRB	Temp = 150°c , Vds=80% of Vdsmax	168hrs 500 hrs 1000 hrs	2 lots 1 lot (Note A*)	231pcs 77 pcs / lot	0	JESD22-A108
HAST	130 +/- 2°c , 85%RH, 33.3 psi, Vgs = 100% of Vgs max	100 hrs	5 lots (Note A*)	275pcs 55 pcs / lot	0	JESD22-A110
Pressure Pot	121°c , 29.7psi, RH=100%	96 hrs	11 lots (Note A*)	847pcs 77 pcs / lot	0	JESD22-A102
Temperature Cycle	-65°c to 150°c , air to air,	250 / 500 cycles	9 lots (Note A*)	693pcs 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): 12

MTTF = 9914 years

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AOTF409/L). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

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

$$= 1.83 \times 10^9 / [2 \times (2 \times 2 \times 77 \times 500 + 2 \times 77 \times 1000) \times 258] = 12$$

$$\text{MTTF} = 10^9 / \text{FIT} = 8.68 \times 10^7 \text{ hrs} = 9914 \text{ years}$$

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**] = $\text{Exp} [E_a / k (1/T_j \text{ u} - 1/T_j \text{ s})]$

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