

AOS Semiconductor

Product Reliability Report

AO4498EL, rev A

Plastic Encapsulated Device

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This AOS product reliability report summarizes the qualification result for AO4498EL. 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 AO4498EL 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 AO4498EL combines advanced trench MOSFET 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

-AO4498EL is Halogen Free

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted			
Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	$T_A=25^\circ\text{C}$	18
		$T_A=70^\circ\text{C}$	14
Pulsed Drain Current ^C	I_{DM}	120	A
Power Dissipation ^B	P_D	$T_A=25^\circ\text{C}$	3.1
		$T_A=70^\circ\text{C}$	2
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics				
Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
$t \leq 10\text{s}$				
Maximum Junction-to-Ambient ^{A D}	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$
Steady-State				
Maximum Junction-to-Lead				

II. Die / Package Information:

	AO4498EL
Process	Standard sub-micron Low voltage N channel
Package Type	8 lead SOIC
Lead Frame	Cu, S/pad, and Ag spot
Die Attach	Ag epoxy
Bond wire	S: Cu 2mils; G: Au 1.3mils
Mold Material	Epoxy resin with silica filler
Flammability Rating	UL-94 V-0
Backside Metallization	Ti / Ni / Ag
Moisture Level	Up to Level 1

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

III. Result of Reliability Stress for AO4498EL

Test Item	Test Condition	Time Point	Lot Attribution	Total Sample size	Number of Failures
Solder Reflow Precondition	168hr 85°C /85%RH +3 cycle reflow @260°C	-	29 lots	3575pcs	0
HTGB	Temp = 150 °c, Vgs=100% of Vgsmax	168hrs 500 hrs 1000 hrs	1 lot (Note A*)	82pcs 77+5 pcs / lot	0
HTRB	Temp = 150 °c, Vds=80% of Vdsmax	168hrs 500 hrs 1000 hrs	1 lot (Note A*)	82pcs 77+5 pcs / lot	0
HAST	130 +/- 2°C, 85%RH, 33.3 psi, Vgs = 80% of Vgs max	100 hrs	16 lots (Note B**)	880pcs 50+5 pcs / lot	0
Pressure Pot	121°C, 29.7psi, RH=100%	96 hrs	20 lots (Note B**)	1100pcs 50+5 pcs / lot	0
Temperature Cycle	-65°C to 150°C, air to air	250 / 500 cycles	29 lots (Note B**)	1595pcs 50+5 pcs / lot	0

III. Result of Reliability Stress for AO4498EL

Continues

DPA	Internal Vision Cross-section X-ray	NA	5 5 5	5 5 5	0
CSAM		NA	5	5	0
Bond Integrity	Room Temp 150°C bake 150°C bake	0hr 250hr 500hr	40 40 40	40 wires 40 wires 40 wires	0
Solderability	245°C	5 sec	15	15 leads	0

Note A: The HTGB and HTRB reliability data presents total of available AO4498EL burn-in data up to the published date.

Note B: The pressure pot, temperature cycle and HAST reliability data for AO4498EL comes from the AOS generic package qualification data.

IV. Reliability Evaluation

FIT rate (per billion): 43

MTTF = 2639 years

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AO4498EL). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

$$\text{Failure Rate} = \text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 1.83 \times 10^9 / [2 \times 164 \times 500 \times 258] = 43$$

$$\text{MTTF} = 10^9 / \text{FIT} = 2.31 \times 10^7 \text{hrs} = 2639 \text{ years}$$

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	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