



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

**AO4850/AO4850L, rev A**

**Plastic Encapsulated Device**

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This AOS product reliability report summarizes the qualification result for AO4850. 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 AO4850 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 AO4850 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. The two MOSFETs may be used in H-bridge, Inverters and other applications.

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted					
Parameter	Symbol	Maximum		Units	
		10 Sec	Steady State		
Drain-Source Voltage	$V_{DS}$	75		V	
Gate-Source Voltage	$V_{GS}$	$\pm 25$		V	
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ\text{C}$	$I_D$	3.1	2.3	A
	$T_A=70^\circ\text{C}$		2.4	1.8	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	15			
Power Dissipation	$T_A=25^\circ\text{C}$	$P_D$	2	1.1	W
	$T_A=70^\circ\text{C}$		1.3	0.7	
Avalanche Current <sup>B</sup>	$I_{AR}$	10		A	
Repetitive avalanche energy 0.3mH <sup>B</sup>	$E_{AR}$	15		mJ	
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 <sup>A</sup> $t \leq 10\text{s}$	$R_{\theta JA}$	50	62.5	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup> Steady-State		82	110	$^\circ\text{C/W}$
Maximum Junction-to-Lead <sup>C</sup> Steady-State	$R_{\theta JL}$	41	50	$^\circ\text{C/W}$

**II. Die / Package Information:**
**AO4850**
**AO4850L (Green Compound)**

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

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

**III. Result of Reliability Stress for AO4850 (Standard) & AO4850L (Green)**

Test Item	Test Condition	Time Point	Lot Attribution	Total Sample size	Number of Failures
Solder Reflow Precondition	Standard: 1hr PCT+3 cycle reflow@260°C Green: 168hr 85°C /85%RH +3 cycle reflow@260°C	-	Standard: 83 lots Green: 29 lots	17380 pcs	0
HTGB	Temp = 150°C, Vgs=100% of Vgsmax	168 hrs 500 hrs 1000 hrs	1 lot  (Note A*)	82 pcs  77+5 pcs / lot	0
HTRB	Temp = 150°C, Vds=80% of Vdsmax	168 hrs 500 hrs 1000 hrs	1 lot  (Note A*)	82 pcs  77+5 pcs / lot	0
HAST	130 +/- 2°C, 85%RH, 33.3 psi, Vgs = 80% of Vgs max	100 hrs	Standard: 81 lots Green: 16 lots  (Note B**)	5335 pcs  50+5 pcs / lot	0
Pressure Pot	121°C, 29.7psi, RH=100%	96 hrs	Standard: 83 lots Green: 20 lots  (Note B**)	5665 pcs  50+5 pcs / lot	0
Temperature Cycle	-65°C to 150°C, air to air	250 / 500 cycles	Standard: 87 lots Green: 29 lots  (Note B**)	6380 pcs  50+5 pcs / lot	0

### III. Result of Reliability Stress for AO4850 (Standard) & AO4850L (Green) Continues

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

**Note A:** The HTGB and HTRB reliability data presents total of available AO4850 and AO4850L burn-in data up to the published date.

**Note B:** The pressure pot, temperature cycle and HAST reliability data for AO4850 and AO4850L comes from the AOS generic package qualification data.

### IV. Reliability Evaluation

**FIT rate (per billion): 128**

**MTTF = 887 years**

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AO4850). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

**Failure Rate** =  $\text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 1.83 \times 10^9 / [2 \times 164 \times 168 \times 258] = 128$

**MTTF** =  $10^9 / \text{FIT} = 7.77 \times 10^6 \text{hrs} = 887 \text{ years}$

**Chi<sup>2</sup>** = 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:**

	<b>55 deg C</b>	<b>70 deg C</b>	<b>85 deg C</b>	<b>100 deg C</b>	<b>115 deg C</b>	<b>130 deg C</b>	<b>150 deg C</b>
<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,  $8.617164 \times 10^{-5} \text{eV} / \text{K}$