



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

**AOI206**, rev A

**Plastic Encapsulated Device**

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This AOS product reliability report summarizes the qualification result for AOI206. 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 AOI206 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 AOI206 uses trench MOSFET technology that is uniquely optimized to provide the most efficient high frequency switching performance. Power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Cr_{SS}$ . In addition, switching behavior is well controlled with a "Schottky style" soft recovery body diode.

- RoHS Compliant
- 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	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>c</sup>	$I_D$	$T_C=25^\circ\text{C}$	54
		$T_C=100^\circ\text{C}$	42
Pulsed Drain Current <sup>c</sup>	$I_{DM}$	130	A
Continuous Drain Current	$I_{DSM}$	$T_A=25^\circ\text{C}$	16
		$T_A=70^\circ\text{C}$	13
Avalanche Current <sup>c</sup>	$I_{AS}, I_{AR}$	30	A
Avalanche energy $L=0.1\text{mH}$ <sup>c</sup>	$E_{AS}, E_{AR}$	45	mJ
Power Dissipation <sup>b</sup>	$P_D$	$T_C=25^\circ\text{C}$	50
		$T_C=100^\circ\text{C}$	25
Power Dissipation <sup>a</sup>	$P_{DSM}$	$T_A=25^\circ\text{C}$	2.5
		$T_A=70^\circ\text{C}$	1.6
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ\text{C}$

Thermal Characteristics					
Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$t \leq 10\text{s}$	$R_{\theta JA}$	15	20	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient <sup>A,D</sup>	Steady-State		41	50	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	2.1	3	$^\circ\text{C}/\text{W}$



## II. Die / Package Information:

<b>Process</b>	<b>AOI206</b> Standard sub-micron Low voltage N channel process
<b>Package Type</b>	3 leads TO251A
<b>Lead Frame</b>	Bare Cu
<b>Die Attach</b>	Soft solder
<b>Bond wire</b>	G: Au 2mils, S: Al 10mils
<b>Mold Material</b>	Soft solder
<b>Flammability Rating</b>	UL-94 V-0
<b>Backside Metallization</b>	Ti / Ni / Ag
<b>Moisture Level</b>	Up to Level 1 *

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

## III. Result of Reliability Stress for AOI206

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	-	3 lots	495pcs	0
HTGB	Temp = 150°C , Vgs=100% of Vgsmax	168hrs 500 hrs 1000 hrs	1 lot  3 lots  (Note A*)	308pcs   77 pcs / lot	0
HTRB	Temp = 150°C , Vds=80% of Vdsmax	168hrs 500 hrs 1000 hrs	1 lot  3 lots  (Note A*)	308pcs   77 pcs / lot	0
HAST	130 +/- 2°C , 85%RH, 33.3 psi, Vgs = 80% of Vgs max	100 hrs	3 lots  (Note B**)	165pcs  50+5 pcs / lot	0
Pressure Pot	121°C , 29.7psi, RH=100%	96 hrs	3 lots  (Note B**)	165pcs  50+5 pcs / lot	0
Temperature Cycle	-65°C to 150°C , air to air	250 / 500 cycles	3 lots  (Note B**)	165pcs  50+5 pcs / lot	0

### III. Result of Reliability Stress for AOI206 (Standard) 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 AOI206 burn-in data up to the published date.

**Note B:** The pressure pot, temperature cycle, HAST and HTS reliability data for AOI206 comes from the AOS generic package qualification data.

### IV. Reliability Evaluation

**FIT rate (per billion): 7**  
**MTTF = 15704 years**

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AOI206). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

$$\text{Failure Rate} = \text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 1.83 \times 10^9 / [2 \times (2 \times 77 \times 168 + 3 \times 2 \times 77 \times 1000) \times 258] = 7$$

$$\text{MTTF} = 10^9 / \text{FIT} = 1.38 \times 10^8 \text{hrs} = 15704 \text{ years}$$

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

**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
<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 X 10<sup>-5</sup>eV / K