AOS Semiconductor
Product Reliability Report

AOI452A, rev A

Plastic Encapsulated Device

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This AOS product reliability report summarizes the qualification result for AOI452A. 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 AOI452A 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 AOI452A is fabricated with SDMOS™ trench technology that combines excellent $R_{DS(ON)}$ with low gate charge.The result is outstanding efficiency with controlled switching behavior. This universal technology is well suited for PWM, load switching and general purpose applications.

- RoHS Compliant
- Halogen Free

Absolute Maximum Ratings T_A=25°C unless otherwise noted				
Parameter		**Symbol**	**Maximum**	**Units**
Drain-Source Voltage		V_{DS}	25	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [G]	T_C=25°C	I_D	55	A
	T_C=100°C		43	
Pulsed Drain Current [C]		I_{DM}	120	
Continuous Drain Current	T_A=25°C	I_{DSM}	16	A
	T_A=70°C		13	
Avalanche Current [C]		I_{AR}	27	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	36	mJ
Power Dissipation [B]	T_C=25°C	P_D	50	W
	T_C=100°C		25	
Power Dissipation [A]	T_A=25°C	P_{DSM}	3.2	W
	T_A=70°C		2.2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	14.2	17	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		39	47	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	2.5	3	°C/W

II. Die / Package Information:

	AOI452A
Process	Standard sub-micron Low voltage N channel process
Package Type	3 leads TO251A
Lead Frame	Bare Cu
Die Attach	Soft solder
Bond wire	G: Au 1.3mils, S: Al 12mils
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 info provided by assembler and mold compound supplier

III. Result of Reliability Stress for AOI452A

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 (Note A*)**	**77pcs 77 pcs / lot**	**0**
HTRB	**Temp = 150°c , Vds=80% of Vdsmax**	**168hrs 500 hrs 1000 hrs**	**1 lot (Note A*)**	**77pcs 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 55 pcs / lot**	**0**
Pressure Pot	**121°c , 29.7psi, RH=100%**	**96 hrs**	**3 lots (Note B**)**	**165pcs 55 pcs / lot**	**0**
Temperature Cycle	**-65°c to 150°c , air to air**	**250 / 500 cycles**	**3 lots (Note B**)**	**165pcs 55 pcs / lot**	**0**

III. Result of Reliability Stress for AOI452A (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 AOI452A burn-in data up to the published date.
Note B: The pressure pot, temperature cycle, HAST and HTS reliability data for AOI452A comes from the AOS generic package qualification data.

IV. Reliability Evaluation

FIT rate (per billion): 23
MTTF = 4957 years

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AOI452A). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

Failure Rate = $Chi^2 \times 10^9$ **/ [**2 (N) (H) (Af)**]** = 1.83×10^9 **/ [**2x 2x77x1000x258**]** = 23
MTTF = 10^9 / FIT =4.34×10^7hrs = 4957 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, 8.617164×10^{-5}eV / K