



AOS Semiconductor Product Reliability Report

AOP608/AOP608L, rev A

Plastic Encapsulated Device

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This AOS product reliability report summarizes the qualification result for AOP608. 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 AOP608 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 AOP608 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used in H-bridge, Inverters and other applications. Standard Product AOP608 is Pb-free (meets ROHS & Sony 259 specifications). AOP608L is a Green Product ordering option. AOP608 and AOP608L are electrically identical.

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted				
Parameter	Symbol	Max n-channel	Max p-channel	Units
Drain-Source Voltage	V_{DS}	40	-40	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	6.3	-5.5	A
	$T_A=70^\circ\text{C}$	5	-4.4	
Pulsed Drain Current ^B	I_{DM}	20	-20	
Power Dissipation	$T_A=25^\circ\text{C}$	2.5	2.5	W
	$T_A=70^\circ\text{C}$	1.6	1.6	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Thermal Characteristics: n-channel and p-channel						
Parameter		Symbol	Device	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10\text{s}$	$R_{\theta JA}$	n-ch	37	50	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		n-ch	74	90	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	n-ch	28	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	$t \leq 10\text{s}$	$R_{\theta JA}$	p-ch	35	50	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		p-ch	73	90	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	p-ch	32	40	$^\circ\text{C/W}$



II. Die / Package Information:

Process	AOP608 Standard sub-micron Low voltage N+P channel process
Package Type	8 leads PDIP8
Lead Frame	Cu, D/pad, Ag spot
Die Attach	Ag epoxy
Bond wire	2 mils Au
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 AOP608

Test Item	Test Condition	Time Point	Lot Attribution	Total Sample size	Number of Failures
Solder Reflow Precondition	Standard: 1hr PCT+3 cycle reflow @250c Green: 168hr 85 c /85RH +3 cycle reflow @250c	-	Standard: 14 lots Green: 4 lots	2860 pcs	0
HTGB	Temp = 150°c , Vgs=100% of Vgsmax	168hrs 500 hrs 1000 hrs	2 lots (Note A*)	154 pcs 77pcs / lot	0
HTRB	Temp = 150°c , Vds=80% of Vdsmax	168hrs 500 hrs 1000 hrs	2 lots (Note A*)	154 pcs 77pcs / lot	0
HAST	130 +/- 2°c , 85%RH, 33.3 psi, Vgs = 80% of Vgs max	100 hrs	Standard: 14 lots Green: 4 lots (Note B**)	990pcs 55 pcs / lot	0
Pressure Pot	121°c , 15+/-1 PSIG, RH=100%	96 hrs	Standard: 14 lots Green: 3 lots (Note B**)	935 pcs 55 pcs / lot	0
Temperature Cycle	-65°c to 150°c , air to air,	250 / 500 cycles	Standard: 14 lots Green: 3 lots (Note B**)	935 pcs 55 pcs / lot	0

III. Result of Reliability Stress for AOP608

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 burn-in data for AOP608 comes from the generic data up to the published date.

Note B: The pressure pot, temperature cycle and HAST reliability data for AOP608 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 (AOP608). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

$$\text{Failure Rate} = \text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 1.83 \times 10^9 / [2 \times 4 \times 77 \times 500 \times 258] = 23$$

$$\text{MTTF} = 10^9 / \text{FIT} = 4.34 \times 10^7 \text{ hrs} = 4957 \text{ years}$$

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)

$$\text{Acceleration Factor [Af]} = \text{Exp} [Ea / k (1/Tj u - 1/Tj s)]$$

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