



AOS Semiconductor Product Reliability Report

AOD5B65M1, rev A

Plastic Encapsulated Device

ALPHA & OMEGA Semiconductor, Inc

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This AOS product reliability report summarizes the qualification result for AOD5B65M1. 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 AOD5B65M1 passes AOS quality and reliability requirements. The released product will be categorized by the process family and be routine monitored for continuously improving the product quality.

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I. Product Description:

- Latest AlphaIGBT (α IGBT) technology
- 650V breakdown voltage
- Very fast and soft recovery freewheeling diode
- High efficient turn-on di/dt controllability
- Low $V_{CE(SAT)}$ enables high efficiencies
- Low turn-off switching loss and softness
- Very good EMI behavior
- High short-circuit ruggedness

Details refer to the datasheet.

II. Die / Package Information:

	AOD5B65M1
Process	Standard sub-micron 650V Alpha IGBT™ with Diode
Package Type	TO-252
Lead Frame	Bare Cu
Die Attach	Solder Paste
Bond	Al wire
Mold Material	Epoxy resin with silica filler
Moisture Level	Level 1

III. Reliability Stress Test Summary and Results

Test Item	Test Condition	Time Point	Total Sample Size	Number of Failures	Reference Standard
HTGB	Temp = 150°C , Vge=100% of Vgemax	168 / 500 / 1000 hours	924 pcs	0	JESD22-A108
HTRB	Temp = 150°C , Vce=80% of Vcemax	168 / 500 / 1000 hours	924 pcs	0	JESD22-A108
MSL Precondition	168hr 85°C / 85%RH + 3 cycle reflow @260°C (MSL 1)	-	5313 pcs	0	JESD22-A113
HAST	130°C , 85%RH, 33.3 psia, Vce = 80% of Vcemax up to 42V	96 hours	924 pcs	0	JESD22-A110
H3TRB	85°C , 85%RH, Vce = 80% of Vcemax up to 100V	1000 hours	924 pcs	0	JESD22-A101
Autoclave	121°C , 29.7psia, RH=100%	96 hours	924 pcs	0	JESD22-A102
Temperature Cycle	-65°C to 150°C , air to air,	1000 cycles	924 pcs	0	JESD22-A104
HTSL	Temp = 150°C	1000 hours	924 pcs	0	JESD22-A103
Power Cycling	Δ Tj = 100°C	15000 cycles	693 pcs	0	AEC Q101

Note: The reliability data presents total of available generic data up to the published date.

IV. Reliability Evaluation

FIT rate (per billion): 1.91

MTTF = 59839 years

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

Failure Rate = $\text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 1.91$

MTTF = $10^9 / \text{FIT} = 59839$ years

Chi² = Chi Squared Distribution, determined by the number of failures and confidence interval

N = Total Number of units from burn-in tests

H = Duration of burn-in 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:

	55 deg C	70 deg C	85 deg C	100 deg C	115 deg C	130 deg C	150 deg C
Af	259	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, $8.617164 \times 10^{-5} \text{eV} / \text{K}$