



AOS Semiconductor Product Reliability Report

AOTF7N60FD, rev A

Plastic Encapsulated Device

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This AOS product reliability report summarizes the qualification result for AOTF7N60FD. 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 AOTF7N60FD 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 AOTF7N60FD has been fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications. By providing low $R_{DS(on)}$, C_{iss} and C_{rss} along with guaranteed avalanche capability this part can be adopted quickly into new and existing offline power supply designs.

Details refer to the datasheet.

II. Die / Package Information:

	AOTF7N60FD
Process	Standard sub-micron 600V, 7A N-Channel MOSFET with Fast Recovery Diode
Package Type	TO220F
Lead Frame	Bare Cu
Die Attach	Soft solder
Bonding	Al wire
Mold Material	Epoxy resin with silica filler
Moisture Level	Up to Level 1 *
Note * based on info provided by assembler and mold compound supplier	

III. Result of Reliability Stress for AOTF7N60FD

Test Item	Test Condition	Time Point	Lot Attribution	Total Sample size	Number of Failures	Reference Standard
MSL Precondition	168hr 85°C /85%RH +3 cycle reflow @260°C	-	12 lots	2112pcs	0	JESD22-A113
HTGB	Temp = 150°C , Vgs=100% of Vgsmax	168hrs 500 hrs 1000 hrs	2 lots 3 lots 3 lots (Note A*)	539pcs 77 pcs / lot	0	JESD22-A108
HTRB	Temp = 150°C , Vds=80% of Vdsmax	168hrs 500 hrs 1000 hrs	2 lots 3 lots 3 lots (Note A*)	539pcs 77 pcs / lot	0	JESD22-A108
HAST	130 , 85%RH, 33.3 psi, Vgs = 100% of Vgs max	96 hrs	9 lots (Note A*)	495pcs 55 pcs / lot	0	JESD22-A110
Pressure Pot	121°C , 29.7psi, RH=100%	96 hrs	9 lots (Note A*)	693pcs 77 pcs / lot	0	JESD22-A102
Temperature Cycle	-65°C to 150°C , air to air,	250 / 500 cycles	12 lots (Note A*)	924pcs 77 pcs / lot	0	JESD22-A104

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

IV. Reliability Evaluation

FIT rate (per billion): 4.73

MTTF = 23972 years

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AOTF7N60FD). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

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

$$= 1.83 \times 10^9 / [2 \times (4 \times 77 \times 168 + 6 \times 77 \times 500 + 6 \times 77 \times 1000) \times 258] = 4.73$$

$$\text{MTTF} = 10^9 / \text{FIT} = 2.10 \times 10^8 \text{ hrs} = 23972 \text{ years}$$

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)

Acceleration Factor [**Af**] = $\text{Exp} [E_a / k (1/T_j - 1/T_u)]$

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