AOS Semiconductor
Product Qualification Report

Qualifying HHNEC as the wafer source for

AO3413(L), AO3415(L), AON4421(L), rev A

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This AOS product qualification report summarizes the qualification result for additional wafer source (HHNEC) in AO3413(L), AO3415(L) & AON4421(L). 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 the new wafer source passes AOS quality and reliability requirements.

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I. Device qualification information

1) Purpose of the qualification:
   To qualify HHNEC wafers for AO3413(L), AO3415(L) & AON4421(L)

2) Qualification Lot Information:

Qual Vehicle	Marking (Lot #)	Device	Reliability Item	
			HTGB/HTRB 168hrs	HTGB/HTRB 1000hrs
AON6403	BA011	BPA11	Pass	Pass
AON6403	BA013	BPA11	Pass	Pass

AON6403	BA015	BPA11	Pass	Pass
AO3415A	AFV03	BP671	Pass	
AO3435	B5V04	BP791	Pass	
AON4421	BA001	BPA51	Pass	

Note:

1) Device BP671 is used in product AO3415(L). Device BP791 is used in product AO3413(L). Device BPA51 is used in product AON4421(L)
2) BP671 / BP791 / BPA51 belongs to the same generic process family of BPA11
3) The wafer process family is qualified by device BPA11 with 3 lot 1000hrs HTGB/HTRB
4) 168hrs HTGB/HTRB is used to verify the mask of derivative device BP671, BP791 and BPA51, respectively.

II. Result of Reliability Stress

Test Item	Test Condition	Time Point	Lot Attribution	Total Sample size	Number of Failures	Reference Standard
HTGB	**Temp = 150°c , Vgs=100% of Vgsmax**	**168hrs 500 hrs 1000 hrs**	**1 lot 3 lots**	**308pcs 77 pcs / lot**	**0**	**JESD22-A108**
HTRB	**Temp = 150°c , Vds=80% of Vdsmax**	**168hrs 500 hrs 1000 hrs**	**1 lot 3 lots**	**308pcs 77 pcs / lot**	**0**	**JESD22-A108**

III. 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. 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 (2x77x168+6x77x1000) x258**] = 7**
MTTF = 10^9 / FIT = 1.38×10^8hrs = 15704 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