

Test Item	Test Condition	Test Time
PCT	121 , 100%R.H., 2.0atm	168Hrs

3.3.2.5. Highly-Accelerated Temperature and Humidity Stress Test

The highly-accelerated temperature and humidity stress test is performed for the purpose of evaluating the reliability of nonhermetic packaged solid-state device in an environment with high humidity. It employs severe condition of temperature, humidity, and bias that accelerate the penetration of moisture through the external protective material (encapsulant or seal) or along the interface between the external protective material and the metallic conductor that pass through it. The stress conditions of the HAST are 130 , 85% relativity humidity, 2.3atm pressure, and 3.6V maximum operating voltage. Samples of surface mount devices are subjected to preconditioning and a final electrical test prior to the highly-accelerated temperature and humidity stress test.

Test Item	Test Condition	Test Time
HAST	130 , 85%R.H., 2.3atm, 3.6V	96Hrs

3.3.2.6. Steady State Temperature and Humidity Life Test

The temperature and humidity test is an environmental test designed to measure the corrosion and moisture resistance of plastic-encapsulated circuits. The stress conditions of the TH are 85 and 85% relativity humidity. Samples of surface mount devices are subjected to preconditioning and a final electrical test prior to the steady state temperature and humidity life test.

Test Item	Test Condition	Test Time
TH	85 , 85%R.H.	1000Hrs

3.3.3. Test Criteria and Result

Table 4 shows the test results and reference standard of environmental test. The test status and results of AS4C32M8SA-6TIN are also pre-sented in the table. All pass from these test results mean that Alliance's SDRAM products are much more durable in most of their service environment.

Test Item	Reference Standard	A/R Criteria	Failure/S.S.	Status	Failure Mode
Moisture Sensitivity	J-STD-020	0/1	0/304	PASS	N/A
HTST	JESD22-A103	0/1	0/76	PASS	N/A
TCT*	JESD22-A104	0/1	0/76	PASS	N/A
PCT*	JESD22-A102	0/1	0/76	PASS	N/A
HAST*	JESD22-A110	0/1	0/76	PASS	N/A
TH*	JESD22-A101	0/1	0/76	PASS	N/A

* Sampling from Moisture Sensitivity

Table 4. Environmental Test Criteria and Result

3.4. ESD Test

Electrical discharge into semiconductor product is one of the leading causes of device failure in the customer's manufacturing process. Alliance performs the ESD test to ensure that the performance of AS4C32M8SA-6TIN will not be degraded to an unacceptable level by exposure to a succession of electrostatic dis-charge. The test methods and test results are shown in Table 5.

Test Item	Test Method				Result (F/S.S)
	Reference Standard	Test Condition	Criteria	Sample	
H.B.M.	JESD22-A114	R=1.5K Ω , C=100pF	$\geq \pm 2KV$	3ea	0/3
M.M.	JESD22-A115	R=0K Ω , C=200pF	$\geq \pm 200V$	3ea	0/3
C.D.M.	JESD22-C101	Non-Socket Mode	$\geq \pm 1KV$	3ea	0/3

Table 5. ESD Test Condition and Result

3.5. Latch-Up Test

CMOS products can be prone to over-voltage exceeding the maximum device rating if the parasitic p-n-p-n SCR (Silicon-controlled rectifier) are improperly biased. When the SCR turns on, it draws excessive current and causes products being damaged by thermal runaway. The Table 6 shows the latch-up test method and the test result of no failure.

Test Item	Test Method			Result (F/S.S)
	Reference Standard	Test Condition & Criteria	Sample	
Latch-Up	JESD78	Vtr(+) 1.5 * Vcc Vtr(-) -0.5 * Vcc Itr(+) 100mA Itr(-) -100mA	6ea	0/6

Table 6. Latch-Up test Condition and Result

4. CONCLUSION

Reliability test is to ensure the ability of a product in order to perform a required function under specific conditions for a certain period of time. Through those tests, the devices of potential failure can be screened out before shipping to the customer. At the same time, the test results are fed back to process, design and other related departments for improving product quality and reliability.

According to the life time test data, *the short-term 12Hrs failure rate (= the normal operation 0-1 year) of AS4C32M8SA-6TIN is equal to 0 DPM at Ta=55°C and Vcc=3.3V with 60% confidence level AND the long-term 1000Hrs failure rate (= the normal operation 1-10 year) of AS4C32M8SA-6TIN is equal to 15 FIT at Ta=55°C and Vcc=3.3V with 60% confidence level.* The results of environmental test, ESD test and latch-up test also ensure that the AS4C32M8SA-6TIN is manufactured under a pre-cise control of quality work by Alliance and its subcontractors. ***Thus, this experi-ment based on the Alliance reliability test standard for above test items can all pass.***

With the extensive research and development activities and the cooperation of all departments, Alliance continuously sets and maintains higher standard of qual-ity and reliability to satisfy the future demand of its customers.