

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 AS4C32M16D3L-12BCN 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 AS4C32M16D3L-12BCN 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=1.5KΩ, C=100pF | ≥±2KV | 3ea | 0/3 |
| M.M. | JESD22-A115 | R=0KΩ, C=200pF | ≥±200V | 3ea | 0/3 |
| C.D.M. | JESD22-C101 | Non-Socket Mode | ≥±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 SCRs (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 AS4C32M16D3L-12BCN is equal to 0 DPM at Ta=55°C and Vcc=1.35V with 60% confidence level AND the long-term 1000Hrs failure rate (= the normal operation 1-10 year) of AS4C32M16D3L-12BCN is equal to 15 FIT at Ta=55°C and Vcc=1.35V with 60% confidence level.* The results of environmental test, ESD test and latch-up test also ensure that AS4C32M16D3L-12BCN is manufactured under a precise control of quality work by Alliance and its subcontractors. ***Thus, this experiment 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 quality and reliability to satisfy the future demand of its customers.