

INVESTIGATION OF RELIABILITY OF ALUMINUM-GOLD CONTACT IN INTEGRATED CIRCUITS

The reliability of the integrated circuit and the performance of its functions strongly depend on the quality of the contacts.

Widespread misconception that formation of wire chip connection is a simple process. This process is complex and requires a thorough understanding of the metallurgy, thermodynamics, and surface chemistry involved. To evaluate the impact of various factors on reliability, simplified models based on the theory of a multifactorial experiment are often used. Design of experiments and data analysis is an important part of reliability testing.

There are needs in effective formalized approach for risk assessment at HT application depends on factors which define bonding reliability risk assessment and degradation prediction of Al-Au intermetallic interface at HT application depending on different groups of factors: Time and Temperature of HTOL test (High temperature operating life); Kind of used Au wires (pure gold, and gold with palladium impurities); Outcome of bonding parameters settings; Kind of used Mold Compound (green or non-green mold compound) [1], [2]. Green mold compounds and substrates are materials that do not include bromine and antimony.

Bond Ball lift failure mode after high temperature stress is one of major and ambiguously interpreted failure mode. Reliability was analyzed using wire bonding pull test. The bond pull test is the most widely used technique for the evaluation and control of wire bond quality. This technique is also used for wire bonding process control and process optimization during assembly manufacturing. The bond pull test involves placing a hook under the wire and applying a normal upward force and the wire is pulled till it fails [3].

The purpose of the work is to construct polynomial models by means of method of multifactorial experiment, which make it possible to predict the behavior of the contact after the influence of the investigated factors.

Proposed approach for post HT stresses assessment of bonding reliability on the base of criticality of Bond Ball Lift Failure Mode category. Approach is based on statistically significant data gathered and analyzed during different products qualifications and research work.

[1] M.Blyzniuk, "Bond Ball Lift Failure Mode Category – Criteria for Post Stress Assessment of WBP Tests", 19th AEC Workshop Detroit, 2017.

[2] M.Blyzniuk, A.Devos, N.Furman, N.Simonne, Y.Vovk, "Post Stress Assessment of WBP Tests", 17th AEC Workshop Detroit, 2015.

[3] Caiyuan Wang, Ronglu Sun, "The Quality Test of Wire Bonding", Modern Applied Science, 2009.

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