How to test loops on different levels

Problem

While testing loops bonded on different levels it often occurs that standard test procedures fail. The steep angle at one side causes the pull hook to slide on either position or it may collide with the IC. So normally force application does not take place on optimal position where $\alpha \approx \beta$. Relating to Fig. 1 the forces inside the bond wires then have to be calculated as follows:

$$F_1 = F_{Mess} \cdot \sin(\alpha)$$
$$F_2 = F_{Mess} \cdot \sin(\beta)$$

With β being small compared to α only very little force will be applied at the (here assumed) weak spot and it often occurs that the system does not break at this point but tears off at any other position.

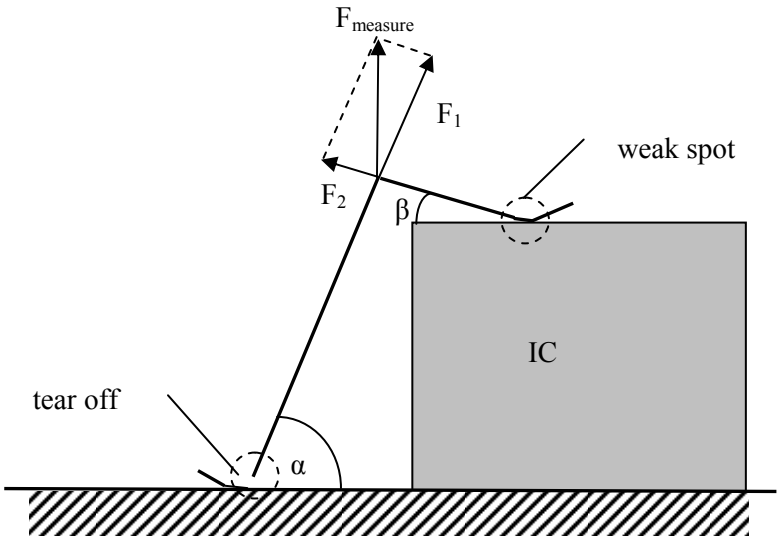

Fig. 1: forces on loops bonded on different levels

Alternative test method

One alternative test method may be to cut off the loop and to test each side of the loop individual. Doing this pull hooks cannot be used any more. Testing single attached wires micro tweezers have to be used.

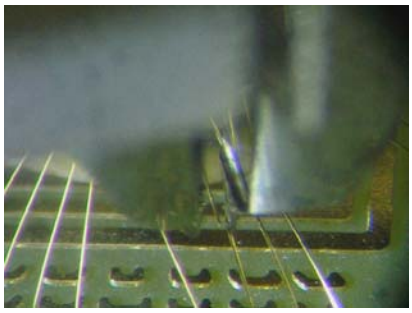

Fig. 2: cutting loops with thweezer

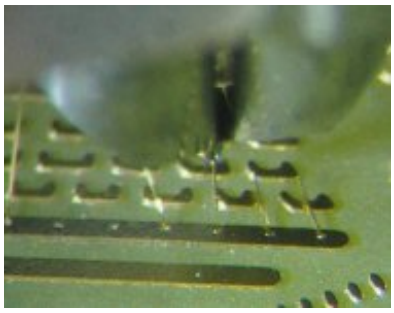

Fig. 3: pull test with thweezer

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Advanced features

After having cut the loop tweezer tests are offering advanced features. Clamping the wire the pull force can be applied in any direction so measuring variance due to unfavourable angles will be minimized.

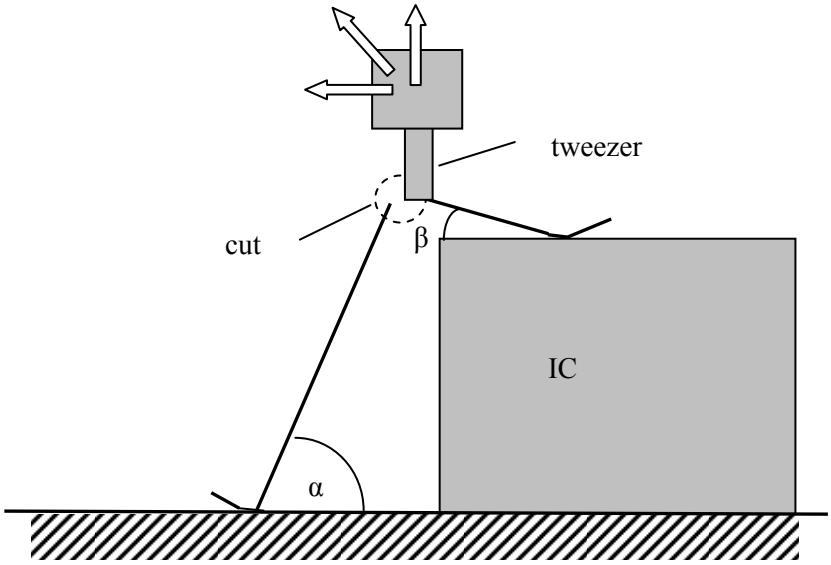

Fig. 4: tweezer test on open loops

Correction factor

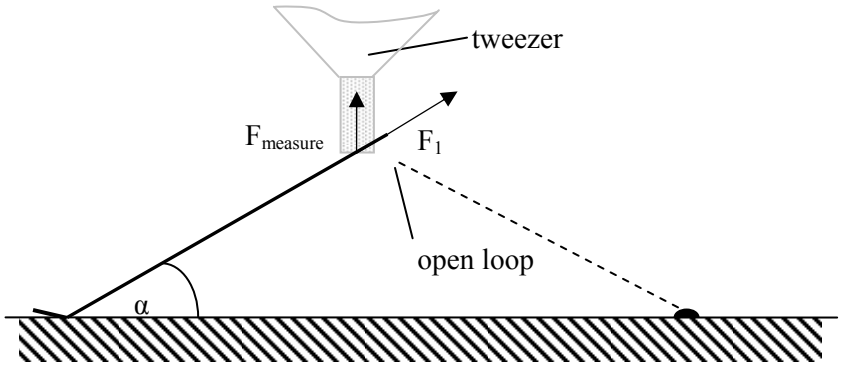

Fig. 5: forces using tweezer

Relating to Fig. 5 the resulting load at the wire has to be calculated as:

$$F_1 = F_{measure} \cdot 2\sin(\alpha)$$

thus giving a correction factor:

$$K_{Tweezer} = \frac{2}{\sin\alpha}.$$

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