



Conditions for cold ball pull tests (CBP)

Problem

Besides ball shear tests a greater demand on cold ball pull (CBP) tests without preparation work can be noticed. The CBP test is used to get additional information about quality issues by combining force measuring and optical inspection of the interconnection area.

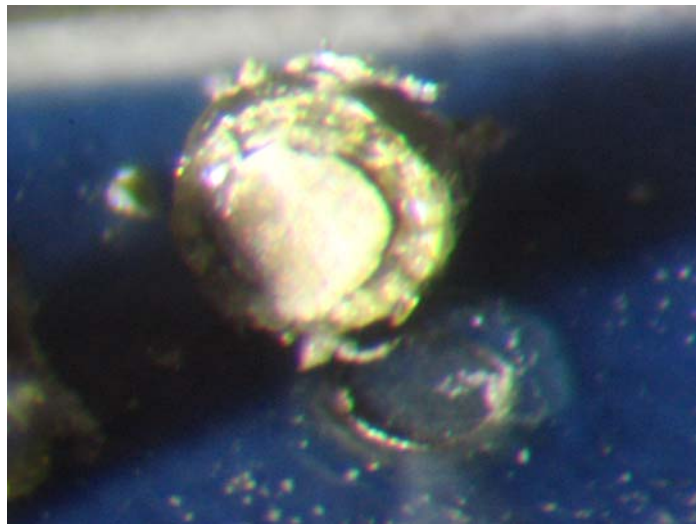


Fig. 1: interconnection area as a result of CBP test
(carrier AlMg3 ceramics)

Test method

Gassmann Engineering has developed special tweezers and tools for doing CBP tests on balls. Using new tweezer technologies and customized tools ball pull tests can be performed easily without preparation effort.

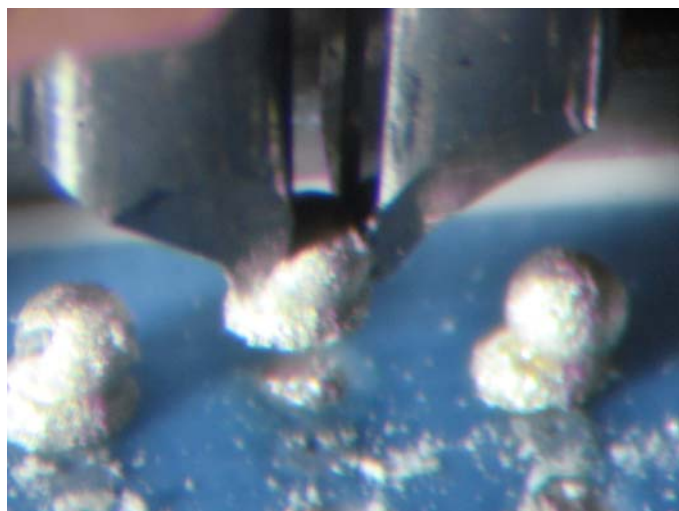


Fig. 2: pull test on solderballs

Gassmann Engineering

Basedowstr. 25
D-01237 Dresden
Germany
Phone +49 (0) 351 46335293
Fax +49 (0) 351 3100619
e-mail gassmann@ifte.de
web www.tweezer-test.com



Conditions for a successful test

For pulling off solderballs mechanically there must be enough volume to apply force on. Since the connection area must not be affected only a certain area may be used to give hold to the tools. Let's assume that there is a good adhesive bond on the joint solderball / carrier and that the joint can take at least the same amount of force per area as the ball itself. Then for tearing the ball off, the connection area A_{Neck} which has to be destroyed must be smaller than the gripping area A_{gripp} where the pull force is applied too.

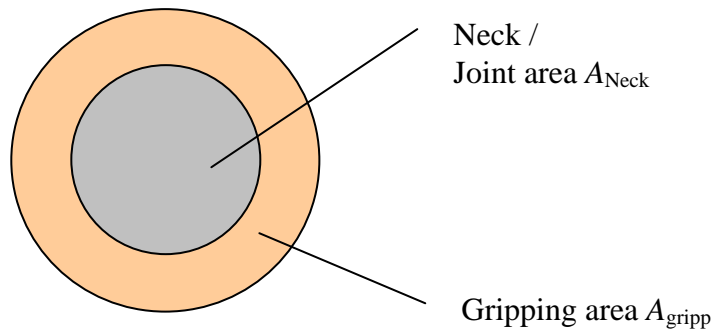


Fig. 3: Geometry of ball connection

Relating to Fig. 3 the conditions for a successful test can be calculated as follows:

$$\frac{\pi}{4}(D^2_{Ball} - D^2_{Neck}) \geq \frac{\pi}{4} D^2_{Neck}$$

$$D^2_{Ball} - D^2_{Neck} \geq D^2_{Neck}$$

$$D^2_{Ball} \geq 2 \cdot D^2_{Neck}$$

$$D_{Ball} \geq \sqrt{2} \cdot D_{Neck}$$

$$\frac{D_{Ball}}{D_{Neck}} \geq 1,41$$

Assuming that a good tool can use 90% of the gripping area the expressions above indicates that the joint diameter has to be 1,6 times smaller than the solderball diameter. This geometry relation is essential to apply enough force for tearing off the joint.

Gassmann Engineering

Basedowstr. 25
D-01237 Dresden
Germany
Phone +49 (0) 351 46335293
Fax +49 (0) 351 3100619
e-mail gassmann@ifte.de
web www.tweezer-test.com