



How to test bonds » Cold Bump Pull (CBP) » closing time, landing, alignment, optimizing, speed

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7. Setting up and doing a test

iv. Closing time

The jaws take time to close and the bump takes time to reform. Bumps of less than 100µm reform almost instantly, where as a large bump of 750µm can take up to 5 seconds. This is why when we were testing the first grips we waited for 5 seconds.

When you are testing your grip and alignment observe how long it takes for the jaws to stop moving. In the test method program there is a safe closing time delay ("Holdtime") to ensure the bumps will be fully reformed at the closing force selected.

v. Landing force and alignment height

When a test is started the Z axis drives the jaws down to touch the substrate and then to a programmable Touchdown force. This force depends on the application. It should be as low as possible but sufficient to ensure the jaws come into good contact with the substrate. When the bumps are very close to each other the landing force can help the jaws slide past the adjacent bumps. This is fine providing the bumps are not significantly damaged.

Typically "Touchdown" forces to get you started should be:

- Bumps up to 150µm about 10 grams
- Bumps up to 500µm about 30 grams
- Bumps above 500µm about 100 grams

Best results are obtained by trial and error but initially set the landing force as shown above.

Most CBP tests require the jaws to close in contact with the substrate. This gives the strongest grip. In the case of metal defined pads a "distance from surface" may be required to avoid damaging the bond when the bump is gripped and reformed.

Metal defined bumps often have low height and require a "distance from surface" resulting in a poor grip force. On the other hand the bond is not supported by the mask and so shear testing is often a better option.

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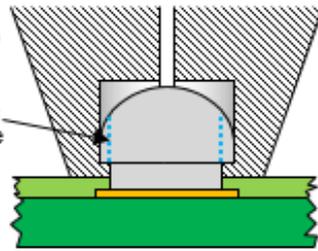
Bond testers

- Condor *Sigma*
- Condor *Sigma Lite*
- Condor *Sigma W12*
- Condor *150HF*

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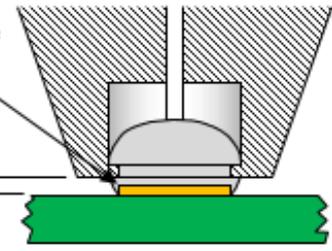


Reforming the ball as low as possible provides a maximum amount of solder above the grip edges for the maximum pull force possible



Mask defined bump

"distance from surface" reduces stresses here on the bond caused when the ball is reformed



Metal defined bump

Metal defined bumps often have low height and require a "distance from surface" resulting in a poor grip force. On the other hand the bond is not supported by the mask and so shear testing is often a better option.

vi. Optimizing the test

Do a few tests with your initial settings, recording the failure modes and test forces.

Most likely you will get extrusions but if you get bond failures lower the grip force until you do get an extrusion. Then increase the grip force a little until you just get all bond failures.

If you get extrusions, increase the closing force until you get either a bond failure or a ductile failure.

If you cannot get a bond failure, try different closing forces to find the one that gives the highest test force. The failure mode can then be extrusion or ductile. For balls above 100µm it will probably be a ductile failure mode. For balls below 100µm it is sometimes an extrusion.

If you are increasing the closing force, watch how long it takes for the bump to reform because you may need to increase the "Hold time".

You can now review all of the settings. It may seem complicated but the simple objective is to get bond failures (failure modes of interest) or the highest test force.

Warning: If you are increasing the closing force observe how the test force changes. If the test force starts to go down, there is no point increasing the closing force any further and you can break the jaws if you carry on increasing it.

vii. Test speed

Test speed will have very little effect in standard CBP. This is because the jaws are locked onto the sample by the grip and the axis has only the landing force distance to acceleration, so all tests are relatively slow. For bumps up to 300µm a test speed of 100µm/s is recommended. Above 300µm you can use 200µm/s to increase the number of tests per minute. At these speeds the axis can accelerate to the programmed speed in the landing force distance.

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