Product Name Application Note

Full Report available at **https://bit.ly/3nmuhIk**

Integrated Circuit Surface Measurement of Etched Characters and Warpage

Bruker alicona

Bruker Alicona is a leading global supplier of optical metrology solutions based on the principle of Focus Variation.

Focus Variation works on the basis of moving a focal plane over a surface and collecting robust 3D data which can then be used to measure geometric form and surface finish from a single optical sensor.

Measurement processes can be fully automated and provide GD&T measurement capabilities across all industrial & medical sectors.

The systems are in use in Industry, Industrial Research, Universities and production facilities globally.

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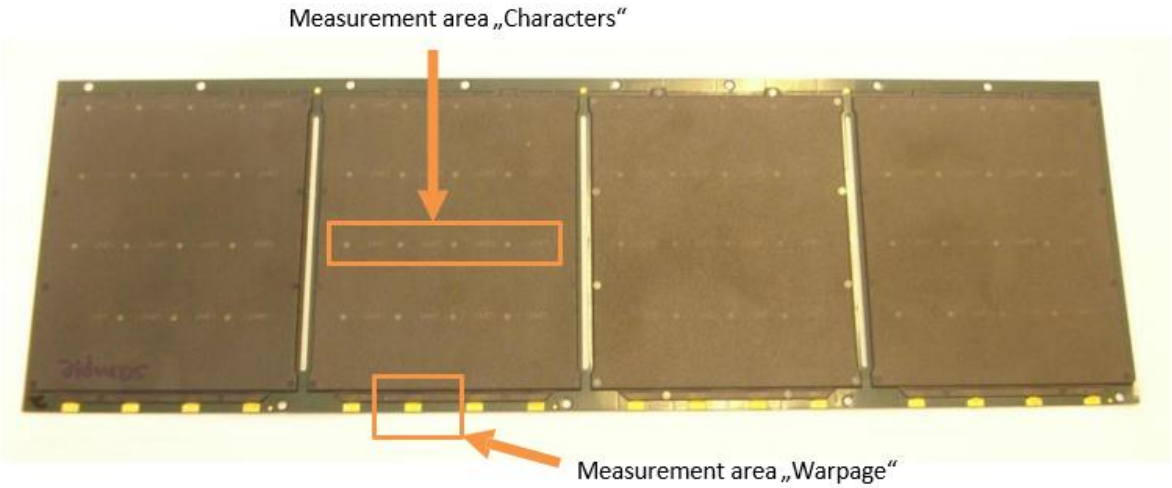
Introduction

In this issue, we summarise a measurement report that studies, using the Bruker Alicona SL measurement system, the 2D and 3D measurement of identification marks and warpage on an Integrated Circuit Strip. The full report can be seen at https://bit.ly/3nmuhIk.

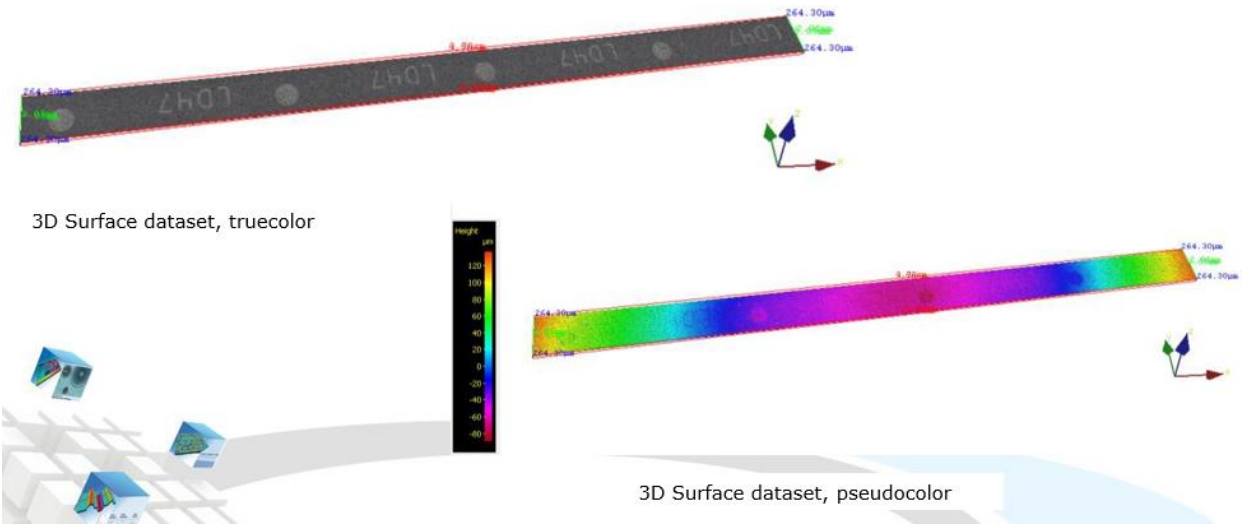
Measurement Task

Circuit boards and electronic components are marked with permanent, solder-resistant and machine-readable laser markings. This allows accurate identification and traceability of the component, this, in turn guarantees a flawless quality assurance process across the entire life cycle chain and the process. Typical marking ranges from complex 2D-data matrix codes to alphanumeric characters and customized contents. The task in this case is to measure these markings to ensure they conform to specification and would not be subject to breakthrough when back grinding and to measure warpage caused by the marking process. The sample measured is shown below with the measurement areas identified.

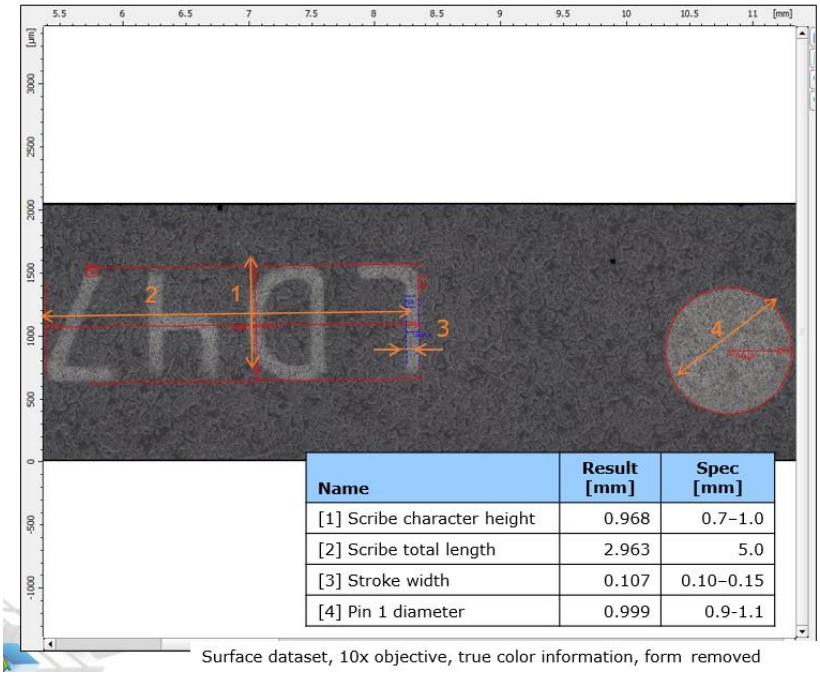


The system used to perform this measurement is the Bruker Alicona SL system, this is an optical 3D metrology system that allows the measurement of 3D profile, 2D dimensions and the surface finish with a single measurement. This, unlike tactile profile-based measurement allows the automatic measurement of 2Ddata and 3D topography data without the risk of damage to the surface caused by a stylus.

In use the sample can be simply placed on the motorised XY stage, or it can be placed in a customised holder if repeat or automatic measurements are required. A scan is made and is shown as either a true colour dataset or with pseudo colour related to height as shown below.



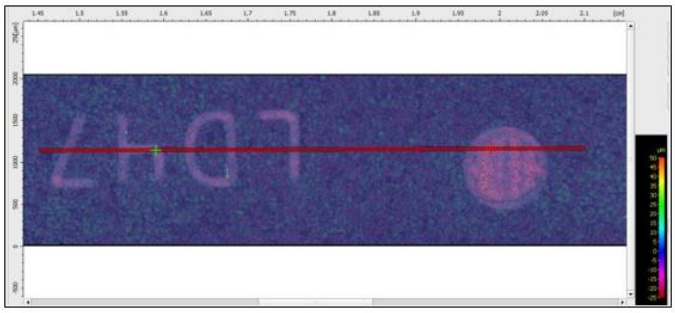
Using the built in 2D measurement module it is these possible to measure the external dimensions of the characters as shown below



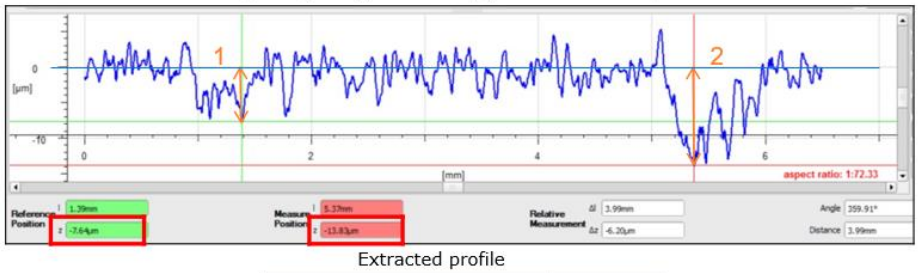
Name	Result [mm]	Spec [mm]
[1] Scribe character height	0.968	0.7–1.0
[2] Scribe total length	2.963	5.0
[3] Stroke width	0.107	0.10–0.15
[4] Pin 1 diameter	0.999	0.9-1.1

Surface dataset, 10x objective, true color information, form removed

Using the same data, the profile of the characters can be measured in 3D by extracting a profile line across the surface as shown below



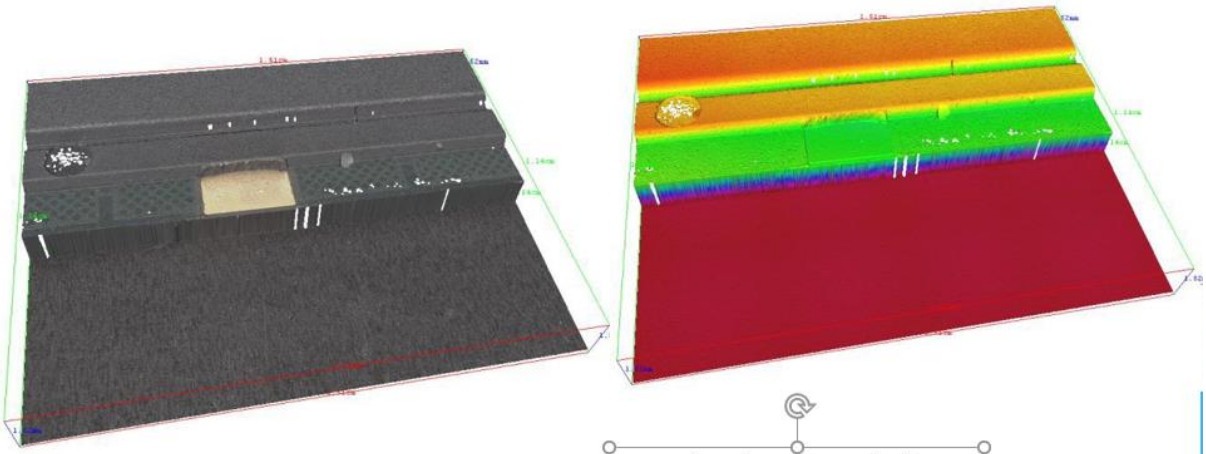
Profile path 1, real-/pseudocolor, profile width: 55.1µm



Extracted profile

Name	Result
[1] Scribe depth („4“)	7.6µm
[2] Scribe depth („Pin“)	13.8µm

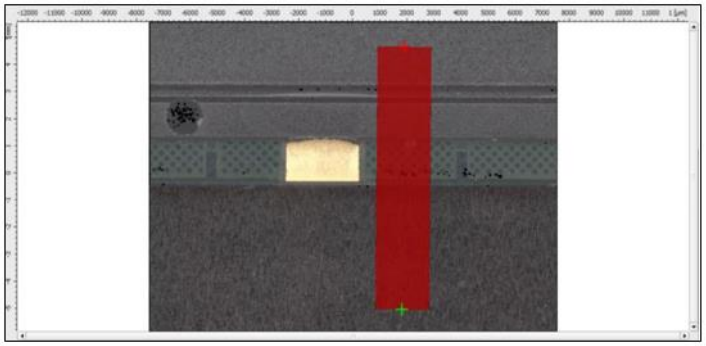
In a new scanned dataset, a user is then able to measure warpage, this is firstly displayed in both true colour and pseudo colour related to height.



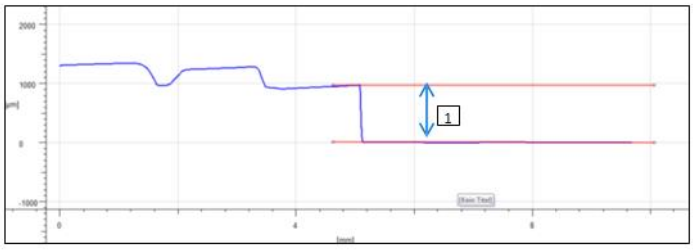
3D Surface dataset, truecolor

3D Surface dataset, pseudocolor

Using the profile measurement, the warpage can then be measured as shown below.



Profile path 1, realcolor, profile width: 1.99mm



Extracted profile

Name	Result
[1] Warpage	966.8µm

Summary

It can be seen that the measurement of features on electronic components is easily achieved using Optical Metrology.

This technique offers many advantages over other techniques that could be used, these are.

- Only one measurement system is required for all the required measurements.
- The measurements are visualised and stored in a database that can be readily retrieved in the event of product issues.
- There is no potential for surface damage that can be caused by stylus-based instruments.
- The instrument user does not require any knowledge of metrology to make the measurements.
- All measurements are fully traceable to international standards