

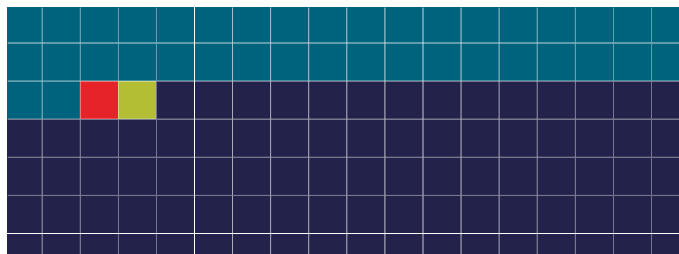
Automation for accurate and reliable quality control measurements

Kulicke & Soffa (NASDAQ: KLIC) is a leading provider of semiconductor packaging and electronic assembly solutions, supporting the global automotive, consumer, communications, computing, and industrial markets.

Introduction

Lithography is a crucial microfabrication technique used in the semiconductor and electronics industries. It involves coating a substrate with a light-sensitive material, applying a patterned mask, and exposing it to radiation or chemicals to yield a patterned coating on a surface. The importance of lithography becomes evident when considering that it accounts for 30% of the manufacturing costs of producing integrated circuits.

“At Kulicke & Soffa, we manufacture world-class projection steppers that need to comply with rigorous quality requirements”, Sylvain Misat says. “In our research and development (R&D) laboratory, we have chosen the Thermo Scientific™ Phenom XL™ desktop scanning electron microscope (SEM) as part of our process validation procedure. Apart from its ease of use and the ability to accommodate 100 mm x 100 mm samples, the Thermo Scientific Phenom XL has the fastest loading cycle for a desktop SEM in its class”.



Sylvain Misat, manager of photolithography applications, Kulicke & Soffa Liteq B.V.

Inspecting samples for quality control

“After a small-scale production run, we inspect samples from our customers to identify the optimal manufacturing conditions”, Misat continues. “To do this, samples are loaded into the microscope, after which critical dimension and sidewall thickness are meticulously measured. Critical dimension and sidewall thickness are parameters that provide information on the lithography process”.

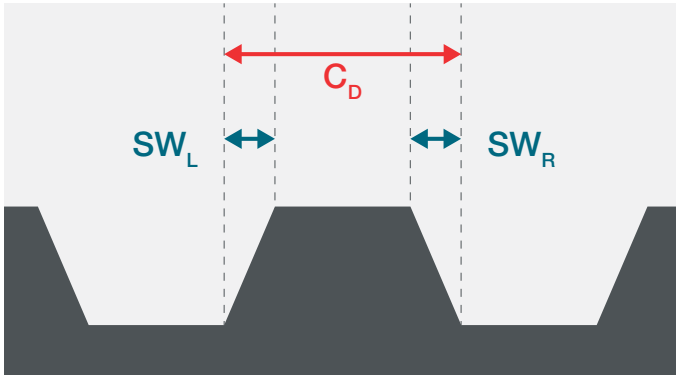


Figure 1 - Diagrammatic representation of critical dimension (CD) and sidewall thickness (SW_L and SW_R).

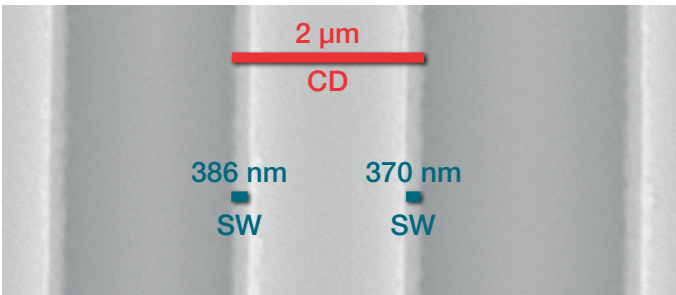


Figure 2 - SEM images can be used to measure critical dimension (CD) and sidewall thickness (SW).

“For a typical factory acceptance test, critical dimension and sidewall thickness must be measured approximately 85 times, which would take a user a full working day. Tasked with bi-weekly factory acceptance tests, we needed to improve the output and efficiency of our laboratory.”



“Phenom XL desktop SEM gave us better data that were far more stable and more reliable than our own.”



Sylvain Misat explains his workflow with Thermo Fisher Scientific.

Why a custom-made software application?

Thermo Scientific Phenom Process Automation (PPA) provides dedicated application engineers to help customers develop automated scripts, allowing the user in production or R&D to perform a fast, efficient, and reliable analysis.

“In consultation with Thermo Fisher Scientific’s software application team, we described our unique requirements to find a solution that increases our output. Subsequently, a software application was specifically designed for our samples. The application has enabled us to automatically measure critical dimension and sidewall thickness at pre-defined positions. Not only does this save time, but these automated measurements prevent user errors and potential measurement differences between users.”

The benefits of automation

For the application, the workflow involves loading the sample, and setting the coordinates of all the positions where measurements need to be taken. These coordinates are relative to the reference position which the user moves to after performing an alignment procedure. The diagram below highlights the workflow of the application (Figure 3):

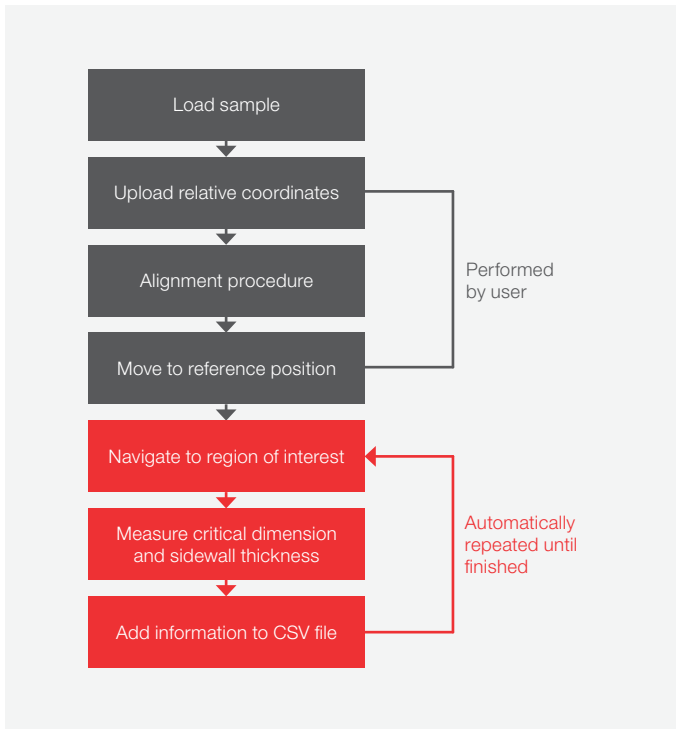


Figure 3 - Application workflow with the automated part of the process highlighted in red.

Whereas making accurate measurements manually require uninterrupted attention from the user for prolonged periods, the application takes these measurements automatically, requiring no further input from the user.

The application makes automatic measurements over a distance of 6 microns, which yields more reliable results than manual measurements, which are performed only at one position.

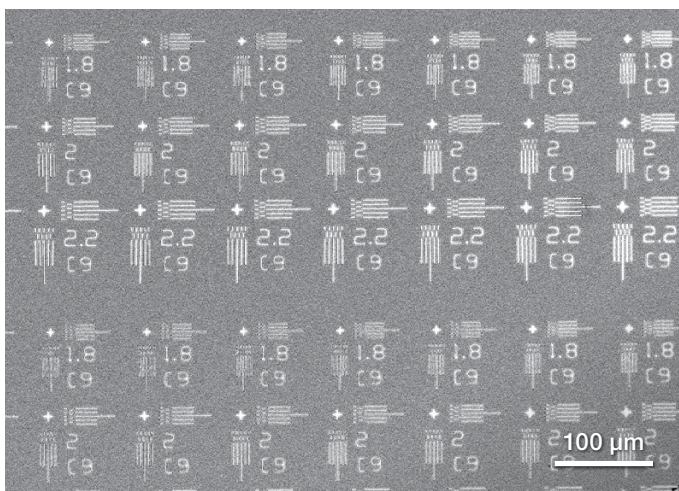


Figure 4 - Without an automated solution, an operator would literally spend days evaluating and measuring this sample.

During operation, the script displays all relevant measurements that are exported to a CSV file.

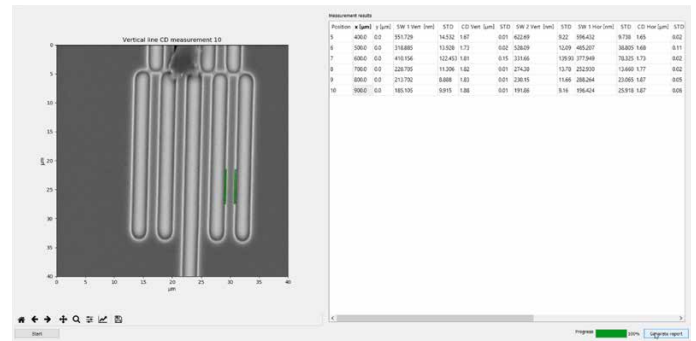


Figure 5 - Script UI, highlighting the area over which critical dimensions were measured (left), and tabulated results (right).

Conclusion

“With the help from Thermo Fisher Scientific™, our lab’s efficiency has been improved. Not only was a laborious manual task automated, requiring minimal user input, but the results are more reliable due to a decrease in operator error.”

Notes

Find out more at thermofisher.com/phenom-xl