



Applied Materials Centura® Sculpta® Patterning System

Animation Script

Applied Materials' pattern-shaping technology is a breakthrough innovation for the patterning engineer's toolkit. In this animation, we will show you how engineers can replace EUV double patterning steps with the Centura® Sculpta® patterning system to reduce the cost, complexity and environmental impact of leading-edge chipmaking.

Advanced chipmakers use EUV lithography to create more dense patterns than immersion lithography permits.

But even EUV has limits to how close together features such as these interconnect vias can be placed using a single EUV mask. Here, we depict the tightest spacing possible using a single EUV pass. The designer may want to reduce this spacing by around one half to optimize die area and cost.

Conventionally, such tight spacing requires EUV double patterning. Here is how it works.

First, patterning films are deposited on the wafer.

Then, an EUV lithography step exposes half of the pattern in the photoresist.

Next, a number of materials removal and process control steps are used to replicate the photoresist pattern in the patterning layers.

Finally, all of these steps are repeated to transfer the second half of the pattern to the patterning layers. It is critical to properly align the second part of the pattern with the first.

Applied's pattern-shaping technology allows this dense pattern to be fabricated with only one EUV lithography step. This eliminates double-patterning alignment errors and saves all of the time, energy, materials, water and cost associated with the second patterning sequence. Here is how it works.

First, one EUV step is used to expose round vias, within the spacing resolution limit of EUV.

Then, the wafer is moved to the Applied Centura Sculpta system for pattern shaping. The Sculpta system uses a unique, angled reactive ribbon beam to sculpt the patterning materials stack.

As the sidewalls are exposed to the beam, chemically reactive species and radicals precisely remove patterning material to enhance the shapes.

The wafer can be rotated in any direction to create desired shapes without any additional lithography.

In this via shaping example, the vias have been reshaped from round to elliptical, the tip-to-tip spacing has been reduced, and the risk of EUV double-patterning alignment errors has been eliminated.



This animation described the first of many potential applications made possible by the Applied Centura Sculpta system. Applied's pattern-shaping technology is a breakthrough innovation, adding new capabilities to the patterning engineer's toolkit. Sculpta reduces patterning cost and complexity, and lessens the environmental impact of advanced chipmaking.