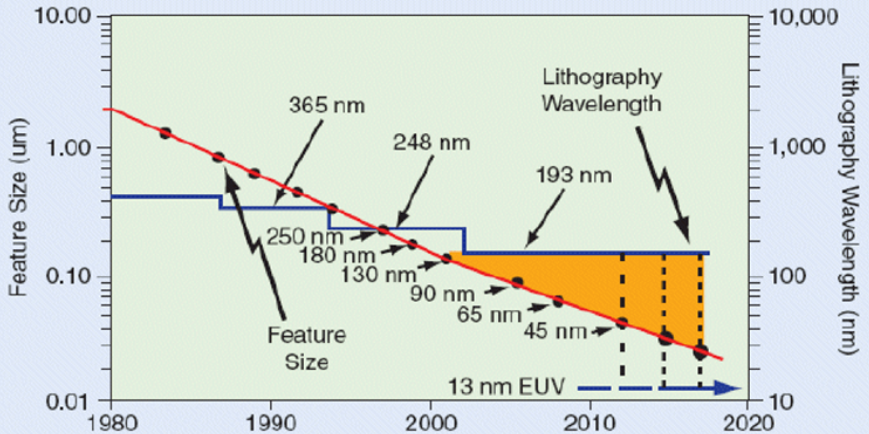
Extreme Ultraviolet Lithography

Introduction

Extreme ultraviolet lithography is the light of the future. First conceived in 1986, this bleeding edge technology has been developed over the past few decades in order to continue meeting the expectations of Moore's Law, which states that transistor density on a microchip should double every two years. With innovations in microchip design declining in recent years, it was clear that unless something changed quick we would soon be unable to keep up with the expectations of Moore's Law.

What is EUV?

EUV is a process used in chip production based on photolithography. Ultraviolet light of minute wavelength is emitted when two pulse laser beams intercept a miniscule droplet of tin. This UV light is directed towards a silicon wafer by reflecting it off numerous mirrors and a mask, which contains the pattern to be etched onto the silicon wafer by the UV light. The objective of EUV is to achieve ever smaller wavelengths of the light. Smaller wavelengths enable finer patterns to be etched into the silicon wafers, allowing us to pack more transistors into a more compact area. As such we are able to maintain the expectations of Moore's Law.



ASML and EUV History

In the 1980's, the wavelength of the light used in lithography for chips was only about 436nm and was produced by a mercury lmap. The wavelength managed to be shortened down to 405nm and then to 365nm. The next big leap came in the 90's, when the industry switched from mercury lmaps to deep ultraviolet lasers starting from 248nm with a Krypton Fluoride laser, and then to 193nm with an Argon Fluoride laser. An attempt was made at 157nm, but that failed and cost the industry billions. The key company behind the development of EUV technology is dutch company ASML,one of the leading semiconductor suppliers to the industry. ASML have been working on EUV tools for 20 years to date. They were the first to acheive the groundbreaking wavelength of 13.5nm only recently in 2015. They have since been producing EUV tools and supplying them to the industry.

EUV's Importance

- Prevented the necessity to research alternate means to reduce transistor size, saving billions on R&D costs
- Enabled the industry to maintain the expectations of Moore's Law which was previously thought to be nearing its deadline.
- Opened the doors for more powerful and cheaper electronic devices.

Future of Technology

- The EUV lithography market is expected to increase from USD 1.24 billion in 2017 to USD 10.31 billion by 2023
- Higher performing, samller, cheaper microchips will become available in the coming years
- Ultimately, this will result in cheaper, power efficient phones, laptops, etc for consumers to purchase.