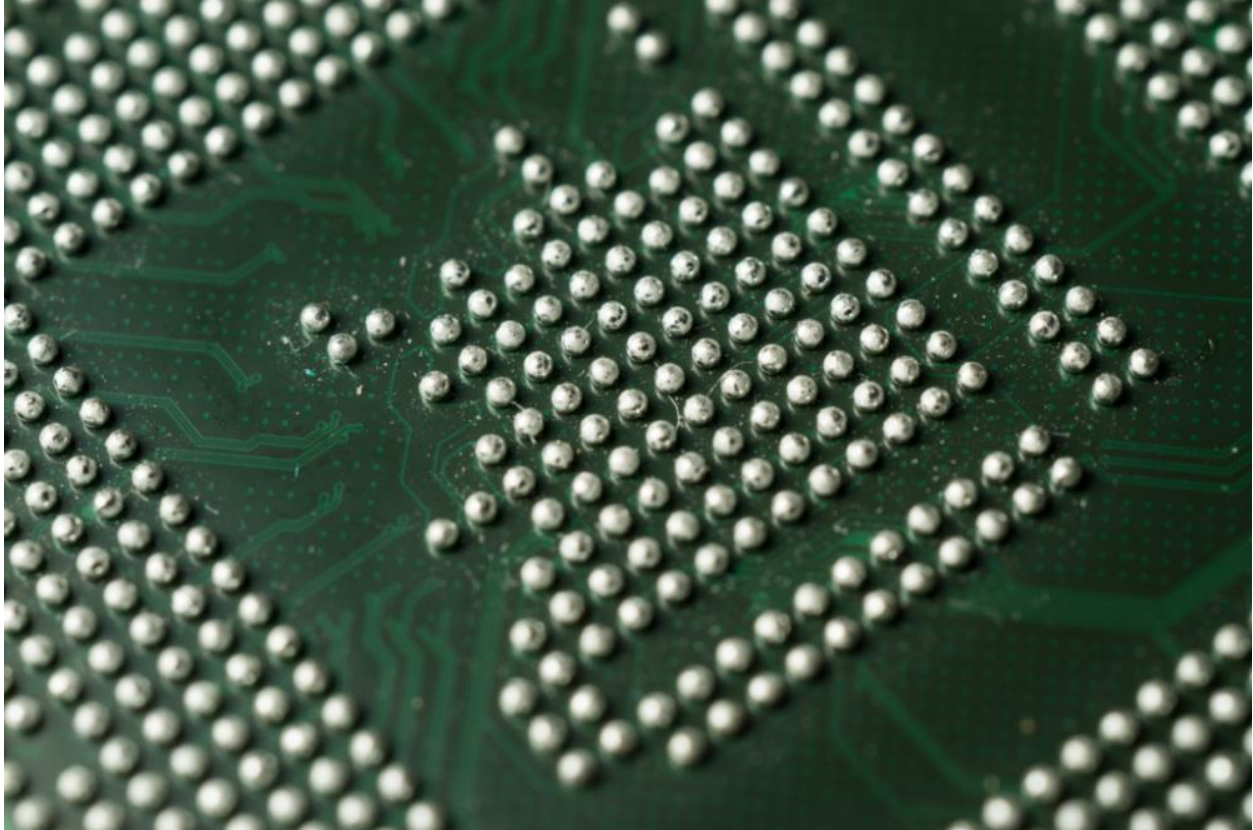


BITS&CHIPS

More than Moore litho - April 19, 2022



E D I T O R I A L

More than Moore litho

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With back-end litho and the “More than Moore” trend, we can look forward to a long and exciting battle.

A dozen players are gunning for a top spot in the back-end lithography market. Previously, only Ultratech (now Veeco) and Rudolph (now Onto Innovation) were visible. Meanwhile, Canon, EV Group, Kulicke & Soffa, Nikon, Shanghai Micro Electronics Equipment, Süss Microtec and several Chinese companies operating under the radar have also entered the arena.

An emerging tech trend in a billion-dollar market and companies capitalizing on it with different technologies – for a tech journalist like me, that’s heaven. I look back with pleasure on the nineties when AMD, Cyrix and IDT (with X86 architectures) and DEC (with its Alpha RISC architecture) challenged the hegemony of Intel. Intriguing was also the marathon ASML eventually won over Canon and Nikon.

After the wins, the market consolidation and the firm positioning are always a lot more boring. Canon and Nikon are no longer a match for ASML, Arm has beaten MIPS, Microsoft is dominating the PC software market. When the winners do flex their muscles, it’s usually not about technology but about legal matters, marketing or trivial capital. Elon Musk’s meddling with Twitter? Not really my thing.

Fresh blood

With back-end litho and the “More than Moore” trend, I’m about to get another front-row seat in an exciting arena. In the coming years, Moore’s famous law will continue to demand higher investments, but economic constraints are increasing as well. Only a limited number of designs can benefit from the most advanced IC manufacturing technology. It’s increasingly interesting to make compact electronics with systems of ICs (More than Moore) in addition to on-chip integration (Moore). Intel, Samsung and TSMC are investing billions in this.

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In the meantime, equipment suppliers are working on machines to create the complex chip packages. Lithography is the technology of choice to make the connections and drill the holes. The details involved are 1-3 micrometers big – dimensions that we saw on ICs in the early 1980s.

The interesting thing: the back-end litho equipment guys use a range of technologies. The traditional player and current market leader is Ultratech, which was acquired by Veeco in 2017. It serves this market with i-line steppers and has the largest installed base, especially at OSATs (outsourced semiconductor assembly and test). But the major integrated device manufacturers Intel, Samsung and TSMC have much deeper pockets. Moreover, when setting up their factories, these IDMs can start with a blank sheet of paper. That offers plenty of openings for fresh blood.

Because ASML barely gives Canon and Nikon any space in the front-end, these players are moving to the back-end where they see breathing room. Not surprisingly, like Veeco, they’re developing i-line technology. But there are also companies coming up that add new technology flavors. Kulicke & Soffa, which has a second position in back-end semicon equipment after ASM PT, in 2017 acquired Liteq, a Dutch player with a stepper design based on 355 nm YAG lasers. Austria’s VE Group is betting on a maskless technology with 375 and 405-nanometer lasers – Mapper with photons for the back-end.

Shakeout?

In recent months, I’ve often wondered to what extent today’s back-end litho market resembles the front-end litho market in the early 1980s. In 1984, ASML started with zero installed base, whereas GCA and Nikon already had hundreds of steppers in the market. At the time, Ultratech, Censor, Perkin Elmer, Optimetrix, TRE and Canon were also contending. The recession in chips in the mid-80s resulted in a shakeout in front-end litho. You might infer that in the back-end, the same will happen, but in semicon, no downturn is in sight. Also, back-end equipment has a momentum of its own, with lots of customers who are open to being helped with all kinds of equipment.

I was surprised that Kulicke & Soffa’s strategist TL Cheam [told me](#) that he expects a shakeout in this market as well and that a top three will remain. I, however, think today’s back-end litho is more comparable to the front-end litho in the late 1970s, when the industry was still using wafer aligners and steppers were just coming into play. When the investments for back-end litho R&D are no longer sustainable, that’s when we’ll start to see dropouts and only much later, we’ll see the establishment of one or more dominant players. Technologies in the back-end can also last very long – you only have to look at the number of wire bonders that are still sold every year. So before there’s a clear winner, we can look forward to a long and exciting battle.

<https://bits-chips.nl/artikel/more-than-moore-litho/>