**Rapid prototyping of single-die ASIC interconnects using direct-write-lithography at XRnanotech**

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**Abstract**

XRnanotech is a spin-off company from the Paul-Scherrer-Institut that offers micro- and nanostructured products and services in this field. To achieve this, they use state-of-the-art nanolithography tools like electron-beam writing, two-photon polymerization and direct-laser-writing.

Such laser-based pattern generators are versatile tools for transferring design layouts into resist structures. The mask-less exposure technology removes the necessity for expensive lithography masks and their time-consuming fabrication while adding complete design flexibility. This makes direct-write-lithography, especially laser writing with its fast writing times, a versatile and powerful technology for rapid prototyping in microtechnology.

At XRnanotech, we use the DWL66+ from Heidelberg Instruments Microtechnology GmbH that operates with a focused laser at 405 nm (h-line) to fabricate prototypes and small series for our wide range of customers. Its precise focusing methods and built-in alignment features enable the exposure of a variety of substrate sizes: From 8 inch wafers to single chips with sizes down to 3mm x 3mm. Recently, we have used this flexible tool to fabricate UBM-interconnects on single-die ASICs with great success.

The challenge in processing single-die ASICs is not only the precisely aligned and uniform exposure, but also the spincoating of the resist layers on such small substrates. Edge bead and reflow of resist often prevents the accurate exposure of the outermost pixels on the ASICs. After years of process development, we were able to overcome these challenges and we are now ready to offer rapid prototyping on small and large substrates. Here, the exposure with DWL66+ uses existing alignment markers for rotational and translational offset correction in order to achieve highest precision.

With our process, we are able to fabricate UBM interconnects on single-die ASICs without the use of photolithography masks and with down to no loss in pixel yield. We are now working on extending this process to the deposition of indium that opens up for bump-bonding later.