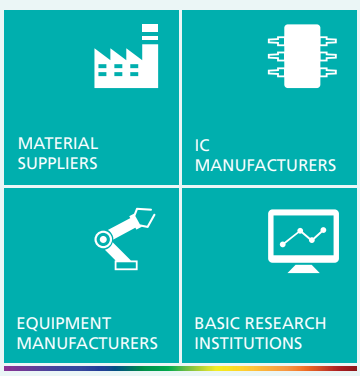
Fraunhofer
IPMS

FRAUNHOFER INSTITUTE FOR PHOTONIC MICROSYSTEMS IPMS

Process chain at Center Nanoelectronic Technologies (CNT)



Fraunhofer Institute for
Photonic Microsystems IPMS
Center Nanoelectronic
Technologies (CNT)

Königsbrücker Str. 178
01099 Dresden
Germany

Dr. Benjamin Uhlig
+49 351 2607 3064
screening@ipms.fraunhofer.de

www.ipms.fraunhofer.de
www.screening-fab.com

E-BEAM LITHOGRAPHY & ETCH

DEVICES & VALUE ADDED SOLUTIONS | ANALYTICAL SERVICES | SCREENING FAB SERVICES

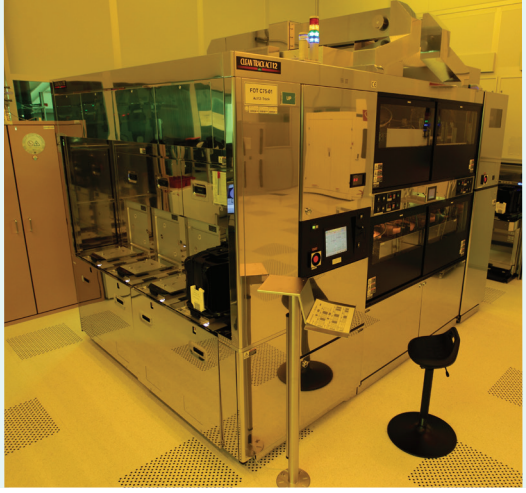
NANOPATTERNING

Creating nano-scale structures is necessary for a wide range of applications in the semiconductor business. Key challenges are creating precisely controlled patterns with small dimensions, flexible and adaptable layout generation and processes as well as uniform and reproducible wafer-scale integration.
Fraunhofer IPMS offers state-of-the-art nanopatterning capabilities using electron beam direct write lithography and reactive ion etching. Thus, customized structures with sizes below 40 nm can be created on a variety of wafer sizes and substrate types. Starting from the customer's design the whole package involving layout generation and modification, data preparation, e-beam lithography, pattern transfer using etch processes together with the needed in-line metrology and analytics up to separation into single chips is offered.

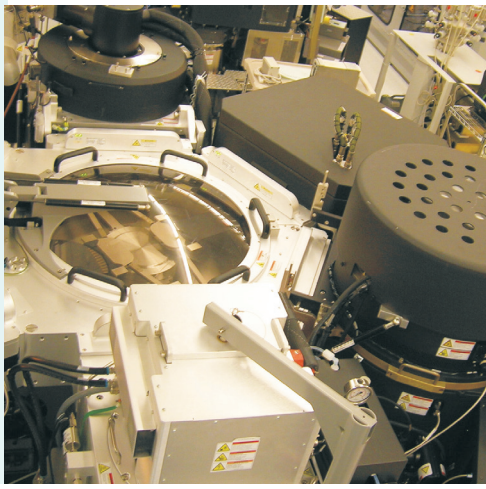
APPLICATION EXAMPLES

- Fabrication of test structures for technology development
- Structuring of Application Specific Integrated Circuits (ASICS)
- Design tests of innovative devices and cell concepts and their variation on a wafer (Chip Shuttle)
- Calibration pattern for metrology development
- MEMS and NEMS patterning with productive quality
- "Mix & Match" with optical exposure techniques
- Optical gratings and light modulation devices
- Correction of design or process errors in finalized CMOS structures (Metal Fix)
- High aspect ratio patterning (TSV, 3D capacitors)
- Nanoimprint masters

▲ *Vistec SB3050DW variable shaped E-beam for direct maskless patterning.*



▲ *TEL ACT 12 Clean Track for fully automated 12“ coating and development.*



▲ *Applied Materials Centura Mainframe for 12“ wafer (for specifications see below).*

ADVANTAGES AT CNT

- *Realization of customer specific patterning from sketch to etch*
- *Direct maskless patterning*
- *Structuring without optical diffraction limit below 40 nm (half pitch)*
- *Exposure of various designs or layout variations on single wafer, mix&match*
- *Different etch capabilities (e.g. ICP, CCP, high-T, MW)*
- *Wide range of inline-metrology and analytics available (patterned defect inspection, TEM, AFM and many more)*
- *ISO 9001 certification for high quality industrial services*
- *Professional contamination management and fast wafer exchange*
- *Close industry connection and vast collaboration network (foundries, supplier and universities) with over 10 years of experience*

EQUIPMENT - LITHOGRAPHY

E-beam - Vistec SB3050DW:
- Wafer sizes: 4“, 6“, 8“ & 12“

Clean Track - TEL ACT 12:
- Fully automated 12“ coating and development
- Processing of chemically amplified resists (CAR) and non-chemically amplified resists
- Additional coating of i-line, KrF and ArF available

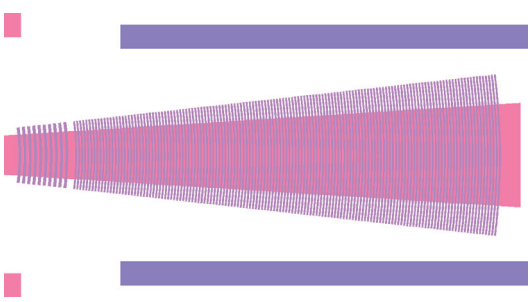
Lab coater - Brewer Science CEE 100 & 200 FX:
- Wafer sizes: 4“, 6“, 8“ & 12“

CD-SEM - AMAT Verity 4i:
- Wafer sizes: 8“ & 12“

Optical inspection - Leica INS3300:
- Wafer sizes: 8“ & 12“

EQUIPMENT - ETCH

Applied Material Centura Mainframes for 12” Wafer (BEOL and FEOL)
- ICP/CCP reactor with an option for high temperature etching (substrate temperature up to 250 °C)
- Active OES endpoint controlling
- Optional 8“ wafer processing
- In-situ plasma analytics viable
- Structures with critical dimension (CD) below 40 nm
- High aspect ratio etching (> 20:1)
- Etching of different materials
  - Standard materials: Substrate Si, poly-Si, amorphous Si
  - Hard mask materials: SiN, SiO_2
  - Metal gate materials: TiN, TaN, W, WSi
  - High-k Materials (at 250 °C): Al_2O_3, HfO_2, SiHfOx, ZrO_2
  - Metal: Al, AlSi



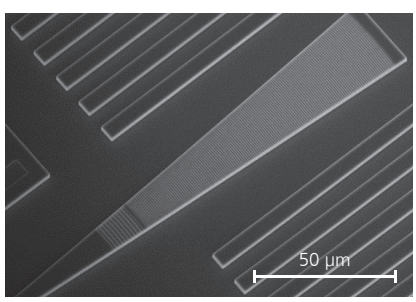


image courtesy: IHM Dresden

▲ *Optical coupling as designed (left) and as final imprint template (right).*

Fraunhofer IPMS

Fraunhofer IPMS SCREENING FAB

DEKRA Quality Management ISO 9001

visit www.ipms.fraunhofer.de
www.screening-fab.com