

Silicon Fabrication Area

State-of-the-art facilities. Dedicated people

The Silicon Fabrication area is configured as a CMOS facility but a key strength of the Tyndall silicon fabrication facility is the flexibility allowed in processing. The laboratory offers the ability to introduce new materials, structures or devices in a CMOS environment with the possibility of transferring successful research output to commercial foundries.

The silicon cleanroom is currently operating on 100mm substrates, but all recent equipment acquisitions can be upgraded to 150 or 200mm capability. There has been significant recent investment in enhanced etch capability, chemical mechanical polish (CMP) and improved implantation facilities.

The laboratory is also ideally set up for process development or prototyping of novel devices. The current silicon wafer-processing has an optical lithography capability to below 1 micron features with the JEOL electron beam system providing deep sub-micron lithography capability.

The cleanroom itself has a floor area of 250m² the bulk of which is designed at Class 1000 but meets considerably better than Class 100 in operation. The photolithography room is class 10 and the service chases are Class 10,000.

Key processes are as follows:

Furnacing: A full range of atmospheric furnaces for oxidation, pre-deposition, diffusion and annealing as well as RTA facilities for annealing and silicide formation. There is an LPCVD capability for Silicon Nitride and Polysilicon.

Etch: A range of sophisticated etch plasma equipment for dielectrics, metals, silicon and polysilicon, the etch techniques include RIE, ICP and High Density Plasma processes. There are also a wet etch facilities for these materials.



Above: state-of-the-art equipment in use in the clean room



Above: JOEL 6000F3 e-beam equipment in use in the clean room

Lithography: Optical lithography using contact/proximity systems as well as a broadband stepper with a resolution down to 0.7mm. There is also the possibility of mix and match processes using the E-Beam system, which has minimum resolution of 20nm.

Deposition: CVD system for dielectrics such as silicon dioxide, nitride and doped oxides and sputtering of metals like aluminium alloys and refractory metals.

Metrology and Inspection: A full range of in-process measurement equipment for film thickness, step height, film stress, line width, resistivity and particulate count.

Implantation: Medium current system for implant of phosphorus, arsenic and boron species.

Case Studies

Development of Bolometer for Low Light Camera

This work involved integrating a sensing element with the CMOS process. The Bolometer process was successfully transferred to a commercial fab(XFAB) and integrated with 0.75 μ m process. Applications include night vision cameras, survivor detection in disaster situations and security applications.

APD/SOI

SOI CMOS process is available The current development is to shrink the process to 0.5 μ m using the electron beam lithography system for the gate patterning in a mix and match mode with the stepper system. This process has been successfully integrated with the APD Avalanche Photodiode process for low light camera applications.

Radiation Detection

The PMOS process in the silicon fabrication facility has been optimised for radiation detection as RADFETs use and currently a number of different RADFETs are available. By their very nature PMOS devices are “radiation soft” this means they make excellent radiation detectors. By clever use of device design architecture the measurement range of the devices has been taken down to the milli-rad range where the devices become useful in medical diagnostic applications.

Key Equipment

Silicon Fab

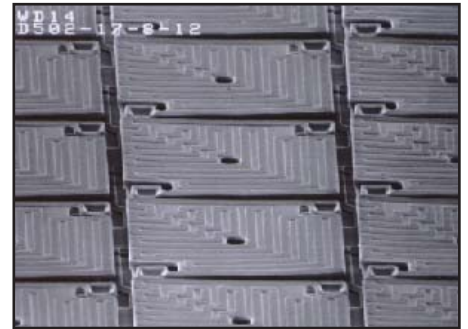
- Matrix One Resist Stripper
- Thermco 9000 Series Furnaces
- Eaton NV6200 AV Ion Implanter
- Electrotech Delta 201 PECVD System
- FSI Mercury Automatic Acid Spray Tool
- Trikon Omega 201 MORI Etch System
- Trikon Omega 201 PERIE Etch System
- Trikon Omega 201 ICP Etch System
- Drytek 384T Triode Etcher
- AST SHS 1000 RTP
- Nordiko 2550 Sputterer
- Convection Oven
- YES Oven
- 2 x Vinylglass Wet Benches

Photolithography Tools

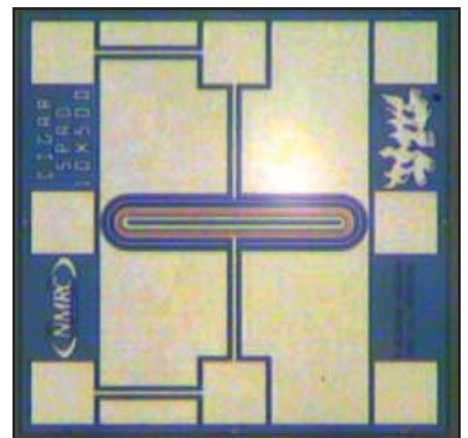
- DNS SOG Tracks
- DNS Resist/Develop Tracks
- Ultratech 1500 1X Stepper
- Canon PLA 501 Proximity Aligner
- Canon PLA 600F Proximity Aligner
- Jeol JBX 6000FS E-Beam

Measurement Tools

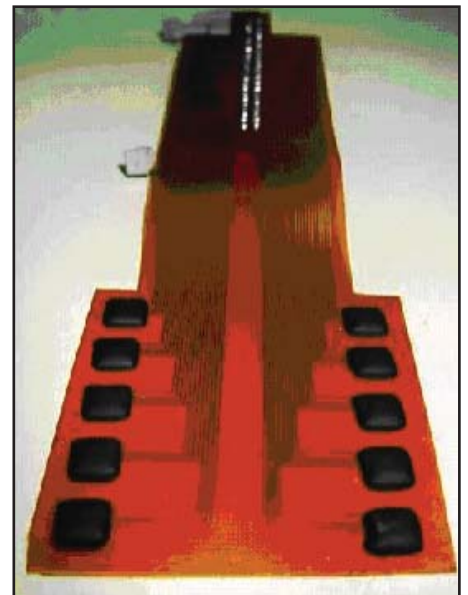
- Nikon LV150 Linewidth Measurement System
- Vickers Linewidth Measurement System
- Gaertner Scientific L1155 Waferskan Ellipsometer
- Prometrix Omnimap RS35 Four Point Probe
- Nanospec 3000 Thin Film Measurement System
- Leitz 200 Inspection Microscope
- Tencor 4500 Surfscan
- Tencor P15 Profilometer
- Nikon L150 Microscope
- Fixed Frequency CV Plotter
- HP 4145A Parametric Analyser
- Signatone S-1160 Analytical Probe Station



Above: IR detector array



Above: Avalanche Photodiode [APD]



Above: RADFET assembly

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