

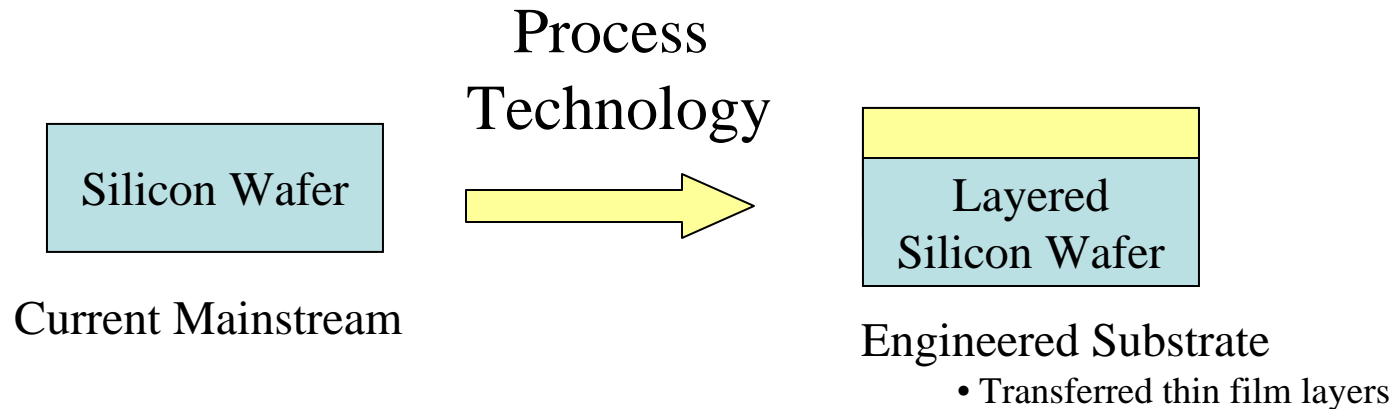
Layer Transfer (LT) Technology for High Performance Substrates

Francois Henley, President & CEO



*Solid State Technology
Engineered Substrates
webcast*

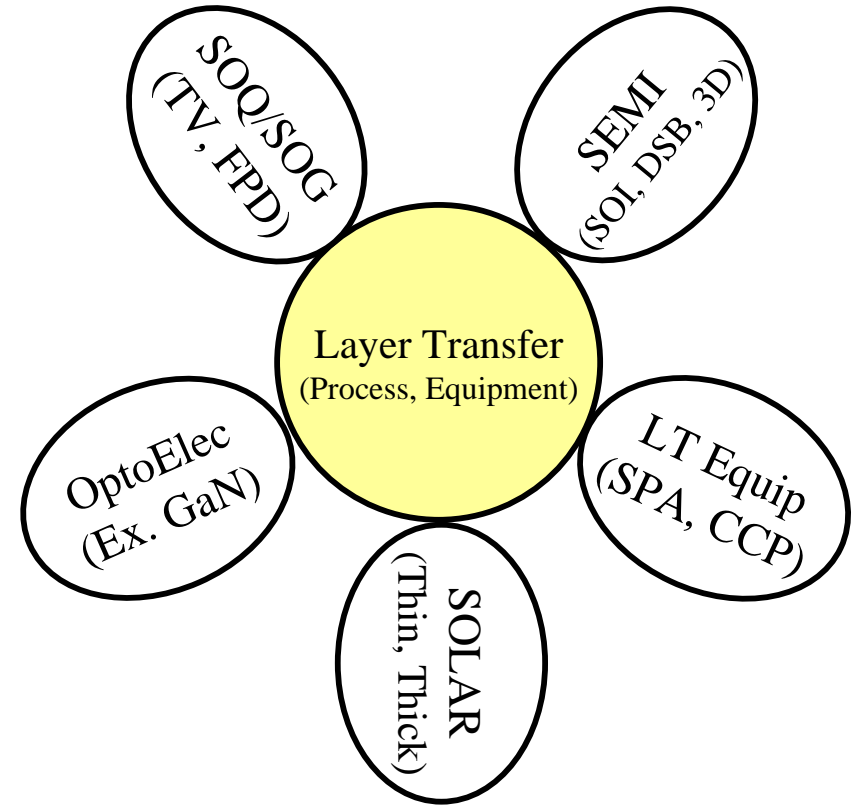
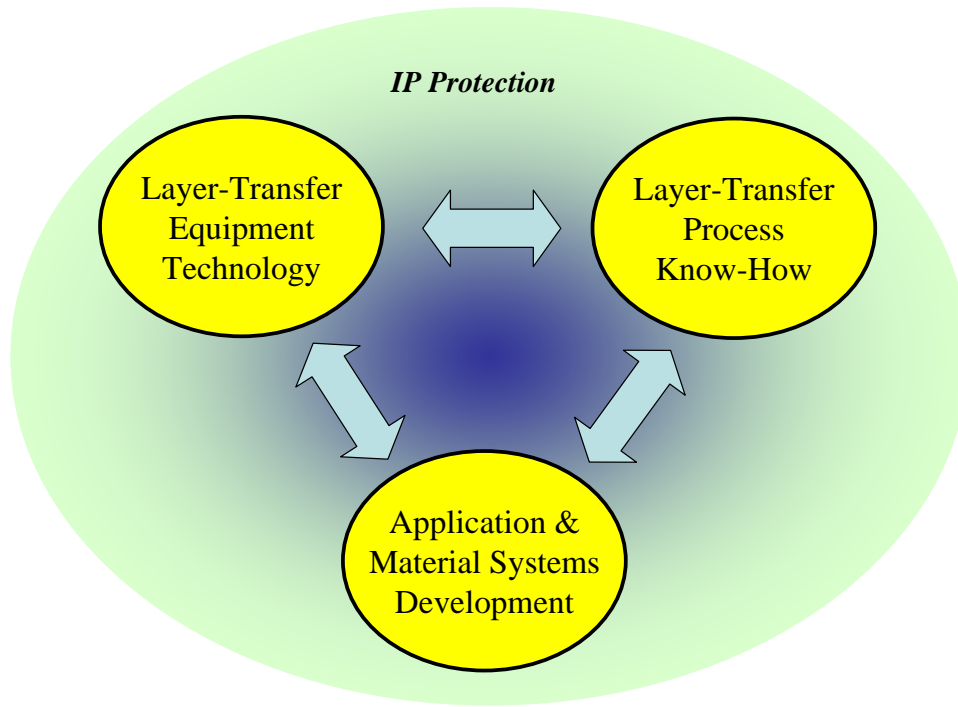
Engineered Substrates



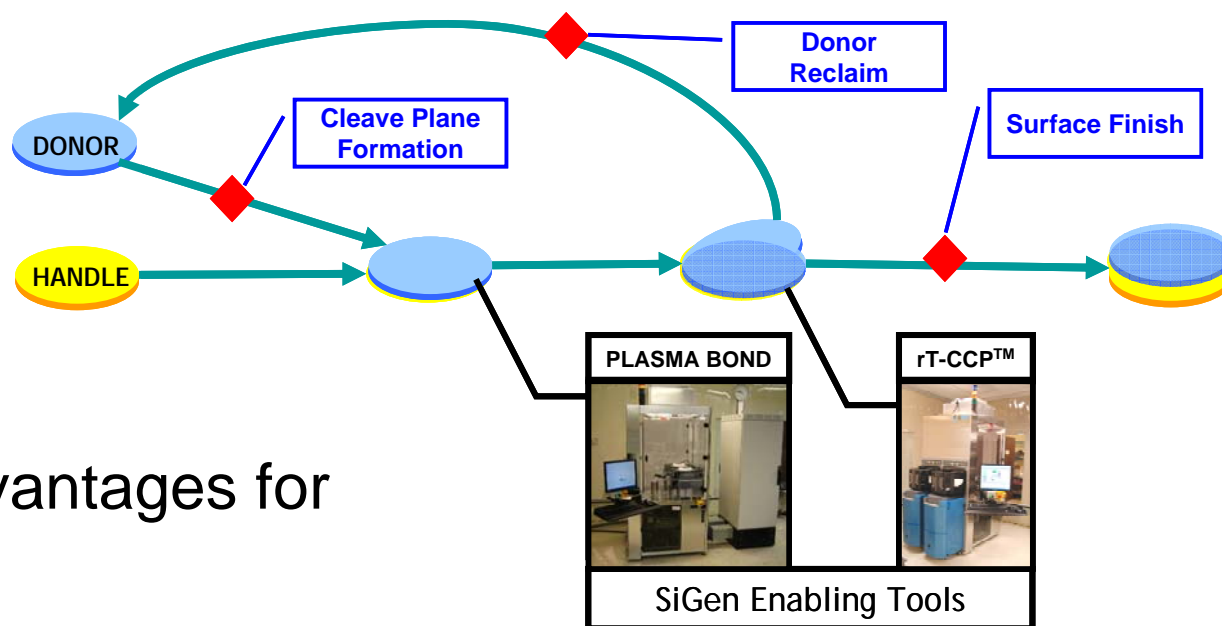
- Engineered Substrates – a “must have” for advanced applications
 - Applications – Solar Cells, IC Devices, LCD Displays, 3D Packaging
 - MOSFET leakage reduction => Reduced power dissipation
 - Reduced capacitance => Higher speed and lower power
 - Improved short channel effects => Stable device operation at small size
 - Modification of Materials => Enables new material combinations

Same Geometry – higher performance and lower power using existing manufacturing technology

Core Technology and Markets



Layer-Transfer Process (Ex. SOI)



- Type - SOI

- Performance advantages for microprocessors

- Improved speed and performance
- Reduced heat generation
- Reduced power consumption

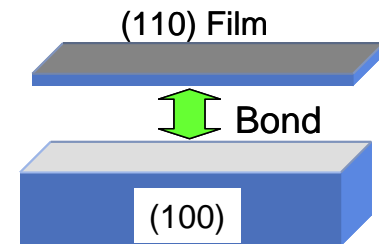
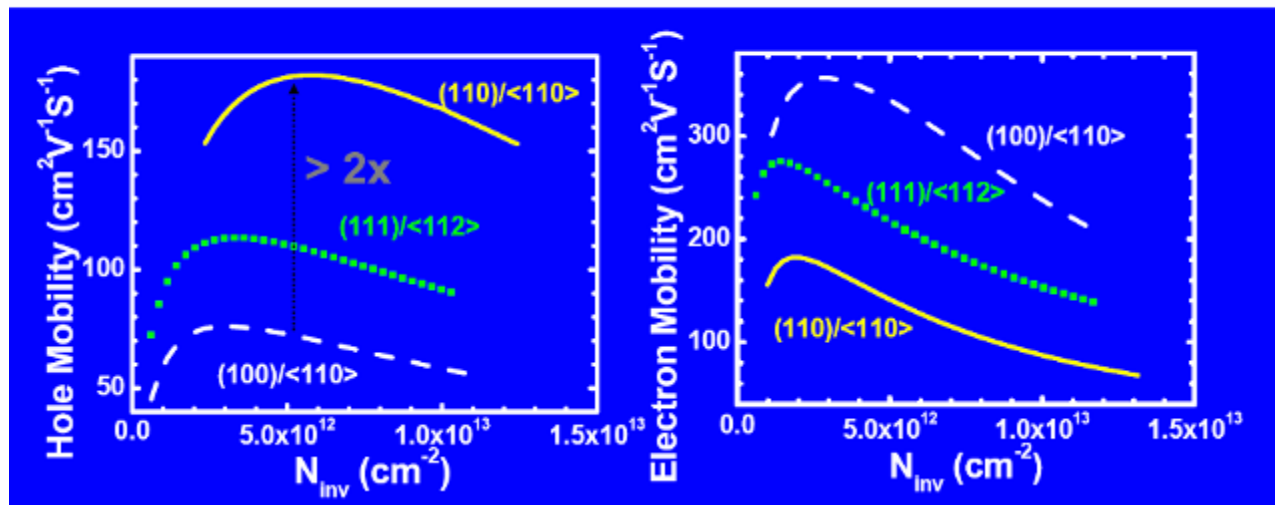
- Performance disadvantages

- Requires additional process steps and equipment

DSB – Direct Silicon Bond

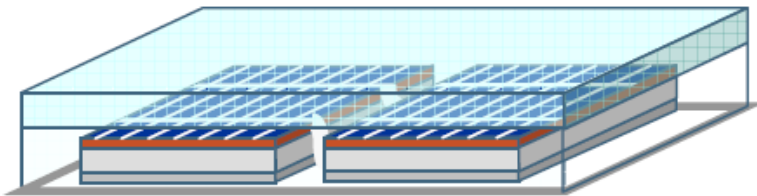
- Performance advantages
 - For equivalent circuit geometries, improved performance over bulk silicon
 - Potential direct replacement for bulk silicon
- Performance disadvantages
 - Additional processing required

Electron mobility is highest on (100) surface
Hole mobility is highest on (110) surface

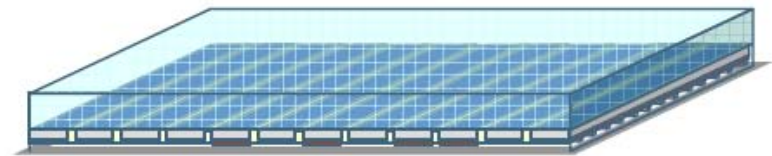


c-Si Films for Solar

- Type – Thin/thick single-crystal Films
 - Performance advantages for Solar PV Cells
 - High conversion efficiency – approx. 18% to 20%
 - No kerf losses
 - Significant material savings - up to 20X
 - Performance disadvantages
 - Thin Films (<50 microns) will require module production and handling modifications



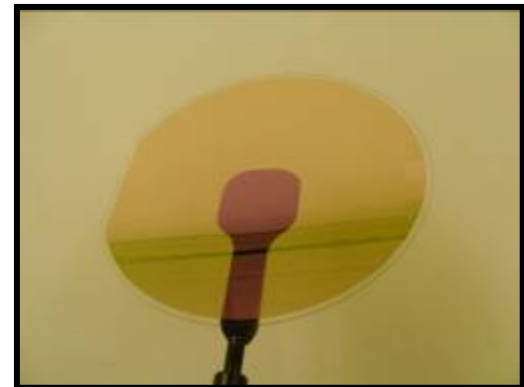
Thick c-Si Module



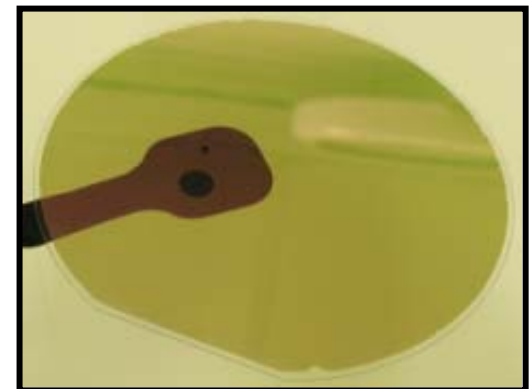
Thin c-Si Module

Silicon-on-Quartz/Silicon-on-Glass

- Type – SOQ/SOG
 - Performance advantages for HDTV Projectors and FPDs
 - Better brightness
 - Lower Cost
 - Higher Resolution
 - Faster Speed
 - Higher Circuit Density
 - Performance disadvantages
 - Cost & Complexity



SOQ



SOG

Materials challenges/solutions

- **Challenges**

- Silicon supply is restraining some markets (solar)
- Material costs are increasing
- Existing processes can't economically achieve required performance goals for new high performance devices

- **Solution** – an alternative approach is needed

- Engineered substrates break the cost/performance barrier

Manufacturing challenges/solutions

- **Challenges**

- Need to minimize changes to expensive, established manufacturing infrastructure
- Need to stick with known materials to minimize defects and production bottlenecks

- **Solutions –**

- Stick with known process technology
- Add/modify known processes to add necessary manufacturing steps
- Utilize known materials to speed time to market

Summary

- Engineered substrates open up new markets with new applications
- Layer-transfer offers a cost-effective process to achieve many variations of highly engineered films
- SiGen's processes and HVM tools are proven solutions in the semiconductor and display industries
- Packaging, solar, and opto-electronics offer new opportunities