

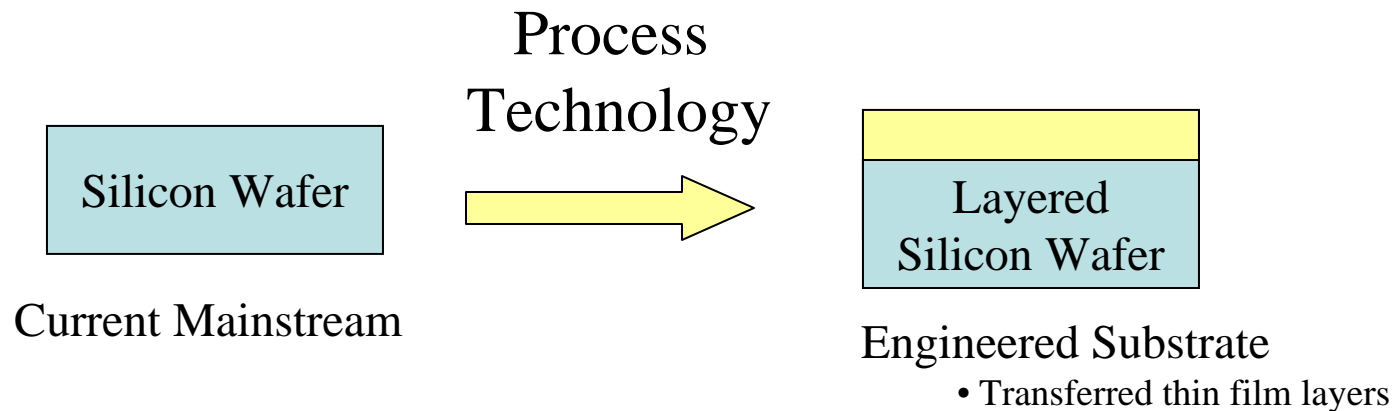
# Layer Transfer (LT) Technology for High Performance Substrates

*Francois Henley, President & CEO*



*Solid State Technology  
Engineered Substrates  
webcast*

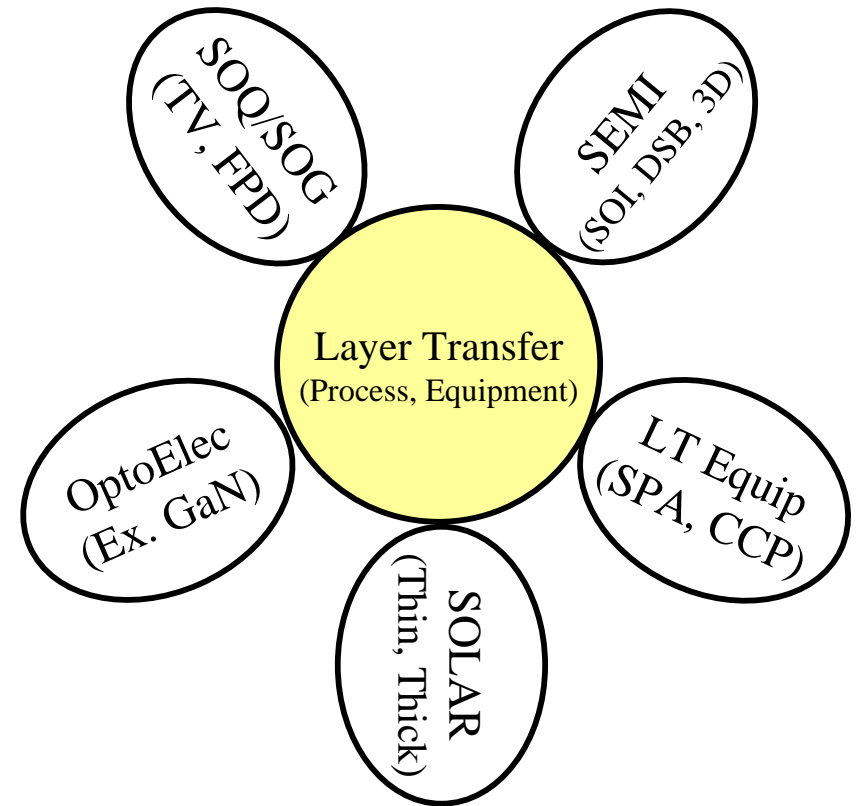
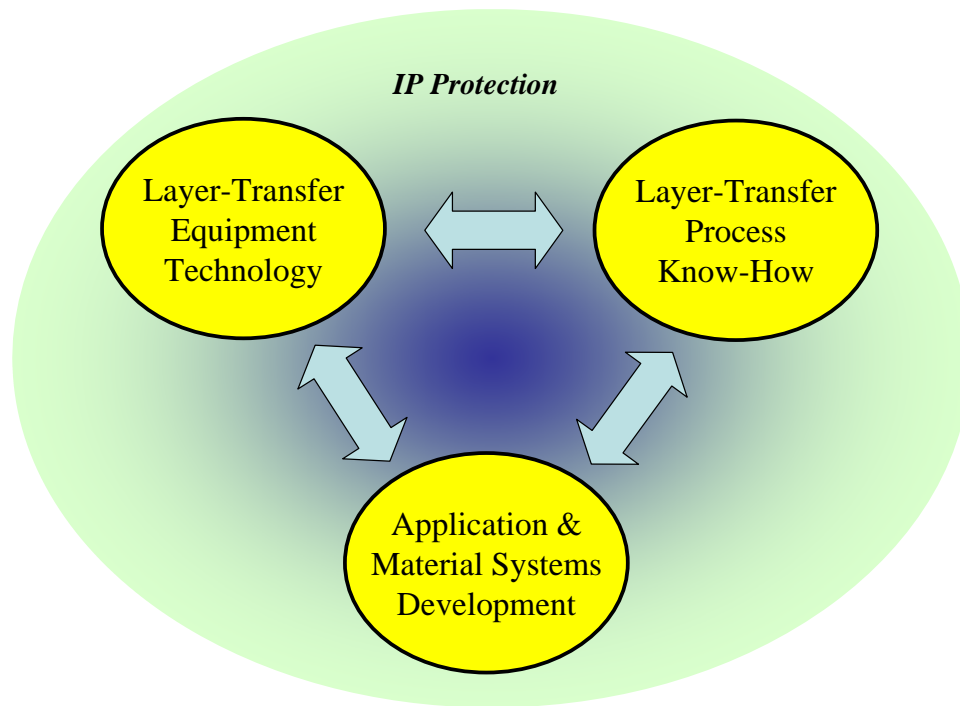
# Engineered Substrates



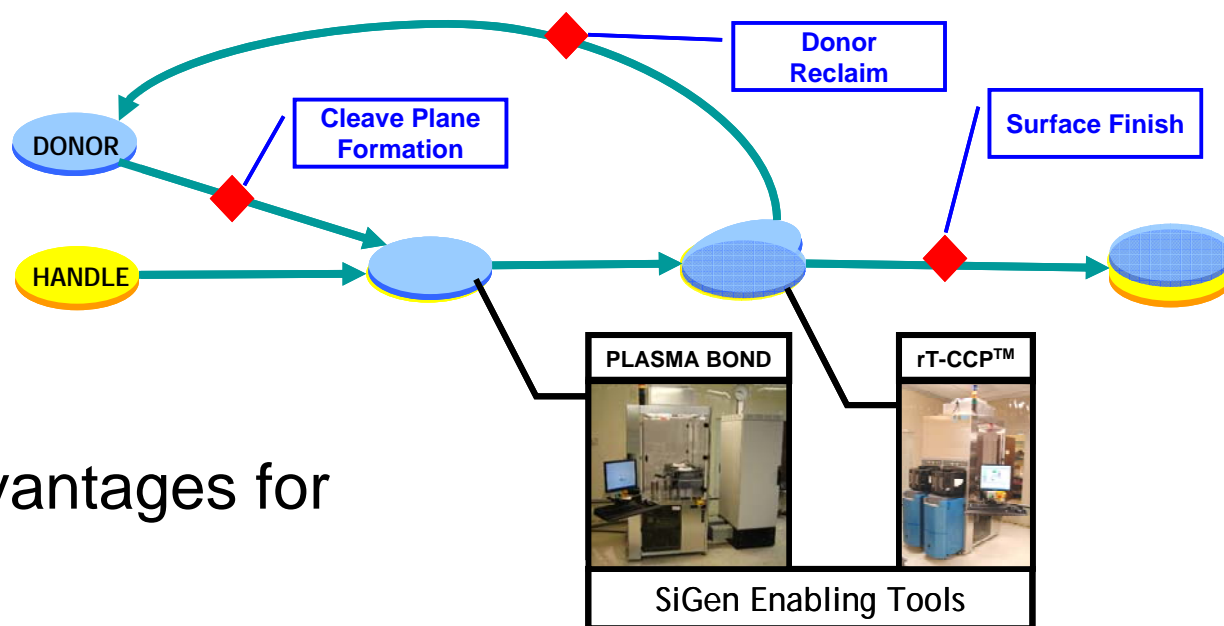
- Engineered Substrates – a “must have” for advanced applications
  - Applications – Solar Cells, IC Devices, LCD Displays, 3D Packaging
  - MOSFET leakage reduction => Reduced power dissipation
  - Reduced capacitance => Higher speed and lower power
  - Improved short channel effects => Stable device 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

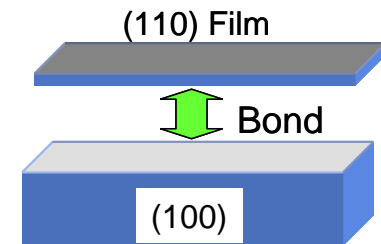
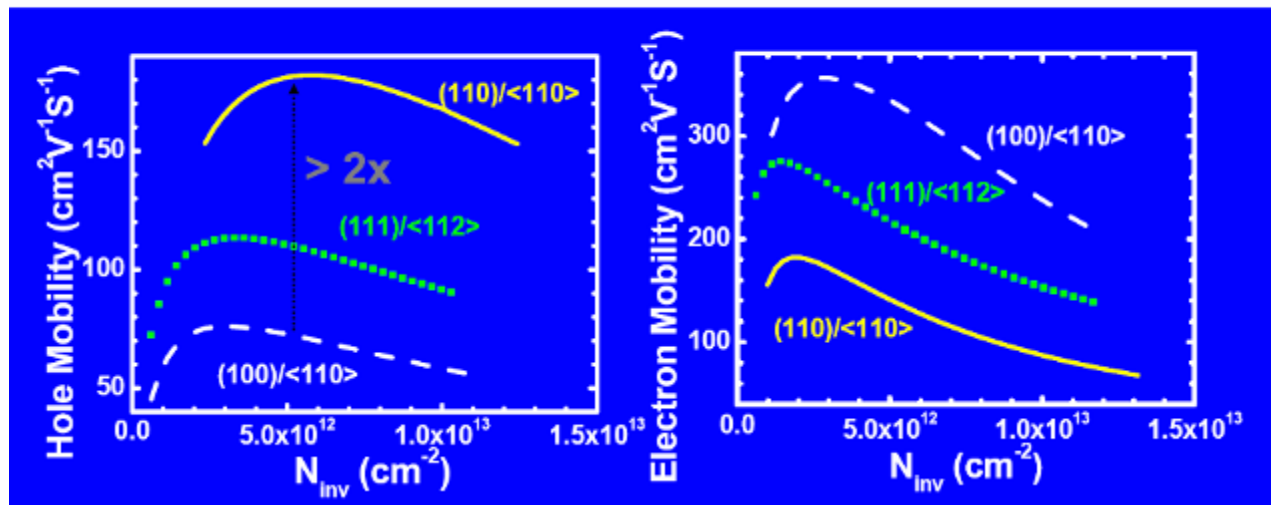
- Performance disadvantages

- Requires additional process steps and equipment

# DSB – Direct Silicon Bond

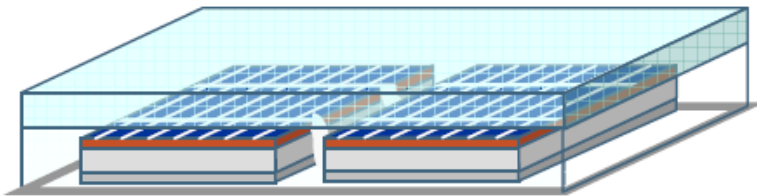
- Performance advantages
  - For equivalent circuit geometries, improved performance over bulk silicon
  - Potential direct replacement for bulk silicon
- Performance disadvantages
  - Additional processing required

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

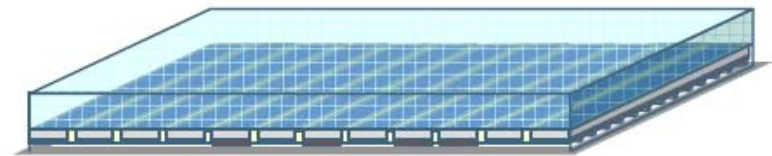


# c-Si Films for Solar

- 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



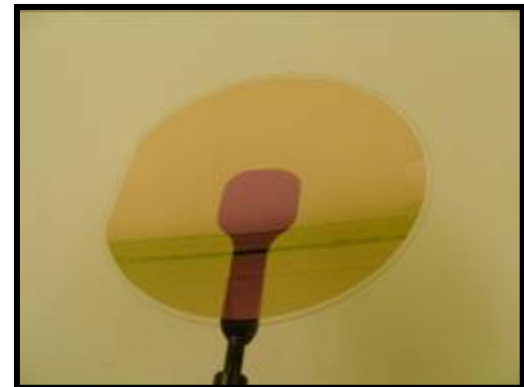
Thick c-Si Module



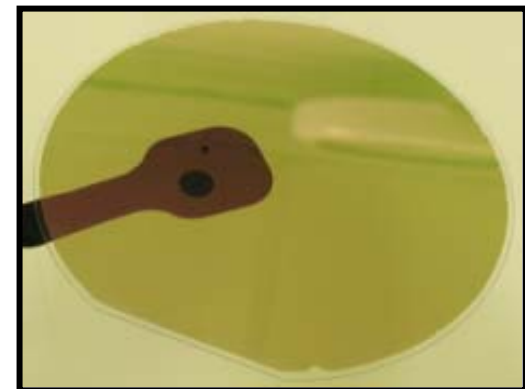
Thin c-Si Module

# 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