



# A Look at Silicon Genesis

Founded in 1997 and headquartered in San Jose California, Silicon Genesis Corporation (SiGen) provides unique, proprietary layer transfer process technology and equipment to a number of large global customers.

## — BUSINESS MODEL —

### 1997

Founded as a fabless IP company to leverage revolutionary thin-film laminate technology enabling the fabrication of engineered substrates.

### 1998

Opened development center in Campbell, California to expand its IP and bonded wafer fab technologies.

### 1999

Opened pilot SOI wafer fab and demo application center in San Jose, California.

### 2000

Company transitions from development to pilot production.

### 2003

Changed business focus to technology licensing. Plasma activated bonding technology licensed to EV group.

▶ **Process Licenses**—SiGen has developed material processes for SOI, SOG, SOQ, and DSB engineered substrates. Each process contains significant intellectual property (IP) and requires know-how to achieve successful results. SiGen provides process licenses, training and know-how/show-how to customers who license these processes. For some customers, royalties may apply as part of a "per substrate" process license.

▶ **Application Engineering Services**—For Customer Specific Substrates (CSS) SiGen offers in-house application-engineering services to develop and tailor processes related to customer requirements. These services are offered on a time and materials basis to speed time-to- production for custom engineered substrates.

▶ **Support Services**—SiGen offers services for process training, installation, and ongoing warranty and support services. Process training is an important part of SiGen's technology transfer for customers taking Process Licenses.

▶ **Equipment Sales**—A major component of SiGen's business is process equipment. The equipment is used in R&D facilities to develop custom substrates to full manufacturing operation for high volume production. SiGen offers a number of equipment platforms to implement its engineered substrate processes.

The customer will develop customized value-added applications through the implementation of the Layer Transfer processes and consultation provided by SiGen.

The Company provides support through a direct sales force and independent representatives in collaboration with a service staff based in its San Jose offices.

### 2004

Licensed bonded SOI wafers layer transfer technology to MEMC. Shipped first 200mm/300mm DB & C Tool.

### 2005

Entered into a broad IP license agreement with Shin-Etsu Chemical and shipped first 300mm Standalone Plasma Activation Tool.

### 2006

Shipped 200mm/300mm DB & C Tool for 3D Memory Applications.

### 2007

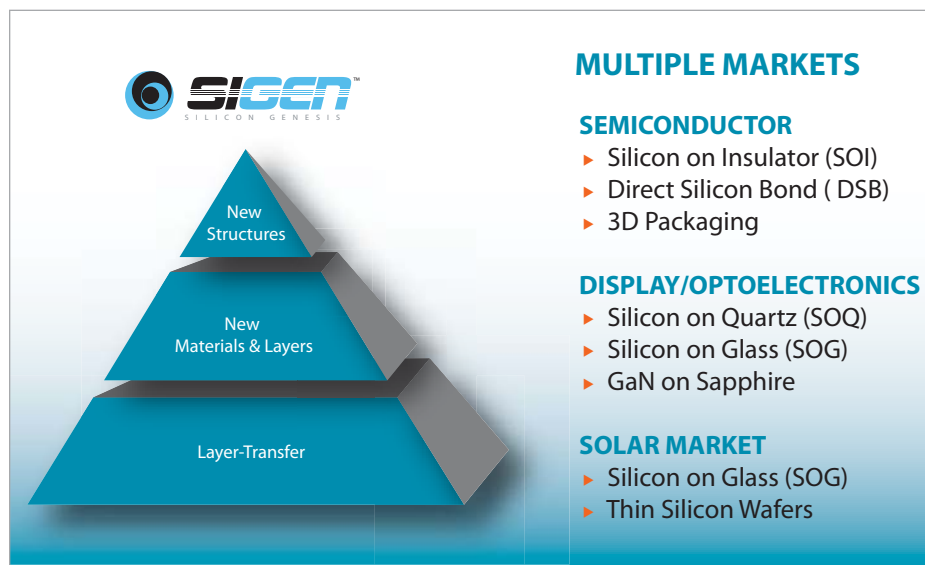
Delivered DSB substrates. Extended LT technology to solar.

### 2008

Expanded LT technology to 3D CIS Application. Repeat tool orders.

## FOUNDATIONAL TECHNOLOGY

SiGen Layer Transfer Technology Processes and Equipment were aggressively developed over the past 10 years creating an invaluable set of technologies which are reflected in almost 100 patents. These technologies enable the next generation devices built on engineered substrates to meet the ever-increasing demands of performance, power consumption and heat dissipation.



### Engineered substrates using SiGen Layer Transfer Technology

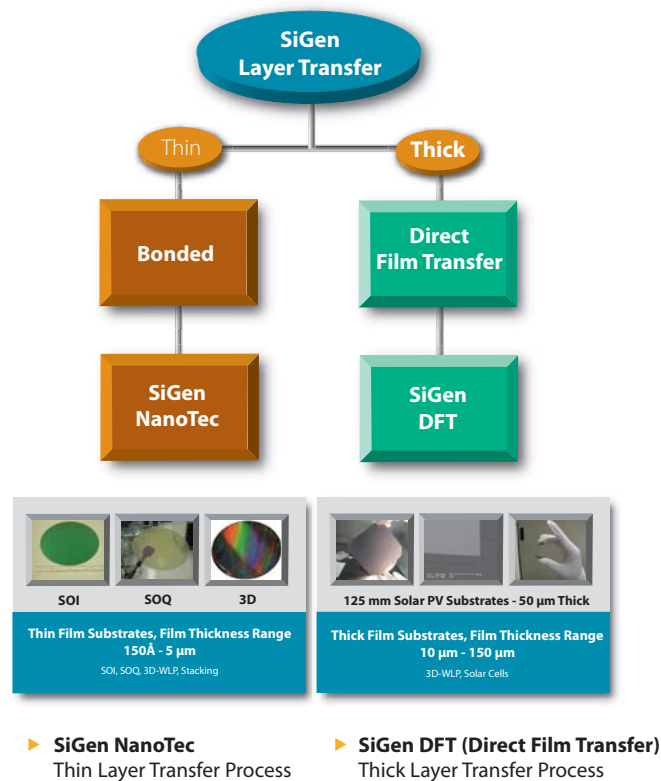
- ▶ **SOI (silicon-on-insulator)**  
Used to reduce device voltage operation and power consumption improve device speed.
- ▶ **DSB (direct silicon bond)**  
Improved device mobility in CMOS circuitry by providing separate crystal orientation layers for NMOS and PMOS.
- ▶ **SOQ (silicon-on quartz)**  
Transferred single-crystal silicon onto a quartz substrate used for RF, display and optical applications
- ▶ **SOG (silicon-on-glass)**  
Transferred single-crystal silicon onto bulk glass enabling low-cost, high-efficiency solar cells, displays, and optical applications.
- ▶ **CSS (customer-specific-substrate)**  
A combination of donor-layer materials on unique handle substrates, including III-V and II-VI donor materials and sapphire, ceramics, and flexible handle substrates.

# LAYER TRANSFER INTEGRATED SOLUTION

SiGen's innovative layer transfer solution is fully integrated into the production of engineered substrates. This patented layer transfer technology allows a very thin layer of material to be transferred to a "handle" wafer, resulting in an engineered substrate for advanced device applications. This is a low temperature process, which allows a wide variety of different materials to be successfully combined to form engineered substrates.

SiGen's layer transfer integrated solution's key components are:

- ▶ Technology Process
- ▶ Equipment
- ▶ Licensing

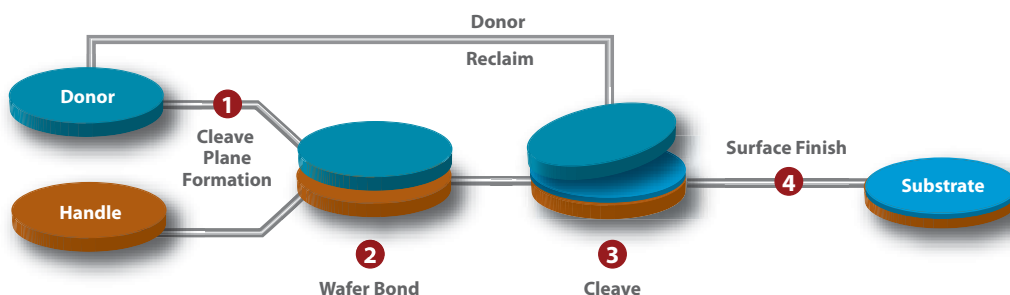


## Technology Process

These processes have allowed SiGen to become a leading provider of innovative-engineered substrates enabling customers to develop new application with greater functionality and higher speed, while improving cost, power efficiency and heat dissipation.

### The four key steps in the NanoTec process:

- 1 Cleave Plane Formation Step
- 2 Plasma Bond Step: using a proprietary plasma-activation bond process
- 3 Cleave Step (rT-CCP™): using a proprietary cleave process.
- 4 Surface Finishing Step: using a proprietary gas-phase non-contact smoothing process





## Equipment

### Stand-Alone Plasma-Activation (SPA) Tool

The stand-alone plasma-activation (SPA) tool is designed to provide a reactive surface to bond silicon wafers and heterogeneous substrates. The SiGen PA Tool allows room temperature bonding up to 80% of bulk covalent bond strength.

### Debond & Cleave (DB&C) Tool

The DB & C Tool is designed for layer transfer applications in room temperature cleave conditions with high throughput and superior yields.

The process is a dynamic, low-stress cleave action in which a donor layer transfers to a handle wafer at room temperature. SiGen's proprietary cleave technology combines a cleave initiation action followed by programmed propagation that optimizes cleave quality and uniformity.



SPA Tool



DB&C Tool

## IP Licensing

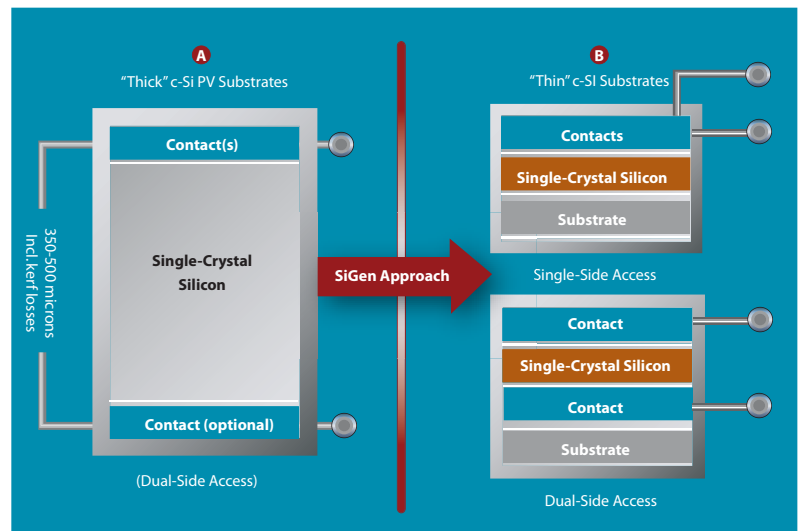
A key component of SiGen's value is offering its extensive and proven intellectual property through a license agreement. As part of the licensing agreement, SiGen works closely with partners to develop a process recipe specific to the needs of the individual customer. SiGen IP licensing can significantly reduce the time-to-production for engineered substrates through its know-how and show-how expertise.

## SIGEN AND THE SOLAR MARKET

The Solar market provides an especially large and interesting opportunity for SiGen. Today, there are two primary types of solar cells — thin film and thick film. The thin film cells have excellent silicon utilization, but suffer from poor conversion efficiency. The thick films have typically high conversion efficiencies, but require excessive amounts of precious silicon. SiGen's layer transfer technology provides for thin films with good efficiencies. SiGen's layer transfer process is a "green" process since there is no sawing, grinding or other mechanical thinning of wafers. Today silicon is the major (approx 60%) cost component of solar cells. With SiGen's layer transfer process, the cost of producing solar cells with high efficiencies will be dramatically reduced, further stimulating an already exploding market.

SiGen's layer transfer process accomplishes the following:

- ▶ Thin film silicon content (<2 grams per peak watt) with thick film efficiencies
- ▶ MINIMAL WASTED SILICON no kerf losses
- ▶ "Clean process" no silicon slurry to recycle or dispose



The SiGen Solution: Reduction of Poly-silicon Consumption

## PARTNERS

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SiGen believes in a close and ongoing relationship with its customers and partners. The development and application of layer transfer technologies has been brought about through the collaboration of SiGen with its partners. Such collaborations not only improve the technology, but also reduce the “time to revenue” for new, engineered substrates and their devices.



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