CSE is to be a leading global company
<table>
<thead>
<tr>
<th><strong>Company Name</strong></th>
<th>CSE Co. Ltd</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C.E.O</strong></td>
<td>Dae Pyo, LEE</td>
</tr>
<tr>
<td><strong>Establishment</strong></td>
<td>AUG 1st, 1999</td>
</tr>
<tr>
<td><strong>Type of Business</strong></td>
<td>Manufacturing/Semiconductor Equipment</td>
</tr>
<tr>
<td><strong>Major Products</strong></td>
<td>Wafer Prober, Probe Card, Accessories &amp; Parts</td>
</tr>
<tr>
<td><strong>Capital</strong></td>
<td>US $ 450K</td>
</tr>
<tr>
<td><strong>Address</strong></td>
<td>121-9, Maejari-gil, Gwangju-si, Gyeonggi-do 464-893, Korea.</td>
</tr>
<tr>
<td><strong>Employees</strong></td>
<td>24</td>
</tr>
<tr>
<td><strong>Contact</strong></td>
<td>TEL.031)765-3060 FAX.031)765-3063</td>
</tr>
<tr>
<td><strong>Website</strong></td>
<td><a href="http://www.proberworld.com">www.proberworld.com</a></td>
</tr>
</tbody>
</table>
Company History

1999. 8  Established as a CSE Corporation

2003. 5  Moved company to Opo-eup, Kwangju-Shi, Gyunggi-do, Korea

2004. 9  Established a company’s R&D Center at Sungnam-Shi in Korea

2004. 10  Made a contract for the supply of goods & service of KEC in Korea.

2004. 11  Made a contract for the supply of goods & service of MagnaChip Co in Korea.

2004. 12  Made a contract for dealership of Signatone. (USA)

2006. 01  Obtain certification for ISO9001 and 14001.

2006. 05  Obtain certification the VENTURE an enterprise by Gyunggi-Do, Korea

2006. 10  Obtain certification the INNO-BIZ
Company History

2008. 09   Registered bright prospect company by Gyeonggi-Do.
2008. 11   Obtain a patent on an Invention (No.10-0522975. 10-0647538. 10-0607094)
2008. 12   Registration an export bright prospect company by SMBC in Korea.
2009. 02   Registration an Specialist company of Electronics components and Material.
2010. 03   Acquisitions and mergers the Zpard probe card company and start probe card business for cantilever and Vertical probe card fields.
2010. 11   1 Million USD export tower Award
2011. 05   Change company name to CSE
2011. 06   3 Million USD export tower Award
2012. 03   Agent contract of probe card and prober with Singapore G4 source Co.,
2012. 11   Registration a Venture company by Korea technology credit guarantee fund.
Organization

CEO/D.P.Lee

Vice president

Management & planning dept
- Support team
- Planning team

Sales Dept.
- Domestic sales
- Overseas sales

Production Dept.
- Production Tech1
- Production Tech2

Research Center
- S/W team
- H/W team

Procurement /Material

Instrument team
Business Portfolio

Wafer Prober
- Manual Prober Station
- Semi-auto Prober
- Full Auto Prober station

Probe Card
- Memory Device
  - Mobile Dram & Nand Flash.
- D.D.I (LDI) Device
- System LSI Device

Accessory
- Linear Motor
- Inker Ass’y / Positioner
- PC PRU Vision System

TESTER
- Image Sensor
- LDI
- LOGIC Device
- Discrete Device
# IP Status

<table>
<thead>
<tr>
<th>Classification</th>
<th>Nomenclature</th>
<th>Registration No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patent</td>
<td>Wafer Probing socket</td>
<td>0343883</td>
</tr>
<tr>
<td>Patent</td>
<td>Chip size Probe card</td>
<td>0389879</td>
</tr>
<tr>
<td>Patent</td>
<td>Manufacturing method of Ceramic bar &amp; Manufactured Ceramic bar by those method</td>
<td>10-0609834</td>
</tr>
<tr>
<td>Patent</td>
<td>Probe card for inspection of semiconductor wafer</td>
<td>10-0689180</td>
</tr>
<tr>
<td>Patent</td>
<td>Manufacturing method for MEMS probe needle by plating Technology</td>
<td>10-0842395</td>
</tr>
<tr>
<td>Patent</td>
<td>Multichip probe frame</td>
<td>0314140</td>
</tr>
<tr>
<td>Patent</td>
<td>Prober system for De-tapped semiconductor chip test</td>
<td>10-0647538</td>
</tr>
<tr>
<td>Patent</td>
<td>Wafer prober system hot chuck with prevent thermal deformation structure.</td>
<td>10-0607094</td>
</tr>
<tr>
<td>Patent</td>
<td>Semiconductor analyzing prober system with Auto align function</td>
<td>10-0522975</td>
</tr>
<tr>
<td>Pat. Pending</td>
<td>Auto semiconductor wafer inspection instrument</td>
<td>10-2006-0017788</td>
</tr>
<tr>
<td>Pat. Pending</td>
<td>Manual semiconductor wafer inspection instrument</td>
<td>10-2006-0017789</td>
</tr>
<tr>
<td>A patent on a new device</td>
<td>Auto semiconductor wafer inspection instrument</td>
<td>20-0415369</td>
</tr>
<tr>
<td>A patent on a new device</td>
<td>Manual semiconductor wafer inspection instrument</td>
<td>20-0415370</td>
</tr>
</tbody>
</table>
Probe Card Products

Vertical Probe Card
(Mobile D-RAM)

Flip Chip 60um Pitch
Vertical probe card
(Option: Up to 40um pitch)

Vertical Probe Card for
System LSI, Soc Devices

L.D.I. Vertical Probe Card

Low Leakage Probe Card

Cantilever Probe Card

www.proberworld.com
Vertical Probe Card.

For Mobile D RAM Probe card

For Nand Flash 300mm One touch

MEMS Probe card Specification

Needle Material : Ni Alloy
Tip shape : Round
Available Minimum pad Pitch : >60um
DUT Parallel: System LSI. SoC, over 2 Para
Nand Flash 300mm One touch down
Test Speed rate : >70Mhz
Voltage (max adjacent tip) : 150VDC
Max Current (recommended) : 1A
Vickers Hardness (Kg/mm²) : 500 ~ 550
Gram Force (g/mil) : 2.5g (Standard).
Adjustable by customer needs.
Alignment accuracy : ±4um
Planarity : < 19um (12inch)
Tip Length : 250 ± 20 um
Leakage Current (nA) / GND.PWR : 10 / 50 nA
Operating Temp, range : -40℃ ~ 150 ℃
Maximum over drive : 100um
Vertical & Cantilever Probe card

D.D.I (L.D.I.) Specification

- Needle Materials: BeCu or Ni-Alloy
- Min, Pad pitch In-line: 20um
- Min, Pad pitch Quad-tier: 35um
- Min, Pad Size (um): 20x71um
- Operating temperature range (℃): 40℃ ~ 150℃
- Max test frequency (MHz): Over 200MHz
- Leakage level (nA): <10nA
- Contact resistance (Ohm): <4Ω

Low leakage Probe card Specification

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle Materials</td>
<td>W, Coaxial or Ni Alloy</td>
</tr>
<tr>
<td>Tip shape</td>
<td>Round</td>
</tr>
<tr>
<td>Alignment accuracy</td>
<td>±4um</td>
</tr>
<tr>
<td>Planarity</td>
<td>&lt;8um</td>
</tr>
<tr>
<td>Leakage Current 10V F</td>
<td>&lt;500 fA, &lt;300 fA (Coaxial needles)</td>
</tr>
<tr>
<td>Contact resistance</td>
<td>&lt;3Ω</td>
</tr>
<tr>
<td>Tip Length</td>
<td>250 ± 20 um</td>
</tr>
<tr>
<td>Operating Temp, range</td>
<td>-40℃ ~ 150℃</td>
</tr>
<tr>
<td>Life time</td>
<td>Over 1M times T/D</td>
</tr>
<tr>
<td>Voltage (max adjacent tip)</td>
<td>150VDC</td>
</tr>
<tr>
<td>Max Current</td>
<td>500mA</td>
</tr>
<tr>
<td>Min, pad Pitch (Both side Fan-out)</td>
<td>30um/ Single side: 60um</td>
</tr>
<tr>
<td>Min, pad Pitch (Both side Fan-out)</td>
<td>60um (Coaxial needles)</td>
</tr>
<tr>
<td>Min, pad Pitch (Both side Fan-out)</td>
<td>120um (Coaxial needles)</td>
</tr>
</tbody>
</table>

Cantilever Specification

- Needle Materials: W, Re-W, BeCu, P7, Pt
- Confront Various type of device for Non Memory Devices
- High Pin Count, Available fine pitch
  - High Pin Count: Over 1~15,000Pins./60um Pitch
- Tip Diameter: 8 ~ 30um (Variable for customer spec.)
- Planarity: less than 15um (depends on Device size)
- Contact resistance: <4 Ohm
# Silicon and Ceramic Guide for fine pitch

## Vertical-40 Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle Material</td>
<td>Ni Alloy</td>
</tr>
<tr>
<td>Beam Diameter</td>
<td>20um x 20um</td>
</tr>
<tr>
<td>Tip Diameter (Flat)</td>
<td>20um x 20um</td>
</tr>
<tr>
<td>Min. Pad to Pad Pitch</td>
<td>≥ 40um</td>
</tr>
<tr>
<td>Alignment (X, Y)</td>
<td>±4um</td>
</tr>
<tr>
<td>Planarity</td>
<td>&lt;12um</td>
</tr>
<tr>
<td>Needle Force</td>
<td>Force @ 70um 2.9 g (Depend on user spec)</td>
</tr>
<tr>
<td>Scrub Mark</td>
<td>≤ 20um</td>
</tr>
<tr>
<td>Recommended OD</td>
<td>70um (Max 90um)</td>
</tr>
<tr>
<td>Contact Resistance</td>
<td>≤ 4Ω (Wired)</td>
</tr>
<tr>
<td>Max Current</td>
<td>450mA</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>≤ 10nA / 5V</td>
</tr>
<tr>
<td>Test Frequency (Probes)</td>
<td>≤ 10nA / 5V</td>
</tr>
<tr>
<td>Test Temperature</td>
<td>-40°C ~ 150°C</td>
</tr>
<tr>
<td>Parallelism</td>
<td>System LSI. SoC: Over 2Para Memory: x32, X64, x128</td>
</tr>
<tr>
<td>Applications</td>
<td>LSI-Logic(SOC Flip chip), CIS, Memories</td>
</tr>
<tr>
<td></td>
<td>Area Array, Inline, Peripheral Bump pad(Au, Solder), Al pad</td>
</tr>
</tbody>
</table>

**Applications:**
- LSI-Logic(SOC Flip chip)
- CIS
- Memories
- Area Array, Inline, Peripheral
- Bump pad(Au, Solder), Al pad
40um Pitch 1,058 Bump pad Probe Head

Probe Head Detail

Pitch 20x20 um / 40 um Hole Center to center

Silicon Guide

Magnification Probe Head

Bump Pad Before Contact
Compare picture the Vertical probe cards with Cantilever Expandible DUT’s Array as the below pictures.
Non linearity Probe Needle force

<table>
<thead>
<tr>
<th>Over Drive</th>
<th>0um</th>
<th>10um</th>
<th>20um</th>
<th>30um</th>
<th>40um</th>
<th>50um</th>
<th>60um</th>
<th>70um</th>
<th>80um</th>
<th>90um</th>
<th>100um</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Force</strong></td>
<td>0</td>
<td>0.5</td>
<td>0.9</td>
<td>1.4</td>
<td>2.2</td>
<td>2.6</td>
<td>2.7</td>
<td>2.8</td>
<td>2.9</td>
<td>3.2</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>High Force</strong></td>
<td>0</td>
<td>1.8</td>
<td>2.4</td>
<td>3.4</td>
<td>3.9</td>
<td>4</td>
<td>4.2</td>
<td>4.3</td>
<td>4.5</td>
<td>4.7</td>
<td>5.0</td>
</tr>
</tbody>
</table>

**Probe Contact Force vs Over Drive**

Contact force/gram vs Over Drive (μm)

- **Cobra Needle**
- **High Force**
- **Low Force**
# Probe needle test results

## Life time Test

<table>
<thead>
<tr>
<th>Life Time</th>
<th>Tip Length</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMS needles</td>
<td>40um x 40um Needle /OD60um 1,000,000 touch down Life Time Test results</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TD’s 200K</td>
<td>TD’s 400K</td>
</tr>
<tr>
<td>initial</td>
<td>360um</td>
<td>357um</td>
</tr>
<tr>
<td>Measured value</td>
<td>357um</td>
<td>354um</td>
</tr>
<tr>
<td>difference</td>
<td>-3um</td>
<td>-3um</td>
</tr>
<tr>
<td>initial</td>
<td>40 x 40um</td>
<td>40 x 40um</td>
</tr>
<tr>
<td>Measured value</td>
<td>40 x 40um</td>
<td>40 x 40um</td>
</tr>
</tbody>
</table>
Interpose Structure

1. Short Transmission Signal (vs. MLC, MLO)
2. High Speed > LSI: 1GHz, DRAM: 250MHz…
3. Fine Pitch > 70um pitch (depend on pad size)
4. Stable Contact > Hard & Soft gold plating
5. Good Planarity > Under 10um (regardless of size)
6. Easy Repair > Just need 1 day
7. Short Delivery > Within 4 weeks based on 8K

Simulation Result

- Delay time

PCB

PCB + MVP + PH

Real PAD Image
<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold Pad thickness</td>
<td>Hard Electric plating</td>
<td>3~5 um</td>
</tr>
<tr>
<td>Contact Resistance</td>
<td>0.1 m-ohm</td>
<td>Under 0.1 m-ohm</td>
</tr>
<tr>
<td>Current</td>
<td>100 um wire</td>
<td>1.2 A</td>
</tr>
<tr>
<td>Pattern Resistance</td>
<td>5mm</td>
<td>Under 0.5 ohm</td>
</tr>
<tr>
<td>Speed</td>
<td>10 mm pattern length</td>
<td>Normal 1 Ghz ( option 2~5Ghz )</td>
</tr>
<tr>
<td>Touch down strength</td>
<td>Cobra tip condition</td>
<td>Over 500 k ( after simple cleaning )</td>
</tr>
<tr>
<td>Repairable</td>
<td>Damaged Pad by hard thing</td>
<td>Available in 1 days</td>
</tr>
<tr>
<td>Min Pitch</td>
<td>80 um pitch</td>
<td>Depend on pad size</td>
</tr>
</tbody>
</table>
# Future Direction of Required Technologies

## System on chip (SoC) Flip Chip Technology

<table>
<thead>
<tr>
<th></th>
<th>Today (Standard) Flipchip</th>
<th>Today (Fine Pitch) Flipchip</th>
<th>Today (Fine Pitch) Flipchip</th>
<th>Today (TSV)</th>
<th>Tomorrow (TSV)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bump Material</strong></td>
<td>EU.Solder</td>
<td>Solder (Sn Ag)</td>
<td>Solder (Sn Ag) Au CuSn</td>
<td>Solder (Sn Ag) Cu-Au</td>
<td>Cu-Au</td>
</tr>
<tr>
<td><strong>Bump type</strong></td>
<td>FlipChip Bump</td>
<td>FC Fine Pitch Bump</td>
<td>FC Fine Pitch Bump U-Bump</td>
<td>U-Bump</td>
<td>Cu Pillar Bump</td>
</tr>
<tr>
<td><strong>Bump Size</strong></td>
<td>100um</td>
<td>50um</td>
<td>50um</td>
<td>20~30um</td>
<td>15~20um</td>
</tr>
<tr>
<td><strong>Bump Pitch</strong></td>
<td>&lt;130um</td>
<td>100um</td>
<td>80um</td>
<td>50~60um</td>
<td>40um</td>
</tr>
<tr>
<td><strong>Probe Size</strong></td>
<td>3mil (75um)</td>
<td>2mil (50um)</td>
<td>1.5mil (38um)</td>
<td>1mil (25um)</td>
<td>0.75mil (19um)</td>
</tr>
<tr>
<td><strong>Cobra (Apollo)</strong></td>
<td>3mil은 Piitch120um 이상 제품</td>
<td>2mil은 90~110um 80um Pitch 대응안됨</td>
<td>1.5mil은 78um ?</td>
<td>&gt; 1mil (25um)</td>
<td>&gt; 0.75mil (20um)</td>
</tr>
<tr>
<td><strong>Bow (MBS) 적용 Size</strong></td>
<td>1.5mil (38~40um) 1.75mil (45um)</td>
<td>1.5mil (38~40um)</td>
<td>&gt; 1mil (25um)</td>
<td>&gt; 0.75mil (20um)</td>
<td></td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td>Fine Pitch SoC</td>
<td>Fine Pitch SoC Si 인터포저 Bump</td>
<td>SoC 2.5D, TSV 2.5D, 3D, TSV</td>
<td>SoC 2.5D, TSV 2.5D, 3D, TSV</td>
<td></td>
</tr>
<tr>
<td><strong>Contact force</strong></td>
<td>C : 2.8g/mil</td>
<td>C : 1.5g/mil</td>
<td>BL : 1.2g/mil</td>
<td>B : 0.8~1.5g@50OD</td>
<td>B : 0.7~1g@50OD</td>
</tr>
<tr>
<td><strong>Si node</strong></td>
<td>32nm (A5)</td>
<td>28nm (A6)</td>
<td>28nm, 22nm</td>
<td>22nm, 20nm</td>
<td>20nm, 14nm</td>
</tr>
<tr>
<td><strong>Pin count</strong></td>
<td>14000/4Dut</td>
<td>20,000/4Dut</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

자료출처: Silicon news
Technologies Required of Fine Pitch Probe card

**Wafer Bumping - Bump Sizes and Pitches**

- **Standard FC bump**
- **FC fine-pitch bump**
- **FC μ-bump**
- **Cu pillar bump**
- **SLID**
- **In bump**

**Bump size & pitch**

- 100 µm, 150 - 200 µm pitch
- 50 µm, 100 µm pitch
- 20 - 30 µm, 30 - 60 µm pitch
- 15 - 20 µm, 20 - 40 µm pitch
- 10 µm, 20 µm pitch
- 5 µm, 10 µm pitch

자료출처: Silicon news
Prober station fields
Probe Station for Analysis

**Prober Station CMP-200S**
- Powerful and easy to use
- For 8inch (3 Inch to 8 Inch Available)
- High accuracy & safety
- Compact and flexible desktop type
- Reasonable price
- User friendly X-Y driver
- Easy wafer handling

**Sanding Station CS-200D**
- Powerful and easy to use
- High performances and durability
- Portability and lightness
- Reasonable Price
- Minimizing of working space
- Controlling of speed and sanding quality
- Measurement of plate planarity by pressure Gauge

www.proberworld.com
Probe Station for Analysis

**Signatone S-460**

The S-460 is a 6” semi-automatic analytical probe stations represents mature technology at its best. Based on linear motor technology, which virtually eliminates accuracy and repeatability issues, the S-460 will deliver years of worry-free performance.

**Signatone S-1160**

The S-1160 is a rugged, economically priced prober that can be fitted with either high powered optics for probing small geometries or lower powered optics for probing bonding pads and larger geometries.
Wafer Probe Station

42” LED Probe Station
- Powerful and easy to use
- High accuracy & safety
- Reasonable price
- User friendly X-Y drive
- Easy LCD Panel handing
- Air Bearing Stage use

EG2001X Probe Station
- For 6inch (3 Inch to 6 Inch Available)
- Gold/Nickel Chuck
- Automatic Alignment
- Stage Resolution 1um to 2.5um
- Option
  . Hot Chuck
  . Probe Card Holder
  . Positioner
  . Interface GP-IB/RS232/TTL

www.proberworld.com Confidential
EG2080S, EG3001X

- For 8inch (3 Inch to 8 Inch Available)
- Gold/Nickel Chuck
- Automatic Alignment
- Stage Resolution 1um to 2.5um
- Option
  - Hot Chuck
  - Probe Card Holder
  - Positioner
  - Interface GP-IB/RS232/TTL

EG4090u

- For 8inch (5 Inch to 8 Inch Available)
- Gold/Nickel Chuck
- Automatic Alignment
- Stage Resolution 1um to 2.5um
- Option
  - Hot Chuck
  - Probe Card Holder
  - Positioner
  - Interface GP-IB/RS232/TTL
**TEL-19S**

- For 6inch (3 Inch to 6 Inch Available)
- Gold/Nickel Chuck
- Automatic Alignment
- Stage Resolution 1um to 2.5um
- Option
  - Hot Chuck
  - Probe Card Holder
  - Positioner
  - Interface GP-IB/RS232/TTL

**TEL-P8 Series**

- For 8inch (5 Inch to 8 Inch Available)
- Gold/Nickel Chuck
- Automatic Alignment
- Stage Resolution 1um to 2.5um
- Option
  - Hot Chuck
  - Probe Card Holder
  - Positioner
  - Interface GP-IB/RS232/TTL
TEL P-12XLM
SACC
Linear Scale
Shield System
OCR
VIP3A/VIP4
Mapping Arm
TSI Loader

TEL Precio
SACC
Linear Scale
Shield System
VIP4
Mapping Arm
TSI Loader
**TSK APM-90A**

- For 8inch (5 Inch to 8 Inch Available)
- Gold/Nickel Chuck
- Automatic Alignment
- Stage Resolution 1um to 2.5um
- Option
  - Hot Chuck
  - Probe Card Holder
  - Positioner
  - Interface GP-IB/RS232/TTL

**TSK UF-200**

- For 8inch (5 Inch to 8 Inch Available)
- Gold/Nickel Chuck
- Automatic Alignment
- Stage Resolution 1um to 2.5um
- Option
  - Hot Chuck
  - Probe Card Holder
  - Positioner
  - Interface GP-IB/RS232/TTL
UF-3000 Series

Full Contact Probing
Multi-Die Probing
Needle Cleaning
Mini-Environment
PMI : Probe Mark Inspection
Loader : Double Loader / Various Automated Loaders including OHT
HST : Head Stage Tilt Unit (Probe Card Tilt Unit)
Chuck : Normal Temp / High Temp / Low Temp / Ultra Low Temp
( Low Noise Option On All Chucks Available )
APC : Automatic Probe Card Changer
Cassette ID Reader
Wafer ID Reader ( Front Surface / Back Surface )
Printer
GP-IB Interface

Thank You.