
Dry Etching System
By the microfabricated technology of the semiconductor, a great number of micromachines come into the world. Development of micromachines are being remarkably advanced by the fusion of biotechnology and nanotechnology, 3D microprocessing, 3D structure to be built up the silicon plate and self-configured 3D microstructure are also achieved. By applying these technology, a micro optical switch, a micromotor and a superconducting delivery system are researched and developed for practical use.

MEMS is applied for mobile devices or computers and it is also greatly expected to contribute to the advanced information such as in-vehicle devices and optical communication network by development for the use of optical signal control and optical sensing, etc. While the medical technology is dramatically being progressed, increase in life expectancy spurs this technical innovation for medical and welfare use. We are making a great progress and contributions in this field. The technology is greatly expected to contribute to environmental compatibility such as usage in the biofield, environment measurement and utilization of the mechanism to make living environment comfortable.

Panasonic Makes Great Contribution In Dryetching Processing.

Micromachine Playing a Role in Various Area Such as a Sensor, Optical Communication and a Microchip.
Panasonic Dry etching device to enable TSV (Through-SiVia) processing used for 3D laminated device which is a main of the next generation bonding, deep drilling processing on a silicon plate and metal processing to support various MEMS devices, high aspect and micro fabrication for the power device and processing of difficult etching materials.

**Rich Lineup Supported for Device Evolution**

**Simple & Compact**

**E600 Series**

- E620 R&D
- E620
- E650

MSC type ICP/RIE

75~200mm

Single-wafer manual placement and automatic transfer

For R&D use Low cost

(Same chamber as that for E620)

- Gate material (Poly-Si, Wsi, W etc)
- Insulation film (SiO2, SiN etc)
- Non-volatile material (Pt, Au, Ir, NiFe etc)
- Ferroelectric Material (PZT, SBT etc)
- Deep-Si (MEMS)
- III-V group compounds (GaAs, GaN, InP etc)
- Others (SiC, Al2O3, resin, quartz, Mo, Ru etc)

**E700 Series**

- E720
- E760

Advanced ICP/RIE

75~200mm

High area productivity

Multi-chamber design

- Metal wiring (Al, Ti, TiN etc)
- Corrosive material (NiFe, PZT, SBT etc)

**Advanced ICP/RIE**

- Gate material (Polysil, Wsi, W etc)
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- Others (SiC, Al2O3, resin, quartz, Mo, Ru etc)

**Metal wiring**

- Photo-mask (Cr, Si, Ru, SiO2, Silicide)
- Corrosive material (NiFe, PZT, SBT etc)
Semiconductor Package Development Trend

The device such as the mobile product of CMOS/CCD which is represented as the mobile phone is being expected to be undergoing big change. We provide higher accuracy and smaller size devices which are demanded for laminated DRAM and CMOS image sensor, etc. essential for mobile equipment. Furthermore, we contribute to produce the higher-level 3D image sensor used in medical and biological field, DSP and memory, etc.

Support Various Dry Etching and Ashing of TSV Process
- Developed the Dry Etching technology for Through-Silicon Via toward small and thin CMOS image sensor (We have introduced result of mass production)
- Currently developing the fine process technology for memories (DRAM and Flash)

Etching Case of TSV (Through-Si Vias) Stoke

Fine and Through-silicon Via Hole Process

Via Bottom SiO2 Process

Taper Control Process

High Speed and Overall Process

TSV Via
ø 10 µm x depth 30 µm

ø 80 µm x depth 100 µm

TSV Real Structure
(Si/SiO2/Metal/Sub.)

TSV Real Structure
(3D-Bare/TSV Die Stack)

Vertical Shape

Taper Shape

Si EIR 56 µm/min
Depth > 110 µm

56 µm/min

Under development

%BSF
547%

%JF
4UBDLJOH

56 µm/min

Stop at the metal layer

Notch-free

Achieving uniform and stable processing in 8-inch

Uniform and stable processing of SiO2 via bottom

TSV Real Structure
(3D-Bare/TSV Die Stack)
Excellent Etching Performance (Etched Sample by ICP)

Panasonic supports the mass-production of leading-edge thin-film devices with technologies developed using a variety of semiconductor manufacturing equipment (3 to 8 inches). Provides the industry’s top processing performance.

MEMS/BOSCH/Deep-Si (High Aspect & Deep-trench Etching)

High Aspect Etching & Deep-trench Etching

Various Applications and Mass Production Experiences

High Rate Via Etching (SiC, InP) / Smooth Etching (GaN)

Long Maintenance Cycle Has Been Proven

Plasma Technology

Fundamentals of The Latest Technology Proven by Its Number of Uses and High Reliability

MSC (Multi-Spiral Coil) Type Advanced ICP

Proprietary Plasma Source

Low-pressure high-density plasma enables micro-processing and high-aspect-ratio etching.

Low-inductance induction coil achieves high power efficiency. 1.5 times more efficient than a single spiral. Excellent matching characteristics can provide a stable electric discharge over a wide range of pressure.

Optimized coil shape achieves highly uniform etching.

Advanced ICP plasma density

Power dependency of advanced-ICP ion saturation current density

Advanced-ICP Configuration

Proprietary Transfer Mechanism

High-speed high-reliability water transfer by the proprietary fully cam-operated mechanism.

MTBF of the cam-driven transfer mechanism > 60,000 hours (There have been no problems for 6 years)

RIE System

For applications not requiring micro-processing! Excellent cost performance. (Plasma source is selectable for each application)

Support for Various Materials

Metal: Ti, k, Cr, NiCo, NiFe / Insulation film: Quartz, sapphire and AIN / Others: PZT, LT, LN
Vast Experience Built Up in Mass Production E600 Series

MSC Type
- MSC Type ICP
- MSC Type RIE

75~200 mm

Single Chamber

Simple & Compact

E600 Series

Advanced Function and High-reliability Further Improved with Space-saving Design

High Serviceability Chamber Structure
Easy maintenance made possible by the simple chamber structure. Easily detachable top quartz component and inner chamber. Built-in chamber heater improves process stability by suppressing the attachment/separation of the reaction product.

Easy-to-see Graphic Screen
Improves Operation and Control
The 15-inch color graphic screen makes the operation easier. Full-range of maintenance functions built into the system.

Equipment Status Screen
- Real-time displays of wafer position, transfer arm and gate condition.

Recipe Input Screen
- 100 recipes can be preset for a chamber.
- Up to 20 steps can be set for a recipe.

Space-saving Design
Industry’s smallest footprint as full automatic production-capable equipment. Integrated control rack into the main unit further improves the compactness.

Easy-to-see Graphic Screen
Improves Operation and Control
The 15-inch color graphic screen makes the operation easier. Full-range of maintenance functions built into the system.

Recipe Input Screen
- 100 recipes can be preset for a chamber.
- Up to 20 steps can be set for a recipe.

Full-range of Optional Functions
- Gas inlet port built into a showerhead
- Large-flow high-speed gas discharge (2400 liter/sec)
- Electric/Static Chuck
- High-accuracy emission spectroscopic EPM, laser EPM
- ESC or mechanical clamp selectable
- Adaptable to a variety of water sizes and shapes
- Clean module unit

The best seller with its ultimate simplicity and compactness

E620 R&D Series
- Single-wafer manual placement and automatic transfer
- For R&D-use: Low cost (Same chamber as that for E620)

E620 Series
- Simple and compact chamber

E620 Series
- Equipment with
  - Installed area

Gate material (Poly-Si, W, W etc.)
Insulation film (SiO2, SiN etc.)
Non-volatile material (Pt, Au, Ir, NiFe etc.)
Ferroelectric Material (PZT, SBT etc.)
Deep-Si (MEMS, II-VI group compounds GaAs, GaN, InP etc.)
Others (SiC, Al2O3, resin, quartz, Mo, Ru etc.)

Metal wiring (Al, Ti, TiN etc.)
Corrosive material (NiFe, PZT, SBT etc.)

Corrosion-free by etching + ashing

E650 Series
- Integrated etching and ashing
- The ashing chamber combined with an ICP-down-flow plasma can handle resist ashing after all types of metal etching and improve the anti-corrosion performance.

Equipment with
  - Installed area
High Performance & Compact

E700 Series

High Productivity Achieved by The Multi-chamber System by The High-vacuum Discharge System.

Up to Four Loadable Chambers
High productivity achieved by the multi-chamber system.

Footprint Within The Industry’s Smallest Class
Integration of the control unit and gas supply unit into the main equipment makes dual-chamber equipment as compact as a single-chamber equipment.

High-accuracy High-uniformity Processing
Advanced ICP and showhead achieve high-accuracy uniform processing.

High Flow-rate High-vacuum Discharge System Increases Process Margin
Use of a large-diameter chamber reduces the effects of the wall surface.

Reduced Dust Generation
Use of a slide type gate reduces dust generation.

Options
- E600 model etching chamber is selectable (E700-SC series)
- Gas supply port built into the showhead
- Large flow-rate high-speed evaluation (2400 liter/sec)
- Electric Static Chuck
- High-accuracy emission spectroscopic EPM, laser EPM
- E84 or mechanical clamp selectable
- Accepts various wafer sizes and shapes (square wafer, glass substrate etc.)
- Clean module unit

Data on the effect of the multi-chamber system.

High area productivity Multi-chamber design

E720 Series
- Largely versatile multi-chamber design
- High-performance and compact

E760 Series
- Multi-chamber design with two etching and two ashing chambers

Data on the effect of the multi-chamber system.

Gas discharge characteristics

- Closed side limit value
- Fully open

Options

- Corsion-free by etching + ashing

Data on the effect of the multi-chamber system.

Advanced ICP Advanced RIE 75–200 mm Multi Chamber

Advanced ICP and showhead achieve high-accuracy uniform processing.

Use of a slide type gate reduces dust generation.

Improved operability and automatic maintenance check function
- Up to 100 recipes can be assigned to each chamber.
- Each recipe can contain up to 20 steps.

Options
- E600 model etching chamber is selectable (E700-SC series)
- Gas supply port built into the showhead
- Large flow-rate high-speed evaluation (2400 liter/sec)
- Electric Static Chuck
- High-accuracy emission spectroscopic EPM, laser EPM
- E84 or mechanical clamp selectable
- Accepts various wafer sizes and shapes (square wafer, glass substrate etc.)
- Clean module unit

Data on the effect of the multi-chamber system.
### Specifications

#### Equipment Specifications

<table>
<thead>
<tr>
<th>E620 R&amp;D</th>
<th>E620</th>
<th>E660</th>
<th>E720</th>
<th>E760</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas Supply Unit</strong></td>
<td><strong>Maximum 3 Systems</strong></td>
<td><strong>Maximum 6 Systems</strong></td>
<td><strong>Maximum 6 Systems</strong></td>
<td><strong>Max. 6 Systems X 2 Chambers</strong></td>
</tr>
<tr>
<td><strong>Gas Discharge System</strong></td>
<td><strong>Etching Chamber 1</strong></td>
<td><strong>Etching Chamber 2</strong></td>
<td><strong>Ashing Chamber</strong></td>
<td><strong>Load Lock</strong></td>
</tr>
<tr>
<td><strong>Etching Chamber 1</strong></td>
<td><strong>Trp + Dry Pump</strong></td>
<td><strong>Trp + Dry Pump</strong></td>
<td><strong>Trp + Dry Pump</strong></td>
<td><strong>Dry Pump</strong></td>
</tr>
<tr>
<td><strong>Etching Chamber 2</strong></td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Ashing Chamber</strong></td>
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<td>—</td>
<td>—</td>
</tr>
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<td><strong>Load Lock</strong></td>
<td>—</td>
<td>—</td>
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</tr>
<tr>
<td><strong>Water Transfer System</strong></td>
<td><strong>Cassette to Cassette / Cam-driven</strong></td>
<td><strong>Double-arm Water Transfer System</strong></td>
<td><strong>Cassette to Cassette / Cam-driven</strong></td>
<td><strong>Double-arm Water Transfer System</strong></td>
</tr>
<tr>
<td><strong>Control System</strong></td>
<td><strong>Keyboard at One Location / 10.4-inch LCD at One Location</strong></td>
<td><strong>(Movable Between The Front and Back)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Utility and Equipment Mass Specifications

<table>
<thead>
<tr>
<th>Power Capacity</th>
<th>7.5 KVA</th>
<th>7.5 KVA</th>
<th>7.5 KVA</th>
<th>42 KVA</th>
<th>60 KVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Consumption</td>
<td>28 KVA</td>
<td>28 KVA</td>
<td>30 KVA</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Water</td>
<td>24 L/min</td>
<td>24 L/min</td>
<td>36 L/min</td>
<td>40 L/min</td>
<td>62 L/min</td>
</tr>
<tr>
<td>Discharge</td>
<td>General Discharge (95%)</td>
<td>1.2 m³/min</td>
<td>1.2 m³/min</td>
<td>1.5 m³/min</td>
<td>5.5 m³/min</td>
</tr>
<tr>
<td>Oxygen Discharge (35%)</td>
<td>4.9 m³/min</td>
<td>4.9 m³/min</td>
<td>4.9 m³/min</td>
<td>9.8 m³/min</td>
<td>11.8 m³/min</td>
</tr>
</tbody>
</table>

#### Equipment Mass

<table>
<thead>
<tr>
<th>Power</th>
<th>1,300 kg</th>
<th>1,800 kg</th>
<th>2,300 kg</th>
<th>2,700 kg</th>
<th>3,200 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Preparation</td>
<td>1,500 kg</td>
<td>1,500 kg</td>
<td>1,800 kg</td>
<td>2,000 kg</td>
<td>4,000 kg</td>
</tr>
</tbody>
</table>

*Use the filter.*

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**PLASMA DRY ETCHING SYSTEM**

### High Cost-Performance

**High Cost-Performance with Precision & Reliability**

The high performance and reliability achieved through our unique plasma sources (ICP and RIE) and board transfer mechanism, coupled with the industry's smallest footprint, provide excellent cost performance.

### Applications for Various Needs

**Applications for Various Needs**

A wide variety of applications meet the processing needs of diverse devices and new materials, such as Si semiconductors, MEMS, compound semiconductors, and nonvolatile materials. Deep Si etching, etching of SiO₂, quartz, and other difficult-to-process materials can be performed on the same platform.

### Total Support

**Total Support for R&D and Mass Production**

Strongly supports the total process from research right through to manufacturing based on the vast experience built up in mass production. Supports 3 to 8-inch diameter boards and square boards.
Panasonic Dry Etching System

Safety Precautions

Please read the operation manual carefully when using the equipment. This equipment is designed for use in a clean room where the air temperature, humidity and cleanliness are controlled. Any equipment operation in other environments may cause a fire, equipment failure, electrical shock or gas leak.

Matsushita Group products are built with the environment in mind.
http://panasonic.co.jp/eco/en/


inquiries...

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*Changes in specifications and appearance may be made without notice for product improvement.
*Recycled paper is used for this Catalog.