

# Challenge to the Future

We develop with society and continue to fulfill our goals of being a highly trustworthy and attractive company.

## Management Principles

- Create a frank and open-minded business culture
- Continue efforts to enhance our technology
- Raise the quality levels of our products
- Contribute to society

## Management Vision

Aim to be a globally trusted corporate group by inspiring customers with high value-added products that have satisfying features, cost and quality.

## The Source of Our Value Creation

### Microprocessing Technologies That Inspire People

TOK delivers value in a wide variety of fields, including the manufacture of semiconductors, by rolling out microprocessing and applied technologies for the nanoscale\* domain, along with implementing our strategy of building close relationships with customers utilizing our technological knowledge and experiences and developing high value-added technologies from new standpoints.

\* Nanometer (1nm) = one millionth of a millimeter; one hundred-thousandth the width of a human hair

# The Cutting Edge

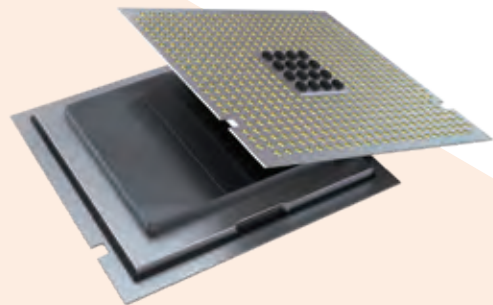
## Cutting-Edge Semiconductor Materials

Cutting-edge technologies such as semiconductors are playing a major role in finding solutions to the global risks and social issues that have been emerging one after another, such as rapid and far-reaching climate change and new pandemics.

TOK is creating shared value by developing high value-added materials for cutting-edge semiconductors that are helping to solve high-level social and scientific issues.



TOK's photoresists and high-purity chemicals



Cutting-edge semiconductors

### TOK's semiconductor material business

#### Economic value

Contributing to the evolution of all types of industry and technological innovation

#### Social value

Accelerating solutions to high-level social and scientific issues  
Contributing to creation of an environmentally friendly society

### Creating shared value



## 80 Years at the Cutting Edge of Technology

Our business model of contributing to solutions for the social issues of each era through cutting-edge fine chemicals has been part of the Company's immutable DNA, passed down since the time of our founder, Shigemasa Mukai.



TOK will continue to create value at the cutting edge, as an R&D-driven company meeting social expectations with chemicals.

1997  
Society's Expectations

ICT



2019

Society's Expectations



2020



**80th anniversary**

We will continue to evolve value creation in cutting-edge fields, aiming to become a 100-year company.

**TOK's Output:**

KrF excimer laser photoresists  
→ Spread of ULSI\*

**Outcome:**

Emergence of the internet and mobile society

**Philosophy:**

Continue efforts to enhance our technology

\* Ultra large scale integration: Integrated circuits with integration density of over 10 million semiconductor elements per chip



**TOK's Output:**

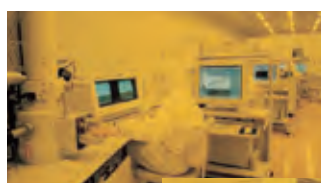
EUV photoresists → 5G & IoT innovation

**Outcome:**

Solving social issues using 5G

**Philosophy:**

Explore new technologies, enhance technological capabilities and meet social expectations with chemicals for a sustainable earth



Electron microscope room, R&D Building at the Sagami Operation Center (1997)



Stepper room, R&D Building at the Sagami Operation Center



TOK Advanced Materials Co., Ltd.



New R&D Building at the Sagami Operation Center

# Cutting-Edge Product

## Cutting-Edge Flagship Product: TOK's Photoresists

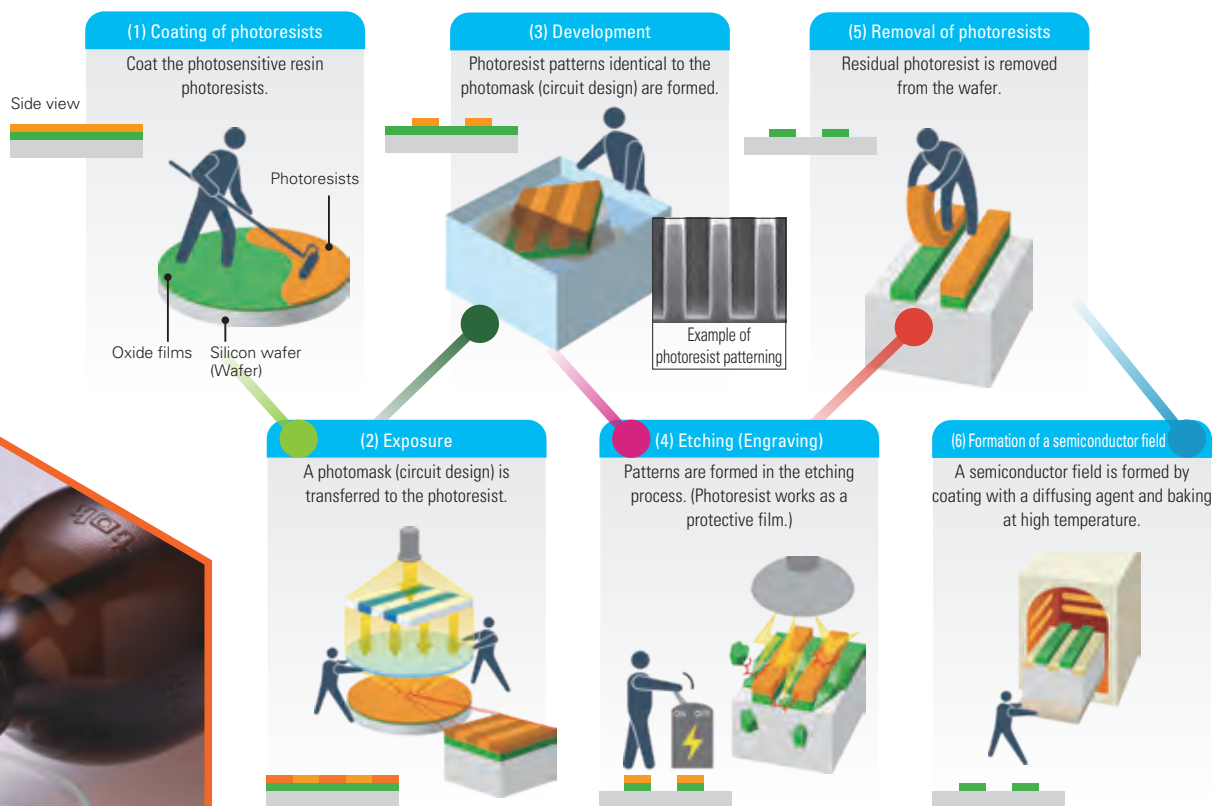
With its accumulated success in creating cutting-edge value, TOK is the world's No. 1 manufacturer of photoresists, which are photosensitive materials indispensable for the manufacture of semiconductors. We will explain the functions and performance of photoresists in the semiconductor manufacturing process.

### TOK's Semiconductor Photoresist Business

Process of making integrated circuits on a silicon thin disk that called wafer and producing LSI chips. The process utilizes photoresists' resistance to etching.

Semiconductor manufacturing flow

#### Front-end processes of semiconductor manufacturing



### Starting point for customer's value creation process

TOK's photoresists become an input in the value creation process of customers, and have a special influence on the quality of customers' output in terms of product quality and yields.

See pages 8-9

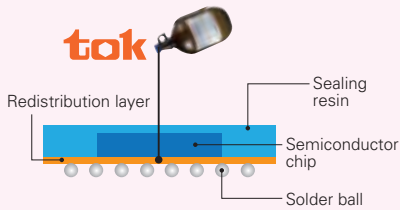
### Creating Shared Value

Load into various types of end products and create shared value

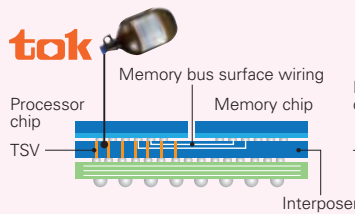
### Our Strength

Providing photoresists that become growth drivers in both front-end and back-end processes of semiconductor manufacturing

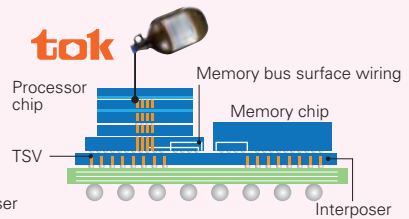
**EX. 1** Fan-out wafer level packaging (FOWLP) with photoresists for RDL fabrication



**EX. 2** 2.5D interposer with photoresists for RDL fabrication



**EX. 3** High Bandwidth Memory (HBM) with photoresists for RDL fabrication

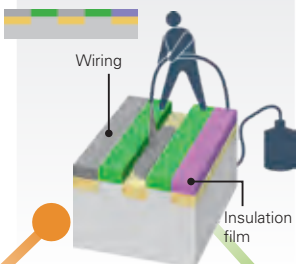


Process of dicing individual semiconductor chips and inserting in each type of packaging. The process utilizes photoresist thick-film forming capabilities.

### Back-end processes of semiconductor manufacturing

**(7) Formation of insulation film and wiring**

Aluminum or copper wirings are formed.



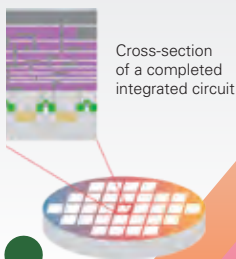
**(8) Formation of integrated circuits**

ICs are formed by repeating the processes (1) through (7).



**(9) Completion of an integrated circuit**

Multiple ICs are created on wafer surface using microprocessing technology.



**(10) Dicing of wafers**

Wafer is diced into chip-sized components.

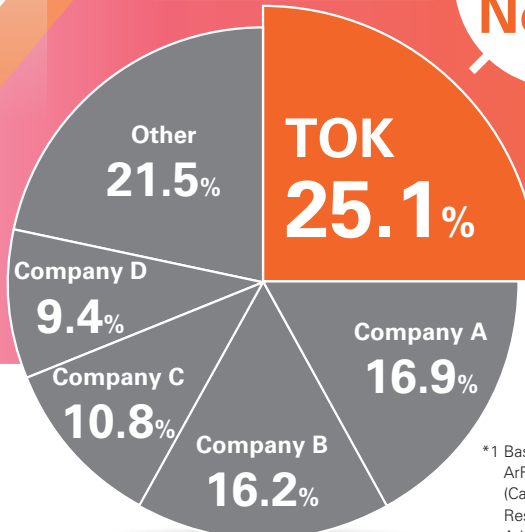


**Semiconductor chips completed**

Each diced wafer becomes a semiconductor chip.



**Global No. 1**



\*1 Based on projected total sales volume of EUV, ArF, KrF, g-Line and i-Line photoresists in 2019 (Calculated by TOK based on Fuji Chimera Research Institute's "2020 Electronics Advanced Materials Current Status and Future Outlook")

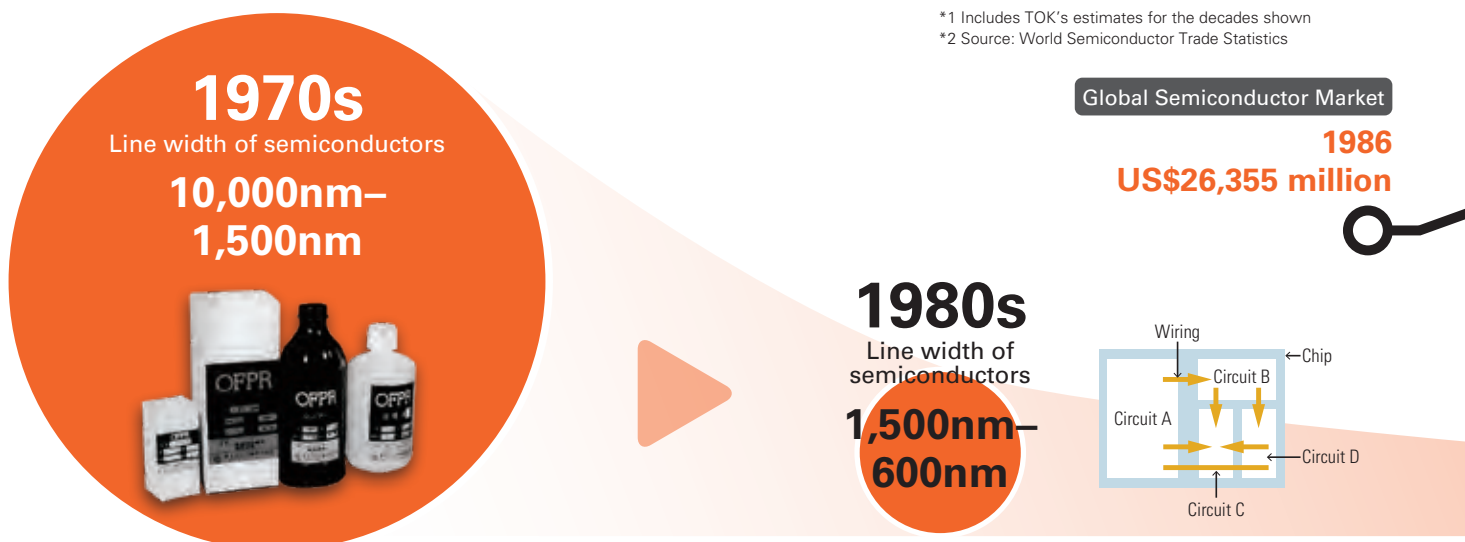
# Cutting-Edge Product Value

## Core Values of the Photoresist Business

Even when making semiconductors with the same line width and specifications, each semiconductor manufacturer requires vastly different features of photoresists and also uses them very differently. TOK has grown hand-in-hand with the semiconductor industry by continuously developing and providing tailor-made photoresists for customers who are leading cutting-edge miniaturization in each era. We will continue to play an essential role in the development and manufacture of cutting-edge semiconductors, contributing to the evolution of all types of industry, technological innovation, and the creation of an environmentally friendly society.

## Semiconductor Line Width\*<sup>1</sup> and Global Semiconductor Market Size\*<sup>2</sup>

\*1 Includes TOK's estimates for the decades shown  
\*2 Source: World Semiconductor Trade Statistics



Semiconductor manufacture using high value-added photoresists

Increasing transistor counts per chip and improving yields



### Factors Adding Value to Semiconductor Photoresists

Sensitivity	Resolution	Roughness* * Fluctuations in line width
Etching resistance	Substrate adhesiveness	Processing applicability
Purity	Substance safety	Cost



**Contributing to the evolution and technological innovation of all types of industry and the creation of an environmentally friendly society**

The value, or market size, of the semiconductor industry has continued to increase over the medium to long term in conjunction with the advancement in miniaturization by photoresists.

### 1990s

Line width of semiconductors

600nm–130nm



### 2000s

Line width of semiconductors

130nm–32nm



### 2010s

Line width of semiconductors

32nm–7nm



Increasing processing speeds and reducing manufacturing costs of semiconductors



Higher performance, greater compactness, lower power consumption, and lower cost of electronic devices

#### Core Values

We have **the capability** of swiftly providing finely tuned tailor-made photoresists for the different needs and requirements of each customer or process

