Epson's Microdevices Business

September 27, 2022
Seiko Epson Corporation

Disclaimer regarding forward-looking statements

The foregoing statements regarding future results reflect the Company’s expectations based on information available at the time of announcement. The information contains certain forward-looking statements that are subject to known and unknown risks and uncertainties that could cause actual results to differ materially from those expressed or implied by such statements. Such risks and uncertainties include, but are not limited to, the competitive environment, market trends, general economic conditions, technological changes, exchange rate fluctuations and our ability to continue to timely introduce new products and services.

Note regarding business profit

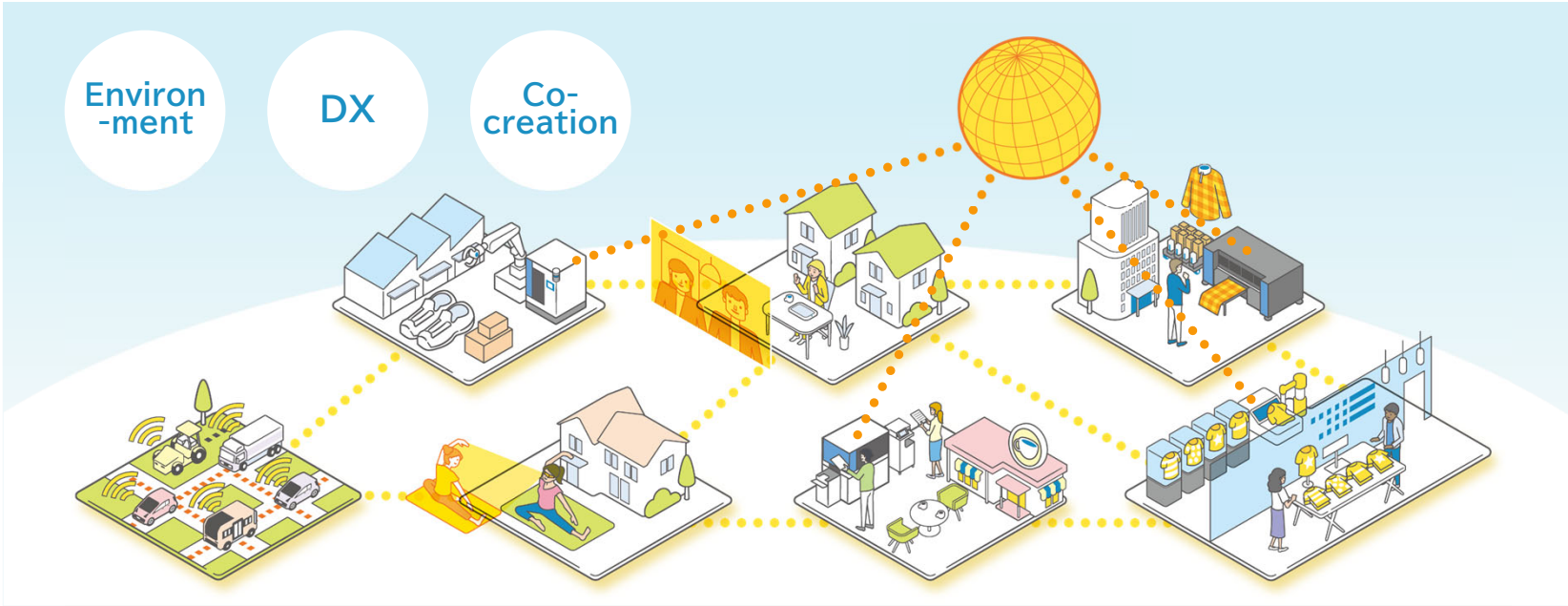
Business profit is calculated by deducting cost of sales and SGA expenses from revenue.
Although not defined in the statement of consolidated comprehensive income, this indicator is very similar to the concept of operating income under J-GAAP. Epson will present this information as a reference, as the Company believes users of financial statements will find it useful when evaluating Epson’s financial performance.

Numerical values presented herein

Numbers are rounded down to the unit indicated. Percentages are rounded off to one decimal place.

Epson 25 Renewed Vision

- Co-creating sustainability and enriching communities to connect people, things, and information by leveraging our efficient, compact, and precision technologies and digital technologies



Goals of the Microdevices Business

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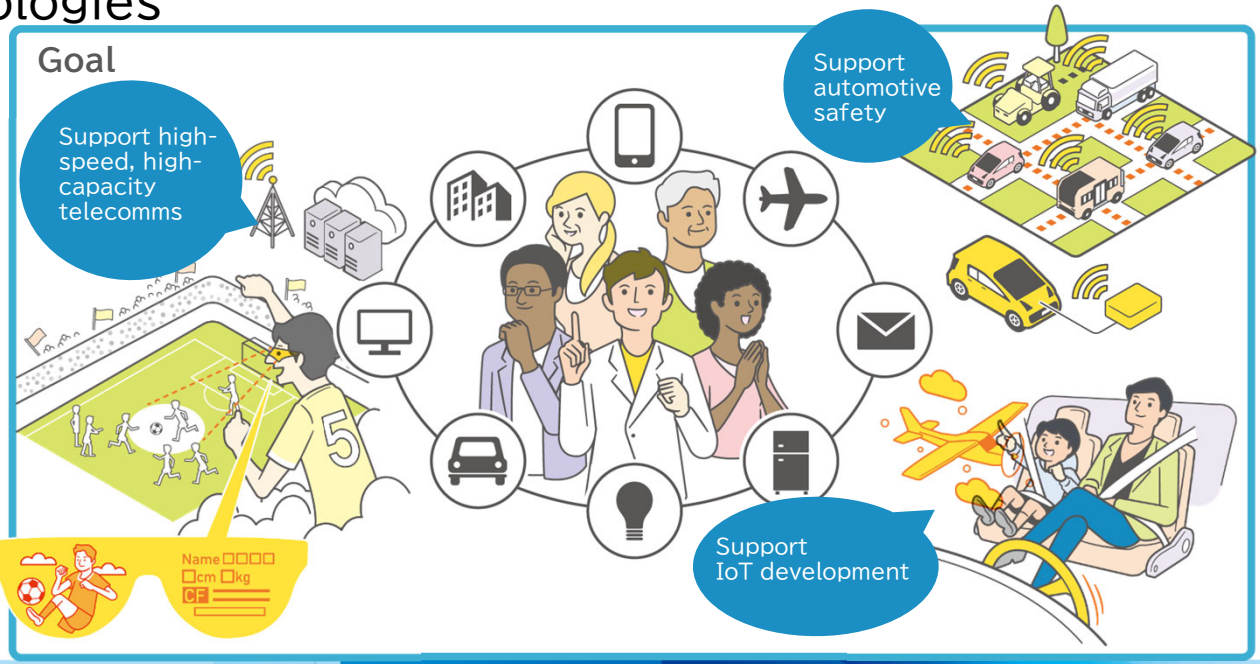
- Contribute to the development of smart communities with crystal and semiconductor solutions enhanced with our efficient, compact and precision technologies

Achieve sustainability in a circular economy

Advance the frontiers of industry

Improve quality of life



Value proposition

- Temperature-stable crystal devices
- Accurate, stable sensing devices
- Stable supply of small, low-power devices

Actions to Achieve the Goal

Telecom & network sector (5G/6G): Support high-speed, high-capacity telecom

Transform high-speed, high-capacity telecommunications infrastructure by providing high-precision, low-jitter products that combine temperature stable quartz crystals with Epson ICs optimized for their characteristics.

Consumer & industrial sector (IoT): Support the development of IoT

Drive the development of IoT infrastructure by providing ultra-compact timing devices manufactured using the best quartz crystal and semiconductor fabrication technologies.

Automotive sector (EV, AD/ADAS): Support automotive safety

Contribute to the realization of easier, safer, and more enjoyable mobility with sensing solutions centered around high-precision quartz crystal WT gyro sensors and ultra-low power timing solutions.

Actions for Enhancing the Value of Epson Products

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Support innovation at Epson

Enhance the value of Epson's finished products with unique technologies centered on efficient, compact, and precise crystal and semiconductor technologies.

Epson's Microdevices & Other Businesses

Financial Performance and Business Size

	Revenue	Business profit [1]	Profit for the year attributable to owners of the parent company
FY2021 Results	¥1,128.9 billion	¥89.6 billion	¥92.2 billion
FY2022 Outlook	¥1,360.0 billion	¥100.0 billion	¥74.0 billion

FY2021 revenue breakdown[2] (billion yen)

Printing Solutions
¥779.9 billion

Office & Home Printing

¥566.3B

Commercial & Industrial Printing

¥213.6B

Visual Communications
¥159.0 billion

Manufacturing-Related & Wearables
¥191.9 billion

Manufacturing Solutions

¥30.5B

Wearable Products

¥34.6B

PCs

¥18.9B

Microdevices, Other

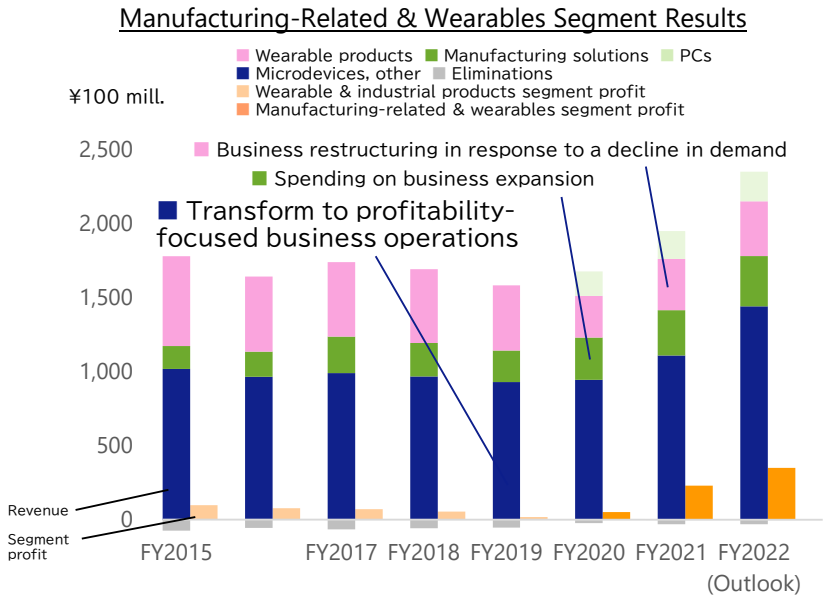
¥110.9B

[1] Calculated by deducting the cost of sales and SGA expenses from revenue. (Business profit is very similar to operating income under Japanese accounting standards.)
[2] Revenue amounts for the businesses include intercompany transactions.

Financial Results Trend

- Microdevices supports segment profit by continuously generating profit.
  - Transform to profitability-focused business operations

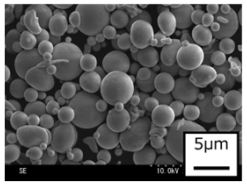
- Responding to strong demand
  - Ease bottleneck processes
  - Stabilize business through long-term contracts with customers



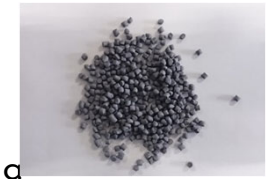
* Up to and including FY2019, the results are for the wearable products & industrial solutions segment. From FY2020, the results are for the manufacturing-related & wearables segment.

Superfine Metal Powders Business

- Characteristics
  - High-performance metal powders
    - ✓ Top sales within industry for manufacturing differentiated metal powders
  - Metal injection molding (MIM)
    - ✓ Parts with complex shapes using difficult-to-process materials
    - ✓ Integrated production system, from metal powder manufacturing to metal injection molding

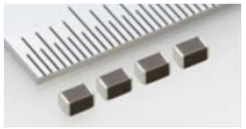


Metal powders


Pellets for molding

Epson Atmix Corporation

- Main applications
  - High-performance components in applications that demand low power consumption, small size, high frequency, and large currents
  - Parts with complex shapes and parts with high density and high strength
  - Materials for 3D metal printers


Inductors


Watch parts


SIDM printer parts


Assorted functional parts

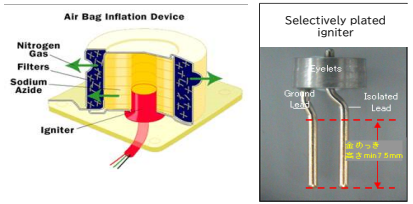
* No. 1 in sales of amorphous powders produced by atomizing

Surface Treatment and Processing Business

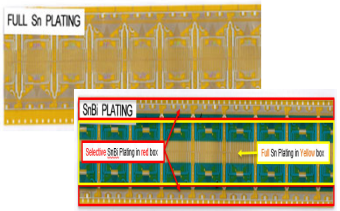
- Features
  - Responding to a wide range of customer requirements with both PVD* plating and wet plating
  - Provides one-stop service from development to plating process.
  - Various initiatives to reduce environmental impact, including the use of solar energy, water recycling/rainwater utilization, resource recovery and reuse.
- Main applications
  - Smart phone, telecommunications, automotive, watches and printers.

Singapore Epson Industrial Pte Ltd
(Plating Plant)

*Physical Vapor Deposition



Airbag components



Flexible printed circuit

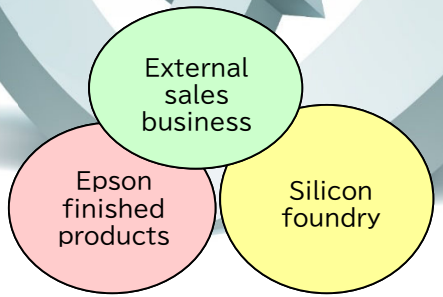
Watch decoration

Microdevices (Semiconductors)

- Generate stable profit with a line of products that boast distinctive features and by helping to enhance the value of Epson products
  - External sales, silicon foundry, and an ideal product portfolio for Epson products

Stable production with technology & quality developed for Epson's own products to support our customers' businesses.

Provide a **stable supply and quality of ICs** that support Epson products



Develop **technology & ICs** developed for Epson products

Semiconductors That Support Epson Products

EPSON
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- Enhance the value of Epson products
  - Feedback technology to enhance the value of finished products
  - Stable supply of semiconductors

Office & Home Printing Innovation

High-speed linehead inkjet multifunction printers

High-capacity ink tank inkjet printers

Commercial & Industrial Printing Innovation

Large-format printers

Manufacturing Innovation

SCARA robots

6-axis robots

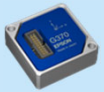
Visual Innovation

Projectors

Smart glasses

Lifestyle Innovation

Watches



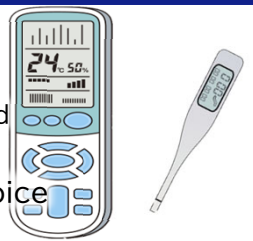
Inertial measurement unit (IMU)

Gyro sensor

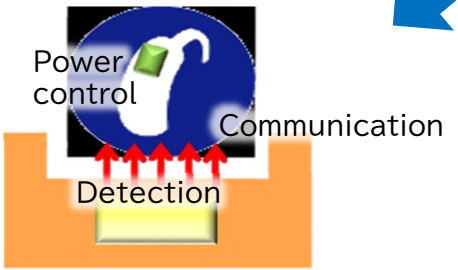
Semiconductor Lineup

- Evolution of products with distinctive features based on low-power technology first developed for watch ICs

Microcontrollers



Wireless charger ICs

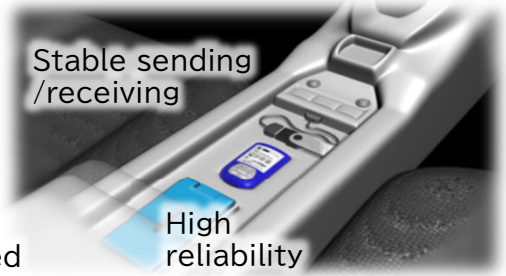


ASICs

Since 1982, we have provided ASICs for industrial equipment & many other applications

Display drivers & controllers

USB-Hub controller



- What are Crystal Devices
  - ✓ Timing devices
  - ✓ Sensing devices

What are Crystal Devices

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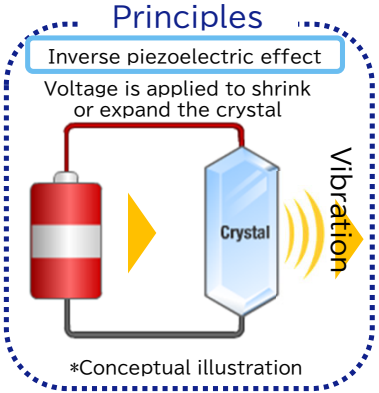
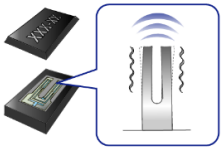
- Timing devices
  - Devices that produce regular electric signals (clock)
  - Essential in electronic devices and equipment



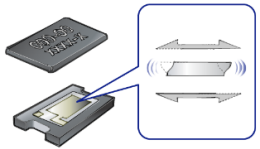
Crystal unit

The piezoelectric effect is used to cause the crystal to generate a fixed frequency

Tuning fork crystal unit



AT-cut crystal unit



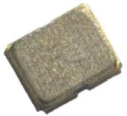
Crystal oscillator

A single package containing a crystal unit and an oscillator circuit

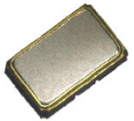
SPXO (crystal oscillator)

VCXO (voltage-controlled crystal oscillator)

Real-time clock (RTC) module



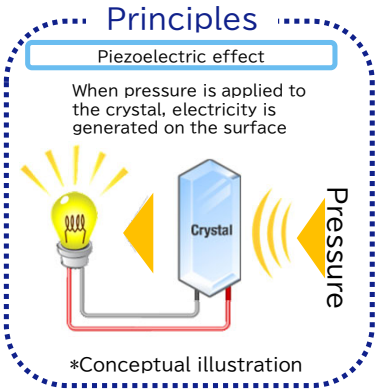
TCXO (temperature compensated crystal oscillator)



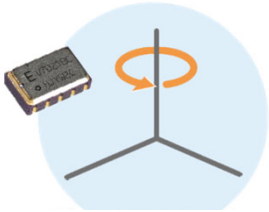
What are Crystal Devices

Sensing devices

- Devices that detect motion, temperature, pressure, etc.
- Convert various physical quantities into electric signals



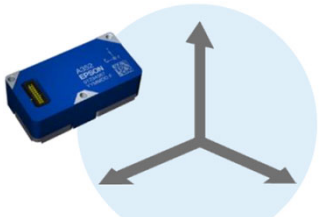
Gyro sensor



Gyro sensor

- A sensor that measures the rotational speed (angular velocity) of an object

Accelerometer



Accelerometer

- A sensor that measures the linear acceleration of an object

IMU

IMU*

- Equipped with a gyro sensor & accelerometer
- Used to measure and control the behavior (attitude and trajectory) of moving bodies based on angular velocity & acceleration measurements

* Inertial measurement unit

Features of Epson's Microdevices Business

Roots of the Crystal Device Business

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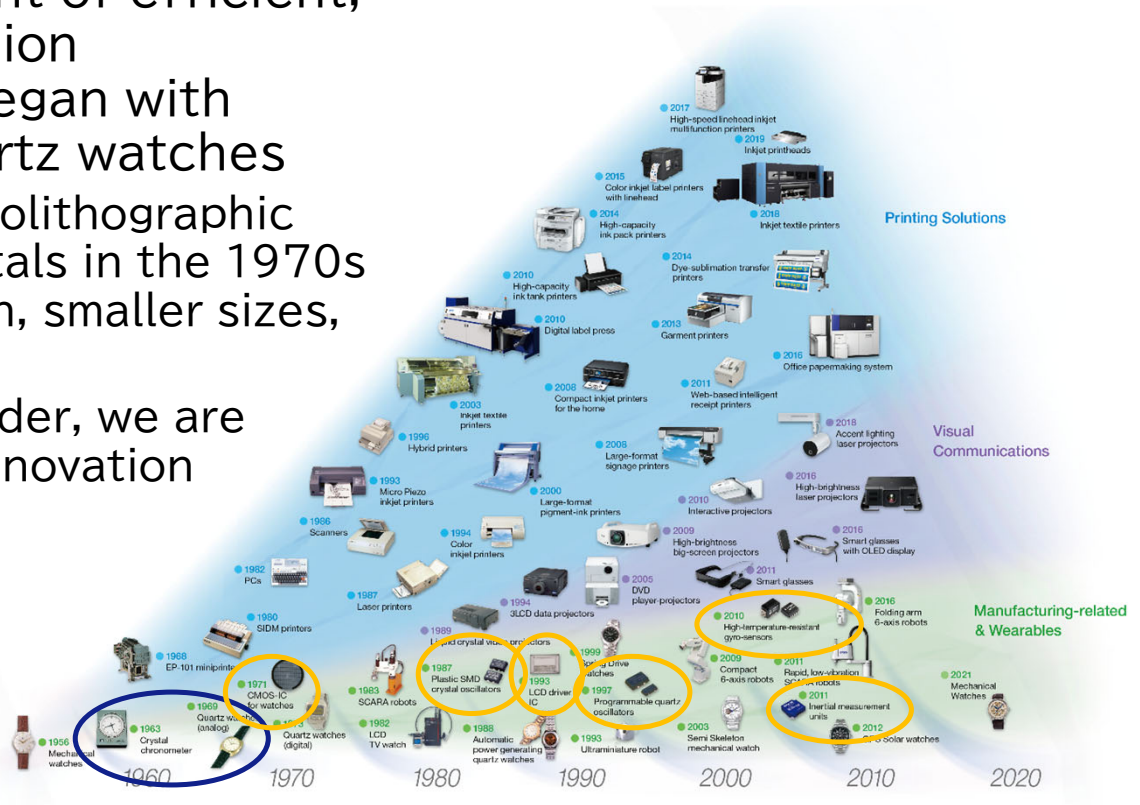
- Ongoing development of efficient, compact, and precision technologies that began with devices used in quartz watches
  - We pioneered photolithographic processing of crystals in the 1970s for higher precision, smaller sizes, and lower costs
  - As the industry leader, we are driving technical innovation

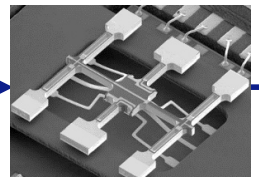


Vertical Integration

- We develop and manufacture in-house, from synthetic crystal production to crystal units and oscillators.
- Integrated crystal device & semiconductor product development & business operations

Synthetic quarts crystal production

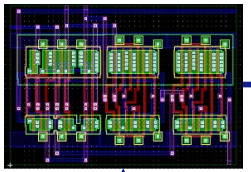
Grown ang produced at three sites



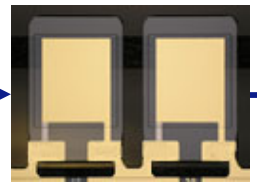
Crystal chip design

Crystal chip designs given a competitive edge with IP (tuning fork, HFF*, gyro)

IC design



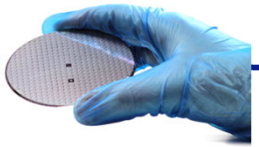
Integrated IC & crystal device design



Crystal unit fabrication

Accumulated photolithographic process technology and IP

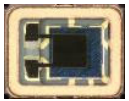
IC manufacturing (own fabs)



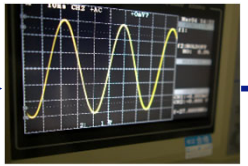
Posses both IC and crystal manufacturing

Manufacturing lines automated with robots

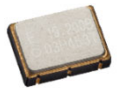
Oscillator manufacturing



Crystal unit & IC packaging (ceramic package)



Product inspection



Final product

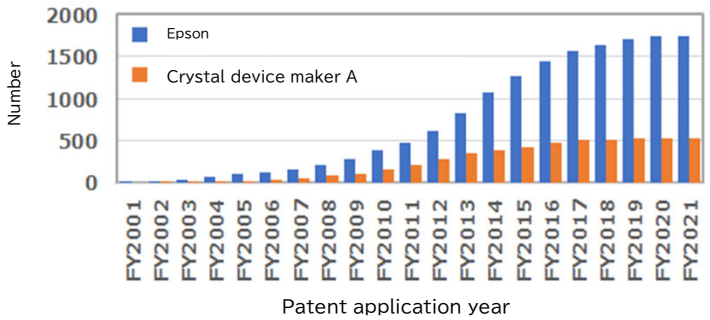
* HFF (high-frequency fundamental) is a registered trademark of Seiko Epson Corp.

Epson's Crystal Device Patents

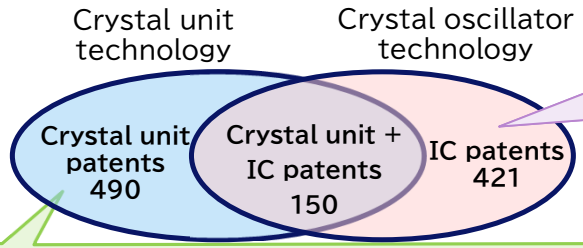
No. 1 in crystal device patents held*

Crystal device patent ranking

1st	Epson	1743
2nd	Company A (Crystal device manufacturer)	529

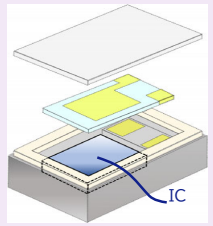


Timing device patent families formed by both crystal units and ICs

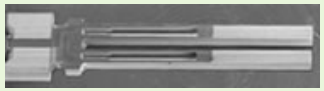


Crystal oscillator

Patents held
Oscillator ICs: 421
Crystal unit & IC in combination: 150

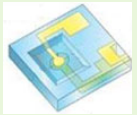


Tuning fork crystal unit



151 patents held

HFF crystal unit

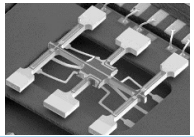


94 patents held

Also hold many gyro sensor patents

Quartz crystal gyro sensor

Patents held: 504



Patent related to improving the temperature stability of quartz crystal gyro sensors (Patent No. 4381354) received the Nagano Prefectural Governor's Award at the Kanto Regional Commendation for Invention in 2013 (sponsored by the Invention Association of Japan)

* Number of timing device and quartz crystal gyro sensor patents in Japan, the U.S., China, and Taiwan as of Sept. 2022 (per Epson research)

Sales Network (Crystal Device & Semiconductors)

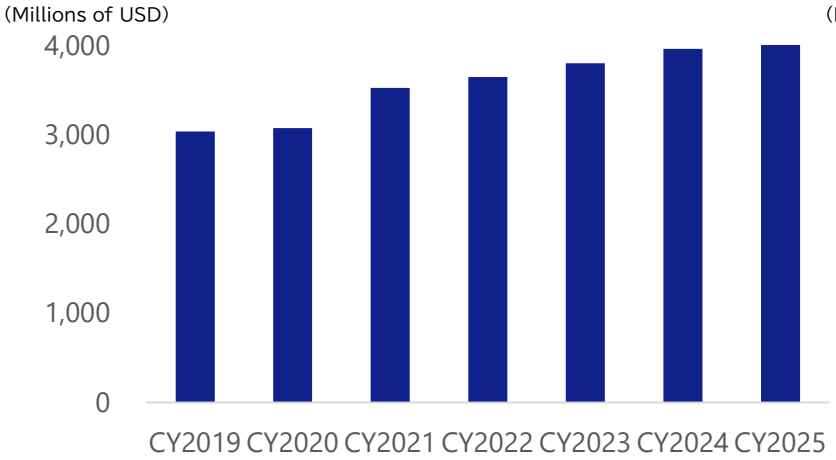
- In addition to our overseas sales companies, we have strong partnerships with dealers to support our customers worldwide

Crystal Device Markets and Epson's actions

Crystal Device Market Trend

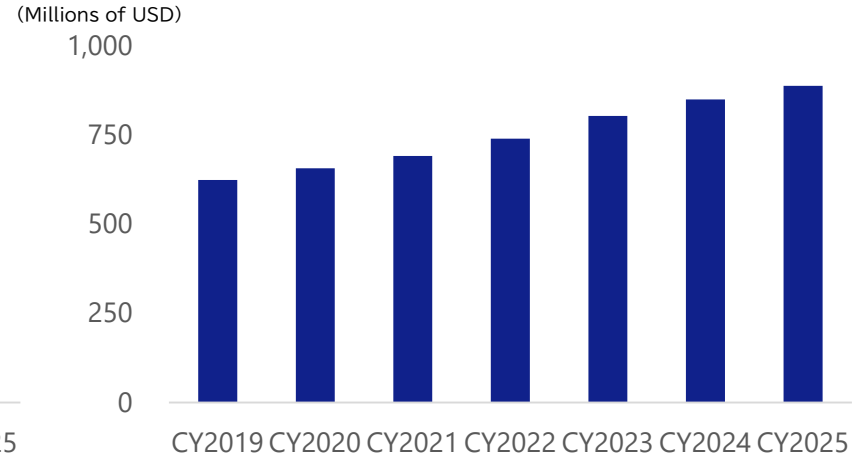
- Continued expansion due to an increase in digital equipment, IoT equipment, and communication infrastructure
- Supply shortages due to COVID-19 will continue for the time being, but will gradually ease

Timing device market size



Epson estimates based on data from research company CS & A LLC

Quartz sensing device market size



Epson estimate based on Yole, High-End Inertial Sensors Yole 2020 Report

Capture Demand for a Wide Range of Applications

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Composition of Epson's crystal device

Industrial

Automotive

Network

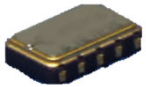
Consumer

Crystal units

A broad lineup of crystal units for 5G, IoT, and the automotive markets

Oscillators

Our oscillator lineup meets the needs of a wide variety of applications with products of various sizes, frequencies, functions, and temperature ranges



Gyro sensors

Accelero meters, IMUs

Lineup includes Quartz crystal gyro sensors, accelerometers, and IMUs that employ both

Consumer IoT equipment

Products

RTC modules
RX8901/4901CE

Compact, high-precision RTC modules that consume 30% less current consumption than previous products and have a time stamp function that can record up to 32 events.

Programmable SPXOs
SG-8101/8018 series

Short lead-times, are available even in small quantities, and can be programmed to output a desired frequency.

IMU
M-G370PDS0

An inertial measurement unit that is ideal for attitude and vibration control applications and has improved short-term noise.

Crystal Device Lineup | Automotive

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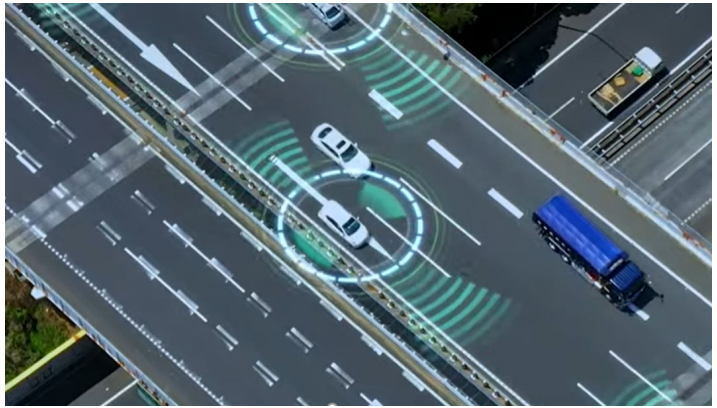
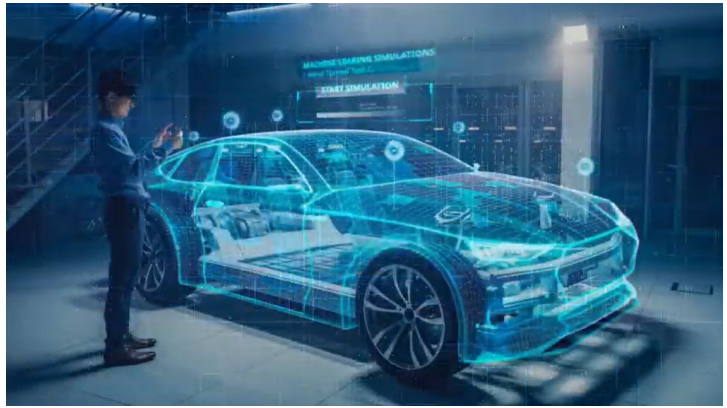
ADAS



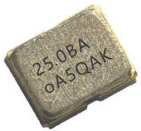
EV



Products

Automotive RTC modules
RA8000/4000CE

Small, accurate RTC modules that have clock and other functions such as time stamps guaranteed to be accurate up to +125°C



Automotive programmable SPXO
SG-8201CJA

Ideal for LiDAR & ADAS ECU, this SPXO has 1/25th the phase jitter of its predecessors. Short lead-times, available even in small quantities, and can be programmed to output a desired frequency.

Automotive gyro sensors

AEC-Q certified gyro sensors that are small and have excellent resistance to shocks and vibrations thanks to a crystal chip with a double-T structure

Crystal Device Lineup | Consumer Market

Consumer IoT equipment

Mirrorless SLR cameras

＊Growth rate (CAGR) estimated by Epson

Products

MHz crystal unit
FA1008AN

A small MHz crystal unit for use in small wireless modules, wearables, healthcare devices, small consumer devices, and small wireless devices

kHz crystal unit
FC2012AN

A kHz crystal unit for IoT modules, wearables, and low-power MCUs, it consumes 20% less current consumption＊ than its predecessor and oscillates stably even with a low drive IC

High-precision gyro sensors

Used for applications such as camera shake correction and unmanned vehicle guidance. Epson crystal chips provide outstanding bias temperature stability and low noise.

＊Results of simulations when an Epson IC is used

Crystal Device Lineup | Network Market

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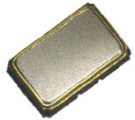
Data traffic

Server

Products

[High frequency oscillators SG2520 series]

High-frequency, low-jitter oscillators with a 44% smaller form factor than their predecessors, ideal for use in small optical telecommunication modules with speeds of 400 Gbps and more



[High-precision TCXO series]

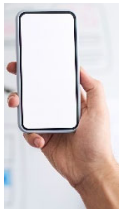
Temperature-compensated crystal oscillators that support 5G base stations
Compliant with industry standards such as free-run accuracy & TDEV, MTIE

Helping to Solve Societal Issues

- Secured priority delivery for medical & social infrastructure during COVID-19 pandemic
- Supported public safety with infrastructure monitoring

Transport of coronavirus vaccines at super-low temperature

Supplied TCXOs for a vaccine transport system (temperature monitoring module), prioritized supply under tight supply and demand.



Vaccine transport package & condition monitoring system (temperature monitoring)

Expansion of global network infrastructure & reduction of environmental impact with low-power performance

Data centers expanded worldwide to accommodate data traffic growth during the pandemic, and Epson responded by increasing production of high-precision TCXOs and high-frequency oscillators.

Data centers

Optical telecommunication (Conceptual image)

Contribution to infrastructure operation to protect citizens from floods

Global warming is resulting in frequent floods. Proper operation of dams and sluices is essential for flood control & public safety. Our high-precision sensors measure vibrations in motors that open/close sluice gates, helping to monitor the state of equipment and keep them properly maintained.

Wrap-Up

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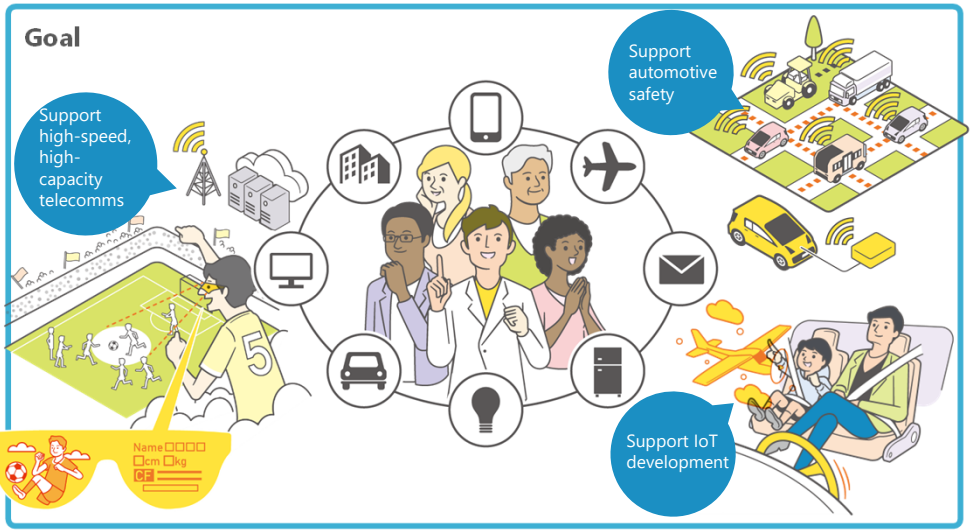
- We will maintain stable business operations by developing differentiated products that help solve social issues

Contribute to the development of smart communities with crystal and semiconductor solutions enhanced with our efficient, compact and precision technologies



		FY2021-FY2023	Until FY2025	Targets
Growth	Office printing Commercial & industrial printing Printhead sales Production systems	Growth strategies		FY2020 → FY2025 revenue CAGR +15% or more
Mature	Projection Watches	Structural changes		+10pt or more
Mature	Home printing Microdevices	Profitability maintenance & improvement		Sustained ROS of 15% or more
New	Sensing Environmental business	Business launch	Growth strategies	FY2025 revenue ¥10 billion or more

Reference

Semiconductor Design & Manufacturing Sites

Tohoku Epson Corp.
Front-end process & tape

Fujimi Plant
Design site

Suwa Minami Plant
WCSP

Epson Canada, Ltd.
Vancouver Design Center

Singapore Epson Industrial Pte. Ltd.
Back-end process

- Front-end process

Wafer size	Site	Start of operations
8 inch	Tohoku Epson	1997
6 inch	Tohoku Epson	1991

* Also outsource & subcontract to partner companies

Crystal Device Design & Manufacturing Sites

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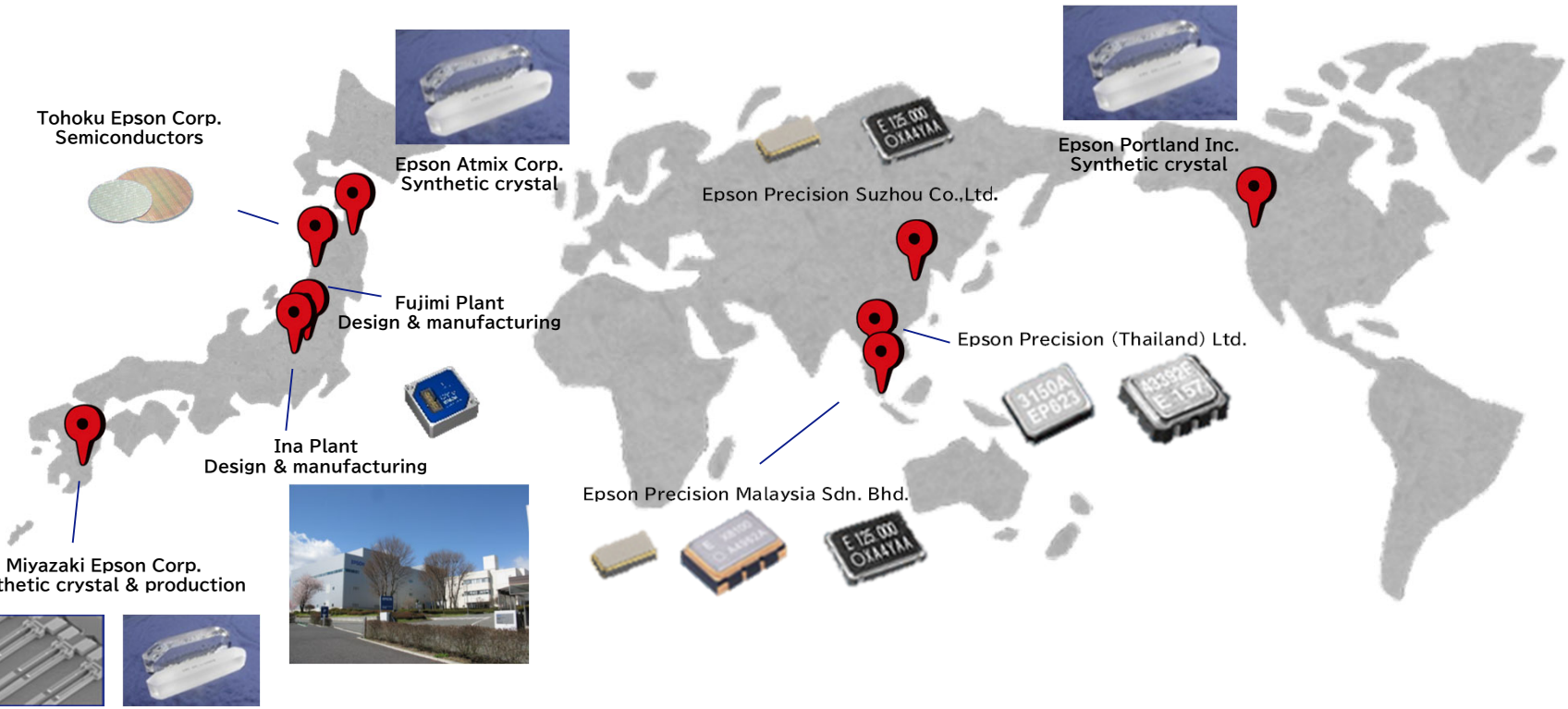


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