

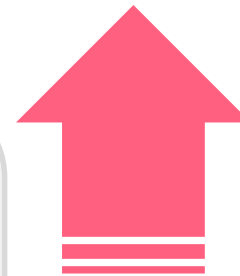
# Information Meeting 2019



## <Risk>

- Uncertainty about global economy due to struggle for technological supremacy, trade friction, and political unrest
- Slow spread of new technology

Economic slowdown  
(short term)



Vitalization of the market  
(medium to long term)

## <Opportunities>

5G / IoT:

Smart devices,  
Infrastructures (base stations),  
Smart factory projects

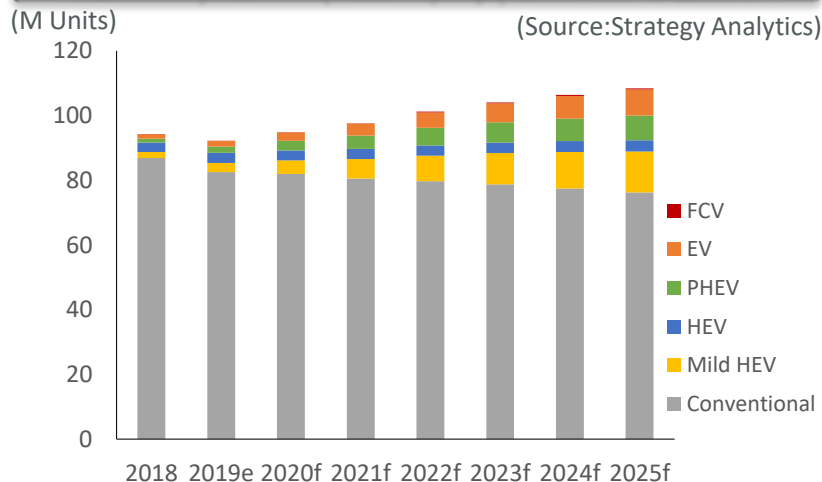
Automotive:

xEV, Connected, Advanced safety

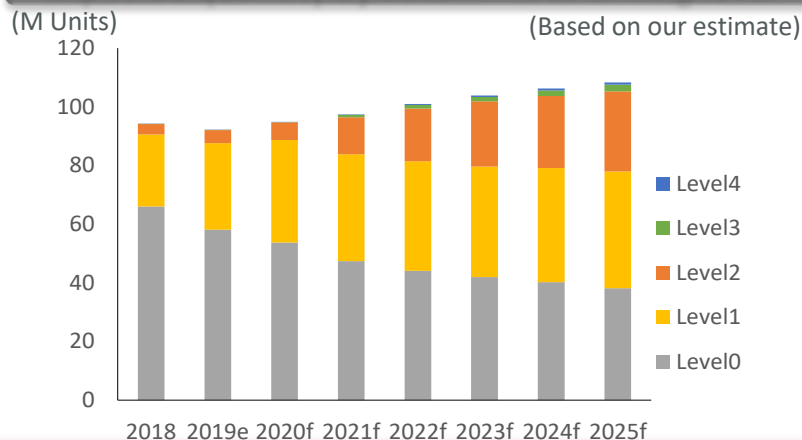
Business opportunities expand in the medium to long term for Murata, which has a varied product lineup, supply capability, and a broad customer base.

# Automotive Market - 1

## Expected quantity by powertrain



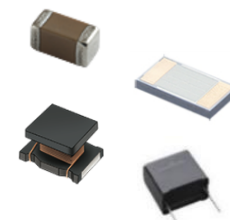
## Expected quantity by autonomous driving level



## Main product lineup

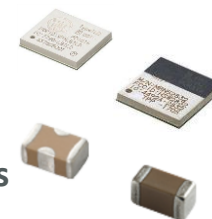
### Electrification xEV

- MLCC
- Film capacitors
- Silicon capacitors
- Power inductors
- Power supply modules, etc.



### Connected cars V2X

- Bluetooth modules
- PA modules
- V2X modules
- EMI suppression filters
- MLCCs, etc.



### Advanced safety ADAS

- MEMS sensors
- Ultrasonic sensors
- Timing devices
- MLCCs, etc.



- ✓ xEV, connected cars, and advanced safety accelerate the use of electrical equipment in automobiles.
- ✓ New demand is expected for communication modules, sensors, and other components.

# Automotive Market - 2

## Understanding market and technology trends

Vehicle disassembly: Component demand, design concept  
Driving evaluation: Required technology and level



- Feedback to R&D
- Improved demand forecast accuracy
- Enhanced proposal ability for customers

(By our research)

(pcs)	Conventional vehicles Autonomous driving Lv 0	HEV Lv 2	EV Lv 3
Capacitors	3,000	6,000	10,000
Inductors	300	600	600

## Technologies required of automotive components

High  
temperature  
guaranteed

High heat  
dissipation

High  
humidity  
guaranteed

<<Environment specific to vehicles>>  
High temperature and high humidity  
Use of higher-power electronic circuits

High  
voltage  
compatible

Measures  
against risk of  
short circuit

Long-term  
reliability

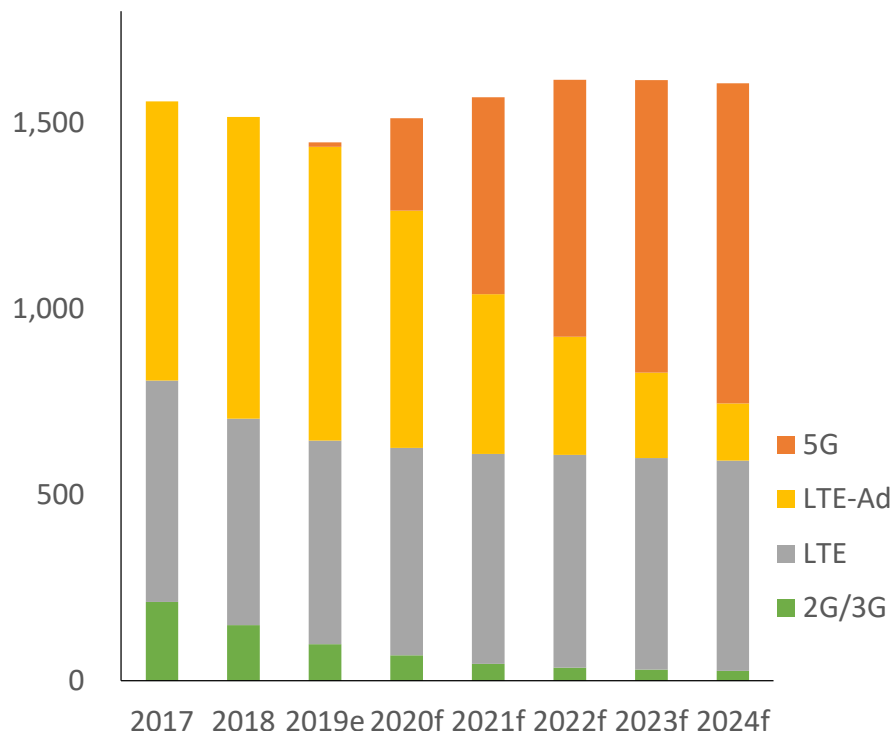


- ✓ Understanding market and technology trends becomes more important due to rapid technological innovation.
- ✓ High reliability and stable supply are increasingly demanded.

# Communication Market - Smartphones

## Expected number of smartphones

(M Units) (Source:TSR 「201910 TSR mobile phone market」)



## Constantly evolving smartphones

- More frequency bands
- Higher frequency
- Advanced communication technology
- Improved IC performance
- More sensors and cameras
- Larger batteries, etc.



## Technologies required of components

**Compact and low-profile, modular, high frequency characteristics, high voltage compatible, high temperature support, low loss (HiQ)**

### Main product lineup

- Capacitors  
- Inductors

- EMI suppression filters

- Connectors  
- Thermistors  
- Batteries

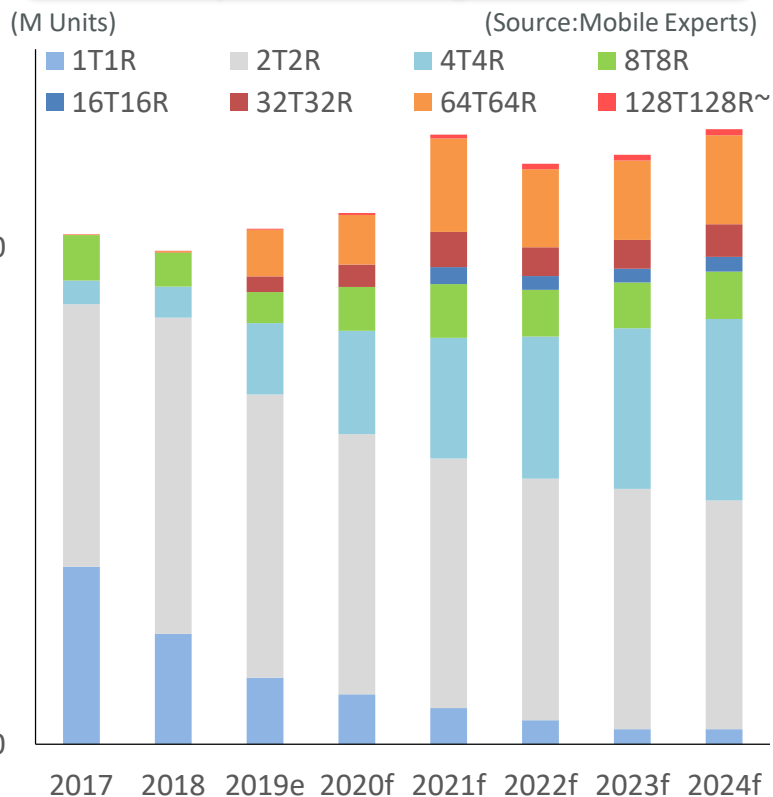
- SAW filters  
- LC filters

- RF modules  
- WiFi modules  
- MetroCirc, etc.

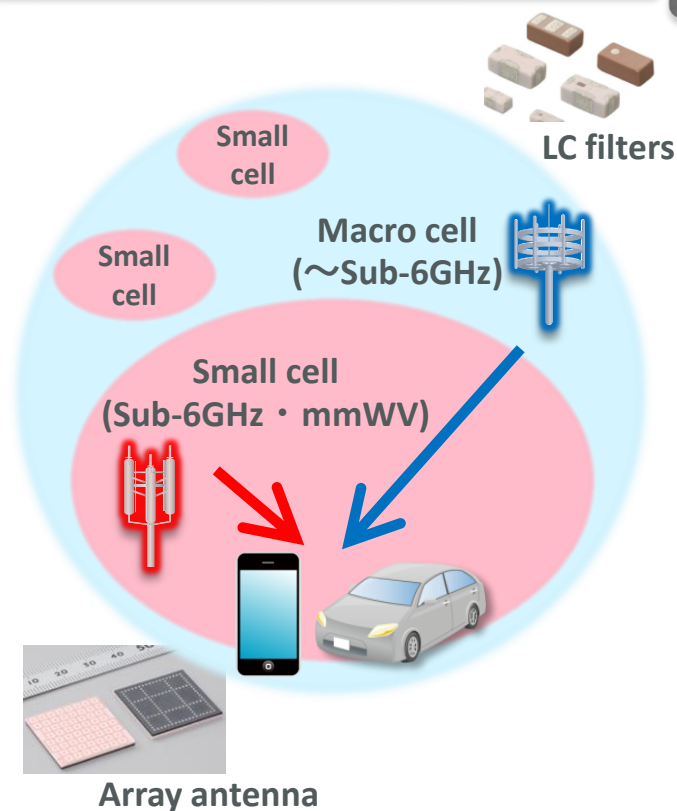
- ✓ Although the number growth is slowing down, LTE-Advanced devices and 5G devices are expanding their shares.
- ✓ Demand for components per device is expanding.

# Communication Market - Base station

## Expected number of base stations (RRU) by antenna configuration



## Base station configuration



## Changes in the number of antennas



## Main product lineup

- Capacitors

- Inductors

- LC filters

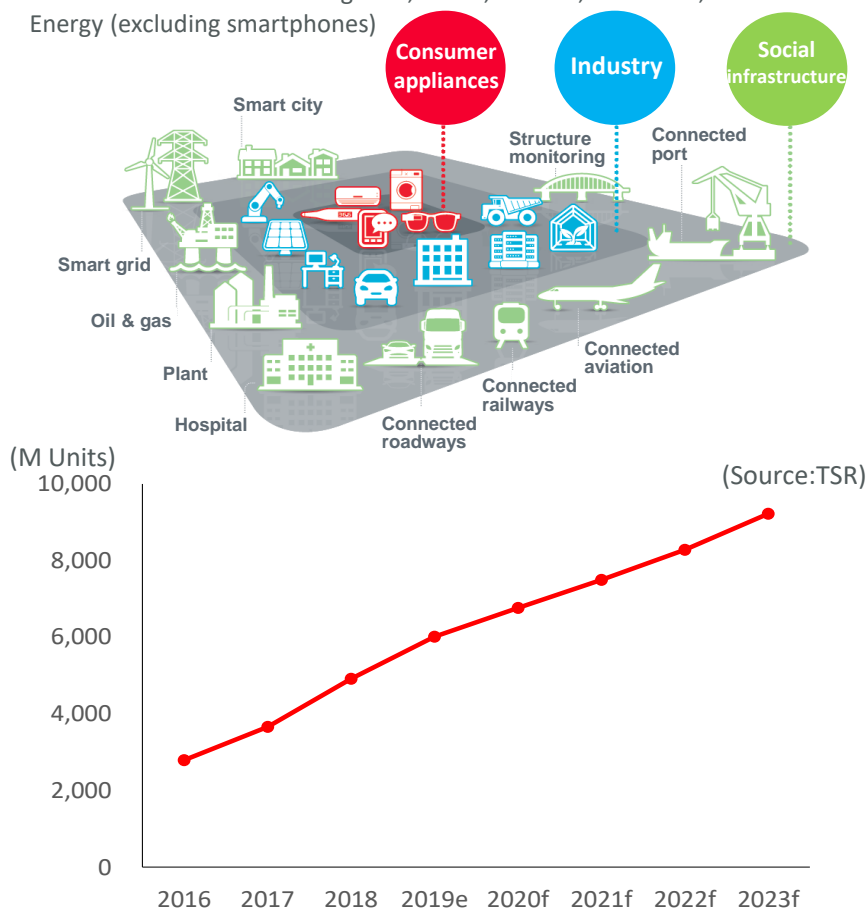
- Array antenna, etc.

- ✓ 5G also uses small cells, increasing the number of base stations.
- ✓ Massive MIMO increases antennas and electronic components per base station.

# Communication Market - IoT

## Expected number of IoT devices\*

\*Communication devices using WiFi, LPWA, Cellular, Bluetooth, or Bluetooth Low Energy (excluding smartphones)



## Main product lineup

### Sensors

Temperature, ultrasonic wave, magnetism, vibration, acceleration, and other sensors



### Communication modules

WiFi, LPWA, Bluetooth, RFID, and other modules



### Batteries

Coin, laminate, all-solid-state, and other batteries



### Passive components

Capacitors, inductors and other components



### Solutions

NAONA, worker safety monitoring, wireless sensing, etc.

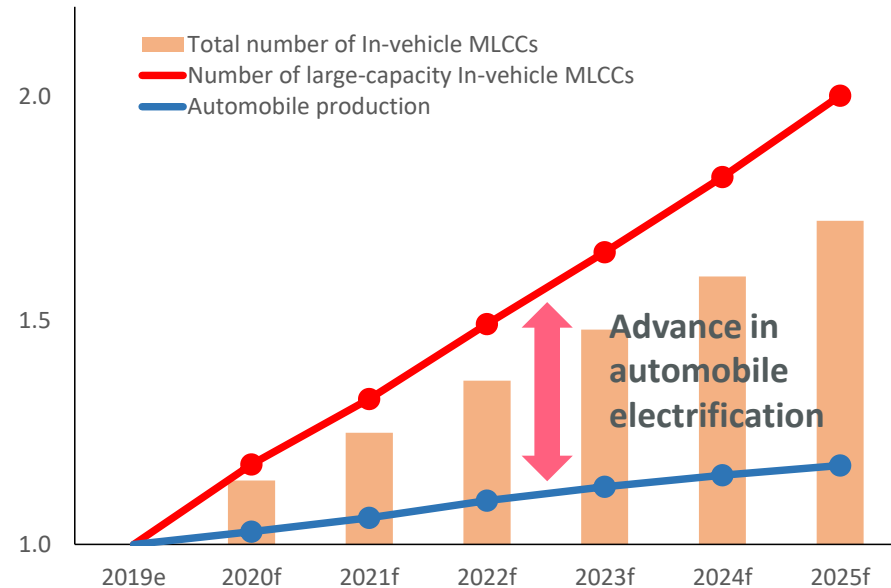
- ✓ Needs are growing for sensors, energy, communication networks, and solutions.
- ✓ Build an infrastructure for IoT society by leveraging our extensive lineup and strength.



# Product Strategy - In-vehicle Capacitors

## In-vehicle MLCC market forecast (quantity basis)

(Based on our estimate)



**Trend of automotive electrification remains unchanged.  
Large-capacity components are increasing especially rapidly.**

## Number of in-vehicle MLCCs used

(pcs)	GAS	Mild HV	Strong HV	PHEV	BEV
Powertrain	300-500	1,000-1,200	1,200-1,600	1,500-2,000	2,000-2,500
ADAS			2,000-3,000		
Safty			300-1,000		
Non Safty			500-2,500		
Infotainment			500-2,500		

## In-vehicle capacitor strategy

- Stable market growth over the medium to long term
- High quality requirements



### Build a stable supply system

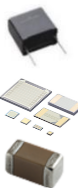
- Enhance capacities with a view to the medium to long term
- Promote smart factory projects

### Strengthen technological development capabilities

- Strengthen dialog with OEM and Tier 1
- Build technical barriers to entry
- Develop materials by utilizing the strength of integrated production

### Respond to a wide range of customer needs

- Enhance the lineup
- High heat-resistant film capacitors
- Silicon capacitors
- Automotive grade HiQ MLCCs



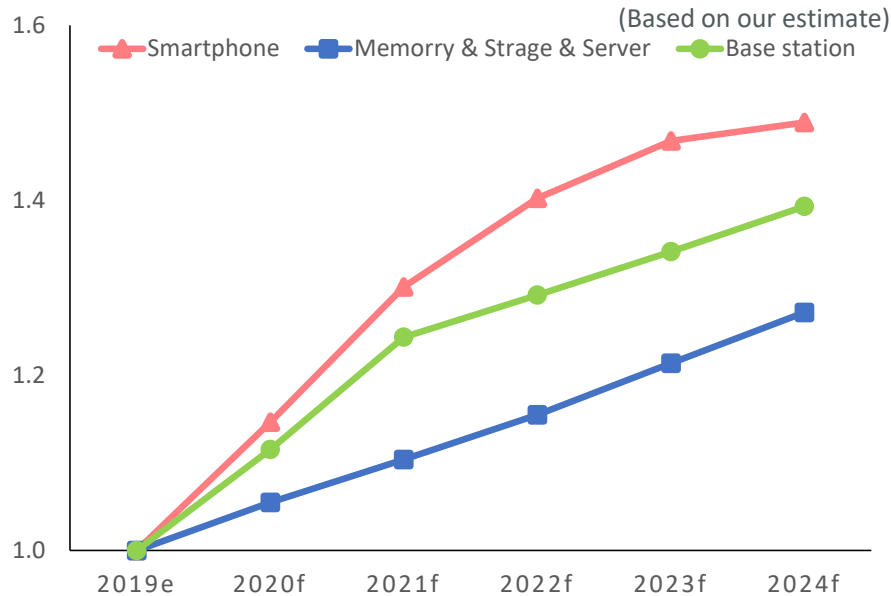
**Aim to expand business in the automotive market with our competitive advantage in production and technology.**



# Product Strategy - Consumer Capacitors

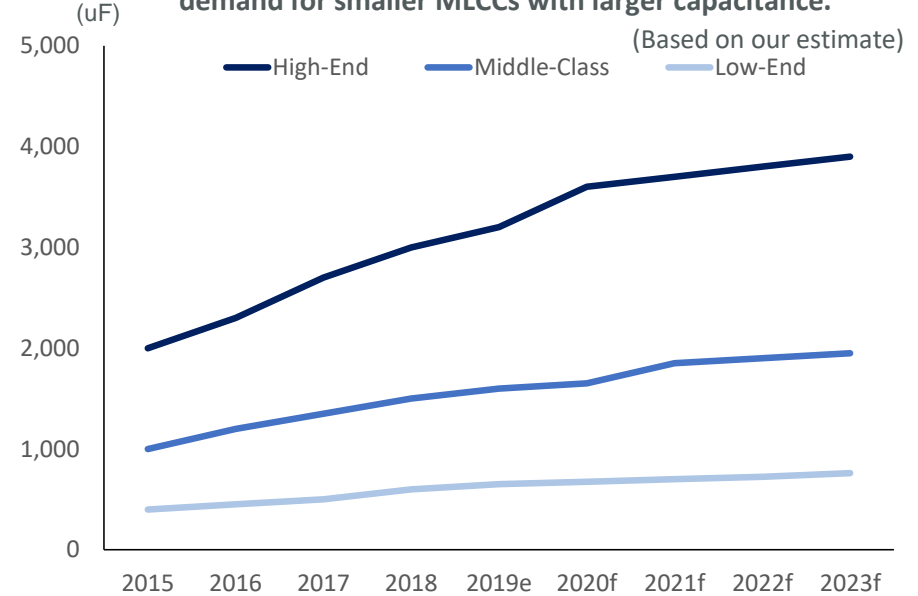
## Expected number of Consumer MLCCs demanded

With the launch of 5G, the quantity demanded will increase year by year.



## Changes of capacitance of MLCCs for smartphones

Power consumption is still increasing, maintaining demand for smaller MLCCs with larger capacitance.



## MLCC characteristics required for 5G

### Changes with 5G

### Technology trends

### Required characteristics

- Smartphones**
- Higher functionality of modules
  - Use of larger batteries

- Increased power consumption
- Requirements for high-density mounting

- **Small and large-capacity**
- **Low loss characteristics**

- Base stations**
- Shift to Massive MIMO
  - Increased small cells

- Higher internal environmental temperature
- Increased output from PA

- **High voltage compatible**
- **High temperature guaranteed**
- **Low loss characteristics**

**Provide new value to customers with product development capabilities, quality, and supply capabilities even in 5G technology innovation!**

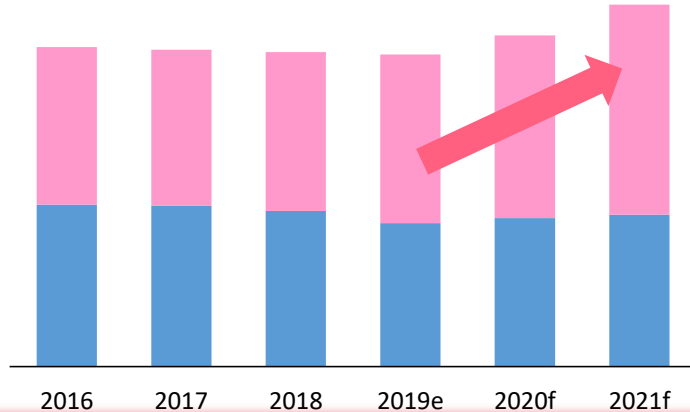
# Product Strategy - SAW Filters

## Expected number of filters demanded

Introduction of 5G accelerates modularization

(Based on our estimate)

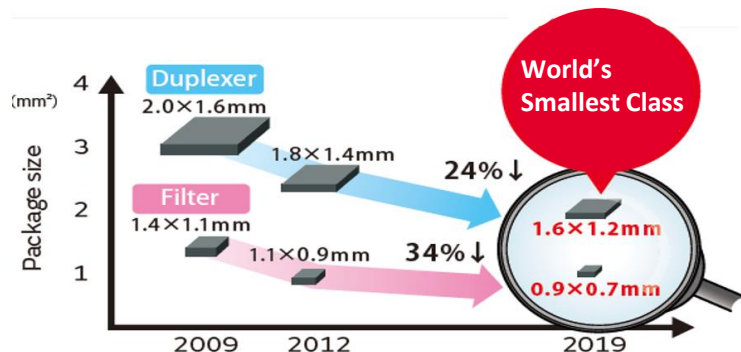
■ Discrete ■ Module



The total demand for filters is expected to increase mainly for those for modules.

## New products

Develop the world's smallest SAW duplexer and filter, and start mass production.



## SAW filter business strategy

### Business environment

- Downsizing needs for higher-density mounting
- Increased demand intended for using on modules
- Changes in the competitive environment



### Strategies

#### Strengthen technological development capabilities

- Differentiate with high power durability
- Downsizing and combination
- I.H.P and XBAR technologies

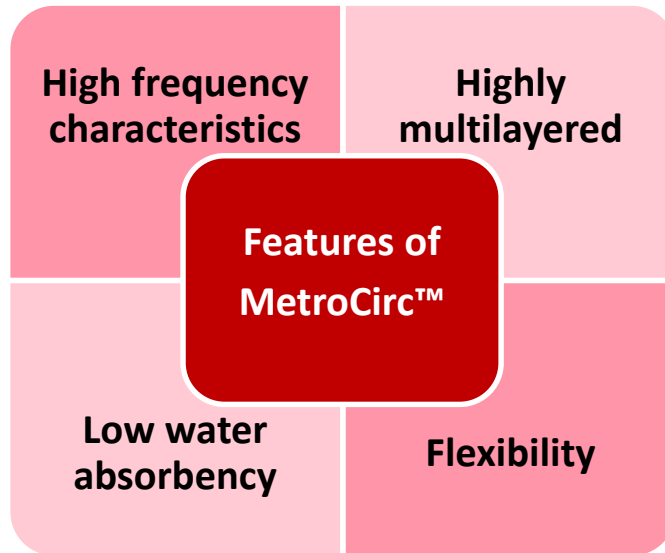
#### Strengthen efforts to improve productivity

- Promote smart factory projects
- Improve the yield

Differentiate from competitors with superior characteristics and downsizing, and strengthen cost competitiveness.

# Product Strategy - MetroCirc™

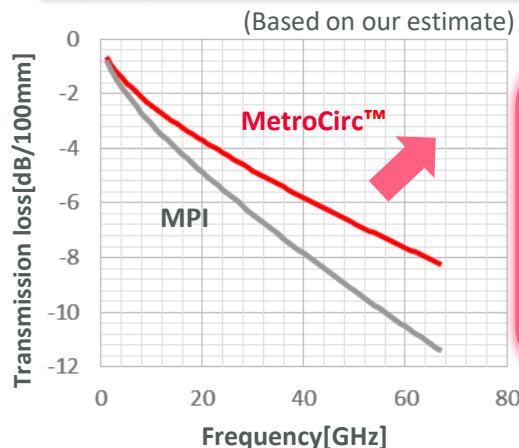
## Features of MetroCirc™



## MetroCirc™ sales expansion strategy



## High frequency characteristics of MetroCirc™



Superior characteristics in the millimeter wave band differentiates MetroCirc™ from competing products.

## Market expansion

- Develop new customers based on existing applications
- Develop new applications with 5G as a keyword

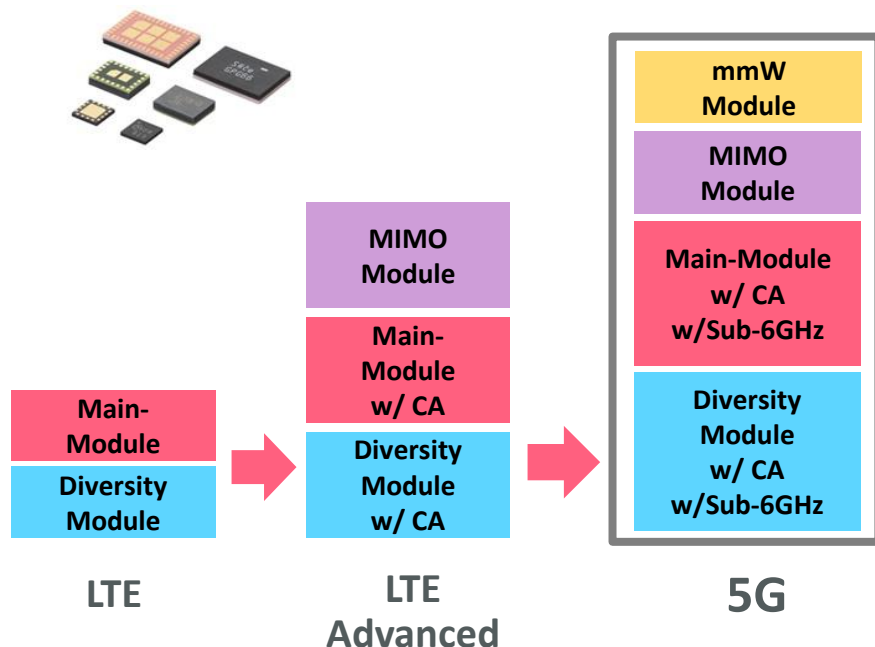
## Strengthen collaboration with other businesses

- Develop modules using MetroCirc™ as the substrate

Utilizing the characteristics of MetroCirc™, aim for customer value creation and continuous growth with unique products!

# Product Strategy - RF modules

## RF module technology trends



5G-compatible modules are added while middle-class devices are more and more modularized.

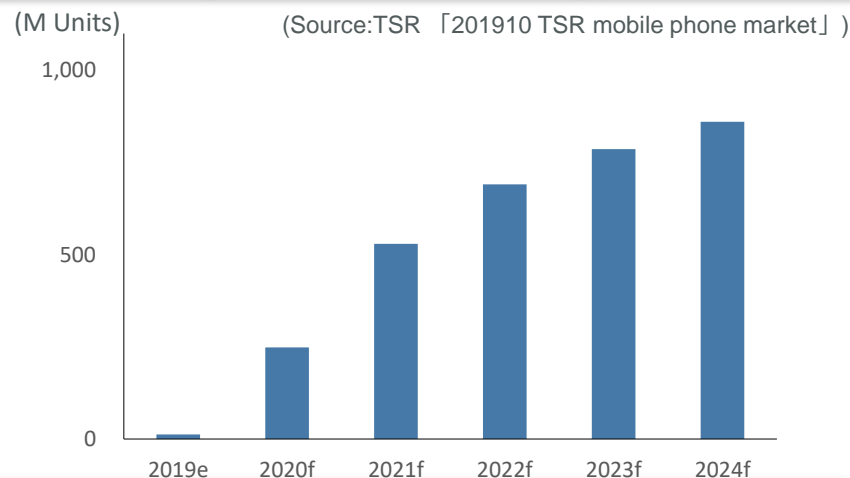
## Keywords in 5G

Higher frequency (Sub-6GHz • mmW)  
MIMO  
Uplink Carrier aggregation  
Dual Connectivity



5G uses advanced communication technology.  
More sophisticated modules are required.

## Expected number of 5G devices



Murata's design and manufacturing capabilities and extensive lineup of components.  
--> Realize **the characteristics, size, quality, cost, and speed** that will be chosen by our customers.

Review battery business strategy and make company-wide efforts to return to profitability

## Make a commitment to achieve profitability in FY 2021

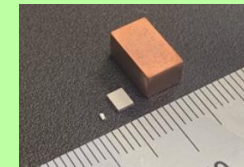
### Strengthen business foundation

- ✓ **Slim down fixed costs**
  - Realize cost structure suitable for business scale
  - Prioritize projects and concentrate technical resources

### Review our portfolio

- ✓ **For mobile devices**
  - Enter the small secondary battery business
- ✓ **For power tools**
  - Strengthen competitiveness in existing fields
  - Expand business into new fields

### Develop new products



- ✓ **Industry-leading all-solid-state battery**
  - Target the wearable market where safety and durability are required
  - Expand the lineup by utilizing our lamination, material, and other technologies

#### Current situation

- : We have an advantage in lamination and chemical technologies. We have developed and launched new products.
- ▲ : The market for power tool components is currently slowing down. However, it is still expanding in the medium to long term.
- × : Mobile device components are especially difficult to differentiate technologically, and therefore is still in the red, recording impairment loss.

# Product Strategy - EMI / Sensor

## Inductors

### Market needs

- Higher-density mounting inside communication devices
- Increased use of electrical equipment in automobiles

### Strength

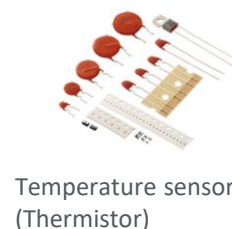
- Low loss characteristics
- Downsizing
- High reliability



Meet market needs with our original technology and extensive lineup.

## Sensor

### Sensors utilizing ceramic material technology



Temperature sensor  
(Thermistor)



Ultrasonic sensor



Infrared sensor

Realize a lineup of compact and high-performance products based on Murata's technology cultivated over many years.

## EMI suppression filters

### Market needs

- Increased need for noise countermeasures following advances in xEV and autonomous driving technology

### Strength

- Downsizing
- High temperature support
- High frequency support



Provide optimal solutions for various applications.

### Sensors utilizing microfabrication technology



Acceleration sensor



Gyro sensor



Magnetic sensor

Fuse together Murata's microfabrication technology and technologies obtained through M&A.  
-> Develop business for applications requiring high accuracy and high reliability.

Meet needs in various markets such as automobiles, wearables, medical care, and healthcare.

# Product Strategy - New Business

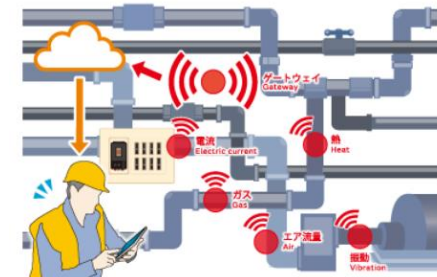
## IoT Solution



Sensor Data Platform "NAONA"



Worker safety monitoring system



Wireless sensing solution

Provide "information" we obtained, as a service, to help customers solve problems.

## Healthcare

### Components



Capacitors for Medical Devices

### Medical equipment



Electronic moxibustion

### Solutions



Vios Monitoring System



Fatigue stress meter

## Energy



Olivine type iron phosphate lithium ion battery (FORTELION)



Home storage battery system



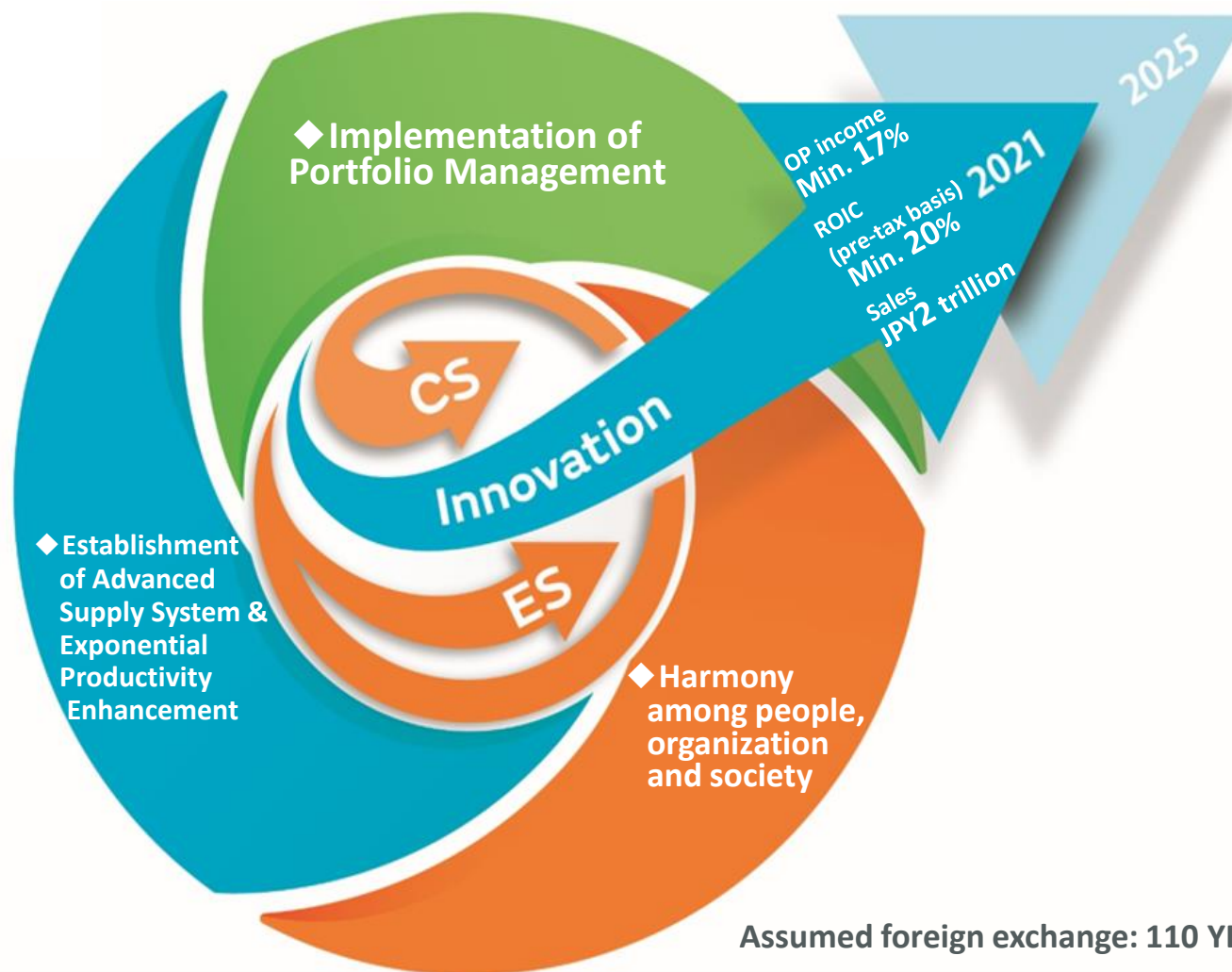
Industrial storage battery system

Create new value for medical and healthcare with original products.

Promote the use of renewable energy with storage battery systems that pursue unique safety technologies.



# Mid-term Direction 2021



Assumed foreign exchange: 110 YEN / USD

- Economic slowdown is a risk to achieving sales targets on time.
- Adhere to profitability targets by improving productivity and reviewing fixed costs.
- Make capital investments at the right time.

# Mid-term Direction 2021 - Strengthening Monozukuri capabilities

## Smart factory projects

### Data utilization

- Abnormal sign monitoring
- AI image classification
- Predictive maintenance
- Individual piece trace

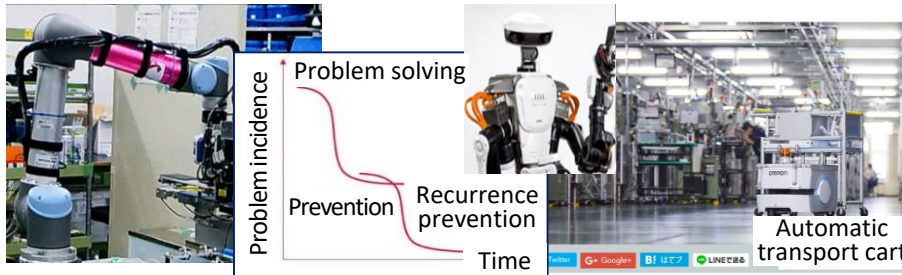
### Automation

- Robot
- AGV
- Work arrangement system
- Automatic machine

### ICT platforms

- Unify information among factories and with suppliers and outsourcing contractors
- Develop new sensing technologies
- Develop new data collection interfaces

## - Examples of initiatives -



**Realize dramatic productivity improvement through “Connection and Automation”!**

## Secure production spaces

### Japan Fukui



Completed in December 2019  
Produces MLCC

### Japan Yasu



Completed in November 2020  
Produces electrode materials

### China Wuxi



Completed in December 2019  
Produces MLCC

### Finland



Completed in March 2020  
Produces MEMS sensors

Also scheduled to be completed in Shimane (for MLCC), Okayama (for raw materials), Malaysia (for inductors), and Yokohama (as a development base).

# Mid-term Direction 2021 - ESG Initiatives

## Opportunity aspect: Solve social issues through business

- Highly efficient components that contribute to strengthening climate change policies
- Miniaturized components that promote sustainable use of resources



## Risk aspect: Address social issues in business processes

### Environmental

- Strengthening climate change policies
- Sustainable use of resources
- Prevention of pollution and management of chemical substances



### Social

- Safe and secure workplace and healthy management
- Respect for human rights and diversity
- Coexistence with local communities



### Governance

- Fair business transactions
- Information security
- Business continuity management (BCM)



- Identify priority issues (materialities) and reflect them in business management.
- Incorporated into multiple indexes as a company actively engaged in ESG.

## Status of adoption in ESG index



MSCI Japan ESG  
Select Leaders Index



FTSE4Good



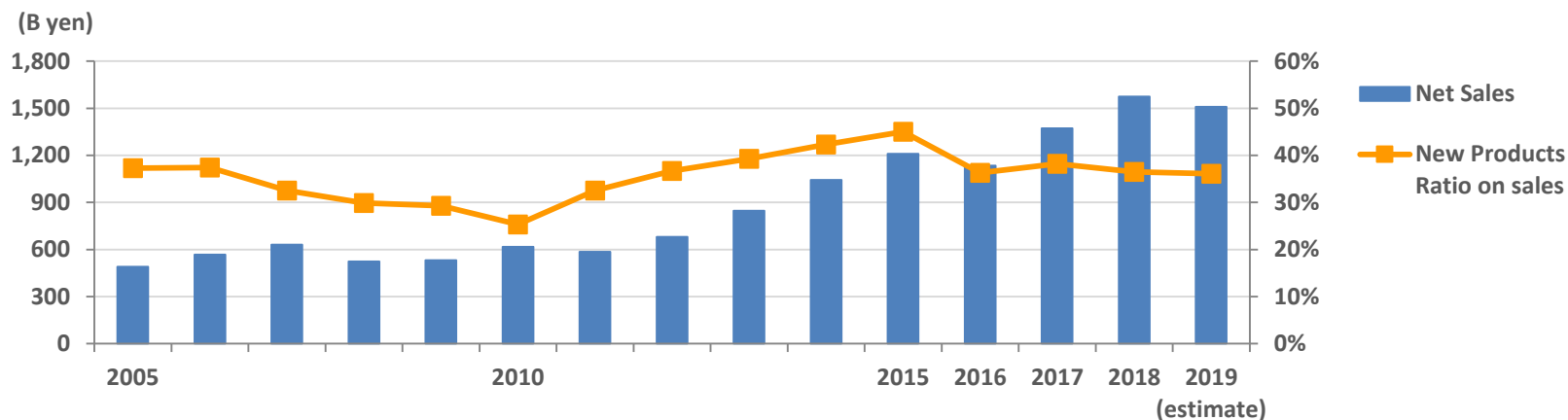
FTSE Blossom  
Japan



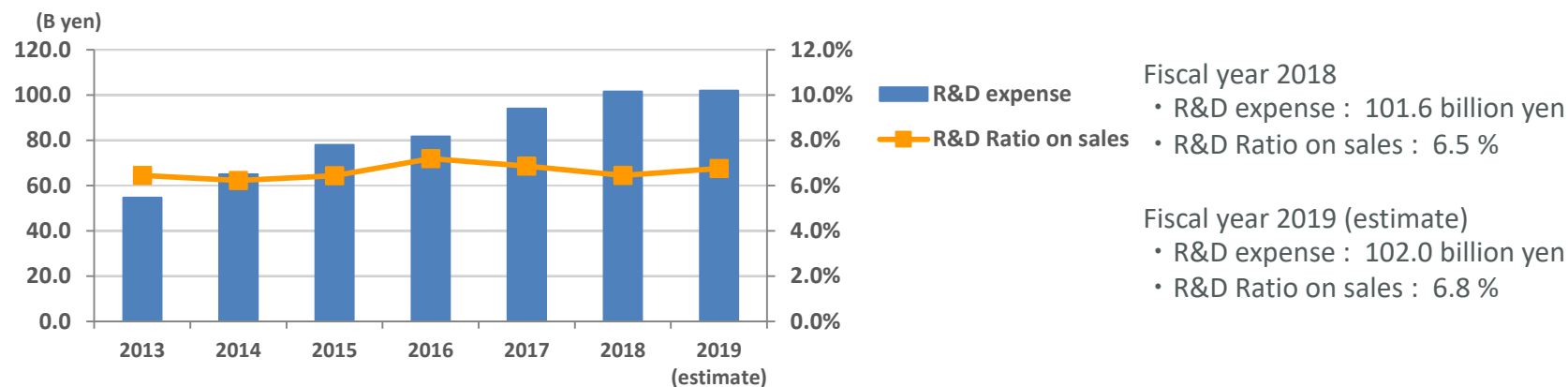
Sense in  
sustainability

# Net Sales and New Products Ratio on sales/ R&D expense and R&D ratio on sales

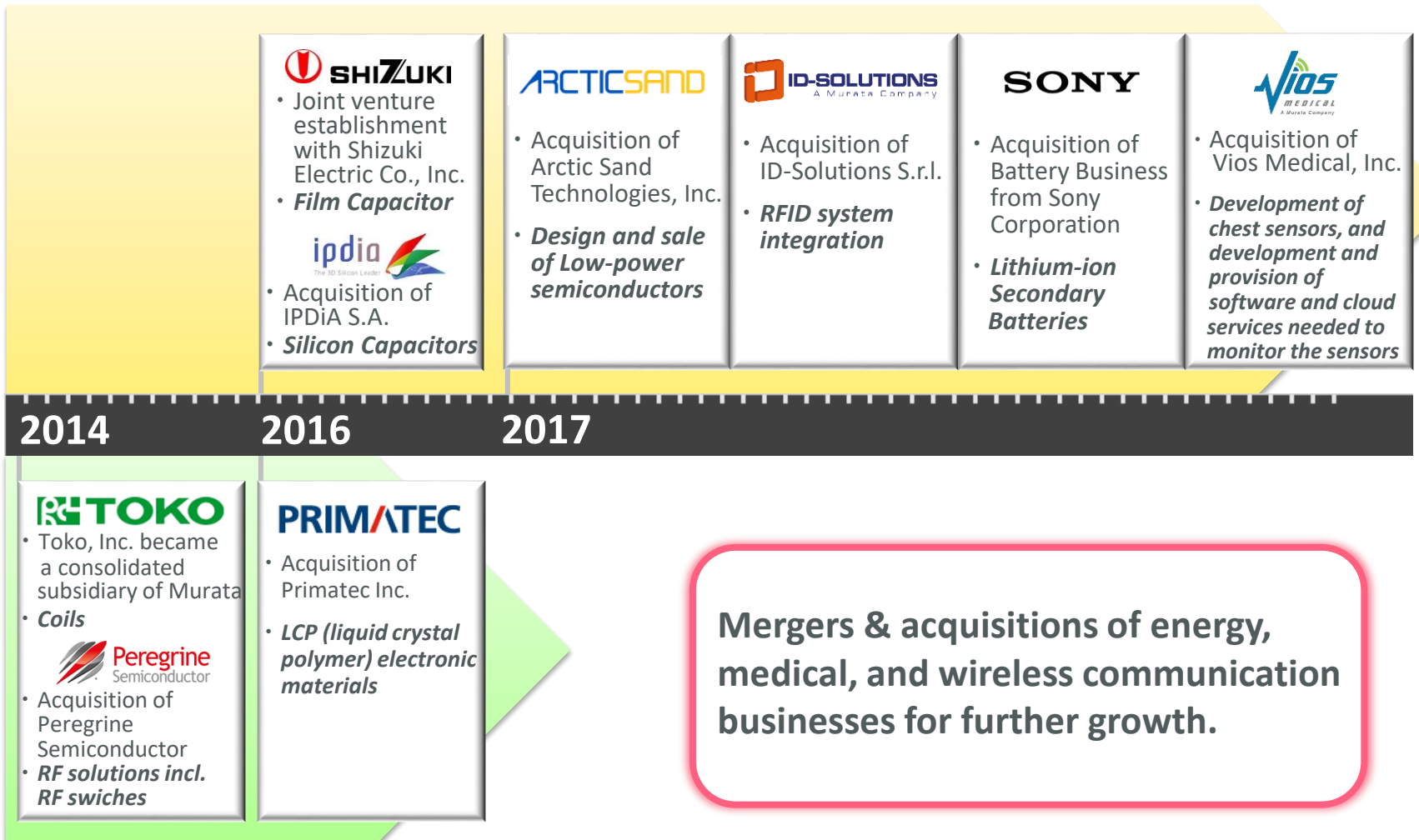
## Net Sales and New Products Ratio on sales



## R&D expense and R&D Ratio on sales



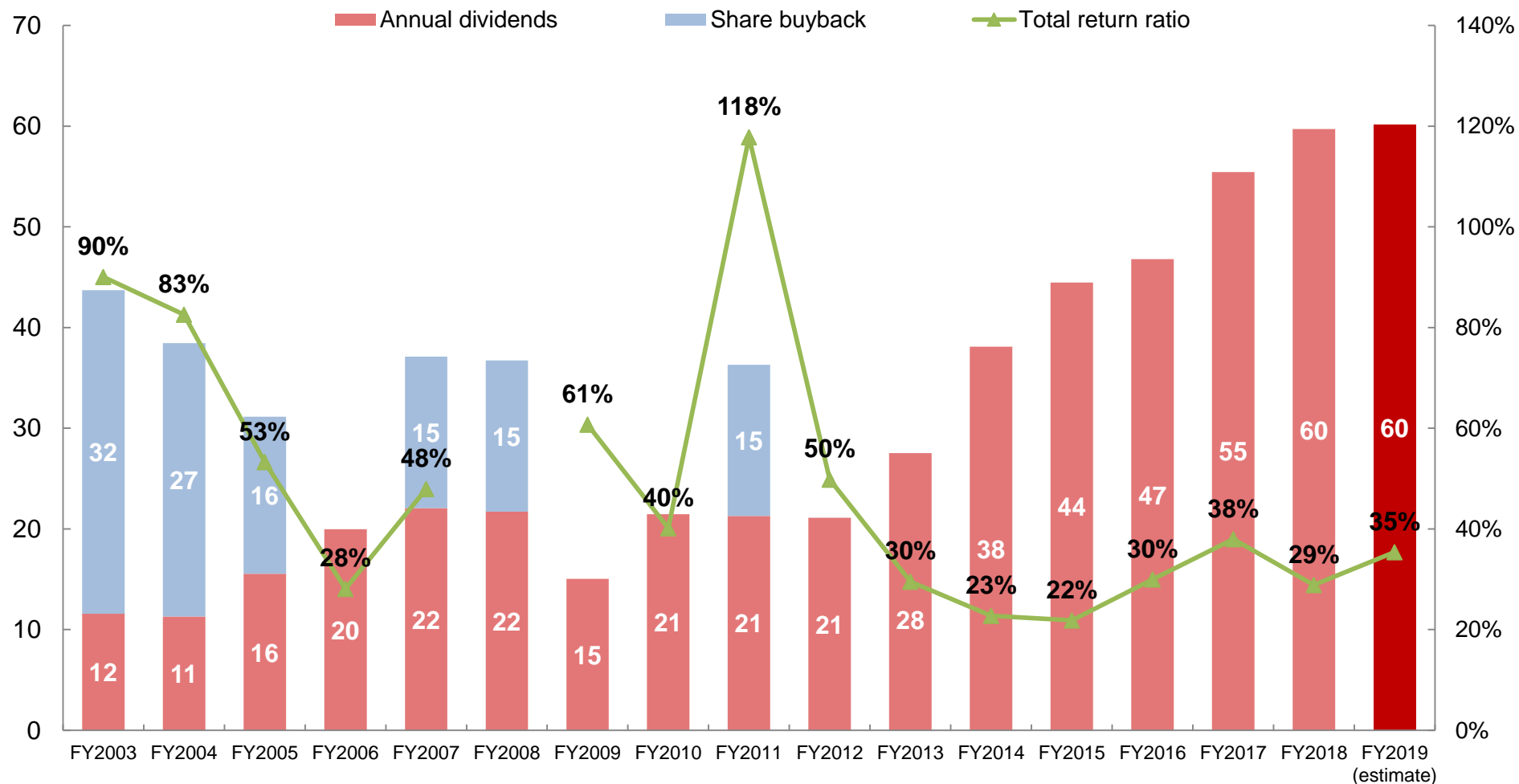
# M&A / Business Alliance



**Mergers & acquisitions of energy, medical, and wireless communication businesses for further growth.**

# Return to Shareholders

(Billion Yen)



Our basic policy of profit distribution to shareholders is to prioritize the sharing of gains through payment of dividends, and to steadily raise them by increasing profit per share.

This report contains forward-looking statements concerning Murata Manufacturing Co., Ltd. and its group companies' projections, plans, policies, strategies, schedules, and decisions. These forward-looking statements are not historical facts; rather, they represent the assumptions of the Murata Group (the “Group”) based on information currently available and certain assumptions we deem as reasonable. Actual results may differ materially from expectations due to various risks and uncertainties. Readers are therefore requested not to rely on these forward-looking statements as the sole basis for evaluating the Group. The Company has no obligation to revise any of the forward-looking statements as a result of new information, future events or otherwise.

Risks and uncertainties that may affect actual results include, but are not limited to, the following: (1) economic conditions of the Company's business environment, and trends, supply-demand balance, and price fluctuations in the markets for electronic devices and components; (2) price fluctuations and insufficient supply of raw materials; (3) exchange rate fluctuations; (4) the Group's ability to provide a stable supply of new products that are compatible with the rapid technical innovation of the electronic components market and to continue to design and develop products and services that satisfy customers; (5) changes in the market value of the Group's financial assets; (6) drastic legal, political, and social changes in the Group's business environment; and (7) other uncertainties and contingencies.

The Company undertakes no obligation to publicly update any forward-looking statements included in this report.



# Thank you

