FY March 2015
Business Strategy Meeting

December 8, 2014
TDK Corporation

Attendees

President and CEO　Takehiro Kamigama

General Manager of Humidifier Countermeasures HQ, and
General Manager of Technology HQ

Executive Vice President　Atsuo Kobayashi

In charge of Applied Film Business Division, Flash Memory Applied Devices Business Division, EMC & RF Engineering Business Division,
General Manager of Magnet Products Business Group, General Manager of Power Systems Business Group

Executive Vice President　Hiroyuki Uemura

TDK-EPC President & CEO
General Manger of Ceramic Capacitors Business Group

Attendees

Senior Vice President
Seiji Osaka
TDK-EPC SEVP* & COO

Senior Vice President
Robin Zeng
General Manager of Energy Devices Business Group

Senior Vice President
Shinya Yoshihara
General Manager of Manufacturing HQ, General Manager of New Business Promotion Office of Manufacturing HQ and Deputy General Manager of Humidifier Countermeasures HQ

Corporate Officer
Takakazu Momozuka
In charge of Finance & Accounting and BPR Project

Senior Vice President
Jyuji Yoneyama
In charge of Corporate Systems Reformation, Human Resources, General Affairs, Legal, CSR Promotion

Corporate Officer
Shigenao Ishiguro
General Manager of Data Storage & Thin Film Technology Components Business Group

Senior Vice President
Noboru Saito
General Manager of Electronic Components Sales & Marketing Group, and General Manager of ICT Group of Electronic Components Sales & Marketing Group

*SEVP : Senior Executive Vice President

Schedule

◆Presentation (10:00 - 11:15)

1. Priority Markets and Strategic Products

Senior Vice President　Noboru Saito

2. Strategy of Priority Five Businesses

- Inductive Devices, High Frequency Components, Piezoelectric Material Products

  Executive Vice President　Hiroyuki Uemura

- Rechargeable Batteries

  Senior Vice President　Robin Zeng

- HDD Heads

  Corporate Office　Shigenao Ishiguro

Schedule

3. Enhancing Financial Strength

Corporate Office　Takakazu Momozuka

4. New Development Areas / Summary

President and CEO　Takehiro Kamigama

◆Q&A (11:15 - 11:35)

◆Convivial party　(11:35 - 12:30)

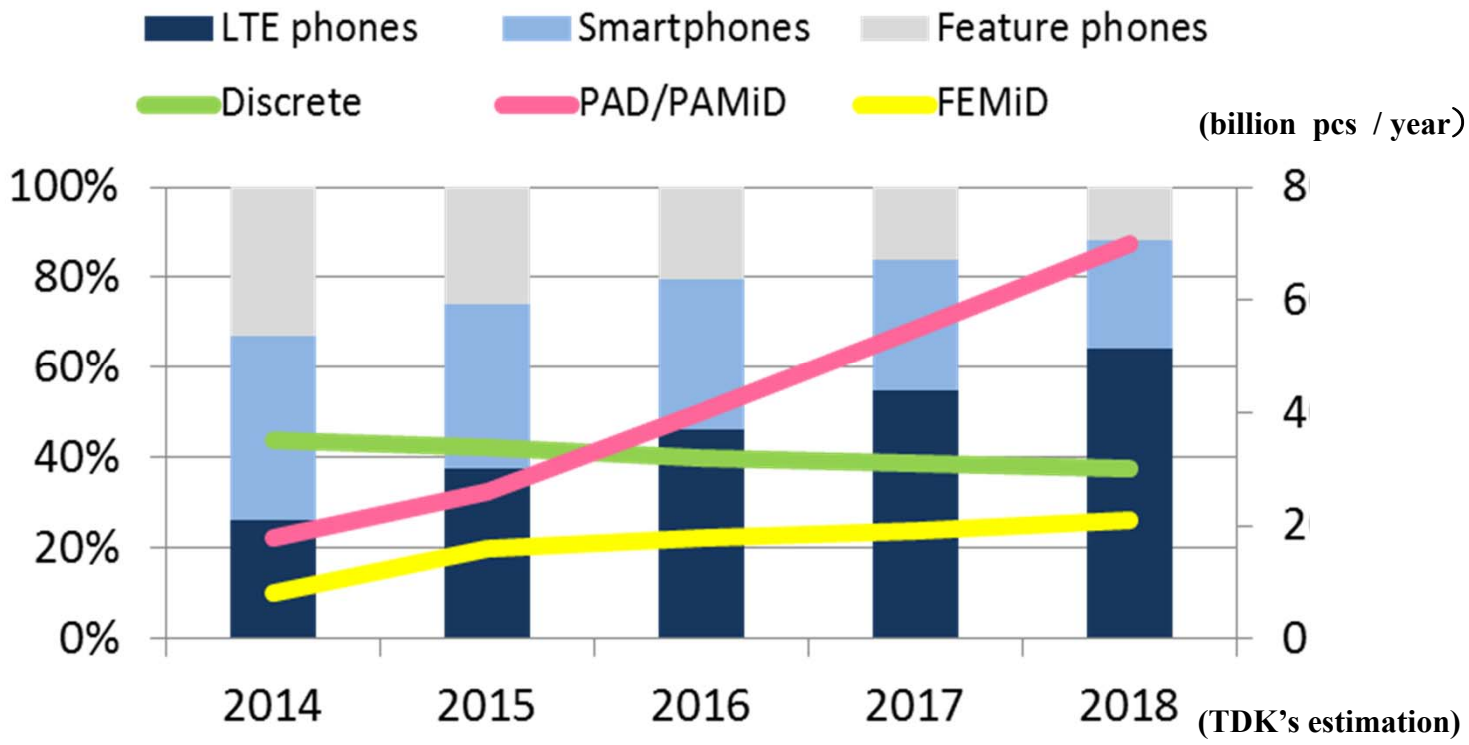
Priority Markets and Strategic Products

Senior Vice President
(General Manager of Electronic Components Sales & Marketing Group)

Noboru Saito

ICT market and TDK's strategic products

Progression of mobile phone production and RF components



The increasing amount of information transmitted via mobile communications necessitates the use of faster communication networks and accelerates the spread of LTE user equipment.

Increasingly complex circuits used in LTE user equipment require components with reduced footprints, which is fuelling a growing demand for components for PAD, PAMiD and FEMiD modules.

ICT market and TDK's strategic products

Medium-term strategies targeting the ICT market

Market drivers are

LTE-4G • 5G

Change points:

Additional increase in number of bands

Efficient power management

Technology

Thin-film technology

Packaging technology

SESUB

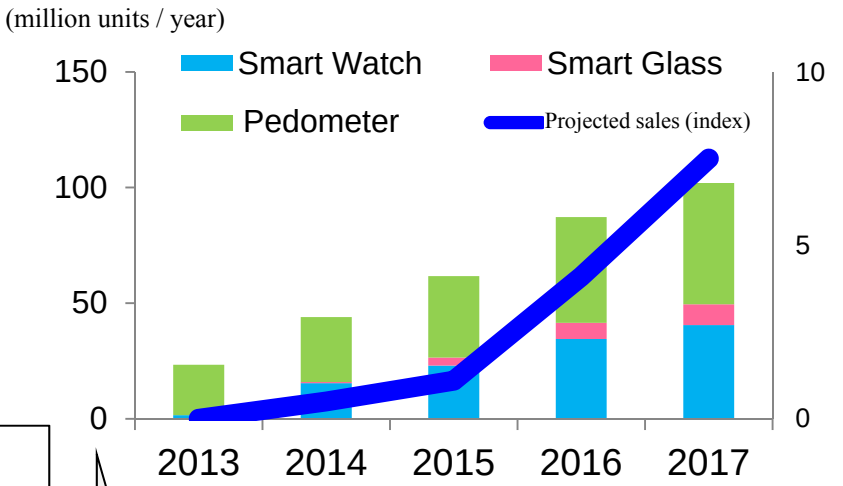
Strategic products

- **Narrow pass band filters**
  - BAW / SAW
- **Components for PAMiD, FEMiD**
  - BAW / SAW / Thin-film products
- **Power management components**
  - Power inductors / Power management modules

IC collaboration

Spread of wearable devices

*Based on estimates by TDK



Wearable device output and projected sales by TDK

Deployment of strategic products involves providing components that meet the requirements for wearable devices

Sales promotion for strategic products through IC collaborations

IC collaboration

Function	IC makers (including PA)	Strategic products (example)
RF use and Power line use	Company C Company T Company N Company P Company K Company V Company L Company X	■ Thin film products Power inductors, Filters etc.
		■ BAW / SAW / Discrete
		■ PAD / PAMiD / FEMiD
		■ SESUB Module (RF, Power management)

+

Sales promotion for existing products

Products with notable features
Lithium polymer battery
Wireless charging unit (WLC)
Low-consumption Bluetooth® module (BLE)
Film photovoltaics
Various sensors

TDK sales over time in the automobile market

Start of use of in-vehicle electrical/electronic devices
- Onboard radio and meters
  - Choke coils
  - Ceramic disc capacitors
  - Motor Magnets

‘70s
(Accounted for 3% of sales)

Beginning of electronic control
- Power windows and ECUs
  - Motor magnets
  - Coils/capacitors
  - Thermistors

‘80s
(5%)

Emergence of electric vehicles
- xEVs and various motors
  - DC/DC converters
  - SMD coils • MLCC
  - NEO magnets

‘90s
(8%)

Spread of onboard networks
- xEV、CanBus
  - Common-mode filters
  - SMD components
  - Magnets

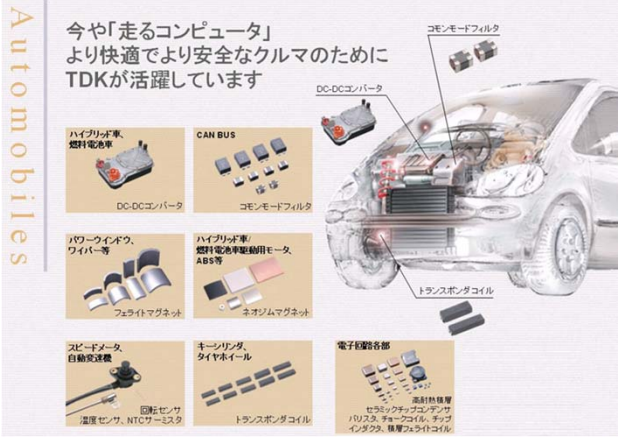
‘00s
(9%)

Spread of smart cars
- Smart Assist
  - Wireless network module
  - TMR sensors • Batteries

Present
(20%)

Medium term
(30%)

Growth of V2x
- ADAS
- Automatic driving
  - Sensors
  - Communications components
  - Energy management

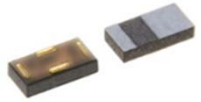
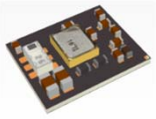


***2004 Company Guide (excerpts)**

＊xEV : EV, HEV, PHEV

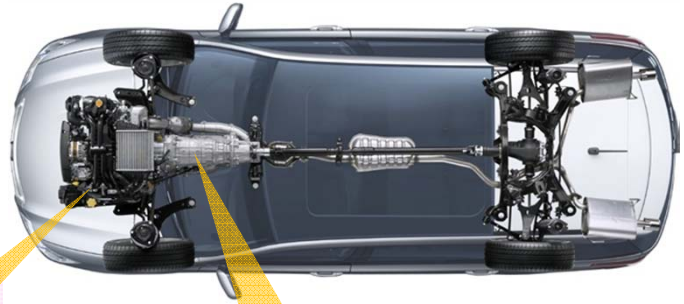
TDK's strategic products targeting the automobile market

Deployment of existing products

Existing products	Newly developed products
Common Mode Filters 	• Ethernet common-mode filters • Suitable for location-free production 
Capacitors   	• Guaranteed operation at high temp. (200ºC)  • Capacitor with resin electrodes
Inductive Devices (Ferrite type, Metal type)	**Power Inductors** • Guaranteed operation at high temp. (150ºC) 
	• Smart keys • Transponder inductors for TPMS 
Deployment of communications components for automobile applications	• SAW Devices 
	• Thin-film high frequency filters 
	• Bluetooth®Modules 

TDK's strategic products targeting the automobile market

Custom-designed products



Power Supply Units

DC-DC Converter

Battery Charger

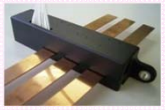
IGBT Transformer

Various Motors

Magnets

- Dysprosium (Dy)-free neodymium magnets
- Lanthanum (La)-free and cobalt (Co)-free ferrite magnets

Sensors



Gear Tooth/ Pressure / Current / Temperature

Wireless Charging Devices for Vehicles

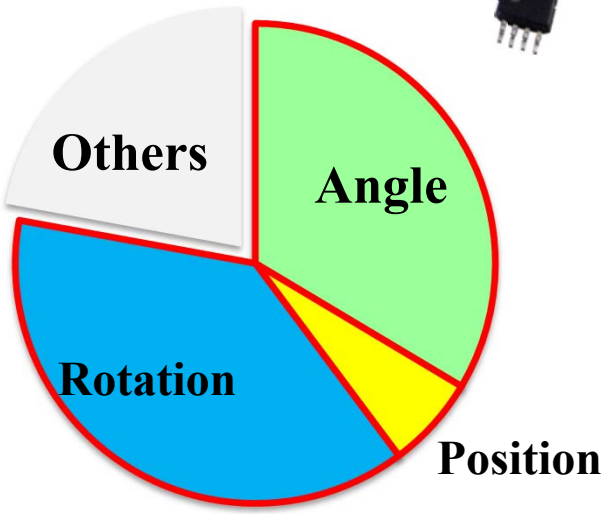
Lithium-Ion Battery

TDK's strategic products targeting the automobile market

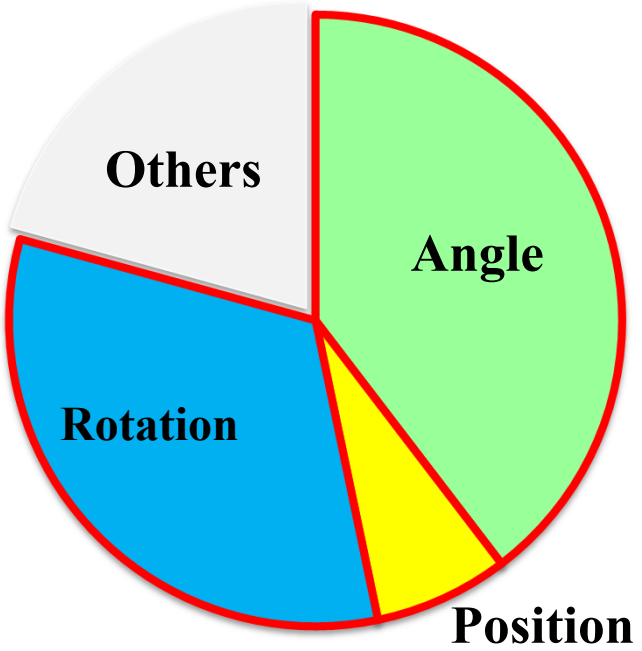
New products

Magnetic Sensors (TMR/GMR)

High-accuracy sensing by TMR/GMR sensors



CY2014 90 billion yen



CY2018 120 billion yen

Demand breakdown for onboard magnetic sensors, by use (billion Yen /Year)

Source: IHS's materials

TDK's strategic products targeting the industrial equipment market

Wireless-charging and TMR/GMR sensors for industrial equipment

Target equipment (example)
Hybrid buses
Catenary-free streetcars
Cable-less elevators

Target equipment (example)
Linear motor encoders
Industrial robots

Electronic components for renewable energy applications

CeraLink

Film capacitors
Aluminum capacitors

Magnets for wind power generator

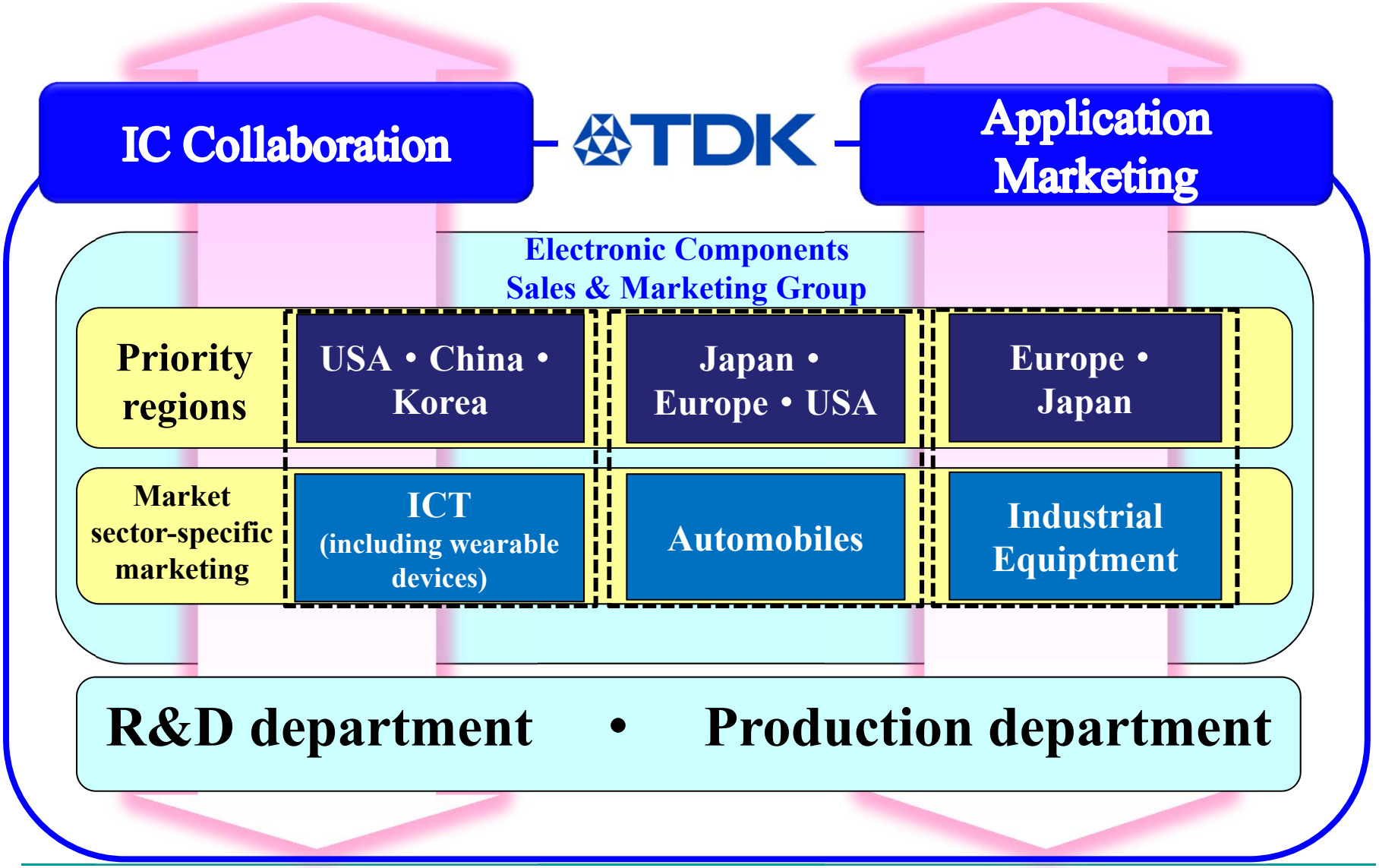
High performance ferrite cores

Filters • Varistors • Arresters

Sensors

Framework of Electronic Components Sales & Marketing Group

Building Customer Value



Strategy of Priority Five Businesses

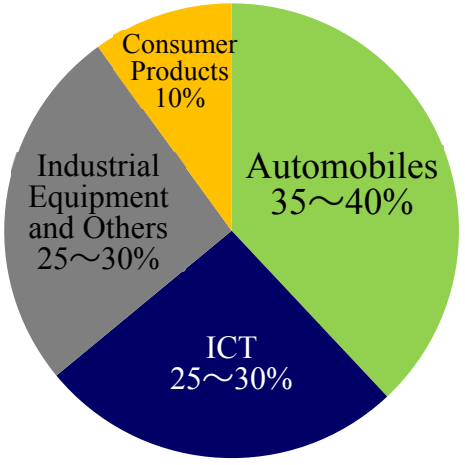
Inductive Devices
High Frequency Components
Piezoelectric Material Products
Rechargeable Batteries
HDD Heads

Executive Vice President
Hiroyuki Uemura

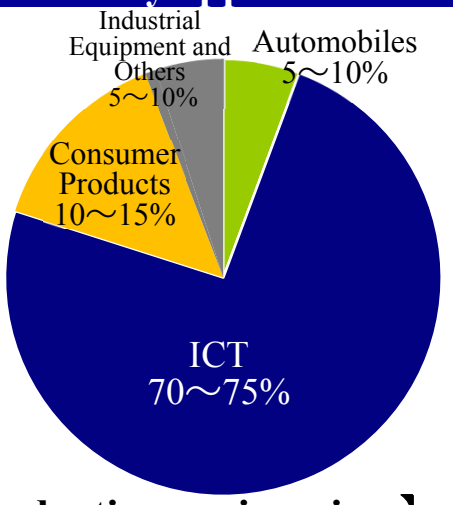
Inductive Devices

Inductive Devices

Inductive device sales by applications



Metal power inductor sales by applications



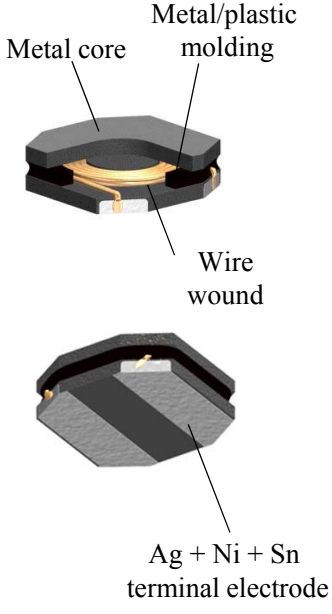
【 Metal inductor production engineering 】

Engineering	Feature	Characteristic		Major product	Competitor
Wire wound	Large current High reliability	Size	2016～1717	VLS CLF SPM	Company C Company S Company T Company V
		Frequency	～10MHz		
		Current	3～10A		
Thin film (plating)	Large current Small/Low profile	Size	1608 height 0.5mm	TFM	Company S
		Frequency	～10MHz		
		Current	2～6A		
Multilayer	Small Low profile Suitable for high-frequency applications	Size	1005～2016	MLS MLP	Company T
		Frequency	～200MHz		
		Current	～2A		

Features of metal power inductors

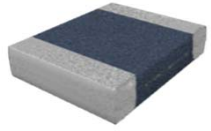
Metal Wire Wound VLS-HB Series

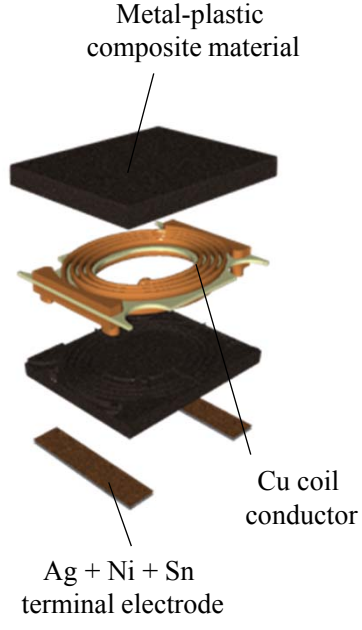
Large current
Broad inductance range



Metal Thin Film (plating) TFM Series

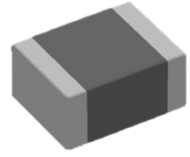
Small/Low profile
Large current

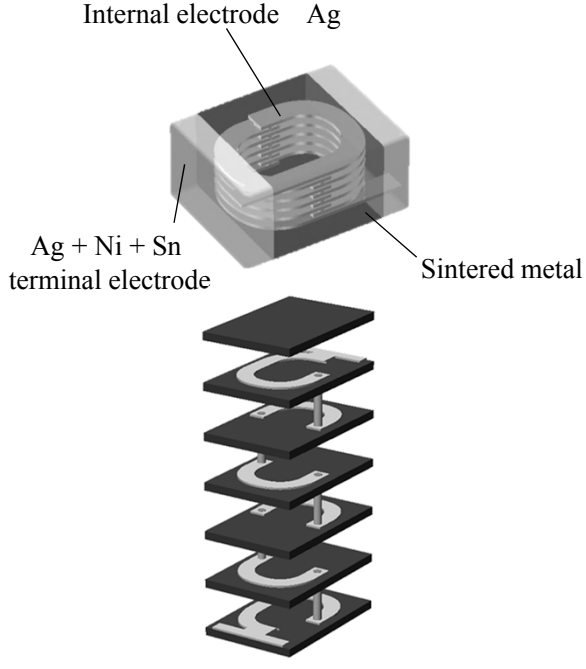




Metal Multilayer MLS Series

Small/Low profile
Low loss

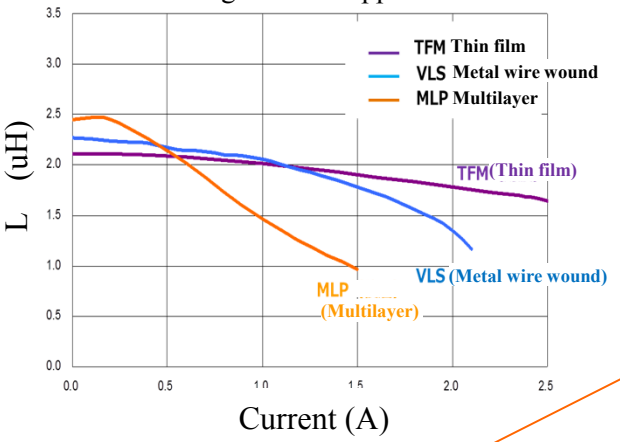




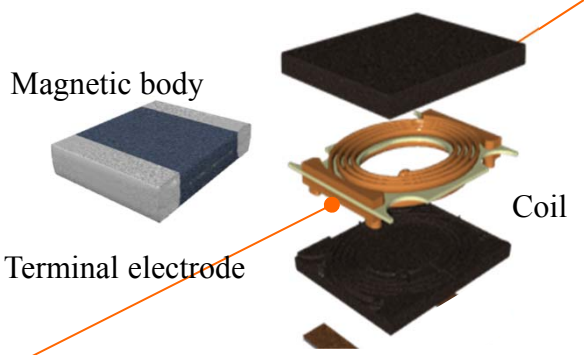
Structure and features of thin-film metal inductor/TFM

Structure

Reduced current-dependent characteristic variation
→ Suitable for large-current applications

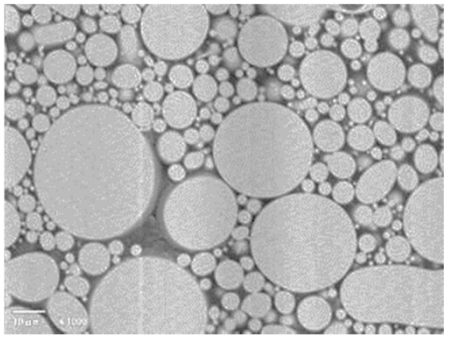


Structure

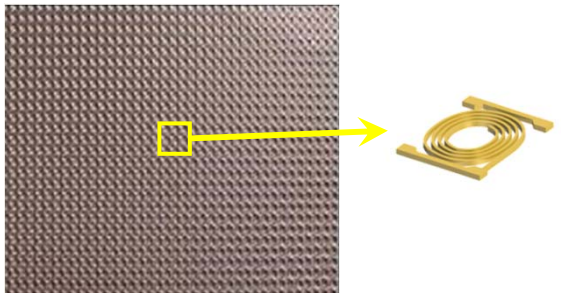


Magnetic metal material

High-dispersion and high-filling technique used to achieve high μ

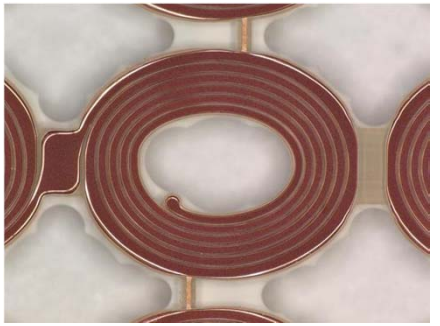


Coil substrate



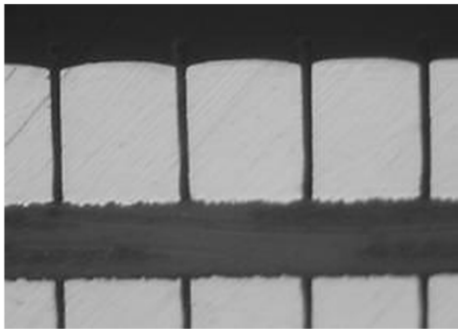
Substrate process to improve production efficiency

Coil conductor



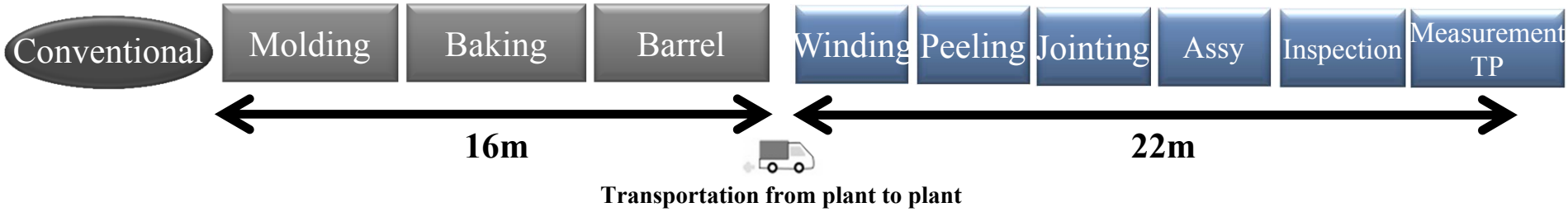
High-density coil conductor formed by micro-patterning

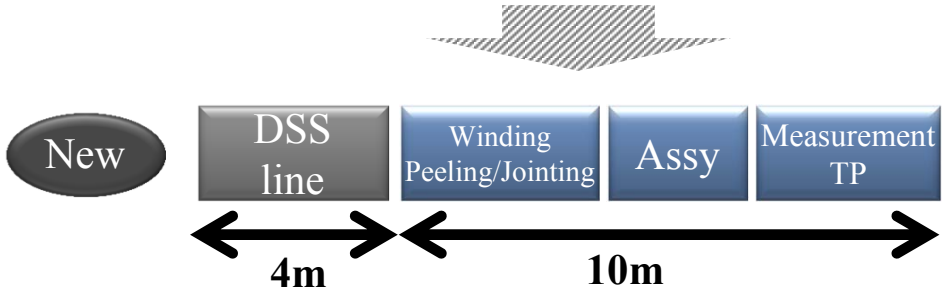
Coil conductor cross section



High-density winding and low-resistance coil enabled by newly developed high-aspect and high-precision plating technique

Core & Inductor: Integrated location-free production





	Reduction rate
Line length	-60～75%
Area	-70～85%
Lead time	-60～75%
Personnel/Line	-70～90%

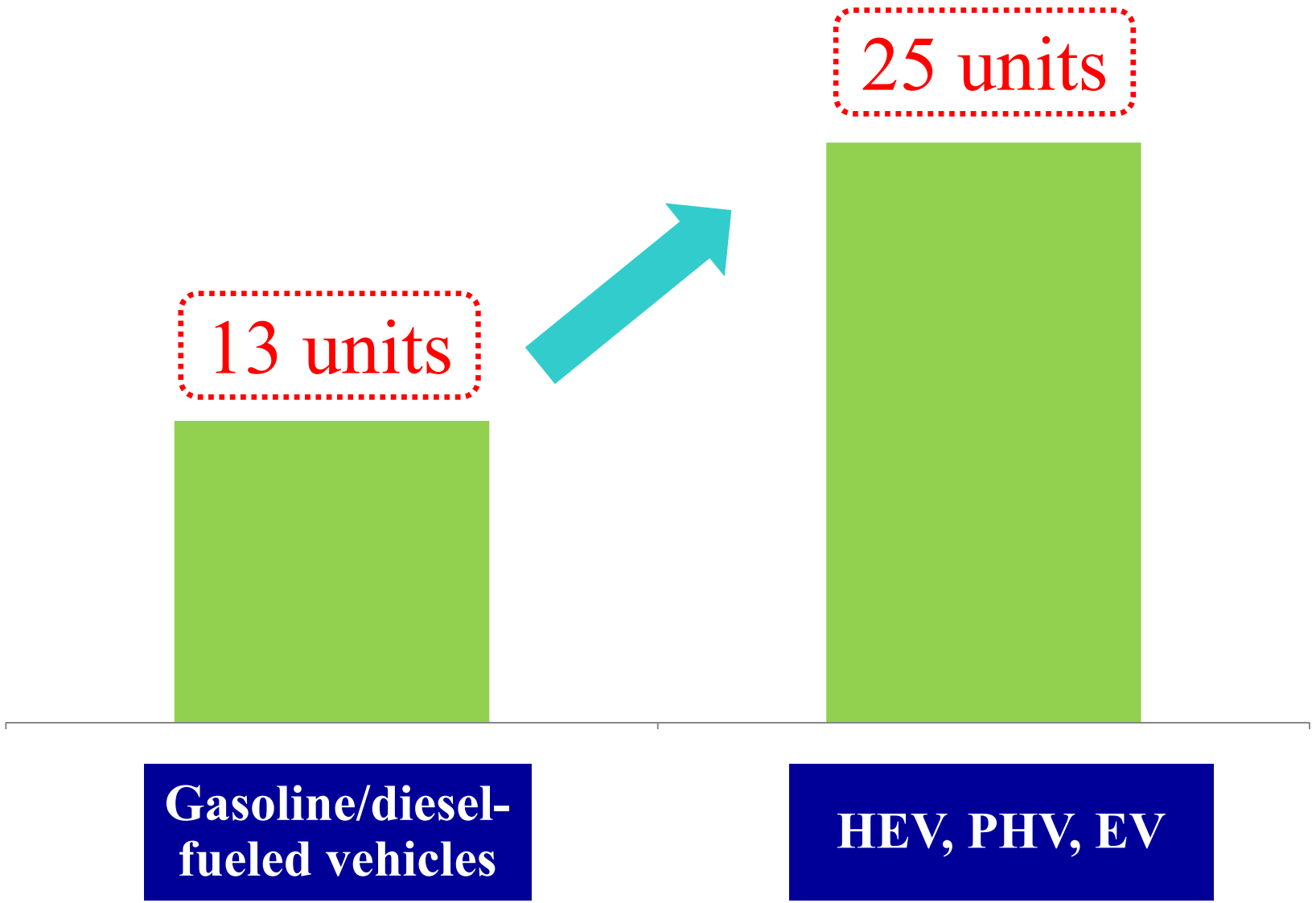
Making it location-free

Manufacturing reformed to produce products for high-demand markets

Advantages

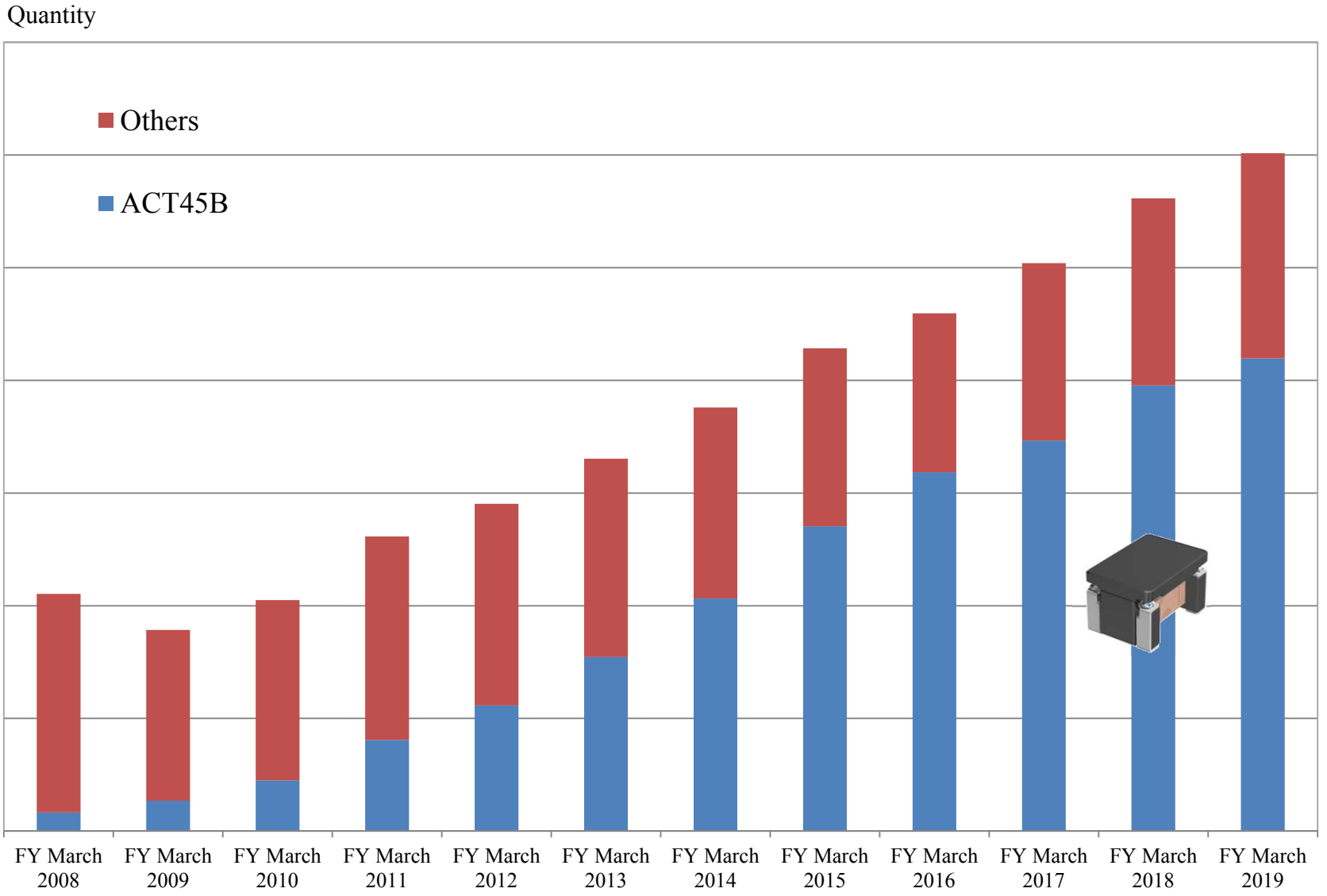
- **Solution to increasing personnel costs in China**
  → Manufacturing in China to meet domestic demand in China
  Manufacturing of export items conducted outside China
  (Manufacturing might be repatriated to Japan.)
- **Capability to cope with sharp foreign exchange movements**

Relationship between vehicle drive systems and numbers of ECUs



※TDK's estimation

CAN filter sales trends



Inductive Devices Overview

① Enhancing metal inductors

Lineup comprising a full range of thin-film, multilayer and wire wound inductors, notably with an increased line of TDK's flagship thin-film inductors

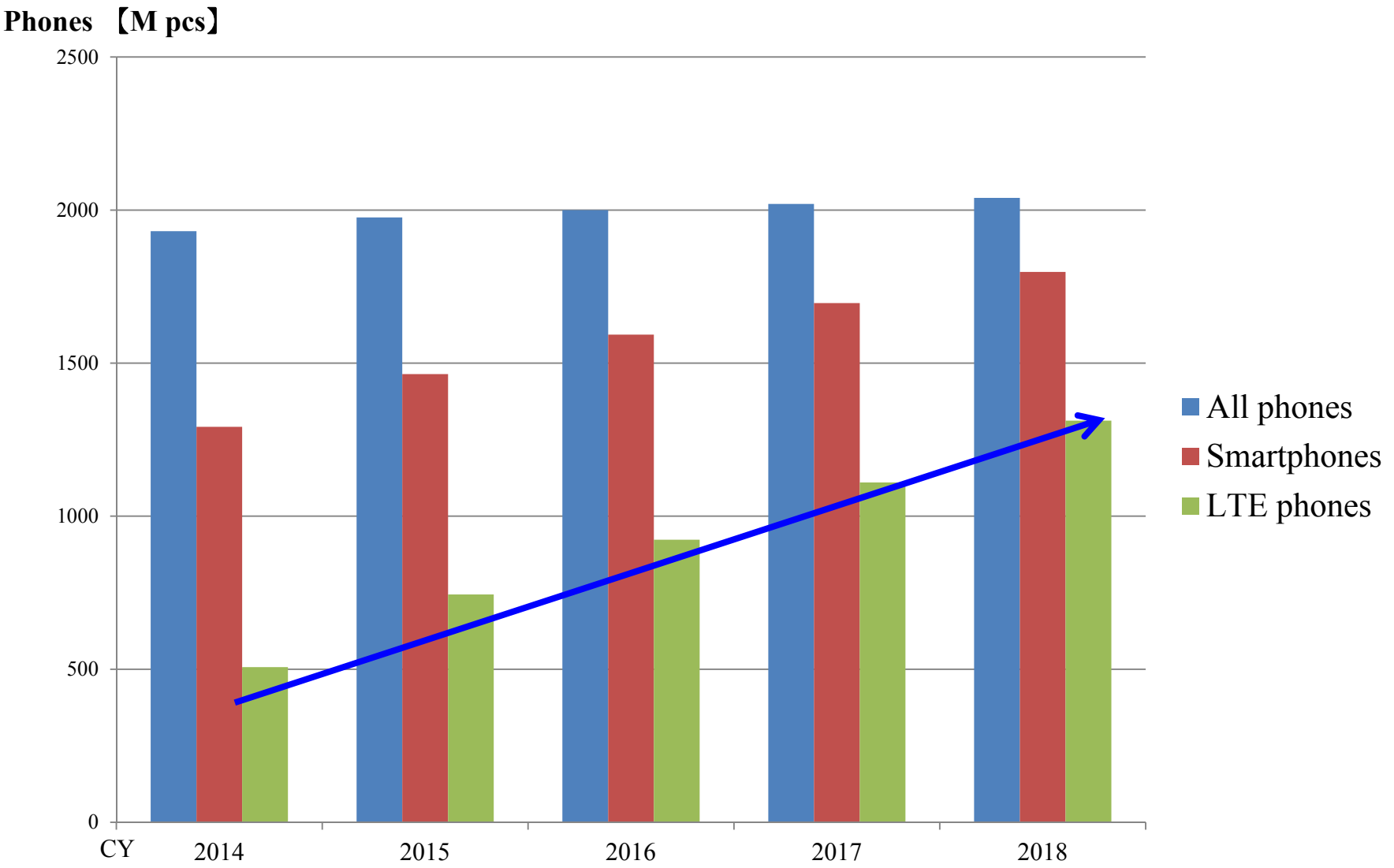
② Comprehensive application of integrated location-free production lines

Relocating part of manufacturing sites from China to Japan to be considered according to foreign exchange movements

③ Strengthening collaborations with IC manufacturers

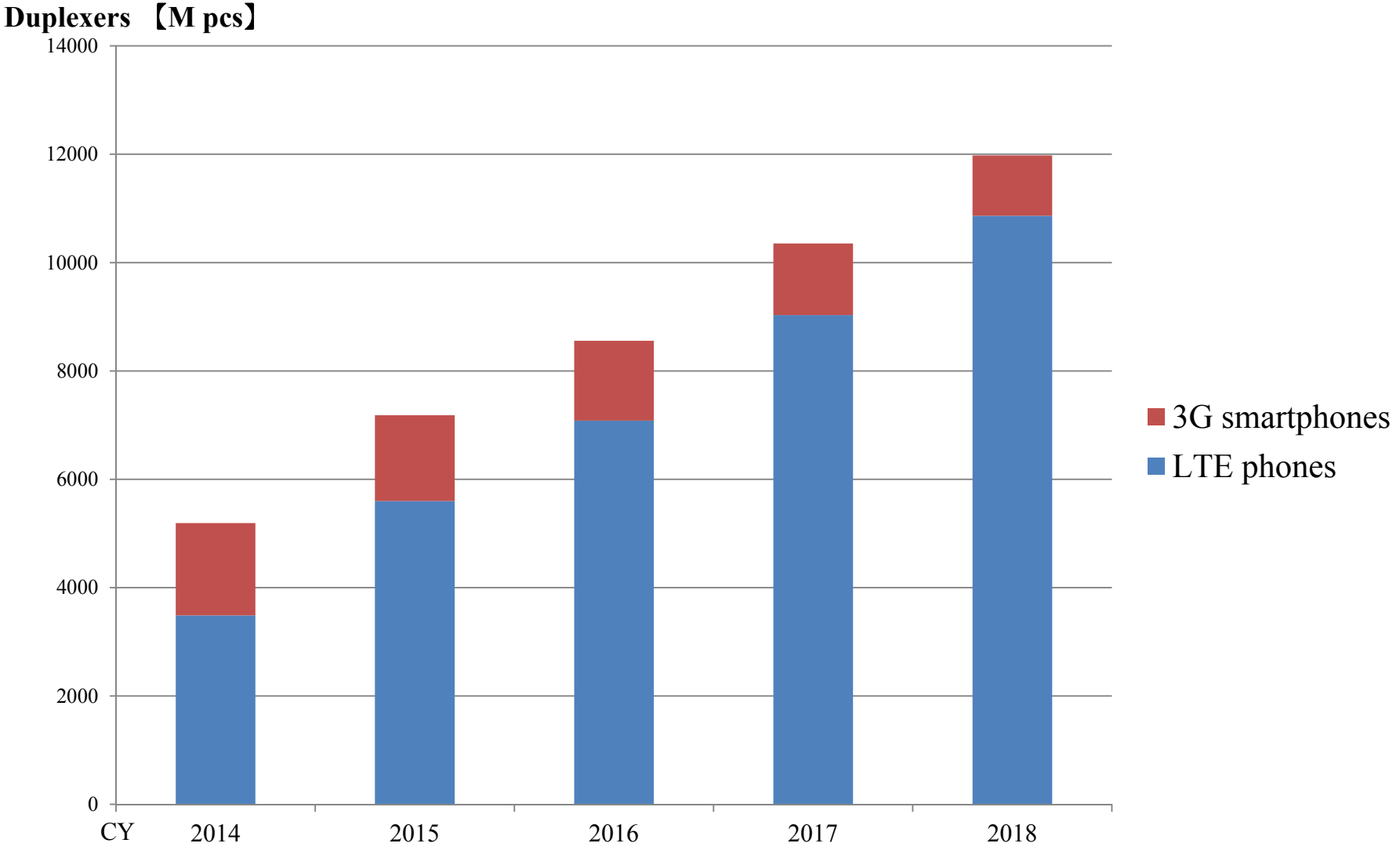
High Frequency Components

Mobile phone market overview



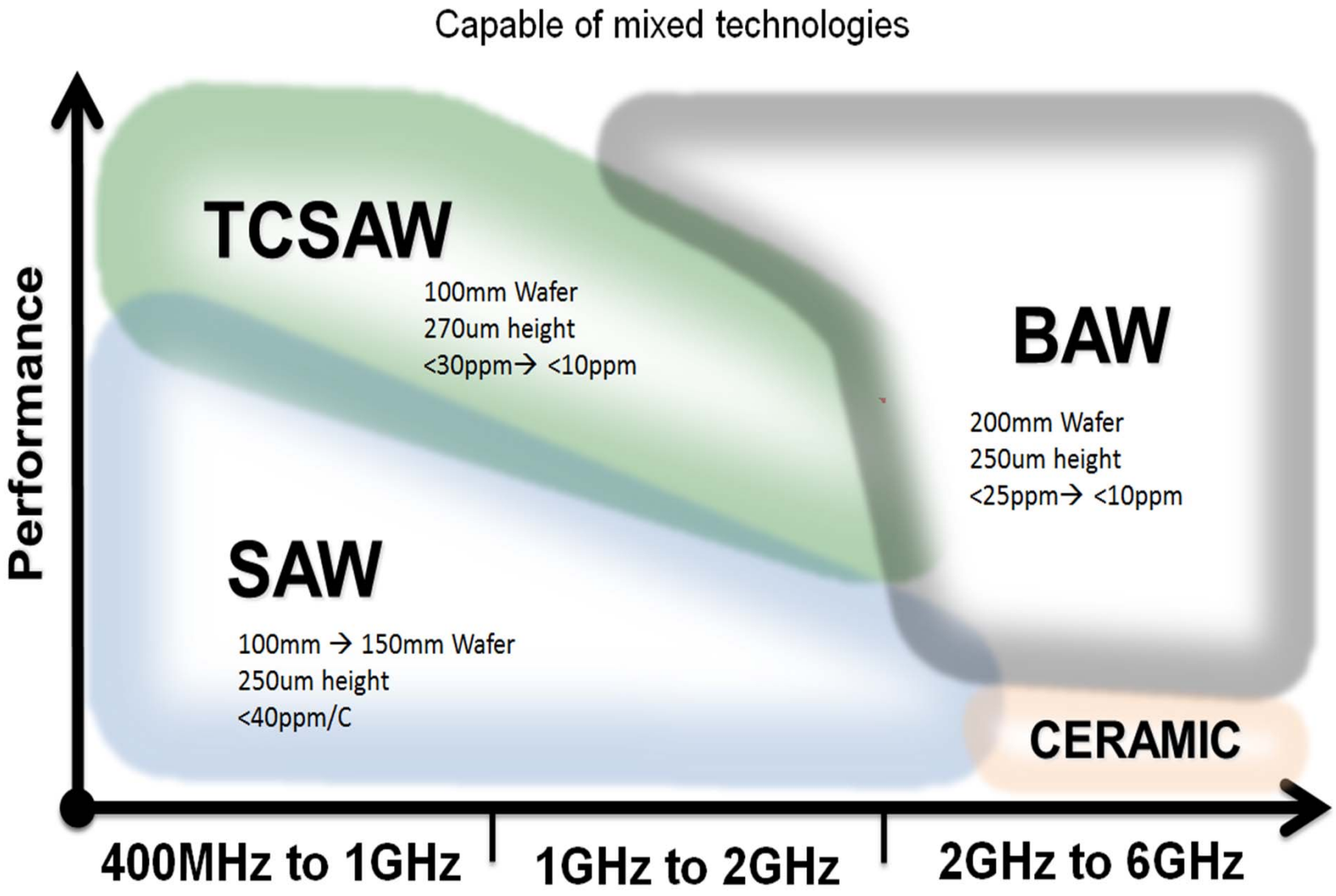
※TDK's estimation

Duplexer market expansion by the use of LTE

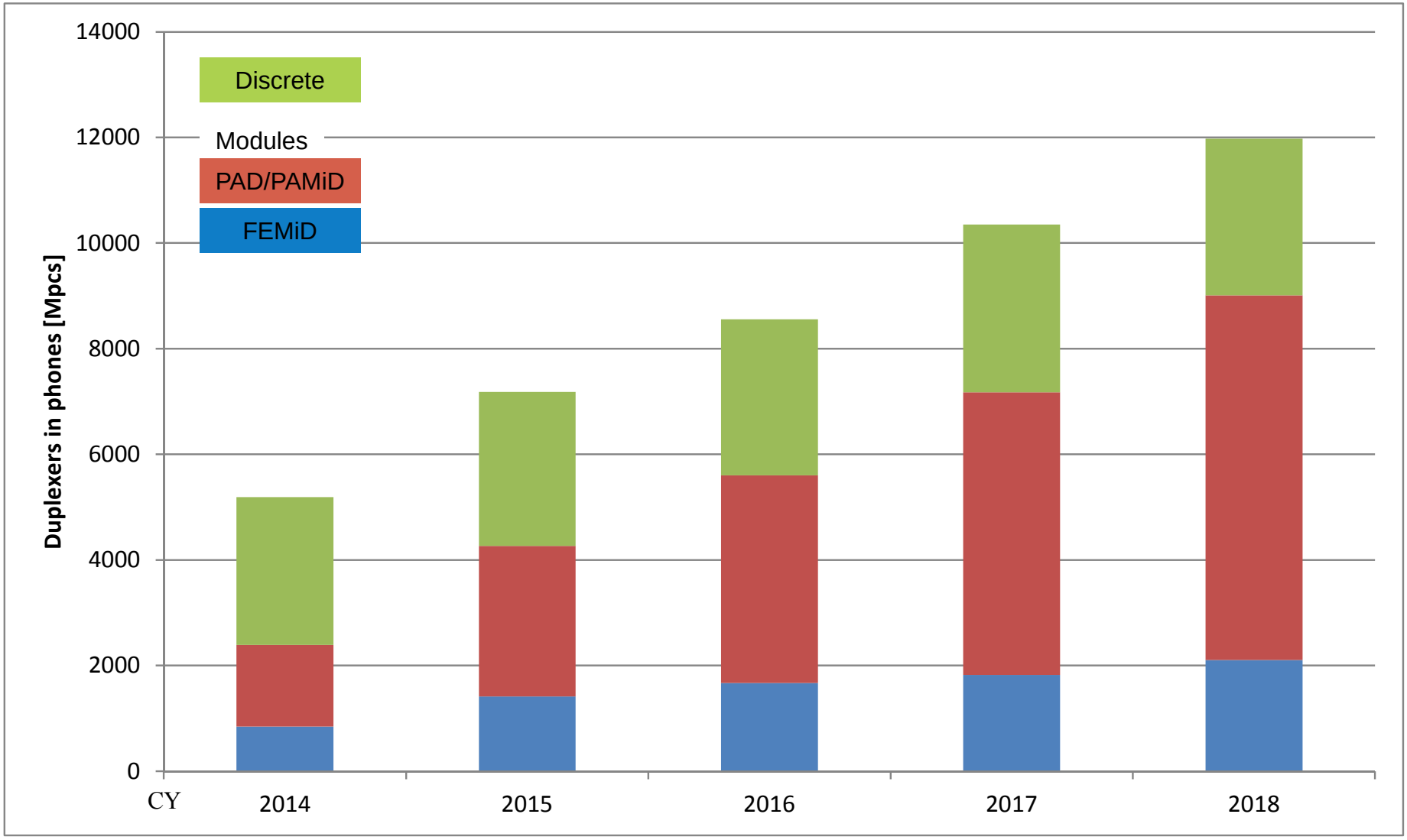


※TDK's estimation

TDK's filter technology and products to cover the entire range

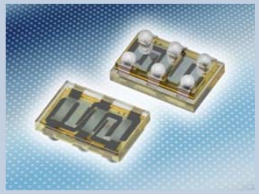
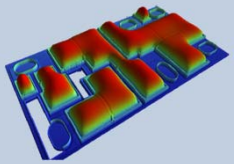


Discrete components versus modules in duplexer market



※TDK's estimation

TDK's advanced packaging technologies

Packaging Technology	Feature	Use	Height
CSSP 	General-purpose package for discrete components (in volume production)	Mobile phones Telematics	0.6 mm
DSSP 	Small package for SAW (in volume production)	Modules for mobile phones	0.4 mm
TFAP 	Next-generation wafer-level package for SAW and BAW (in preparation for volume production)	Modules for next-generation mobile phones	0.25 mm

High Frequency Components overview

① Making filters higher value-added and suitable for modules

- SAW, TCSAW and BAW filters to cover the entire range
- New packages for shifting toward smaller size and lower profile and for simplifying the subsequent process

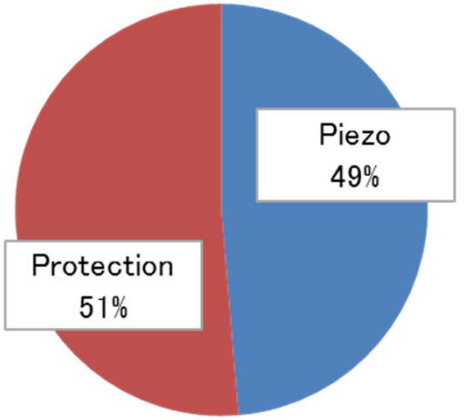
② Strengthen relationships with IC manufacturers

- Providing solutions drawing on reference design-in
- Collaboration with PA manufacturers to meet PAD/PAMiD market needs

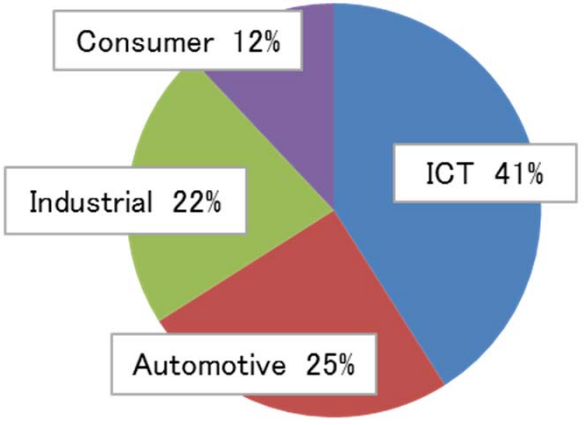
Piezoelectric Material Products

Piezoelectric Material Products

【Sales breakdown】



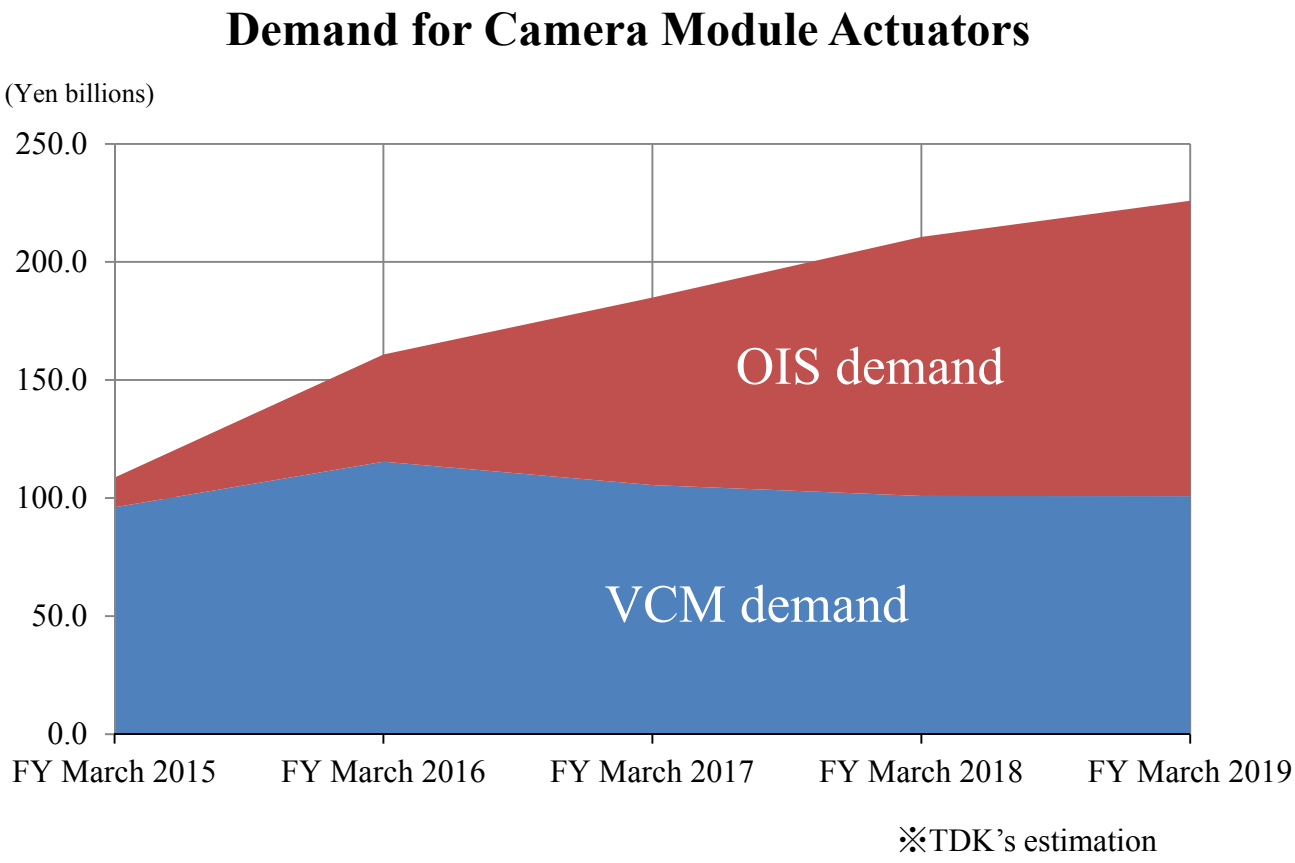
【Sales by applications】



Application	Main Products
ICT	Camera module actuators Surge arresters Chip components (varistors and NTCs)
Automobiles	Piezo injecters Chip components (varistors and NTCs) PTC
Industrial Equipment and Others	Disc varistors PTC Chip components (varistors and NTCs)
Consumer Products	Piezo actuators PTC Disc varistors

- Growth in ICT market principally with camera module actuators
- Ceramic protection components cover all areas of application

Camera module actuator market trends



Demand for high-performance OIS camera module actuators is expected to grow from now on. TDK's OIS sales will be expanded to achieve overall business growth.

Piezoelectric Material Products overview

① Growth of OIS camera module actuator products

② Promoting development of Ceralink for the automotive industry

③ TDK has the largest share of the market for ceramic protection components (arresters, varistors, PTCs and chip components) and earns profits stably from this market

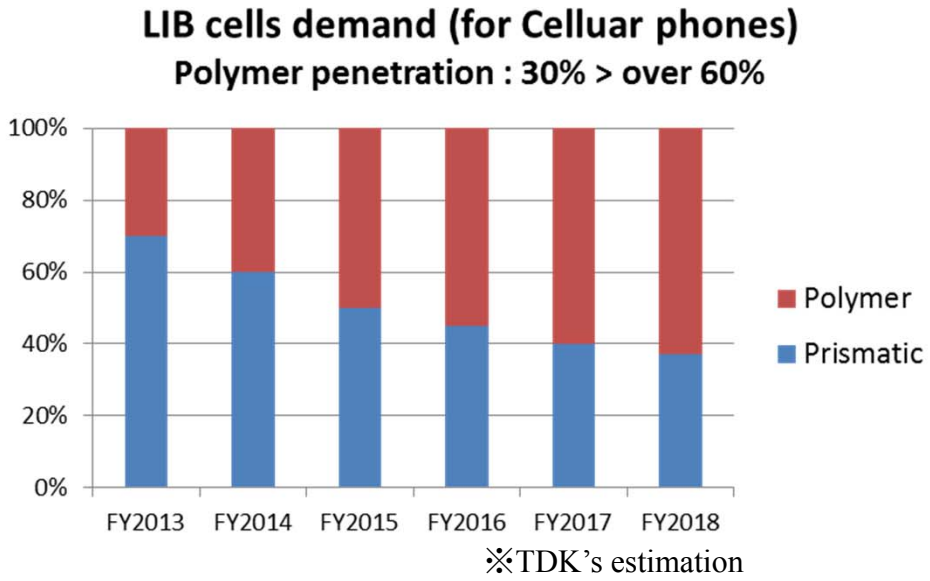
Strategy of Priority Five Businesses

Inductive Devices
High Frequency Components
Piezoelectric Material Products
Rechargeable Batteries
HDD Heads

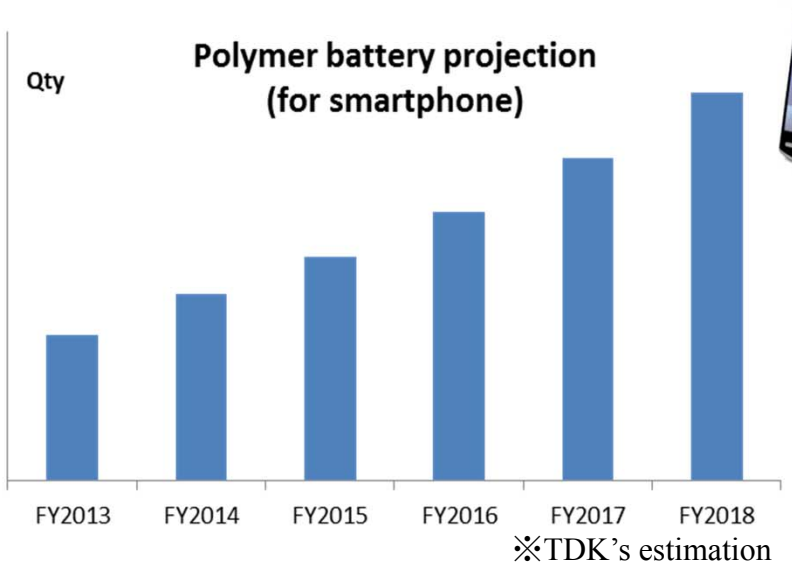
Senior Vice President
Robin Zeng

ICT Market Growth Projection

We expect higher growth of Polymer Battery demand in next mid-term

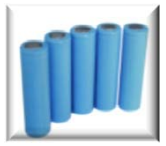


※TDK's estimation



※TDK's estimation

- Smart Phone market growth rate up to 20% per annual
- Tablet & Notebook PC growth up to 10% per annual
- Slim type notebook PC will cause more demand of polymer battery transfer from cylindrical battery



FY2013 : FY March 2014

Customer portfolio in ICT market

Plan to increase market share by expanding customer base to adapt the change of market and business environment

USA

China

Korea

Japan

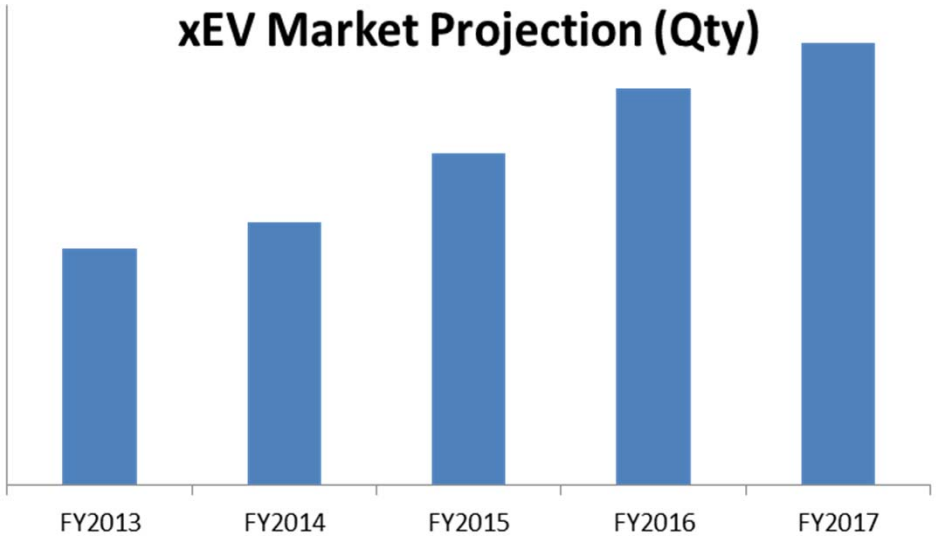
Growth Strategy for ICT market

- Provide solution to customers from battery cell to pack design

- Strengthen R&D activities in new material development, manufacturing technology, design development

- Cost competitiveness
  - Continue to improve manufacturing efficiency to enhance our competitive advantage
  - Utilize in-house developed equipment for low cost and process enhancement

Business opportunity in EV/ESS



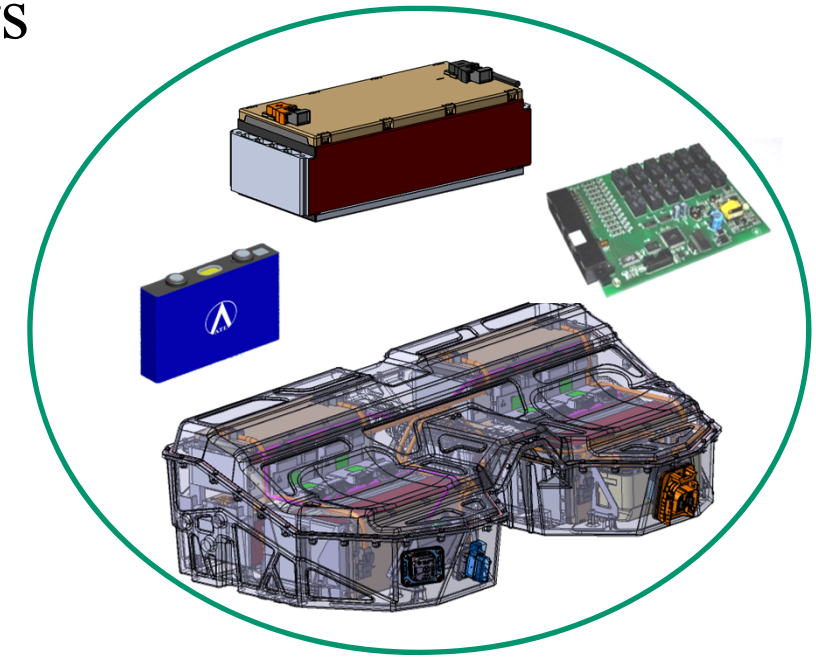
※TDK's estimation

- Huge potential of market growth in EV/ESS
- EV : 48V, PHEV, EREV, BEV initial introduction
- ESS : Smart grid, home storage, large scale ESS for frequency regular and China special solar plant/ wind farm are on early introduction stage

FY2013 : FY March 2014

Strategy for EV segment

Aim to become a technology solution provider of Battery Energy Storage System (BESS), provide the best cost to performance service for customers



- Material Research
- Development and manufacturing of
  - Battery cells
  - Battery Module
  - Battery Management System
  - Battery Pack
- Reuse & Recycle (value chain)
  - Invest one Chinese recycle company for customer service

Winning Strategy

Three factors to enhance competitive advantage

Risks management policy

- Battery is active safety device with the combination of technology of chemistry, material, electronics, mechanical and thermal management etc. It may cause safety event in the field and the larger battery has higher risk.

Our Quality Policy to overcome the risk

> Start from material intrinsic safety to design battery to manufacturing with quality system build in. Especially on FMEA* system applying to design and process

*FMEA : Failure Mode and Effect Analysis

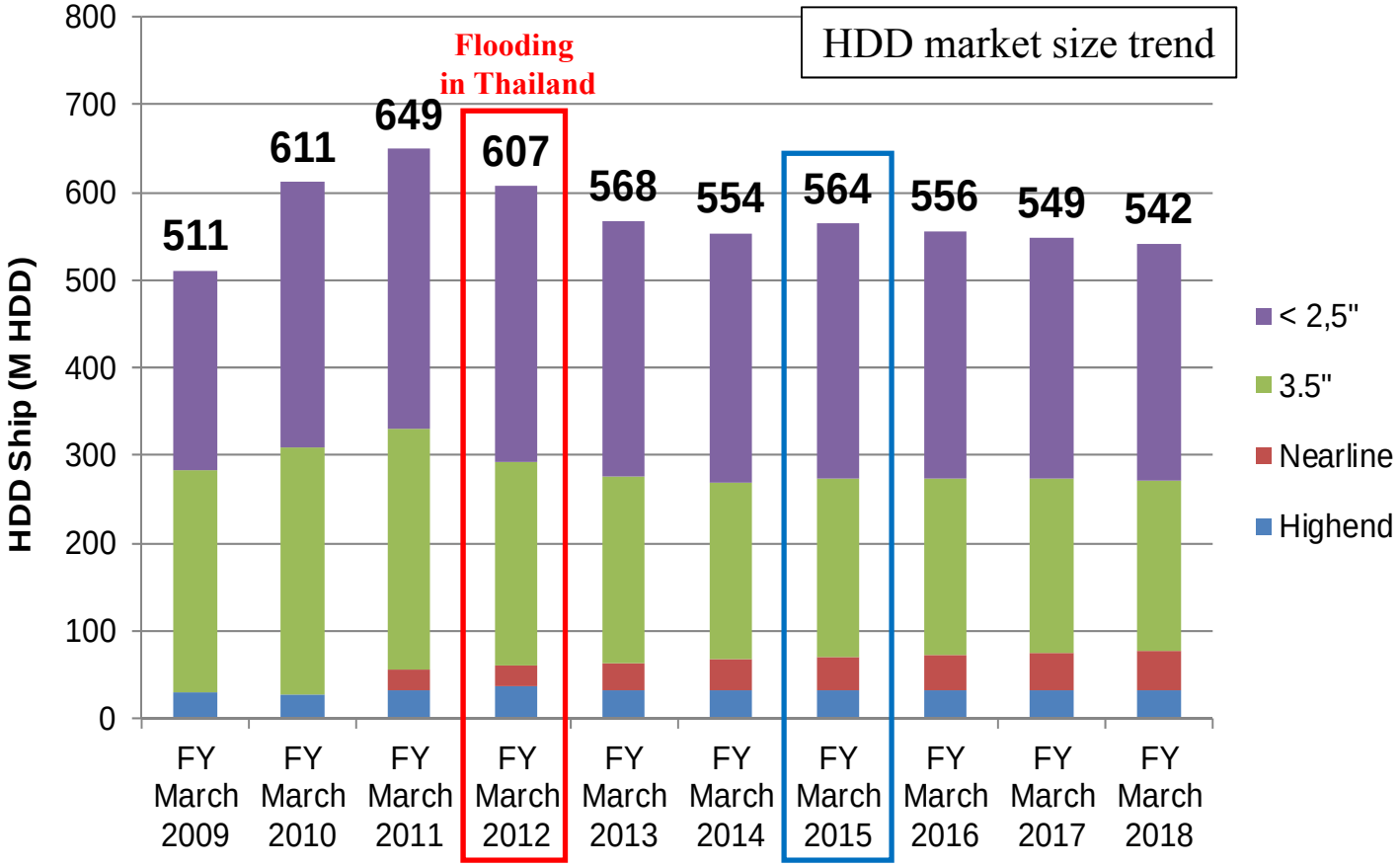
Strategy of Priority Five Businesses

Inductive Devices
High Frequency Components
Piezoelectric Material Products
Rechargeable Batteries
HDD Heads

Corporate Officer
Shigenao Ishiguro

About the HDD market

＜About the HDD market size and changes＞



※TDK's estimation

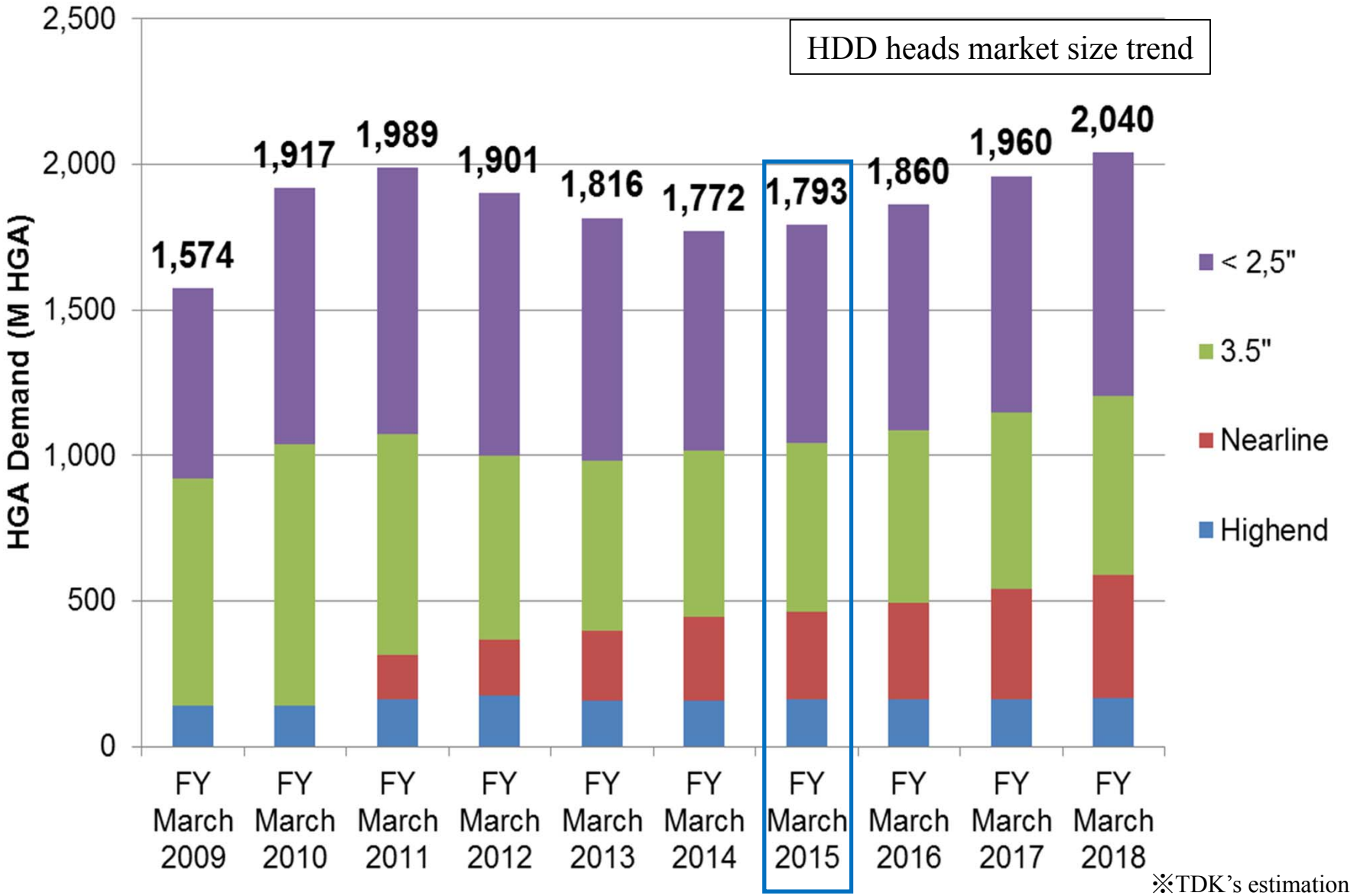
Changes in the HDD market

- **HDD market shifting from mobility to capacity**
- **High-capacity HDDs to sustain the era of big data**

<Key Success Factors>

1) **Continued development of new head products for multi-disk HDD**
2) **Accelerated development of assisted recording (with TAMR being most promising) and establishment of the TAMR business**

About the HDD heads market



HDD heads overview

① –2014: Starting up high-capacity storage business

② –2017: Introduce SMR*1 and DSA*2 technologies for new multi-disk HDD

③ 2017–: Target set at 50% share of TAMR head market

*1: Shingle MR
*2: Dual Stage Actuator

Enhancing Financial Strength

Corporate Officer
Takakazu Momozuka

Enhancing financial strength

① **Improve profitability by expanding priority businesses**

② **Improve efficiency in general and administrative expenses and R&D expenses**

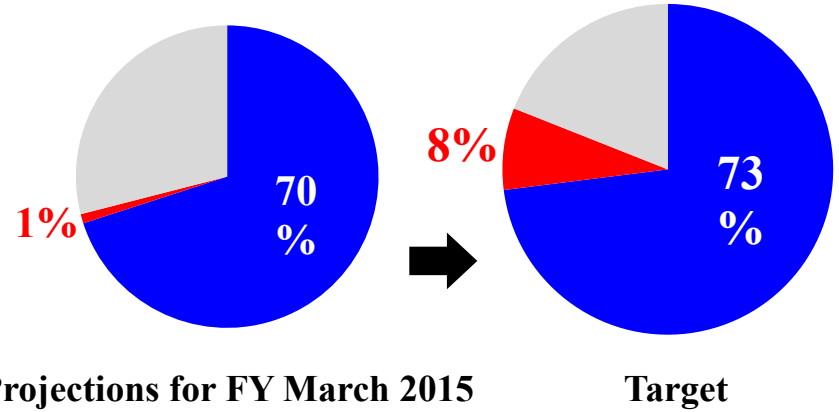
③ **Financial strategy**

Improve profitability by expanding priority businesses

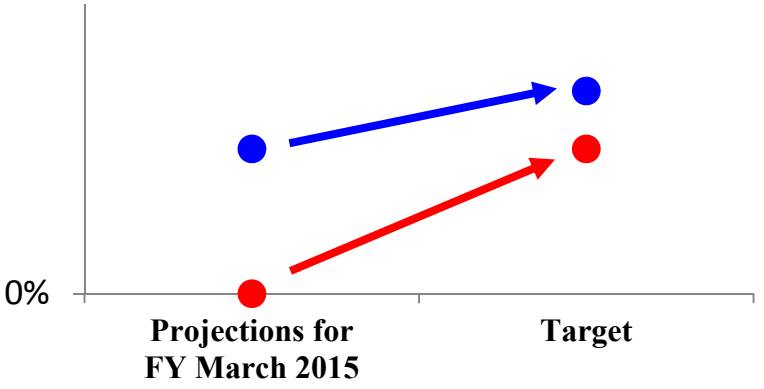
Priority businesses

Priority Five Businesses New Businesses Others

Business size expansion (sales breakdown)

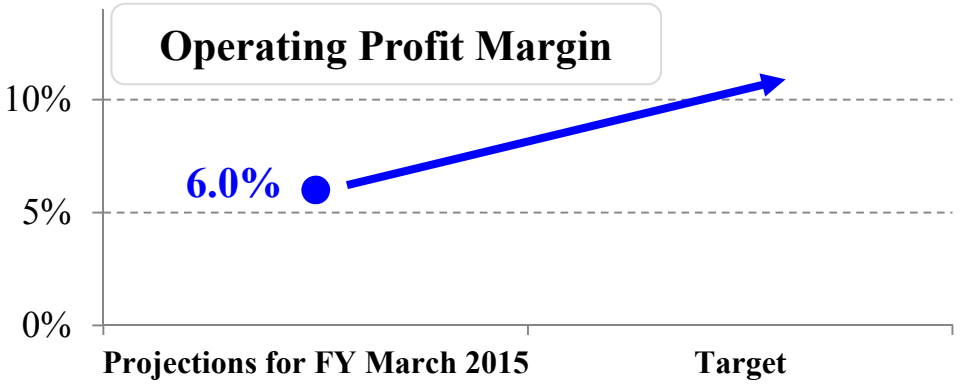


Improved profitability (operating profit margin)



Company-wide

	Projections for FY March 2015	Target
OP margin	6.0%	Over 10%



Projections for FY March 2015	Sales percentage
SGA expenses (excluding R&D expenses)	12.5%
R&D expenses	6.5%
SGA expenses Total	19.0%

Measures

✓ **Promote reforms for Head Office functions**

- Speedy business operations enabled by delegation.
- Efficiency improvements by consolidating service divisions

✓ **Review the R&D system at Head Office**

- Shifting toward a global R&D system
- Enhancing business strength by making development efforts within local divisions
- Medium- to long-term development themes promoted by Head office

Improve profitability by reducing the percentage of general management expenses and improving development efficiency

Financial strategy

Net Debt

↓

Net Cash

Cash build-up

Return to shareholders

Growth investment

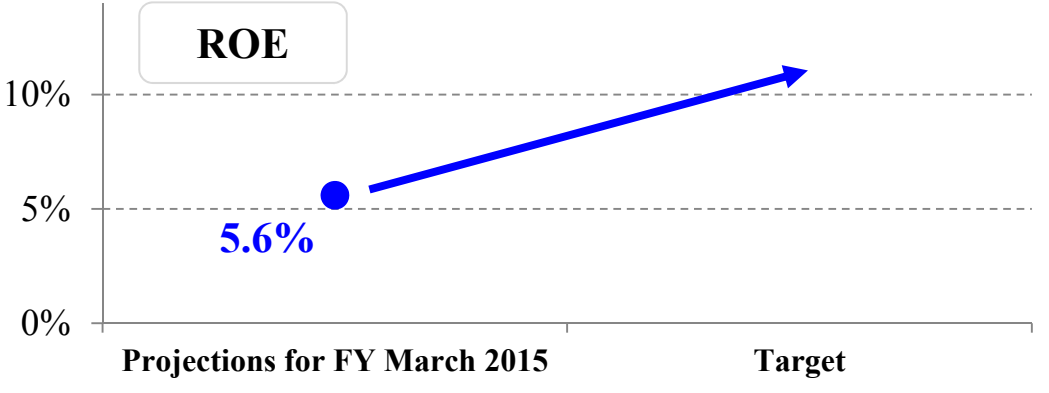
Dividend policy

Strive to achieve stable dividend increases through growth in the earnings per share figure

Invest funds into the development of new products and new businesses

Consider the acquisition of own share, in addition to dividends, as an option to provide returns to stockholders

	Projections for FY March 2015	Target
ROE	5.6%	Over 10%



New Development Areas/ Summary

President and CEO
Takehiro Kamigama

Global R&D system

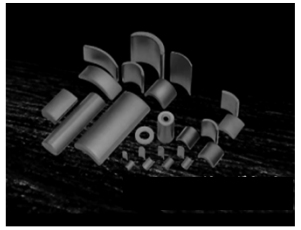
- Development functions of Head Office in Japan focus principally on material development and other medium- to long-term themes
- Overseas group companies strengthen their development functions beginning with research projects

Energy device growth scenario / Automotive field

- Strengthen power unit components for next-generation vehicles(BEV/HEV/PHV/FCV)
- Promote the sales of power-related components drawing on magnetic technology, which is TDK's core competence

Automotive field

1 to 2 years



Ferrite magnets

HEV motor-generators

High-performance neodymium magnets

Dy-free magnets with Nd reduced by half for drive motors

Lead-free piezoelectric material (Ceralink)

High-efficiency small DC-DC converters & chargers

Secondary batteries for xEVs (lithium ion)

Wireless charging systems for xEVs

3 to 5 years

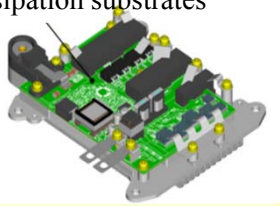
Rare-earth-free/strongest magnetic materials for drive motors

Lead-free piezoelectric materials (thin-film, bulk)

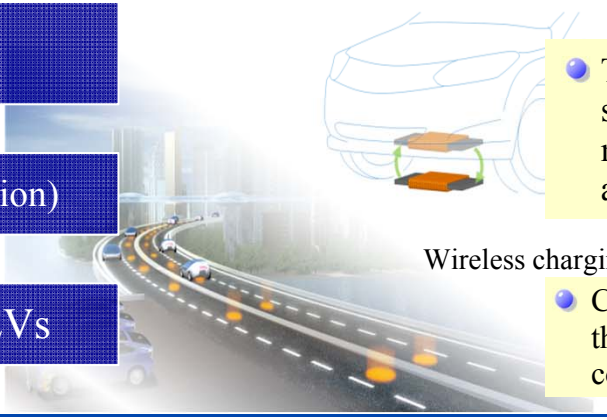
Secondary batteries for xEVs (high-safety technology)

- Performance improvements by grain-boundary composition control technology

High heat dissipation substrates



- TDK's proprietary high heat dissipation substrate and high-performance ferrite material used to achieve size reduction and efficiency improvements



Wireless charging during driving

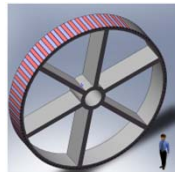
- Compliance with noise regulations set out in the Radio Law, using TDK's proprietary coil noise reduction technology

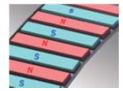
Energy device growth scenario / Industrial equipment & energy fields

- Strengthen energy devices for renewable energy-related systems
- Promote the sales of power components drawing on magnetic technology, which is TDK's core competence

Industrial equipment & energy fields

1 to 2 years





- Free from the impact of instability in the supply of rare-earth elements

Dy-free magnets with Nd reduced by half for wind power generation

Lead-free piezoelectric material (Ceralink)

High-capacity high-efficiency power supplies

Secondary batteries (Storage battery systems)

Wireless charging systems (for industrial machinery)

- Ceramic capacitors that reach the maximum capacitance under a high DC bias voltage
- Deployment of wireless charging technology for xEVs in the area of industrial equipment

Chip component mounter

3 to 5 years

Rare-earth-free/strongest magnetic materials for wind power generation

Lead-free piezoelectric materials (thin-film, bulk)

Secondary batteries (Stationary type, high-safety battery technology)

- Battery material technology combined with processing technology to reduce electrode expansion

Deployment of wireless charging technology in the automotive and industrial equipment fields

- Build wireless charging systems for use in the automotive and industrial equipment fields

Automotive and industrial equipment fields

Wireless charging systems for xEVs

Small power-receiving coil unit

- Downsized power-receiving coil with a built-in multilayer ceramic capacitor

High-efficiency 3.3 kW transmission

- High transmission efficiency achieved by using low core loss material PC95
- Vibration resistance rendered by TDK's proprietary ferrite material

Forklift/AGV※

- Application of wireless charging technology to forklifts

Outdoor cart

- Application of wireless charging technology to outdoor carts

※Automatic Guided Vehicle

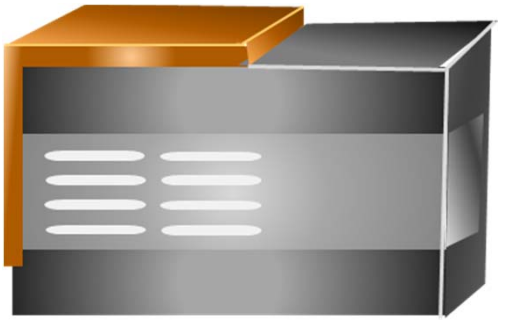
Goals for the thin-film device business

TDK has developed thin-film technologies through its head business and materials technologies through its passive component business. By merging these technologies, we will provide high value-added products that positively respond to the needs of the information and communications fields that are expected diversify in the future.

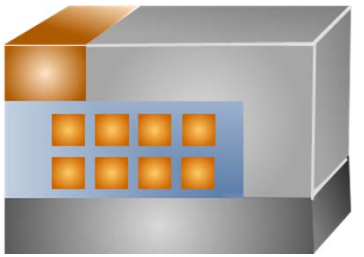
Advantages of thin-film technology
Reduced conductor shape variability
Reduced variability in film thickness for dielectric materials and piezoelectric layers
High aspect ratio (conductor)

Differences from semiconductor technology
Three-dimensional fine structure
Features of thin-film materials (magnetic/dielectric/piezoelectric) used at the core of TDK's high-performance products

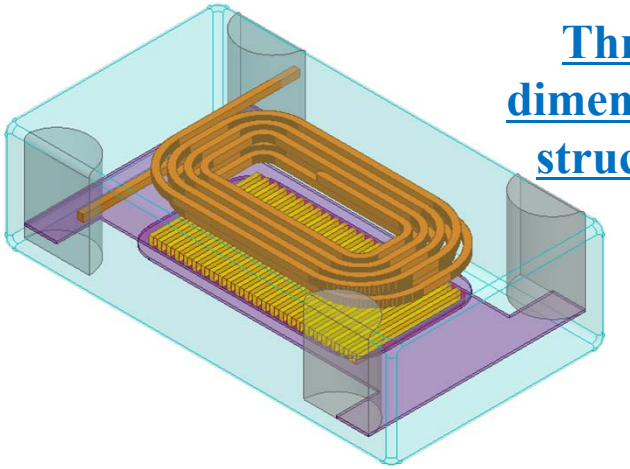
Multilayer type



Thin Film type



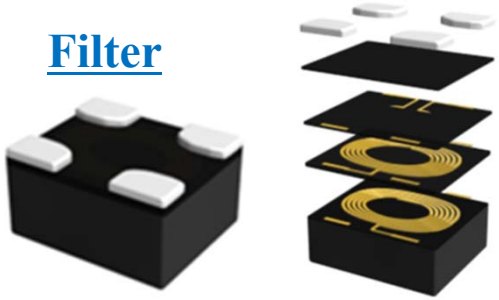
Three-dimensional structure



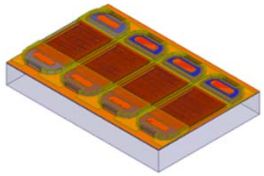
Product families in the thin-film device business and their features

Product family	Feature
Common-mode filters	Size reduction and performance improvements
High-frequency filters	Reduced footprint enabled by size reduction and use of arrayed configuration Performance improvements in high-frequency
Inductors	Low-profile power devices (low-profile modules) and embedded high Q-factor types (low profile)
Composite components (capacitors and inductors)	Reduced footprint and low profile achieved by composite design.
MEMS	Three-dimensional structure and material characteristics used at the core to achieve performance improvements.

Filter



Array Type

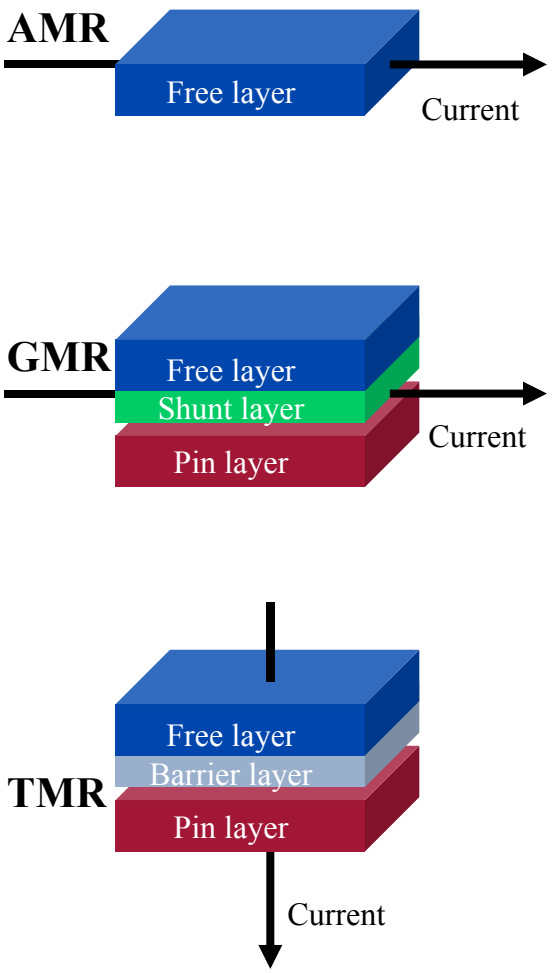


Future angle sensor accuracy requirements (for automobile applications)

Application	Accuracy of predecessor	Future accuracy requirement
Throttle valves	±2° to ±3°	±1°
Wipers	±1.2° (20 to 130 mT)	±0.6° (20 to 130 mT)
Steering (EPS motor)	±0.6° (20 to 80 mT)	±0.3° (20 to 80 mT) Redundancy ISO 26262

At least a two-fold angle sensing accuracy will be realized with this technology

Development of magnetic sensor technology



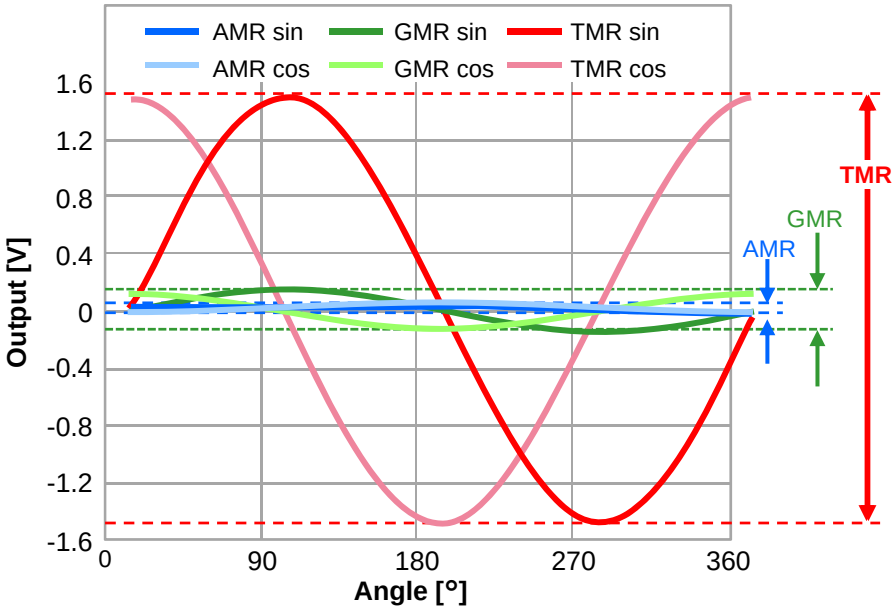
	MR Ratio [%]	Output [mV]	SNR @ 10 kHz [dB]	Temperature dependence 25 °C to 125 °C [%]
AMR	3	90	72	-29
GMR	12	360	77	-23
TMR	**100**	**3000**	**96**	**-13**

TMR Output

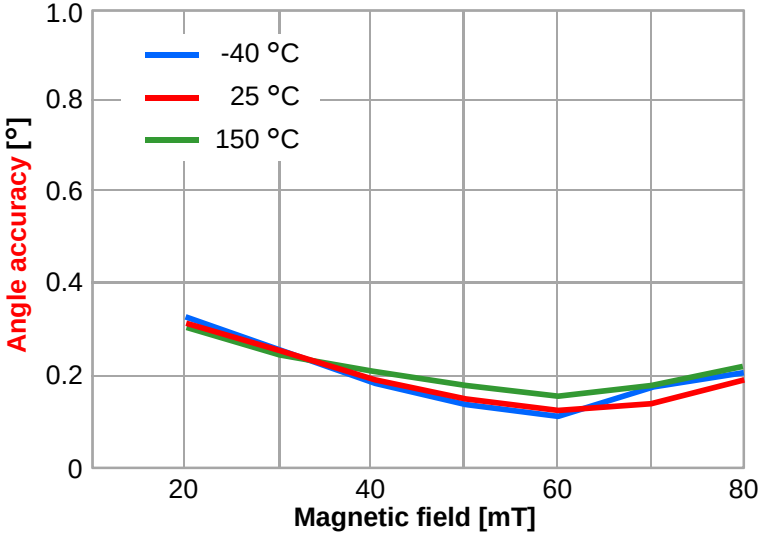
- **30 times better than AMR**
- **8 times better than GMR**
- **Stable angle sensing accuracy across a broad range of temperature variations**

TDK's TMR angle sensors with excellent characteristics

Output waveforms

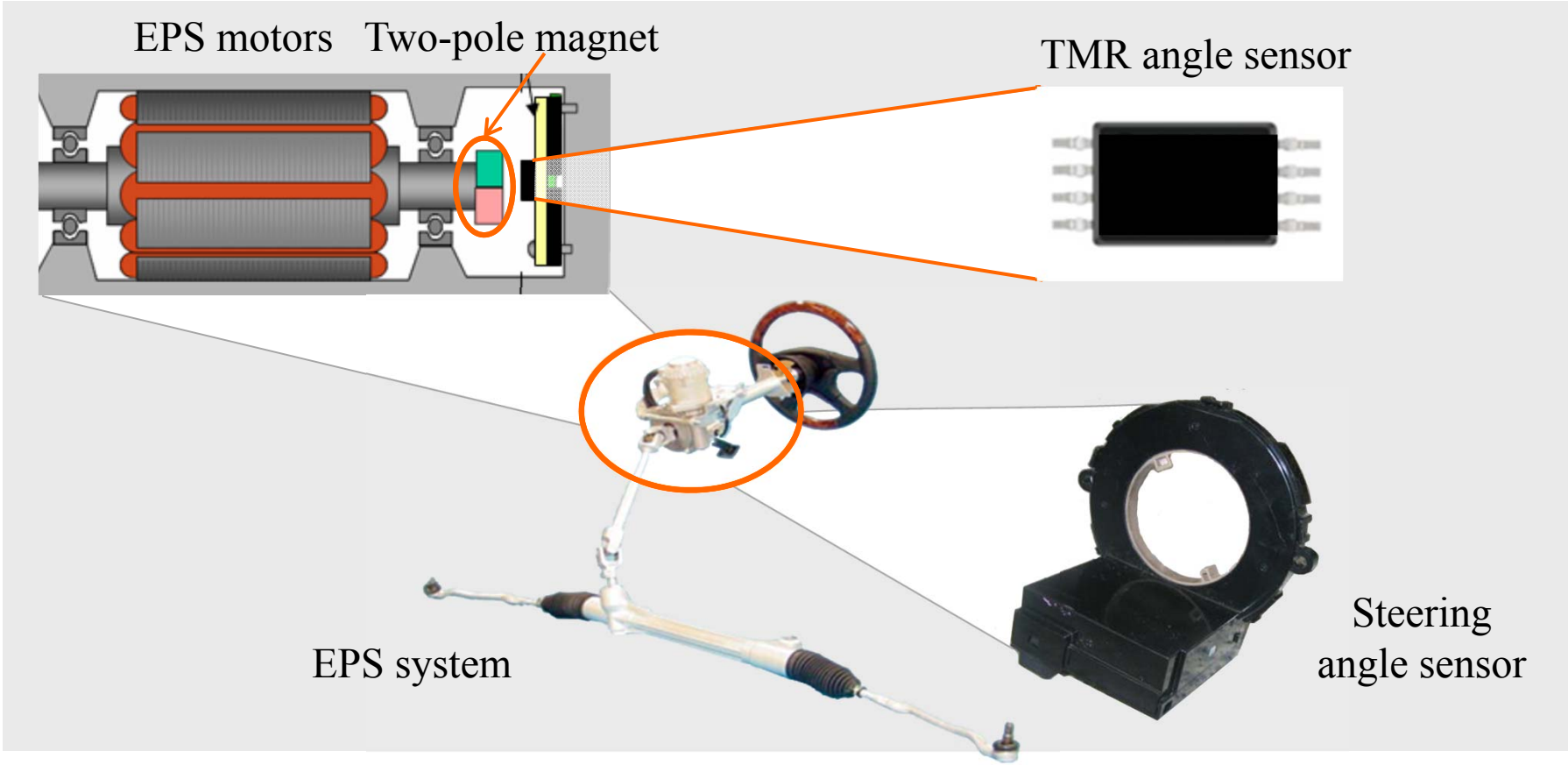


Angle sensing accuracy vs. magnetic field in a broad temperature range



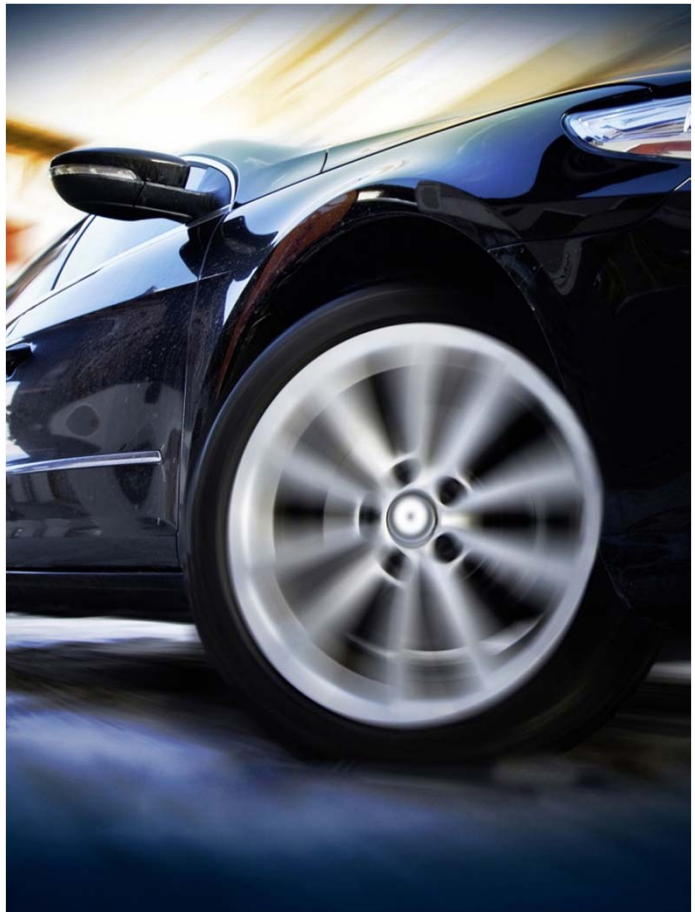
- **High power**
  3.0V_{pp} @ 5 V (30x AMR, 8x GMR)
- **Excellent angle sensing accuracy**
  Angle sensing error: within ±0.6°
  Conditions : Magnetic field range: 20 to 80 mT / Temperature range: −40ºC to 150ºC
- **Low power consumption**
  5 mW (under recommended conditions)

Steering systems: Largest angle sensor market



TMR sensor opposed to two-pole magnet

TDK TMR sensors : Enhanced product families for our customers



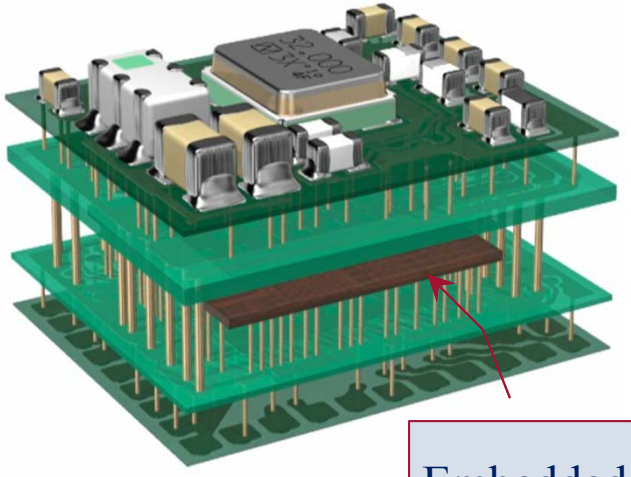
- High-accuracy angle sensors
- Rotation sensors
- Linear encoders
- Rotary encoders
- Current sensors

Angle sensors and other sensor products are geared to meet diverse application needs

Target applications of thin-film devices/SESUB

Target Applications		SESUB	Thin Film Devices
Smartphones • Tablet Devices	Power line use	Power Module	Low-profile inductors
	RF use	PA/RF Module	High Frequency Filters Capacitors downsized, arrayed and with narrow tolerance Hign Q inductors MEMS
	Sensor	Asic Package	
	Other		Common mode filters Composite components
Wearable devices (health care)	Power line use	Charger Module	Low-profile inductors
	RF use	PAN Module	
	Sensor	Asic Package	
Data Centers (servers)	CPU		Embedded capacitors

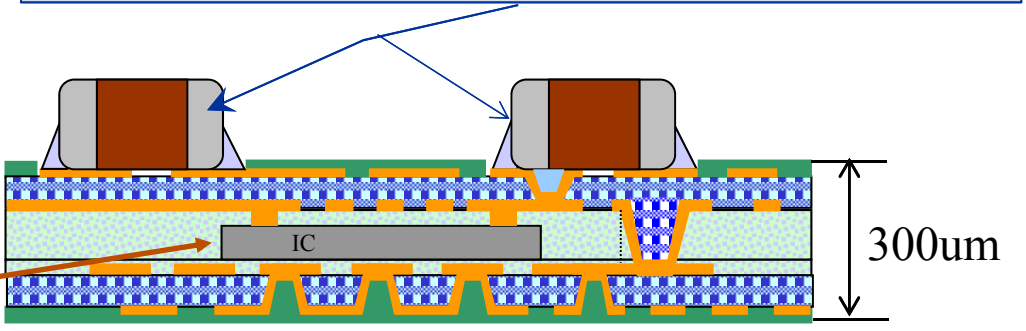
SESUB product features



Embedded IC

SESUB cross-sectional view

Components can be mounted on SESUB as on plastic substrates

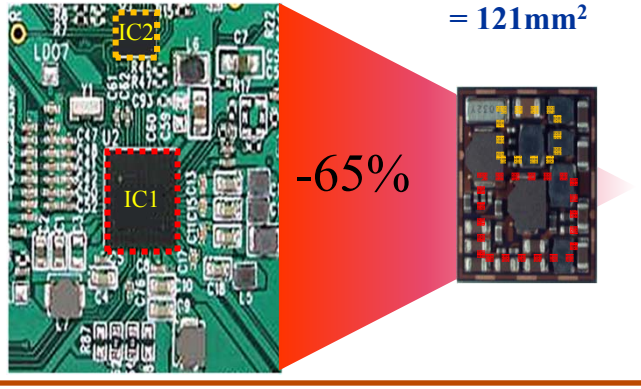


Size reduction

A high percentage of embedded components enables downsizing

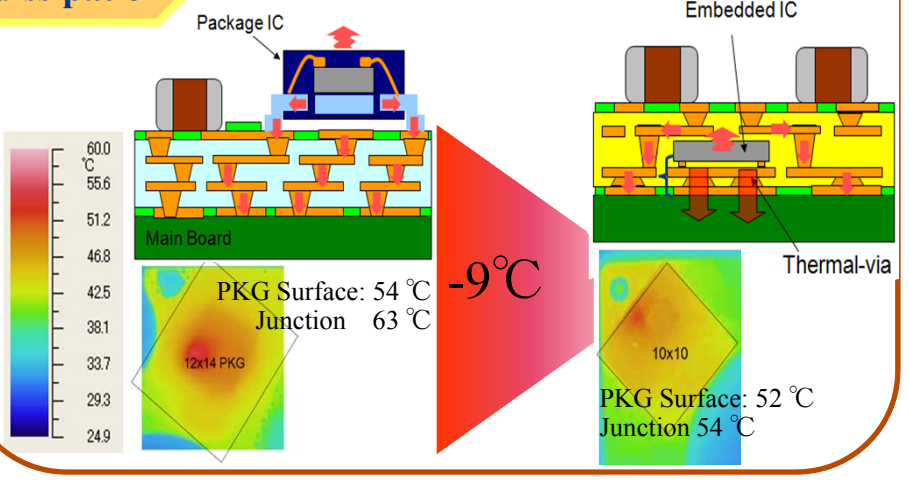
Discrete Solution = 350mm²

SESUB Module = 121mm²



Excellent heat dissipation

Excellent heat dissipation capability
To raise the degree of deign freedom



Business model for SESUB products

Market change

Industry led by IC manufacturers rather than by telephone manufacturers

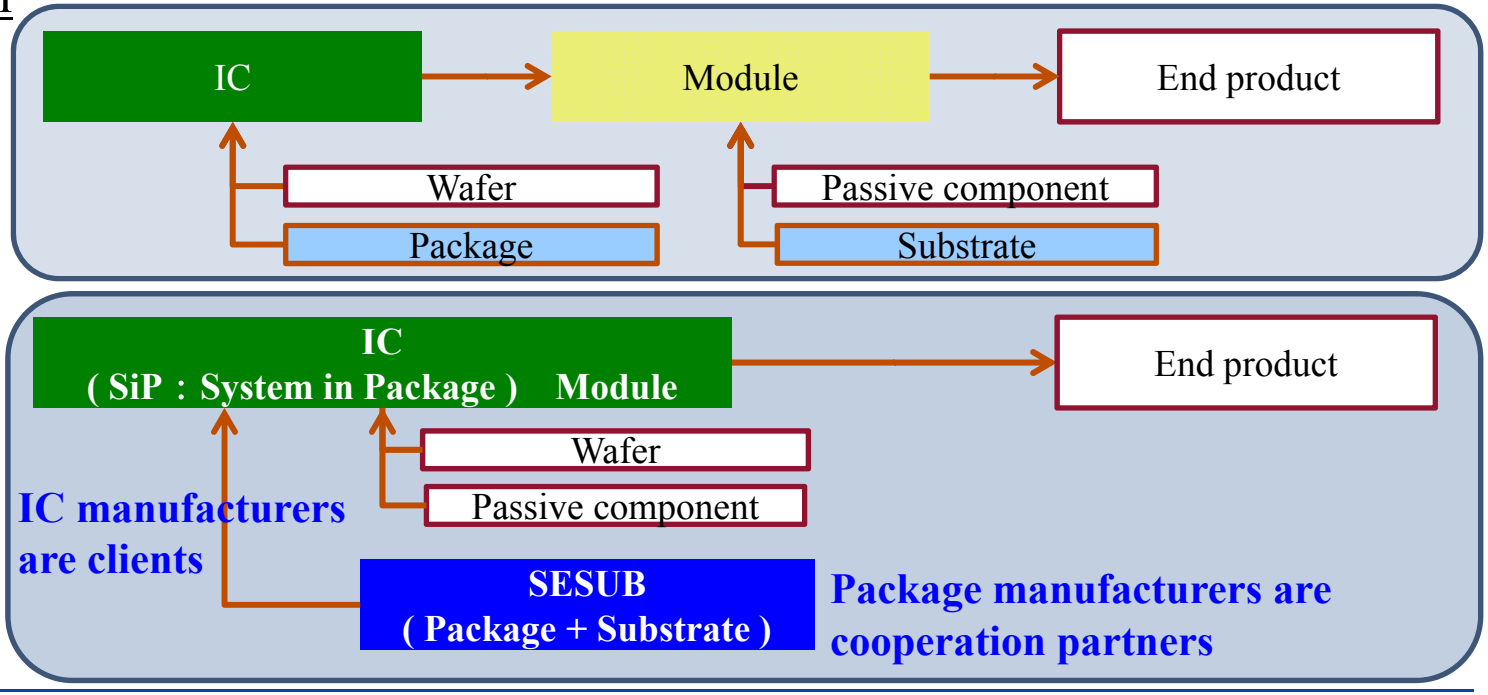
- Uniformized specifications
- Standardized OS (e.g., Android and iOS)
- Shortened development period

↓

Smartphone manufacturers use IC manufacturers' references

SESUB business: IC manufacturers are our clients, while IC package manufacturers are our cooperation partners

Business model



Corporate goals in mid-term

① **Launch new businesses following the three key segments to hit ¥100 billion sales**

② **Pursue zero-defect quality drawing on the Company's high level of technical expertise**

③ **Conduct speedy business operations to promote true globalization**

Cautionary Statements with Respect to Forward-Looking Statements

This material contains forward-looking statements, including projections, plans, policies, management strategies, targets, schedules, understandings, and evaluations about TDK, or its group companies (TDK Group). These forward-looking statements are based on the current forecasts, estimates, assumptions, plans, beliefs, and evaluations of the TDK Group in light of the information currently available to it, and contain known and unknown risks, uncertainties, and other factors. The TDK Group therefore wishes to caution readers that, being subject to risks, uncertainties, and other factors, the TDK Group's actual results, performance, achievements, or financial position could be materially different from any future results, performance, achievements, or financial position expressed or implied by these forward-looking statements, and the TDK Group undertakes no obligation to publicly update or revise any forward-looking statements after the issue of this material except as provided for in laws and ordinances.
The electronics markets in which the TDK Group operates are highly susceptible to rapid changes, risks, uncertainties, and other factors that can have significant effects on the TDK Group including, but not limited to, shifts in technology, fluctuations in demand, prices, interest and foreign exchange rates, and changes in economic environments, conditions of competition, laws and regulations. Also, since the purpose of these materials is only to give readers a general outline of business performance, many numerical values are shown in units of a billion yen. Because original values, which are managed in units of a million yen, are rounded off, the totals, differences, etc. shown in these materials may appear inaccurate. If detailed figures are necessary, please refer to our financial statements and supplementary materials.


TDK