Strategy of Priority Five Businesses

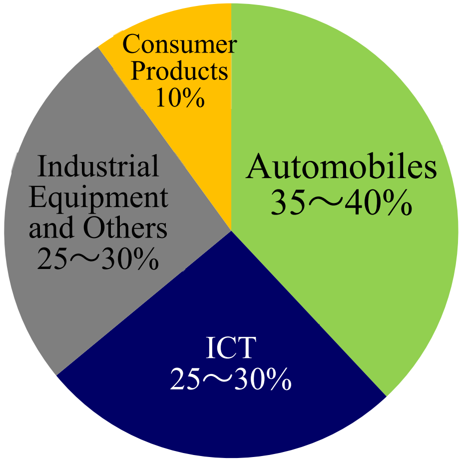
Inductive Devices
High Frequency Components
Piezoelectric Material Products
Rechargeable Batteries
HDD Heads

Executive Vice President
Hiroyuki Uemura

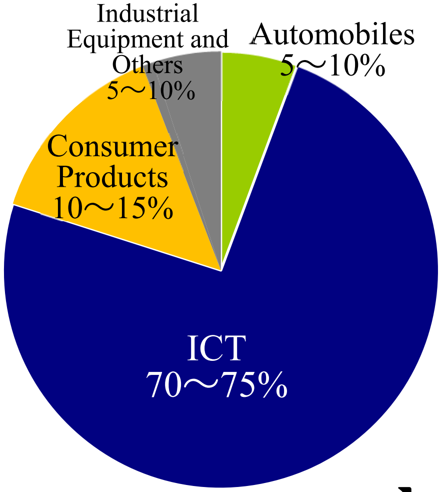
Inductive Devices

Inductive Devices

Inductive device sales by applications



Metal power inductor sales by applications



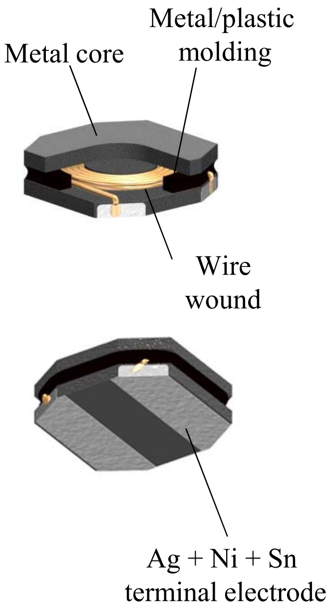
【 Metal inductor production engineering 】

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

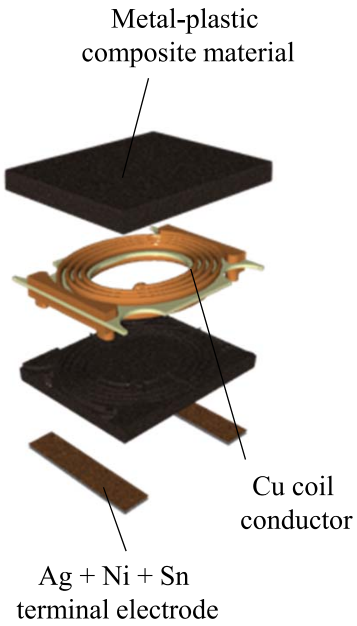
Metal Wire Wound
VLS-HB Series

Large current
Broad inductance range



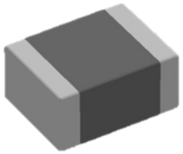
Metal Thin Film (plating)
TFM Series

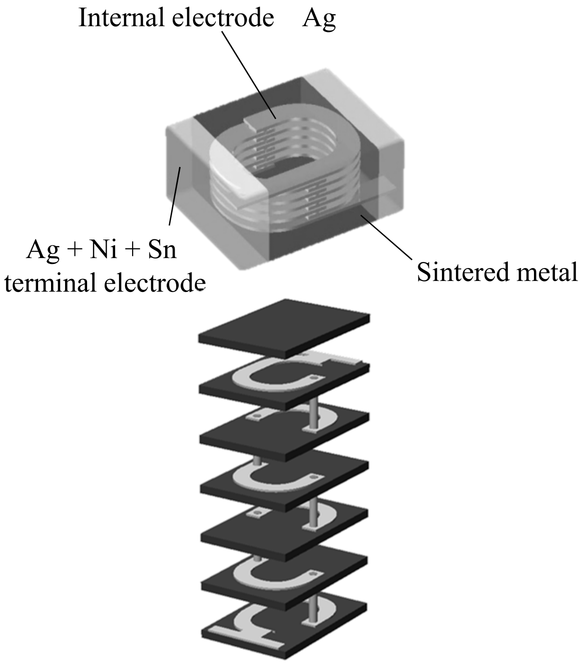
Small/Low profile
Large current



Metal Multilayer
MLS Series

Small/Low profile
Low loss

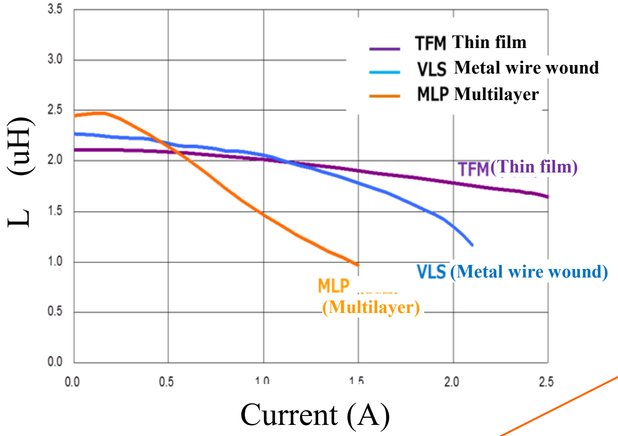




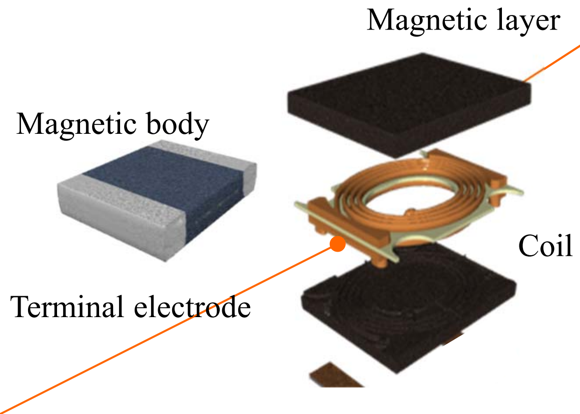
Structure and features of thin-film metal inductor/TFM

Structure

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

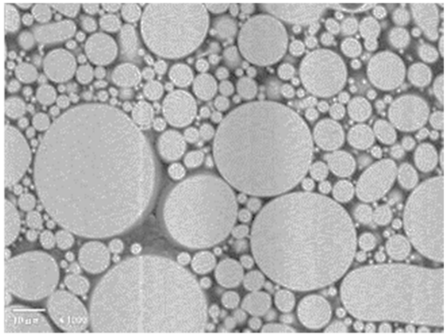


Structure

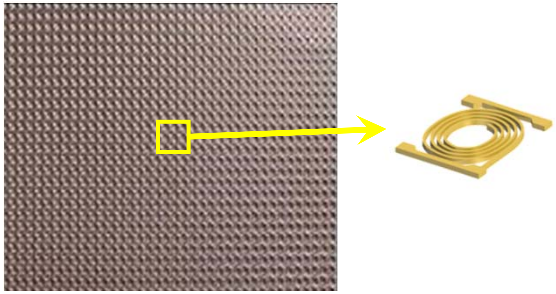


Magnetic metal material

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

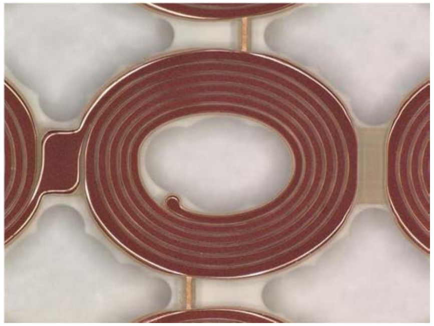


Coil substrate



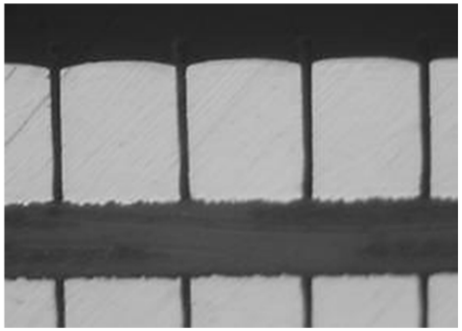
Substrate process to improve production efficiency

Coil conductor



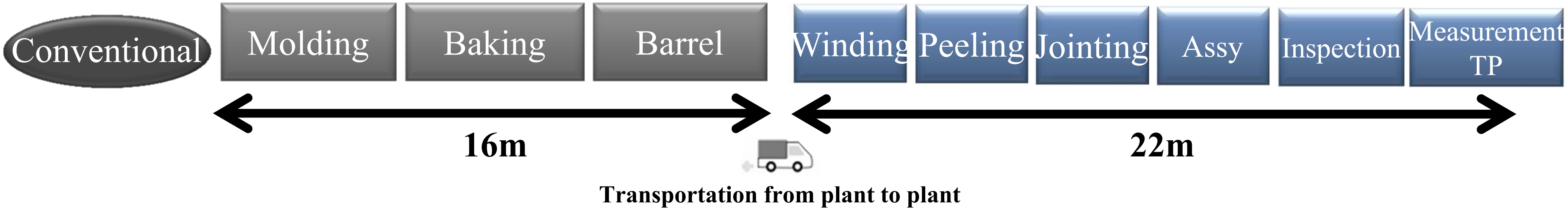
High-density coil conductor formed by micro-patterning

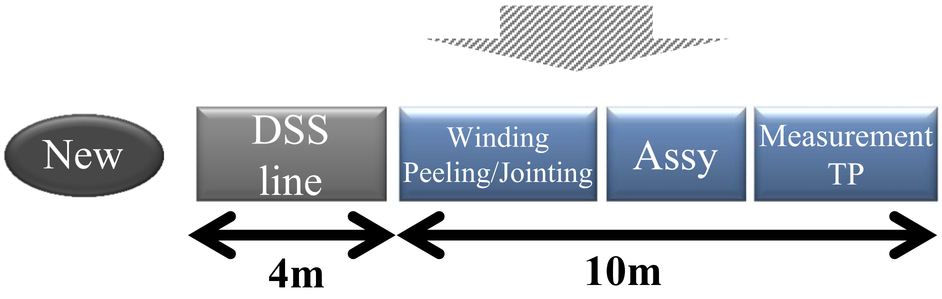
Coil conductor cross section



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%

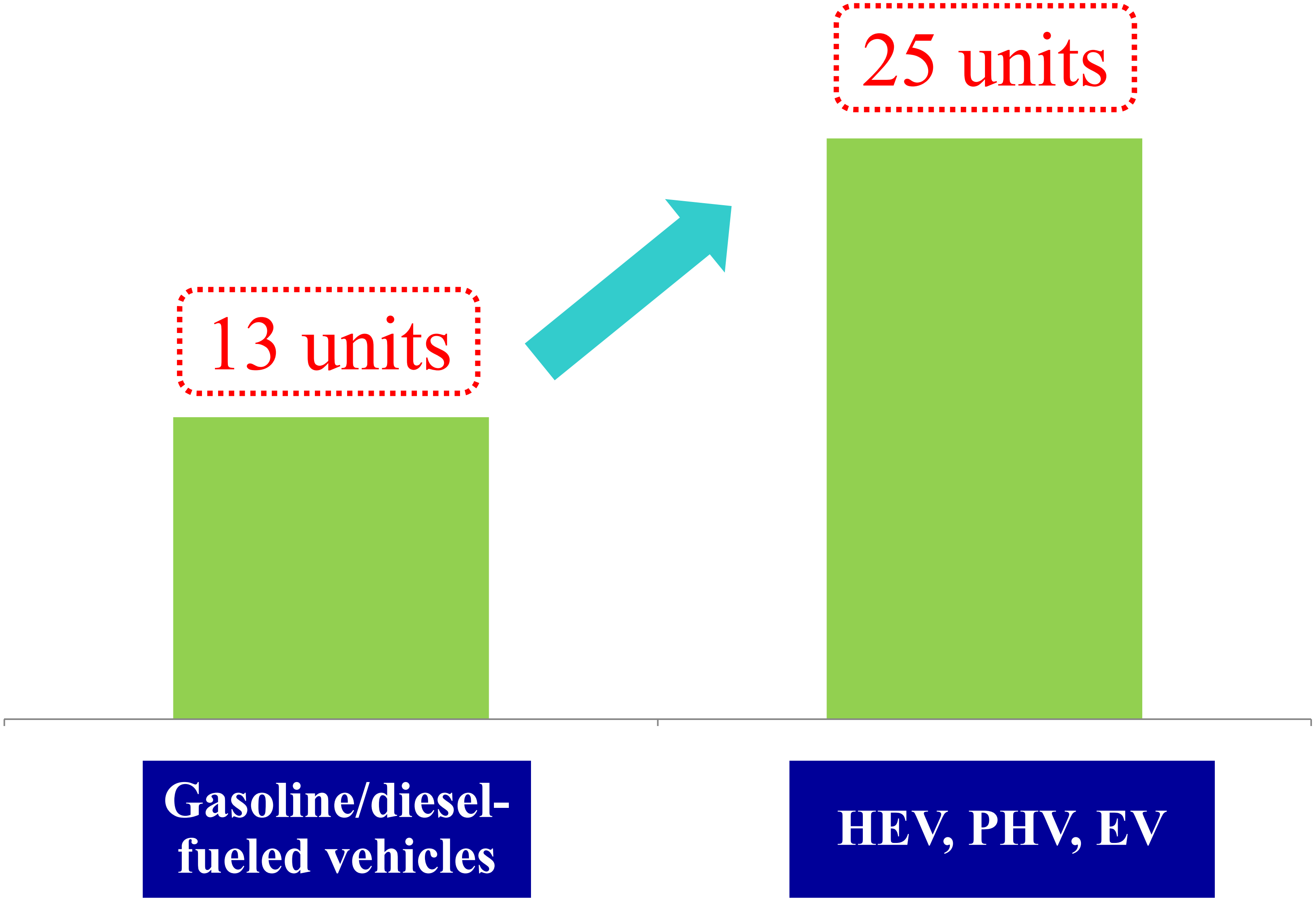
Making it location-free

Manufacturing reformed to produce products for high-demand markets

Advantages

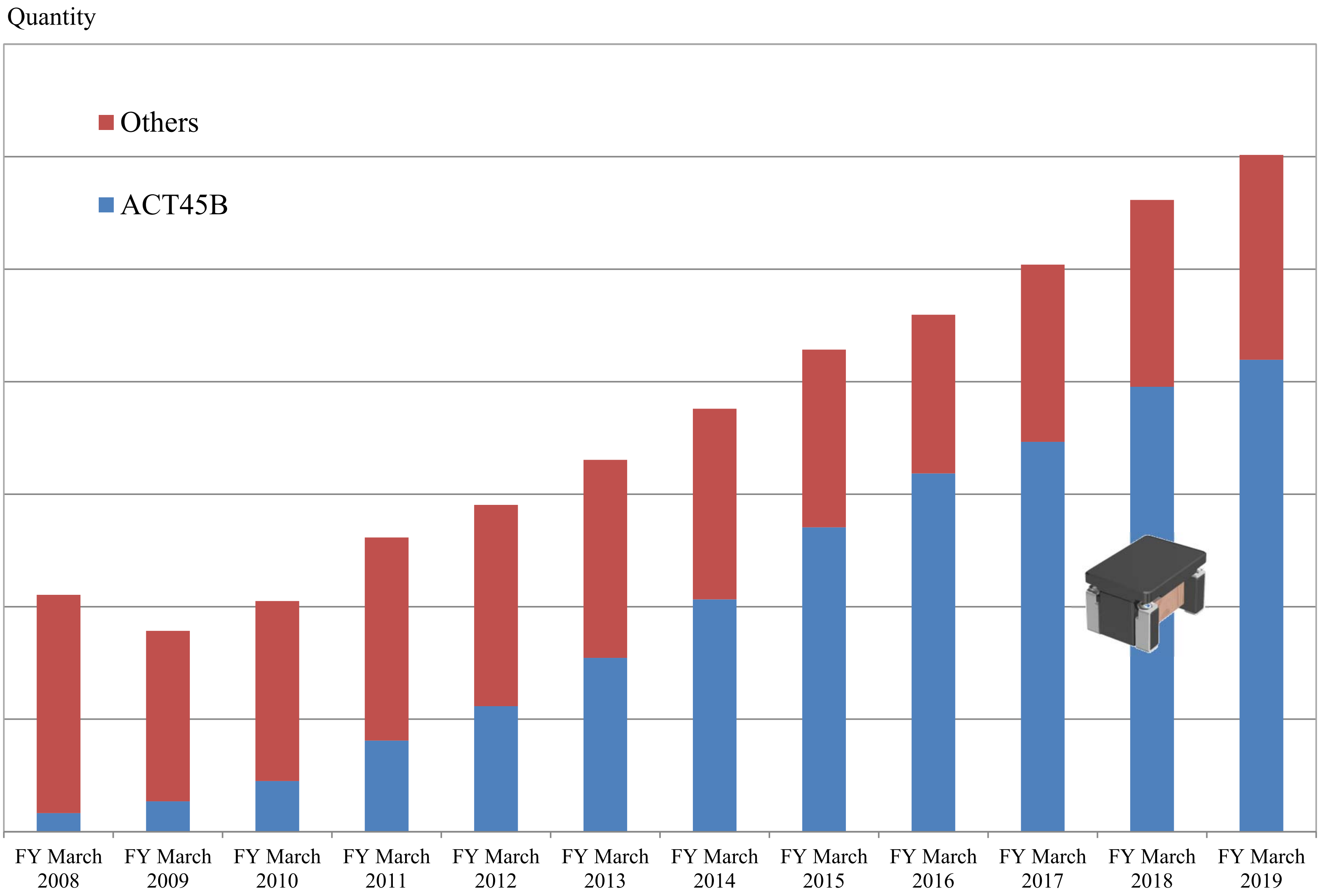
- **Solution to increasing personnel costs in China**
  → Manufacturing in China to meet domestic demand in China
  Manufacturing of export items conducted outside China
  (Manufacturing might be repatriated to Japan.)
- **Capability to cope with sharp foreign exchange movements**

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

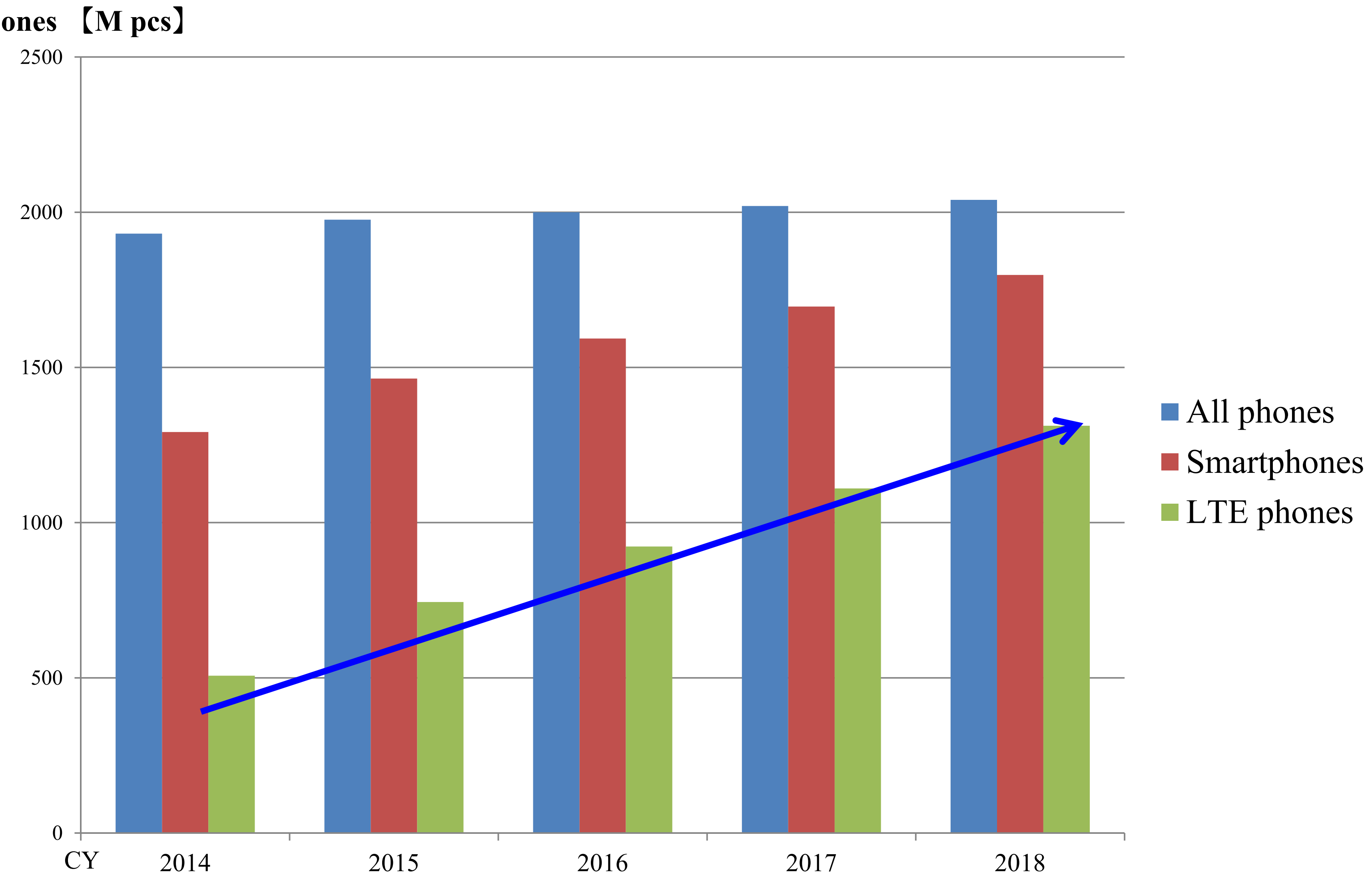
② Comprehensive application of integrated location-free production lines

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

③ Strengthening collaborations with IC manufacturers

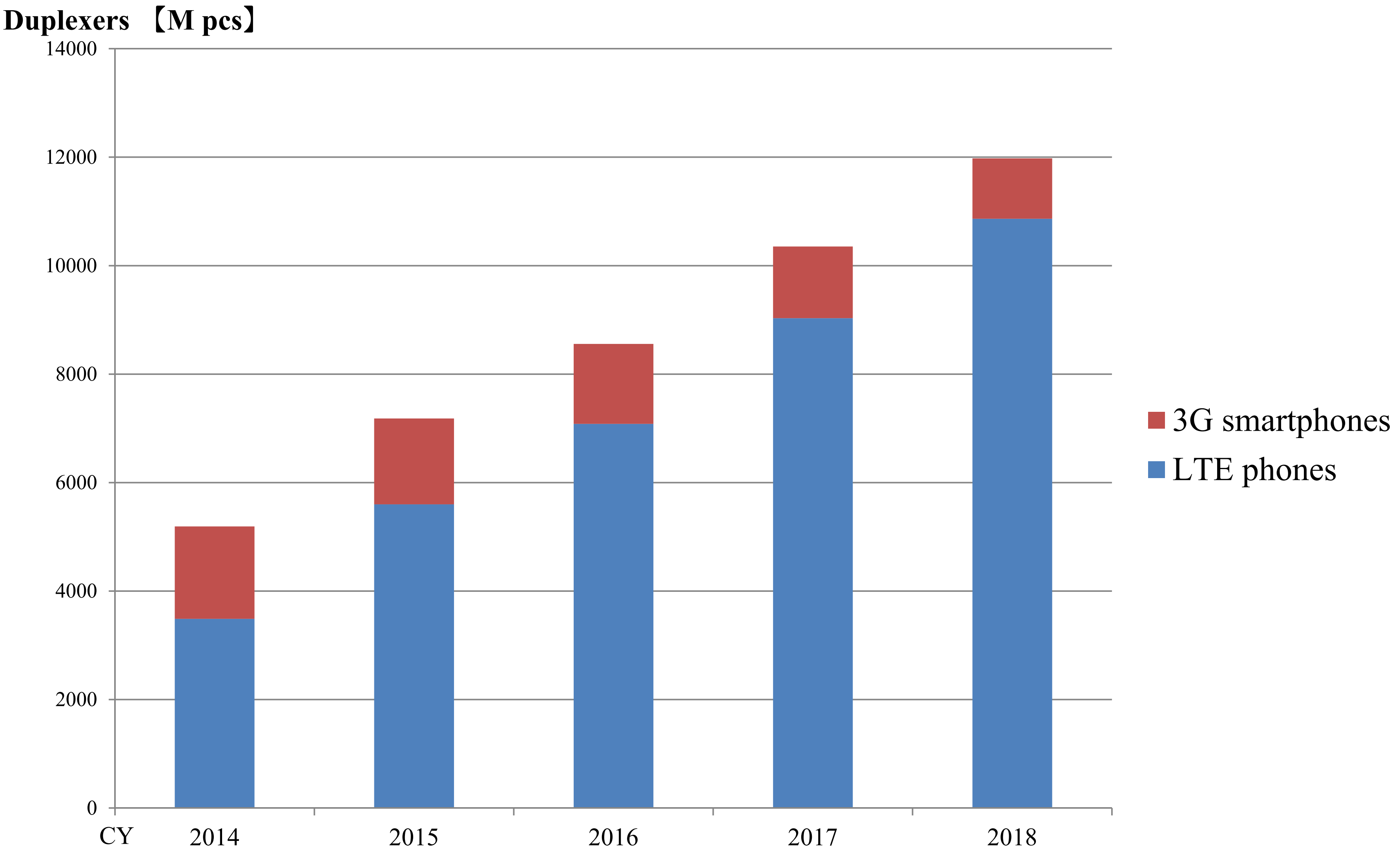
High Frequency Components

Mobile phone market overview



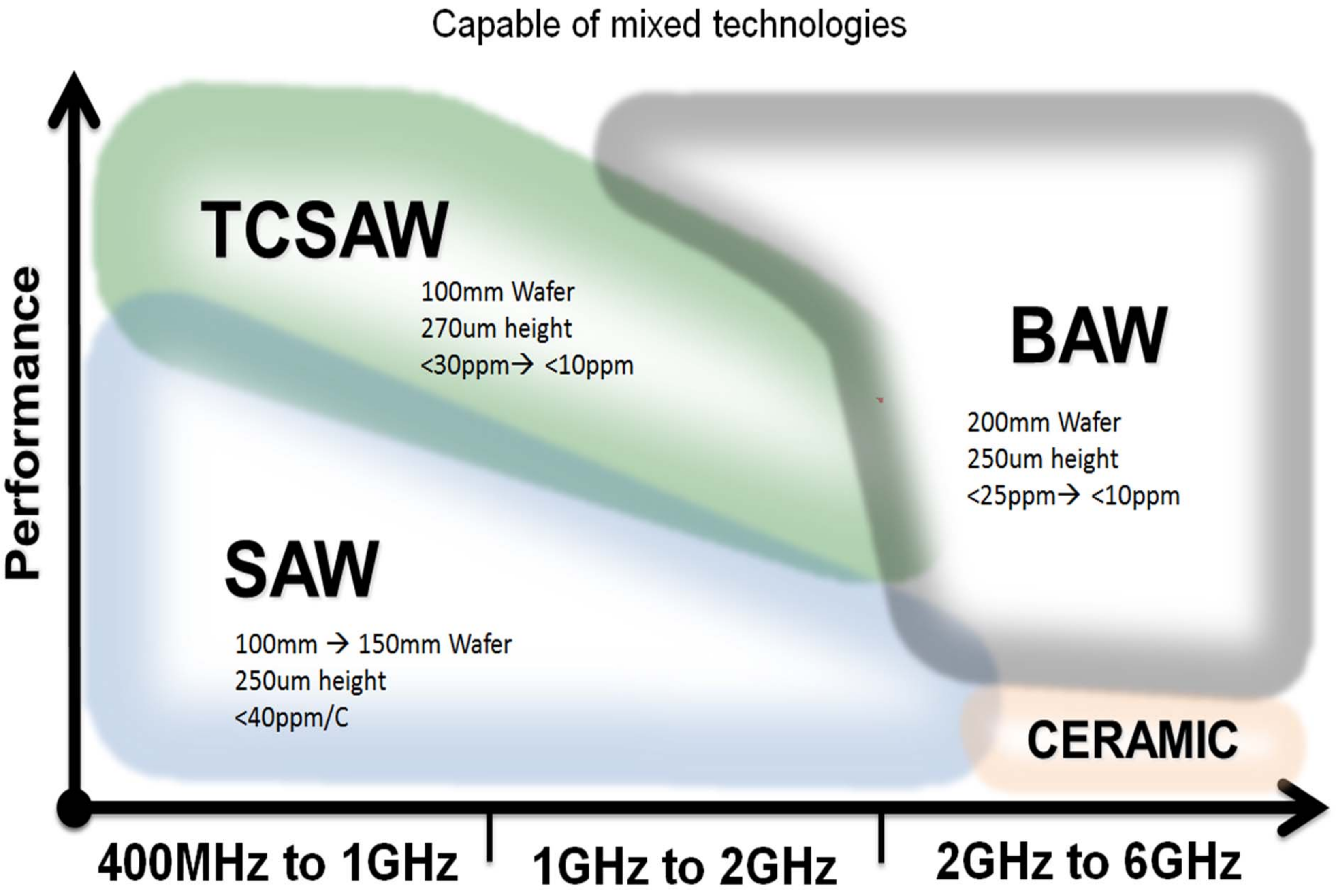
※TDK's estimation

Duplexer market expansion by the use of LTE

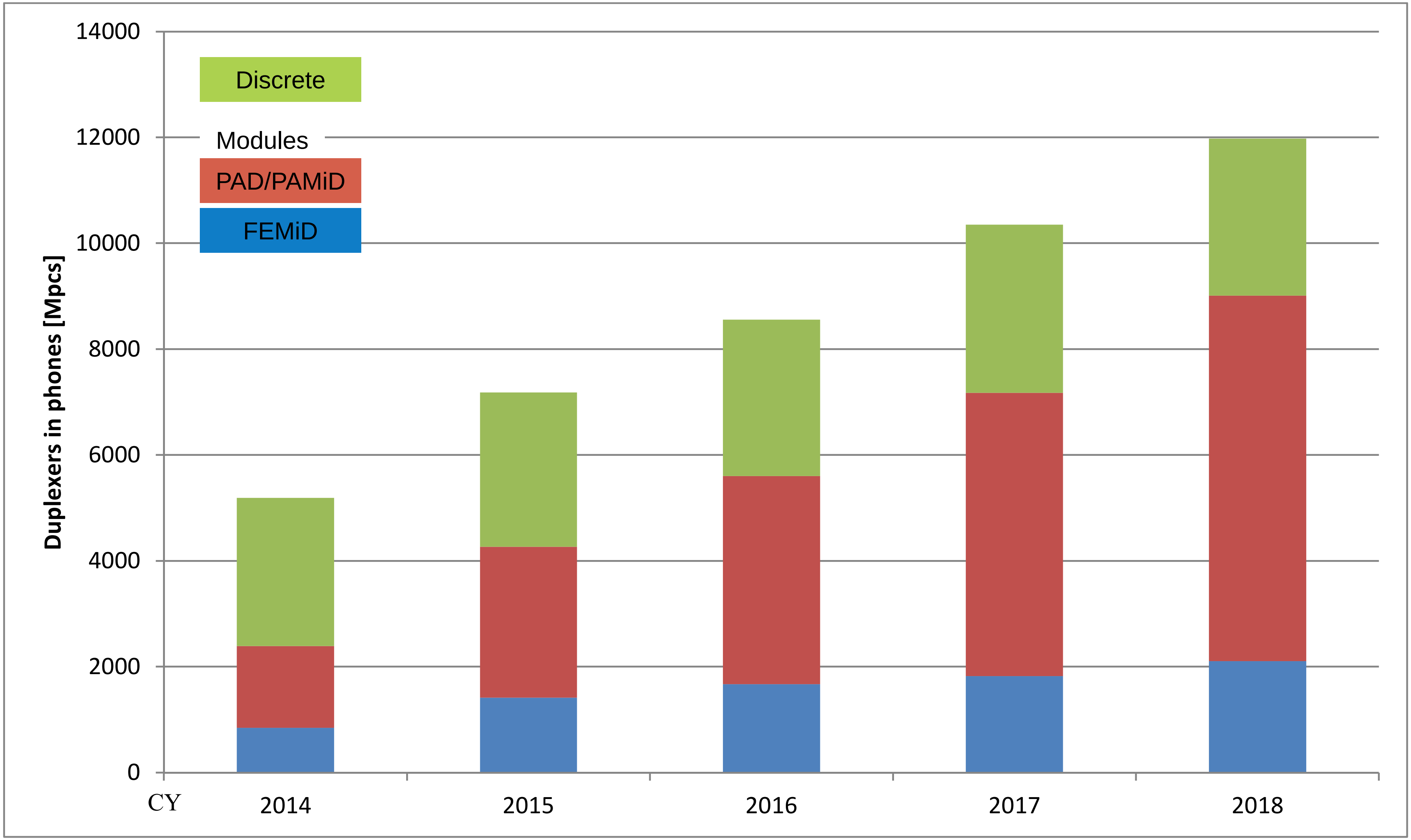


※TDK's estimation

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

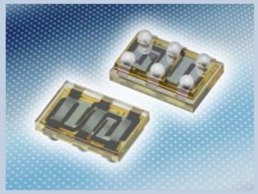
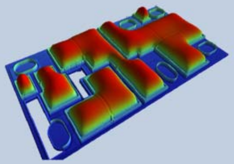


Discrete components versus modules in duplexer market



※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

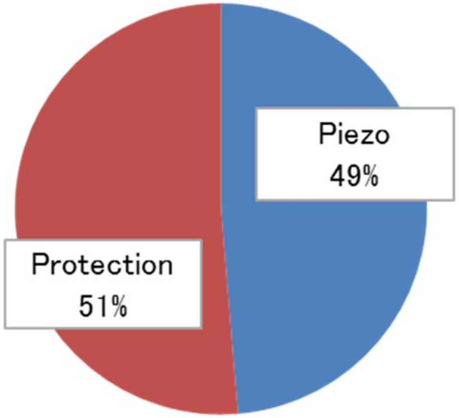
② Strengthen relationships with IC manufacturers

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

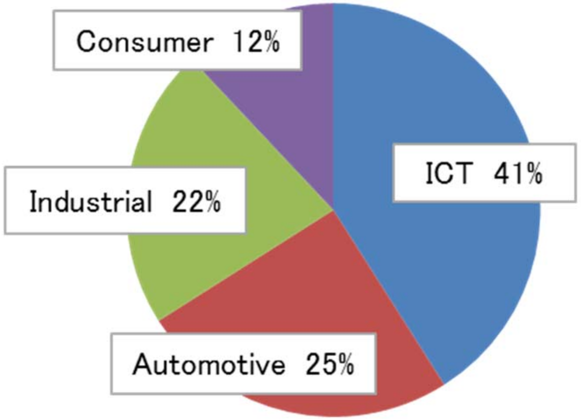
Piezoelectric Material Products

Piezoelectric Material Products

【Sales breakdown】



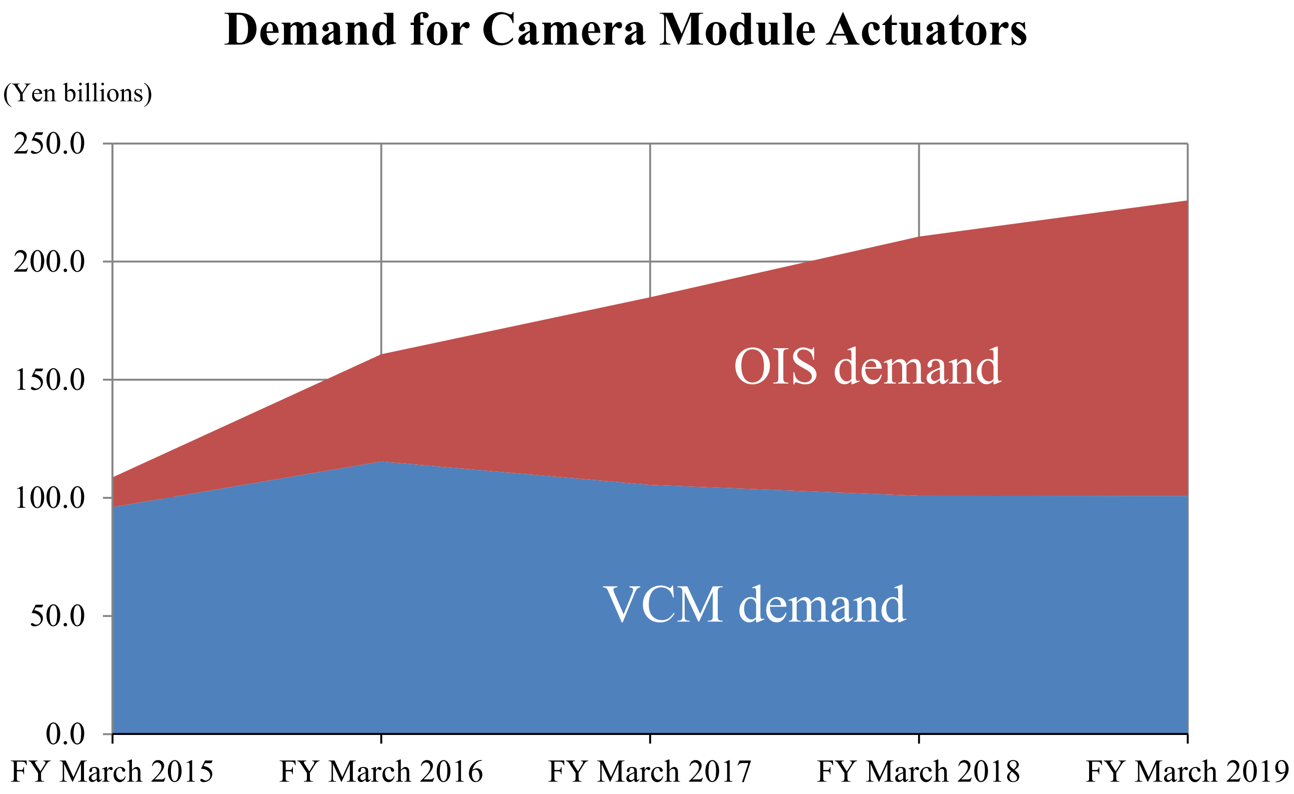
【Sales by applications】



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



※TDK's estimation

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

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