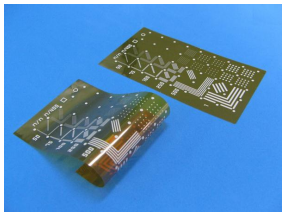
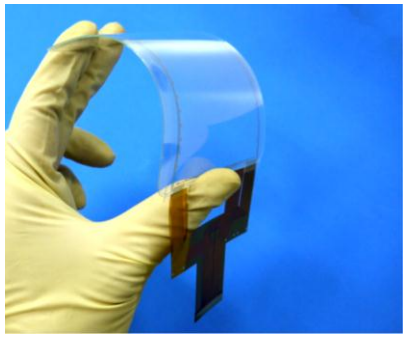


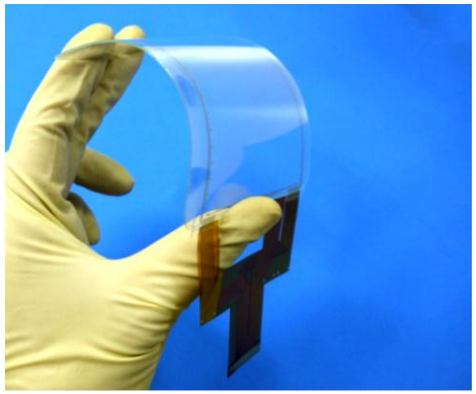
Development of Printed Flex Circuits

Hirofumi Matsumoto, Ph.D.
Product development planning office
Operating Officer and Division Manager
Nippon Mektron, Ltd.

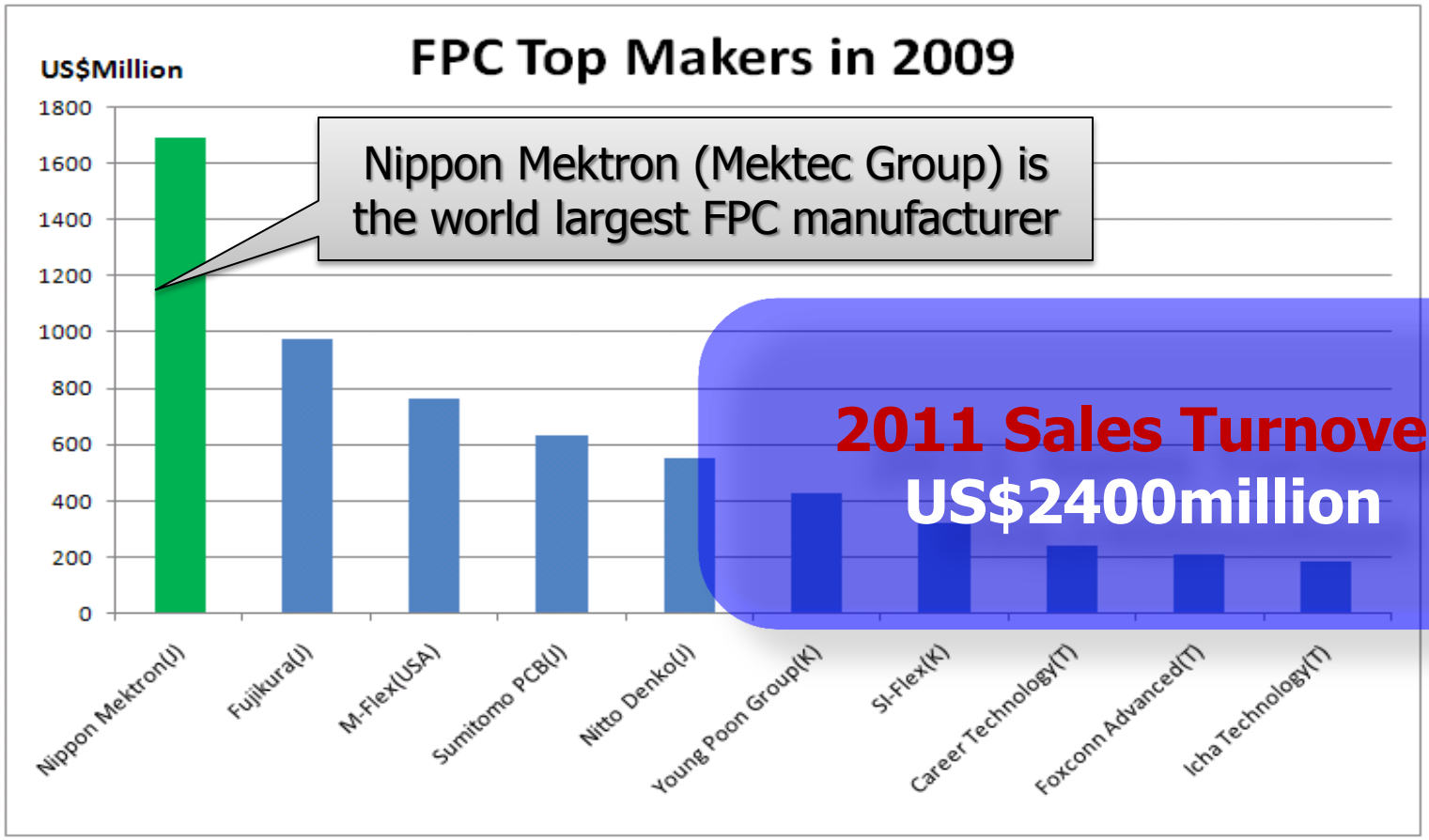


Outline

- Short Company Profile of Nippon Mektron
- Developments of Printed FPCs
  - PE resist for long FPCs
  - Flexible Touch Sensor Panel(TSP) application
  - Single-sided Printed FPCs
  - Double-sided Printed FPCs
  - Smart Printed FPCs
- Summary

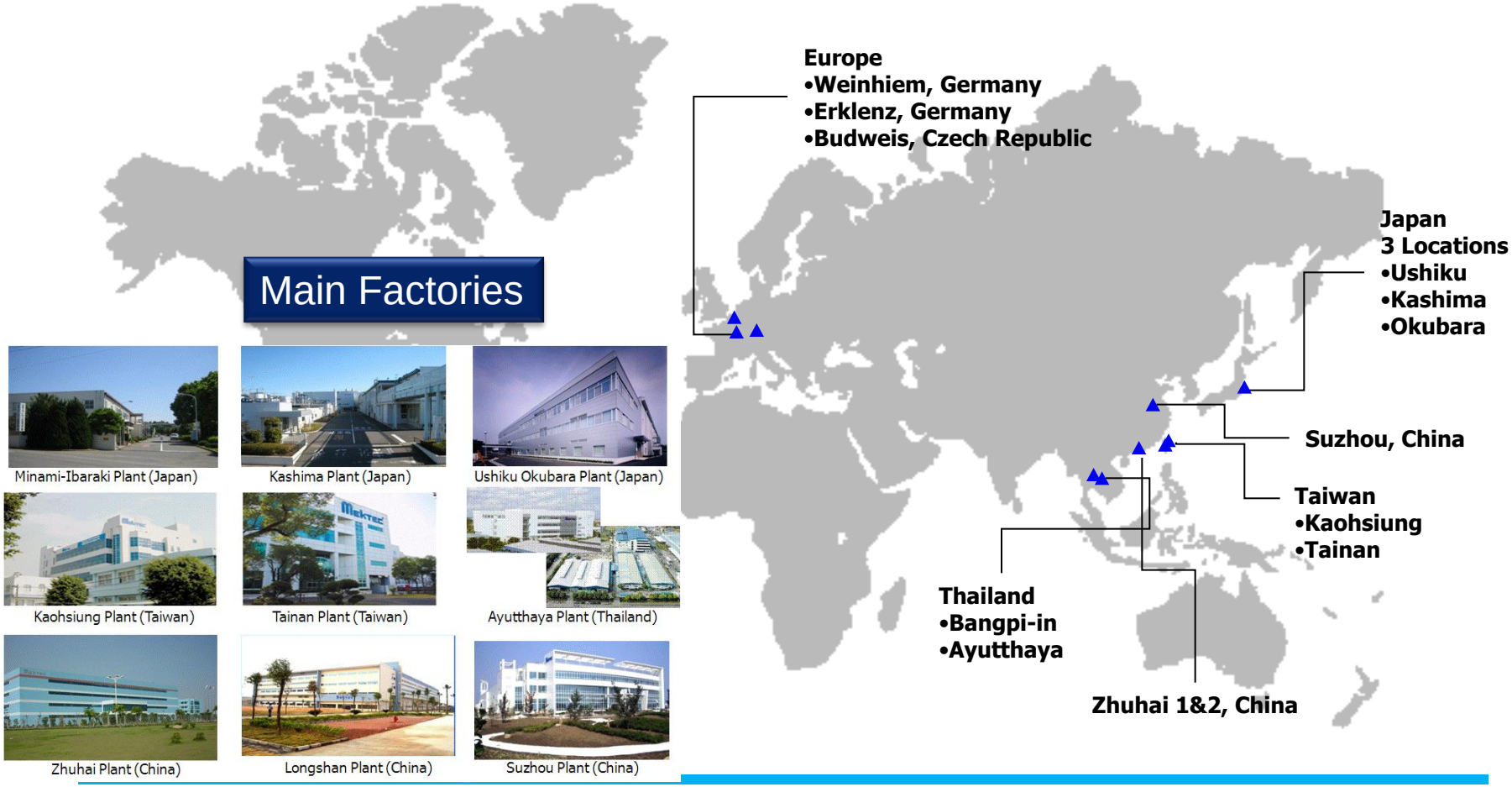


Sales Turnover of Global FPC Top makers



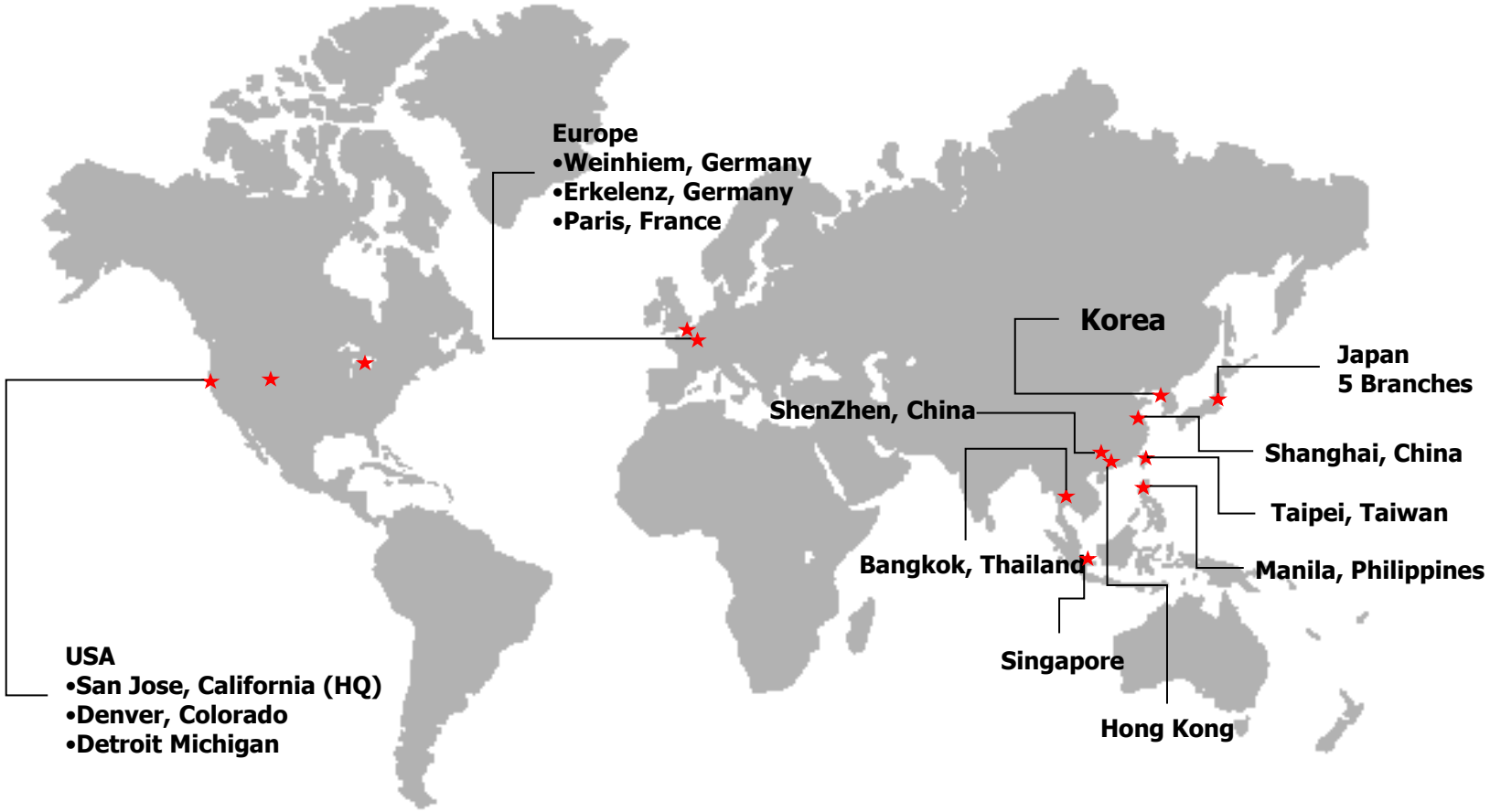
Global Production Network

13 Factories in 6 Countries

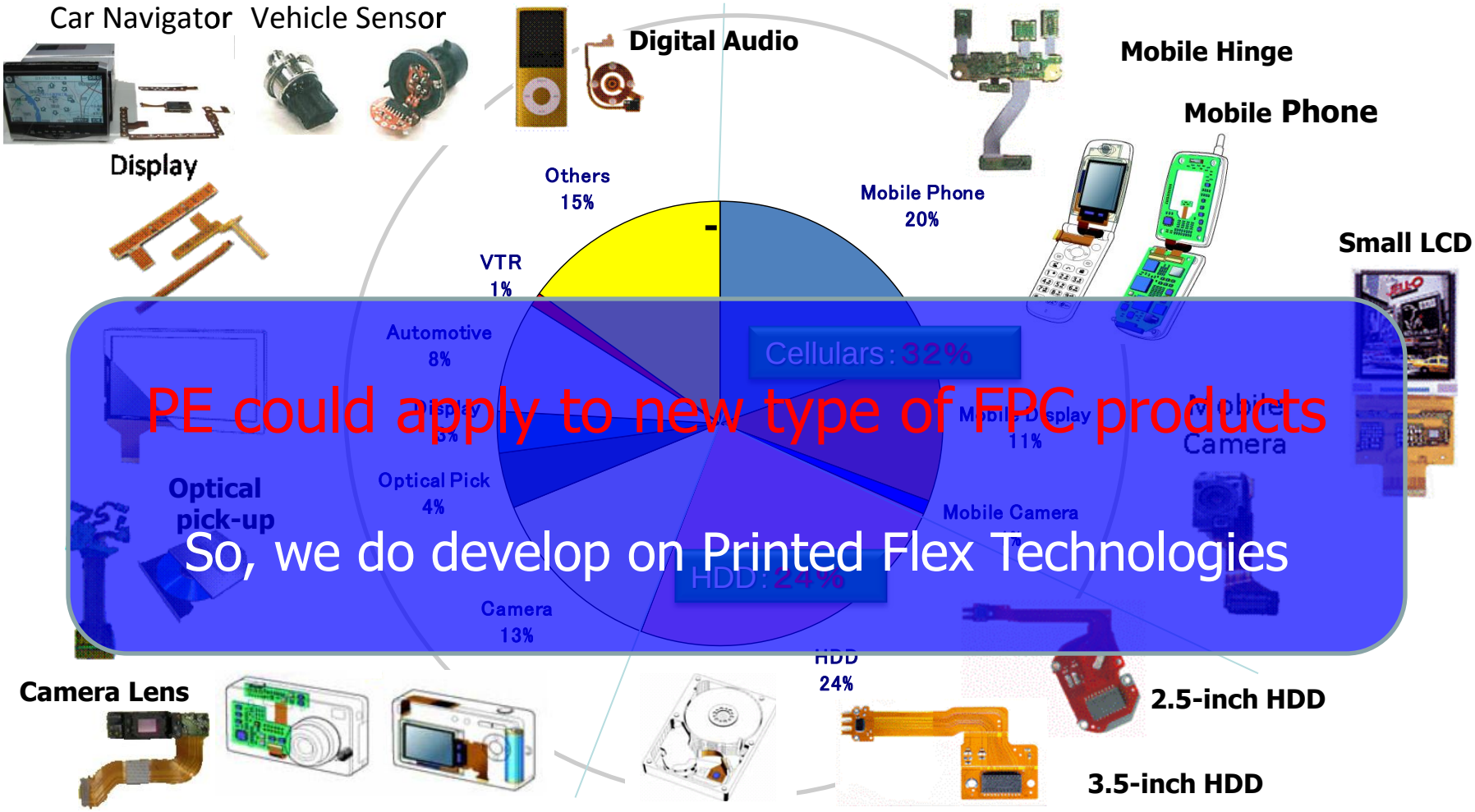


Global Sales Support

25 Sales Locations in 10 Countries



FPC Sales Mix of Mektec Group

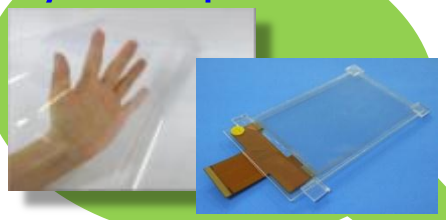


PE could apply to new type of FPC products

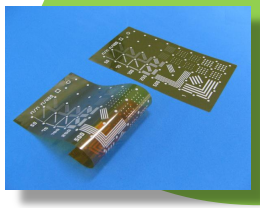
So, we do develop on Printed Flex Technologies

Nippon Mektron Printed Flex Technology Roadmap

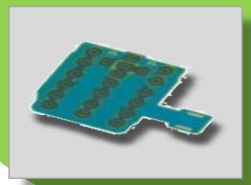
Fully transparent FPC



Single sided Printed FPC



Double sided
& multi-layer Printed FPC



PE Resist Process
for long length FPC

Short term

2012

2013

2014

Middle term

2015

Long term

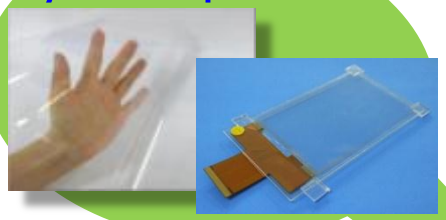
2020

"Smart Printed FPC"
Printed OLED, Active
& Passive Parts and Battery

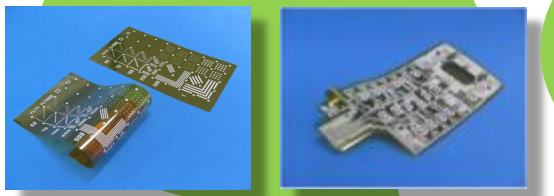
Sample
of Fraunhofer IZM

Nippon Mektron Printed Flex Technology Roadmap

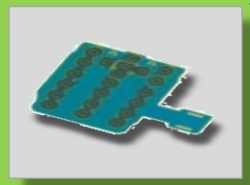
Fully transparent FPC



Single sided Printed FPC



Double sided
& multi-layer Printed FPC



PE Resist Process
for long length FPC

2012

Short term

2013

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2020

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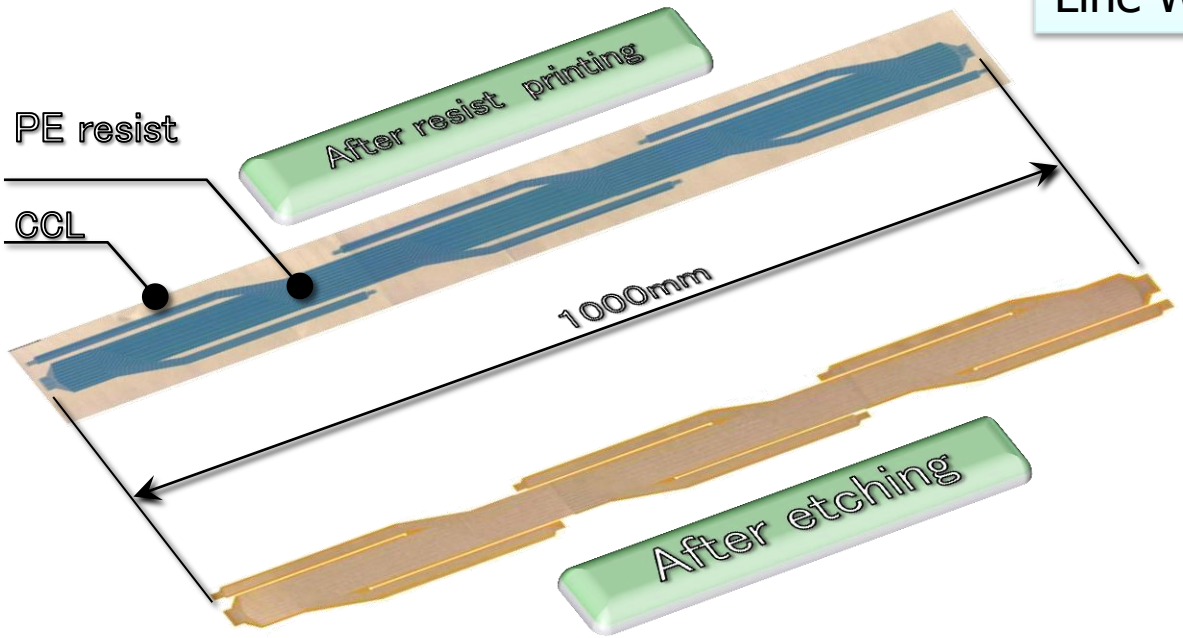
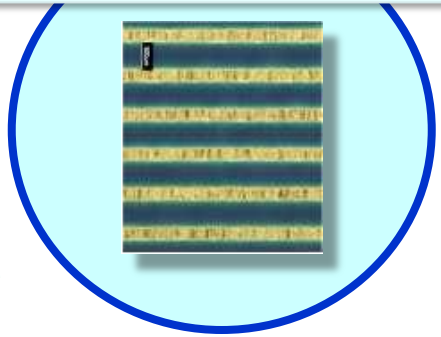
"Smart Printed FPC"
Printed OLED, Active
& Passive Parts and Battery

Sample
of Fraunhofer
IZM

PE Resist Process for long length FPC



Line Width/Space < 100/100μm



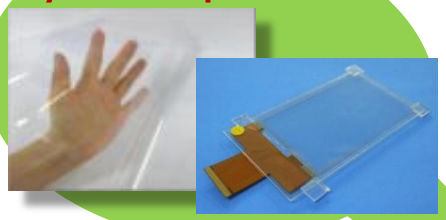
No need to have:
-Dry film lamination
-DF Exposure
-DF development

+

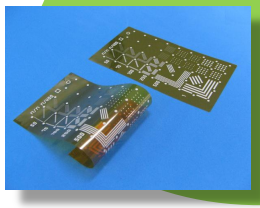
-Low Cost
-Less energy & Material

Nippon Mektron Printed Flex Technology Roadmap

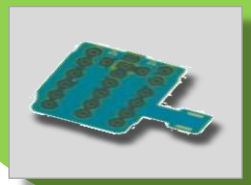
Fully transparent FPC



Single sided Printed FPC



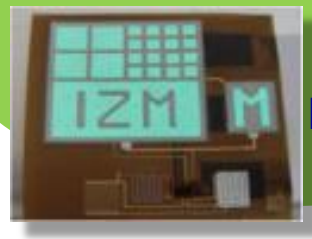
Double sided
& multi-layer Printed FPC



PE Resist Process
for long length FPC

Long term
2020
Middle term
2015
2014
2013
Short term
2012

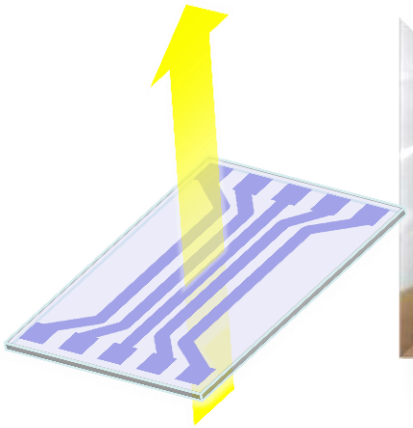
"Smart Printed FPC"
Printed OLED, Active
& Passive Parts and Battery

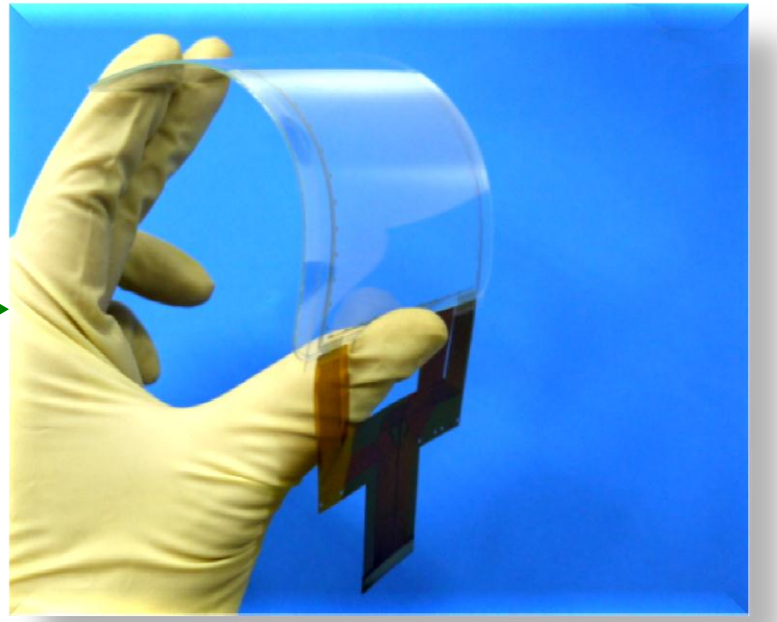


Sample
of Fraun
Fraunhofer IZM

Flexible Touch Sensor Panel(TSP) Development

Fully Printed Transparent FPC





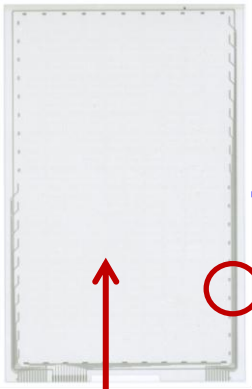
Flexible Printed TSP Module

LED Transparent FPC

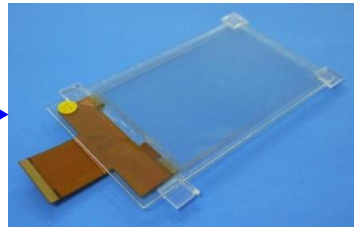
Touch Sensor Panel Application of Fully Transparent Flex

Fully Transparent FPC

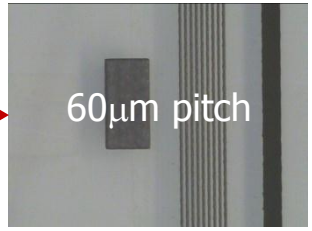
Projected Capacitive Touch Sensor Panel



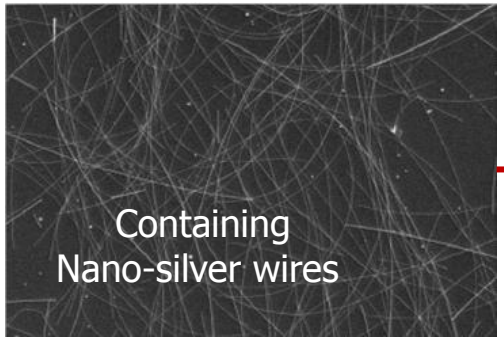
Our TSP module



Advanced PE technology

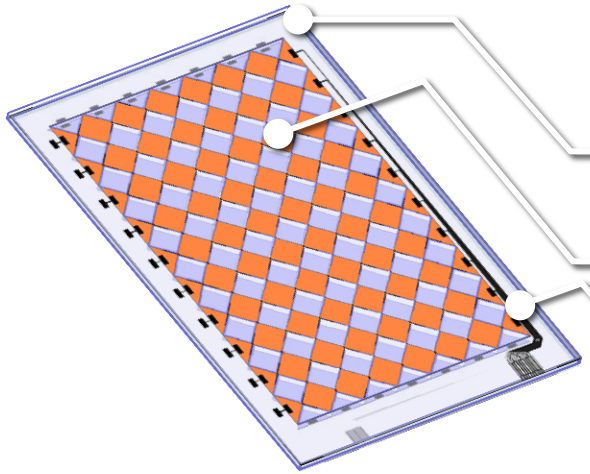


(for slim boarder needs)



Touch Sensor Panel Application of Fully Transparent Flex

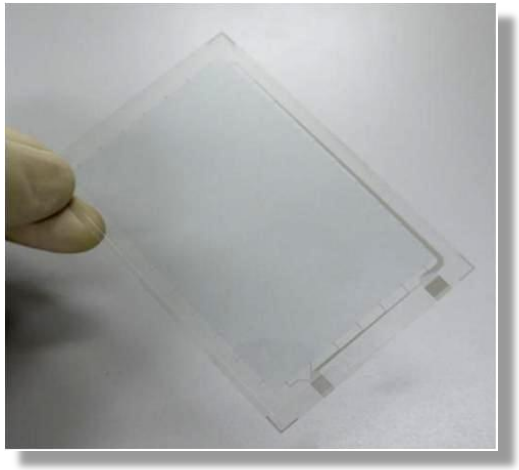
To realize" Projected Capacitive Type"



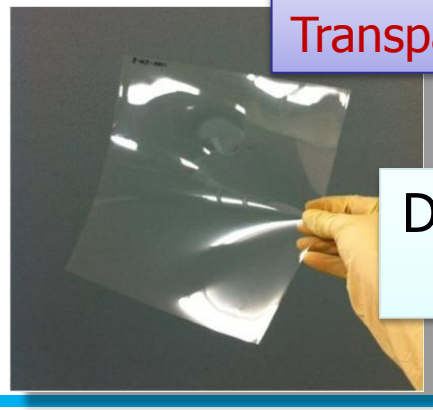
◇PET

◇ AgNW

◇ nano-Silver Paste

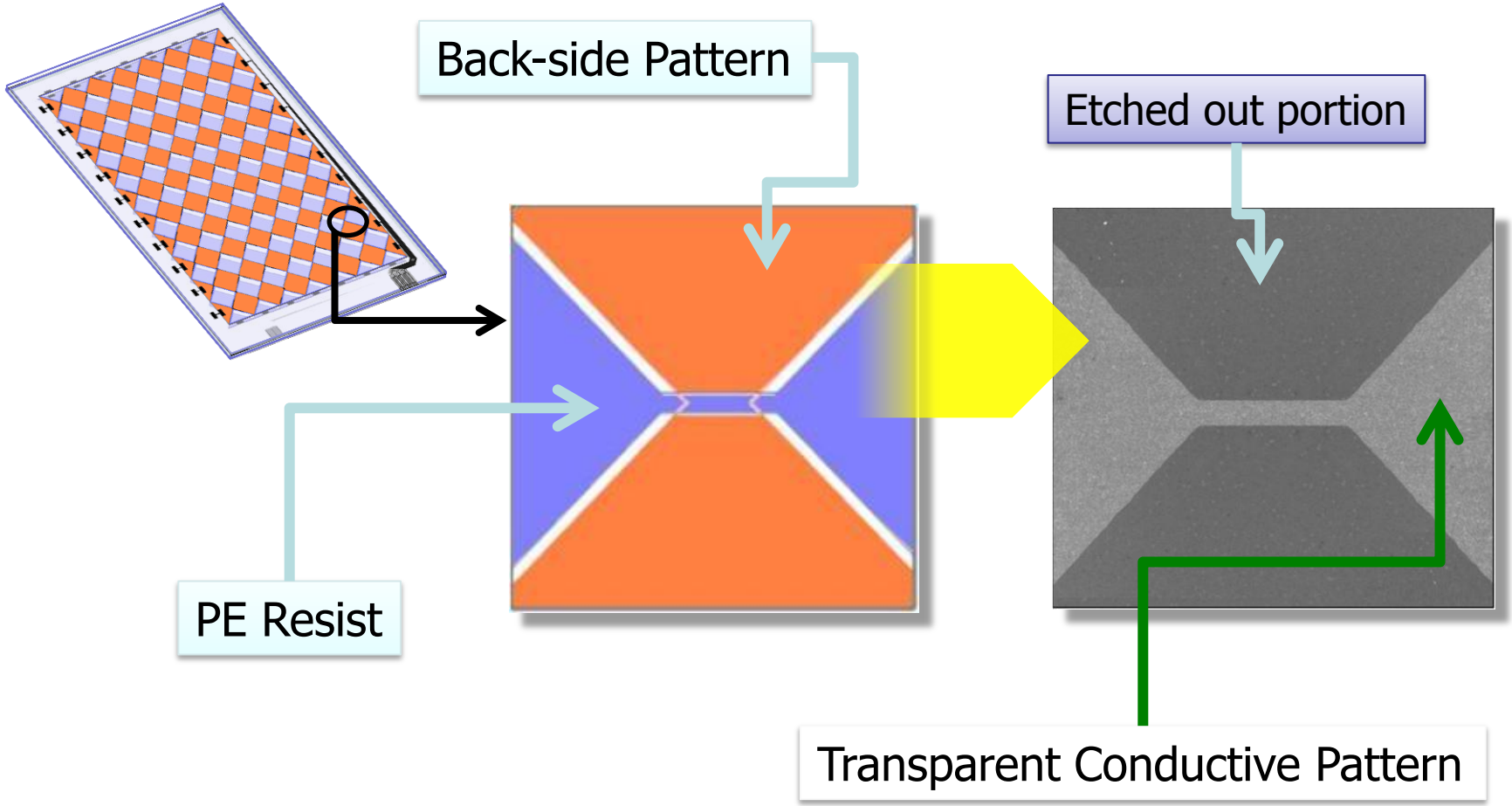


Sheet resistivity<80Ω/□
Transparent rate>90%

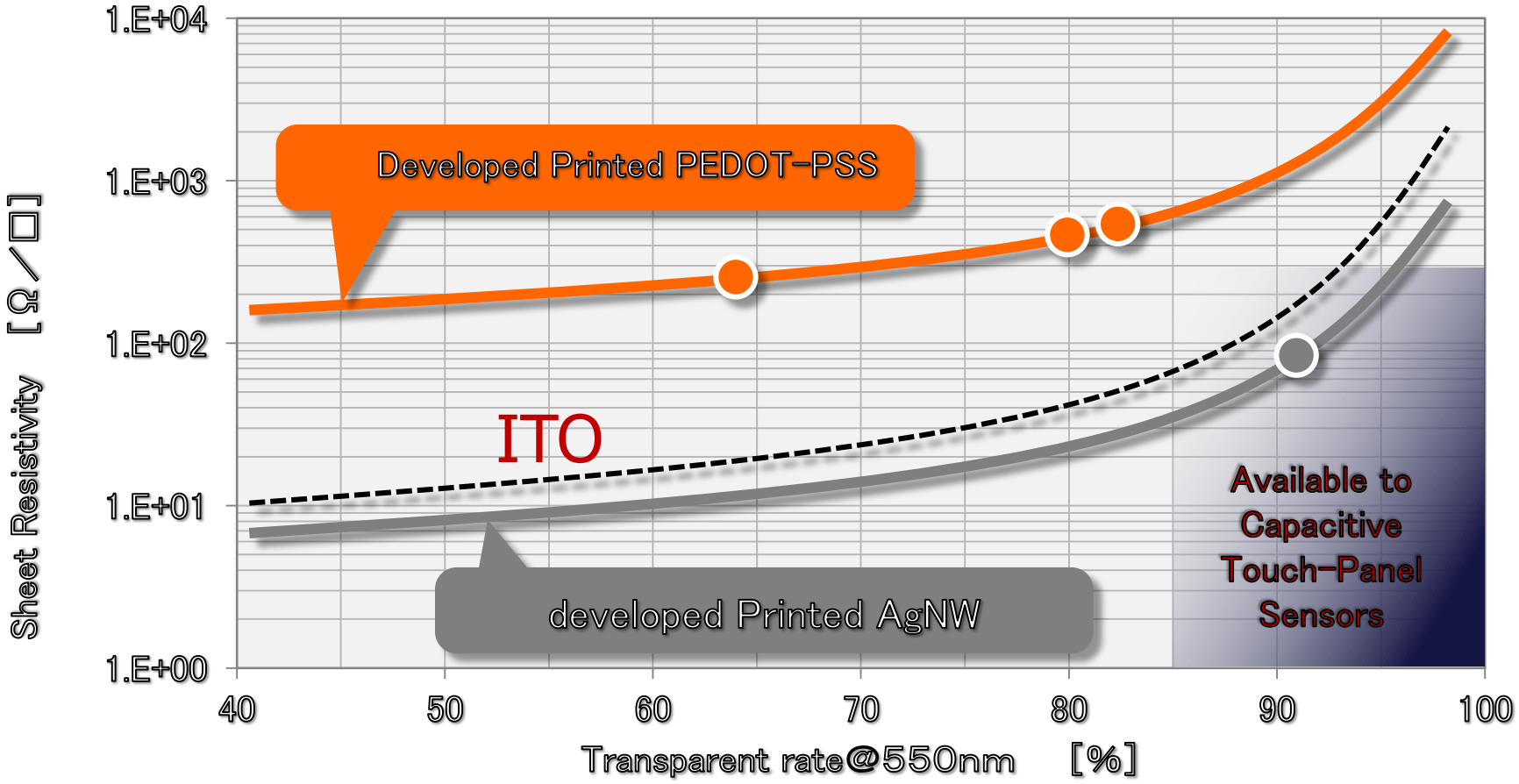


Double-side Printing
AgNW onto PET

AgNW formation by PE

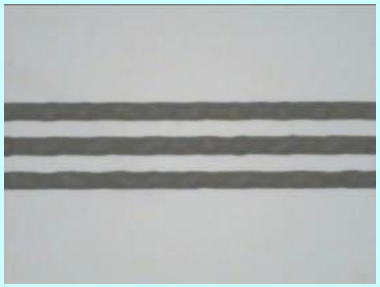


Sheet Resistivity vs. Transparent Rate

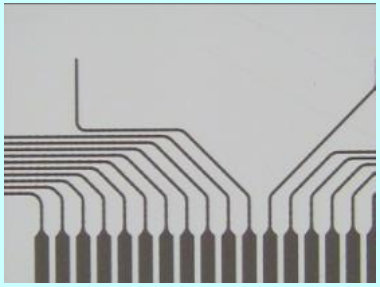


Ag printed wirings

Conventional Ag Printing

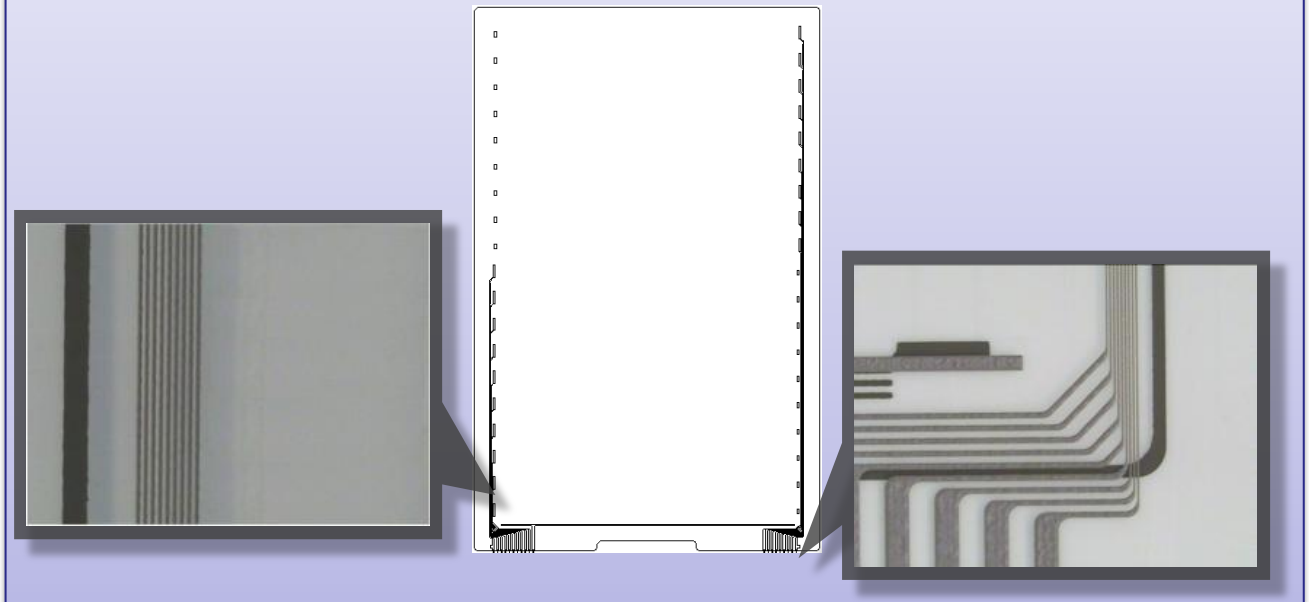


L/S=100/100μm



Pitch=500μm

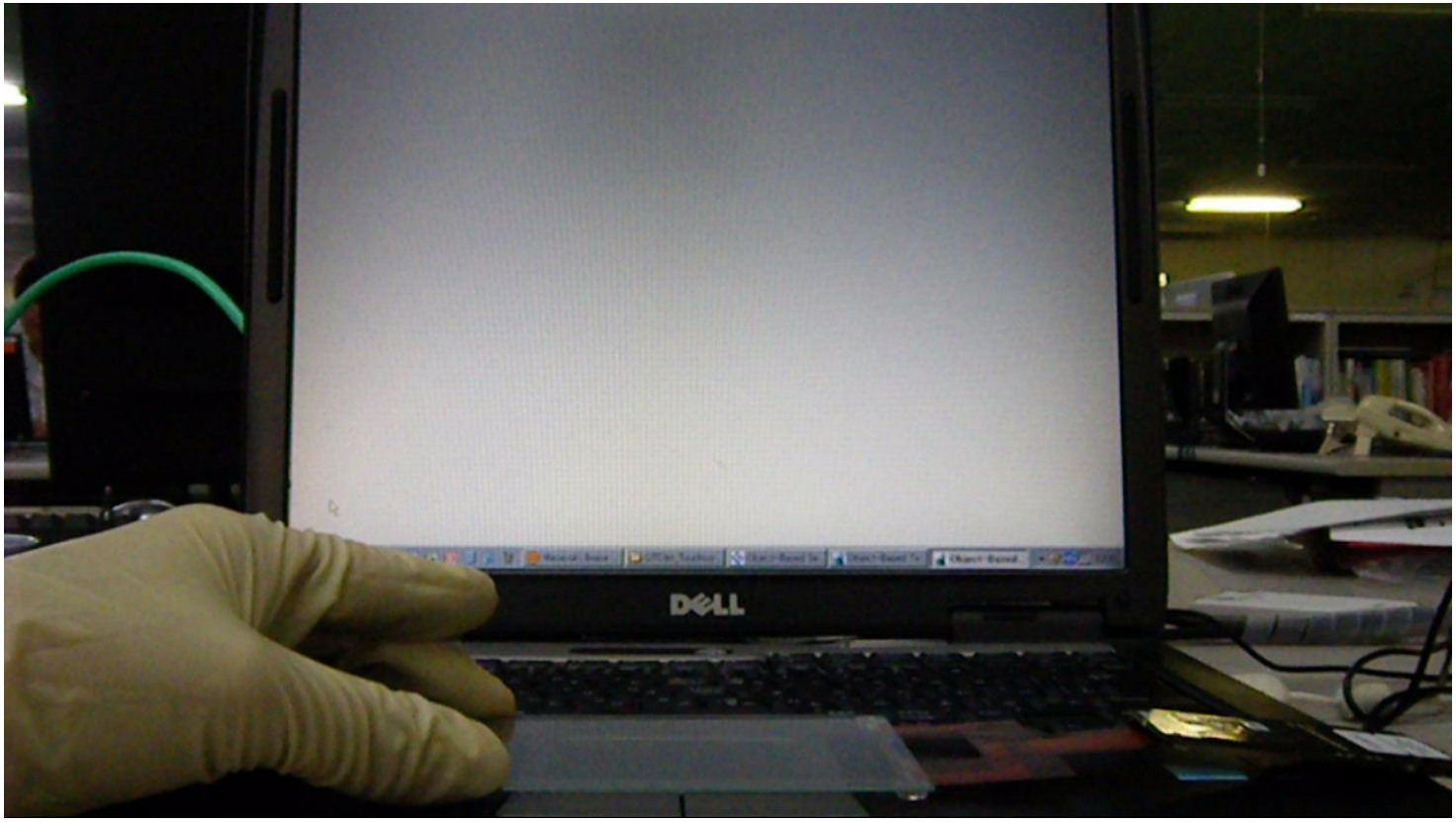
Developed "Super Fine Ag Printing"



L/S=30/30μm

L/S=30/30μm

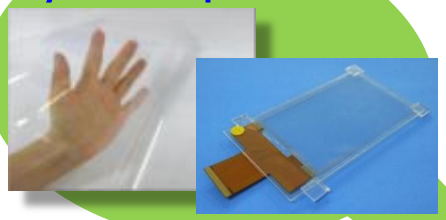
Projected Capacitive Touch Sensor Panel



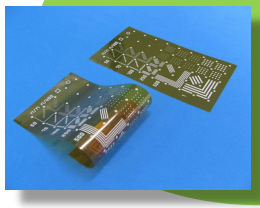
Video demonstration of developed TSP module

Nippon Mektron Printed Flex Technology Roadmap

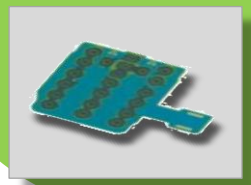
Fully transparent FPC



Single sided Printed FPC



Double sided
& multi-layer Printed FPC



PE Resist Process
for long length FPC

Short term

2012

2013

2014

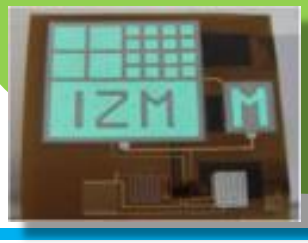
2015

Middle term

2020

Long term

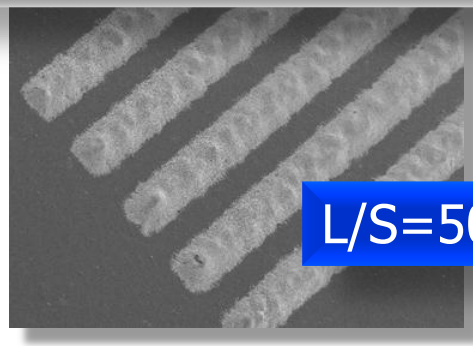
"Smart Printed FPC"
Printed OLED, Active
& Passive Parts and Battery



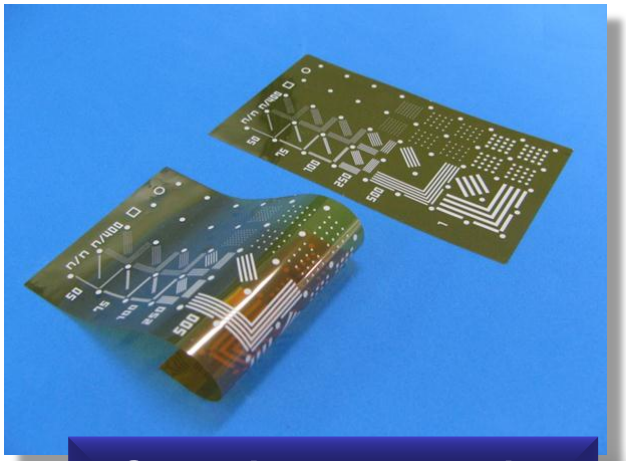
Sample
of Fraunhofer
IZM

Single-sided Printed FPCs

Newly developed Ag paste

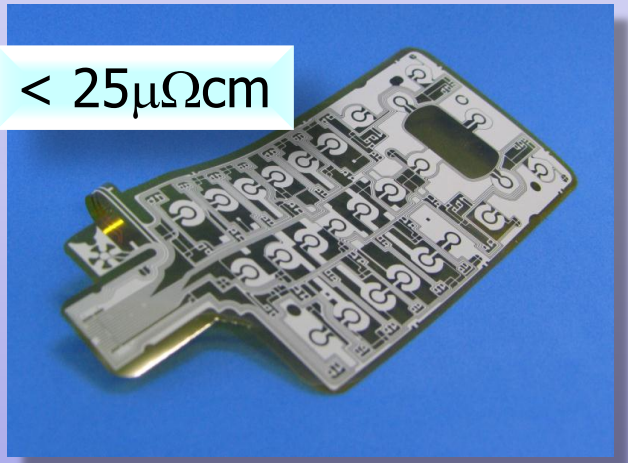


L/S=50/50μm



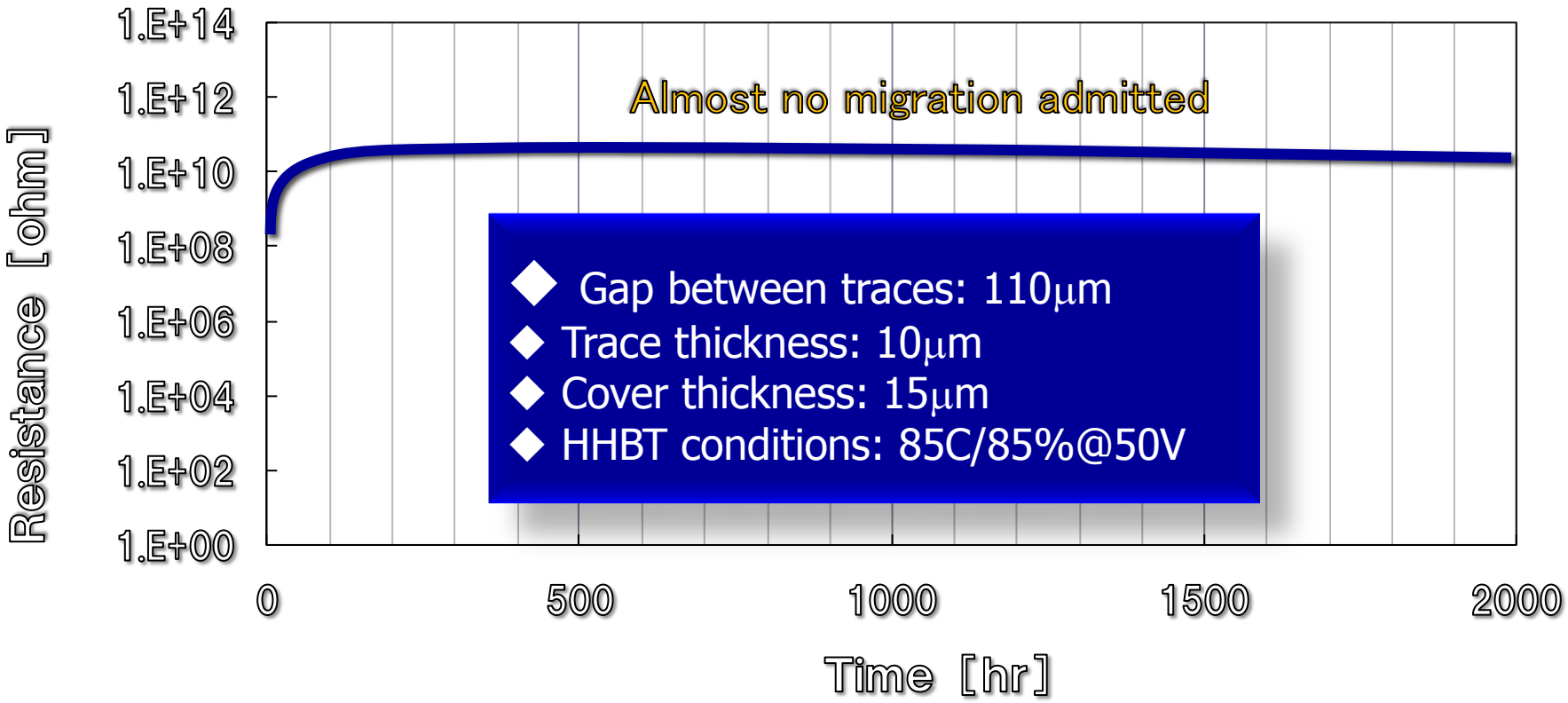
R2R print processing

< 25μΩcm

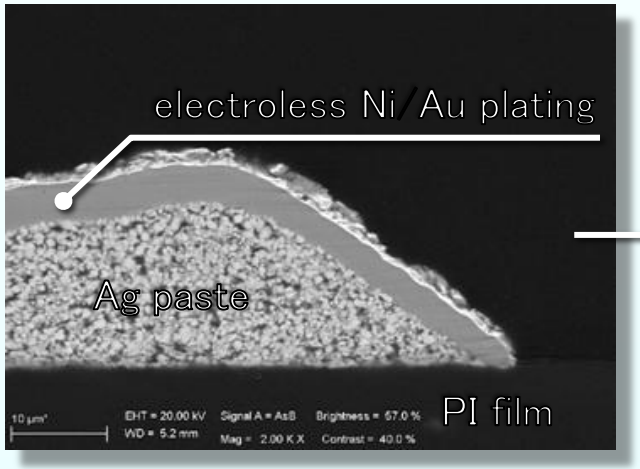


Single-sided Printed FPCs

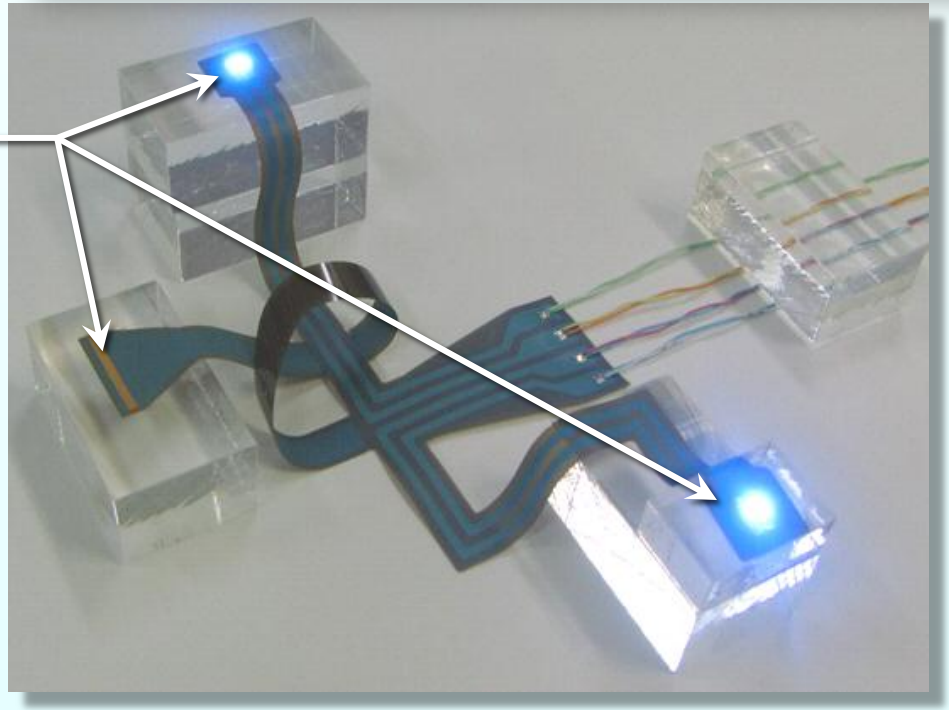
Less or no migration is key issue!!



Single-sided Printed FPCs

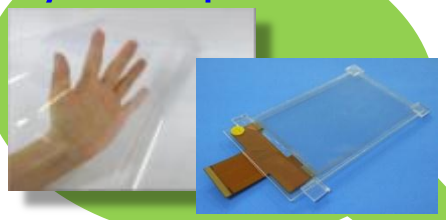


LED assembled SS Printed FPCs

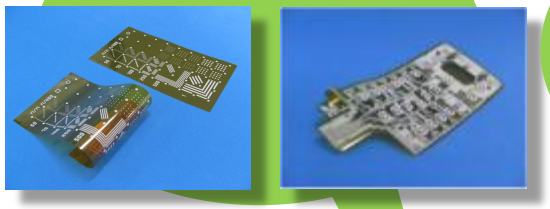


Nippon Mektron Printed Flex Technology Roadmap

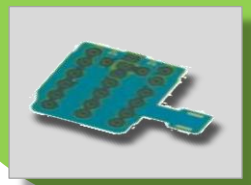
Fully transparent FPC



Single sided Printed FPC



Double sided
& multi-layer Printed FPC



PE Resist Process
for long length FPC

2012

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Middle term

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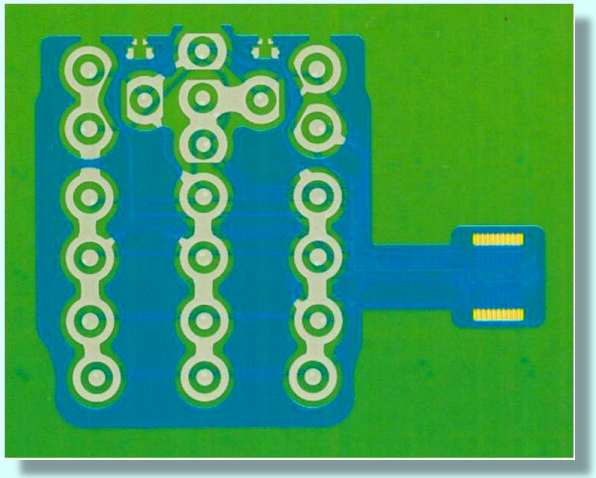
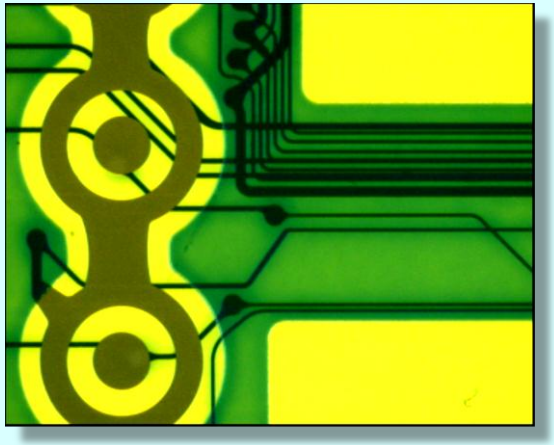
"Smart Printed FPC"
Printed OLED, Active
& Passive Parts and Battery

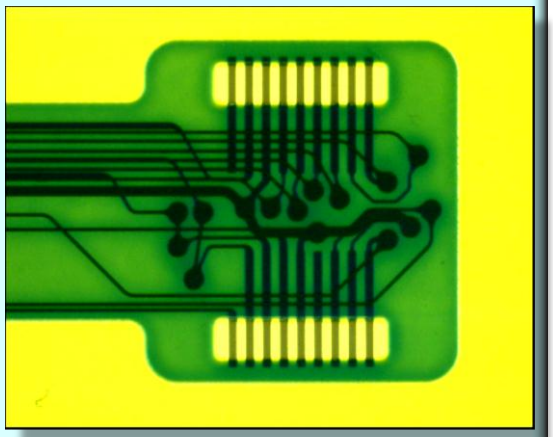
Sample
of Fraunhofer IZM

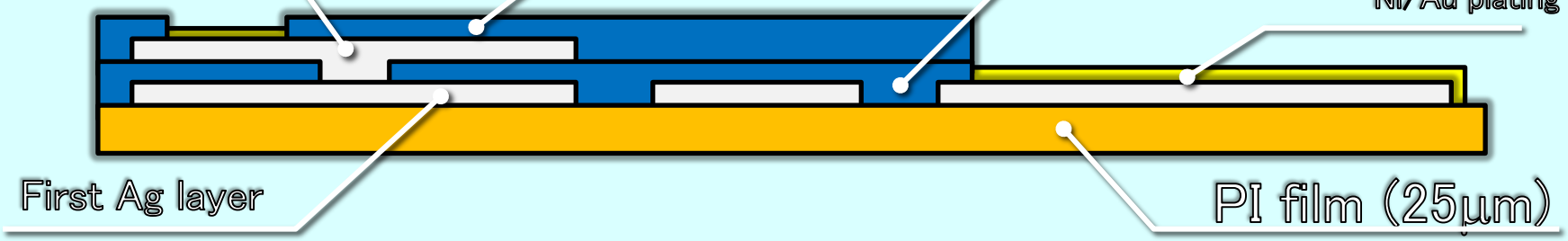
Double-sided Printed FPC



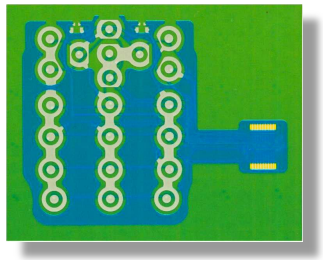
Top view of the sample

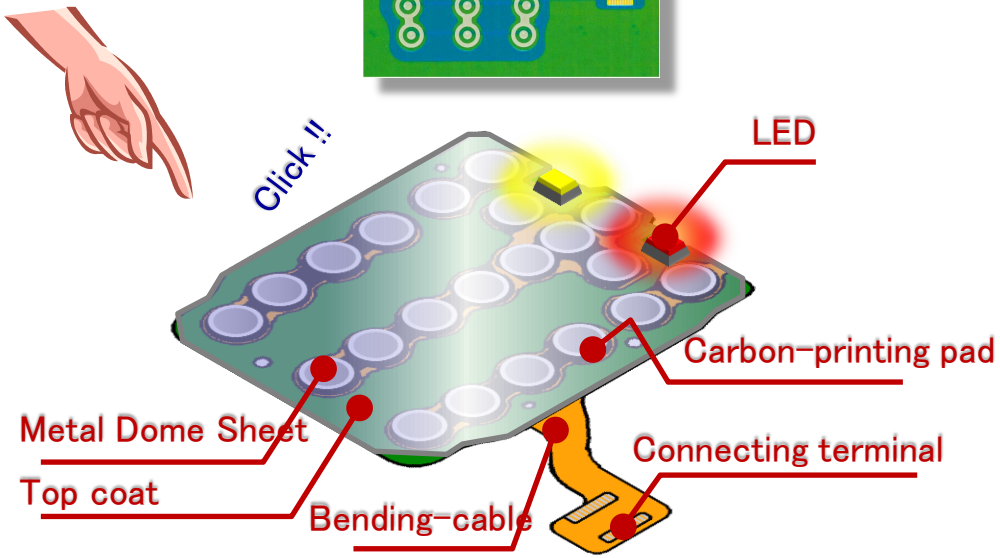




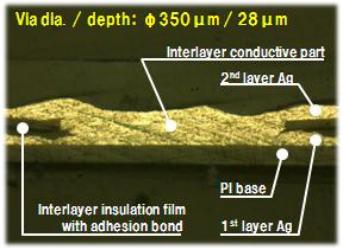


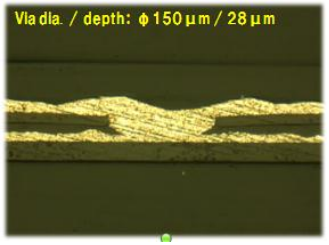
Double-sided Printed FPC

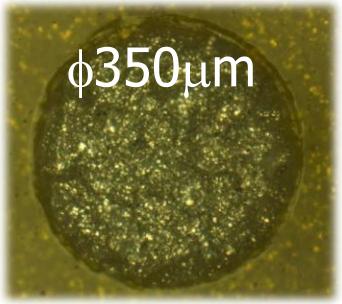


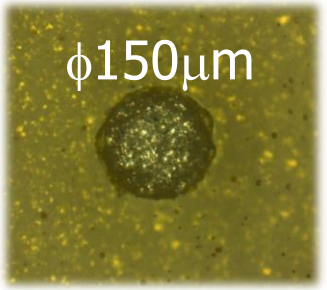


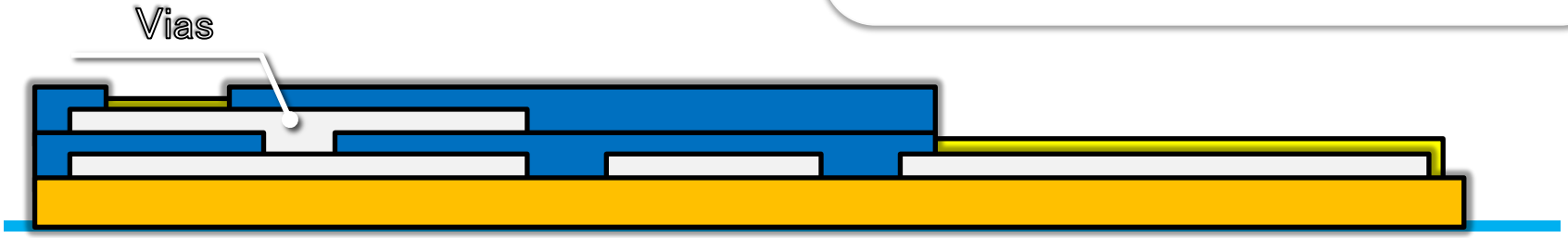
Via formation





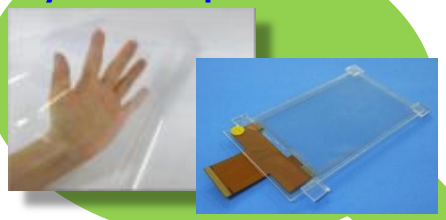




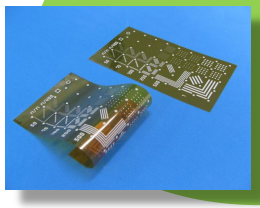


Nippon Mektron Printed Flex Technology Roadmap

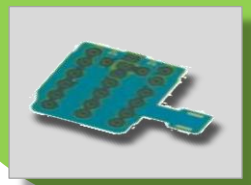
Fully transparent FPC



Single sided Printed FPC



Double sided
& multi-layer Printed FPC



PE Resist Process
for long length FPC

Short term

2012

2013

2014

Middle term

2015

Long term

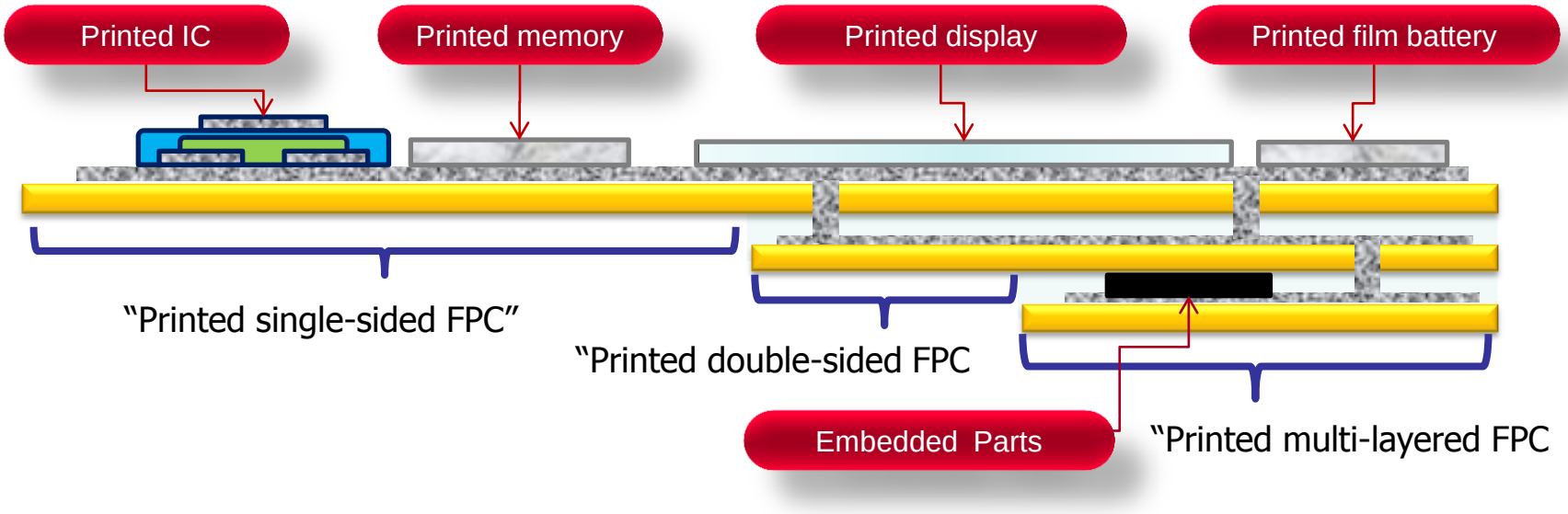
2020

"Smart Printed FPC"
Printed OLED, Active
& Passive Parts and Battery

Sample
of Fraunhofer IZM

Smart Printed FPCs

Schematic of "Smart Printed FPCs"



Summary

Current FPC Products

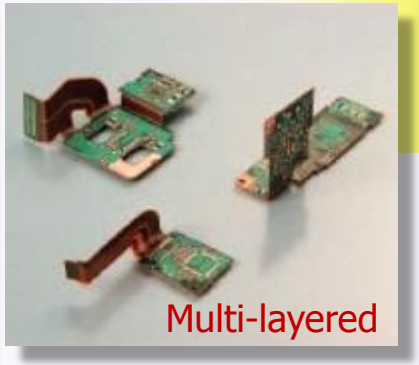
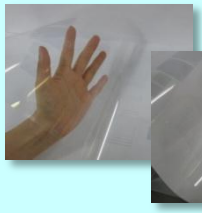
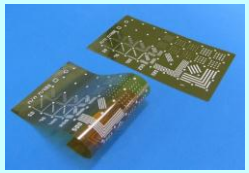
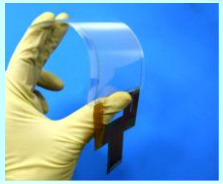


Photo-lithography products
-Subtractive etching/additive plating-

New FPC Products by "Printed Electronics"







eco

The end

Thank you for your attention

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