# Features of Shinko advanced package and Optical sensor developed with Fraunhofer ENAS

Yuichiro Shimizu
SHINKO ELECTRIC INDUSTRIES CO., LTD.

# Company's Outline

- Head office 80, Oshimada-machi, Nagano-shi, Japan
- Date of Establishment September 12, 1946
- Amount of sales €1,119 million in 2016 (€1 = ¥125)
- Employees 4,076 (4,880 consolidated)
- Major Business Lines
  Development, manufacturing, and sales of Semiconductor Packages
  - Plastic Packages
    PLP(Plastic Laminated Package ), IC Assembly
  - Metal Packages
    Leadframe, Glass-to-metal Seals,
    Heat Spreader, Electro Static Chuck

***Most of SHINKO products are manufactured in Japan***

# Domestic Network

**Head Office/Kohoku Plant**
**SHINKO R&D Center**

90 minutes from Tokyo

**Tokyo Office**

- Head Office / Plants & Facilities
- Sales Offices

**Arai Plant**

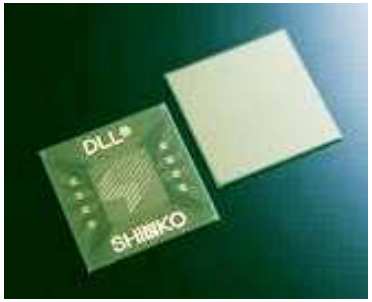
**Takaoka Plant**

**Wakaho Plant**

**Kyogase Plant**

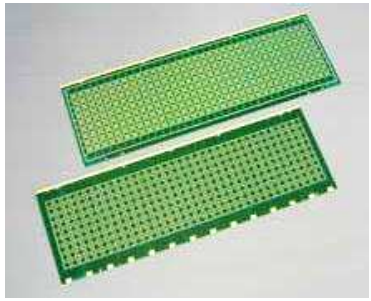
# Product Lineup

## IC Package



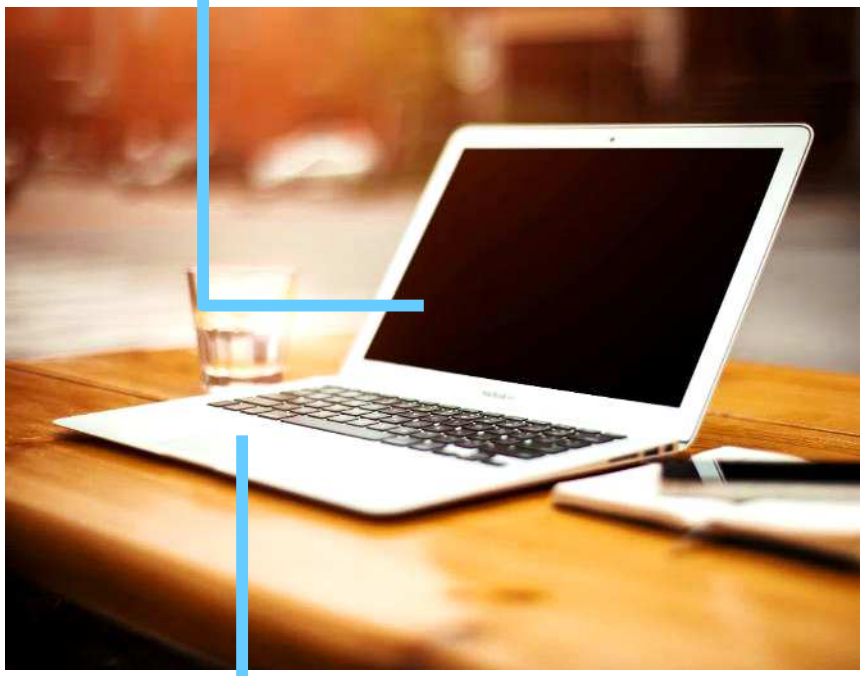

### Build-up Substrate（DLL®,DLL3®）

Application
MPU and ASIC
High-density routing



### IVH/P-BGA Substrate

Application
In Chip set, Controller, Memory, and ASIC.



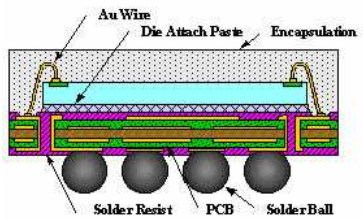
## Heat control

### Heat Spreader

Application
Heat Spreader for Flip chip package, Memory Module

# Product Lineup

## Packaging (IC Assembly)

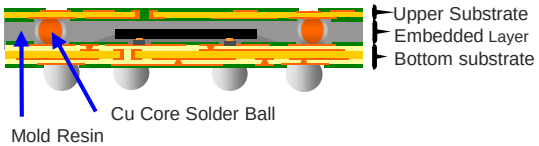



### FBGA/FLGA

Application
Flash Memory, SRAM, DRAM, and ASIC (MPU)

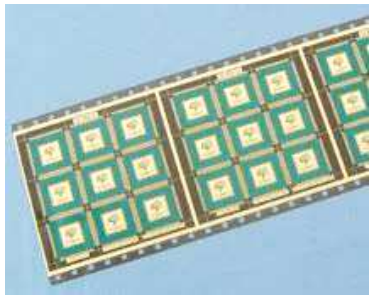
### System in Package

MCeP®




- MCeP®
- PoP
- MCP

## IC Package



### Tape BGA

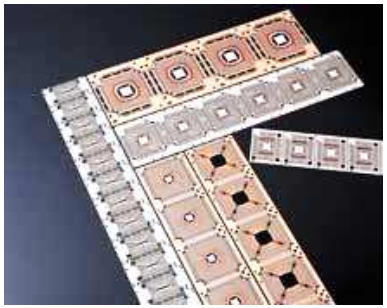
Application
In mobile devices that require compactness and lightness such as DSP

### Module

Application
Cell phone, DSC, super small and high density products
Camera module for cell phone

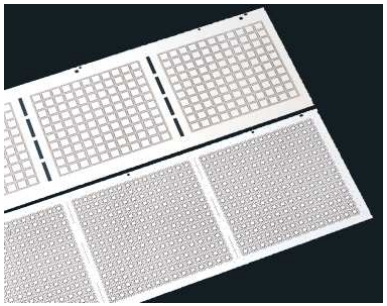
# Product Lineup

## Metal Package



### Leadframe

- Super Fine Pitch Stamped Leadframe
- Multilayer Leadframe
- Riveting Leadframe
- Leads on chip (LOC) for memory
- Plastic Very Thin Quad Flat Non-leaded (P-VQFN)



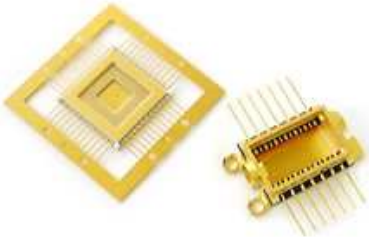
Application
ASIC, Memory, MCU, Analog, Power Semiconductor

## Optical package

### Glass-to-Metal Seals

Application
LD (laser diode) , Sensors

### Ceramic Package



Application
Optical communications devices
High-frequency devices

# Features of SHINKO advanced packages

# Build-up Substrate DLL® (Direct Laser & Lamination)

## Concept

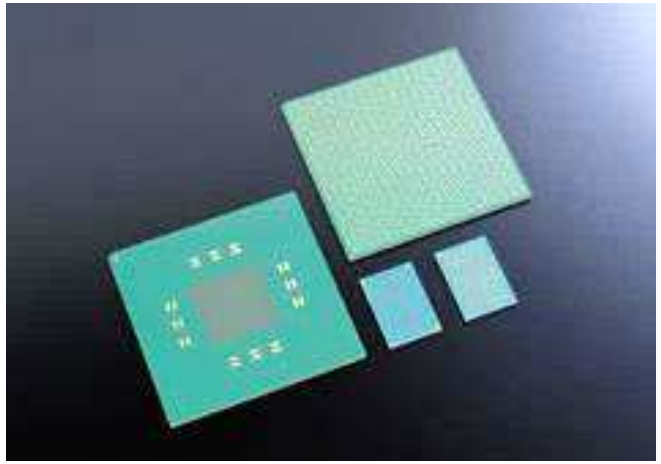
- Build-up Substrate with Flip Chip interconnection
- High wiring density & high performance IC package

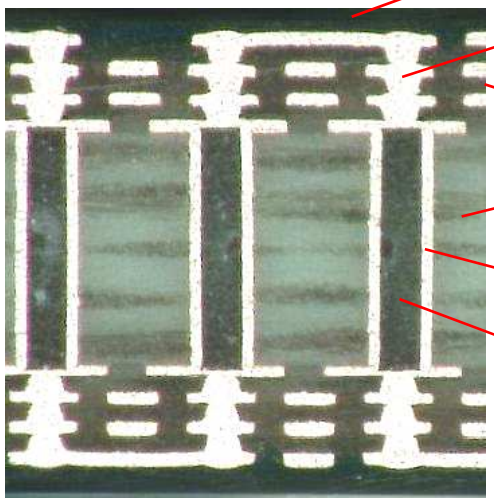
## Features

- Direct Laser & Lamination (DLL®) Process
- Semi-additive process
- Multi-layer structure
- Total package support
  Design, manufacturing and IC assembly

## Applications

- Chip sets, memory and ASICs



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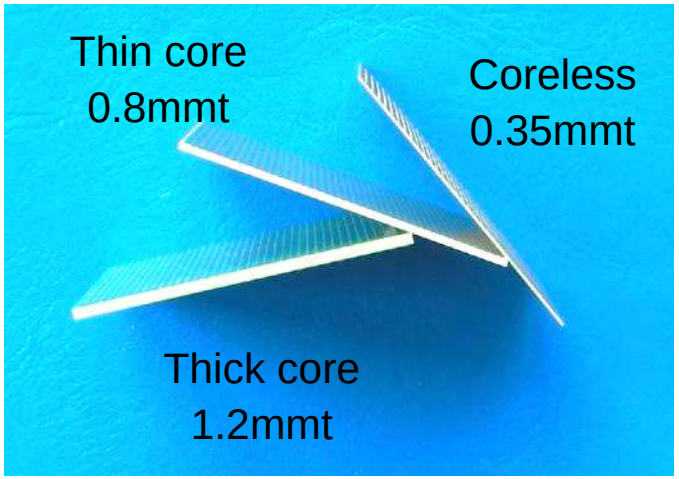
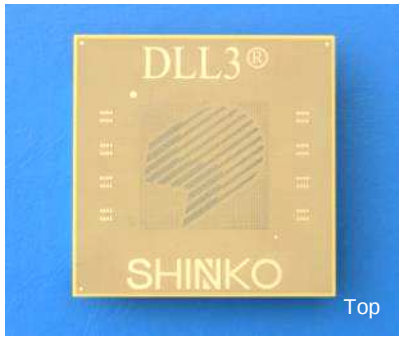
*DLL is a registered trademark of SHINKO ELECTRIC IDUSTRIES CO.,LTD.

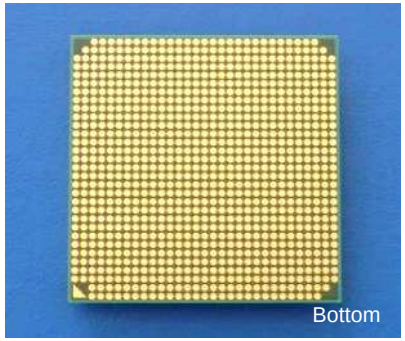
# Build-up Substrate DLL3® (Coreless Substrate)

## Concept

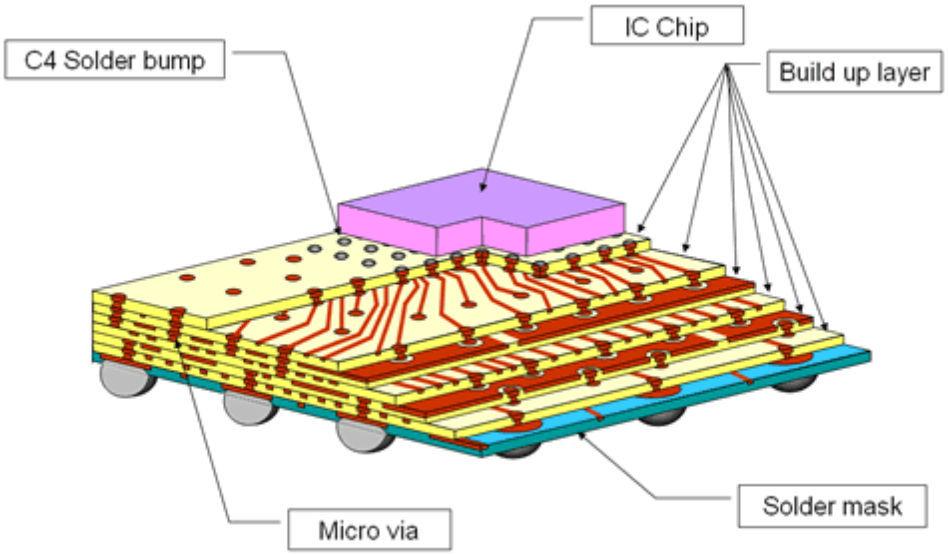
- Coreless Substrate using DLL® technology

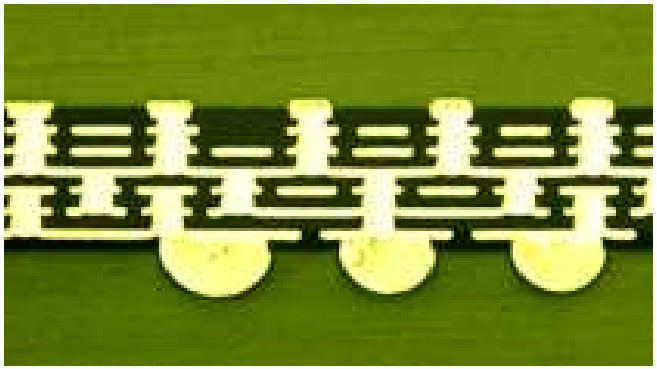



## Structure



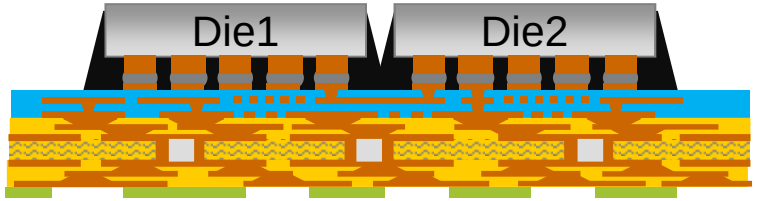



*DLL3 is a registered trademark of SHINKO ELECTRIC IDUSTRIES CO.,LTD.

# integrated Thin film High density Organic Package i-THOP®

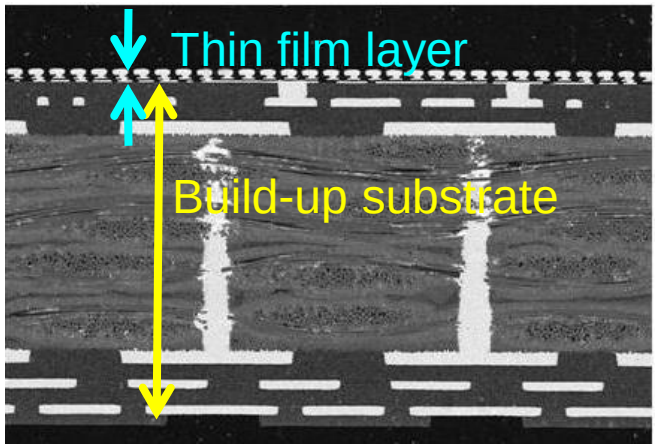
## Concept

- Package with thin film layer on conventional BU substrate

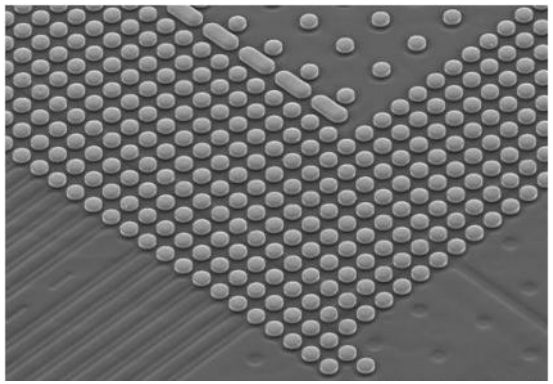



## Applications

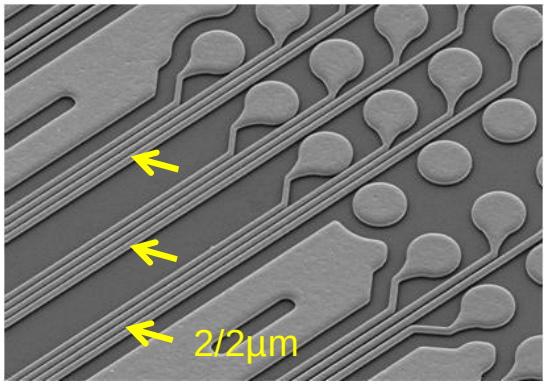
- Logic-Logic (Die Partitioning) for Mobile Application
- Heterogeneous interconnection for High-End Application



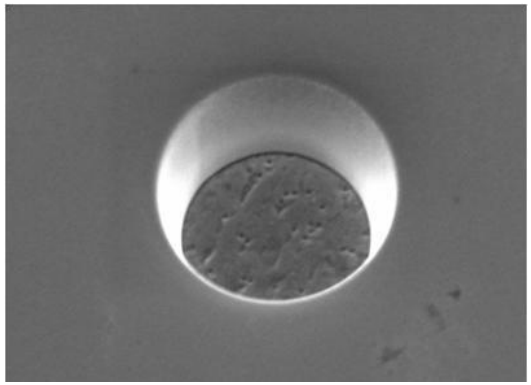

40µm pitched FC pad



2µm-width Cu traces




Micro via of 10µm diameter



*i-THOP is a registered trademark of SHINKO ELECTRIC IDUSTRIES CO.,LTD.

# Device Embedded Package MCeP®

## Concept

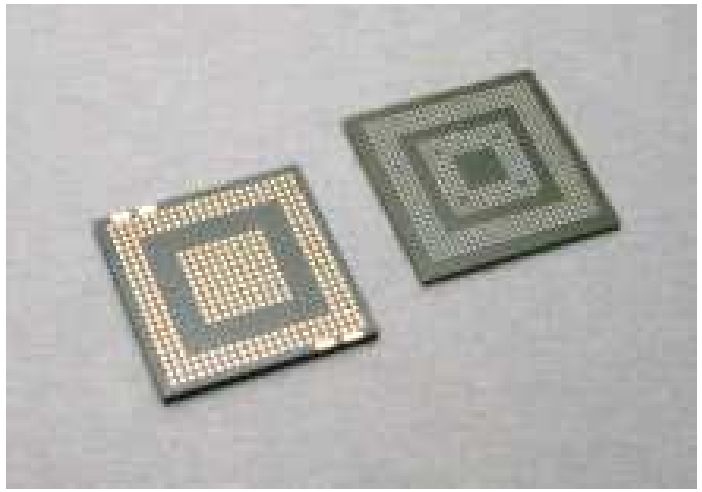
- Chip embedded package structure

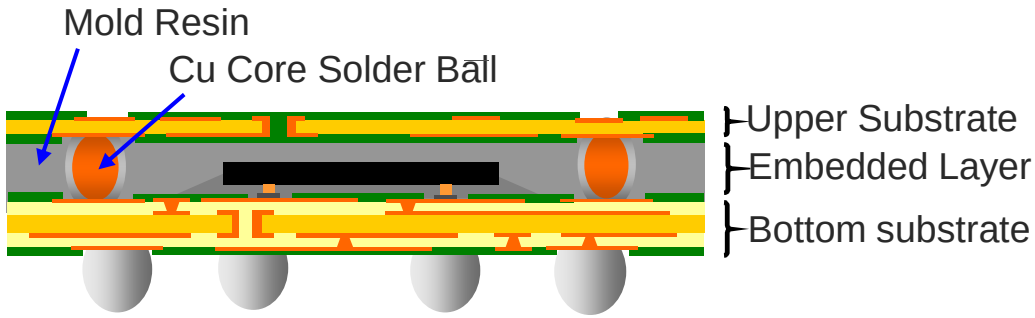
## Features

- High yield and Short TAT (Assembly process only)
- Fine Pitch FC connection by Au-Solder
- Connection between Sub and Base substrate by Cu core solder ball
- Flat, low warpage package with high reliability by mold resin encapsulation

## Applications

- Substitution of PoP and SiP
- Small Modules

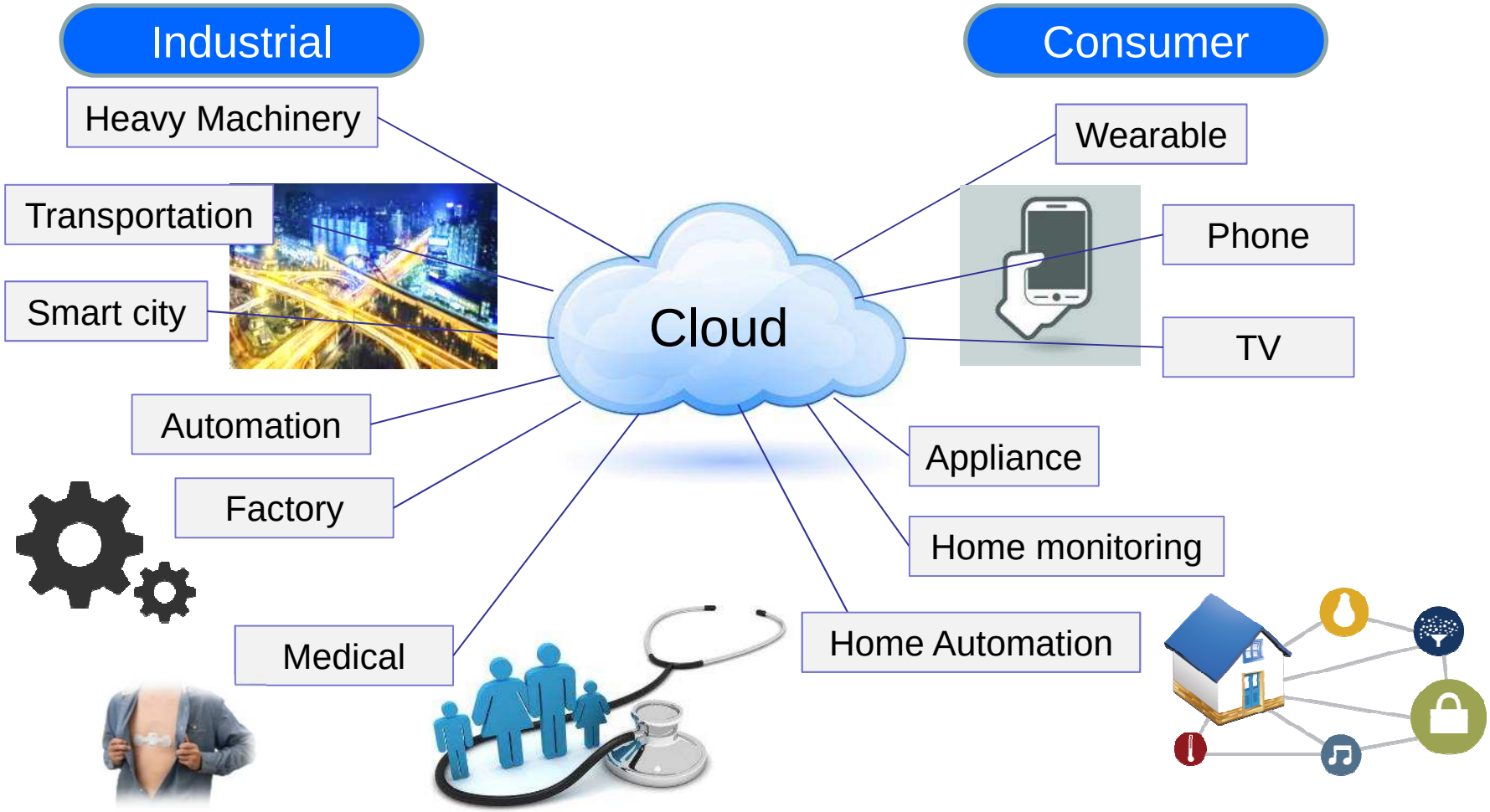





Back: BGA
Surface: SMD(Surface Mount Device)

*MCeP is a registered trademark of SHINKO ELECTRIC IDUSTRIES CO.,LTD.

# Contribution to IoT




Sensor demand increases dramatically, as IoT technology goes forwards.
SHINKO will contribute to interconnect technologies for IoT and Industry 4.0.

# Wireless Sensor Module Under development

## Features

- All in one module (Sensing device, CPU, RF-IC, Battery, Antenna)
- Bare die assembly technology for thin and small form factor
- 3D fine structure (PoP)
- Human body friendly medical device (Flexible type)
- Antenna Matching Circuit Design

## Sensing object

- Vital signs
- Body motion, Position (Acceleration)
- Temperature etc.

## Application area

- Medical Care
- Health Care, Nursing Care, Preventive Care

< Product Image >

Flexible type

< Application example for IoT >

# Development of Optical sensor
## (Fraunhofer ENAS – SHINKO collaborative project)

# Background of optical sensor development

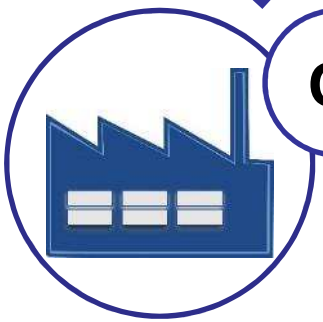
- Contribution to market demand
  - Sensing is one of candidate technologies for SHINKO products
- Demand for non-destructive, non-invasive and continuous measurement
  - Optical sensing is the best suited method
- Characteristics of near infrared (NIR)
  - Less influence of water than IR
  - High possibility analysis of invisible things
- Fraunhofer ENAS support
  - Extensive experience in sensor system, especially optical sensor

# Target of optical sensor

## Medical application

**Target product**

Body fluid analyzer, Physical condition monitor
(ex. Blood, sweat, tear, urine, saliva, etc.)
Combined with Wireless Sensor Module



## Concept confirmation

**Prototype for electrolytic copper plating**

to identify the chemical substances in plating solution
to measure chemical concentration in situ
to confirm sensing methodology

# Summary

- Future plan
  - Sensor for process control
    - Practical verification of plating solution sensor
    - Application to other treatment solutions
  - Application to medical field
    - Biological sensor, ex. blood component analyzer
    - Combination with wireless sensor module
- SHINKO …
  - will keep proposing interconnect technology by packaging technologies and advanced packages.