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

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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

IC Package
- Tape BGA
  - Application: In mobile devices that require compactness and lightness such as DSP

Packaging (IC Assembly)
- FBGA/FLGA
  - Application: Flash Memory, SRAM, DRAM, and ASIC (MPU)

System in Package
- MCeP®
- PoP
- MCP

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)

**Optical package**

- **Glass-to-Metal Seals**
  - Application
    - LD (laser diode), Sensors

- **Ceramic Package**
  - Application
    - Optical communications devices
    - High-frequency devices

- **Application**
  - ASIC, Memory, MCU, Analog, Power Semiconductor
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

*DLL is a registered trademark of SHINKO ELECTRIC INDUSTRIES CO., LTD.*
Build-up Substrate DLL3® (Coreless Substrate)

**Concept**
- Coreless Substrate using DLL® technology

**Structure**

```
IC Chip
Built up layer

C4 Solder bump

Micro via
Solder mask
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*DLL3 is a registered trademark of SHINKO ELECTRIC INDUSTRIES CO., LTD.*
**Concept**

- Package with thin film layer on conventional BU substrate

**Applications**

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

*Thick-film layer*  
*Build-up substrate*

40µm pitched FC pad  
2µm-width Cu traces  
Micro via of 10µm diameter

*i-THOP is a registered trademark of SHINKO ELECTRIC INDUSTRIES 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

*MCeP is a registered trademark of SHINKO ELECTRIC INDUSTRIES CO., LTD.*
Sensor demand increases dramatically, as IoT technology goes forwards. SHINKO will contribute to interconnect technologies for IoT and Industry 4.0.
Wireless Sensor Module

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

< 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

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

Medical application

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