INSIGHT SIP
Who Are We
What Do We Do
Why Us
AGENDA

• Overview
• LTE and Telephony
• Antenna Design & Antenna-in-Package
• Custom SIP
• Bluetooth Low Energy
• Summary
Established in 2005
- Founded by actual CEO and CTO
- Core team from National Semiconductor

Product Lines
- Full Turn-key design services and creative packaging solutions
- Standard modules for wireless electronic industry

Experts in RF System-in-Package (SiP) and Antenna-in-Package (AiP)
- Fabless company
- Design & industrialization expertise
- Design team: cross-cultural resources of PhD/MSc experts

Locations
- Europe – HQ and Technical team in Sophia-Antipolis (France)
- North America – Subsidiary in Denver (USA) since 2008
- Asia – Sales office in Tokyo (Japan) since 2008
- Global network of distributors
• Manufacturing with multiple established partners
  - Amkor
  - ASE
  - AT&S
  - Barry Ind
  - Kyocera
  - Tong Hsing

**Break by Application Volumes**

<table>
<thead>
<tr>
<th>Year</th>
<th>Low Energy Connectivity</th>
<th>Connectivity</th>
<th>4G/5G Front End &amp; Radio</th>
<th>Secure Connectivity (Internal and licensed production)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
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<td>2015</td>
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<td>2017</td>
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**Quality standards in production**

- ISO9000 standards and several other equivalent certifications
- OHSAS18001 – Health and Safety management
- ISO13485 – Medical requirements
- AS9100 – Aerospace requirements
- QS9000 – Automotive requirements
Complete 3D RF System Including

- Multiple Semiconductors Dies, Systems-on-Chip (SOC), Analog Functions, Digital & RF Functions, Passive Functions, Clocking, Power Management, Interface to Application on PCB

- Made of Heterogeneous Technologies – CMOS, RF-CMOS, GaAs, SiGe, Quartz, Advanced Packaging Techniques, 3D packaging, IPD, Passive SMD, Organo-Metallic Substrates, Multilayer Ceramic Substrates, …

Benefits of SiP

- More Function in Less Space
- Optimized Cost and Reduced Design Cycles
Core Competence

- Any Wireless Connectivity to Fit Any Device Space
- System-in-Package (SIP) Or Module Design Approach
- Highly Integrated Antenna Design Expertise
- Unique Methods to Estimate Package Size and Performance
- Multiple Technologies: BT, FR4, LTCC, HTCC, Thick Film, PCB, IPD,…
- Multiple Assembly Methods: SMT, Wirebond, Flipchip, Embedded Dies…
- Track Record of Delivering Smallest Solutions

Technical Successes

Cellular 2G/3G/4G/LTE/5G, 60GHz, ANT, Bluetooth®, Bluetooth Smart ®, GPS/GNSS, ISM, NFC, RFID, TransferJet, UWB, WHDI™, WiFi, Zigbee ®, ….

Benefits To Our Customers:
Smaller, Faster, Lower Cost
From Assessment to Production

**DESIGN TO DELIVERY**
- Pre-Study
- Design Implementation

**BLE MODULE**
- Design In-house
- Module Maker I/F

**CUSTOM SiP/Module**

**BLE SiP**
- Catalog, Licensed, or Custom

Manufacturing with Established Partners
- Amkor, ASE, AT&S, Barry Ind, Kyocera, SPIL, Tong Hsing, ...
3G/LTE duplexers
- SAW or BAW
- LTCC and SMT matching

Legacy GSM filtering
- Rx filters (SAW)
- Tx Low Pass Filters (LTCC)

Multi-throw switch
- 12 or more throws
- MIPI or SPI interface
- Silicon on sapphire
- Low loss and high intermodulation

Small size
- 4 x 5 x 1 mm for 4 dplx
- High Isolation (ca 55 dB)

LTCC Technology
5 Band GSM/W-CDMA Module

- RF SiP based on Silicon IPD with Laminate Substrate
- Transceiver
- Passives on IPD
- Co-Design with Substrate
- All Transmit Baluns are moved from PCB to BGA
  - 50% overall PCB Footprint Reduction
  - Reduces BOM
  - Eliminates messy Design Task on PCB

Application:

- Mobile Handsets
Integrated PCB Antenna for M2M Module

- Printed Structure
- Covers 820MHz – 2.2Ghz
- Extension to cover all LTE bands possible
- Replaces expensive ceramic/metal antenna

Antenna Matching Module for Smartphone

- Interface between Antenna and RF Front End
- Improves return loss, thus allows lower power consumption
- Part of Dynamic tuning system
Antenna In Package (AiP)

- 3D stack SiP 8x12x1.5mm:
  - 4 layer substrate
  - MCU bare die
  - 2.4GHz Radio bare die
  - Side 2.4GHz PIFA Antenna
- Application:
  - Wireless USB
UWB ANTENNA

- 7 x 7 mm LGA
- 1.5 mm ht

- 3D stack SiP 7x7x1.5mm:
  - 4 layer substrate
  - MCU bare die
  - UWB Radio bare die
  - Miniature Patch Antenna
- BW > 1 GHz at 7.5 GHz
- Application:
  - High Speed Data Transfer up to 500 Mb/s

UWB 7 GHz
Extensive track record of designs covering a wide range of RF cellular standards…. But not only

✅ GPS
✅ NFC
✅ Bluetooth V2.1
✅ UWB
✅ Multi standard Combo module
✅ WiFi 802.11 b/g/n/ac

✅ WHDI (Wireless Video)
✅ 60GHz
✅ IoT
✅ µSD Card
**SIP Examples**

- LTCC WiFi Integrated Filter/Baluns
  - 7 x 7 x 1.5 mm

- WHDMI Transmit Display Mini Card
  - 44 x 27 x 5 mm

- 2 die SiP, Secure NFC Contact-less
  - 5 x 5 x 0.8 mm

- GPS Module, Baseband, Radio, SMD
  - 6 x 4 x 1 mm

- µSD 3D SiP Device, Smart Secure
  - 11 x 15 x 1 mm

- 4 die SiP, BT ASIC Memories
  - 12 x 12 x 1 mm
**Advanced Design**

**60GHz Front End Module**

- **60GHz Antenna**
  - ✓ Low Cost Beam forming antenna
  - ✓ Miniature Front-end-Module

- **Applications**
  - ✓ In-house High Speed Data
  - ✓ Point to Point Radio Link

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**Diagram:**

- Substrate
- Flip chip Si
- Mother Board
- Controlled Impedance Path: Antenna to 60 GHz PA or LNA
- Digital BB, control, power and ground
• Insight SiP intends to propose a complete BLE solution offer

- **Module solution**
  - Ready to Use BLE Module to be integrated in application circuit
  - Off shelf

- **Sensor solution**
  - Ready to Use Radio and Hardware circuit with integrated sensor
  - Custom or Off shelf

- **Custom SiP**
  - Radio and Hardware included in a Custom Design SiP
  - Specific form factor
Insight SiP has a wide range of solutions based on existing design framework (eg AiP etc …) in order to offer extended capabilities in the BLE domain:

- « Own Brand » ready to use modules
- Licence of module design to customers
  - Replacement of chipset with different choice
  - « Combo » modules (BLE/WiFi, BLE + Sensor)
  - Different form factor or content
- Custom BLE integrated into body network device

Values To Our Customers:

- Relies on Insight SiP Unique Technology and Expertise
- Allows to Focus on Embedded Systems (eg SW development) rather than Design Implementation
- Enables Faster Time-to-Market
- Provides Faster ROI
The roadmap is subject to chipset availability

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
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<tbody>
<tr>
<td>2009</td>
<td>BLE ISP0912_01, BLE ISP1302_01</td>
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<tr>
<td>2017</td>
<td>BLE ISP1303_01, BLE ISP1507</td>
</tr>
<tr>
<td>2018 H1</td>
<td>UWB ISP1510, Long Range &amp; Mesh</td>
</tr>
<tr>
<td>2018 H2</td>
<td>UWB ISP1810, ISP1807</td>
</tr>
<tr>
<td>2019 H1</td>
<td>ISP1930</td>
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BLE GUIDELINES

Large Choice of Platforms with Integrated Antenna

- **ISP0912\text{01}**
  - BLE 4.0
  - BLE Connectivity
- **ISP1303\text{01}**
  - BLE 4.2
  - BLE + Integrated MCU Sensor Node & Mesh
- **ISP1302**
  - BLE 4.2
  - BLE Connectivit
- **ISP1507**
  - BLE 4.2
  - BLE + Integrated MCU Mesh & Long Range
- **ISP1807**
  - BT 5
  - BLE + Integrated MCU Mesh & Long Range

**Best Sellers**

**Price**

**Performance**
Key Takeaways

- Long-term partnership with our customers
  - Assist our customers from design early stage to volume production
  - Multiple design projects
- Leader in RF SiP design
- Extensive design track records
- Partnership with world class SiP & module manufacturers

Benefits To Our Customers:
Smaller, Faster, Lower Cost
THANK YOU