CORE COMPETENCIES

- ANY WIRELESS CONNECTIVITY TO FIT ANY DEVICE SPACE
- SYSTEM-IN-PACKAGE (SIP) DESIGN APPROACH
- HIGHLY INTEGRATED ANTENNA DESIGN EXPERTISE
- OPTIMIZATION SIZE/COST/TIME TO MARKET
- 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...

TECHNICAL SUCCESSES

3G, 60 GHZ, ANT, BLE, BLUETOOTH®, GSM/W-CDMA, GPS, ISM, LTE, NFC, RFID, UMTS, UWB, WHDI™, WIFI, WLan, ZIGBEE®...
READY-TO-USE RF MODULES / ANTENNA DESIGN IPs

DESIGN IN-HOUSE

PRODUCTION WITH MODULE MAKER / ASSEMBLY PARTNER

2.4 GHz Modules (Proprietary, Bluetooth Low Energy, ...), ...
HD Video (WHDI), ...

DESIGN SERVICES

FEASIBILITY STUDY

DETAILED DESIGN

TEST AND DEBUG

SYSTEM-IN-PACKAGE

COMBINATION MODULES

ANTENNA-IN-PACKAGE
THE STANDARD SIP DESIGN APPROACH
- Based on Trial and Error ➔ Time Consuming and Uncertain
- Based on Classical Lay-Out Methodology coming from Low End PCB Designs ➔ NOT USABLE for Complex RF SIP Design

➢ “Most SIP Designs are just Small Surface Mount Assemblies using Chip and Wire for ICs and Conventional Passives”
(Dr. Leonard Schapper - University of Arkansas – IEEE Workshop Como, Jan. 2007)

INSIGHT SIP Uses a Unique Design Methodology
From a Reference Design to a Highly Integrated Custom (RF) Module:
- Substrate Design with Coupling/Matching Analyses
- Manufacturing and Supply Chain Supervision
- Debug and Characterization Capabilities
WiFi Module

RF SiP based on LTCC Substrate
- CMOS Baseband
- GaAs Antenna Switch
- Passives Embedded in Substrate
- Quartz Clock
- SiGe Transceiver
- 7x7 mm²

Applications
- Cellular Phone
- Digital Camera
2.4 GHz Antenna In Package

RF SiP based on Laminate Substrate
- MCU & RF Transceiver
- Embedded Antenna
- 8x12 mm² QFN

Application:
- Wireless USB
BLE MODULE  ISP091201x

- Single Mode Bluetooth® Low Energy v4.0 Slave
- Includes Transceiver, Baseband and Software Stack
- Ultra Low Power Consumption
- Single 1.9 to 3.6 V Supply
- Temperature -40°C to 85°C
- Fully Integrated RF Matching and Antenna
- 12mm x 8mm x 1.5mm
- Based on Nordic Semiconductor nRF800x Family
**Bluetooh/Audio - 4 Chip SiP**

- 12 x 12 mm
- 2 Memories
- 1 RF IC
- 1 Digital & Analog ASIC
- 3 Wirebonded Chips
- 1 Flip-chip Device
RF SiP based on Silicon IPD with Laminate Substrate

- Transceiver
- Passives on IPD
- Co-Design with Substrate

Application:
- Mobile Handsets
7 BAND GSM/W-CDMA MODULE

**Complex RF Module**
- 7 Band Modem
- Memory
- Power Management
- Transceiver w/ Diversity
- Power Amplifiers
- Front Ends

**Application**
- Mobile Internet Devices
- Ultra Mobile PC
QUAD BAND GSM INTEGRATED ANTENNA MODULE

APPLICATION: M2M

RETURN LOSS MEASUREMENT WITH AND WITHOUT PLASTIC CASE (RANDOM)
GPS SiP

RF SiP based on Laminate Substrate
Baseband, Transceiver, SMDs
6x4 mm² High Count VFBGA Package

Application
Cellular Phone
ISM IQ MIXER

SILICON BASED IPD
• PASSIVES ON IPD
• CO-DESIGN WITH SUBSTRATE
• 3.5 mm² x 4.5 mm² IPD

APPLICATION:
• TELEMETERING
LTE FRONT END MODULES

NEXT GENERATION OF LTE FRONT END MODULES

• RADIO CHIPS
  – ST ERICSSON
  – LIME SEMICONDUCTOR

• APPLICATIONS
  – SMART PHONES
  – LTE PICO-CELLS
  – M2M
5GHZ WHDI™ MODULES

WHDI Receiver Module - ISP100903
• 47 x 41 x 4.5MM (without HDMI connector)
• 65 x 41 x 7.5MM (with HDMI connector)

WHDI Transmitter Display Mini Card - ISP091204
• 44.4 x 26.8 x 5 MM
MINIATURE WIRELESS SENSORS

• EMBEDDING
  – BLE RADIO
  – MICROCONTROLLER
  – SENSORS
  – POWER

• OVERALL SIZE – 1 INCH – IE COIN CELL DIA

• APPLICATIONS
  – BODY NETWORK
  – MINIATURE M2M DEVICES
ULTRA SLIM SiP

• DESIGN SUCCESS
  – GPS MODULE – OVERALL THICKNESS << 0.8mm

• ADVANCE PROGRAM
  – OTHER STANDARDS
UWB AIP

• ADVANCE R&D PROGRAM
  – CONFIDENTIAL

• APPLICATIONS
  – CELL PHONE
  – ULTRA-FAST DATA TRANSFER
  – WiMEDIA
60 GHz Module

• Advance R&D Program
  – Confidential

• Applications
  – Ultra-Fast Data Transfer
  – HD Video
  – Cell Phone
**SUMMARY**

**DESIGN HOUSE WITH A UNIQUE EXPERTISE IN:**

- **RF SiP** (up to 60 GHz and more)
- Antenna Design and Integration
- Cellular and Wireless Communication Systems:
  - 3G, 60GHz, ANT, BLE, Bluetooth®, GSM/W-CDMA, GPS, ISM, LTE, NFC, RFID, UMTS, UWB, WHDI™, WiFI, WLAN, Zigbee ...

**WE DELIVER ON THE PROMISE OF SiP:**

- More Function in Less Space,
- Optimized Cost and Reduced Design Cycles.
THANK YOU

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