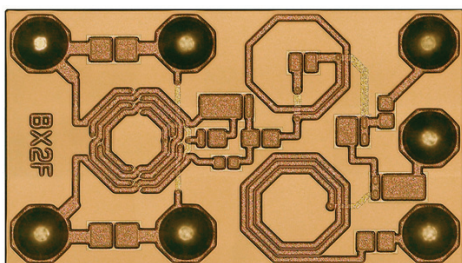
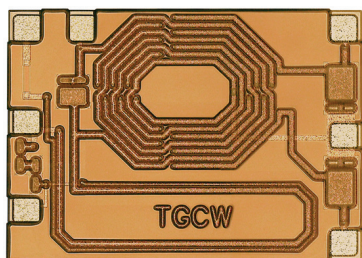


IPD

Integrated Passive Devices



WiMAX
Balanced Filter



GSM
Balun & Coupler

Features

- Embedded RLC components with excellent performance
- Resistors to 100,000 ohms
- Capacitors range: 0.2pF-100pF
- Inductors to 30nH
- IPD diplexers, filters for wireless applications
- Compact baluns for RF applications
- Computerized component generation for fast flawless design (1st run silicon success is typical)
- Library RLC components, filters and baluns for GSM, DCS, PCS, GPS, WiMAX and WLAN a/b/g
- Full electrical models of all library components
- Foundry matrix mask space available
- Packaging available in QFN, FBGA, FLGA and eWLB formats

Applications

- RF Power Amplifier Matching/Filters/Couplers
- Front End Modules (FEM)
- GSM/DCS and CDMA cellular phones
- Wireless LAN 802.11 a/b/g and WiMAX systems
- 802.11a/b/g and WiMAX filters
- GPS Systems
- Functional Interposers
- Baluns from 750MHz-6GHz
- Multi-band RF Transceivers
- Miniaturization of RF Systems

Description

Passive components are indispensable parts of System-in-Package (SiP) solutions and are used for various functions, such as decoupling, biasing, resonating, filtering, matching, transforming, etc. With the growing industry trend for increased integration in a small, light weight form factor, there has been an increasing need for integrated passive devices (IPDs) in SiP solutions.

By integrating and fabricating passive devices at the silicon wafer level, we are able to produce IPDs which are significantly smaller, thinner and higher performance than the standard discrete passive devices that are commercially available today.

Enabling SiP Solutions

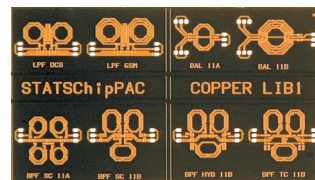
SiP solutions feature a modular architecture that integrates mixed IC technologies and a wide variety of passive devices such as resistors, capacitors, inductors, filters, baluns, transceivers, receivers and interconnects directly onto a substrate for a cost effective, system level solution. IPDs are a cost effective way to reduce footprint, reduce interconnection complexity, improve component tolerance, yield and reliability. By integrating passive devices at the silicon wafer level, we are able to fabricate IPDs which are significantly smaller, thinner and with higher performance than standard passive devices.

Passive functional blocks, such as filters, baluns, couplers, dividers and matching circuits, are indispensable parts of RF front-end modules in cellular, WiFi and WiMAX applications. For a typical function, such as a filter, silicon IPDs can achieve a 50% size reduction compared to LTCC. In addition, the thickness of silicon IPDs is typically 150um to 250um, which is thinner than standard LTCC and suitable for SiP applications.

To achieve superior IPD performance, we employ a copper metallization process capable of depositing 8 microns or more of copper on a silicon wafer. This results in higher Q components that reduce loss in the RF signal transmission path, thereby increasing battery performance of the wireless system and improving reception. The size of matching circuitry and filters is often reduced by 40%.

IPD Component Library

Our foundry service includes fully characterized resistor, capacitor, inductor, filter and balun libraries, complete with full electrical models of all library components for packages such as QFN, FBGA, FLGA and eWLB. In addition to standard IPD library solutions, customized IPD designs are also available. Refer to the IPD Products Databook (2nd edition) for a comprehensive list of IPD products that can be integrated into RF SiP solutions.



Sample
Filter
Library

Process Highlights

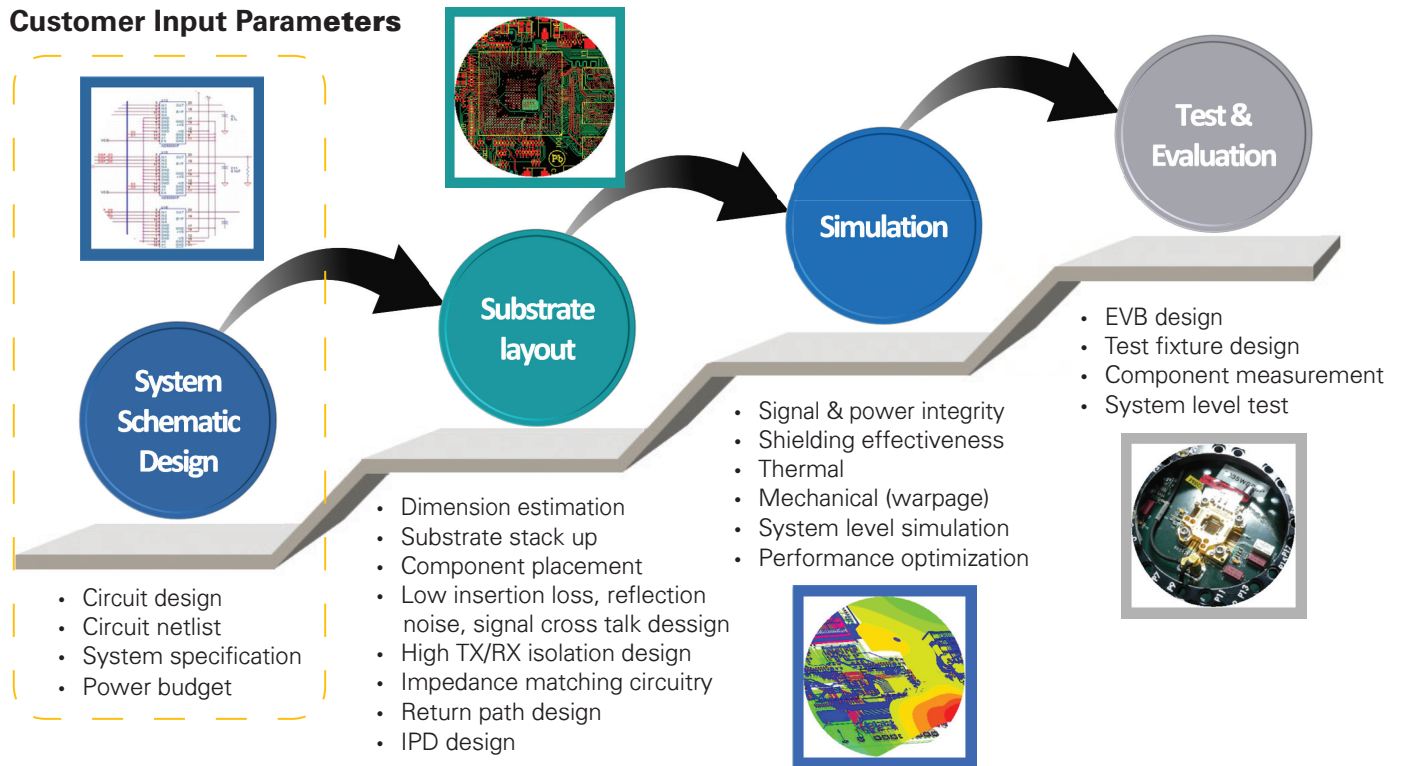
Die Thickness	250μm (nom)
Gold Wire	1.0mil
Marking	Laser Mark (black or white)
Packing options	JEDEC tray / tape and reel

Reliability

Moisture Sensitivity Level	JEDEC Level 1
Temperature Cycling	-65°C/150°C, 1000 cycles
Unbiased HAST (laminated package)	130°C/85% RH, 96 hrs
High Temperature Storage	150°C, 500 hrs
Pressure Cooker Test (WLCSP)	121°C 100%, RH, 2 atm, 168 hrs
Liquid Thermal Shock	-65°C/150°C, 500 cycles

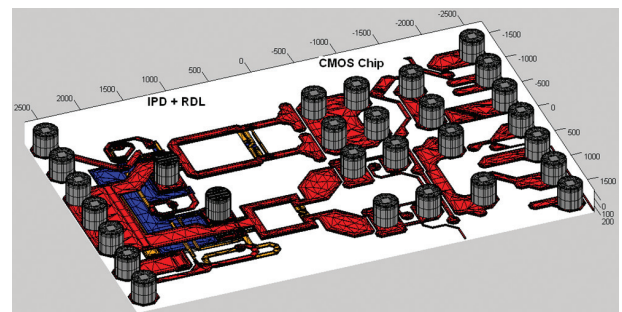
Design and Simulation Capabilities

Customer Input Parameters



Package Configurations

- **FBGA-SiP** - LFBGA packages with body sizes up to and including 15 x 15mm². Refer to our FBGA datasheet.
- **FLGA-SiP** - FLGA packages with body sizes up to 15 x 15mm². Refer to our FLGA datasheet.
- **WL CMSP** - SiP package with body size of 10 x 10 mm².
- **eWLB** - IPD integrated in eWLB package with body size of 6 x 6 mm² or less.
- **IPD** - Standalone IPDs (balun, diplexer, LPF, BPF, etc.) for RF applications. Refer to our IPD Product Databook (2nd ed.) for a complete product list.



Sample eWLB module containing a CMOS power amplifier chip (on the right) and an IPD chip (on the left). The IPD chip is used for matching and filtering functions. The interconnection between the CMOS chip and the IPD chip is made by RDL through the eWLB process.

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