Innovation in Design Service

John Zhuang
Sep. 2018
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Revolution in Business Model
### Paradigm Shift of the Semiconductor Industry
#### Before 1989 (Pre-PC ERA)

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<th>IDM (Integrated Device Manufacture)</th>
<th>System House</th>
</tr>
</thead>
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<tr>
<td><strong>IC Definition</strong>&lt;br&gt;Design Spec&lt;br&gt;IC Design&lt;br&gt;IC Fabrication&lt;br&gt;Package&lt;br&gt;Testing&lt;br&gt;Sales &amp; Support</td>
<td><strong>Apple</strong>&lt;br&gt;<strong>Burroughs</strong>&lt;br&gt;<strong>Cisco</strong>&lt;br&gt;<strong>Compaq</strong>&lt;br&gt;<strong>Control Data Corp.</strong>&lt;br&gt;<strong>Data General</strong>&lt;br&gt;<strong>Dell</strong>&lt;br&gt;<strong>Digital Equipment</strong>&lt;br&gt;<strong>Fujitsu</strong>&lt;br&gt;<strong>General Micro Electronics</strong>&lt;br&gt;<strong>Honeywell</strong>&lt;br&gt;<strong>HP</strong></td>
</tr>
<tr>
<td><strong>Fairchild Semiconductor</strong>&lt;br&gt;<strong>Fujitsu</strong>&lt;br&gt;<strong>Hitachi</strong>&lt;br&gt;<strong>IBM</strong>&lt;br&gt;<strong>Intel</strong>&lt;br&gt;<strong>Mitsubishi</strong>&lt;br&gt;<strong>Motorola</strong>&lt;br&gt;<strong>National Semiconductor</strong>&lt;br&gt;<strong>Oki</strong></td>
<td><strong>IBM</strong>&lt;br&gt;<strong>NCR</strong>&lt;br&gt;<strong>Panasonic</strong>&lt;br&gt;<strong>Philips</strong>&lt;br&gt;<strong>Prime</strong>&lt;br&gt;<strong>Siemens</strong>&lt;br&gt;<strong>Sony</strong>&lt;br&gt;<strong>Sperry</strong>&lt;br&gt;<strong>Toshiba</strong>&lt;br&gt;<strong>Univac</strong>&lt;br&gt;<strong>Wang Labs</strong></td>
</tr>
<tr>
<td><strong>Panasonic</strong>&lt;br&gt;<strong>Philips</strong>&lt;br&gt;<strong>RCA</strong>&lt;br&gt;<strong>Siemens Semiconductor</strong>&lt;br&gt;<strong>SJ Thompson</strong>&lt;br&gt;<strong>TI</strong>&lt;br&gt;<strong>Toshiba</strong>&lt;br&gt;<strong>Zilog</strong></td>
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</tbody>
</table>
Paradigm Shift of the Semiconductor Industry

1990-2000 PC ERA

Fabless Design House
- Altera
- Broadcom
- Conexant Systems
- Etron
- Marvell
- Media Tek
- NVIDIA
- QUALCOMM
- Sun Microelectronics

IC Design Service
- (Traditional)
  - CoAsia
  - Faraday
  - Global Unichip
  - Goya
  - PGC

Wafer Foundry
- TSMC
- UMC
- CSM (Chartered)
- SMIC
- Vanguard
- Dongbu Electronics

Packaging
- Amkor
- ASE
- Carsem
- ChipMOS
- ChipPAC
- Greatek
- OSE
- PowerTech
- SPIL
- UTAC

Testing
- Amkor
- ASE
- Carsem
- ChipMOS
- ChipPAC
- Greatek
- OSE
- PowerTech
- SPIL
- UTAC

Vertical Dis-integration

IDM
- AMD
- Fujitsu
- Hitachi
- Hyundai
- IBM
- Infineon
- Intel
- Matsushita
- Micron
- Mitsubishi
- Motorola
- National Semiconductor

System House
- Apple
- Cisco
- Compaq
- Dell
- Fujitsu
- HP
- IBM
- Panasonic
- Philips
- Siemens
- Sony
- Toshiba
Paradigm Shift of the Semiconductor Industry
2013~ New SoC / IoT ERA

System House

SoC Design Service
Design Foundry Virtual IDM

- System Spec
- Re-usable Soft IP
- Re-usable Silicon good Die
- IP Platform
- IoT platform & ECO-system
- Functional & Design Spec
- IP Integration
- Design Automation
- Chip Layout
- SIP / 2.5D IC / 3D IC Design
- DFM / DFT
- Extra Low Power

Vertical Virtual integration

Fabless Design House

- SIP / 2.5D IC / 3D IC
- Wafer Foundry
- Packaging
- Testing

IDM
IDM Fab-lite

DFM / 2.5D IC / 3D IC
SIP / 2.5D IC / 3D IC
DFT / 2.5D IC / 3D IC
First Fab-Lite, Then Design-Lite

- More and more SoC will rely on KGD/3DIC to achieve the needed upgrade than pure process advancement.
- Silicon IPs will exist both as soft-core and KGD.
- Most Fabless and System Co. can not afford the heavy investment for in house 3DIC capability, but turn to SoC Design Service Co. who possess the 3DIC capability for design support.
- Design Lite Era (for Fabless and System House) is now begin to become reality.
2

Trusted Eco-System
Advanced Design Service Supply Chain
Relationship with SMIC

Strong support from SMIC + LFoundry beyond Brite

- Price
- Capacity
- Cycle Time
- Yield & Quality Control
- Service & Supporting
- Assurance
Brite’s Offerings: Design Flows, IPs, Platforms
Who is Brite?

Design Service Company
Founded in 2008 with VC from Silicon valley

Major shareholder: SMIC

130+ Employees (80% are R&D)

>240 design wins in 6 years
Projects focus on the advance process node (<65nm)

We provide ASIC design services and ARM CPU, CEVA DSP and SNPS ARC based SoC platform.

www.britesemi.com
Total Solution: OEM+ODM

- Product Specification
- Architecture & RTL Design
- IP Selection & Integration
- IC Physical Design
- Wafer Fabrication
- Package and Assembly
- Test & Prod Engineering
- Prod & Logistics

SDK Development

www.britesemi.com
Brite’s Service Offerings

ASIC Turn-Key & SoC Services
- Spec/RTL/Netlist to Silicon, complete hardware service
- Porting/Shrinking from an existing product to a derivative product, from other FAB to SMIC

System Integration Services
- ARM Core based system integration
- CEVA/Cadence DSP Core based system integration
- Synopsys Core based system integration

Tape out & Manufacturing Services
- GDS in
- Mask in and production management

IP Procurement & Customization Services
- Internal development
- Partnership
- Customer Driven

As an important part of SMIC eco-system & a bridge to the China markets
- Platform development
- Design porting
- PDK QA & IP QA

www.britesemi.com
IC-ONE
An ecosystem for IP management, SOC design flow and big data application platforms

**IP management**
- Build, track, reuse IP

**IP reuse**
- Library setup file auto generation
- IP version control
- Supported IP reuse in SOC design

**Project management**
- Project registration
- Library info registration
- Project workflow management

**Smart plug-In for EDA**
- Knowledge tree

**Transparent visualization of project details**
- Data mining application in SOC design
- Data visualization

**Push button retrieval**
- Smart push button retrieve for project experience and smart reuse.

**PPA Evaluation**
- Base on spec. to evaluate PPA

**Advanced tech. solutions**
- Web application
- Support mySQL, sqLite database
- Platform architecture effectively supports sustainable development

**Benign ecosystem**
- The architecture design takes IP management, IP reuse and SOC design into consideration and forms closed cycle.
One Stop Operation Flow

CUSTOMER

Production / Shipping Instruction  Real Time WIP Report

Mass Production Management & Logistics Flow

Mask Tooling  Wafer Fabrication  Bumping (flip chip)  Wafer Probing  Assembly  Final Test  Packing & Drop Ship

Quality and Yield Management

Planning & PO  WIP Monitoring  Shipping & Delivery

Yield Improvement  Cost Reduction

SUPPLIERS
Brite New SiP Roadmap
Rich IP Availability

<table>
<thead>
<tr>
<th>Std Cell/Memory/IO</th>
<th>Memory Complier</th>
<th>Std. IO</th>
<th>SDIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell Library</td>
<td>0.18um-28nm</td>
<td>0.11um-28nm</td>
<td></td>
</tr>
<tr>
<td>0.35um-28nm</td>
<td>0.25um-28nm</td>
<td>0.13um-28nm</td>
<td></td>
</tr>
<tr>
<td>0.25um-90nm</td>
<td>0.25um-28nm</td>
<td>0.13um-40nm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fundamental IP</th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Regulator</td>
<td>DC/DC</td>
<td>Cap-less LDO</td>
<td>Power On Reset</td>
</tr>
<tr>
<td>0.18um-28nm</td>
<td>0.18um-55nm,95ULP</td>
<td>0.18um-28nm</td>
<td>0.18um-28nm</td>
</tr>
<tr>
<td>0.13um-40nm</td>
<td>0.13um-55nm,95ULP</td>
<td>0.13um-28nm</td>
<td>0.11um-40nm</td>
</tr>
<tr>
<td>0.11um-40nm,95nm ULP</td>
<td>55nm,95ULP</td>
<td>55nm,95ULP</td>
<td>0.11um-55nm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ADC/DAC</th>
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</thead>
<tbody>
<tr>
<td>SD ADC</td>
<td>SAR ADC</td>
<td>Audio/Video DAC</td>
<td>Baseband/</td>
</tr>
<tr>
<td>0.35-28nm</td>
<td>0.35-28nm</td>
<td>0.18um-28nm</td>
<td>WLAN AFE</td>
</tr>
<tr>
<td>0.18um-28nm</td>
<td>0.13um-28nm</td>
<td>0.18um-28nm</td>
<td>0.18um-65nm</td>
</tr>
<tr>
<td>55nm,40nm,95ULP</td>
<td>55ULP</td>
<td>0.13um-28nm</td>
<td>0.18um-65nm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HS Interface</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>USB3.0/OTG</td>
<td>USB2.0/OTG</td>
<td>DDR2/3/4</td>
<td>PCIe Gen 1</td>
</tr>
<tr>
<td>0.13um-28nm</td>
<td>0.13um-28nm</td>
<td>65nm-28nm</td>
<td>1/2/3/4</td>
</tr>
<tr>
<td>28nm HK</td>
<td>0.13um-28nm</td>
<td>65nm-28nm</td>
<td>65nm-28nm</td>
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<tr>
<td>65nm-28nm</td>
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<td>65nm-28nm</td>
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<td></td>
<td></td>
<td>0.13um-28nm</td>
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<thead>
<tr>
<th>CPU Solution</th>
<th></th>
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<tbody>
<tr>
<td>ARM Cortex A53</td>
<td>ARM Cortex A7</td>
<td>ARM Cortex A9</td>
<td>ARM Cortex</td>
</tr>
<tr>
<td>28nm PS 1.3GHz</td>
<td>40nm 1.1GHz</td>
<td>28nm</td>
<td>M0/M0+</td>
</tr>
<tr>
<td>40nm-28nm</td>
<td>0.13um EF</td>
<td>40nm-28nm</td>
<td>55nm</td>
</tr>
<tr>
<td>ARM Cortex A9</td>
<td></td>
<td>0.13um EF</td>
<td></td>
</tr>
<tr>
<td>0.13um-40nm,95ULP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEVA XM4 Quad Core</td>
<td>CEVA DSP Core</td>
<td>AXI/AHB/APB/Arbiter/Bridge</td>
<td>CEVA TL421</td>
</tr>
<tr>
<td>40nm-28nm</td>
<td>MM3101,X1643,TL420,etc.</td>
<td>0.18um-28nm</td>
<td>55nm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Digital Peripherals</th>
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<td></td>
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<table>
<thead>
<tr>
<th>Other third parties</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SMIC</td>
<td>The other third parties</td>
<td>Brite with customization service</td>
<td><a href="http://www.britesemi.com">www.britesemi.com</a></td>
</tr>
</tbody>
</table>
Brite YouIP family

- YouIP consists of 4 branches:
  - YouPHY
  - YouRF
  - YouSiP
  - YouAnalog

- YouSiP (silicon platform) includes:
  - YouSiP-Audio
  - YouSiP-Vision
  - YouSiP-AP
  - YouSiP-IoT
  - YouSiP-IoM

- Each platform is launched through silicon validated and product-like application proven
<table>
<thead>
<tr>
<th>IP type</th>
<th>IP name</th>
<th>Description</th>
<th>Bits</th>
<th>Speed (MSPS)</th>
<th>Speed (KSPS)</th>
<th>Frequency (MHz)</th>
<th>Data Rate (Mbps)</th>
<th>Power Sub (V)</th>
<th>Process</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADC</td>
<td>B40NLL_PIPADC_12B170M</td>
<td>12bit 170MSps Pipelined ADC</td>
<td>12</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
<td>1.1V</td>
<td>SMIC40</td>
<td>Silicon Proven</td>
</tr>
<tr>
<td></td>
<td>B28HK_SARADC_12B125M</td>
<td>12bit 125MSps High Speed SAR ADC</td>
<td>12</td>
<td>125</td>
<td></td>
<td></td>
<td></td>
<td>0.9V</td>
<td>SMIC28</td>
<td>Silicon Proven</td>
</tr>
<tr>
<td>DAC</td>
<td>B40NLL_DAC_10B300M4CH</td>
<td>10bit 300MSps 4-Channel Video DAC</td>
<td>10</td>
<td>300</td>
<td></td>
<td></td>
<td></td>
<td>3.3V/1.1V</td>
<td>SMIC40</td>
<td>Silicon Proven</td>
</tr>
<tr>
<td>AFE</td>
<td>B40NLL_TPAFE_12B200K</td>
<td>Driver and digitizer for 4-wire or 5-wire resistive Touch Panel integrating 12bit SAR ADC</td>
<td>12</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td>3.3V/1.1V</td>
<td>SMIC40</td>
<td>Mass Production</td>
</tr>
<tr>
<td>PLL</td>
<td>B55NLL_PLL_SSCG1P2G</td>
<td>Low Jitter Spread-Spectrum Clock Generator (SSCG)</td>
<td></td>
<td></td>
<td>VCO=200<del>1200 OUT=12.5</del>1200</td>
<td></td>
<td></td>
<td>1.2V</td>
<td>SMIC65/55</td>
<td>Mass Production</td>
</tr>
<tr>
<td>Audio Codec</td>
<td>B55NLL_AUDCODEC</td>
<td>Stereo ADC, Stereo DAC, Output Power Amplifier</td>
<td>ADC=16 DAC=24</td>
<td>8~96</td>
<td></td>
<td></td>
<td></td>
<td>3.3V/1.2V</td>
<td>SMIC65/55</td>
<td>Mass Production</td>
</tr>
<tr>
<td>LVDS TX</td>
<td>B40NLL_LVDS_TX1P05G</td>
<td>High speed LVDS transmitter used for digital flat panel display systems</td>
<td></td>
<td></td>
<td>25<del>150 @CLK=25</del>150 1050 @throughput</td>
<td></td>
<td></td>
<td>3.3V/1.2V</td>
<td>SMIC40</td>
<td>Mass Production</td>
</tr>
</tbody>
</table>
Brite provides a complete DDR subsystem including not only controller, PHY and IO, also corresponding tuning and configuration software.

YouPHY-DDR is developed on 130um to 28nm process respectively and support LPDDR2, DDR3, LPDDR3, DDR4 and LPDDR4 combo PHY with the data rate from 667Mbps to 2933Mbps.

With patented dynamic self-calibrating logic (DSCL) and dynamic adaptive bit calibration (DABC) technology, YouPHY-DDR can automatically compensate chip/package/board/memory PVT variation and bit-bit skew.
Brite provides USB2.0 OTG PHY which is a complete mixed-signal IP solution designed to implement OTG connectivity for a System-on-Chip (SoC) design.

The USB2.0 OTG PHY supports the USB2.0 480Mbps protocol and data rate, and is backward compatible with the USB 1.1 1.5Mbps and 12Mbps protocol and data rates.

This solution can be adapted from 130nm to 28nm process. It has been verified by a number of end products, especially suitable for the internet of things (IoT) applications.
YouPHY-Serdes provides 1.25-12.5Gbps multi-rate SERDES IP which is designed for smooth integration of multiple SERDES lanes offering best in class performance, area and power.

The programmable PHY supports major standards such as PCIe Gen 1/2/3, USB 3.0 / 3.1, XAUI, SATA Gen 1/2/3, CEI-11G-LR, 10GBase-KX4, JESD204B, SGMII/QSGMII, RAPID I/O, HSSTP (Trace Port), V-By-One, DisplayPort and HMC, based on advanced process as 40nm and 28nm.
Brite provides a complete Bluetooth Low Energy (BLE) analog PHY.

The RF is a high performance 2.4GHz ISM band wireless transceiver. It integrates high sensitivity receivers, 5G PLL and high efficiency power amplifier, which can support 1Mbps GFSK modulation and demodulation. And can be combined with the Bluetooth smart baseband and controller to form a complete Bluetooth Smart solution.

YouRF-BLE is developed on SMIC 55nm LL process, support 0.9V-4.3V supply voltage with on-chip Buck-Boost DC/DC converter and LDOs, Low power consumption: RX<10mW; TX<12mW@0dBm
YouSiP-Audio is developed based on the CEVA-TeakLite-4 DSP core and fabricated at SMIC’s 55nmLP process, running up to 500MHz.

The platform provides designers with a powerful means to add 'smart and connected' capabilities to these devices, including always-on sensing, local processing and intelligence connectivity. The platform also provides real-time power measurement that allows developers to improve power consumption of system by optimizing their DSP software effectively.

It provides a complete development and demo system integrating DSP and multiple peripherals& interfaces IP, and supports diverse wireless technologies including Bluetooth Smart and Smart Ready, Wi-Fi, ZigBee and GNSS. It can be adopted on mobile, wearable, wireless speaker, smart home, surveillance, automotive and so on.
YouSiP-Vision is an image signal processor (ISP) platform integrated with CEVA XM4, and some high speed interface IPs as MIPI, PCIe, LPDDR3 and USB which is developed based on SMIC 28nm, 40nm process.

It can support 3D vision including real-time 3D depth map generation and point cloud processing for 3D scanning, computational photography algorithms including refocus, background replacement, zoom, super-resolution, image stabilization, HDR, noise reduction and improved low-light capabilities, visual perception including deep learning, object detection, recognition & tracking, context aware, augmented reality(AR) and others.

This platform targets any camera-enabled devices such as smartphones, tablets, ADAS and infotainment, robotics, security and surveillance, AR/VR and drones.
YouSiP-IoT (Internet of Thing) is a comprehensive platform solution designed for emerging application as IoT based on SMIC 55nm low leakage (LL) and 95nm ultra low power (ULP) process.

This solution integrates ARM Cortex Mx series MCU and CEVA TeakLite or MM series DSP, involves WiFi, Bluetooth/BLE interfaces, can connect to a series of different sensors.

YouSiP-IoT platform can assist customer to reduce the processing delay time, enhance the data security, improve the data rate and reduce power consumption of their SoC design, which is adopted in battery power supply environment as smart home, IoT and wearable devices with excellent low power management.
YouSiP-AP (Application Processor) provides an ARM Cortex-A series core architecture based SoC platform prototype which has been verified on SMIC 28nm and 40nm process.

Complete development tool including ISP/ICP tools, development boards, reference code and programmer and peripheral IPs can be offered to customer, enabling customer to achieve SoC product with shorter time to market and higher one time delivery rate, and assisting them win the emerging market opportunities in the field of industrial control, home appliance, security, toys, mobile devices, etc.
YouSiP-IoM (Internet of Meter) is an innovative interconnection SoC solution with SMIC 40nm LL process for smart meters.

YouSiP-IoM based on ARM Cortex A7 and Cadence Tensilica LX6 DSP architecture. Multiply transmission interface IPs are integrated to support industrial level wire and wireless connection as PLC, IEEE 802.15.4g and WiFi which can bring intelligent and connection to smart water, electricity and gas meters.

Abundant peripheral interface containing NAND Flash, LPDDR1/2, SD/MMC, USB 2.0 OTG, UART, SPI, I2C and RTC enable designer to extend sensing function and smart measuring technology and adapt product on various emerging applications and systems.
Summary
A close partner of SMIC/L Foundry and JCET, a bridge for supply chain localization on China

Flexible business models and assist customer to shorter system to IC

Complete offerings in platform, IP, design, and manufacturing as a one-stop service.

High quality and on time delivery control

Summary
THANK YOU!

Email: sales_bs@britesemi.com

Tel.: +86 21 5037 6566