FleX™ Silicon-on-Polymer™: Flexible ICs from Commercial Foundry Processes

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Flexible Electronic Products and Services Provider

Corporate Headquarters – Boise, ID
- Engineering – Design, Process, Modeling
- FleX™ Silicon-on-Polymer™ mfg and assembly
- Test & Characterization Cleanroom
- Sales, Marketing, Administration

Process Engineering Center – Santa Clara, CA

Manufacturing – pilot SoP operations

Small Business
Privately Held
Founded November, 2001

Product Lines
- FleX – Silicon-on-Polymer™ (Flexible ICs)
- Design Services – Turnkey Design Solutions

ITAR Compliant

American Semiconductor Inc.

2007 Supplier of the Year

ITAR Compliant

DoME 45nm CMOS
This work is sponsored by the Air Force Research Laboratory
Pliable Sensor System (2012)

Pliable Smart Sensor System Applications

Fly-by-feel
Conformal Load Bearing Antenna

Flexible Substrate
Thin Film Battery
OLED
Flexible Chips
Polymer Solar Cell
Sensor Coating

Pliable Smart Sensor System

FleX IC

2013 “Flexible Hybrid Systems” (FHS)
(Flexible Hybrid Systems & CLAS – 2013FLEX 8.7)
Demonstrated Flexible CMOS (2012)

FleX: Transparently Thin Functional CMOS

Electrical Testing

Proof-of-Concept

Functional CMOS

Qualified Foundry Process

Proof-of-Concept

Electrical Testing

Functional CMOS

Process Qual

Production

Flexet Process

Functional Devices

Initial Production

Volume Production

Today (Feb 2012)

Orders of magnitude faster, at lower voltage!

Jazz CS18-FleX is the industry’s first commercially available flexible CMOS foundry process.

Characterization of CS18 in FleX is underway.

First wafers show excellent mechanical properties.

DC data pre- and post-FleX show no shift in transistor performance.

RF pre-FleX data collection completed with post-FleX evaluation underway.

Initial characterization data will provide a preliminary CS18-FleX PDK for prototyping.
FleX Option for Jazz CS18/13

- Jazz CS18/CS13 (180/130nm) SOI process is on-shore and ITAR capable
  - Partially depleted thin SOI process
  - Floating body & body contacted devices supported
  - 2fF/um² MIM Capacitor
  - Low and high value salicided poly resistors
  - Four Al metal levels with 3um thick top metal
- Process Design Kits available for both Silvaco and Cadence based EDA flows
- Design libraries and reusable IP are in development
- Regular multi-project wafer (MPW) wafer lots provide low cost options for manufacturing test chips, prototypes and key IP building blocks
2013: Commercial Flexible IC Capability

Flexible High-performance Single Crystalline CMOS

- Commercial foundry process for flexible IC’s (Industry First)
- Available today for ASIC prototypes (Industry First)
- Demonstrated system functionality (NASA RockSat June 2012)
Recent and Current FleX Programs

NASA RockSat (NNU & ASI)  
June 2012

CLAS Antenna (AFRL-RQSE) In-progress

picL Microprocessor (AFRL-RVSE) In-progress

Proprietary Images

Prototype Program  
Contacted  
Contactless  
Hybrid  
Plastic and Paper

Flexible Smart Card (ASI) In-progress

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Relevant Markets and Opportunities

Flexible Hybrid System
“Combination of flexible printed materials and flexible silicon-based ICs to create a new class of flexible electronics.”

Printed Electronics
Low Cost, R2R, Large Format

Smart Cards:
SIM/PIV/CIV
Identity
Finance
Contacted
Contactless

Consumer:
Tablets
Phones
eReader
Ultra-thin
Flexible

Flexible Flex ICs
High Performance, High Density

Fly-by-Feel:
Conformal
Structural
Antenna
Sensors
Ruggedness
Durability
THANK YOU

For more information:
www.americansemi.com

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