2013 IC Design Contest

Background:

The IC Design Contest is a collaboration between Silterra Malaysia, a leading Malaysian foundry, Chipus Microelectronics, a Brazilian analog IP design house, and the Ibero-American Science&Technology Consortium, ISTEC.

The goals of this contest are:

- For Silterra, as an ISTEC partner, to help foster research and innovation in Ibero-America
- To introduce Silterra as a foundry of choice for Latin-American IC designers
- To allow designers in the region to have their designs validated in silicon

Details:

➢ The contest will be open to university, R&D Institutes and R&D company departments, with access to EDA tools compatible with Silterra PDKs

➢ The designs to be based on Silterra's 0.18 micron technology

➢ Details about design categories will be disclosed soon

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2013 IC Design Contest

Details (cont.):

➢ Contest to run throughout 2013

➢ The best design in each category will be chosen by using a figure-of-merit (FOM) to be announced later

➢ Access to Silterra's PDKs/technology specs to be provided to the contestants

➢ The winner design in each category will be offered a free shuttle in a Silterra MPW for silicon verification

Preliminary information is provided at the contest website:

www.icdesigncontest.com

Further details on the IC design contest to be updated on the contest website.

SilTerra Overview

## SilTerra headquarters located at Kulim Hi-Tech Industrial Park, Malaysia

- Worldwide reachable Sales offices in the U.S. and Taiwan
- Business Partners in China, Japan, Korea & Europe

Production started in Q1 2001

- Top Fab of 2002 (Semiconductor International)
- ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007 and QC 080000 certified

Workforce Competency

- >1200 employees

Non Technical 17%
Technical 83%

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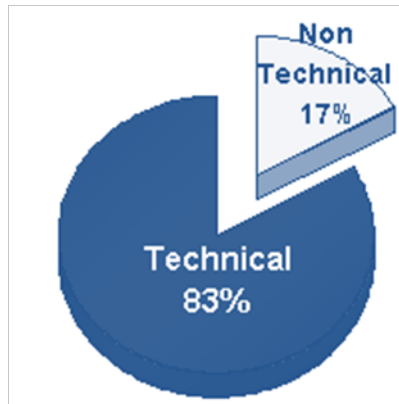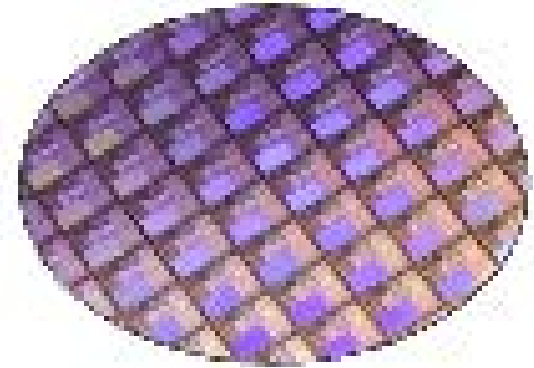
Our Core Business

Offer Foundry Solutions for Advanced CMOS & Specialty Technologies

- Leading foundry-matched logic technologies (T-like & U-like)

- Mixed-signal and RF technologies

- Leading-edge high voltage technologies

- Advanced Analog technologies (BCD, V-Tr FET)

- MEMS

- Non-Volatile Memory (OTP, MTP and eFlash)

" More Than Moore" Tech

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SilTerra's Focused Strategies

Provide Leading Foundry Matched Processes

– Logic, mixed signal and RF
– High voltage technologies for display drivers
– BCD/PowerMOS technologies for Smart Power IC
– Embedded NVM tech for consumer applications

Offer Specialized Technologies

- Custom processes to meet special requirements

Deliver World-class Manufacturing Performance

– First time proto success
– 6 Sigma QC program for continuous improvement in yield, cycle-time & cost reduction

Leverage IP and Design Network for Complete Design Solution

- Application driven IP strategy
- Best-in-class IP blocks

SilTerra Market Positioning

Focus in high volume & high growth market applications

Digital Consumer Chipset
Display Drivers
Wireless Connectivity
Wired / Networking chipsets
PC Connectivity
& Others

350nm   250nm   180nm   160nm   153nm   130nm   110nm   90nm   65nm

Silterra Positioning
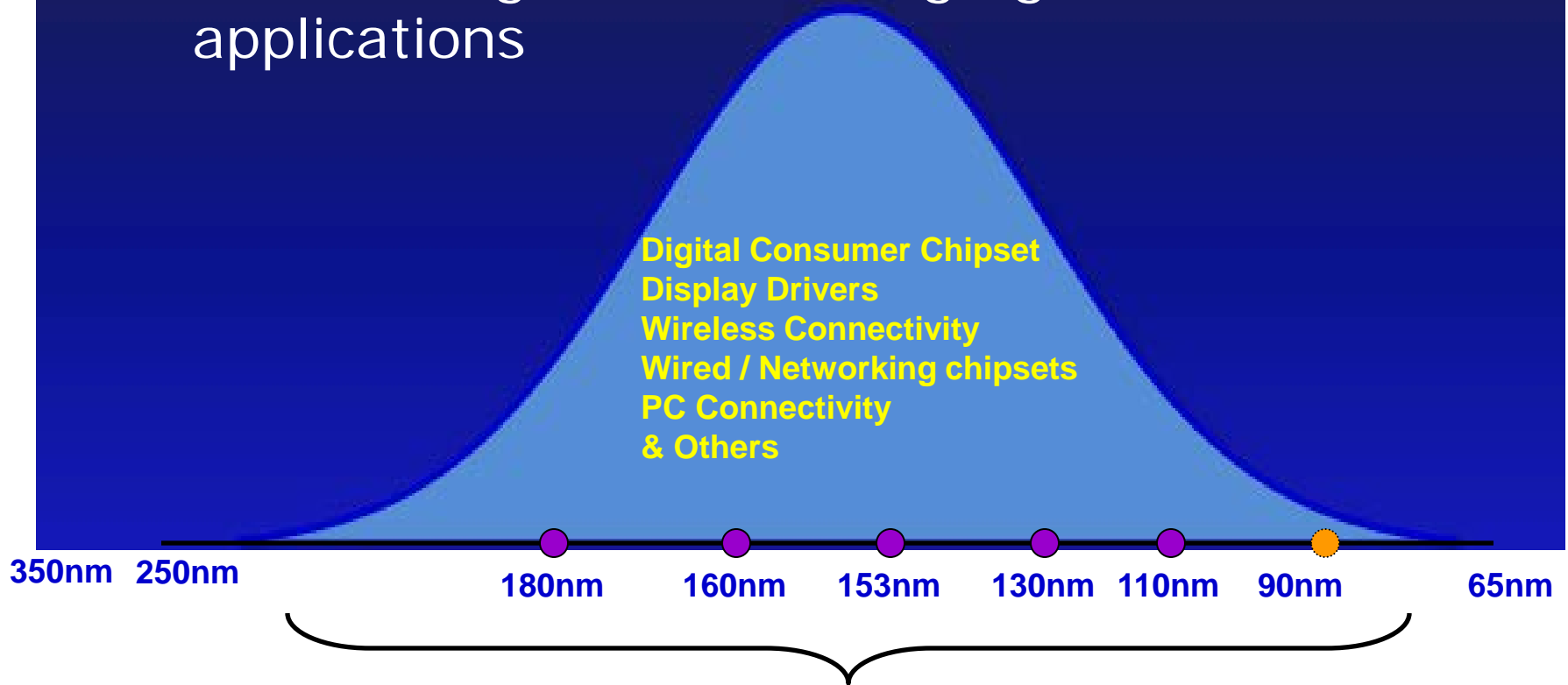
⬤ **Mass Production**

⬤ **In Development**

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Our Target Market

Wireless

Mobile TV Tuner

WLAN / GPS

RF Transceiver

Bluetooth Link

FM Tuner

GPS

Comms

Printer Fax Modem

Router (xDSL)

Switches

Home Gateway

USB Modem

Computing

PCIe-SATA Bridge

PCIe-USB Bridge

SSD Controller

ROM/RW Drive

PC Audio

Consumer

Display Driver

Touch Controller

DTV T-Con

SD Memory Controller

Digital Photo Frame

USB Flash Drive

MP3 / PMP

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Logic Technology Leadership

- Leading foundry compatible processes
- High volume production with stable yield
- Intercept sweet spots of target application segments
- Offer cost effective migration path (0.18μm to 0.11μm)
- Offer 130nm and 110nm Aluminum BEOL
- Provide high quality design kits
- Supply application optimized IP blocks

RF CMOS Technology Leadership

- Advanced RF CMOS technologies
  - High performance, low noise processes
  - Triple-well, high value resistors, thick metal inductors, finger and MiM caps
  - Stacked MiM Caps (4fF/μm^2)
  - Redistribution Layers
  - Offered 0.18, 0.16, 0.13μm & 0.11μm RFCMOS nodes
  - 0.13 & 0.11 RFCMOS AI BEOL in development

- Accurate analog models
  - MOSFET characterized to 20GHz
  - Support BSIM3, BSIM4 & PSP Models

- Comprehensive PDK

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High Voltage Technology Leadership

- Advanced processes optimized for display drivers
  - 0.22µm to 0.11µm
  - Extremely low leakage
  - Industry leading aggressive SRAM cells (25% smaller) for high resolution displays
  - Three HV modules available: 6V, 21V and 32V
- Industry first C13HV-1TSRAM in production
- Winner of 2009 Frost and Sullivan Industrial Technologies Award
- High volume production for top tier customers
- Customized design libraries
- OTP Macro & eFuse bitcell are available
- MTP and 90nm HV is in development

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POWER MOSFET Value Propositions

- 0.18μm Power MOSFET Technology

- Trench-type Gate electrode

- Low Rdson MOSFET devices (20V, 30V, 60V and 75V Vbd)

- Low mask count

- Superb yield and device performance

- Target for DC-DC Converter socket in Battery charger and Notebook

- Design Service supported

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180nm BCDMOS Value Propositions

- Integrated with 0.18um logic CMOS 1.8/5V with HV LDMOS (20V/24V/40V). 50V/60V in development

- Optimized for applications requiring high voltage CMOS with high digital gate counts with thick metal.

- Integrated with SilTerra 0.18um RFCMOS processing capability for complete power equipped wireless SoC.

- Skillful resurf technique allows wide range of breakdown voltage to be obtained thru layout optimization for HV transistors.

- TCAD calibrated for HV LDMOS allows Pre-defined HV LDMOS with various on-resistances optimized for BVDss and area.

- Analog and passive options (MiM, HRI, UTM, NPN/PNP, Zener, SBD) fasten the design.

- Cadence proven foundry design kit.

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Platform-Based IP Strategy

- Best-of-breed application focused IP portfolio
  - Analog blocks, high speed I/Os, processor cores, memories
  - Foundation design libraries
- Silicon proven IP blocks
  - Enable fast design cycles and first-time-success
- Extensive partnership network to provide IP and design support
  - Custom IP to meet specific design requirements
  - Fast turn-around time

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Complete Foundry Design Ecosystem

Foundry Design Kit (DR, Models etc)

Foundation IPs (Std Cell, SRAM,I/O)

Design IPs (CPU Core, Hi Speed Interface, Conversion IP, Embedded Memory, Analog IP)

Process Design Kit (Cadence, Mentor Synopsys)

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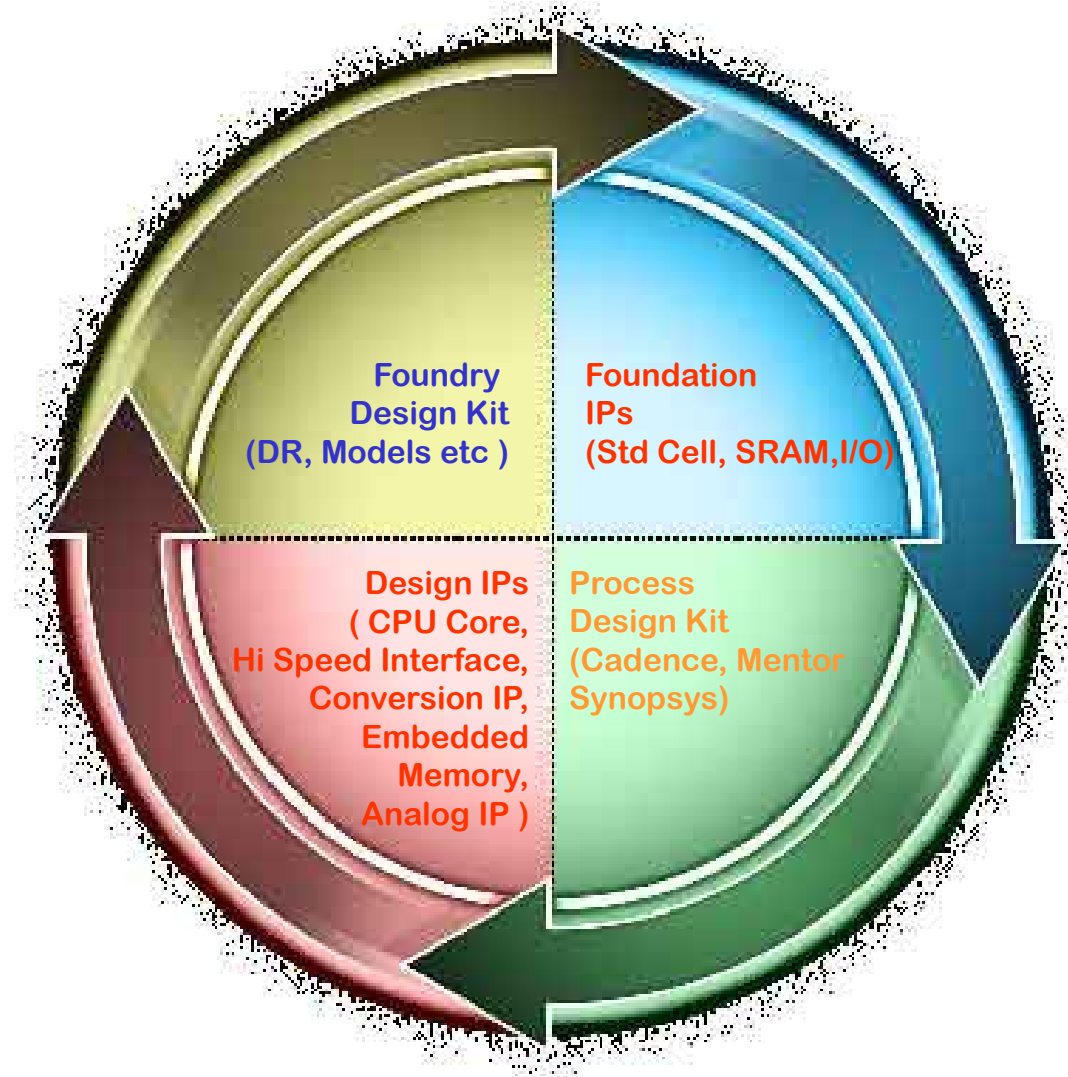
Enabling System on Chip

Pervasive SoC IP

Library Platform
- **Standard Cells**
- **Embedded Memory**
- **I/O Functionality**

High Speed Interfaces
- **DDR**
- **Serial PHYs**
  - **USB 2.0 PHY**
  - **SSTL1.8**
  - **LVDS**

Analog IP
- **Voltage regulator**
- **Bandgap Reference**
- **Analog MUX**

CPU
- **ARM7**
- **ARM9**
- **MIPS 4Kc**

Signal Data Conversion
- **Analog-Digital Converter**
- **Digital-Analog Converter**
- **Delay Locked Loop**
- **Phase Locked Loop**

Memory
DDR
Memory
ARM Core
Serial PHYs
Standard Cells
DSP
Memory
USB PHY
ADC
Regulator
I/O Cells

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Non-Volatile Memory Solutions

Partner	Tech	Applications

OTP — eMemory — All Logic / All HV — ROM Code, Fuse Trim, Gamma Control, Analog Matching

Resistor
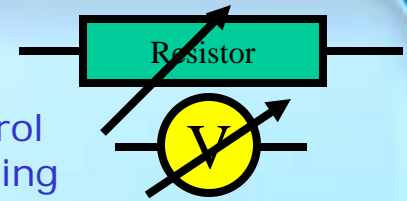
MTP — SYNOPSYS — C18G/C16G C13HV/C11HV — RFID, Touch Controller

eFlash — SST — C18G — Smart Card, MCU

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Design Solutions Partners
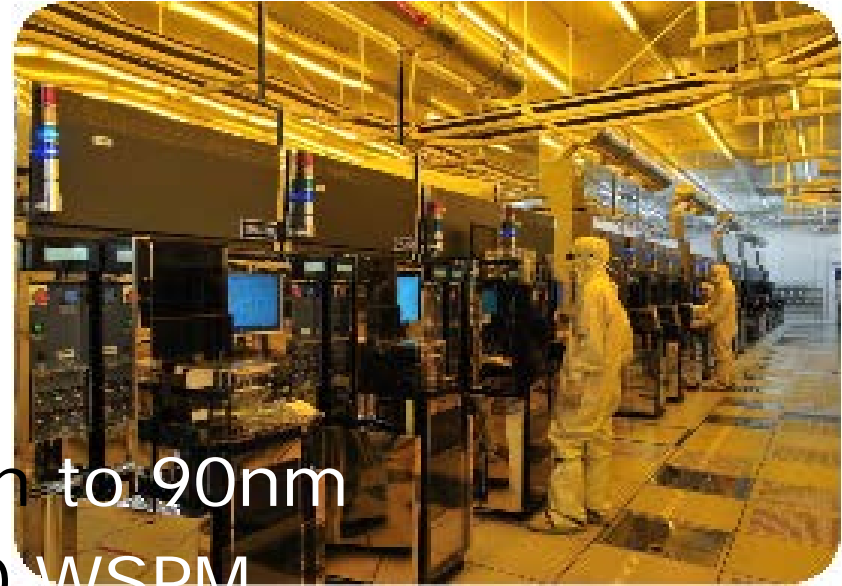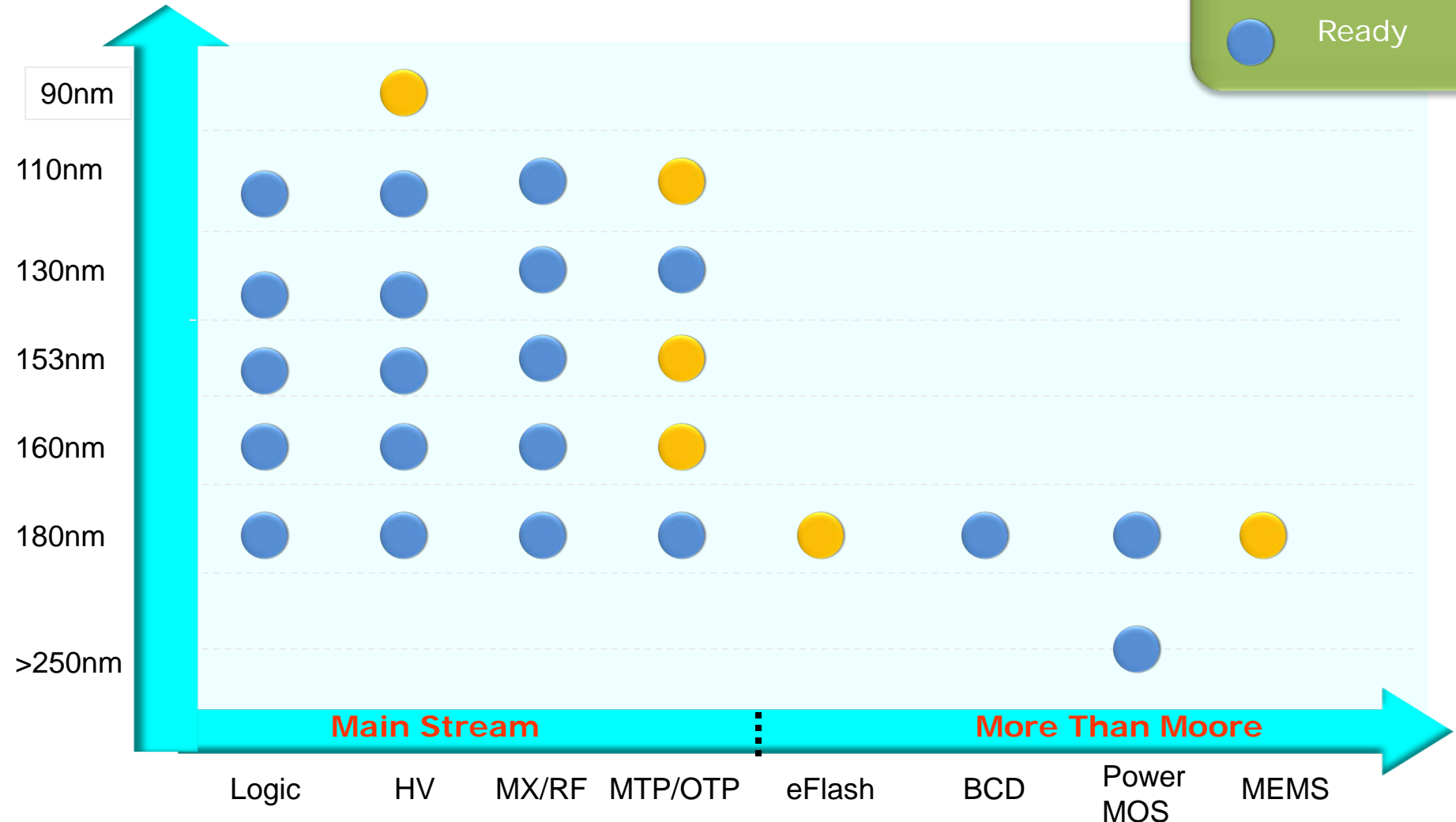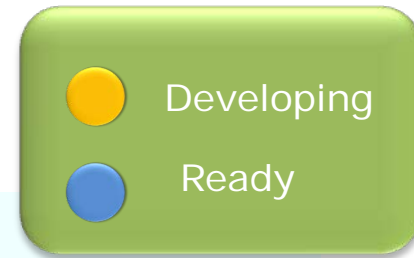
Fab 1 Overview

- Wafer size: 200mm
- Equipment is capable down to 90nm
- Designed capacity: 40,000 WSPM
  Installed capacity: 38,000 WSPM
- 100,000 feet² Class 100 clean room
  SMIF Class 1 mini-environments
- 100% ASML scanners (I-Line, DUV & ArF)
- ISO 9001:2008, ISO 14001:2004, OHSAS
  18001:2007 and QC 080000 certified

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High Voltage Technology Roadmap

Production	2012				2013			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Large Panel

CL200H18
3.3/18V

Mainstream HV Small Panel

CL160H21
1.8/5V/21V

CL180H5
1.8/3.3/5V

CL160H32X
1.8/3.3/5/32V

CL180H32
1.8/3.3/5/32V

CL160H32
1.8/3.3/5/32V

CL160H32
1.8/3.3/7/32V

CL110H32
+ MRAM
1.5/3.3/6/32V

Advanced HV Small Panel

CL130H32
1.5/3.3/6/32V

CL110H32
1.5/3.3/6/32V

CL130H32
1.5/3.3/6/32V
1TSRAM

CL130H32
1.5/3.3/6/32V
1TSRAM-X

CL090H32
1.2/3.3/6/32V

CL110H32
+ NVM
1.5/3.3/6/32V

CL080H32
1.2/3.3/6/32V

Note: Left edge of box is start of pilot production.

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Logic, LP & Mixed Signal Technology Roadmap

Production			2012				2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Logic / Mixed Signal

CL130U 1.2 / 3.3V	CL130G 1.2/2.5, 3.3V	CL110G 1.2/2.5, 3.3V
CL130LVT 1.2/2.5, 3.3V	CL130Mix VT 1.2/2.5, 3.3V	CL130HVT 1.2/2.5, 3.3V
CL180GH5 1.8/5.0V	CL160GH5 1.8/5.0V	CL180G5 1.8/5.0V
CL180G 1.8/3.3V	CL160G 1.8/3.3V	CL153G 1.8/3.3V
		CL110GH5 1.2/5.0V

2012 column entries:
- CL110U 1.2 / 3.3V (Q1 2012)
- CL110G5 1.2 / 5V
- CL130GH5 1.2 / 5V
- CL130G5 1.2 / 5V
- CL130AL 1.2 / 3.3V

2013 column entries:
- CL090G 1.0/1.8, 2.5, 3.3V
- CL110AL 1.2/ 3.3V

Low Power

CL180LP 1.8/3.3V	CL130LP 1.5/2.5, 3.3V

- CL090LP 1.2/1.8, 2.5, 3.3V (2013)

Note: Left edge of box is start of pilot production
CL130MixVT is the combination of C13G and C13HVT.

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"More Than Moore" Technology Roadmap

				2012				2013			
	Production			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Power MOSFET
- VTr MOS 20V, 30V
- VTr MOS 60V,70V,75V
- Schottky 45V, 60V
- VTr- MOS 50V or 100V

Power Mgmt
- CL180BCD 1.8/5/20V, 24V
- CL180BCD 1.8/5/40V
- CL180BCD 1.8/5/50V
- CL180BCD 1.8/5/60V

Non Volatile Memory
- One Time Programming
- Multiple-Time Programming
- CL180G eFlash

RFCMOS
- CL180MR 1.8/3.3V
- CL160MR 1.8/3.3V
- CL130MR 1.2/2.5,3.3V
- CL180LPMR 1.8/3.3V
- CL130LPMR 1.5/2.5, 3.3V
- CL110MR 1.2/2.5,3.3V
- CL130ALMR 1.2/3.3V

Note: Left edge of box is start of pilot production.

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Silicon Verification Vehicle

- Multi-project design and IP verification service

- Typical test chip size (5mm x 5mm)
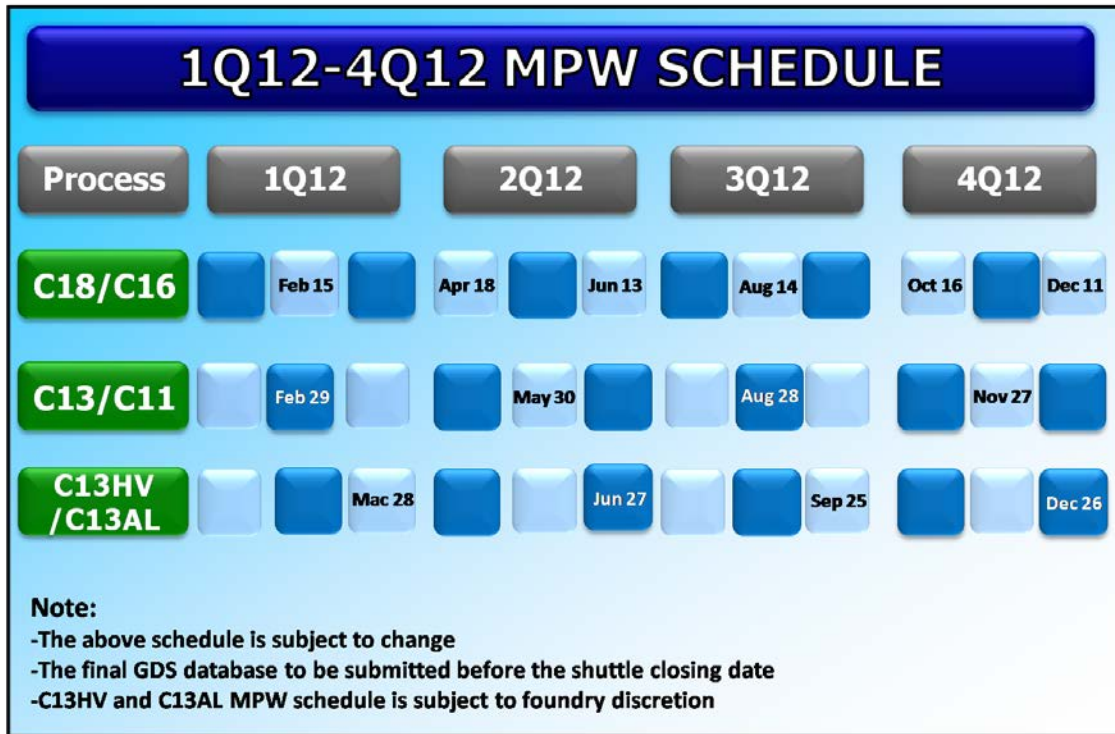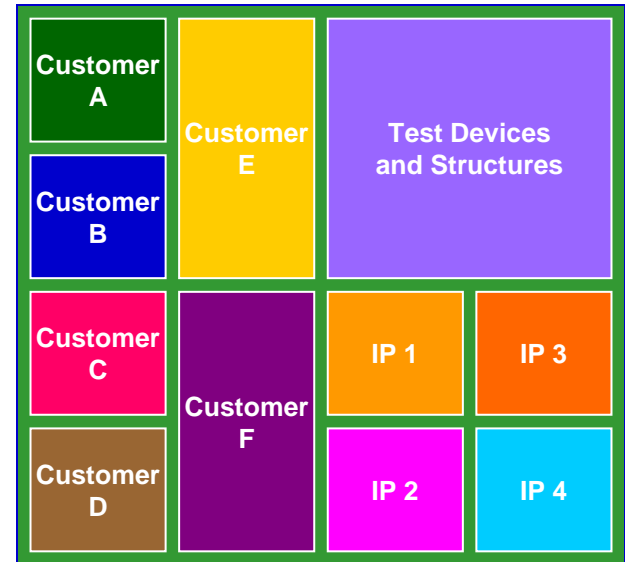
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Why SilTerra ?

- Proven Leading Foundry Matched Process
- Leader in HV CMOS Technology
- Complete Foundry Design Ecosystem
- First Time Proto Success
- High Yielding Wafers
- Cost Competitiveness
- Turnkey Service (Design to Backend)

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Contact Information

Corporate HQ
Kulim Hi-Tech Park
Malaysia
T: 604.401.5111

KL Office
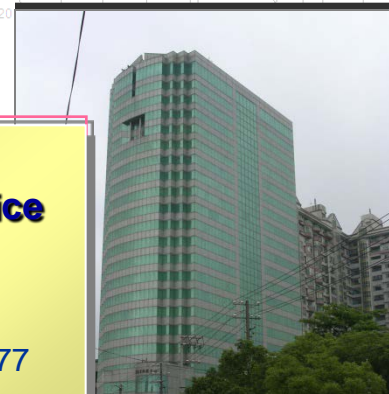Bandar Utama
Malaysia
T: 603.7726.6610

U.S. Office
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USA
T: 1.408.530.0888

Taiwan Office
HsinChu City
Taiwan
T: 886.3.516.5577

Corporate Location

Corporate headquarters and manufacturing facility are strategically located in KHTP, Malaysia.

Kulim High Tech Park

- 30km from Penang
- No typhoons and geologically stable
- Access to highly educated technical labor force
- Current tenants include Intel, First Solar, BASF Infineon, Celestica, Fuji Electric, Hoya, MEMC, Toyo Memory, Asyst, Novellus and others
- High quality infrastructure
  - Reliable power supply
  - Malaysian Cybercity status
  - High capacity fiber optic network
  - Abundant water supply from 3 dedicated reservoirs

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