ANALOG BITS
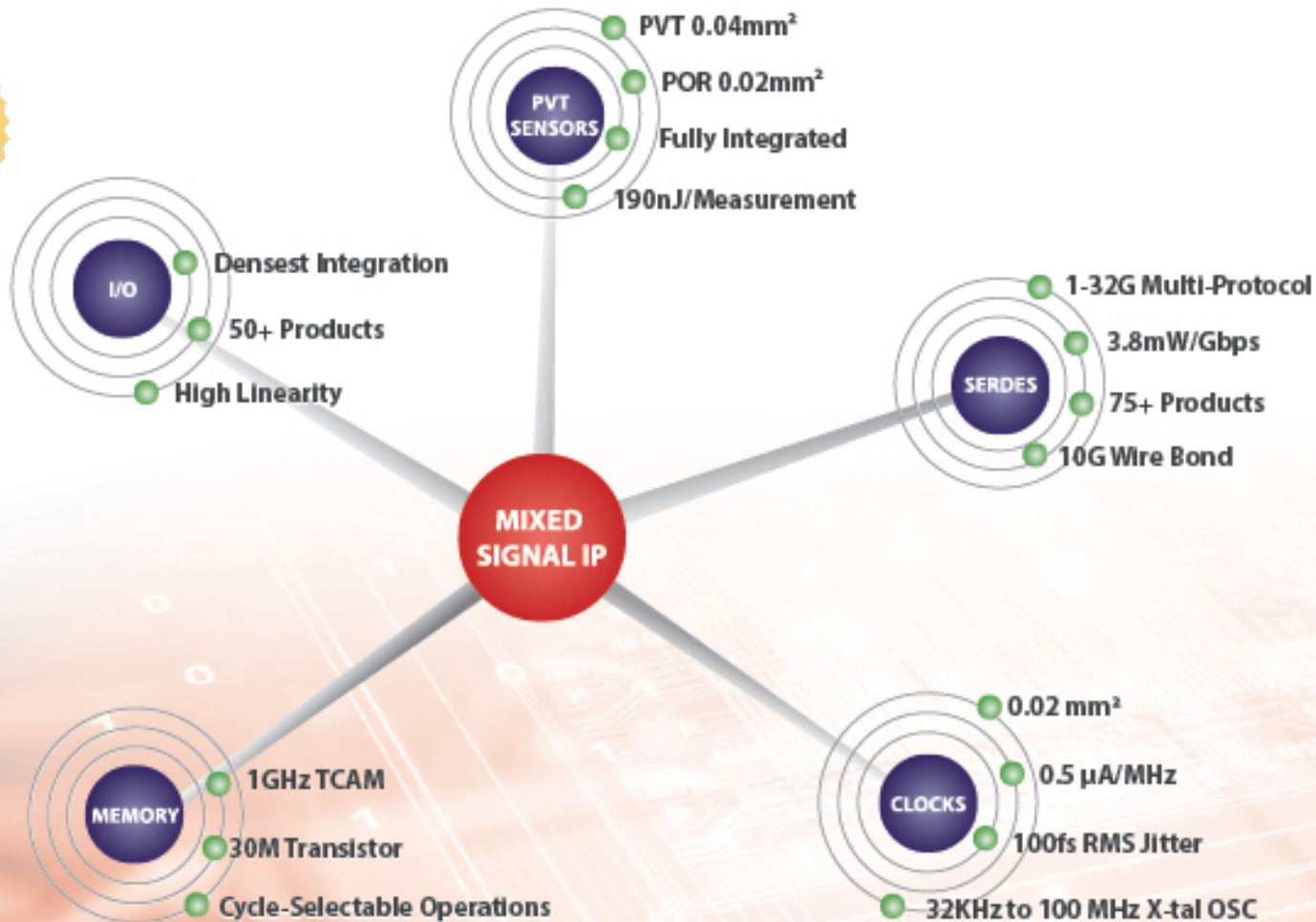
Broadest Portfolio of Low Power Differentiated IP

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7nm Working Silicon Design Kits Available

MIXED SIGNAL IP

PVT SENSORS
- PVT 0.04mm²
- POR 0.02mm²
- Fully Integrated
- 190nJ/Measurement

I/O
- Densest Integration
- 50+ Products
- High Linearity

SERDES
- 1-32G Multi-Protocol
- 3.8mW/Gbps
- 75+ Products
- 10G Wire Bond

MEMORY
- 1GHz TCAM
- 30M Transistor
- Cycle-Selectable Operations

CLOCKS
- 0.02 mm²
- 0.5 µA/MHz
- 100fs RMS Jitter
- 32KHz to 100 MHz X-tal OSC

Cut SERDES Power In Half
16/12 FinFET Production Silicon

75+ Processes	350+ Customers	800+ Products

Lowest System Cost

Greatest Reliability

Smartest Systems

Corporate Background

Heritage

Focused on differentiated low power mixed-signal IP
- Founded in 1995, based in the Silicon Valley
- Independent with no external funding

Track Record

World-class mixed signal CMOS engineering staff
- Extensive experience in advanced SoC designs
- IP in billions of silicon from $0.25\mu m$ to 5nm FF

Core Values

Premier IP partner from architecture to silicon
- Customer-centric business engagement
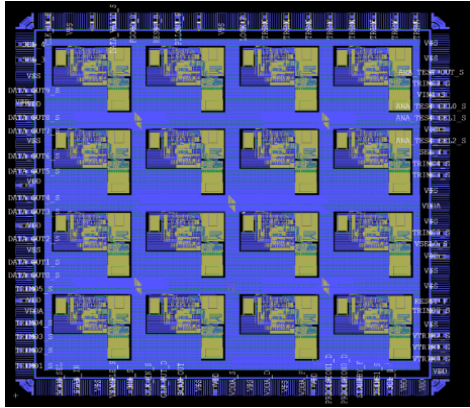- Engineering-centric support

Client Base

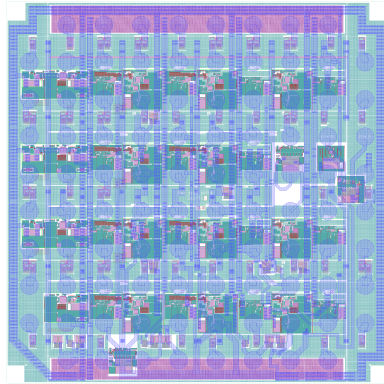Global customer base: 50% US, 50% international
- 500+ Customers in 70+ Processes

Unparalleled Power Performance

ANALOG BITS

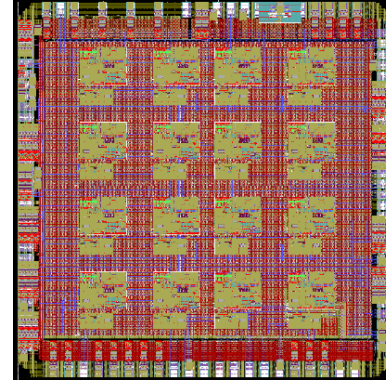# Advanced Technology Leadership in FinFet Proceses
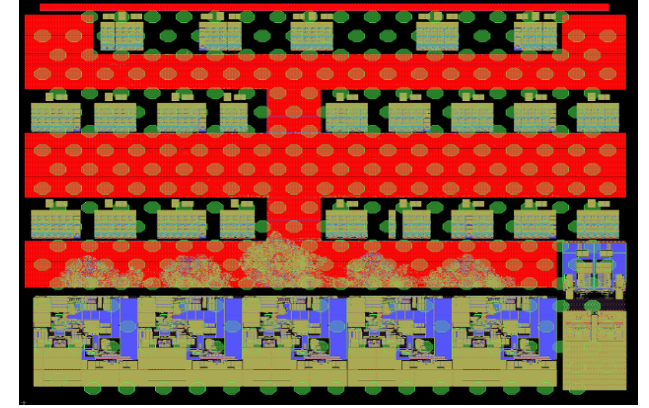
16/12/14nm IP Shipping in Production & Numerous 7nm Production Tape-outs

5nm Test Chip
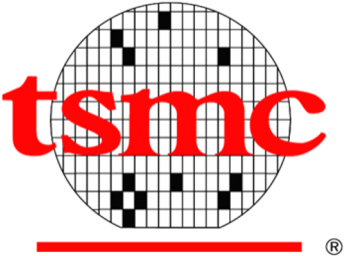

Automotive Grade 7FF Test Chip

Automotive Grade 16FFC Test Chip

8nm Multi-Lane PCIe Gen5 SERDES Test Chip

- Multiple products on 16nm/14nm in **Mass Production** for Smart Phones using PLL's, Sensors and IO's
- **Lowest power 4.3pj/bit** 1-15G SERDES on AI SoC on 16FF+
- 16FFC/14LPP **Production Silicon** - PLL and Sensor, IO, Serdes
- 16FFC **Automotive-grade** PLL, Sensor and Xtal OSC available
- 16FFC 1-25G Enterprise Class SERDES **shipping**
- 16FFC and 12FFC 1-10G Ultra low power SERDES **shipping**
- GF 12LP Taped-out with PLL, Sensor, POR and IO's – Q4-19

- Numerous **production FinFet tape-outs** at TSMC, Samsung, GF
- **7FF Automotive-grade** PLL, Sensor and IO's **Working Silicon**
- N6 Test-Chip Tape-out with PLL, Sensors, IO **Taped Out**
- Enterprise class 1-32G PCI Gen5 SERDES **Taped Out in 8nm**
- Ultra Low Power 1-16G Low Power SERDES **Taped Out in 7nm**
- Ultra Short Reach and Die to Die SERDES in development
- N5P Test-Chip Tape-out with PLL, Sensors, IO – Q1-2020
- N6 Test-chip with HP PLL, IO's – Q2-2020

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70+ Processes and 900+ IP Products Delivered

Merchant Fabs	Process Names, (Red in Production, Black pre-production)
tsmc	CL025, CL018G, CL018LV, CL018IMG, CL015G, CL015LV, CL013G, CL013LV CL013LVOD, CL011LV, CL011G, CLN90G, CLN90GT, CLN90LP, CLN80GC, CLN65LP, CLN65GP, CLN55GP, CLN40G, CLN40LP, CLN28HP, CLN28HPL, CLN28HPM, CLN28HPC, CLN28HPC+, CLN22ULL, CLN20SOC, 16FFT, 16FF+, 16FFC, 12FFC, N7, N7+, N6, N5, N5P
SAMSUNG	45LP, 32LP, 28LP, 28FDSOI, 14LPP, 8LPP, 7LPP, 5LPE
GLOBALFOUNDRIES	0.13u, CH90G, CH90LP, CH65G, CH65LP, CH65LPE, CH45LP, 40LP, 32LP, 28SLP, 22FDX, 14LPP, 12LP, 12LP+
UMC	L250, L180 HS, L150 HS, L130E HS, L130 SP, L130 LL, L90SP, L90G, 65SP, 65LL, 40LP, 28HPL, 22ULL

IDM Fabs

Low Cost Fabs

FUJITSU   TOSHIBA   Dongbu

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Analog Bits - Clocking and Sensor IP Portfolio

Clocking

- Wide-range, low power PLL- Integer, FracN/SSCG
- Ultra low jitter sub-picosecond LC PLL
- PCIe Clock PHY IP – eliminates Clock Chip, saves BOM
- High performance C2C PLL (20GHz)
- Digital Core Power PLL
- Ultra low power sub-micro watt IOT class PLL
- High reliability radiation tolerant PLL

Sensors

- Integrated On-Die PVT Sensor
- Power on Reset with Burn-Out Detection
- On-Die Power Supply Glitch Detector
- Digital Core Power Sensor
- Bandgap Generator
- System Power Detector

New Products introduced in 2019 and 2020

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Differentiated IO for High Performance & Low Power/Cost IoT Markets

- **Differential clock transmitter and receiver**

  - LVDS, CML, etc

- **PCI-Express - HCSL clock drivers**

- **C2C IO's**

- **Low noise and low power crystal oscillators**

- **Lowest Power Crystal-less OSC pads for IoT**

- **Voltage tolerant IO buffers**

- **DDR IO's**
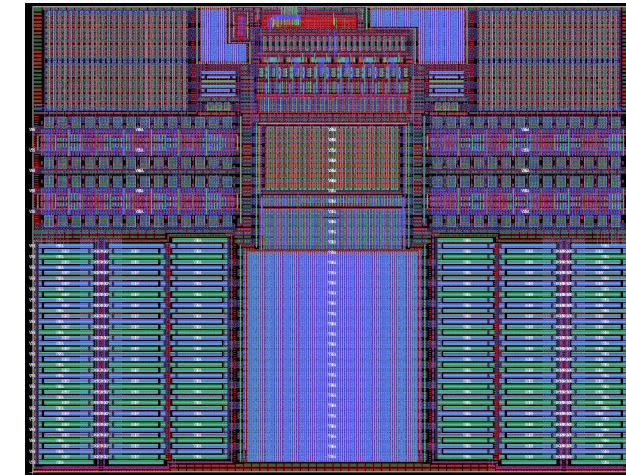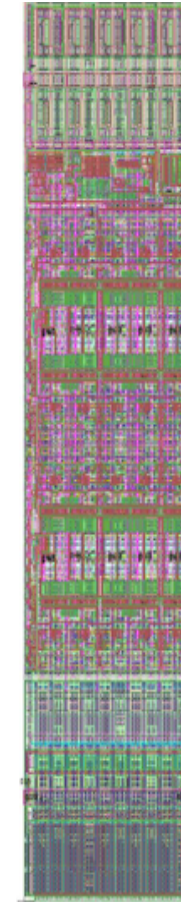
7nm Differential IO TX/RX
7nm CML Pads

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Portfolio of Analog Foundation IP Availability in FinFET

Foundation Analog IP	TSMC N5P	TSMC N7//N6	TSMC 16FFC	TSMC 12FFC	Samsung 14LPP	GF 14LPP/12LP
Integer PLL	Apr-2020	Available	Available	Available	Available	Available
FracN/SSCG PLL	May-2020	Available	Available	Available		Available
PCI Ref Clock PLL	Q2-2020	Q2-20	Available	Available		Available
20GHz C2C PLL	Apr-2020	Available				
Sensor	Apr-2020	Available	Available	Available	Available	Available
POR	Q2-2020	Q2-20	Available	Available		Available
Glitch Detector	Apr-2020	Available				
System Power Sensor	Q2-2020					
Bandgap	Q2-2020	Available				
OSC Pads	Apr-2020	Available	Available	Available		
Clock Buffers	Apr-2020	Available	Available	Available		

Production Silicon and/or Test Chip Proven IP's
New Products introduced

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8

Analog Bits Low-Power, Multi-Protocol SERDES

- **Multi-rate, multi-protocol SERDES**
  - Lowest power & latency
  - Smallest area
  - Programmable for numerous channel environments

Wearables

- **And enabling many SOC applications**

| FPGA | Consumer Cables | Mobile Computing | DataCenters & Communications | Flat Panel Display |

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PCIe Gen 4 and Gen5 Developments

- **Enterprise Class PCIe Gen5 SERDES**
  - 1-32G multiprotocol enterprise class PCIe Gen 4/5 SERDES
    - Area: $0.432mm^2$
    - Power: 7.5 pj/bit
    - Taped-out in October in Samsung 8nm
      - Expected Silicon in Q2

- **Low Power PCIe SERDES**
  - 1-16G multiprotocol low power PCIe Gen 4 SERDES
    - Area: $0.35mm^2$
    - Power: 6 pj/bit
  - 1-8G multiprotocol low power PCIe Gen 3 SERDES
    - Power: 4 pj/bit
  - Taped-out in December in Samsung 7nm

PCIe Gen5 SERDES

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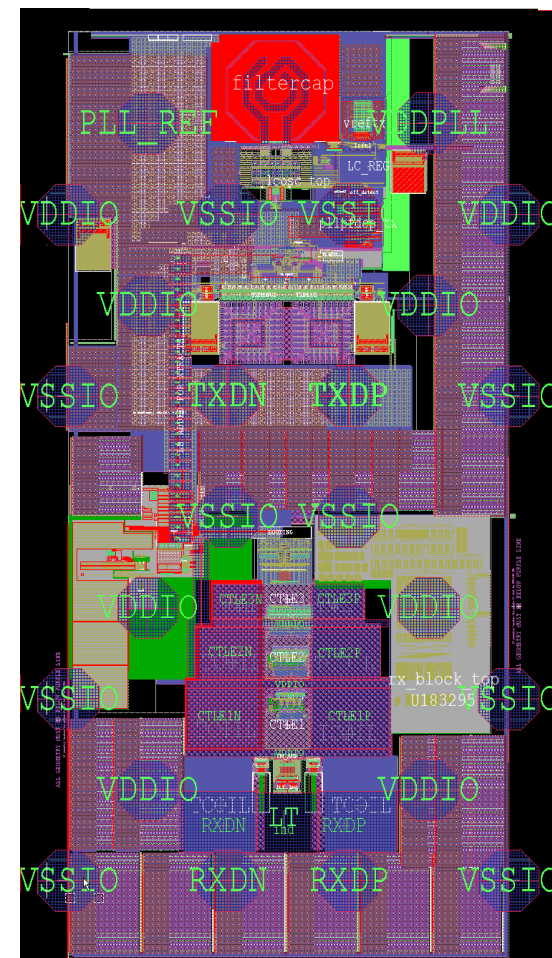
SERDES IP Availability
TSMC 16FFC, 12FFC, 7FF, Samsung 14LPP, 8FF, 7FF

Serdes IP	TSMC 16FFC	TSMC 12FFC	Samsung 14LPP
1-25G PCIe3/4, SAS3/4, SATA3 (Multiprotocol enterprise class)	Production Silicon		
Enterprise grade 1-16G PCIe3/4	Production Silicon		Production Silicon
1-8G Low power SERDES (PCIe 2/3 – consumer)	Production Silicon	Production Silicon	Production Silicon

Serdes IP	Samsung 8FF	Samsung 7FF/5FF	TSMC N5P
1-32G PCIe3/4/5, SAS3/4, SATA3 (Multiprotocol enterprise class)	Available		Upon Customer Program Request
Enterprise grade 1-16G PCIe3/4		Available	Upon Customer Program Request
1-8G low power SERDES (PCIe 2/3 – consumer)		Available	Upon Customer Program Request

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Why Analog Bits

Differentiated IP with broadest portfolio focused with best in class PPA

Excellent Reputation for best-in-class mixed signal designs in the Silicon Valley

Global Customer Base from 0.25µm to 5nm FinFET

Volume Business Friendly no royalty model

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