Why Heterogeneous SoC

And Blending of Wine

Makes Fine Products
### Milestones in Evolution of Vinification vs SoC Industry

<table>
<thead>
<tr>
<th>Milestones</th>
<th>Vinification</th>
<th>SoC Industry</th>
</tr>
</thead>
</table>
| Philosophy:         | Traditional: Old World  
                    | Modern: New World                      | Analog, Interface, RF  
                    |                               | Digital, Memory               |
| Integration of      | Controlled Fermentation                    | Moore’s Law                         |
| Science             |                                            |                                    |
| Industrialization   | Refrigeration                              | EDA/Foundry/IP                      |
| Downturn            | Phylloxera                                  | Global Recession                    |
| Disaggregation      | Vineyard -> Bottle 1 entity                | IDM-> Silicon                       |
|                     | Vineyard,WineMaker,Channel                 | Fabless, EDA/IP, Fabs               |
Cross Section of a Wine Grape vs SoC

Tanin is the Analog Mixed Signal IP
Pulp (Sugar) is Digital Logic

Unparalleled Power Performance
Sizes and Compositions of Wine Grapes in a Bottle vs SoC’s in a System

Red Wines By Grape Type

- **5.5**
  - **High Acidity**
  - **Red Wines**
    - **Zinfandel**
      - Big fruit of black & red berries with cherry, plum
    - **Pinot Noir**
      - Bold spicy, intense, peppery and jammy dark berry fruit
    - **Shiraz/Syrah**
      - Floral with delicate fruit of raspberries, strawberries and soft tannins

- **5**
  - **Low Acidity**
  - **Light Body**
    - **Malbec**
      - Intense smoky dark berry and earthiness
    - **Merlot**
      - Assertive aroma, currant, clove, chocolate
  - **Full Body**
    - **Cabernet Sauvignon**
      - Soft fruity flavours of red berry fruit
The FinFet Digital Terroir – Logic and Memory

- 100’s of Billions of Transistors
- Defined and prescribed methodology with EDA tools and endorsed by fabs
- Lots of engineers working on RTL
- Even more engineers working on verification
- Lots of EDA tools
- Huge compute and server farms
- Cloud-based computing
- Project managers for every block
The FinFet Analog Terroir – Analog and Interfaces

- Precision and patience
- Start everything from *physics* and *metal* – EM/IR/RC challenges
- Metal first design for high speed SERDES and Clocking
- Parasitic not just due to RC but due to gate resistance in FinFets
- Worry about layout topology and FinFet structures
- Leakage at 150C for automotive applications changes architecture
- Aging of transistors and flicker noise impact on performance
What Makes the Perfect Blend

Wine is all about balance, and winemakers look for the perfect balance between flavor components like sugar, acid, and tannin.

SOC is about Perfect Amalgamation of Analog and Digital
Wine Blending vs Heterogeneous
Broadest Portfolio of Low Power Differentiated IP

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

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
- 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 0.25µm 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
Analog Engineer and Wine Maker – The Eternal Artists

Thinks *electrons* all day - uses paper and pens and scientific calculator (1+1 is never 2)
Imagines and challenge to solve problems in projects and fights to succeed
Loves physics, geek talks and labs
Circuit Sims, layout checks, EM/IR, IBIS/AMI
Checks every result carefully with relentless patience and decides with 1000’s data points

Thinks *brix* all day – Soil, Fermentation, Barrels, Bubbling. 1+1 is never 2
Imagination to take a grape to wine and later realize it in winery relentless
Loves chemistry, microbiology and labs
pH, titration, sugar by refractometer, YAN analysis, malic acid
1000’s of decisions

*If your circuit has a mistake you own it and fix it*

*If your bottle is a mistake you own it and deal with it*