

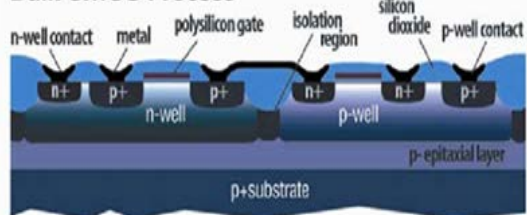
UltraCMOS®

The Microwave Technology for
Integration

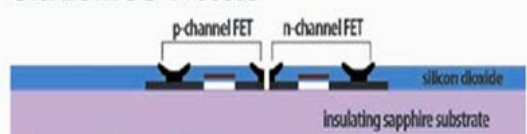


UltraCMOS® Technology Advantages

Bulk CMOS Process

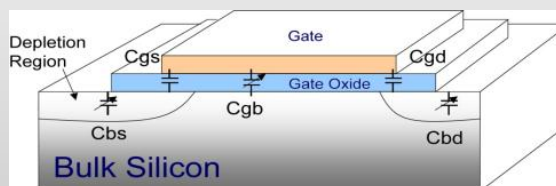


UltraCMOS™ Process



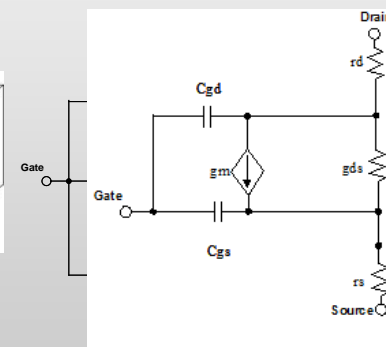
- UltraCMOS®**
- Insulating substrate
 - CMOS Digital, Analog, RF
 - Logic functions
 - High yielding
 - High ESD rating
 - Processed in multiple fabs

UltraCMOS® Linearity

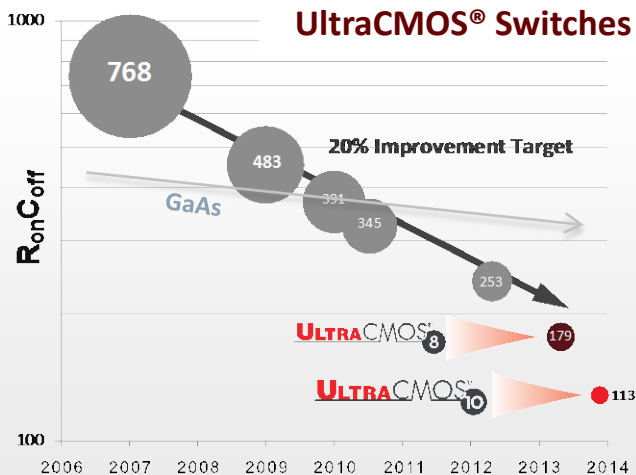


**Results in High Linearity
Microwave blocks**

Standard CMOS

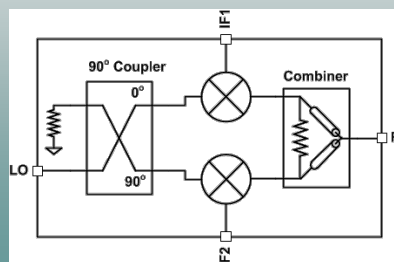


The small signal model is simplified with the removal of the shaded elements associated with the bulk node.



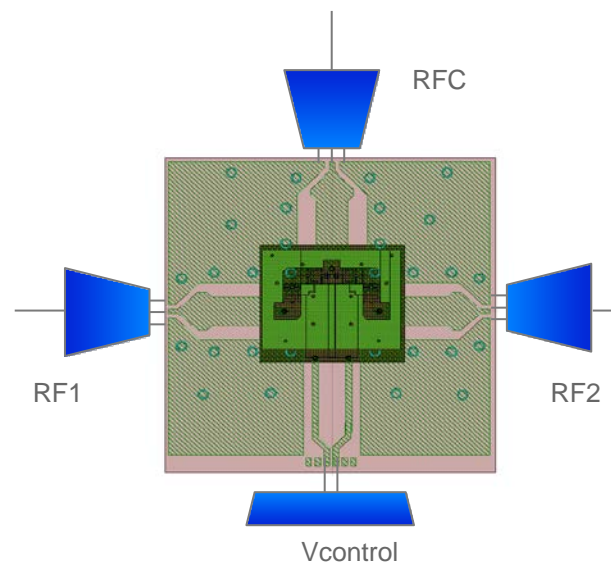
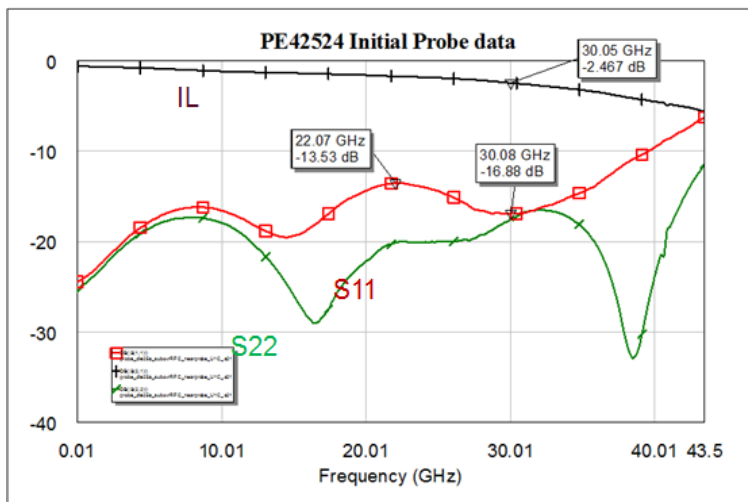
UltraCMOS® Integration

	Substrate Thickness	Frequency	Loss Tangent	Q ₀
Alumina 96%	0.126mm	19.3GHz	1.2x10 ⁻³	5,700
Sapphire	0.150mm	19.9GHz	1.4x10 ⁻⁴	7,420

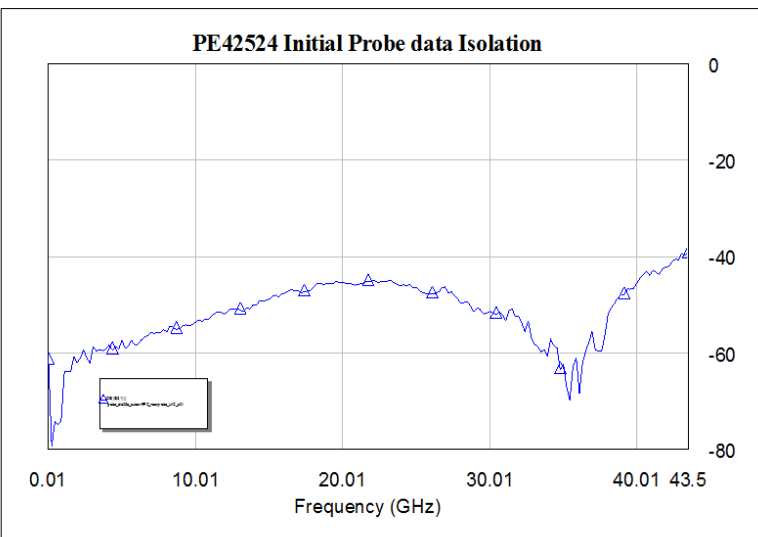


- High Q insulating substrate
- Allows RF Integration
- High Q passives (L/C)
- Lange Couplers
- Wilkinson Combiners
- RF Hybrids

40 GHz High Isolation Switch

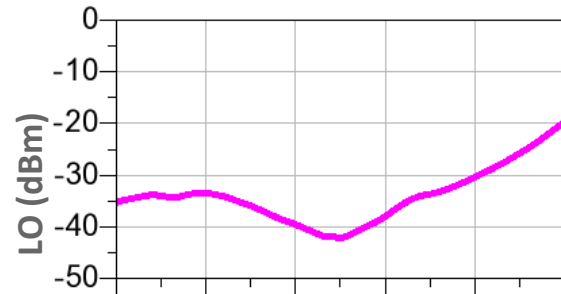
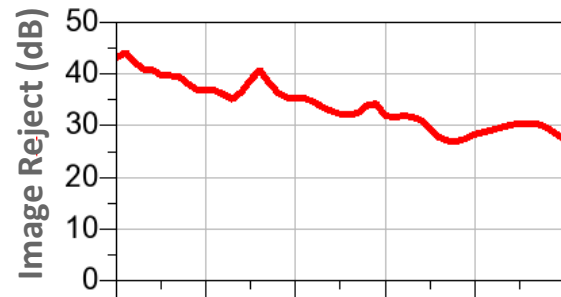
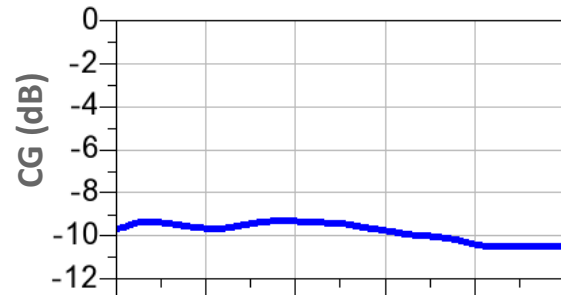
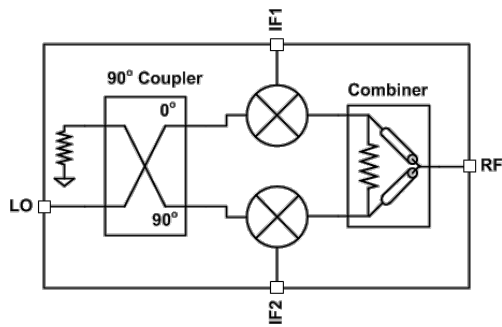


3 port data measured on 4 port VNA



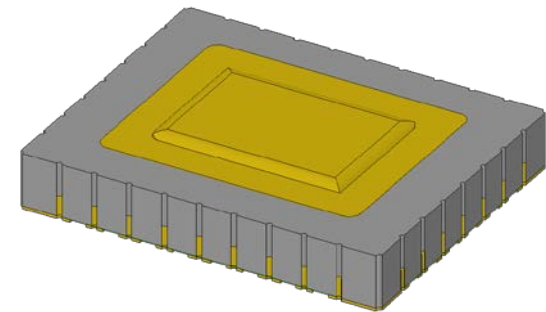
- 2.5dB IL at 30GHz
- >45dB Isolation all the way up to 40GHz!
- IIP3 50dBm (10GHz)

12-18GHz Mixer – MMIC Approach



LO Frequency (GHz)

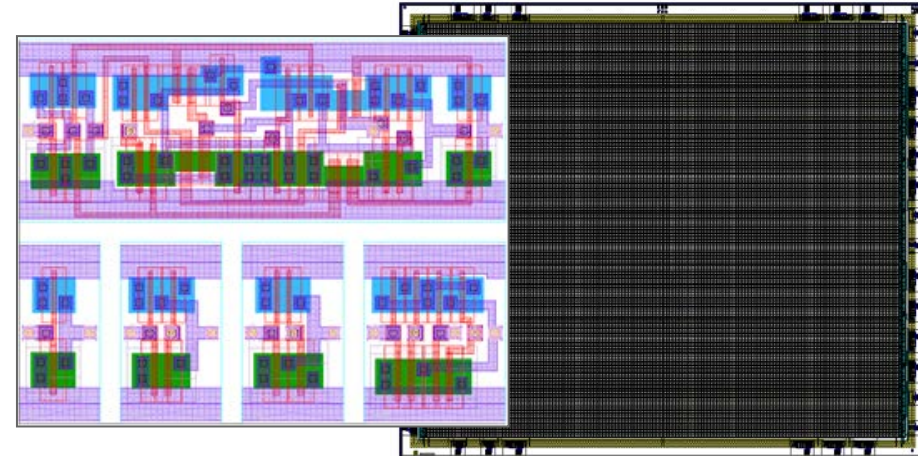
- **Single Die**
- **High Q Substrate**
 - **Integrated Lange Coupler**
 - **Integrated RF Combiner**
- **Frequency Range: 12-18GHz**
- **Double balanced**
- **IIP3 +21dBm (IF Port)**
- **Conversion loss 10dB**
- **Noise Figure 10dB**
- **ESD 1000V (Class 1C)**



RF Calibration & Control

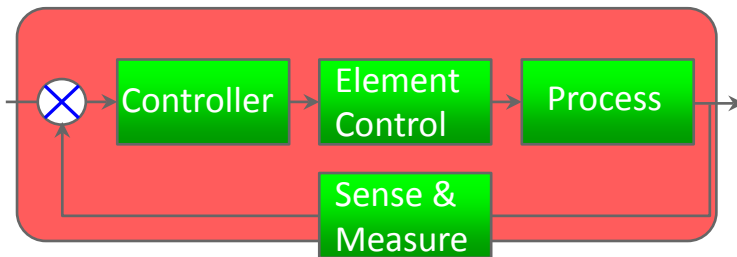
UltraCMOS[®] supports high-performance RF control and calibration loops

- Digital Cell Library: RTL to GDS
- >200 standard cells & I/O
- 20kGates/mm²
 - 1GHz Max freq - Complex DFF



- Complex control loops can be fully integrated using digital, analog, and mixed-signal capability of UltraCMOS[®] technology

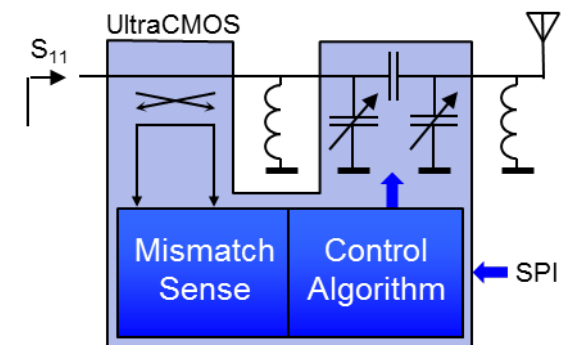
UltraCMOS[®] Supports Full Integration



Integration Examples

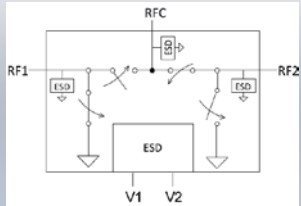
Antenna Impedance Matching

- Integrated RF sense & control
- Leverages high Q passives
- Serial control interface

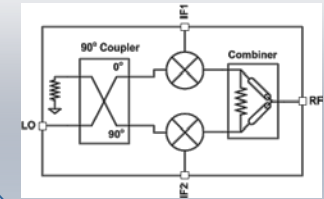


UltraCMOS® - enabling Microwave Integration

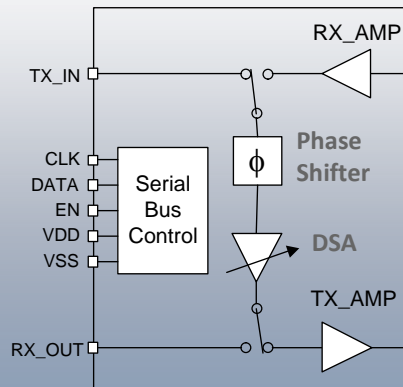
Microwave Performance



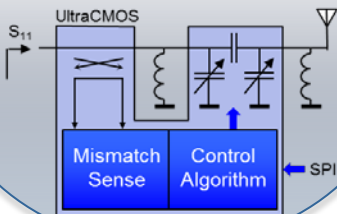
MMIC Techniques



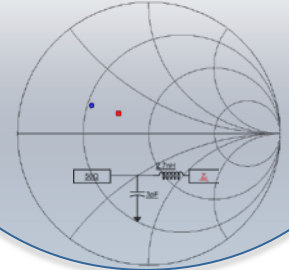
Single Die Solutions



Control Logic Calibration



Multi-band/ Multi-mode tuning



Thank You



NASDAQ: PSMI
psemi.com