Process Technology Options for RF and Microwave

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Analog Devices
# ADI RF / Microwave Process Strategy

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<th>Process</th>
<th>Key Strengths</th>
<th>Key Applications</th>
<th>Outlook</th>
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<tr>
<td>RF CMOS</td>
<td>Very low cost digital, High Ft @ 65nm and below</td>
<td>SoCs with high digital content</td>
<td>Expanding up in frequency</td>
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<tr>
<td>XF4C SiGe</td>
<td>Higher Ft, SOI, High-performance PNP &amp; NPN, 0.18u RFCMOS</td>
<td>High Performance, Medium Integration</td>
<td>Growing, replacing GaAs across signal chain</td>
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<tr>
<td>GaAs</td>
<td>High Power, Low Noise</td>
<td>LNAs, PAs</td>
<td>Declining</td>
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<tr>
<td>GaN</td>
<td>Wideband Power</td>
<td>Wideband PAs</td>
<td>Has potential if costs come down</td>
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XF3C/4C SiGe BiCMOS Process Features:

- **Dual Thick Metals**
  - High Q inductors and baluns

- **High Quality MiM cap and TF resistors**

- **Complementary Bipolars (PNP & NPN)**
  - 5V/44GHz to 2.2V/120GHz BV/Ft options

- **Deep Trench Isolation**
  - Eliminates substrate feed-through on integrated products
  - Fully isolated CMOS switch

- **Low Loss SOI Substrate**
  - Good for RF BW, Low passive losses
Unique Advantage from ADI SiGe BiCMOS on SOI

- NPN provides very high OIP3 RF Modulator with Low Noise
- High-Q Inductor provides MC-GSM VCO Phase Noise
- Trench MOS Switch for Wideband High OIP3 VVA
- High Speed NPN provides low NF LNA
- High breakdown NPN provides for high P1dB RF Driver
- Complimentary NPN/PNP provides high OIP3 IF VGA
- 0.18um CMOS provides for PLL/DAC/ADC cores

XF3C/4C has a unique set of advanced devices optimized for Highly Integrated, High Performance RFIC’s
VCO Phase Noise: SiGe Vs. GaAs

VCO on GaAs HBT
15% Tuning range

VCO on XF3C SiGe BiCMOS
30% Tuning range

-116dBc/Hz @ 100kHz

-113dBc/Hz @ 100kHz
24GHz Radar Sensor Evolution

- **Current Generation**
  - RF Discrete
  - GaAs + Silicon BJT

- **Next Generation**
  - RF Integrated MMICs on SiGe BiCMOS
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