Analog, Mixed-Signal & RF

Advanced technologies to serve and support your most demanding projects

Analog, Mixed-Signal & RF
Intellectual Property Solutions
### ADC speeds from 25MHz to 25 GHz, with resolutions from 6 to 12 bits.

Alphacore’s ADCs are verified designs using popular contemporary technologies. Each design is optimized for lowest power dissipation while achieving the highest performance and resolutions for single and multi-channel applications including in some cases radiation tolerant functionality.

Alphacore’s rad hard high-speed analog and mixed-signal ICs are designed with a distinct focus on Space & Defense, Telecommunications, Test Equipment and Scientific Experiment applications. Our analog IC products provide state-of-the-art performance to meet all of your design needs.

### High Sample Rate ADC Solutions

Alphacore has designed an interpolated flash ADC architecture ideally suited for reconfigurable phased array applications. The ADC specifications are:

- **End goal is 8b, 40GS/s, 20GHz, 500mW interpolated flash ADC**
- **28nm CMOS SOI technology**
- **Radiation hard up to 500krad(Si) and SEL immune**
- **Power dissipation <500mW**
- **First test chip containing the analog front-end and calibration circuit taped out in 2016**

Our team has the expertise to provide ADC designs in cutting-edge analog and mixed-signal technologies, resulting in more efficient use of board space, power, and more dependable delivery schedules and budgets for your designs.

### Spectrometer with RFI Mitigation Back-End

Alphacore’s low power RFI mitigating receiver backend ASIC for broad band microwave radiometers is ideally suited for Space missions. RFI can be effectively mitigated for space-based sensitive L-band sensing instruments with a filter-bank that has user-configurable coefficients. This rad hard ASIC, with novel ADC design, offers a low power, low mass, low data rate and higher reliability RFI mitigating backend with maximum power dissipation well under half a Watt.

**Receiver Backend ASIC Specification includes:**

- ADC with 12b / 3GS/s with polyphase filter bank, and DSP
- Max combined power dissipation of 250mW
- Rad hard up to 500krad(Si) and SEL immune
- Eliminates exponentially increasing RFI from terrestrial and space-borne sources
- Chip containing the ADC analog front-end and calibration circuit taped out 2016

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Specific Analog, Mixed-Signal & RF products, company capabilities and services are detailed at [www.alphacoreinc.com](http://www.alphacoreinc.com)
Alphacore’s Engineering team provides advanced, cost-effective solutions for mixed-signal IC design, implementation, and system packaging. We partner with manufacturers and trusted sources to deliver total solutions which can save time-to-market for government, commercial, and consumer product customers with complete products or licensable ready-to-go IP.

**Optimized Power and Performance**

**Phase-Locked Loops (PLL)**
Such as a 25GHz frequency, 20% tuning range and 150fs jitter; and 12GHz frequency, 60% tuning range and 400fs jitter.

**Interface IPs**
Such as a High-speed I/O transceiver with 28Gb/s data rate and 18mW power consumption in 28nm CMOS; and a High-speed I/O transceiver with 16Gb/s data rate and 16mW power consumption in 65nm CMOS.

**Readout Integrated Circuit (ROIC)**
Such as a 16-channel CSA+ ADC combination, 10-bits, 50 MSPS, ENOB = 9.3, 8m W per channel, and an optional 5-bit PGA front end.

**High-speed CMOS Image Sensor**
Such as 10,000 pixels, a pixel size of 20um x 20um, global shutter, minimum integration time of 500ns, readout speed of 10k-100k frames/sec, ADC resolution of 10 bits.

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**Why Choose Alphacore Analog & Mixed-Signal ICs?**

- Optimized Performance & Power
- Noise Reduction
- Efficient Board Space Usage
- Characterized to Design Spec’s
- Improved Reliability
- IP Licensing and Technical support
- Long Product Life Cycle
- Lower Cost

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**Advanced Analog and Mixed-Signal Products**

- High Dynamic Range ADCs
- Detector Array & Readout Cores
- Digitizer & Sensor Solutions
- High Efficiency DC-DC Converters
- Analog-to-Information Processors
- Analog & RF IP Cores
- PLL & Interface IP Cores
Rad-Hard Smart Digital Readout Detector Circuits

We specialize in building-block solutions for multi-channel readout preamplifiers including shapers with novel high sample rate ADCs.

- 6b, 25GSPS, 25GHz, <750mW ADC
- Also available as 4b, 25GSPS, 25GHz, 500mW flash ADC with 12.5GHz I/Os (optimized for interfacing to an FPGA)
- Designed in 28nm CMOS SOI
- Radiation-hard up to 500krad(Si) and SEL immune

These ultra-fast detector designs deliver significant performance improvement for digitizer boards in critical remote sensing systems. They target a range of NASA’s remote sensing instruments, scalable for use in balloons, aircraft and satellites.

Digital readout ICs (DROICs) enable efficient and sensitive detectors for much higher count rates and consume less power for extended operational lifetimes compared to currently available imager systems.

Alphacore serves a diverse customer base for DROICs and detectors. Applications in these markets include medical imaging such as nondestructive ultrasound, portable ultrasound with digital beam-forming systems, and space-based remote sensors.

Direct Analog-to-Information Processing (AIP)

A unique analog IC design transforms wideband and high dynamic range RF inputs directly to useful information without off-chip digitization. The architecture incorporates an ADC with a low sampling rate for significant power savings via reduced DSP computational loads.

Alphacore’s solution is an innovative high input bandwidth, high linearity input sampler design which incorporates a bank of filters and on-chip digital signal processing circuitry for extremely low jitter at desired Nyquist frequencies.

Includes an ADC with impressive specs:

- ENOB > 10bits
- Linearity > 12bits
- Bandwidth > 10GHz
- Core Design Power < 150mW

AIP can have a beneficial impact by lowering cost, reducing size and weight, and speeding results in domains where multiple signals of disparate nature must be analyzed and processed together. Radar for Defense, aerospace and Space-based platforms are ideal for this technology where potential size and weight advantages of a system on a single optical, radio or radar receiver can do the work of many. AIP is also of growing importance in the automotive market.

Illustration of automotive AIP application

Whether your need is for RF or mixed-signal IP, an imager system, hardware-based cybersecurity tools, or other high-performance electronics, please allow our design experts to collaborate with your project team to formulate the most cost-effective design or test solution.

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