

Technical Summary

The P23801A polarimetric spectrometer ASIC processes two 10GHz bandwidth (H/V) input signals from RF front ends. Signal spectrum is channelized into 4,096 frequency bins, the frequency-domain results of each channel as well as the cross-products (4 stokes parameters) are calculated, and then accumulated. The analog front ends include VGAs and 6-bit ADCs. The digital back ends include PFB based FFT cores, accumulators and cross-channel analysis functions. The chip also includes an output data interface, a PLL based clock synthesizer and an SPI interface for the ASIC's programming and data interchange at low speed (Fig.1). The chip is offered in a BGA package (Fig.2). The ASIC (P23801A) is offered as a component and as a board level solution (Fig.3). Fig. 4 shows measured ASIC measurement results.

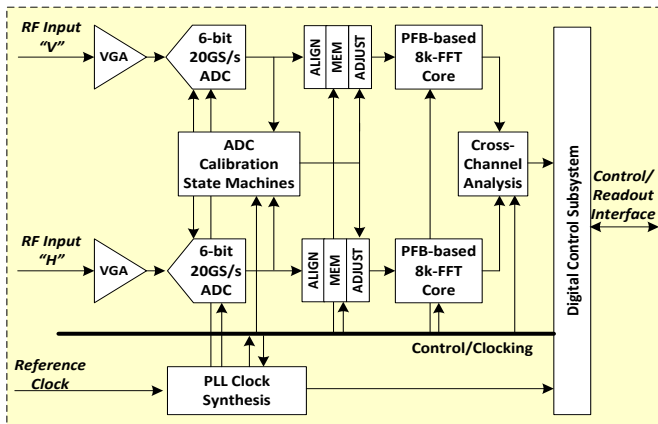


Figure 1. A block diagram of the ASIC.



Figure 2. Chip photo and the BGA packaged ASIC part.



Figure 3. An evaluation PCB.

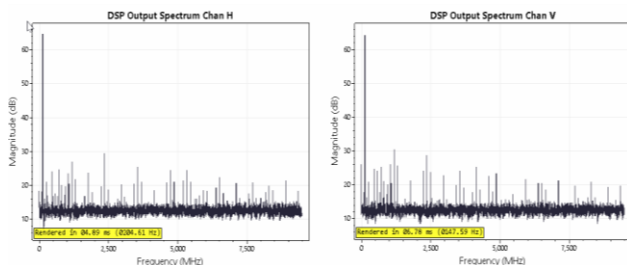


Figure 4. Demonstration of ASIC functionality.

Operational Capabilities

The ASIC includes 2 channels that digitize the RF signal and split spectrum into 4,096 frequency bins, thus, achieving 2.44MHz spectral resolution. Specific capabilities/features:

- Input signal -3dB bandwidth up to 14GHz
- Sampling rate up to 20GS/s
- Input signal FSR power -15dBm and 5dB gain adjustability
- Digitizer ENOB > 4-bits up to 10GHz
- Power consumption < 4.5W (full functionality)
- Selectable number of frequency bins within 0 to 10GHz, maximum of 4096.
- User-defined window function can be applied
- Output data is 4 stokes parameters
- Highly linear 15dB input power range with <0.02dB non-linearity ($\pm 0.5\%$)
- Accumulation time programmable from 1us to 0.4s
- An integrated 20GHz PLL, selectable Fref
- An SPI interface for control, diagnostics and readout
- A high-speed 1.25Gbps LVDS data readout interface
- Temperature range -40°C to 110°C
- 15 x 15 BGA package (12.8mm x 12.8 mm)
- Fabrication technology 28nm CMOS

Applications

- Remote sensing instruments
- Radio astronomy
- Planetary exploration missions
- Synthetic aperture radiometers
- Spectrum analyzers

Measured broadband gaussian noise standard deviation:

