Advantages of Analog Signal Processing over FPGA and DSP in Fuzing

Douglas Cox and John Ambrose

Presented at the

57th Annual Fuze Conference

July 31, 2014
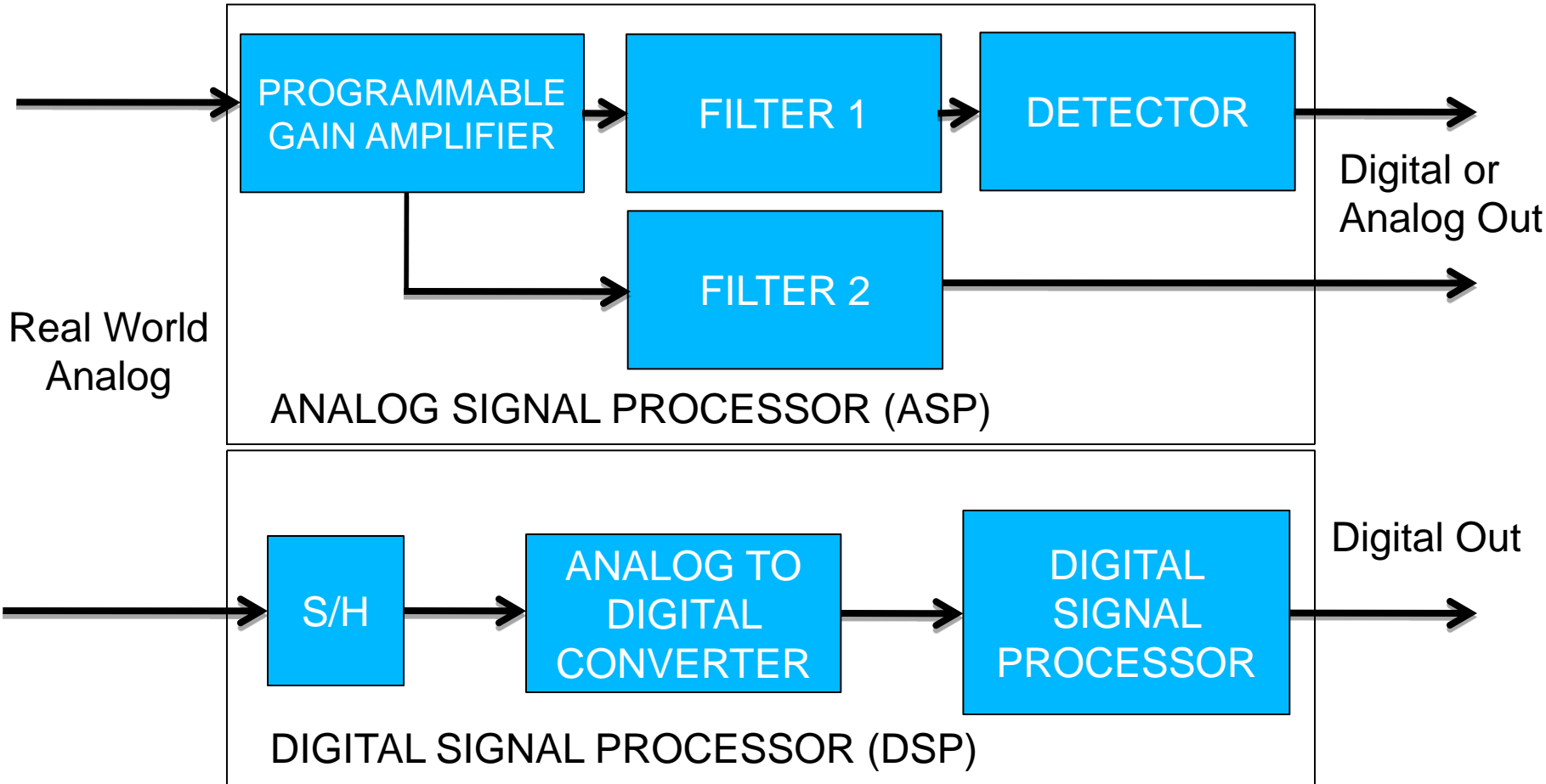
by Douglas Cox

≡MSI≡ Mixed Signal Integration

ASP vs. DSP

Advantages of DSP

- Software programmability
- High noise immunity
- Implement any mathematical function
- Standard filter function codes
- Less sensitive to temperature variation
- Digital output can be stored in memory
- Large number of bits accuracy and resolution possible

Disadvantages of DSP

- Typically do not include the A/D and D/A
- Require more current for filter function
- External gain best if done pre DSP
- Quantization error limits dynamic range
- Large package size
- Significant software development time
- Increased development and part costs to achieve optimal performance

Advantages of ASP

- Lower cost
- Lower power consumption
- Small device sizes
- Packages as small as 3x3 mm

Disadvantages of ASP

- Limited programmability
- Custom chip often required
- Signal to noise limited to process
- Functions limited to analog library

Analog Signal Processing Functional Capabilities

- Filters

- Op Amps/Comparators

- Multiplexors

- Mixers

- Data Converters

- Limiter/Companders

- Analog Phase Locked Loop

- Analog Front End

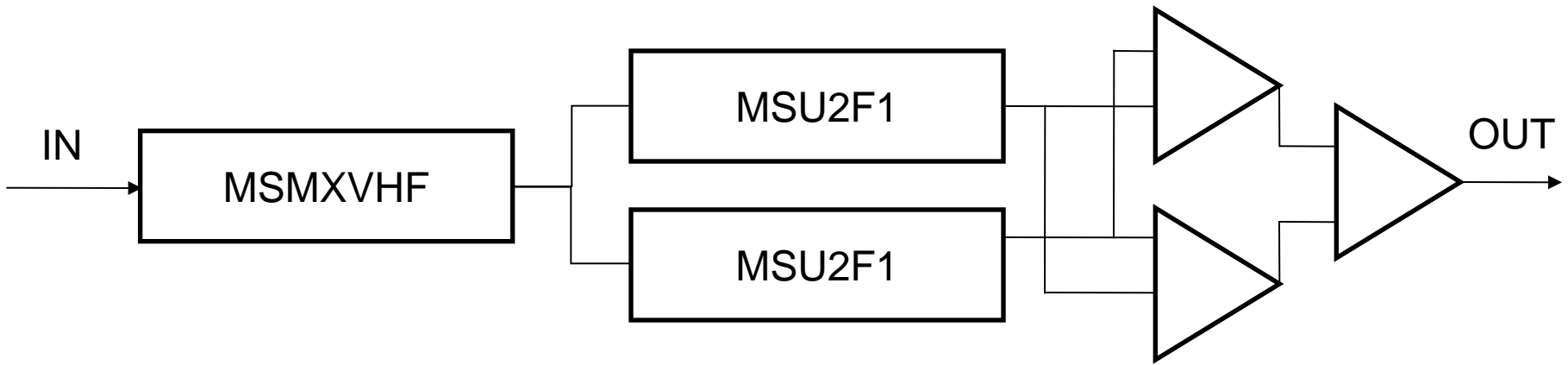# Typical ASP Performance using CMOS technology

- Ultra low power of under 1mW

- Low voltage operation down to 1V

- Up to 70dB of gain

- 14-16 bits digital resolution

- 80dB overall System Signal to Noise Ratio (SNR)
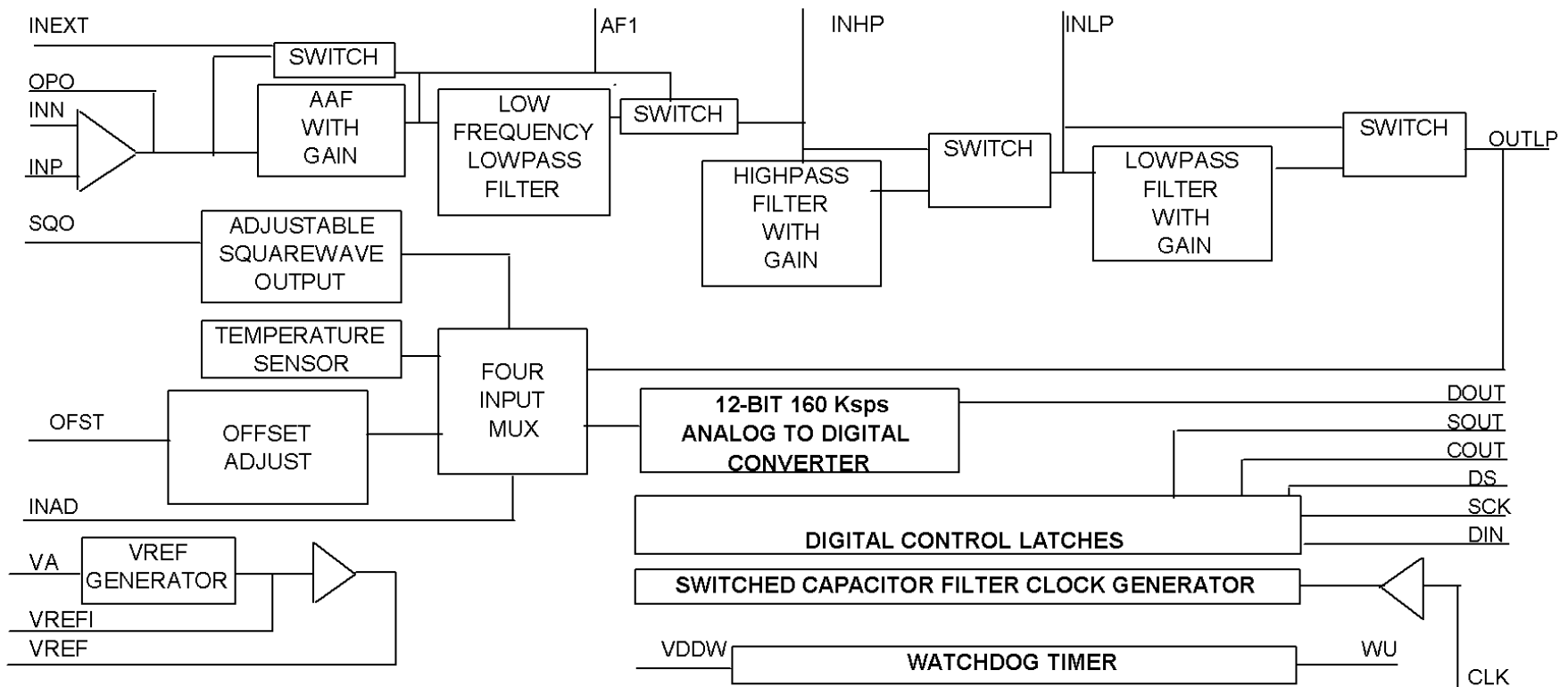
Signal Processing Example 1

IN → MSMXVHF → MSU2F1 / MSU2F1 → amplifiers → OUT

SINGLE SIDEBAND SUPRESSED CARRIER DEMODULATOR
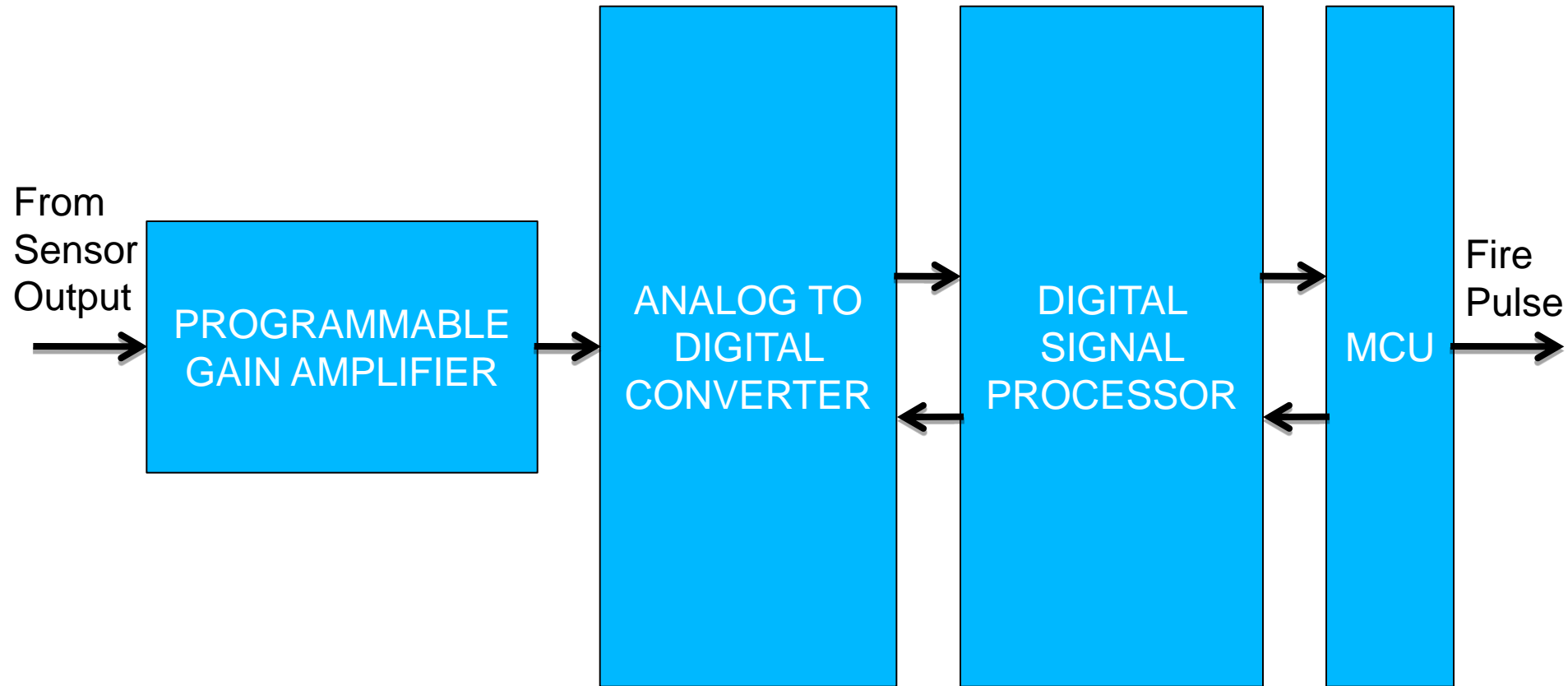
Signal Processing Example 2

MIXED SIGNAL SMART PROGRAMMABLE SENSOR INTERFACE

Fuze Signal Processing Example (DSP)

DSP vs ASP Power Issues

DSP	Mode	Current	ASP	Mode	Current
320F	Regular	330 mA	MSMXVHF	Regular	15 mA
320F	Reduced	30 mA	MSMXVHF	Reduced	5 mA
320F	Reduced	30 mA	MSSPSI	Regular	5 mA

Note: MSI parts are available in SnPb lead finish.   DSP suppliers typically provide all RoHS parts that must be post processed to achieve Sn/Pb lead finish.

Summary

- Analog Signal Processing is very suitable for Fuzing Applications
  - Lower power than SOC DSPs
  - Smaller size than SOC DSPs
  - DSP usually needs analog pre-filtering
  - Lower cost
  - Ideal for high volume

Mixed Signal Integration

Mixed Signal Integration

2157-50 O'Toole Avenue

San Jose, CA 95131

+1 408-434-6305

www.mix-sig.com

info@mix-sig.com