Advantages of Analog Signal Processing over FPGA and DSP in Fuzing

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ASP vs. DSP

ANALOG SIGNAL PROCESSOR (ASP)

DIGITAL SIGNAL PROCESSOR (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/Componders
- 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

SINGLE SIDEBAND SUPPRESSED CARRIER DEMODULATOR
Signal Processing Example 2

MIXED SIGNAL SMART PROGRAMMABLE SENSOR INTERFACE
Fuze Signal Processing Example (DSP)

- From Sensor Output
- Programmable Gain Amplifier
- Analog to Digital Converter
- Digital Signal Processor
- MCU
- Fire Pulse
## DSP vs ASP Power Issues

<table>
<thead>
<tr>
<th>DSP</th>
<th>Mode</th>
<th>Current</th>
<th>ASP</th>
<th>Mode</th>
<th>Current</th>
</tr>
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<tbody>
<tr>
<td>320F</td>
<td>Regular</td>
<td>330 mA</td>
<td>MSMXVHF</td>
<td>Regular</td>
<td>15 mA</td>
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<tr>
<td>320F</td>
<td>Reduced</td>
<td>30 mA</td>
<td>MSMXVHF</td>
<td>Reduced</td>
<td>5 mA</td>
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<tr>
<td>320F</td>
<td>Reduced</td>
<td>30 mA</td>
<td>MSSPSI</td>
<td>Regular</td>
<td>5 mA</td>
</tr>
</tbody>
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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 Fusing Applications
  – Lower power than SOC DSPs
  – Smaller size than SOC DSPs
  – DSP usually needs analog pre-filtering
  – Lower cost
  – Ideal for high volume
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