TI HealthTech
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AFE5809: Analog Front End for Ultrasonic Applications

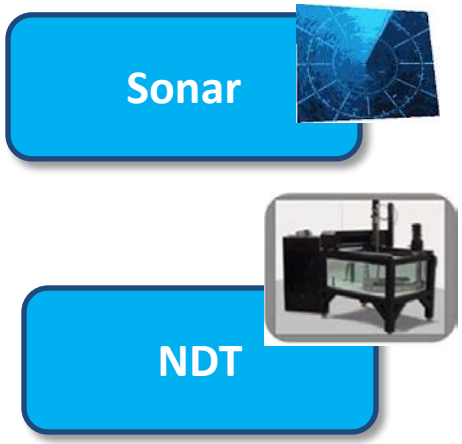
Imaging

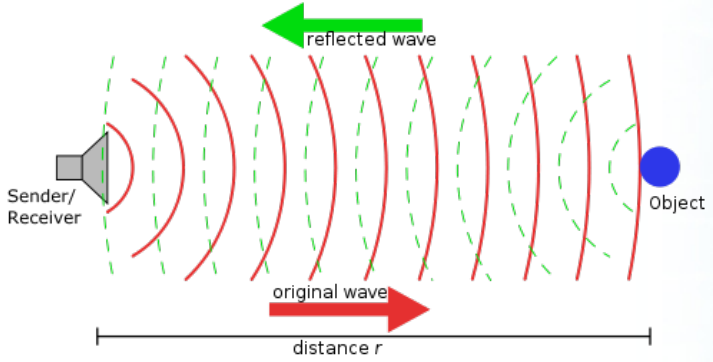
Introduction

- Purpose
  - To introduce TI's AFE5809 for Ultrasonic Rx path
- Objective
  - To discuss AFE5809's features and benefits
- Content
  - Ultrasound vs Ultrasonic
  - Sonar applications
  - Non-destructive testing applications
  - AFE5809 Analog Front End for Ultrasonic Rx
  - Why is the AFE5809 so great?

Ultrasonic vs Ultrasound

- Ultrasonic refers to more than just Medical Ultrasound.
- It refers to any application that uses high frequency sound pulses or electromagnetic waves to measure distance, velocity, or material characteristics.
- Basic operation and electronic components are similar, but frequencies, distances, measurement environments, and total number of channels can vary greatly.





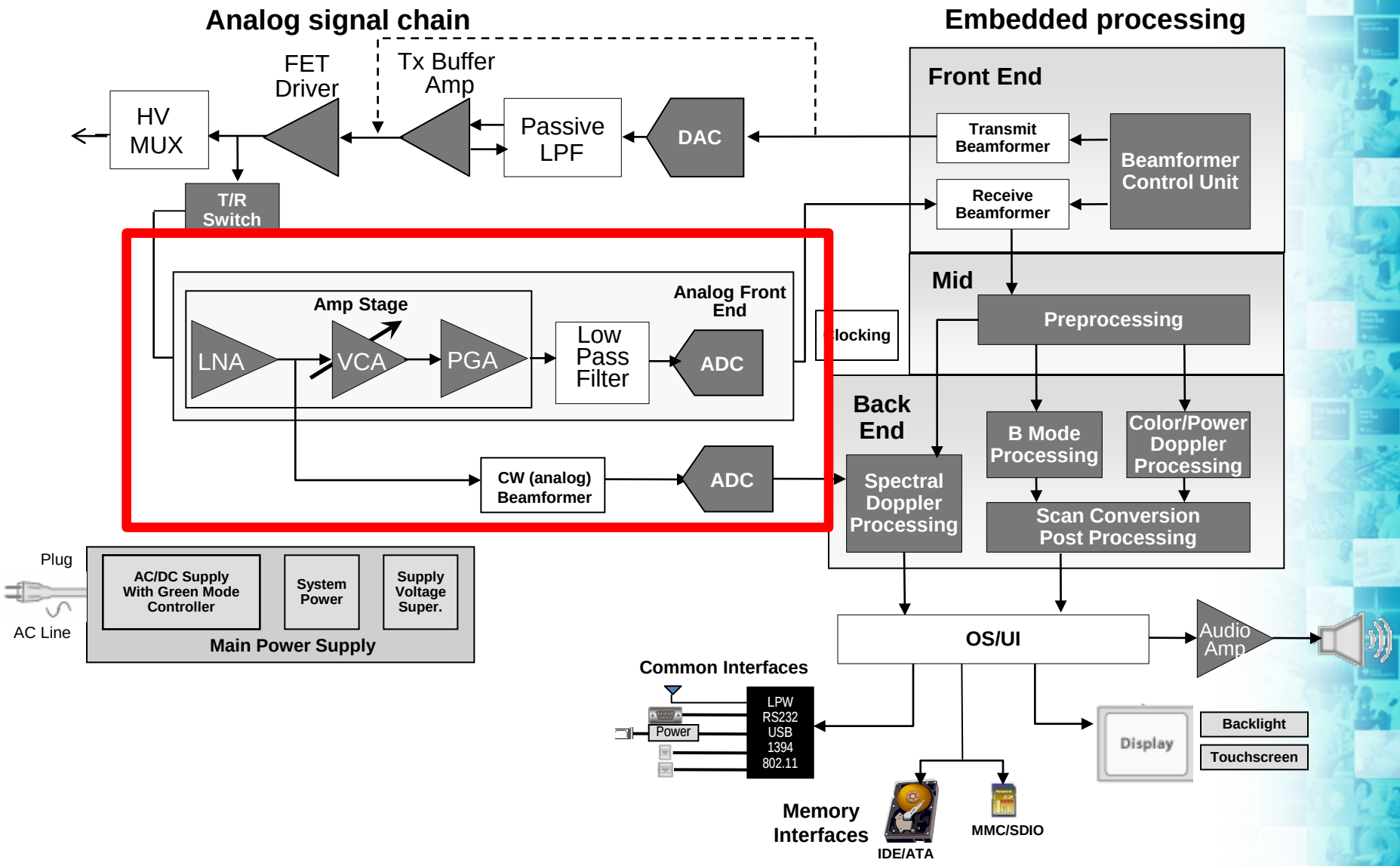
Sonar Applications

- Sonar:
  - Uses sound waves to measure or detect objects on or under the surface of the water.
  - Similar to medical ultrasound, beamforming is used and an array of receivers produces spatial differentiation.
  - Unlike medical ultrasound, lower frequency's and higher gain ranges are sometimes needed to measure very far distances.
  - Typical Sonar applications include:
    - Fish finders – lower channel count, smaller size
    - Deep water survey – longest distances
    - Military and Stealth applications

Non-Destructive Testing (NDT)

- NDT:
  - Refers to a wide group of analysis techniques used to evaluate the properties of a material, component or system without causing damage
  - One type of NDT test is ultrasonic testing
    - Uses ultrasonic pulse waves launched into materials to detect internal flaws or characterize materials.
  - Has higher frequency and dynamic range requirements compared to medical ultrasound.
  - Typical NDT ultrasonic applications include:
    - Thickness measurement
    - Flaw detection
    - Stud finders

Ultrasonics: Sonar / NDT



AFE5809:

AFE with Passive CW Mixer & Digital I/Q Demod

Features

- 8 CH AFE with LNA, VCAT, PGA, LPF, ADC, CW Mixer and integrated:
  - **Digital I/Q demodulator**
  - Continuous wave Doppler (CWD)
- 14 bit ADC w/ **77 dBFS SNR**.
- Selectable power/noise combo's to optimize system
  - 158mW/ch at **0.75nV/rtHz**, 65MSPS
  - 99mW/ch at 1.1nV/rtHz, 40MSPS
  - 80mW/ch at CW Mode
- Package: 15 mm x 9 mm, 135-BGA

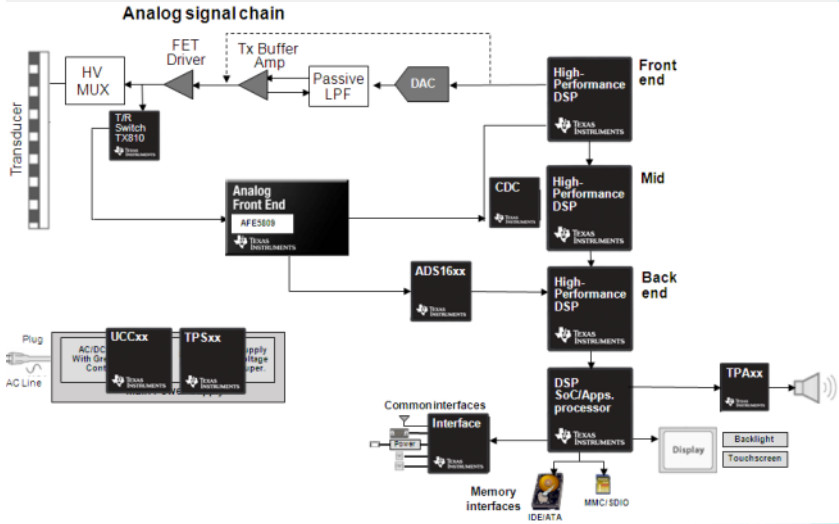
Benefits

- Complete AFE for Ultrasound and Ultrasonic systems
- Lowers interface rate, cost of FPGA
- Measures blood flow velocity in Spectral Doppler systems
- Best in-class noise levels for crisp image qualities.
- Ability to fine-tune power consumption for portable systems

Applications

- Ultrasound Imaging
- Non-destructive Testing
- Sonar
- Military Radar

Samples: Now
EVM: Now
Production: Released!

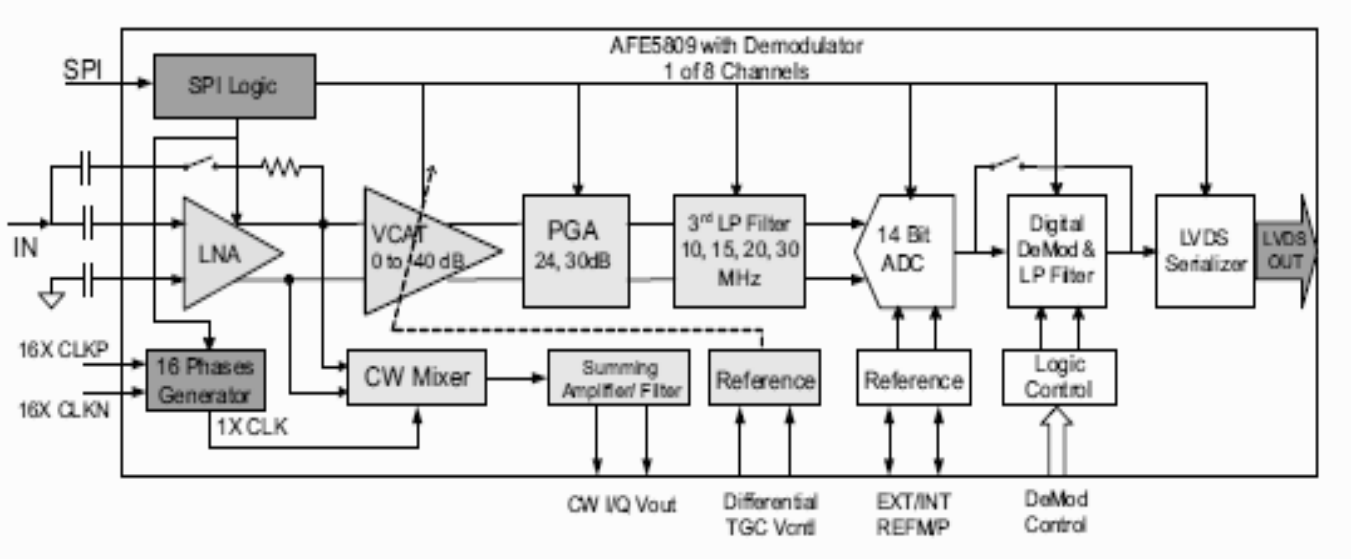


Why is the AFE5809 so great?

What it is: Complete 8 ch front end integrating all of the components of a typical Ultrasound Receiver.

Features and Benefits:

- Complete front end solution = easier design and lowered BOM cost
- Digital I/Q demodulation = reduced FPGA processing requirements
- Lowest noise and lowest power = highest image quality at lowest power



Summary

- Complete 8 ch front end integrating all of the components of a typical reciever for ultrasonic applications such as Sonar or NDT.

- Features and Benefits include
  - Complete front end solution = easier design and lowered BOM cost
  - Digital I/Q demodulation = reduced FPGA processing requirements
  - Lowest noise and lowest power = highest image quality at lowest power

- To learn more or order samples or evaluation module please visit www.ti.com/product/AFE5809