Semiconductor Innovations in Medical Electronics

Srinivas Kantheti
Pulse Oximeter - A typical Block diagram
Key Challenges and Solutions

• Challenges
  • Light Interference
  • Movement artifacts
  • Sensor mechanicals
  • Inadequate blood flow

• Key Products
  • AD7685 - 16 bit resolution, 250Ksps sample rate, 1nA standby current
  • Integrated Low Power micro
  • Signal Processing - A way out of the common problems
    • Interesting case is SET (Signal Extraction Technology from Masimo Pulse Oximeters)
  • High performance at extremely low powers
    • Low Power critical for iPhone based accessories
    • Floating point performance at ultra low power
Activity Monitor

- Accelero meters
- Impedance measurements
- Temperature measurement
- Heart rate & Others

Small and variety of form factors
Long battery life
High levels of Integration for cost, size and power
All with ease of use and affordable
Key Challenges and Solutions

- **Challenges**
  - Small size
  - Power
  - Operate across a wide range of voltages

- **Key Products**
  - ADXL 362 - Low Power accelerometer 2uA at 100Hz, Motion activated wakeup
  - AD7147A cap touch controller for single electrode capacitance sensors
  - ADF7020 Transceiver IC - Upto 200Ksps data rate in FSK mode.
ADUCM350 Low Power Healthcare Meter on a Chip

- 16-bit accurate, 160 kSPS A/D converter
- Hardware accelerators for waveform generation and filtering
- Complex impedance measurement (waveform generation and filtering)
- 16 MHz ARM® Cortex™ M3 processor with SRAM and flash memory
- Communication I/O: USB, audio, display, beeper, and serial
- Passive and active sensor fusion functionality
- Coin cell battery compatible
- Package: 120 pin 8 mm x 8 mm CSP_BGA
Heart Rate Monitor

Single Lead Heart Rate Monitor Analog Front End

Low Power 5 Electrode ECG Front End with Respiration Measurement and Pace detection
Low Power Micro controller with Integrated Sigma Delta ADCs
Bringing it all Together to Smartphones