

TI HealthTech

Engineering components for life.

AFE4490: Analog Front End for Photometry



Introduction

- Purpose
 - To introduce TI's AFE4490 for Photometry applications
- Objectives
 - To discuss AFE4490's features and benefits
- Content
 - Photometry / Pulse Ox equipment types
 - Why is the AFE4490 so great?
 - Example AFE4490 Photometry System Solution
 - iCombo: AFE4490 + MSP4305528 + CC2541
 - Health Hub: Finger Clip Pulse Ox Demo

Photometry / Pulse Ox: Product Types



- Standard Monitoring for ICU/Surgery
- Anesthesia Monitoring
- Neonatal Monitoring
- Monitoring for High Altitudes (Pilots)
- Exercise Monitoring
- Sleep Studies
- Stress Testing



Why is the AFE4490 so great?

What it is: Complete front end integrating all of the components of a typical clinical pulse ox or photometry system.

Features:

- High degree of integration
- Low power overall vs discrete designs
- High performance in the presence of ambient light

Benefits:

- Integrated solution requires less design time, board space, and in-house design expertise.
 - Designers can focus more on algorithms and “secret sauce”
 - Features for open/short detection make system diagnostics easier
- Lower power results in longer battery life
- More accurate measurements even in non-ideal conditions

AFE4490

Integrated Solution for Photometry (Clinical SpO2)

Features

Transmitter

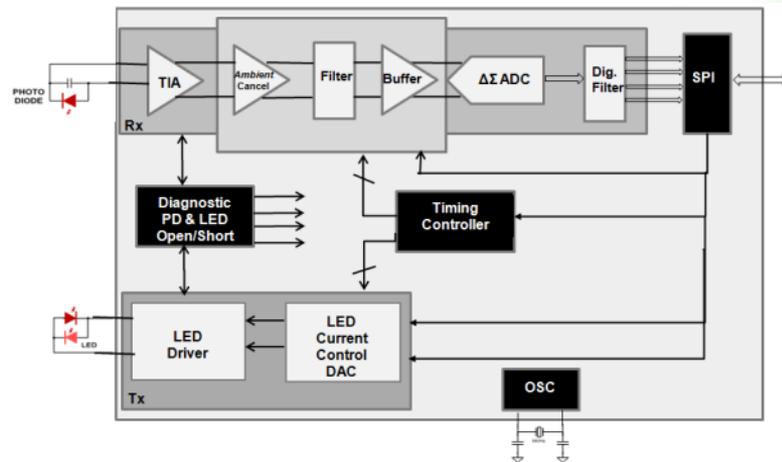
- H-Bridge LED driver
- Dynamic range >105dB
- LED current 150mA (w/ 8-bit current setting)
- LED ON (programmable 50uS to 250uS)
- LED Current Reference (Independent RED and IR)
- LED Open/Short Detect

Receiver

- Pulse frequency 625Hz to 100Hz
- 1uA photodiode current (>13 noise free bits)
- 5uA photodiode current (>13.5 noise free bits)
- Low Power Receiver (<4mW at 2.2V)
- Receiver sample time 50uS to 250uS
- Programmable Trans-Impedance Amp w/ 7 resistor settings
 - Independent settings for RED and IR paths
- Digital ambient estimation and subtraction (separate RED/IR ambient values)
- Photodiode Open/Short Detect

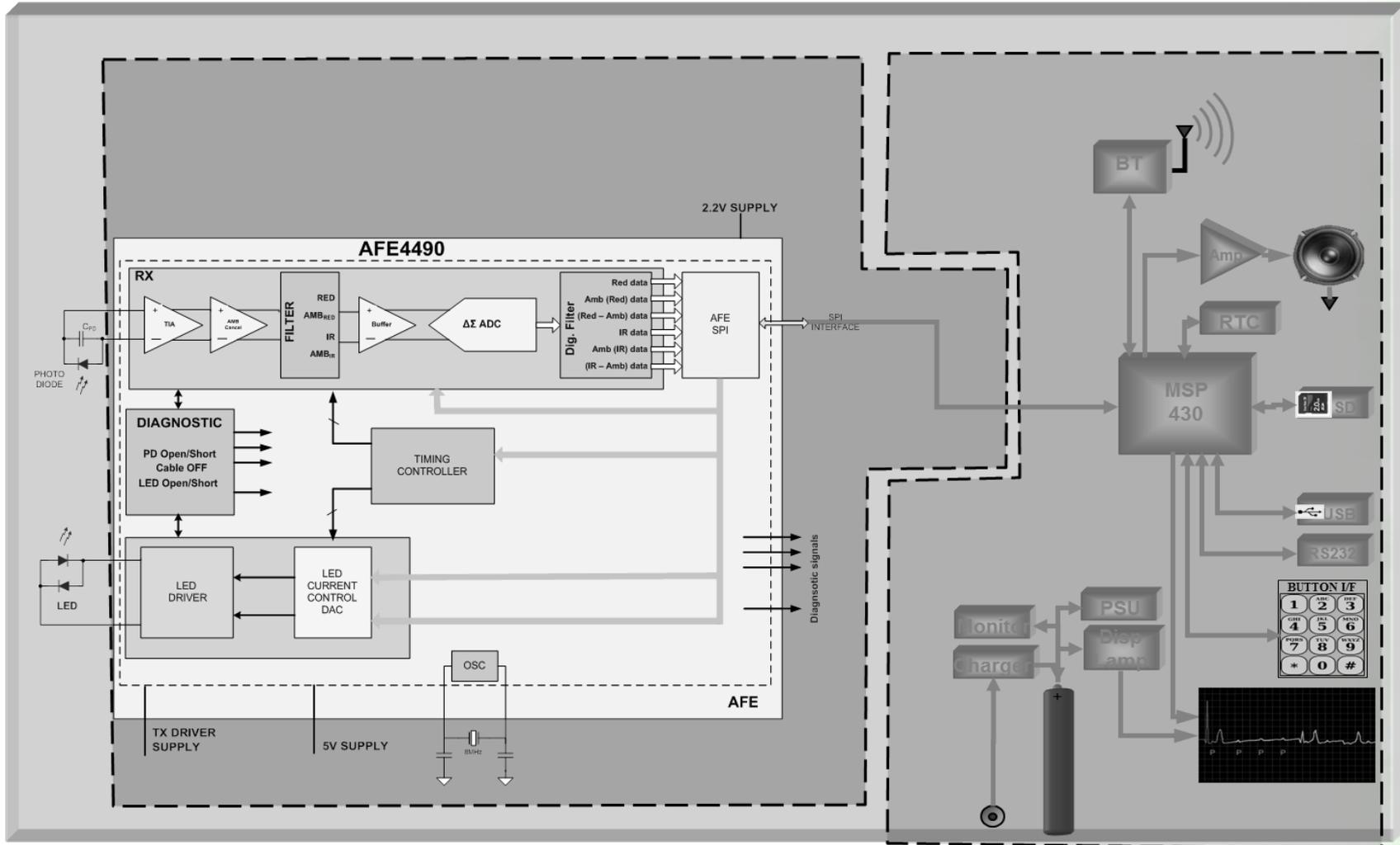
Other Features

- Flexible Pulse Sequencing and Timing
- Cable On/Off detect
- Supplies (Rx: 2.2V to 3.6V, Tx: 5V)



Samples: Now
EVM: Now
Production: Now

AFE4490 Photometry System Solution



iCombo: AFE4490 + MSP4305528 + CC2541

Pulse Ox AFE + MSP430 + BLE Module for Wireless Photometry

iCombo Features

Signal Chain:

- The AFE4490 is a single chip front end transmit/receive solution for photometry
- The MSP4305528 MCU includes USB charging capability
- CC2541 based BLE module creates smart connectivity

Tools & Resources

AFE4490SPO2EVM and HealthTech Hub Demo Kit

AFE4490SPO2EVM

- DB9 pulse oximeter sensor cable support
- Two modes of operation: Evaluation and Live SpO2 / Heart rate
- Acquire data at up to 1300 Hz in evaluation mode

Health Hub Demo kit

- Off-the-shelf pulse ox cable modified to plug into TI board
- AFE4490 for LED transmit and receive paths
- MSP4305528 MCU
- BLE module connection featuring TI's CC2541
- iPad as data aggregator

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iCombo Benefits

Forms an easy to implement solution for clinical grade pulse ox measurement to be wirelessly transmitted for data aggregation, analysis, or recording.

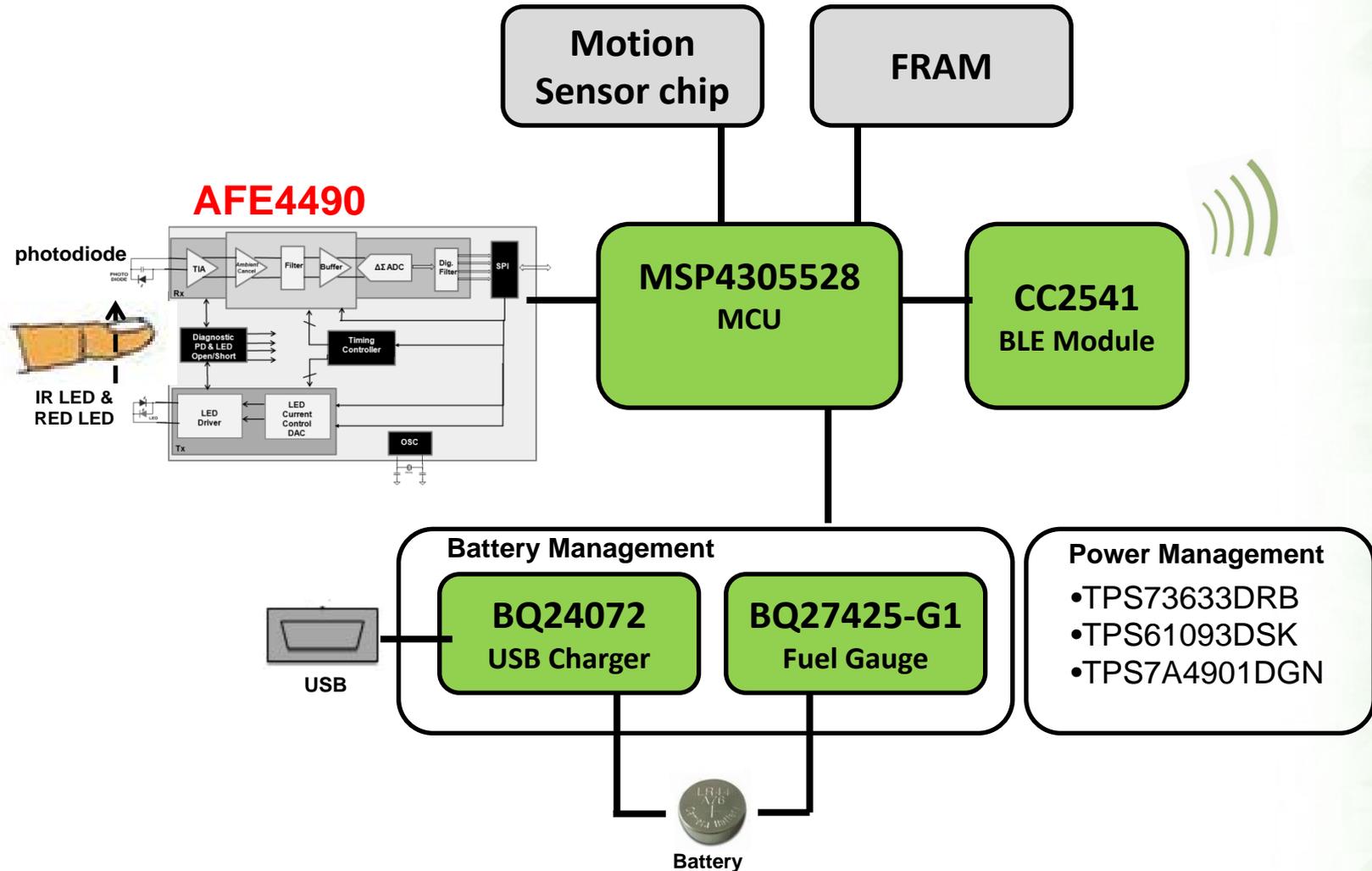
This working solution can be demonstrated to customers with TI HealthTechs HealthHub Demo kit.



simplified block diagram



Health Hub: Finger Clip Pulse Ox



Summary

- The AFE4490 is a complete analog front end solution for photometry applications such as clinical pulse ox.
- Features and Benefits include
 - High degree of integration enabling fast design
 - Low power overall vs discrete designs
 - High performance in the presence of ambient light
- To learn more or order samples or evaluation module please visit www.ti.com/product/AFE4490