Low-power signal chain solutions based on C5515 DSP for portable medical application development

Electrocardiogram (ECG), Pulse Oximeter (PO) and Digital Stethoscope (DS) Medical Development Kits

TEXAS INSTRUMENTS

The portable medical applications market is growing rapidly and companies with limited teams and expertise need to enter quickly to meet consumers' growing need for devices that are more portable, consume less power and provide more sophistication, all at a lower cost. To answer these needs, TI has launched a set of medical application development tools with complete signal chain designs and software for electrocardiograms, digital stethoscopes, and pulse oximeter products.

Each of the three medical development kits (MDKs) is comprised by purchasing an analog front-end (AFE) module with specific circuitry design optimized for each end product plus a TMS320C5515 DSP Evaluation Module (EVM). With hardware and software design information, including schematics, application source code, medical-specific algorithms and technical documents, each MDK decreases the development time for customers by six to eight months. In addition, MDKs provide a great evaluation platform to help medical device manufacturers focus on product differentiation, like algorithm development and feature enhancement. They also lower the barrier for novice developers who want to enter the medical industry quickly.
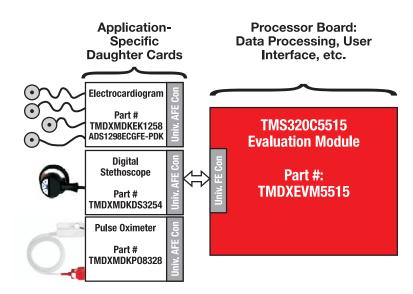
Key Benefits
- Extended battery life based on low power components
  - TI's latest low-power DSP TMS320C5515
  - Low-power audio codecs, A/D, D/A and other analog parts
- Increased user functionality:
  - Real-time medical information display and menu option on LCD screen and PC monitor
  - Audio recording and playback
  - Faster data transfer using high-speed USB 2.0 port
  - Alert indication and more connectivity options
- Smarter and greener platform with FFT hardware accelerator for high-end portable medical devices

To the left is a system block diagram of the three medical development kits. Through standard connector interfaces, users can get the most flexibility of mix-and-match analog front-end modules with multiple TI processor platforms, maximizing their return on investment. Moreover, by choosing low-power IC components, MDK designs offer longer battery life to enable more portability in the end products.

Application-Specific Daughter Cards

Processor Board: Data Processing, User Interface, etc.

Electrocardiogram
Part # TMDXMDKEK1258 ADS1298ECGFE-PDK
Univ. AFE Con

Digital Stethoscope
Part # TMDXMDKDS3254
Univ. AFE Con

Pulse Oximeter
Part # TMDXMDKPO8328
Univ. AFE Con

Univ. FE Con

TMS320C5515 Evaluation Module

Part #: TMDXEVM5515

▲ Figure 1: TMS320C5515 Medical Development Kits system block diagram

ECG system solution features

- 12-lead ECG output using 10-electrode input
- Bandwidth – 0.05 Hz to 150 Hz
- Leads-off detection
- Real-time ECG waveform display on LCD
- ECG waveform display on PC
- Defibrillator protection
- Heart-beat rate display
- 4-KV isolation (required only when operating on AC power)
- 10 µA leakage current
- Display waveform and other indications on LCD display unit

Digital stethoscope system solution features

- Display of heart-beat rate
- Audio output in three selectable modes:
  - Bell mode (20 Hz to 220 Hz)
  - Diaphragm mode (50 Hz to 600 Hz)
  - Extended range (20 Hz to 2000 Hz)
- Volume control and mute
- Noise-reduction filters
- Headphone / speaker output

Pulse oximeter system solution features

- Digital display of oxygen level percentage ranging from 0 to 100 percent
- Pulse range 20 to 300 beats per minute (BPM) (heart rate value in full range)
- Perfusion index check
- Sensor-off detection
- Display waveform and other indications on LCD display unit

Common features

- Display waveform and other indications on PC monitor
- Playback and record signals
- Store data on PC
- User friendly GUI
- Power switch for hard reset
- Scalable software implementation based on user needs
- UART port to connect to PC for data downloading

Pricing and availability

The electrocardiogram (ECG) analog front-end module (part number TMDXMDKEK1258) is available and priced at U.S. $449.
www.ti.com/ecg

The ADS1298 ECG Front End Performance Demonstration Kit (part number ADS1298ECGFE-PDK) is available at U.S. $199.
www.ti.com

The digital stethoscope (DS) analog front-end module (part number TMDXMDKDS3254) is available and is priced at U.S. $375.
www.ti.com/ds

The pulse oximeter (PO) analog front-end module (part number TMDXMDKPO8328) is available and priced at U.S. $395.
www.ti.com/po

The TMS320C5515 DSP evaluation module (part number TMDXEVM5515) is available and priced at U.S. $199.
www.ti.com

Purchase of any of the boards will get free access to ECG, digital stethoscope and pulse oximeter MDK implementation sample code based on the TMS320C5515 platform and MDK PC application software.

TI Worldwide Technical Support

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support.ti.com
TI E2E™ Community Home Page
e2e.ti.com

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