Healthcare System Solution at STMicroelectronics

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ST System LAB
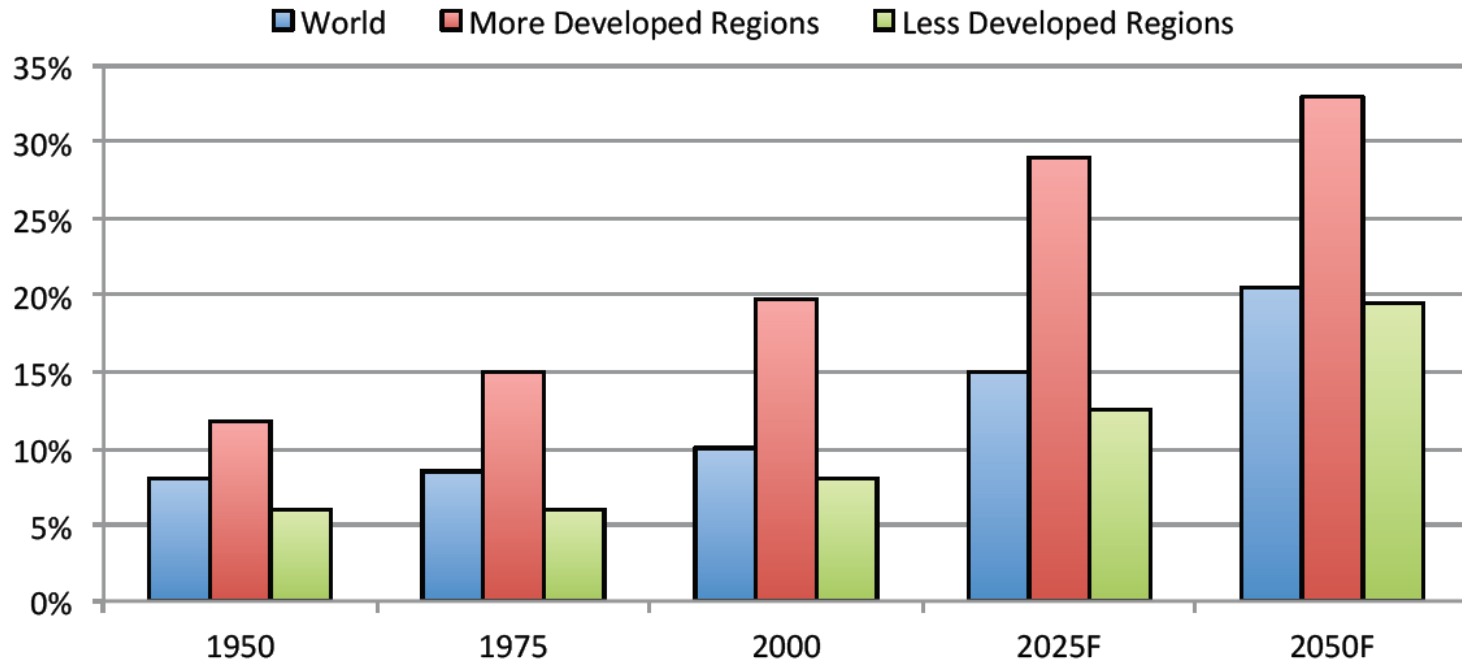
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Contents

- Social Trends

- ST in Healthcare

- Healthcare Solutions
    - **Portable Healthcare Equipment**
    - **Clinical Diagnostic & Therapy**
    - **Sport & Fitness**

Social Trends (1/2)

Percent of Population Aged 60 or Older (1950-2050)

Source: United Nations

The United Nations estimates that 841 million humans were 60 years old or older in 2013 (about 12% of the world's population), with 120 million of those being 80 or above (1.7% of the total). In 1950, just 8% of the world's population was 60 or older (205 million). The U.N. predicts the 60-and-above segment will reach 21% of the world's population in 2050 (over 2 billion humans), with 4.1% (about 392 million) being 80 or more that year.

The aging population increases the need for chronic disease management, and that means cost pressures will grow in healthcare in the years ahead.
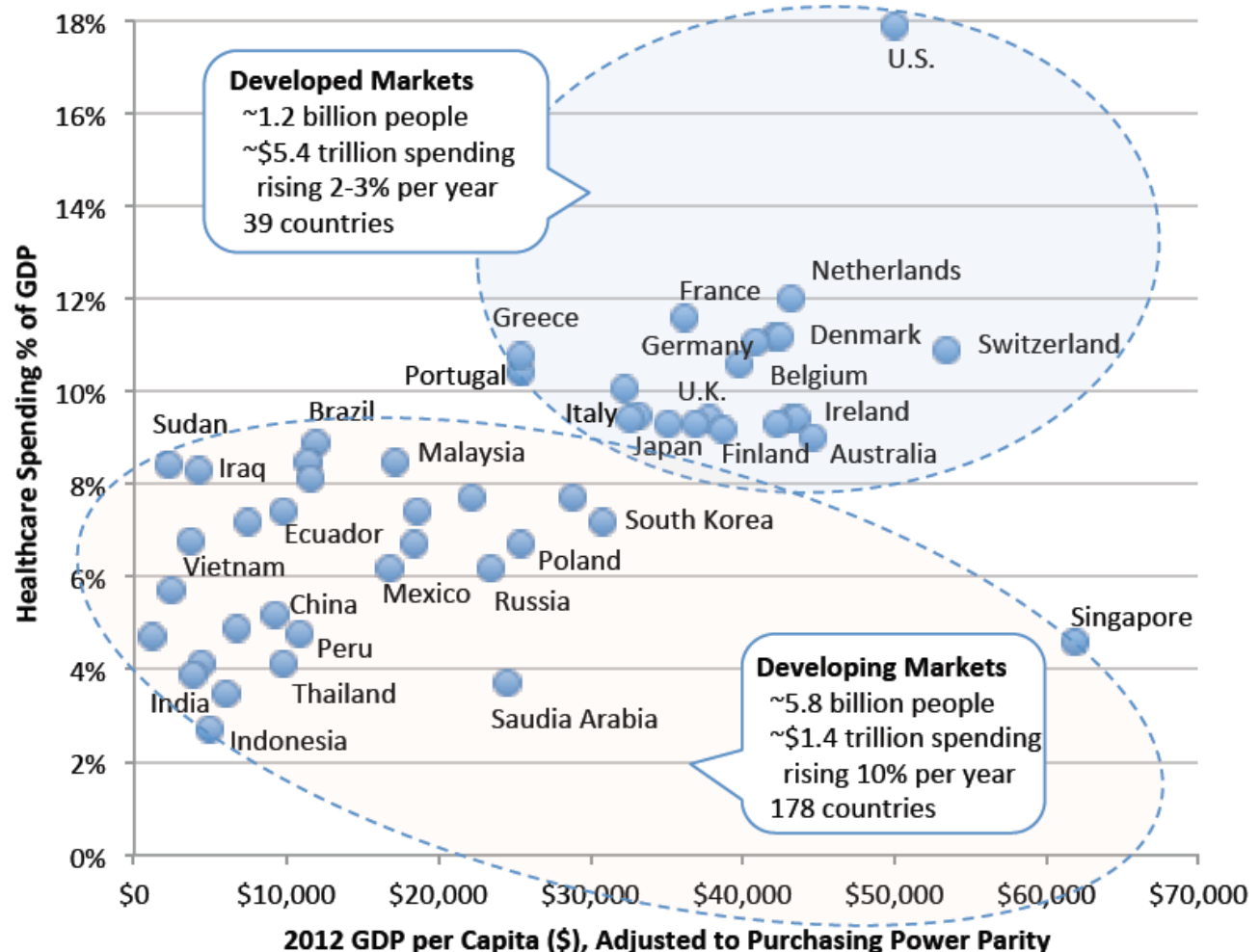
Developed countries, with 18% of the world's population, currently account for nearly 80% of total healthcare spending — about $5.4 trillion versus $1.4 trillion in 178 developing and poor countries in 2012, based on the latest data available.

Healthcare Spending by Country

Source: World Bank, GE Healthcare, and IC Insights

OUR VISION:

Our microelectronics make a positive contribution to people's lives

OUR MISSION:

Develop an integrated offer to the Healthcare environments exploiting synergies among Sensors, MEMS, Advanced Analog Technologies, Microcontrollers, Power Management ICs and all the ST best in class products

OUR STRATEGY:

Create a brand awareness for ST as the best Partner for Healthcare Applications

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ST is a trusted provider of high quality technical solutions enabling the development of breakthrough medical systems

- Motion MEMS & Environmental Sensors
- Analog and mixed signal components
- ASSP for Medical
- Ultra-low power connectivity
- Ultra-low power microcontrollers
- Smart energy management

E C G - Monitor

60 bpm

Healthcare

Portable Healthcare Equipment

- Baby Monitoring
- Blood Pressure Monitor
- Hemoglobin Meter
- Breath Analyzer
- Glucose Meter
- Infrared Thermometer
- Pulse Oximetry
- Stethoscope, Digital
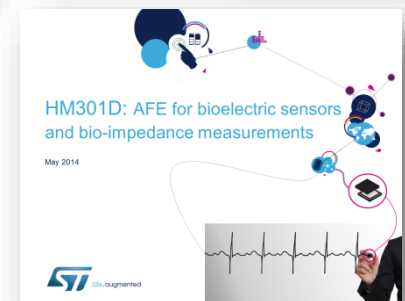
Clinical Diagnostic & Therapy

- Clinical ECG
- Automated External Defibrillator
- Ultrasound Systems

Sport & Fitness

- Activity Tracker
- Wristband

MARCOM Activities

Power management
for handheld and portable

Analog ICs
for wearable devices

HM301D: AFE for bioelectric sensors
and bio-impedance measurements
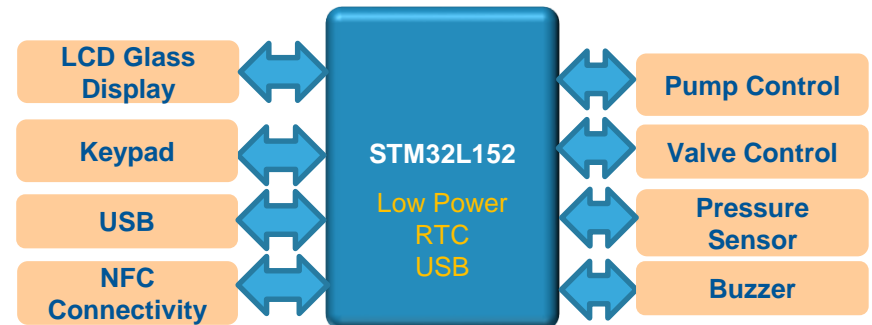
May 2014

Blood Pressure Monitor

Solution for estimating Blood Pressure by using a Sphygmomanometer

Key features

- Large LCD for easy reading
- Internal Memory for saving results with Date and Time
- Simple one button operation
- PC Connectivity using USB
- Software for Data Analysis
- Auto power off

Key products

- **STM32L152R8T6** (STM32 Low Power MCU)
- **TSV612AIST** (Op-Amp)
- **ESDALCL6-4P6A** (Multi-Line ESD Protection)
- **LD2985BM30R** (LDO Regulator)
- **STM809SWX6F** (Voltage Monitor)
- **STS5PF30L** (P-channel STripFET™ Power MOS)
- **STL6N2VH5** (N-channel , STripFET™ Power MOS)
- **STPS2L30A** (Power Schottky Rectifier)

LCD Glass Display		STM32L152		Pump Control
Keypad		Low Power RTC USB		Valve Control
USB				Pressure Sensor
NFC Connectivity				Buzzer

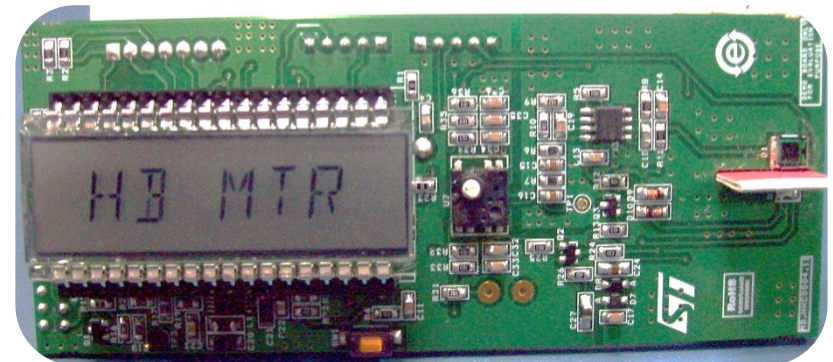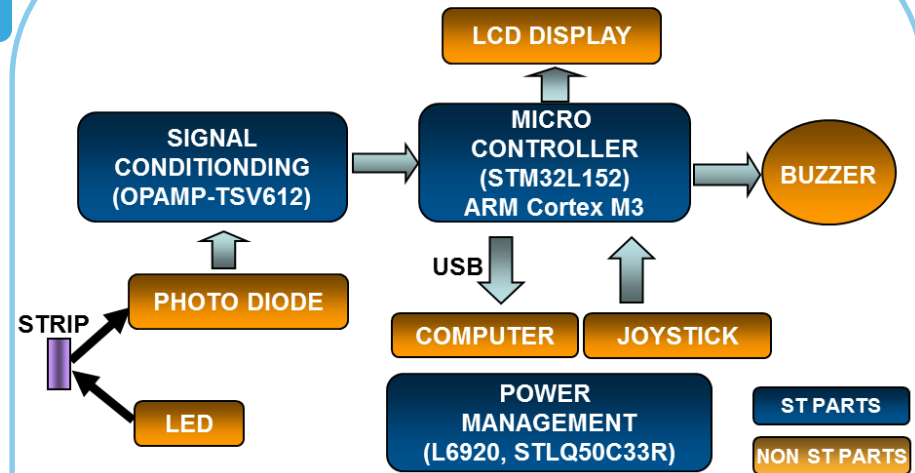Demonstrator available on request

Hemoglobin Meter

Measures content of hemoglobin in blood using Diffuse Reflectance Photometry

Key features

- Operates on one 3-volt lithium battery
- USB interface for data transfer
- Memory for Data Storage
- Self Calibrating
- Fast Results - 30 seconds or less
- Auto power off
- Cost-effective
- Portable & easy to use

Key products

- **STM32L152R8T6D** (MCU-ARM Cortex™-M3)
- **TSV612A** (Op-Amp)
- **L6920D** (Step Up Converter)
- **STLQ50C33R** (low drop linear regulator)
- **ESDAULC6-3B6** (Multi-Line ESD Protection)
- **2STR2215** (Transistor)
- **2STR1215** (Transistor)
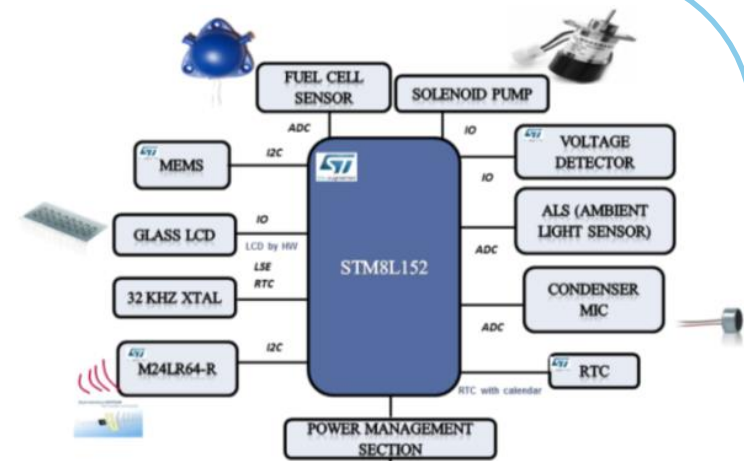

Demonstrator available on request

Solution for estimating Blood Alcohol content using Breath analysis

Key features

- STM8L based low power battery operated platform
- Fuel Cell Sensor to measure the breath alcohol
- Automatic LCD backlight to make the screen visible in darkness
- Solenoid is attached with bellow to draw sample of small, fixed volume from the main pipe
- On board dual interface EEPROM to save BAC (Breath Alcohol Content) readings

Key products

- **STM8L152R8T6** (8bit microcontroller)
- **STLQ015XG30R** (Voltage Regulator)
- **TS507ILT** (Precision single supply rail to rail op-amp)
- **M24LR64-R** (Dual Interface EEPROM)
- **STC4054GR** (Li-ION Battery Charger)
- **LM4041AICT-1.2** (micropower shunt voltage reference)
- **STM1061N31** (Low Power Voltage Detector)
- **STN4NF03L** (N-Channel STripFET Power MOSFET)
- **STTH1R04A** (Ultrasoft Recovery Diode)

Demonstrator available on request

Infrared Thermometer

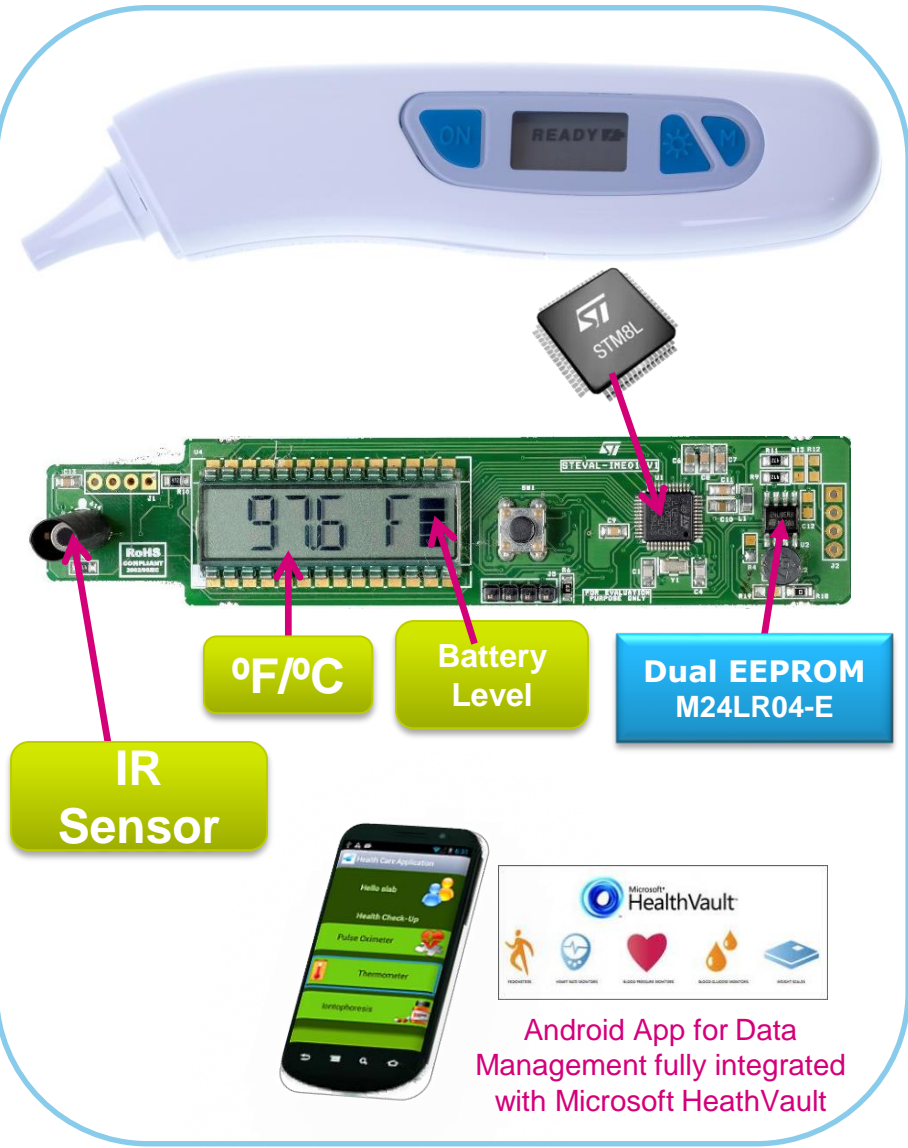Solution for non-contact type Thermometer design based on STM8L MCU

Key features

- IR sensor connected to STM8L MCU
- Thermometer to be powered by coin cell
- Mechanical Specifications as per the customer casing
- Direct LCD driving
- Low Battery indication
- Portable, low power device

Key products

- **STM8L052C6T6** (8bit microcontroller)
- **M24LR64-R** (Dual Interface EEPROM)

MARKETING Package Available

STM8L

ºF/ºC

Battery Level

Dual EEPROM M24LR04-E

IR Sensor

Microsoft HealthVault

Android App for Data Management fully integrated with Microsoft HeathVault

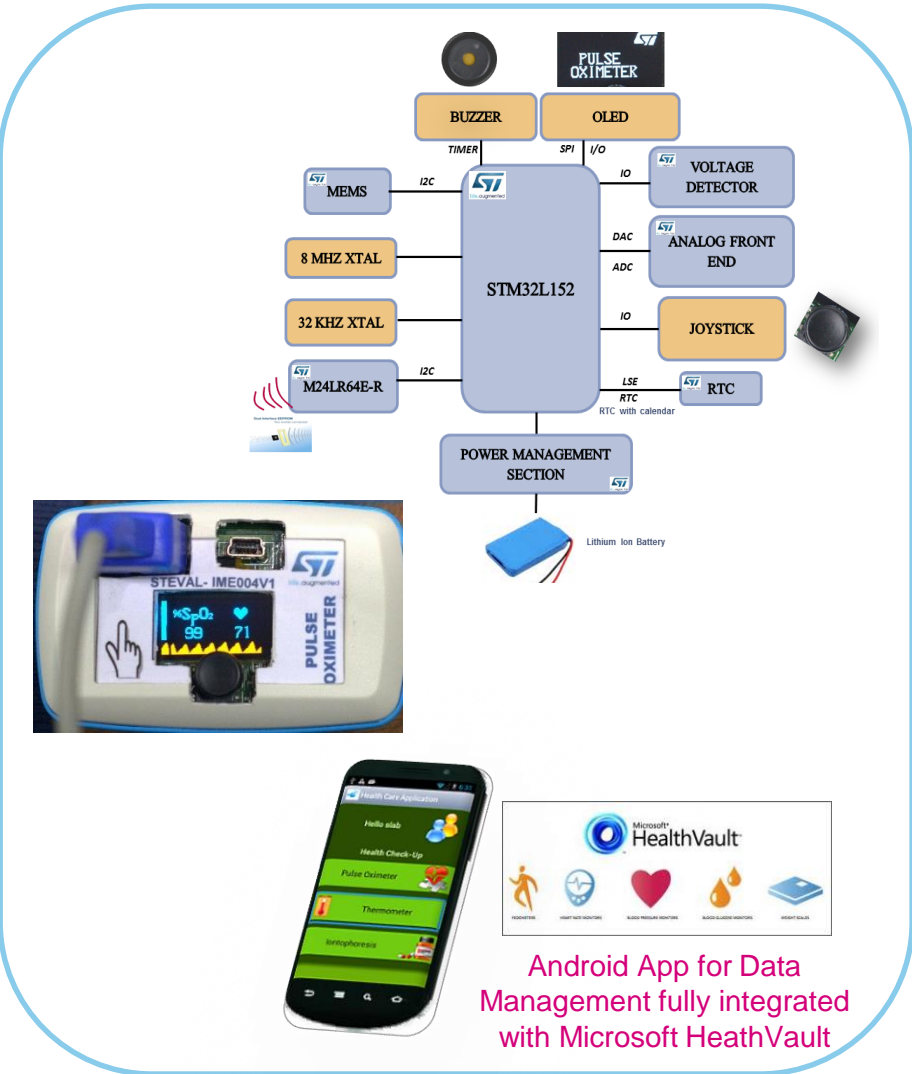Demonstrator available on request

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Solution for estimating SpO2% and Heart Rate non-invasively using STM32L

Key features

- Non Invasive measurement of Oxygen Saturation (SpO2%) using transmittance photometry
- SpO2 and Heart Rate display on OLED
- Android App for data retrieval from Dual-EEPROM over NFC Interface.
- TeleHealth capability for online health data management using Microsoft HealthVault
- Wearable and portable design for comfort & portability

Key products

- **STM32L152R8T6** (32bit microcontroller)
- **STLQ015XG30R** (Voltage Regulator)
- **TSV612ID** (Rail to rail input/output CMOS op-amp)
- **M24LR64-R** (Dual Interface EEPROM)
- **STC4054GR** (Li-ION Battery Charger)
- **STOD1812PUR** (Power supply for PMOLED display)
- **STG3684** (Dual SPDT Switch)
- **LM4041AICT** (Precision shunt voltage reference)
- **ESDAULC6-3BP6** (ESD Protection for high speed interface)

Android App for Data Management fully integrated with Microsoft HeathVault
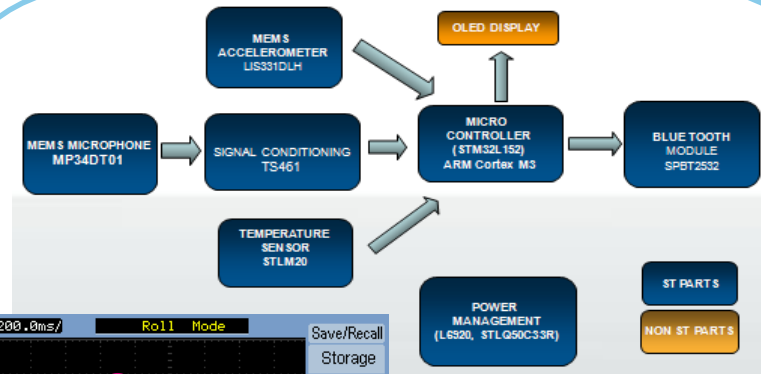
Demonstrator available on request

MEMS Microphone based Heart Rate Monitor
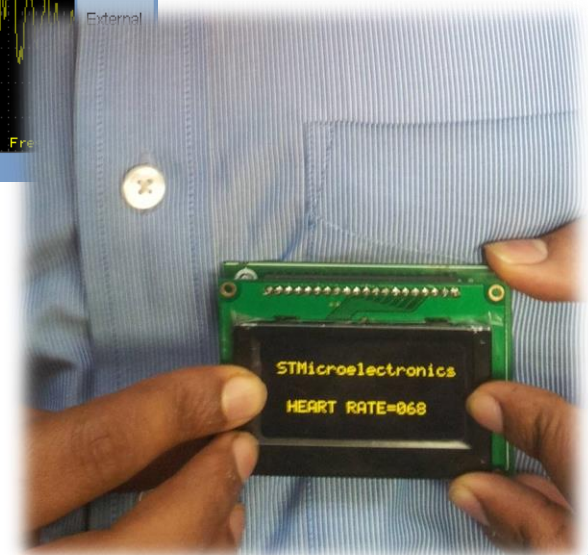
Key features

- MEMS Microphone able to capture heart rate
- Capable to capture beat over the shirt
- Direct LCD driving
- Heart Rate detection

Key products

- **STM32L152R8T6D** (32bit microcontroller)
- **LIS3DH** (3 Axis Accelerometer)
- **M24LR64E** (Dual Interface EEPROM)
- **MP34DT01** (MEMS audio sensor omnidirectional stereo digital microphone)
- **TS461** (Output rail-to-rail op-amps)
- **L6920D** (Synchronous rectifier step up converter)
- **LD1117S33** (Fixed low drop positive voltage regulator)
- **STLM20** (Ultra-low current 2.4 V precision analog temperature sensor)

Embedded Algorithm for Peak Detection

Demonstrator available on request
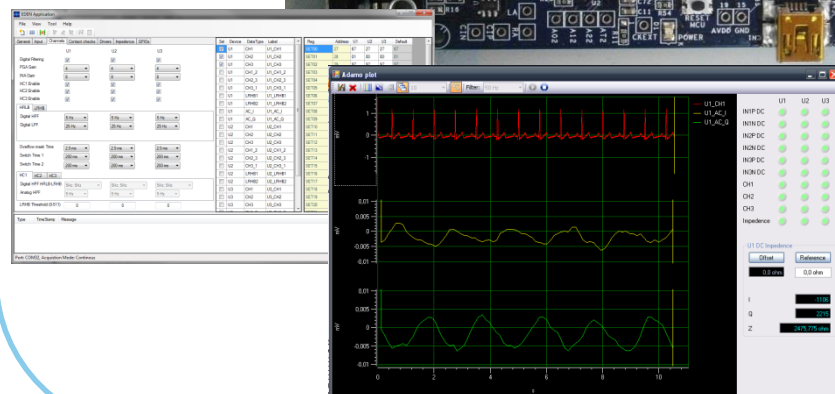
Clinical ECG: Kart (1/2)

Multi lead electrocardiogram (ECG) and body impedance evaluation board

Key features

- Configure all the internal parameters of the 3 HM301D
- View all the HM301D registers
- Advanced Plot of data acquired
- Lead Off detection
- Body impedance measurement

Key products

- **3x HM301D** (Diagnostic quality acquisition system for bio-electric sensors and bio-impedance measurements)
- **STM32F103CBT6** (ARM Cortex-M3 32 bit MCU)
- **ESDALCL6-2SC6** (Very low capacitance and low leakage current ESD protection)
- **STG3692** (Low Voltage High Bandwidth Quad SPDT)

MARKETING Package Available

Order Code: STEVAL-IME002V1
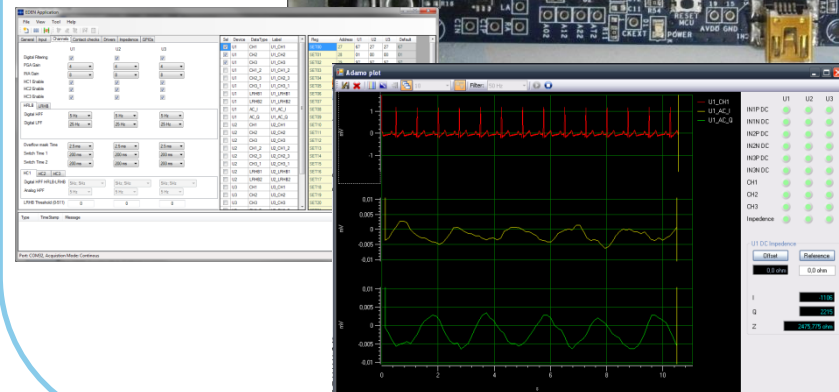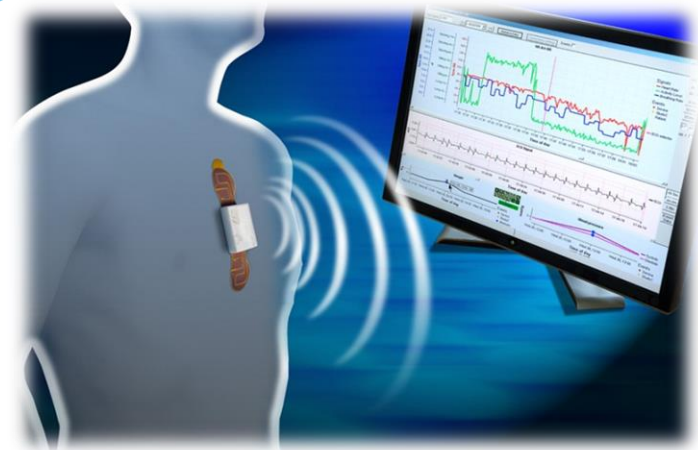
Clinical ECG: Portable (2/2)

Single lead electrocardiogram (ECG) and body impedance evaluation board

Key features

- Configure all the internal parameters of HM301D
- View all the HM301D registers
- Advanced Plot of data acquired
- Lead Off detection
- Body impedance measurement

Key products

- **HM301D** (Diagnostic quality acquisition system for bio-electric sensors and bio-impedance measurements)
- **STM32F103CBT6** (ARM Cortex-M3 32 bit MCU)
- **ESDALCL6-2SC6** (Very low capacitance and low leakage current ESD protection)

MARKETING Package Available
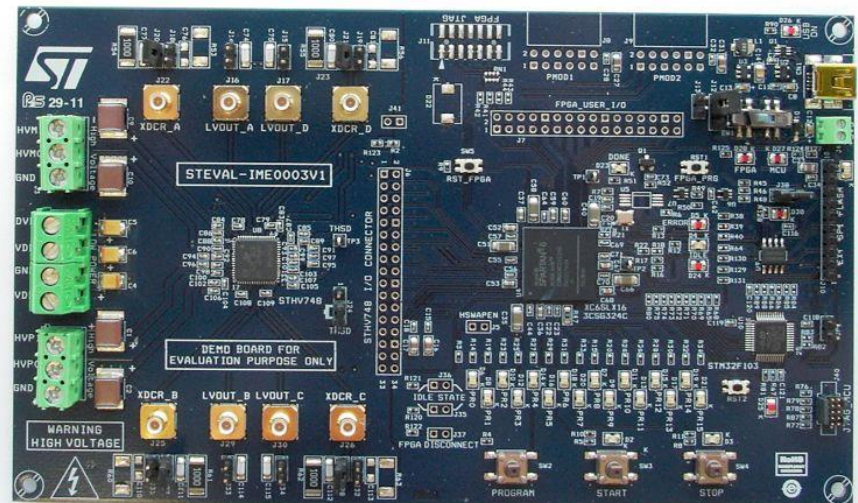
Order Code: STEVAL-IME002V2

4-Channels 5-Levels Ultrasound Demonstration Board based on STHV748

Key features

- 4-channel outputs: high voltage and low voltage BNC connectors
- Load simulator using signal equivalent circuits
- Possibility to set up own load simulator
- Up to 16 preset waveforms, upgradable through USB
- Human machine interface to select, start and stop the generation of the preset waveforms

Key products

- **STHV748** (Quad ±90 V, ±2 A, 3/5 levels, high-speed ultrasound pulser)
- **STM32F103C8T6** (ARM Cortex-M3 32 bit MCU)
- **LDS3985M33R** (Very low drop and low noise BiCMOS 300 mA voltage regulator)
- **ST1S12G12R** (Step-down switching regulator)
- **USBUF02W6** (2-line EMI filter and ESD protection)
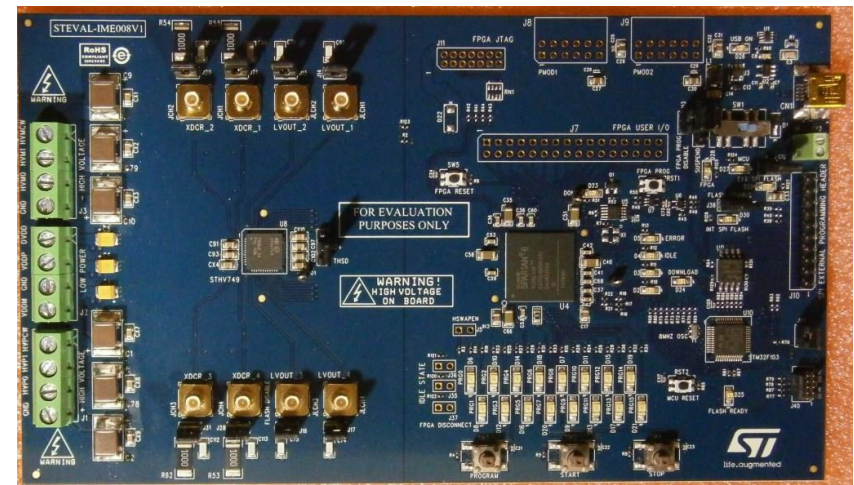

Order Code: STEVAL-IME003V1

4-Channels 7-Levels Ultrasound Demonstration Board based on STHV749

Key features

- 4-channel outputs: high voltage and low voltage BNC connectors
- Load simulator using signal equivalent circuits
- Up to 16 preset waveforms, upgradable through USB
- Human machine interface to select, start and stop the generation of the preset waveforms

Key products

- **STHV749** (Quad ±90 V, ±2 A, ±4 A, 3-, 5-, 7-level RTZ, high-speed ultrasound pulser)
- **STM32F103C8T6** (ARM Cortex-M3 32 bit MCU)
- **LDS3985M33R** (Very low drop and low noise BiCMOS 300 mA voltage regulator)
- **ST1S12G12R** (Step-down switching regulator)
- **USBUF02W6** (2-line EMI filter and ESD protection)
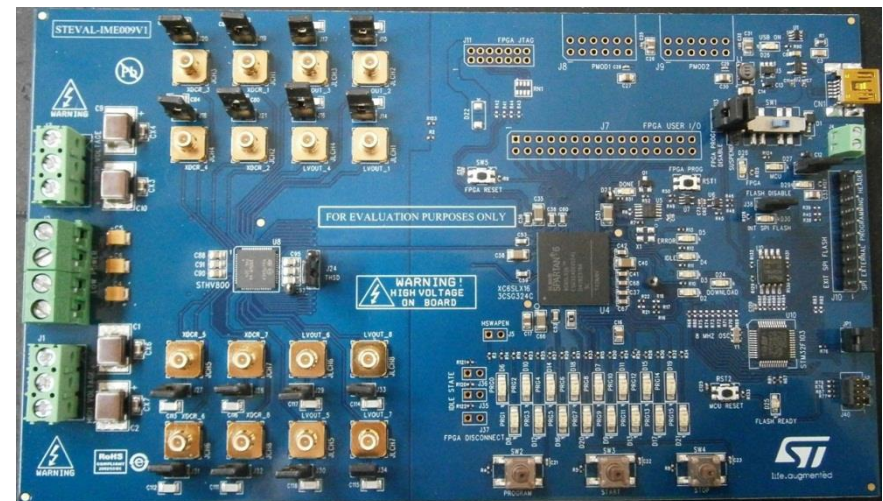

Order Code: STEVAL-IME008V1

8-Channels 3-Levels Ultrasound Demonstration Board based on STHV800

Key features

- 8-channel outputs: high voltage and low voltage BNC connectors
- Load simulator using signal equivalent circuits
- Up to 16 preset waveforms, upgradable through USB
- Human machine interface to select, start and stop the generation of the preset waveforms

Key products

- **STHV800** (Octal ±90 V, ±2 A, 3-level RTZ, high-speed ultrasound pulser)
- **STM32F103C8T6** (ARM Cortex-M3 32 bit MCU)
- **LDS3985M33R** (Very low drop and low noise BiCMOS 300 mA voltage regulator)
- **ST1S12G12R** (Step-down switching regulator)
- **USBUF02W6** (2-line EMI filter and ESD protection)

Order Code: STEVAL-IME009V1

Wristband for Fitness

Wearable Pedometer: counts steps taken and calculates distance travelled, calories consumed, maximum speed

Key features

- STM32L0 based low power design for low operating and standby power consumption
- NFC connectivity to connect with smartphones & tablets
- Android App to record & display distance travelled, calories consumed, maximum speed in graphical format
- Micro USB connector for battery charging

Key products

- **STM32L051** (MCU-ARM Cortex™-M0+)
- **M24SR64** (Dynamic NFC/RFID tag IC)
- **LIS3DH** (3-axes "nano" Accelerometer)
- **STNS01PUR** (Li-Ion battery charger with LDO)

Android App Available

MARKETING Package Available

STDEMO-WPEWBR151 (Red)
STDEMO-WPEWBG151 (Green)
STDEMO-WPEWBW151 (White)
Sample Order available on STAM

Thanks