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Specifications

Shimmer3/3R
ECG/EMG Unit



Key Features

5-wire, 4-channel ECG, measuring bipolar limb leads and user's choice of V1 - V6

Measure 2 channels of EMG data with a common reference electrode

Software configurable right-leg drive for common-mode interference rejection

Software configurable amplifier gain

Software configurable data rate

Respiration demodulation capability on-chip

Lead-off detection capability on-chip

Test signal on-chip for validation purposes

EEPROM for board identification, with 2032 of its 2048 bytes free for user data

Introduction

The ECG/EMG unit, also known as the ExG unit, provides a configurable digital front-end, optimised for the measurement of physiological signals, for example 5-wire ECG (Electrocardiography) and 2-channel EMG (Electromyography).

The ECG/EMG unit also has integrated inertial sensing via accelerometers, gyroscope, magnetometer and altimeter, and provides highly accurate and scientifically reliable raw data to allow complete control over capture and interpretation of sensed data in real-time.

Product Overview

While addressing the challenges of mobility, the ECG unit can record the pathway of electrical impulses through the heart muscle, and can be recorded on resting and ambulatory subjects.

When configured for EMG, the unit can also measure and record the electrical activity associated with muscle contractions and their activation level, or can be used to analyse and measure the biomechanics of human movement.

Applications

Cardiac research (heart rate, heart rate variability)

Biomechanics, muscle activity, gait and posture disturbance

Fatigue analysis

Sports technique, performance and medicine

Neuro Rehabilitation

Tremor Analysis

Veterinary Science

Orthopaedics

Thoracic Bioimpedance (Respiration)

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Supporting Software

Shimmer ConsensysPRO & ConsensysBASIC
Shimmer LabVIEW Instrument Driver
Shimmer MATLAB Instrument Driver
Shimmer Java / Android API
Shimmer C# API

Supporting Hardware & Accessories

Calibration Stand
Biophysical Leads
Straps, Documents, Charging Dock/Base, Case
Electrodes

Technical Specifications

Gain	Configurable (1, 2, 3, 4, 6, 8, 12)
Data rate	software configurable (125, 250, 500, 1000, 2000, 4000, 8000 SPS). These are the ADS1292R's own rates; the Shimmer samples at no more than 4096 Hz
Input differential dynamic range[1]	approx 800 mV (for gain = 6)
Bandwidth[2]	8.5 kHz (amplifier); the digital filter's −3 dB point is 0.262 × the data rate (131 Hz at 500 SPS)
Ground	Wilson Type Driven Ground
Input Protection	ESD and RF/EMI filtering; Current limiting; inputs include defibrillation protection (survive only, not repeat). NOTE: For inputs LA and RA the defibrillation protection is not present in order to facilitate Respiration demodulation
Connections	Input RA, Input LA, Input LL, Input Vx, Reference (RL) All Hospital-Grade 1mm Touchproof IEC/EN 60601-1 DIN 42802 jacks
Ultra-lightweight (31 grams); Compact Dimensions (65 x 32 x 12 mm)	
EEPROM memory	2048 bytes

[1] Calculated specification; exact value subject to environmental and component variation. ADS1292R is optimized for power with a differential input signal of approx. 300 mV when gain = 6.

[2] Specifications from ADS1292R datasheet; exact value subject to environmental and component variation.

Configured for EMG

Input Protection	ESD and RF/EMI filtering; Current limiting; inputs include defibrillation protection (survive only, not repeat). NOTE: For inputs Ch2N and Ch2P the defibrillation protection is not present in order to facilitate respiration demodulation when the unit is configured as an *ECG Unit*; see *Measuring Respiration* in the *ECG User Guide*
Connections	Input Ch1N, Input Ch1P, Input Ch2N, Input Ch2P, Reference (Ref) All Hospital-Grade 1mm Touchproof IEC/EN 60601-1 DIN 42802 jacks

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Shimmer3/3R Specifications

	Shimmer3R	Shimmer3
Processor	ST STM32U5A5 (32-bit Arm Cortex-M33), runs at 48 MHz 2.5 MB RAM, 4 MB flash	TI MSP430F5437A (16-bit), up to 24 MHz 16 KB RAM, 256 KB flash
Radio	Bluetooth Classic and Bluetooth Low Energy: Ezurio Vela IF820 module (453-00171C), integrated chip antenna	Class 2 Bluetooth: Roving Networks RN-42 (Classic), or Microchip RN4678 (Classic and Bluetooth Low Energy) on later units
Storage	microSD slot: microSDHC and microSDXC cards, FAT32 or exFAT Read by a PC through a *Shimmer Dock* or *Consensys Base*, or over USB-C as a removable drive Files can be listed, read and deleted over Bluetooth	microSD slot: microSD and microSDHC cards up to 32 GB, not microSDXC; an 8 GB SanDisk card is supplied Full-speed transfer to a PC through a *Shimmer Dock* or *Consensys Base*
Battery and power	3.7 V rechargeable lithium battery, 400 mAh, with a safety circuit Battery voltage monitoring, on a converter of its own Soft power control of the Bluetooth radio and the sensor supplies	3.7 V rechargeable lithium battery: 450 mAh, or 400 mAh on current units, with a safety circuit Battery voltage monitoring Soft power control of the Bluetooth radio and the microSD card Designed for EN 60601-1 compliance
Integrated sensors	3-axis low-noise accelerometer and 3-axis gyroscope (ST LSM6DSV) 3-axis wide-range accelerometer (ST LIS2DW12) 3-axis magnetometer (ST LIS2MDL) Pressure and temperature sensor (Bosch BMP390, or BMP581 on later units)	3-axis low-noise accelerometer 3-axis wide-range accelerometer 3-axis gyroscope 3-axis magnetometer Pressure and temperature sensor

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