IcyHeart

System-on-Chip for wearable ECG monitoring

IcyHeart is a System-on-Chip (SoC) for ECG signal acquisition, processing and RF transmission enabling the realization of tiny battery powered wearable smart systems.

The IcyHeart SoC incorporates a 3-lead low noise ECG front-end, an 863-928 MHz ultra-low power RF transceiver, a 16/32-bit 120 µA/MHz dual-MAC DSP RISC core with 96 kibytes of SRAM and various peripherals.

Advanced ECG signal analysis can be implemented in the embedded processor to monitor cardiac events and minimize RF transmission needs.

The integrated power management with capacitive step-up and step-down converters enables the use of any voltage source between 1 V and 3.6 V.

Applications

- Pulse rate detection for fitness applications
- ECG on demand
- Event monitors for arrhythmia detection
- At-home wireless monitoring
- Medical and Body Area Networks (BAN)

Availability

- Samples and evaluation kits are available
- Packaging options: bare die or QFN
- The IcyHeart platform is configurable to customer specific requirements

Features

- Three ECG channels (Input >2.5MΩ< 10pF, IEC 60601)
- Auxiliary analog input (e.g. for temperature)
- Lead off detection to ensure correct positioning of the leads
- Active ground
- Low noise amplification (< 1 uVrms with 500 Hz bandwidth)
- 16-bit Sigma-Delta ADC
- Power consumption (not including RF) with 500 Hz BW: 850 µW at 1 V
- 16/32-bit icyflex1 DSP / CPU, 120 µA / MHz, dual MAC
- Ultra-low power 863-928 MHz transceiver / Tx 4.5 mW @ -5 dBm, Rx 3 mW @ -105 dBm
- 96 kiB low leakage SRAM (program and data)
- Voltage operation from 1 V to 3.6 V
- Minimum current standby mode with RTC based on 32 kiHz crystal oscillator: 1 µA at 25 °C/1 V
- Integrated power management
- Standard digital interfaces: SPI, UART, I2C, I2S and GPIO
- Software development kit: gcc, gdb, ISS, Eclipse

csem