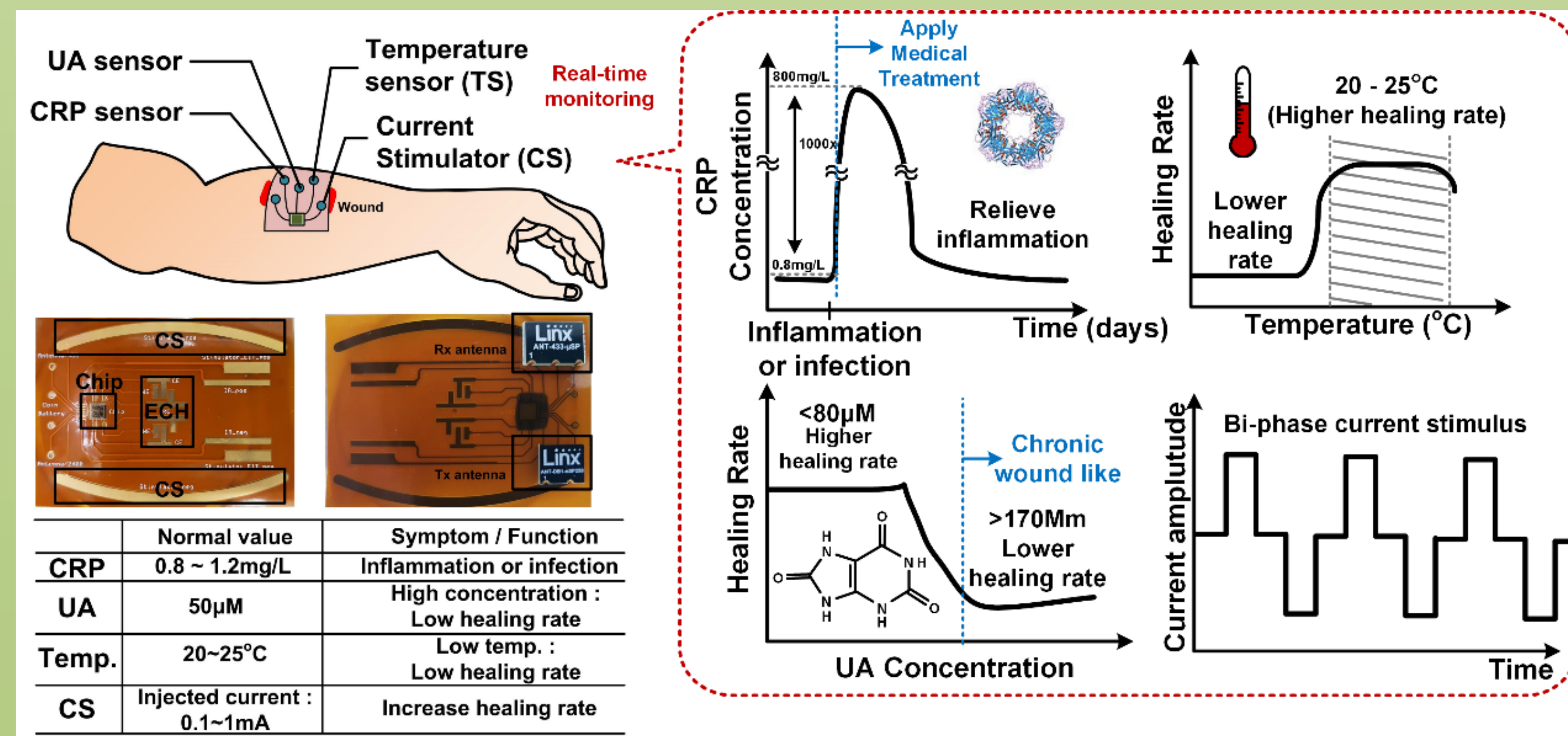


Abstract

This paper presents a fully integrated wireless multimodality chip with CA/CV/FSCV/SWV electrochemical sensing at a scanning rate from 0.08–400 V/s, temperature monitoring, and electrical stimulation for wound healing progress monitoring. The time-based readout circuitry with a 1–20X scalable resolution at the same LSB current in the DAC feedback achieves R^2 linearity of 0.995 over a wide current detection range (2 pA–12 μ A) while consuming 49 μ W at a 1.2 V supply.

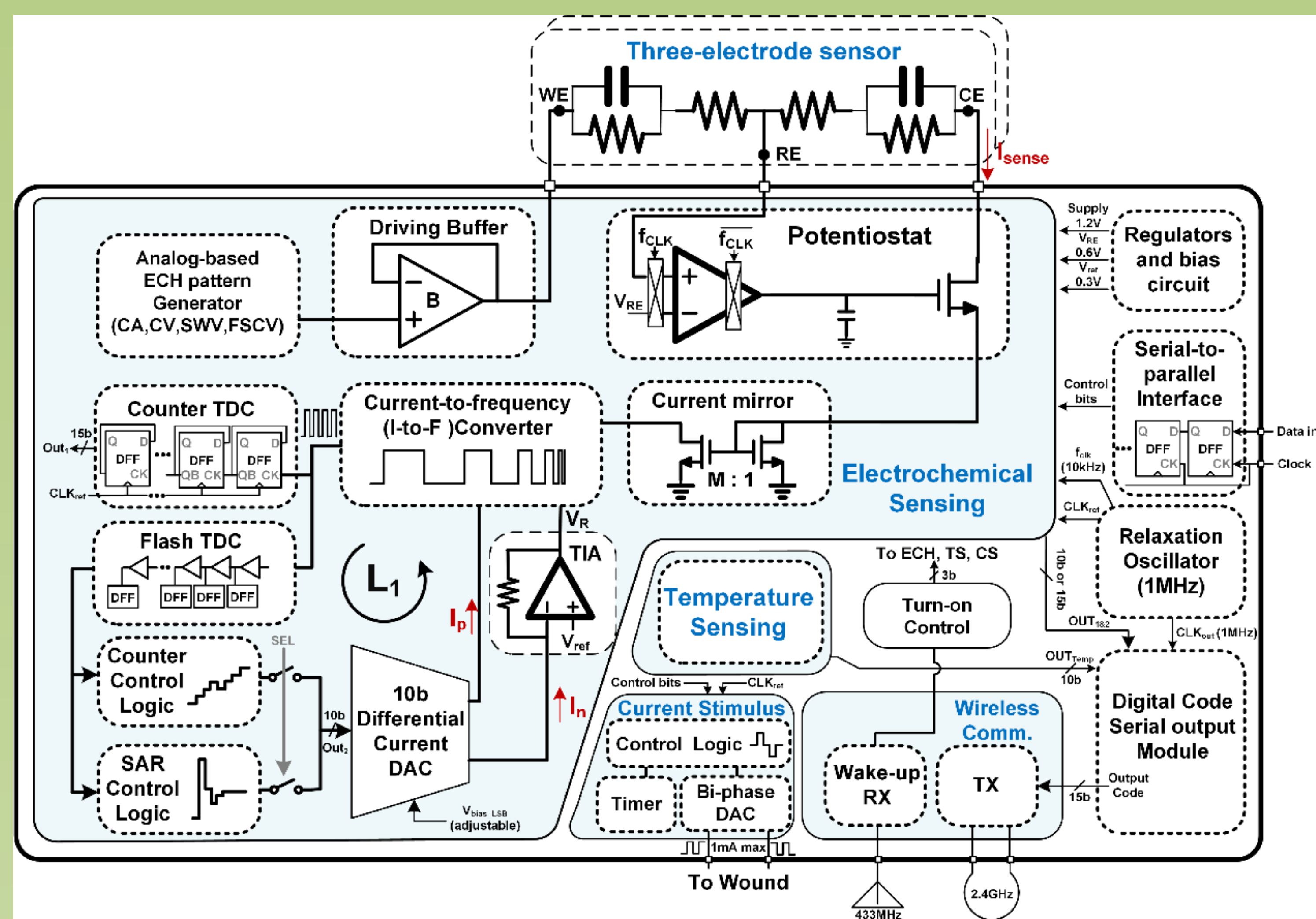
Highlight

1. The design integrates a multimodality readout IC for measuring critical biomarkers, namely C-reactive protein, uric acid, and temperature, and an electrical current stimulator for monitoring chronic wound healing progress.
2. An analog waveform generator is designed using current reducer techniques to eliminate the large passive RC components. The design can perform CA/CV/FSCV/SWV measurements with a scanning rate of up to 400 V/s.
3. A dynamic threshold voltage adjustment improves the resolution of the current-to-digital converter by 20X without scaling the LSB current of the DAC in the feedback. The resolution of the design is 2 pA for a current range up to 12 μ A, resulting in a dynamic range of 129 dB and R^2 linearity > 0.995 .

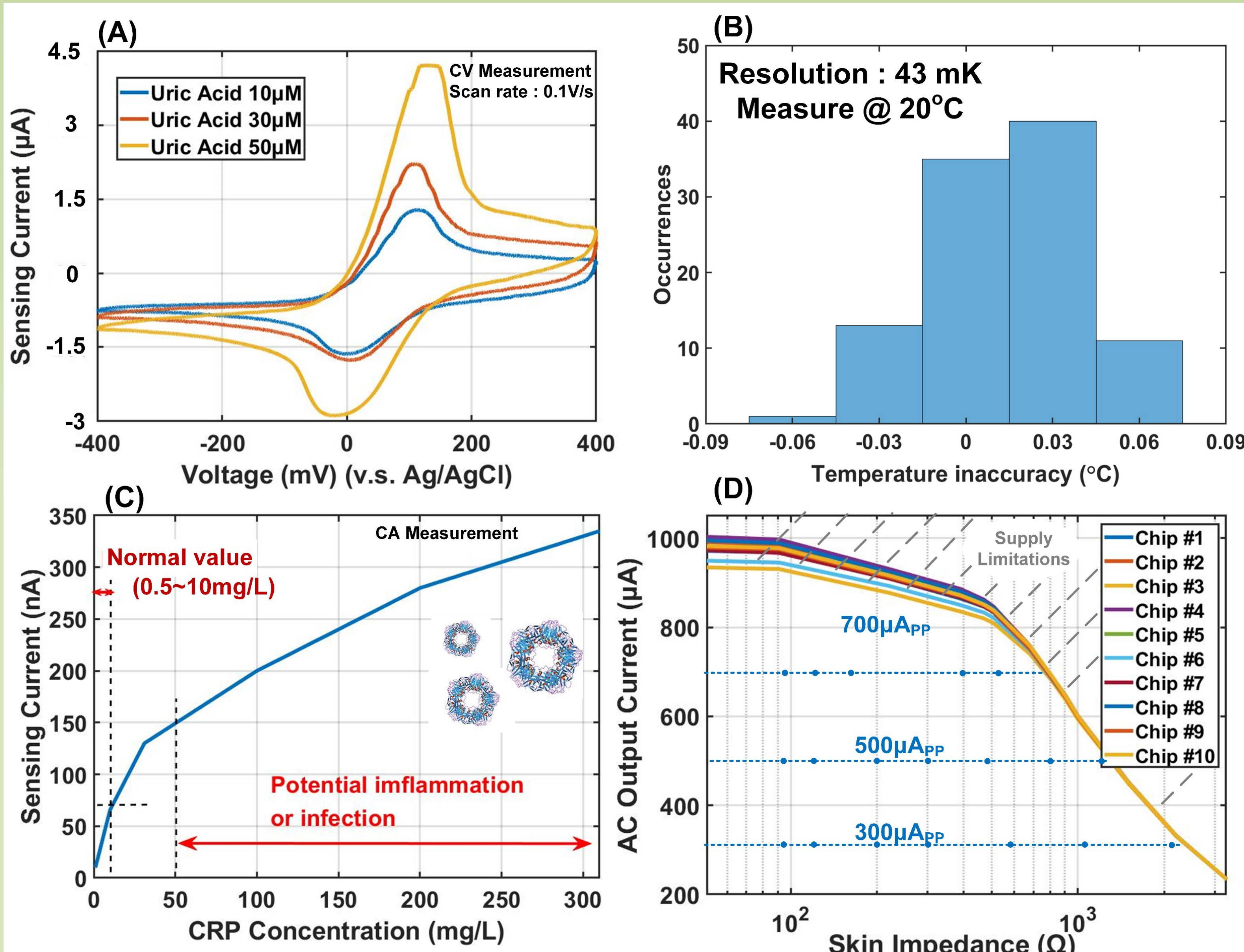


	Function Modality	Architecture
Modality 1	Electrochemical Sensing	Potentiostat with on-chip pattern generation (CA, CV, SWV, FSCV) +time-based digitalization converter
Modality 2	Temp. Sensing	Leakage-based
Modality 3	Current Stimulus	Cascode current DAC

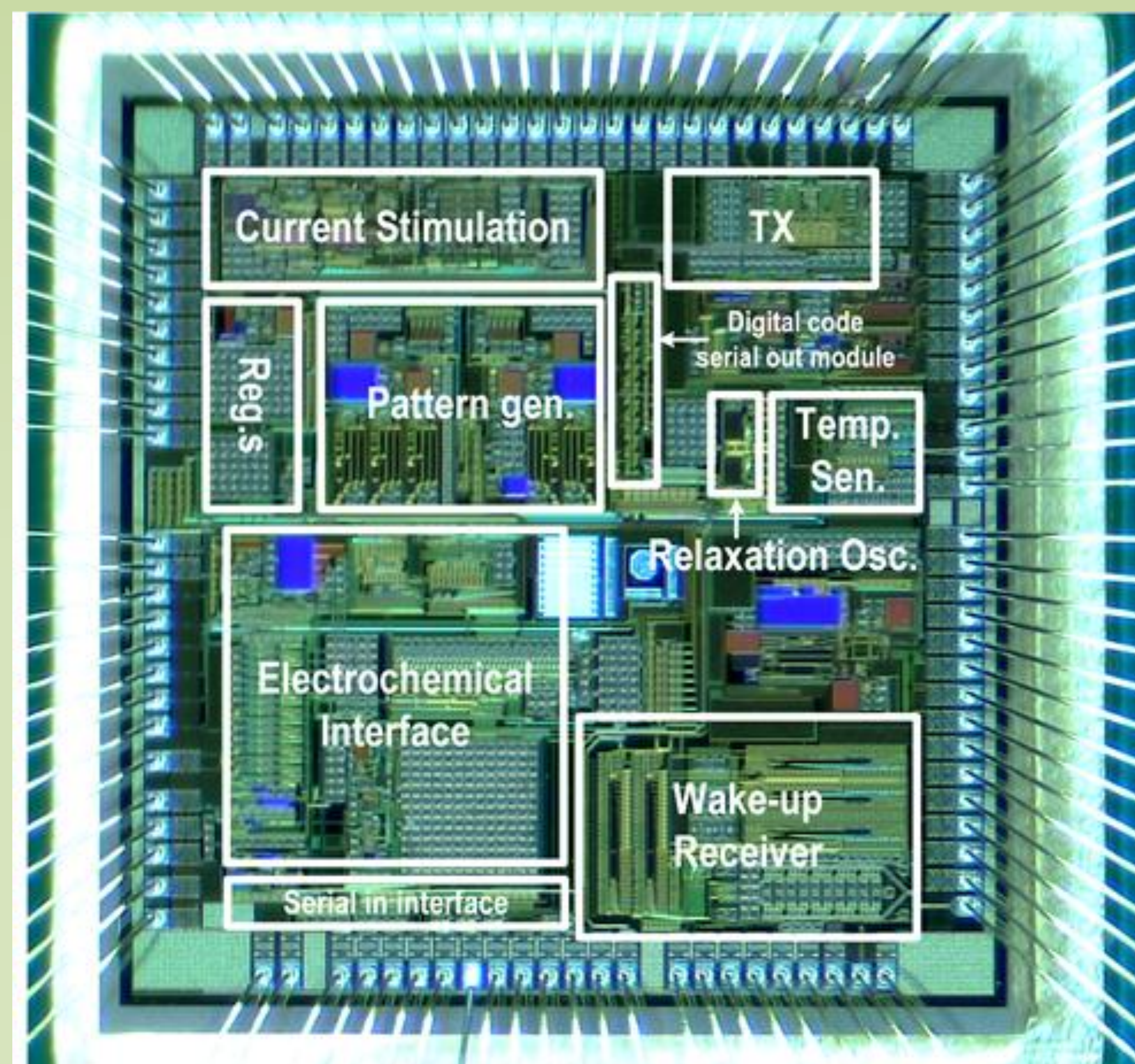
The Chronic Wound Monitoring System



Schematic of the proposed multimodal SoC



Measurement results for UA, temp, CRP and current stimulation



Chip micrograph