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作品名稱	應用於生醫感測之 CMOS 微型永續能源晶片系統 Miniature Sustainable Energy Harvesting System for Biomedical Sensing Application
隊伍名稱	沒有不可“能” / Nothing is impossible
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作品摘要 Abstract

為解決可攜式電子產品長久以來的能源問題，本企劃將開發一高效率的永續節能之 CMOS 生醫感測系統晶片。此系統將可結合直流（太陽能、熱溫差能）和交流（無線電波耦合、振動能）兩種環境能量發電技術，把環境能量擷取進來，並有效率地轉換成電子系統電路操作的直流電壓。其具備高能量轉換效率之 AC/DC 轉換器，利用全波整流技術將交流訊號轉換為直流電源，並進一步利用切換電容技術結合由太陽電池或熱溫差發電元件所產生的直流電源後，透過一 DC/DC 升壓直流轉換器，對系統的電池或超級電容進行充電儲能。此外，本作品含有一電源管理控制之數位微控制器，其能將應用系統中暫不使用的電路區塊關掉，減少系統中不必要的功率浪費。此系統亦進一步整合 ECG 無線讀取電路系統於同一晶片中，展示永續生醫感測系統平台之可能，提供一個永續且微小的人體生理感測節點設計方案。所設計之能源擷取系統，亦可拿來與一般隨身消費性電子產品結合，如手錶、計算機等，增進隨身消費性電子產品的國際競爭力。

In order to solve the long-lasting energetic issue, this project is going to develop a CMOS green/biomedical circuit system which features high power-efficiency and energy-saving. The system can combine DC energy, such as solar energy and thermoelectric energy, with AC energy, such as piezoelectric oscillation energy and RF coupling energy, together by using energy harvesting technique, and then further boost this harvested energy to large enough DC voltage efficiently for its electrical application circuits. An AC/DC converter with tremendous high conversion efficiency (80 %) is involved. It takes the advantage of the technology of full-wave rectification to transfer the AC signal to DC energy. After combined together with the DC energy from a solar cell or a thermoelectric generator by a switched-capacitor combiner, the total harvested output voltage is up-stepped by a PFM boost DC/DC converter (82 % transfer efficiency) to recharge the battery in the system. A microcontroller, which is capable of power management, is also implemented in this project to prevent from the waste of unnecessary power consumption. Furthermore, a wireless ECG recording system is integrated in this chip to demonstrate the possibility of a sustainable and miniature biomedical sensing platform.