# D11-008

作品名稱 **能量採集積體電路系統之自動合成設計**
**Automatic Synthesis Design for Energy Harvesting IC System**

隊伍名稱 **充充充 Charging**
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## 作品摘要

本篇論文針對能量採集積體電路系統提出一自動設計工具，此軟體以Visual Basic(VB)作為開發工具，應用此合成工具可縮短設計到的上市時間。為了達到最佳的電池充電控制，提出的設計加入最大功率點追蹤演算法與充電控制。

接著，開發一個新型的量測系統並結合網路，用戶可以在任何時間或地點得到能量採集系統的信息，且測量時不需其他任何儀錶。最後以模擬與實驗結果驗證所提出的方法之準確性和優越的性能。

本論文中，已完成三顆晶片設計，分別為可規劃式PWM IC、數位式PWM IC、類比數位轉換(ADC) IC。控制器晶片可以由提出的程式合成，並經由國家晶片系統設計中心下線。這些IC加上一個 8位元微控制器晶片，實現了新型太陽能充電器。

## ABSTRACT

In this paper, an automatic design tool for energy-harvesting circuit and system is developed with the visual basic (VB) software. The synthesis tool can be used to shorten the design time to market. The design with charge controller and maximum power point tracking (MPPT), in order to achieve optimal battery charging control function.

Meanwhile, a smart metering system is developed to measure the energy-harvesting system's information with an online system. In this way, users can get the proposed system's information at any time and from anywhere. Finally, computer simulations and experimental results demonstrate the superior performance of the proposed technique.

Three chips are finished in this thesis. All of the chips had been taped out through the design flow of the Chip Implementation Center (CIC). These chips are analog pulse-width modulator (APWM) IC, digital pulse-width modulator (DPWM) IC, and analog to digital converter (ADC) IC, respectively. The ICs are combined with an 8-bit microcontroller chip to implement the novel solar charger.

# D11-034

作品名稱 **單線雙向傳輸之嵌入式全數位溫度感測晶片設計**
**Embedded All Digital Bi-Directional Transmission Temperature Sensor Chip Design**

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## 作品摘要

目前傳統溫度感測器大都未考量以多點溫度偵測來監控系統晶片內各功能方塊溫度變化，而[15]雖有設計多點偵測，但仍有高電壓敏感度、繞線複雜度高等問題需要解決。故本文以單線雙向傳輸之全數位溫感測器為基礎，提出高效率雙向傳輸之嵌入式全數位溫度感測器，使每個溫度感測器與溫度監控系統只需”一條訊號線”進行資料傳輸，降低多點偵測時溫度監控系統與溫度感測器之間繞線複雜度，並且利用時基電路在一次溫度感測動作中對溫度感測器進行多次取樣，使其獲得良好之溫度精確度。也針對系統晶片內某些對溫度特別要求高的應用，在溫度監控系統電路中加入”平均模式”對溫度之數位碼取平均，有效改善因電壓供應雜訊所造成的誤差。因此，本文之高效率雙向傳輸之嵌入式全數位溫度感測器較傳統溫度感測器更適用於大型系統晶片中嵌入多點溫度感測。 測試晶片實現於 TSMC 0.18μm Mixed-Signal SALICIDE (1P6M+, 1.8V/3.3V) 製程，包含溫度監控系統與四點溫度感測器電路，其中溫度監控系統電路面積僅0.01005mm2、每點溫度感測器電路面積為0.00206 mm2，解析度為 0.18℃，誤差約為-1.8℃~0.9℃，量測範圍為-40℃~130℃，最高功率消耗在取樣率 6.2K samples/Sec.溫度130℃時，約為 153μW。

## ABSTRACT

At present, the traditional temperature sensors [1]-[15] are not been considered in order to multi-point temperature monitoring system to detect the function of the chip temperature blocks, only [15] designed for multi-point detection,  but its still a high voltage sensitivity, temperature sensors and temperature monitoring system between the complexity of higher routing problems to  be solved. Therefore, in this thesis, bi-directional single line transmission of  all-digital temperature sensor, based on proposed the highly efficient transmission embedded bi-directional all-digital temperature sensors, so that each temperature sensor and temperature monitoring systems only "a signal line" for data transmission, reducing the multi-point temperature monitoring system to detect when the temperature sensor and winding between the complexity, and the Time-Based circuit is used number of sample to temperature sensor on a temperature sensing action, temperature sensor so that a good precision of temperature. In this thesis, the system chip also focus on some special requirements for high temperature applications, research and development in the circuit temperature monitoring system to include the "average mode" of the digital temperature code from the average, effective in improving the  supply voltage due to noise caused by the temperature sensor error. Therefore, this thesis proposed an efficient embedded all-digital bi-directional transmission temperature sensors in comparison to traditional temperature sensors, is more applicable to a system embedded in multi-chip temperature sensor. Test chip to achieve in TSMC 0.18μm Mixed-Signal SALICIDE (1P6M +, 1.8V/3.3V) process, including temperature monitoring system and four-point temperature sensor circuit, which the area  of temperature monitoring system is only 0.01005mm2, each temperature sensor's area is 0.00206mm2, 0.18℃ resolution, the error is about -1.8℃~ 0.9℃, measurement range of -40℃~ 130℃, the highest power consumption, when sampling rate at 6.2K samples/Sec, temperature 130℃, about 153μW.