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.