低溫複晶矽薄膜電晶體之溫度效應用於溫度感測器之研究

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摘要

多晶矽薄膜電晶體(poly-Si TFTs)基於其優於非晶矽薄膜電晶體(amorphous silicon TFTs)的電流驅動能力，最近在液晶顯示器(AMLCD)及有機發光二極體(AMOLED)顯示器的周邊電路整合應用上皆備受矚目。

近年來，顯示器產業一直致力於追求高價值的面板，而將各種感測器整合進面板是其中一種增加面板價值的方法。被整合的感測器包括了光感測器、影像感測器以及氣體感測器等等。在本論文中，提出一種新式可整合進面板的溫度感測器。此感測器電路包括感測、讀出與數位化,均以低溫多晶矽薄膜電晶體元件構成，故可在不變動製程步驟和不增加成本的情況下達到整合的目的。

考慮到元件的溫度特性以及變動性的影響，以漏電流的溫度變化為感測的依歸。更進一步考慮到元件變動性包括漏電流大小變動以及臨界電壓的漂移對溫度感測電路所產生的量測誤差。此論文中提出一種校正方法，成功的將元件變動性所產生的量測溫度誤差降至5℃。

Study on the Thermal Effect of LTPS TFT for Temperature Sensor Application

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Abstract

Low Temperature Polycrystalline Silicon (LTPS) thin film transtrators (TFTs) have attracted much attention in the application on the integrated peripheral circuits of display electronics such as active matrix liquid crystal displays (AMLCDs) and active matrix organic light emitting diodes (AMOLEDs) due to its better current driving compared with a-Si (amorphous silicon) TFTs.

Recently high-end flat panel display is what we are pursuing. Sensor on panel is one of value-added functions for display panel. Various sensors are created on panel such as ambient light sensor, image sensor, gas sensor and so on. In this thesis, we propose a temperature sensor circuit, which includes sensing, read out and digitization, can directly use LTPS TFTs identically fabricated with the pixel TFT. So we don't need any additional cost.

Considering the thermal characteristic and variation characteristic of LTPS TFTs, off region current is utilized. In addition a calibrate method is proposed to deal with the device variation. This method can reduce the sensing errors of measuring to 5℃.

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