

低溫複晶矽薄膜電晶體之單位光通量漏電 流特性分析

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摘要

低溫複晶矽薄膜電晶體(LTPS TFTs) 由於擁有良好的電流驅動能力，目前已被廣泛的運用在主動式矩陣液晶顯示器(AMLCD)上。另外許多高附加價值的功能像光感測器、觸控式面板、影像掃描等等，都被試著整合至顯示器電路週邊的玻璃基板上，倘若我們可以直接利用低溫複晶矽薄膜電晶體做為光偵測器而達到上述的效果的話，不僅可以降低功率的消耗，也可以簡化製程的步驟。因此低溫複晶矽薄膜電晶體的光效應是值得我們去探討的。

在此篇論文中，首先確認了光漏電流在低溫複晶矽薄膜電晶體中主要產生的區域為汲極端，之後我們進一步的去研究關於製造額外缺陷態對光效應的影響。熱載子效應(Hot Carrier effect)與自發熱(Self Heating effect)效應兩種分別提供了不同種類的缺陷，並在不同的汲極電壓下對光效應產生不同的影響。此外，我們還修正了之前所提出關於描述光漏電流行為的經驗公式，修正後新的經驗公式更能符合完整描述光漏電流在不同溫度與缺陷下的行為變化。因此我們利用新經驗公式中各個參數與缺陷態之間的變化結果，試著去提出一個簡單的模型來解釋這些不規則的光電流變化與缺陷態的關係。

Study on the Mechanism of Unit-Lux Current for LTPS TFTs

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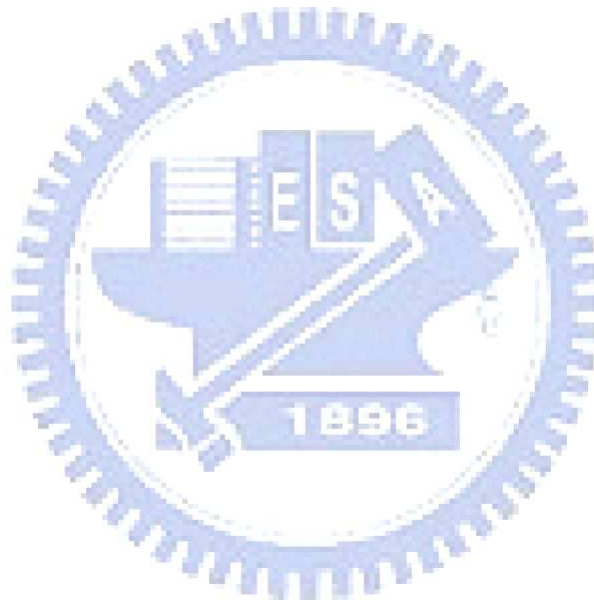
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Abstract

Low temperature polycrystalline silicon (LTPS) thin-film transistors (TFTs) have been widely used on the active-matrix liquid-crystal displays due to the excellent current driving ability. In addition, all kinds of attempts of high added value functions like light sensor, touch panel, image scanner, etc. have been reported to integrate display circuits to peripheral area of the glass substrate. If we integrate the ambient light sensor with the same LTPS technology used to fabricate the display, the power consumption can be reduced, and the fabrication process can be simplified. Therefore, the photosensitivity of LTPS TFTs is a significant design consideration for achieving high-image-quality display panels

In this thesis, first, we confirm that the photo leakage current occurs mainly on the drain side. Furthermore, photo current behaviors affected by extra defect states creation have been also investigated. Hot-Carrier and Self-Heating effects afford different types of defect states creation in the energy gap and change photo leakage current versus drain bias. Moreover, we also revise the empirical formula for ULC to provide even more accurate description of the photo induced current under the

presentation of defect states and temperature. Thus, we proposed a ULC model for TFT versus the changing trend of fitting factors to explain these illumination behaviors.



Acknowledgements

首先，要感謝我的指導教授戴亞翔老師。讓我很慶幸我可以加入D A D S 這個氣氛歡樂的實驗室大家庭。兩年來，感謝老師的包容與指導。在老師的帶領之下，不僅增進了我許多學術上的經驗與知識能力，在閒暇之餘，老師不時也會傳授我們關於未來在職場上所要面對到的一些待人處事的道理。因為這些點點滴滴的累積，都讓我的碩士生涯獲益良多！

此外，還要感謝彥甫與士哲兩位博班學長，在我研究的過程中總是不厭其煩的與我討論，並給予我許多建議與幫助，使我能夠順利地完成我的碩士論文。感謝這兩年來實驗室裡一起扶持努力的好夥伴：耿維、游博、紹文、歐趴。還有已經畢業的學長姐：首席、小黑、翔帥、曉嫻、憲哥、龍哥、阿貴、偉倫、育德、琬萍、、、，感謝學長姊們無論是在研究、生活甚至是在我找工作的時候，經常帶給我精神上的鼓勵與幫助。感謝學弟小瓜呆、趴趴、紹宏的加入幫忙。在碩士兩年的生涯裡，D A D S 的大家一同創造了許多甜美的回憶！因為有你們的陪伴，才能賦予我有精彩且多采多姿的碩士生活。感謝我的好姐妹林米奇與好學妹郁心，很貼心的幫助我修訂英文。感謝施旻、阿釘、竹君、茹倫以及新竹九降風的好partner：moss、小龜、hiking、tex、詩鎰、大雕、孟珊、士豪。還有其他國小、國高中與大學的好朋友們，因為有妳們的陪伴與支持，讓我適時的放鬆與宣洩壓力，研究的路途上才能更充滿動力！

最後，最感謝的是我親愛的家人。尤其是我的父母，一直都給予我最大的支持與包容，家人的後盾讓我在求學的路途上無後顧之憂。使我無論面臨到再大的困境與難題，都能以樂觀永不放棄的態度去迎刃而解！還有在新竹很照顧我的阿妹阿姨與豪泰姨丈，讓在異鄉求學的我常常倍感溫暖。感謝所有一直支持我幫助我的人，現在碩士這個階段性的挑戰完成了！我會繼續努力加油！期望未來也能夠再接再厲！一路順遂並且成功的走下去！

國珮 2009/06/17

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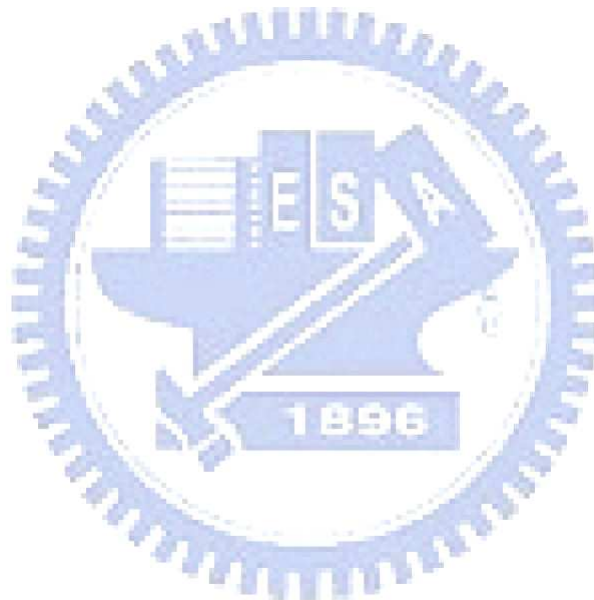


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