

友達光電公司委託學術機構研究計畫書

低溫多晶矽數位電路元件資料庫之建立與驗證

**Cell Library Construction and Verification for
LTPS-TFT Digital Circuits**

計畫編號：

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二、計畫摘要：

LTPS (Low Temperature Poly Silicon)-TFT LCD具有高電子移動率的特性，可將週邊的電路同時製作在玻璃基板上，達到系統整合(System on Panel)的目標。而System on Panel不但可節省驅動IC與控制IC的成本、並且具有縮減組裝及系統設計時程、降低EMI等特性，因此，將成為未來LCD相關電路設計的主要趨勢。然而，目前System on Panel的設計，仍存在著許多技術上的瓶頸，同時LTPS-TFT LCD也尚未有Cell Based Design Flow來輔助電路設計，也因此，設計者必需以Full Custom的方式設計，這個方法耗損過多的人力與時間成本。

為了實現Cell Based LTPS-TFT Circuit Design的願景，本計畫以LTPS-TFT Cell Library的建立與驗證為主要目標，並且以LCD的核心電路—時序控制電路(Timing Control Circuit)為設計實例，以此電路驗證Cell Based LTPS-TFT Circuit設計的可行性，並進一步實現高效能的時序控制電路，提供高品質、高穩定的畫面。

System on a Panel is becoming the new paradigm for TFT-related circuit designs. It has the advantages in reducing the cost of discrete ICs, shortening the design cycle, as well as decreasing the electromagnetic interference (EMI). In order to build a circuit on panel, people tend to use special device materials such as Low Temperature Poly Silicon (LTPS)-TFT for various types of circuits on LCD panels. However, due to the substantial deviation on the device characteristics, most of the LTPS-TFT designs are still based on full-custom design style and therefore may waste much human resource and lead to a long turn-around time.

In order to achieve a robust and repeatable LCD circuit design flow, we propose to construct a LTPS-TFT cell library for digital circuit designs. We will start by reviewing the existing timing controller design and analyze the potential library cells out of it. We will then create a prototype LTPS-TFT cell library and adopt the conventional CMOS design techniques for the library verification and optimization. The library parameters will then be tuned by the real manufacturing data and the types of cells will be extended for more LCD controller circuit designs. Finally, we will revise the designs and library by using the proposed automatic TFT cell-based design flow.