

TFT Model Extraction For Various Technologies & Brightness

Service Project:

While developing the advanced amorphous-silicon TFT devices for high-performance display panels, customer was finding it difficult to correctly model the TFT device based on measured data, especially for leakage currents. This project goal was to extract a complete set of model parameters that fit all physical measurements, for various technologies and at different brightness. Legend’s MSIM-TFT Model Extractor was used for this service project.

Measured Data Provided:

The input data required for model extraction are (1) channel length of device, (2) channel width of device, (3) ambient temperature, and (4) device currents.

Each set of measurement data are I_{DS} vs V_{GS} at various V_{DS} . Based upon the combinations of 3 technologies and 4 brightness environments, there are 12 sets of measured data provided, with the format shown below

Technology A		Brightness A	Brightness B	Brightness C	Brightness D
V_{DS}	V_{GS}	I_{DS}	I_{DS}	I_{DS}	I_{DS}
		:			
10	-11	$3.86e-13$	$4.73e-12$	$1.08e-11$	$1.87e-11$
10	-10	$5.72e-13$	$6.28e-12$	$1.33e-11$	$2.39e-11$
		:			
Technology B		Brightness A	Brightness B	Brightness C	Brightness D
		:			

Model Extracted:

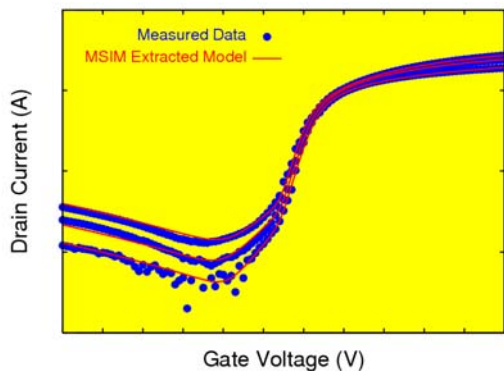


Fig. 1: I_{DS} vs V_{GS} at various V_{DS} for TFT Device of Technology A at Brightness A

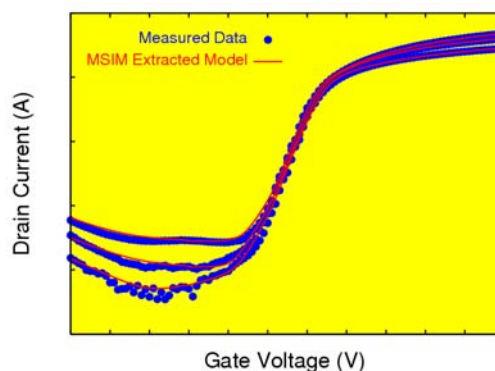


Fig. 3: I_{DS} vs V_{GS} at various V_{DS} for TFT Device of Technology B at Brightness A

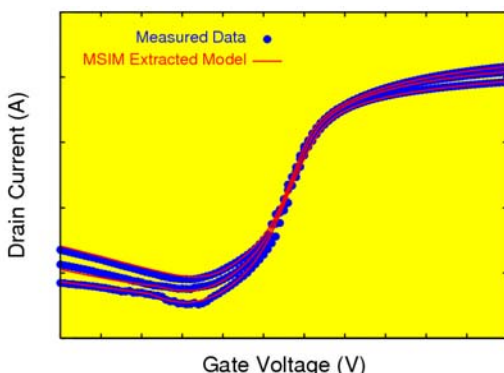


Fig. 2: I_{DS} vs V_{GS} at various V_{DS} for TFT Device of Technology A at Brightness B

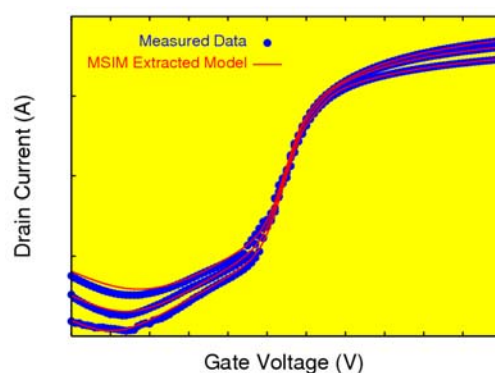


Fig. 4: I_{DS} vs V_{GS} at various V_{DS} for TFT Device of Technology B at Brightness B

Summary:

As shown from Fig. 1 to Fig. 4, the accuracy of TFT models extracted during this service project has been well proven by comparing with those measured data for various technologies and at different brightness conditions. Especially, those extremely low leakage currents simulated using the extracted models have been very well fitted with the physical measurements. In summary, the high-accuracy models produced through this model extraction service project will enable the precise simulation and analysis of panel designs for high-quality display products.