Legend Design Technology

Application Note

IGZO Model Extraction

For Amorphous-IGZO TFT Devices

Purposes:

The amorphous-IGZO TFT device is becoming popular due to its superior characteristics of high field-effect mobility, large-area uniformity, transparent, and low-temperature deposition of fabrication. Without accurate a-IGZO models implemented in circuit simulation tool, customers cannot correctly predict the circuit behavior and design performance. This Application Note is to illustrate how to extract a complete set of a-IGZO model parameters that fit all available physical measured data. MSIM-IGZO Model Extractor was used here.

Measured Data Provided:

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

The set of measurement data are I_{DS} vs V_{GS} at various V_{DS}, and I_{DS} vs V_{DS} at various V_{GS}. Based upon the given technology, we have the measured data with the format shown below

I_{DS} vs V_{GS}

V_{DS}	V_{GS}	I_{DS}
		:
1.1	2.5	3.2481e-06
		:
1.1	10.3	5.5770e-05
		:
4.1	0.5	1.7083e-10
		:
4.1	15	6.2963e-04
		:

I_{DS} vs V_{DS}

V_{GS}	V_{DS}	I_{DS}
		:
6	7.5	7.0588e-05
		:
6	1.0	2.3529e-05
		:
12	10	3.1177e-04
		:
12	3.5	1.7647e-04
		:

Model Extracted:

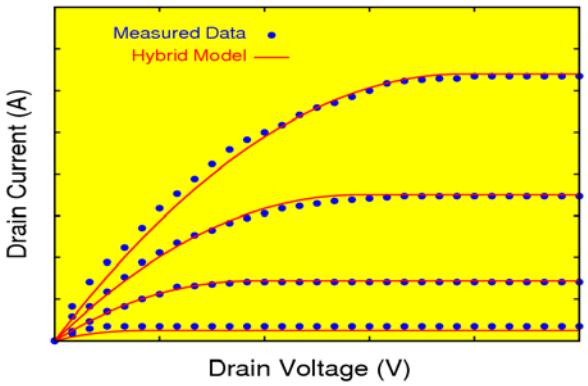

Fig. 1: MSIM extracted model and measured data comparison of I_{DS} versus V_{DS} at various V_{GS} for a-IGZO TFT device

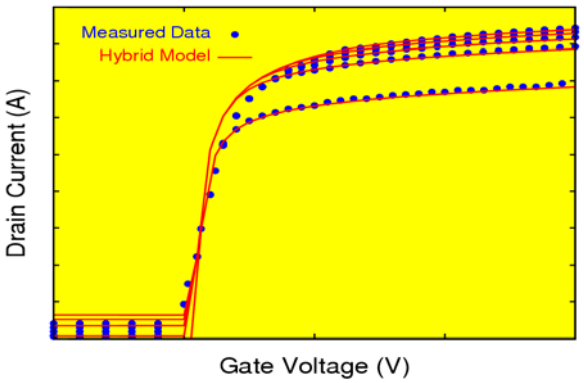

Fig. 2: MSIM extracted model and measured data comparison of I_{DS} versus V_{GS} at various V_{DS} for a-IGZO TFT device

Summary:

As shown in Fig. 1 and Fig. 2, the accuracy of a-IGZO TFT models extracted has been fully proven by comparing with the measurement data. The MSIM-IGZO Model Extractor can correctly extract the a-IGZO model, and effectively predict the behavior of a-IGZO TFT device. In summary, the high-accuracy a-IGZO models extracted shall enable the precise simulation and analysis of IGZO designs for high-quality display products.