

Evaluation on MOSFET diodes, the need of diode in 2PASCL and doctoral thesis contents

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Abstract

The paper demonstrate the simulation results of MOSFET diodes. The objective is to find the current characteristics by sweeping the V_{DS} . We also examine the needs for the MOSFET diodes in 2PASCL. Finally, the first proposal of graduate thesis table of contents is presented.

1 Introduction

In this paper we simulate generic diodes, MOSFETs diodes used in the 2PASCL circuits and the current values at different values of L and W .

2 MOSFET diodes characteristic

The circuit diagrams are as shown in the Fig. 1. It shows generic diodes D_1 and D_2 (both Motorola 1N4148 silicon, A:0.2V, V:75V). M_3 is the pMOS with L/W 40/40 μ and M_1 , M_2 and M_4 are nMOS. Both pMOs and nMOS are using 0.18 μ CMOS process. V_{dd} is 1.8 V. The current conditions are demonstrated in Fig. 2. For nMOS M1, from the $-I_s(M1)$ vs. V_{DS} graph, the R_{DSon} measured is 1 kOhm. From the second graph, we understand that the V_{thn} increase when the voltage source is added between the transistor and GND.

3 The needs of MOSFET diodes in 2PASCL (2-inverter chain)

3.1 Output voltage evaluation

In Fig. 3, the diagrams of 2-inverter chains of 2PASCL are shown. The details of the diagram are listed in Table 1. The results of this evaluation are as

Table 1 Details of 2-inverter chain 2PASCL

| | pMOS diodes L/W | nMOS diodes L/W |
|---------|-------------------|-------------------|
| Dia (a) | 0.18/0.6 μ | 0.18/0.6 μ |
| Dia (b) | none | none |
| Dia (c) | none | 0.18/0.6 μ |
| Dia (d) | 40/40 μ | 0.18/0.6 μ |
| Dia (e) | 1.8/5 μ | 1.8/5 μ |

follows in Fig. 4, second graph. The input frequency is 100 MHz, taking as the worse condition.

3.2 Current flow evaluation evaluation

The results of the measurement of I_d and I_s are as shown in Fig. 4, third and fourth graphs.

3.2.1 Dissipated energy evaluation

The results in Fig. 4 fifth graphs shows that only I(B6)+I(B7) has the highest energy dissipated based on the supplied energy measurement.

4 The needs of MOSFET diodes in 2PASCL (4-inverter chain)

In Fig. 5, the diagrams of 4-inverter chains of 2PASCL are shown. The details of the diagram are listed in Table 2. The results are demonstrated in Fig. 6, where the first graph is the input and power clocks, the second graph is the output waveforms, the third is the measured drain currents at the transistors, the fourth is the source currents and follows by the supplied energy graphs.

Table 2 Details of 4-inverter chain 2PASCL

| | pMOS diodes L/W | nMOS diodes L/W |
|---------|-------------------|-------------------|
| Dia (a) | none | none |
| Dia (b) | 0.18/0.6 μ | 0.18/0.6 μ |
| Dia (c) | none | 0.18/0.6 μ |

5 Conclusion

The needs for pMOS diodes is not essential for 2PASCL.

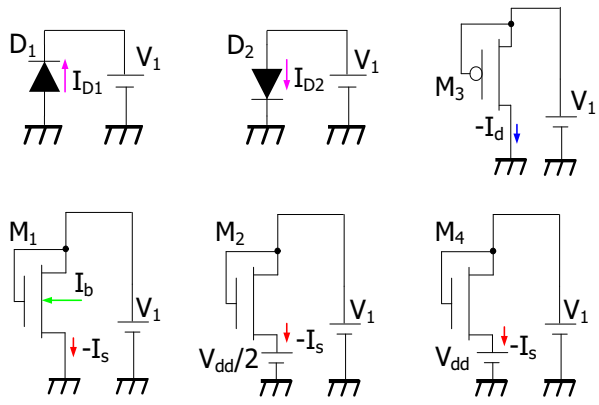


Fig. 1 Evaluation on the generic and MOSFETs diodes used in 2PASCL.

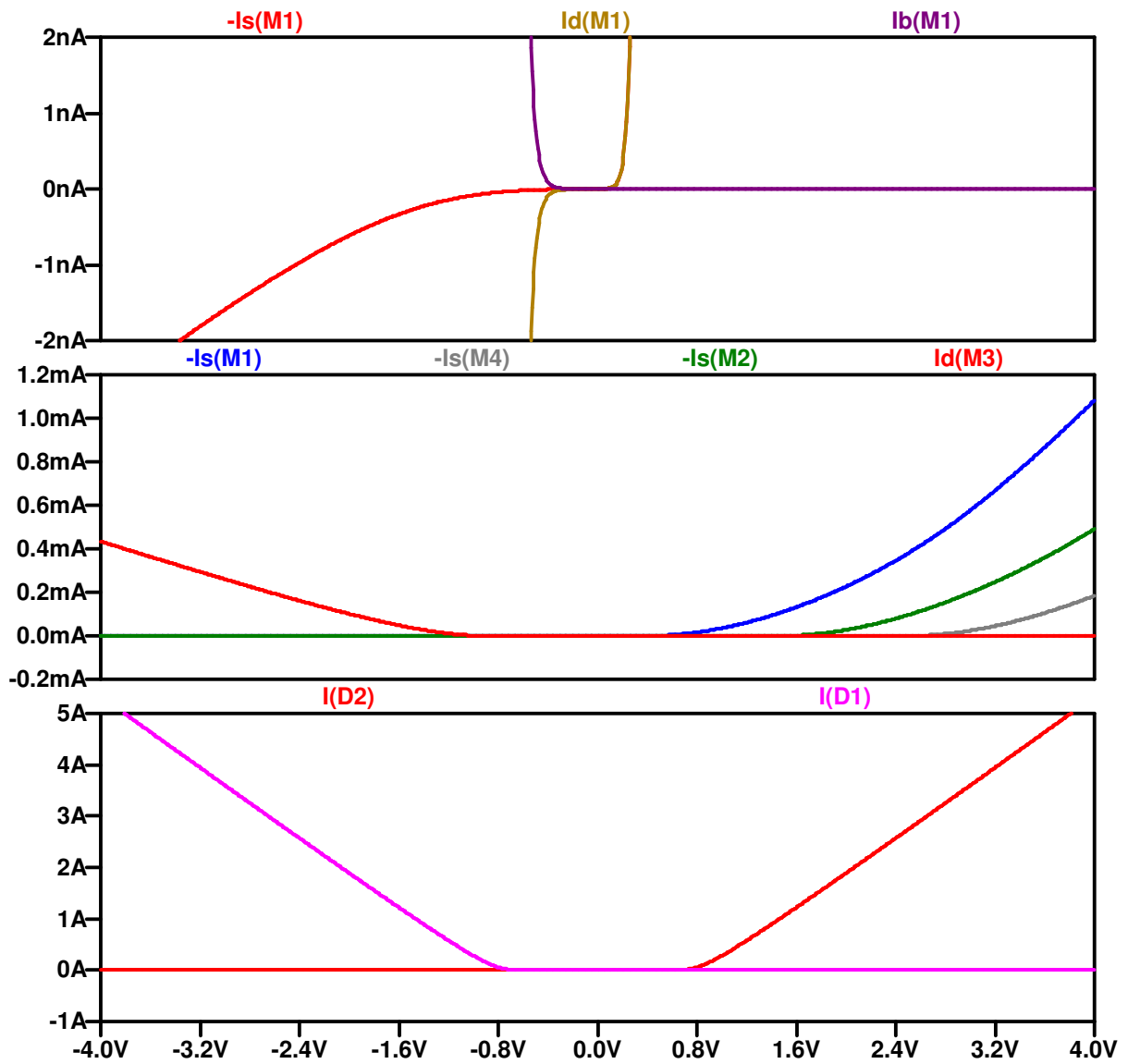


Fig. 2 Current flow in the transistors vs. drain-source voltage (V_{DS}).

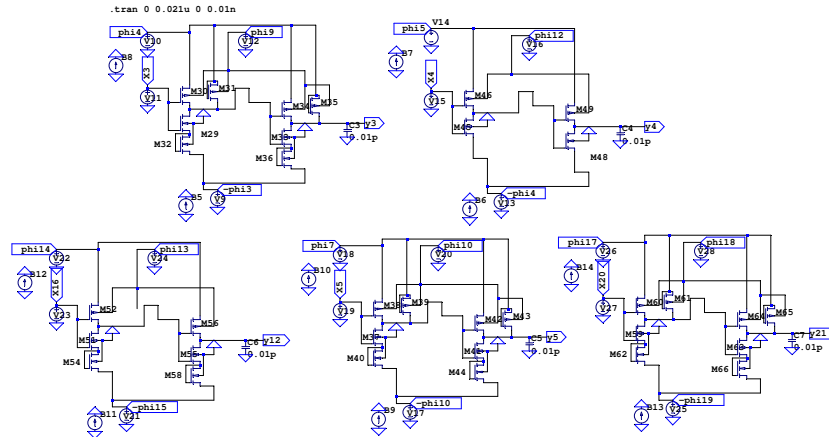


Fig. 3 2-inverter chain evaluation circuit diagram.

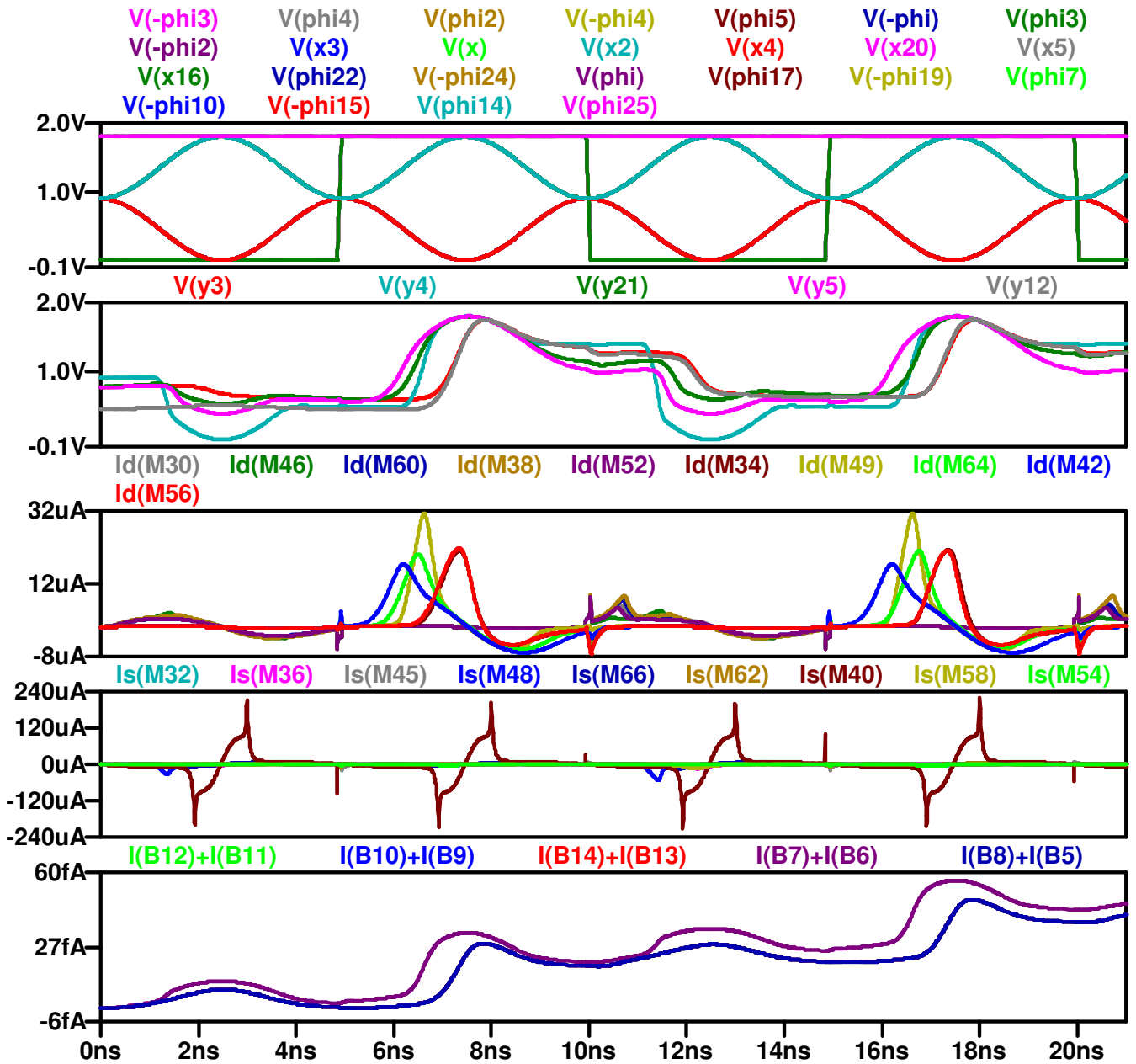


Fig. 4 2-inverter chain evaluation results from the simulation.

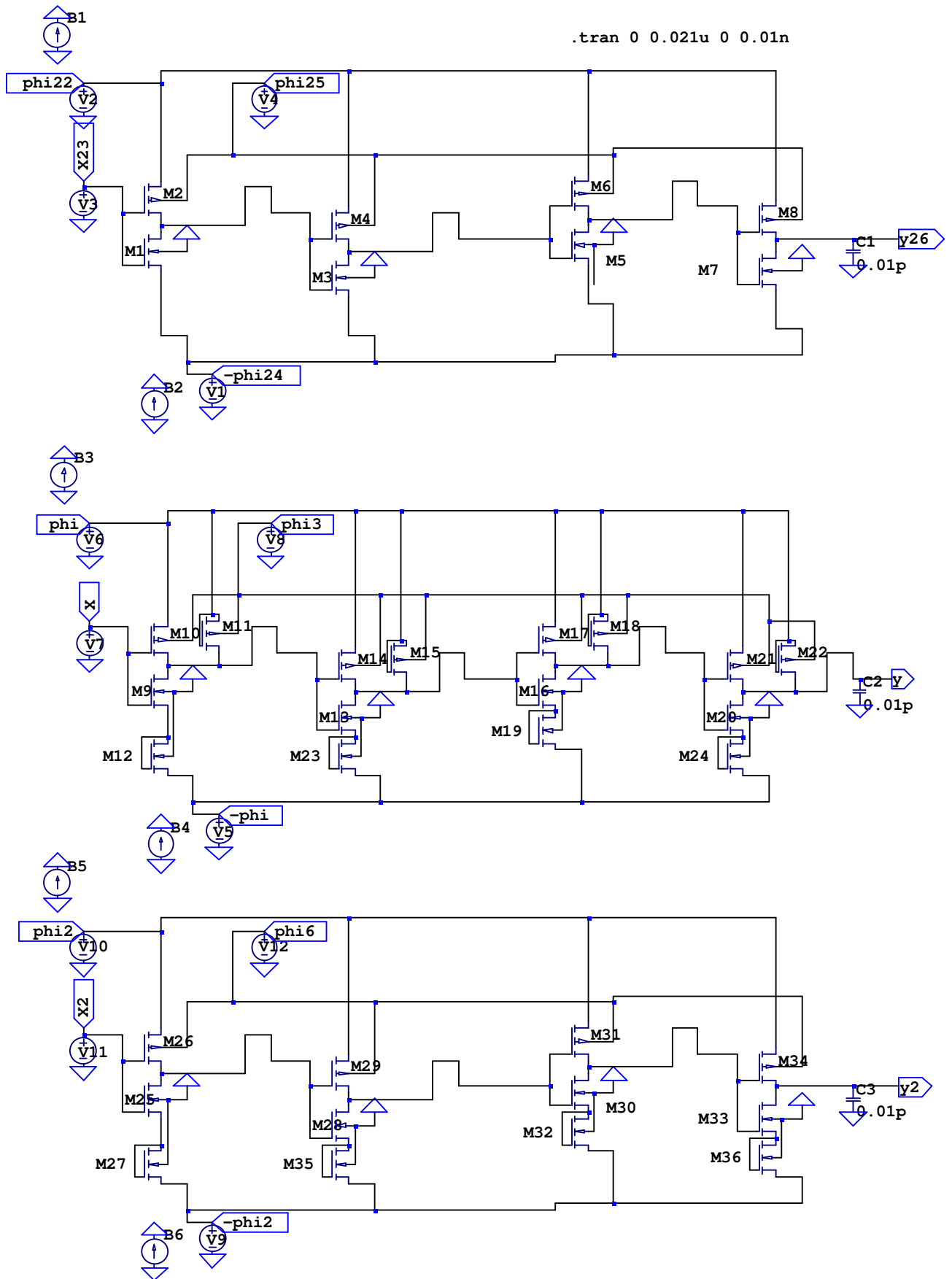


Fig. 5 4-inverter chain evaluation circuit diagram.

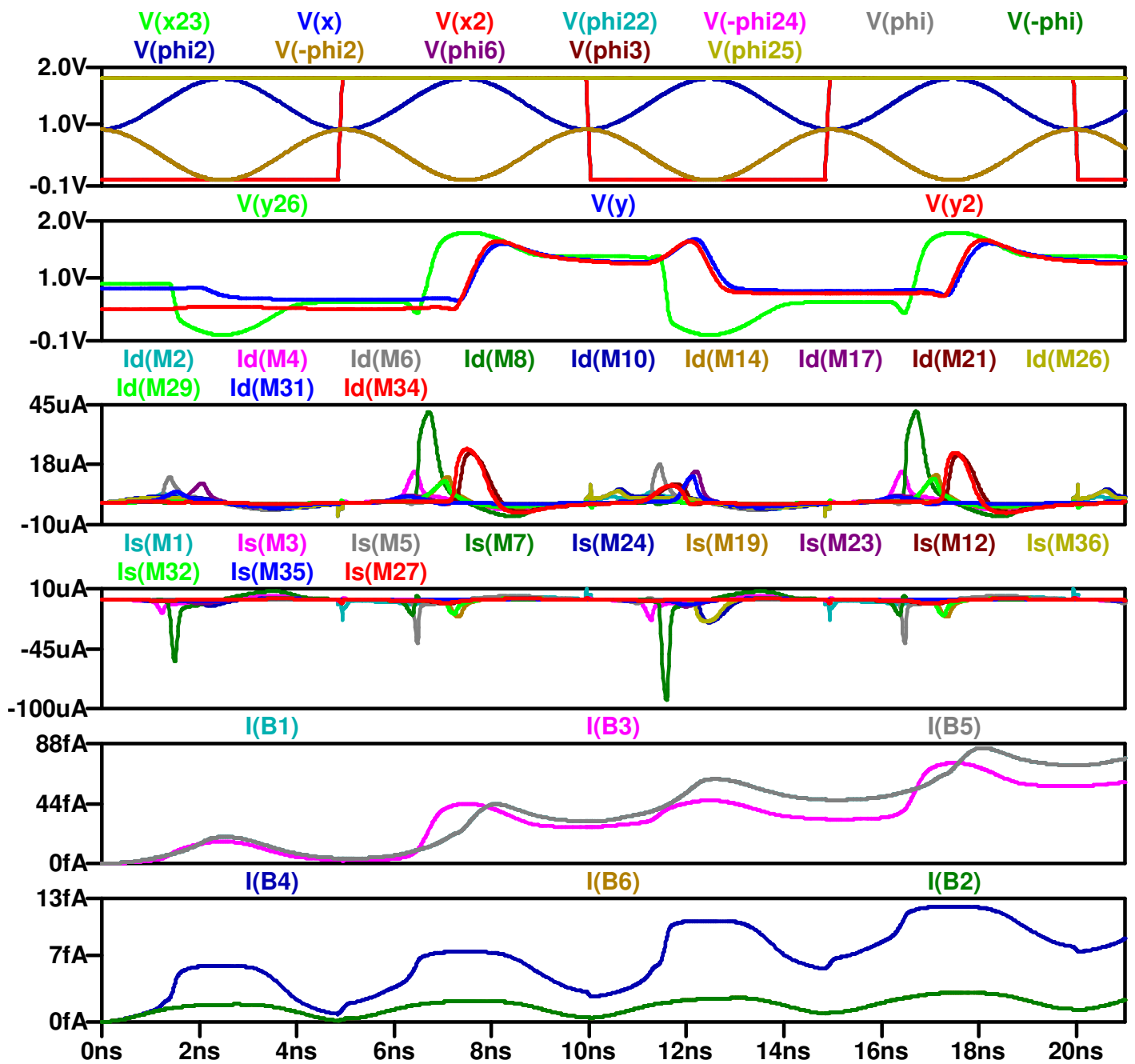


Fig. 6 4-inverter chain evaluation results from the simulation.