PROJECT REPORT

Title: Construction of a 4x4 MRAM memory array using LTSpice tool.

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Abstract:

- MRAM stands for Magneto Resistive Random Access Memory.
- It basically consists of elements whose resistance varies with applied magnetic field ,ie,it is made up of magneto resistive materials.
- It mainly contains 2 ferromagnets
a)   one fixed magnetic polarity
b)   A variable magnetic polarity
- Here the Bit line and Digit line is orthogonal to each other.
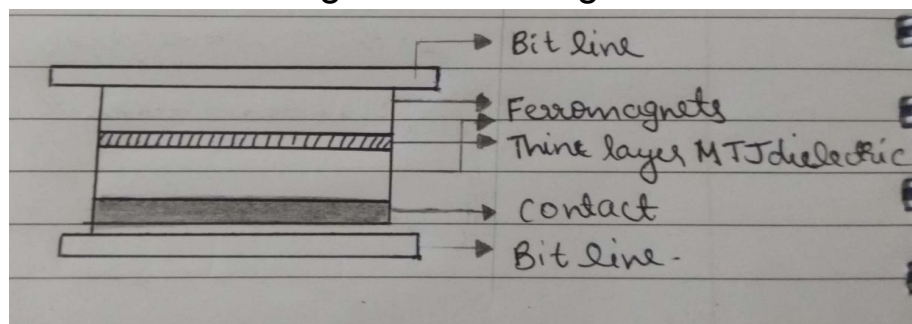
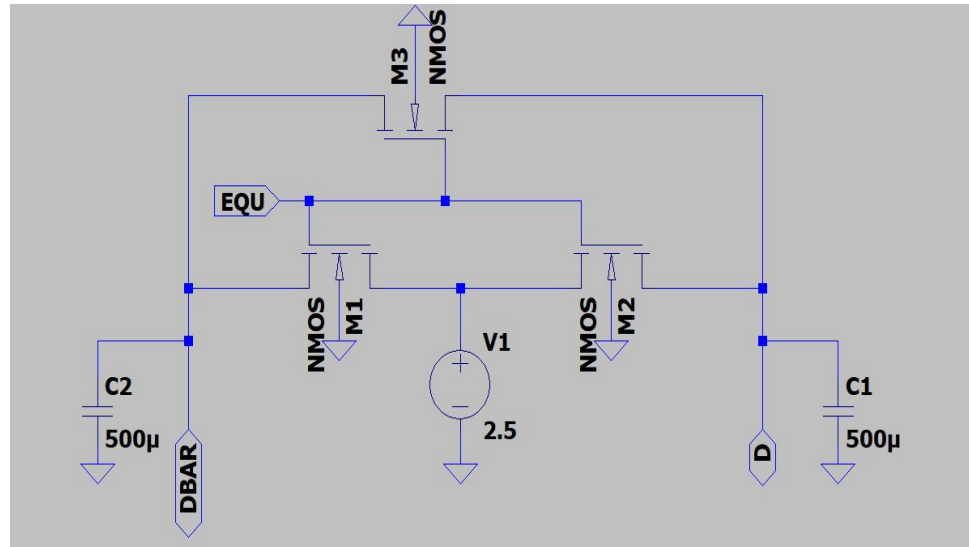
MRAM Cell Used:
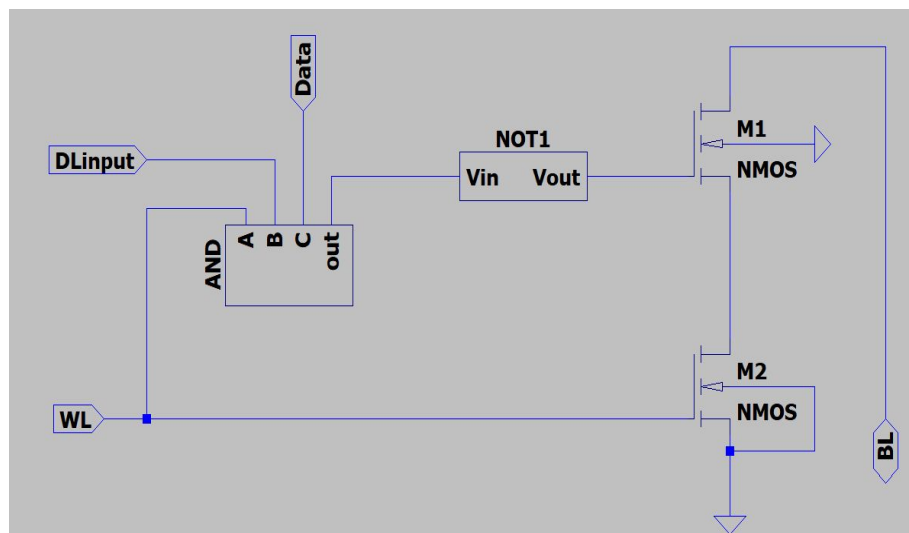
WL: Word Line
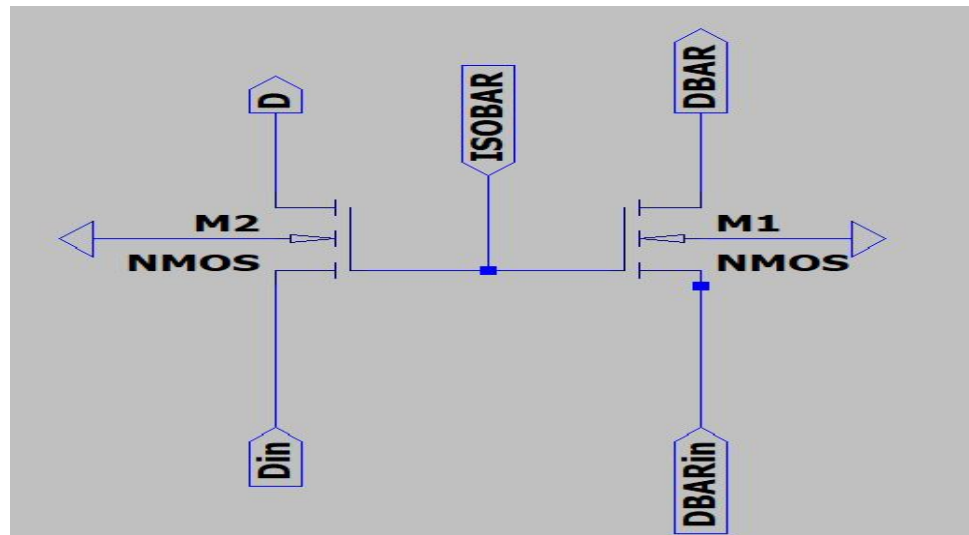BL: Bit Line
DLinput: Column Selector
The transistor sizing we have used here is 3.6u/0.6u.
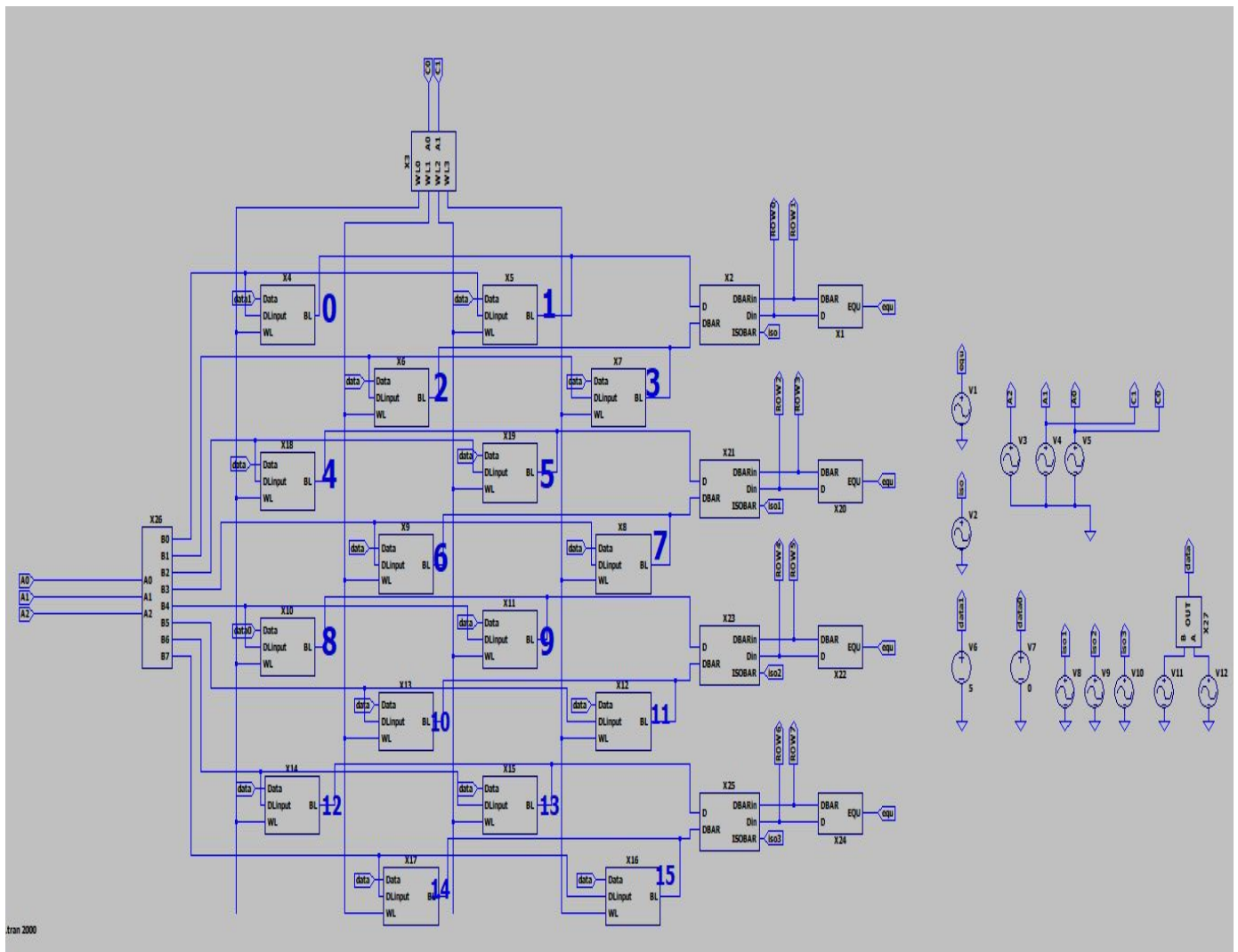
Peripheral Circuits used:

1. Pre charge Circuit

2. Isolation Circuit:

Complete Schematic:

- Here the row decoder and the column decoder is used to select a particular cell for performing the read and the write operations.
- The decoders are simple NOR decoders.

The Read and Write Operations:

- Here for the various operations we are using 4 cells .
- a) Read '1'   ---> cell 0
- b) Write '0'   ---> cell 5
- c) Read '0'   ---> cell 8
- d) Write '1'   ---> cell 13

- The total simulation time is of 2000s which is divided into 4 sections for all the operations. Every operation lasts for 500s.

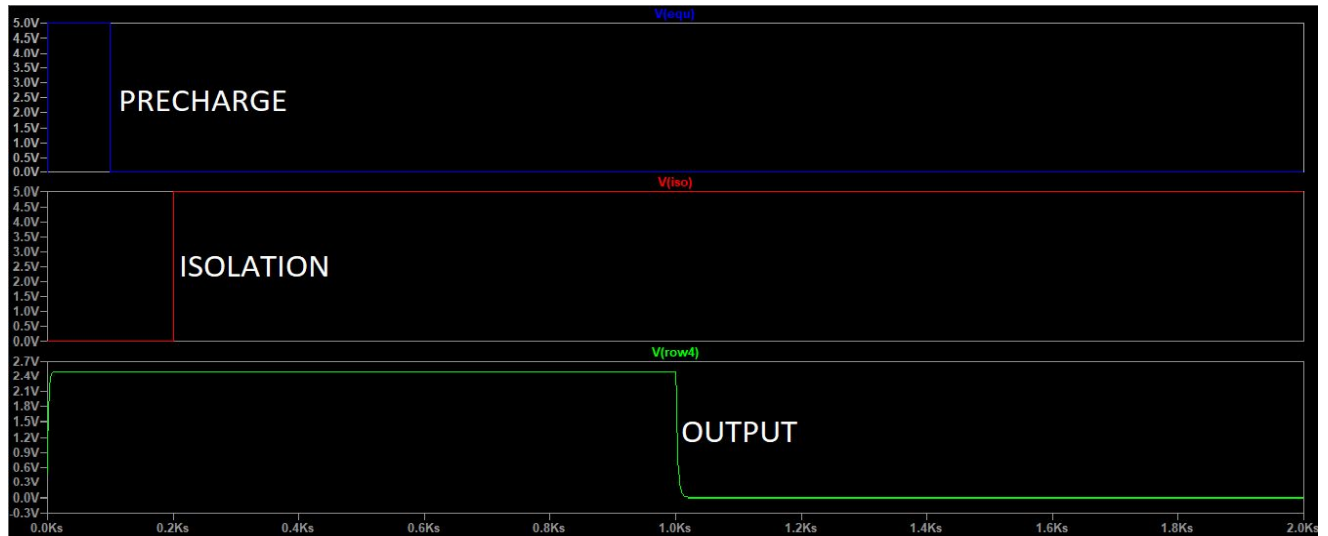- The operations are done in the order mentioned above.
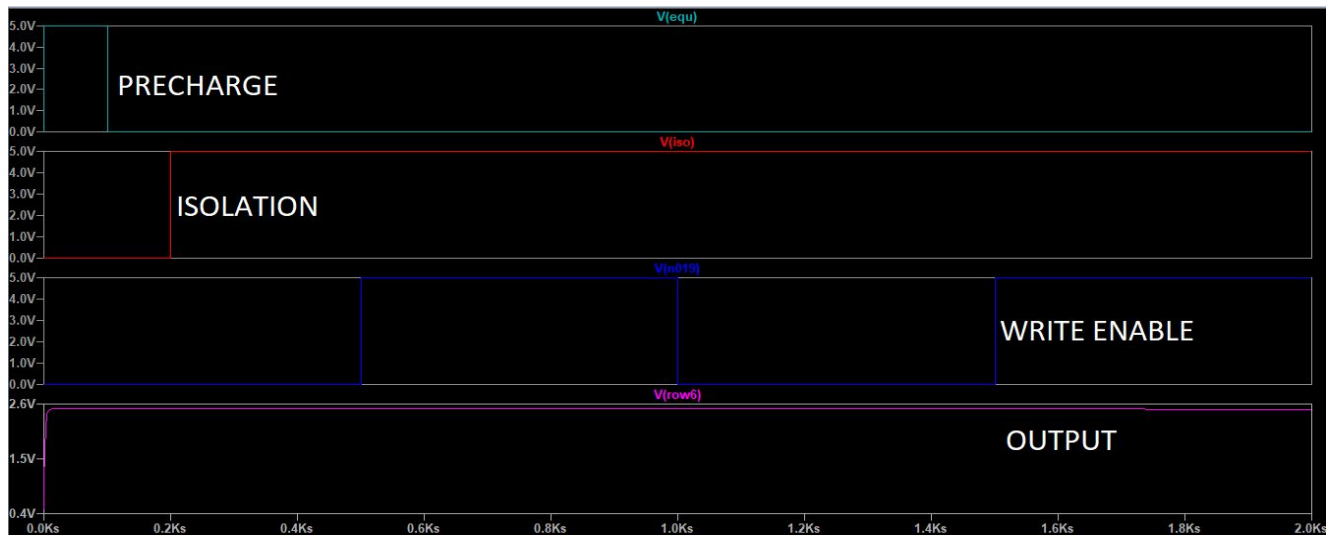
Read '1' : Cell 0 (0 to 500s)
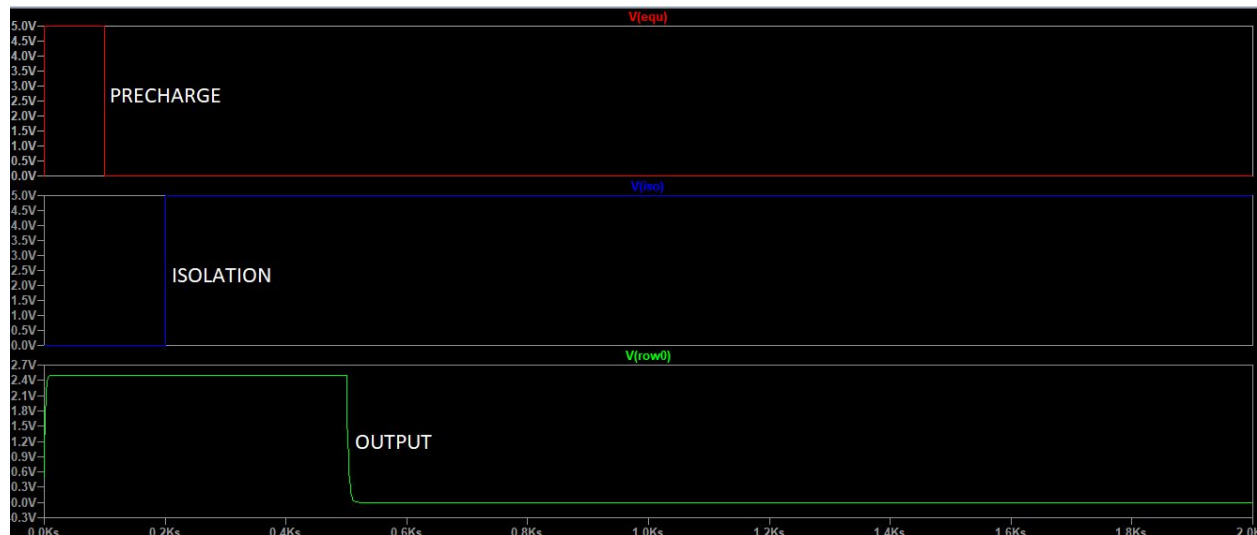
Write '0': Cell 5 (500 to 1000s)
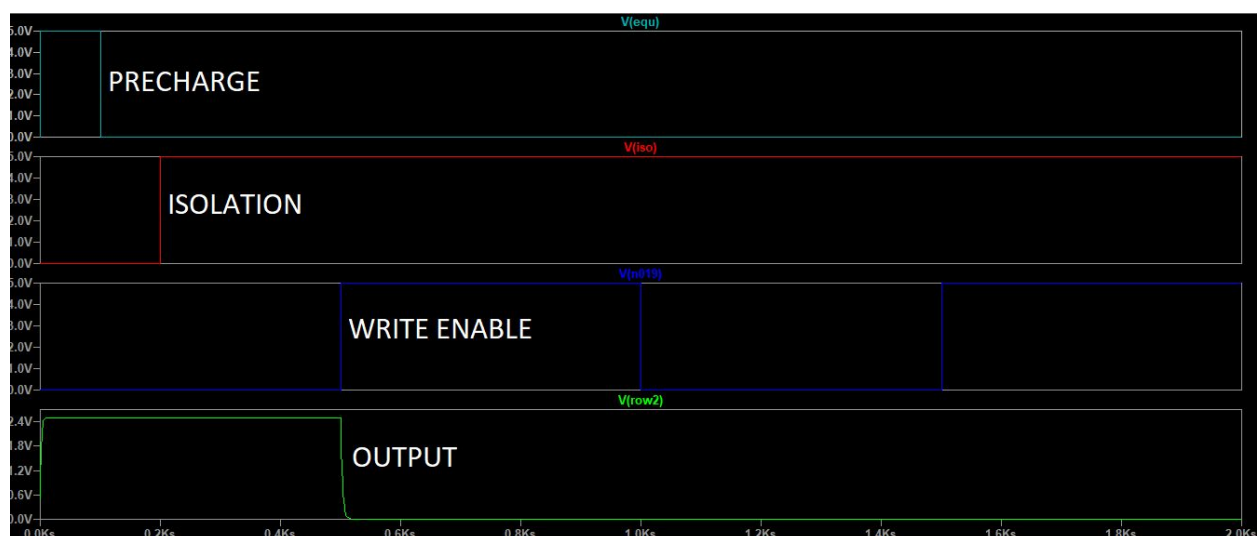
Read '0': Cell 8 (1000 to 1500s)

Write '1': Cell 13 (1500 to 2000s)

Summary:

Results And Conclusions:

- We were successfully able to implement a 4x4 MRAM using nmos and logic gates in the LTSpice tool and show that the MRAM constructed is non-volatile.
- We could simulate various read and write operations using the same .
- MRAM is not used in the industries even though it is highly non volatile due to the shrinkage of the memory sizes magnetic field of one cell affects the other neighbouring cells thus corrupting the data.