4-bit Magnitude comparator compares two 4-bit binary numbers A = a4a3a2a1 and B = b4b3b2b1 and outputs whether A>B, A=B or A<B.

For A=B, the circuit takes the XOR of aibi, where i = 1 to 4. If all XORs produced are 0, then A=B.

For A>B, we find the value of a4b4’ + x4a3b3’ + x4x3a2b2’ + x4x3x2a1b1’. If it is 1, then A>B.

For A<B, we find the value of a4’b4 + x4a3’b3 + x4x3a2’b2 + x4x3x2a1’b1. If it is 1, then A<B.

Here, xi = ai XNOR bi, for i = 1 to 4.