Research Migration Project

https://esim.fossee.in/research-migration-project

Name of the participant : Chandru E

Title of the circuit : An Efficient Implementation of BCD to Seven Segment Decoder using MGDI.

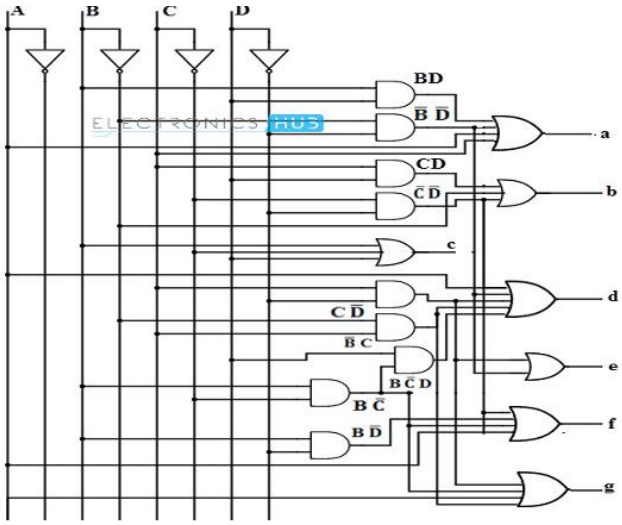
Problem Statement:

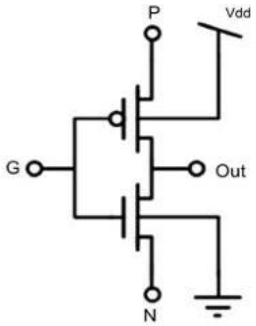
Conventional CMOS-based BCD to seven-segment decoders suffer from high power consumption, larger area, and increased delay. These drawbacks limit their suitability for compact and low-power digital display applications. As seven-segment displays are widely used, a more efficient decoder design is needed. This work aims to overcome these issues by implementing a low-power, area-efficient MGDI-based decoder.

Theory:

The BCD to seven-segment decoder converts 4-bit binary-coded decimal inputs into signals that illuminate the appropriate segments of a seven-segment display. Conventional CMOS-based decoders require more transistors, leading to higher power consumption, larger area, and increased delay. The Modified Gate Diffusion Input (MGDI) technique offers an efficient alternative by reducing transistor count while maintaining full logic swing. MGDI cells use redesigned substrate connections to overcome signal degradation issues found in basic GDI circuits. By employing MGDI-based logic gates, the decoder achieves compact layout, lower switching power, and improved speed. Simulation using 180 nm technology confirms significant reductions in area, delay, and power compared to standard CMOS implementation. Thus, MGDI provides a highly optimized solution for low-power digital display applications such as counters and embedded display systems.

Circuit Diagram(s) :





Modified GDI Cell

Source/Reference(s) :

https://ieeexplore.ieee.org/document/8653674