

a. Is the 4-digit seven-segment display on the BASYS 3 board a common anode for common cathode? Please explain.

Ans: According to Basys 3™ FPGA Board Reference Manual, it's common anode.

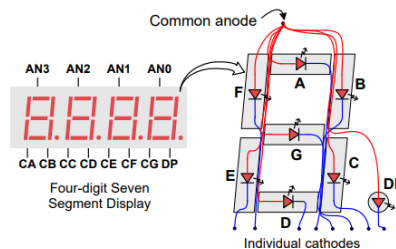
8.1 Seven-Segment Display

The Basys 3 board contains one four-digit **common anode** seven-segment LED display. Each of the four digits is composed of seven segments arranged in a "figure 8" pattern, with an LED embedded in each segment. Segment LEDs can be individually illuminated, so any one of 128 patterns can be displayed on a digit by illuminating certain LED segments and leaving the others dark, as shown in Fig. 17. Of these 128 possible patterns, the ten corresponding to the decimal digits are the most useful.

Because they work well with common electronics and make it easier to control the display using typical electronic components. They are a practical choice for many projects.

b. From the wiring of the board, which logic do you have to assign to the 7-segment pins (a to g and dot) to turn the LED on.

Ans: Use LOW logic to turn on the LED segments on the BASYS 3 board



c. Given that the clock of the BASYS3 is around 10ns, how many bits do you have to divide the clock with to get the appropriate clock for the TDM. Please provide your analysis (calculation).

Ans: From the reference manual, the 7-segment display should be switched every 1 to 16 ms to ensure that the human eye can still distinguish it without flickering. In this calculation, I've chosen to use 16 ms.

$$\text{Clock Divider} = \log_2 (\text{desired clock/clock actual}) = \log_2(15 \text{ ms}/10 \text{ ns}) = \log_2(1,500,000) \approx 20.52$$

Rounded up to 21 bits for the clock divider to achieve a switching interval of 15 ms.