In this demo, it should be noted that the tubes in the routine are connected by common anode. Because I do not find anode digital tube for this demo, I change some code, so that I can use the common cathode tube to display.

* Development tool: Gowin V1.9
* Motherboard: Gowin MINI\_STAR
* Accessories: TypeC USB cable
* Routine: Gowin ultrasonic ranging demo

Follow the official instructions to install Gowin software, then download the routine. Go to the project file and double click to open the project to see the relevant files.  
Verilog files include clock configuration, ultrasonic ranging, digital tube drive. Here it needs to change common anode tube to common cathode tube. Double click the seq\_control.v file, and then change the bit-selection signal and segment-selection signal values to the corresponding values of the common cathode. Actually you just need to negate each bit in turn. The following is the code for the common cathode.

1. /\*===================================================
2. Bit selection mapping common cathode
3. ===================================================\*/
4. always @(\*)
5. begin
6. case(sel)
7. 2'd0:dig = 4'b0111;
8. 2'd1:dig = 4'b1011;
9. 2'd2:dig = 4'b1101;
10. 2'd3:dig = 4'b1110;
11. default:dig = 4'b1111;
12. endcase
13. end
14. /Common cathode digital tube, 1, valid, lit
15. //===========================================
16. always @(\*)
17. begin
18. case(key)
19. 4'd0:smg = 8'b0111\_1110;//"0" 8'b0111\_1110
20. 4'd1:smg = 8'b0011\_0000;//"1" 8'b0011\_0000
21. 4'd2:smg = 8'b0110\_1101;//"2" 8'b0110\_1101
22. 4'd3:smg = 8'b0111\_1001;//"3" 8'b0111\_1001
23. 4'd4:smg = 8'b0011\_0011;//"4" 8'b0011\_0011
24. 4'd5:smg = 8'b0101\_1011;//"5" 8'b0101\_1011
25. 4'd6:smg = 8'b0101\_1111;//"6" 8'b0101\_1111
26. 4'd7:smg = 8'b0111\_0000;//"7" 8'b0111\_0000
27. 4'd8:smg = 8'b0111\_1111;//"8" 8'b0111\_1111
28. 4'd9:smg = 8'b0111\_1011;//"9" 8'b0111\_1011
29. default:smg = 8'b0111\_1110;
30. endcase
31. end

After modification, switch menu to the "Process". Double click "Synthesize" and "Place & Route" in order.   
Then click "Program Device" to download, and note that you need to add resistor to limit the current to drive the digital tube.