

STM32 | 7-Segment Display

Objective

- Interface a common anode 7-segment display with STM32F103C8
 - Use GPIO Port A (PA0–PA6) as segment control pins.
 - Display digits 0–9 sequentially.
-

Hardware Setup

Components

- STM32 Blue Pill
 - 1× 7-Segment Display (Common Anode type)
 - 7× 330 Ω resistors
 - Breadboard, jumper wires
-

Segment-to-Pin Mapping

Segment	STM32 Pin	Notes
a	PA1	GPIO Output
b	PA2	GPIO Output
c	PA3	GPIO Output
d	PA4	GPIO Output
e	PA5	GPIO Output
f	PA6	GPIO Output
g	PA7	GPIO Output
Common Anode pin	+5 V (through resistor)	VCC



Note:
Each LED segment turns ON when the pin output is LOW, since this is Common Anode configuration.

CubeIDE Configuration

1. Open STM32CubeIDE → New STM32 Project for STM32F103C8Tx.
 2. In the Pinout View, configure:
 - o PA1–PA7 → GPIO_Output
 3. Leave the rest at default.
 4. Click GENERATE CODE.
-

Full Code

```
#include "main.h"

static void MX_GPIO_Init(void);

// Lookup table for digits 0-9
// For Common Anode: 0 = ON, 1 = OFF
uint8_t segCode[10][7] = {
    // a, b, c, d, e, f, g
    {0,0,0,0,0,1}, // 0
    {1,0,0,1,1,1,1}, // 1
    {0,0,1,0,0,1,0}, // 2
    {0,0,0,0,1,1,0}, // 3
    {1,0,0,1,1,0,0}, // 4
    {0,1,0,0,1,0,0}, // 5
    {0,1,0,0,0,0,0}, // 6
    {0,0,0,1,1,1,1}, // 7
    {0,0,0,0,0,0,0}, // 8
    {0,0,0,0,1,0,0} // 9
};

int main(void)
{
    HAL_Init();
    MX_GPIO_Init();

    while (1)
    {
        for (int num = 0; num < 10; num++) // loop 0-9
        {
            for (int i = 0; i < 7; i++)
            {
                HAL_GPIO_WritePin(GPIOA, (GPIO_PIN_1 << i), segCode[num][i]);
            }
            HAL_Delay(1000); // 1 s delay per digit
        }
    }

    /* GPIO Init Function */
    static void MX_GPIO_Init(void)
    {
        GPIO_InitTypeDef GPIO_InitStruct = {0};
        __HAL_RCC_GPIOA_CLK_ENABLE();
```

```

GPIO_InitStruct.Pin = GPIO_PIN_1|GPIO_PIN_2|
                      GPIO_PIN_3|GPIO_PIN_4|GPIO_PIN_5|GPIO_PIN_6|GPIO_PIN_7;
GPIO_InitStruct.Mode = GPIO_MODE_OUTPUT_PP;
GPIO_InitStruct.Pull = GPIO_NOPULL;
GPIO_InitStruct.Speed = GPIO_SPEED_FREQ_LOW;
HAL_GPIO_Init(GPIOA, &GPIO_InitStruct);
}

```

Explanation

Concept	Description
segCode	2D array holds ON/OFF logic for each segment of digits 0–9
HAL_GPIO_WritePin(GPIOA, (GPIO_PIN_0 << i), segCode[num][i]);	Writes each bit of the digit pattern
0 = ON	Because in Common Anode, LOW turns segment ON
HAL_Delay(1000)	Shows each digit for 1 second

Simulation in Proteus

1. Place STM32F103C8 and 7SEG-COM-ANODE components.
 2. Connect a-g pins to PA1–PA7 through 330 Ω resistors.
 3. Tie Common Anode pin to +5 V.
 4. Load the .hex file from CubeIDE output folder.
 5. Run the simulation — digits 0–9 should appear sequentially.
-