

# Application Note

## T-TYPE LED STRUCTURE

Version 1.03

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# 1 Introduction

This document describes the T-Type LED structure and how to control it.

1. LED Matrix Structure
  - M-Type Structure
  - T-Type Structure
2. T-Type Structure Control

## 2 LED Matrix Structure

### 2.1 M-Type Structure

: The M-Type structure is composed of physically separated COM/SEG ports. Therefore, In case of 8COM/8SEG configuration, the number of ports is 8+8, and the number of LEDs is 8x8.

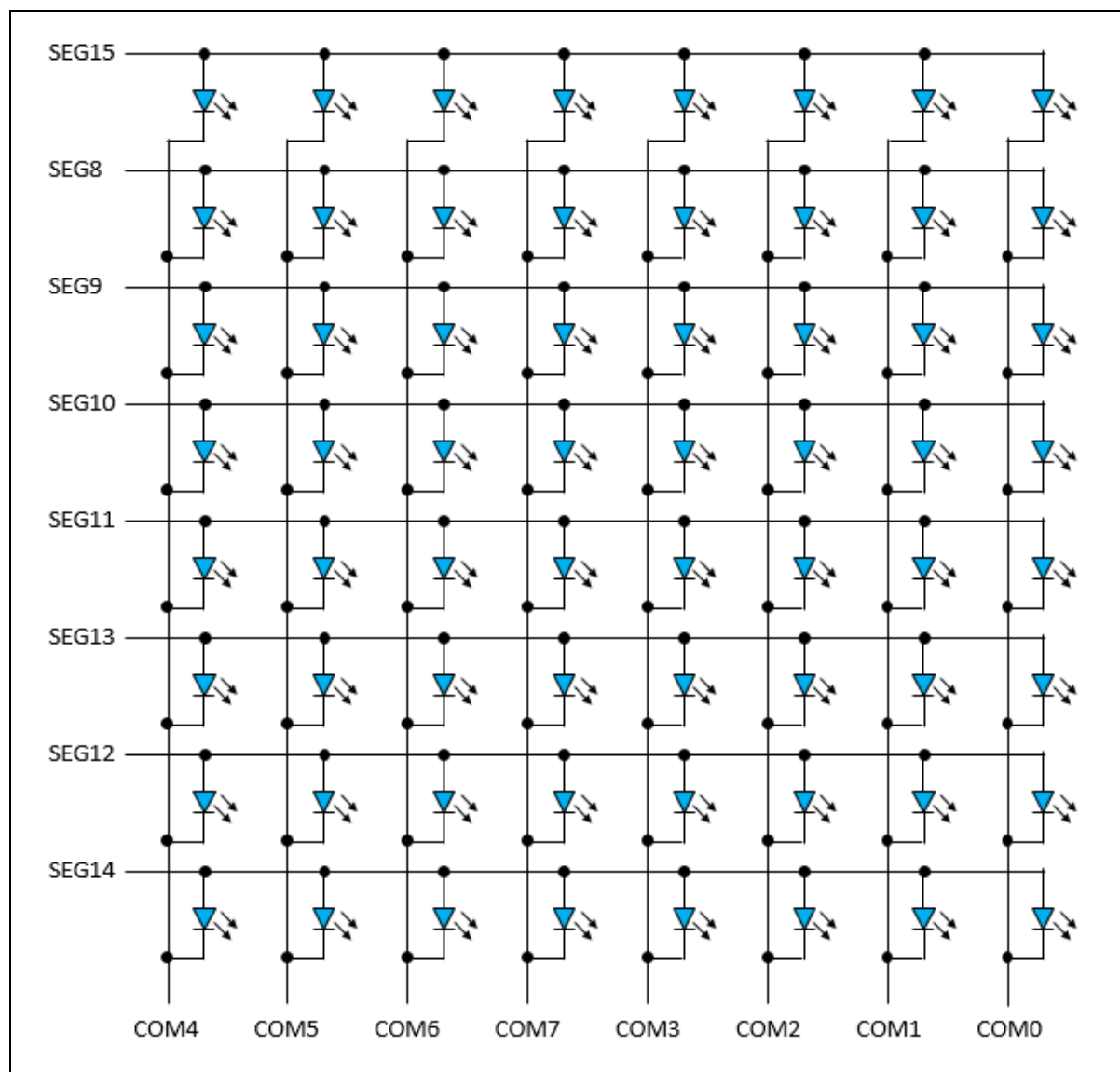


Figure 1. M-Type Structure

### 2.2 T-Type Structure

: The T-Type structure physically shares the COM/SEG ports. For this reason, a port running as COM can't act as a SEG. Therefore, In case of 8COM/8SEG configuration, the number of ports is 8, and the number of LEDs is  $8 \times (8-1)$ .

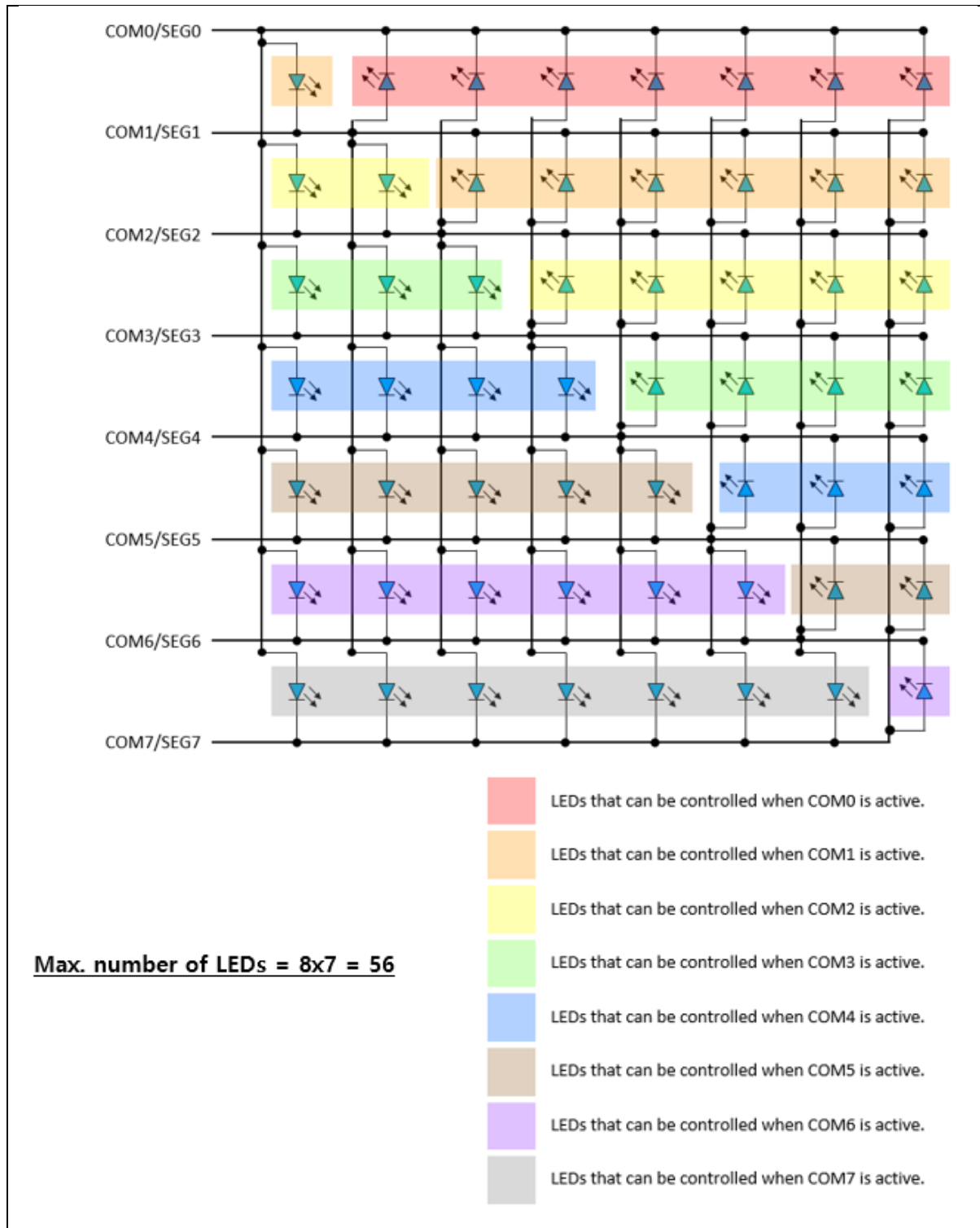


Figure 2. T-Type Structure

### 3 T-Type Structure Control

#### 3.1 Hardware Configuration

##### 1. A96T418GDN Shield Board



Figure 3. T-Type LED Module of the A96T418GDN Shield Board

##### 2. T-Type LED module pin map

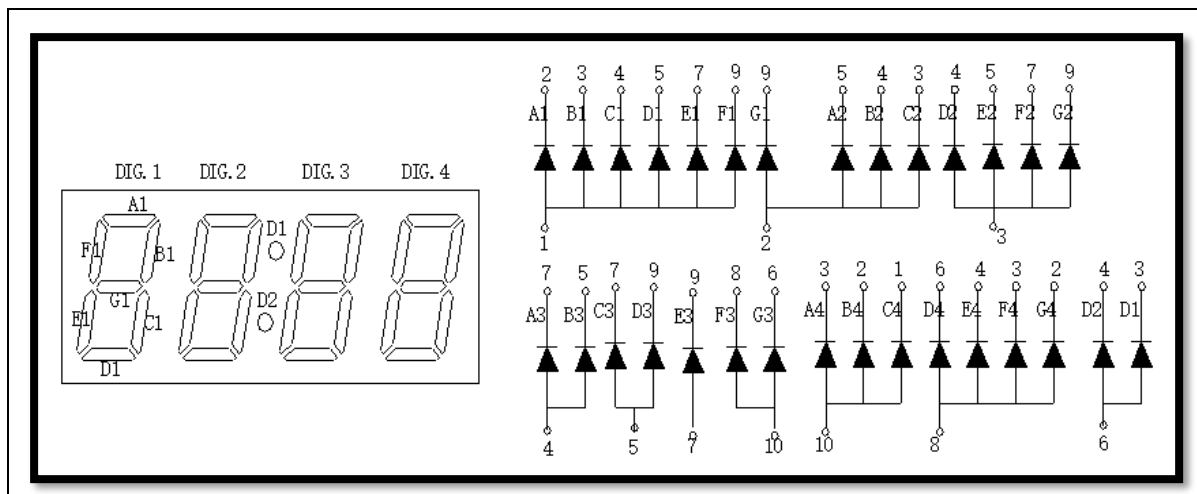


Figure 4. T-Type LED module pin map

##### 3. Schematic

- The LED driver of A96T418 is common cathode type IP.
- The T-Type LED module applied to the circuit is the common anode type.
- For all LED segments control, COM3/SEG3 and COM7/SEG7 are double connected to the LED segment module.



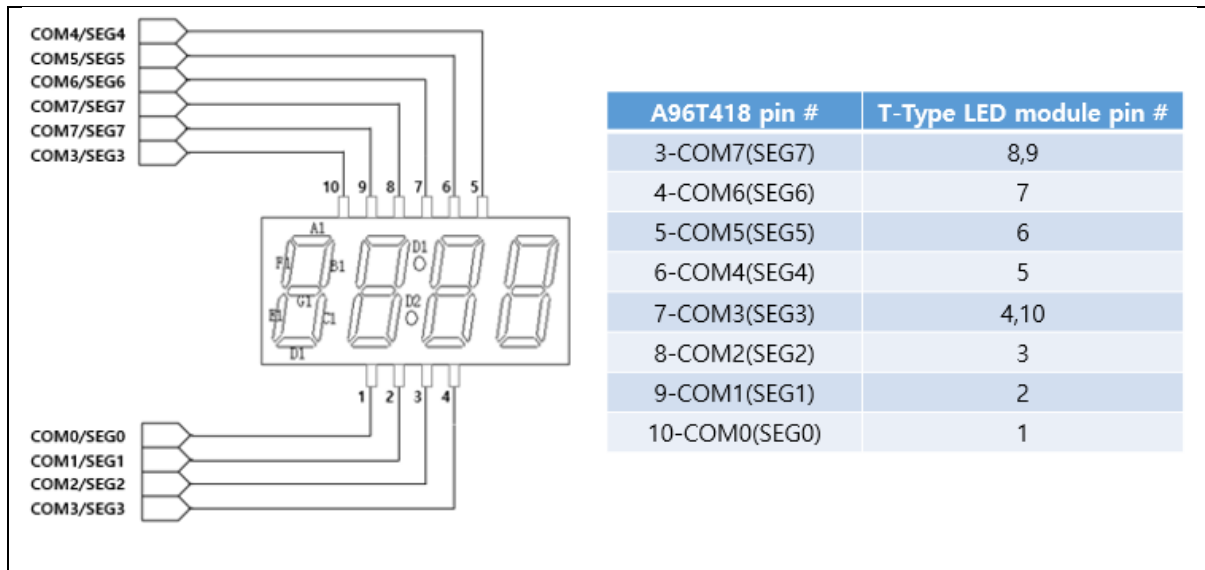


Figure 5. Schematic

### 3.2 Software Control

#### 1. Segment Turn-on Condition

- Example of A1 segment

: A1 segment lights up when SEG0 is high in the COM1 active section

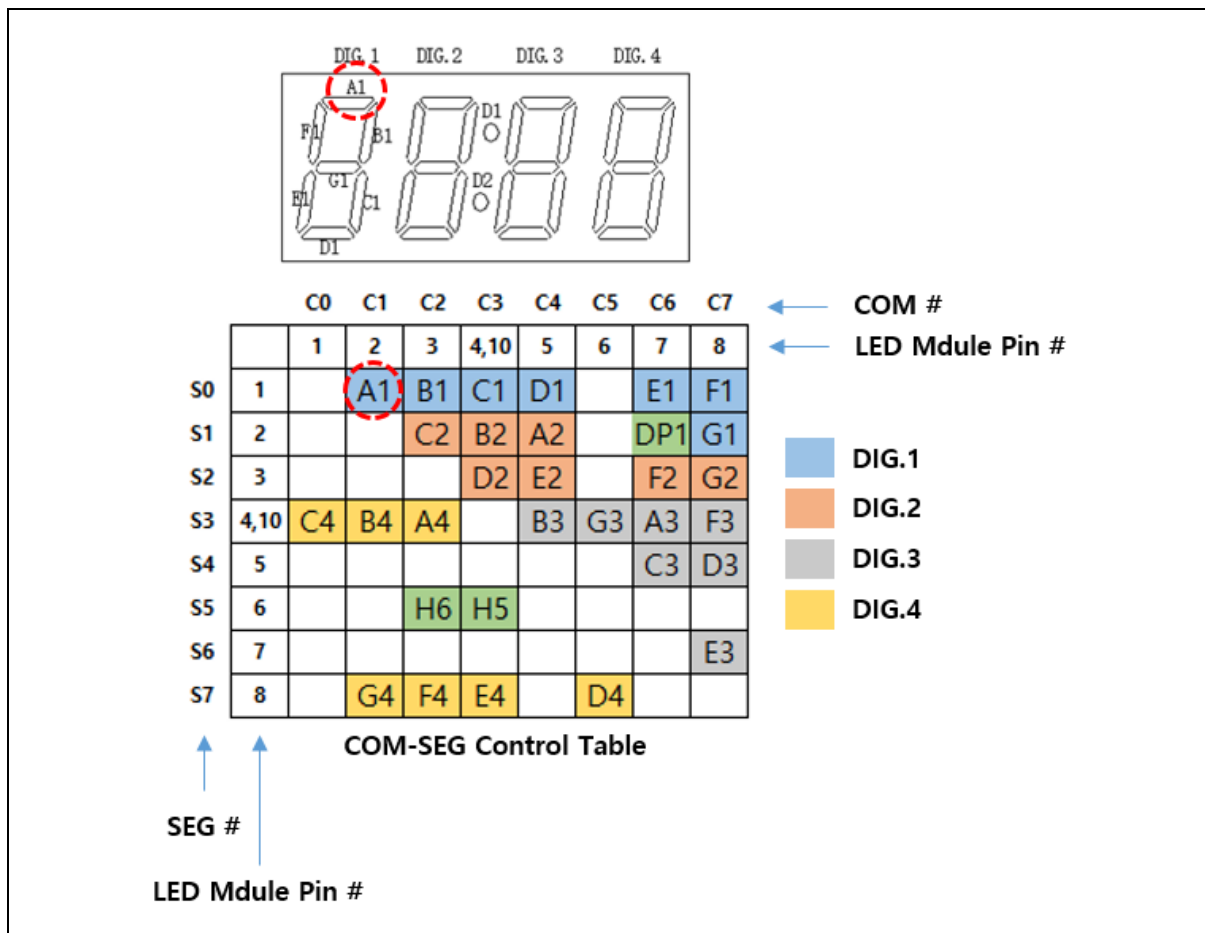


Figure 6. COM-SEG Control Table

## 2. Program Structure

## A. user.h

: define the SEG bit for each segment.

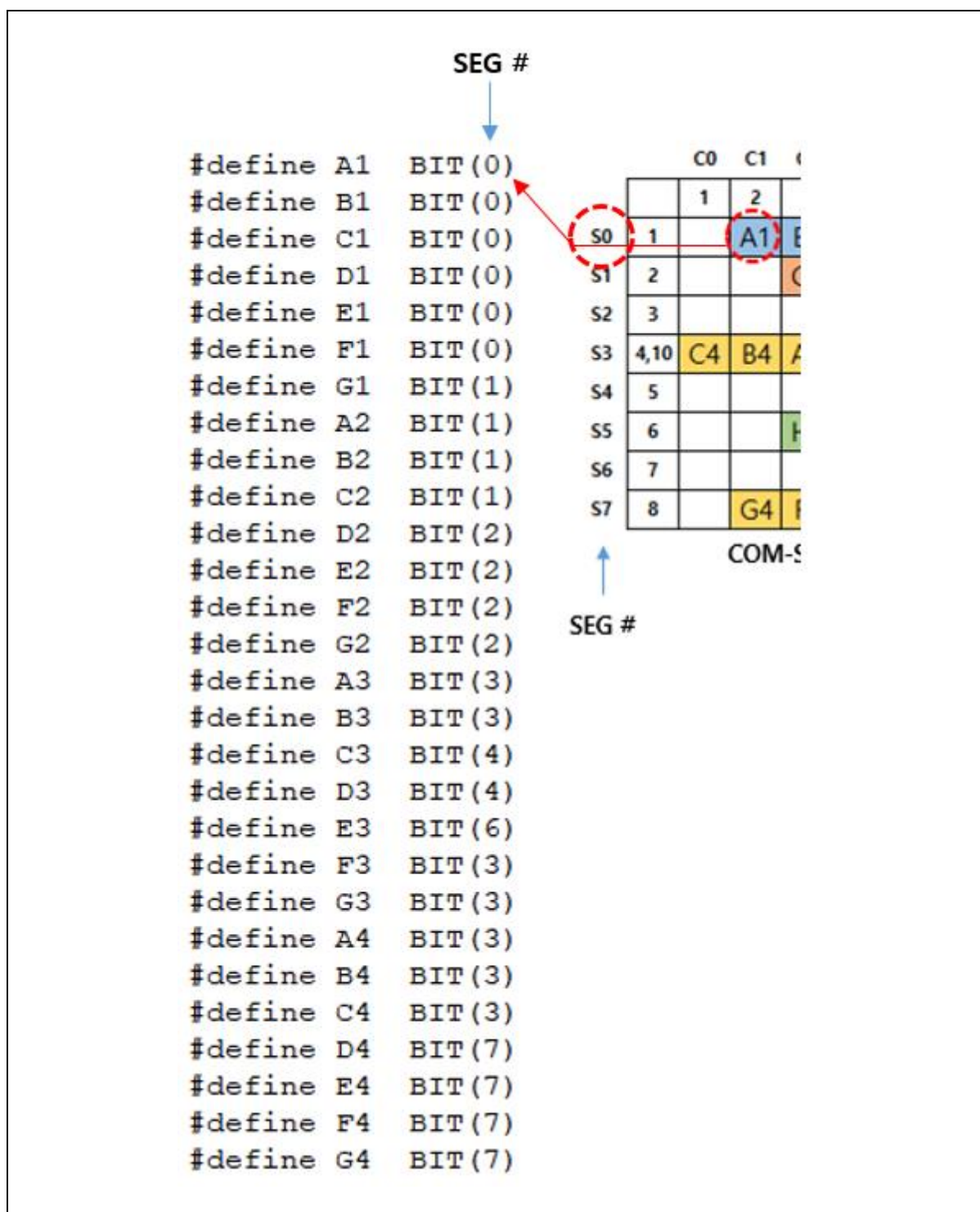


Figure 7. SEG bit definition

## B. user.c

## 1. Control Table For 4-digit

: For each of the 4-digit, a table that can display 10 numbers (0 to 9) may be required.

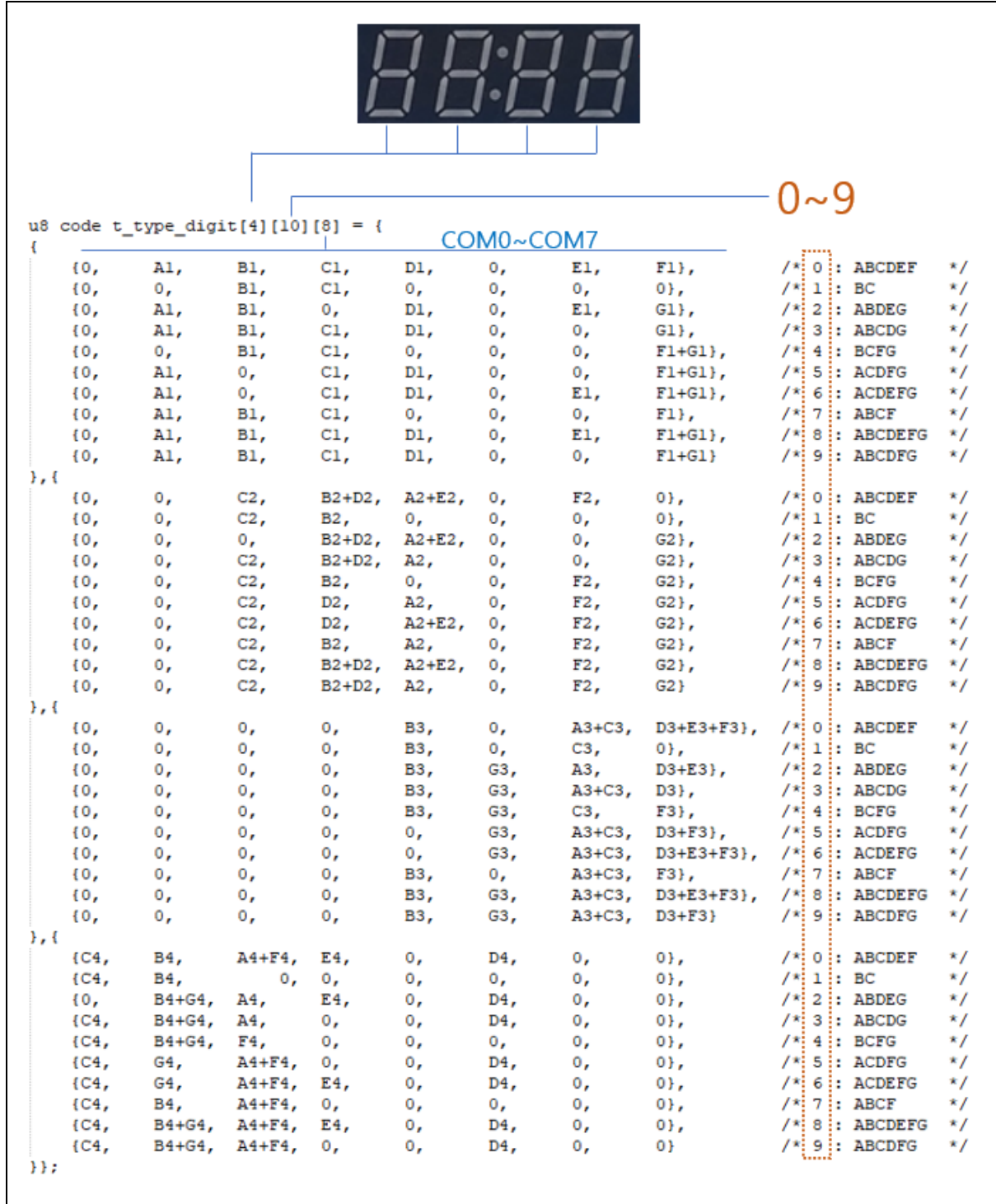


Figure 8. Control table for 4-digit

## 2. Control Code

: For 8 COM sections, each SEG output value is ORed.

```

void LED_Renew_Data(void)
{
    u8 seg_low[8];
    u8 seg_high[8];
    u8 *disp_addr;
    u8 digit[4];

    u8 com_idx;
    u8 num_idx;

    disp_addr = (u8*)(&DISPLAYRAM0L);

    /***** clear led data *****/
    for (com_idx = 0; com_idx < 8; com_idx++)
    {
        seg_high[com_idx] = 0;
        seg_low[com_idx] = 0;
    }
    #if (1)
    /***** T-TYPE 4DIGIT 7-SEGMENT *****/
    for (num_idx = 0; num_idx < 4; num_idx++)
    {
        digit[num_idx] = ((ts.detect_key >> (num_idx*4)) & 0x0f);
    }
    for (num_idx = 0; num_idx < 4; num_idx++)          /* 4DIGIT */
    {
        for (com_idx = 0; com_idx < 8; com_idx++)      /* COM0~7 */
        {
            seg_low[com_idx] |= t_type_digit[num_idx][digit[num_idx]][com_idx];
        }
    }
    #endif
    /***** M-TYPE 8x8 : '0'~'C' display *****/
    for (num_idx = 0; num_idx < 13; num_idx++)
    {
        if (ts.detect_flag & BIT(num_idx))
        {
            break;
        }
    }
    for (com_idx = 0; com_idx < 8; com_idx++)          /* COM0~7 */
    {
        seg_high[com_idx] |= m_type_digit[num_idx][com_idx];
    }
    /***** renew led data *****/
    for (com_idx = 0; com_idx < 8; com_idx++)
    {
        *(disp_addr+com_idx*2+1) = seg_high[com_idx];
        *(disp_addr+com_idx*2+0) = seg_low[com_idx];
    }
}

```

For 8 COM sections,  
each SEG output value is ORed

Display RAM update

Figure 9. Control Code

## Revision history

Date	Revision	Description
20.04.10	1.00	Document created
21.01.04	1.01	Variable name & Function name modified
22.11.01	1.02	Revised the font of this document
24.12.02	1.03	Updated the disclaimer.

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