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
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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.

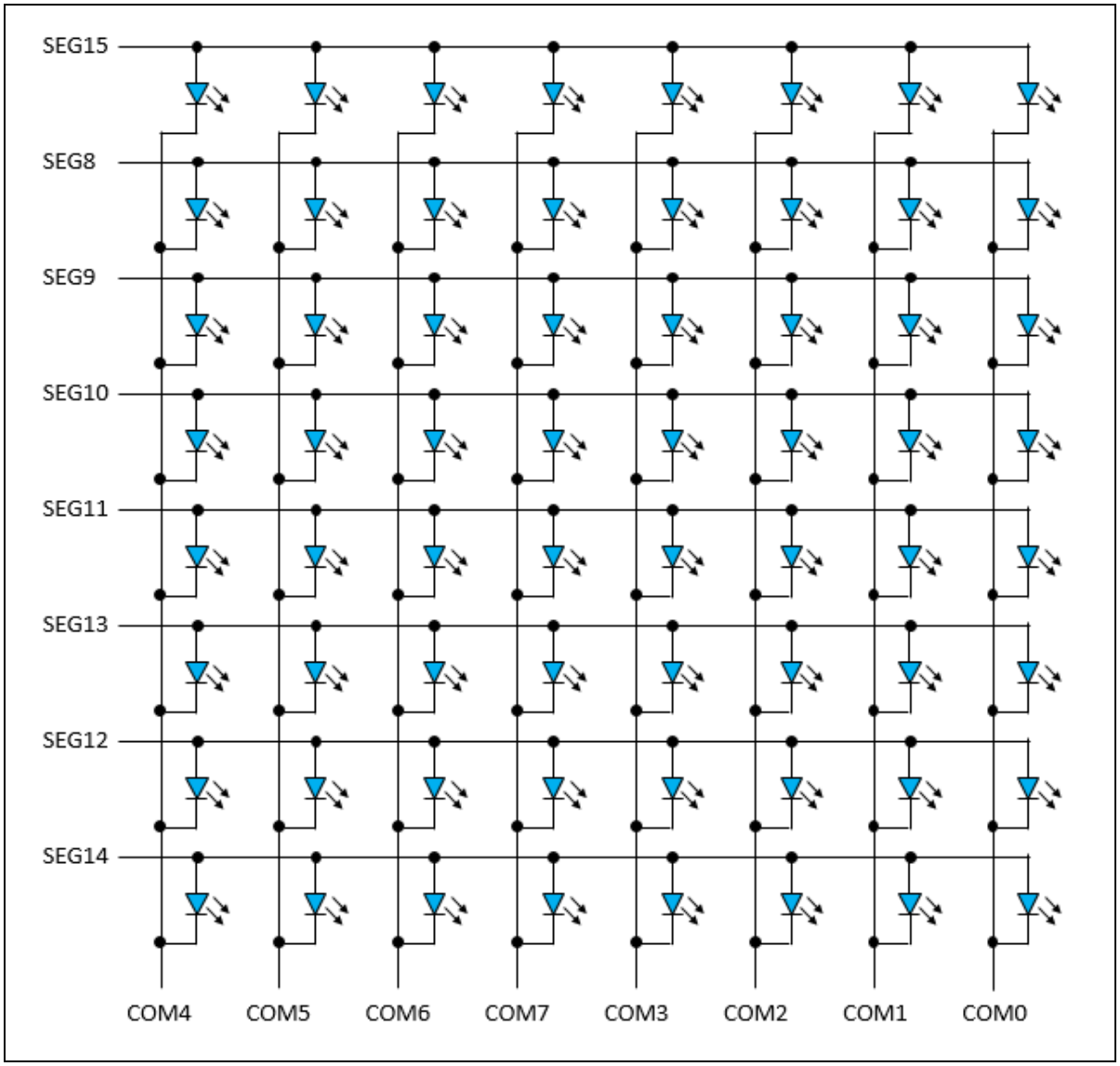


Figure 1. M-Type Structure

2.2 T-Type Structure

: The T-Type structure is 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/SEG configuration, the number of ports is 8, and the number of LEDs is 8 x (8-1).

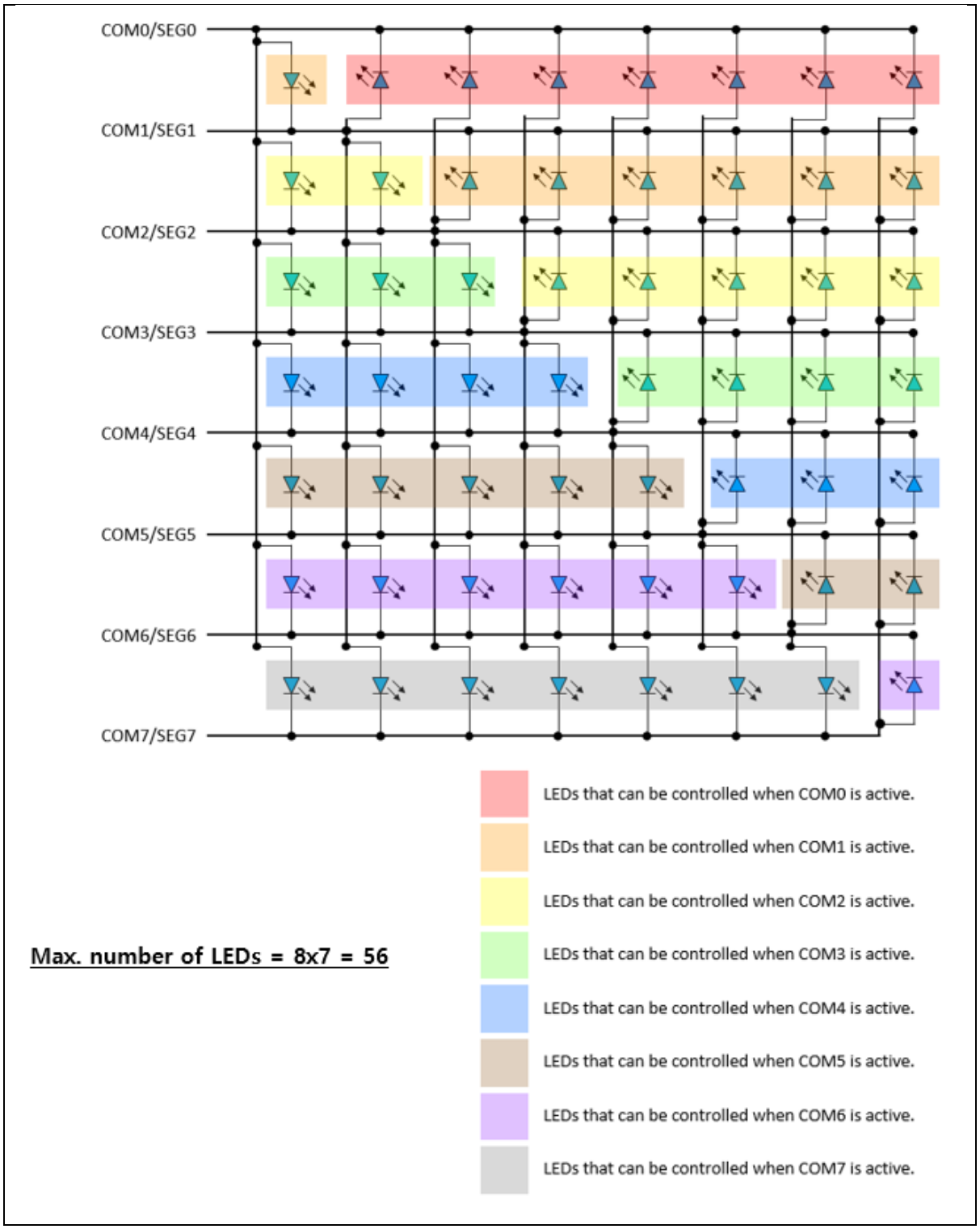


Figure 2. T-Type Structure

3 T-Type Structure Control

3.1 Hardware Configuration

1. A96T418GDN Shield Board

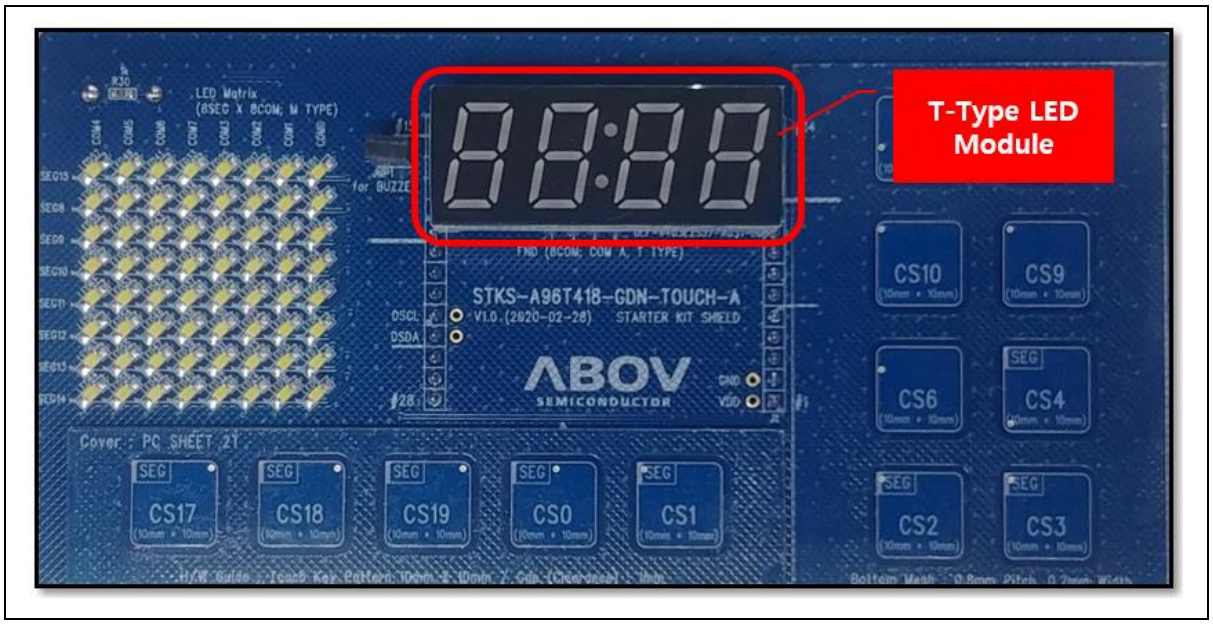


Figure 3. T-Type LED Module of the A96T418GDN Shield Board

2. T-Type LED module pin map

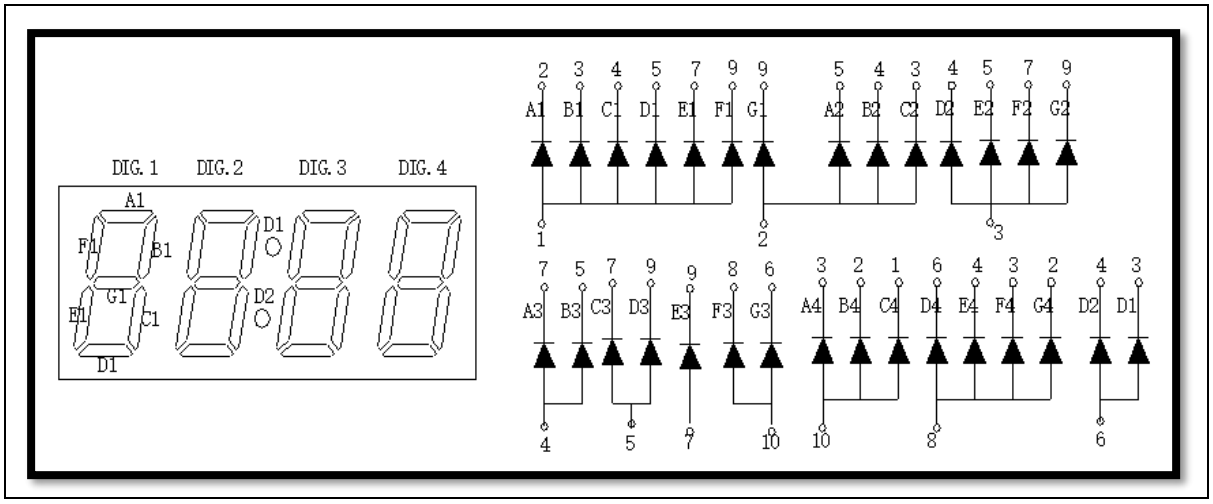
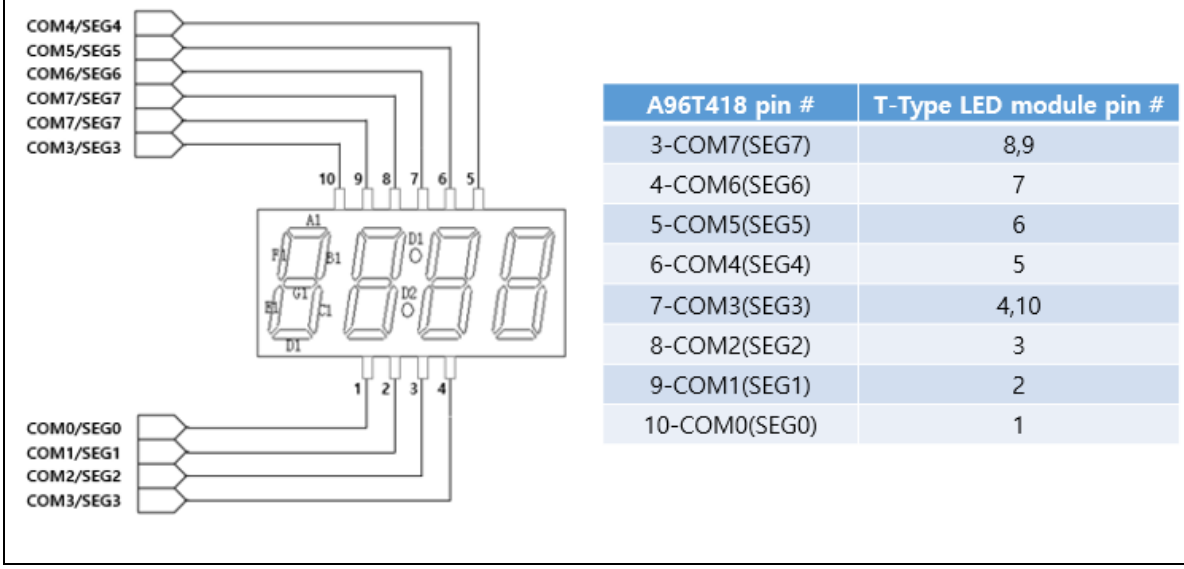


Figure 4. T-Type LED module pin map

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.



A96T418 pin #	T-Type LED module pin #
3-COM7(SEG7)	8,9
4-COM6(SEG6)	7
5-COM5(SEG5)	6
6-COM4(SEG4)	5
7-COM3(SEG3)	4,10
8-COM2(SEG2)	3
9-COM1(SEG1)	2
10-COM0(SEG0)	1

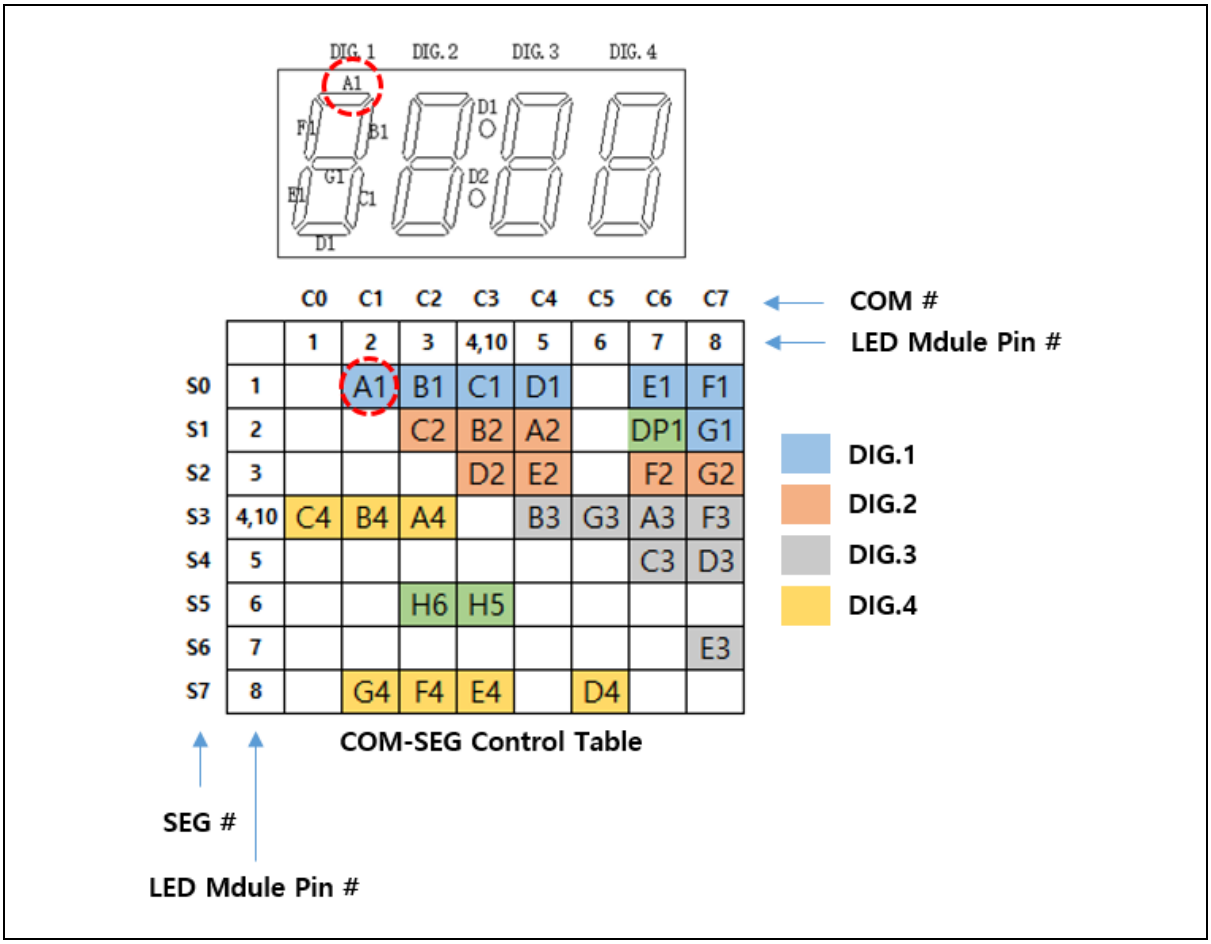
Figure 5. Schematic

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



	C0	C1	C2	C3	C4	C5	C6	C7
	1	2	3	4,10	5	6	7	8
S0	1		A1	B1	C1	D1		E1	F1
S1	2			C2	B2	A2		DP1	G1
S2	3				D2	E2		F2	G2
S3	4,10	C4	B4	A4		B3	G3	A3	F3
S4	5							C3	D3
S5	6			H6	H5				
S6	7								E3
S7	8		G4	F4	E4		D4		

COM-SEG Control Table

Figure 6. COM-SEG Control Table

2. Program Structure

A. user.h

: define the SEG bit for each segment.

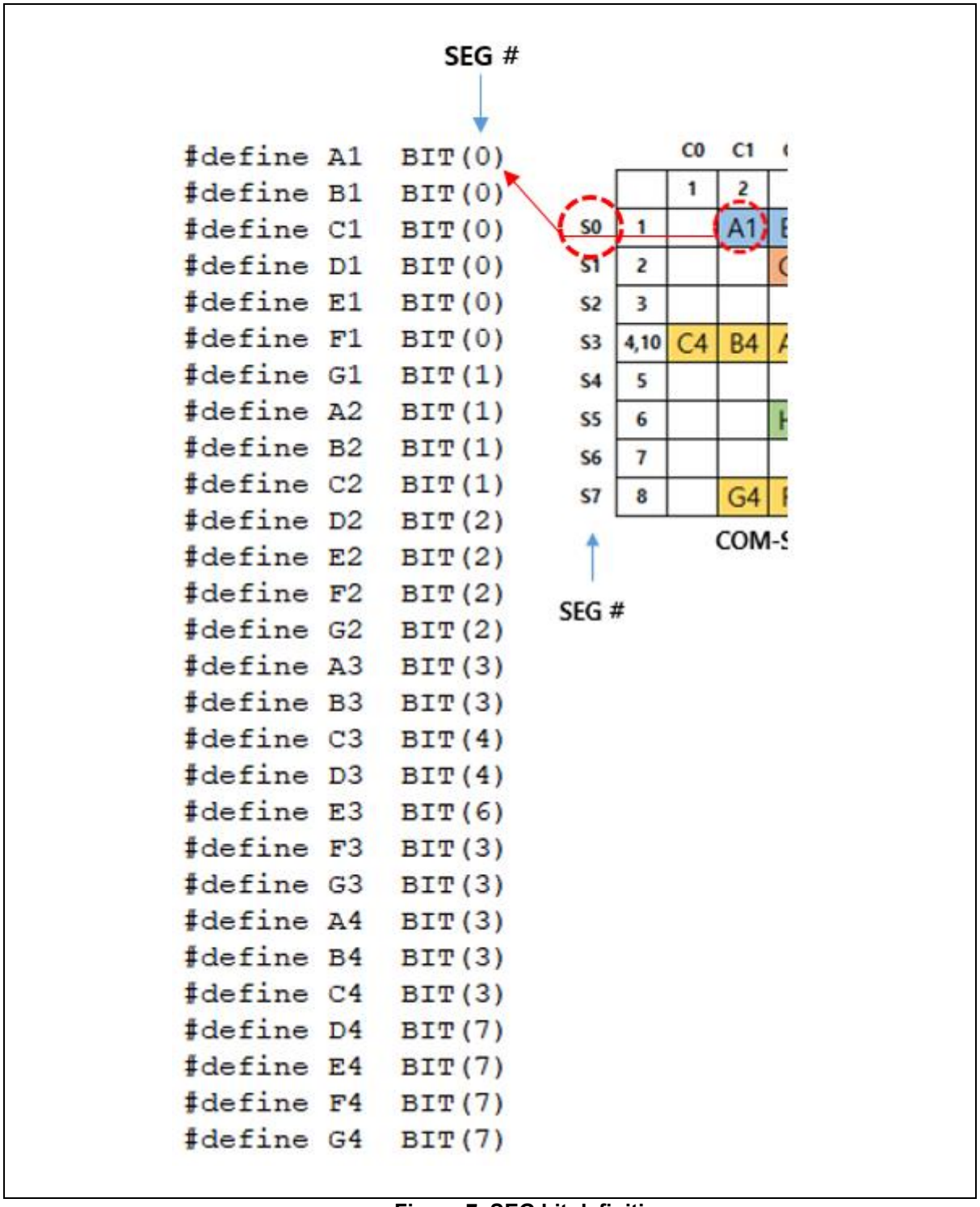
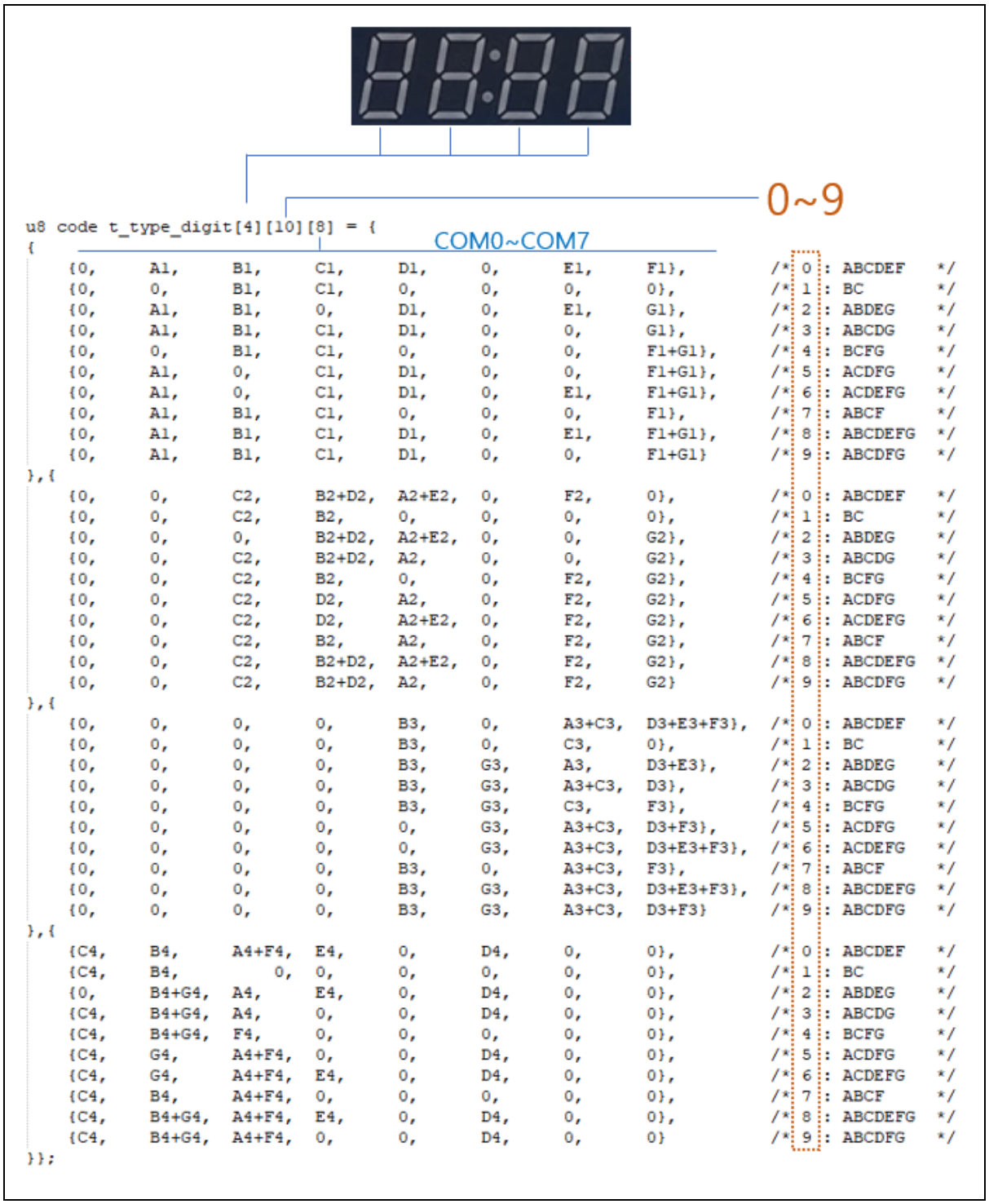


Figure 7. SEG bit definition

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.




```
u8 code t_type_digit[4][10][8] = {
{
    {0,     A1,     B1,     C1,     D1,     0,      E1,     F1},        /* 0 : ABCDEF   */
    {0,     0,      B1,     C1,     0,      0,      0,      0},         /* 1 : BC       */
    {0,     A1,     B1,     0,      D1,     0,      E1,     G1},        /* 2 : ABDEG    */
    {0,     A1,     B1,     C1,     D1,     0,      0,      G1},        /* 3 : ABCDG    */
    {0,     0,      B1,     C1,     0,      0,      0,      F1+G1},     /* 4 : BCFG     */
    {0,     A1,     0,      C1,     D1,     0,      0,      F1+G1},     /* 5 : ACDFG    */
    {0,     A1,     0,      C1,     D1,     0,      E1,     F1+G1},     /* 6 : ACDEFG   */
    {0,     A1,     B1,     C1,     0,      0,      0,      F1},        /* 7 : ABCF     */
    {0,     A1,     B1,     C1,     D1,     0,      E1,     F1+G1},     /* 8 : ABCDEFG  */
    {0,     A1,     B1,     C1,     D1,     0,      0,      F1+G1}      /* 9 : ABCDFG   */
},{
    {0,     0,      C2,     B2+D2,  A2+E2,  0,      F2,     0},         /* 0 : ABCDEF   */
    {0,     0,      C2,     B2,     0,      0,      0,      0},         /* 1 : BC       */
    {0,     0,      0,      B2+D2,  A2+E2,  0,      0,      G2},        /* 2 : ABDEG    */
    {0,     0,      C2,     B2+D2,  A2,     0,      0,      G2},        /* 3 : ABCDG    */
    {0,     0,      C2,     B2,     0,      0,      F2,     G2},        /* 4 : BCFG     */
    {0,     0,      C2,     D2,     A2,     0,      F2,     G2},        /* 5 : ACDFG    */
    {0,     0,      C2,     D2,     A2+E2,  0,      F2,     G2},        /* 6 : ACDEFG   */
    {0,     0,      C2,     B2,     A2,     0,      F2,     G2},        /* 7 : ABCF     */
    {0,     0,      C2,     B2+D2,  A2+E2,  0,      F2,     G2},        /* 8 : ABCDEFG  */
    {0,     0,      C2,     B2+D2,  A2,     0,      F2,     G2}         /* 9 : ABCDFG   */
},{
    {0,     0,      0,      0,      B3,     0,      A3+C3,  D3+E3+F3},  /* 0 : ABCDEF   */
    {0,     0,      0,      0,      B3,     0,      C3,     0},         /* 1 : BC       */
    {0,     0,      0,      0,      B3,     G3,     A3,     D3+E3},     /* 2 : ABDEG    */
    {0,     0,      0,      0,      B3,     G3,     A3+C3,  D3},        /* 3 : ABCDG    */
    {0,     0,      0,      0,      B3,     G3,     C3,     F3},        /* 4 : BCFG     */
    {0,     0,      0,      0,      0,      G3,     A3+C3,  D3+F3},     /* 5 : ACDFG    */
    {0,     0,      0,      0,      0,      G3,     A3+C3,  D3+E3+F3},  /* 6 : ACDEFG   */
    {0,     0,      0,      0,      B3,     0,      A3+C3,  F3},        /* 7 : ABCF     */
    {0,     0,      0,      0,      B3,     G3,     A3+C3,  D3+E3+F3},  /* 8 : ABCDEFG  */
    {0,     0,      0,      0,      B3,     G3,     A3+C3,  D3+F3}      /* 9 : ABCDFG   */
},{
    {C4,    B4,     A4+F4,  E4,     0,      D4,     0,      0},         /* 0 : ABCDEF   */
    {C4,    B4,         0,  0,      0,      0,      0,      0},         /* 1 : BC       */
    {0,     B4+G4,  A4,     E4,     0,      D4,     0,      0},         /* 2 : ABDEG    */
    {C4,    B4+G4,  A4,     0,      0,      D4,     0,      0},         /* 3 : ABCDG    */
    {C4,    B4+G4,  F4,     0,      0,      0,      0,      0},         /* 4 : BCFG     */
    {C4,    G4,     A4+F4,  0,      0,      D4,     0,      0},         /* 5 : ACDFG    */
    {C4,    G4,     A4+F4,  E4,     0,      D4,     0,      0},         /* 6 : ACDEFG   */
    {C4,    B4,     A4+F4,  0,      0,      0,      0,      0},         /* 7 : ABCF     */
    {C4,    B4+G4,  A4+F4,  E4,     0,      D4,     0,      0},         /* 8 : ABCDEFG  */
    {C4,    B4+G4,  A4+F4,  0,      0,      D4,     0,      0}          /* 9 : ABCDFG   */
}};
```

Figure 8. Control table for 4-digit

2. Control Code

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

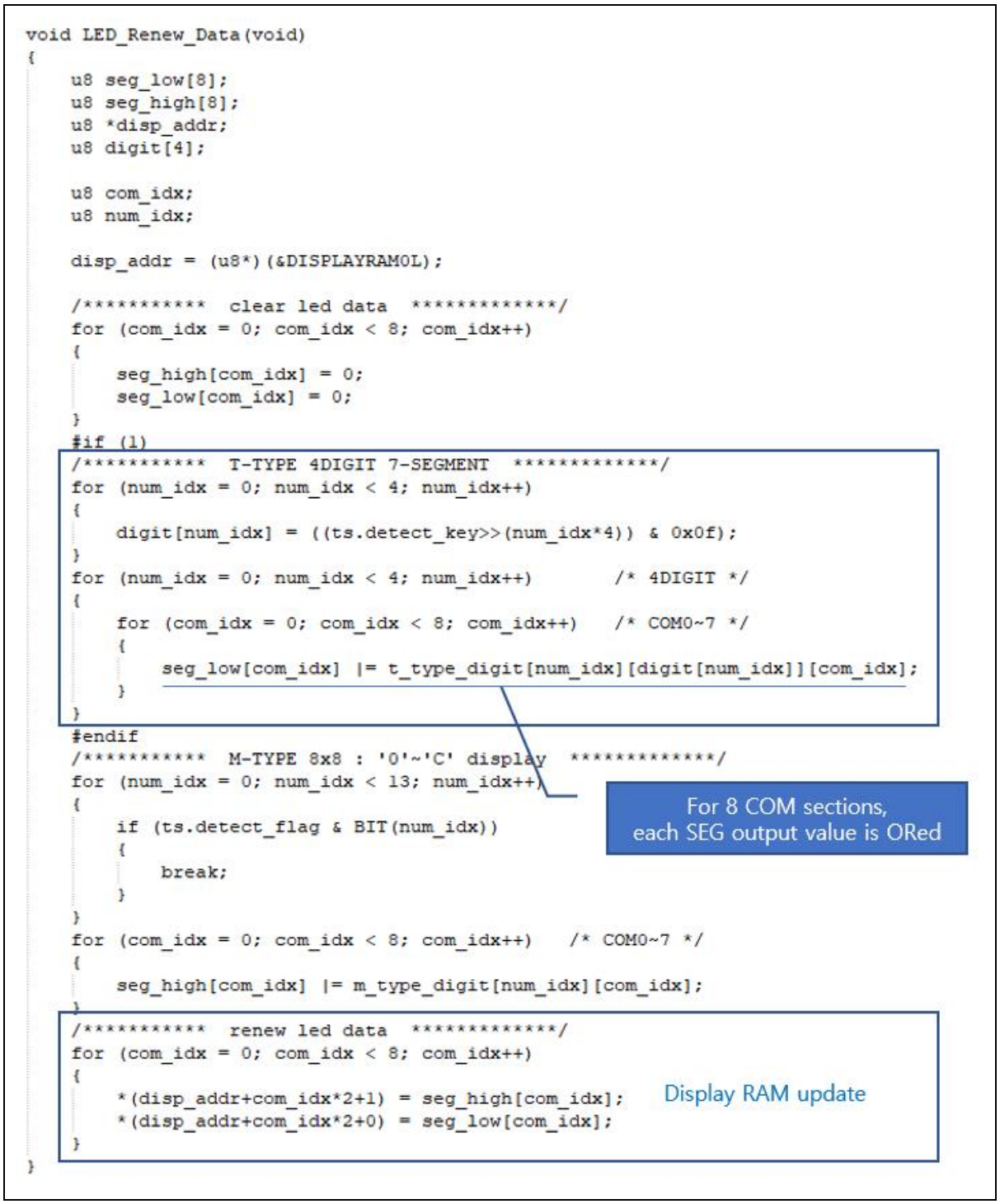


Figure 9. Control Code

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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