LED 数码管应用文档

V0.1

目录

LED 数码管概述

1. LED 数码管应用说明

GPIO 可以直接驱动 LED 数码管，数字端口输出的高低结合模拟端口的下拉电流源可以来控制数码管的显示。

2. LED 数码管应用举例

目前有许多场合用到的 LED 是 COM 和 SEG 共用的，这样可以节省 GPIO，比如下图是一个 7 个引脚，可显示 5 个 COM 和 8 个 SEG 的数码管的对照图。

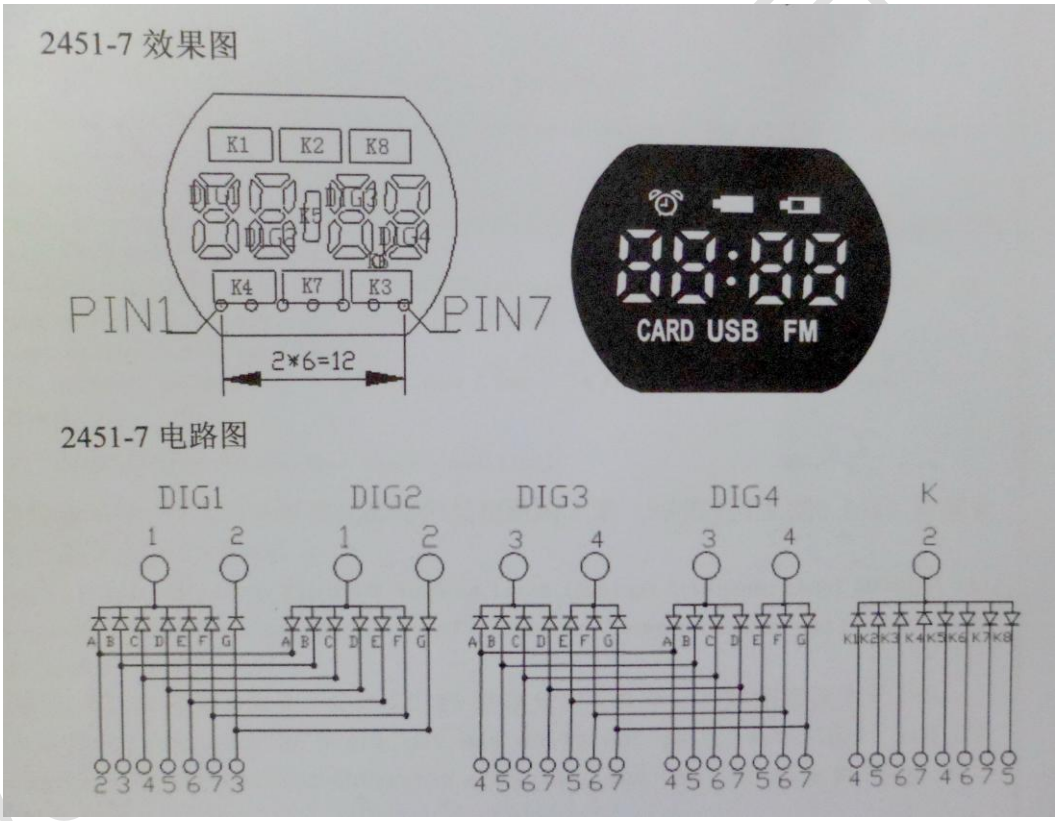

图 1：COM SEG 复用 GPIO 的对照图

这里选取在音乐播放时常用的数码管举例，其外形如下：

图 2：LED 数码管实物图

原理图如下：

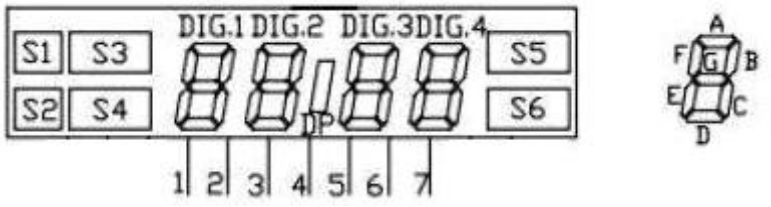

图 3：LED 数码管引脚图

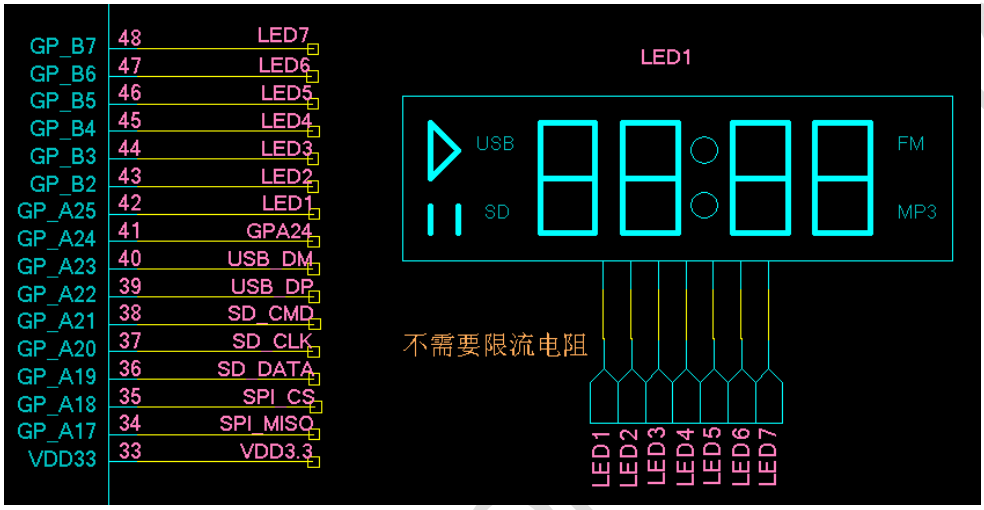

图 4：LED 数码管原理图

	Pin1(SEG)	Pin2(SEG)	Pin3(SEG)	Pin4(SEG)	Pin5(SEG)	Pin6(SEG)	Pin7(SEG)
Pin1(COM)	unused	1A	1B	1E	S4	S1	4C
Pin2(COM)	1F	unused	2A	2B	2E	2D	4G
Pin3(COM)	1G	2F	unused	DP	3B	S2	S6
Pin4(COM)	1C	2G	3F	unused	3C	4E	4B
Pin5(COM)	1D	2C	3G	3A	unused	unused	unused
Pin6(COM)	3D	S3	3E	4D	unused	unused	unused
Pin7(COM)	4F	unused	S5	4A	unused	unused	unused

注：上面的显示段位为竖栏设置为输出且输出高，横栏设置为开启下拉电流源。比如要显示段位 1A，则 pin1 设置为输出且输出高，pin2 打开下拉电流源。

端口初始化

无上拉、无下拉、输出禁止、关闭下拉电流源 即 PU=1、PD=0、OE=0、1MA7=0、2MA4=0

刷新数码管的代码应该放在定时器中断里面，以保证定时刷新，假如需要点亮 S2，查询得知 pin1 设为输出且输出高，pin6 打开下拉电流源：

```
void LedFlushDisp(void)
{
    LedAllPinGpioInput();//关闭恒流源
    LED_PIN6_IN_ON;//打开需要显示的恒流源
    LED_PIN1_OUT_HIGH;//输出使能且输出高
}
```

3. 参考代码

```
//引脚初始化
#define LED_PIN1_PORT_PU       GPIO_A_PU
#define LED_PIN1_PORT_PD       GPIO_A_PD
#define LED_PIN1_PORT_OE       GPIO_A_OE
#define LED_PIN1_PORT_IE       GPIO_A_IE
#define LED_PIN1_PORT_ICS_1MA7  GPIO_A_PULLDOWN1
#define LED_PIN1_PORT_ICS_2MA4  GPIO_A_PULLDOWN2
#define LED_PIN1_PORT_OUT      GPIO_A_OUT
#define LED_PIN1_BIT           GPIOA25

#define LED_PIN2_PORT_PU       GPIO_B_PU
#define LED_PIN2_PORT_PD       GPIO_B_PD
#define LED_PIN2_PORT_OE       GPIO_B_OE
#define LED_PIN2_PORT_IE       GPIO_B_IE
#define LED_PIN2_PORT_ICS_1MA7  GPIO_B_PULLDOWN1
#define LED_PIN2_PORT_ICS_2MA4  GPIO_B_PULLDOWN2
#define LED_PIN2_PORT_OUT      GPIO_B_OUT
#define LED_PIN2_BIT           GPIOB2

#define LED_PIN3_PORT_PU       GPIO_B_PU
#define LED_PIN3_PORT_PD       GPIO_B_PD
#define LED_PIN3_PORT_OE       GPIO_B_OE
#define LED_PIN3_PORT_IE       GPIO_B_IE
#define LED_PIN3_PORT_ICS_1MA7  GPIO_B_PULLDOWN1
#define LED_PIN3_PORT_ICS_2MA4  GPIO_B_PULLDOWN2
#define LED_PIN3_PORT_OUT      GPIO_B_OUT
#define LED_PIN3_BIT           GPIOB3

#define LED_PIN4_PORT_PU       GPIO_B_PU
#define LED_PIN4_PORT_PD       GPIO_B_PD
#define LED_PIN4_PORT_OE       GPIO_B_OE
#define LED_PIN4_PORT_IE       GPIO_B_IE
#define LED_PIN4_PORT_ICS_1MA7  GPIO_B_PULLDOWN1
#define LED_PIN4_PORT_ICS_2MA4  GPIO_B_PULLDOWN2
#define LED_PIN4_PORT_OUT      GPIO_B_OUT
#define LED_PIN4_BIT           GPIOB4

#define LED_PIN5_PORT_PU       GPIO_B_PU
#define LED_PIN5_PORT_PD       GPIO_B_PD
#define LED_PIN5_PORT_OE       GPIO_B_OE
```

```
#define LED_PIN5_PORT_IE       GPIO_B_IE
#define LED_PIN5_PORT_ICS_1MA7  GPIO_B_PULLDOWN1
#define LED_PIN5_PORT_ICS_2MA4  GPIO_B_PULLDOWN2
#define LED_PIN5_PORT_OUT      GPIO_B_OUT
#define LED_PIN5_BIT           GPIOB5

#define LED_PIN6_PORT_PU       GPIO_B_PU
#define LED_PIN6_PORT_PD       GPIO_B_PD
#define LED_PIN6_PORT_OE       GPIO_B_OE
#define LED_PIN6_PORT_IE       GPIO_B_IE
#define LED_PIN6_PORT_ICS_1MA7  GPIO_B_PULLDOWN1
#define LED_PIN6_PORT_ICS_2MA4  GPIO_B_PULLDOWN2
#define LED_PIN6_PORT_OUT      GPIO_B_OUT
#define LED_PIN6_BIT           GPIOB6

#define LED_PIN7_PORT_PU       GPIO_B_PU
#define LED_PIN7_PORT_PD       GPIO_B_PD
#define LED_PIN7_PORT_OE       GPIO_B_OE
#define LED_PIN7_PORT_IE       GPIO_B_IE
#define LED_PIN7_PORT_ICS_1MA7  GPIO_B_PULLDOWN1
#define LED_PIN7_PORT_ICS_2MA4  GPIO_B_PULLDOWN2
#define LED_PIN7_PORT_OUT      GPIO_B_OUT
#define LED_PIN7_BIT           GPIOB7
void LedPinGpioInit(void)
{
    GpioSetRegOneBit(LED_PIN1_PORT_PU, LED_PIN1_BIT);
    GpioSetRegOneBit(LED_PIN2_PORT_PU, LED_PIN2_BIT);
    GpioSetRegOneBit(LED_PIN3_PORT_PU, LED_PIN3_BIT);
    GpioSetRegOneBit(LED_PIN4_PORT_PU, LED_PIN4_BIT);
    GpioSetRegOneBit(LED_PIN5_PORT_PU, LED_PIN5_BIT);
    GpioSetRegOneBit(LED_PIN6_PORT_PU, LED_PIN6_BIT);
    GpioSetRegOneBit(LED_PIN7_PORT_PU, LED_PIN7_BIT);
    GpioClrRegOneBit(LED_PIN1_PORT_PD, LED_PIN1_BIT);
    GpioClrRegOneBit(LED_PIN2_PORT_PD, LED_PIN2_BIT);
    GpioClrRegOneBit(LED_PIN3_PORT_PD, LED_PIN3_BIT);
    GpioClrRegOneBit(LED_PIN4_PORT_PD, LED_PIN4_BIT);
    GpioClrRegOneBit(LED_PIN5_PORT_PD, LED_PIN5_BIT);
    GpioClrRegOneBit(LED_PIN6_PORT_PD, LED_PIN6_BIT);
    GpioClrRegOneBit(LED_PIN7_PORT_PD, LED_PIN7_BIT);
    GpioClrRegOneBit(LED_PIN1_PORT_OE, LED_PIN1_BIT);
    GpioClrRegOneBit(LED_PIN2_PORT_OE, LED_PIN2_BIT);
    GpioClrRegOneBit(LED_PIN3_PORT_OE, LED_PIN3_BIT);
    GpioClrRegOneBit(LED_PIN4_PORT_OE, LED_PIN4_BIT);
    GpioClrRegOneBit(LED_PIN5_PORT_OE, LED_PIN5_BIT);
```

```
    GpioClrRegOneBit(LED_PIN6_PORT_OE, LED_PIN6_BIT);
    GpioClrRegOneBit(LED_PIN7_PORT_OE, LED_PIN7_BIT);
    GpioClrRegOneBit(LED_PIN1_PORT_ICS_1MA7, LED_PIN1_BIT);
    GpioClrRegOneBit(LED_PIN2_PORT_ICS_1MA7, LED_PIN2_BIT);
    GpioClrRegOneBit(LED_PIN3_PORT_ICS_1MA7, LED_PIN3_BIT);
    GpioClrRegOneBit(LED_PIN4_PORT_ICS_1MA7, LED_PIN4_BIT);
    GpioClrRegOneBit(LED_PIN5_PORT_ICS_1MA7, LED_PIN5_BIT);
    GpioClrRegOneBit(LED_PIN6_PORT_ICS_1MA7, LED_PIN6_BIT);
    GpioClrRegOneBit(LED_PIN7_PORT_ICS_1MA7, LED_PIN7_BIT);
    GpioClrRegOneBit(LED_PIN1_PORT_ICS_2MA4, LED_PIN1_BIT);
    GpioClrRegOneBit(LED_PIN2_PORT_ICS_2MA4, LED_PIN2_BIT);
    GpioClrRegOneBit(LED_PIN3_PORT_ICS_2MA4, LED_PIN3_BIT);
    GpioClrRegOneBit(LED_PIN4_PORT_ICS_2MA4, LED_PIN4_BIT);
    GpioClrRegOneBit(LED_PIN5_PORT_ICS_2MA4, LED_PIN5_BIT);
    GpioClrRegOneBit(LED_PIN6_PORT_ICS_2MA4, LED_PIN6_BIT);
    GpioClrRegOneBit(LED_PIN7_PORT_ICS_2MA4, LED_PIN7_BIT);
}
```

```
//关闭显示
void LedAllPinGpiInput(void)
{
    GpioClrRegBits(GPIO_B_OE, (GPIOB2 | GPIOB3 | GPIOB4 | GPIOB5 | GPIOB6 | GPIOB7));
    GpioClrRegBits(GPIO_A_OE, GPIOA25);
    GpioClrRegBits(GPIO_B_PULLDOWN1, (GPIOB2 | GPIOB3 | GPIOB4 | GPIOB5 | GPIOB6 |
GPIOB7));
    GpioClrRegBits(GPIO_B_PULLDOWN2, (GPIOB2 | GPIOB3 | GPIOB4 | GPIOB5 | GPIOB6 |
GPIOB7));
    GpioClrRegBits(GPIO_A_PULLDOWN1, GPIOA25);
    GpioClrRegBits(GPIO_A_PULLDOWN2, GPIOA25);
}
```

```
//引脚设置宏定义
#define LED_PIN1_OUT_HIGH   GpioSetRegOneBit(LED_PIN1_PORT_OE,LED_PIN1_BIT),\
                            GpioSetRegOneBit(LED_PIN1_PORT_OUT,LED_PIN1_BIT)

#define LED_PIN2_OUT_HIGH   GpioSetRegOneBit(LED_PIN2_PORT_OE,LED_PIN2_BIT),\
                            GpioSetRegOneBit(LED_PIN2_PORT_OUT,LED_PIN2_BIT)

#define LED_PIN3_OUT_HIGH   GpioSetRegOneBit(LED_PIN3_PORT_OE,LED_PIN3_BIT),\
                            GpioSetRegOneBit(LED_PIN3_PORT_OUT,LED_PIN3_BIT)

#define LED_PIN4_OUT_HIGH   GpioSetRegOneBit(LED_PIN4_PORT_OE,LED_PIN4_BIT),\
                            GpioSetRegOneBit(LED_PIN4_PORT_OUT,LED_PIN4_BIT)
```

```
#define LED_PIN5_OUT_HIGH   GpioSetRegOneBit(LED_PIN5_PORT_OE,LED_PIN5_BIT),\
                            GpioSetRegOneBit(LED_PIN5_PORT_OUT,LED_PIN5_BIT)

#define LED_PIN6_OUT_HIGH   GpioSetRegOneBit(LED_PIN6_PORT_OE,LED_PIN6_BIT),\
                            GpioSetRegOneBit(LED_PIN6_PORT_OUT,LED_PIN6_BIT)

#define LED_PIN7_OUT_HIGH   GpioSetRegOneBit(LED_PIN7_PORT_OE,LED_PIN7_BIT),\
                            GpioSetRegOneBit(LED_PIN7_PORT_OUT,LED_PIN7_BIT)


#define LED_PIN1_IN_ON   GpioSetRegOneBit(LED_PIN1_PORT_ICS_2MA4,LED_PIN1_BIT),
                         GpioSetRegOneBit(LED_PIN1_PORT_ICS_1MA7,LED_PIN1_BIT)

#define LED_PIN2_IN_ON   GpioSetRegOneBit(LED_PIN2_PORT_ICS_2MA4,LED_PIN2_BIT),\
                         GpioSetRegOneBit(LED_PIN2_PORT_ICS_1MA7,LED_PIN2_BIT)

#define LED_PIN3_IN_ON   GpioSetRegOneBit(LED_PIN3_PORT_ICS_2MA4,LED_PIN3_BIT),\
                          GpioSetRegOneBit(LED_PIN3_PORT_ICS_1MA7,LED_PIN3_BIT)

#define LED_PIN4_IN_ON   GpioSetRegOneBit(LED_PIN4_PORT_ICS_2MA4,LED_PIN4_BIT),\
                         GpioSetRegOneBit(LED_PIN4_PORT_ICS_1MA7,LED_PIN4_BIT)

#define LED_PIN5_IN_ON   GpioSetRegOneBit(LED_PIN5_PORT_ICS_2MA4,LED_PIN5_BIT),\
                         GpioSetRegOneBit(LED_PIN5_PORT_ICS_1MA7,LED_PIN5_BIT)

#define LED_PIN6_IN_ON  GpioSetRegOneBit(LED_PIN6_PORT_ICS_2MA4,LED_PIN6_BIT),\
                        GpioSetRegOneBit(LED_PIN6_PORT_ICS_1MA7,LED_PIN6_BIT)

#define LED_PIN7_IN_ON  GpioSetRegOneBit(LED_PIN7_PORT_ICS_2MA4,LED_PIN7_BIT),\
                        GpioSetRegOneBit(LED_PIN7_PORT_ICS_1MA7,LED_PIN7_BIT)
```

```
//段码宏定义
#define SEGA_BITNO  0
#define SEGB_BITNO  1
#define SEGC_BITNO  2
#define SEGD_BITNO  3
#define SEGE_BITNO  4
#define SEGF_BITNO  5
#define SEGG_BITNO  6
#define SEGH_BITNO  7
```

```
#define SEG_A   (1 << SEGA_BITNO)
#define SEG_B   (1 << SEGB_BITNO)
#define SEG_C   (1 << SEGC_BITNO)
#define SEG_D   (1 << SEGD_BITNO)
#define SEG_E   (1 << SEGE_BITNO)
#define SEG_F   (1 << SEGF_BITNO)
#define SEG_G   (1 << SEGG_BITNO)
#define SEG_H   (1 << SEGH_BITNO)

#define NUM_0   (SEG_A | SEG_B | SEG_C | SEG_D | SEG_E | SEG_F)
#define NUM_1   (SEG_B | SEG_C)
#define NUM_2   (SEG_A | SEG_B | SEG_D | SEG_E | SEG_G)
#define NUM_3   (SEG_A | SEG_B | SEG_C | SEG_D | SEG_G)
#define NUM_4   (SEG_B | SEG_C | SEG_F | SEG_G)
#define NUM_5   (SEG_A | SEG_C | SEG_D | SEG_F | SEG_G)
#define NUM_6   (SEG_A | SEG_C | SEG_D | SEG_E | SEG_F | SEG_G)
#define NUM_7   (SEG_A | SEG_B | SEG_C)
#define NUM_8   (SEG_A | SEG_B | SEG_C | SEG_D | SEG_E | SEG_F | SEG_G)
#define NUM_9   (SEG_A | SEG_B | SEG_C | SEG_D | SEG_F | SEG_G)

#define CHR_A   (SEG_A | SEG_B | SEG_C | SEG_E | SEG_F | SEG_G)
#define CHR_B   (SEG_C | SEG_D | SEG_E | SEG_F | SEG_G)
#define CHR_C   (SEG_A | SEG_D | SEG_E | SEG_F)
#define CHR_D   (SEG_B | SEG_C | SEG_D | SEG_E | SEG_G)

#define CHR_E   (SEG_A | SEG_D | SEG_E | SEG_F | SEG_G)
#define CHR_F   (SEG_A | SEG_E | SEG_F | SEG_G)
#define CHR_G   (SEG_A | SEG_C | SEG_D | SEG_E | SEG_F)
#define CHR_H   (SEG_B | SEG_C | SEG_E | SEG_F | SEG_G)
#define CHR_I   (SEG_E | SEG_F)
#define CHR_J   (SEG_B | SEG_C | SEG_D)
#define CHR_K   (SEG_D | SEG_E | SEG_F | SEG_G)
#define CHR_L   (SEG_D | SEG_E | SEG_F)
#define CHR_M   (SEG_A | SEG_B | SEG_E | SEG_F)
#define CHR_N   (SEG_A | SEG_B | SEG_C | SEG_E | SEG_F)
#define CHR_O   (SEG_A | SEG_B | SEG_C | SEG_D | SEG_E | SEG_F)
#define CHR_P   (SEG_A | SEG_B | SEG_E | SEG_F | SEG_G)
#define CHR_Q   (SEG_A | SEG_B | SEG_C | SEG_F | SEG_G)
#define CHR_R   (SEG_E | SEG_F | SEG_G)
#define CHR_S   (SEG_A | SEG_C | SEG_D | SEG_F | SEG_G)
#define CHR_T   (SEG_A | SEG_E | SEG_F)
#define CHR_U   (SEG_B | SEG_C | SEG_D | SEG_E | SEG_F)
#define CHR_V   (SEG_C | SEG_D | SEG_E)
#define CHR_W   (SEG_C | SEG_D | SEG_E | SEG_F)
```

```
#define CHR_X   (SEG_B | SEG_C | SEG_E | SEG_F | SEG_G)
#define CHR_Y   (SEG_B | SEG_C | SEG_D | SEG_F | SEG_G)
#define CHR_Z   (SEG_A | SEG_D)
#define CHR_    (SEG_G)
#define CHR_NUL 0
```

```
//中断刷新代码
void LedFlushDisp(void)
{
    static uint8_t ScanPinNum = 0;

    ScanPinNum++;
    if(ScanPinNum >= (MAX_LED_PIN_NUM + 1))
    {
        ScanPinNum = 1;
    }

    LedAllPinGpioInput();
    switch(ScanPinNum)
    {
        case 1:
            if(gDispBuff[0] & SEG_A)
            {
                LED_PIN2_IN_ON;
            }

            if(gDispBuff[0] & SEG_B)
            {
                LED_PIN3_IN_ON;
            }

            if(gDispBuff[0] & SEG_E)
            {
                LED_PIN4_IN_ON;
            }

            if(gDispBuff[4] & SEG_A)
            {
                LED_PIN6_IN_ON;
            }   //PLAY

            if(gDispBuff[4] & SEG_D)
            {
                LED_PIN5_IN_ON;
```

```
        }   //SD

        if(gDispBuff[3] & SEG_C)
        {
            LED_PIN7_IN_ON;
        }
        LED_PIN1_OUT_HIGH;
        break;

    case 2:
        if(gDispBuff[0] & SEG_F)
        {
            LED_PIN1_IN_ON;
        }

        if(gDispBuff[1] & SEG_A)
        {
            LED_PIN3_IN_ON;
        }

        if(gDispBuff[1] & SEG_B)
        {
            LED_PIN4_IN_ON;
        }

        if(gDispBuff[1] & SEG_E)
        {
            LED_PIN5_IN_ON;
        }

        if(gDispBuff[1] & SEG_D)
        {
            LED_PIN6_IN_ON;
        }

        if(gDispBuff[3] & SEG_G)
        {
            LED_PIN7_IN_ON;
        }
        LED_PIN2_OUT_HIGH;
        break;

    case 3:
        if(gDispBuff[0] & SEG_G)
```

```
        {
            LED_PIN1_IN_ON;
        }

        if(gDispBuff[1] & SEG_F)
        {
            LED_PIN2_IN_ON;
        }

        if(gDispBuff[4] & SEG_E)
        {
            LED_PIN4_IN_ON;
        }  //K5 DOT

        if(gDispBuff[2] & SEG_B)
        {
            LED_PIN5_IN_ON;
        }

        if(gDispBuff[4] & SEG_B)
        {
            LED_PIN6_IN_ON;
        }  //K2 PAUSE

        if(gDispBuff[4] & SEG_G)
        {
            LED_PIN7_IN_ON;
        }  //K7 MP3
        LED_PIN3_OUT_HIGH;
        break;

    case 4:
        if(gDispBuff[0] & SEG_C)
        {
            LED_PIN1_IN_ON;
        }

        if(gDispBuff[1] & SEG_G)
        {
            LED_PIN2_IN_ON;
        }

        if(gDispBuff[2] & SEG_F)
        {
```

```
            LED_PIN3_IN_ON;
        }

        if(gDispBuff[2] & SEG_C)
        {
            LED_PIN5_IN_ON;
        }

        if(gDispBuff[3] & SEG_E)
        {
            LED_PIN6_IN_ON;
        }

        if(gDispBuff[3] & SEG_B)
        {
            LED_PIN7_IN_ON;
        }
        LED_PIN4_OUT_HIGH;
        break;

    case 5:
        if(gDispBuff[0] & SEG_D)
        {
            LED_PIN1_IN_ON;
        }

        if(gDispBuff[1] & SEG_C)
        {
            LED_PIN2_IN_ON;
        }

        if(gDispBuff[2] & SEG_G)
        {
            LED_PIN3_IN_ON;
        }

        if(gDispBuff[2] & SEG_A)
        {
            LED_PIN4_IN_ON;
        }
        LED_PIN5_OUT_HIGH;
        break;

    case 6:
```

```
            if(gDispBuff[2] & SEG_D)
            {
                LED_PIN1_IN_ON;
            }

            if(gDispBuff[4] & SEG_C)
            {
                LED_PIN2_IN_ON;
            }  //K3 USB

            if(gDispBuff[2] & SEG_E)
            {
                LED_PIN3_IN_ON;
            }

            if(gDispBuff[3] & SEG_D)
            {
                LED_PIN4_IN_ON;
            }
            LED_PIN6_OUT_HIGH;
            break;

        case 7:
            if(gDispBuff[3] & SEG_F)
            {
                LED_PIN1_IN_ON;
            }

            if(gDispBuff[4] & SEG_F)
            {
                LED_PIN3_IN_ON;
            } //K6 FM

            if(gDispBuff[3] & SEG_A)
            {
                LED_PIN4_IN_ON;
            }
            LED_PIN7_OUT_HIGH;
            break;

        default:
            break;
    }
}
```

```
//更新显示如需显示数字 1234 则设置如下
gDispBuff[0]=NUM_1;
gDispBuff[1]=NUM_2;
gDispBuff[2]=NUM_3;
gDispBuff[3]=NUM_4;
```