

P22102

128x128 OLED Application Notes

Revision History

Version	Content
X01	First release

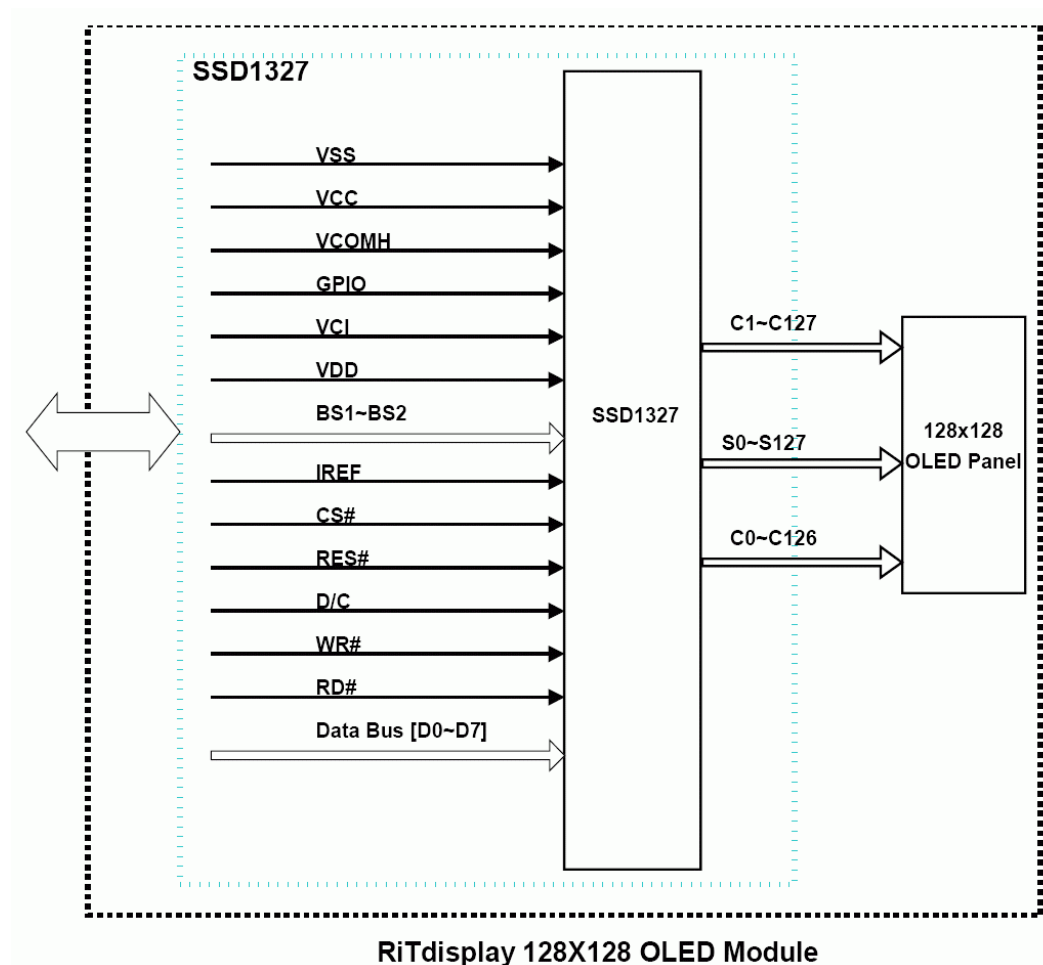
DESCRIPTION

P22102 is a 128X128 dot matrix white passive OLED module with controller for many compact portable applications.

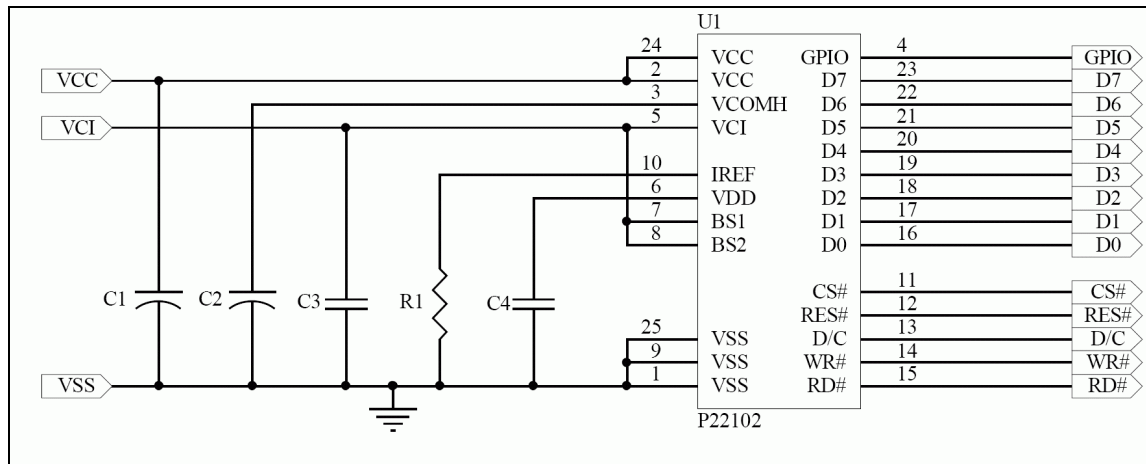
FEATURE

- Panel matrix 128x128.
- Driver IC: SSD1327.
- 16 gray scale
- $V_{CC} = 15V$
- $V_{CI} = 2.6V \sim 3.5V$
- Embedded 128 x 128 x 4 bit SRAM display buffer.
- 8-bit 6800-series Parallel Interface, 8-bit 8080-series Parallel Interface, Serial Peripheral Interface, I²C Interface.
- Screen saving continuous scrolling function in both horizontal and vertical direction.
- Row Re-mapping and Column Re-mapping
- Programmable Frame Rate and Multiplexing Ratio.

FUNCTION BLOCK DIAGRAM



Application circuit



Component:

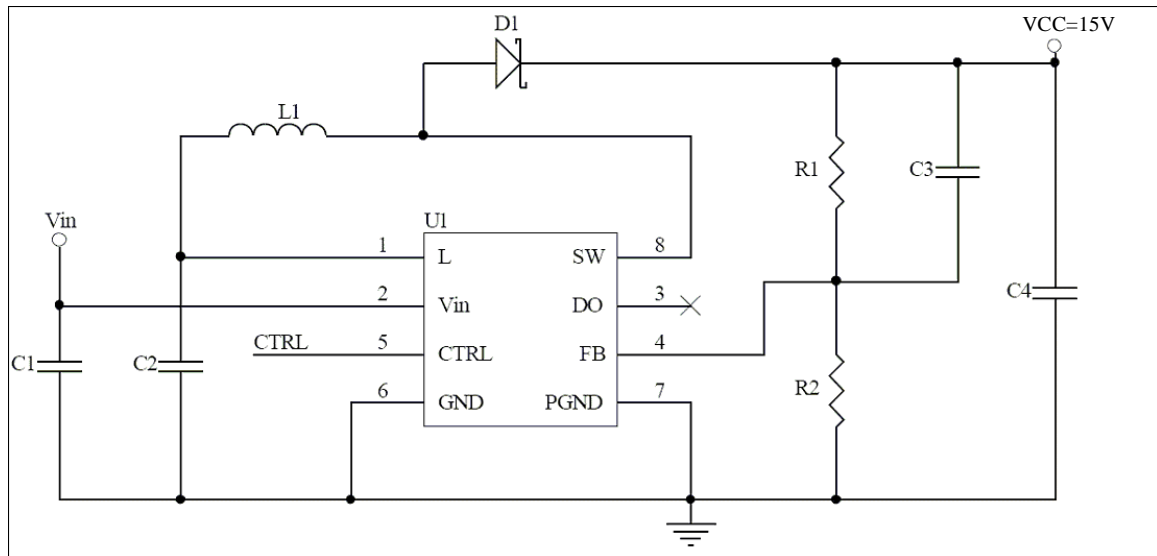
C1, C2: 4.7uF/35V(Tantalum type) or VISHAY (572D475X0025A2T)

C3, C4: 1uF/16V(0603)

R1: 1M ohm (0603) 1%

This circuit is for 8080 8bits interface.

DC-DC application circuit for OLED module



Recommend components:

The C1: 0.1uF/6.3V.

The C2: 4.7 uF/6.3V.

The C3: 22pF/16V.

The C4: 4.7uF/35V Tantalum type capacitor.

The R1: 1.27M ohm 1%.

The R2: 113K ohm 1%.

The D1: SCHOTTY DIODE.

The L1: 10uH.

The U1: HPA00483DRBR

The R1, R2 and C3 value should be fine tune by customer.

NOTE a. The HPA00483DRBR is low cost DC/DC for TI.

b. The HPA00483DRBR spec. is same as TPS61045.

Pin Assignments

PIN NAME	PIN NO	DESCRIPTION
VSS	1	Ground.
VCC	2	Power supply for analog circuit.
VCOMH	3	Com Voltage Output. A capacitor should be connected between this pin and V_{SS} .
GPIO	4	General I/O port.
VCI	5	Power supply for logic circuit.
VDD	6	A capacitor should be connected between this pin and V_{SS} .
BS1	7	MCU bus interface selection pins.
BS2	8	MCU bus interface selection pins.
VSS	9	Ground.
IREF	10	Reference current input pin. A resistor should be connected between this pin and V_{SS} .
CS#	11	Chip select input.
RES#	12	Reset signal input. When it's low, initialization of SSD1327 is executed.
D/C	13	Data/ Command control. Pull high for write/read display data. Pull low for write command or read status.
WR#	14	MCU interface input. Data write operation is initiated when it's pull low.
RD#	15	MCU interface input. Data read operation is initiated when it's pull low.
D0	16	Data bus(for parallel interface)
D1	17	
D2	18	
D3	19	
D4	20	
D5	21	
D6	22	
D7	23	
VCC	24	Power supply for analog circuit.
VSS	25	Ground.

Application Initial Setting

/*128x128 OLED driver program */

```
void initial(void)
```

```
{
```

```
comm_out(0xae); //Set display off
```

```
comm_out(0xa0); //Set re-map
```

```
comm_out(0x43);
```

```
comm_out(0xa1); //Set display start line
```

```
comm_out(0x00);
```

```
comm_out(0xa2); //Set display offset
```

```
comm_out(0x00);
```

```
comm_out(0xa4); //Normal Display
```

```
comm_out(0xa8); //Set multiplex ratio
```

```
comm_out(0x7f);
```

```
comm_out(0xab); //Function Selection A
```

```
comm_out(0x01); //Enable internal VDD regulator
```

```
comm_out(0x81); //Set contrast
```

```
comm_out(0x77);
```

```
comm_out(0xb1); //Set Phase Length
```

```
comm_out(0x31);
```

```
comm_out(0xb3); //Set Front Clock Divider /Oscillator Frequency
```

```
comm_out(0xb1);
```

```
comm_out(0xb4); //For brightness enhancement
```

```
comm_out(0xb5);
```

```
comm_out(0xb6); //Set Second pre-charge Period
```

```
comm_out(0x0d);
```

comm_out(0xbc); //Set Pre-charge voltage

comm_out(0x07);

comm_out(0xbe); //Set VCOMH

comm_out(0x07);

comm_out(0xd5); //Function Selection B

comm_out(0x02); //Enable second pre-charge

comm_out(0xaf); //Display on

}

After initial the driver IC, user must clear the whole DDRAM.

```
void cleanDDR(void)
{
    int i,j;
    comm_out(0x15);//Set column address
    comm_out(0x00);//Column Start Address
    comm_out(0x3f);//Column End Address
    comm_out(0x75);//Set row address
    comm_out(0x00);//Row Start Address
    comm_out(0x7f);//Row End Address
    for(i=0;i<128;i++)
    {
        for(j=0;j<64;j++)
        {
            data_out(0x00);
        }
    }
}
```

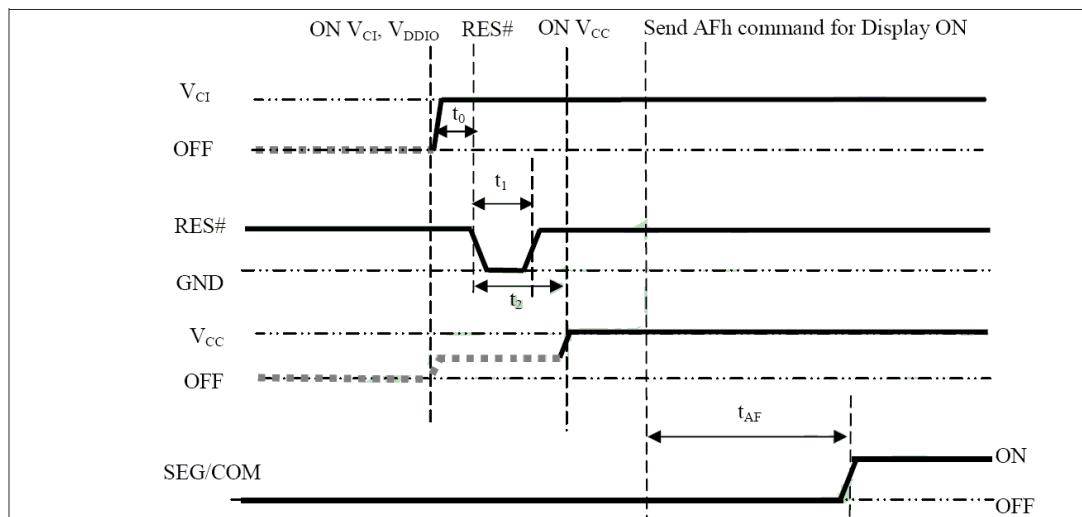
```
void show_data(char a)
{
    int i,j;
    comm_out(0x15);//Set column address
    comm_out(0x00);//Column Start Address
    comm_out(0x3f);//Column End Address
    comm_out(0x75);//Set row address
    comm_out(0x00);//Row Start Address
    comm_out(0x7f);//Row End Address
    for(i=0;i<128;i++)
    {
        for(j=0;j<64;j++)
        {
            data_out(a);
        }
    }
}
```

Power ON / OFF Sequence

Power ON sequence:

1. Power ON V_{CI} .
2. After V_{CI} becomes stable, set wait time at least 1ms (t_0) for internal V_{DD} become stable. Then set RES# pin LOW (logic low) for at least 100us (t_1)⁽⁴⁾ and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 100us (t_2). Then Power ON V_{CC} .⁽¹⁾
4. After V_{CC} become stable, send command AFh for display ON. SEG/COM will be ON after 200ms(t_{AF}).

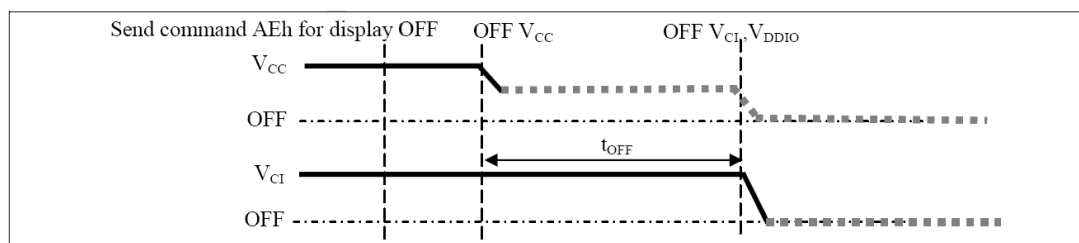
The Power ON sequence.



Power OFF sequence:

1. Send command AEh for display OFF.
2. Power OFF V_{CC} .^{(1), (2), (3)}
3. Wait for t_{OFF} . Power OFF V_{CI} . (where Minimum t_{OFF} =80ms⁽⁵⁾, Typical t_{OFF} =100ms)

The Power OFF sequence



Note:

- (1) Since an ESD protection circuit is connected between V_{CI} and V_{CC} , V_{CC} becomes lower than V_{CI} whenever V_{CI} is ON and V_{CC} is OFF as shown in the dotted line of V_{CC} in above figures.
- (2) V_{CC} should be kept disable when it is OFF.
- (3) Power pins (V_{CI} , V_{CC}) can never be pulled to ground under any circumstance.
- (4) The register values are reset after t_1 .
- (5) V_{CI} should not be Power OFF before V_{CC} Power OFF.

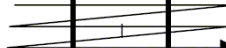
Graphic Display Data RAM Address Map

The GDDRAM is a bit mapped static RAM holding the bit pattern to be displayed. The size of the RAM is 128x128x4 bits. For mechanical flexibility, re-mapping on both Segment and Common outputs can be selected by software. The GDDRAM address maps below tables show some examples on using the command "Set Re-map" A0h to re-map the GDDRAM. In the following tables, the lower nibble and higher nibble of D0, D1, D2 ... D8189, D8190, D8191 represent the 128x128 data bytes in the GDDRAM.

The GDDRAM map under the following condition:

- Command "Set Re-map" A0h is set to:
 Disable Column Address Re-map (A[0]=0)
 Disable Nibble Re-map (A[1]=0)
 Enable Horizontal Address Increment (A[2]=0)
 Disable COM Re-map (A[4]=0)
- Display Start Line=00h
- Data byte sequence: D0, D1, D2 ... D8191

GDDRAM address map 1

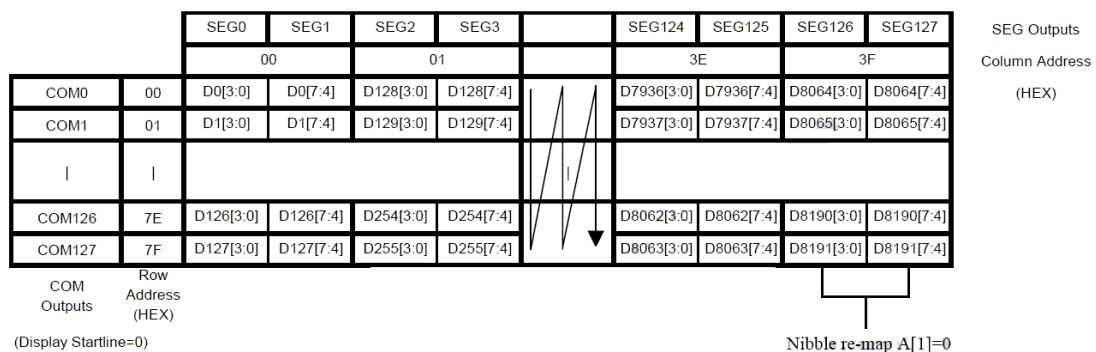
		SEG0	SEG1	SEG2	SEG3		SEG124	SEG125	SEG126	SEG127	SEG Outputs Column Address (HEX)
		00		01			3E		3F		
COM0	00	D0[3:0]	D0[7:4]	D1[3:0]	D1[7:4]		D62[3:0]	D62[7:4]	D63[3:0]	D63[7:4]	
COM1	01	D64[3:0]	D64[7:4]	D65[3:0]	D65[7:4]		D126[3:0]	D126[7:4]	D127[3:0]	D127[7:4]	
											
COM126	7E	D8064[3:0]	D8064[7:4]	D8065[3:0]	D8065[7:4]		D8126[3:0]	D8126[7:4]	D8127[3:0]	D8127[7:4]	
COM127	7F	D8128[3:0]	D8128[7:4]	D8129[3:0]	D8129[7:4]		D8190[3:0]	D8190[7:4]	D8191[3:0]	D8191[7:4]	
COM Outputs	Row Address (HEX)										

Nibble re-map A[1]=0

The GDDRAM map under the following condition:

- Command “Set Re-map” A0h is set to:
Disable Column Address Re-map (A[0]=0)
Disable Nibble Re-map (A[1]=0)
Enable Vertical Address Increment (A[2]=1)
Disable COM Re-map (A[4]=0)
- Display Start Line=00h
- Data byte sequence: D0, D1, D2 ... D8191

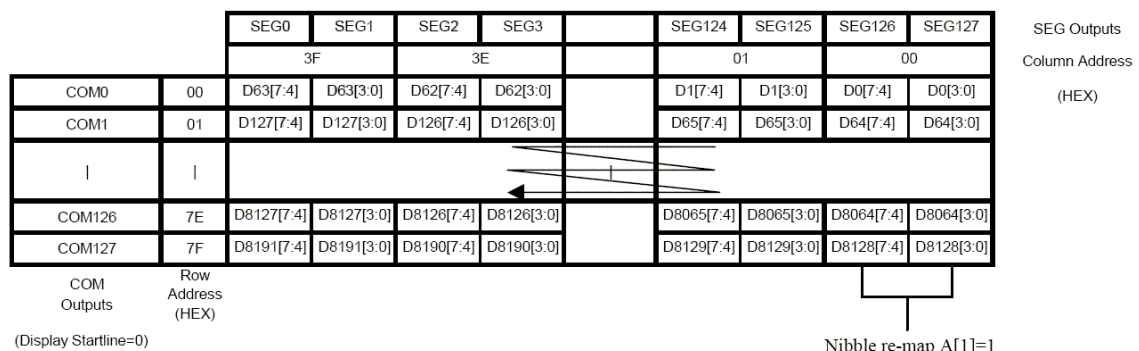
GDDRAM address map 2



The GDDRAM map under the following condition:

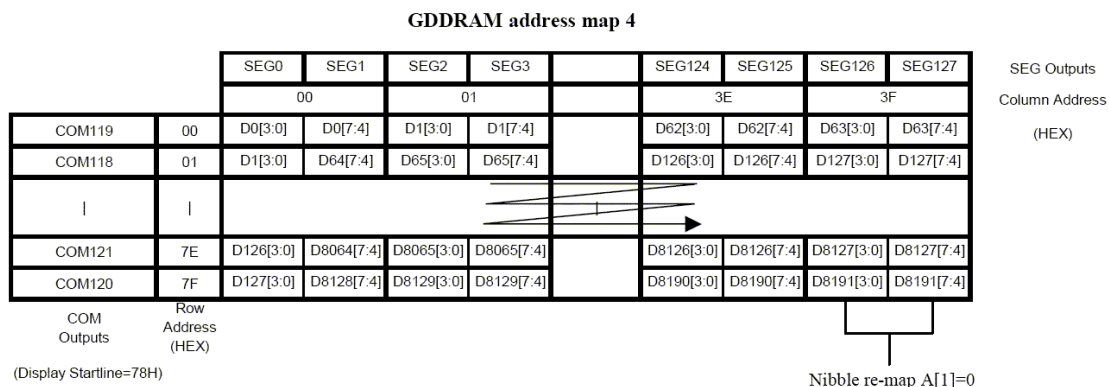
- Command “Set Re-map” A0h is set to:
Enable Column Address Re-map (A[0]=1)
Enable Nibble Re-map (A[1]=1)
Enable Horizontal Address Increment (A[2]=0)
Disable COM Re-map (A[4]=0)
- Display Start Line=00h
- Data byte sequence: D0, D1, D2 ... D8191

GDDRAM address map 3



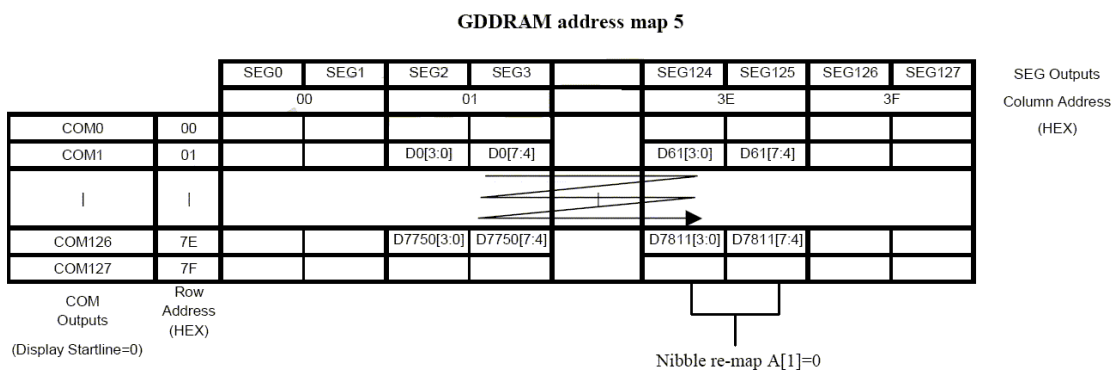
The example in which the display start line register is set to 10h with the following condition:

- Command “Set Re-map” A0h is set to:
 Disable Column Address Re-map (A[0]=0)
 Disable Nibble Re-map (A[1]=0)
 Enable Horizontal Address Increment (A[2]=0)
 Enable COM Re-map (A[4]=1)
- Display Start Line=78h (corresponds to COM119)
- Data byte sequence: D0, D1, D2 ... D8191



The GDDRAM map under the following condition:

- Command “Set Re-map” A0h is set to:
 Disable Column Address Re-map (A[0]=0)
 Disable Nibble Re-map (A[1]=0)
 Enable Horizontal Address Increment (A[2]=0)
 Disable COM Re-map (A[4]=0)
- Display Start Line=00h
- Column Start Address=01h
- Column End Address=3Eh
- Row Start Address=01h
- Row End Address=7Eh
- Data byte sequence: D0, D1, D2 ... D7811



Thank You

