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Application Note

NVK-064SC012F-S-0100
(96XRGBX64 65K OLED)

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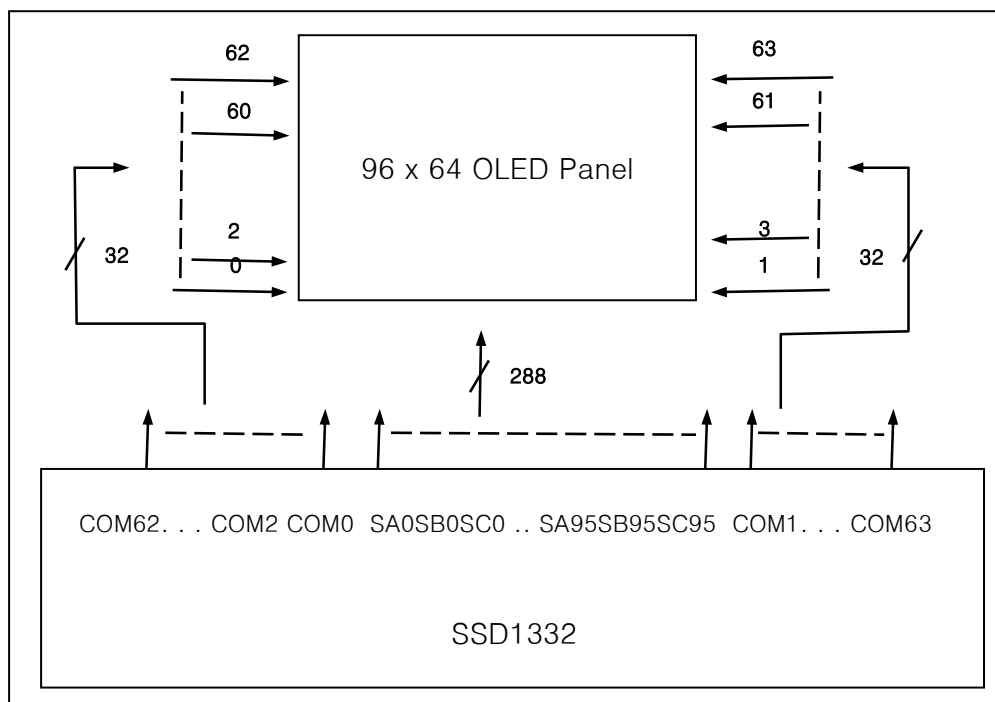
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1. Features

- Display Format : 96(W) x R.G.B. x 64(H) dots
- Display Color : 65K colors
- Driver Element : passive matrix OLED(Organic Light Emitting Diode)
- Interface : 8bit parallel data with MPU(8080-series MPU)
- Multiplexing Ratio : 1/64 Duty
- Control IC / Drive IC : SSD1332 (Manufacturer : Solomon systech, Inc)
- Polarizer : With POL (Glare Type)
- Applications : Display terminal for mobile phone, MP3 player

2. Block Diagram



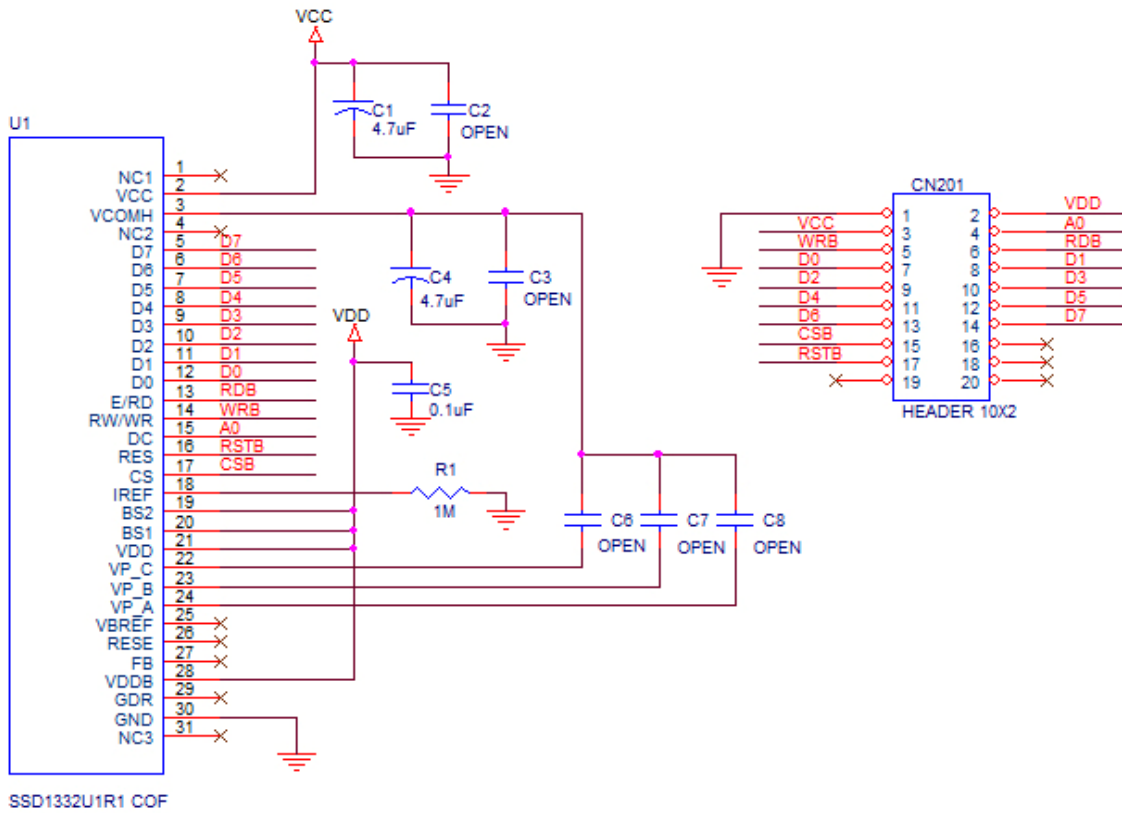
POWER	VDD for Logic Power	2.8V
	VCC for OLED Power	15V
	VSS	0V
Signal Line	CS,RD,WR,DC(A0),RES(RSET)	
Data Bus	D[7:0]	

3. Pin Description

Pin No	Symbol	I/O	Description	Remark
1	NC	-	No Connection	
2	VCC	P	The Most Positive voltage	
3	VCOMH	I	The voltage output high level for COM signals	
4	NC	-	No Connection	
5	D7	I/O	8-bit bi-direction data bus	
6	D6	I/O	8-bit bi-direction data bus	
7	D5	I/O	8-bit bi-direction data bus	
8	D4	I/O	8-bit bi-direction data bus	
9	D3	I/O	8-bit bi-direction data bus	
10	D2	I/O	8-bit bi-direction data bus	
11	D1	I/O	8-bit bi-direction data bus	
12	D0	I/O	8-bit bi-direction data bus	
13	E(RD)	I	Read enable pin("Low" enable).	
14	RW#(WR)	I	Write enable pin("Los" enable).	
15	DC#	I	Address input pin.("Low"=Command, "High"=Parameter)	
16	RES#	I	Reset input pin When RSTB is "Low", Initialization is executed.	
17	CS#	I	Chip select input pin("Low" enable).	
18	IREF	O	The segment output current reference pin.	
19	BS2	I	These pins are used to configure MCU interface selection	
20	BS1	I	These pins are used to configure MCU interface selection	
21	VDD	P	Logic Power supply	
22	VP-C	I/O	The pre-charge driving voltages for OLED driving segment pins	
23	VP-B	I/O	The pre-charge driving voltages for OLED driving segment pins	
24	VP-A	I/O	The pre-charge driving voltages for OLED driving segment pins	
25	VBREF	I	The internal voltage reference of booster circuit.	
26	RESE	I	Connects to the source current pin of the external NMOS of the booster circuit.	
27	FB	I	The feedback resistor input of the booster circuit.	
28	VDDDB	P	The power supply for the internal buffer of the DC-DC voltage converter.	
29	GDR	O	Drive the gate of the external NMOS	
30	VSS	P	Ground	
31	NC	-	No Connection	

4. Application Circuit

4-1 Peripheral Circuit



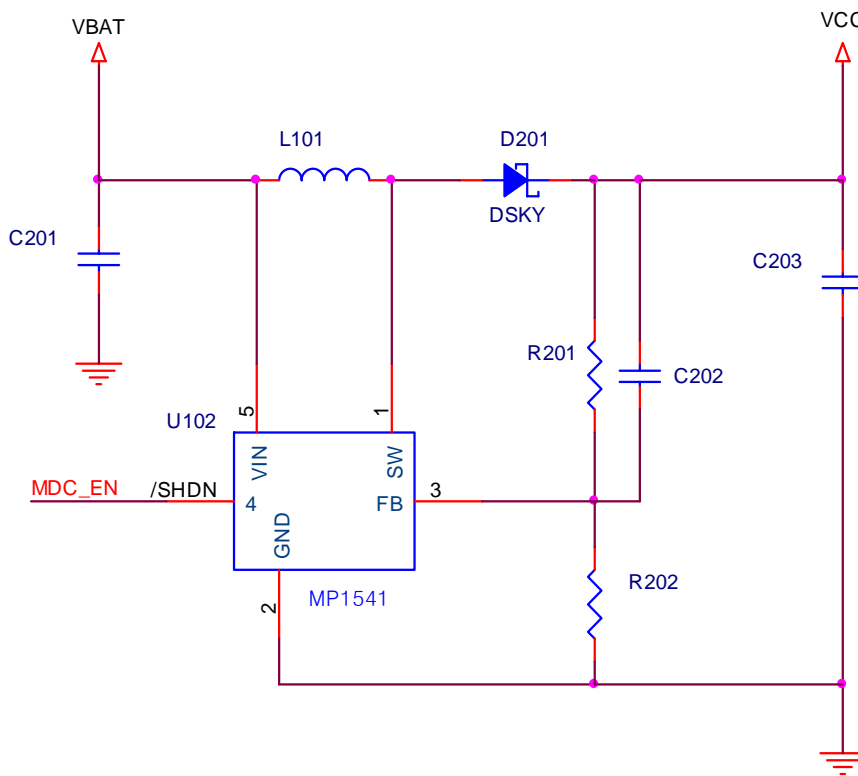
- PART LIST

Ref.No.	Part Name	Manufacture
C1,C4	4.7uF / 25V / Tantal	-
C5	0.1uF / 16V	-
R1	1M ohm/ F(±1%)	-
C2,C3,C6, C7,C8	OPEN	-
HEADER	PIN HEADER (2*10)	-

- 20PIN INFORMATION

Pin No	Name	Pin No	Name
1	GND	6	RDB
2	VDD	7 ~ 14	D0 ~ D7
3	VCC	15	CSB
4	A0	17	RSTB
5	WRB	16,18,19,20	NC

4-2 DC-DC Converter



VBAT : 3.6V

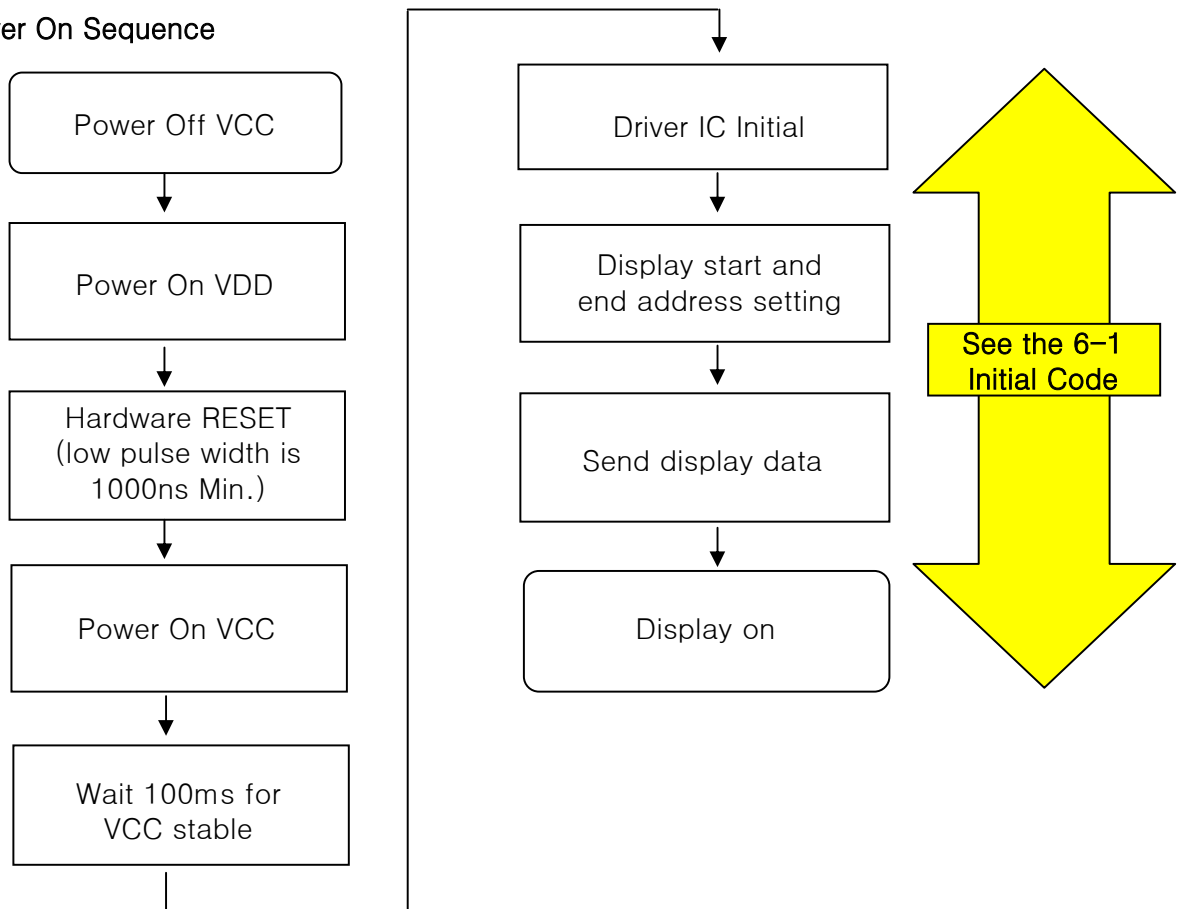
VCC : 15V

$VCC = 1.25 * ((R201/R202)+1)$

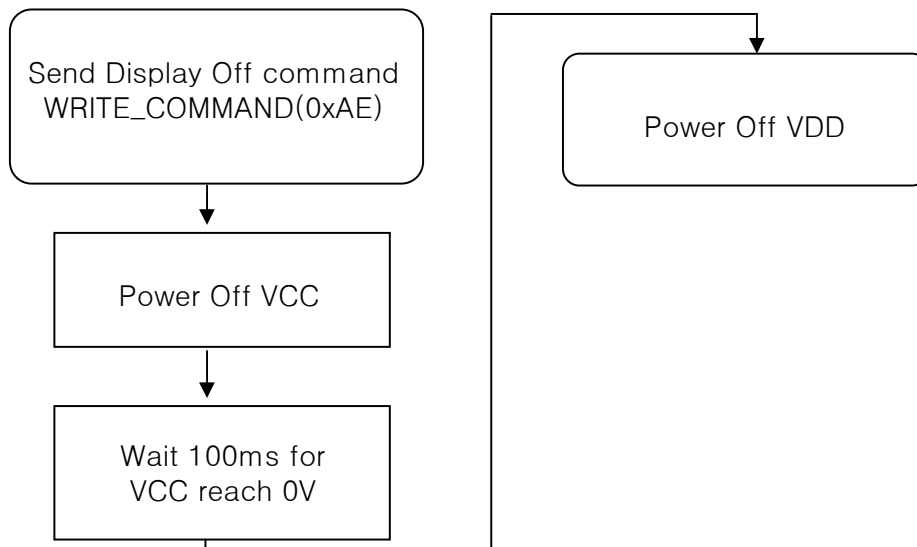
Recommend component				
	PART NAME	DESCRIPTION	PART NUMBER	MANUFACTURE
C201	CAPACITOR	4.7uF / 25V X5R	GRM21BR61E475KA12L	MURATA
C202	CAPACITOR	120pF / 16V	GRM188R61C121DA12D	MURATA
C203	CAPACITOR	4.7uF / 25V X5R	GRM21BR61E475KA12L	MURATA
L101	Inductor	10uH	SF0B3412	SAMHWA
R201	RESISTOR	110K ohm / 1%.	RM04FT1503	ANY
R202	RESISTOR	11K ohm / 1%.	RM04FT1342	ANY
D201	SCHOTTKY DIODE	0.5A,30V	B0530WS-F	DIODES
U102	DC-DC Converter	MP1541	MP1541DJ	MPS

5. Power Sequence

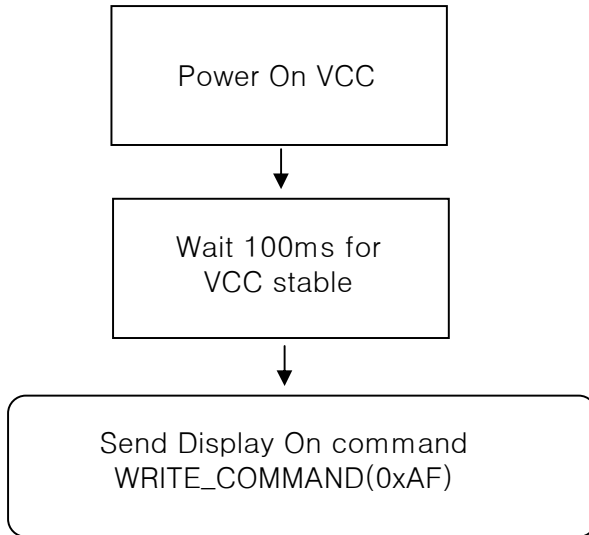
5-1 Power On Sequence



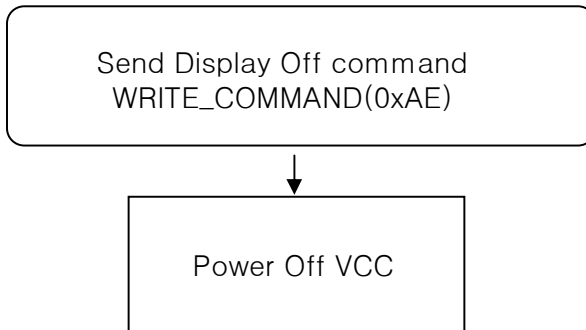
5-2 Power Off Sequence



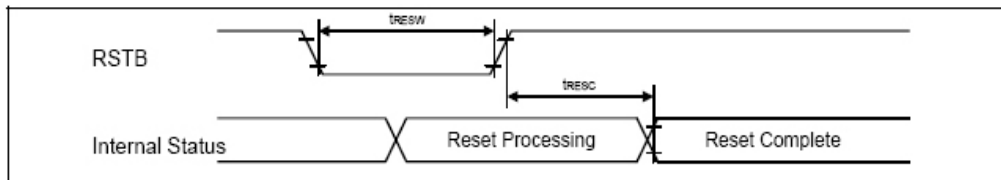
5-3 Display On Sequence



5-4 Display Off Sequence



5-5 Reset Input Timing



($V_{DD} = 1.8V/2.8V, T_a = 25^\circ C$)

Symbol	Parameter	Conditions	Related Pins	MIN	TYP	MAX	Unit
t_{RESW}	Reset low pulse width	-	RSTB	1000	-	-	ns
t_{RESC}	Reset complete time	-	-	-	-	1000	ns

6. Application Software

6-1. Initial Example

WRITE_COMMAND(0xAE); // Display Off

WRITE_COMMAND(0x15); // Column Address

WRITE_COMMAND(0x00); // Set

WRITE_COMMAND(0x5F); // Set

WRITE_COMMAND(0x75); // Row Address

WRITE_COMMAND(0x00); // Set

WRITE_COMMAND(0x3F); // Set

WRITE_COMMAND(0x81); // Set Contrast for Color A

WRITE_COMMAND(0x5A); // Set

WRITE_COMMAND(0x82); // Set Contrast for Color B

WRITE_COMMAND(0x2C); // Set

WRITE_COMMAND(0x83); // Set Contrast for Color C

WRITE_COMMAND(0x54); // Set

WRITE_COMMAND(0x87); // Master Current Control

WRITE_COMMAND(0x09); // Set

WRITE_COMMAND(0xA0); // Set Re-map & Data Format

WRITE_COMMAND(0x70); // Set

WRITE_COMMAND(0xA1); // Set Display Start Line

WRITE_COMMAND(0x00); // Set

WRITE_COMMAND(0xA2); // Set off Set

WRITE_COMMAND(0x00); // Set

WRITE_COMMAND(0xA8); // Multiplex Ratio

WRITE_COMMAND(0x3F); // Set

WRITE_COMMAND(0xAD); // Master Configuration

WRITE_COMMAND(0x8E); // Set

WRITE_COMMAND(0xB1); // Adjust Driving period

WRITE_COMMAND(0x11); // Set

WRITE_COMMAND(0xB3); // Colock Divider Oscillator Frequency

WRITE_COMMAND(0xD0); // Set

WRITE_COMMAND(0xBB); // Pre_charge Voltage Setting

WRITE_COMMAND(0x00); // Set

WRITE_COMMAND(0xBC); // Pre_charge Voltage Setting

WRITE_COMMAND(0x2A); // Set

WRITE_COMMAND(0xBD); // Pre_charge Voltage Setting

WRITE_COMMAND(0x00); // Set

WRITE_COMMAND(0xBE); // Set VCOMH Level

WRITE_COMMAND(0x3F); // Set

WRITE_COMMAND(0xB9); // Enable Linear Gray Scale

WRITE_COMMAND(0xAF); // Display On

Now setting value is 15V, 100cd.
If you want to change
the OLED Brightnees.
Pls see the Note 1)

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the OLED Brightnees.
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```

WRITE_COMMAND(0x15); //Set Column Address RAM
WRITE_COMMAND(0x00); //Dec->0
WRITE_COMMAND(0x5F); //Dec->95

```

```

WRITE_COMMAND(0x75); //Set Row RAM Address
WRITE_COMMAND(0x00); //Dec->0
WRITE_COMMAND(0x3F); //Dec->63

```

```

for(Y=0;Y<64;Y++) // Example. RED COLOR Display
{
  for(X=0;X<96;X++)
  {
    WRITE_DATA(0xF8);
    WRITE_DATA(0x00);
  }
}

```

6-2. Write Command/Parameter Function

```

WRITE_COMMAND(unsigned char db_data)
{
  cs(0);
  a0(0);
  write_data(db_data);
  wr(0); wr(1);
  cs(1);
}

```

```

WRITE_DATA(unsigned char db_data)
{
  cs(0);
  a0(1);
  write_data(db_data);
  wr(0); wr(1);
  cs(1);
}

```

6-3. Screen saving (Vertical scrolling)

Screen saver Stop and Display off after setting time command
S_SleepStart is execute the follows after 10msec will gone.

```

VERTICAL SCROLL ( )
{
    int i;
    for(i=0;i<64;i++)
    {
        WRITE_COMMAND(0xA1);
        WRITE_COMMAND(0x00+i);
        Delay(1000); //delay 10ms
    }
}
    
```

Note 1)

VDD : 2.8V, VCC : 15V

Register Luminance	Contrast(A,B,C)			Master	Pre-Charge			Remark
	81h	82h	83h	87h	BBh	BCh	BDh	
100cd/m2	0x5A	0x2C	0x54	0x09	0x00	0x2A	0x00	
80cd/m2	0x59	0x2E	0x5A	0x06	0x00	0x2A	0x00	