DisplayModule

DM-OLED095-626

0.95” 96 X 64 FULL COLOR OLED DISPLAY MODULE WITH SPI INTERFACE

Contents

1 Revision History

Date	Changes
2015-12-28	First release

2 Main Features

Item	Specification	Unit
Diagonal Size	0.95”	inch
Display Mode	Passive Matrix OLED	-
Display Colors	65,536(Maximum)	Colors
Resolution	96 x 64	pixel
Controller IC	SSD1331	-
Duty	1/64	duty
Interface	SPI	-
Active Area	20.14 x 13.42	mm
Module Dimension	25.70 x 22.20 x 1.50	mm
Weight	1.8	g

3 Pin Description

3.1 Panel Pin Description

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Function Description</th></tr>
<tr><td>1</td><td>NC</td><td>Reserved Pin (Supporting Pin)
The supporting pins can reduce the influences from stresses on the function pins.</td></tr>
<tr><td>2</td><td>VSS</td><td>Ground of OEL System
This is a ground pin. It also acts as a reference for the logic pins, the OEL driving voltages, and the analog circuits. It must be connected to external ground.</td></tr>
<tr><td>3</td><td>VDD</td><td>Power Supply Pins for Core VDD
This is a voltage supply pin. It must be connected to external source.</td></tr>
<tr><td>4</td><td>VDDIO</td><td>Power Supply for Interface Logic Level
It should be match with the MCU interface voltage level.
VDDIO must always be equal or lower than VDD.</td></tr>
<tr><td>5
6</td><td>BS1
BS2</td><td>Communicating Protocol Select
These pins are MCU interface selection input. See the following table:
<table>
<tr><th></th><th>68XX-parallel</th><th>80XX-parallel</th><th>Serial</th></tr>
<tr><td>BS1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>BS2</td><td>1</td><td>1</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>7</td><td>IREF</td><td>Current Reference for Brightness Adjustment
This pin is segment current reference pin. A resistor should be connected between this pin and VSS. Set the current at 10uA.</td></tr>
<tr><td>8</td><td>CS#</td><td>Chip Select
This pin is the chip select input. The chip is enabled for MCU communication only when CS# is pulled low.</td></tr>
<tr><td>9</td><td>RES#</td><td>Power Reset for Controller and Driver
This pin is reset signal input. When the pin is low, initialization of the chip is executed.</td></tr>
<tr><td>10</td><td>D/C#</td><td>Data/Command Control
This pin is Data/Command control pin. When the pin is pulled high, the input at D0~D7 is treated as display data. When the pin is pulled low, the input at D0~D7 will be transferred to the command register. For detail relationship to MCU interface signals, please refer to the Timing Characteristics Diagrams.</td></tr>
<tr><td>11</td><td>R/W# (WR#)</td><td>Read/Write Select or Write
This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as Read/Write (R/W#) selection input. Pull this pin to “High” for read mode and pull it to “Low” for write mode.
When 80XX interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled low and the CS# is pulled low.</td></tr>
<tr><td>12</td><td>E (RD#)</td><td>Read/Write Enable or Read
This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled high and the CS# is pulled low.</td></tr>
</table>

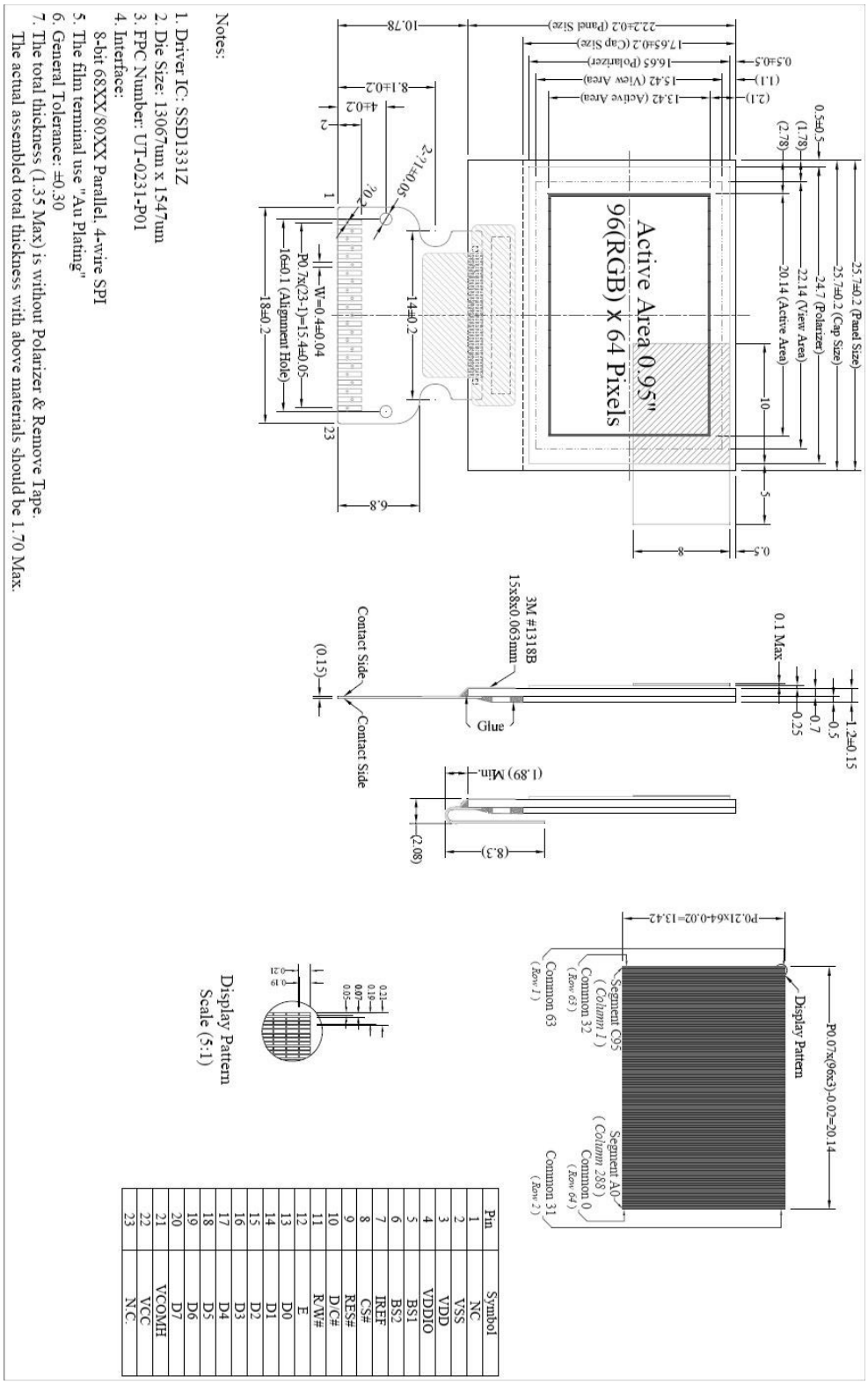
		When connecting to an 80XX-microprocessor, this pin receives the Read (RD#) signal. Data read operation is initiated when this pin is pulled low and CS# is pulled low.
13-20	D0-D7	Host Data Input/Output Bus These pins are 8-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial mode is selected, D1 will be the serial data input SDIN and D0 will be the serial clock input SCLK.
21	VCOMH	Voltage Output High Level for COM Signal The COM signal deselected voltage level. A tantalum capacitor should be connected between this pin and VSS.
22	VCC	Power Supply for OEL Panel This is the most positive voltage supply pin of the chip. It should be supplied externally.
23	NC	Reserved Pin (Supporting Pin) The supporting pins can reduce the influences from stresses on the function pins.

3.2 Module Pin Description

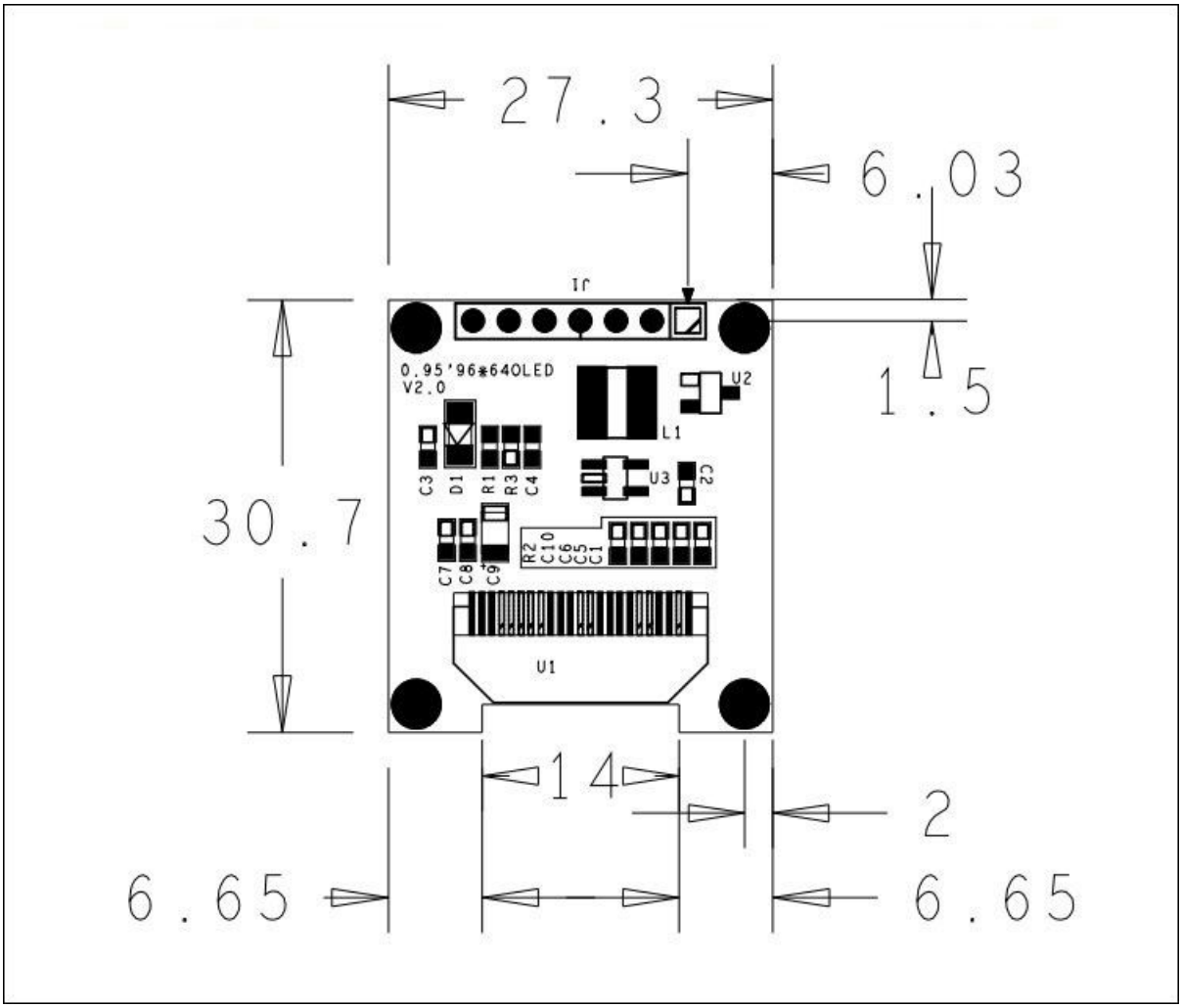
Pin No.	Symbol	Function Description
1	GND	Ground
2	VCC_IN	Power Supply
3 4	SCL SDA	Host Data Input/Output Bus These pins are 8-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial mode is selected, D1 will be the serial data input SDIN and D0 will be the serial clock input SCLK.
5	RES	Power Reset for Controller and Driver This pin is reset signal input. When the pin is low, initialization of the chip is executed.
6	D/C	Data/Command Control This pin is Data/Command control pin. When the pin is pulled high, the input at D0~D7 is treated as display data. When the pin is pulled low, the input at D0~D7 will be transferred to the command register. For detail relationship to MCU interface signals, please refer to the Timing Characteristics Diagrams.
7	CS	Chip Select This pin is the chip select input. The chip is enabled for MCU communication only when CS# is pulled low.

4 Mechanical Drawing

4.1 Panel Mechanical Drawing



4.2 Module Mechanical Drawing



5 Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage	VDD		2.4	2.8	3.5	V
Operating Current	ICC	Note 1		13.5	18	mA
Low Level Input Voltage	V_{IL}		0	-	$0.2xV_{DDIO}$	V
High Level Input Voltage	V_{IH}		$0.8xV_{DDIO}$	-	V_{DDIO}	V
Low Level Output Voltage	V_{OL}		0		$0.1xV_{DDIO}$	V
High Level Output Voltage	V_{OH}		$0.9xV_{DDIO}$		V_{DDIO}	V
Operating Temperature	TOP	Absolute Max	-30		70	℃
Storage Temperature	TST	Absolute Max	-40		80	℃

Note 1: VDD = 2.8V, VCC = 12V, IREF=910K 100% Display Area Turn on.

6 Optical Characteristics

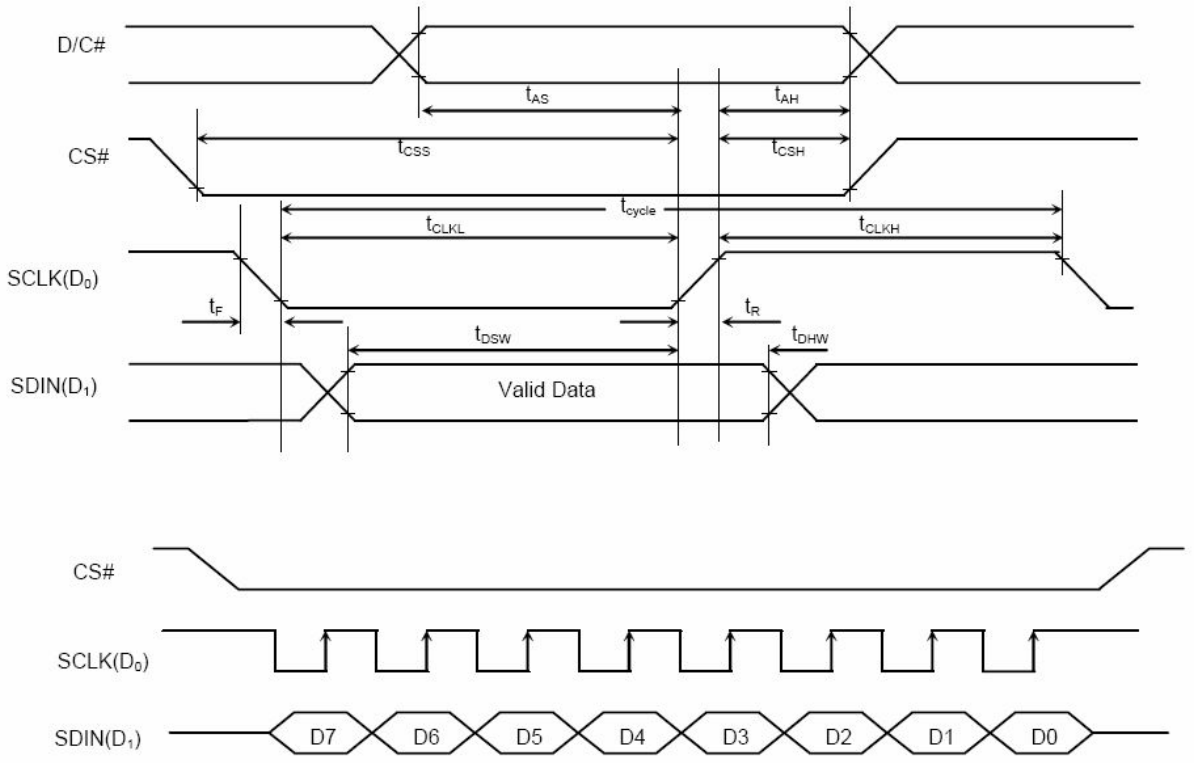
Item	Symbol	Min	Typ	Max	Unit
View Angles		>160	-	-	°
Response Time (25°C)	Tr + Tf				us
Brightness		80	100	-	cd/m²
Contrast Ratio	CR		>1,000:1		
Lifetime		10,000			Hrs

7 Timing Characteristics

7.1 Serial Interface Timing Characteristics

TA=25℃,VDD-VSS=1.65-3.5V

Symbol	Item	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	150	-	-	ns
t_{AS}	Address Setup Time	40	-	-	ns
t_{AH}	Address Hold Time	40	-	-	ns
t_{CSS}	Chip Select Setup Time	75	-	-	ns
t_{CSH}	Chip Select Hold Time	60	-	-	ns
t_{DSW}	Write Data Setup Time	40	-	-	ns
t_{DHW}	Write Data Hold Time	40	-	-	ns
t_{CLKL}	Clock Low Time	75	-	-	ns
t_{CLKH}	Clock High Time	75	-	-	ns
t_R	Rise Time	-	-	15	ns
t_F	Fall Time	-	-	15	ns



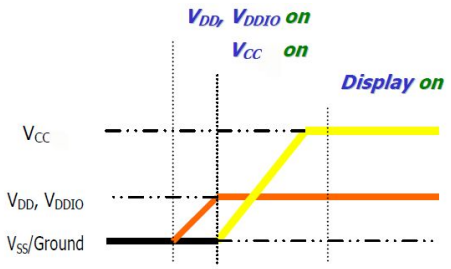
8 Functional Specification

8.1 Power down and Power up Sequence

To protect OEL panel and extend the panel life time, the driver IC power up/down routine should include a delay period between high voltage and low voltage power sources during turn on/off. It gives the OEL panel enough time to complete the action of charge and discharge before/after the operation.

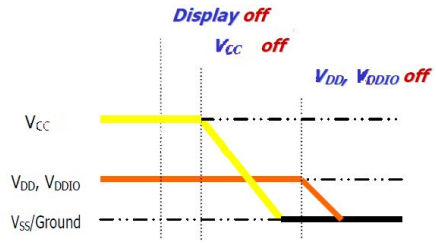
Power up Sequence

1. Power up V_{DD} & V_{DDIO}
2. Send Display off command
3. Clear Screen
4. Power up V_{CC}
5. Delay 100ms
   (when VDD & VDDIO is stable)
6. Send Display on command



Power down Sequence

1. Send Display off command
2. Power down V_{CC}
3. Delay 100ms
   (When V_{CC}/V_{BAT} is reach 0 and panel is completely discharges)
4. Power down V_{DD}



8.2 Reset Circuit

When RES# input is low, the chip is initialized with the following status:

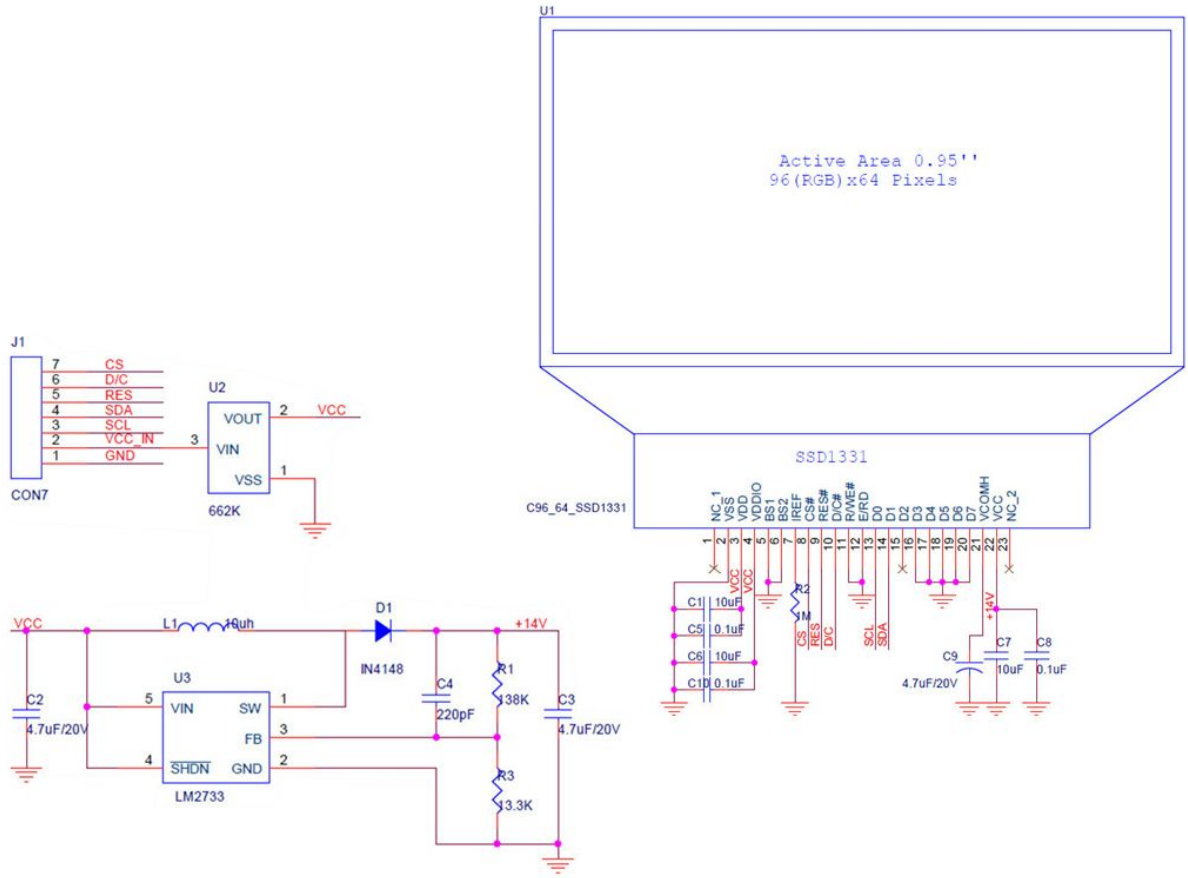
1. Display is OFF
2. 64 MUX Display Mode
3. Display start line is set at display RAM address 0
4. Display offset set to 0
5. Normal segment and display data column address and row address mapping (SEG0 mapped to address 00H and COM0 mapped to address 00H)
6. Column address counter is set at 0
7. Master contrast control register is set at 0FH
8. Individual contrast control registers of color A, B, and C are set at 80H
9. Shift register data clear in serial interface
10. Normal display mode (Equivalent to A4 command)

9 Driver/Controller Information

Built-in SSD1331 Controller:

https://drive.google.com/file/d/0B_HGldxxTS9iM2JzOWtlZWlIOGs/view?usp=sharing

10 Module Schematic



11 Example Application

Command usage and explanation of an actual example

<Initialization Setting>
Set Display On/Off (1010111X)
10101110 => 0xAE (Display Off)

Set Display Mode (101001XX)
10100100 => 0xA4 (Normal Display Mode)

Set Display Clock Divide Ratio / Oscillator Frequency
(10110011 with XXXXXXXX)

Set Display Offset
(10100010 with XXXXXXXX)

Set Multiplex Ratio
(11001000 with XXXXXXXX)

Set Master Configuration
(10101101 with 1000111X)
10001110 => 0x8E (External VCC Supply Selected)

Set Display Start Line
(10100001 with XXXXXXXX)
Set Segment Re-map & Data Format
(10100000 with XXXXXXXX)

Set Master Current Control
(10000111 with ****XXXX)
Set Contrast Control for Color “A”
(10000001 with XXXXXXXX)
Set Contrast Control for Color “B”
(10000010 with XXXXXXXX)
Set Contrast Control for Color “C”
(10000011 with XXXXXXXX)

Set Pre-charge Level
(10111011 with **XXXXXX)
Set Second Pre-charge Speed of Color A
(10001010 with XXXXXXXX)
Set Second Pre-charge Speed of Color B
(10001011 with XXXXXXXX)
Set Second Pre-charge Speed of Color C
(10001100 with XXXXXXXX)
Set VCOMH

(10111110 with 00XXXXX0)

Set Phase 1 & 2 Period Adjustment
(10110001 with XXXXXXXX)

Set Power Saving Mode
(10110000 with 000XXXXX)

Set Display On/Off (1010111X)
10101111 => 0xAF (Display On)

<Display Boundary Setting>
Set Column Address
(00010101 with XXXXXXXX for Start & XXXXXXXX for End)
Set Row Address
(01110101 with XXXXXXXX for Start & XXXXXXXX for End)

If the noise is accidentally occurred at the displaying window during the operation, please reset the display in order to recover the display function.

12 Command Table

Fundamental Commands												
D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description	Default
0	15	0	0	0	1	0	1	0	1	Set Column Address	Setup Column start and end address	
0	A[6:0]	*	A_6	A_5	A_4	A_3	A_2	A_1	A_0		A[6:0] start address from 00d-95d	00d (00h)
0	B[6:0]	*	B_6	B_5	B_4	B_3	B_2	B_1	B_0		B[6:0] end address from 00d-95d	95d (5Fh)
0	75	0	1	1	1	0	1	0	1	Set Row Address	Setup Row start and end address	
0	A[5:0]	*	*	A_5	A_4	A_3	A_2	A_1	A_0		A[5:0] start address from 00d-63d	00d (00h)
0	B[5:0]	*	*	B_5	B_4	B_3	B_2	B_1	B_0		B[5:0] end address from 00d-63d	63d (3Fh)
0	81	1	0	0	0	0	0	0	1	Set Contrast for Color "A"	Set contrast for all color "A" segment (Pins:SA0 – SA95)	
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0		A[7:0] valid range: 00d to 255d	128d (80h)
0	82	1	0	0	0	0	0	1	0	Set Contrast for Color "B"	Set contrast for all color "B" segment (Pins:SB0 – SB95).	
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0		A[7:0] valid range: 00d to 255d	128d (80h)
0	83	1	0	0	0	0	0	1	1	Set Contrast for Color "C"	Set contrast for all color "C" segment (Pins:SC0 – SC95).	
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0		A[7:0] valid range: 00d to 255d	128d (80h)
0	87	1	0	0	0	0	1	1	1	Master Current Control	Set master current attenuation factor	
0	A[3:0]	0	0	0	0	A_3	A_2	A_1	A_0		A[3:0] from 00d to 15d corresponding to 1/16, 2/16... to 16/16 attenuation.	15d (0Fh)

Fundamental Commands

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description	Default
0	8A	1	0	0	0	1	0	1	0	Set Second Pre-charge Speed for Color "A", "B" and "C"	A[7:0]: Set Second Pre-charge Speed Ranges: 0000000b to 1111111b, a higher value of A[7:0] gives a higher Second Pre-charge speed. **Note** (1) The default values of A[7:0] in 8Ah, A[7:0] in 8Bh and A[7:0] in 8Ch are equal to the contrast values for color A, B and C(refer to commands: 81h, 82h, 83h) respectively. (2) All six bytes (8Ah A[7:0], 8Bh A[7:0] and 8Ch A[7:0]) must be inputted together. For example: the original value is like that Original value: 8Ah A[7:0]: 80h; 8Bh A[7:0]: 80h; 8Ch A[7:0]: 80h If it is wanted to change the value of 8Bh A[7:0] to 75h, then all the following 6 bytes must be inputted: 8Ah,*80h,* 8Bh,*75h,* 8Ch,*80h.*	A[7:0] of 81h
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0			
0	8B	1	0	0	0	1	0	1	1			A[7:0] of 82h
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0			
0	8C	1	0	0	0	1	1	0	0			A[7:0] of 83h
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0			
0	A0	1	0	1	0	0	0	0	0	Remap & Color Depth setting	Set driver remap and color depth	
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0		A[0]=0, Horizontal address increment A[0]=1, Vertical address increment	A[0]=0
											A[1]=0, RAM Column 0 to 95 maps to Pin Seg (SA,SB,SC) 0 to 95 A[1]=1, RAM Column 0 to 95 maps to Pin Seg (SA,SB,SC) 95 to 0	A[1]=0
											A[2]=0, normal order SA,SB,SC (e.g. RGB) A[2]=1, reverse order SC,SB,SA (e.g. BGR)	A[2]=0
											A[3]=0, Disable left-right swapping on COM A[3]=1, Set left-right swapping on COM	A[3]=0
											A[4]=0, Scan from COM 0 to COM [N –1] A[4]=1, Scan from COM [N-1] to COM0. Where N is the multiplex ratio.	A[4]=0
											A[5]=0, Disable COM Split Odd Even (RESET) A[5]=1, Enable COM Split Odd Even	A[5]=0
											A[7:6] = 00; 256 color format A[7:6] = 01; 65k color format A[7:6] = 10; 65k color format 2 If 9 / 18 bit mode is selected, color depth will be fixed to 65k regardless of the setting.	A[7:6]=01
0	A1	1	0	1	0	0	0	0	1	Set Display Start Line	Set display start line register by Row	
0	A[5:0]	0	0	A_5	A_4	A_3	A_2	A_1	A_0		A[5:0]: from 00d to 63d	00d (00h)
0	A2	1	0	1	0	0	0	1	0	Set Display Offset	Set vertical offset by Com	
0	A[5:0]	0	0	A_5	A_4	A_3	A_2	A_1	A_0		A[5:0]: from 00d to 63d	00d (00h)

Fundamental Commands

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description	Default
0	A4 /	1	0	1	0	0	1	X_1	X_0	Set Display Mode	A4h=Normal Display A5h=Entire Display On, all pixels turn on at GS63 A6h=Entire Display Off, all pixels turn off A7h=Inverse Display	A4h
0	A5 /											
0	A6 /											
0	A7 /											
0	A8	1	0	1	0	1	0	0	0	Set Multiplex Ratio	Set MUX ratio to N+1 Mux N = A[5:0] from 15d to 63d A[5:0] from 00d to 14d are invalid entry	63d (3Fh)
0	A[5:0]	0	0	A_5	A_4	A_3	A_2	A_1	A_0			
0	AB	1	0	1	0	1	0	1	1	Dim Mode Setting	Configure dim mode setting A[7:0] = Reserved. (Set as 00h) B[7:0] = Contrast setting for Color A, valid range 0 to 255d. C[7:0] = Contrast setting for Color B, valid range 0 to 255d. D[7:0] = Contrast setting for Color C, valid range 0 to 255d. E[4:0] = Precharge voltage setting, valid range 0 to 31d.	\
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0			
0	B[7:0]	B_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0			
0	C[7:0]	C_7	C_6	C_5	C_4	C_3	C_2	C_1	C_0			
0	D[7:0]	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0			
0	E[4:0]	0	0	0	E_4	E_3	E_2	E_1	E_0			
0	AD	1	0	1	0	1	1	0	1	Set Master Configuration	A[0]=0b, Select external V_{CC} supply A[0]=1b, Reserved (RESET) **Note** (1) Bit A[0] **must be** set to 0b after RESET. (2) The setting will be activated after issuing Set Display ON command (AFh)	A[0] = 1
0	A[0]	1	0	0	0	1	1	1	A_0			
0	AC	1	0	1	0	1	1	A_1	A_0	Set Display On/Off	ACh = Display ON in dim mode AEh = Display off (sleep mode) AFh = Display on in normal mode	AEh
	AE											
	AF											
0	B0	1	0	1	1	0	0	0	0	Power Save Mode	A[7:0]=1Ah, Enable Power save mode (RESET) A[7:0]=0Bh, Disable Power save mode	1Ah
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0			
0	B1	1	0	1	1	0	0	0	1	Phase 1 and 2 period adjustment	A[3:0] Phase 1 period in N DCLK. 1~15 DCLK allowed. A[7:4] Phase 2 period in N DCLK. 1~15 DCLK allowed	74h
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0			
0	B3	1	0	1	1	0	0	1	1	Display Clock Divider / Oscillator Frequency	A[3:0]: Define the divide ratio (D) of the display clocks (DCLK): Divide ratio (D) = A[3:0] + 1 (i.e., 1 to 16) A[7:4] Fosc frequency. Frequency increases as setting value increases	D0h
0	A[7:0]	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0			

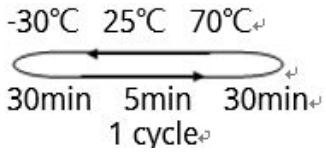
Fundamental Commands

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description	Default
0	B8	1	0	1	1	1	0	0	0	Set Gray Scale Table	These 32 parameters define pulse widths of GS1 to GS63 in terms of DCLK A[6:0]: Pulse width for GS1, RESET=01d B[6:0]: Pulse width for GS3, RESET=05d C[6:0]: Pulse width for GS5, RESET=09d … AE[6:0]: Pulse width for GS61, RESET=121d AF[6:0]: Pulse width for GS63, RESET=125d **Note:** (1) GS0 has no pre-charge and current drive stages. (2) GS2, GS4…GS62 are derived by Pn = (Pn-1+Pn+1)/2 (3) Pn will be truncated to integer if it is with decimal point. (4) Pn+1 should always be set to larger than Pn-1 (5) Max pulse width is 125	\
0	A[6:0]	*	A_6	A_5	A_4	A_3	A_2	A_1	A_0			
0	B[6:0]	*	B_6	B_5	B_4	B_3	B_2	B_1	B_0			
0	C[6:0]	*	C_6	C_5	C_4	C_3	C_2	C_1	C_0			
0	…	…	…	…	…	…	…	…	…			
0	AE[6:0]	*	AE_6	AE_5	AE_4	AE_3	AE_2	AE_1	AE_0			
0	AF[6:0]	*	AF_6	AF_5	AF_4	AF_3	AF_2	AF_1	AF_0			
0	B9	1	0	1	1	1	0	0	1	Enable Linear Gray Scale Table	Reset built in gray scale table (Linear) Pulse width for GS1 = 1d; Pulse width for GS2 = 3d; Pulse width for GS3 = 5d; … Pulse width for GS61 = 121d; Pulse width for GS62 = 123d; Pulse width for GS63 = 125d.	\
0	BB	1	0	1	1	1	0	1	1	Set Pre-charge level	Set pre-charge voltage level. All three color share the same pre-charge voltage. A[5:1] | Hex code | pre-charge voltage 00000 | 00h | 0.10 x V_{CC} : | : | : 11111 | 3Eh | 0.50 x V_{CC} Refer to Figure 31 for the details setting of A[5:1].	3Eh
0	A[5:0]	0	0	A_5	A_4	A_3	A_2	A_1	0			
0	BC-BD	1	0	1	1	1	1	0	X_0	NOP	Command for No operation	\
0	BE	1	0	1	1	1	1	1	0	Set V_{COMH}	Set COM deselect voltage level (V_{COMH}) A[5:1] | Hex code | V_{COMH} 00000 | 00h | 0.44 x V_{CC} 01000 | 10h | 0.52 x V_{CC} 10000 | 20h | 0.61 x V_{CC} 11000 | 30h | 0.71 x V_{CC} 11111 | 3Eh | 0.83 x V_{CC}	3Eh
0	A[5:1]	0	0	A_5	A_4	A_3	A_2	A_1	0			
0	E3	1	1	1	0	0	0	1	1	NOP	Command for No operation	\
0	FD	1	1	1	1	1	1	0	1	Set Command Lock	A[2]: MCU protection status A[2] = 0b, Unlock OLED driver IC MCU interface from entering command [reset] A[2] = 1b, Lock OLED driver IC MCU interface from entering command **Note** (1) The locked OLED driver IC MCU interface prohibits all commands and memory access except the FDh command.	12h
0	A[2]	0	0	0	1	0	A_2	1	0			

Graphic Acceleration Commands											
D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
0	21	0	0	1	0	0	0	0	1	Draw Line	A[6:0]: Column Address of Start
0	A[6:0]	*	A_6	A_5	A_4	A_3	A_2	A_1	A_0		B[5:0]: Row Address of Start
0	B[5:0]	*	*	B_5	B_4	B_3	B_2	B_1	B_0		C[6:0]: Column Address of End
0	C[6:0]	*	C_6	C_5	C_4	C_3	C_2	C_1	C_0		D[5:0]: Row Address of End
0	D[5:0]	*	*	D_5	D_4	D_3	D_2	D_1	D_0		E[5:1]: Color C of the line
0	E[5:1]	*	*	E_5	E_4	E_3	E_2	E_1	*		F[5:0]: Color B of the line
0	F[5:0]	*	*	F_5	F_4	F_3	F_2	F_1	F_0		G[5:1]: Color A of the line
0	G[5:1]	*	*	G_5	G_4	G_3	G_2	G_1	*		
0	22	0	0	1	0	0	0	1	0	Drawing Rectangle	A[6:0]: Column Address of Start
0	A[6:0]	*	A_6	A_5	A_4	A_3	A_2	A_1	A_0		B[5:0]: Row Address of Start
0	B[5:0]	*	*	B_5	B_4	B_3	B_2	B_1	B_0		C[6:0]: Column Address of End
0	C[6:0]	*	C_6	C_5	C_4	C_3	C_2	C_1	C_0		D[5:0]: Row Address of End
0	D[5:0]	*	*	D_5	D_4	D_3	D_2	D_1	D_0		E[5:1]: Color C of the line
0	E[5:1]	*	*	E_5	E_4	E_3	E_2	E_1	*		F[5:0]: Color B of the line
0	F[5:0]	*	*	F_5	F_4	F_3	F_2	F_1	F_0		G[5:1]: Color A of the line
0	G[5:1]	*	*	G_5	G_4	G_3	G_2	G_1	*		H[5:1]: Color C of the fill area
0	H[5:1]	*	*	H_5	H_4	H_3	H_2	H_1	*		I[5:0]: Color B of the fill area
0	I[5:0]	*	*	I_5	I_4	I_3	I_2	I_1	I0		J[5:1]: Color A of the fill area
0	J[5:1]	*	*	J_5	J_4	J_3	J_2	J_1	*		
0	23	0	0	1	0	0	0	1	1	Copy	A[6:0]: Column Address of Start
0	A[6:0]	*	A_6	A_5	A_4	A_3	A_2	A_1	A_0		B[5:0]: Row Address of Start
0	B[5:0]	*	*	B_5	B_4	B_3	B_2	B_1	B_0		C[6:0]: Column Address of End
0	C[6:0]	*	C_6	C_5	C_4	C_3	C_2	C_1	C_0		D[5:0]: Row Address of End
0	D[5:0]	*	*	D_5	D_4	D_3	D_2	D_1	D_0		E[6:0]: Column Address of New Start
0	E[6:0]	*	E_6	E_5	E_4	E_3	E_2	E_1	E_0		F[5:0]: Row Address of New Start
0	F[5:0]	*	*	F_5	F_4	F_3	F_2	F_1	F_0		
0	24	0	0	1	0	0	1	0	0	Dim Window	A[6:0]: Column Address of Start
0	A[6:0]	*	A_6	A_5	A_4	A_3	A_2	A_1	A_0		B[5:0]: Row Address of Start
0	B[5:0]	*	*	B_5	B_4	B_3	B_2	B_1	B_0		C[6:0]: Column Address of End
0	C[6:0]	*	C_6	C_5	C_4	C_3	C_2	C_1	C_0		D[5:0]: Row Address of End
0	D[5:0]	*	*	D_5	D_4	D_3	D_2	D_1	D_0		The effect of dim window: GS15~GS0 no change GS19~GS16 become GS4 GS23~GS20 become GS5 ... GS63~GS60 become GS15
0	25	0	0	1	0	0	1	0	1	Clear Window	A[6:0]: Column Address of Start
0	A[6:0]	*	A_6	A_5	A_4	A_3	A_2	A_1	A_0		B[5:0]: Row Address of Start
0	B[5:0]	*	*	B_5	B_4	B_3	B_2	B_1	B_0		C[6:0]: Column Address of End
0	C[6:0]	*	C_6	C_5	C_4	C_3	C_2	C_1	C_0		D[5:0]: Row Address of End
0	D[5:0]	*	*	D_5	D_4	D_3	D_2	D_1	D_0		
0	26	0	0	1	0	0	1	1	0	Fill Enable / Disable	A0 0 : Disable Fill for Draw Rectangle Command (RESET) 1 : Enable Fill for Draw Rectangle Command A[3:1] 000: Reserved values A4 0 : Disable reverse copy (RESET) 1 : Enable reverse during copy command.
0	A[4:0]	*	*	*	A_4	0	0	0	A_0		

Graphic Acceleration Commands											
D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
0	27	0	0	1	0	0	1	1	1	Continuous Horizontal & Vertical Scrolling Setup	A[6:0]: Set number of column as horizontal scroll offset Range: 0d-95d (no horizontal scroll if equals to 0)
0	A[6:0]	*	A_6	A_5	A_4	A_3	A_2	A_1	A_0		
0	B[5:0]	*	*	B_5	B_4	B_3	B_2	B_1	B_0		B[5:0]: Define start row address
0	C[6:0]	*	C_6	C_5	C_4	C_3	C_2	C_1	C_0		C[6:0]: Set number of rows to be horizontal scrolled B[5:0]+C[6:0] <=64
0	D[5:0]	*	*	D_5	D_4	D_3	D_2	D_1	D_0		D[5:0]: Set number of row as vertical scroll offset Range: 0d-63d (no vertical scroll if equals to 0)
0	E[1:0]	*	*	*	*	*	*	E_1	E_0		E[1:0]: Set time interval between each scroll step 00b 6 frames 01b 10 frames 10b 100 frames 11b 200 frames **Note**: (1) Vertical scroll is run with 64MUX setting only (2) The parameters should not be changed after scrolling is activated
0	2E	0	0	1	0	1	1	1	0	Deactivate scrolling	This command deactivates the scrolling action. **Note** (1) After sending 2Eh command to deactivate the scrolling action, the ram data needs to be rewritten.
0	2F	0	0	1	0	1	1	1	1	Activate scrolling	This command activates the scrolling function according to the setting done by Continuous Horizontal & Vertical Scrolling Setup command 27h.

13 Reliability

Test Item	Content of Test	Test Condition	Note
High Temperature Storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature Storage	Endurance test applying the high storage temperature for a long time.	-40℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 200hrs	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30 ℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max, for 96hrs under no-load condition excluding the polarizer. Then taking it out and drying it at normal temperature.	60℃,90%RH 96hrs	1,2
Thermal Shock Resistance	The sample should be allowed stand the following 10 cycles of operation 	-30℃/70℃ 10 cycles	-
Vibration Test	Endurance test applying the vibration during transportation and using	Total fixed amplitude: 15mm; Vibration: 10~55Hz; One cycle 60 seconds to 3 directions of X, Y, Z, for each 16 minutes.	3
Static Electricity Test	Endurance test apply the electric stress to the terminal.	VS=800V, RS=1.5kΩ, CS=100pF, 1 time.	-

Note1: No dew condensation to be observed.
Note2: The function test shall be conducted after 4 hours storage at the normal. Temperature and humidity after remove from the rest chamber.
Note3: Test performed on product itself, not inside a container.

14 Warranty and Conditions

http://www.displaymodule.com/pages/faq