



MULTI-INNO TECHNOLOGY CO., LTD.

LCD MODULE SPECIFICATION

Model : MI12864CO

| | |
|---------------|--|
| Revision | |
| Engineering | |
| Date | |
| Our Reference | |

PRODUCT SPECIFICATION

MI12864CO

128x64 GRAPHICS OLED DISPLAY MODULE



MI12864CO-S001



MI12864CO-S002



MI12864CO-S003



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1 Overview

MI12864CO is an OLED monochrome 128x64 dot matrix display module. The characteristics of this display module are high brightness, self-emission, high contrast ratio, slim/thin outline, wide viewing angle, wide temperature range, and low power consumption. It can be controlled by 8-bit Microprocessor directly. Different of MI12864CO-S001 and-S002、 S003 is S001 need external voltage (OLED luminosity can be adjusted),but S002、 S003 integrate with DC-DC circuit(OLED luminosity fixed); at configuration, there are difference for each other.

2 Features

- 128x64 pixels
- High contrast ratio
- Wide viewing angle
- Wide range of operating temperature
- low power consumption
- 8-bit 8080-Databus or 8-bit 6800-series parallel interface or series peripheral interface
- Display data is stored in Display Data RAM from MPU
- Power supply to logic system: +3V±10%
- Power supply to OLED driving system: +9V to +16V
- Built-in Solomon SSD1303 standard OLED controller

3 Mechanical Data

| NO. | ITEM | SPECIFICATION | UNIT |
|-----|---------------|---|----------------|
| 1 | Dot Matrix | 128(W) x 64(H) | |
| 2 | Dot Size | 0.4(W) x 0.4 (H) | mm |
| 3 | Dot Pitch | 0.43 (W) x 0.43(H) | mm |
| 4 | Aperture Rate | 87 | % |
| 5 | Active Area | 55 . 01 (W) x 27.49 (H) | m ² |
| 6 | Panel Size | 65 . 5(W) x 40 (H) | mm |
| 7 | Module Size | 66.1 (W) x 50 (H) x 5.75(MAX) (T) 75 (W) x 52.75 (H) x 6.75(MAX) (T) | mm |
| 8 | Polarizer | with | |
| 9 | Duty | 1/64 | |



4 Recommended Operation Conditions

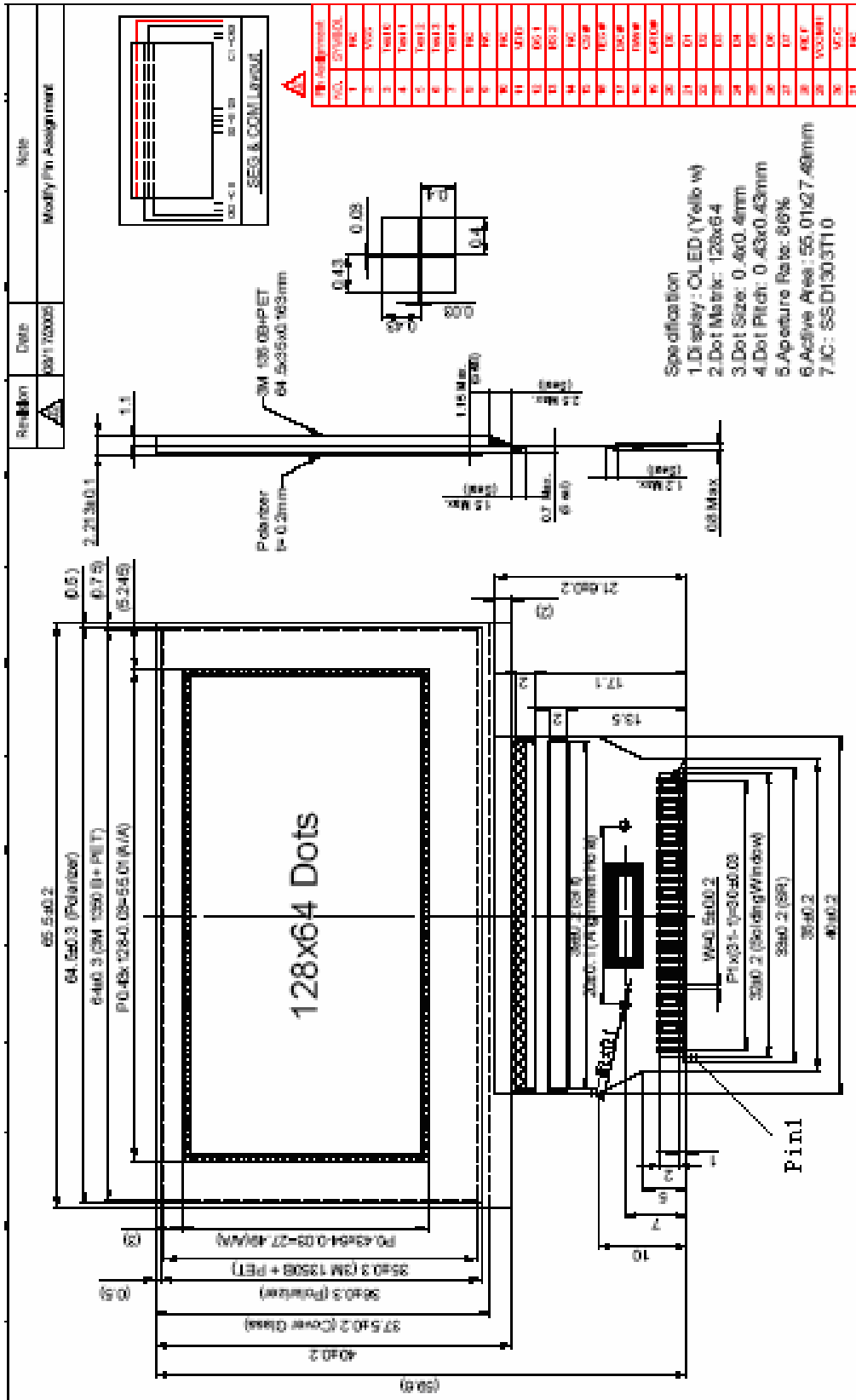
| Symbol | ITEM | MIN | TYP | MAX | UNIT |
|------------------|----------------------|-----|-----|------|------|
| V _{DD} | Logic supply voltage | 2.4 | 3.0 | +3.5 | V |
| V _{CC} | Operating voltage | 7 | 14 | +16 | V |
| T _{op} | Operating Temp. | -20 | - | +70 | |
| T _{stg} | Storage Temp | -30 | - | +80 | |

5 Electrical Characteristics

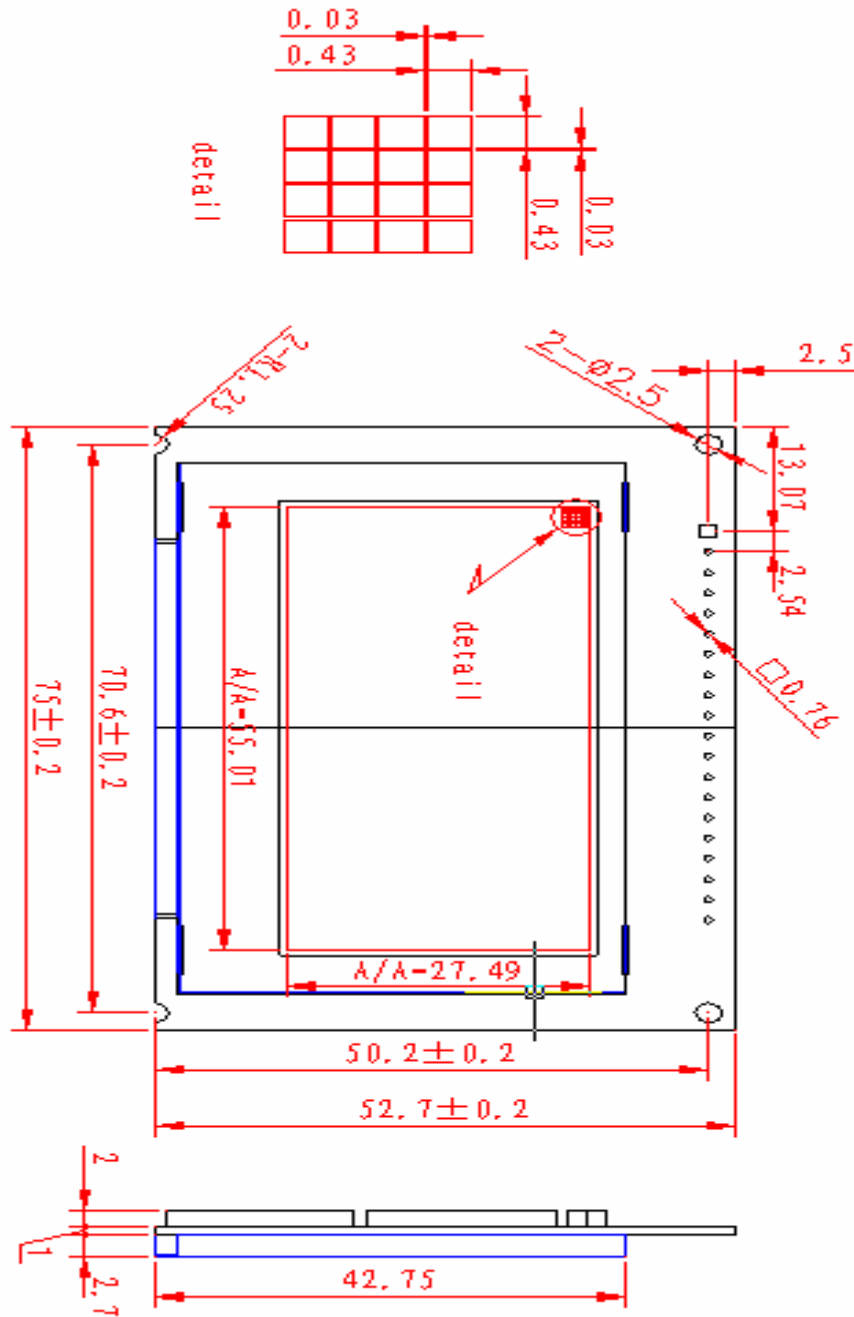
| symbol | ITEM | Test condition | MIN | TYP | MAX | Unit |
|------------------|--------------------------|--|-----|-----|--------------------|-------|
| I _{CC} | Operating supply Current | VDD=3.0 | - | 10 | - | mA |
| I _{DD} | Logic supply Current | VCC=14.0 | - | - | - | mA |
| p _T | Total Power | Note: 40cd/m ² T _{op} =25 | - | 140 | - | mW |
| V _{IH} | Digital Input HIGH | - | 2.4 | - | 3.5 | Volts |
| V _{IL} | Digital Input LOW | - | 0 | - | 0.2V _{DD} | Volts |
| F _{FRM} | Frame Frequency | | | | | Hz |

Note: 40cd/m² with polarization film, be equal to 100cd/m²

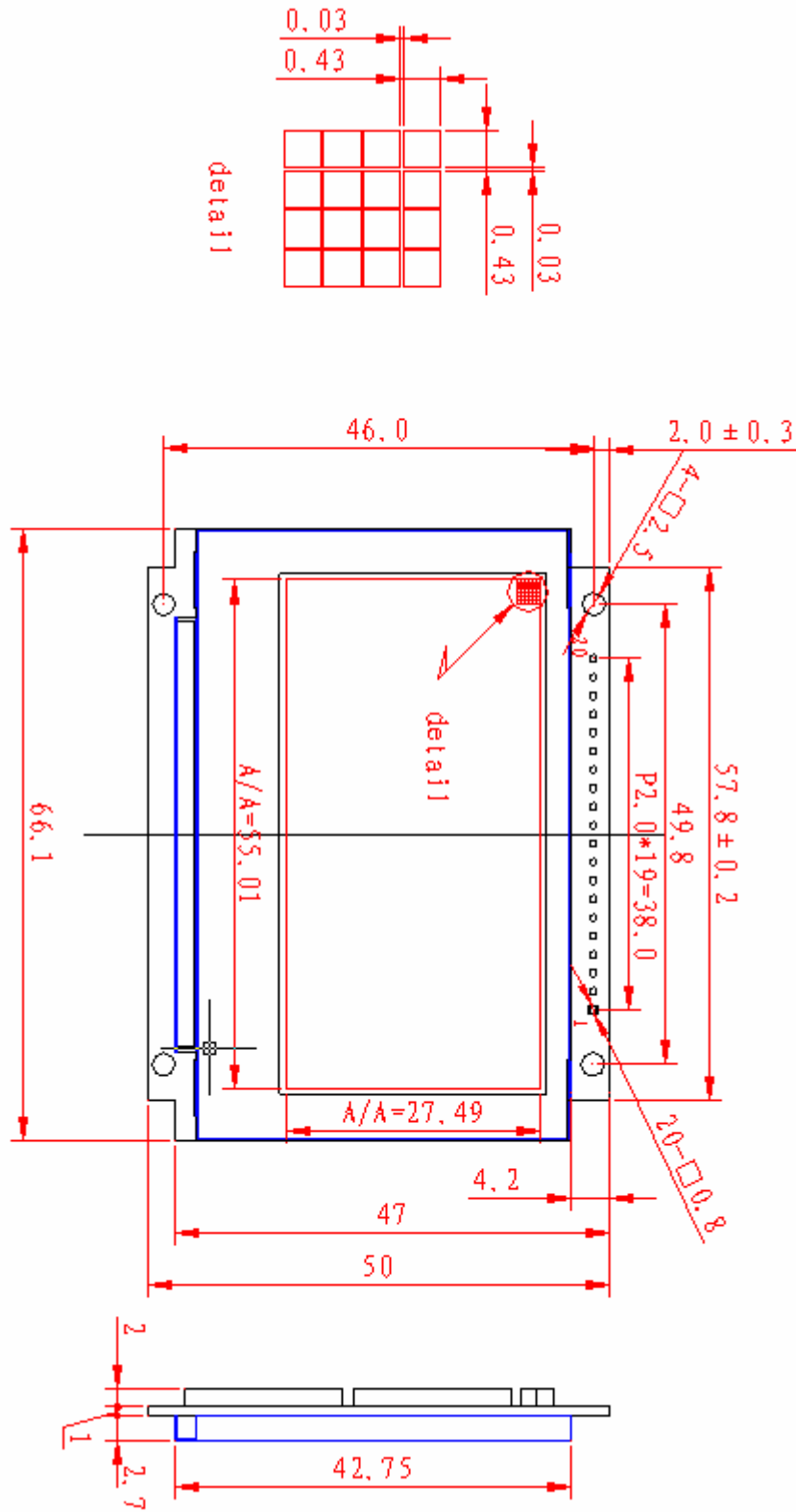
6 Module Drawing



Type MI12864CO-S001



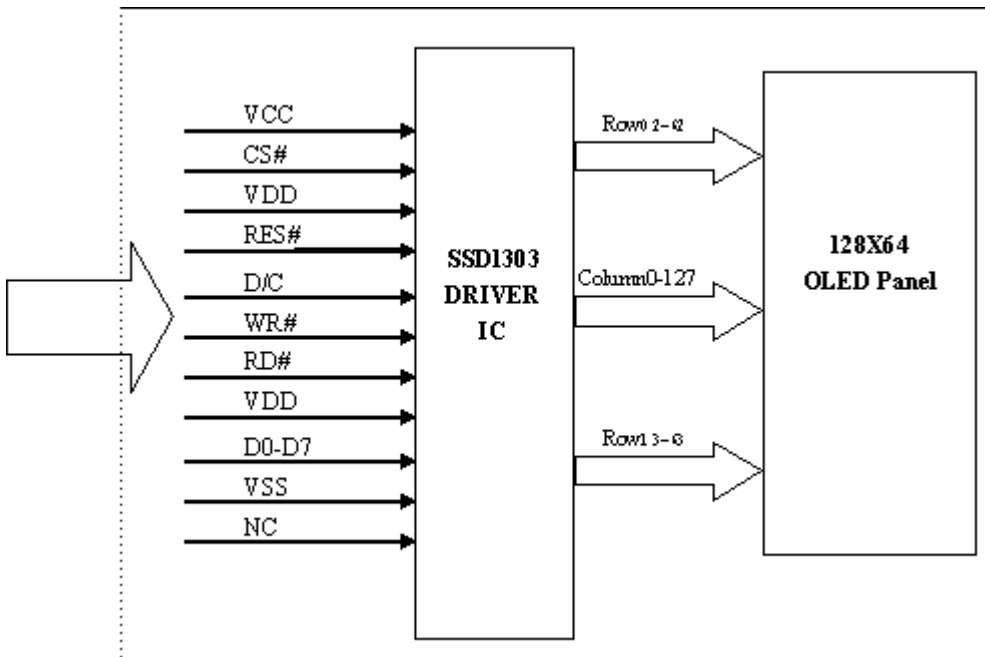
Type MI12864CO-S002



Type MI12864CO-S003

7 Function Block Diagram

MI12864CO OLED Module



NOTE: Some pins omitted



8 Module Interface

Type (MI12864CO-S001)

| PIN NAME | PIN NO | DESCRIPTION | | | |
|----------|--------|--|-------------------------|-------------------------|------------------|
| NC | 1 | No Connection | | | |
| VCC | 2 | OLED drive voltage +14V, It should be supplied externally (S001) . | | | |
| VCOMH | 3 | This is an input pin for the voltage output high level for COM signals. A capacitor should be connected between this pin and VSS. | | | |
| IREF | 4 | This is a segment current reference pin. A resistor should be connected between this pin and VSS. Set the current at 10uA. | | | |
| D7-D0 | 5-12 | These are 8-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial interface mode is selected, D1 will be the serial data input, SDIN, and D0 will be the serial clock input, SCLK. | | | |
| E(RD#) | 13 | This is a MCU interface input pin. When 6800-series Parallel Interface is selected, this pin is used as Enable (E) signal. Read/Write operation is initiated when this pin is pulled HIGH and the CS# pin is pulled LOW. When 8080-series Parallel Interface is selected, this pin is used to receive the Read Data (RD#) signal. Data read operation is initiated when this pin is pulled LOW and CS# pin is pulled LOW. | | | |
| R/W(WR#) | 14 | This is a MCU interface input pin. When 6800-series Parallel Interface mode is selected, this pin is 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 8080-series Parallel Interface mode is selected, this pin is used as Write (WR#) selection input. Pull this pin to LOW for write mode. Data write operation is initiated when this pin is pulled LOW and the CS# is pulled LOW. | | | |
| D/C | 15 | Data/Command Select. This is the Data/Command control pin. When it is pulled HIGH, the input at D7-D0 is treated as display data. When it is pulled LOW, the input at D7-D0 is transferred to the command registers. For detail relationship to MCU interface signals, please refer to the Timing Characteristics Diagrams. | | | |
| RES# | 16 | Reset, active low | | | |
| CS# | 17 | Chip Select, active low | | | |
| NC | 18 | No Connection | | | |
| BS2 | 19 | These are MCU interface input selection pins. See the following table for selecting different interfaces: | | | |
| | | | 6800-parallel interface | 8080-parallel interface | Serial interface |
| BS1 | 20 | BS1 | 0 | 1 | 0 |
| | | BS2 | 1 | 1 | 0 |
| VDD | 21 | Logic Voltage +3V | | | |
| NC | 22 | No Connection | | | |
| NC | 23 | No Connection | | | |
| NC | 24 | No Connection | | | |



| | | |
|-------|----|--|
| VBREF | 25 | This is an internal voltage reference pin for booster circuit. A stabilization capacitor, typ. 1uF, should be connected to Vss. |
| RESE | 26 | This is a source current pin of the external NMOS of the booster circuit. |
| FB | 27 | This is a feedback resistor input pin for the booster circuit. It is used to adjust the booster output voltage level, Vcc. |
| VDDDB | 28 | This is a power supply pin for the internal buffer of the DC-DC voltage converter. It must be connected to VDD when the converter is used. |
| GDR | 29 | This is an output pin drives the gate of the external NMOS of the booster circuit. |
| VSS | 30 | Ground |
| NC | 31 | No Connection |

Type (MI12864CO-S002)

| PIN NAME | PIN NO | DESCRIPTION |
|----------|--------|-------------------------------|
| VSS | 1 | Ground |
| VDD | 2 | Logic Voltage +3V |
| NC | 3 | No Connection |
| D/C | 4 | Data/Command Select |
| WR# | 5 | Write Select |
| RD# | 6 | Read Select |
| D0-D7 | 7-14 | 8-bit bi-directional data bus |
| CS# | 15 | Chip Select, active low |
| NC | 16 | No Connection |
| RES# | 17 | Reset, active low |
| NC | 18 | No Connection |
| NC | 19 | No Connection |
| FG | 20 | Frame Ground |

Type (MI12864CO-S003)

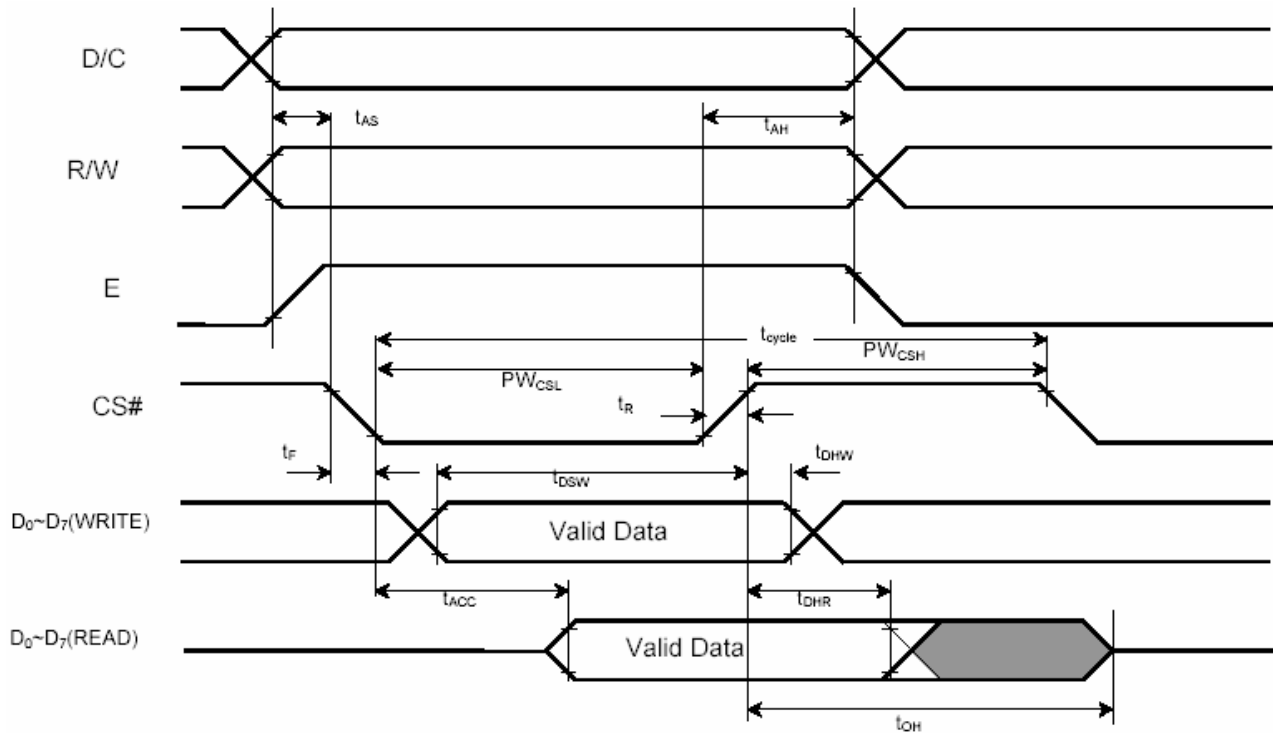
| PIN NAME | PIN NO | DESCRIPTION |
|----------|--------|-------------------------------|
| VSS | 1 | Ground |
| VDD | 2 | Logic Voltage +3V |
| NC | 3 | No Connection |
| D/C | 4 | Data/Command Select |
| WR# | 5 | Write Select |
| RD# | 6 | Read Select |
| D0-D7 | 7-14 | 8-bit bi-directional data bus |
| CS# | 15 | Chip Select, active low |
| CS# | 16 | The same as Pin15 |
| RES# | 17 | Reset, active low |
| NC | 18 | No Connection |
| NC | 19 | No Connection |
| FG | 20 | Frame Ground |

9 Timing Characteristics

Type (MI12864CO-S001)

6800-Series MPU Parallel Interface Timing Characteristics (VDD - VSS = 2.4 to 3.5V, TA = 25°C)

| Symbol | Parameter | Min | Typ | Max | Unit |
|-------------|---|-----------|-----|-----|------|
| t_{cycle} | Clock Cycle Time | 300 | - | - | ns |
| t_{AS} | Address Setup Time | 0 | - | - | ns |
| t_{AH} | Address Hold Time | 0 | - | - | ns |
| t_{DSW} | Write Data Setup Time | 40 | - | - | ns |
| t_{DHW} | Write Data Hold Time | 15 | - | - | ns |
| t_{DHR} | Read Data Hold Time | 20 | - | - | ns |
| t_{OH} | Output Disable Time | - | - | 70 | ns |
| t_{ACC} | Access Time | - | - | 140 | ns |
| PW_{CSL} | Chip Select Low Pulse Width (read) Chip Select Low Pulse Width (write) | 120 60 | - | - | ns |
| PW_{CSH} | Chip Select High Pulse Width (read) Chip Select High Pulse Width (write) | 60 60 | - | - | ns |
| t_R | Rise Time | - | - | 15 | ns |
| t_F | Fall Time | - | - | 15 | ns |

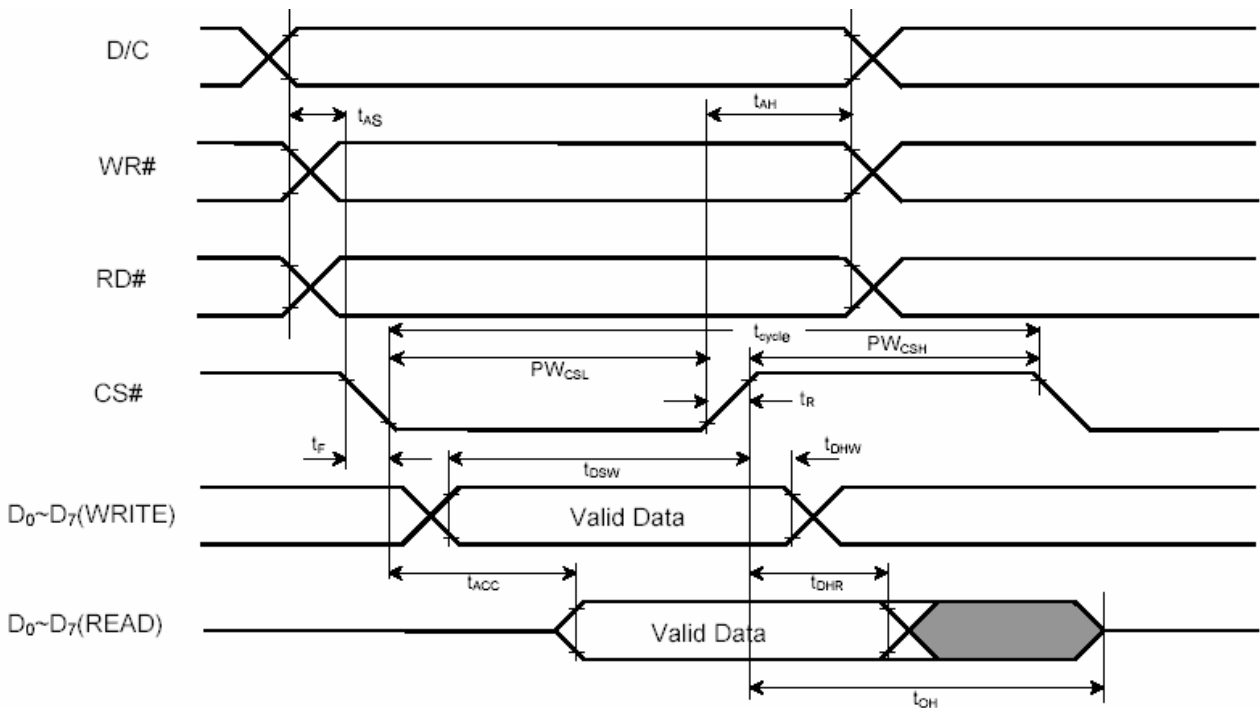


6800-series MPU parallel interface characteristics



8080-Series MPU Parallel Interface Timing Characteristics (VDD - VSS = 2.4 to 3.5V, TA =25°C)

| Symbol | Parameter | Min | Typ | Max | Unit |
|-------------|--------------------------------------|-----|-----|-----|------|
| t_{cycle} | Clock Cycle Time | 300 | - | - | ns |
| t_{AS} | Address Setup Time | 0 | - | - | ns |
| t_{AH} | Address Hold Time | 0 | - | - | ns |
| t_{DSW} | Write Data Setup Time | 40 | - | - | ns |
| t_{DHW} | Write Data Hold Time | 15 | - | - | ns |
| t_{DHR} | Read Data Hold Time | 20 | - | - | ns |
| t_{OH} | Output Disable Time | - | - | 70 | ns |
| t_{ACC} | Access Time | - | - | 140 | ns |
| PW_{CSL} | Chip Select Low Pulse Width (read) | 120 | - | - | ns |
| | Chip Select Low Pulse Width (write) | 60 | - | - | ns |
| PW_{CSH} | Chip Select High Pulse Width (read) | 60 | - | - | ns |
| | Chip Select High Pulse Width (write) | 60 | - | - | ns |
| t_R | Rise Time | - | - | 15 | ns |
| t_F | Fall Time | - | - | 15 | ns |

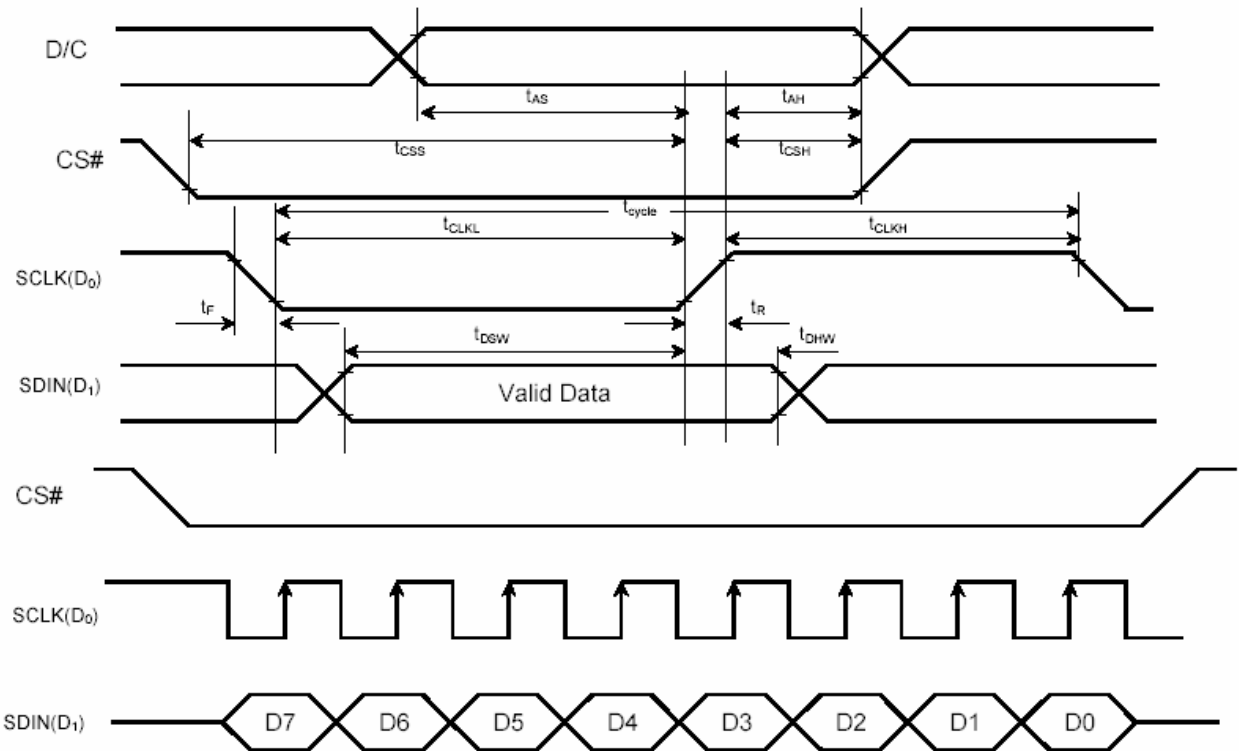


8080-series MPU parallel interface characteristics



Serial Interface Timing Characteristics (VDD - VSS = 2.4 to 3.5V, TA = 25°C)

| Symbol | Parameter | Min | Typ | Max | Unit |
|-------------|------------------------|-----|-----|-----|------|
| t_{cycle} | Clock Cycle Time | 250 | - | - | ns |
| t_{AS} | Address Setup Time | 150 | - | - | ns |
| t_{AH} | Address Hold Time | 150 | - | - | ns |
| t_{CSS} | Chip Select Setup Time | 120 | - | - | ns |
| t_{CSH} | Chip Select Hold Time | 60 | - | - | ns |
| t_{DSW} | Write Data Setup Time | 100 | - | - | ns |
| t_{DHW} | Write Data Hold Time | 100 | - | - | ns |
| t_{CLKL} | Clock Low Time | 100 | - | - | ns |
| t_{CLKH} | Clock High Time | 100 | - | - | ns |
| t_R | Rise Time | - | - | 15 | ns |
| t_F | Fall Time | - | - | 15 | ns |

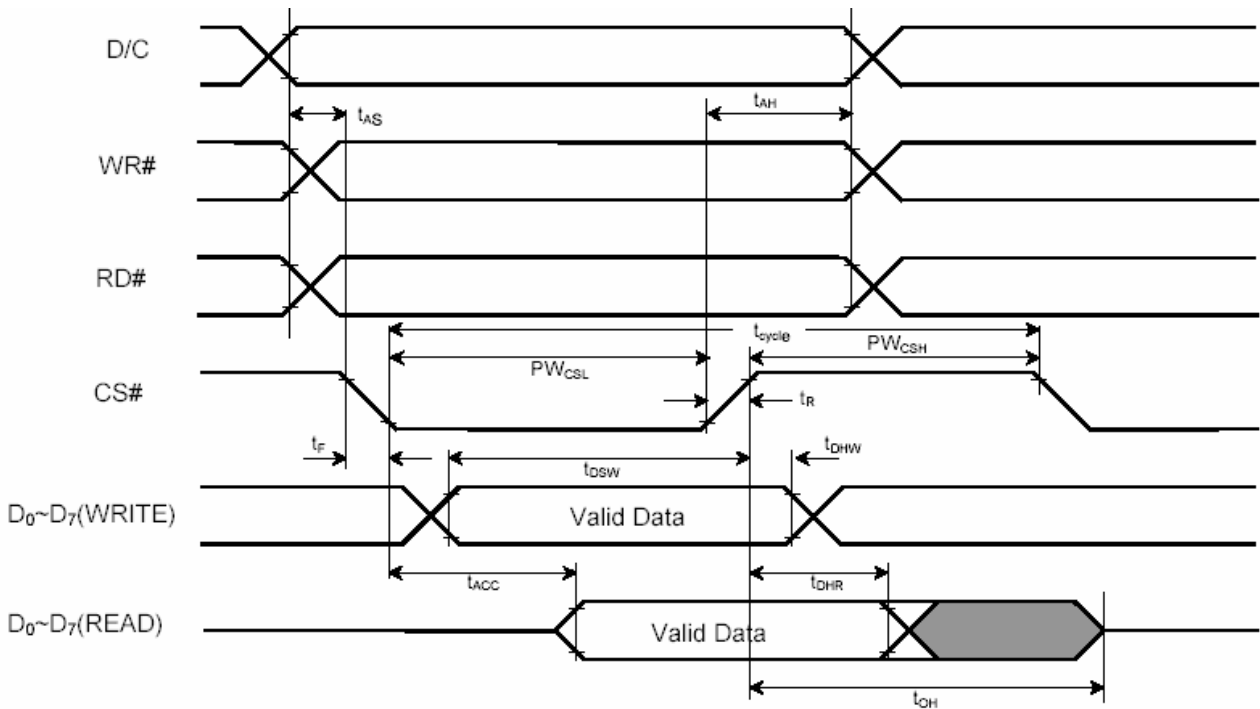


Serial interface characteristics

Type (MI12864CO-S002)

8080-Series MPU Parallel Interface Timing Characteristics (VDD - VSS = 2.4 to 3.5V, TA = 25°C)

| Symbol | Parameter | Min | Typ | Max | Unit |
|-------------|---|-----------|-----|-----|------|
| t_{cycle} | Clock Cycle Time | 300 | - | - | ns |
| t_{AS} | Address Setup Time | 0 | - | - | ns |
| t_{AH} | Address Hold Time | 0 | - | - | ns |
| t_{DSW} | Write Data Setup Time | 40 | - | - | ns |
| t_{DHW} | Write Data Hold Time | 15 | - | - | ns |
| t_{DHR} | Read Data Hold Time | 20 | - | - | ns |
| t_{OH} | Output Disable Time | - | - | 70 | ns |
| t_{ACC} | Access Time | - | - | 140 | ns |
| PW_{CSL} | Chip Select Low Pulse Width (read) Chip Select Low Pulse Width (write) | 120 60 | - | - | ns |
| PW_{CSH} | Chip Select High Pulse Width (read) Chip Select High Pulse Width (write) | 60 60 | - | - | ns |
| t_R | Rise Time | - | - | 15 | ns |
| t_F | Fall Time | - | - | 15 | ns |



8080-series MPU parallel interface characteristics



10 Display Control Instruction

Command table (D/C =0, R/W (WR#)=0, E (RD#)=1)

| Bit Pattern | Command | Description |
|---|----------------------------------|---|
| 0000 X3X2X1X0 | Set Lower Column Address ** | Set the lower nibble of the column address register using X3X2X1X0 as data bits. The initial display line register is reset to 0000b after POR. |
| 0001 X3X2X1X0 | Set Higher Column Address ** | Set the higher nibble of the column address register using X3X2X1X0 as data bits. The initial display line register is reset to 0000b after POR. |
| 00101111 | Activate horizontal scroll | Start horizontal scrolling |
| 00101110 | Deactivate horizontal scroll | Stop horizontal scrolling |
| 001001100 A[2:0] B[2:0] C[1:0] D[2:0] | Horizontal scroll setup | A[2:0] Set the number of column scroll per step Valid value: 001b, 010b, 011b, 100b B[2:0] Define start page address C[1:0] Set time interval between each scroll step in terms of frame frequency 00b – 12 frame 01b – 64 frames 10b – 128 frames 11b – 256 frames D[2:0] Define end page address Set the value of D[2:0] larger or equal to B[2:0] |
| 10000001 A[7:0] | Set Contrast Control Register ** | Double byte command to select 1 out of 256 contrast steps. Contrast increases as the value increases. (POR = 80h) |
| 1010010X0 | Set Entire Display ON/OFF ** | X0=0: normal display (POR) X0=1: entire display ON |
| 1010011X0 | Set Normal/Inverse Display ** | X0=0: normal display (POR) X0=1: inverse display |
| 10101000 A[5:0] | Set Multiplex Ratio ** | The next command, A[5:0] determines multiplex ratio N from 16MUX-64MUX, POR= 64MUX |
| 1010111X0 | Set Display ON/OFF ** | X0=0: turns OFF OLED panel (POR) X0=1: turns ON OLED panel |
| 1011X3X2X1X0 | Set Page Address ** | Set GDDRAM Page Address (0~7) for read/write using X3X2X1X0 |
| 1100X3 * * * | Set COM Output Scan Direction | X3=0: normal mode (POR) Scan |

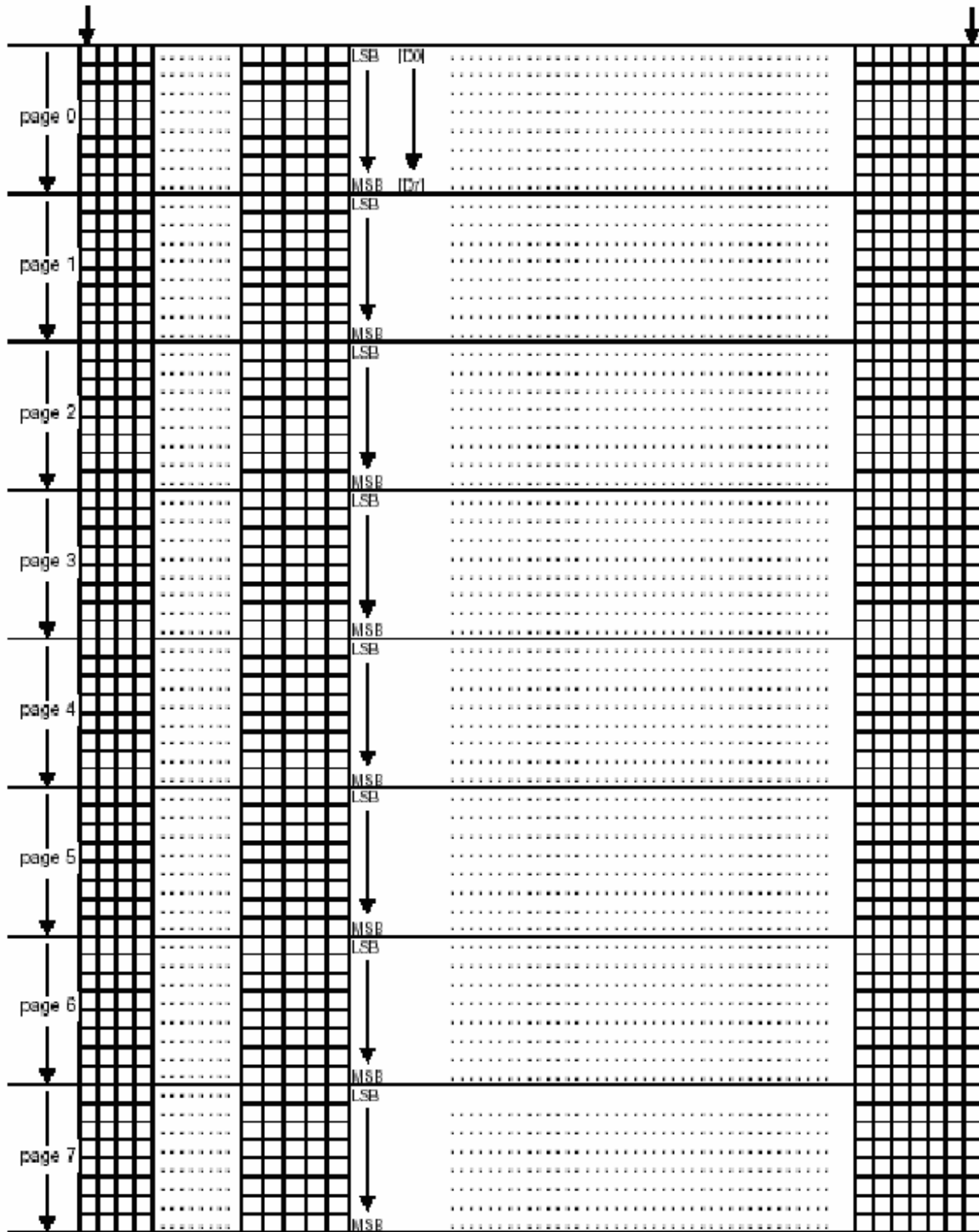


| | | |
|--------------------------|--|---|
| | ** | from COM 0 to COM [N –1] X3=1: remapped mode. Scan from COM [N-1] to COM0 Where N is the Multiplex ratio. |
| 11010011 A[5:0] | Set Display Offset ** | Set vertical scroll by COM from 0-63. The value is reset to 00H after POR. |
| 11011001 X7X6X5X40010 | Set Pre-charge period | Set length of pre-charge period in number of DCLK Default value of X7X6X5X4 is 0010b |
| 11011010 000X40010 | Set COM pins hardware configuration | X4=0, Sequential COM pin configuration (i.e. COM31, 30, 29....0 ; SEG0-132; COM31,32....62,63) X4=1(POR), Alternative COM pin configuration (i.e. COM62,60,58,...2,0; SEG0-132;COM1,3,5...61,6 3) |
| 11100010 | Reserved | Reserved |
| 11100011 | NOP ** | Command for No Operation |

11 Graphic Display Data Ram Address Map

Column address 00H

Column address 7FH





12 Precautions for operation and Storage

12.1 Precautions for Operation

- (1) Since OLED panel is made of glass, in order to prevent from glass broken, please do not apply any mechanical shock or impact or excessive force to it when installing the OLED module. Any strong mechanical impact due to falling dropping etc. may cause damage (breakage or cracking).
- (2) The polarizer on the OLED surface is made of soft material and is easily scratched. Please take most care when handing.
- (3) If OLED surface is contaminated, please wipe it off gently by using moisten soft cloth with normal ethanol, do not use acetone, ketone, isopropyl alcohol or water. If there is saliva or water on the OLED surface, please wipe it off immediately.
- (4) When handling OLED module, please be sure that the body and the tools are properly rounded. And do not touch I/O pins with bare hands or contaminate I/O pins, it will cause disconnection or defective insulation of terminals.
- (5) Do not attempt to disassemble or process the OLED module.
- (6) OLED module should be used under recommended operating conditions shown in the specification. Since the higher voltage leads to the shorter lifetime, be sure to use the specified operating voltage.
- (7) Foggy dew, moisture condensation or water droplets deposited on surface and contact terminals will cause polarizer stain or damage, the deteriorated display quality and electrochemical reaction then leads to the shorter life time and permanent damage to the module probably. Please pay attention to the environmental temperature and humidity.

12.2 Soldering

- (1) Use the high quality solder. (60-63% tin mixed with lead)
- (2) Iron: no higher than 260 and less than 3~4 sec during soldering.
- (3) Soldering: only to the I/O terminals.
- (4) Rewiring: no more than 3 times.

12.3 Precautions for Storage

- (1) Please store OLED module in a dark place, avoid exposure to sunlight, the light of fluorescent lamp or any ultraviolet ray.
- (2) Keep the environment temperature at between 10°C and 35°C and the relative humidity less than 60%. Avoid high temperature, high humidity.
- (3) That keeps the OLED modules stored in the container shipped from supplier before using them is recommended.
- (4) Do not leave any article on the OLED module surface for an extended period of time.

12.4 Warranty period

Multi-inno Technology Co. Ltd. warrants for aperiod of 12 months from the shipping date when stored or used under normal condition

12.5 Test Status

| TEST ITEM | TEST CONDITION | QUANTITY |
|------------------------------|------------------------|----------|
| High temperature (storage) | 70°C,240 hours | 3pcs |
| Humidity (storage) | +85°C, 100%RH, 24hours | 3pcs |
| Low temperature (storage) | - 25 ,120 hours | 3pcs |
| Low temperature (operating) | -25°C, 120 hours | 2pcs |
| High temperature (operating) | 70°C, 120hours | 2pcs |

Note: After test 2 hours (room temperature), check function & appearance.

13 Contact us

<http://www.multi-inno.com/>

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