

BOE

0.71 Inch Active Matrix Color OLED Panel Module

1. Overview/Application

BO071M1920M is a 0.71 inch diagonal, FHD resolution(1920 x1080), active matrix color OLED (Organic Light Emitting Display)panel module based on single crystal silicon backplane . The pixel circuits and drivingIC are integrated on the silicon backplane to get the compact size and very low power consumption.

(Potential applications: Virtual Reality application (AR/VR) , Head mounted displays, Near-Eye Displays etc.)

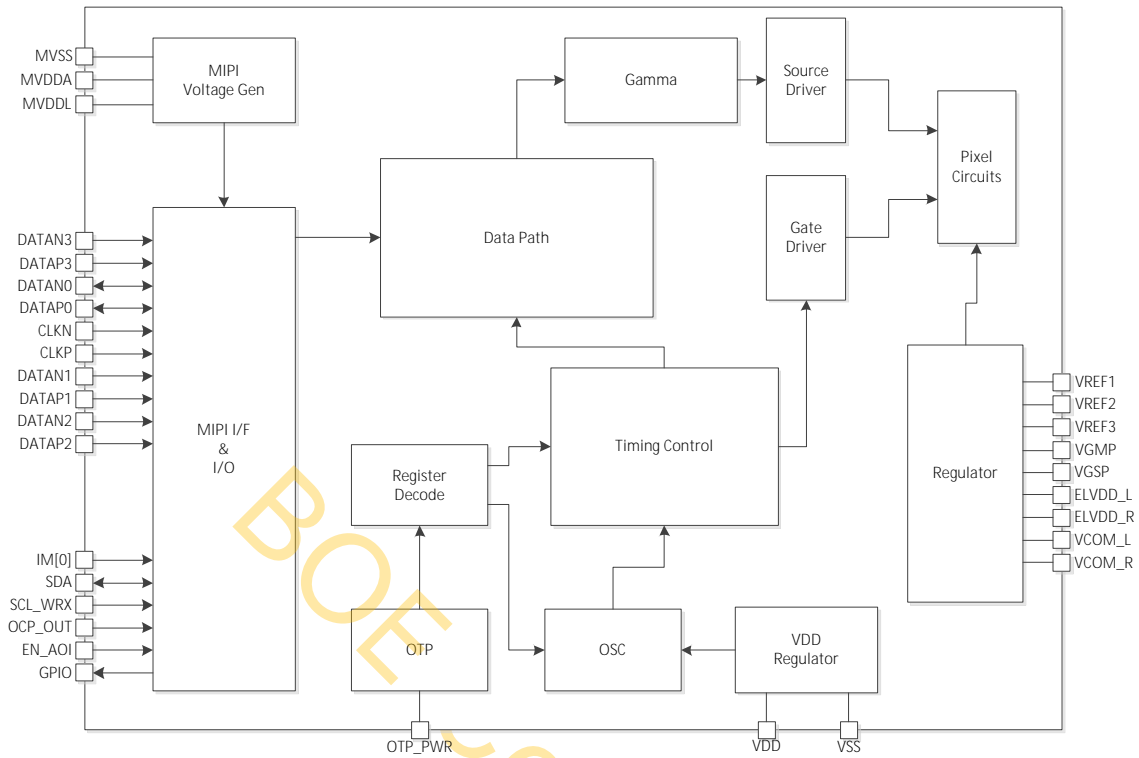
2. Features

- Small-size, high resolution 0.71 FHD Display PPI=3135
- AP Operated Resolution 1920 x 1080 up to 90Hz
- Full color mode , 16.7M colors
- Fast response
- Thin and light in weight
- Color enhancement
- High contrast
- IR compensation with 2D
- Idle mode for save power
- Scan direction selection, up or down
- Interface , Support MIPI only or MIPI(data)+I²C(CMD)
Support VESA-DSC in-chip decoder (3X and 3.75X compression ratio)
Support scaling up 1.33x (1440x810 to 1920 x 1080) and 1.5x (1280x720 to 1920 x 1080)
- Sequential/Global emission

3. Module Structure

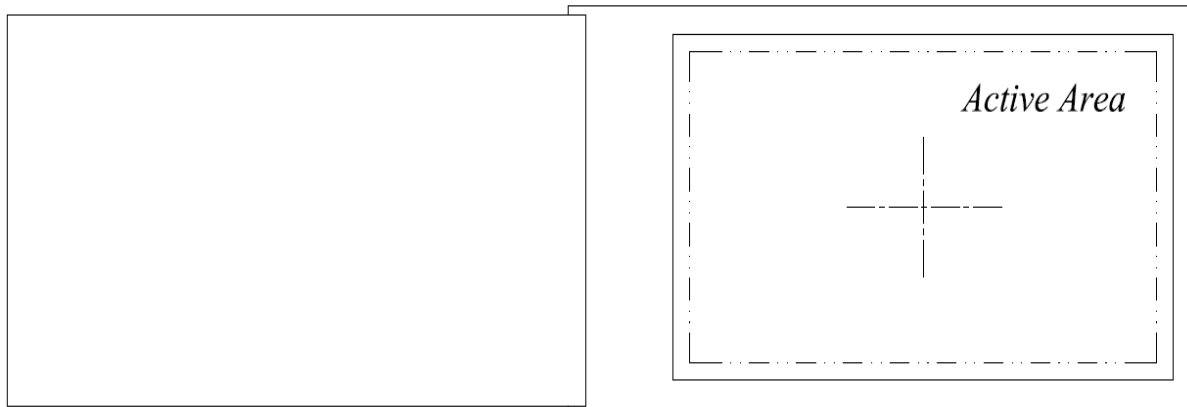
- Active matrix color OLED display with on-chip driver based on single crystal silicon transistors

4. System Block Diagram

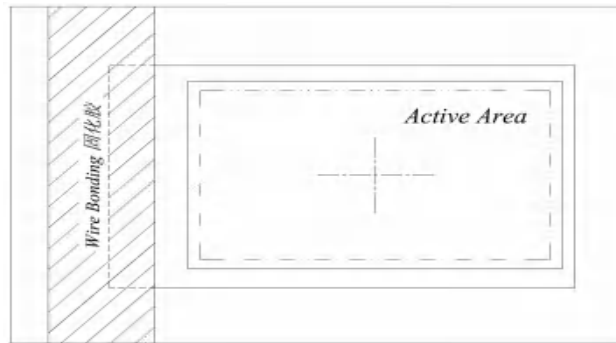


5. Pin Description

5.1 Pin Assignment



- FPC module



● PCB module

5.2 Pin description of FPC Module

| PIN No. (FPC Side) | Symbol | Type | Description |
|-----------------------|------------|--------------|---|
| 1 | GND | Power Supply | Circuit ground |
| 2 | OCP_OUT | Output | Over current protect flag |
| 3 | AVEE | Power Supply | Power supply for OLED cell, Connect a capacitor for stabilization |
| 4 | AVEE | Power Supply | Power supply for OLED cell, Connect a capacitor for stabilization |
| 5 | AVDD | Power Supply | Power supply for OLED cell, Connect a capacitor for stabilization |
| 6 | AVDD | Power Supply | Power supply for OLED cell, Connect a capacitor for stabilization |
| 7 | GND | Power Supply | Circuit ground |
| 8 | ELVDD | Output | Power supply for OLED cell, Connect a capacitor for stabilization |
| 9 | ELVDD | Output | Power supply for OLED cell, Connect a capacitor for stabilization |
| 10 | GND | Power Supply | Circuit ground |
| 11 | VREF2 | Output | VREF voltage, Connect a capacitor for stabilization |
| 12 | VREF3 | Output | VREF voltage, Connect a capacitor for stabilization |
| 13 | VGMP | Output | Gamma top voltage, Connect a capacitor for stabilization |
| 14 | VGSP | Output | Gamma bottom voltage, Connect a capacitor for stabilization |
| 15 | VREF1 | Output | VREF voltage, Connect a capacitor for stabilization |
| 16 | GND | Power Supply | Circuit ground |
| 17 | VDD | Output | Internal system power, Connect a capacitor for stabilization |
| 18 | VDD | Output | Internal system power, Connect a capacitor for stabilization |
| 19 | VDDI | Power Supply | External power supply (1.8V for digital system power) |
| 20 | VDDI | Power Supply | External power supply (1.8V for digital system power) |
| 21 | VCOM | Output | Power supply for OLED cell, Connect a capacitor for stabilization |
| 22 | VCOM | Output | Power supply for OLED cell, Connect a capacitor for stabilization |
| 23 | GND | Power Supply | Circuit ground |
| 24 | TEST PIN 1 | Input | TEST pin (no connect , floating) |

| 25 | TEST PIN 2 | Input | TEST pin , connect to GND | | | | | | | | | |
|--------|-----------------|--------------|---|--------|-----------------|-------------|---|------|------|---|-----|------|
| 26 | SDA | Input/Output | Bi-direction data pin in I2C I/F If this pin is not used, please connect to VDDI | | | | | | | | | |
| 27 | SCL_WRX | Input | Synchronous clock signal in I2C IF. If this pin is not used, please connect to VDDI | | | | | | | | | |
| 28 | TEST PIN 3 | Input/Output | TEST pin , (no connect , floating) | | | | | | | | | |
| 29 | IM [0] | Input | <p>Use to select the Interface type.</p> <table border="1"> <thead> <tr> <th>IM [0]</th> <th>Command Execute</th> <th>Image Write</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>MIPI</td> <td>MIPI</td> </tr> <tr> <td>1</td> <td>I2C</td> <td>MIPI</td> </tr> </tbody> </table> <p>Note: MIPI 1port or 2port is selected by register setting</p> | IM [0] | Command Execute | Image Write | 0 | MIPI | MIPI | 1 | I2C | MIPI |
| IM [0] | Command Execute | Image Write | | | | | | | | | | |
| 0 | MIPI | MIPI | | | | | | | | | | |
| 1 | I2C | MIPI | | | | | | | | | | |
| 30 | RESX | Input | This signal will reset the device and must be applied to properly initialize the chip, signal is active low | | | | | | | | | |
| 31 | MVDDL | Output | Internal system power, Connect a capacitor for stabilization | | | | | | | | | |
| 32 | MVDDA | Output | Internal system power, Connect a capacitor for stabilization | | | | | | | | | |
| 33 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 34 | DATAP2 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 35 | DATAN2 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 36 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 37 | DATAP1 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 38 | DATAN1 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 39 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 40 | CLKP | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 41 | CLKN | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 42 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 43 | DATAP0 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 44 | DATAN0 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 45 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 46 | DATAP3 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 47 | DATAN3 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 48 | GND | Input | Circuit ground for MIPI | | | | | | | | | |

5.3 Pin description of PCB Module

| PIN No. (FPC Side) | Symbol | Type | Description | | | | | | | | | |
|--------------------|-----------------|--------------|---|--------|-----------------|-------------|---|------|------|---|-----|------|
| 1 | GND | Power Supply | Circuit ground | | | | | | | | | |
| 2 | GND | Power Supply | Circuit ground | | | | | | | | | |
| 3 | GND | Power Supply | Circuit ground | | | | | | | | | |
| 4 | OCP_OUT | Output | Over current protect flag | | | | | | | | | |
| 5 | GND | Power Supply | Circuit ground | | | | | | | | | |
| 6 | GND | Input | Circuit ground | | | | | | | | | |
| 7 | DATAP2 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 8 | DATAN2 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 9 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 10 | DATAP1 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 11 | DATAN1 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 12 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 13 | CLKP | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 14 | CLKN | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 15 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 16 | DATAP0 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 17 | DATAN0 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 18 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 19 | DATAP3 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 20 | DATAN3 | Input | Differential small amplitude signal of MIPI data input | | | | | | | | | |
| 21 | GND | Input | Circuit ground for MIPI | | | | | | | | | |
| 22 | GND | Power Supply | Circuit ground | | | | | | | | | |
| 23 | GND | Power Supply | Circuit ground | | | | | | | | | |
| 24 | TEST PIN 1 | Input | TEST pin (no connect , floating) | | | | | | | | | |
| 25 | GND | Power Supply | Circuit ground | | | | | | | | | |
| 26 | GND | Power Supply | Circuit ground | | | | | | | | | |
| 27 | TEST PIN 2 | Input | TEST pin , connect to GND | | | | | | | | | |
| 28 | SDA | Input/Output | Bi-direction data pin in I2C I/F If this pin is not used, please connect to VDD1 | | | | | | | | | |
| 29 | SCL_WRX | Input | Synchronous clock signal in I2C I/F. If this pin is not used, please connect to VDD1 | | | | | | | | | |
| 30 | TEST PIN 3 | Input | TEST pin (no connect , floating) | | | | | | | | | |
| 31 | IM [0] | Input | <p>Use to select the Interface type.</p> <table border="1"> <thead> <tr> <th>IM [0]</th> <th>Command Execute</th> <th>Image Write</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>MIPI</td> <td>MIPI</td> </tr> <tr> <td>1</td> <td>I2C</td> <td>MIPI</td> </tr> </tbody> </table> <p>Note: MIPI 1port or 2port is selected by register setting</p> | IM [0] | Command Execute | Image Write | 0 | MIPI | MIPI | 1 | I2C | MIPI |
| IM [0] | Command Execute | Image Write | | | | | | | | | | |
| 0 | MIPI | MIPI | | | | | | | | | | |
| 1 | I2C | MIPI | | | | | | | | | | |

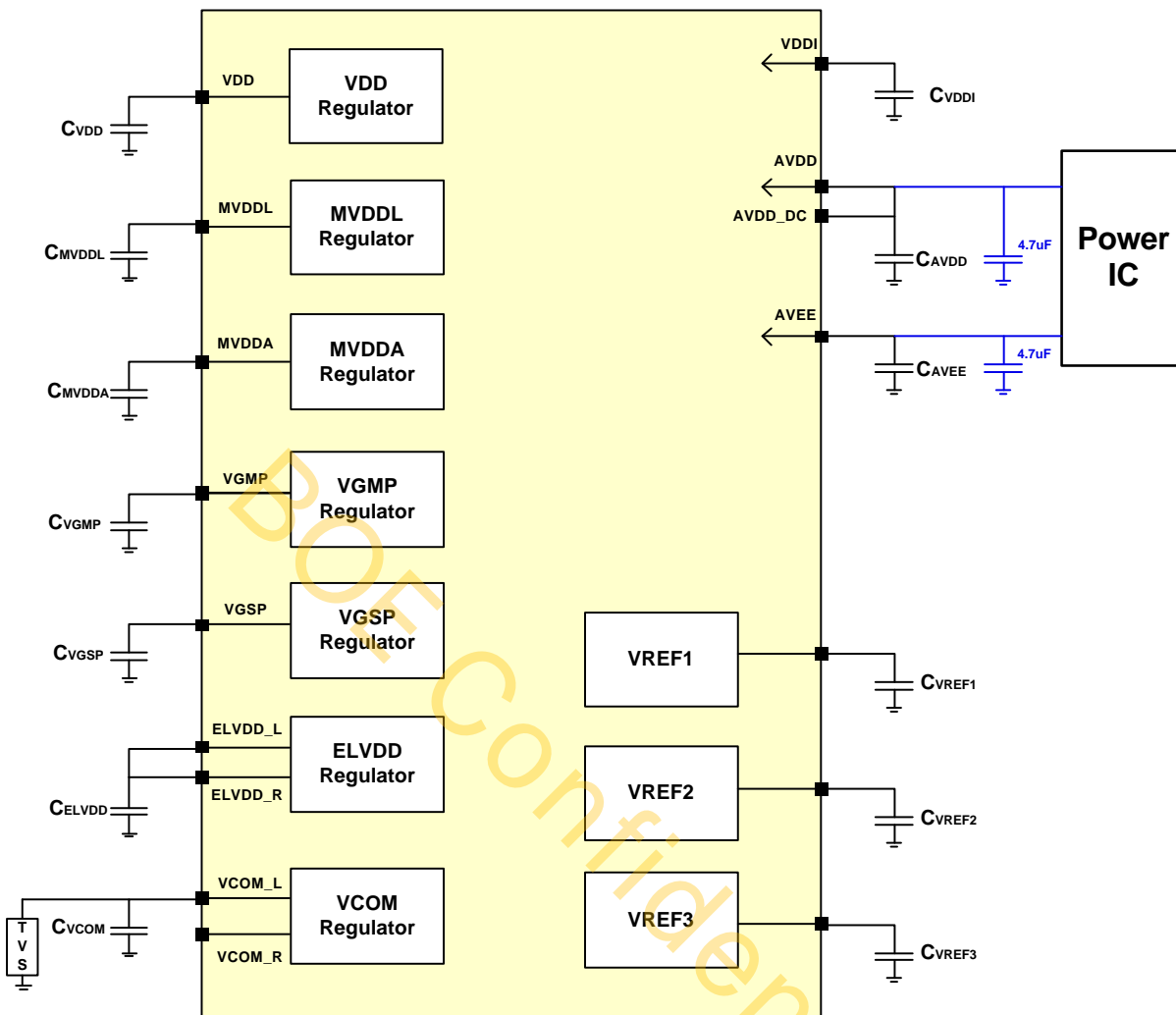
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| | | | |
|----|------------|--------------|---|
| 32 | RESX | Input | This signal will reset the device and must be applied to properly initialize the chip, signal is active low |
| 33 | TEST PIN 3 | Input | TEST pin (no connect , floating) |
| 34 | TEST PIN 4 | Input | TEST pin (no connect , floating) |
| 35 | GND | Power Supply | Circuit ground |
| 36 | GND | Power Supply | Circuit ground |
| 37 | GND | Power Supply | Circuit ground |
| 38 | GND | Power Supply | Circuit ground |
| 39 | GND | Power Supply | Circuit ground |
| 40 | GND | Power Supply | Circuit ground |
| 41 | GND | Power Supply | Circuit ground |
| 42 | GND | Power Supply | Circuit ground |
| 43 | VDDI | Power Supply | External power supply (1.8V for digital system power) |
| 44 | VDDI | Power Supply | External power supply (1.8V for digital system power) |
| 45 | VDDI | Power Supply | External power supply (1.8V for digital system power) |
| 46 | VIN | Power Supply | External power supply |
| 47 | VIN | Power Supply | External power supply |
| 48 | VIN | Power Supply | External power supply |
| 49 | VIN | Power Supply | External power supply |
| 50 | GND | Power Supply | Circuit ground |

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5.4 Peripheral Circuit

Mounting the capacitor for each power supply to ensure that the panel display normally.



Notes:

| Signal Name | Typical Value | Maximum Rated Voltage | Connection |
|--------------------|-------------------|-----------------------|-----------------------------|
| VDDI | Cap, 2.2uF | 6.3V | VDDI — — GND |
| AVDD AVDD_DC | Cap, 1.0uF | 10V | AVDD AVDD_DC — — GND |
| ELVDD_L ELVDD_R | Cap, 2.2uF | 10V | ELVDD_L ELVDD_R — — GND |
| AVEE | Cap, 1uF | 10V | AVEE — — GND |
| VDD | Cap, 4.7uF | 6.3V | VDD — — GND |
| MVDDA | Cap, 1uF | 6.3V | MVDDA — — GND |
| MVDDL | Cap, 1uF | 6.3V | MVDDL — — GND |
| VGMP | Cap, 1uF | 10V | VGMP — — GND |
| VGSP | Cap, 1uF | 10V | VGSP — — GND |
| VREF1 | Cap, 1uF | 6.3V | VREF1 — — GND |
| VREF2 | Cap, 1uF | 6.3V | VREF2 — — GND |
| VREF3 | Cap, 1uF | 6.3V | VREF3 — — GND |
| VCOM_L VCOM_R | Cap, 2.2uF TVS | 10V | VCOM_L VCOM_R — — GND |

- (1) There are totally 13 capacitors and 1 TVS.
- (2) The TVS is placed between VCOM and ground.

6. Absolute Maximum Ratings

| Item | Symbol | Min. | Maximum Ratings | Unit |
|-----------------------|-----------------|------|-----------------|------|
| External power supply | VDDI | 1.65 | 1.95 | V |
| | Vin (for PCB) | 2.7 | 5.5 | V |
| OLED Power Supply | AVDD | 5.0 | 6.5 | V |
| | AVEE | -5.0 | -6.5 | V |
| Logic input voltage | Vi | 1.65 | 1.95 | V |
| Operating temperature | Topr | -40 | 85 | °C |
| Storage temperature | Tstg | -55 | 125 | °C |

7. Recommended Operating Conditions

| Item | Symbol | Min. | Typ. | Max | Unit |
|-----------------------|-----------------|------|------|------|------|
| External power supply | VDDI | 1.65 | 1.8 | 1.95 | V |
| | Vin (for PCB) | 2.7 | 3.3 | 5.5 | V |
| OLED Power Supply | AVDD | 5.0 | 5.4 | 6.5 | V |
| | AVEE | -5.0 | -5.4 | -6.5 | V |
| Logic input voltage | Vi | 1.65 | 1.8 | 1.95 | V |
| Operating temperature | Topr | -10 | | 80 | °C |

8. Electrical Characteristics

8.1 DC Characteristics

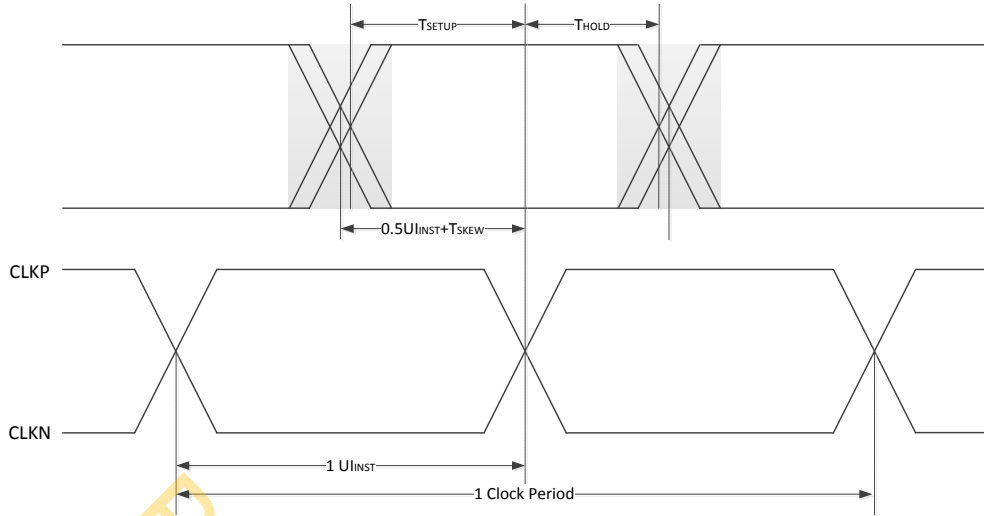
| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|--------------------------------------|---------------|--------------------|----------|------|----------|------|
| Power & Operation Voltage | | | | | | |
| AVDD Input Level | AVDD | - | 5.0 | | 6.5 | V |
| AVEE Input Level | AVEE | - | -5.0 | | -6.5 | V |
| Digital I/O Power Supply | VDDI | - | | 1.8 | | V |
| Digital I/O Input Level @Logic High | VIH | VDDI=1.65V ~ 1.95V | 0.7*VDDI | - | VDDI | V |
| Digital I/O Input Level @Logic Low | VIL | VDDI=1.65V ~ 1.95V | 0 | - | 0.3*VDDI | V |
| Power IC Input Level | VIN (for PCB) | Vin = 2.5V~5.5V | 2.5 | 4.4 | 5.5 | V |

8.2 AC Characteristics

8.2.1 MIPI High Speed Mode Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit |
|----------------------|--------|-------|------|------|------|
| UI instantaneous | UIINST | 1 | - | 3 | ns |
| T Data to Clock Skew | TSKEW | -0.15 | - | 0.15 | UIHS |

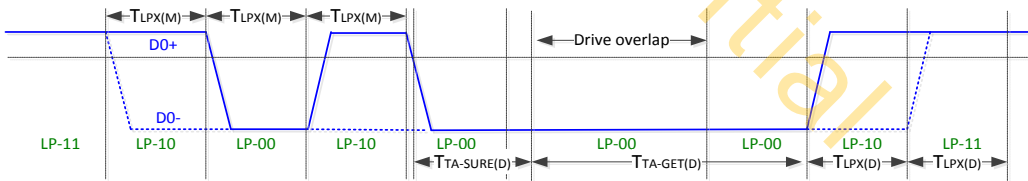
| | | | | | |
|---------------------------------------|--------|------|---|---|------|
| RX Data to Clock Setup Time Tolerance | TSETUP | 0.15 | - | - | UIHS |
| RX Data to Clock Hold Time Tolerance | THOLD | 0.15 | - | - | UIHS |



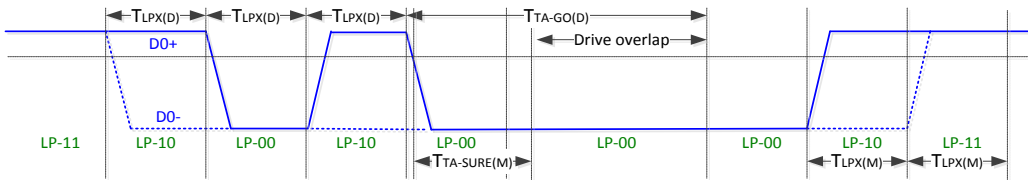
8.2.2 MIPI Low Power Mode Characteristics

| Parameter | Description | Min | Typ. | Max | Unit |
|----------------------|--|---------------------|------|---------------------|------|
| T _{L PX(M)} | Transmitted length of any Low-Power state period (MCU to display module) | 50 | - | - | ns |
| T _{L PX(D)} | Transmitted length of any Low-Power state period (display module to MCU) | 50 | - | - | ns |
| T _{TA-SURE} | Time that the new transmitter waits after the LP-10 state before transmitting the Bridge state(LP-00) during a Link Turnaround | T _{L PX} | - | 2*T _{L PX} | |
| T _{TA-GET} | Time that the new transmitter drives the Bridge state(LP-00) after accepting control during a Link Turnaround | 5*T _{L PX} | | | |
| T _{TA-GO} | Time that the transmitter drives the Bridge state(LP-00) before releasing control during a Link Turnaround | 4*T _{L PX} | | | |

- Bus Turnaround from MPU to display module



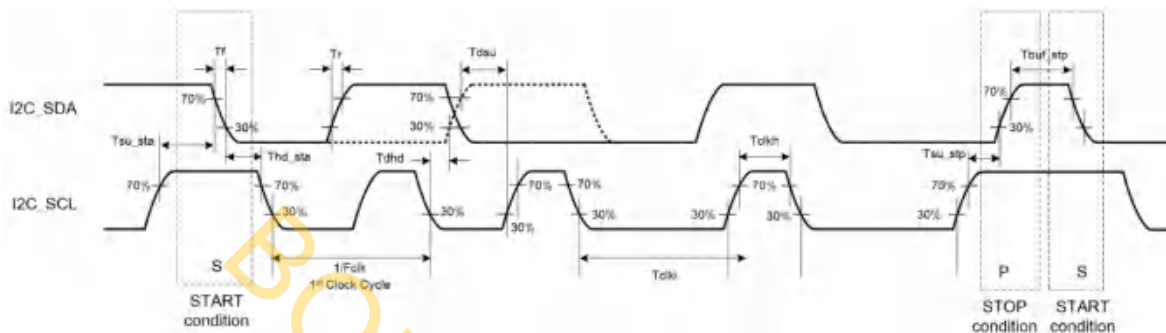
- Bus Turnaround from display module to MPU



8.2.3 I2C Interface Timing

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---------------------|--------|------|------|------|------|
| I2C Clock Frequency | Fclk | - | - | 400 | kHz |
| I2C Clock Low | TclkL | 1300 | - | - | ns |
| I2C Clock High | TclkH | 600 | - | - | ns |

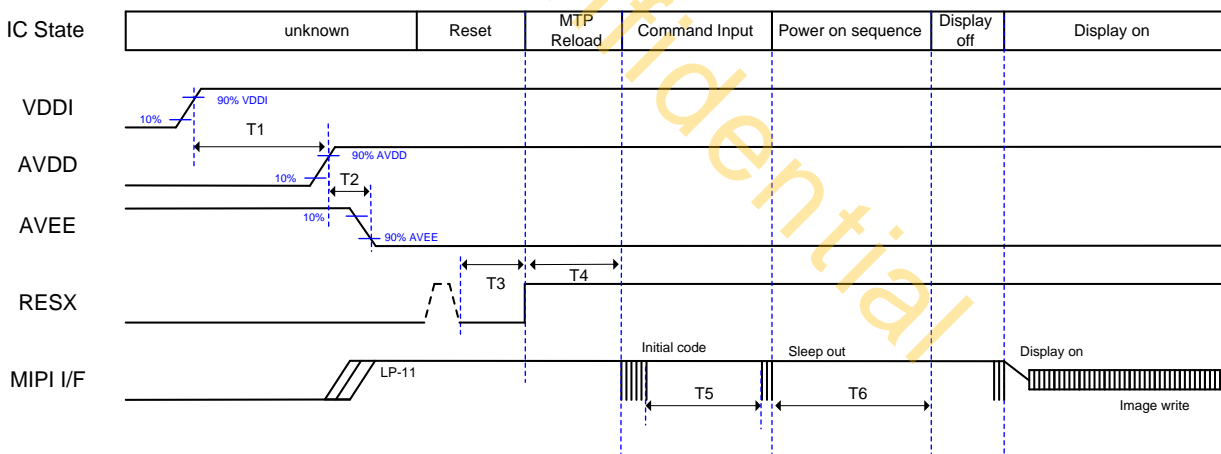
| | | | | | |
|------------------------------------|----------|------|---|-----|----|
| I2C Data Rising Time | Tdr | - | - | 300 | ns |
| I2C Data Falling Time | Tdf | - | - | 300 | ns |
| I2C Data Setup Time | Tdsu | 100 | - | - | ns |
| I2C Data Hold Time | Tdhd | - | - | TBD | ns |
| I2C Setup Time (Start Condition) | Tsu_sta | 600 | - | - | ns |
| I2C Hold Time (Start Condition) | Thd_sta | 600 | - | - | ns |
| I2C Setup Time (Stop Condition) | Tsu_stp | 600 | - | - | ns |
| I2C Bus Free Time (Stop Condition) | Tbuf_stp | 1300 | - | - | ns |



9. Power Supply Sequence

9.1 Power On/Off Sequence

Power on sequence



Power off sequence