



1.0 cm(Type 0.39) Active Matrix Color OLED Panel Module

Hong Kong Panox Electronics Co.,Ltd

BO039M1920M

1. Overview/Application

BO039M1920M is a 0.39 inch (1 cm) 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 driving IC 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.)

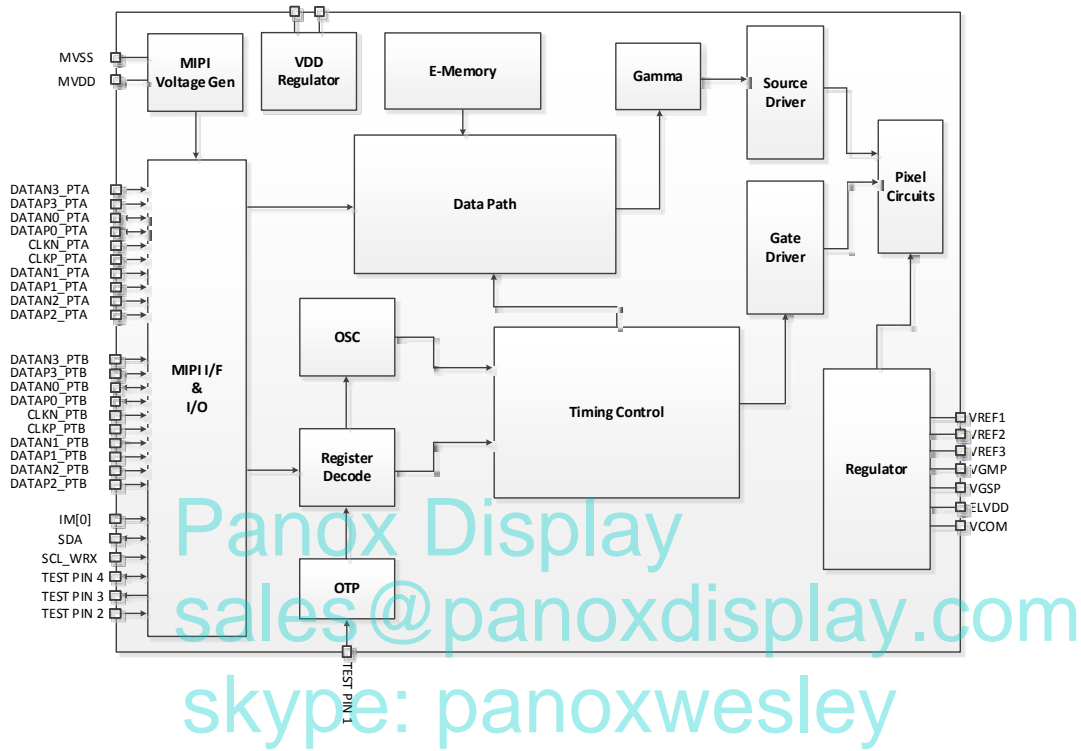
2. Features

- Small-size, high resolution 0.39 FHD Display PPI=5644
- AP Operated Resolution (8*M, M=40~240) x RGB x (8*N, N=30~135)
- Full color mode , 16.7M colors
- Fast response
- Thin and light in weight
- Color enhancement, Sharpness enhancement
- High contrast mode
- High fluency mode
- Power-saving (PS) mode
- Scan direction selection, up or down
- Interface , Support MIPI only or MIPI(data)+I²C(CMD)

3. Module Structure

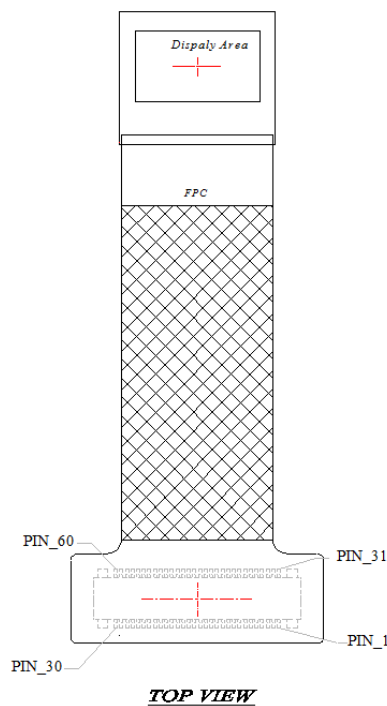
- Active matrix color OLED display with on-chip driver based on single crystal silicon transistors

System Block Diagram

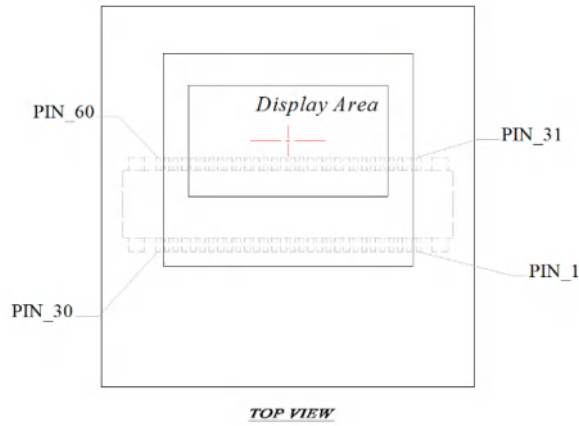


5. Pin Description

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	GND	Power Supply	Circuit ground									
3	TEST PIN 1	Input	TEST pin (no connect , Floating)									
4	VREF2	Output	VREF voltage , Connect a capacitor for stabilization									
5	VREF3	Output	VREF voltage , Connect a capacitor for stabilization									
6	VGMP	Output	Gamma top voltage , Connect a capacitor for stabilization									
7	VGSP	Output	Gamma bottom voltage , Connect a capacitor for stabilization									
8	AVEE	Power Supply	Power supply for OLED cell , Connect a capacitor for stabilization									
9	VREF1	Output	VREF voltage , Connect a capacitor for stabilization									
10	IM [0]	Input	Use to select the Interface type. <table border="1" style="margin-left: 20px;"> <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> Note: MIPI 1port or 2port is selected by register setting	IM [0]	Command Execute	Image Write	0	MIPI	MIPI	1	I2C	MIPI
IM [0]	Command Execute	Image Write										
0	MIPI	MIPI										
1	I2C	MIPI										
11	OTP_SEL	Input	MTP type selection. OTP_SEL=0: use external MTP OTP_SEL=1: use internal MTP									
12	OCP_OUT	Output	Over current protect flag									
13	TEST PIN 2	Input	TEST pin , connect to GND									
14	SDA	Input/ Output	Bi-direction data PIN in I2C I/F If this pin is not used, please connect to VDDI									
15	SCL_WRX	Input	Synchronous clock signal in I2C I/F. If this pin is not used, please connect to VDDI									
16	TEST PIN 3	Output	TEST pin , (no connect , Floating)									
17	TEST PIN 4	Input/ Output	TEST pin , (no connect , Floating)									
18	RESX	Input	This signal will reset the device and must be applied to properly initialize the chip , Signal is active low									
19	MVDDL	Output	Internal system Power , Connect a capacitor for stabilization									
20	MVDDA	Output	Internal system Power , Connect a capacitor for stabilization									

21	GND	Power Supply	Circuit ground
22	VDDI	Power Supply	External power supply (1.8V for digital system power)
23	DVDD	Output	Internal system Power , Connect a capacitor for stabilization
24	DVDD	Output	Internal system Power , Connect a capacitor for stabilization
25	AVDD	Power Supply	Power supply for OLED cell , Connect a capacitor for stabilization
26	ELVDD	Output	Power supply for OLED cell , Connect a capacitor for stabilization
27	VCOM	Output	Power supply for OLED cell , Connect a capacitor for stabilization
28	VCOM	Output	Power supply for OLED cell , Connect a capacitor for stabilization
29	GND	Power Supply	Circuit ground
30	GND	Power Supply	Circuit ground
31	GND	Input	Circuit ground for MIPI
32	DATAP2_PTA	Input	Differential small amplitude signal of MIPI data input
33	DATAN2_PTA	Input	Differential small amplitude signal of MIPI data input
34	GND	Input	Circuit ground for MIPI
35	DATAP1_PTA	Input	Differential small amplitude signal of MIPI data input
36	DATAN1_PTA	Input	Differential small amplitude signal of MIPI data input
37	GND	Input	Circuit ground for MIPI
38	CLKP_PTA	Input	MIPI CLK
39	CLKN_PTA	Input	MIPI CLK
40	GND	Input	Circuit ground for MIPI
41	DATAP0_PTA	Input/ Output	Differential small amplitude signal of MIPI data input
42	DATAN0_PTA	Input/ Output	Differential small amplitude signal of MIPI data input
43	GND	Input	Circuit ground for MIPI
44	DATAP3_PTA	Input	Differential small amplitude signal of MIPI data input
45	DATAN3_PTA	Input	Differential small amplitude signal of MIPI data input
46	GND	Input	Circuit ground for MIPI
47	DATAP2_PTB	Input	Differential small amplitude signal of MIPI data input
48	DATAN2_PTB	Input	Differential small amplitude signal of MIPI data input
49	GND	Input	Circuit ground for MIPI
50	DATAP1_PTB	Input	Differential small amplitude signal of MIPI data input
51	DATAN1_PTB	Input	Differential small amplitude signal of MIPI data input
52	GND	Input	Circuit ground for MIPI
53	CLKP_PTB	Input	MIPI CLK
54	CLKN_PTB	Input	MIPI CLK
55	GND	Input	Circuit ground for MIPI
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57	DATAN0_PTB	Input/ Output	Differential small amplitude signal of MIPI data input
58	GND	Input	Circuit ground for MIPI
59	DATAP3_PTB	Input	Differential small amplitude signal of MIPI data input
60	DATAN3_PTB	Input	Differential small amplitude signal of MIPI data input

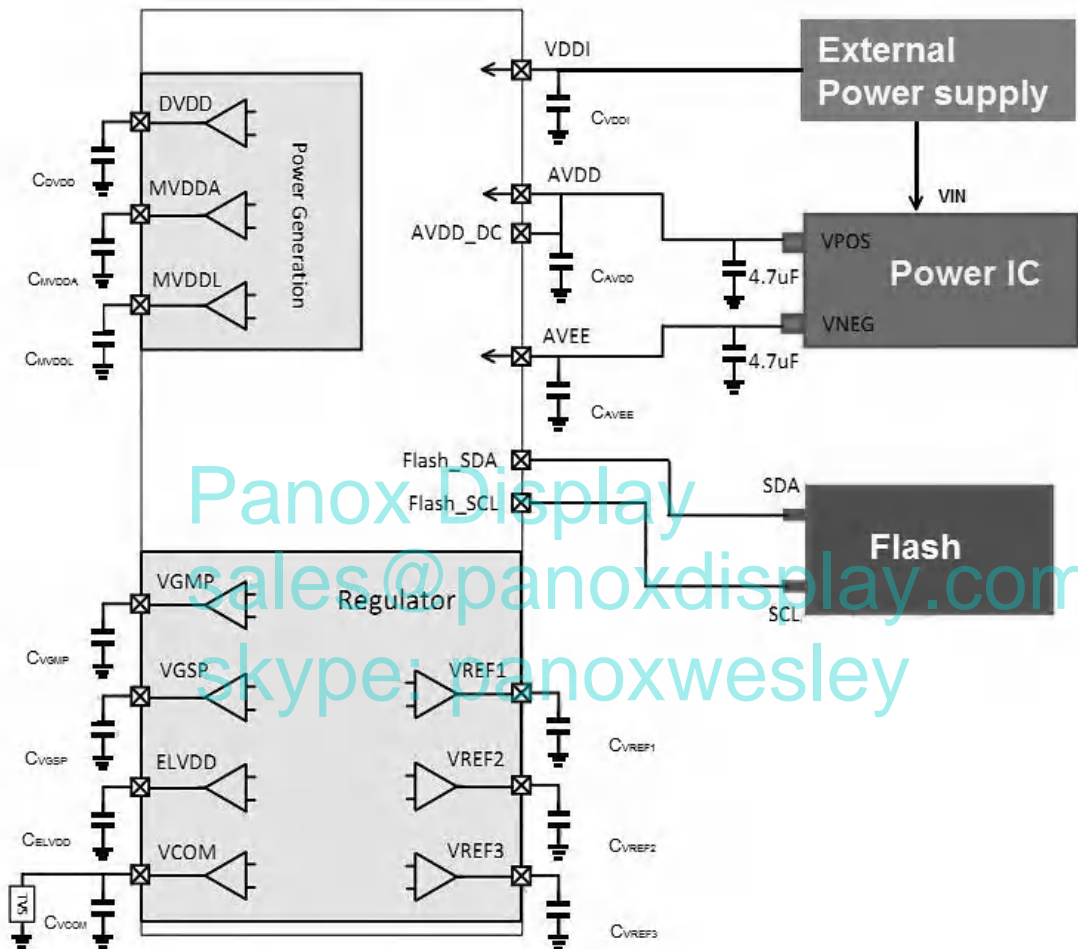
5.3 Pin description of PCB Module

PIN No. (PCB Side)	Symbol	Type	Description									
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10	RESX	Input	This signal will reset the device and must be applied to properly initialize the chip , Signal is active low									
11	VDDI	Power Supply	External power supply (1.8V for digital system power)									
12	VDDI	Power Supply	External power supply (1.8V for digital system power)									
13	VIN	Power Supply	External power supply									
14	VIN	Power Supply	External power supply									
15	ENP	Input	Enable pin for Power IC (Connect to VIN)									
16	ENN	Input	Enable pin for Power IC (Connect to VIN)									
17	GND	Power Supply	Circuit ground									
18	GND	Power Supply	Circuit ground									
19	GND	Power Supply	Circuit ground									
20	GND	Power Supply	Circuit ground									
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45	DATAN3_PTA	Input	Differential small amplitude signal of MIPI data input
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47	DATAP2_PTB	Input	Differential small amplitude signal of MIPI data input
48	DATAN2_PTB	Input	Differential small amplitude signal of MIPI data input
49	GND	Input	Circuit ground for MIPI
50	DATAP1_PTB	Input	Differential small amplitude signal of MIPI data input
51	DATAN1_PTB	Input	Differential small amplitude signal of MIPI data input
52	GND	Input	Circuit ground for MIPI
53	CLKP_PTB	Input	MIPI CLK
54	CLKN_PTB	Input	MIPI CLK
55	GND	Input	Circuit ground for MIPI
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57	DATAN0_PTB	Input/ Output	Differential small amplitude signal of MIPI data input
58	GND	Input	Circuit ground for MIPI
59	DATAP3_PTB	Input	Differential small amplitude signal of MIPI data input
60	DATAN3_PTB	Input	Differential small amplitude signal of MIPI data input

5.4 Peripheral Circuit

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



Notes:

- (1) There are totally 13 capacitors and 1 Schottky diode.
- (2) The Schottky diode 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)	2.5	5.5	V
OLED Power Supply	AVDD	5.0	6.0	V
	AVEE	-5.0	-6.0	V
Logic input voltage	V _i	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)	2.5	4.4	5.5	V
OLED Power Supply	AVDD	5.0	5.4	6.0	V
	AVEE	-5.0	-5.4	-6.0	V
Logic input voltage	Vi	1.65	1.8	1.95	V
Operating temperature	Topr	-10		80	°C

8. Electrical Characteristics

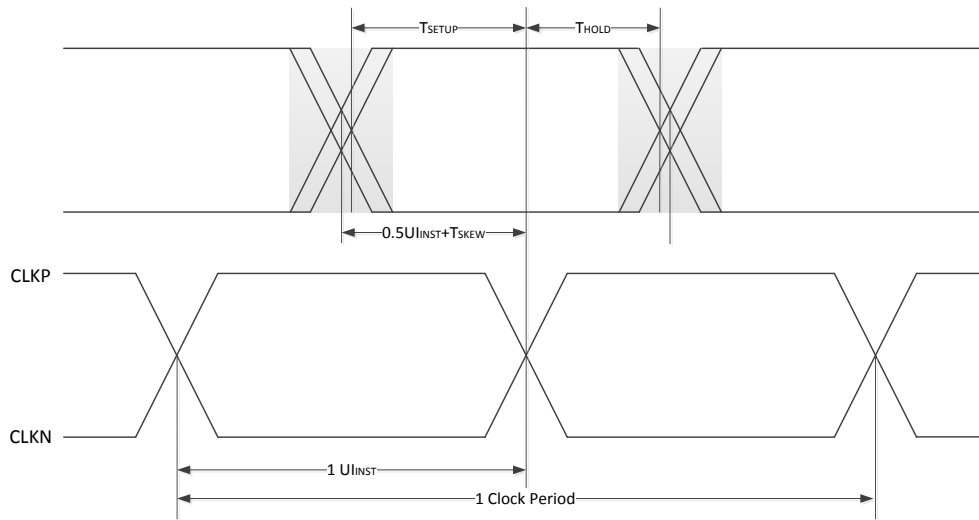
8.1 DC Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Power & Operation Voltage						
AVDD Input Level	AVDD	-	5.0		6.0	V
AVEE Input Level	AVEE	-	-5.0		-6.0	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

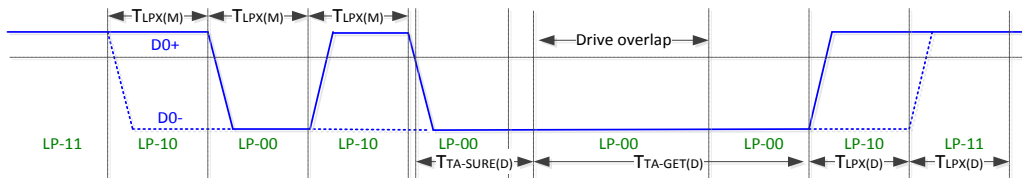
Parameter	Symbol	Min	Typ.	Max	Unit
UI instantaneous	UIINST	1	-	3	ns
T Data to Clock Skew	TSKEW	-0.15	-	0.15	UIHS
RX Data to Clock Setup Time Tolerance	TSETUP	0.15	-	-	UIHS
RX Data to Clock Hold Time Tolerance	THOLD	0.15	-	-	UIHS



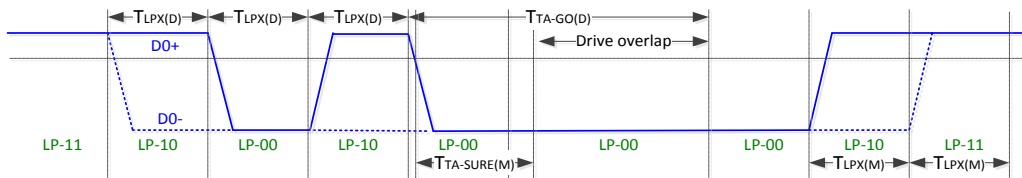
8.2.2 MIPI Low Power Mode Characteristics

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

- Bus Turnaround from MPU to display module



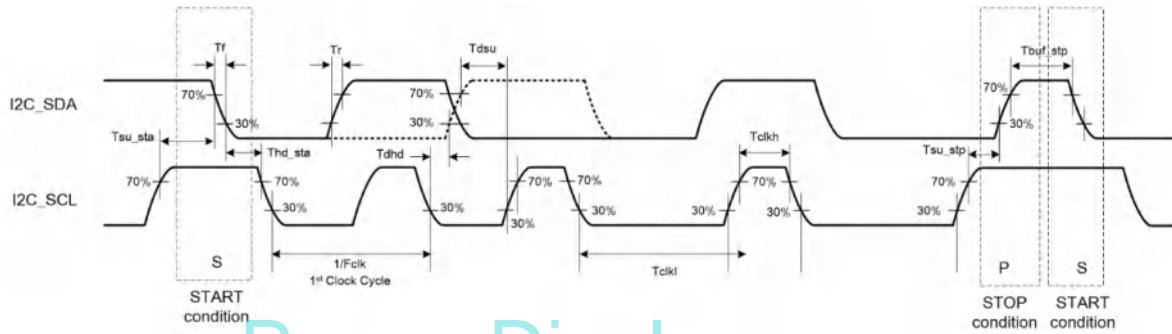
- Bus Turnaround from display module to MPU



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



Panox Display

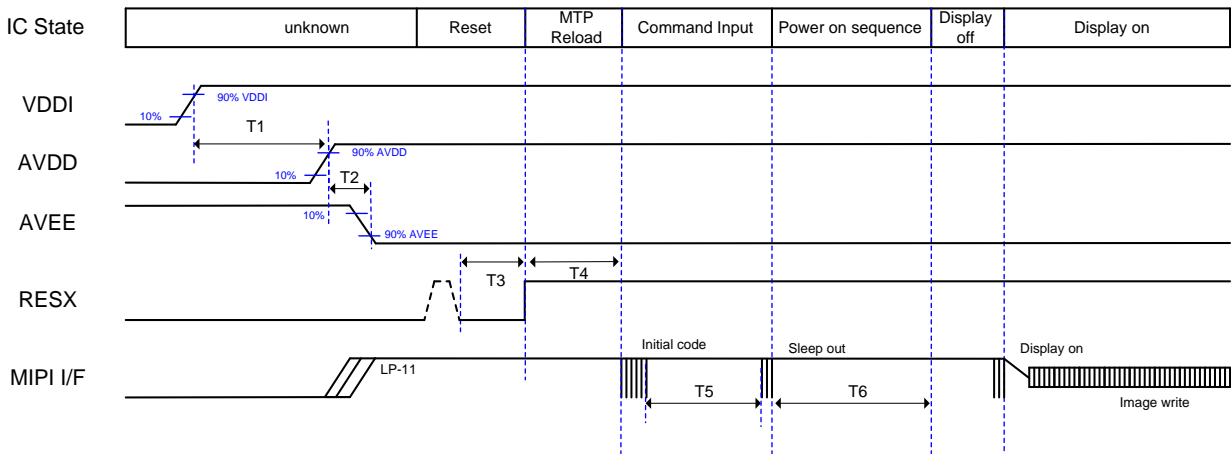
9. Power Supply Sequence

sales@panoxdisplay.com

9.1 Power On/Off Sequence

skype: panoxwesley

Power on sequence



Power off sequence