Rocktech Displays Limited

LCD Module Specification

Module P/N: RK101II092

Version: 1.0

Description : 10.1 inch TFT 800*1280 Pixels with LED Backlight,All viewing angle, 320 nits brightness

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Revision History

Date	Rev.	Page	Description
2022-03-10	1.0	All	First issue

CONTENTS

1. General Features

Item	Spec	Remark
Display Mode	Normally Black transmissive	
Viewing Direction	Free	IPS
Input Signals	MIPI	
Outside Dimensions	143.00(W) x228.60(H) x2.51(D)	
Active Area	135.36mm(W)×216.58mm(H)	
Number of Pixels	800(RGB)×1280	
Dot Pitch	0.1692mm(H) ×0.1692mm(W)	
Pixel Arrangement	RGB Vertical stripes	
TFT Driver IC	ILI9881C	

2. Absolute Maximum Ratings

The following are maximum values which, if exceeded may cause operation or damage to the unit.

Item	Sym.	Min	Max	Unit	Note
Power for Circuit Driving	VCC	-0.3	3.9	V	Note
Power for Circuit Logic	VCCIO	-0.3	3.9	V	Note
Operation Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	

3. Electrical Specification

3.1 Driving TFT LCD Panel

Item		Sym.	Min	Typ.	Max	Unit	Note
Power Voltage		VCC	2.65	2.8	3.3	V	
		VCCIO	1.65	1.8	3.3	V	
Logic Input Voltage	Low Voltage	V_{IL}	0	-	0.2VCCIO	V	
	High Voltage	V_{IH}	0.8 VCCIO	-	VCCIO	V	
Logic Output Voltage	Low Voltage	V_{OL}	0	-	0.2 VCCIO	V	
	High Voltage	V_{OH}	0.8 VCCIO	-	VCCIO	V	

3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V_F	-	12.8	-	V	
Backlight driving current	I_F	120	160	200	mA	
Backlight Power Consumption	W_{BL}	-	2048	-	mW	
Life Time	-	-	50,000	-		Note 3

Note 1: (Unless specified, the ambient temperature Ta=25℃)
Note 2: The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

4.Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 ℃. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Item	Sym.	Values			Unit	Note
		Min.	Typ.	Max.		
1)Contrast Ratio	C/R	800	1000	-		FIG.1
2)Module Luminance	L	270	320	-	cd/m^2	
3)Response time	Tr+Tf	-	25	35	ms	FIG.2
4)Viewing Angle	θ_T	75	80	-	Degree	FIG.3
	θ_B	75	80	-		
	θ_L	75	80	-		
	θ_R	75	80	-		
5)Chromaticity	Wx	0.262	0.302	0.342		
	Wy	0.289	0.329	0.369		
	Rx	-	-	-		
	Ry	-	-	-		
	Gx	-	-	-		
	Gy	-	-	-		
	Bx	-	-	-		
	By	-	-	-		

◆ Measurement System

Notes:

1. Contrast Ratio(CR) is defined mathematically as :

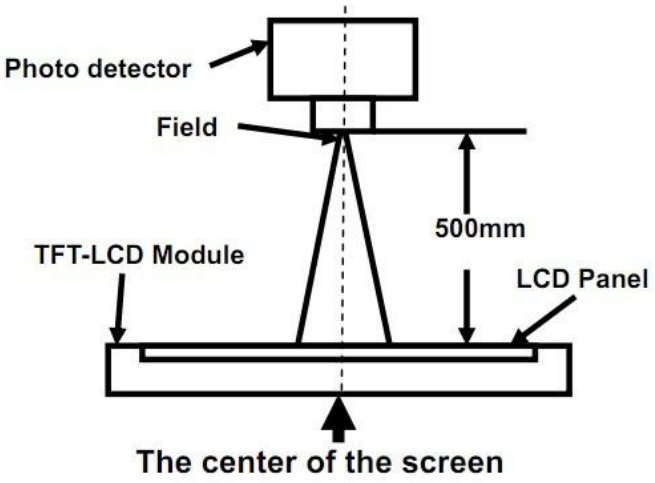
$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.

3. Response time is the time required for the display to transition from white to black (Rising Time, Tr) and from black to white (Falling Time, Tf). For additional information see FIG 2.

4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

FIG. 1 Optical Characteristic Measurement Equipment and Method



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

FIG. 2 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

Response Time = Rising Time(Tr) + Falling Time(Tf)

- Rising Time(Tr) : Full White 90% → Full White 10% Transmittance.
- Falling Time(Tf) : Full White 10% → Full White 90% Transmittance.

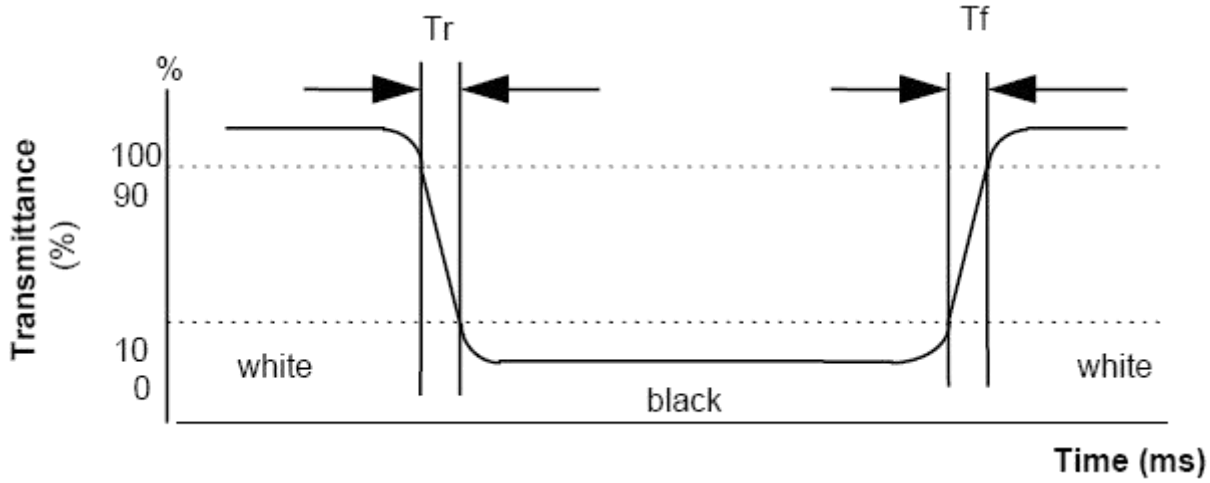
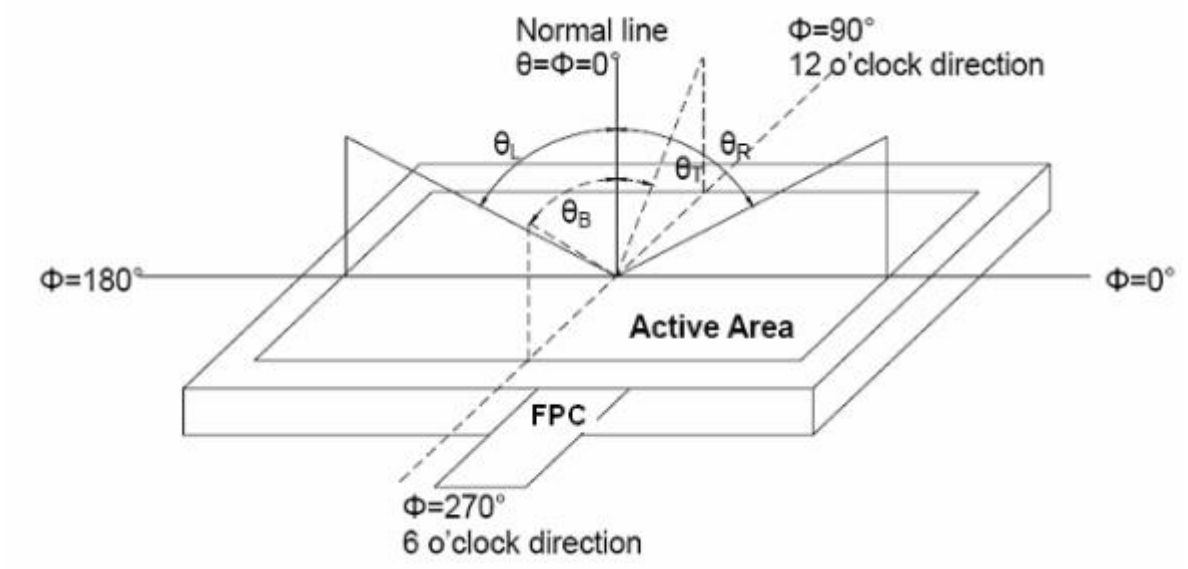
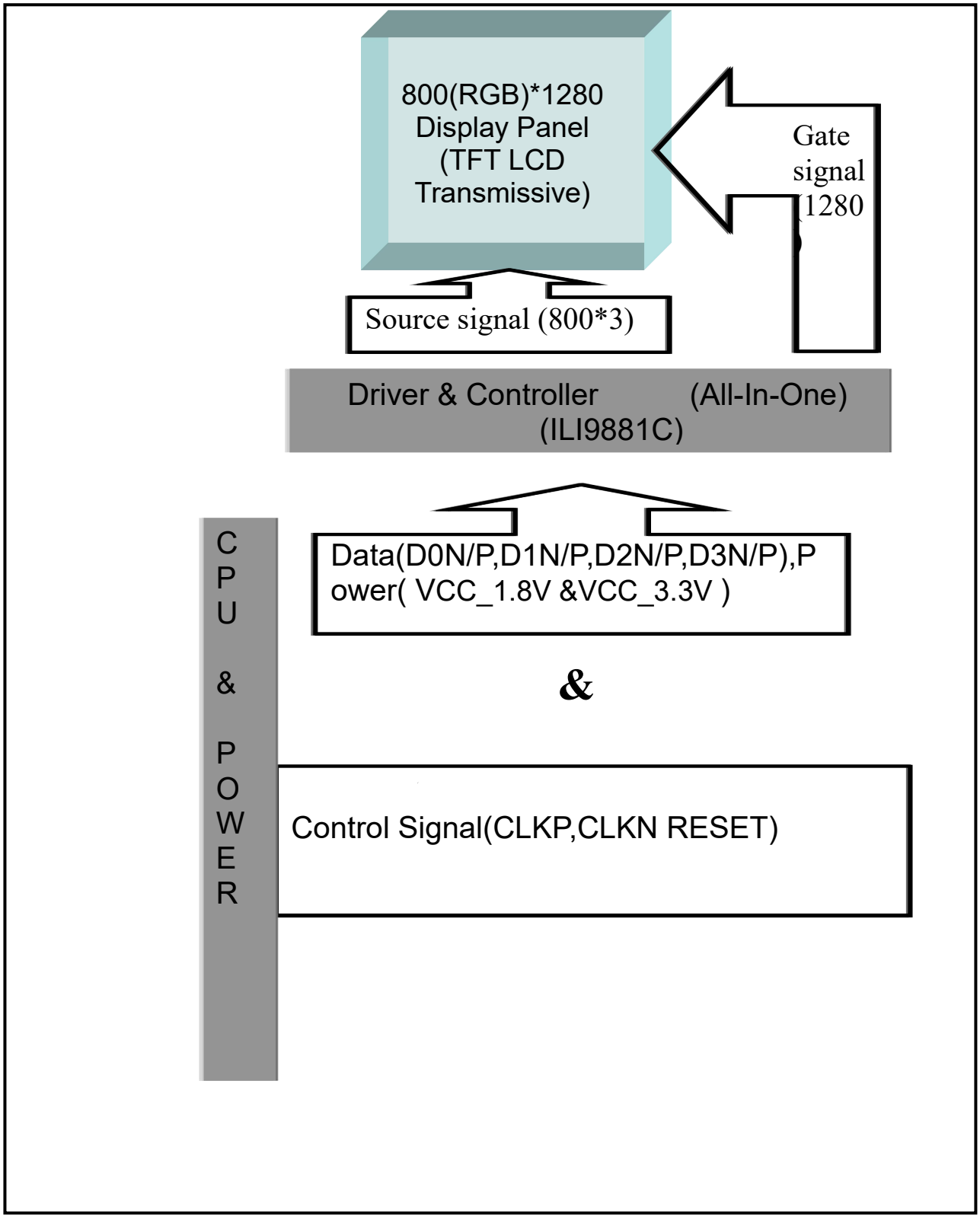


FIG. 3 The definition of Viewing Angle

Use Fig. 1(Test Procedure) under Measurement System to measure the contrast from the measuring direction specified by the conditions as the following figure.



5.Block Diagram



6.Pin Description

Item	Terminal	Functions
1	GND	GND
2	D0P	MIPI DSI data-0 signal line (+)
3	D0N	MIPI DSI data-0 signal line (-)
4	GND	GND
5	D1P	MIPI DSI data-1 signal line (+)
6	D1N	MIPI DSI data-1 signal line (-)
7	GND	GND
8	CLK_P	MIPI DSI Clock strobe signal line (+).
9	CLK_N	MIPI DSI Clock strobe signal line (-).
10	GND	GND
11	D2P	MIPI DSI data-2 signal line (+)
12	D2N	MIPI DSI data-2 signal line (-)
13	GND	GND
14	D3P	MIPI DSI data-3 signal line (+)
15	D3N	MIPI DSI data-3 signal line (-)
16,17	GND	GND
18,19	VCC_1.8V	Power supply 1.8V
20-23	NC	No Connection
24	LCM_RST	LCD Reset Pin
25,26	NC	No Connection
27	GND	GND
28,29	LEDK	Backlight Cathode input pin.
30	GND	GND
31	NC	No Connection
32,33	GND	GND
34	NC	No Connection
35,36	LEDA	Backlight Anode input pin.
37	GND	GND
38,39	VCC_3.3V	Power supply VDD 3.3V
40	NC	No Connection

7.Timing Characteristics

7.1 High Speed Mode-Clock Channel Timing

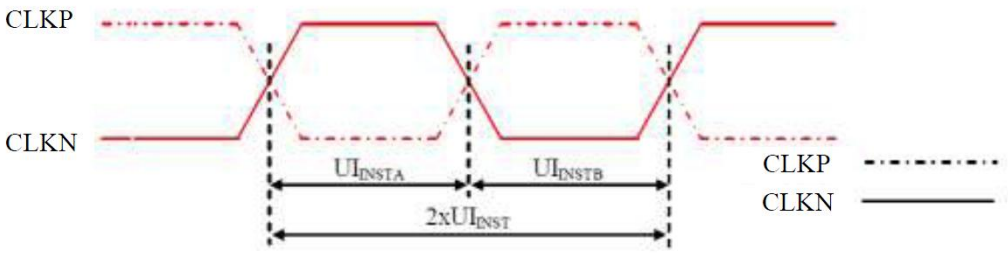


Figure 116: DSI Clock Channel Timing

Table 38: DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
CLKP/N	$2xUI_{INST}$	Double UI instantaneous	*Note 2*	25	ns
CLKP/N	UI_{INSTA}, UI_{INSTB} (Note 1)	UI instantaneous Half	*Note 2*	12.5	ns

Notes:

1. UI = UIINSTA = UIINSTB

2. Define the minimum value, see Table 39.

Table 39: Limited Clock Channel Speed

Data type	Two Lanes speed	Three Lanes speed	Four Lanes speed
Data Type = 00 1110 (0Eh), RGB 565, 16 UI per Pixel	566 Mbps	466 Mbps	366 Mbps
Data Type = 01 1110 (1Eh), RGB 666, 18 UI per Pixel	637 Mbps	525 Mbps	412 Mbps
Data Type = 10 1110 (2Eh), RGB 666 Loosely, 24 UI per Pixel	850 Mbps	700 Mbps	550 Mbps
Data Type = 11 1110 (3Eh), RGB 888, 24 UI per Pixel	850 Mbps	700 Mbps	550 Mbps

7.2 High Speed Mode-Data Clock Channel Timing

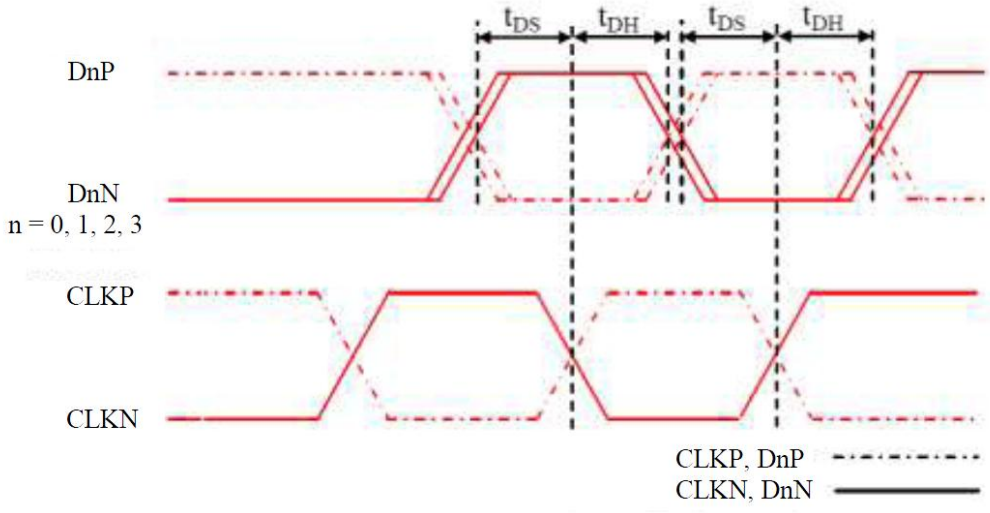


Figure 117: DSI Data to Clock Channel Timings

Table 40: DSI Data to Clock Channel Timings

Signal	Symbol	Parameter	Min	Max
DnP/N , n=0 and 1	t_{DS}	Data to Clock Setup time	0.15xUI	-
	t_{DH}	Clock to Data Hold Time	0.15xUI	-

7.3 High Speed Mode-Rising and Falling Timing

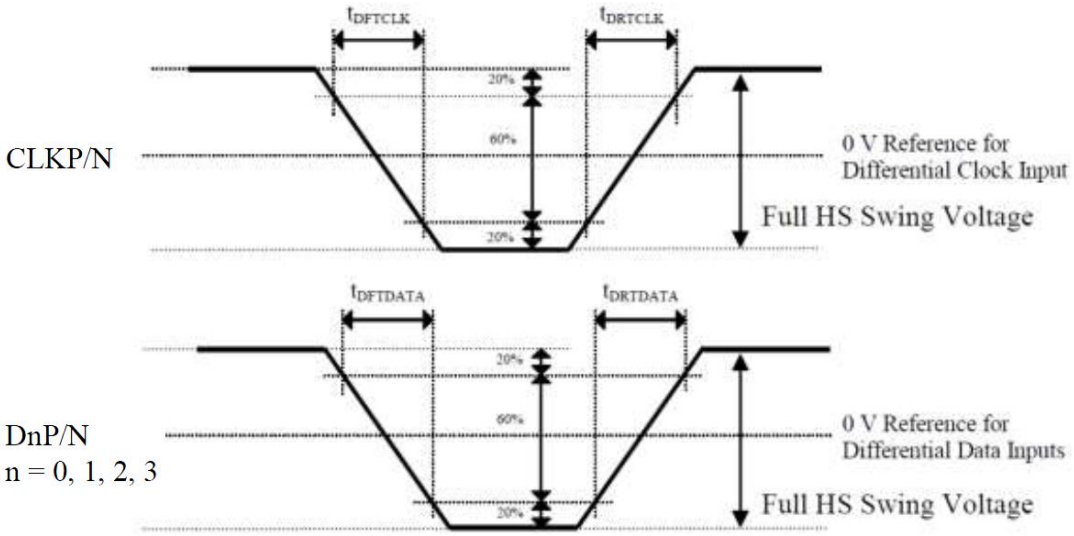


Figure 118: Rising and Falling Timings on Clock and Data Channels

Table 41: Rise and Fall Timings on Clock and Data Channels

Parameter	Symbol	Condition	Specification		
			Min	Typ	Max
Differential Rise Time for Clock	t_{DRTCLK}	CLKP/N	150 ps	-	0.3UI (Note)
Differential Rise Time for Data	$t_{DRTDATA}$	DnP/N n=0 and 1	150 ps	-	0.3UI (Note)
Differential Fall Time for Clock	t_{DFTCLK}	CLKP/N	150 ps	-	0.3UI (Note)
Differential Fall Time for Data	$t_{DFTDATA}$	DnP/N n=0 and 1	150 ps	-	0.3UI (Note)

Note: *The display module has to meet timing requirements, which are defined for the transmitter (MCU) on MIPI D-Phy standard.*

7.4 Reset Timing

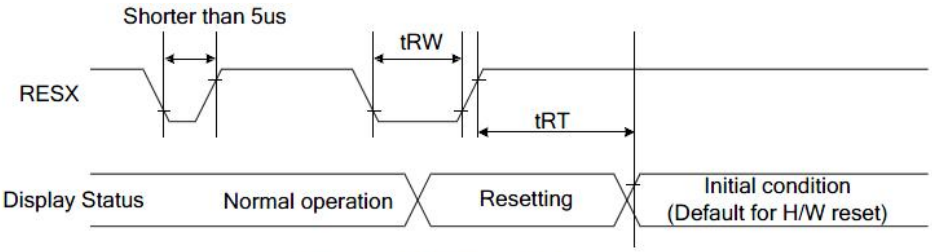


Figure 124: Reset Timing

Table 47: Reset Timing

Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

Notes:

1. *The reset cancel also includes required time for loading ID bytes, VCOM setting and other settings from EEPROM to registers. This loading is done every time when there is H/W reset cancel time (tRT) within 5 ms after a rising edge of RESX.*
2. *Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the Table 48.*

Table 48: Reset Descript

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts

3. During the Resetting period, the display will be blanked (The display enters the blanking sequence, which maximum time is 120 ms, when Reset Starts in the Sleep Out mode. The display remains the blank state in the Sleep In mode.) and then return to Default condition for Hardware Reset.
4. Spike Rejection can also be applied during a valid reset pulse, as shown below:

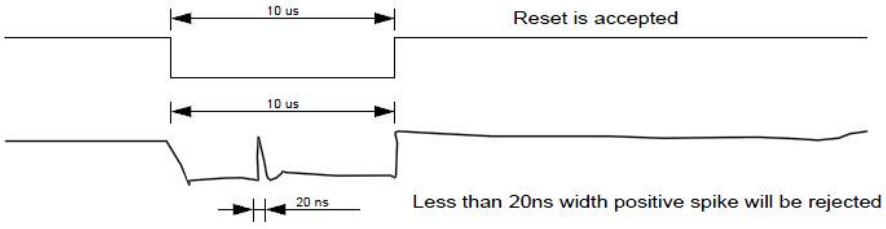
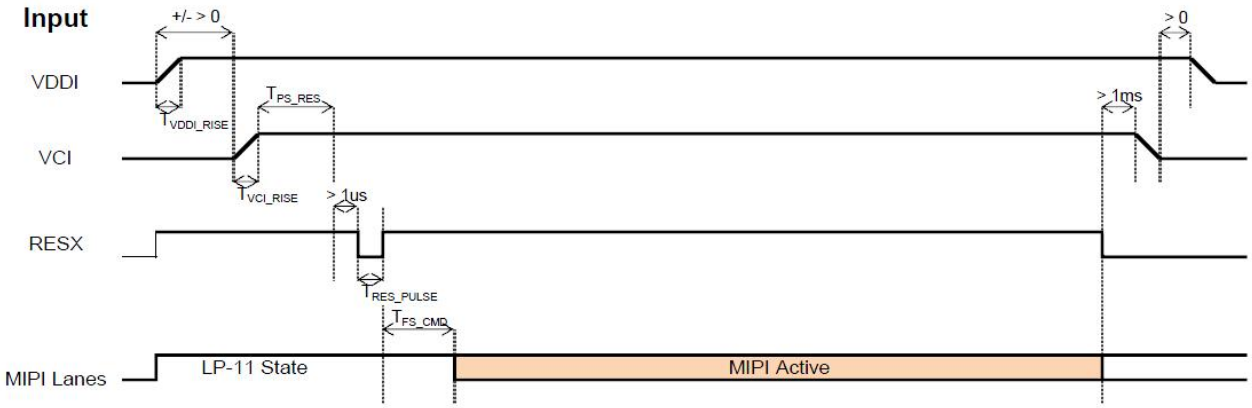


Figure 125: Positive Noise Pulse during Reset Low

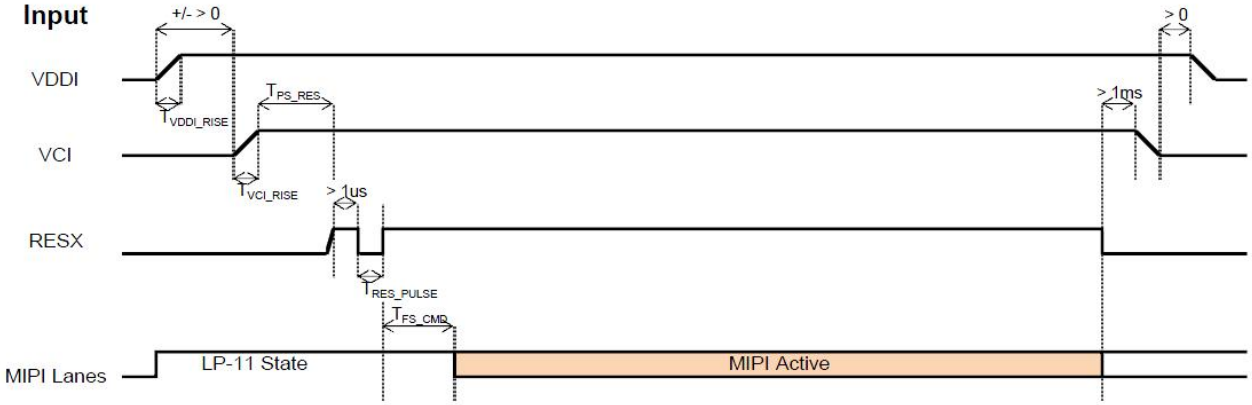
5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

7.5 Power ON/OFF Sequence

Case A:

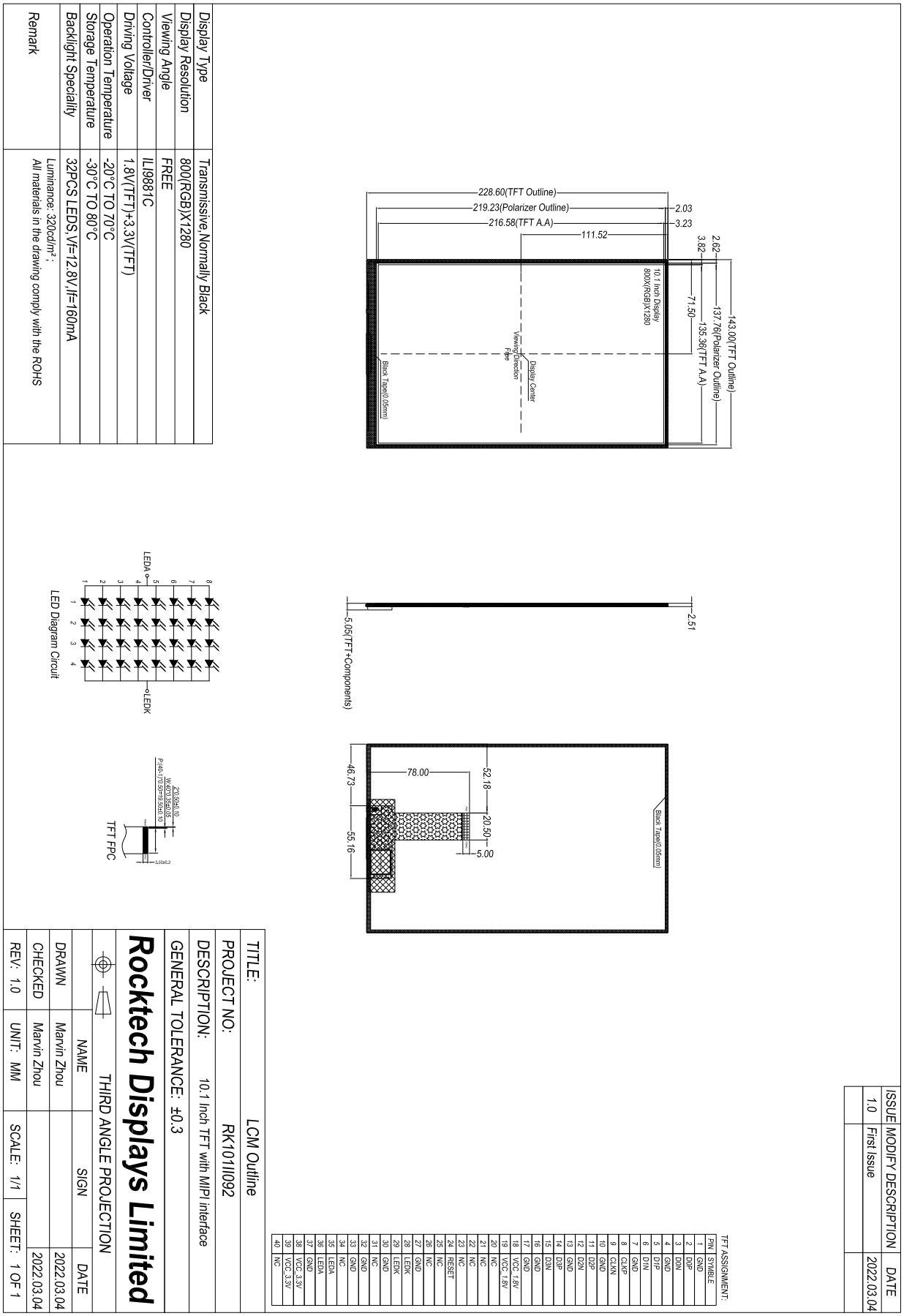


Case B:



Symbol	Characteristics	Min.	Typ.	Max.	Units
T_{VDDI_RISE}	VDDI Rise time	20	-	-	us
T_{VCI_RISE}	Case A: VCI Rise time	200	-	-	us
	Case B: VCI Rise time	40			
T_{PS_RES}	VDDI/VCI on to Reset high	5	-	-	ms
T_{RES_PULSE}	Reset low pulse time	10	-	-	us
T_{FS_CMD}	Reset to first command	10	-	-	ms

8.Outline Dimension



Display Type	Transmissive,Normally Black
Display Resolution	800(RGB)X1280
Viewing Angle	FREE
Controller/Driver	ILI9881C
Driving Voltage	1.8V(TFT)+3.3V(TFT)
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Backlight Speciality	32PCS LEDS,Vf=12.8V,If=160mA
Remark	Luminance: 320cd/m²; All materials in the drawing comply with the ROHS

TFT ASSIGNMENT:

PIN	SYMBLE	PIN	SYMBLE
1	GND	21	NC
2	D0P	22	NC
3	D0N	23	NC
4	GND	24	RESET
5	D1P	25	NC
6	D1N	26	NC
7	GND	27	GND
8	CLKP	28	LEDK
9	CLKN	29	LEDK
10	GND	30	GND
11	D2P	31	NC
12	D2N	32	GND
13	GND	33	GND
14	D3P	34	NC
15	D3N	35	LEDA
16	GND	36	LEDA
17	GND	37	GND
18	VCC_1.8V	38	VCC_3.3V
19	VCC_1.8V	39	VCC_3.3V
20	NC	40	NC

ISSUE	MODIFY DESCRIPTION	DATE
1.0	First issue	2022.03.04

TITLE: LCM Outline

PROJECT NO: RK101II092

DESCRIPTION: 10.1 Inch TFT with MIPI interface

GENERAL TOLERANCE: ±0.3

Rocktech Displays Limited

THIRD ANGLE PROJECTION

	NAME	SIGN	DATE
DRAWN	Marvin Zhou		2022.03.04
CHECKED	Marvin Zhou		2022.03.04

REV: 1.0 UNIT: MM SCALE: 1/1 SHEET: 1 OF 1

9. Reliability and Inspection Standard

No.	Test Item		Test Conditions	Remark
1	High Temperature	Storage	80℃, 120Hr	Note
		Operation	70℃, 120Hr	Note
2	Low Temperature	Storage	-30℃, 120Hr	Note
		Operation	-20℃, 120Hr	
3	High Temperature and High Humidity		40℃, 90%RH, 120Hr	Note
4	Thermal Cycling Test(No operation)		-20℃ for 30min, 70℃ for 30 min. 100 cycles. Then test at room temperature after 1 hour	Note
5	Vibration Test(No operation)		Frequency :10~55 HZ; Stroke :1.5 mm;Sweep:10HZ~55HZ~10HZ; 2hours for each direction of X, Y, Z(6 hours for total)	
6	Package Drop Test		Height:60 cm,1 corner, 3 edges, 6 surfaces	
7	Electro Static Discharge		±2KV,Human Body Mode, 100pF/1500Ω	

Note:

1) Sample quantity for each test item is 5~10pcs.
2) Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

10.PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
- Isopropyl alcohol
- Ethyl alcohol
Do not scrub hard to avoid damaging the display surface.
(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
- Water
- Ketone
- Aromatic solvents
Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
(9) Do not attempt to disassemble or process the LCD module.
(10) NC terminal should be open. Do not connect anything.
(11) If the logic circuit power is off, do not apply the input signals.
(12) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
- Do not alter, modify or change the shape of the tab on the metal frame.
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Do not damage or modify the pattern writing on the printed circuit board.
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal

connector.
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist LCM.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.
(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.
(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.
- Exposed area of the printed circuit board.
-Terminal electrode sections.