

# Rocktech Displays Limited



Module P/N: RK055MHD091A0-CTG

Version: 1.0

Description : 5.5 inch TFT 720\*1280 Pixels with LED backlight, full viewing angle, MIPI interface and capacitive touch panel

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**Revision History**

<b>Date</b>	<b>Rev.</b>	<b>Page</b>	<b>Description</b>
<b>2021-05-17</b>	<b>1.0</b>	<b>All</b>	<b>First issue</b>

**1. General Features**

Item	Spec	Remark
Display Mode	Normally Black Transmissive	
Viewing Direction	Free	IPS cell
Input Signals	MIPI	
Outside Dimensions	79.24(W) x133.96(H) x3.90(D)	With CTP
Active Area	68.04mm(W) × 120.96mm(H)	
Number of Pixels	720 × RGB × 1280 Pixels	
Dot Pitch	0.0315mm(H) × 0.0945mm(W)	
Pixel Arrangement	RGB Vertical stripes	
TFT Drive IC	HX8394-F	
CTP Drive IC	GT911	

## 2. Absolute Maximum Ratings

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

ITEM	Sym.	Min.	Typ.	Max.	Unit	Remark
Power for Circuit Driving	V <sub>CC</sub>	-0.3	-	4.6	V	
Power for Circuit Logic	V <sub>t</sub>	-0.3	-	V <sub>CC</sub> +0.3	V	
Storage Humidity	H <sub>ST</sub>	10	-		%RH	At 25±5°C
Storage Temperature	T <sub>ST</sub>	-30	-	80	°C	
Operating Ambient Humidity	H <sub>OP</sub>	10	-		%RH	
Operating Ambient temperature	T <sub>OP</sub>	-20	-	70	°C	

### 3. Electrical Specification

#### 3.1 Driving TFT LCD Panel

Item		Sym.	Min	Typ.	Max	Unit	Note
Power Voltage		VCC	2.5	2.8	3.6	V	
						V	
		IOVCC	1.65	1.8	3.6	V	
						V	
Logic Input Voltage	Low Voltage	V <sub>IL</sub>	0	-	0.3IOVCC	V	
	High Voltage	V <sub>IH</sub>	0.7IOVCC	-	IOVCC	V	
Logic Output Voltage	Low Voltage	V <sub>OL</sub>	0	-	0.2VCC	V	
	High Voltage	V <sub>OH</sub>	0.8IOVCC	-	IOVCC	V	

#### 3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V <sub>F</sub>	21.6	22.4	23.2	V	
Backlight driving current	I <sub>F</sub>	-	40	-	mA	
Backlight Power Consumption	W <sub>BL</sub>	-	896	-	mW	
Life Time	-	-	30,000	-		Note 3

Note 1: (Unless specified, the ambient temperature Ta=25°C)

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 °C. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of  $\Phi$  and  $\theta$  equal to 0°.

Item	Sym.	Values			Unit	Note
		Min.	Typ.	Max.		
1) Contrast Ratio	C/R	-	800	-		FIG.1
2) Module Luminance	L	220	280	-	cd/m <sup>2</sup>	After CTP
3) Response time	Tr	-	35	45	ms	FIG.2
	Tf					
4) Viewing Angle	$\theta_T$	-	80	-	Degree	FIG.3
	$\theta_B$	-	80	-		
	$\theta_L$	-	80	-		
	$\theta_R$	-	80	-		
5) Chromaticity	Wx	0.271	0.311	0.351		
	Wy	0.299	0.339	0.379		
	Rx	-	-	-		
	Ry	-	-	-		
	Gx	-	-	-		
	Gy	-	-	-		
	Bx	-	-	-		
	By	-	-	-		

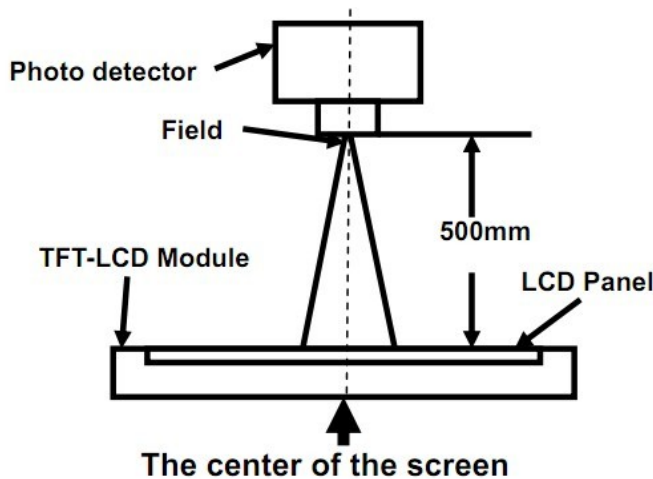
## ◆ Measurement System

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**



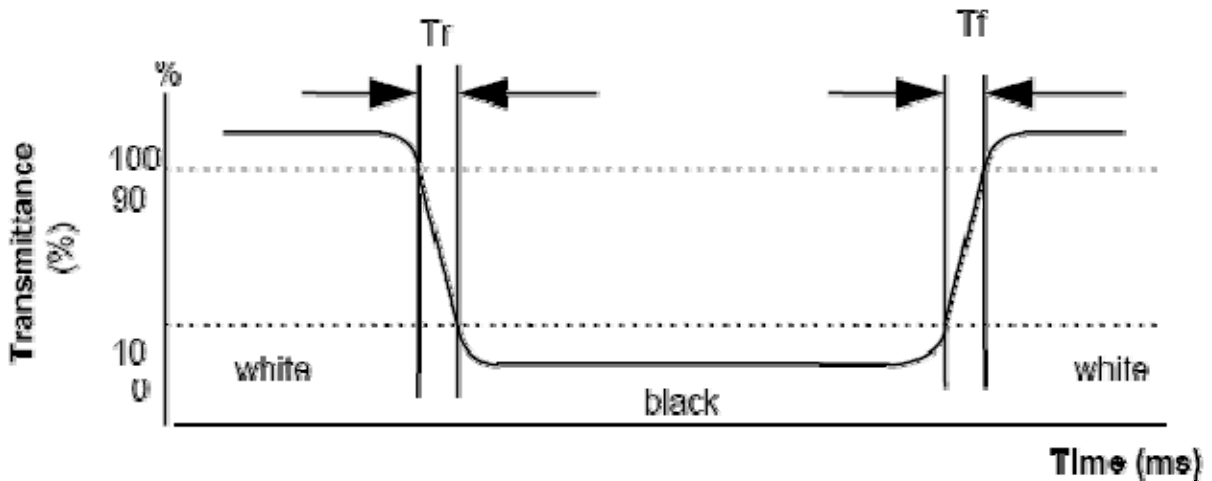
Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

**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”.

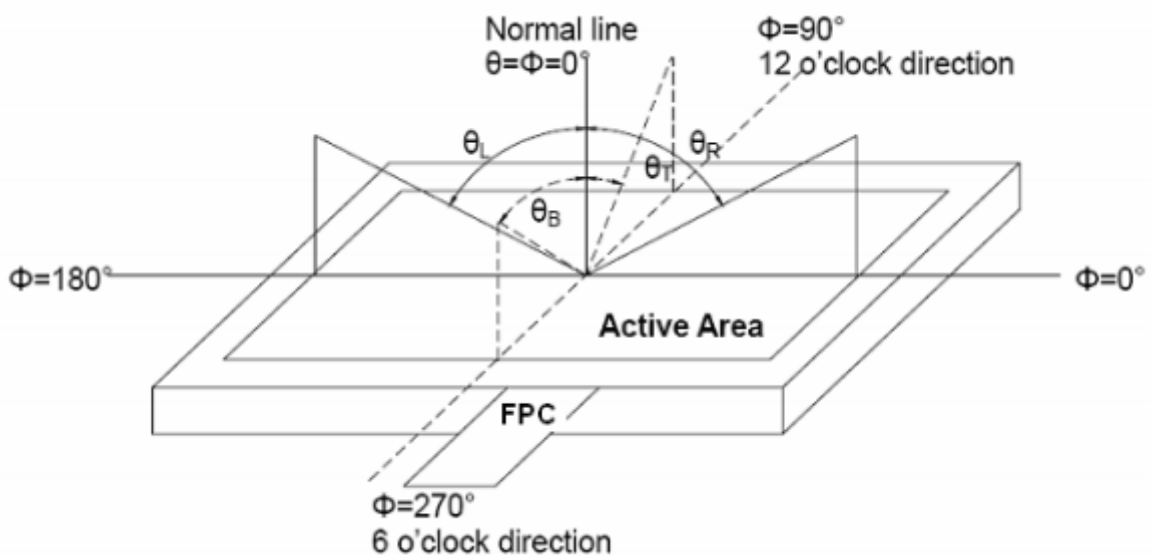
Response Time = Rising Time( $T_r$ ) + Falling Time( $T_f$ )

- Rising Time( $T_r$ ) : Full White 90% → Full White 10% Transmittance.
- Falling Time( $T_f$ ) : Full White 10% → Full White 90% Transmittance.



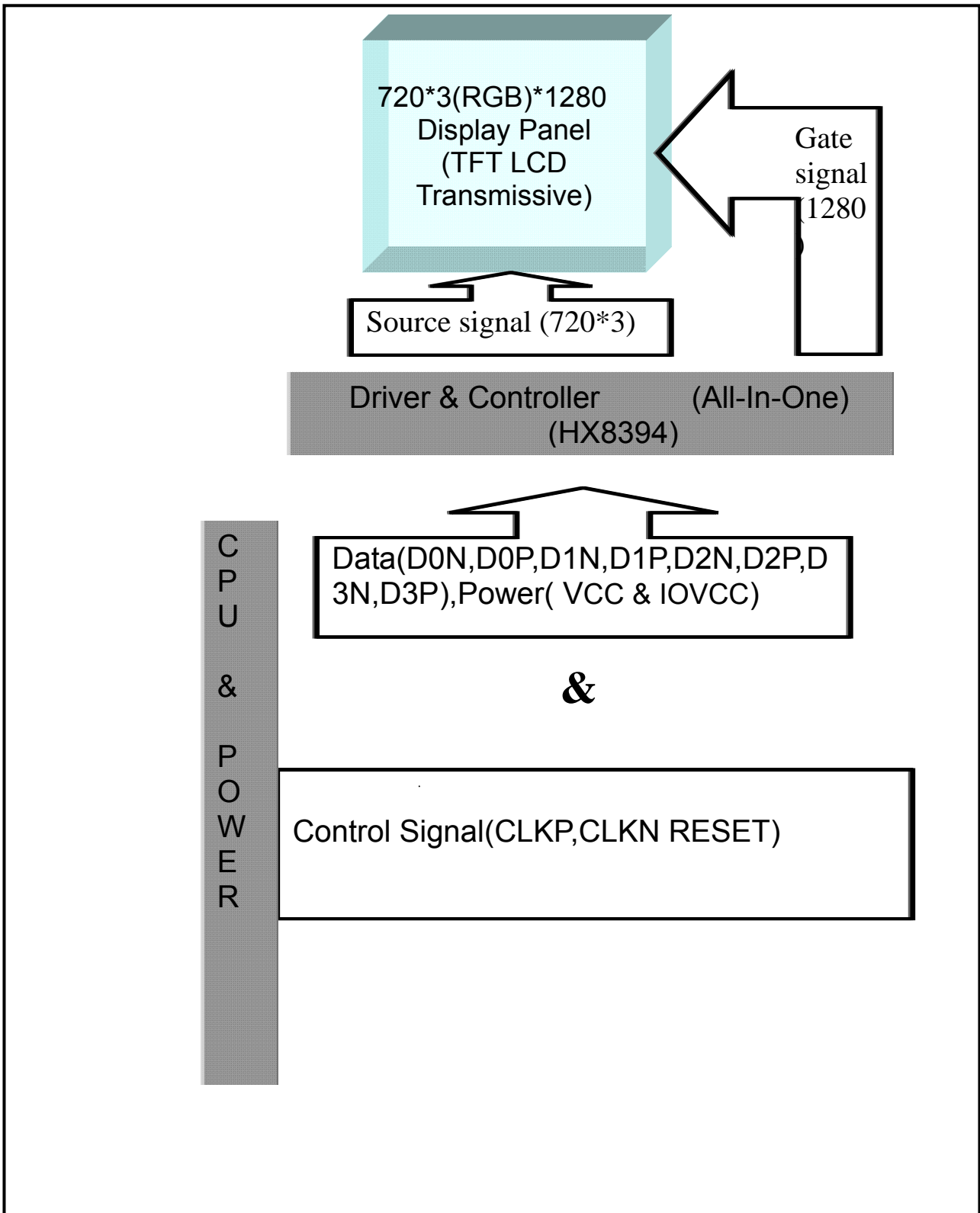
**FIG. 3 The definition of Viewing Angle**

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	Symbol	Description
1	LEDK	Backlight Cathode input pin.
2	LEDA	Backlight Anode input pin.
3	NC	NC
4	GND	GND
5	MIPI_TDN0	MIPI DSI data-0 signal line (-).
6	MIPI_TDP0	MIPI DSI data-0 signal line (+).
7	GND	GND
8	MIPI_TDN1	MIPI DSI data-1 signal line (-).
9	MIPI_TDP1	MIPI DSI data-1 signal line (+).
10	GND	GND
11	MIPI_TCN	MIPI DSI Clock strobe signal line (-).
12	MIPI_TCP	MIPI DSI Clock strobe signal line (+).
13	GND	GND
14	MIPI_TDN2	MIPI DSI data-2 signal line (-)
15	MIPI_TDP2	MIPI DSI data-2 signal line (+)
16	GND	GND
17	MIPI_TDN3	MIPI DSI data-3 signal line (-)
18	MIPI_TDP3	MIPI DSI data-3 signal line (+)
19	GND	GND
20	GND	GND
21	LRSTB	LRSTB
22	LPTE	Tearing effect output pin to synchronies MCU to frame writing, activated by S/W command.
23	VDD 2.8	Power supply VDD
24	LCD_ID	NC
25	IOVCC 1.8	Power supply VDD
26	CTP_SDA	CTP I2C Data
27	CTP_SCL	CTP I2C Clock
28	CTP_RST	CTP Reset
29	CTP_INT	CTP Interrupt
30	VDD 3.3	CTP Working voltage 2.8-3.3V
31	GND	GND

CTP IC driver source code will be offered separately.

## 7. Timing Characteristics (Details refer to HX8394-F spec)

### 7.1 Vertical Timing

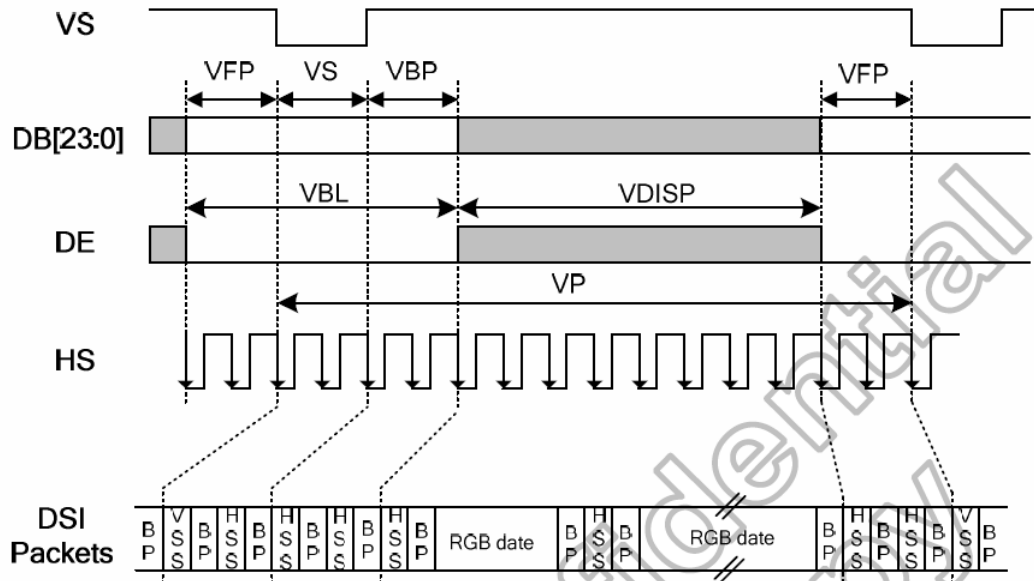


Figure 7.9: Vertical timings for DSI I/F

Resolution=720x1280(VSSA=0V, VDD1=1.8V, VDD2=2.8V, VDD3=2.8V, T<sub>A</sub>=25 °C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Vertical cycle	VP	-	1286	-	-	Line
Vertical low pulse width	VS	-	2	-	Note(1)	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note(1)	Line
Vertical data start point	-	VS+VBP	4	-	Note(1)	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	1280	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Note: (1) The VS/VBP/VFP pulse width are related to RD3h (Set GIP Option0). Please refer to the application note for VS/VBP/VFP setting.

Table 7.13: Vertical timings for DSI I/F

## 7.2 Horizontal Timing

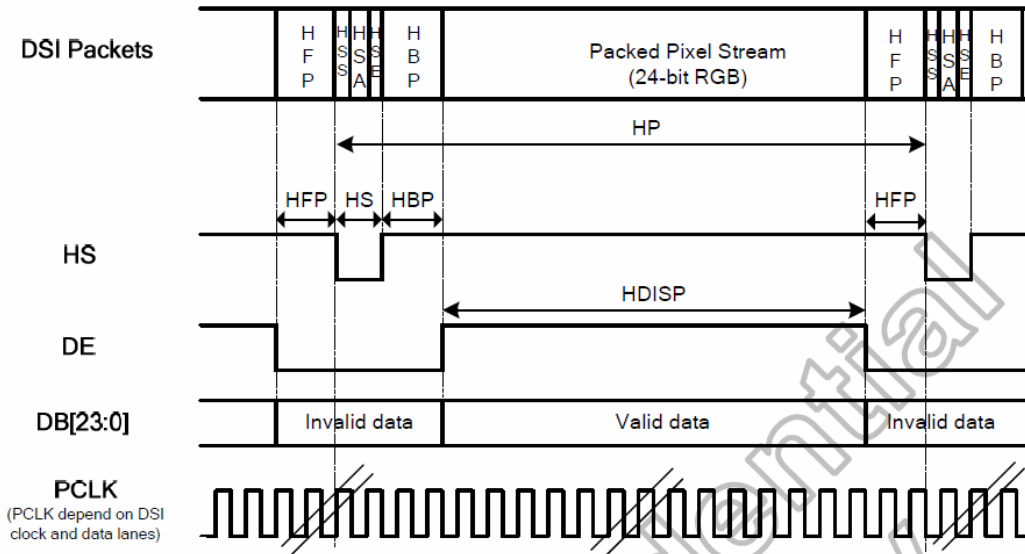


Figure 7.10: Horizontal timing for DSI video mode I/F

Resolution=720x1280 (VSSA=0V, VDD1=1.8V, VDD2=VDD3=VCC=2.8V, T<sub>A</sub>=25°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Horizontal cycle	HP	-	762	-	-	DCK
HS low pulse width	HS	-	6	-	-	DCK
Horizontal back porch	HBP	-	24	-	-	DCK
Horizontal front porch	HFP	-	12	-	-	DCK
Horizontal data start point	-	HS+HBP	30	-	-	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	12	-	-	DCK
Horizontal active area	HDISP	-	-	720	-	DCK

**Note:** (1) HS > 0.2us (12-DCK @ 352.8Mbps /4-lane, Frame rate 60Hz, min DSI CLK rate)  
(20-DCK @ 550Mbps /4-lane, Frame rate 60Hz, max DSI CLK rate)  
(2) HBP > 0.4us (24-DCK @ 352.8Mbps /4-lane, Frame rate 60Hz, min DSI CLK rate)  
(40-DCK @ 550Mbps /4-lane, Frame rate 60Hz, max DSI CLK rate)  
(3) HFP > 0.2us (12-DCK @ 352.8Mbps /4-lane, Frame rate 60Hz, min DSI CLK rate)  
(20-DCK @ 550Mbps /4-lane, Frame rate 60Hz, max DSI CLK rate)

Table 7.14: Horizontal timings for DSI video mode I/F

## 7.3 Power Sequence

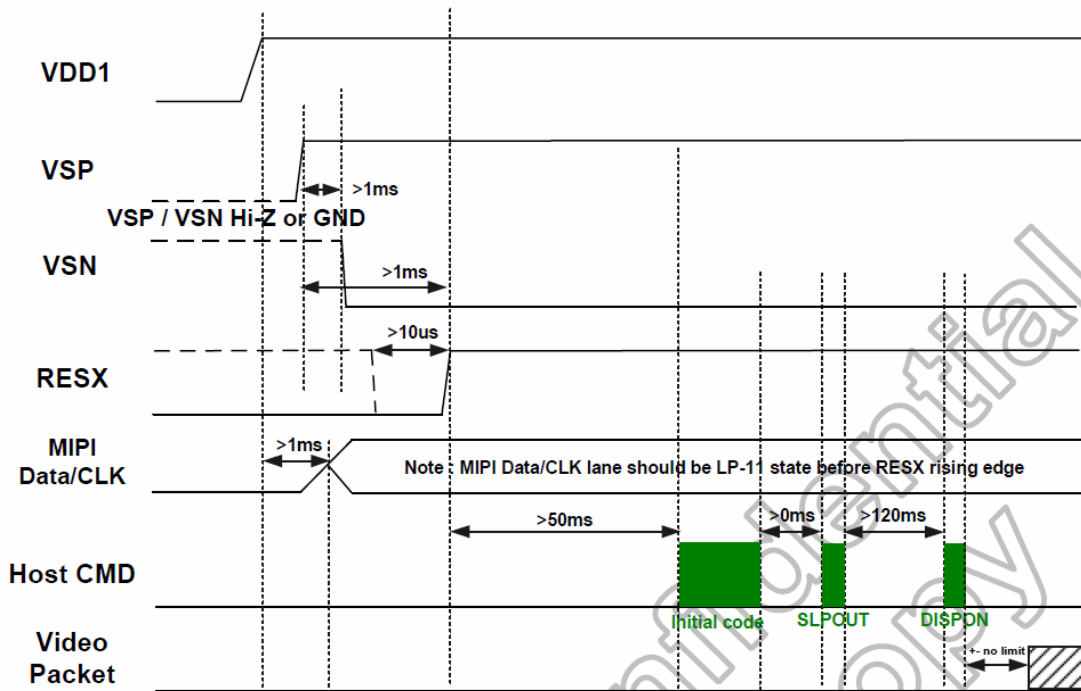


Figure 5.30: VDD1/ VSP/VSN input power on sequence

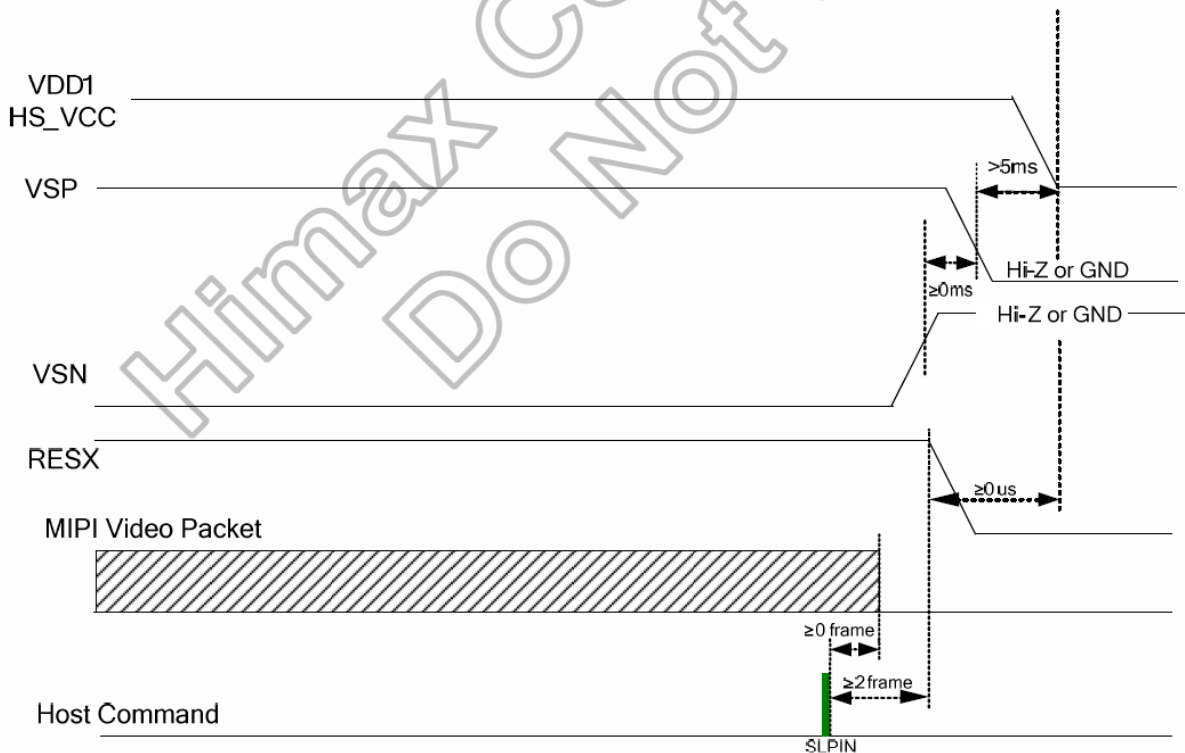


Figure 5.31: VDD1/VSP/VSN input power off sequence

### 8.Outline Dimension

Display Type	Transmissive, Normally Black
Display Resolution	720(RGB)*1280
Viewing Angle	Free
Controller/Driver	HX8394(F(TFT)+GT911(CTP))
Driving Voltage	1.8V(TFT)+2.8V(TFT)+3.3V(CTP)
Operation Temperature	-20°C TO 60°C
Storage Temperature	-30°C TO 70°C
Backlight Speciality	LED Side(White, 14PCS DIES)
Remark	All materials in the drawing comply with the ROHS

Technical drawing showing the outline dimensions of the 5.46" TFT-LCD module. The front view shows a 720\*RGB\*1280 display area with a black masking border. Dimensions include 66.08mm for the display width, 46.585mm for the total width, and 33.173mm for the total height. Various sensor and cover outlines are also indicated.

The side view shows the module's thickness with labels for the LED (14pcs), OCUT (130mm), Sensor (14.10mm), and Adhesive (14x27mm). Dimensions include 3.90mm for the LED height and 1.90mm for the sensor height.

A detailed view of the LED assembly shows 14 LEDs (8 LEDA and 6 LEDK) mounted on a substrate. The LEDA LEDs are arranged in two rows of four, and the LEDK LEDs are in two rows of two. The total width of the LED assembly is 14.8mm.

The drawing also includes a 3rd angle projection of the module and a detailed view of the CTP (Control TFT Panel) assembly with various electrical connections.

ISSUE	MODIFY DESCRIPTION	DATE
1.0	First Issue	2021.05.14

**TITLE:** LCM Outline

**PROJECT NO.:** RK055MHD091A0-CTG

**DESCRIPTION:** 5.5 Inch TFT+CTP

**General Tolerance:** ±0.2

**Rocktech Displays Limited**

THIRD ANGLE PROJECTION

NAME	SIGN	DATE
DRAWN	Marvin Zhou	2021.05.14
CHECKED	Marvin Zhou	2021.05.14

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

**CTP ASSIGNMENT:**

1	NOE Part Name
2	LEDA
3	NC
4	GND
5	TDIN
6	TDPO
7	GND
8	TDNT
9	TDPT
10	GND
11	TGN
12	TOP
13	GND
14	NC(TDIN2)
15	NC(TDIN2)
16	GND
17	NC(TDIN3)
18	NC(TDIN3)
19	GND
20	GND
21	LRSTB
22	LRTE
23	VCC 2.8
24	LOD_ID
25	DOVCC 1.4
26	CTP_SDA
27	CTP_SCL
28	CTP_RST
29	CTP_RST
30	VDD 3.3
31	GND

## 9. Reliability and Inspection Standard

No.	Test Item	Test Conditions	Remark	
1	High Temperature	Storage	80°C, 120Hr	Note
		Operation	70°C, 120Hr	Note
2	Low Temperature	Storage	-30°C, 120Hr	Note
		Operation	-20°C, 120Hr	
3	High Temperature and High Humidity	40°C, 90%RH, 120Hr	Note	
4	Thermal Cycling Test(No operation)	-20C for 30min, 70c 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

### Handling 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 in contact 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 alcoholDo 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 solventsWipe 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.