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# TFT | OLED | CHARACTER | GRAPHIC | UWVD | SEGMENT | CUSTOM

# **TFT** Display Module

Part Number E70RF-I-MW400-CB

## **Overview:**

- 7.0-inch TFT: 119.46x176.78mm
- 1200 1920<sup>-</sup>
- 4-Lane MIPI @
- Wide u erature Range
- All View

- Transmissive
- Capacitive Touch Panel
- 400 NITS
- Controllers: HX8279\*2
- OCA Bonding
- RoHS Compliant



#### Description

This is a color active matrix TFT (Thin Film Transistor) LCD (Liquid Crystal Display) that uses amorphous silicon TFT as a switching device. This model is composed of a transmissive type TFT-LCD Panel, driver circuit, capacitive touch panel and backlight unit. The resolution of the 7.0" TFT-LCD contains 1200(RGB)x1920 pixels and can display up to 16.7M colors.

#### **TFT Features**

Display Colors: 16.7M Interface: MIPI Touch Panel: Capacitive

General Information Items	Specification	Unit	Note
	Main Panel	Unit	
TFT Display Area (AA)	94.5(H) x 151.2(V) (7.0 inch)	mm	
CTP View Area	95.3(H) x 151.82(V)	mm	
Driver Element	TFT active matrix		
Display Colors	16.7M	colors	
Number of Pixels	1200(RGB)x1920	dots	
TFT Pixel Arrangement	RGB vertical stripe		
Pixel Pitch	0.07875(H) x 0.07875(V)	mm	
Viewing Angle	ALL	o'clock	
TFT Controller IC	HX8279*2		
CTP Driver IC	GT9271		
Display Mode	Transmissive/Normally Black		
Touch Mode	Multi-Touch		
Operating Temperature	-20 to +70	°C	
Storage Temperature	-30 to +80	°C	

## **Mechanical Information**

ltem		Min.	Тур.	Max.	Unit	Note
	Horizontal (H)		119.46		mm	
Module Size	Vertical (V)		176.78		mm	
	Depth (D)		3.98		mm	
	Weight		157		g	Approximate

## 1. Outline Dimensions





# 2. Input terminal Pin Assignment



## 2.1 TFT PIN Define

Connector on FPC : FH26-31S-0.3HW(0.5)

NO.	SYMBOL	DISCRIPTION	I/O
1	VDD	LED power supply.	Р
2	VDD	LED power supply.	Р
3	VDD	LED power supply.	Р
4	VDD	LED power supply.	Р
5	GND	Ground.	Р
6		1.LED backlight enable, High active.	
0		2. PMW input pin.	
7	NC	No connectedS	
8	GND	Ground.	Р
9	MIPI_3N	MIPI data 3 negative signal	I/O
10	MIPI_3P	MIPI data 3 positive signal	I/O
11	GND	Ground.	Р
12	MIPI_0N	MIPI data 0 negative signal	I/O
13	MIPI_0P	MIPI data 0 positive signal	I/O
14	GND	Ground.	Р
15	MIPI_CLKN	MIPI CLK negative signal	I/O
16	MIPI_CLKP	MIPI CLK positive signal	I/O
17	GND	Ground.	Р
18	MIPI_1N	MIPI data 1 negative signal	I/O
19	MIPI_1P	MIPI data 1 positive signal	I/O
20	GND	Ground.	Р
21	MIPI_2N	MIPI data 2 negative signal	I/O
22	MIPI_2P	MIPI data 2 positive signal	I/O
23	GND	Ground.	Р
24	XRES	Reset, Low active	I
25	TE	- Tearing effect output pin. Leave the pin open when not in use.	I
26	VDDp	Power IC supply.	Р
27	VDDp	Power IC supply.	Р
28	GND	Ground.	Р
29	GND	Ground.	Р
30	DCDC_EN	Power IC supply enable, High active	I
31	IOVCC	Power supply for IO.	Р



## 2.2 CTP PIN Define

NO.	SYMBOL	DISCRIPTION	I/O
1	VDD	Supply voltage	Р
2	RST	External Reset, Low is active	I
3	INT	External interrupt to the host	Ι
4	SCL	I2C clock input	I
5	SDA	I2C data input and output	I
6	GND	Ground	Р



# 3. LCD Optical Characteristics

## 3.1 Optical specification

ltem		Symbol	Condition	Min.	Тур.	Max.	Unit.	Note
Contrast Ra	ntio	CR	Θ=0	1000	1200			(2)
Response Time	Rising	TR+TF	Normal viewing		25	35	ms	(4)
	Falling		angle					(4)
Color Gam	ut	S(%)		62	67		%	(5)
	White	WX		0.255	0.295	0.335		
		WY		0.291	0.331	0.371		
	Red Green Blue	Rx		0.609	0.649	0.689		
Color Filter		RY		0.306	0.346	0.386		(5)(6)
Chromaticity		GX		0.252	0.292	0.332		
		GY		0.547	0.587	0.627		
		ВХ		0.106	0.146	0.186		
		Βγ		0.049	0.089	0.129		
	Hor	ΘL		75	80			
		ΘR		75	80			(1)(6)
viewing Angle	Ver	ΘU		75	80			
	v or.	ΘD		75	80			
Option View Dir	ection		ALL					

### Measuring Condition

- 1. Dark Room
- 2. Ambient Temperature of 25±2°C
- 3. 15 Minute Warm up



# **Optical Specification Reference Notes:**

## (1) Definition of Viewing Angle:

The viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface.



#### (2) Definition of Contrast Ratio:

Measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

$$Cr = \frac{LW}{Ld}$$

### (3) Definition of Transmittance (T%):

The transmittance of the panel including the polarizers is measured with electrical driving. The equation for transmittance Tr is:

$$Tr = \frac{It}{I0} 100\%$$



*Io* = *the brightness of the light source. It* = *the brightness after panel transmission* 

#### (4) Definition of Response Time (TR, TF):

The rise time 'Tr' is defined as the time for luminance to change from 90% to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.





#### (5) Definition of Color Gamut:

Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y),G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.The color chromaticity shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.



#### (6) Definition of Optical Measurement Setup:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 20 minutes.





# 4. TFT Electrical Characteristics

## 4.1 Absolute Maximum Rating (Ta=25°C, VSS=0V)

Characteristics	Symbol	Min	Мах	Unit
Digital Supply Voltage	VDD	3.0	8.4	V
Supply Voltage (Logic)	IOVCC	3.0	4.8	V
Operating Temperature	TOP	-20	+70	°C
Storage Temperature	TST	-30	+80	°C

NOTE: If the absolute maximum rating of the above parameters is exceeded, even momentarily, the quality of the product may be degraded. Absolute maximum ratings specify the values which the product may be physically damaged if exceeded. Be sure to use the product within the range of the absolute maximum ratings.

## 4.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Тур.	Max.	Unit	Note
Power Supply Input Voltage	VDDp	3.0	3.3	4.8	V	
	IOVCC	1.7	1.8	2.0	V	
Normal Mode Current Consumption	IDD_3.3V		165	300	mA	
Normal Mode Current Consumption	IDD_1.8V		17	30	mA	
Level Input Voltage	VIH	0.8 IOVCC		IOVCC	V	
	VIL	GND		0.2 IOVCC	V	
Level Output Voltage	Vон	0.8 IOVCC		IOVCC	V	
	VOL	GND		0.2 IOVCC	V	

## 4.3 LED Backlight Characteristics

Characteristics	Symbol	Min.	Тур.	Max.	Unit
VLED Supply Voltage	VDD	4.5	5.0	7.5	V
VLED Current Consumption	IDD		250	500	mA
ŠÔT /ĨŠ˘ { ặ æ) &^	ŠX	350	400		cd/m2
LED_EN Logic High Voltage	VIH	1.4			V
LED_EN Logic Low Voltage	VIL			0.4	V
PWM Control Frequency	Fdim	100		100K	HZ

Note: There is an LED driver IC inside the module to drive the backlight, IC number: LP3310.



Note 3: Luminance Uniformity of these 9 points is defined as below:



 $Luminance = \frac{(Total Luminance of 9 Points)}{9}$ 



## 5.0 TFT AC Characteristics

#### 5.1 High Speed Data Transmission: Data-Clock Timing

For high speed data transmission data-clock timing diagrams and tables, see table and diagram on page 115 of the data sheet for controller IC HX8279. The data sheet can be found here: <u>https://focuslcds.com/</u> <u>content/HX8279-D\_DS\_v03.pdf</u>

#### 5.2 High Speed Data Transmission

For high speed data transmission diagrams and tables, see the first table and diagram page 113 of the data sheet for controller IC HX8279. The data sheet can be found here: <u>https://focuslcds.com/content/HX8279-</u> D\_DS\_v03.pdf

#### 5.3 Turnaround Procedure

For turnaround procedure diagrams and tables, see the second table and diagram page 113 of the datasheet for controller IC HX8279. The data sheet can be found here: <u>https://focuslcds.com/content/HX8279-D\_DS\_v03.pdf</u>

#### 5.4 Switching the Clock Lane Between Clock Transmission and Low-Power Mode

For switching the clock lane between clock transmission and low-power mode tables and diagrams, see page 113 of the data sheet for controller IC HX8279.. The data sheet can be found here: <u>https://focusicds.com/</u> <u>content/HX8279-D\_DS\_v03.pdf</u>

#### 5.5 Reset Timing Characteristics

For the reset timing characteristics table and diagram, see page 119 for the data sheet for controller IC HX8279. The data sheet can be found here: <u>https://focusicds.com/content/HX8279-D\_DS\_v03.pdf</u>



# 6.0 CTP Electrical Characteristics

## 6.1 Absolute Maximum Rating

ltem	Symbol	Min	Max	Unit	Note
Power Supply Voltage	VDD	2.66	3.47	V	
Operating Temperature	TOP	-20	+80	°C	
Storage Temperature	TST	-30	+80	°C	

## 6.2 DC Electrical Characteristics

Ambient temperature: 25°C, AVDD=2.8V, VDDIO=1.8V or VDDIO=VDD

Item	Min	Тур.	Max	Unit	Note
Normal Mode Operating Current		13		mA	
Green Mode Operating Current		4.5		mA	
Sleep Mode Operating Current	70		120	uA	
Digital Input Low Voltage/VIL	-0.3		0.25*VDD	V	
Digital Input High Voltage/VIH	0.75*VDD		VDD+0.3	V	
Digital Output Low Voltage/VOL			0.15*VDD	V	
Digital Output High Voltage/VOH	0.85*VDD	3.3	3.6	V	

### 6.3 AC Characteristics

Ambient temperature: 25°C, AVDD=2.8V, VDDIO=1.8V

Parameter	Min	Тур.	Мах	Unit
OSC Oscillation Frequency	59	60	61	NHZ
I/O Output Rise Time, Low to High		14		ns
I/O Output Fall Time, High to Low		14		ns

## 6.4 I2C Timing

For I2C timing diagrams and tables, see page 9 of the data sheet for touch panel IC GT9271. The data sheet for GT9271 can be found here: <u>https://focusicds.com/content/GT9271.pdf</u>



#### 6.5 Power-On Timing

For the power on timing diagram, see the first diagram on page 10 of the data sheet for touch panel IC GT9271. The data sheet for GT9271 can be found here: https://focusicds.com/content/GT9271.pdf

#### 6.6 Timing for Host Resetting GT9271

For the host resetting timing diagram, see the second diagram on page 10 of the data sheet for touch panel IC GT9271. The data sheet for GT91271 can be found here: <u>https://focuslcds.com/content/GT9271.pdf</u>

#### 6.7 Timing for Setting Slave Address to 0x28/0x29

For this setting slave address timing diagram, see the third diagram on page 10 of the data sheet for touch panel IC GT9271. The data sheet for GT9271 can be found here: <u>https://focuslcds.com/content/GT9271.pdf</u>

#### 6.8 Timing for Setting Slave Address to 0xBA/0xBB

For this setting slave address timing diagram and instructions, see pages 11-12 of the data sheet for touch panel IC GT9271. The data sheet for GT9271 can be found here: <u>https://focuslcds.com/content/GT9271.pdf</u>

## 7.0 Quality Inspection Standards

For TFT quality inspection standards, please see the following link: <u>https://focuslcds.com/tft-quality-inspection-standards/</u>



# 8.0 Cautions and Handling Precautions

## 8.1 Handling and Operating the Module

- 1. When the module is assembled, it should be attached to the system firmly. Do not warp or twist the module during assembly work.
- 2. Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
- 3. Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
- 4. Do not allow drops of water or chemicals to remain on the display surface. If you have the droplets for a long time, staining and discoloration may occur.
- 5. If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- 6. The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- 7. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
- 8. Protect the module from static; it may cause damage to the CMOSICs.
- 9. Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- 10. Do not disassemble the module.
- 11. Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- 12. Pins of I/F connector shall not be touched directly with bare hands.
- 13. Do not connect, disconnect the module in the "Power ON" condition.
- 14. Power supply should always be turned on/off by the item Power On Sequence & Power Off Sequence.

#### 8.2 Storage and Transportation.

- 1. Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%
- 2. Do not store the TFT-LCD module in direct sunlight.
- 3. The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
- 4. It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module. In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
- 5. This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.