



# FOCUS LCDs

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

## TFT Display Module

Part Number

*E101RF-HW400-C*

### Overview:

- 10.1-inch TFT (229.06x148.70mm)
- 1280x800 Pixels
- HDMI Interface
- Wide Temperature Range
- All Viewing Angles
- TN, Transmissive
- Capacitive Touch Panel
- 400 NITS
- TFT IC: EK79202D
- 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, backlight unit, and HDMI adapter board. The resolution of the 10.1" TFT-LCD contains 1280x800 pixels and can display up to 16.7M colors.

## Features

Input Voltage: 12V

TFT Interface: HDMI

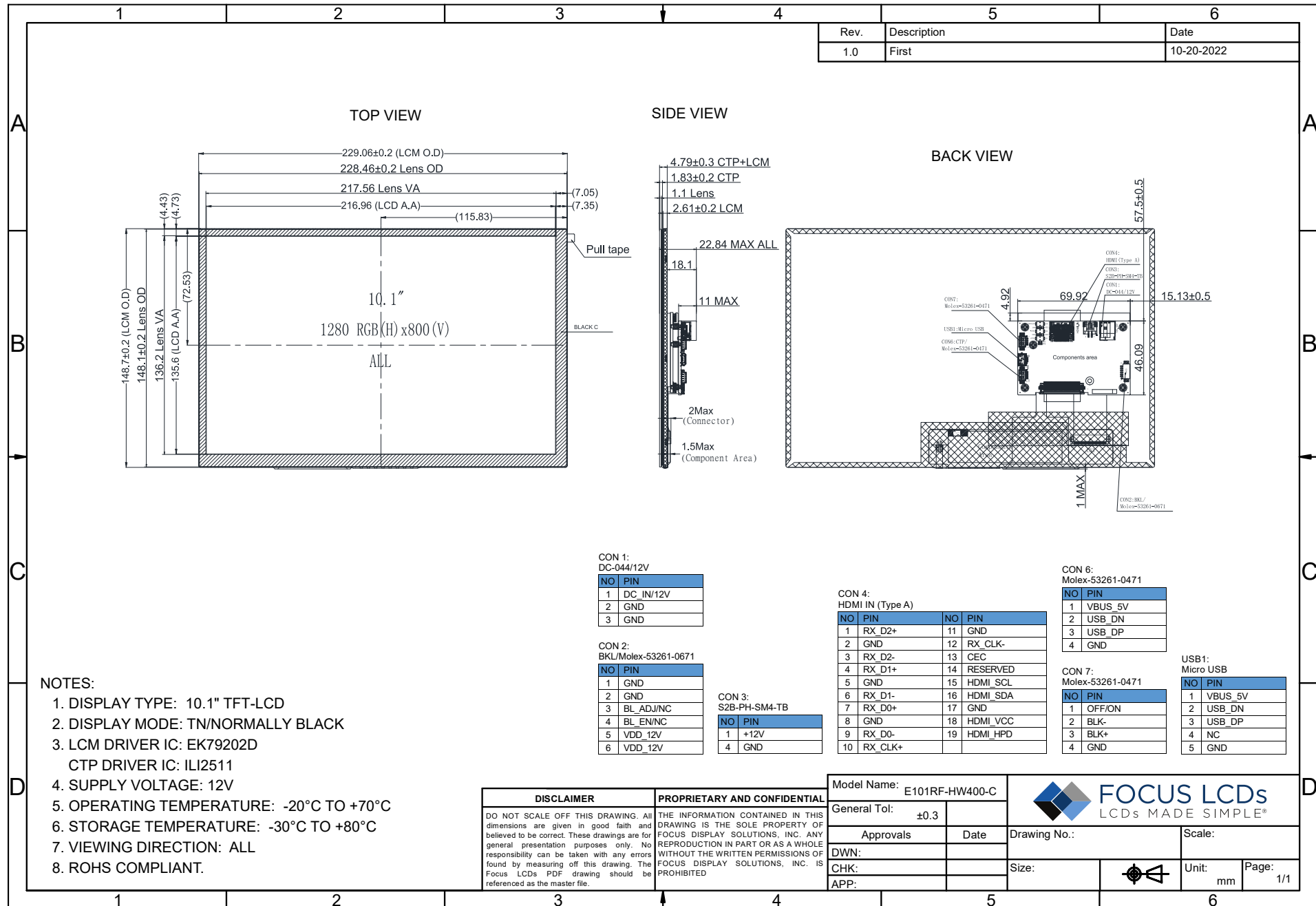
CTP Interface: Micro USB

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display Area (AA)	219.96(H) x 135.60(V) (10.1 inch)	mm	--
CTP View Area	217.56(H) x 136.20(V)	mm	--
Driver Element	TFT active matrix	--	--
Display Colors	16.7M	colors	--
Number of Pixels	1280(RGB)x800	dots	--
TFT Pixel Arrangement	RGB vertical stripe	--	--
Pixel Pitch	0.1692 (H) x 0.1692 (V)	mm	--
Viewing Angle	ALL	o'clock	--
TFT Controller IC	EK79202D	--	--
CTP Driver IC	ILI2511	--	--
Display Mode	Transmissive/Normally Black	--	--
Touch Points	Multiple point	--	--
Operating Temperature	-20 to +70	°C	--
Storage Temperature	-30 to +80	°C	--

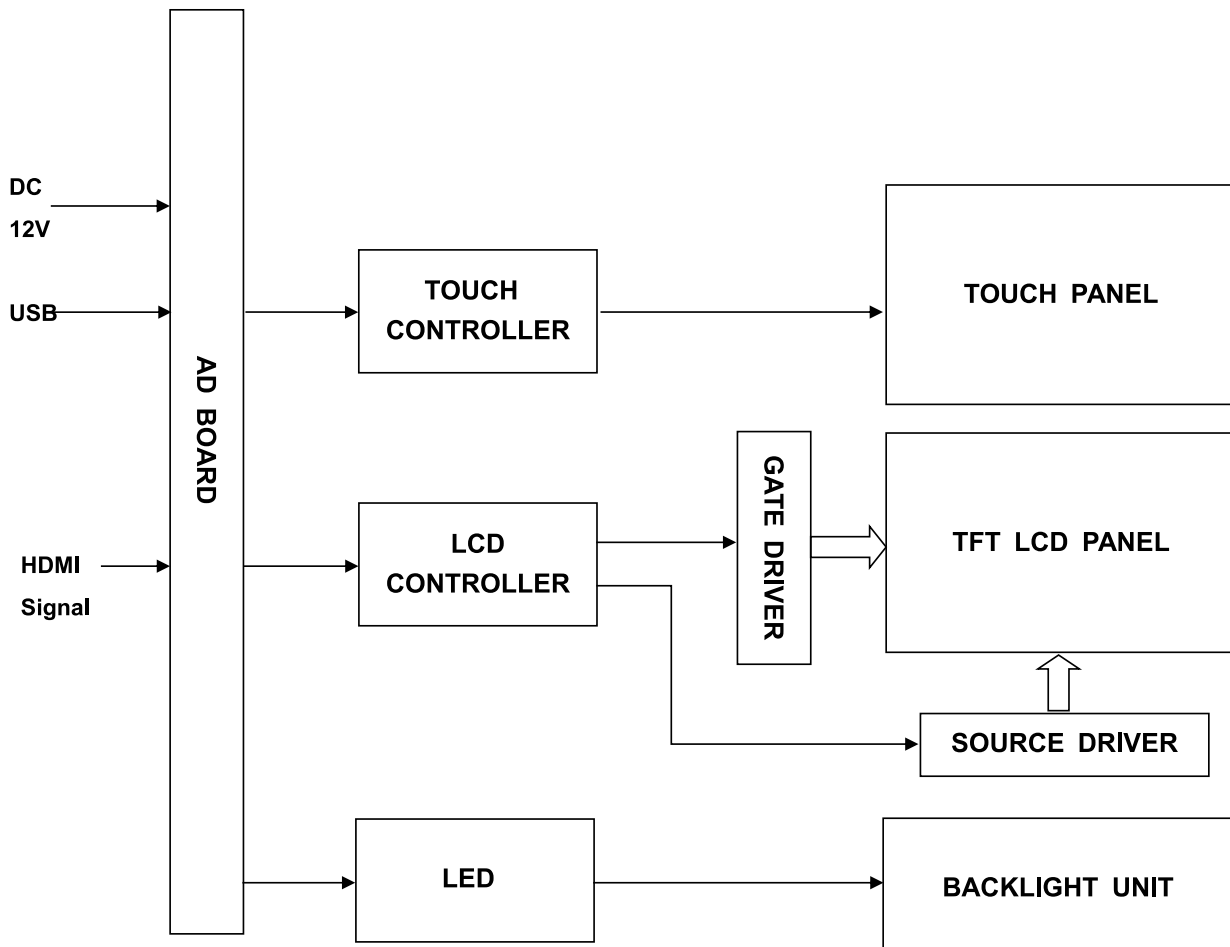
## Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	229.06	--	mm	--
	Vertical (V)	--	148.70	--	mm	--
	Depth (D)	--	--	22.84	mm	--
Weight		--	400	--	g	Approximate

## 1. Outline Dimensions



## 2. Block Diagram



### 3. Terminal Pin Assignment

#### 3.1 Power Input Pin Assignment

CON1 (DC-044 Socket)

NO.	Symbol	Description	I/O
1	DC_IN	Power supply (DC 12V).	P
2	GND	Ground.	P
3	GND	Ground.	P

Extension CON3 (JST:S2B-PH-SM4-TB)

NO.	Symbol	Description	I/O
1	+12V	Power supply (DC 12V).	P
2	GND	Ground.	P

#### 3.2 Touch Input Pin Assignment

USB1 (Micro USB)

NO.	Symbol	Description	I/O
1	VBUS_5V	Supply voltage (5V).	P
2	USB_DN	USB- signal.	I/O
3	USB_DP	USB+ signal.	I/O
4	NC	No connection.	--
5	GND	Ground.	P

Extension CON6 (Molex:53261-0471)

NO.	Symbol	Description	I/O
1	VBUS_5V	Supply voltage (5V).	P
2	USB_DN	USB- signal.	I/O
3	USB_DP	USB+ signal.	I/O
4	GND	Ground.	P

### 3.3 HDMI Pin Assignment

CON4: The type of HDMI connector is a type A.

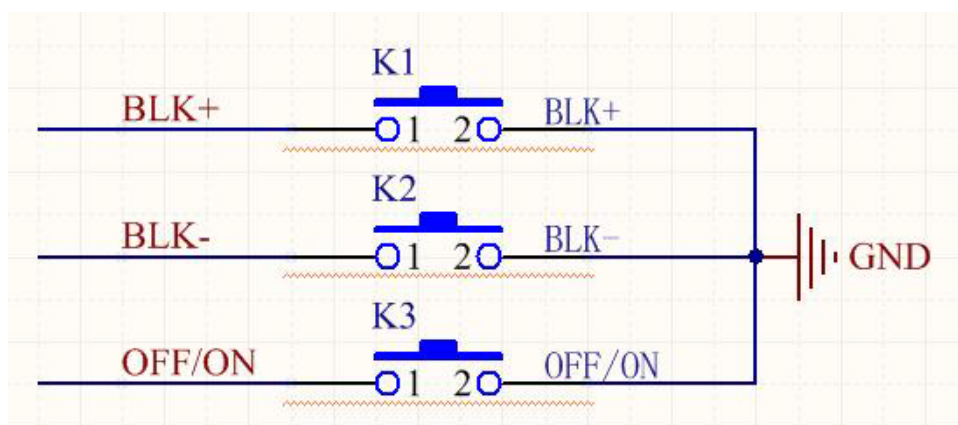
NO.	Symbol	Description	I/O
1	RX_D2+	HDMI receiver channel 2 positive analog input.	I/O
2	GND	Ground.	P
3	RX_D2-	HDMI receiver channel 2 negative analog input.	I/O
4	RX_D1+	HDMI receiver channel 1 positive analog input.	I/O
5	GND	Ground.	P
6	RX_D1-	HDMI receiver channel 1 negative analog input.	I/O
7	RX_D0+	HDMI receiver channel 0 positive analog input.	I/O
8	GND	Ground.	P
9	RX_D0-	HDMI receiver channel 0 negative analog input.	I/O
10	RX_CLK+	HDMI receiver clock positive analog input.	I
11	GND	Ground.	P
12	RX_CLK-	HDMI receiver clock negative analog input.	I
13	CEC	No connection.	--
14	RESERVED	No connection.	--
15	HDMI_SCL	HDMI receiver DDC data channel.	I
16	HDMI_SDA	HDMI receiver DDC clock channel.	I/O
17	GND	Ground.	P
18	HDMI_VCC	HDMI supply voltage (5.0V).	P
19	HDMI_HPD	HDMI receiver hot plug detect output.	O

*I: Input, O: Output, P: Power*

### 3.4 Backlight Key Output Pin Assignment

CON7 (Molex-53261-0471)

NO.	Symbol	Description	I/O
1	OFF/ON	Turn off or turn on backlight.	I
2	BLK-	Reduce brightness of backlight.	I
3	BLK+	Increase brightness of backlight. Note: The brightness is configured for maximum after power on.	I
4	GND	Ground.	P



Key Circuit Diagram

### 3.5 Extension Backlight Output Pin Assignment

CON2 (Molex-53261-0671)

NO.	Symbol	Description	I/O
1	GND	Ground.	P
2	GND	Ground.	P
3	BL_ADJ	PWM signal output.	O
4	BL_EN	Enable signal.	O
5	12V	Power supply.	P
6	12V	Power supply.	P

## 4. LCD Optical Characteristics

### 4.1 Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note	
Color Gamut		S(%)		40	45.6	--	%	(5)	
Contrast Ratio		CR	θ=0 Normal viewing angle	800	1000	--	%	(2)	
Response Time	Rising	TR		--	25	35	ms	(4)	
	Falling	TF							
Color Filter Chromaticity	White	WX		0.2670	0.3070	0.3470		(5)(6)	
		WY		0.2870	0.3270	0.3670			
	Red	RX		0.5480	0.5880	0.6280			
		RY		0.3170	0.3570	0.3970			
	Green	GX		0.3190	0.3590	0.3990			
		GY		0.5120	0.5520	0.5920			
	Blue	BX		0.1080	0.1480	0.1880			
		BY		0.0610	0.1010	0.1410			
	Viewing Angle	Hor.		θL	CR>10	70			80
θR				70		80	--		
Ver.		θT		70		80	--		
		θB	70	80		--			
Option View Direction		ALL						(1)	

#### Measuring Conditions:

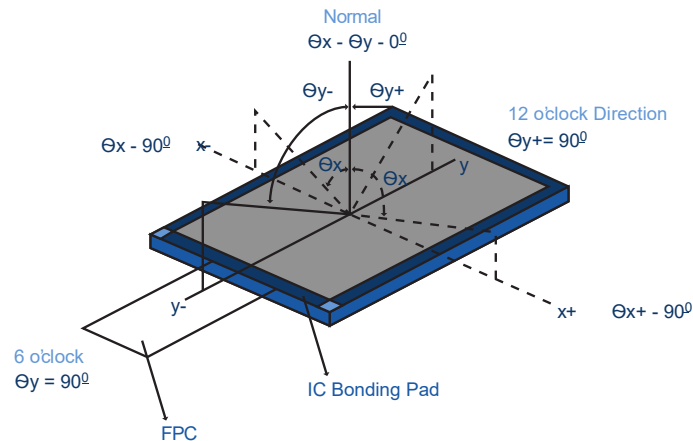
1. Dark Room
2. Ambient Temperature of  $25\pm 2^\circ\text{C}$
3. 15 Minute Warm up



## 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).

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

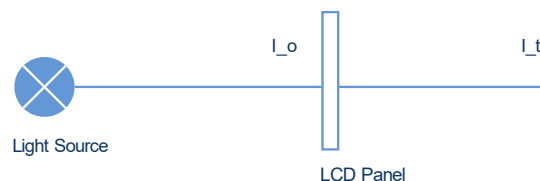
### (3) Definition of Transmittance (T%):

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

$$Tr = \frac{It}{Io} \times 100\%$$

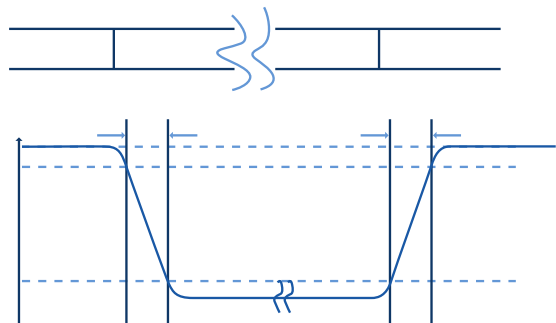
*Io = the brightness of the light source.*

*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.

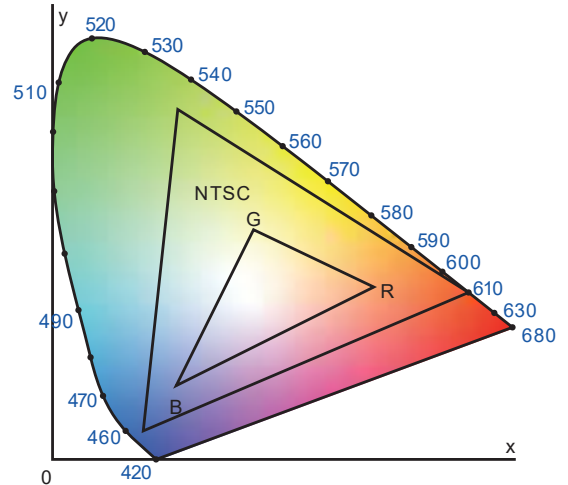
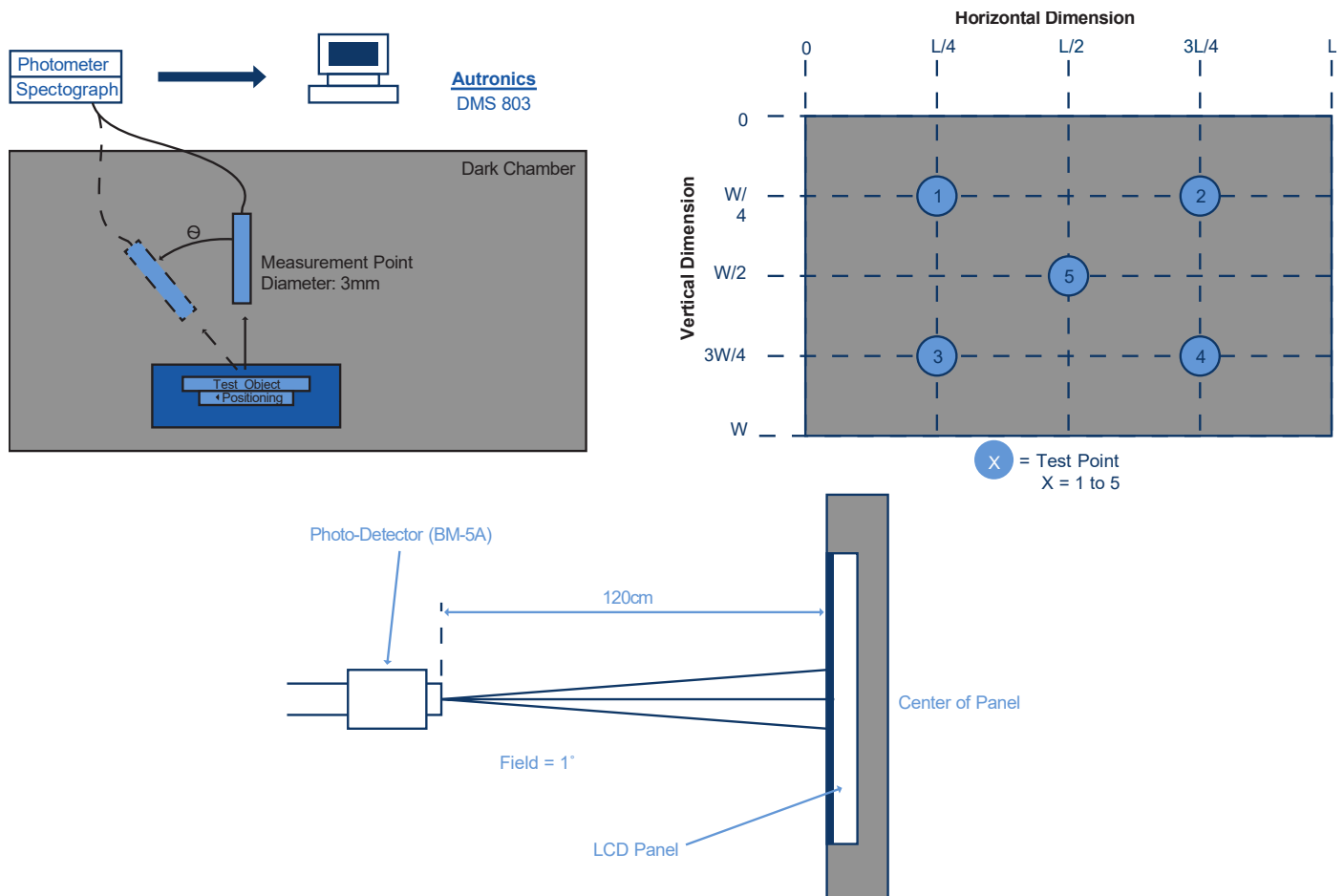


Fig. 1931 CIE Chromaticity Diagram

$$\text{Color Gamut: } S = \frac{\text{Area of RGB Triangle}}{\text{Area of NTSC Triangle}} \times 100\%$$

##### (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.



## 5. TFT Electrical Characteristics

### 5.1 Absolute Maximum rating (Ta=25°C, VSS=0V)

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	DC_IN	-0.5	16.0	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.*

### 5.2 DC Electrical Characteristics

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
Digital Supply Voltage	DC_IN	9	12	16	V	--
Normal Mode Current Consumption	IDC_IN	--	TBD	--	mA	DC_IN=12V
Level Input Voltage	VIH	0.8*VDD	--	VDD	V	--
	VIL	GND	--	0.2*VDD	V	--

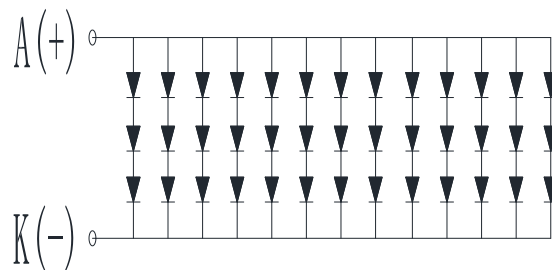
### 5.3 LED Backlight Characteristics

The backlight system is edge lighting type with 39 LED Chips

Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	$I_F$	--	260	--	mA	--
Forward Voltage	$V_F$	--	9.3	--	V	--
LCM Luminance	$L_v$	350	400	--	cd/m <sup>2</sup>	(3)
LED Lifetime	$H_r$	5000	--	--	hour	(1)(2)
Uniformity	Avg	70	80	--	%	(3)

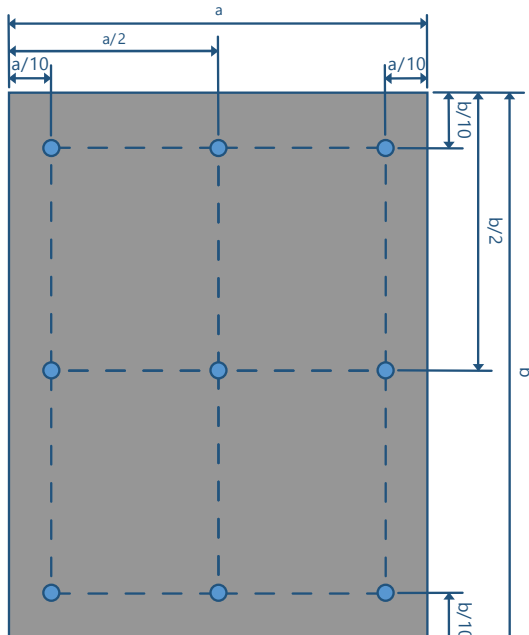
**Note 1:** LED lifetime ( $H_r$ ) can be defined as the time in which it continues to operate under the condition:  $T_a=25 \pm 3^\circ\text{C}$ , typical  $IL$  value indicated in the above table until the brightness becomes less than 50%.

**Note 2:** The "LED lifetime" is defined as the module brightness decrease to 50% original brightness at  $T_a=25^\circ\text{C}$  and  $I_F = 260\text{mA}$ . The LED lifetime could be decreased if operating  $I_F$  is larger than 260mA. The constant current driving method is suggested.



**BL CIRCUIT DIAGRAM**

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



$$\text{Luminance} = \frac{\text{Total Luminance of 9 Points}}{9}$$

$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 Points (1-9)}}{\text{Maximum Luminance in 9 Points (1-9)}}$$

## 6. CTP Electrical Characteristics

### 6.1 Absolute Maximum Rating

Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	VDD	-0.3	3.6	V	
Operating Temperature	TOP	-40	+85	°C	
Storage Temperature	TST	-40	+150	°C	

### 6.2 DC Electrical Characteristics

Ambient temperature: 25°C, VDD3A=VDD3D=3.3V

Item	Min	Typ.	Max	Unit	Note
Normal Mode Operating Current	--	100	--	mA	Active Mode @ 21.5"
Digital Input Low Voltage/VIL	0	--	0.3*VDDIO	V	
Digital Input High Voltage/VIH	0.6*VDDIO	--	VDDIO+0.5	V	
Digital Output Low Voltage/VOL	--	--	0.3*VDDIO	V	VDDIO =3.3V, IOL=10mA
Digital Output High Voltage/VOH	0.7*VDDIO	--	--	V	VDDIO =3.3V, IOH=8mA

### 6.3 I2C Timing

For I2C timing diagrams and tables, see page 13 of the data sheet for touch panel IC ILI2511. The data sheet for ILI2511 can be found here: <https://focuslcds.com/wp-content/uploads/Drivers/ILI2511.pdf>

### 6.4 Power-On Timing

For the power on timing diagram, see the first diagram on page 14 of the data sheet for touch panel IC ILI2511. The data sheet for ILI2511 can be found here: <https://focuslcds.com/wp-content/uploads/Drivers/ILI2511.pdf>

### 6.5 Typical Application Circuit

For the typical application circuit, see the diagram on pages 18-19 of the data sheet for touch panel IC ILI2511. The data sheet for ILI2511 can be found here:

<https://focuslcds.com/wp-content/uploads/Drivers/ILI2511.pdf>

## 7. Quality Inspection Standards

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

## **8. 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 CMOS ICs.
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.