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

TFT Display Module

Part Number

E101RA-HS500-C

Overview:

- 10.1-inch TFT (?59x?44.6mm)
- I 5a LInterface
- ?00x1920 pixels
- All Viewing Angle
- White LED back-light

- Transmissive / Normally Black
- / Li xln[N[t Touch Panel
- 300 NITS
- Controller: NT51021
- 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 an HDMI board backlight unit. The resolution of a 10.1" TFT LCD contains 1200(RGB)x1920 pixels and can display up to 16M colors.

TFT Features

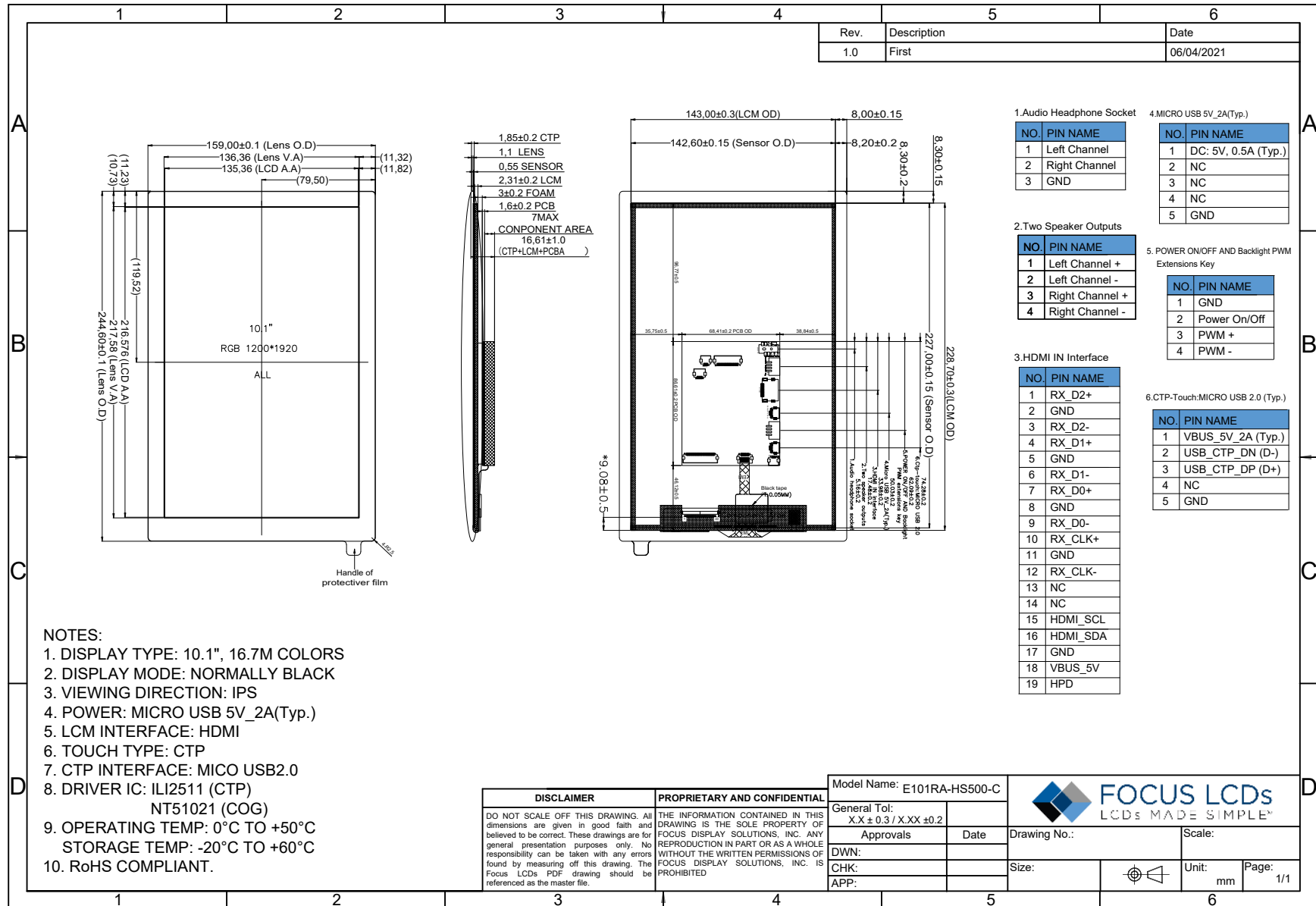Low Input Voltage: 3.3V

Display Colors: 16M

TFT Interface: HDMI

General Information Items	Specification Main Panel	Unit	Note
TFT Display area (AA)	135.36(H) x 216.576(V) (10.1 inch)	mm	-
Driver Element	TFT active matrix	-	-
Display Colors	16M	colors	-
Number of pixels	1200(RGB)x1920	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel Pitch	0.1692(H)x0.1692(V)	mm	-
Viewing angle	All	o'clock	-
Display mode	Transmissive, Normally Black	-	-
TFT Controller	NT51021	-	-
Operating temperature	-20 - +70	℃	-
Storage temperature	-20 - +70	℃	-

Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module Size	Horizontal (H)		159		mm	-
	Vertical (V)		244.6		mm	-
	Depth (D)		16.61		mm	-
	Weight		379		g	

1. Outline Dimensions

Rev.	Description	Date
1.0	First	06/04/2021

Dimensions (left view):
- 159,00±0.1 (Lens O.D)
- 136,36 (Lens V.A)
- 135,36 (LCD A.A)
- (11,23)
- (10,73)
- (11,32)
- (11,82)
- (79,50)
- (119,52)
- (216,576 (LCD A.A))
- (217,576 (Lens V.A))
- 244,60±0.1 (Lens O.D.)

10.1"
RGB 1200*1920
ALL

Handle of protectiver film

Side view dimensions:
- 1,85±0.2 CTP
- 1,1 LENS
- 0,55 SENSOR
- 2,31±0.2 LCM
- 3±0.2 FOAM
- 1,6±0.2 PCB
- 7MAX CONPONENT AREA
- 16,61±1.0 (CTP+LCM+PCBA)

Back view dimensions:
- 143,00±0.3(LCM OD)
- 142,60±0.15 (Sensor O.D)
- 8,00±0.15
- 8,20±0.2
- 8,30±0.2
- 8,30±0.15
- 96,77±0.5
- 35,75±0.5
- 68,41±0.2 PCB OD
- 38,84±0.5
- 88,61±0.2 PCB OD
- 46,12±0.5
- 74,28±0.2
- 227,00±0.15 (Sensor O.D)
- 228,70±0.3(LCM OD)
- *9,08±0.5

Black tape (±0.05MM)

NOTES:
1. DISPLAY TYPE: 10.1", 16.7M COLORS
2. DISPLAY MODE: NORMALLY BLACK
3. VIEWING DIRECTION: IPS
4. POWER: MICRO USB 5V_2A(Typ.)
5. LCM INTERFACE: HDMI
6. TOUCH TYPE: CTP
7. CTP INTERFACE: MICO USB2.0
8. DRIVER IC: ILI2511 (CTP)
        NT51021 (COG)
9. OPERATING TEMP: 0°C TO +50°C
    STORAGE TEMP: -20°C TO +60°C
10. RoHS COMPLIANT.

1. Audio Headphone Socket

NO.	PIN NAME
1	Left Channel
2	Right Channel
3	GND

2. Two Speaker Outputs

NO.	PIN NAME
1	Left Channel +
2	Left Channel -
3	Right Channel +
4	Right Channel -

3. HDMI IN Interface

NO.	PIN NAME
1	RX_D2+
2	GND
3	RX_D2-
4	RX_D1+
5	GND
6	RX_D1-
7	RX_D0+
8	GND
9	RX_D0-
10	RX_CLK+
11	GND
12	RX_CLK-
13	NC
14	NC
15	HDMI_SCL
16	HDMI_SDA
17	GND
18	VBUS_5V
19	HPD

4. MICRO USB 5V_2A(Typ.)

NO.	PIN NAME
1	DC: 5V, 0.5A (Typ.)
2	NC
3	NC
4	NC
5	GND

5. POWER ON/OFF AND Backlight PWM Extensions Key

NO.	PIN NAME
1	GND
2	Power On/Off
3	PWM +
4	PWM -

6. CTP-Touch:MICRO USB 2.0 (Typ.)

NO.	PIN NAME
1	VBUS_5V_2A (Typ.)
2	USB_CTP_DN (D-)
3	USB_CTP_DP (D+)
4	NC
5	GND

Model Name: E101RA-HS500-C

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General Tol: X.X ± 0.3 / X.XX ±0.2

Approvals	Date	Drawing No.:	Scale:
DWN:			
CHK:		Size:	Unit: mm / Page: 1/1
APP:			

2. Input Terminal Pin Assignment

2.1 Micro USB Pin Definition & Signal Connector

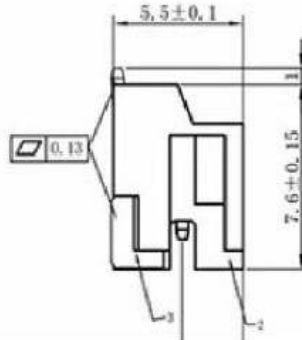| NO.	Symbol	Description	I/O
1	DC:5V, 2A (Typ.)	Supply voltage (5V, 2A Typ.)	P
2	NC	No connection	--
3	NC	No connection	--
4	NC	No connection	--
5	GND	Ground	P

I: Input, O: Output, P: Power

Micro-USB Connector Dimensions:

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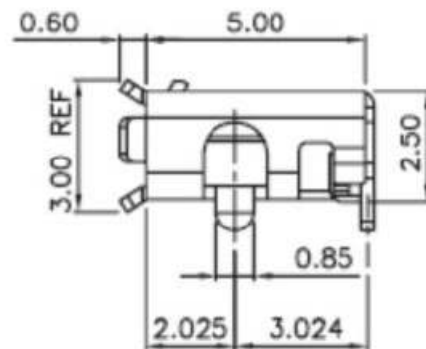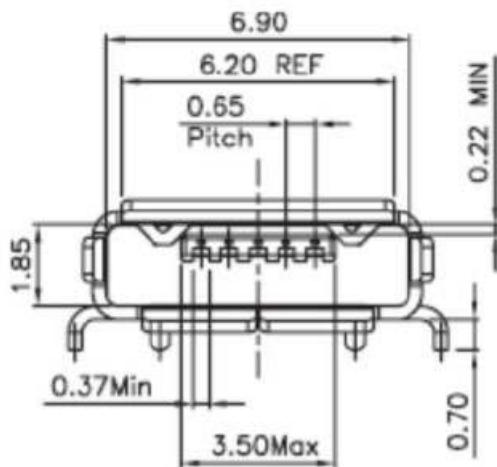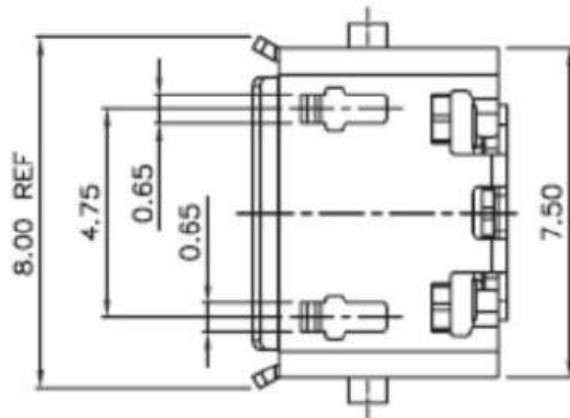
2.2 Power ON/OFF and Backlight PWM Extension Key Pin Definition & Signal Connector

NO.	Symbol	Description	I/O
1	GND	Ground	P
2	Power ON/OFF	ON/OFF key	P
3	PWM+	The backlight brightness of each button is increased by one level until the maximum brightness reaches level 9	I
4	PWM-	The backlight brightness of each button is reduced by one level until the lowest brightness reaches level 9	I
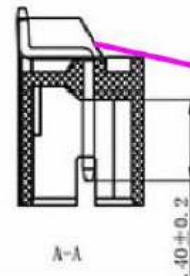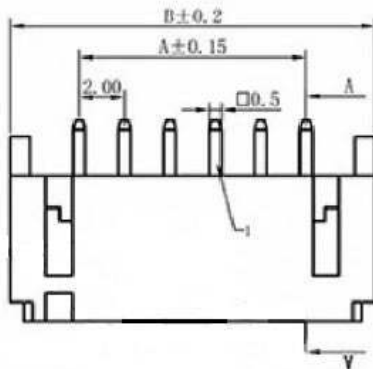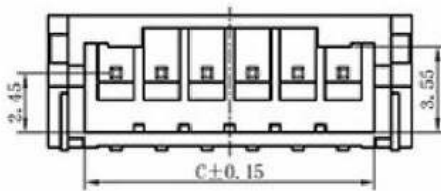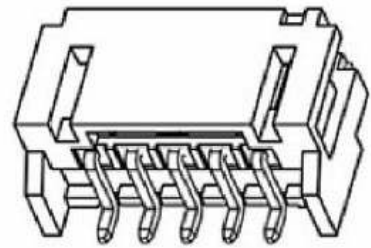
2.3   Type-C PIN Definition & Signal Connector

NO.	Symbol	Description
A1	GND	Ground
A2	TX1+	Superspeed transmitter differential pair
A3	TX1-	
A4	VBUS	Power
A5	CC2	Configuration
A6	D+	USB 2.0 differential pair
A7	D-	
A8	SBU1	Reserved
A9	VBUS	Power
A10	RX2-	Superspeed receiver differential pair
A11	RX2+	
A12	GND	Ground
B1	GND	Ground
B2	TX2+	Superspeed transmitter differential pair
B3	TX2-	
B4	VBUS	Power
B5	CC2	Configuration
B6	D+	USB 2.0 differential pair
B7	D-	
B8	SBU2	Reserved
B9	VBUS	Power
B10	RX1-	Superspeed receiver differential pair
B11	RX1+	
B12	GND	Ground
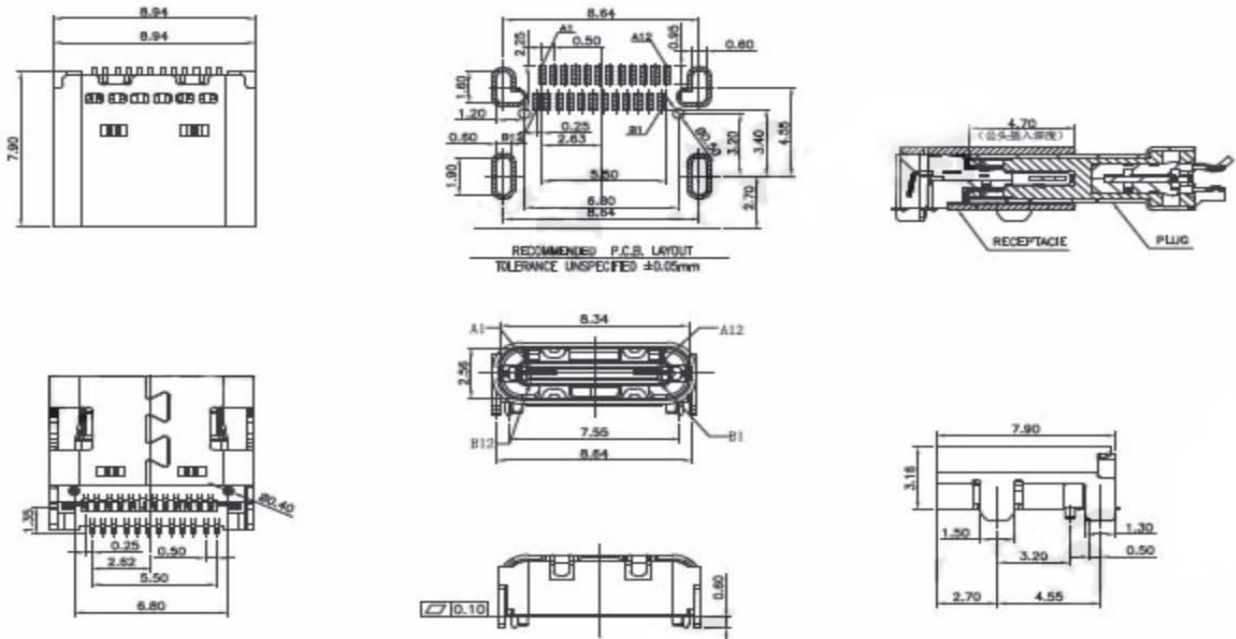
2.4   Audio Headphone Socket Pin Definition & Input Signal Connector

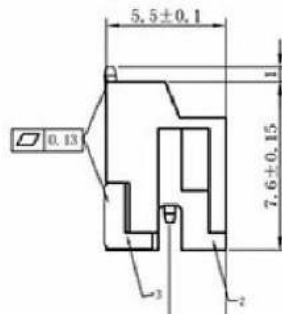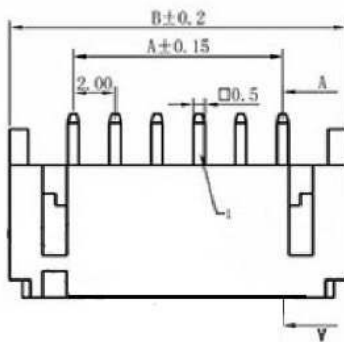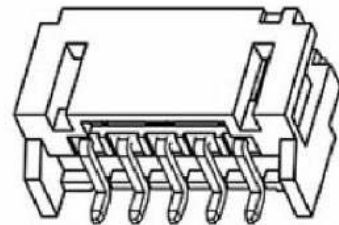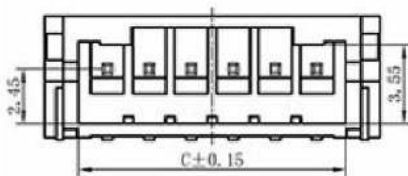| NO.	Symbol	Description	I/O
1	Left channel	Audio output left channel	
2	Right channel	Audio output right channel	
3	GND	Ground	
4	GND	Ground	
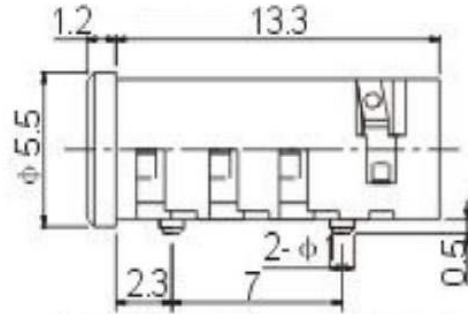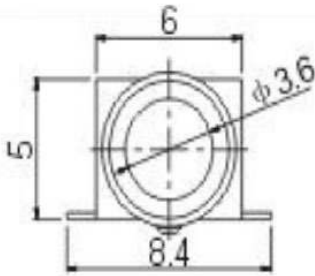
P.C.B Layout(copper- sided view)

2.5   Two Speaker Outputs Pin Definition & Input Signal Connector

NO.	Symbol	Description	I/O
1	Left channel+	Audio output left channel	
2	Left channel-		
3	Right channel-	Audio output right channel	
4	Right channel+		

Note: SMT PH2.0mm spacing connector 4p
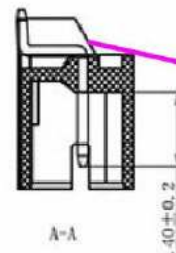
2.6 CTP: MICRO USB PIN Definition & Signal Connector

NO.	Symbol	Description	I/O
1	DC:5V, 2A(Typ.)	Supply Voltage (5.0V, 2A Typ.)	P
2	USB_CTP_DN(D-)	USB Data Negative Analog Input	I/O
3	USB_CTP_DP(D+)	USB Data Positive Analog Input	I/O
4	NC	No Connection	I
5	GND	Ground	P

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3. LCD Optical Characteristics

3.1 Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit
Uniformity		S(%)		--	80	--	%
Contrast Ratio		CR		600	800	--	%
Response Time	Rising	TR + TF		--	25	50	ms
	Falling						
Color Filter Chromaticity	White	W_X	θ=0 Normal viewing angle	0.246	0.286	0.326	
		W_Y		0.281	0.321	0.361	
	Red	R_X		0.579	0.619	0.659	
		R_Y		0.289	0.329	0.369	
	Green	G_X		0.261	0.301	0.341	
		G_Y		0.560	0.600	0.640	
	Blue	B_X		0.110	0.150	0.190	
		B_Y		0.019	0.059	0.099	
Viewing Angle	Hor.	ΘL	CR≥10	--	85	--	degree
		ΘR		--	85	--	
	Ver.	ΘT		--	85	--	
		ΘB		--	85	--	
Option View Direction		ALL					

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.
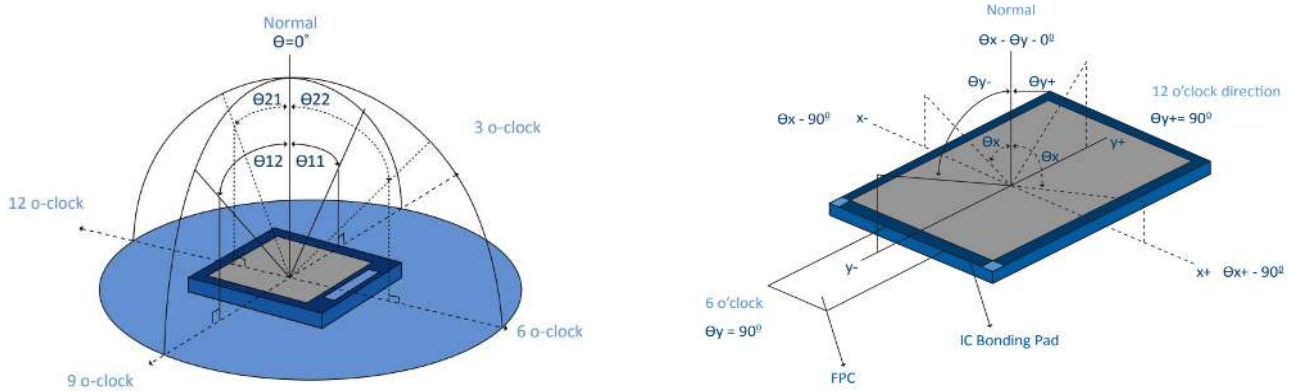

(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

(3) Definition of transmittance (T%): The transmittance of the panel including the polarizers is measured with electrical driving. The equation for transmittance Tr is:

$$Tr = \frac{It}{Io} x\ 100\%$$
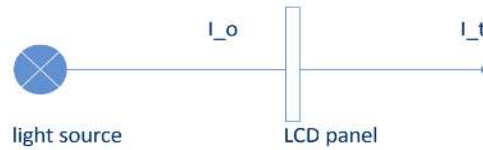
Io = the brightness of the light source.
It = the brightness after panel transmission

(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.
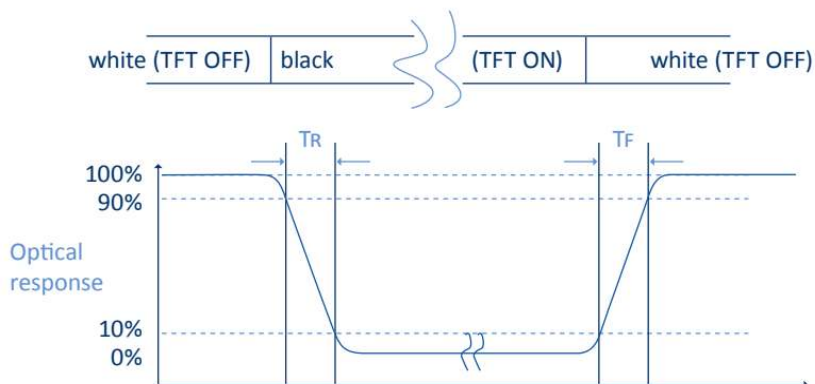
(5) Definition of Color Gamut:

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.
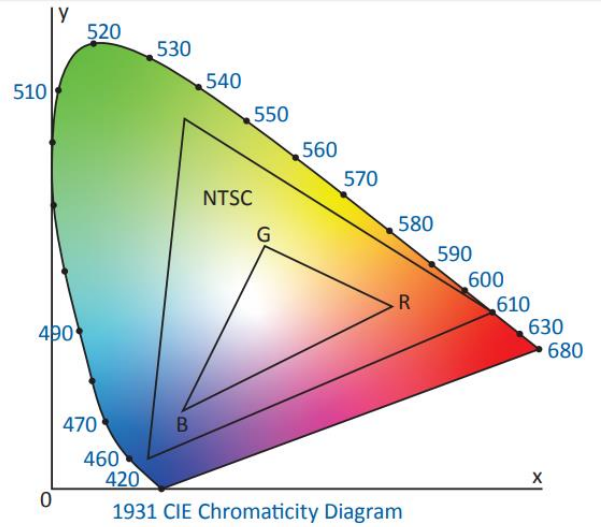

Fig. 1931 CIE chromacity diagram

Color gamut: $S = \dfrac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$

(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.
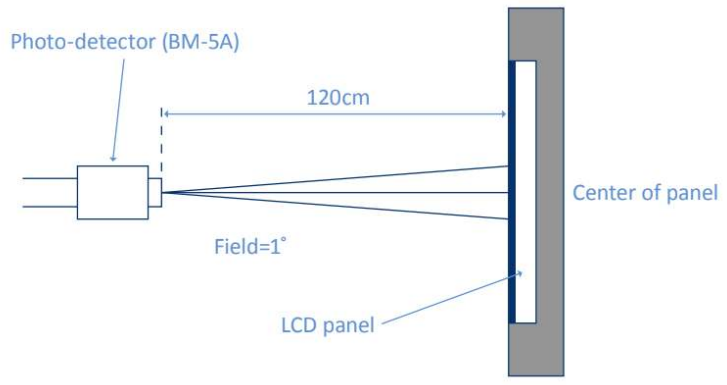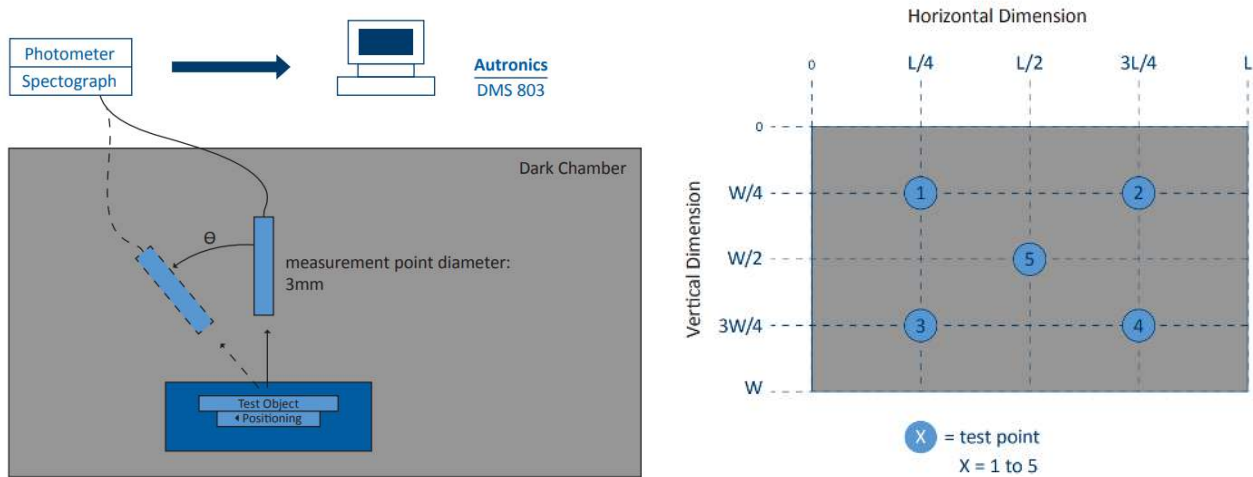
4. TFT Electrical Characteristics

4.1 Absolute Maximum Rating (Ta=25 ℃, VSS=0V)

Characteristics	Symbol	Min	Max	Unit
Power Supply Voltage (Analog)	VDD-GND	-0.3	6.0	V
	VDDp-GND	-0.3	6.0	V
Input Signal Voltage (LED)	V(LED)	-0.3	5.5	V
Input Signal Voltage (PWR)	V(PWR)	-0.3	5.5	V
Operating Temperature	TOP	0	+50	℃
Storage Temperature	TST	-20	+60	℃

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	Typ.	Max	Unit
Digital Supply Voltage	VCI	2.5	3.3	6.0	V
Digital Interface Supply Voltage	VDDIO	1.65	1.8	3.6	V
Normal Mode Current	IDD	--	110	220	mA
Level Input Voltage	VIH	0.7*VDDIO	--	VDDIO	V
	VIL	GND	--	0.3*VDDIO	V
Level Output Voltage	VOH	0.8*VDDIO	--	VDDIO	V
	VOL	GND	--	0.2*VDDIO	V

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4.3   LED Backlight Characteristics

The backlight system is edge lighting type with 30 chips LED

Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	I_F	60	80	--	mA	
Forward Voltage	V_F	--	24	--	V	
LCM Luminance	LV	250	300	--	cd/m2	Note 3
LED lifetime	Hr	--	50000	--	hour	Note1 & 2
Uniformity	Avg	80	--	--	%	Note 3

Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 ℃, 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 Ta=25℃ and IL = 80mA. The LED lifetime could be decreased if operating IL is larger than 80 mA. The constant current driving method is suggested.

B/L Circuit
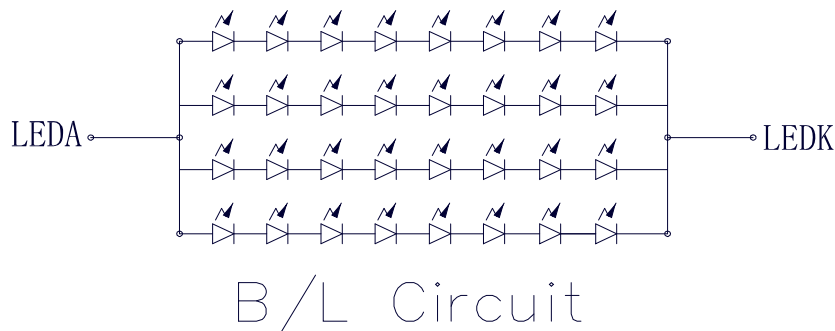
Note 3: Luminance Uniformity of these 9 points is defined as below:
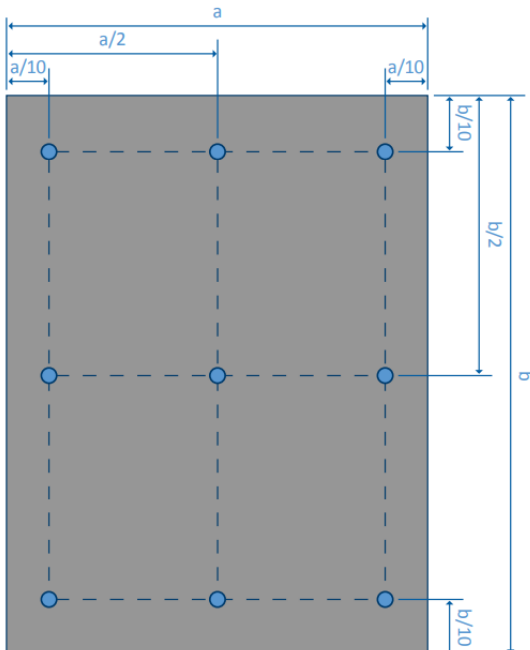
$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points(1-9)}}{\text{maximum luminance in 9 points(1-9)}}$$

5. CTP Electrical Characteristics

5.1   Absolute Maximum Rating

Characteristics	Symbol	Min	Max	Unit
I2C Power Supply Voltage	VDD	-0.3	3.6	V
USB Power Supply Voltage	VBUS	-0.3	6.0	V
Operating Temperature	TOP	-30	+80	℃
Storage Temperature	TST	-30	+80	℃

5.2   DC Electrical Characteristics

Characteristics	Symbol	Min	Typ.	Max	Unit	Condition
Input Low	VIL	--	--	0.8	V	
Input High (driven)	VIH	2.0	--	--	V	
Differential Input Sensitivity	VDI	0.2	--	--	V	(D+) – (D-)
Differential Common-Mode Range	VCM	0.8	--	2.5	V	Includes VDI range
Single-ended receiver threshold	VSE	0.8	--	2.0	V	
Receiver hysteresis	VRH	--	200	--	mV	
Output low (driven)	VOL	0	--	0.3	V	
Output high (driven)	VOH	2.8	--	3.6	V	
Output signal cross voltage	VCRS	1.3	--	2.0	V	
Pull-up resistor	RPU	1.425	--	1.575	kΩ	
Pull-down resistor	RPD	14.25	--	15.75	kΩ	
Termination Voltage for upstream port pull up (RPU)	VTRM	3.0	--	3.6	V	

6. Cautions and Handling Precautions

6.1 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.

6.2 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 ℃ 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.