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

TFT Display Module

Part Number

E101RA-I-MS300-C1

Overview:

- 10.1-inch TFT (174.37x255.12mm)
- 1200x1920 Pixels
- 4-Lane MIPI Interface
- Special Temperature Range
- All View

- Transmissive, IPS
- Capacitive Touch Panel
- 300 NITS
- TFT IC: 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 backlight unit. The resolution of the 10.1" TFT-LCD contains 1200x1920 pixels and can display up to 16M colors.

Features
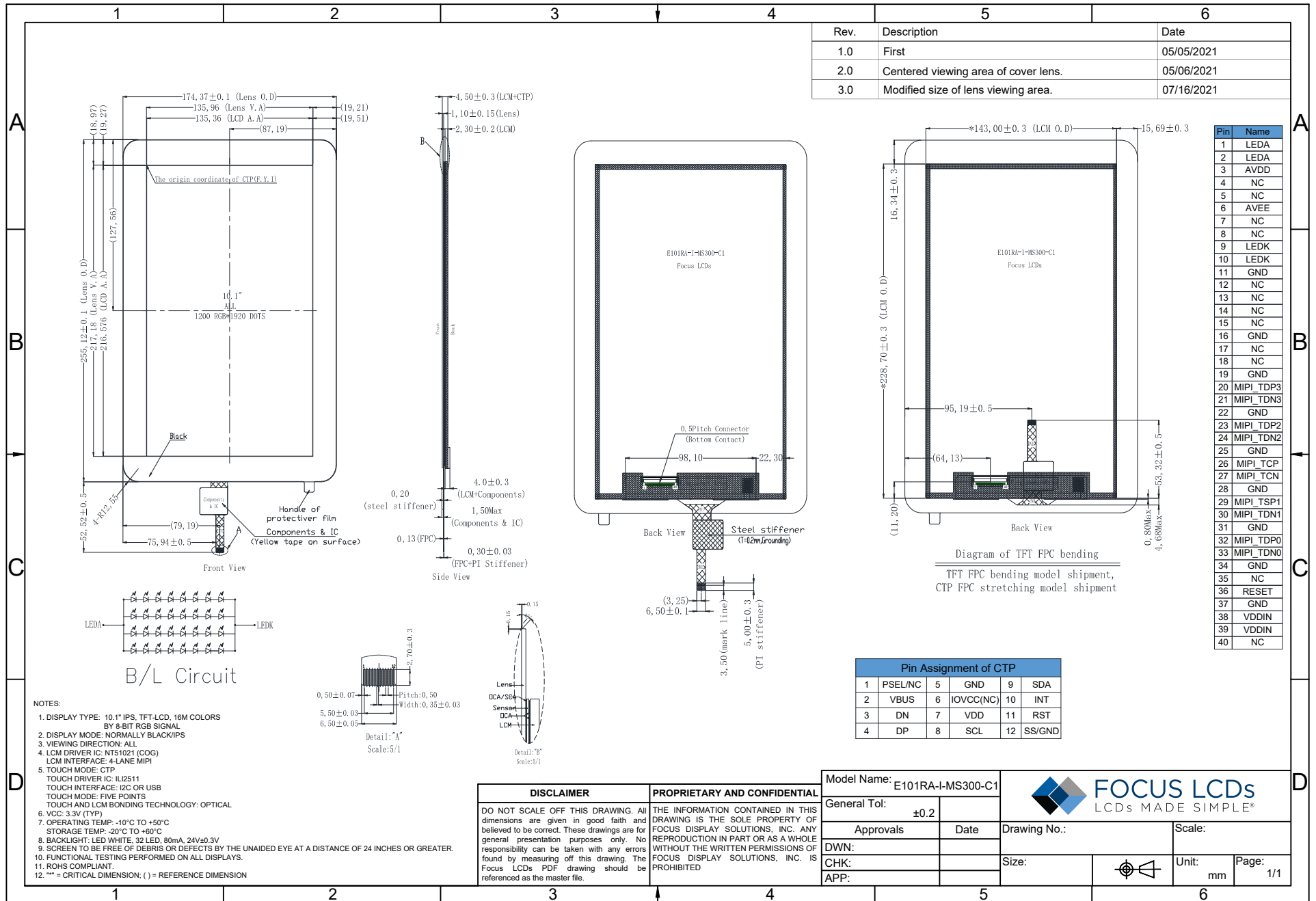
Input Voltage: 3.3V
TFT Interface: 4-Lane MIPI
CTP Interface: I2C or USB

General Information	Specification Main Panel	Unit	Note
TFT Display Area (AA)	135.36(H) x 216.58(V) (10.1 inch)	mm	--
CTP View Area	135.96(H) x 217.18(V)	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	0.1128 (H) x 0.1128 (V)	mm	--
Viewing Angle	ALL	o'clock	--
TFT Controller IC	NT51021	--	--
CTP Driver IC	ILI2511	--	--
Display Mode	Transmissive/Normally Black	--	--
Touch Mode	True Multi-Touch	--	--
CTP Bonding	Optical Bonding	--	--
Operating Temperature	-10 to +50	°C	--
Storage Temperature	-20 to +60	°C	--

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Height (H)	--	174.37	--	mm	--
	Vertical (V)	--	255.12	--	mm	--
	Depth (D)	--	4.50	--	mm	--
Weight		--	104	--	g	--

1. Outline Dimensions

Rev.	Description	Date
1.0	First	05/05/2021
2.0	Centered viewing area of cover lens.	05/06/2021
3.0	Modified size of lens viewing area.	07/16/2021

Front View

- 174,37±0.1 (Lens O.D)
- 135,96 (Lens V.A)
- 135,36 (LCD A.A)
- (18,97)
- (19,27)
- (19,21)
- (19,51)
- (87,19)
- The origin coordinate of CTP(F.Y.I)
- (127,56)
- 255,12±0.1 (Lens O.D)
- 217,18 (Lens V.A)
- 216,576 (LCD A.A)
- 10.1" ALL
- 1200 RGB*1920 DOTS
- Black
- 52,52±0.5
- 4-R12,55
- Components & IC
- (79,19)
- 75,94±0.5
- Handle of protectiver film
- Components & IC (Yellow tape on surface)

B/L Circuit

LEDA — LEDK

Side View

- 4,50±0.3 (LCM+CTP)
- 1,10±0.15 (Lens)
- 2,30±0.2 (LCM)
- 0,20 (steel stiffener)
- 4.0±0.3 (LCM+Components)
- 1,50Max (Components & IC)
- 0,13 (FPC)
- 0,30±0.03 (FPC+PI Stiffener)

Detail:"A" Scale:5/1
- 0,50±0.07
- 5,50±0.03
- 6,50±0.05
- 2,70±0.3
- Pitch:0,50
- Width:0,35±0.03

Detail:"B" Scale:5/1
- 0,15
- Lens
- DCA/SEN
- Sensor
- DCA
- LCM

Back View
E101RA-I-MS300-C1
Focus LCDs

- 0.5Pitch Connector (Bottom Contact)
- 98,10
- 22,30
- Steel stiffener (T=0.2mm,Grounding)
- (3,25)
- 6,50±0.1
- 3,50 (mark line)
- 5,00±0.3 (PI stiffener)

Back View
E101RA-I-MS300-C1
Focus LCDs

- *143,00±0.3 (LCM O.D)
- 15,69±0.3
- 16,34±0.3
- *228,70±0.3 (LCM O.D)
- 95,19±0.5
- (64,13)
- (11,20)
- 53,32±0.5
- 0,80Max
- 4,68Max

Diagram of TFT FPC bending
TFT FPC bending model shipment,
CTP FPC stretching model shipment

Pin	Name
1	LEDA
2	LEDA
3	AVDD
4	NC
5	NC
6	AVEE
7	NC
8	NC
9	LEDK
10	LEDK
11	GND
12	NC
13	NC
14	NC
15	NC
16	GND
17	NC
18	NC
19	GND
20	MIPI_TDP3
21	MIPI_TDN3
22	GND
23	MIPI_TDP2
24	MIPI_TDN2
25	GND
26	MIPI_TCP
27	MIPI_TCN
28	GND
29	MIPI_TSP1
30	MIPI_TDN1
31	GND
32	MIPI_TDP0
33	MIPI_TDN0
34	GND
35	NC
36	RESET
37	GND
38	VDDIN
39	VDDIN
40	NC

Pin Assignment of CTP

1	PSEL/NC	5	GND	9	SDA
2	VBUS	6	IOVCC(NC)	10	INT
3	DN	7	VDD	11	RST
4	DP	8	SCL	12	SS/GND

NOTES:
1. DISPLAY TYPE: 10.1" IPS, TFT-LCD, 16M COLORS BY 8-BIT RGB SIGNAL
2. DISPLAY MODE: NORMALLY BLACK/IPS
3. VIEWING DIRECTION: ALL
4. LCM DRIVER IC: NT51021 (COG) LCM INTERFACE: 4-LANE MIPI
5. TOUCH MODE: CTP
   TOUCH DRIVER IC: ILI2511
   TOUCH INTERFACE: I2C OR USB
   TOUCH MODE: FIVE POINTS
   TOUCH AND LCM BONDING TECHNOLOGY: OPTICAL
6. VCC: 3.3V (TYP)
7. OPERATING TEMP: -10°C TO +50°C
   STORAGE TEMP: -20°C TO +60°C
8. BACKLIGHT: LED WHITE, 32 LED, 80mA, 24V±0.3V
9. SCREEN TO BE FREE OF DEBRIS OR DEFECTS BY THE UNAIDED EYE AT A DISTANCE OF 24 INCHES OR GREATER.
10. FUNCTIONAL TESTING PERFORMED ON ALL DISPLAYS.
11. ROHS COMPLIANT.
12. "*" = CRITICAL DIMENSION; ( ) = REFERENCE DIMENSION

Model Name: E101RA-I-MS300-C1

General Tol: ±0.2

Approvals	Date
DWN:	
CHK:	
APP:	

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Drawing No.:

Scale:

Size:

Unit: mm

Page: 1/1

2. Input Terminal Pin Assignment

2.1 TFT Pin Assignment

NO.	Symbol	Description	I/O
1	LEDA	LED Anode	P
2	LEDA	LED Anode	P
3	AVDD/NC	OPEN	--
4	NC	OPEN	--
5	NC	OPEN	--
6	AVEE/NC	OPEN	--
7	NC	OPEN	--
8	NC	OPEN	--
9	LEDK	LED Cathode	P
10	LEDK	LED Cathode	P
11	GND	Ground	P
12	NC	OPEN	--
13	NC	OPEN	--
14	NC	OPEN	--
15	NC	OPEN	--
16	GND	Ground	P
17	NC	OPEN	--
18	NC		
19	GND	Ground	P
20	MIPI_TDP3	MIPI data input.	I/O
21	MIPI_TDN3		
22	GND	Ground	P
23	MIPI_TDP2	MIPI Data Input.	I/O
24	MIPI_TDN2		
25	GND	Ground	P
26	MIPI_TCP	MIPI Clock Input.	I/O
27	MIPI_TCN		
28	GND	Ground	P
29	MIPI_TDP1	MIPI Data Input.	I/O
30	MIPI_TDN1		
31	GND	Ground	P
32	MIPI_TDP0	MIPI Data Input	I/O
33	MIPI_TDN0		
34	GND	Ground	P
35	NC	OPEN	--
36	RESET	Global Reset Signal	I
37	GND	Ground	P
38	VDDIN	Power Supply 3.3V	P
39	VDDIN	Power Supply 3.3V	P
40	NC	OPEN	--

2.2   CTP Pin Assignment

NO.	Symbol	Description	I/O
1	PSEL/NC	OPEN	--
2	VBUS	USB 5V Input Power Supply Voltage	P
3	DN	USB D-	I/O
4	DP	USB D+	I/O
5	GND	Ground	P
6	IOVCC/NC	OPEN	--
7	VDD	Supply Voltage	P
8	SCL	I2C Clock Input	I
9	SDA	I2C Data Input and Output	I
10	INT	External Interrupt to the Host	I
11	RST	External Reset, Low is Active	I
12	SS/GND	Ground	P

3. LCD Optical Characteristics

3.1 Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR	θ=0	600	800	--	%	(2)
Response Time	Rising	T_R+T_F	Normal Viewing Angle	--	25	50	ms	
	Falling							
Color Filter Chromaticity	White	W_X		-0.04	0.286	+0.04		(5)(6)
		W_Y			0.321			
	Red	R_X			0.619			
		R_Y			0.329			
	Green	G_X			0.301			
		G_Y			0.600			
	Blue	B_X			0.150			
		B_Y			0.059			
Viewing Angle	Hor.	ΘL	CR≥10	--	85	--	degree	(1)(6)
		ΘR		--	85	--		
	Ver.	ΘT		--	85	--		
		ΘB		--	85	--		
Option View Direction		ALL						(1)

Measuring Conditions

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

Measuring Equipment

FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

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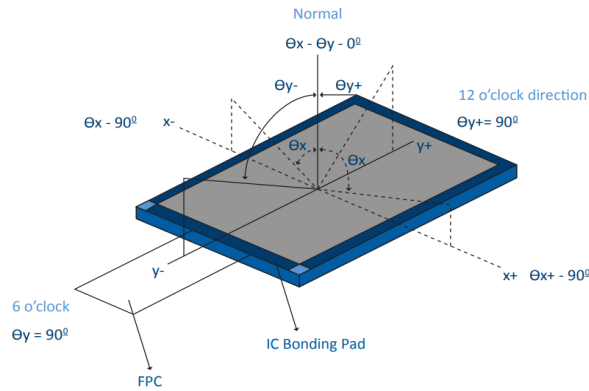
(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

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

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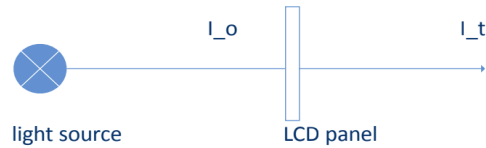
Io = the brightness of the light source.
It = the brightness after panel transmission

(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.
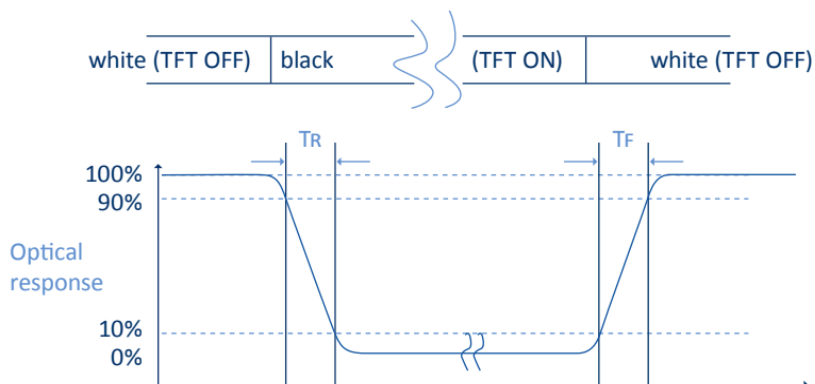
(5) Definition of Color Gamut:

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.
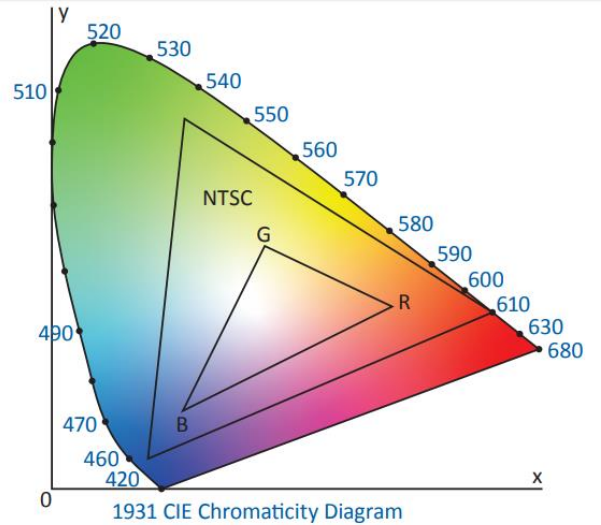
Fig. 1931 CIE chromacity diagram

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

(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.
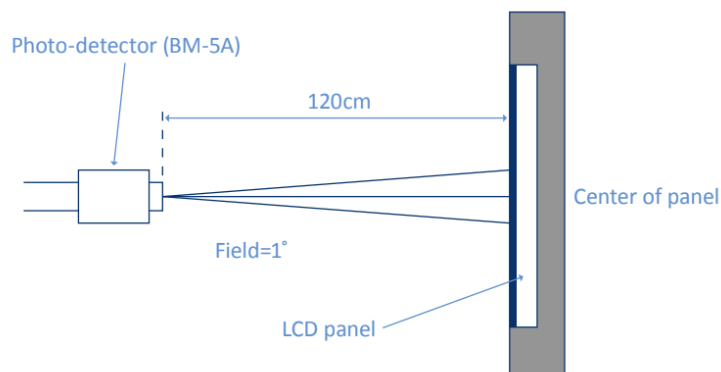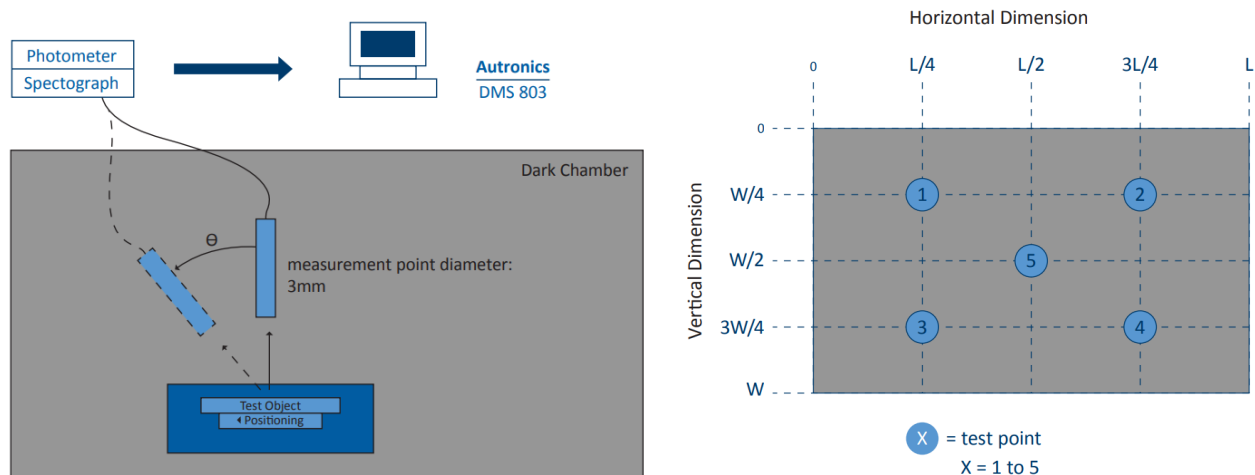
4. TFT Electrical Characteristics

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

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	VDD	-0.3	5.5	V
Operating Temperature	TOP	-10	+50	°C
Storage Temperature	TST	-20	+60	°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	Typ.	Max	Unit	Note
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Normal Mode Current Consumption	IDD	--	110	220	mA	
Level Input Voltage	V_{IH}	0.7*VDD	--	VDD	V	
	V_{IL}	GND	--	0.3*VDD	V	

4.3   LED Backlight Characteristics

The backlight system is edge lighting type with 32 LED chips

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	(3)
LED Lifetime	Hr	--	50000	--	hour	(1)(2)
Uniformity	Avg	80	--	--	%	(3)

Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3°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 Ta=25°C 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
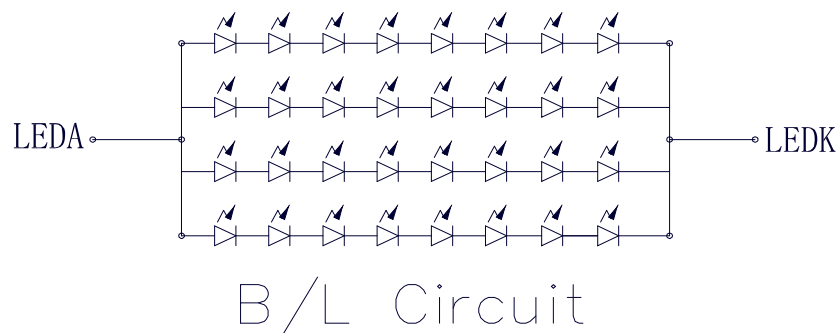
Note 3: Luminance Uniformity of these 9 points is defined as below:
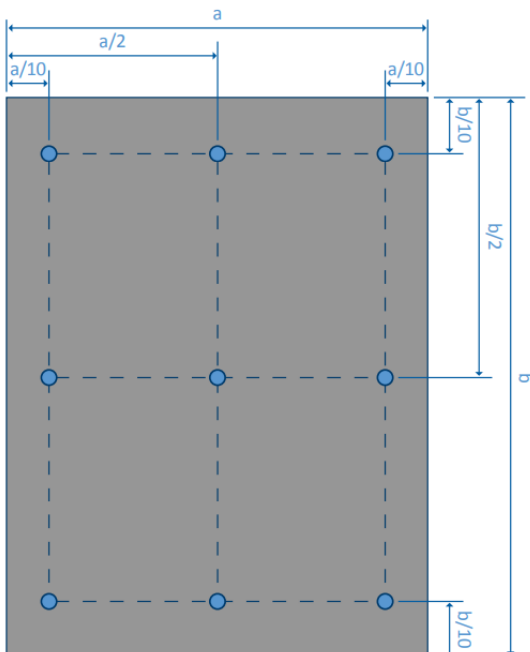
$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

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

5.0 Signal Timing Specifications

5.1 MIPI Timing

Item			Symbol	Min	Typ.	Max	Unit
LCD		Frame Rate	--	--	60	--	Hz
		Pixel Rate	--	156.8	156.8	159.9	MHz
Timing	MIPI CLK	Frequency	fCLK	490	490	498	MHz
		Period	Tclk	2.01	2.04	2.04	ns
	Horizontal	Horizontal Total Time	tHP	1343	1343	1366	t_{CLK}
		Horizontal Active Time	tHadr		1200		t_{CLK}
		Horizontal Pulse Width	tHsync	1	1	1	t_{CLK}
		Horizontal Back Porch	tHBP	32	32	32	t_{CLK}
		Horizontal Front Porch	tHFP	110	110	133	t_{CLK}
	Vertical	Vertical Total Time	tvp	1946	1946	1951	t_H
		Vertical Active Time	tVadr		1920		t_H
		Vertical Pulse Width	tVsync	1	1	1	t_H
		Vertical Back Porch	tVBP	14	14	14	t_H
		Vertical Front Porch	tVFP	11	11	16	t_H
Bit Rate			TX SPD	980	980	995	Mbps
Lane				--	4	--	Lane

5.2 Power On Timing Sequence

Lane Pair	MCU (Master)　Display Module (Slave)
Clock Lane	Unidirectional Lane: • Clock Only • Escape Mode (ULPS Only)
Data Lane 0	Bi-Directional Lane • Forward High-Speed • Bi-Directional Escape Mode • Bi-Directional LPDT
Data Lane 1 Data Lane 2 Data Lane 3	Unidirectional Lane • Forward High-Speed • Escape Mode (ULPM only) • No LPDT

5.3 Power on Timing Sequence

VDD = 3.3 V
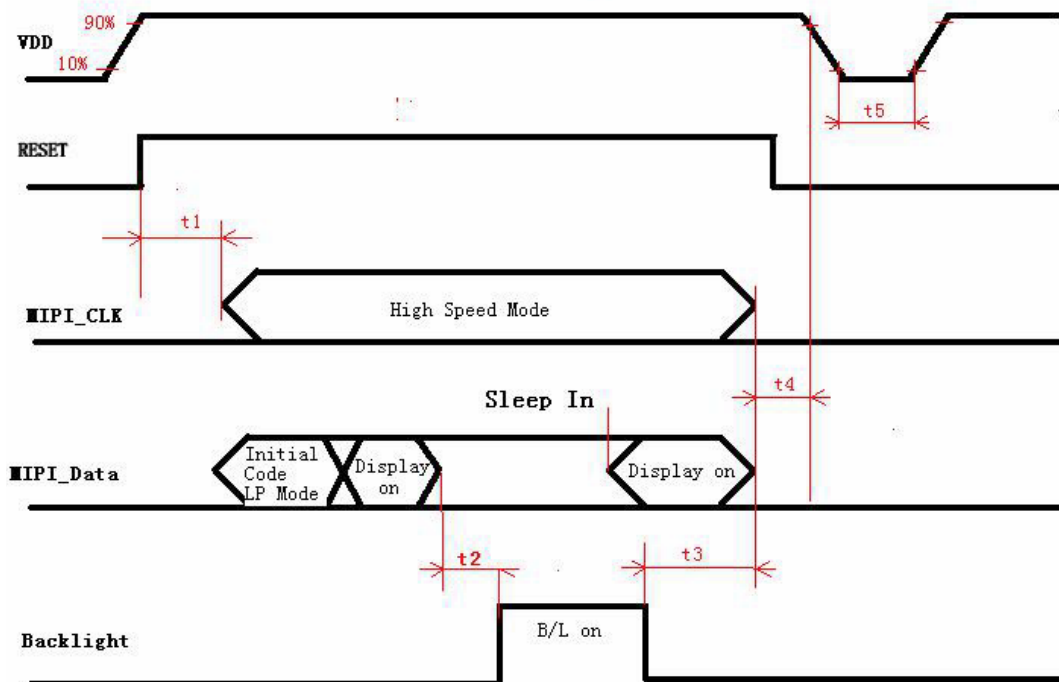
	Min	Typ.	Max	Unit
T1	30	--	60	ms
T2	100	--	--	ms
T3	80	--	--	ms
T4	0	--	--	ms
T5	300	--	--	ms

6.0   CTP Electrical Characteristics

6.1   Absolute Maximum Rating

Item	Symbol	Min	Max	Unit	Note
USB 5V Input Power Supply Voltage	V_{DD5V}	-0.3	6.0	V	
Digital Input Power Supply Voltage	V_{DD}	-0.3	3.6	V	
I/O Input Power Supply Voltage	V_{DDIO}	0.3	3.6	V	

6.2   DC Electrical Characteristics

Item	Symbol	Min	Typ.	Max	Unit	Note
USB 5V Input Power Supply Voltage	V_{DD5V}	4.4	5.0	5.5	V	
Digital Input Power Supply Voltage	V_{DD}	3.0	3.3	3.6	V	
I/O Input Power Supply Voltage	V_{DDIO}	3.0	3.3	3.6	V	

6.3   I2C DC Characteristics

For I2C DC Characteristics, see table 5-4 on page 11 of the data sheet for controller IC ILI2511. The data sheet can be found here: https://focuslcds.com/content/ILI2511.pdf

6.4   USB DC Characteristics

For USB DC Characteristics, see table 5-5 on page 12 of the data sheet for controller IC ILI2511. The data sheet can be found here: https://focuslcds.com/content/ILI2511.pdf

6.5   I2C AC Characteristics

For I2C AC Characteristics, see diagram in section 5.4 and table 5-7 on page 13 of the data sheet for controller IC ILI2511. The data sheet can be found here: https://focuslcds.com/content/ILI2511.pdf

6 6   Power-On Sequence
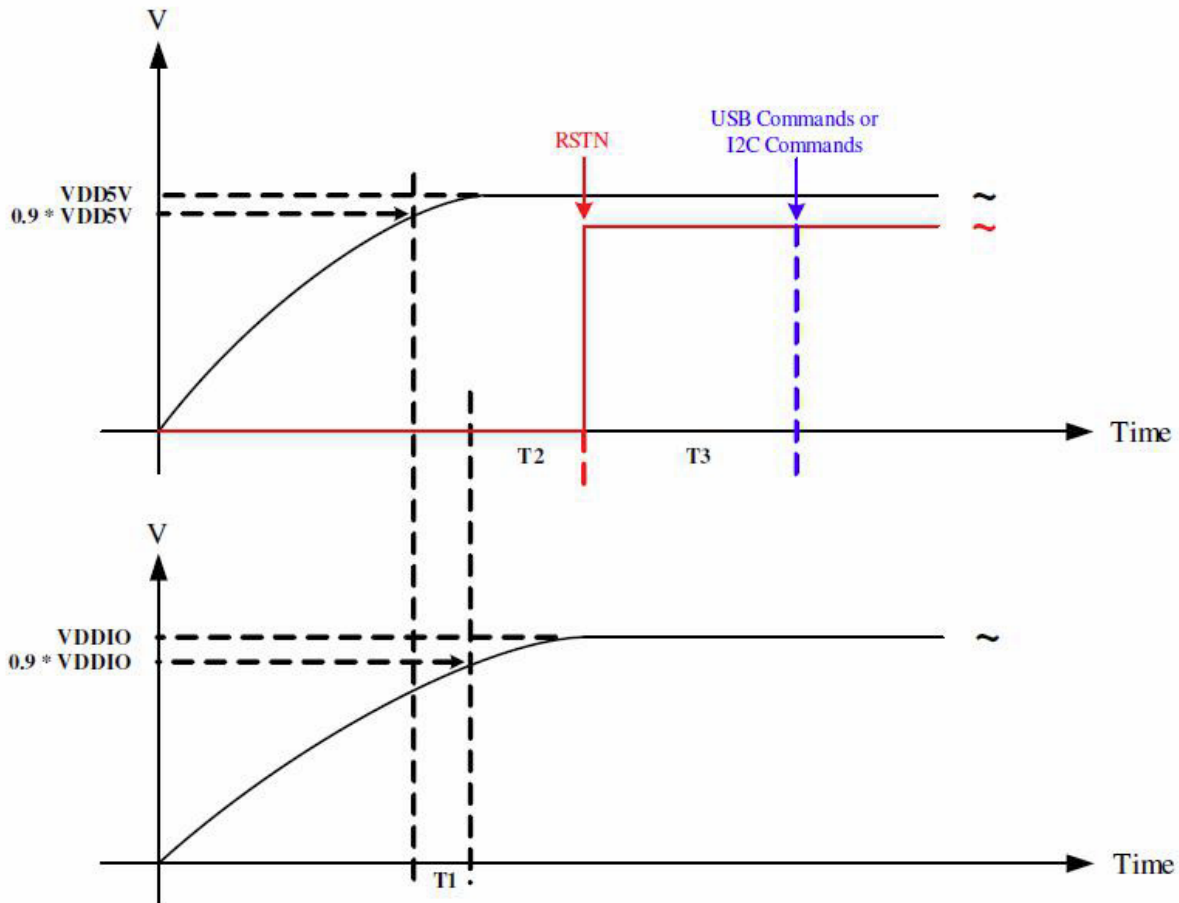
1. T1: The time difference between 0.9*VDD and 0.9*VDDIO. T1 must be ≥ 0 sec.
2. T2: The time difference between 0.9*VDDIO and RSTN. T2 must be ≥ 200 us.
3. T3: The time difference between RSTN and Commands.
     T3 in case of USB must be ≥20ms.
     T3 in case of I2C must be ≥300ms.

6.7   Power-off to Power-On Sequence
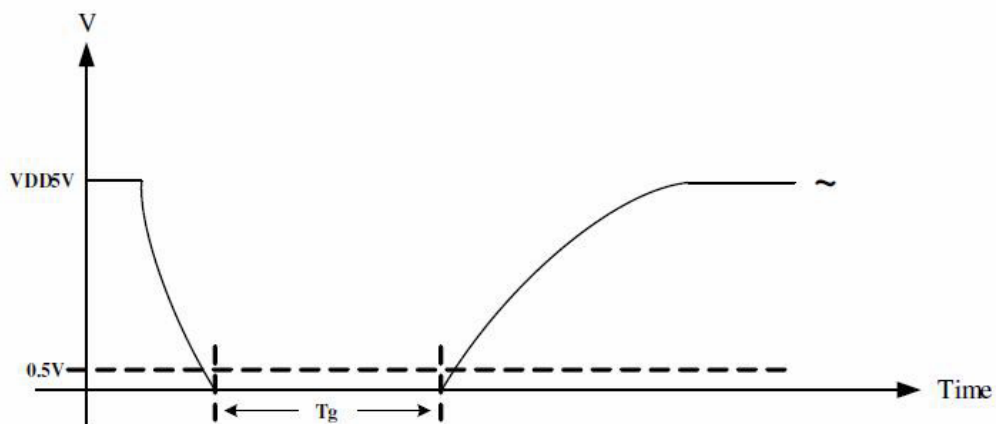
Tg: The time difference between power-off and power-on. Tg must be >10us.

Note: During the power off time, the VDD5V must be lower than 0.5V to make sure the touch controller has been correctly reset.

7. Quality Inspection Standards

For TFT quality inspection standards, please see the following link: https://focuslcds.com/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 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 ℃ 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.