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TFT | CHARACTER | UWVD | FSC | SEGMENT | CUSTOM | REPLACEMENT

TFT Display Module

Part Number

E55RA-FW340-C

Overview:

- 5.5-inch TFT: 86.72x144.96
- 1080 1920
- HDMI @
- ‡   u
- All View

- Transmissive
- Capacitive Touch Panel
- 340 NITS
- Controllers: NT35532+GT911
- 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, HDMI board and a backlight unit. The resolution of the 5.5" TFT-LCD contains 1080(RGB)x1920 pixels and can display up to 16.7M colors.

TFT Features

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

General Information Items	Specification Main Panel	Unit	Note
TFT Display area (AA)	68.04(H) x 120.96(V) (5.5 inch)	mm	-
Driver Element	TFT active matrix	-	-
Display Colors	16.7M	colors	-
Number of pixels	1080(RGB)x1920	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel Pitch	0.063(H)x0.063(V)	mm	-
Viewing angle	ALL	o'clock	-
TFT Controller IC	NT35532	-	-
CTP Driver IC	GT911	-	-
TFT Interface	HDMI	-	-
CTP Interface	Micro-USB	-	-
TFT+CTP Luminance	290	nits	(TYP)
CTP Firmware Version	CTP_V01	-	-
CTP Bonding	Tape	-	-
Touch Cover Thickness	1.1	mm	-
Touch Mode	Five Points and Gestures	-	-
Display mode	Transmissive/ Normally Black	-	-
Operating temperature	-20～+70	℃	-
Storage temperature	-30～+80	℃	-
Recommended Resolution	1080(RGB)x1920	pixels	55-60Hz

Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module Size	Horizontal (H)		86.04		mm	-
	Vertical (V)		144.96		mm	-
	Depth (D)		4.75		mm	-
	Weight		124		g	

1.) Outline Dimensions

Detail:A
Scale 3:1

FPC bending diagram.

The finished products are bent and shipped

1.MICRO USB 5V_2A(Typ.)

NO.	Pin Name
1	DC: 5V,2A(Typ.)
2	NC
3	NC
4	NC
5	GND

2.POWER ON/OFF AND Backlight PWM extensions key

NO.	Pin Name
1	GND
2	POWER ON/OFF
3	PWM+
4	PWM+

3.Ctp-touch:MICRO USB 2.0

NO.	Pin Name
1	DC:5V,2A(Typ.)
2	USB_CTP_DN(D-)
3	USB_CTP_DP(D+)
4	NC
5	GND

4.Audio headphone socket

NO.	Pin Name
1	Left channel
2	Right channel
3	GND

6.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	X_CLK -
13	NC
14	NC
15	HDMI_SCL
16	HDMI_SDA
17	GND
18	BUS_5V
19	HPD

5.Two speaker outputs

NO.	Pin Name
1	Left channel+
2	Left channel-
3	Right channel-
4	Right channel+

NOTES:
1. DISPLAY TYPE: 5.5", TFT-LCD, 16.7M COLORS
2. DISPLAY MODE: NORMALLY BLACK/IPS
3. VIEWING DIRECTION: FREE
4. POWER: MICRO USB 5V_2A(Typ.)
5. LCM Interface: MIPI
6. Touch type: CTP
7. CTP Interface: MICRO USB2.0
8. Touch and LCM Bonding technology: Tape Bonding
9. OPERATING TEMP: -20°C TO 70°C
   STORAGE TEMP: -30°C TO 80°C
10. RoHS COMPLIANT.

ReV.	Revision content description	Date
V1.0	FIRST	2019. 03. 18
V1.1	SECOND_VERSION	2019. 05. 07

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TOLERANCE		DRAWING NAME	
		PART NO.	E55RA-FW340-C
TOLERANCE UNLESS	X.X±0.3	Drawn	Unit
OTHERWISE SPECIFIED	X.XX±0.2	Checked	mm
Scale 1:1		Approve	Page 1/1

2. Block Diagram

```
┌──────────────┐           ┌─────────────────┐           ┌──────────────┐
│   HDMI IN    │ ═════════>│                 │ ═════════>│     LCM      │
└──────────────┘           │                 │           └──────────────┘
                           │                 │
┌──────────────┐           │                 │           ┌──────────────┐
│ USB(MICRO)   │ ═════════>│   HDMI Board    │ ═════════>│  Back Light  │
│ POWER DC:5V_2A│          │                 │           └──────────────┘
└──────────────┘           │                 │
                           │                 │
┌──────────────┐           │                 │           ┌──────────────┐
│ USB(MICRO)   │ ═════════>│                 │ ═════════>│  Ctp-touch   │
│ Ctp-touch    │           └─────────────────┘           └──────────────┘
└──────────────┘
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3. Input Terminal Pin Assignment

3.1 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:
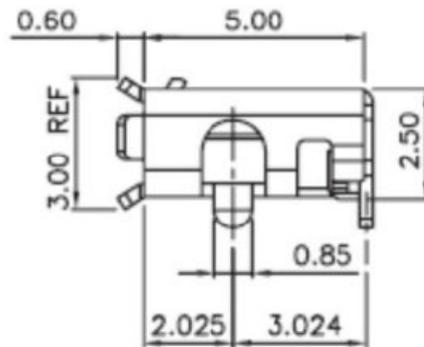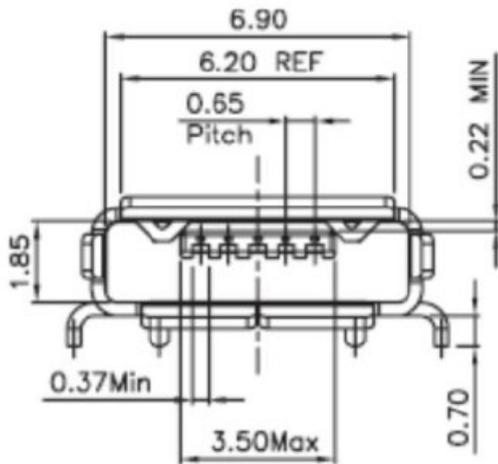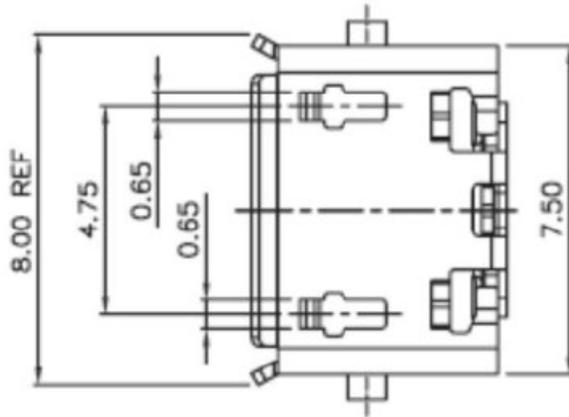
3.2 Power ON/OFF and Backlight PWM Extension Key Pin Definition & Signal Connector

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
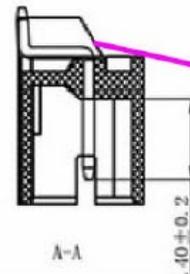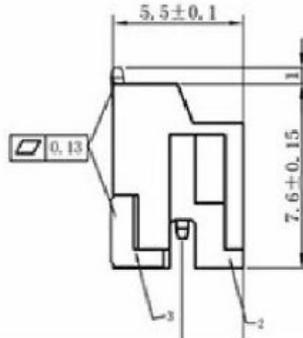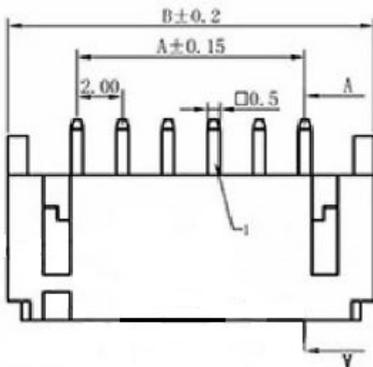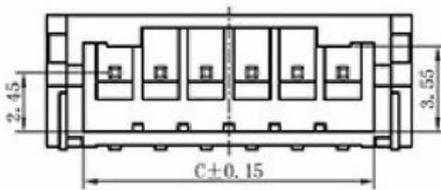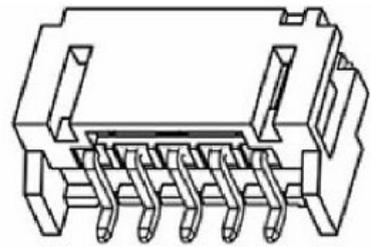
poles	A	B	C
2	2.00	8.00	4.75
3	4.00	10.00	6.75
4	6.00	12.00	8.75
5	8.00	14.00	10.75
6	10.00	16.00	12.75
7	12.00	18.00	14.75
8	14.00	20.00	16.75
9	16.00	22.00	18.75

3.3 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	
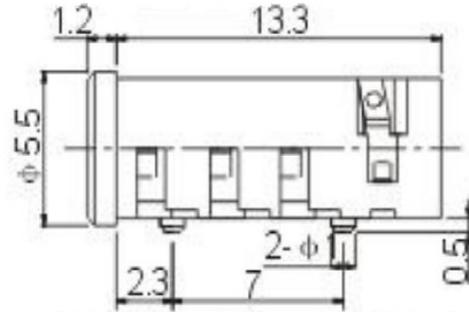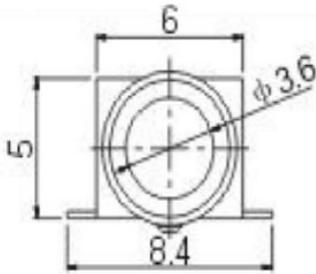
P.C.B Layout(copper-sided view)

3.4 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
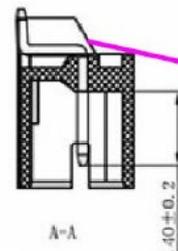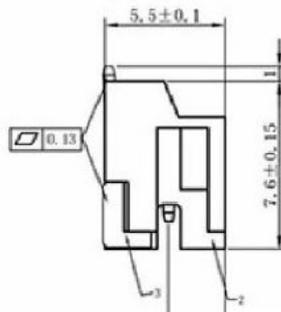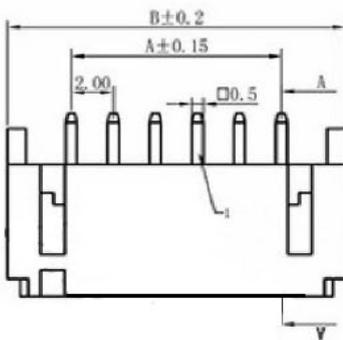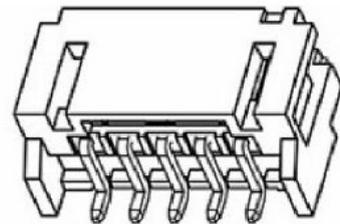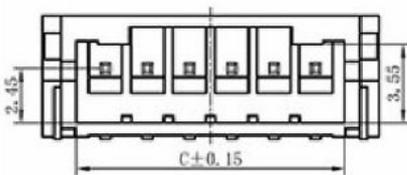
PLR poles	A	B	C
2	2.00	8.00	4.75
3	4.00	10.00	6.75
4	6.00	12.00	8.75
5	8.00	14.00	10.75
6	10.00	16.00	12.75
7	12.00	18.00	14.75
8	14.00	20.00	16.75
9	16.00	22.00	18.75

3.6   HDMI Pin Definition & Signal Connector

NO.	Symbol	Description	I/O
1	RX_D2+	HDMI receiver channel 2 positive analog input	I
2	GND	Ground	P
3	RX_D2-	HDMI receiver channel 2 negative analog input	I
4	RX_D1+	HDMI receiver channel 1 positive analog input	I
5	GND	Ground	P
6	RX_D1-	HDMI receiver channel 1 negative analog input	I
7	RX_D0+	HDMI receiver channel 0 positive analog input	I
8	GND	Ground	P
9	RX_D0-	HDMI receiver channel 0 negative analog input	I
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	NC	Not connected	
14	NC	Not connected	
15	HDMI_SCL	HDMI receiver DDC data channel	I/O
16	HDMI_SDA	HDMI receiver DDC clock channel	I
17	GND	Ground	P
18	HDMI_5V	HDMI supply voltage (5V)	P
19	HPD	HDMI receiver hot plug detect output	O

HDMI Connector Dimensions:
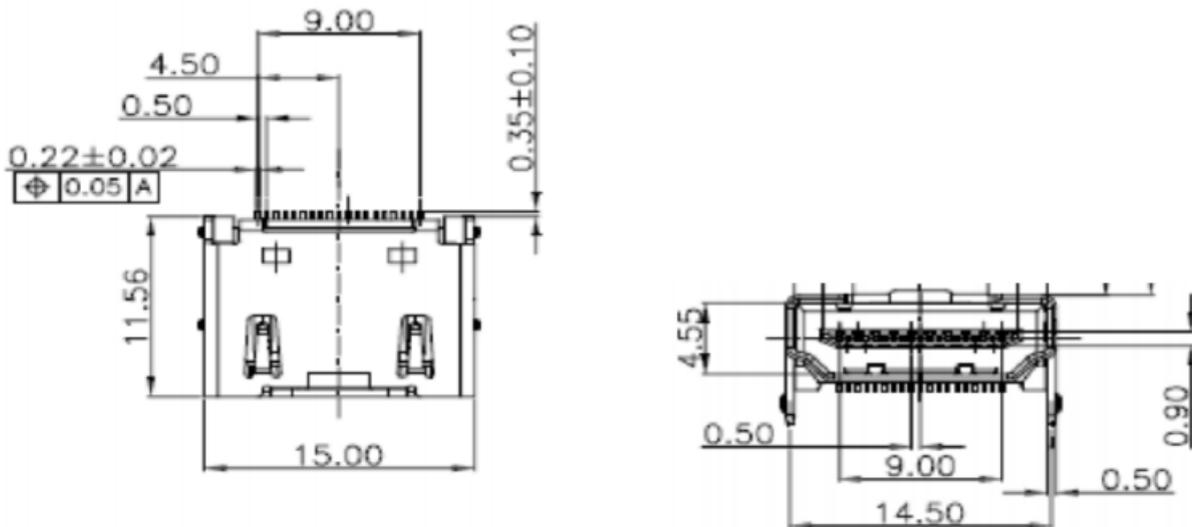
4.   LCD Optical Characteristics

4.1   Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Color Gamut		S%		--	80	--	%	(3)
Contrast Ratio		CR		700	1000	--	%	(2)
Response Time	Rising	TR+TF		--	--	35	ms	(4)
	Falling							
Color Filter Chromaticity	White	W_X	θ=0 Normal viewing angle	0.2529	0.2929	0.3329		(5)(6)
		W_Y		0.2706	0.3106	0.3506		
	Red	R_X		0.5952	0.6352	0.6752		
		R_Y		0.2998	0.3398	0.3798		
	Green	G_X		0.2638	0.3038	0.3438		
		G_Y		0.5487	0.5887	0.6287		
	Blue	B_X		0.1041	0.1441	0.1841		
		B_Y		0.0135	0.0535	0.0935		
Viewing Angle	Hor.	ΘL	CR≥10	--	85	--	degree	(1)(6)
		ΘR		--	85	--		
	Ver.	ΘT		--	85	--		
		ΘB		--	85	--		
Option View Direction		ALL						(1)

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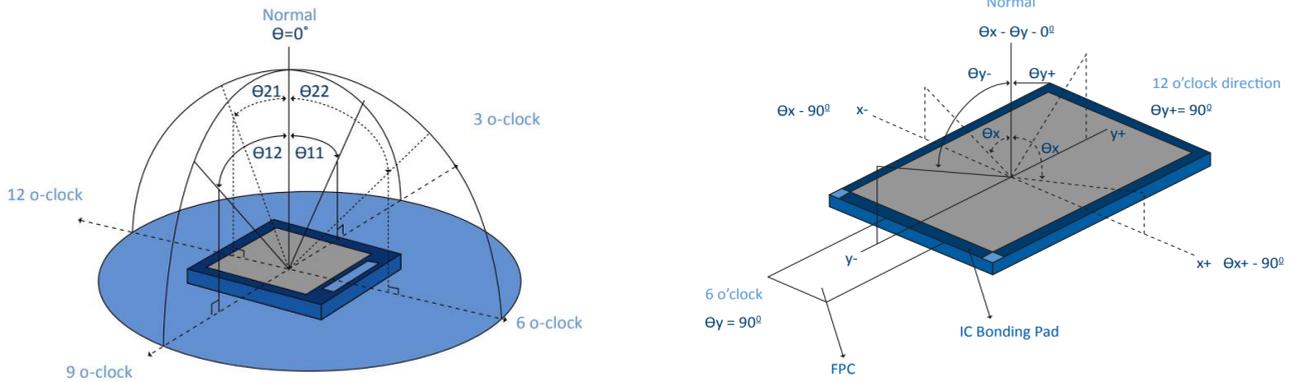
(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

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

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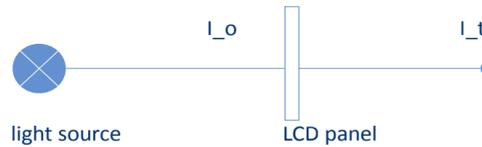
Io = the brightness of the light source.
It = the brightness after panel transmission

(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.
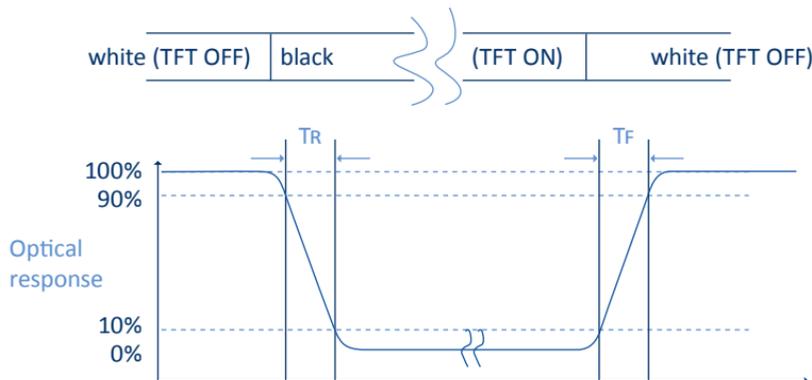
(5) Definition of Color Gamut:

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.
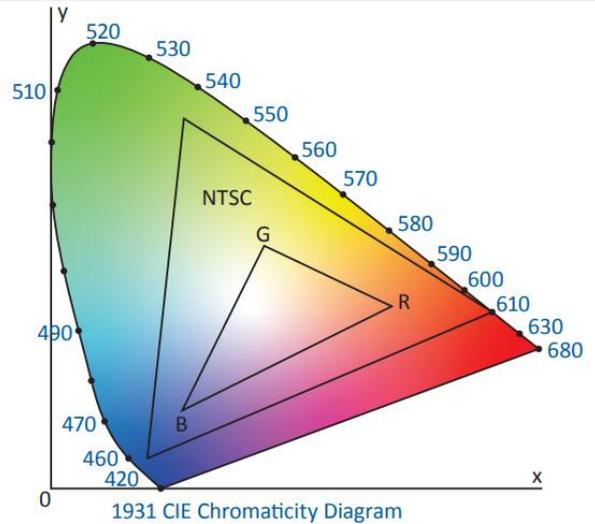
Fig. 1931 CIE chromacity diagram

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

(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.

Autronics DMS 803

Photometer
Spectograph

Dark Chamber

θ

measurement point diameter: 3mm

Test Object
◄ Positioning

Horizontal Dimension

Vertical Dimension

0   L/4   L/2   3L/4   L

W/4 — 1 ... 2
W/2 — 5
3W/4 — 3 ... 4
W

X = test point
X = 1 to 5

Photo-detector (BM-5A)

120cm

Center of panel

Field=1°

LCD panel
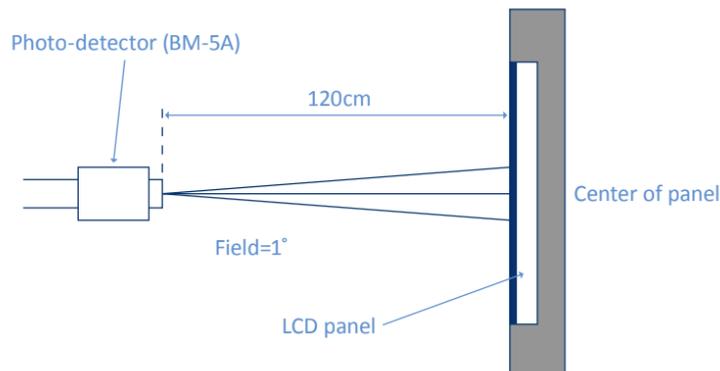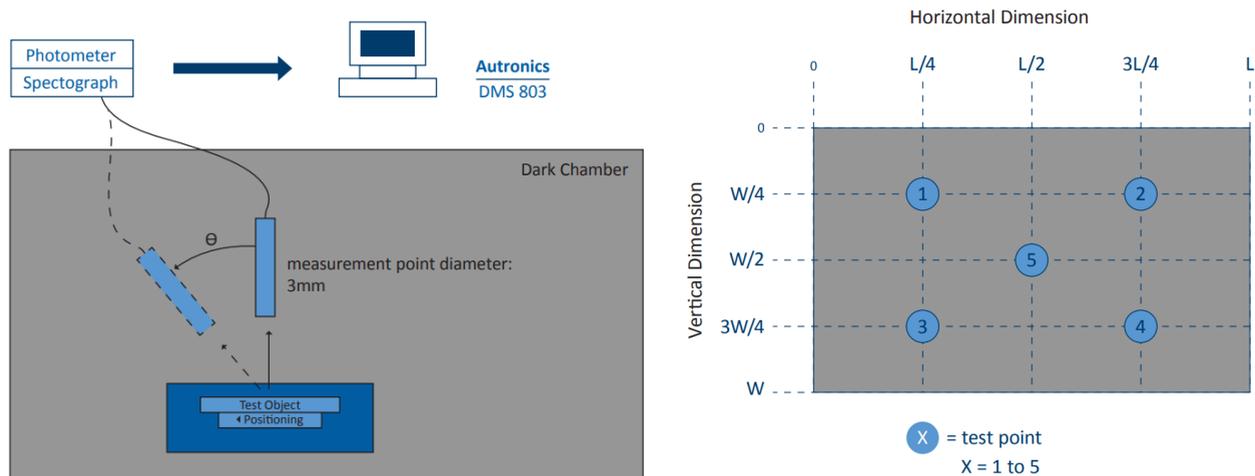
5. TFT Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 ˚C, VSS=0V)

Characteristics	Symbol	Min	Max	Unit
Analog Power Supply Voltage	VDD-GND	-0.3	6.0	V
	VDDp-GND	-0.3	6.0	V
LED Input Signal Voltage	V_{LED}	-0.3	6.0	V
PWR Input Signal Voltage	V_{PWR}	-0.3	5.5	V
Operating Temperature	TOP	-20	+70	℃
Storage Temperature	TST	-30	+80	℃

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	VCI	2.5	3.3	3.6	V	
Logic Supply Voltage	IOVCC	1.65	1.8	3.6	V	
Level Input Voltage	VIH	0.7IOVCC	--	IOVCC	V	
	VIL	GND	--	0.3IOVCC	V	
Level Output Voltage	VOH	0.8IOVCC	--	IOVCC	V	
	VOL	GND	--	0.2IOVCC	V	

5.3 LED Backlight Characteristics

Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	IF	30	40	--	mA	
Forward Voltage	VF	--	22.4	--	V	
LCM Luminance	LV	290	340	--	cd/m2	Note 3
LED lifetime	Hr	50000	--	--	hour	Note1 & 2
Uniformity	AVg	80	--	--	%	Note 3

The back-light system is edge-lighting type with 214chips LED

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=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.
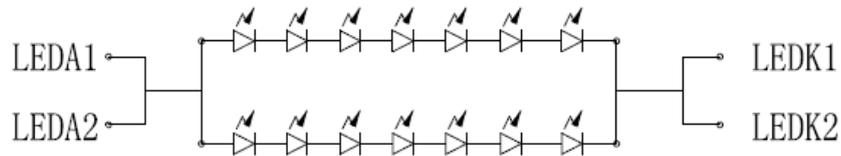
Note 3: Luminance Uniformity of these 9 points is defined as below:
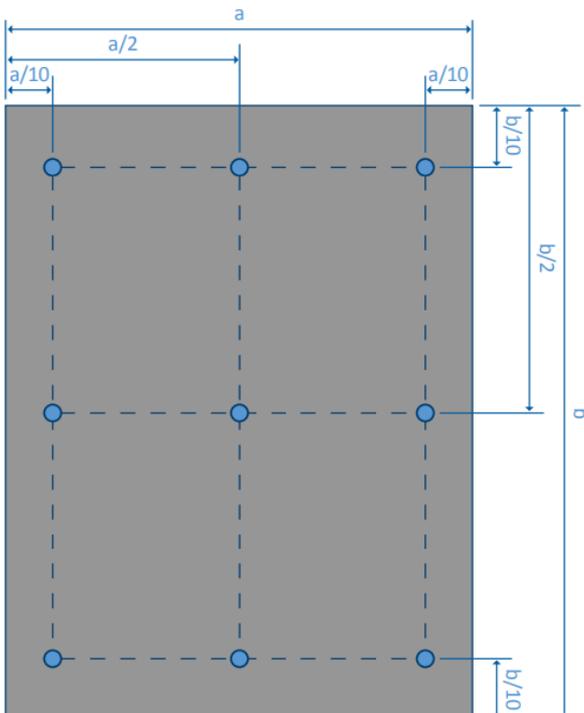
$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

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

6. AC Characteristics

6.1 Turnaround Procedure

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Length of any low power state period: master side	T_{LPX}	50	--	75	ns	
Length of any low power state period: slave side	T_{LPX}	50	--	75	ns	
Ratio of TLPX(Master)/TLPX(Slave) between master and slave side	$Ratio_{TLPX}$	2/3	--	3/2	ns	
Time-out before new TX side start driving	$T_{TA-Sure}$	T_{LPX}	--	$2T_{LPX}$	ns	
Time to drive LP-00 by new TX	T_{TA-GET}	--	$5\ T_{LPX}$	--	ns	
Time to drive LP-00 after turnaround request	T_{TA-GO}	--	$4\ T_{LPX}$	--	ns	
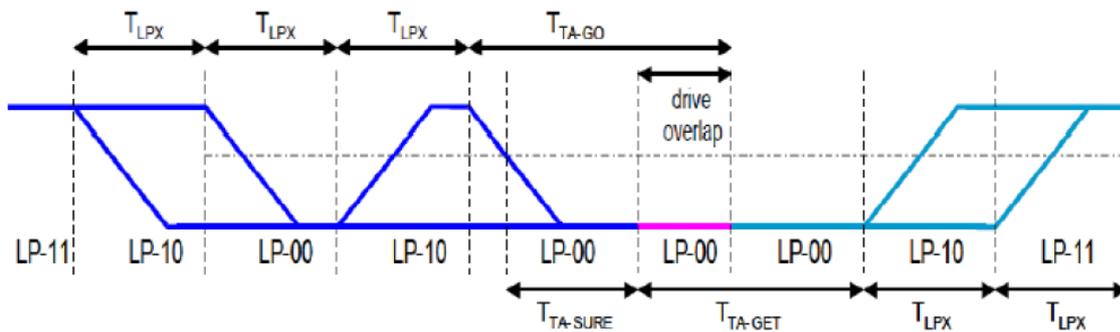
6.2 High Speed Transmission

| Parameter	Symbol	Min	Typ.	Max	Unit	Note
UI Instantaneous	UI_{INST}	2	--	12.5	ns	1,2,10
Data to clock skew (measured at transmitter)	$T_{SKEW(TX)}$	-0.15	--	0.15	UI_{INST}	3
		-0.2		0.2		4
Data to clock setup time (measured at receiver)	$T_{SETUP(RX)}$	-0.15	--	0.15	UI_{INST}	5
		-0.2		0.2		6
Data to clock hold time (measured at receiver)	$T_{HOLD(RX)}$	-0.15	--	0.15	UI_{INST}	5
		-0.2		0.2		6
20%-80% rise and fall time	T_R/T_F	100	--	--	ps	9
		--	--	0.3	UI_{INST}	7
		--	--	0.35	UI_{INST}	8
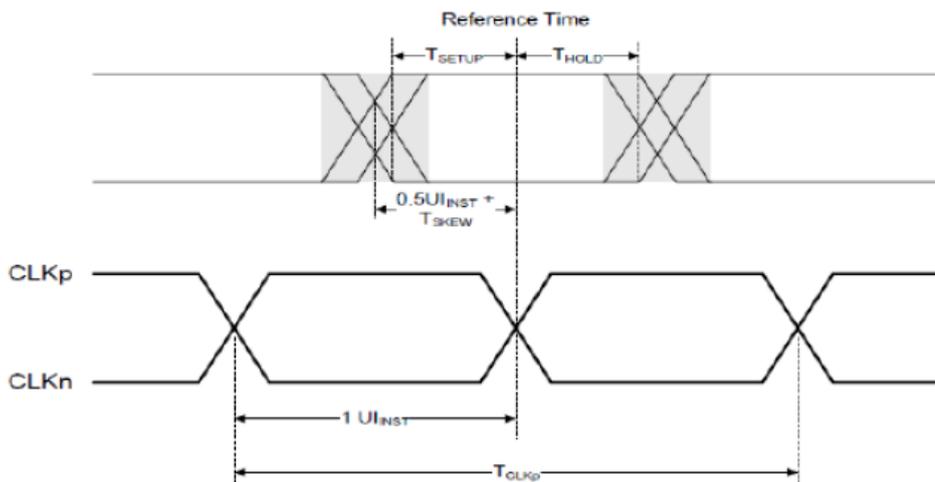
Notes:
1.) *This value corresponds to a minimum of 80MHz.*
2.) *The minimum UI should not be violated for any single bit period (any DDR half cycle)*
3.) *Total silicon and package delay of 0.3UI$_{INST}$ with D-PHY supports maximum data rate of 1Gbps.*
4.) *Total silicon and package delay of 0.4UI$_{INST}$ with D-PHY supports maximum data rate > 1Gbps.*
5.) *Total setup and window for receiver of 0.3UI$_{INST}$ with D-PHY supports maximum data rate of 1Gbps.*
6.) *Total setup and window for receiver of 0.4UI$_{INST}$ with D-PHY supports maximum data rate > 1Gbps.*
7.) *Applicable when operating at HS bit rates ≤ 1Gbps (UI ≥ 1ns).*
8.) *Applicable when operating at HS bit rates > 1Gbps (UI < 1ns).*
9.) *Applicable for all HS bit rates. To avoid excessive noise, bit rates ≤ 1 Gbps (UI ≥ 1ns), should not use values below 150ps.*
10.) *For MIPI speed limitations: Bandwidth 1 Gbps per lane, Total bit rate: 4Gbps for 8-8-8; 3Gbps for 6-6-6 and 2.67 Gbps for 5-6-5*

6.3 Switching Clock Lane from Clock Transmission to Low Power Mode

Parameter	Symbol	Min	Typ.	Max	Unit
Time that the transmitter shall continue sending HS clock after the last associated data lane has transitioned to LP mode	T$_{CLK-POST}$	60+128UI	--	--	ns
Detection time that the clock has stopped toggling	T$_{CLK-MISS}$	--	--	60	ns
Time to drive LP-00 to prepare for HS clock transmission	T$_{CLK-PREPARE}$	38	--	95	ns
Minimum lead HS-0 drive period before starting clock	T$_{CLK-PREPARE}$+T$_{CLK-ZERO}$	300	--	--	ns
Time to enable clock lane receiver line termination measured from when Dn crosses VILMAX	T$_{HS-TERM-EN}$	--	--	38	ns
Minimum time that the HS clock must be prior to any associated data lane beginning the transmission from LP to HS mode	T$_{CLK-PRE}$	8	--	--	UI
Time to drive HS differential state after last payload clock bit of a HS transmission burst	T$_{CLK-TRAIL}$	60	--	--	ns
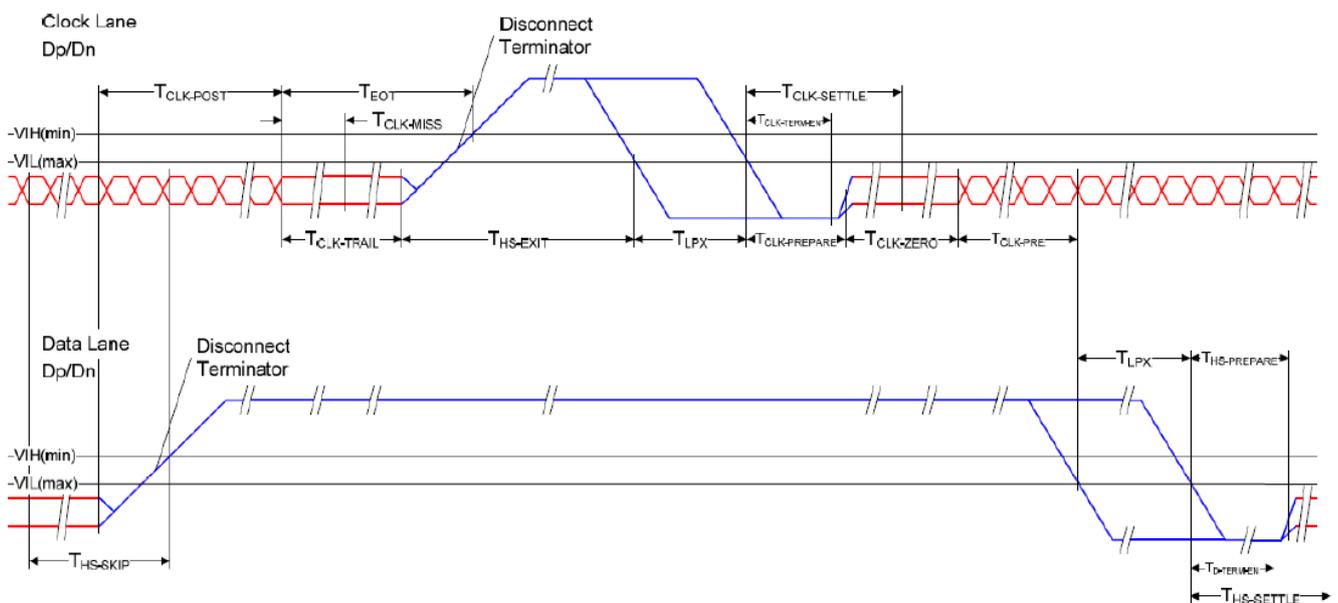
7. CTP Electrical Characteristics

7.1 Absolute Maximum Rating

Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	VDD	2.66	3.47	V	1
I/O Digital Voltage	VDDIO	--	--	V	1
Operating Temperature	T_{OP}	-30	+70	℃	-
Storage Temperature	T_{ST}	-30	+80	℃	-

Note: If used beyond the absolute maximum ratings, GT911may permanently damage. It is strongly recommended that the device be used within the electrical characteristics in normal operations. If exposed to the condition not within the electrical characteristics, it may affect the reliability of the device.

7.2 DC Electrical Characteristics (Ta=25℃)

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note
Digital supply voltage	VDD		2.7	3.3	3.47	V	
I/O Digital supply voltage	VDDIO		--	--	--	V	
Normal operation mode current consumption	I_{OPr}	VDD=2.7V		8		mA	
Green mode current consumption	I_{mon}	Ta=25℃ MCLK=17.5M		3.3		mA	
Sleep mode current consumption	I_{sip}	Hz	70	42	120	uA	
Level input voltage	V_{IH}		0.75VDD		VDD+0.3	V	
	V_{IL}		-0.3		0.25VDD	V	
Level output voltage	V_{OH}	I_{OH}=-0.1mA	0.85VDD			V	
	V_{OL}	I_{OL}=0.1mA			0.15VDD	V	

7.3 AC Characteristics

Item	Symbol	Test Condition	Min	Typ.	Max	Unit	Note
OSC clock 1	fosc1	VDDA=2.7V; Ta=25℃	59	60	61	MHz	
Sensor acceptable clock	ftx	VDDA=2.8V; Ta=25℃	0	100	300	kHz	
Sensor output rise time	Ttxr	VDDA=2.8V; Ta=25℃	-	14	-	Ns	
Sensor output fall time	Ttxf	VDDA=2.8V; Ta=25℃	-	14	-	Ns	
Sensor input voltage	Trxi	VDDA=2.8V; Ta=25℃	-	5	-	V	

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 ℃ 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.

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