TFT Display Module

Part Number

E104RG88060LB6M400-C

Overview:

- 10.4-inch TFT (248.4x195.4mm)
- 16/18/24-bit RGB Interface
- 800x600 pixels
- 3.3V
- White LED back-light

- Transmissive/ Normally White
- Capacitive Touch Screen
- 400 NITS
- CTP Driver: GT9271
- 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 and backlight unit. The resolution of the 10.4" TFT-LCD contains 800x600 pixels and can display up to 65K/262K/16.7M colors.

Features

Low Input Voltage: 3.3V (TYP)
Display Colors of TFT LCD: 65K/262K/16.7M colors
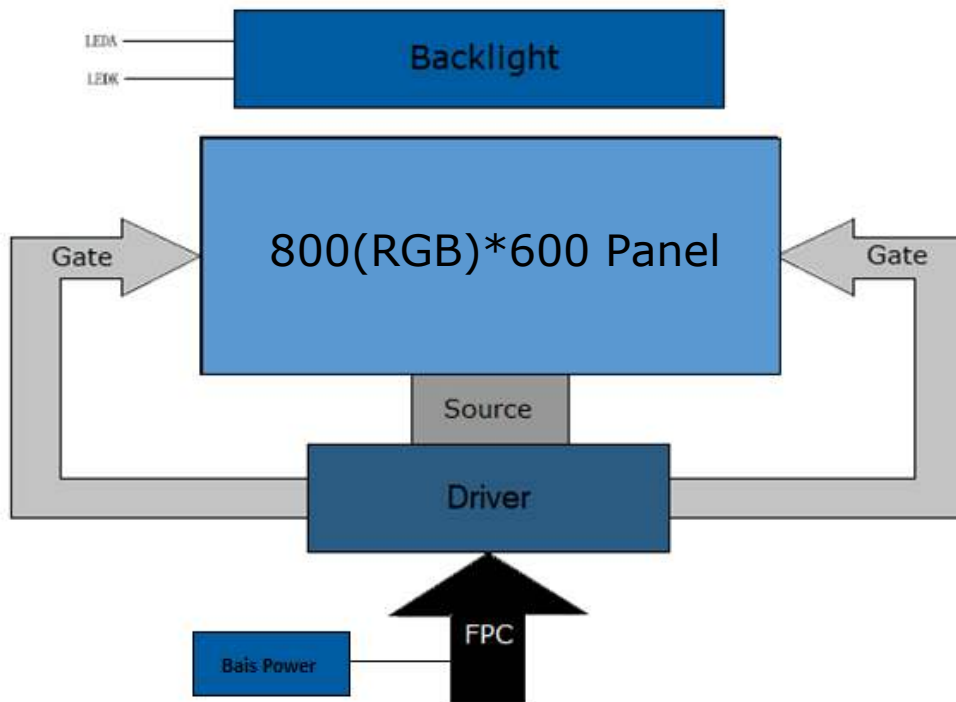TFT Interface: 16/18/24-bit RGB
CTP Interface: I2C

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display area (AA)	211.20(H) x 158.40(V) (10.4 inch)	mm	-
CTP View Area	212.20(H)*159.40(V)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K/262K/16.7M	colors	-
Number of pixels	800(RGB)x600	dots	-
TFT Pixel arrangement	RGB stripe	-	-
Pixel pitch	0.264 (H) x 0.264 (V)	mm	-
Viewing angle	6:00	o'clock	-
CTP Driver IC	GT9271	-	-
Simultaneous Touch Points	10	-	-
Display mode	Transmissive/ Normally White	-	-
Operating temperature	-20～+70	℃	-
Storage temperature	-30～+80	℃	-

Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module size	Height (H)		248.40		mm	-
	Vertical (V)		195.40		mm	-
	Depth (D)		8.23		mm	-
Weight			TBD		g	-

1. Block Diagram

2. Outline Dimension

2.1 LCM

Dimensions shown on the LCM outline drawing:

- 228.40±0.3 OUTLINE
- 214.20±0.3 BEZEL OPEN
- 213.20±0.3 POL
- 212.80 VA
- 211.20 AA
- 115.40
- 84.60
- 10.4"TFT
- 800*RGB*600
- 119.70
- 175.40±0.3 OUTLINE
- 162.50±0.3 BEZEL OPEN
- 160.40±0.3 POL
- 160.00 VA
- 158.40 AA
- 12.3(Bending Area)
- 4.00
- W=0.35
- 0.50±0.05
- 60
- S=0.15
- P0.5*(60-1)=29.50±0.07
- 30.50±0.07
- 99.00±0.5
- 15.00±0.5
- 5.90±0.3
- 43.00
- 46.00
- 45.00
- 160±5
- JST-BHSR-02VS-1
- 5.00±0.3
- 0.30±0.05(W/STIFFENER)

Pin Assignment Table

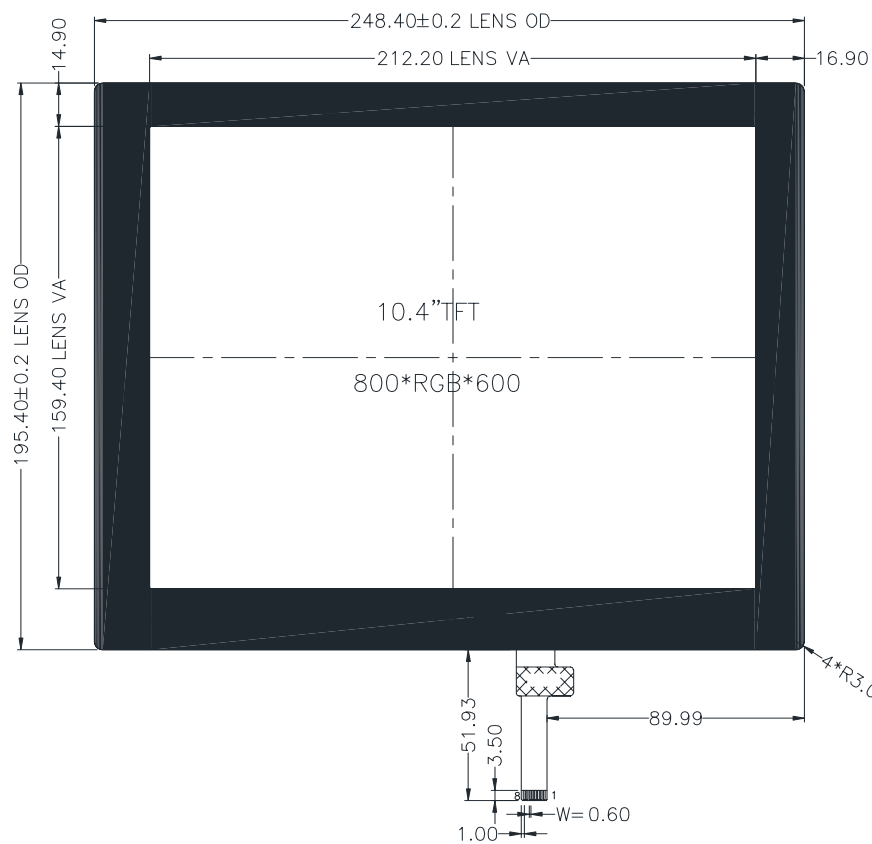| NO.	Pin Name
1	GND
2	AVDD
3	VCC
4	R0
5	R1
6	R2
7	R3
8	R4
9	R5
10	R6
11	R7
12	G0
13	G1
14	G2
15	G3
16	G4
17	G5
18	G6
19	G7
20	B0
21	B1
22	B2
23	B3
24	B4
25	B5
26	B6
27	B7
28	CLKIN
29	DEN
30	HSD
31	VSD
32	MODE
33	NC
34	NC
35	NC
36	VCC
37	NC
38	GND
39	GND
40	AVDD
41	VCOM
42	DITH
43	NC
44	VCOM OUT
45	NC
46	NC
47	NC
48	NC
49	NC
50	NC
51	NC
52	NC
53	NC
54	NC
55	NC
56	VGH
57	VCC
58	VGL
59	GND
60	NC

B/L Circuit

NOTES:

1. DISPLAY TYPE: 10.4", TFT-LCD, 16.7M COLORS
2. DISPLAY MODE: T/N NORMALLY WHITE
3. VIEWING DIRECTION: 6:00 CLOCK
4. VCC: 3.3V
5. OPERATING TEMP: -10°C TO 50°C
   STORAGE TEMP: -20°C TO 60°C
6. BACK LIGHT: LED WHITE, 36 LED, 220-240mA, 9.6V±0.3V
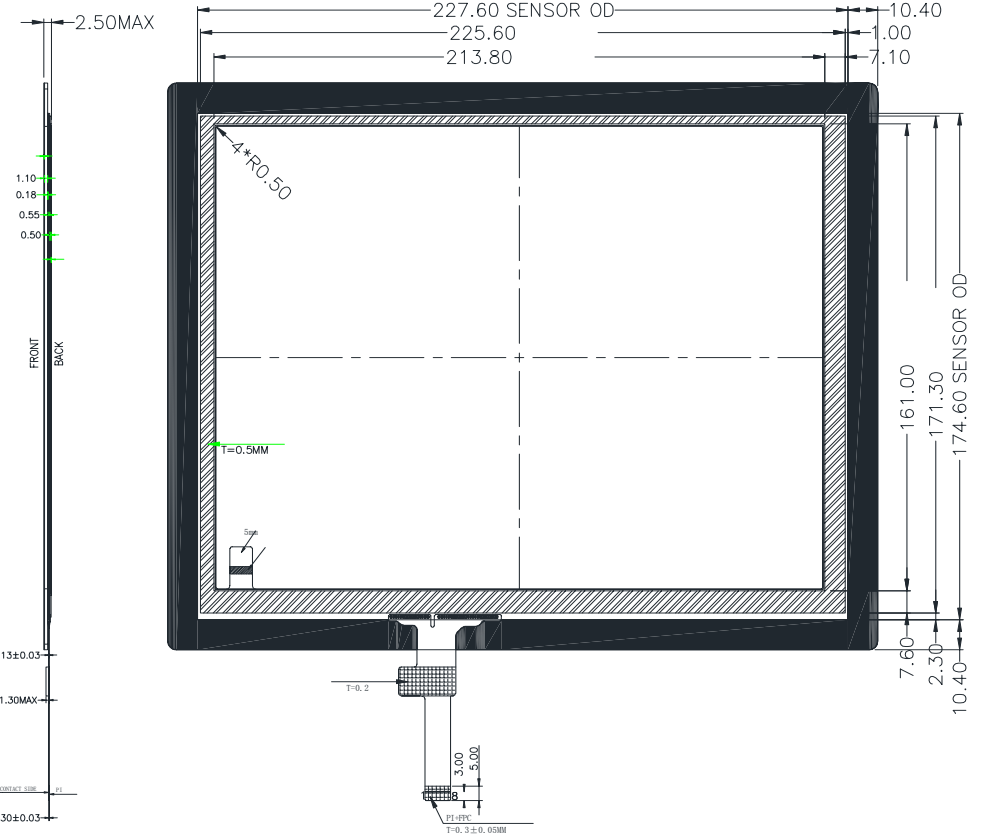7. RoHS COMPLIANT.

2.2 CTP

248.40±0.2 LENS OD
212.20 LENS VA
16.90
14.90
195.40±0.2 LENS OD
159.40 LENS VA

10.4"TFT

800*RGB*600

4*R3.00
51.93
3.50
89.99
B 1
W= 0.60
1.00

FRONT

2.50MAX
FRONT
BACK
1.10
0.18
0.55
0.50
0.13±0.03
1.30MAX
CONTACT SIDE   P1
0.30±0.03

SIDE

227.60 SENSOR OD
225.60
213.80
10.40
1.00
7.10
4*R0.50
T=0.5MM
5mm
161.00
171.30
174.60 SENSOR OD
7.60
2.30
10.40
T=0.2
3.00
5.00
8
P1=FPC
T=0.3±0.05MM

BACK

NO.	Pin Name
1	GND
2	VDDIO
3	VDD
4	SCL
5	SDA
6	INT
7	RST
8	GND

NOTES:
1. DRIVER IC: GT9271
2. WORKING VOLTAGE: 3.3V
3. LIGHT TRANSMISSION: ≥86
4. SURFACE HARDNESS: 6H
5. OPERATING TEMP: −20℃～+70℃, ≤90%RH
6. STORAGE TEMP: −30℃～+80℃, ≤90%RH
7. UNMARKED TOLERANCE±0.2mm
8. PRECISE DIMENSION IN<>

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ReV.	Revision content description	Date	TOLERANCE( )		DRAWING NAME	E104RG88060LB6M400-C	
					PARTS NO.		
A	FIRST	2013/03/29	TOLERANCE UNLESS	X.X±0.3	Drawn		Unit
			OTHERWISE SPECIFIED	X.XX±0.2	Checked		mm
			Scale 1:1		Approve		Page 1/1

2.3 LCM+CTP

TFT Pin Name

NO.	TFT Pin Name
1	GND
2	AVDD
3	VCC
4	R0
5	R1
6	R2
7	R3
8	R4
9	R5
10	R6
11	R7
12	G0
13	G1
14	G2
15	G3
16	G4
17	G5
18	G6
19	G7
20	B0
21	B1
22	B2
23	B3
24	B4
25	B5
26	B6
27	B7
28	CLKIN
29	DEN
30	HSD
31	VSD
32	MODE
33	NC
34	NC
35	NC
36	VCC
37	NC
38	GND
39	GND
40	AVDD
41	VCOM
42	DITH
43	NC
44	VCOM OUT
45	NC
46	NC
47	NC
48	NC
49	NC
50	NC
51	NC
52	NC
53	NC
54	NC
55	NC
56	VGH
57	VCC
58	VGL
59	GND
60	NC

CTP Pin Name

NO.	CTP Pin Name
1	GND
2	VDDIO
3	VDD
4	SCL
5	SDA
6	INT
7	RST
8	GND

NOTES:
1. DISPLAY TYPE: 8.0", TFT-LCD, 16.7M COLORS
2. DISPLAY MODE: T/N NORMALLY WHITE
3. VIEWING DIRECTION: 6:00
4. CTP DRIVER IC: GT9271
5. VCI: 3.3V(TFT)
   VDD: 3.3V(CTP)
6. CTP SURFACE HARDNESS: 6H
7. OPERATING TEMP: -20°C TO 70°C
   STORAGE TEMP: -30°C TO 80°C
8. TFT BACK LIGHT: LED WHITE, 33 LED, 200~220mA, 9.9±0.6V
9. RoHS COMPLIANT.

B/L Circuit

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E104RG88060LB6M400-C
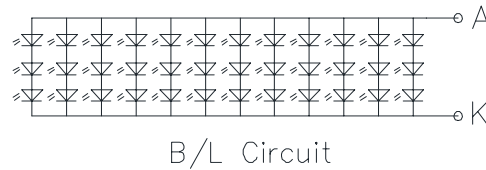
ReV.	Revision content description	Date	TOLERANCE( )			
A	FIRST	2014/04/17	TOLERANCE UNLESS	X.X ±0.3	Drawn	Unit
			OTHERWISE SPECIFIED	X.XX ±0.2	Checked	mm
			Scale 1:1		Approve	Page 1/1

3. Input Terminal Pin Assignment

3.1 TFT

NO.	Symbol	Description	I/O
1	GND	Power ground	P
2	AVDD	Analog input voltage	P
3	VCC	Digital input voltage	P
4	R0	Red data input (LSB)	I/O
5-10	R1-R6	Red data input	I/O
11	R7	Red data input (MSB)	I/O
12	G0	Green data input (LSB)	I/O
13-18	G1-G6	Green data input	I/O
19	G7	Green data input (MSB)	I/O
20	B0	Blue data input (LSB)	I/O
21-26	B1-B6	Blue data input	I/O
27	B7	Blue data input (MSB)	I/O
28	CLKIN	Dot clock input	I
29	DEN	Data enable signal	I
30	HSD	HSYNC signal	I
31	VSD	VSYNC signal	I
32	MODE	H: DE mode (Default) L: SYNC mode	I
33	NC	Not connected, leave open	--
34	NC	Not connected, leave open	--
35	NC	Not connected leave open	--
36	VCC	Digital input voltage	P
37	NC	Not connected, leave open	--
38	GND	Power ground	P
39	GND	Power ground	P
40	AVDD	Analog input voltage	P
41	VCOM	VCOM DC input	P
42	DITH	Dithering function setting. H: Disable dithering function L: Enable dithering function	I
43	NC	Not connected, leave open	--
44	VCOM (OUT)	VCOM output, connect to an external capacitor.	O
45-51	NC	Not connected, leave open	--

I: Input, O: Output, P: Power

3.2 CTP

NO.	Symbol	Description	I/O
1	GND	Ground	P
2	VDDIO	I/O power supply voltage	P
3	VDD	Supply voltage	P
4	SCL	I2C clock input	I
5	SDA	I2C data input and output	I/O
6	INT	External interrupt to host	I
7	RST	External reset, low is active	I
8	GND	Ground	P

4. LCD Optical Characteristics

4.1 Optical Specifications

| Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR		300	500	--	--	(2)
Response time	Rising	TR		--	5	10	ms	(4)
	Falling	TF		--	15	20	ms	(4)
Brightness		B		200	250	--	cd/m²	(3)
Uniformity		Yu		--	80	--	%	
NTSC		--		--	50	--	%	(5)
Color Filter Chromaticity	White	W_X	$\Theta = \phi = 0$ Normal viewing angle	0.26	0.31	0.36		(5)(6)
		W_Y		0.328	0.33	0.38		
	Red	R_X		0.532	0.573	0.623		
		R_Y		0.30	0.350	0.40		
	Green	G_X		0.286	0.336	0.386		
		G_Y		0.547	0.597	0.647		
	Blue	B_X		0.102	0.152	0.202		
		B_Y		0.062	0.112	0.162		
Viewing angle	Hor.	Θ_L	CR≥10 Backlight On	60	70	--	degree	(1)(6)
		Θ_R		60	70	--		
	Ver.	Θ_T		40	50	--		
		Θ_B		50	60	--		
Option View Direction			6:00					(1)

4.2 Measuring Condition

VDD = 3.3V, IL = 260mA (Backlight current)

Ambient temperature: 25 ± 2℃

15min. warm-up time

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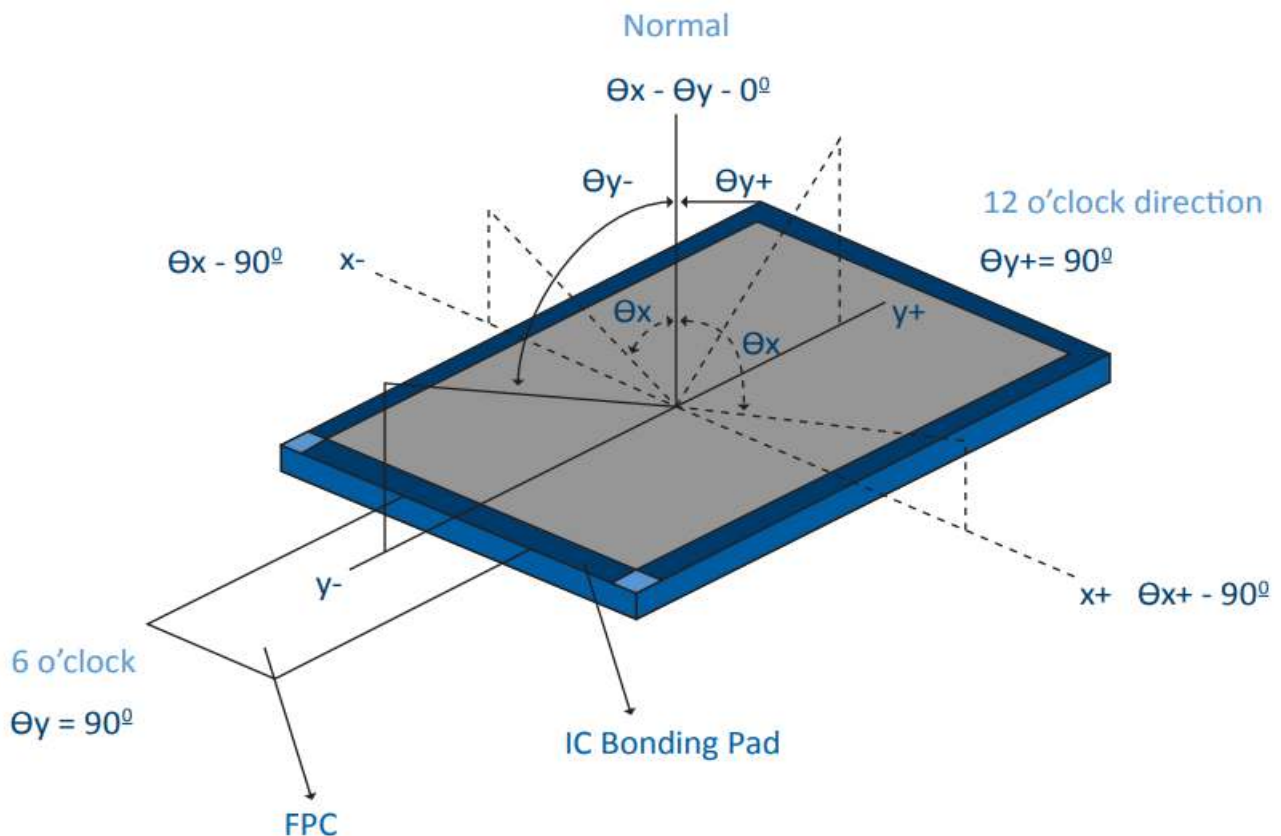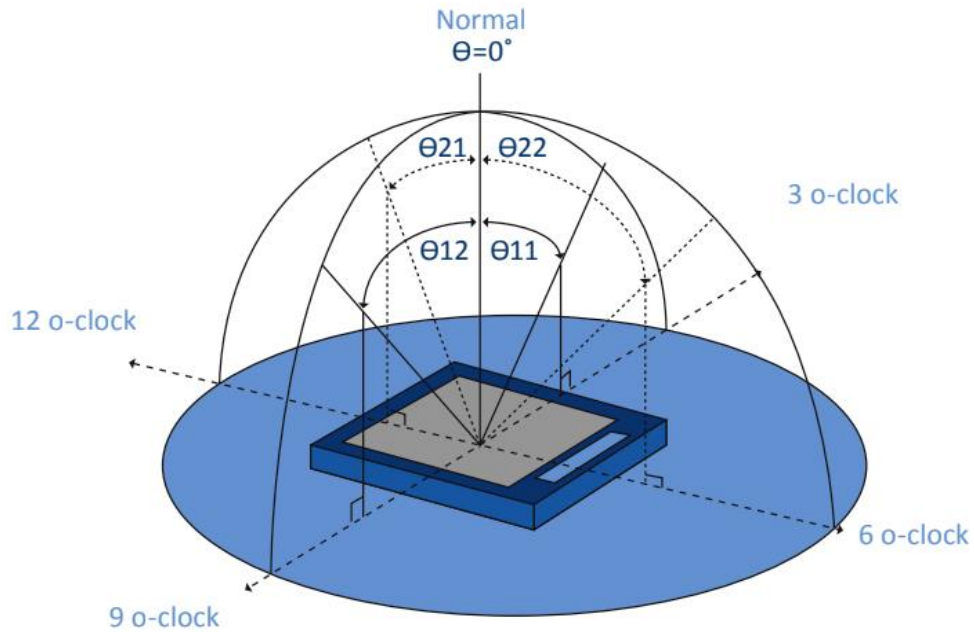
(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

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

I_o   I_t

light source   LCD panel
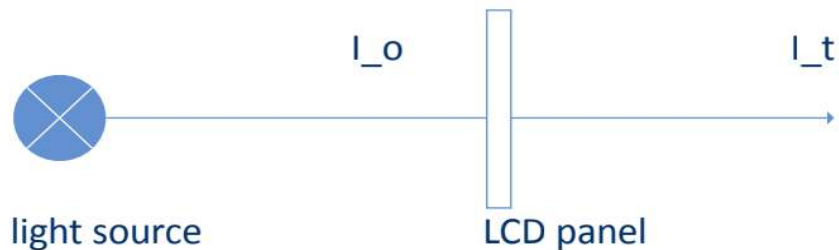
The transmittance is defined as:

$$Tr = \frac{It}{Io} \; x \; 100\%$$

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.

white (TFT OFF) | black   (TFT ON) | white (TFT OFF)

TR   TF

100%
90%

Optical response

10%
0%
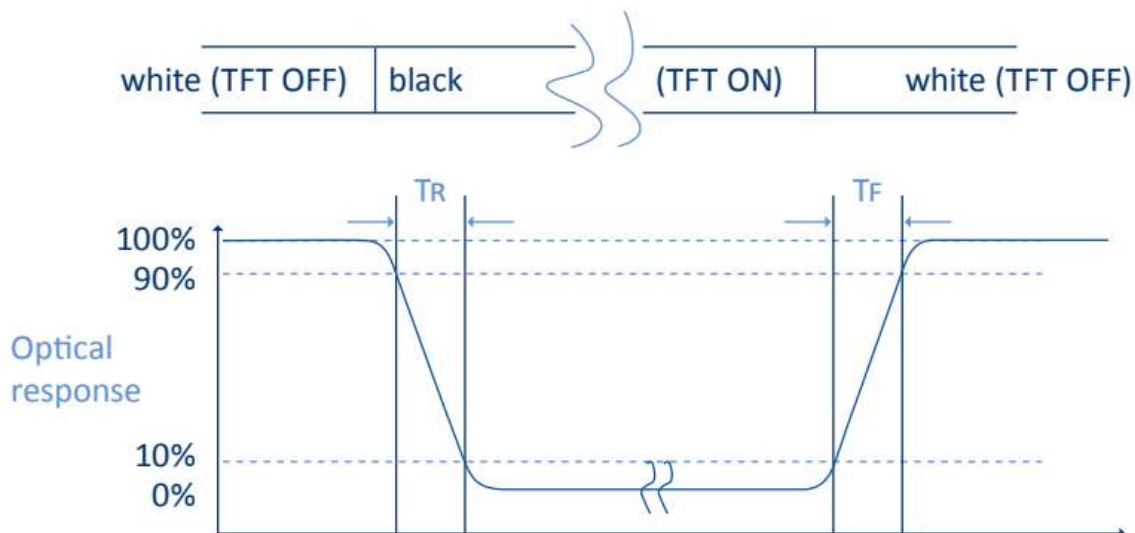
(5) Definition of Color Gamut: Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y),G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics. The color chromaticity shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
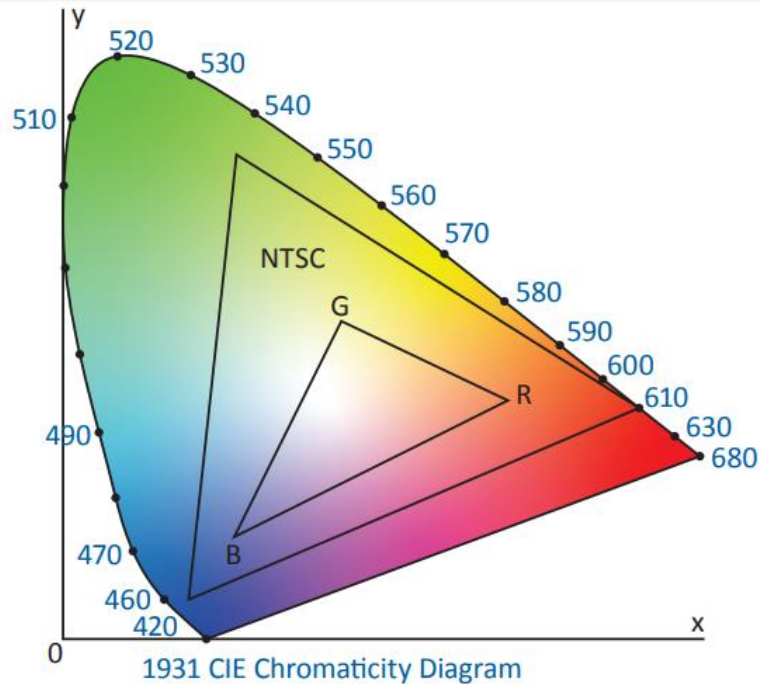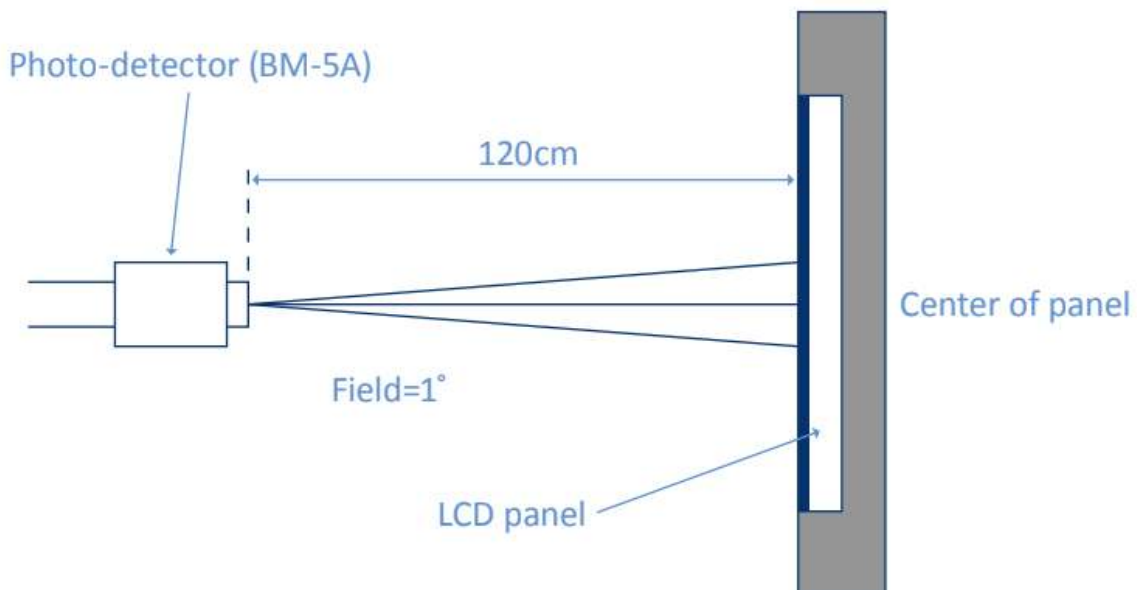


1931 CIE Chromaticity Diagram

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:

(6) Optical Measurement Setup Continued:

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.
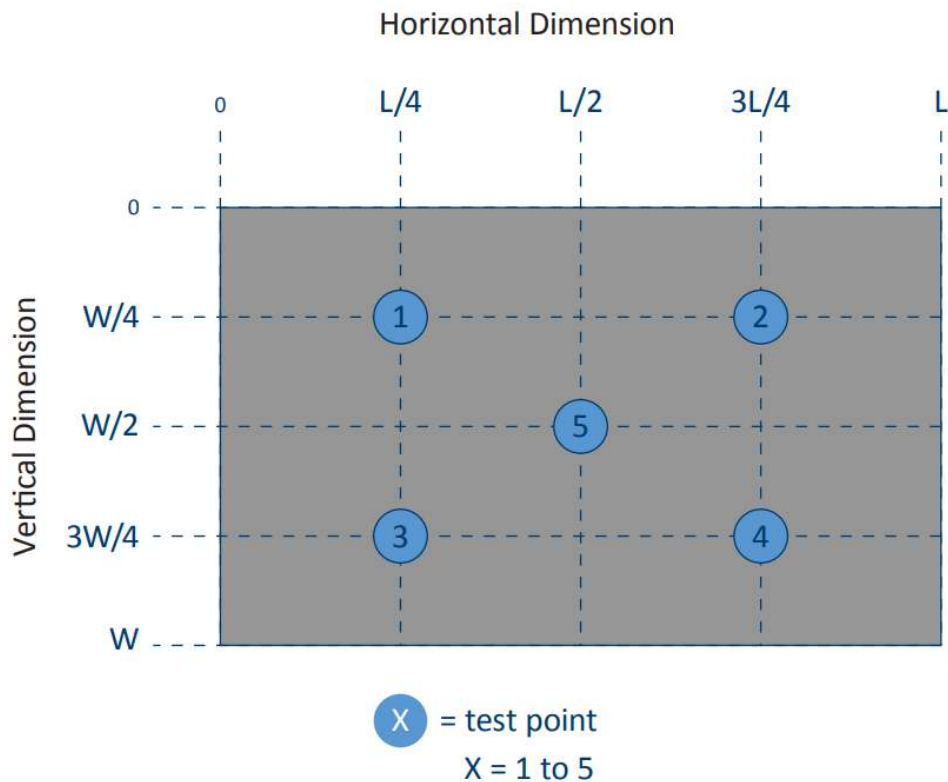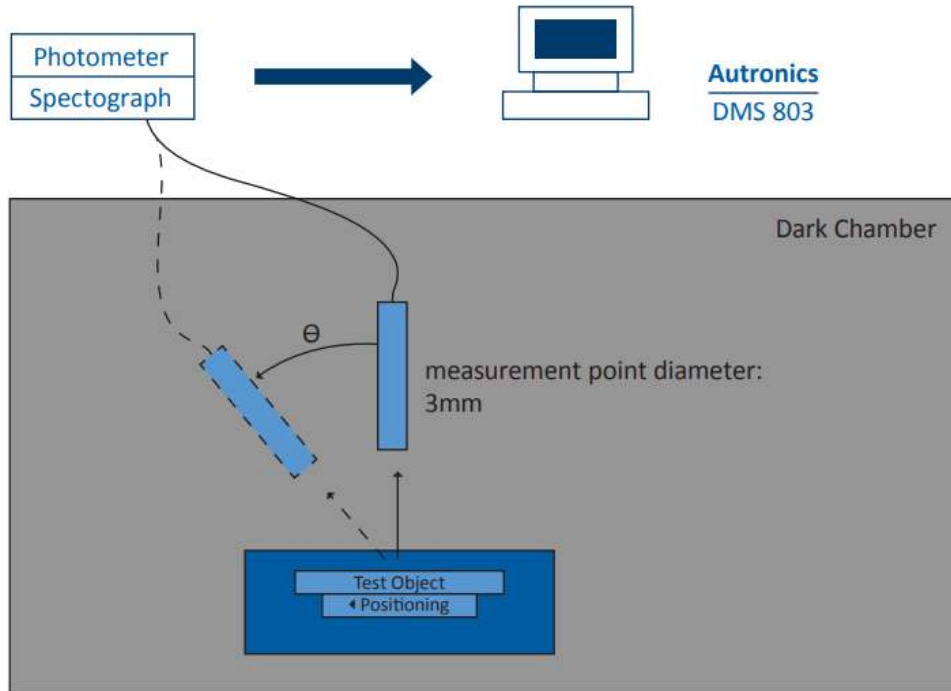
5. TFT Electrical Characteristics

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

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	V_{DD}	-0.3	5.0	V
Digital Interface Supply Voltage	V_{DDIO}	-0.3	V_{DD}+0.3	V
Analog Power Supply Voltage	AV_{DD}	-0.5	15	V
TFT Device ON Voltage	V_{GH}	-0.3	42	V
TFT Device OFF Voltage	V_{GL}	V_{GH}-42	0.3	V
Operating Temperature	T_{OP}	-10	+50	℃
Storage Temperature	T_{ST}	-20	+60	℃

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. 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	V_{DD}	3.0	3.3	3.6	V	
Digital Interface Supply Voltage	V_{DDIO}	3.0	3.3	3.6	V	
Analog Power Supply Voltage	AV_{DD}	10.3	10.5	10.7	V	
TFT Device ON Voltage	V_{GH}	--	18	--	V	
TFT Device OFF Voltage	V_{GL}	--	-7	--	V	
Common Electrode Driving Voltage	V_{COM}	--	4.45	--	V	
Normal Mode Current Consumption	I_{CC}	24	30	45	mA	Black Pattern
	IAV_{DD}	32	40	60	mA	Black Pattern
Level Input Voltage	V_{IH}	$0.7V_{DDIO}$	--	V_{DDIO}	V	
	V_{IL}	GND	--	$0.3V_{DDIO}$	V	
Level Output Voltage	V_{OH}	$0.8V_{DDIO}$	--	V_{DDIO}	V	
	V_{OL}	GND	--	$0.2V_{DDIO}$	V	

5.3 LED Backlight Characteristics

The backlight system is edge lighting type with 36 chips LED.

Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	I_F	162	180	198	mA	
Forward Voltage	V_F	9.3	9.9	10.5	V	
LCM Luminance	LV	400	--	--	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 = 180mA. The LED lifetime could be decreased if operating IL is larger than 180mA. The constant current driving method is suggested.

Backlight LED Circuit
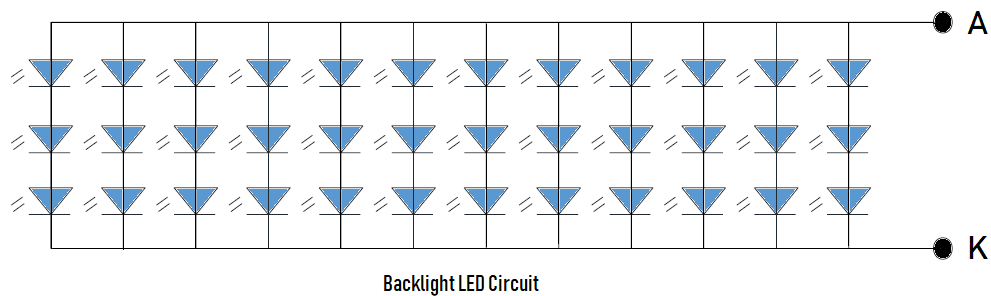
Note 3: Luminance Uniformity of these 9 points is defined as below:
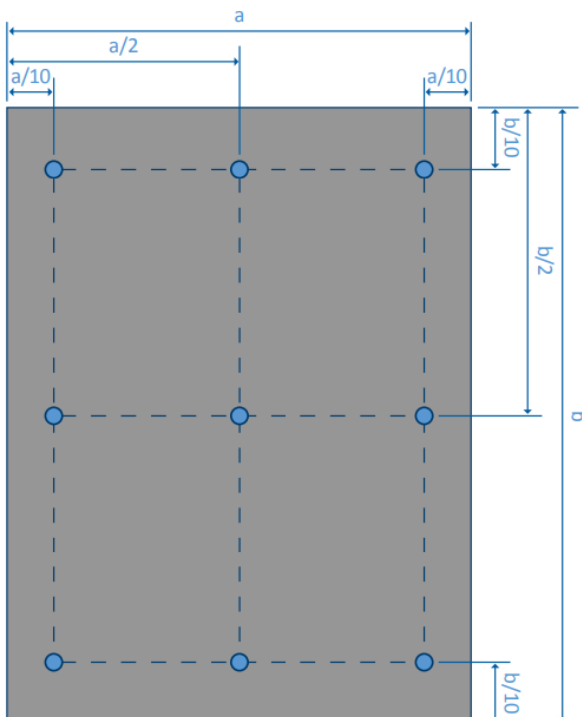
$$Luminance = \frac{(Total\ Luminance\ of\ 9\ points)}{9}$$

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

6. AC Timing Characteristics

6.1 Data Timing (Under frame rate is equal to 60Hz)

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Horizontal Display Area	thd	800	800	800	CLK	
CLK Frequency	fclk	--	40	50	MHz	
One Horizontal Line	th	862	1056	1200	CLK	
HS Pulse Width	thpw	1	--	40	CLK	
HS Back Porch	thb	46	46	46	CLK	
HS Front Porch	thfp	16	210	354	CLK	

Table 6.1: Horizontal Input Timing Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Vertical Display Area	tvd	600	600	600	th	
VS Period Time	tv	624	635	700	th	
VS Pulse Width	tvpw	1	--	20	th	
VS Back Porch	tvb	23	23	23	th	
VS Front Porch	tvfp	1	12	77	th	

Table 6.2: Vertical Input Timing Characteristics

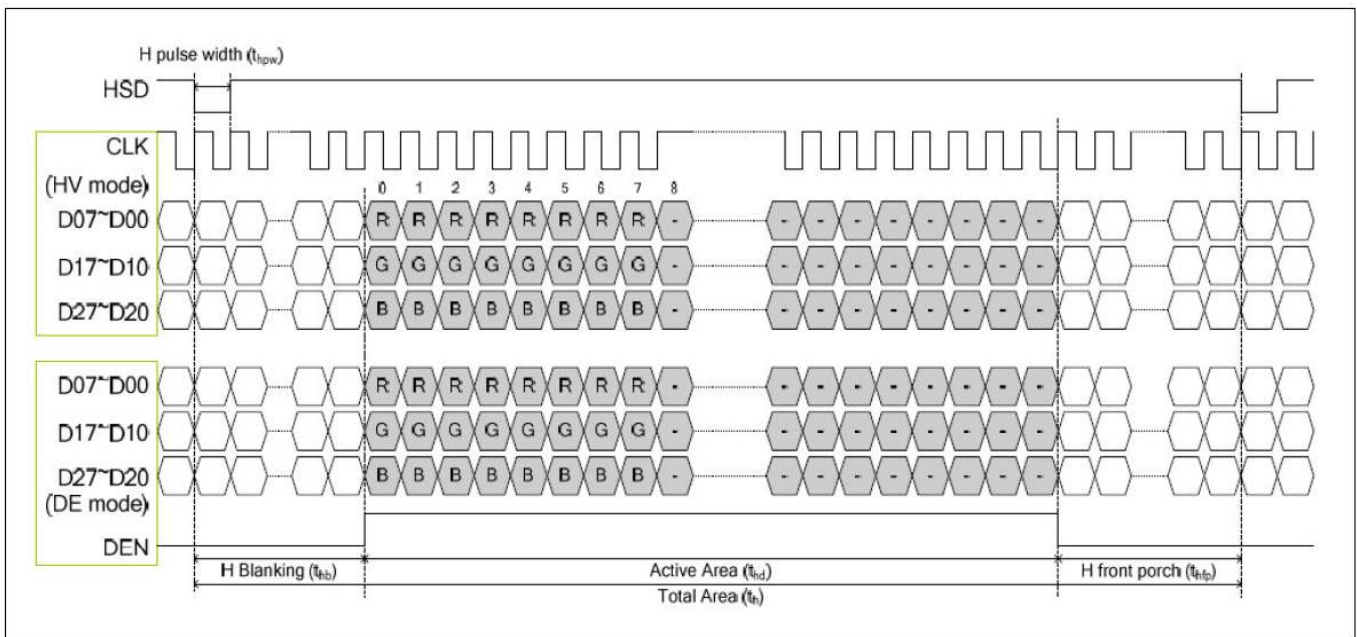*Note: CMO suggests using a frame rate of 60Hz for better performance.*

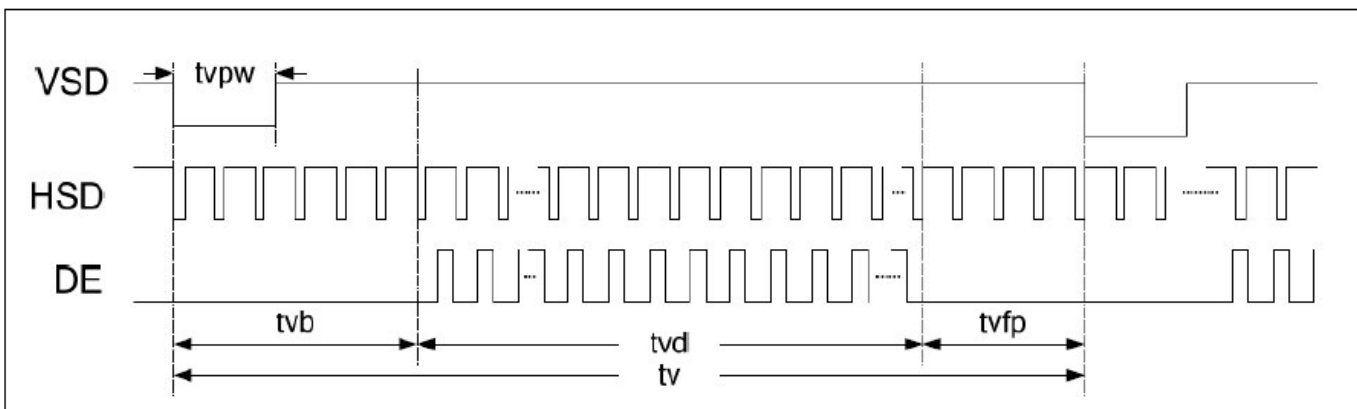*Figure 6.1: Horizontal Data Input Timing Diagram*

Figure 6.2: Vertical Data Input Timing Diagram

6.2 AC Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
HS Setup Time	That	8	--	--	ns
HS Hold Time	Thhd	8	--	--	ns
VS Setup Time	Tvst	8	--	--	ns
VS Hold Time	Tvhd	8	--	--	ns
Data Setup Time	Tdsu	8	--	--	ns
Data Hold Time	Tdhd	8	--	--	ns
DE Setup Time	Tesu	8	--	--	ns
DE Hold Time	Tehd	8	--	--	ns
VDD Power ON Slew Rate	TPOR	--	--	20	ms
RSTB Pulse Width	TRst	10	--	--	us
CLKIN Cycle Time	Tcph	20	--	--	ns
CLKIN Pulse Duty	Tcwh	40	50	60	%
Output Stable Time	Tsst	--	--	6	ns
Repair OPA Output Stable Time	TRsst	--	--	6	ns

Table 6.3: Interface Data Timing Characteristics

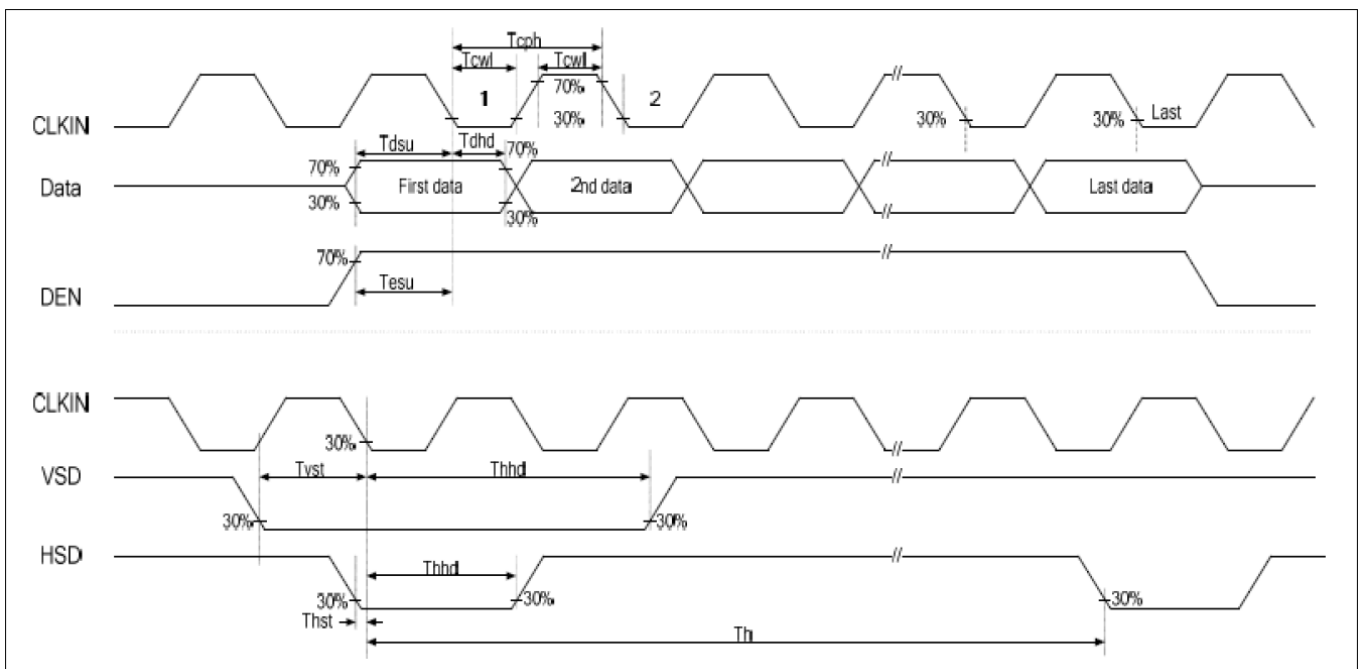*Figure 6.3: Input Clock and Data Timing Diagram*

7. CTP Electrical Characteristics

7.1 Absolute Maximum Rating

Characteristics	Symbol	Min	Max	Unit
Power Supply Voltage	V_{DD}	-0.3	3.47	V
I/O Digital Voltage	V_{DDIO}	-0.3	3.47	V
Operating Temperature	T_{OP}	-20	+70	℃
Storage Temperature	T_{ST}	-30	+80	℃

Table 7.1: CTP Absolute Maximum Rating Characteristics

NOTE: If used beyond the absolute maximum ratings, GT9271 may be permanently damaged. It is strongly recommended that the device be used within the electrical characteristics in normal operations. If exposed to the conditions not within the electrical characteristics, it may affect the reliability of the device.
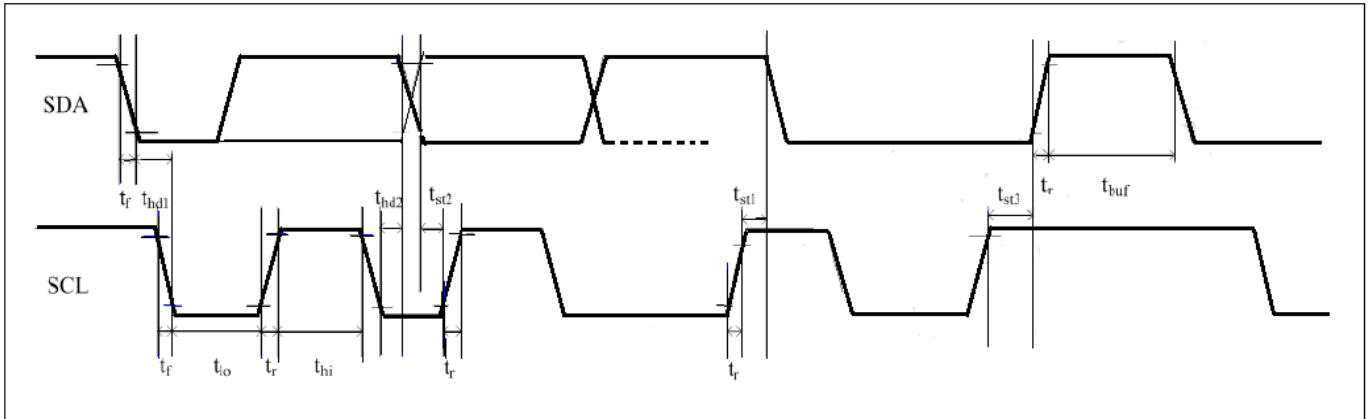
7.2 DC Electrical Characteristics (Ta=25˚C)

Characteristics	Symbol	Min	Typ.	Max	Unit
Digital Supply Voltage	V_{DD}	2.8	--	3.3	V
I/O Digital Supply Voltage	V_{DDIO}	1.8	--	3.3	V
Normal Operation Mode Current Consumption	I_{opr}	--	13	--	mA
Green Mode Current Consumption	I_{mon}	--	4.5	--	mA
Sleep Mode Current Consumption	I_{sip}	70	--	120	uA
Level Input Voltage	V_{IH}	0.75VDDIO	--	VDDIO+0.3	V
	V_{IL}	-0.3	--	0.25VDDIO	V
Level Output Voltage	V_{OH}	0.85VDDIO	--	--	V
	V_{OL}	--	--	0.15VDDIO	V

Table 7.2: CTP DC Electrical Characteristics

7.3   I2C Interface Characteristics

GT9271 provides a standard I2C interface for SCL and SDA to communicate with the host. GT9271 always serves as slave device in the system with all communication being initialized by the host. It is recommended that transmission rate be kept at or below 400kbps. The figure shown below is the I2C timing:

Parameter	Symbols	Condition	Min	Max	Units
SCL low period	t_{lo}		1.3		us
SCL high period	t_{hi}		0.6		us
SCL setup time for start condition	t_{st1}		0.6		us
SCL setup time for stop condition	t_{st3}		0.6		us
SCL hold time for start condition	t_{hd1}		0.6		us
SDA setup time	t_{st2}		0.1		us
SDA hold time	t_{hd2}		0		us

Table 7.3: I2C AC Characteristics, 1.8V interface voltage, 400kbps transmission rate, 2k pull-up resistor

Parameter	Symbols	Condition	Min	Max	Units
SCL low period	t_{lo}		1.3		us
SCL high period	t_{hi}		0.6		us
SCL setup time for start condition	t_{st1}		0.6		us
SCL setup time for stop condition	t_{st3}		0.6		us
SCL hold time for start condition	t_{hd1}		0.6		us
SDA setup time	t_{st2}		0.1		us
SDA hold time	t_{hd2}		0		us

Table 7.4: I2C AC Characteristics, 3.3V interface voltage, 400kbps transmission rate, 2k pull-up resistor

GT9271 supports two I2C slave addresses: 0xBA/0xBB and 0x28/0x29. The host can select the address by changing the status of Reset and INT pins during the power-on initialization phase. The configuration methods and timings are shown below:
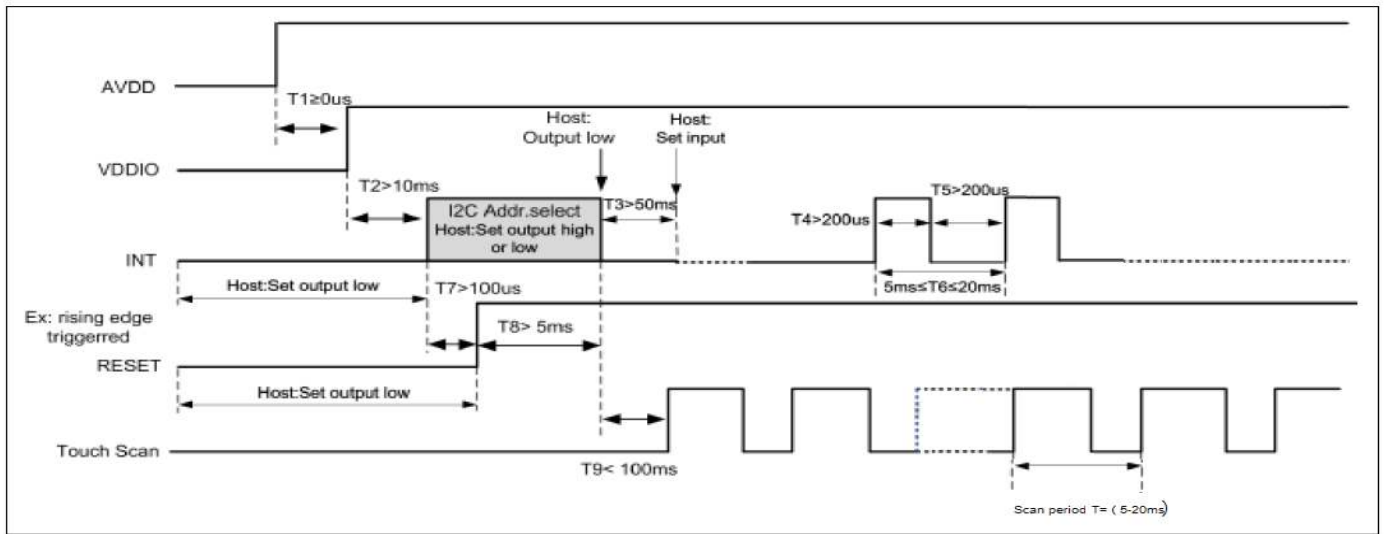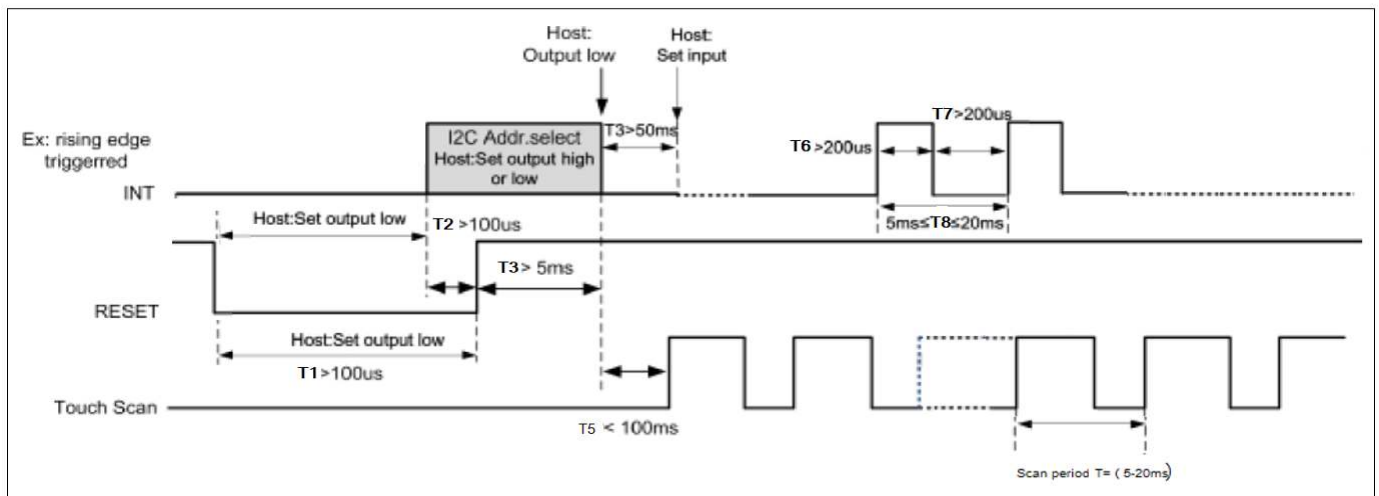

Figure 7.1: I2C Power on Timing

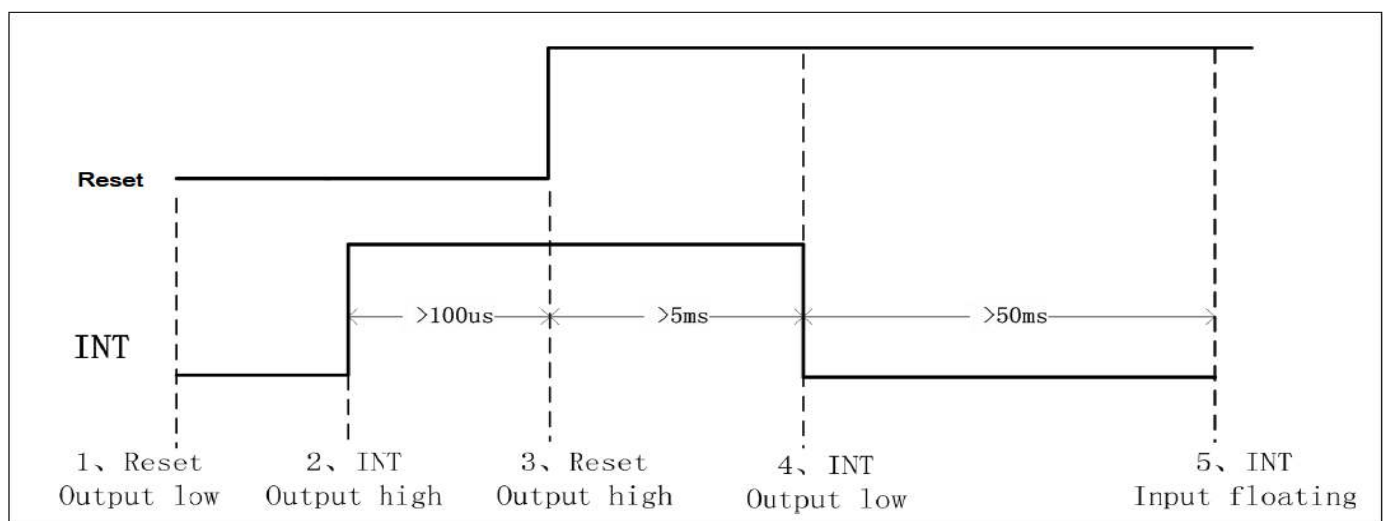

Figure 7.2: I2C Host Resetting Timing

Figure 7.3: Setting Slave Address to 0x28/0x29 Timing
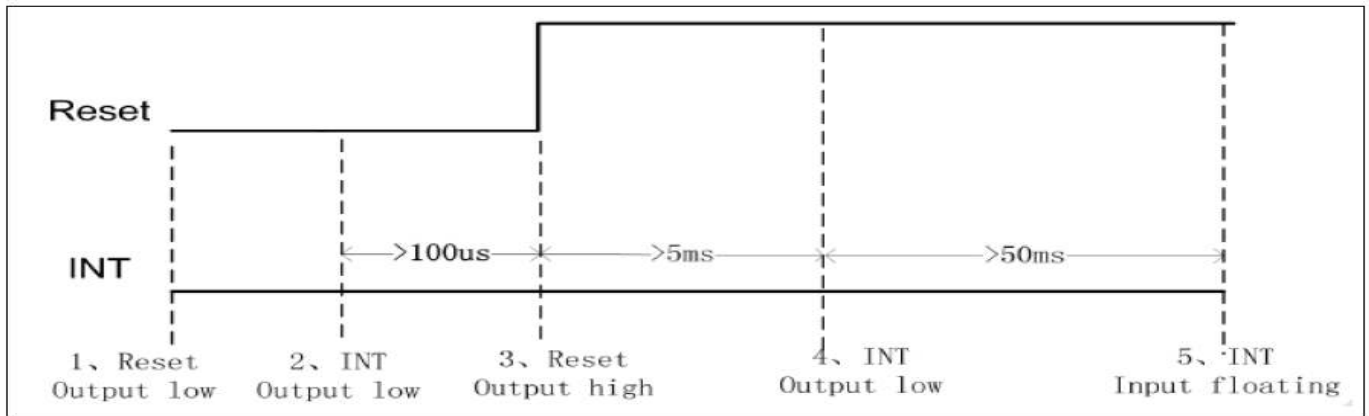
Figure 7.4: Setting Slave Address to 0xBA/0xBB Timing

Data Transmission *(ex. 0xBA/0xBB)*

Communication is always initiated by the host. Valid start condition is signaled by pulling SDA line from high to low when SCL is high. Data flow or address is transmitted after the start condition.

All slave devices connected to I2C bus should detect the 8-bit address issued after start condition and send the correct ACK. After receiving matching address, GT9271 acknowledges by configuring SDA line as output port and pulling SDA line low during the ninth SCL cycle. When receiving unmatched address, namely not 0xBA or 0xBB, GT9271 will stay in an idle state.

For data bytes on SDA, each of the 9 serial bits will be sent on nine SCL cycles. Each data byte consists of 8 valid data bits and one ACK or NACK bit sent by the recipient. The data transmission is valid when SCL line is high. When communication is completed the host will issue the stop condition. Stop condition implies the transition of SDA line from low to high when SCL is high.

Writing Data to GT9271

The diagram displays the timing sequence of the host writing data onto GT9271. First the host issues a start condition. The host sends 0xBA (address bits and R/W bit; R/W bit as 0 indicates write operation) to the slave device. After receiving ACK, the host sends the 16-bit register address (where writing starts) and the 8-bit data bytes (to be written onto the register)

The location of the register address pointer will automatically add 1 every write operation. When the host needs to perform write operations on a group of registers of continuous addresses it can write continuously. The write operation is terminated when the host issues the stop condition.

Reading Data from GT9271

The diagram below is the timing sequence of the host reading data from GT9271. The host issues the start condition and sends 0xBA (Address bits and R/W bit, R/W bit as 0 indicates write operation) to the slave device. After receiving ACK, the host sends the 16-bit register address (where reading starts) to the slave device. Then the host sets register addresses which need to be read.
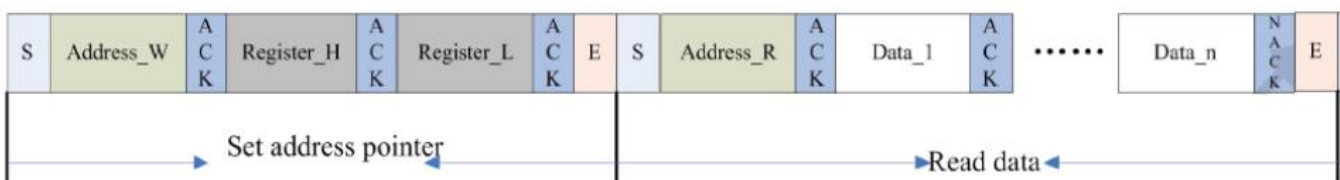
The host issues the start condition once again and sends 0xBB (read operation). After receiving ACK, the host starts to read the data. GT9271 also supports continuous read operation. When receiving a byte of data, the host sends an ACK signal indicating successful reception. After receiving the last byte of data, the host sends a NACK signal followed by a STOP condition which terminates communication.

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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.