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

TFT Display Module

Part Number

E70RD-FS400-C

Overview:

- 7.0-inch TFT: 119.72x176.78mm
- 1200 1920
- 4-Lane MIPI @
- Special u erature Range
- All View
- Transmissive
- Capacitive Touch Panel
- 400 NITS
- Controllers: R69429, FT5436
- 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 a backlight unit. The resolution of the 7.0" TFT-LCD contains 1200(RGB)x1920 pixels and can display up to 16.7M colors.

TFT Features

Display Colors: 16.7M

Interface: MIPI

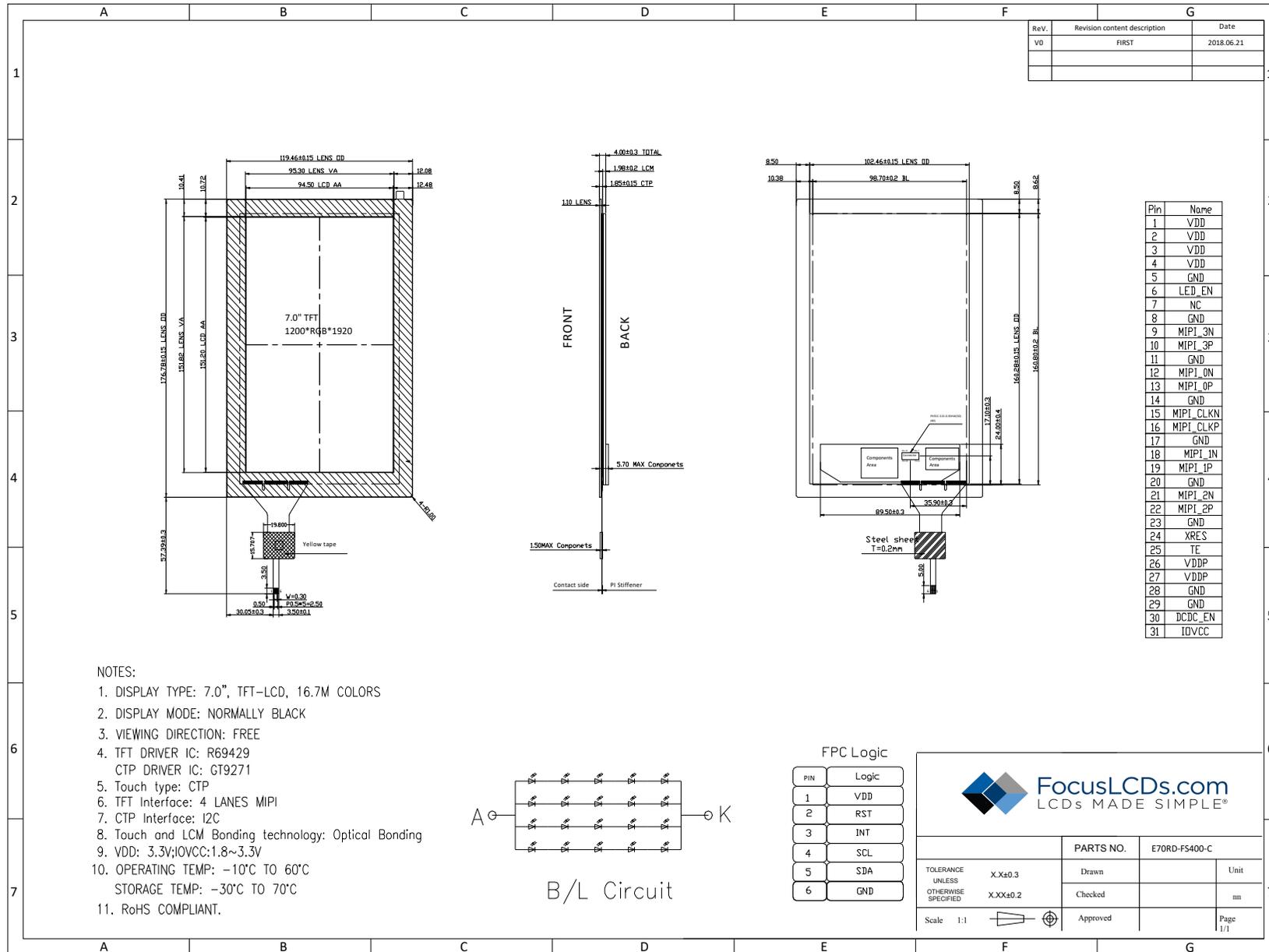
Touch Panel: Capacitive

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display area (AA)	94.5(H) x 151.2(V) (7.0 inch)	mm	-
Driver Element	TFT active matrix	-	-
Display Colors	16.7M	colors	-
Number of pixels	1200(RGB)x1920	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel Pitch	0.07875(H)x0.07875(V)	mm	-
Viewing angle	ALL	o'clock	-
TFT Controller IC	R69429	-	-
CTP Driver IC	GT9271	-	-
TFT Interface	4-Lane MIPI	-	-
CTP Interface	I2C	-	-
CTP Structure	G+G	-	-
CTP Slave Address	0x5D(7bit) or 0x14(7bit)	-	-
CTP Bonding	Tape	-	-
Touch Mode	Five Points and Gestures	-	-
Display mode	Transmissive/ Normally Black	-	-
Operating temperature	-10~+60	°C	-
Storage temperature	-30~+70	°C	-
Recommended Resolution	1080(RGB)x1920	pixels	55-60Hz

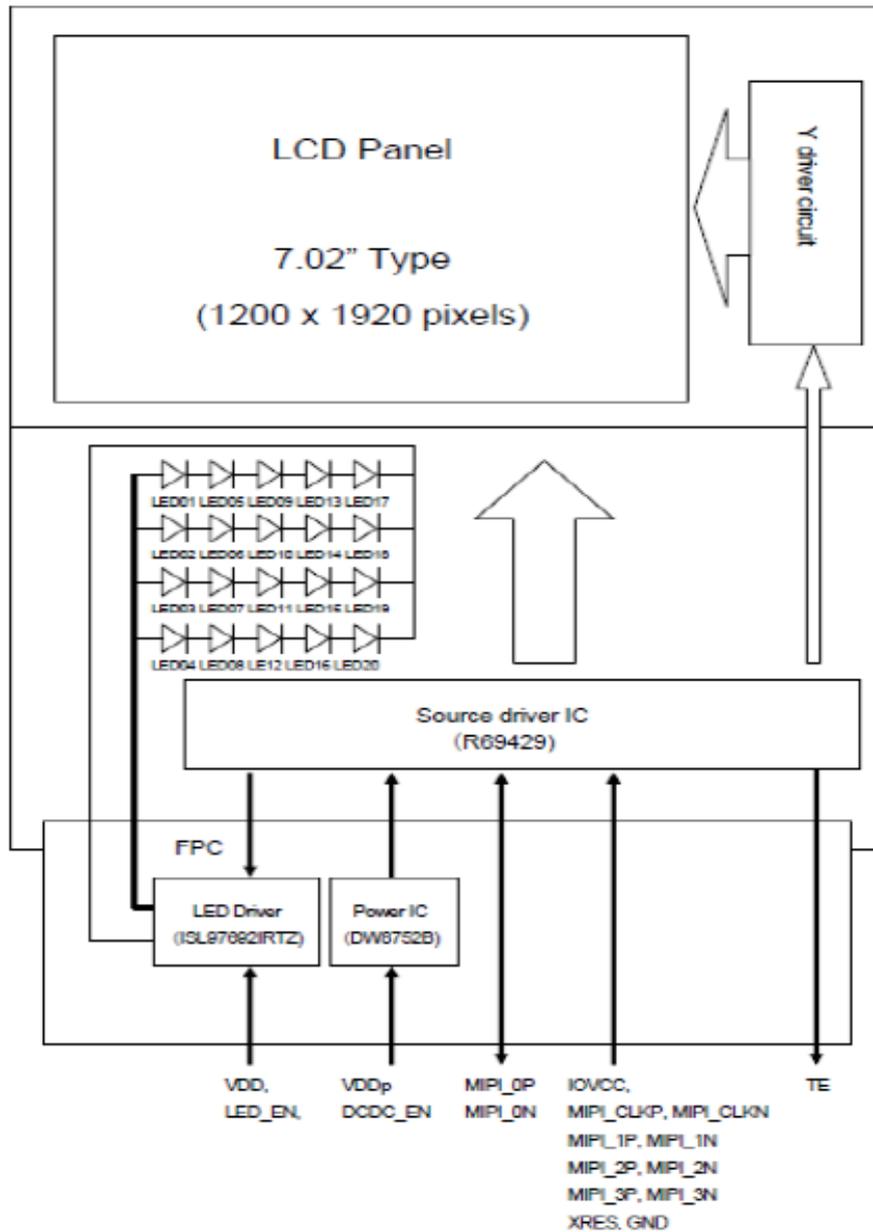
Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module Size	Horizontal (H)		119.46		mm	-
	Vertical (V)		176.78		mm	-
	Depth (D)		4.0		mm	-
	Weight		--		g	

1. Outline Dimensions



2. Block Diagram



3. Input TFT Terminal Pin Assignment

Recommended TFT Connector: FH41-31S-0.5SH(05)

Recommended CTP Connector: FH12-8S-0.5SH(55)

NO.	Symbol	Description	I/O
1	VDD	LED power supply (3-5V)	P
2	VDD		P
3	VDD		P
4	VDD		P
5	GND	Ground	P
6	LED_EN	Backlight enable. Active High.	P
7	NC		
8	GND	Ground	P
9	D3N	MIPI DSI differential data pair (Data lane 3)	I/O
10	D3P		I/O
11	GND	Ground	P
12	D0N	MIPI DSI differential data pair (Data lane 0)	I/O
13	D0P		I/O
14	GND	Ground	P
15	CLKN	MIPI DSI differential clock pair	I/O
16	CLKP		
17	GND	Ground	P
18	D1N	MIPI DSI differential data pair (Data lane 1)	I/O
19	D1P		
20	GND	Ground	P
21	D2N	MIPI DSI differential data pair (Data lane 2)	I/O
22	D2P		
23	GND	Ground	P
24	RESET	Reset signal of the device, active low.	O
25	TE	Tearing effect signal	O
26	VDDp	Power Supply (3-5V)	P
27	VDDp	Power Supply (3-5V)	P
28	GND	Ground	P
29	GND	Ground	P
30	DCDC_EN	Power supply IC enable, active high	P
31	IOVCC	Power supply for LCM (1.8V)	P

I: Input, O: Output, P: Power

3.1 CTP

NO.	Symbol	Description	I/O
1	VDD	Supply Voltage	P
2	RST	External reset pin, active low	I
3	INT	External interrupt pin	I
4	SCL	I2C clock input	I
5	SDA	I2C data input and output	I/O
6	GND	Ground	P

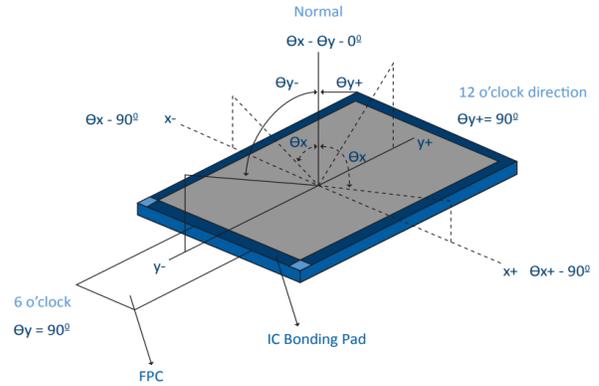
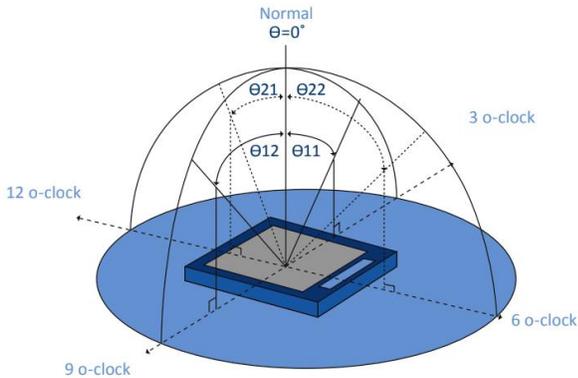
4. LCD Optical Characteristics

4.1 Optical Specifications

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note	
Color Gamut	S%	$\theta=0$ Normal viewing angle	--	71.5	--	%	(3)	
Contrast Ratio	CR		700	1000	--	%	(2)	
Color Filter Chromaticity	White		W_x	0.27	0.31	0.35	degree	(5)(6)
			W_y	0.29	0.33	0.37		
	Red		R_x	0.60	0.64	0.68		
			R_y	0.29	0.33	0.37		
	Green		G_x	0.27	0.31	0.35		
			G_y	0.57	0.61	0.65		
	Blue		B_x	0.11	0.15	0.19		
			B_y	0.01	0.05	0.09		
Viewing Angle	Hor.	Θ_L	80	--	--	degree	(1)(6)	
		Θ_R	80	--	--			
	Ver.	Θ_T	80	--	--			
		Θ_B	80	--	--			
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.

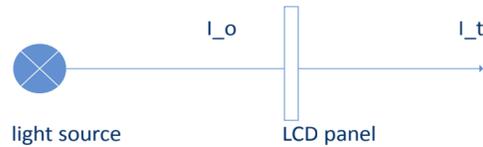


(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

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

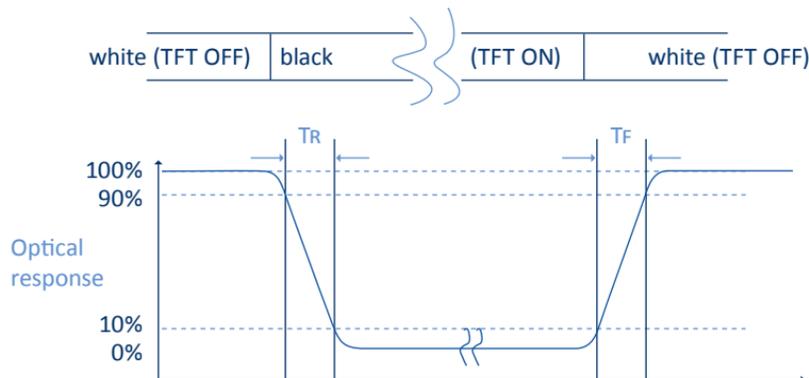
(3) Definition of transmittance (T%): The transmittance of the panel including the polarizers is measured with electrical driving. The equation for transmittance Tr is:

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



I_o = the brightness of the light source.
 I_t = the brightness after panel transmission

(4) Definition of Response Time (T_r , T_f): The rise time ' T_r ' 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 ' T_f ' 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.

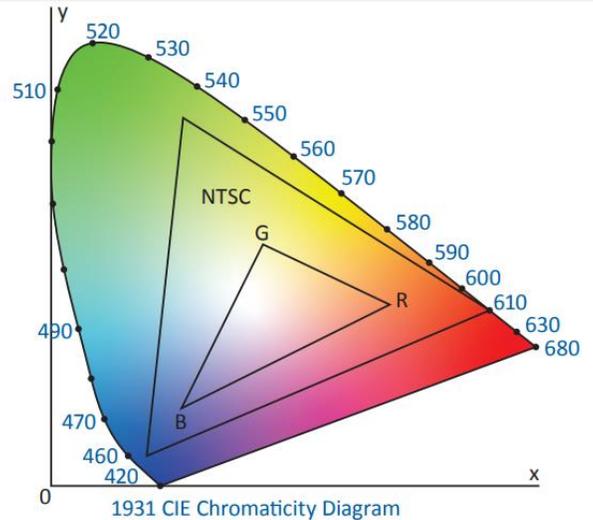
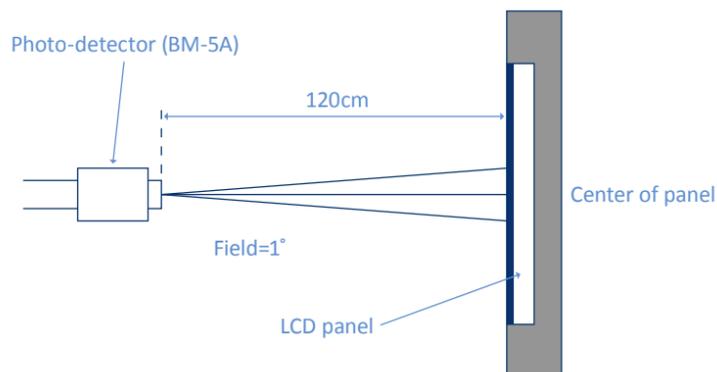
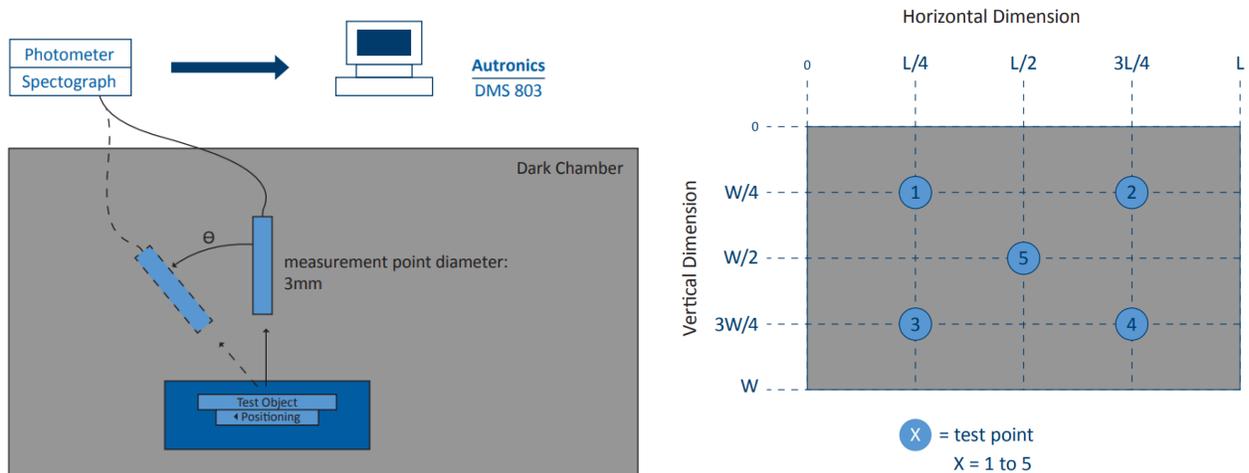


Fig. 1931 CIE chromacity diagram

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

(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.



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
Power Supply Voltage Logic	IOVCC	-0.3	4.6	V
RES Input Signal Voltage	Vi	-0.3	IOVCC+0.3	V
DSI Input Signal Voltage	ViDSI	-0.3	1.8	V
PWR Input Signal Voltage	ViPWR	-0.3	5.5	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
Analog Supply Voltage	VDD	3.0	--	5.0	V	
	VDDp	3.0	--	5.0		
Logic Supply Voltage	IOVCC	1.70	1.8	1.90	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	

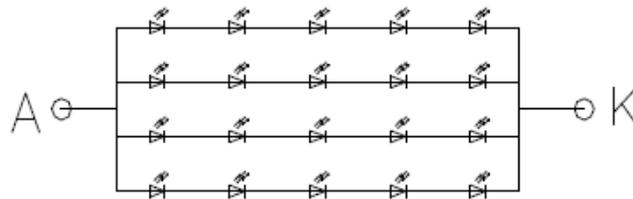
5.3 LED Backlight Characteristics

The backlight system is edge lighting type with 20 chips LED.

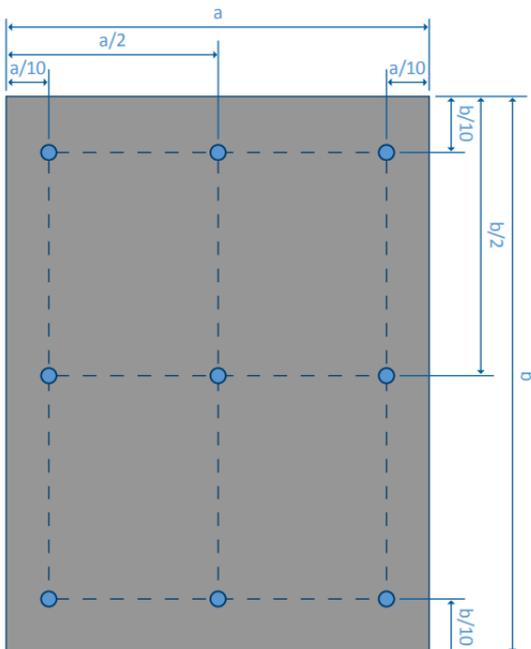
Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	I _F	160	180	--	mA	
Forward Voltage	V _F	--	6	--	V	
LCM Luminance	LV	440	400	--	cd/m ²	Note 3
LED lifetime	Hr	50000	--	--	hour	Note1 & 2
Uniformity	AVg	80	--	--	%	Note 3

Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: T_a=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 T_a=25°C and IL= 180mA



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

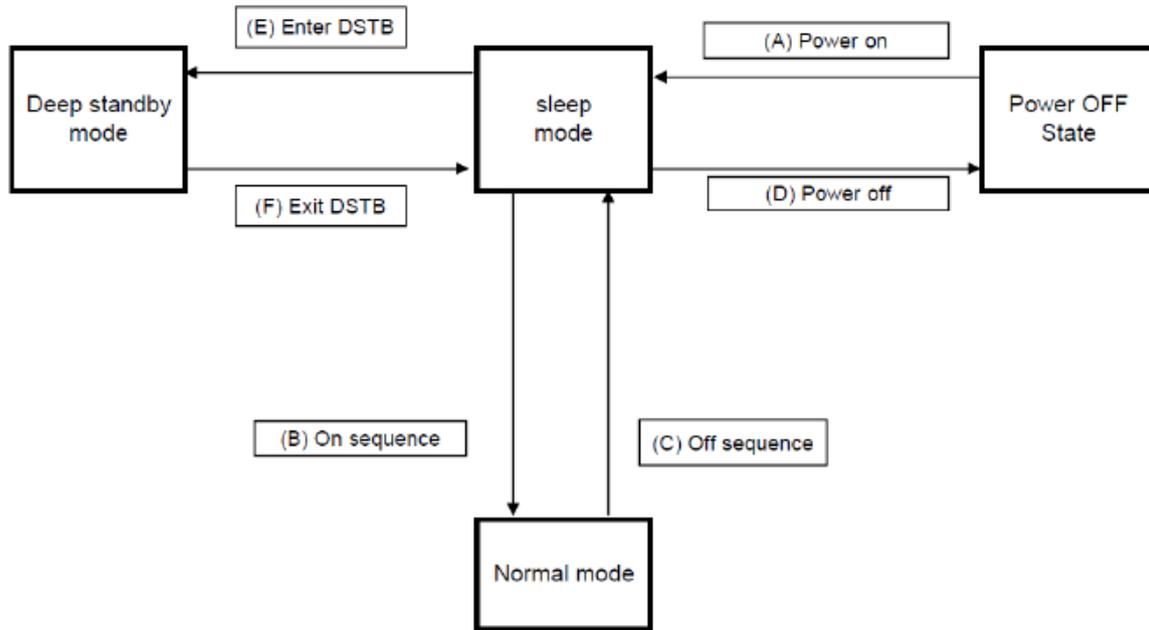


$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

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

6. Command Sequence

(1200RGBx1920, R69429, MIPI 4lane)



7. CTP Specification

7.1 Electrical Characteristics

7.1.1 Absolute Maximum Rating

Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	VDD	2.66	3.47	V	1
I/O Digital Voltage	VDDIO	1.8	3.6	V	1
Operating Temperature	T	-10	+60	°C	-
Storage Temperature	T _{ST}	-30	+70	°C	-

Note: If used beyond the absolute maximum ratings, GT9271 may 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.

7.1.2 DC Electrical Characteristics (Ta=25°C)

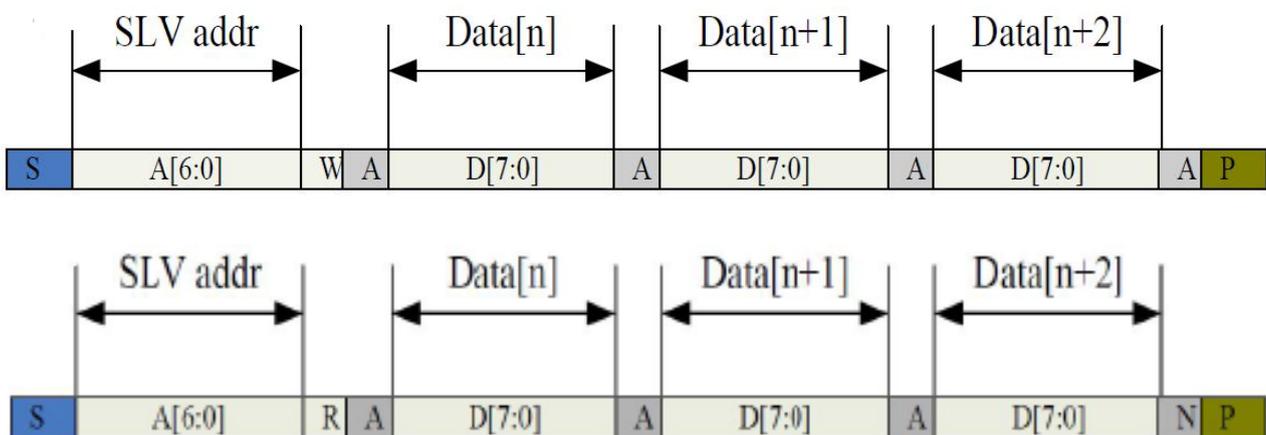
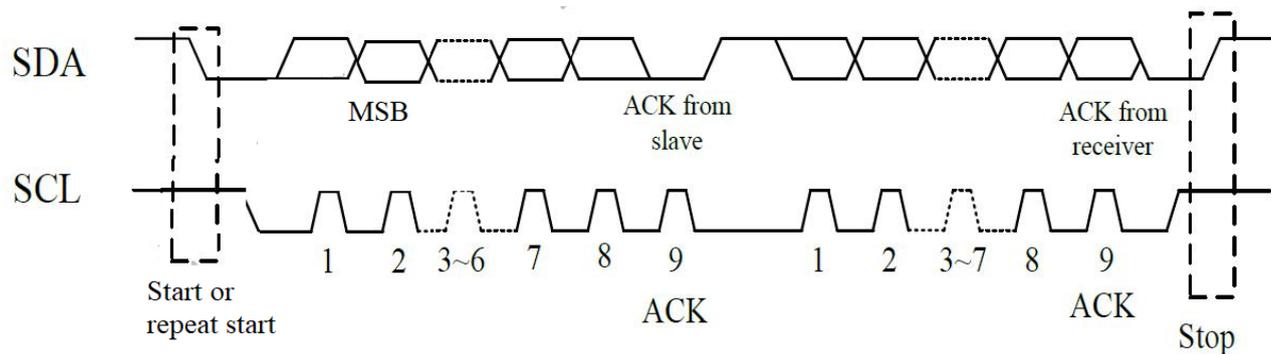
Item	Symbol	Condition	Min	Typ.	Max	Unit	Note
Digital supply voltage	VDD		2.7	--	3.6	V	
I/O Leakage Current	ILI		-1	--	1	uA	
Normal operation mode current consumption	I _{OPr}	VDD=2.8V Ta=25°C MCLK=17.5M Hz	--	11	--	mA	
Monitor mode current consumption	I _{mon}		--	0.43	--	mA	
Sleep mode current consumption	I _{sip}		70	--	120	uA	
Level input voltage	V _{IH}		0.7IOVCC		IOVCC	V	
	V _{IL}		-0.3		0.3IOVCC	V	
Level output voltage	V _{OH}	I _{OH} =-0.1mA	0.7IOVCC			V	
	V _{OL}	I _{OL} =0.1mA			0.3IOVCC	V	

7.1.3 AC Characteristics

Item	Symbol	Test Condition	Min	Typ.	Max	Unit	Note
OSC clock 1	fosc1	VDDA=2.7V; Ta=25°C	59	60	61	MHz	
I/O output rise time	T _{txr}	VDDA=2.7V; Ta=25°C	-	14	-	ns	
I/O output fall time	T _{txf}	VDDA=2.7V; Ta=25°C	-	14	-	ns	

7.1.4 I2C Interface

The I2C is always configured in the slave mode. The data transfer format is shown below.



The following table lists the meanings of the mnemonics used in the above figures.

Mnemonics	Description
S	I2C start or I2C restart
A [6:0]	Slave address
R/W	Read/Write bit, '1' for read, '0' for write
A(N)	ACK(NACK)
P	Stop: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

I2C Interface Timing Characteristics

Parameter	Min	Max	Unit
SCL frequency	0	400	kbps
Bus free time between a stop and start condition	1.3	-	us
Hold time (repeated) start condition	0.6	-	us
Data setup time	0.1	-	ns
Setup time for a repeated start condition	0.6	-	us
Setup time for stop condition	0.6	-	us

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.