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MODEL NO : ET070FH01-OT

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2022-11-23

☐ Preliminary Specification

☒ Final Product Specification

Customer : _____

Approved by	Notes

Youri Confirmation

Prepared by	Reviewed by	Approved by
John	Johnny	Wang

Revision History

[illegible]

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* 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 module is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 7.0" TFT-LCD contains 1080x1920 pixels, and can display up to 16.7M colors.

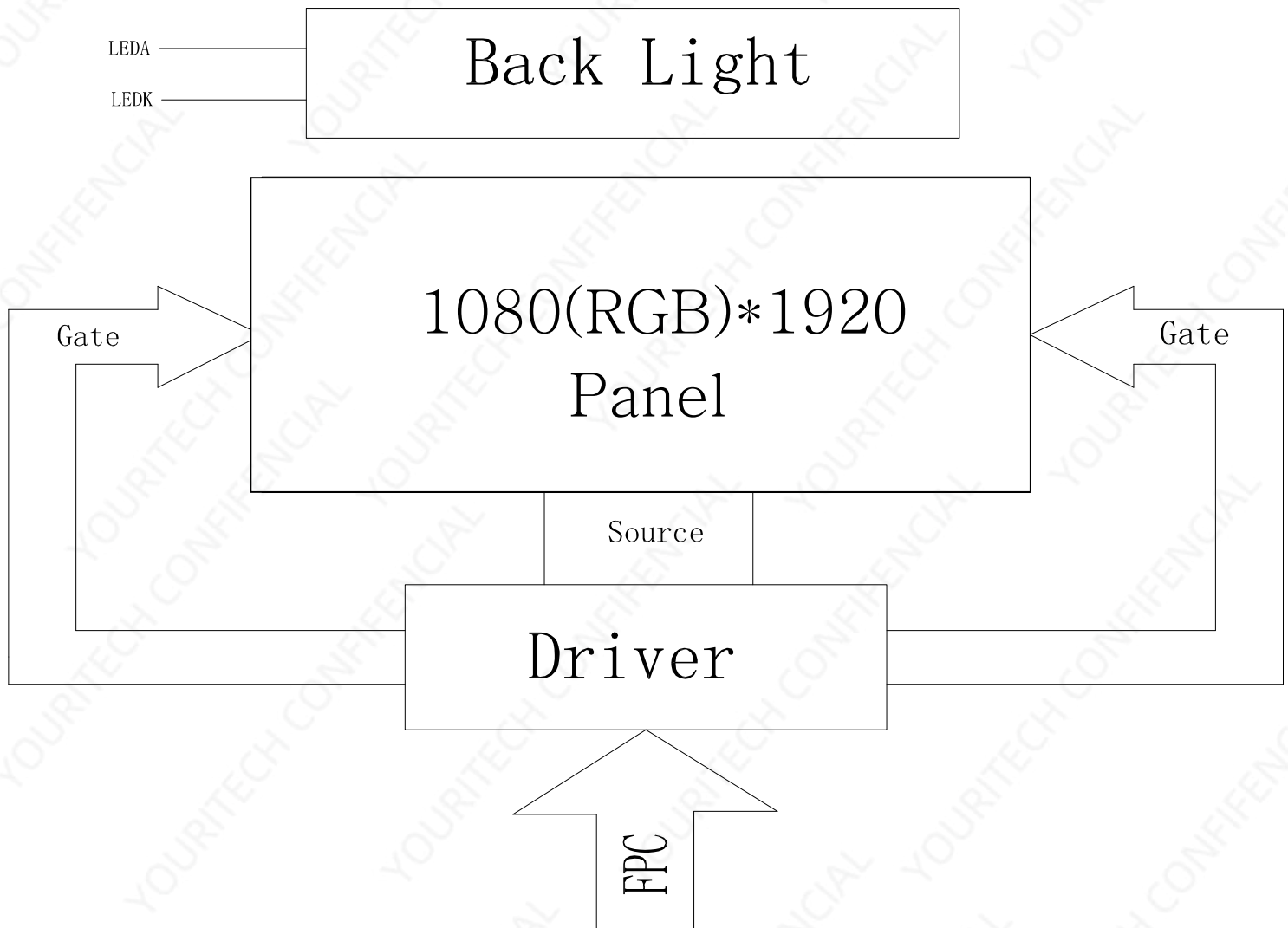
* Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	85.21(H)*151.2(V)	mm	
Driver element	TFT active matrix	-	
Display colors	16.7M	colors	
Number of pixels	1080(RGB)*1920	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.02625(H)*0.07875(V)	mm	
Viewing angle	Free	o'clock	
Controller IC	/	-	
LCM Interface	4-Lane MIPI	-	
Display mode	Transmissive /Normally Black	-	
Operating temperature	-10~+60	°C	
Storage temperature	-20~+70	°C	

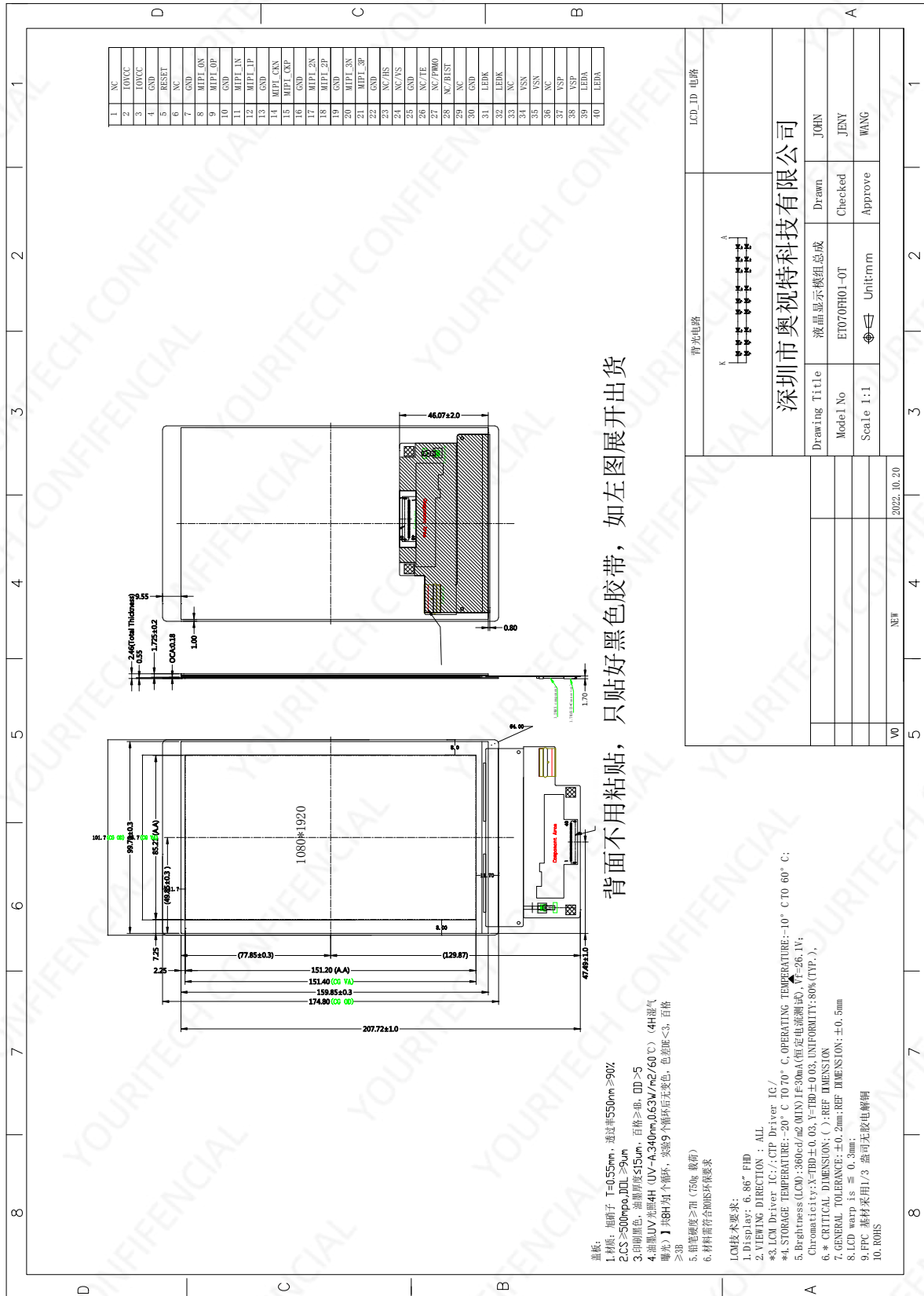
* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	99.70	-	mm	
	Vertical(V)	-	159.85	-	mm	
	Depth(D)	-	1.730	-	mm	
Weight		-	TBD	-	g	

1. Block Diagram



2. Outline dimension



3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	NC	No connected	
2	IOVCC	A power supply for the I/O circuit. 1.8V	P
3	IOVCC	A power supply for the I/O circuit. 1.8V	P
4	GND	Ground	
5	RESET	Device reset signal.	I
6	NC	No connected	--
7	GND	Ground	
8	MIPI_0N	MIPI Negative data signal (-)	I/O
9	MIPI_0P	MIPI Positive data signal (+)	I/O
10	GND	Ground	
11	MIPI_1N	MIPI Negative data signal (-)	I/O
12	MIPI_1P	MIPI Positive data signal (+)	I/O
13	GND	Ground	
14	MIPI_CKN	MIPI Negative clock signal (-)	I/O
15	MIPI_CKP	MIPI Positive clock signal (+)	I/O
16	GND	Ground	
17	MIPI_2N	MIPI Negative data signal (-)	I/O
18	MIPI_2P	MIPI Positive data signal (+)	I/O
19	GND	Ground	
20	MIPI_3N	MIPI Negative data signal (-)	I/O
21	MIPI_3P	MIPI Positive data signal (+)	I/O
22	GND	Ground	
23	HS	No connected	
24	VS	No connected	
25	GND	Ground	
26	NC/TE	No connected	
27	PWMO	No connected	
28	NC/BIST	No connected	
29	NC	No connected	
30	GND	Ground	
31	LED-K	LED Cathode	P
32	LED-K	LED Cathode	P
33	NC	No connected	
34	VSN	Negative step-up voltage	

35	VSN	Negative step-up voltage	
36	NC	No connected	
37	VSP	Positive step-up voltage	
38	VSP	Positive step-up voltage	
39	LED-A	LED anode	P
40	LED-A	LED anode	P

4. LCD Optical Characteristics

4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	$\Theta=0$ Normal viewing angle	1000	2000	--		(2)
Response time	Rising	T_{R+T_F}		--	21	50	msec	(3)
	Falling			--				
Color Gamut		S(%)			50		%	
Color Filter Chromaticity	White	W_X		-0.03	0.310	+0.03		(4)
		W_Y			0.321			CF glass
Viewing angle	Hor.	Θ_L	CR>10	--	80	--		(1)
		Θ_R		--	80	--		
	Ver.	Θ_U		--	80	--		
		Θ_D		--	80	--		
Option View Direction		Free						

4.2 Measuring Condition

- Measuring surrounding: dark room
- Ambient temperature: $25 \pm 2^\circ\text{C}$
- 15min. warm-up time.

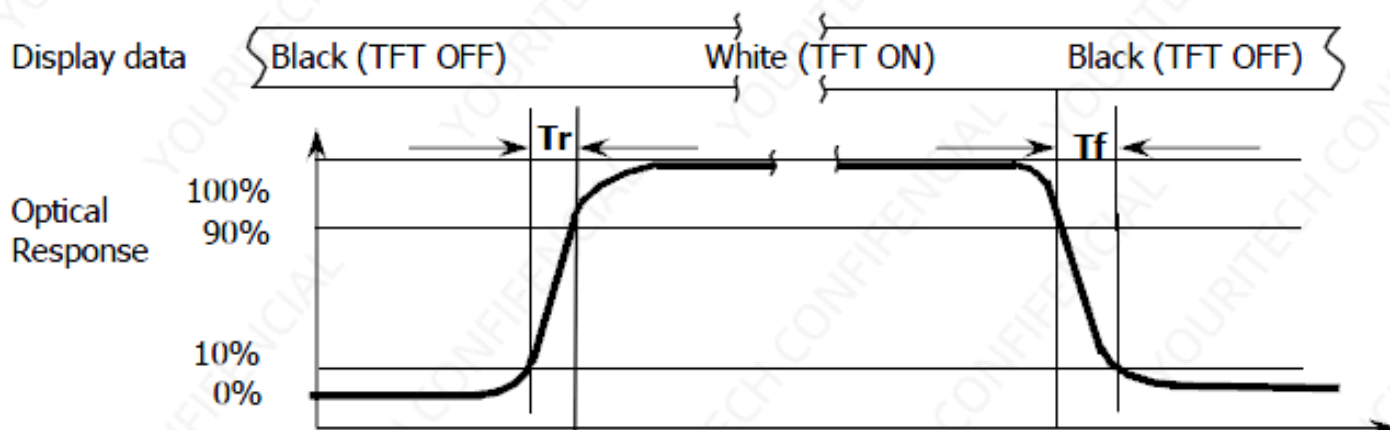
4.3 Measuring Equipment

Note :

1. 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 (see FIGURE 1).
2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

Note3



Note4

The color chromaticity coordinates specified 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.

5. Electrical Characteristics

5.1 Absolute Maximum Rating

Item	Symbol	Min.	Max.	Unit	Remark
Input power supply	IOVCC	-0.3	3.6	V	
Analog power supply	VSP	-0.3	6.5	V	VSP-AGND
	VSN	-0.3	6.5	V	AGND-VSN

Note 1: If the module exceeds the absolute maximum ratings, it may be damaged permanently. Also, if the module operates with the absolute maximum ratings for a long time, the reliability may drop.

5.2 DC Electrical Characteristics

a. Typical Operation Condition (GND = 0V)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Digital Power Supply		IOVCC	1.7	1.8	1.9	V	
Analog Power Supply		VSP	5.3	5.5	5.7	V	
		VSN	-5.7	-5.5	-5.3	V	
Input Signal Voltage	H Level	V _{IH}	0.7*IOVCC	-	IOVCC	V	
	L Level	V _{IL}	GND	-	0.3* IOVCC	V	
Output Signal Voltage	H Level	V _{OH}	0.8* IOVCC	-	IOVCC	V	
	L Level	V _{OL}	GND	-	0.2* IOVCC	V	

5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 21 chips LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F		30	--	mA	
Forward Voltage	V_F	--	26.1	--	V	
LCM Luminance	LV	-	360	--	cd/m ²	Note3
LED life time	Hr	--	20000	--	Hour	Note1,2
Uniformity	Avg	--	80	--	%	Note3

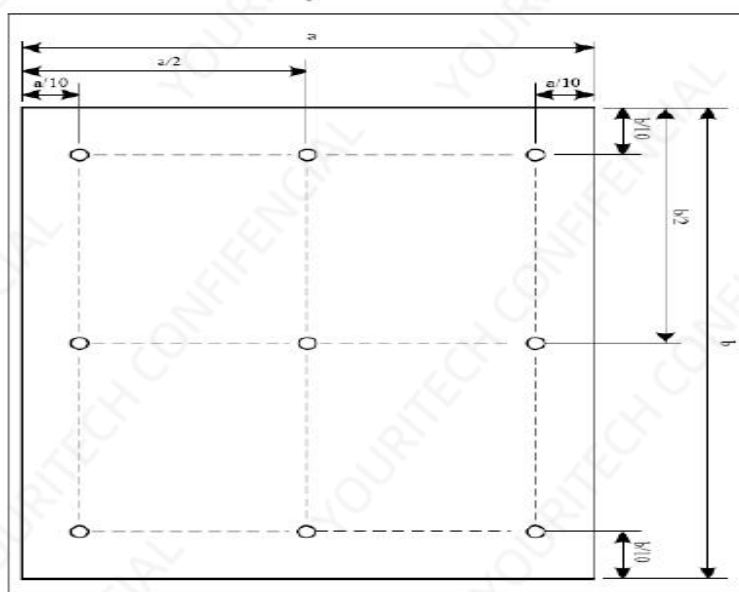
Note1: LED life time (Hr) can be defined as the time in which it continues to operate under the condition:

$T_a=25\pm3\text{ }^{\circ}\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at

$T_a=25^{\circ}\text{C}$ and $IL=140\text{mA}$. The LED lifetime could be decreased if operating IL is larger than 140mA. The constant current driving method is suggested.

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



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

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

6. AC Characteristics

6.1 Timings for DSI Video mode

Table 67 Vertical Display Timing (Video Mode, RM = 1h, DM = 3h, Method-2)

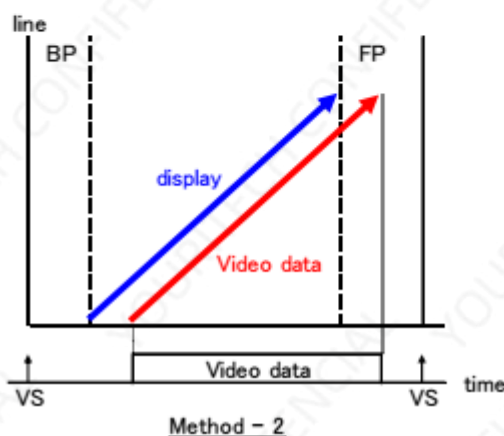
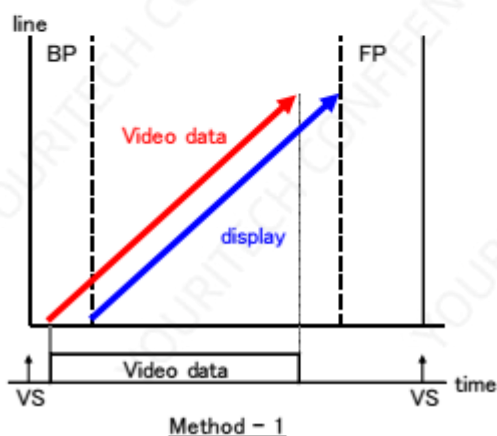
Item	Symbol	Condition	Unit	Min.	Typ.	Max.	Notes
Vertical cycle	VP		Line	1448	1928	1928	
Vertical low pulse width	VS		Line	1	1	-	See
Vertical front porch	VFP		Line	4	-	-	
Vertical back porch	VBP		Line	BP+3	-	-	See
Vertical data start point	-	VS+VBP	Line	BP+4	-	-	See
Vertical blanking period	VL	VBP+VFP	Line	BP+7	-	-	See
Vertical active area	Vadr		Line	1440	1920	1920	

Note: "VS + VBP" is set as back porch by BP register.

1 line : prescribed by HSYNC (when RM = 2'h0, DM = 4'h1)

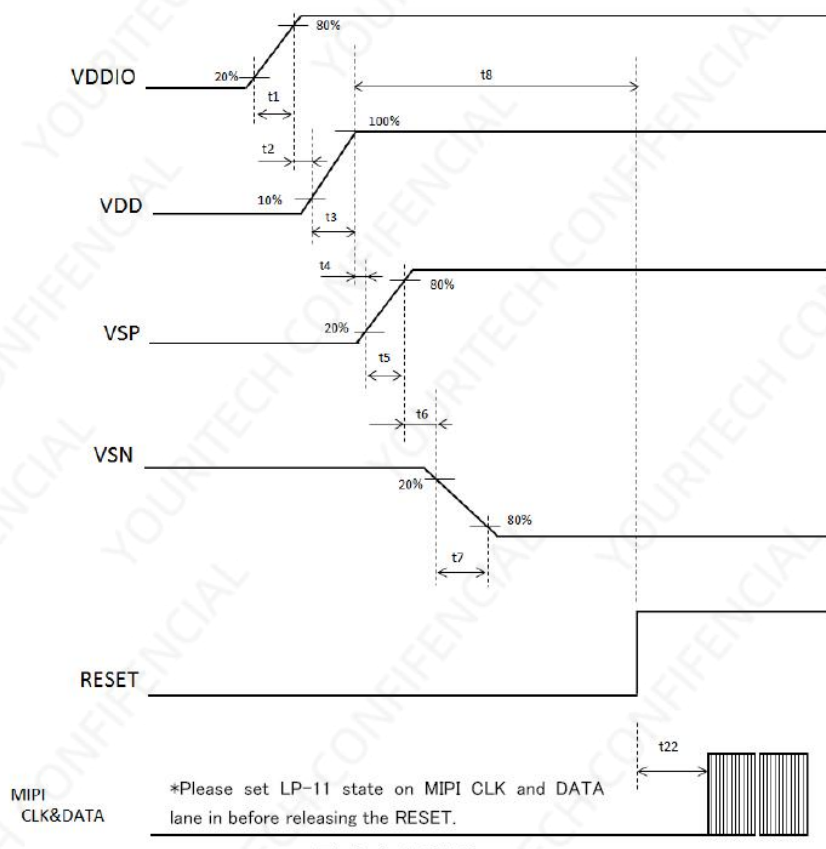
prescribed by RTN setting (when RM = 2'h1, DM = 4'h3)

BP : register setting

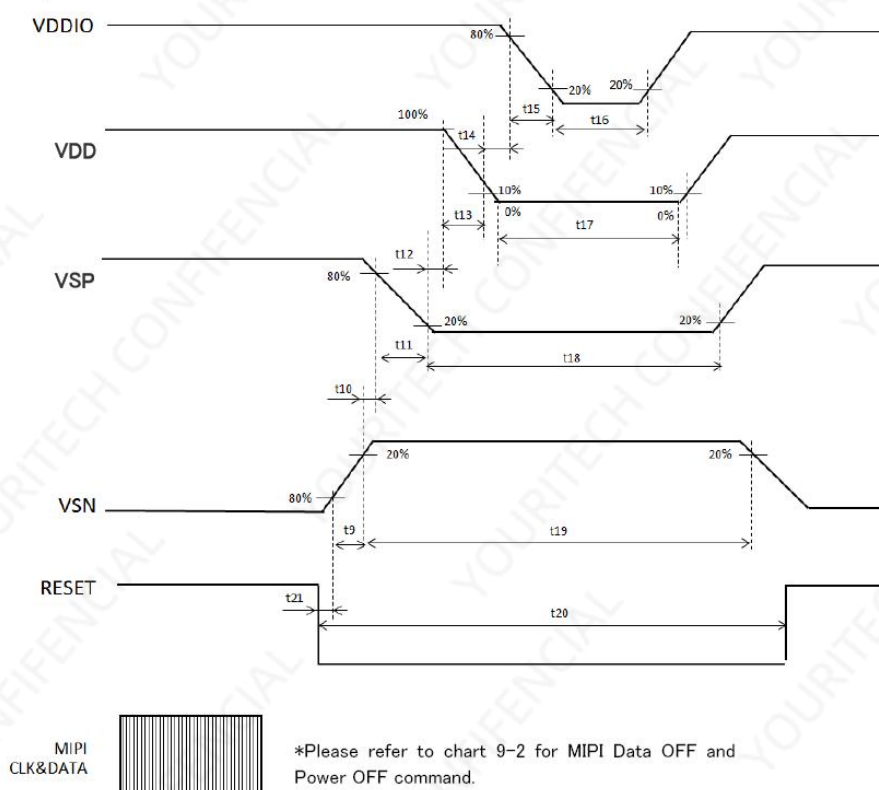


6.2 ON/OFF timing

ON Sequence



OFF Sequence $\Delta 4$



Item		Min	Typ	Max	Unit	Item		Min	Typ	Max	Unit
VDDIO 20%→80%	t1	0.2	1	—	ms	VDD 100%→10%	t13	0.2	1	—	ms
VDDIO ↑ (80%) → VDD ↓ (10%)	t2	0	1	—	ms	VDD ↓ (10%) → VDDIO ↓ (80%)	t14	0	1	—	ms
VDD 10%→100%	t3	0.2	1	80	ms	VDDIO 80%→20%	t15	0.2	1	—	ms
VDD ↑ (100%) → VSP ↑ (20%)	t4	0.2	1	—	ms	VDDIO ↓ 20%→VDDIO ↑ 20%	t16	0.2	—	—	ms
VSP 20%→80%	t5	0.2	1	—	ms	VDD ↓ 0%→VDD ↑ 0%	t17	20	—	—	ms
VSP ↑ (80%) → VSN ↓ (20%)	t6	0	1	—	ms	VSP ↓ 20%→VSP ↑ 20%	t18	0.2	—	—	ms
VSN 20%→80%	t7	0.2	1	—	ms	VSN ↑ 20%→VSN ↓ 20%	t19	0.2	—	—	ms
VDD ↑ (100%) → RESETB ↑	t8	1	1	—	ms	RESET ↓ → RESET ↑	t20	(*) 1	—	—	ms
VSN 80%→20%	t9	0.2	1	—	ms	RESET ↓ → VSN ↑ 80%	t21	0.2	—	—	ms
VSN ↑ (20%) → VSP ↓ (80%)	t10	0	1	—	ms	RESETB ↑ → Command Input	t22	2	—	—	ms
VSP 80%→20%	t11	0.2	1	—	ms						
VSP ↓ (20%) → VDD ↓ (100%)	t12	0.2	1	—	ms						

(*) If Reset = Lo → HI of the periods indicated, Wait of MIN140ms is needed.

7. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	60°C, 240H	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD; 2. Non-display; 3. Missing segments/line; 4. Glass crack; 5. Current IDD is twice higher than initial value.
Low Temperature Operating	-10°C, 240HR	
High Temperature Storage	70°C, 240HR	
Low Temperature Storage	-20°C, 240HR	
High Temperature & High Humidity (Non-operation)	+40°C, 90% RH, 240 hours.	
Thermal Shock (Non-operation)	-20°C, 30 min ↔ +70°C, 30 min, Change time: 5min 10CYC.	
Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.5mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces, 80cm (MEDIUM BOX)	

Remark:

1. The test samples should be applied to only one test item.
2. Sample size for each test item is 5~10pcs.
3. For Damp Proof Test, Pure water (Resistance > 10MΩ) should be used.
4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
5. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

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 finger-stalls 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 6.1 Power On Sequence & 6.2 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.

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(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

9. Packing

---TBD-----

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