



## Specification for TFT

### AFY1280800A1-10.1INTH-C-M

Revision C

A	Orient Display
FY	TFT Type
1280800	Resolution 1280 x 800
A1	Serial A1
10.1	10.1", Module Dimension 232.90x154.60x6.55 mm
I	IPS Display
N	Top: -20~+70°C; Tstr: -30~+80°C
T	Transmissive
H	High Brightness, 850 cd/m2
C	Capacitive Touch Panel
/	EK79202B OR COMPATIBLE(TFT) GT9271(CTP)
/	LVDS interface
M	Internal Code



## REVISION RECORD

[illegible]

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## 1. GENERAL INFORMATION

No.	Item	Contents	Unit
1	LCD size	10.1 inch (Diagonal)	/
2	Display mode	IPS/NORMALLY BLACK/Transmissive	/
3	Viewing direction(eye)	FREE	/
4	Gray scale inversion direction	-	/
5	Resolution(H*V)	1280*800 Pixels(TFT)/ 1280*800 Dots(CTP)	/
6	Module size (L*W*H)	232.90*154.60*6.55	mm
7	Active area (L*W)	216.96*135.60	mm
8	Pixel pitch (L*W)	0.1695*0.1695	mm
9	Interface type	LVDS interface(TFT)/I2C(CTP)	/
10	Color Depth	16.7M	/
11	Module power consumption	TBD(Appr)	W
12	Back light type	EDGE&WHITE LED	/
13	Driver IC	EK79202B OR COMPATIBLE(TFT) GT9271(CTP)	/
14	Weight	TBD(Appr)	G

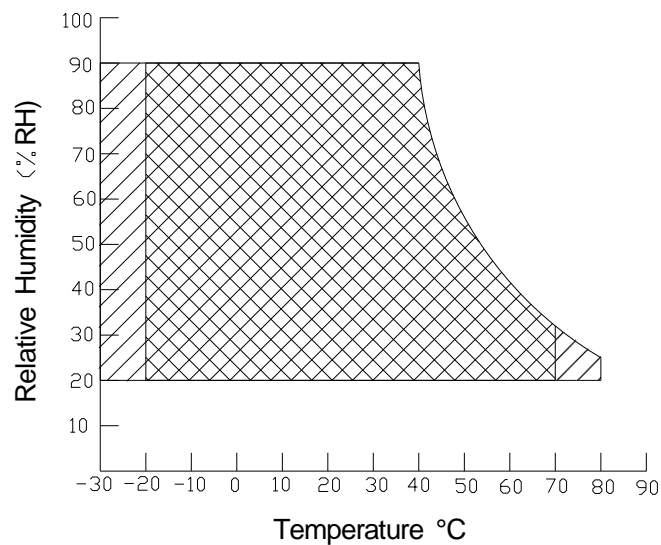
## 2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power supply input voltage for TFT	VDD	-0.5	4.0	V	
Power supply input voltage for CTP	VCC	2.66	3.47	V	
Backlight current (normal temp.)	ILED	-	225	mA	
Operation temperature	Top	-20	+70	°C	Note1
Storage temperature	Tst	-30	+80	°C	Note1
Humidity	RH	20%	90%	/	Note1

Note1 :

1).The relative humidity and temperature range are as below sketch,90%RH Max.

2).The maximum wet bulb temperature  $\leq 40^{\circ}\text{C}$  and without dewing.



Operating Range  Storage Range  + 

### 3. ELECTRICAL CHARACTERISTICS

#### TFT DC CHARACTERISTICS(at Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply input voltage	VDD	2.3	2.5	2.7	V	
Input voltage 'H' level	VIH	0.8VDD	-	VDD	V	
Input voltage 'L' level	VIL	VSS	-	0.2VDD	V	
Power supply current	IVDD	-	TBD	-	mA	
TFT gate on voltage	VGH	14.5	15.0	15.5	V	
TFT gate off voltage	VGL	-13.5	-13.0	-12.5	V	
Analog power supply voltage	AVDD	8.0	8.2	8.4	V	
Differential input common mode voltage	Vcom	-	-	-	V	Note1
LVDS Differential input high Threshold voltage	R <sub>XVTH</sub>	-	-	+100	mV	R <sub>XVCM</sub> =1.2V
LVDS Differential input low Threshold voltage	R <sub>XVTL</sub>	-100	-	-	mV	
LVDS Differential input common mode voltage	R <sub>XVCM</sub>	0.7	-	1.6	V	
LVDS Differential voltage	VID	200	-	600	mV	

Note1 : The value is just the reference value. VCOM must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc..

#### CTP DC CHARACTERISTICS(at Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply input voltage	VCC	3.1	3.3	3.47	V	Note1
Input Power ripple	Vpp	-	-	50	mV	
I/O Signal Voltage	IOVCC	-	1.8	-	V	Note1
Input voltage 'H' level	VIH	0.7IOVCC	-	IOVCC	V	
Input voltage 'L' level	VIL	VSS	-	0.3IOVCC	V	
Operating Current (Normal Mode)	IVCC	-	TBD	-	mA	
Operating Current (Sleep mode)	IVCC	-	-	-	mA	

Note1 : If you need more information of CTP, please refer to our Spec of CTP.

## 4. BACKLIGHT CHARACTERISTICS

(at Ta=25°C, RH=60%)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED forward voltage	VF	18.9	21.7	23.1	V	
LED forward current	IF	-	180	-	mA	IF=30*6mA
LED power consumption	PLED	-	3.906	-	W	Note1
Number of LED	-		42		PCS	
Connection mode	-	7 in series 6 in parallel			/	
LED life-time	-	20000	-	-	Hrs	Note2

Note1 : Calculator value for reference :  $IF \cdot VF = PLED$

Note2 : The LED life-time define as the estimated time to 50% degradation of initial brightness at Ta=25°C and IF =180mA. The LED lifetime could be decreased if operating IF is larger than 180mA.

## 5. TOUCH PANEL CHARACTERISTICS

(at Ta=25°C)

Item	Description	Remark
Product Structure	G+G	
Surface Hardness	≤6H	Pencil, Loading 500g, 45 deg
Ball-falling Test	≤80cm	Steel ball weight 64g
Touch Count Max	10 points	
I2C Slave Address*	0x5D	
Origin of Coordinate*	top left corner	

## D



## 7. ELECTRO - OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time	Tr+ Tf	-	-	25	50	ms	FIG.1	Note 1
Contrast ratio	Cr		480	640	-	-	FIG.2	Note 2
Surface luminance	Lv	$\theta=0^\circ$	600	850	-	cd/m <sup>2</sup>	FIG.2	Note 3
Luminance uniformity	Yu	$\theta=0^\circ$	75	80	-	%	FIG.2	Note 4
NTSC	-	$\theta=0^\circ$	-	50	-	%	FIG.2	Note 5
Viewing angle	$\theta$	$\phi=90^\circ$	75	85	-	deg	FIG.3	Note 6
		$\phi=270^\circ$	75	85	-	deg	FIG.3	
		$\phi=0^\circ$	75	85	-	deg	FIG.3	
		$\phi=180^\circ$	75	85	-	deg	FIG.3	
CIE (x,y) chromaticity	Red x	$\theta=0^\circ$ $\phi=0^\circ$ $T_a=25^\circ\text{C}$	Typ -0.04	TBD	Typ +0.04	-	FIG.2 CIE1931	Note 5
	Red y			TBD		-		
	Green x			TBD		-		
	Green y			TBD		-		
	Blue x			TBD		-		
	Blue y			TBD		-		
	White x			TBD		-		
	White y			TBD		-		

The TFT module should be stabilized at a given temperature for 10 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 10 minutes in a windless room.

### Note1. Definition of response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state.

Normally white: Rise time ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%.

And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.

Normally black: Rise time ( $T_{ON}$ ) is the time between photo detector output intensity changed from 10% to 90%.

And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 90% to 10%.

For additional information see FIG1.

### Note2. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula.

For more information see FIG.2.

$$\text{Contrast ratio} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Measured at the center area of the LCD

### Note3. Definition of surface luminance

Surface luminance is the luminance with all pixels displaying white.

For more information see FIG.2.

$L_v$  = Average Surface Luminance with all white pixels( $P_1, P_2, P_3, \dots, P_n$ )

### Note4. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance. For more information see FIG.2.

$$Y_u = \frac{\text{Minimum surface luminance with all white pixels } (P_1, P_2, P_3, \dots, P_n)}{\text{Maximum surface luminance with all white pixels } (P_1, P_2, P_3, \dots, P_n)}$$

### Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity, The x,y value is determined by screen active area center position. For more information see FIG.2.

### Note6. Definition of viewing angle

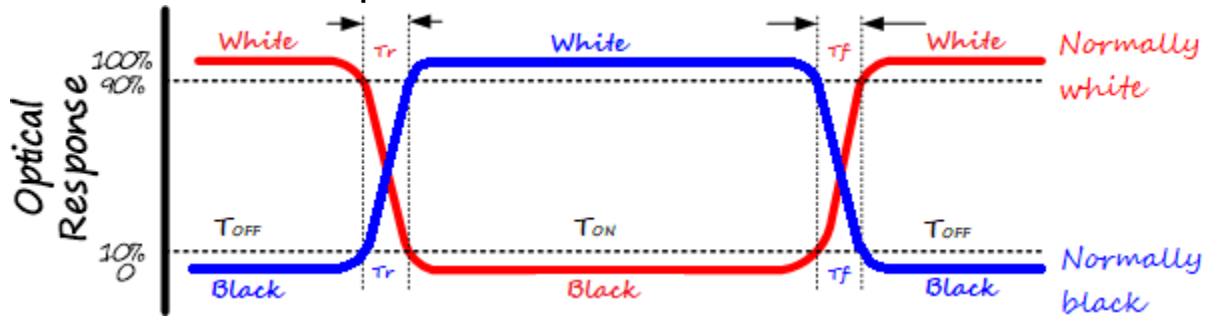
Viewing angle is the angle at which the contrast ratio is greater than 10 angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the display surface.

For more information see FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope or DMS series Instruments or compatible. For contrast ratio, Surface Luminance, Luminance uniformity and

CIE, the testing data is base on CS-2000/BM-7 photo detector or compatible.

**FIG.1. The definition of response Time rise**



**FIG.2. Measuring method for contrast ratio, surface luminance, luminance uniformity, CIE (x,y) chromaticity**

H,V : Active area

Light spot size  $\varnothing=1.5\text{mm}$  or  $\varnothing=7.7\text{mm}$  (CS-2000/BM-7) 50cm distance or compatible distance from the LCM surface to detector lens.

Test spot position : see Figure a.

measurement instrument : Luminance meter CS-2000/BM-7 or compatible ,see Figure b.

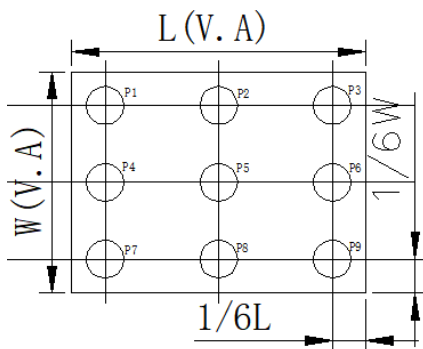


Figure a

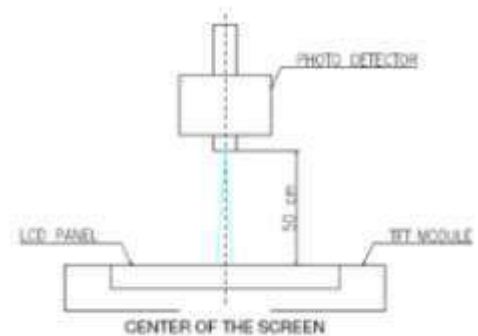
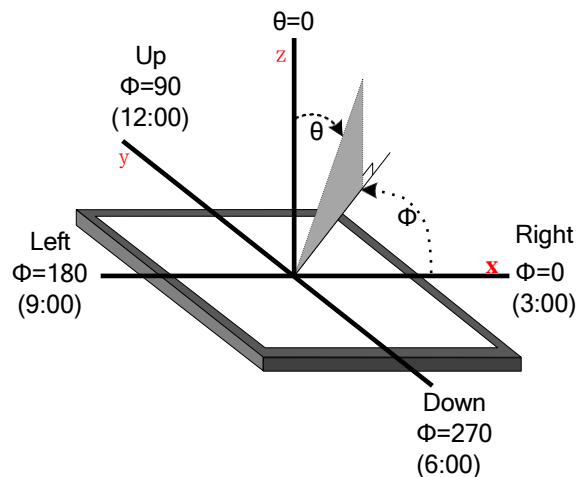


Figure b

**FIG.3. The definition of viewing angle**



## 8. INTERFACE DESCRIPTION

### TFT Module Interface description

Interface No.	Name	I/O or connect to	Description
1	NC	/	No connection
2-3	VDD	P	Power Supply
4-6	NC	/	No connection
7	GND	P	Ground
8	Rxin0-	I	-LVDS Differential Data Input
9	Rxin0+	I	+LVDS Differential Data Input
10	GND	P	Ground
11	Rxin1-	I	-LVDS Differential Data Input
12	Rxin1+	I	+LVDS Differential Data Input
13	GND	P	Ground
14	Rxin2-	I	-LVDS Differential Data Input
15	Rxin2+	I	+LVDS Differential Data Input
16	GND	P	Ground
17	RxCLK-	I	-LVDS Differential Clock Input
18	RxCLK+	I	+LVDS Differential Clock Input
19	GND	P	Ground
20	Rxin3-	I	-LVDS Differential Data Input
21	Rxin3+	I	+LVDS Differential Data Input
22	GND	P	Ground
23-24	NC	/	No connection
25	GND	P	Ground
26-28	NC	/	No connection
29	AVDD	P	Power for Analog Circuit
30	GND	P	Ground
31-32	LED-	P	LED Cathode
33-34	NC	/	No connection
35	VGL	P	Gate OFF Voltage
36-37	NC	/	No connection
38	VGH	P	Gate ON Voltage
39-40	LED+	P	LED Anode

I: input, O: output, P: Power, NC or / : No connection

### CTP interface description;

Interface No.	Name	I/O or connect to	Description
1	RESET	I	Reset low
2	VDD	P	Power Supply of CTP
3	GND	P	Ground
4	INT	O	State change interrupt
5	SCL	I	Serial interface clock
6	SDA	I/O	Serial interface data

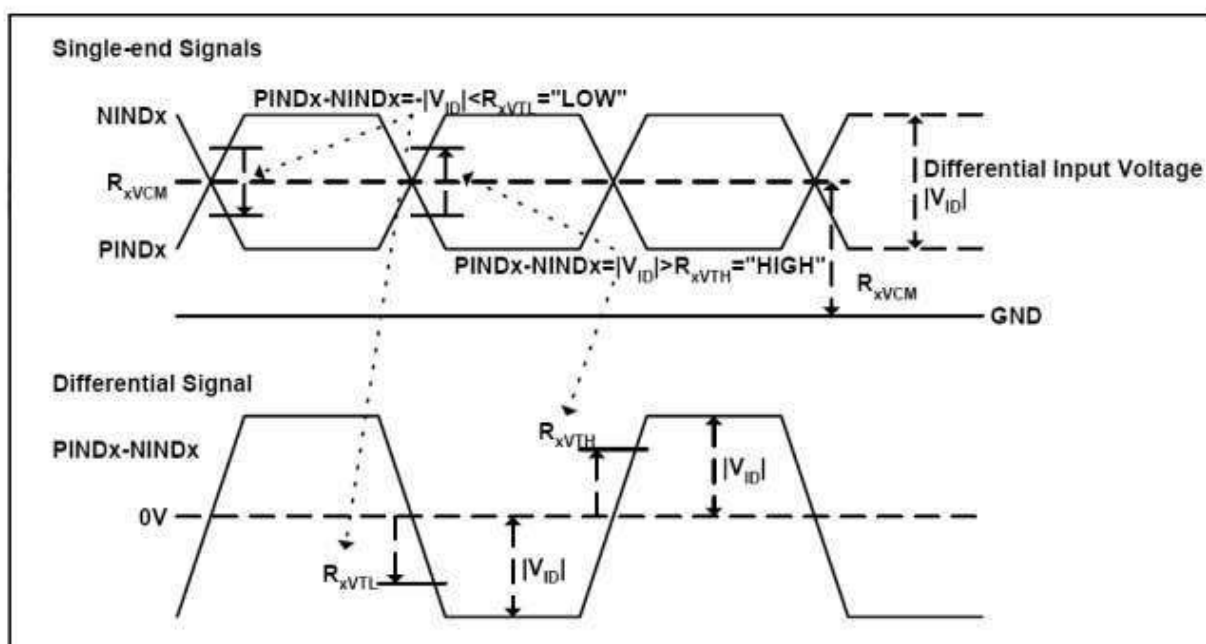
I: input, O: output, P: Power, NC or / : No connection

## 9. AC CHARACTERISTICS

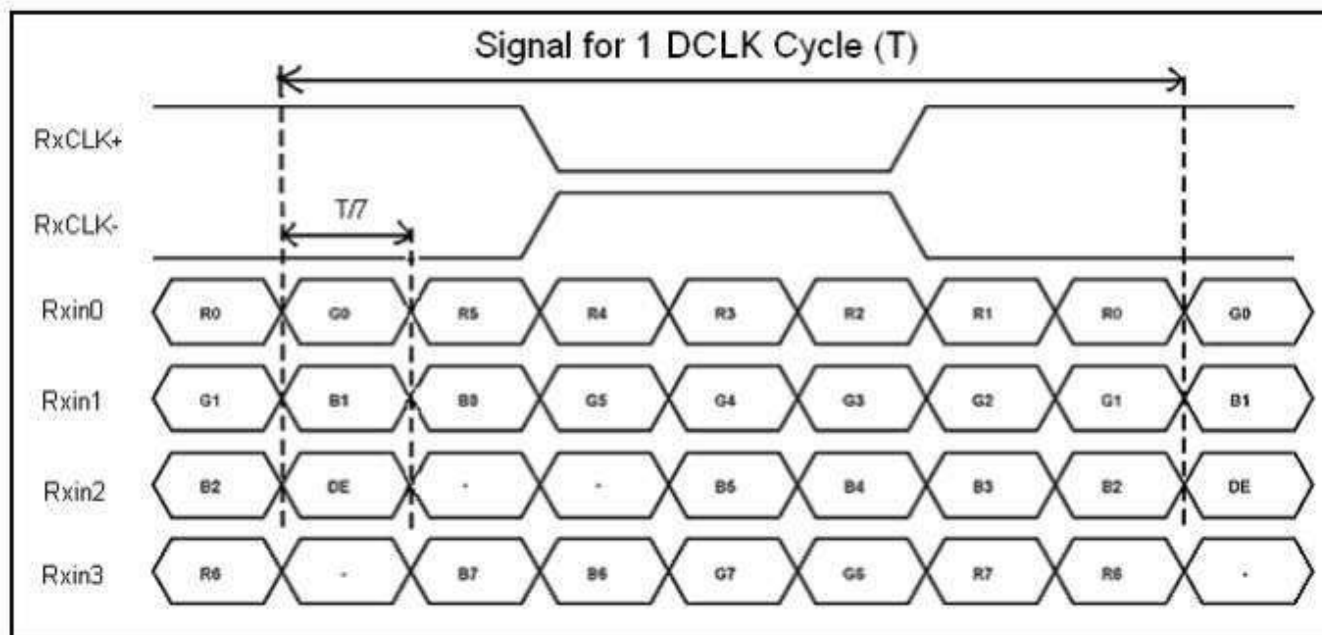
### TFT Module AC CHARACTERISTICS

#### LVDS Signal Timing Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	$R_{xVTH}$	-	-	+100	mV	$R_{xVCM}=1.2V$
LVDS Differential input low Threshold voltage	$R_{xVTL}$	-100	-	-	mV	
LVDS Differential input common mode voltage	$R_{xVCM}$	0.7	-	1.6	V	
LVDS Differential voltage	$ V_{ID} $	200	-	600	mV	

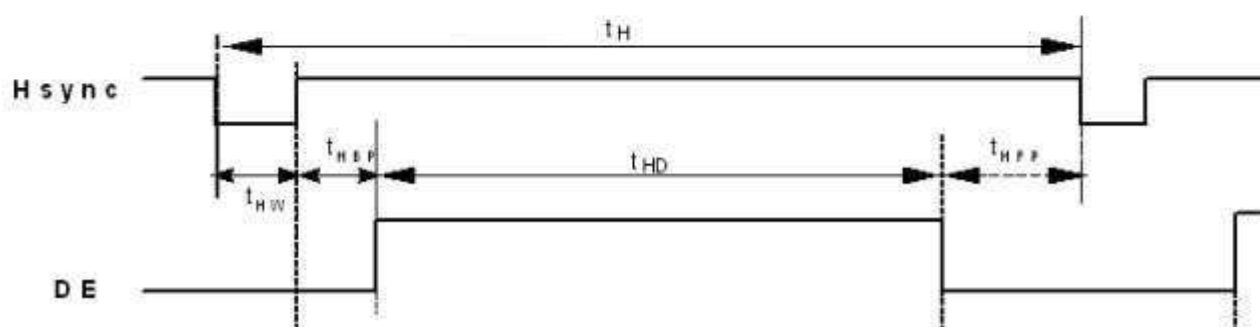
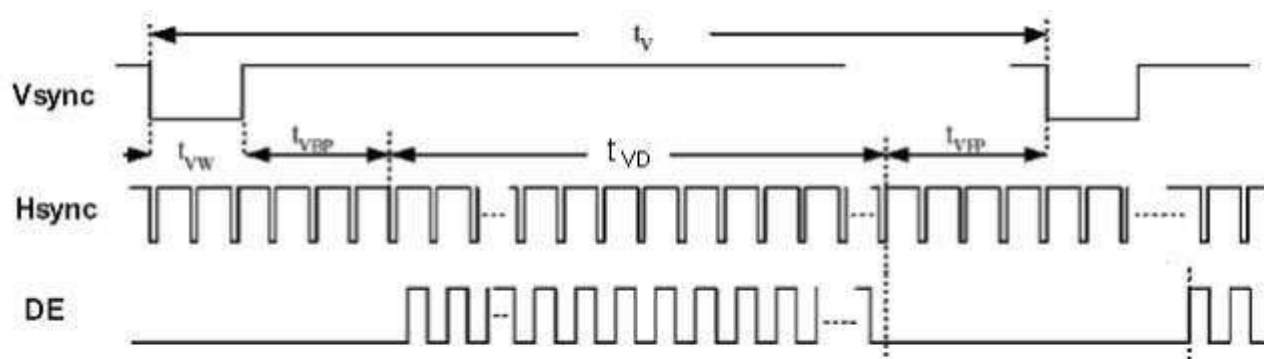


#### LVDS Data Input Format

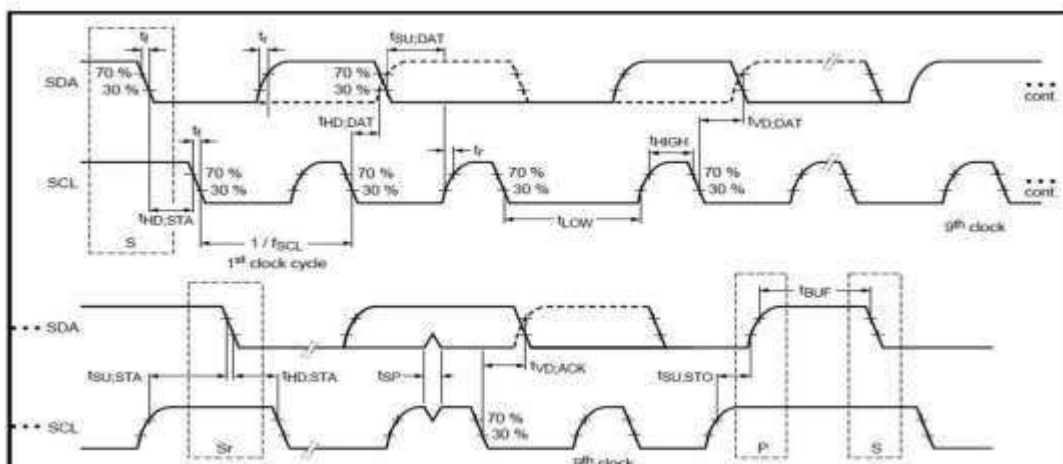


Timing Table

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	1/Tc	66.3	72.4	78.9	MHz	Frame rate =60Hz
Horizontal display area	t <sub>HD</sub>	1280			Tc	
HSYNC pulse width	t <sub>HPW</sub>	2	-	40	Tc	
HSYNC back porch(with pulse width)	t <sub>HBP</sub>	88	88	88	Tc	
HSYNC front porch	t <sub>HFP</sub>	12	72	132	Tc	
Vertical display area	t <sub>VD</sub>	800			t <sub>H</sub>	
VSNC pulse width	t <sub>VPW</sub>	2	-	20	t <sub>H</sub>	
VSNC back porch(with pulse width)	t <sub>VBP</sub>	23	23	23	t <sub>H</sub>	
VSNC front porch	t <sub>VFP</sub>	1	15	49	t <sub>H</sub>	



## CTP AC CHARACTERISTICS



**Table 5-7: I2C AC Characteristics**

Parameter	Symbol	Standard-mode		Fast-mode		Unit
		Min	Max	Min	Max	
SCL clock frequency	$f_{SCL}$	0	100	0	400	kHz
Hold time START condition	$t_{HD,STA}$	4.0	-	0.6	-	us
LOW period of the SCL clock	$t_{LOW}$	4.7	-	1.3	-	us
HIGH period of the SCL clock	$t_{HIGH}$	4.0	-	0.6	-	us
Set-up time for a repeated START condition	$t_{SU,STA}$	4.7	-	0.6	-	us
Data hold time	$t_{HD,DAT}$	300	-	300	-	ns
Data set-up time	$t_{SU,DAT}$	250	-	100	-	ns
Rise time of both SDA and SCL signals (30% to 70%)	$t_r$	-	1000	20	300	ns
Fall time of both SDA and SCL signals (70% to 30%)	$t_f$	-	300	20	300	ns
Set-up time for STOP condition	$t_{SU,STO}$	4.0	-	0.6	-	us
Bus free time between a STOP and START condition	$t_{BUF}$	4.7	-	1.3	-	us
Capacitive load for each bus line	$C_b$	-	400	-	400	pF
Noise margin at the LOW level for each connected device	$V_{nL}$	$0.1V_{DD}$	-	$0.1V_{DD}$	-	V
Noise margin at the HIGH level for each connected device	$V_{nH}$	$0.2V_{DD}$	-	$0.2V_{DD}$	-	V

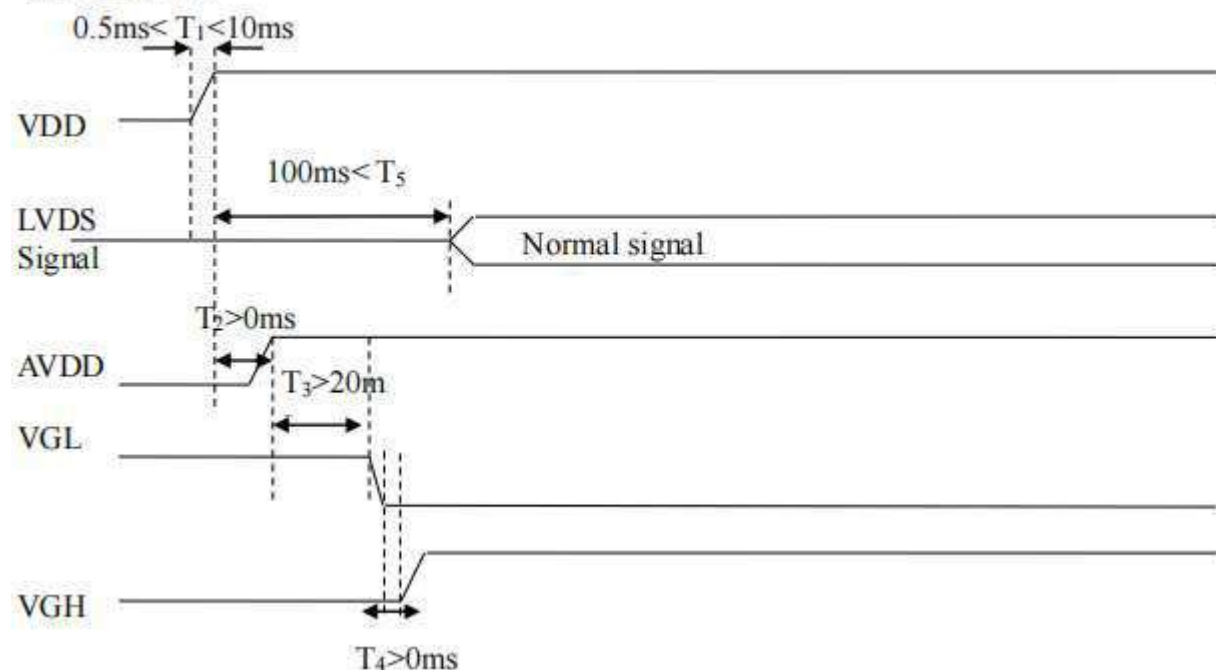
\*SCL = I2C Host must to support clock stretching mode for using 400 kHz.

## 10. POWER SEQUENCE

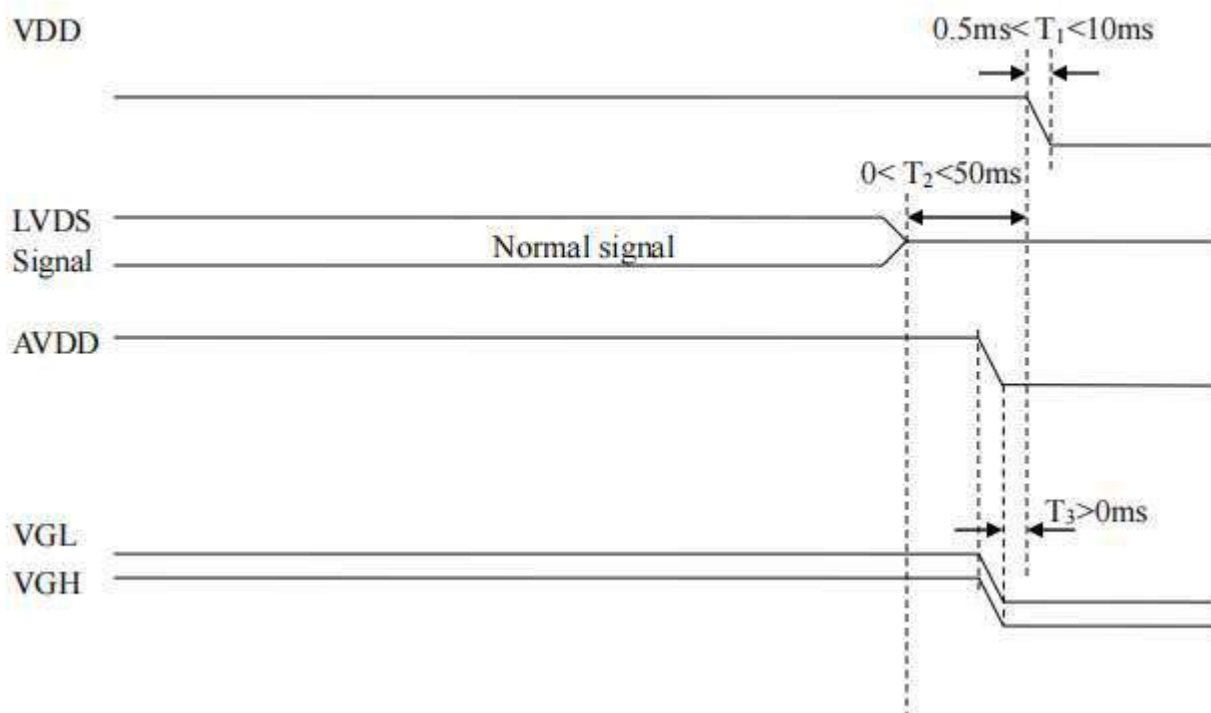
### TFT Module POWER SEQUENCE

To prevent the device damage from latch up and Improve subjective display effect,the power ON/OFF sequence shown below must be followed.

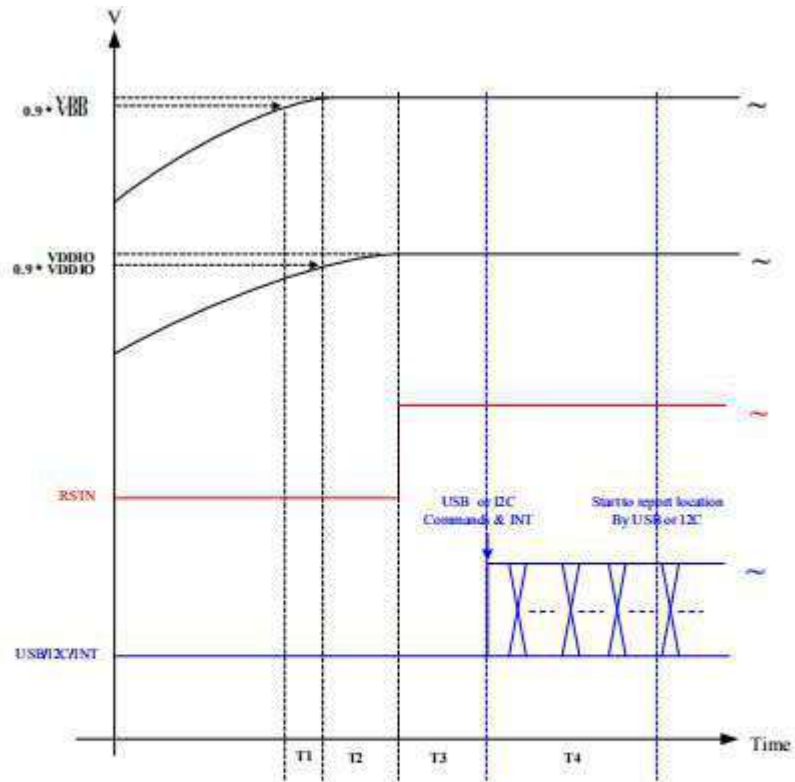
#### a. Power on:



#### b. Power off:

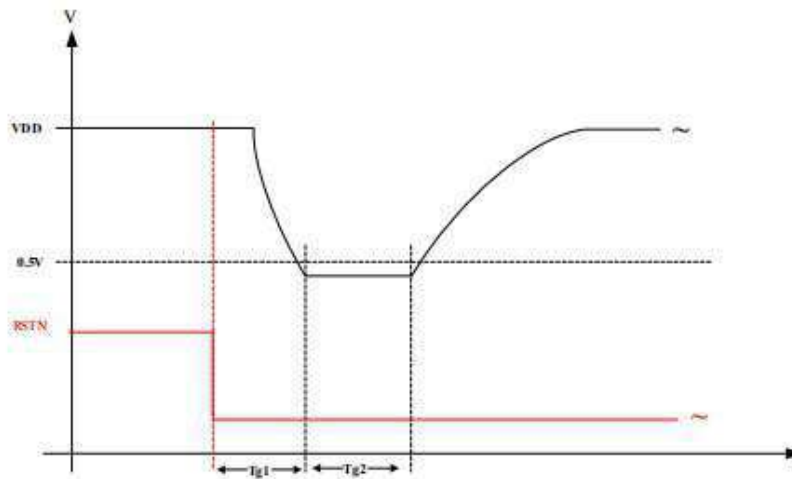


## CTP POWER SEQUENCE Power On



1. T1: the time difference between 0.9\*VDD and 0.9\*VDDIO. T1 must be  $\geq 0$  sec.
2. T2: the time difference between 0.9\*VDDIO and RSTN. T2 must be  $\geq 200$  us.
3. T3: the time difference between RSTN and Commands. T3 must be  $\geq 150$  ms.
4. T4: IC start to report point location to host. T4 must be  $\geq 300$  ms.

## Power Off



Tg1: the time difference between power-off and power-on. Tg1 must be  $> 10\mu s$ .

Tg2: the time difference between power-off and power-on. Tg2 must be  $> 10\mu s$ .

**Note.** During the power off time, the VDD must be lower than 0.5V that make sure the touch controller have been correctly reset.

## 11. RELIABILITY TEST CONDITIONS

No.	Test item	Test condition		Inspection after test
11.1	High temperature storage test	+80℃/240 hours		Inspection after 2~4hours storage at room temperature, the sample should not have following defects: 1. Current changing value before test and after test is 50% larger; 2. Function defect : Non-display,abnormal-d isplay,missing lines, Short lines,ITO corrosion; 3. Visual defect : Air bubble in the LCD,Seal leak,Glass crack.
11.2	Low temperature storage test	-30℃/240 hours		
11.3	High temperature operating test	+70℃/240 hours		
11.4	Low temperature operating test	-20℃/240 hours		
11.5	Thermal Shock (non-operation )	-30℃ ↔ +80℃/10cycles (30min.)(<30sec.) (30min.)		
11.6	High temperature high humidity test	+50℃*90% RH/240 hours		
11.7	Vibration test for Packaging	Frequency : 250 r/min Amplitude : 1 inch Time: 45min		
11.8	Drop test for Packaging	Drop direction: 1 corner/3 edges/6 sides 10 times		
		Packing weight(kg)	Drop height(cm)	
		<11	80±1.6	
		11≤G<21	60±1.2	
		21≤G<31	50±1.0	
		31≤G<40	40±0.8	
11.9	ESD test	Air discharge: ±12KV, 10times Contact discharge: ±6KV, 10times		
Remark : 1. The test samples should be applied to only one test item. 2. Sample size for each test item is 3~5pcs. 3. For High temperature high humidity 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. 6. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.				

## 12. INSPECTION CRITERION

Refer to 《Inspection Criterion for MTP Products-To customer》

## 13. HANDLING PRECAUTIONS

### 13.1 Mounting method

The TFT module consists of two thin glass plates with polarizers which easily be damaged. And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the TFT modules.

### 13.2 Caution of TFT module handling and cleaning

When cleaning the display surface, Use soft cloth with solvent [recommended below] and wipe lightly :

- .Isopropyl alcohol
- .Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent :

- .Water
- .Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated :

- .Soldering flux
- .Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

### 13.3 Caution against static charge

The TFT module uses C-MOS LSI drivers, so we recommend that you :

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

### 13.4 Packing

Module employs TFT elements and must be treated as such.

- .Avoid intense shock and falls from a height.
- .To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity.

### 13.5 Caution for operation

- .It is an indispensable condition to drive TFT module within the specified voltage limit since the higher voltage than the limit causes the shorter TFT module life.
- .An electrochemical reaction due to direct current causes TFT module undesirable deterioration, so that the use of direct current drive should be avoided.
- .Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature TFT module shows dark color in them. However those phenomena do not mean malfunction or out of order with TFT module, which will come back in the specified operation temperature.
- .If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- .A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.
- .Usage under the maximum operating temperature, 50%Rh or less is required.
- .When fixed patterns are displayed for a long time, remnant image is likely to occur.

### 13.6 Storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- .Storing in an ambient temperature 10°C to 30°C, and in a relative humidity of 45% to 75%. Don't expose to sunlight or fluorescent light.
- .Storing in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- .Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- .Storing with no touch on polarizer surface by anything else.

It is recommended to store them as they have been contained in the inner container at the time of delivery from

us.

### **13.7 Safety**

- .It is recommendable to crash damaged or unnecessary TFT module into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- .When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

## **14. PRECAUTION FOR USE**

**14.1** A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

**14.2** On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- .When a question is arisen in this specification.
- .When a new problem is arisen which is not specified in this specifications.
- .When an inspection specifications change or operating condition change in customer is reported to ODNA, and some problem is arisen in this specification due to the change.
- .When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

## **15. PACKING SPECIFICATION**

Please consult our technical department for detail information.

## **16. INITIALIZATION CODE**

Please consult our technical department for detail information.

## **17. HSF COMPLIANCE**

- .This products complies with ROHS 2011/65/EU and 2015/863/EU、REACH 1907/2006/EC requirements, and the packaging complies with 94-62-EC.