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Optical Bonding



SPECIFICATION FOR LCM+CTP Module

MODULE No:	ET068WV20-KT
CUSTOMER:	

YOURITECH	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		



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1.Basic Specifications

* 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, capacitance touch panel, back-light unit. The resolution of a 6.8 " TFT-LCD contains 800x480 pixels, and can display up to 16.7M colors.

1.1 TFT Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	148.104(H) *88.8624(V) (7.0inch)	mm	
Driver element	TFT active matrix	-	
Display colors	16.7M	colors	
Number of pixels	800(RGB)*480	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.18513(H) x 0.18513 (V)	mm	
Viewing angle	ALL	o'clock	
LCM Interface	24 BIT RGB	-	
Display mode	Transmissive /Normally Black	-	
Operating temperature	-30~+85	°C	
Storage temperature	-30~+85	°C	
Touch and LCM Bonding technology	Optical bonding	-	

1.2 CTP Features

General Information Items	Specification	Unit	Note
	Main Panel		
Resolution	800(H)*480(V)	-	
Structure	G+G	-	
Controller IC	GT9271	-	
Interface	I2C	-	
Slave Adress	0x5D(7bit) or 0x14(7bit)	-	Note1
Touch mode	Ten points and Gestures	-	-
Logic level	3.3	V	

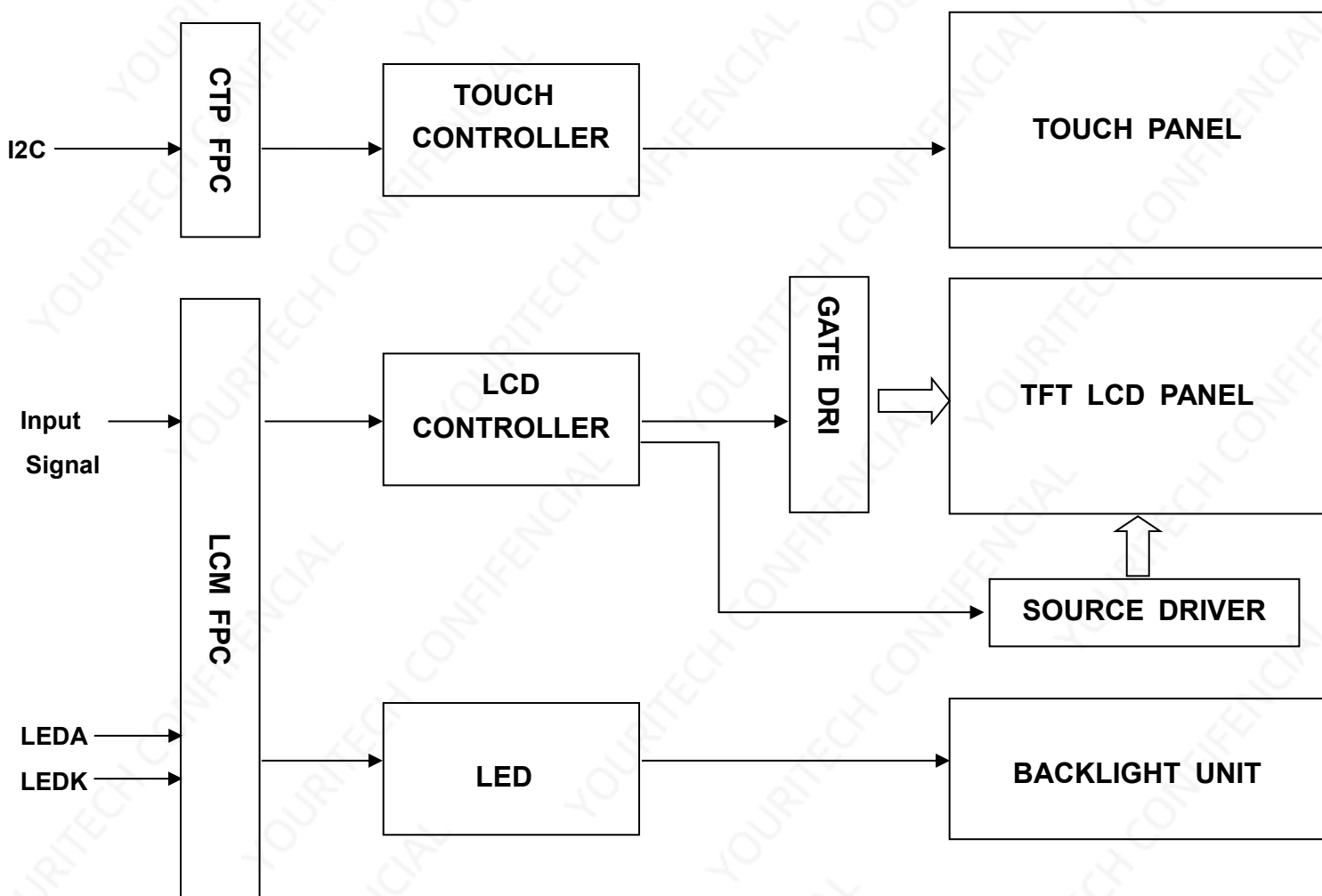
Note1: For specific configuration method, please refer to section 8.2



1.3 Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		155.96		mm	-
	Vertical(V)		100.77		mm	-
	Depth(D)		7.29		mm	-
Weight			203		g	-

2. Block Diagram



4. Input terminal Pin Assignment

4.1 TFT PIN Define

NO.	SYMBOL	DISCRIPTION	I/O
1	VLED+	Power for LED backlight (Anode).	P
2	VLED+	Power for LED backlight (Anode).	P
3	VLED-	Power for LED backlight (Cathode).	P
4	VLED-	Power for LED backlight (Cathode).	P
5	GND	Power Ground.	P
6	NC	No connection.	--
7	DVDD	Power for Digital Circuit.	P
8	MODE	DE/SYNC mode select.	I
9	DE	Data Input Enable.	I
10	VS	Vertical Sync Input.	I
11	HS	Horizontal Sync Input.	I
12-19	B7-B0	Blue data.	I/O
20-27	G7-G0	Green data.	I/O
28-35	R7-R0	Red data.	I/O
36	GND	Power Ground.	P
37	DCLK	Sample clock.	I
38	GND	Power Ground.	P
39	L/R	Left / right selection.	I
40	U/D	Up/down selection.	I
41	NC	No connection.	--
42	NC	No connection.	--
43	NC	No connection.	--
44	RESET	Global reset pin.	I
45	NC	No connection.	--



46	NC	No connection.	--
47	NC	No connection.	--
48	GND	Power Ground.	P
49	NC	No connection.	--
50	NC	No connection.	--

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.

When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE="0", DE must be grounded.

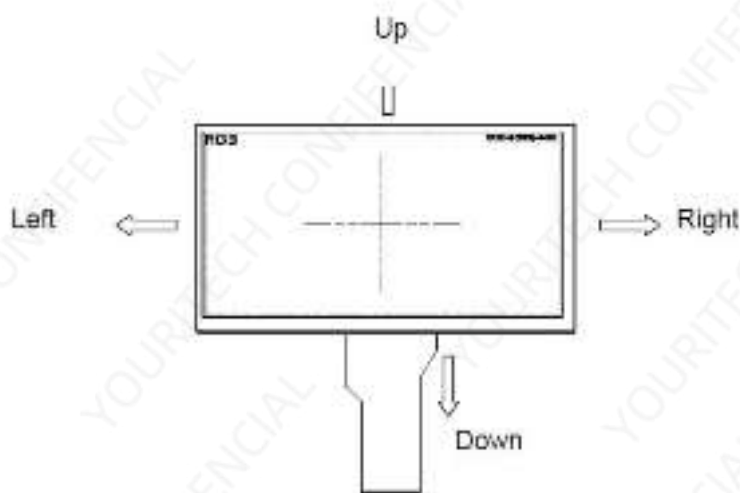
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DV _{DD}	Up to down, left to right
DV _{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV _{DD}	DV _{DD}	Down to up, left to right

Note 5: Definition of scanning direction.
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.



4.2 CTP PIN Define

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground	P
2	NC	No Connection	
3	VDD	Supply voltage	P
4	SCL	I2C clock input	I
5	SDA	I2C data input and output	I
6	INT	External interrupt to the host	I
7	RST	External Reset, Low is active	I
8	GND	Ground	P



5. LCD Optical Characteristics

5.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	$\Theta=0$ Normal viewing angle	--	1000	--		(1)(2)
Response time	Rising	T _R		--	30	--	msec	(1)(3)
	Falling	T _F						
Color gamut		S(%)		52	57	--	%	
Color Filter Chromaticity	White	W _X		0.257	0.297	0.337		(1)(4) CA-310
		W _Y		0.266	0.306	0.346		
	Red	R _X		0.576	0.616	0.656		
		R _Y		0.329	0.369	0.409		
	Green	G _X		0.288	0.328	0.368		
		G _Y		0.523	0.563	0.603		
	Blue	B _X		0.108	0.148	0.188		
		B _Y		0.018	0.058	0.098		
Viewing angle	Hor.	Θ_L	CR>10	--	85	--		(1)(4)
		Θ_R		--	85	--		
	Ver.	Θ_U		--	85	--		
		Θ_D		--	85	--		
Option View Direction		ALL						

*The data comes from the LCD specification.

Measuring Condition

Measuring surrounding : dark room

Ambient temperature : $25\pm 2^\circ\text{C}$

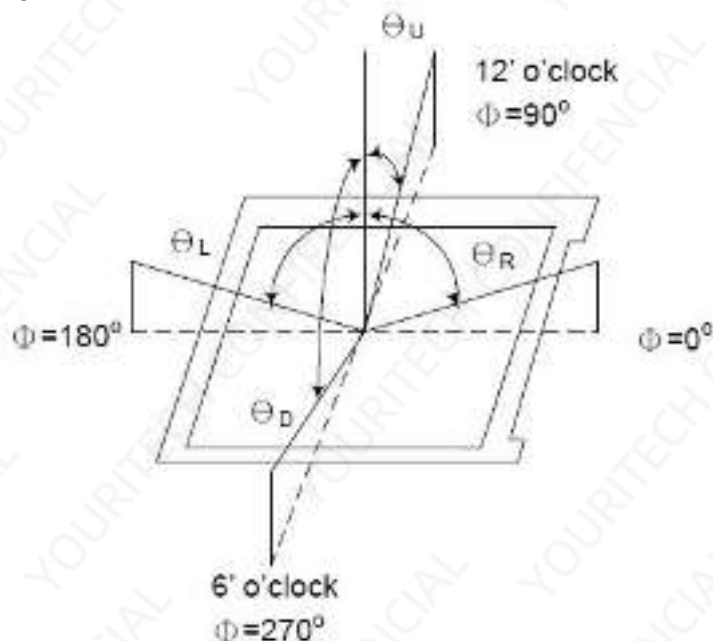
15min. warm-up time.

Measuring Equipment

FPM520 , which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.



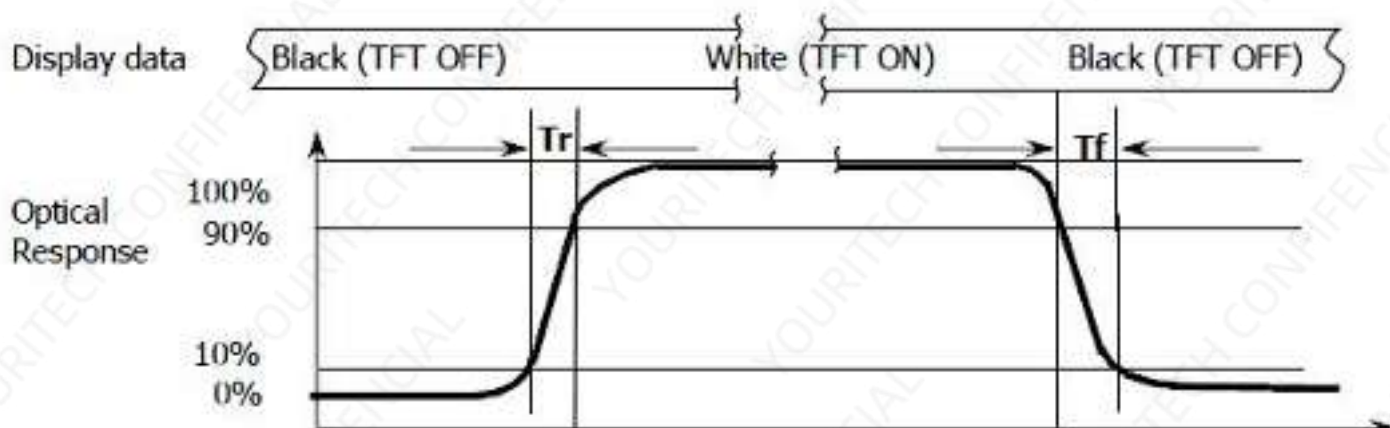
Note (1): Definition of Viewing Angle :



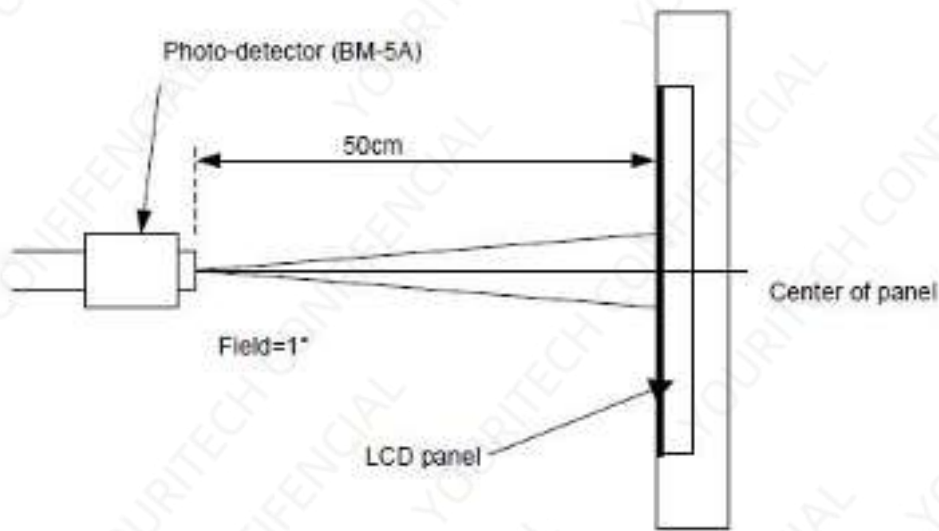
Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3): Response Time



Note (4): Definition of optical measurement setup



6. Electrical Characteristics

6.1 Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	DVDD	-0.3	+4.0	V	Note1
Operating temperature	T _{OP}	-30	+85	°C	
Storage temperature	T _{ST}	-30	+85	°C	

NOTE1: 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.

6.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	DVDD	3.1	3.3	3.6	V	
Normal mode Current consumption	IDD	--	40	80	mA	
Level input voltage	V _{IH}	0.7DVDD	--	DVDD	V	
	V _{IL}	GND	--	0.3DVDD	V	
Level output voltage	V _{OH}	DVDD-0.4	--	VDD	V	
	V _{OL}	GND	--	GND+0.4	V	



6.3 Current Consumption

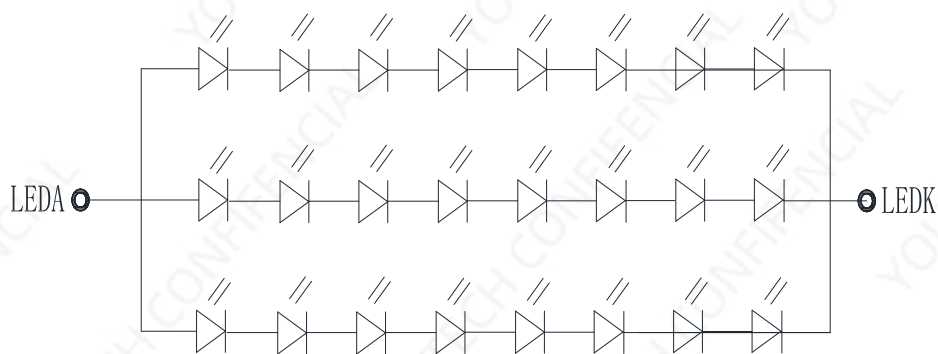
The back-light system is edge-lighting type with 24chips White LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	--	150	--	mA	
Forward Voltage	V_F	22.4	24	26.4	V	
LCM Luminance	L_V	750	800	--	cd/m ²	Note3
LED life time	Hr	--	20000	--	Hour	Note1,2
Uniformity	AVg	80	--	--	%	Note3

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition:

$T_a = 25 \pm 3^\circ \text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

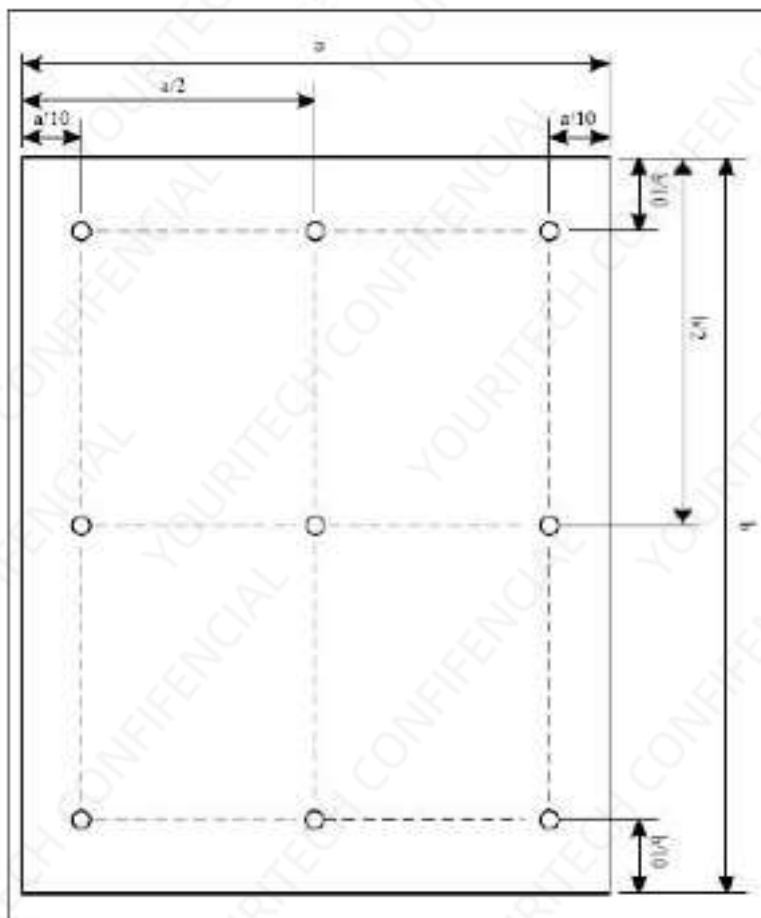
Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a = 25^\circ \text{C}$ and $I_L = 150 \text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 150mA. The constant current driving method is suggested.



B/L Circuit



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



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

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



7. AC Characteristic

7.1 AC Electrical Characteristics

DC Electrical Characteristics (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C, Bare Chip)

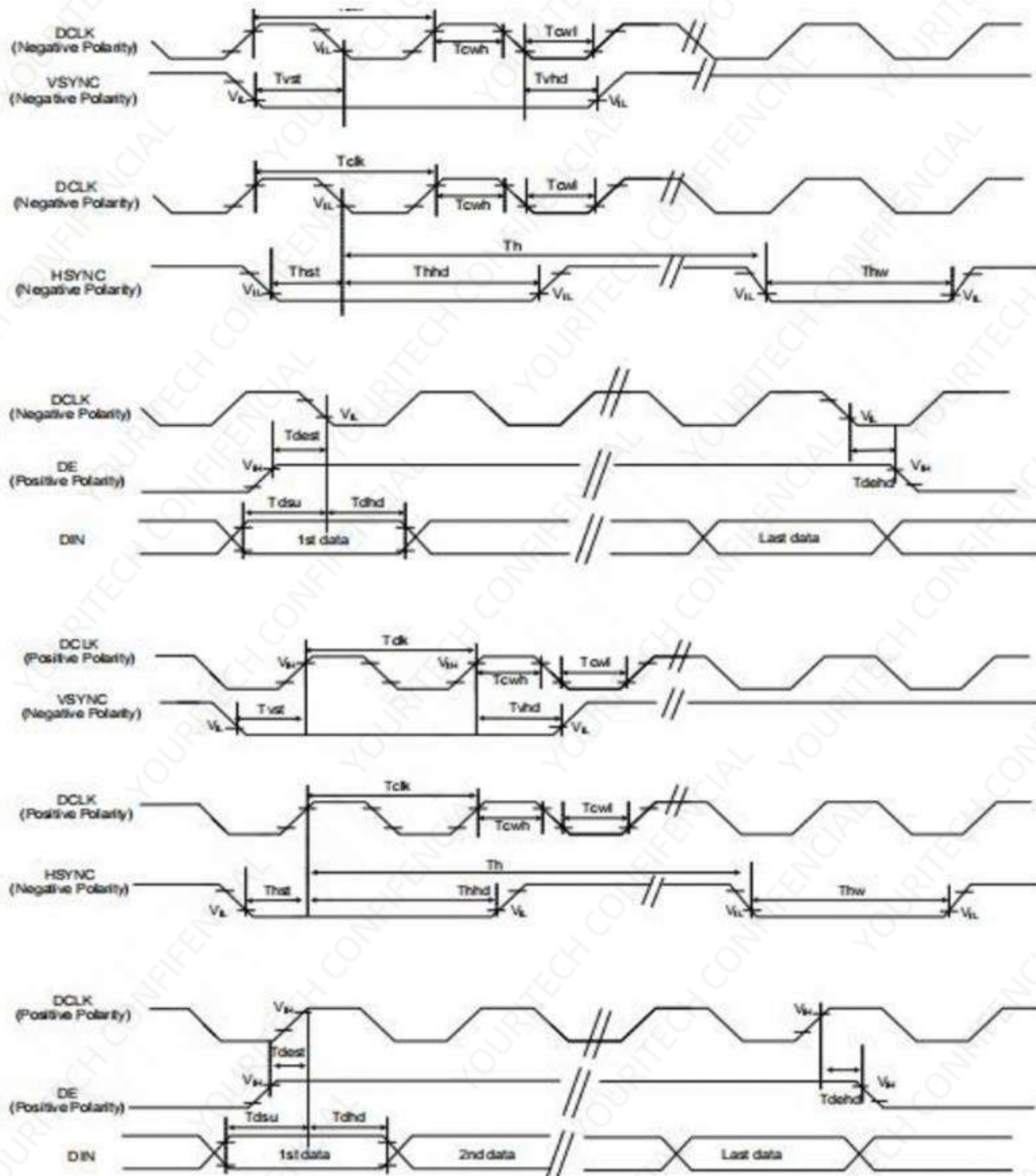
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
VDD Power Source Slew Time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB Pulse Width	tIRSTW	10	50	-	us	R=10Kohm, C=1uF
SD Output Stable Time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD Output Rise and Fall Time	Tgst	-	-	6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF

7.2 System Bus Timing for RGB Interface

DC Electrical Characteristics (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C, Bare Chip)

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tcw	40	50	60	%	
VSYNC Setup Time	Tvst	10	-	-	ns	
VSYNC Hold Time	Tvhd	10	-	-	ns	
HSYNC Setup Time	Thst	10	-	-	ns	
HSYNC Hold Time	Thhd	10	-	-	ns	
Data Setup Time	Tdsu	10	-	-	ns	
Data Hold Time	Tdhd	10	-	-	ns	
DE Setup Time	Tdest	10	-	-	ns	
DE Hold Time	Tdehd	10	-	-	ns	





7.3 Input Timing Table

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Parallel 24-bit RGB Interface Timing Table						
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	Fclk	23	25	27	MHz	.
HSYNC	Period Time	Th	808	816	848	DCLK
	Display Period	Thdisp	800			DCLK
	Back Porch	Thbp	4	8	24	DCLK
	Front Porch	Thfp	4	8	24	DCLK
	Pulse Width	Thw	2	4	8	DCLK
VSYNC	Period Time	Tv	496	512	528	HSYNC
	Display Period	Tvdisp	480			HSYNC
	Back Porch	Tvbp	8	16	24	HSYNC
	Front Porch	Tvfp	8	16	24	HSYNC
	Pulse Width	Tvw	2	4	8	HSYNC

Note: 1. The minimum blanking time depends on the GIP timing of the panel specification

2. To ensure the compatibility of different panels, it is recommended to use the typical setting.

3. It is necessary to keep Tvbp =8 and Thbp =8 in sync mode. DE mode is unnecessary to keep it.

4. The maximum DCLK Frequency is 27MHz. If the case needs faster DCLK, please contact Sitronix .

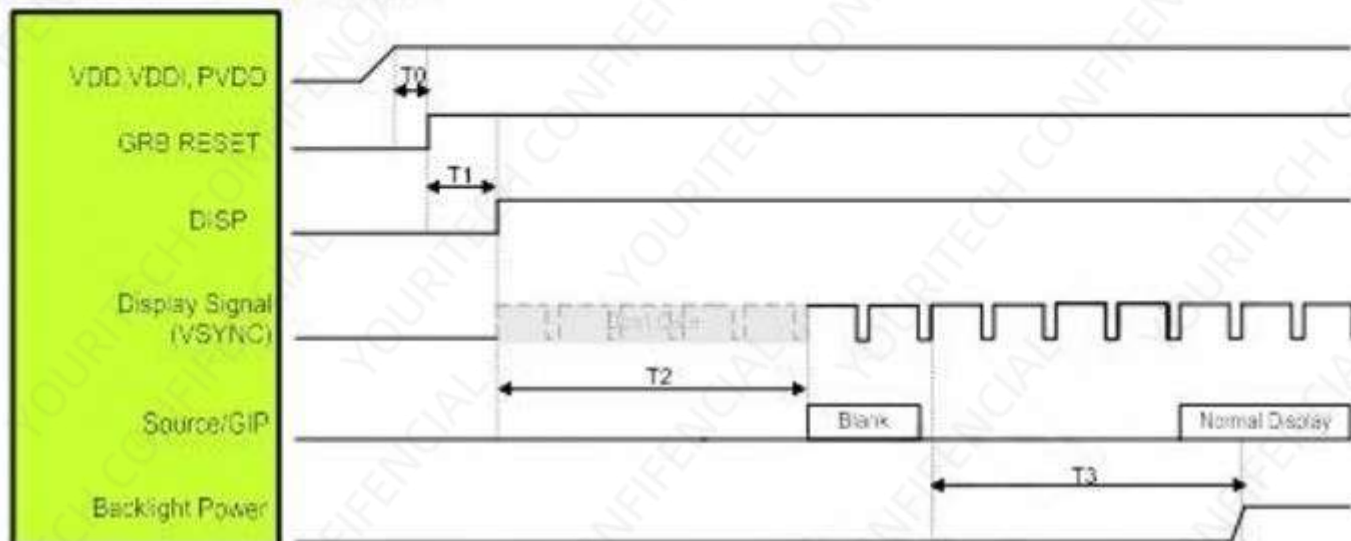


7.4 Input Timing Table

POWER ON/OFF SEQUENCE

Power On Sequence

Internal Power Mode



Symbol	Description	Time	Unit
T0	System power stability to GRB RESET signal	≥ 1	ms
T1	GRB RESET = "High" to DISP = "High"	≥ 10	ms
T2	DISP = "High" to Source/GIP scan blank	85	ms
T3	Display Signal input to Backlight power on (base on Display Signal Frame Rate 60Hz)	≥ 100	ms

Note:

1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures. Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.
2. RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]
3. LVDS interface Display signal: DCLK P/N; RX[3:0] P/N



8. CTP Specification

8.1 Electrical Characteristics

8.1.1 Absolute Maximum Rating

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	2.66	3.47	V	
Operating temperature	T _{OP}	-30	+85	°C	
Storage temperature	T _{ST}	-40	+90	°C	

8.1.2 DC Electrical Characteristics (Ta=25°C)

(Ambient temperature:25°C, VDD=2.8V, VDDIO=1.8V or VDDIO=VDD)

Item	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage/VDD	2.66	3.3	3.47	V	
Normal mode operating current	--	13	--	mA	
Green mode operating current	--	4.5	--	mA	
Sleep mode operating current	70	--	120	uA	
Digital Input low voltage/VIL	-0.3	--	0.25*VDD	V	
Digital Input high voltage/VIH	0.75*VDD	--	VDD+0.3	V	
Digital Output low voltage/VOL	--	--	0.15*VDD	V	
Digital Output high voltage/VOH	0.85*VDD	--	--	V	



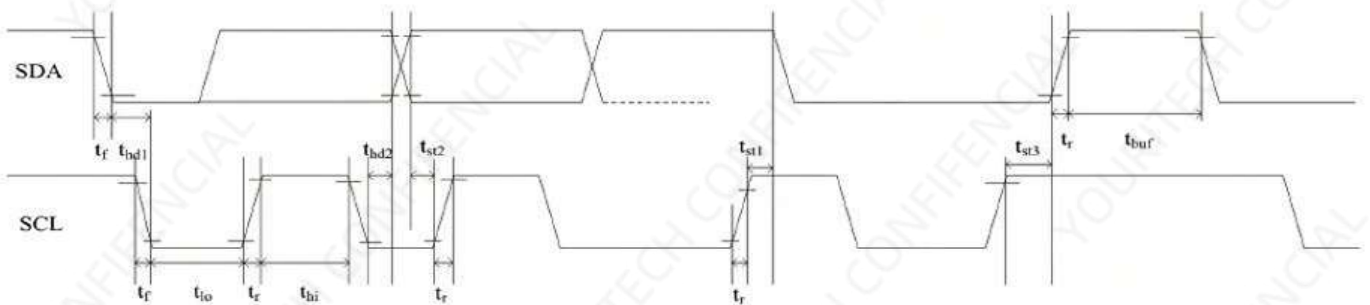
8.1.3 AC Characteristics

(Ambient temperature:25℃, VDD=2.8V, VDDIO=1.8V)

Parameter	Min	Typ	Max	Unit	Note
OSC oscillation frequency	59	60	61	MHZ	
I/O output rise time,low to high	-	14	-	ns	
I/O output rfall time,high to low	-	14	-	ns	

8.2 I2C Timing

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 strongly recommended that transmission rate be kept at or below 400Kbps. The I2C timing is shown below:



Test condition 1: 1.8V host interface voltage, 400Kbps transmission rate, 2K pull-up resistor

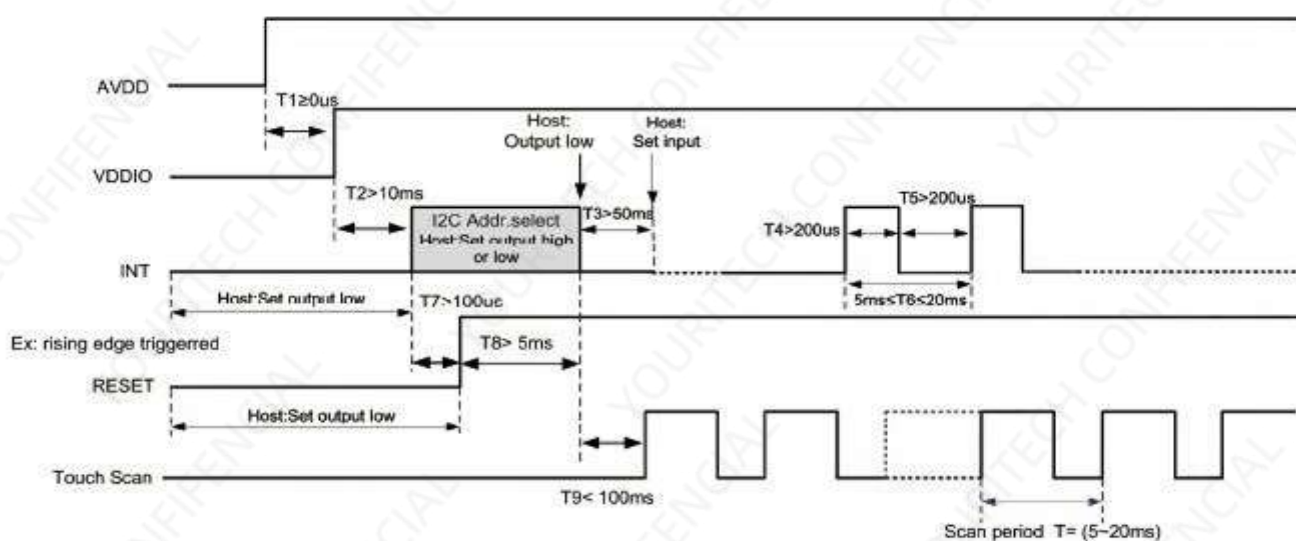
Parameter	Symbol	Min.	Max.	Unit
SCL low period	t_{lo}	1.3	-	us
SCL high period	t_{hi}	0.6	-	us
SCL setup time for Start condition	t_{st1}	0.6	-	us
SCL setup time for Stop condition	t_{st3}	0.6	-	us
SCL hold time for Start condition	t_{hd1}	0.6	-	us
SDA setup time	t_{st2}	0.1	-	us
SDA hold time	t_{hd2}	0	-	us

Test condition 2: 3.3V host interface voltage, 400Kbps transmission rate, 2K pull-up resistor

Parameter	Symbol	Min.	Max.	Unit
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

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. See the diagram below for configuration methods and timings:

Power-on Timing:



Ex: rising edge triggered

INT

RESET

Touch Scan

Host: Output low

Host: Set input

I2C Addr. select

Host: Set output high or low

Host: Set output low

$T1 > 100\mu s$

$T2 > 100\mu s$

$T3 > 5ms$

$T4 > 50ms$

$T5 < 100ms$

$T6 > 200\mu s$

$T7 > 200\mu s$

$5ms \leq T8 \leq 20ms$

Scan period $T = (5 \sim 20ms)$

Reset

INT

Longer than 100us

Longer than 5ms

Longer than 50ms

1. Reset Output low

2. INT Output high

3. Reset Output high

4. INT Output low

5. INT Input floating

Timing diagram for the 8255 PPI showing the sequence of events:

1. Reset: Output low
2. INT: Output low
3. Reset: Output high
4. INT: Output low
5. INT: Input floating

The diagram also indicates the duration of the INT signal pulses: Longer than 100ns, Longer than 5ns, and Longer than 50ns.

a) Data Transmission

(For example: slave address is 0xBA/0xBB)

Communication is always initiated by the host. Valid Start condition is signaled by pulling SDA line from high to low when SCL line 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 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 which implies the transition of SDA line from low to high when SCL line is high.

b) Writing Data to GT9271

(For example: slave address is 0xBA/0xBB)



Timing for Write Operation

The diagram above displays the timing sequence of the host writing data onto GT9271. First, the host issues a Start condition. Then, 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 after every Write Operation. Therefore, when the host needs to perform Write Operations on a group of registers of continuous addresses, it is able to write continuously. The Write Operation is terminated when the host issues the Stop condition.



c) Reading Data from GT9271

(For example: slave address is 0xBA/0xBB)



Timing for Read Operation

The diagram above is the timing sequence of the host reading data from GT9271. First, the host issues a 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.

Also after receiving ACK, the host issues the Start condition once again and sends 0xBB (Read Operation). After receiving ACK, the host starts to read data.

GT9271 also supports continuous Read Operation and, by default, reads data continuously. Whenever 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.



9. LCD Module Out-Going Quality Level

9.1 VISUAL & FUNCTION INSPECTION STANDARD

9.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

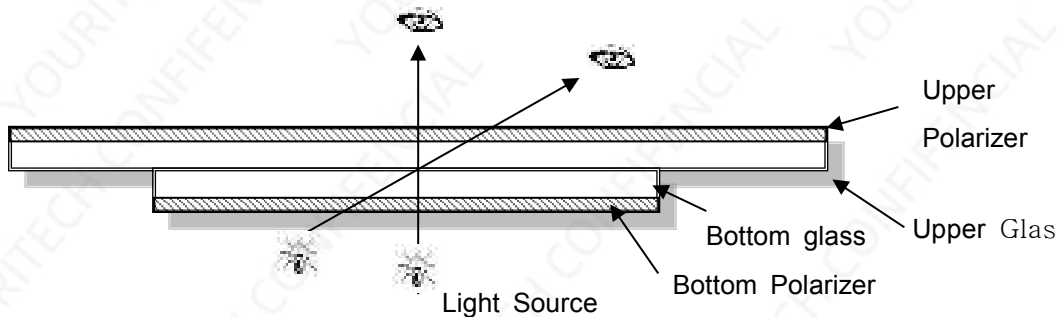
Temperature : $25\pm 5^{\circ}\text{C}$

Humidity : $65\%\pm 10\%\text{RH}$

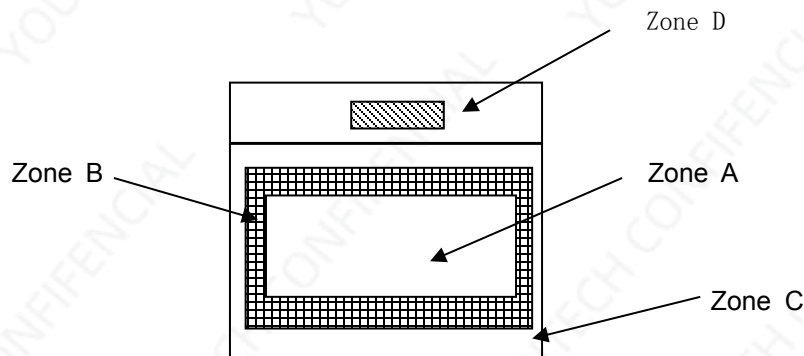
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



9.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

Note:As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer



9.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class II

AQL:

Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display , LCM: Liquid Crystal Module, CTP: Capacitive Touch Panel

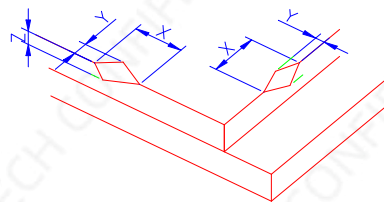
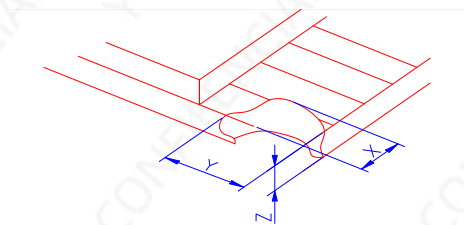
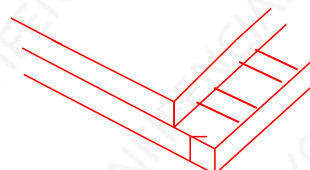
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. etc	Major
2	Missing	Missing components and etc	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed, deformation and etc	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot/Line defect	Light dot, Dim spot, (Note1) Polarizer Air Bubble, Polarizer accidented spot and etc	
6	Soldering appearance	Good soldering , Peeling off is not allowed and etc	
7	LCD/Polarizer/CTP	Black/White spot/line, scratch, crack, etc.	

Note1: a) Light dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

b) Dim dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.



9.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of IT O, T: Height of LCD	(1) The edge of LCD broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
	X	Y	Z					
	≤3.0mm	<Inner border line of the seal	≤T					
(2)LCD corner broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	≤L	≤T	
X	Y	Z						
≤3.0mm	≤L	≤T						
(3) LCD crack	 Crack Not allowed							



Spot defect

2.0

Y

X

$\Phi=(X+Y)/2$

① light dot (black/white spot , pinhole, stain, etc.)

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.15$	Ignore	Ignore	
$0.15 < \Phi \leq 0.25$	3(distance $\geq 10\text{mm}$)		
$0.25 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.4$	0		

② Dim spot (light leakage、dent、dark spot, etc)

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.15$	Ignore	Ignore	
$0.15 < \Phi \leq 0.25$	3(distance $\geq 10\text{mm}$)		
$0.25 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.4$	0		

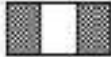
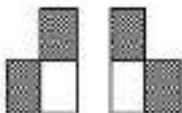
③ Polarizer accidented spot

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		Ignore
$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.5$	0		

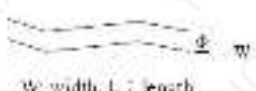
④Polarizer Bubble

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		Ignore
$0.2 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.4$	0		



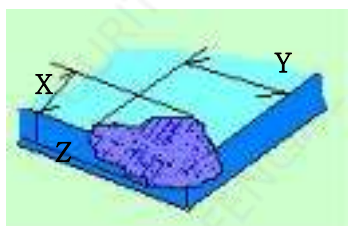
3.0	LCD Pixel defect	Pixel bad points																							
		<table> <tr> <th>Item</th><th>Zone A</th><th>Acceptable Qt</th></tr> <tr> <td rowspan="3">Bright dot</td><td>Random</td><td>$N \leq 2$</td></tr> <tr> <td>2 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td>3 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td rowspan="3">Dark dot</td><td>Random</td><td>$N \leq 3$</td></tr> <tr> <td>2 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td>3 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td>Distance</td><td> 1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot. </td><td>5mm</td></tr> <tr> <td colspan="2">Total bright and dark dot</td><td>$N \leq 4$</td></tr> </table> Note: A) Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern. B) Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture. C) 2 dot adjacent = 1 pair = 2 dots Picture:   2 dot adjacent 2 dot adjacent (vertical)   2 dot adjacent 2 dot adjacent (slant)	Item	Zone A	Acceptable Qt	Bright dot	Random	$N \leq 2$	2 dots adjacent	$N \leq 0$	3 dots adjacent	$N \leq 0$	Dark dot	Random	$N \leq 3$	2 dots adjacent	$N \leq 0$	3 dots adjacent	$N \leq 0$	Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm	Total bright and dark dot		$N \leq 4$
Item	Zone A	Acceptable Qt																							
Bright dot	Random	$N \leq 2$																							
	2 dots adjacent	$N \leq 0$																							
	3 dots adjacent	$N \leq 0$																							
Dark dot	Random	$N \leq 3$																							
	2 dots adjacent	$N \leq 0$																							
	3 dots adjacent	$N \leq 0$																							
Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm																							
Total bright and dark dot		$N \leq 4$																							



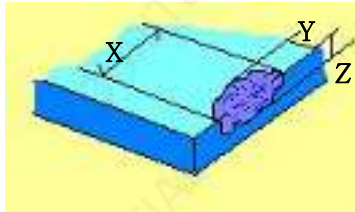
4.0	Line defect (LCD /Polarizer backlight black/white line, scratch, stain)  W: width, L: length N : Count	Width(mm)	Length(m)	Acceptable Qty		
				A	B	C
		$\Phi \leq 0.05$	Ignore	Ignore		Ignore
		$0.05 < W \leq 0.06$	$L \leq 5.0$	$N \leq 3$		
		$0.06 < W \leq 0.08$	$L \leq 4.0$	$N \leq 2$		
$W > 0.08$	Define as spot defect					
5.0	Electronic Components SMT.	Not allow missing parts, solderless connection, cold solder joint, mismatch, The positive and negative polarity opposite				
6.0	Display color& Brightness.	1. Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples. 2. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.				
7.0	LCD Mura/Waving/ Hot spot	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary.				

8.0	CTP Related	CTP Cover sensor acc identified black/white spot				
			Size Φ (mm)	Acceptable Qty		
				A	B	C
			$\Phi \leq 0.15$	Ignore		Ignore
			$0.15 < \Phi \leq 0.25$	4 (distance $\geq 10\text{mm}$)		
			$0.25 < \Phi \leq 0.35$	3 (distance $\geq 10\text{mm}$)		
$\Phi > 0.35$	0					



		CTP Cover scratch	<table><tr><th rowspan="2">Width(mm)</th><th rowspan="2">Ignore (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>$\Phi \leq 0.05$</td><td>Ignore</td><td colspan="3">Ignore</td></tr><tr><td>$0.05 < W \leq 0.06$</td><td>$L \leq 4.0$</td><td colspan="3">$N \leq 3$</td></tr><tr><td>$0.06 < W \leq 0.08$</td><td>$L \leq 3.0$</td><td colspan="3">$N \leq 2$</td></tr><tr><td>$0.08 < W$</td><td colspan="4">Define as spot defect</td></tr></table>	Width(mm)	Ignore (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.05$	Ignore	Ignore			$0.05 < W \leq 0.06$	$L \leq 4.0$	$N \leq 3$			$0.06 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$			$0.08 < W$	Define as spot defect				
			Width(mm)			Ignore (mm)	Acceptable Qty																									
				A	B		C																									
			$\Phi \leq 0.05$	Ignore	Ignore																											
			$0.05 < W \leq 0.06$	$L \leq 4.0$	$N \leq 3$																											
		$0.06 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$																												
		$0.08 < W$	Define as spot defect																													
		CTP Cover Pinhole/ Lack of ink	<table><tr><th rowspan="2">Zone Size (mm)</th><th>Acceptable Qty</th></tr><tr><th>C</th></tr><tr><td>$\Phi \leq 0.2$</td><td>Ignore</td></tr><tr><td>$0.2 < \Phi \leq 0.3$</td><td>4(distance $\geq 10\text{mm}$)</td></tr><tr><td>$0.3 < \Phi \leq 0.4$</td><td>2(distance $\geq 10\text{mm}$)</td></tr><tr><td>$\Phi > 0.4$</td><td>0</td></tr></table>	Zone Size (mm)	Acceptable Qty	C	$\Phi \leq 0.2$	Ignore	$0.2 < \Phi \leq 0.3$	4(distance $\geq 10\text{mm}$)	$0.3 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)	$\Phi > 0.4$	0																		
			Zone Size (mm)		Acceptable Qty																											
				C																												
$\Phi \leq 0.2$	Ignore																															
$0.2 < \Phi \leq 0.3$	4(distance $\geq 10\text{mm}$)																															
$0.3 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)																															
$\Phi > 0.4$	0																															
CTP Bondi ng bubble/ accident ed spot	<table><tr><th rowspan="2">Size $\Phi(\text{mm})$</th><th colspan="2">Acceptable Qty</th></tr><tr><th>A</th><th>B</th></tr><tr><td>$\Phi \leq 0.1$</td><td colspan="2">Ignore</td></tr><tr><td>$0.1 < \Phi \leq 0.2$</td><td colspan="2">3(distance $\geq 10\text{mm}$)</td></tr><tr><td>$0.2 < \Phi \leq 0.3$</td><td colspan="2">2(distance $\geq 10\text{mm}$)</td></tr><tr><td>$\Phi > 0.3$</td><td colspan="2">0</td></tr></table>	Size $\Phi(\text{mm})$	Acceptable Qty		A	B	$\Phi \leq 0.1$	Ignore		$0.1 < \Phi \leq 0.2$	3(distance $\geq 10\text{mm}$)		$0.2 < \Phi \leq 0.3$	2(distance $\geq 10\text{mm}$)		$\Phi > 0.3$	0															
	Size $\Phi(\text{mm})$		Acceptable Qty																													
		A	B																													
	$\Phi \leq 0.1$	Ignore																														
	$0.1 < \Phi \leq 0.2$	3(distance $\geq 10\text{mm}$)																														
	$0.2 < \Phi \leq 0.3$	2(distance $\geq 10\text{mm}$)																														
$\Phi > 0.3$	0																															
Assembly deflection	beyond the edge of backlight $\leq 0.2\text{mm}$																															
CTP cover broken X : length Y : width Z : height	<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>$X \leq 0.5\text{mm}$</td><td>$Y \leq 0.5\text{mm}$</td><td>$Z < \text{cover thickness}$</td></tr></table>	X	Y	Z	$X \leq 0.5\text{mm}$	$Y \leq 0.5\text{mm}$	$Z < \text{cover thickness}$																									
	X	Y	Z																													
$X \leq 0.5\text{mm}$	$Y \leq 0.5\text{mm}$	$Z < \text{cover thickness}$																														
Circuitry broken is not allowed.																																



			X	Y	Z	
		CTP cover broken	$X \leq 0.3\text{mm}$	$Y \leq 0.3\text{mm}$	$Z < \text{cover thickness}$	
		X : length Y : width Z : height				
			* Circuitry broken is not allowed.			

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	CTP no function	Not allowed



10. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	85℃,96H	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	-30℃, 96HR	
High Temperature Storage	85℃, 96HR	
Low Temperature Storage	-30℃, 96HR	
High Temperature & High Humidity Operating	+60℃, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-10℃,30 min ↔ +60℃,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15℃~35℃, 30%~60%).	
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.
6. The color fading mura of polarizing filter should not care.



11. Cautions and Handling Precautions

11.1 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.

11.2 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.

