Product Specifications

Customer	
Description	**5.7” TFT LCD Module**
Model Name	**OSD057AC111**
Date	**2006/07/26**
Doc. No.	
Revision	**07**

Customer Approval	
Date	
The above signature represents that the product specifications, testing regulation, and warranty in the specifications are accepted	

		Design Engineering		
		Approval	Check	Design
		宋	王顏若燕	林佩瑩

CONETNTS

RECORD OF REVISIONS

Revision No.	Revision Date	Page	Summary
00	2006/4/13	all	New Creation
01	2006/6/6	18	Viewing angle
02	2006/6/8	5	VCOM Voltage
03	2006/6/14	27	Add: Quality Assurance
04	2006/6/20	30	Add: Precaution
05	2006/6/23	6,29	Add: LED_B/L schematic; Packing
06	2006/6/30	26	Change: Cable length & color; Add: FPC thickness
07	2006/7/26	19	Modify: Optical Characteristics

1. SUMMARY

This technical specification applies to 5.7“ color TFT-LCD panel. The 5.7“ color TFT-LCD panel is designed for industry, vehicle application and other electronic products which require high quality flat panel displays.

This module follows RoHS.

2. FEATURES

High Resolution: 230,400 Dots (320 RGB x 240). Image Reversion: Up/Down and Left/Right.

3. GENERAL SPECIFICATIONS

Parameter		Specifications	Unit
Screen size		5.7(Diagonal)	inch
Display Format		320 RGB x 240	Dot
Active area		115.25(H) x 86.4(V)	mm
Dot pitch		0.12(H) x 0.36(V)	mm
Surface treatment		Anti-glare	
Pixel Configuration		RGB-Stripe	
Outline dimension		126.00(W) x 101.55(H) x 5.70(D)	mm
Weight		(85)	g
View Angle direction		6 o’clock	
Temperature Range	Operation	-20~70	℃
	Storage	-30~80	℃

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power Voltage	V_{DD},V_{CC}	GND=0	-0.3	7.0	V	
	V_{GH}	GND=0	-0.3	32.0	V	
	V_{GL}	GND=0	-22.0	0.3	V	
	V_{GH} –V_{GL}	GND=0	-0.3	+45.0	V	
Input Signal Voltage	V_{in}	GND=0	-0.3	V_{DD}+0.3	V	
Logic Output Voltage	V_{OUT}	GND=0	-0.3	+0.7	V	

Note : Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

5. ELECTRICAL CHARACTERISTICS

5.1. Operating conditions:

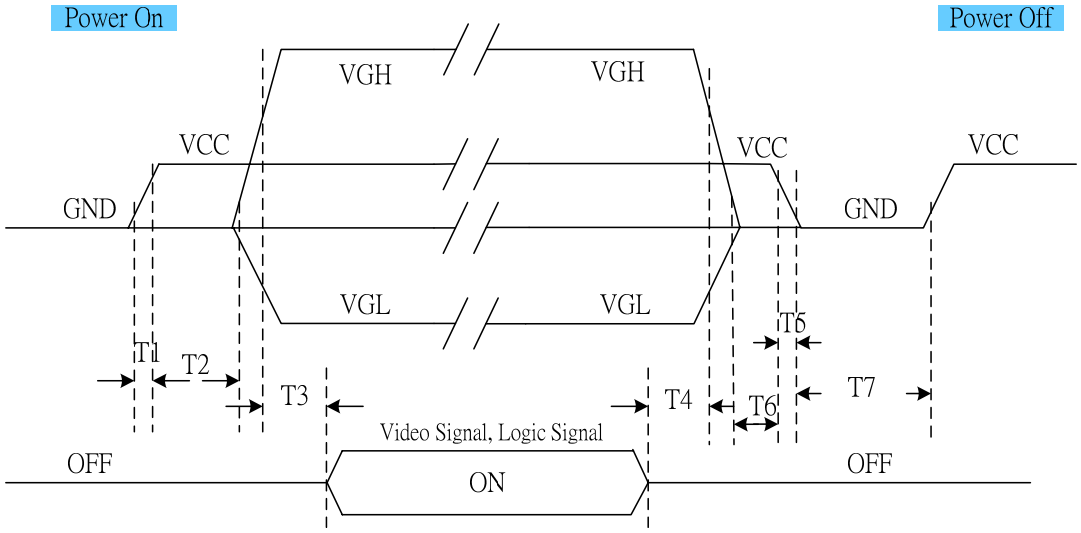
Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
Power Voltage	VCC	3.0	3.3	3.6	V	
	VDD	3.8	5	5.5	V	
	VGH	10	-	30	V	
	VGL	-17	-	-5	V	
Low level input voltage	V_{IL}	0	-	0.3 VDD	V	SCL, SDI,UD,LRC,IF1,IF2
Hight level input voltage	V_{IH}	0.7 VDD	-	VDD	V	
Analog operating current	I_{VDD}	-	-	TBD	mA	f_{CLKIN}=27MHz,f_{OEH}=15.7KHz, VDDA=5V
Vcom High Voltage	VcomH	-	4.6	-	V	Note1
Vcom Low Voltage	VcomL		-0.4		V	Note1

Note：

1. VcomH& VcomL：Adjust the color with gamma data.

5.2 Power Sequence

Sequence for power on/off and Signal on/off



T1 ≦ 15ms (From 10%*VCC to 90%*VCC，when VCC is Low to High);
T2 ≦ 10ms (From 90%*VCC to 10%*VGH，when VCC is Low to High);
T3 ≦ 10ms (From 90%*VGH to Video signal，when VGH is Low to High);
T4 ≦ 10ms (From Video signal to 90%*VGH，when VGH is High to Low);
T5 ≦ 20ms (From 90%*VCC to 10%*VCC，when VCC is High to Low);
T6 ≦ 10ms (From 10%*VGH to 90%*VCC，when VCC is Low to High);
T7 ≦ 0.4s (From 10%*VCC is H → L to 10%*VCC is L → H)。

To prevent the device from damage due to latch-up, the power ON/OFF sequence shown below must be followed.

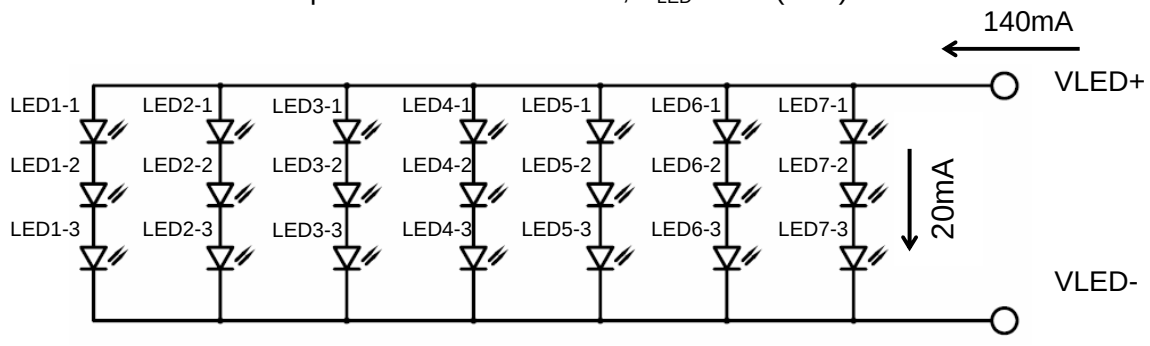
Power ON : VDD, VCC → VGL → Input Signals → VGH

Power OFF : VGH → Input Signals → VGL → VDD, VCC

5.3 LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I_{LED}		140	210	mA	Note 1
LED voltage	V_{LED}	9.9	-	10.5	V	
LED Life Time	-	(10,000)	-	-	Hr	Note 2,3

Note 1 : There are 7 Groups LED shown as below , V_{LED}=9.9V (min.).



Note 2 : Ta = 25℃ ,
Note 3 : Brightess to be decreased to 50% of the initial value.

6. AC Characteristics

6.1. CCIR601/656 Interface

6.1.1. Input signal characteristics

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
CLK period	T_{OSC}	-	37	-	ns
Data setup time	T_{SU}	12	-	-	ns
Data hold time	T_{HD}	12	-	-	ns

6.1.2 Hardware reset timing

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
RESET low pulse width	T_{RSB}	10	-	-	μs

6.1.3. Output signal characteristics

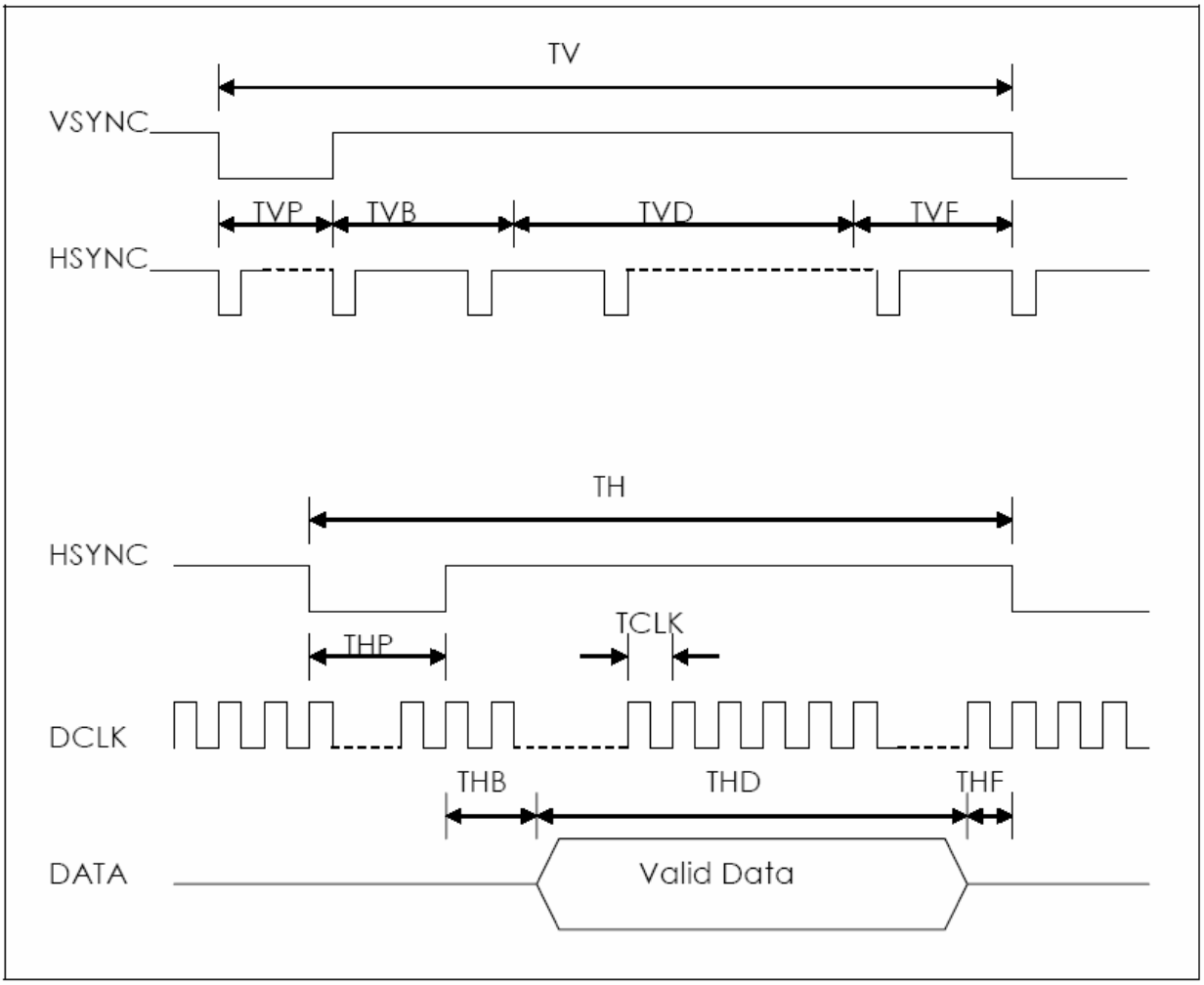
PARAMETER		Symbol	Min.	Typ.	Max.	Unit
Rising time		T_r	-	-	10	ns
Falling time		T_f	-	-	10	ns
Internal STH setup time		T_{SUS}	12	-	-	ns
Internal STH hold time		T_{HDS}	12	-	-	ns
Internal data setup time		T_{SUD}	60	-	-	ns
Internal data hold time		T_{HDD}	40	-	-	ns
OEH pulse width		T_{OEH}	-	1248	-	ns
OEV pulse width		T_{OEV}	-	4992	-	ns
CKV pulse width		T_{CKV}	-	3744	-	ns
Hsync – DEH time		T_1	-	4368	-	ns
Hsync – CKV time		T_2	-	2496	-	ns
Hsync – OEV time		T_3	-	624	-	ns
Vsync – setup time		T_{SUV}		1872	-	ns
Vsync – pulse time		T_{STV}		1	-	T_H
Vsync – STV time	NTSC	T_{VS1}	-	19	-	T_H
	PAL	T_{VS1}	-	27	-	T_H
OEH – STV time		T_{HE}	-	2	-	T_H
Output settling time		T_{OES}	-	12	20	μs

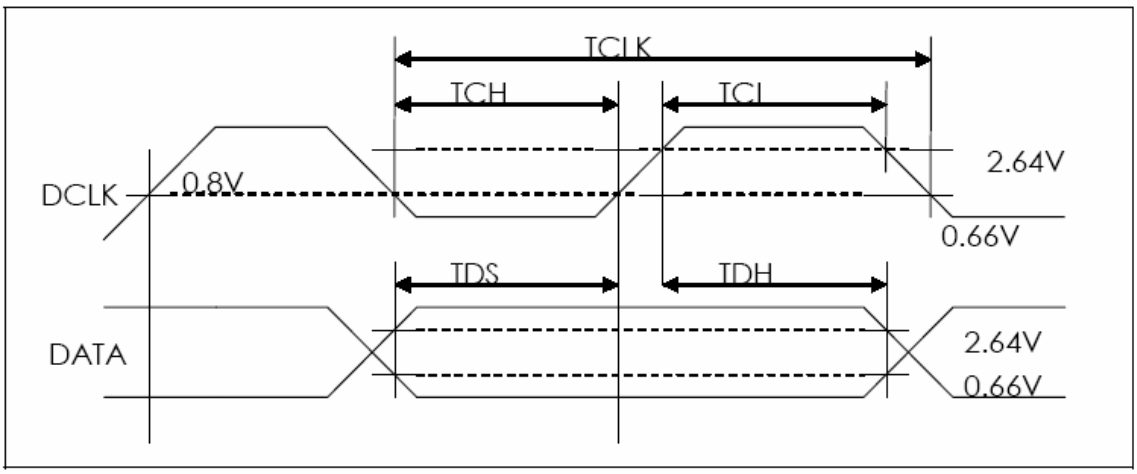
6.2. 24-bits parallel RGB Interface

6.2.1 AC Timing Characteristics

Signal	Item		Symbol	Min	Typ	Max	Unit
Dclk	Frequency		Dclk	-	6.4	-	MHZ
	High Time		Tch	-	78	-	ns
	Low Time		Tcl	-	78	-	ns
Data	Setup Time		Tds	12	-	-	ns
	Hold Time		Tdh	12	-	-	ns
Hsync	Period		TH	-	408	-	DCLK
	Pulse Width		Thp	-	30	-	DCLK
	Back-Porch		Thb	-	38	-	DCLK
	Display Period		Thd	-	320	-	DCLK
	Front-Porch		Thf	-	20	-	DCLK
Vsync	Period	NTSC	Tv	-	262.5	-	TH
		PAL			312.5		
	Pulse Width		Tvp	1	3	5	TH
	Back-Porch	NTSC	Tvb	-	15	-	TH
		PAL			23		
	Display Period		Tvd	-	240	-	TH
	Front-Porch	NTSC	Tvf	-	4.5	-	TH
		PAL			46.5		

6.2.2 AC Timing Diagrams



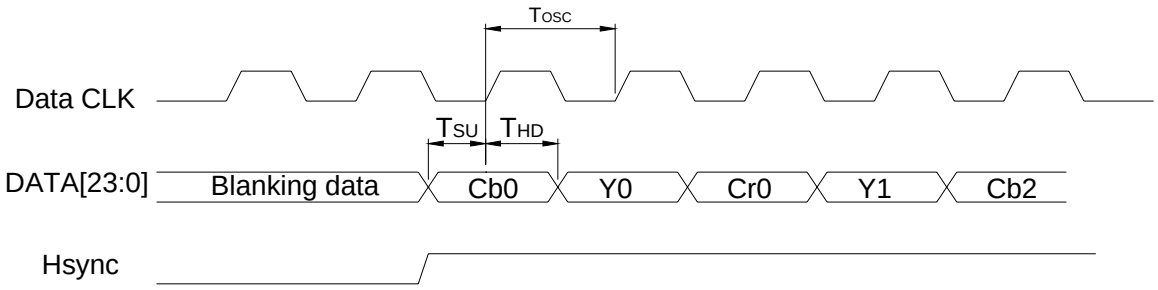


7. Waveform

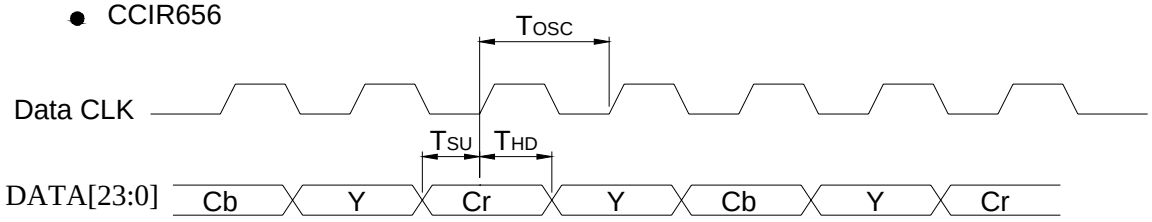
7.1. Timing Controller Timing Chart

7.1.1. Clock and Data waveform

- CCIR601(HS_POL="L" in Register R2)



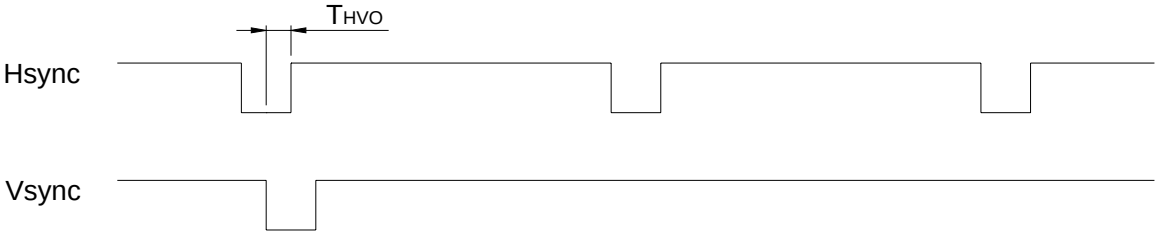
- CCIR656



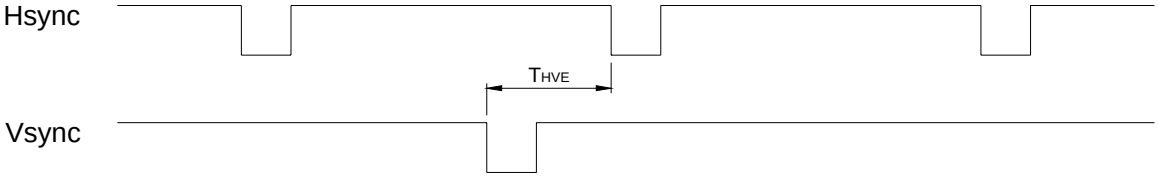
7.1.2 Digital / Analog RGB timing waveform

7.1.2.1 Hsync and Vsync timing

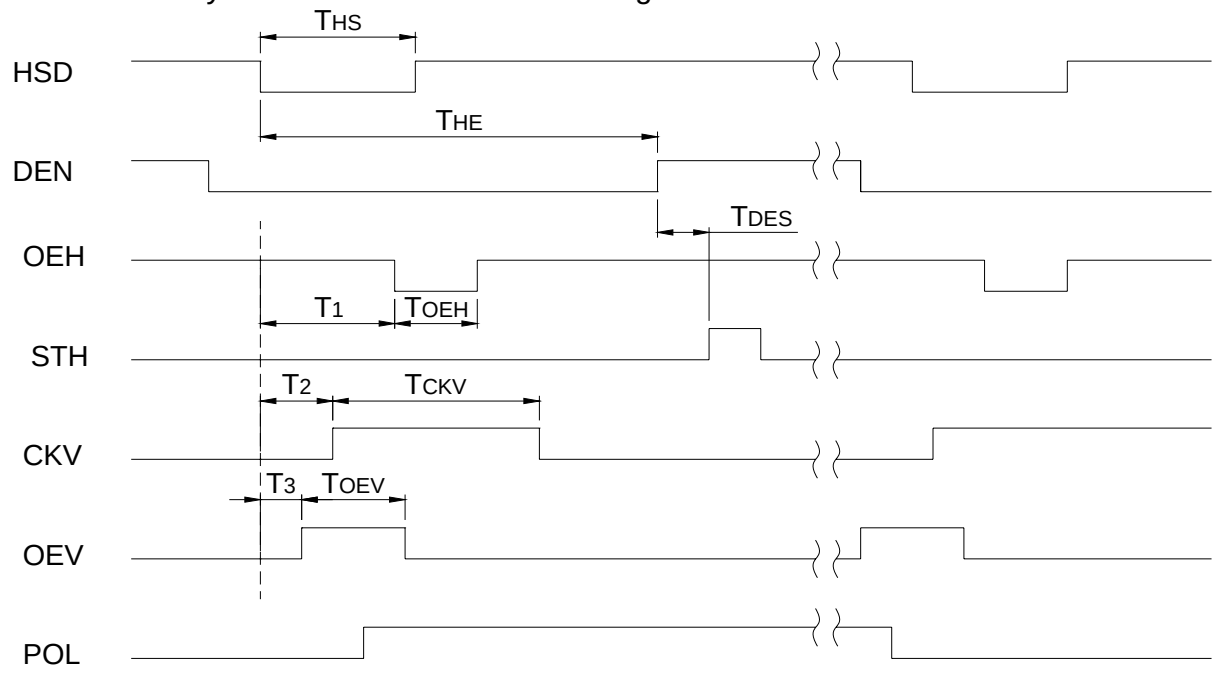
- Odd field



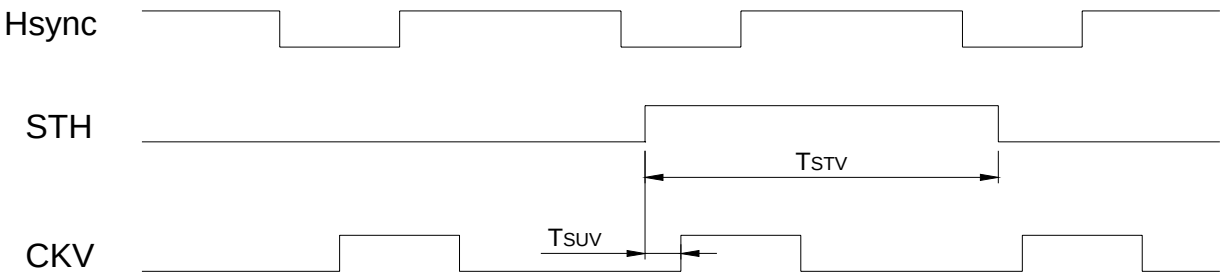
- Even field



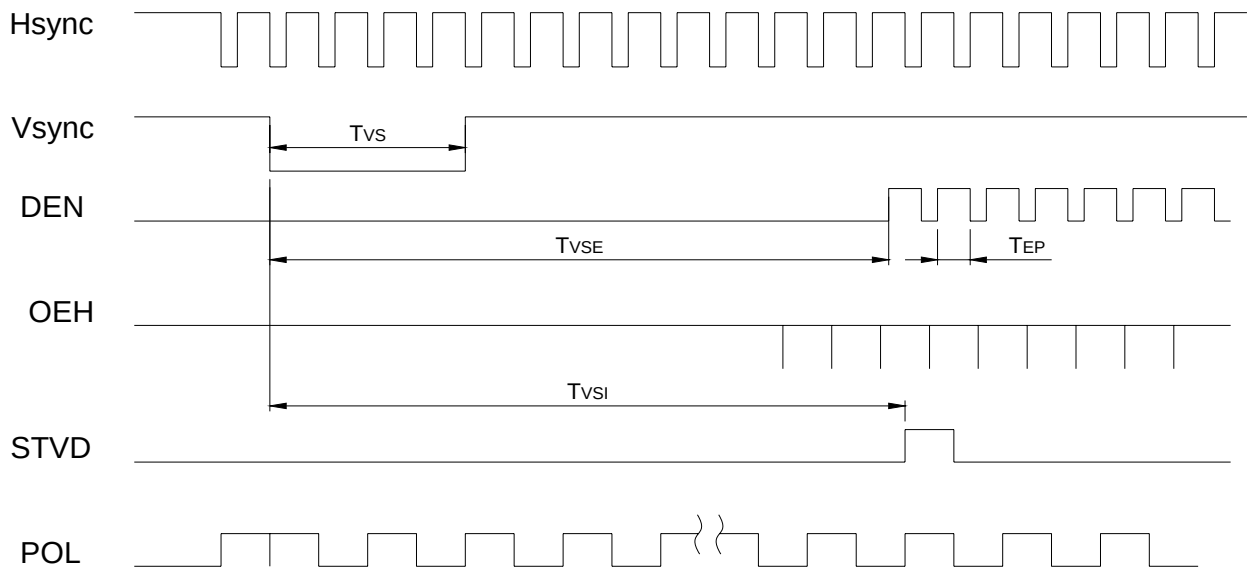
7.1.2.2 Hsync and horizontal control timing waveform



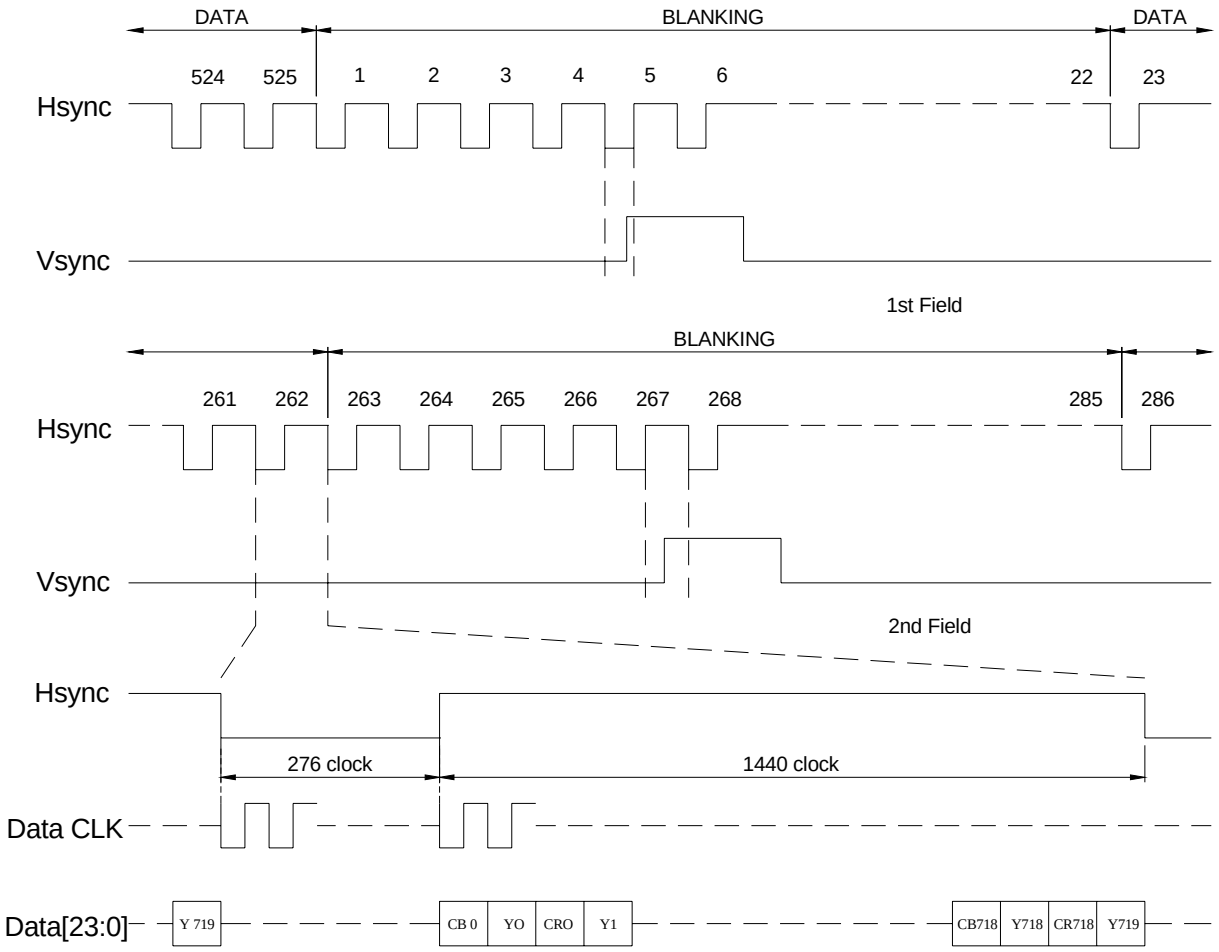
7.1.2.3 Hsync and vertical shift clock timing waveform



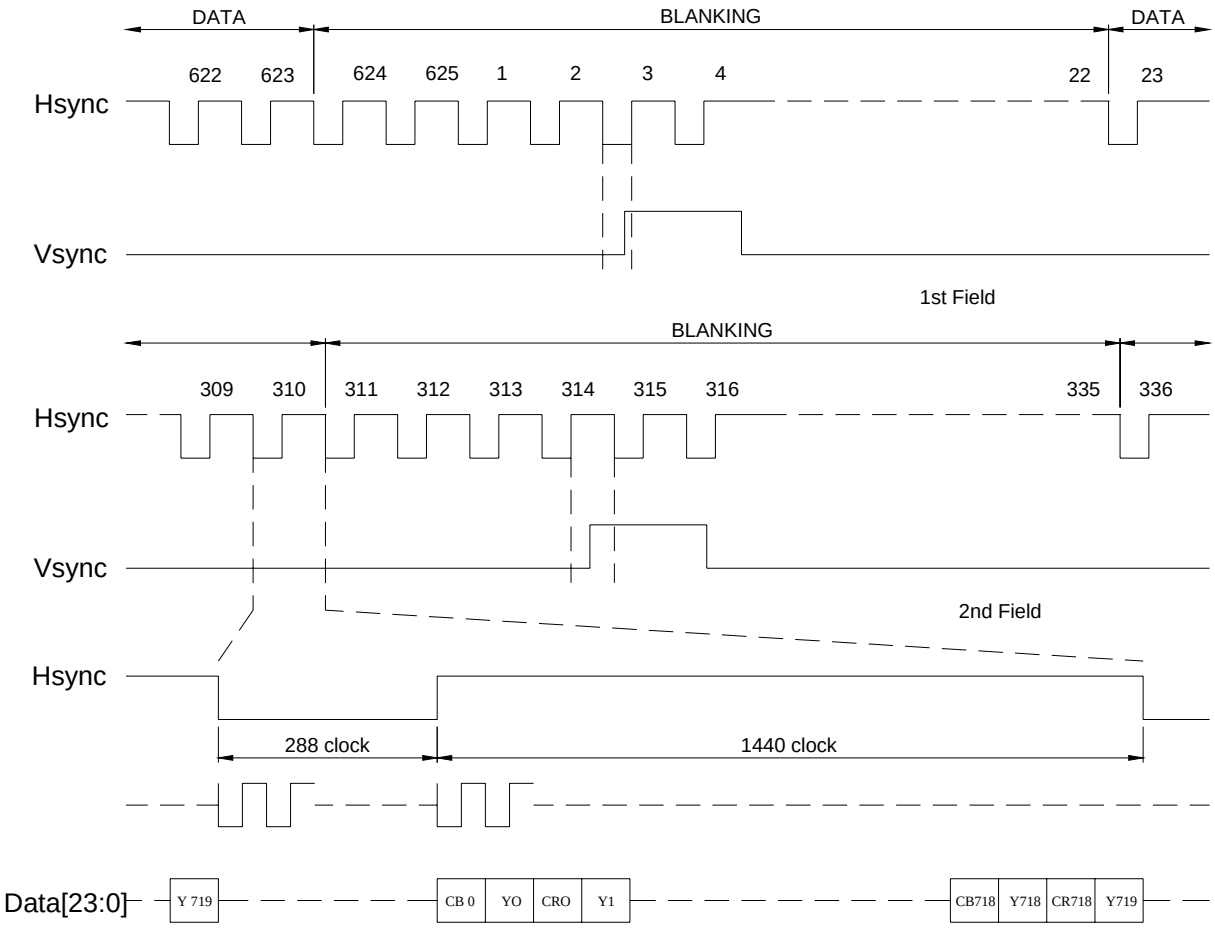
7.1.2.4 Hsync and vertical control timing waveform



7.1.3 CCIR601 timing waveform (VS_POL="H" , HS_POL="L" in Register R2)



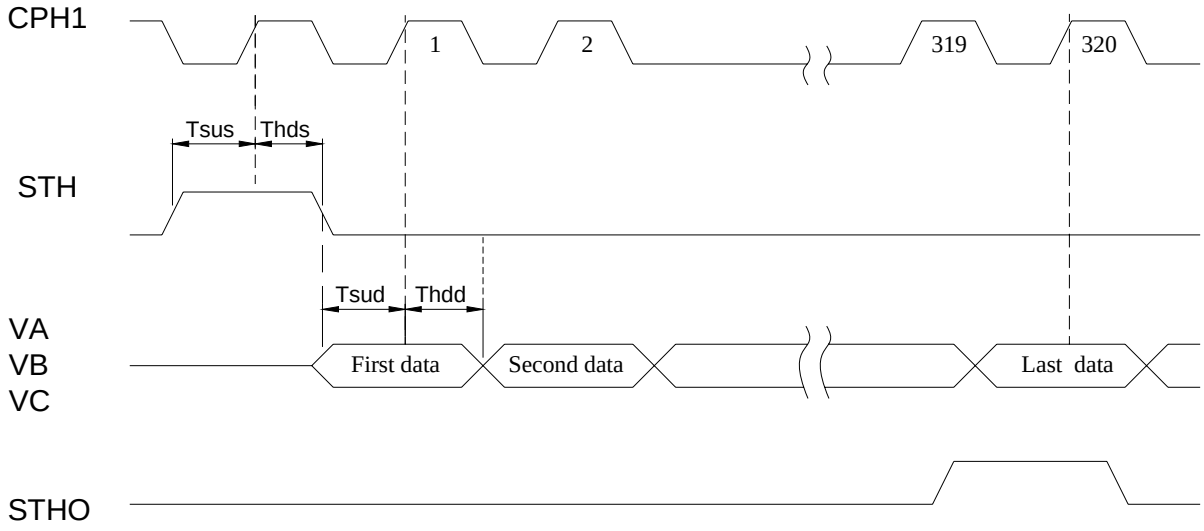
ITU-BT.601 NTSC Input Timing



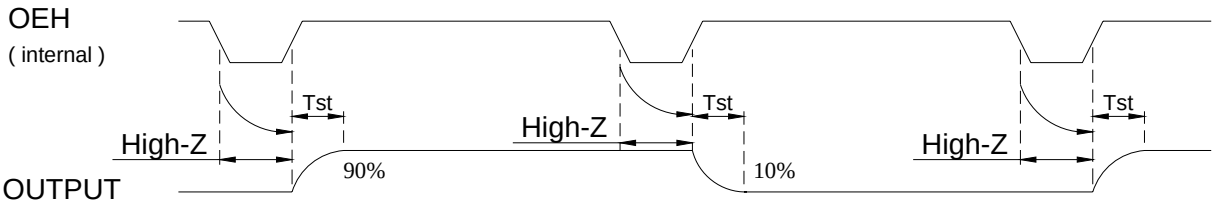
ITU-BT.601 PAL Input Timing

7.2 Source Driver Timing Chart

7.2.1 Clock and Start Pulse timing waveform



7.2.2 OEH and Data Output timing waveform



7.3 Analog video signal characteristics

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
Video signal amplitude (VA, VB, VC)	V_{IAC}	-	3.81	-	V
	V_{IDC}	-	2.385	-	V

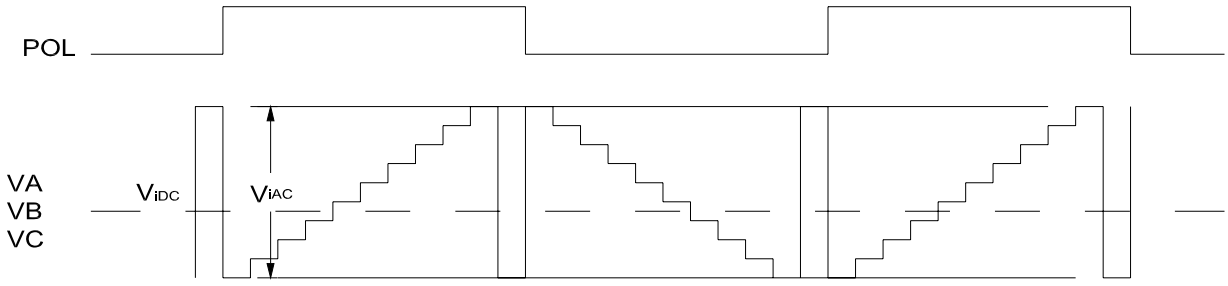
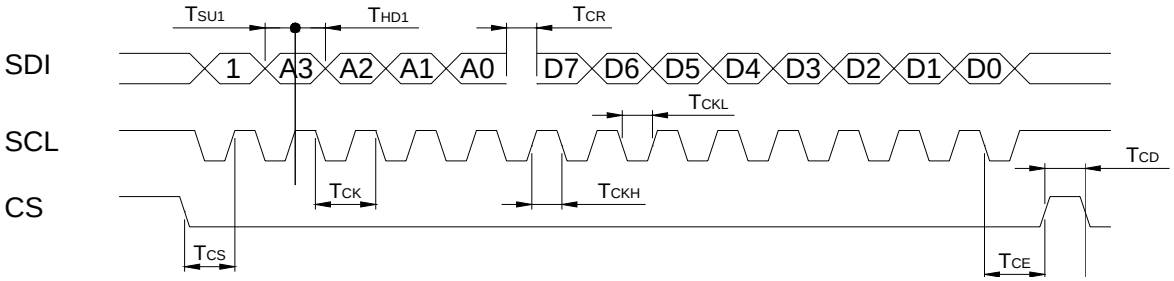


Fig. 4-(a) Horizontal timing

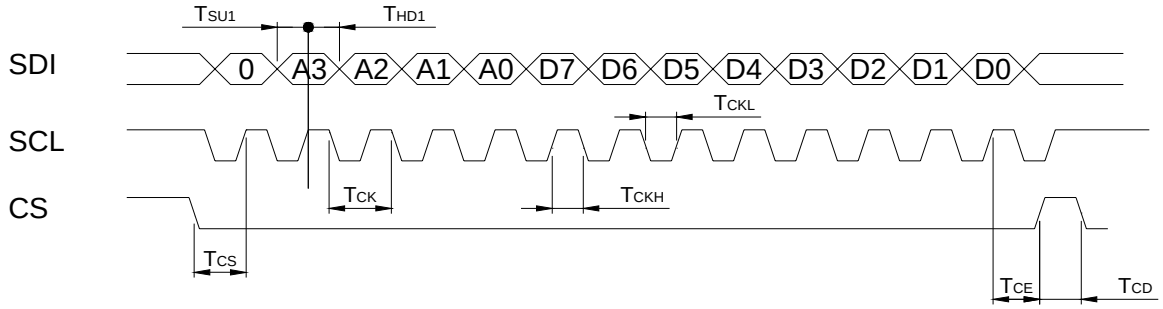
7.4 SPI timing characteristics

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
SCL period	T_{CK}	60	-	-	ns
SCL high width	T_{CKH}	30	-	-	ns
SCL low width	T_{CKL}	30	-	-	ns
Data setup time	T_{SU1}	12	-	-	ns
Data hold time	T_{HD1}	12	-	-	ns
CS to SPCK setup time	T_{CS}	20	-	-	ns
CS to SPDA hold time	T_{CE}	20	-	-	ns
CS high pulse width	T_{CD}	50	-	-	ns
SDI output latency	T_{CR}		1/2	-	T_{CK}

- SPI "read" timing

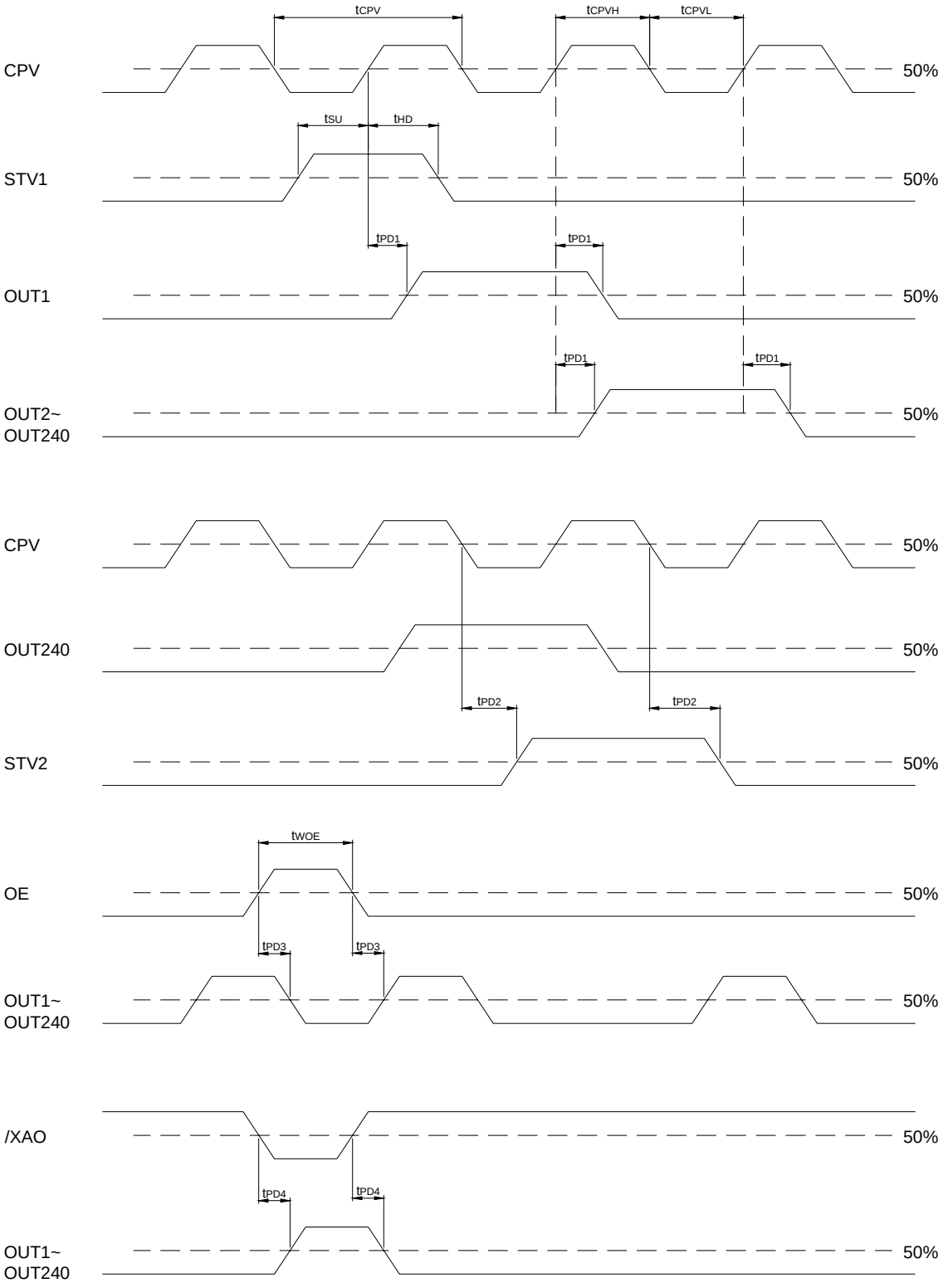


- SPI "write" timing



7.5 Gate Driver Timing Chart

Parameter	Symbol	Condition	Spec		Unit
			Min.	Max.	
Operation frequency	tCPV		5	-	μs
CPV pulse width	tCPVH,tCPVL	50%duty cycle	2.5	-	
OE pulse width	twOE		1	-	
Data setup time	tsu		0.4	-	us
Data hold time	thd		0.7	-	
Output delay time	tpd1	CL=300pF	-	1	
Output delay time	tpd2	CL=300pF	-	0.8	
Output delay time	tpd3	CL=300pF	-	0.8	
Output delay time	tpd4	CL=300pF	-	10	


tCPV
tCPVH
tCPVL
CPV
50%
tSU
tHD
STV1
50%
tPD1
tPD1
OUT1
50%
tPD1
tPD1
OUT2~
OUT240
50%
CPV
50%
OUT240
50%
tPD2
tPD2
STV2
50%
tWOE
OE
50%
tPD3
tPD3
OUT1~
OUT240
50%
/XAO
50%
tPD4
tPD4
OUT1~
OUT240
50%

8. Optical Characteristics

Ta=25±2℃, ILED=140mA

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time		Tr	θ=0°	-	15	30	ms	Note 3,5
		Tf		-	35	50	ms	
Contrast ratio		CR	At optimized viewing angle	150	200			Note 4,5
Color Chromaticity	White	Wx	θ=0°	(0.25)	(0.30)	(0.35)		Note 2,6,7
		Wy		(0.27)	(0.32)	(0.37)		
Viewing angle	Hor.	Θ_R	CR≥10	50	65	-	Deg.	Note 1
		Θ_L		50	65	-		
	Ver.	Θ_T		30	50	-		
		Θ_B		50	55	-		
Uniformity		U	-	(70)	(75)	-	%	Note 8
Brightness		-	-		350	-	cd/m^2	Center of display

Note 1: Definition of viewing angle range

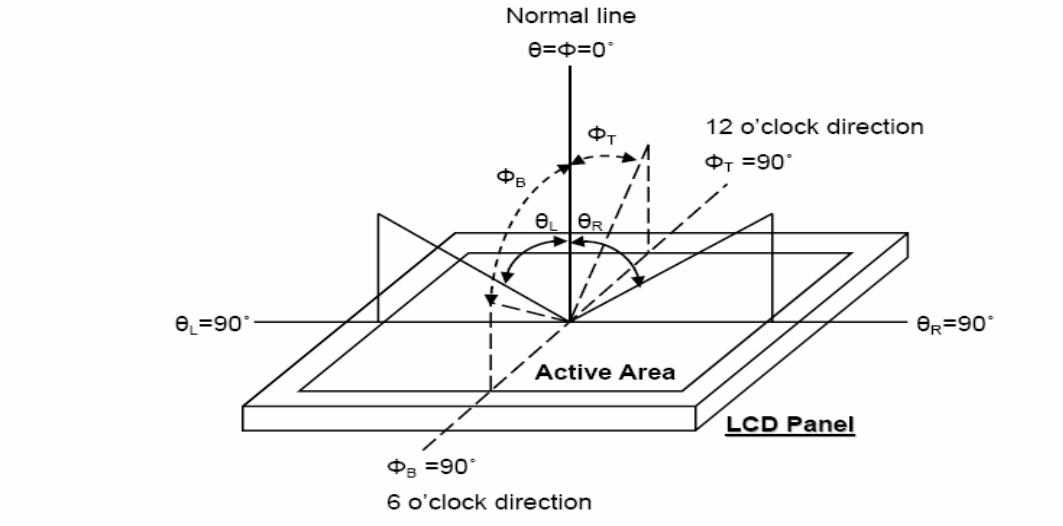


Fig. 8-1 Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 5 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

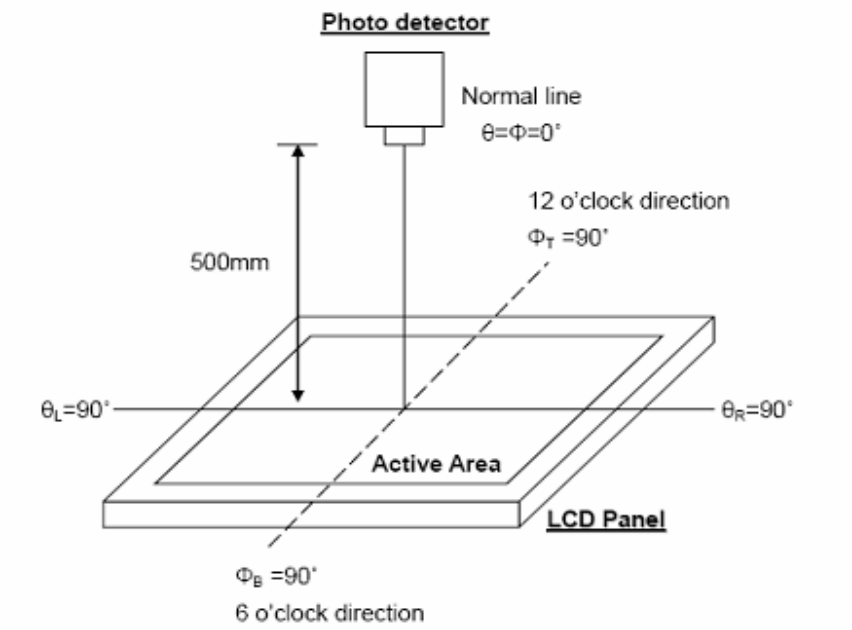


Fig. 8-2 Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time, Tr, is the time between photo detector output intensity changed from 90% to 10% . And fall time, Tf, is the time between photo detector output intensity changed from 10% to 90% .

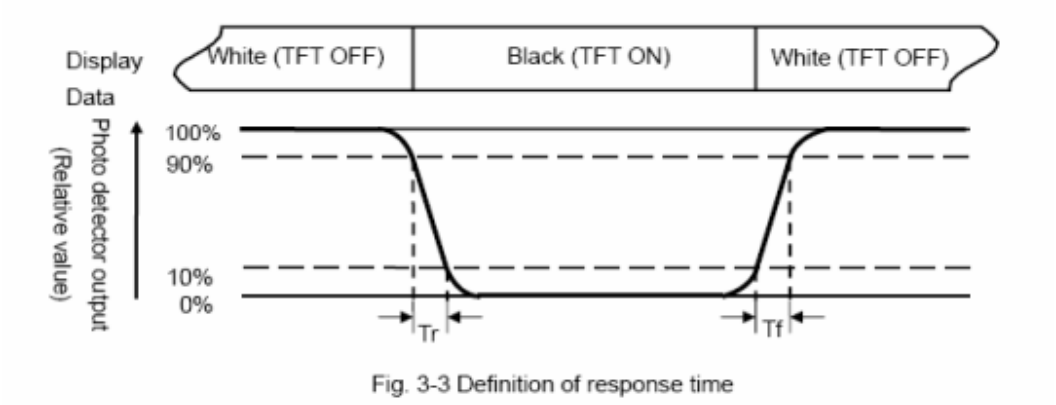


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the “White” state}}{\text{Luminance measured when LCD on the “Black” state}}$$

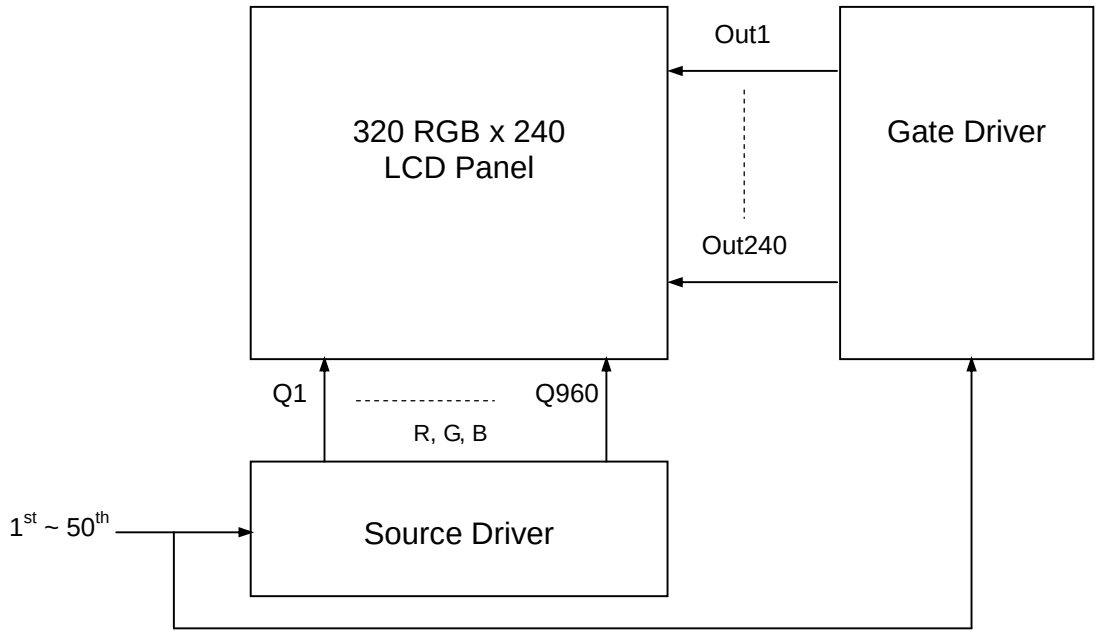
Note 5: White Vi = $V_{i50} \pm 1.5V$
Black Vi = $V_{i50} \pm 2.0V$
“±” means that the analog input signal swings in phase with VCOM signal.
“±” means that the analog input signal swings out of phase with VCOM signal.
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

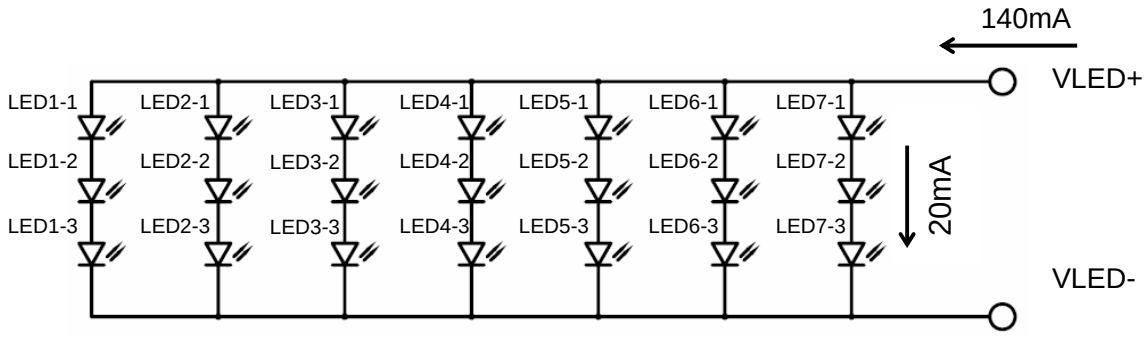
Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

$$\text{Note 8 : Uniformity (U)} = \frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$$

9. BLOCK DIAGRAM





10. Input / Output Terminals

10.1. LCM PIN Definition

0.5mm Pitch FPC

Pin No.	Symbol	I/O	Description	Remark
1	IF1	I	Input data format control (Note1)	Note1
2	IF2	I	Input data format control (Note1)	Note1
3	POL	O	Polarity Signal connect to VCOM driving circuit.	Note3
4	RESET	I	Hardware reset.	
5	SPENA	I	Chip select	Note2
6	SPCL	I	Serial Clock	Note2
7	SPDA	I/O	Serial Data	
8	B0	I	Blue Data bit (LSB)	
9	B1	I	Blue Data bit	
10	B2	I	Blue Data bit	
11	B3	I	Blue Data bit	
12	B4	I	Blue Data bit	
13	B5	I	Blue Data bit	
14	B6	I	Blue Data bit	
15	B7	I	Blue Data bit (MSB)	
16	G0	I	Green Data bit (LSB)	
17	G1	I	Green Data bit	
18	G2	I	Green Data bit	
19	G3	I	Green Data bit	
20	G4	I	Green Data bit	
21	G5	I	Green Data bit	
22	G6	I	Green Data bit	
23	G7	I	Green Data bit (MSB)	
24	R0	I	Red Data bit (LSB)	
25	R1	I	Red Data bit	
26	R2	I	Red Data bit	
27	R3	I	Red Data bit	
28	R4	I	Red Data bit	
29	R5	I	Red Data bit	
30	R6	I	Red Data bit	
31	R7	I	Red Data bit (MSB)	
32	Hsync	I	Horizontal synchronous signal	
33	Vsync	I	Vertical synchronous signal	
34	Data CLK	I	Dot data clock	
35	AVDD(analog)	I	Analog power: 4.5V~5.5V	

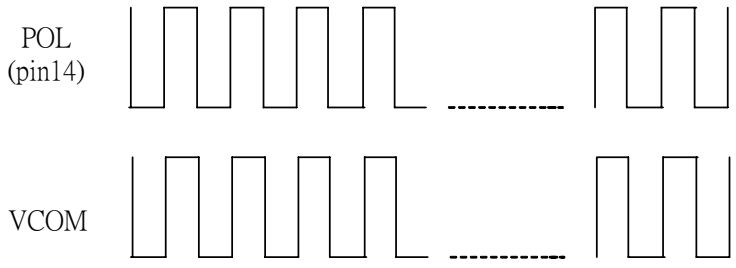
36	AVDD(analog)	I	Analog power: 4.5V~5.5V	
37	VDD(Digital)	I	Digital power: 3V~3.6V	
38	VDD(Digital)	I	Digital power: 3V~3.6V	
39	NPC	O	NTSC/PAL mode Auto detection result H:NTSC/L:PAL	
40	VGL	I	Gate off power	
41	VGL	I	Gate off power	
42	UD	I	Up/Down scan setting. H: Reverse scan / L: Normal scan	
43	VGH	I	Gate on power	
44	LRC	I	Shift direction of device internal shift register control.	
45	GND	I	GROUND	
46	VCOM	I	VCOM driving input	Note3
47	VCOM	I	VCOM driving input	
48	ENB	I	Data enable input.Normally pull low.	Note4
49	GND	I	GROUND	
50	GND	I	GROUND	

Note:

1. Control the input data format.

IF2,IF1	Input data format
L,L(default)	Serial RGB
L,H	Parallel RGB
H,L	CCIR601
H,H	CCIR656

2. Pin 5、Pin 6 usually pull high.
3. The polarity of VCOM (Pin 46,47) should be generated from POL (Pin 3).
4. For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If ENB signal is fixed low, SYNC mode is used. Otherwise, DE+SYNC mode is used.
5. The phase of POL (pin 3):

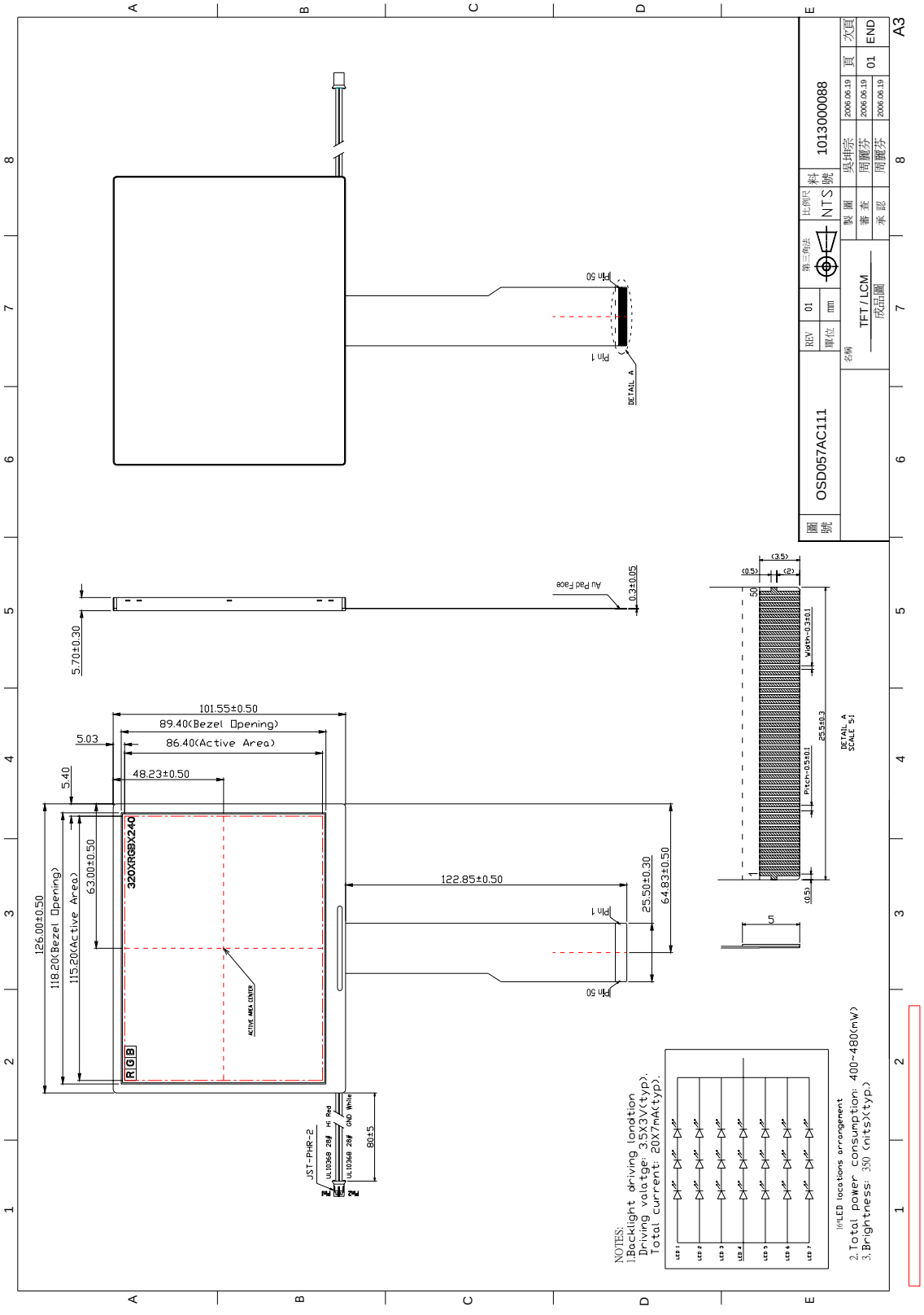


10.2. Backlight PIN Definition

Pin No.	Symbol	I/O	Description
1	VLED+	I	Red, LED_ Anode
2	VLED-	I	White, LED_ Cathode

Note: The backlight interface connector is a model **PHR-2** manufactured by JST or equivalent.
The matching connector part number is **S 2B-PH-K-S** manufactured by JST or equivalent.

11. Outline Drawing



12.Quality Assurance

No.	Test Items	Test Condition	REMARK
1	High Temperature Storage Test	Ta=80℃ 50%RH 240h	
2	Low Temperature Storage Test	Ta=-30℃ Dry 240h	
3	High Temperature Operation Test	Ta=70℃ 50%RH 240h	
4	Low Temperature Operation Test	Ta=-20℃ Dry 240h	
5	High Temperature and High Humidity Operation Test	Ta=60℃ 90%RH 240h	
6	Electro Static Discharge Test	-Panel Surface/Top_Case: 150pF ±15kV 150Ω (direct discharge, five times) -FPC input terminal : 100pF ±200V 0Ω	
7	Shock Test (non-operating)	Half sine wave, 180G, 2ms one shock of each six faces (I.e. run 180G 2ms for all six faces)	
8	Vibration Test (non-operating)	Sine wave, 10 ~ 500 ~ 10Hz, 1.5G, 0.37oct/min 3 axis, 1hour/axis	
9	Thermal Shock Test	-30℃(0.5h) ~ 80℃(0.5h) / 100 cycles	

***** Ta= Ambient Temperature

13. Designation Of Lot Mark

13-1. Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L

A：YEAR　　B,C：MONTH

D：　WEEK　　E,F：PRODUCTION MANAGEMENT

G,H,I,J,K：SERIAL NO.

Note

1. YEAR

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Mark	3	4	5	6	7	8	9	0	1	2

2. MONTH

Month	Jan	Fed	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	01	02	03	04	05	06	07	08	09	10	11	12

3. WEEK

Week	1st~7th	8th~14th	15th~21st	22nd~28th	29th~31st
Mark	1	2	3	4	5

4. SERIAL NO.

Year	1~999999	1000000~
Mark	000001~999999	A00000~A99999, …….,Z99999

13-2. Location of Lot Mark

Serial NO. is printed on the label. The label is attached to the backside of the LCD module. This is subject to change without prior notice.

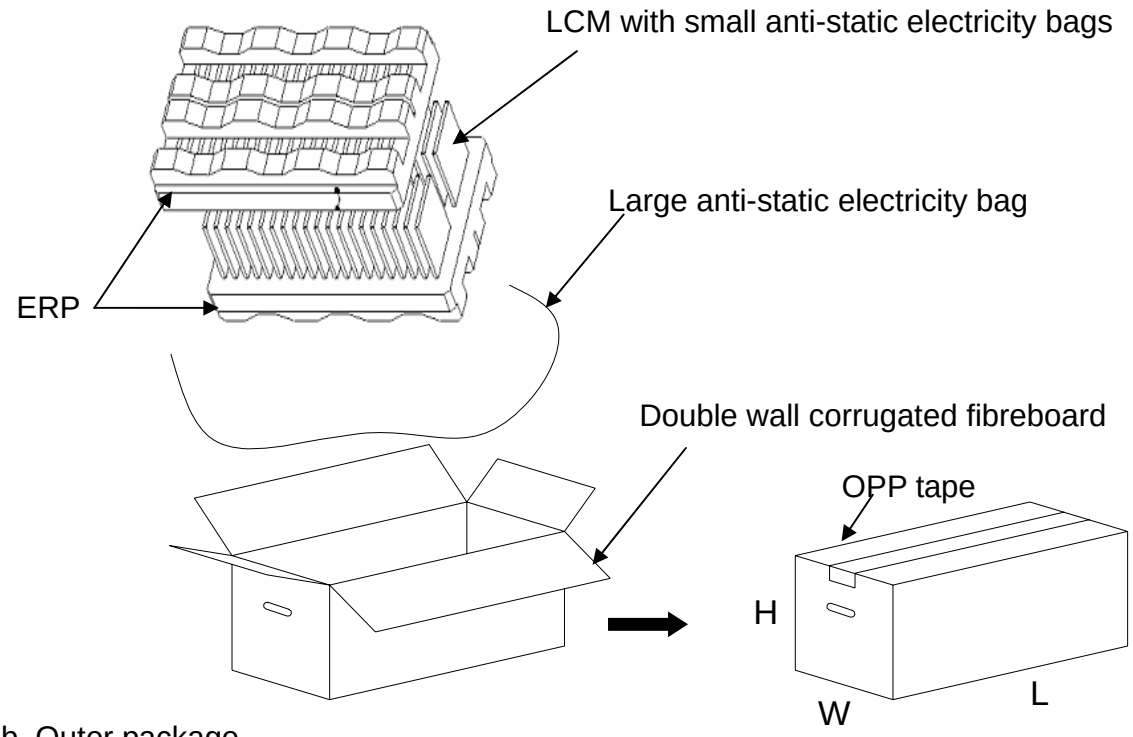
14. Packaging Form

a. Inner package

(1) Quantity ：40pcs / 1Box

(2) Size：(L)510x(W)310x(H)269

(unit：mm)

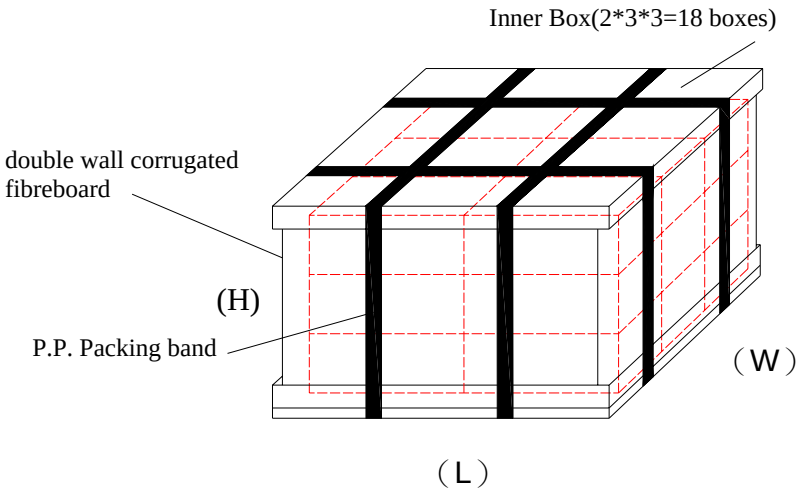


b. Outer package

(1) Quantity：720pcs / 1Box

(2) Size：(L)1100x(W)1000x(H)950

(unit：mm)



15 . PRECAUTIONS

Please pay attention to the following when you use this TFT LCD module.

15-1.MOUNTING PRECAUTIONS

(1) You must mount a module using arranged in four corners or four sides.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach a transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not describe because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are determined to the polarizer)
(7) When the surface becomes dusty, please wipe gently with adsorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

15-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage：V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower)
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

15-3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc. And don’t touch interface pin directly.

15-4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

15-5 STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

15-6 HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) The protection film is attached to the polarizer with a small amount of glue. Is apt to remain on the polarizer.
Please carefully peel off the protection film without rubbing it against the polarizer.

(3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.

(4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.