

SPECIFICATIONS

CUSTOMER : _____

SAMPLE CODE : GFT057GA320240

DRAWING NO. : _____

DATE : 2008.11.10

CERTIFICATION : ROHS

Customer Sign	Sales Sign	Approved By	Prepared By

Revision Record

Data(y/m/d)	Ver.	Description	Note	page
2008.11.10	00	New		27

2009.06.16	01	Add CONNECT DRAWING		26

CONETNTS

No.	ITEM	PAGE
1	SUMMARY	4
2	FEATURES	4
3	GENERAL SPECIFICATIONS	4
4	ABSOLUTE MAXIMUM RATINGS	4
5	ELECTRICAL CHARACTERISTICS	4~6
6	AC CHARATERISTICS	7~9

7	WAVEFORM	10~17
8	OPTICAL CHARACTERISTIC	18~20
9	BLOCK DIAGRAM	21
10	INPUT/OUTPUT TERMINALS	22~24
11	OUTLINE DRAWING	25~26
12	QUALITY ASSURANCE	27
13	DESIGNATION OF LOT MARK	28
14	PACKAGE	29
15	PRECAUTIONS	30

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		115.20(H) x 86.40(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		6o'clock	
Temperature Range	Operation	-20~70	°C
	Storage	-30~80	°C

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Voltage	VDD ,AVDD	-0.3	7	V	GND=0
	VGH	-0.3	32	V	GND=0
	VGL	-22	0.3	V	GND=0
	VGH-VGL	-0.3	+45	V	GND=0
Input Signal Voltage	V _{in}	-0.3	VDD+0.3	V	GND=0
Logic Output Voltage	V _{OUT}	-0.3	+0.7	V	GND=0

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

above

5. ELECTRICAL CHARACTERISTICS

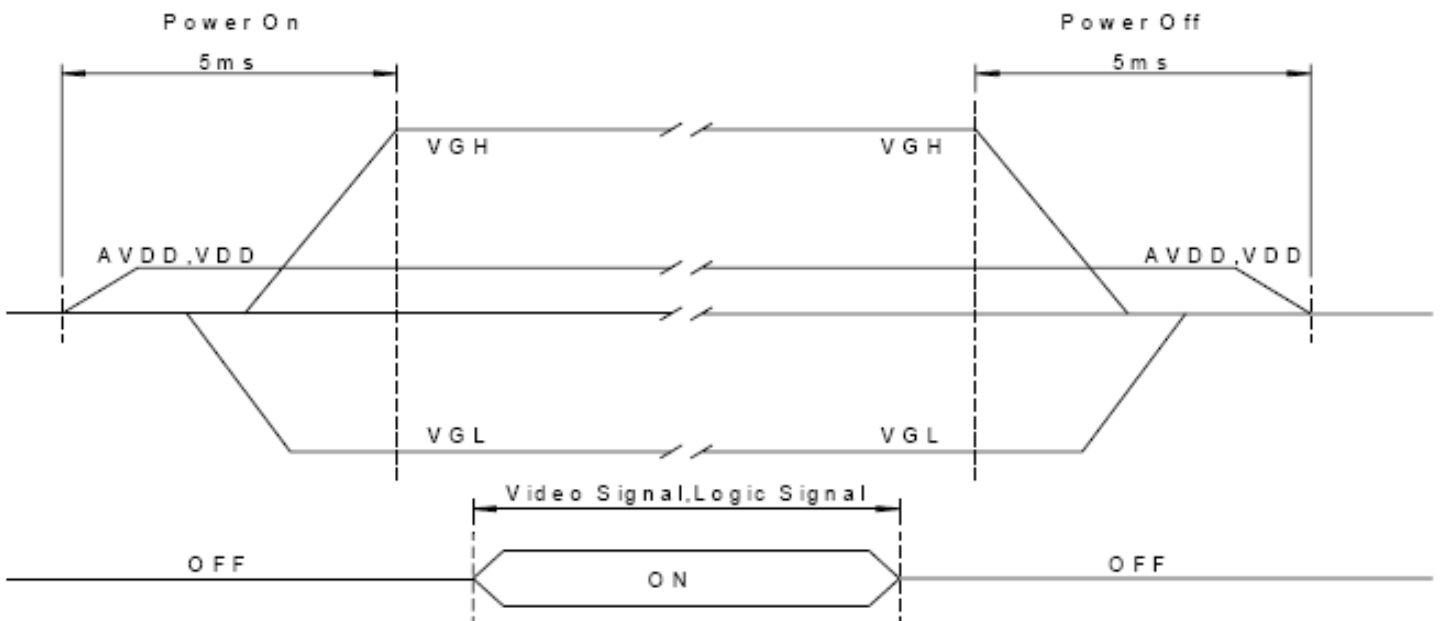
Operating conditions:

Item	Symbol	Rating			Unit	Remark
		Min.	Typ.	Max.		
Power Voltage	VDD	3.0	3.3	3.6	V	
	AVDD	3.8	5.0	5.5	V	
	VGH	10	-	30	V	
	VGL	-17	-	-5	V	
Low level input voltage	VIL	0	-	0.3 VDD	V	SPCL, SPDA,UD,LRC,IF1,IF2
Hight level input voltage	VIH	0.7 VDD	-	VDD	V	
Analog operating current	IAVDD	(7)	(12)	-	mA	AVDD=5V
Digital operating current	IVDD	(5)	(8)	-	mA	VDD=3.3V
Gate voltage "H" level current	IVGH	-	-	(100)	uA	VGH=15V
Gate voltage "L" level current	IVGL	-	-	(100)	uA	VGL=-10V
VCOM High Voltage	VcomH	-	4.6	-		Note1
VCOM Low Voltage	VcomL		-0.4			Note1

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

5.2 Power Sequence

Sequence for power on/off and Signal on/off



Note 1: AVDD, VDD, VGH and VGL could be OFF at the same time within the designated period(5ms)

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

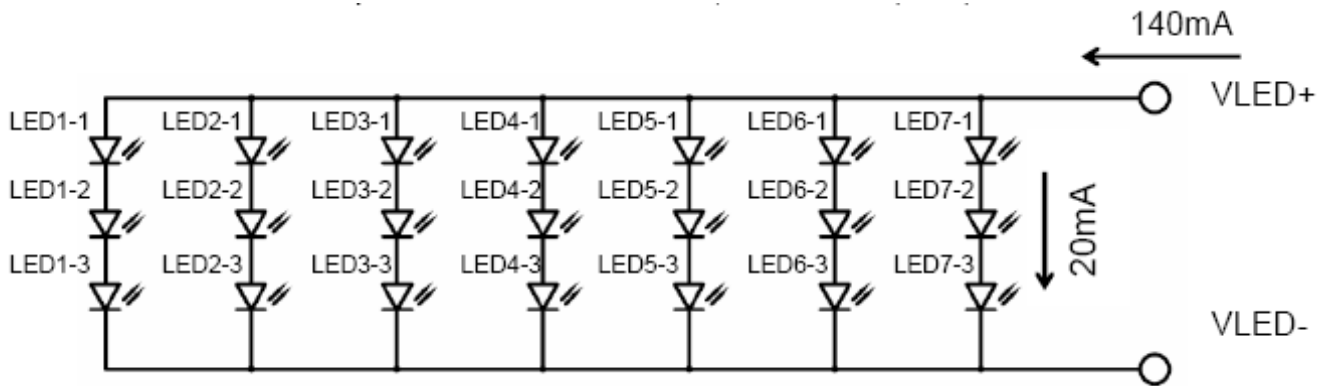
Power ON: AVDD, VDD → VGL → Input Signals → VGH

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

5.3 LED driving conditions

Item	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 , $V_{LED}=9.9V(\text{min.})$.



Note 2: $T_a=25^{\circ}C$,

Note 3: Brightness 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}	-	4996	-	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	

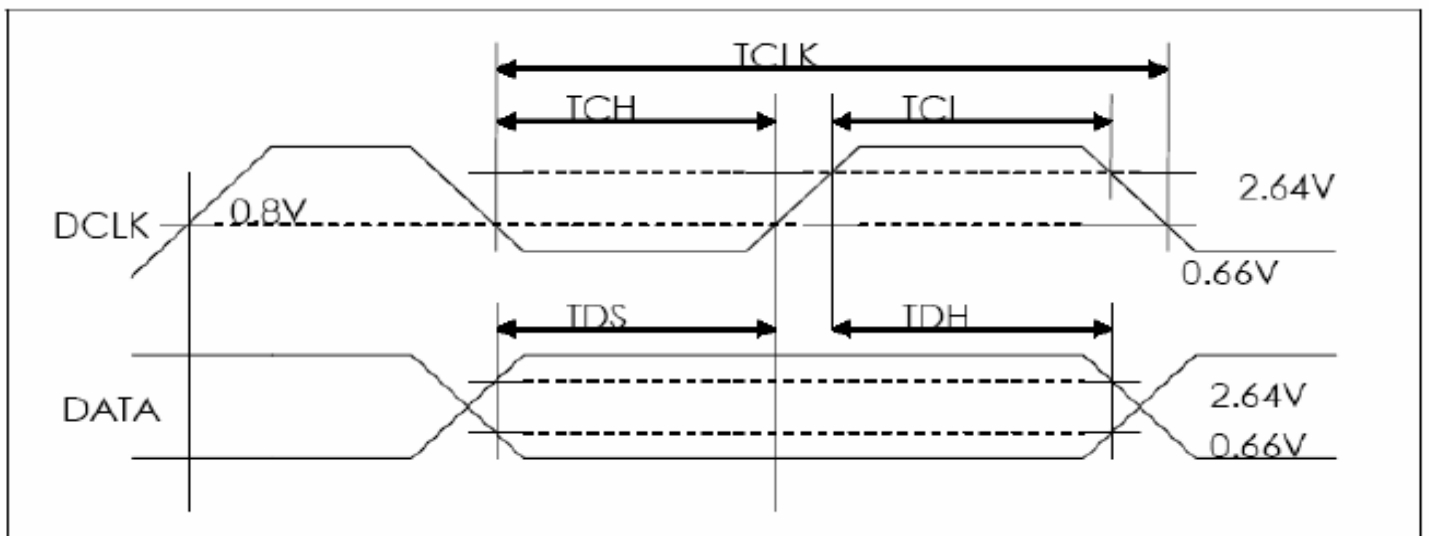
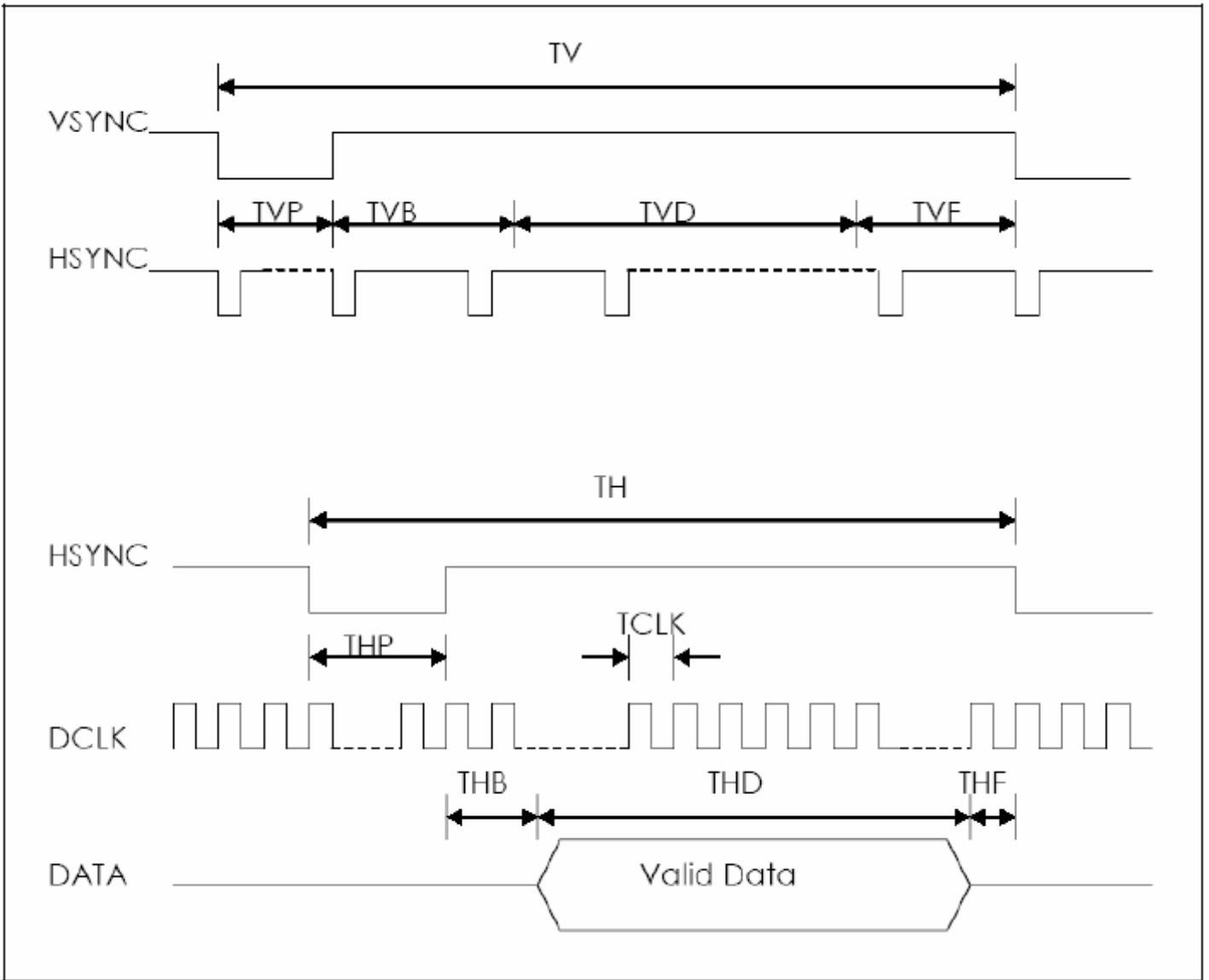
6.2. 24-bits parallel RGB Interface

6.2.1 AC Timing Characteristics

Signal	Item	Symbol	Min.	Typ.	Max.	Unit
Dclk	Frequency	Dclk	-	6.4	-	MHZ
	High Time	T _{ch}	-	78	-	ns
	Low Time	T _{cl}	-	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	-	

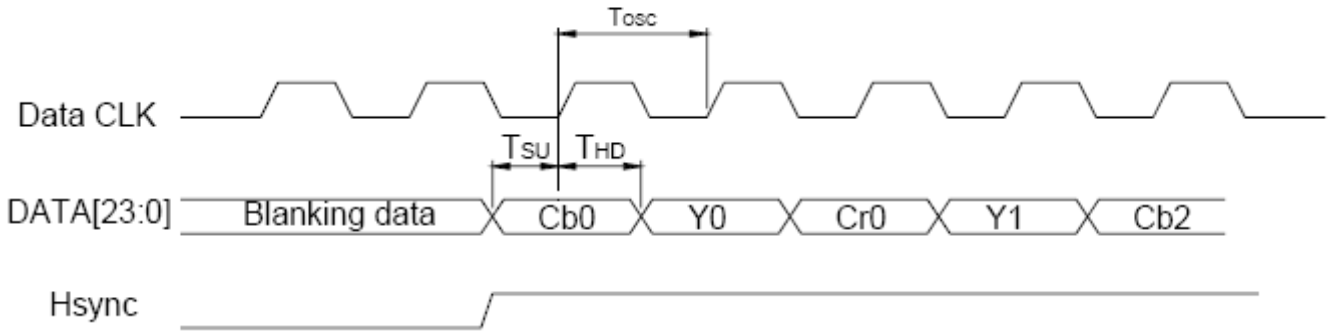
6.2.2 AC Timing Diagrams



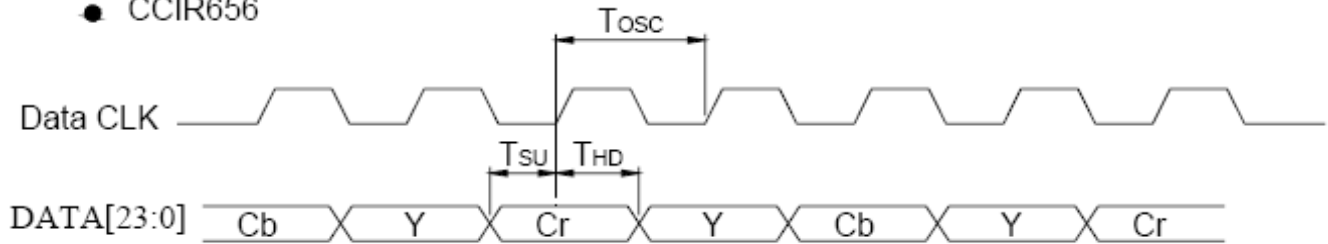
7.1. Timing Controller Timing Chart

7.1.1. Clock and Data waveform

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



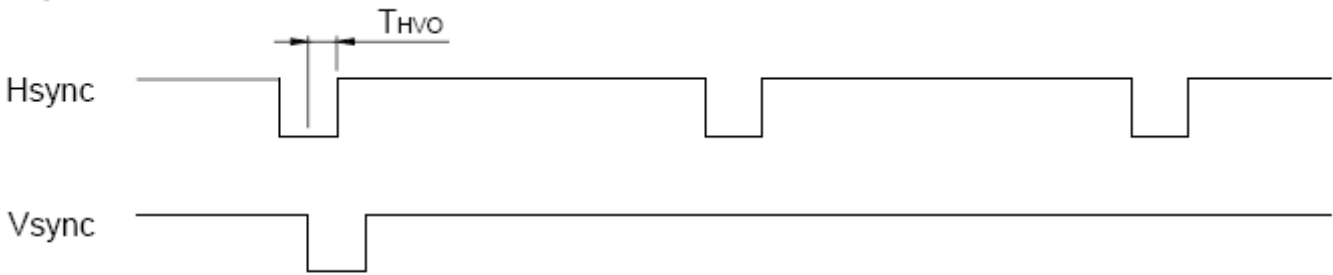
- CCIR656



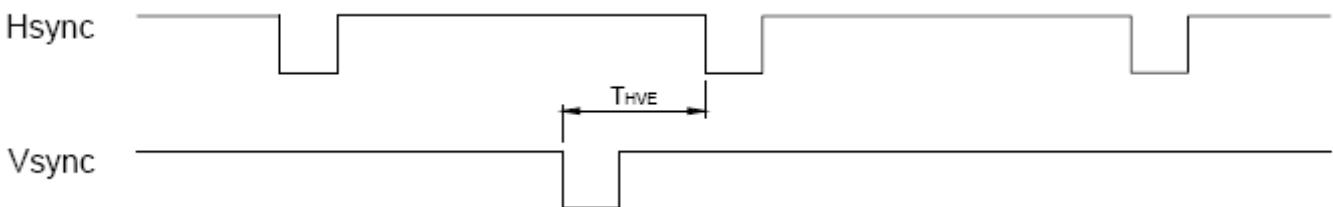
7.1.2 Digital / Analog RGB timing waveform

7.1.2.1 Hsync and Vsync timing

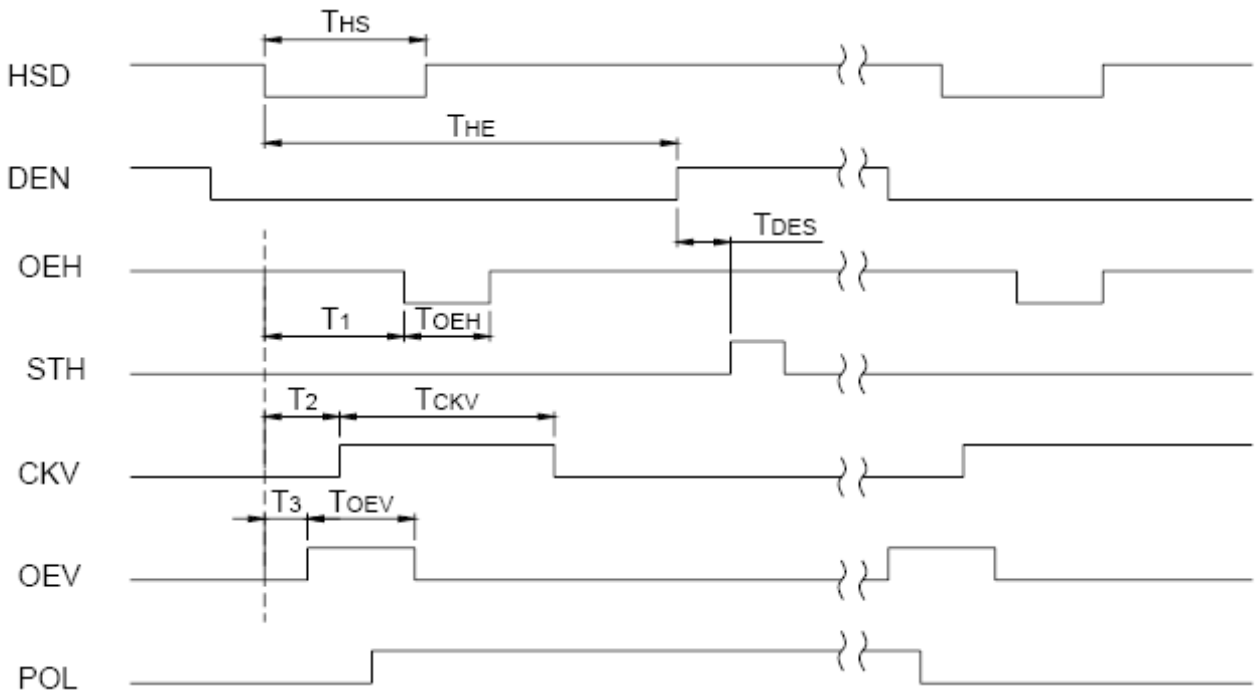
- Odd field



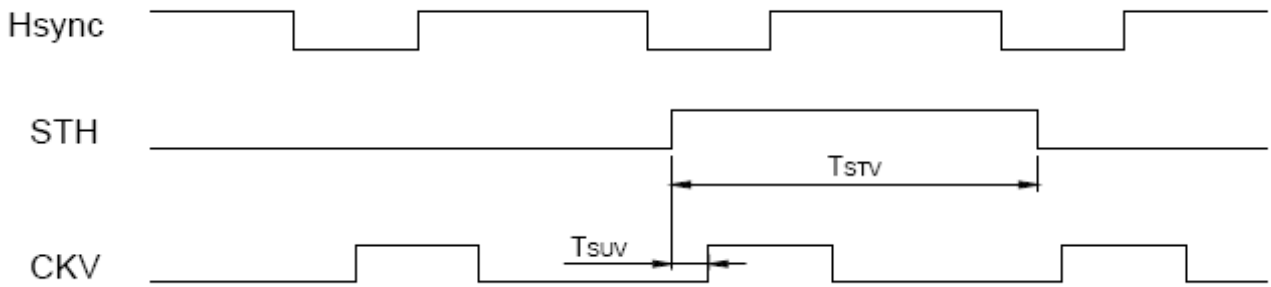
- Even field



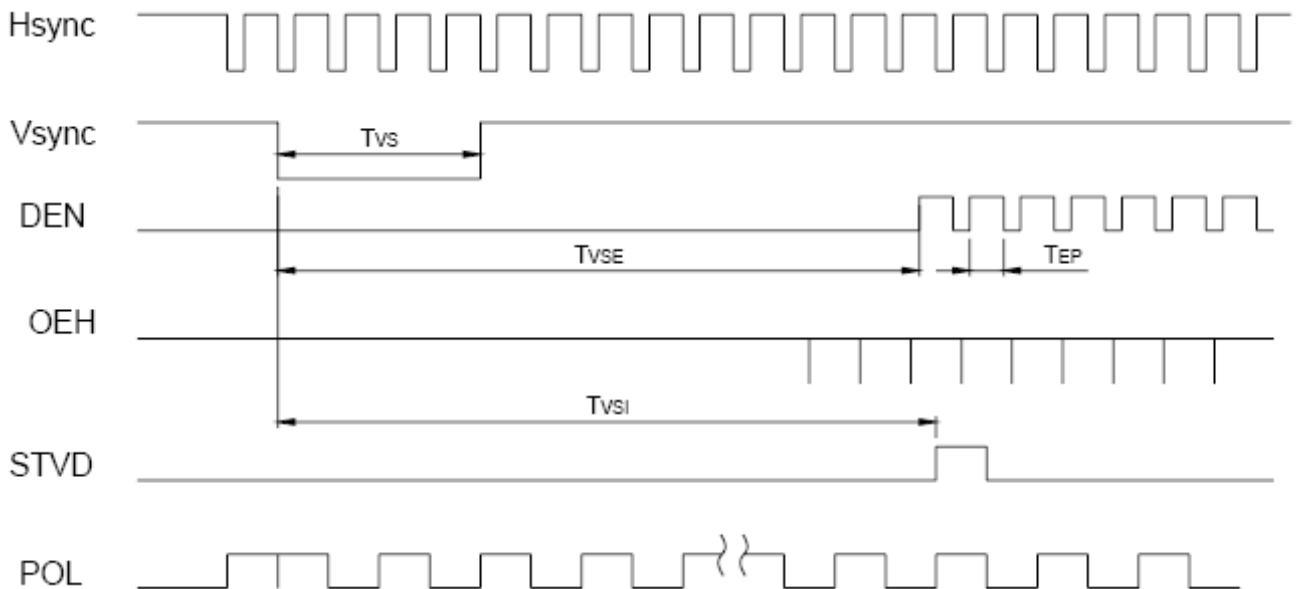
7.1.2.2 Hsync and horizontal control timing waveform



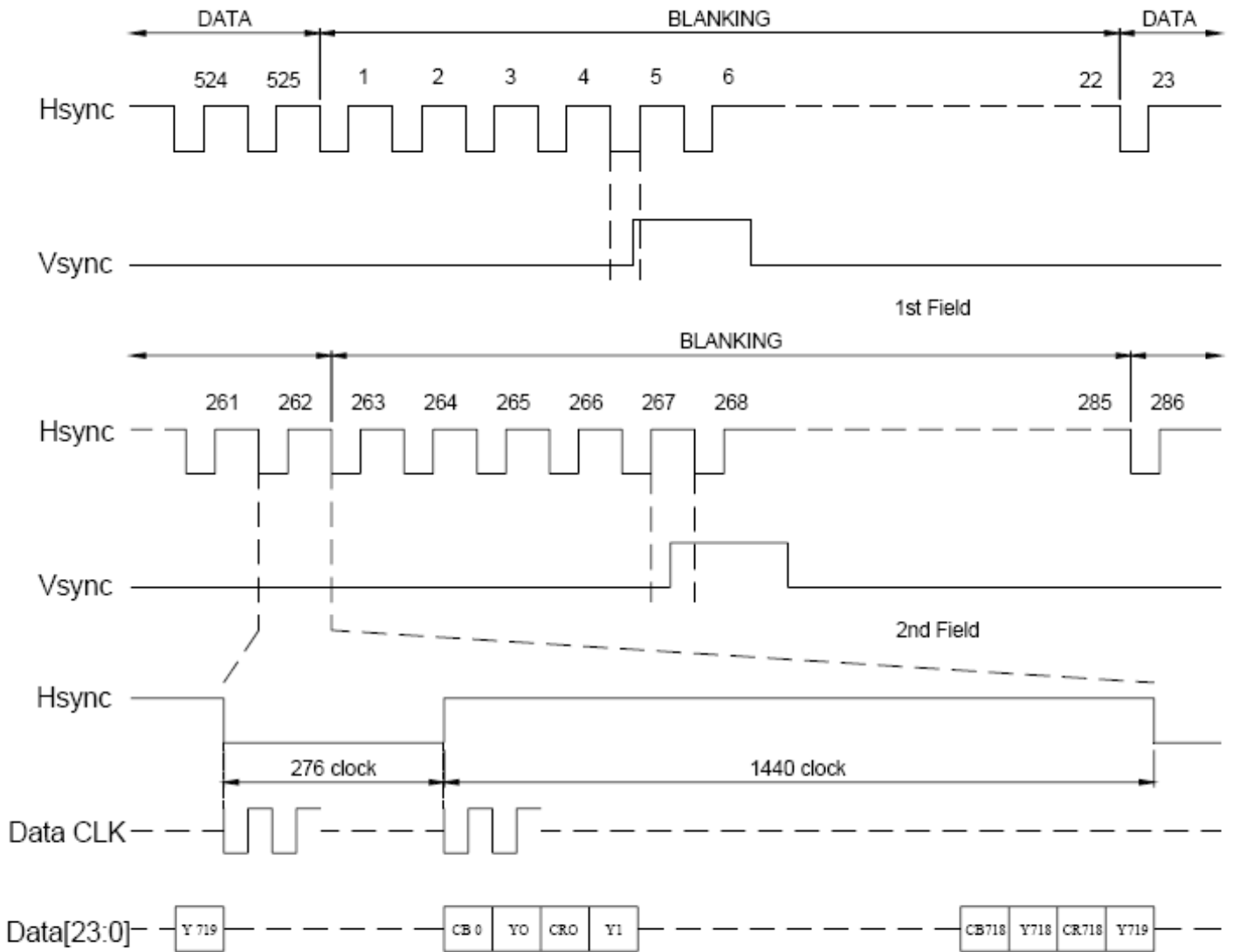
7.1.2.3 Hsync and vertical shift clock timing waveform



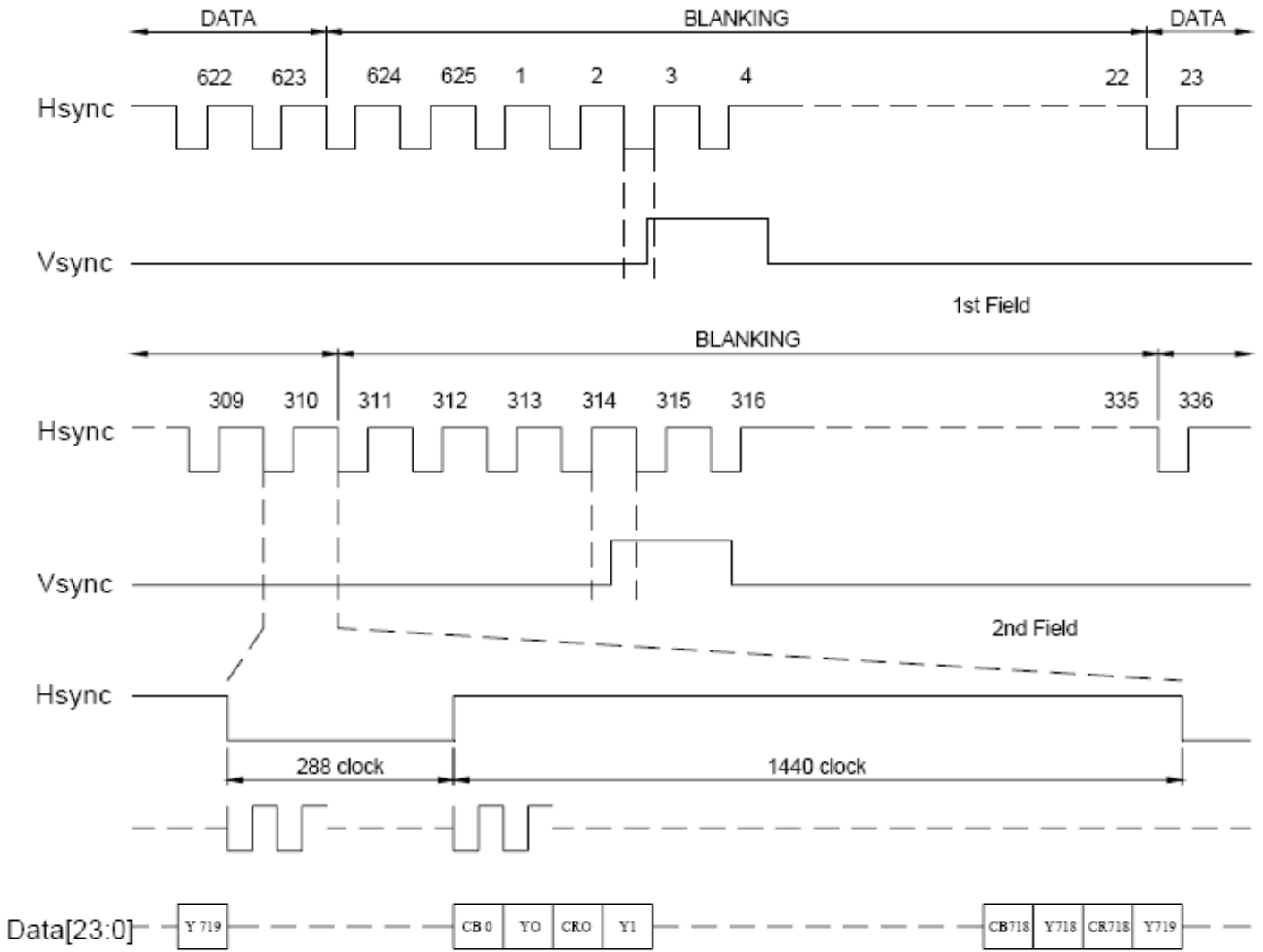
7.1.2.4 Hsync and vertical control timing waveform



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



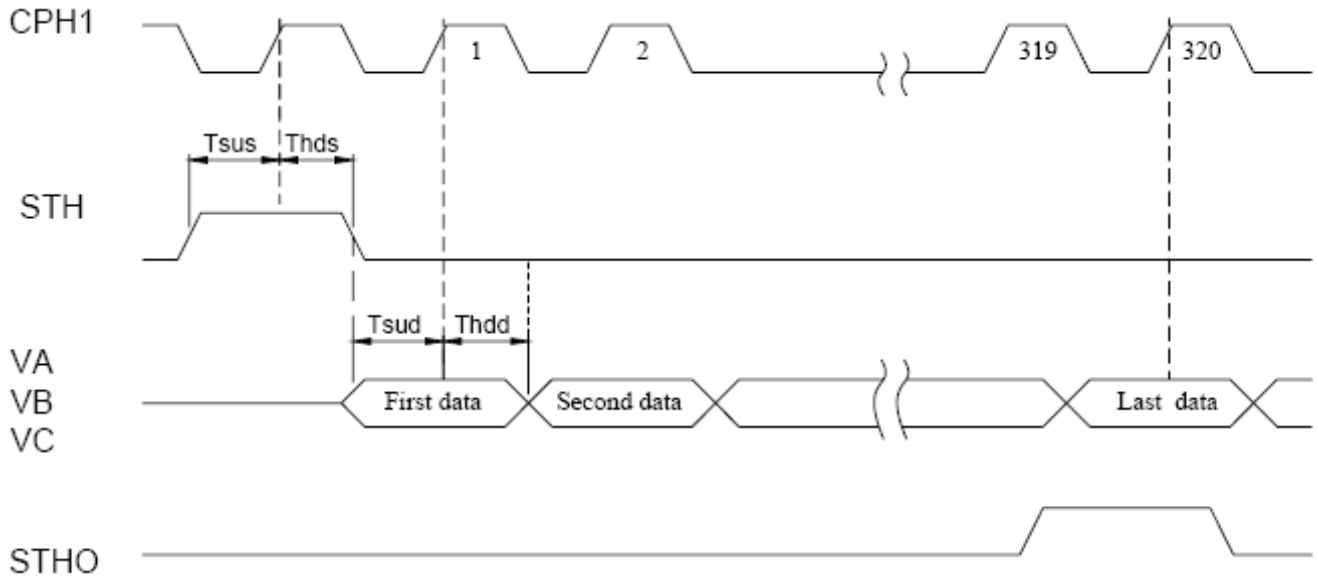
ITU-BT.601 NTSC Input Timing



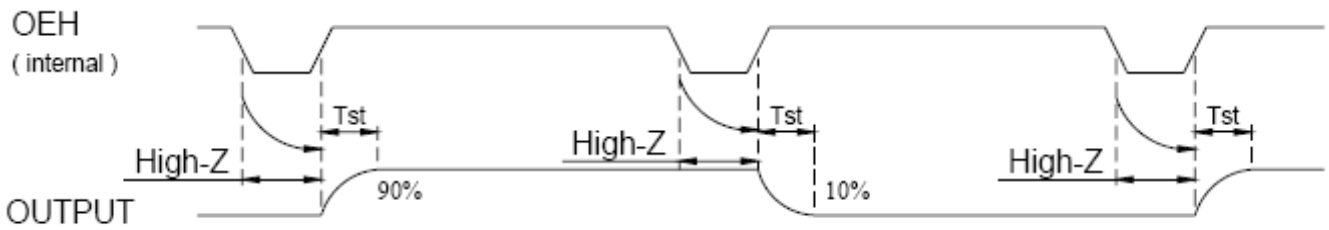
ITU-BT.601 PAL Input Timing

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

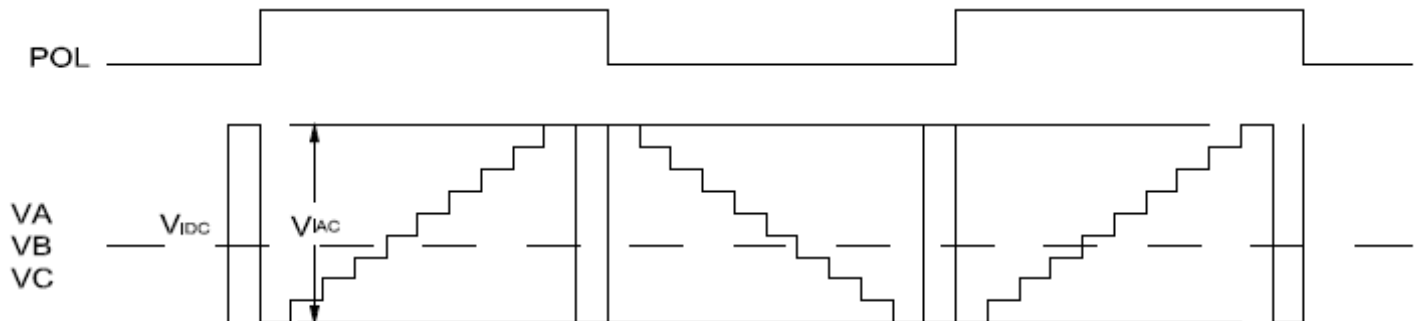
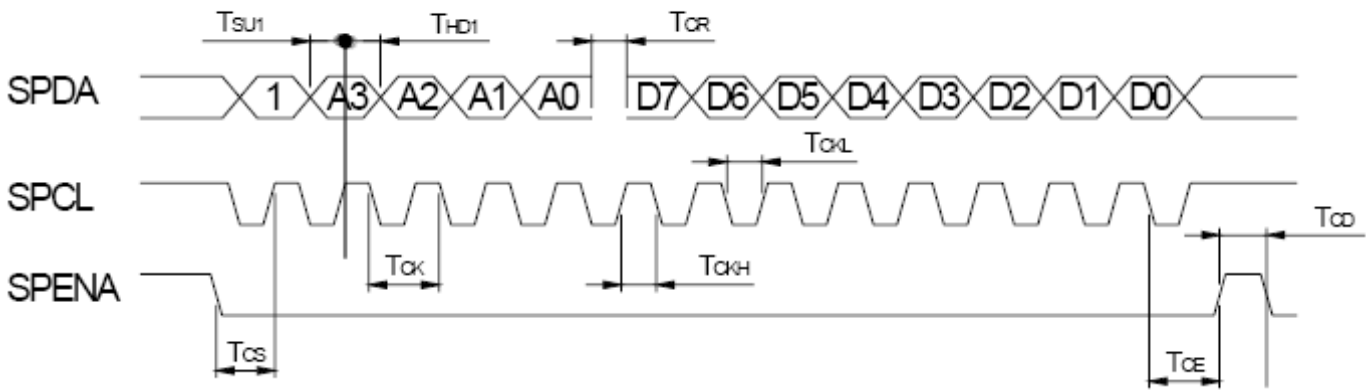


Fig. 4-(a) Horizontal timing

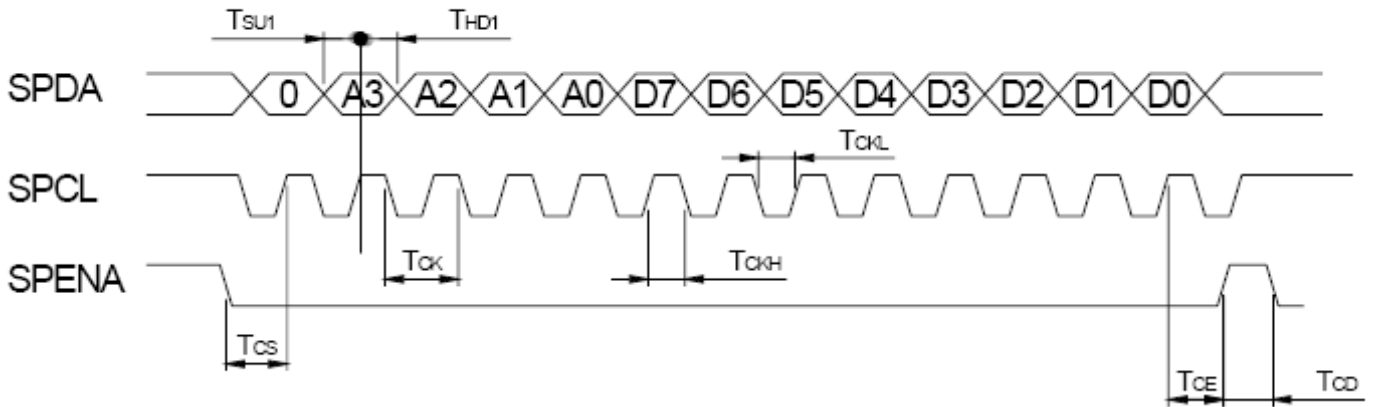
7.4 SPI timing characteristics

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

● SPI "read" timing



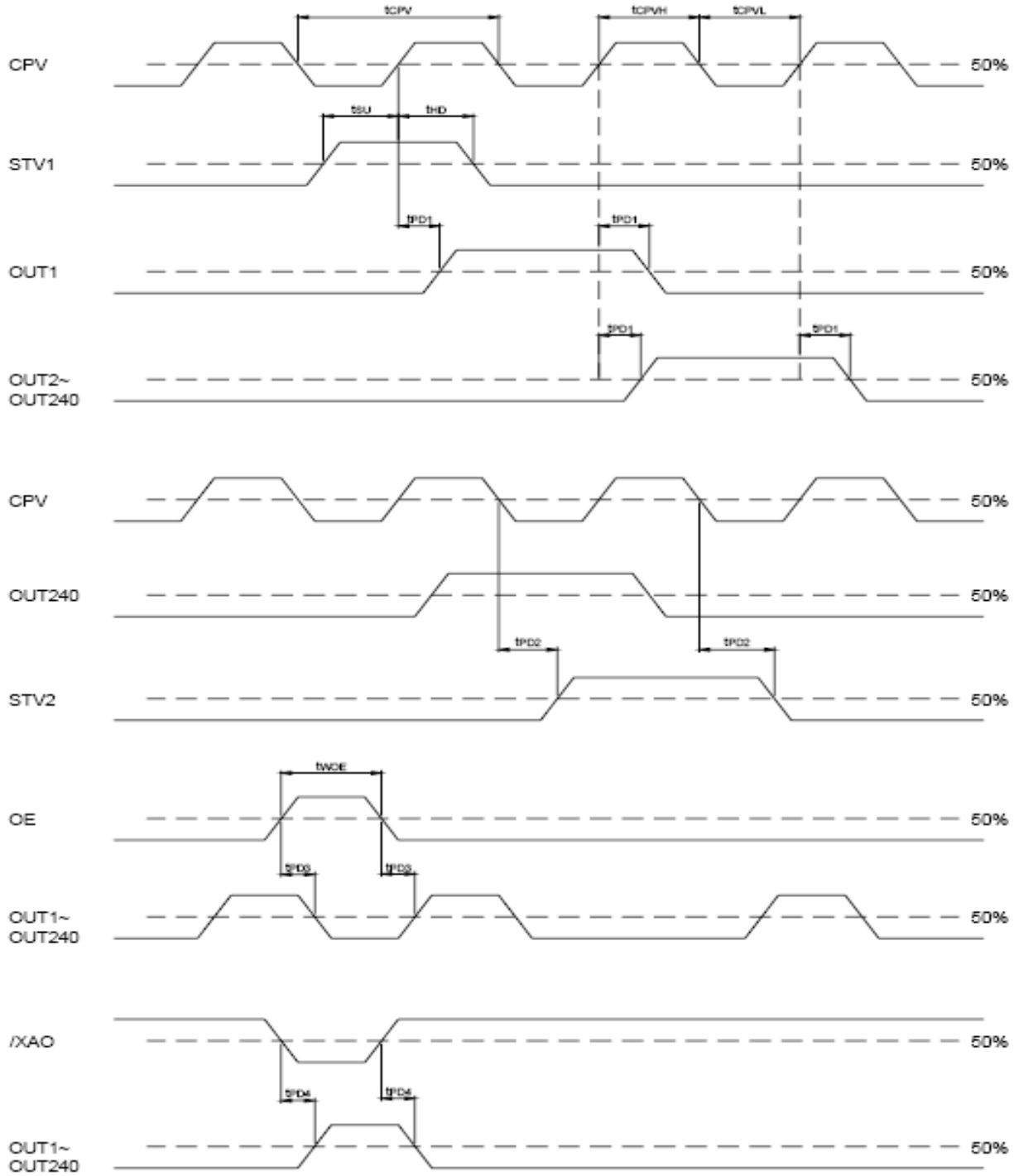
● SPI "write" timing



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	30	1	-	ns
Data setup time	tsu		0.4	-	
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	



8. Optical Characteristics

Ta = 25±2°C , ILED=140mA

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Response time		Tr	$\theta = 0^\circ$	-	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	$\theta = 0^\circ$	0.25	0.30	0.35		Note 2,6,7
		Wy		0.27	0.32	0.37		
Viewing Angle	Hor	Θ_R	$CR \geq 10$	50	65	-	Degree	Note 1
		Θ_L		50	65	-		
	Ver	Θ_T		30	50	-		
		Θ_B		50	55	-		
Uniformity		U	-	(70)	(75)	-	%	Note 8
Brightness		-	-	300	350	-	cd/m2	Center of display

Note 1: Definition of viewing angle range

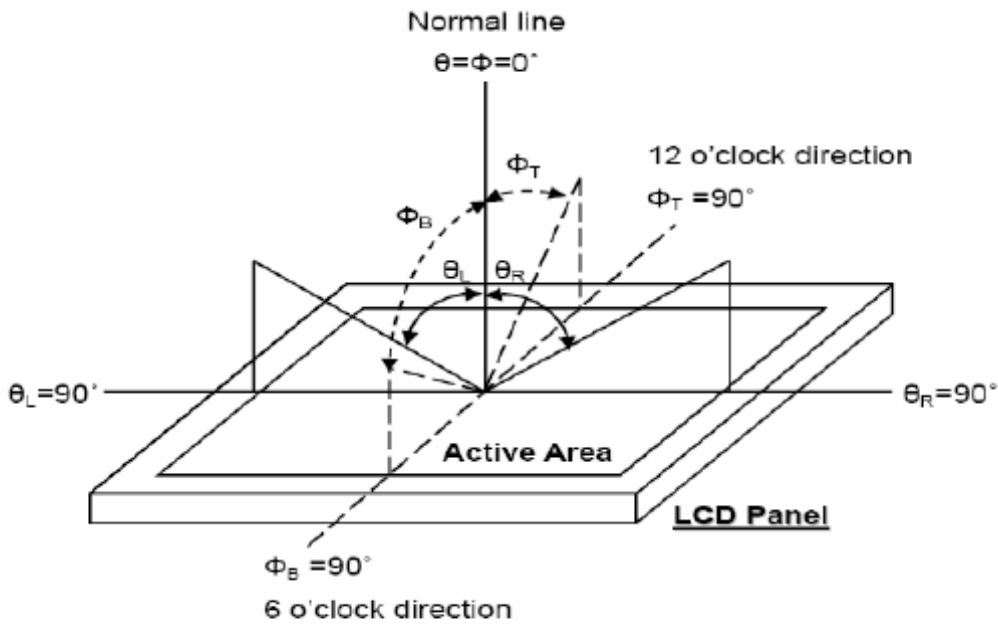


Fig. 8-1 Definition of viewing angle

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.

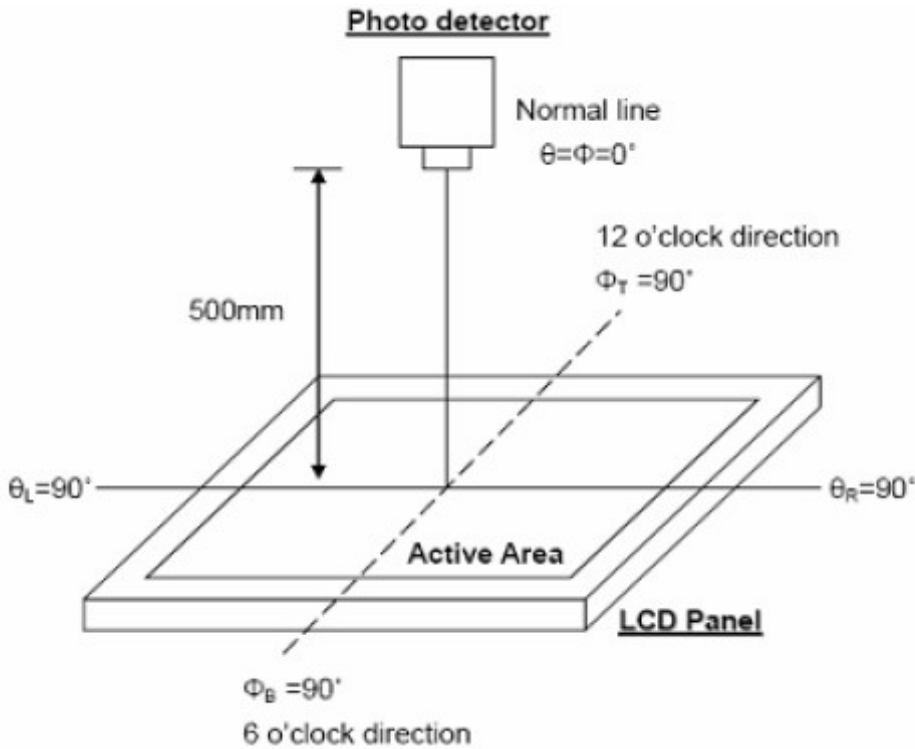


Fig. 8-2 Optical measurement system setup

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, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%.

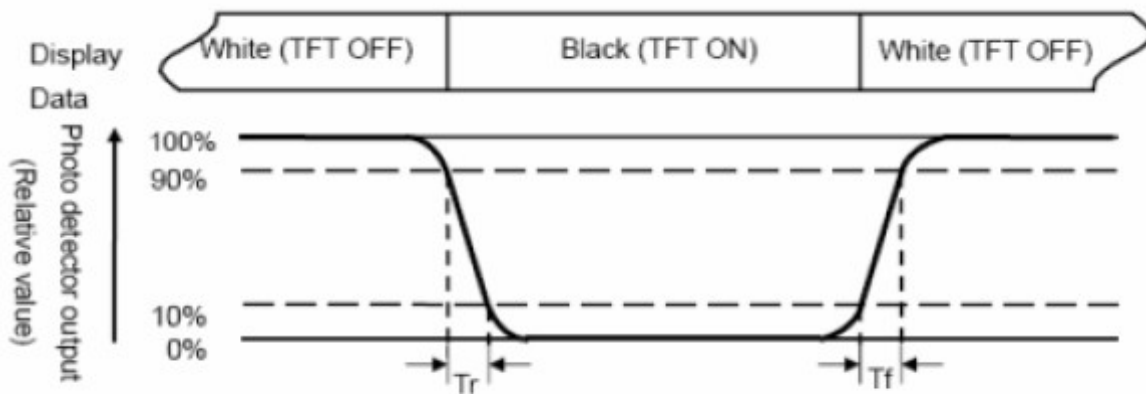


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

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

Luminance measured when LCD on the “Black” state

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

“±” 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

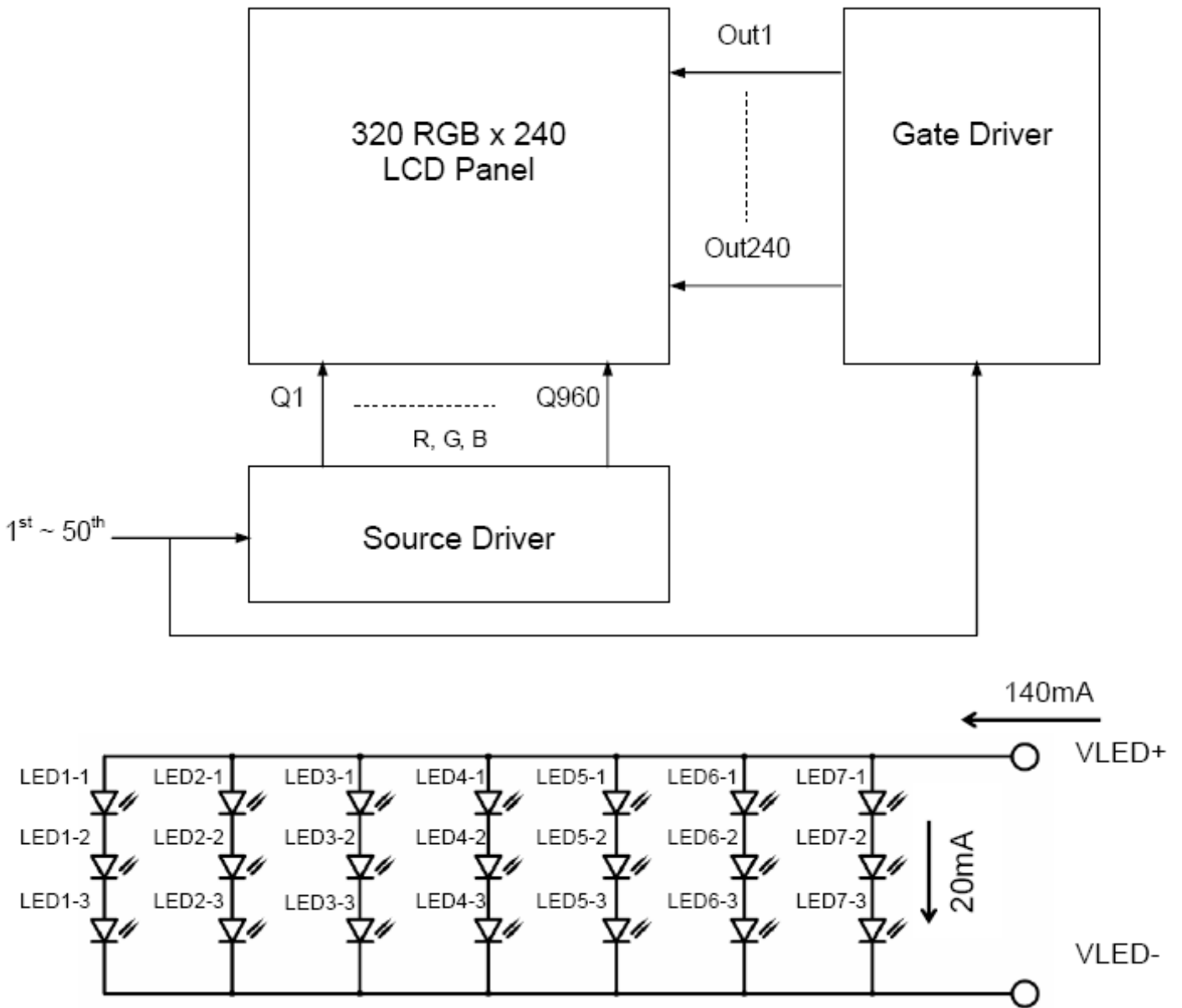
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Brightness (min)

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

Brightness (max)

9. BLOCK DIAGRAM



10. Input / Output Terminals

10.1 LCM PIN Definition

Pin No.	Symbol	I/O	Description	Remark
---------	--------	-----	-------------	--------

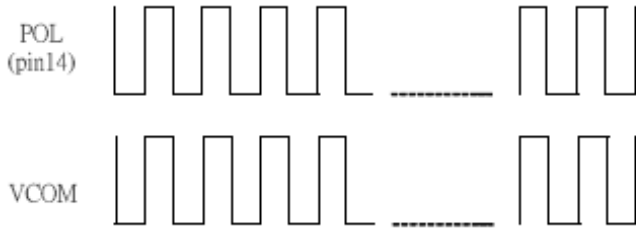
1	IF1	I	Input data format control (Note 1)	Note 1
2	IF2	I	Input data format control (Note 1)	Note1
3	POL	0	Polarity Signal connect to VCOM driving circuit.	Note 3
4	RESET	I	Hardware reset.	
5	SPENA	I	Chip select	Note 2
6	SPCL	I	Serial Clock	Note 2
7	SPDA	I/O	Serial Data	
8	B0	I	Blue Data bit (LSB)	
9	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	
16	G0	I	Green Data bit (MSB)	
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		Green Data bit	
22	G6	I	Green Data bit	
23	G7	I	Green Data bit	
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	
32	Hsync	I	Horizontal synchronous signal	
33	Hsync	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):



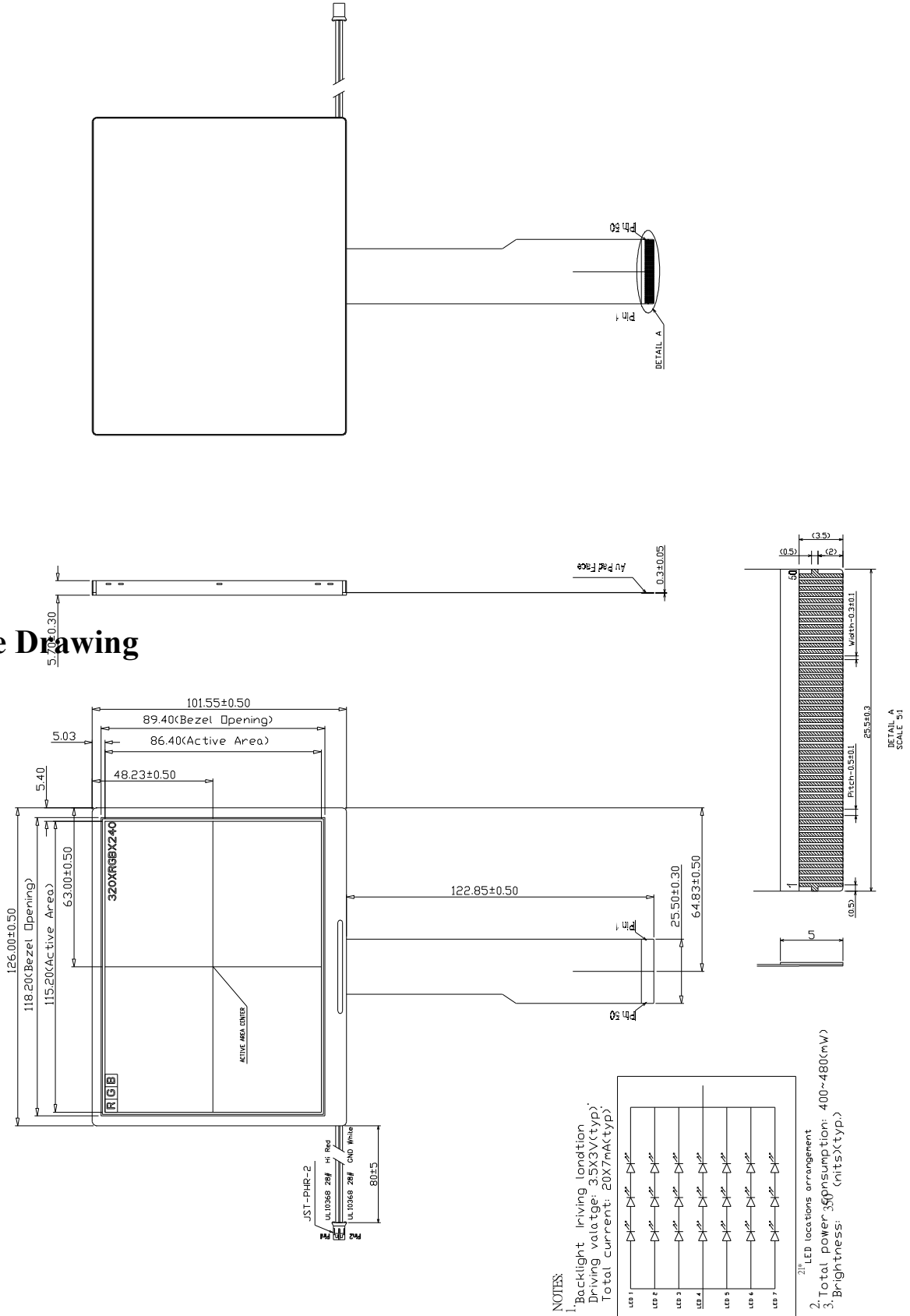
10.2 Backlight PIN Definition

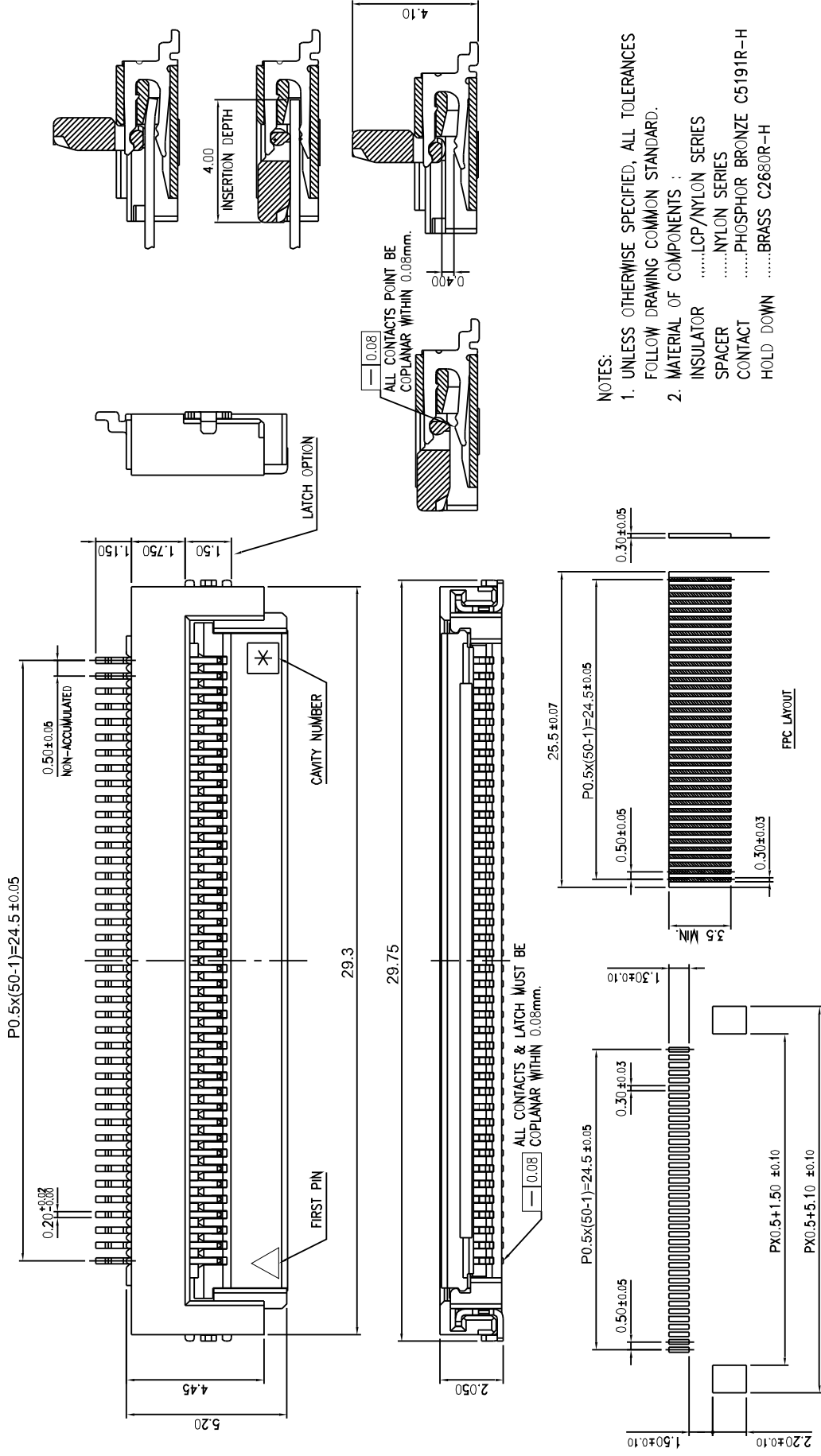
Pin No.	Symbol	I/O	Description
1	VLED+	I	Red, LED Anode
2	VLED-	I	White, LED Cathode

Note: The backlight interface connector is 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





- NOTES:
- UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES FOLLOW DRAWING COMMON STANDARD.
 - MATERIAL OF COMPONENTS :
 - INSULATORLCP/NYLON SERIES
 - SPACERNYLON SERIES
 - CONTACTPHOSPHOR BRONZE C5191R-H
 - HOLD DOWNBRASS C2680R-H

RECOMMENDED P.C. BOARD PATTERN LAYOUT
 RECOMMENDED METAL MASK THICKNESS: 1=0.15

No.	Test Items	Test Condition	REMARK
1	High Temperature Storage Test	Ta=80°C 50%RH 240h	
2	Low Temperature Storage Test	Ta=-30°C Dry 240h	
3	High Temperature Operation Test	Ta=70°C 50%RH 240h	
4	Low Temperature Operation Test	Ta=-20°C Dry 240h	
5	High Temperature and High Humidity Operation Test	Ta=60°C 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°C(0.5h) ~ 80°C(0.5h) / 100 cycles	

***** Ta= Ambient Temperature

13. Designation of Lot Mark

13-1. Lot Mark



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	Feb	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.

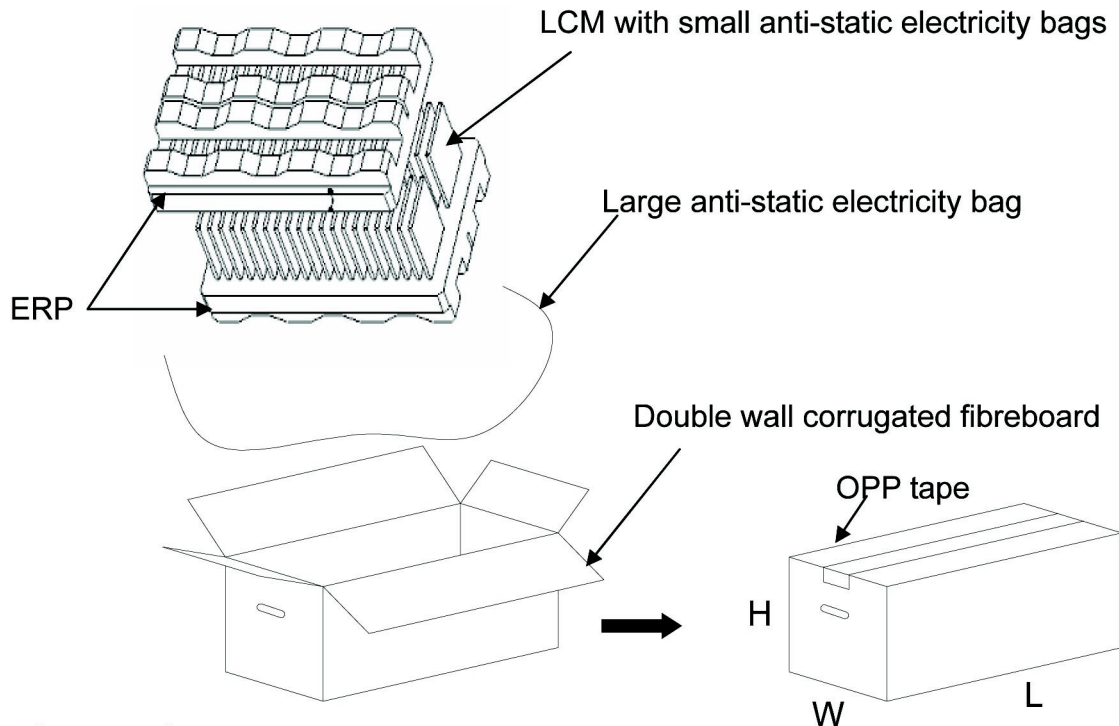
14. Packaging Form

a. Inner package

(1) Quantity : 40pcs / 1Box

(2) Size : (L)510x(W)310x(H)269

(unit : mm)

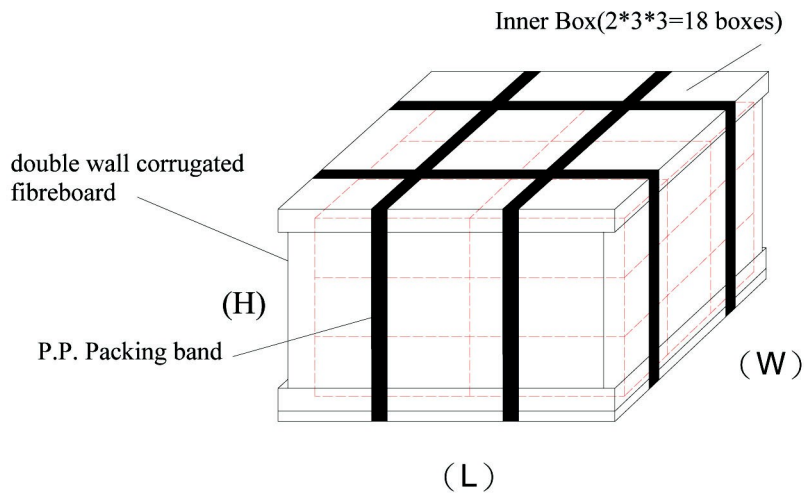


b. Outer package

(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 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 described because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electrochemical 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 be harmful to the polarizer)
- (7) When the surface becomes dusty, please wipe gently with adsorbent cotton or other soft materials like chamois soaked 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 : $V = \pm 200\text{mv}$
(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°C and 35°C 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.