



RAYSTAR

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RFC57DD-AIW-DNG

SPECIFICATION

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Release DATE:

TFT Display Inspection Specification: <https://www.raystar-optronics.com/download/products.htm>

Precaution in use of TFT module: <https://www.raystar-optronics.com/download/declaration.htm>

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0 A	2018/08/30 2019/05/06		First issue Modify CTP FW Version

RAYSTAR OPTRONICS

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1.Module Classification Information

R	F	C	57	DD	-	A	I	W	-	D	N	G
1	2	3	4	5	-	6	7	8	-	9	10	11

Item	Description	
1	R : Raystar Optonics Inc.	
2	Display Type : F→TFT Type, J→ Custom TFT	
3	Solution: A: 128x160 B:320x234 C:320x240 D:480x234 E:480x272 F:800x480 G:640x480 H:1024x600 I:320x480 J:240x320 K:1280x800 L:240x400 M:1024x768 N:128x128 O:480x800 P:640x320 Q:800x600 S:480x128 T:800x320	
4	Display Size : 5.7" TFT	
5	Version Code.	
6	Model Type: A : TFT LCD E : TFT+FR+CONTROL BOARD J : TFT+FR+A/D BOARD N : TFT+FR+A/D BOARD+CONTROL BOARD S : TFT+FR+POWER BOARD (DC TO DC) 1 : TFT+CONTROL BOARD	6 : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD B : TFT+POWER BD
7	Polarizer Type, Temperature range, View direction	I→Transmissive, W. T, 6:00 ; C→Transmissive, N. T, 6:00 L→Transmissive, W.T,12:00 ; F→Transmissive, N.T,12:00 Y→Transmissive,W.T, IPS TFT ; A→Transmissive, N.T, IPS TFT Z→Transmissive, W.T, O-TFT R→Transmissive, Super W.T, O-TFT N→Transmissive, Super W.T, 6:00; Q→Transmissive, Super W.T, 12:00 V→Transmissive, Super W.T, VA TFT
8	Backlight	W : LED, White H : LED, High Light White F : CCFL, White
9	Driver Method	D: Digital A: Analog L : LVDS M:MIPI
10	Interface	N : without control board A : 8Bit B : 16Bit S:SPI Interface R: RS232 U:USB I: I2C
11	TS	N : Without TS S : resistive touch panel C : capacitive touch panel capacitive touch panel (G-F-F) G : capacitive touch panel(G-G)

2.Summary

TFT 5.7” is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module, It is usually designed for industrial application and this module follows RoHs,

RAYSTAR OPTRONICS

3.General Specifications

- Size: 5.7 inch
- Dot Matrix: 320 x RGBx240(TFT) dots
- Module dimension: 126.00(W) x 101.55(H) x 8.235(D)(MAX) mm
- Active area: 115.2 x 86.40 mm
- Dot pitch: 0.12 x 0.36 mm
- LCD type: TFT, Normally White, Transmissive
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Interface: 24-bit RGB
- Aspect Ratio: 4:3
- Backlight Type: LED, Normally White
- CTP FW Version: FT5426 or Equivalent
- CTP Interface: I2C
- CTP IC: FN058A001_FT5426__V03_20180910_all.bin
- With /Without TP: With CTP
- Surface: Glare

*Color tone slight changed by temperature and driving voltage.

4.Interface

4.1. LCM PIN Definition

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	I	Analog power: 4.5V~5.5V	
36	AVDD	I	Analog power: 4.5V~5.5V	
37	Vcc	I	Digital power: 3V~3.6V	
38	Vcc	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.

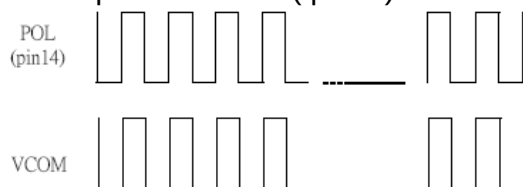
IF2,IF1	Input data format
L,L(default)	Serial RGB
L,H	Parallel RGB
H,L	CCIR601
H,H	CCIR656

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):



4.2. Backlight PIN Definition

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

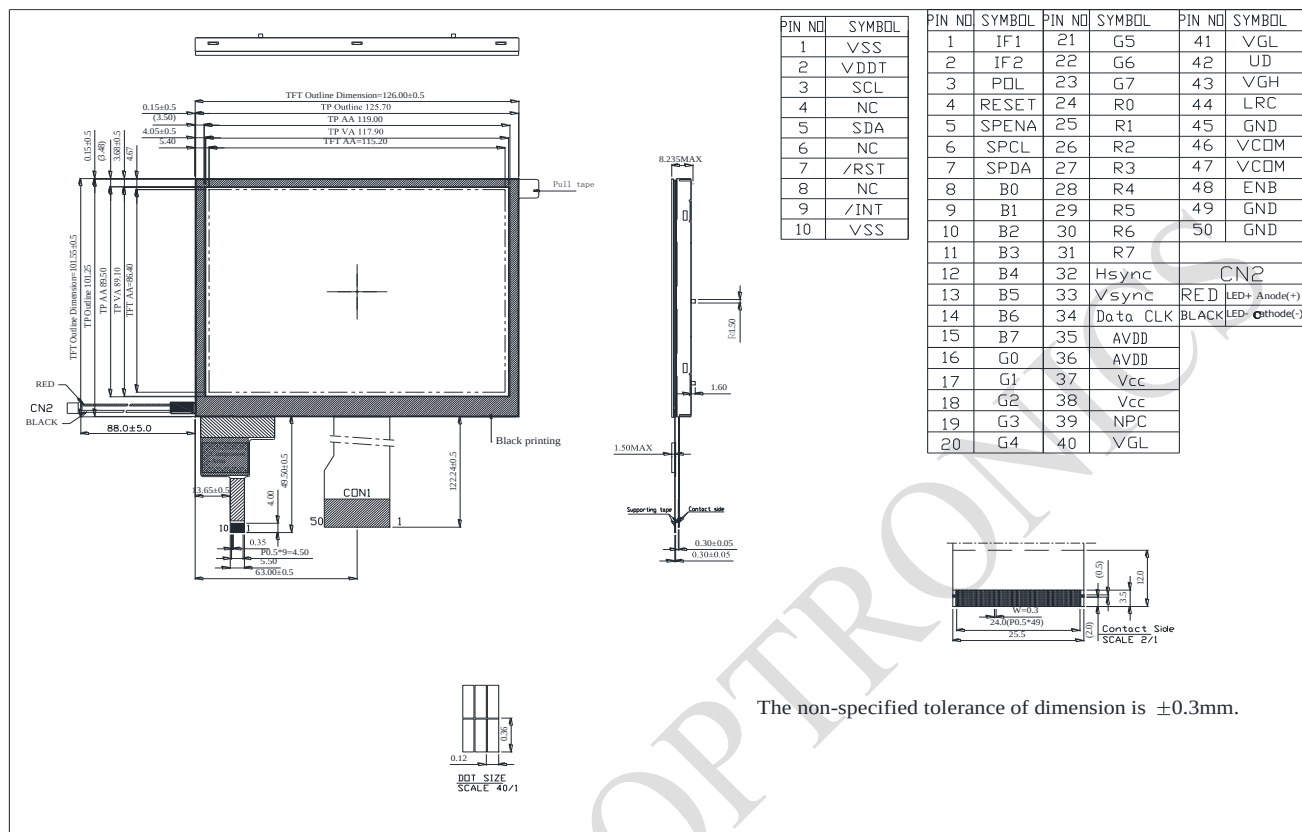
Note: The backlight interface connector is a model **PHR-2** manufactured by JST or equivalent.

The matching connector part number is S 2B-PH-K-S manufactured by JST or equivalent.

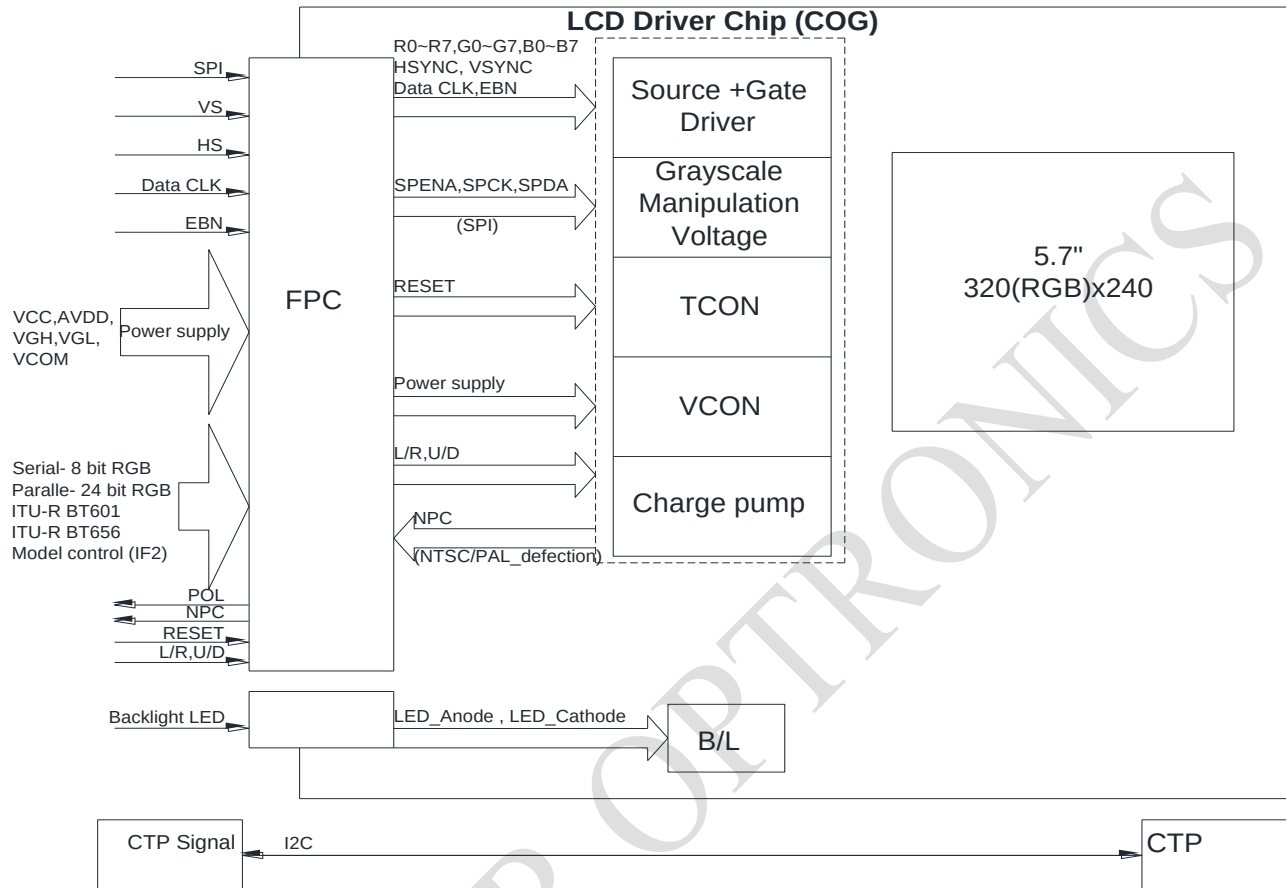
4.3. CTP PIN Definition

Pin	Symbol	Function	Remark
1	VSS	Ground for analog circuit	
2	VDDT	Power Supply : +3.3V	
3	SCL	I2C clock input	
4	NC	No connect	
5	SDA	I2C data input and output	
6	NC	No connect	
7	/RST	External Reset, Low is active	
8	NC	No connect	
9	/INT	External interrupt to the host	
10	VSS	Ground for analog circuit	

5. Contour Drawing



6. Block Diagram



7. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	°C
Storage Temperature	TST	-30	—	+80	°C

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

1. Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

8. Electrical Characteristics

8.1. Operating conditions:

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For LCM	VCC	—	3.0	3.3	3.6	V
Supply Voltage For CTP	VDDT	—	2.8	—	3.3	V
Input High Volt.	V _{IH}	—	0.7 VCC	—	VCC	V
Input Low Volt.	V _{IL}	—	0	—	0.3 VCC	V
LCD Driving Supply Voltage	V _{GH} *1	Ta=25℃		15		V *3
	V _{GL} *2			-10		
	VcomH		2.5		5.5	
	VcomL		-2.0		0	
Supply Current For LCM	I _{VCC}	VCC=3.3V	—	5	8	mA

Notes:

*1) V_{GH} is TFT Gate on operating voltage.

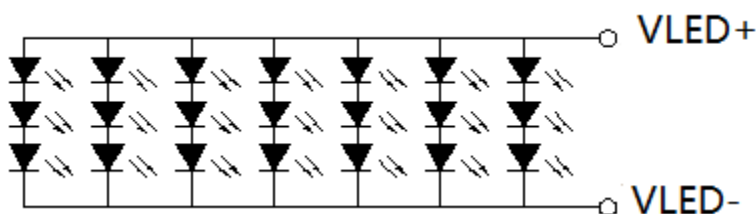
*2) V_{GL} is TFT Gate off operating voltage, V_{GL} signal must be fluctuates with same phase as Vcom when Storage on Gate structure.

*3) Vcom must be adjusted to optimize display quality_Crosstalk Contrast Ratio and etc.

8.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current		-	140	-	mA	
Power Consumption			1365	1470	mW	
LED voltage	VBL+	9.0	-	10.5	V	Note 1
LED Life Time		-	50,000	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



Note 2 : Ta = 25 °C

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

9.DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	V_{IL}	0	-	0.3VCC	V	
High level input voltage	V_{IH}	0.7VCC	-	VCC	V	

10.AC CHARACTERISTICS

10.1. CCIR601/656 Interface

Input signal characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK period	Tosc	-	37	-	ns
Data setup time	Tsu	12	-	-	ns
Data hold time	THo	12	-	-	ns

Hardware reset timing

Parameter	Symbol	Min.	Typ	Max	Unit
Reset low pulse width	TRSB	10	-	-	μs

Output signal characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Rising time	Tr	-	-	10	ns
Falling time	Tf	-	-	10	ns
Internal STH setup time	TSUS	12	-	-	ns
Internal STH hold time	THDS	12	-	-	ns
Internal data setup time	TSUD	60	-	-	ns
Internal data hold time	THDD	40	-	-	ns
OEH pulse width	TOEH	-	1248	-	ns
OEV pulse width	TOEV	-	4992	-	ns
CKV pulse width	TCKV	-	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	TSUV		1872	-	ns
Vsync-pulse time	TSTV		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	TOES	-	12	20	μs

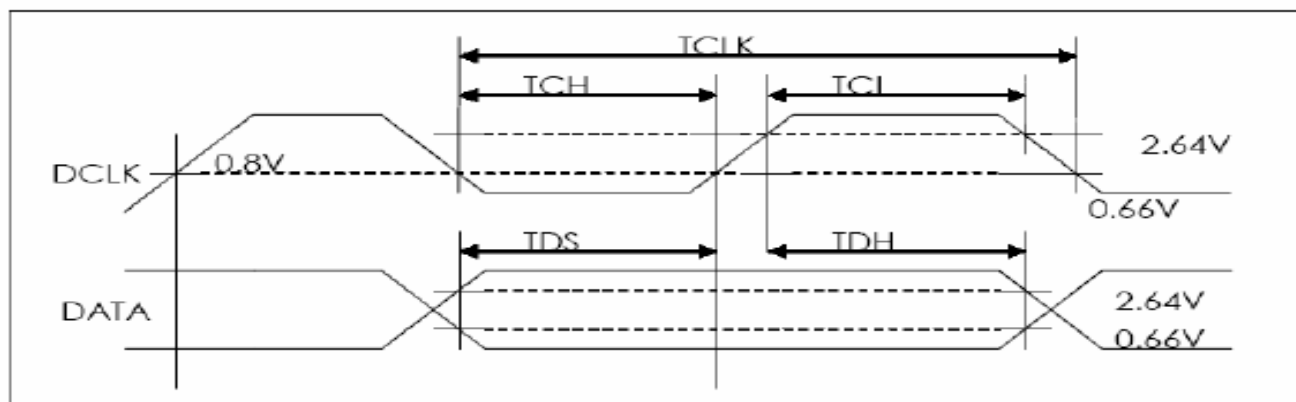
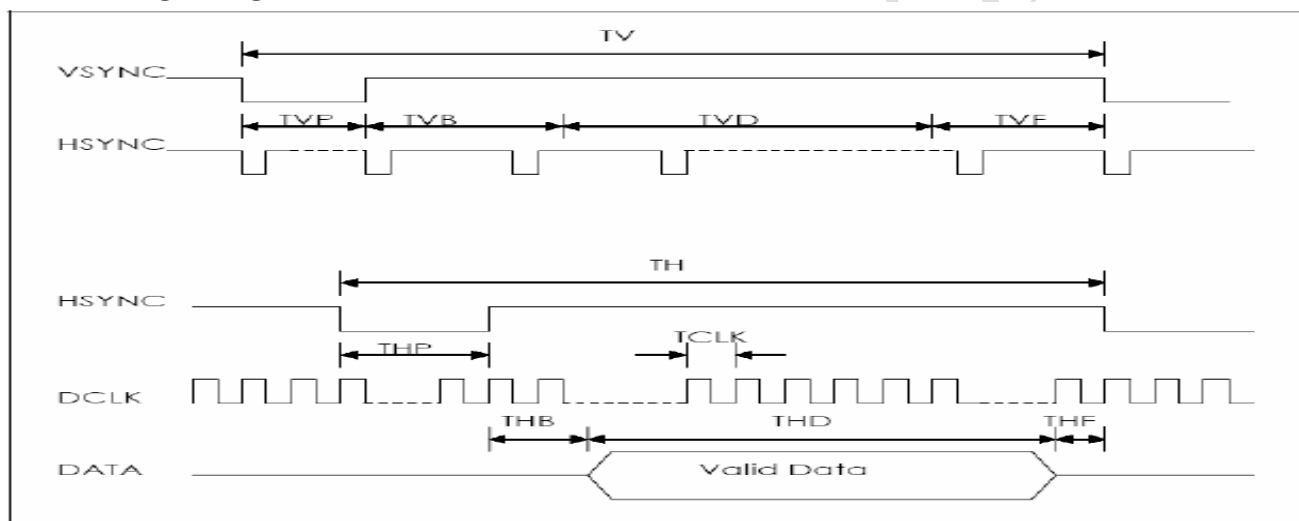
10.2. 24-bits parallel RGB Interface

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	-	DCLK
		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		

AC Timing Diagrams

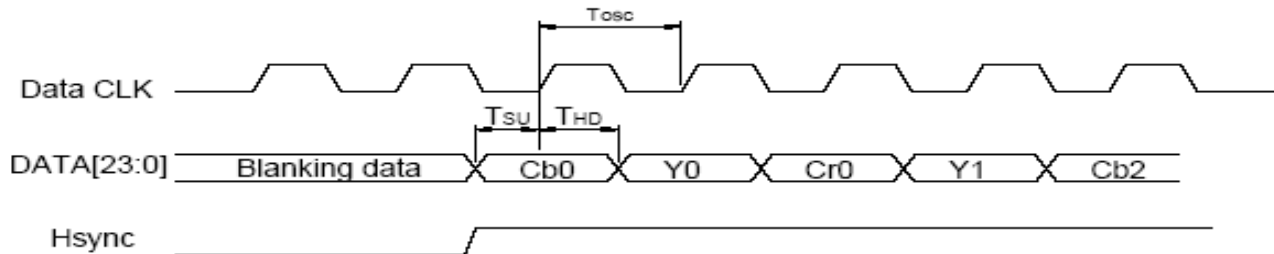


11. Waveform

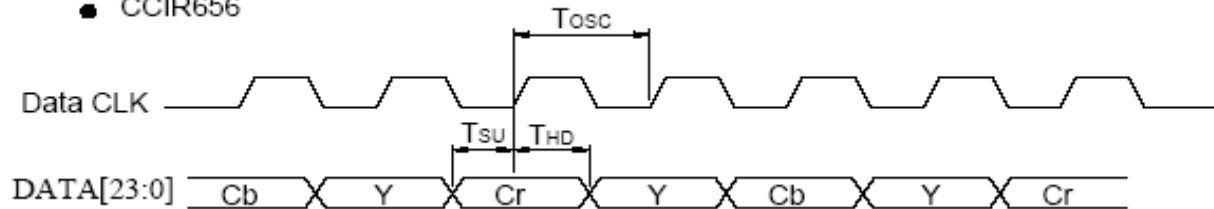
11.1. Timing Controller Timing Chart

Clock and Data waveform

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



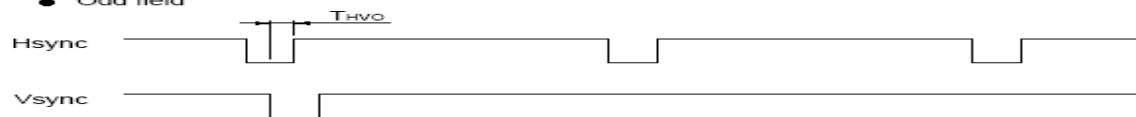
- CCIR656



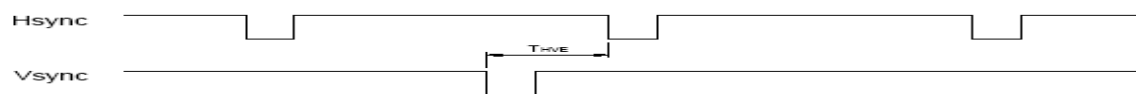
11.2. Digital / Analog RGB timing waveform

Hsync and Vsync timing

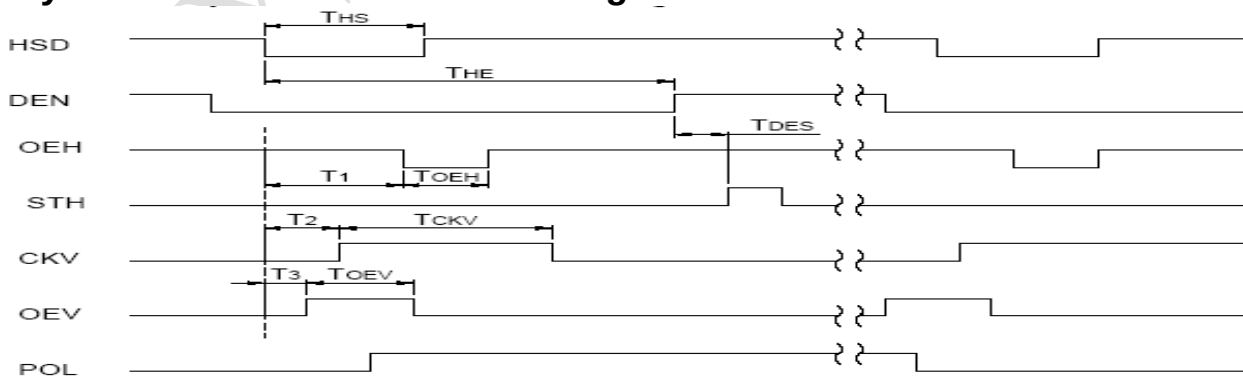
- Odd field



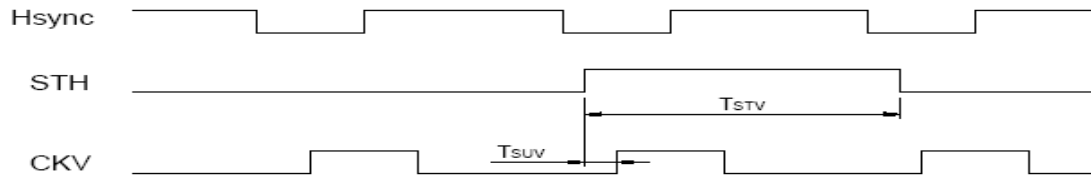
- Even field



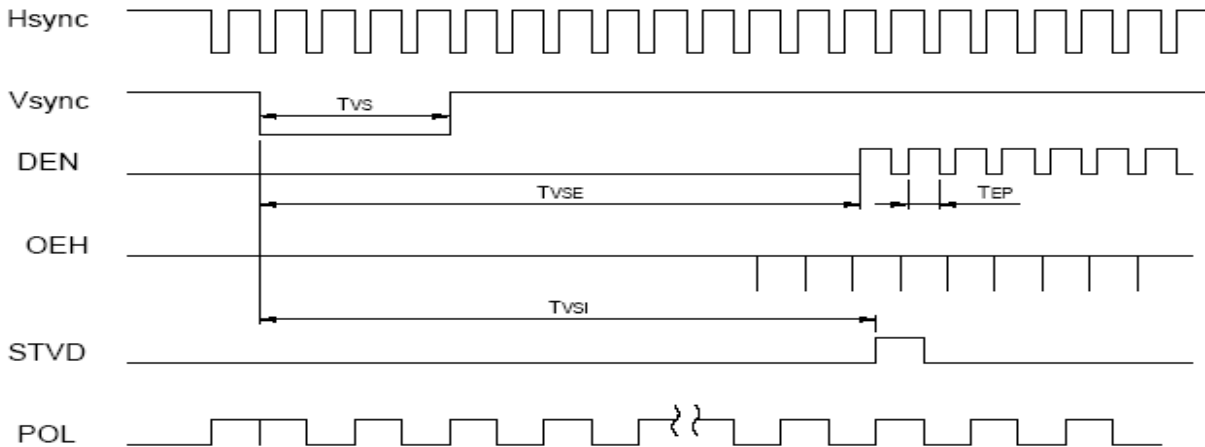
Hsync and horizontal control timing waveform



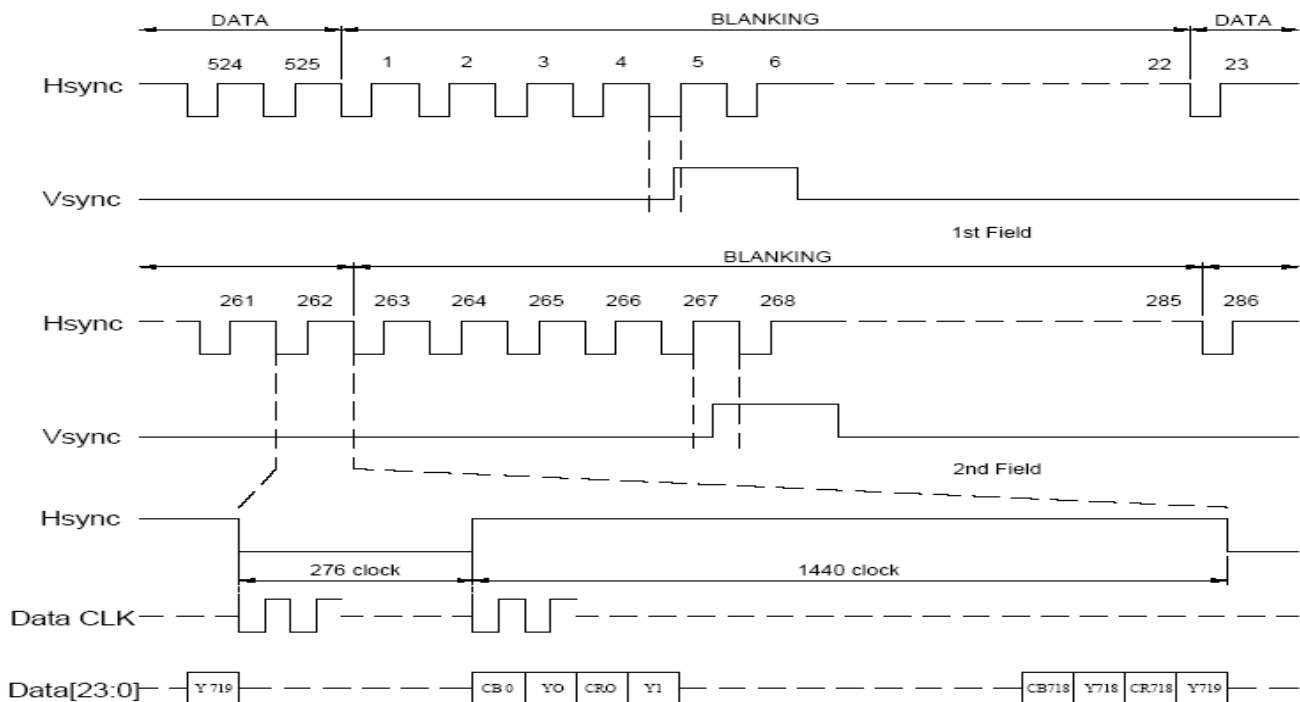
Hsync and vertical shift clock timing waveform



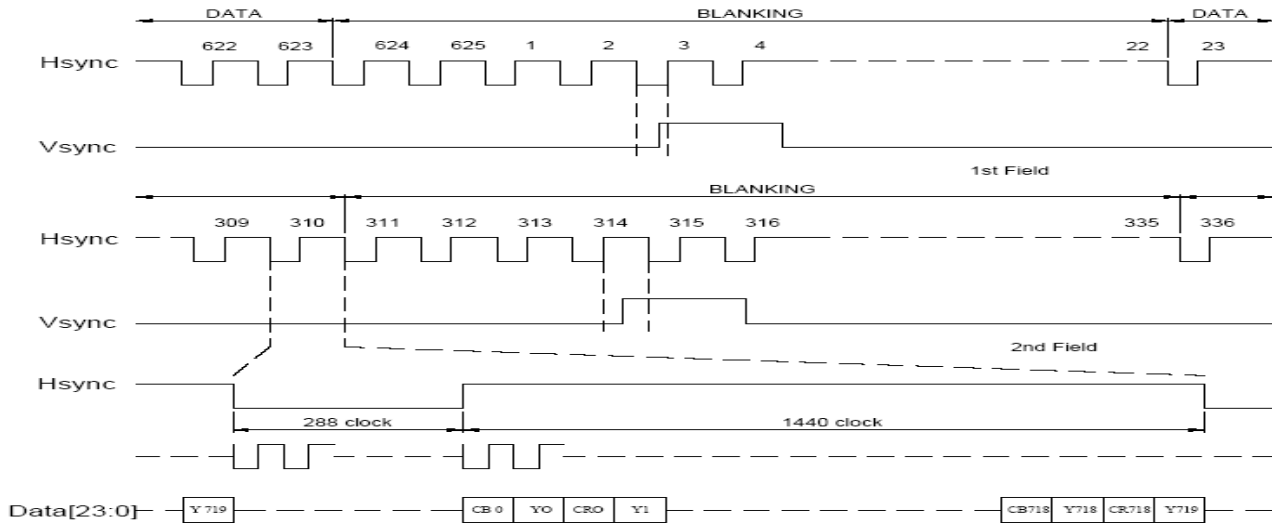
Hsync and vertical shift clock timing waveform



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



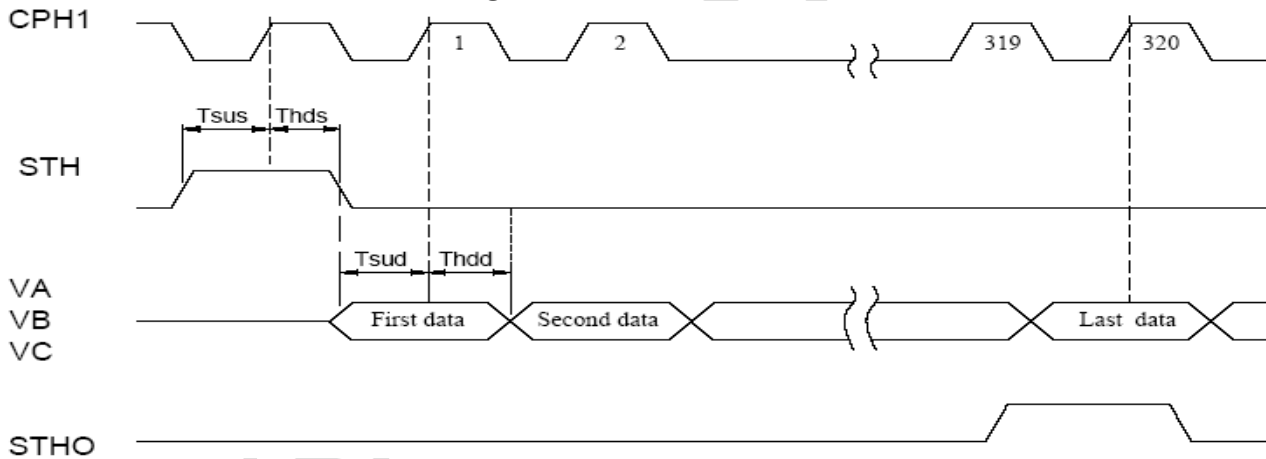
ITU-BT.601 NTSC Input Timing



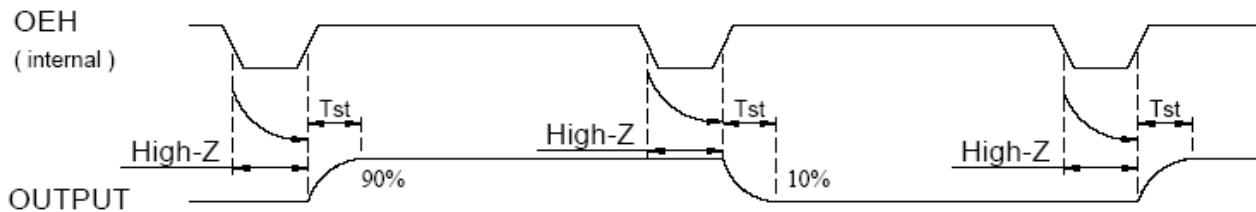
ITU-BT.601 PAL Input Timing

11.4. Source Driver Timing Chart

Clock and Start Pulse timing waveform



11.5. OEH and Data Output timing waveform



11.6. 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

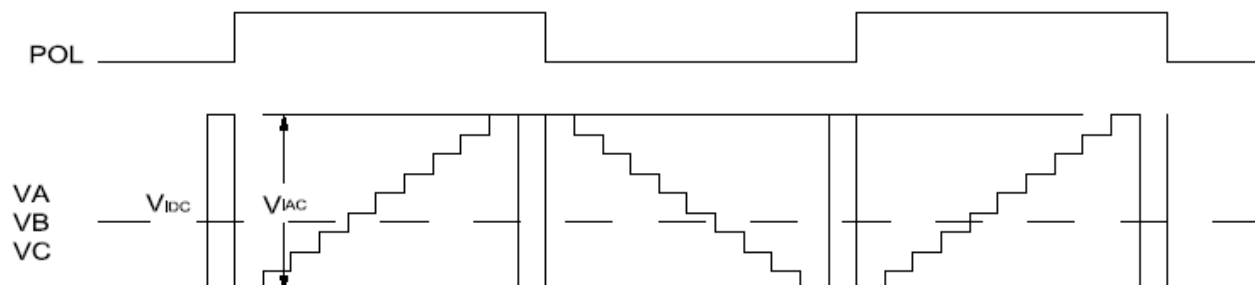
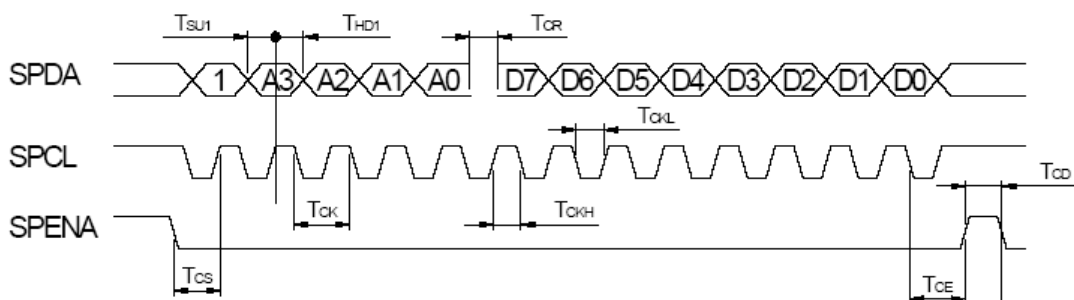


Fig. 4-(a) Horizontal timing

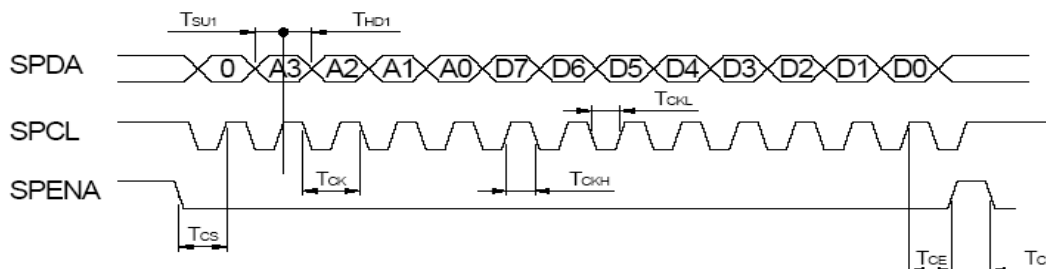
11.7. SPI timing characteristics

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

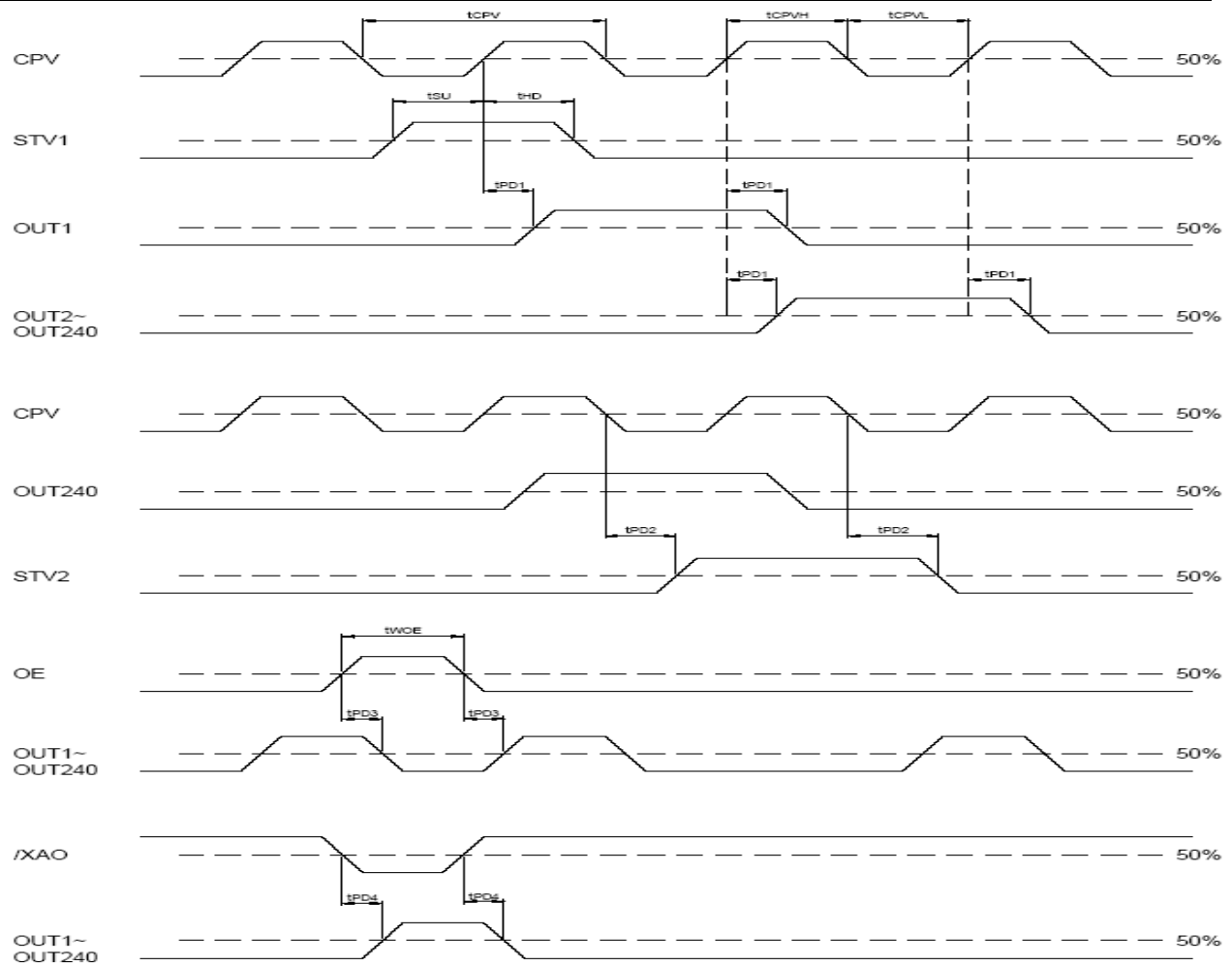


● SPI "write" timing



11.8. Gate Driver Timing Chart

Parameter	Symbol	Condition	Spec		Unit
			Min.	Max.	
Operation frequency	tCPV		5	-	μ s
CPV pulse width	tCPVH,tCPVL	50%duty cycle	2.5	-	
OE pulse width	twOE		1	-	
Data setup time	tsu		0.4	-	μ s
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	



12. Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	15	30	-	.ms	Note 3
		Tf		35	50	-	.ms	
Contrast ratio		CR	At optimized viewing angle	150	250	-	-	Note 4
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0$	0.282	0.312	0.342		Note 2,6,7
		Wy		0.319	0.349	0.379		
Viewing angle (Gray Scale Inversion Direction)	Hor.	ΘR	$CR \geq 10$	60	70	-	Deg.	Note 1
		ΘL		60	70	-		
	Ver.	ΦT		40	50	-		
		ΦB		60	70	-		
Brightness		-	-	600	700	-	Cd/m ²	Center of display
Uniformity		(U)	-	75	-	-	%	Note5

Ta=25±2℃, IL=140mA

Note 1: Definition of viewing angle range

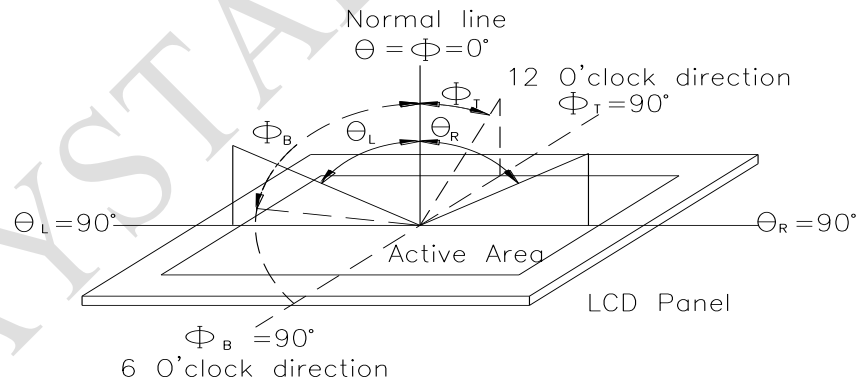


Fig.12.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 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 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

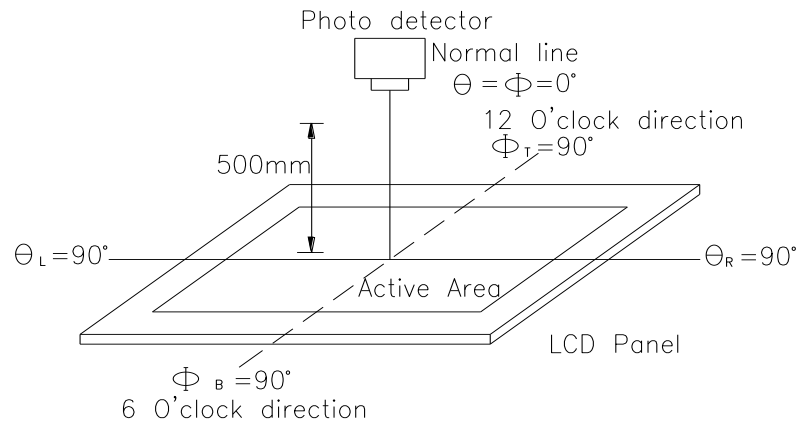
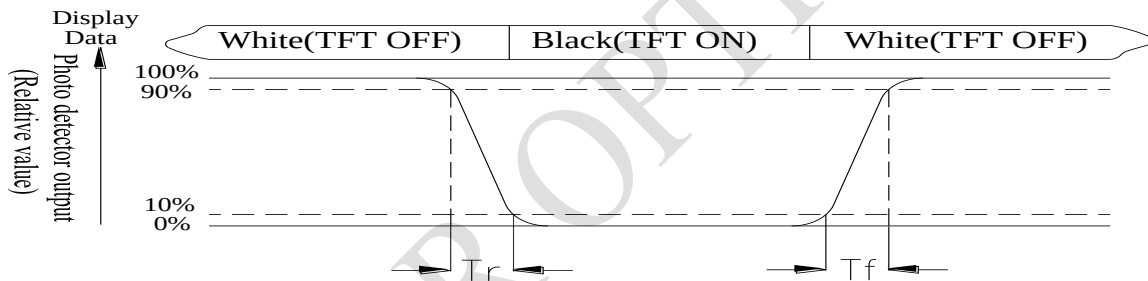


Fig. 12.2. Optical measurement system setup

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%



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: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = $L_{min}/L_{max} \times 100\%$

L = Active area length

W = Active area width

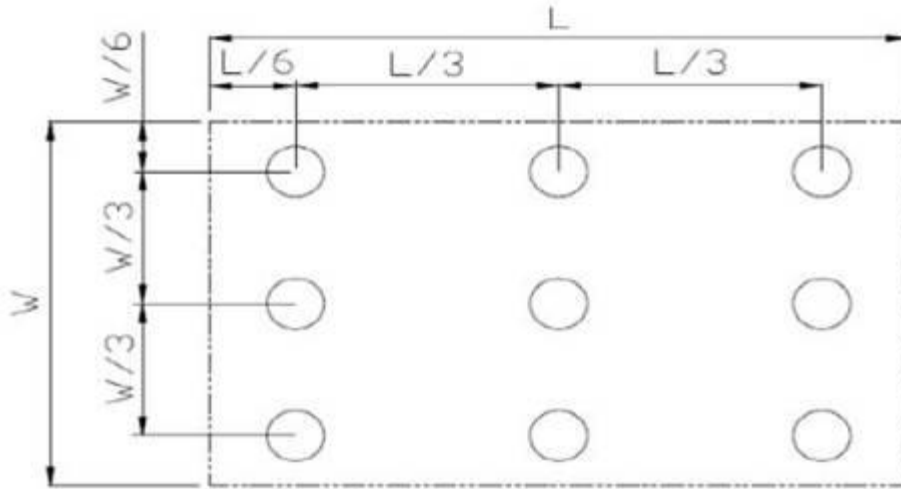


Fig . Definition of uniformity

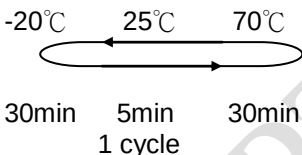
Note 6: Definition of color chromaticity (CIE 1931)

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.

13. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

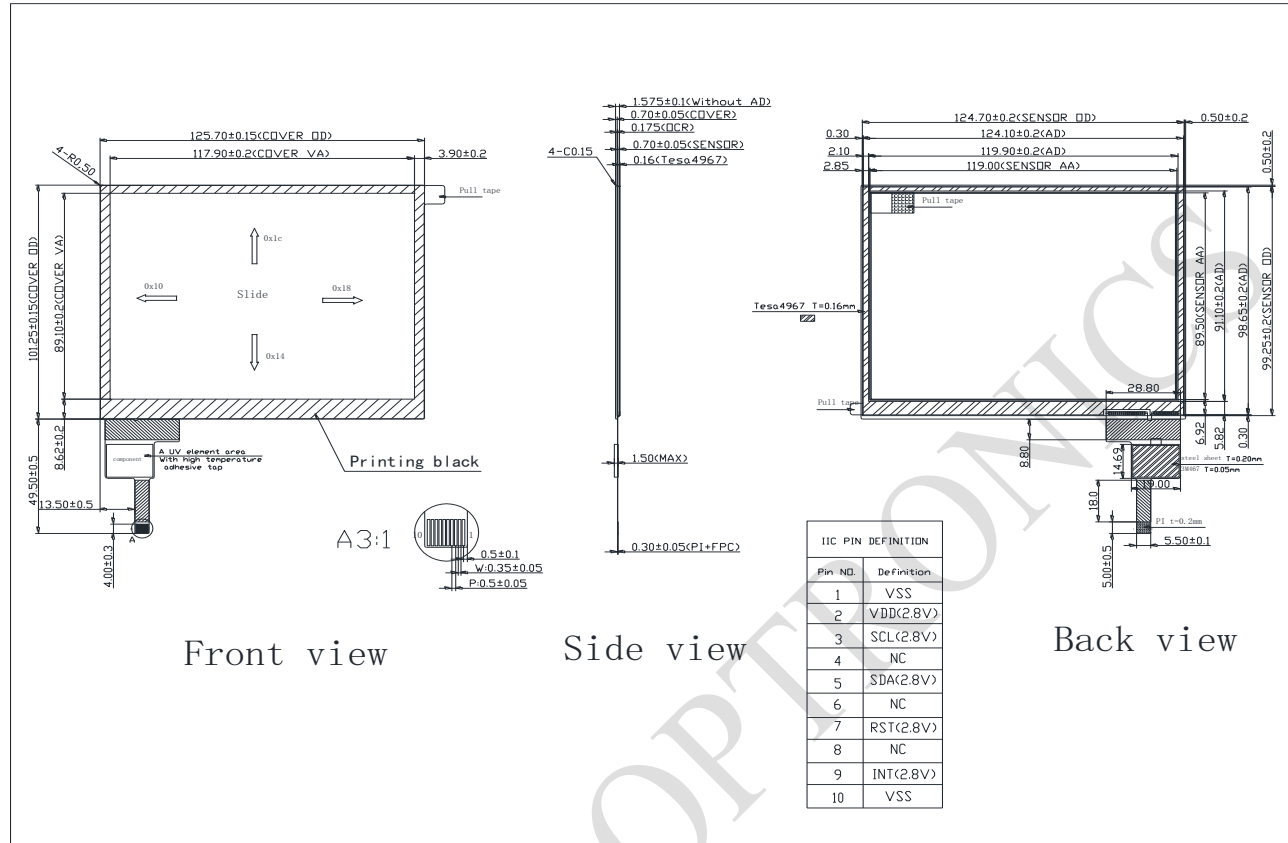
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max	60°C,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation 	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 3 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact) ,±800v(air), RS=330Ω CS=150pF 10 times	—

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

14.Touch Panel Information



LCM Sample Estimate Feedback Sheet		
Module Number : _____		
1 、 <u>Panel Specification</u> :		
1. Panel Type :	☐ Pass	☐ NG , _____
2. View Direction :	☐ Pass	☐ NG , _____
3. Numbers of Dots :	☐ Pass	☐ NG , _____
4. View Area :	☐ Pass	☐ NG , _____
5. Active Area :	☐ Pass	☐ NG , _____
6. Operating Temperature :	☐ Pass	☐ NG , _____
7. Storage Temperature :	☐ Pass	☐ NG , _____
8. Others : _____		
2 、 <u>Mechanical Specification</u> :		
1. PCB Size :	☐ Pass	☐ NG , _____
2. Frame Size :	☐ Pass	☐ NG , _____
3. Material of Frame :	☐ Pass	☐ NG , _____
4. Connector Position :	☐ Pass	☐ NG , _____
5. Fix Hole Position :	☐ Pass	☐ NG , _____
6. Backlight Position :	☐ Pass	☐ NG , _____
7. Thickness of PCB :	☐ Pass	☐ NG , _____
8. Height of Frame to PCB :	☐ Pass	☐ NG , _____
9. Height of Module :	☐ Pass	☐ NG , _____
10. Others :	☐ Pass	☐ NG , _____
3 、 <u>Relative Hole Size</u> :		
1. Pitch of Connector :	☐ Pass	☐ NG , _____
2. Hole size of Connector :	☐ Pass	☐ NG , _____
3. Mounting Hole size :	☐ Pass	☐ NG , _____
4. Mounting Hole Type :	☐ Pass	☐ NG , _____
5. Others :	☐ Pass	☐ NG , _____
4 、 <u>Backlight Specification</u> :		
1. B/L Type :	☐ Pass	☐ NG , _____
2. B/L Color :	☐ Pass	☐ NG , _____
3. B/L Driving Voltage (Reference for LED Type) : ☐ Pass ☐ NG , _____		
4. B/L Driving Current :	☐ Pass	☐ NG , _____
5. Brightness of B/L :	☐ Pass	☐ NG , _____
6. B/L Solder Method :	☐ Pass	☐ NG , _____
7. Others :	☐ Pass	☐ NG , _____

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Module Number : _____

5 、 Electronic Characteristics of Module :

1.Input Voltage :	☐ Pass	☐ NG , _____
2.Supply Current :	☐ Pass	☐ NG , _____
3.Driving Voltage for LCD :	☐ Pass	☐ NG , _____
4.Contrast for LCD :	☐ Pass	☐ NG , _____
5.B/L Driving Method :	☐ Pass	☐ NG , _____
6.Negative Voltage Output :	☐ Pass	☐ NG , _____
7.Interface Function :	☐ Pass	☐ NG , _____
8.LCD Uniformity :	☐ Pass	☐ NG , _____
9.ESD test :	☐ Pass	☐ NG , _____
10.Others :	☐ Pass	☐ NG , _____

6 、 Summary :
Sales signature : _____

Customer Signature : _____

Date : / /