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SPECIFICATIONS

SDT035T

Swissdis 108934

TFT 3.5" with Touch
Resolution 320 x 240

Version August 2013

INDEX

ISSUE RECORD

NO.	VER.	DATE	PAGE	MODIFY CONTENTS
1	A	2013/05/07	All	New issued
2	B	2013/8/29	28	OUTLING DRAWING

1. SUMMARY:

This technical specification applies to 3.45“color TFT-LCD panel. The 3.45“ color TFT-LCD panel is designed for GPS, camcorder, digital camera 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). SDT035T is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver ICs, FPC and a backlight unit.

3. GENERAL SPECIFICATION

Parameter		Specifications	Unit
Screen Size		3.45(Diagonal)	Inch
Display Format		320 x RGB x 240	Dot
Active Area		70.08(H) x 52.56(V)	mm
Dot Size		73 x 219	um
Pixel Configuration		RGB-Stripe	mm
Outline Dimension		76.9(W) x 63.9(H) x 4.5(D)	mm
Display Mode		Normally White/ Transmissive	
Display Garmut		NTSC 60%	
Input Interface		Digital 24-bit RGB/SERIAL RGB/CCIR656/CCIR601	
Temperature Range	Operation	-20 ~ +70	℃
	Storage	-30 ~ +80	℃

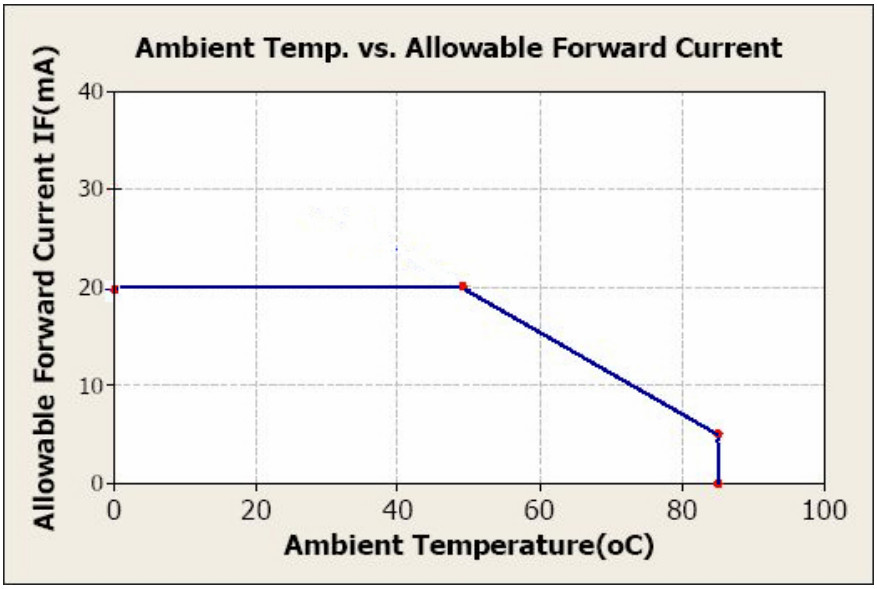
4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power Voltage	DVDD,AVDD	GND=0	-0.3	5.0	V	
Input Signal Voltage	V_{IN}	GND=0	-0.3	VDD+0.3	V	
Logic Output Voltage	V_{OUT}	GND=0	-0.3	VDD+0.3	V	Note

Note1: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

1. Temp. ≦ 60℃, 90% RH MAX.
   Temp. > 60℃, Absolute humidity shall be less than 90% at 60℃.

2.



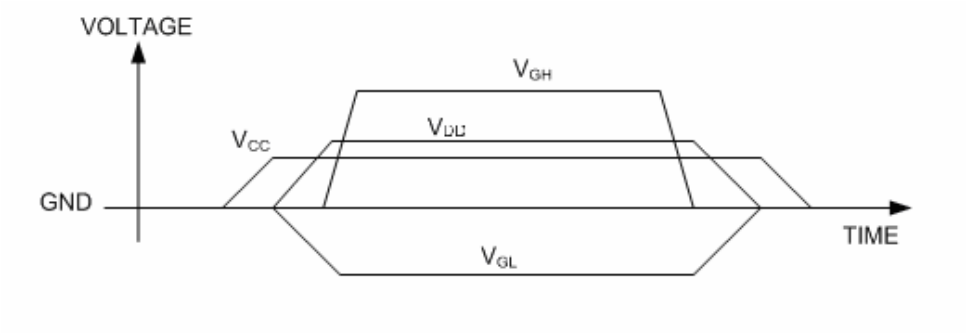
5. ELECTRICAL CHARACTERISTICS

5.1 Operating Conditions:

Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
Power Voltage	Vcc	3.0	3.3	3.6	V	
Digital Operation Current	I cc		8.6		mA	
Gate On Power	VGH	14	15	18	V	
Gate Off Power	VGL	-11	-10	-8	V	
Vcom High Voltage	VcomH		3.7		V	Note1
Vcom Low Voltage	VcomL		-1.6		V	Note1
Vcom Level Max	VcomA	0	-	6	V	

Note 1 : VcomH & VcomL : Adjust the color with gamma data, Vp-p should be higher then 4V. (Option 5V)

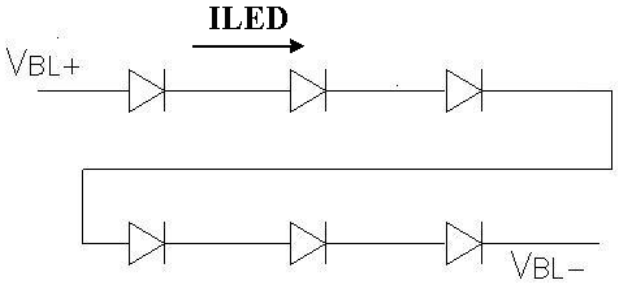
Note: Please Power on following the sequence VCC → VDD



5.2 LED Driving Conditions:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Current		-	20	-	mA	
Power Consumptioin			400	420	mW	
LED Voltage	VBL+	18.6	19.8	21	V	Note 1
LED Life Time	-		(50,000)	-	Hr	Note 2,3

Note 1 : There are 1 Groups LED



Note 2 : continued light on Ta = 25℃ Humidity = 60%+- 5%

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

The definition of back light life is under bellow conditions:

Constant current <= 20mA

6. DC CHARACTERISTICS

Parameter	Symbol	Rating			Condition
		Min.	Typ.	Max.	
Low Level Input Voltage	V_{IL}	0	-	0.3 VCC	
High Level Input Voltage	V_{IH}	0.7 VCC	-	VCC	

7. AC CHARACTERISTICS

Digital Parallal RGB Interface

Signal	Item	Symbol	Min.	Typ.	Max.	Unit
Dclk	Frequency	Tosc	-	156	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns
Hsync	Period	TH	-	408	-	Tosc
	Pulse Width	THS	5	30	-	Tosc
	Back-Porch	Thb		38		Tosc
	Display Period	TEP	-	320	-	Tosc
	Hsync-den Time	THE	36	68	88	Tosc
	Front-Porch	Thf	-	20	-	Tosc
Vsync	Period	Tv	-	262	-	TH
	Pulse Width	Tvs	1	3	5	TH
	Back-Porch	Tvb	-	15	-	TH
	Display Period	Tvd	-	240	-	TH
	Front-Porch	Tvf	2	4	-	TH

Note: (1) Thp + Thb = 68, the user is make up by yourself.

(2) Tv = Tvs + Tvb + Tvd + Tvf, the usder is make up by yourself.

(3) When SYNC mode is used, 1st data start from 68th Dclk after Hsync falling.

Digital Serial RGB Interface

Signal	Item	Symbol	Min.	Typ.	Max.	Unit
Dclk	Frequency	Tosc	-	52	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns
Hsync	Period	TH	-	1224	-	Tosc
	Pulse Width	THS	5	90	-	Tosc
	Back-Porch	Thb		114		Tosc
	Display Period	TEP	-	960	-	Tosc
	Hsync-den Time	THE	108	204	264	
	Front-Porch	Thf	-	60	-	Tosc
Vsync	Period	Tv	-	262	-	TH
	Pulse Width	Tvs	1	3	5	TH
	Back-Porch	Tvb	-	15	-	TH
	Display Period	Tvd	-	240	-	TH
	Front-Porch	Tvf	2	4	-	TH

Note: (1) Thp + Thb = 204, the user is make up by yourself.

(2) Tv = Tvs + Tvb + Tvd + Tvf, the usder is make up by yourself.

(3) When SYNC mode is used, 1st data start from 204th Dclk after Hsync falling.

CCIR601/656 Interface

Signal	Item	Symbol	Min.	Typ.	Max.	Unit
Dclk	Frequency	Tosc	-	37	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns

7.1 Waveform

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

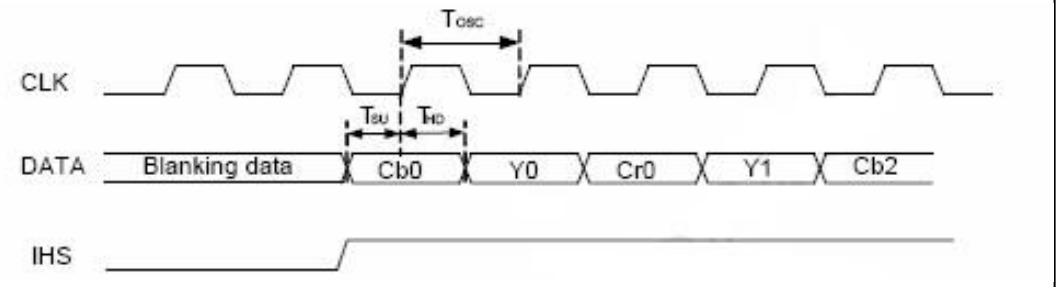


Figure1 CLK,DATA and HIS waveforms in CCIR601

- **CCIR656**

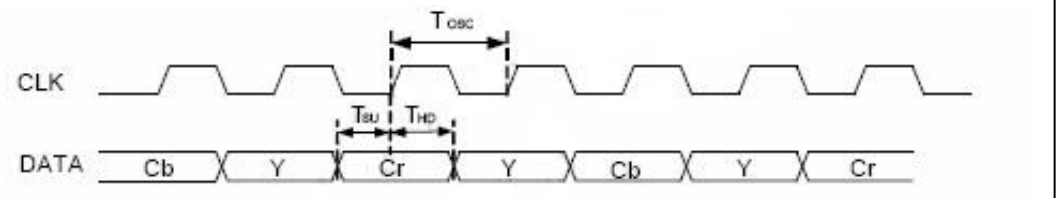


Figure2 CLK and DATA waveforms in CCIR656

- **Digital Serial RGB**

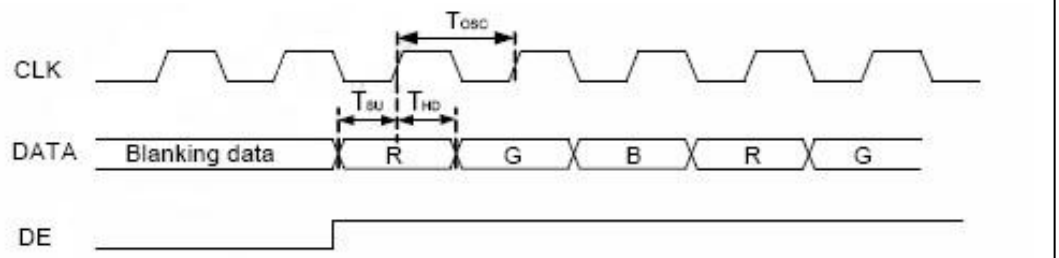


Figure3 CLK, DATA and DE waveforms in Digital Serial RGB

- **Digital Parallel RGB**

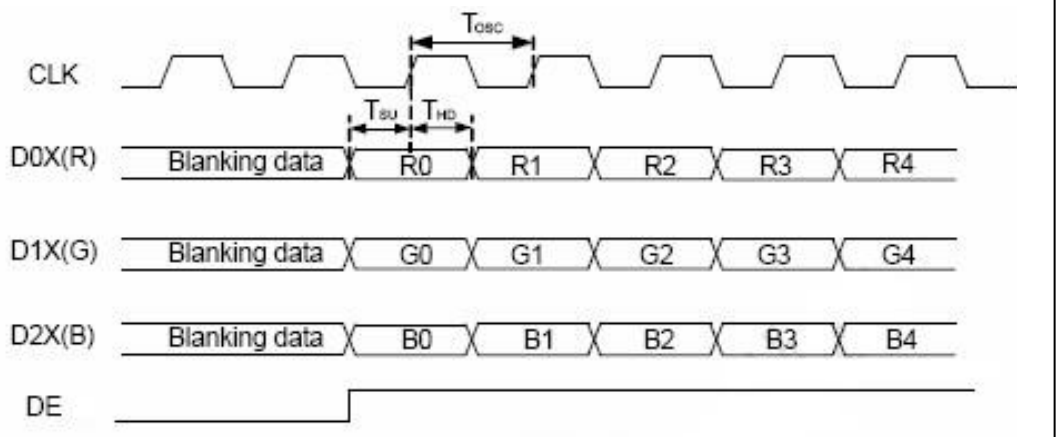


Figure4 CLK, DATA and DE waveforms in Digital Parallel RGB

7.1.1 Standby ON/OFF control

SDT035 has a power ON/OFF sequence control function. When STB pin is pulled L, blank data is outputted for 5-frames first, form the falling edge of the following VSYNC signal. The blank data would be gray level 255 for normally white LC.

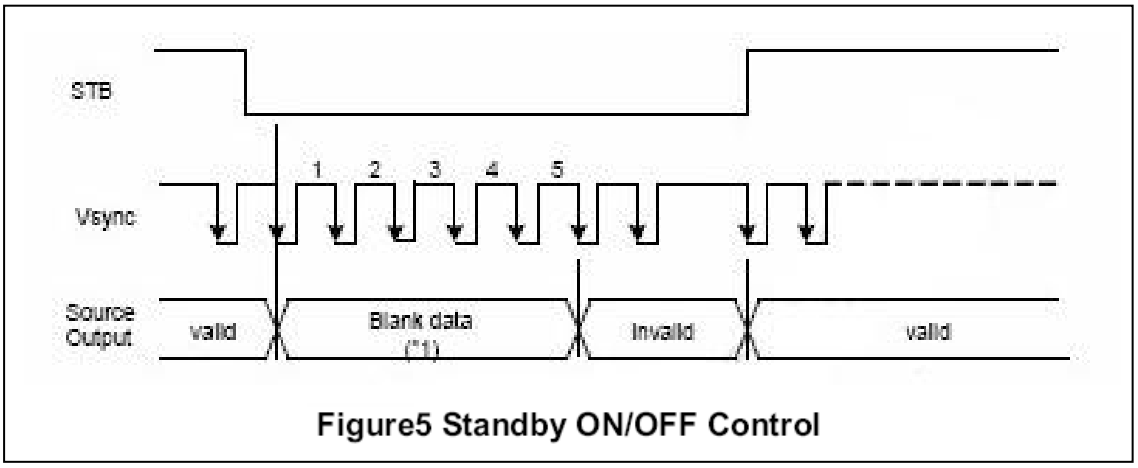


Figure5 Standby ON/OFF Control

7.1.2 Clock & SYNC waveforms

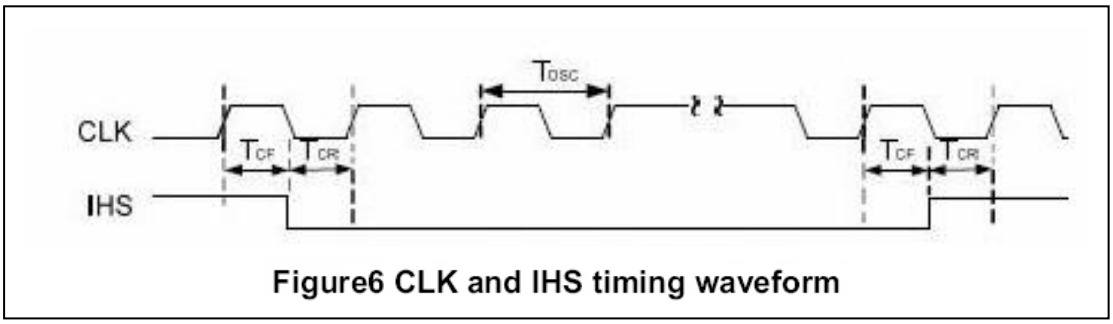


Figure6 CLK and IHS timing waveform

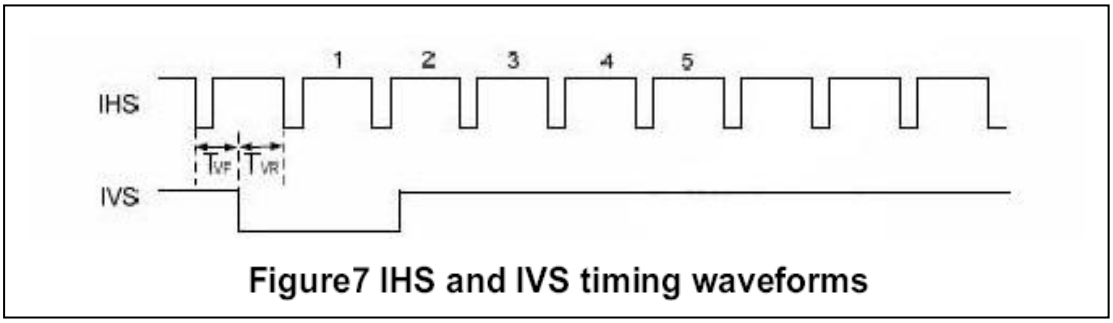
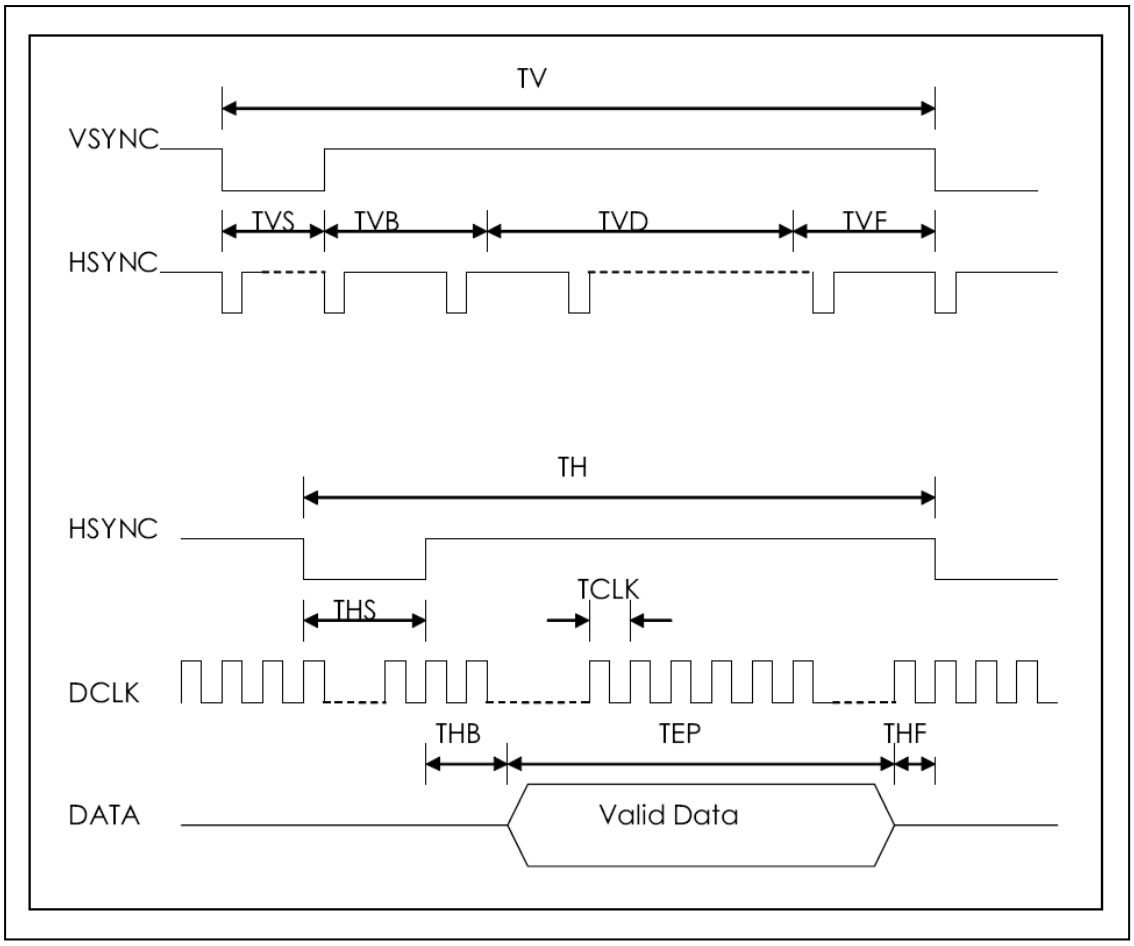
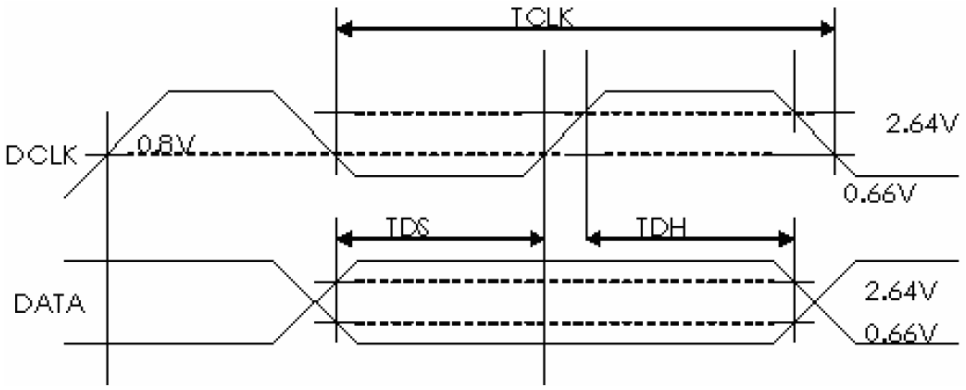


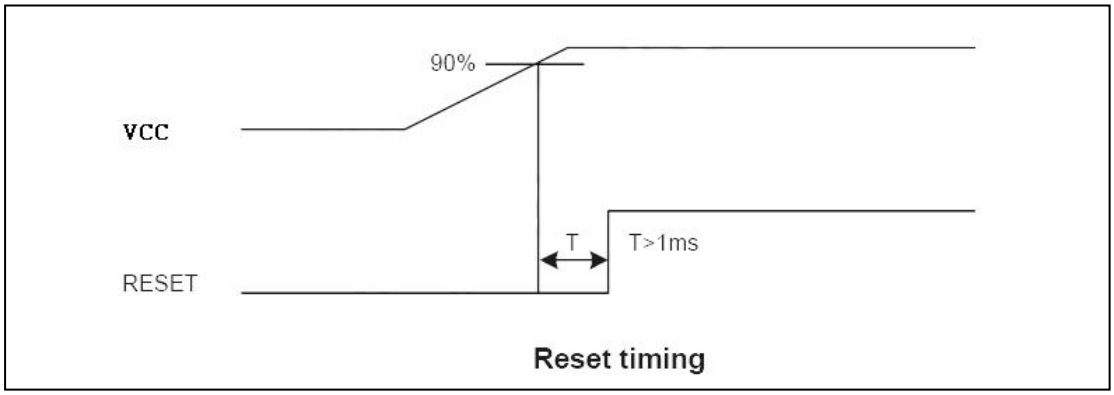
Figure7 IHS and IVS timing waveforms





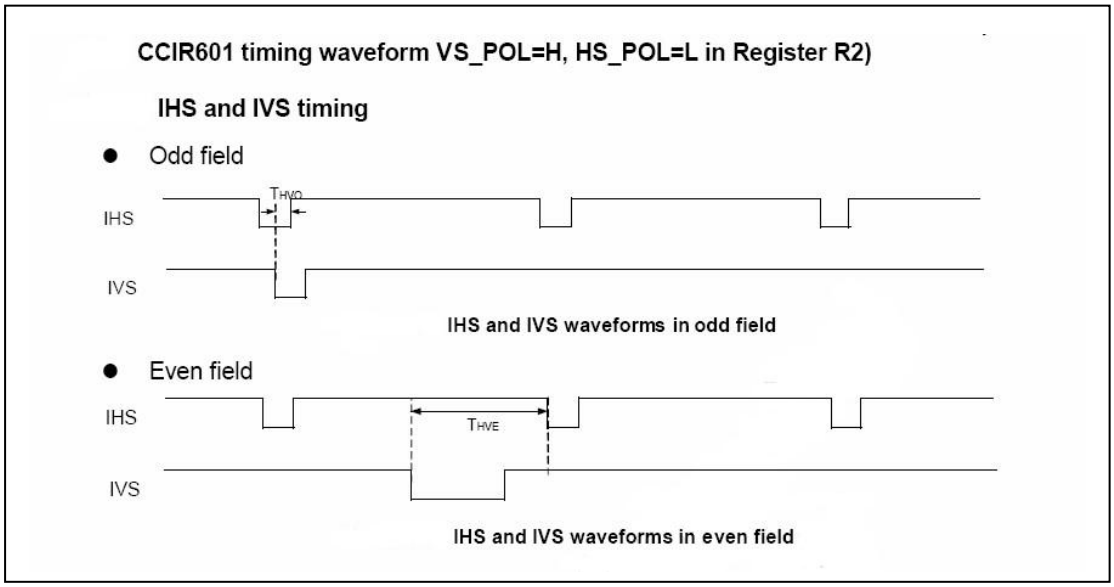
7.2 Reset Timing Chart

The RESET input must be held at least 1ms after power is stable.

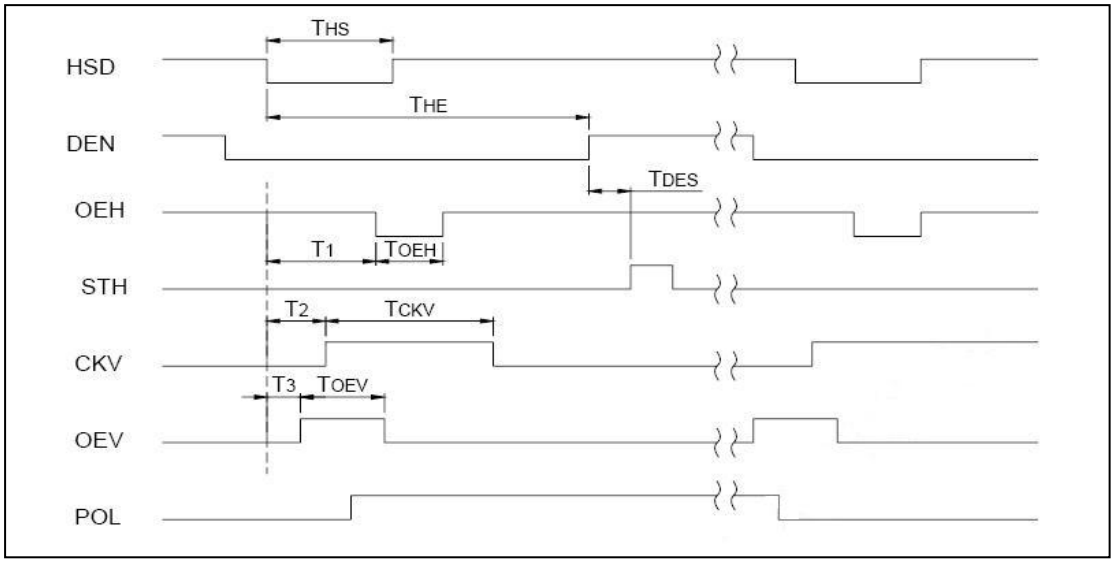


7.3 Digital RGB Timing Waveform

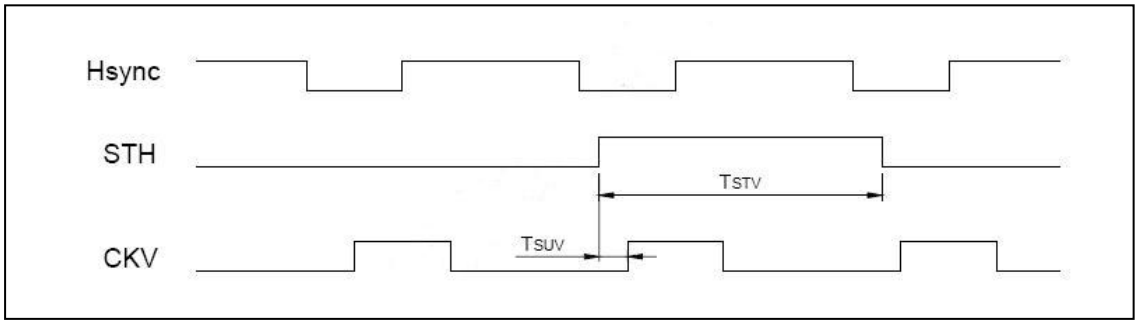
Hsync and Vsync timing



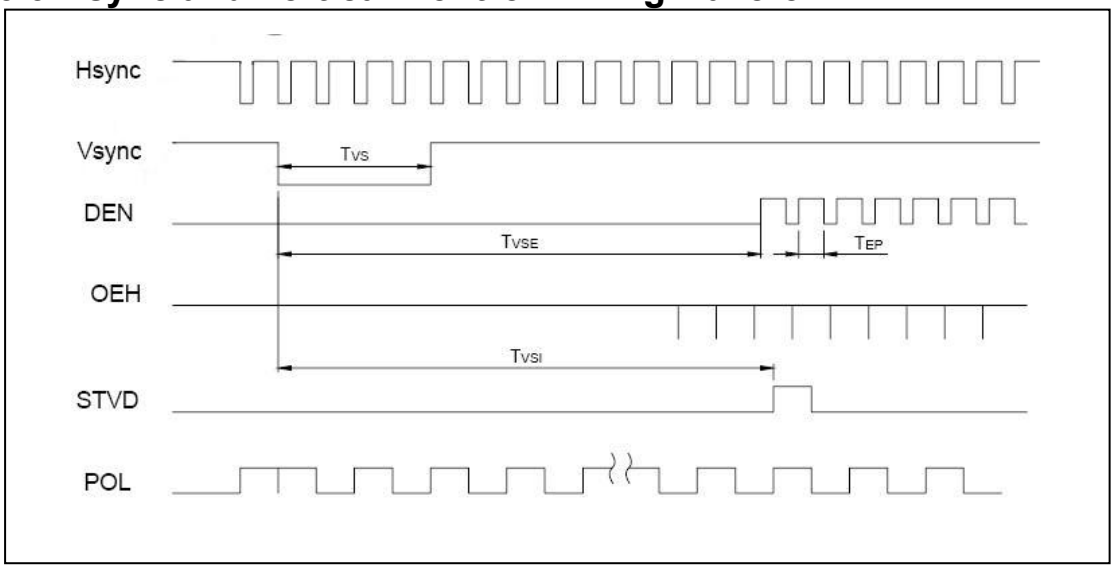
7.3.1 Hsync and Horizontal Control Timing waveform



7.3.2 Hsync and Vertical Shift Clock Timing waveform

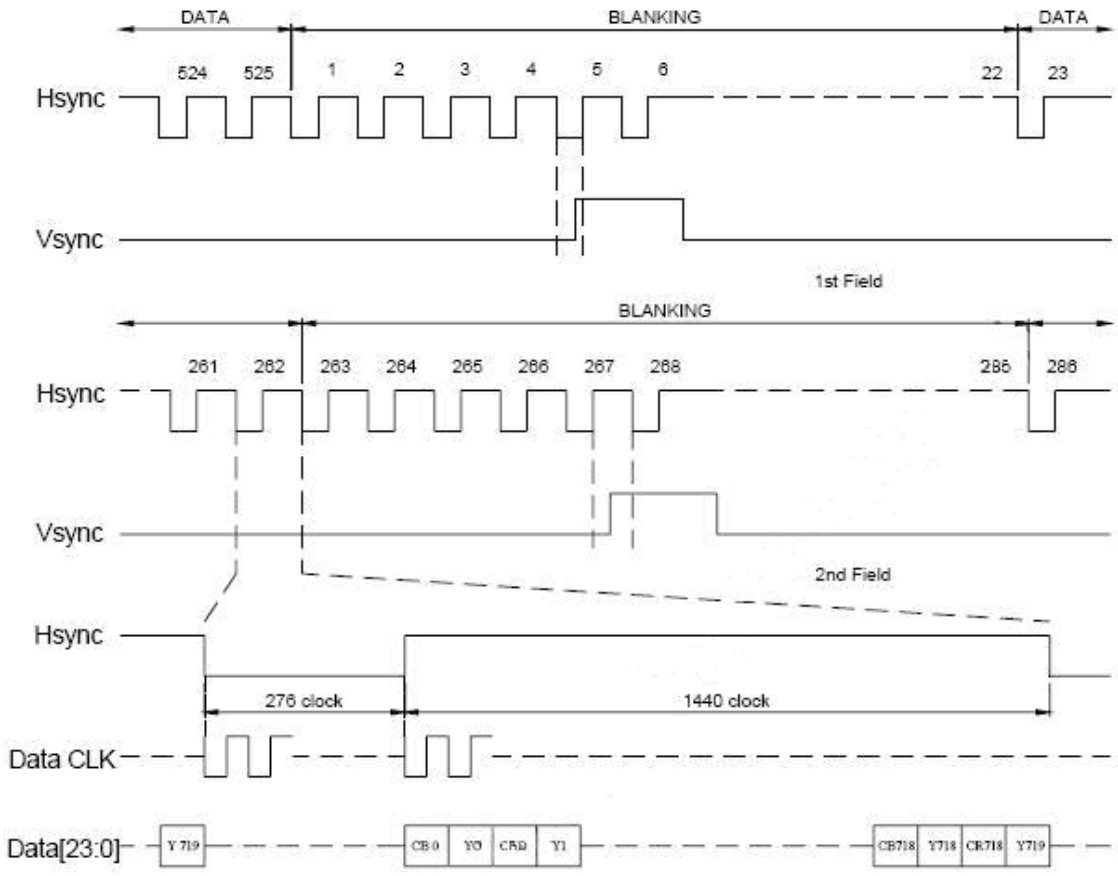


7.3.3 Hsync and Vertical Control Timing waveform

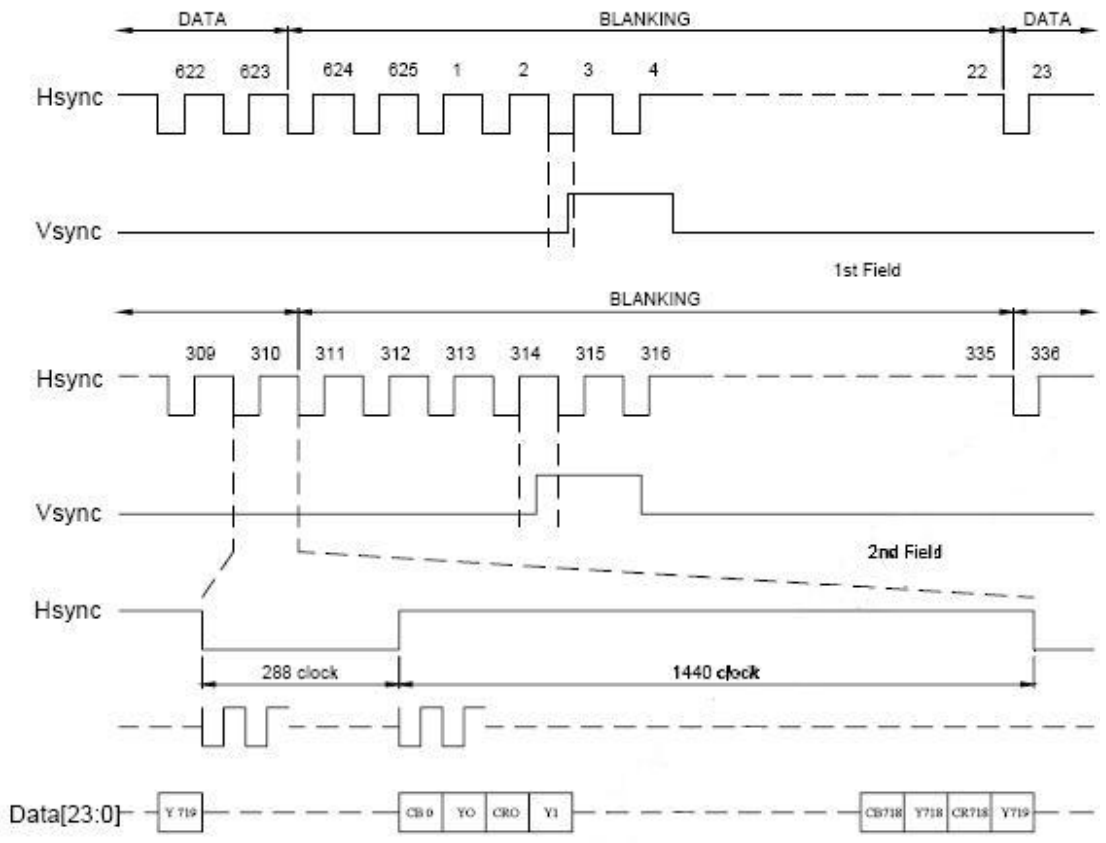


7.3.4 CCIR601 Timing Waveform

CCIR601 Timing Waveform (VS_POL="H", HS_POL="L" in Register R2)



ITU-BT 601 NTSC Input Timing

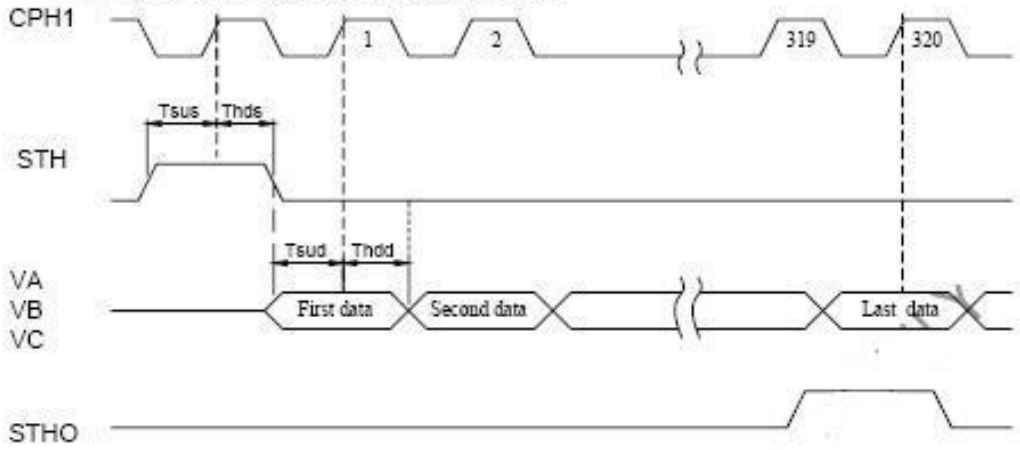


ITU-BT 601 PAL Input Timing

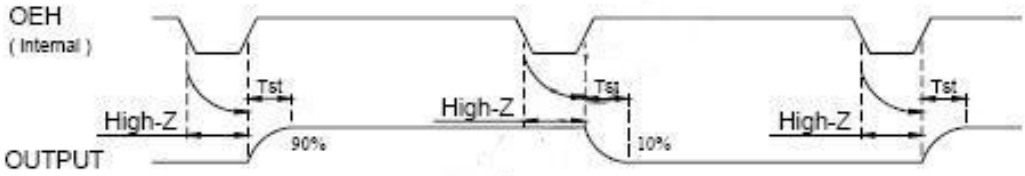
7.3.5 Source Driver Timing Chart

Source Driver Timing Chart

Clock and Start Pulse timing waveform

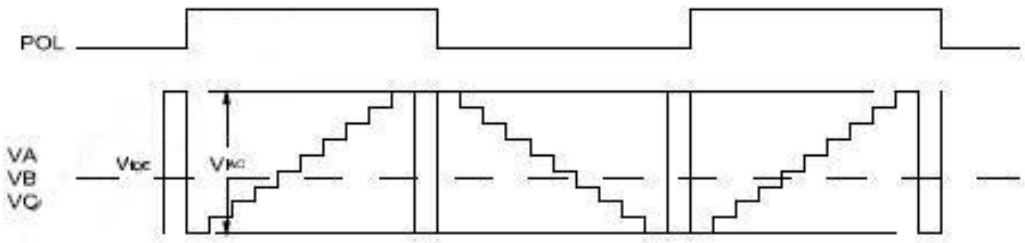


OEH and Data Output timing waveform



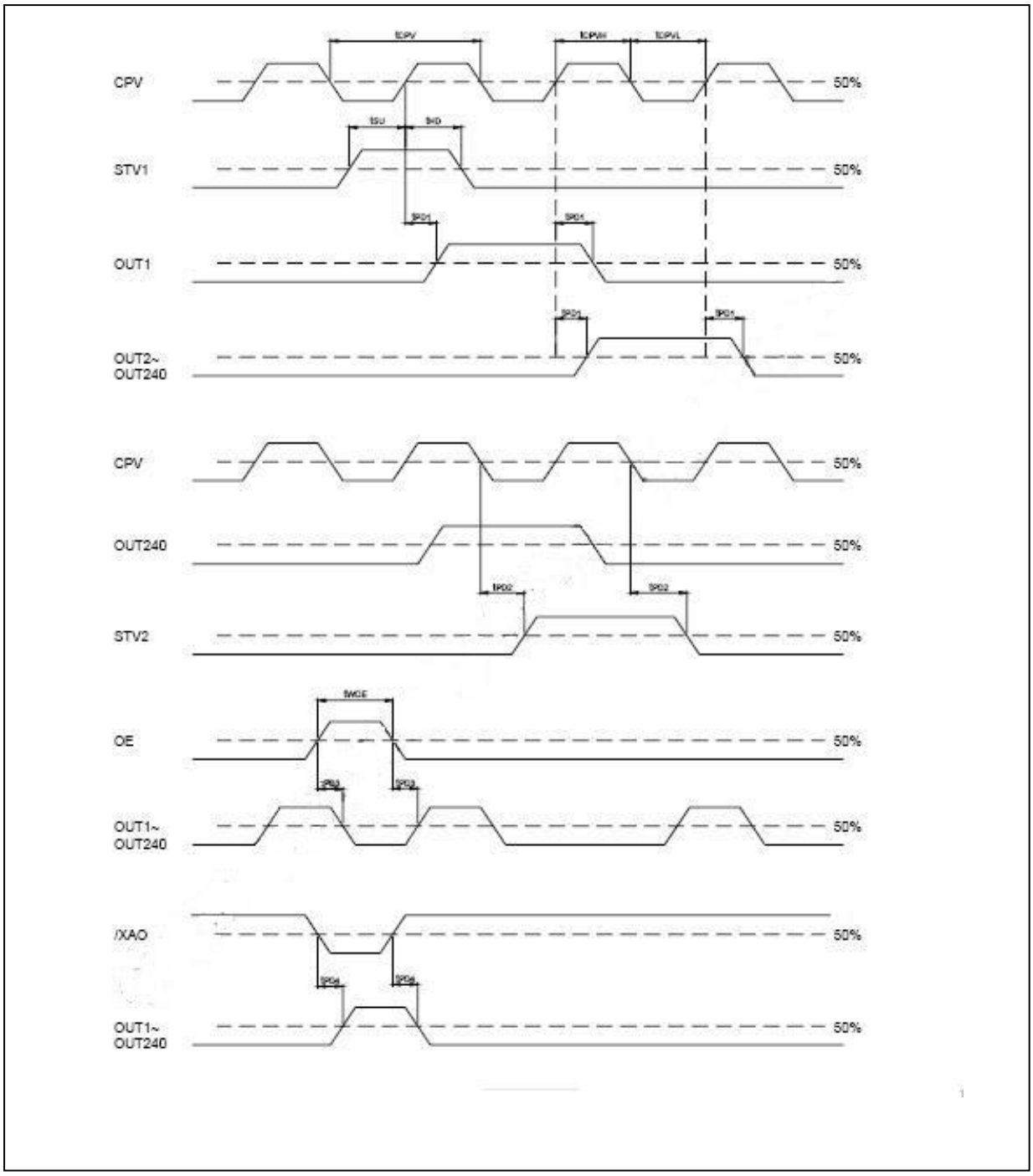
Analog video signal characteristics

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



Horizontal timing

7.3.6 Gate Driver Timing Chart



8. OPTICAL CHARACTERISTIC

Ta = 25±2℃, ILED=20mA

Item		Symbol	Condition	Rating			Unit	Note
				Min.	Typ.	Max.		
Response Time		T_r	$\theta = 0^\circ$	--	10		ms	(3)(5)
		T_f	$\psi = 0^\circ$	--	15		ms	
Contrast Ratio		CR	At optimized Viewing Angle	300	400	--	--	(4)(5)
Chromaticity	White	Wx	$\theta = 0$ $\psi = 0$	(0.26)	(0.31)	(0.36)		(2)(6)(7)
		Wy		(0.28)	(0.33)	(0.38)		
	Red	Rx					--	
		Ry					--	
	Blue	Bx					--	
		By					--	
	Green	Gx					--	
		Gy					--	
Viewing Angle	Hor	ΘR	CR≧10	(50)	(60)		Deg.	(1)
		ΘL		(50)	(60)			
	Ver	ΨT		(40)	(50)			
		ΨB		(45)	(55)			
Brightness		--	--	--	280	--	cd/m^2	Center of Display

Note (1) Definition of Viewing Angle Range

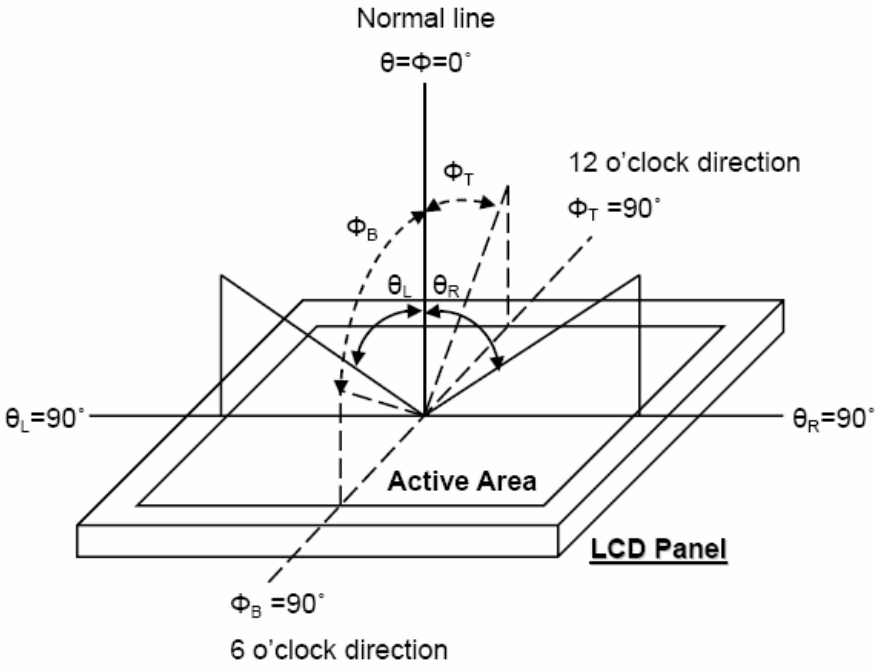


Fig.8-1 Definition of Viewing Angle

Note(2) Test Equipment Setup

After Stabilizing and leaving the panel along 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 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

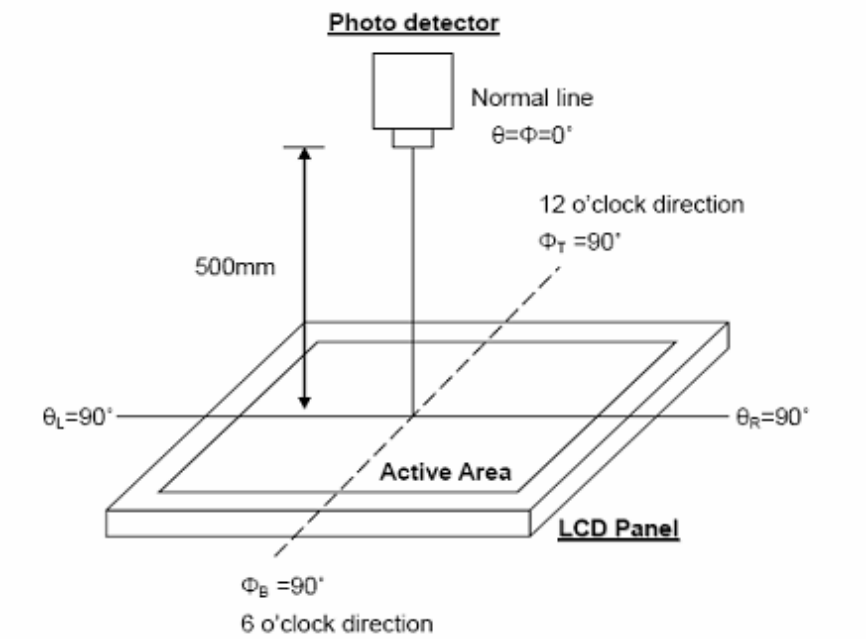


Fig.8-2 Optical Measurement System Setup

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%.

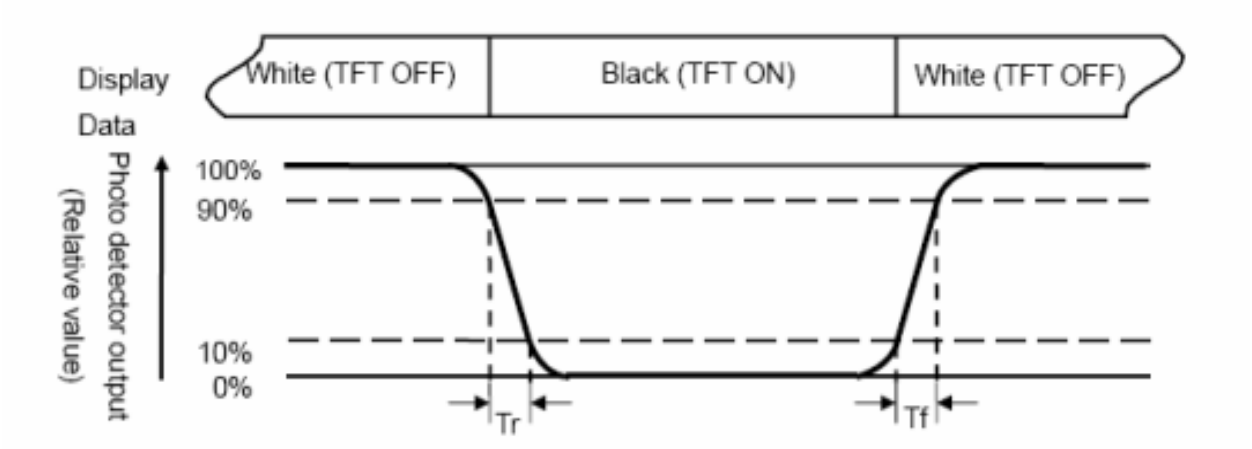


Fig.8-3 Definition of Response Time

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 = Vi50 ± 1.5V

Black Vi = Vi50 ± 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. INTERFACE

9.1 LCM Pin Definition

Pin No.	Symbol	I/O	Description	Remark
1	VBL-	I	Backlight LED Ground	
2	VBL-	I	Backlight LED Ground	
3	VBL+	I	Backlight LED Power	
4	VBL+	I	Backlight LED Power	
5	Y1	I	Top Electrode	
6	X1	I	Right Electrode	
7	NC		Not Use	
8	/REST	-	Hardware Reset	
9	SPENA	I	SPI Interface Data Enable Signal	Note 3
10	SPCLK	I	SPI Interface Data Clock	Note 3
11	SPDAT	I	SPI Interface Data	Note 3
12	B0	I	Blue Data Bit 0	
13	B1	I	Blue Data Bit 1	
14	B2	I	Blue Data Bit 2	
15	B3	I	Blue Data Bit 3	
16	B4	I	Blue Data Bit 4	
17	B5	I	Blue Data Bit 5	
18	B6	I	Blue Data Bit 6	
19	B7	I	Blue Data Bit 7	
20	G0	I	Green Data Bit 0	
21	G1	I	Green Data Bit 1	
22	G2	I	Green Data Bit 2	
23	G3	I	Green Data Bit 3	
24	G4	I	Green Data Bit 4	
25	G5	I	Green Data Bit 5	
26	G6	I	Green Data Bit 6	
27	G7	I	Green Data Bit 7	
28	R0	I	Red Data Bit 0 / DX0	Note 4
29	R1	I	Red Data Bit 1 / DX1	Note 4
30	R2	I	Red Data Bit 2 / DX2	Note 4
31	R3	I	Red Data Bit 3 / DX3	Note 4
32	R4	I	Red Data Bit 4 / DX4	Note 4
33	R5	I	Red Data Bit 5 / DX5	Note 4
34	R6	I	Red Data Bit 6 / DX6	Note 4
35	R7	I	Red Data Bit 7 / DX7	Note 4
36	HSYNC	I	Horizontal Sync Input	
37	VSYNC	I	Vertical Sync Input	
38	DCLK	I	Dot Data Clock	
39	NC		Not Use	
40	NC		Not Use	
41	Vcc	I	Digital Power	

Pin No.	Symbol	I/O	Description	Remark
42	Vcc	I	Digital Power	
43	Y2	I	Bottom Electrode	
44	X2	I	Left Electrode	
45	NC	-	Internal Test use	
46	NC	-	Not Use	
47	NC	-	Not use	
48	IF2	I	Control the input data format / Floating	Note 1
49	IF1	I	Control the input data format	Note 1, 5
50	IF0	I	Control the input data format	Note 1, 5
51	NC		Not Use	
52	DE	I	Data Enable Input	Note 2
53	GND	I	Ground	
54	GND	I	Ground	

Note:

1. The mode control (IF2) not use, it can't control CCIR601 interface, if not use CCIR601, it can floating.
2. For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If DE signal is fixed low, SYNC mode is used. Otherwise, DE+SYNC mode is used. Suggest used SYNC model.
3. Usually pull high.
4. IF select serial RGB or CCIR601/656 input mode is selected, only DX0-DX7 used, and the other short to GND. Only selected serial RGB、CCIR601/656 interface, DX BUS will enable, Digital Input Mode DX0 is LSB and DX7 is MSB.
5. Control the input data format:

   IF2-0: Define the input interface mode

IF2	IF1	IF0	Format	Operating Frequency
0	0	0	Parallel-RGB data format (Only support stripe type color filter)	6.5 MHz
0	0	1	Serial-RGB data format	19.5 MHz
0	1	0	CCIR 656 data format (640RGB)	24.54 MHz
0	1	1	CCIR 656 data format (720RGB)	27 MHz
1	0	0	YUV mode A data format (Cr-Y-Cb-Y)	24.54 MHz
1	0	1	YUV mode B data format (Cr-Y-Cb-Y)	27 MHz
1	1	0	YUV mode A data format (Cb-Y-Cr-Y)	27 MHz
1	1	1	YUV mode A data format (Cb-Y-Cr-Y)	24.54 MHz

Input format	DOTCLK Freq(MHz)	Display Data	Active Area(DOTCLK)
YUV mode	24.54	640	1280
	27	720	1440

Mode	D[23:16]	D[15:8]	D[7:0]	IHS	IVS	DEN
ITU-R BT656	D[23:16]	GND	GND	NC	NC	NC
ITU-R BT601	D[23:16]	GND	GND	IHS	IVS	NC
8 bit RGB	D[23:16]	GND	GND	IHS	IVS	NC for HV Mode
						DEN for DEN Mode
24 bit RGB	R[7:0]	G[7:0]	B[7:0]	IHS	IVS	NC for HV Mode
						DEN for DEN Mode

9.2 SPI Timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
SPCK Period	T_{CX}	60	-	-	ns
SPCK High Width	T_{CXH}	30	-	-	ns
SPCK Low Width	T_{CXL}	30	-	-	ns
Data Setup Time	T_{SU1}	12	-	-	ns
Data Hold Time	T_{HO1}	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_{CO}	50	-	-	ns
SPDA output latency	T_{CR}	-	1/2	-	T_{CX}

● **SPI Read Timing**

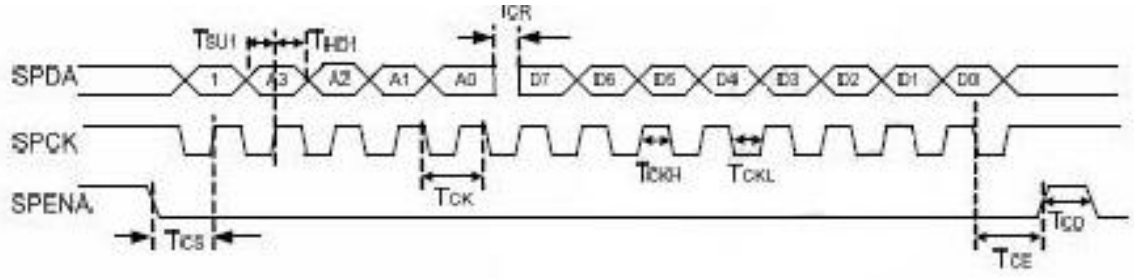


Figure 8 SPI read timing

● **SPI Write Timing**

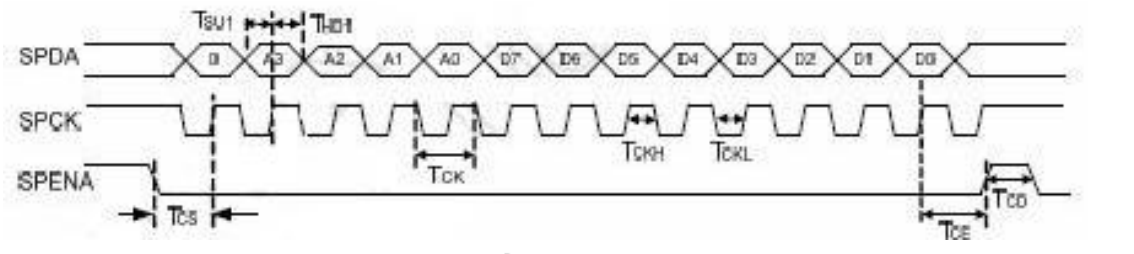


Figure 9 SPI write timing

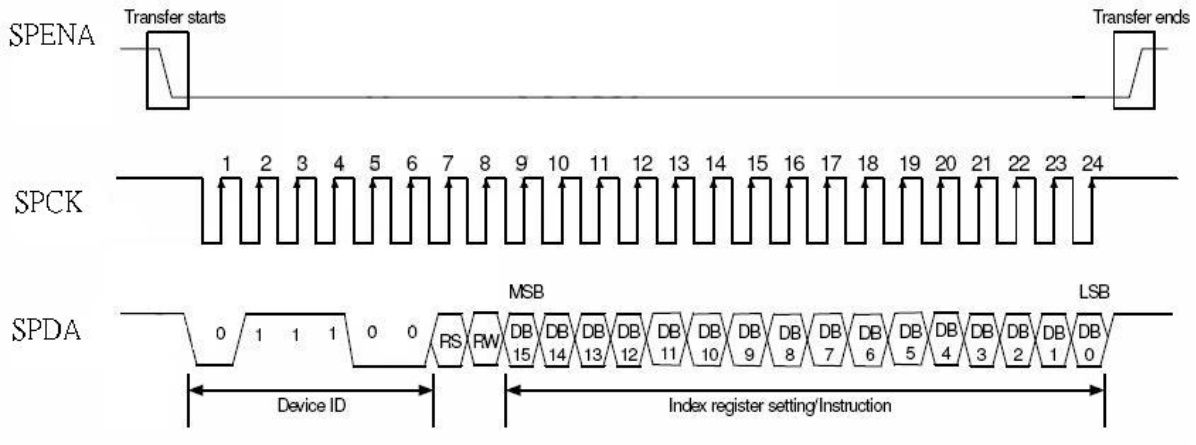


Figure 10 SPI timing

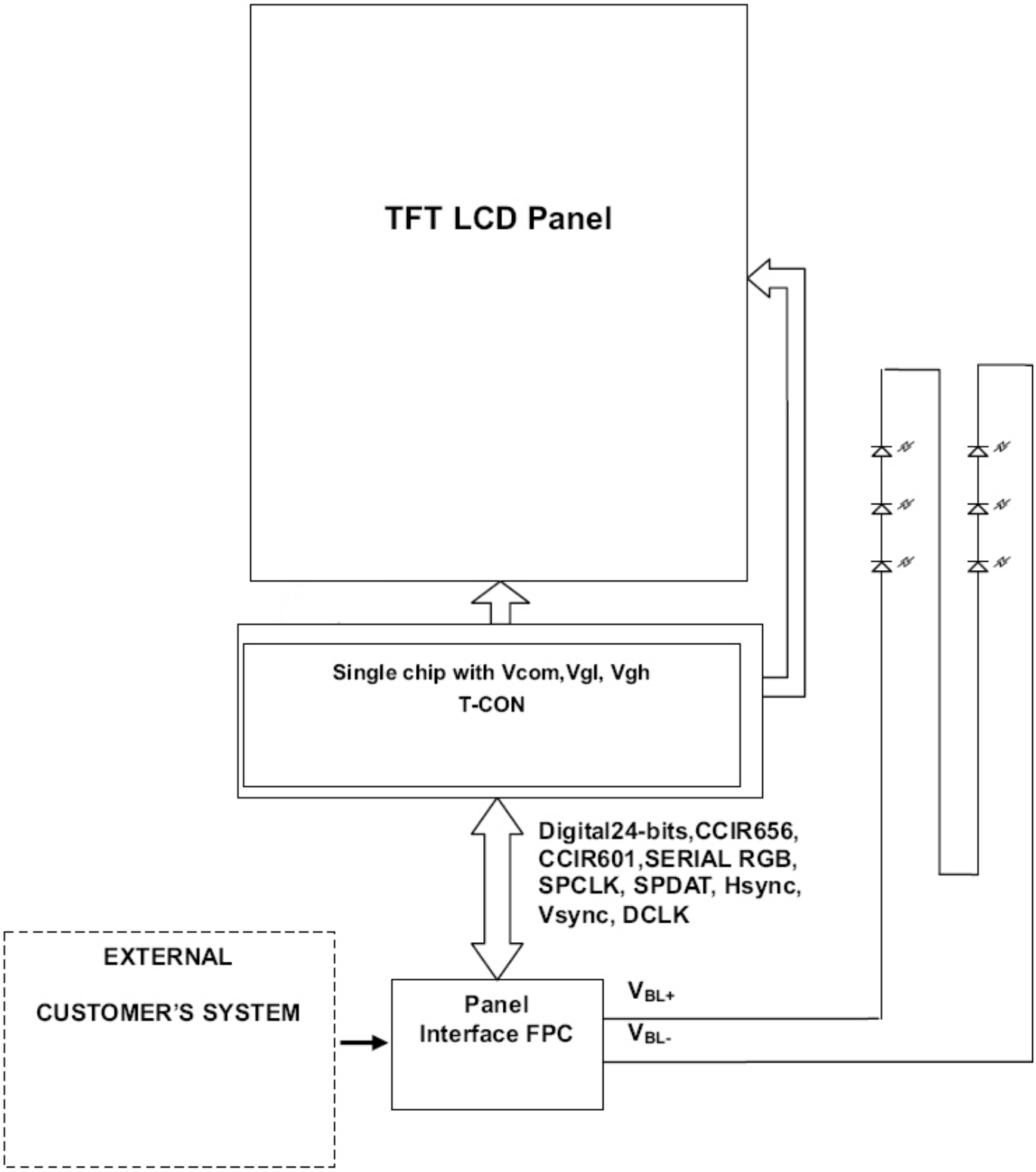
9.3 SPI Register Description

Will be showing on the Application Note.

9.4 Basic Display color and Gray Scale

Color		Input Color Data																							
		Red								Green								Blue							
		MSB						LSB		MSB						LSB		MSB						LSB	
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red(0) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255) Bright	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(0) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255) Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Blue(0) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		1	1	1	1	1	0
	Blue(255) Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		1	1	1	1	1	1

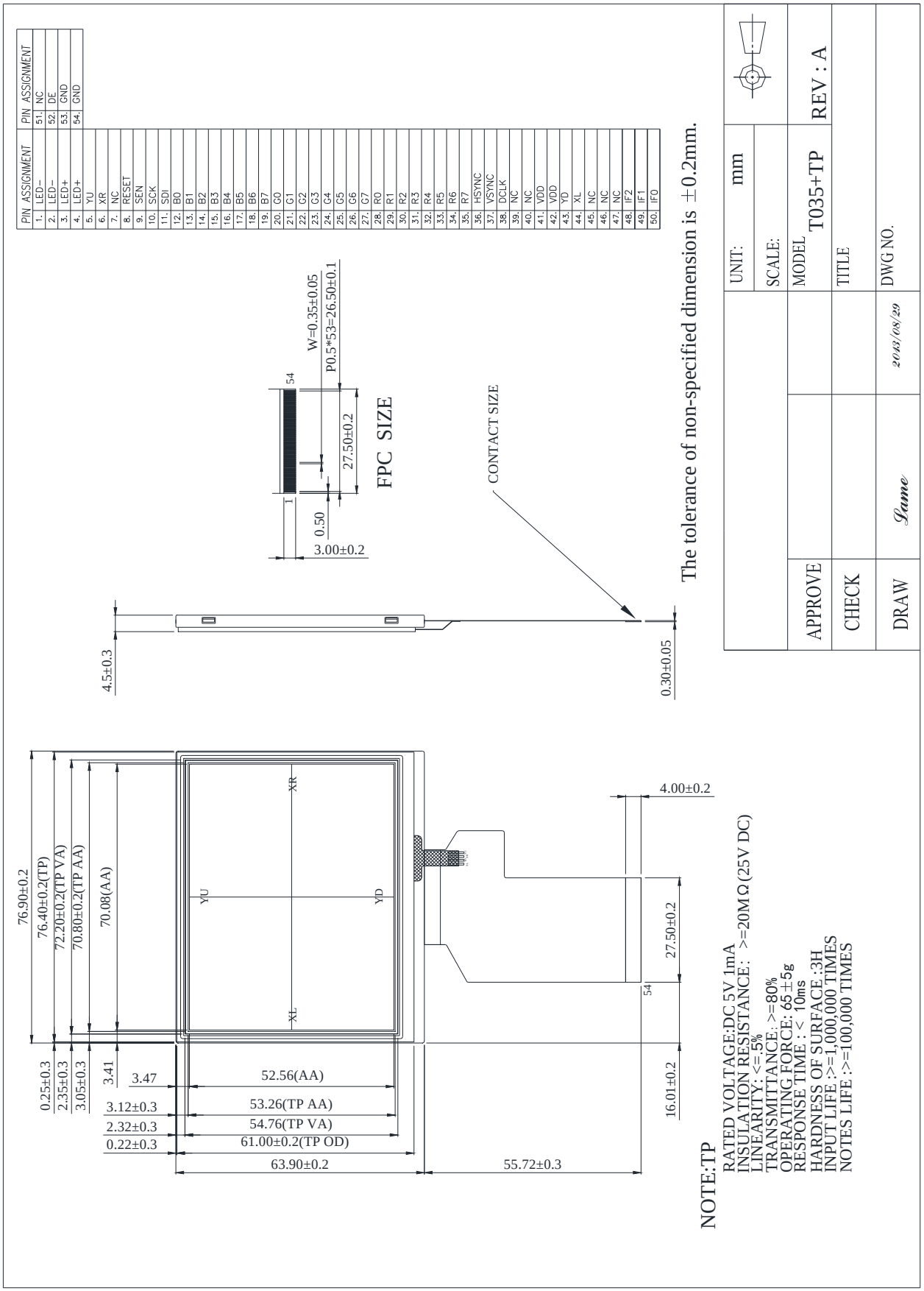
10. BLOCK DIAGRAM



11. QUALITY ASSURANCE

NO	Item	Condition	Method
1	High / Low Temperature Storage	80℃/-30℃ 120hrs	Check and record every 48Hrs
2	High / Low Temperature Life	70℃/-20℃ 120hrs (operating mode)	Check and record every 48Hrs
3	High Temperature、High Humidity Operating	60℃,90% RH, 96Hrs	Check and record every 48hrs
4	Thermal Shock	-30℃(30Min) → 25℃ (5Min) → 80℃(30Min) (conversion time, : 5 sec) 20 cycles	Each 10 cycles end , check
5	Vibration	10Hz~55Hz~10Hz Amplitude: 1.5mm 2hrs for each direction(X,Y,Z)	Each direction end, Check the Appearance and Electrical Characteristics
6	Static Electricity	Gap mood: ±1KV~±8KV (10 times air discharge with positive/negative voltage voltage gap : 1kv) Touch mood: ±1KV~±4KV	Each discharge end, Check the Electrical Characteristics
7	Curve	60 Thousand times, 40 times/min 150° (according to die if exist)	Check and record every 2~4 thousand times
8	Slump	Free faller movement for each side、cording、angle (75cm High、6 sides、2 angle、2 cording)	End

12. OUTLINE DRAWING



13. PRECAUTIONS

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

13.1 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.

(1) 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 polarizer 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 polarizer. 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.

13.2 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.

(2) 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.

13.3 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.

13.4 Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

13.5 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.

13.6 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.

14.INSPECTION STANDARDS

14.1 Acceptable quality level

The AQL define:

Inspection Item	Major defect	Minor defect
Cosmetic	1.0%	1.5%
Electrical test	0.4%	0.65%

14.2 Basic conditions for inspection

14.2.1 . Inspection performed under the following conditions is recommended.

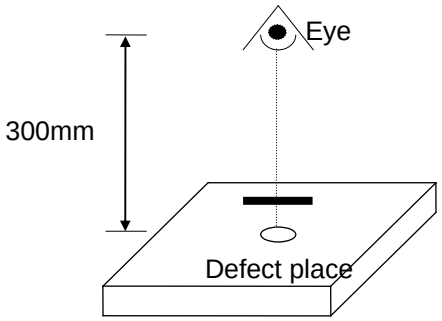
Temperature : 25±5℃

Humidity : 65%±10%RH

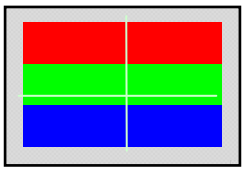
Viewing Angle : Normal viewing Angle.

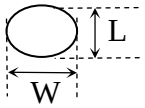
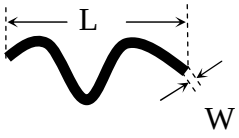
Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



(1) LCM electrical criterion (With Touch Panel)

No	Defect	Criteria		Remark
1	No display (Major)	Not allowed		
2	Missing line (Major)	Not allowed		
3	Darker or lighter line (Major)	Not allowed		
4	Weak line (Minor)	By limit sample		
5	Bright / Dark point (Minor)	Spec.	Permissible Qty	1:1sub-pixel: 1R or 1G or 1B 2:Point defect area≧1/2 sub

		Bright point	1	pixel.
		Dark point	2	
6	Round type (Minor)	Spec.	Permissible Qty	1. ϕ =(L+W)/2, L: Length, W: Width 2. Disregard if out of A.A. 
		$\phi \leqq$0.15mm	Disregard	
		0.15mm< $\phi \leqq$0.20mm	4	
		0.25mm< $\phi \leqq$0.40mm	3	
		$\phi >$0.40mm	0	
7	Line type (Minor)	Spec.	Permissible Qty	1. L: Length, W: Width 2. Disregard if out of A.A. 
		W$\leqq$0.03mm	Disregard	
		L$\leqq$6.0mm and 0.03mm<W$\leqq$0.06mm	6	
		L$\leqq$6.0mm and 0.06mm<W$\leqq$0.10mm	4	
		W>0.10mm or L>3.0mm	0	
8	Mura (Minor)	By 5% ND filter invisible		
9	Bubble in Cell	It should be found by eyes		

Bezel	Scratch	No harm	Minor
	Dirt		Minor
	Wrap	No harm	Minor
	Sunken	No harm	Minor
Label	No label	No	Minor
	Inverted		Minor
	Broken		Minor
	Dirt	Word can be read.	Minor
	Not clear	No	Minor
	Word out		Minor
	Mistake	No	Minor
	Position	Be attached on right position	Minor
Screw	Not	No	Minor
	Limp	No	Minor
Connector	Connectio	No bend on pins and damage	Minor
FPC/FFC	Broken	No	Minor