



SPECIFICATION

AGO 0035W

Atualizado em 13/05/19.

RECORDS OF REVISION
DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2014/05/09		First issue
A	2015/08/27		Add size & Surface. Modify Block Diagram& Static electricity test.

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1.Summary

This technical specification applies to 3.45' color TFT-LCD panel. The 3.45' color TFT-LCD panel is designed for camcorder, digital camera application and other electronic products which require high quality flat panel displays. This module follows RoHS.

2.General Specifications

Item	Dimension	Unit
Size	3.5	inch
Dot Matrix	320 x RGBx240(TFT)	dots
Module dimension	76.9(W) x 63.9(H) x 3.26(D)	mm
Active area	70.08 x 52.56	mm
Dot pitch	0.073 x 0.219	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	12 o'clock	
Gray Scale Inversion Direction	6 o'clock	
Backlight Type	LED,Normally White	
With /Without TP	Without TP	
Surface	Anti-Glare	

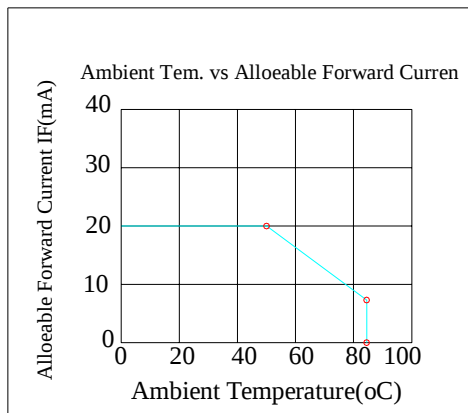
*Color tone slight changed by temperature and driving voltage.

3. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	$^{\circ}C$
Storage Temperature	T_{ST}	-30	—	+80	$^{\circ}C$
Input signal voltage	V_{IN}	-0.3	—	VCC+0.3	V
Logic output voltage	V_{OUT}	-0.3	—	VCC+0.3	V

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

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



4. Electrical Characteristics

1. Operating conditions:

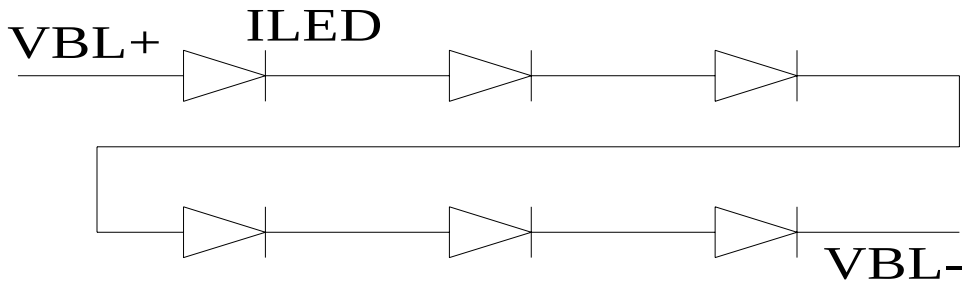
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VCC	—	3.0	3.3	3.6	V	
Supply Current For LCM	Icc	—	—	8.6	—	mA	Note 1

Note 1 : This value is test for VDD=3.3V , Ta=25 °C only

2 LED driving conditions

Parameter	Symbol	Min	Typ	Max	Unit	Remark
LED current	—	—	20	—	mA	—
Power Consumption	—	—	400	420	mW	—
LED voltage	VBL+	17.4	19.8	21.0	V	Note 1
LED Life Time	—	10K	—	—	Hr	Note 2,3

Note 1 : There are 1 Groups LED



Note 2 : Ta = 25°C

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

5. DC CHARACTERISTICS

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	

6.AC CHARACTERISTICS

Digital Parallel 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	Tsoc
	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. $T_{hp} + T_{hb} = 68$, the user is make up by yourself.
2. $T_v = T_{vs} + T_{vb} + T_{vd} + T_{vf}$, the user 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 user 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

6.1 Waveform

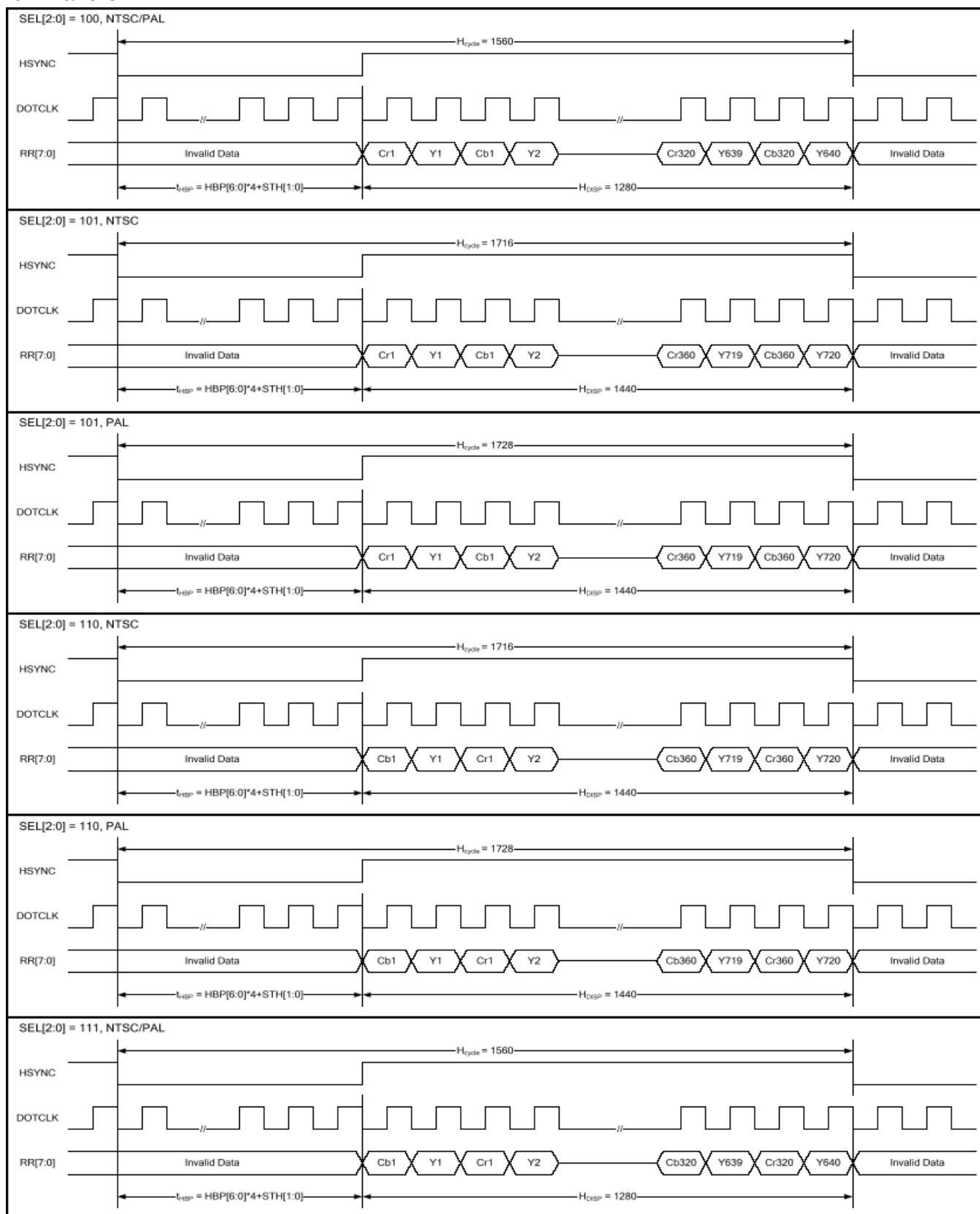


Figure 1 CCIR601 Horizontal Timing

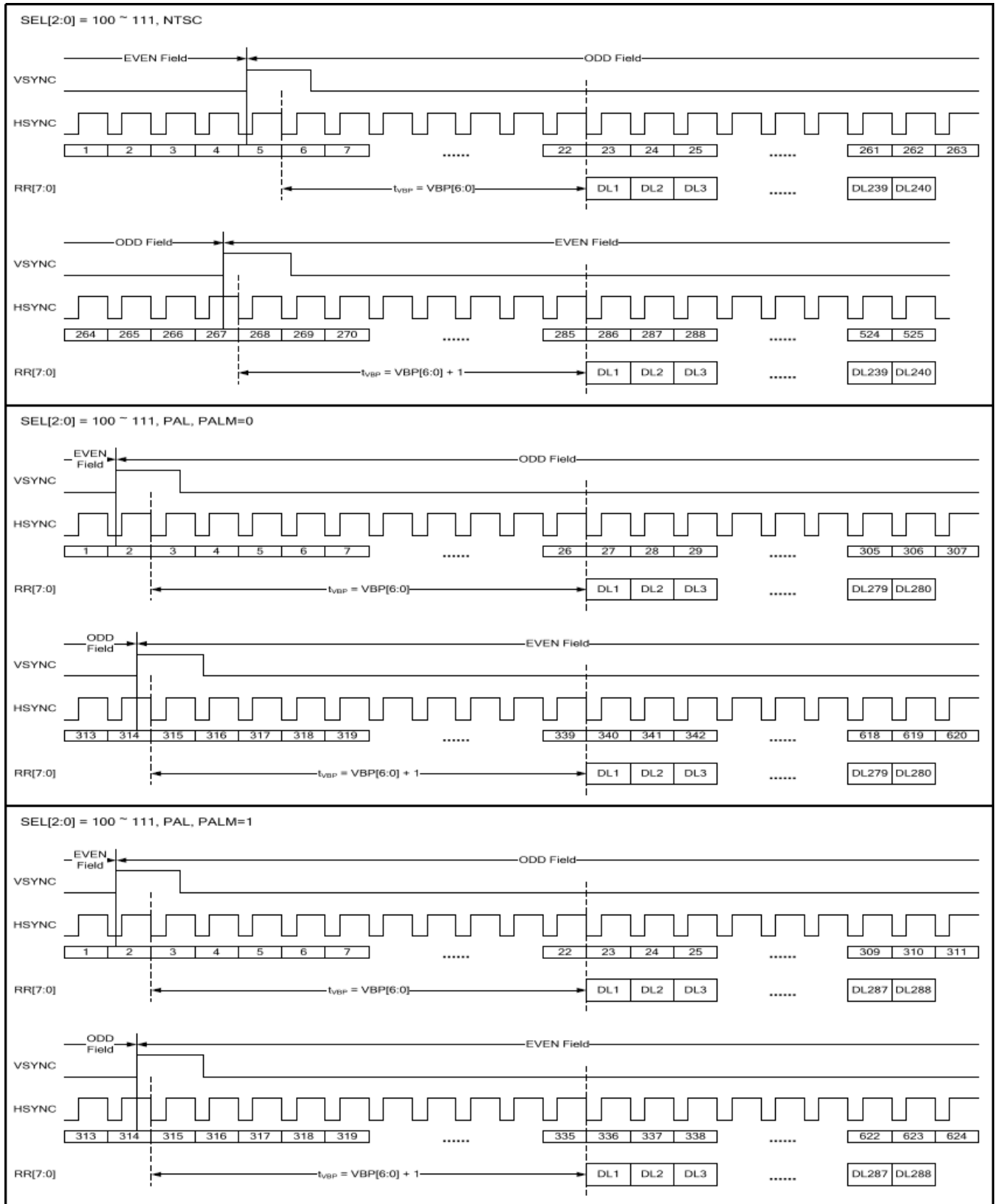


Figure 1 CCIR601 Vertical Timing

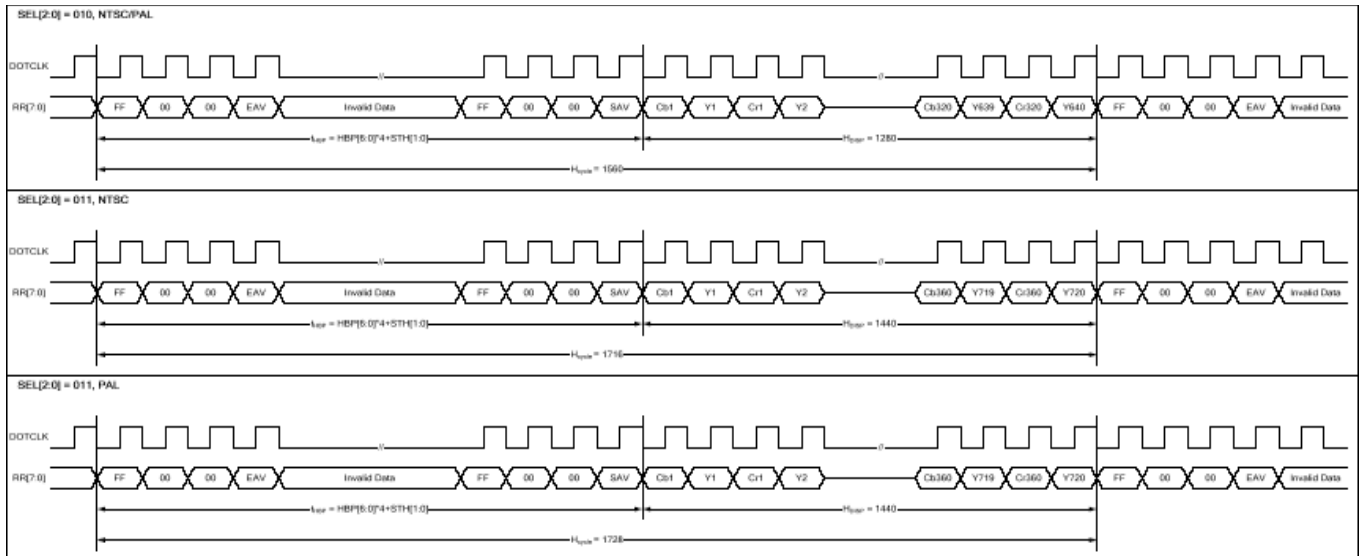


Figure 2 CCIR656 Horizontal Timing

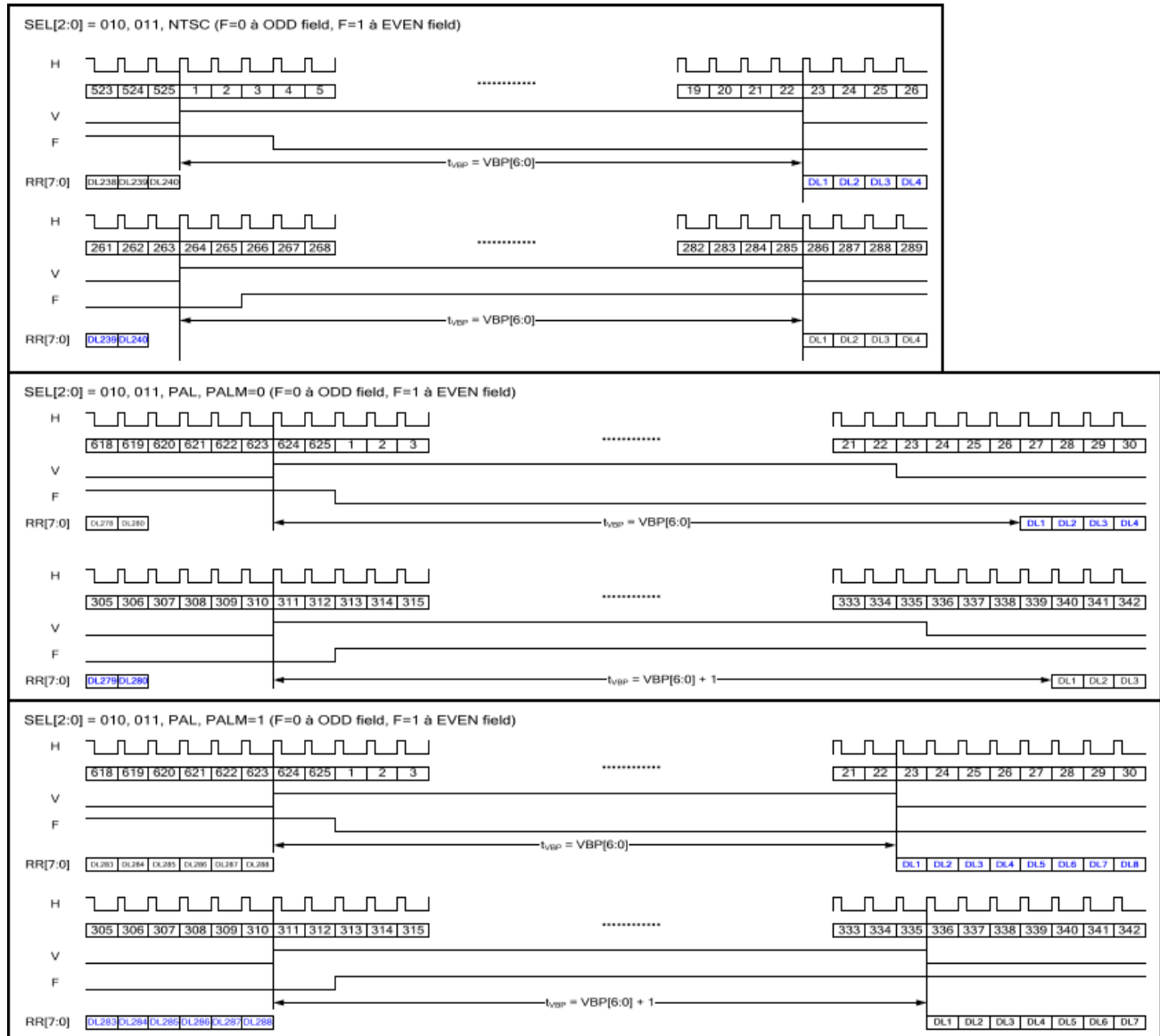


Figure 2 CCIR656 Vertical Timing

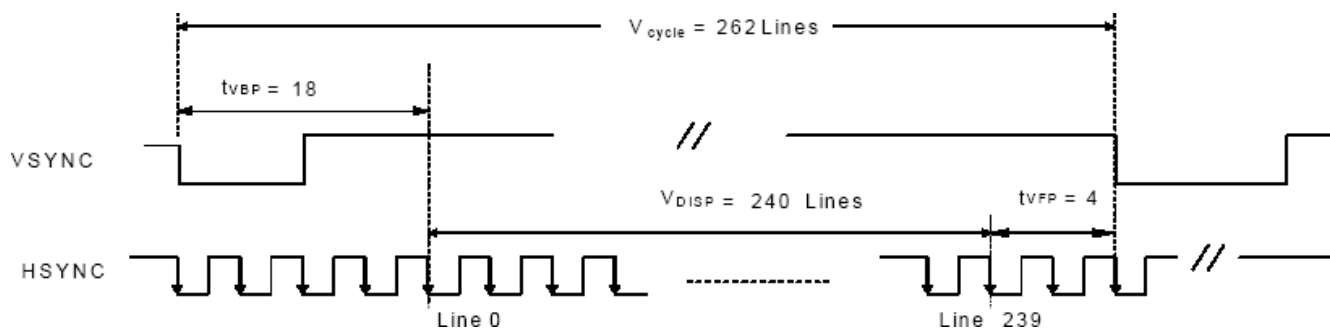
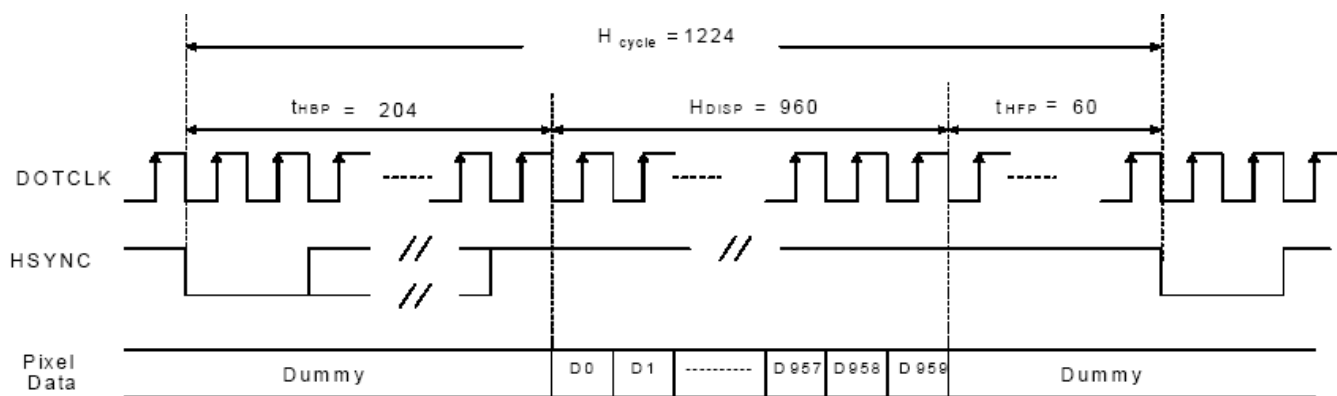
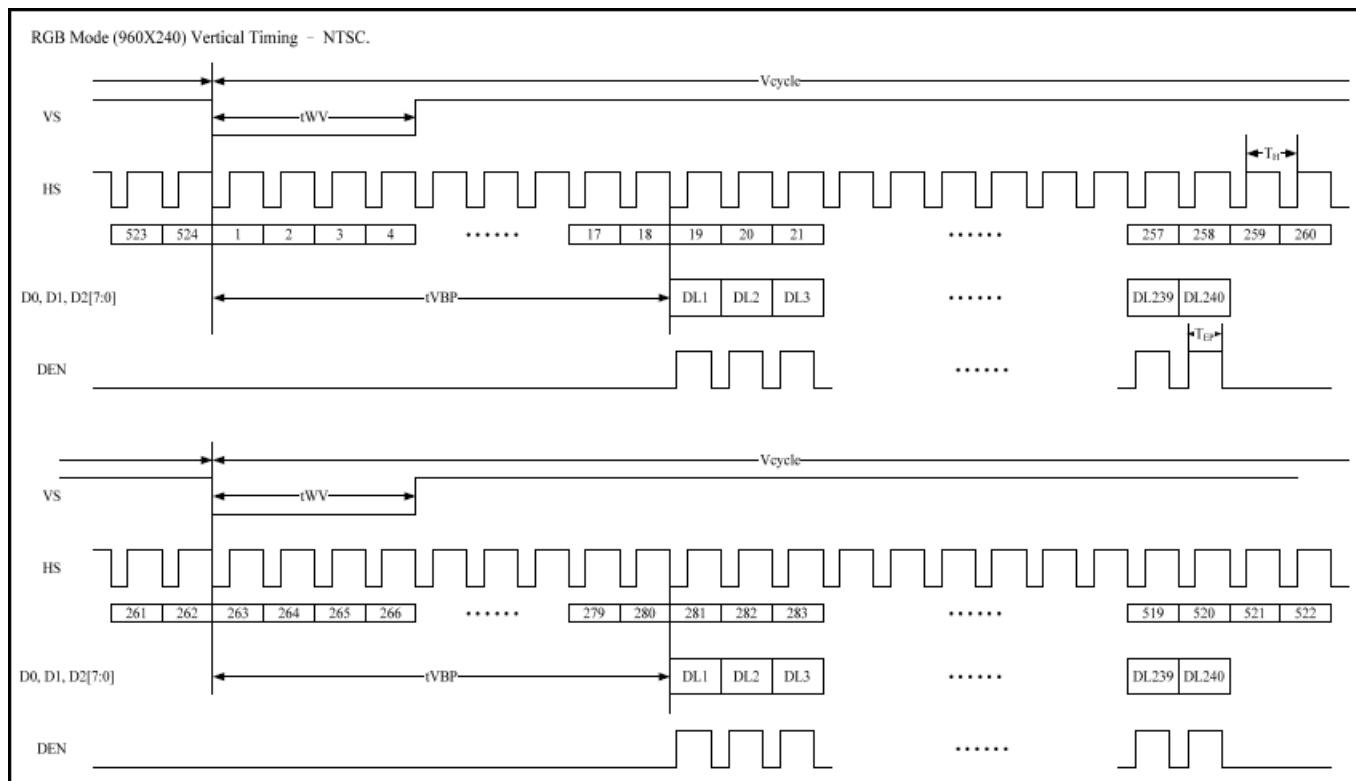


Figure 3 Data Transaction Timing in Serial RGB (8 bit) Interface (SYNC Mode)

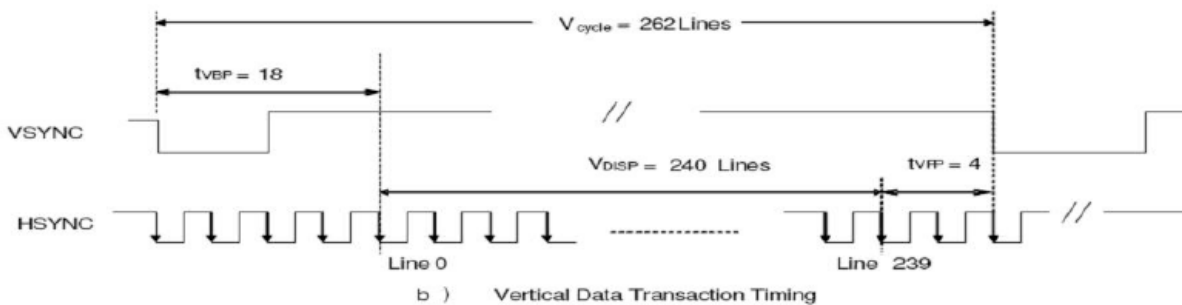
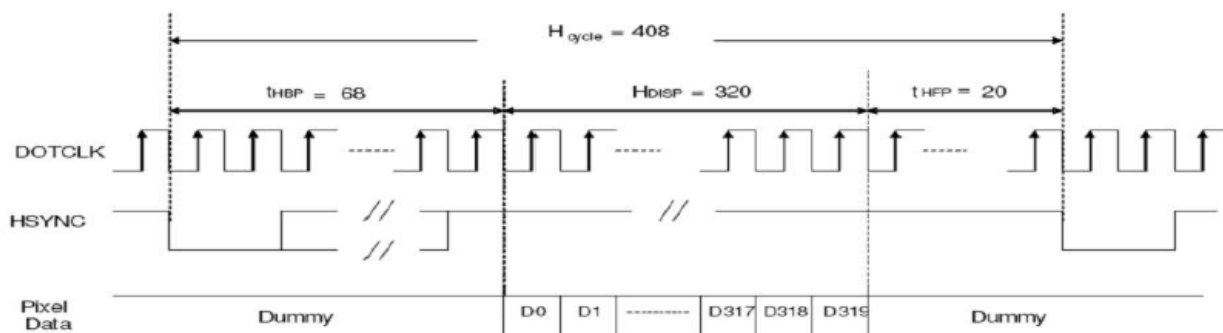
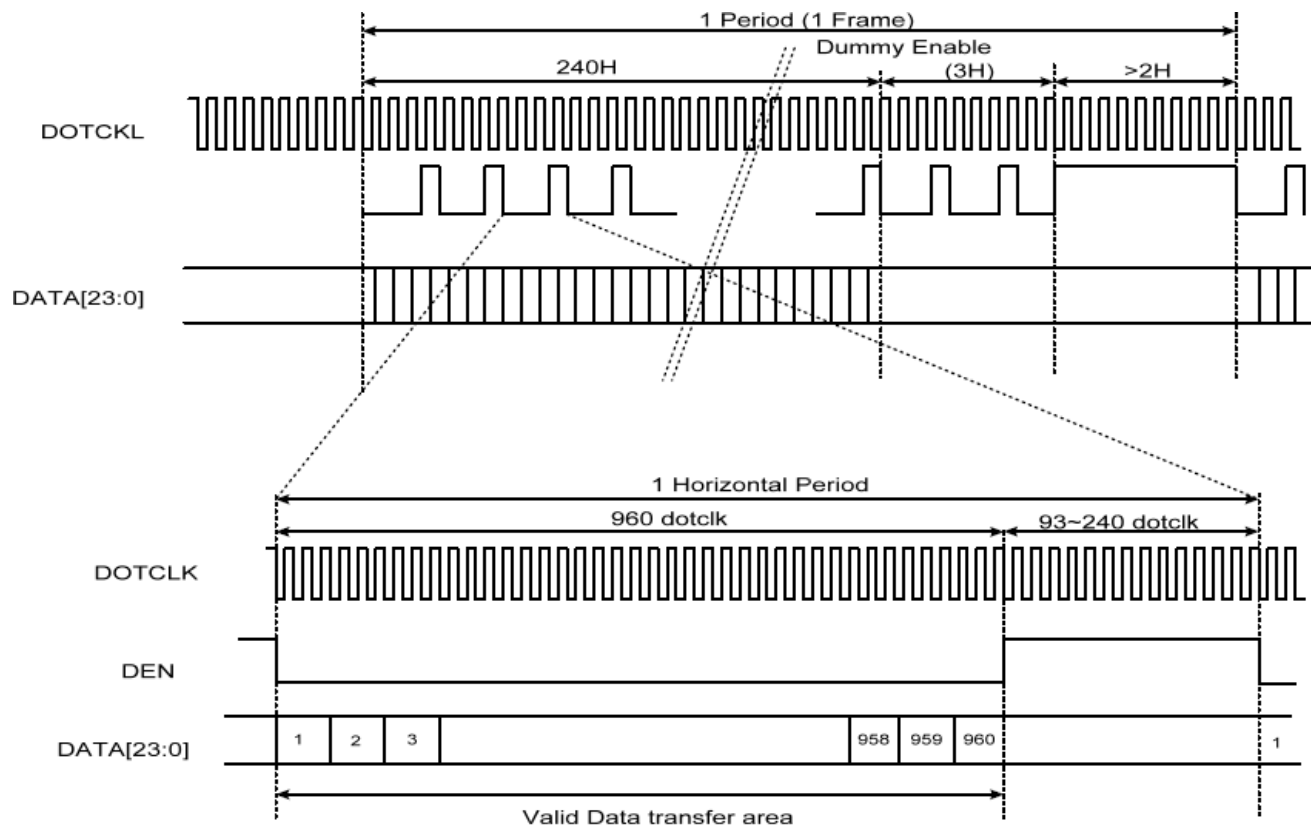


Figure 3 Data Transaction Timing in Parallel RGB (24 bit) Interface (SYNC Mode)

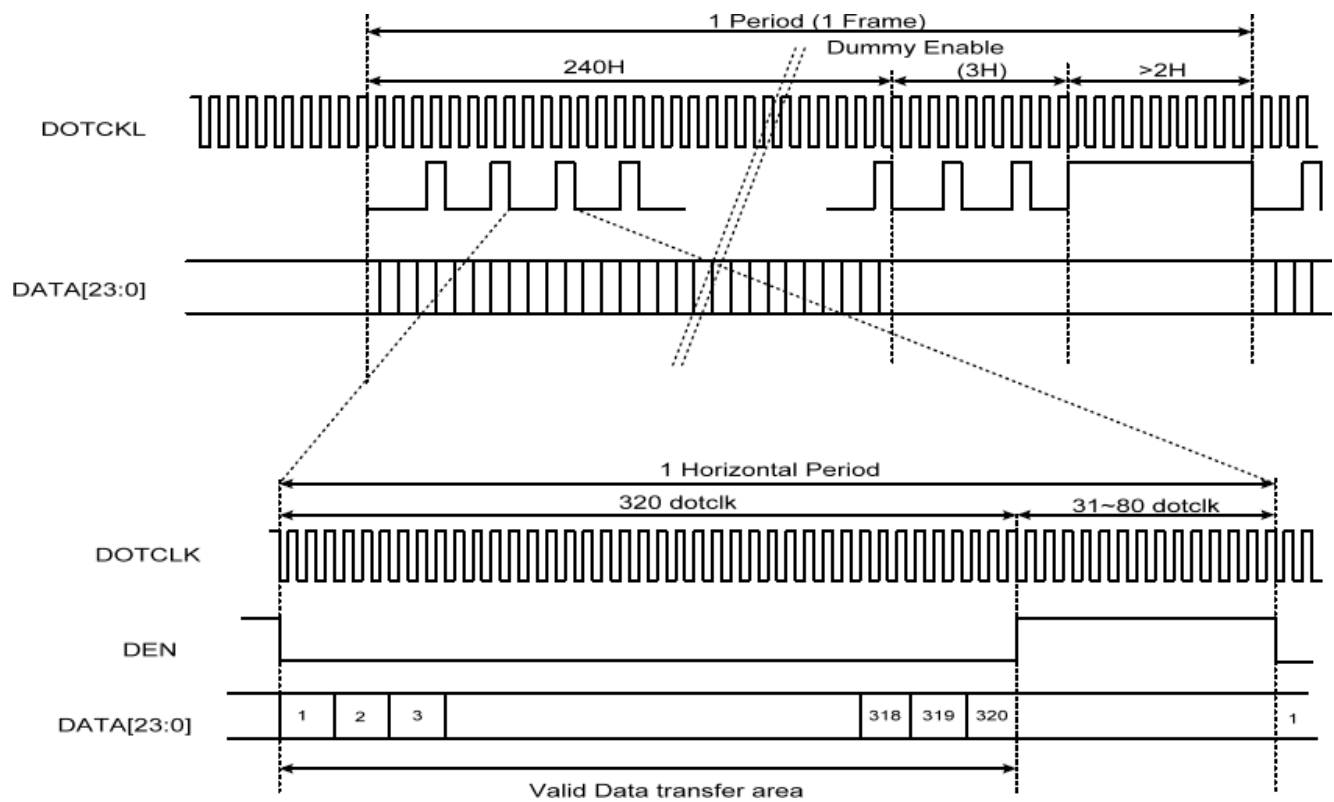


Figure 3 Data Transaction Timing in Parallel RGB (24 bit) Interface (DE Mode)

6.1.1 Clock and Sync waveforms

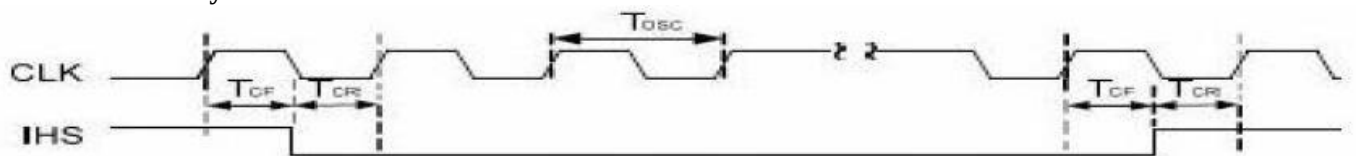


Figure 6 CLK and IHS timing waveform

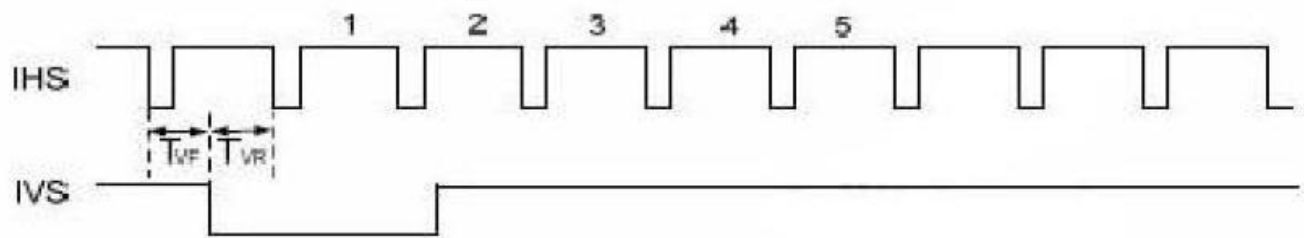
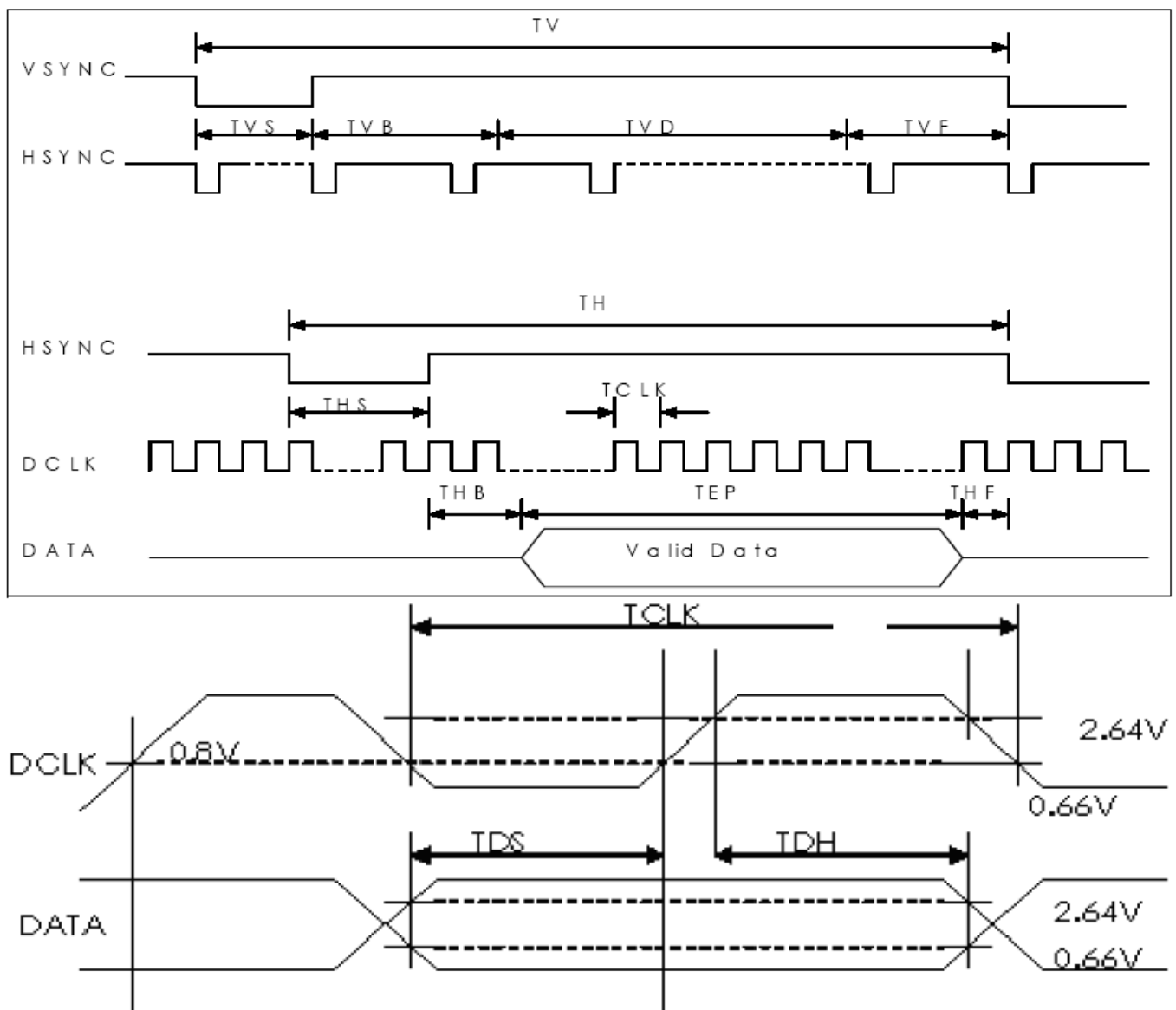
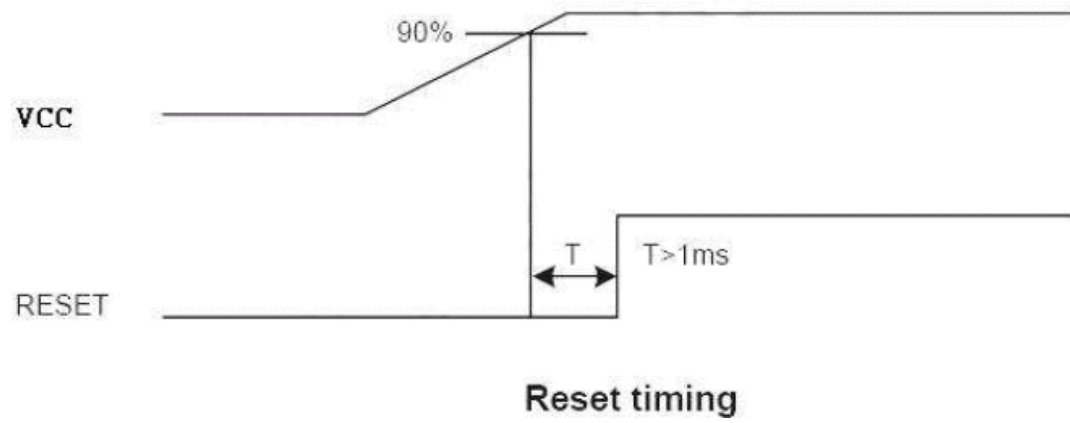


Figure 4 IHS and IVS timing waveforms



6.2 Reset Timing Chart

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



7. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr	$\theta = 0^\circ$ 、 $\Phi = 0^\circ$	-	10		.ms	Note 3,5
	Tf		-	15		.ms	
Contrast ratio	CR	At optimized viewing angle	300	400	-	-	Note 4,5
Color Chromaticity	White	$\theta = 0^\circ$ 、 $\Phi = 0^\circ$	0.26	0.31	0.36		Note 2,6,7
			0.28	0.33	0.38		
Viewing angle (Gray Scale Inversion Direction)	Hor.	Θ_R	50	60		Deg.	Note 1
		Θ_L	50	60			
	Ver.	Φ_T	40	50			
		Φ_B	45	55			
Brightness	-	-	200	300	-	cd/m2	Center of display

Ta=25±2°C, IL=20mA

Note 1: Definition of viewing angle range

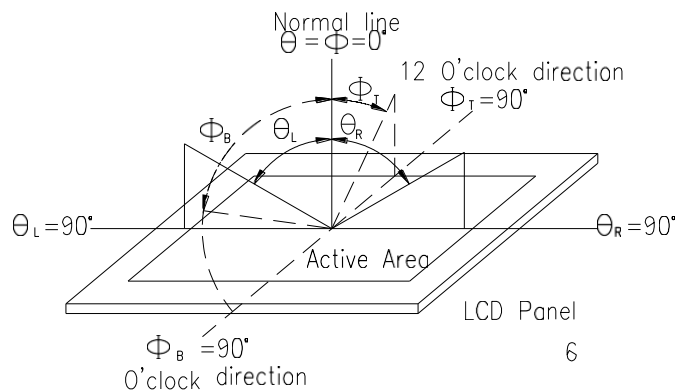


Fig. 8.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 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.

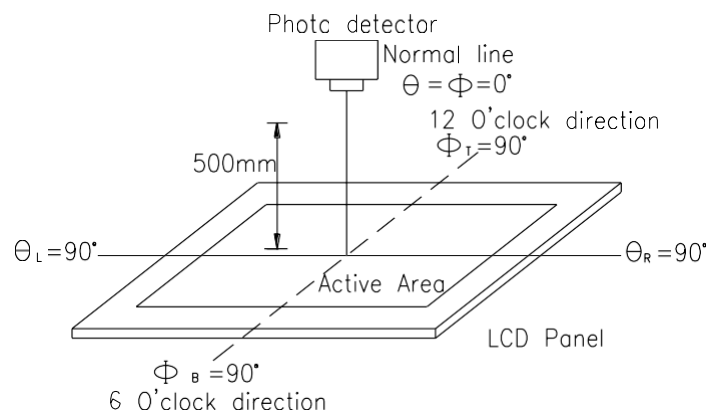
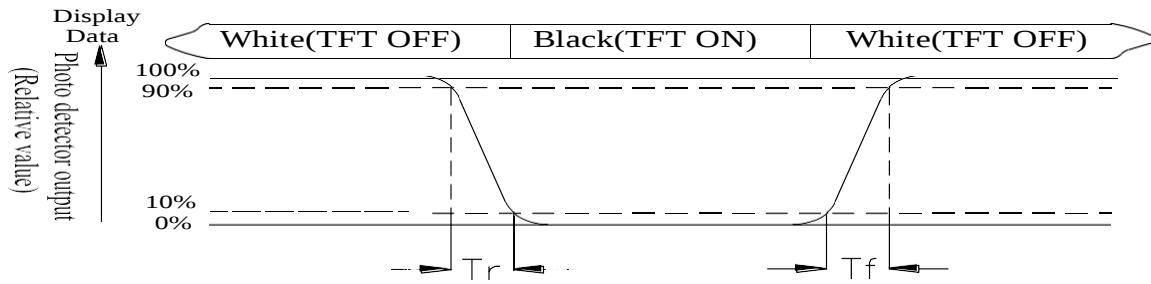


Fig. 8.2. Optical measurement system setup

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, 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: 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.

8.Interface

LCM PIN Definition

Pin	Symbol	I/O	Function	Remark
1	VLED-	I	Backlight LED Ground	
2	VLED-	I	Backlight LED Ground	
3	VLED+	I	Backlight LED Power	
4	VLED+	I	Backlight LED Power	
5	NC		Not use	
6	NC		Not use	
7	NC		Not use	
8	/RESET	-	Hardware reset	
9	SPENA	I	SPI interface Data Enable signal	
10	SPCLK	I	SPI interface Data Clock	
11	SPDAT	I	SPI interface Data	
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	G 1	I	Green Data Bit 1	
22	G 2	I	Green Data Bit 2	
23	G 3	I	Green Data Bit 3	
24	G 4	I	Green Data Bit 4	
25	G 5	I	Green Data Bit 5	
26	G 6	I	Green Data Bit 6	
27	G 7	I	Green Data Bit 7	
28	R0	I	Red Data Bit0/DX0	
29	R1	I	Red Data Bit1/DX1	
30	R2	I	Red Data Bit2/DX2	
31	R3	I	Red Data Bit3/DX3	
32	R4	I	Red Data Bit4/DX4	
33	R5	I	Red Data Bit5/DX5	
34	R6	I	Red Data Bit6/DX6	
35	R7	I	Red Data Bit7/DX7	
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	
42	Vcc	I	Digital power	
43	NC		Not use	
44	NC		Not use	

45	NC		Not use	
46	NC		Not use	
47	NC		Not use	
48	IF2	I	Control the input data format /floating	
49	IF1	I	Control the input data format	
50	IF0	I	Control the input data format	
51	NC		Not use	
52	DE	I	Data Enable input	
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 mode!!_
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	IF21	IF20	Format	Operating Frequency
0	0	0	Parallel-RGB data format (only support stripe type color filter)	6.5MHZ
0	0	1	Serial-RGB data format	19.5 MHZ
0	1	0	CCIR 656data format (640RGB)	24.54 MHZ
0	1	1	CCIR 656data format (720RGB)	27 MHZ
1	0	0	YUV mode A data format(Cr-Y-Cb-Y)	24.54 MHZ
1	0	1	YUV mode A data format(Cr-Y-Cb-Y)	27 MHZ
1	1	0	YUV mode B data format(Cr-Y-Cr-Y)	27 MHZ
1	1	1	YUV mode B data format(Cr-Y-Cr-Y)	24.54 MHZ

Input format	DOTCLK Ferg(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 BT 656	D[23:16]	GND	GND	NC	NC	NC
ITU-R BT 601	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

SPI timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
SPCK period	Tcx	60	-	-	ns
SPCK high width	Tcxh	30	-	-	ns
SPCK low width	Tcxl	30	-	-	ns
Data setup time	Tsu1	12	-	-	ns
Data hold time	Thd1	12	-	-	ns
SPENA to SPCK setup time	Tcs	20	-	-	ns
SPENA to SPDA hold time	Tce	20	-	-	ns
SPENA high pulse width	Tcd	50	-	-	ns
SPDA output latency	Tcs	-	1/2	-	Tcx

● SPI read timing

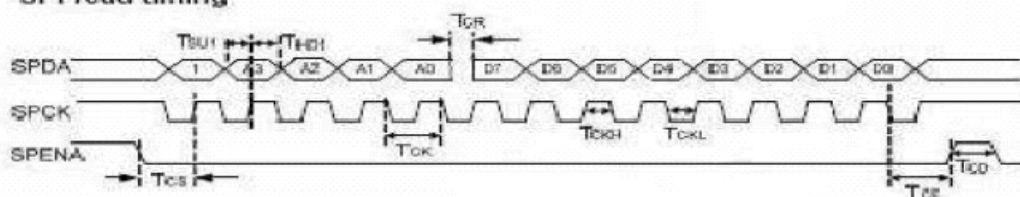


Figure8 SPI read timing

● SPI write timing

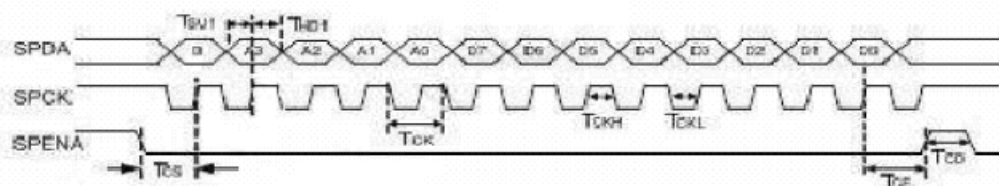


Figure9 SPI write timing

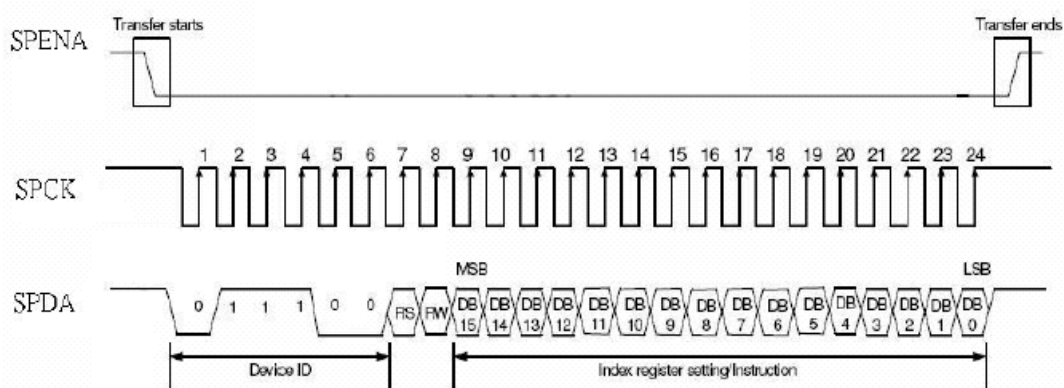
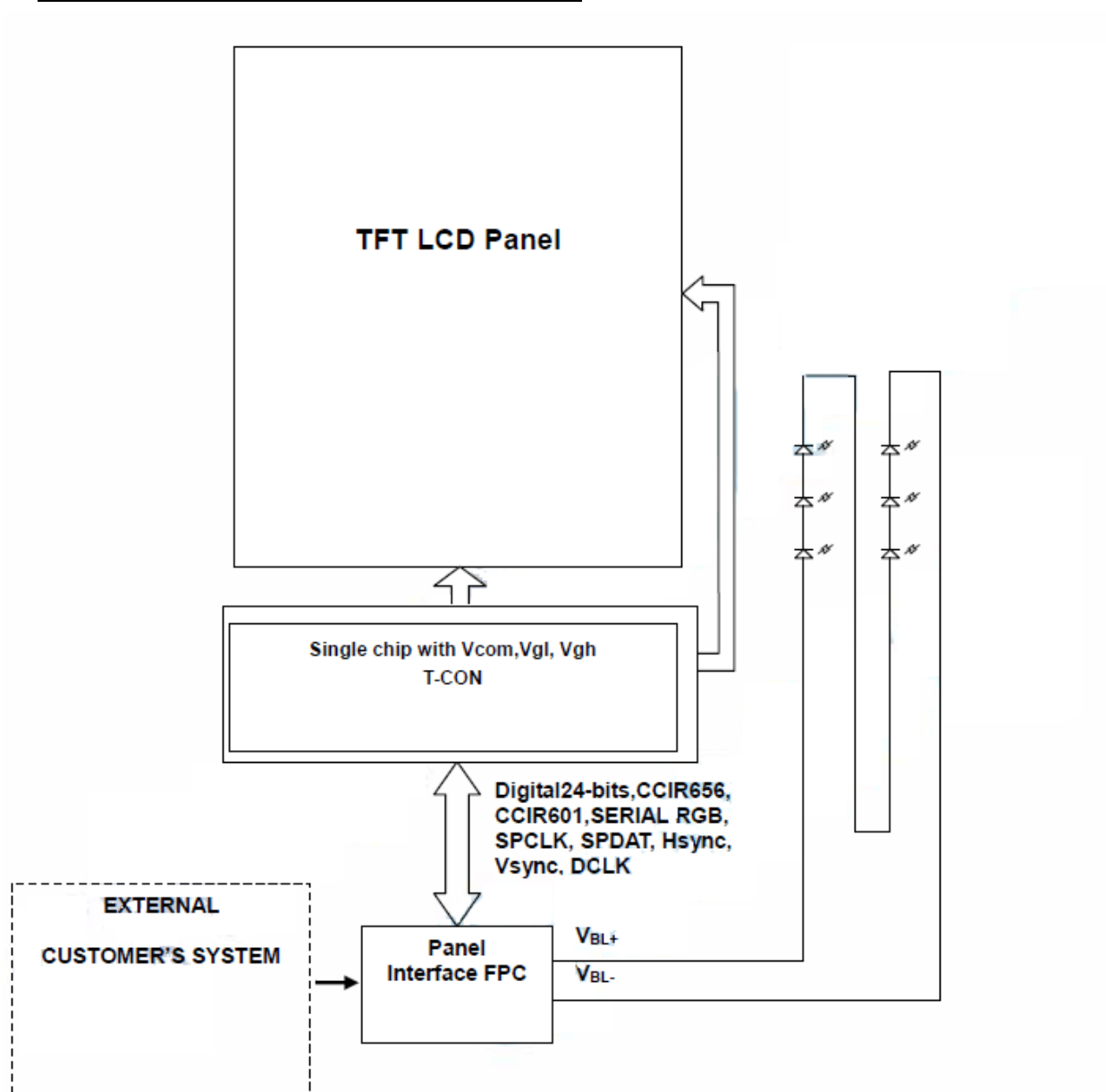


Figure10 SPI timing

Basic Display Color and Gray Scale

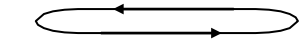
Color		Input Color Data																									
		Red								Green								Blue									
		MSB				LSB				MSB				LSB				MSB				LSB					
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0		
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(255)	1	1	1	1	1	1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

9. BLOCK DIAGRAM



10. Reliability

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

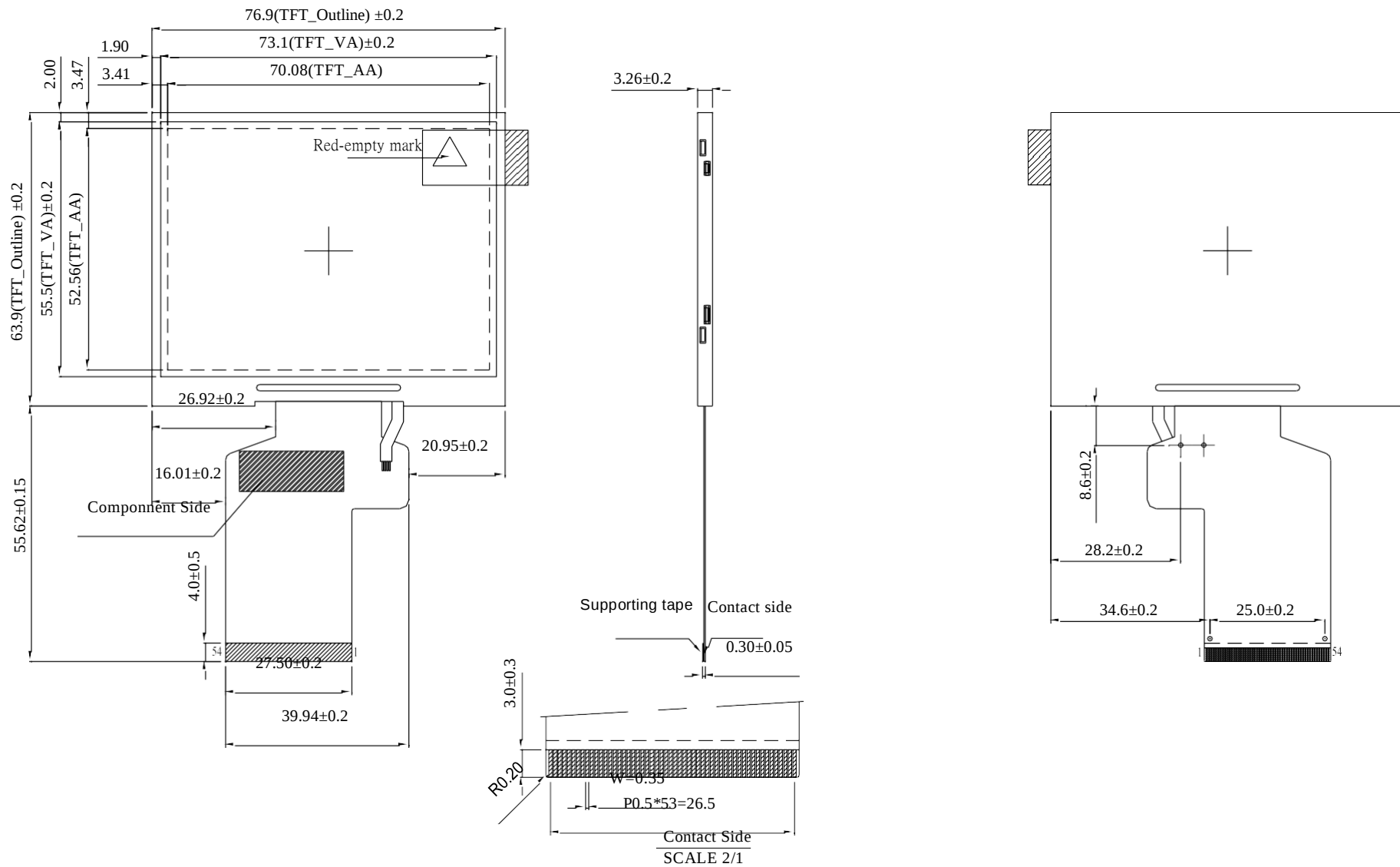
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature 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 25°C 70°C  30min 5min 30min 1 cycle	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm 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=800V, RS=1.5kΩ CS=100pF 1 time	—

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.

11. Contour Drawing



PIN NO.	SYMBOL	PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	VLED-	21	G1	41	VCC
2	VLED-	22	G2	42	VCC
3	VLED+	23	G3	43	NC
4	VLED+	24	G4	44	NC
5	NC	25	G5	45	NC
6	NC	26	G6	46	NC
7	NC	27	G7	47	NC
8	/RESET	28	R0	48	IF2
9	SPENA	29	R1	49	IF1
10	SPCLK	30	R2	50	IF0
11	SPDAT	31	R3	51	NC
12	B0	32	R4	52	DE
13	B1	33	R5	53	GND
14	B2	34	R6	54	GND
15	B3	35	R7		
16	B4	36	Hsync		
17	B5	37	Vsync		
18	B6	38	DATA CLK		
19	B7	39	NC		
20	G0	40	NC		