TITLE : HT07W12-120 Preliminary Product Specification

Rev. P0

BOE-HYDIS TECHNOLOGY CO., LTD.

SPEC. NUMBER	PRODUCT GROUP	REV.	ISSUE DATE	PAGE
	TFT-LCD PRODUCT	P0	2003.03	1 OF 23

RASR 055-3

A4 (210 X 297)

REVISION HISTORY

REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0		Initial Release	2003.03	D.J.LEE

Contents

SPEC. NUMBER	**SPEC. TITLE**	**PAGE**
	HT07W12-120 Preliminary Product Specification	3 OF 23

RASR 057-1   A4(210 X 297)

1.0 GENERAL DESCRIPTION

1.1 Introduction

HT07W12-120 is a color active matrix TFT-LCD unit using amorphous silicon TFT's (Thin Film Transistors) as active switching devices. This unit has a 7 inch (18cm) diagonally (Aspect ratio 16:9) measured active area with resolutions (480 horizontal by 234 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots, which are arranged in vertical stripe and this unit can display full colors.
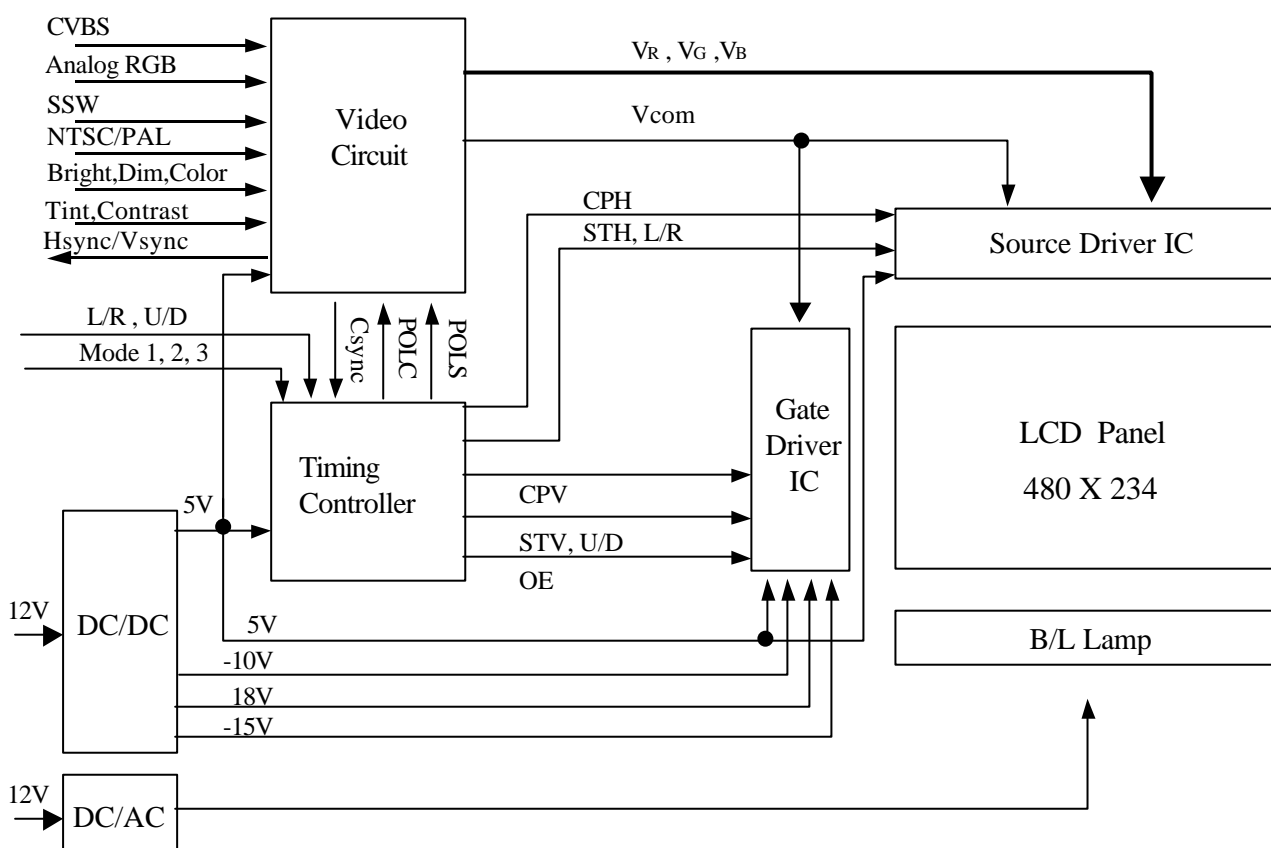
1.2 Features

- Slim, light weight and compact
- Wide view angle and high contrast ratio
- Compatible with NTSC and PAL system
- High brightness
- Image reversion: Up/Down and Left/Right
- Multi Video display mode

1.3 Application

- CAR TV & Portable TV

SPEC. NUMBER	SPEC. TITLE		PAGE
	HT07W12-120 Preliminary Product Specification		4 OF 23

RASR 057-1   A4(210 X 297)

1.4 General Specifications
   The followings are general specifications at the model HT07W12-120.

Table 1. General Specifiations

Parameter	Specification	Unit	Remarks
Display Mode	Normally white		
Supply Voltage	V_{CC1}(+12.0V), V_{CC2}(+12.0V)	Volts	V/B Input
	V_{COM}(9V), V_{DD}(5V), V_{GH}(18V), $V_{GL(-15V)}$, $V_{DL(-10V)}$	Volts	S/B Input
Drive System	H-Line Inversion		
Number of pixels	480(H)*234(V)	Pixels	
Pixel Pitch	0.321(H)*0.372(V)	mm	
Pixel Arrangement	RGB Vertical stripe		
Display Colors	Full	Colors	
Effective Viewing Area	154.080*87.048	mm	
	7.0 (Diagonal)	Inch	
Sync Signal	Hor./Ver. Sync Output for RGB		TTL Level
Brightness	450 Typ.(Note2) / 220 Typ.(Note3)	Cd / m^2	
Outline Dimension	167.0*102.0 (typ)	Mm	
Thickness	15.5 max	mm	
Back-light	1CCFL(Note1), Side-light type,' ' type		
Weight	250typ.	g	
Surface Treatment	Anti-Glare and Hard Coating		

Note: 1. CCFL (Cold Cathode Fluorescent Lamp)
Note: 2. Non-Operating Condition
Note: 3. Operating Condition

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

2.1 Environmental

Table 2. Environmental Maximum Specifications

Parameter	Symbol	Min.	Max.	Unit	Remarks
Operation Temperature (Humidity)	T_{OP}	-20	70		If humidity is larger than 45RH, temperature should be kept lower than 45 .
	RH		45	%	
	T_{OP}		45		
	RH		90	%	
Storage Temperature (Humidity)	T_{ST}	-30	85		
	RH		45	%	

2.2 Video Board Input

Table 3. Video Board Input Maximum Specifications

Parameter		Symbol	Min.	Max.	Unit	Remarks
Supply Voltage	Module Circuit	V_{CC1}	9	14	V	Ta= 25
	Back light	V_{CC2}	9	14	V	
Input Signal	Video Signal	Video Sync R,G,B	-	2.0	Vpp	
	Control Signal	CONT COLOR TINT N/P L/R, U/D VSW SSW MODE1~3 DIM	-0.2	5.2	V	

2.3 Source Board Input

Table 4. Source Board Input Maximum Specifications

Parameter	Symbol	Min.	Max.	Unit	Remarks
VCOM Driving Voltage	V_{COM}	-10.0	9.0	V	Ta= 25 V_{CC1} = +12V V_{CC2} = +12V Z=75**W**
Logic Voltage	V_{DD}	-0.3	6.0	V	
Source Driver Voltage	V_{EE}	-0.3	7.0	V	
Logic Signal Voltage	V_{IN}	-0.3	V_{DD}+0.3	V	
Analog Input Voltage	V_{ANA}	-0.3	V_{EE}+0.3	V	
Gate High Voltage	V_{GH}	0.3	40.0	V	Ta= 25 V_{CC} = +12V
Gate Low Voltage	V_{GL}	-20.0	+0.3	V	

Note: Source board input is supplied by Video board, so, customer doesn't need to adjust these values. This table is reference if customer uses their own video board design.

3.0 ELECTRICAL SPECIFICATIONS

3.1 Driving Condition for TFT-LCD Panel

[Ta = 25± 2]

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply Voltage for Logic	V_{DD}		5.0		V	
Supply Current for Logic	I_{DD}		33.0			
Supply Voltage for COM	V_{COM}		9.0		V	
Supply Current for COM	I_{COM}		8.5			
Supply Voltage for Gate Driver	V_{GH}		+18		V	Gate High
	V_{GL}		-15		V	Gate Low
	V_{DL}		-10		V	Gate Ref.
Supply Current for Gate Driver	I_{GH}		0.1			Gate High
	I_{GL}		2.8			Gate Low
	I_{DL}		8.5			Gate Ref.
LCD Panel Power Consumption	P_{LCD}		0.5		W	
Analog R, G, B	R, G, B		5.0		Vpp	
Horizontal Sync	H_{SYNC}		5.0		Vpp	
Vertical Sync	V_{SYNC}		5.0		Vpp	
Composite Sync	C_{SYNC}		5.0		Vpp	
Input s/w signal	L/R,U/D,N/P, SSW, VSW, MODE1~3	+4.7	5.0	-	V	Level "H
		-	-	+0.2	V	Level "L
Vertical sync frequency	F_V	58.0	59.94	62.00	Hz	@ NTSC
Horizontal sync frequency	F_H	15.2	15.73	16.20	KHz	@ NTSC

3.2 Driving Condition for Video Board

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply Voltage for Logic	V_{CC1}	11	12	13	V	
Supply Current for Logic	I_{CC1}		250			Note1
Supply Voltage for Inverter	V_{CC2}	11	12	13	V	
Supply Current for Inverter	I_{CC2}		430			Note1
V/B Power Consumption	P		8.2		W	Note1
Analog R, G, B	R, G, B		0.7		Vpp	
Composite Sync	SYNC		1.0		Vpp	
Input s/w signal	L/R,U/D,N/P, SSW, VSW, MODE1~3	+4.7	5.0	-	V	Level "H
		-	-	+0.2	V	Level "L
Control	CONT	0		5.0	V	
	COLOR	0		5.0	V	
	TINT	1.0		3.0	V	
	DIM	1.0		5.0	V	
Vertical sync frequency	F_V	58.0	59.94	62.00	Hz	@ NTSC
Horizontal sync frequency	F_H	15.2	15.73	16.20	KHz	

Note1. Video Board is connected to LCD Panel.

3.3 Driving Condition for BLU

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Backlight Lamp Voltage	V_{BL}		970		Vrms	
Backlight Lamp Current	I_{BL}		4.0	4.3	rms	
Lamp Operating Frequency	F_L	30		80	KHz	
Lamp Start Voltage				1700	Vrms	0
				1360	Vrms	25
Lamp Life		20,000	30,000		Hours	IBL=4.0
BLU Power Consumption	V_{BL}		4.0		W	

4.0 OPTICAL SPECIFICATIONS

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and φ equal to 0°. We refer to $\theta_{\phi=0}$ (=θ_3) as the 3 o'clock direction (the "right"), $\theta_{\phi=90}$ (=θ_{12}) as the 12 o'clock direction ("upward"), $\theta_{\phi=180}$ (=θ_9) as the 9 o'clock direction ("left") and $\theta_{\phi=270}$ (=θ_6) as the 6 o'clock direction ("bottom"). While scanning θ and/or φ, the center of the measuring spot on the display surface shall stay fixed. The measurement shall be executed 30 minutes after lighting at rating with the back-light CCFL being run at a 4.0 mA current after 30 minutes warm-up period. Vdd shall be 5.00±0.2V at 25 . Optimum viewing angle direction is 6 o'clock. The test setup, geometry, and measurement location are shown in FIGURE 2. and FIGURE 3. (shown in Appendix)

4.2 Optical Specifications

< Table 5. Optical Specifications >

[Be measured at Composite NTSC/PAL, Ta = 25± 2]

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	3	CR > 5 IL = 4.0mA Operation		60	-	Deg	Note 1
		9			60	-	Deg	
	Vertical	12			30	-	Deg	
		6			60	-	Deg	
Luminance of white		Y_W			220		cd/m^2	
Luminance of white		Y_W	= 0° IL = 4.0mA NonOperation		450		cd/m^2	Note 2
White Chromaticity		Wx			0.295			Note 3
		Wy			0.315			
Luminance contrast ratio		CR		70	150	-		Note 4
White luminance uniformity		Y	= 0° IL = 4.0mA Operation			1.2		Note 5
Response time		Tr		-	10	20	ms	Note 6
		Td		-	25	50		

Note

1. Viewing angle is the angle at which the contrast ratio is greater than 5. The viewing angles are determined for the horizontal or 3, 6 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1 shown in Appendix)

2. Average luminance of white is defined as arithmetic mean of one point across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

3. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue, and white measurements shall be made at the center of the panel.

4. Contrast measurements shall be made at viewing angle of q= 0° and at the center of the LCD surface. See FIGURE 1 (located in Appendix). Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. Luminance Contrast Ratio (CR) is defined mathematically as : CR = Luminance when displaying a white raster / Luminance when displaying a black raster.

5. The white luminance uniformity on LCD surface is then expressed as : *D*Y = Maximum luminance of five points / Minimum luminance of five points.

6. The electro-optical response time measurements shall be made as shown in FIGURE 3 (shown in Appendix) by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td and 90% to 10% is Tr.

5.0 INTERFACE CONNECTION

5.1 Video I/O Interface

   CN4:   Interface Connector   :   52207-3090 (Molex) or equivalent

Pin No.	Symbol	Description	SPEC	I/O	Remark
1	VDD	DC 5V	5V± 0.2V	O	
2	Color	Color Adjustment	0 ~ 5V	I	
3	Brightness	Brightness Adjustment	0 ~ 5V	I	
4	Contrast	Contrast Adjustment	0 ~ 5V	I	
5	Composite or Y	Composite video or S-Video	1.0 Vpp	I	
6	SGND	Signal Ground	0V	I	
7	PGND	Power Ground	0V	I	
8	PGND	Power Ground	0V	I	
9	B/L Vcc	Power supply for Backlight	DC 12V± 1V	I	
10	B/L Vcc		DC 12V± 1V	I	
11	U/D	Up/Down Selection	0V:Down / 5V:Up	I	
12	L/R	Left/Right Selection	0V:Right / 5V:Left	I	
13	DIM	Dimmer Control	DC 1 ~ 5V	I	
14	MODE1	Display Mode Selection 1	High / Low	I	Note 1
15	MODE2	Display Mode Selection 2	High / Low	I	Note 1
16	MODE3	Display Mode Selection 3	High / Low	I	Note 1
17	N/P	NTSC/PAL Selection	0V:PAL / 5V:NTSC	I	
18	TINT	TINT Adjustment	DC 1 ~ 3V	I	
19	VSW	RGB or Composite Select	0V:Composite/5V:RGB	I	
20	Csync Out	Composite Sync Output	Positive 5Vpp	O	
21	YCSYNC	Chrominance Signal(S-video)	0.7Vpp	I	
22	SSW	Sync Select(RGB/Composite)	0V:Composite/5V:RGB	I	
23	SYNC	RGB Sync Signal(negative)	1.0 Vpp	I	
24	SGND	Signal Ground	0V	I	
25	EXT G	Green Video Input	1 Vpp/75	I/O	
26	EXT B	Blue Video Input	1 Vpp/75	I	
27	EXT R	Red Video Input	1 Vpp/75	I	
28	Vcc	Power Supply for Circuit	DC 12V± 1V	I	
29	VSY	Vertical Sync Output	TTL Level	O	
30	HSY	Horizontal Sync Output	TTL Level	O	

   Note 1: Display mode is changed by Mode1, Mode2 and Mode 3 (see 5.4)

.5.2 Source I/O interface: CN1 : Interface Connector : GF053-30S-LSS (LG) or equivalent

Pin No.	Symbol	Description	SPEC	I/O	Remark
1	NC	No Connection	-		
2	Analog Red	Analog Red Video Input	5Vpp	I	
3	Analog Green	Analog Green Video Input	5Vpp	I	
4	Analog Blue	Analog Blue Video Input	5Vpp	I	
5	GND	Ground	0 V	I/O	
6	NC	No Connection	-		
7	NC	No Connection	-		
8	V_{COM}	Common Electrode Voltage	DC 9V	I	
9	NC	No Connection	-		
10	Mode1	Display Mode Selection 1	High(5V) / Low(0V)	I	TTL Level
11	Mode2	Display Mode Selection 2	High(5V) / Low(0V)	I	TTL Level
12	Mode3	Display Mode Selection 3	High(5V) / Low(0V)	I	TTL Level
13	GND	Ground	0 V	I/O	
14	BLK	Zoom in Control Signal	High(5V) / Low(0V)	O	
15	H_{SYNC}	Horizontal Sync Output	5Vpp	O	TTL Level
16	V_{SYNC}	Vertical Sync Output	5Vpp	O	TTL Level
17	NC	No Connection	-	-	
18	Pol S	Data Polarity Alteration Signal	High(5V) / Low(0V)	O	TTL Level
19	NC	No Connection	-	-	
20	NC	No Connection	-	-	
21	U/D	Scan(Up/Down) Selection	0V: Normal / 5V: Opposite	I	TTL Level
22	L/R	Scan(Left/Right) Selection	0V: Normal / 5V: Opposite	I	TTL Level
23	N/P	NTSC/PAL Selection	0V: PAL / 5V: NTSC	I	TTL Level
24	NC	No Connection	-	-	
25	Csync	Composite Sync	5Vpp	I	
26	GND	Ground	0 V	I/O	
27	V_{DD}	Logic Supply Voltage	DC 5V	I	
28	V_{GH}	Gate High Voltage	DC 18V	I	
29	V_{DL}	Gate Driver Reference Voltage	DC -10V	I	
30	V_{GL}	Gate Low Voltage	DC -15V	I	

5.3 Lamp connection(CN2): Connector : 2 pins, SM02(8.0)B-BHS-1-TB (JST) or equivalent
User side Connector : BHR-03VS-1 (JST) or equivalent

Pin No.	Input	Function	Color
1	HI	Power Supply for BackLight Unit(High Voltage)	Pink
2	GND	Power Supply for BackLight Unit(GND Side)	White
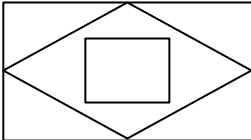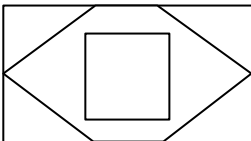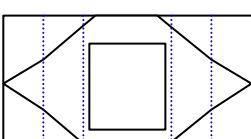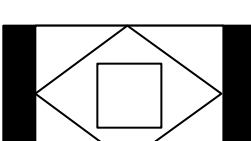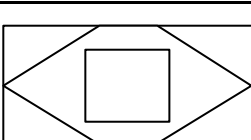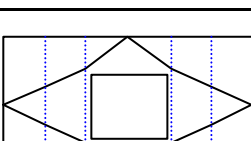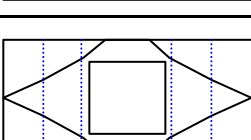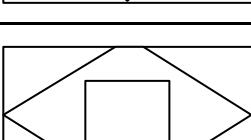
SPEC. NUMBER	SPEC. TITLE	PAGE
	HT07W12-120 Preliminary Product Specification	13 OF 23

5.4 Display mode

Mode	Input			Display (4:3 aspect-ratio input signal)	Note
	MODE1	MODE2	MODE3		
Full	H	H	H		Input signals are displayed on full screen(16:9)
Zoom1	L	H	H		Central 176 lines of input signals are displayed on full screen (vertical extension zoom factor=4/3)
Zoom Wide1	H	L	H		Central 176 lines of input signals are displayed on full screen with different horizontal timing scaling
Normal	L	L	H		Input signals(4:3) are displayed on center 75% screen(4:3)
Zoom2	H	H	L		Lower 205 lines of input signals are displayed on full screen (vertical extension zoom factor=8/7)
Wide	L	H	L		Input signals are displayed on full screen with different horizontal timing scaling
Zoom Wide2	H	L	L		Lower 205 lines of input signals are displayed on full screen with different horizontal timing scaling
Zoom3	L	L	L		Center 205 lines of input signals are displayed on full screen (vertical extension zoom factor=8/7)

6.0 SIGNAL TIMING SPECIFICATION

6.1 Display Time Range

ITEMS	Condition		Display Mode				Unit
			Full	Zoom1	Zoom wide	Normal	
Vertical Display Start	NTSC	ODD	24	53	53	24	Line
		EVEN	287	316	316	287	Line
	PAL	ODD	29	62	62	29	Line
		EVEN	342	375	375	342	Line
Vertical Display Position	NTSC		234	176	176	234	Line
	PAL		281	210	210	281	Line
Horizontal Display Start	NTSC		12.96	12.96	12.96	8.83	µs
	PAL		13.86	13.86	13.86	9.85	µs

ITEMS	Condition		Display Mode				Unit
			Zoom2	Wide	Zoom Wide2	Zoom3	
Vertical Display Start	NTSC	ODD	50	24	50	38	Line
		EVEN	313	287	313	301	Line
	PAL	ODD	65	29	65	48	Line
		EVEN	378	342	378	361	Line
Vertical Display Position	NTSC		205	234	205	205	Line
	PAL		239	281	239	239	Line
Horizontal Display Start	NTSC		12.96	12.96	12.96	12.96	µs
	PAL		13.86	13.86	13.86	13.86	µs

6.2 H / V Timing Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Vertical sync. Width	tVSYN		4		tH	
Vsync period	tV		16.7		ms	
Csync period	tH	61.5	63.5	65.5		
Csync pulse width	t_{CSYN}	4	4.7	5.4		
Hsync pulse width	tHSYN		4.64			
Csync to Hsync time	t2	1.8	2.5	15.8		

7.0 Signal Timing Waveform

7.1 NTSC
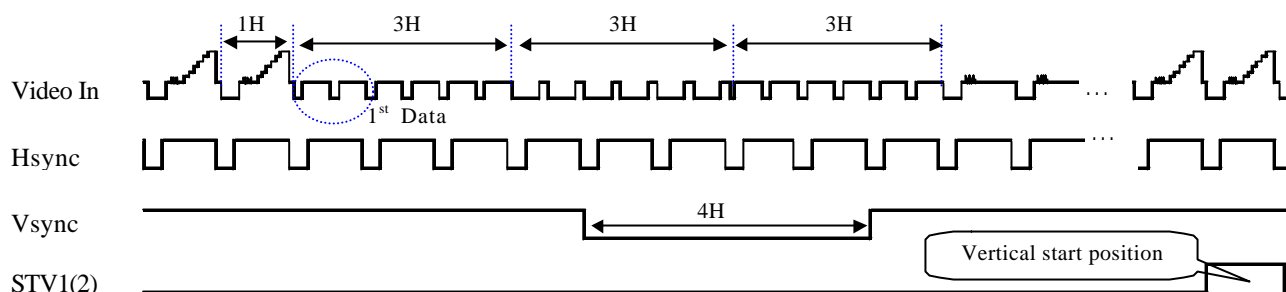
Odd Field Timing
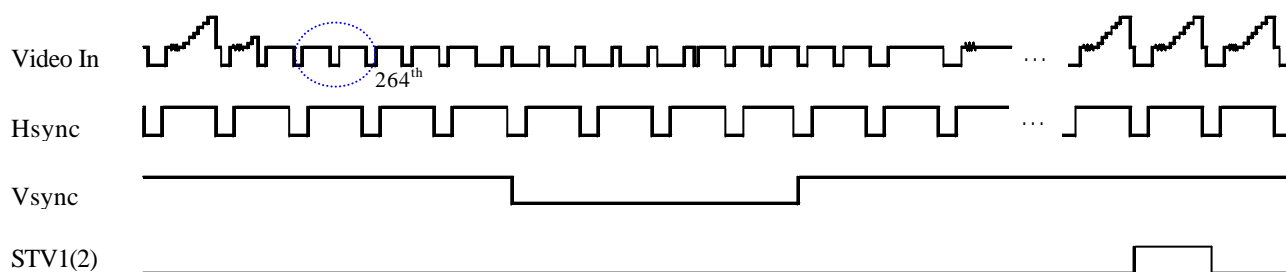
Even Field Timing

7.2 PAL
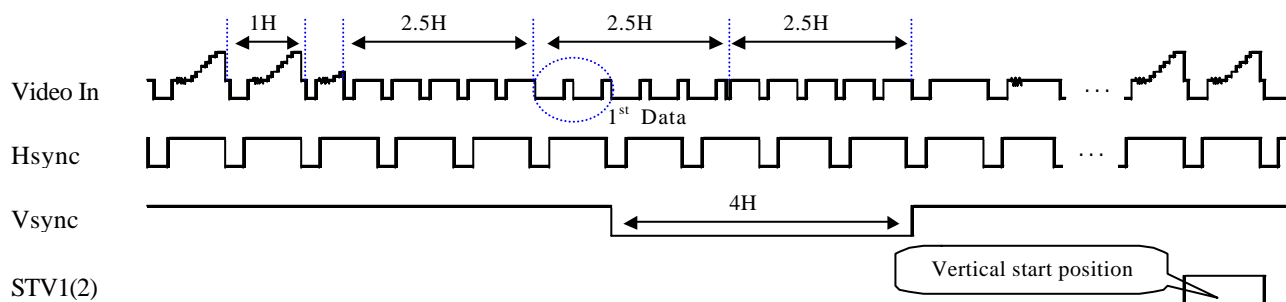
Odd Field Timing
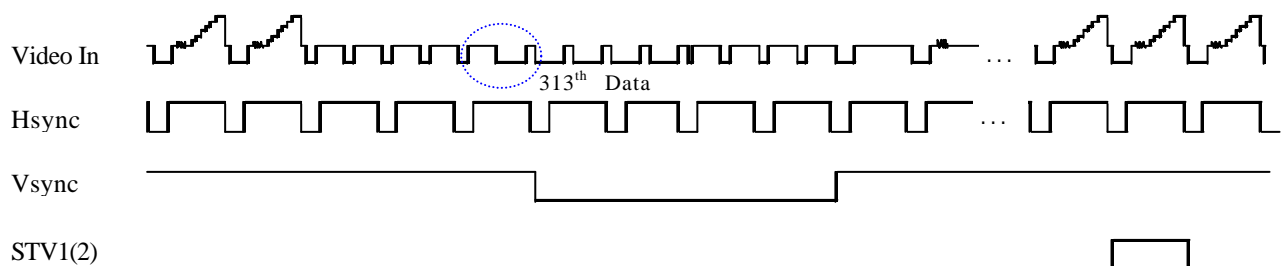
Even Field Timing

7.3 Vertical Timing Waveform(NTSC)

VSYNC

tVSYN

tV
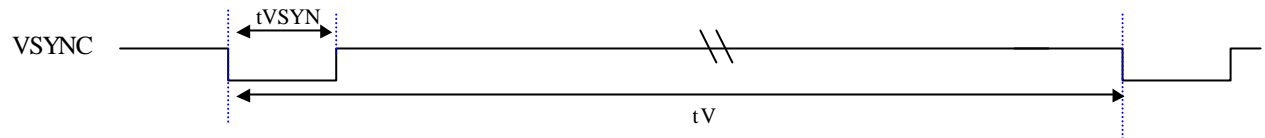
7.4 Horizontal Timing Waveform(NTSC)
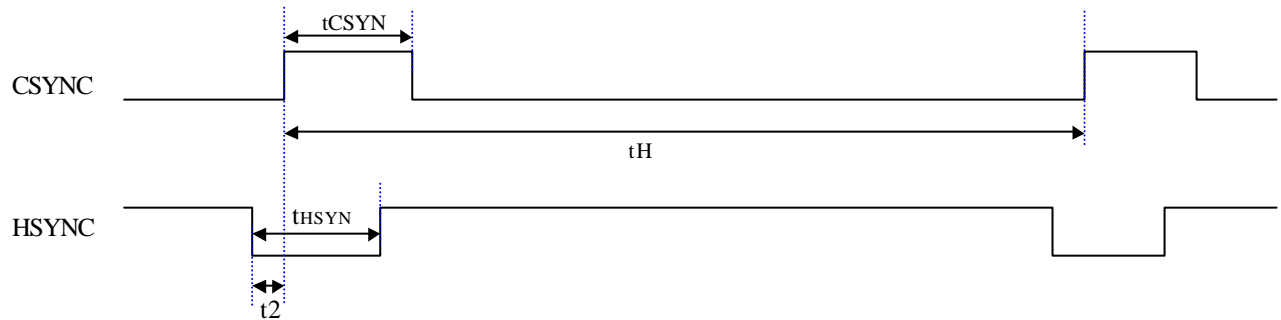
CSYNC

tCSYN

tH

HSYNC

tHSYN

t2

SPEC. NUMBER	**SPEC. TITLE**	**PAGE**
	HT07W12-120 Preliminary Product Specification	18 OF 23

RASR 057-1   A4(210 X 297)

8. Power Sequence

To prevent abnormal operation of the LCD module, the power sequence shall be as shown in below.
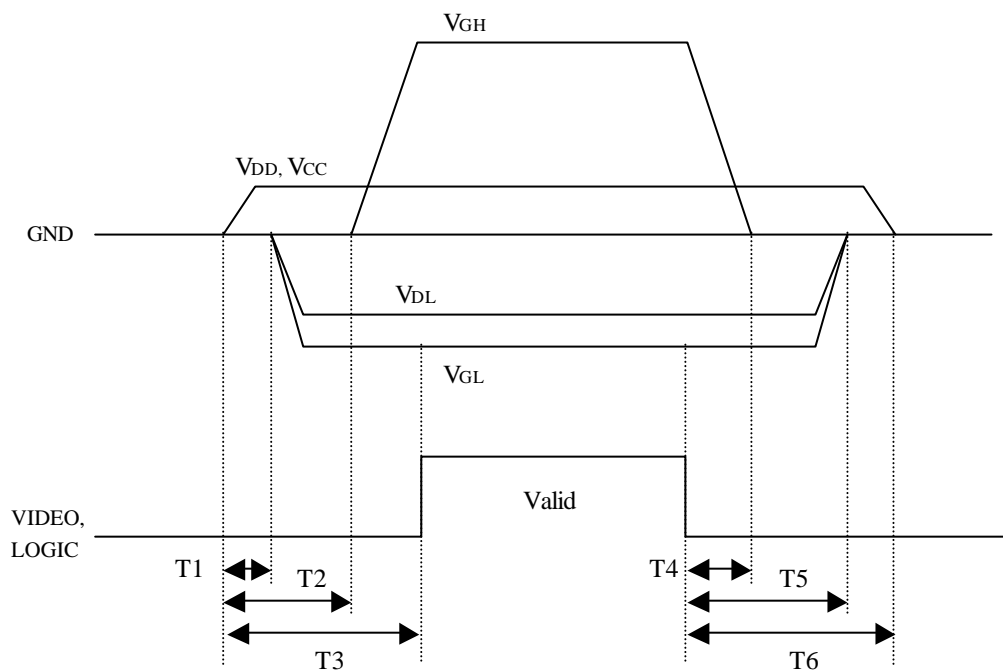
- $10\ ms \leq T1 \leq T2 \leq T3$
- $10\ ms \leq T4 \leq T5 \leq T6$

Define of upper term

V_{DD} : Logic Supply Voltage

V_{CC} : System Supply Voltage

V_{GH} : Gate ON Voltage

V_{GL} : Gate OFF Voltage

V_{DL} : Gate Driver IC inner operation Voltage

SPEC. NUMBER	**SPEC. TITLE**	**PAGE**
	HT07W12-120 Preliminary Product Specification	19 OF 23

RASR 057-1   A4(210 X 297)

9. RELIABLITY TEST

The Reliability test items and its conditions are shown in below.

Table 6. Reliability Test Parameter

No	Test item	Conditions
1	High temperature storage test	Ta=85°C, 192hrs
2	Low temperature storage test	Ta=-30°C, 192hrs
3	High temperature & high humidity operation test	Ta=60°C, 95%RH, 240hrs
4	High temperature operation test	Ta=70°C, less than 45RH, 192hrs
5	Low temperature operation test	Ta=-20°C, 192hrs
6	Thermal shock	Ta=-30°C (30m)　85°C (30m):100 cycles
7	Vibration test	Frequency : 10 ~ 55Hz Amplitude : 1.5mm Sweep : 11mins 6Cycles for each direction of X, Y, Z
8	Shock Test	100G, 6ms, Direction: ±X, ±Y, ±Z 2Times
9	Endurance of atmospheric pressure	0.5AT,2hrs

10.0 HANDLING & CAUTIONS

(1) Cautions for handling the module
- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and back-light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD module is operating.
- Handle connectors and cables with care.

(2) Other cautions
- Do not disassemble and/or re-assemble LCD module.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend using the original shipping packages.
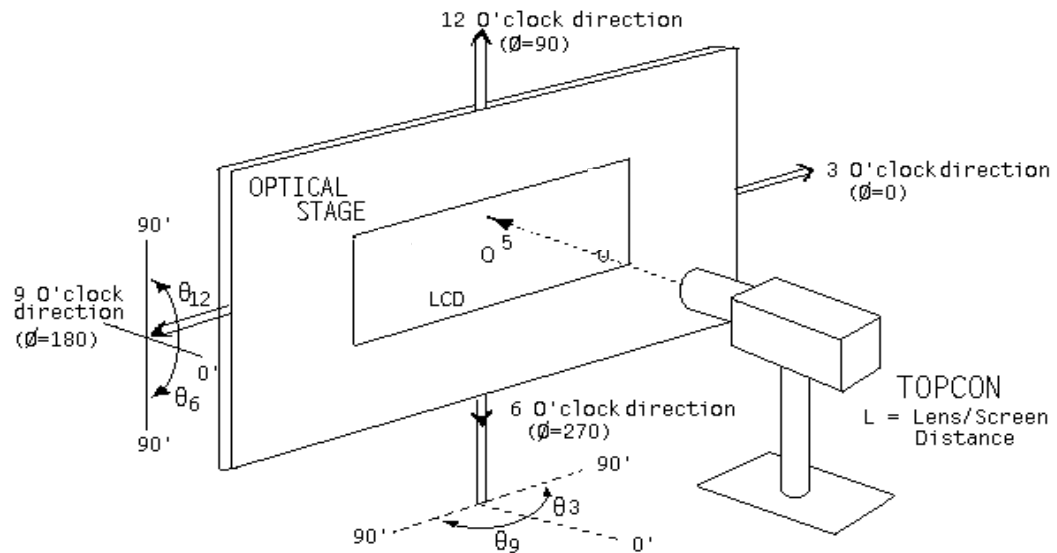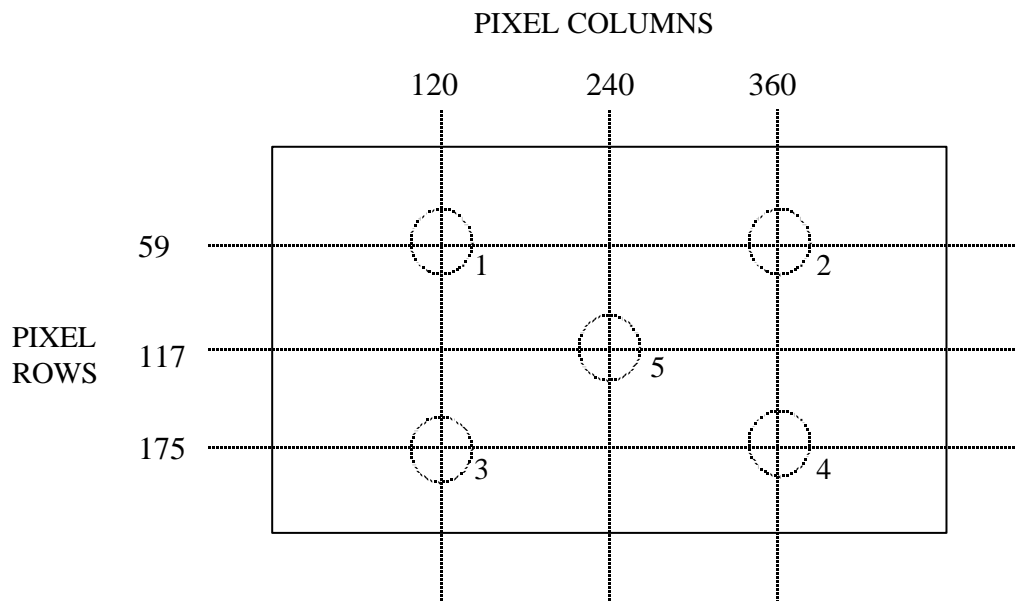
11.0 APPENDIX

Figure 1. Measurement Set Up

Figure 2. Measurement Locations

PIXEL COLUMNS

Figure 3. Response Time Testing
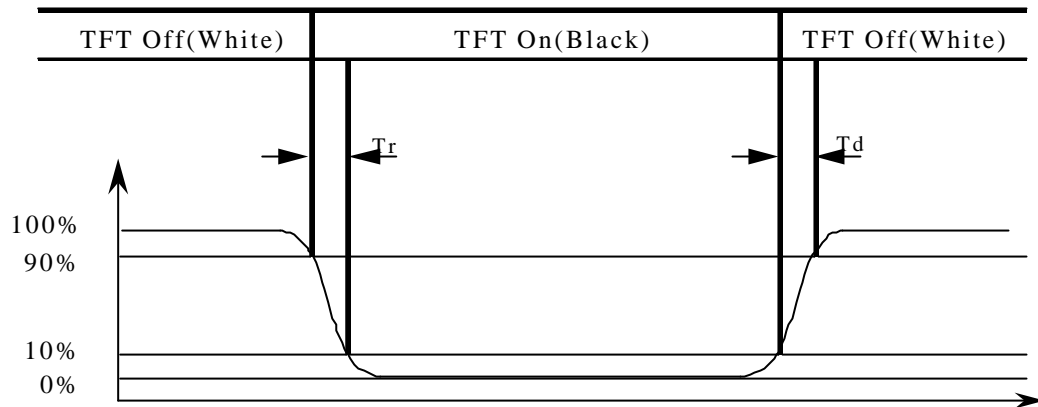
TFT Off(White)	TFT On(Black)	TFT Off(White)

Tr

Td

100%
90%

10%
0%

SPEC. NUMBER	**SPEC. TITLE**	**PAGE**
	HT07W12-120 Preliminary Product Specification	22 OF 23

RASR 057-1   A4(210 X 297)

Figure 5. Product Outline
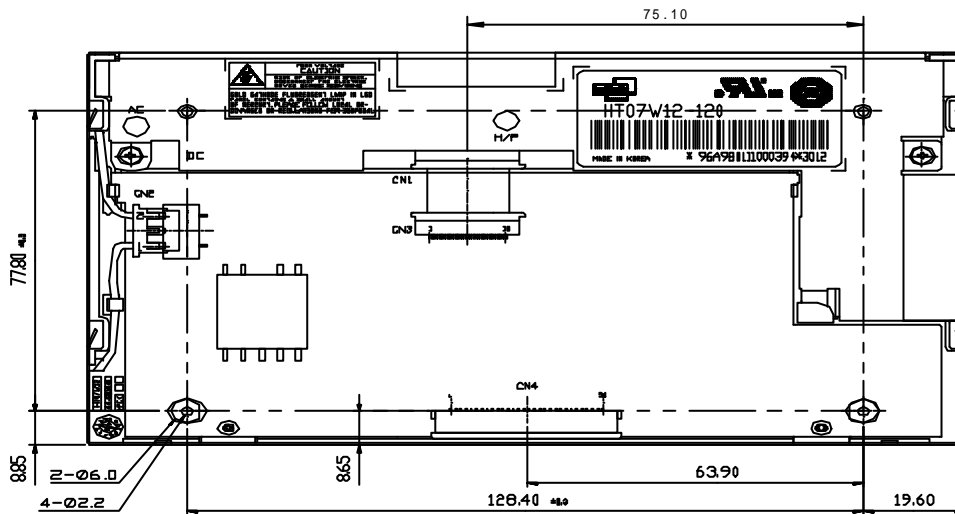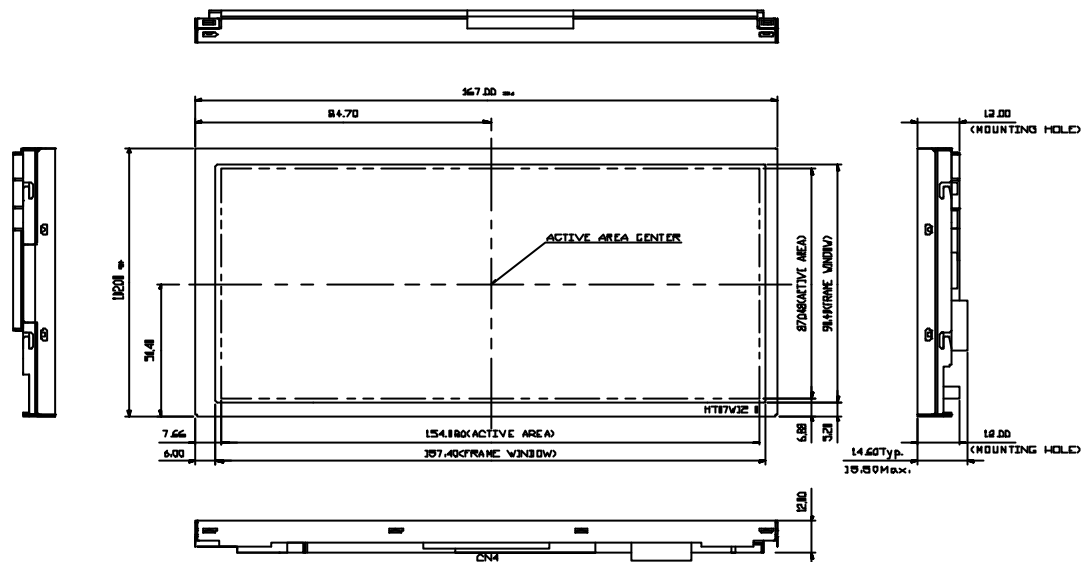
NOTE

1.CN 1 : MOLEX(52437-3091)
   or LG(ST30FLS-RSM1-T_30P)
2.CN 2 : JST(BHR-03VS-1)
3.CN 3 : MOLEX(52437-3091)
4.CN 4 : MOLEX(52207-3090)
5.GENERAL TOLERANCE±0.5mm
6.RECOMMEND SCREW FOR FIX MODULE:
   TAPPING SCREW Ø2.5 L=3mm
   TORQUE: 27.44 N cm