TITLE : HVA37WV1-M01

Preliminary Product Specification

HYDIS Technologies

REVISION HISTORY

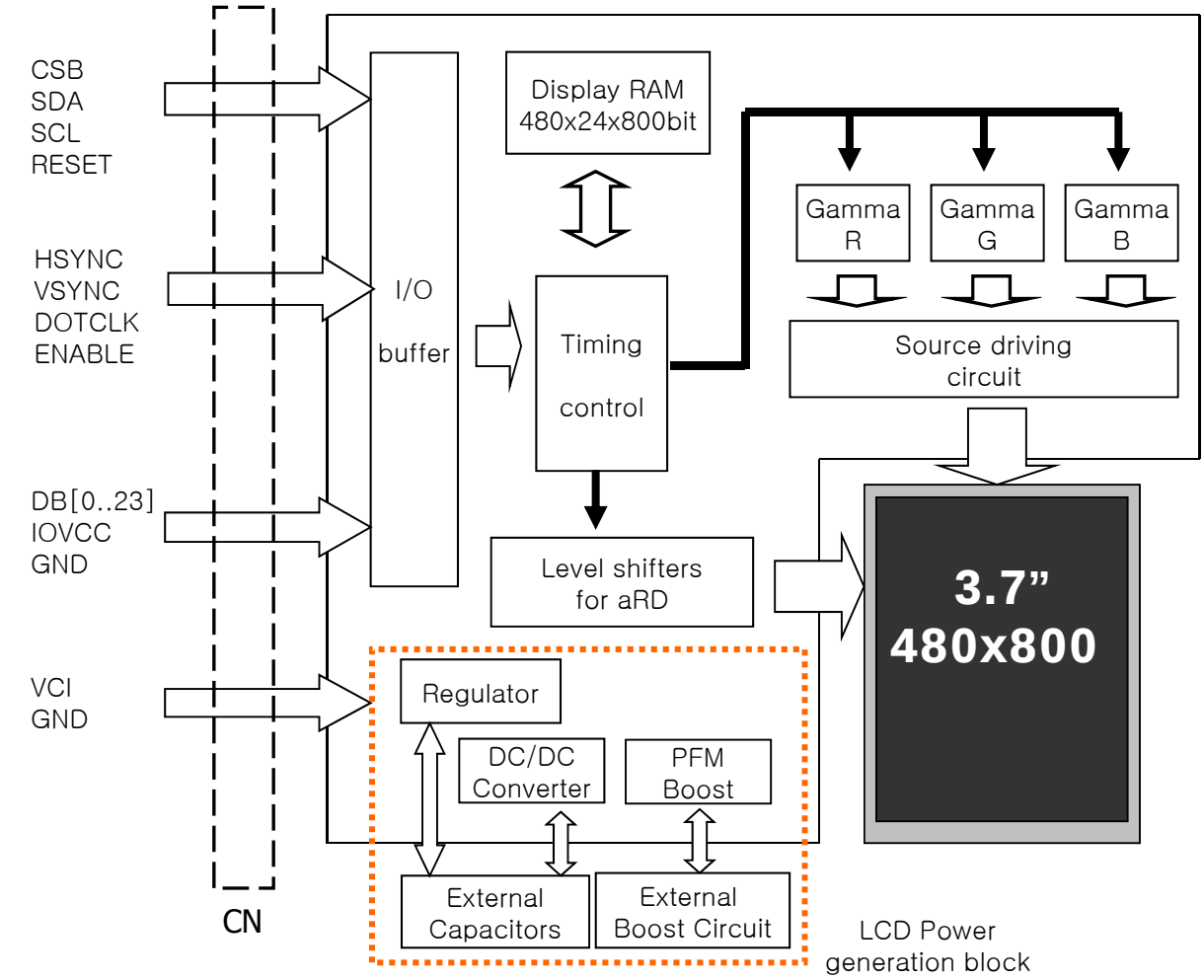
REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0		▪ Initial Release	2011.01.03	C.Y.KIM

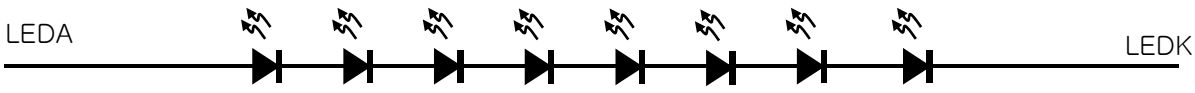
Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

3.7" WVGA aRD is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This Model is composed of a Transmissive TFT LCD panel, a drive IC driver circuit and a backlight unit. This module has a LCD 3.7 inch diagonally measured active area with 480 × RGB × 800 resolutions.
This module can display 16.2M colors.





<LED>

1.2 Features

- High Resolution & Wide View (HFFS Technology)
- aRD (a-Si Row Driver) Technology
- LCD Driver : LG4573
- Serial & 24 bit RGB I/F (16.2M Colors)
- Sleep, Moving mode display
- Green Product (RoHS Compliant)

1.3 Applications

- Smart Phone

1.4 General Specification

The followings are general specification at the model 3.7” WVGA aRD

< Table 1. General Specification >

Parameter	Specification	Unit	Remarks
Active area	48.24(H) × 80.4(V)	mm	
Number of pixels	480(H) × 800(V)	pixels	
Pixel pitch	100.5(H) × 100.5(V)	um	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.2M	colors	
Display mode	Normally Black		
Dimensional outline	52.54 (H) X 89.5 (V) X 1.8 (T)	mm	W/O FPCB
Weight	20.0 (typ.) / 25.0 (max.)	gram	
Back-light	8-LEDs serial type		White LED

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

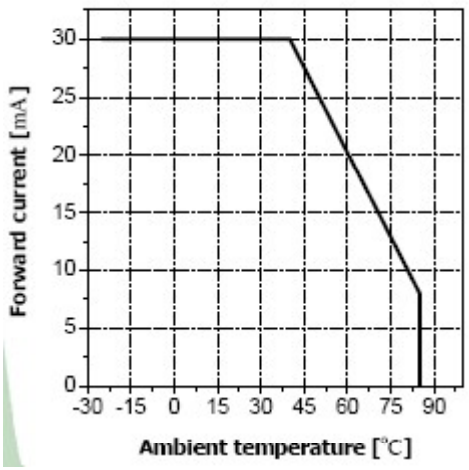
< Table 2. Absolute Maximum Ratings > [VSS=GND=0V]

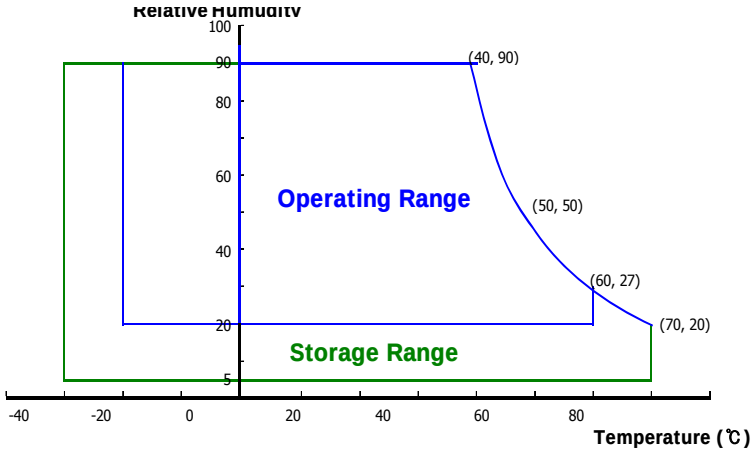
Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Input Voltage	VCC	VSS-0.3	4.5	V	Ta = 25 ℃
Power Input Voltage	IOVCC	VSS-0.3	4.5	V	
Storage Humidity	H_{STG}	10	90	% (RH)	Note 1
Storage Temperature	T_{STG}	-30	+80	℃	
Operating Humidity	H_{OPR}	15	90	% (RH)	
Operating Temperature	T_{OPR}	-20	+60	℃	

Note :

1. Temperature and relative humidity range are shown in the figure below.
   90% RH Max. (50℃ ≥ Ta)

※ Maximum wet - bulb temperature at 39℃ or less. (> 40℃) No condensation.





3.0 OPTICAL SPECIFICATIONS

The test of Optical specification shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometric 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 $\theta_{Ø=0}$ (=θ_3) as the 3 o'clock direction (the "right"), $\theta_{Ø=90}$ (= θ_{12}) as the 12 o'clock direction ("upward"), $\theta_{Ø=180}$ (= θ_9) as the 9 o'clock direction ("left") and $\theta_{Ø=270}$(= θ_6) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement.

< Table 3. Optical Specifications >

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	Note 1
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Contrast ratio		CR	Θ = 0°	500	800	-		Note 2
Luminance of White		Y_w		300	400	-	cd/m²	Note 4
White Luminance uniformity		ΔY9		80	90	-	%	
Color Gamut		Gamut		71.1			%	Note 3
Color Temperature		CCT		6500	7500	8500	˚K	
Reproduction of color	White	W_x	Θ = 0° (Center) Normal Viewing Angle	0.309	0.294	0.288	-	
		W_y		0.319	0.316	0.297		
	Red	R_x		0.613	0.633	0.653		
		R_y		0.316	0.336	0.356		
	Green	G_x		0.294	0.324	0.354		
		G_y		0.591	0.621	0.651		
	Blue	B_x		0.123	0.143	0.163		
		B_y		0.040	0.060	0.080		
Response Time ($T_r + T_d$)			Ta= 25° C	-	40	-	ms	Note 5
Cross Talk		CT	Θ = 0°	-	-	3.0	%	Note 6

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 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 Figure1 in Appendix).
2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See Figure 2 shown in Appendix). Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. The color chromaticity coordinates specified in Table 2 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 C/F with the Polarizer.
4. The White luminance uniformity on LCD surface is then expressed as :

   ΔY = (Minimum Luminance of 9 points / Maximum Luminance of 9 points) * 100

   (See Figure 2 shown in Appendix).
5. The electro-optical response time measurements shall be made as 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 Tr, and 90% to 10% is Td.
6. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven white

   (Refer to Figure 4 in Appendix)

$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_B} \right| \times 100$$

4.0 ELECTRICAL SPECIFICATIONS

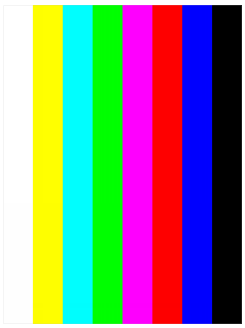
4.1 TFT LCD Module

< Table 4. LCD Module Electrical Specification > [Ta =25±2 ℃]

Parameter		Symbol	Values			Unit	Remark
			Min	Typ	Max		
Interface Power Supply Voltage		IOVCC	1.65	1.8	3.3	V	
Analog Circuit Supply Voltage		VCC	2.6	3.0	3.3	V	
Frame Frequency		f_{FRAME}		62		Hz	
Main Clock Frequency		f_{CLK}		26.68		MHz	
Logic signal input voltage		V_{IH}	0.8IOVCC	-	IOVCC	V	
		V_{IL}	-0.3	-	0.2IOVCC		
Logic signal output voltage		V_{OH}	0.8IOVCC			V	
		V_{OL}			0.2IOVCC		
Input leak current		I_{LI}	-1		1	μA	VI=IOVCC or GND
Output leak current		O_{LI}	-1		1		VO=IOVCC or GND
Power Consumption	16.2M	$P_{16.2M}$		551.84	659	mW	Note 1, 3, 4, 5
	Sleep mode	P_{SPL}		453.85	454.02	mW	Note 2

Note :

1. In 16.2M Color mode, Display data consists of 8bits each for R, G, B.
2. In sleep mode, Display operation is completed halted, GRAM data and the contents of each register are kept and can not be changed. (Deep Stand by Mode of LG4573)
3. Display Pattern at Typ. Power Consumption is “Color Bar Pattern” as followers.
   1) White
   2) Yellow
   3) Cyan
   4) Green
   5) Magenta
   6) Red
   7) Blue
   8) Black



4. Display Pattern at Min. Power Consumption is “Black Pattern” in case of this module. (@62Hz)
5. Display Pattern at Max. Power Consumption is “White Pattern” in case of this module. (@62Hz)

4.2 Back-Light Unit

< Table 5. Back-Light Unit Electrical Specification > [Ta =25±2 ℃]

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
LED Forward Voltage	V_F	2.9	3.1	3.3	V	
LED Forward Current	I_F	-	18.3	20	mA	
Back-light LED Total Voltage	V_{BL}	-	24.8	26.4	V	Note 1
Back-light LED Total Current	I_{BL}	-	18.3	20	mA	
Back-light Power Consumption	P_{BL}	-	453.84	528	mW	Note 2
Luminous Intensity	Iv	2,050	-	2,300	mcd	If=20mA
LED Rank		NY, NZ				If=20mA

Note :

1. The power supply voltage and current is measured and specified at the interface connector of LCM.
2. Calculated value for reference ($V_F \times I_F \times$ # of LEDs (8EA)).

5.0 INTERFACE CONNECTION

5.1 Electrical Interface Connection

< Table 6. Electrical Interface Connection Specification >

CN1	Module Side Connector	24-5802-054-002-829 (Kyocera)

Pin No	Symbol	Description	Pin No	Symbol	Description
1	VCI	Analog Power for LCD	2	LEDA	
3	VCI	Analog Power for LCD	4	LEDA	
5	IOVCC	Logic Power for LCD	6	LEDK	
7	RESET	Module Reset	8	LEDK	
9	VPP	Power for OTP	10		
11	GND		12	GND	
13	SPI_SCL	Serial Clock for LCD	14	DENB	Data Enable
15	SPI_SDA	Serial Data for LCD	16	VSYNC	Vertical Sync
17	SPI_CS	Chip select	18	HSYNC	Horizontal Sync
19	DB1	Data Blue 1	20	DCK	Dot Clock
21	DB3	Data Blue 3	22	GND	
23	DB5	Data Blue 5	24	DB0	Data Blue 0
25	DB7	Data Blue 7	26	DB2	Data Blue 2
27	DB9	Data Green 1	28	DB4	Data Blue 4
29	DB11	Data Green 3	30	DB6	Data Blue 6
31	DB13	Data Green 5	32	DB8	Data Green 0
33	DB15	Data Green 7	34	DB10	Data Green 2
35	DB17	Data Red 1	36	DB12	Data Green 4
37	DB19	Data Red 3	38	DB14	Data Green 6
39	DB21	Data Red 5	40	DB16	Data Red 0
41	DB23	Data Red 7	42	DB18	Data Red 2
43			44	DB20	Data Red 4
45			46	DB22	Data Red 6
47			48	GND	
49			50		
51			52		
53			54		

5.2 Input signal, Basic Display Colors and Gray Scale of Each Colors

Colors & Gray Scale		Data signal																	
		Red data						Green data						Blue data					
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Light Blue	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Purple	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray Scale of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	1	0	1	1	1	1	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	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	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	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	▽	0	0	0	0	0	0	↓						0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of Blue	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	0	0	0	0	0	0	1	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	↓					
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Gray Scale of White & Black	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
	Darker	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1
	▽	↓						↓						↓					
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

6.0 INTERFACE SPECIFICATION

6.1 SPI Interface

6.1.1 Start Byte Format

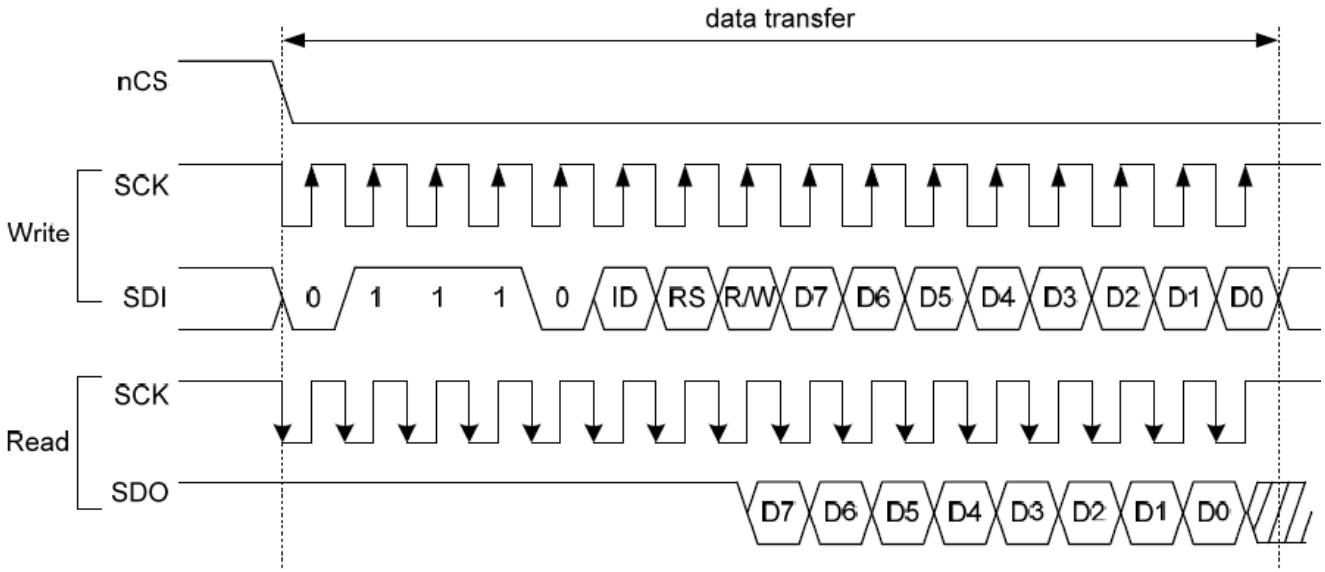
Transferred bits	S	1	2	3	4	5	6 (IM0/ID)	7	8
Start byte format	Transfer start	Device ID code						RS	R/W
		0	1	1	1	0	**1**	1/0	1/0

Note: ID bit is selected by setting the IM0/ID pin

- RS and R/W Bit Function

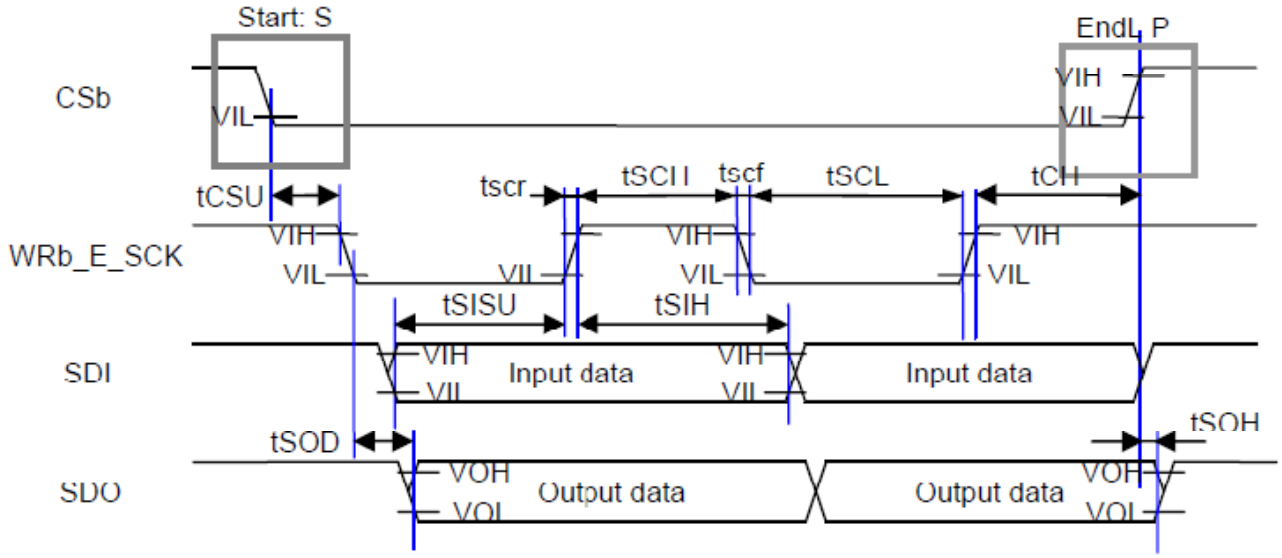
RS	R/W	Function
0	0	Set an index register
0	1	Read a status
1	0	Write an instruction or RAM data
1	1	Read an instruction or RAM data

6.1.2 Data transmission through SPI (Register)



6.1.3 SPI interface timing characteristics (IOVCC = 1.65 ~ 3.3V)

- AC Timing Characteristics Diagram



- AC Timing Characteristics Table

Item		Symbol	Unit	Min	Typ	Max
Serial clock cycle time	Write (received)	t_{SCYC}	ns	20		20000
	Read (Transmitted)			100		20000
Serial clock cycle time	Write (received)	t_{SCH}	ns	10		
	Read (Transmitted)			50		
Serial clock cycle time	Write (received)	t_{SCL}	ns	10		
	Read (Transmitted)			50		
Serial clock rise/fall time		t_{scr}, t_{scf}	ns			20
Chip select setup time		t_{CSU}	ns	20		
Chip select hole time		t_{CH}	ns	10		
Serial input data setup time		t_{SISU}	ns	5		
Serial input data hole time		t_{SIH}	Ns	10		
Serial output data setup time		t_{SOD}	ns	80		150
Serial output data hold time		t_{SOH}	ns			80

6.2 RGB Interface

6.2.1 Data format

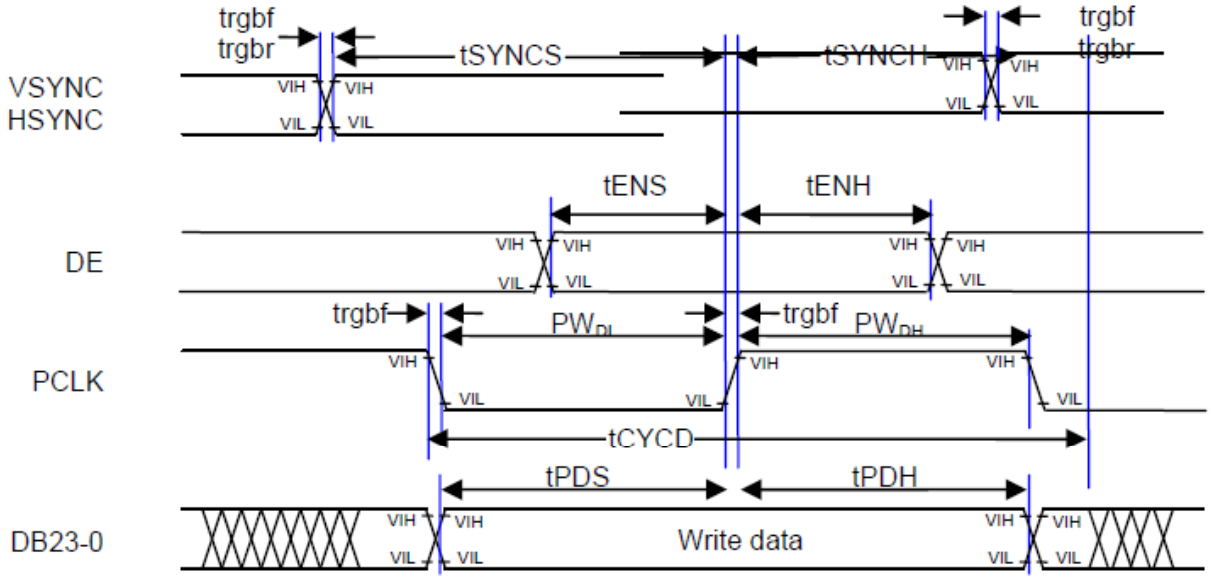
Signal Line	16-bit			18-bit		24-bit
	Configuration 1	Configuration 2	Configuration 3	Configuration 1	Configuration 2	
D23	(not used)	(not used)	(not used)	(not used)	(not used)	R7
D22	(not used)	(not used)	(not used)	(not used)	(not used)	R6
D21	(not used)	(not used)	R4	(not used)	R5	R5
D20	(not used)	R4	R3	(not used)	R4	R4
D19	(not used)	R3	R2	(not used)	R3	R3
D18	(not used)	R2	R1	(not used)	R2	R2
D17	(not used)	R1	R0	R5	R1	R1
D16	(not used)	R0	(not used)	R4	R0	R0
D15	R4	(not used)	(not used)	R3	(not used)	G7
D14	R3	(not used)	(not used)	R2	(not used)	G6
D13	R2	G5	G5	R1	G5	G5
D12	R1	G4	G4	R0	G4	G4
D11	R0	G3	G3	G5	G3	G3
D10	G5	G2	G2	G4	G2	G2
D9	G4	G1	G1	G3	G1	G1
D8	G3	G0	G0	G2	G0	G0
D7	G2	(not used)	(not used)	G1	(not used)	B7
D6	G1	(not used)	(not used)	G0	(not used)	B6
D5	G0	(not used)	B4	B5	B5	B5
D4	B4	B4	B3	B4	B4	B4
D3	B3	B3	B2	B3	B3	B3
D2	B2	B2	B1	B2	B2	B2
D1	B1	B1	B0	B1	B1	B1
D0	B0	B0	(not used)	B0	B0	B0

6.2.2 RGB interface timing characteristics (IOVCC = 1.65 ~ 3.3V, VCI = 2.6~3.3V)

- Timing Characteristics Table

Item	Symbol	Min.	Typ.	Max.	Unit
Clock cycle	fclk		26.68		MHz
Vsync cycle	1/tv		62		Hz
Horizontal display period	thd		480		CLK
Horizontal front porch	thf		13		CLK
Horizontal pulse width	thp		510		CLK
Horizontal back porch	thb		17		CLK
Vertical display period	tvd		800		H
Vertical front porch	tvf		20		H
Vertical pulse width	tvp		850		H
Vertical back porch	tvb		30		H

- AC Timing Characteristics Diagram



- AC Timing Characteristics Table

Item	Symbol	Unit	Min	Typ	Max
VSYNC/HSYNC setup time	tSYNCS	ns	5		
VSYNC/HSYNC hold time	tSYNCH	ns	5		
DE setup time	tENS	ns	5		
DE hold time	tENH	ns	5		
PCLK “Low” level pulse width	PWDL	ns	10		
PCLK “High” level pulse width	PWDH	ns	10		
PCLK cycle time	tCYCD	ns	20		
Data setup time	tPDS	ns	6		
Data hold time	tPDH	ns	6		
PCLK, VSYNC, HSYNC, DE rise/fall time	trgbr, trbgf	ns			13

7.0 REGISTER RESET CONDITION

If the RESET input becomes L or the reset command in input, the each register to its default value. These default values are listed in the table below.

Register		Default	Remark	
No Operation	R00h	-	Command Only	User command Set
Software Reset	R01h	-		
Read Display Power Mode	R0AH	-	Read Only	
Read Display MADCTL	R0Bh	-		
Read Display Pixel Format	R0Ch	-		
Read Display Image Mode	R0Dh	-		
Sleep In	R10h	-	Command Only / Display Control	
Sleep Out	R11h	-		
Display Inversion Off	R20h	-		
Display Inversion On	R21h	-		
Display Off	R28h	-		
Display On	R29h	-		
Set Address Mode (MADCTL)	R36h	00h	Display Control	
Idle Mode Off	R38h	-		
Idle Mode On	R39h	-		
Interface Pixel Format	R3Ah	70h		
Write Display Brightness	R51h	00h	Back Light Control	
Read Display Brightness Value	R52h	00h		
Write Control Display	R53h	00h		
Read Control Display	R54h	00h		
Write Content Adaptive Brightness	R55h	00h		
Read Content Adaptive Brightness Control	R56h	00h		
Write CABC Minimum Brightness	R5Eh	00h		
Read CABC Minimum Brightness	R5Fh	-		

(continued)

Register		Default	Remark	
RGB Interface Setting	RB1h	06h	Interface Control / Display Control	Manufacture Command Set
		1Eh		
		0Ch		
Panel Characteristic Setting	RB2h	11h		
		D8h		
Panel Drive Setting	RB3h	02h		
Display Mode Setting	RB4h	04h		
Display Control (1)	RB5h	10h		
		10h		
		10h		
		00h		
		00h		
Display Control (2)	RB6h	01h		
		18h		
		02h		
		40h		
		10h		
		00h		
Internal Oscillator Setting	RC0h	00h	Power Control	
		00h		
Power control (1)	RC1h	02h		
Power Control (2)	RC2h	00h		
Power control (3)	RC3h	00h		
		04h		
		03h		
		03h		
		03h		

(continued)

Register		Default	Remark	
Power Control (4)	RC4h	00h	Power Control	Manufacture Command Set
		00h		
		00h		
		00h		
		05h		
		0Bh		
Power Control (5)	RC5h	00h		
Power Control (6)	RC6h	23h		
		50h		
		00h		
Channel Amp Offset Control	RC7H	00h		
		B0h		
		40h		
Back-Light Control	RC8h	00h		
		00h		
Positive Gamma for Red	RD0h	00h	Gamma Control	
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		

(continued)

Register		Default	Remark	
Negative Gamma for Red	RD1h	00h	Gamma Control	Manufacture Command Set
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
Positive Gamma for Green	RD2h	00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
Negative Gamma for Green	RD3h	00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		

(continued)

Register		Default	Remark	
Positive Gamma for Blue	RD4h	00h	Gamma Control	Manufacture Command Set
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
Negative Gamma for Blue	RD5h	00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
		00h		
Test Register	RF0h	00h	Test	
EEPROM Control (1)	RF8h	00h	EEPROM Control	
		00h		
		00h		
EEPROM Control (2)	RF9h	00h		
EEPROM Control (3)	RFAh	-	EEPROM Read Data Out	
		-		
		-		
		-		

8.0 TFT-LCD DRIVER IC CONTROL ALGORITHMS

8.1 Initial Sequence of LCD (Power supply setting)

No.	Item	Function	Register	Recommend
1	RESET LCD Driver	nReset=1		
		DELAY 1ms		
		nReset=0		
		DELAY 10ms		
		nReset=1		
		DELAY 50ms		
2	Start Initial Sequence	Power Control (1) – Stand-by off	RC1h	0000h
		Sleep Out Powers for the display are On	R11h	-
		Interface Pixel format	R3Ah	0070h
		RGB Interface Setting	RB1h	0000h
				0014h
				0006h
		Panel Characteristics Setting	RB2h	0010h
				00C8h
		Panel Drive Setting (Column Inversion) [1-Dot Inversion : Set 0001h]	RB3h	0000h
		Display Mode Control	RB4h	0004h
		Display Control (1)	RB5h	0005h
				0010h
				0010h
				0000h
				0000h
		Display Control (2)	RB6h	0001h
				0001h
				0002h
				0040h
				0002h
				0000h

(continued)

No.	Item	Function	Register	Recommend
3	OSC control	Oscillator Control	RC0h	0000h
				001Fh
4	Power Control	Power Control (2)	RC2h	0000h
		Power Control (3)	RC3h	0003h
				0004h
				0005h
				0006h
				0001h
		Power Control (4)	RC4h	0002h
				0023h
				0016h
				0016h
				0002h
				007Ah
		Power Control (5)	RC5h	0077h
		Power Control (6)	RC6h	0024h
				0060h
				0000h
5	Gamma Control	Positive Gamma for Red	RD0h	0000h
				0001h
				0066h
				0026h
				0000h
				0000h
				0066h
				0031h
				0003h

(continued)

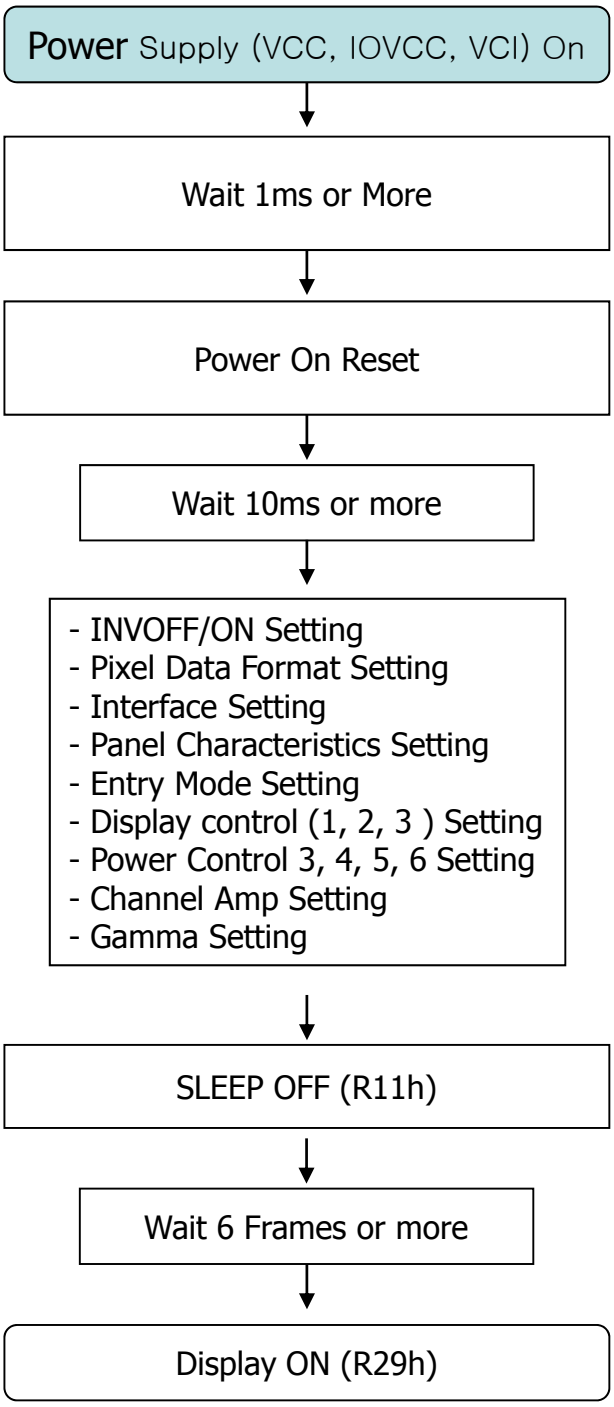
No.	Item	Function	Register	Recommend
		Negative Gamma for Red	RD1h	0000h
				0001h
				0066h
				0026h
				0000h
				0000h
				0066h
				0031h
				0003h
		Positive Gamma for Green	RD2h	0000h
				0001h
				0066h
				0026h
				0000h
				0000h
				0066h
				0031h
				0003h
		Negative Gamma for Green	RD3h	0000h
				0001h
				0066h
				0026h
				0000h
				0000h
				0066h
				0031h
				0003h

(continued)

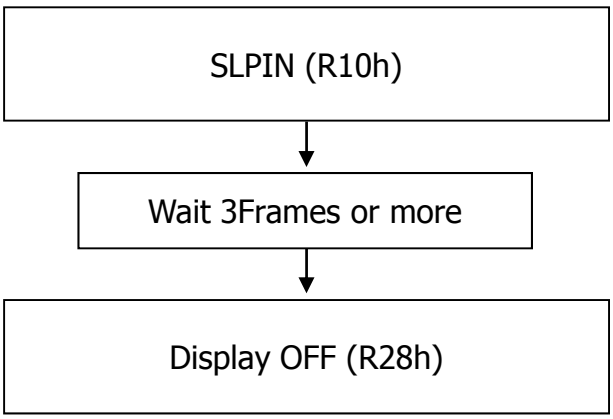
No.	Item	Function	Register	Recommend
		Positive Gamma for Blue	RD4h	0000h
				0001h
				0066h
				0026h
				0000h
				0000h
				0066h
				0031h
				0003h
		Negative Gamma for Blue	RD5h	0000h
				0001h
				0066h
				0026h
				0000h
				0000h
				0066h
				0031h
				0003h
6	Display On	Display On	R29h	-

8.2 Display On/Off Sequence of LCD

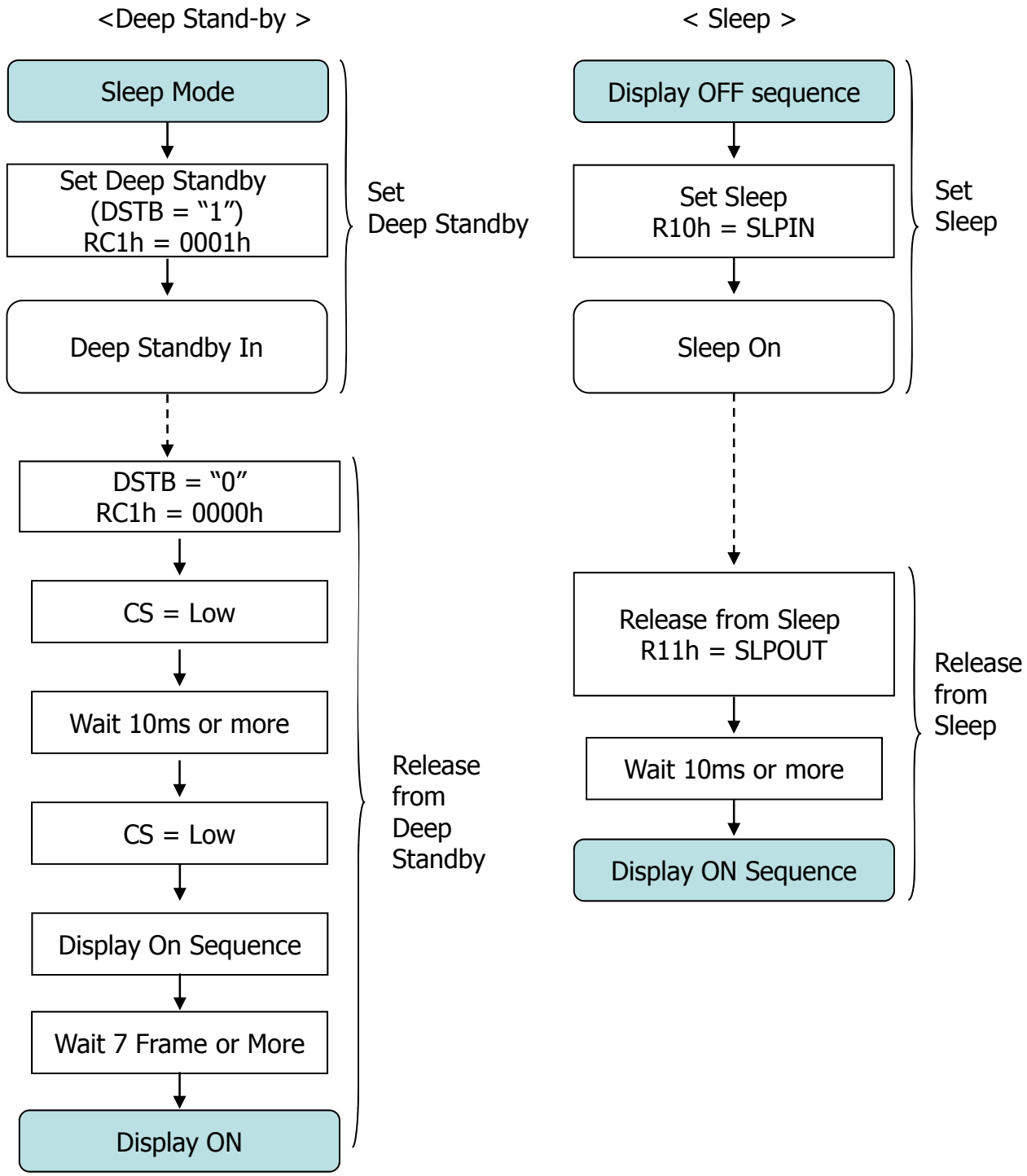
< Display ON Sequence >



< Display OFF Sequence >



8.3 Stand-by and Sleep mode LCD



9.0 MECHANICAL CHARACTERISTICS

9.1 Dimensional Requirements

Figure 5 (located in Appendix) shows mechanical outlines for the model 3.7" WVGA aRD Other parameters are shown in Table 10.

<Table 10. Dimensional Parameters Specification >

Parameter	Specification	Unit
Dimensional outline	52.54±0.1(H)×89.50±0.1(V)×1.8±0.1 (T)	mm
Weight	20.0 (typ.) / 25.0 (max.)	gram
Active area	48.24(H) × 80.4(V)	mm
Pixel pitch	100.5H) × 100.5(V)	um
Number of pixels	480(H) × 800(V) (1 pixel = R + G + B dots)	pixels
Back-light	8-LEDs serial type	

9.2 Clearness and Polarizer Hardness.

The surface of the LCD has an clear film to increase visibility and a hard coating to reduce scratching.

9.3 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 350 [lux.]

10.0 RELIABLITY TEST

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

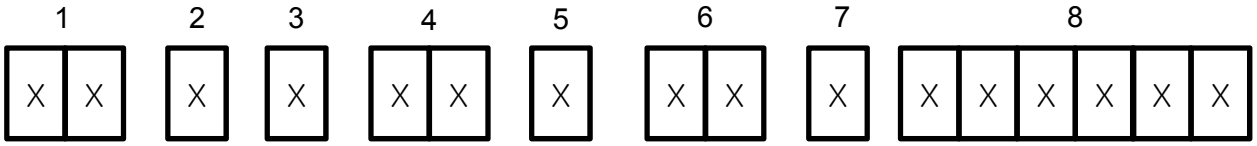
<Table 12. Reliability Test Conditions >

No	Test Item	Conditions
1	High temperature operation test	Ta = 60 °C, 24 hrs
2	Low temperature operation test	Ta = -20 °C, 24 hrs
3	High temperature & high humidity operation test	Ta = 60 ℃, 95%RH, 96hrs
4	8585 test	Ta = 85 ℃, 85%RH, 120hrs
5	Thermal shock	Ta = -40 °C ↔ 85 °C (30min), 30 cycle
6	ALT	Ta = 65 ℃, 93%RH ~-10℃, 240hrs
7	Cold Bubble test	Ta = -20 °C, 48 hrs / 5 times dropping (height of 10cm) iron ball(5.4g, φ11.0)
8	LCM 3point bending test	Speed : 3mm/min, Measurement : the center of the LCM
9	Panel 3point bending test	Speed : 3mm/min, Measurement : the center of the Panel
10	Cell gap strength test	Speed : 5mm/min, Power : 70kgf, 2sec
11	FOG tension strength test	Speed : 50mm/min, MIN 600gf/cm cpk 1↑ The shape of FPC : 1cm at the center of TFT PNL
12	Panel peel-off Strength test	Speed : 5mm/min, spec : min 2kgf , Push jig D=5mm
13	LDI 3point bending test	MIN B10 350Mpa
14	Electro-static discharge test (non-operating)	Air : 150pF, 330ohm, 15KV Contact : 150pF, 330ohm, 8KV

11.0 LABELS

11.1 Product Marking Table

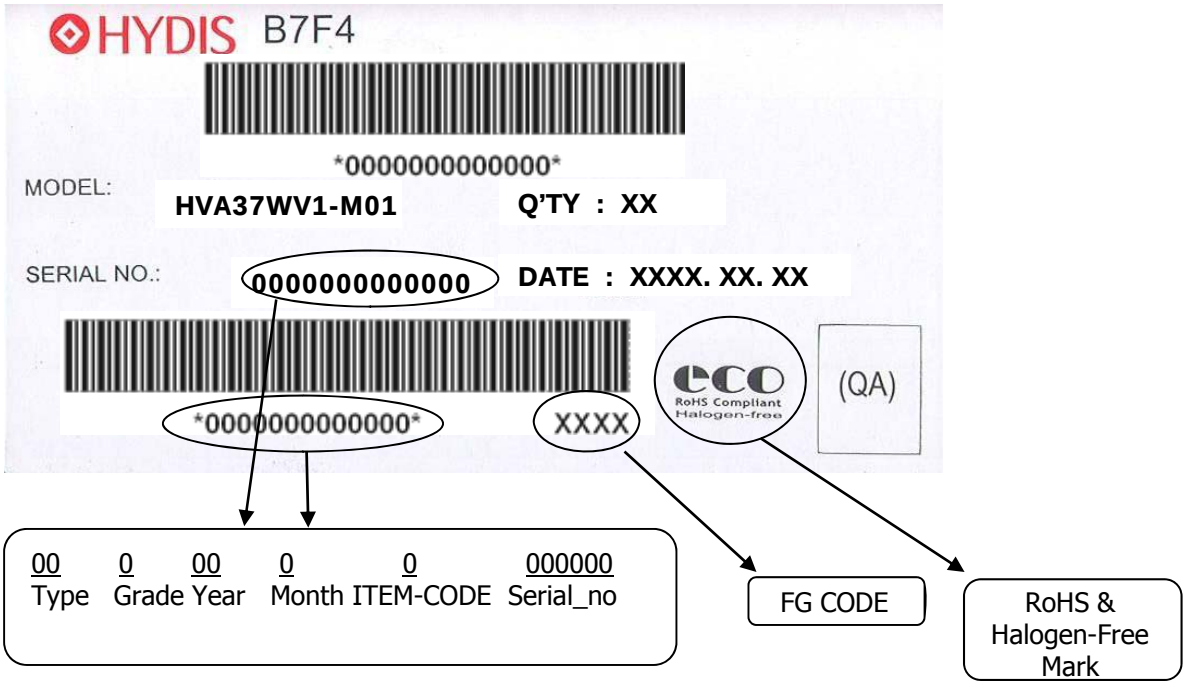
• Barcode (Printed on back cover)



No 1. Control Number
No 2. Grade
No 3. Supplier code
No 4. Year
No 5. Month (1, 2, 3, …, X, Y, Z)
No 6. Day
No 7. Revision code
No 8. Serial Number

11.2 Packing Label

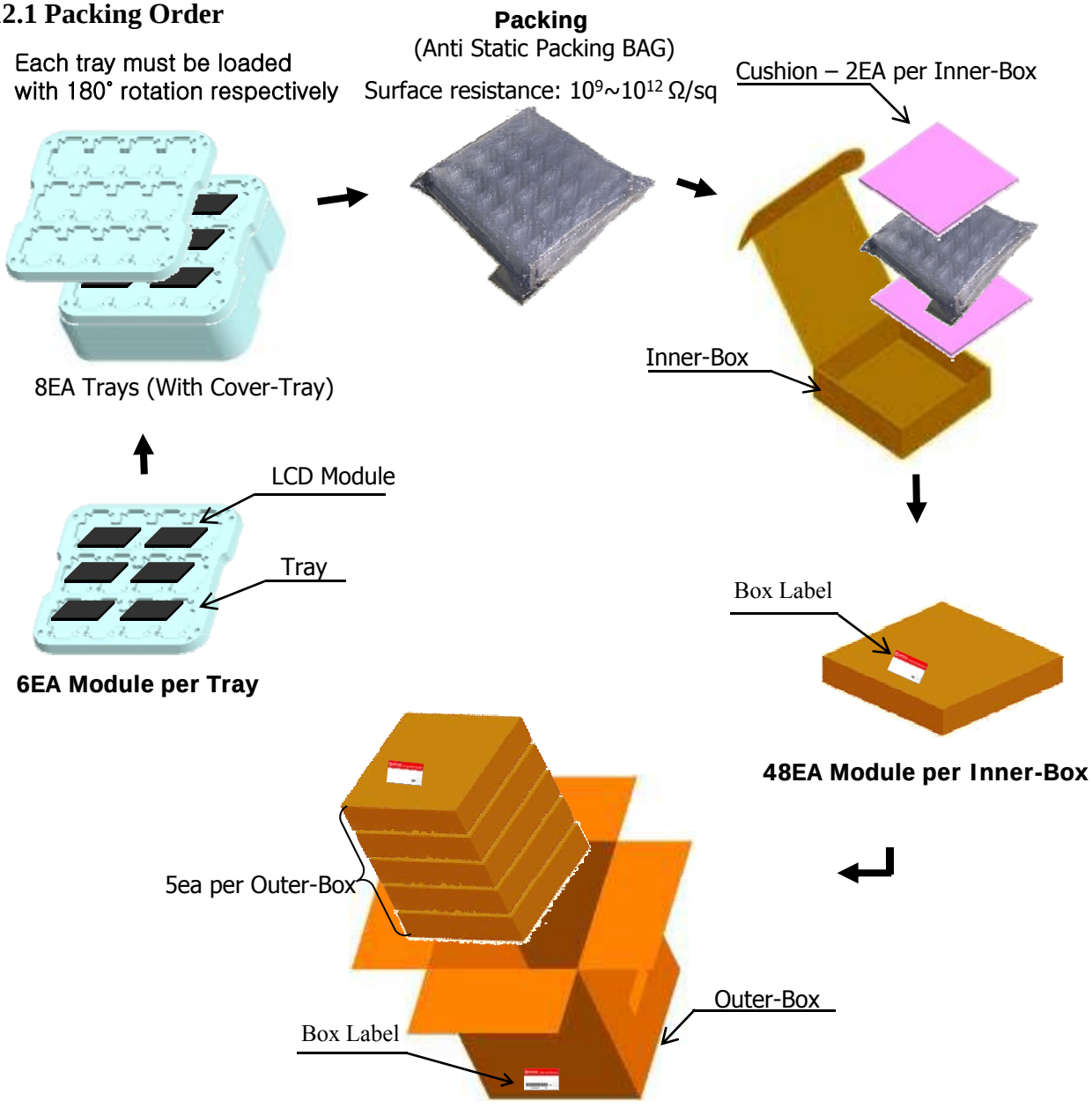
Label Size: 108 mm (L) × 56 mm (W)
Contents
Model: HVA37WV1-M01
Q`ty: Module Q`ty in one box
Serial No.: Box Serial No. See next figure for detail description.
Date: Packing Date
FG Code: FG Code of Product



12.0 PACKING INFORMATION

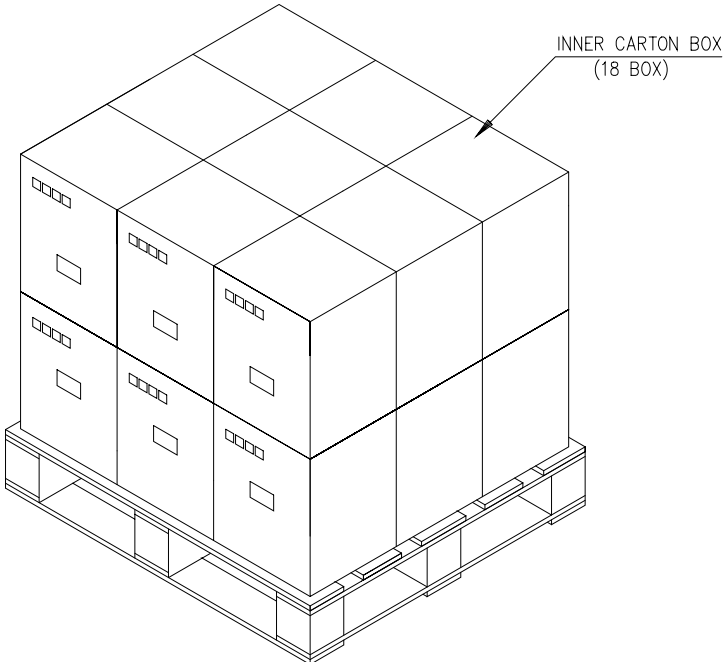
HYDIS provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method and Barcode information are shown in below.

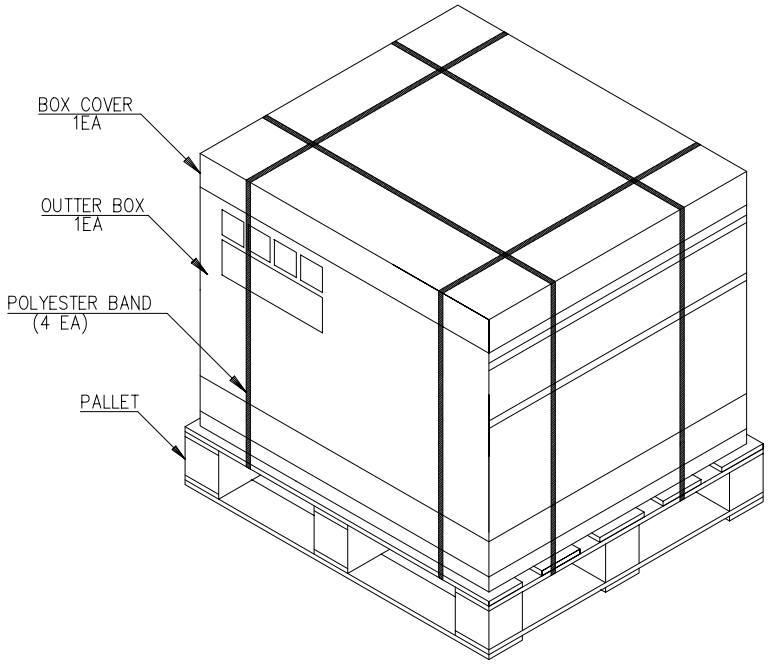
12.1 Packing Order



Notes : 1. Box Dimension: 333mm(W) X 333mm(D) X 435mm(H)
2. Package Quantity in one Box : 240pcs

12.2 Pallet Packing





*** Note**

- Pallet Dimension : : 1100 mm (L) × 1100 mm (W) × 120 mm (H)
- Package Quantity in one Box : 240pcs
- Box Quantity in one Pallet : 18box

13.0 HANDLING & CAUTIONS

(1) Cautions when taking out the module
- Pick the pouch only, when taking out module from a shipping package.

(2) 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.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

(3) Cautions for the operation
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

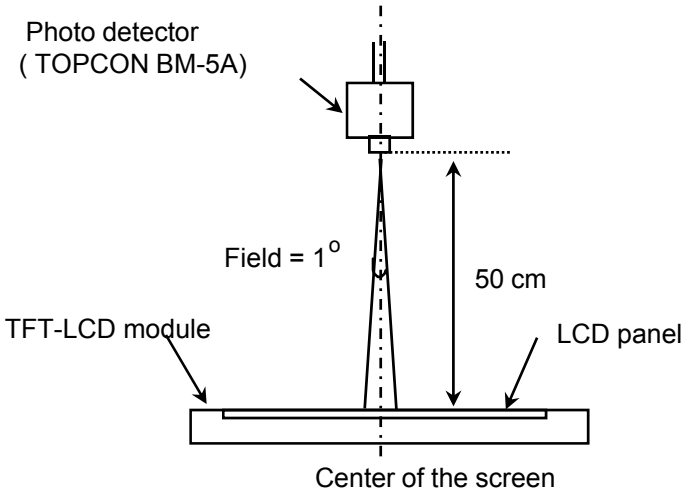
(4) Cautions for the atmosphere
- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(5) Cautions for the module characteristics
- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

(6) Other cautions
- Do not disassemble and/or re-assemble LCD module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages

14.0 APPENDIX

Figure 1. Measurement Set Up



Optical characteristics measurement setup

Figure 2. White Luminance (Center point) and Uniformity Measurement Locations (9 points)

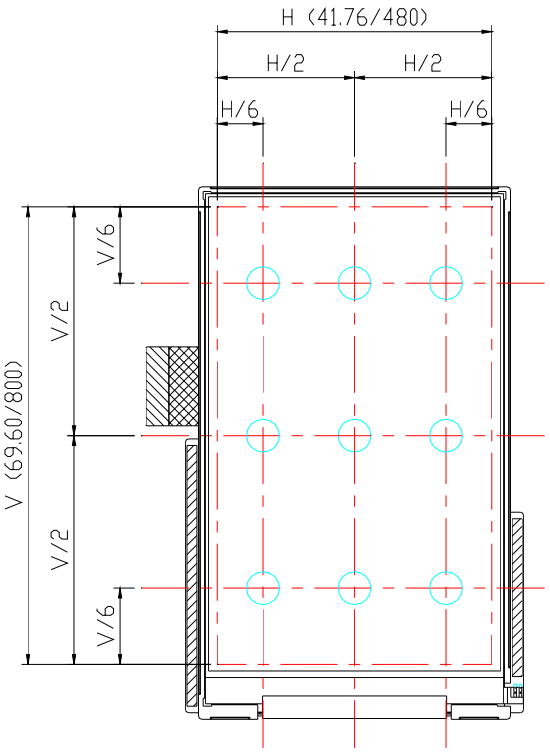


Figure 3. Response Time Testing

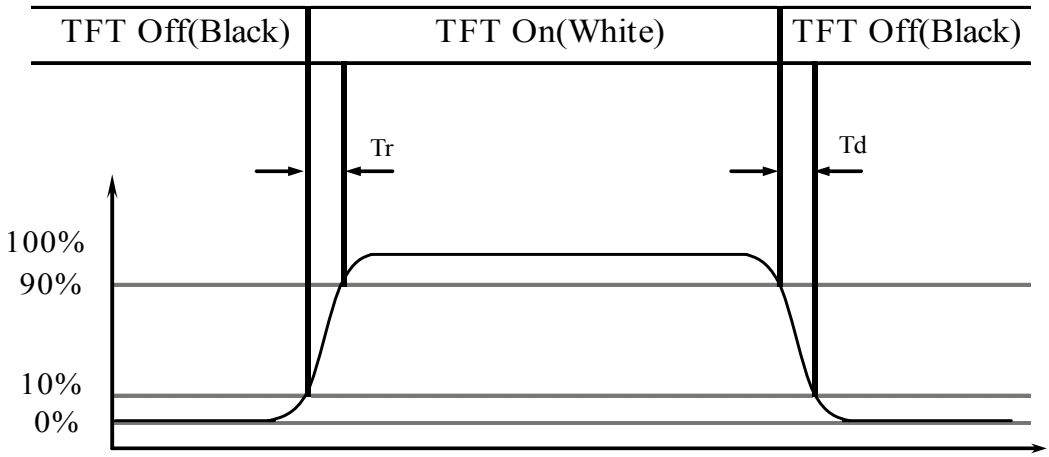
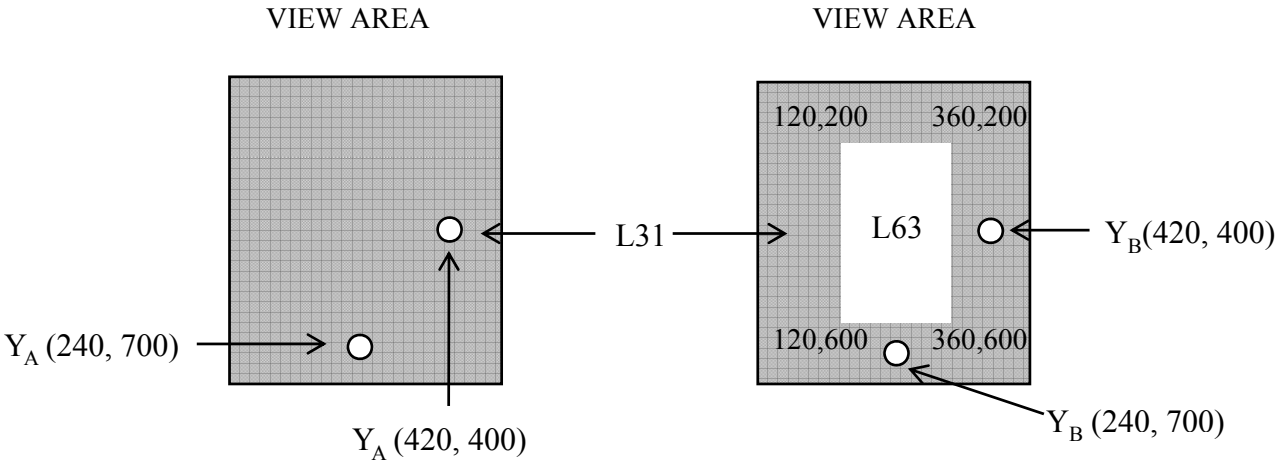


Figure 4. Cross Modulation Test Description



$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_B} \right| \times 100$$

Where:

Y_A = Initial luminance of measured area (cd/m^2)

Y_B = Subsequent luminance of measured area (cd/m^2)

The location measured will be exactly the same in both patterns

Figure 5. TFT-LCD Module Outline Dimension

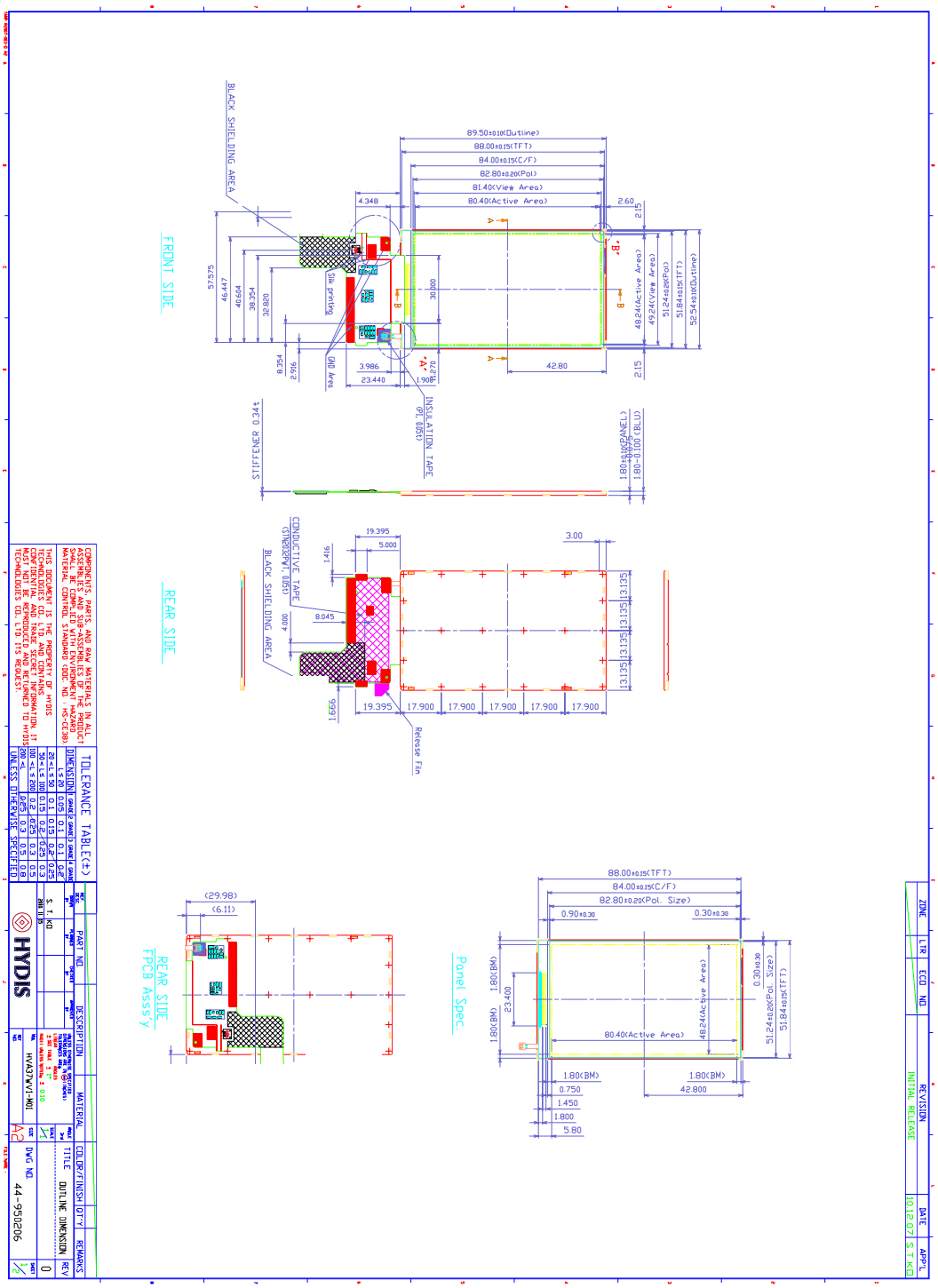


Figure 5. TFT-LCD Module Outline Dimension

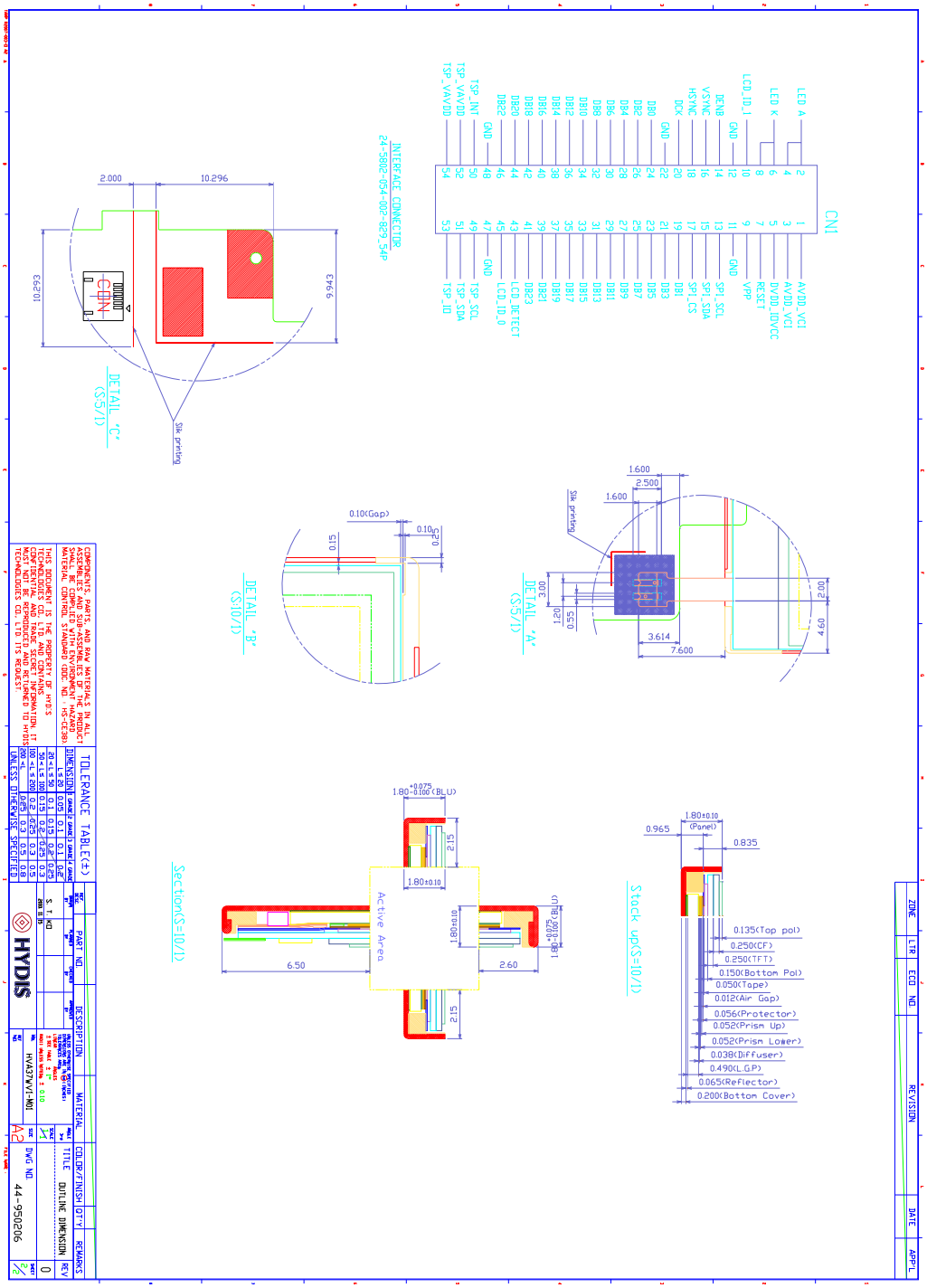


Figure 6. Circuit Diagram