Product Specification For TFT Module

Model Name	XF4851920360B-ILHL
Customer	
Note	

■Preliminary Specification

☐Final Specification

☐CUSTOMER'S APPROVAL
BY: DATE:

Comment

PRESENTED BY
XinSunDisplay.Integration 2023.11.02 APPROVAL

Contents   Page

3.Record of Revision

Date	Ver.	Description	Page
		Ver.00	

4. General Specisications

It is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses the amorphous silicon TFT as a switching devices. This model is composed of a Transmissive type TFT-LCD Panel, a driver circuit and a back-light unit. The resolution of a 48.5 inch LCD contains 1920RGB x360 pixels.
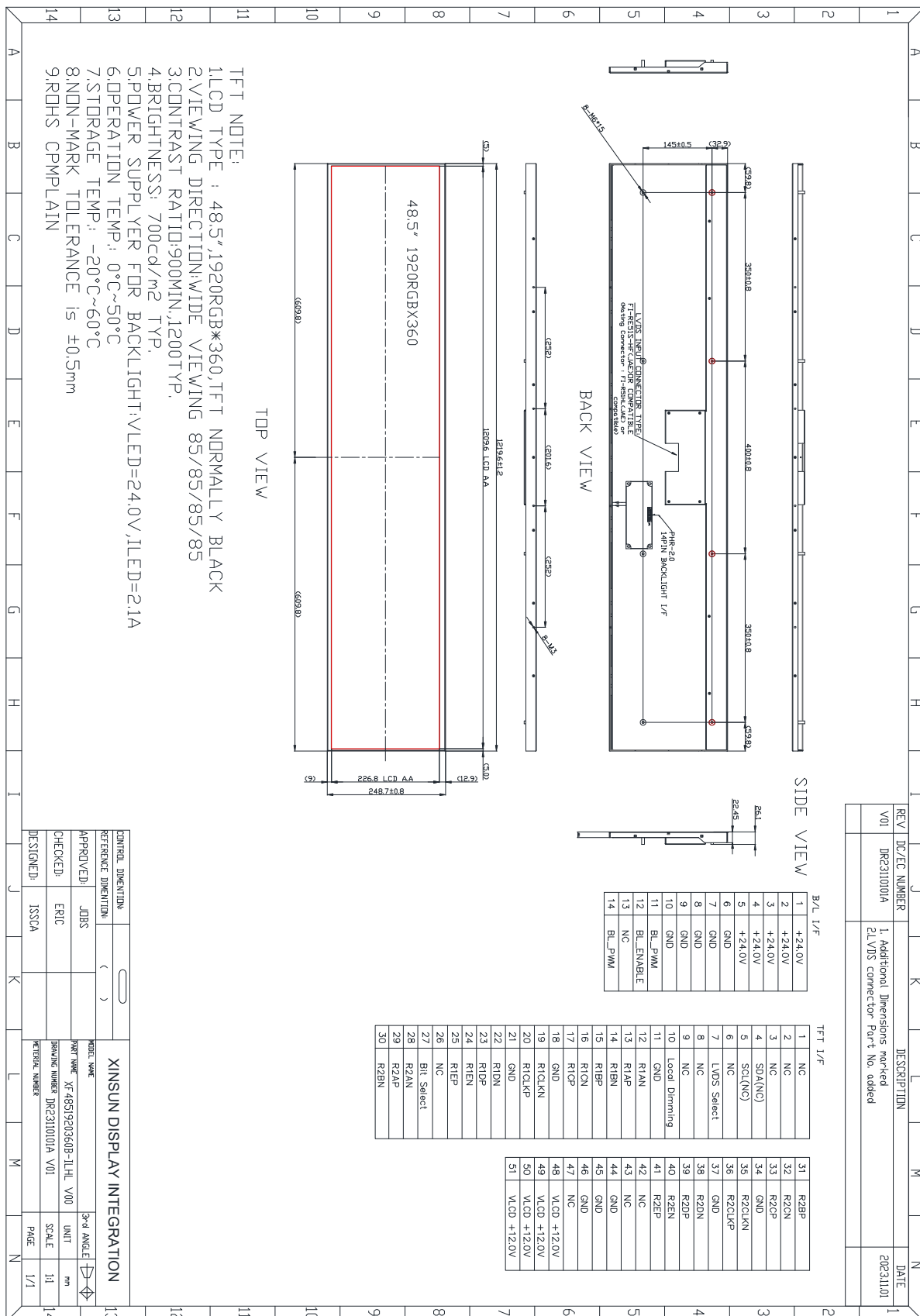
4.1 Features

--Wide viewing angle

--High contrast ratio

--Super Fast response time

--High color saturation

--1920*360 Pixels resolution

-- High Brightness

4.2 General Specisications

Item	Standard Value	Unit
Screen Size	48.5	Inch
Dot Matrix	1920(RGB)*360	-
Color Depth	10bit(D), 1.07Billon colors	-
Module Dimension	1219.6(W)*248.7(H)*26.1(T)	mm
Active Area	1209.6(W)*226.8(H)	mm
Pixel Pitch	0.630(W)*0.630(H)	mm
Color Arrangement	RGB-stripe	-
LCD Type	a-Si TFT,TRANSMISSIVE, Normally Black	-
Backlight type	LED,WHITE	-
Interface	LVDS	-
Weight	TBD	-

5.Mechanical Drawing and Interface

TFT NOTE:
1.LCD TYPE : 48.5"1920RGB*360,TFT NORMALLY BLACK
2.VIEWING DIRECTION:WIDE VIEWING 85/85/85/85
3.CONTRAST RATIO:900MIN.,1200TYP.
4.BRIGHTNESS: 700cd/m2 TYP.
5.POWER SUPPLYER FOR BACKLIGHT:VLED=24.0V,ILED=2.1A
6.OPERATION TEMP.: 0℃~50℃
7.STORAGE TEMP.: -20℃~60℃
8.NON-MARK TOLERANCE is ±0.5mm
9.ROHS CPMPLAIN

TOP VIEW

BACK VIEW

SIDE VIEW

LVDS INPUT CONNECTOR TYPE/
FI-RE51S-HF,CAE/JDR COMPATIBLE
Mating Connector: FI-R51HL(AD) or compatible

PHR-2.0 14PIN BACKLIGHT I/F

48.5" 1920RGBX360

Dimensions: 145±0.5, (32.9), 350±0.8, 400±0.8, 350±0.8, 248.7±0.8, 226.8 LCD AA, 1219.6 LCD AA, (609.8), (252), (201.6), (9), (12.9)

B/L I/F	
1	+24.0V
2	+24.0V
3	+24.0V
4	+24.0V
5	+24.0V
6	GND
7	GND
8	GND
9	GND
10	GND
11	BL_PWM
12	BL_ENABLE
13	NC
14	BL_PWM

TFT I/F					
1	NC	18	GND	35	R2CLKN
2	NC	19	R1CLKN	36	R2CLKP
3	NC	20	R1CLKP	37	GND
4	SDA(NC)	21	GND	38	R2DN
5	SCL(NC)	22	R1DN	39	R2DP
6	NC	23	R1DP	40	R2EN
7	LVDS Select	24	R1EN	41	R2EP
8	NC	25	R1EP	42	NC
9	NC	26	NC	43	NC
10	Local Dimming	27	Bit Select	44	GND
11	GND	28	R2AN	45	GND
12	R1AN	29	R2AP	46	GND
13	R1AP	30	R2BN	47	NC
14	R1BN	31	R2BP	48	VLCD +12.0V
15	R1BP	32	R2CN	49	VLCD +12.0V
16	R1CN	33	R2CP	50	VLCD +12.0V
17	R1CP	34	GND	51	VLCD +12.0V

REV	DC/EC NUMBER	DESCRIPTION	DATE
V01	DR23110101A	1. Additional Dimensions marked 2.LVDS connector Part No. added	2023.11.01

DESIGNED:		
CHECKED:	ERIC	
APPROVED:	JDBS	
REFERENCE DIMENTION	( )	
CONTROL DIMENTION	ISSCA	

MODEL NAME
PART NAME XF 48519203360B-ILHL V00
DRAWING NUMBER DR23110101A V01
MATERIAL NUMBER

XINSUN DISPLAY INTEGRATION

3rd ANGLE
UNIT mm
SCALE 1:1
PAGE 1/1

5.1 Interface Pin Descriptio

5.1.1 Interface for TFT Module

- LCD Connector(CN1): FI-RXE51S-HFS, (manufactured by JAE) or compatible
- Mating Connector : FI-R51HL(JAE) or compatible

Pin No.	Symbol	I/O	Description	Note
1~3	NC	-	No connection	
4	SDA	I/O	SDA	
5	SCL	I	SCL	
6	NC	-	No connection	
7	LVDS Select	I	"H" =JEIDA , "L" = VESA	
8~9	NC	-	No connection	
10	Local Dimming	I	"H" =Enable only	
11	GND	P	Ground	
12	R1AN	I	FIRST LVDS Receiver Signal (A-	
13	R1AP	I	FIRST LVDS Receiver Signal (A+)	
14	R1BN	I	FIRST LVDS Receiver Signal (B-)	
15	R1BP	I	FIRST LVDS Receiver Signal (B+)	
16	R1CN	I	FIRST LVDS Receiver Signal (C-)	
17	R1CP	I	FIRST LVDS Receiver Signal (C+)	
18	GND	P	Ground	
19	R1CLKN	I	FIRST LVDS Receiver Clock Signal(-)	
20	R1CLKP	I	FIRST LVDS Receiver Clock Signal(+)	
21	GND	P	Ground	
22	R1DN	I	FIRST LVDS Receiver Signal (D-)	
23	R1DP	I	FIRST LVDS Receiver Signal (D+)	
24	R1EN	I	FIRST LVDS Receiver Signal (E-)	
25	R1EP	I	FIRST LVDS Receiver Signal (E+)	
26	NC	-	No connection	
27	Bit Select	I	"H" or NC = 10bit(D), "L" = 8bit	
28	R2AN	I	SECOND LVDS Receiver Signal (A-)	
29	R2AP	I	SECOND LVDS Receiver Signal (A+)	
30	R2BN	I	SECOND LVDS Receiver Signal (B-)	
31	R2BP	I	SECOND LVDS Receiver Signal (B+)	
32	R2CN	I	SECOND LVDS Receiver Signal (C-)	
33	R2CP	I	SECOND LVDS Receiver Signal (C+)	
34	GND	P	Ground	

35	R2CLKN	I	SECOND LVDS Receiver Clock Signal(-)	
36	R2CLKP	I	SECOND LVDS Receiver Clock Signal(+)	
37	GND	P	Ground	
38	R2DN	I	SECOND LVDS Receiver Signal (D-)	
39	R2DP	I	SECOND LVDS Receiver Signal (D+)	
40	R2EN	I	SECOND LVDS Receiver Signal (E-)	
41	R2EP	I	SECOND LVDS Receiver Signal (E+)	
42~43	NC	-	No connection	
44~46	GND	P	Ground	
47	NC	-	No connection	
48~51	VLCD	P	Power Supply +12.0V	

Note:

1. P: POWER I: Input O: Output .

2. All GND (ground) pins should be connected together to the LCD module"s metal frame.

3. All VLCD (power input) pins should be connected together.

4. All Input levels of LVDS signals are based on the EIA 644 Standard.

5. LVDS pin (pin No. #24,25,40,41) are used for 10Bit(D) of the LCD module.

   If used for 8Bit(R), these pins are no connection.

6. Specific pin No. #44 is used for "No signal detection" of system signal interface.

   It should be GND for NSB (No Signal Black) while the system interface signal is not.

   If this pin is "H", LCD Module displays AGP (Auto Generation Pattern).

6.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

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	VLCD	-0.3	14.0	V	Note1
T-Con Option Selection Voltage	VLOGIC	-0.3	4.0	V	Ta =25 °C+/-2.0°C
Operating Temperature	T_{OP}	0	+50	°C	Note2, Note3
Storage Temperature	T_{ST}	-20	+60	°C	

Notes :

1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.

2. Ambient temperature condition (Ta = 25+/-2°C)

3. Temperature and relative humidity range are shown in the figure below.
   Wet bulb temperature should be Max 39°C, and no condensation of water.

4. The maximum operating temperatures is based on the test condition that the surface temperature of display area is less than or equal to 68°C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 68℃. The range of operating temperature may be degraded in case of improper thermal management in final product design.

5. Gravity mura can be guaranteed below 40°C and under backlight luminance 700nit conditio
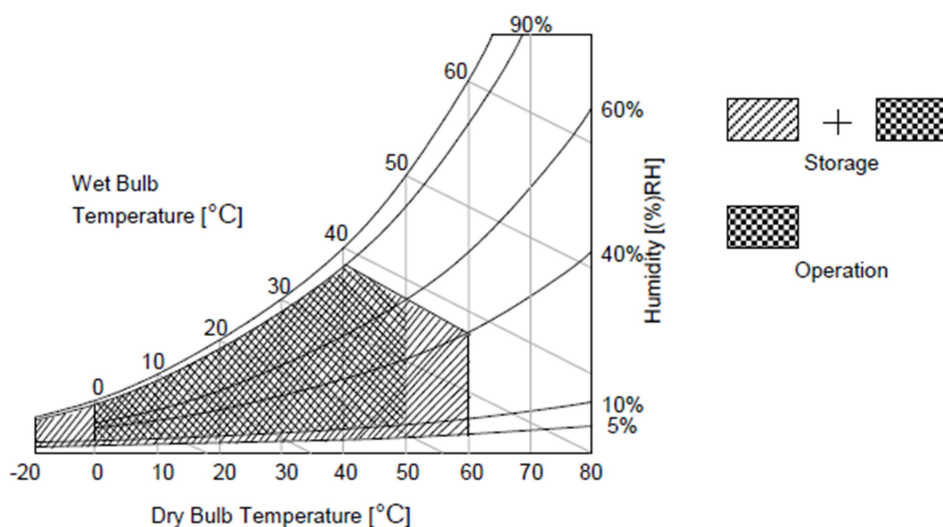
7.Electrical Characteristics

7.1 TFT-LCD panel driving

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Circuit :							
Power Input Voltage		V_{LCD}	10.8	12.0	13.2	V_{DC}	
Power Input Current		I_{LCD}	-	625	810	mA	1
			-	820	1065	mA	2
T-CON Option Selection Voltage	Input High Voltage	V_{IH}	2.7	-	3.6	V_{DC}	
	Input Low Voltage	V_{IL}	0	-	0.7	V_{DC}	
Power Consumption		P_{LCD}	-	7.5	9.8	Watt	1
			-	9.8	12.7	Watt	2
Rush current		I_{RUSH}	-	-	6	A	3

Notes :

1. The specified current and power consumption are under the VLCD=12.0V, Ta=25+/-2°C, fV=60Hz condition, and mosaic pattern(8 x 6) is displayed and fV is the frame frequency.
2. The current is specified at the maximum current pattern.
3. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.).
4. Ripple voltage level is recommended under ±5% of typical voltage

White : 1023 Gray
Black :　　0 Gray
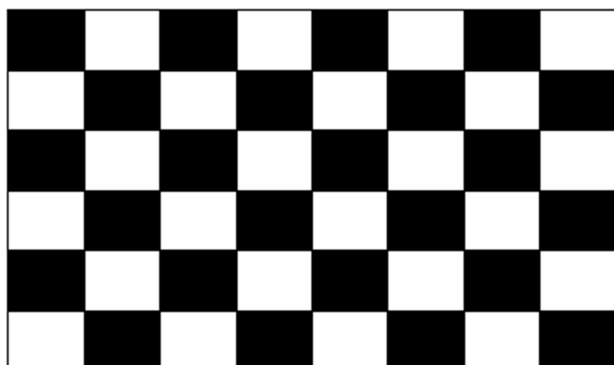
White : 1023 Gray

Mosaic Pattern(8 x 6)

Max Current Pattern

7.2 DC Characteristics for Backlight(B/L)

Ta=25℃

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage for LED Backlight Driver	VLED		-	24.0	-	V
Supply Current for LED Backlight Driver	ILED		-	(2.1)	-	A
LED Driver ON/OFF	ON		2.0	-	5.0	V
	OFF		0	-	1	V
PWM Control Level	V_{PWM}		0	-	5.0	V
Brightness Control Frequency	fPWM		90	-	800	Hz
Brightness Control Duty Ratio	Duty		1	-	100	%
LED Dice Life Time(Note3)	-		-	50,000	-	Hr

Note

1. The LED of B/L is drive by current only, drive voltage is for reference only.
   drive voltage can make driving current under safety area.(under maximum).
2. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 60 minutes at 25±2°C. The specified current and power consumption are under the typical supply Input voltage 24V and VBR (Duty : 100%), it is total power consumption.
3. The life time (MTTF) is determined as the time which luminance of the LED is 50% compared to that of initial value at the typical LED current (Duty : 100%) on condition of continuous operating in LCM state at 25±2°C.
4. The duration of rush current is about 200ms. This duration is applied to LED on time.

8.Optical Characteristics and Definitions

8.1 Optical Characteristics   Ta = 25°C

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness		B		-	700	-	cd/m^2	(1)
Contrast Ratio		C/R		900	1200	-	-	(2)
Response Time		Tr+Tf	θ=0° Normal viewing angle At the center of panel	-	25	40	ms	(3)
Color chromaticity (CIE)	Red	Rx		Typ – 0.03	0.663	Typ + 0.03	-	-
		Ry			0.325			
	Green	Gx			0.280			
		Gy			0.592			
	Blue	Bx			0.134			
		By			0.117			
	White	Wx			0.314			
		Wy			0.330			
Viewing Angle	Top	θ$_U$	CR≥10 Backlight On	-	89	-	degrees	(4)
	Bottom	θ$_D$		-	89	-		
	Left	θ$_L$		-	89	-		
	Right	θ$_R$		-	89	-		
Uniformity		Un	θ=0° Normal viewing angle	70	-	--	%	(5)

8.2 Definition of Optical Characteristics

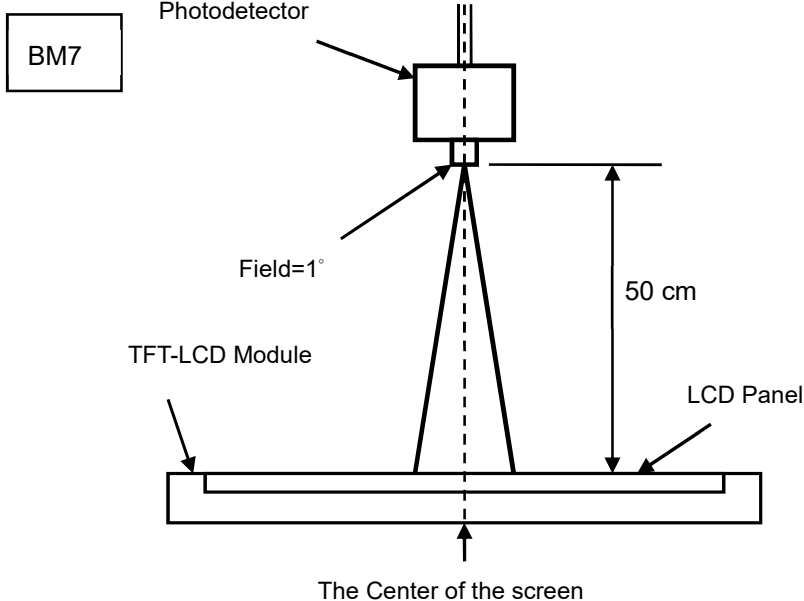Note:Definition of LCD driving voltage and waveform
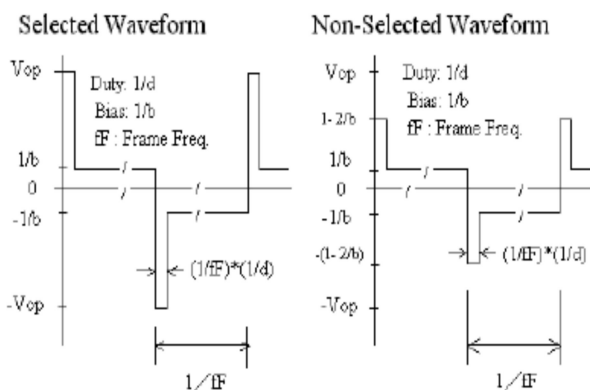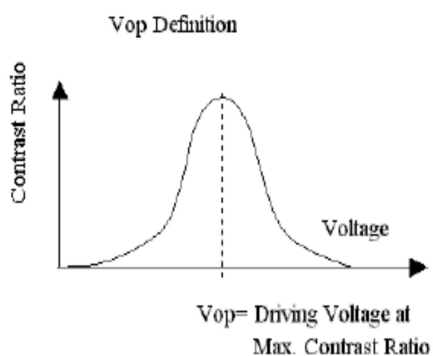
Note 1: The brightness test equipment setup

VLED=24.0V, Field=1°

(As measuring "black" image, field=1°
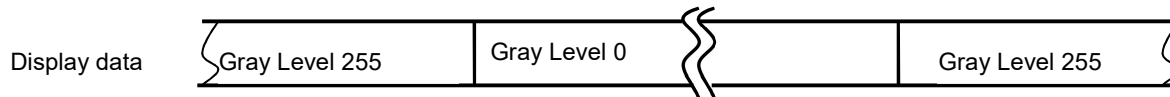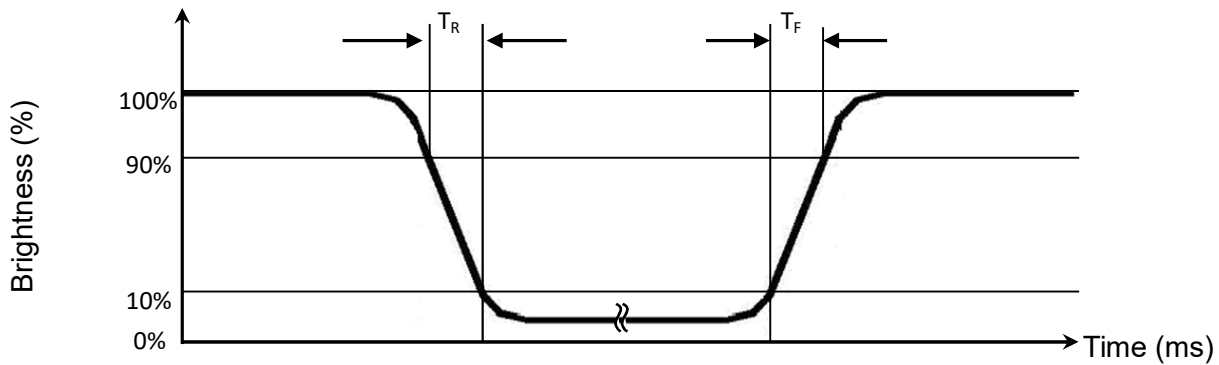
Is the best testing condition.)

BM7

Photodetector

Field=1°

50 cm

TFT-LCD Module

LCD Panel

The Center of the screen

Note 2: Definition of contrast Ratio (C.R)

$$C.R = \frac{\text{Brightness When LCD is at "White" State}}{\text{Brightness When LCD is at "Black" State}}$$

Note 3: Definition of response time

Note 4: Definition of viewing angle
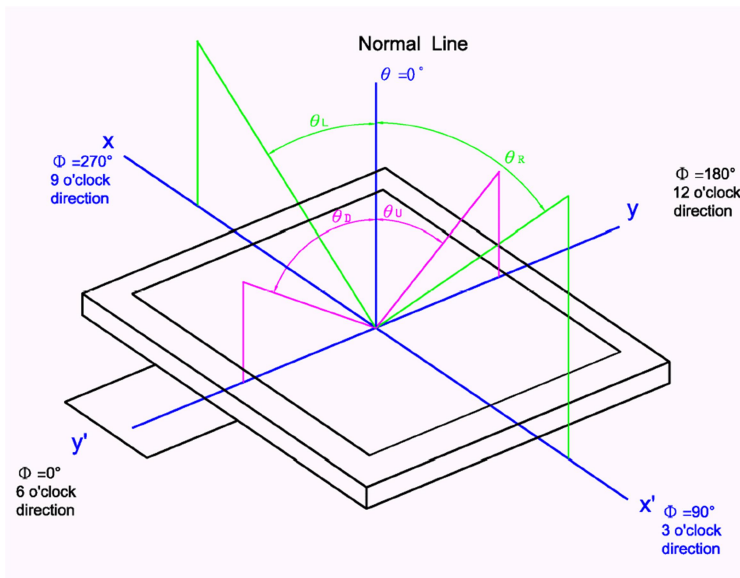
Note 5: Definition of uniformity (Un)

$$\text{Brightness Uniformity} = \frac{\text{Minimum Brightness of Point 1~9}}{\text{Maximum Brightness of Point 1~9}}$$
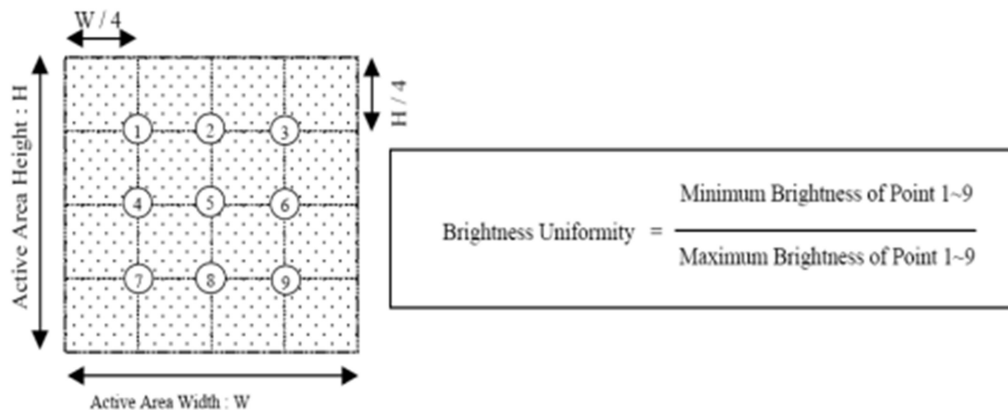
Note 6:

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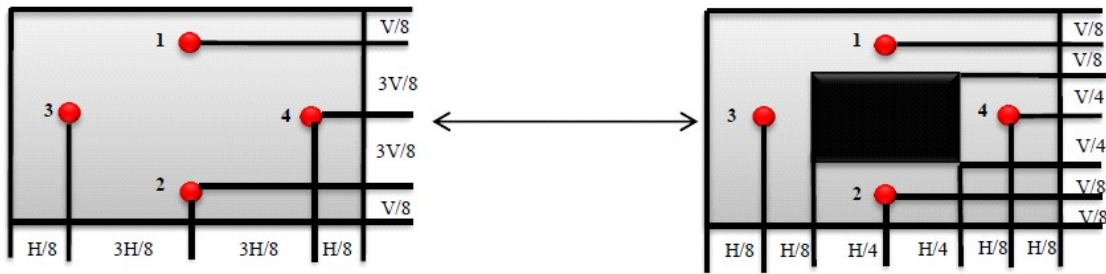
$$\text{Cross Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Figure . Cross Talk Modulation Test Description

Where:

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

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

The location 1/2/3/4 measured will be exactly the same in both patterns. The test background gray is from L64 to L192.Take the largest data as the result.

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 dark.(Refer to Figure)

Note 7: In a Dark Room.

9. Timing characteristics of input signals
9.1 TIMING TABLE for NTSC & PAL (DE Only Mode)

Table shows the signal timing required at the input of the LVDS transmitter. All of the interface signal timings should be satisfied with the following specification for normal operation.
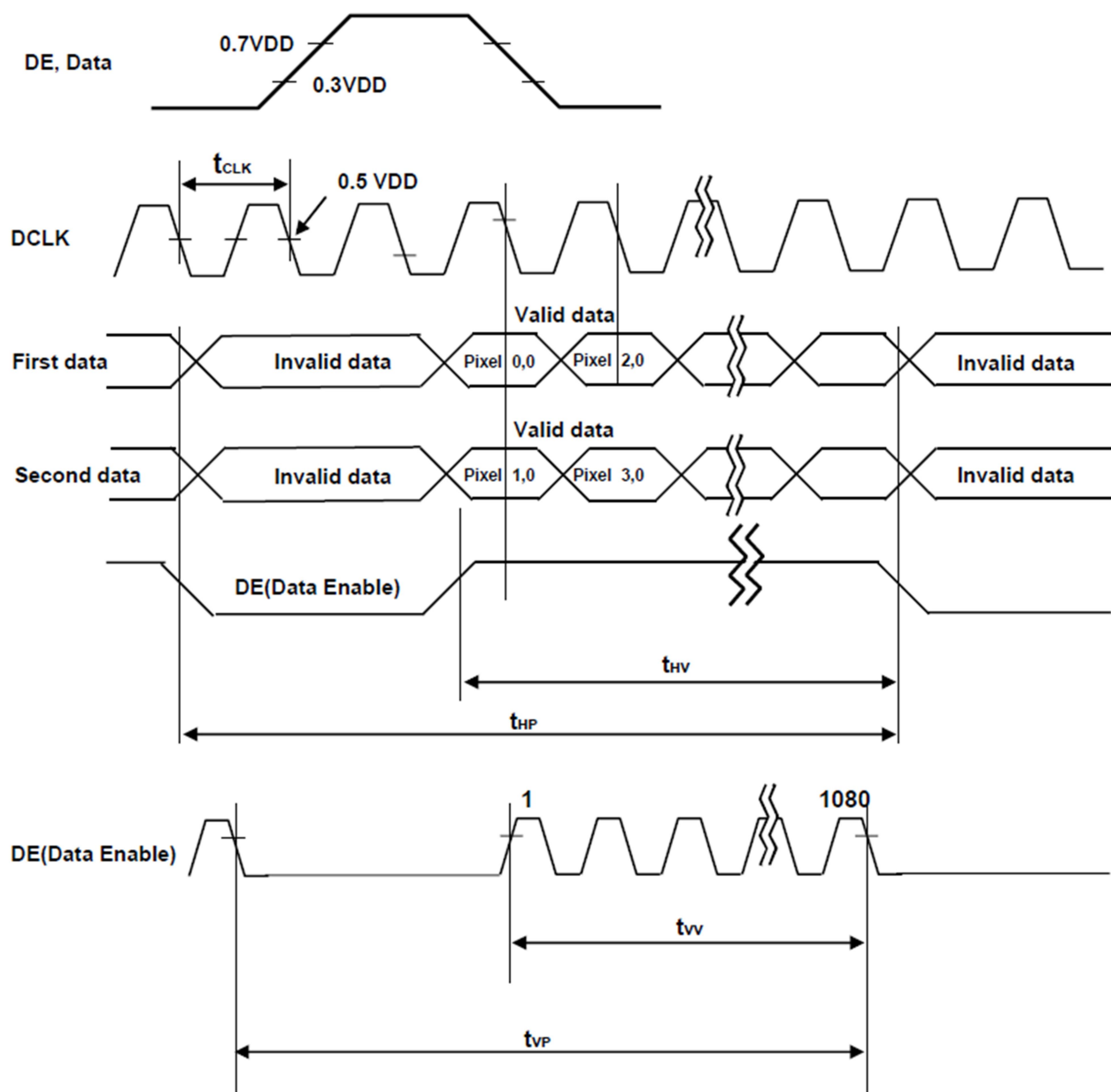
ITEM		Symbol	Min	Typ	Max	Unit	notes
Horizontal	Display Period	tHV	960	960	960	tCLK	1920 / 2
	Blank	tHB	100	140	240	tCLK	1
	Total	tHP	1060	1100	1200	tCLK	
Vertical	Display Period	tVV	1080	1080	1080	Lines	
	Blank	tVB	20	45	300	Lines	1
	Total	tVP	1100	1125	1380	Lines	

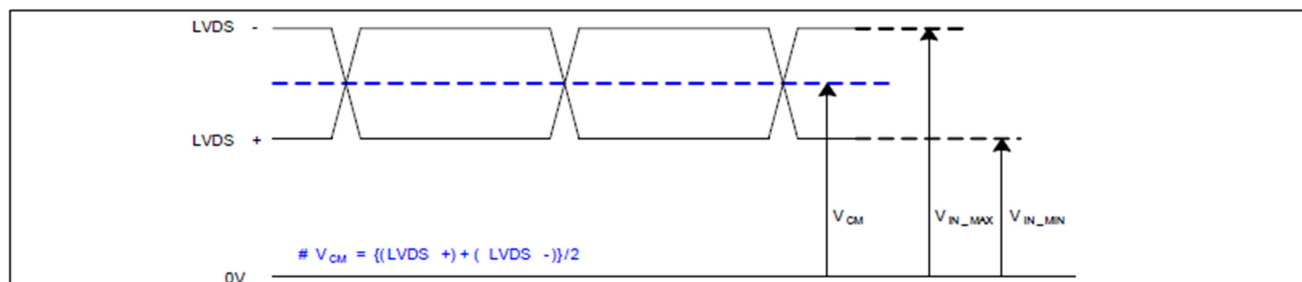| ITEM		Symbol	Min	Typ	Max	Unit	notes
Frequency	DCLK	fCLK	60.00	74.25	78.00	MHz	
	Horizontal	fH	57.3	67.5	70	KHz	2
	Vertical	fV	47	60	63	Hz	2

Note:

1. The input of HSYNC & VSYNC signal does not have an effect on normal operation (DE Only Mode). If you use spread spectrum of EMI, add some additional clock to minimum value for clock margin.
2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency
3. Spread Spectrum Rate (SSR) for 50KHz ~ 100kHz Modulation Frequency(FMOD) is calculated by (7 – 0.06*Fmod), where Modulation Frequency (FMOD) unit is KHz.LVDS Receiver Spread spectrum Clock is defined as below figure

※ Timing should be set based on clock frequency.

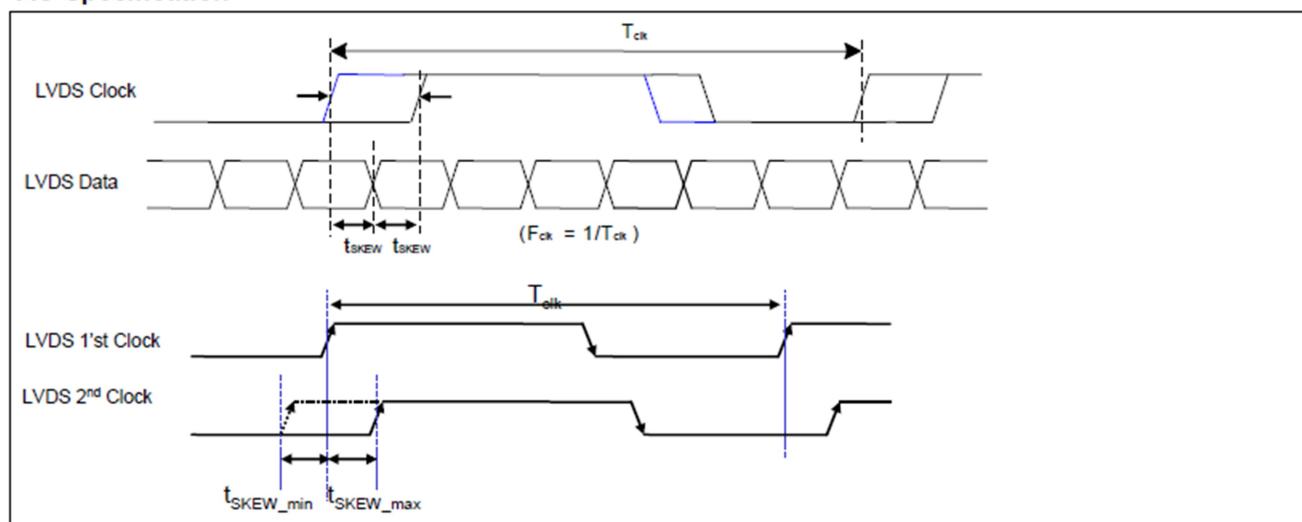## 9.2 LVDS Input Signal Timing Diagram

9.3 LVDS Input Signal Characteristics

DC Specification

$$\# V_{CM} = \{(LVDS\ +) + (\ LVDS\ -)\}/2$$

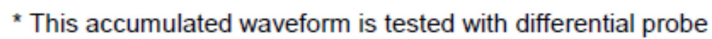| Description	Symbol	Min	Max	Unit	notes
LVDS Common mode Voltage	V_{CM}	1.0	1.5	V	-
LVDS Input Voltage Range	V_{IN}	0.7	1.8	V	-
Change in common mode Voltage	ΔVCM	-	250	mV	-

AC Specification

$(F_{ck} = 1/T_{ck})$

| Description	Symbol	Min	Max	Unit	notes
LVDS Differential Voltage	V_{TH}	100	600	mV	Tested with Differential Probe
	V_{TL}	-600	-100	mV	2
LVDS Clock to Data Skew	t_{SKEW}	-	$\lvert(0.25*T_{clk})/7\rvert$	ps	-
Effective time of LVDS	t_{eff}	$\lvert\pm360\rvert$	-	ps	-
LVDS Clock to Clock Skew (Even to Odd)	t_{SKEW_EO}	-	$\lvert1/7*T_{clk}\rvert$	ps	-

Note:

1. All Input levels of LVDS signals are based on the EIA 644 Standard.

2. LVDS Differential Voltage is defined within teff

* This accumulated waveform is tested with differential probe

9.4 Color Data Input Assignment

The brightness of each primary color (red, green, blue) is based on the 10bit gray scale data input for the color.The higher binary input, the brighter the color. Table provides a reference for color versus data input.

COLOR DATA REFERENCE

Color		Input Color Data		
		RED MSB · · · · · · · · LSB R9 R8 R7 R6 R5 R4 R3 R2 R1 R0	GREEN MSB · · · · · · · · LSB G9 G8 G7 G6 G5 G4 G3 G2 G1 G0	BLUE MSB · · · · · · · · LSB B9 B8 B7 B6 B5 B4 B3 B2 B1 B0
Basic Color	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
	Red (1023)	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
	Green (1023)	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0
	Blue (1023)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1
	Cyan	0 0 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
	Magenta	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0	1 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 1 1 1 1	0 0 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 1 1 1 1 1 1
RED	RED (0000)	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
	RED (0001)	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 0 0 0
	…	…	…	…
	RED (1022)	1 1 1 1 1 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
	RED (1023)	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
GREEN	GREEN (0000)	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
	GREEN (0001)	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
	…	…	…	…
	GREEN (1022)	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 0	0 0 0 0 0 0 0 0 0 0
	GREEN (1023)	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0
BLUE	BLUE (0000)	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
	BLUE (0001)	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
	…	…	…	…
	BLUE (1022)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 0
	BLUE (1023)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1

9.5 Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below.
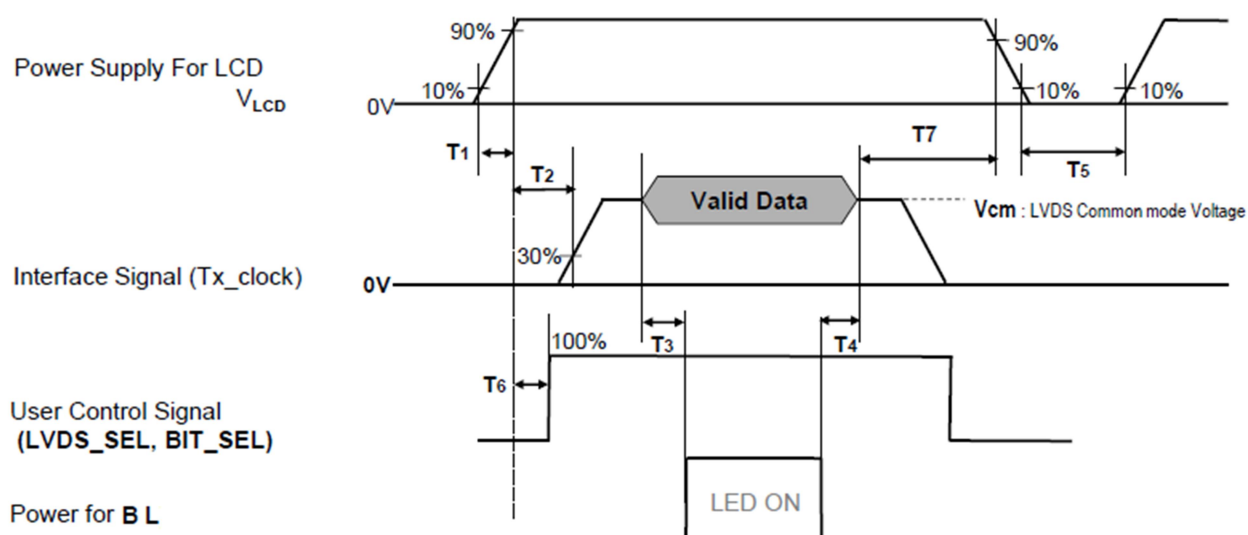
POWER SEQUENCE

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5	-	20	ms	1
T2	0	-	-	ms	2
T3	400	-	-	ms	3
T4	100	-	-	ms	3
T5	1.0	-	-	s	4
T6	0	-	T2	ms	5
T7	0	-	-	ms	6

Note:

1. Even though T1 is over the specified value, there is no problem if I2T spec of fuse is satisfied.

2. If T2 is satisfied with specification after removing LVDS Cable, there is no problem.

3. The T3 / T4 is recommended value, the case when failed to meet a minimum specification,

abnormal display would be shown. There is no reliability problem.

4. T5 should be measured after the Module has been fully discharged between power off and on period.

5. If the on time of signals (Interface signal and user control signals) precedes the on time of Power (VLCD),

it will be happened abnormal display. When T6 is NC status, T6 doesn"t need to be measured.

6. It is recommendation specification that T7 has to be 0ms as a minimum value.

※ Please avoid floating state of interface signal at invalid period.

※ When the power supply for LCD (VLCD) is off, be sure to pull down the valid and invalid data to 0V.

10. Reliability Test

No	Items	Condition	INSPECTION AFTER TEST
1	High temperature operating	50℃,240 hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects:
2	Low temperature operating	0℃,240 hours	1, Air bubble in the LCD.
3	High temperature storage	60℃,240 hours	2, Seal leak. 3, Non-display.
4	Low temperature storage	-20℃,240 hours	4, Missing segments. 5, Glass crack.
5	High temperature and humidity storage	50℃,50%RH,240 hours	6, Current IDD is twice higher than initial value.
6	Thermal Shock storage	0℃←————→50℃ 30min 5min 30min after 5 cycle, Restore 2H at 25℃Power off	7, The surface shall be free from damage. 8, The electric characteristic requirements shall be satisfied.
7	Room temperature and humidity storage	25℃,60%,no dew	

NOTE:

1.The Test samples should be applied to only one test item.

2.Sample side for each test item is 5~10pcs.

3.For Damp Proof Test, Pure water(Resistance＞10MΩ)should be used.

4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.

5.Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11.Precautions in Use of TFT LCM

11.1 Safety
1.If the LCD panel breaks,be careful not to get the liquid crystal to touch your skin.
2.If the liquid crystal touches your skin or clothes,please wash it off immediately by using
  Soap and water.

11.2 Handling
1.Avoid any strong mechanical shock which can break the glass.
2.Do not remove the panel or frame from the module.
3.The polarizing plate of the display is very fragile.So,please handle it very carefully and
  do not touch,push or rub the exposed polarizing.
4.Do not touch the display area with bare hands,this will stain the display area.
5.Do not wipe the polarizing plate with a dry cloth,as it may easily scratch the surface of plate.
6.Do not use ketonics solvent and Aromatic solvent,use with a soft cloth soaked with a cleaning
  Naphtha solvent.
7.To avoid organic solvent(include liquid)stained on LCM.

11.3 Storage
1.Store the panel or module in a dark place where the temperature is 25℃±5℃ and in a relative
  Humidity of 40~60%RH.
2.Store in a clean environment ,do not place the module near organics solvent
  or corrosive gases.
3.Do not crush,shake,or jolt the module.
4.Store in anti-static electricity container.

11.4 Soldering
1.Use a no leakage soldering iron and the high quality solder.
2.To control temperature and time of soldering conditions is 280±10℃ and 3~5sec.
3.Soldering:only to the I/O terminals.
4.Rewiring:no more than 3 times.

11.5 Static electricity warning
1.The TFT Module uses CMOS LSI technology. Therefore strict measures to avoid static
  electricity discharge are followed through all processes from manufacturing through shipping.
  So attention to the following:

(1) Always use a ground strap when handling a TFT Module

    Always use a ground strap while working with the module, from the time it is taken out of the anti-static bag until it is assembled. When it is necessary to transfer the LCM, once it has been taken out of the bag, always place it in an electric conductive container. Avoid wearing clothes made of chemical fibers, the use of cotton or conductive treated fiber clothing is recommended.

(2) Do not take the TFT Module from its anti-static bag until it's to be assembled. LCM's are individually packaged in bags specially treated to resist static electricity.
When storing, keep the TFT Module packed in the original bags, or store them in a container processed to be resistant to static electricity, or in an electric conductive container.

(3) Always ground electrical apparatuses required for assembly.

    Electrical apparatuses required to assemble the TFT Module into a product, i.e. electrical screw drivers are to be first grounded to avoid transmitting spike noises from the motor.

(4) Use a no-leak iron for soldering the TFT Module
The soldering iron to be used for soldering the I/O terminals to the TFT Module are to be insulated or grounded at the iron tip.

(5) Pay attention to the humidity in the work area, 50~60% RH is recommended.

(6) Peel off the TFT Module protective film slowly. The module is attached with a film to protect the display surface from contamination, damage, adhesion of flux, etc. Peeling off this film abruptly could case static electricity to be generated, so peel the tape slowly.

(7) Assure that the work bench is properly grounded.

11.6 Precaution:

Please pay attention to the following items when you use the LCD Module with back-light unit.

(1) Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.

(2) Adopt measures in adequately ventilated environment. Be sure to use the module in the specified temperature range.

(3) Avoid dust or oil mist during assembly.

(4) Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.

(5) Try to avoid the electrical magnetic interference, and it will be more safety and less noise.

(6) Please operate module in suitable temperature. The response time & brightness will drift by different temperature.

(7) Avoid displaying the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image sticking.

(8) Be sure to turn off the power when connecting or disconnecting the circuit.

(9) Display surface Polarizer scratches easily, please avoid dirt and stains carefully.

(10) A dewdrop may lead to destruction. Please wipe off any moisture before using module.

(11) Sudden temperature changes cause condensation, and it will cause polarizer damaged.

(12) High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.

(13) Avoid any acid or chlorine compounds, which are harmful to the LCD module.

(14) Static electricity will damage the modules; please do not touch the module without any grounded device connected.

(15) Do not disassemble and reassemble the module by self.

(16) Do not touch the rear side directly to avoid the electrical shock by the backlight high voltage.

(17) Avoid strong vibration or shock. or it will cause the module broken.

(18) Store the modules in suitable environment with regular packing.

(19) Be careful of injury from a broken display module. Please avoid the pressure adding to the surface (front or rear side) of modules, because it will cause the non-uniformity or other function issue to display.

12.Specification of Quality Assurance

12.1 Purpose

This standard for Quality Assurance should affirm the quality of TFT Module (TFT LCM)
products.

12.2 Standard Quality Test

1.Inspection:

Before delivering,the supplier should take the following tests,and affirm the quality of product.

2.Electro-Optical Characteristics:

According to the individual specification to test the product.

3.Test of Apperance Characteristics:

According to the individual specification to test the product.

4.Test of Reliability Characteristics:

According to the definition of reliability on the specification for testing products.

12.3 Nonconforming Analysis and Deal with manners

1.Purchaser should supply the detail data of non-conforming sample and the non-suitable state.

2.After accepting the detail data from purchaser,the analysis of nonconforming should be
finished in two weeks.

3.If supplier can not finish analysis on time,must announce purchaser before one weeks.

4.If find any product defect of supplier during assembly time,supplier must change the good
Product for every defect after recognition.

5.Both supplier and customer should analyze the reason and discuss the disposition of
Nonconforming when the reason of nonconforming is not sure.

12.4 Agreement items

Both sides should discuss together when the following problems happen.

1.There is any problem of standsrd of quality assurance,and both sides think that it must be
modified.

2.There is any argument item which does not record in standard of quality assurance.

3.Any other special problem.
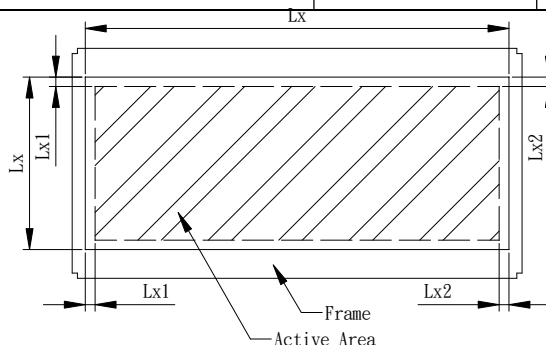
12.5 Inspection Specification for assembly

1. Inspection Standard:MIL-STD-105E table normal inspection single sampling level II.

2. Test condition: Ambient temperature: $25 \pm 5°C$ //Humidity: $55 \pm 10\%$ RH

3. The defects classify of AQL(%) as following:

    Major defect:AQL=0.65

    Minor defect:AQL=2.5

4. Manner of appearance test:

  (1)The test must be under 40W fluorescent light,and the distance of view must be at 30cm.

  (2)The test direction is base on about around 45° of vertical line.

  (3)Definition of area:

    A area:Active area.

    B area:Viewing area.

    C area:Out of viewing area.(Outside viewing area)>>Do not count
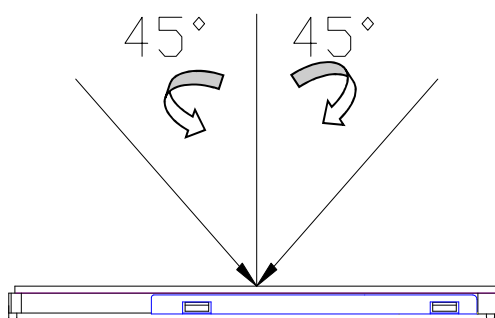
5. It will accord to AQL when the standard can not be described.

6. The sample of the lowest acceptable quality level must be discussed by both supplier and Customer when any dispute happened.

7. Must add new item on time when it is necessary.

ZONE C:FRAME AREA
ZONE B:VIEWING AREA
ZONE A:ACTIVE AREA

TFT MODULE

PRINTING COLOR:BLACK
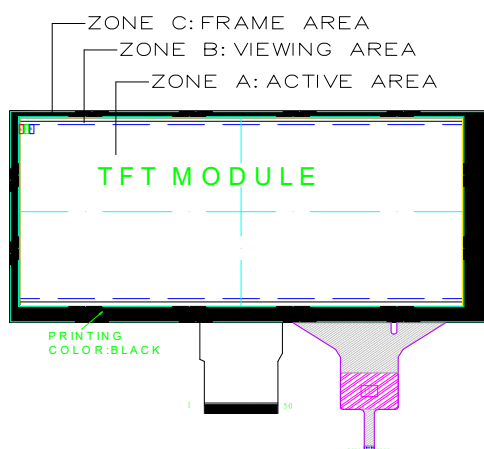
12.6 Inspection Quality Criterion

ITEM	DESCRIPTION OF DEFECTS			Class of defects	Acceptable level (%)
DIMENSION	Refer to individual acceptance specification			Major	2.5
SLANT	Viewing Area	| Lx1-Lx2 |	Judgment	Minor	2.5
	Lx ≦100mm	≦ 0.2mm	ACC		
	100mm < Lx ≦ 150mm	≦ 0.3mm	ACC		
	150mm < Lx ≦200mm	≦ 0.4mm	ACC		
	200mm < Lx	≦0.5mm	ACC		
LINEAR DEFECT (particle, black/white linears, stain & dust.)	(a) W ≦ 0.05mm, Ignore (b) L ≦8.0mm & ≦0.1mm, N≦8 (c) L ≦4.0mm & ≦0.2mm, N≦8 (d) W >0.2mm(see dot shape)			Minor	2.5
SPOT DEFECT (particle, black/white, stain & dust.)	Average diameter, D (a) D≦0.8mm, Ignore (b) 0.8mm< D ≦1.0mm, N ≦8,ACC (c) D>1.0mm, REJ		$D=\dfrac{a+b}{2}$	Minor	2.5
Bubble/ DENT ON SURFACE	Average diameter D (a) D≦0.8mm,Ignore (b) 0.8mm < D ≦2.0mm, N ≦10,ACC (c) D> 2.0mm, REJ		$D=\dfrac{a+b}{2}$	Minor	2.5
RIFT	Not allowed.			Major	1.5
LIFTED ON POLIZER EDGE SIDE	Average diameter D (a) D > 1.0mm, REJ (b) L >10mm, W > 1.0mm, REJ			Minor	2.5
CHROMA MURA	Not allowed if it can be observed through ND Filter 5%. Refer to individual acceptance limited sample			Minor	2.5

COLOR NOT ACCORD	Not allowed if it can be observed through ND Filter 5%. Refer to individual acceptance limited sample					Minor	2.5

BRIGHT/ DARK POINT						Minor	2.5

Item		Allow number in Area A
(a) Bright point	Single point	3
	Two adjacent point	1
	Three adjacent point	0
	Total point	3
(b) Dark point	Single point	7
	Two adjacent point	2
	Three adjacent point	0
	Total point	7

※ Point：A sub pixel 1R or 1G or 1B
※Full Black dot,Joined Black dots - Full Black dot
   ,Joined Black dots >5mm
※ Bright dot-Bright dot>5mm
※ Flashing dot is counted as a Black dot

LINE DEFECT ON SURFACE (SCRATCHES, BLACK/ WHITE LINE)	Width W, Length L	A	B	Minor	2.5
	W≦0.05mm,	Ignore			
	L≦20mm,W≦0.1mm	10	-		
	L>20mm,W≦0.1mm	0	-		
	W >0.1mm	0	-		

DISPLAY ABNORMAL	(a) Non display (b) Line defect (c) Response time, contrast ratio, brightness or viewing angle abnormal (d) Water ripple (e) Flicker	Major	1.5

NOTE：(1) ACC：Accept   (2) REJ：Reject

13. Terms of Warranty

1.Applicable warranty period

The period is within thirteen months since the date of shipping out under normal using and Storage conditions.

2.Unaccepted responsibility

This product has been manufactured to your company's specification as a part for use in your company's general electronic products.It is guaranteed to perform according to delivery specifications.For any other use apart from general electronic equipment,we cannot take responsibility if the product is used in aerospace,unclear power control equipment,fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.

14.Material List of Components for ROHS

XINSUN Display Integration Ltd. hereby declares that our company do not intentionally contain any of the substances listed in applicable EU directives and regulations and all our products will conform to content requirement of 6 substances
(Pb, Cd, Hg, Cr^{6+}, PBB, PBDE) of RoHS directive, and we will not use these 6 substances in the manufacturing process, and guarantee that the content of these substances in our products won't exceed the limit value of RoHS as followings:

Hazardous Substance	Limit value of RoHS (ppm, mg/kg)
Lead and its compounds (Pb)	＜1000
Cadmium and its compounds (Cd)	＜100
Mercury and its compounds (Hg)	＜1000
Chromium VI and its compounds (Cr^{6+})	＜1000
Polybrominated Biphenyls (PBB)	＜1000
Polybromodiphenyl Ether (PBDE)	＜1000
Packaging: PB + Cd+Hg+Cr^{6+}	＜100

Remarks:
(1) In addition to the basic restricted items in the above list, if any individual customers have any other special item requirement, please specify, so that
we can specially try to conform.
(2) If any individual customers really need to have RoHS compliant earlier than
the above schedule, please specify on Purchase Order so that we can specially
try to conform.