



Product Specification For TFT Module

Model Name	XF185WXS01A-ILLL
Customer	
Note	

Preliminary Specification

Final Specification

CUSTOMER'S APPROVAL

BY:

DATE:

Comment

PRESENTED BY

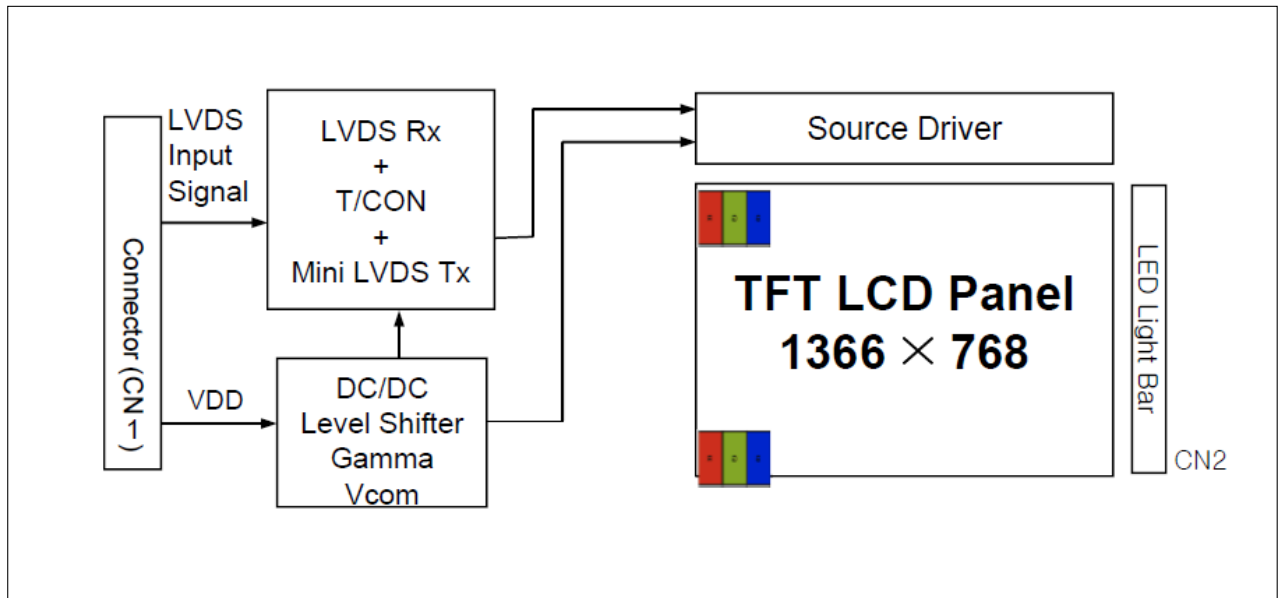
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1.0 GENERAL DESCRIPTION

1.1 Introduction

XF185WXS01A-ILLL is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as active switching devices. This module has a 18.5 inch diagonally measured active area with WXGA resolutions (1366 horizontal by 768 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.



1.2 Features

- LVDS Interface with 1 pixel / clock
- High-speed response
- Low power consumption
- 6-bit (Hi-FRC) color depth, display 16.7M colors
- Incorporated edge type back-light (One Light Bar)
- High luminance and contrast ratio, low reflection and normal viewing angle
- DE (Data Enable) only
- RoHS
- ES 6.0 compliant
- Gamma correction

1.3 Application

- Desktop Type of PC & Workstation Use
- Slim-Size Display for Stand-alone Monitor
- Display Terminals for Control System
- Monitors for Process Controller

1.4 General Specification

The followings are general specifications at the model XF185WXS01A-ILLL.

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	409.8(H) × 230.4(V)	mm	
Number of pixels	1366(H) × 768(V)	pixels	
Pixel pitch	0.1(H) × 0.3(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M	colors	
Display mode	Normally Black		
Dimensional outline	430.4(H) × 254.6(V) × 10.9(D) typ.	mm	Detail refer to drawing
Weight	1300(typ.)	g	
Bezel width (L/R/U/D)	8.5/8.5/10.3/10.3	mm	
Surface Treatment	Haze 25%, 3H		
Back-light	right edge side, 1- LED Light bar		

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.

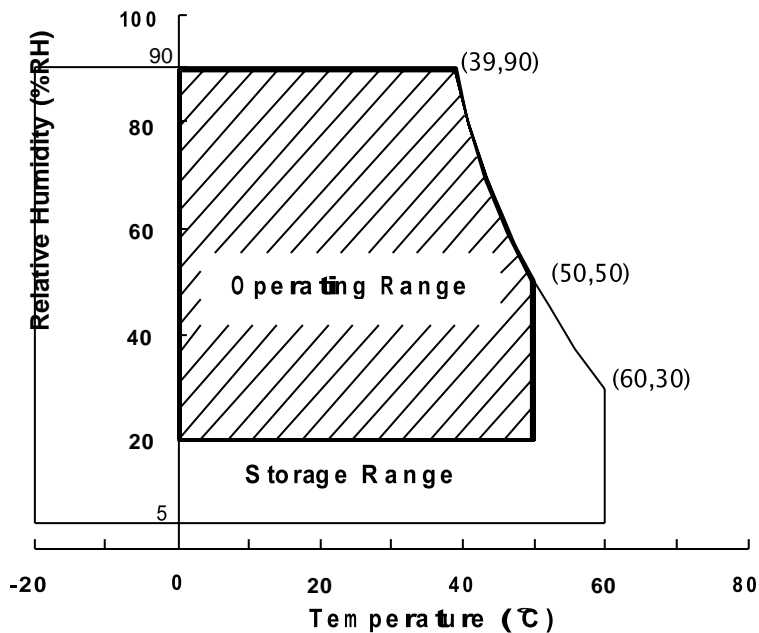
< Table 2. Absolute Maximum Ratings >

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-0.3	5.5	V	Ta = 25 °C
Logic Supply Voltage	V_{IN}	VSS-0.3	$V_{DD}+0.3$	V	
LED Channel Current	I_{BL}	-	85	mA	
Operating Temperature	T_{OP}	0	+50	°C	1)
Storage Temperature	T_{ST}	-20	+60	°C	1)

Note : 1) Temperature and relative humidity range are shown in the figure below.

Wet bulb temperature should be 39°C max and no condensation of water.



3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

< Table 3. Electrical Specifications >

[Ta =25±2 °C]

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	4.5	5.0	5.5	V	Note1
Power Supply Current	I _{DD}	-	500	720	mA	
In-Rush Current	I _{RUSH}	-	2	3	A	Note 2
Permissible Input Ripple Voltage	V _{RF}	-	-	300	mV	Note1,3
High Level Differential Input Threshold Voltage	V _{IH}	-	-	+100	mV	
Low Level Differential Input Threshold Voltage	V _{IL}	-100	-	-	mV	
Differential input voltage	V _{ID}	200	-	600	mV	
Differential input common mode voltage	V _{cm}	1.0	1.2	1.5		V _{IH} =100mV, V _{IL} =-100mV
LED Channel Voltage	V _L	17.4	18	19.8	V	
LED Channel Current	I _L	-	100	-	mA	
LED Lifetime		30,000	-	-	Hrs	
Power Consumption	P _D	-	2.5	3.6	W	@60Hz
	P _{BL}	-	7.2	7.92	W	I _L =100 mA, Note 4
	P _{total}	-	8.62	10.33	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for VDD=5.0V, Frame rate=60Hz and Clock frequency = 75.4MHz. Test Pattern of power supply current

a) Typ : Color Bar pattern

b) Max: Gray Level 255

2. Duration of rush current is about 2 ms and rising time of VDD is 520 μs ± 20 %

3. Ripple Voltage should be covered by Input voltage Spec.

4. Calculated value for reference (V_L × I_L) × 4(channel) excluding driver loss. (LED Light bar: 6S4P)

3.2 Backlight Unit

< Table 4. LED Backlight Unit >

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Light Bar Input Voltage Per Input Pin	VPIN	17.4	18	19.8	V	Duty 100%
LED Light Bar Input Current Per Input Pin	IPIN	-	100	-	mA	Note1,2,
LED Power Consumption	P _{BL}	-	7.2	7.92	W	Note 3
LED Life-Time	-	30,000	-		Hrs	Note 4

LED bar consists of 24LED packages,4 strings(parallel)*6packages(serial)

Note1: There are one light bar ,and the specified current is input LED chip 100% duty current

Note2: The sense current of each input pin is 100mA

Note3: $P_{BL}=4 \text{ Input pins} \times V_{PIN} \times I_{PIN}$

Note4: The lifetime is determined as the time at which luminance of LED become 50% of the initial brightness or not normal lighting at $I_{PIN}=85\text{mA}$ on condition of continuous operating at $25 \pm 2 \text{ } ^\circ\text{C}$

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCONE PR730) 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 $\theta_{\theta=0}$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta_{\theta=90}$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta_{\theta=180}$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta_{\theta=270}$ ($=\theta_6$) 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 after 30 minutes warm-up period. VDD shall be 5.0V +/-10% at 25°C . Optimum viewing angle direction is 6 o'clock.

4.2 Optical Specifications

[VDD = 5.0V, Frame rate = 60Hz, Clock = 75.4MHz, $I_{BL} = 340\text{mA}$, $T_a = 25 \pm 2^\circ\text{C}$]

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	85	89	-	Deg.	Note 1
		Θ_9		85	89	-	Deg.	
	Vertical	Θ_{12}		85	89	-	Deg.	
		Θ_6		85	89	-	Deg.	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$ (Center) Normal Viewing Angle	700	1000	-		Note 2
Luminance of White		Y_w		200	250	-	cd/m ²	Note 3
White luminance uniformity		ΔY		75	80	-	%	Note 4
Reproduction of color	White	W_x		0.283	0.313	0.343	-	Note 5
		W_y	0.299	0.329	0.359			
	Red	R_x	0.638	0.658	0.688			
		R_y	0.308	0.338	0.368			
	Green	G_x	0.267	0.297	0.327			
		G_y	0.627	0.657	0.687			
	Blue	B_x	0.122	0.152	0.182			
		B_y	0.040	0.070	0.100			
Response Time	GTG	T_g	-	14	25	ms	Note 6	
Cross Talk		CT	-	-	2.0	%	Note 7	

< Table 5. Module Optical >

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.
2. Contrast measurements shall be made at viewing angle of $\theta = 0^\circ$ 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 1 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. Center Luminance of white is defined as 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.
4. The White luminance uniformity on LCD surface is then expressed as :
 $\Delta Y = (\text{Minimum Luminance of 9points} / \text{Maximum Luminance of 9points}) * 100$ (See FIGURE 2 shown in Appendix).
5. 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.
6. Response time T_g is the average time required for display transition by switching the input signal as below table and is based on Frame rate $f_V = 60\text{Hz}$ to optimize. Each time in below table is defined as appendix Figure 3 and shall be measured by switching the input signal for "any level of gray(bright)" and "any level of gray(dark)"
7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark. (See FIGURE 4 shown in Appendix).

5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

5.1.1 LED Light Bar

-LED connector : 3708K-Q06N-00R manufactured by Entry

< Table 6. LED Light Bar >

Pin No	Symbol	Description
1	IRLED1	LED current sense for string1
2	IRLED2	LED current sense for string2
3	VLED	LED power supply
4	VLED	LED power supply
5	IRLED3	LED current sense for string3
6	IRLED4	LED current sense for string4

- CN1

Module Side Connector : UJU IS100-300-C23 or
 Equivalent
 User Side Connector : JAE FI-X30H or
 Equivalent

Pin No	Symbol	Function	Remark
1	NC	No connection	
2	NC	No connection	
3	NC	No connection	
4	GND	GND Ground	
5	RX0-	Negative LVDS differential data input. Channel 0	
6	RX0+	Positive LVDS differential data input. Channel 0	
7	GND	Ground	Optical: Bist function
8	RX1-	Negative LVDS differential data input. Channel 1	
9	RX1+	Positive LVDS differential data input. Channel 1	
10	GND	Ground	
11	RX2-	Negative LVDS differential data input. Channel 2	
12	RX2+	Positive LVDS differential data input. Channel 2	
13	GND	Ground	
14	RXCLK-	Negative LVDS differential clock input.	
15	RXCLK+	Positive LVDS differential clock input.	
16	GND	Ground	
17	RX3-	Negative LVDS differential data input. Channel 3	
18	RX3+	Positive LVDS differential data input. Channel 3	
19	GND	Ground	
20	NC	Not connection, this pin should be open.	
21	NC	Not connection, this pin should be open.	
22	NC	Not connection, this pin should be open.	
23	GND	Ground	
24	GND	Ground	
25	GND	Ground	
26	VCC	5V Power supply	
27	VCC		
28	VCC		
29	VCC		
30	VCC		

5.2 LVDS Interface (Tx; THC63LVDF83A or Equivalent)

< Table 8. LVDS Interface >

	Input Signal	Transmitter		Interface		MT185WHM-N20 (CN11)	Remark
		Pin No.	Pin No.	System (Tx)	TFT-LCD (Rx)	Pin No.	
L V D S	OR0	51	48 47	OUT0- OUT0+	RXO0- RXO0+	5 6	
	OR1	52					
	OR2	54					
	OR3	55					
	OR4	56					
	OR5	3					
	OG0	4					
	OG1	6	46 45	OUT1- OUT1+	RXO1- RXO1+	8 9	
	OG2	7					
	OG3	11					
	OG4	12					
	OG5	14					
	OB0	15					
	OB1	19					
	OB2	20	42 41	OUT2- OUT2+	RXO2- RXO2+	11 12	
	OB3	22					
	OB4	23					
	OB5	24					
	Hsync	27					
	Vsync	28					
	DE	30					
	MCLK	31	40 39	CLK OUT- CLK OUT+	RXO CLK- RXO CLK+	14 15	
	OR6	50	38 37	OUT3- OUT3+	RXO3- RXO3+	17 18	
	OR7	2					
	OG6	8					
	OG7	10					
	OB6	16					
	OB7	18					
RSVD	25						

6.0 SIGNAL TIMING SPECIFICATION

6.1 The XF185WXS01A-ILL is operated by the DE only.

< Table 9. Timing Table >

Item	Symbols		Min	Typ	Max	Unit
DCLK	Period	tCLK	10.6	13.26	15.91	ns
	Frequency	-	62.9	75.4	94.3	MHz
Horizontal Display Term	Period	tHP	1446	1560	1936	tCLK
	Horizontal Valid	tHV	1366	1366	1366	tCLK
	Horizontal Blank	tHB	80	194	570	tCLK
	Frequency	fH	40.3	48.36	60.45	KHz
Vertical Display Term	Period	tVP	778	806	888	tHP
	Vertical Valid	tVV	768	768	768	tHP
	Vertical Blank	tVB	10	38	120	tHP
	Frequency	fV	50	60	75	Hz
LVDS Receiver clock	Input spread spectrum ratio	SSr	-3	-	+3	%

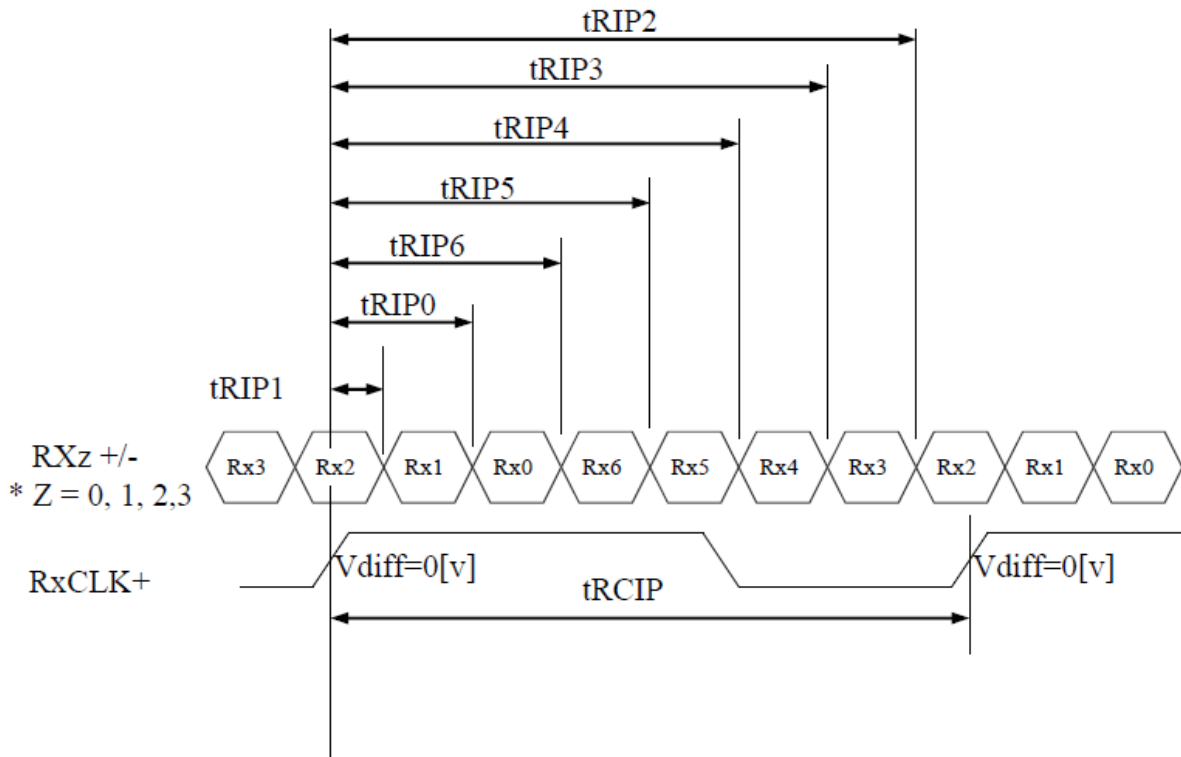
Note: The DCLK range at last line of V-blanking should be set in 0~987

6.2 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 10.

< Table 10. LVDS Rx Interface Timing Specification >

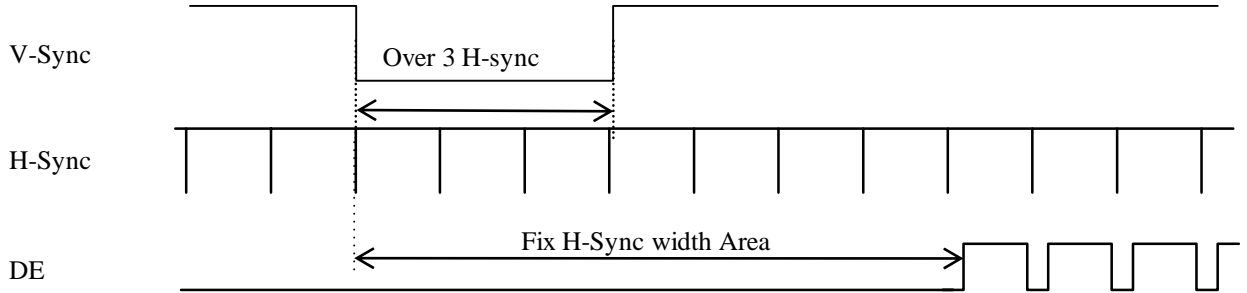
Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	10.60	13.26	15.91	nsec	
Input Data 0	tRIP1	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP0	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP6	2 × tRCIP/7-0.4	2 × tRCIP/7	2 × tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3 × tRCIP/7-0.4	3 × tRCIP/7	3 × tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4 × tRCIP/7-0.4	4 × tRCIP/7	4 × tRCIP/7+0.4	nsec	
Input Data 5	tRIP3	5 × tRCIP/7-0.4	5 × tRCIP/7	5 × tRCIP/7+0.4	nsec	
Input Data 6	tRIP2	6 × tRCIP/7-0.4	6 × tRCIP/7	6 × tRCIP/7+0.4	nsec	



* $V_{diff} = (RXz+) - (RXz-), \dots, (RXCLK+) - (RXCLK-)$

7.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

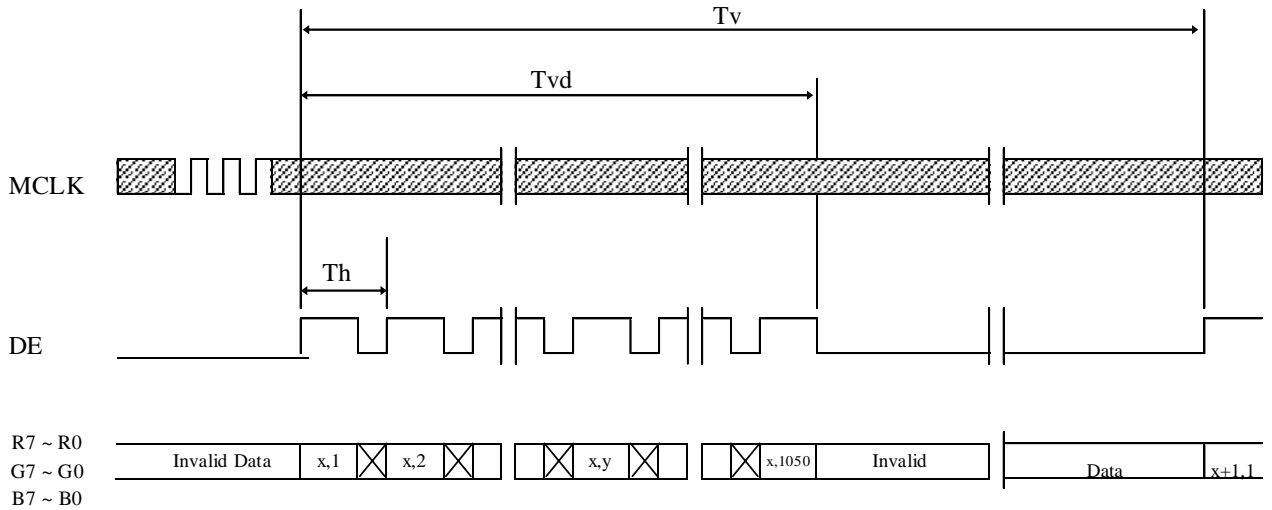
7.1 Sync Timing Waveforms



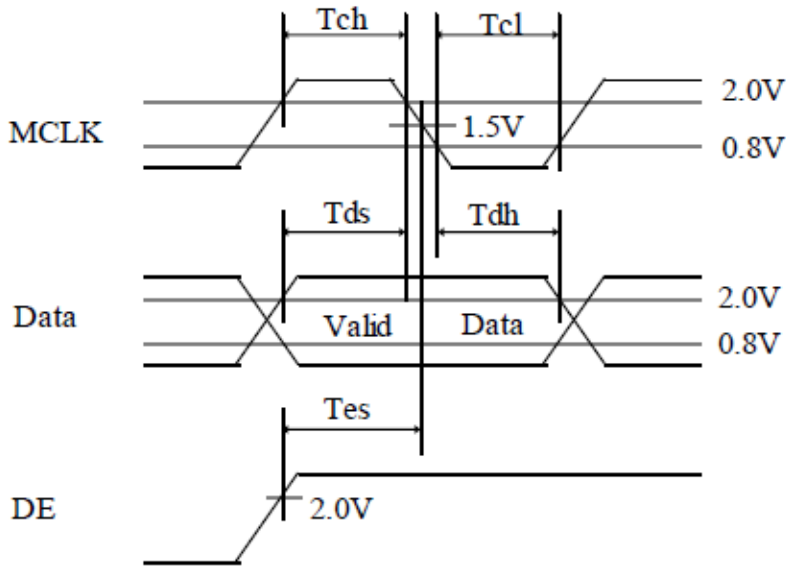
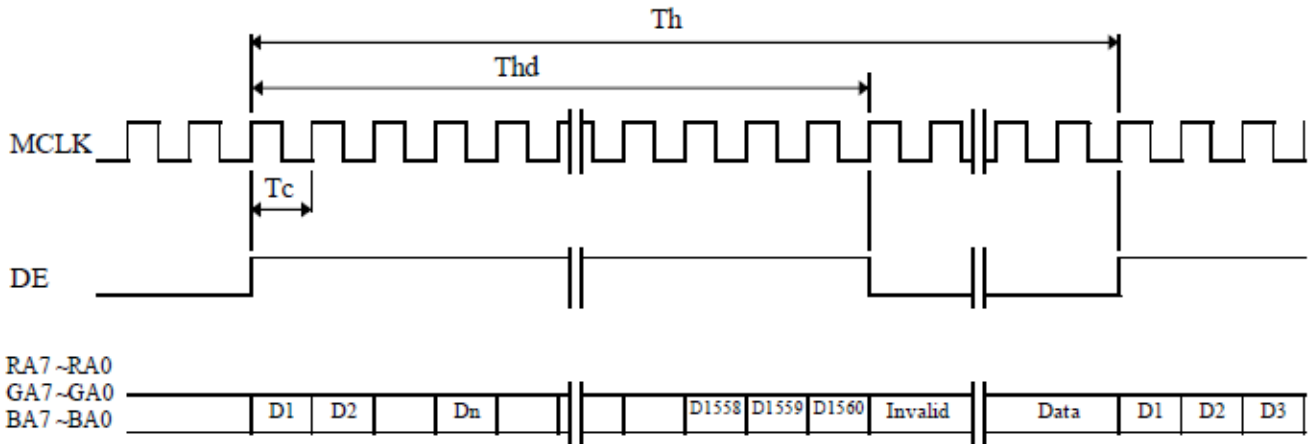
Note : 1. Need over 3 H-sync during V-Sync Low.

2. Fix H-Sync width from V-Sync falling edge to first rising edge.

7.2 Vertical Timing Waveforms

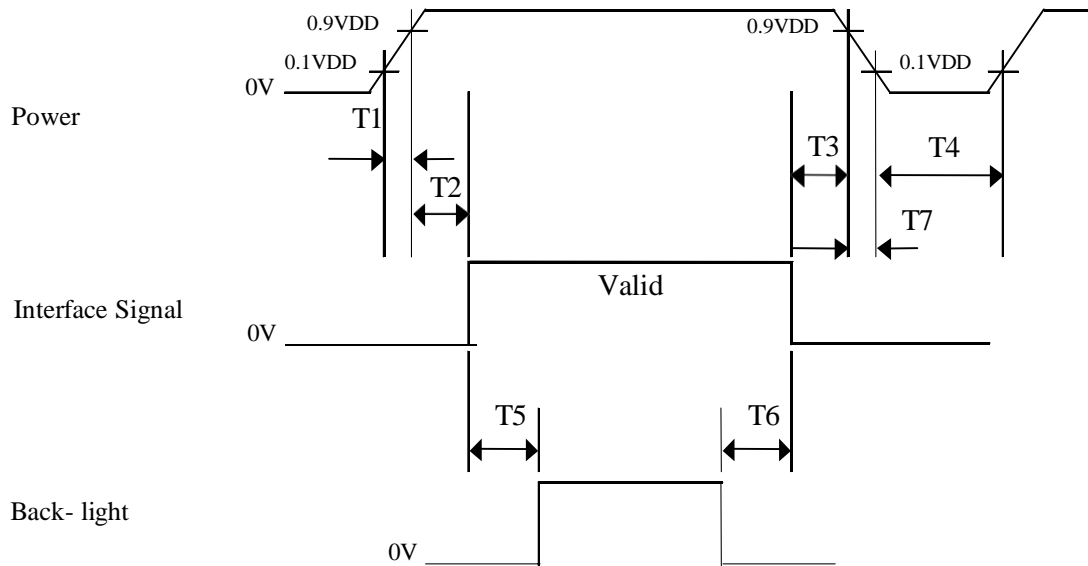


7.3 Horizontal Timing Waveforms



9.0 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.



- $0.5 \text{ ms} \leq T1 \leq 10 \text{ ms}$
- $0 \leq T2 \leq 50 \text{ ms}$
- $0 < T3 \leq 50 \text{ ms}$
- $1 \text{ sec} \leq T4$
- $200 \text{ ms} \leq T5$
- $200 \text{ ms} \leq T6$

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on.
3. Back Light must be turn on after power for logic and interface signal are valid.
4. T7 decreases smoothly, there is none re-bouncing voltage.

10.0 MECHANICAL CHARACTERISTICS

10.1 Dimensional Requirements

FIGURE 6 (located in Appendix) shows mechanical outlines for the model XF185WXS01A-ILL. Other parameters are shown in Table 12.

< Table 12. Dimensional Parameters >

Parameter	Specification	Unit
Dimensional outline	430.4 × 254.6 × 10.9	mm
Weight	1300(typ.)	gram
Active area	409.8(H) × 230.4(V)	mm
Pixel pitch	0.1(H) × 0.3(V)	mm
Number of pixels	1366(H) × 768(V) (1 pixel = R + G + B dots)	pixels
Back-light	Right edge side 1-LED Light bar Type	

10.2 Mounting

See FIGURE 5 (shown in Appendix).

10.3 Anti-Glare and Polarizer Hardness

The surface of the LCD has an anti-glare coating to minimize reflection and a coating to reduce scratching

10.4 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 350lux.

11.0 RELIABILITY TEST

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

< Table 13. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	Ta = 60 °C, 240 hrs
2	Low temperature storage test	Ta = -20 °C, 240 hrs
3	High temperature & high humidity operation test	Ta = 50 °C, 80%RH, 240hrs
4	High temperature operation test	Ta = 50 °C, 240hrs
5	Low temperature operation test	Ta = 0 °C, 240hrs
6	Thermal shock	Ta = -20 °C ↔ 60 °C (0.5 hr), 100 cycle
7	Vibration test (non-operating)	Frequency 10 ~ 300 Hz, Sweep rate 30 min Gravity / AMP 1.5 G Period X, Y, Z 30 min
8	Shock test (non-operating)	Gravity 50G
		Pulse width 11msec, sine wave
		Direction ± X, ± Y, ± Z Once for each
9	Electro-static discharge test (non-operating)	Air : 150 pF, 330Ω, 15 KV Contact : 150 pF, 330Ω, 8 KV
10	Altitude test	Operating: 0 to 16400ft , 0 to 40°
		Non Operating: 0 to 40000ft, -20 to 40°

12.0 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.

13.0 APPENDIX

Figure 1. Measurement Set Up

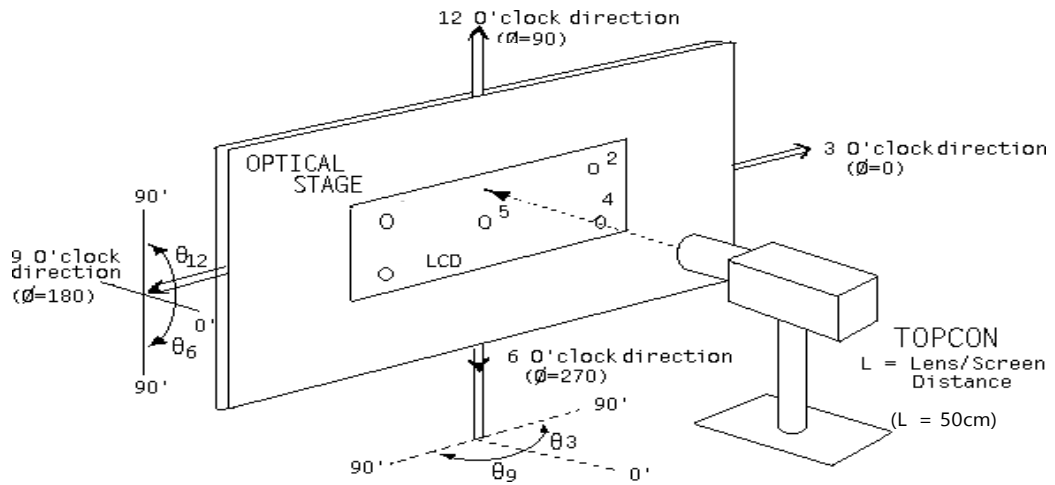


Figure 2. White Luminance and Uniformity Measurement Locations (9 points)

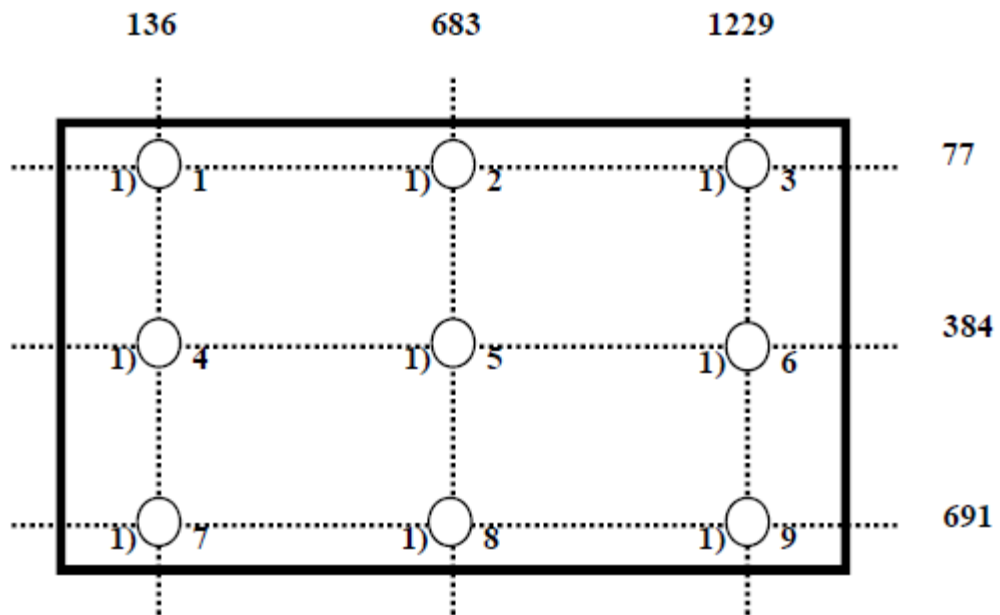


Figure 3. Response Time Testing

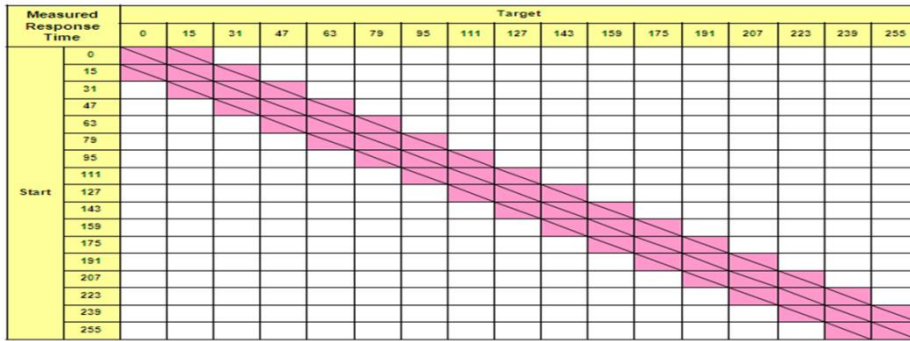
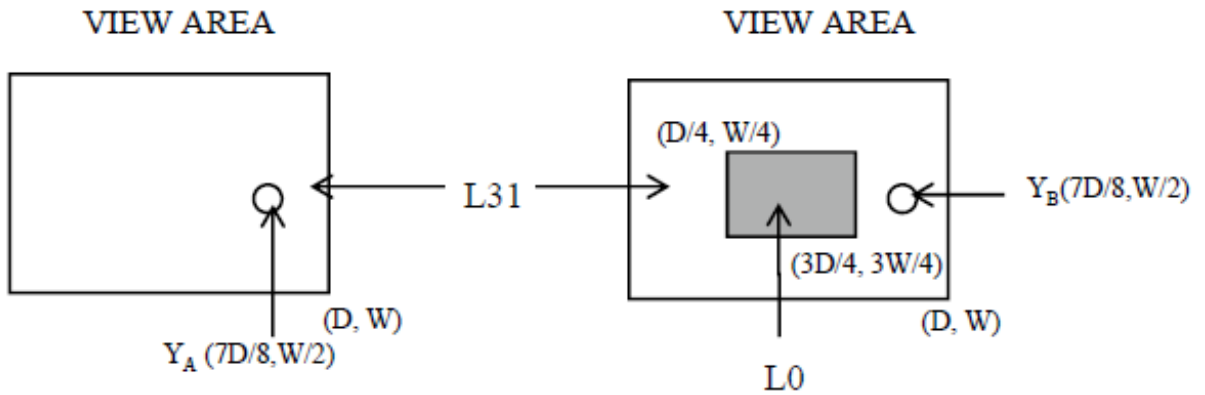


Figure 4. Cross Modulation Test Description



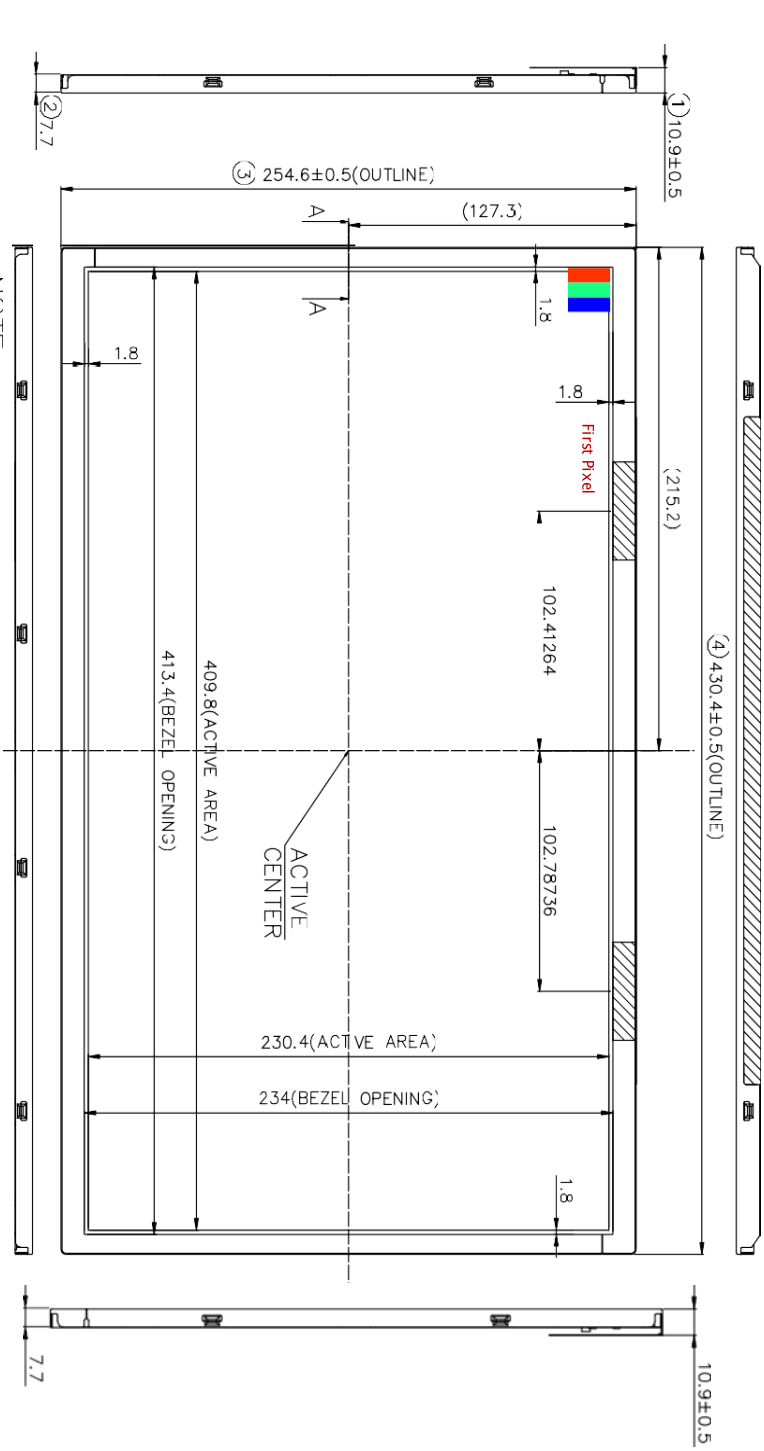
$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where: Y_A = Initial luminance of measured area (cd/m²)

Y_B = Subsequent luminance of measured area (cd/m²)

The location measured will be exactly the same in both patterns

Figure 5. TFT-LCD Module Outline Dimensions (Front view)



SECTION A-A
 SCALE 2/1

NOTE:

1. I/F CONNECTOR SPECIFICATION
 FI-XB30SSL-HF15 (JAE) or IS100-L300-Q23 (UJU)
2. LED CONNECTOR SPECIFICATION
 3707K-Q06N-08X (ENTERY) or Equivalent
3. Lift and portial disposition tolerance of display area as following
 (1)Y-direction: |A-B| ≤1.4
 (2)X-direction: |C-D| ≤1.4
4. CRITICAL DIMENSION: ①~④

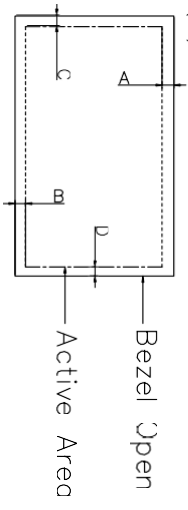


Figure 6. TFT-LCD Module Outline Dimensions (Rear view)

