Chefree Technology Ô[¦] .

15.6" Wide-XGA

High brightness color TFT-LCD module

Model: 7<%)*7 @@<6%

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Date: Mar. 16th, 2011

Note: This specification is subject to change without notice

Customer：
Approved by ：
Date：

Approved	Prepared
Date:	Date:

Contents

RECORD OF REVISION

Version and Date	Page	Old description	New description	Remark
0.1 2011/3/16	All	First Edition for customer		

1. HANDLING PRECAUTIONS

1) Since front polarizer is easily damaged, pay attention not to scratch it.

2) Be sure to turn off power supply when inserting or disconnecting from input connector.

3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.

6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.

7) Do not open or modify the Module Assembly.

8) Do not press the reflector sheet at the back of the module to any directions.

9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.

10) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

2 General Specifications

2.1 Over view

CH156CLIL-HB1 is 15.6 inch-wide Color a-Si TFT-LCD Module. The display supports the HD - 1366(H) x 768(V) screen format and 16.7M colors (RGB 6-bits + Hi-FRC data). All input signals are LVDS interface and this module doesn't contain driver board for backlight.

2.2 Features

    - Sunlight readable display, 1000nits.
    - LED backlight
    - Long operation life
    - RoHS Compliance

2.3 Application

    Industrial Application.

2.4 Display Specifications

Items	Unit	Specification
Screen Diagonal	inch	15.6
Active Area	mm	344.232(W) × 193.536(H) mm
Pixels H x V	pixels	1366 × 3(RGB) × 768
Pixels Pitch	mm	0.252 × 0.252(H)
Pixel Arrangement		RGB Vertical stripe
Display mode		TN mode, normally white
White luminance (center)	Cd/m^2	1000 (Typ.)
Contrast ratio		500 (Typ.)
Optical Response Time	msec	8 ms (Typ. on/off)
Normal Input Voltage VDD	Volt	5.0
Power Consumption (VDD Line + LED L Lines)	Watt	19.3
Weight	Grams	1160 typ.
Physical size	mm	363.8(W)×215.9(H)×14.3(D)
Electrical Interface		1 Chanel LVDS
Support Colors		16.7 M colors (RGB 6-bits + Hi-FRC)
Surface Treatment		Anti-Glare, 3H
Temperature range		
Operating	^{0}C	-20 ~ 60(LCD surface temperature
Storage (Shipping)	^{0}C	-30 ~ 70
RoHS Compliance		RoHS Compliance

Note 1: Refer to Mechanical Drawing.
Note 2: Refer to Optical Specifications.

2.5 Optical Characteristics

The following optical characteristics are measured under stable condition at 25 ^{0}C

Items	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing angle	Deg.	Horizontal (Right) CR=10 (Left)	150	170		2
		Vertical (Up) CR=10 (Down)	140	160		
Contrast Ratio		Normal Direction	350	500		3
Response Time	msec	Raising time (T_{rR})		6		4
		Falling time (T_{rF})		2		
		Raising + Falling		8		
Color / Chromaticity Coordinates (CIE)		Red x	-0.03	0.638	+0.03	5
		Red y		0.333		
		Green x		0.290		
		Green y		0.591		
		Blue x		0.153		
		Blue y		0.082		
Color coordinates (CIE) White		White x		0.313		
		White y		0.329		
Center Luminance	Cd/m^2		800	1000		6
Luminance Uniformity	%			70		7
Crosstalk (in 60 Hz)	%				1.2	
Flicker	dB				-20	

Test Conditions:

1. VCC=5.0V, IL=320mA (Backlight current), the ambient temperature
   is 25℃.
2. The test systems refer to Note 2.

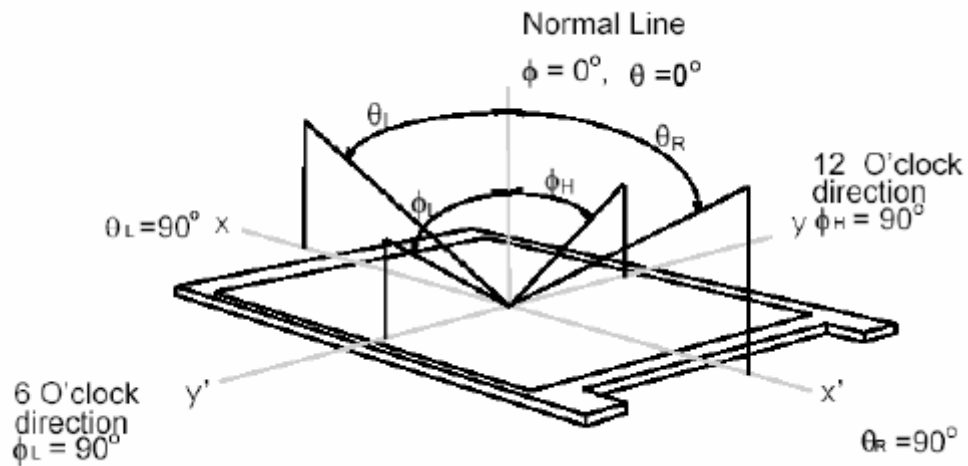Note 1 : Definition of viewing angle range

Fig. 4.1 Definition of viewing angle

Note 2: Definition of optical measurement system.

　　　　The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)
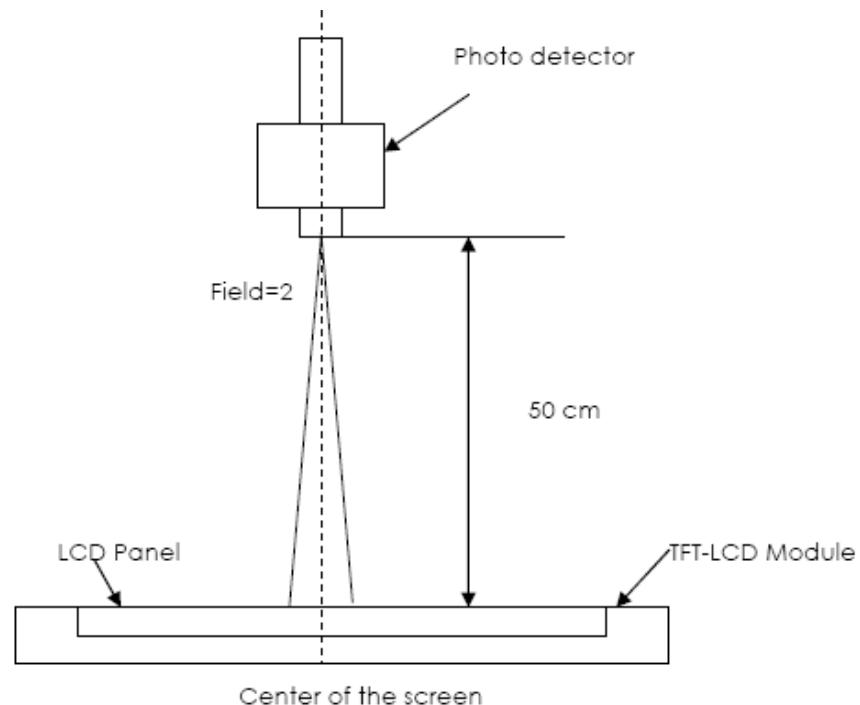

Fig. 4.2 Optical measurement system setup

Note 3: Definition of Response time

      The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.
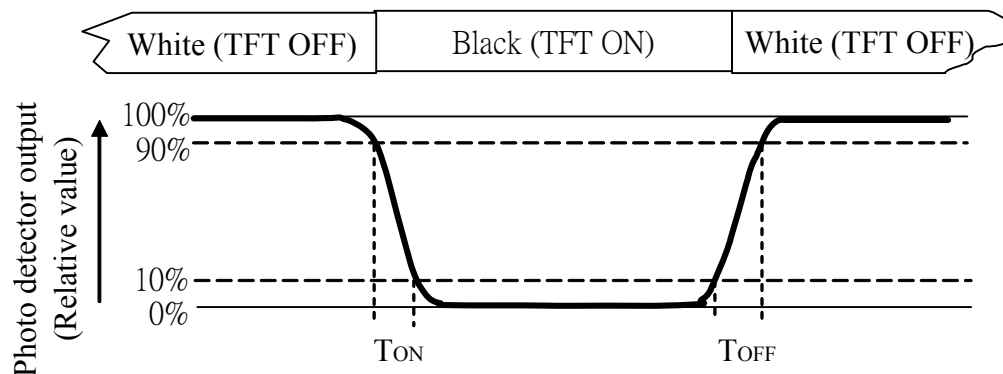
Note 4: Definition of Contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

      Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=300mA .

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4.4). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$
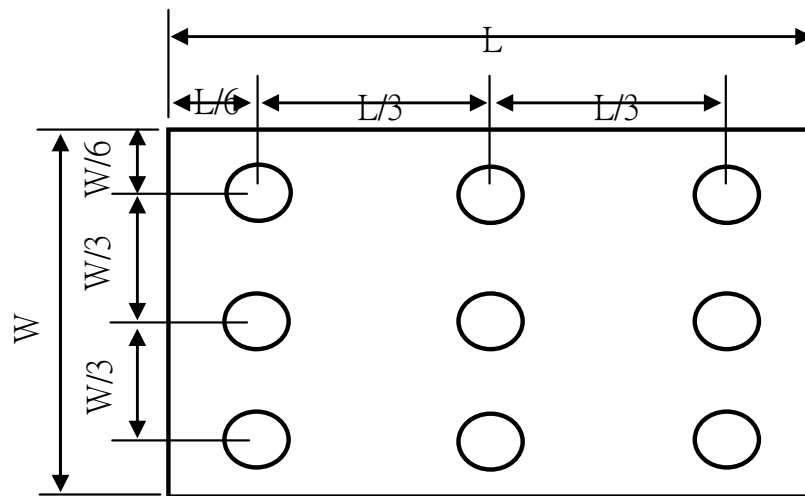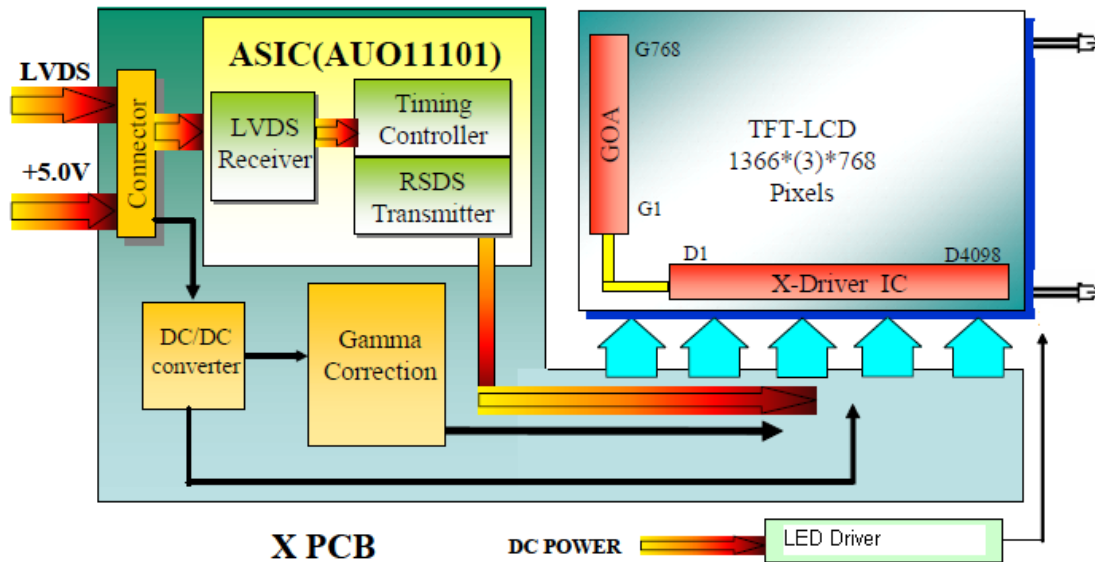
L ----- Active area length W ----- Active area width

Fig. 4.4 Definition of measuring points

Bmax: The measured maximum luminance of all measurement position.
Bmin: The measured minimum luminance of all measurement position.

3 Functional Block Diagram

The following diagram shows the functional block of the 15.6 inches wide Color TFT/LCD

I/F PCB Interface:

JAE / FI-XB30SSL-HF15

STM / MSBKT2407P30HB

Mating Type:

FI-X30HL (Locked Type)

4 Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Logic/LCD Drive	VDD	0.0	-	6.0	V	Note 1, 2

4.2 Backlight Unit

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LED current	ILED		-	480	mA	Note 1, 2

4.3 Absolute Ratings of Environment

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Operating	TOP	-20	-	60	℃	Note 3
Operation Humidity	HOP	5	-	95	％	Note 3
Storage Temperature	TST	-30	-	70	℃	Note 3
Storage Humidity	HST	5	-	95	％	Note 3

Note 1 : At Ta (25℃)

Note 2 : Permanent damage to the device may occur if exceed maximum values.

Note 3 : For quality performance, please refer to IIS

5 Electrical characteristics

5.1. Power Specification

The power specification are measured under 25℃ and frame frequency under 60Hz

Symble	Parameter	Min	Typ	Max	Units	Note
VDD	Logic/LCD Drive voltage	4.5	5.0	5.5	V	
PDD	VDD Power		3.75	4.25	W	Note1,2
IDD	IDD current		750	850	mA	Note1,2
IRush	Inrush current			2500	mA	
VDDrp	Allowable Logic/LCD drive ripple voltage			300	mVp-p	

Note 1 : Maximum measurement condition : black pattern at 5.0V driving voltage.
Note 2 : Measure condition

The duration of rising time of power input is 470 us.
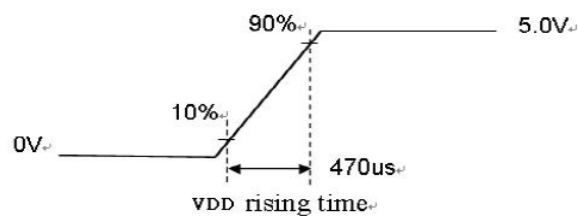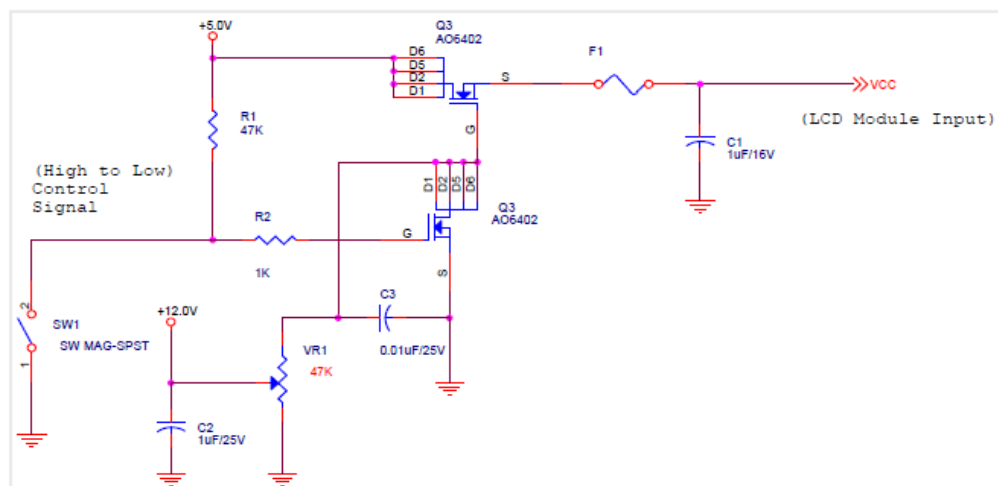
5.2. Signal Electrical Characteristics:

Input signals shall be low or Hi-Z state when VDD is off. Please refer to specifications of SN75LVDS82DGG (Texas Instruments) in detail..

Signal electrical characteristics are as follows;

Parameter	Condition	Min	Typ	Max	Unit
V_{TH}	Differential input high threshold (Vcm=1.2V)		50	100	mV
V_{TL}	Differential input low threshold (Vcm=1.2V)	-100	-50		mV
$\mid V_{ID} \mid$	Differential input voltage	100		600	mV
V_{CM}	Differential input common mode voltage	1.0	1.2	1.5	V

Note: LVDS signal waveform
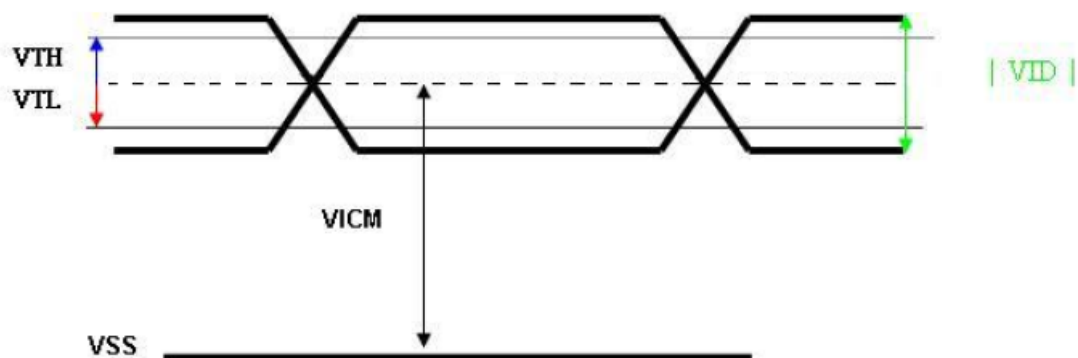
5.3. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	VL		19.8		V	Note 1
Current for LED backlight	IL		400	480	mA	Note 1
Power consumption	PL		15.8		W	2 LED
LED life time	-		40k	-	Hr	Note 2 Note 3

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and
   IL =400mA for each LED bar. .
Note 2: The "LED life time" is defined as the module brightness decrease to 50%
   original brightness at Ta=25℃ and IL =400mA. The LED lifetime could be
   decreased if operating IL is lager than 400mA.
Note 3: The "LED life time" is defined as the module brightness decrease to 50%
   initial brightness. The LED lifetime could be 40K hours min At Ta=25℃
   and IL =400mA ,and shorter if operating IL is lager than 400mA.
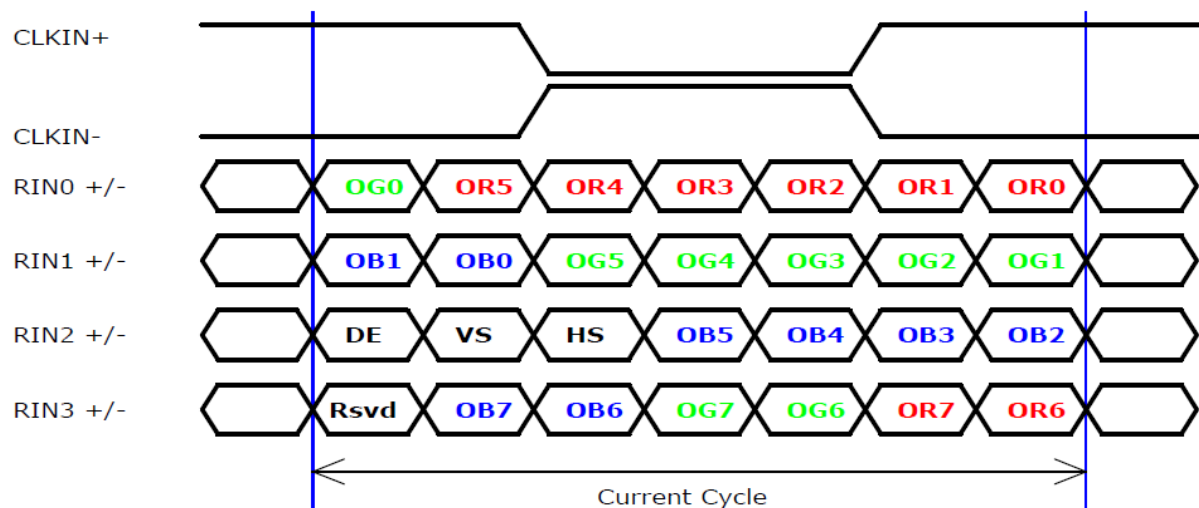
6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.
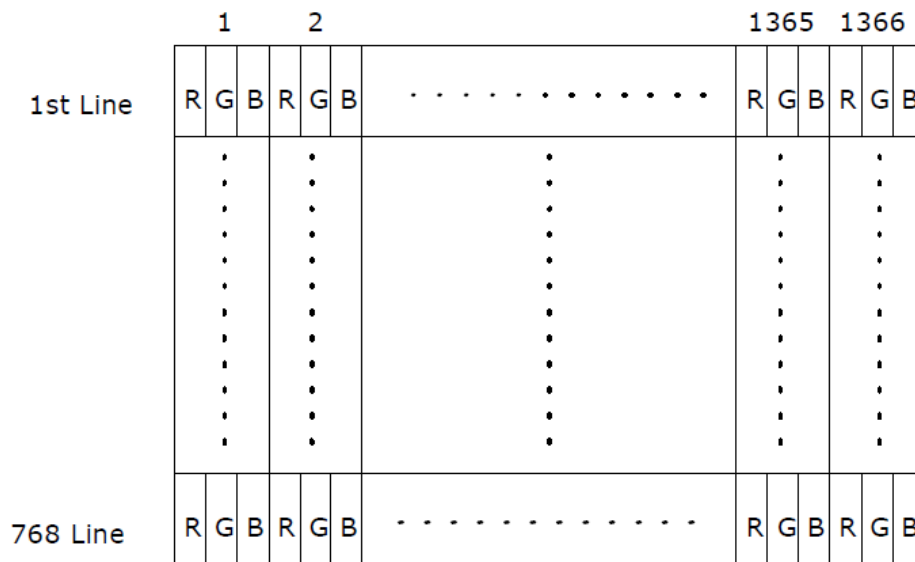

6.2 The input data format

Note 1: R/G/B data 7:MSB, R/G/B data 0:LSB

6.3 Signal Description

The module using one LVDS receiver SN75LVDS82(Texas Instruments). LVDS transmitters shall be SN75LVDS83(negative edge sampling). The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

Pin No	Symbol	Description
1	Reserved	No Connection
2	Reserved	No Connection
3	Reserved	No Connection
4	GND	Ground
5	RXIN0-	-LVDS Differential Data Input, CH0
6	RXIN0+	+LVDS Differential Data Input, CH0
7	GND	Ground
8	RXIN1-	-LVDS Differential Data Input, CH1
9	RXIN1+	+LVDS Differential Data Input, CH1
10	GND	Ground
11	RXIN2-	-LVDS Differential Data Input, CH2
12	RXIN2+	+LVDS Differential Data Input, CH2
13	GND	Ground
14	RXCLKIN-	-LVDS Differential Clock Input, CH3
15	RXCLKIN+	+LVDS Differential Clock Input, CH3
16	GND	Ground
17	RXIN3-	-LVDS Differential Data Input, CH3
18	RXIN3+	+LVDS Differential Data Input, CH3
19	GND	Ground–Shield
20	Reserved	Internal used (recommend no connection)
21	Reserved	Internal used (recommend no connection)
22	Reserved	Internal used (recommend no connection)
23	GND	Ground
24	GND	Ground
25	GND	Ground
26	AVDD	Power +5V, (typical)
27	AVDD	Power +5V, (typical)
28	AVDD	Power +5V, (typical)
29	AVDD	Power +5V, (typical)
30	AVDD	Power +5V, (typical)

Note1: Start from left side
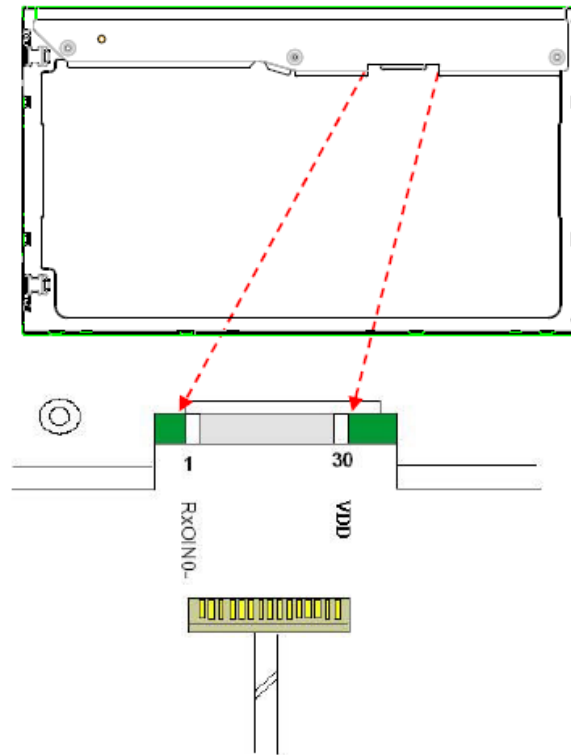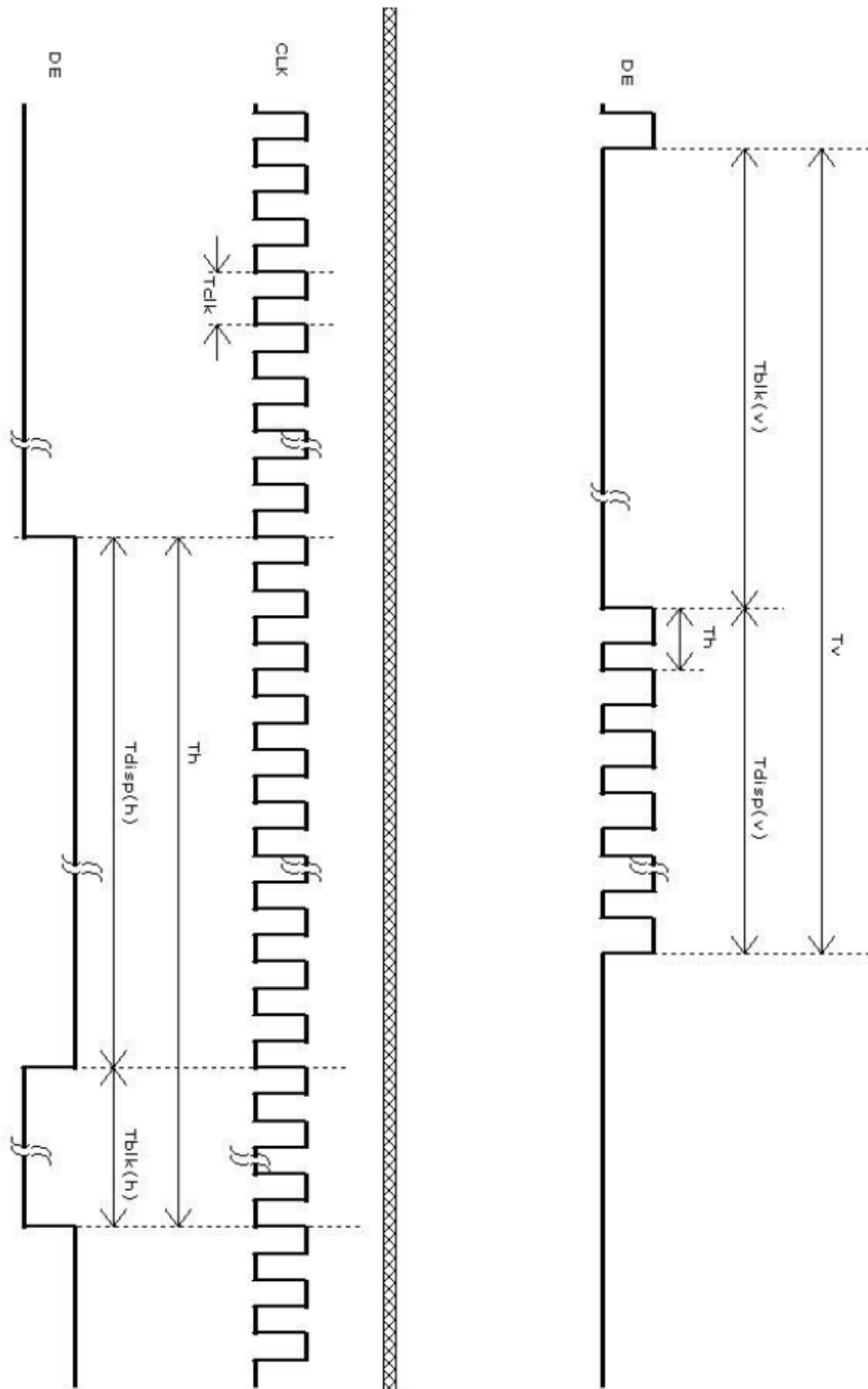
6.4 Interface Timing

6.4.1 Timing Characteristics
Basically, interface timing described here is not actual input timing of LCD module but close to output timing of SN75LVDS82DGG (Texas Instruments) or equivalent.

| Item		Symbol	Min	Typ	Max	Unit
Data CLK		Tclk	50	76	90	[MHz]
H-section	Period	Th	1446	1560	1936	[Tclk]
	Display Area	Tdisp(h)	1366	1366	1366	[Tclk]
	Blanking	Tblk(h)	80	200	570	[Tclk]
V-section	Period	Tv	778	806	888	[Th]
	Display Area	Tdisp(v)	768	768	768	[Th]
	Blanking	Tblk(v)	10	38	120	[Th]
Frame Rate		F	50	60	75	[Hz]

Note : DE mode only

6.4.2 Timing diagram

6.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence are as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off
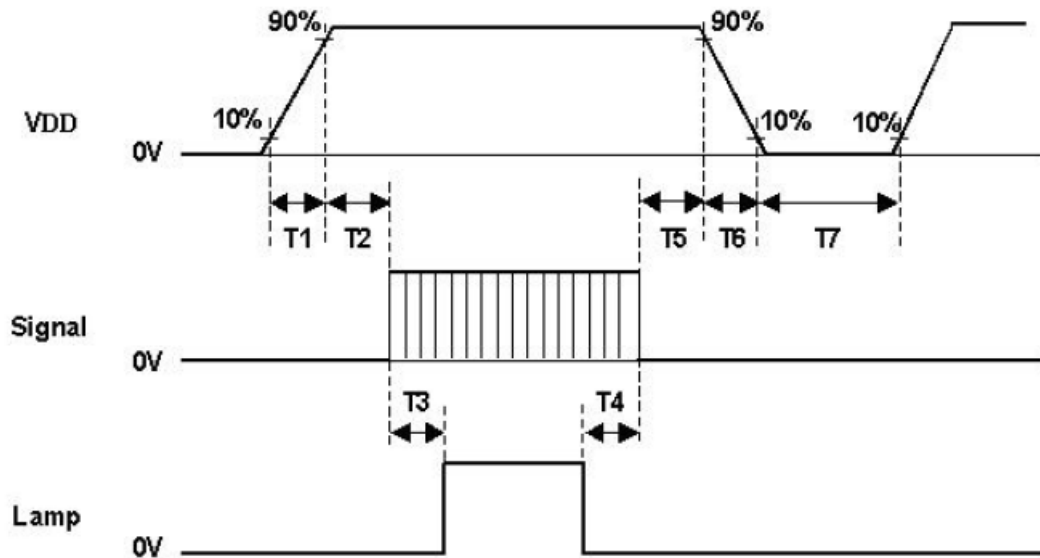
Power Sequence Timing				
Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	
T2	0	-	50	
T3	200	-	-	
T4	100	-		ms
T5	0	16	50	
T6	-	-	100	
T7	1000	-	-	

7 Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	JAE STM
Type Part Number	FI-XB30SSL-HF15 MSBKT2407P30HB
Mating Housing Part Number	FI-X30HL (Locked Type)

7.1.1 Pin Assignment

Pin#	Signal Name	Pin#	Signal Name
1	Reserved	2	Reserved
3	Reserved	4	GND
5	RXIN0-	6	RXIN0+
7	GND	8	RXIN1-
9	RXIN1+	10	GND
11	RXIN2-	12	RXIN2+
13	GND	14	RXCLKIN-
15	RXCLKIN+	16	GND
17	RXIN3-	18	RXIN3+
19	GND	20	Reserved
21	Reserved	22	Reserved
23	GND	24	GND
25	GND	26	AVDD
27	AVDD	28	AVDD
29	AVDD	30	AVDD

7.2 Backlight Unit Section

Pin No.	Symbol	I/O	Function	Remark
1	VLED+	P	Power for LED backlight anode	White
2	VLED-	P	Power for LED backlight cathode	Black

LED Light Bar Connector is used for the integral backlight system. The recommended model is BHSR-02VS-1 manufactured by JST.

Note 1: Input signals shall be low or high-impedance state when VDD is off.

8. Reliability Test Items

Item	Test Conditions	Remark
High Temperature Storage	Ta = 70℃　35%RH　300hrs	Note 1, 4
Low Temperature Storage	Ta = -30℃　50%RH　300hrs	Note 1, 4
High Temperature Operation	Ts = 60℃　　　300hrs	Note 2, 4
Low Temperature Operation	Ta = -20℃　　　300hrs	Note 1, 4
Operate at High Temperature and Humidity	+40℃, 90%RH　300hrs	Note 4
Thermal Shock	-20℃/30 min ~ +60℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	1.5G,　10-500Hz Random, 30 minutes each axis (X, Y, Z)	
Mechanical Shock	220G 2ms,half sine wave, X, Y, Z one time for each direction	
Electro Static Discharge	± 2KV,　Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

9. General Precautions

9.1. Safety
Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

9.2. Handling
1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

9.3. Static Electricity
1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

9.4. Storage
1. Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

9.5. Cleaning
1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

10. Mechanical Drawing