PHOENIX DISPLAY INTERNATIONAL, INC.

PHOENIX DISPLAY INTERNATIONAL, INC

SPECIFICATION FOR LCD MODULE

CUSTOMER	
PART NUMBER	PDIS213BWU02HG
DESCRIPTION	21.3" 1920 x (RGB) x 540 Dots
VERSION	V1.0
ISSUE DATE	05-Jun-19

COMPANY ADDRESS:
Phoenix Display International, Inc.
6150 W. Gila Springs Place Unit 2
Chandler, AZ 85226
USA
www.phoenixdisplay.com
(630) 359-5700 office
(630) 359-5701 fax

Product Specification

Model Name	S213BWU02HG
Description	Standard LCD Module 21.3" 1920(RGB)x540 Dots
Date	2019/06/05
Version	1.0

Approved by/Date	**Check by/Date**	**Prepared by/Date**
ZHP 2019/06/05	HZX 2019/06/05	Yigui.Han 2019/06/05

Customer Approval	
Date	

Table of Contents

1. Record of Revision.....3

2. General Specifications.....4

3. Input/Output Terminals..... 5

4. Absolute Maximum Rating.....6

5.Electrical Characteristics.....6

6. Interface Timing.....8

7. LVDS INPUT SIGNAL SPECIFICATIONS.....16

8. Environmental / Reliability Tests..... 19

9. Mechanical Drawing..... 20

10. Packing.....21

11. TFT-LCD Module Inspection Criteria..... 22

12. Precautions for Use of LCD modules.....26

1. Record of Revision

Rev	Issued Date	Description	Editor
1.0	2019/6/05	First Release.	Yigui.Han

2. General Specifications

Feature		Spec
Characteristics	Size	21.3 inch
	Resolution	1920(horizontal)*540(Vertical)
	Interface	2 port LVDS
	Connect type	Connector
	Display Colors	16.7M
	Technology type	a-Si
	Pixel pitch (mm)	0.2715*0.2715
	Pixel Configuration	R.G.B.-Stripe
	Display Mode	Normally black
	LCD Driver IC	TBD
	Viewing Direction	Full view
Mechanical	LCM (W x H x D) (mm)	547.4*175.40*19.0
	Active Area(mm)	521.28*146.61
	With /Without TSP	Without TSP
	LED Numbers	TBD

Note 1: Requirements on Environmental Protection: RoHs
Note 2: LCM weight tolerance: +/- 5%

3. Input/Output Terminals

LCD PIN-MAP

1	RX0[O]N	Odd LVDS Signal-
2	RX0[O]P	Odd LVDS Signa+
3	RX1[O]N	Odd LVDS Signal-
4	RX1[O]P	Odd LVDS Signal+
5	RX2[O]N	Odd LVDS Signal-
6	RX2[O]P	Odd LVDS Signal+
7	GND	Power ground
8	RXC[O]N	LVDS Clock-
9	RXC[O]P	LVDS Clock+
10	RX3[O]N	Odd LVDS Signal-
11	RX3[O]P	Odd LVDS Signal+
12	RX0[E]N	Even LVDS Signal-
13	RX0[E]P	Even LVDS Signal+
14	GND	Power ground
15	RX1[E]N	Even LVDS Signal-
16	RX1[E]P	Even LVDS Signal+
17	GND	Power ground
18	RX2[E]N	Even LVDS Signal-
19	RX2[E]P	Even LVDS Signal+
20	RXC[E]N	LVDS Clock-
21	RXC[E]P	LVDS Clock+
22	RX3[E]N	Even LVDS Signal-
23	RX3[E]P	Even LVDS Signal+
24	GND	Power ground
25	NC	No connection
26	NC	No connection
27	NC	No connection
28	5V	DC power supply
29	5V	DC power supply
30	5V	DC power supply

4. Absolute Maximum Rating

Item	Symbol	MIN	Typ	MAX	Unit	Remark
Operating Temperature	TOPR	0	-	+50	℃	
Storage Temperature	TSTG	-20	-	+60	℃	

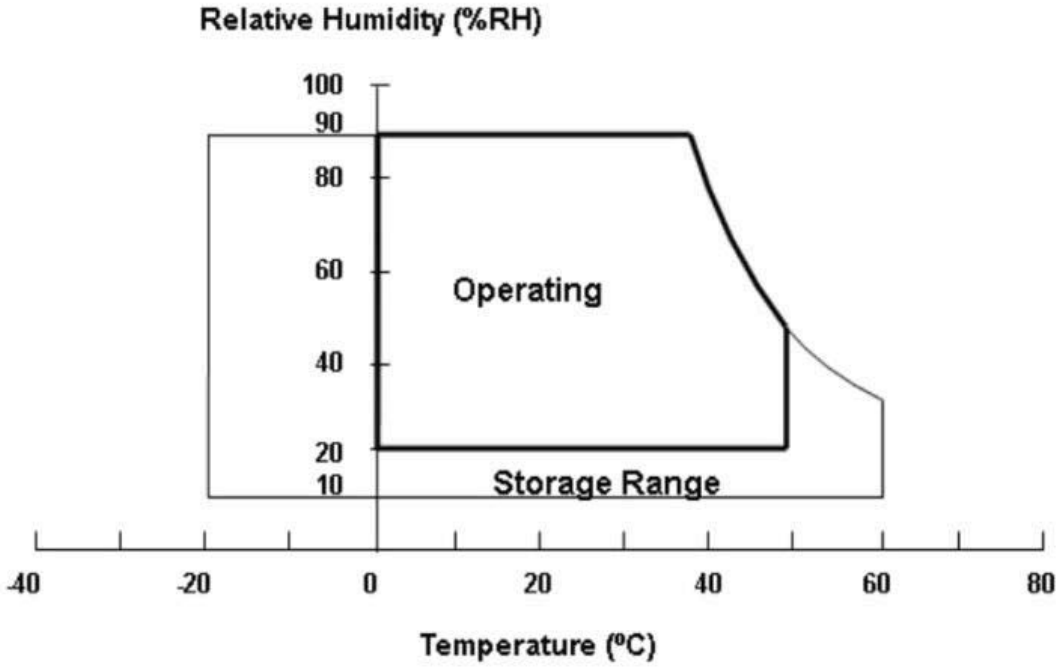
Note (1)

(a) 90 %RH Max. (Ta <= 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel surface should be 0 ºC min. and 60 ºC max.



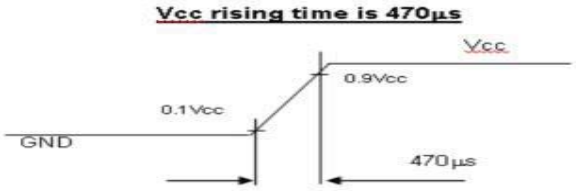
5.Electrical Characteristics

5.1 LCD ELETRONICS SPECIFICATION

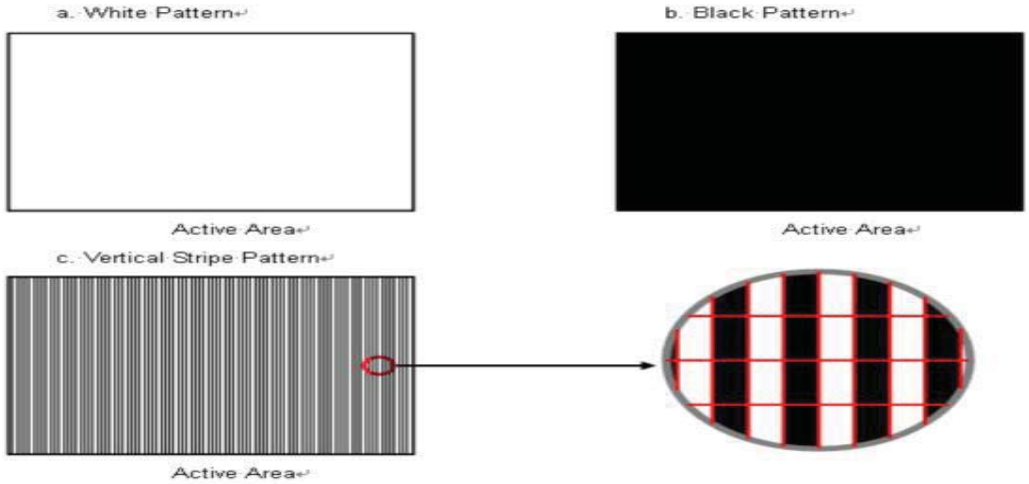
Item		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		VRP	-	-	300	mV	-
Rush Current		IRUSH	-	-	3	A	(2)
Power Supply Current	White		-	-	410	430	mA	(3)a
	Black		-	-	1040	1200	mA	(3)
	Vertical Stripe		-	-	940	1030	mA	(3)c
Power Consumption		PLCD	-	5.2	6	Watt	(4)(6)
LVDS differential input voltage		Vid	200	-	600	mA	
LVDS common input voltage		Vic	1.0	1.2	1.4	V	
Logic High Input Voltage		VIH			0.1	V	
Logic Low Input Voltage		VIL	-0.1			V	

Note (1) The ambient temperature is Ta = 25 ± 2 °C.

Note (2) Measurement Conditions:



Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 °C, Fr = 75Hz, whereas a power dissipation check pattern below is displayed.



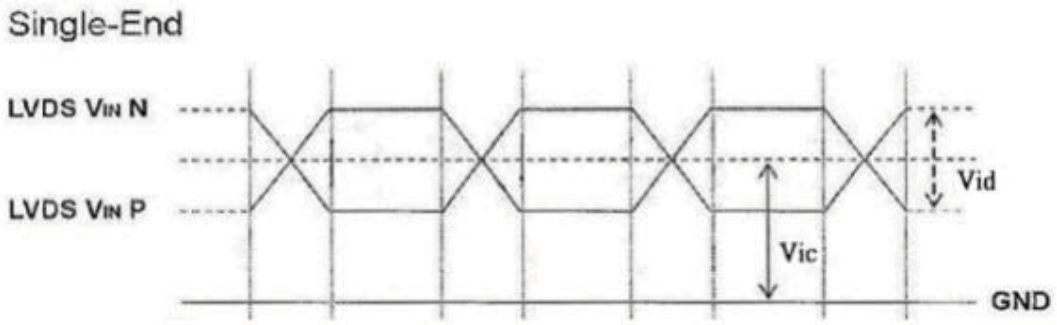
Note (4) The power consumption is specified at the pattern with the maximum current.

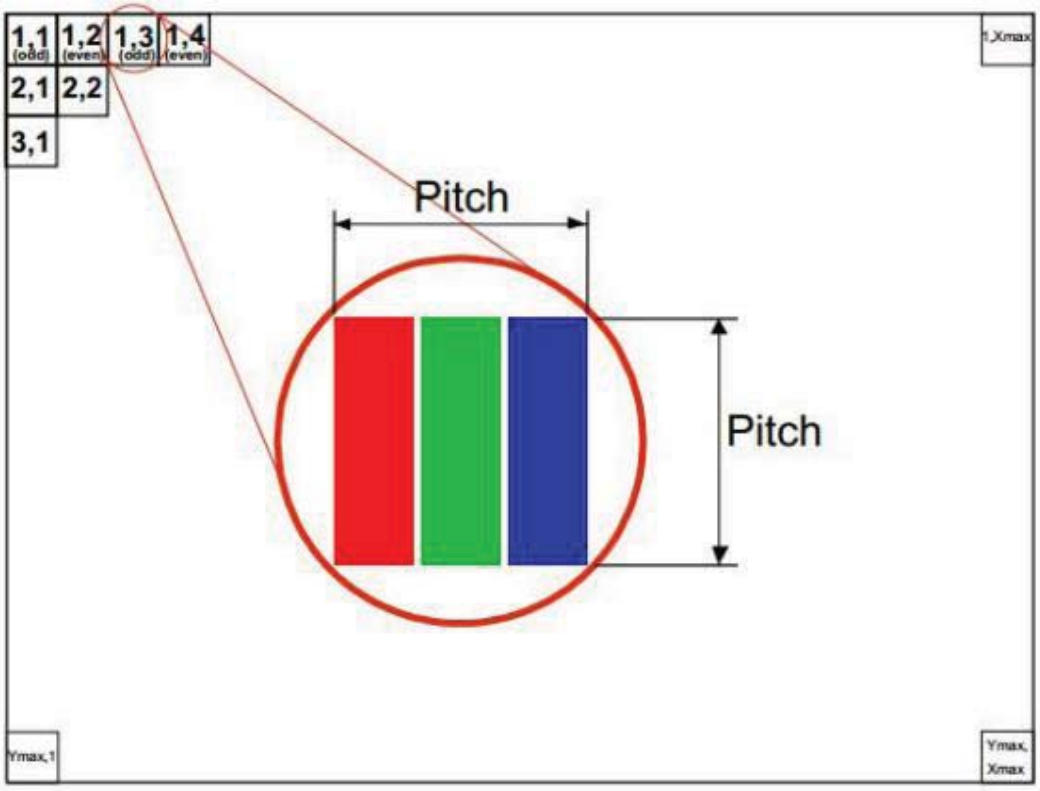
Note (5) VID waveform condition

Single-End

Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5) VID waveform condition





Note(2)

All GND pins should be connected together to the LCD module's metal frame.

All 5V(power input) pins should be connected together.

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

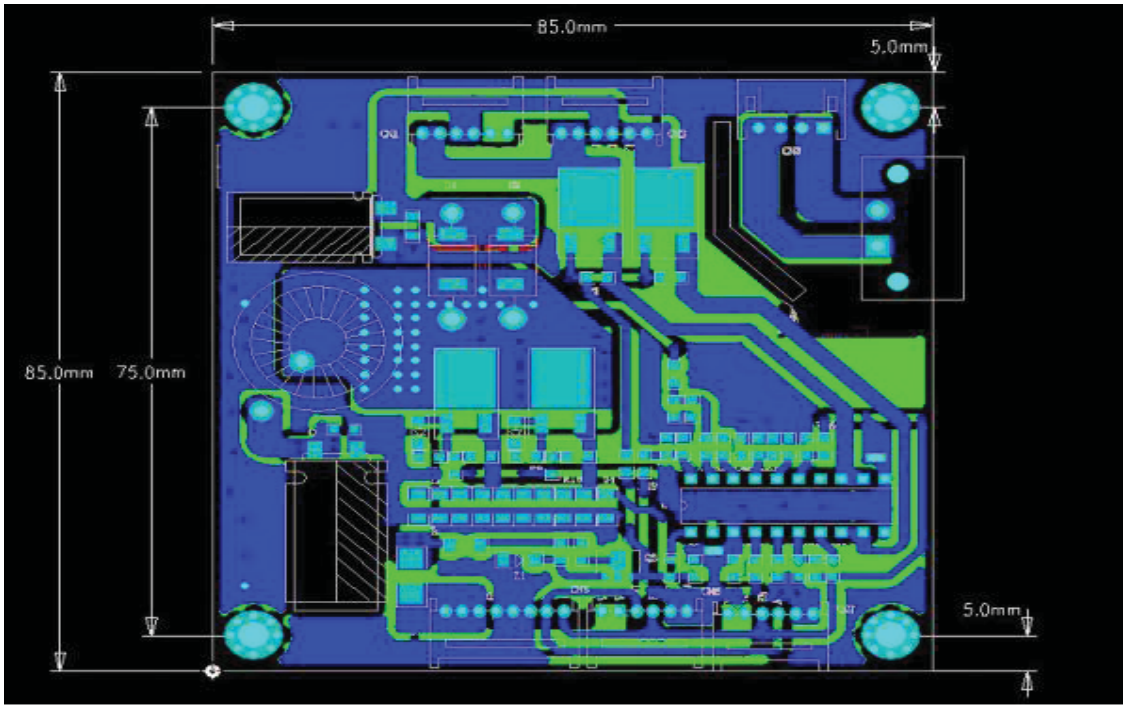
5.3 LED Driving Conditions

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	-	200	mA	
Forward Voltage	V_F	-	-	36.3	V	
Backlight Power consumption	W_{BL}	-	-	7.26	W	
LED Lifetime		-	50000	-	Hrs	

Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:

Note (2) PBL(Typ) = IPIN(Typ) × VPIN(Typ) × (2) ,PBL(Max)=IPIN(TYP) ×VPIN(Max) ×(2) , LED light bar circuit is (11)Series, (4)Parallel.

5.4 LED DRIVER BOARD CONNECTOR



5.5.**BACKLIGHT UNIT**

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Forward Current Per Input Pin	I_F	-	-	50	mA	(1),(2) Duty=100%
LED Pulse Forward Current Per Input Pin	I_P	-	-	400	mA	(1),(2) Pulse Width≦ 10msec. and Duty= 30%

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for input pin of LED light bar at Ta=25±2 °C (Refer to 4.3.3 and 4.3.4 for further information).

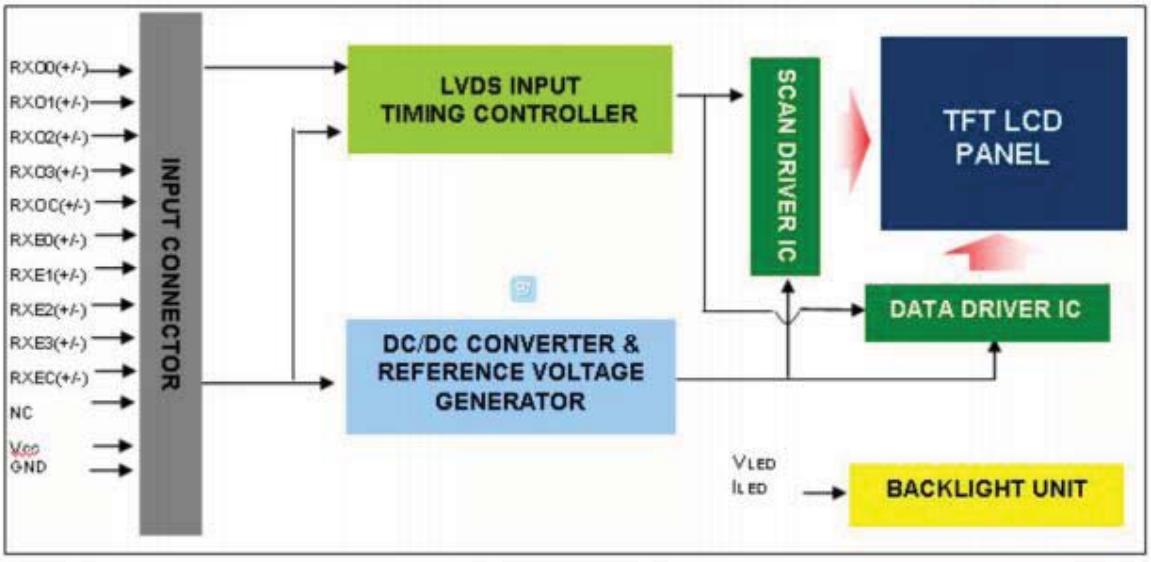
Connector type: P2004WL-06（90 度）

PIN	SYMBOL	DESCRIPTION
1	V+	12V/24V
2	V+	
3	ADJ	PWM
4	SW	OFF:0-0.8V / ON:2-VDD
5	GND	
6	GND	

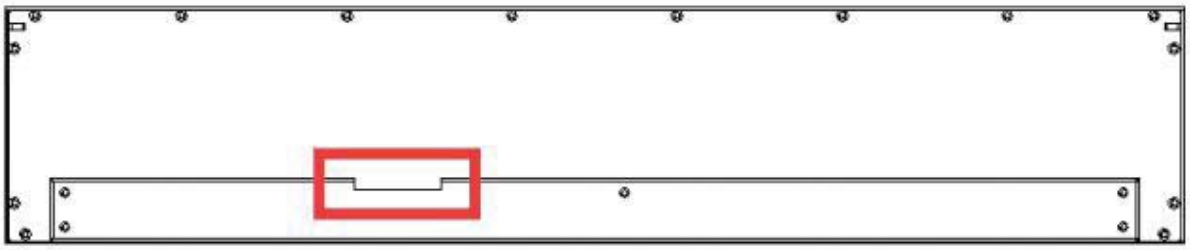
Connector type: 6PIN　P2004WL-06（90 度）

PIN	SYMBOL	DESCRIPTION
1	LED-	LED2 Current backtrack
2	LED-	LED2 Current backtrack
3	LED+	LED power supply
4	LED+	LED power supply
5	LED-	LED1 Current backtrack
6	LED-	LED1 Current backtrack

5.6 FUNCTION BLOCK DIAGRAM



6.LVDS INPUT SIGNAL SPECIFICATIONS



6.1 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	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
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	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	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
Gray Scale Of Red	Red(0) / Dark	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)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	:0	0	0	0	0	0	0	0	0	0	0	0	:0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	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(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	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(1)	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(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

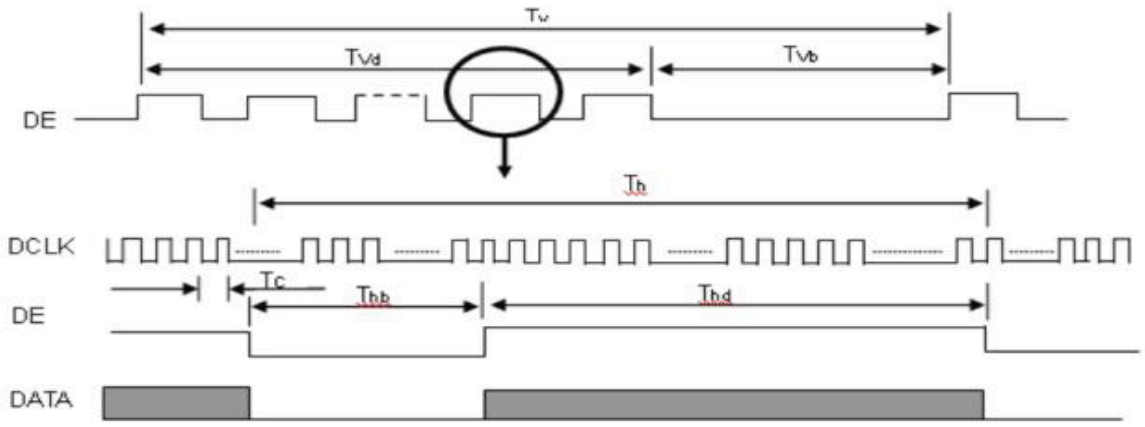
6.2 DISPLAY TIMMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

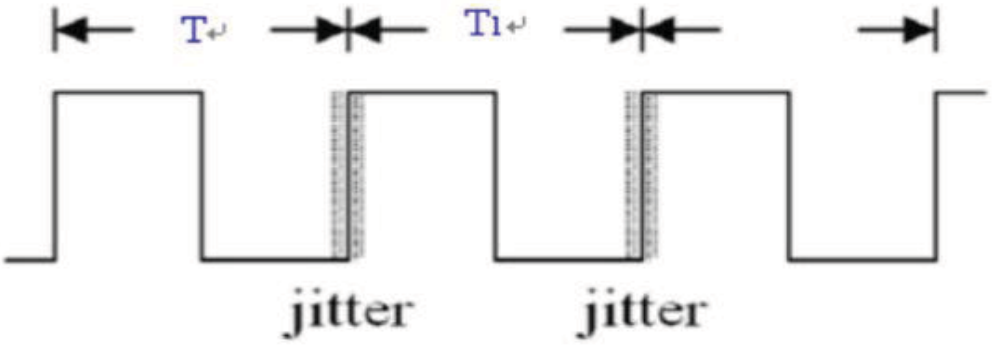
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frequency	Clock	Fc	58.54	74.25	98	MHz	-
	Hsync	Fh	-	74	-	KHz	
	Vsync	Fv	50	60	75	Hz	
Vertical Display Term	Frame Rate	Fr	50	60	75	Hz	Tv=Tvd+Tvb
	Total	Tv	1115	1125	1136	Th	-
	Active Display	Tvd		1080		Th	-
	Blank	Tvb	Tv-Tvd	45	Tv-Tvd	Th	-
Horizontal Display Term	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
	Active Display	Thd		960		Tc	-
	Blank	Thb	Th-Thd	140	Th-Thd	Tc	-

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

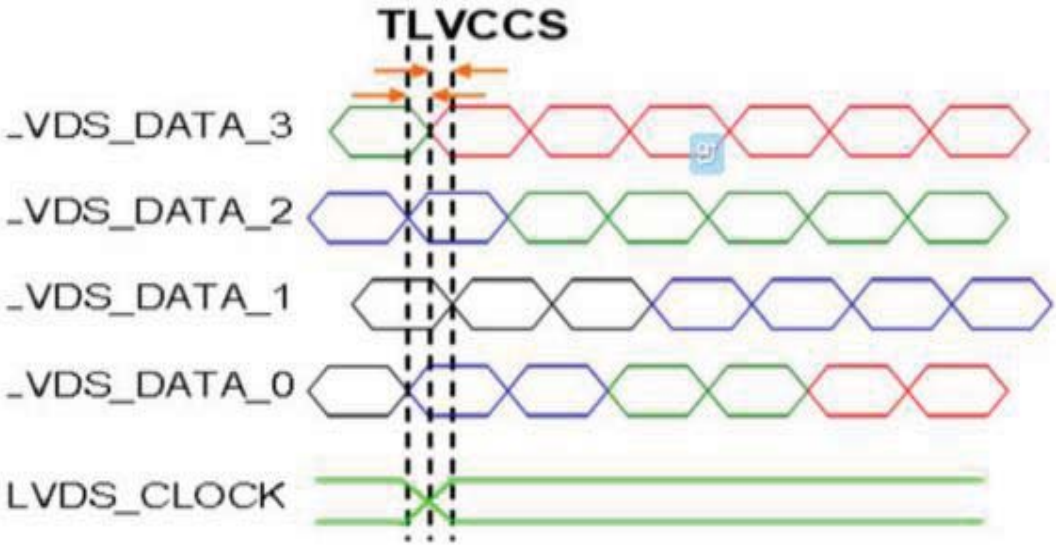
INPUT SIGNAL TIMING DIAGRAM



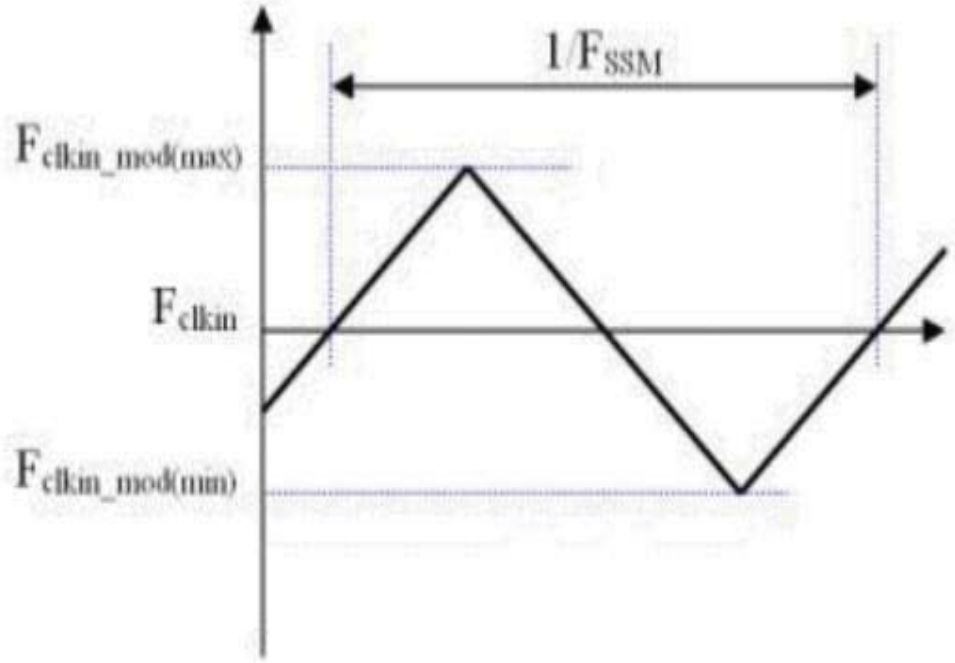
Note (1) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T1 – TI



Note (2) Input Clock to data skew is defined as below figures.



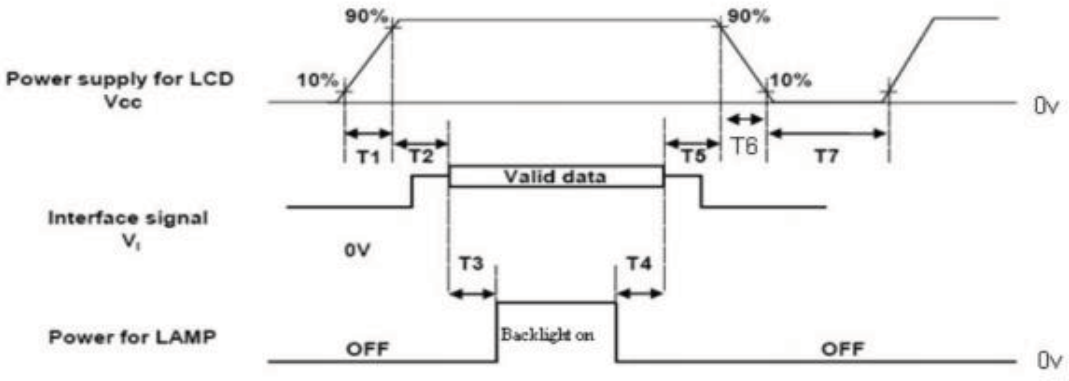
Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (4) The DCLK range at last line of V-blank should be set in 0 to Hdisplay/2

6.3 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.



Parameters	Values			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	450	-	-	ms
T4	90	-	-	ms
T5	0	-	50	ms
T6	5	-	150	ms
T7	500	-	-	ms

Note (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

Note (4) T7 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

Note (6) CMI won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.

Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "t6 spec".

5. Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time		Tr+Tf	-	-	25	30	ms	FIG.1	Note4
Contrast Ratio		CR		-	1000	-	-	FIG.2	Note1
Surface luminance		LV	θ =0°	-	700	-	cd/m2	FIG.2	Note2
Luminance uniformity		Yu	θ =0°	70	80	-	%	FIG.2	Note3
NTSC		-	θ =0°	65	70	-	%	FIG.2	Note5
Viewing angle		θ_T	Center CR≥10	-	80	-	deg	FIG.3	Note6
		θ_B		-	80	-	deg	FIG.3	
		θ_L		-	80	-	deg	FIG.3	
		θ_R		-	80	-	deg	FIG.3	
Chromaticity	Red	R_X	θ =0° ∅=0° Ta=25°	TBD	TBD	TBD	-	FIG.2 CIE1931	Note5
		R_Y		TBD	TBD	TBD	-		
	Green	G_X		TBD	TBD	TBD	-		
		G_Y		TBD	TBD	TBD	-		
	Blue	B_X		TBD	TBD	TBD	-		
		B_Y		TBD	TBD	TBD	-		
	White	W_X		TBD	TBD	TBD	-		
		W_Y		TBD	TBD	TBD	-		

Note1. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula. For more information see FIG.2.

$$\text{Contrast ratio} = \frac{\text{Luminance measured when LCD on the “White” state}}{\text{Luminance measured when LCD on the “Black” state}}$$

For contrast ratio, Surface Luminance, Luminance uniformity and CIE,the testing data is base on TOPCON’s BM-5 or BM-7 photo detector or compatible.

Note2. Definition of surface luminance.

Surface luminance is the luminance with all pixels displaying white. For more information see FIG.2.

Lv = Average Surface Luminance with all white pixels(P1,P2,P3, ...,Pn)

Note3. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance.For more information see FIG.2.

$$YU = \frac{\text{Minimum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}{\text{Maximum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}$$

Note4. Definition of response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black"state.Rise time (Tr) is the time between photo detector output intensity changed from 90% to 10%. And fall time (Tf) is the time between photo detector output intensity changed from 10% to 90%.

For additional information see FIG1.

Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity,The x,y value is determined by screen active area center position P5.For more information see FIG.2.

Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. Angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers' s ConoScope or DMS series Instruments or compatible.

FIG.1.The definition of response Time

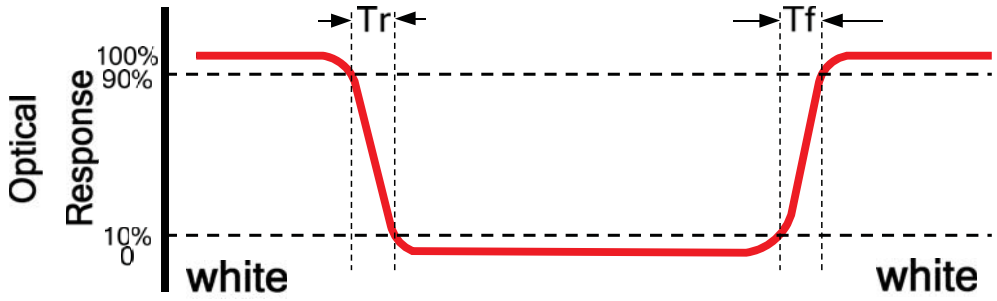


FIG.2. Measuring method for contrast ratio, surface luminance, luminance uniformity, CIE (x,y) chromaticity

Size : S≤5"(see Figure a) A : 5 mm B : 5 mm
H,V : Active area
Light spot size ∅=5mm(BM-5) or ∅=7.7mm (BM-7)50cm distance or compatible distance from the LCD surface to detector lens.
test spot position : see Figure a.
measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

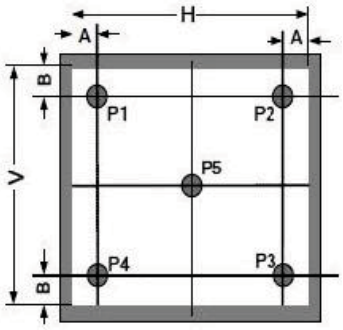


Figure a

Size : 5"＜S≤12.3"(see Figure b) H,V : Active area

Light spot size ∅=5mm(BM-5) or ∅=7.7mm (BM-7)50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure b.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

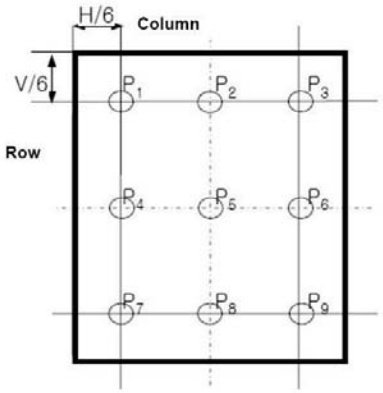


Figure b

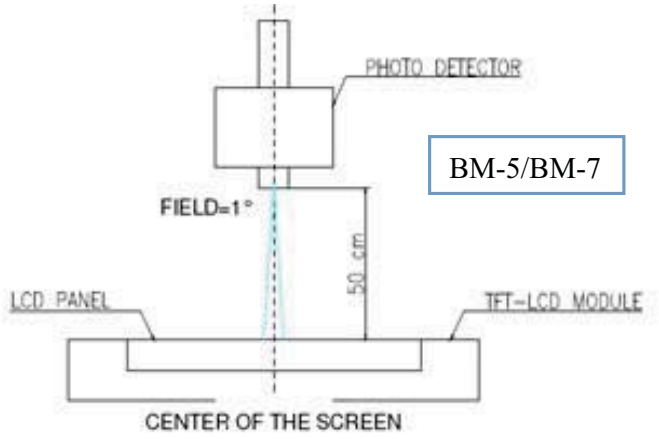
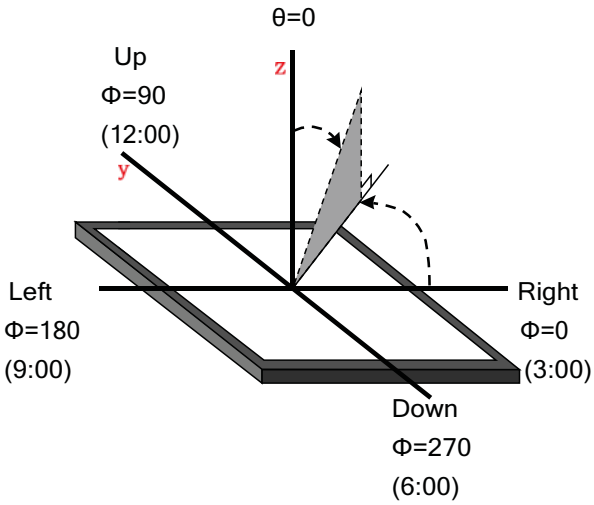


Figure c

FIG.3.The definition of viewing angle

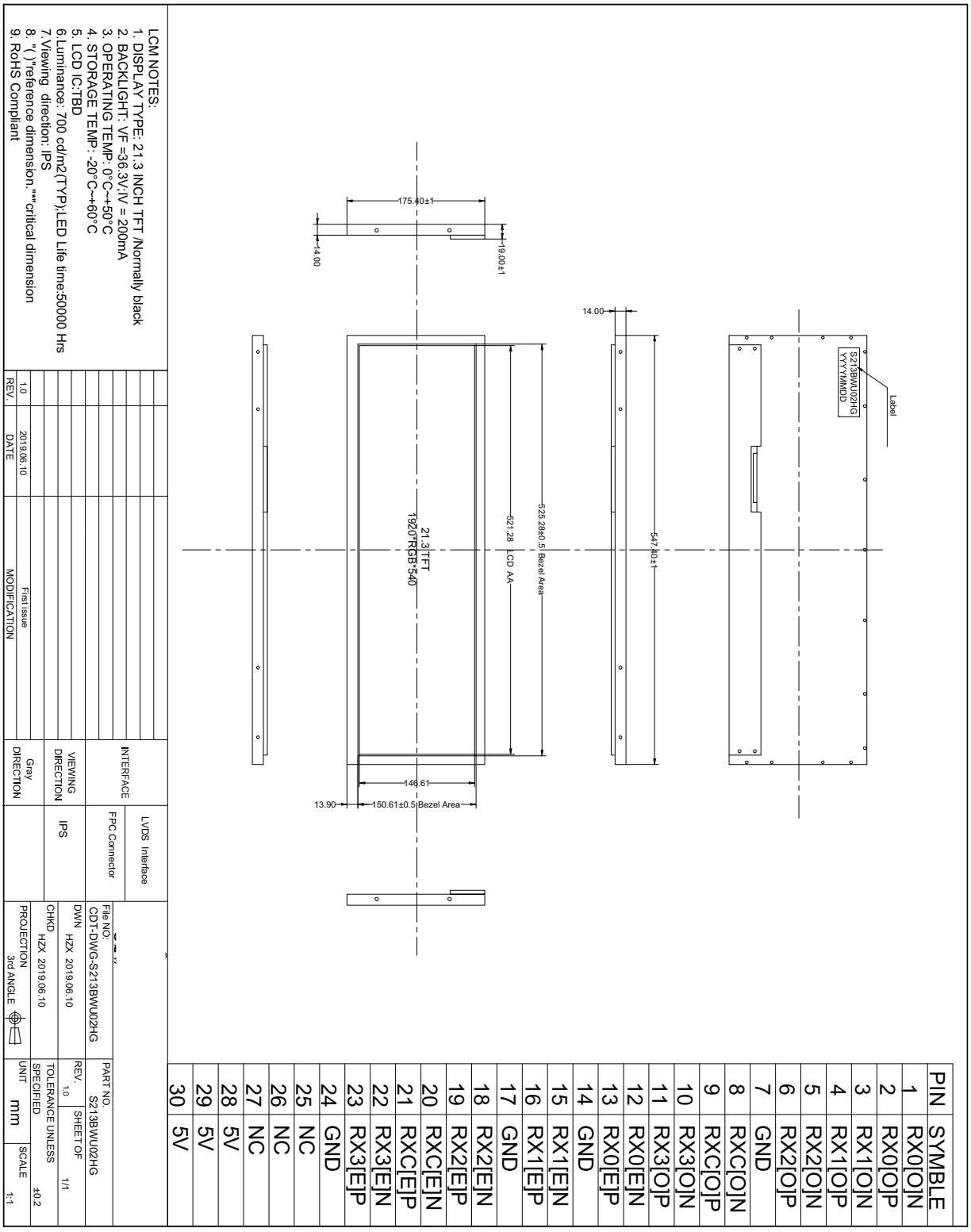


8.Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +50℃, 96hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= 0℃, 96hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +60℃, 96hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -20℃, 96hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60℃, 90% RH max,96hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-40℃ 30 min ~ +95℃ 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Static Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15℃ ~ 35℃, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995

Note: 1. Ts is the temperature of panel's surface.
2. Ta is the ambient temperature of sample.
3. The size of sample is 5pcs.

9.Mechanical Drawing



PIN	SYMBLE
1	RX0[O]N
2	RX0[O]P
3	RX1[O]N
4	RX1[O]P
5	RX2[O]N
6	RX2[O]P
7	GND
8	RXC[O]N
9	RXC[O]P
10	RX3[O]N
11	RX3[O]P
12	RX0[E]N
13	RX0[E]P
14	GND
15	RX1[E]N
16	RX1[E]P
17	GND
18	RX2[E]N
19	RX2[E]P
20	RXC[E]N
21	RXC[E]P
22	RX3[E]N
23	RX3[E]P
24	GND
25	NC
26	NC
27	NC
28	5V
29	5V
30	5V

LCM NOTES:
1. DISPLAY TYPE: 21.3 INCH TFT /Normally black
2. BACKLIGHT: VF =36.3V;IV = 200mA
3. OPERATING TEMP: 0°C~+50°C
4. STORAGE TEMP: -20°C~+60°C
5. LCD IC:TBD
6.Luminance: 700 cd/m2(TYP);LED Life time:50000 Hrs
7.Viewing direction: IPS
8. " ( )"reference dimension."*" critical dimension
9. RoHS Compliant

REV.	DATE	MODIFICATION
1.0	2019.06.10	First issue

INTERFACE: LVDS Interface
FPC Connector
VIEWING DIRECTION: IPS
Gray DIRECTION

File NO:	CDT-DWG-S213BWU02HG
DWN	HZX 2019.06.10
CHKD	HZX 2019.06.10
PROJECTION	3rd ANGLE
PART NO.	S213BWU02HG
REV.	1.0
SHEET OF	1/1
TOLERANCE UNLESS SPECIFIED	±0.2
UNIT	mm
SCALE	1:1

10Packing

Packing Method

TBD

11.TFT-LCD Module Inspection Criteria

11.1 Scope

The incoming inspection standards shall be applied to TFT －LCD Modules (hereinafter Called "Modules") that supplied by CDTech Technology LTD.

11.2 Incoming Inspection

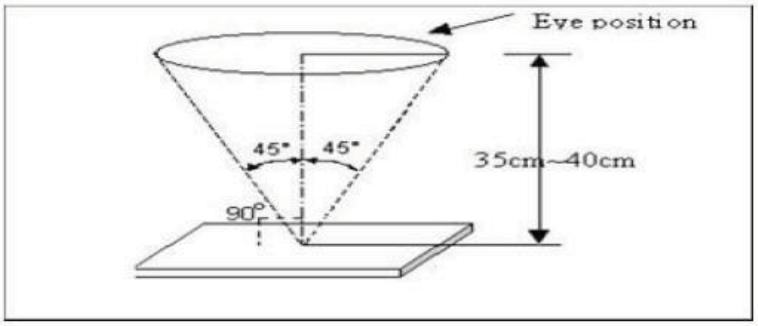
The customer shall inspect the modules within twenty calendar days of the delivery date（the “inspection period）at its own cost. The result of the inspection（acceptance or rejection）shall be recorded in writing, and a copy of this writing will be promptly sent to The seller, If the results of the inspecting from buyer does not send to the seller within twenty Calendar days of the delivery date. The modules shall be regards as acceptance. Should the customer fail to notify the seller within the inspection period, the buyers Right to reject the modules shall be lapsed and the modules shall be deemed to have Been accepted by the buyer

11.3 Inspection Sampling

3.1. Lot size: Quantity per shipment lot per model
3.2. Sampling type: Normal inspection, Single sampling
3.3. Inspection level: II
3.4. Sampling table: MIL-STD-105E
3.5. Acceptable quality level （AQL ）
Major defect: AQL=0.65 Minor defect: AQL=1.00

11.4 Inspection Conditions

4.1 Ambient conditions:
a. Temperature: Room temperature 25±5℃
b. Humidity: (60±10) ％RH
c. Illumination: Single fluorescent lamp non-directive (300 to 700 Lux)
4.2 Viewing distance
The distance between the LCD and the inspector’s eyes shall be at least 35±5 ㎝.
4.3 Viewing Angle
U/D: 45 ° /45°, L/R: 45° /45°



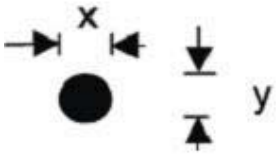
11.5 Inspection Criteria

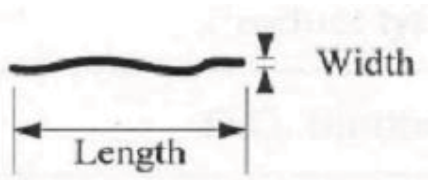
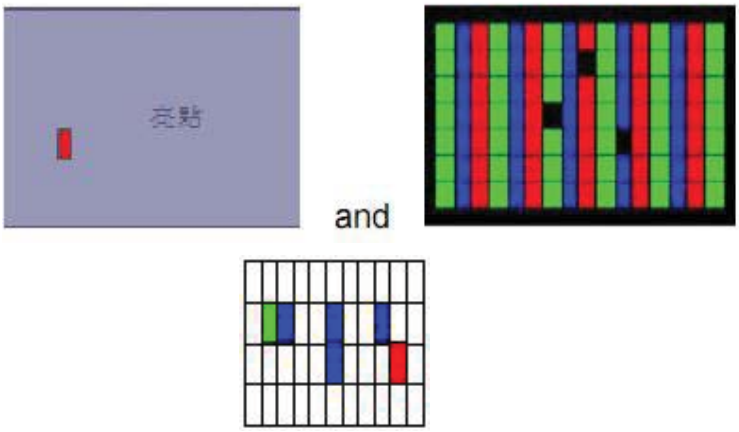
Defects are classified as major defects and minor defects according to the degree of Defectiveness defined herein.

11.5.1 Major defect

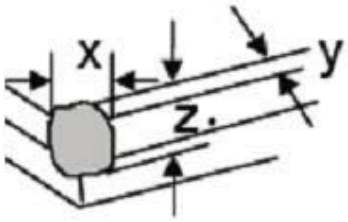
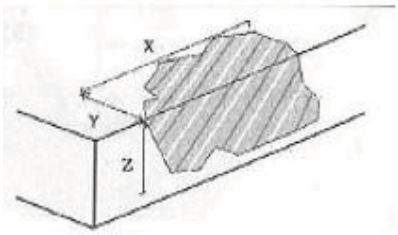
Item No	Items to be inspected	Inspection Standard
5.1.1	All functional defects	1) No display 2) Display abnormally 3) Short circuit 4) line defect
`5.1.2	Missing	Missing function component
5.1.3	Crack	Glass Crack

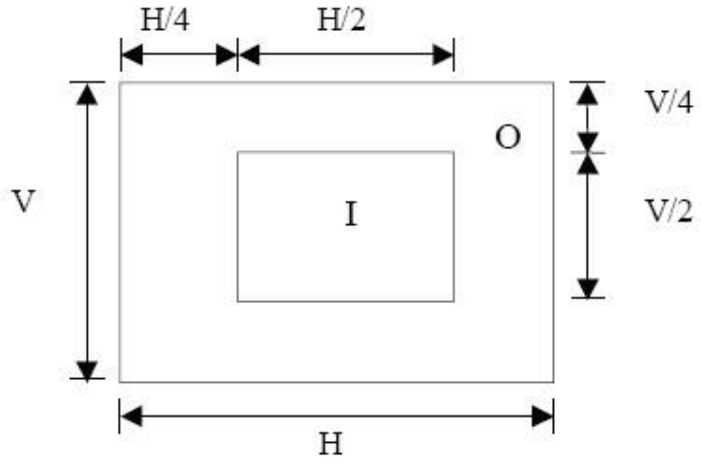
11.5.2 Minor defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th colspan="2">Inspection standard</th></tr>
<tr><td rowspan="5">5.2.1</td><td rowspan="5">Spot Defect
Including Black spot White spot
Pinhole Foreign particle
Polarizer dirt</td><td colspan="2">For dark/white spot is defined
$\varphi = (x+y) / 2$

</td></tr>
<tr><td>Size φ(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>Φ<0.2</td><td>Ignore</td></tr>
<tr><td>0.2 ≤Φ≤0.5</td><td>N≤4</td></tr>
<tr><td>Φ>0.5</td><td>Not allowed</td></tr>
</table>

<table>
<tr><td rowspan="4">5.2.2</td><td rowspan="4">Line Defect
Including Black line
White line Scratch</td><td colspan="2">Define:

</td></tr>
<tr><td>Width(mm)
Length(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>W<0.05</td><td>Ignore</td></tr>
<tr><td>0.05≤W≤0.1
0.3≤L≤3.0</td><td>N≤5</td></tr>
<tr><td>L>3.0</td><td>Not allowed</td></tr>
<tr><td rowspan="4">5.2.3</td><td rowspan="4">Polarizer
Dent/Bubble</td><td>Sizeφ(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>Φ<0.2</td><td>Ignore</td></tr>
<tr><td>0.2 ≤Φ≤0.5</td><td>N≤4</td></tr>
<tr><td>Φ>0.5</td><td>Not allowed</td></tr>
<tr><td rowspan="6">5.2.4</td><td rowspan="6">Electrical Dot
Defect</td><td colspan="2">Bright and Black dot define:


Two Adjacent Dot</td></tr>
<tr><td colspan="2">Inspection pattern: Full white、Full black、Red、green and blue screens</td></tr>
<tr><td rowspan="2">Item</td><td colspan="3">Acceptable Quantity</td></tr>
<tr><td>Single Dot</td><td>Adjacent 2dots</td><td>Note</td></tr>
<tr><td>Black dot defect</td><td>5</td><td>1</td><td>5</td></tr>
<tr><td>Bright dot defect</td><td>4</td><td>0</td><td>4</td></tr>
<tr><td>Total Dot</td><td colspan="2"></td><td>7</td></tr>
</table>

<table>
<tr><td rowspan="5">5.2.5</td><td rowspan="5">Glass defect</td><td colspan="2">1.Corner Fragment:

</td></tr>
<tr><td>Size(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>X≤3mm
Y≤1mm
Z≤T</td><td>Ignore
T：Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
<tr><td colspan="2">2. Side Fragment:

</td></tr>
<tr><td>Size(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>X≤5.0mm
Y ≤1mm
Z≤T</td><td>T：Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
</table>



I area & O area

Note: 1). Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.

2). The distance between two bright dot defects (red, green, blue, and white) should be larger than 15mm.

3). The distance between black dot defects or black and bright dot defects should be more than 5mm apart.

4). Polarizer bubble is defined as the bubble appears on active display area. The defect of polarizer bubble shall be ignored if the polarizer bubble appears on the outside of active display area.

11.6 Mechanics specification

As for the outside dimension, weight of the modules, please refer to product specification For more details

12.Precautions for Use of LCD modules

12.1 Handling Precautions

12.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

12.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

12.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

12.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol

－ Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

－ Water

－ Ketene

－ Aromatic solvents

12.1.6. Do not attempt to disassemble the LCD Module.

12.1.7. If the logic circuit power is off, do not apply the input signals.

12.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

12.1.8.1. Be sure to ground the body when handling the LCD Modules.

12.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

12.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

12.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

12.2 Storage Precautions

12.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

12.2.2. The LCD modules should be stored under the storage temperature range If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

12.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

12.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.