Chunghwa Picture Tubes, Ltd.
Technical Specification

To ：**HENGJIAYU**

Date ：2013/06/17

CPT TFT-LCD

CLAA070NQ02 XN

HENGJIAYU

S1086-7DI-24

ACCEPTED BY：

Tentative

APPROVED BY	CHECKED BY	PREPARED BY
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1. OVERVIEW

CLAA070NQ02XN is 7.0” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight. By applying 1024×600 images are displayed on the 7.0” diagonal screen. Display 16.7M colors by R.G.B signal input.

General specifications are summarized in the following table：

ITEM	SPECIFICATION			
Display Area (mm)	154.2144(H) × 85.92(V)			
Number of Pixels	1024(H) × 3(RGB) ×600(V)			
Pixel Pitch (mm)	0.1506(H) × 0.1432(V)			
Color Pixel Arrangement	RGB vertical stripe			
Display Mode	Normally Black			
Number of Colors	16.7M			
Brightness (cd/m^2)	250nits(typ)			
Response Time (ms)	30ms(typ.),50ms(max)			
NTSC	50%			
Contrast Ratio	800(typ)			
Viewing Angle (CR≧10)	85°、 85°/ 85°、85°(Typ.) 80°、80° / 80°、80°(Min)			
Power Consumption (W)	(2 W)(typ)			
Inversion	Dot			
Interface connection	TTL			
Module Size (mm)		Min.	Typ.	Max
	Horizontal (H)	164.8	164.9	165.1
	Vertical (V)	99.9	100.0	100.2
	Depth (D)	2.7	2.8	2.95
Module Weight (g)	105 (MAX)			
Backlight Unit	LED			
Surface Treatment	Anti-Glare			

2. ABSOLUTE MAXIMUM RATINGS

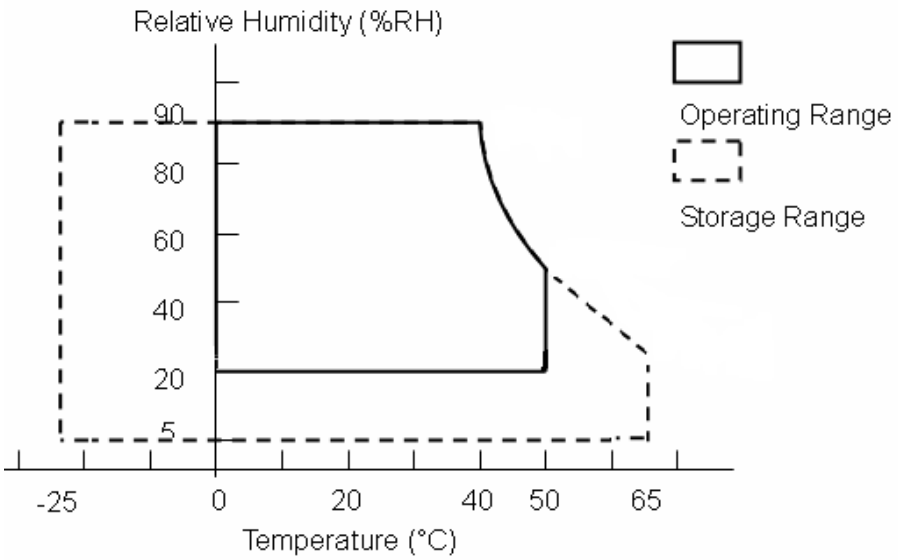
The following are maximun values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	DVDD DVDD_LVDS	-0.3	4	V	
Analog Supply Voltage	AVDD	-0.5	15	V	
Gate On Voltage	VGH	-0.3	40	V	
Gate Off Voltage	VGL	-20	0.3	V	
Gate On-Gate Off Voltage	VGH-VGL	12	40	V	
Signal Input Voltage	NIND0 ~ NIND3 PIND0 ~ PIND3 NINC,PINC	-0.5	5	V	
Forward Current（per LED）	If	-	30	mA	
Reverse Voltage（per LED）	VR	-	5	V	
Pulse forward current（per LED）	Ifp	-	160	mA	Note 1、2
Operating temperature	Topa	0	50	℃	Note 3
Storage temperature	Tstg	-25	65	℃	Note 3

Note1：Ifp Conditions ： Pulse Width ≦10msec；Duty ≦1/10

Note2：perating must under the condition as below drawing.

(Ambient Temperature /Allowable Forward Current) Each LED .



Note3：If users use the product out off the environmemtal operation range（temperature and humidity）,it will have visual quality concerns.

3. ELECTRICAL CHARACTERISTICS

3.1 Typical Operation Conditions

Ta=25℃

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Digital Power Supply Voltage For LCD	DVDD	3	3.3	3.6	V	
Analog Power Supply Voltage	AVDD	9.4	9.6	9.8	V	
Gate On Power Supply Voltage	VGH	17	18	19	V	
Gate Off Power Supply Voltage	VGL	-6.6	-6	-5.4	V	
Logic Input Voltage	VIH	0.7*DVDD	-	DVDD	V	
	VIL	GND	-	0.3*DVDD	V	

3.2 Current consumption

ITEM	SYMBOL	CONDITION	MIN	TYPE	MAX	UNIT	NOTE
Gate on power current	IVGH	VGH =18V	- -	(0.5)	(1)	mA	Note1
Gate off power current	IVGL	VGL= -6V	- -	(0.5)	(1)	mA	Note1
Digital power current	IDVDD	DVDD = 3.3V	- -	(30)	(45)	mA	Note1
Analog power current	IAVDD	AVDD = 9.6V	- -	(35)	(45)	mA	Note1
Total Power Consumption	PC		- -	(447)	(604)	mW	Note1

【Note1】Max. specification：White test Pattern

Typ. specification：Gray-level test Pattern

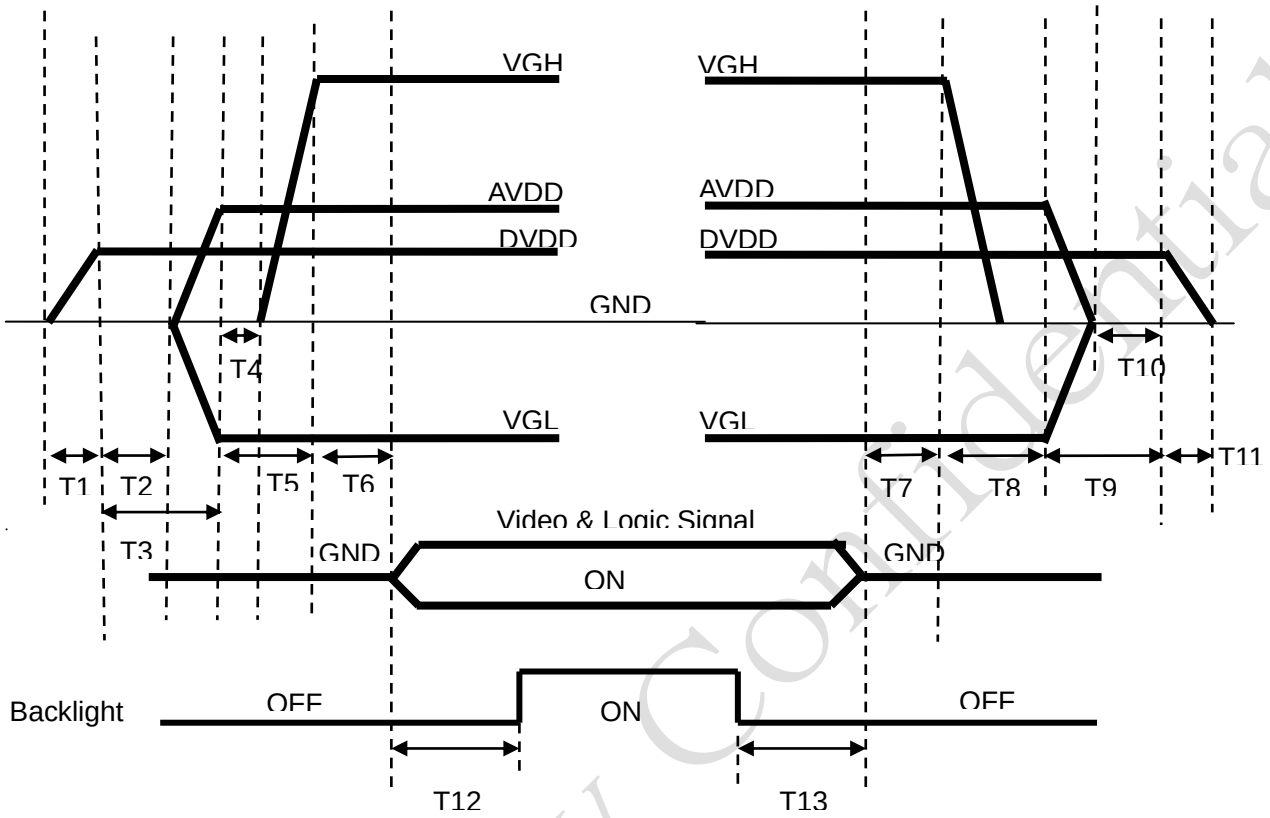
256 gray pattern

White Pattern

3.3 Power、Signal Sequence

Power On：DVDD→AVDD/VGL →VGH →Video &Logic Signal→Backlight

Power Off：Backlight→Video &Logic Signal→ VGH→AVDD/VGL→DVDD



0<T1≦10ms

T2>0ms

T3>20ms

T4>0ms

T5>10ms

T7>0ms

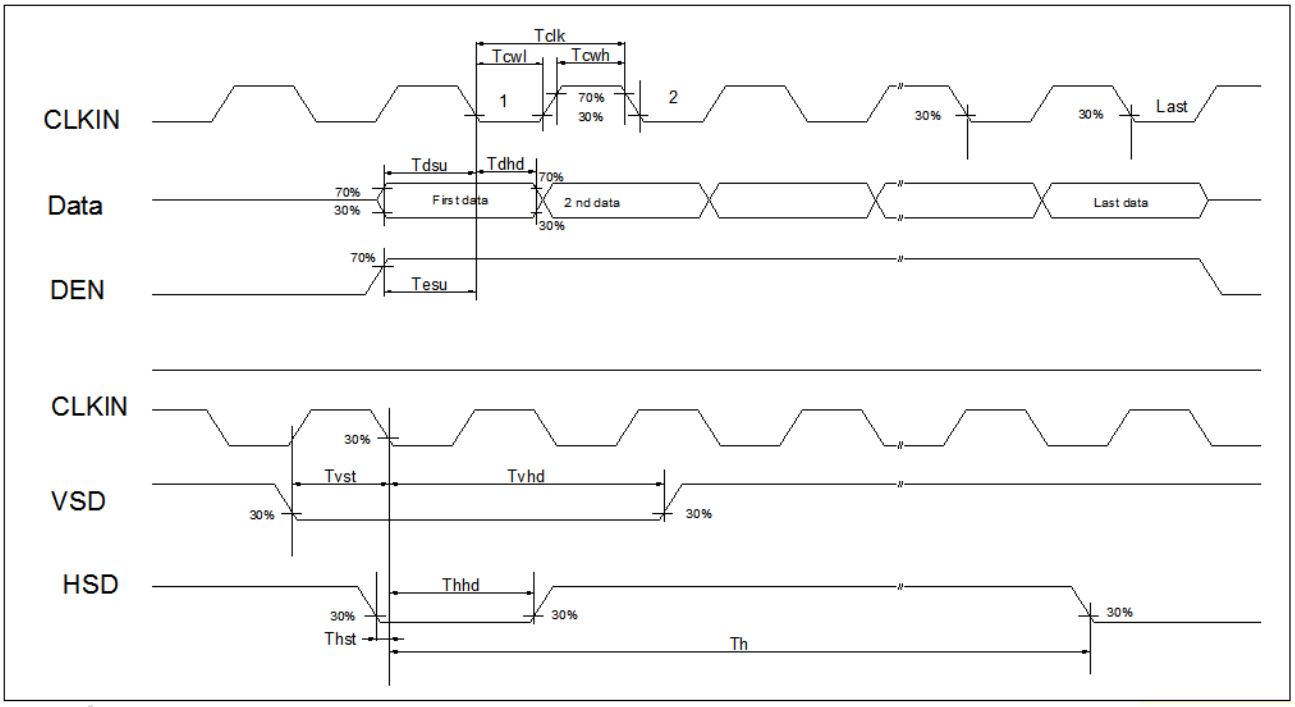
T8>0ms

T9>0ms

T10>0ms

3.4 Timing Characteristics of Input Signals

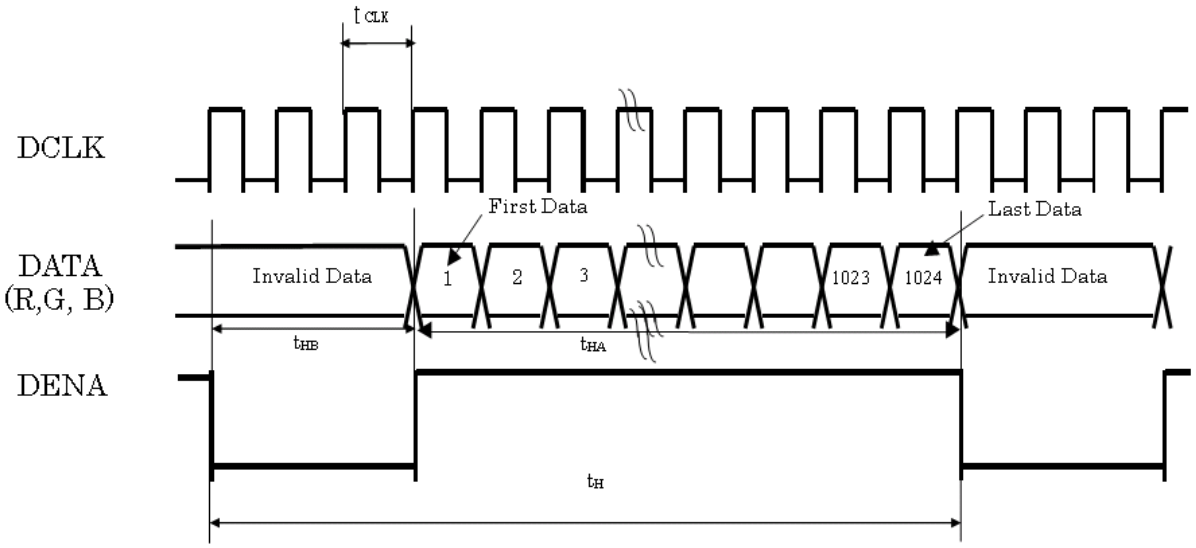
ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	Note
DE MODE	Dot Clock	1/tCLK	45	51.2	57	MHz	
	DCLK Pulse Duty	Tcwh	40	50	60	%	
	Horizontal Total Time	tH	1324	1344	1364	tCLK	
	Horizontal Effective Time	tHA		1024		tCLK	
	Horizontal Blank Time	tHB	300	320	340	tCLK	
	Vertical Total Time	tV	625	635	645	tH	
	Vertical Effective Time	tVA		600		tH	
	Vertical Blank Time	tVB	25	35	45	tH	
SYNC MODE	Horizontal Total Time	TH	1324	1344	1364	tCLK	
	Horizontal Pulse Width	Thpw		20	-	tCLK	thb + thpw
	Horizontal Back Porch	Thb		140	-	tCLK	=160DCLK is fixed
	Horizontal Front Porch	Thfp	140	160	180	tCLK	
	Horizontal Effective Time	THA		1024		tCLK	
	Vertical Total Time	TV	625	635	645	tH	
	Vertical Pulse Width	Tvpw		3	-	th	tvpw + tvb
	Vertical Back Porch	Tvb	-	20	-	th	=23th is fixed
	Vertical Front Porch	Tvfp	2	12	22	th	
	Vertical Valid	Tvd		600		th	



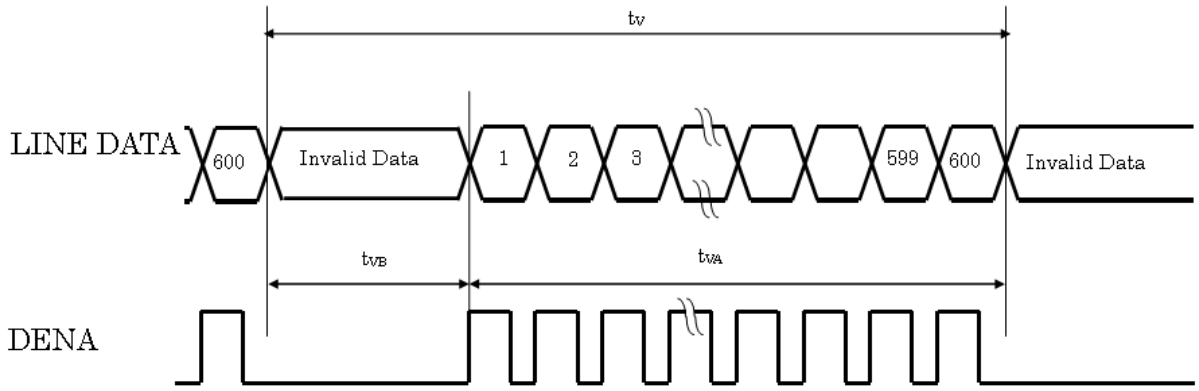
3.5 Timing Sequence(Timing Chart)

3.5.1 DE Mode

Horizontal Timing Sequence

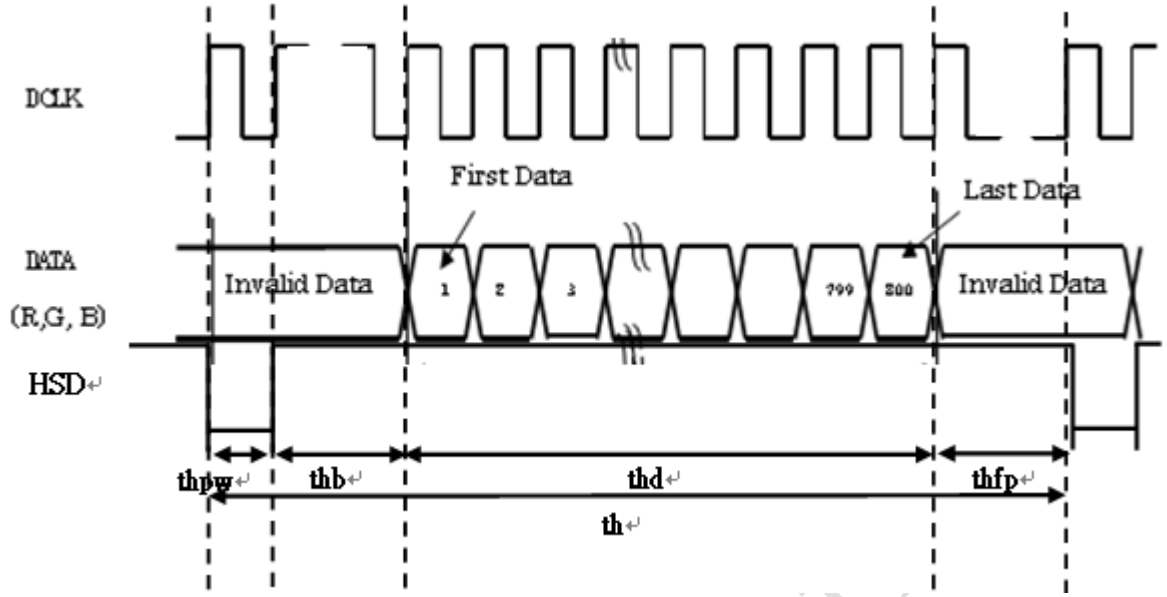


Vertical Timing Sequence

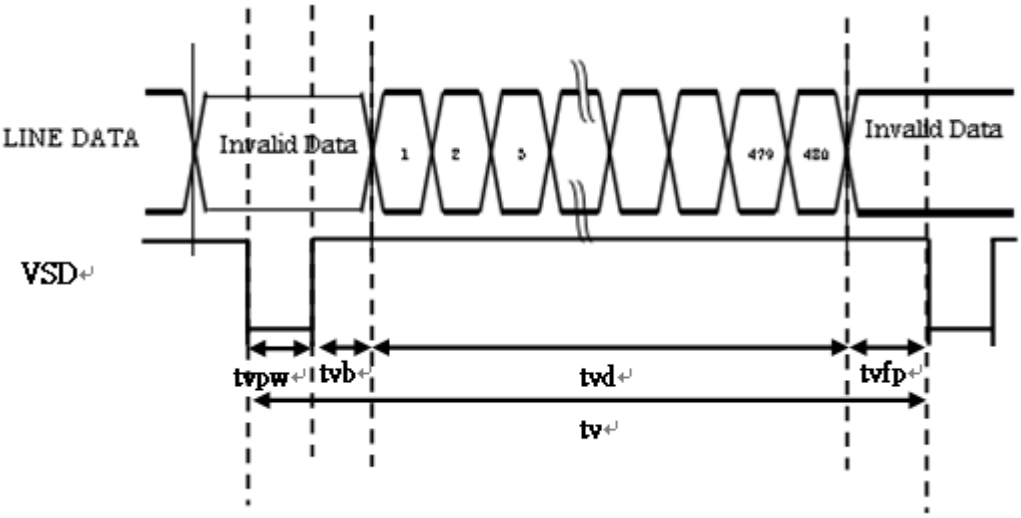


3.5.2 SYNC mode

Horizontal timing：

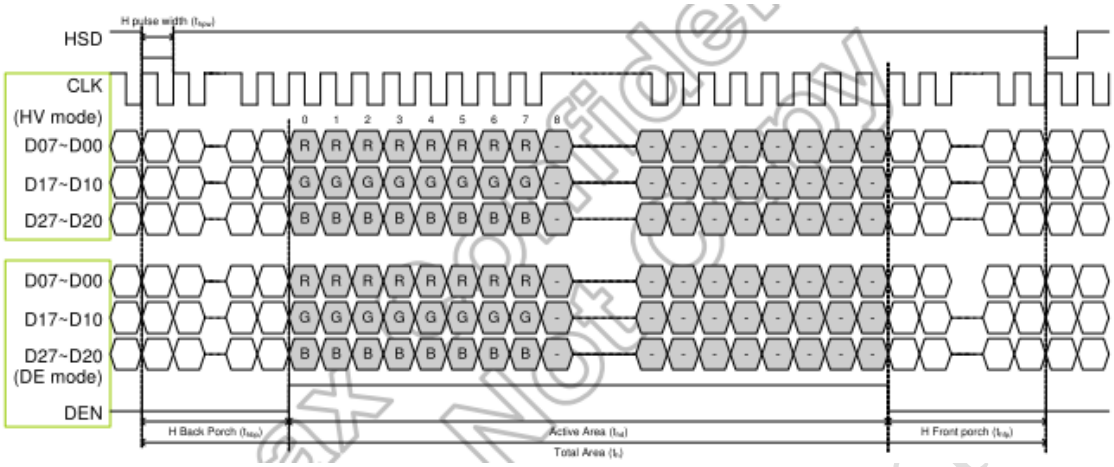


Vertical timing：

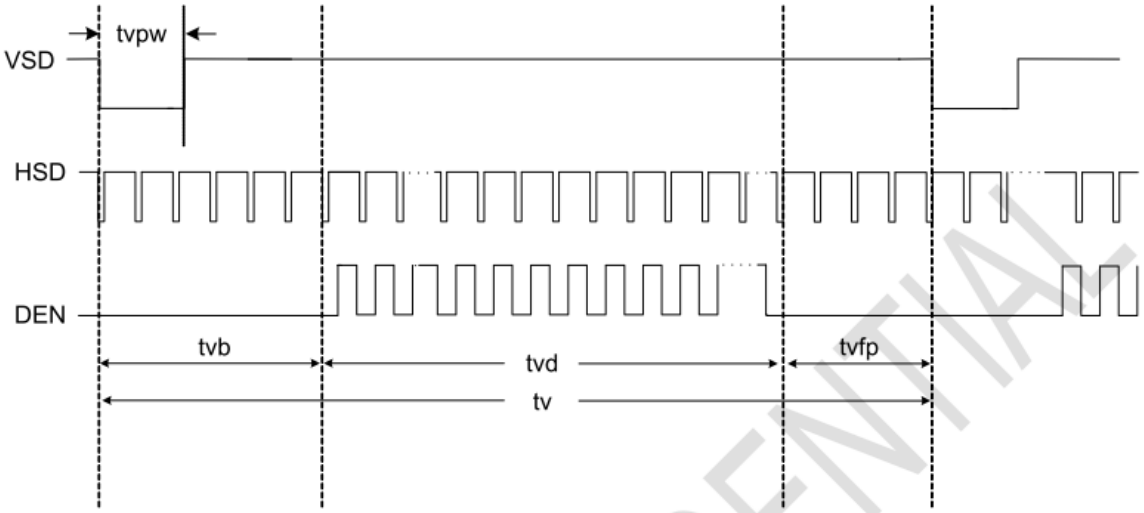


3.5.3 Data Input Format

Horizontal timing：



Vertical timing：



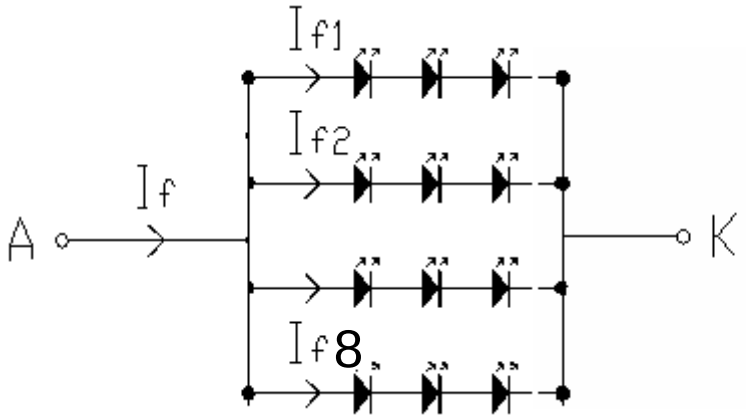
3.6 Backlight

Ta=25℃

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
LED current	IL	Ta=25℃ Each serial=20mA	-	160	-	mA
LED voltage	VL	Ta=25℃ Each serial=20mA	-	(9)	(9.5)	V
Power consumption	WL	Ta=25℃ Each serial=20mA	-	(1.548)	(1.704)	W
LED Lifetime	-	Ta=25℃ Each serial=20mA	15000			Hr

【Note】

*1)LED Circuit Diagram：



*2) A：Anode(＋)，K：Cathode(－)

*3) LED control suggested fixed current.

*4) Definition of the LED life time：Luminance will decay less than 50%

4. INTERFACE CONNECTION

4.1 CN1 (Input Signal)

Pin NO.	SYMBOL	DESCRIPTION
1	LED+	LED Anode
2	LED+	LED Anode
3	LED-	LED Cathode
4	LED-	LED Cathode
5	GND	Ground
6	NC	Not Connect
7	DVDD	Digital Power
8	MODE	DE/SYNC Mode Select. Normally Pull High H: DE mode. L: HSD/VSD mode
9	DEN	Data Enable signal
10	VSD	Vertical sync input. Negative polarity
11	HSD	Horizontal sync input. Negative polarity
12	B7	Blue Data Input(MSB)
13	B6	Blue Data Input
14	B5	Blue Data Input
15	B4	Blue Data Input
16	B3	Blue Data Input
17	B2	Blue Data Input
18	B1	Blue Data Input
19	B0	Blue Data Input(LSB)
20	G7	Green Data Input(MSB)
21	G6	Green Data Input
22	G5	Green Data Input
23	G4	Green Data Input
24	G3	Green Data Input
25	G2	Green Data Input
26	G1	Green Data Input
27	G0	Green Data Input(LSB)
28	R7	Red Data Input(MSB)
29	R6	Red Data Input
30	R5	Red Data Input
31	R4	Red Data Input
32	R3	Red Data Input
33	R2	Red Data Input
34	R1	Red Data Input
35	R0	Red Data Input(LSB)
36	GND	Power Ground
37	DCLK	Clock Input
38	GND	Power Ground
39	SHLR	Left or Right Display Control 【Note1】
40	UPDN	Up / Down Display Control
41	VGH	Positive Power for TFT
42	VGL	Negative Power for TFT

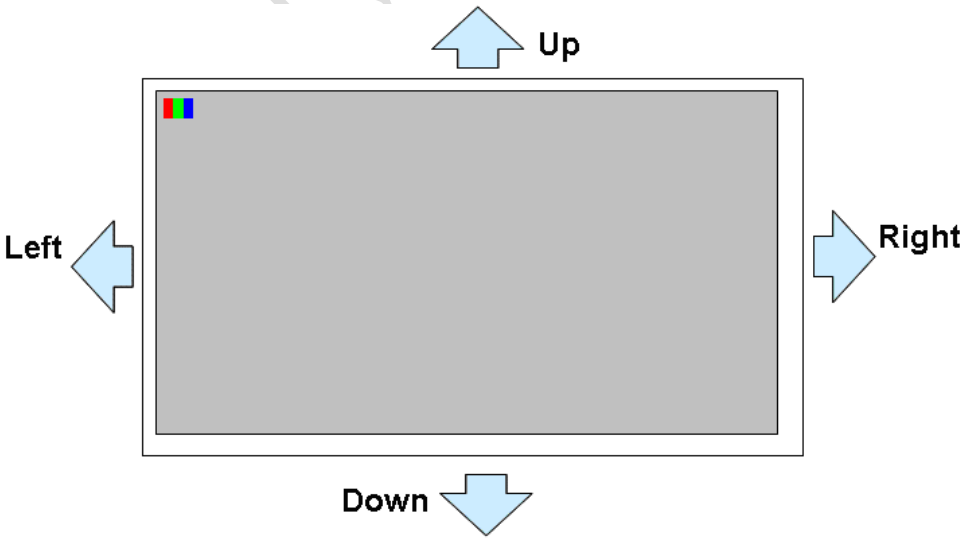
43	AVDD	Analog Power
44	RESET	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ，C=1μF)
45	NC	Not Connect
46	NC	Not Connect
47	DITH	Dithering function enable control. Normally pull low DITHER = “1”, Enable internal dithering function DITHER = “0”, Disable internal dithering function
48	GND	Power Ground
49	NC	Not Connect
50	NC	Not Connect

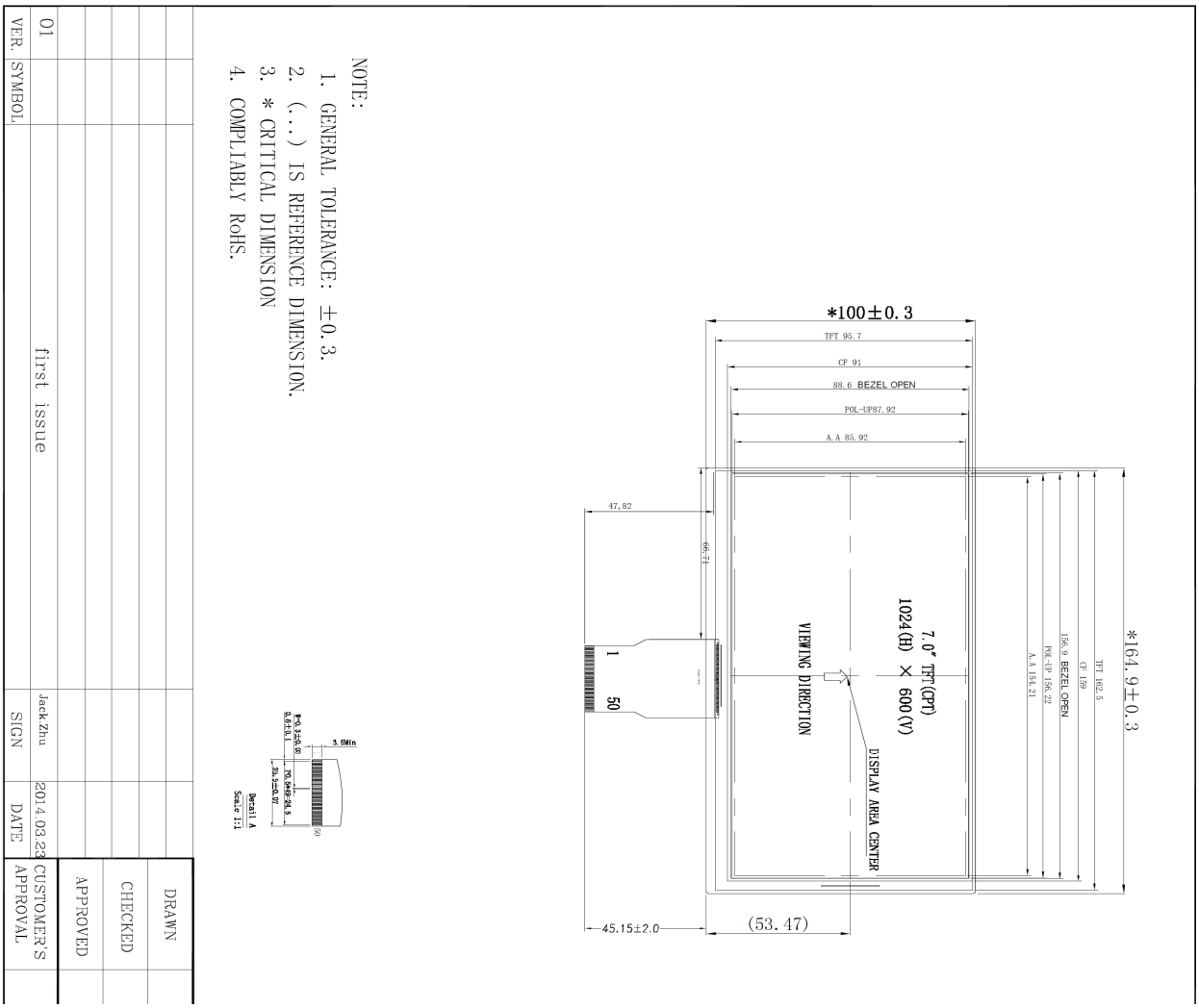
【Note1】SHLR：left or right setting

UPDN：up or down setting

UPDN	SHLR	FUNCTION
0	1	Normal Display
0	0	Inverse Left and Right
1	1	Inverse Up and Down
1	0	Inverse Left and Right Inverse Up and Down

Definition of scanning direction.

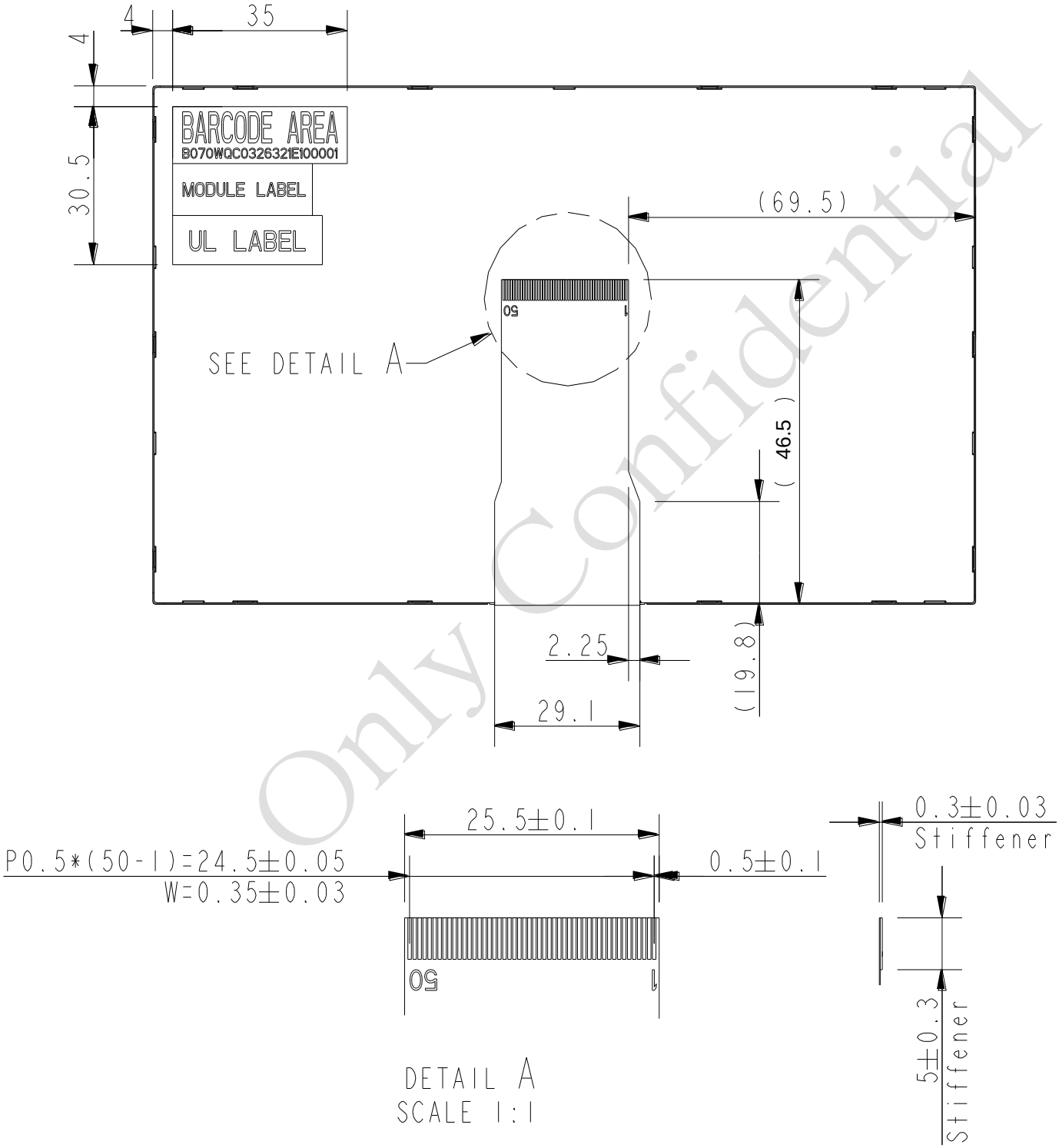




5. MECHANICAL DIMENSIONC

5.2 Rear Side

(Unit： mm)



[Note]：

1.Tolerance is ±0.3mm unless noted

2.The tolerance of module thickness is 0.2mm.

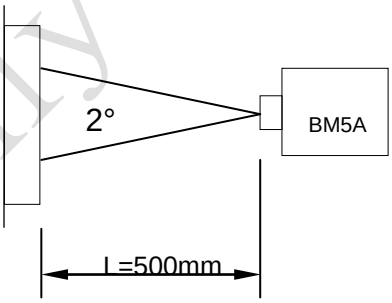
6. OPTICAL CHARACTERISTICS

(Use CPT LED backlight)

Ta=25℃

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio		CR	Point-5)	550	800	--	--	2
Response Time		Tr +Tf	Point-5	--	30	50	ms	3
Luminance		L	Point-5	250	350	--	cd/m^2	
Luminance Uniformity		ΔL	*2)	70	80	--	%	
NTSC				--	50%	--		
Viewing Angle	Left	ϕ	Point-5 CR≧10	80	85			4
	Right	ϕ		80	85			4
	Upper	θ		80	85			4
	Lower	θ		80	85			4
MDL Chromacicity	White	x	θ=ϕ= 0°	0.273	0.313	0.353		
		y		0.289	0.329	0.369		
	Red	x	θ=ϕ= 0°	0.582	0.622	0.662		
		y		0.288	0.328	0.368		
	Green	x	θ=ϕ= 0°	0.317	0.357	0.397		
		y		0.528	0.568	0.608		
	Blue	x	θ=ϕ= 0°	0.111	0.151	0.191		
		y		0.074	0.114	0.154		

Note1: Measure condition：25℃±2℃，60±10%RH，under10 Lux in the dark room.BM-5A



(TOPCON)，viewing angle2°，**IL=160 mA**（Backlight current）measurement after lighting on 10 mins.

Note2: Definition of contrast ratio：

Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

Definition of luminance：Measure white luminance on the point 5 as figure.6-1

Δ L = [L(MIN)/L(MAX)]×100

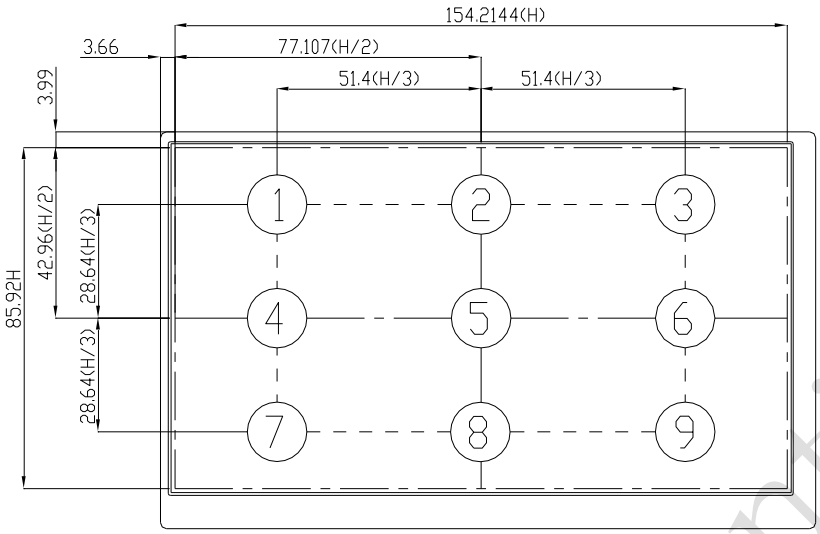


Fig. 6-1 Measuring point

Note 3: Definition of Response Time.(White-Black)

The response time is defined as the time interval between the 10% and 90% amplitudes.

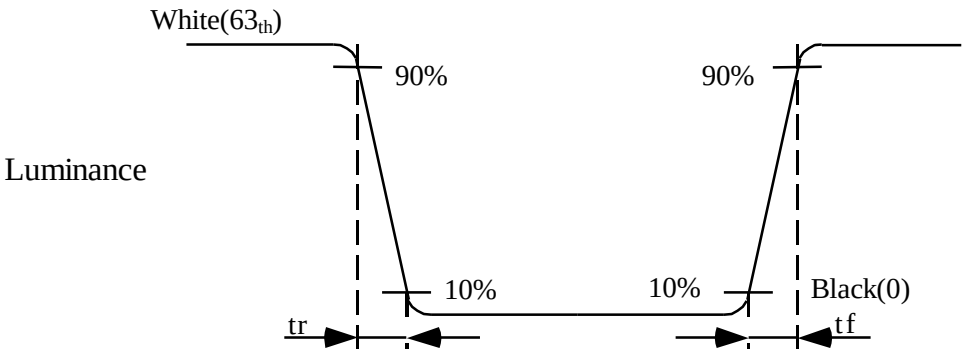


Fig. 6-2 Measuring point

Note 4: Definition of Viewing Angle(θ,ψ),refer to Fig.6 as below：

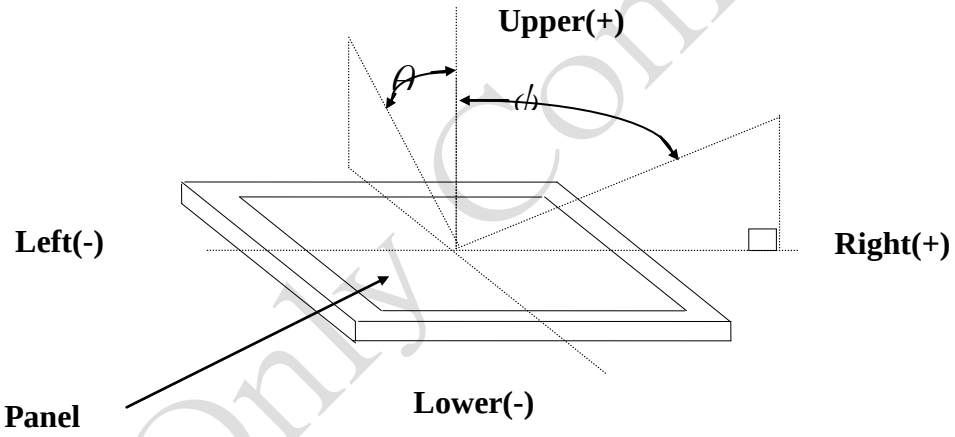


Fig.6-3 Definition of Viewing Angle