Chunghwa Picture Tubes, Ltd.
Technology Specification

To :

Date : 110419

TFT LCD

CLAA090NA02CW

ACCEPTED BY : (V0.1)

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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
0.0	First revision (Tentative)	--	2010/11/19
0.1	Revised Power Consumption and Module Weight of Overview	4	2011/03/17
0.1	Revised Signal Input Voltage of ABSOLUTE MAXIMUM RATINGS	5	2011/03/17
0.1	Revised ELECTRICAL CHARACTERISTICS	6	2011/03/17
0.1	Revised TFT-LCD Current Consumption and Power、Signal sequence	7	2011/03/17
0.1	Revised Backlight and LED Circuit Diagram	8	2011/03/17
0.1	Revised Timing Specification	11	2011/03/17
0.1	Revised Rear Side	14	2011/03/17
0.1	Revised optical characteristics	15	2011/03/17

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1. OVERVIEW

CLAA090NA01CW is 9” 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 9” diagonal screen. Display 16.2M colors by R.G.B signal input.

General specification are summarized in the following table:

ITEM	SPECIFICATION
Display Area (mm)	196.608(W) x 114.15(H)
Number of Pixels	1024(H) × 3 (RGB) × 600(V)
Pixel Pitch (mm)	0.192(W) x 0.19025(H)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white
Number of Colors	16.2M
Viewing Direction	6 o'clock (Max. contrast ratio, Gray level inversion)
Brightness (cd/m^2)	300nit(typ)
Response Time (ms)	25ms(typ.)
NTSC	50%
Contrast Ratio	500:1
Viewing Angle (CR≧10)	140degree (Horizontal) / 120degree (Vertical)
Power Consumption (W)	2.295 (Typ.); 2.484(Max)
Interface connection	LVDS
Module Size (mm)	211.1(W) x 126.5(H) x 3.4(D)
Module Weight (g)	180
Backlight Unit	LED
Surface Treatment	Anti-Glare 3H

2. ABSOLUTE MAXIMUM RATINGS

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

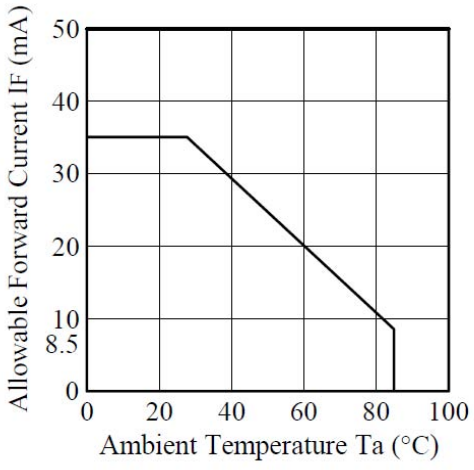
Item	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	VDD VDD_LVDS	-0.3	5	V	
Analog Supply Voltage	AVDD	-0.5	15	V	
Gate On Voltage	VGH	-0.3	40	V	
Gate Off Voltage	VGL	-20	0.3	V	
Gate On-Gate Off Voltage	VGH-VGL	-0.3	40	V	
Signal Input Voltage	NIN0 ~ NIN3 PIN0 ~ PIN3 NINC,PINC	-0.5	5	V	
Forward Current (per LED)	If	-	30	mA	
Reverse Voltage (per LED)	VR	-	5	V	
Pulse forward current (per LED)	Ifp	-	100	mA	Note 1、2
Operation Temperature	T_{op}	-20	70	℃	Note 3
Storage Temperature	T_{stg}	-30	80	℃	Note 3

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

Note2：perating must under the condition as below drawing.

(Ambient Temperature /Allowable Forward Current) Each LED .

■ Ambient Temperature vs.
Allowable Forward Current



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

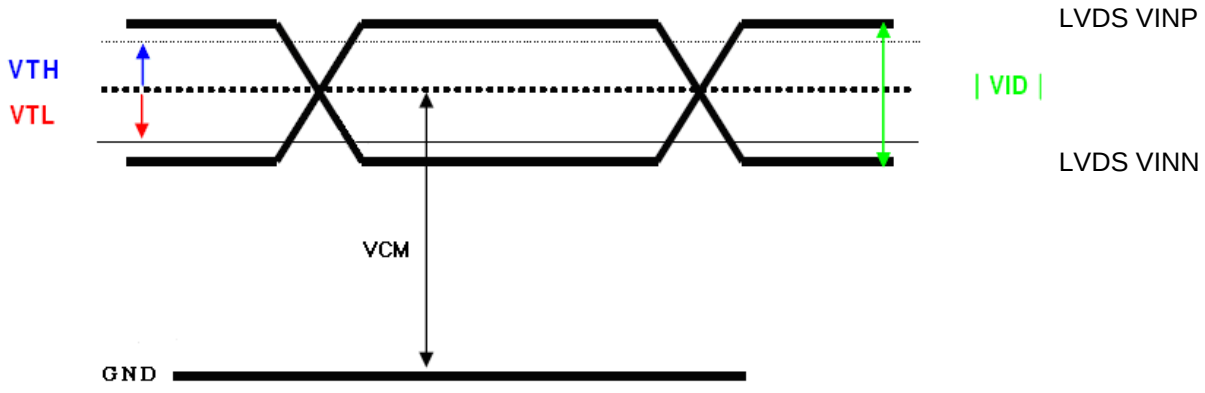
3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD

Ta=25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Power Supply Voltage For LCD	VDD VDD_LVDS	3	3.3	3.6	V	
Logic Input Voltage (LVDS:IN+,IN-)	VCM	$\frac{\lvert VID \rvert}{2}$	-	$2.4-\frac{\lvert VID \rvert}{2}$	V	Note1
	$\lvert VID \rvert$	200	-	600	mV	Note1
	VTH	-	-	100	mV	VCM=1.2V Note1
	VTL	-100	-	-	mV	
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	
Common Power Supply Voltage	VCOM	TBD	3.35	TBD	V	Note2
Gamma Voltage	V1		8.54		V	
	V2		8.43		V	
	V3		6.94		V	
	V4		6.48		V	
	V5		6.16		V	
	V6		5.79		V	
	V7		5.70		V	
	V8		3.32		V	
	V9		3.22		V	
	V10		2.66		V	
	V11		2.25		V	
	V12		1.75		V	
	V13		0.27		V	
	V14		0.22		V	

【Note1】LVDS signal



【Note2】Please adjust VCOM to make the flicker level be minimum.

3.2 TFT-LCD Current Consumption

Item	Symbol	Condition	Min.	Typ.	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	IVDD	VDD = 3.3V	-	30	40	mA	Note1
Analog power current	IAVDD	AVDD = 9.6V	-	35	50	mA	Note1
Total Power Consumption	PC		-	447	636	mW	Note1

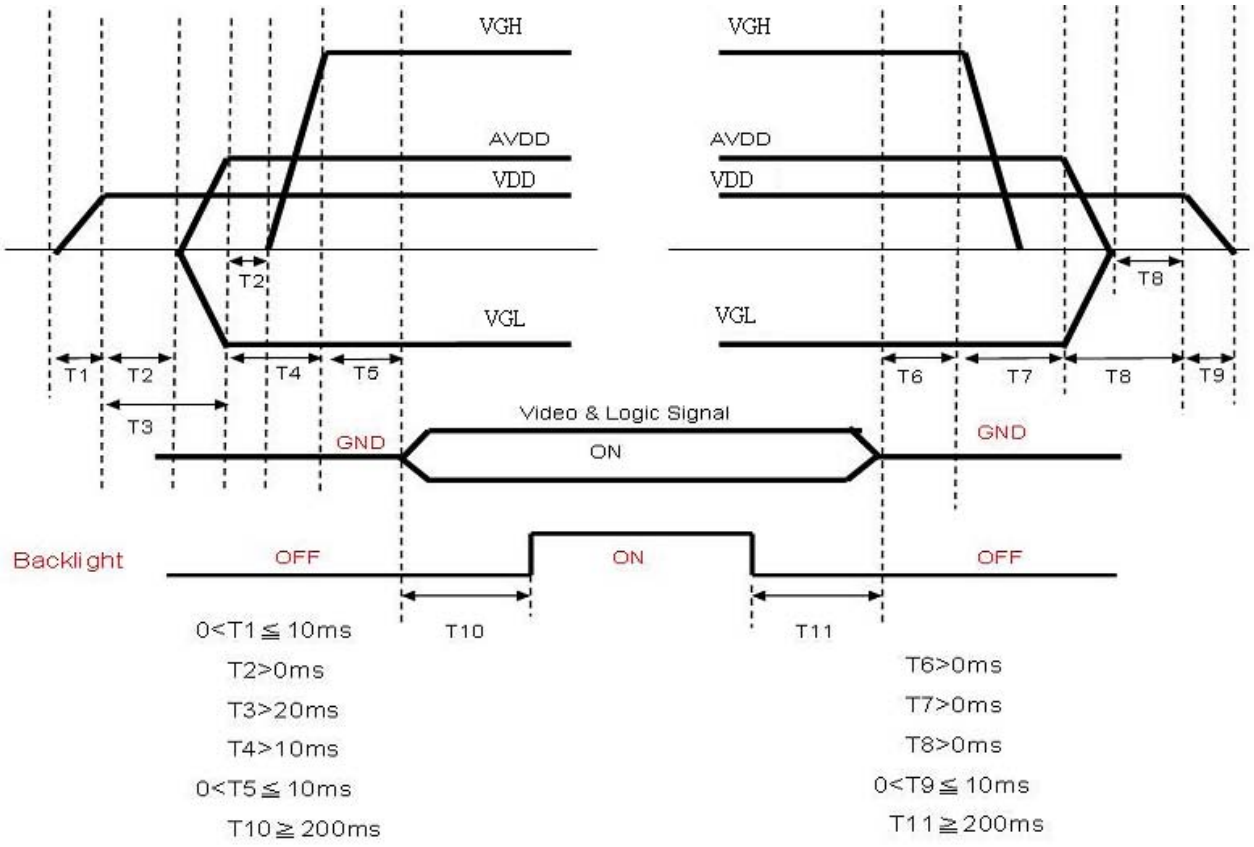
Note1: Typical: Under 256 gray pattern
Maximum: Under black pattern

256 gray pattern

Black Pattern

3.3 Power、Signal sequence

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



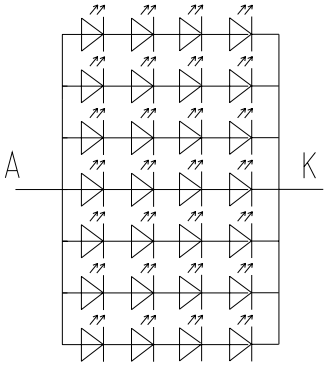
3.4 Backlight

Ta=25℃

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED current	IL	Ta=25℃ (20mA/serise)	--	140	--	mA	
LED voltage	VL	Ta=25℃ (20mA/serise)	11.6	13.2	14.4	V	
Power consumption	WL	Ta=25℃ (20mA/serise)	--	1.848	--	W	
LED Lifetime	-	Ta=25℃ IF=20mA	20,000	--	--	Hr	

Remarks：

*1) LED Circuit Diagram



*2) A：Anode(＋)，K：Cathode(－)

*3) Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.

*4) Definition of Led lifetime：Luminance < Initial luminance 50%.

4. INTERFACE CONNECTION

4.1 CN1 (Input Signal)

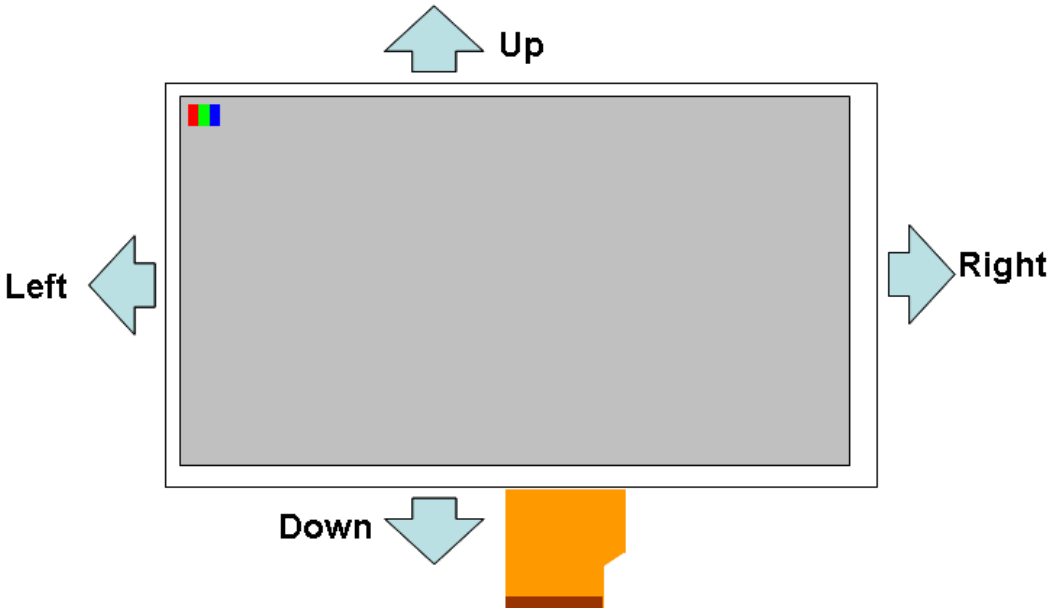
PIN NO	SYMBOL	DESCRIPTION
1	AGND	Analog ground
2	AVDD	Analog power
3	VDD	Digital power
4	GND	Digital ground
5	VCOM	Common voltage
6	VDD	Digital power
7	GND	Digital ground
8	V14	Gamma correction voltage reference
9	V13	Gamma correction voltage reference
10	V12	Gamma correction voltage reference
11	V11	Gamma correction voltage reference
12	V10	Gamma correction voltage reference
13	V9	Gamma correction voltage reference
14	V8	Gamma correction voltage reference
15	GND	Digital ground
16	VDD_LVDS	LVDS power
17	GND	Digital ground
18	PIND3	Positive LVDS differential data inputs
19	NIND3	Negative LVDS differential data inputs
20	GND	Digital ground
21	PINC	Positive LVDS differential clock inputs
22	NINC	Negative LVDS differential clock inputs
23	GND	Digital ground
24	PIND2	Positive LVDS differential data inputs
25	NIND2	Negative LVDS differential data inputs
26	GND	Digital ground
27	PIND1	Positive LVDS differential data inputs
28	NIND1	Negative LVDS differential data inputs
29	GND	Digital ground
30	PIND0	Positive LVDS differential data inputs
31	NIND0	Negative LVDS differential data inputs
32	GND	Digital ground
33	GND_LVDS	LVDS ground
34	GRB	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=0.1μF)
35	STBYB	Standby mode, normally pull high STBYB=”1”, normal operation STBYB=”0”,timing control, source driver will turn off, all output are high-Z
36	SHLR	Left or right display control
37	VDD	Digital power
38	UPDN	Up / down display control
39	AGND	Analog ground
40	AVDD	Analog power
41	VCOM	Common voltage
42	DITH	Dithering function enable control. Normally pull low DITHER = “1”, Enable internal dithering function DITHER = “0”, Disable internal dithering function
43	GND	Digital ground
44	VDD	Digital Power
45	GND	Digital ground
46	V7	Gamma correction voltage reference

47	V6	Gamma correction voltage reference
48	V5	Gamma correction voltage reference
49	V4	Gamma correction voltage reference
50	V3	Gamma correction voltage reference
51	V2	Gamma correction voltage reference
52	V1	Gamma correction voltage reference
53	GND	Digital ground
54	VDD	Digital power
55	GND	Digital ground
56	VGH	Positive power for TFT
57	VDD	Digital power for Gate IC
58	VGL	Negative power for TFT
59	GND	Digital ground for Gate IC
60	NC	Not connect

Remarks：

1) Mating connector：089N60-000100-G2-R (STARCONN)
2) UPDN and SHLR control function

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



4.2 CN2 (LED backlight)

PIN NO	SYMBOL	FUNCTION
1	A	Anode
2	K	Cathode

Note：
Input connector : BHSR-02VS-1(JST)
Outlet connector: SM02B-BHSS-1(JST)

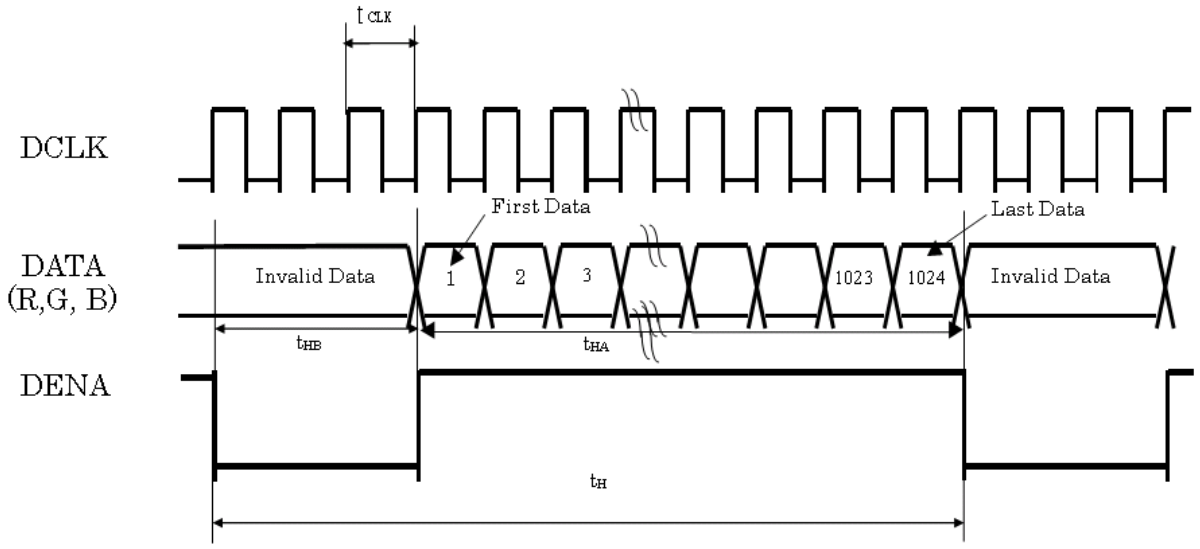
5. INPUT SIGNAL(DE ONLY MODE)

5.1 Timing Specification

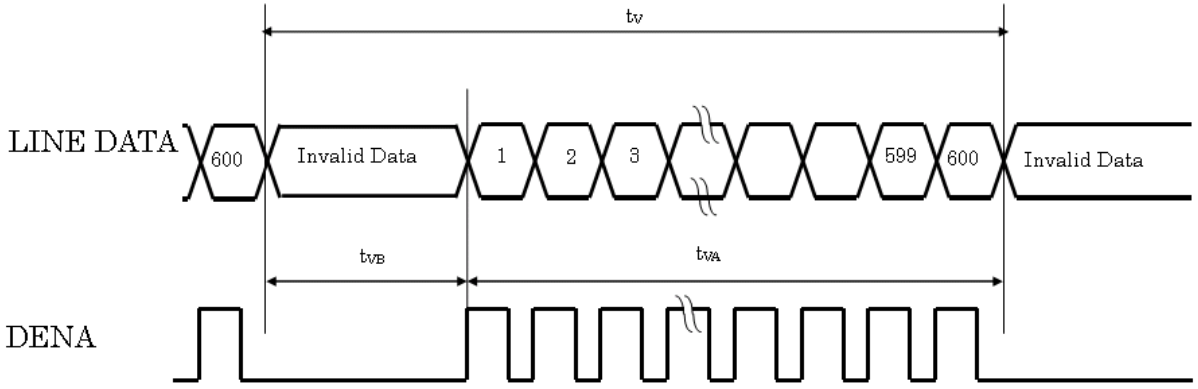
ITEM				SYMBOL	MIN	TYP	MAX	UNIT
LVDS input signal sequence	CLK Frequency			tclk	45	51.2	57	MHz
LCD input signal sequence （Input LVDS Transmitter）	DENA	Horizontal	Horizontal total Time	t_H	1324	1344	1364	tCLK
			Horizontal effective Time	t_{HA}	1024			tCLK
			Horizontal Blank Time	t_{HB}	300	320	340	tCLK
		Vertical	Vertical total Time	t_V	625	635	645	t_H
			Vertical effective Time	t_{VA}	600			t_H
			Vertical Blank Time	t_{VB}	25	35	45	t_H

5.2 Timing sequence(Timing chart)

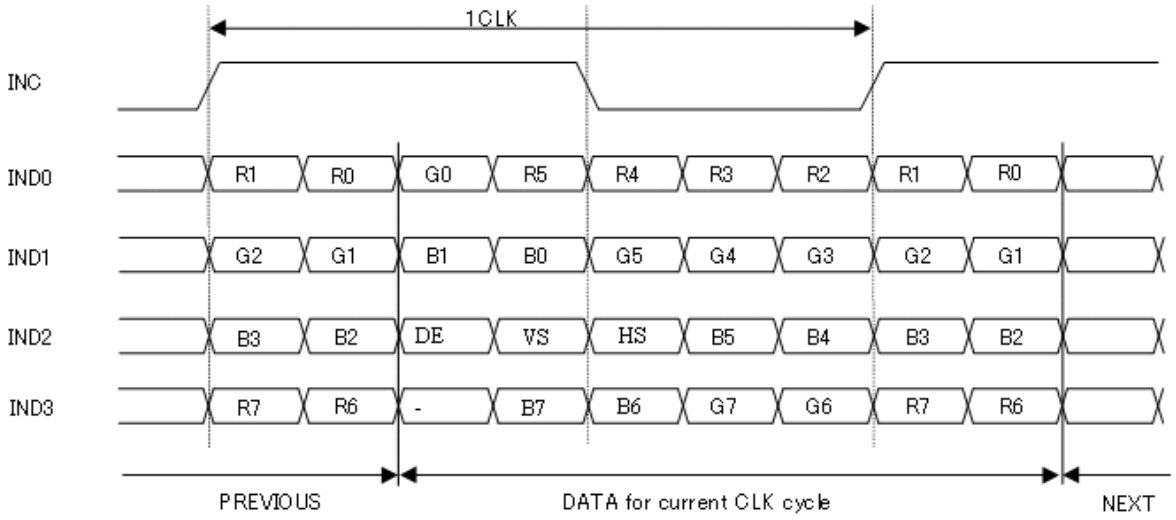
5.2.1 Horizontal Timing Sequence



5.2.2 Vertical Timing Sequence



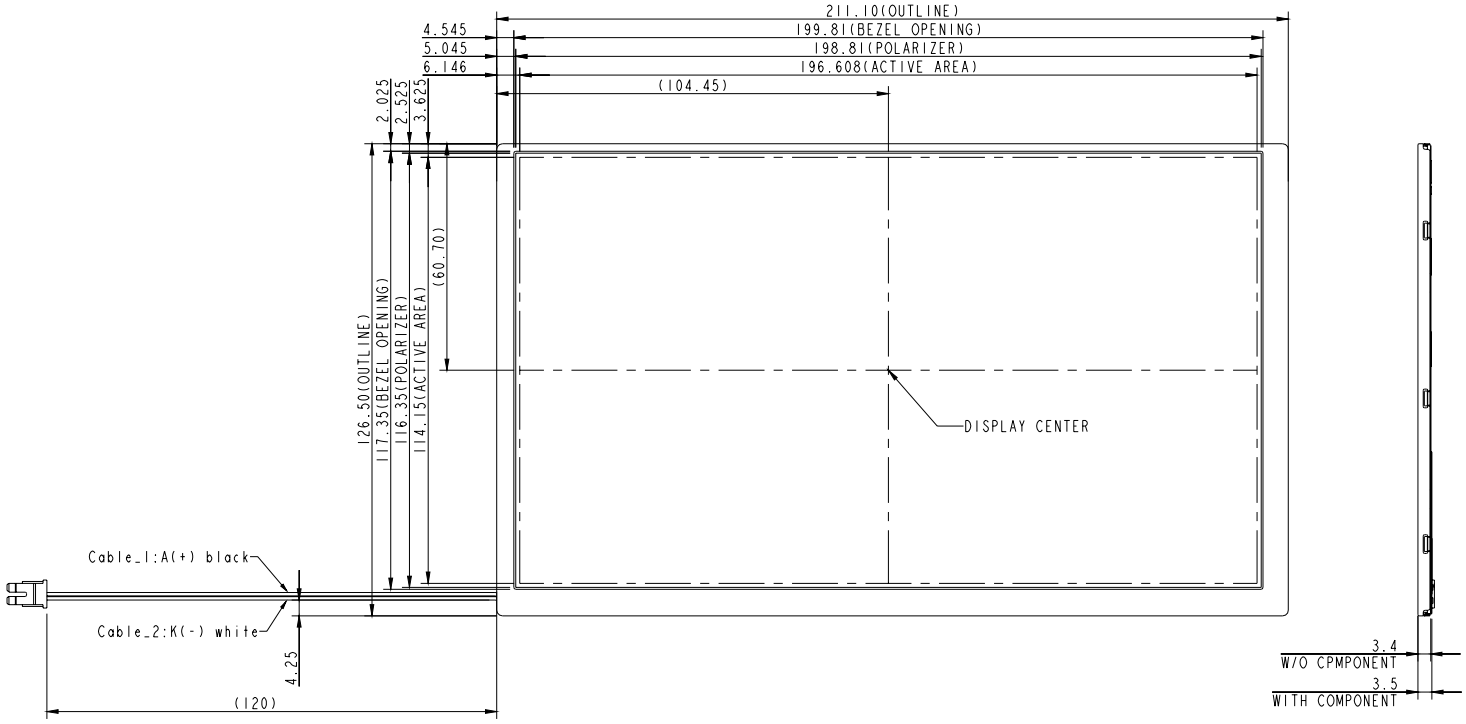
5.2.3 LVDS Input Data mapping



6. MECHANICAL DIMENSION

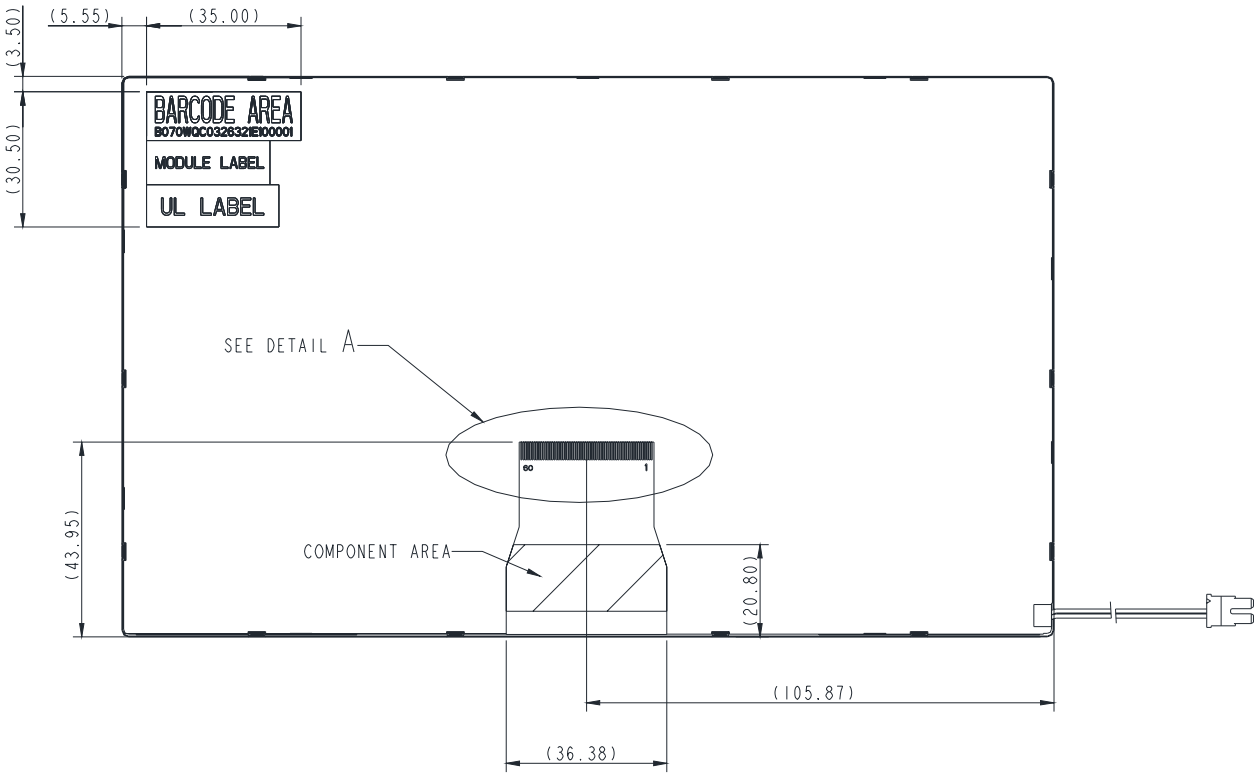
6.1 Front Side

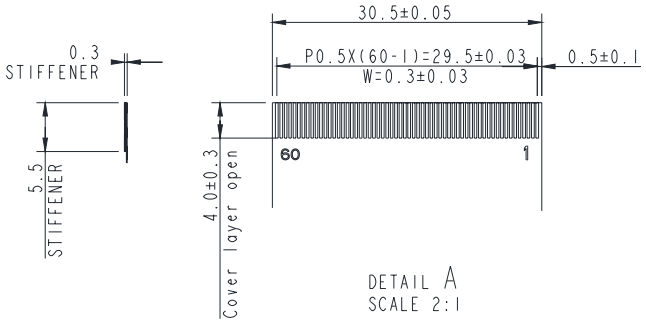
[Unit：mm]



6.2 Rear Side

[Unit：mm]





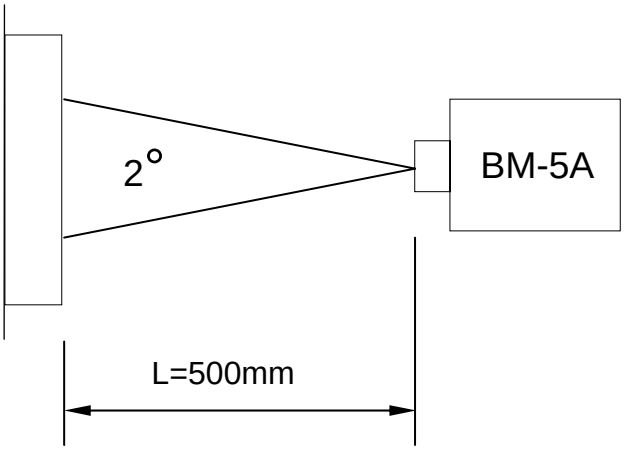
Remark：General tolerance ±0.3mm

7. OPTICAL CHARACTERISTICS

Ta = 25°C, VCC=3.3V

ITEM		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Constrast Ratio		CR	Point-5	400	500	-	--	1, 2, 3
Luminance(CEN)		Lw	Point-5	240	300	-	cd/m^2	1, 3
Luminance Uniformity		ΔL		70	80	-	%	1, 3
Response Time (White - Black)		Tr +Tf	Point-5	-	25	40	ms	1, 3, 5
NTSC		-	Point-5	45	50	-	%	1, 3
Viewing Angle	Upper	θ	CR≧10 Point-5	40	50	-	°	1, 3, 4
	Lower			60	70	-		
	Left	ψ		60	70	-		
	Right			60	70	-		
Color Coordinate	White	Wx Wy	Point-5	0.273 0.289	0.313 0.329	0.353 0.369	--	1, 3
	Red	Rx Ry		(0.561) (0.299)	(0.601) (0.339)	(0.641) (0.379)		
	Green	Gx Gy		(0.301) (0.557)	(0.341) (0.597)	(0.381) (0.637)		
	Blue	Bx By		(0.122) (0.075)	(0.162) (0.115)	(0.202) (0.155)		

Note1: Measure condition：25℃±2℃，60±10%RH，under10 Lux in the dark room.BM-5A (TOPCON)，viewing angle2°，IL=140 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

Note3: Definition of luminance：Measure white luminance on the point 5 as figure.6-1

Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure.6-1

△L = [L(MIN)/L(MAX)]×100

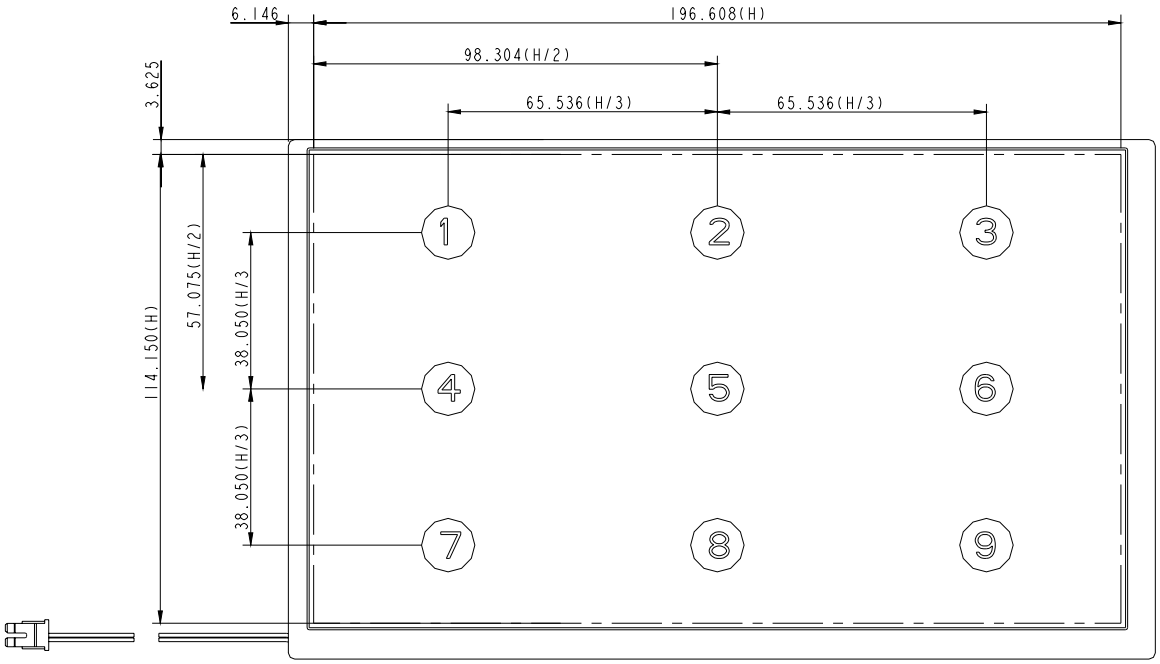


Fig.7-1 Measuring point

Note 4: Definition of Viewing Angle(θ,ψ),refer to Fig.7-2 as below：

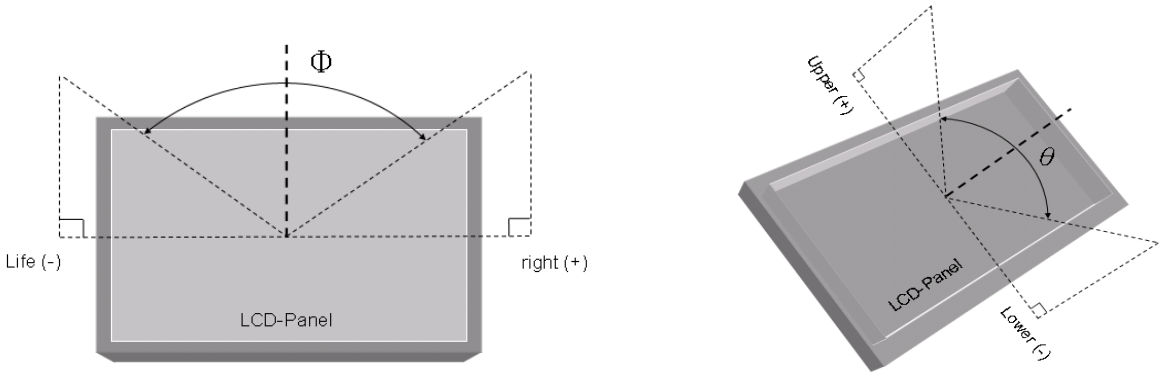


Fig.7-2 Definition of Viewing Angle

Note5: Definition of Response Time.(White-Black)

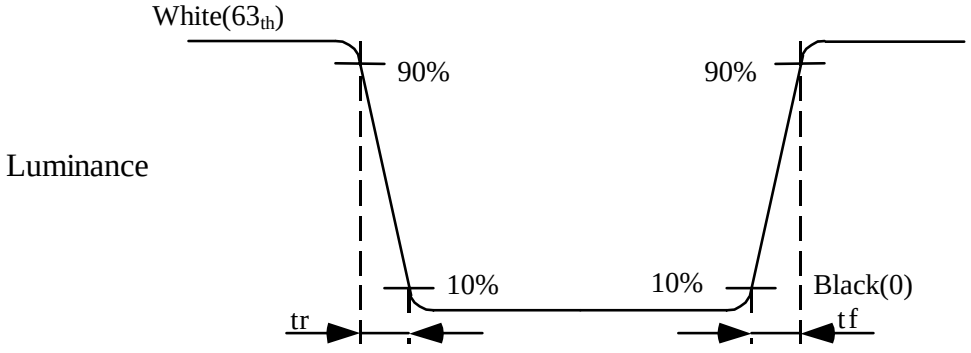


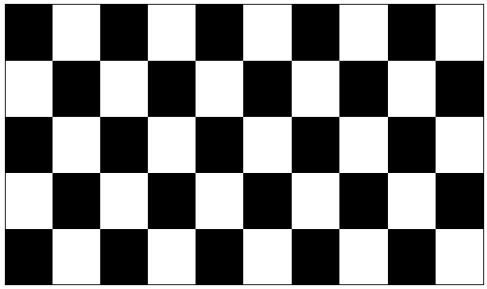
Fig.7-3 Definition of Response Time(White-Black)

8. RELIABILITY TEST

8.1 Temperature and humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	70℃ ;240hrs	
High Temperature Storage	80℃ ; 240hrs	
High Temperature High Humidity Operation	60℃ ; 90%RH ;240hrs	No condensation
Low Temperature Operation	-20℃ ; 240hrs	Backlight unit always turn on
Low Temperature Storage	-30℃ ; 240hrs	
Thermal Shock	–30℃(0.5hr) ~ 80℃(0.5hr) ; 200 Cycles	
Image Image Sticking	25℃ ; 4hrs	
MTBF	20,000Hrs	

Note：
Condition of Image Sticking test：25 ℃± 2 ℃
Operation with test pattern sustained for 24 hrs, then change to gray pattern immediately.
After 5 mins, the mura must be disappeared completely .



8.2 Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	● Shock level: 980m/s^2(equal to 100G). ● Waveform: half sinusoidal wave,6ms. ● Number of shocks: one shock input in each direction of three mutually perpendicular axes for a total of three shock inputs.
Vibration (Non-operation)	● Frequency range:8~33.3Hz ● Stoke：1.3 mm ● Vibration: sinusoidal wave, perpendicular axis(both x, y,z axis: 2Hrs). ● Sweep: 2.9G,33.3 Hz -400 Hz ● Cycle: 15 min

8.3 Electrostatic Discharge

TEST ITEM	CONDITIONS	Note
ESD	150pF，330Ω，±8kV&±15kV air& contact test	1
	200pF，0Ω，±200V contact test	2

Note: Measure
1: LCD glass and metal bezel
2: IF connector pins

8.4. Judgment standard

The Judgment of the above test should be made as follow:
Pass: Normal display image with no obvious non-uniformity and no line defect.Partial transformation of the module parts should be ignored.
Fail: No display image, obvious non-uniform

9. PACKING

TBD

10. WARRANTY

10.1 The period is within 12 months since the date of shipping out under normal using and storage conditions.

10.2 The warranty will be avoided in case of defect induced by customer.