Chunghwa Picture Tubes, Ltd.
Product Specification

To : Topovision

Date : 111019

TFT LCD

CLAA101NC01CW

ACCEPTED BY : (V0.7)

APPROVED BY	CHECKED BY	PREPARED BY
鍾昭玟	葉國超	田志坚

Prepared by :

Product Planning Management Division

Small & Medium TFT Product Business Unit

CHUNGHWA PICTURE TUBES, LTD.

1127 Hopin Rd., Padeh, Taoyuan, Taiwan 334, R.O.C.

TEL: +886-3-3675151 FAX: +886-3-377-3858

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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
Ver. 0.0	First revision (Tentative)	-	2010.11.23
Ver. 0.1	Revised Optimum Viewing Direction	P4	2010.12.17
	Image Sticking –pattern	P17	2010.12.17
Ver. 0.2	General specification table	P.4	2011.01.05
	The Signal Input Voltage symbol	P.5	
	Minimum and Maximum value of Analog Power Supply Voltage	P.6	
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	The figure for UPDN and SHLR control fuction	P.10	
	LVDS Input Data mapping	P.12	
	Typical value of Luminance Uniformity	P.15	
Ver. 0.3	Modify the power, signal sequence	P.7	2011.02.24
	Modify the minimum value of Timing Specification	P.11	
Ver.0.4	Gammma and Vcom voltage	P.6	2011.03.14
Ver.0.5	Optical characteristics	P.15	2011.03.18
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Ver.0.7	Common Power Supply Voltage	P.6	2011.04.28

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1. OVERVIEW

CLAA101NC01CW is 10.1” 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 10.1” 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)	222.72(W) x 125.28(H)
Number of Pixels	1024(H) × 3 (RGB) × 600(V)
Pixel Pitch (mm)	0.2175(W) x 0.2088(H)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white
Number of Colors	16.2M
Brightness (cd/m^2)	250nit(Typ)
Response Time (ms)	20ms(Typ.)
Optimum Viewing Direction	6 O'clock
Contrast Ratio	500:1(min)
Viewing Angle (CR≧10)	140degree (Horizontal.)
	120degree (Vertical)
Power Consumption (W)	2.2W
Interface connection	LVDS
Module Size (mm)	235(W) x 143(H) x 4.5(D)
Module Weight (g)	285g(Typ)
Backlight Unit	LED
Surface Treatment	Anti-Glare

2. ABSOLUTE MAXIMUM RATINGS

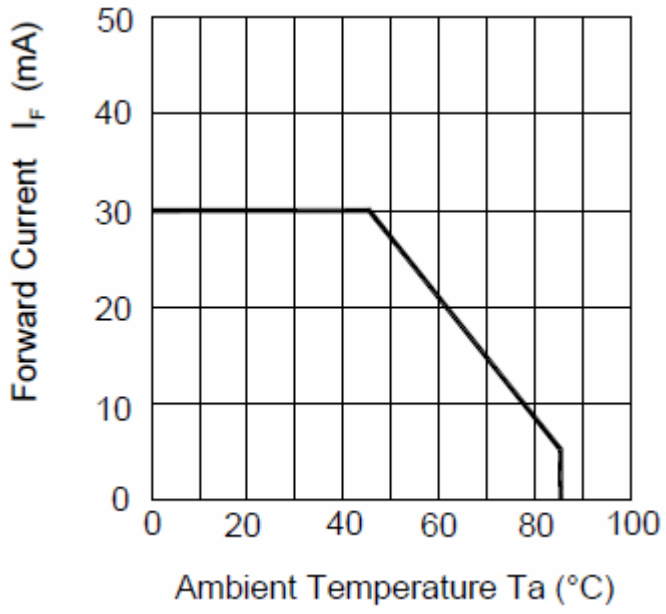
The following are maximun values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	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	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	-	100	mA	Note 1、2

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 .



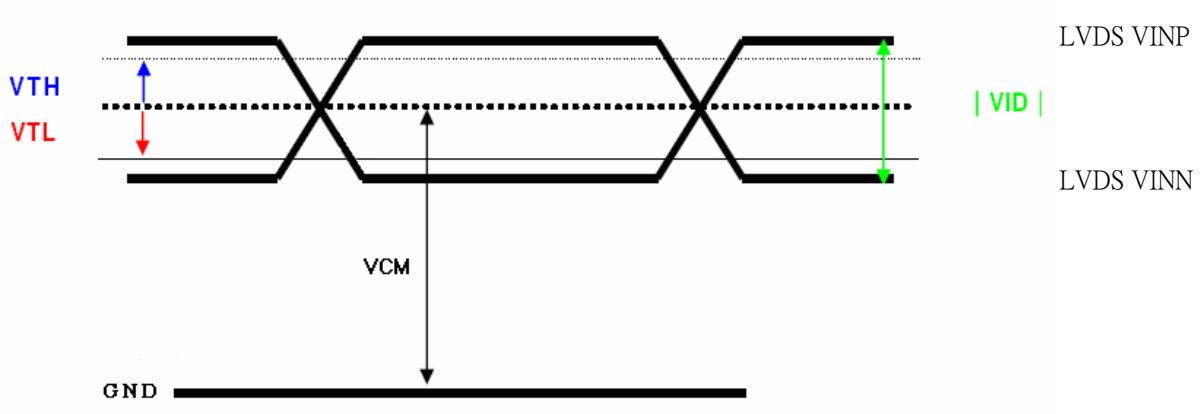
3. ELECTRICAL CHARACTERISTICS

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	$\frVert VID \vert}{2}$	-	$2.4-\frac{\vert VID \vert}{2}$	V	Note1
	$\vert VID \vert$	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**	**4.0**	**TBD**	V	Note2
Gamma Voltage	V1		9.02		V	
	V2		9.01		V	
	V3		7.62		V	
	V4		7.15		V	
	V5		6.85		V	
	V6		6.52		V	
	V7		6.46		V	
	V8		3.58		V	
	V9		3.5		V	
	V10		3.1		V	
	V11		2.76		V	
	V12		2.23		V	
	V13		0.67		V	
	V14		0.63		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 Current	IVGH	VGH =18V	-	0.5	1	mA	【Note1】
Gate off Current	IVGL	VGL= -6V	-	0.5	1	mA	【Note1】
Digital Current	IVDD	VDD = 3.3V	-	40	50	mA	【Note1】
Analog Current	IAVDD	AVDD = 9.6V	-	35	45	mA	【Note1】
Total Power Consumption	PC		-	480	621	mW	【Note1】

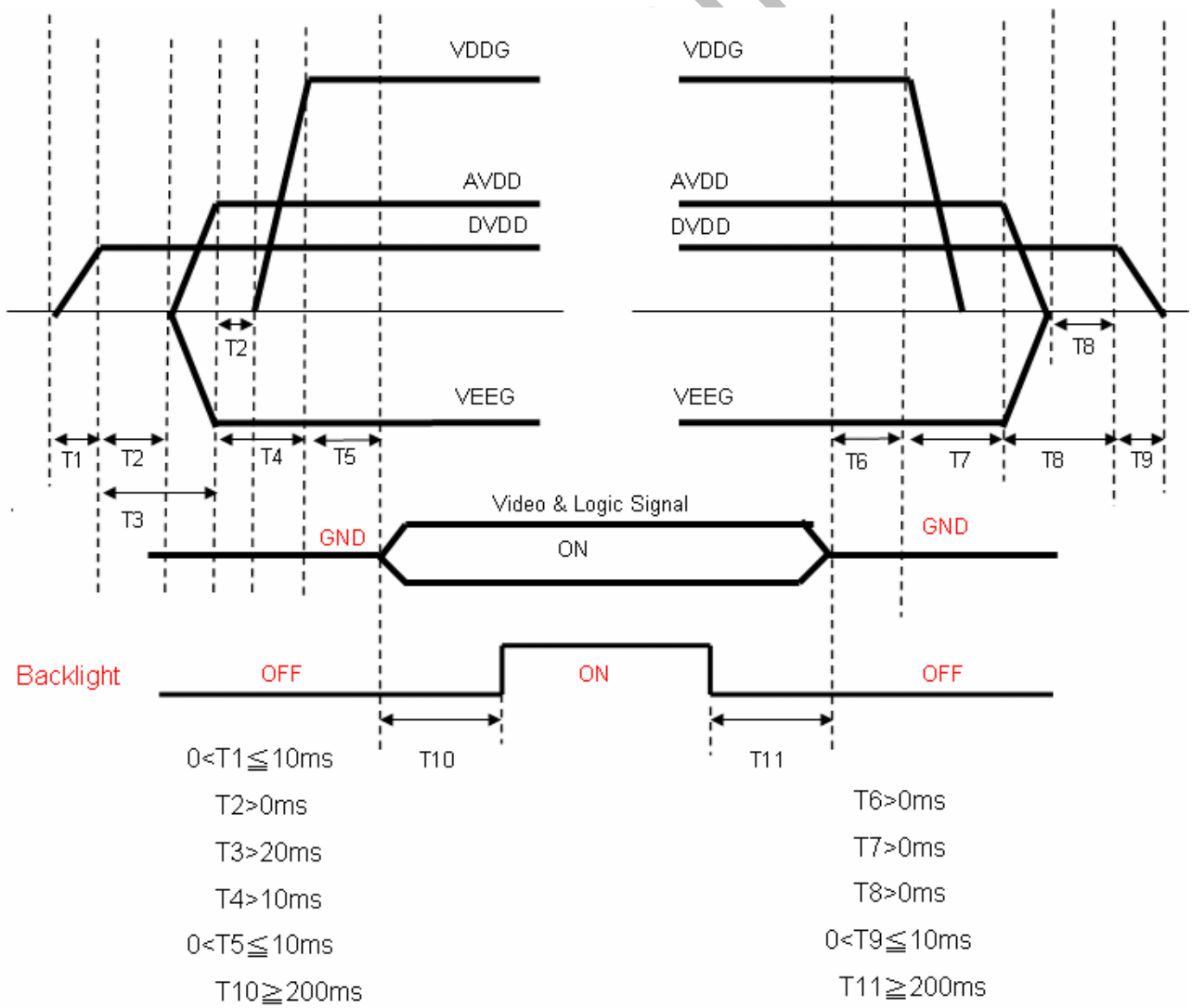
Note1: Typical: Under 256 gray pattern
Maximum: Under black pattern

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



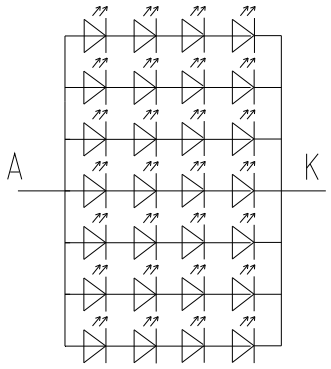
3.4 Backlight

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)	11.4	12.8	14.2	V	
Power consumption	WL	Ta=25℃ (20mA/serise)	--	1.792	--	W	
LED Lifetime	-	Ta=25℃ IF=20mA	20000			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)

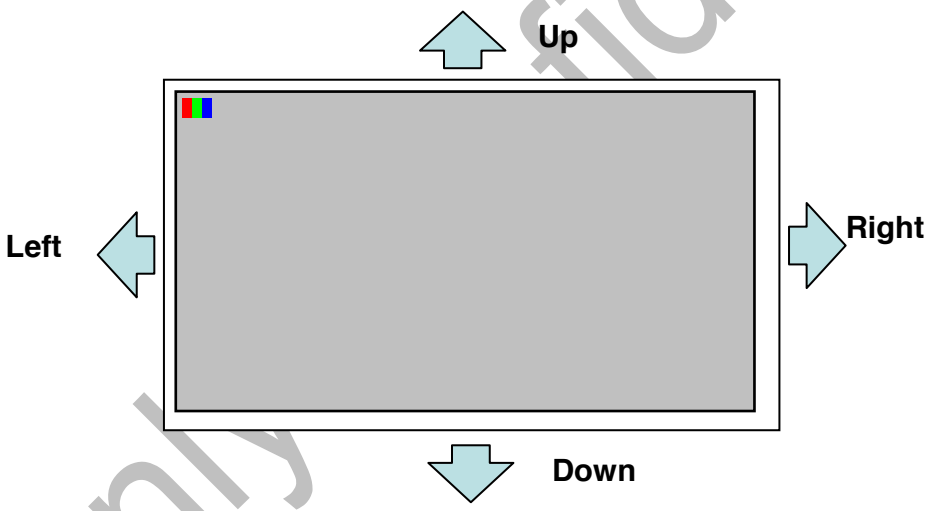
PIN NO	SYMBOL	DESCRIPTION
1	AGND	Analog ground
2	AVDD	Analog power
3	VDD	Digital power
4	GND	Digital ground
5	VCOM	Common voltage
6	VDD	Digital power
7	GND	Digital ground
8	V14	Gamma correction voltage reference
9	V13	Gamma correction voltage reference
10	V12	Gamma correction voltage reference
11	V11	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：089K60-000100-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)

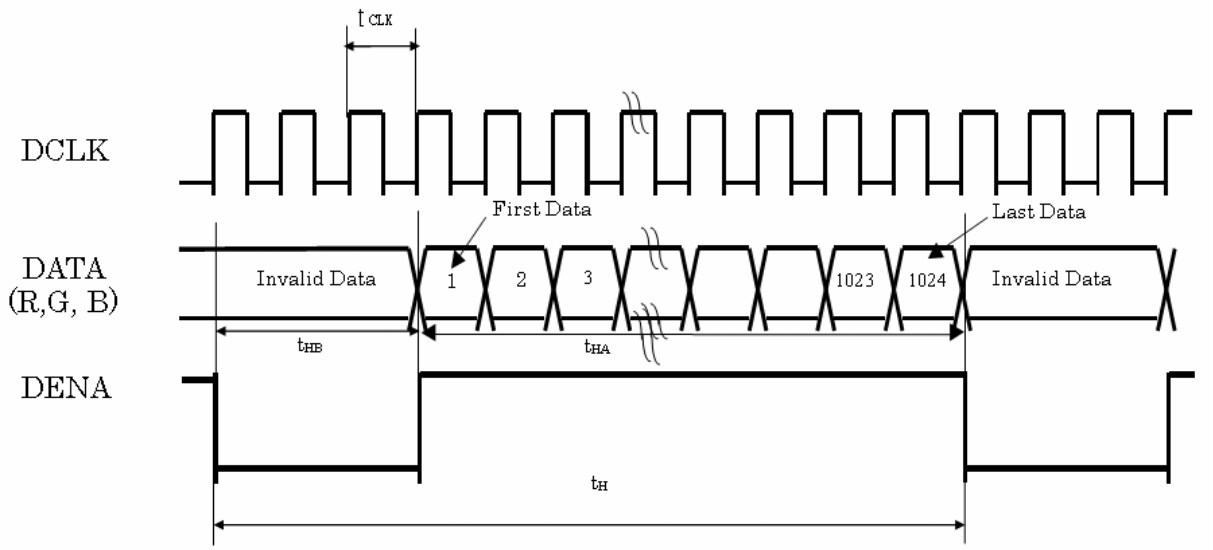
5. INPUT SIGNAL(DE ONLY MODE)

5.1 Timing Specification

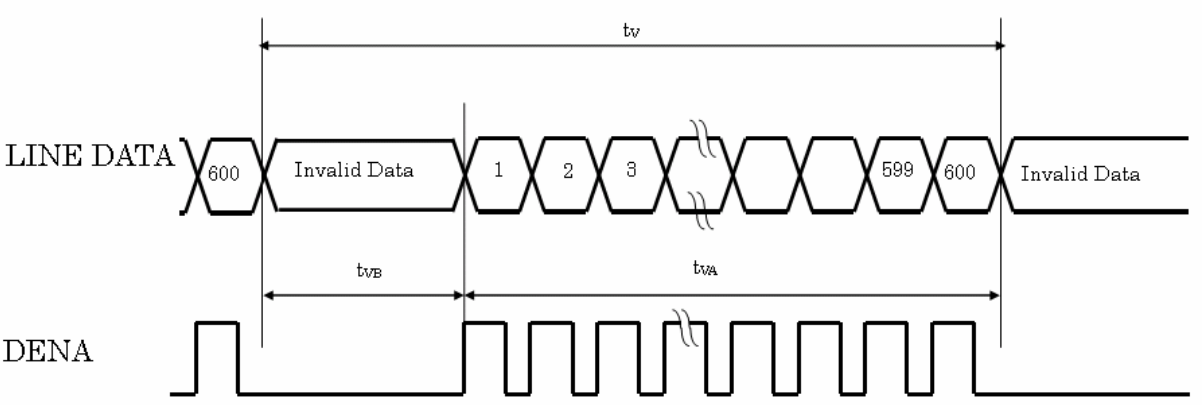
ITEM				SYMBOL	MIN	TYP	MAX	UNIT
LVDS input signal sequence	CLK Frequency			tclk	41	51.2	57	MHz
LCD input signal sequence （Input LVDS Transmitter）	DENA	Horizontal	Horizontal total Time	t_H	1214	1344	1364	tCLK
			Horizontal effective Time	t_{HA}	1024			tCLK
			Horizontal Blank Time	t_{HB}	190	320	340	tCLK
		Vertical	Vertical total Time	t_V	615	635	645	t_H
			Vertical effective Time	t_{VA}	600			t_H
			Vertical Blank Time	t_{VB}	15	35	45	t_H

5.2 Timing sequence(Timing chart)

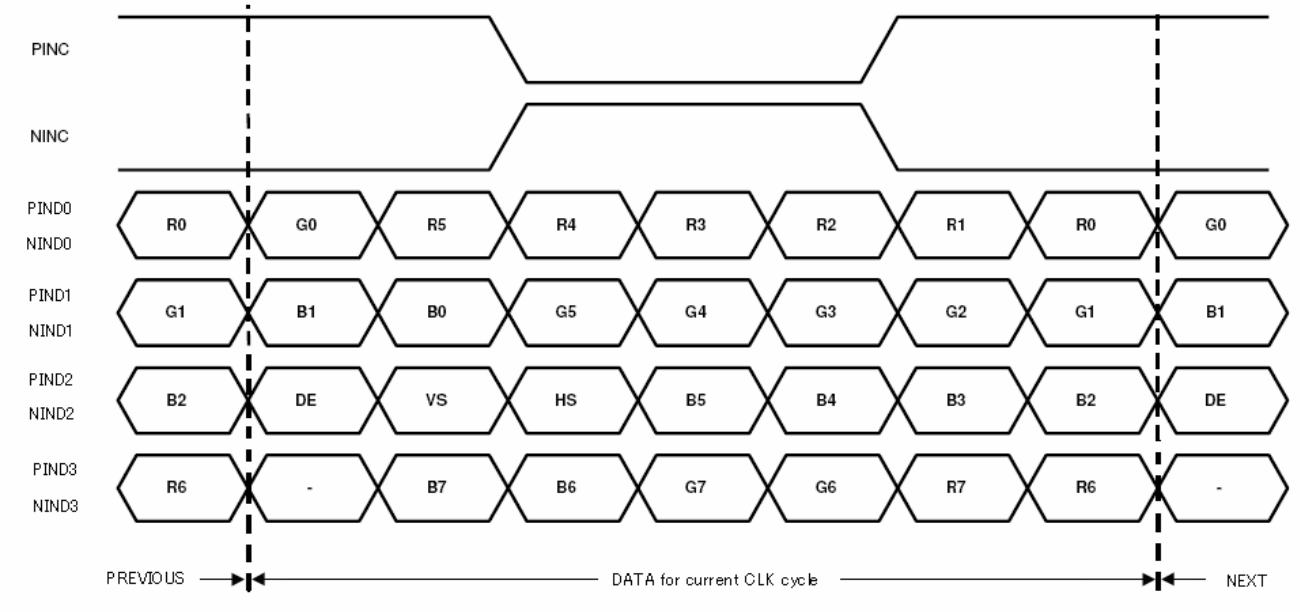
5.2.1 Horizontal Timing Sequence



5.2.2 Vertical Timing Sequence



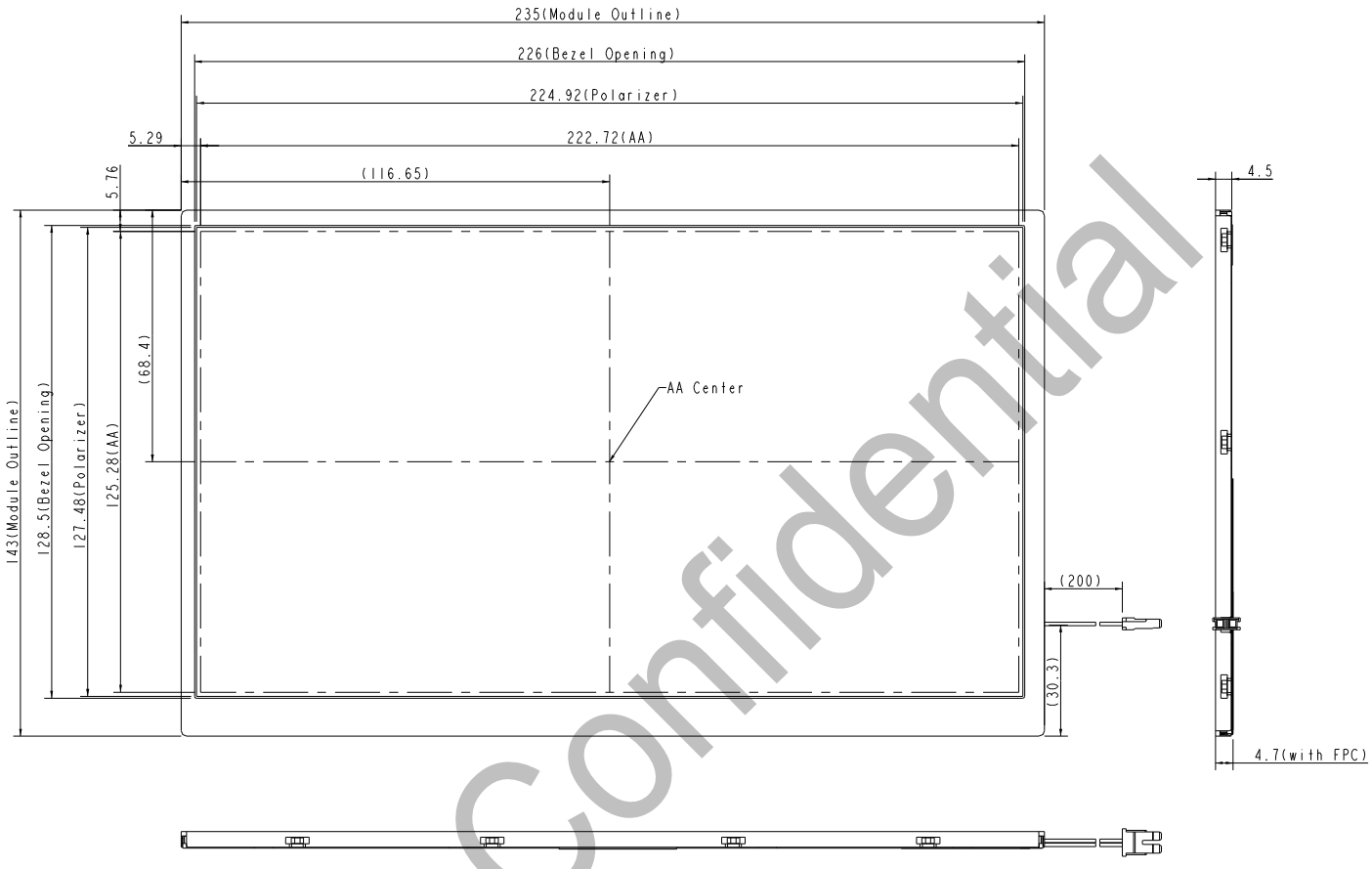
5.2.3 LVDS Input Data mapping



6. MECHANICAL DIMENSION

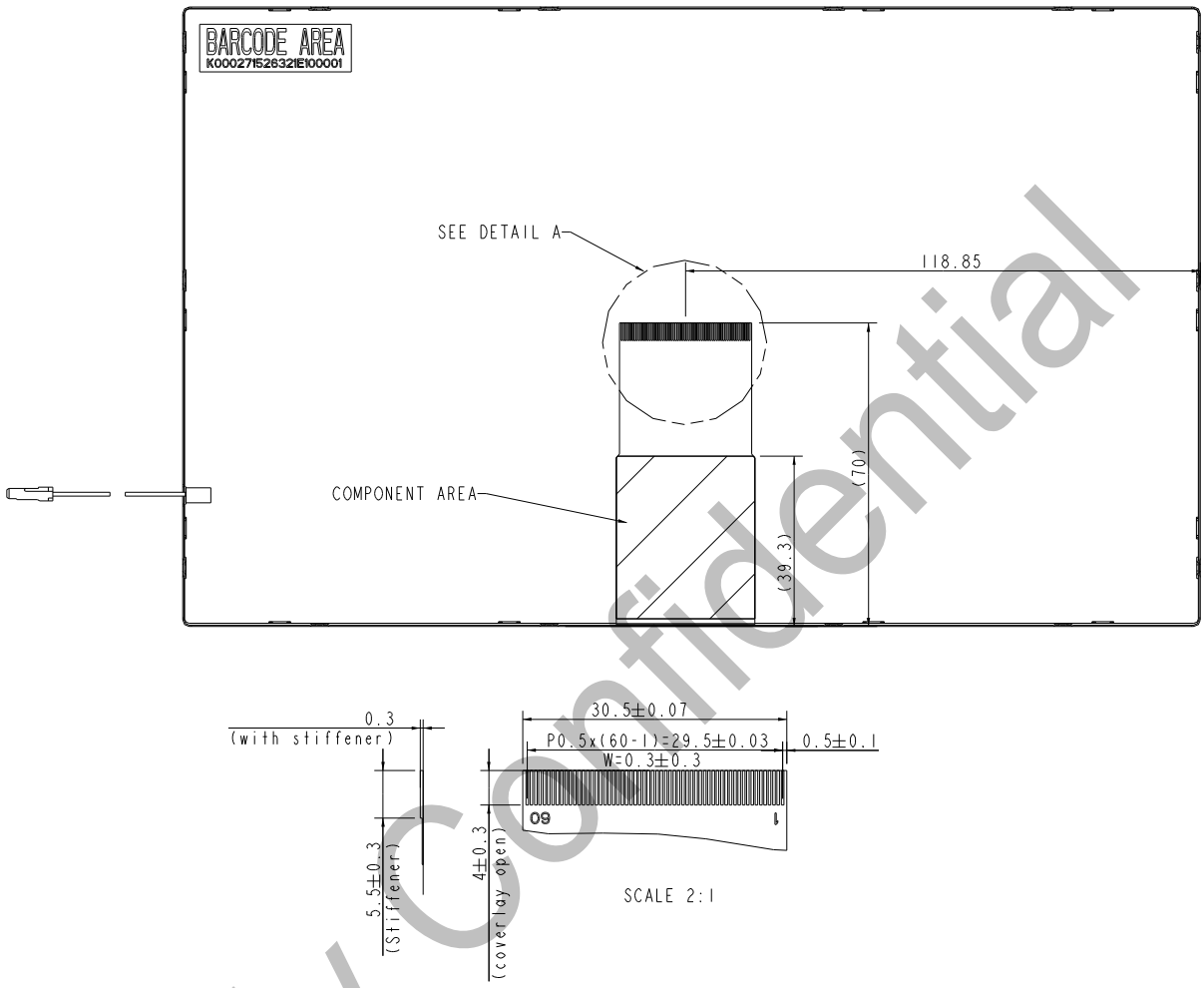
6.1 Front Side

[Unit：mm]



6.2 Rear Side

[Unit：mm]



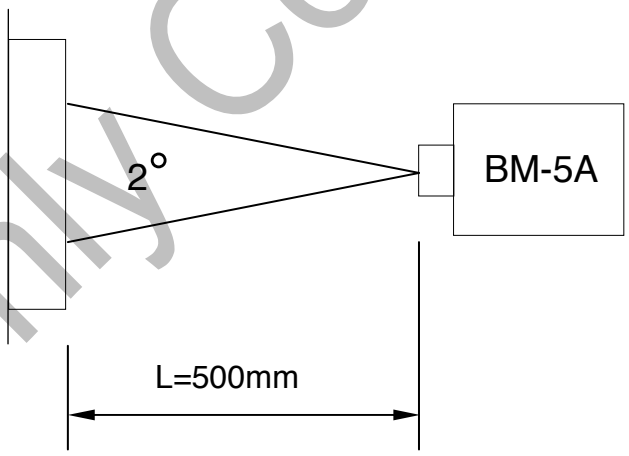
Remark：General tolerance ±0.3mm

7. OPTICAL CHARACTERISTICS

Ta = 25℃, 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	200	250		cd/m^2	1, 3
Luminance Uniformity		ΔL		70	80		%	1, 3
Response Time (White - Black)		Tr +Tf	Point-5	-	20	40	ms	1, 3, 5
NTSC		-	Point-5	45	50	-	%	1, 3
Viewing Angle	Horizontal		CR≧10 Point-5	120	140	--	°	1, 3
	Vertical			100	120	--	°	1, 2, 4
Color Coordinate	White	Wx Wy	Point-5	0.273 0.289	0.313 0.329	0.353 0.369	--	1, 3
	Red	Rx Ry		0.550 0.293	0.590 0.333	0.630 0.373		
	Green	Gx Gy		0.301 0.549	0.341 0.589	0.381 0.629		
	Blue	Bx By		0.122 0.059	0.162 0.099	0.202 0.139		

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

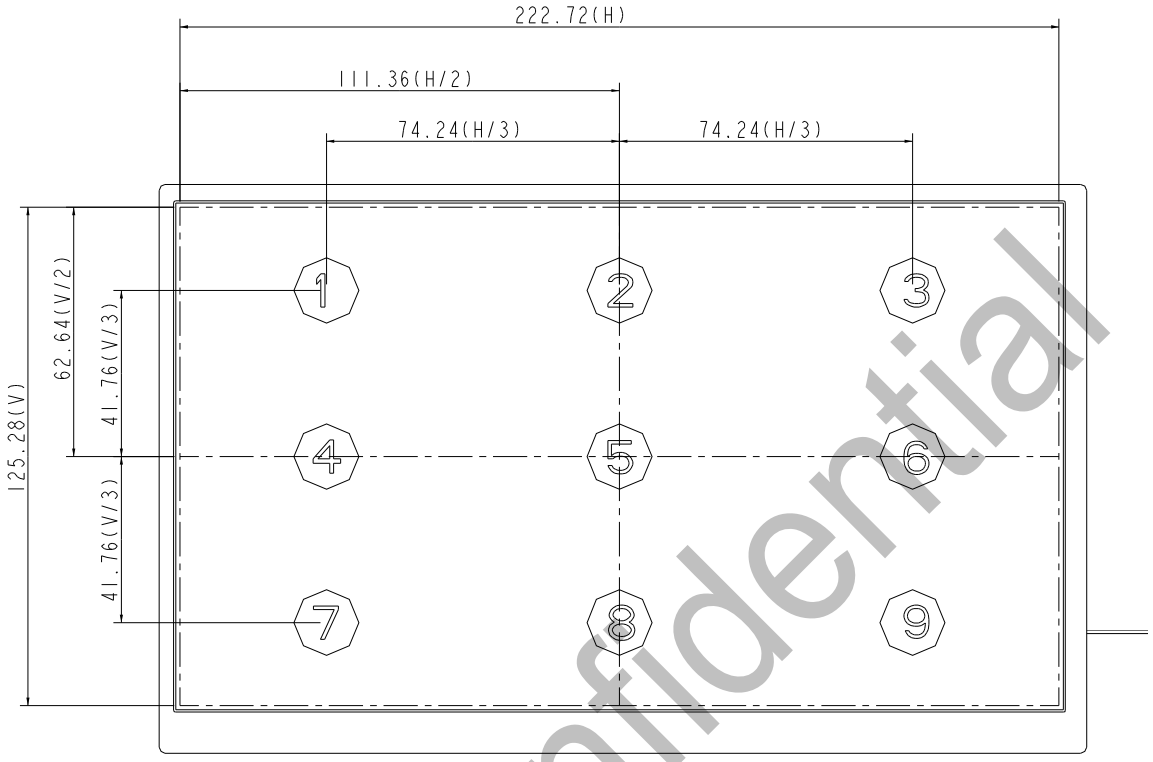


Fig.7-1 Measuring point

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

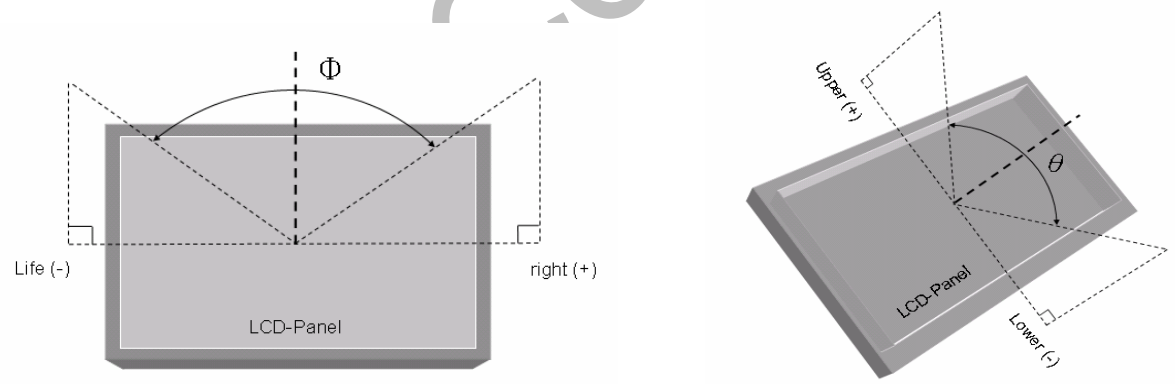


Fig.7-2 Definition of Viewing Angle

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

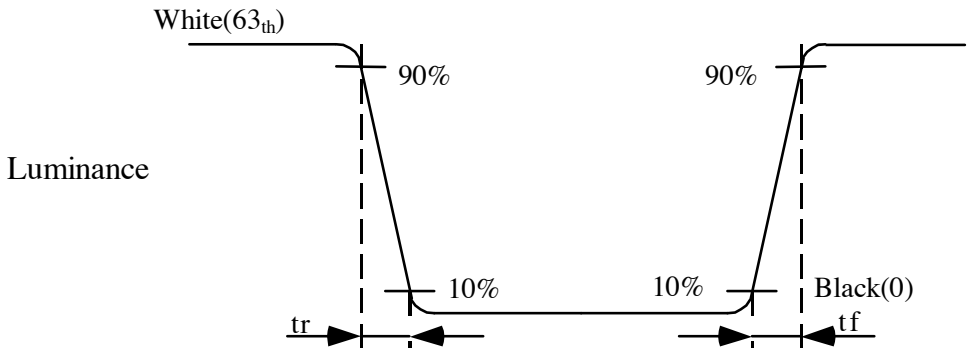


Fig.7-3 Definition of Response Time(White-Black)

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 Sticking	25 ℃± 2 ℃ ; 24hrs	Note 1

Note 1. :
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 .

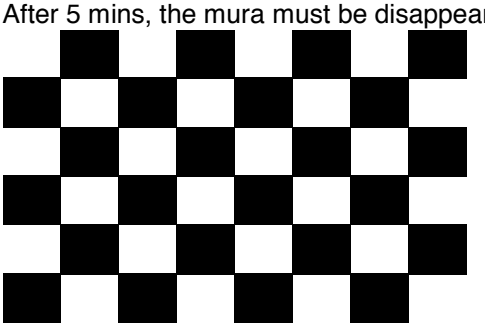


Image Sticking –pattern

Mid-Gray pattern

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: ±X,±Y,±Z axes for a total of six shock inputs.
Vibration (Non-operation)	● Frequency range:8~33.3Hz ● Stoke：1.3 mm ● Vibration: sinusoidal wave, perpendicular axis(both x, z axis: 2hrs ,y axis: 4hrs). ● Sweep: 2.9G,33.3 Hz -400 Hz ● Cycle time: 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