Chunghwa Picture Tubes, Ltd.
Product Specification

TFT LCD

CLAA103WA03 XN

ACCEPTED BY : (V0.2)

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1. OVERVIEW

CLAA103WA03XN is 10.3” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight. By applying 1280×480 images are displayed on the 10.3” diagonal screen. Display 16.7M colors by R.G.B signal input.

General specification are summarized in the following table:

ITEM	SPECIFICATION			
Display Area (mm)	243.84(W) x 91.44(H)			
Number of Pixels	1280(H) × 3 (RGB) × 480(V)			
Pixel Pitch (mm)	0.1905(W) x 0.1905(H)			
Color Pixel Arrangement	RGB vertical stripe			
Display Mode	Normally black			
Number of Colors	16.7M			
Brightness (cd/m^2)	450 (Min.)/700 (Typ.)			
Response Time (ms)	25ms(Typ.)			
Optimum Viewing Direction	Full			
Contrast Ratio	1000:1(Typ.)/ 800:1(min)			
Viewing Angle (CR≧10)	170degree (Horizontal.)			
	170degree (Vertical)			
Power Consumption (W)	4.431W(Typ)			
Interface connection	LVDS			
Module Size (mm)		Min.	Typ.	Max.
	Horizontal(H)	264.9	265.2	265.5
	Vertical(V)	109.5	109.8	110.1
	Depth(D) (w/o FPC)	7.7	8	8.3
Module Weight (g)	TBD			
Backlight Unit	LED			
Surface Treatment	AG 25%			

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2. ABSOLUTE MAXIMUM RATINGS

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

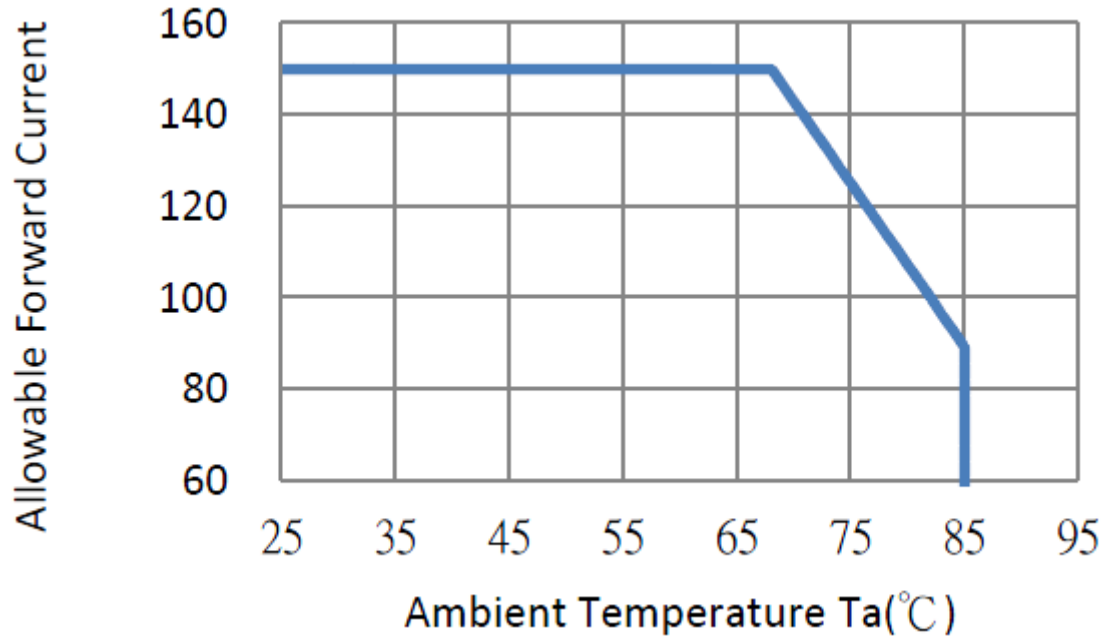
Item	Symbol	Min.	Max.	Unit	Note
LCD Voltage	VCC	-0.3	5	V	
Signal Input Voltage	NIND0 ~ NIND3 PIND0 ~ PIND3 NINC,PINC	-0.3	VCC+0.3	V	
Forward Current （per LED）	If	-	100	mA	
Reverse Voltage（per LED）	VR	-	5	V	
Pulse forward current（per LED）	Ifp	-	120	mA	1、2、3
Operating temperature	Topa	-30	85	℃	4
Storage temperature	Tstg	-40	90	℃	4

Note：

*1) If the product were used out of the operation and storage range, it will have quality issue.

*2) Ifp Conditions ： Pulse Width≦10msec，Duty≦1/10.

*3) Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward Current.



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

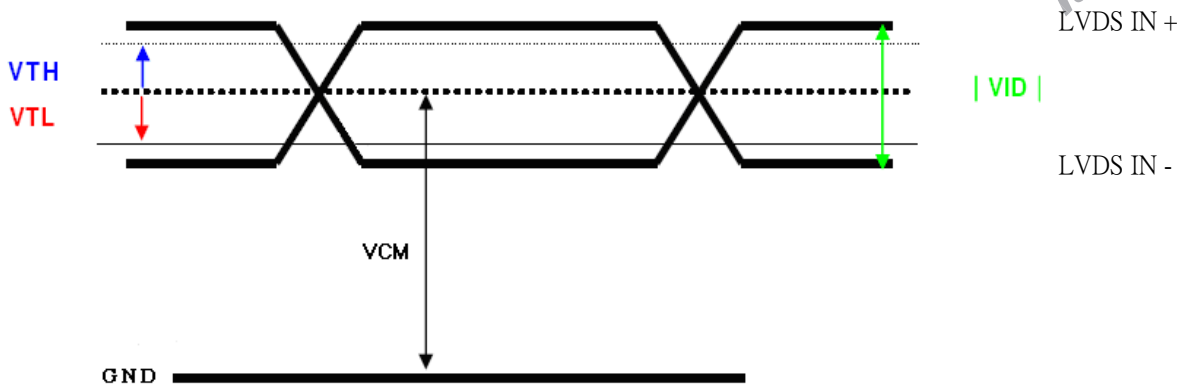
3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD

Ta=25℃

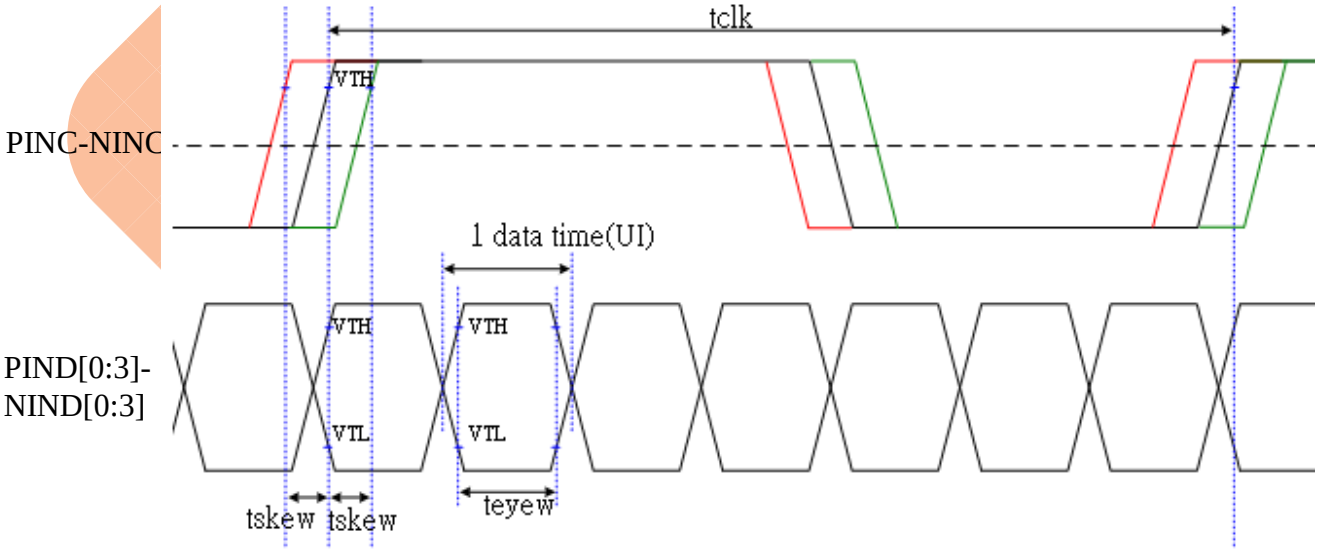
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power	VCC	3	3.3	3.6	V	
Logic Input Voltage (LVDS:IN+,IN-)	VCM	$\frac{\lvert VID \rvert}{2}$	-	VCC-1.2	V	Note1
	$\lvert VID \rvert$	200	-	600	mV	Note1
	VTH	-	-	100	mV	VCM=1.2V Note1
	VTL	-100	-	-	mV	
1 Data time	UI	-	tclk*1/7	-	tclk	
LVDS clock to data skew	tskew	-	-	0.2	UI	Note3
input data eye width	teyew	0.6	-	-	UI	
Logic Input Voltage	VIH	0.7*VCC	-	VCC	V	
	VIL	GND	-	0.3*VCC	V	

【Note1】LVDS signal (Single end)



【Note3】LVDS differential signal

The following conditon is base on operation frequency at 54.77MHz



3.2 TFT-LCD Current Consumption

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.	Note.
LCD Power	VCC	VCC = 3.3V	-	(170)	(350)	mA	【Note1】
Total Power Consumption	PC		-	(231)	(1155)	mW	【Note1】

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



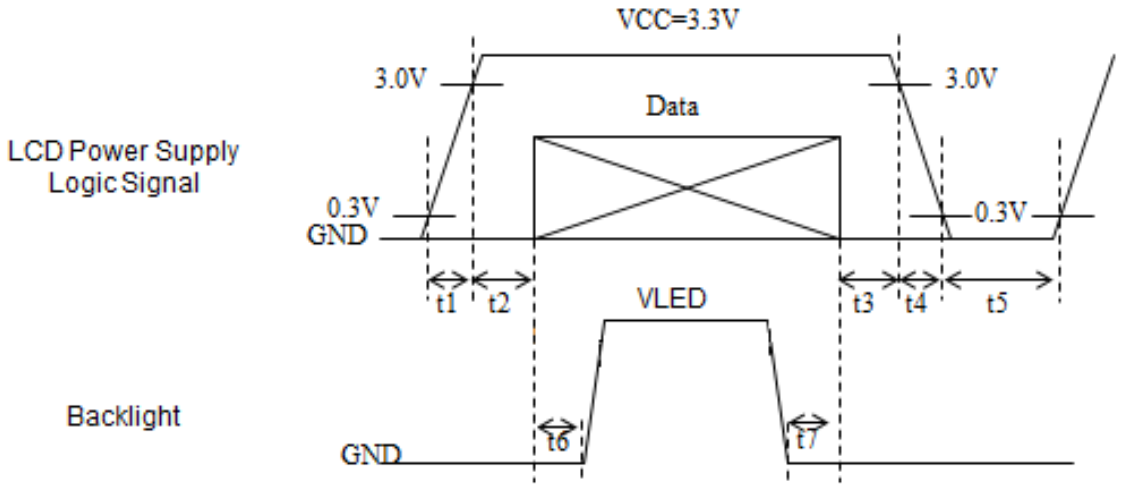
256 gray pattern



White Pattern

3.3 Power、Signal sequence

Power On：VCC→Video &Logic Signal→Backlight
Power Off：Backlight→Video &Logic Signal→VCC



0.5<t1≦10ms
0＜t2≦50ms
0＜t3≦50ms
0＜t4≦10ms
200ms≦t5
200ms≦t6
200ms≦t7
10ms≦t8
10ms≦t9

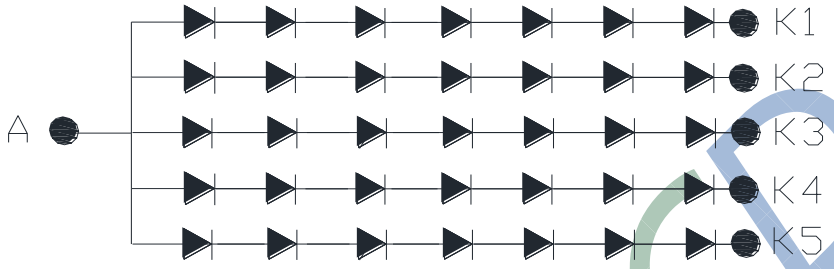
3.4 Backlight

Ta=25℃

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED current	IL	Ta=25℃ (40mA/serise)	--	200	--	mA	
LED voltage	VL	Ta=25℃ (40mA/serise)	18.55	19.67	24.15	V	
Power consumption	WL	Ta=25℃ (40mA/serise)	--	3.914	--	W	
LED Lifetime	-	Ta=60℃ IF=40mA	30000	--	--	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 70%..

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4. INTERFACE CONNECTION

4.1 CN1 (Input Signal)

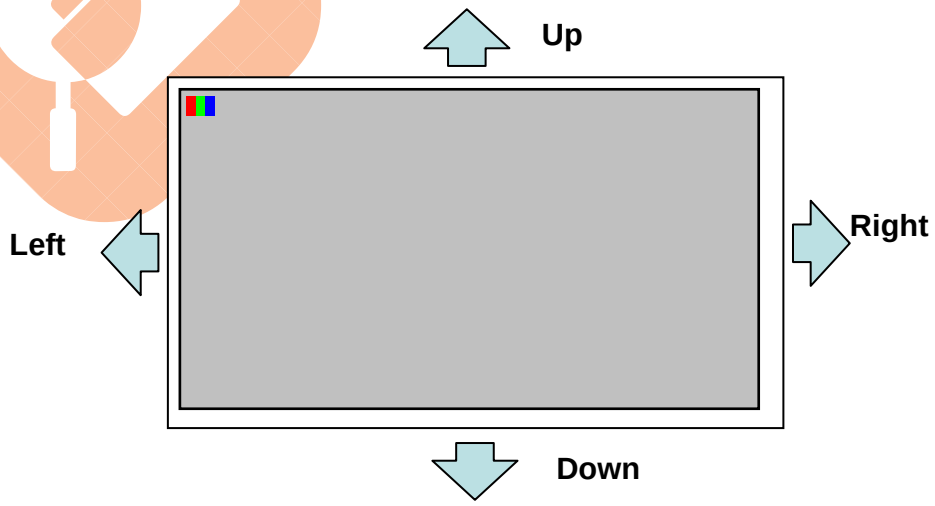
PIN NO	SYMBOL	DESCRIPTION
1	GND	Digital ground
2	NC	Not connect
3	VCC	LCD power
4	GND	Digital ground
5	NC	Not connect
6	VCC	LCD power
7	GND	Digital ground
8	NC	For CPT internal test, please keep it floating
9	NC	For CPT internal test, please keep it floating
10	NC	For CPT internal test, please keep it floating
11	NC	For CPT internal test, please keep it floating
12	NC	For CPT internal test, please keep it floating
13	NC	Not connect
14	NC	Not connect
15	GND	Digital ground
16	VCC	LCD power
17	GND	Digital ground
18	PIND3	Positive LVDS differential data input
19	NIND3	Negative LVDS differential data input
20	GND	Digital ground
21	PINC	Positive LVDS differential clock input
22	NINC	Negative LVDS differential clock input
23	GND	Digital ground
24	PIND2	Positive LVDS differential data input
25	NIND2	Negative LVDS differential data input
26	GND	Digital ground
27	PIND1	Positive LVDS differential data input
28	NIND1	Negative LVDS differential data input
29	GND	Digital ground
30	PIND0	Positive LVDS differential data input
31	NIND0	Negative LVDS differential data input
32	GND	Digital ground
33	GND	Digital 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=47KΩ，C=1μF)
35	STBYB	Standby mode, normally pull high STBYB=”1”, normal operation STBYB=”0”,timing control, source driver will turn off, all output are GND.
36	SHLR	Left or right display control
37	VCC	LCD power
38	UPDN	Up / down display control
39	GND	Digital ground
40	NC	Not connect
41	NC	Not connect

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42	NC	For CPT internal test, please keep it floating
43	NC	For CPT internal test, please keep it floating
44	VCC	LCD power
45	GND	Digital ground
46	NC	Not connect
47	NC	Not connect
48	NC	Not connect
49	NC	Not connect
50	NC	Not connect
51	NC	Not connect
52	NC	Not connect
53	GND	Digital ground
54	VCC	LCD power
55	SELB	6bit/8bit mode select, SELB = “1”, LVDS input data is 8bits SELB = “0”, LVDS input data is 6bits
56	NC	Not connect
57	VCC	LCD power
58	NC	Not connect
59	GND	Digital ground
60	NC	Not connect

Remarks：Mating connector：FH52-60S-0.5SH (Hirose)
Note 1：UPDN and SHLR control function

SHLR	UPDN	Data shifting
VCC	GND	Left→Right，Up→Down(default)
GND	GND	Right→Left，Up→Down
VCC	VCC	Left→Right，Down→Up
GND	VCC	Right→Left，Down→Up



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4.2 CN2 (LED backlight)

Pin No.	SYMBOL	FUNCTION
1	A	Anode
2	A	Anode
3	A	Anode
4	K1	Cathode 1
5	K2	Cathode 2
6	K3	Cathode 3
7	K4	Cathode 4
8	K5	Cathode 5
9	NTC_A	NTC_Anode
10	NTC_K	NTC_Cathode

Note-1：suggest connector (10pin) : FH52-10S-0.5SH (HRS)
Note-2：NTC-Murata (NCU15XH103F6SRC)

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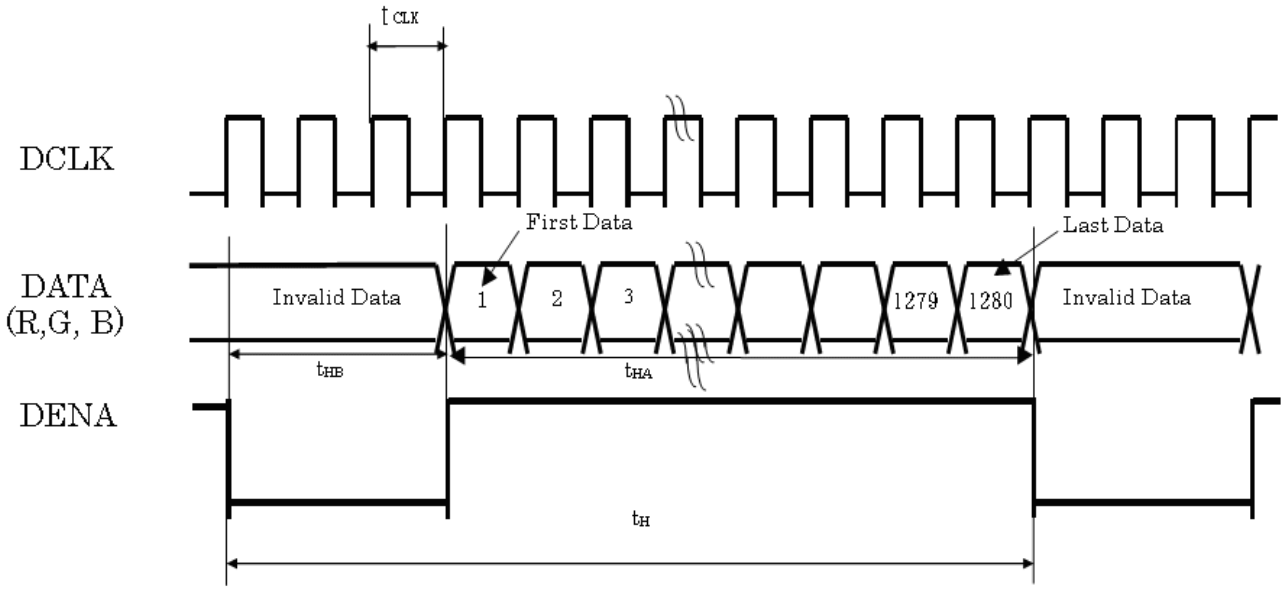
5. INPUT SIGNAL(DE ONLY MODE)

5.1 Timing Specification

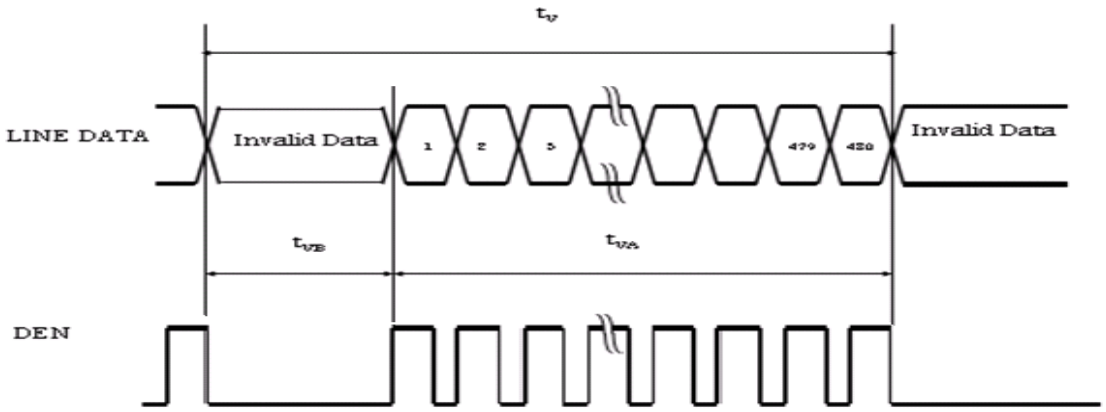
Item				Symbol	Min.	Typ.	Max.	Unit
LVDS input signal sequence	CLK Frequency			tclk	(47.74)	51.19	(54.77)	MHz
LCD input signal sequence （Input LVDS Transmitter）	DENA	Horizontal	Horizontal total Time	t_H	(1530)	1580	(1630)	tCLK
			Horizontal effective Time	t_{HA}	1280			tCLK
			Horizontal Blank Time	t_{HB}	(250)	300	(350)	tCLK
		Vertical	Vertical total Time	t_V	(520)	540	(560)	t_H
			Vertical effective Time	t_{VA}	480			t_H
			Vertical Blank Time	t_{VB}	(40)	60	(80)	t_H

5.2 Timing sequence(Timing chart)

5.2.1 Horizontal Timing Sequence

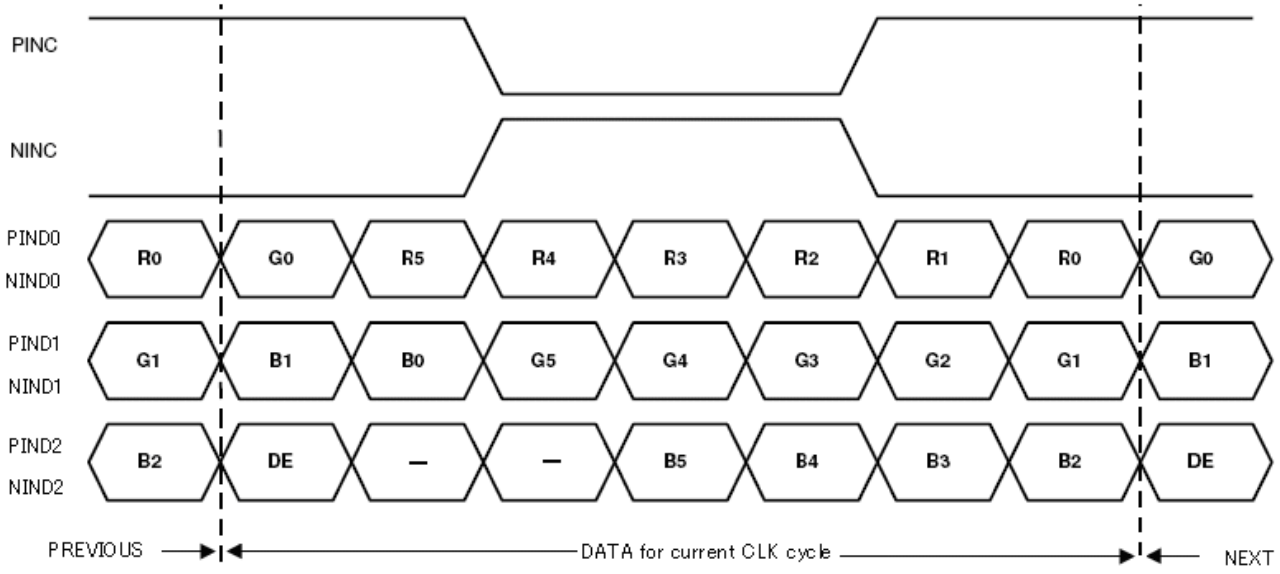


5.2.2 Vertical Timing Sequence

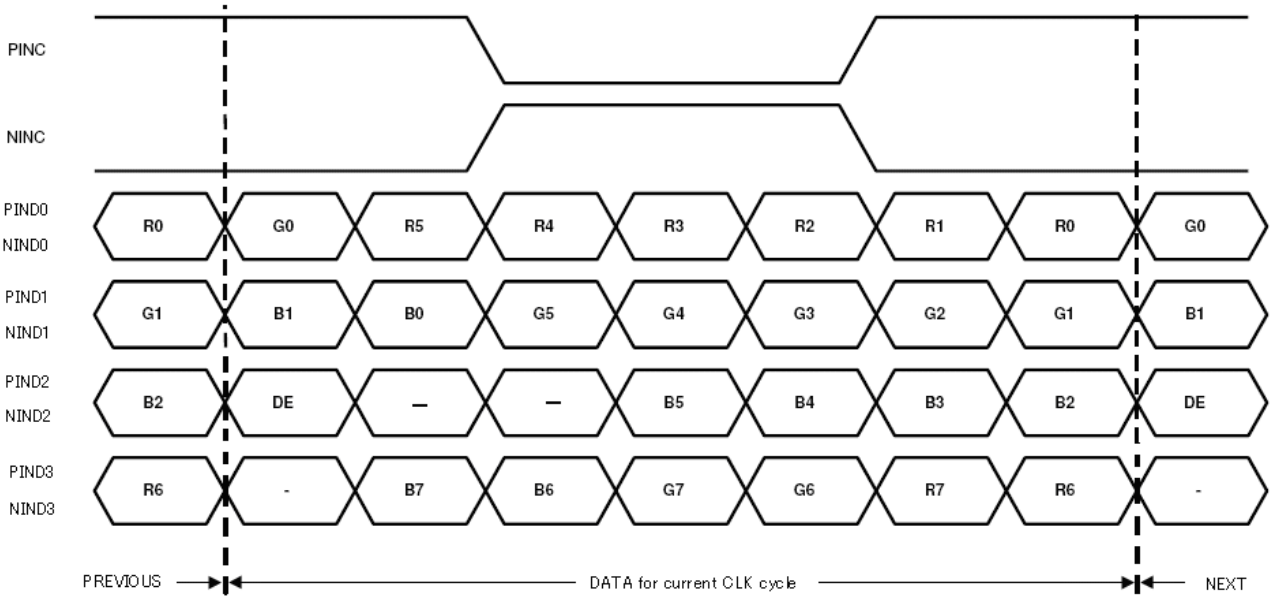


5.2.3 LVDS Input Data mapping

6 Bit LVDS input



8 Bit LVDS input



5.2.4 Color Data Reference

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	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(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
	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
	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
	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
RED	RED(0)	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(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
GREEN	GREEN(0)	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(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
BLUE	BLUE(0)	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(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) Gray level:
Color(n)：n is level order; higher n means brighter level.

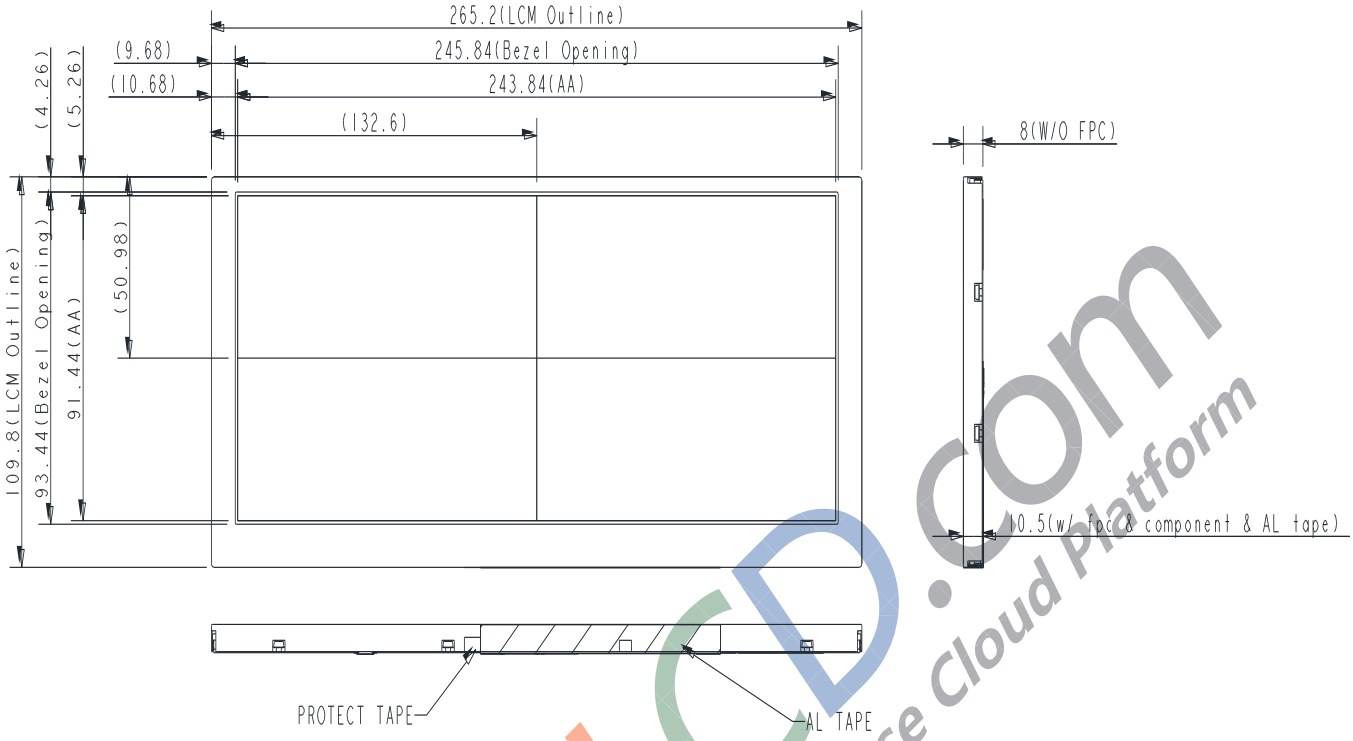
2) DATA:
1: high，0: low

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6. MECHANICAL DIMENSION

6.1 Front Side

[Unit：mm]

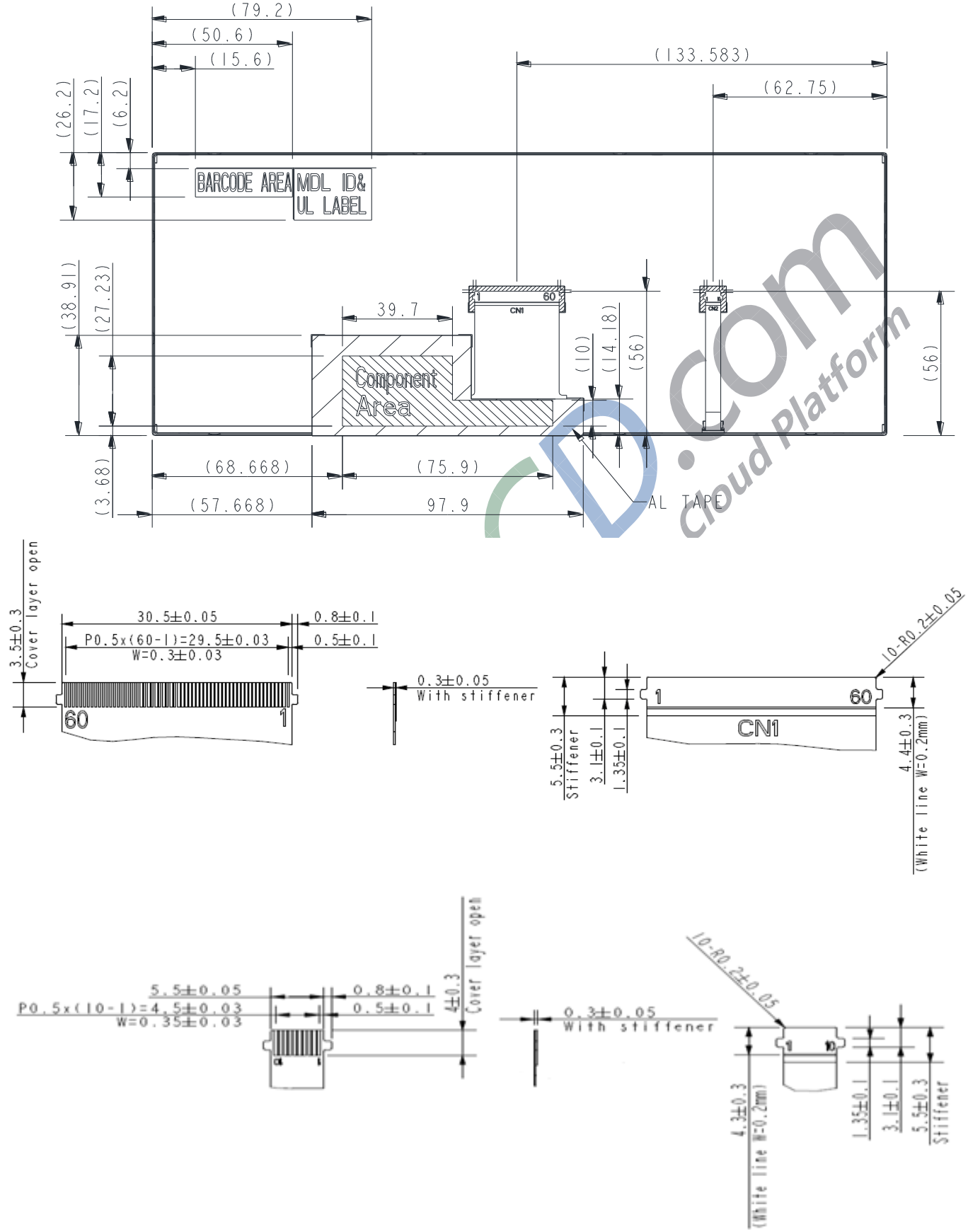


NOTE: General tolerance=±0.3mm

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6.2 Rear Side

[Unit：mm]



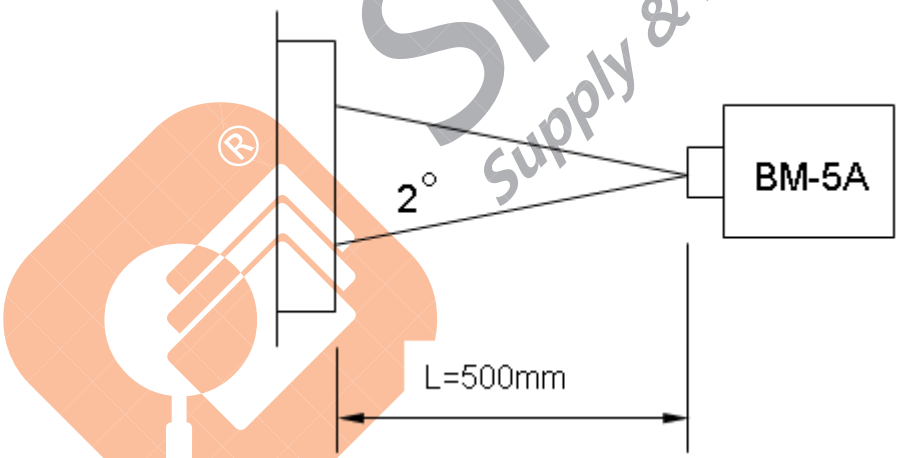
NOTE: General tolerance=±0.3mm
CN1 suggest connector (60pin): FH52-60S-0.5SH (Hirose)
CN2 suggest connector FH52-10S-0.5SH (HRS)

7. OPTICAL CHARACTERISTICS

Ta = 25°C, VCC=3.3V

ITEM		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Constrast Ratio		CR	Point-5	800	1000		--	1, 2, 3
Luminance(CEN)		Lw	Point-5	450	700		cd/m^2	1, 3
Luminance Uniformity		ΔL		70	85		%	1, 3
Response Time (White - Black)		Tr +Tf	Point-5	-	25	35	ms	1, 3, 5
NTSC		-	Point-5	60	70	-	%	1, 4
Viewing Angle	Vertical	Upper(θ)	CR≧10 Point-5	75	85	--	°	1, 4
		Down(θ)		75	85			1, 4
	Horizontal	Left(ψ)		75	85			1, 4
		Right(ψ)		75	85	--	°	1, 4
Color Coordinate	White	Wx Wy	Point-5	0.264 0.295	0.304 0.335	0.344 0.375	--	1, 3
	Red	Rx Ry		0.609 0.301	0.649 0.341	0.689 0.381		
	Green	Gx Gy		0.269 0.603	0.309 0.643	0.349 0.683		
	Blue	Bx By		0.107 0.049	0.147 0.089	0.187 0.129		

Note1: Measure condition：25℃±2℃，60±10%RH，under 1 Lux in the dark room.BM-5A (TOPCON)，viewing angle2°，IL=200mA（Backlight current），measurement after lighting on 10 mins.



Note2: Definition of contrast ratio：

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

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Note3: Definition of luminance：Measure white luminance on the point 5 as figure.7-1
Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure.7-1
ΔL = [L(MIN)/L(MAX)]×100

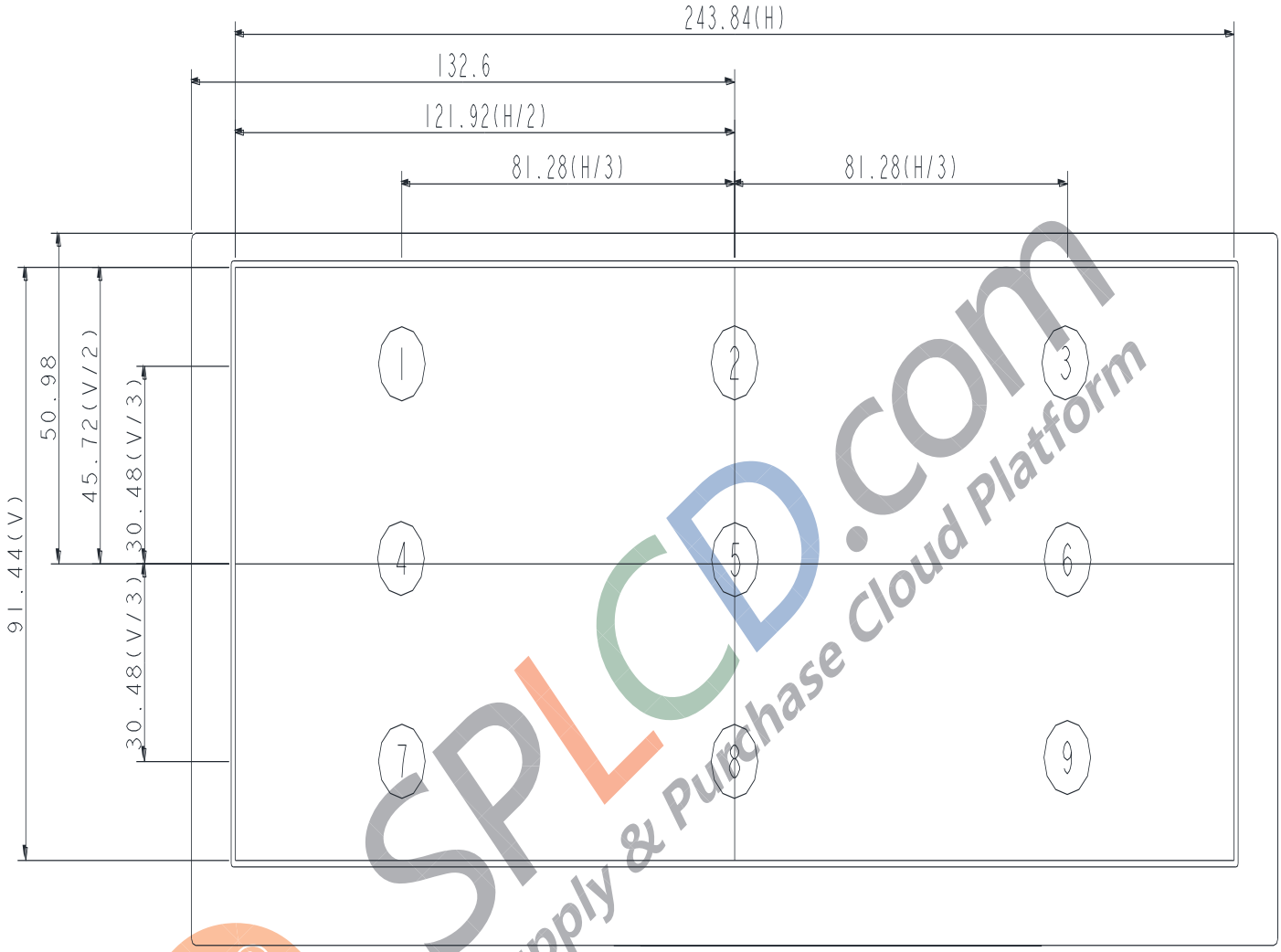


Fig.7-1 Measuring point

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

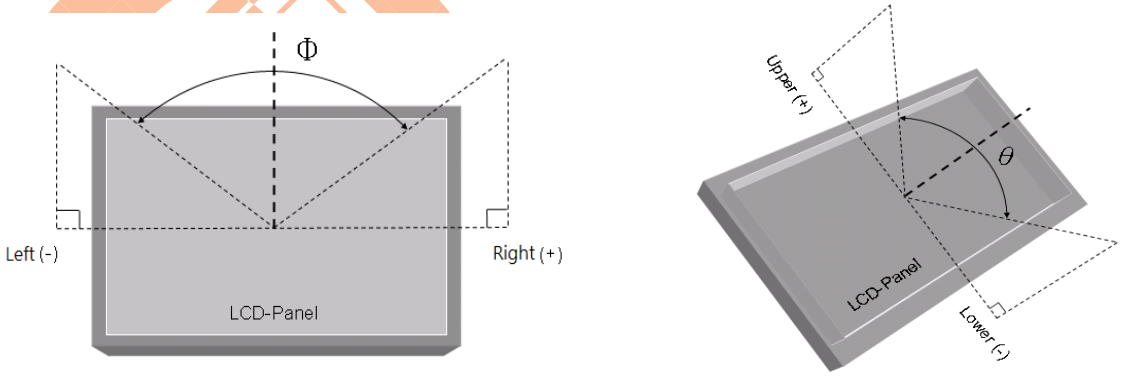


Fig.7-2 Definition of Viewing Angle

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

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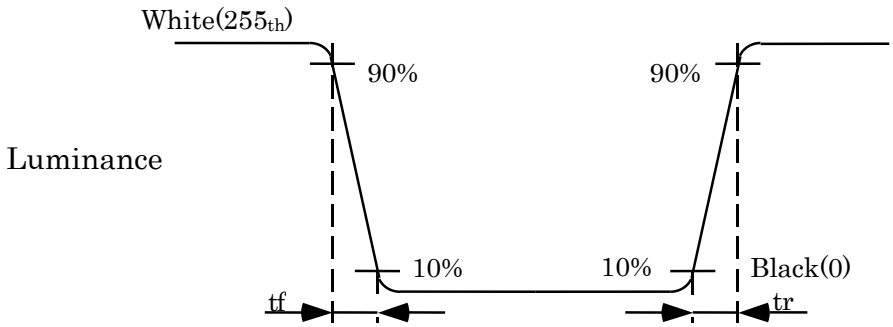


Fig.7-3 Definition of Response Time(White-Black)

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8. RELIABILITY TEST

8.1. Temperature and humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	85°C ； 240hrs	
High Temperature Storage	90°C ；240hrs	
High Temperature High Humidity Operation	60°C ；90% RH；240hrs	No condensation
Low Temperature Operation	-30°C ；240hrs	
Low Temperature Storage	-40°C ；240hrs	
Thermal Shock	–40℃(0.5hr) ~ 85℃(0.5hr) ; 200 Cycles	
Image Sticking	25 ℃± 2 ℃ ; 2hrs	Note 1

Note 1.：
Condition of Image Sticking test：25 ℃± 2 ℃
Operation with test pattern sustained for 2 hrs, then change to gray pattern immediately.
After 5 mins, the mura must be disappeared completely .

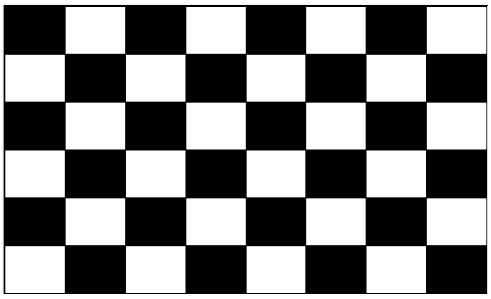


Image Sticking –pattern



Mid-Gray pattern

8.2. Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	● Shock level: 980m/s2(equal to 100G). ● Waveform: half sinusoidal wave,6ms. ● Number of shocks: +X,+Y,+Z each axis 3 times
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(Power off)	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 line defect.
Fail: No display image, or line defects.

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9. WARRANTY

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

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

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