



Chunghwa Picture Tubes, Ltd.

Product Specification

Date : 070911

TFT LCD

CLAA090VA01 Y

ACCEPTED BY :

Tentative V0.3

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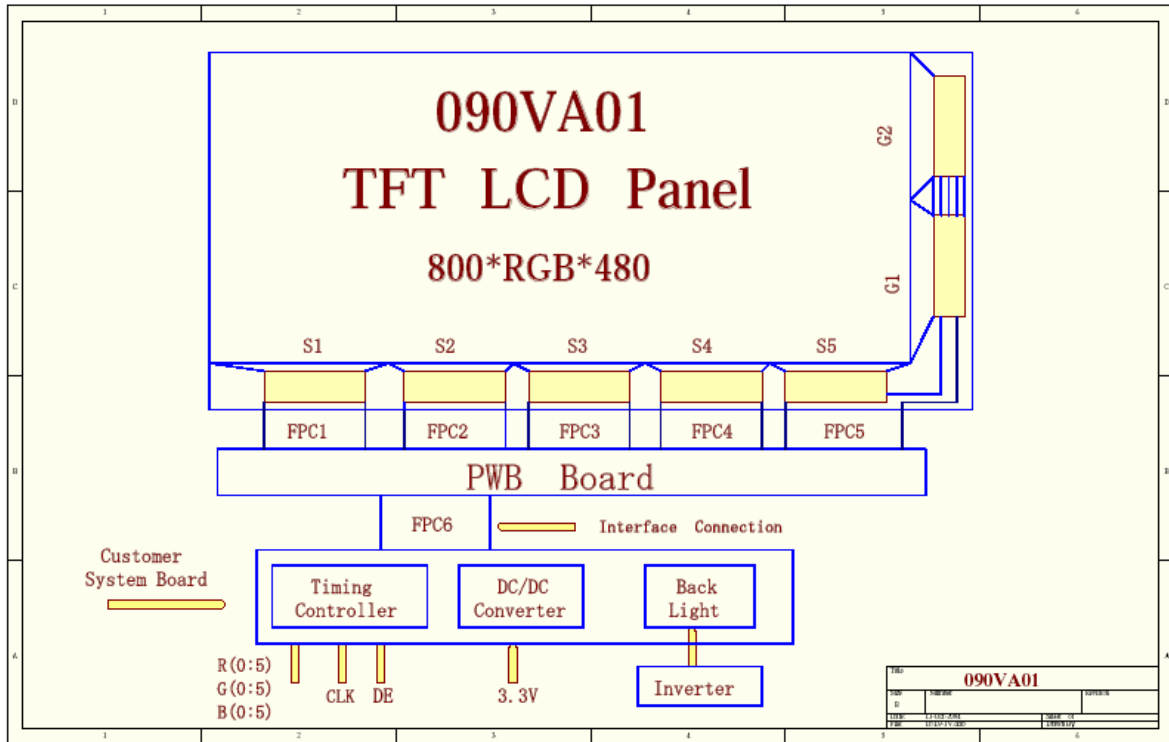
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1. OVERVIEW

CLAA090VA01 is 9" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, and backlight. Utilizes a panel with a 16:9 aspect ratio.

The 9.0" screen produces a high resolution image that is composed of 384,000(800x480) pixel elements in a stripe arrangement. Inverter for backlight is not included in this module.



General specifications are summarized in the following table:

ITEM	SPECIFICATION
Panel Size	9" inch
Display Area (in mm)	198(W) x 112.08(H)
View Area (in mm)	201.10(W) x 115.15(H)
Number of Pixels	800(W) x 480(H)
Pixel Pitch (in mm)	0.2475x0.2335
Color Pixel Arrangement	RGB vertical strip
Display Mode	Normally white
Number of color	262k
Brightness(cd/m ²)	260nit(min) / 300nit(typ)
Contrast Ratio	350:1(typ)
Response Time (Tr+Tf)	30ms (typ)
Outline Dimension (in mm)	210.7 (W)x 126.4(H) x 6.2(D)
Viewing Angle(Typical) (BL On,CR>10)	120 degree (Horizontal.) 110 degree (vertical)
NTSC ratio	45%
Driving Method	TFT active matrix
BL unit	CCFL
Input signal	TTL
Viewing Direction	6 o'clock
Power Consumption(W)	4.6W
weight(g)	240g

2. ABSOLUTE MAXIMUM RATINGS

The following values are maximum operation conditions. If exceeded, it may cause faulty operation or damage.

ITEM	SYMBOL	MIN.	MAX.	UNIT
Power Supply Voltage for LCD	V _{CC}	-0.5	4.6	V
Signal input voltage	DCLK,DE,R0,G0, B0~R5,G5,B5	-0.5	4.6	V
Operation Temperature *1)	Top	0	60	°C
Storage Temperature *1)	Tstg	-30	70	°C
Lamp Voltage	VL	-	776	Vrms
Lamp Current	IL	4.0	8.0	mArms
Lamp Frequency	FL	40	80	kHz

[Note] :

*1) Humidity \leq 85% RH. without condensation.

3. ELECTRICAL CHARACTERISTICS

3.1 Typical operating conditions

(GND=AVSS=0V)

PARAMETER	SYMBOL	SPECIFICATION			UNIT
		MIN.	TYP.	MAX.	
Power Voltage	VDDD	3.0	3.3	3.6	V
	VDDA	9.2	9.6	10.2	V
	VGH	16.8	18	19.2	V
	VCOM	-	4.0	-	V
	VGL	-6.5	-6	-5.5	V
Gamma Voltage	V1~V5	0.4VDDA	-	VDDA-0.1	V
	V6~V10	0.1	-	0.6VDDA	V
Logic Input Voltage	VTH	0.7*VDDD	-	VDDD	V
	VTL	0	-	0.3*VDDD	V

3.2 Current Consumption Condition

(GND=AVSS=0V)

SYMBOL	CONDITION	SPECIFICATION			UNIT
		MIN.	TYP	MAX.	
IGH	VGH=18V	-	-	100	uA
IGL	VGL=-6V	-	-	100	uA
IDDD	VDDD=3.3V	-	10	20	mA
IDDA	VDDA=9.6V	-	20	30	mA

3.3 Backlight System

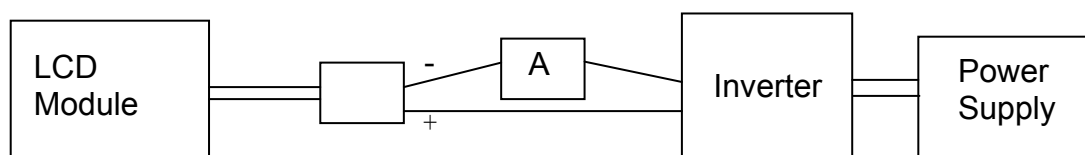
Ta = 25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	VL	583	648	713	Vrms	IL=6mA
Lamp Current	IL	5.5	6.0	6.5	mArms	*1)
Frequency	FL	40	-	80	KHz	*3)
Lamp life time	Life L	15000	-	-	Hr	*2) IL=6mA
Lamp Power	WL		3.89		W	IL=6mA
Starting Lamp Voltage	Ta = 0°C	-	-	1530	Vrms	*4)
	Ta = 25°C	-	-	1180		
Turn on and off life	-	100,000	-	-	times	

1 time = on / 30sec + off / 30ces

[Note] :

*1)Measure method : galvanometer connect to low voltage

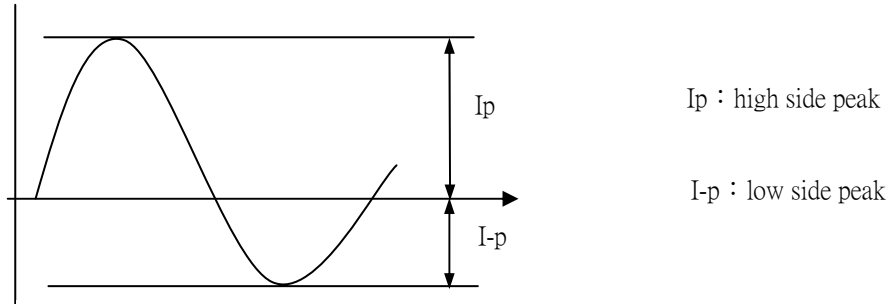


*2) Lamp Life Time define : Lamp brightness decay to 50%, $V_s = 1180 \text{ V}$, $T_a = 25^\circ\text{C}$, $I_L = \text{Max } 6 \text{ mA}$.

If the driving waveform of Lamp is asymmetric, the distribution of mercury inside the lamp tube will become unequally or will deplete the Ar gas in it. Then it may cause the abnormal phenomenon of lighting up. Therefore, designers have to try their best to for fill the conditions under the inverter designing-stage as below :

The degrees of unbalance : $< 10\%$

The ratio of wave height : $< \sqrt{2} \pm 10\%$



A : The degrees of unbalance = $| I_p - I-p | / I_{rms} \times 100 (\%)$

B : The ratio of wave height = $I_p \text{ (or } I-p) / I_{rms}$

*3) Frequency in this range can make the characteristics of electric and optics maintain in $\pm 10\%$ except hue. Lamp frequency of inverter may produce interference with horizontal synchronous frequency, and this may cause horizontal beat on the display. Therefore, please adjust lamp frequency, and keep inverter as far from module as possible or use electronic shielding between inverter and module to avoid the interference.

*4) The initial voltage for the lamp had to as possible as arrive to the maximum of the initial voltage.

4. INTERFACE PIN CONNECTION

4.1 Pin Assignment

Pin NO.	SYMBOL	DESCRIPTION
1	VCOM	Common Voltage
2	VCOM	Common Voltage
3	DIO1	Horizontal start Pulse Signal I/O
4	VDDD	Power Supply for Digital Circuit
5	CLK	Horizontal Clock
6	SHL	Select Left / Right Shift
7	R0	Red Data (LSB)
8	R1	Red Data
9	R2	Red Data
10	R3	Red Data
11	R4	Red Data
12	R5	Red Data (MSB)
13	G0	Green Data (LSB)
14	G1	Green Data
15	G2	Green Data
16	G3	Green Data
17	G4	Green Data
18	G5	Green Data (MSB)
19	VDDA	Power Supply for Analog Circuit
20	V1	Gamma Voltage Level 1
21	V2	Gamma Voltage Level 2
22	V3	Gamma Voltage Level 3
23	V4	Gamma Voltage Level 4
24	V5	Gamma Voltage Level 5
25	V6	Gamma Voltage Level 6
26	V7	Gamma Voltage Level 7
27	V8	Gamma Voltage Level 8
28	V9	Gamma Voltage Level 9
29	V10	Gamma Voltage Level 10
30	AVSS	Power Gound
31	B0	Blue Data (LSB)
32	B1	Blue Data
33	B2	Blue Data
34	B3	Blue Data
35	B4	Blue Data
36	B5	Blue Data (MSB)
37	LD	Latch The Polarity of Output and Switch The New Data to Output
38	REV	Control Signals are Inverted or not
39	POL	Polarity Selection
40	GND	Power Gound
41	DIO2	Horizontal start Pulse Signal I/O
42	OEV	Output Enable
43	UD	Up / Down Control Pin
44	VCLK	Vertical Clock
45	STVU	Vertical start Pulse Signal I/O
46	STVD	Vertical start Pulse Signal I/O Ground
47	VGH	Gate ON Voltage
48	VGL	Gate OFF Voltage
49	VDDD	Power Supply for Digital Circuit
50	GND	Power Gound

**GAMMA Voltage Reference: V1 = 9.2V , V2 =7.99V, V3 = 7.41V, V4 = 7.02V, V5 = 5.8V
V6 = 3.9V, V7 = 2.68V, V8 = 2.29V, V9 = 1.74V, V10 = 0.507V**

4.2 CN2 (Backlight)

Backlight-side connector: BHSR-02VS-1 (JST)

Inverter-side connector: SM02B-BHSS-1 (JST)

Pin No.	SYMBOL	FUNCTION
1	CTH	VBLH (High)
2	CTL	VBLL (Low)

[Note] : VBLH-VBLL=VL

5. TIMING SPECIFICATION

5.1 Horizontal Timing Specification

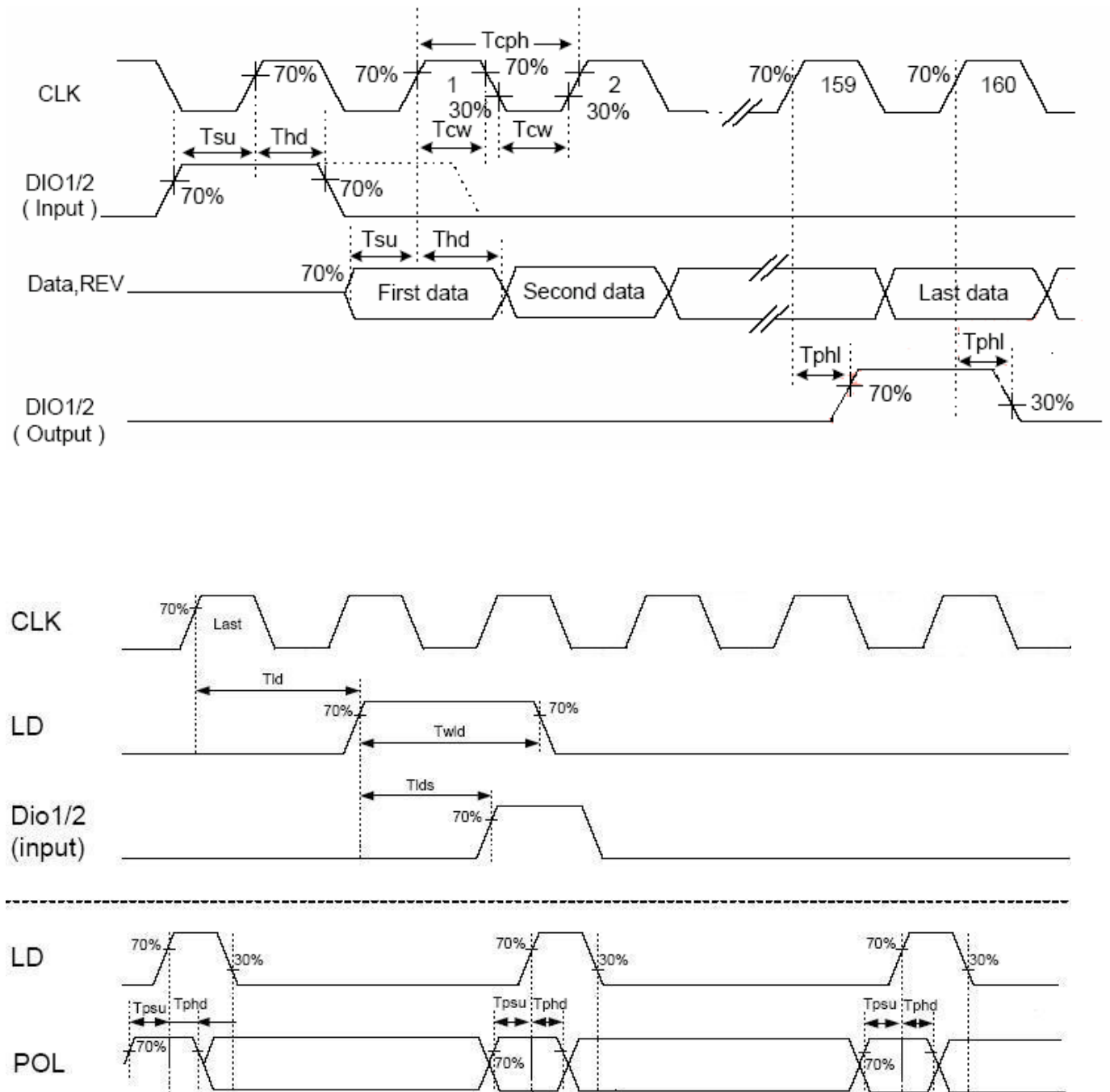
PARAMETER	SYMBOL	SPECIFICATION			UNIT
		MIN.	TYP.	MAX.	
CLK Frequency	Fclk	25	27	32.11	MHz
CLK Period	Tclk	31	37	40	ns
CLK Pulse Width	Tcw	8		-	ns
Data Set-up Time	Tsu	4	-	-	ns
Data Hold Time	Thd	2	-	-	ns
Propagation Delay of DIO2/1	Tphl	6	10	15	ns
Time That The Last Data to LD	Tld	1	-	-	Tcph
Pulse Width of LD	Twld	2	-	-	Tcph
Time That LD to DIO1/2	Tlds	5	-	-	Tcph
POL Set-up Time	Tpsu	6	-	-	ns
POL Hold Time	Tphd	6	-	-	ns
Output Stable Time	Tst	-	-	12	us

5.2 Vertical Timing Specification

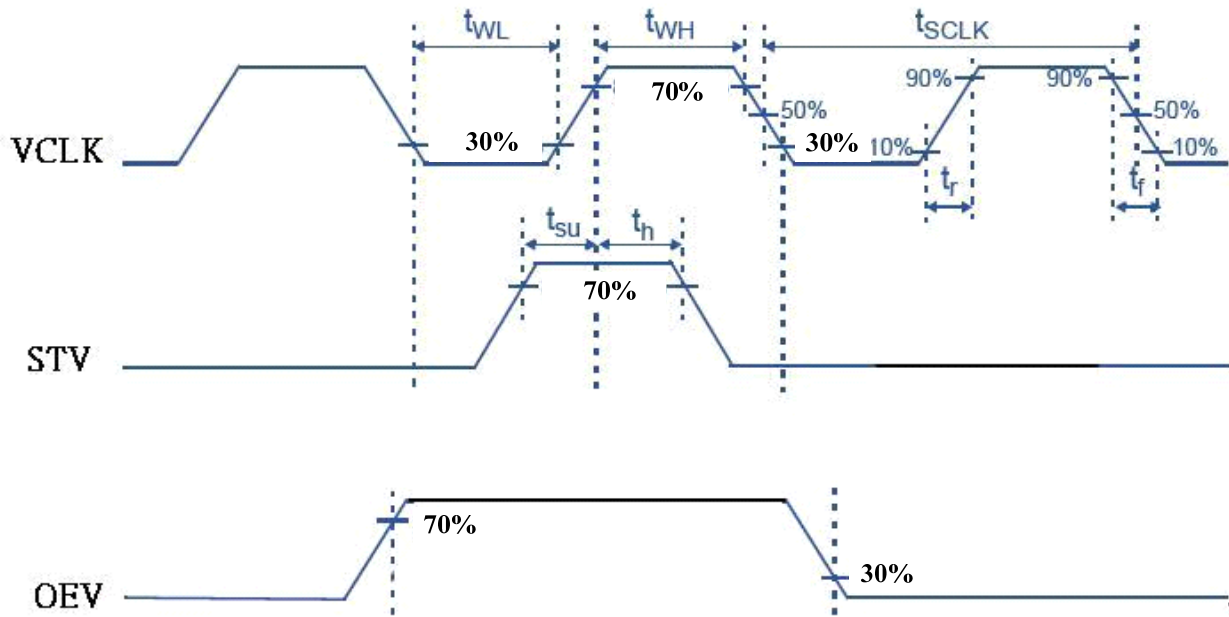
PARAMETER	SYMBOL	SPECIFICATION			UNIT
		MIN.	TYP.	MAX.	
VCLK Period	tSCLK	10	-	-	us
VCLK High-Level Pulse Width	tWH	4	-	-	us
VCLK Low-Level Pulse Width	tWL	4	-	-	us
STV Set-up Time	tsu	50		-	ns
STV Hold Time	th	350	-	-	ns

6. TIMING CHARACTERISTIC

6.1 Horizontal Timing Diagram



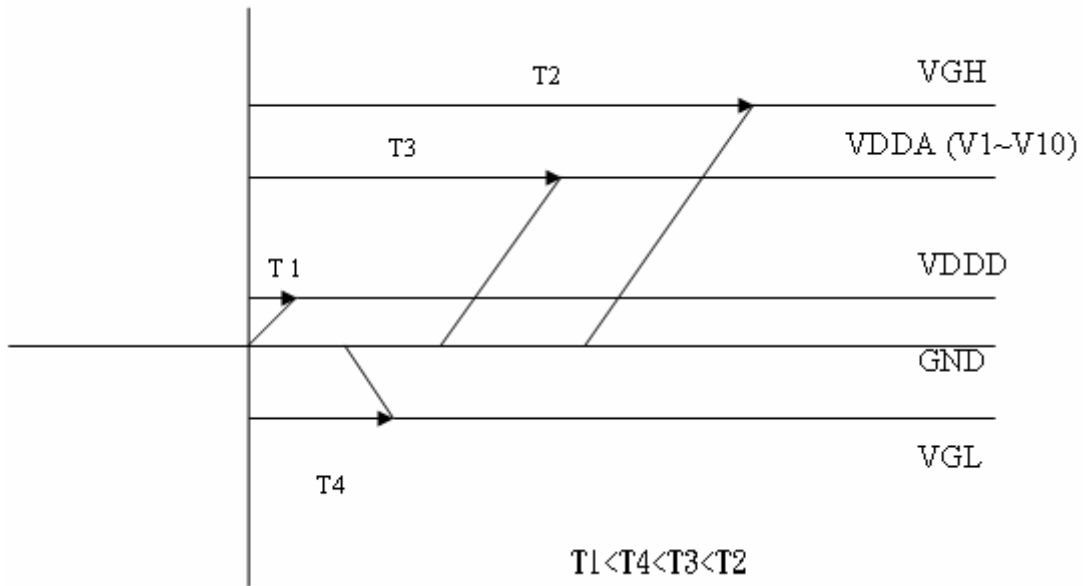
6.2 Vertical Timing Diagram



7. POWER SEQUENCE

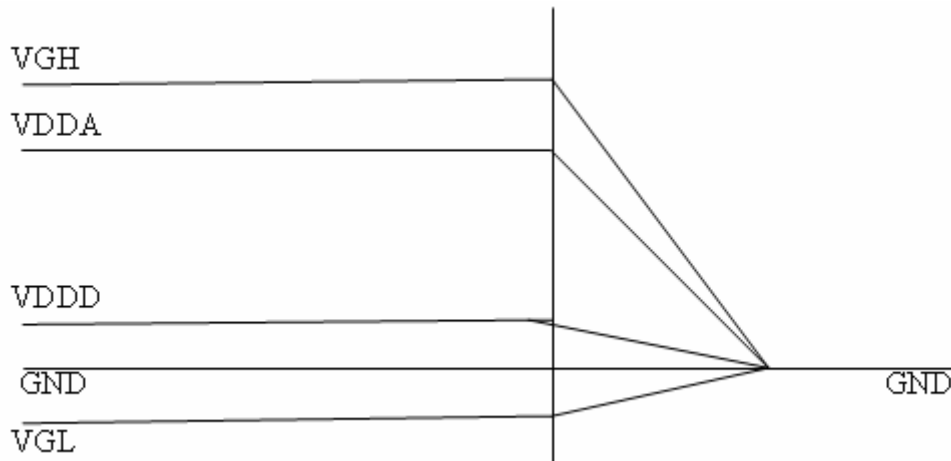
7.1 Turn ON Sequence

VDDD → VGL → VDDA → VGH



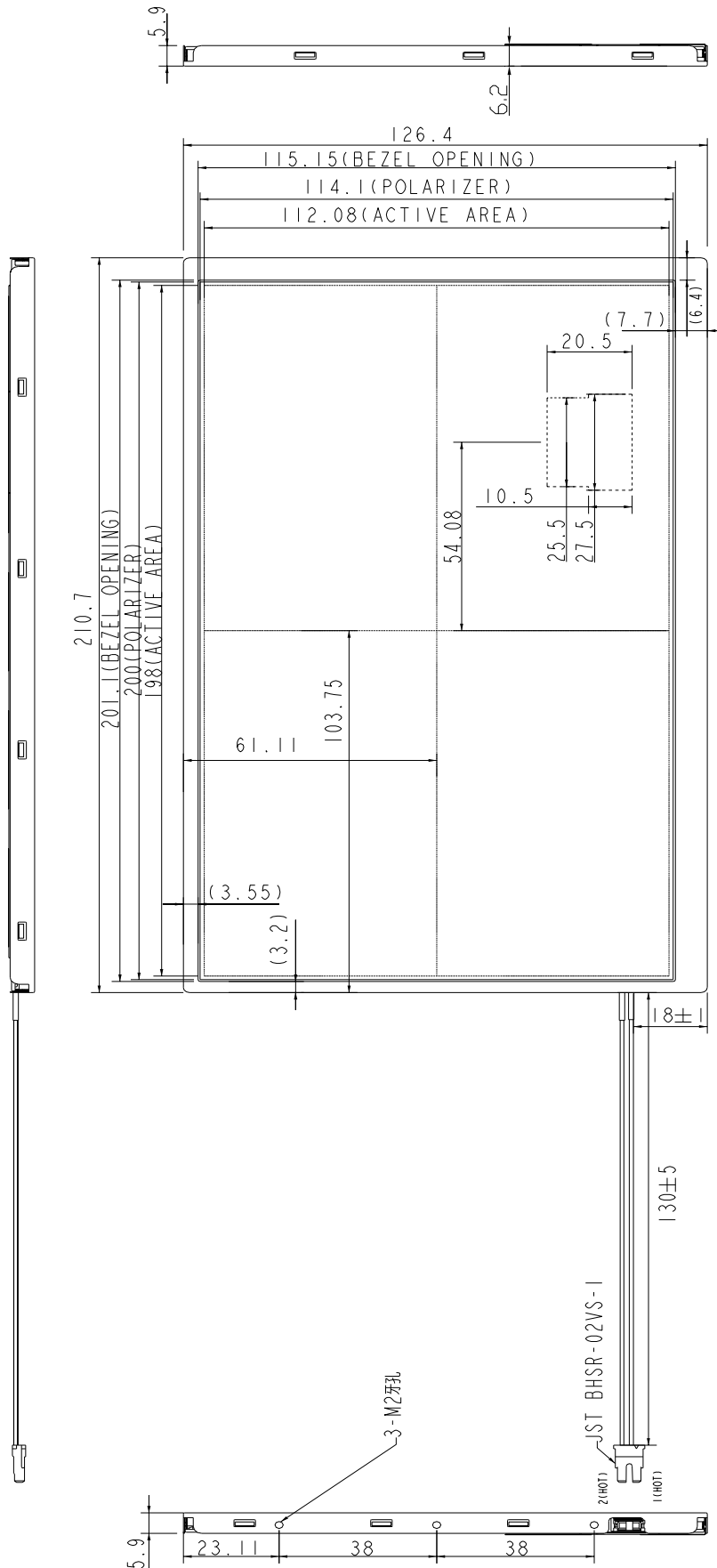
7.2 Turn Off Sequence

Turn Off Simultaneously



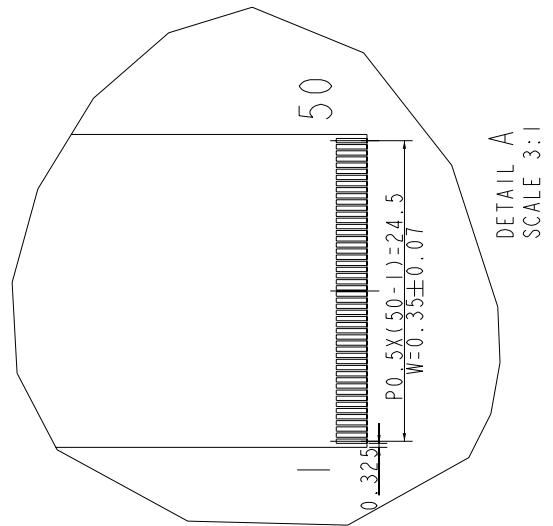
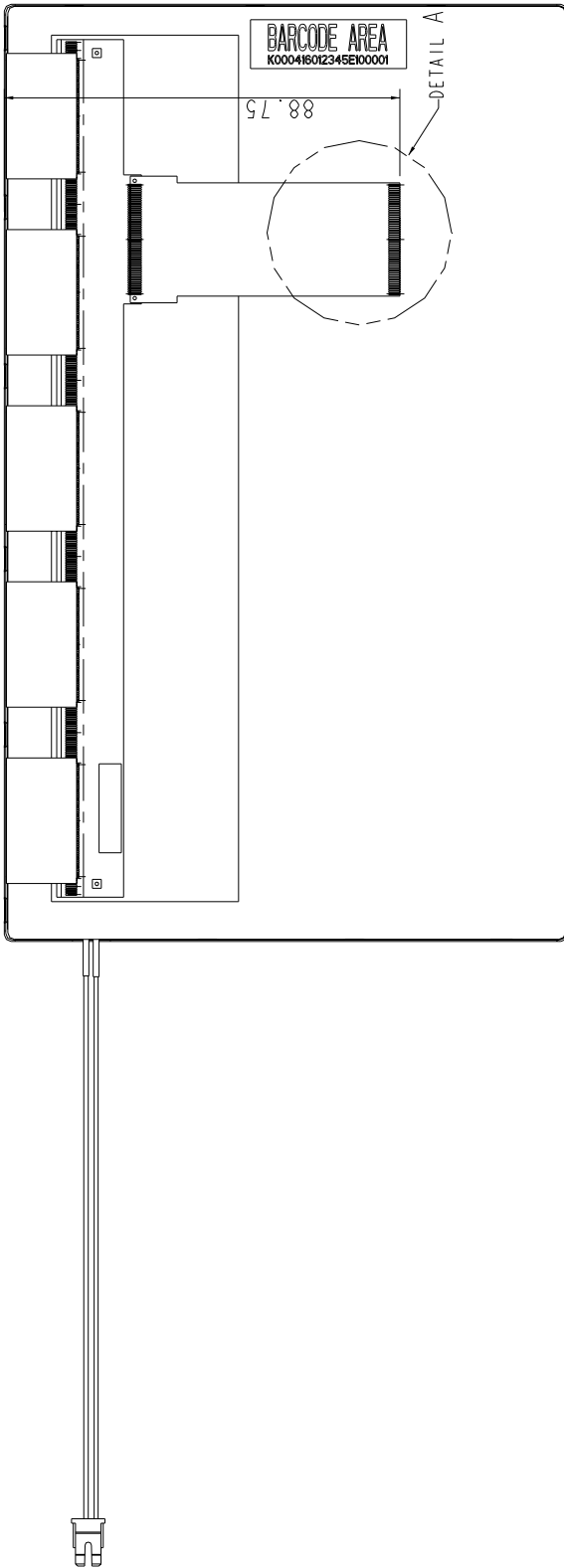
8. MECHANICAL DIMENSION

(1) Front Side



[Note] : Undefined Tolerances to be ±0.3mm

(2) Rear Side



9. OPTICAL CHARACTERISTICS

Ta=25°C , VCC=3.3V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Contrast Ratio		CR	*1)	300	350	--	--
Luminance		L	I _L = 6 mA	260	300	--	cd/m ²
Luminance Uniformity		ΔL	*2)	70	80	--	%
Response Time		Tr	*4)	--	10	15	ms
		Tf		--	20	30	ms
Viewing Angle	Horizontal	ψ*3)	CR ≥ 10	110	120	--	°
	Vertical	θ*3)		100	110	--	°
Color Coordinate	White	x y	θ = φ = 0°	0.283 0.299	0.313 0.329	0.343 0.359	--
	Red	x y	θ = φ = 0°	0.561 0.305	0.591 0.335	0.621 0.365	
	Green	x y	θ = φ = 0°	0.283 0.518	0.313 0.548	0.343 0.578	
	Blue	x y	θ = φ = 0°	0.121 0.108	0.151 0.138	0.181 0.168	

[Note] :

These items are measured by BM-5A (TOPCON) or CA-1000(MINOLTA) in the dark room. (no ambient light).

*1) Definition of contrast ratio :

Measure contrast ratio on the below 9 points (refer to figure1, #1~#9 point) and take the average value.

Contrast ratio is calculated with the following formula :

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

*2) Definition of Luminance Uniformity :

Measure maximum luminance(L(MAX))and minimum luminance (L(MIN))on the 9 points as figure 1(#1~#9 poin).Luminance Uniformity is calculated with the following formula :

$$\Delta L = (L(\text{MIN}) \div L(\text{MAX})) \times 100$$

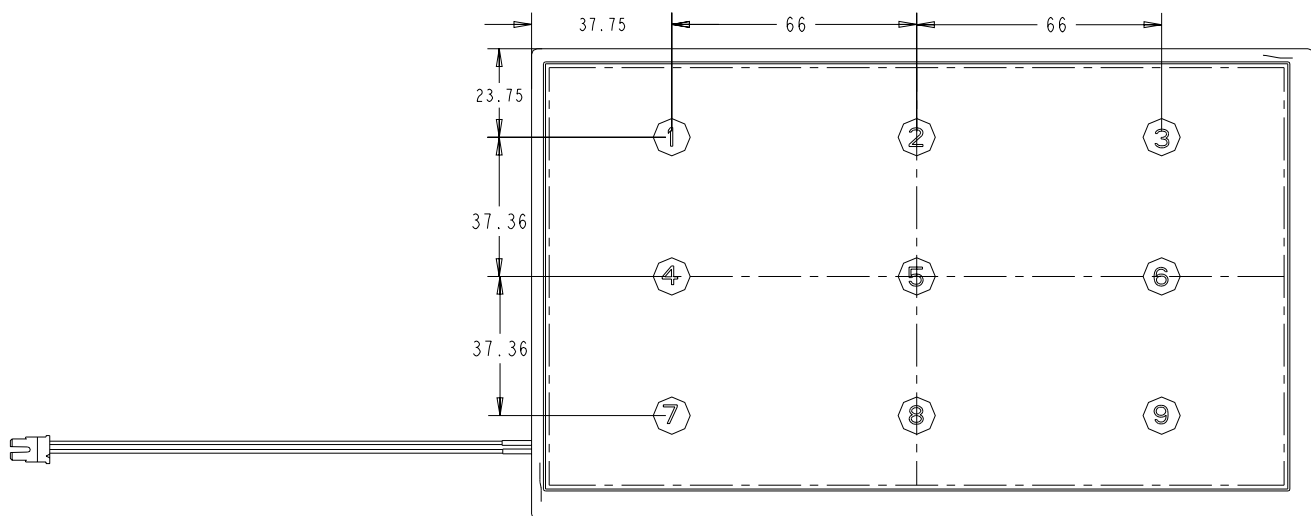


Fig.1 Measuring point

*3) Definition of Viewing Angle (θ, ψ), refer to Fig.2 as below :

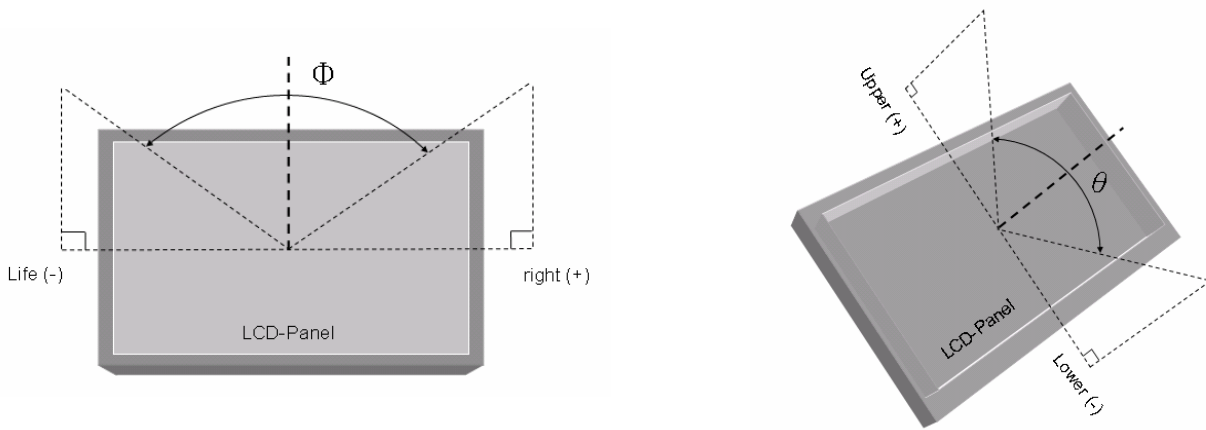


Fig.2 Definition of Viewing Angle

*4) Definition of Response Time :

The response time is defined as the time interval between the 10% and 90% amplitudes. Refer to figure 3 as below.

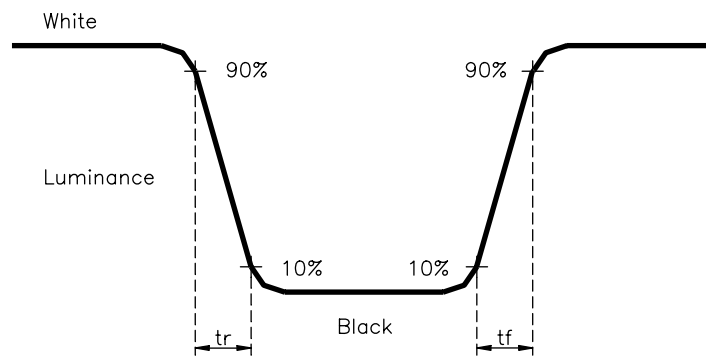


Fig.3 Definition of Response Time

10. RELIABILITY TEST CONDITIONS

10.1 Temperature and Humidity

TEST ITEM	CONDITION
HIGH TEMPERATURE OPERATION	60° C ; 240Hrs
HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	40° C ; 90% RH ; 240Hrs
HIGH TEMPERATURE AND HIGH HUMIDITY STORAGE	60° C ; 90% RH Max. ; 48Hrs
HIGH TEMPERATURE STORAGE	70° C ; 240Hrs
LOW TEMPERATURE OPERATION	0° C ; 240Hrs, Backlight unit always turn on
LOW TEMPERATURE STORAGE	-30° C ; 240Hrs
THERMAL SHOCK (No operation)	-20° C (0.5Hr)~60° C (0.5Hr) 200 CYCLE

10.2 Shock & Vibration

TEST ITEM	CONDITION
SHOCK (NON-OPERATION)	<ul style="list-style-type: none"> ● Shock level: 980m/s²(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)	<ul style="list-style-type: none"> ● 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: 15 min

10.3 ESD

ITEM	CONDITIONS	REMARK
ESD	150 pF , 330 Ω , ±8 kV , 5 times , air discharge 150 pF , 330 Ω , ±4 kV , 5 times , contact discharge 200 pF , 0 Ω , ±200 V , once for each terminal	Non operation

10.4 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-uniformity or line defects.