



# Chunghwa Picture Tubes, Ltd. Product Specification

To

Date : 20070116

*CPT TFT-LCD*

*CLAA040JB02CW*

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## 1. OVERVIEW

CLAA040JB02CW is 10.16cm(4") color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit and backlight. By applying 480×272 images are displayed on the 10.16cm(4") diagonal screen. Inverter for backlight is not included in this module. General specification are summarized in the following table:

ITEM	SPECIFICATION
Display Area (mm)	87.84(H) ×49.776(V) (4-inch diagonal)
Number of Pixels	480(H) X 3(RGB) X 272(V)
Pixel Pitch (mm)	0.183(H) × 0.183(V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white, TN
Number of Colors	16.7M
Optimum Viewing Angle	6 o'clock
Brightness (cd/m <sup>2</sup> )	350nit(typ)
Viewing Angle	130 Horizontal/110 Vertical (Typ.)
Power Consumption(with B/L)	0.65W(Typ.)
Module Size (mm)	98.3 (W)x 62.6(H) x 5.0(D) (Typ)
Module Weight (g)	42g(typ)
Backlight Unit	LED
Surface Treatment	Anti-Glare, Hardness:3H

## 2. ABSOLUTE MAXIMUM RATINGS

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

Items	Symbol	Product Specification			Unit	NOTE
		Min	Typ	Max		
Power Voltage	VCC	-0.3	-	6	V	
Input Signal Voltage	V <sub>i</sub>	-0.3	-	VCC+0.3	V	
Operating Temperature	T <sub>opa</sub>	-30	-	85	°C	
Storage Temperature	T <sub>stg</sub>	-55	-	125	°C	
Single LED Forward Current	I <sub>F</sub>	-	-	30	mA	
Single LED Pulse Forward Current	I <sub>FP</sub>	-	-	100	mA	Note1
Single LED Reverse Voltage	V <sub>R</sub>	-	-	5	V	

**Note 1 : I<sub>fp</sub> Conditions : Duty 1/10@0.1KHz**

## 3. ELECTRICAL CHARACTERISTICS

(A)3.1 Typical operation conditions ( GND = Avss = 0V )

Items	Symbol	Product Specification			Unit
		Min	Typ	Max	
Power Voltage	VCC	3.0	3.3	3.6	V
Input H/L Level Voltage	VIH	0.7VCC	-	VCC	°C
	VIL	0	-	0.3VCC	°C

(B)current consumption

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Current For Driver	I <sub>VCC</sub>	VCC = 3.3V	-	55	60	mA

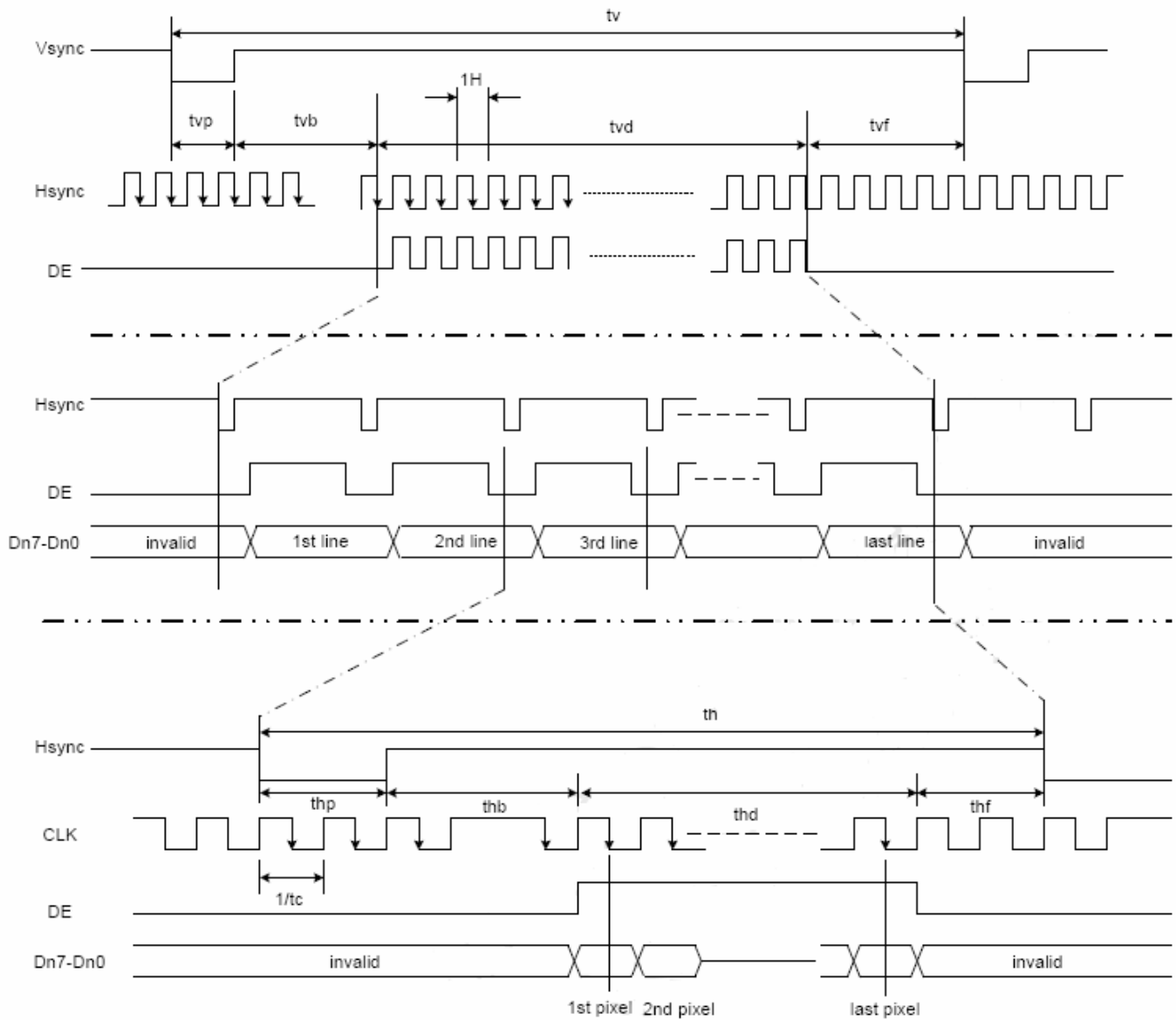
(C) Timing conditions

(480RGBx272, T<sub>A</sub> =25°C, DVDD=2.25V to 3.6V, DVSS= 0V)

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
Clock cycle	f <sub>CLK</sub>	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th <sup>*2</sup>	-	525	-	CLK
Horizontal display period	thd	-	480	-	CLK
Horizontal front porch	thf	2	-	-	CLK
Horizontal pulse width	thp	2	41	-	CLK
Horizontal back porch	thb	2	2	-	CLK
Vertical Signal					
Vertical cycle	tv	-	286	-	H
Vertical display period	tvd	-	272	-	H
Vertical front porch	tvf	1	2	-	H
Vertical pulse width	tvp	1	10	-	H
Vertical back porch	tvb	1	2	-	H

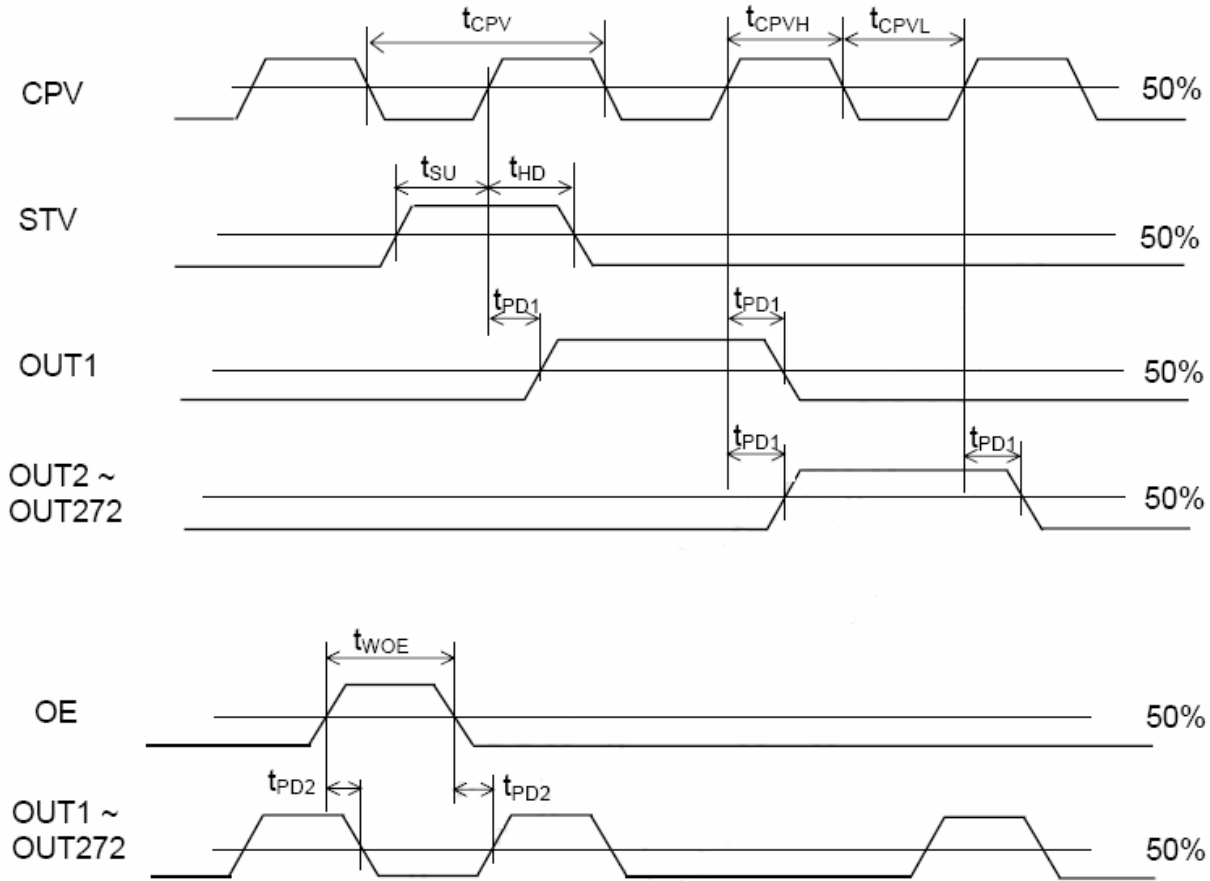
(d) timing characteristic

Horizontal Waveforms



Vertical Waveforms

Parameter	Symbol	Condition	Spec			Unit
			Min.	Typ.	Max.	
CPV period	$t_{CPV}$	-	5	-	-	$\mu s$
CPV pulse width	$t_{CPVH}, t_{CPVL}$	50% duty cycle	2.5	-	-	
OE pulse width	$t_{WOE}$	-	1	-	-	
Data setup time	$t_{SU}$	-	0.2	-	-	
Data hold time	$t_{HD}$	-	0.3	-	-	
CPV to output delay time	$t_{PD1}$	CL=220pF	-	-	0.9	
OE to output delay time	$t_{PD2}$	CL=220pF	-	-	0.8	



(e) Backlight

e.1. Electrical Characteristics

Ta=25°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Voltage (IL=20 mA)	VL	--	23.1	25.2	V	
Power consumption	WL	--	462	--	mW	Note 1

Note 1. T=25°C, IL=20mA, serial LED circuit.



## 4. INTERFACE PIN CONNECTION

(a.)CN1

Pin NO.	SYMBOL	DESCRIPTION	Remark
1	VSS	Ground	
2	VSS	Ground	
3	Vcc	Power Supply	
4	Vcc	Power Supply	
5	R0	Red Data Bit 0	
6	R1	Red Data Bit 1	
7	R2	Red Data Bit 2	
8	R3	Red Data Bit 3	
9	R4	Red Data Bit 4	
10	R5	Red Data Bit 5	
11	R6	Red Data Bit 6	
12	R7	Red Data Bit 7	
13	G0	Green Data Bit0	
14	G1	Green Data Bit1	
15	G2	Green Data Bit2	
16	G3	Green Data Bit3	
17	G4	Green Data Bit4	
18	G5	Green Data Bit5	
19	G6	Green Data Bit6	
20	G7	Green Data Bit7	
21	B0	Blue Data Bit0	
22	B1	Blue Data Bit1	
23	B2	Blue Data Bit2	
24	B3	Blue Data Bit3	
25	B4	Blue Data Bit4	
26	B5	Blue Data Bit5	
27	B6	Blue Data Bit6	
28	B7	Blue Data Bit7	
29	Vss	Ground	

30	DCLK	Dot Data Clock	
31	DISP	Display/On/Off	Note1
32	Hsync	Horizotal Sync Input	
33	Vsync	Vertical Sync Input	
34	DE	Data Enable Control	Note2
35	U/D	Shift up or down Control	Note3
36	L/R	Shift Left or Right Control	Note3
37	Vss	Ground	
38	Vss	Ground	
39	X1	Right(TP)	
40	Y1	Bottom(TP)	
41	X2	Left(TP)	
42	Y2	UP(TP)	
43	Vss	Ground	
44	Vss	Ground	
45	Vss	Ground	
46	VLED-	LED Ground	
47	VLED+	LED Power	
48	Vss	Ground	
49	Vss	Ground	
50	Vss	Ground	

Note1 : DISP set High, input data are valid. DISP set Low, input data are invalid.

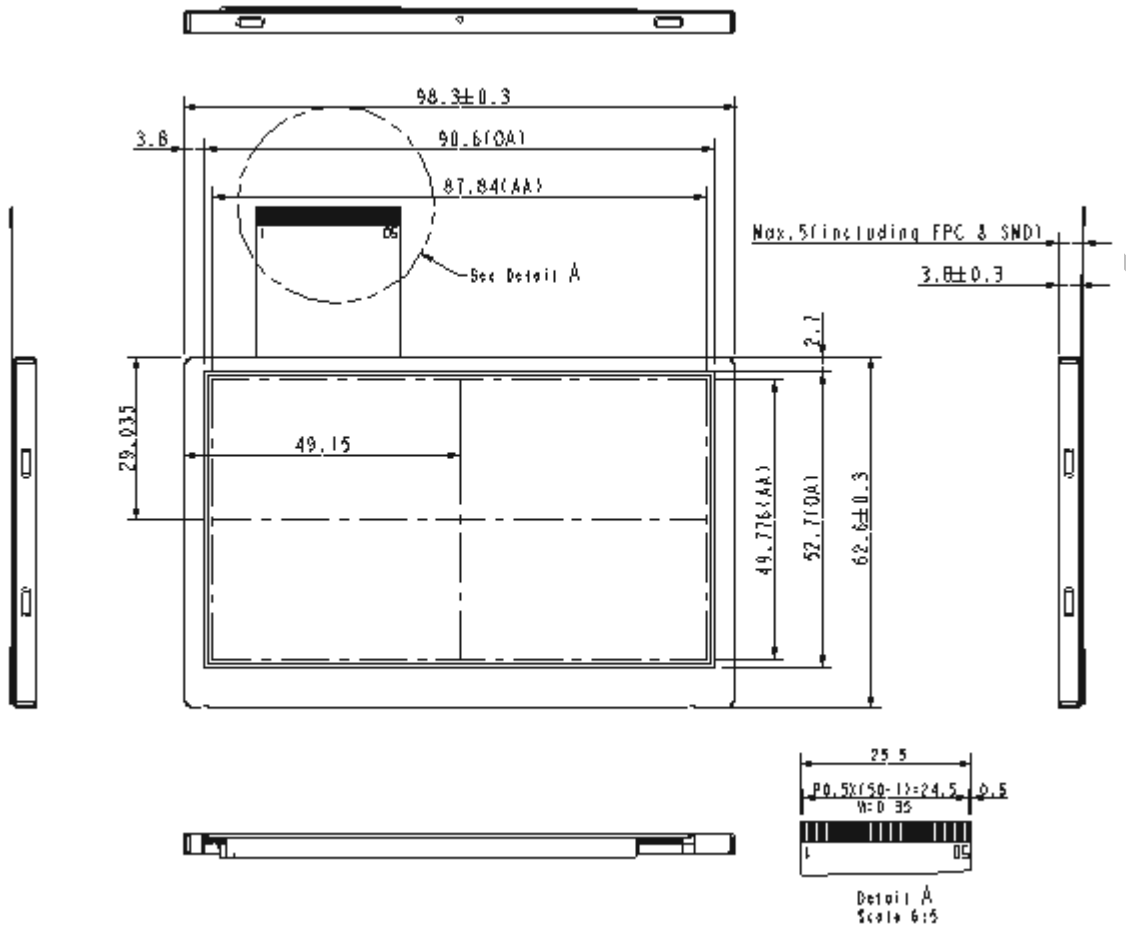
Note2 : DE is High, data can be access. DE is Low, data can not be access.

Note3 : U/D set High→Up to Down. U/D set Low→Down to UP.

L/R set High→Left to Right. L/R set Low→Right to Left.

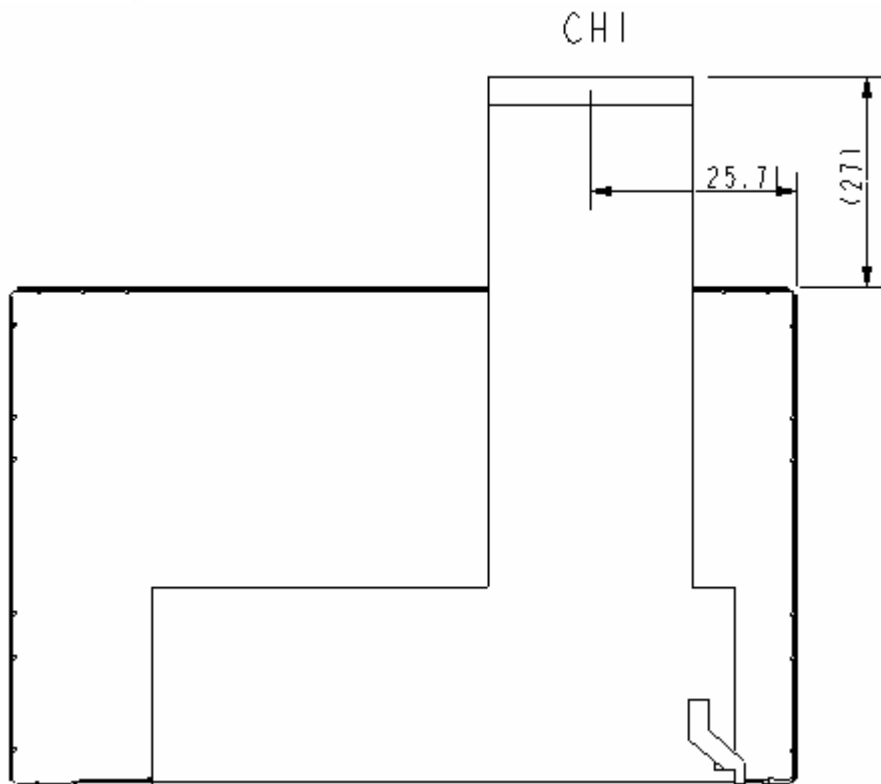
### 5. MECHANICAL SPECIFICATION

( a )Front side (Tolerance is  $\pm 0.3\text{mm}$  unless noted) [Unit: mm]



( b )Rear side (Tolerance is  $\pm 0.3\text{mm}$  unless noted)

[Unit: mm]



## 6. OPTICAL CHARACTERISTICS

Ta = 25°C

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Contrast		CR	*1)	280	350	--	--
Luminance (CEN)		L	$I_L = 20 \text{ mA}$	280	350	--	$\text{cd/m}^2$
Luminance Uniformity		$\Delta L$	*3)	(70)	(80)	--	%
Color saturation				45	50		%
Response Time		Tr	*4)	--	10	15	ms
		Tf		--	15	20	ms
View angle	$\phi^{*2)}$			120	130		
	$\theta^{*2)}$	$\theta^{*2)}$		100	110		
Color	Wx	$\theta = \phi = 0^\circ$		0.273	0.313	0.353	
Coordinate	Wy	$\theta = \phi = 0^\circ$		0.289	0.329	0.369	

[Note]

Measured by BM-5A (TOPCON) under the dark room condition (no ambient light).

Measurement Condition:  $I_L = 20 \text{ mA}$

Measures points: figure (1)

Measures Viewing Angle : figure(2)  $\theta = \psi = 0^\circ$

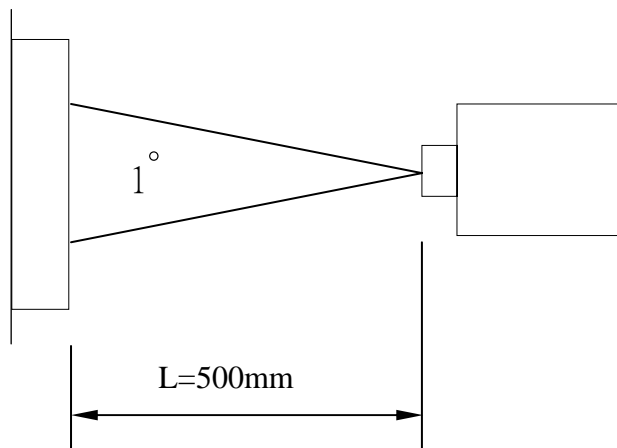


Figure (1)

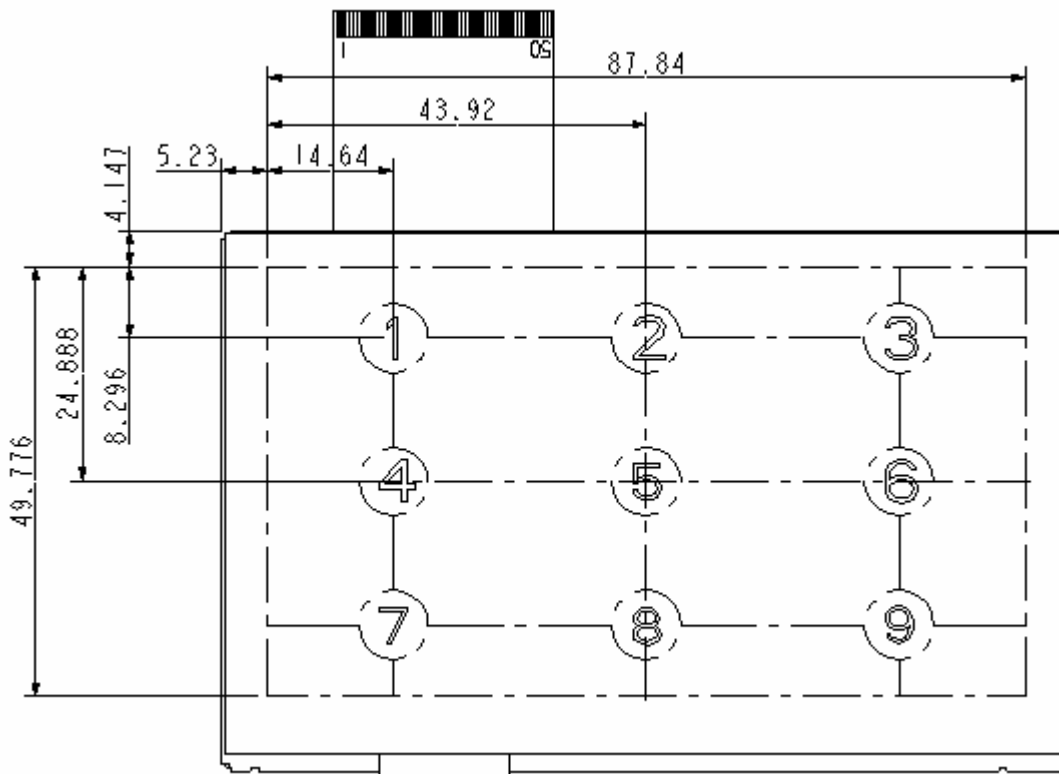


Figure (2)

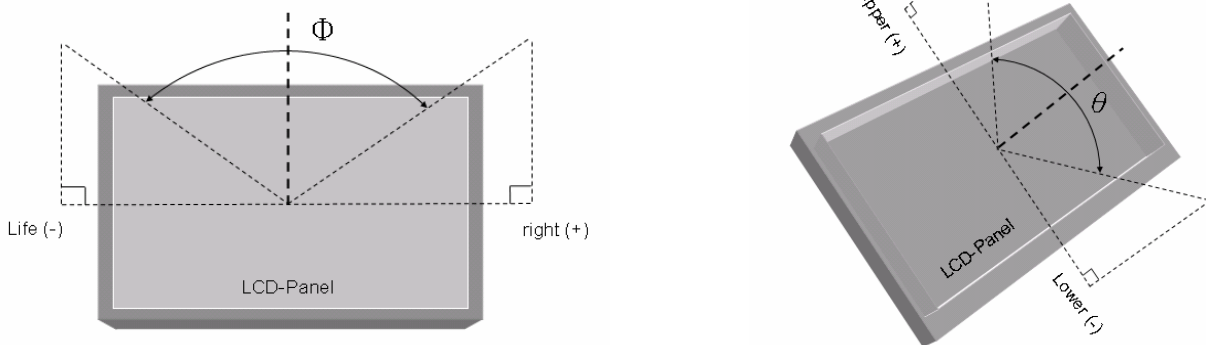


Figure (3)

#### \*1) Definition of Contrast Ratio

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

#### \*2) Definition of Viewing Angle( $\theta, \psi$ )

#### \*3) Definition of Luminance Uniformity:

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

$$\Delta L = [L(\text{MIN})/L(\text{MAX})] \times 100\%$$

#### \*4) Definition of Response Time

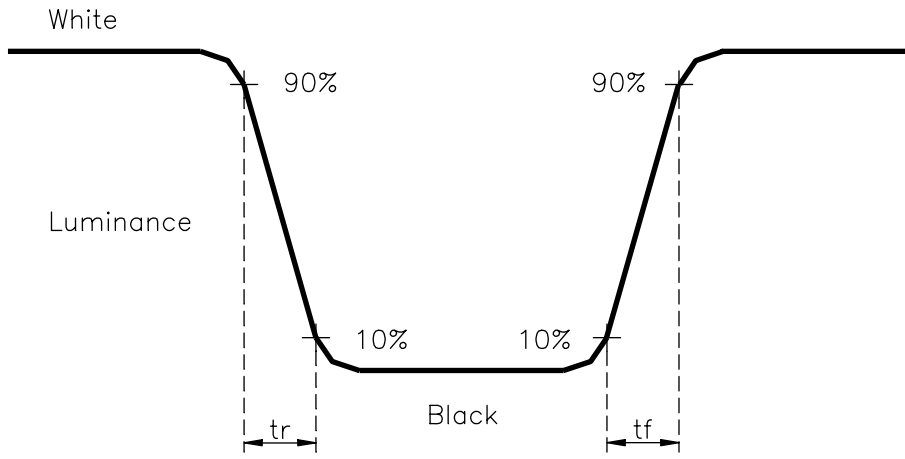


Fig.3 Definition of Response Time

## 7.RELIABILITY TEST CONDITIONS

## (a)Temperature and Humidity

TEST ITEMS	CONDITIONS
High Temperature Operation	85°C; 240hrs
High Temperature High Humidity Operation	60°C; 90%RH; 240hrs (No condensation)
High Temperature Storage	95°C; 240hrs
Low Temperature Operation	-30°C; 240hrs (Backlight unit always turn on)
Low Temperature Storage	-40°C; 240hrs
Thermal Shock (No operation)	Between -30°C (0.5hr) and 85°C (0.5hr); 200 Cycles

## (b) Shock &amp; Vibration

ITEMS	CONDITIONS
Shock (Non-Operation)	Shock level: 980m/s <sup>2</sup> (100G) Waveform: half sinusoidal wave, 6ms Number of shocks: one shock input in each direction of three mutually perpendicular 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, 33.3~400Hz Cycle: 15 min

## (c) Electrostatic Discharge

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

[NOTE]Measure point :(1)LCD glass and metal bezel

(2)IF connector pins

(d) 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.