



Chunghwa Picture Tubes, Ltd.

Technical Specification

To :

Date : 2008/10/02

TFT LCD

CLAA154WB11A

ACCEPTED BY :

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1. OVERVIEW

CLAA154WB11A is 15.4" color (39.116cm) TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, LVDS driver ICs, control circuit and backlight. By applying 6 bit digital data, 1280×RGB (3) ×800, 262K-color images are displayed on the 15.4" diagonal screen. general specifications are summarized in the following table :

ITEM	SPECIFICATION
Display Area (mm)	331.2 (H)×207.0 (V) (15.4-inch diagonal)
Number of Pixels	1280 ×3(H)×800(V)
Pixel Pitch (mm)	0.25875(H)×0.25875(V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white
Number of Colors	262,144(6bits)(RSDS)
Gamut	45%(typ)
Optimum Viewing Angle	6 o'clock
Response Time (ms)	8ms
Viewing Angle	45°、45°/25°、35°(Typ.)
Brightness (cd/m ²)	220 cd/m ² (5point)/20 mA (Typ.)
Uniformity	5point : 80%(Typ.)
Consumption of Power (W)	5.5 W (Max)
Module Size (mm)	344.5(W)×222.5(H)×6.2(D) (Max)
Module Weight (g)	520(Max)
Surface Treatment	Glare type (3H)

The LCD Products listed on this document are not suitable for use of aerospace equipment, submarine cable, and nuclear reactor control system and life support systems. If customers intend to use these LCD products for applications listed above or those not included in the "Standard" list as follows, please contact our sales in advance.

Standard : Computer, Office equipment, Communication equipment, Test and Measurement equipment, Machine tool, Industrial robot, Audio and Visual equipment, Other consumer products.

2. ABSOLUTE MAXIMUM RATINGS

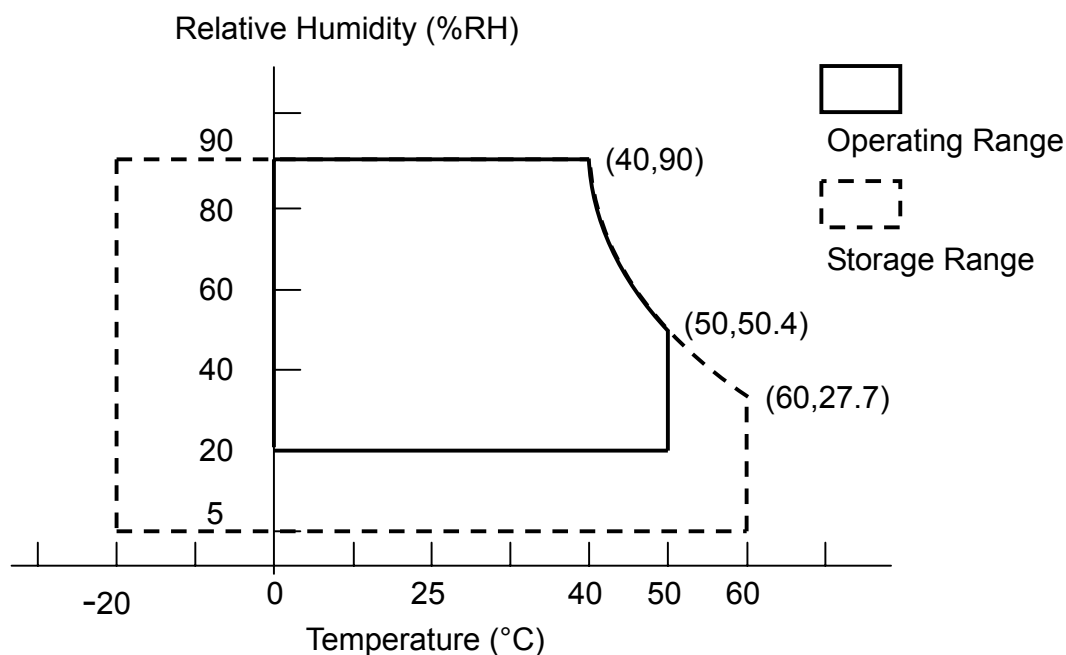
The following are maximum value, which if exceeded, may cause faulty operation or damage to the unit.

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
Power Supply Voltage for LCD	VCC	0	4.0	V	
LED Forward voltage	V_F	3.0	3.5	V	
LED Forward current	I_F	-	30	mA	*1). 2)
Operation Temperature	Top	0	50	°C	*3). 4). 5). 6)
Storage Temperature	Tstg	-25	65	°C	*3). 4). 5)

【Note】

- *1) Product life-time relate to LED, please operate production follow statement at page 9, "3.2 Backlight".
- *2) When LED current over the definition of absolute max. ,product life-time will decay rapidly or operate unusual.
- *3) The relative temperature and humidity range are as below sketch, 90%RH Max. ($T_a \leq 40^\circ\text{C}$)
- *4) The maximum wet bulb temperature $\leq 39^\circ\text{C}$ ($T_a > 40^\circ\text{C}$) and without dewing.
- *5) If product in environment which over the definition of the relative temperature and humidity out of range too long, it will affect visual of LCD.
- *6) If you operate LCD in normal temperature range, the center surface of panel should be under 60°C .

Before test TD, lamp should operate at least 1min, and lamp current should follow tpical lamp current specification. To place panel at room temp. ($25 \pm 2^\circ\text{C}$) below for 24hrs,nd then to measure TD with the same starting lamp voltage in dark room.



3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD

Ta=25°C

TEM	SYMBOL	MIN	TYP	MAX	UNIT	REMARK
LCD POWER VOLTAGE	VCC	3.0	3.3	3.6	V	[Note 1]
LCD POWER CURRENT	ICC	-	300	390	mA	[Note 2]
Rush CRRENT	Irush	-	-	2	A	[Note 4]
LOGIC INPUT VOLTAGE (LVDS: IN+,IN-) [Note 3]	INPUT VOLTAGE	VIN	0	-	VCC	V
	COMMON VOLTAGE	VCM	1.125	1.25	1.375	V
	DIFFERENTIAL INPUT VOLTAGE	VID	250	350	450	mV
	THRESHOLD VOLTAGE (HIGH)	VTH	-	-	100	mV
	THRESHOLD VOLTAGE (LOW)	VTL	-100	-	-	mV
DIFFERENTIAL INPUT VOLTAGE TOLERANCE		Δ VID	-	-	35	mV
COMMON VOLTAGE TOLERANCE		Δ VCM	-	-	35	mV

[Note 1] Power Sequence :

$$t1 \leq 10\text{ms}$$

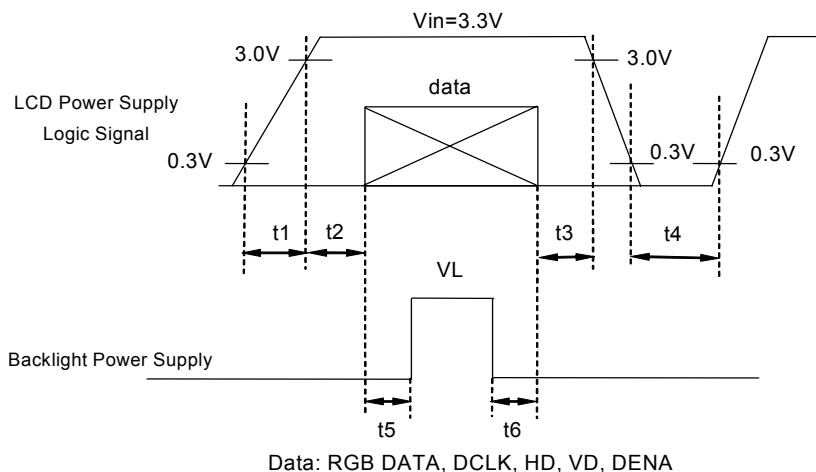
$$0.01 \text{ ms} < t2 \leq 50 \text{ ms}$$

$$0.01 \text{ ms} < t3 \leq 50 \text{ ms}$$

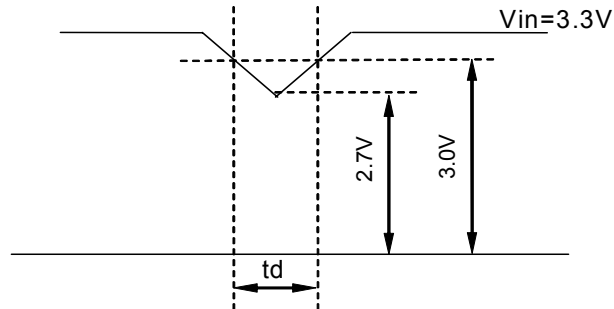
$$1 \text{ sec} \leq t4$$

$$200 \text{ ms} \leq t5$$

$$200 \text{ ms} \leq t6$$



VCC-dip state

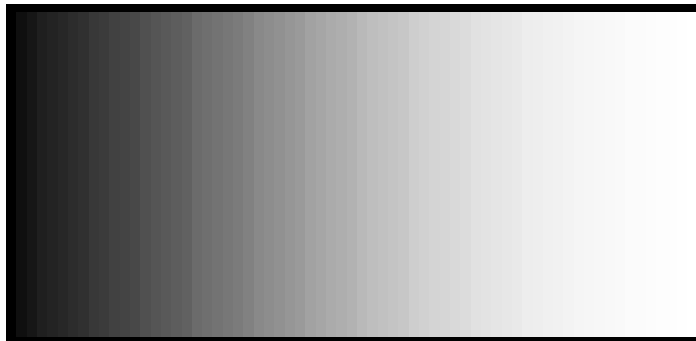
(1)when $3.0 > VCC \geq 2.7V$, $t_d \leq 10$ ms(2)when $VCC < 2.7V$, VCC-dip condition should as the VCC-turn-off condition.

[Note 2]

Typical value is 0~63 gray level.(Horizontal line Pattern)

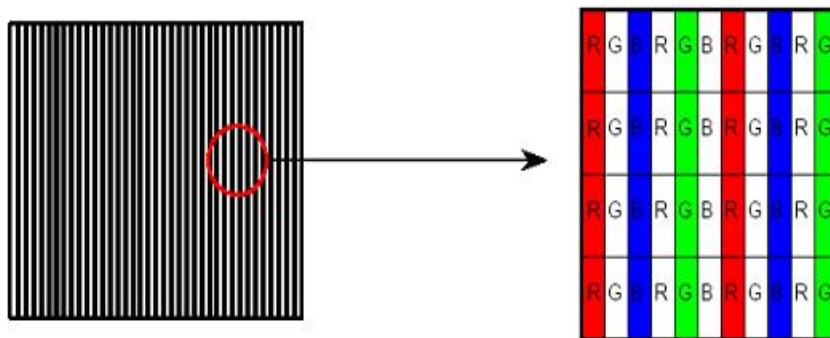
800 line mode , $VCC = +3.3V$

Circuit condition (Typ.)

 $VCC = 3.3$ V , $f_V = 60$ Hz $f_H = 48.9$ kHz , $f_{CLK} = 68.9$ MHz

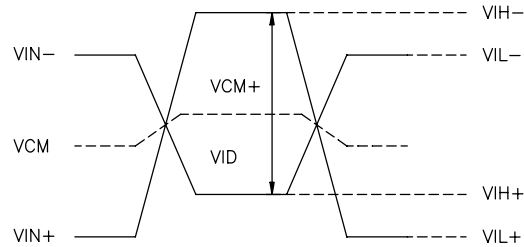
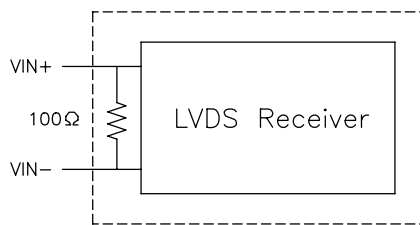
64-Gray

Circuit condition (MAX.)

 $VCC = 3.3$ V , $f_V = 60$ Hz $f_H = 48.9$ kHz , $f_{CLK} = 68.9$ MHz

[Note 3]

LVDS Signal Define :



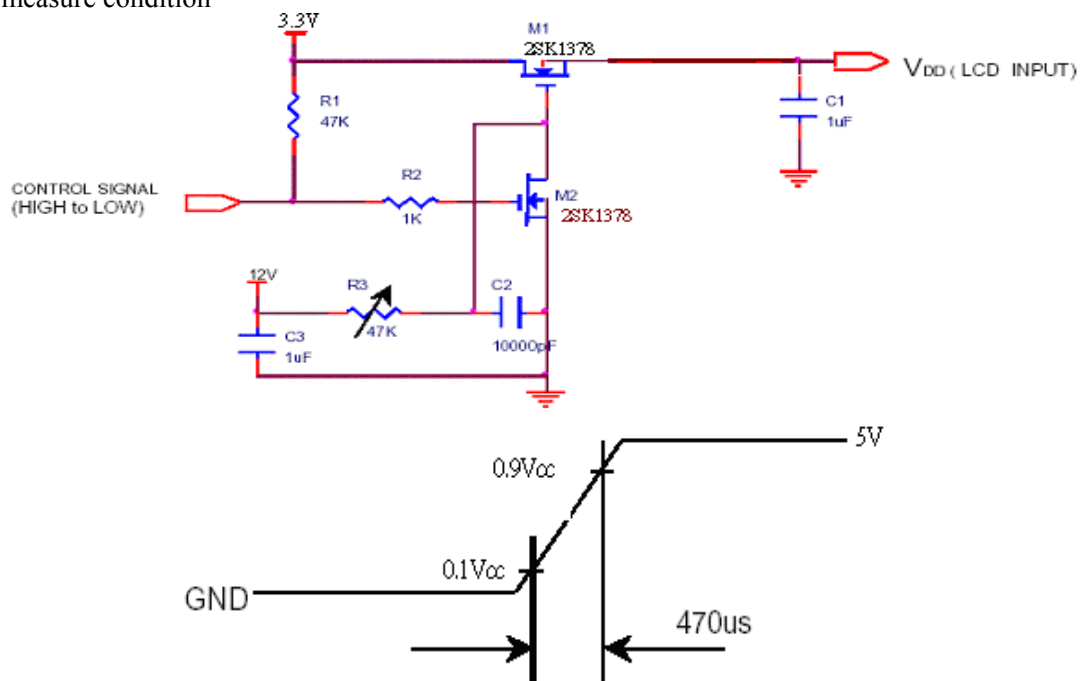
$$\begin{aligned}
 VID &= VIN_+ - VIN_- \\
 \Delta VCM &= |VCM_+ - VCM_-| \\
 \Delta VID &= |VID_+ - VID_-| \\
 VID_+ &= |VIH_+ - VIL_-| \\
 VID_- &= |VIL_+ - VIH_-| \\
 VCM &= (VIN_+ + VIN_-)/2 \\
 VCM_+ &= (VIH_+ + VIH_-)/2 \\
 VCM_- &= (VIL_+ + VIL_-)/2
 \end{aligned}$$

VIN+ : Positive differential DATA & CLK
Input

VIN- : Negative differential DATA & CLK
Input

4) Refer to Inverter rated voltage

[Note 4] Irush measure condition



3.2 BACK LIGHT

(a) ELECTRICAL CHARACTERISTICS(for one chip)

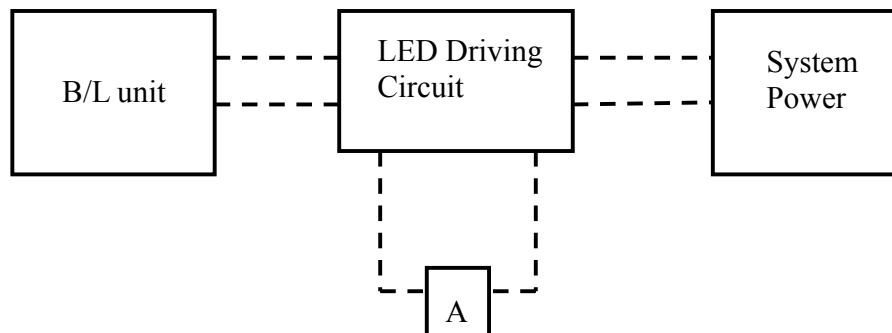
 $T_a=25^{\circ}\text{C}$

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	REMARK
Forward Voltage	V_F	3.0	3.3	3.5	V	$I_F=20\text{mA}$
Forward Current	I_F	-	20	30	mA	*1)
Power consumption	W		66		mW	*2)

(b)LED LIFE – TIME

ITEM	Condition	min	typ	max	UNIT	REMARK
LIFE TIME*2)	$I_F=20\text{mA}$ 、 $T_s=25^{\circ}\text{C}$	15000			hrs	

*1) This model total LED chips for this model are 54 pcs,6(parrallel)X9(series)=54pcs chips.
1chip is 20 mA , 1parallel is 6x20=120mA.



*2)This model total LED chips for this model are 54 pcs,6(parrallel)X9(series)=54pcs.
For one chip is 66mW, total BL power consumption is 54x66mW = 3.56W(typ.)

*3)Life time means that estimated time to 50% degradation of initial luminous intensity.

4.Connector Interface PIN & Function

4.1 CN1(Interface signal)

Outlet connector: FI-XB30SL-HF10 (JAE)

Link connector: FI-X30H (JAE, Locking Type)

Pin No.	SYMBOL	Function
1	Vss	Ground
2	Vin	+3.3V
3	Vin	+3.3V
4	V_EDID	DDC 3.3V Power
5	NC	No connect
6	CLK_EDID	DDC Clock
7	DATA_EDID	DDC Data
8	R0N	minus signal of channel 0(LVDS)
9	R0P	plus signal of channel 0(LVDS)
10	Vss	Ground
11	R1N	minus signal of channel 1(LVDS)
12	R1P	plus signal of channel 1(LVDS)
13	Vss	Ground
14	R2N	minus signal of channel 2(LVDS)
15	R2P	plus signal of channel 2(LVDS)
16	Vss	Ground
17	RCLKN	minus signal of clock channel (LVDS)
18	RCLKP	plus signal of clock channel (LVDS)
19	Vss	Ground
20	NC	No connect
21	NC	No connect
22	NC	No connect
23	NC	No connect
24	NC	No connect
25	NC	No connect
26	NC	No connect
27	NC	No connect
28	NC	No connect
29	NC	No connect
30	NC	No connect

【Note】

*1) DDC: Display Data Requirements

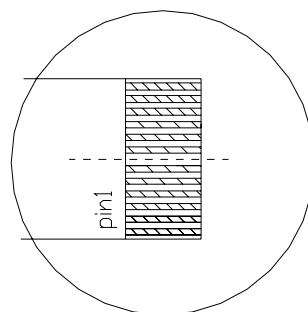
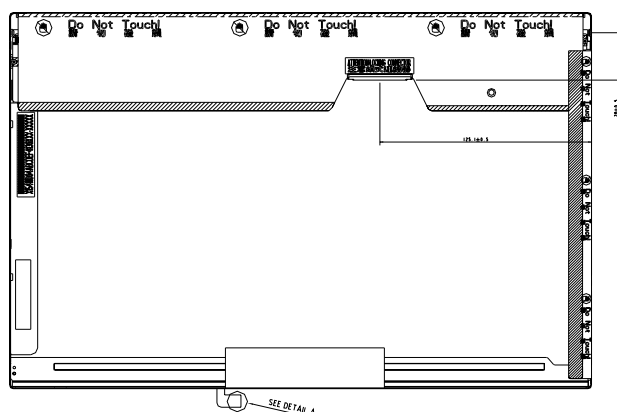
*2) Refer to Data Mapping of page 7,8,9.

4.2 LED LIGHTBAR FPC PIN ASSIGNMENT (BACKLIGHT)

Pin No.	Symbol	Function
1	VCC	Input voltage power supply
2	VCC	Input voltage power supply
3	VCC	Input voltage power supply
4	NC	No connect
5	H1-	LED current sense for string 1
6	H2-	LED current sense for string 2
7	H3-	LED current sense for string 3
8	H4-	LED current sense for string 4
9	H5-	LED current sense for string 5
10	H6-	LED current sense for string 6
11	H7-	Reserve
12	H8-	Reserve

[Note]

The FPC lead pad is upwards as shown in the following figure



DETAIL A

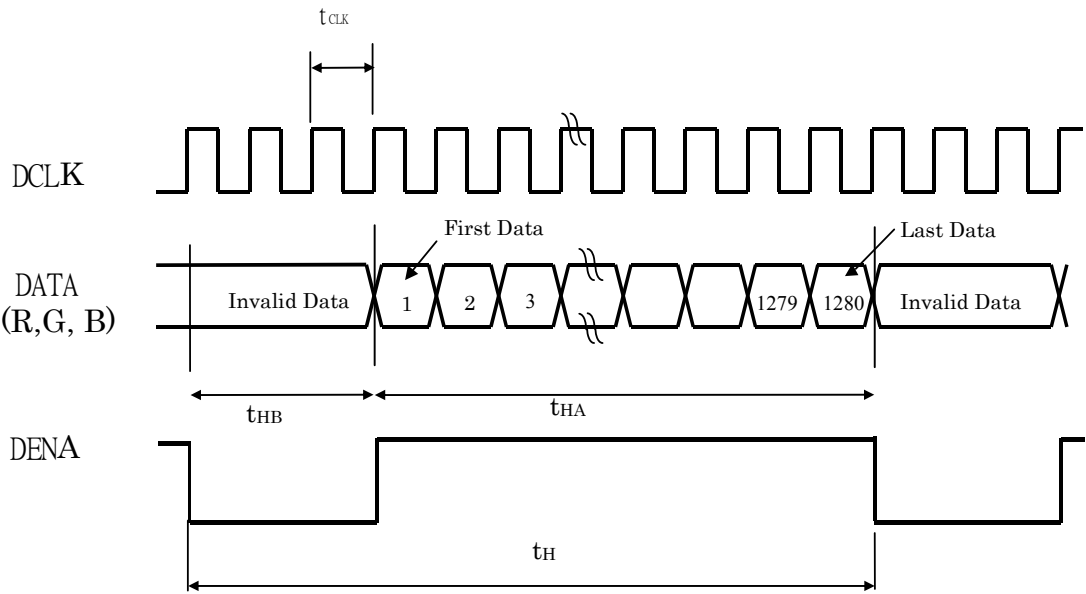
Suggested connector part no is STARCONN P/N : 089H12-000100-G2-R or equivalent.

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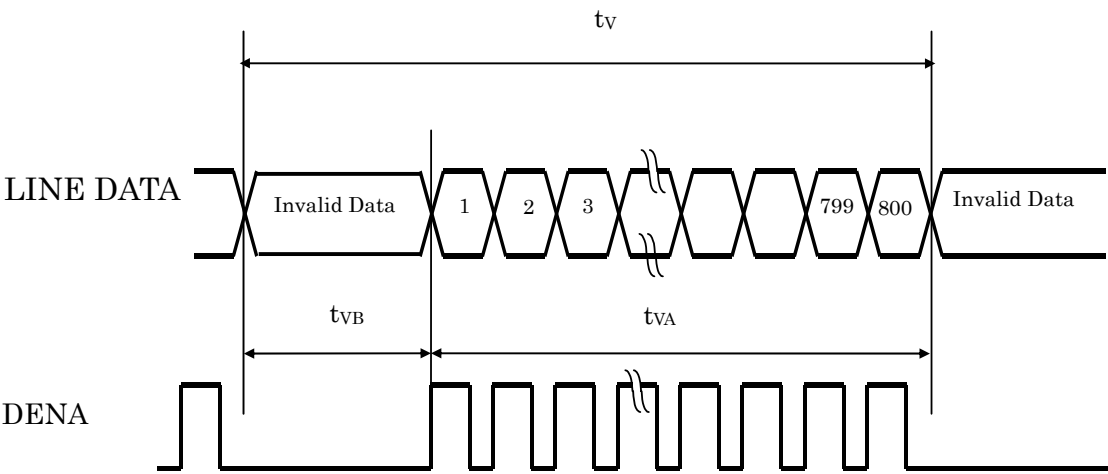
5. INTERFACE TIMING CHART

5.1LCD Input Signal Timing Chart

5.1.1 Horizontal Timing sequence



5.1.2 Vertical Timing sequence:



5.2 Timing Chart :

ITEM			SYMBOL	MIN	TYP	MAX	UNIT
LCD input signal	DCLK	frequency	f _{CLK}	65.3	68.9	74.7	MHz
		period	t _{CLK}	15.3	14.5	13.3	ns
	DENA	Horizontal total Time	t _H	1344	1408	1500	t _{CLK}
		Horizontal Active Time	t _{HA}	1280	1280	1280	t _{CLK}
		Horizontal Blank Time	t _{HB}	64	128	220	t _{CLK}
		Vertical total Time	t _V	810	816	830	t _H
		Vertical Active Time	t _{VA}	800	800	800	t _H
		Vertical Blank Time	t _{VB}	10	16	30	t _H

【Note】

- *1) Data is latched during DCLK falling period.
- *2) HD 、VD is negative.
- *3) DENA (DATA ENABLE) usually is positive.
- *4) During the whole blank period, DCLK should keep input. During the vertical blank period, HD should keep input.

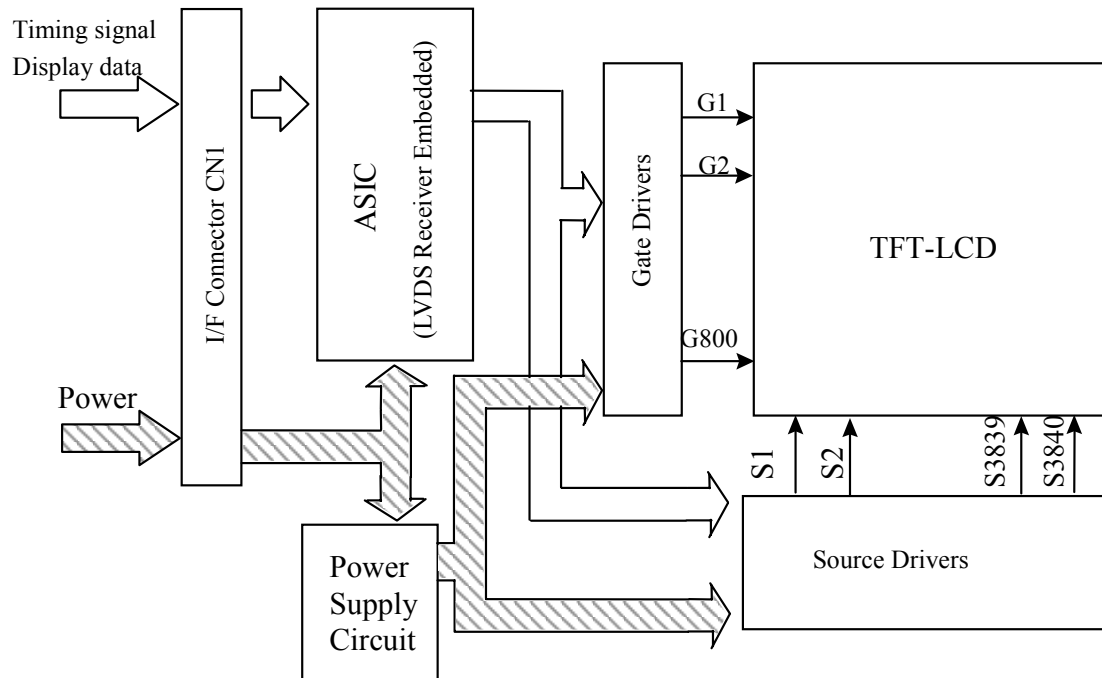
5.3 Color DATA Assignment

Color	Input Data	R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MS B					LS B	MS B					LS B	MS B					LS B
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
RED	RED(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	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	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
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	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
	Blue(1)	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	1	0	0
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

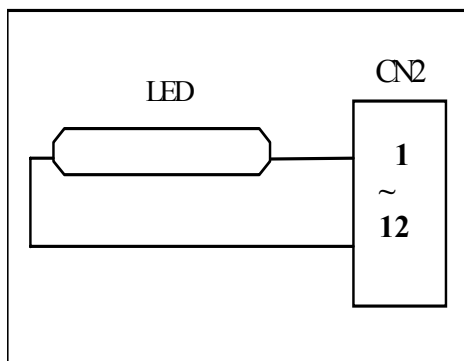
【Note】

- (1) Definition of gray scale:
 Color(n) : n means level of gray scale .
 Larger n means brighter level.
- (2) Data : 1= High , 0 = Low

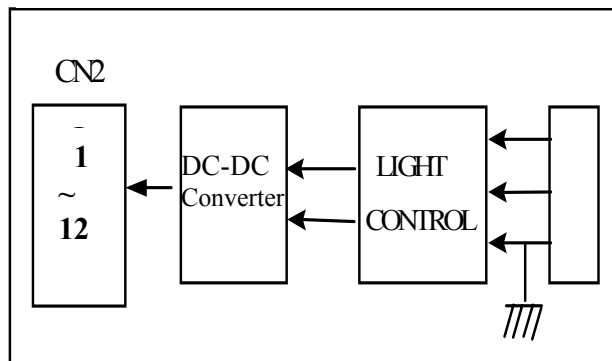
6. BLOCK DIAGRAM



BACKLIGHT



CONVERTER CIRCUIT (OUTSIDE)

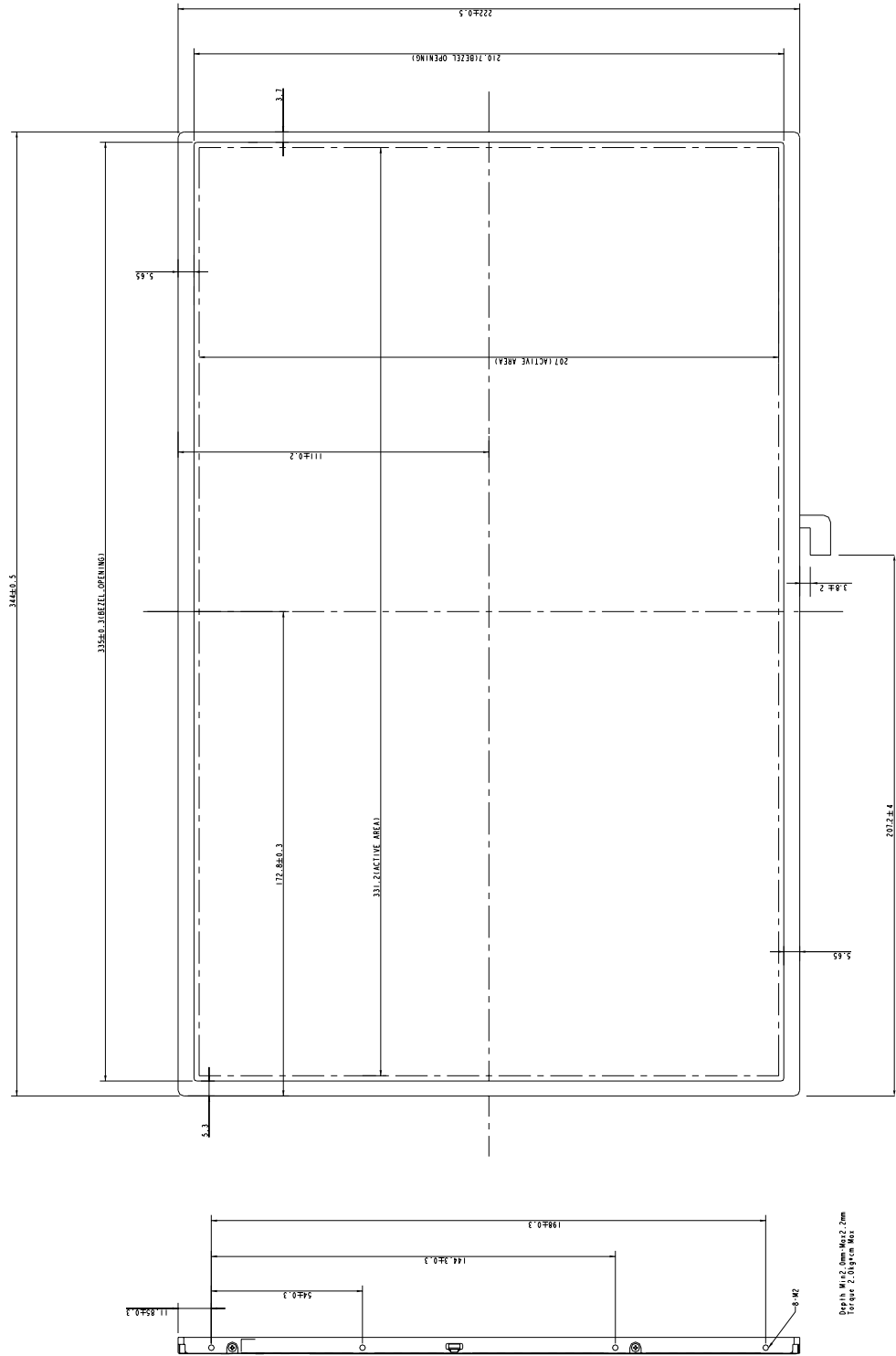


7.MECHANICAL SPECIFICATION

(1) Front side

The tolerance, not show in the figure, is ±0.5mm.

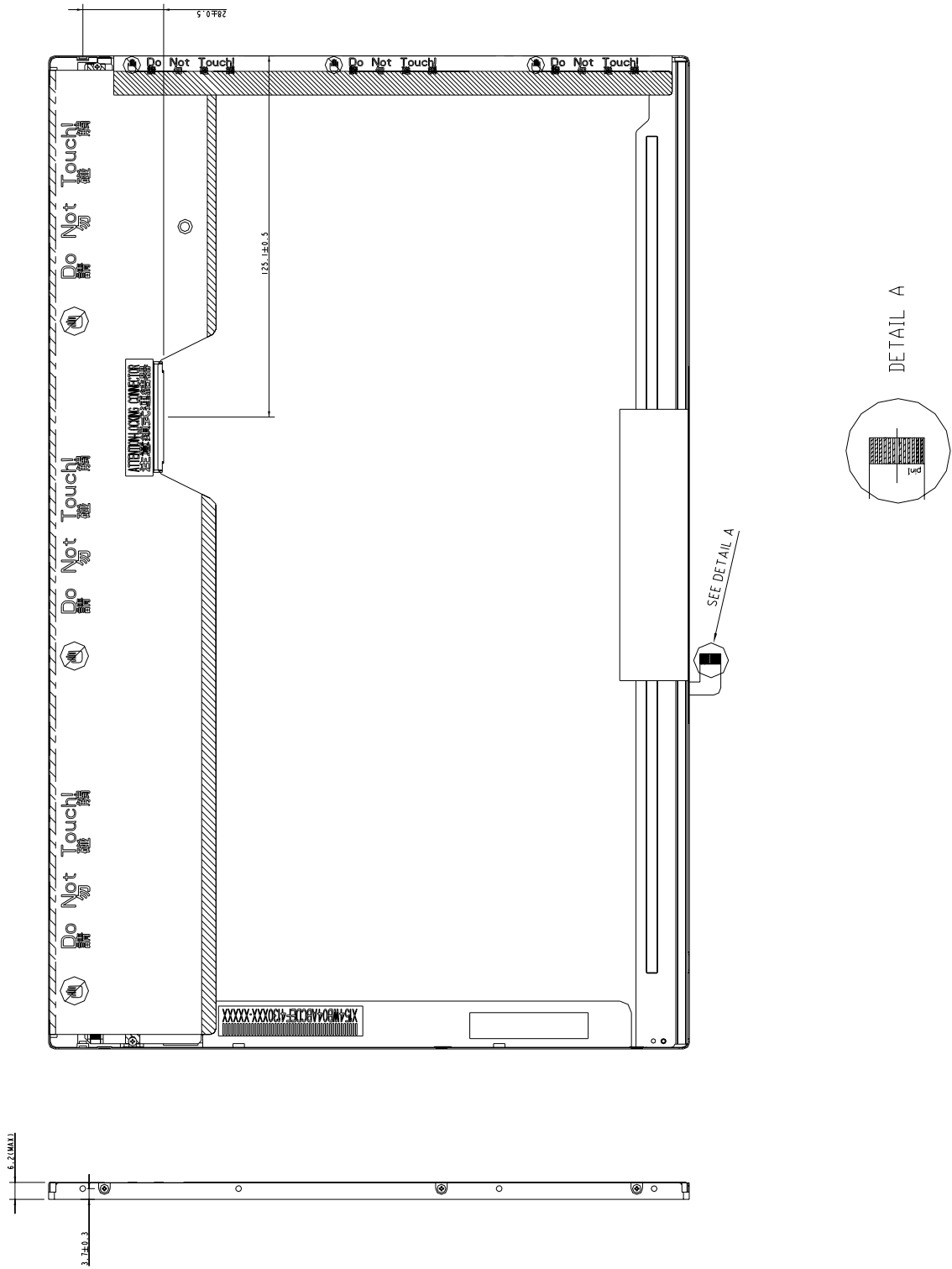
[Unit : mm]



2) Rear side

The tolerance, not show in the figure, is $\pm 0.5\text{mm}$.

[Unit : mm]



8. OPTICAL CHARACTERISTICS

Ta=25℃ , VCC=3.3V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Contrast Ratio		CR	$\theta = \psi = 0^\circ$	300	600		--	*1)
Luminance (5P)		L	$\theta = \psi = 0^\circ$	190	220		cd/m ²	*2)
Uniformity(5P)		ΔL	$\theta = \psi = 0^\circ$	80			%	*2)
Response Time		Tr	$\theta = \psi = 0^\circ$		3	6	ms	*4)
		Tf	$\theta = \psi = 0^\circ$		5	10	ms	*4)
Cross talk		CT	$\theta = \phi = 0^\circ$ *3			1	%	*5)
View angle	Horizontal	Ψ	$CR \geq 10$	35/-35	45/-45		°	*3)
	Vertical	θ		20/-30	25/-35		°	*3)
Color Temperature Coordinate	W	X Y	$\theta = \psi = 0^\circ$	0.283 0.299	0.313 0.329	0.343 0.359		*2)
	R	X Y		TBD	TBD	TBD		
	G	X Y		TBD	TBD	TBD		
	B	X Y		TBD	TBD	TBD		
Gamut			$\theta = \psi = 0^\circ$	40	45		%	
Gamma		γ	GL	2.0	2.2	2.4		*6)

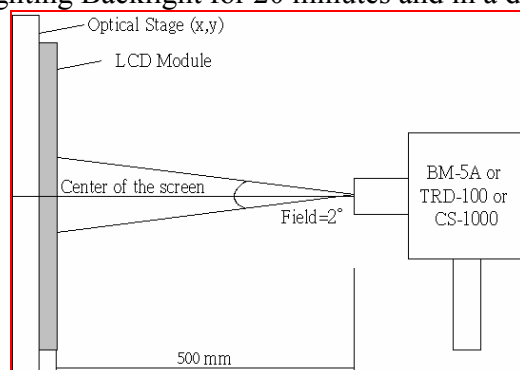
Color coordinate and color gamut are measured by CS-1000, and all the other items are measured by BM-5A (TOPCON). All these items are measured under the dark room condition (no ambient light).

Measurement Condition: IL = 20 mA

Definition of these measurement items is as follows:

1) Setup of Measurement Equipment

The LCD module should be turn-on to a stable luminance level to be reached. The measurement should be executed after lighting Backlight for 20 minutes and in a dark room.



*2) Definition of Luminance and Luminance uniformity

Central luminance: The white luminance is measured at the center position "1" on the screen, see Fig.1 below.

5P Uniformity: $\Delta L = (L_{\min} / L_{\max}) \times 100\%$

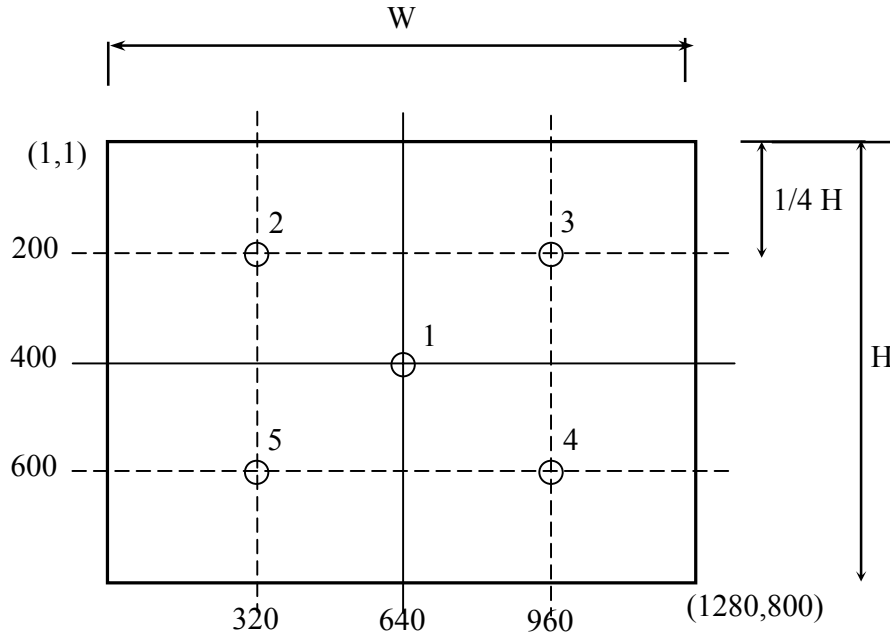
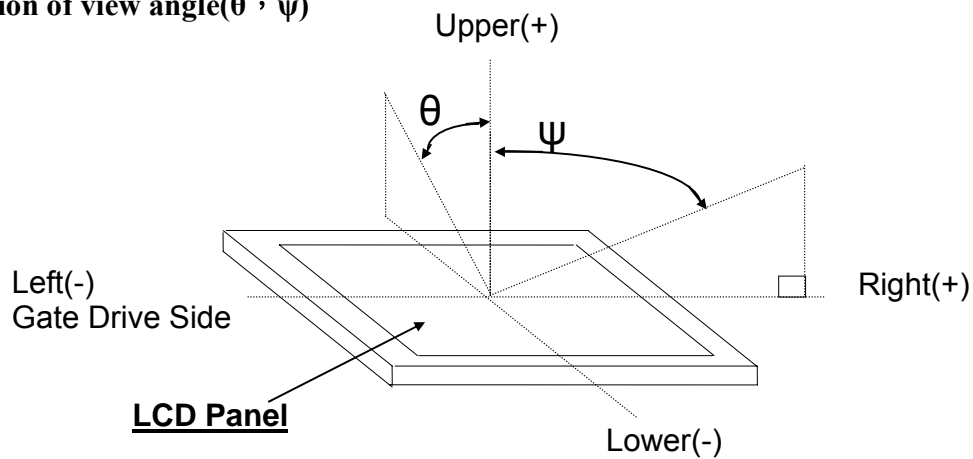
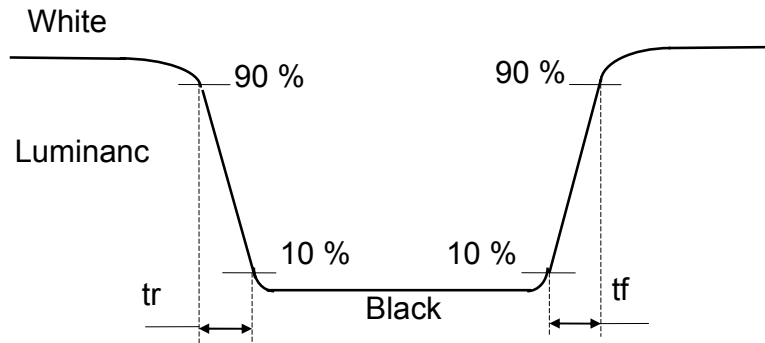


Fig.1 Measure

*3) Definition of view angle(θ , ψ)



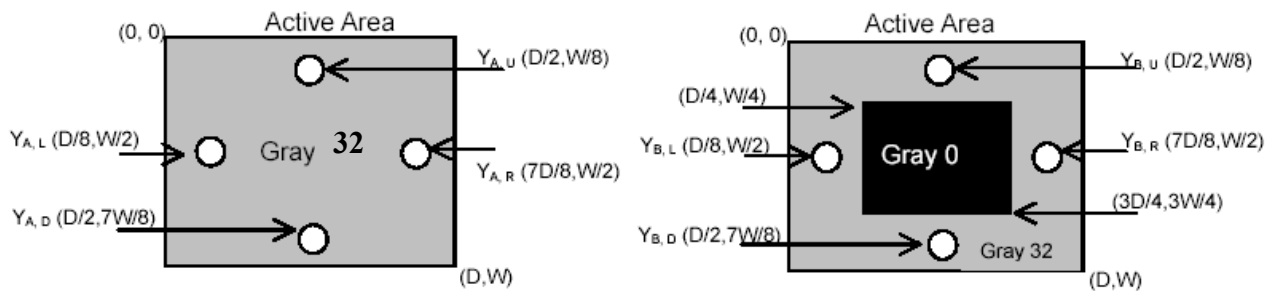
4) Definition of response time**5) Crosstalk Modulation Ratio:**

$$CT = |Y_B - Y_A| / Y_A \times 100\%$$

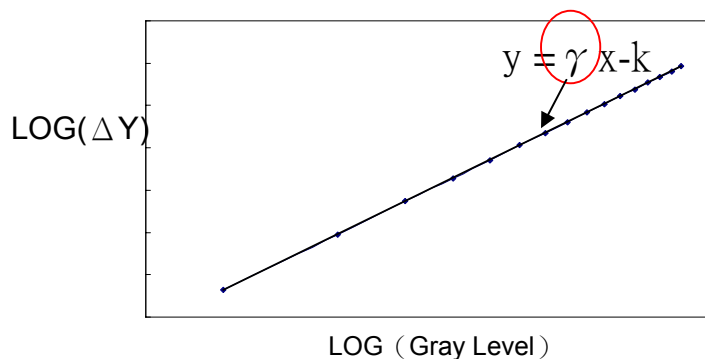
Y_A 、 Y_B measure position and definition

Y_A means luminance at gray level 32(exclude gray level 0 pattern)

Y_B means luminance at gray level 32(include gray level 0 pattern)

***6) Definition Gamma (VESA)**

Based on Customer Sample, take the average value as a standard center value and the variation range of Gamma value caused by loop voltage error should be between ± 0.2 . the bellow figure shows how to obtain the gamma curve and γ (from gray level: 0、16、32-----224、240、255).



9.RELIABILITY TEST CONDITIONS

9.1 Temperature and Humidity

TEST ITEMS	CONDITIONS
High Temperature Operation	50° C ; 240Hrs
High Temperature Storage	60° C ; 240Hrs
High Temperature High Humidity Operation	50° C ; 90% RH ; 240Hrs
High Temperature High Humidity Storage	60° C ; 90% RH ; 48 Hrs
Low Temperature Operation	0° C ; 240 Hrs
Low Temperature Storage	-20° C ; 240 Hrs
Thermal Shock	-20° C (0.5 hr)~60° C (0.5 hr) , Ramp<20° C , 100 CYCLE

9.2 Shock & Vibration

TEST ITEMS	CONDITIONS
Shock (Non-Operation)	Shock level : 1960m/s ² (220G), Waveform : half sinusoidal wave, 2ms, 6 axis (± X,± Y,± Z) per cycle
Vibration (Non-Operation)	Vibration level : 9.8m/s ² (1.0G), sinusoidal wave (each x, y, z axis : 1hr, total 3hrs) Frequency range : 5~500 Hz Sweep speed : 0.5 Octave/min.

9.3 ESD

	Surface discharge(Panel display area、Frame、PWB、Panel back side)		Electrics capacity of Connector
	Contact	Air	Contact
Capacity	150 pF	150 pF	200 pF
Resistance	330 Ω	330 Ω	0 Ω
Voltage	±8kV	±8kV/±15kV	±250 V
Interval	1 sec	1 sec	1 sec
Times(single point)	25	25	1

Acceptance Criteria	Air Discharge	
	+/-8 kV	+/-15 kV
A	Permitted	Permitted
B	Permitted	Permitted
C	Not Permitted	Permitted
D	Not Permitted	Not Permitted

Acceptance Definitions	
A	Normal operation. No degradation. No failures.
B	Some performance degradation allowed. No data lost. Self-recoverable.
C	Temporary performance degradation. Recovery by operator is acceptable.
D	Degradation or loss of function, which is not recoverable due to damage of equipment (components)

9.4 MTBF without B/L: 200,000 Hrs (min) lifetimes.

9.5 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.

10. HANDLING PRECAUTIONS FOR TFT-LCD MODULE

Please pay attention to the followings in handling- TFT-LCD products;

10.1 ASSEMBLY PRECAUTION

- (1) Please use the mounting hole on the module side in installing and do not beading or wrenching LCD in assembling. And please do not drop, bend or twist LCD module in handling.
- (2) Please design display housing in accordance with the following guidelines.
 - Housing case must be destined carefully so as not to put stresses on LCD all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.
 - Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. Approximately 1.0 mm of the clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.
 - When some parts, such as, FPC cable and ferrite plate, are installed underneath the LCD module, still sufficient clearance is required, such as 0.5mm. This clearance is, especially, to be reconsidered when the additional parts are implemented for EMI countermeasure.
 - Design the inverter location and connector position carefully so as not to give stress to lamp cable, or not to interface the LCD module by the lamp cable.
 - Keep sufficient clearance between LCD module and the others parts, such as inverter and speaker so as not to interface the LCD module. Approximately 1.0mm of the clearance in the design is recommended.
- (3) Please do not push or scratch LCD panel surface with any-thing hard. And do not soil LCD panel surface by touching with bare hands. (Polarizer film, surface of LCD panel is easy to be flawed.)
- (4) Please do not press any parts on the rear side such as source TCP, gate TCP, control circuit board and FPCs during handling LCD module. If pressing rear part is unavoidable, handle the LCD module with care not to damage them.
- (5) Please wipe out LCD panel surface with absorbent cotton or soft clothe in case of it being soiled.
- (6) Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.
- (7) Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
- (8) Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.
- (9) Please pay attention to handling lead wire of backlight so that it is not tugged in connecting with inverter.

10.2 OPERATING PRECAUTIONS

- (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
- (2) Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification.
- (3) Please consider that LCD backlight takes longer time to become stable of radiation characteristics in low temperature than in room temperature.

- (4) A condensation might happen on the surface and inside of LCD module in case of sudden change of ambient temperature.
- (5) Please pay attention to displaying the same pattern for very long time. Image might stick on LCD. If then, time going on can make LCD work well.
- (6) Please obey the same caution descriptions as ones that need to pay attention to ordinary electronic parts.

10.3 PRECAUTIONS WITH ELECTROSTATICS

- (1) This LCD module use CMOS-IC on circuit board and TFT-LCD panel, and so it is easy to be affected by electrostatics. Please be careful with electrostatics by the way of your body connecting to the ground and so on.
- (2) Please remove protection film very slowly on the surface of LCD module to prevent from electrostatics occurrence.

10.4 STORAGE PRECAUTIONS

- (1) When you store LCDs for a long time, it is recommended to keep the temperature between 0°C ~40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
- (2) Please do not leave the LCDs in the environment of high humidity and high temperature such as 60°C and 90%RH.
- (3) Please do not leave the LCDs in the environment of low temperature(below -20°C.)

10.5 SAFETY PRECAUTIONS

- (1) When you waste LCDs, it is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- (2) If any liquid leaks out of a damaged-glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

10.6 OTHERS

- (1) A strong incident light into LCD panel might cause display characteristic changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight and strong UV rays.
- (2) Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
- (3) For the packaging box, please pay attention to the followings:
 - Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.
 - Please do not pile them up more than 3 boxes. (They are not designed so.) And please do not turn over.
 - Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
 - Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)