Chunghwa Picture Tubes, Ltd.
Product Specification

To : MITAC

Date : 2009/10/21

TFT LCD
CLAA101NB01A

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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
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1. OVERVIEW

CLAA101NB01A is 25.5cm(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 262K colors by 6 Bit R.G.B signal input. Use 3.3 voltage to drive the power of LCD system.

General specification are summarized in the following table:

ITEM	SPECIFICATION	NOTE
Display Area (mm)	222.72(H) x 125.28(V) (10.1-inch diagonal)	
Number of Pixels	1024(H) × 3(RGB) × 600(V)	【Note1】
Pixel Pitch (mm)	0.2175 (H) × 0.2088 (V)	
Color Pixel Arrangement	RGB vertical stripe	【Note1】
Display Mode	Normally white, TN	
Number of Colors	262,144	
Optimum Viewing Angle	6 o'clock	
Brightness (cd/m^2)	200nit(typ.)	
NTSC ratio	45%	
Response Time (Tr+Tf)	25ms (typ.)	
Viewing Angle(BL on,CR≧10)	L/R:45/45 degree	
	U/D:15/30 degree	
Power Consumption	2.1(w) (typ)	
Electrical Interface(data)	LVDS	
Module Size (mm)	235.5(W)x143.5(H)x5.2(D)(max.)	
Module Weight (g)	190(max.)	
Backlight Unit	LED	
Surface Treatment	Glare type Hardness:3H	

【Note】

【Note1】Pixel arrangement

(1,1)

(1024,600)

2. ABSOLUTE MAXIMUM RATINGS

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

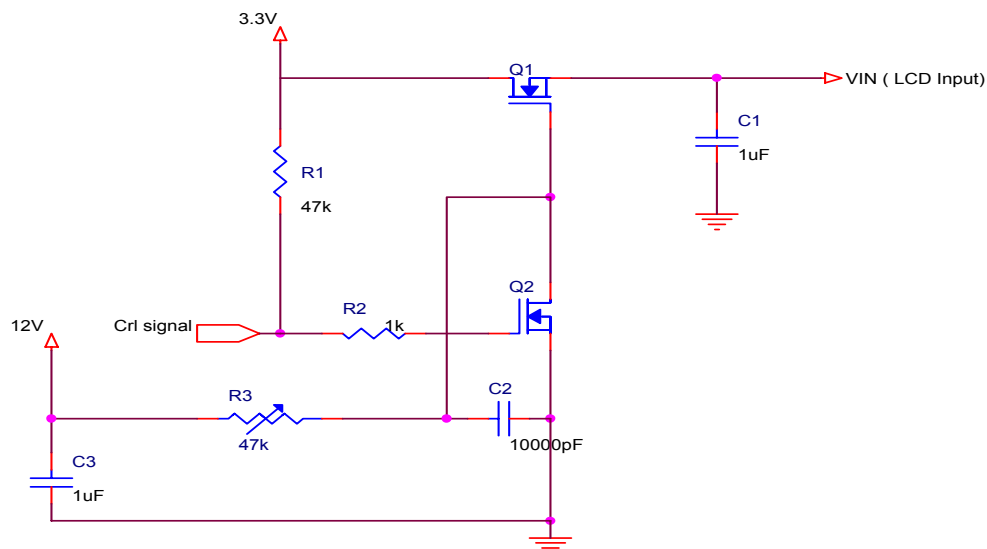| ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	Vcc	-0.3	4.0	V	
LED Supply Voltage	VLED	-0.3	25.0	V	
Static Electricity	VESDc	-200	200	V	【Note2】
	VESDm	-15K	15K	V	
ICC Rush Current	IRUSH	-	1	A	【Note 3】
Operation Temperature	T_{op}	0	50	℃	【Note 1】
Storage Temperature	T_{stg}	-20	60	℃	【Note 1】

【Note】

【Note1】If users use the product out off the environmemt operation range（temperature and humidity），it will concern for visual quality.

【Note2】Test Condition: IEC 61000-4-2 ,
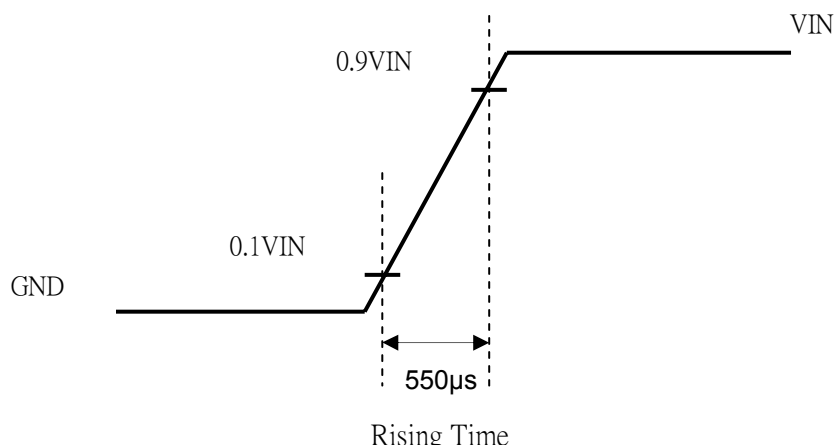   VESDc ：Contact discharge to input connector
   VESDm：Discontact discharge to module

【Note3】The input pulse-current measurement system as below：

Control signal:High(+3.3V)→Low(GND)
Supply Voltage of rising time should be from R3 and C2 tune to 550 us.

Rising Time

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD Power Voltage

Ta=25℃

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Power Supply Voltage For LCD		V_{CC}	3.0	3.3	3.6	V	【Note 1】
Power Supply Voltage For LED		V_{LED}	5	12	19	V	
Logic Input Voltage (LVDS:IN+,IN-)	Input Voltage	VIN	0	-	V_{CC}	V	
	Common Mode Voltage	VCM	1.08	1.2	1.32	V	
	Differential Input Voltage	∣VID∣	250	350	450	mV	
	Threshold Voltage(high)	VTH	-	-	100	mV	
	Threshold Voltage(low)	VTL	-100	-	-	mV	
ADJ Input Voltage	Input Voltage(high)	VIH	3.0		3.3	V	
	Input Voltage(low)	VIL	GND		0.3	V	

【Note】

【Note1】 LVDS signal
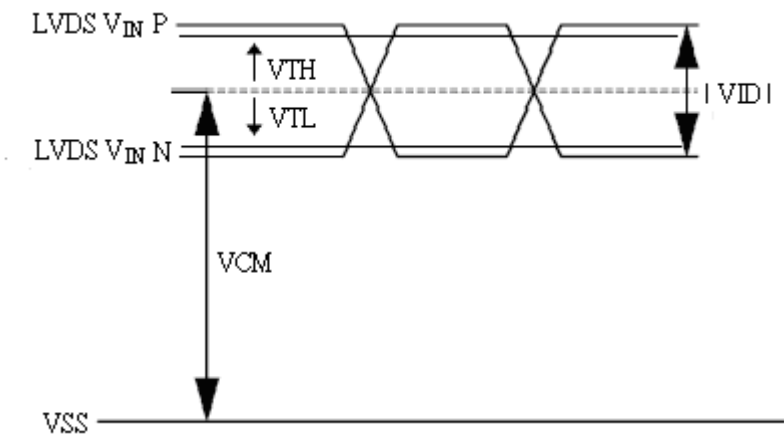
3.2 TFT-LCD Current Consumption

ITEM	SYMBOLI	MIN.	TYP.	MAX.	UNIT	NOTE
LCD Power Current	I_{CC}	--	250	300	mA	【Note1】
LED Power Current	I_{LED}	--	160	175	mA	【Note2】

【Note1】 Typical: Under 64 gray pattern @ Vcc = 3.3 V (Frame rate is 60 Hz)
Maximum: Under black pattern @ Vcc = 3.0 V (Frame rate is 60 Hz)
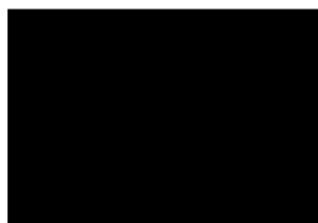
(a)64 Gray Pattern   (b)Black Pattern

【Note2】 VLED = 12V；ADJ high pulse is 100%

3.3 Power、Signal sequence

0.5<t1≦10ms   500ms≦t4
0＜t2≦50ms   200ms≦t5
0＜t3≦50ms   200ms≦t6

Data: RGB DATA, DCLK, HD, VD, DENA

3.4 LED ON/OFF Sequence

$10ms \leqq t1$
$10ms \leqq t2$
$0ms \leqq t3$
$10ms \leqq t4$
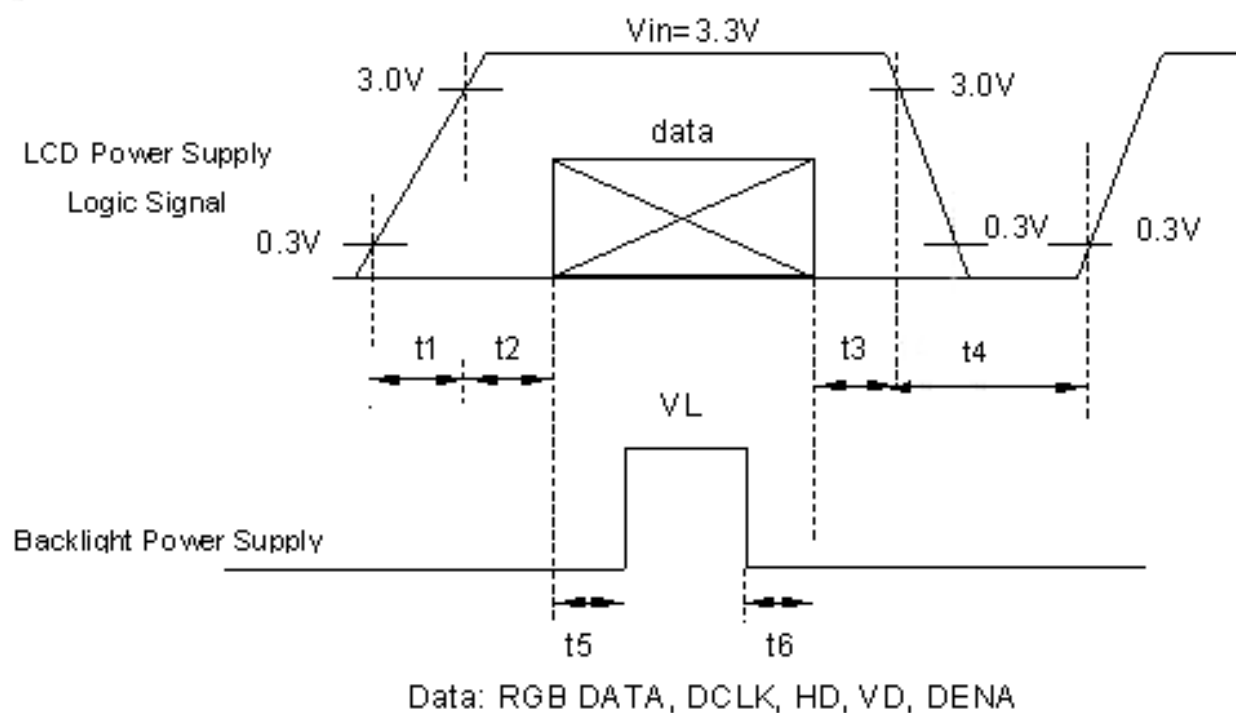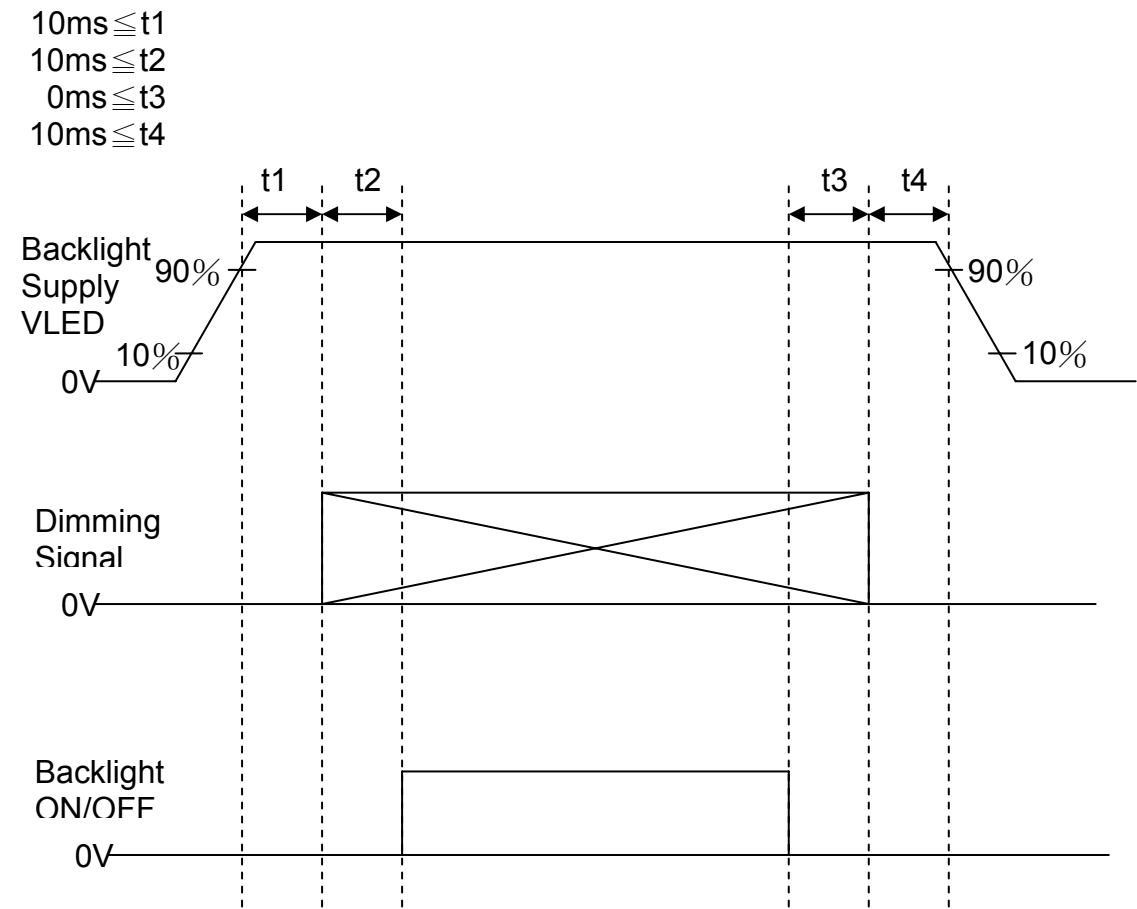
3.5 Backlight

Ta=25℃

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LED Lift Time	---	10,000			Hour	【Note1】

【Note1】 Definition of life time : I_F=20mA，Luminance＜50% initial value

4. INTERFACE CONNECTION

4.1 CN1

Connector type：I-PEX 20455-040E-12

Pin No.	SYMBOL	FUNCTION
1	NC	NC
2	V_{CC}	+3.3V Power
3	V_{CC}	+3.3V Power
4	V_EDID	EDID 3.3V Power
5	NC	NC
6	CLK_EDID	EDID Clock
7	DATA_EDID	EDID Data
8	RXIN0-	LVDS Signal(-)—channel 0
9	RXIN0+	LVDS Signal(+)—channel 0
10	GND	Ground
11	RXIN1-	LVDS Signal(-)—channel 1
12	RXIN1+	LVDS Signal(+)—channel 1
13	GND	Ground
14	RXIN2-	LVDS Signal(-)—channel 2
15	RXIN2+	LVDS Signal(+)—channel 2
16	GND	Ground
17	RXCLKIN-	LVDS Clock Signal(-)
18	RXCLKIN+	LVDS Clock Signal(+)
19	GND	Ground
20	NC	NC
21	NC	NC
22	GND	Ground
23	NC	NC
24	NC	NC
25	GND	Ground
26	NC	NC
27	NC	NC
28	GND	Ground
29	NC	NC
30	NC	NC
31	GND	Ground
32	GND	Ground
33	GND	Ground
34	NC	NC
35	ADJ	Adjust for LED brightness
36	LED-EN	LED Enable pin(+3V Input)
37	NC	NC
38	V_{LED}	Power Supply for LED(V_{LED} =5V-19V)
39	V_{LED}	Power Supply for LED(V_{LED} =5V-19V)
40	V_{LED}	Power Supply for LED(V_{LED} =5V-19V)

【Note】

1) ADJ adjust brightness to control Pin，Pulse duty the bigger the brighter.
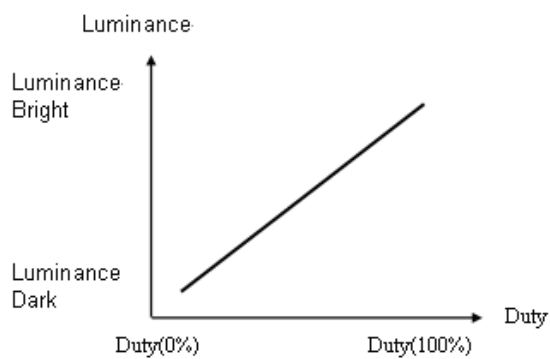
2) ADJ signal=0~3.3V, operation frequency：180HZ~220KHz. ADJ pin shound not connect to GND, it shound pull-high if not adjust brightness.
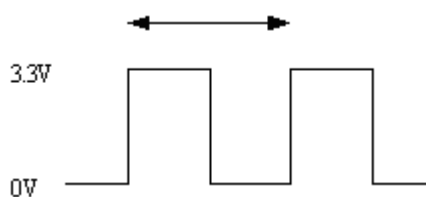

3) GND Pin must ground contact，can not be floating.

# 5. INPUT SIGNAL (DE MODE ONLY)

5.1 Timing Specification:

| Item				Symbol	Min	Typ	Max	Unit
LVDS input signal sequence	CLK Frequency			f_{CLKin}	39.05	45	51.42	MHz
	CLK Period			t_{CLKin}	25.61	22.22	19.45	ns
LCD input timing	DENA	Horizontal	Horizontal Total Time	t_H	1160	1200	1240	tCLK
			Horizontal Effective Time	t_{HA}	1024	1024	1024	tCLK
			Horizontal Blank Time	t_{HB}	136	176	216	tCLK
		Vertical	Frame	f_V	55	60	65	Hz
			Vertical Total Time	t_V	612	625	638	t_H
			Vertical EffectiveTime	t_{VA}	600	600	600	t_H
			Vertical Blank Time	t_{VB}	12	25	38	t_H

5.2 Timing sequence (Timing chart)

5.2.1 Horizontal Timing Sequence
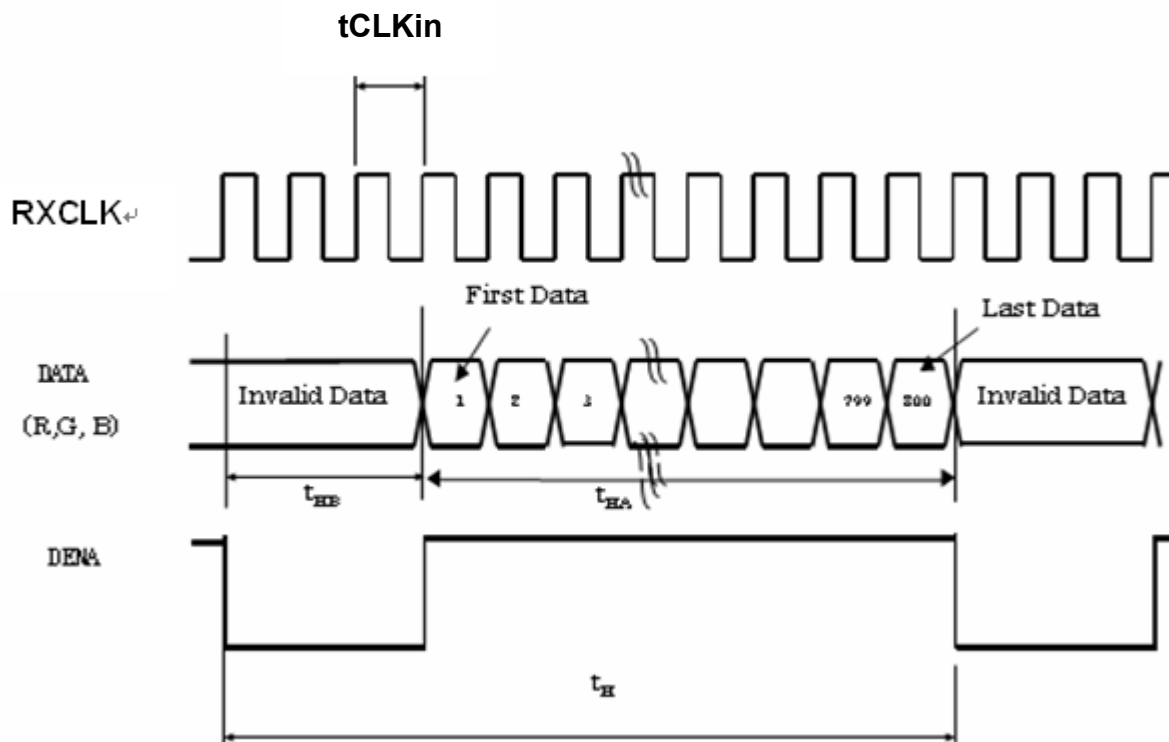
5.2.2 Vertical Timing Sequence
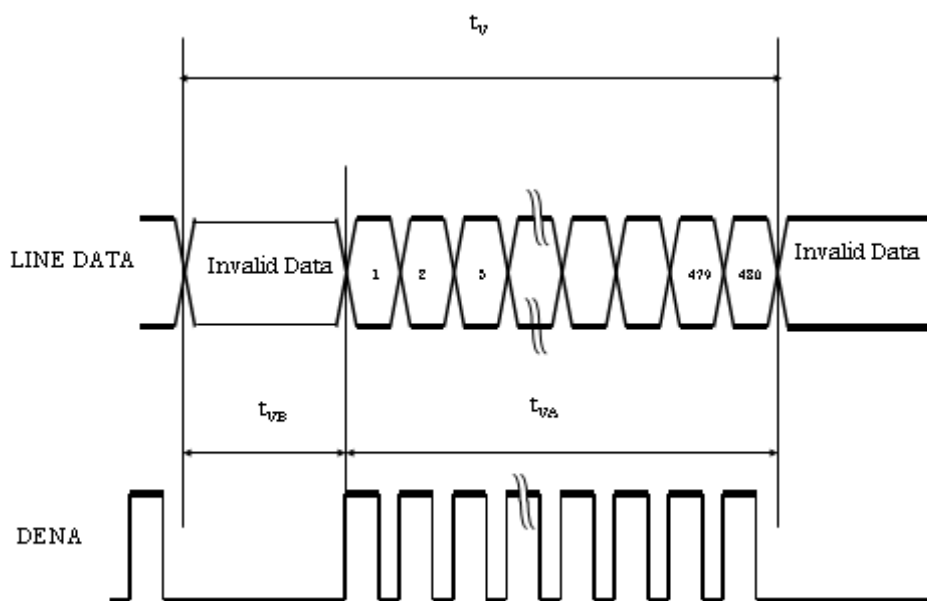
## 5.2.3 LVDS Input Data mapping
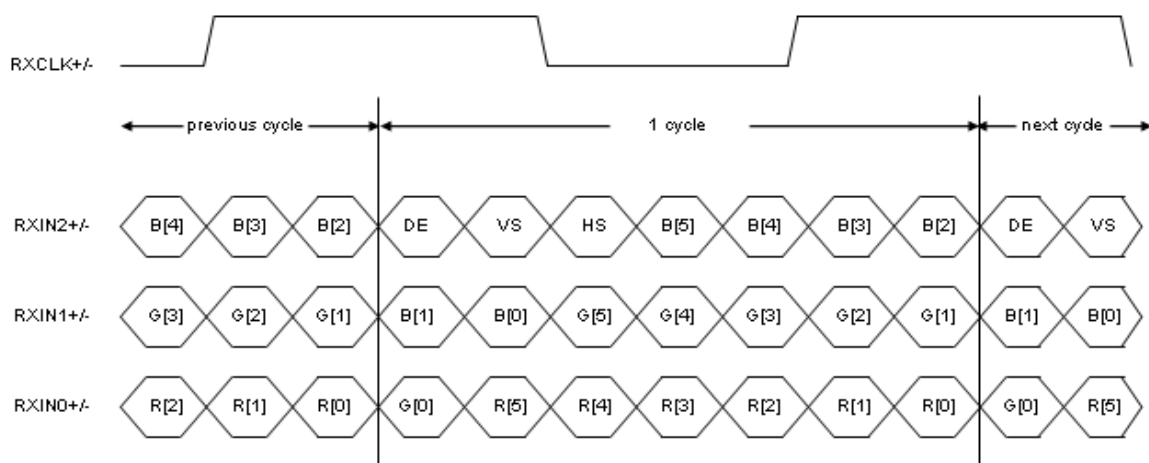
5.3 Color data assignment

COLOR	INPUT	R DATA						G DATA						B DATA					
	DATA	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	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	0	1	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	0	1	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

【Note1】 Definition of Gray Scale

　　　　 color(n)：n is series of Gray Scale. The more n value is the bright Gray Scale.
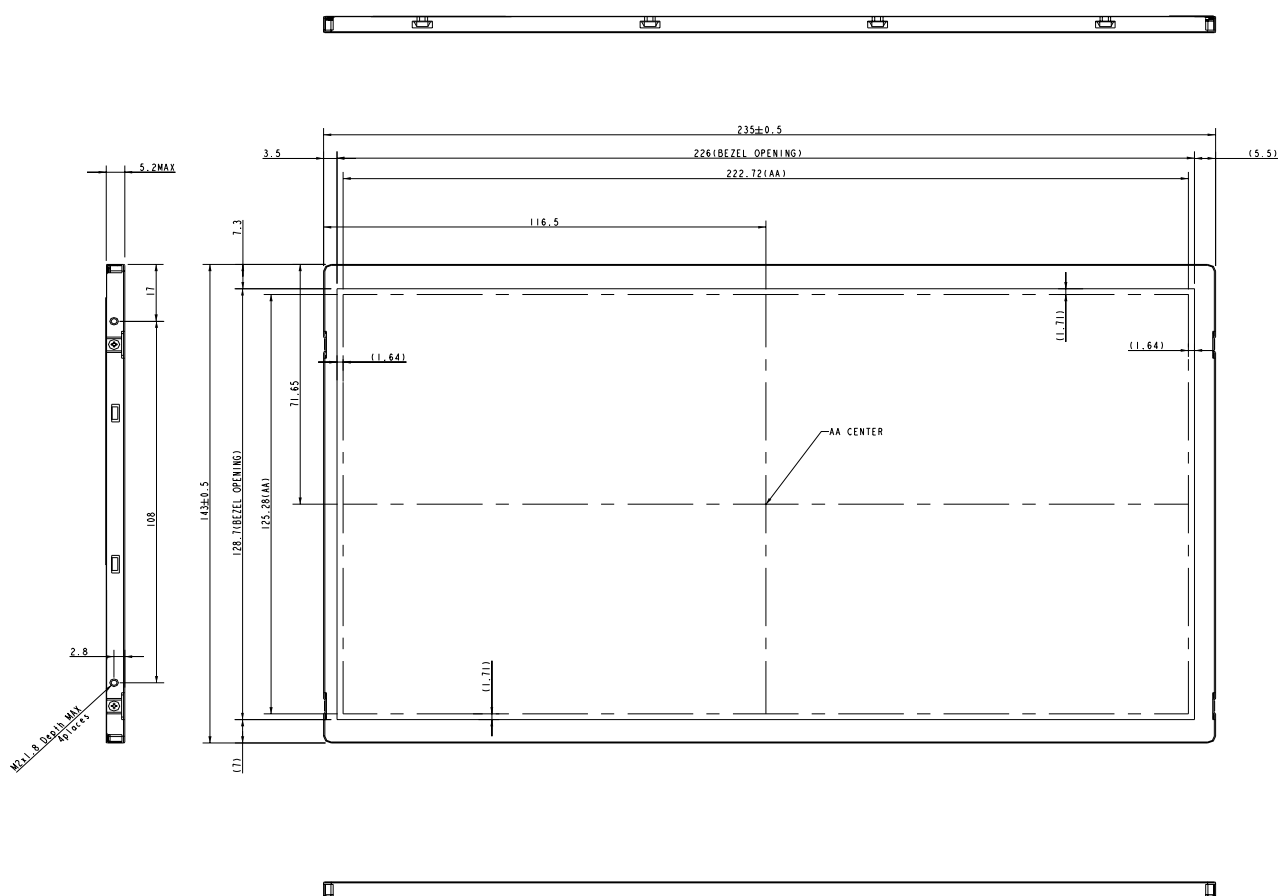
【Note2】 Data:1-High, 0-Low.
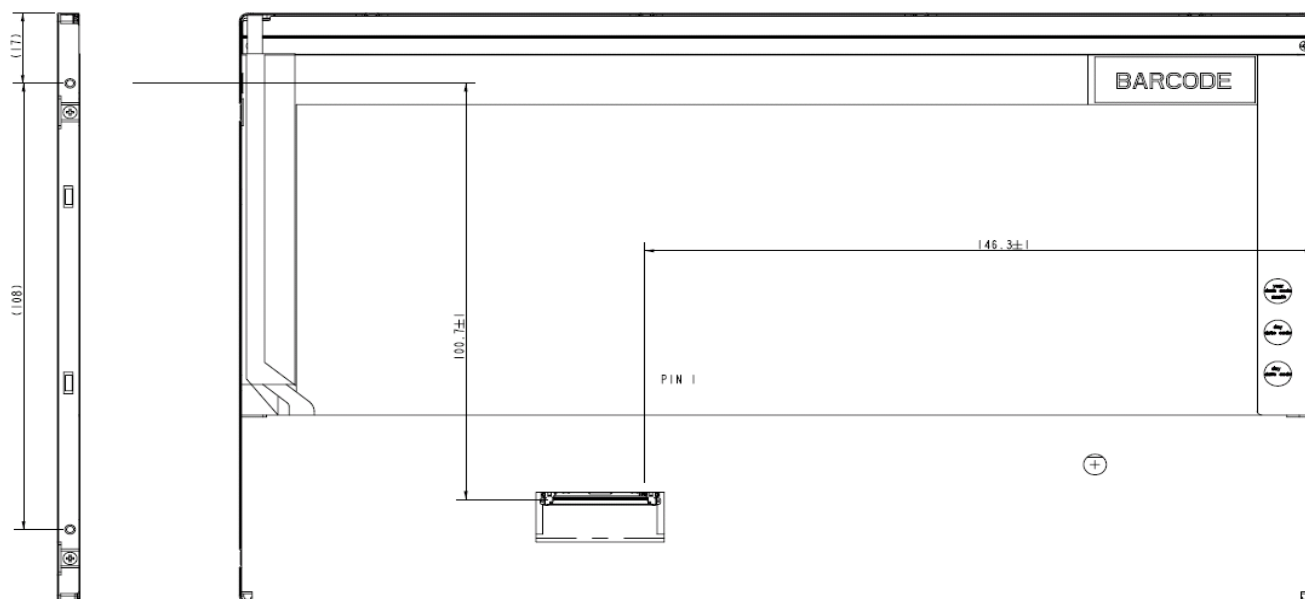
6. BLOCK DIAGRAM
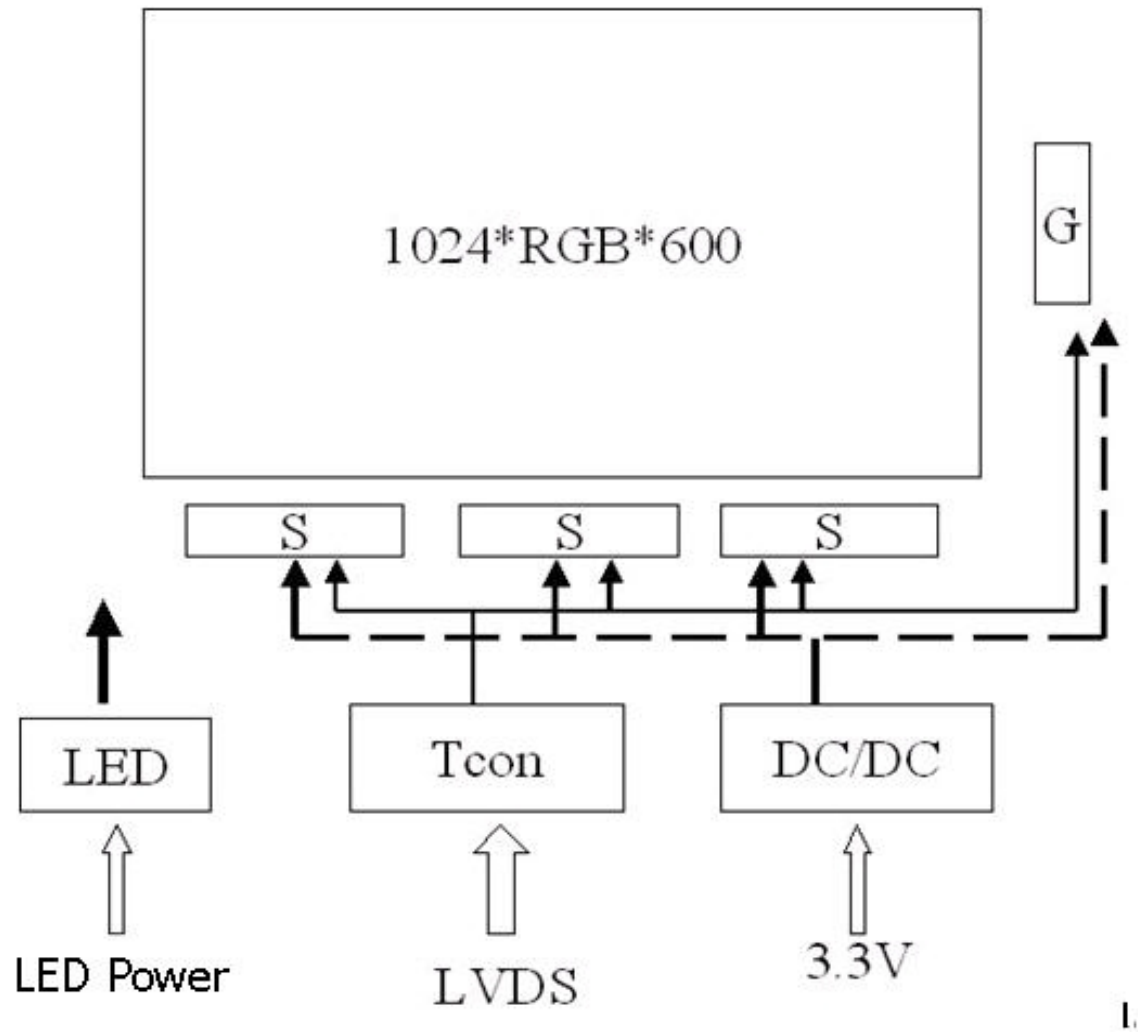
7. MECHANICAL DIMENSION

7.1 Front Side

[Unit：mm]

7.2 Rear Side

[Unit：mm]

[Note]：1.Tolerance is ±0.3mm unless noted
   2.Screw Torque Maximum=2.0kgf-cm

8. OPTICAL CHARACTERISTICS

Ta = 25°C, V_{CC} =3.3V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Constrast Ratio		CR	Point-7	400	500	--	--	*1)*2)*4)
Luminance*)		Lw	5 Points Avg	180	200	--	cd/m^2	*1)*3)
Luminance Uniformity		ΔL	5 Points	--	--	1.25	%	*1)*4)
Response Time (White - Black)		Tr+ Tf	Point-7	--	25	30	ms	*1)*4)*7)
NTSC		--	Point-7	--	45		%	*1)*4)*7)
Viewing Angle	Horizontal	ψ	CR≧10	80	90	--	°	*1)*2)*7)
	Vertical	θ	Point-7	35	45	--	°	*1)*2)*7)
Color Coordinate	White	Wx Wy	θ=φ= 0° Point-7	0.273 0.289	0.313 0.329	0.353 0.369	--	*1)
	Red	Rx Ry		0.542 0.307	0.572 0.337	0.602 0.367		
	Green	Gx Gy		0.318 0.539	0.348 0.569	0.378 0.599		
	Blue	Bx By		0.131 0.086	0.161 0.116	0.191 0.146		

【Note】

*1)Measure condition：25℃±2℃，60±10%RH，under 10 Lux in the dark room. BM-5A (TOPCON)，viewing angle 2°，V_{LED} =12V.(ADJ Duty 100%).
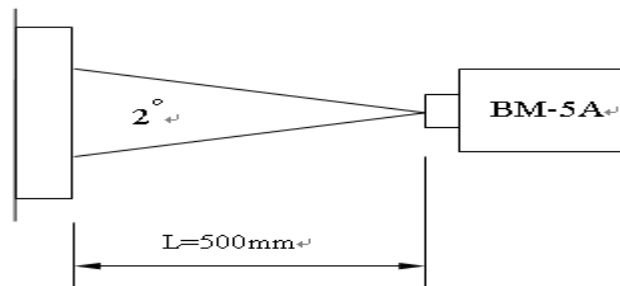
*2）Definition of contrast ratio:
  Measure the point-7 as figure 8-1
  Contrast Ratio (CR)= (White) Luminance of ON / (Black) Luminance of OFF

*3) Definition of luminance: Measure white luminance on the 5 points as figure 8-1

$$Lw_{,AVE}=[Lw(1)+Lw(2)+Lw(3)+Lw(4)+Lw(5)]/5$$

*4) Definition of Luminance Uniformity: Measure white luminance on the point 1、2、3、4、5as figure8-1

$$\triangle L = Lw(Max)_{5points} / Lw(MIN)_{5points} \times 100\%$$
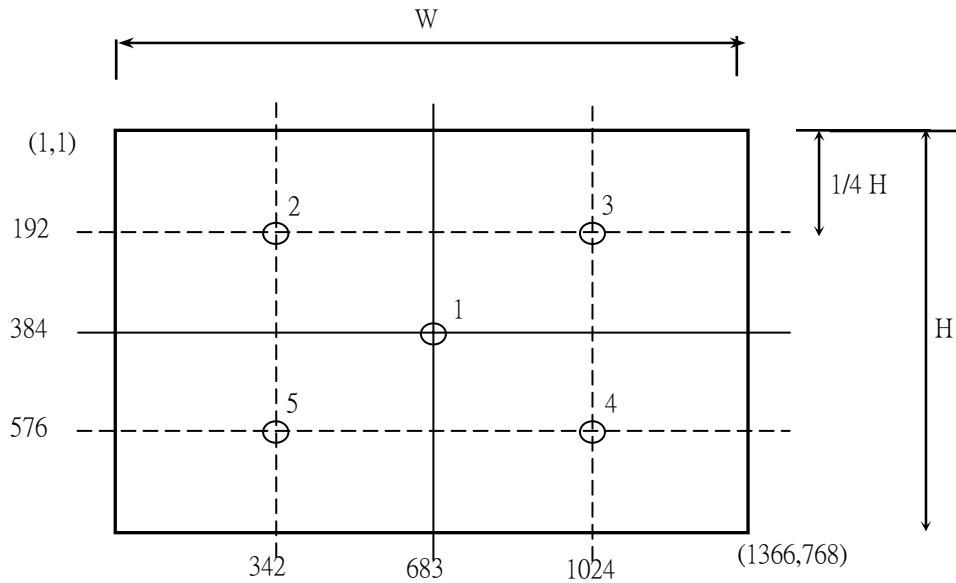
Fig8-1 Measuring point

*6) Definition of Viewing Angle(θ,ψ),refer to Fig8-2 as below： These items are measured by
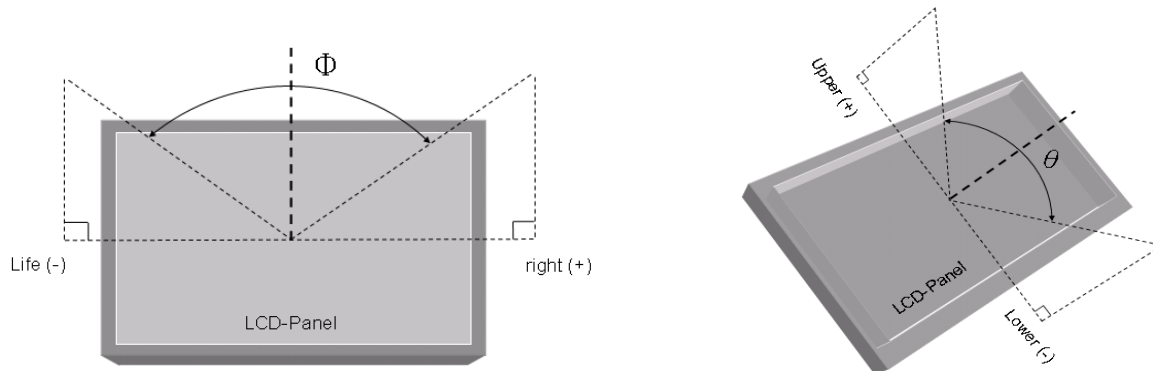EZ-CONTRAST (ELDIM) in the dark room. (no ambient light).

Fig8-2 Definition of Viewing Angle
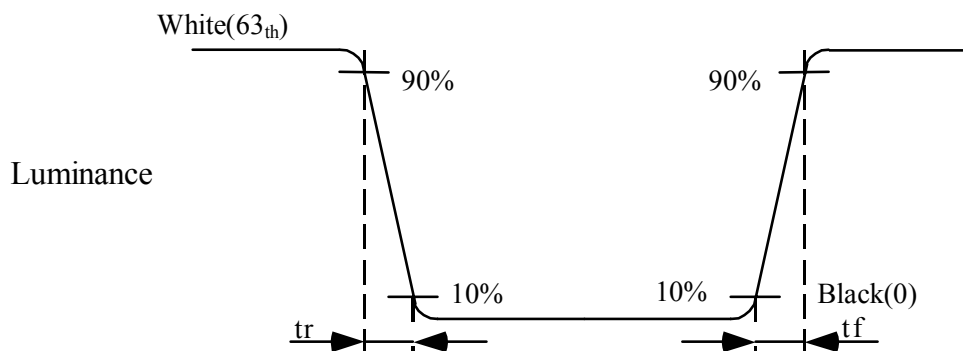
*7) Definition of Response Time.(White-Black)

Fig8-3 Definition of Response Time (White-Black)

9. RELIABILITY TEST CONDITIONS

(1) Temperature、Humidity and Pressure

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 (30 Mins)～60° C (30 Mins)， 200 CYCLE
Low Temperature Low Pressure Storage	0℃、260hPa、24 Hrs

(2) Shock & Vibration

TEST ITEMS	CONDITIONS
Shock (Non-Operation)	Shock level : 1980m/s^2(200G), Waveform : half sinusoidal wave, 2ms, 6 axis (± X,± Y,± Z) per cycle
Vibration (Non-Operation)	Vibration level : 14.7m/s^2(1.5G), sinusoidal wave (each x, y, z axis : 1hr, total 3hrs) Frequency range : 5～500 Hz Sweep speed : 0.5 Octave/min.

(3) ESD

	Surface discharge (Panel display area、Frame)		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

(4) MTBF without B/L : 200,000 Hrs(min) lifetime.

(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℃ ~40℃ 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℃ 90%RH.

(3) Please do not leave the LCDs in the environment of low temperature; below -20℃.

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 throughly with soap and water.

10.6 OTHERS

(1) A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight Land 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.