Chunghwa Picture Tubes, Ltd.
Technical Specification

To : **HONG YEI TECHNOLOGY CO,.LTD**
Date : 2002.11.07

CPT TFT- LCD

CLAA150XG 02

ACCEPTED BY：

APPROVED BY	CHECKED BY	PREPARED BY
		TFT-LCD Plant Application Dept.

Prepared by : TFT-LCD Application Department

CHUNGHWA PICTUER TUBES, LTD.

1. OVERVIEW

CLAA150XG 02(CLAA150XG 01 without control board) is 15.0" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, and backlight.

By applying 8 bit digital data, 1024×768, 16.7M-color images are displayed on the 15.0" diagonal screen.

Interface of data and control signals is Typ. 32.5MHz digital. 2 pixel data are transmittd per cycle. General specifications are summarized in the following table:

ITEM	SPECIFICATION
Display Area(mm)	304.1(H)x228.1(V) (15.0-inch diagonal)
Number of Pixels	1024(H)x768(V)
Pixel Pitch(mm)	0.297(H)x0.297(V)
Color Pixel Arrangement	RGB vertical strip
Display Mode	normally white TN
Number of Colors	16.7M(8bits/color)
Brightness(cd/m^2)	250(cd/m^2)@8mA
Viewing Angle	(-60~60)(H),(-55~45)(V)(Typ.)
Wide Viewing Angle Technology	Optical Compensation Film
Surface Treatment	Anti-glare
Optimum Viewing Angle	6 o'clock
Module Size(mm)	326.0(W) x252.0(H) x11(D)
Module Weight(g)	1100
Backlight Unit	2 CCFLs edge-light(top/bottom)

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

ITEM	SYMBOL	MIN.	MAX.	UNIT
Operation Temperature *1)	Top	0	50	℃
Storage Temperature *1)	Tstg	-20	60	℃

Note:

*1)Humidity

Relative Humidity ≦95% (Ta≦ 40℃)

Wet Bulb Temperature ≦39℃(Ta≧40℃)

3. ELECTRICAL CHARACTERISTICS

(a)TFT-LCD

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	Remark
Power Supply Voltage for Logic	VDDD	3.0	3.3	3.6	V	Note1
Power Supply Current for Logic	IDDD	-	110	300	mA	Note2
Permissive Ripple Voltage for Logic	VRDD	-	-	121	mV	
Power Supply Voltage for Gamma	VDDA	8.9	9.2	9.5	V	
Power Supply Current for Gamma	IDDA	-	100	200	mA	Note2
Permissive Ripple Voltage for Gamma	VRDA	-	-	222	mV	
Power Supply Voltage for Gate ON	VDDG	17	18	19	V	Note1
Power Supply Current for Gate ON	IDDG	-	10	20	mA	Note2
Permissive Ripple Voltage for Gate ON	VRDG	-	-	58	mV	
Power Supply Voltage for Gate OFF	VEEG	-5.4	-6	-6.6	V	Note1

Power Supply Current for Gate OFF		IEEG		10	20	mA	Note2
Permissive Ripple Voltage for Gate OFF		VREG	-	-	76	mV	
Power Supply Voltage for Common		VCOM	2.95	3.6	3.95	V	Note1、3
Power Supply Current for Common		ICOM	-	100	200	mA	Note2
Permissive Ripple Current for Common		VRCO	-	-	138	mV	
Input Threshold Voltage	High	VTH	2.2	3.3	5.5	V	
	Low	VTL	0	-	0.8	V	

[Note 1]

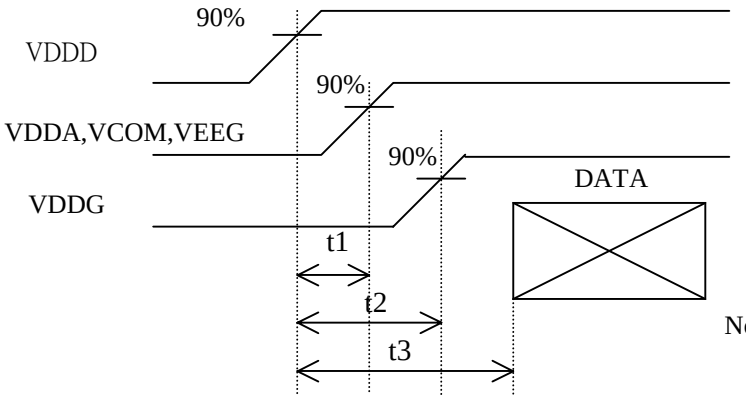
Power sequence

VDDD->VEEG,VDDA,VCOM->VDDG

1 ms≦t1

2ms ≦t2

t3≦50ms



Notes: VDDA,VCOM,VEEG power sequence don't care.

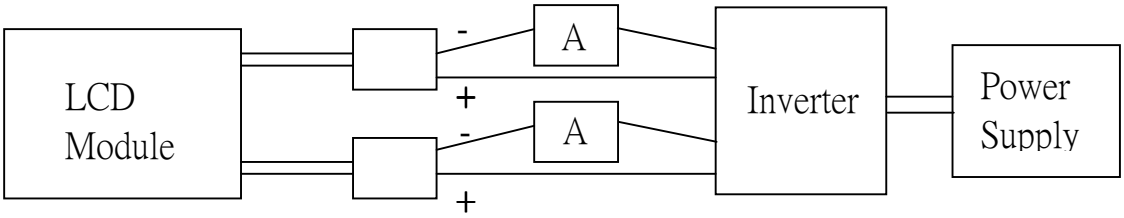
[Note 2] Typical current situation : 256-gray-bar pattern, 768 line mode, VCC=+5.0V

[Note 3] VCOM is the adjustment voltage,the max and min value is the adjustment range.

(b)Backlight

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	REMARK
Lamp Voltage	VL	-	630	-	V	IL=8.0mA
Lamp Current	IL	5.0	8.0	8.5	mA	Note1
Interter Frequency	FI	40	50	60	kHz	
Starting Lamp Voltage	VS	1300	-	-	V	Ta=0℃
		1100	-	-	V	Ta=25℃
Lamp life Time	LT	50000@6mA 30000@8mA	50000@6mA	-	hr	Continuous Operation

[Note 1] Lamp Current measurement method (The current meter is inserted in cold line)



4. INTERFACE PIN CONNECTION

(a) CN1(Source side signal)

Used connector: IL-FHR-B50S-HF (JAE)

Pin	Symbol	Function	Pin	Symbol	Function
1	GND		2	GND	
3	STH	Start pulse	4	LP	Latch pulse
5	HMS1_O	Data polarity inverting pin	6	HMS2_E	Data polarity inverting pin
7	POL	M signal	8	GND	
9	GND		10	GND	
11	GND		12	VDDA	Gamma voltage
13	VDDA	Gamma voltage	14	VDDA	Gamma voltage
15	VDDA	Gamma voltage	16	VDDA	Gamma voltage
17	VDDA	Gamma voltage	18	GND	
19	GND		20	OR0	Red odd data(LSB)
21	OR1	Red odd data	22	OR2	Red odd data
23	OR3	Red odd data	24	OR4	Red odd data
25	OR5	Red odd data	26	OR6	Red odd data
27	OR7	Red odd data(MSB)	28	GND	
29	OG0	Green odd data(LSB)	30	OG1	Green odd data
31	OG2	Green odd data	32	OG3	Green odd data
33	OG4	Green odd data	34	OG5	Green odd data
35	OG6	Green odd data	36	OG7	Green odd data(MSB)
37	GND		38	OB0	Blue odd data(LSB)
39	OB1	Blue odd data	40	OB2	
41	OB3	Blue odd data	42	OB4	Blue odd data
43	OB5	Blue odd data	44	OB6	Blue odd data
45	OB7	Blue odd data(MSB)	46	GND	Blue odd data
47	GND		48	CLKH	Horizontal shift clock input
49	GND		50	GND	

(b)CN2(Source and Gate side signal)

Used connector:IL-FHR-B50S-HF(JAE)

Pin	Symbol	Function	Pin	Symbol	Function
51	GND		52	GND	
53	ER0	Red even data(LSB)	54	ER1	Red even data
55	ER2	Red even data	56	ER3	Red even data
57	ER4	Red even data	58	ER5	Red even data
59	ER6	Red even data	60	ER7	Red even data(MSB)
61	GND		62	EG0	Green even data(LSB)
63	EG1	Green even data	64	EG2	Green even data
65	EG3	Green even data	66	EG4	Green even data
67	EG5	Green even data	68	EG6	Green even data
69	EG7	Green even data(MSB)	70	GND	
71	EB0	Blue even data(LSB)	72	EB1	Blue even data
73	EB2	Blue even data	74	EB3	Blue even data
75	EB4	Blue even data	76	EB5	Blue even data
77	EB6	Blue even data	78	EB7	Blue even data(MSB)
79	GND		80	GND	
81	VCOM	Common voltage	82	VCOM	Common voltage
83	VCOM	Common voltage	84	VCOM	Common voltage
85	VCOM	Common voltage	86	VCOM	Common voltage
87	VDDD	Logic voltage	88	VDDD	Logic voltage
89	VDDD	Logic voltage	90	VDDD	Logic voltage
91	VDDD	Logic voltage	92	VDDD	Logic voltage
93	STV	Shift data pin	94	CLKV	Vertical shift clock input
95	VDDG	Gate IC ON voltage	96	VDDG	Gate IC ON voltage
97	VEEG	Gate IC OFF voltage	98	VEEG	Gate IC OFF voltage
99	GND		100	GND	

(c)CN3,4(BACKLIGHT)

Backlight-side connector: BHR-03VS-1(JST)

Inverter-side connector: SM02(8.0)B-BHS-1(JST)

Pin No.	Symbol	Function
1	CTH	VBLH(High voltage)
3	CTL	VBLL(High voltage)

[Note]

VBLH-VBLL = VL

5. INTERFACE TIMING

(a)Timing Specifications

Horizontal signal:

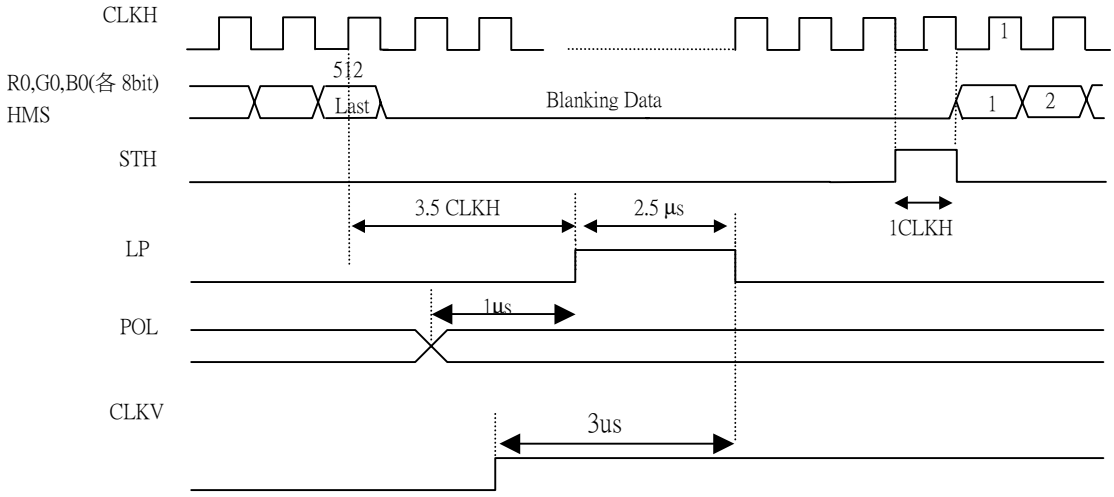
Item	Symbol	Min	Typ	Max	Unit
CLK pulse width(H)	twh	3	-	-	ns
CLK pulse width(L)	twl	3	-	-	ns
DATA set-up time	tst1	1	-	-	ns
DATA hold time	Thd1	2	-	-	ns
STH set-up time	tst2	1	-	-	ns
STH hold time	thd2	2	-	-	ns
CLK-LP time	tst3	6	-	-	ns
LP-CLK time	thd3	6	-	-	ns

Vertical sigal:

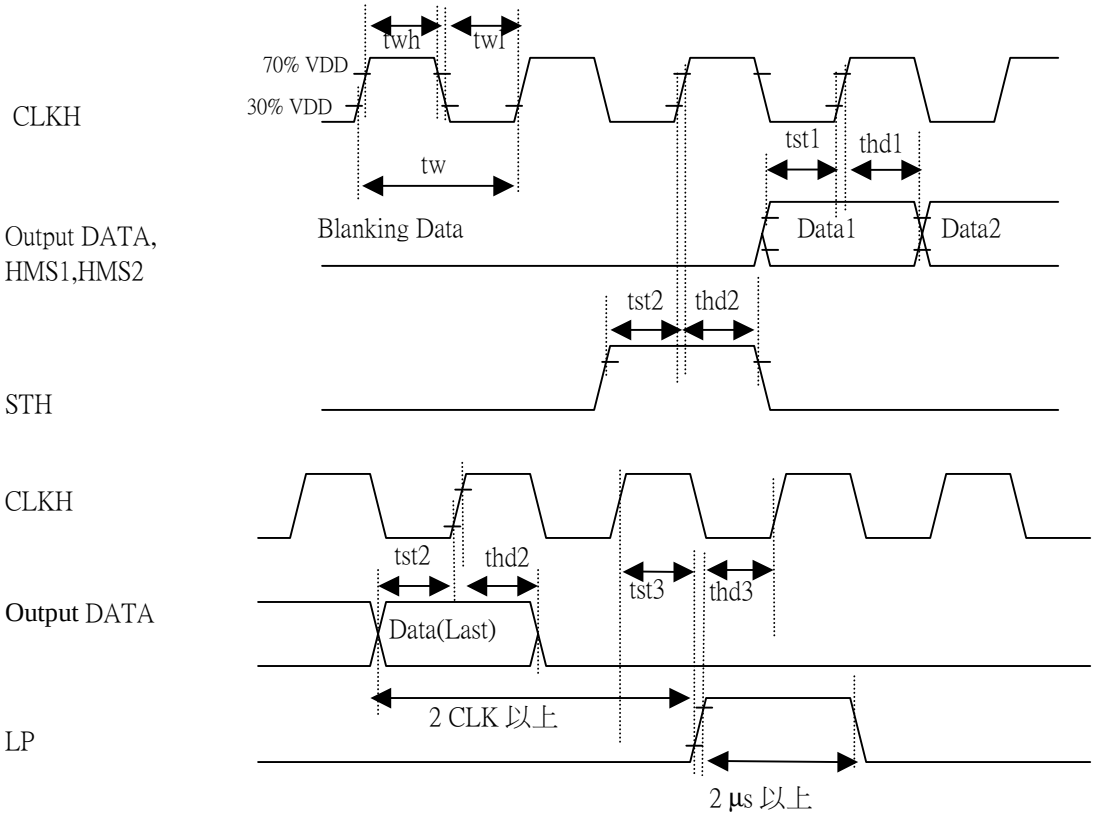
Item	Symbol	Min	Typ	Max	Unit
STV set-up time	tst(STV)	1	-	-	μs
STV hold time	thd(STV)	1	-	-	μs
CLKV period	tw(CLKV)	8	-	-	μs
CLKV High width	twH(CLKV)	3.5	-	-	μs
CLKV Low width	twL(CLKV)	3.5	-	-	μs

(b)Timing Chart

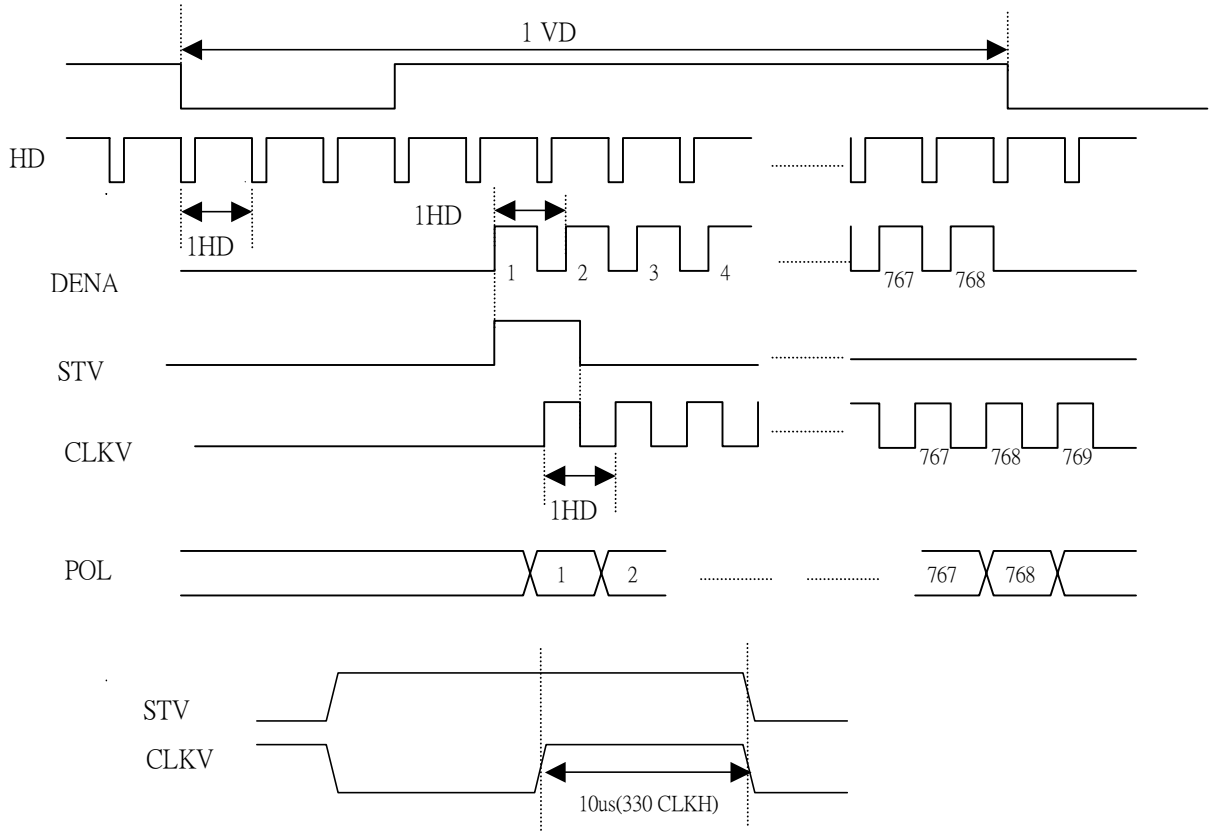
Horizontal signal 1



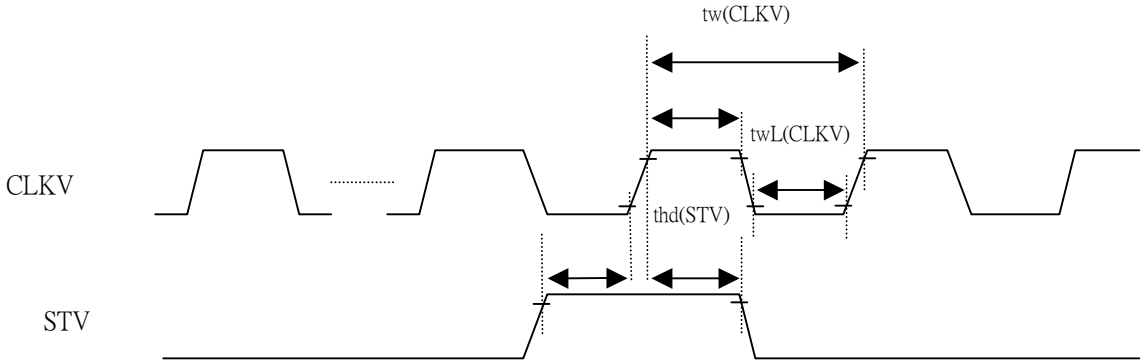
Horizontal signal 2



Vertical signal 1



Vertical signal 2



(c)Color Data Assignment

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)Definition of gray scale:

Color(n) : n indicates gray scale level.

Higher n means brighter level.

(2)Data:1-High,0-Low.

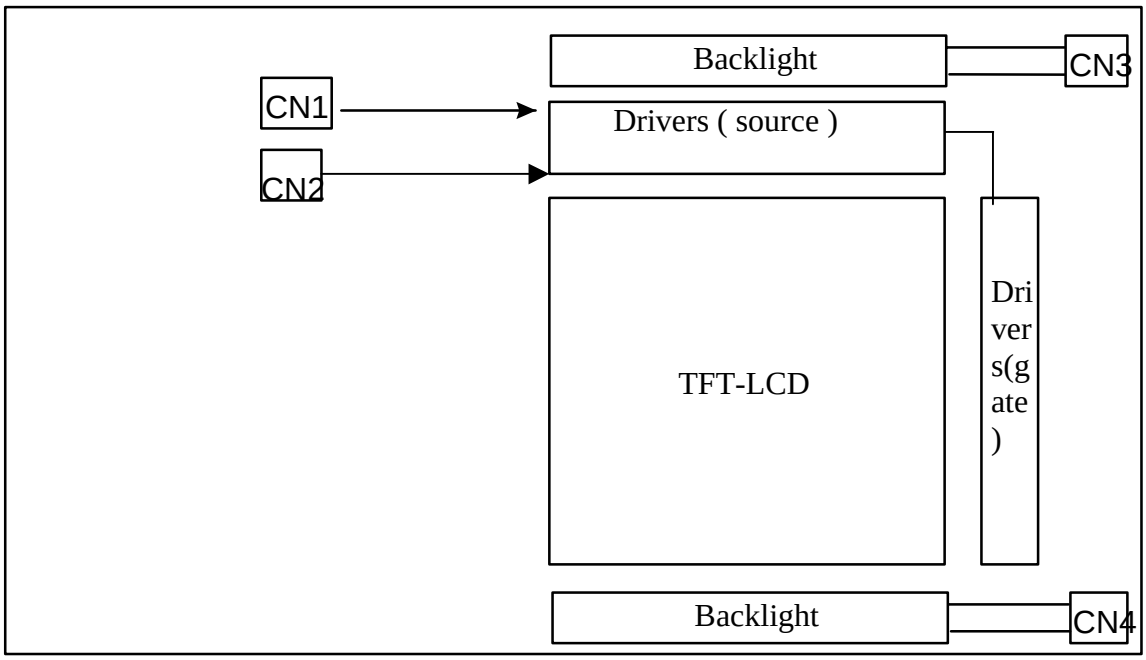
(3)This assignment is applied to both odd and even data.

(d)Color Data Assignment

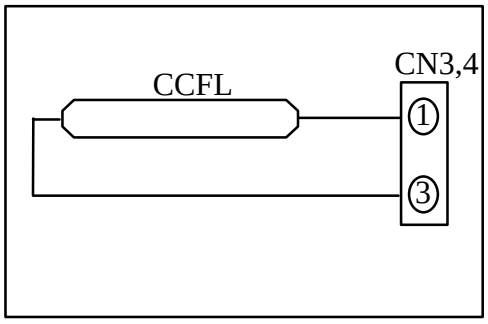
D(1,1)	D(2,1)	..	D(X,1)	..	D(1023,1)	D(1024,1)
D(1,2)	D(2,2)	..	D(X,2)	..	D(1023,2)	D(1024,2)
..	..	+	..	+	..	..
D(1,Y)	D(2,Y)	..	D(X,Y)	..	D(1023,Y)	D(1024,Y)
..	..	+	..	+	..	..
D(1,767)	D(2,767)	..	D(X,767)	..	D(1023,767)	D(1024,767)
D(1,768)	D(2,768)	..	D(X,768)	..	D(1023,768)	D(1024,768)

6. BLOCK DIAGRAM

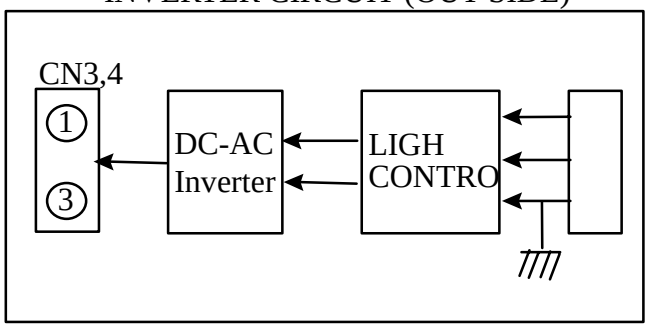
TFT-LCD Module



BACK LIGHT



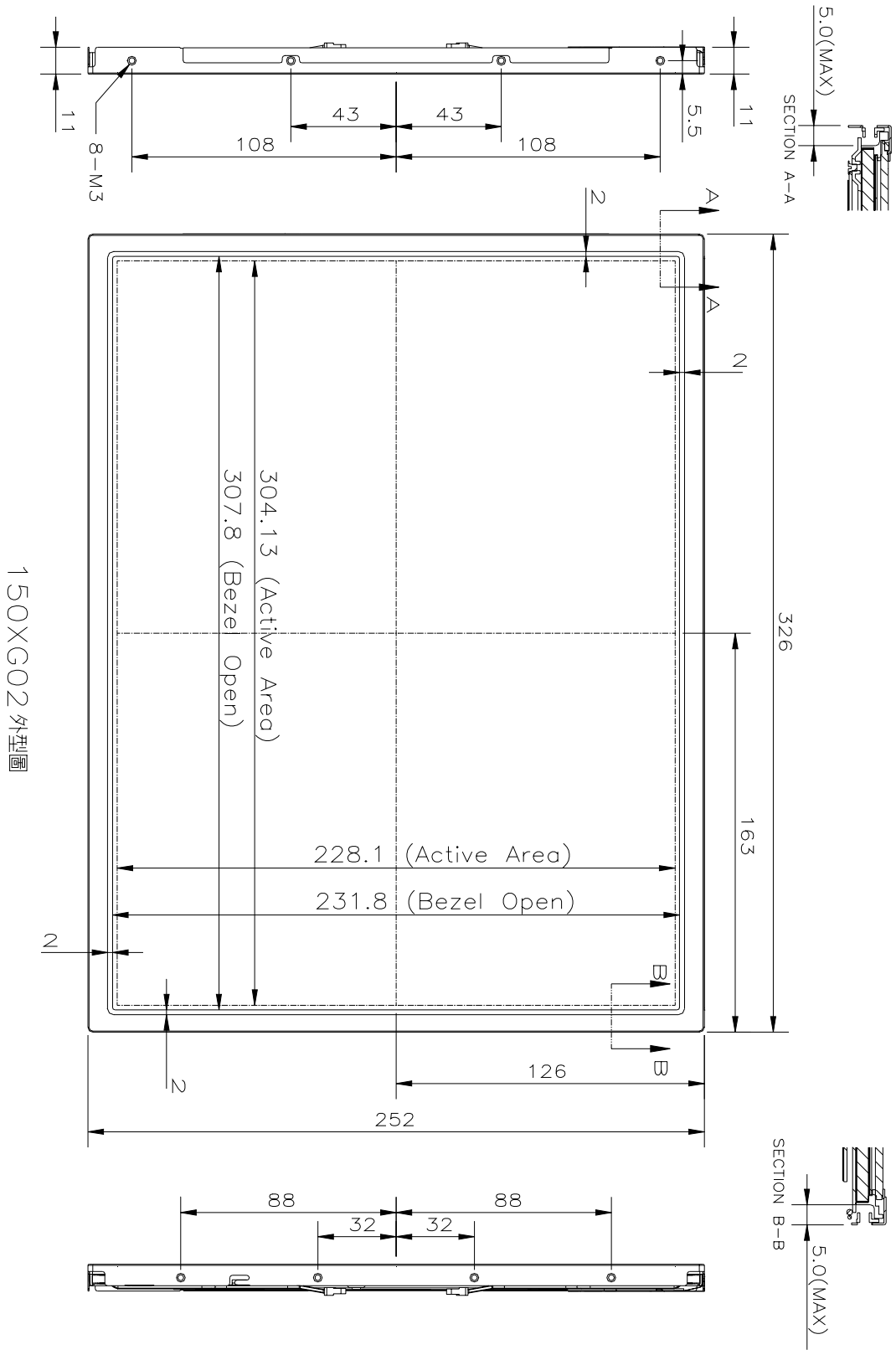
INVERTER CIRCUIT (OUT SIDE)



7. MECHANICAL SPECIFICATION

(a) Front side

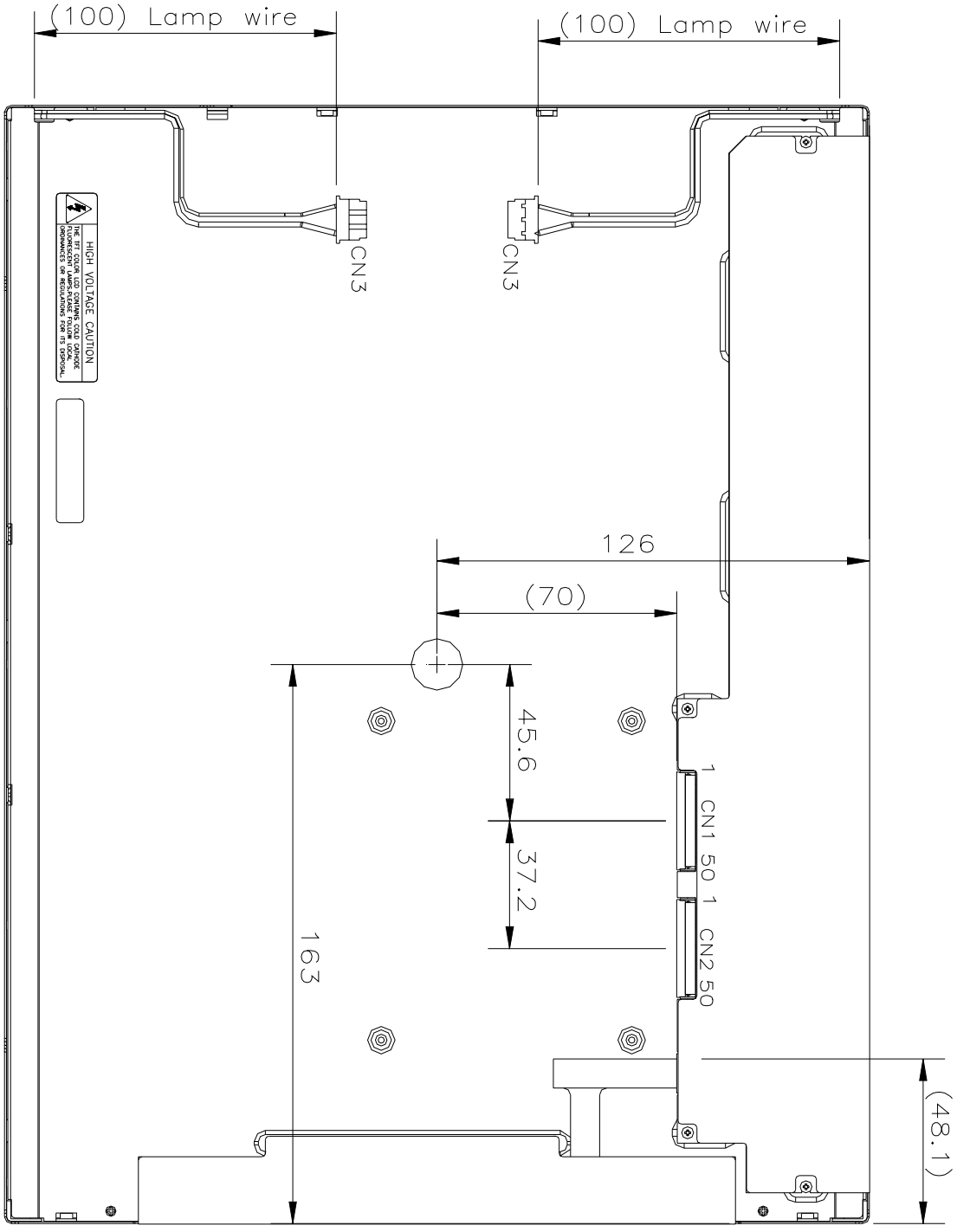
Unit: mm



Tolerance is ± 0.5mm unless noted

(b) Rear side

Unit: mm



Tolerance is ±0.5mm unless noted

Tolerance is ±0.5mm unless noted

8.OPTICAL CHARACTERISTICS

Ta=25℃,VCC=5.0V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	note
Contrast Ratio		CR	$\varphi=\theta=0^\circ$	250	400	-	-	
Luminance	Normal	L	$\varphi=\theta=0^\circ$	200	250	-	cd/m^2	*1)
	Uniformity	△L	$\varphi=\theta=0^\circ$	-	-	30	%	
Response Time		Tr	$\varphi=\theta=0^\circ$	-	8	-	ms	
		Tf	$\varphi=\theta=0^\circ$	-	22	-	ms	
Viewing Angle	Horizontal	φ	CR≧10	-50~50	-60~60	-	°	
	Vertical	θ		-45~35	-55~45	-	°	
Image sticking		Tis	2 hours	-	-	2	S	
Color Coordinates	Red	X	$\varphi=\theta=0^\circ$	0.570	0.600	0.630		-
		Y		0.315	0.345	0.375		
	Green	X		0.270	0.300	0.330		
		Y		0.545	0.575	0.605		
	Blue	X		0.120	0.150	0.180		
		Y		0.100	0.130	0.160		
	White	X		0.270	0.300	0.330		
		Y		0.300	0.330	0.360		

These items are measured using BM-5A(TOPCON) OR LCD-7000 (Outsuka Electronic) under the dark room condition(no ambient light).

*1) Condition: IL=8.0mA,Inverter frequency: 50kHz.

Definition of these measurement items are as follows:

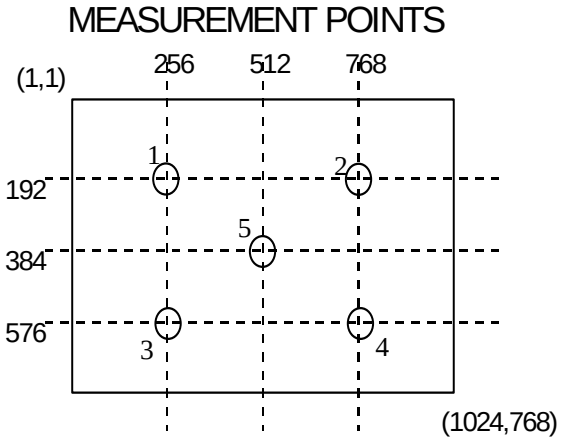
(1)Definition of Contrast Ratio

CR=ON(White)Luminance/OFF(Black)Luminance

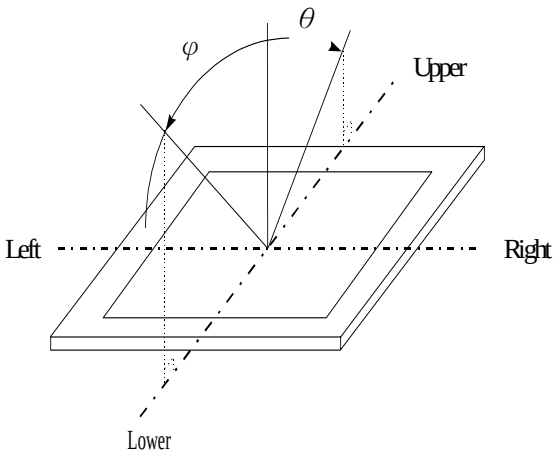
(2)Definition of Luminance and Luminance uniformity

△L=[L(MAX)/L(MIN)-1]×100

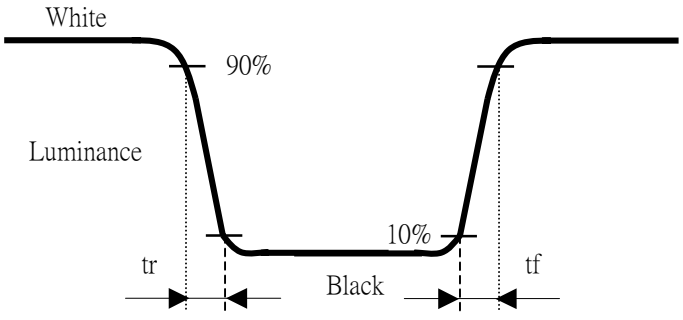
Measure White Luminance on the below 5 points



(3)Definition of Viewing Angle(θ , ϕ)



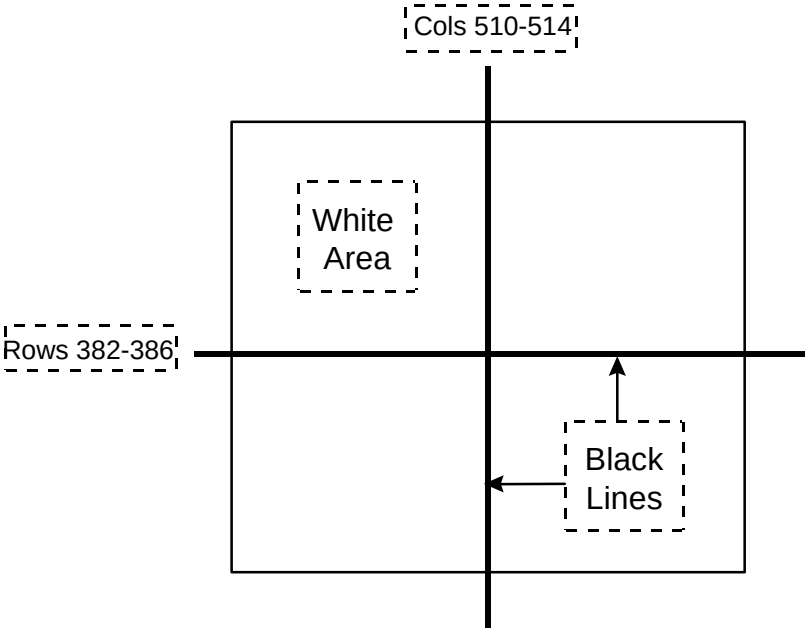
(4)Definition of Response Time



(5)Image sticking:

Continuously display the test pattern shown in the figure below for two-hours. Then display a completely white screen. The previous image shall not persist more than two seconds at 25℃.

TEST PATTERN FOR IMAGE STICKING TEST



9.RELIABILITY TEST CONDITIONS

(1)Temperature and Humidity

TEST ITEMS	CONDITIONS
HIGH TEMPERATURE HIGH HUMIDITY OPERATION	40℃,95%RH,240h (No condensation)
HIGH TEMPERATURE OPERATION	55℃,240h
LOW TEMPERATURE STORAGE	-20℃,240h
THERMAL SHOCK	BETWEEN -20℃(1hr)AND 60℃(1hr),5 CYCLES
HIGH TEMPERATURE STORAGE	60℃,240h
LOW TEMPERATURE OPERATION	0℃,240h
LOW HUMIDITY OPERATION AND STORAGE	10%,240h

(2)Shock & Vibration

ITEMS	CONDITIONS
SHOCK (NON-OPERATION)	Shock level:980m/s^2(100G) Waveform: half sinusoidal wave, 2ms Number of shocks: one shock input in each direction of three mutually perpendicular axes for a total of six shock inputs
VIBRATION (NON-OPERATION)	Vibration level: 9.8m/s^2(1.0G) zero to peak Waveform: sinusoidal Frequency range: 5 to 500 Hz Frequency sweep rate: 0.5 octave/min Duration: one sweep from 5 to 500 to 5 Hz in each of three mutually perpendicular axis(each x,y,z axis: 1 hour, total 3 hours)

(3)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;

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 guide lines.

(2.1) 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.

(2.2) 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.

(2.3) 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.

(2.4) 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.

(2.5) 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 cloth 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 wit inverter.

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 charge 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.

3 PRECAUTFONSWITHELECTROSTATICS

(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.

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℃.

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.

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:

(3.1) 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.

(3.2) Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.

(3.3) Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.

(3.4) 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.)