Chunghwa Picture Tubes, Ltd.
Product Specification

Date : 090331

TFT LCD

CLAA070VA01 Y

ACCEPTED BY :（V1.0）

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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
1.0	First revision	--	2006.03.17

CONTENTS

1. OVERVIEW

CLAA070VA01 is 7" color TFT-LCD(Thin Film Transistor Liquid Crystal Display)module composed of LCD panel,driver ICs,control circuit,and backlight.

The 7.0"screen produces a high resolution image that is composed of 800×480 pixel elements in a stripe arrangement.Display 262K colors by 6 Bit R.G.B signal input.Inverter for backlight and Drive board for panel are included in this module.

General specifications are summarized in the following table:

ITEM	SPECIFICATION
Panel Size	7 inch(panel diagonal)
Display Area (mm)	152.4(W)×91.44(H)
Number of Pixels	800×3(H)×480(V)
Pixel Pitch (mm)	0.1905(H)×0.1905(V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white
Number of colors	262,144
Brightness(cd/m^2)	185nit(min)/220nit(typ)
NTSC ratio	50%
Response Time (Tr+Tf)	30ms
Outline Dimension(in mm)	165.0(W)×104.0(H)×5.5(D)
Viewing Angle(BL on,CR≧10)	140 degree(H)，100degree(V)
Power consumption	BL:2.2W(Typ) LC to drive:0.6W(Typ)
BL unit	CCFL，1 lamp
Electrical Interface(data)	TTL
Viewing Direction	6 o´clock
Surface Treament	Anti-Glare，Hardness:3H
Weight(g)	140g(Typ)

2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	Vcc	-0.5	4.6	V	
Signal Input Voltage	DCLK,DE,R0,G 0B0,~R5,G5,B5	-0.5	4.6	V	
Lamp Voltage	VL	-	484	Vrms	
Lamp Current	IL	4.0	8.0	MArms	
Lamp Frequency	FL	30	80	KHz	
Static Electricity	VESDc	-4000	4000	V	
ICC Rush Current	IRUSH	-	1	A	*5)
Operation Temperature	T_{op}	0	60	℃	*1)*2)*3)*4)
Storage Temperature	T_{stg}	-30	70	℃	*1)*2)*3)

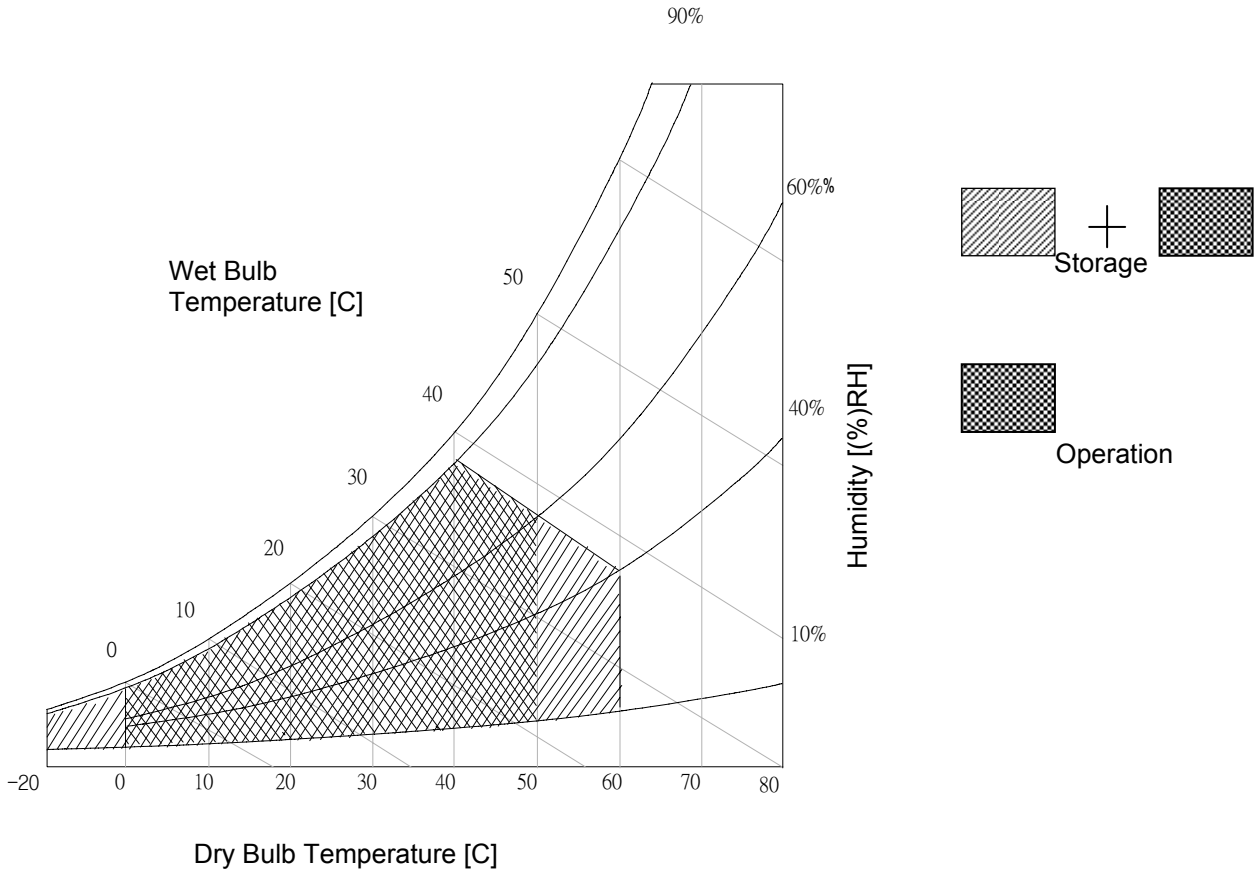
[Note]

*1) Temp. vs. Humidity related chart (90% RH max.,Ta≦ 40℃):

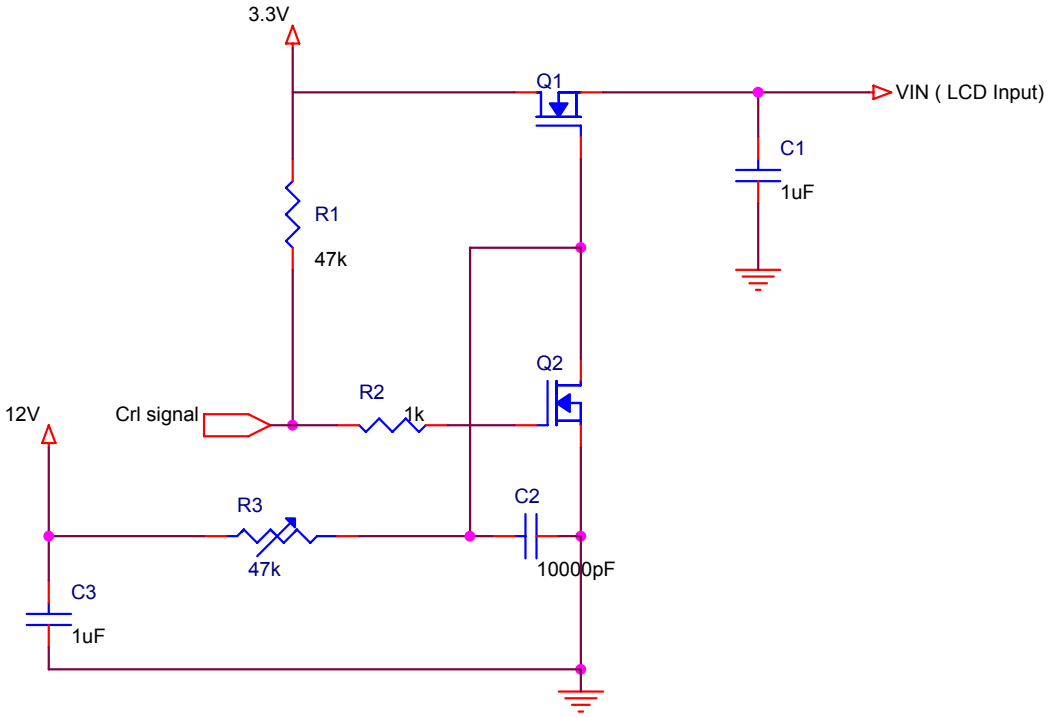
*2) Max. Wet Bulb temp. ≦39℃(Ta＞40℃) without condensation

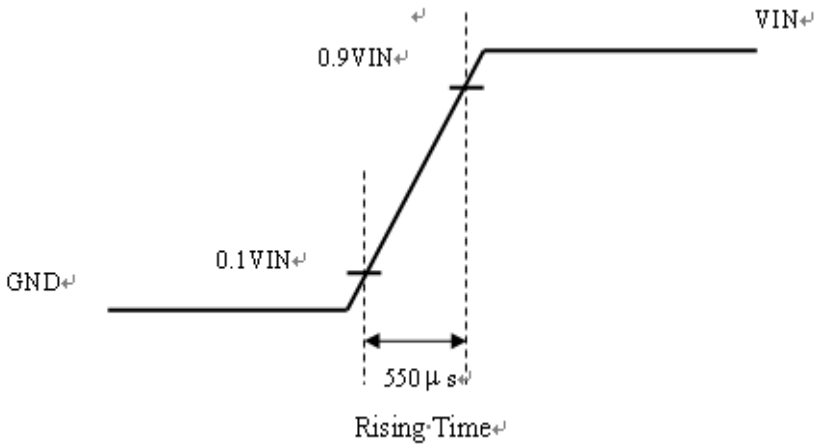
*3) If users use the product out off the environmemt operation range（temperature and humidity）,it will concern for visual quality.

*4) The product must work at operation temperature range and the temperature of the panel's center point must lower than 60℃.



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


3.3V
Q1
VIN (LCD Input)
C1
1uF
R1
47k
Q2
R2
12V
Crl signal
1k
R3
C2
47k
10000pF
C3
1uF


VIN
0.9VIN
0.1VIN
GND
550μs
Rising Time

3. ELECTRICAL CHARACTERISTICS

3.1TFT LCD

Ta=25℃

Item		Symbol	Min.	Typ	Max.	Unit	Note
Power Supply Voltage For LCD		Vcc	3.0	3.3	3.6	V	[Note1]
Logic Input Voltage (High Level)		DCLK,DE,R0, G0,B0~R5,G5, B5	2.0		VCC	V	
Logic Input Voltage (Low Level)		DCLK,DE,R0, G0,B0~R5,G5, B5	0		0.8	V	
Power Supply Current For LCD	(a)64Gray	ICC	-	150	190	mA	[Note2]
	(b)Black		-	170	200		
	(c)White		-	130	170		

[Note1]

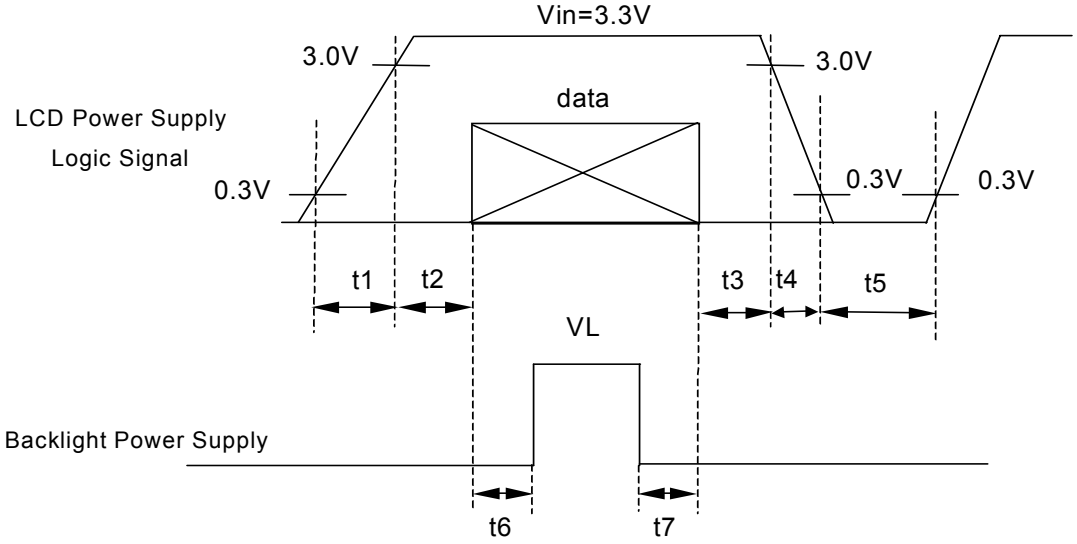
Source、Signal sequence

0＜t1≦10ms　　1 sec≦t5

0＜t2≦50ms　　300ms≦t6

0＜t3≦50ms　　300ms≦t7

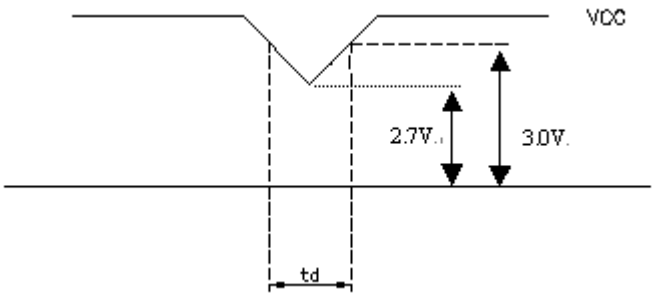
0＜t4≦10ms



Data: RGB DATA, DCLK, DENA

VCC –dip codition:

1) When 2.7 V≦VCC＜3.0V，td≦ms.
2) VCC＞3.0V，VCC-dip condition should be same as VCC-turn-on condition.



[Note2]

Current Condition(Typ)
480 line mode，
VCC=3.3V，f_H=30kHz，f_V=60 Hz，f_{CLK}=27MHz


(a)64 Gray Pattern


(b)Black Pattern


(c)White Pattern

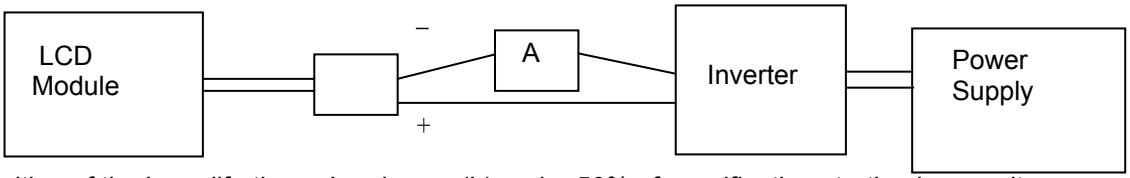
3.2 Backlight

Ta=25℃

Item		Symbol	Min.	Typ	Max.	Unit	Note
Lamp Voltage		VL	-	400	440	Vrms	*1)IL=5.5mA
Lamp Current		IL	5.0	5.5	6.0	mArms	*1) *2)
Lamp Frequency		FI	30	-	80	kHz	*4)
Lamp life time		LT	20,000	-	-	Hr	*1) *2) *3)IL=5.5mA，operation
Turn on and off life		-	100,000	-	-	Times	*1) *2) *3)IL=5.5mA，operation，time cycle 30s
Start Lamp Voltage	Ta=0℃	-			1050	Vrms	*5)
	Ta=25℃				800		
Power Consumption		PBL		(2.2)	-	Watt	VL*IL，IL=5.5mA/1 Lamp

[Note]

*1) Table of specifications are definition of single lamp.
*2) Lamp Current measurement method (The current meter is inserted in cold line)



*3) Definition of the lamp life time：Luminance(L) under 50% of specification starting lamp voltage.
*4) 1.Frequency in this range can mala the characterisitics of electric and optics maintain in ±10% except hue.
2.Lamp frequency of inverter may produce interference with horizontal synchronous frequency (or vertical synchronous frequency),and this may cause ripple noise on the display. Therefore, please adjust inverter

frequency, and keep inverter as far from module as possible or use electronic shielding between inverter and module to avoid the interference.

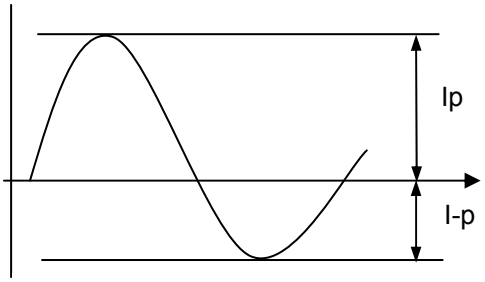
*5) 1.Starting Lamp Voltage: Vs = initial value Vs

2.Definition of starting lamp voltage means max. voltage of starting lamp. We suggest the inverter starting voltage greater then max. voltage of starting lamp to certify starting lamp stability.

*6) 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：＜√2 ±10 %



I p：high side peak

I-p：low side peak

A：The degrees of unbalance = ｜Ip – I-p｜/ Irms ×100 (%)

B：The ratio of wave height = Ip (or I-p) / Irms

4. INTERFACE CONNECTION

4.1 CN1(Liquid crystal)

Pin NO.	SYMBOL	DESCRIPTION
1	V_{SS}	Ground
2	V_{SS}	Ground
3	NC	No Connection
4	V_{CC}	Power Supply
5	V_{CC}	Power Supply
6	V_{CC}	Power Supply
7	V_{CC}	Power Supply
8	NC	No Connection
9	DE	Data Enable Timing Signal
10	V_{SS}	Ground
11	V_{SS}	Ground
12	V_{SS}	Ground
13	B5	Blue Data 5 (MSB)
14	B4	Blue Data 4
15	B3	Blue Data 3
16	V_{SS}	Ground
17	B2	Blue Data 2
18	B1	Blue Data 1
19	B0	Blue Data 0 (LSB)
20	V_{SS}	Ground
21	G5	Green Data 5 (MSB)
22	G4	Green Data 4
23	G3	Green Data 3
24	V_{SS}	Ground
25	G2	Green Data 2
26	G1	Green Data 1
27	G0	Green Data 0 (LSB)
28	V_{SS}	Ground
29	R5	Red Data 5 (MSB)
30	R4	Red Data 4
31	R3	Red Data 3
32	V_{SS}	Ground
33	R2	Red Data 2
34	R1	Red Data 1
35	R0	Red Data 0
36	V_{SS}	Ground
37	V_{SS}	Ground
38	DCLK	Data Clock
39	V_{SS}	Ground
40	V_{SS}	Ground

Remarks:
1) NC Pin must be retain, this pin can't contact GND or other signal.
2) GND Pin must ground contact，can not be floating.

4.2 CN2(Back Light)

Input connector type for back light : BHSR-02VS-1(JST)

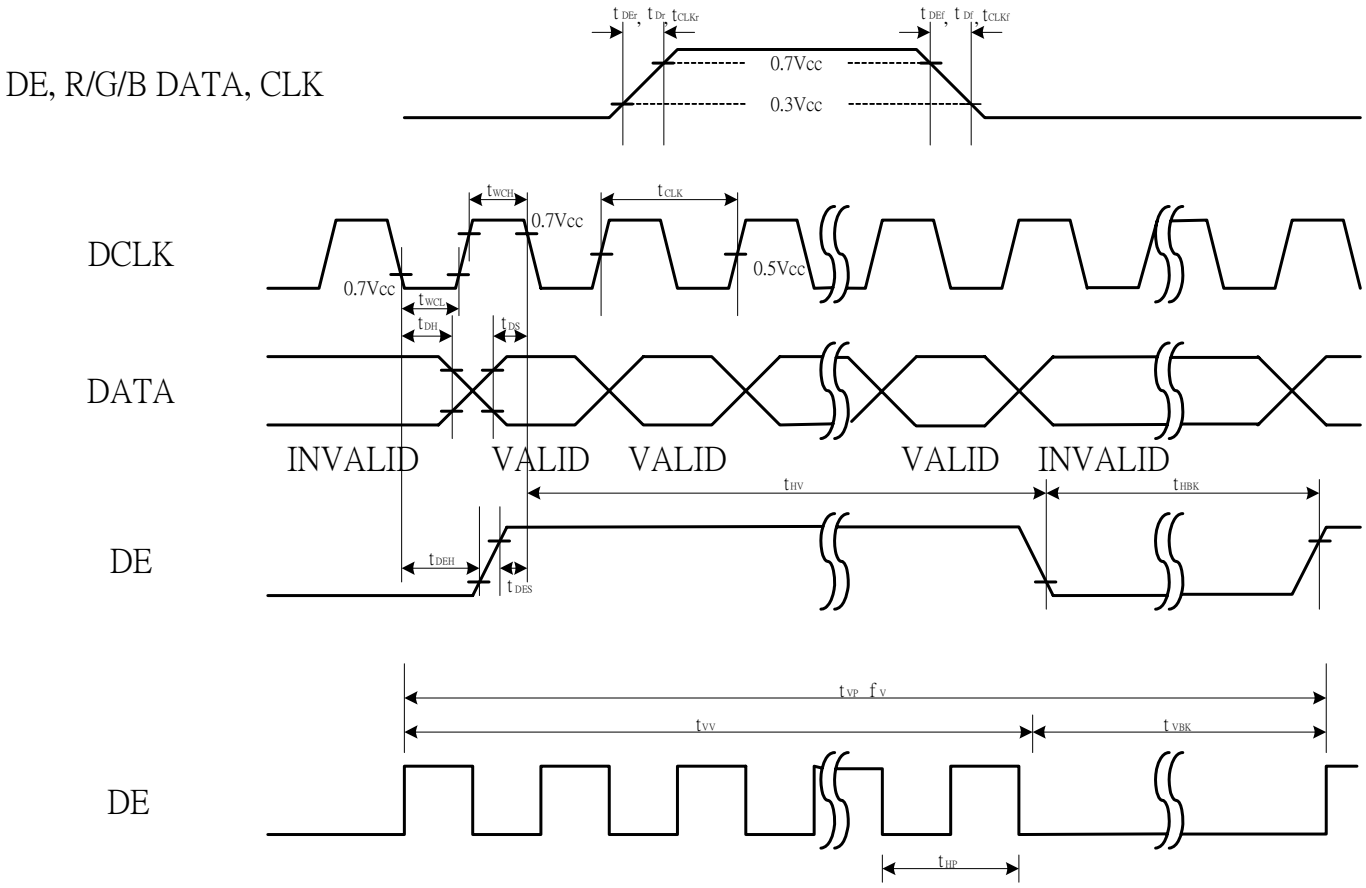
Output connector type for Inverter: SM02B-BHSS-1-(JST)

Pin No.	Symbol	function
1	CTH	VBLH(High-Voltage)
2	CTL	VBLL(Low-Voltage)

[Note]:VBLH-VBLL=VL

5. INPUT SIGNAL(DE ONLY MODE)

5.1 Timing sequence



5.2 Timing Specification(De only mode)

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT
DCLK	Period	t_{CLK}	31	37.0	40.0	ns
	Dot Clock	f_{CLK}	25	27	32.2	MHz
	Rise/Fall Time	t_{CLKr},t_{CLKf}	-	-	10	ns
DE	Setup Time	t_{DES}	5	-	-	ns
	Hold time	t_{DEH}	10	-	-	
	Rise/Fall Time	t_{Der},t_{DEf}	-	-	16	
	Horizontal Period	t_{HP}	850	900	950	t_{CLK}
	Horizontal Valid	t_{HV}		800		
	Horizontal Blank	t_{HBK}	50	100	150	
	Vertical Period	t_{VP}	490	500	520	t_{HP}
	Vertical Valid	t_{VV}		480		
	Vertical Blank	t_{VBK}	10	20	40	
	Vertical Frequency	f_V	55	60	65	Hz
DATA	Setup Time	t_{DS}	5	-	-	ns
	Hold Time	t_{DH}	10	-	-	
	Rise/Fall Time	t_{Dr},t_{Df}	-	-	10	

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
		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

[Note]

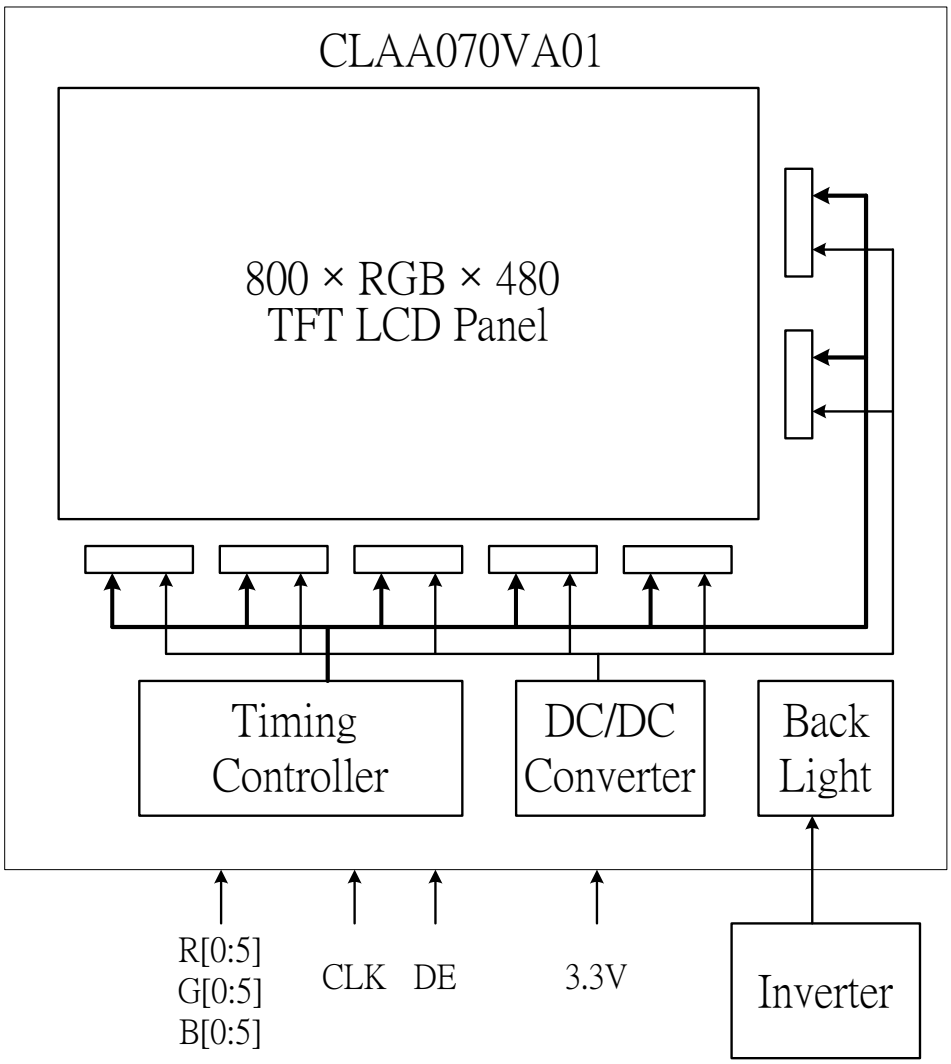
(1) Definition of Gray Scale

color(n)：n is series of Gray Scale

The more n value is, the bright Gray Scale.

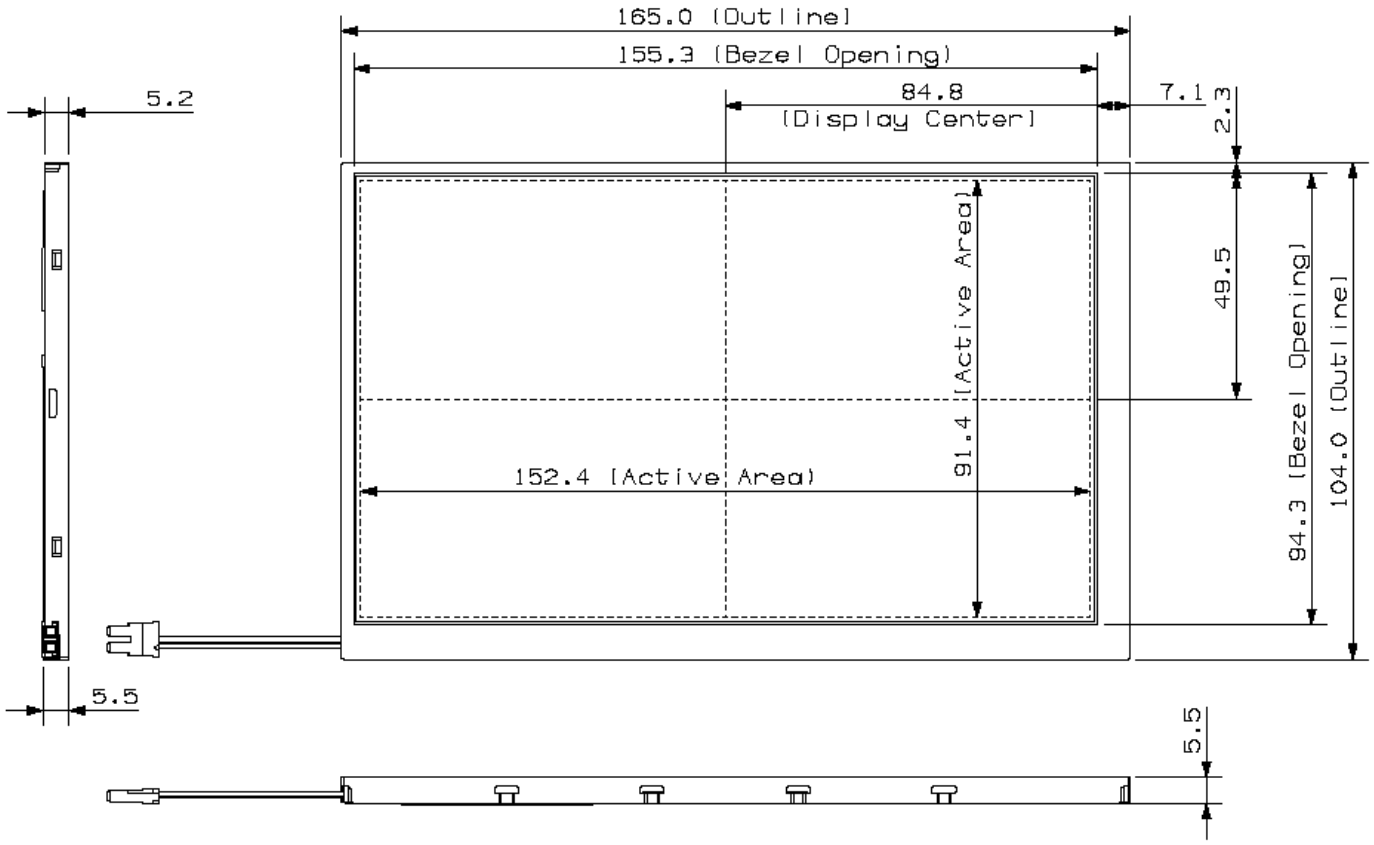
(2)Data:1-High,0-Low

6. BLOCK DIAGRAM



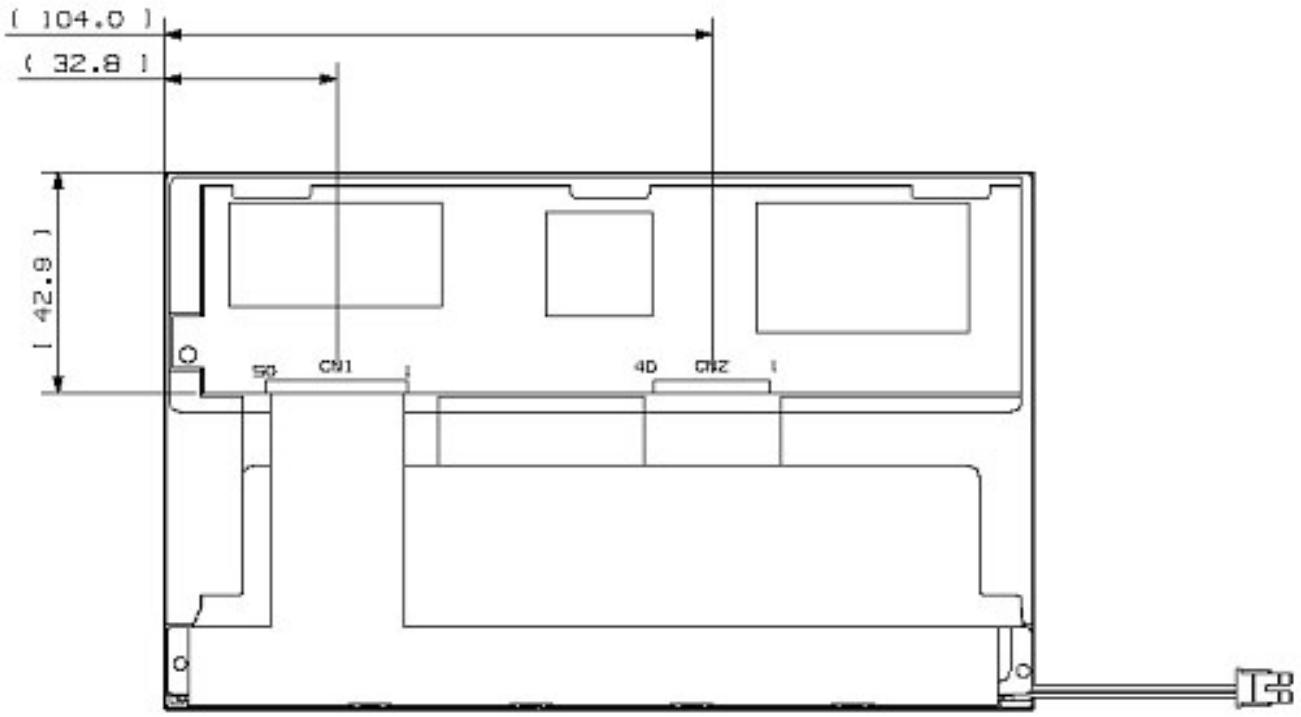
7. MECHANICAL DIMENSION

7.1 Front Side [Unit : mm]



7.2 Rear Side

Length of Lamp wire=60±5mm



CN1 FH19S-50S-0.5SH(Hirose)
CN2 FH19S-40S-0.5SH(Hirose)
CCFL connector: BHSR-02VS-1 (JST)

8. OPTICAL CHARACTERISTICS

VCC=3.3V Ta=25℃

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	Remarks
Constrast Ratio		CR	Point-5	300	400	--	--	*1)*2)*3)
Luminance*)		Lw		185	220	--	cd/m^2	*2)*3)
Luminance Uniformity		ΔL		70	80		%	*2)*3)
Response Time (White - Black)		Tr		--	12		ms	*3)*4)
		Tf			18		ms	
Viewing Angle	Horizontal	ϕ	CR≧10 Point-5	120	140	--	°	*2)*3)
	Vertical	θ		80	100	--	°	*2)*3)
Color Coordinate	White	Wx Wy	. θ=ϕ= 0° Point-5	0.283 0.299	0.313 0.329	0.343 0.359	--	*2)*3)
	Red	Rx Ry		0.550 0.284	0.580 0.314	0.610 0.344		
	Green	Gx Gy		0.271 0.534	0.301 0.564	0.331 0.594		
	Blue	Bx By		0.118 0.093	0.148 0.123	0.178 0.153		

[Note]

- Brightness conditions : I_L = 5.5 mA ,

*1) Definition of contrast ratio：

These items are measured by BM-5A (TOPCON) in the dark room. (no ambient light).
Measure contrast ratio on the below 5 points (refer to figure1, #1~#5 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：

These items are measured by BM-5A (TOPCON) in the dark room. (no ambient light).
Measure white luminance on the same 5 points and take the average value.
Definition of Luminance Uniformity:
These items are measured by BM-5A (TOPCON) in the dark room. (no ambient light)
Measure maximum luminance(L(MAX))and minimum luminance (L(MIN))on the 5 points as figure8-1
Luminance Uniformity is calculated with the following formula ：

△L = [L(MIN)/L(MAX)]×100

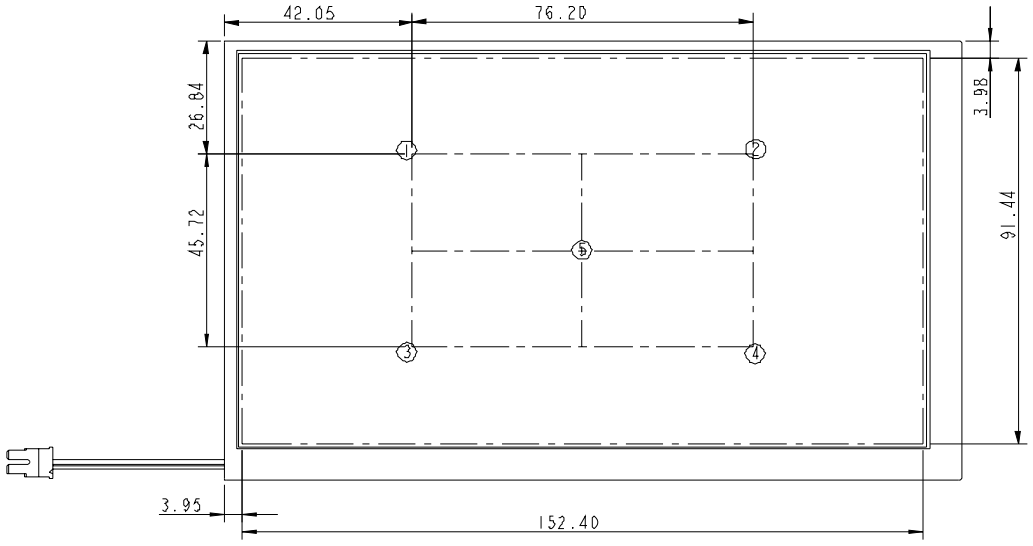


Fig8-1 Measuring point

*3) 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).

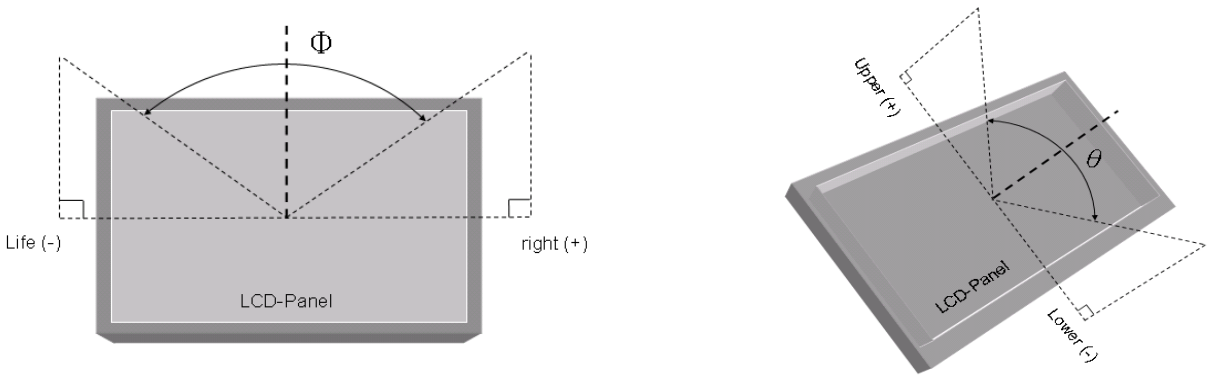


Fig8-2 Definition of Viewing Angle

*4) Definition of Response Time.(White-Black)

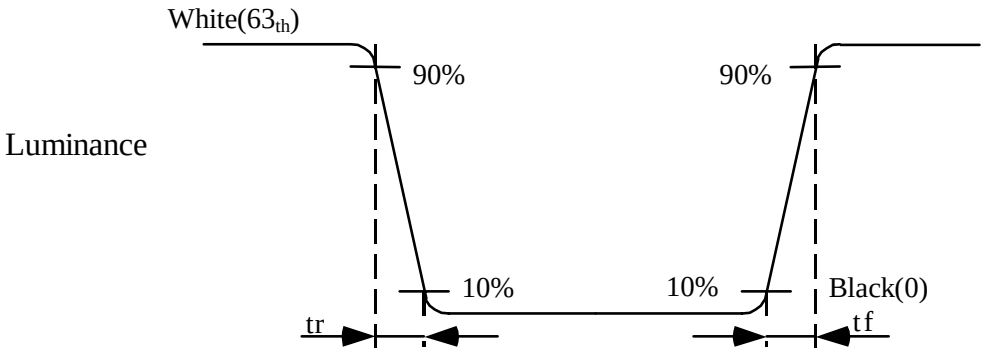


Fig8-3 Definition of Response Time(White-Black)

9. RELIABILITY TEST

9-1. Temperature and humidity

TEST ITEMS	CONDITIONS	REMARK
High Temperature Operation	60℃，240H	
High Temperature Storage	70℃，240H	
High Temperature High Humidity Operation	40℃，90%RH，240H	No condensation
High Temperature High Humidity Storage	60℃，90%RH，48H	No condensation
Low Temperature Operation	0℃，240H	
Low Temperature Storage	-30℃，240H	
Thermal Shock	-20℃（0.5Hr）~ 60℃(0.5Hr) 200 cycles	

9-2. Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	● Shock level:980m/s^2(equel 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)	● Frequency range:8~33.3Hz ● Stoke:1.3mm ● Vibration:sinusodial wave,perpendicularaxis(both x,y,z axis:2Hrs). ● Sweep:2.9G,33.3Hz-400Hz ● Cycle:15min

9-3. 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 trasformation of the module parts should be ignored.

Fail:No display image,obvious non-uniformity,or line defect.

10. HANDLING PRECAUTIONS FOR TFT-LCD MODULE

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

(A) 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.

(B) 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.

(C) PRECAUTIONS WITHELECTROSTATICS

(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.

(D) 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 90%RH.

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

(E) 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.

(F) 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.)