Chunghwa Picture Tubes, Ltd.
Technical Specification

To :

Date : 2006.01.20

CPT TFT-LCD

CLAA370WA03

ACCEPTED BY：

TENTATIVE

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RECORD OF REVISIONS

Revision No.	Date	Page	Description
0.0	Jan 20,2006		Preliminary Specification (First Draft)

CONTENTS

1. OVERVIEW

CLAA370WA02 is 37” color (94.03cm) TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, LVDS driver ICs, control circuit and backlight. By applying 8 bit digital data, 1366*768, 16.7 million-color images are displayed on the 37” diagonal screen.Inverter for backlight is included in this module. General specification are summarized in the following table:

1.1 GENERAL INFORMATION

Items	Specifications	Unit
Display Area	819.6(H) × 460.8(V) (37.02 inch diagonal)	mm
Number of Pixels	1366(H) × 768(V)	16:9
Pixel Pitch	0.6(H) × 0.6(V)	mm
Bezel Opening Area	826.6 x 467.8	mm
Color Pixel Arrangement	RGB Vertical Strip	
Display Mode	Normally Black	
Number of Colors	16.7M (8bits)	color
Surface Treatment	Hard coating : 2H , Anti-reflective coating <less than 3% reflection.	
Total Module Power	127(B/L with inverter120W at 5.25mA)(Typ.)	W

1.2 MECHANICAL INFORMATION

Items			Min	Typ.	Max.	Unit
Module outline dimension	Horizontal(H)		876.0	877.0	878.0	mm
	Vertical(V)		515.8	516.8	517.8	mm
	Depth(D)	without inverter	---	45.3	---	mm
		with inverter	---	55.5	---	mm
Module Weight			-	12000	-	g

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	REMARK
Power Supply Voltage For LCD	VCC	-0.3	14.0	V	
Input voltage of inverter	VBL	-0.3	27	V	
Inverter dimming	VDIM	-0.3	5.5	Vdc	
Backlight on/off	V_{BLON}	-0.3	5.5	Vdc	
Operation Ambient	T_{op}	0	50	℃	*1) *2) *3)
Storage Temperature	T_{stg}	-20	60	℃	*1) *2)

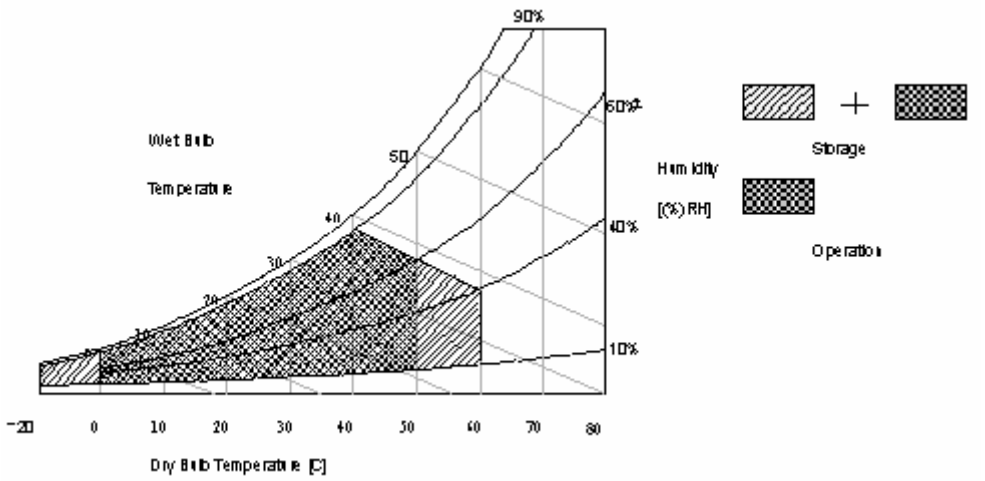
[Note1] The relative temperature and humidity range are as below sketch

Humidity≦85%RH without condensation.

Relative Humidity ≦90% (Ta≦ 40℃) , Wet Bulb Temperature ≦39℃(Ta≧40℃)

[Note2] If you use the product in an environment which's over the definition of temperature and humidity too long,it will effect the result of visual inspection.

[Note3] If you operate the product in normal temperature range, the center surface of panel should be under 60℃.



3. ELECTRICAL CHARACTERISTICS

3.1 TFT-LCD MODULE

Ta=25℃

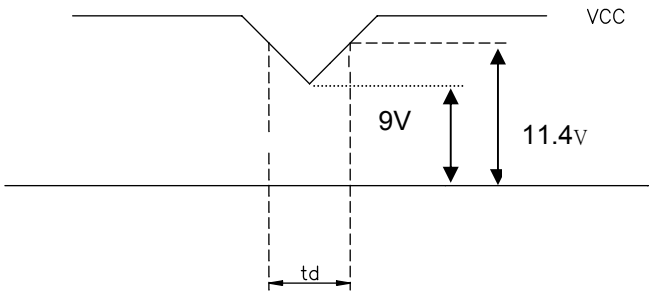
ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Supply Voltage		VCC	11.4	12.0	12.6	V	*1)
Ripple Voltage		Vrpd	--	--	100	mVp-p	VIN=+12.0V
Rush current		Irush	--	--	3	A	*2)
LCD Power Supply Current	White	ICC		540	--	mA	*3)
	Black			400			
	RGB stripe			570			
LCD power consumption		Pc	--	6.84	10	W	
High input voltage of LVDS		V_{IN+}	--	--	100	mV	*4)
Low input voltage of LVDS		V_{IN-}	100	--	--	mV	
Input common voltage of LVDS		VCM	--	1.25	-	V	
Input terminal resist of LVDS		R_T	--	100	--	ohm	

[Note 1] The module should be always operated within above ranges.

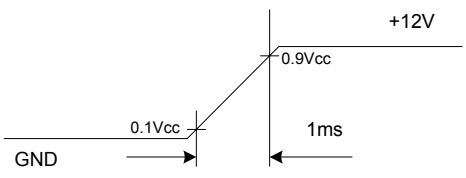
VCC-dip state：

1)When 9V≦VCC＜11.4 V, td≦10 ms.

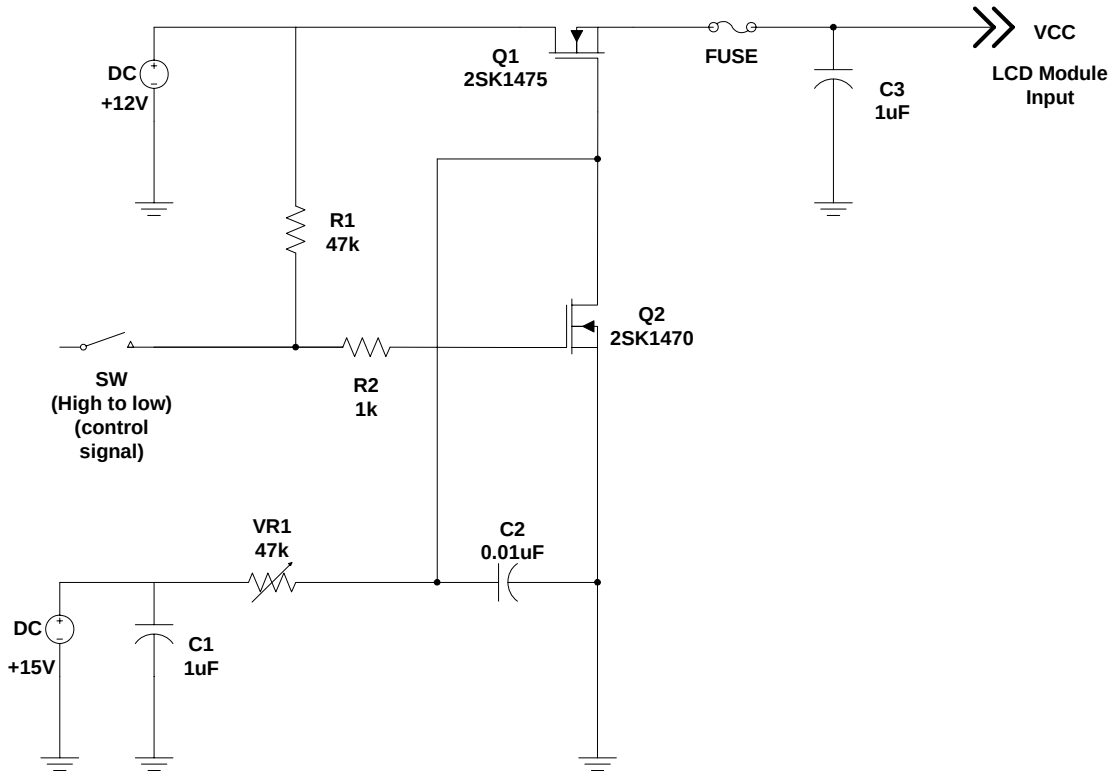
2)VCC ＞ 11.4V, VCC-dip condition should also follow the VCC-turn-off condition.



[Note 2] Measure conditions：



Vcc rising time is 1 ms

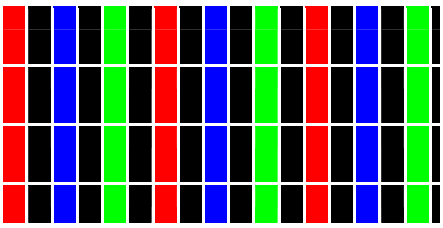


[Note 3] The specified power supply current is under condition at Vcc=12V, Ta=25+/-2℃, f_V=60Hz, whereas a power dissipation check pattern below is displayed.

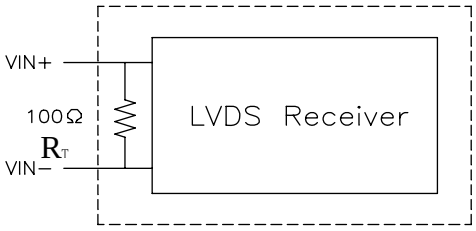
a. White pattern

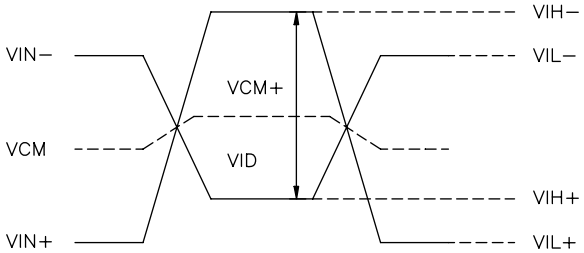
b. Black pattern

c. RGB Stripe pattern



[Note 4] LVDS signal definition ：





VID = VIN_+ – VIN-，△VCM = ｜VCM_+–VCM-｜，

△VID = ｜VID_+–VID-｜，VID+ = ｜VIH_+–VIH-｜，

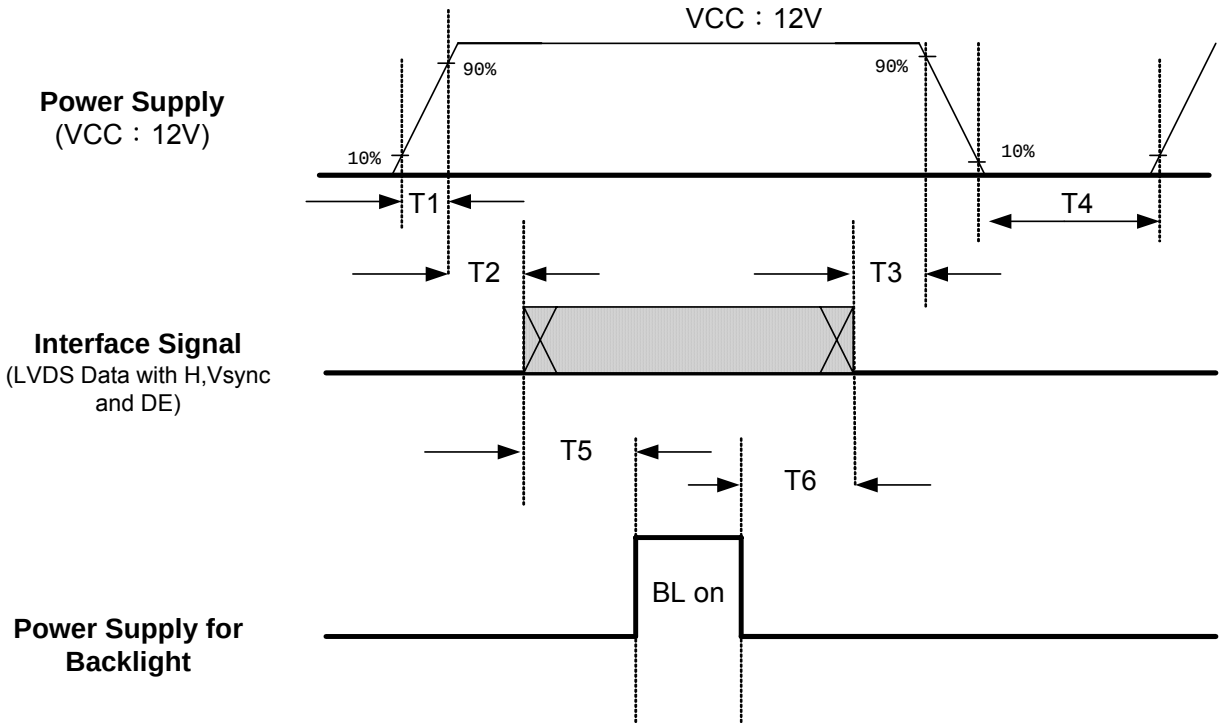
VID- = ｜VIL_+–VIL-｜，VCM = (VIN_++VIN-) / 2，

VCM+ = (VIH_++VIH-) / 2,VCM- =(VIL_++VIL-) / 2

VIN+: Positive differential DATA & CLK input

VIN-: Negative differential DATA & CLK input

3-2 POWER SEQUENCE



Power Sequence

Parameter	Value			Unit
	Min	Typ	Max	
T1	1	---	30	ms
T2	0	---	50	ms
T3	0	---	50	ms
T4	2000	---		ms
T5	1000	---		ms
T6	100	---		ms

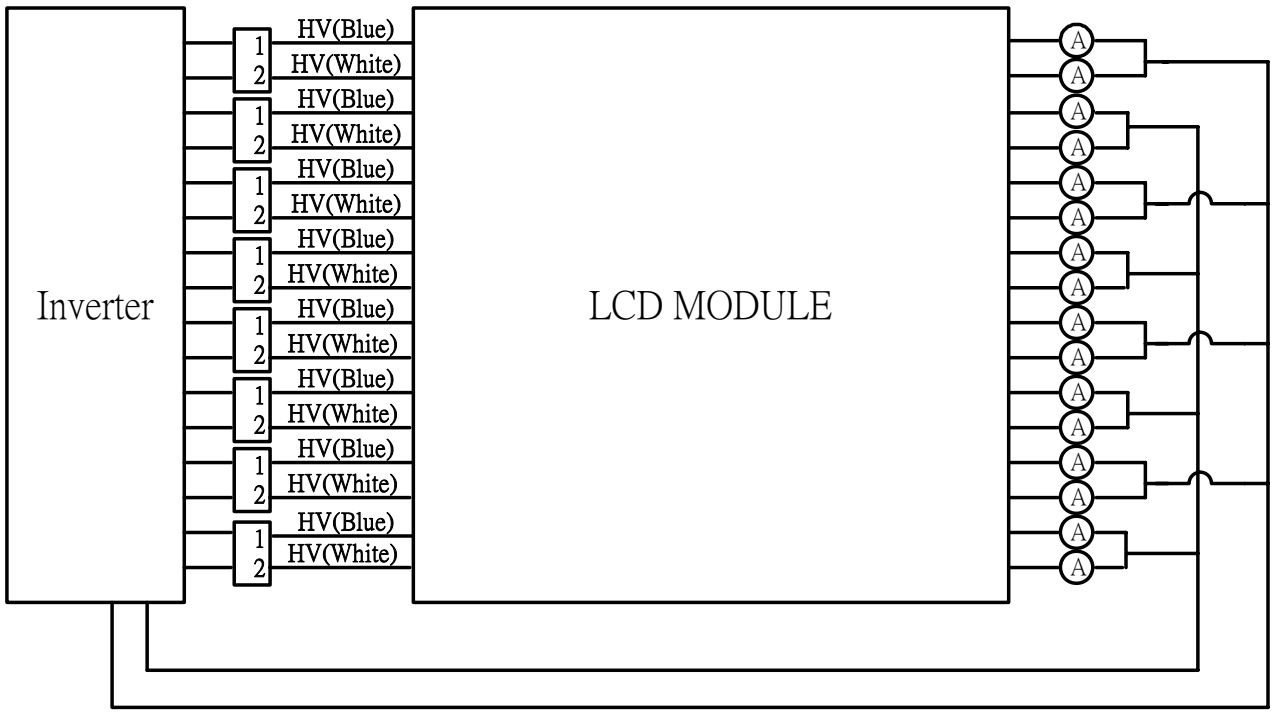
[Note 1] Please avoid floating state of interface signal at invalid period.

[Note 2] When the interface signal is invalid , be sure to pull down the power supply of LCD to 0V.

[Note 3] Lamp power must be turn off after power supply of LCD which the interface signal is valid.

3-3 BACKLIGHT INVERTER UNIT

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Lamp Life Time		LT	50000	--	--	hr	*1)
Input Voltage of Inverter		VBL	21.6	24	26.4	V	*2)
Input Current of Inverter		IIN	--	(5)	(6)	A	*3)
Analog Dimming Control Voltage		Vdim	0	--	3.3	V	*4)
PWM Dimming Control Frequency		Fpwm	100	180	350	Hz	
PWM Dimming Control Voltage		Vdim	2.0	--	3.3	V	High *5)
		Vdim	0	--	0.8	V	Low *5)
PWM select Voltage		Vsel	2.0	--	3.3	V	High *5)
		Vsel	0	--	0.8	V	Low*5)
Inverter Duty Ratio		D	20	--	100	%	
Backlight on /off Control Voltage	ON	VBLON	2.4	--	5	V	
	OFF		0	--	0.8		
Power Consumption (Backlight)		BLW	--	(108)	(132)	W	*3)



[Note 1] Definition of the lamp life time：

When lamp luminance redue to 50% or lower than its initial value.

[Note 2] Ripple voltage that occur at the instant of power-on can’t exceed 30V.

[Note 3] 25℃; Vdim=3.3V(Max.), after power on for 30 Minutes.
[Note 4] Brightness is the darkest when V_{DIM} = 0V ;
Brightness is the brightest when V_{DIM} = 3.3V .
[Note 5] Duty Signal Input with 3.3V TTL specification.

4. INTERFACE PIN CONNECTION

4.1 TFT LCD MODULE

Connector Part No.：20389-030E (I-PEX) or FI-X30SSL-HF(JAE) or compatible

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	VCC	Power supply: +12V	
2	VCC	Power supply: +12V	
3	VCC	Power supply: +12V	
4	VCC	Power supply: +12V	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	DMS	LVDS Data Mapping Select	*1)
10	Reserved	N.C.	
11	GND	Ground	
12	RxIN0-	Data-	
13	RxIN0+	Data+	
14	GND	Ground	
15	RxIN1-	Data-	
16	RxIN1+	Data+	
17	GND	Ground	
18	RxIN2-	Data-	
19	RxIN2+	Data+	
20	GND	Ground	
21	RxCLKIN-	Clock-	
22	RxCLKIN+	Clock+	
23	GND	Ground	
24	RxIN3-	Data-	
25	RxIN3+	Data+	
26	GND	Ground	
27	NC	NC	
28	NC	NC	
29	GND	Ground	
30	GND	Ground	

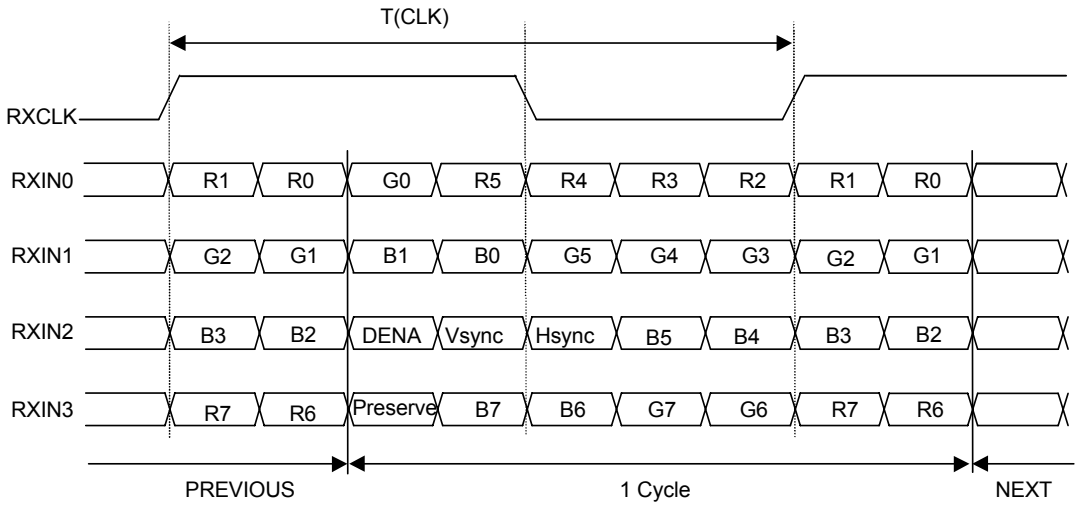
[Note 1] LVDS OPTION PIN 27(DMS)：

DMS(Pin 27)	LVDS format
GND	No-JEIDA
NC	JEIDA

4-2 LVDS DATA MAPPING

1) Pin 27：GND, Non-JEIDA mode

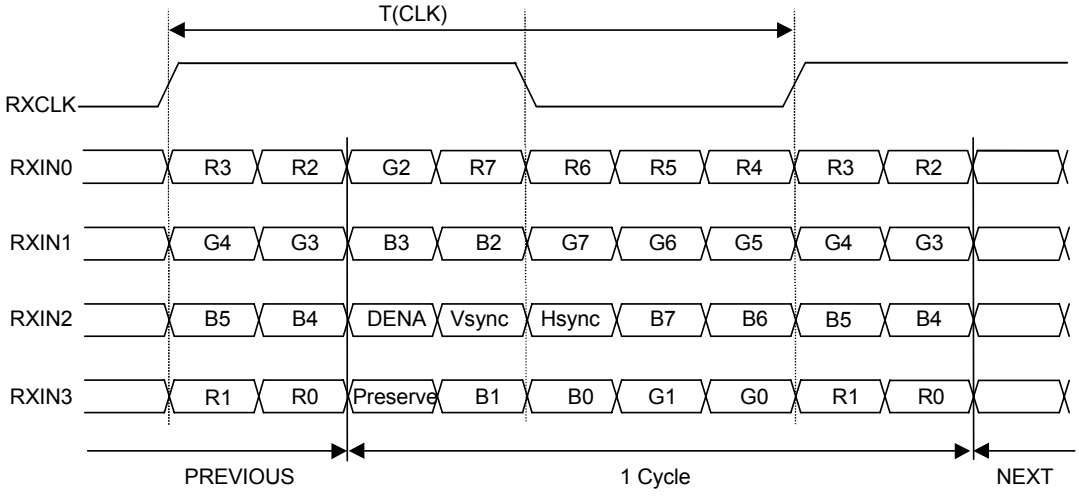
Non-JEIDA SPEC



Note: R/G/B[7]s are MSBs and R/G/B[0]s are LSBs

2) Pin 27：NC, JEIDA mode

JEIDA SPEC



Note: R/G/B[7]s are MSBs and R/G/B[0]s are LSBs

4-3. INVERTER

(1) Inverter – Connector：

1.) Connector(Receptacle)： S14B-PH-SM3-TB(JST) or compatible.

2.) Mating connector(Plug)： PRH-14(JST) or compatible.

PIN No.	SYMBOL	DESCRIPTION	NOTE
1	VBL	Supply Voltage 24V	
2	VBL	Supply Voltage 24V	
3	VBL	Supply Voltage 24V	
4	VBL	Supply Voltage 24V	
5	VBL	Supply Voltage 24V	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	GND	Ground	
10	GND	Ground	
11	NC	NC (Test pin or else)	
12	BLON	B/L On: NC /High(2.4~5.0V) B/L Off: GND (0~0.8V)	
13	VDIM	External PWM or Analog Input (Min.:0V; Max: 3.3V)	*1)
14	PWM -SEL	GND: External PWM Dimming (Pin 13) NC /High : Analog Dimming (Pin 13)	*2)

[Note 1] VDIM is External PWM control or Analog control input; i.e. External PWM should be able to control width of Voltage Burst of inverter output for Lamp Driving. This input can have two types of input; Ordinary default setting will be DC level signal using Saw Tooth Wave control for PWM duty control. The other setting is Duty Signal Input with 3.3V TTL specification. These two methods should be decided by 14th Pin input setting.

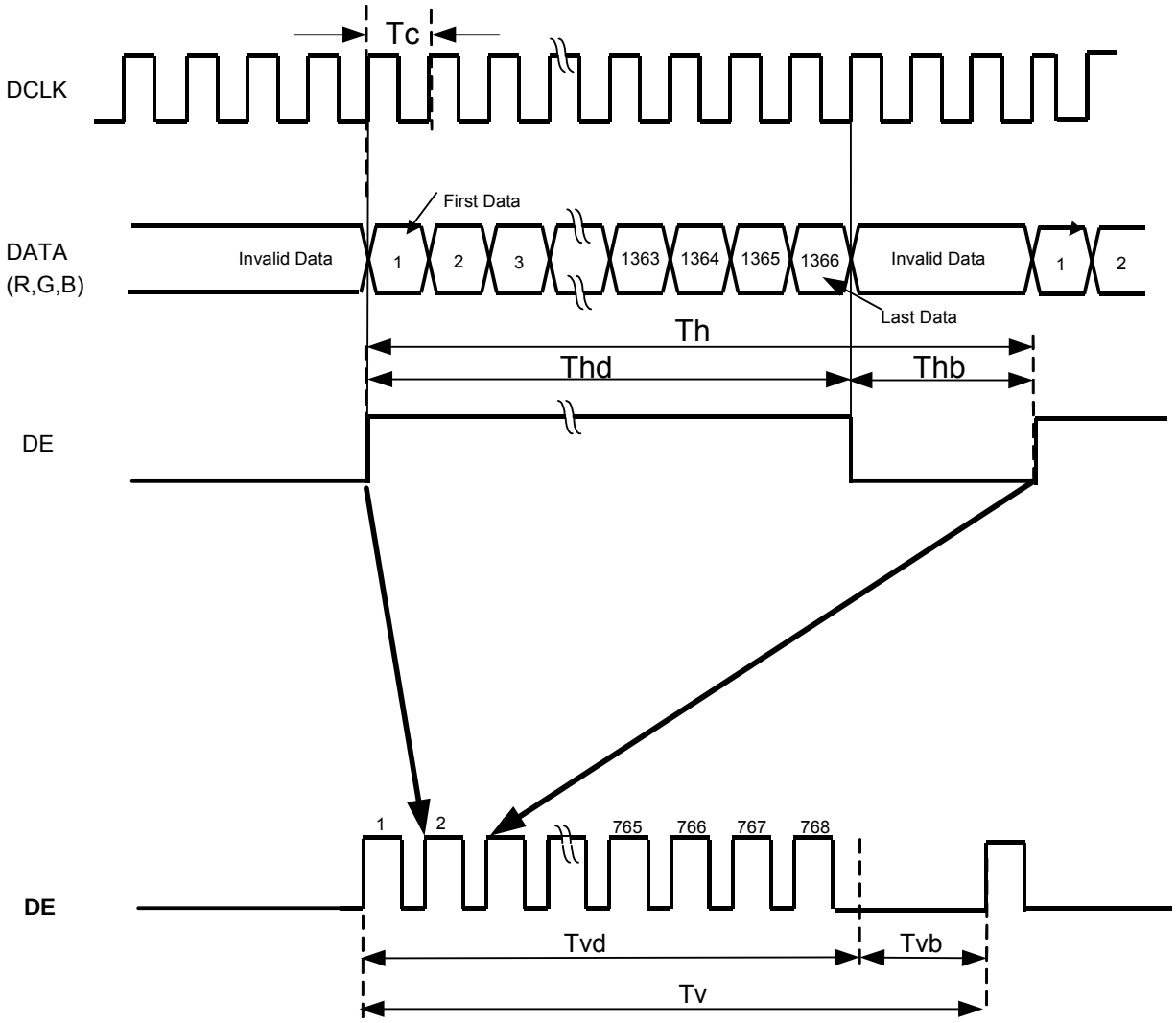
[Note 2] 14th Pin is selection pin for PWM control method; if this pin is connected to GND, VDIM input of 13th Pin should have Logic Level Duty Signal for PWM control. If this is set to High or Open, 13th Pin should have DC level signal.

5. INTERFACE TIMING

5-1 TIMING SPECIFICATION

Signal	Item	Symbol	Min	Typ	Max	Unit	Note
Clock	Frequency	1/Tc	62.7	80	84	MHz	
Vertcial Active Display Term	Frame Rate	Fr	47	60	63	Hz	
	Total	Tv	790	810	888	Th	Tv=Tvd+Tvb
	Display	Tvd	768	768	768	Th	
	Blank	Tvb	22	42	120	Th	
Horizontal Active Display Term	Total	Th	1575	1648	1936	Tc	Th=Thd+Thb
	Display	Thd	1366	1366	1366	Tc	
	Blank	Thb	209	282	570	Tc	

5-2 . TIMING CHART



5-3. COLOR DATA ASSIGNMENT

Color		Input Color Data																							
		Red								Green								Blue							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
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
	Megenta	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(000) Dark	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(001)	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(002)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(253)	1	1	1	1	1	1	0	1	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) Bright	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(000) Dark	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(001)	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(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	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) Bright	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(000) Dark	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(001)	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(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1

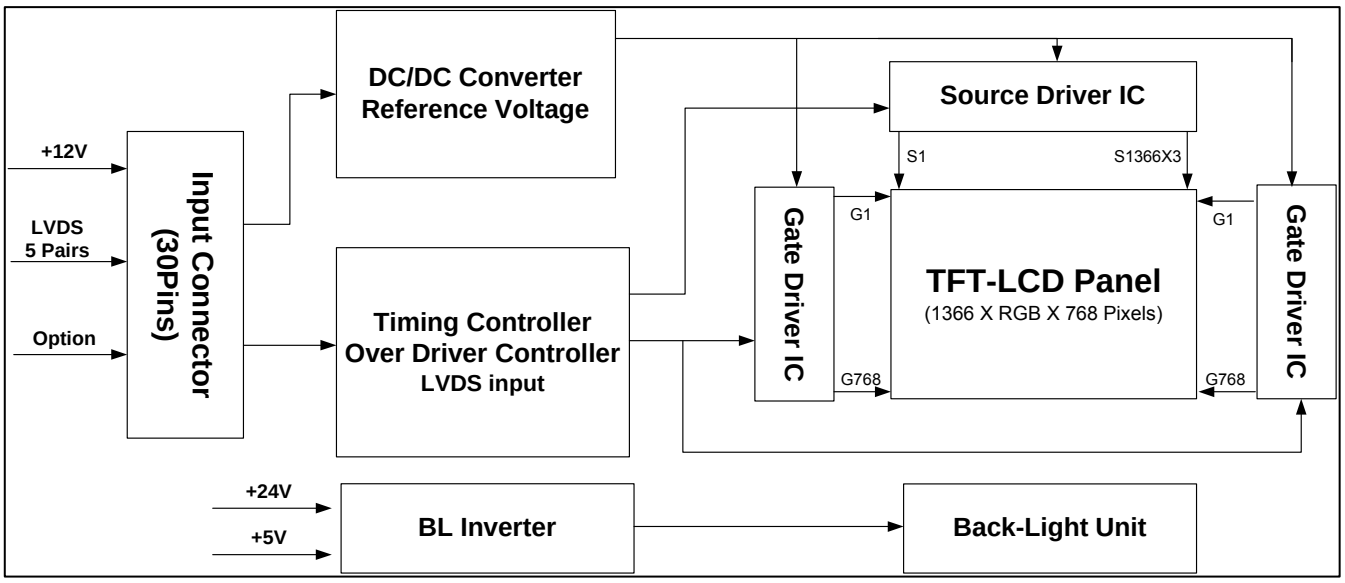
[Note 1] Definition of gray scale

Color (n)：n indicates gray scale level，higher n means brighter level.

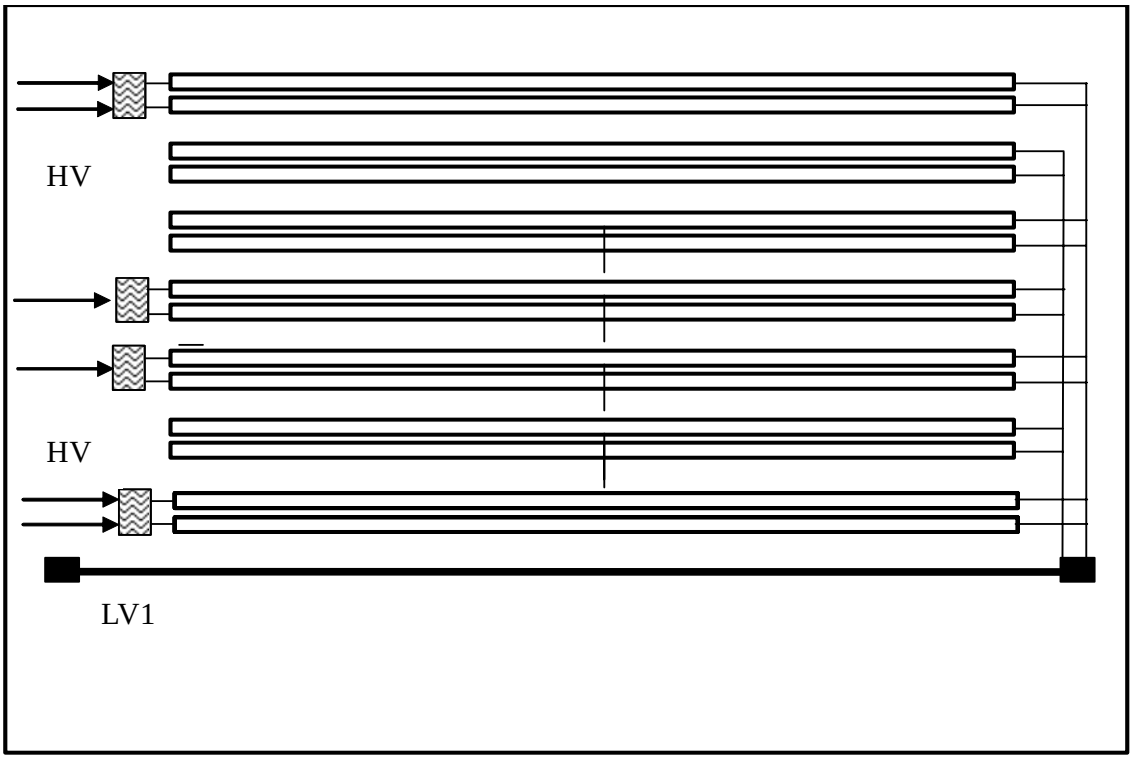
[Note 2] Data：1-High，0-Low

6. BLOCK DIAGRAM

6.1 TFT LCD MODULE



6-2. BACKLIGHT UNIT



[Note 1] Lamp connector

HV(CN2)：BHR-02(8.0)VS-1(JST)*8 or compatible

Mating connector：SM02(8.0)B-BHS-1-TA(JST) or compatible

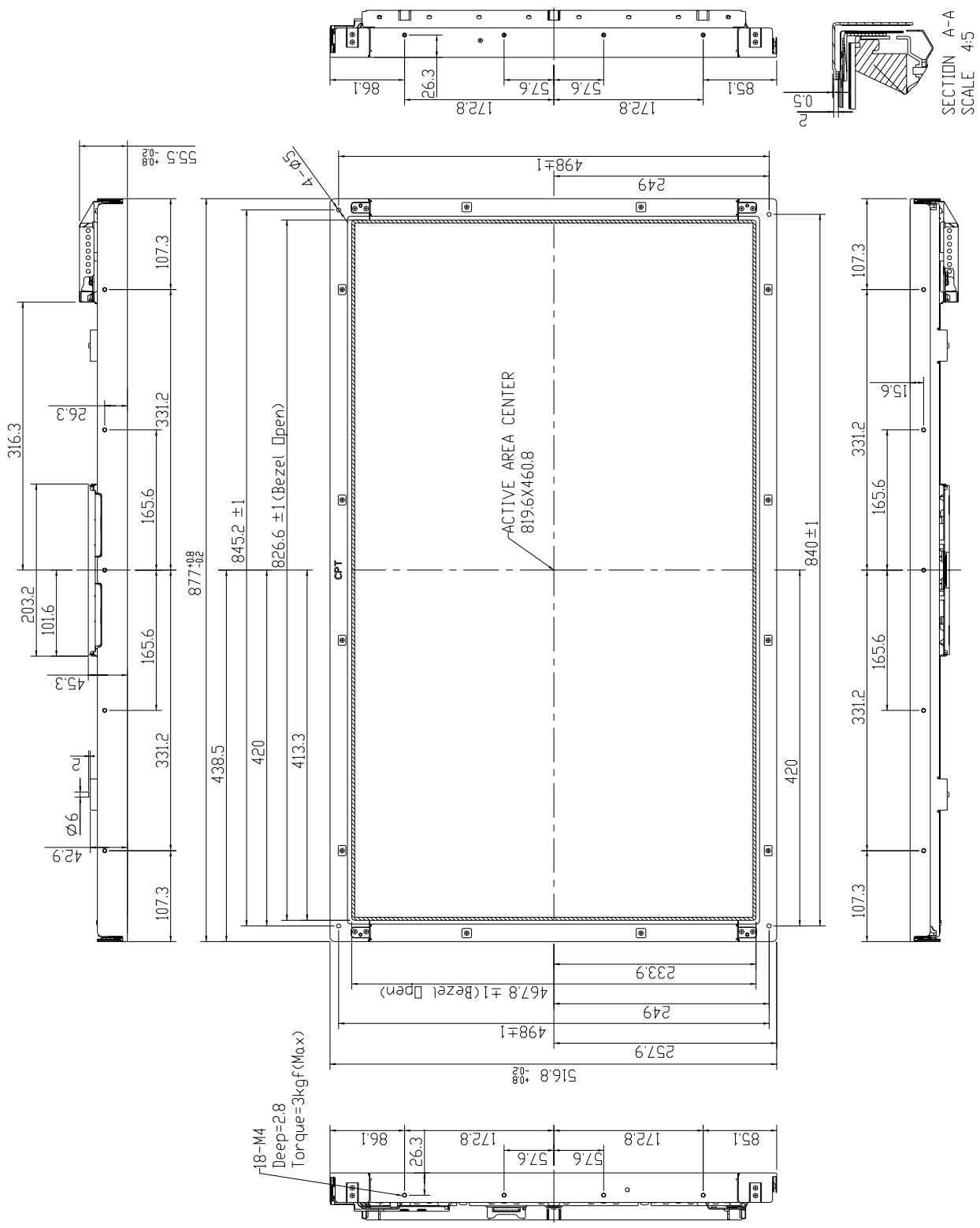
LV1：BHSR-02VS-1(JST) or compatible; Mating connector：SM02B_BHSS-1-TB or compatible

7. MECHANICAL SPECIFICATION

7-1. FRONT SIDE

(include Inverter, if the dimension is not clear,please refer to the table.)

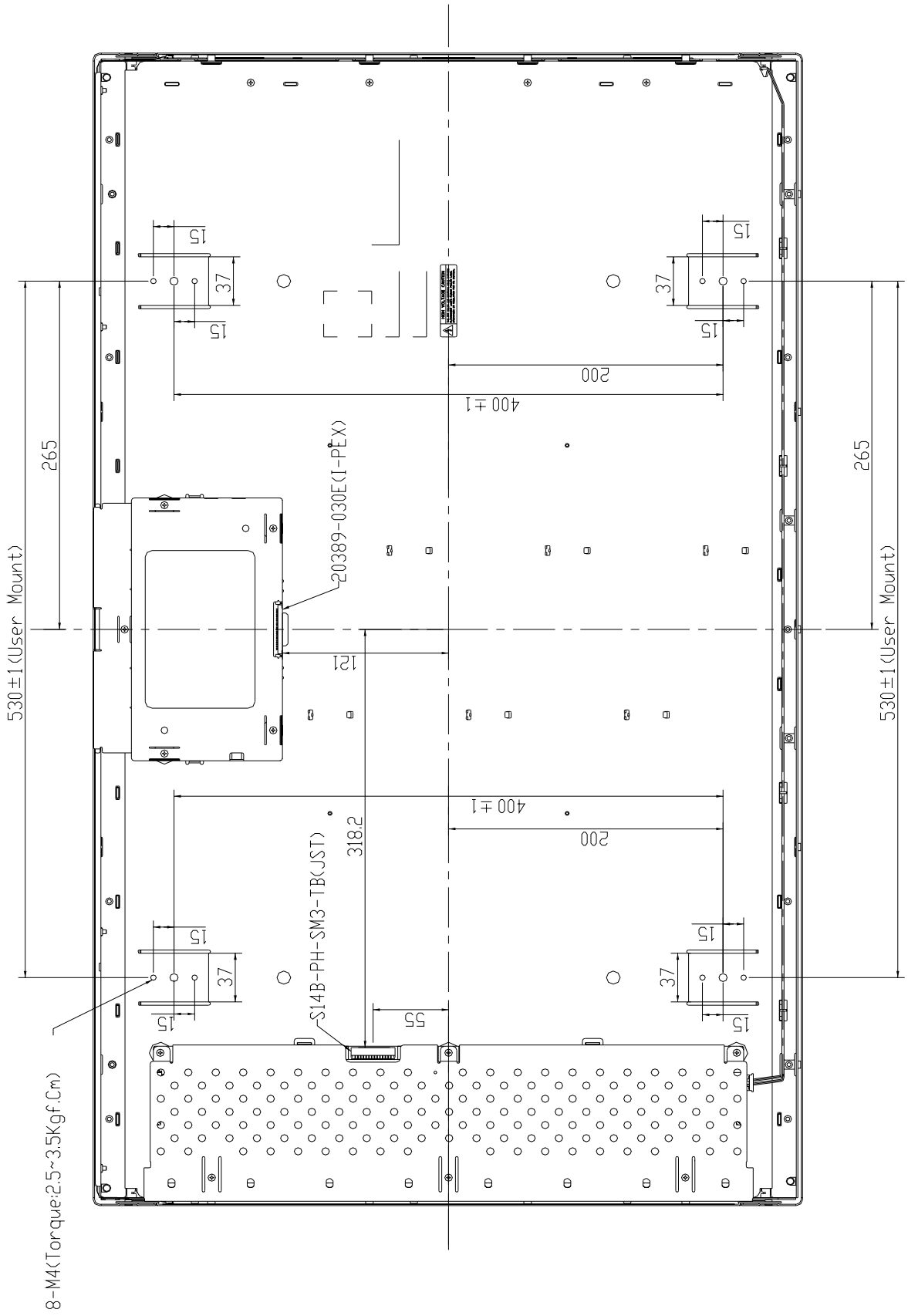
[Unit: mm]



7-2. REAR SIDE

(include Inverter, if the dimension is not clear ,please refer to the table.)

[Unit: mm]



8. OPTICAL CHARACTERISTICS

Ta = 25°C, VCC=12V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast (CEN)		CR	θ=ψ= 0° Point-5	900	1200	--	--	*1)*2)*3)
Luminance	Central luminance	Lwc	θ=ψ= 0°	400	500	--	cd/m^2	*9)
	9P Luminance (AVG)	Lw9	θ=ψ= 0°	--	450	--	cd/m^2	*2)*3)
	Uniformity	△Lw	θ=ψ= 0°	75	--	--	%	*2)*3)
Response Time (White – Black)		tr	θ=ψ= 0°	--	10	17	ms	*3)*4)
		tf	θ=ψ= 0°		6	10	ms	*3)*4)
ResponseTime (Gray to gray)		trg, tfg		--	8	15	ms	*5)
Image sticking		tis	4 h	--	--	3	sec	*6)
View angle	Horizontal	ψ	CR ≧ 20 Point-5	-80~80	-85~85	--	°	*2)*3)
	Vertical	θ		-80~80	-85~85	--	°	*2)*3)
Crosstalk Ratio		CMR	θ=ψ= 0°	--	--	1	%	*3)*7)
Color Chromaticity	Red	Rx Ry	θ=ψ= 0° Point-5		TBD		---	*2)*3)
	Green	Gx Gy			TBD			
	Blue	Bx By			TBD			
	White	Wx Wy		0.253 0.267	0.283 0.297	0.313 0.327		
Color Temperature		Tc		--	9300	--	K	*3)
Color Gamut		CG		--	75	--	%	*8)

[Note]

These items are measured using：BM-5A (TOPCON)

View Angle：EZ contrast XL-88，Response Time：Westar TRD-100

[under the dark room condition (no ambient light).]

Definition of these measurement items is as follows：

[Note 1] Definition of Contrast Ratio：

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

[Note 2] Definition of Luminance and Luminance uniformity and Contrast and the Deviation of Color Coordinate：

Luminance and Contrast：To measure at the center position “5” on the screen (NO.5)，see Fig.8-1 below.

Luminance Uniformity：Lw (MAX) and Lw (MIN) are the maximum and minimum luminance value measure at the position “1~5” on the screen (NO.1~5)，see Fig.8-1 and below show equation：

$$\Delta Lw = [Lw(MIN)) / Lw(MAX)] \times 100\%$$

The Deviation of Color Coordinate：To measure at the position “1~9” on the screen (NO.1~9)，see Fig.8-1 below.

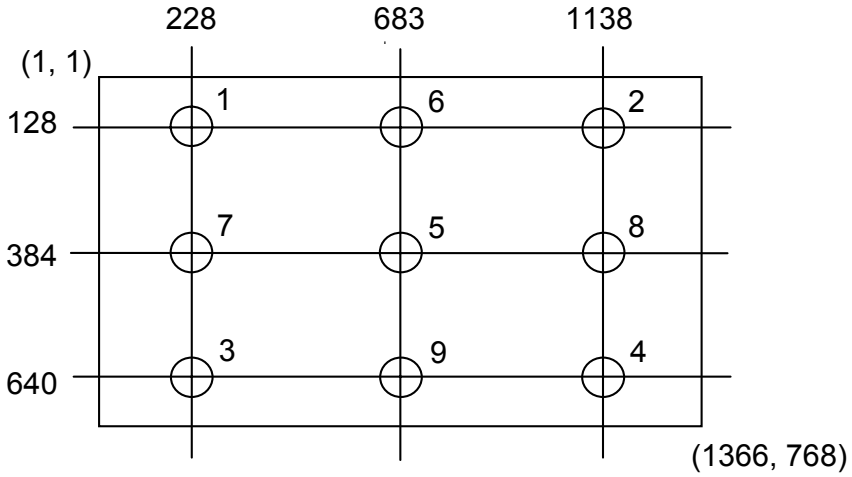


Figure 8-1. Measurement positions

[Note 3] Definition of Viewing Angle (θ，ψ)：

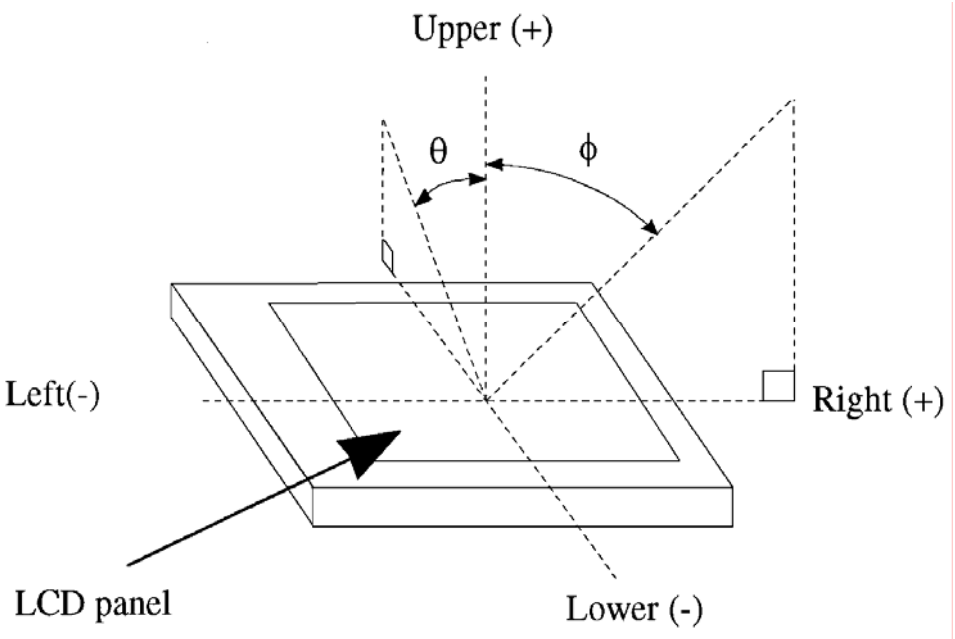


Figure 8-2. Definition of Viewing Angle

[Note 4] Definition of Response Time (White – Black)

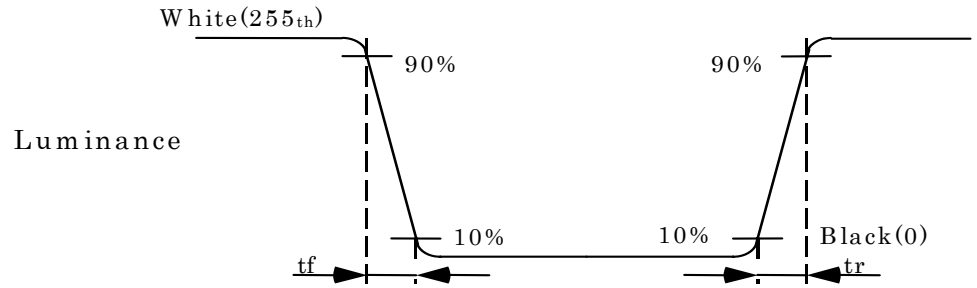


Figure 8-3. Definition of Response Time (White – Black)

[Note 5] Definition of Response Time (Gray to Gray Average)

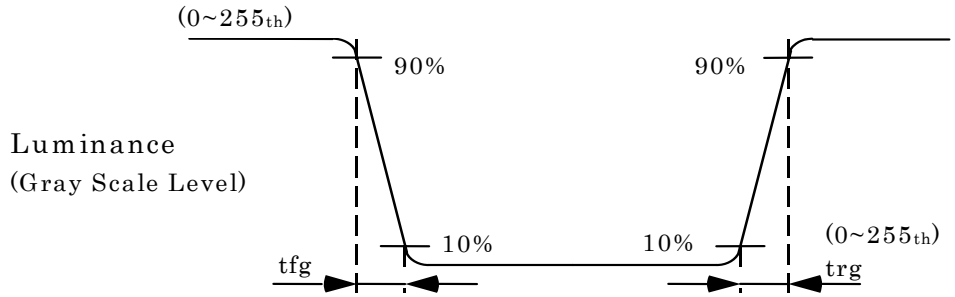


Figure 8-4. Definition of Response Time (Gray Scale Level)

The driving signal time means the signal of gray level 0、31、63、95、127、159、191、223、255.

Gray to Gray Average means the average switching time of gray level 0、31、63、95、127、159、191、223、255 to each other.

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance，the measurement should be executed after lighting backlight for 1 hour in a windless room.

[Note 6] Image sticking test method：

Continuously display the test pattern shown in the figure below for specified time. To change the module frame to gray pattern (gray 120 pattern) , and it's displaying grade still under specfication.

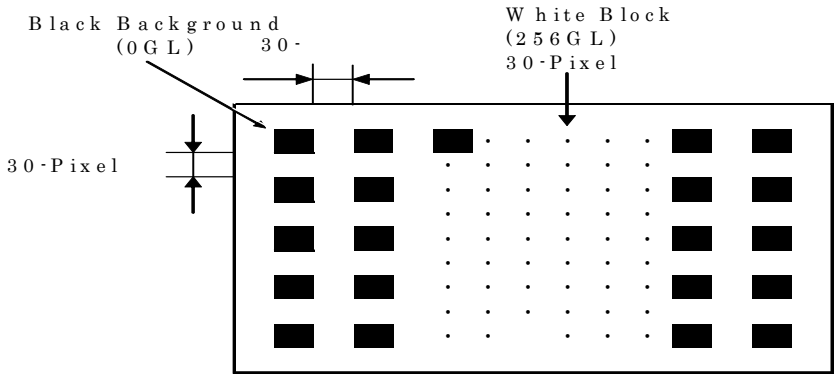


Figure 8-5. The pattern of image sticking test

[Note 7] Definition of Cross Talk Ratio

CMR = MAX (*(| (LB1 - LA) / LC |) × 100%* ， *(| (LB2 - LA) / LC |) × 100%*)

LA： Pattern A(Half-Tone pattern) Measure point Luminance

LB1，LB2： Pattern B1、Pattern B2 Measure point Luminance

LC： Pattern C(white pattern) Measure point Luminance

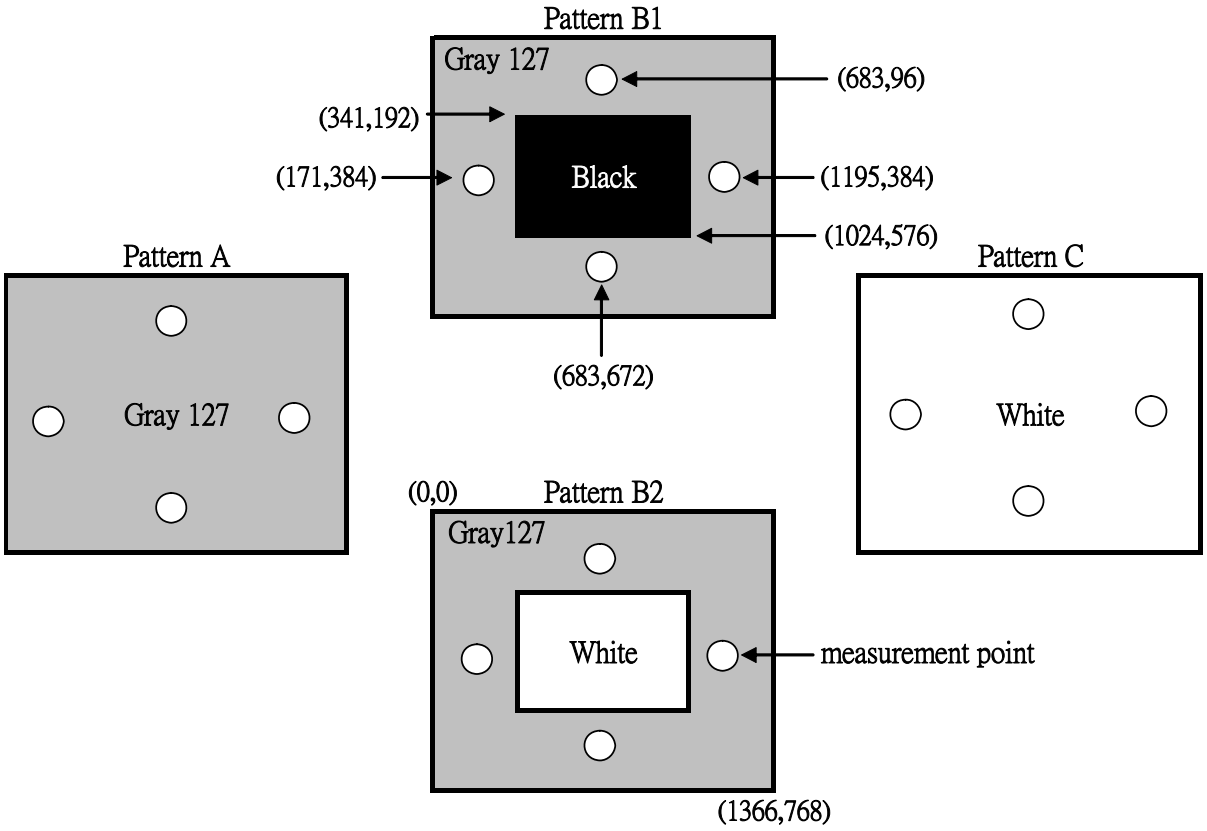


Figure 8-6. The pattern of cross talk test

[Note 8] Definition of Color Gamut:

To measure RGB three sub-pixels color gamut coordinate at CIE coordinate chart from the center of module , to form a triangle area = A_{RGB}.

RGB three sub-pixels of NTSC at CIE coordinate chart to form a triangle area = N_{RGB}.

$$CG = \frac{A_{RGB}}{N_{RGB}} \times 100$$

[Note 9] Definition of Central Luminance:

After lighting on the panel 30 minute, you can proceed the Central Luminance testing.

The definiton of TYP value is under status of Inverter Dimming Voltage=5V.

9. RELIABILITY TEST CONDITIONS

9.1 TEMPERATURE AND HUMIDITY

TEST ITEMS	CONDITIONS
High Temperature Operation	50℃；240hrs
High Temperature Storage	60℃；240hrs
High Temperature High Humidity Operation	50℃；90% RH；240 hrs (No condensation)
Low Temperature Operation	0℃；240 hrs
Low Temperature Storage	-20℃；240 hrs
Thermal Shock	Between -20℃(1hr) and 60℃(1hr)； 50 Cycles

9.2 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：14.7m/s^2(1.5G) zero to peak Waveform：sinusoidal Frequency range：10 to 300 Hz Frequency sweep rate：0.5 octave/min Duration：each x，y，z axis：10 min，total 30 mins

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 transformation of the module parts should be ignored.

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

10. PACKAGING

10.1 PACKING SPECIFICATIONS

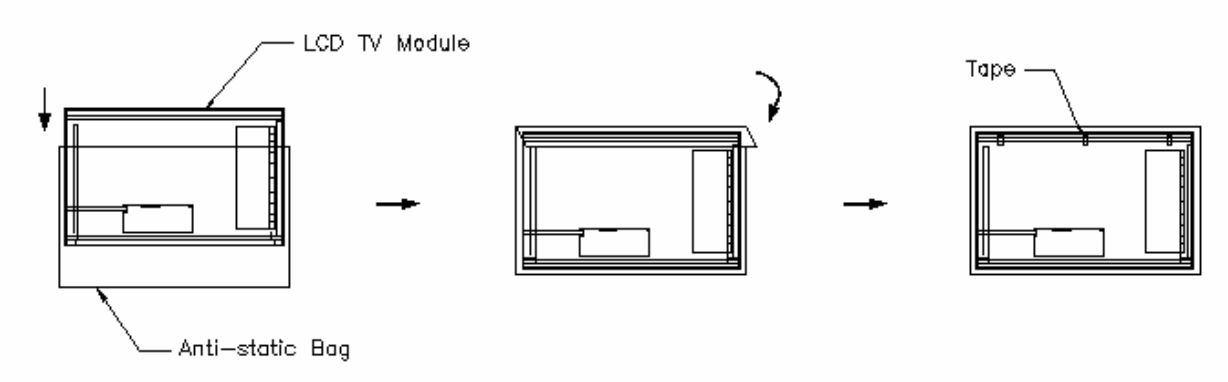
(1) 3 LCD TV modules/1 Box

(2) Box dimensions：1055(L)×315(W)×621(H)

(3) Weight：approximately KG (3 modules per box)

10.2 PACKING METHOD

Fiqure 1 and 2 are the packing method



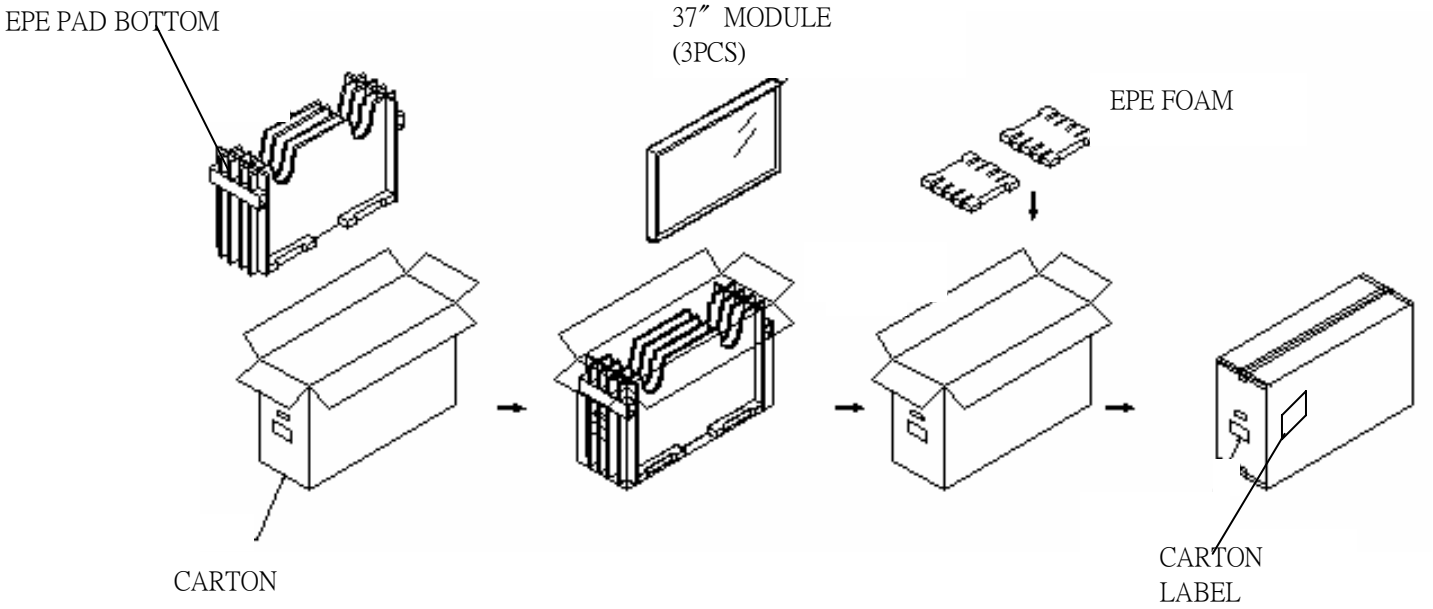


Figure 1 packing method

(1) Corner protector：L1242 x 50mm x 5 mm

(2) Pallet：L1000 x W1150 x H110 mm

(3) Bottom Cap：1000 x W1150 x H130 mm

(4) Pallet Stack：1000 xW1150 x H1375 mm

(5) Gross： kg

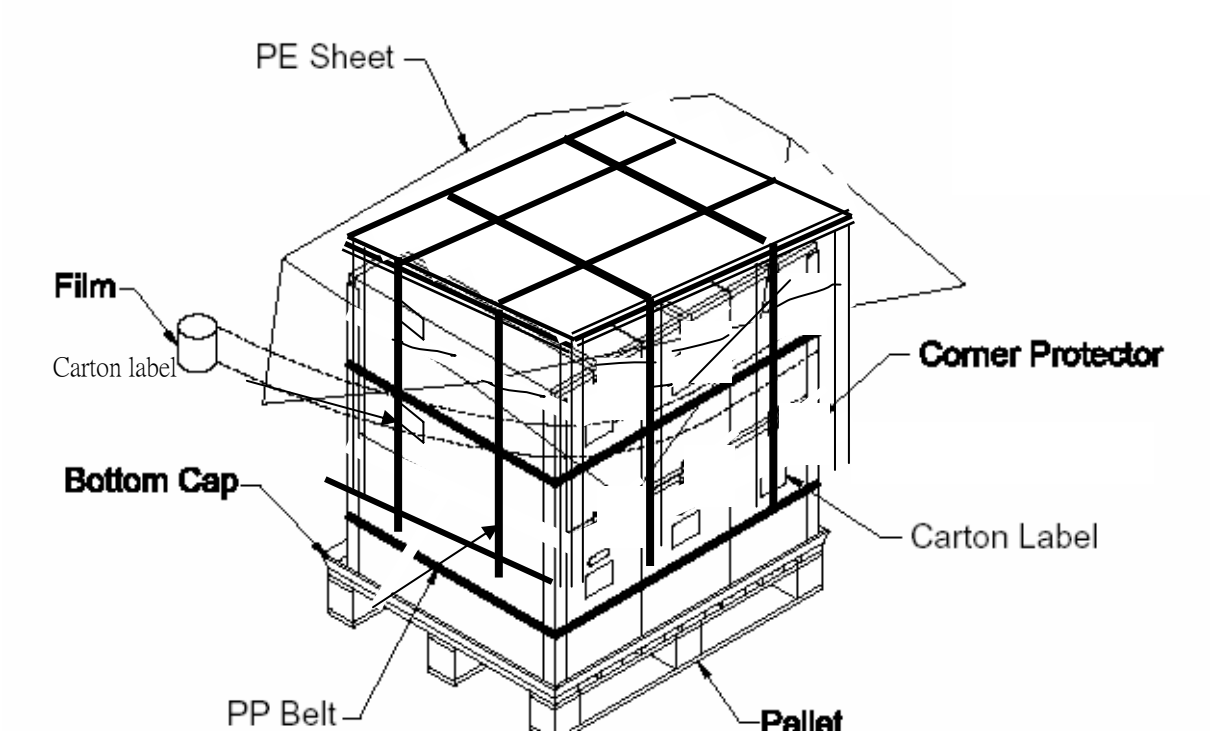


Figure2 packing method

11. DEFINITION OF LABELS

11.1 CPT MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

(a) LABEL：

- Model Name：CLAA370WA03
- Panel ID：XXXXXXXX XXX

CPT Internal Use.

- Product date：X XX XXXX X XXX

Customer NO.
Product Line.
Serial NO.
Week.
Year.

(b) MODULE LABEL :

(c) B/L MAKER LABEL :

(d) DISPOSAL LABEL:

12. HANDLING PRECAUTIONS FOR TFT-LCD MODULE

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

12.1 ASSEMBLY PRECAUTION

(1) Please use the mounting hole on the module side in installing and do not bending 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.

12.2 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.

12.3 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.

12.4 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℃.

12.5 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.

12.6 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 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.)