

Version : 1.0

液晶之友 电话: 020-33819057
Http://www.lcdfriends.com

TECHNICAL SPECIFICATION
MODEL NO.: PD104ST1

Customer's Confirmation

Customer Name _____

Date _____

By _____

PVI's Confirmation

Confirmed By _____

Prepared By _____

PRIME VIEW INTERNATIONAL CO.,LTD.
3,LI SHIN RD. 1,SCIENCE-BASED INDUSTRIAL
PARK,HSINCHU,TAIWAN,R.O.C.
<http://www.pvi.com.tw>

Date: Mar.28, 2002

This technical specification is subject to change without notice.
Please contact with PVI for more detail information about this specification sheet.

TECHNICAL SPECIFICATION**CONTENTS**

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1.Application

This data sheet applies to a color TFT LCD module, PD104ST1.

PD104ST1 module applies to OA product, car TV(must use Analog to Digital drive board), which require high quality flat panel display. If you must use in high reliability environment can't over reliability test condition

Prime View assume no responsibility for any damage resulting from the use of the device which dose not comply with the instructions and the precautions in these specification sheet.

2. Features

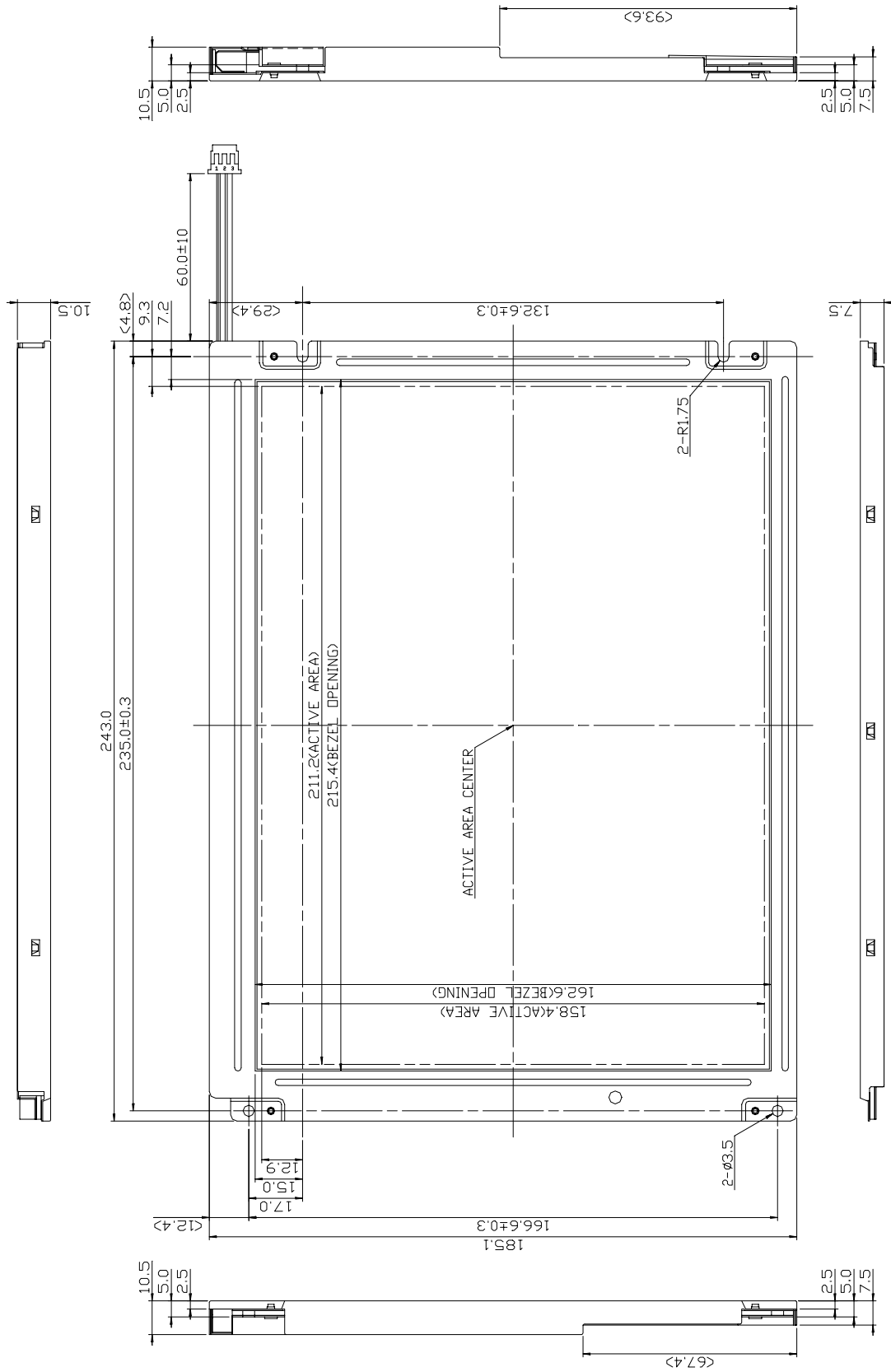
- . Amorphous silicon TFT LCD panel with back-light unit
- . Pixel in stripe configuration
- . Slim and compact, designed for O/A application
- . Display Colors : 262,144 colors
- . Optimum Viewing Direction : 6 o'clock
- . +3.3V DC supply voltage for TFT LCD panel driving
- . Backlight driving DC/AC inverter not included in this module
- . Wide Viewing Angle
- . TTL transmission interface

3.Mechanical Specifications

Parameter	Specifications	Unit
Screen Size	26.4(diagonal)	cm
	10.4 (diagonal)	inch
Display Format	800× (R, G, B)× 600	dot
Display Colors	262,144	
Active Area	211.2(H)× 158.4 (V)	mm
Pixel Pitch	0.264 (H)× 0.264 (V)	mm
Pixel Configuration	Stripe	
Outline Dimension	243 (w)× 185.1(H)× 11(typ.) (D)	mm
Weight	490(typ.),	g
Back-light	CCFL, 2 tubes	
Surface treatment	Anti-glare and hard-coating	
Display mode	Normally white	

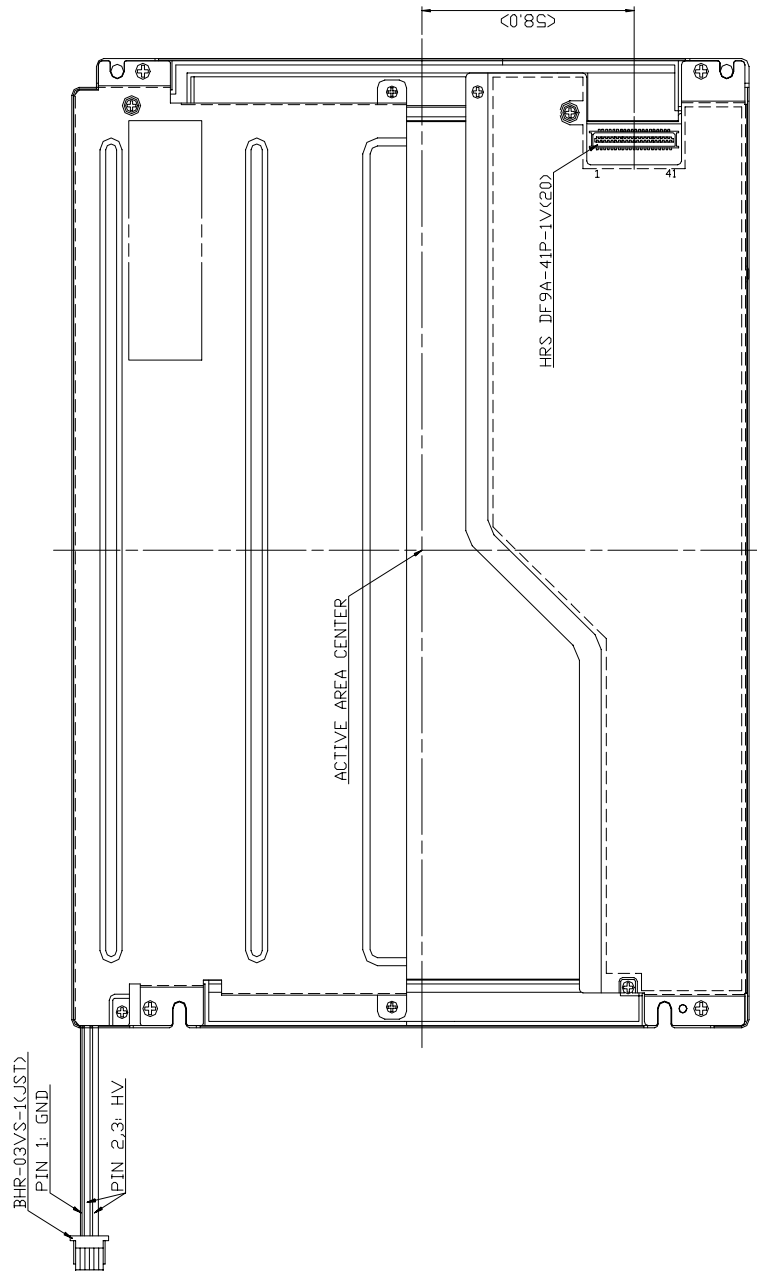
4.Mechanical Drawing of TFT-LCD Module

Outline Drawing : Front View (unit mm)



Outline Drawing : Front View

NOTE
1.GENERAL TOLERANCE : ±0.5



5.Input Terminals

5-1) TFT-LCD Panel Driving

Connector type: UJU 3674A-4101R 41P P=1mm

Pin No.	Symbol	Function	Remark
1	GND	Ground	
2	CLK	Clock	
3	GND	Ground	
4	Hsync	Horizontal sync	
5	Vsync	Vertical sync	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	R0	Red data(LSB)	
10	R1	Red data	
11	R2	Red data	
12	GND	Ground	
13	R3	Red data	
14	R4	Red data	
15	R5	Red data(MSB)	
16	GND	Ground	
17	GND	Ground	
18	GND	Ground	
19	G0	Green data(LSB)	
20	G1	Green data	
21	G2	Green data	
22	GND	Ground	
23	G3	Green data	
24	G4	Green data	
25	G5	Green data(MSB)	
26	GND	Ground	
27	GND	Ground	
28	GND	Ground	
29	B0	Blue data(LSB)	
30	B1	Blue data	
31	B2	Blue data	
32	GND	Ground	
33	B3	Blue data	
34	B4	Blue data	
35	B5	Blue data(MSB)	
36	GND	Ground	
37	NC	No connect	
38	SDS	Scan direction select	Note 5-1
39	Vcc	Power supply	
40	Vcc	Power supply	
41	NC	No connect	

Note 5-1:SDS can change scan direction .
High or open = normal scan, Low = reverse scan

5-2) Backlight driving

Connector type : "BHR-03VS-1" of Japan Solderless Terminal MFG Co. LTD

PIN NO.	Symbol	Description	Remark
1	LV	Ground	White
2	HV	Lamp power input	Pink (or Gray)
3	HV	Lamp power input	Pink (or Gray)

6. Absolute Maximum Ratings:

GND=0V, Ta=25°C

Parameters	Symbol	MIN.	MAX.	Unit	Remark
Supply Voltage	V _{CC}	-0.3	+3.6	V	
Backlight Driving Voltage	V _L	-	2000	V	
Backlight Driving Frequency	F _L	0	100	KHz	
Storage Temperature	T _{ST}	-20	+60	°C	Note 6-1
Operating Temperature	T _{OP}	0	+50	°C	

Note 6-1: Humidity : 90% RH Max. at Ta ≤ 40°C.

Maximum wet-bulb temperature is at 39°C or less at Ta > 40°C and no condensation.

7. Electrical Characteristics

7-1) Recommended Operating Conditions:

GND = 0V , Ta = 25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage	VDD	3.0	3.3	3.6	V	
Current Dissipation	I _{DD}	-	350	450	mA	Note 7-1
Lamp Current	I _{FL}	6.0	14.0	16.0	mA	Note 7-2 Note 7-4
Lamp Voltage	V _L	400	430	530	Vrms	Note 7-2
Lamp Initial Voltage	V _{SFL}	-	-	875	Vrms	at Ta=25°C Note 7-3
		-	-	1300		at Ta=0°C Note 7-3
Lamp Driving Frequency	F _L	30	55	60	KHz	
Lamp power consumption		4	8	11	W	Note 7-4
Lamp Life Time		30000	40000		Hrs	Note 7-5
LCD Panel Life Time(MTBF)			50000		Hrs	

Note 7-1 : To test the current dissipation of VDD, using the “color bars” testing pattern shown as below

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

1. White
2. Yellow
3. Cyan
4. Green
5. Magenta
6. Red
7. Blue
8. Black

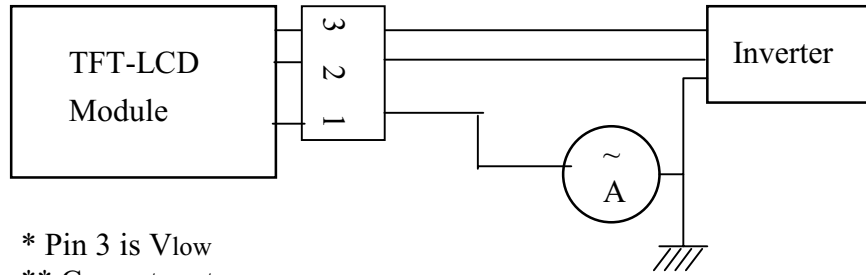
Idd current dissipation testing pattern

Note 7-2 : The back-light driving waveform should be as closed to sine-wave as possible.

In order to satisfy the quality of B/L , no matter use what kind of inverter , the output lamp current must between Min. and Max. to avoid the abnormal display image caused by B/L.

Note 7-3 : Not including the efficiency of backlight DC/AC inverter

Note 7-4 : Lamp current is measured with current meter for high frequency as shown below



* Pin 3 is Vlow
 ** Current meter :
 Yokogawa 2016-01

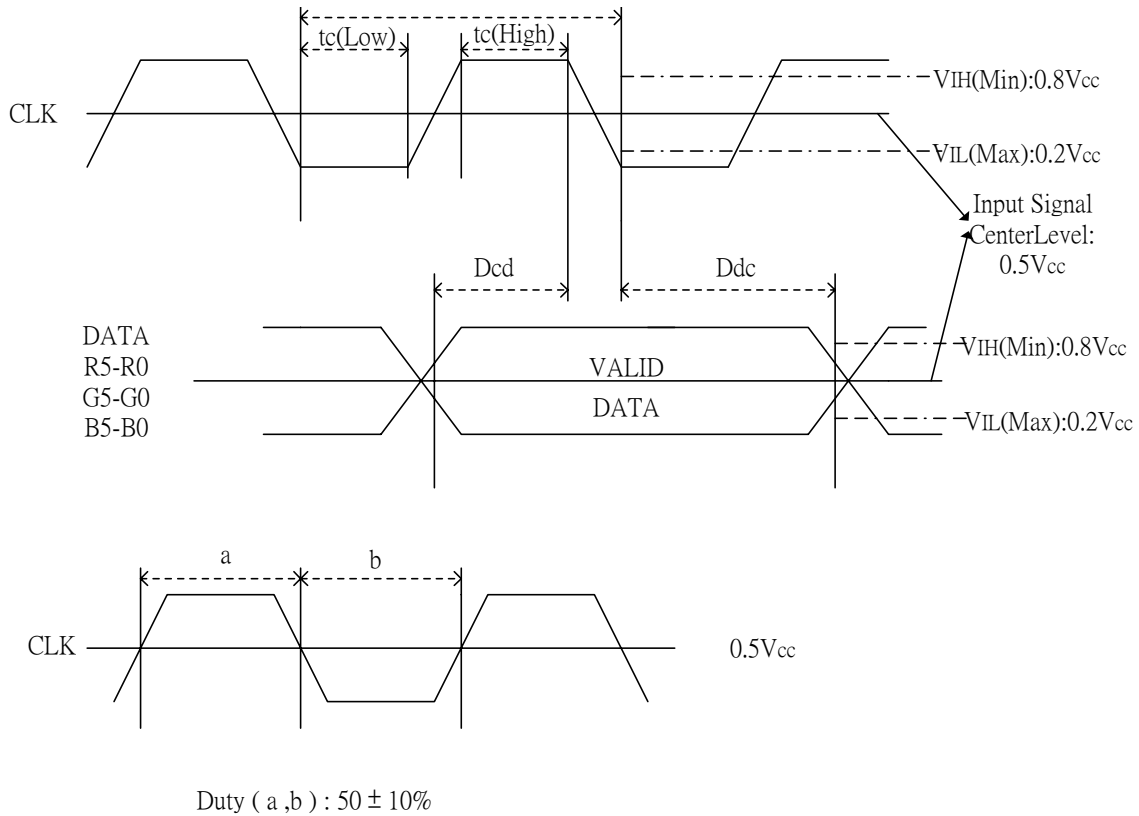
Lamp current dissipation testing configuration

Note 7-5: The life time is determined as the time at which brightness of lamp is 50% compare to that of initial value at the typical lamp current.

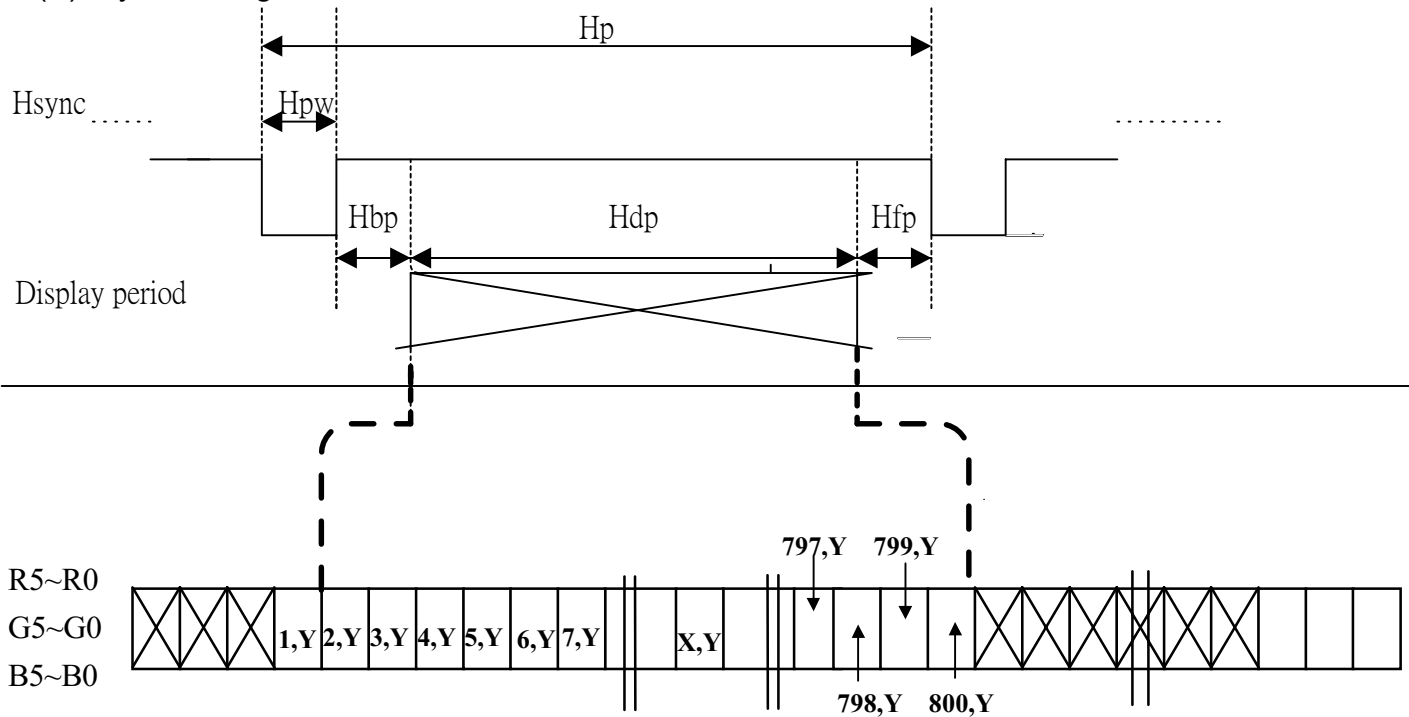
7-2) Input signal timing chart

		Symbol	Min.	Typ.	Max.	Unit	Remarks
Power supply		Vcc	3.0	3.3	3.6	V	
CLK	Frequency	1/tc		40		MHz	40MHz(Typ.)
		tc		25		ns	
		tc(High)		9		ns	
		tc(Low)		9		ns	
Hsync	Period	Hp		26.4		us	
				1056		tc	
	Display period	Hd		800		tc	
	Pulse width	Hpw	12	128	128	tc	
	Back-porch	Hbp	86	86	202	tc	
	Front-porch	Hfp		42		tc	
	Hpw+Hbp			214		tc	
	Hsync-CLK	Hhc	10		Tc-10	ns	
Vsync-Hsync	Hvh	2		Hp-2	tc		
Vsync	Period	Vp		16.579		ms	60.3Hz(Typ.)
			628	628	780	Hp	
	Display period	Vdp		600		Hp	
	Pulse width	Vpw	1	4	4	Hp	
	Back-porch	Vbp	22	22	25	Hp	
	Front-porch	Vfp	2	2	754	Hp	
Vpw+Vpb			26		Hp		
DATA R0~R5 G0~G5 B0~B5	CLK-DATA	Dcd	10			ns	
	DATA-CLK	Ddc	7			ns	

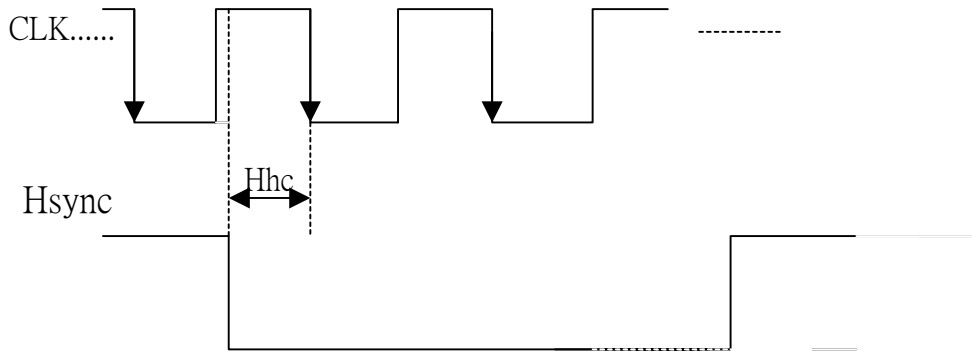
(A) CLK,DATA relationship



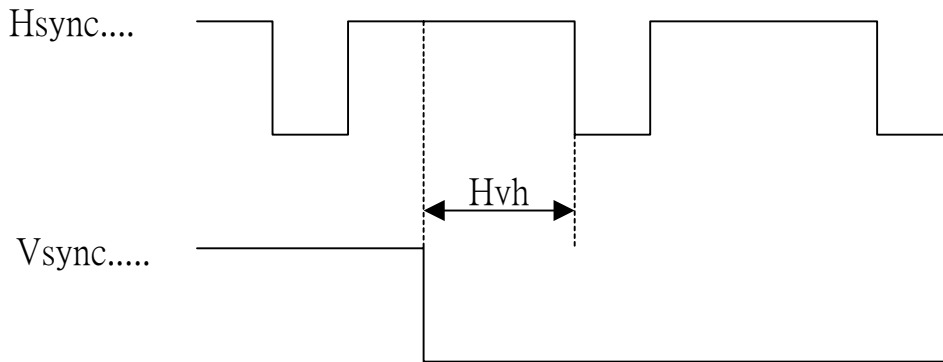
(B)Hsync Timing



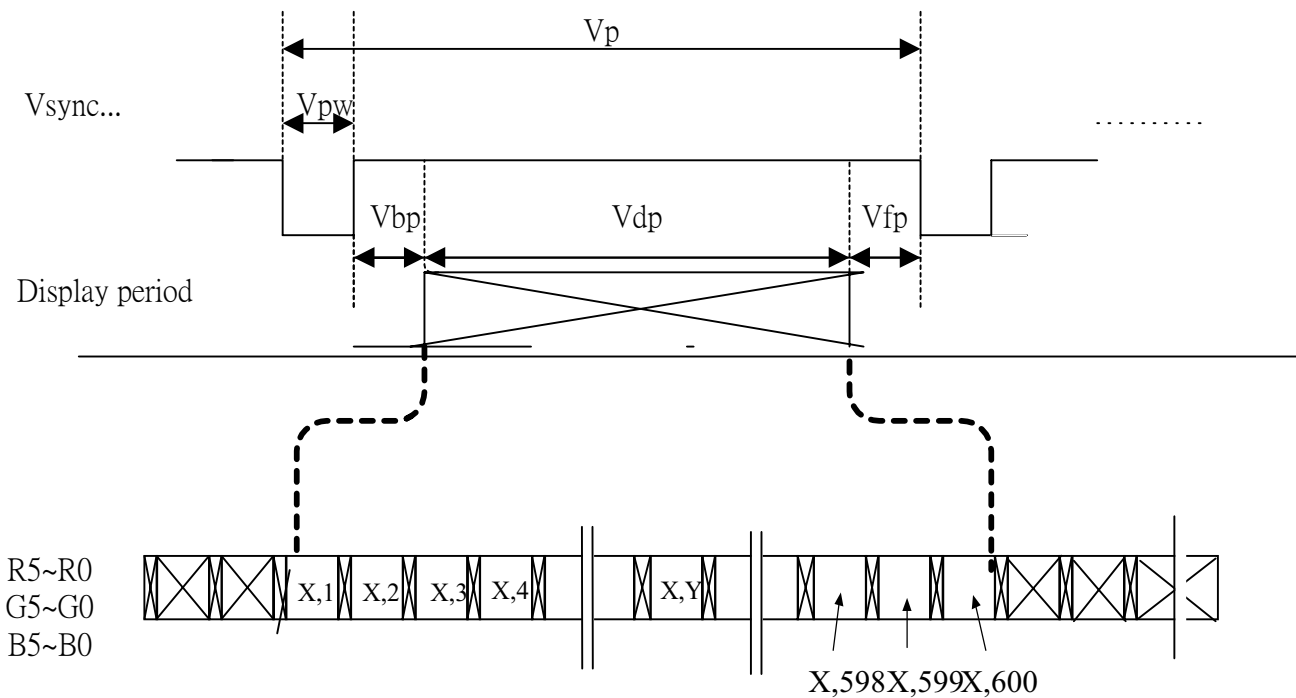
(C)CLK,Hsync relationship:



(D)Hsync,Vsync relationship



(E)Vsync Timing:

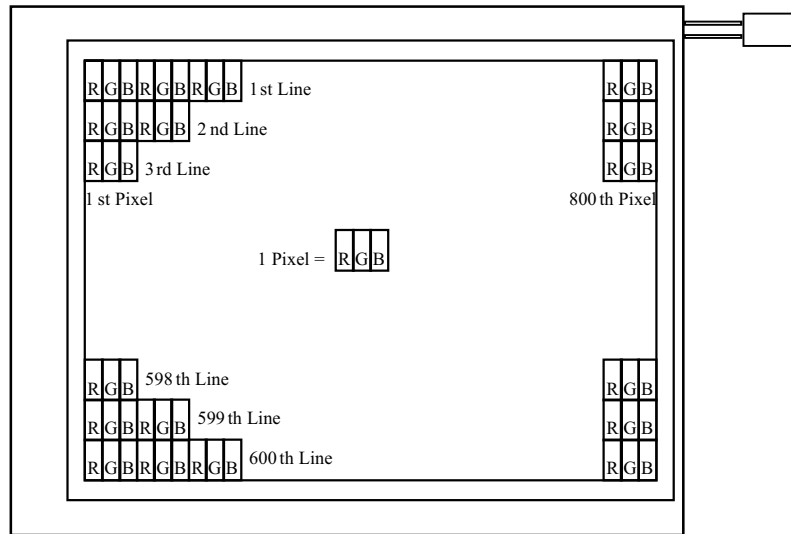


7-3) Display Color and Gray Scale Reference

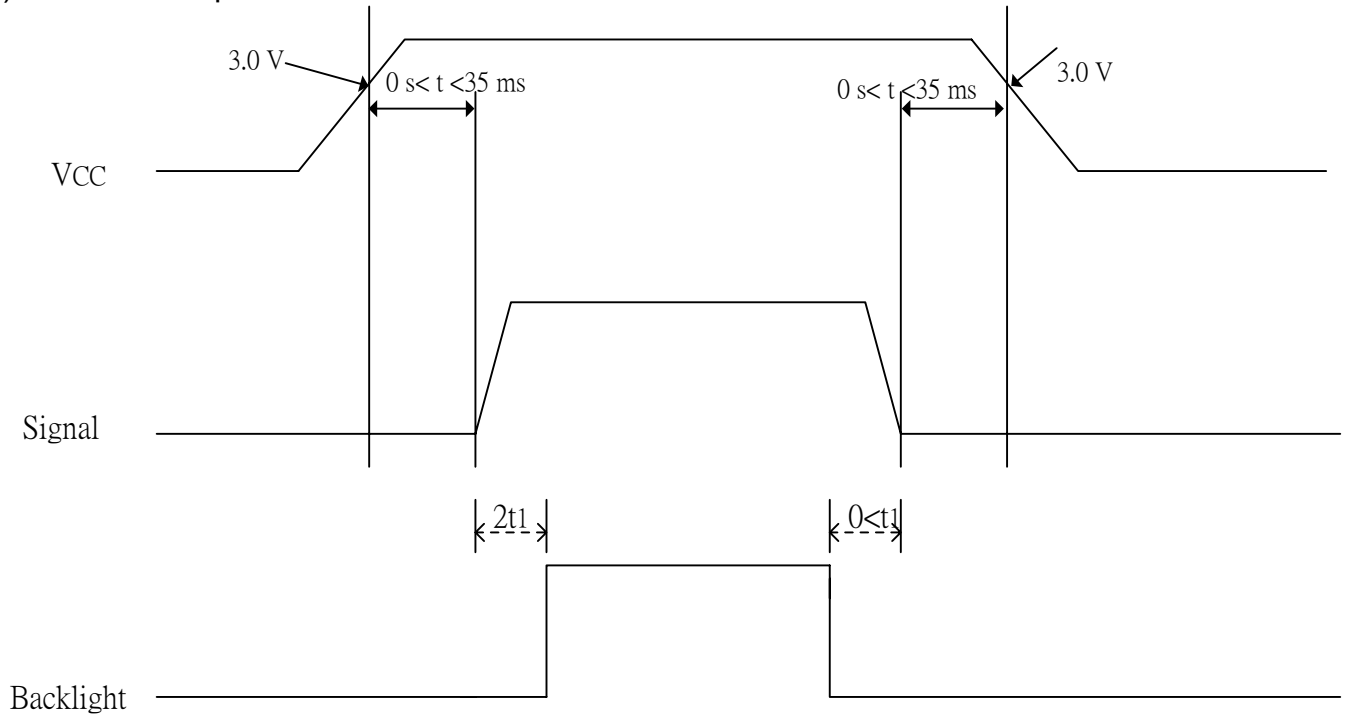
Color		Input Color Data																	
		Red					Green					Blue							
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue (63)	0	0	0	0	0	0	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 (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (01)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (02)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker																		
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																		
	Red (61)	1	1	1	1	0	1	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 (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (01)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green (02)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker																		
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																		
	Green (61)	0	0	0	0	0	0	1	1	1	1	0	1	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 (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Darker																		
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																		
	Blue (61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	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	

7-4) Pixel Arrangement

The LCD module pixel arrangement is the stripe.



8.)Power On Sequence



1. The supply voltage for input signals should be same as V_{CC} .
2. When the power is off , please keep whole signals (Hsync, Vsync, CLK, Data) low level or high impedance

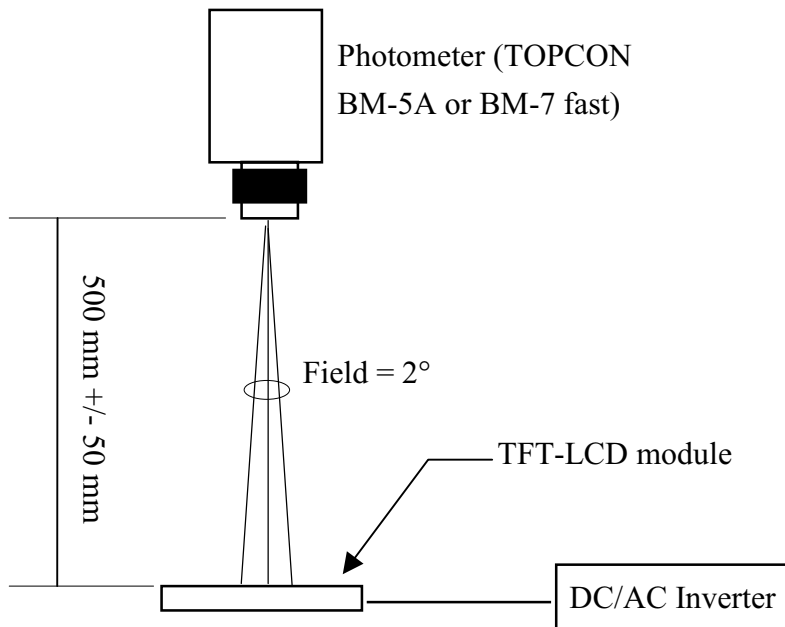
9.) Optical Characteristics

9-1) Specification:

Ta = 25°C

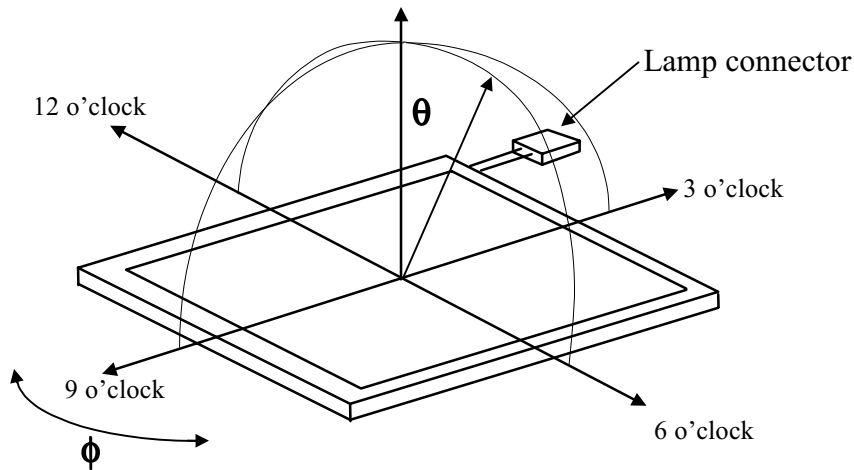
Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ	CR \geq 10	± 55	± 60	-	deg	Note 9-1
	Vertical	θ (to 12 o'clock)		35	40	-	deg	
		θ (to 6 o'clock)		50	55	-	deg	
Contrast Ratio		CR	Optimum direction	100	180	-	-	Note 9-2
Response time	Rise	Tr	$\theta = 0^\circ$	-	15	50	ms	Note 9-4
	Fall	Tf	$\varphi = 0^\circ$	-	25	50	ms	
Luminance		L	$\theta = 0^\circ / \varphi = 0^\circ$	310	350	-	cd/m ²	Note 9-3
Luminance Uniformity		U		55	80	-	%	Note 9-5
White Chromaticity		x		0.290	0.340	0.390	-	
		y		0.290	0.340	0.390	-	
Cross Talk Ratio		CTK		-	-	3.5	%	Note 9-6

All the optical measurement shall be executed 30 minutes after backlight being turn-on. The optical characteristics shall be measured in dark room (ambient illumination on panel surface less than 1 Lux). The measuring configuration shows as following figure.



Optical characteristics measuring configuration

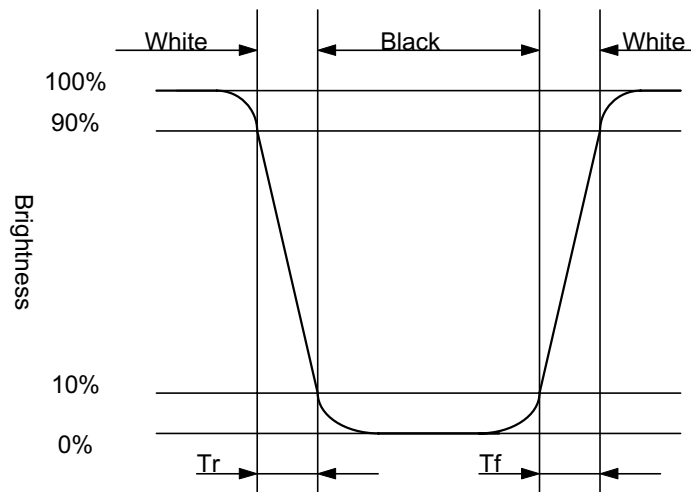
Note 9-1 : The definitions of viewing angles are as follows.



Note 9-2 : The definition of contrast ratio $CR = \frac{\text{Luminance at gray level 63}}{\text{Luminance at gray level 0}}$

Note 9-3 : Topcon BM-5A luminance meter 2° field of view is used in the testing (after 30 minutes' operation). The typical luminance value is measured at lamp current 14.0 mA.

Note 9-4: Definition of Response Time Tr and Tf:



Note 9-5: The uniformity of LCD is defined as

$$U = \frac{\text{The Minimum Brightness of the 9 testing Points}}{\text{The Maximum Brightness of the 9 testing Points}}$$

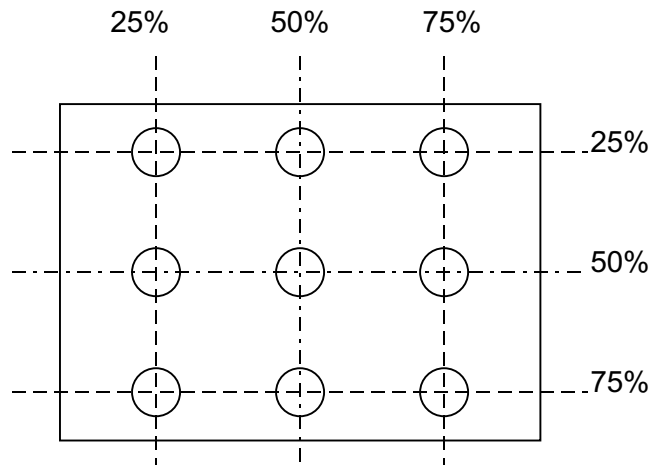
Luminance meter : BM-5A or BM-7 fast(TOPCON)

Measurement distance : 500 mm +/- 50 mm

Ambient illumination : < 1 Lux

Measuring direction : Perpendicular to the surface of module

The test pattern is white (Gray Level 63).



Note 8-6: Cross Talk (CTK) = $\frac{|YA-YB|}{YA} \times 100\%$

YA: Brightness of Pattern A

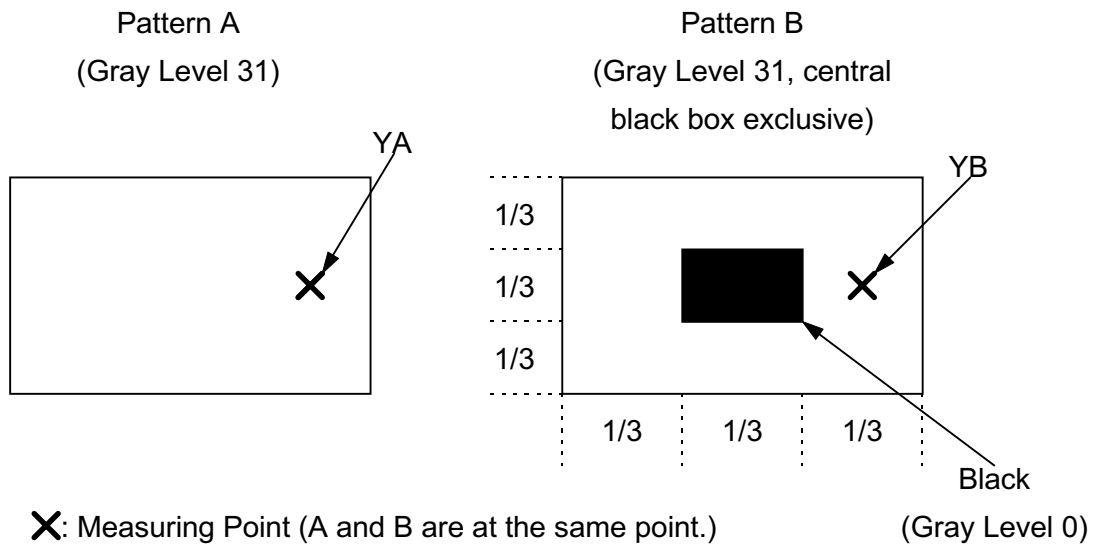
YB: Brightness of Pattern B

Luminance meter : BM 5A (TOPCON)

Measurement distance : 500 mm +/- 50 mm

Ambient illumination : < 1 Lux

Measuring direction : Perpendicular to the surface of module



10. Reliability Test

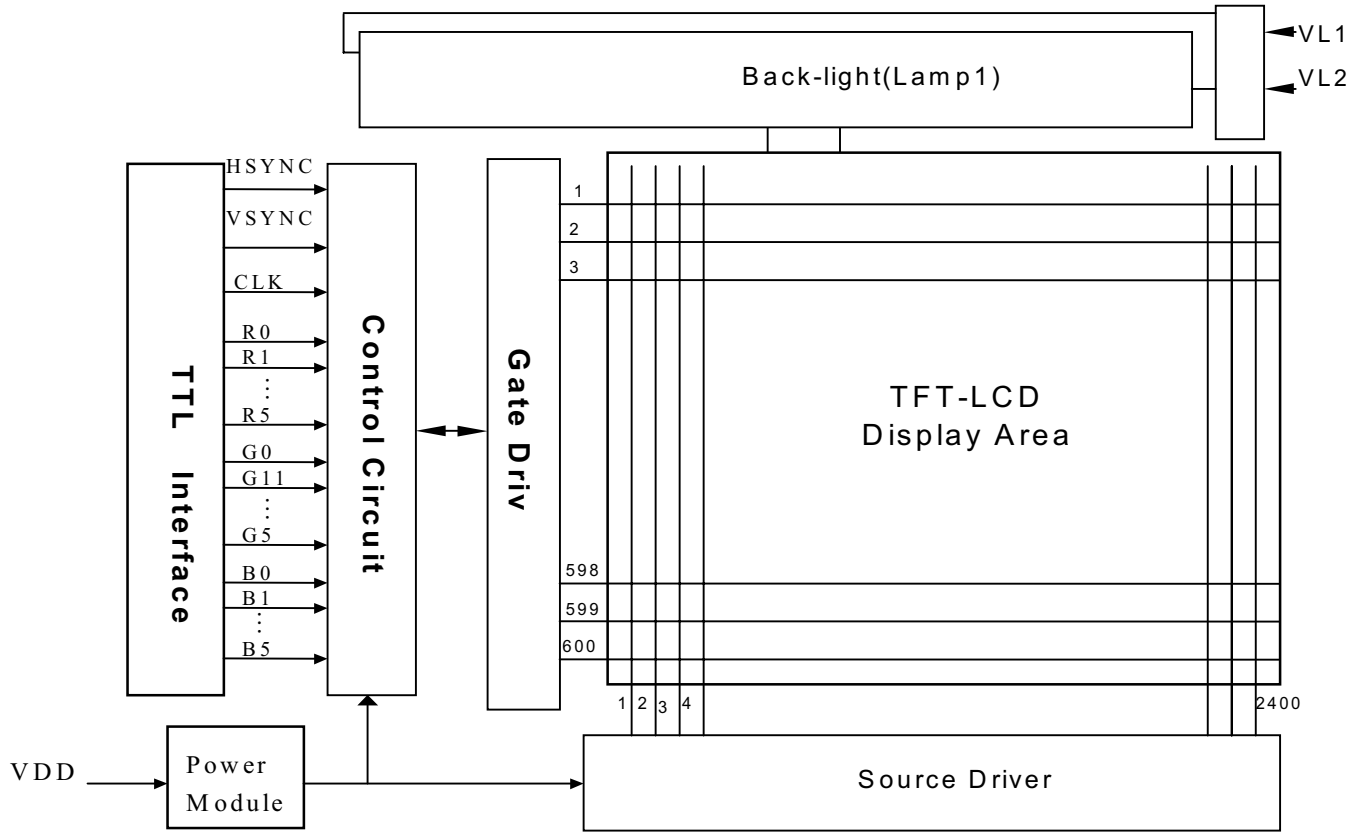
No	Test Item	Test Condition	Remark
1	High Temperature Storage Test	Ta = +60°C, 240 hrs	
2	Low Temperature Storage Test	Ta = -20°C, 240 hrs	
3	Low Temperature Operation Test	Ta = 0°C, 240 hrs	
4	High Temperature & High Humidity Operation Test	Ta = +50°C, 80%RH, 240 hrs (No Condensation)	
5	Thermal Cycling Test (non-operating)	0°C ←→ +25°C ←→ +60°C, 50 Cycles 1Hr 0.5Hr 1Hr	
6	Vibration Test (non-operating)	Frequency : 10 ~ 57 Hz, Amplitude : 0.15 mm 58~500Hz, 1G Sweep time: 11 min Test Period: 3 hrs (1 hr for each direction of X, Y, Z)	
7	Shock Test (non-operating)	80G, 6ms, X,Y, Z 1 times for each direction	

Ta: ambient temperature

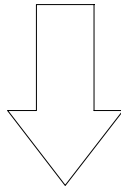
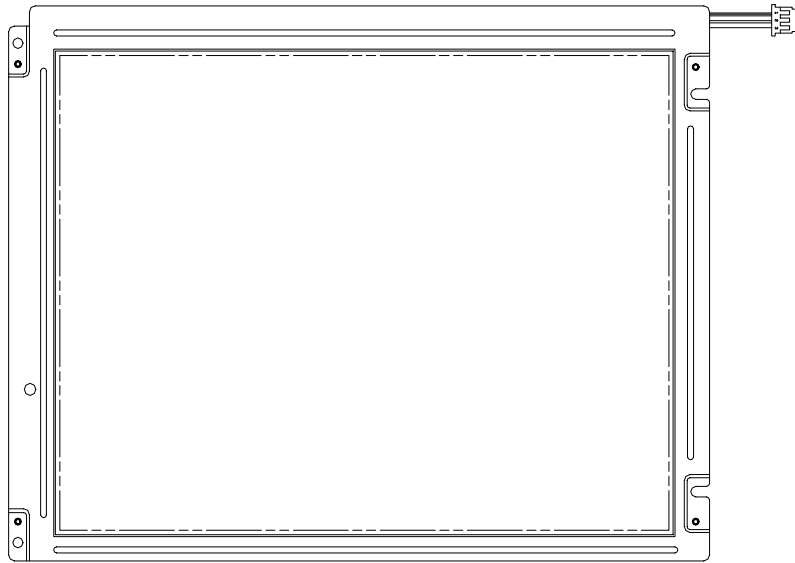
[Judgement Criteria]

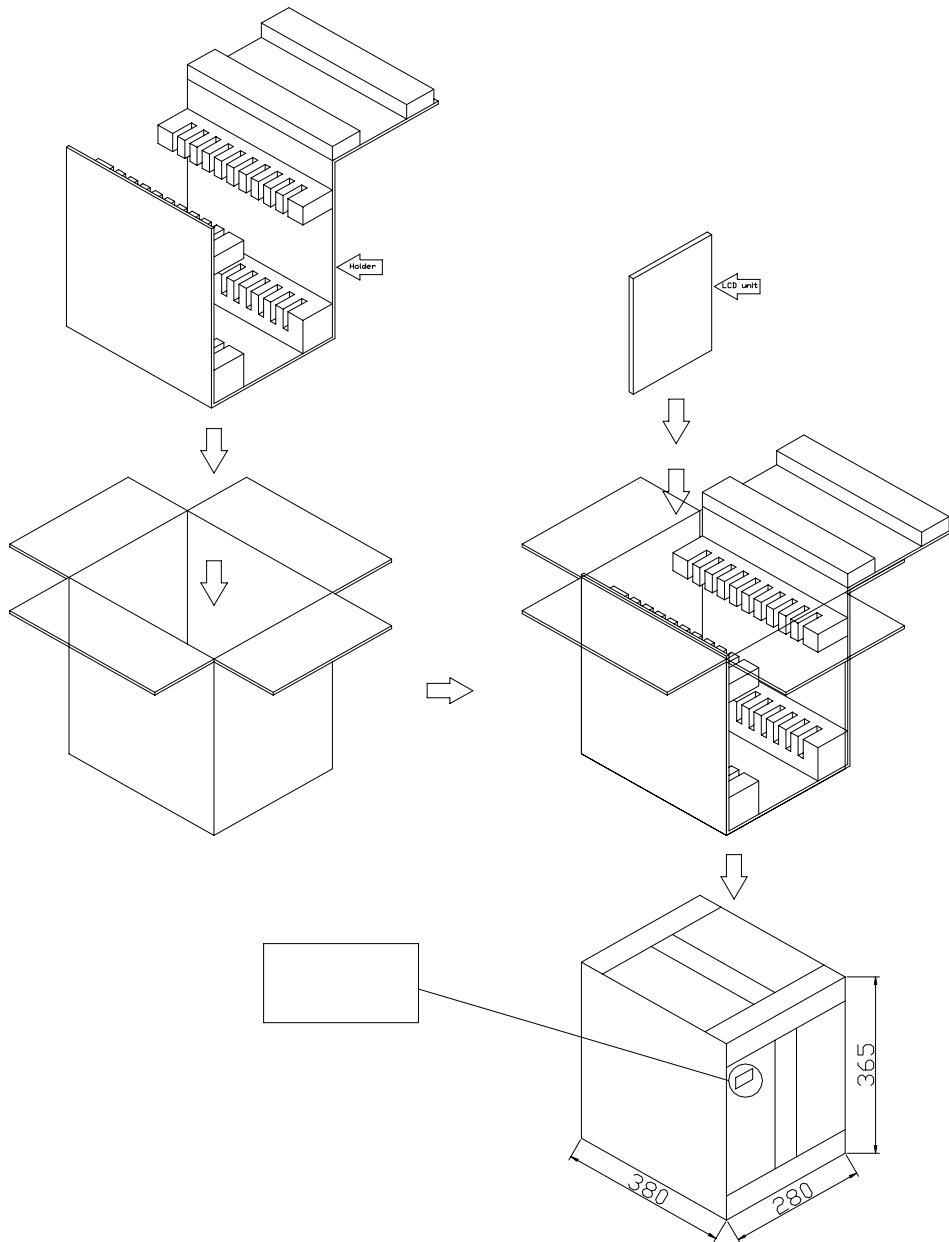
Under the display quality test conditions with normal operation state , there should be no change which may affect practical display function.

11.)Block Diagram

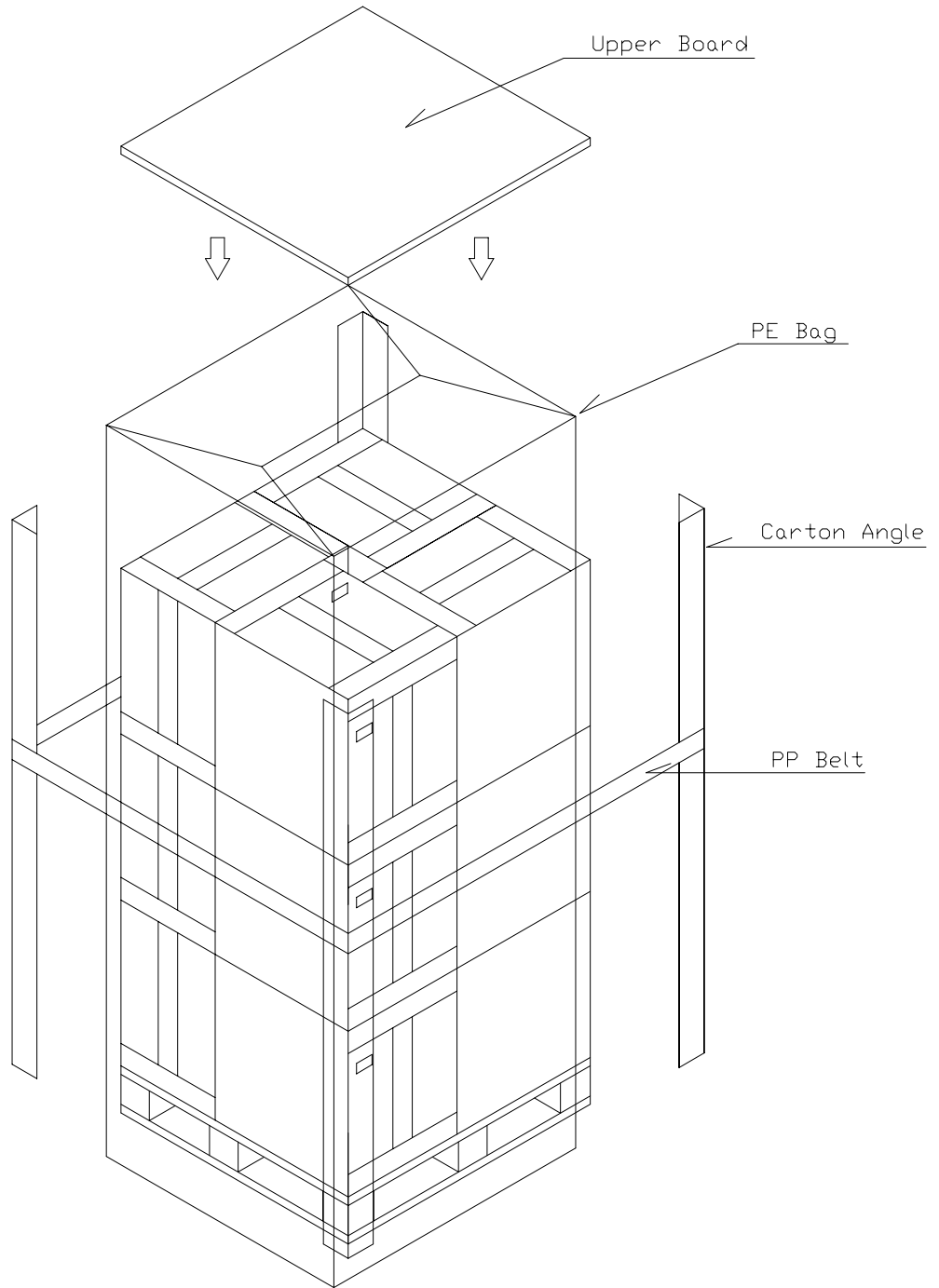


12.)Packing





3RD ANGLE PROJECTION		MATERIAL		NAME Packing Method	
APVD	David Liu	SCALE	2=1	MODEL NO.	
CHKD		SHEET	1/1	DWG NO.	
DWN		UNIT	M/M	PART NO.	
		DATE			



3RD ANGLE PROJECTION		MATERIAL		NAME Packing Method	
APVD		SCALE	2=1	MODEL NO.	
CHKD		SHEET	1/1	DWG NO.	
DWN	David Liu	UNIT	M/M	PART NO.	
		DATE			

Revision History

Rev.	Issued Date	Revised Content
1.0	Mar 28, 2002	New