






DOCUMENT NUMBER AND REVISION
VL-PS-TLM-TA40T3130-01 REV. A
(TLM-TA40T3130)

DOCUMENT TITLE:
PRELIMINARY SPECIFICATION
OF
LCD MODULE TYPE
MODEL NUMBER: TLM-TA40T3130-01

DEPARTMENT	NAME	SIGNATURE	DATE
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**Preliminary Specification
 of
 LCD Module Type
 Model No.: TLM-TA40T3130-01**

1. General Description

- 10.4"(diagonal), 800 x RGB x 600 dots, transmissive, 262k color, amorphous silicon TFT LCD module.
- Pixel in stripe configuration.
- Input voltage for gate driver (VDD): +3.3V(Typ.).
- Slim and compact, designed for O/A application
- Anti-glare and EWV.
- Wide viewing angle.
- Normally white.
- White LED backlight.

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

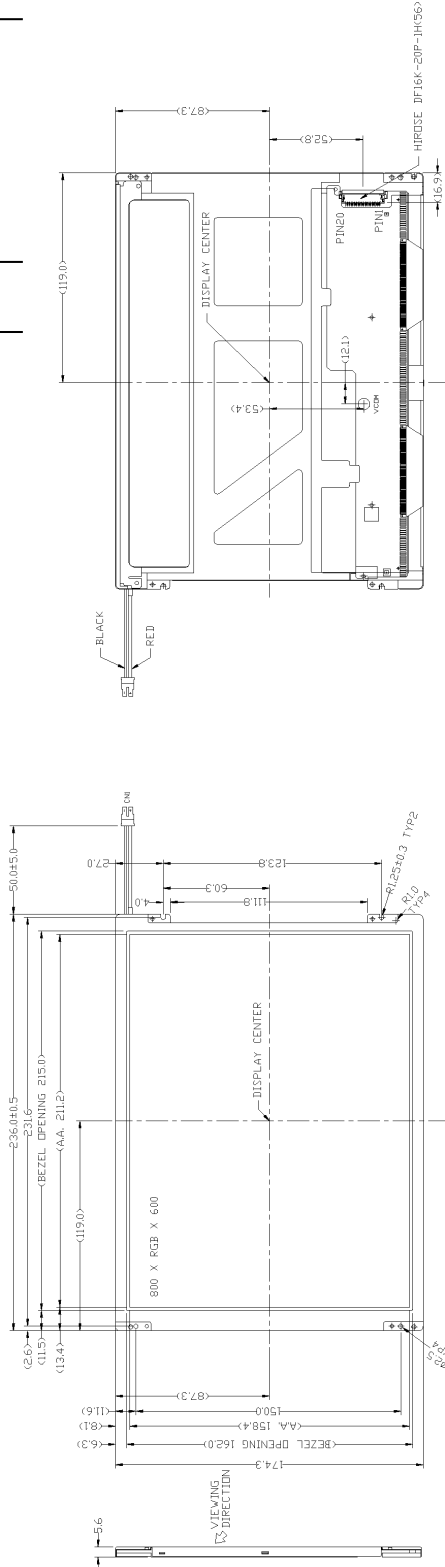
Table 1

Parameter		Specifications	Unit
Outline dimensions		236.0(W) x 174.3(H) x 5.6(D) (excluded connector & cable for backlight)	mm
Color TFT 800xRGBx600 dots	Bezel opening	215.0(W) x 162.0(H)	mm
	Active area	211.2(W) x 158.4(H)	mm
	Display format	800 x RGB x 600	dots
	Color configuration	RGB stripe	-
	Dot pitch	0.264(RGB)(W) x 0.264(H)	mm
Weight		Approx. 330±15	grams

ISSUE	AMENDMENT	DATE

PRELIMINARY

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TITLE: LCM Module Specification	
PROJECT NO: TLM-TA40T3130	
CUSTOMER REF:	
TOLERANCE UNLESS OTHERWISE SPECIFIED: X.X ±0.3 X.XX ±0.1 ANGULAR ± 1°	MATERIAL: N/A FINISH: N/A SCALE: 300 MIT ON SCALE OVERALL THK: N/A
THIRD ANGLE PROJECTION	
DISPLAY TYPE: 10.4" TRANSMISSIVE, 262K COLOR TFT DISPLAY RESOLUTION: 800 X RGB X 480 INPUT VOLTAGE FOR GATE DRIVER(VDD): +3.3V (TYP.) OPERATING TEMPERATURE: -20 TO +70 DEGREE C STORAGE TEMPERATURE: -20 TO +70 DEGREE C	NAME: KVK KA LDK SIGN: [Signature] DATE: 08.09.11
BACKLIGHT TYPE: LED COLOR: WHITE DRIVING CONDITION: 10.0V(TYP.)@20mA LUMINANCE (ON THE MODULE SURFACE): 400 CD/M2	CHECKED: PHILIP HO APPROVED: CYRUS CHEUNG
ITEM NO.: TLM-TA40T3130-01	
DESCRIPTION: TLM-TA40T3130	
FILE NO: TLM-TA40T3130-01-RO/REV: 0	
SHEET 1 OF 1	

DISPLAY TYPE: 10.4" TRANSMISSIVE, 262K COLOR TFT DISPLAY RESOLUTION: 800 X RGB X 480 INPUT VOLTAGE FOR GATE DRIVER(VDD): +3.3V (TYP.) OPERATING TEMPERATURE: -20 TO +70 DEGREE C STORAGE TEMPERATURE: -20 TO +70 DEGREE C	NAME: KVK KA LDK SIGN: [Signature] DATE: 08.09.11
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ITEM NO.: TLM-TA40T3130-01	
DESCRIPTION: TLM-TA40T3130	
FILE NO: TLM-TA40T3130-01-RO/REV: 0	
SHEET 1 OF 1	

1	VDD	2	IND+	3	GND	4	GND	5	IND-	6	IND+	7	GND	8	IND-	9	IN+	10	GND
11	IND-	12	IND+	13	GND	14	CLK-	15	CLK+	16	GND	17	NC	18	NC	19	IN+	20	GND

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NOTES:
 1. ○ 1 SPECIAL CHARACTERISTIC
 2. + 1 SAFETY CHARACTERISTIC
 3. ∇ 1 CRITICAL DIMENSION
 4. ⊕ 1 REFERENCE DIMENSION

Figure 1: Outline Drawing

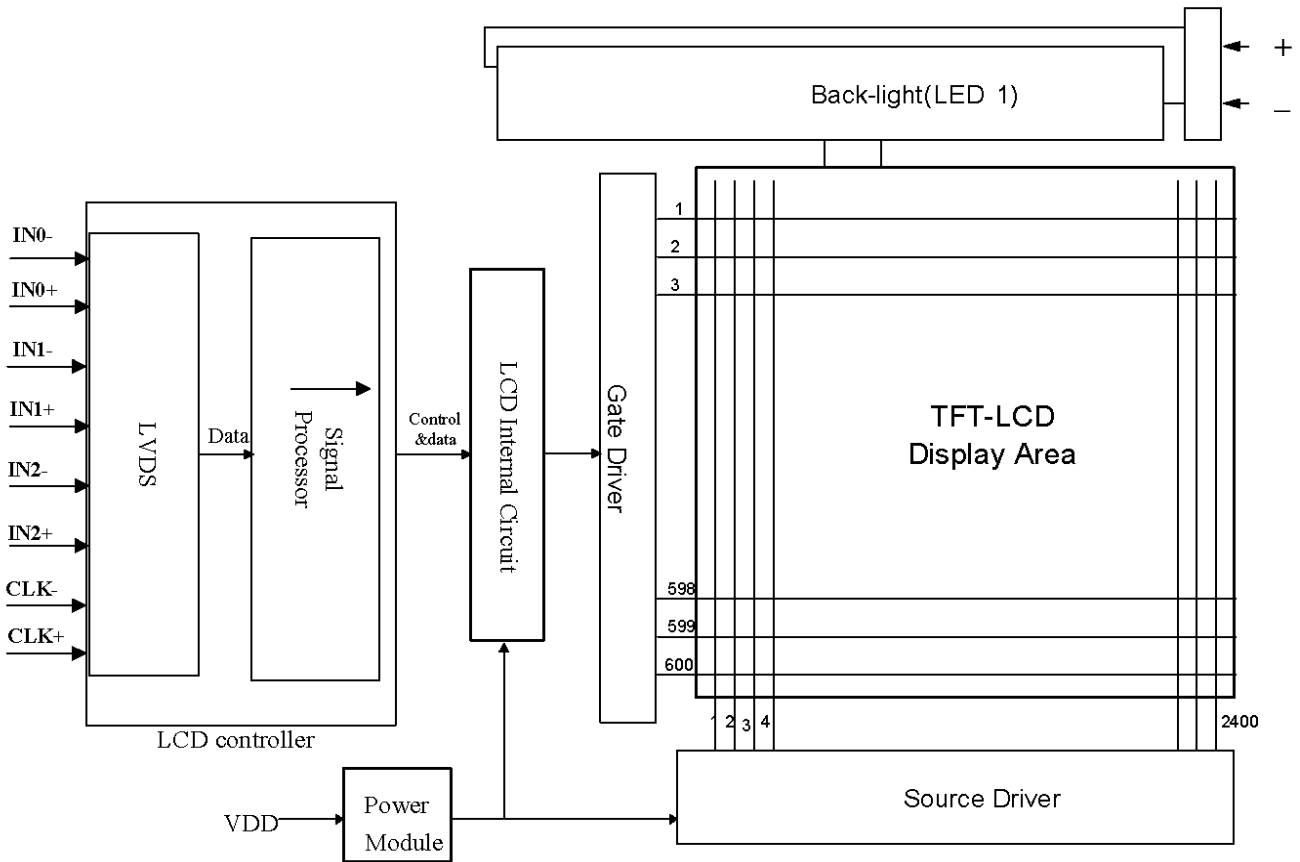


Figure 2: Block Diagram

3. Interface Signals

3.1 TFT-LCD Panel Driving

Connector type: HIROSE DF19K20P1H (56)

Table 2

Pin No.	Symbol	Function	Remark
1	VDD	+3.3V Power Supply	
2	VDD	+3.3V Power Supply	
3	GND	Ground	
4	GND	Ground	
5	IN0-	LVDS receiver signal channel 0	
6	IN0+	LVDS receiver signal channel 0	
7	GND	Ground	
8	IN1-	LVDS receiver signal channel 1	
9	IN1+	LVDS receiver signal channel 1	
10	GND	Ground	
11	IN2-	LVDS receiver signal channel 2	
12	IN2+	LVDS receiver signal channel 2	
13	GND	Ground	
14	CLK-	LVDS receiver signal clock	
15	CLK+	LVDS receiver signal clock	
16	GND	Ground	
17	NC	No connection	
18	NC	No connection	
19	GND	Ground	
20	GND	Ground	

Recommended Transmitter (THC63LVDM63A Thine) to LCD module:TLM-TA40T3130-01 interface assignment:

Table 3

Input terminal of THC63LVDM63A		Graphic controller output signal		Output signal symbol	To LCD module Interface terminal(Symbol)
Symbol	No.	Symbol	Function		
TIN0	44	R0	Red pixel data (LSB)	Tout0- Tout0+	No.5 : IN0- No.6 : IN0+
TIN1	45	R1	Red pixel data		
TIN2	47	R2	Red pixel data		
TIN3	48	R3	Red pixel data		
TIN4	1	R4	Red pixel data		
TIN5	3	R5	Red pixel data (MSB)		
TIN6	4	G0	Green pixel data (LSB)	Tout1- Tout1+	No.7 : IN1- No.8 : IN1+
TIN7	6	G1	Green pixel data		
TIN8	7	G2	Green pixel data		
TIN9	9	G3	Green pixel data		
TIN10	10	G4	Green pixel data		
TIN11	12	G5	Green pixel data (MSB)		
TIN12	13	B0	Blue pixel data (LSB)	Tout2- Tout2+	No.9 : IN2- No.10 : IN2+
TIN13	15	B1	Blue pixel data		
TIN14	16	B2	Blue pixel data		
TIN15	18	B3	Blue pixel data		
TIN16	19	B4	Blue pixel data		
TIN17	20	B5	Blue pixel data (MSB)		
TIN18	22	HSYNC	Horizontal sync signal	TCLK out- TCLK out+	No.11 : CLK - No.12 : CLK +
TIN19	23	VSYNC	Vertical sync signal		
TIN20	25	DENB	Compound Synchronization signal		
TCLK in	26	CLK	Data sampling clock		

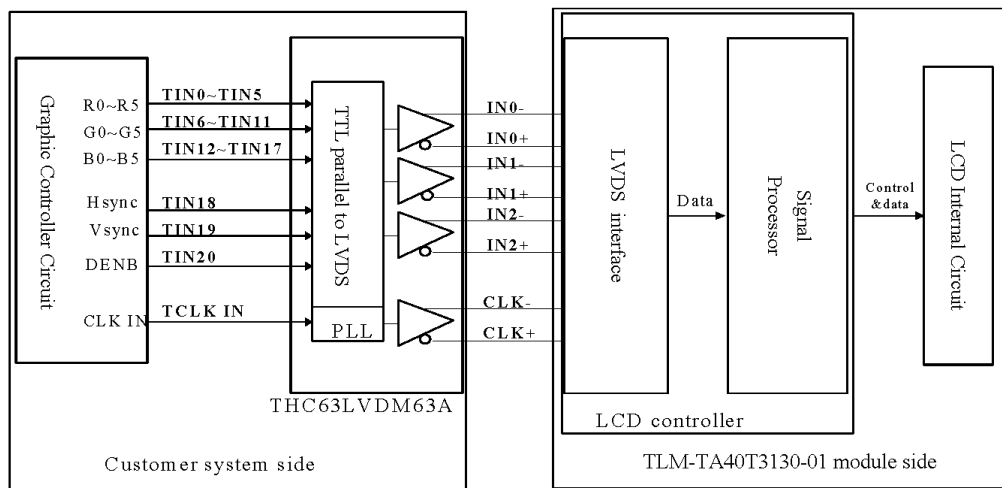


Figure 3: LVDS Interface Block Diagram

3.2 Backlight Driving

Connector type : “BHSR-02VS-1” of Japan Solderless Terminal MFG Co. LTD

Table 4: Pin Assignment of backlight

Pin No.	Symbol	Description	Remark
1	+	Input terminal (Anode)	Wire Color : Red
2	-	Input terminal (Cathode)	Wire Color : Black

4. Absolute Maximum Ratings

4.1 Electrical Maximum Ratings – For IC Only

Table 5

Parameters	Symbol	MIN.	MAX.	Unit	Remark
Supply voltage	VDD	-0.3	+4.0	V	
Input Signals Voltage	VIN	-0.3	VDD+0.3	V	LVDS signal.

Note:

1. GND=0V, Ta=25°C.
2. The modules may be destroyed if they are used beyond the absolute maximum ratings.

5. Electrical Specifications

5.1 Typical Electrical Characteristics

At Ta = 25 °C, VDD=3.3V±0.3V, GND=0V.

Table 6

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage	VDD	3.0	3.3	3.6	V	
Current dissipation	IDD	-	190	380	mA	Note 1
LVDS differential input high threshold	VTH	-	-	100	mV	Note 2
LVDS differential input low threshold	VTL	-100	-	-	mV	

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

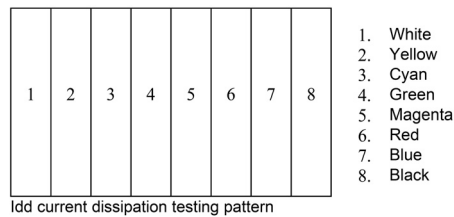


Figure 4

Note 2: Please refers to THC63LVDF63A specification by THINE Corporation. This LCD module conforms to LVDS standard.

5.2 Recommended Driving Condition for Back Light

At Ta = 25 °C

Table 7

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage of LED backlight	VLED	-	-	(11)	V	Note 1
Supply current of LED backlight	ILED	-	20	-	mA	Note 2
Backlight Power Consumption	PLED	-	-	2.86	W	Note 1/ Note 3

Note 1 : ILED = 20mA (Constant Current).

Note 2 : The LED driving condition is defined for each LED module. (3 LED Serial)

$$\text{Input current} = 20\text{mA} * 13 = 260\text{mA}$$

Note 3 : PLED = VLED-1 * ILED-1 + VLED-2* ILED-2 + VLED-12 * ILED-12+VLED-13 * ILED-13

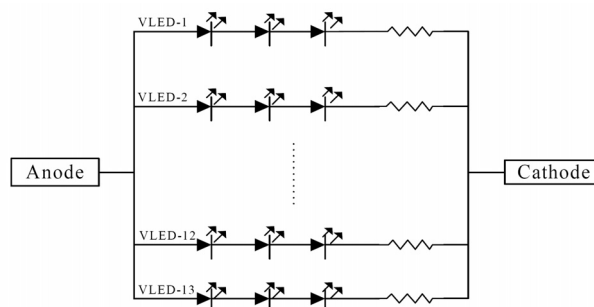


Figure 5

5.3 Timing Specifications

5.3.1 Input Signal Timing

DENB pin have high priority than SYNC mode (HSVC+VSYNC). When IC only use SYNC pin, DENB pin have to connect to ground.

5.3.1.1 Timing Specifications (DENB Mode)

Table 8

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Frame Cycling Period	t1	604 X t3	628 X t3	800 X t3	-	
		14	16.58	20	ms	
Vertical Display Period	t2	600 X t3	600 X t3	600 X t3	-	
Horizontal Scanning Time	t3	920 X t5	1056 X t5	1064 X t5	-	
		24	26.4	33	μ s	
Horizontal Display Period	t4	800 X t5	800 X t5	800 X t5	-	
Clock Cycle	t5	20	25.0	31.25	ns	
Clock High Level Time	t6	9.0	-	-	ns	
Clock Low Level Time	t7	9.0	-	-	ns	
Hold time	t8	4.0	-	-	ns	
Set-up time	t9	5.0	-	-	ns	

5.3.1.2 Timing Specifications (SYNC Mode)

Table 9

	Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
HSYNC	Period	Hp	24	26.4	33	us		
			920	1056	1064	tc		
	Display period	Hdp	800	800	800	tc		
	Pulse width	Hpw	12	128	202	tc		
	Back-porch	Hbp	12	86	202	tc		
	Front-porch	Hfp	42	42	42	tc		
	Hpw+Hbp			214	214	214	tc	
	Hsync-CLK		Hhc	10	-	Tc-10	ns	
Vsync-Hsync		Hvh	0	0	200	tc		
VSYNC	Period (Frame cycling period)	Vp	14	16.58	20	ms	Note 1	
			604	628	800	Hp		
	Display period	Vdp	600	600	600	Hp		
	Pulse width	Vpw	2	4	27	Hp		
	Back-porch	Vbp	0	23	25	Hp		
	Front-porch	Vfp	1	1	1	Hp		
	Vpw+Vbp			27	27	27	Hp	

Note 1 : Frame cycling period is optimum in 16.58ms.(60Hz)

5.3.1.3 Timing Chart

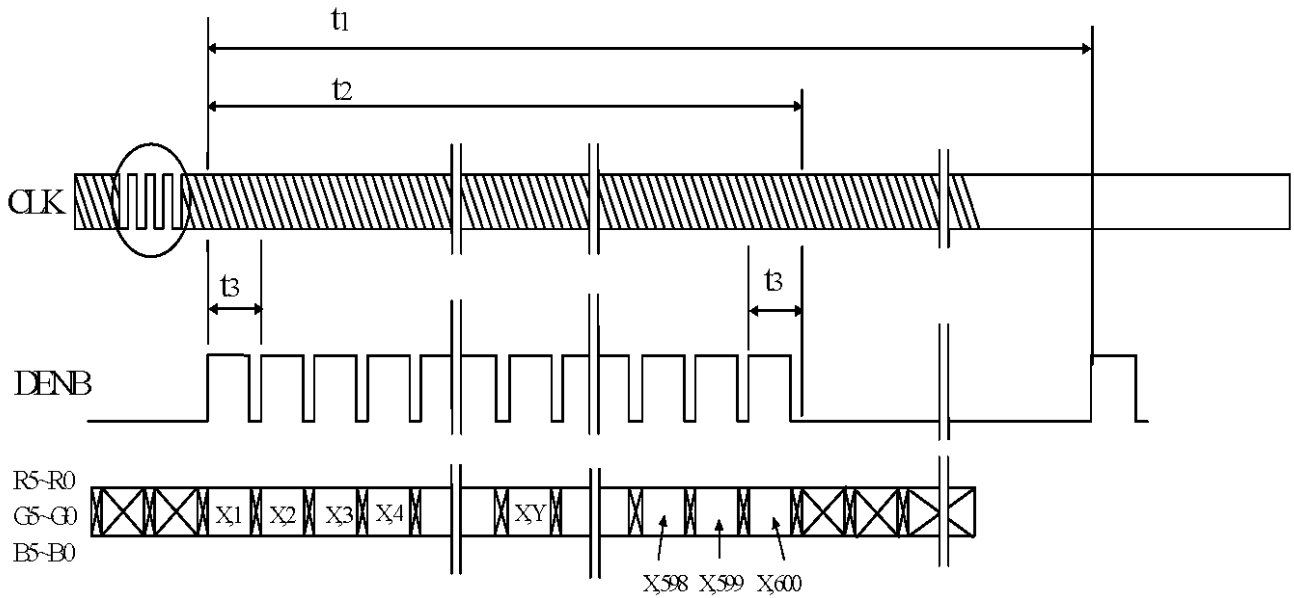


Figure 6

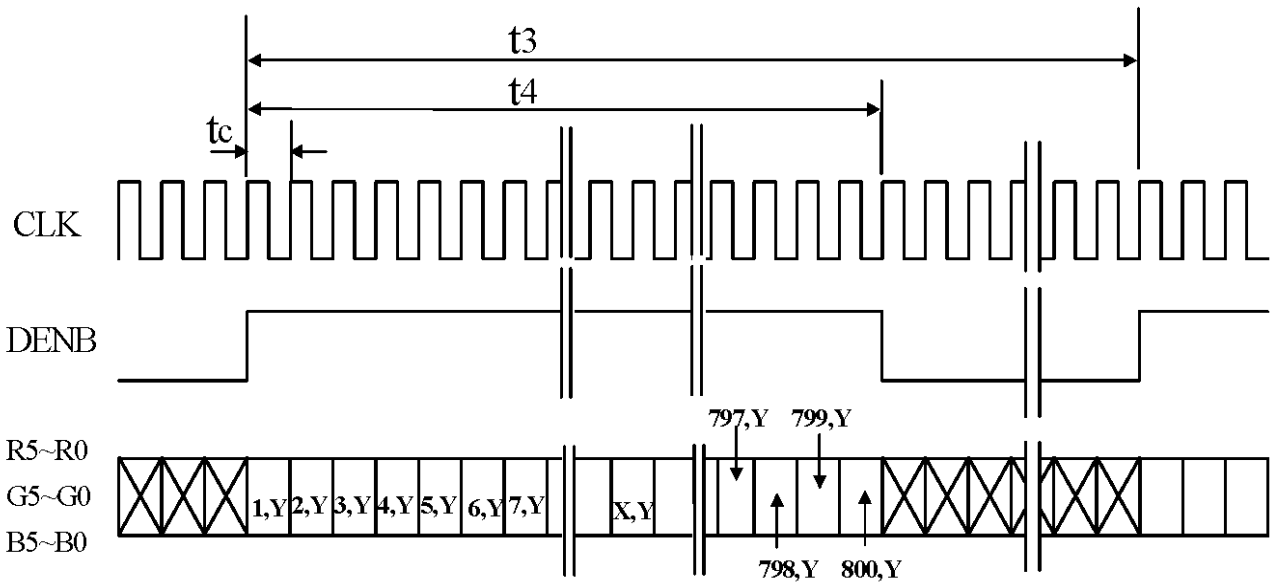


Figure 7

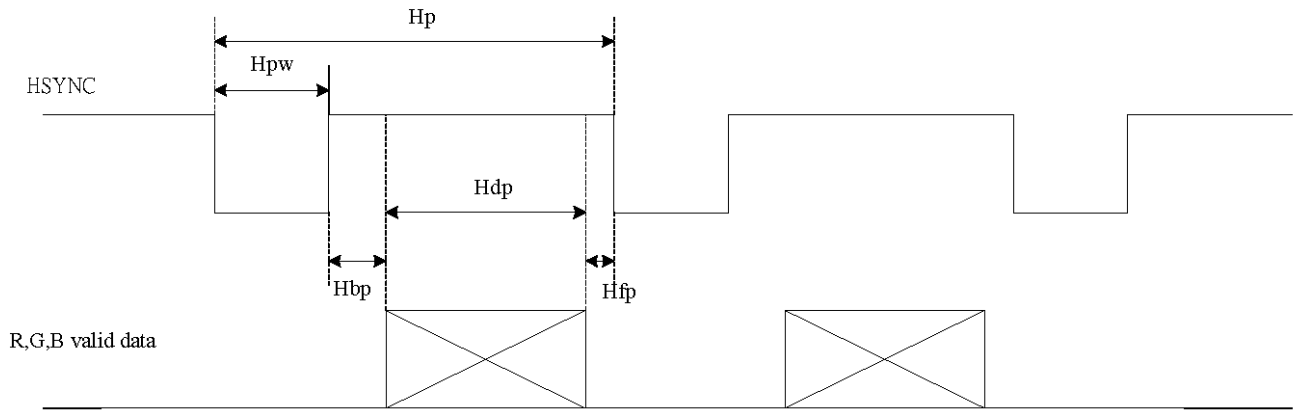


Figure 8

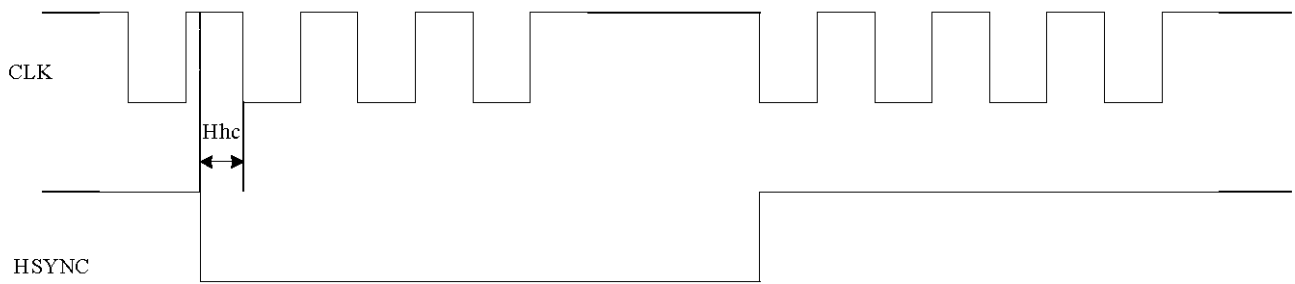


Figure 9

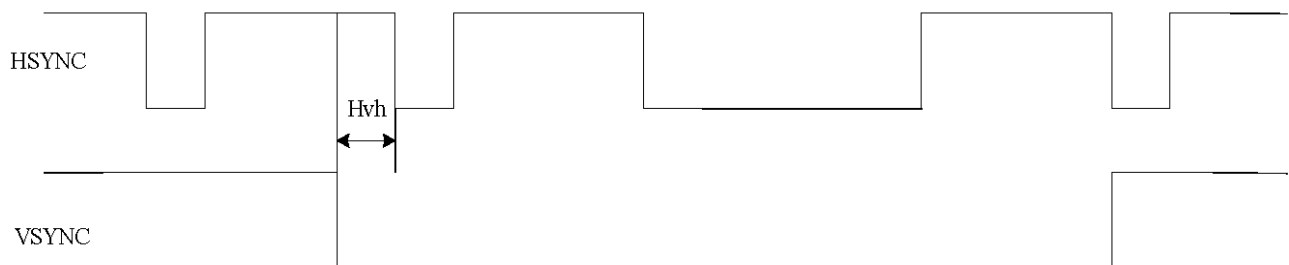


Figure 10

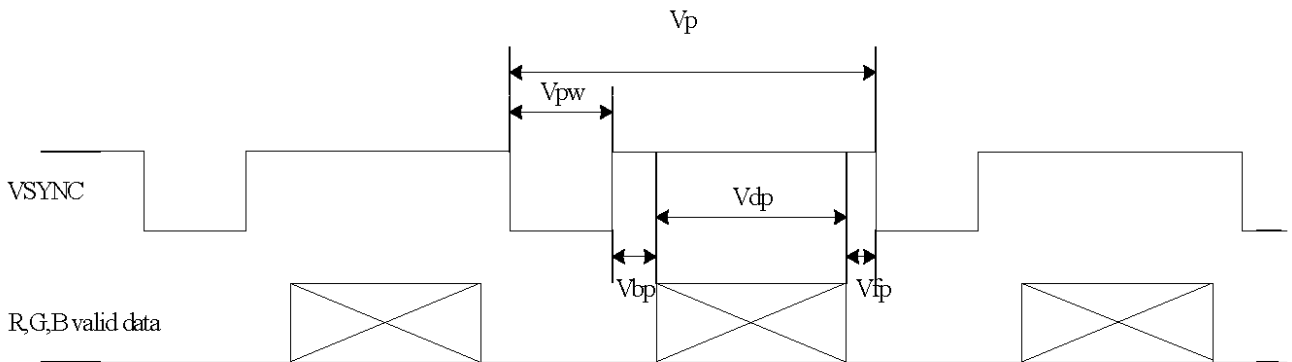
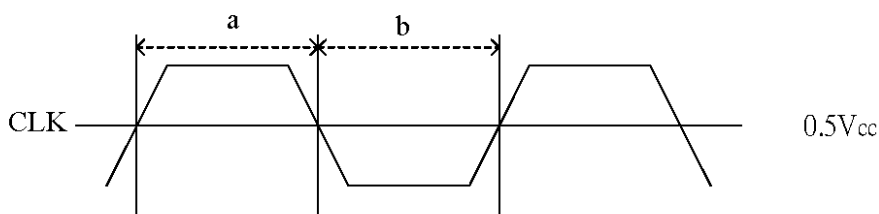
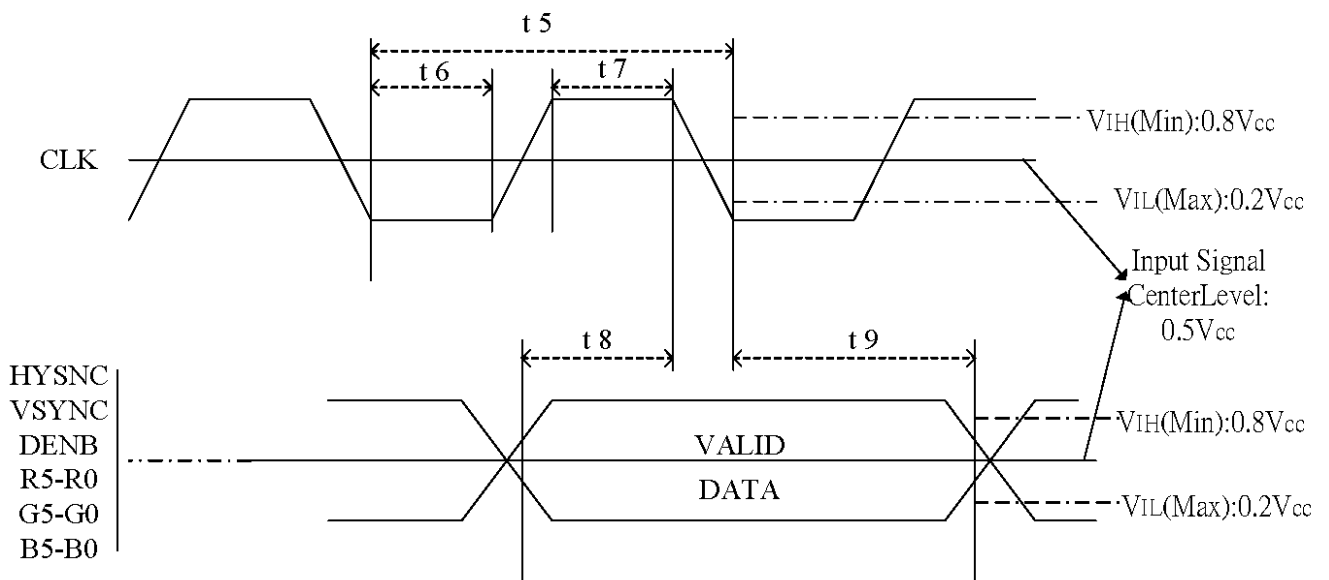


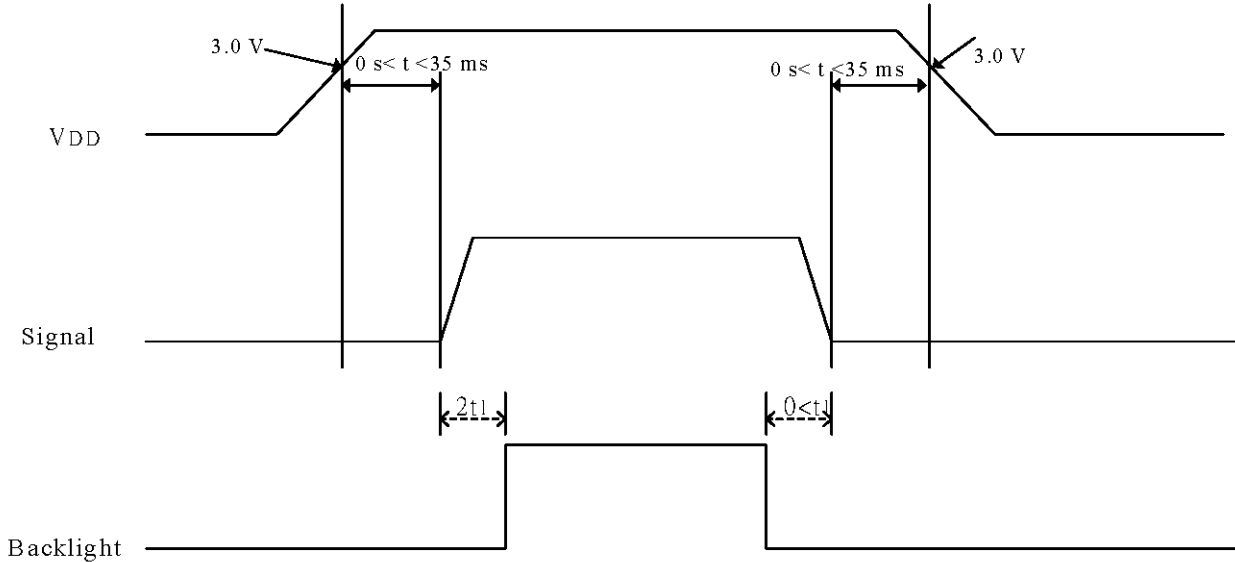
Figure 11



Duty (a, b) : $50 \pm 10\%$

Figure 12

6. Power On Sequence



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

Figure 13

7. Pixel Arrangement

The LCD module pixel arrangement is the stripe.

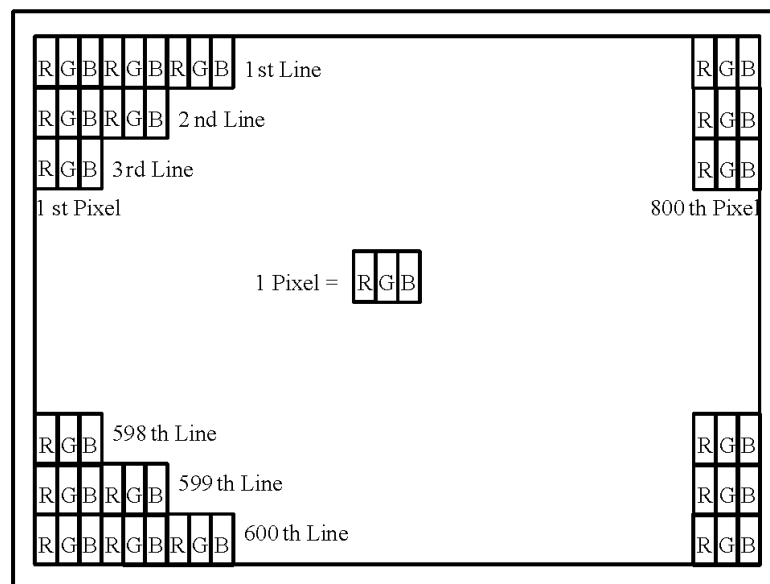


Figure 14

8. Display Color and Gray Scale Reference

Table 10

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

9. Optical Characteristics

Table 11: Optical characteristics (Ta=25°C)

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks	
Viewing angle	Horizontal	$\phi 1$ (3 o'clock), $\phi 2$ (9 o'clock)	$CR \geq 10$	± 65	± 70	-	deg	Note 1
	Vertical	$\theta 2$ (12 o'clock)		45	50	-	deg	
		$\theta 1$ (6 o'clock)		55	60	-	deg	
Contrast ratio	CR	Optimum direction	200	400	-	-	Note 2	
Response time	Rise	Tr	$\theta=0^\circ, \phi=0^\circ$	-	15	50	ms	Note 3
	Fall	Tf		-	25	50	ms	
Brightness	L	$\theta=0^\circ/\phi=0^\circ$	300	400	-	cd/m ²	Note 4	
Luminance Uniformity	U		70	80	-	%	Note 5	
White chromaticity	x		0.28	0.32	0.36	-		
	y		0.31	0.35	0.39	-		
Cross talk ratio	CTK		-	-	3.5	%	Note 6	
LED life time	-		20000	30000	-	hrs	Note 7	

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.

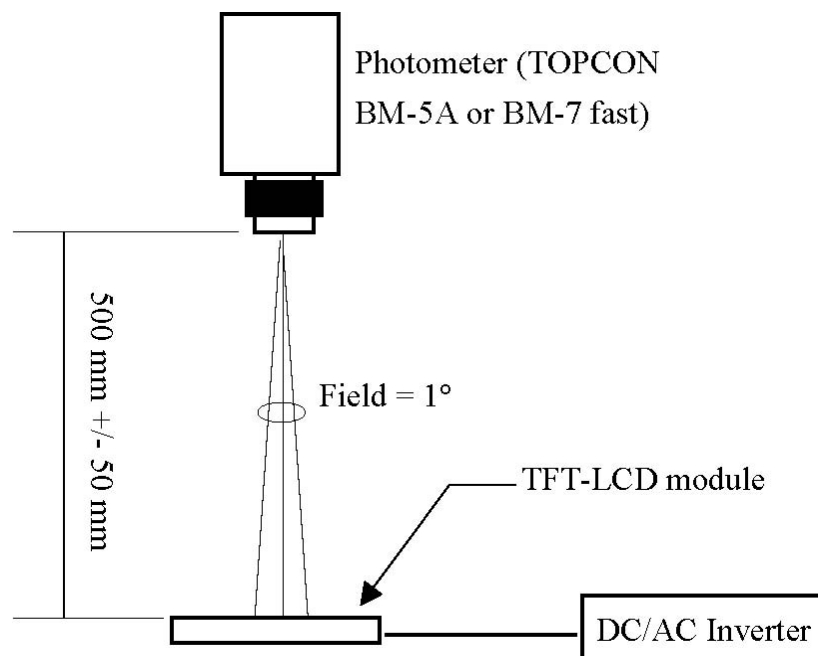


Figure 15: Optical characteristics measuring configuration

Note: 1: The definition of viewing angle are as follow:

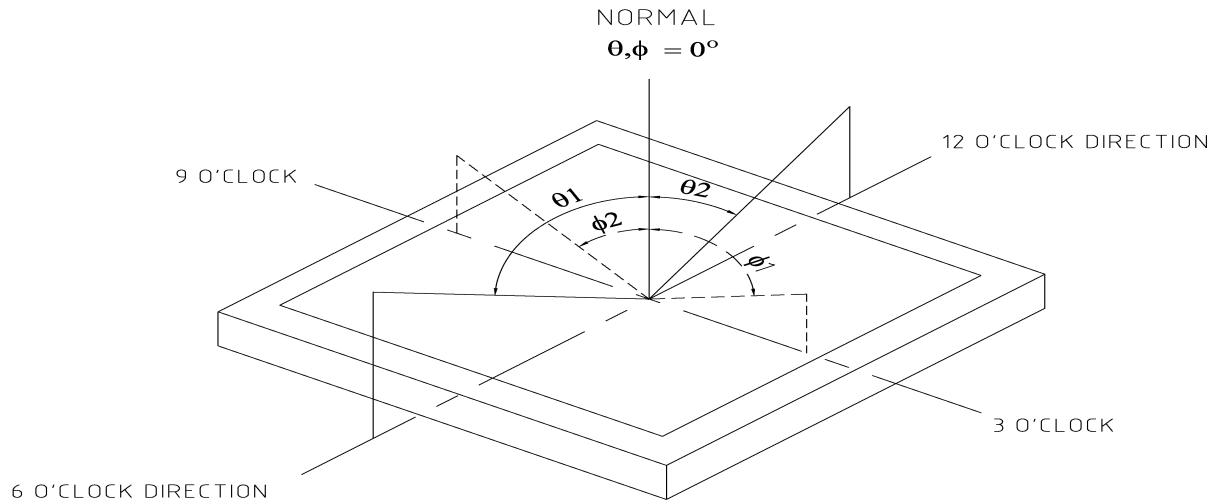


Figure 16

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

Note 3: Definition of Response Time Tr and Tf:

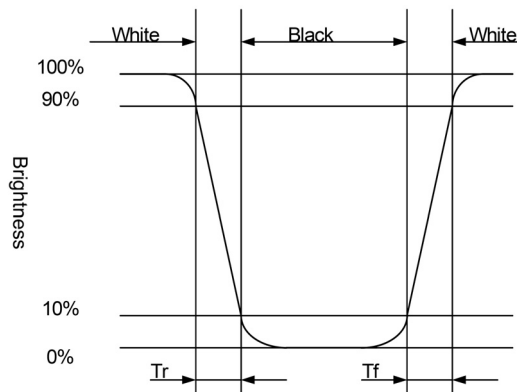


Figure 17

Note 4: Topcon BM-5A or BM-7 fast luminance meter 1° field of view is used in the testing.

Note 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).

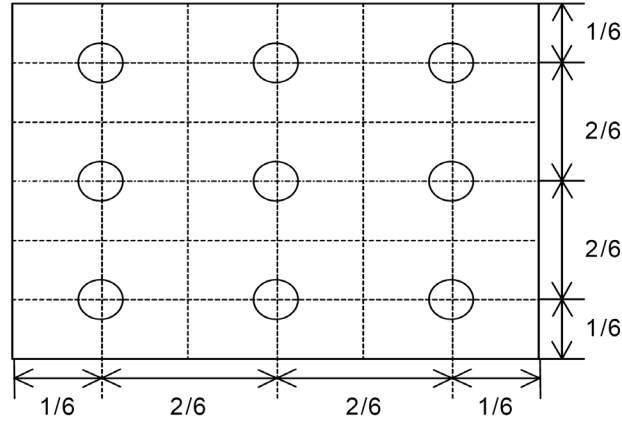


Figure 18

Note 6: Cross Talk (CTK) = $(|YA - YB| / YA) \times 100\%$

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

Pattern A

Pattern B

(Gray Level 31)

(Gray Level 31, central
black box exclusive)

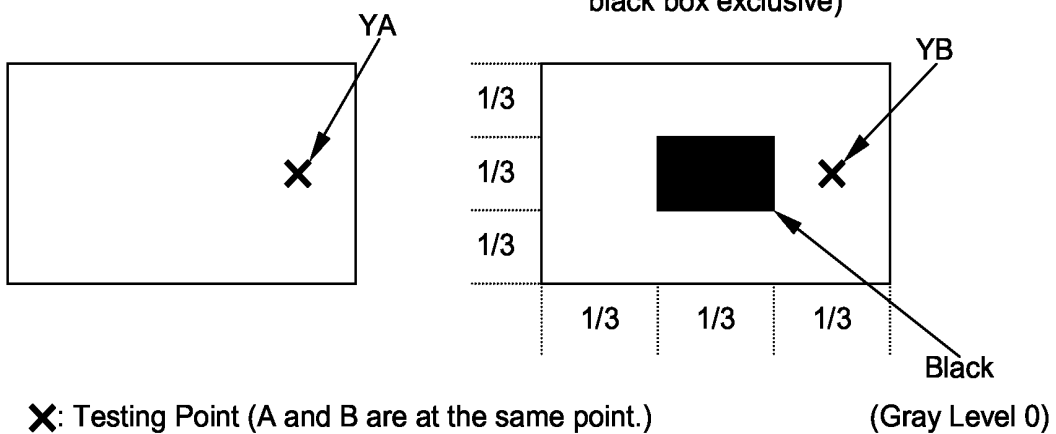


Figure 19

Note 7: The "LED Life time" is defined as the module brightness decrease to 50% original Brightness that the ambient temperature is 25°C and ILED = 260mA.

10. Reliability Test

Table 12

No	Test Item	Test Condition	Remark
1	High temperature storage test	Ta = +70°C, 240 hrs	
2	Low temperature storage test	Ta = -20°C, 240 hrs	
3	High temperature operation test	Ta = +70°C, 240 hrs	
4	Low temperature operation test	Ta = -20°C, 240 hrs	
5	High temperature & high humidity operation test	Ta = +50°C, 80%RH, 240 hrs (No Condensation)	
6	Thermal cycling test (non-operating)	0°C←→+60°C, 100 Cycles 1Hr 1Hr	
7	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)	
8	Shock test (non-operating)	80G, 6ms, X,Y, Z 1 times for each direction	
9	Electron static discharge	C=150pF,R=330Ω Contact=±8KV Air=±15KV 10 times/terminal	

Ta: ambient temperature

Note: The protective film must be removed before temperature test.

[Criteria]

In the standard conditions, there is not display function NG issue occurred. (including : line defect ,no image). All the cosmetic specification is judged before the reliability stress.

11. Handling Cautions

11.1 Mounting of module

- Please power off the module when you connect the input/output connector.
- Polarizer which is made of soft material and susceptible to flaw must be handled carefully.
- Protective film (Laminator) is applied on surface to protect it against scratches and dirt.
- Please following the tear off direction as figure 20 to remove the protective film as slowly as possible, so that electrostatic charge can be minimized.

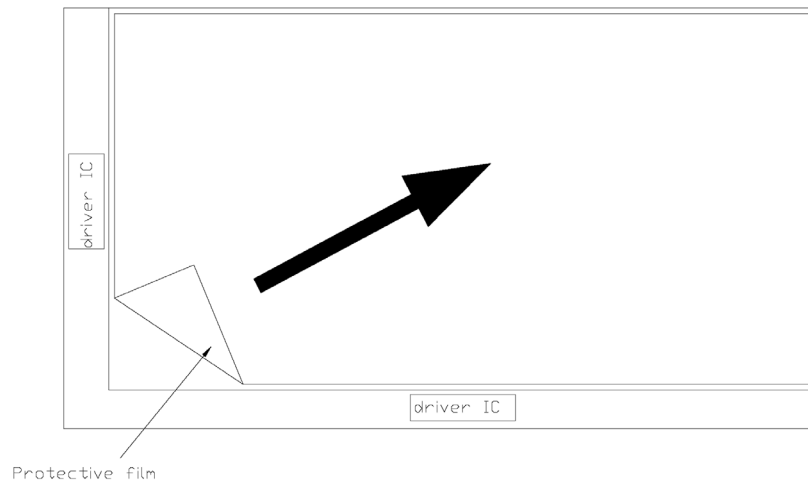


Figure 20: The way to peel off protective film

11.2 Precautions in mounting

- When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth.
- Wipe off water drops or finger grease immediately. Long contact with water may cause discoloration or spots.
- TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.
- Since CMOS LSI is used in the module. So take care of static electricity and earth yourself when handling.

11.3 Adjusting module

- Adjusting volumes on the rear face of the module have been set optimally before shipment.
- Therefore, do not change any adjusted values. If adjusted values are changed, the specifications described may not be satisfied.

11.4 Polarizer Mark

- The polarizer mark is to describe the direction of wide view angle film how to mach up with the rubbing direction.

11.5 Others

- Do not expose the module to direct sunlight or intensive ultraviolet rays for many hours.
- Store the module at a room temperature place.
- The voltage of beginning electric discharge may over the normal voltage because of leakage current from approach conductor by to draw lump read lead line around.
- If LCD panel breaks, it is possibly that the liquid crystal escapes from the panel. Avoid putting it into eyes or mouth. When liquid crystal sticks on hands, clothes or feet. Wash it out immediately with soap.
- Observe all other precautionary requirements in handling general electronic components.
- Please adjust the voltage of common electrode as material of attachment by 1 module.

“Varitronix Limited reserves the right to change this specification.”

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