



TFT-LCD Module Specification

Version: V1.2

☐ **APPROVAL FOR SAMPLE**

Team Source Display:		
Presented by	Reviewed by	Organized by

Document Revision History

[illegible]

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1. LCM Specification

1.1 Description

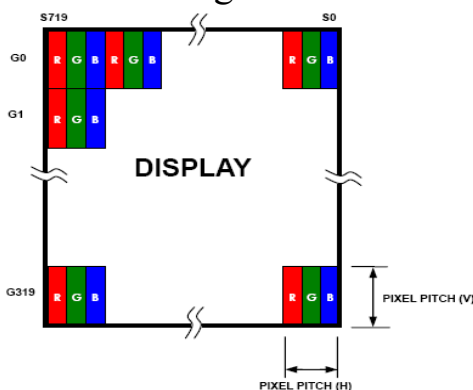
TST101WSBH-11 is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, a drive IC, a FPC, and a WLED-backlight unit. The active display area is 10.1 inches diagonally measured and the native resolution is 1024*RGB*600. Features of this product are listed in the following table.

1.2 Functions & Features

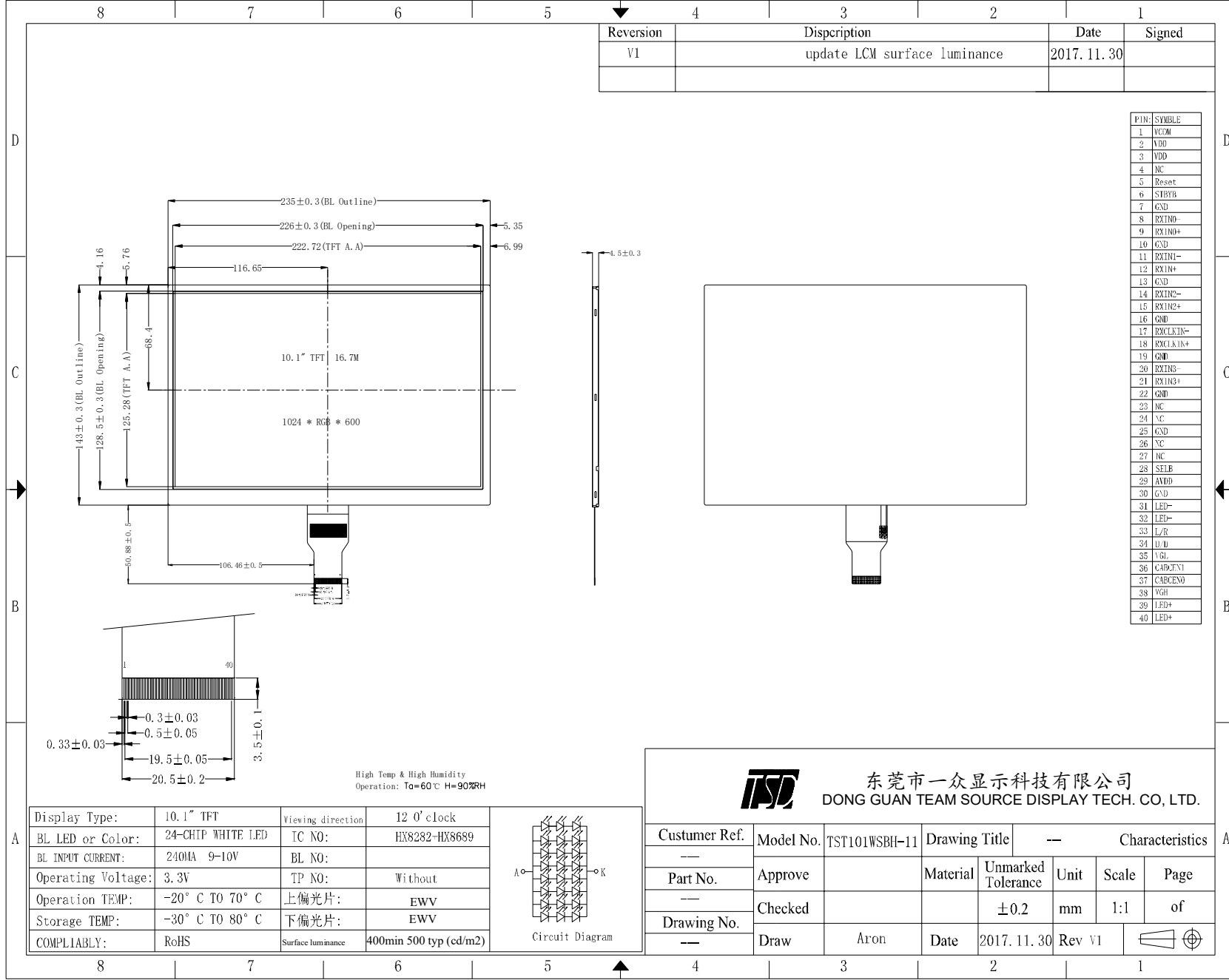
Table1.1 Module Functions & Features

Parameter	Value	Unit
LCD Mode	a-Si TFT/transmissive	-
Color	16.7M	-
Display Resolution	1024*3(RGB)*600	pixels
Outline Dimension	235.0(W) *143.0(H) *4.5(T)	mm
Active Area(A.A)	222.72*(W) *125.28(H)	mm
Pixel Arrangement	RGB-stripe	-
Viewing Direction	12 O'clock	
Display Mode	Normally White	
IC Package Type	COG	-
Surface Treatment	Anti-glare	
With/Without TP	Without	
Drive IC	HX8282+HX8696	
Back-light	White LED*24CHIP	pcs
Operation Temperature	-20~70	℃
Storage Temperature	-30~80	℃

Pixel Arrangement



2. Mechanical Specification



3. Electrical Units

3.1 Electrical Specification

<Table3. Electrical specifications>

Item	Symbol	Unit	Value			Note
			Min	Typ	Max	
Power voltage	DVDD	V	3.0	3.3	3.6	
	AVDD	V	9.4	9.6	9.8	
	VGH	V	20	21	22	-
	VGL	V	-9	-8	-7	
Input signal voltage	VCOM	V	3.3	3.8	4.3	
Operating Temperature	TOP	°C	-20		+70	
Storage Temperature	TST	°C	-30		+80	

Notes:

1. VGH is TFT Gate operating voltage.
2. VGL is TFT Gate operating voltage. The low voltage level of VGL signal must be fluctuates with same phase as Vcom.
3. Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.
4. DVDD setting should match the signals output voltage (refer to Note 3) of customer' s system board.
5. DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

3.2 Pin Descriptions

3.2.1 TFT LCD Panel interface FPC Pin Description

Pin NO.	Function Descriptions	Symbol
1	Common Voltage	VCOM
2	Digital Power	VDD
3	Digital Power	VDD
4	Not connect	NC
5	Global rest pin	RESET
6	Standby mode, Normally pulled high STBYB = “1” , normal operation STBYB = “0” , timing controller, source driver will turn off, all output are High-Z	STBYB
7	Power ground	GND
8	- LVDS differential data input	RXIN0-

9	LVDS differential data input	RXIN0+
10	Power ground	GND
11	- LVDS differential data input	RXIN1-
12	LVDS differential data input	RXIN1+
13	Power ground	GND
14	- LVDS differential data input	RXIN2-
15	LVDS differential data input	RXIN2+
16	Power ground	GND
17	- LVDS differential clock input	RXCLKIN-
18	+LVDS differential clock input	RXCLKIN+
19	Power ground	GND
20	- LVDS differential data input	RXIN3-
21	LVDS differential data input	RXIN3+
22	Power ground	GND
23	Not connect	NC
24	Not connect	NC
25	Power ground	GND
26	Not connect	NC
27	Not connect	NC
28	6bit/8bit mode select	SELB
29	Power for Analog Circuit	AVDD
30	Power ground	GND
31	LED Cathode	LED-
32	LED Cathode	LED-
33	Horizontal inversion	L/R
34	Vertical inversion	U/D
35	Gate OFF Voltage	VGL
36	CABC H/W enable	CABCEN1
37	CABC H/W enable	CABCEN0
38	Gate ON Voltage	VGH
39	LED Anode	LED+
40	LED Anode	LED+

Note1: If LVDS input data is 6 bits ,SELB must be set to High;

If LVDS input data is 8 bits ,SELB must be set to Low.

Note2: When CABC_EN=" 00 " , CABC OFF.

When CABC_EN=" 01 " , user interface image.

When CABC_EN=" 10 " , still picture.

When CABC_EN=" 11 " , moving image.

When CABC off, don' t connect DIMO, else connect it to backlight.

Note3: When L/R=" 0 " , set right to left scan direction.

When L/R=" 1 " , set left to right scan direction.

When U/D=" 0 " , set top to bottom scan direction.

When U/D=" 1 " , set bottom to top scan direction.

3.3.1 Electrical characteristics (Ta=25℃)

3.3.2 TFT-LCD Current Consumption

Table 3.2:

Item	Symbol	Unit	Test Condition	Min	Typ.	Max	Note
Gate on power current	IVGH	mA	VGH=21V	-	TBD		-
Gate off power current	IVGL	mA	VGL= -7.0V	-	TBD		-
Analog power current	IVDD	mA	VDD=3.3V	-	TBD		-
Analog power current	IAVDD	mA	AVDD=9.6V	-	TBD		

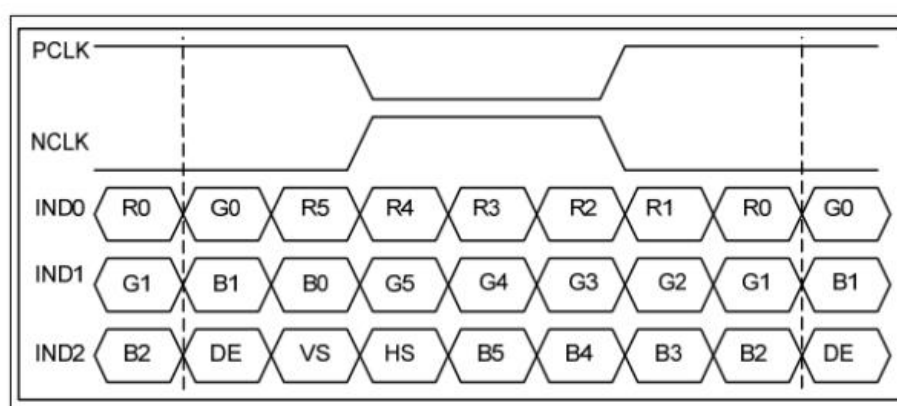
3.4 Back-light Specification

Table 3.3 Back-light Specification

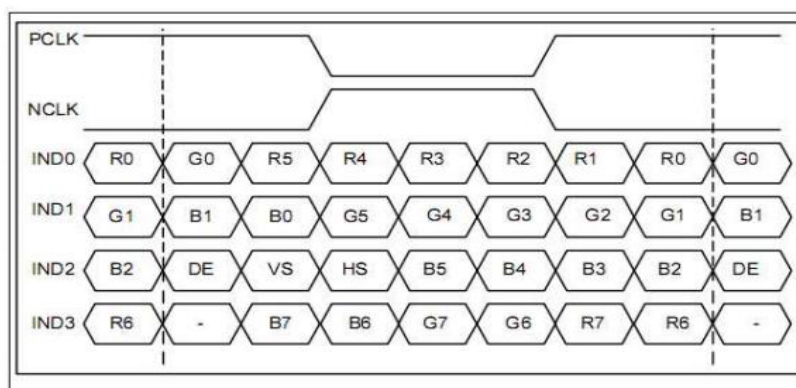
ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V_f	-	9.6	-	V
Current for LED backlight	I_f	-	240	-	mA
Power consumption	Wbl	-	2304	-	mW
Uniformity	Avg	75	-	-	%
LED Life Time	-	30000	40000	-	Hrs

4.Timing Characteristics

4.1. 6bit LVDS input



4.2. 8bit LVDS input

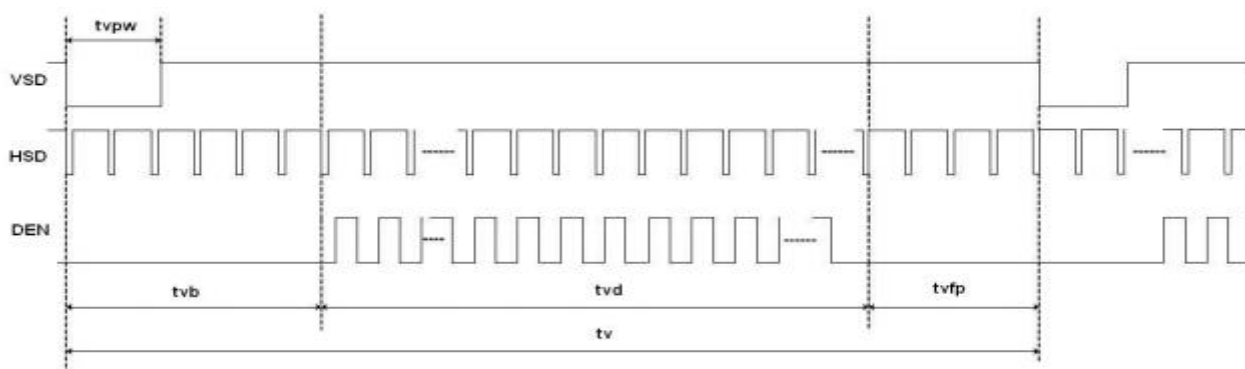


4.3 Interface Timing (DE mode)

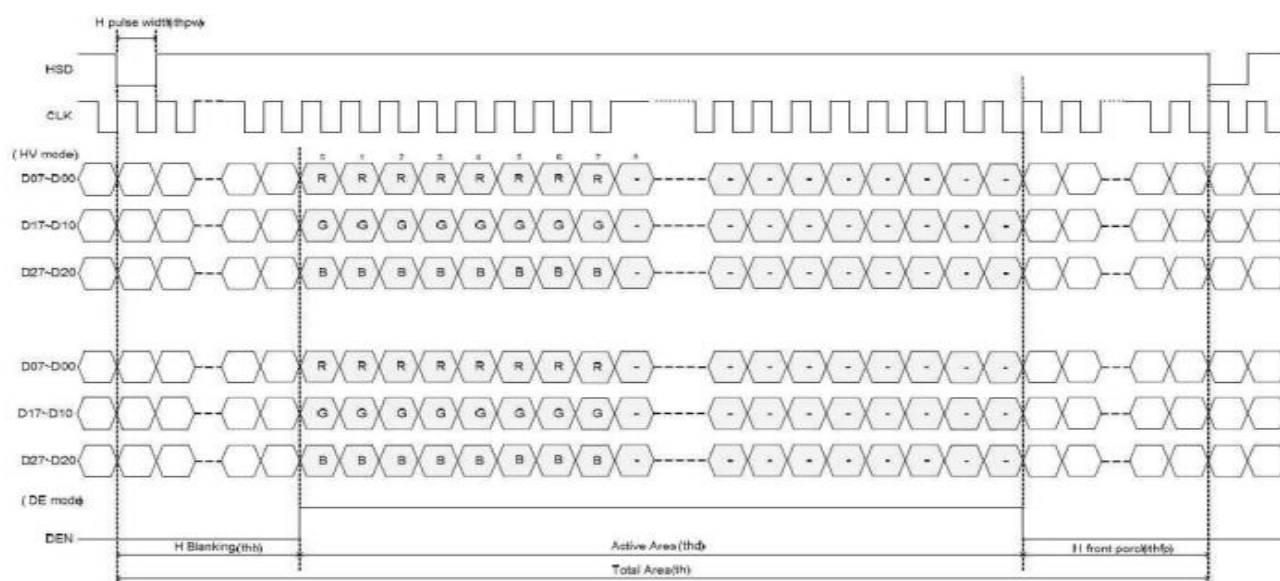
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	55	60	65	Hz
Frame Period	t1	610	635	800	line
Vertical Display Time	t2	600	600	600	line
Vertical Blanking Time	t3	10	35	200	line
1 Line Scanning Time	t4	1114	1344	1400	clock
Horizontal Display Time	t5	1024	1024	1024	clock
Horizontal Blanking Time	t6	90	320	376	clock
Clock Rate	t7	37.4	51.2	72.8	MHz

Timing Diagram of Interface Signal (DE mode)

(1) Vertical input timing



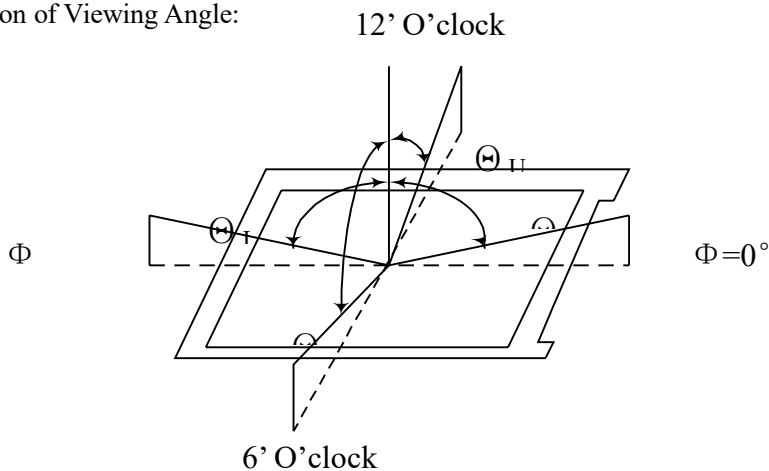
(2) Horizontal Vertical input timing



5 Optical Specifications

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (With PZ)		T		—	-	—		
Contrast		CR	⊙=0 Normal viewing angle	500	600	—		(1)(2)
Response time	Rising	TR		—	4	8	msec	(1)(3)
	Falling	TF		—	12	24		
White luminance(center)		YL		400	500	—	cd/m²	I=240mA
Color gamut		S		—	50	—	%	C light
Color chromaticity (CIE1931)	White	Wx		0.300	0.304	0.308		(1)(4) CF Glass C light
		Wy		0.335	0.339	0.343		
	Red	Rx		0.597	0.601	0.605		
		Ry		0.320	0.324	0.328		
	Green	Gx		0.297	0.301	0.305		
		Gy		0.563	0.567	0.571		
	Blue	Bx		0.139	0.143	0.147		
		By	0.169	0.173	0.177			
Viewing angle	Hor.	⊙ L	CR>10	70	80	—		
		⊙ R		70	80	—		
	Ver.	⊙ U		50	60			
		⊙ D		60	70			
Optima View Direction		12 O'clock						(5)

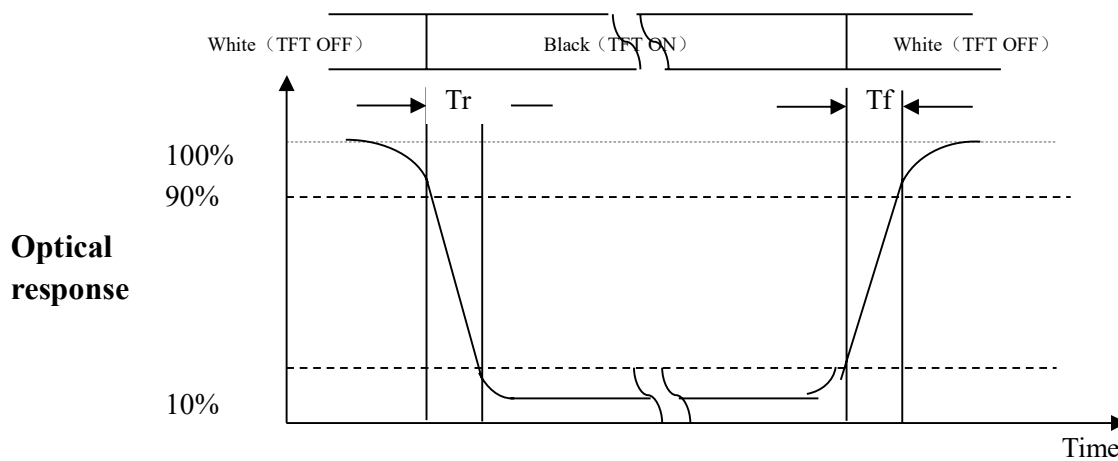
Note (1) Definition of Viewing Angle:



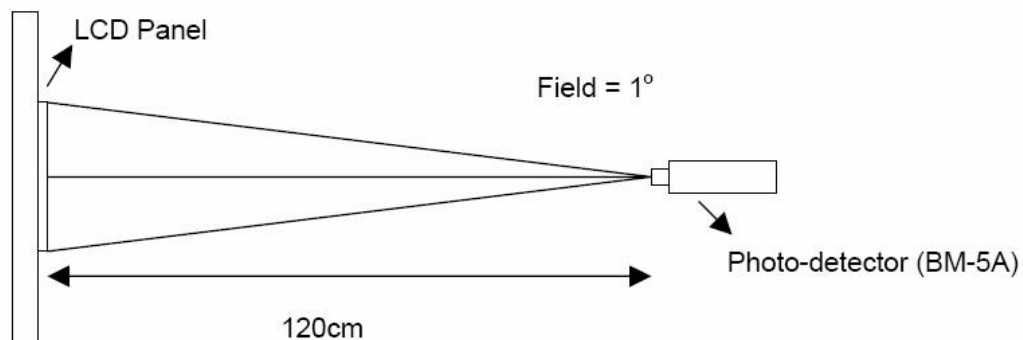
Note (2) Definition of Contrast Ratio (CR):
measured at the center point of pane

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3) Definition of Response Time: Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction.

6 Reliability Test Items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80℃, 240hrs	
2	Low Temperature Storage	Ta=-30℃, 240hrs	
3	High Temperature Operation	Ta=+70℃, 240hrs	
4	Low Temperature Operation	Ta=-20℃, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+70℃, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30℃(30min) → +80℃(30min), 200cycles	
7	Electrostatic Discharge	±200V,200pF(0Ω) 1 time/each terminal	
8	Vibration	1.Random: 1.04Grms, 5~500Hz, X/Y/Z, 30min/each direction 2. Sine: Freq. Range: 8~33.3Hz Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hr, Y: 4hr, cyc: 15min	
9	Shock	100G, 6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
10	Vibration (with carton)	Random: 0.015G ² /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ each direction: 2hr	
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

Reliability Test Criteria:

Display function should be no change under normal operating condition.

7. Handling Precautions

7.1 Safety

The liquid crystal in the LCD is poisonous. Keep away from your mouth and eyes. If the liquid crystal contacts with your skin, mouse or clothes, use soap to wash it off immediately.

7.2 Handling

- i. The LCD panel is made by thin glass. Prevent the panel from mechanical shock or putting excessive force on its surface.
- ii. The polarizer attached on the display is very easy to be damaged, handle it with special attention.
- iii. To avoid contamination on the display surface, do not touch the display surface with bare hands.
- iv. The transparent electrodes may be disconnected if you use the LCD panel under dew-condensing environment.

v. The characteristics of the semiconductor devices may be affected when they are exposed to light, possibly resulting in malfunctioning of the ICs. To prevent such malfunctioning of the ICs, make sure the application and the mounting of the panel are designed so that the IC is not exposed to light.

7.3 Static Electricity

Ground soldering iron tips, tools and testers when you operate. Also ground your body when handling the products and store the products in an anti-electrostatic container.

7.4 Storage

Store the products in a dark place where the temperature is within the range of 25 ± 10 and with low humidity (65%RH or less). Do not store the LCD product in an atmosphere containing organic solvents or corrosive gases.

7.5 Cleaning

Do not wipe the polarizer with dry cloth, as it might cause scratching. Wipe the polarizer with a soft cloth soaked with petroleum IPA. Other chemical might damage the panel.