



深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.: TST040WVBS-13

Version: V1.0

☐ APPROVAL FOR SPECIFICATION

☐ APPROVAL FOR SAMPLE

For Customer' s Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Organized by

Version No.	Date	Content	Remark
V1.0	2020-04-25	Initial Release	

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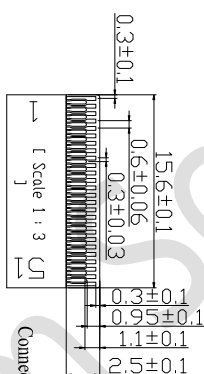
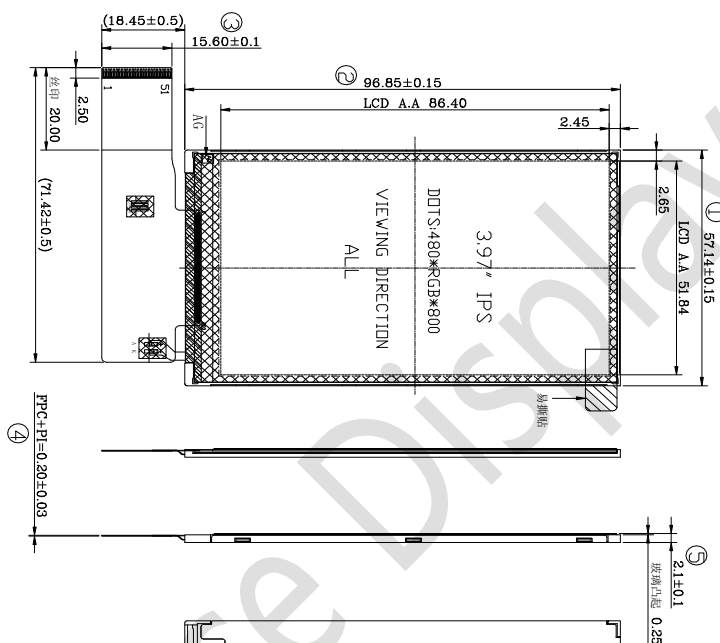
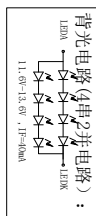
1 General Characteristics

ITEM	Specification	Unit
LCD Type	a-Si TFT,Transmissive,Normally black,IPS	-
LCD Size	3.97	inch
Resolution (W x H)	480 x (RGB) × 800	pixel
LCM size	57.14(W) x 96.85(H) x 2.1(D)	mm
Active Area	51.84 (W) x 86.4 (H)	mm
Dot Pitch	0.108(H)x0.108(V)	mm
Viewing Direction	all o'clock	-
Gray Scale Inversion Direction	-	-
Viewing Angle	Top:80,Bottom:80; Left/ Right:80	deg.
Color Depth	16.7M	-
Pixel Arrangement	RGB-stripe	-
Backlight Type	8 LEDs, 40mA	-
Surface Luminance	500	cd/m2
Surface Treatment	Anti-Glare	-
Driver IC	ST7701S	-
Interface Type	SPI+RGB	-
Input Voltage	2.8(TYP)	V
With/Without TP	Without	-
Weight	TBD	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

LCD Type	3.9" TFT, Transmissive
Resolution	Normally black, IPS 480RGB/800
View Direction	All, O'CLOCK
LCD Driver IC	ST7701S
Color Depth	16/7M
Interface Types	SP+RGB
Operating voltage	2.5V
TV Lines	Without
Backlight LEDs	8 LEDs, 40mA, 1.25V
Surface luminance	500 cd/m ² Typ
Operating temperature	-20 ~ +70 °C
Storage temperature	-30 ~ +80 °C



Connector : FH26-51S-0.3SHW

RGB + SPI
SCL rising edge trigger

版本 (Version)	变更记录(Change History)						
A0	Initial release	日期(Date) 2020.03.25					
		设计(DESIGN)				Bill	
		审核(CHECKED)				Atron	
		批准(APPROVED)				Atron	
		客户承认 (CUSTOMER APPROVAL)					
 TSO™ 一众显示 							
TITLE:							
MODULE SPEC		页面(Page)		1 / 1			
		单位(Unit)		mm			
Drawing No.		比例(SCALE)		1 : 1			
JSTO40WBS-13		角度(Angle)					

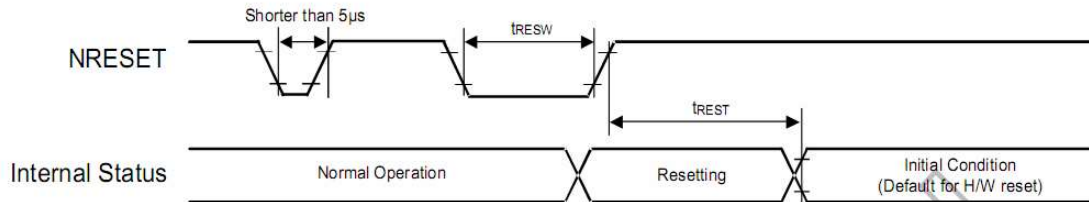
51	GND	47	NC	46	LEDJN	45	LEDJN	44	V5VNC	43	HSOTICK	42	DTCLK	41	ENABLE	40	DB00	39	DB01	38	DB02	37	DB03	36	DB04	35	DB05	34	DB06	33	DB07	32	DB08	31	DB09	30	DB10	29	DB11	28	DB12	27	DB13	26	DB14	25	DB15	24	DB16	23	DB17	22	DB18	21	DB19	20	DB20	19	DB21	18	DB22	17	RE5X	16	RE5X	15	C5X	14	WR5CL	13	SD1	12	SD0	11	TE	10	I0VCC	9	NC	8	VCI_28V	7	GND	6	CRX- +	5	YLCX- +	4	YLCX- +	3	YUCY- +	2	LEDA	1	LEMD	Pin
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3 Interface description

引脚(PIN)	符号(symbol)	描述(description)
1	LEDK	Backlight K Cathode input pin.
2	LEDA	Backlight A Aothod input pin.
3	YU	The touch panel Y Up pin
4	XL	The touch panel X Left pin
5	YD	The touch panel Y Down pin
6	XR	The touch panel X Right pin
7	GND	System Ground. (0V)
8	VCI	Power supply +2.8V
9	NC	No connect
10	IOVCC	Power supply +1.8V~+2.8V
11	TE	Tearing Effect output signal
12	SDO	Serial data output
13	SDI	serial data input
14	SCL	SPI: SCL pin as Serial Clock when operates in the serial
15	CSx	Chip select signal.
16	RESET	Reset input signal
17~40	DB23~DB0	Data Pin
41	ENABLE	A data ENABLE input signal
42	DOTCLK	Dot clock signal
43	HSYNC	Line synchronizing signal
44	VSYNC	Frame synchronizing signal
45	LEDPWM	If no use,please open it
46	LEDON	If no use,please open it
47	NC	No connect
48	NC	No connect
49	NC	No connect
50	NC	
51	GND	System Ground. (0V)

4 LCM Interface Timing

4.1 Reset Timing



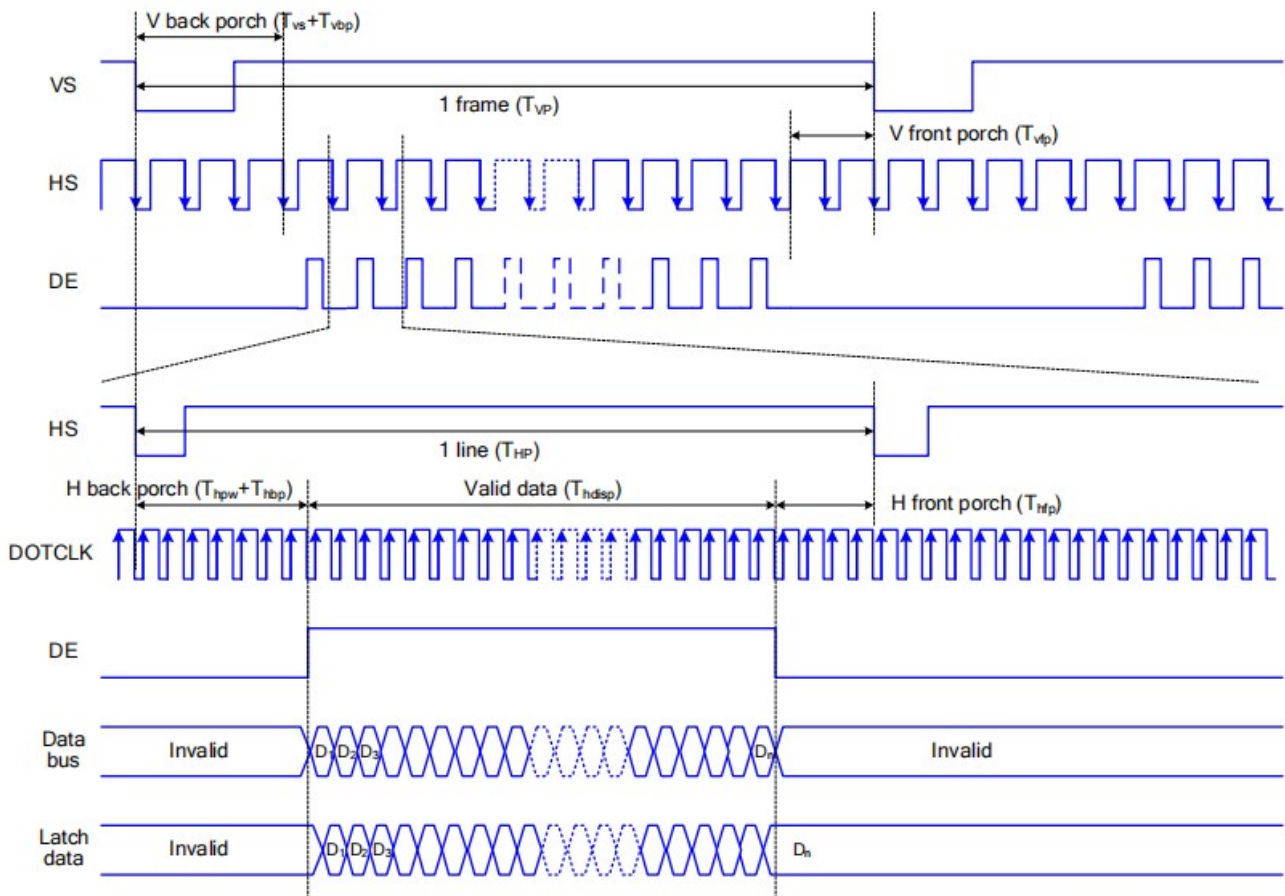
Signal	Symbol	Parameter	Min	Max	Unit
NRESET	t_{RESW}	Reset low pulse width	10	-	us
	t_{REST}	Reset complete time	-	5 (note 1)	ms
			-	120(note 2)	ms

Note: (1) When reset applied during SLPIN mode;

(2) When reset applied during SLPOUT mode.

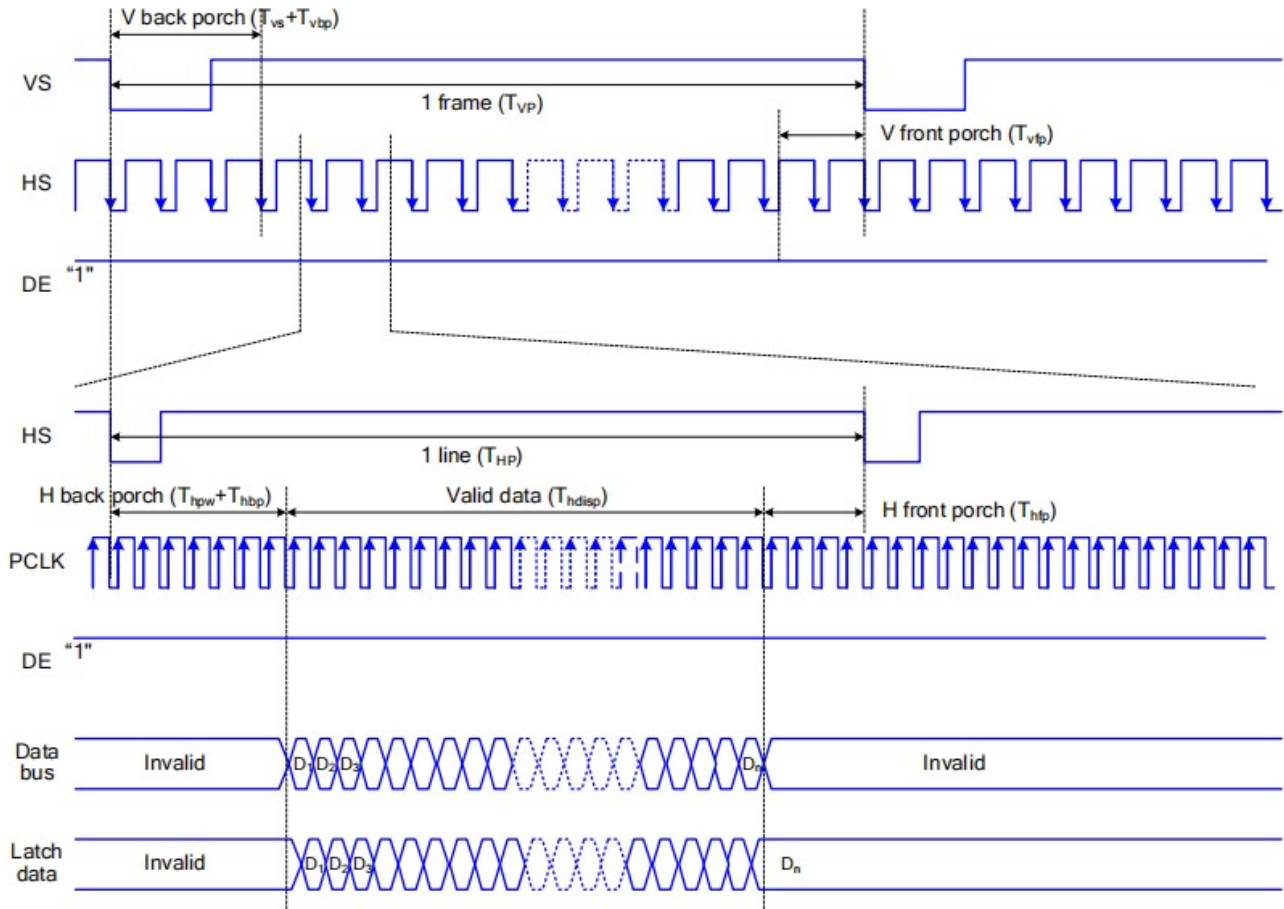
4.2 RGB Timing Characteristics

The timing chart of RGB interface DE mode is shown as follows.



Note: The setting of front porch and back porch in host must match that in IC as this mode.

The timing chart of RGB interface HV mode is shown as follows.



$VDDI=1.8, VDD=2.8, AGND=DGND=0V, T_a=25\text{ }^{\circ}\text{C}$

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYSN, HSYNCS Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	

Please refer to the following table for the setting limitation of RGB interface signals.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Horizontal Sync. Width	hpw	1	-	255	Clock
Horizontal Sync. Back Porch	hbp	1	--	255	Clock
Horizontal Sync. Front Porch	hfp	1	--	-	Clock
Vertical Sync. Width	vs	1	--	254	Line
Vertical Sync. Back Porch	vbp	1	--	254	Line
Vertical Sync. Front Porch	vfp	2	--	--	Line

Note:

1. Typical value are related to the setting frame rate is 60Hz..

4.3 SPI Interface Characteristics (3-Pin SPI, 9-bit/16-bit)

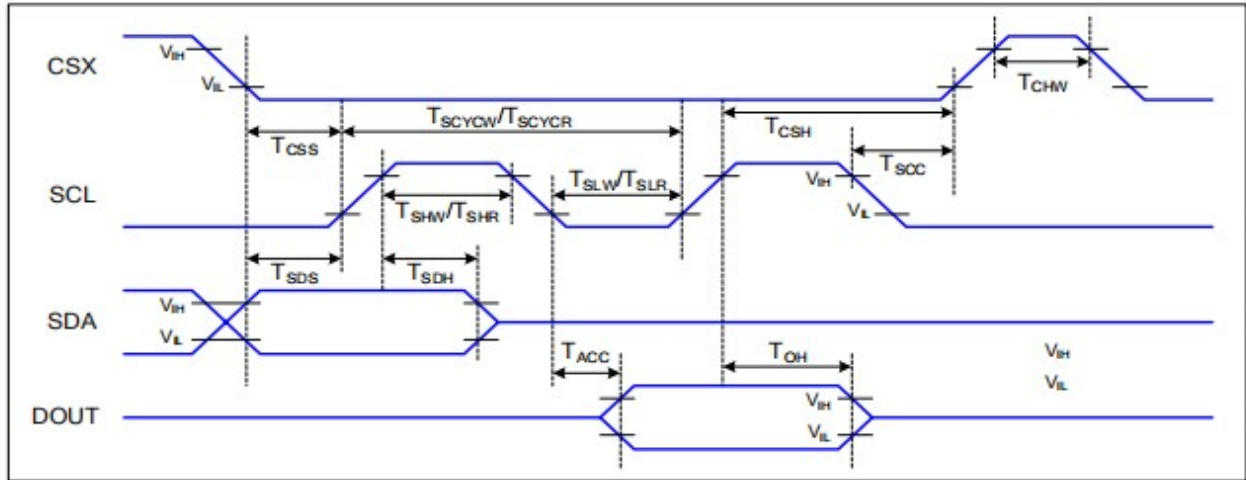


Figure 1 3-line serial Interface Timing Characteristics

VDDI=1.8, VDD=2.8, AGND=DGND=0V, $T_a=25^{\circ}\text{C}$

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SOC}	Chip select hold time (read)	60		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	

Table 4 3-line serial Interface Characteristics

Note : The rising time and falling time (T_r , T_f) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VDD~GND	-0.3	+4.6	V
Logic signal voltage(I/O)	IOVDD~GND	-0.3	+4.6	V
Operating Temperature	TOP	-20	70	° C
Storage Temperature	TST	-30	80	° C
Humidity	RH	-	90%(Max 60° C)	RH

6 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Analog operating voltage	VDD	2.5	2.8	3.6	V
Logic operating voltage	IOVDD	1.65	1.8	VDD	V
Input Current	IDD	-	TBD	-	mA
Input Voltage ' H ' level	VIH	0.7IOVCC	-	IOVCC	V
Input Voltage ' L ' level	VIL	GND	-	0.3IOVCC	
Output Voltage ' H ' level	VOH	0.8IOVCC	-	IOVCC	
Output Voltage ' L ' level	VOL	GND	-	0.2IOVCC	

7 Backlight Characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V _f	-	12.8	-	V
Current for LED backlight	I _f	-	40	-	mA
Power consumption	W _{bl}	-	512	-	mW
Uniformity	Avg	80	-	-	%
LED Life Time	-	30000	40000	-	Hrs

Note:

- 1.The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C, 60%RH ±5 %.
2. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions.
3. Typical operating life time is an estimated data.
4. Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded .Functional operation should be restricted to the conditions described under normal operating conditions.

8 LCD Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min	Typ	Max		
Response time (By Quick)	Tr+Tf	$\theta = 0^\circ$	-	35	-	ms	Note 5
Contrast ratio	CR	$\theta = 0^\circ$	650	900	-		Note 2,6
Viewing angle	Top	$CR \geq 10$	-	85	-	Deg.	Note 2,6,7
	Bottom	$CR \geq 10$	-	85	-		
	Left	$CR \geq 10$	-	85	-		
	Right	$CR \geq 10$	-	85	-		
Color Filter Chromaticity with C light	Wx	$\theta = 0^\circ$	0.638	0.658	0.678		Note 3
	Wy		0.305	0.325	0.345		
	Rx		0.256	0.276	0.296		
	Ry		0.578	0.598	0.618		
	Gx		0.114	0.134	0.154		
	Gy		0.104	0.124	0.144		
	Bx		0.274	0.294	0.314		
	By		0.312	0.332	0.352		
Transmittance	Trans		-	5.3%	-		Note 4

Note 1: Ambient temperature = 25°C.

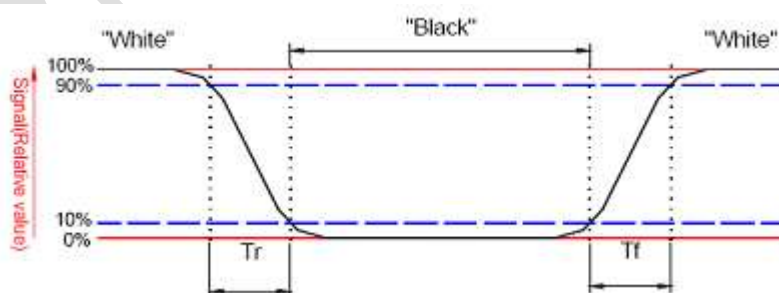
Note 2: To be measured with a viewing cone of 2° by Topcon luminance meter BM-5A.

Note 3: To be measured with Otsuta chromaticity meter LCF-2100M, CF only measure under C light simulation.

Note 4: CTC shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer.
The tolerance of Transmittance is $\pm 10\%$.

Note 5: Definition of response time:

The output signals of TRD-100 are measured when the input signals are changed to "White" (falling time) and from "White" to "Black" (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.

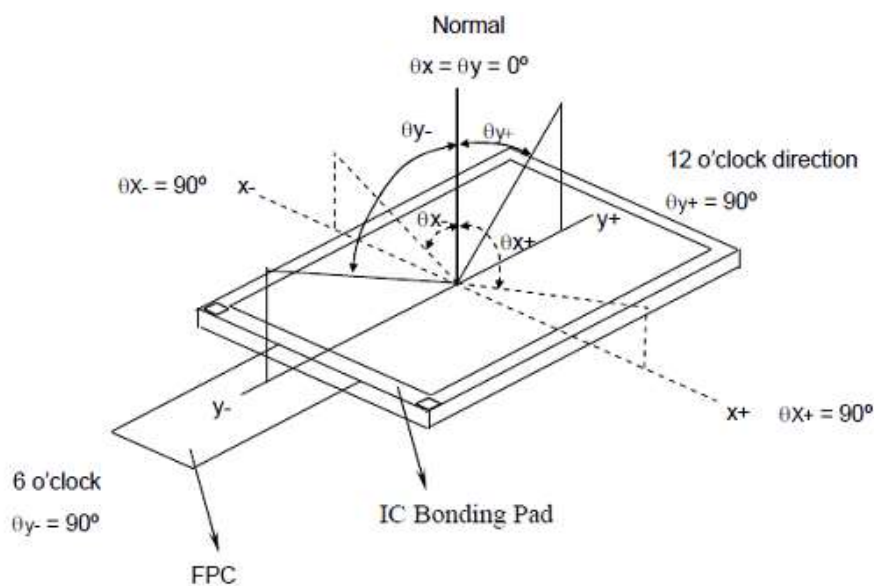


Note 6: Definition of contrast ratio:

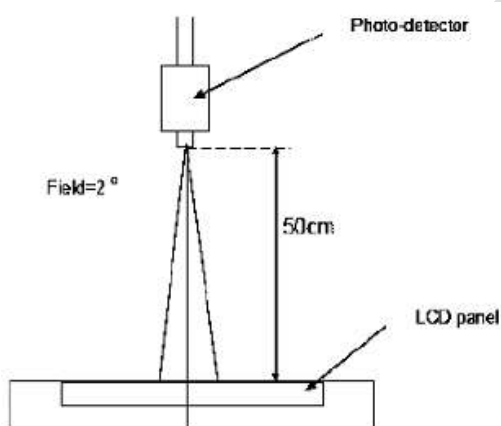
Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

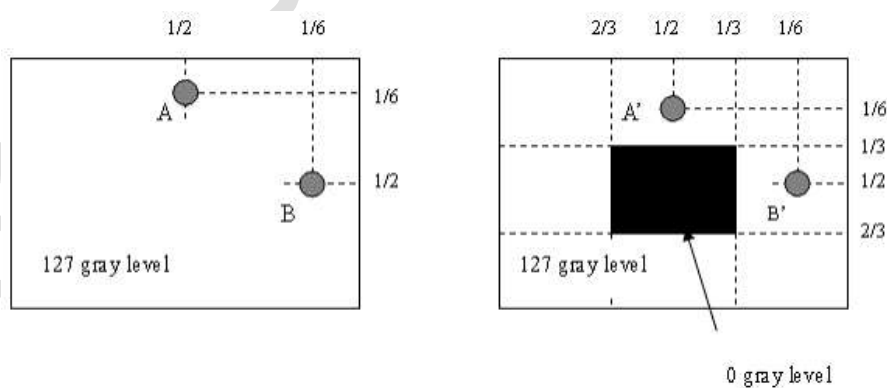
Note 7: Definition of viewing angle



Note 8: Optical characteristic measurement setup.



Note 9:



$1 \text{ LA-LA}' / \text{LA} \times 100\% = 2\% \text{ max.}$, LA and LA' are brightness at location A and A'.

$1 \text{ LB-LB}' / \text{LB} \times 100\% = 2\% \text{ max.}$, LB and LB' are brightness at location B and B'.

9 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	80±2°C/96 hours	Inspection after 2~4 hours storage at room temperature and humidity. The condensation is not accepted. The sample shall be free from defects: 1. Air bubble in the LCD 2. Seal leak 3. Non-display 4. Missing segments 5. Glass crack
2	Low Temperature Storage	-30±2°C/96 hours	
3	High Temperature Operating	70±2°C/96 hours	
4	Low Temperature Operating	-20±2°C/96 hours	
5	Temperature Cycle	-30±2°C ~ 25~ 80± 2°C × 10 cycles (30 min.) (5min.) (30min.)	
6	Damp Proof Test	60°C ±5°C × 90%RH/96 hours	
7	Vibration Test	Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~150 Hz~10Hz 2 hours For each direction of X, Y, Z	
8	Shock Test	Half-sine, wave, 300m/s	
9	Packing Drop Test	Height: 80 cm 1 corner, concrete floor	
10	Electrostatic Discharge Test	C=150pF, R=330 Ω Air: ±8KV 150pF/330Ω 30 times Contact: ±4KV,20 times	

10 Suggestions for using LCD modules

10.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.
2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.
3. Don't apply excessive force on the surface of the LCM.
4. If the surface is contaminated, clean it with soft cloth. If the LCM is severely contaminated, use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer. The following solvents is especially prohibited: water , ketone Aromatic solvents etc.
5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
7. Don't disassemble the LCM.
8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

9. Do not alter, modify or change the the shape of the tab on the metal frame.

10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

11. Do not damage or modify the pattern writing on the printed circuit board.

12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector

13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

14. Do not drop, bend or twist LCM.

10.2 Storage

1. Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.

2. Storage in a clean environment, free from dust, active gas, and solvent.

3. Store in antistatic container.

