Display Elektronik GmbH

DATA SHEET

TFT MODULE

DEM 800800B VMH-PW-N

(ROUND 3,4" TFT)

Product Specification   Version: 0

17.01.2024

Revision History

Date	Rev. No.	Page	Summary
17.01.2024	0	ALL	FIRST ISSUE

Contents

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit, backlight unit. The resolution of a 3.4" TFT-LCD contains 800xRGBx800 Pixels, and can display up to 16.7Million colors.
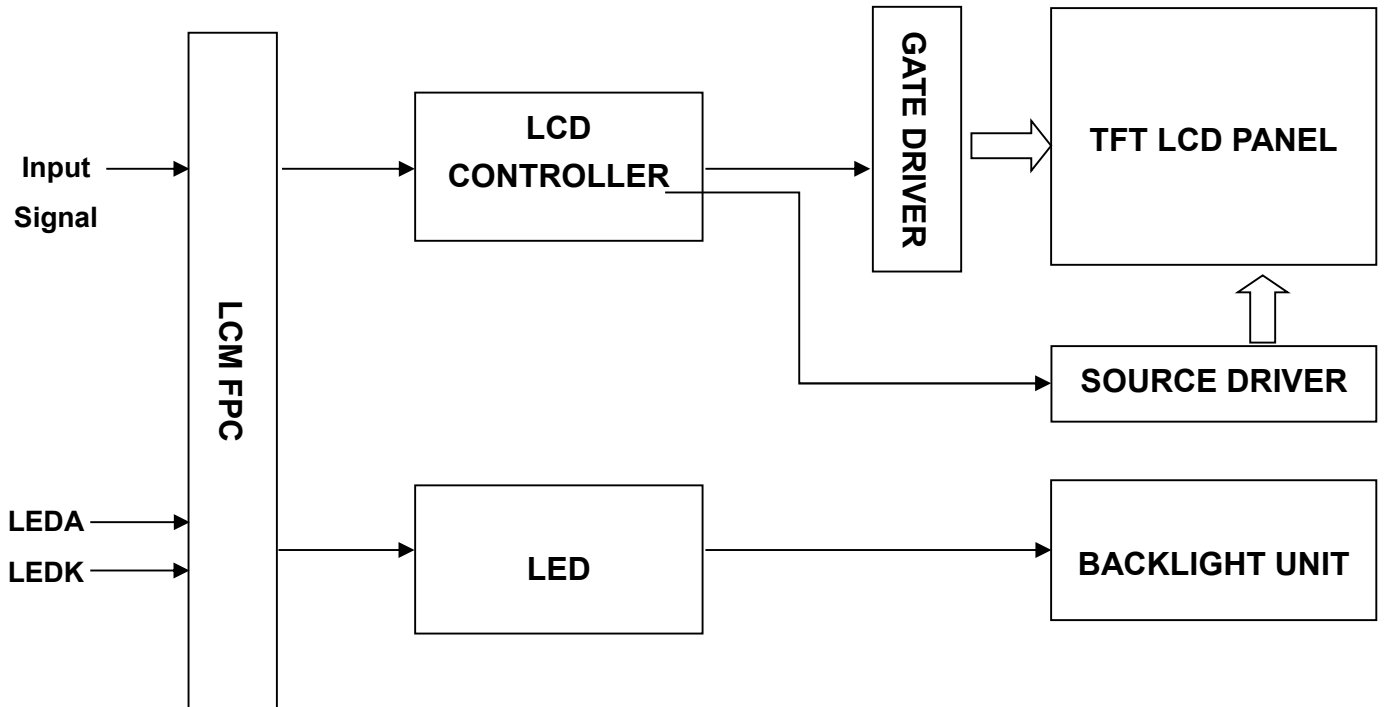
* TFT Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display Area(AA)	87.60 x 87.60 (3.4 Inch)	mm	-
Driver Element	TFT Active Matrix	-	-
Display Colors	16.7 Million	colors	-
Number of Pixels	800 x RGB x 800	dots	-
Pixel Arrangement	RGB Vertical Stripe	-	-
Pixel Pitch	0.1095 x 0.1095	mm	-
Viewing Angle	ALL	o'clock	-
Controller IC	NV3051F-L	-	-
LCM Interface	8Bit LVDS	-	-
Display Mode	IPS, Transmissive / Normally Black	-	-
Operating Temperature	-20°C ~ +70°C	°C	-
Storage Temperature	-30°C ~ +80°C	°C	-

* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	-	94.9	-	mm	-
	Vertical(V)	-	96.95	-	mm	-
	Depth(D)	-	2.18	-	mm	-
Weight		-	35	-	g	-

1. Block Diagram

```
                                                  ┌──────────┐      ┌──────────────────┐
                                                  │  GATE    │      │                  │
                                                  │  DRIVER  │ ⇨    │  TFT LCD PANEL    │
              ┌─────┐      ┌───────────┐          │          │      │                  │
  Input       │     │      │   LCD     │          └──────────┘      │                  │
  ──────────▶ │  L  │─────▶│ CONTROLLER│────────┐                   │                  │
  Signal      │  C  │      │           │        │                   │          ⬆       │
              │  M  │      └───────────┘        │                   └──────────────────┘
              │     │                           │                          ⬆
              │  F  │                           │                   ┌──────────────────┐
              │  P  │                           └──────────────────▶│  SOURCE DRIVER   │
              │  C  │                                               └──────────────────┘
  LEDA  ────▶ │     │      ┌───────────┐                            ┌──────────────────┐
  LEDK  ────▶ │     │─────▶│    LED    │──────────────────────────▶ │  BACKLIGHT UNIT  │
              └─────┘      └───────────┘                            └──────────────────┘
```

2. Outline Dimension

Pin	Name
1	VC
2	VDD
3	VDD
4	NC
5	NC
6	STBYB
7	GND
8	RXIN0-
9	RXIN0+
10	GND
11	RXIN1-
12	RXIN1+
13	GND
14	RXIN2-
15	RXIN2+
16	GND
17	RXCLKIN-
18	RXCLKIN+
19	GND
20	RXIN3-
21	RXIN3+
22	GND
23	NC
24	NC
25	GND
26	NC
27	NC
28	NC
29	NC
30	GND
31	LED-
32	LED-
33	NC
34	NC
35	NC
36	NC
37	NC
38	NC
39	LED+
40	LED+

Date Code
BL0340801
LH YYMMDD

DEM 800800B VMH-PW-N/S
WYW-CODE

Molex:505110-4096
(Pitch0.5mm/Bottom contact clamshell type)

21.21±0.50
47.45±0.80
1.45
40.18±0.20
22.21

2.18±0.20 LCD
1.04±0.15 LCD O.D
1.14±0.20 BL

2.33±0.25
1.30 max

FRONT
BACK

REMOVE TAPE

0.15
0.45
3.25
3.65

47.45

3.4"TFT
800×RGB×800
DOTS
VIEWING
DIRECTION
ALL CLOCK

AG Dot
AG Dot

94.90±0.20 BL O.D
94.60±0.15 LCD O.D
94.00±0.20 TOP POL.
88.40±0.20 BL V.A
87.60 LCD A.A

46.45
87.60 LCD A.A
88.40±0.20 BL V.A
91.80±0.20 TOP POL.
96.60±0.15 LCD O.D
96.95±0.20 BL O.D

2.65
2.25
0.45
0.15

B/L Circuit
LED K
LED A

NOTE:
1. DISPLAY TYPE:3.4", TFT-LCD,16.7M COLORS
2. DISPLAY MODE:NORMALLY BLACK/IPS
3. VIEWING DIRECTION:ALL
4. LCM DRIVER IC:NV3051F-L (COG)
   LCM Interface:LVDS
5. VDD/VCI:3.3V(TYP.)
6. OPERATING TEMP: -20° C TO 70° C
   STORAGE TEMP: -30° C TO 80° C
7. BACK LIGHT:LED WHITE, 8 LED,40mA,10.8-13.2V
8. RoHS COMPLIANT.
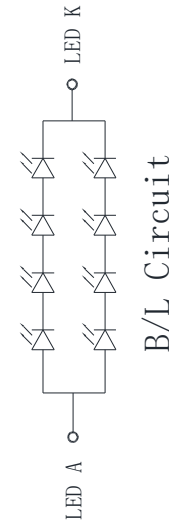
3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	NC	No connected	--
2	VDD	Power supply for digital circuits	P
3	VDD		P
4	NC	No connected	--
5	NC	No connected	--
6	STBYB	Power ON/OFF PIN, Normally pulled high STBYB = "1",Power ON. STBYB = "0", Power OFF.	I
7	GND	Ground	P
8	RXIN0-	- LVDS differential data input	I/O
9	RXIN0+	+ LVDS differential data input	I/O
10	GND	Ground	P
11	RXIN1-	- LVDS differential data input	I/O
12	RXIN1+	+ LVDS differential data input	I/O
13	GND	Ground	P
14	RXIN2-	- LVDS differential data input	I/O
15	RXIN2+	+ LVDS differential data input	I/O
16	GND	Ground	P
17	RXCLKIN-	- LVDS differential clock input	I/O
18	RXCLKIN+	+ LVDS differential clock input	I/O
19	GND	Ground	P
20	RXIN3-	- LVDS differential data input	I/O
21	RXIN3+	+ LVDS differential data input	I/O
22	GND	Ground	P
23	NC	No connected	--
24	NC	No connected	--
25	GND	Ground	P
26	NC	No connected	--
27	NC	No connected	--
28	NC	No connected	--
29	NC	No connected	--
30	GND	Ground	P
31	LED-	LED Cathode	P
32	LED-	LED Cathode	P
33	NC	No connected	--

34	NC	No connected	--
35	NC	No connected	--
36	NC	No connected	--
37	NC	No connected	--
38	NC	No connected	--
39	LED+	LED anode	P
40	LED+	LED anode	P

4. LCD Optical Characteristics

4.1 Optical Specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	$\Theta=0$	1000	1200	--		(1)(2)
Response Time	Rising	T_R+T_F	Normal Viewing Angle	--	30	35	msec	
	Falling							(1)(3)
Color Gamut		S(%)		60	64	--	%	
Color Filter Chromacicity	White	W_X		-0.04	0.291	+0.04		(1)(4) CA-310
		W_Y			0.331			
	Red	R_X			0.639			
		R_Y			0.352			
	Green	G_X			0.316			
		G_Y			0.586			
	Blue	B_X			0.144			
		B_Y			0.085			
Viewing Angle	Hor.	ΘL	CR>10	80	85	--		(1)(4)
		ΘR		80	85	--		
	Ver.	ΘU		80	85	--		
		ΘD		80	85	--		
Option View Direction		ALL						

*The data comes from the LCD specification.

Measuring Condition

Measuring surrounding: dark room

Ambient temperature: 25°C±2°C

15min. warm-up time.

Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity

and BM-5A for other optical characteristics.

Note (1): Definition of Viewing Angle:
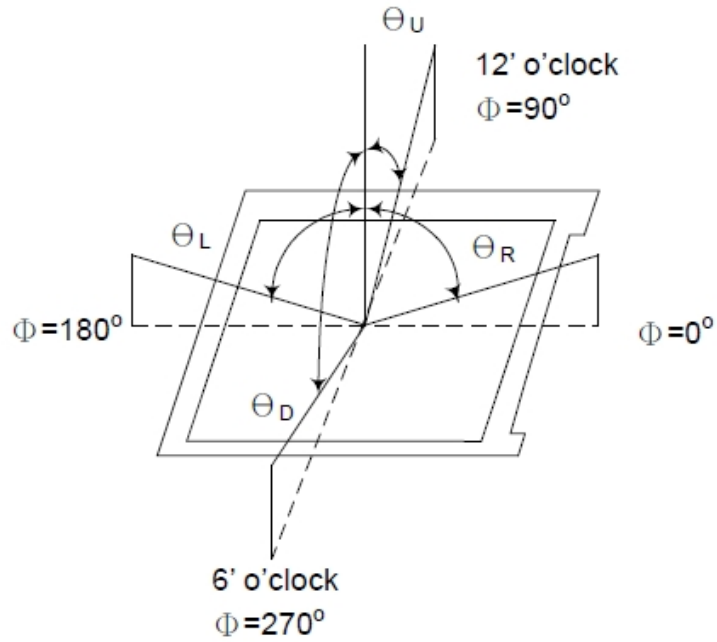
Note (2): Definition of Contrast Ratio(CR): measured at the center point of panel

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

Note (3): Response Time
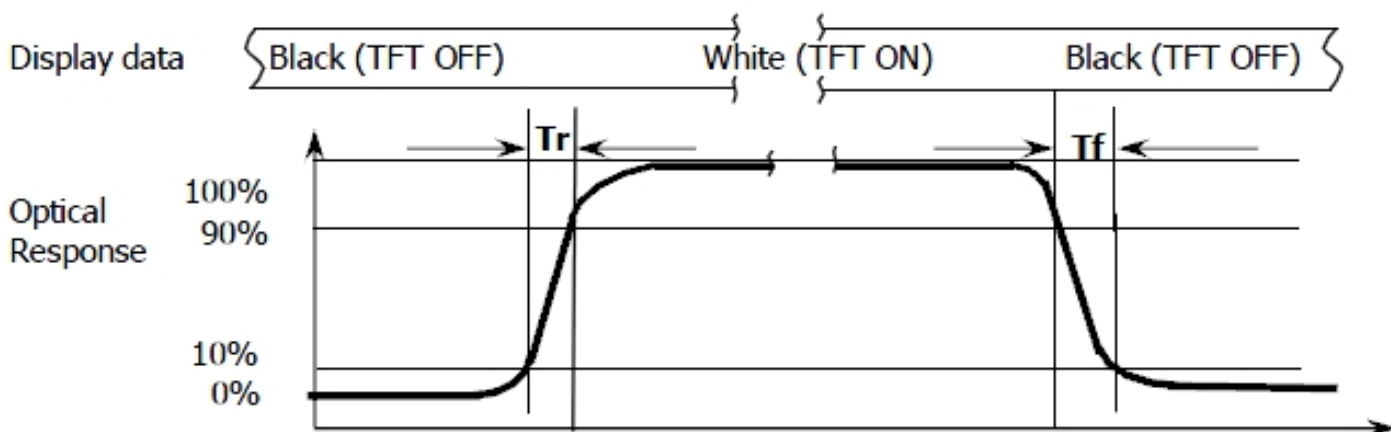
Note (4): Definition of optical measurement setup
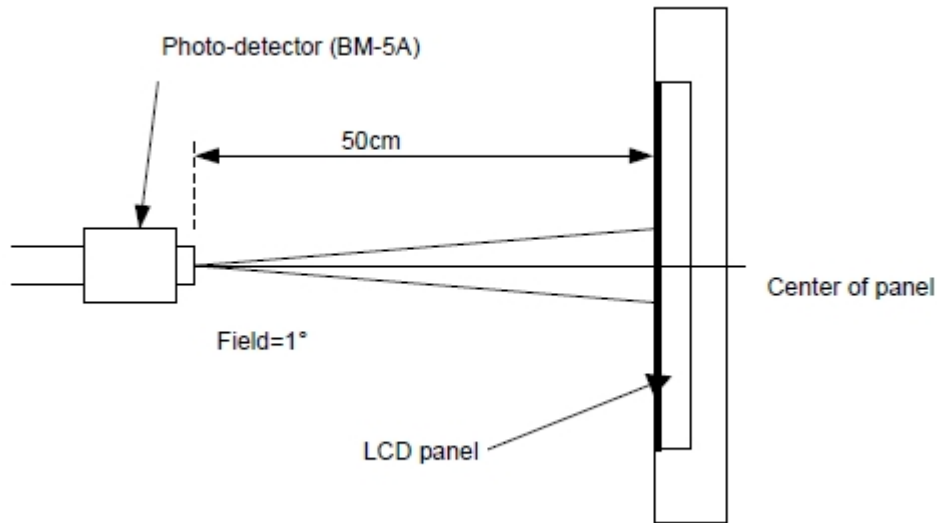
5. Electrical Characteristics

5.1 Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	VDD	-0.3	4.5	V	Note1
Operating Temperature	T_{OP}	-20	+70	°C	-
Storage Temperature	T_{ST}	-30	+80	°C	−

NOTE1: If the absolute maximum rating of even is one of the above parameters is exceeded even
momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore,
specify the values exceeding which the product may be physically damaged.
Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VCI	2.5	3.3	3.6	V	-
Normal Mode Current	IDD	--	33	66	mA	-
Level Input Voltage	V_{IH}	0.7 VDD	--	VDD	V	-
	V_{IL}	-0.3	--	0.3 VDD	V	-
Level Output Voltage	V_{OH}	0.8* VDD	--	VDD	V	-
	V_{OL}	GND	--	0.2 VDD	V	-

5.3 LED Backlight Characteristics

The backlight system is edge-lighting type with 8 chips LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	--	40	--	mA	-
Forward Voltage	V_F	10.8	--	13.2	V	-
LCM Luminance (I_F =40mA)	LV	350	420	--	cd/m2	Note3
LED Lifetime	Hr	50000	--	--	Hour	Note1,2
Uniformity	Avg	80	--	--	%	Note3

Note1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25°C±3°C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA.

The constant current driving method is suggested.

LED A ○——————— LED K
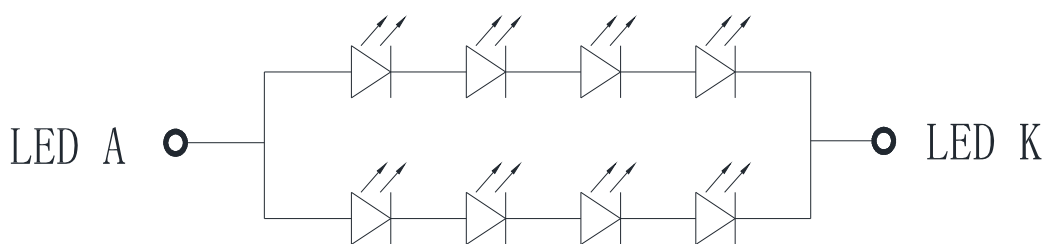
CIRCUIT DIAGRAM

Note (3)   Luminance Uniformity of these 9 points is defined as below:
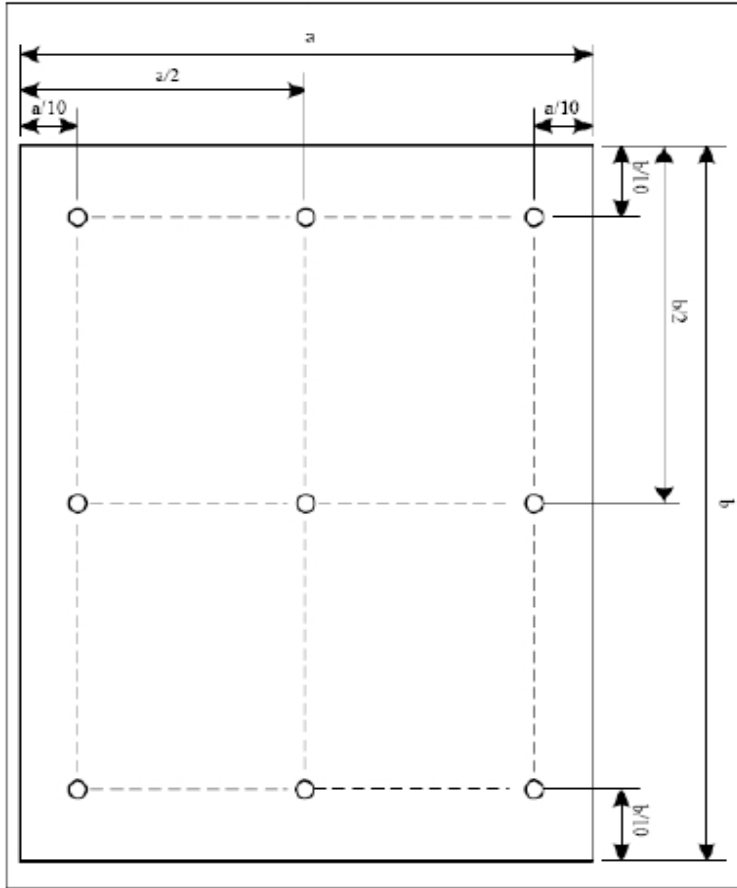
$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

6. LVDS Interface Characteristics

6.1 LVDS AC Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Clock Frequency	RxFCLK	-	30	-	TBD	MHz
Input data skew margin	TRSKM	$\|VID\|$=200mV RxVCM=1.2V RxFCLK=81MHz	500	-	-	ps
Clock High Time	TLVCH	-	-	4/(7*RxFCLK)	-	ns
Clock Low Time	TLVCL	-	-	3/(7*RxFCLK)	-	ns
PLL wake-up-time	TenPLL	-	-	-	150	us
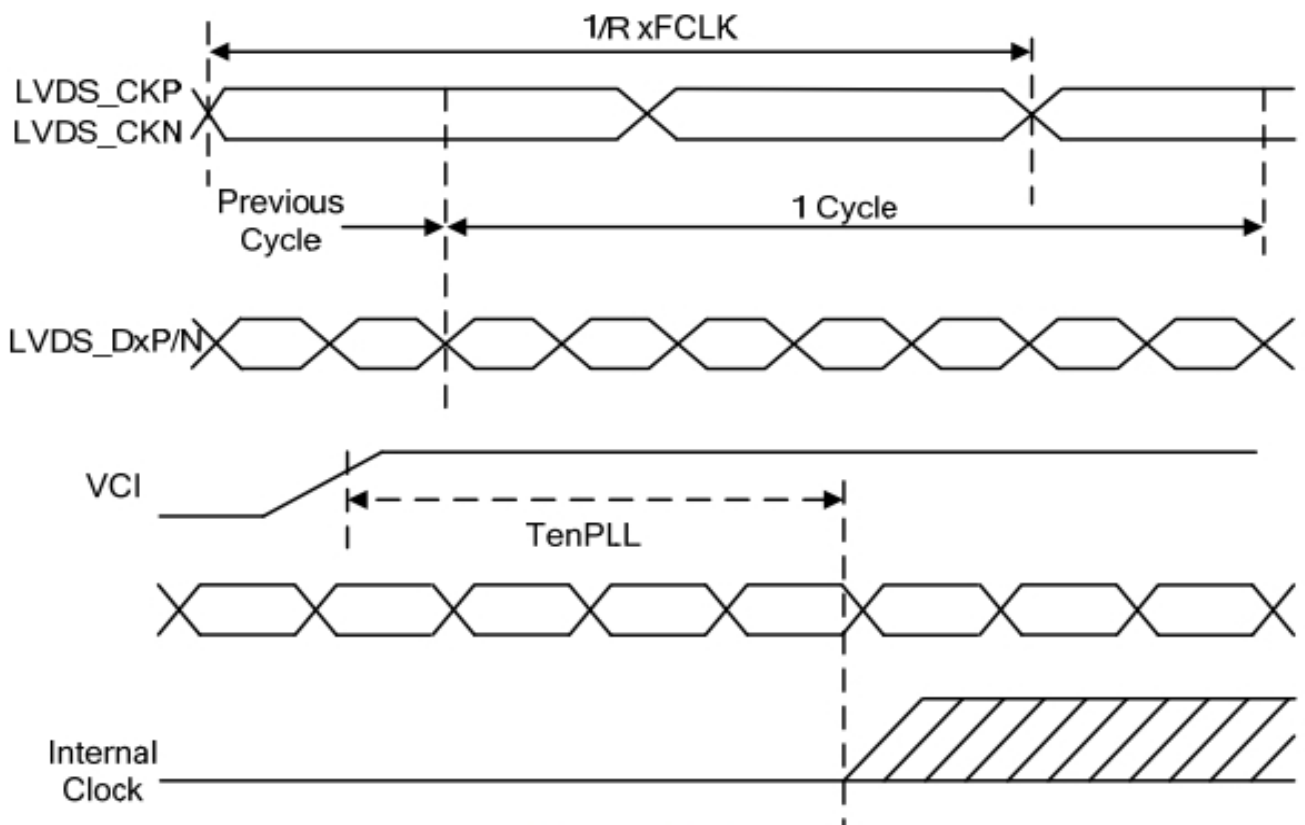
Figure LVDS figure

Parameter	Symbol	Min.	Typ.	Max.	Units	Condition
Modulation Frequency	SSCMF	23	-	93	KHz	
Modulation Rate	SSCMR	-	-	+3	%	
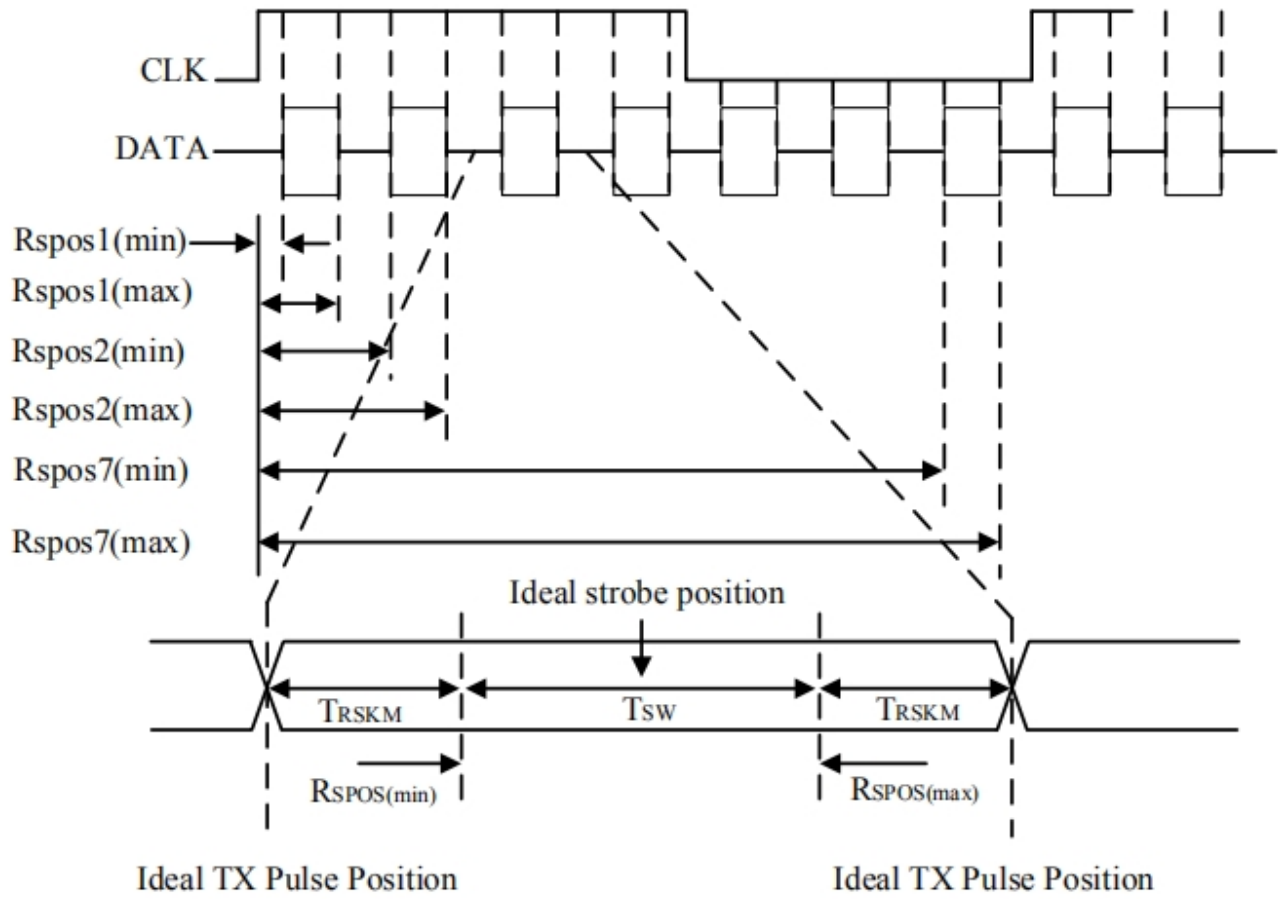
T_{SW}: Strobe width (Internal data sampling window)
R_{SPOS}: Receiver strobe position
T_{RSKM}: Receiver strobe margin

6.2 LVDS DC Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Differential input high threshold voltage	$V_{Rx,TH}$	$V_{RxVCM}=1.2V$	-	0.2	-	V
Differential input low threshold voltage	$V_{Rx,TL}$		-	-0.2	-	V
Input voltage range(single-end)	V_{RxIN}		0	-	1.8	V
Differential input common mode voltage	V_{RxVCM}		$|VID|/2$	1.2	$1.8 - |VID|/2$	V
Differential input voltage	$|VID|$		0.2	0.4	0.6	V
Differential input leakage current	I_{LCLVDS}		-10	-	10	uA
Differential input impedance	ZID		80	100	140	Ω
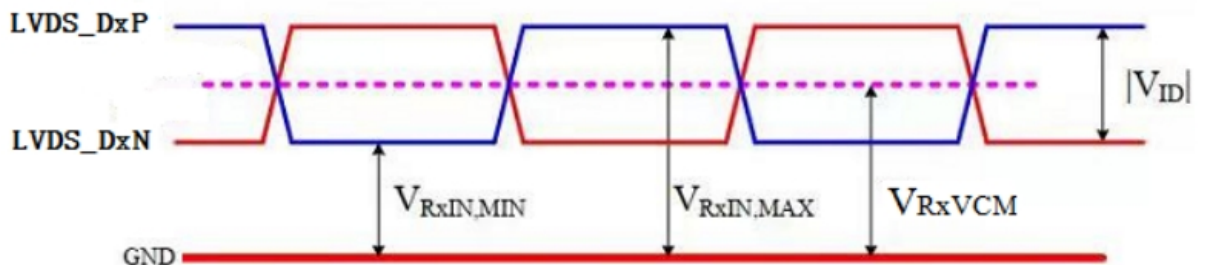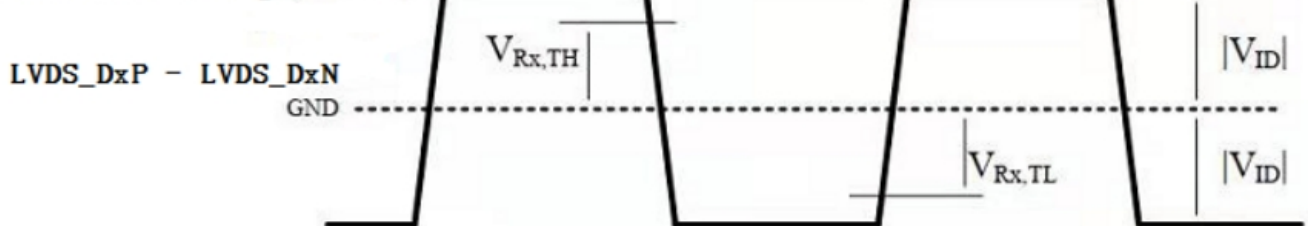
Figure: LVDS Receiver Differential Definition

6.3 Timing for LVDS Mode
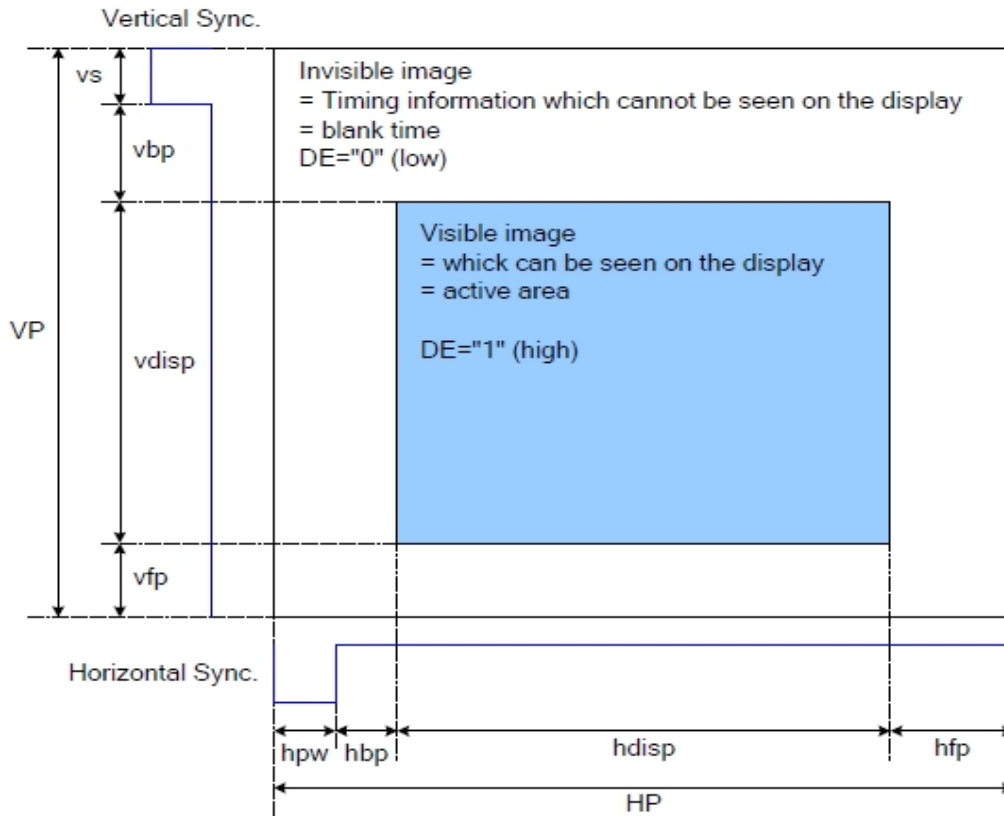
Parameter	Symbol	Min.	Typ.	Max.	Unit
DCLK frequency	FCLK	--	(43)	--	MHz
Horizontal display area	HDISP	--	800	--	Clock
Horizontal Sync. Width	hpw	1	4	--	Clock
Horizontal Sync. Back Porch	hbp	1	30	-	Clock
Horizontal Sync. Front Porch	hfp	1	24	--	Clock
Vertical display area	VDISP	--	800	--	Line
Vertical Sync. Width	vs	1	4	--	Line
Vertical Sync. Back Porch	vbp	1	10	--	Line
Vertical Sync. Front Porch	vfp	1	20	--	Line
Frame-Rate		--	60	--	Hz

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

7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

Temperature: 25°C±5°C

Humidity: 65%±10%RH

Viewing Angle: Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance: 30-50cm

Upper Polarizer

Bottom glass   Upper

Bottom Polarizer

Light Source
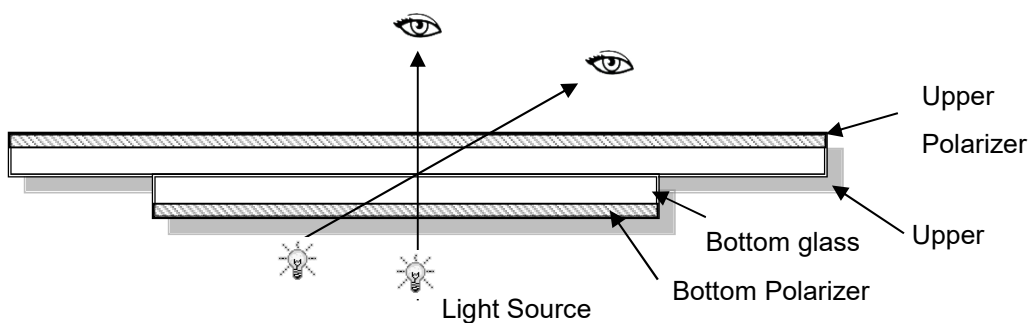
7.1.2 Definition

Zone D

Zone B   Zone A
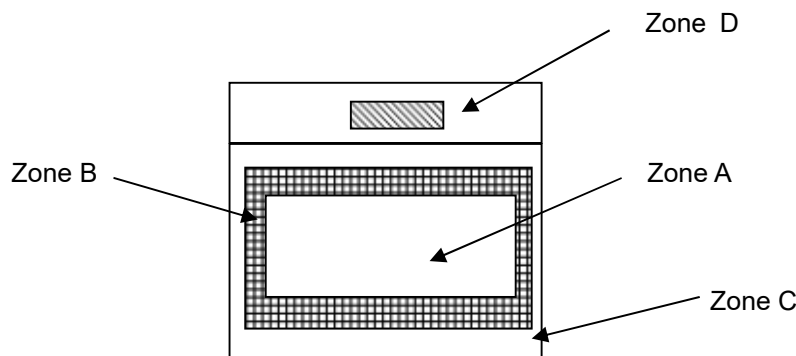
Zone C

Zone A : Effective Viewing   Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer

Zone D : IC Bonding Area

Note: As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

7.1.3 Sampling Plan

According to GB/T 2828-2012, normal inspection, Class Ⅱ

AQL:

Major Defect	Minor Defect
0.65	1.5
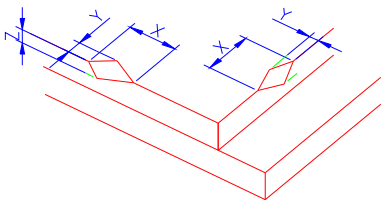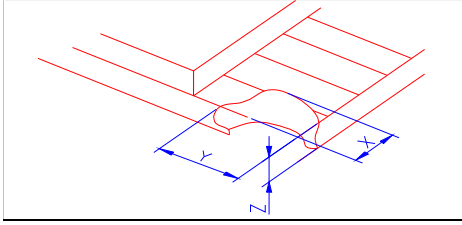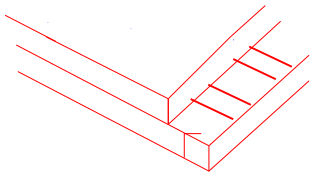
LCD: Liquid Crystal Display, LCM: Liquid Crystal Module,
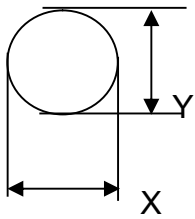
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. etc…	Major
2	Missing	Missing components and etc…	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed,deformation and etc…	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot/Line defect	Light dot,Dim spot,(Note1) Polarizer Air Bubble, Polarizer accidented spot and etc.	
6	Soldering appearance	Good soldering , Peeling off is not allowed and etc.	
7	LCD/Polarizer	Black/White spot/line, scratch, crack, etc.	

Note1:

a) Light dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black
   pattern.

b) Dim dot: Dots appear dark and unchanged in size in which LCD panel is displaying under
   pure red, green, blue picture.

7.1.4 Criteria (Visual)

Number	Items	Criteria(mm)		
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken			
		X	Y	Z
		≤3.0mm	<Inner border line of the seal	≤T
	(2)LCD corner broken			
		X	Y	Z
		≤3.0mm	≤L	≤T
	(3) LCD crack	Crack Not allowed		

Spot defect

2.0

$\Phi=(X+Y)/2$

① light dot（ black/white spot , pinhole, stain，etc.）

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore	Ignore	
0.15<Φ≤0.25	3(distance≧6mm)		
0.25<Φ≤0.4	2(distance≧6mm)		
Φ>0.4	0		

② Dim spot（light leakage、dent、dark spot，etc）

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore	Ignore	
0.15<Φ≤0.25	3(distance≧6mm)		
0.25<Φ≤0.4	2(distance≧6mm)		
Φ>0.4	0		

③ Polarizer accidented spot

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.5	2(distance≧6mm)		
Φ>0.5	0		

④Polarizer Bubble

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.4	3(distance≧6mm)		
Φ>0.4	0		

3.0	LCD Pixel defect	Pixel bad points

Item	Zone A	Acceptable Qty
Bright dot	Random	N≤2
	2 dots adjacent	N≤0
	3 dots adjacent	N≤0
Dark dot	Random	N≤2
	2 dots adjacent	N≤0
	3 dots adjacent	N≤0
Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm
Total bright and dark dot		N≤4

Note:

A) Bright dot：Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

B) Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.

C) 2 dot adjacent = 1 pair = 2 dots

Picture:

2 dot adjacent   2 dot adjacent

2 dot adjacent (vertical)   2 dot adjacent (slant)

| 4.0 | Line defect (LCD /Polarizer backlight black/white line, scratch, stain)

 W: width, L : length

 N：Count | | | | | |

Width(mm)	Length(mm)	Acceptable Qty		
		A	B	C
Φ≤0.03	Ignore	Ignore		Ignore
0.03<W≤0.04	L≤3.0	N≤2		
0.04<W≤0.05	L≤2.0	N≤1		
W>0.05	Define as spot defect			

5.0	Electronic Components SMT.	Not allow missing parts，solderless connection，cold solder joint，mismatch，The positive and negative polarity opposite
6.0	Display color& Brightness.	1. Color：Measuring the color coordinates, The measurement standard according to the datasheet or samples. 2. Brightness：Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.
7.0	LCD Mura/Waving / Hot spot	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary.

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed

8. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	+70°C,96h	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD; 2. Non-display; 3. Missing segments/line; 4. Glass crack; 5. Current IDD is twice higher than initial value.
Low Temperature Operating	-20°C, 96h	
High Temperature Storage	+80°C, 96h	
Low Temperature Storage	-30°C, 96h	
High Temperature & High Humidity Operating	+60°C, 90% RH ,96h	
Thermal Shock (Non-operation)	-10°C, 30 min ↔ 60°C, 30 min, Change time: 5min 20CYC.	
ESD Test	C=150pF, R=330,5points/panel Air:±4kV, 5times; Contact:±2kV, 5 times; (Environment: 15℃~35℃, 30%~60%).	
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces,80㎝(MEDIUM BOX)	

Remark:

1. The test samples should be applied to only one test item.

2. Sample size for each test item is 5~10pcs.

3. For Damp Proof Test, Pure water (Resistance > 10MΩ) should be used.

4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

5. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

6. The color fading mura of polarizing filter should not care.

9. Cautions and Handling Precautions

9.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.

Do not warp or twist the module during assembly work.

(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display surface.

If you have the droplets for a long time, staining and discoloration may occur.

(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static; it may cause damage to the CMOS ICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(12) Pins of I/F connector shall not be touched directly with bare hands.

(13) Do not connect, disconnect the module in the "Power ON" condition.

9.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0°C to 35°C
and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.