TO :

DATE : Sep. 27. 2010

SAMSUNG MOBILE DISPLAY TFT-LCD

MODEL NO. : LMS700JF04-0

NOTE :

Approved by : J.O. KWAG

LCD Product Development team
SAMSUNG Mobile Display Co., Ltd.

Contents

Revision History

Date	Rev. No.	Page	Summary
Sep. 27. 2010	000		Approval Rev.000 was issued.

General Description

* Description

LMS700JF04 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching devices. This model is composed of a TFT LCD panel, a driver circuit and a back-lightsystem. The resolution of a 7.0" contains 1024 x 600pixels and can display up to 16.2M colors.

* Features

- High Brightness
- Wide viewing angle
- High contrast ratio
- WSVGA(1024x600pixels) resolution
- LED Back-light unit
- DE(Data enable) mode
- LVDS Interface with 1 pixel / clock (1 channel)
- mPVA(mobile Patterned Vertical Alignment) LC mode
- Color reproducibility : 70% (CIE1931)
- Pb free product

* Applications

- Display terminals for Digital AV application products
- Amusement application products
- Please contact SMD When using on not specified applications

* General information

Items	Specification	Unit	Note
Display area	153.6(H) x 90.0(V) (7" diagonal)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16.2M	colors	-
Number of pixels	1024(H) x 600(V) (WSVGA)	pixel	-
Pixel arrangement	RGB stripe	-	-
Pixel pitch	0.150(H) x 0.150(V) (Typ)	mm	-
Display mode	Normally Black	-	-

* Mechanical information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	164.65	164.95	165.25	mm	(1)
	Vertical(V)	101.45	101.75	102.05	mm	(1)
	Depth(D)	2.97	3.17	3.37	mm	(1)
Weight		-	124	-	g	-

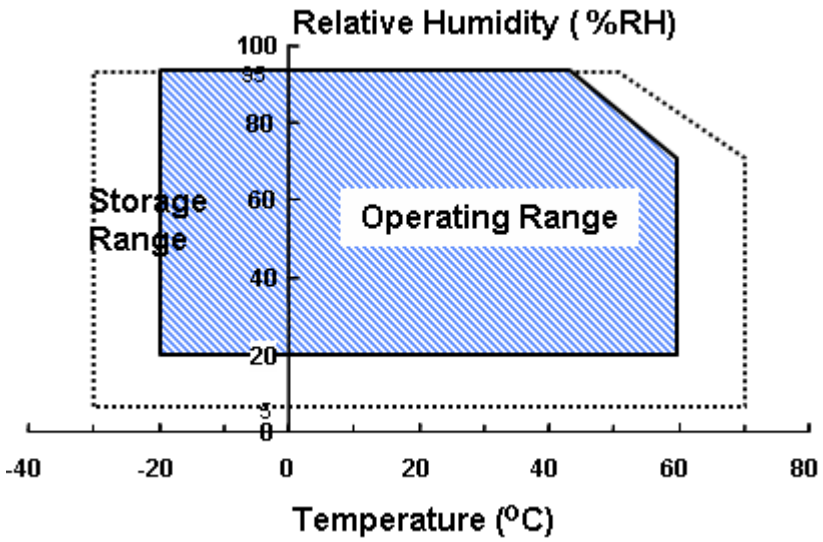
Note (1) PCB is not included.

1. Absolute Maximum Ratings

1.1 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	TSTG	-30	70	℃	(1)
Operating temperature (Ambient temperature)	TOPR	-20	60	℃	(1)
Shock (non-operating)	SNOP	-	100	G	(2),(4)
Vibration (non-operating)	VNOP	-	1.5	G	(3),(4)

Note (1) Temperature and relative humidity range are shown in the figure below.
90% RH Max. (40℃ ≥ Ta)
Maximum wet - bulb temperature at 39℃ or less. (Ta ≥ 40℃) No condensation.



Note (2) 6ms, (half) sine wave, one time for ±X, ±Y, ±Z.

Note (3) (10) - (500) Hz, Sweep rate (1)hr, (3)hr for X,Y,Z.

Note (4) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.

1.2 Electrical Absolute Ratings

(1) TFT-LCD Module

(VSS=GND=0V)

Characteristics	Symbol	Min.	Max.	Unit	Note
Power Supply voltage	VDD	3.2	3.4	V	(1)

Note (1) Within Ta =25 ± 2°C

(2) Back-Light Unit

(Ta = 25 ± 2°C)

Item	Symbol	Min.	Max.	Unit.	Note
Current	IL	-	25	mA	(1)

Note (1) 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.

2. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note.

* Measuring equipment: SR-3, DMS 803, EZ-Contrast

(Ta = 25 ± 2°C, VDD = 3.3V, fV = 70Hz, IL = 20mA)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast ratio (Center point)		C/R	B/L On	500	700	-	-	(1)
Luminance of white (Center point)		YL	B/L On	300	400	-	cd/m2	(2)
9-Point White Uniformity		U	B/L On	70	80	-	%	(3)
NTSC Color Purity (CIE 1931)		Cp	B/L On	65	70	-	%	(4)
Response time	Rising:Tr	Tr+Tf	B/L On	-	25	-	msec	(5)
	Falling:Tf							
Color chromaticity (CIE 1931)	White	Wx	B/L On	0.250	0.300	0.350	-	(6)
		Wy		0.290	0.340	0.390		
	Red	Rx		0.600	0.650	0.700		
		Ry		0.290	0.340	0.390		
	Green	Gx		0.260	0.310	0.36)		
		Gy		0.540	0.590	0.640		
	Blue	Bx		0.100	0.150	0.200		
		By		0.010	0.060	0.110		
Viewing angle	Hor.	θL	C/R≥10 B/L On	70	80	-	Degrees	(7)
		θR		70	80	-		
	Ver.	ϕH		70	80	-		
		ϕL		70	80	-		

Note (1) Definition of Contrast Ratio (C/R) : Ratio of gray max (Gmax) & gray min (Gmin) at the center point

$$CR = \frac{G\,\max}{G\,\min}$$

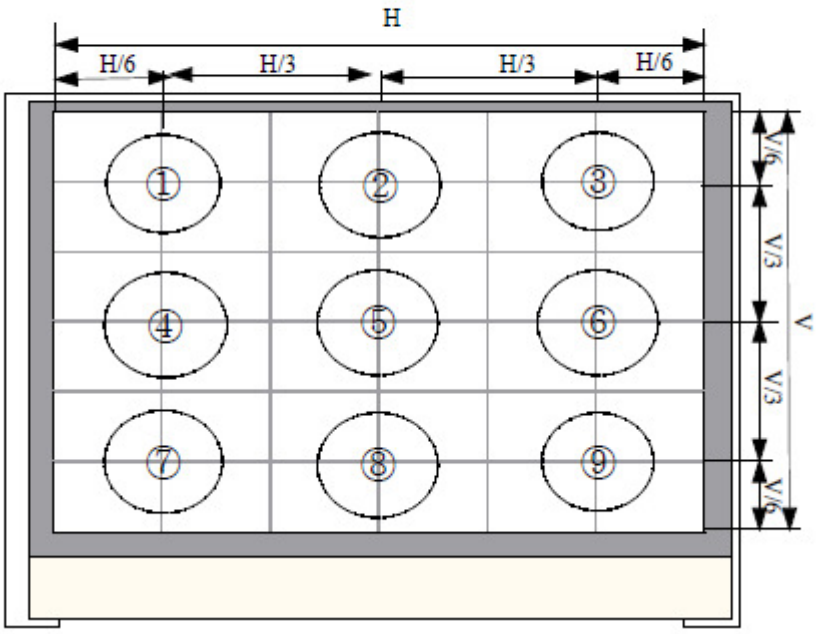
* Gmax : Luminance with all pixels white
* Gmin : Luminance with all pixels black

Note (2) Definition of Luminance of White : Luminance of white at the center point

Light Source of Back-Light Unit	24-LED Parallel Type

Note (3) Definition of 9-Point White Uniformity

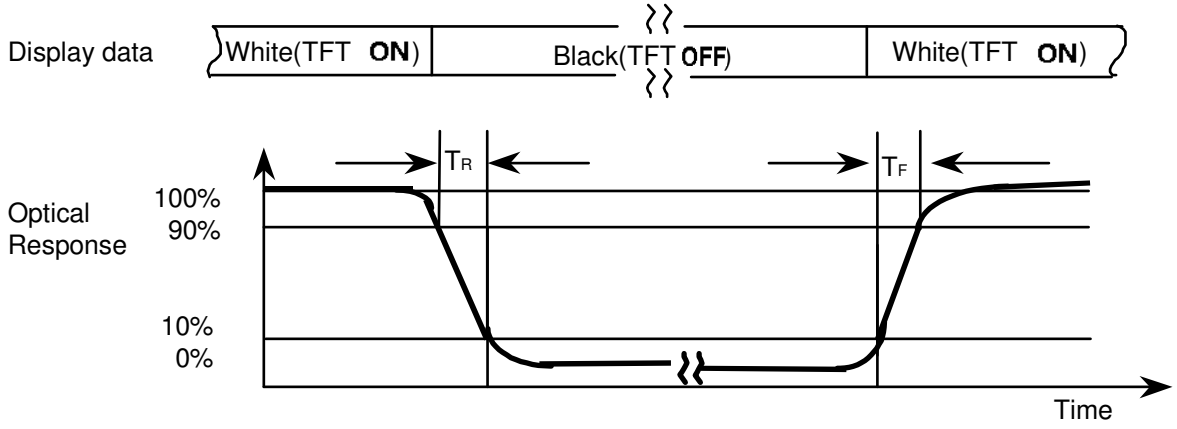
$$\text{White Uniformity} = \frac{\text{Min luminance of white among 9-points}}{\text{Max luminance of white among 9-points}} \times 100$$



Note (4) NTSC Color Purity (CIE 1931)

$$\frac{\text{Triangle Area based on measured red, green, blue color coordinate}}{\text{Triangle Area based on NTSC standard red, green, blue color coordinate}} \times 100\%$$

Note (5) Definition of Response time : Sum of Tr ,Tf

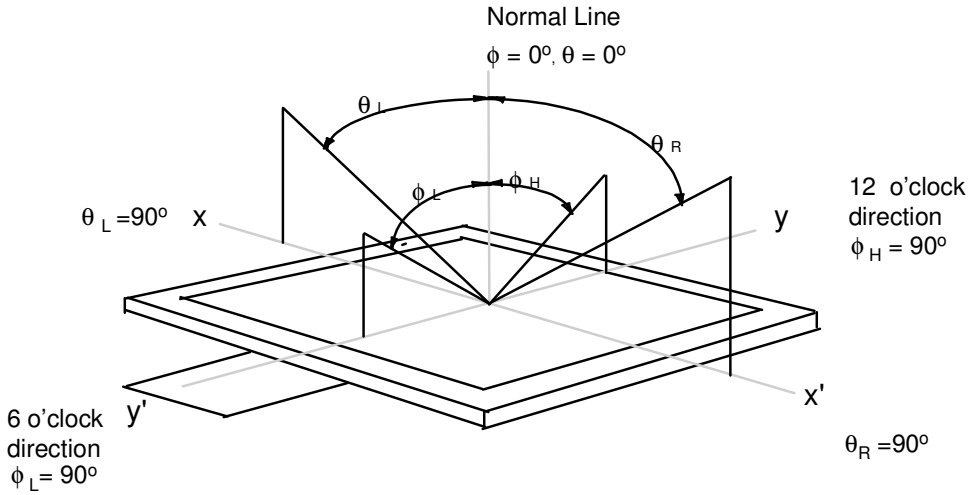


Note (6) Definition of Color Chromaticity (CIE 1931)

Color coordinate of white & red, green, blue at center point.

Light Source of Back-Light Unit	24-LED Parallel Type

Note (7) Definition of Viewing Angle



3. Electrical Characteristics

3.1 TFT-LCD Module

(Ta = 25 ± 2°C)

Characteristics		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		VDD	3.2	3.3	3.4	V	
Differential Input Voltage for LVDS Receiver Threshold	High	VIH	-	-	+100	mV	
	Low	VIL	-100	-	-	mV	
Vsync Frequency		fv	-	70	-	Hz	
Hsync Frequency		fH	-	44.17	-	KHz	
Main Frequency		fDCK	-	50.8	-	MHz	
Rush Current		IRUSH	-	-	1.5	A	
Current of LED(BLU)	White/Black	ILED	-	20	25	mA	
		ITOTAL	-	60	75	mA	3pairs

3.2 Back-Light unit

The back-light system is an edge-lighting type with 24 white LEDs (Light Emitting diodes)

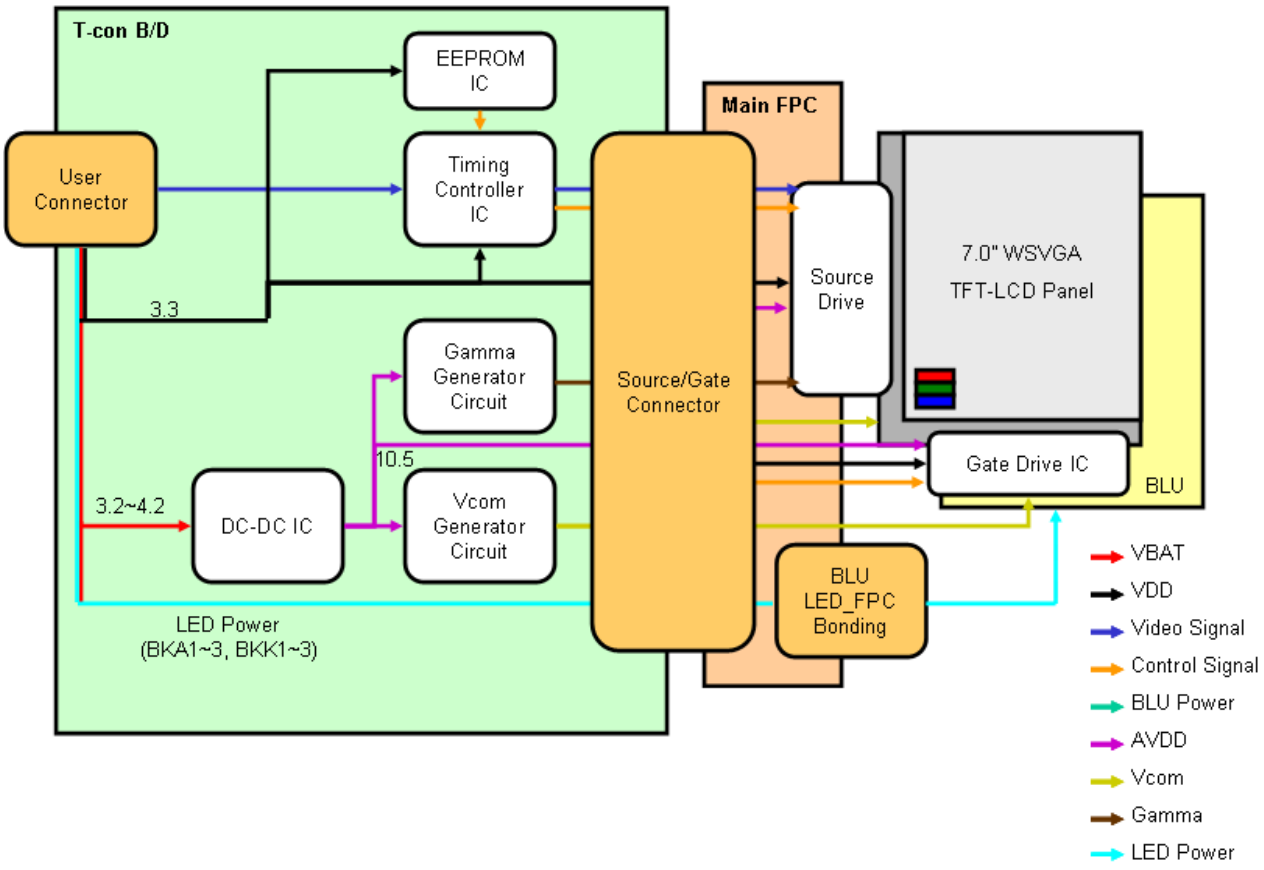
(Ta=25 ± 2°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Current	IL	-	20	25	mA	(1)

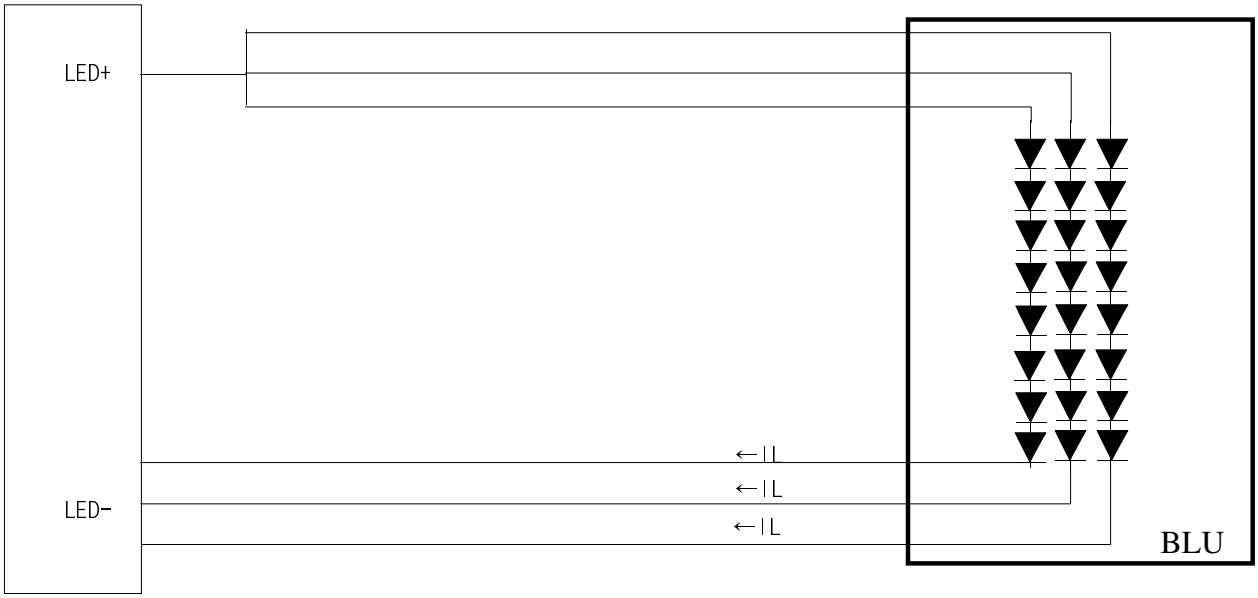
Note (1) The LEDs 3 parallel type.

4. Block Diagram

4.1 TFT LCD Module



4.2 Back-Light unit

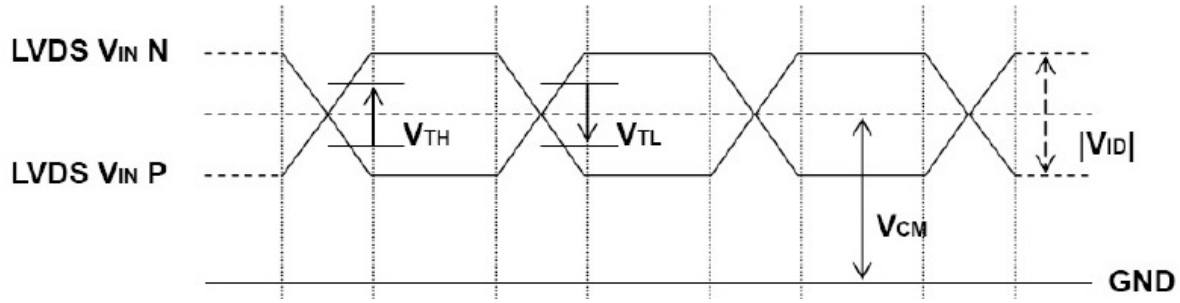


5. Input Terminal Pin Assignment

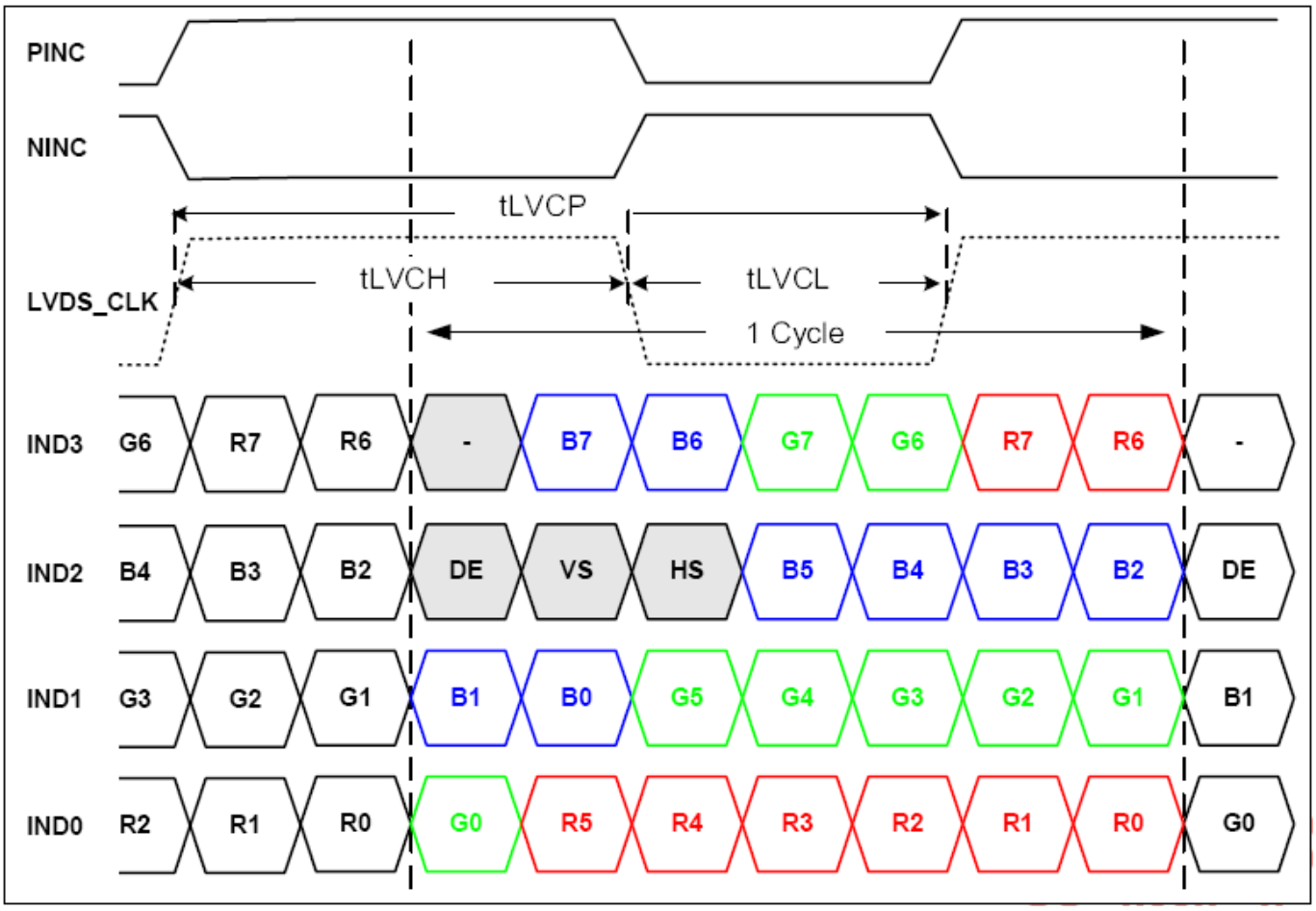
5.1 Input Signal & Power(LVDS, Connector : 20347-140E-12)

Pin No	Symbol	Function	Polarity	Remark
1	GND	Ground	-	-
2	NC	No Connect	-	-
3	NC	No Connect	-	-
4	VDD	Power supply +3.3V	-	-
5	VDD	Power supply +3.3V	-	-
6	VDD	Power supply +3.3V	-	-
7	VDD	Power supply +3.3V	-	-
8	NC	No Connect	-	-
9	NC	No Connect	-	-
10	GND	Ground	-	-
11	RxIN0N	LVDS Differential DATA Input	Negative	R0~R5, G0
12	RxIN0P	LVDS Differential DATA Input	Positive	
13	GND	Ground	-	-
14	RxIN1N	LVDS Differential DATA Input	Negative	G1~G5, B0~B1
15	RxIN1P	LVDS Differential DATA Input	Positive	
16	GND	Ground	-	-
17	RxIN2N	LVDS Differential DATA Input	Negative	B2~B5, Vs, Hs, DE
18	RxIN2P	LVDS Differential DATA Input	Positive	
19	GND	Ground	-	-
20	RxCLKN	LVDS Differential DATA Input	Negative	Clock
21	RxCLKP	LVDS Differential DATA Input	Positive	
22	GND	Ground	-	-
23	RxIN3N	LVDS Differential DATA Input	Negative	R6~R7, G6~B7, B6~B7
24	RxIN3P	LVDS Differential DATA Input	Positive	
25	GND	Ground	-	-
26	NC	No Connect	-	-
27	NC	No Connect	-	-
28	BKA	BLU LED Anode	-	-
29	BKA	BLU LED Anode	-	-
30	BKA	BLU LED Anode	-	-
31	NC	No Connect	-	-
32	BKK1	BLU LED Cathode1	-	-
33	BKK2	BLU LED Cathode2	-	-
34	BKK3	BLU LED Cathode3	-	-
35	I2C INT.	I2C INT.	-	TSP control
36	PSOC VDD	PSOC VDD	-	
37	USB N/CLK	USB N/CLK	-	
38	XRES	XRES	-	
39	USB P/DATA	USB P/DATA	-	
40	PSOC GND	PSOC GND	-	

5.2 Timing Diagrams of LVDS for Transmission



LVDS DC Electrical Characteristics (V_{DD} = 3.3V)						
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{TH}	high LVDS input threshold	V_{CM}=1.2V			+100	mV
V_{TL}	low LVDS input threshold	V_{CM}=1.2V	-100			mV
V_{IN}	Input Voltage Range (Singled-end)		0		2.4	V
$\| V_{ID} \|$	Differential input voltage		0.1		0.6	V
V_{CM}	LVDS input common mode voltage		($\| V_{ID} \|$ / 2)	-	2.4-($\| V_{ID} \|$ / 2)	V
I_{IN}	Input current		-10		10	μA



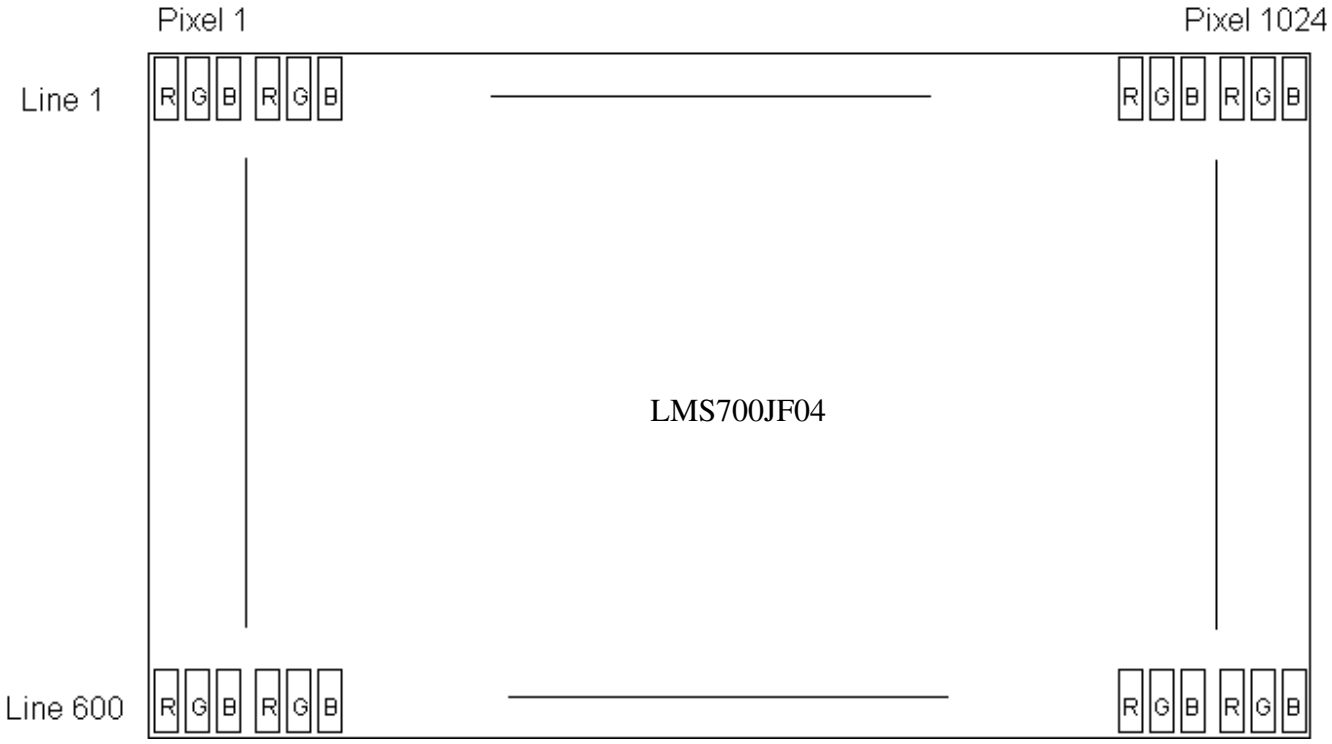
5.3 Input Signal, Basic Display Colors and Gray Scale of Each Colors

COLOR	DISPLAY	Data Signal																							GRAY SCALE LEVEL
		RED								GREEN								BLUE							
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:			:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R252
	↓ LIGHT	:	:	:	:	:	:			:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G252
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B252
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B255

Note (1) Definition of Gray : Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Note (2) Input Signal : 0 = Low level voltage, 1 = High level voltage

5.4 Pixel Format



6. Interface Timing

6.1 Timing Parameters

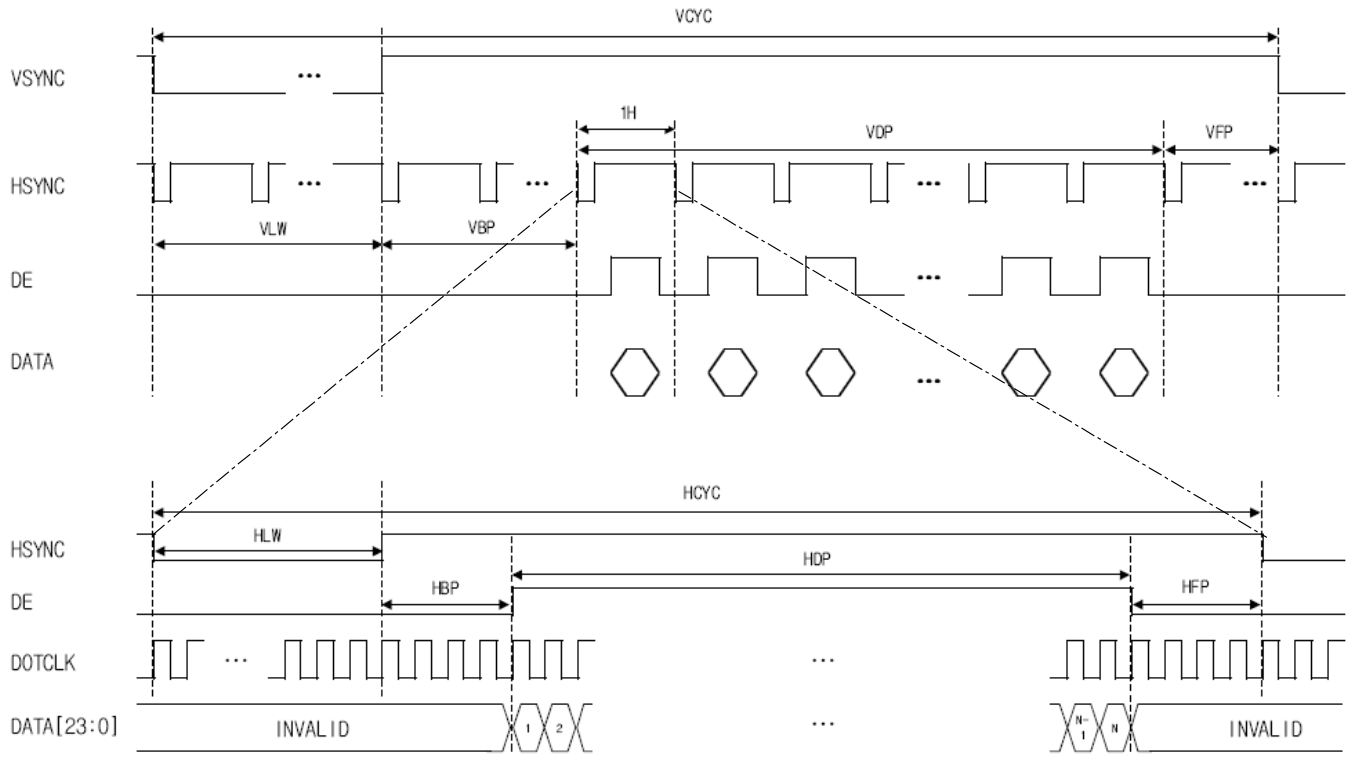
(a) Vertical timing

Signal	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	f_{FRM}	-	70	-	Hz	
VSYNC (Frame) Period	VCYC	-	631	-	H	
VSYNC Low Width	VLW	-	10	-	H	
Vertical Display Period	VDP	-	600	-	H	
Vertical Back Porch	VBP	-	11	-	H	
Vertical Front Porch	VFP	-	10	-	H	

(b) Horizontal timing

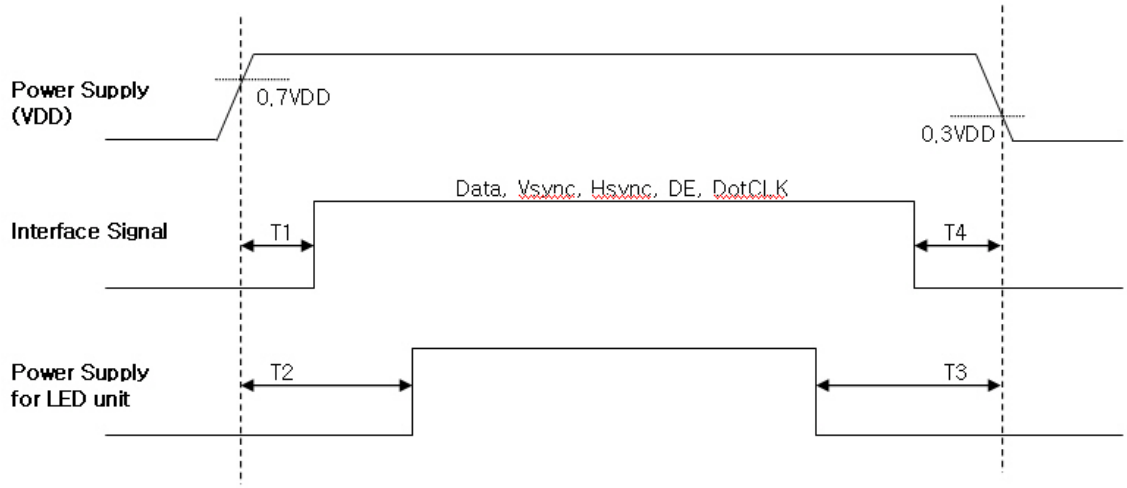
Signal	Symbol	Min.	Typ.	Max.	Unit	Note
DotCLK Frequency	f_{CLK}	-	50.8	-	MHz	
HSYNC (Frame) Period	HCYC	-	1150	-	DotCLK	
HSYNC Low Width	HLW	-	30	-	DotCLK	
Horizontal Display Period	HDP	-	1024	-	DotCLK	
Horizontal Back Porch	HBP	-	60	-	DotCLK	
Horizontal Front Porch	HFP	-	36	-	DotCLK	

6.2 Timing Diagrams of TFT-LCD Module Input Signals



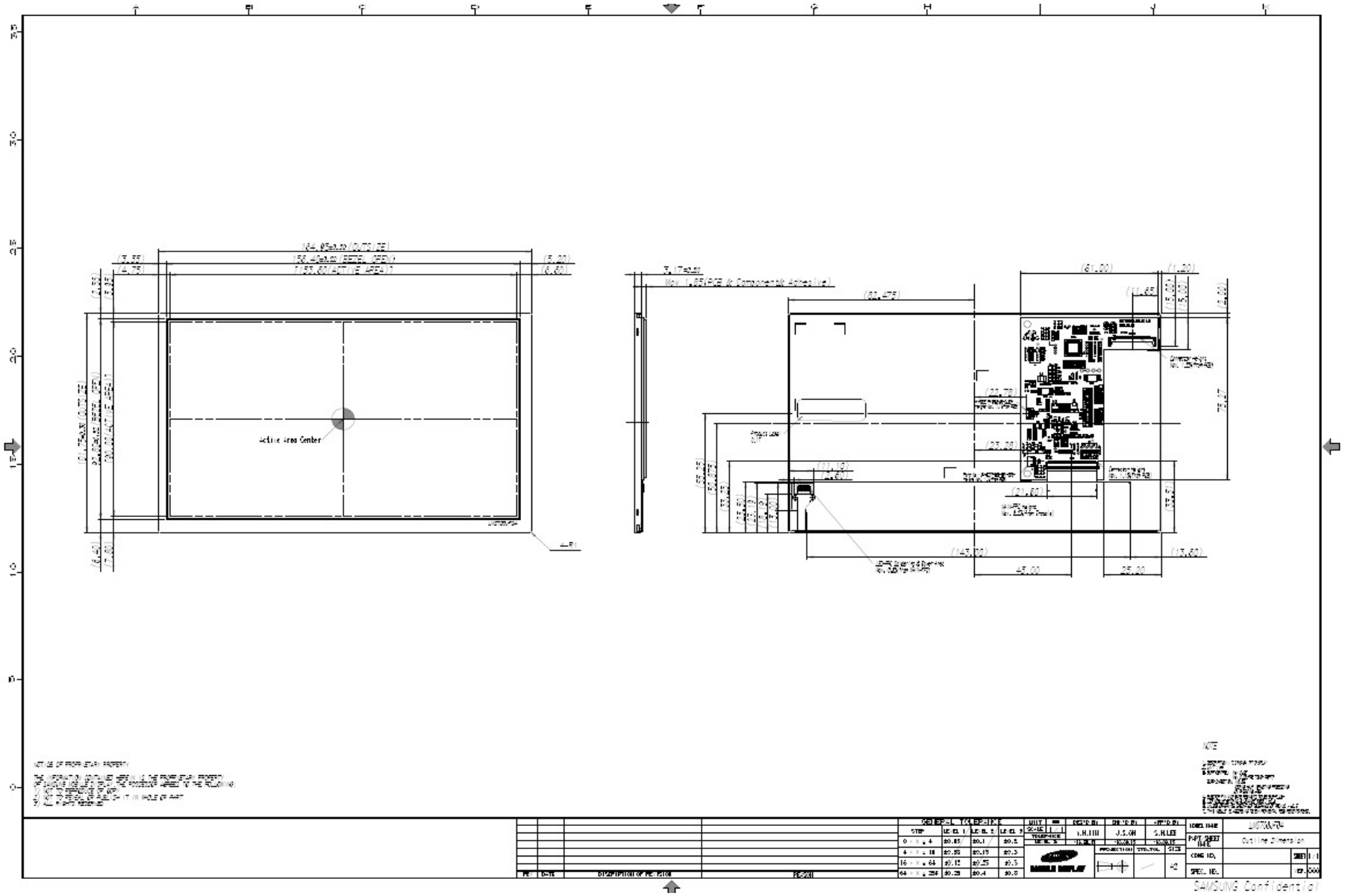
6.3 Power ON/OFF Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



Symbol	Specification	Note
T1	90ms < T1	
T2	T1 + 200ms < T2	
T3	T4 + 200ms < T3	
T4	0ms < T4 < 60	

7. Mechanical Outline Dimension



7.1 Bar-code Label

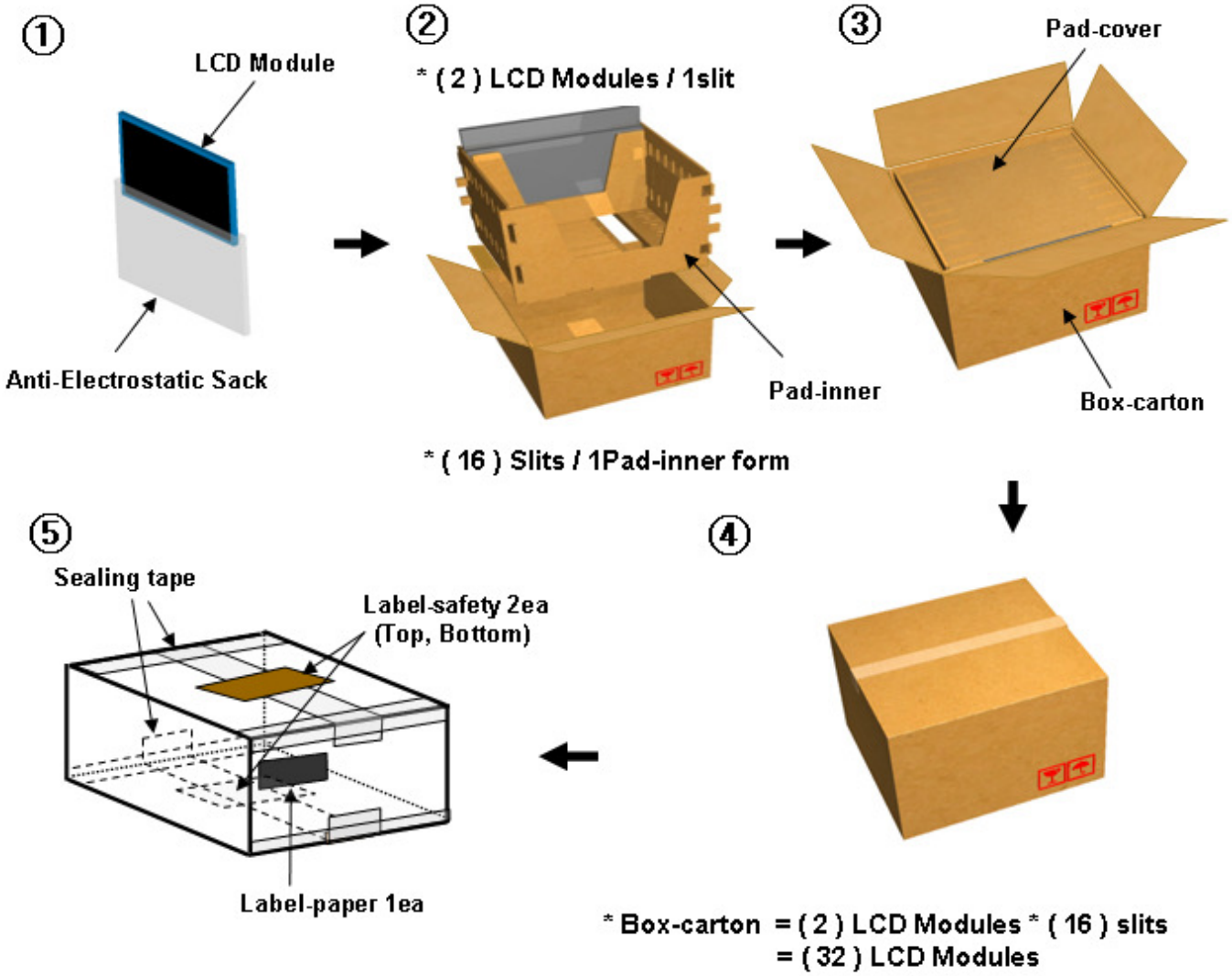
- 16 digits marking on the back side of TFT-LCD module

S	V	A	09	10	29	A	0	00001
①	②	③	④	⑤	⑥	⑦	⑧	⑨

① Customer code(fixed)
② Module Site: K(SEC), V(VODA), I(IDS), T(Intelligent), E(E-Litecom)
③ Product Shift
④ Year : 09(2009), 10(2010)
⑤ Month : 01(January), 02(February), 03(March)
⑥ Day
⑦ Assy Line
⑧ Sample Rev.
⑨ Serial No. : 00001 ~ 99999 (refresh every month)

8. Packing

8.1 Case & Box



Note

- Total : Box-carton approx. : (4.95) kg
- Size : 397(L) x 266(W) x 171 (H)

(1) Put the LCD Module in the Anti-Electrostatic Sack

(2) Put the 2 ea LCD Modules in the each slot of Pad-inner form

(3) Cover the Pad-cover form with bottom Pad-inner form

(4) Put 1 Pad-inner form in the Box-carton

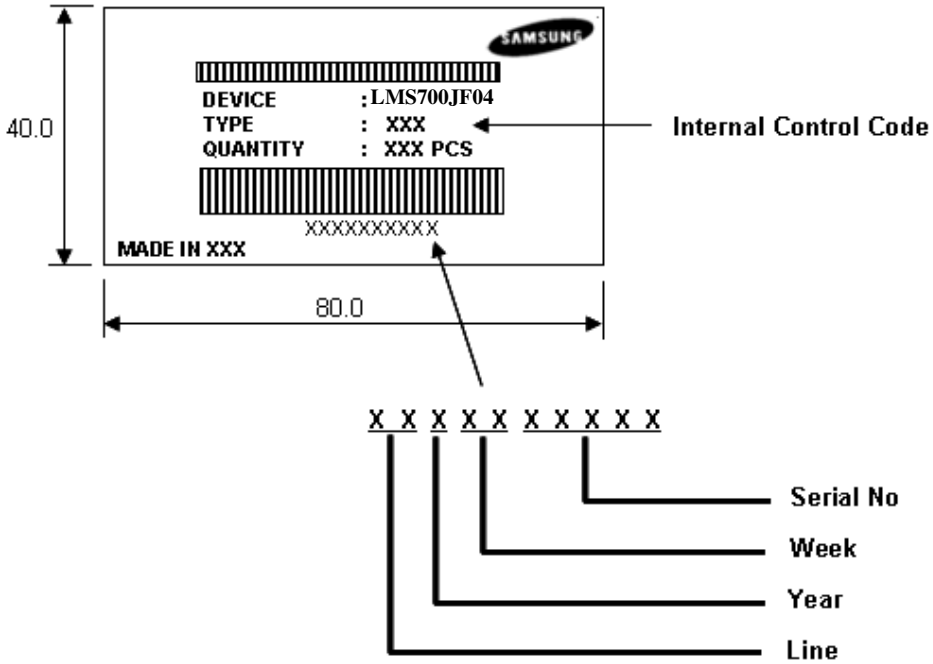
(5) Seal the Box-carton and affix the Label-safety & Label-paper

9. Marking & Others

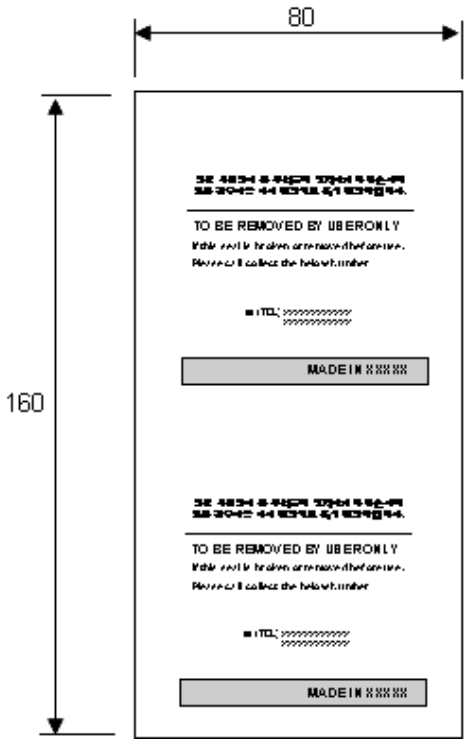
A nameplate bearing followed by is affixed to a shipped product at the Specified location on each product.

9.1 Attached Label on Packing case

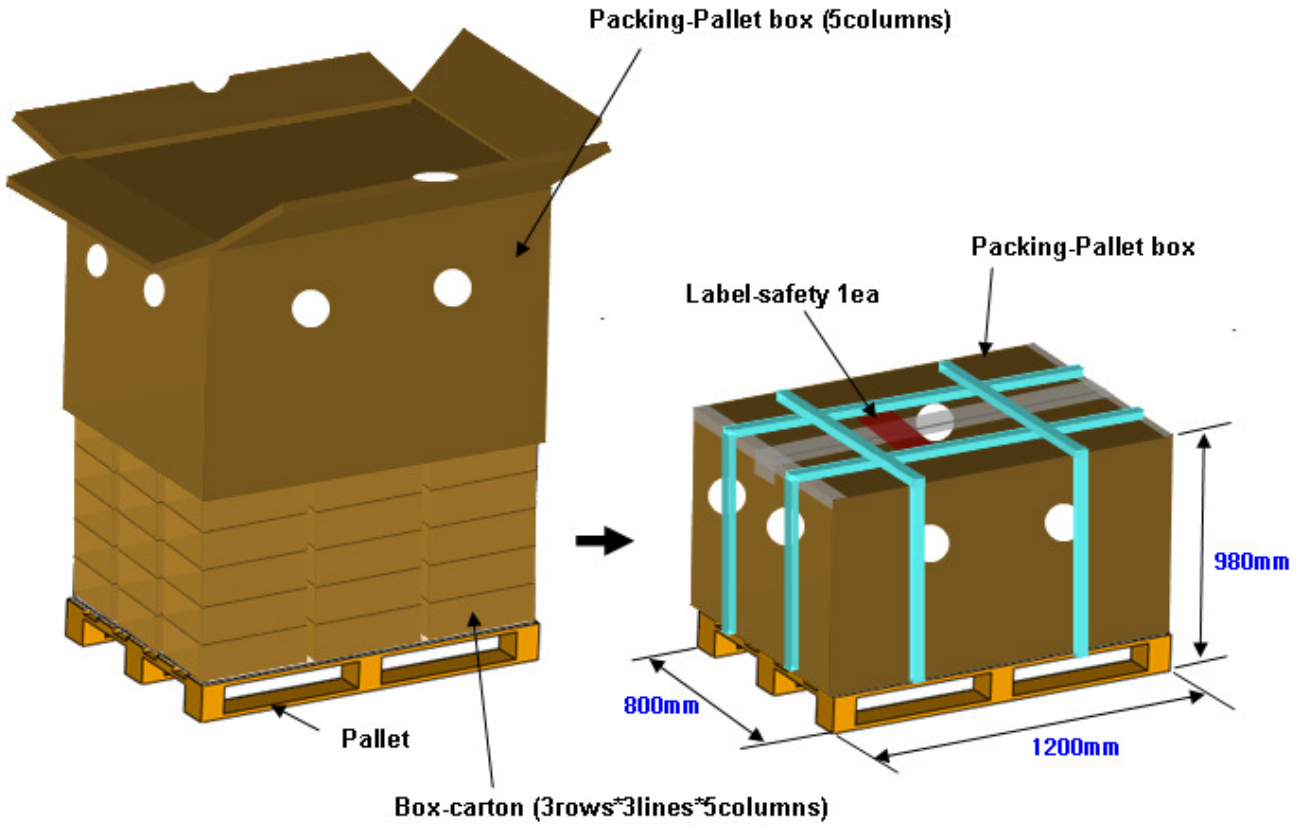
* Label-paper



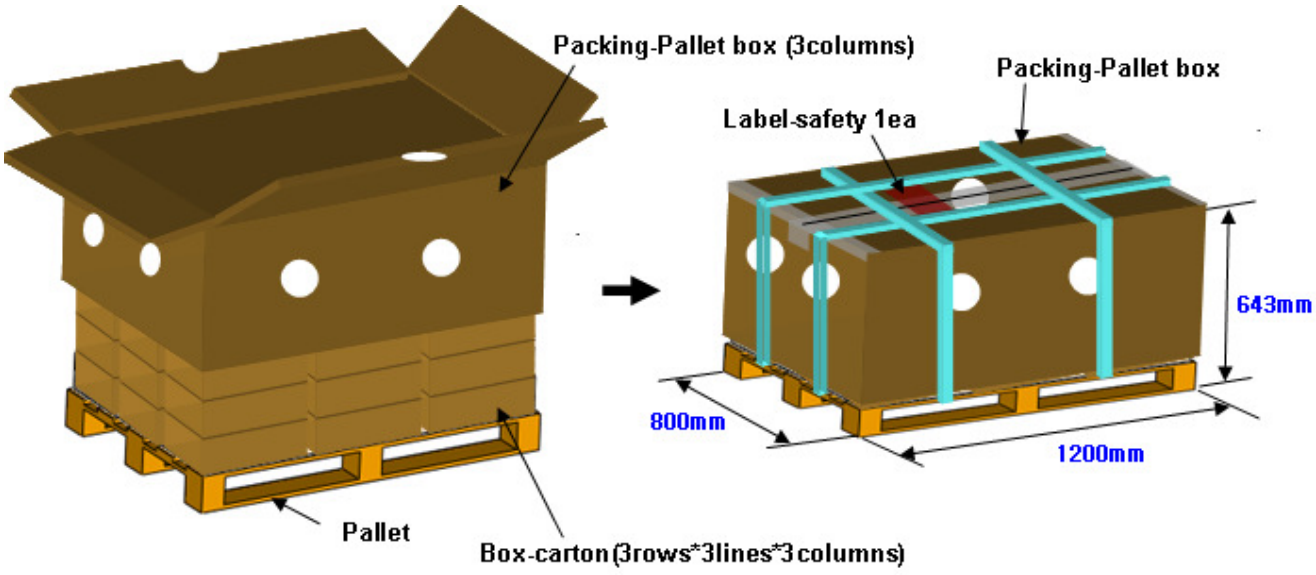
* Label-safety



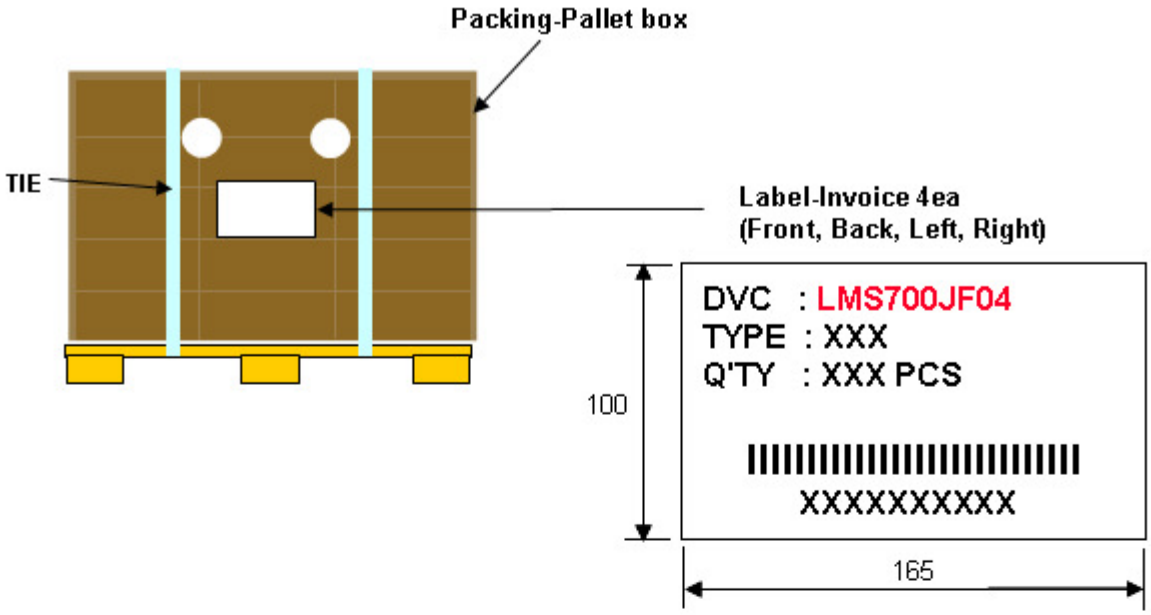
9.2 Over pack



9.3 Packing for small Quantities



9.3 Over Pack Attach



Box-Carton		
Over-Pack (Pallet 구성)		

10. General Precautions

10.1 Handling

(a) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bend the module.

(b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

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

(f) The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Kepton type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) 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.

(h) Protect the module from static , it may cause damage to the Integrated Gate Circuit.

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

(j) Do not disassemble the module.

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

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

10.2 Storage

(a) 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 to 35°C and relative humidity of less than 70%.

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

(c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

10.3 Operation

(a) Do not connect, disconnect the module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

10.4 Others

(a) The Liquid crystal is deteriorated by ultraviolet, do not leave it in direct sunlight and strong ultraviolet ray for many hours.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the panel may be damaged.

(d) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image "Sticks" to the screen.

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