SAMSUNG ELECTRONICS

Approval

TO :

DATE : April 4, 2003

SAMSUNG TFT-LCD

MODEL NO.:LTN150XB-L02

(G Version)

Any Modification of Spec is not allowed without SEC' permission

APPROVED BY : K. H. Shin

PREPARED BY : **Technical Customer Service Team, AMLCD Division**

SAMSUNG ELECTRONICS CO., LTD.

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REVISION HISTORY

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Date	Rev.No.	Page	Summary
May.10, 2002	000	All	-LTN150XB-L02 model is First issued.
Aug.31,2002	001	5 6 12,13,16	-Weight change due to lower polarizer thickness change as a sheet wrinkle improvement solution. Typ 585g → 595g, Max 605g → 615g -Add the lamp absolute voltage : Max 2kVrms -Lamp wire color change from pink to blue
Dec.02,2002	002	4 24	-Color filter polarizer changed . NPF-SEG1425DU AGS1 → NPF-SEG1425DU ARCHCT . Haze 0, Hardness 2H -Product Revision Code changed . LTN150XB-L02-0 → LTN150XB-L02-G
Dec.20,2002	003	21 24	-Revised the Outline Dimension . Changed the wire length : 70 ± 5mm → 100 ± 5mm . Removed the Wire Tape (43mm) -Inserted the Packing method

GENERAL DESCRIPTION

DESCRIPTION

LTN150XB-L01 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 backlight system. The resolution of a 15.0" contains 1,024 x 768 pixels and can display up to 262,144 colors. 6 O'clock direction is the Optimum viewing angle.

FEATURES

- Thin and light weight
- High contrast ratio
- XGA (1024x768 pixels) resolution
- Low power consumption
- DE (Data enable) only mode.
- 3.3V LVDS (FPD Link) Interface with 1 pixel / clock
- SPWG style-B design

APPLICATIONS

- Notebook PC and desktop monitors
- Display terminals for AV application products
- Monitors for Industrial machine
- If the usage of this product is not for PC application, but for others, please contact SEC

GENERAL INFORMATION

ITEM	SPECIFICATION	UNIT	NOTE
Display area	304.128(H)X228.096(V) (15.0”diagonal)	mm	
Driver element	a-si TFT active matrix		
Display colors	262,144		
Number of pixel	1024 x 768	pixel	
Pixel arrangement	RGB vertical stripe	mm	
Pixel pitch	0.297(H) x 0.297(V)		
Display Mode	Normally white		
Surface treatment	HAZE 0, HARD-COATING 2H		

Mechanical Information

ITEM		MIN.	TYP.	MAX.	NOTE
Module size	Horizontal (H)	316.8	317.3	317.8	
	Vertical (V)	241.4	242.0	242.6	
	Depth (D)	-	-	6.5	(1)
Weight			595g	615g	

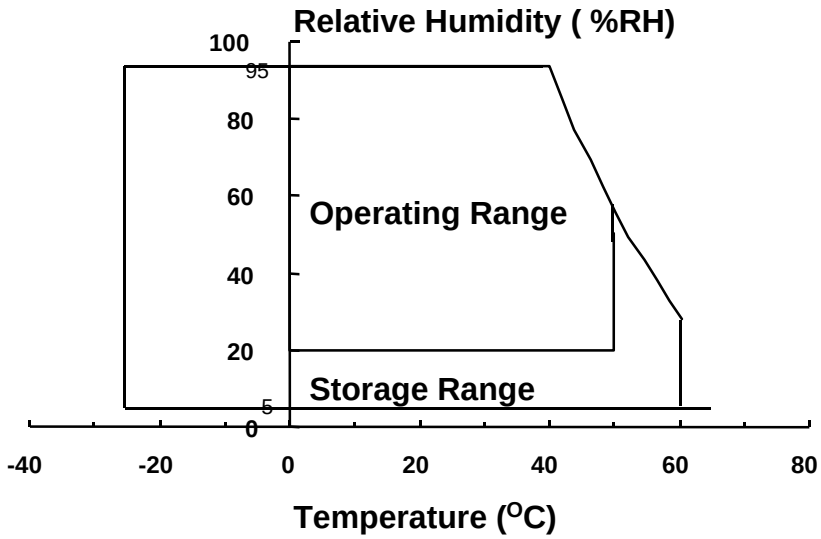
Note (1) Measurement condition of outline dimension
. Equipment : Vernier Calipers
. Push Force : 500g ·f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Storage temperate	T_{STG}	-25	60	^{O}C	(1)
Operating temperate (Temperature of glass surface)	T_{OPR}	0	50	^{O}C	(1)
Shock (non-operating)	Snop	-	220	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.
95 % RH Max. (40 $^{O}C \geq Ta$)
Maximum wet - bulb temperature at 39 ^{O}C or less. (Ta > 40 ^{O}C) No condensation.
(2) 220G,2ms, half sine wave, one time for ± X, ± Y, ± Z.
(3) 10 ~ 300 ~ 10 Hz, Sweep rate 10 min, 30 min for X,Y,Z.
(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 = 0 V)

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	Vcc	Vss-0.3	4.0	V	(1)
Logic Input Voltage	V_{IN}	Vss-0.3	Vcc + 0.3	V	(1)

NOTE (1) Within Ta (25 ± 2 ^{O}C)

(2) BACK-LIGHT UNIT

Ta = 25 ± 2 ^{O}C

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Lamp Current	I_L	2.0	7.0	mArms	(1)
Lamp frequency	F_L	50	80	kHz	
Lamp Voltage	V_L	-	2000	Vrms	

NOTE (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under Normal Operating Conditions.

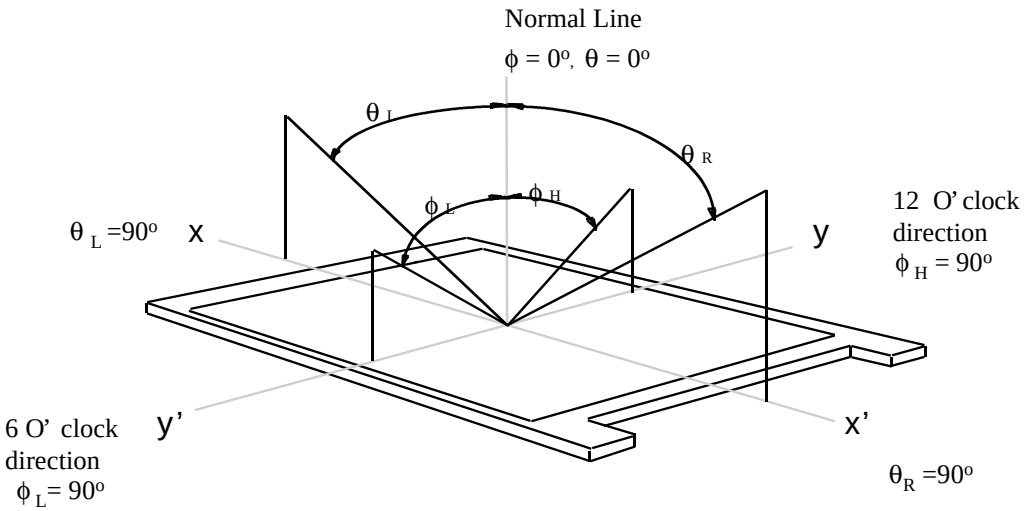
2. OPTICAL CHARACTERISTICS

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 (5).
Measuring equipment : TOPCON BM-5A

* Ta = 25 ± 2 ºC , Vcc=3.3V, fv= 60Hz, f_{DCLK}=65MHz, I_L= 6.0mA

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio (5 Points)		CR	ϕ = 0, θ = 0 Normal Viewing Angle	200	-	-		
Response Time at 25°C	Rising	T_R		-	10	20	msec	(1), (3)
	Falling	T_F		-	30	50		
White Luminance At Center Point		Y_L		170	180	-	cd/m^2	(1), (4)
Color Chromaticity (CIE)	Red	R_X		0.546	0.576	0.606		(1), (5)
		R_Y		0.311	0.341	0.371		
	Green	G_X		0.293	0.323	0.353		
		G_Y		0.502	0.532	0.562		
	Blue	B_X		0.123	0.153	0.183		
		B_Y		0.102	0.132	0.162		
	White	W_X		0.285	0.315	0.345		
		W_Y		0.300	0.330	0.360		
Viewing Angle	Hor.	θ_L	CR ≥10 (at center point)	40	45	-	Degrees	
		θ_R		40	45	-		
	Ver.	ϕ_H		20	25	-		
		ϕ_L		40	45	-		
13 Points White Luminance Variation		δ_L		-	-	1.8		(6)

Note 1) Definition of Viewing Angle :

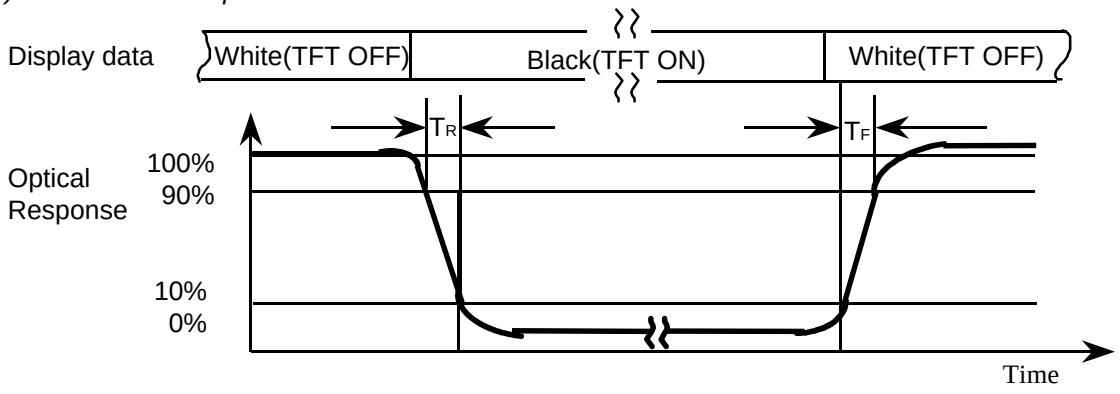


Note 2) Definition of Contrast Ratio (CR) :

$$CR = \frac{CR1 + CR2 + CR3 + CR4 + CR5}{5}$$

POINTS : ④ , ⑤ , ⑦ , ⑨ , ⑩ at FIGURE OF NOTE 6)

Note 3) Definition of Response time :

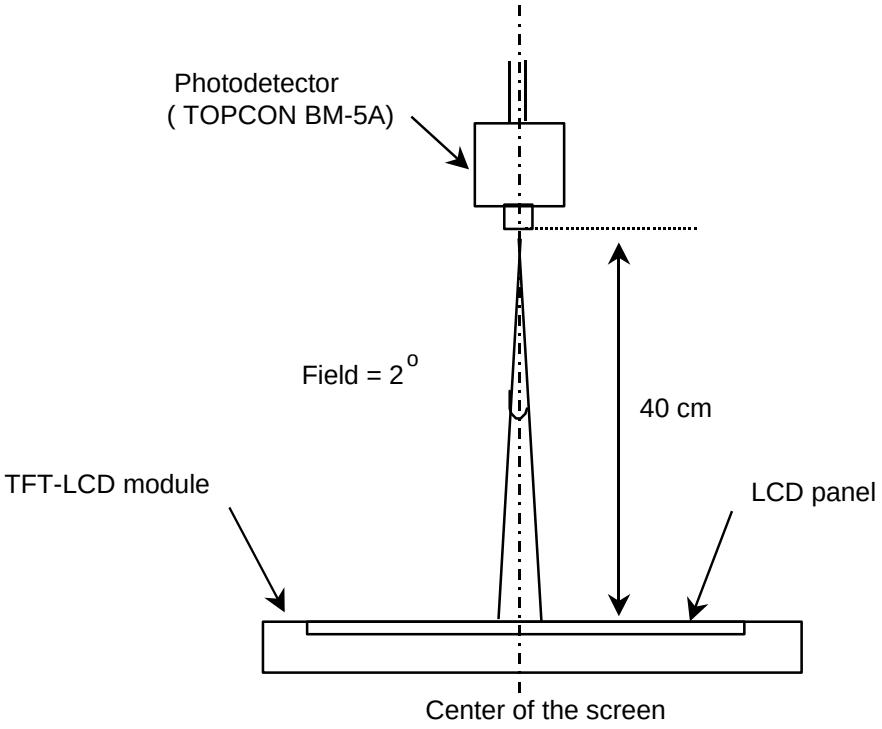


Note 4) Definition of Average Luminance of White : measure the luminance of white at center point.

Luminance of White ($Y_{L,AVE}$) $Y_{L,AVE} = Y_{L7}$

Test Point Definition : Refer to the Figure NOTE 6)

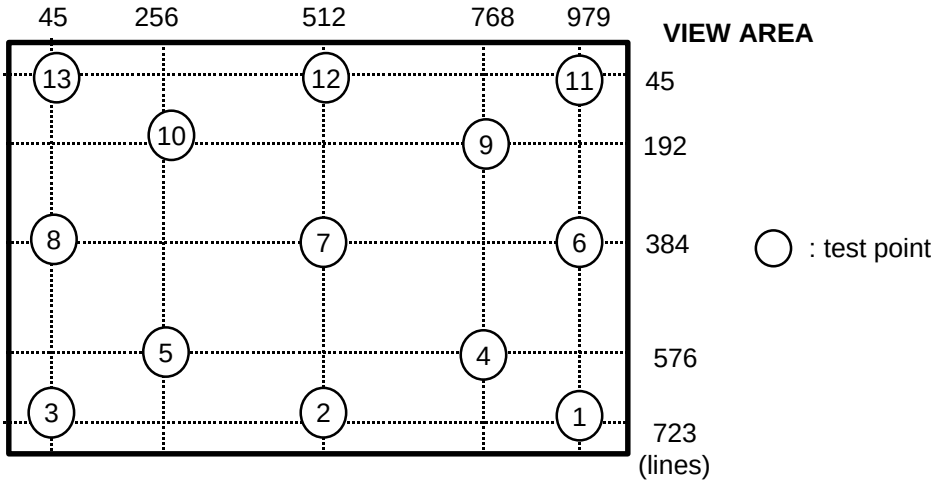
Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 minutes, the measurement should be executed. Measurement should be executed in a stable, windless,and dark room.
30 minutes after lighting the back-light. This should be measured in the center of screen.
Lamp current : 6.0 mA
Environment condition : Ta = 25 ± 2 °C



Optical characteristics measurement setup

Note 6) Definition of 13 points white variation (d_L) [① ~ ⑬]

$$\delta_L = \frac{\text{Maximum luminance of 13 points}}{\text{Minimum luminance of 13 points}}$$



3. ELECTRICAL CHARACTERISTICS

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3.1 TFT LCD MODULE

Ta=25 ± 2 °C

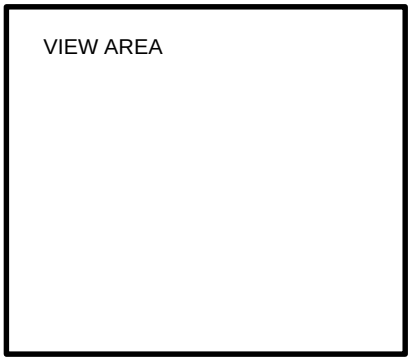
ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Voltage of Power Supply		V_{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	V_{CM}=+1.2V
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		fv	-	60	-	Hz	
Hsync Frequency		f_H	-	48.2	-	KHz	
Main Frequency		f_{DCLK}	63.4	65	66.6	MHz	
Rush Current		I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	I_{DD}	-	310	-	mA	(2),(3)*a
	Mosaic		-	360	-	mA	(2),(3)*b
	Max Pattern		-	440	500	mA	(2),(3)*c

Note (1) Display data pins and timing signal pins should be connected.(GND=0V)

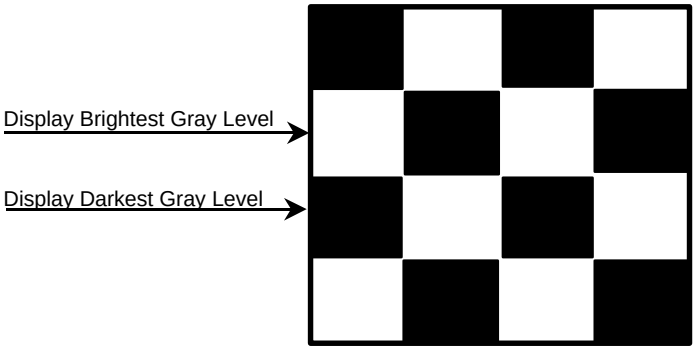
(2) f_V=60Hz, f_{DCLK} =65MHZ, Vdd = 3.3V , DC Current.

(3) Power dissipation pattern

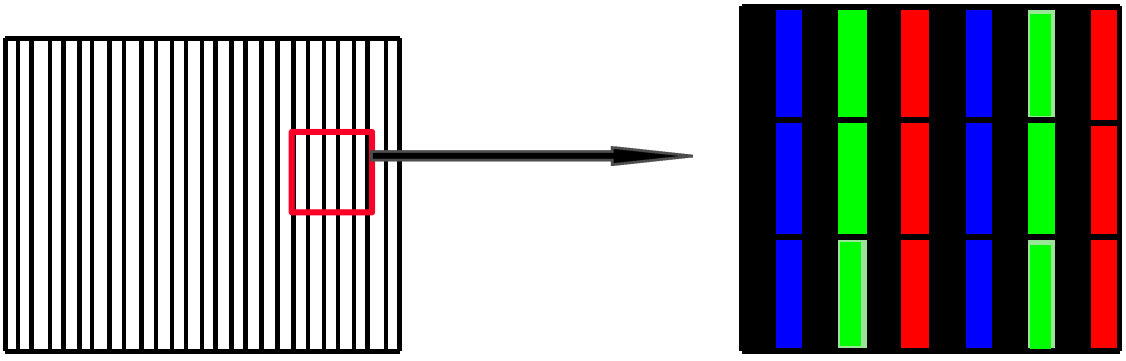
*a) White Pattern



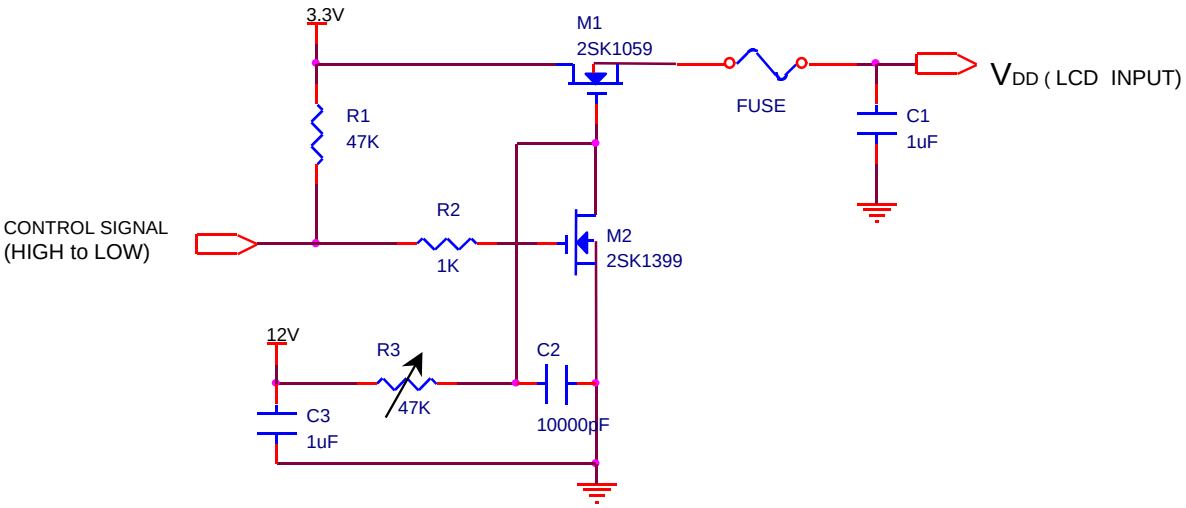
*b) Mosaic Pattern



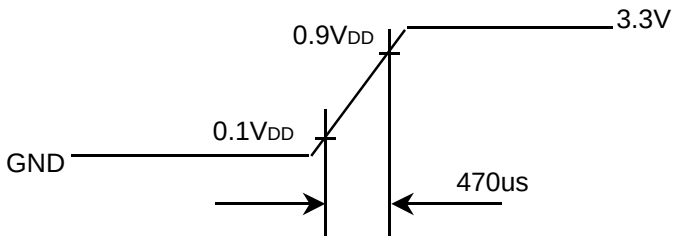
*c) Max. pattern : Vertical stripe.



4) Rush current measurement condition



VDD rising time is 470us



3.2 BACK-LIGHT UNIT

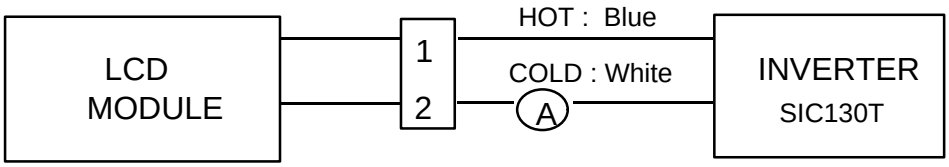
The backlight system is an edge - lighting type with a single CCFL (Cold Cathode Fluorescent Lamp).
The characteristics of a single lamp are shown in the following tables.
INVERTER : SIC130T(Frequency typ. 60kHz)

Ta=25 ± 2 °C

ITEM	SYMB	MIN	TYP	MAX	UNIT	NOTE
Lamp Current	I_L	3.0	-	6.0	mArms	(1)
Lamp Voltage	V_L		710		Vrms	I_L=6.0mA
Frequency	f_L	50	60	65	kHz	(2)
Power Consumption	P_L	-	4.26	-	W	(3)
Operating Life Time	Hr	10,000	-	-	Hour	(4)
Startup Voltage	V_S	-	-	1200 (25°C) 1400 (0 °C)	Vrms	(5)

Note) The waveform of the inverter output voltage must be area symmetric and the design of the inverter must have specifications for the modularized lamp.
The performance of the backlight, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.
When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter(miss lighting, flicker, etc.) never occur. When you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Note (1) Lamp current is measured with a high frequency current meter as shown below.



Switching Frequency : Typ 60kHz

(2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

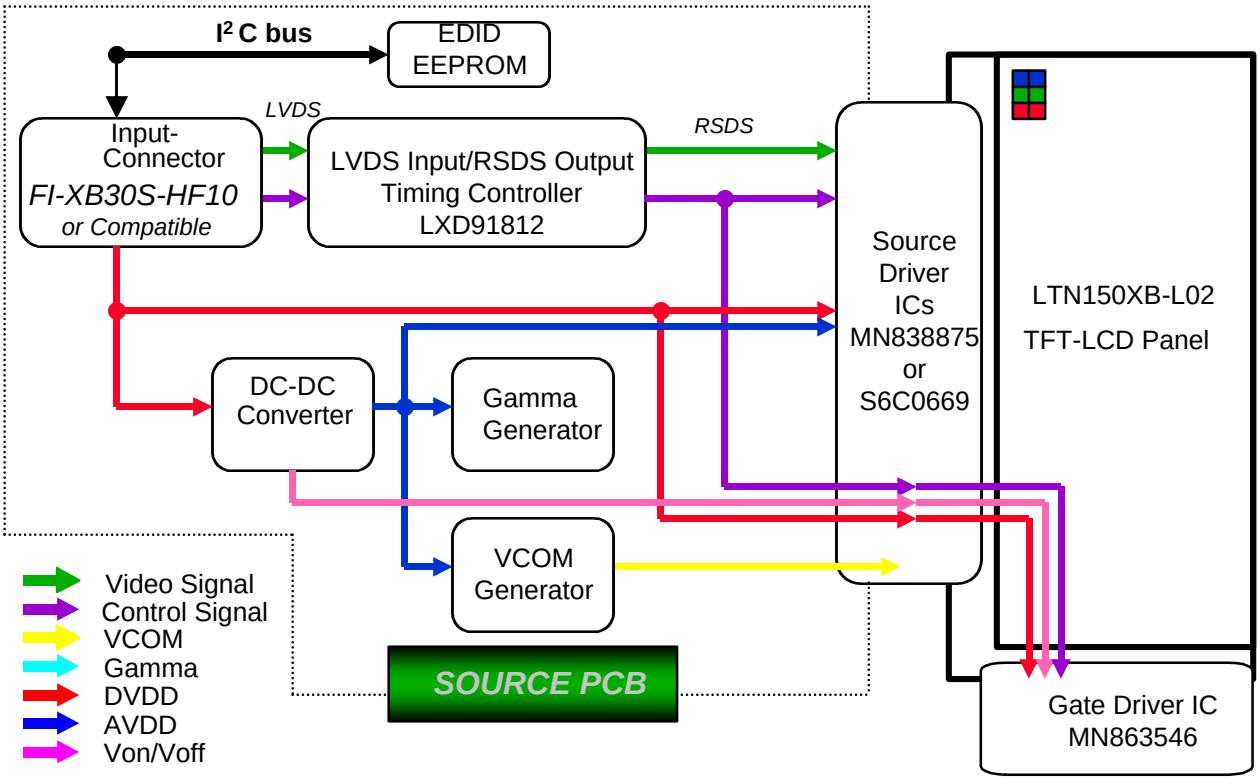
(3) refer to $I_L \times V_L$ to calculate.

(4) Life time (Hr) of a lamp can be defined as the time in which it continues to operate under the condition Ta = 25 ±2 °C and I_L = 6.0 mArms until one of the following event occurs.
1. When the brightness becomes 50% or lower than the original.

(5) The voltage above this value should be applied to the lamp for more than 1 second to startup Otherwise the lamp may not be turned on.

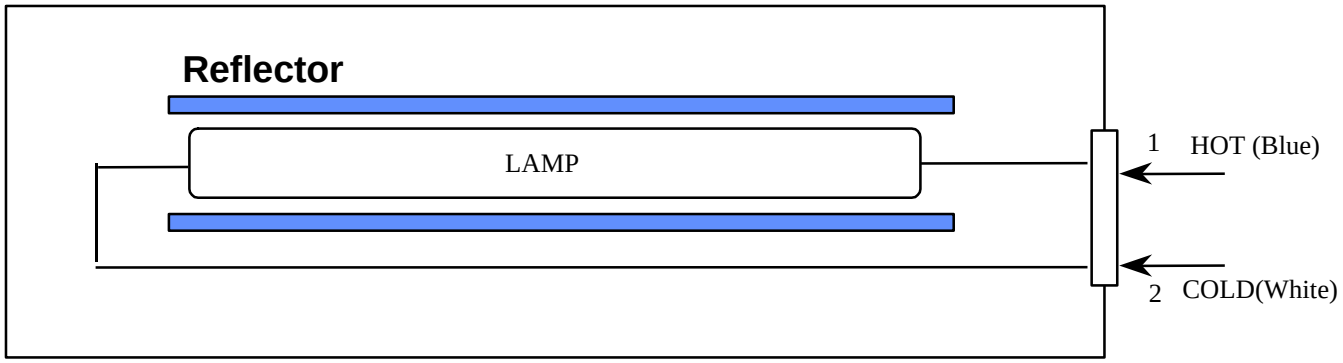
4. BLOCK DIAGRAM

4.1 TFT LCD Module



Connector :JST BHSR-02VS-1

4.2 BACK-LIGHT UNIT



Note) The output of the inverter may change according to the material of the reflector.

5. INPUT TERMINAL PIN ASSIGNMENT

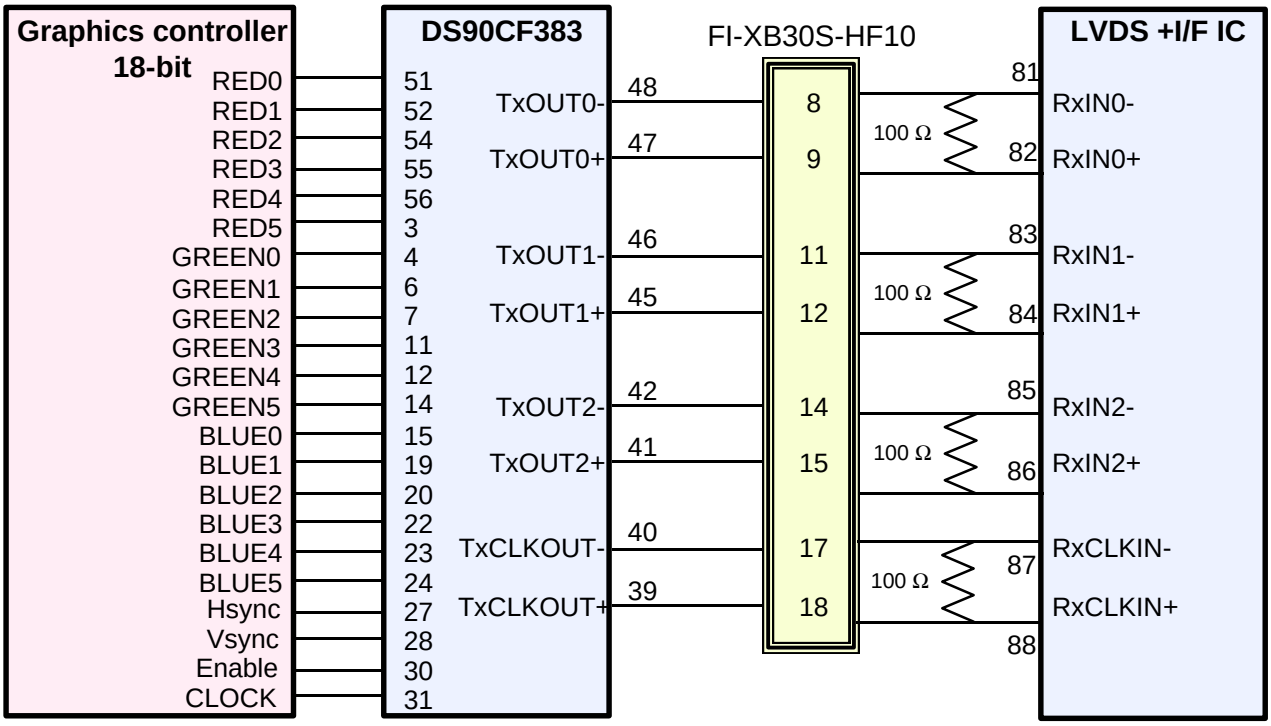
5.1. Input Signal & Power LVDS, Connector : JAE, FI-XB30S-HF10
Mating Connector : JAE FI-X30M or compatible

PIN NO	SYMBOL	FUNCTION	POLARITY	REMARK
1	VSS	Ground		
2	VDD	POWER SUPPLY +3.3V		
3	VDD	POWER SUPPLY +3.3V		
4	VEEDID	DDC 3.3V Power		
5	NC	Reserved for supplier test point		
6	CLKEDID	DDC Clock		
7	DATAEDID	DDC data		
8	RxIN0-	LVDS Differential Data INPUT (R0-R5,G0)	Negative	
9	RxIN0+	LVDS Differential Data INPUT (R0-R5,G0)	Positive	
10	GND	Ground		
11	RxIN1-	LVDS Differential Data INPUT (G1-G5,B0-B1)	Negative	
12	RxIN1+	LVDS Differential Data INPUT (G1-G5,B0-B1)	Positive	
13	GND	Ground		
14	RxIN2-	LVDS Differential Data INPUT (B1-B5,Sync,DE)	Negative	
15	RxIN2+	LVDS Differential Data INPUT (B1-B5,Sync,DE)	Positive	
16	GND	Ground		
17	RxCLK-	LVDS Differential Data INPUT (Clock)	Negative	
18	RxCLK+	LVDS Differential Data INPUT (Clock)	Positive	
19	GND	Ground		
20	NC	NC		
21	NC	NC		
22	GND	Ground		
23	NC	NC		
24	NC	NC		
25	GND	Ground		
26	NC	NC		
27	NC	NC		
28	GND	Ground		
29	NC	NC		
30	NC	NC		

5.2 LVDS Transmitter : DS90CF383 (National Semiconductor) or Compatible

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
51	TxIN0	R0	14	TxIN14	G5
52	TxIN1	R1	15	TxIN15	B0
54	TxIN2	R2	19	TxIN18	B1
55	TxIN3	R3	20	TxIN19	B2
56	TxIN4	R4	22	TxIN20	B3
3	TxIN6	R5	23	TxIN21	B4
4	TxIN7	G0	24	TxIN22	B5
6	TxIN8	G1	27	TxIN24	Hsync
7	TxIN9	G2	28	TxIN25	Vsync
11	TxIN12	G3	30	TxIN26	DE
12	TxIN13	G4	31	TxCLKIN	Clock

LVDS INTERFACE



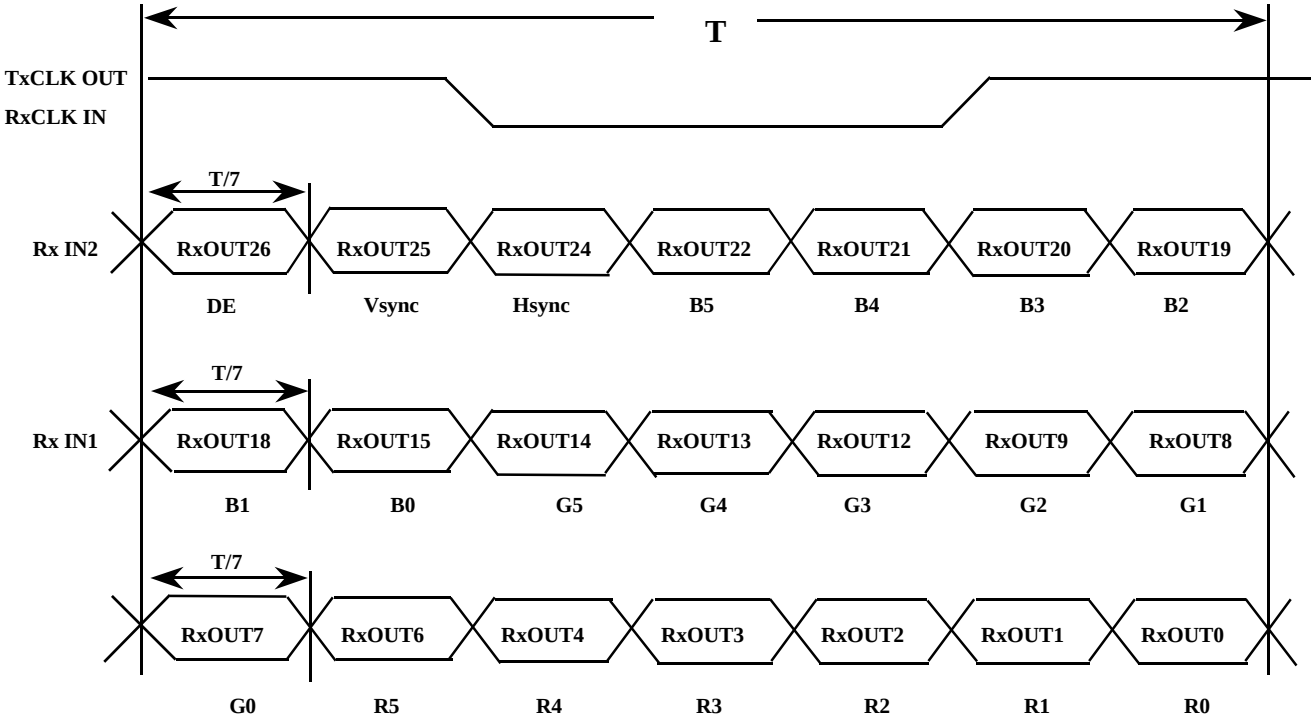
Note : The LCD Module uses a 100ohm resistor between positive and negative lines of each receiver input.

5.3 BACK LIGHT UNIT

Connector : JST BHSR - 02VS –1
Mating Connector : JST SM02B-BHSS-1

Pin NO.	Symbol	Color	Function
1	HOT	Blue	High Voltage
2	COLD	White	Ground

5.4 Timing Diagrams of LVDS For Transmission



5.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

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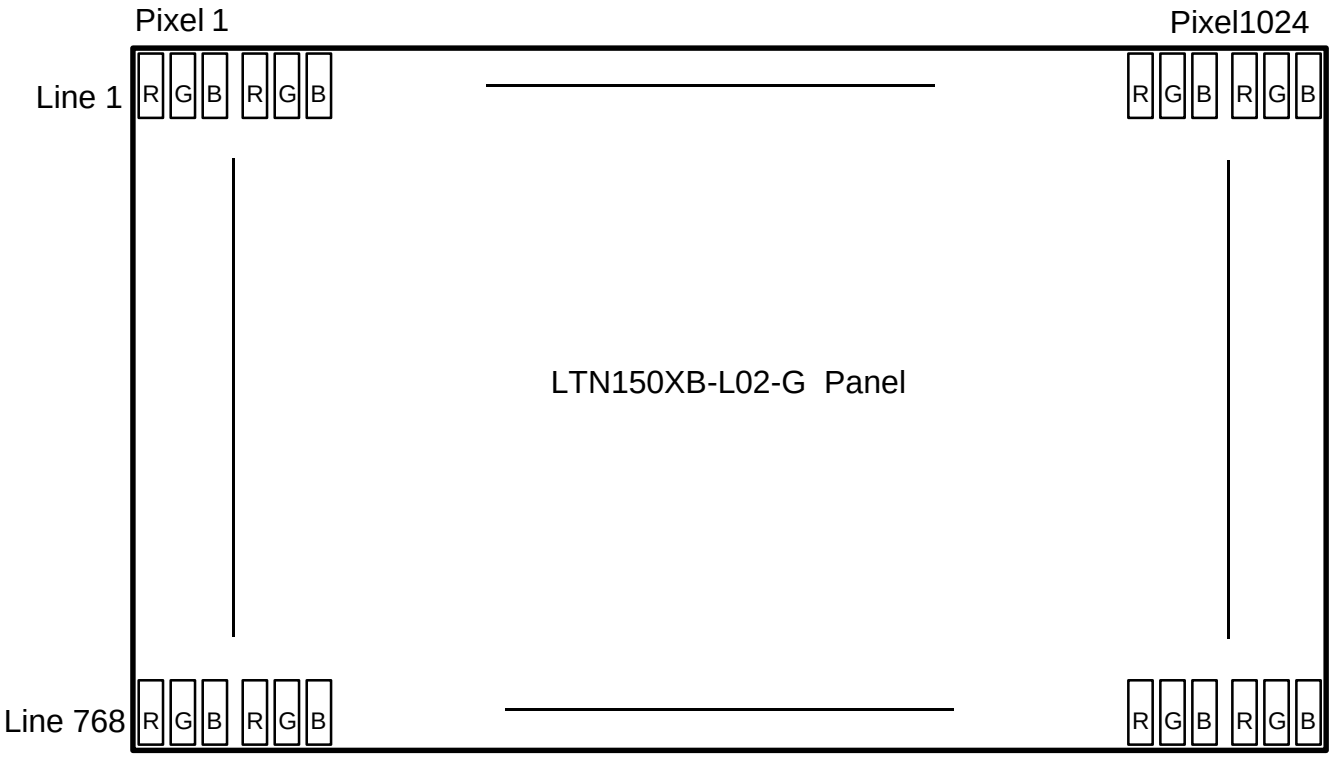
COLOR	DISPLAY	DATA SIGNAL																		GRAY SCALE LEVEL
		RED						GREEN						BLUE						
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5	
COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
	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	-
GRAY SCALE OF **RED**	BLACK	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	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R60
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R61
		0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R62
	RED	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R63
GRAY SCALE OF **GREEN**	BLACK	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	1	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G60
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	G61
		0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	G62
	GREEN	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	G63
GRAY SCALE OF **BLUE**	BLACK	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	1	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B60
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	B61
		0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	B62
	GREEN	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	B63

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

5.6 Pixel Format in the display

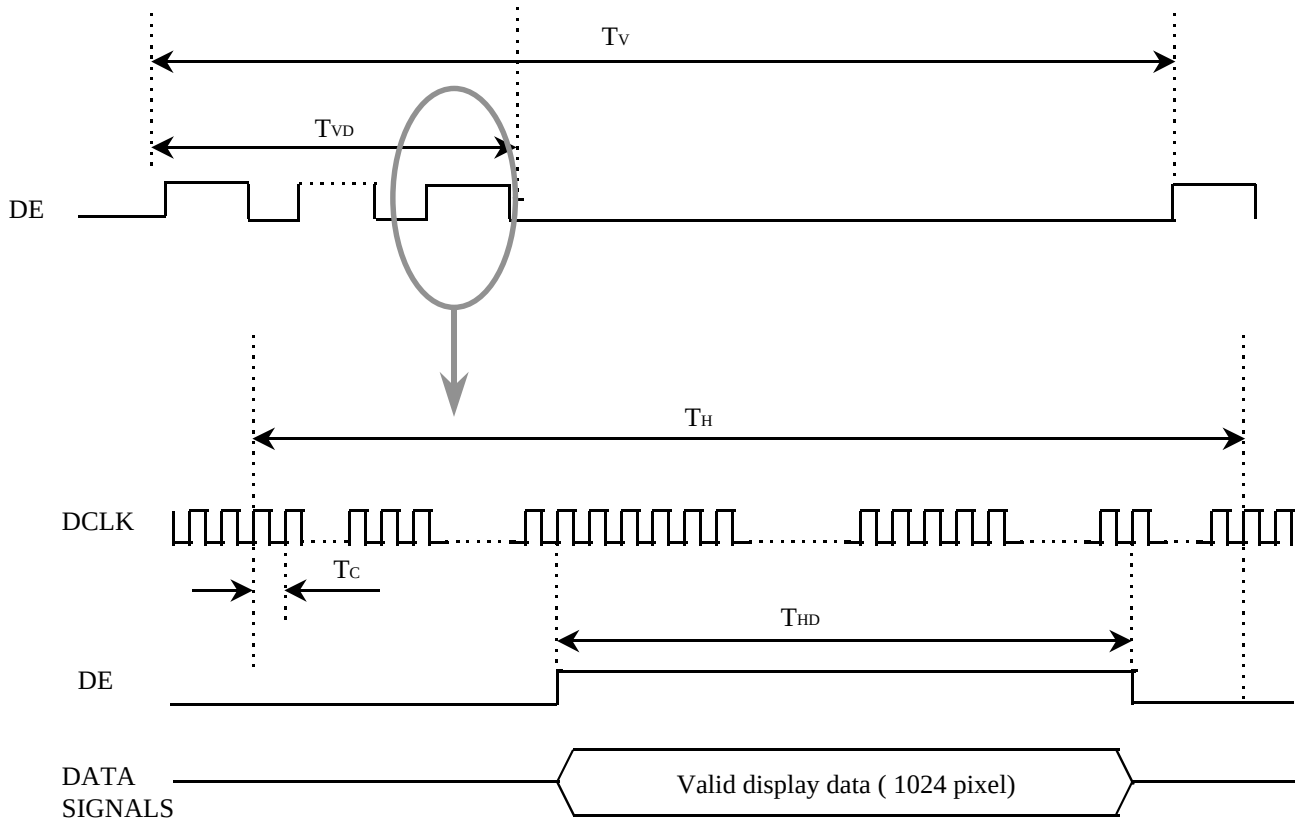


6. INTERFACE TIMING

6.1 Timing Parameters

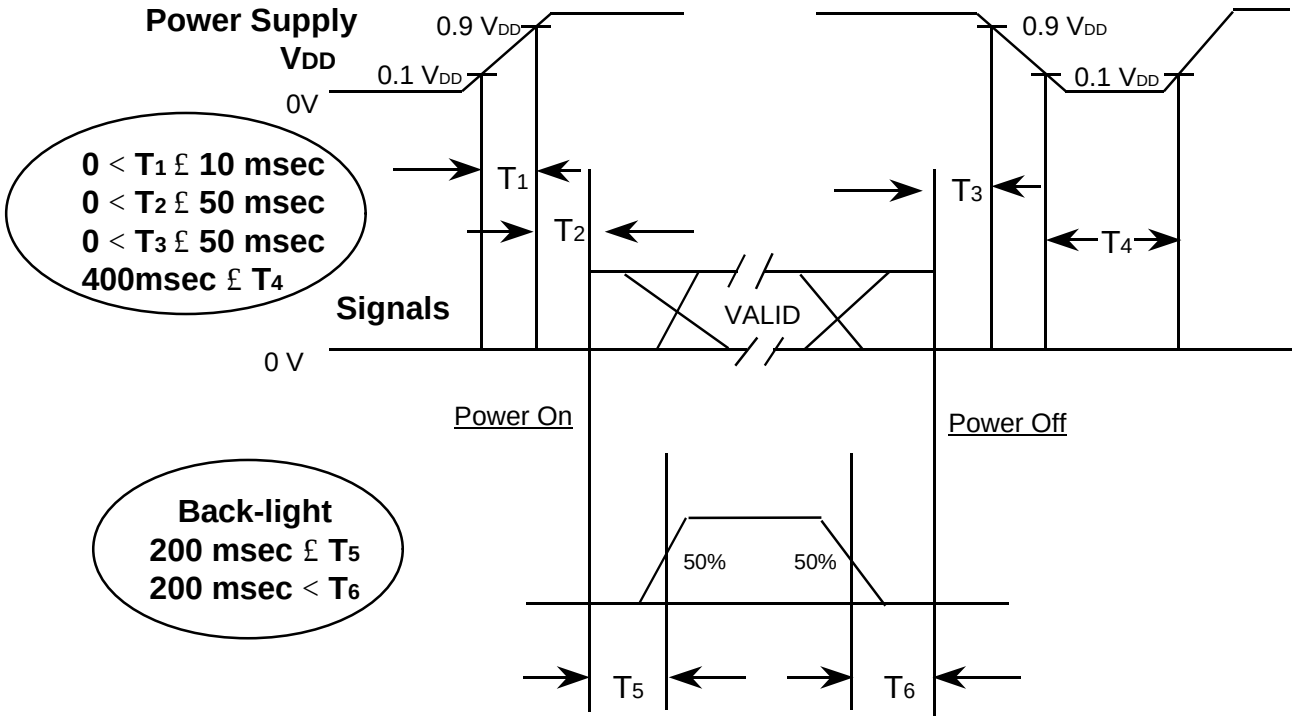
Signal	Item	Symbol	MIN	TYP	MAX	Unit	Note
Frame Frequency	Cycle	Tv	-	806	-	lines	
Vertical Active Display Term	Display Period	T_{VD}	-	768	-	lines	
One Line Scanning Time	Cycle	T_H	-	1344	-	clocks	
Horizontal Active Display Term	Display Period	T_{HD}	-	1024	-	clocks	

6.2 Timing diagrams of interface signal



6.3 Power ON/OFF Sequence

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



Power ON/OFF Sequence

T1 : Vdd rising time from 10% to 90%
T2 : The time from Vdd to valid data at power ON.
T3 : The time from valid data off to Vdd off at power Off.
T4 : Vdd off time for Windows restart
T5 : The time from valid data to B/L enable at power ON.
T6 : The time from valid data off to B/L disable at power Off.

NOTE.

(1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD}.

(2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become white.

(3) In case of V_{DD} = off level, please keep the level of input signals on the low or keep a high impedance.

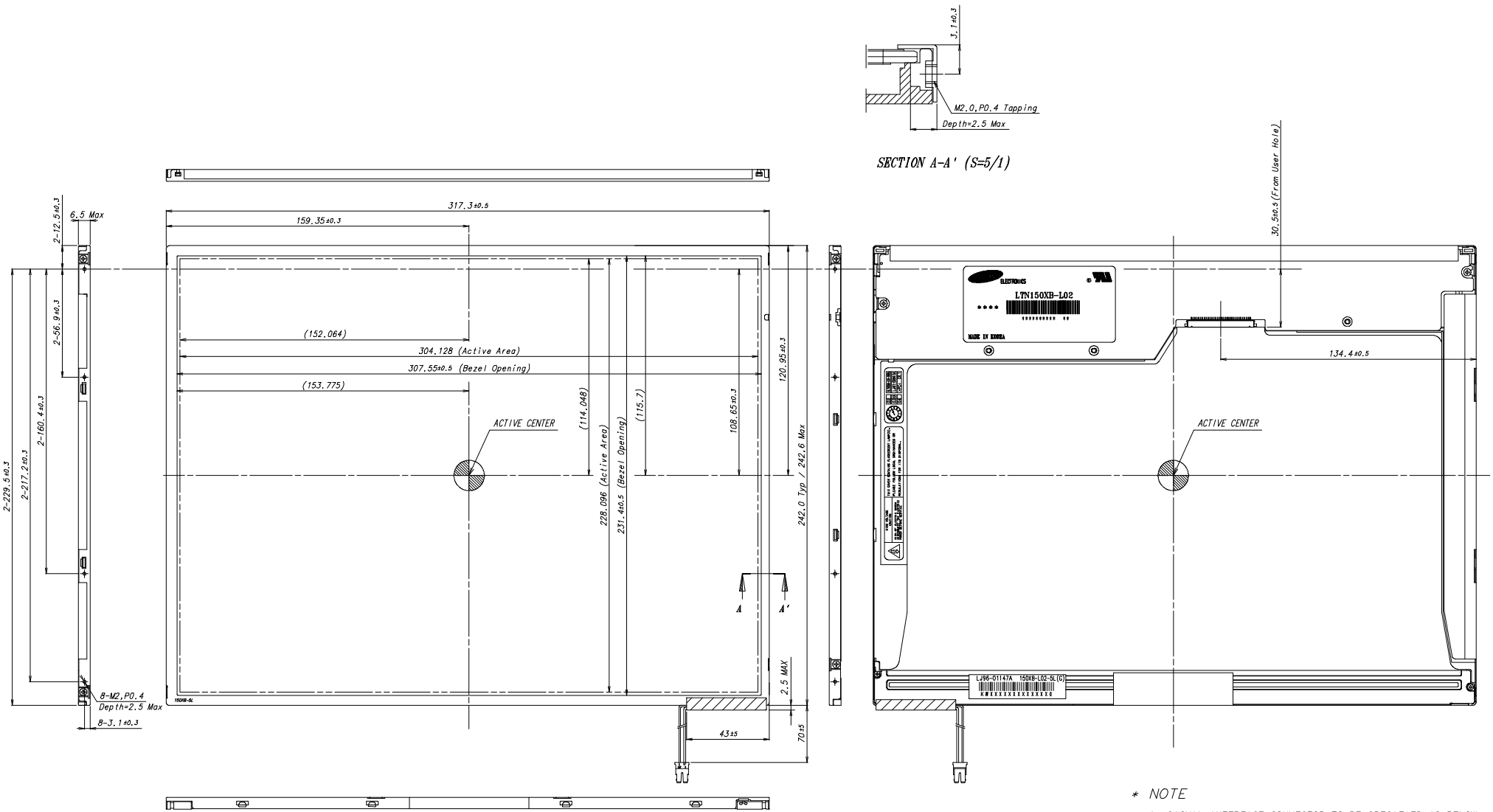
(4) T4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

7. Mechanical Outline Dimension

Approval

[Refer to the next page]



* NOTE

1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
   - MAKER : JAE
   - PART NO : F1-XB30S-HF10

2. CCFT CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW.
   - MAKER : JST
   - PART NO : BHSR-02VS-1

GENERAL TOLERANCE			
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X ≤ 4	±0.05	±0.1	±0.2
4 < X ≤ 16	±0.08	±0.15	±0.3
16 < X ≤ 64	±0.12	±0.25	±0.5
64 < X ≤ 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION				REASON	CHG'D BY
UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY	MODEL NAME	LTN150XB-L02(G)
SCALE	1/1	J.C.Choi	J.C.Choi	H.S.Kim	J.H.Choi		
TOLERANCE LEVEL2		03.04.18	02.11.22	03.04.18	03.04.18	PART/SHEET NAME	Outline-Dimension
SAMSUNG ELECTRONICS					SPEC. NO	SHEET	1/1
					CODE NO.	VER.	000

8. GENERAL PRECAUTIONS

1. Handling

(a) When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.

(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 CCFT backlight.

(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(Isoprophyl Alcohol) or Hexane.
Do not use Ketone 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 C-MOS Gate Array IC.

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

(j) Do not disassemble the module.

(k) Do not pull or fold the lamp wire.

(l) Do not adjust the variable resistor which is located on the back side.

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

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

2. STORAGE

(a) Do not leave the module 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.

3. OPERATION

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

(b) Power supply should always be turned on/off by following item 6.3 " Power on/off sequence ".

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The cable between the backlight connector and its inverter power supply shall be a minimized length and be connected directly . The longer cable between the backlight and the inverter may cause lower luminance of lamp(CCFT) and may require higher startup voltage(Vs).

4. OTHERS

(a) Ultra-violet ray filter is necessary for outdoor operation.

(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, so on) Otherwise the module may be damaged.

(d) If the module 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 module has its circuitry PCB' s on the rear side and should be handled carefully in order not to be stressed.

9. Packing

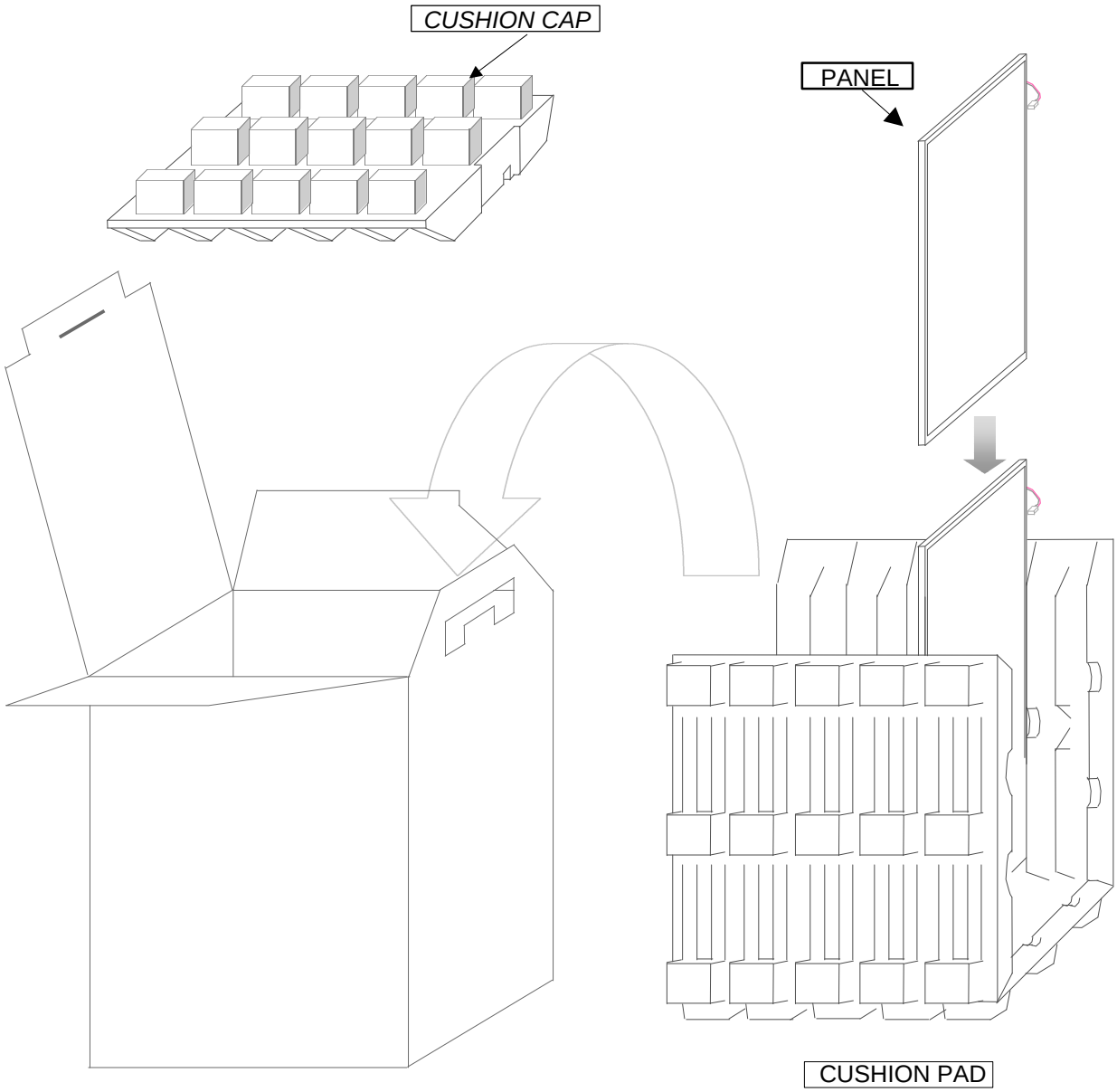
9.1 Packing

CARTON(Internal Package)

(1)Packing Form

Corrugated fiberoard box and corrugated cardboard as shock absorber

(2)Packing Method



Note (1)Total : Approx. 7.5Kg

(2)Acceptance number of piling : 10 sets

(3)Carton size : 325(W) X 260(D) X 420(H)

(4)Max accumulation quality : 5cartons

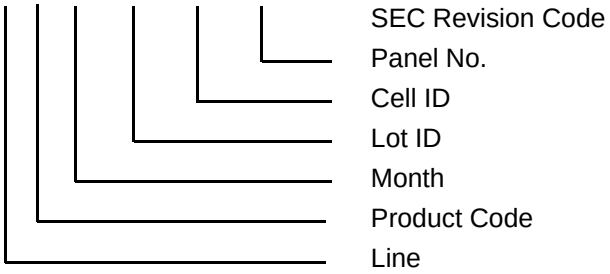
(3)Packing Material

NO.	Parts name	Quantity
1.	Static eletric protective sack	10
2.	Cushion pad(inner box) included shock absorber	1 set
3.	Pictorial marking	2 pics
4.	Carton	1 set

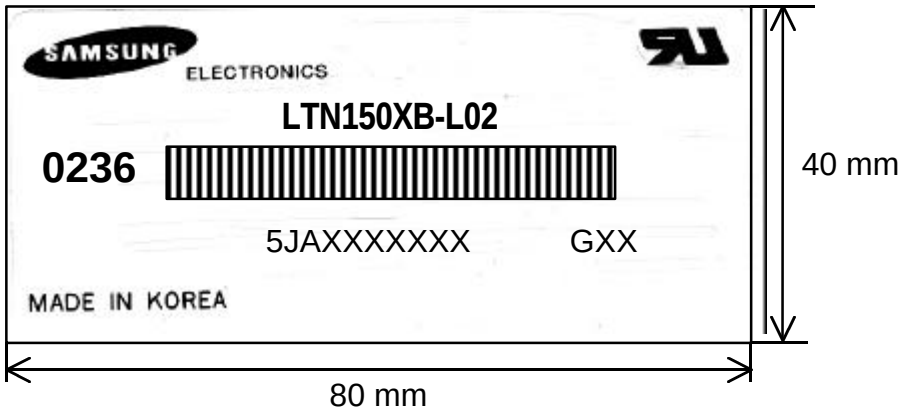
10. MARKING & OTHERS

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

(1)Parts number : LTN150XB-L02
(2)Revision : One letter
(3)Control code : One letter
(4)Lot number : 5 J A XXX XX XX G00

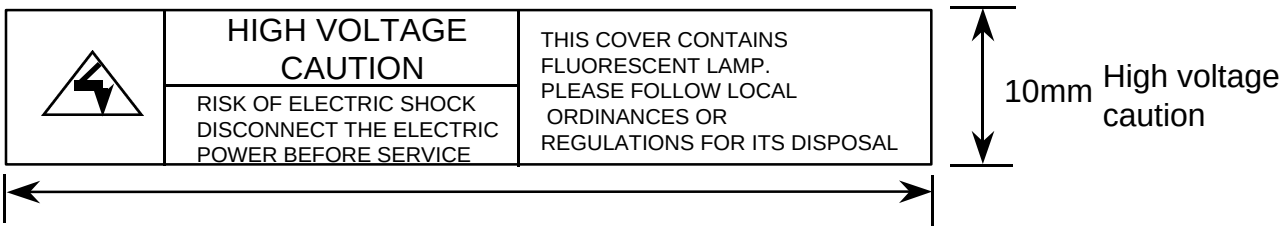


(5) Nameplate Indication

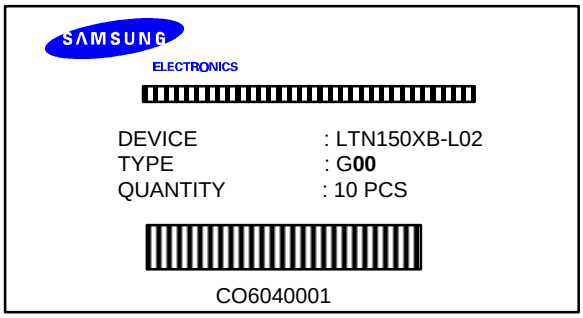


Parts name : LTN150XB-L02
Lot number : 5JAXXXXXXX
Inspected work week : 0236(2002 year 36th week)
Product Revision Code : GXX

High voltage caution label



(6) Packing small box attach



(7) Packing box Marking : Samsung TFT-LCD Brand Name

Reliability Test Result

- Calculation of Failure Rate for few failures

(failure quantity: 0 ~ 2 units)

$$FR = \frac{Chisq(2r+2)\ @\ 60\%UCL}{2 \times S/S \times AF \times Stress\ Hours}$$

Where, TAF = EXP(Ea/k)(1/Tu - 1/Ts) . Ea : Activation Energy (= 0.7eV)
HAF = (RHs%/RHu%)n . n : Experimental Constant(= 7)
Tu : User Temperature . Ts : Stress Temperature
RHu : User Relative Humidity . RHs : Stress Relative Humidity

MTBF(Mean Time Between Failure) = 1/Failure Rate

Item	Stress Cond.	User Cond.	S/S	MTBF
HTOL	500hr @ 50°C	25°C	0/12pnl	54khrs

MTBF : 54 khrs calculated from HTOL test

LCD QA Group
Semiconductor Business
Samsung Electronics Co., Ltd.