SAMSUNG ELECTRONICS

Approval

TO : Hikari Inovision

DATE : Feb. 16, 2006.

SAMSUNG TFT-LCD

MODEL NO. : LTN141XB-L04

NOTE :

Any Modification of Spec is not allowed without SEC's permission

APPROVED BY : K. H. Shin

PREPARED BY : LCD Product Planning Group 1, Marketing Team

SAMSUNG ELECTRONICS CO., LTD.

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Approval

CONTENTS

REVISION HISTORY

Approval

Date	Revision No.	Page	Summary
Feb. 16. 2006	A00	All	LTN141XB-L04 Model spec was issue first.

GENERAL DESCRIPTION

DESCRIPTION

LTN141XB-L04 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 unit. The resolution of a 14.1" contains 1024 x 768 pixels and can display up to 262,144 colors. 6 O'clock direction is the Optimum viewing angle.

FEATURES

- High contrast ratio, high aperture structure
- XGA (1024 x 768 pixels) resolution
- Low power consumption
- Fast Response
- Single CCFL
- DE(Data enable) only mode
- 3.3V LVDS Interface
- Onboard EEDID chip
- PB-free product

APPLICATIONS

- Notebook PC
- 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	285.7(H) x 214.3(V) (14.1” 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		
Pixel pitch	0.279(H) x 0.279(V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 25, Hard-Coating 3H		

Mechanical Information

ITEM		MIN.	TYP.	MAX.	NOTE
Module size	Horizontal (H)	298.5	299.0	299.5	
	Vertical (V)	227.5	228.0	228.5	
	Depth (D)	-	5.2	5.5	(1)
Weight			420g	430g	

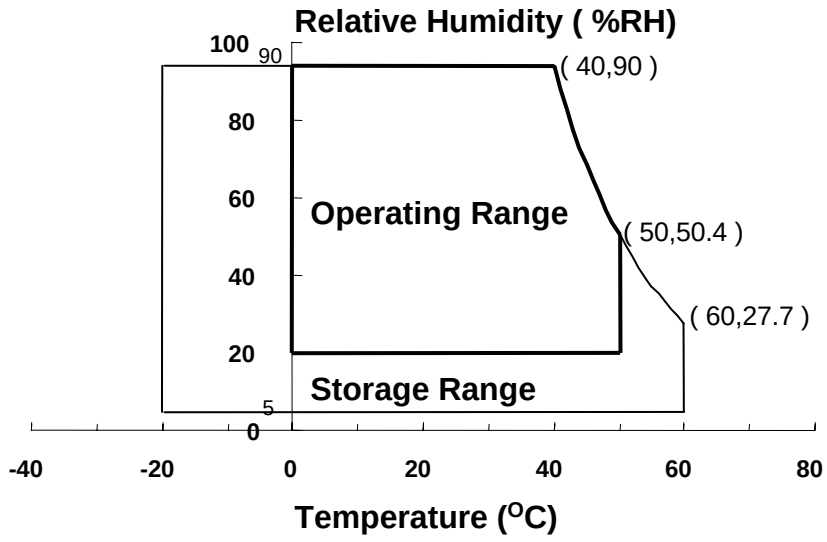
Note (1) Measurement condition of outline dimension
. Equipment : Bernier Calipers
. Push Force : 500g ·f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	TSTG	-20	60	°C	(1)
Operating temperate (Temperature of glass surface)	TOPR	0	50	°C	(1)
Shock (non-operating)	Snop	-	240	G	(2),(4)
Vibration (non-operating)	Vnop	-	2.41	G	(3),(4)

Note (1) Temperature and relative humidity range are shown in the figure below.
95 % RH Max. (40 °C ≥ Ta)
Maximum wet - bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation



(2) 2ms, half sine wave, one time for ±X, ±Y, ± Z.
(3) 5 - 500 Hz, random vibration, 30min 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

V_{DD} =3.3V, V_{SS} = GND = 0V

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	V_{DD} - 0.3	V_{DD} + 0.3	V	(1)
Logic Input Voltage	V_{IN}	V_{DD} - 0.3	V_{DD} + 0.3	V	(1)

Note (1) Within Ta (25 ± 2 °C)

(2) BACK-LIGHT UNIT

Ta = 25 ± 2 °C

Item	Symbol	Min.	Max.	Unit	Note
Lamp Current	I_L	2.0	7.0	mArms	(1)
Lamp frequency	F_L	40	80	kHz	(1)

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.

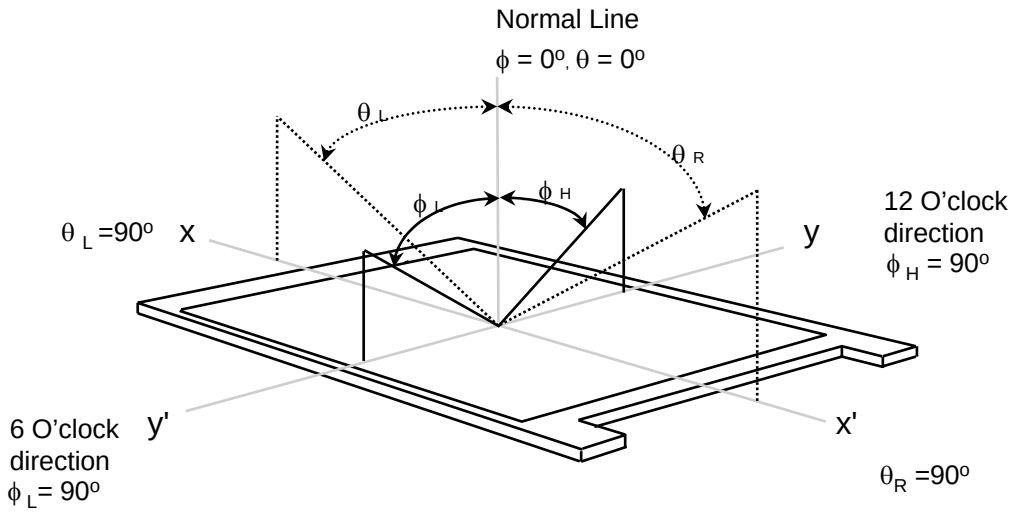
2. OPTICAL CHARACTERISTICS

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 and PR-650

* Ta = 25 ± 2 °C, V_{DD}=3.3V, fv= 60Hz, f_{DCLK} = 65MHz, I_L = 6.0 mA

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)		CR		300	-	-	-	(1), (2), (5)
Response Time at Ta (Rising + Falling)		T_{RT_BW}		-	25	35	msec	(1), (3)
		T_{RT_GRAY}		-	50	70	msec	G32/G48
Average Luminance of White (5 Points)		$Y_{L,AVE}$	Normal Viewing Angle $\phi = 0$ $\theta = 0$	150	185	-	cd/m^2	I_L=6.0mA (1), (4)
Color Chromaticity (CIE)	Red	R_X		0.575	0.595	0.615	-	(1), (5) PR-650
		R_Y		0.309	0.329	0.349		
	Green	G_X		0.300	0.320	0.340		
		G_Y		0.523	0.543	0.563		
	Blue	B_X		0.133	0.153	0.173		
		B_Y		0.110	0.130	0.150		
	White	W_X		0.295	0.315	0.335		
		W_Y		0.310	0.330	0.350		
Color gamut		C_g		42	45	-	%	NTSC
Viewing Angle	Hor.	θ_L	CR ≥ 10 At center	40	45	-	Degrees	(1), (5) BM-5A
		θ_H		40	45	-		
	Ver.	ϕ_H		10	20	-		
		ϕ_L		30	40	-		
13 Points White Variation		δ_L		-	-	1.55	-	(6)

Note 1) Definition of Viewing Angle : Viewing angle range(10 ≤ C/R, 100 ≤ C/R)

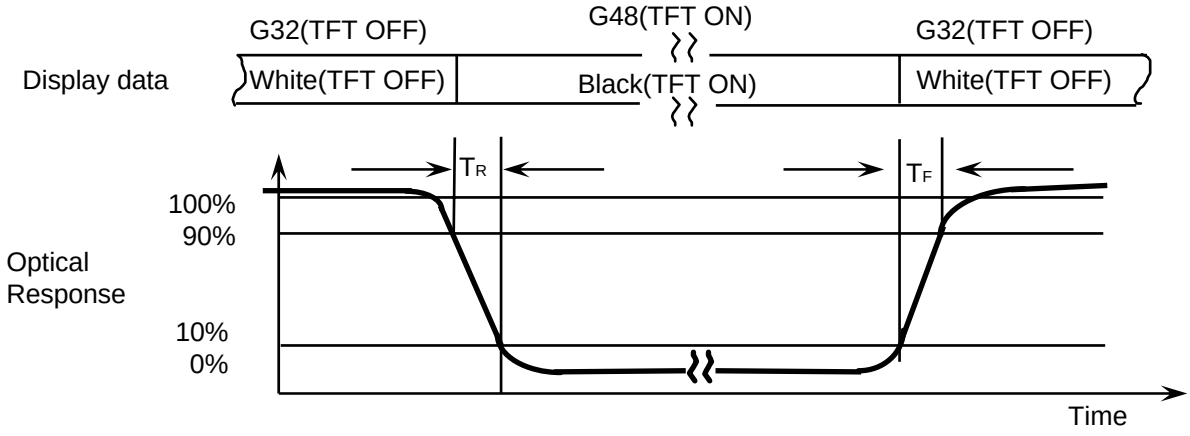


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points(4, 5, 7, 9, 10)

$$CR = \frac{CR(4) + CR(5) + CR(7) + CR(9) + CR(10)}{5}$$

Points : ④ , ⑤ , ⑦ , ⑨ , ⑩ at the figure of Note (6).

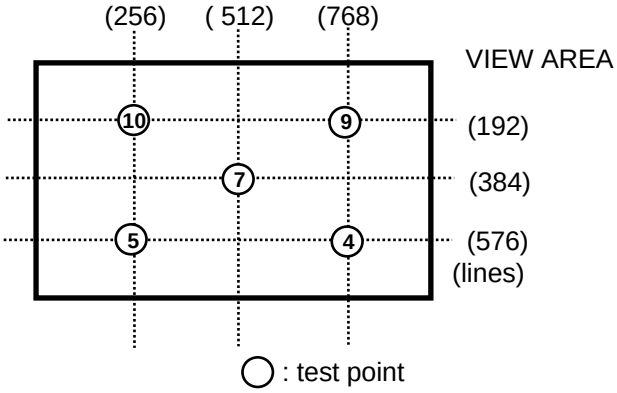
Note 3) Definition of Response time :



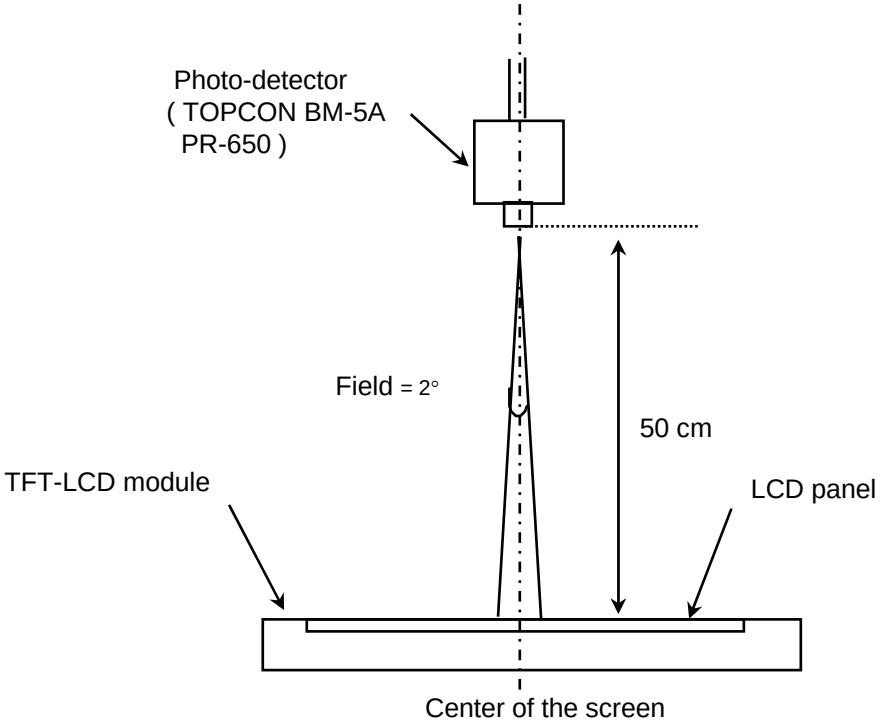
Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.

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

$$Y_{L,AVE} = \frac{Y_{L4} + Y_{L5} + Y_{L7} + Y_{L9} + Y_{L10}}{5}$$



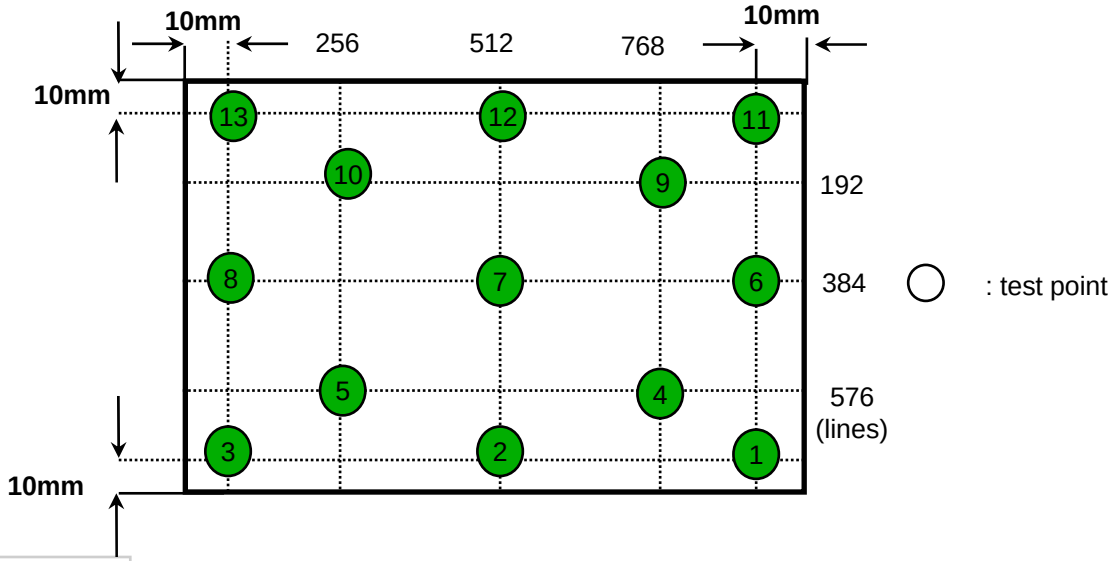
Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless,and dark room.
30 min after lighting the backlight. This should be measured in the center of screen.
Lamp current : 6.0mA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



[Optical characteristics measurement setup]

Note 6) Definition of 13 points white variation (δ_L), CR variation(C_{VER}) [① ~ ⑬]

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



3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= 25 ± 2°C

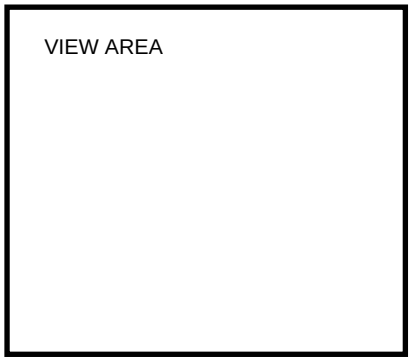
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	V_{CM} = +1.2V
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		fv	-	60	-	Hz	
Hsync Frequency		f_H	-	48.36	-	KHz	
Main Frequency		f_{DCLK}	-	65	-	MHz	
Rush Current		I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	I_{DD}	-	280	-	mA	(2),(3)*a
	Mosaic		-	300	-	mA	(2),(3)*b
	V. stripe		-	360	420	mA	(2),(3)*c

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

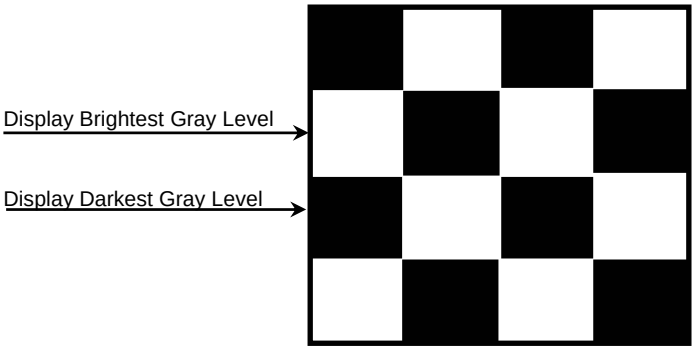
(2) f_V=60Hz, f_{DCLK} =65MHZ, Vdd = 3.3V , DC Current.

(3) Power dissipation pattern

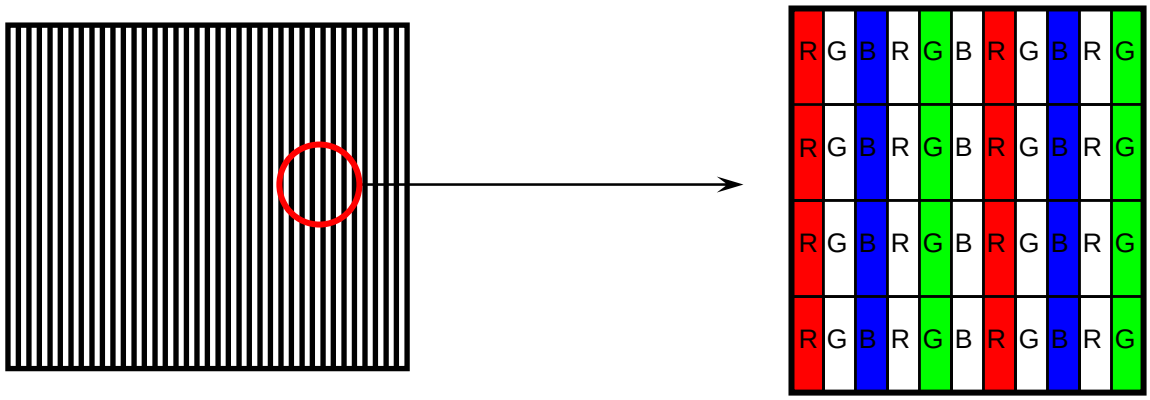
*a) White Pattern



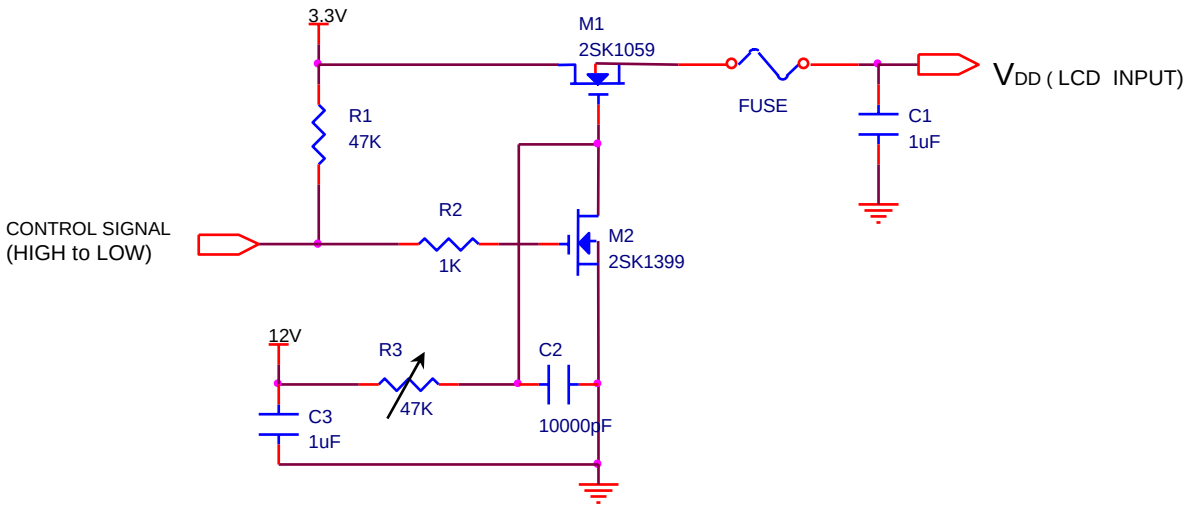
*b) Mosaic Pattern



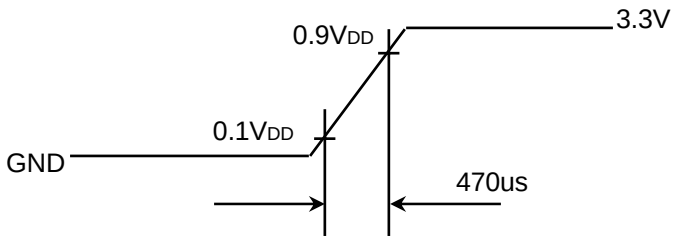
*c) 1dot Vertical stripe pattern



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 CCFT (Cold Cathode Fluorescent Tube).
The characteristics of a single lamp are shown in the following table.

- INVERTER : SEM SIC 130T

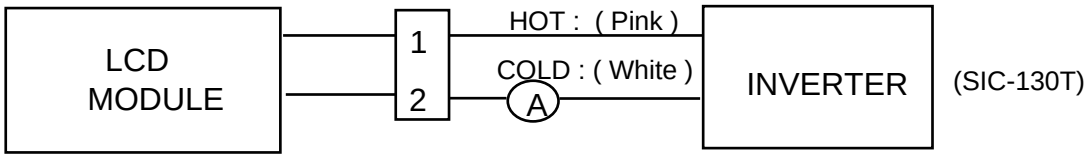
Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp Current	I_L	3.0	5.0	6.0	mArms	(1)
Lamp Voltage	V_L	-	700	-	Vrms	I_L = 6.5mA
Frequency	f_L	50	-	65	KHz	(2)
Power Consumption	P_L	-	4.2	-	W	(3) I_L = 6.0mA
Operating Life Time	Hr	10,000	-	-	Hour	(4)
Startup Voltage	V_S	-	-	1095	Vrms	25°C, (5)
				1315	Vrms	0°C, (5)
Lamp Start-up time	T_S	-	-	0.5	sec	

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.



(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.
2. When the Effective ignition length becomes 80% or lower than the original value.
   (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

(5) The inverter open voltage - this voltage should be measured after ballast capacitor- have to be larger than the lamp startup voltage, otherwise backlight may has blinking for a moment after turns on or not be turned on.
If an inverter has shutdown function it should keep its open voltage for longer than 1 second even if lamp connector open.

3.3 Inverter

Inverter Manufacturer : AMBIT, SUMIDA

Ta = 25 ± 2°C

Item		Min.	Typ.	Max	Unit	Note
Input Voltage (Vin)		7.5	14.4	21.0	V	
Open Circuit Voltage		1400	-	1800	Vrms	I_L = 6.0mArms
Lamp Current (Duty Cycle)		10 @SMB_DAT FFH	-	100 @SMB_DAT 00H I_L=6.5mArms	%	Vin=14.4V (3)
Efficiency	Optical	20	-	-	nit / W	After 30min turn on at the center of LCD Vin=14.4V @6.5mA
	Electrical	-	85	-	%	
Operating Frequency		45	55	65	kHz	SMB_DAT=00H
Input voltage ripple		-	-	0.5	V	Peak-to-peak
Input Power Consumption		-	5.2	6.0	W	Vin=14.4V Iout = 6.0mArms
In-rush current		-	-	1.5	A	
Shutdown time		0.6	1.0	1.4	sec	
Start-up time		-	-	0.1	sec	(1)

Note)

(1) Inverter start-up time

(2) Efficiency should be calculated as below formulation.

Optical efficiency = output Brightness(nits) / Input power(watt)

Electrical efficiency = output power / input power

(3) Below items are not guaranteed, if this product is used at 10nit setting.

1. Luminance deviation

. Luminance deviation 20% can not be guaranteed under 20% duty ratio.

2. Luminance reduction at low temperature

. Luminance can be reduced at lower temperature.

3. Partial turn-on of lamp / No turn-on / Non-uniformity

. Visual characteristic problems can be happened due to abnormal turn-on of lamp.

. Lamp can not be turn-on under 20% duty ratio.

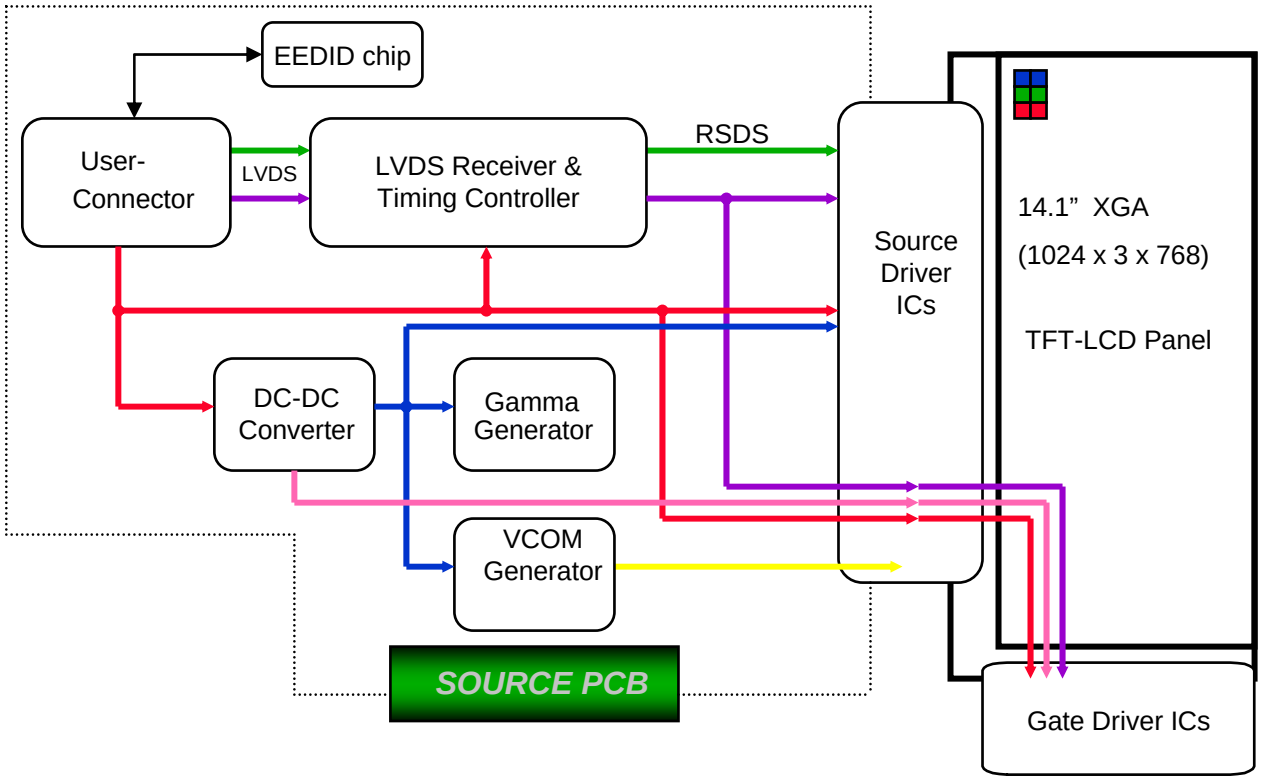
. Non-uniformity can be occurred due to mercury distribution under 20% duty ratio.

4. Lamp life time reduction

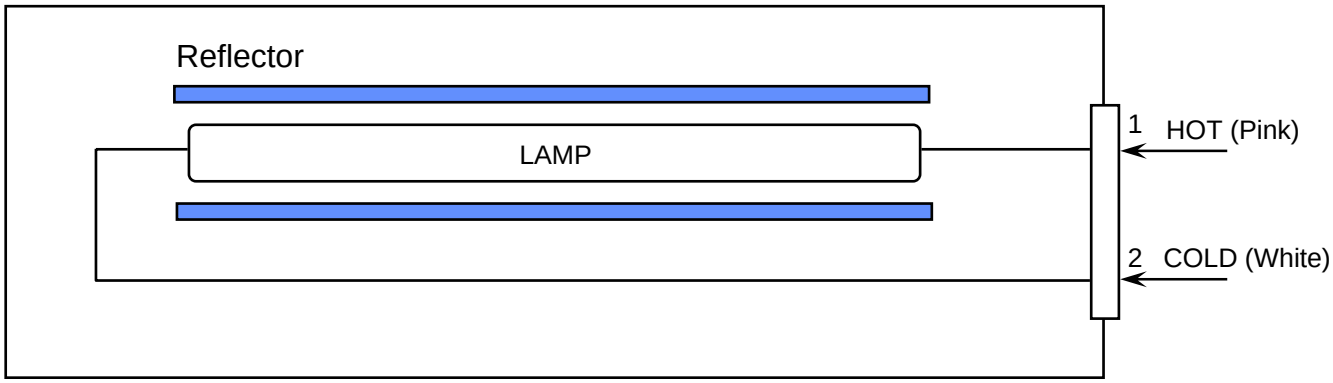
. Lamp life time can be shortened under the usage of low temperature or lower duty ratio for a long time.

4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 BACKLIGHT UNIT

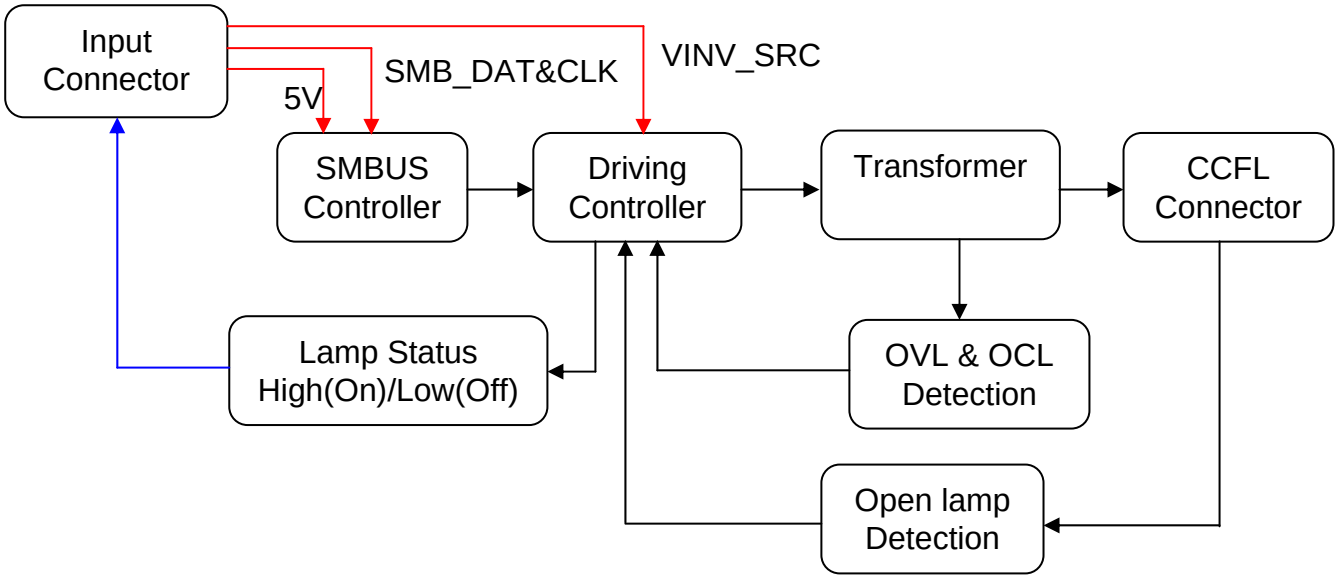


Note) The output of the inverter may change according to the material of the reflector.

4.3 Inverter UNIT

Input Connector : Honda, LVC-D20SFYG

Lamp Connector : JST, SM02B-BHSS-1-TB



5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power (LVDS, Connector : JAE FI-XB30SRL-HF11 or compatible)
Mating Connector : JAE FI-X30CL or compatible)

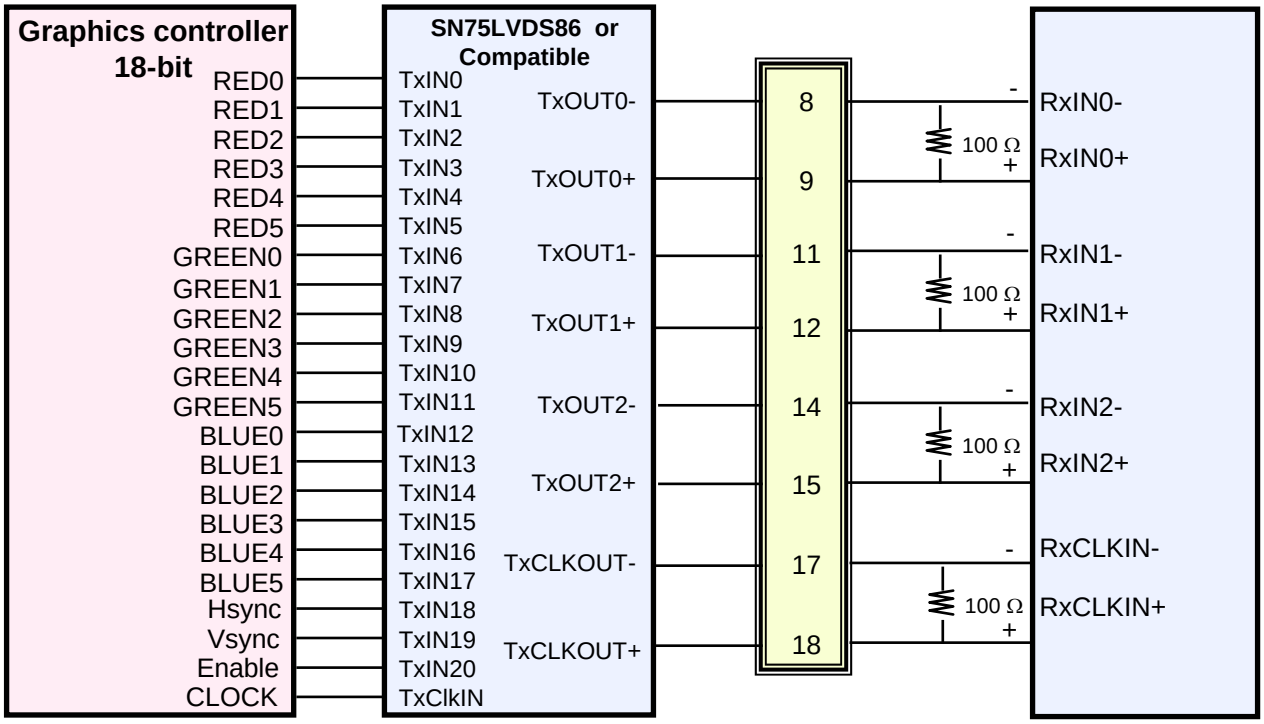
No.	Symbol	Function	Polarity	Remarks
1	VSS	Ground		
2	VDD	POWER SUPPLY +3.3V		
3	VDD	POWER SUPPLY +3.3V		
4	VEEDID	DDC 3.3V Power		
5	NC	Not Connected		
6	CLKEDID	DDC Clock		
7	DATAEDID	DDC data		
8	RxIN0-	LVDS Differential Data INPUT (R0-R5,G0)	Negative	
9	RxIN0+	LVDS Differential Data INPUT (R0-R5,G0)	Positive	
10	GND	Ground		
11	RxIN1-	LVDS Differential Data INPUT (G1-G5,B0-B1)	Negative	
12	RxIN1+	LVDS Differential Data INPUT (Odd G1-G5,B0-B1)	Positive	
13	GND	Ground		
14	RxIN2-	LVDS Differential Data INPUT (B2-B5,Sync,DE)	Negative	
15	RxIN2+	LVDS Differential Data INPUT (B2-B5,Sync,DE)	Positive	
16	GND	Ground		
17	RxCLK-	LVDS Differential Data INPUT	Negative	
18	RxCLK+	LVDS Differential Data INPUT	Positive	
19	GND	Ground		
20	NC	No connection		
21	NC	No connection		
22	NC	No connection		
23	NC	No connection		
24	NC	No connection		
25	NC	No connection		
26	NC	No connection		
27	NC	No connection		
28	NC	No connection		
29	NC	No connection		
30	NC	No connection		

5.2 LVDS Interface : Transmitter DS90CF363 or Compatible

LVDS for Odd pixel

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
44	TxIN0	RO0	12	TxIN11	GO5
45	TxIN1	RO1	13	TxIN12	BO0
47	TxIN2	RO2	15	TxIN13	BO1
48	TxIN3	RO3	16	TxIN14	BO2
1	TxIN4	RO4	18	TxIN15	BO3
3	TxIN5	RO5	19	TxIN16	BO4
4	TxIN6	GO0	20	TxIN17	BO5
6	TxIN7	GO1	22	TxIN18	Hsync
7	TxIN8	GO2	23	TxIN19	Vsync
9	TxIN9	GO3	25	TxIN20	DE
10	TxIN10	GO4	26	TxCLK IN	Clock

LVDS INTERFACE



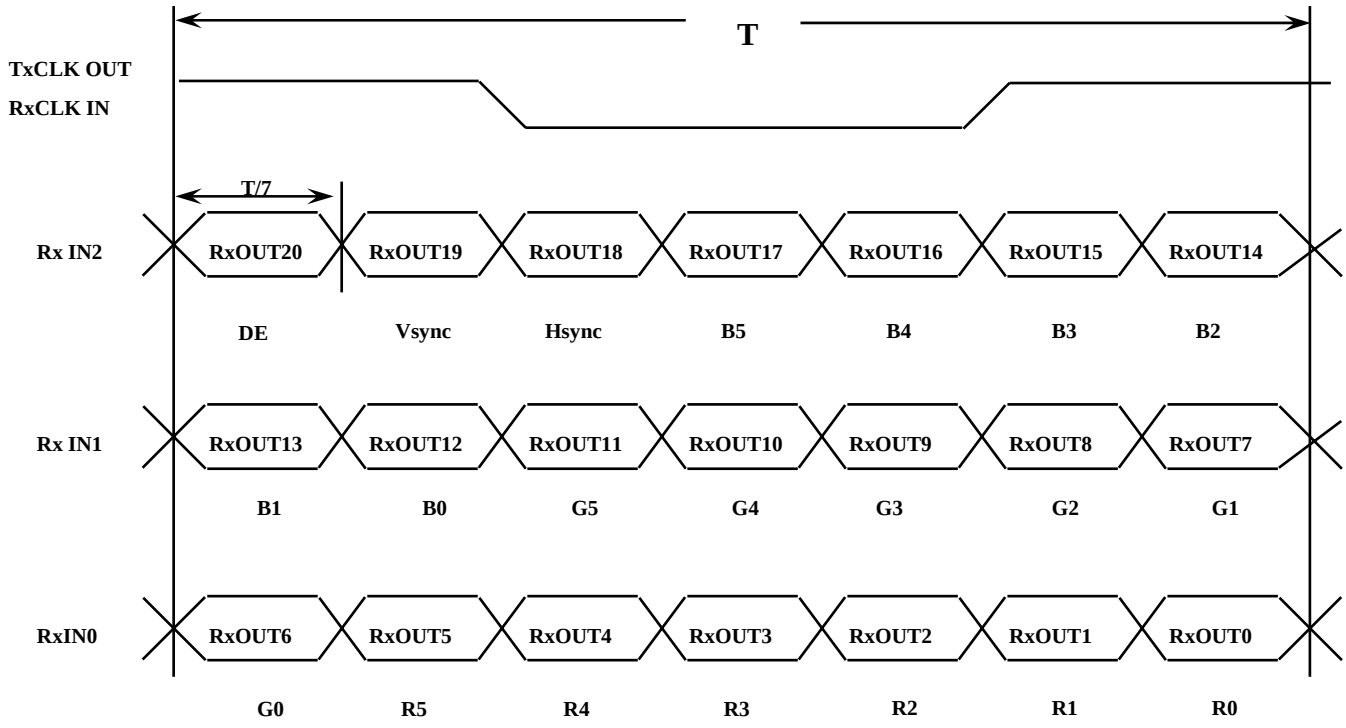
5.3 BACK LIGHT UNIT

Connector : JST BHSR - 02VS -1
Mating Connector : SM02B-BHSS-1(JST)

Pin NO.	Symbol	Color	Function
1	HOT	Pink	High Voltage
2	COLD	White	Low Voltage

5.4 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON

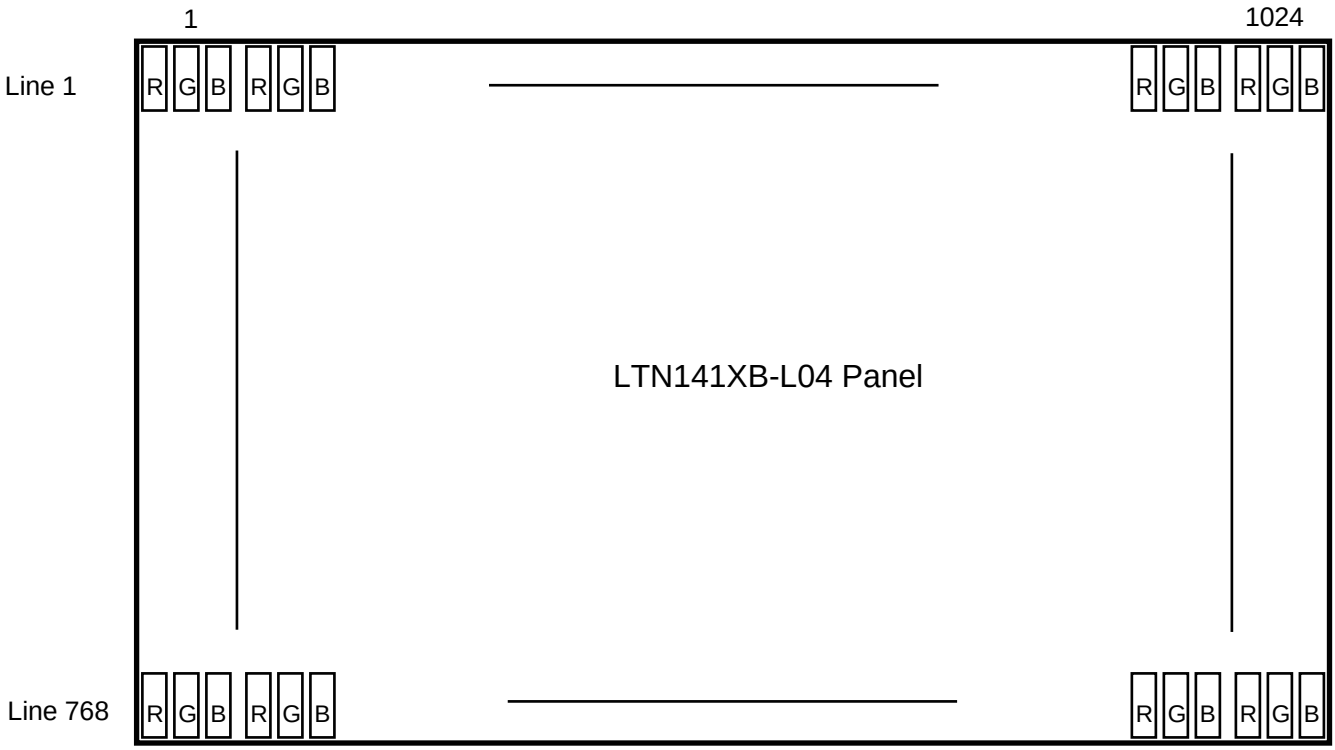


5.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

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	45	B5	
Basic Colors	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R61
	Light	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	G61
	Light	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	B61
	Light	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	B62
	Blue	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



5.7 Inverter signals & power

Inverter Connector : Honda, LVC-D20SFYG

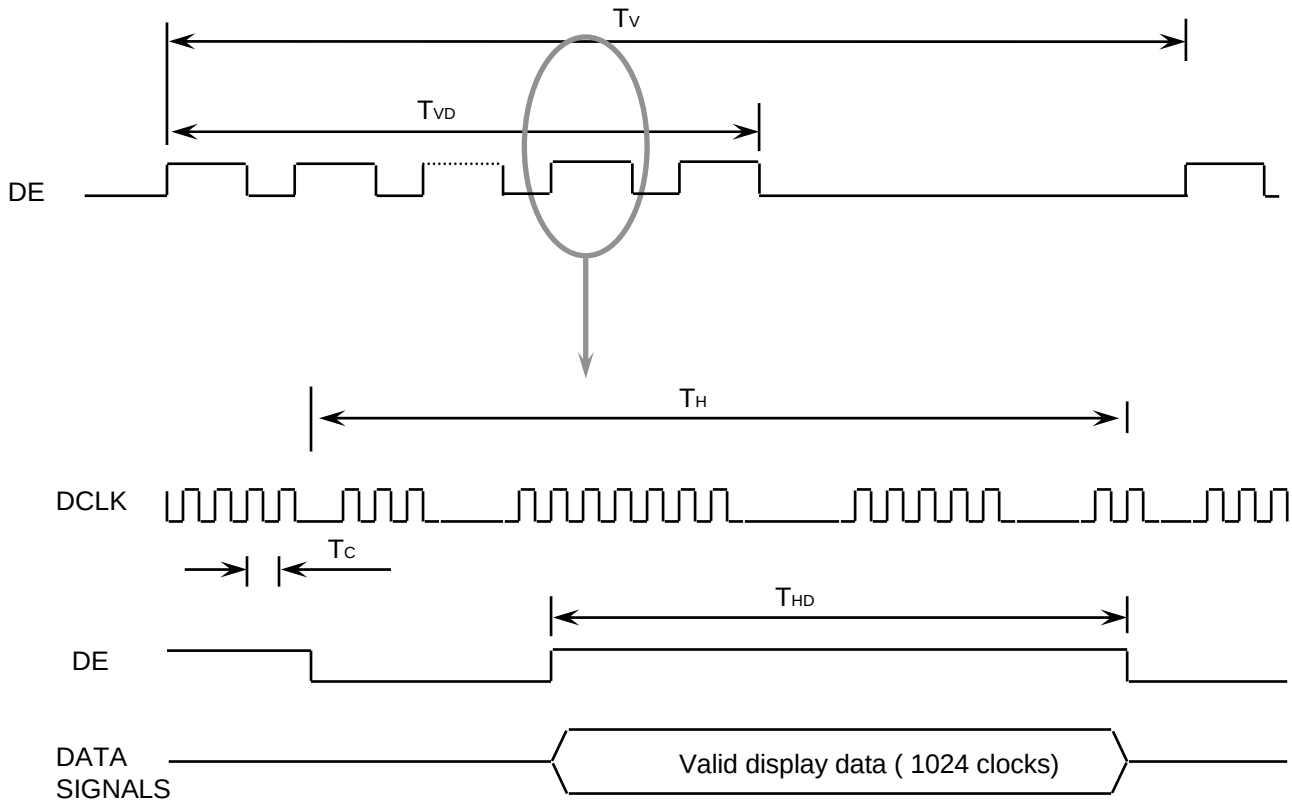
Pin No.	Symbol	Voltage	Comments
1	INV_SRC	7.5V to 21V	This power rail should be used as a power rail to drive the back-light DC-AC converter.
2	INV_SRC	7.5V to 21V	This power rail should be used as a power rail to drive the back-light DC-AC converter.
3	INV_SRC	7.5V to 21V	This power rail should be used as a power rail to drive the back-light DC-AC converter.
4	NC	-	No Connection
5	GND	0V	Ground
6	NC	-	No Connection
7	5VALW	5V	This should be used as power source that stores the brightness/contrast values & the circuit that interfaces with SMB_CLK & SMB_DAT.
8	GND	0V	Ground
9	SMB_DAT	-	SMBUS interface for sending brightness & contrast information to the inverter/panel
10	SMB_CLK	-	SMBUS interface for sending brightness & contrast information to the inverter/panel
11	GND	0V	Ground
12	FPBACK	-	Control signal input into the inverter to turn ON or OFF Lamp. (1 - ON, 0 - OFF)
13	GND	0V	Ground
14	LAMP_STAT	-	Lamp Status Output On (High) / Off (Low) from control chip.
15	NC	-	No Connection
16	NC	-	No Connection
17	NC	-	No Connection
18	NC	-	No Connection
19	NC	-	No Connection
20	NC	-	No Connection

6. INTERFACE TIMING

6.1 Timing Parameters

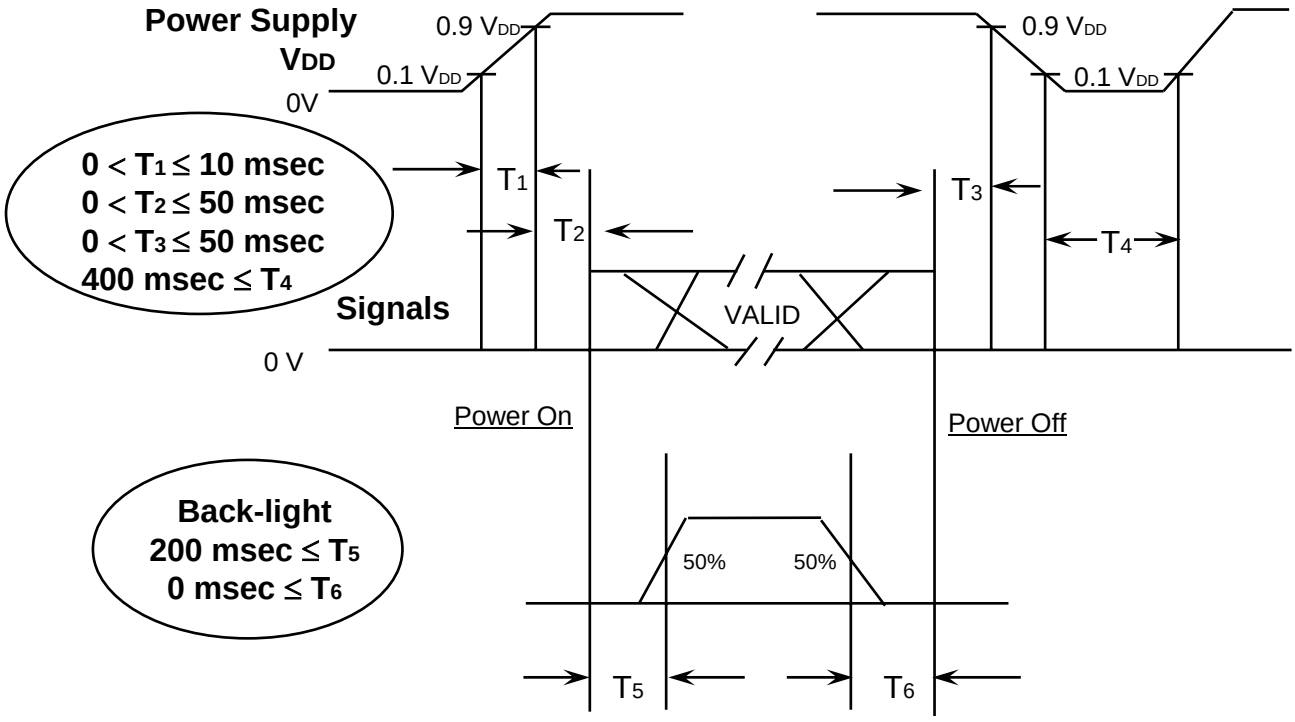
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	TV	-	806	-	Lines	
Vertical Active Display Term	Display Period	TVD	-	768	-	Lines	
One Line Scanning Time	Cycle	TH	-	1344	-	Clocks	
Horizontal Active Display Term	Display Period	THD	-	1024	-	Clocks	

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 should be as the diagram 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 back-light turns on before the LCD operation or the LCD turns off before the back-light 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.

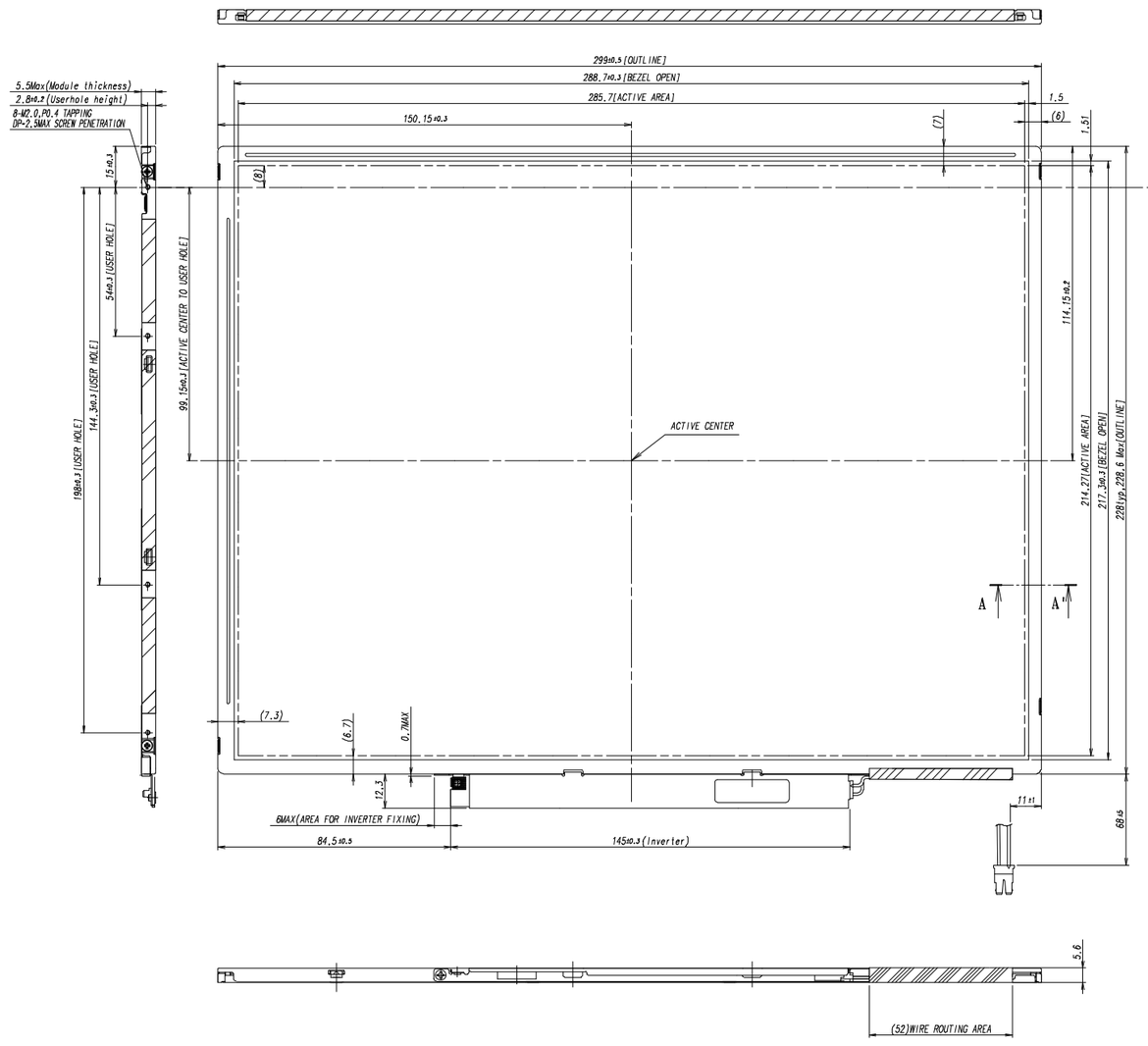
(5) Interface signal shall not be kept at high impedance when the power is on.

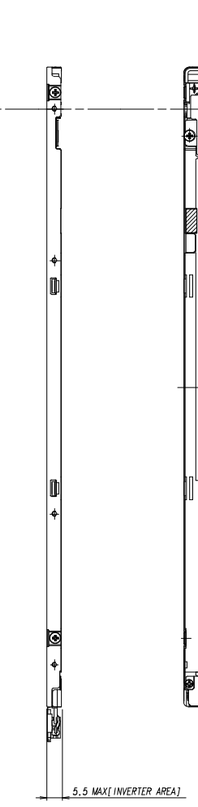
7. Mechanical Outline Dimension

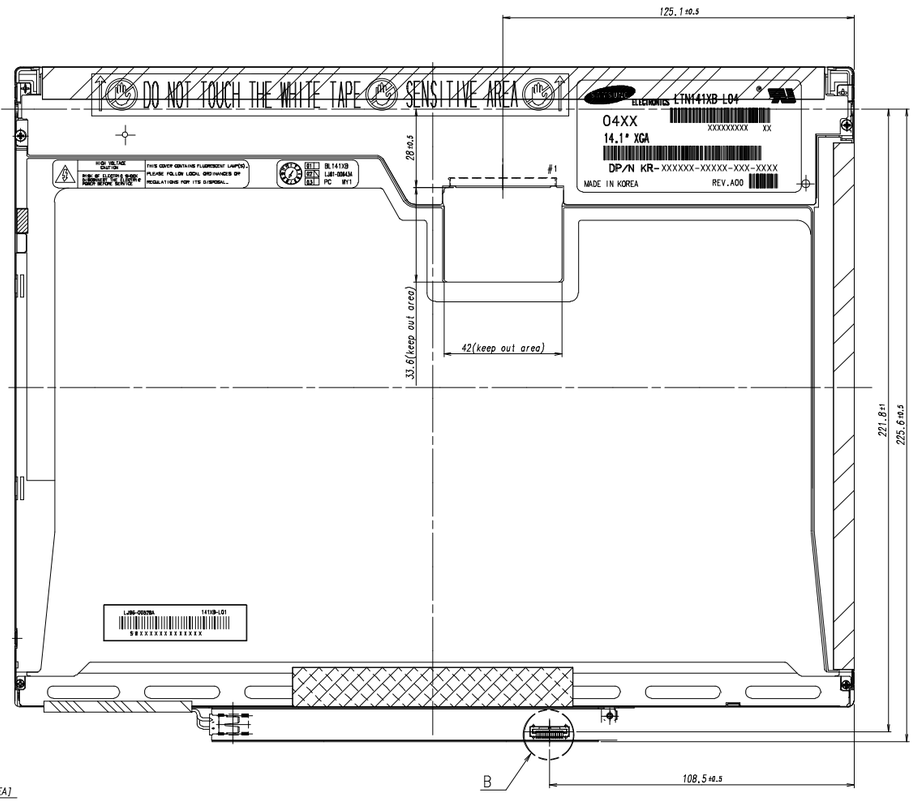
It will be attached with PDF file

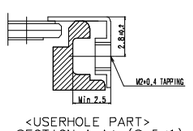
FILE NO.

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	WEIGHT FINISH	WEIGHT MATERIAL	UNFOLDED DIM. OR MATERIAL	REMARK

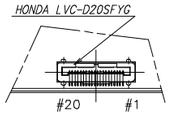








<USERHOLE PART>
SECTION A-A' (S=5/1)



DETAIL B(S=2/1)

* NOTE

1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
   - MAKER : JAE
   - INPUT MATCHING CONNECTOR : JAE FI-XB30SRL-HF11
2. CCFT CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW.
   - MAKER : JST
   - PART NO : BHSR-02VS-1
   - LAMP DIAMETER : ø1.8
3. CALIFERS MEASURING FORCE :530 ± 150 gf
4. ALLOWED DEPTH OF USERHOLE SCREW INSERTION IS 2.5mm MAX

REVISION

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		
SCALE	1/1		Y.J.LEE	H.S.CHUN	D.C.YANG	MODEL NAME	LTN141XB-L04
TOLERANCE LEVEL	3		04.10.21	04.10.21	04.10.21	PART/SHEET NAME	OUTLINE DIMENSION SHEET 1/1
SAMSUNG ELECTRONICS					SPEC. NO	CODE NO.	VER.

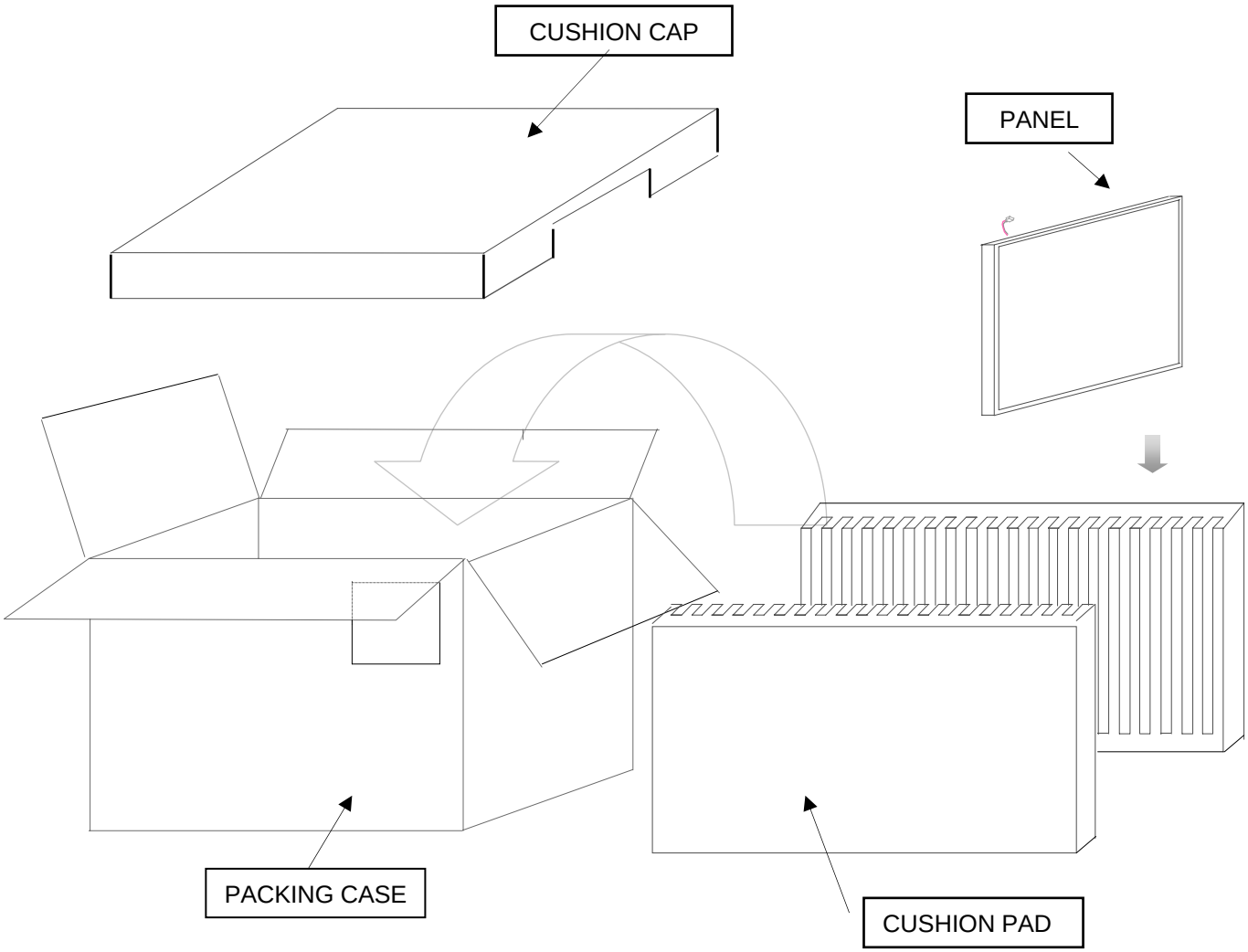
8. PACKING

1. CARTON(Internal Package)

(1) Packing Form

Corrugated Cardboard box and EPS(Expandable Polystyrene) form as shock absorber

(2) Packing Method



Note 1)Total Weight : Approximately 14 kg

2) Acceptance number of panel : 20 sets

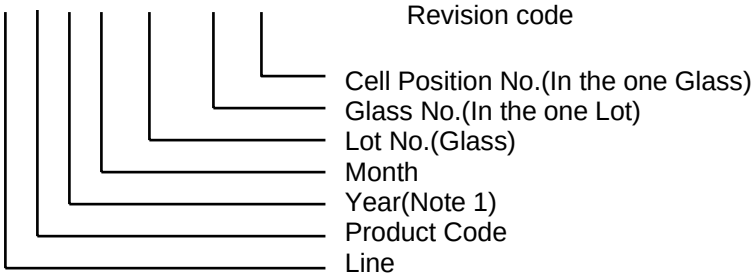
3) Carton size : 504(W)×370(D)×324(H)

No	Part name	Quantity
1	Static electric protective sack	20
2	Packing case (Inner box) included shock absorber	1 set
3	Pictorial marking	2 pcs
4	Carton	1 set

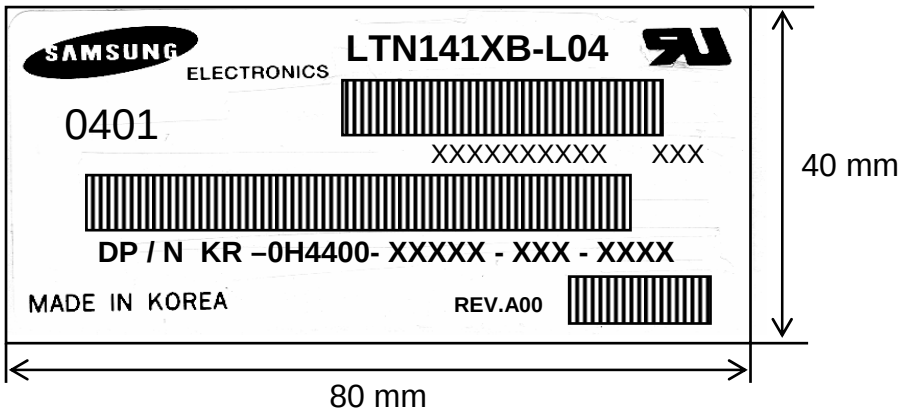
9. MARKINGS & OTHERS

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

(1)Parts number : LTN141XB-L04
(2)Revision : Three letters
(3)Lot number : X X X X XXX XX X XXX

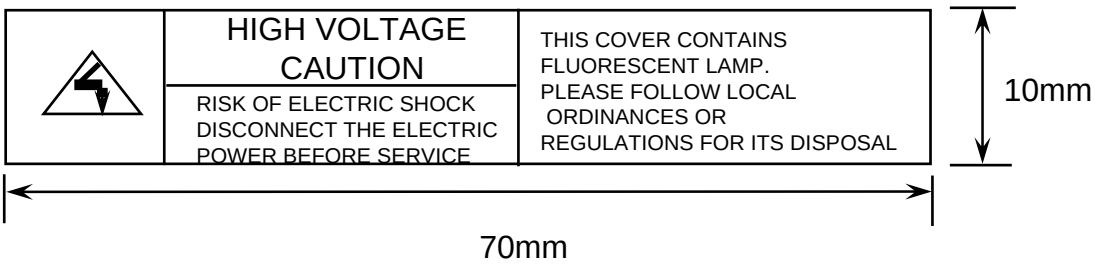


(4) Nameplate Indication

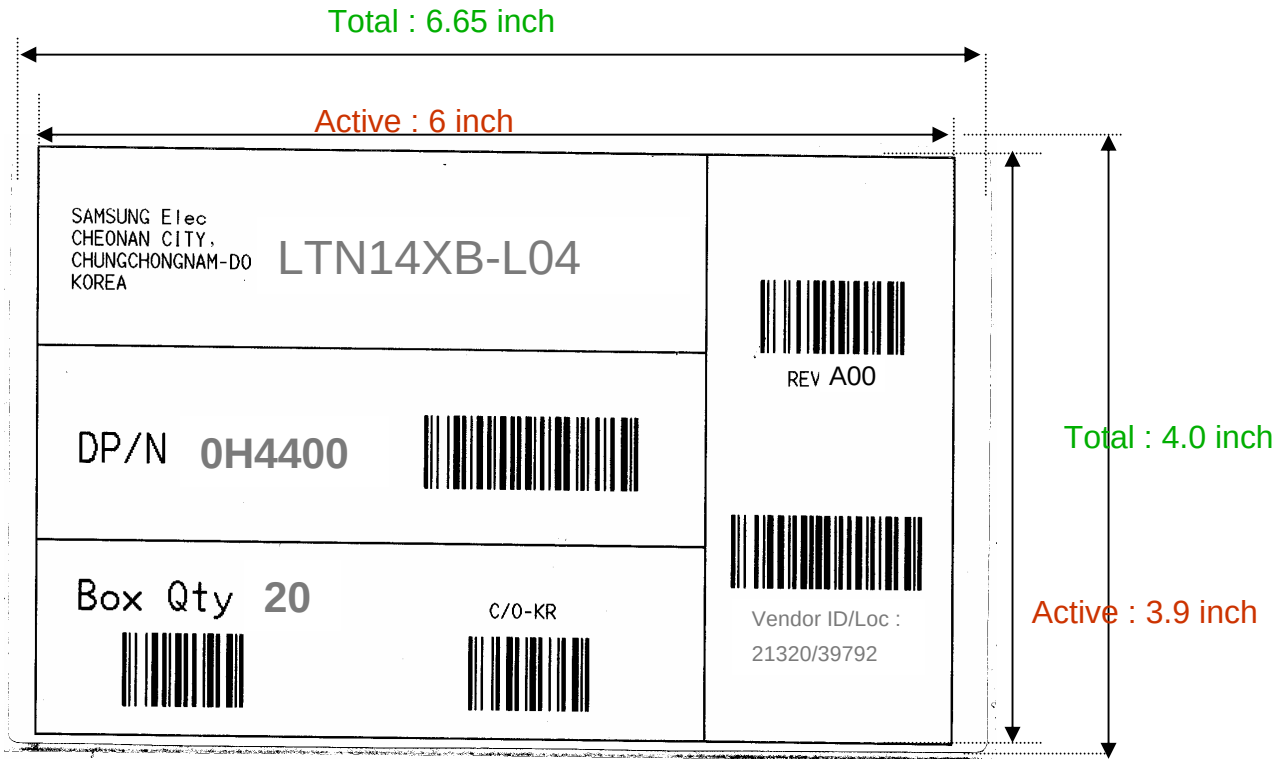


Parts name : LTN141XB - L04
Lot number : XXXXXXXXXX
Inspected work week : 0401
DP/N : Customer Part Number
REV.A00 : Product Revision Code

(5) High voltage caution notice



(6) Packing box attach



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

10. GENERAL PRECAUTIONS

Approval

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 back-light.

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

(e) The standard limited warranty is only applicable when the module is used for general notebook applications. If used for purposes other than as specified, SEC is not to be held reliable for the defective operations. It is strongly recommended to contact SEC to find out fitness for a particular purpose.

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.

11. EDID

	Byte (hex)	Field Name and Comments	Value (hex)	Value (binary)
Header	0	Header	00	00000000
	1	Header	FF	11111111
	2	Header	FF	11111111
	3	Header	FF	11111111
	4	Header	FF	11111111
	5	Header	FF	11111111
	6	Header	FF	11111111
	7	Header	00	00000000
Vendor / Product EDID Version	8	EISA manufacture code = 3 Character ID	4C	01001100
	9	EISA manufacture code (Compressed ASCII)	A3	10100011
	0A	Panel Supplier Reserved – Product Code	58	01011000
	0B	Panel Supplier Reserved – Product Code	42	01000010
	0C	LCD module Serial No - Preferred but Optional (“0” if not used)	00	00000000
	0D	LCD module Serial No - Preferred but Optional (“0” if not used)	00	00000000
	0E	LCD module Serial No - Preferred but Optional (“0” if not used)	00	00000000
	0F	LCD module Serial No - Preferred but Optional (“0” if not used)	00	00000000
	10	Week of manufacture	00	00000000
	11	Year of manufacture	0E	00001110
	12	EDID structure version # = 1	01	00000001
	13	EDID revision # = 3	03	00000011
Display Parameters	14	Video I/P definition = Digital I/P (80h)	80	10000000
	15	Max H image size = (Rounded to cm)	1D	00011101
	16	Max V image size = (Rounded to cm)	15	00010101
	17	Display gamma = (gamma ×100)-100 = Example: (2.2× 100) – 100 = 120	78	01111000
	18	Feature support (no DPMS, Active off, RGB, timing BLK 1)	0A	00001010
Panel Color Coordinates	19	Red/Green Low bit (RxRy/GxGy)	87	10000111
	1A	Blue/White Low bit (BxBy/WxWy)	F5	11110101
	1B	Red X Rx = 0.xxx	94	10010100
	1C	Red Y Ry = 0.xxx	57	01010111
	1D	Green X Gx = 0.xxx	4F	01001111
	1E	Green Y Gy = 0.xxx	8C	10001100
	1F	Blue X Bx = 0.xxx	27	00100111
	20	Blue Y By = 0.xxx	27	00100111
	21	White X Wx = 0.xxx	50	01010000
	22	White Y Wy = 0.xxx	54	01010100
Established Timings	23	Established timings 1 (00h if not used)	00	00000000
	24	Established timings 2 (00h if not used)	00	00000000
	25	Manufacturer’s timings (00h if not used)	00	00000000
Standard Timing ID	26	Standard timing ID1 (01h if not used)	01	00000001
	27	Standard timing ID1 (01h if not used)	01	00000001
	28	Standard timing ID2 (01h if not used)	01	00000001
	29	Standard timing ID2 (01h if not used)	01	00000001
	2A	Standard timing ID3 (01h if not used)	01	00000001
	2B	Standard timing ID3 (01h if not used)	01	00000001
	2C	Standard timing ID4 (01h if not used)	01	00000001
	2D	Standard timing ID4 (01h if not used)	01	00000001
	2E	Standard timing ID5 (01h if not used)	01	00000001
	2F	Standard timing ID5 (01h if not used)	01	00000001
	30	Standard timing ID6 (01h if not used)	01	00000001
	31	Standard timing ID6 (01h if not used)	01	00000001
	32	Standard timing ID7 (01h if not used)	01	00000001
	33	Standard timing ID7 (01h if not used)	01	00000001
	34	Standard timing ID8 (01h if not used)	01	00000001
	35	Standard timing ID8 (01h if not used)	01	00000001

Timing Descripter #1	36	Pixel Clock/10,000 (LSB)	64	01100100
	37	Pixel Clock/10,000 (MSB)	19	00011001
	38	Horizontal Active = xxxx pixels (lower 8 bits)	00	00000000
	39	Horizontal Blanking (Thbp) = xxxx pixels (lower 8 bits)	40	01000000
	3A	Horizontal Active/Horizontal blanking (Thbp) (upper4:4 bits)	41	01000001
	3B	Vertical Active = xxxx lines	00	00000000
	3C	Vertical Blanking (Tvbp) = xxxx lines (DE Blanking typ. for DE only panels)	26	00100110
	3D	Vertical Active : Vertical Blanking (Tvbp) (upper4:4 bits)	30	00110000
	3E	Horizontal Sync, Offset (Thfp) = xxxx pixels	18	00011000
	3F	Horizontal Sync, Pulse Width = xxxx pixels	88	10001000
	40	Vertical Sync, Offset (Tvfp) = xx lines Sync Width = xx lines	36	00110110
	41	Horizontal Vertical Sync Offset/Width upper 2 bits	00	00000000
	42	Horizontal Image Size =xxx mm	1E	00011110
	43	Vertical image Size = xxx mm	D6	11010110
	44	Horizontal Image Size / Vertical image size	10	00010000
	45	Horizontal Border = 0 (Zero for Notebook LCD)	00	00000000
	46	Vertical Border = 0 (Zero for Notebook LCD)	00	00000000
	47	Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives, **DE only note: LSB is set to "1" if panel is DE-timing only. H/V can be ignored.**	19	00011001
Timing Descripter #2	48	Pixel Clock/10,000 (LSB)	28	00101000
	49	Pixel Clock/10,000 (MSB)	15	00010101
	4A	Horizontal Active = xxxx pixels (lower 8 bits)	00	00000000
	4B	Horizontal Blanking (Thbp) = xxxx pixels (lower 8 bits)	40	01000000
	4C	Horizontal Active/Horizontal blanking (Thbp) (upper4:4 bits)	41	01000001
	4D	Vertical Active = xxxx lines	00	00000000
	4E	Vertical Blanking (Tvbp) = xxxx lines (DE Blanking typ. for DE only panels)	26	00100110
	4F	Vertical Active : Vertical Blanking (Tvbp) (upper4:4 bits)	30	00110000
	50	Horizontal Sync, Offset (Thfp) = xxxx pixels	18	00011000
	51	Horizontal Sync, Pulse Width = xxxx pixels	88	10001000
	52	Vertical Sync, Offset (Tvfp) = xx lines Sync Width = xx lines	36	00110110
	53	Horizontal Vertical Sync Offset/Width upper 2 bits	00	00000000
	54	Horizontal Image Size =xxx mm	1E	00011110
	55	Vertical image Size = xxx mm	D6	11010110
	56	Horizontal Image Size / Vertical image size	10	00010000
	57	Horizontal Border = 0 (Zero for Notebook LCD)	00	00000000
	58	Vertical Border = 0 (Zero for Notebook LCD)	00	00000000
	59	Module "A" Revision = Example: 00, 01, 02, 03, etc.	19	00011001
Timing Descripter #3 Dell specific information	5A	Flag	00	00000000
	5B	Flag	00	00000000
	5C	Flag	00	00000000
	5D	Dummy Descriptor	FE	11111110
	5E	Flag	00	00000000
	5F	Dell P/N 1st Character	48	01001000
	60	Dell P/N 2nd Character	34	00110100
	61	Dell P/N 3rd Character	34	00110100
	62	Dell P/N 4th Character	30	00110000
	63	Dell P/N 5th Character	30	00110000
	64	LCD Supplier EEDID Revision #	03	00000011
	65	Manufacturer P/N	31	00110001
	66	Manufacturer P/N	34	00110100
	67	Manufacturer P/N	31	00110001
	68	Manufacturer P/N	58	01011000
	69	Manufacturer P/N	42	01000010
	6A	Manufacturer P/N	0A	00001010
	6B	Manufacturer P/N (If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000

Timing Descripter #4	6C	Flag	00	00000000
	6D	Flag	00	00000000
	6E	Flag	00	00000000
	6F	Data Type Tag:	FE	11111110
	70	Flag	00	00000000
	71	SMBUS Value = XX nits	E8	11101000
	72	SMBUS Value = XX nits	D0	11010000
	73	SMBUS Value = XX nits	C0	11000000
	74	SMBUS Value = XX nits	B8	10111000
	75	SMBUS Value = XX nits	90	10010000
	76	SMBUS Value = XXX nits	60	01100000
	77	SMBUS Value = XXX nits	30	00110000
	78	SMBUS Value = max nits (Typically = 00h, XXX nits)	00	00000000
	79	Number of LVDS receiver chips = '01' or '02'	01	00000001
	7A	BIST Enable: Yes = '01' No = '00'	01	00000001
	7B	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
	7C	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
	7D	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
Checksum	7E	Extension flag (# of optional 128 EDID extension blocks to follow, Typ = 0)	00	00000000
	7F	Checksum (The 1-byte sum of all 128 bytes in this EDID block shall = 0)	A0	10100000