SAMSUNG ELECTRONICS

APPROVAL

TO : DELL/QUANTA

DATE : April 10, 2001

SAMSUNG TFT-LCD

MODEL NO. : LTN141X8-L02

NOTE :

Any Modification of Spec is not allowed without SEC' permission

APPROVED BY : B. W. Lee

PREPARED BY : **Application Engineering Team**

SAMSUNG ELECTRONICS CO., LTD.

wise view™

APPROVAL

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REVISION HISTORY

APPROVAL

Date	Rev.No.	Page	Summary
Jur.27,2000	P00	ALL	LTN141X8-L02 model was First issued.
Dec.13,2000	P01	5	Mechanical Information -Module size tolerance : ±0.5 → ±0.3 -Weight : (550g) → 520g
		7	Update color chromaticity(CIE)
		13	Add Inverter electrical characteristics
		15	Add Inverter block diagram
		19	Add Inverter input pin definition
Aug.28,2000	P02	5	Add measurement condition of outline dimension Add the user hole torque
		7	13 points white variation : 2.0 → 1.75
Sep.B,2000	A00	-	RTS & MP start
Sep.28,2000	A01	-	Change the epoxy material around inverter connector : Threebond → Eccobond
Oct.28,2000	A02	-	Inverter Bracket thickness : 0.3t → 0.2t Gate PCB cover : PET → Al type Multiplication of B/L Unit : Yuka, Wooyoung → Yuka, Wooyoung, Taesan
Nov.28,2000	A03	-	Change the production line : Line 3 → Line 3 & Line 4
Feb.08,2001	A04	-	Multiplication of S/D IC : SEC LDI → SEC LDI, Hitachi Change the V/R : RH02AXC → RH02B1C Multiplication of SEC LDI S/D IC Film : COF → COF, TCP
Mar.15,2001	A05	-	Inverter input connector : Epoxy type → Long term connector (4 through hole type)
Apr.06,2001	A06	-	Multiplication of inverter : Ambit → Ambit, Sumida
		20	Add the inverter part name and revision number
		27	Add the PPID label and change revision code

GENERAL DESCRIPTION

DESCRIPTION

LTN141X8-L02 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, a back-light system, inverter, brackets, FPC. The resolution of a 14.1 ″ contains 1024 x 768 pixels and can display up to 262,144colors. 6 o'clock direction is the optimum viewing angle.

FEATURES

- Thin and light weight
- High contrast ratio, high aperture structure
- XGA (1024x768 pixels) resolution
- Low power consumption
- Single CCFL
- DE(Data enable) only mode
- 3.3V LVDS Interface

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	285.696(H) x 214.272(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)	298.2	298.5	298.8	LCD panel only
	Vertical (V)	226.2	226.5	226.8	
	Depth (D)	-	-	6.4	Inverter assembly (1), (2)
Weight		-	500	520	LCD panel only
		-	510	535	Inverter assembly

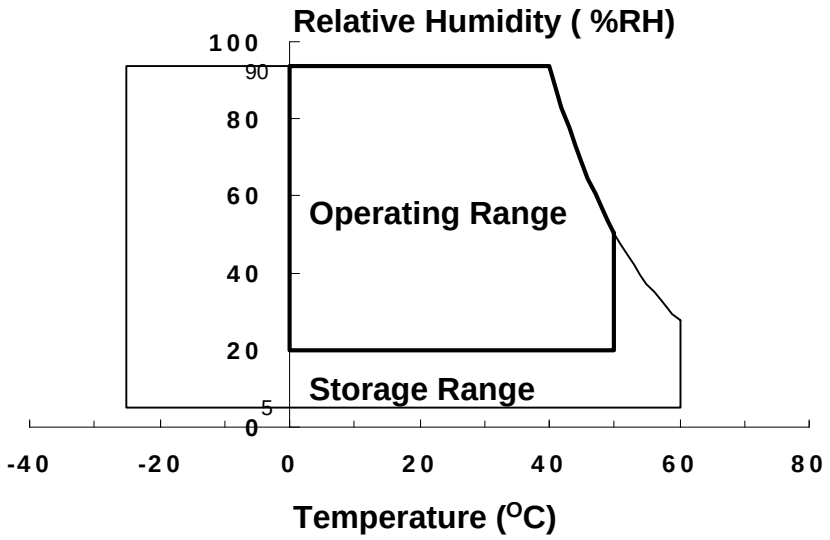
Note (1) Measurement condition of outline dimension
. Equipment : Vernier Calipers
. Push Force : 500g ·f (minimum)
(2) User Hole Torque : 2.8 kg·f·cm, 5 times

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Storage temperature	T_{STG}	-25	60	%°C	(1)
Operating temperature (Temperature of glass surface)	T_{OPR}	0	50	%°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°C ≥ Ta)
Maximum wet - bulb temperature at 39°C or less. (Ta > 40°C) No condensation.



(2) 220G, 2ms, Half sine wave, one time for ±X, ±Y, ±Z axis
(3) 10 ~ 300 ~ 10 Hz, Sweep rate 10min, 30min for X, Y,Z axis
(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} =3.3, Vss=GND= 0V

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	V_{DD}	Vss -0.3	4.0	V	(1)
Logic Input Voltage	V_{IN}	Vss -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	3.0	6.5	mA_{rms}	(1)
Lamp frequency	F_L	30	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.

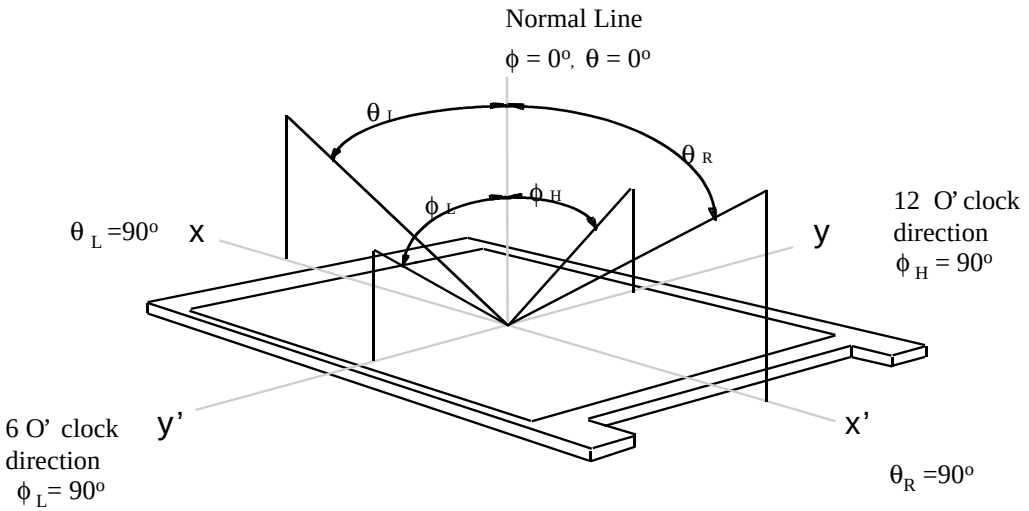
2. OPTICAL CHARACTERISTICS

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

* 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	ϕ = 0, θ = 0 Normal Viewing Angle	150	-	-		(1), (2), (5)
Response Time at Ta	Rising	T_R		-	10	50	msec	(1), (3)
	Falling	T_F		-	30	50		
Average Luminance of White (5 Points)		$Y_{L,AVE}$		110	140	-	cd/m^2	(1), (4) at 6mA
Color Chromaticity (CIE)	Red	R_X		0.535	0.565	0.595		(1), (5)
		R_Y		0.300	0.330	0.360		
	Green	G_X		0.290	0.320	0.350		
		G_Y		0.480	0.510	0.540		
	Blue	B_X		0.122	0.152	0.182		
		B_Y		0.113	0.143	0.173		
	White	W_X		0.283	0.313	0.343		
		W_Y		0.299	0.329	0.359		
Viewing Angle	Hor.	θ_L	CR(at center point) ≥ 10	40	45	-	Degrees	
		θ_R		40	45	-		
	Ver.	ϕ_H		15	20	-		
		ϕ_L		35	40	-		
13 Points White Variation		δ_L		-	-	1.75		(6)

Note 1) Definition of Viewing Angle :

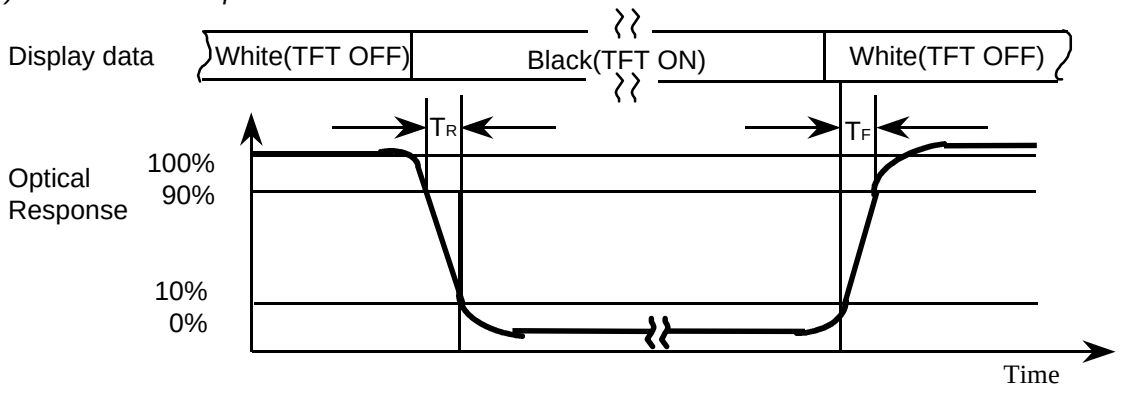


Note 2) Definition of Contrast Ratio (CR) :

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

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

Note 3) Definition of Response time :



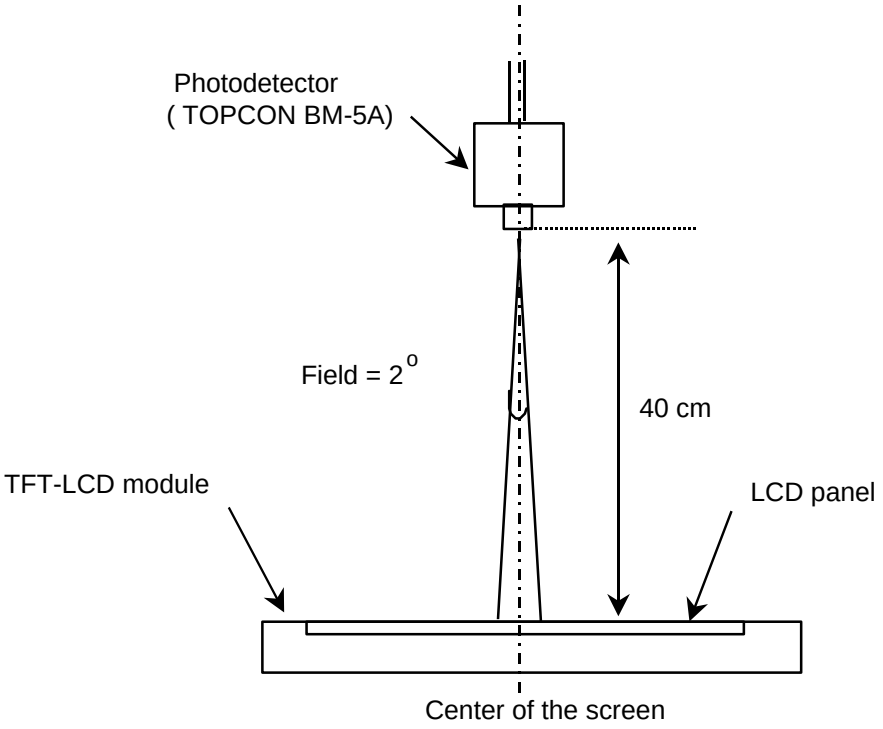
Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.

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

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

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

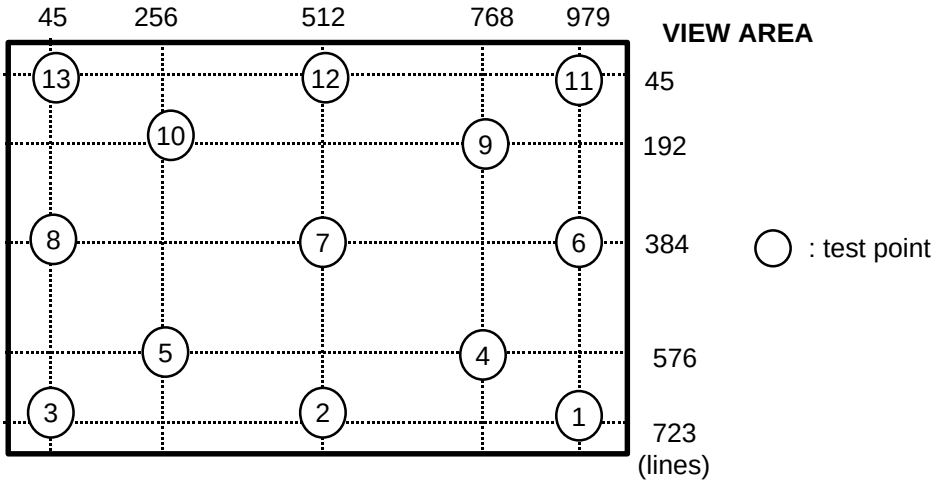
Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 minutes, the measurement should be executed. Measurement should be executed in a stable, windless,and dark room.
30 minutes after lighting the back-light. This should be measured in the center of screen.
Lamp current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



Optical characteristics measurement setup

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

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



3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2%°C

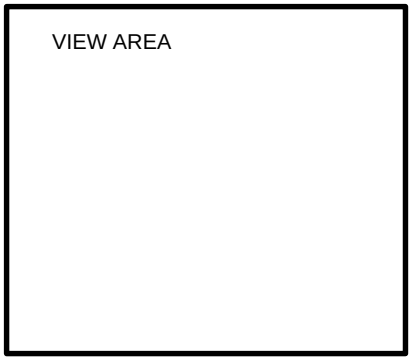
ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Voltage of Power Supply		V_{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	(1)
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		fv	-	60	-	Hz	
Hsync Frequency		f_H	-	48.3	-	KHz	
Main Frequency		f_{DCLK}	-	65	-	MHz	
Rush Current		I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	I_{DD}	-	250	-	mA	(2),(3)*a
	Mosaic		-	300	-	mA	(2),(3)*b
	Maximum current		-	400	500	mA	(2),(3)*c

Note (1) Condition : V_{CM}=+1.2V(Common mode Voltage)

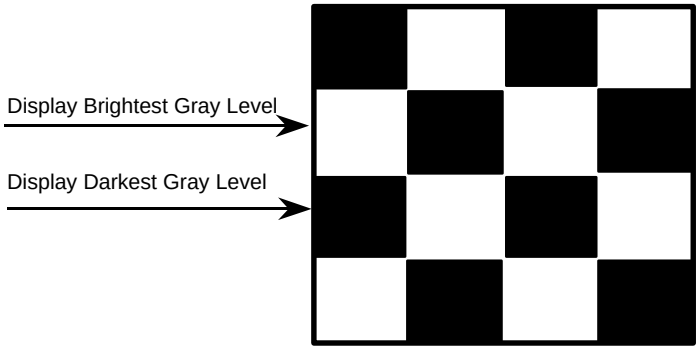
(2) f_V=60Hz, f_{DCLK} =65MHZ, Vdd = 3.3V , DC Current.

(3) Power dissipation check pattern

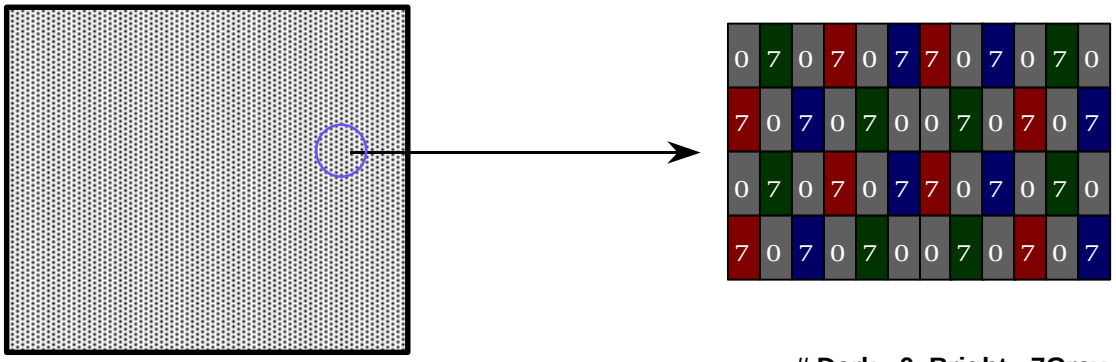
*a) White Pattern



*b)Mosaic Pattern

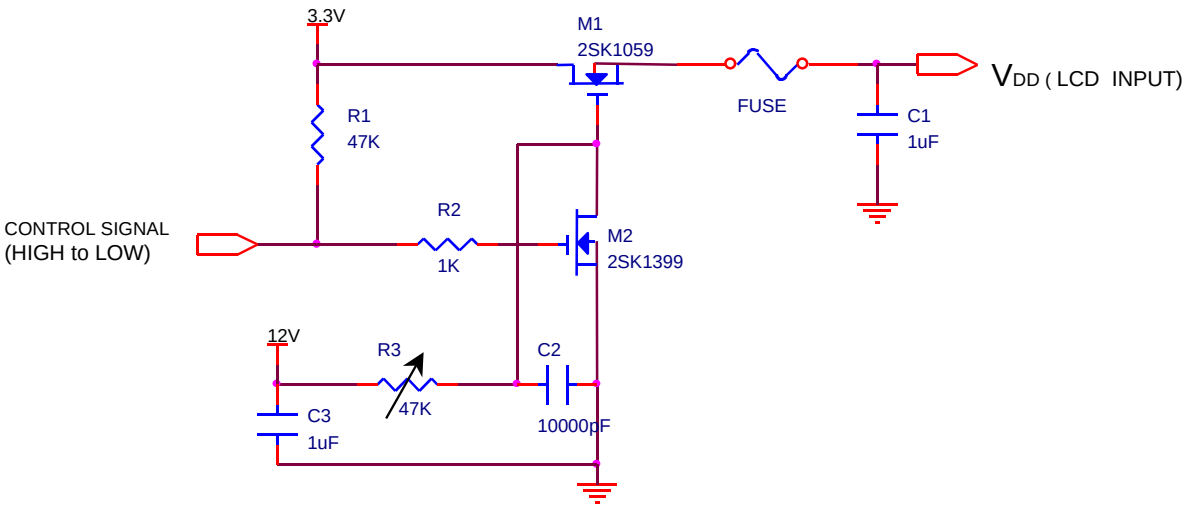


*c) Maximum current pattern (0,7gray dot inversion)

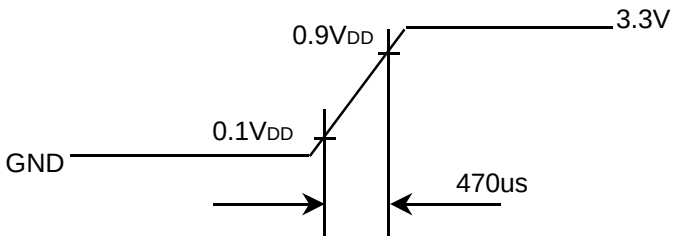


 # Dark : 0, Bright : 7Gray

(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 tables.

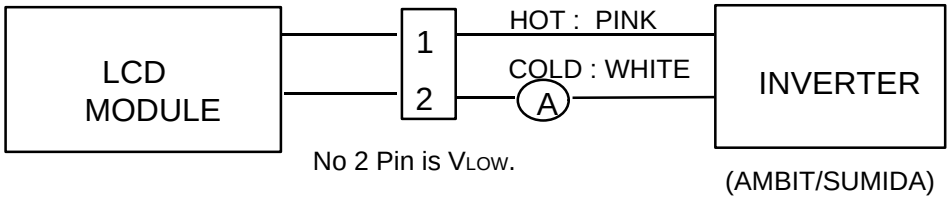
INVERTER : AMBIT/SUMIDA

Ta = 25 ± 2°C

ITEM	SYMB	MIN	TYP	MAX	UNIT	NOTE
Lamp Current	I_L	3.0	5.0	6.0	mA_{rms}	(1)
Lamp Voltage	V_L	-	660	-	V_{rms}	I_L=5.0mA
Frequency	f_L	50	-	65	KHz	(2)
Power Consumption	P_L	-	3.3	-	W	(3) I_L=6.0mA
Operating Life Time	Hr	10,000	-	-	Hour	(4)
Startup Voltage	V_S	-	-	1100	V_{rms}	25°C
		-	-	1200	V_{rms}	0°C
Lamp Startup Time	V_S	-	-	1	sec	(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 back-light, 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 back-light 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 X 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 mA_{rms} until one of the following event occurs.
1. When the brightness becomes 50% or lower than it' s original.
2. When the Effective ignition length becomes 80% or lower than it' s 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 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.

3.3 INVERTER

Inverter Manufacturer : AMBIT, SUMIDA

Ta = 25 ± 2°C

ITEM		MIN	TYP	MAX	UNIT	NOTE
Input Voltage(Vin)		9.0	14.4	21.0	mArms	
Open Circuit Voltage		1250	1400	1700	Vrms	IL =6.0 mArms
Lamp Current		2.0 @SMB_DAT FFH	-	6.0 @SMB_DAT 00H	mArms	Vin=14.4V
Efficiency	Optical	-	33.3	-	Nit/W	After 30min turn on at the center of LCD Vin=14.4V @6.0mA
	Electrical	75	85	-	%	
Operating Frequency		50±5	55±5	60±5	kHz	SMB_DAT=00H
Input Voltage Ripple		-	-	0.5	Vpp	Peak to peak value
Input Power Consumption		-	4.5	-	W	(1) Iout=6.0mArms
In-rush current		-	-	1	A	
Shutdown time		0.6	1.0	1.4	sec	
Start-up time		-	-	0.1	sec	(2)

Note

(1) Iin=312mA, Efficiency=85%

(2) Inverter start-up time

(3) Efficiency should be calculated as below formulation.

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

Electrical efficiency = output power / input power

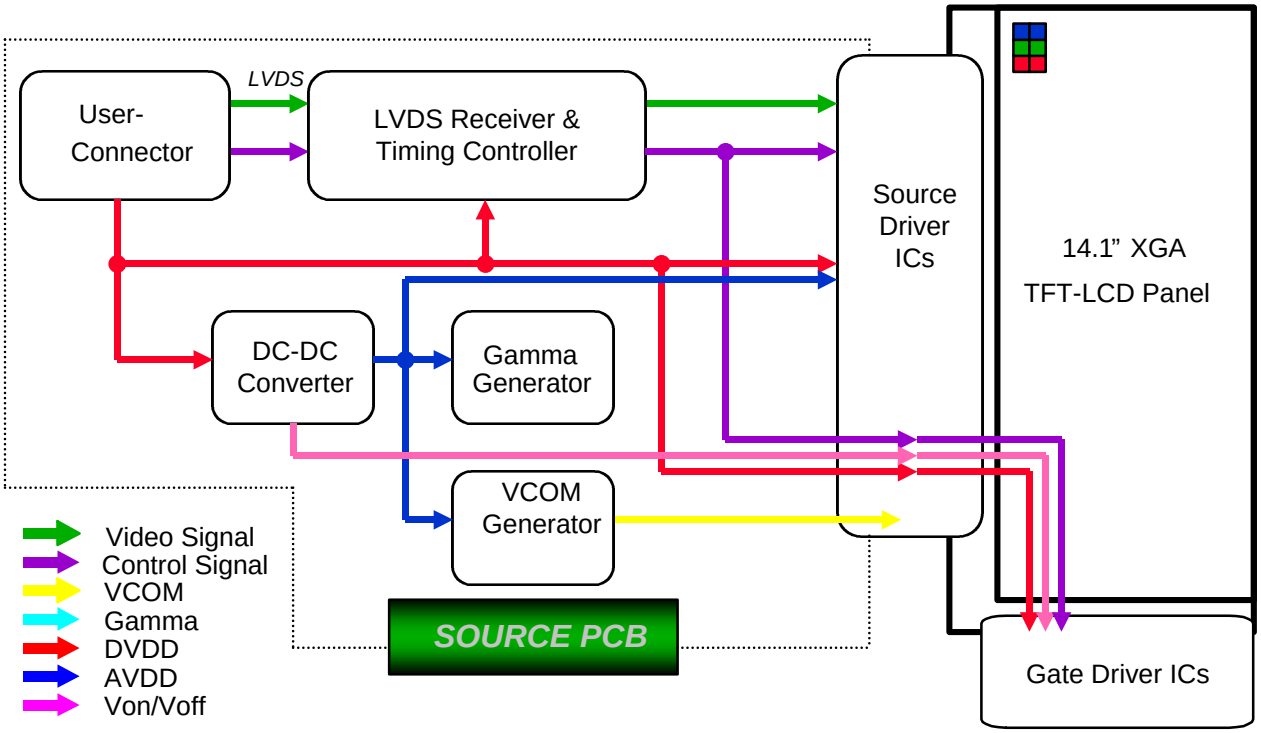
(4) SEC recommends user to set the value of SMB_Data to meet the minimum current(3.0mA) of Lamp.

.Reference value of SMB_Data for 3.0mA of Lamp current : **C0H**

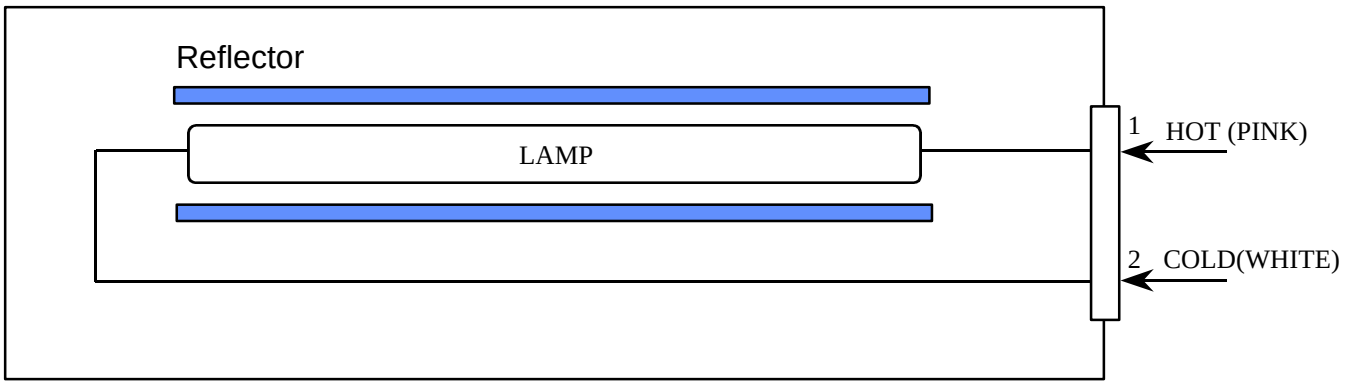
If the lamp current is under the 3.0mA, the lamp flicker may happen.

4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 BACKLIGHT UNIT

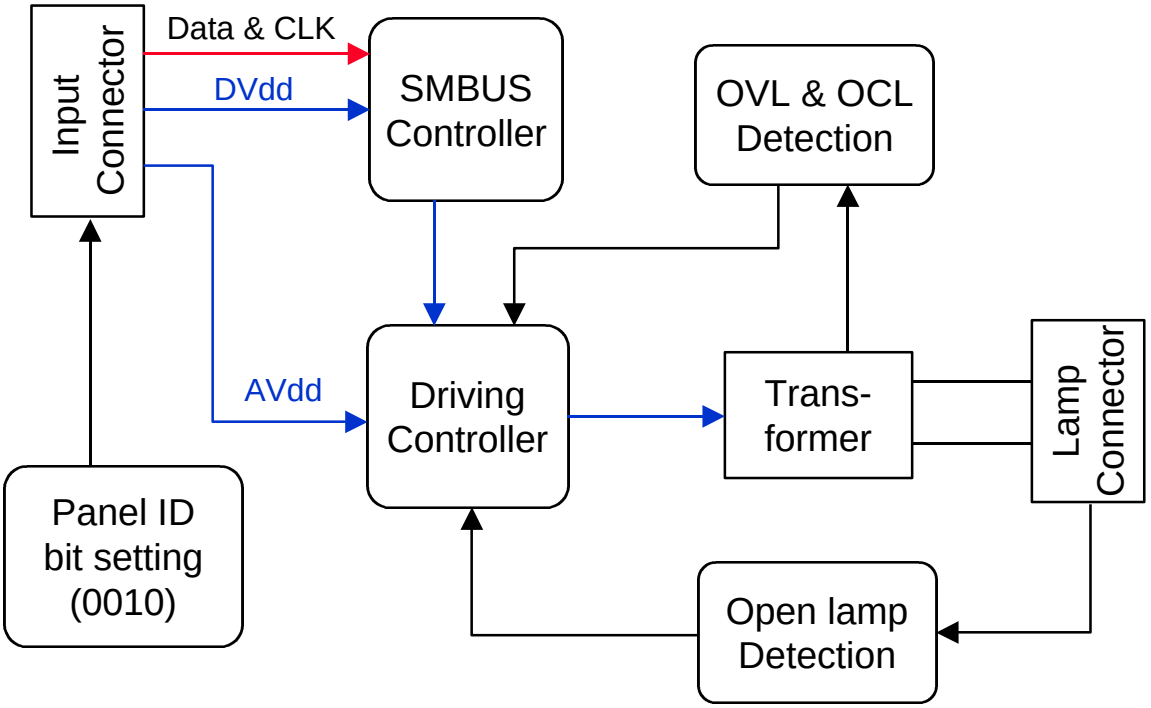


Note) The output of the inverter may change according to the material of the reflector.

4.3 INVERTER

Input Connector : JAE, WR-L16S-VF-1

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



5. INPUT TERMINAL PIN ASSIGNMENT

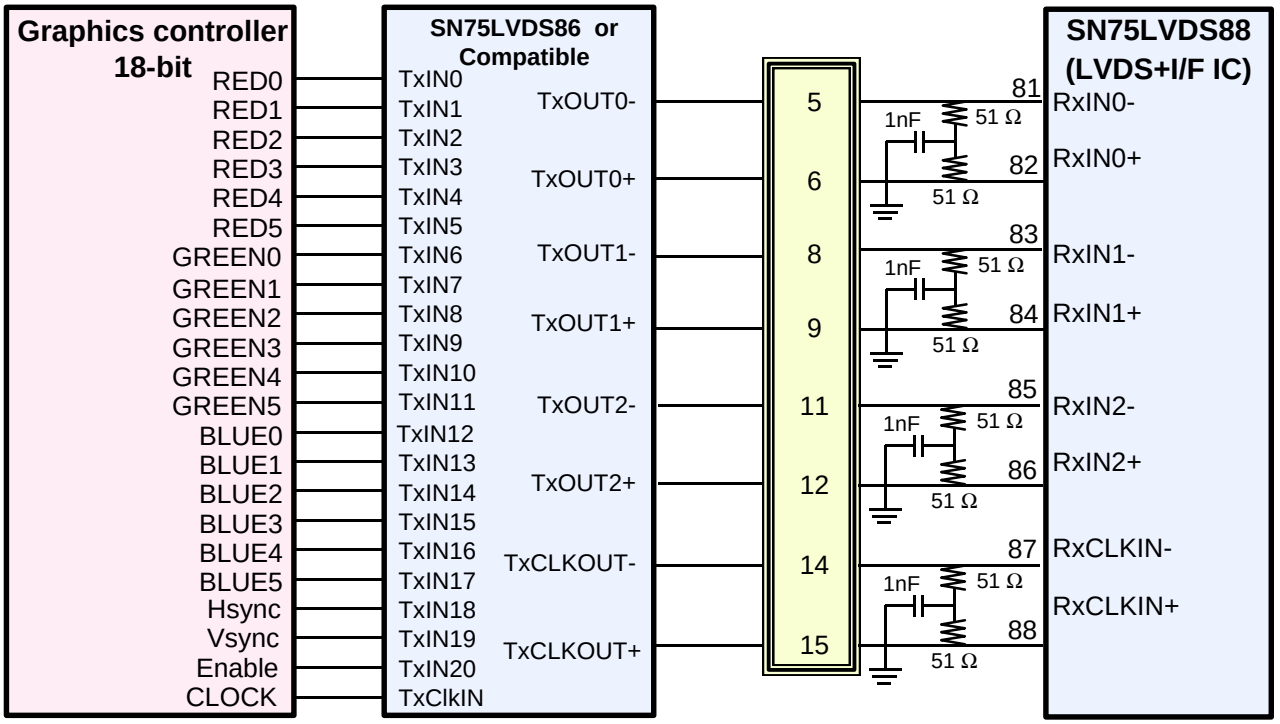
5.1. Input Display Signal & Power (LVDS, Connector : FI-SEB-20P-HF10 or compatible
Mating Connector : JAE FI-SE20M-HF)

PIN NO	SYMBOL	FUNCTION	POLARITY	REMARK
1	VDD	POWER SUPPLY +3.3V		
2	VDD	POWER SUPPLY +3.3V		
3	GND	GROUND		
4	GND	GROUND		
5	RxIN0-	LVDS Differential Data INPUT	Negative	R0~R5 G0
6	RxIN0+	LVDS Differential Data INPUT	Positive	
7	GND	GROUND		
8	RxIN1-	LVDS Differential Data INPUT	Negative	G1~G5 B0~B1
9	RxIN1+	LVDS Differential Data INPUT	Positive	
10	GND	GROUND		
11	RxIN2-	LVDS Differential Data INPUT	Negative	B2~B5,DE Hsync,Vsync
12	RxIN2+	LVDS Differential Data INPUT	Positive	
13	GND	GROUND		
14	RxCLKIN-	LVDS Differential Data INPUT	Negative	
15	RxCLKIN+	LVDS Differential Data INPUT	Positive	
16	GND	GROUND		
17	NC	No Connection		
18	NC	No Connection		
19	GND	GROUND		
20	GND	GROUND		

5.2 LVDS Interface : Transmitter SN75LVDS86 or Compatible

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
44	TxIN0	R0	12	TxIN11	G5
45	TxIN1	R1	13	TxIN12	B0
47	TxIN2	R2	15	TxIN13	B1
48	TxIN3	R3	16	TxIN14	B2
1	TxIN4	R4	18	TxIN15	B3
3	TxIN5	R5	19	TxIN16	B4
4	TxIN6	G0	20	TxIN17	B5
6	TxIN7	G1	22	TxIN18	Hsync
7	TxIN8	G2	23	TxIN19	Vsync
9	TxIN9	G3	25	TxIN20	DE
10	TxIN10	G4	26	TxCLK IN	Clock

LVDS INTERFACE

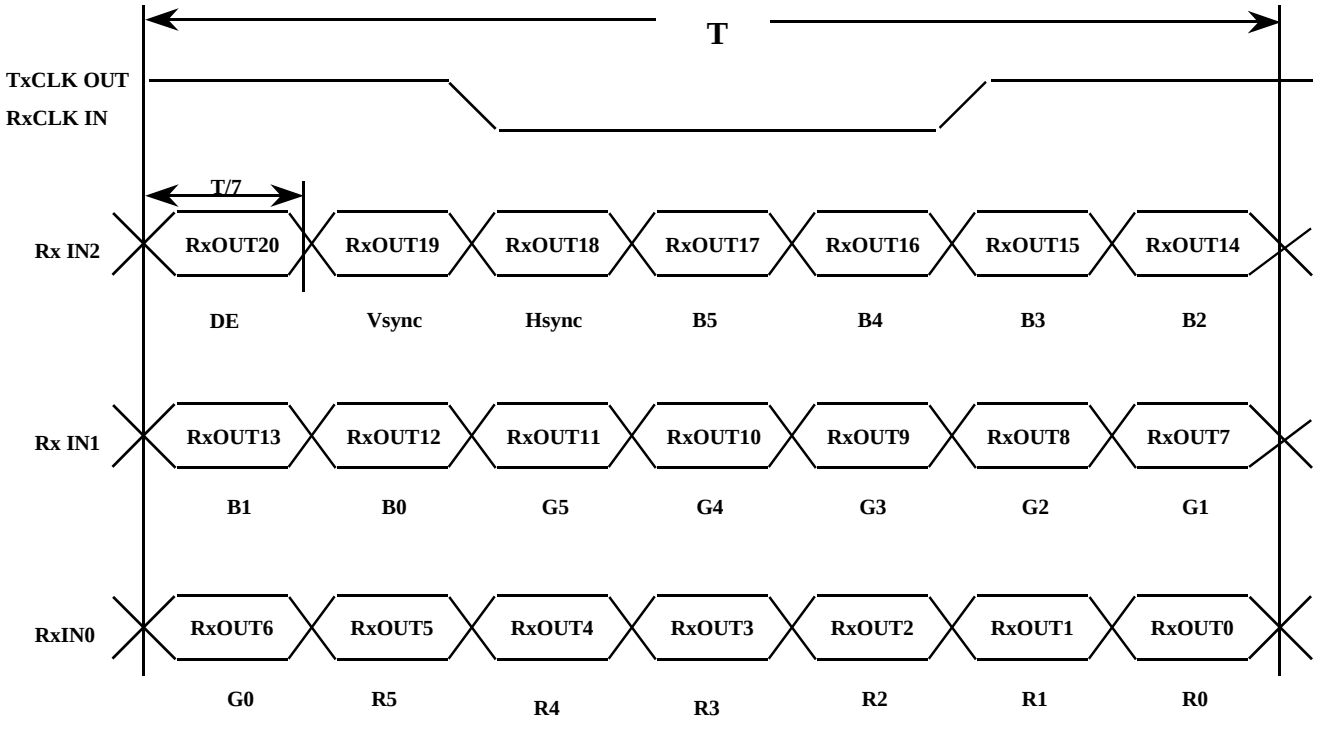


5.3 BACK LIGHT UNIT

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

Pin NO.	Symbol	Color	Function
1	HOT	PINK	High Voltage
2	COLD	WHITE	Low Voltage

5.4 Timing Diagrams of LVDS For Transmission



5.5 INVERTER signals & power

Inverter Connector : JAE, WR-L16S-VF-1

PIN NO	SYMBOL	Voltage	Comments
1	INV_SRC	9.0V to 21V	This power rail should be used as a power rail to drive the back-light DC-AC converter.
2	INV_SRC	9.0V to 21V	This power rail should be used as a power rail to drive the back-light DC-AC converter.
3	GND	0V	Ground
4	INV_SRC	9.0V to 21V	This power rail should be used as a power rail to drive the back-light DC-AC converter.
5	GND	0V	
6	GND	0V	
7	5VSUS	4.85 to 5.2V	This should be used as power source for the control circuitry on the inverter.
8	5VALW	5V	This should be used as power source that stores the brightness/contrast values & the circuit that interfaces with SMB_CLK & SMB_DAT.
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	FPVEE	-	Control signal input into the inverter to turn ON or OFF Lamp. (1 - ON, 0 - OFF)
12	NC	-	
13	PANEL_ID3	-	Output pin, See Note(2)
14	PANEL_ID2	-	Output pin, See Note(2)
15	PANEL_ID1	-	Output pin, See Note(2)
16	PANEL_ID0	-	Output pin, See Note(2)

Note (1) SMBus address Definition

SMBus address definition for brightness & contrast

Inverter SMBus address	A2	A1	A0
Address = 50h	0	0	0

※ Recommend using Dallas Semiconductor DS1803-dual digital potentiometer (or equivalent). Use Wiper‘0’ for contrast control & Wiper‘1’ for brightness (backlight) control.

Note (2) Panel ID bit Definition

Panel type	Product ID	ID3	ID2	ID1	ID0
14.1”XGA single channel LVDS TFT-LCD	LTN141X8-L02	**0**	**0**	**1**	**0**

Note (3) Inverter Part Name

- Ambit : **K02I024.03**
  - * K02I024.00 : Epoxy around the input connector
  - * K02I024.03 : New connector (4 through hole type)
- Sumida : **PWB-IV11155T/B13**

Note (4) Inverter revision number

- Ambit : **REV:9**
- Sumida : **REV:10**

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

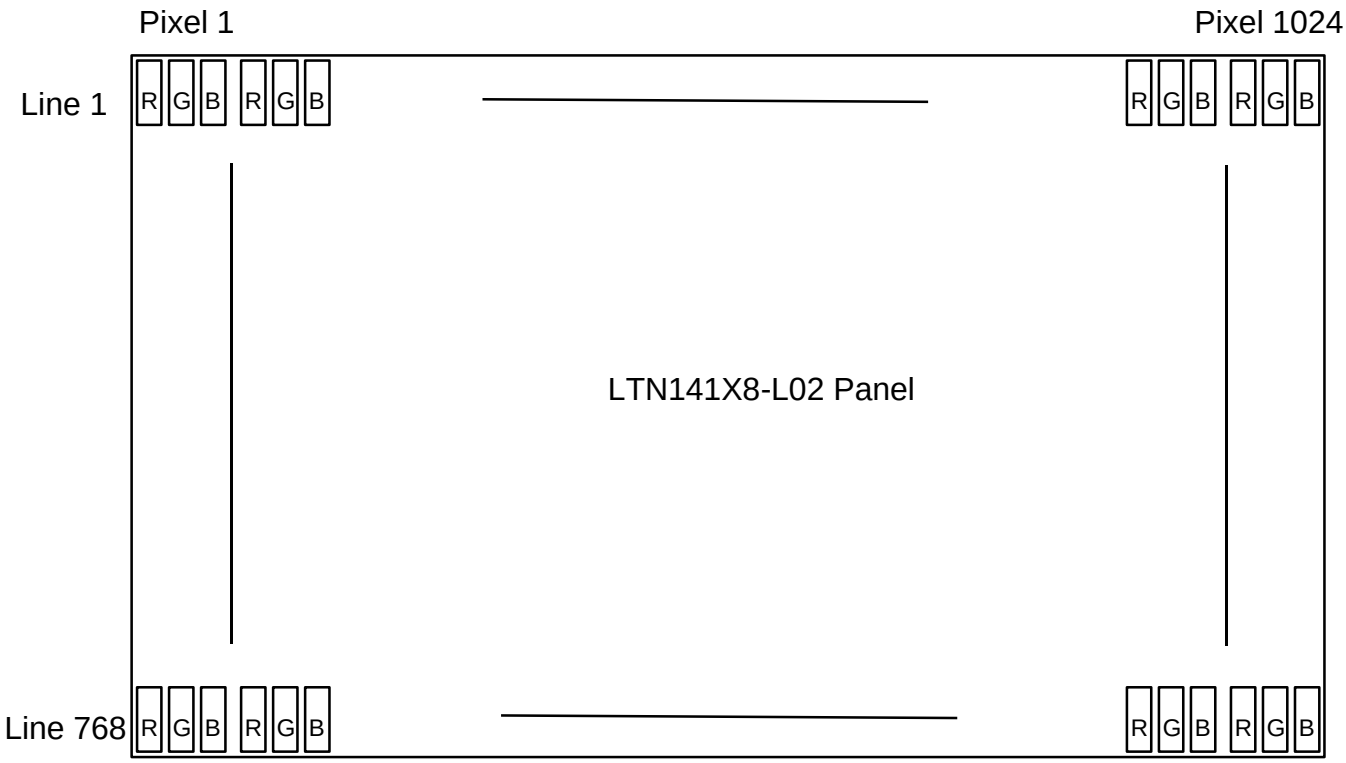
COLOR	DISPLAY	DATA SIGNAL																		GRAY SCALE LEVEL
		RED						GREEN						BLUE						
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	CYAN	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
	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)

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

5.7 PIXEL FORMAT

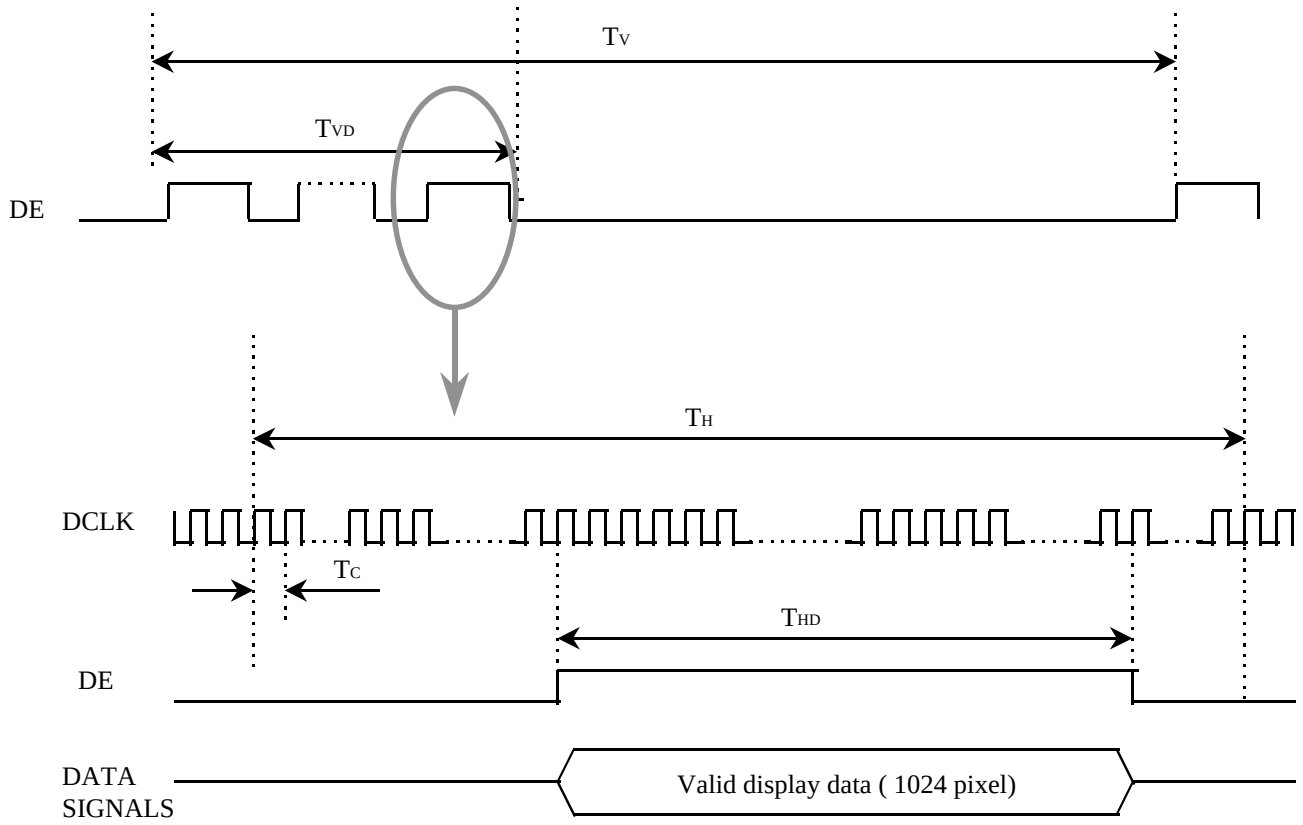


6. INTERFACE TIMING

6.1 Timing Parameters

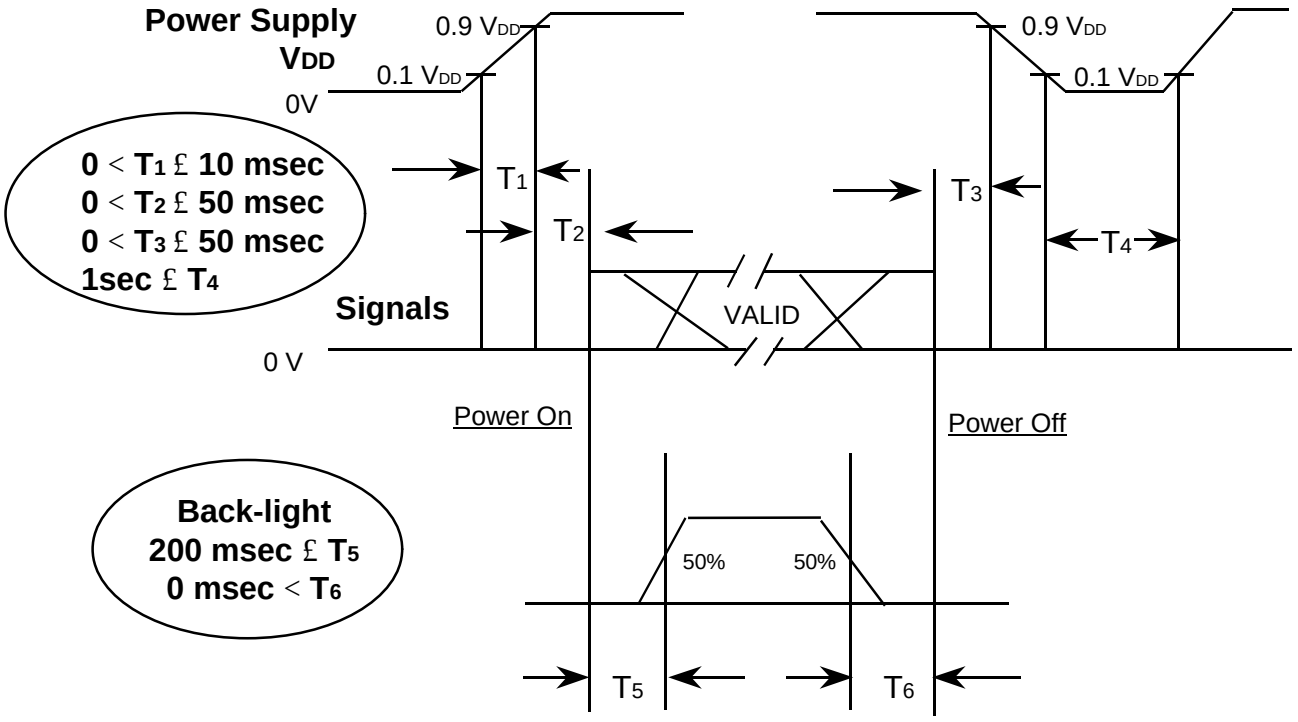
Signal	Item	Symbol	MIN	TYP	MAX	Unit	Note
Frame Frequency	Cycle	T_V		806		lines	
Vertical Active Display Term	Display Period	T_{VD}		768		lines	
One Line Scanning Time	Cycle	T_H		1344		clocks	
Horizontal Active Display Term	Display Period	T_{HD}		1024		clocks	

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.

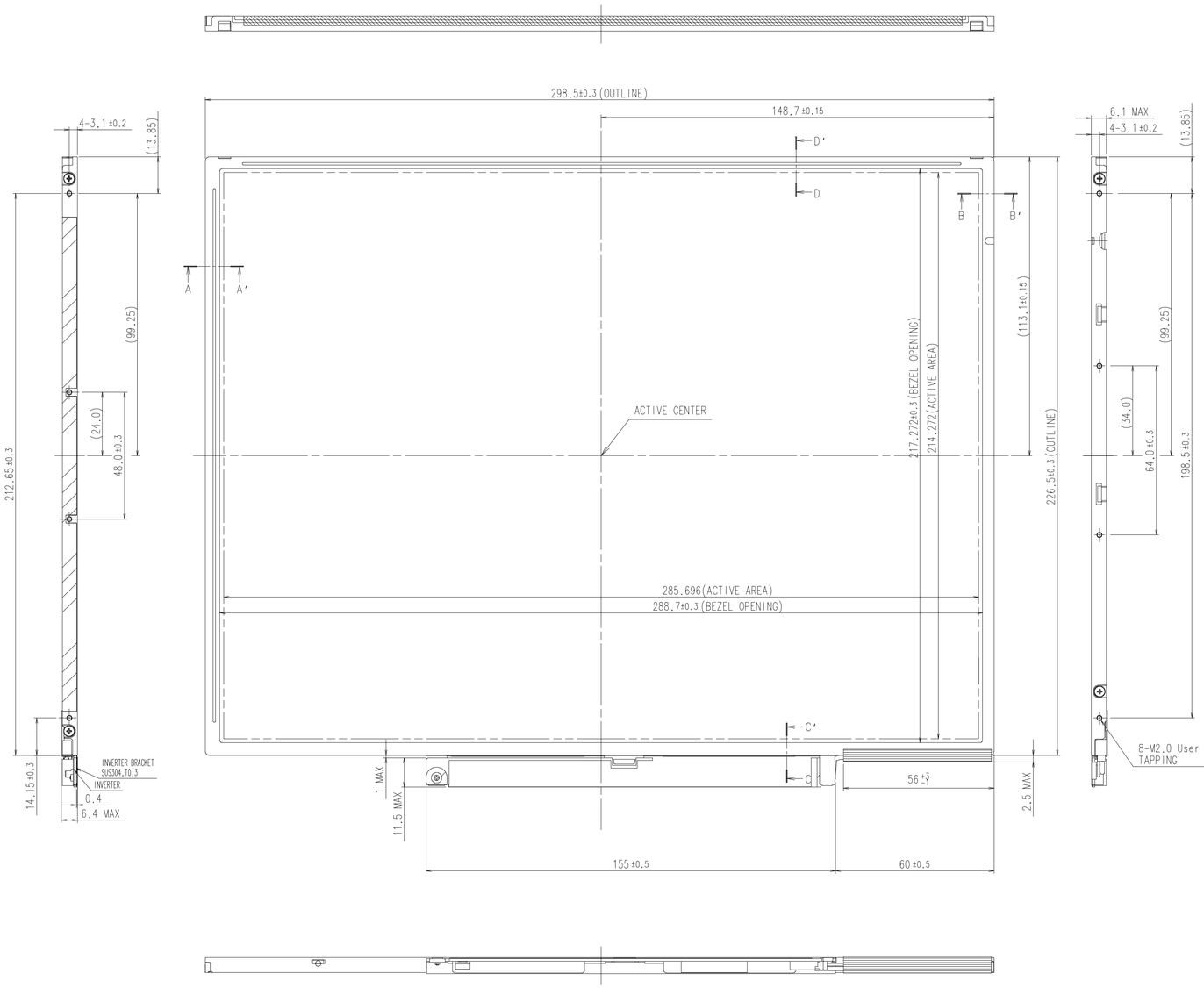
(3) In case of V_{DD} = off level, please keep the level of input signals on the low or keep a high impedance.

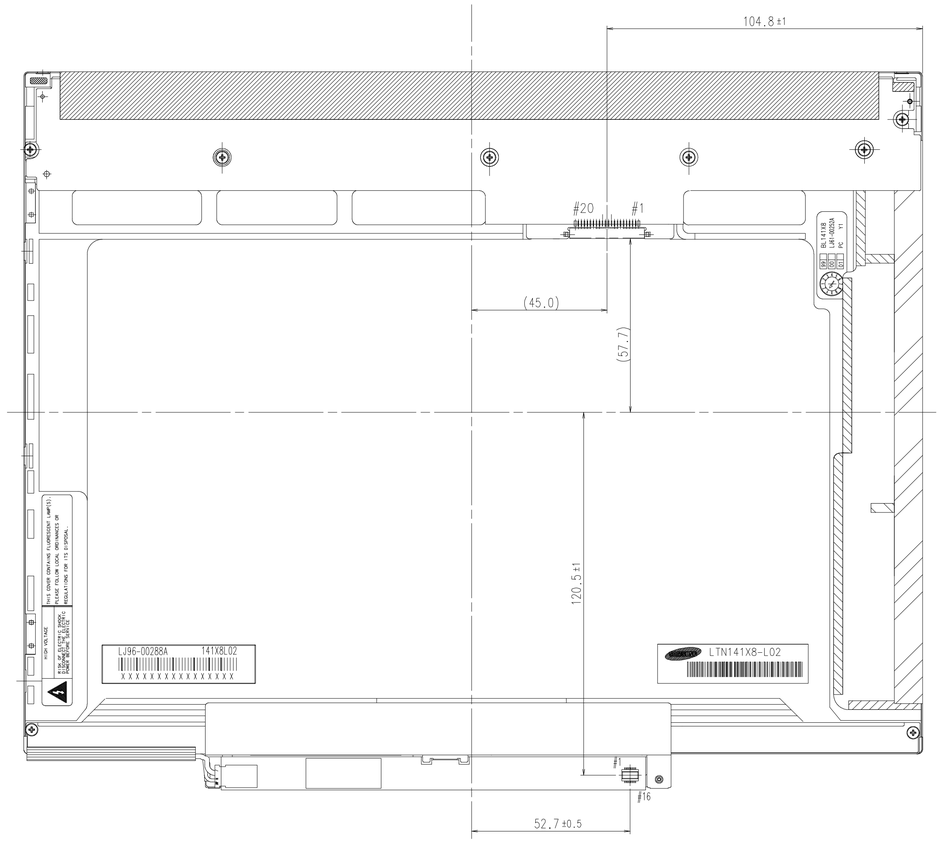
(4) T4 should be measured after the module has been fully discharged between power off and on period.

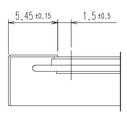
(5) Interface signal shall not be kept at high impedance when the power is on.

FILE NO.

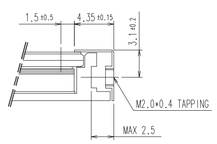
NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	WEIGHT FINISH	WEIGHT MATERIAL	UNFOLDED DIM. OF MATERIAL	REMARK



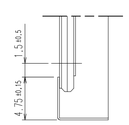




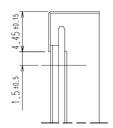
SECTION A-A'(S=3/1)



<Userhole parts>
SECTION B-B'(S:3/1)



SECTION C-C'(S=3/1)



SECTION D-D'(S=3/1)

* NOTE

1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
   - MAKER : UJU
   - PART NO : 1524B-2041R
   - INPUT MATCHING CONNECTOR : JAE F1-SE20M-HF
2. CCFT CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW.
   - MAKER : JST
   - PART NO : BHSR-02VS-1
   - LAMP DIAMETER : ø2.0

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						
TOLERANCE LEVEL	3	J.C.CHOI	S.H.LEE	Y.B.CHU			
		00.6.2	00.6.2	00.6.2			
		SAMSUNG ELECTRONICS			SPEC. NO		

MODEL NAME	LTN141X8-L02		
PART/SHEET NAME	OUTLINE DIMENSION	SHEET	1/1
CODE NO.		VER.	00

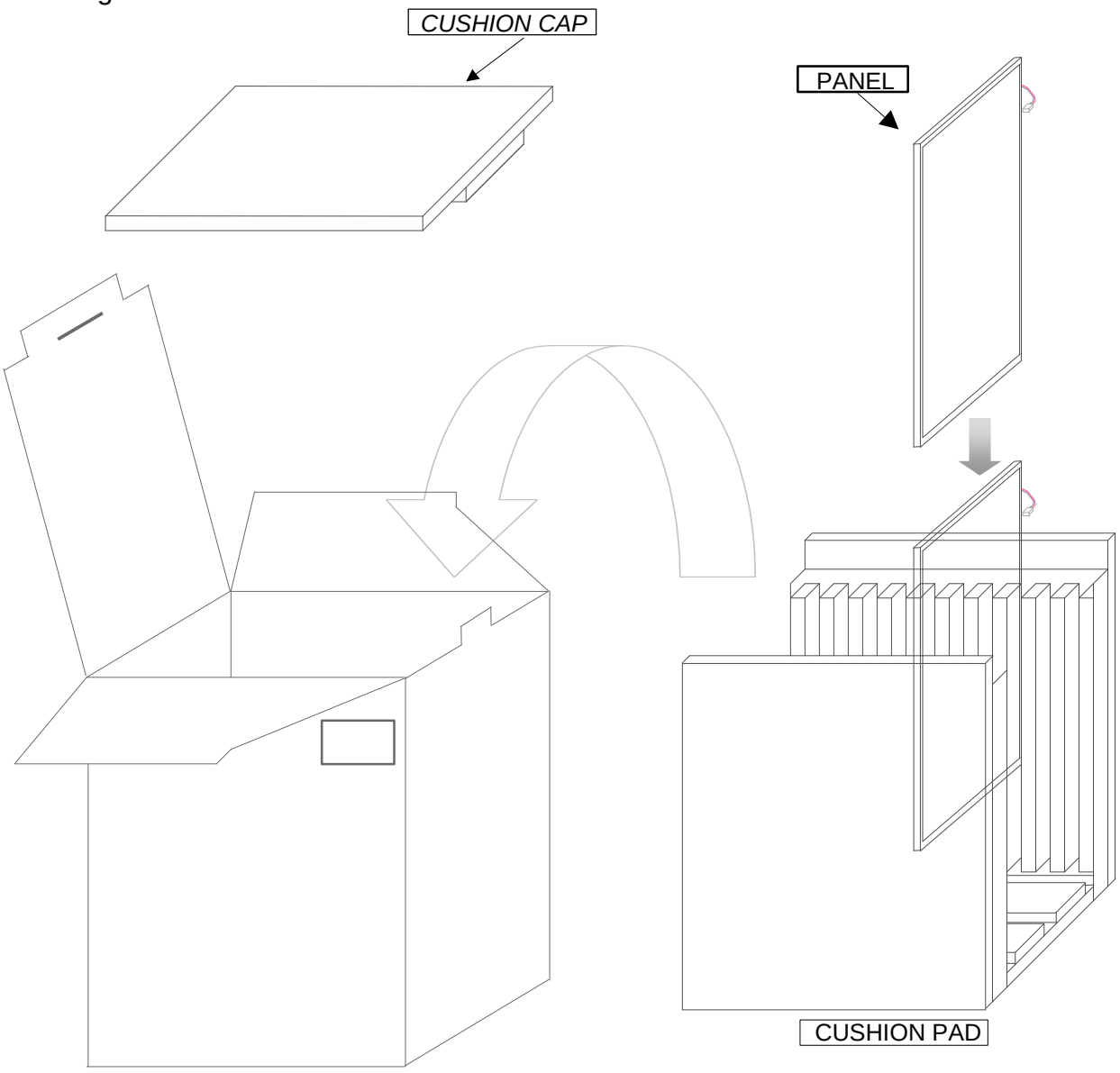
8. PACKING

1. CARTON(Internal Package)

(1) Packing Form

Corrugated Cardboard box and Corrupad form as shock absorber

(2) Packing Method



Note 1)Total Weight : Approximately 6.0 kg

2) Acceptance number of piling : 10 sets

3) Carton size : 317(W)×286(D)×355(H)

4) MAX accumulation quantity : 5 cartons

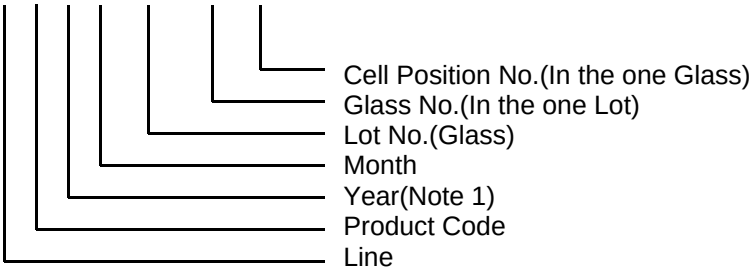
PACKING CASE

No	Part name	Quantity
1	Static electric protective sack	10
2	Packing case(Inner box) included shock absorber	1 set
3	Pictorial marking	2 pics
4	Carton	1 set

9. MARKINGS & OTHERS

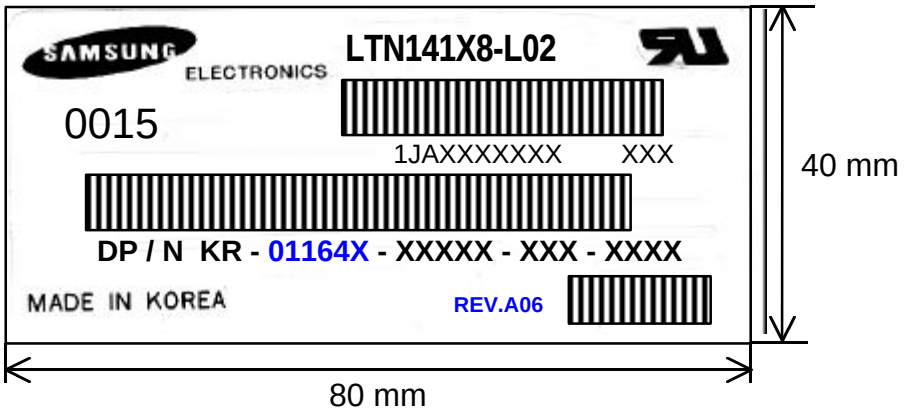
A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1)Parts number : LTN141X8-L02
(2)Revision : One letter
(3)Control code : One letter
(4)Lot number : 3 M O K XXXXXX XXX



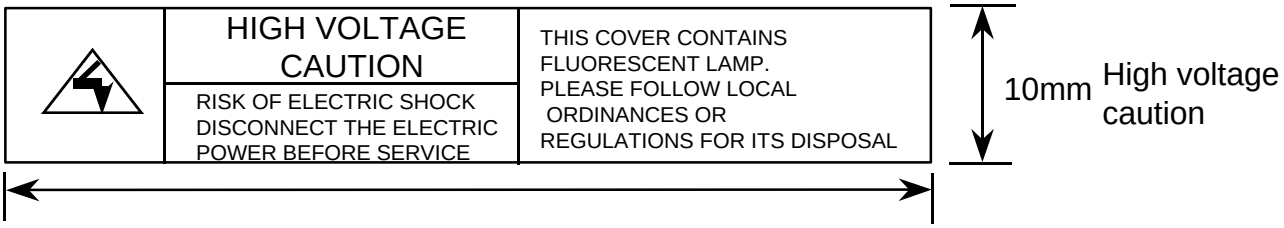
NOTE 1). This code indicating year is omitted in the products of Chun-an site.

(5) Nameplate Indication (Dell PPID Label)

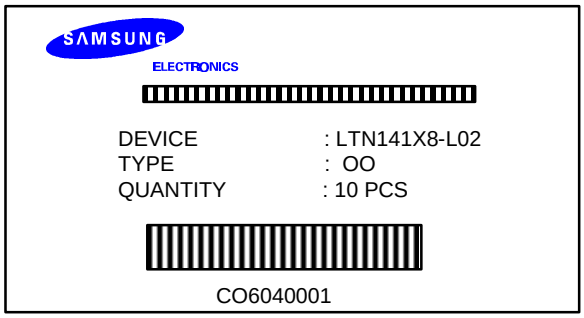


Parts name : LTN141X8 - L02
Lot number : 3MOKXXXXXX XXX
Inspected work week : 0015
DP/N : Dell Part Number ("**01164X**" is for 141X8-L02)
REV.A06 : Product Revision Code

High voltage caution label



(6) Packing box attach



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

10. 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 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).

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.