SAMSUNG ELECTRONICS

Approval

LEAD-FREE

DATE: Feb. 14, 2011.

SAMSUNG TFT-LCD

MODEL NO. : LTN101NT08-W**

NOTE : Extension code [-8]
→ LTN101NT08-W**
Surface type [**Anti Glare**]

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

APPROVED BY :

PREPARED BY : ***H.S. Oh***

Application Engineer part 1, Device Solution (LCD)

SAMSUNG ELECTRONICS CO., LTD.

CONTENTS

REVISION HISTORY

Approval

Date	Revision No.	Page	Summary
Feb.14,2011	A00	All	The approval specification of LTN101NT08-W** was issued first.

GENERAL DESCRIPTION

DESCRIPTION

LTN101NT08-W** is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as switching devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight system. The resolution of a 10.1" contains 1024 x 600 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
- 1024 x 600 pixels resolution
- Fast Response Time
- LED BLU Structure
- DE (Data enable) only mode.
- 3.3V LVDS Interface
- On board EDID chip
- RoHS Compliance
- PB, Halogen 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	222.72(H) X 125.28(V) (10.1”diagonal)	mm	
Driver element	a-si TFT active matrix		
Display colors	262,144		
Number of pixel	1024 x 600	pixel	16 : 9
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.2175(H) x 0.2088(V) (TYP.)	mm	
Display Mode	Normally white		
Glass Thickness	0.5T		
Surface treatment	Haze 25, Hard-Coating 3H		

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	244.5	245	245.5	mm	Outline with Bracket
		234.5	235.0	235.5	mm	Module ~ Module
	Vertical (V)	146.0	146.5	147.0	mm	Module ~ PCB
	Depth (D)	-	-	3.6	mm	(1)
Weight		-	-	175	g	

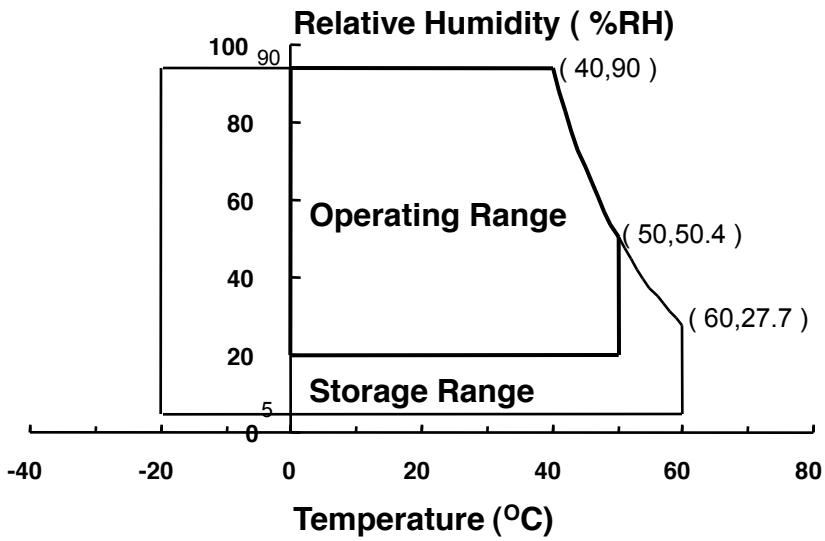
Note (1) Measurement condition of outline dimension
. Equipment : Vernier Calipers
. Push Force : 750g ·f (minimum)

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_{DD}	V_{DD} – 0.3	V_{DD} + 0.3	V	(1)

Note (1) Within Ta (25 ± 2 °C)

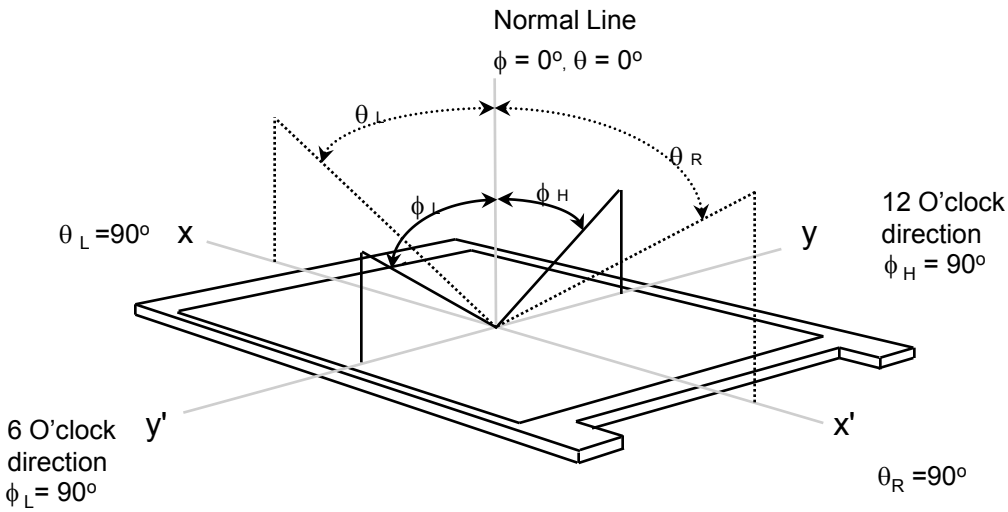
2. OPTICAL CHARACTERISTICS

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} =57.6 MHz, I_L = 25 mA

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)		CR	Normal Viewing Angle $\phi = 0$ $\theta = 0$	300	-	-	-	(1), (2), (5)
Response Time at Ta (Rising + Falling)		T_{RT}		-	16	25	msec	(1), (3)
Average Luminance of White (5 Points)		$Y_{L,AVE}$		170	200	-	cd/m^2	(1), (4)
Color Chromaticity (CIE)	Red	R_X		Typ -0.03	0.576	Typ +0.03	-	(1), (5) PR-650
		R_Y			0.348			
	Green	G_X			0.342			
		G_Y			0.568			
	Blue	B_X			0.164			
		B_Y			0.121			
	White	W_X			0.313			
		W_Y			0.329			
Viewing Angle	Hor.	θ_L	CR ≥ 10	40	-	-	Degrees	(1), (5) BM-5A
		θ_H		40	-	-		
	Ver.	ϕ_H		15	-	-		
		ϕ_L		30	-	-		
Color Gamut		CG		-	45	-	%	
13 Points White Variation		δ_L		-	-	1.7	-	(6)

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

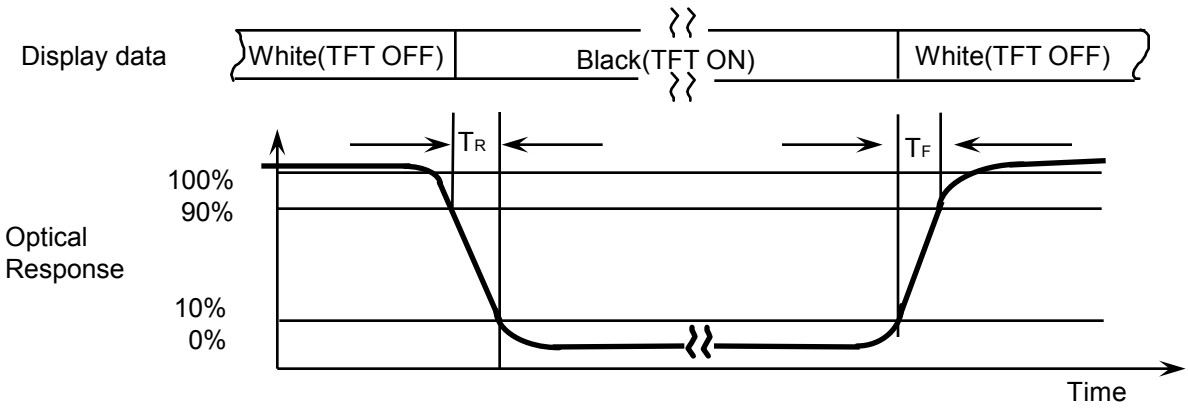


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points(4, 5, 7, 9, 10)

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

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

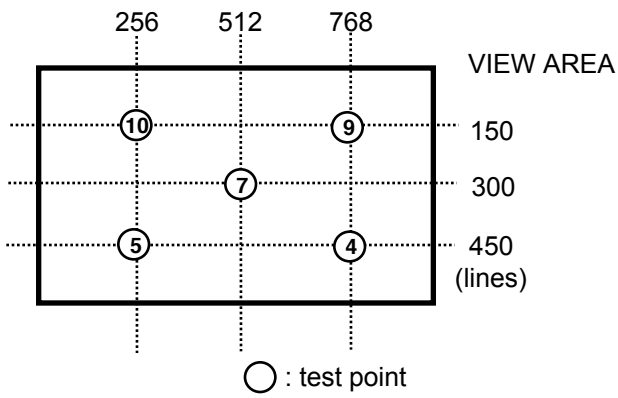
Note 3) Definition of Response time :



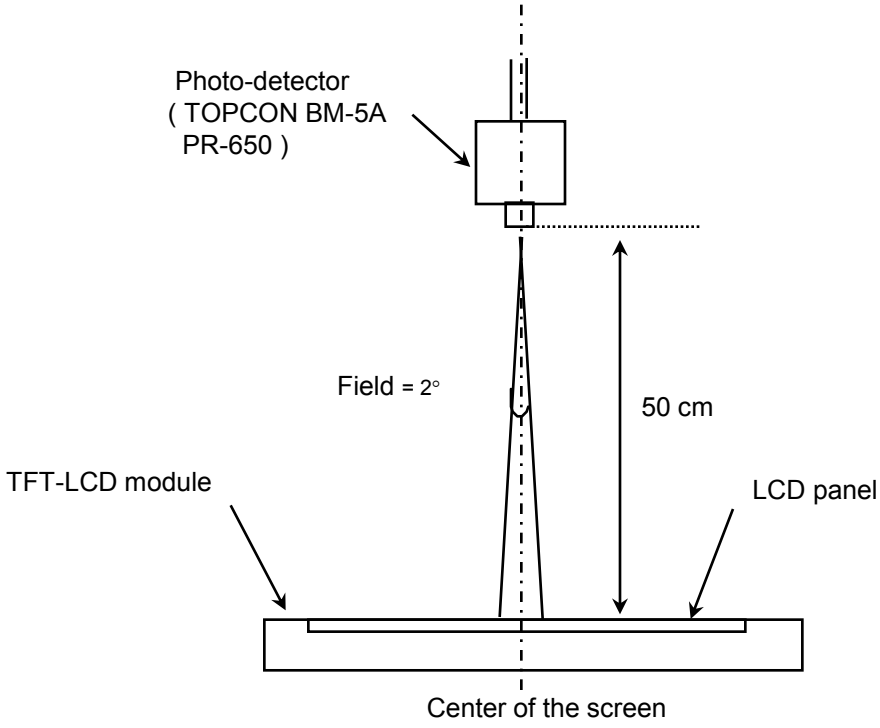
Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.

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

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



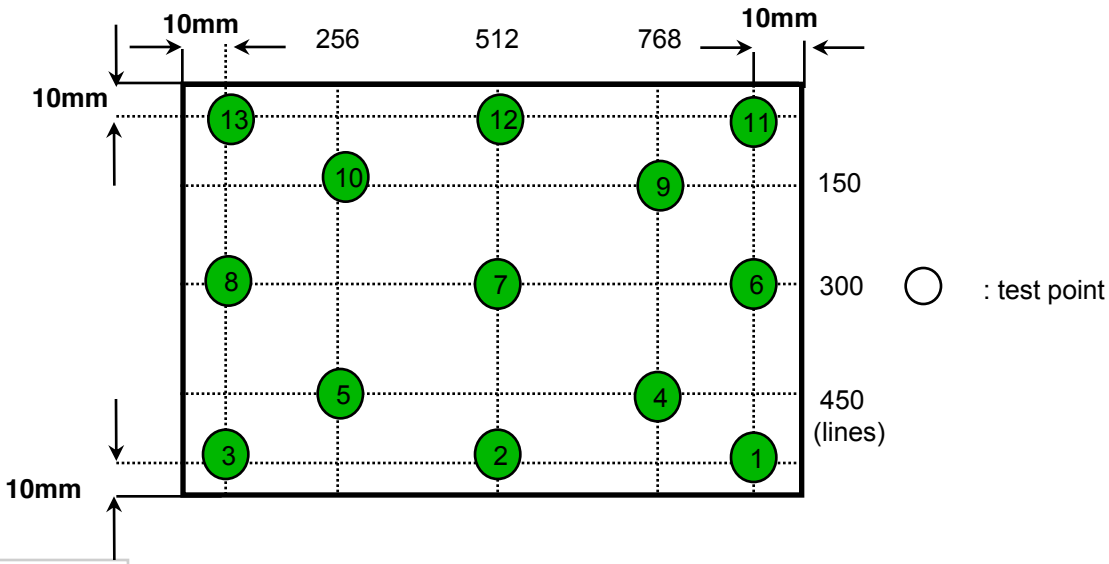
Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless,and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.
LED current : 25 mA (Inverter : SIC-130T)
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

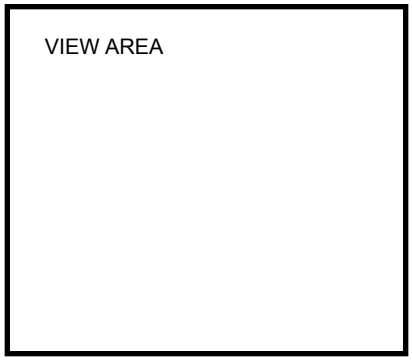
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		fv	-	60	-	Hz	
Main Frequency		f_{DCLK}	-	57.6	-	MHz	
Rush Current		I_{RUSH}	-	-	2	A	(4)
Current of Power Supply	White	I_{DD}	-	175	-	mA	(2),(3)*a
	Mosaic		-	175	-	mA	(2),(3)*b
	V.stripe		-	210	240	mA	(2),(3)*c

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

(2) f_V = 60Hz, f_{DCLK} = 57.6 MHZ, V_{DD} = 3.3V , DC Current.

(3) Power dissipation pattern

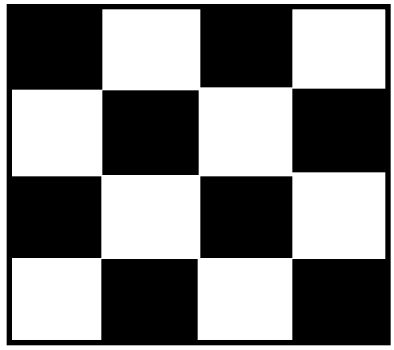
*a) White Pattern



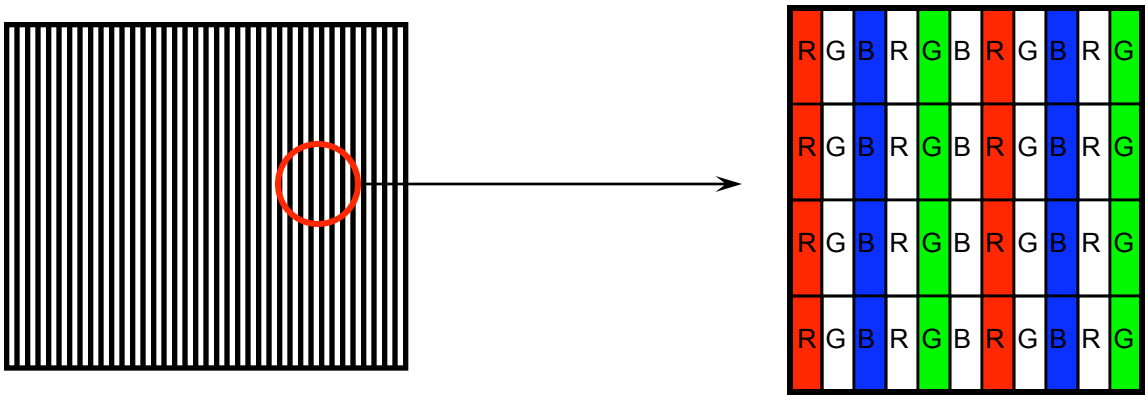
Display Brightest Gray Level

Display Darkest Gray Level

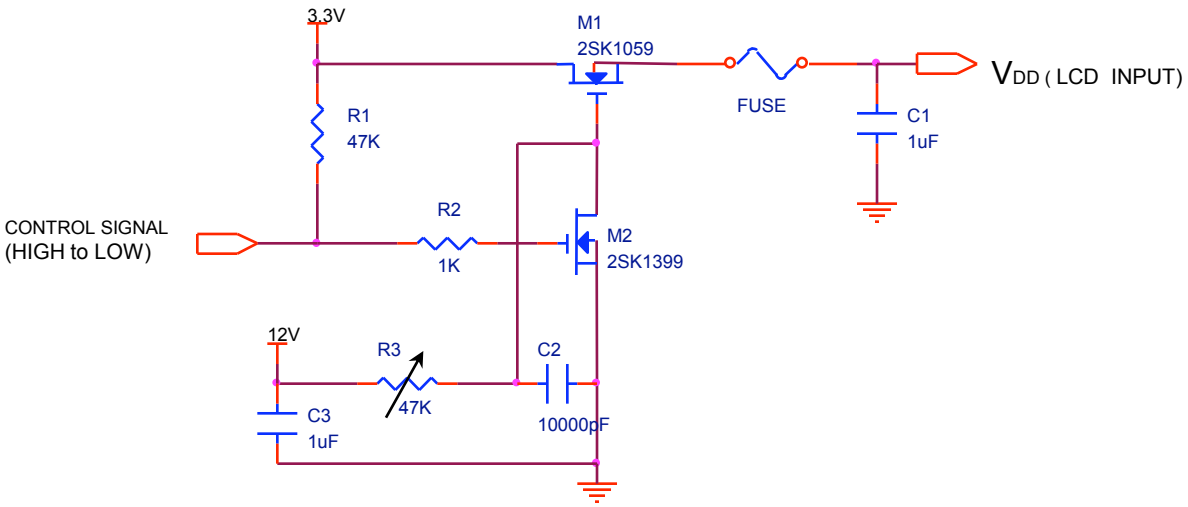
*b) Mosaic Pattern



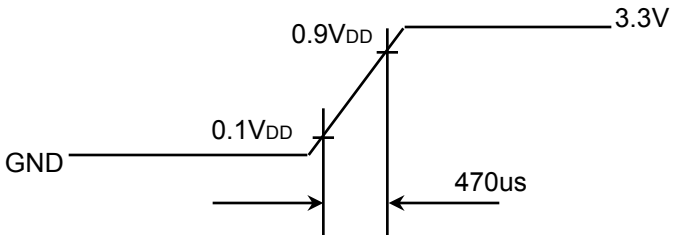
*c) 1dot Vertical stripe pattern



4) Rush current measurement condition



VDD rising time is 470us



3.2 BACK-LIGHT UNIT

Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	23	25	27	mA	
LED Forward Voltage	VF	3.0	3.2	3.4	V	
Operating Life Time	Hr	10000	-	-	Hour	(1)

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

3.3 LED Driver

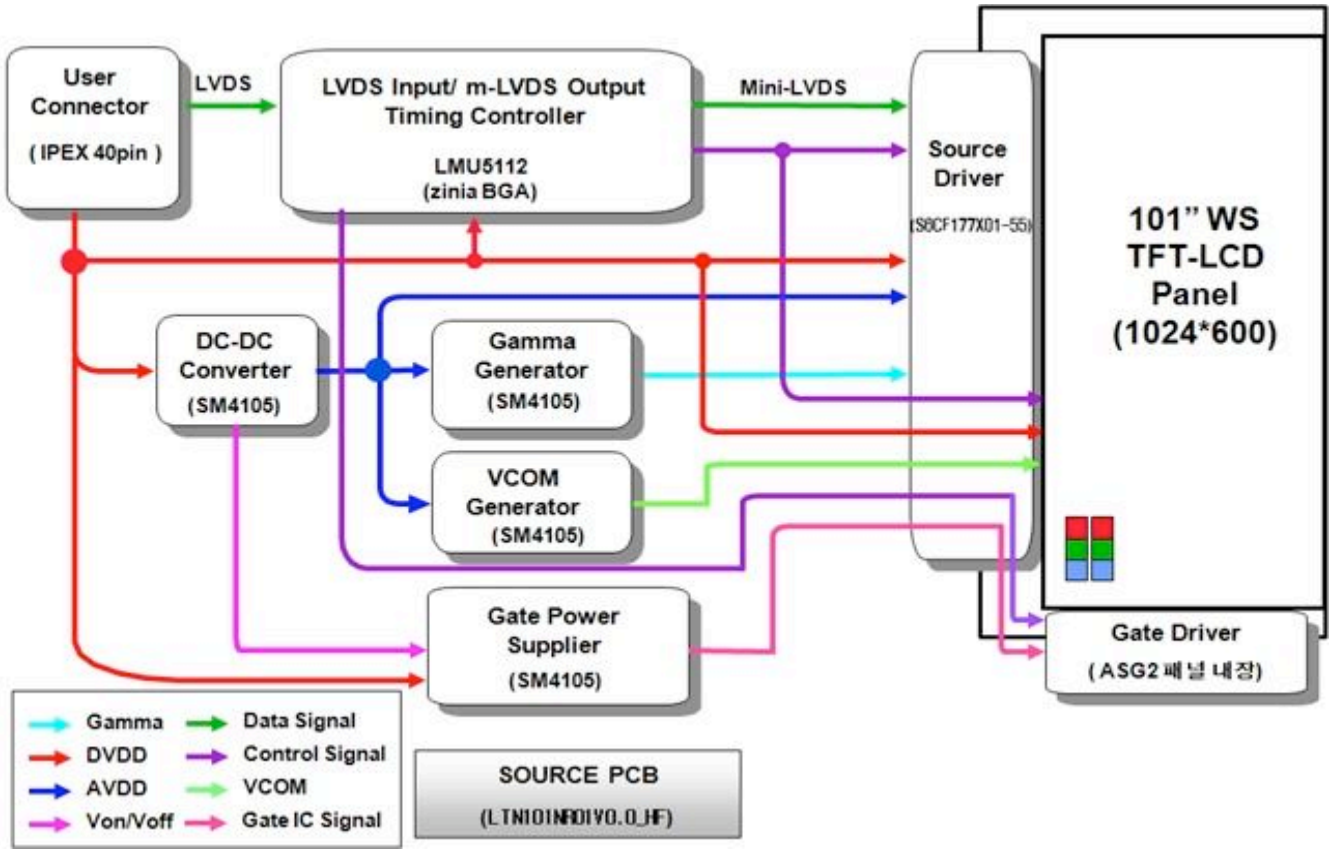
Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V_{in}	5.5	12	20	V	
Input Current	I	-	166	-	mA	
EN Control Level	ON	2	3.3	5.0	V	
	OFF	0	0	0.5	V	
PWM Control Level	ON	2	3.3	5.0	V	
	OFF	0	0	0.5	V	
BL power consumption	Pin	-	0.6	-	W	@ 60nit
		-	2	2.5W	W	@ Max
PWM duty ratio	D	10	-	100	%	PWM Freq. : 1kHz~10KHz
		5		100		200Hz~1KHz
External PWM Dimming Control Frequency (BLIM)	F_{BLIM}	200	1.6	10	kHz	Vin=7~20V, BLIM=PWM 0V~3.3V

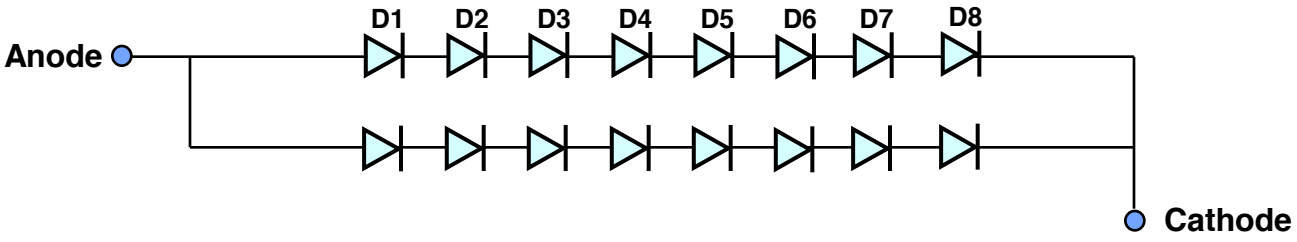
Note (1) Test Equipment : Fluke 45
(2) SEC guarantee PWM frequency from 0.2kHz to 10KHz

4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 LED placement structure



5. INPUT TERMINAL PIN ASSIGNMENT

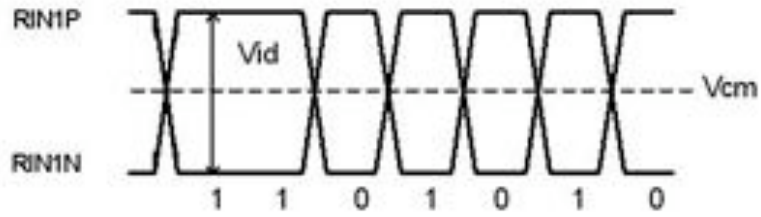
5.1. Input Signal & Power (LVDS, Connector : I-PEX 20455-040E or equivalent)

Pin	Symbol	Function
1	NC	no connect (Reserved for supplier)
2~3	VDD	Logic power 3.3V (Panel logic, BL logic)
4	VEDID	EDID 3.3V power
5	NC	no connect (Reserved for supplier)
6	CLK	EDID clock
7	DATA	EDID data
8	RIN0-	- LVDS differential data input (R0-R5, G0)
9	RIN0+	+ LVDS differential data input (R0-R5, G0)
10	GND	Ground
11	RIN1-	- LVDS differential data input (G1-G5, B0-B1)
12	RIN1+	+ LVDS differential data input (G1-G5, B0-B1)
13	GND	Ground
14	RIN2-	- LVDS differential data input (B2-B5,HS,VS, DE)
15	RIN2+	+ LVDS differential data input (B2-B5,HS,VS, DE)
16	GND	Ground
17	CLK-	- LVDS differential clock input
18	CLK+	+ LVDS differential clock input
19	GND	Ground
20 ~ 21	NC	no connect
22	GND	Ground
23 ~ 24	NC	no connect
25	GND	Ground
26 ~ 27	NC	no connect
28	GND	Ground
29 ~ 30	NC	no connect
31 ~ 33	VLED_GND	LED Ground
34	NC	no connect
35	S_PWMIN	System PWM Signal Input
36	BL_ON	LED enable pin (+3V input, +5V tolerance)
37	NC	No connect
38~40	VLED	LED Power Supply 7V-20V

5.2 LVDS Interface

5.2.1 LVDS DC characteristic

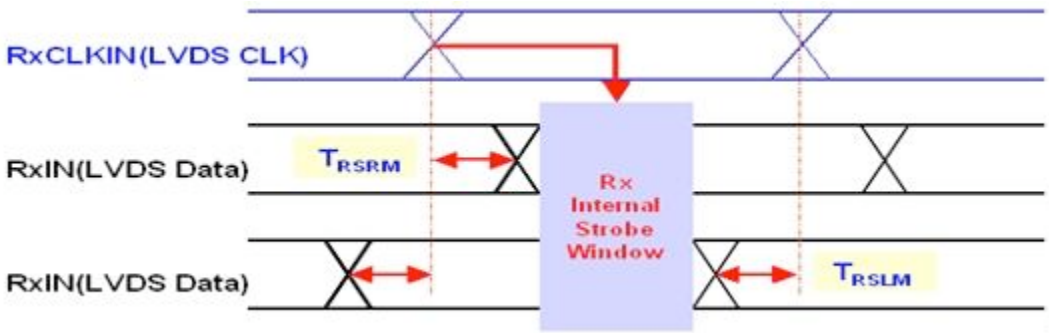
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LVDS Differential Voltage	Vid	200	-	600	mV	
Input Common Mode Voltage	V_{CM}	0.8	1.2	1.4	V	



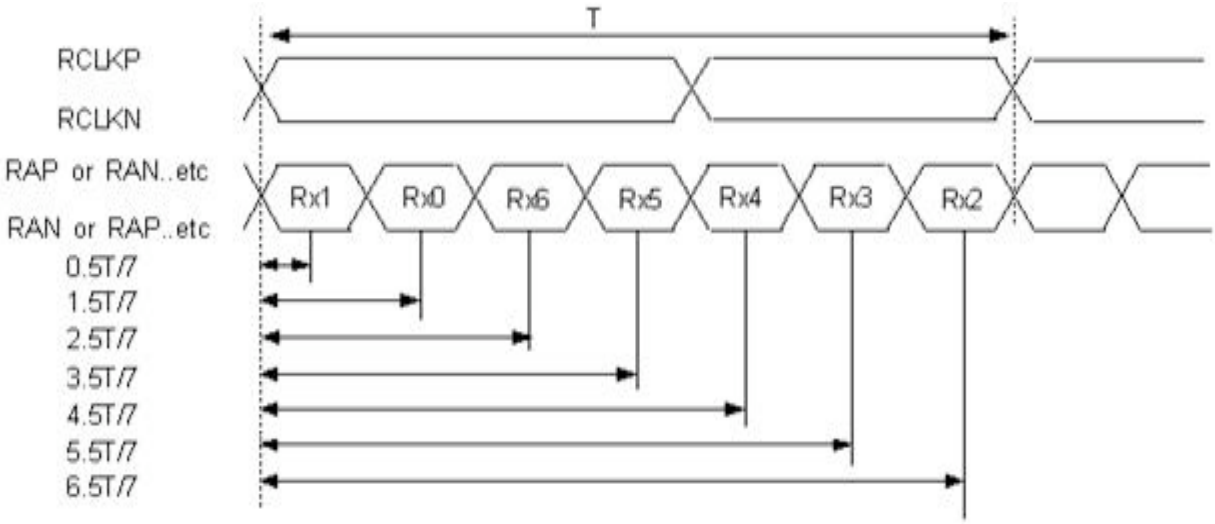
5.2.2 LVDS AC characteristic

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LVDS input clock frequency		FCLK_LVDS	20		90	MHz	
RIN skew margin	90MHz > F_{CLK_LVDS} ≥ 65MHz	TRSRM	-400	0	400	ps	(1),(2)
	65MHz > F_{CLK_LVDS} ≥ 20MHz		-600	0	600	ps	(1),(2)
Modulating frequency of LVDS input clock during SSCG		FCLK_MOD	-	-	300	KHz	(3)
Maximum deviation of LVDS input clock during SSCG		FCLK_DEV	-	-	± 3	%	(3)

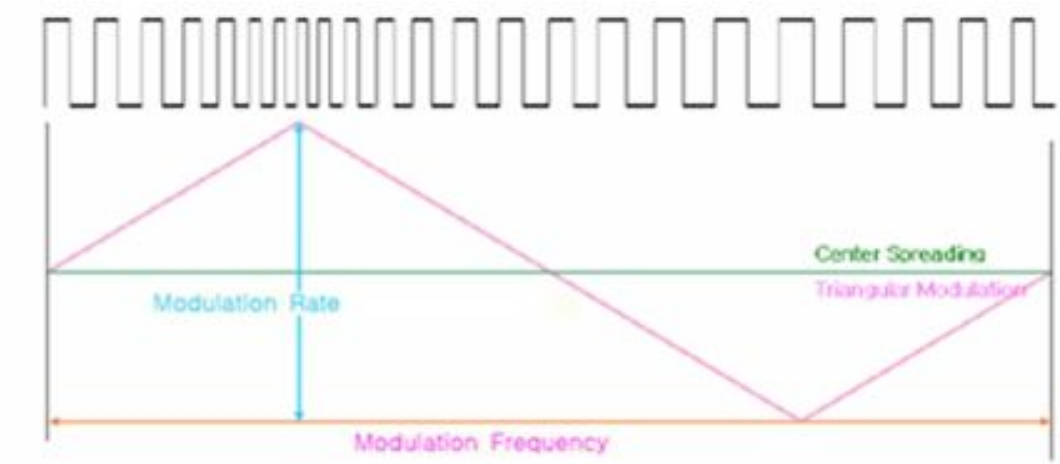
Note (1) : LVDS Receiver Skew (Strobe) Margin



Note (2) : Ideal Strove Positions for LVDS Input

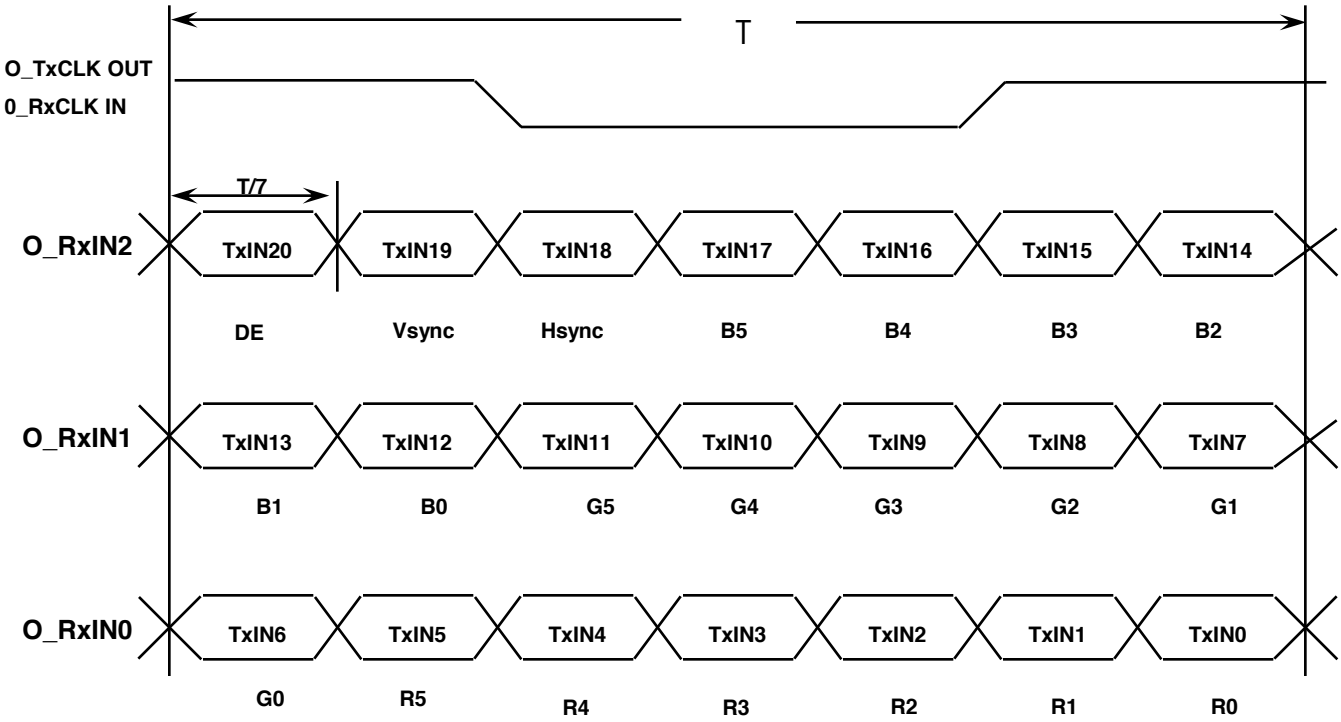


Note (3) : SSC (Spread Spectrum Clock)



5.3 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON

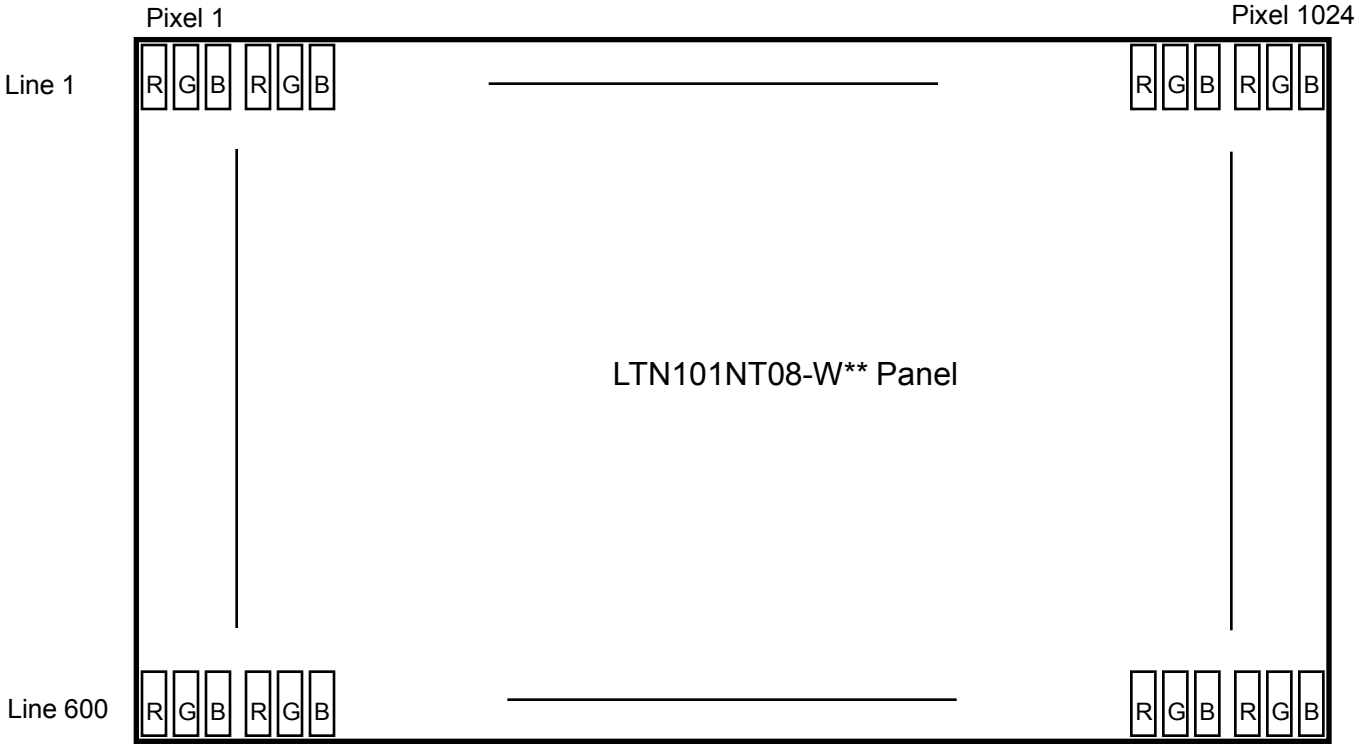


5.4 Input Signals, Basic Display Colors and Gray Scale of Each Color

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

5.5 Pixel Format in the display

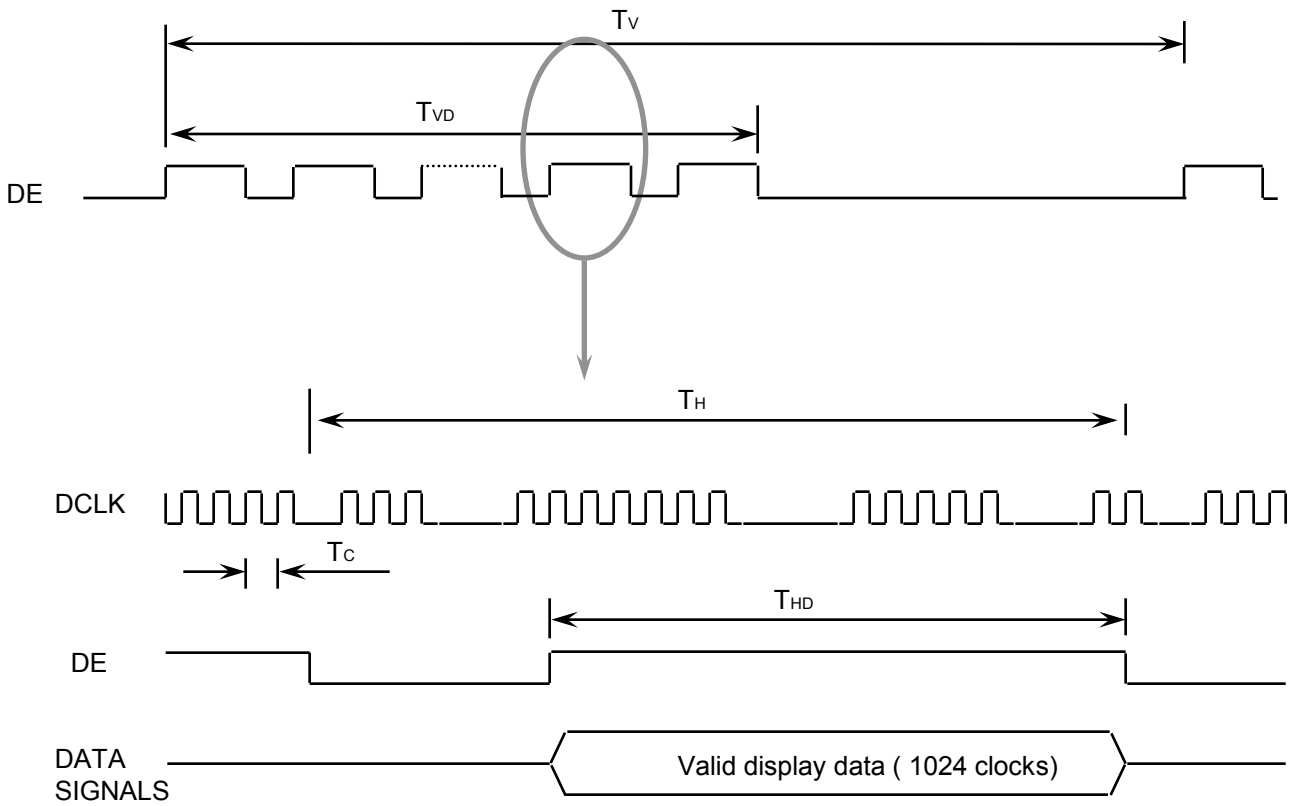


6. INTERFACE TIMING

6.1 Timing Parameters

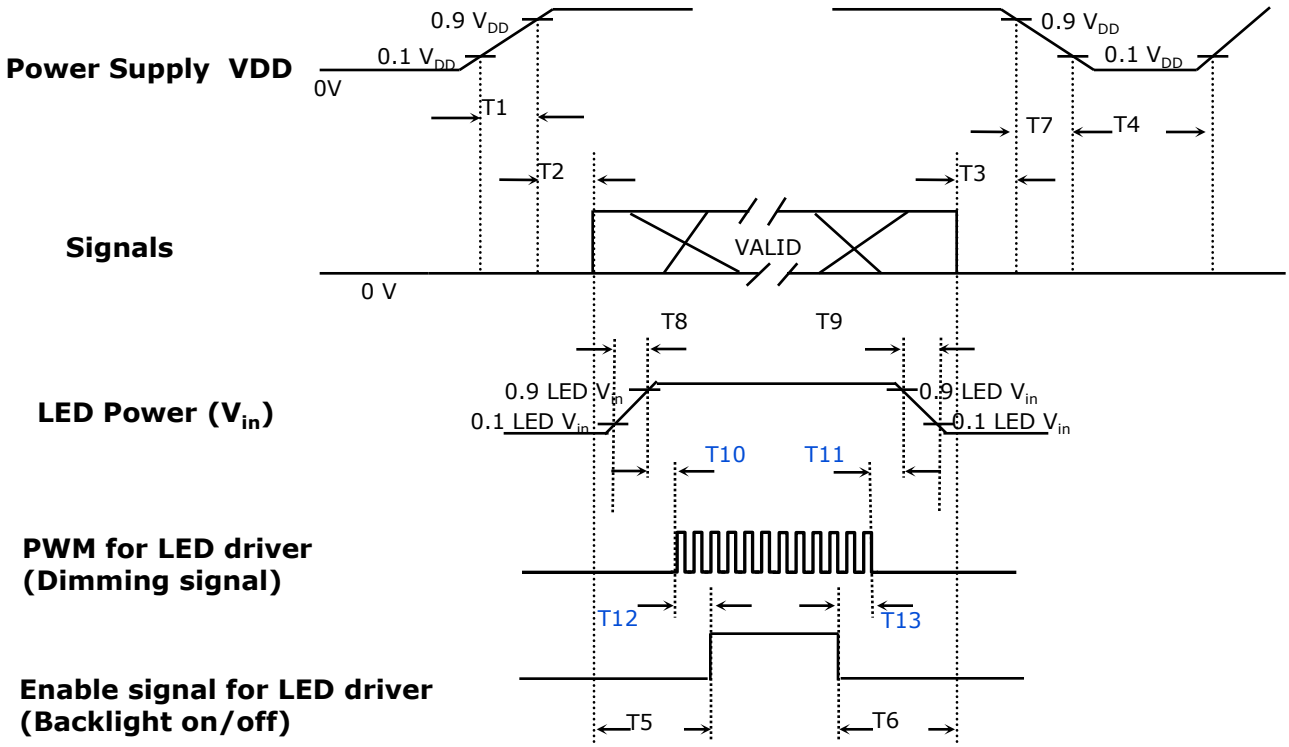
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	TV	-	670	-	Lines	-
Vertical Active Display Term	Display Period	TVD	-	600	-	Lines	-
One Line Scanning Time	Cycle	TH	1200	1344	1600	Clocks	-
Horizontal Active Display Term	Display Period	THD	-	1024	-	Clocks	-

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

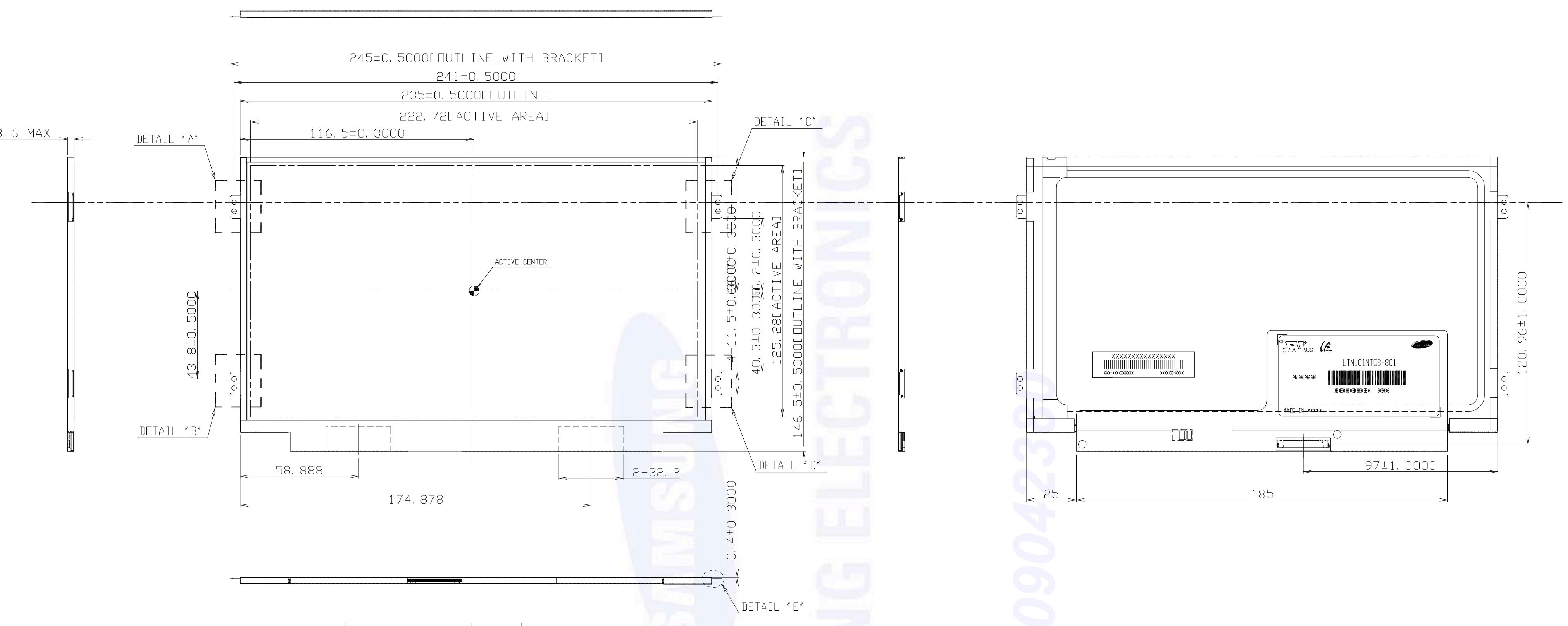
Timing (ms)	Remarks
0.5 < T1 ≤ 10	V_{DD} rising time from 10% to 90%
0 < T2 ≤ 50	Delay from V_{DD} to valid data at power ON
0 < T3 ≤ 50	Delay from valid data OFF to V_{DD} OFF at power Off
500 ≤ T4	V_{DD} OFF time for Windows restart
200 ≤ T5	Delay from valid data to B/L enable at power ON
200 ≤ T6	Delay from valid data off to B/L disable at power Off
0 < T7 ≤ 10	V_{DD} falling time from 90% to 10%
0.5 < T8 ≤ 10	LED V_{in} rising time from 10% to 90%
0.5 < T9 ≤ 10	LED V_{in} falling time from 90% to 10%
0 ≤ T10	Delay from LED driver Vin rising time 90% to PWM ON
0 ≤ T11	Delay from PWM Off to LED driver Vin falling time 10%, Must Keep rule
0 ≤ T12	Delay from PWM ON to B/L Enable ON, Must Keep rule
0 ≤ T13	Delay from B/L Enable Off to PWM Off

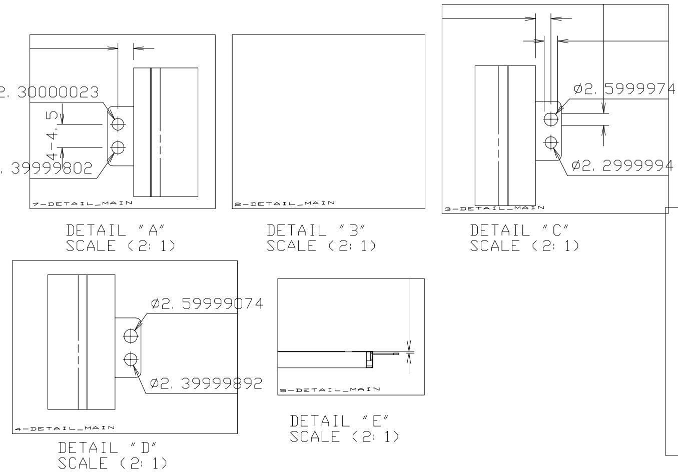
Power Sequence & Timing Parameters

7. MECHANICAL OUTLINE DIMENSION

Approval

[Refer to the next page]





LTN101NT08-801

PRELIMINARY

SAMSUNG CONFIDENTIAL

※ NOTE

1. INPUT SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
   - MAKER : I-PEX OR COMPATIBLE
   - INPUT CONNECTOR : I-PEX ,20455-#40#-##
2. CALIFERS MEASURUNG FORCE : 750 gf
3. WEIGHT SPEC : 175 g MAX
4. In order to avoid IC damage, it is not allow that overlapping of cables or antennas, camera , WLAN , WWAN over these COF locations.

REVISION

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	LTN101NT08-801	
SCALE	1/1		S.B.KIM			PART/SHEET NAME	OUTLINE DIMENSION	SHEET 1/1
TOLERANCE	±0. 5		10.08.20					
SAMSUNG ELECTRONICS					SPEC. NO	CODE NO.		VER. 001

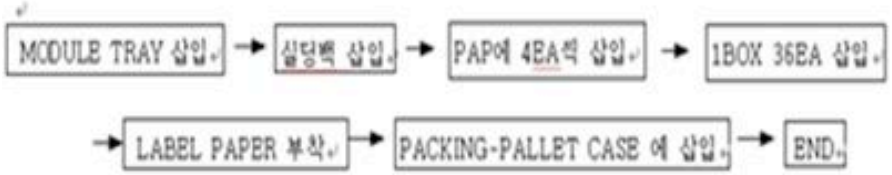
8. PACKING

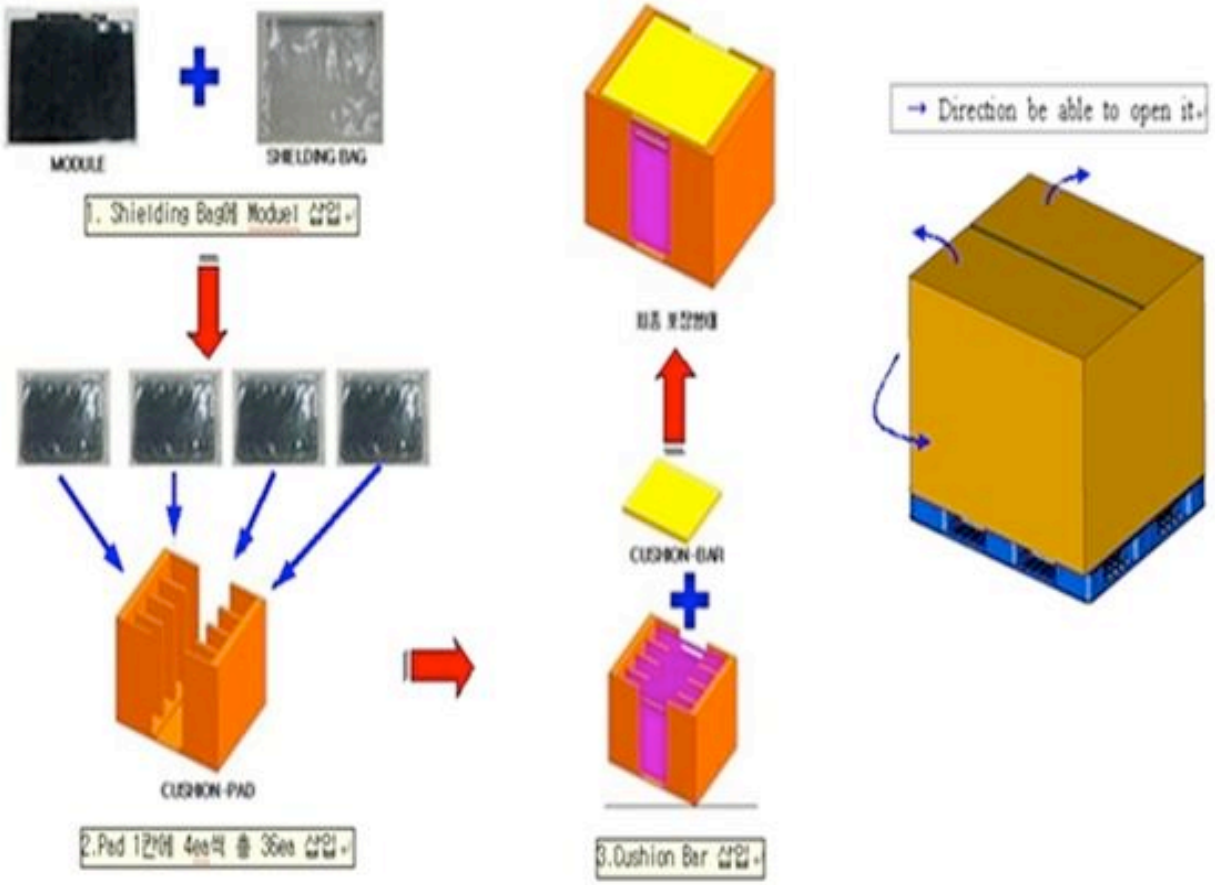
1. CARTON(Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method





Note 1)Total Weight : Approximately : 8.2 kg

2) Acceptance number of piling : 36sets

3) Carton size : 321(W) ×373(L) × 247(H)

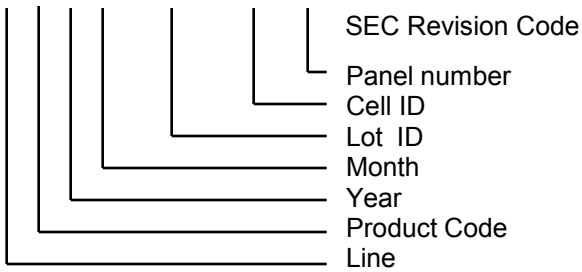
(3)Packing Material

No	Part name	Quantity
1	Static electric protective sack	36
2	Packing case (Inner box)	1 set
3	Pictorial marking	2 pcs
4	Silicagel (500 x 1)	1
5	Carton	1 set

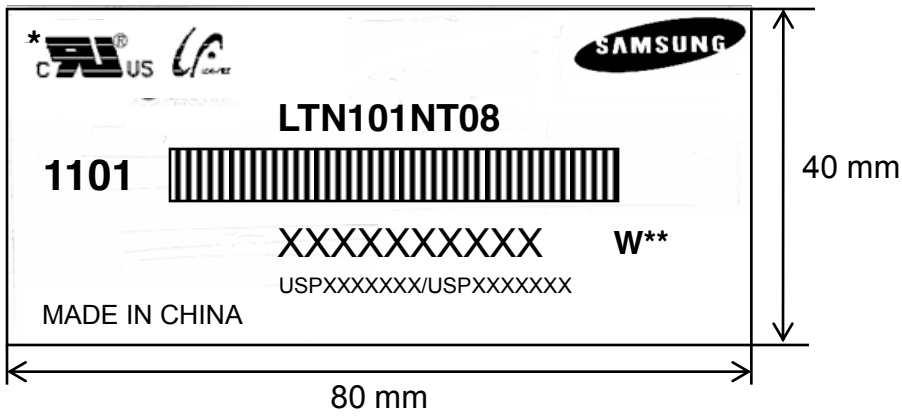
9. MARKINGS & OTHERS

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

(1)Parts number : LTN101NT08
(2)Revision code : 3 letters
(3)Lot number : X X X X XXX XX X **W****

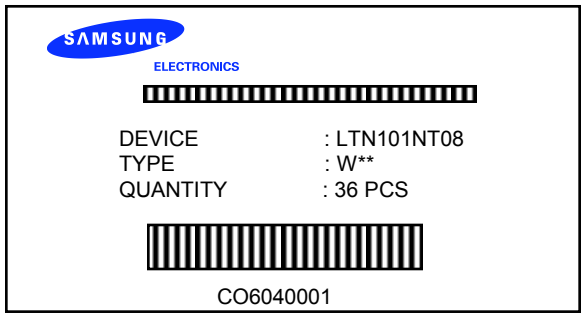


(5) Nameplate Indication



Parts name : LTN101NT08
Lot number : XXXXXXXXXX
USPXXXXXXX/USPXXXXXXX : US Patent Num.
Inspected work week : 1101(2011 year, 01th week)
Product revision Code : W**

(6) Packing small box attach



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 LED 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) Keep products at a storage temperature in the range of 5℃ to 40℃ and at a storage humidity between 35% and 75% for less than an year.
(b) The storage room should provide good ventilation and temperature control.
(c) Products should not be placed on the floor, but on the Pallet away from a wall.

(d) Prevent products from direct sunlight, moisture nor water; be cautious of a build up of condensation.
(e) Avoid other hazardous environment while storing goods.
(f) Long Term storage
If products delivered or kept in conditions of over the storage period of 3 months, the recommended temperature or humidity range, we recommend you leave them at a temperature of 20℃ and a humidity of 50% for 24 hours.

3. OPERATION

(a) Do not connect, and 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.