SAMSUNG ELECTRONICS

Approval

TO : Dell / Quanta

DATE : August. 28, 2008

SAMSUNG TFT-LCD

MODEL NO. : LTN170CT08

NOTE :

- Extension code [0]
- Surface type [Anti-glare]

The information described in this SPEC is preliminary and can be changed without prior notice.

APPROVED BY : K. H. Shin

PREPARED BY : **LCD Product Planning Group I, Marketing Team**

SAMSUNG ELECTRONICS CO., LTD.

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REVISION HISTORY

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Date	Revision No.	Page	Summary
May. 09, 2008	P00	All	Issued first for LTN170CT07-0 [FR928]
August. 28, 2008	A00	All	A00 Spec update for LTN170CT08-0

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GENERAL DESCRIPTION

DESCRIPTION

LTN170CT08 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 17.0" contains 1,920 x 1200 pixels and can display up to 16,777,216colors. 6 O'clock direction is the Optimum viewing angle.

FEATURES

- High contrast ratio, high aperture structure
- 1920 x 1200 pixels resolution
- True 8-bit Source IC.
- Low power consumption
- Fast Response
- RGB-LED Back light with LED driver
- 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	367.20(H) x 229.50(V) (17.0” diagonal)	mm	
Driver element	a-Si TFT active matrix		
Display colors	16,777,216		
Number of pixel	1920 x 1200	pixel	16 : 10
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.19125(H) x 0.19125(V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 25 , Hard-Coating (4H)		

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Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	381.7	382.2	382.7	mm	-
	Vertical (V)	227.0	247.5	248.0	mm	
	Depth (D)	-	-	6.5	mm	(1)
Weight		-	-	700	g	-

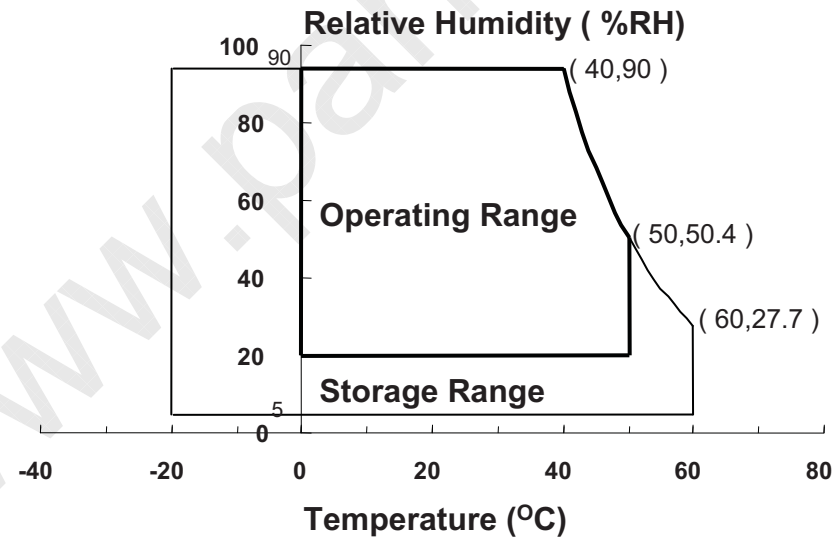
Note (1) Measurement condition of outline dimension
. Equipment : Vernier Calipers
. Push Force : 500g ·f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	TSTG	-20	60	°C	(1),(5)
Operating temperate (Temperature of glass surface)	TOPR	0	50	°C	(1),(5)
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.
(5) If product is used for extended time excessively or exposed to high temperatures for extended time, there is a possibility of wide viewing angle film damage which could affect visual characteristics.

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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)

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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} = 83 MHz

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)		CR	Normal Viewing Angle $\phi = 0$ $\theta = 0$	400	-	-	-	(1), (2), (5)
Response Time at Ta (Rising + Falling)		T_{RT}		-	16	20	msec	(1), (3)
		T_{RT_gray}		-	8	16		Gray32 ↔ Gray48
Average Luminance of White (5 Points)		$Y_{L,AVE}$		250	300	-	cd/m^2	(1), (4)
Color Chromaticity (CIE)	Red	R_X		0.617	0.639	0.659	-	(1), (5) PR-650
		R_Y		0.279	0.299	0.319		
	Green	G_X		0.168	0.188	0.208		
		G_Y		0.695	0.715	0.735		
	Blue	B_X		0.124	0.144	0.164		
		B_Y		0.042	0.062	0.082		
	White	W_X		0.293	0.313	0.333		
		W_Y		0.309	0.329	0.349		
Viewing Angle	Hor.	θ_L	CR ≥ 10	65	-	-	Degrees	(1), (5) BM-5A
		θ_H		65	-	-		
	Ver.	ϕ_H		55	-	-		
		ϕ_L		55	-	-		
	Hor.	θ_L	CR ≥ 100	35	-	-	Degrees	
		θ_H		35	-	-		
	Ver.	ϕ_H		35	-	-		
		ϕ_L		35	-	-		
13 Points White Variation		δ_L		-	-	1.7	-	(6)

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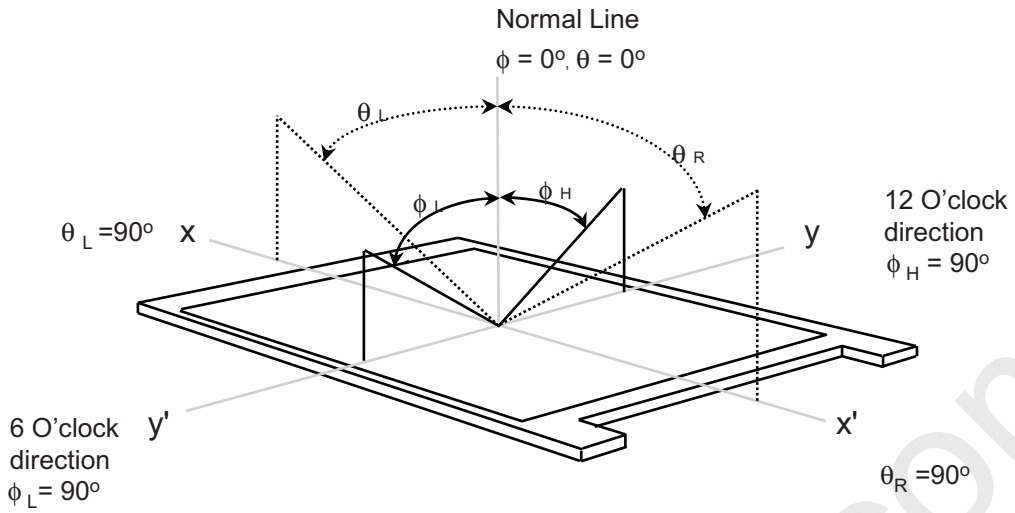
Note 1) Definition of Viewing Angle : Viewing angle range(10 ≤ C/R)

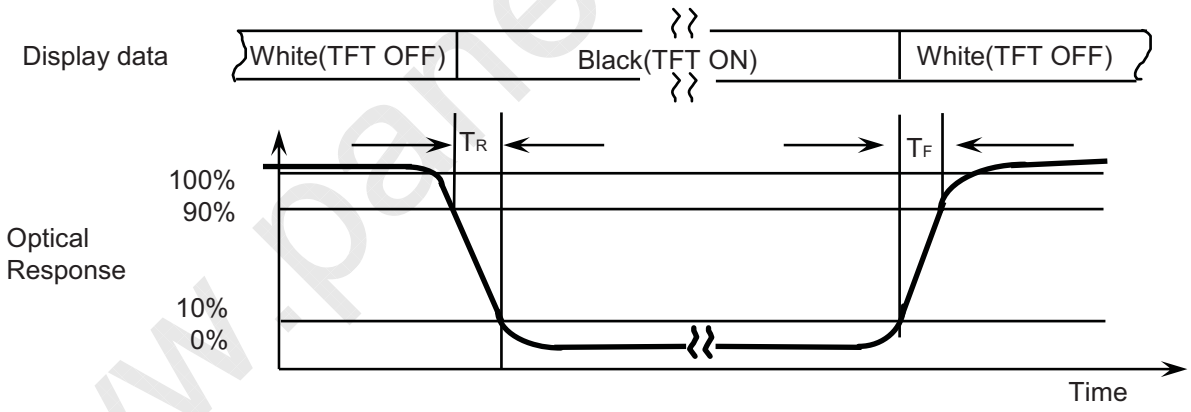


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points(4, 5, 7, 9, 10)

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

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

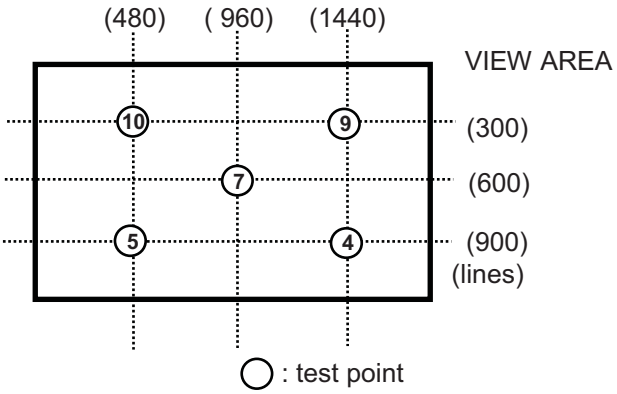
Note 3) Definition of Response time :



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

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

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



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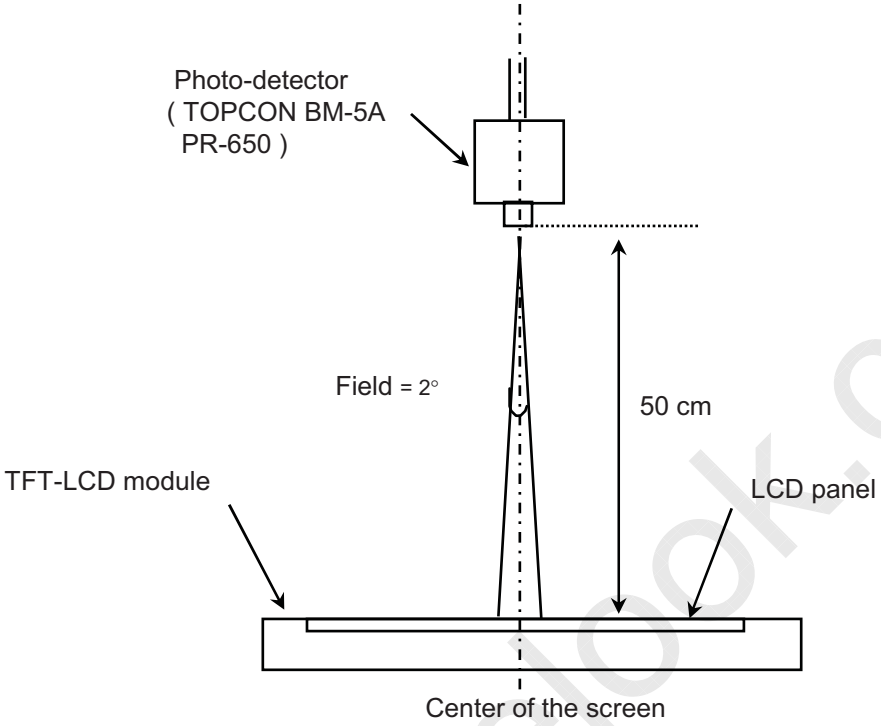
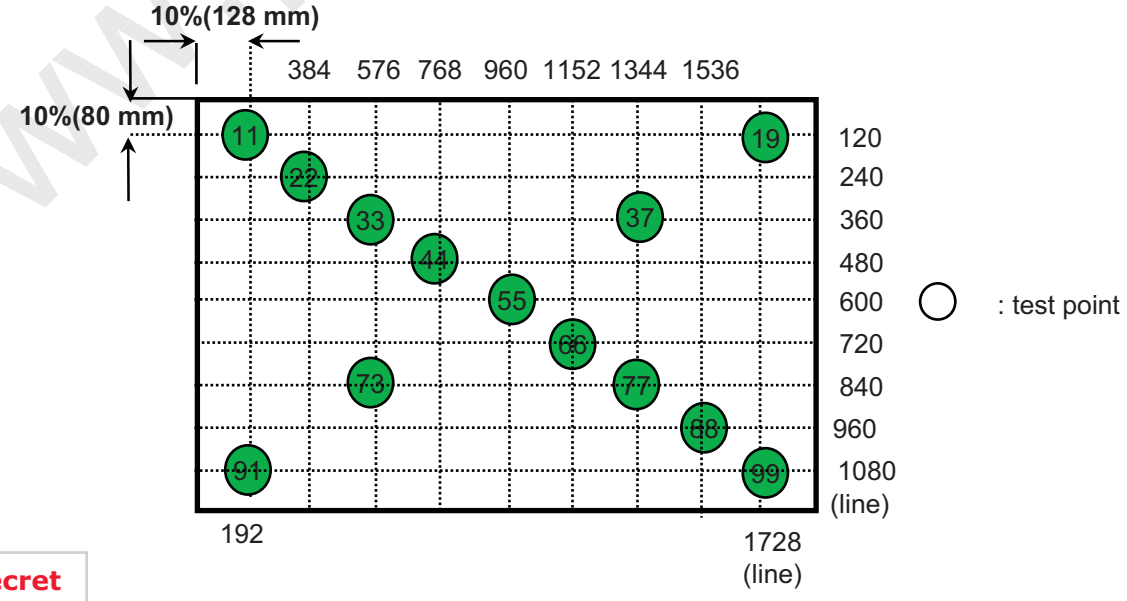
Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless,and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.
Environment condition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



[Optical characteristics measurement setup]

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

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



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3. ELECTRICAL CHARACTERISTICS

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3.1 TFT LCD MODULE

Ta= 25 ± 2°C

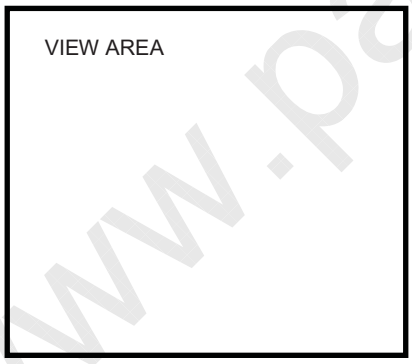
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	V_{CM} = +1.2V
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		fv	-	60	-	Hz	
Hsync Frequency		f_H	-	74.1	-	KHz	
Main Frequency		f_{DCLK}	-	82.4	-	MHz	
Rush Current		I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	I_{DD}	-	820	-	mA	(2),(3)*a
	Mosaic		-	950	-	mA	(2),(3)*b
	V. stripe		-	1000	1210	mA	(2),(3)*c

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

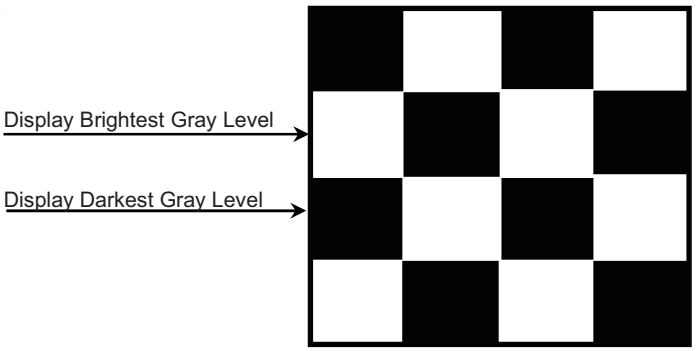
(2) f_V = 60Hz, f_{DCLK} =82.4MHZ, V_{DD} = 3.3V , DC Current.

(3) Power dissipation pattern

*a) White Pattern



*b) Mosaic Pattern



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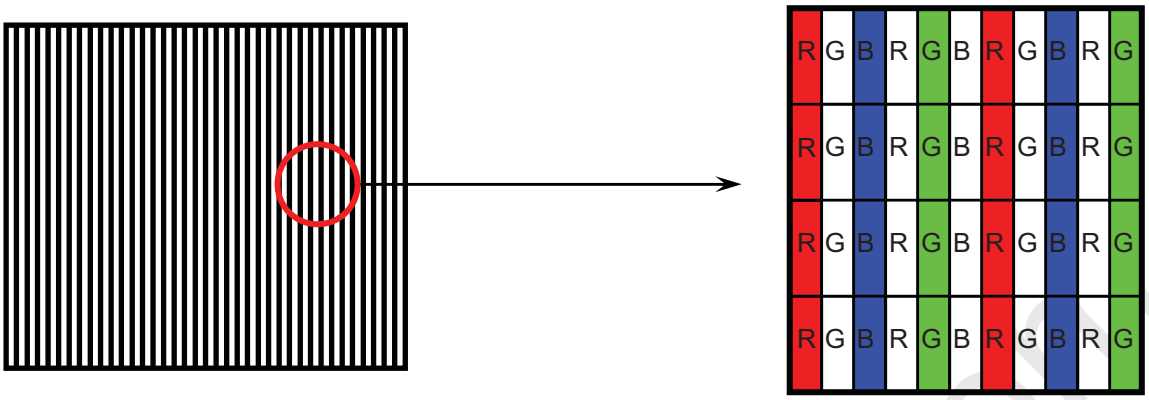
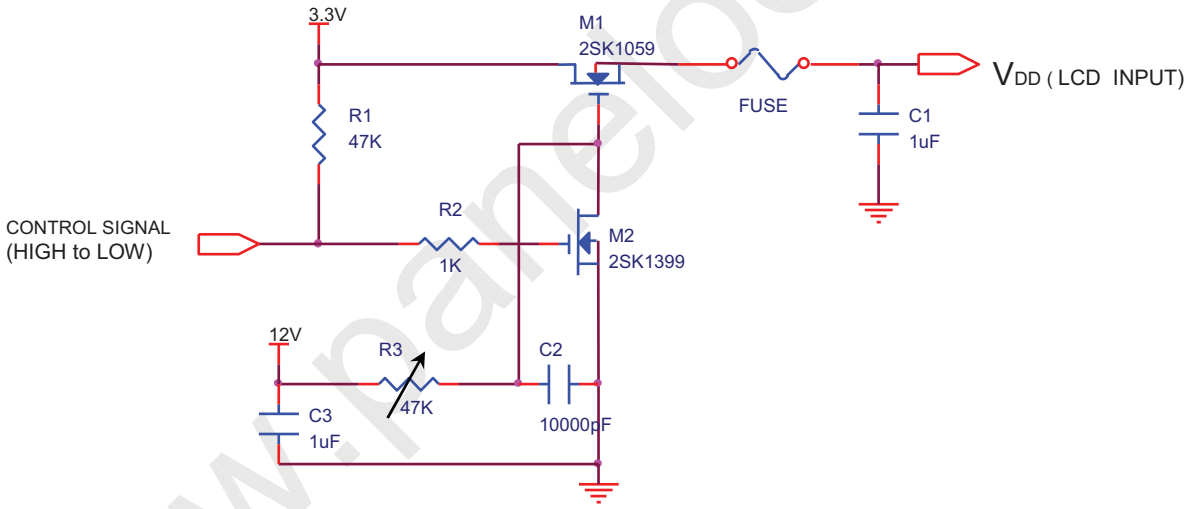
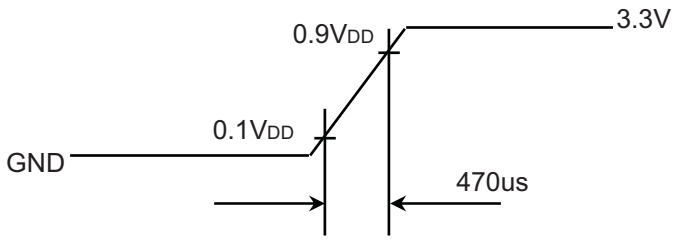
*c) 1dot Vertical stripe pattern



4) Rush current measurement condition



VDD rising time is 470us



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3.2 BACK-LIGHT UNIT

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	Ir	-	28.5	-	mA	-
	Ig	-	33	-	mA	-
	Ib	-	21	-	mA	-
LED Forward Voltage	Vr	-	2.2	-	V	-
	Vg	-	3.1	-	V	-
	Vb	-	3.1	-	V	-
Power Consumption	P	-	11.0	12.0	W	-

3.3 LED Driver

- LED Driver Manufacturer : LP8540 (National Semiconductor)

Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V_{in}	7.5	12	20	V	
Operating Frequency	F_o	-	1.25	-	MHz	-
Output PWM Frequency	F_{PWM}	-	3	-	kHz	
External PWM Dimming Control Frequency	F_{BLIM}	0.2	-	25	kHz	
Output Current (each LED string)	Red	-	228	400	mA	
	Green	-	264	400	mA	
	Blue	-	168	400	mA	
Output Voltage	Vout	10	-	40	V	

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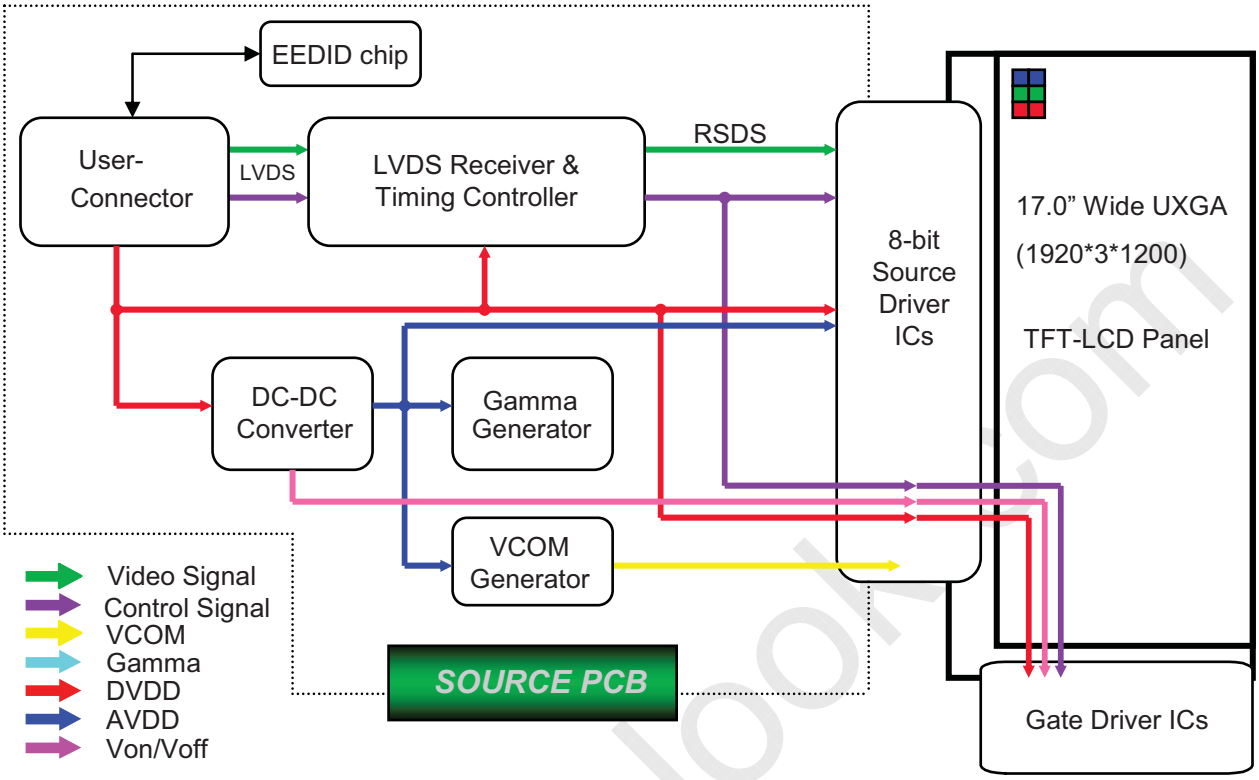
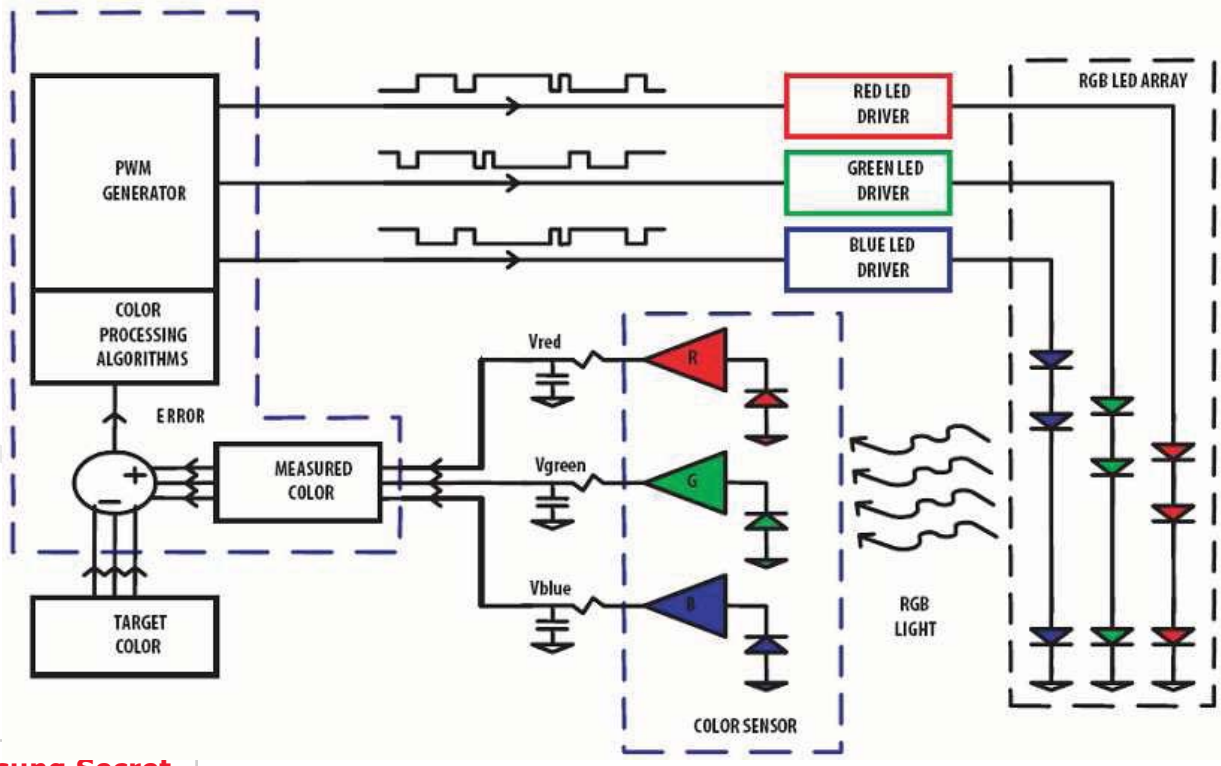
4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 LED Backlight Unit



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5. INPUT TERMINAL PIN ASSIGNMENT

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5.1. Input Signal & Power (40pins, JAE NXB40SL-HF10, 0.8mm pitch & 20pins, JAE XB20S-HF10, 1.0mm pitch)

Pin	Signal	Function
1	Test Loop (only to pin 40)	Connector test
2	VDD	Logic power 3.3V (Panel logic)
3	VDD	Logic power 3.3V (Panel logic)
4	VDD	Logic power 3.3V (Panel logic)
5	TEST (BIST_EN)	Panel Self Test
6	AI (for DBC)	DBC signal form T-con
7	VEEDID (3.3v)	EDID 3.3V power
8	CLK EEDID	EDID clock
9	DATA EEDID	EDID data
10	VSS	Ground
11	Odd_Rin0-	G0 / R0,1,2,3,4,5
12	Odd_Rin0+	G0 / R0,1,2,3,4,5
13	VSS	Ground
14	Odd_Rin1-	B0,1 / G1,2,3,4,5
15	Odd_Rin1+	B0,1 / G1,2,3,4,5
16	VSS	Ground
17	Odd_Rin2-	DE/ VSYNC/ HSYNC/ B2,3,4,5
18	Odd_Rin2+	DE/ VSYNC/ HSYNC/ B2,3,4,5
19	VSS	Ground
20	Odd_ClkIN-	- LVDS differential clock input
21	Odd_ClkIN+	+ LVDS differential clock input
22	VSS	Ground
23	Odd_Rin3-	B6,7 / G6,7 / R6,7
24	Odd_Rin3+	B6,7 / G6,7 / R6,7
25	VSS	Ground
26	Even_Rin0-	G0 / R0,1,2,3,4,5
27	Even_Rin0+	G0 / R0,1,2,3,4,5
28	VSS	Ground
29	Even_Rin1-	B0,1 / G1,2,3,4,5
30	Even_Rin1+	B0,1 / G1,2,3,4,5
31	VSS	Ground
32	Even_Rin2-	DE/ VSYNC/ HSYNC/ B2,3,4,5
33	Even_Rin2+	DE/ VSYNC/ HSYNC/ B2,3,4,5
34	VSS	Ground
35	Even_ClkIN-	- LVDS differential clock input
36	Even_ClkIN+	+ LVDS differential clock input
37	VSS	Ground
38	Even_Rin3-	B6,7 / G6,7 / R6,7
39	Even_Rin3+	B6,7 / G6,7 / R6,7
40	Test Loop (only to pin 1)	Connector test

Pin	Signal	Function
1	CONNTST	Connector test
2	+5V_ALW	Power source_store brightness/contrast values & circuit SMB interface
3	VSS	Ground
4	VSS	Ground
5	PWM_BL	PWM brightness control
6	VBL-	LED power return
7	VBL-	LED power return
8	VBL-	LED power return
9	VBL-	LED power return
10	NC	no connect
11	VBL+	7.5V – 21V LED power
12	VBL+	7.5V – 21V LED power
13	VBL+	7.5V – 21V LED power
14	VBL+	7.5V – 21V LED power
15	SMB_DATA	SMBUS data
16	SMB_CLK	SMBUS clock
17	NC	no connect
18	NC	no connect
19	NC	no connect
20	CONNTST	Connector test

5.2 LVDS Interface : Transmitter DS90C387 or Compatible

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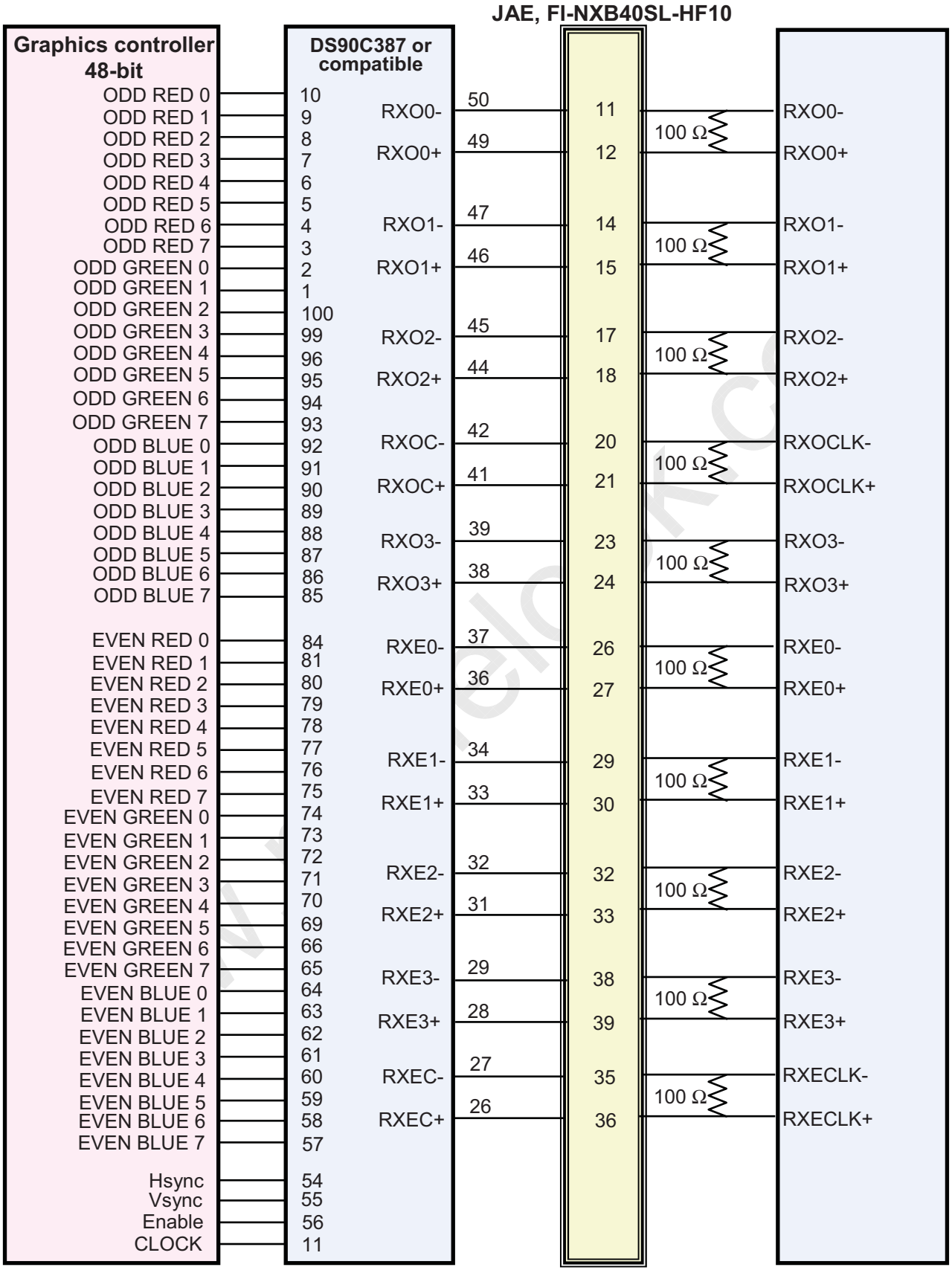
LVDS Interface



Note : The LCD Module uses a 82ohm resistor between positive and negative lines of each receiver input.

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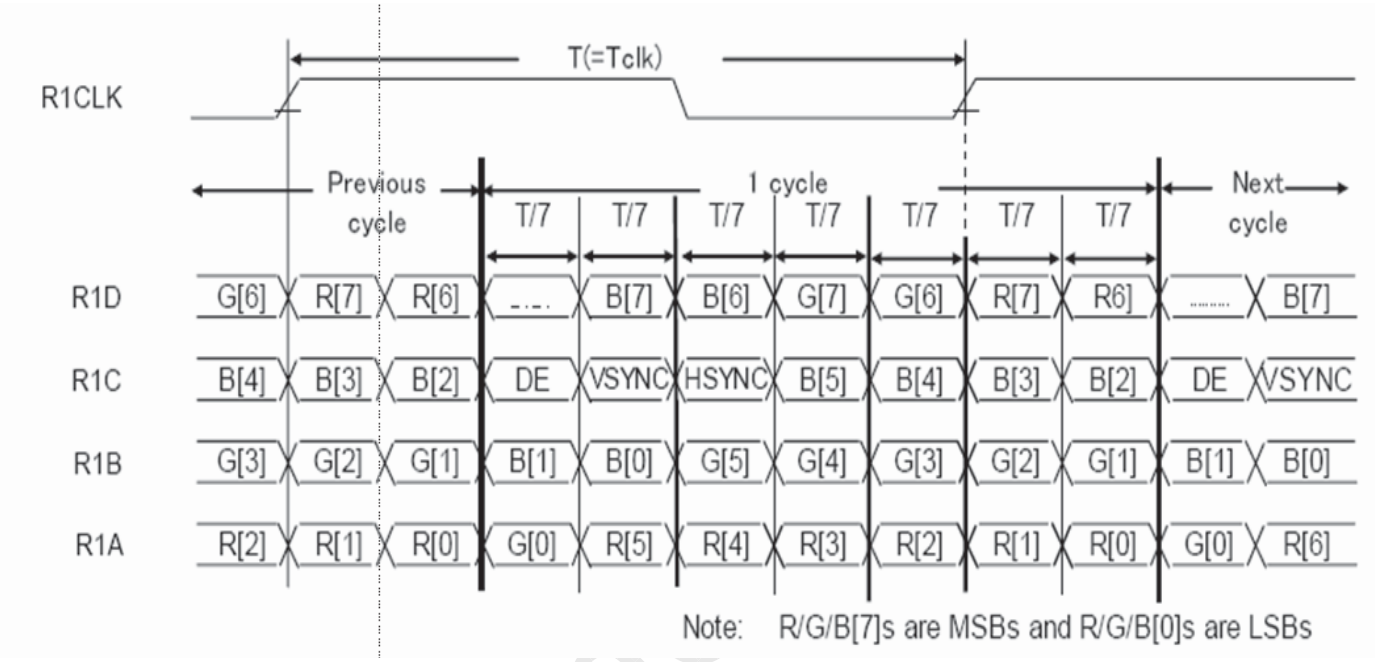
5.3 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON



(※ R1A=Rx0 / R1B=Rx1 / R1C=Rx2 / R1D=Rx3)

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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

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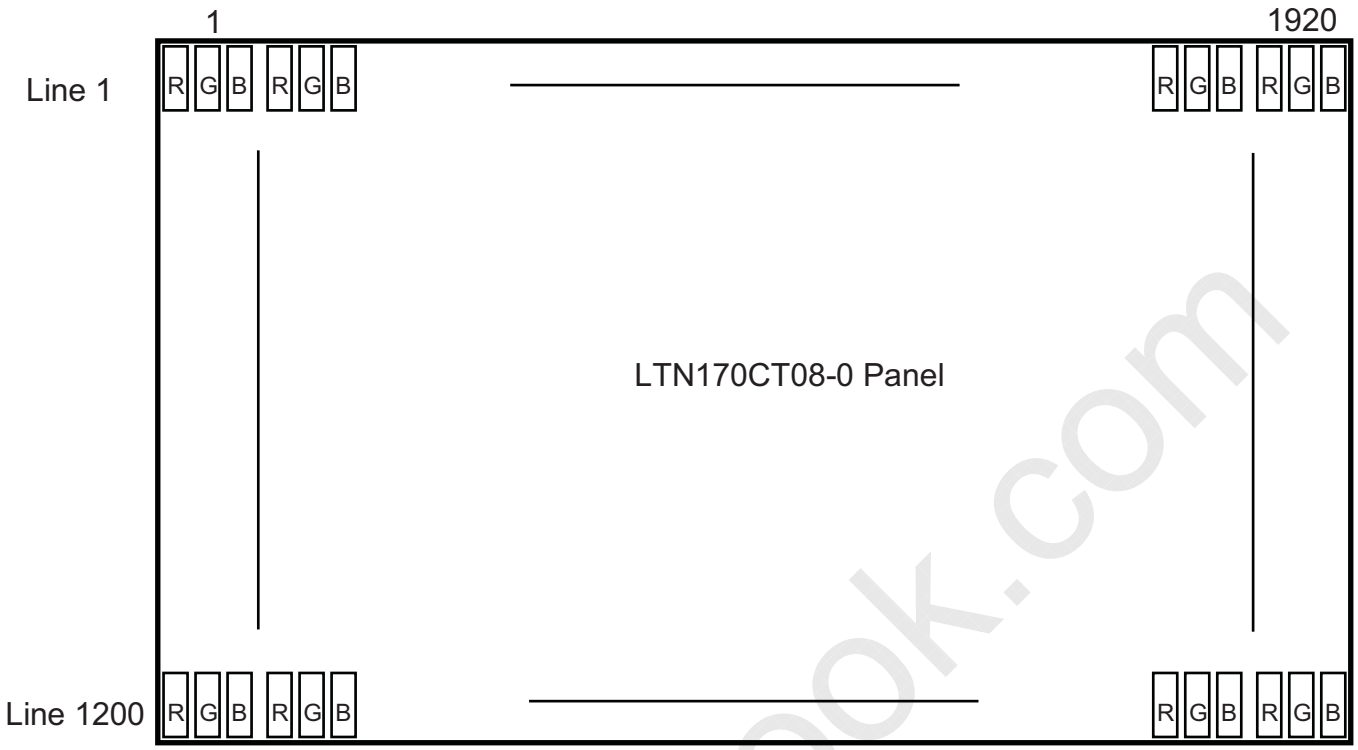
5.5 Pixel Format in the display



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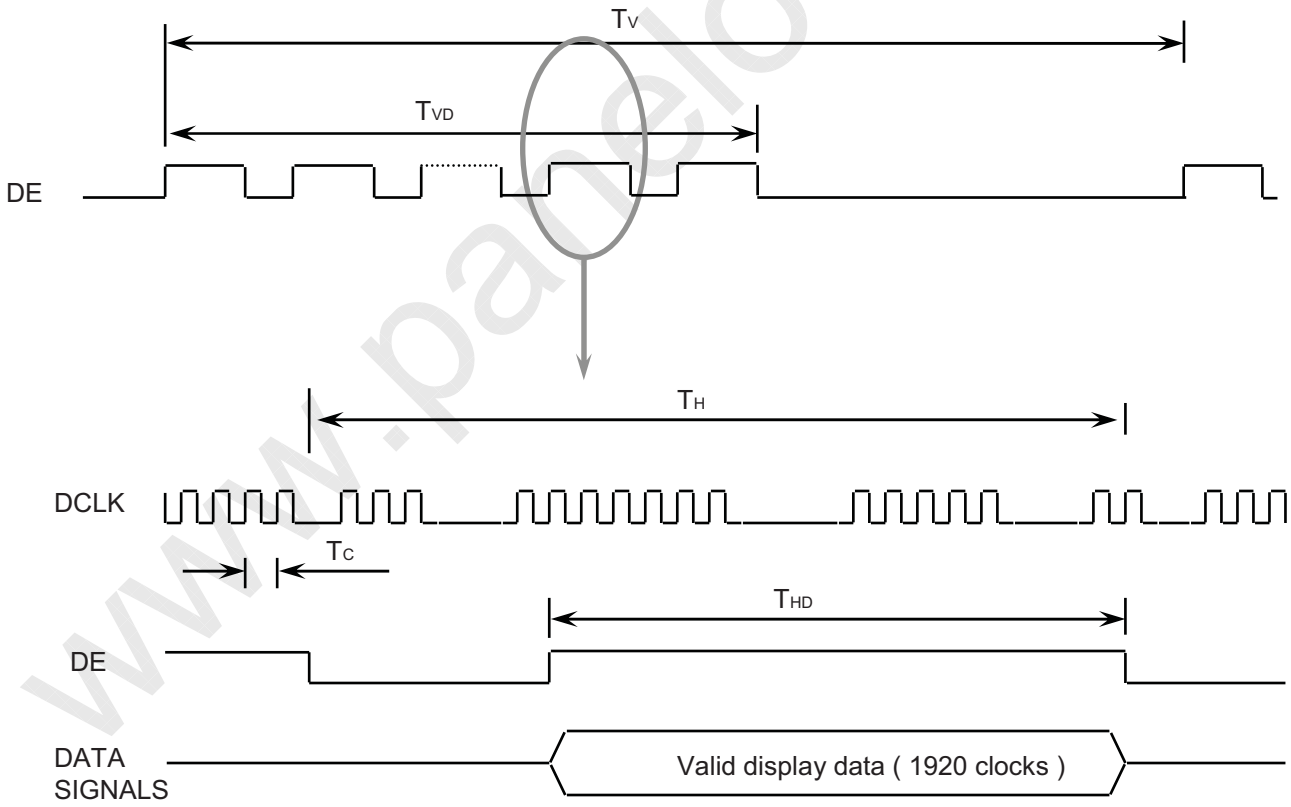
6. INTERFACE TIMING

6.1 Timing Parameters

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	TV	-	1235	-	Lines	
Vertical Active Display Term	Display Period	TVD	-	1200	-	Lines	
One Line Scanning Time	Cycle	TH	-	1112	-	Clocks	2pixel /clock
Horizontal Active Display Term	Display Period	THD	-	960	-	Clocks	2pixel /clock

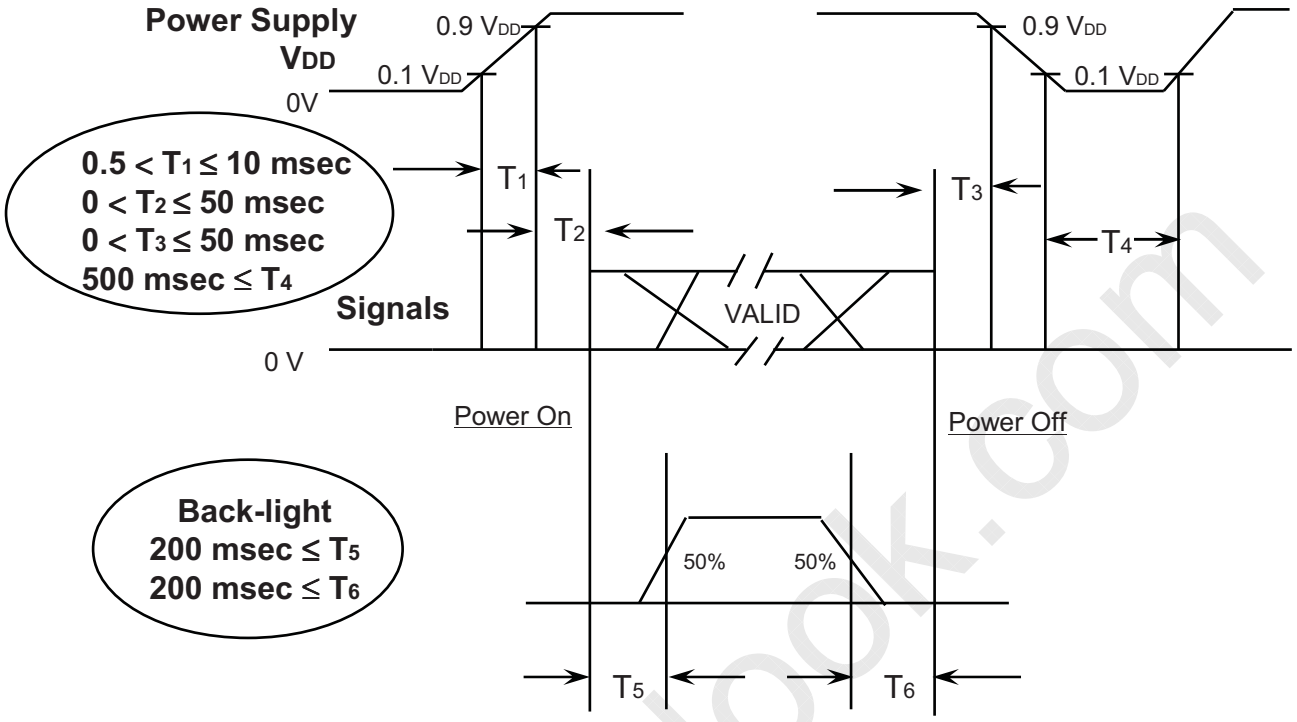
6.2 Timing diagrams of interface signal



6.3 Power ON/OFF Sequence

Approval

: 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 VDD.

(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 VDD = 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.

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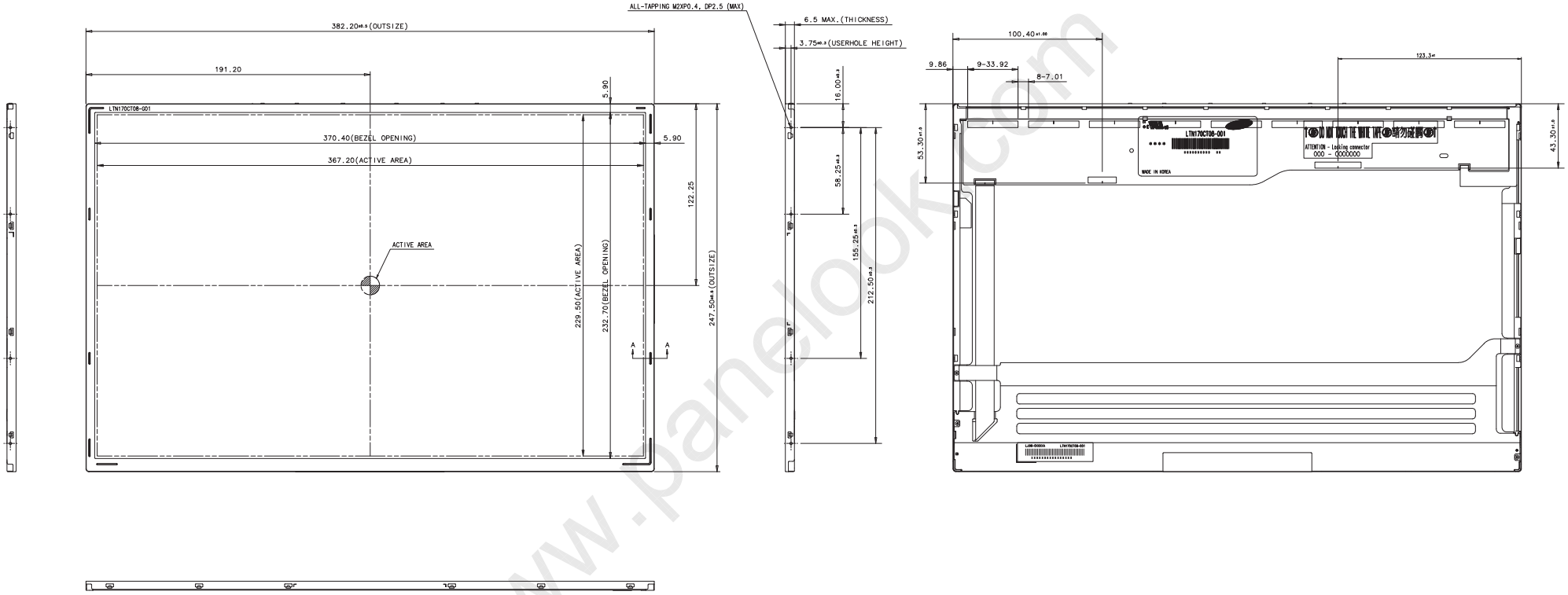
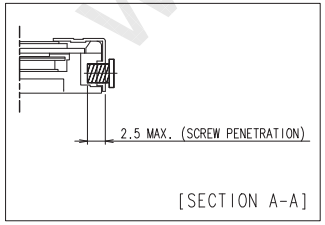
7. Mechanical Outline Dimension

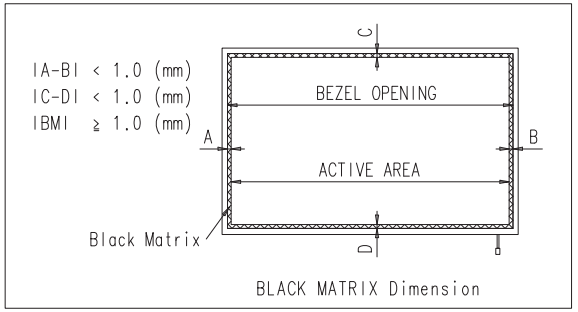
Approval

It will be attached with PDF file

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	SPEC NO.	REMARK
1	OUTLINE	LTN170CT08-001				







*NOTE
1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
   - MAKER : JAE
   - PART NO. : NXB40SL-HF10 (0.8mm pitch)

2. CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW.
   - MAKER: JAE
   - PART NO.: XB20S-HF10 (1.0mm pitch)

3. CALIFERS MEASURING FORCE :750 ± 250 gf

4. USER HOLE TORQUE SPEC : 2.5 kgfcm MAX. (5TIMES)

REVISION

REV	DATE	DESCRIPTION OF REVISION	REASON	CHK'D BY

UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY
SCALE	1 / 1	JUNU. YOU			D.L. SHIN
GENERAL TOLERANCE	±0.5	2008.08.05			2008.08.05

SAMSUNG ELECTRONICS

MODEL NAME	LTN170CT08-001	
PART/SHEET NAME	OUTLINE DIMENSION	SHEET 1/1
SPEC. NO		
CODE NO.	-	VER. 000

8. PACKING

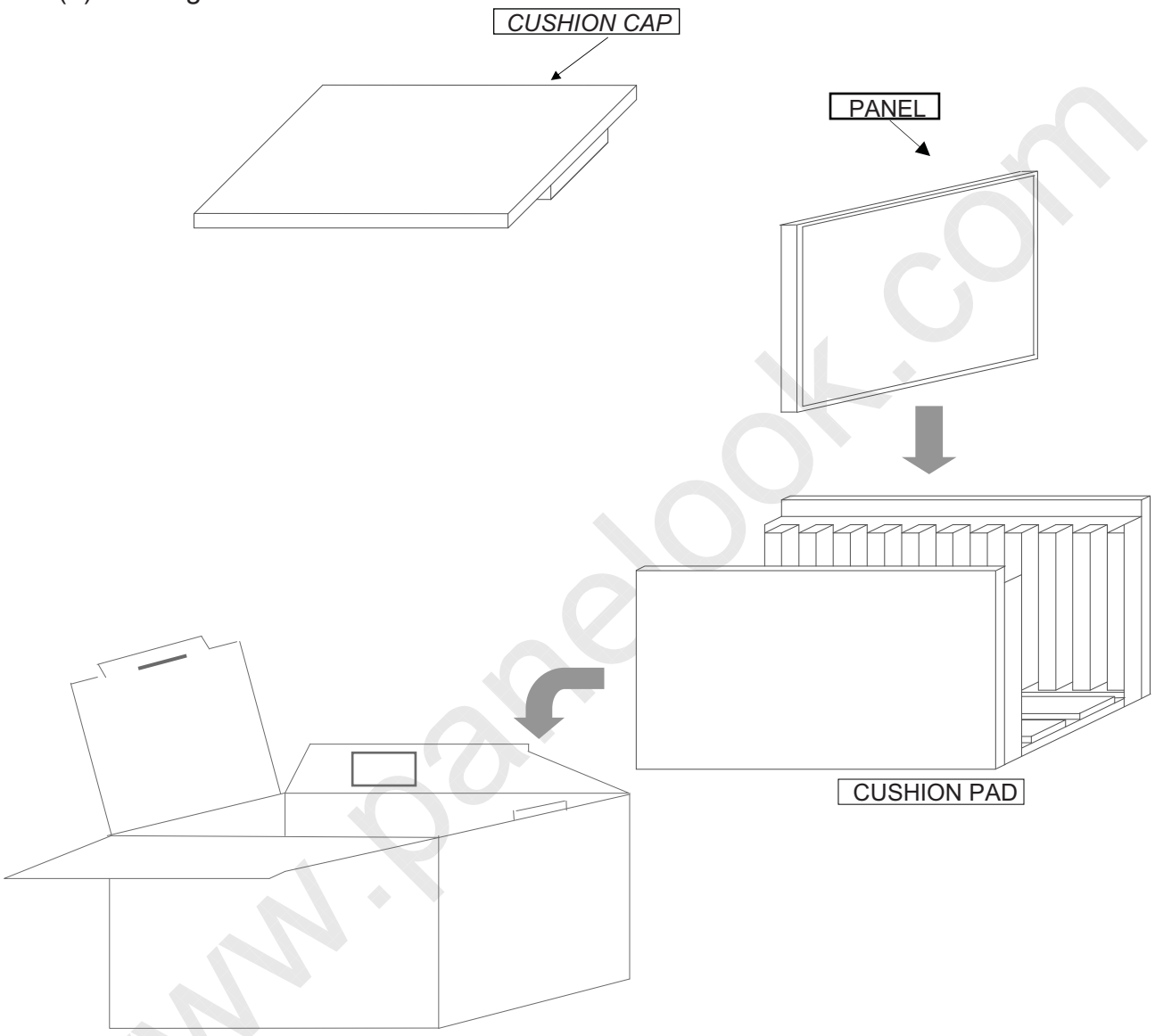
Approval

1. CARTON(Internal Package)

(1) Packing Form

Corrugated Cardboard box and Corrupad form as shock absorber

(2) Packing Method



Note 1)Total Weight : Approximately 10 kg

2) Acceptance number of piling : 10 sets

3) Carton size : 465(W)×360(D)×335(H)

PACKING CASE

Approval

No	Part name	Quantity
1	Static electric protective sack	10
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 : LTNXXXXXXX-XXX

- Product code. + Customer code. → extension code.
- Generation
- Tech, information
- Resolution
- Size

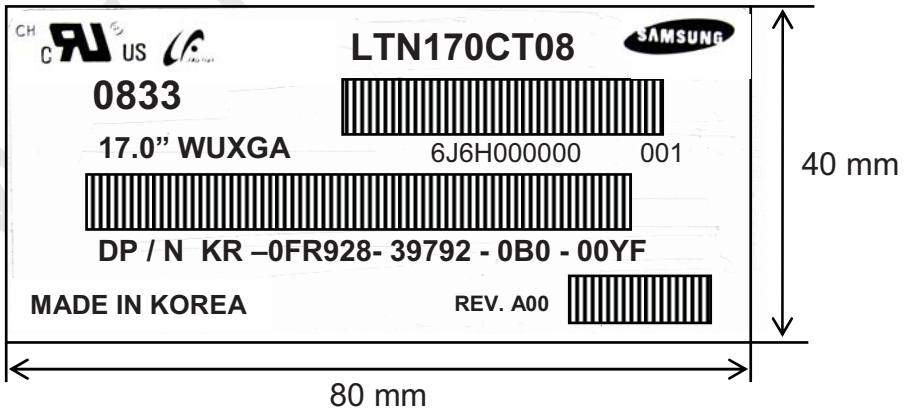
(2) Revision : Three letters

(3) Lot number : X Y 7 A XXX XX X

- Cell Position No.(In the one Glass)
- Glass No.(In the one Lot)
- Lot No.(Glass)
- Month
- Year(Note 1)
- Product Code
- Line

NOTE 1). This code indicating year is omitted in the products of KIHENG site.

(4) Nameplate Indication (Following example is only for reference)



Parts name : LTN170CT08
Lot number : 6J6H000000
Inspected work week : 0833
DP/N : Dell Part Number ("FR928" is for LTN170CT08-0)
REV. A00 : Product Revision Code

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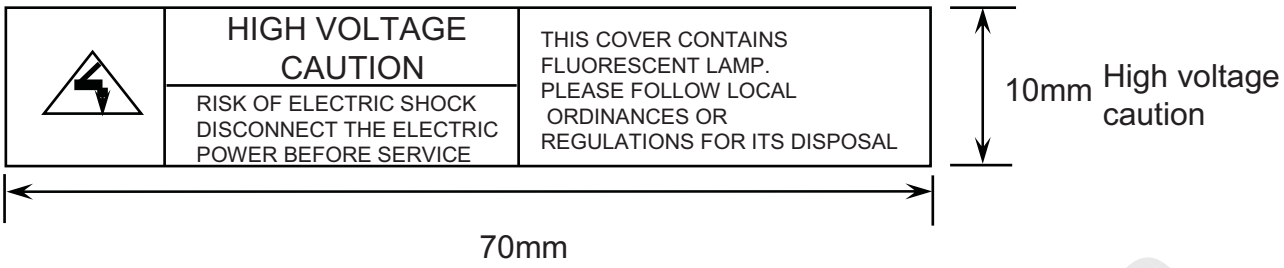
This HIGH VOLTAGE CAUTION is carved in mold frame



(6) Packing box attach

0FR928 : DELL P/N

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

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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 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.