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**ELECTRONICS**

Approval



TO

DATE : Jul. 14. 2009.

**SAMSUNG TFT-LCD**

**MODEL NO. : LTN154AT12**

NOTE :

- Extension code [ -0 ] ; LTN154AT12-0
- Surface type [ **Anti-glare** ]

Any Modification of Specification is not allowed without SEC's Permission.

APPROVED BY :

*K. H. Shin*

PREPARED BY : **LCD Development Group 1 (Mobile)**

**SAMSUNG ELECTRONICS CO., LTD.**



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# REVISION HISTORY

Approval

Date	Revision No.	Page	Summary
Jul. 14. 2009	A00	All	Approval spec was issued.

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## GENERAL DESCRIPTION

### DESCRIPTION

LTN154AT12 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 15.4" contains 1,280 x 800 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
- 1280 x 800 pixels resolution
- Low power consumption
- Fast Response
- DE (Data enable) only mode
- 3.3V LVDS Interface
- Onboard EEDID chip
- LED BLU

### 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	331.2(H) x 207.0(V) (15.4" diagonal )	mm	
Driver element	a-Si TFT active matrix		
Display colors	262,144		
Number of pixel	1280 x RGB(3) x 800	pixel	16 : 10
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.2588(H) x 0.2588(V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 40, Hard-Coating 3H		Anti Glare

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## Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	343.5	344.0	344.5	mm	w/o inverter ass'y
	Vertical (V)	221.5	222.0	222.5	mm	
	Depth (D)	-	-	6.5	mm	
Weight		-	550	565	g	LCD module only (w/o converter)

## 1. ABSOLUTE MAXIMUM RATINGS

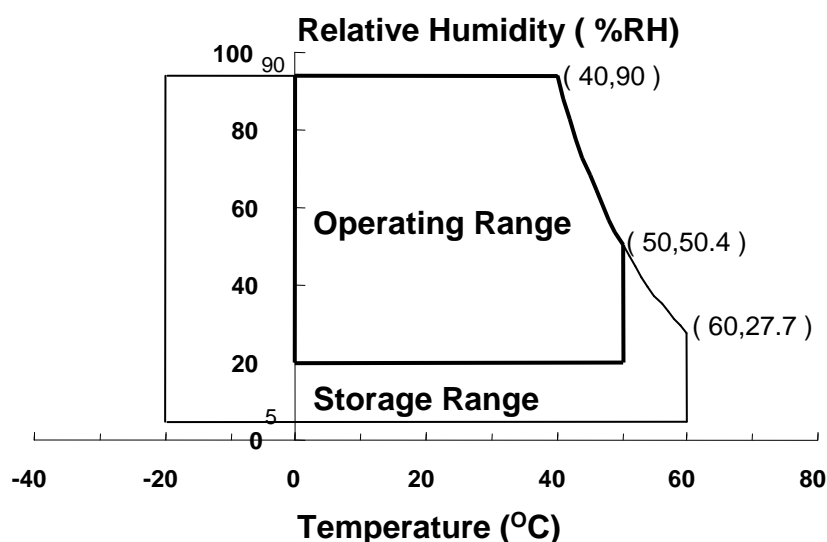
## 1.1 ENVIRONMENTAL ABSOLUTE RATINGS

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. ( $40\text{ }^{\circ}\text{C} \geq T_a$ )

Maximum wet - bulb temperature at  $39\text{ }^{\circ}\text{C}$  or less. ( $T_a > 40\text{ }^{\circ}\text{C}$ ) No condensation



(2) 2ms, half sine wave, one time for  $\pm X, \pm Y, \pm Z$ .

(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  $T_a$  ( $25 \pm 2$  °C )

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## 2. OPTICAL CHARACTERISTICS

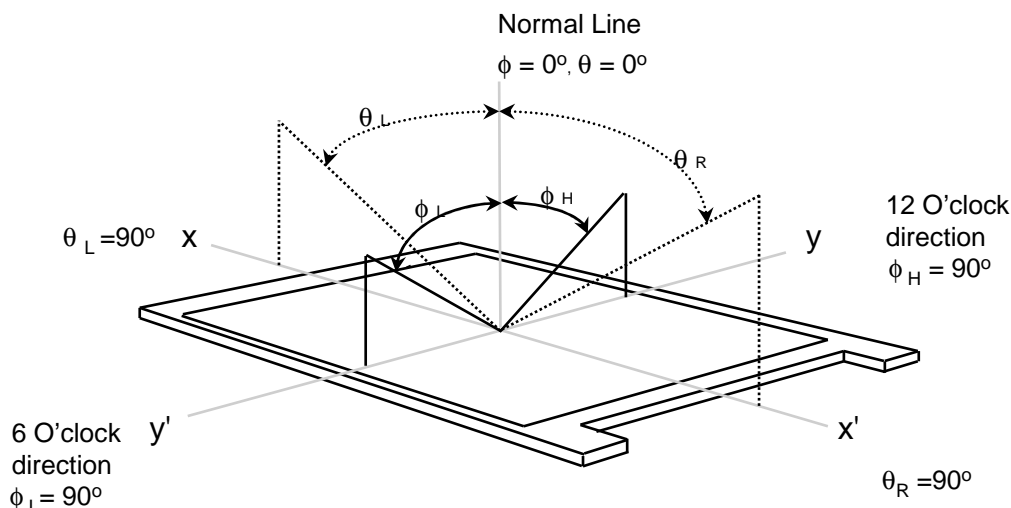
The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (5).  
Measuring equipment : TOPCON BM-5A and PR-650

\* Ta = 25 ± 2 °C, VDD=3.3V, fv= 60Hz, fDCLK = 74.76MHz

Item	Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)	CR		300	500	-	-	AG (1), (2), (5)
Response Time at Ta ( Rising + Falling )	T <sub>RT,BW</sub>		-	16	25	msec	(1), (3)
Average Luminance of White (5 Points)	Y <sub>L,AVE</sub>		200	220	-	cd/m <sup>2</sup>	(1), (4)
Color Chromaticity ( CIE )	Red	R <sub>X</sub>	0.555	0.585	0.615	-	(1), (5) PR-650
		R <sub>Y</sub>	0.311	0.341	0.371		
	Green	G <sub>X</sub>	0.312	0.342	0.372		
		G <sub>Y</sub>	0.515	0.545	0.575		
	Blue	B <sub>X</sub>	0.121	0.151	0.181		
		B <sub>Y</sub>	0.083	0.113	0.143		
	White	W <sub>X</sub>	0.283	0.313	0.343		
		W <sub>Y</sub>	0.299	0.329	0.359		
Viewing Angle	Hor.	θ <sub>L</sub>	40	45	-	Degrees	(1), (5) BM-5A
		θ <sub>H</sub>	40	45	-		
	Ver.	φ <sub>H</sub>	10	15	-		
		φ <sub>L</sub>	25	30	-		
	Hor.	θ <sub>L</sub>	25	-	-	Degrees	
		θ <sub>H</sub>	25	-	-		
	Ver.	φ <sub>H</sub>	5	-	-		
		φ <sub>L</sub>	15	-	-		
13 Points White Variation	δ <sub>L</sub>		-	-	1.54	-	(6)

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Note 1) Definition of Viewing Angle : Viewing angle range( $10 \leq C/R$ )

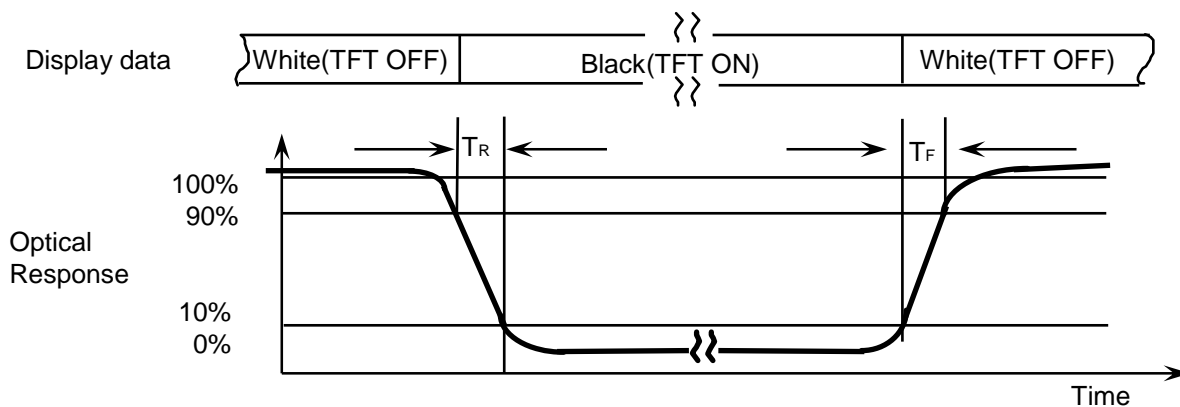


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax), gray min (Gmin) at 5 points (33, 55, 77, 37, 73)

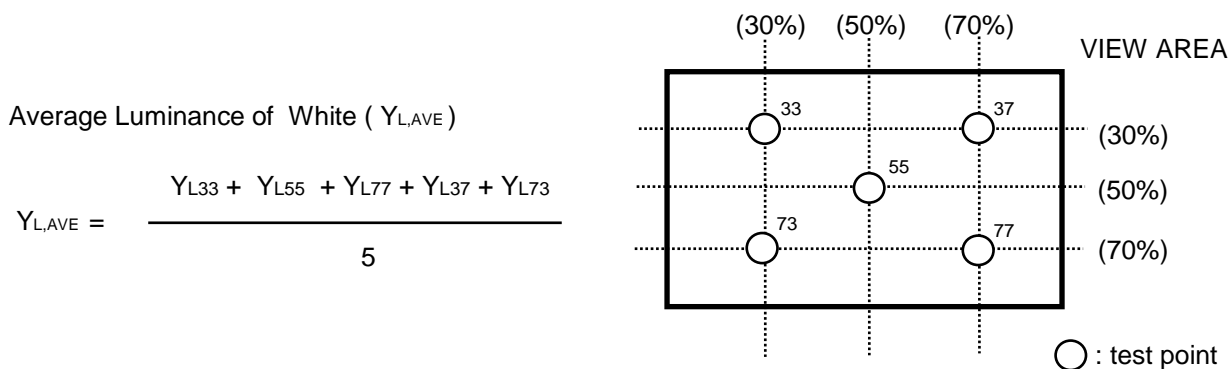
$$CR = \frac{CR(33) + CR(55) + CR(77) + CR(37) + CR(73)}{5}$$

Points : 33, 55, 77, 37, 73 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 ( $Y_{L,AVE}$ )

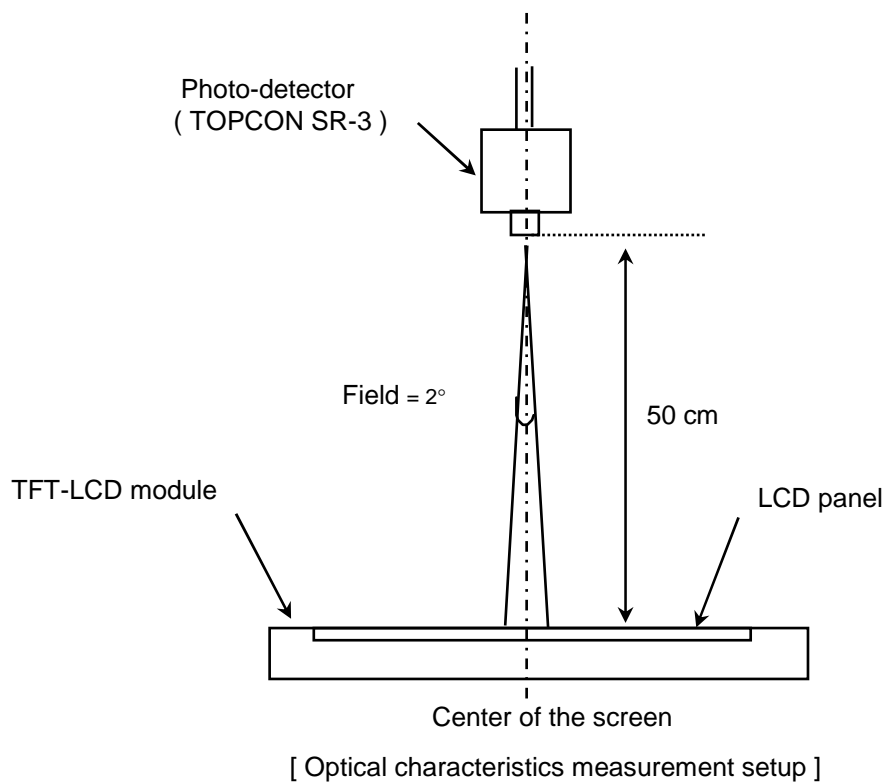
$$Y_{L,AVE} = \frac{Y_{L33} + Y_{L55} + Y_{L77} + Y_{L37} + Y_{L73}}{5}$$

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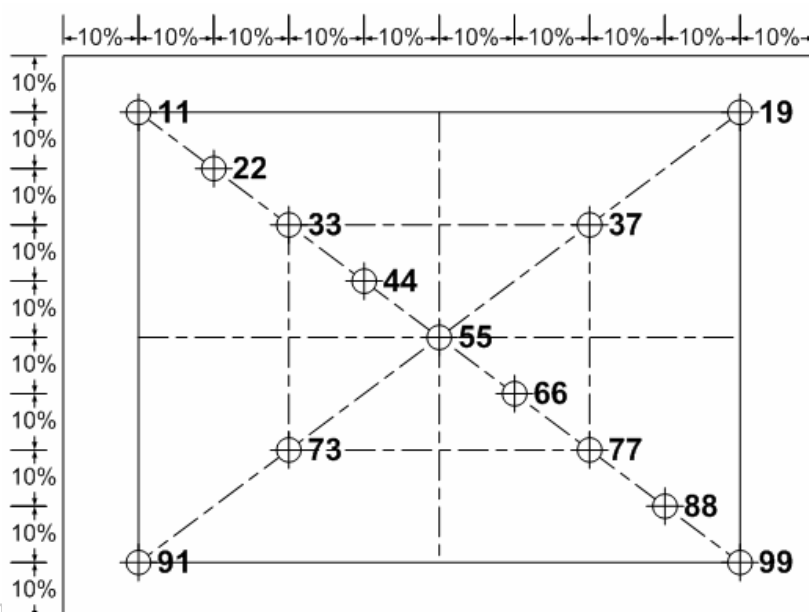
Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.

Environment condition :  $T_a = 25 \pm 2 \text{ }^\circ\text{C}$



Note 6) Definition of 13 points white variation ( $\delta L$ ), [ 11 ~ 99 ]

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



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### 3. ELECTRICAL CHARACTERISTICS

#### 3.1 TFT LCD MODULE

 $T_a = 25 \pm 2^\circ\text{C}$ 

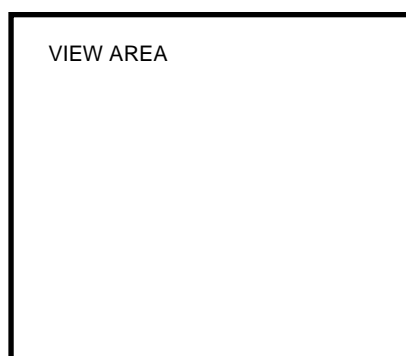
Item	Symbol	Min.	Typ.	Max.	Unit	Note	
Voltage of Power Supply	$V_{DD}$	3.0	3.3	3.6	V		
Differential Input Voltage for LVDS Receiver Threshold	High	$V_{IH}$	-	-	+100	mV	$V_{CM} = +1.2V$
	Low	$V_{IL}$	-100	-	-	mV	
Vsync Frequency	$f_V$	-	60	-	Hz		
Hsync Frequency	$f_H$	-	50.04	-	KHz		
Main Frequency	$f_{DCLK}$	-	74.76	85	MHz		
Rush Current	$I_{RUSH}$	-	-	1.5	A	(4)	
Current of Power Supply	White	$I_{DD}$	-	300	-	mA	(2),(3)*a
	Mosaic		-	350	-	mA	(2),(3)*b
	V. stripe		-	450	520	mA	(2),(3)*c

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

(2)  $f_V = 60\text{Hz}$ ,  $f_{DCLK} = 74.76\text{ MHz}$ ,  $V_{DD} = 3.3V$ , DC Current.

(3) Power dissipation pattern

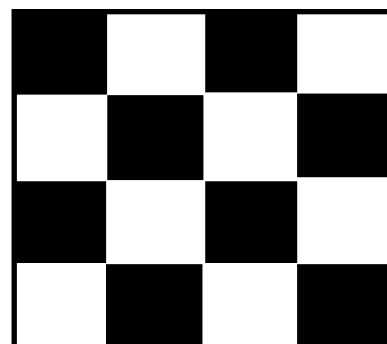
\*a) White Pattern



\*b) Mosaic Pattern

Display Brightest Gray Level →

Display Darkest Gray Level →



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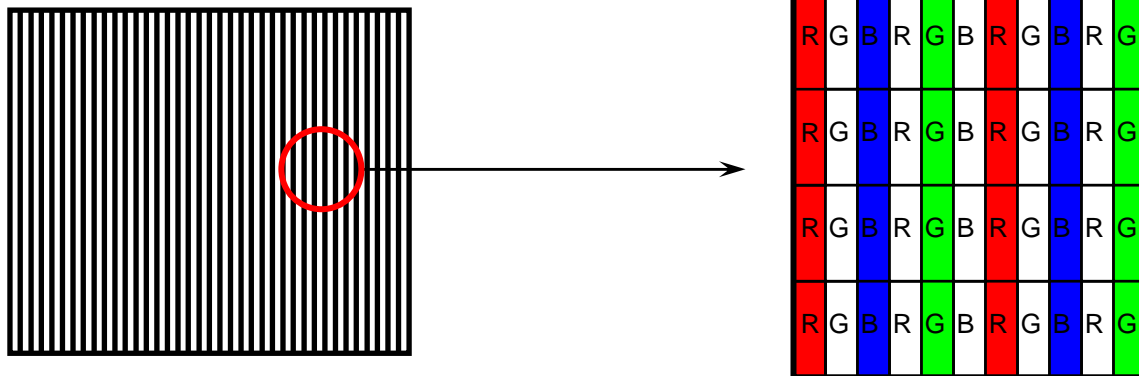
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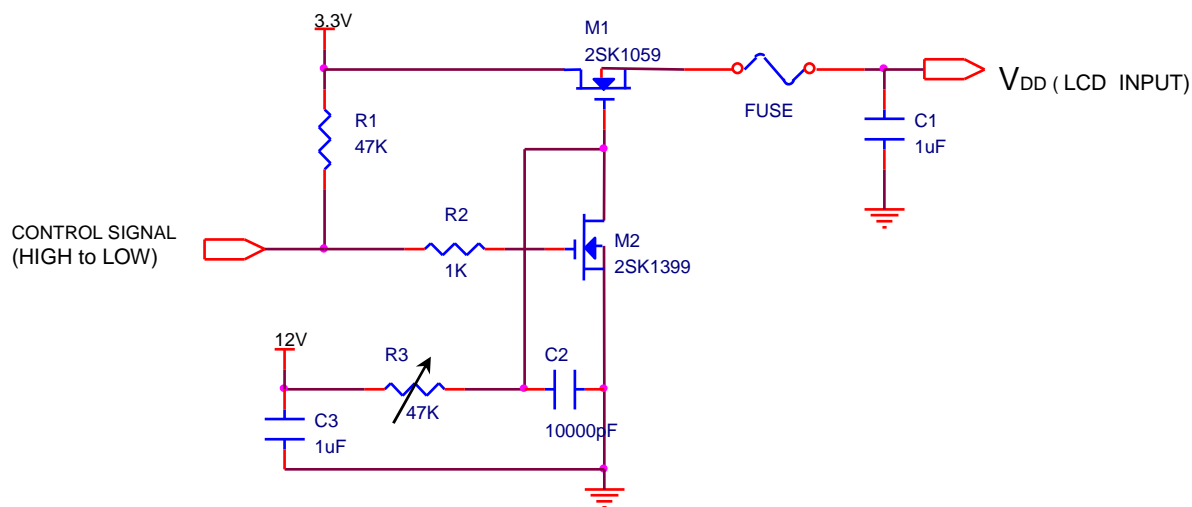
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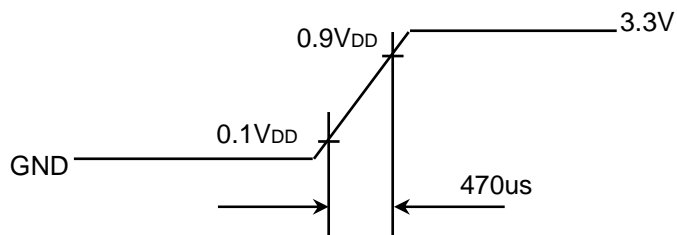
\*c) 1dot Vertical stripe pattern



4) Rush current measurement condition



$V_{DD}$  rising time is 470us



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## 3.2 BACK-LIGHT UNIT

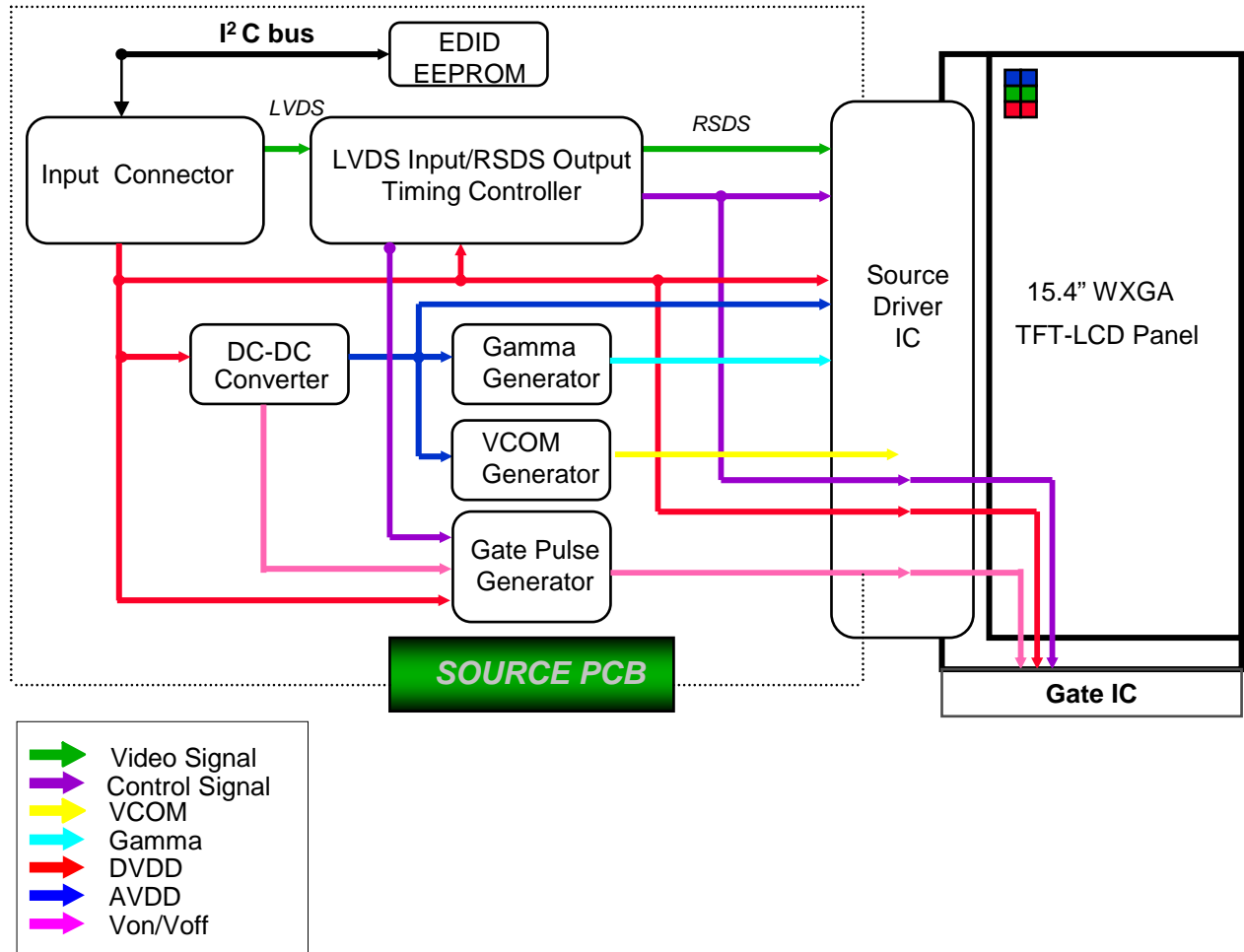
Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	-	20	-	mA	
LED Forward Voltage	VF	-	3.2	-	V	
LED Array Voltage	VP	-	25.6	-	V	VF X 8 LEDs
Power Consumption	P	-	3.07	-	W	IF X VF X 48 LEDs (w/o Converter)
Operating Life Time	Hr	-	15000	-	Hour	

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## 4. BLOCK DIAGRAM

### 4.1 TFT LCD Module



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## 5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power (LVDS, Connector : JAE FI-XB30SRL-HF11 or compatible )  
Mating Connector : JAE FI-XB30Sx-HFxx 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	BIST	Panel BIST enable		
6	CLKEDID	DDC Clock		
7	DATAEDID	DDC data		
8	RxIN0-	LVDS Differential Data INPUT (R0-R5,G0)	Negative	
9	RxIN0+	LVDS Differential Data INPUT (R0-R5,G0)	Positive	
10	GND	Ground		
11	RxIN1-	LVDS Differential Data INPUT (G1-G5,B0-B1)	Negative	
12	RxIN1+	LVDS Differential Data INPUT (G1-G5,B0-B1)	Positive	
13	GND	Ground		
14	RxIN2-	LVDS Differential Data INPUT (B2-B5,Sync,DE)	Negative	
15	RxIN2+	LVDS Differential Data INPUT (B2-B5,Sync,DE)	Positive	
16	Vss	Ground		
17	ClkIN-	LVDS Differential Clock INPUT	Negative	
18	ClkIN+	LVDS Differential Clock INPUT	Positive	
19	Vss	Ground		
20	NC	No connect		
21	NC	No connect		
22	NC	No connect		
23	NC	No connect		
24	NC	No connect		
25	NC	No connect		
26	NC	No connect		
27	NC	No connect		
28	NC	No connect		
29	NC	No connect		
30	NC	No connect		

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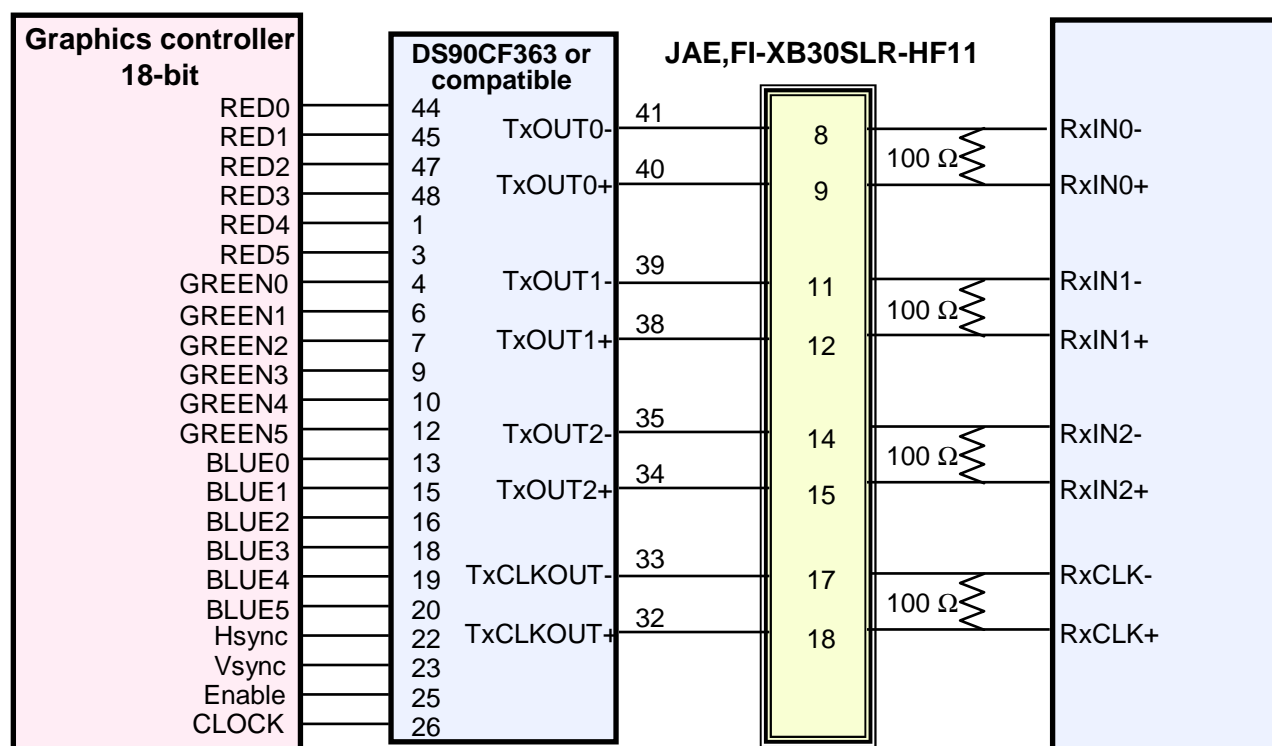
## 5.2 LVDS Interface : Transmitter DS90CF363 or Compatible

## LVDS

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

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## LVDS Interface



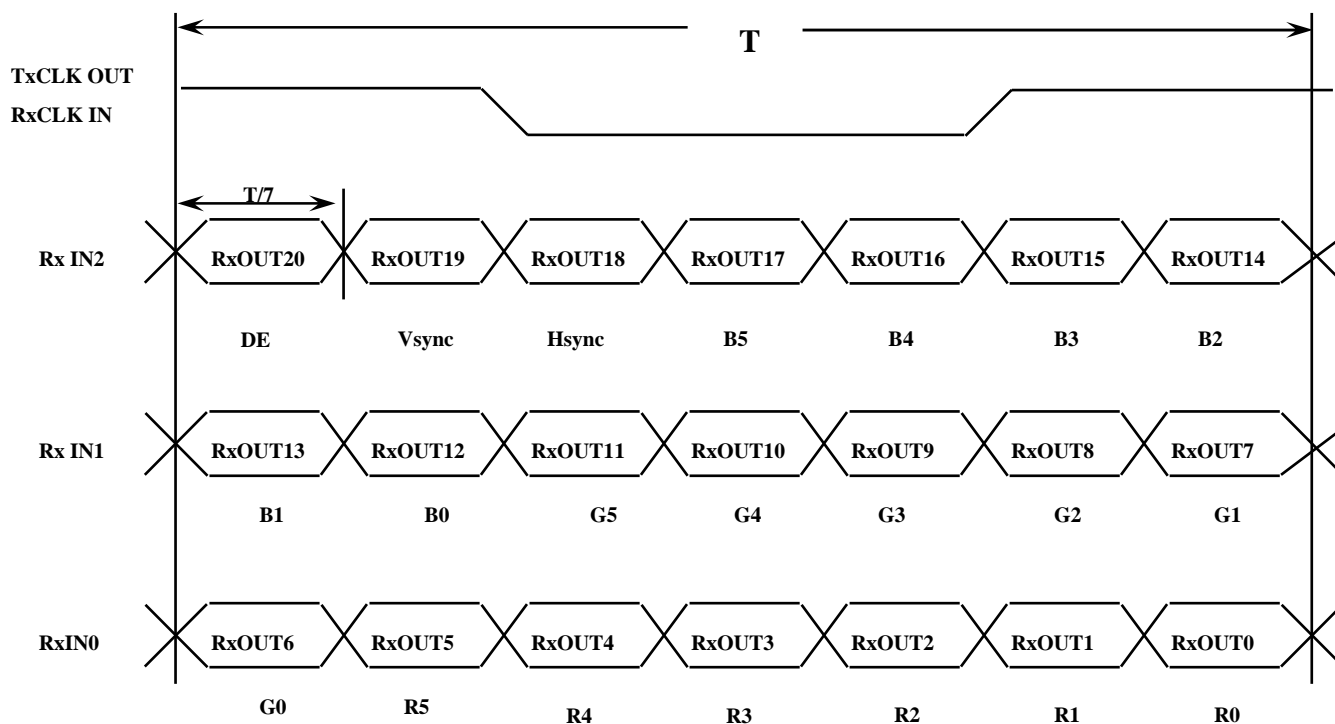
Note : The LCD Module uses a 100ohm resistor between positive and negative lines of each receiver input.

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## 5.3 Timing Diagrams of LVDS For Transmission

## LVDS Receiver : Integrated T-CON



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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
Basic Colors	Black	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	-
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	-
	Cyan	0	0	0	0	0	0	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	-
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	-
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	-
	White	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	R0
	Dark	1	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	R3~R60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	1	0	1	1	1	1	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	R62
	Red	1	1	1	1	1	1	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	G0
	Dark	0	0	0	0	0	0	1	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	G3~G60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	G61
	Light	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	G62
	Green	0	0	0	0	0	0	1	1	1	1	1	1	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	B0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	B1
	↑	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	B3~B60
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	B61
	Light	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	B62
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	B63

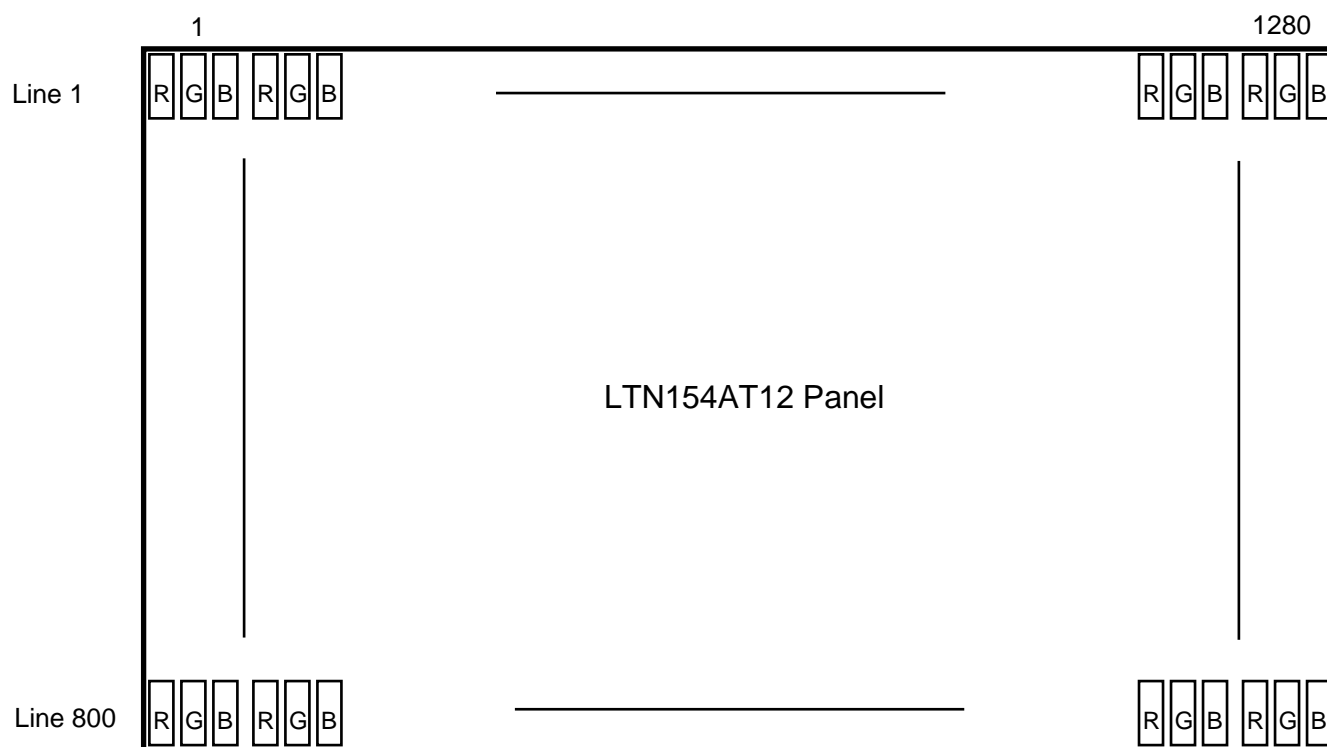
Note 1) Definition of gray :

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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## 5.6 LED FPC Connector &amp; Pin Assignment

LED FPC Connector : FH33-12S-0.5SH(05)) or Compatible

Pin No.	Function
1	LCD channel 1 cathode
2	LCD channel 2 cathode
3	LCD channel 3 cathode
4	LCD channel 4 cathode
5	LCD channel 5 cathode
6	LCD channel 6 cathode ( May be NC if channel<6)
7	LCD channel 7 cathode ( May be NC if channel<7)
8	LCD channel 8 cathode ( May be NC if channel<8)
9	NC
10	LED power bus ( LED Anode)
11	LED power bus ( LED Anode)
12	LED power bus ( LED Anode)

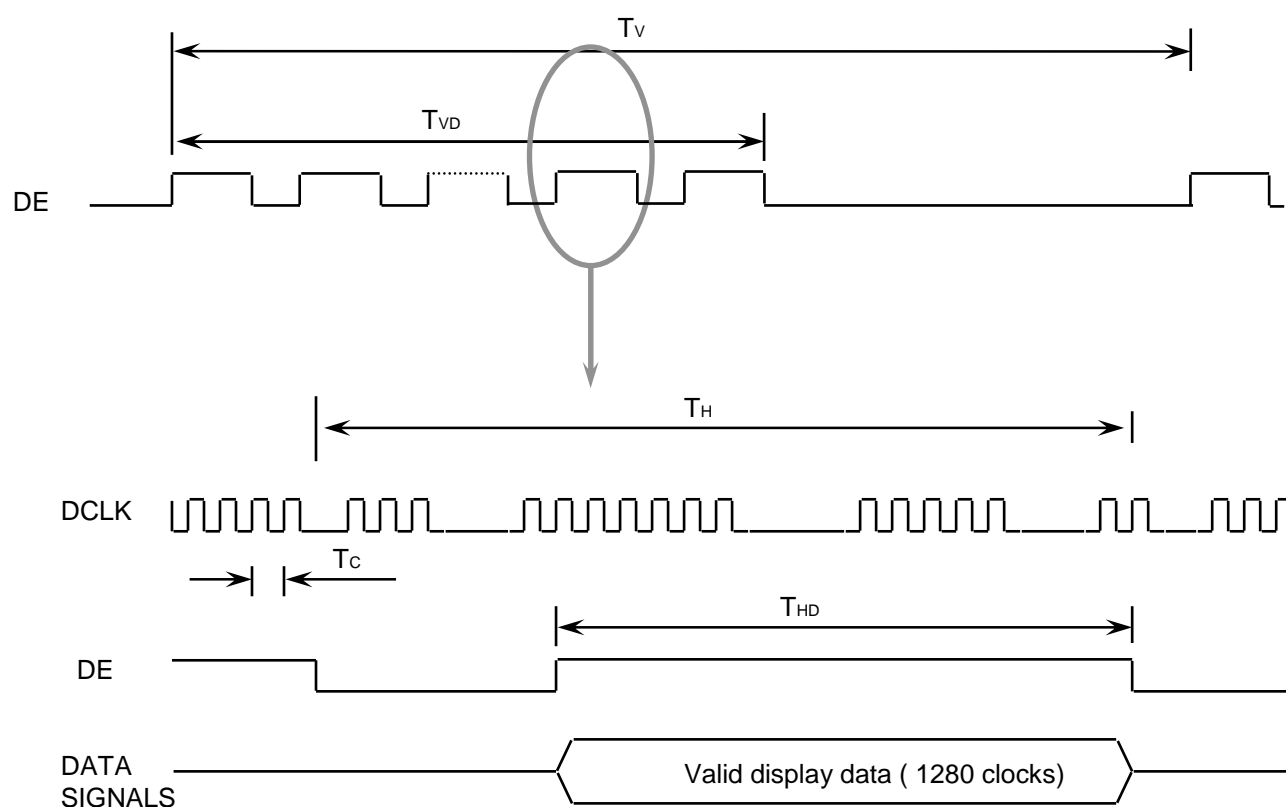
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## 6. INTERFACE TIMING

### 6.1 Timing Parameters

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	TV	804	816	1000	Lines	
Vertical Active Display Term	Display Period	TV <sub>D</sub>	-	800	-	Lines	
One Line Scanning Time	Cycle	TH	1350	1400	1550	Clocks	
Horizontal Active Display Term	Display Period	TH <sub>D</sub>	-	1280	-	Clocks	

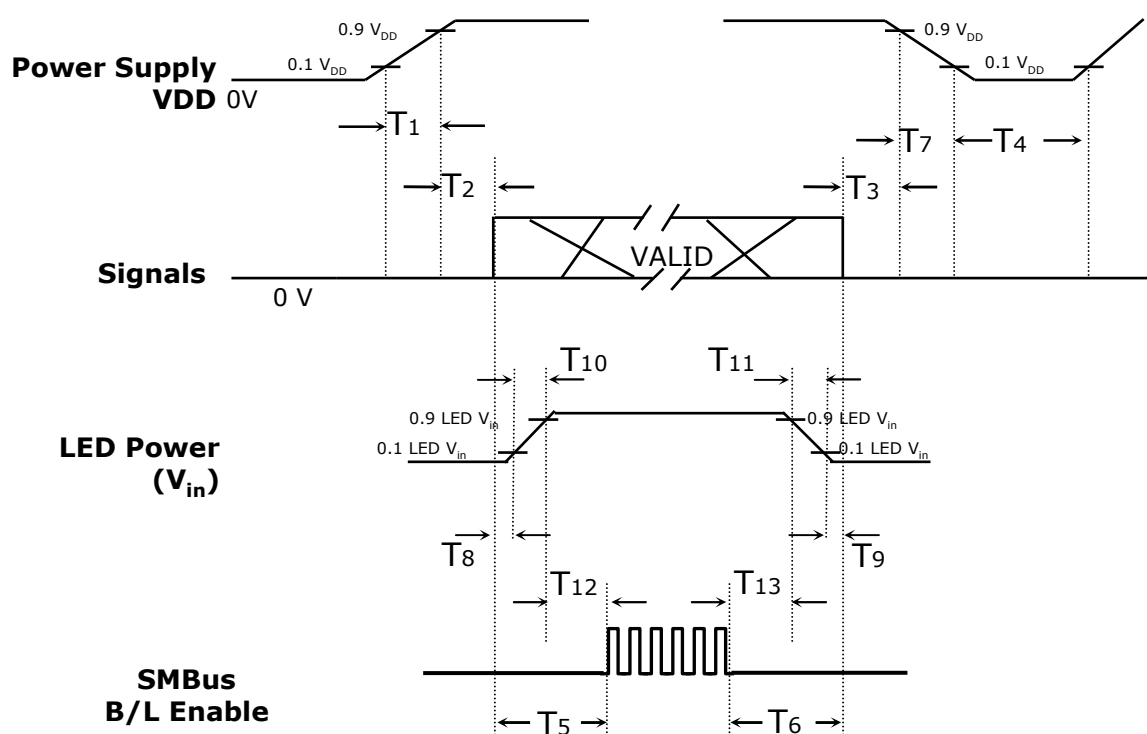
### 6.2 Timing diagrams of interface signal



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### 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
$0.5 < T_1 \leq 10$	V <sub>DD</sub> rising time from 10% to 90%
$0 < T_2 \leq 50$	Delay from V <sub>DD</sub> to valid data at power ON
$0 < T_3 \leq 50$	Delay from valid data OFF to V <sub>DD</sub> OFF at power Off
$500 \leq T_4$	V <sub>DD</sub> OFF time for Windows restart
$200 \leq T_5$	Delay from valid data to B/L enable at power ON
$200 \leq T_6$	Delay from valid data off to B/L disable at power Off
$0 < T_7 \leq 10$	V <sub>DD</sub> falling time from 90% to 10%
$10 < T_8$	Delay from valid data on to LED driver V <sub>in</sub> rising time 10%
$10 < T_9$	Delay from LED driver V <sub>in</sub> falling time 10% to valid data Off
$0.5 < T_{10} \leq 10$	LED V <sub>in</sub> rising time from 10% to 90%
$0.5 < T_{11} \leq 10$	LED V <sub>in</sub> falling time from 90% to 10%
$20 < T_{12}$	Delay from LED driver V <sub>in</sub> rising time 90% to B/L Enable
$20 < T_{13}$	Delay from B/L enable to LED driver V <sub>in</sub> falling time 10%

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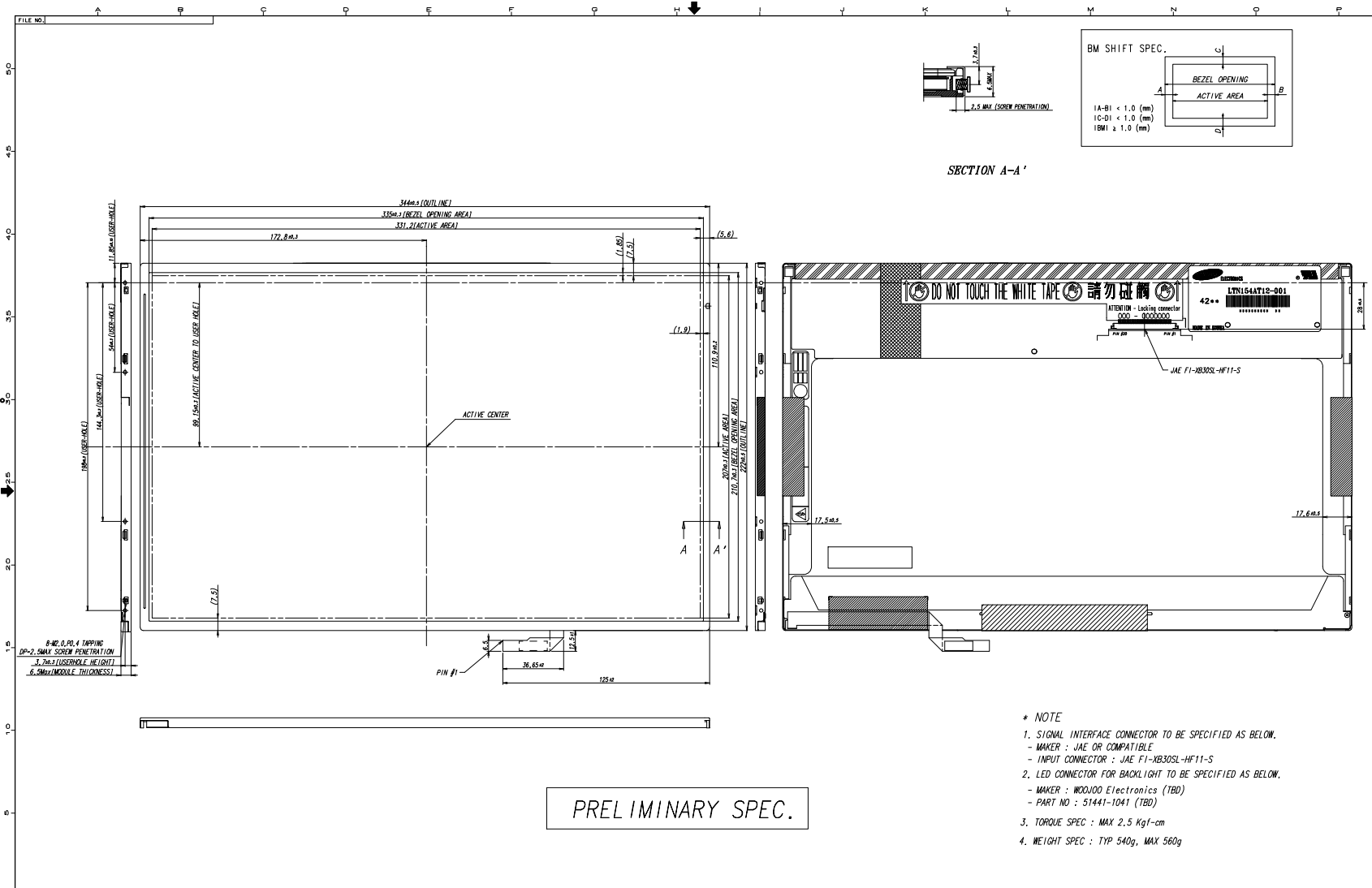
## 7. Mechanical Outline Dimension

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It will be attached with PDF file

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SECTION A-A'

PRELIMINARY SPEC.

- \* NOTE
- SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.  
 - MAKER : JAE OR COMPATIBLE  
 - INPUT CONNECTOR : JAE FI-XB30SL-HF11-S
  - LED CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW.  
 - MAKER : WOOJOO Electronics (TBD)  
 - PART NO : 51441-1041 (TBD)
  - TORQUE SPEC : MAX 2.5 Kgf-cm
  - WEIGHT SPEC : TYP 540g, MAX 560g

REV	DATE	GENERAL TOLERANCE			REV	DATE	DESCRIPTION OF REVISION	DRAWN BY	DESIGNED BY	CHECKED BY	APP'D BY	REASON	DWG NO BY	
		STEP	LEVEL 1	LEVEL 2										LEVEL 3
0	X	4	±0.05	±0.1	±0.2	SCALE	1:1						MODEL NAME	LTN154AT12-001/101
4	X	16	±0.08	±0.15	±0.3	TOLERANCE							PART/SHEET NAME	OUTLINE DIMENSION SHEET 1/1
16	X	64	±0.12	±0.25	±0.5								SPEC. NO.	
64	X	256	±0.25	±0.4	±0.8			SAMSUNG ELECTRONICS					CODE NO.	VER. 000



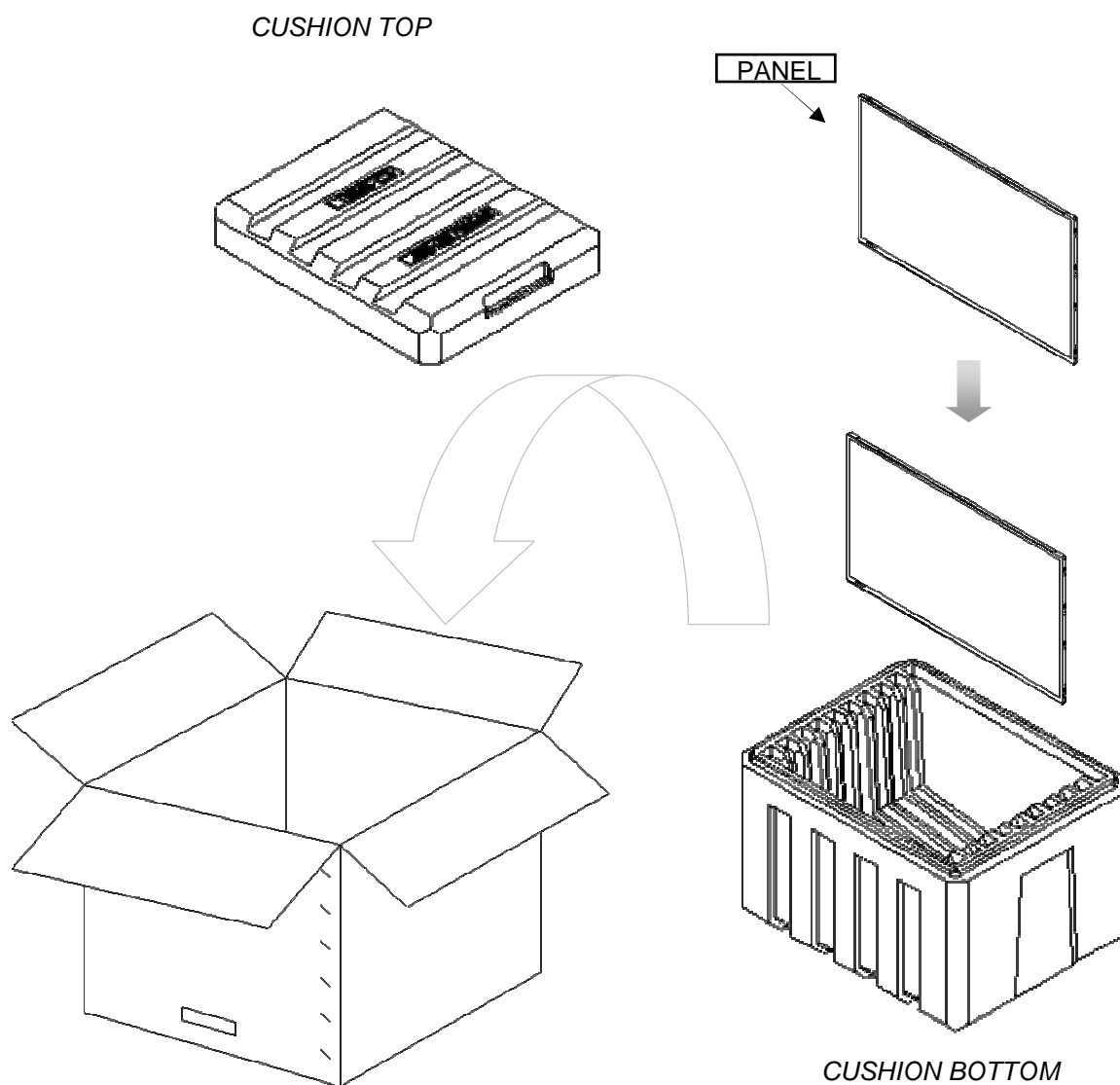
**8. PACKING**

## 1. CARTON(Internal Package)

## (1) Packing Form

Corrugated Cardboard box and Corrupad form as shock absorber

## (2) Packing Method



Note 1) Total Weight : Approximately 15.0 kg

2) Acceptance number of piling : 20 sets

3) Carton size : 344(W) x 432(D) x 329 (H)

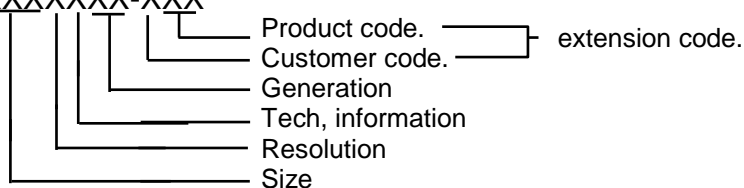
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No	Part name	Quantity
1	Static electric protective sack	10
2	Packing case (Inner box) included shock absorber	1 set
3	Pictorial marking	2 pcs
4	Carton	1 set

### 9. MARKINGS & OTHERS

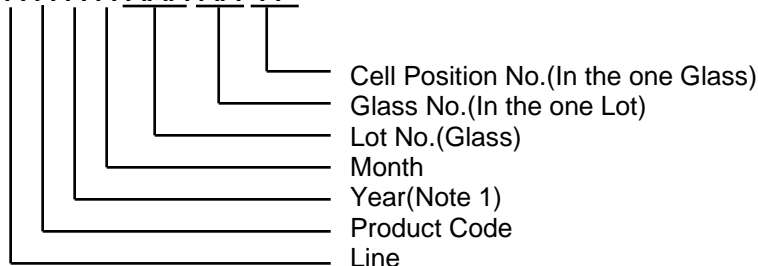
A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1) Parts number : LTNXXXXXXXX-XXX



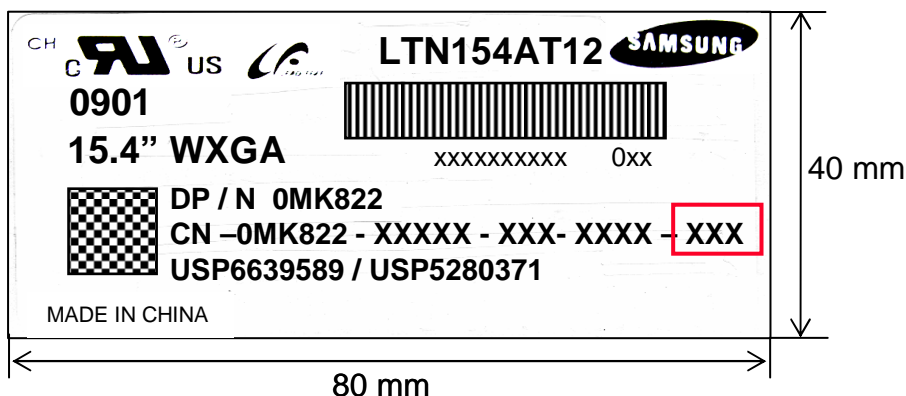
(2) Revision : Three letters

(3) Lot number : X X X X XXX XX X



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

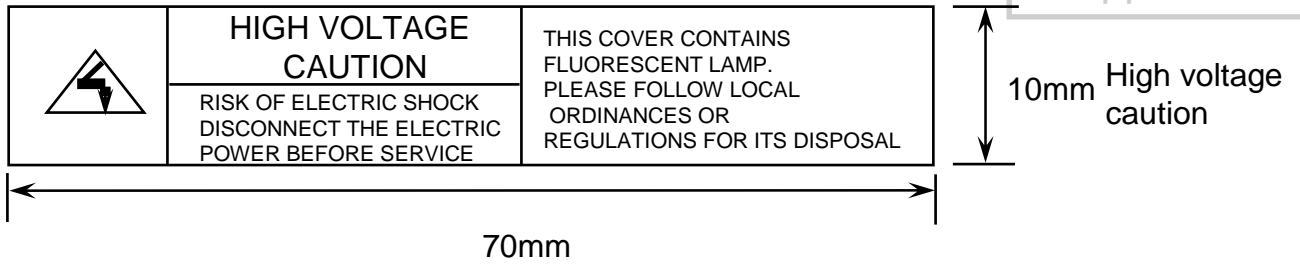
(5) Nameplate Indication( Following example is only for reference )



Parts name : LTN154AT12-0  
Lot number : xxxxxxxxxxxx  
Inspected work week : 0901 Number  
DP/N : Dell Part ("XXXXXX" is for 154AT12-0)  
REV.xxx : Product Revision Code

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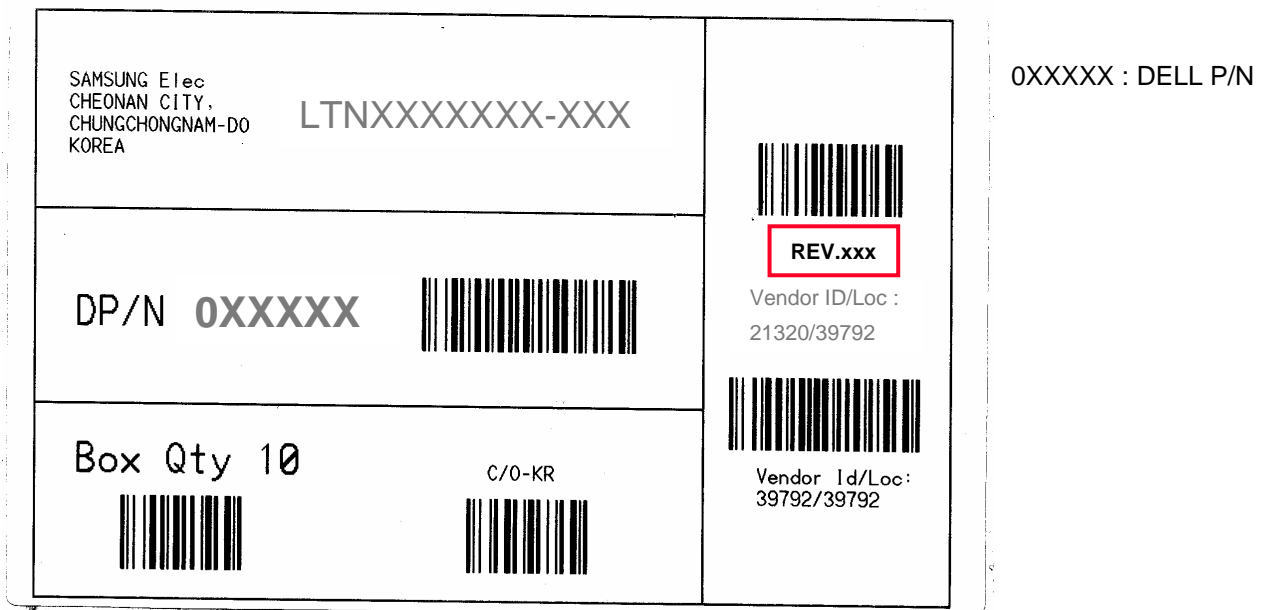
This HIGH VOLTAGE CAUTION is carved in mold frame



※ Panel revision code scheme (Refer to the Red box on the label)

Build Name(s)	Revision Code(s)
SST (WS)	X00, X01, X02, ... X09
PT (ES)	X10, X11, X12, ... X19
ST (CS)	X20, X21, X23, ... X29
XB (MP)	A00, A01, A02, ... A99

(6) Packing small box attach ( Following example is only for reference )



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



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## 10. GENERAL PRECAUTIONS

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### 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 (Isopropyl 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.

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## 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.

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	Byte	Field Name and Comments	Value	Value
	(hex)		(hex)	(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	41	01000001
	0B	Panel Supplier Reserved – Product Code	54	01010100
	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	13	00010011
	12	EDID structure version # = 1	01	00000001
	13	EDID revision # = 3	03	00000011
	Display Parameters	14	Video I/P definition = Digital I/P	90
15		Max H image size = (Rounded to cm)	21	00100001
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

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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 Descriptor #1	36	Pixel Clock/10,000 (LSB)	34	00110100	
	37	Pixel Clock/10,000 (MSB)	1D	00011101	
	38	Horizontal Active = xxxx pixels (lower 8 bits)	00	00000000	
	39	Horizontal Blanking (Thbp) = xxxx pixels (lower 8 bits)	D6	11010110	
	3A	Horizontal Active/Horizontal blanking (Thbp) (upper4:4 bits)	50	01010000	
	3B	Vertical Active = xxxx lines	20	00100000	
	3C	Vertical Blanking (Tvbp) = xxxx lines (DE Blanking typ. for DE only panels)	22	00100010	
	3D	Vertical Active : Vertical Blanking (Tvbp) (upper4:4 bits)	30	00110000	
	3E	Horizontal Sync, Offset (Thfp) = xxxx pixels	10	00010000	
	3F	Horizontal Sync, Pulse Width = xxxx pixels	30	00110000	
	40	Vertical Sync, Offset (Tvfp) = xx lines Sync Width = xx lines	13	00010011	
	41	Horizontal Vertical Sync Offset/Width upper 2 bits	00	00000000	
	42	Horizontal Image Size =xxx mm	4B	01001011	
	43	Vertical image Size = xxx mm	CF	11001111	
	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	Bit[7] 0: Non-interlace, 1: Interlace Bit[6:5] 00: Normal display, no stereo, XX: See table xx for definition Bit[4:3] 00: Analog composite, 01: Bipolar analog composite, 10: Digital composite, 11: Digital separate Bit[2:1] :The interpretation of bits 2 and 1 is dependent on the decode of bits 4 and 3 - see Table 3.18. Bit[0] :See Table VESA EDID spec for definition  Referenced Default = 1Ah	1A	00011010	
	Timing Descriptor #2	48	Pixel Clock/10,000 (LSB)	78	01111000
		49	Pixel Clock/10,000 (MSB)	13	00010011
4A		Horizontal Active = xxxx pixels (lower 8 bits)	00	00000000	
4B		Horizontal Blanking (Thbp) = xxxx pixels (lower 8 bits)	D6	11010110	
4C		Horizontal Active/Horizontal blanking (Thbp) (upper4:4 bits)	50	01010000	
4D		Vertical Active = xxxx lines	20	00100000	
4E		Vertical Blanking (Tvbp) = xxxx lines (DE Blanking typ. for DE only panels)	22	00100010	
4F		Vertical Active : Vertical Blanking (Tvbp) (upper4:4 bits)	30	00110000	
50		Horizontal Sync, Offset (Thfp) = xxxx pixels	10	00010000	
51		Horizontal Sync, Pulse Width = xxxx pixels	30	00110000	
52		Vertical Sync, Offset (Tvfp) = xx lines Sync Width = xx lines	13	00010011	
53		Horizontal Vertical Sync Offset/Width upper 2 bits	00	00000000	
54		Horizontal Image Size =xxx mm	4B	01001011	
55		Vertical image Size = xxx mm	CF	11001111	
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	Bit[7] 0: Non-interlace, 1: Interlace Bit[6:5] 00: Normal display, no stereo, XX: See table xx for definition Bit[4:3] 00: Analog composite, 01: Bipolar analog composite, 10: Digital composite, 11: Digital separate Bit[2:1] :The interpretation of bits 2 and 1 is dependent on the decode of bits 4 and 3 - see Table 3.18. Bit[0] :See Table VESA EDID spec for definition  Referenced Default = 1Ah	1A	00011010		



Timing Descriptor #3 Dell specific information	5A	Flag	00	00000000
	5B	Flag	00	00000000
	5C	Flag	00	00000000
	5D	Data Type Tag: Alphanumeric Data String (ASCII)	FE	11111110
	5E	Flag	00	00000000
	5F	Dell P/N 1 <sup>st</sup> Character	4D	01001101
	60	Dell P/N 2 <sup>nd</sup> Character	4B	01001011
	61	Dell P/N 3 <sup>rd</sup> Character	38	00111000
	62	Dell P/N 4 <sup>th</sup> Character	32	00110010
	63	Dell P/N 5 <sup>th</sup> Character	32	00110010
	64	LCD Supplier EEDID Revision # Bit[7] : 0=X, 1=A Bit[6:0] : 00, 01, 02... for SST 10, 11, 12... for PT 20, 21, 22... for ST 00, 01, 02... for X-Build (if Bit[7]=1)	80	10000000
	65	Manufacturer P/N	31	00110001
	66	Manufacturer P/N	35	00110101
	67	Manufacturer P/N	34	00110100
	Timing Descriptor #4	68	Manufacturer P/N	41
69		Manufacturer P/N	54	01010100
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
6C		Flag	00	00000000
6D		Flag	00	00000000
6E		Flag	00	00000000
6F		Data Type Tag: Manufacturer Specified Data 00	00	00000000
70		Flag	00	00000000
71		SMBUS Value = XX nits	00	00000000
72		SMBUS Value = XX nits	00	00000000
73		SMBUS Value = XX nits	00	00000000
74		SMBUS Value = XX nits	00	00000000
75		SMBUS Value = XX nits	00	00000000
76		SMBUS Value = XXX nits	00	00000000
77	SMBUS Value = XXX nits	00	00000000	
78	SMBUS Value = max nits (Typically = 00h, XXX nits)	00	00000000	
79	Bit[7:3] Reserved Bit[2] 0: No RTC support, 1: RTC support Bit[1:0] 00: reserved, 01: single LVDS, 10: dual LVDS, 11: reserved  01h single channel LVDS, no RTC support 02h single channel LVDS, with RTC support 05h dual channel LVDS, no RTC support 06h dual channel LVDS, with RTC support	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)	4E	01001110

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