



DATE : July. 17, 2007

SAMSUNG TFT-LCD**MODEL NO : LTN154BT03-001**Surface type [**Glossy**]Any Modification of Spec is not allowed without SEC' permissionAPPROVED BY : W. B. YounPREPARED BY : LCD Development Team 3**SAMSUNG ELECTRONICS CO., LTD.****Samsung Secret**

CONTENTS

| | |
|---|--------------|
| Revision History | ----- (3) |
| General Description | ----- (4) |
| 1. Absolute Maximum Ratings | ----- (5) |
| 1.1 Absolute Ratings of environment | |
| 1.2 Electrical Absolute Ratings | |
| 2. Optical Characteristics | ----- (7) |
| 3. Electrical Characteristics | ----- (10) |
| 3.1 TFT LCD Module | |
| 3.2 Backlight Unit | |
| 4. Block Diagram | ----- (13) |
| 4.1 TFT LCD Module | |
| 4.2 Backlight Unit | |
| 5. Input Terminal Pin Assignment | ----- (14) |
| 5.1 Input Signal & Power | |
| 5.2 LVDS Interface | |
| 5.3 Backlight Unit | |
| 5.4 Timing Diagrams of LVDS For Transmitting | |
| 5.5 Input Signals, Basic Display Colors and Gray Scale of Each Color. | |
| 5.6 Pixel format | |
| 6. Interface Timing | ----- (19) |
| 6.1 Timing Parameters | |
| 6.2 Timing Diagrams of interface Signal | |
| 6.3 Power ON/OFF Sequence | |
| 7. Outline Dimension | ----- (21) |
| 8. General Precaution | ----- (23) |

REVISION HISTORY

Approval

| Date | Revision No. | Page | Summary |
|---------------|--------------|---------------|---|
| Jan. 22, 2007 | P00 | All | LTN154BT03-001 Model spec was issued first. |
| Apr. 05 2007 | P01 | 7 12 14 | Brightness spec was adjusted to 300nit(typ) Max. LED forward voltage was changed to 3.45V Pin assignment was changed by Apple. Pin#5 NC → VDD(+3.3V) |
| Apr. 27 2007 | A00 | All | LTN154BT03-001 Model spec was approved. |
| Jul. 17 2007 | A01 | 7 | Tolerance of white color coordinate was changed. 13point uniformity was changed to 1.5max Viewing angle was changed |
| | | | |

Samsung Secret

Doc.No.

LTN154BT03-001

Rev.No

04-A01-G-070717

Page

3 / 25

GENERAL DESCRIPTION

DESCRIPTION

LTN154BT03-001 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 15.4" contains 1440 x 900 pixels and can display up to 262,144 colors. 6 O'clock direction is the Optimum viewing angle.

FEATURES

- Thin and light weight
- High contrast ratio, high aperture structure
- Wide XGA+ (1440x900 pixels) resolution
- Fast Response Time
- Low power consumption
- LED BLU Structure
- DE (Data enable) only mode.
- 3.3V LVDS Interface
- On board EDID 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 | 331.56(H) X 207.23(V) (15.4" diagonal) | mm | |
| Driver element | a-si TFT active matrix | | |
| Display colors | 262,144 | | |
| Number of pixel | 1440 x 900 (16 : 10, Wide XGA) | pixel | |
| Pixel arrangement | RGB vertical stripe | | |
| Pixel pitch | 0.23025(H) x 0.23025(V) | mm | |
| Display Mode | Normally white | | |
| Surface treatment | Haze 0, Hard-Coating 3H | | LT4 |

Samsung Secret

Mechanical Information

| Item | | Min. | Typ. | Max. | Unit | Note |
|-------------|----------------|-------|-------|-------|------|------|
| Module size | Horizontal (H) | 343.5 | 344.0 | 344.5 | mm | |
| | Vertical (V) | 221.5 | 222.0 | 222.5 | mm | |
| | Depth (D) | - | 5.8 | 6.1 | mm | (1) |
| Weight | | - | 430 | 450 | g | |

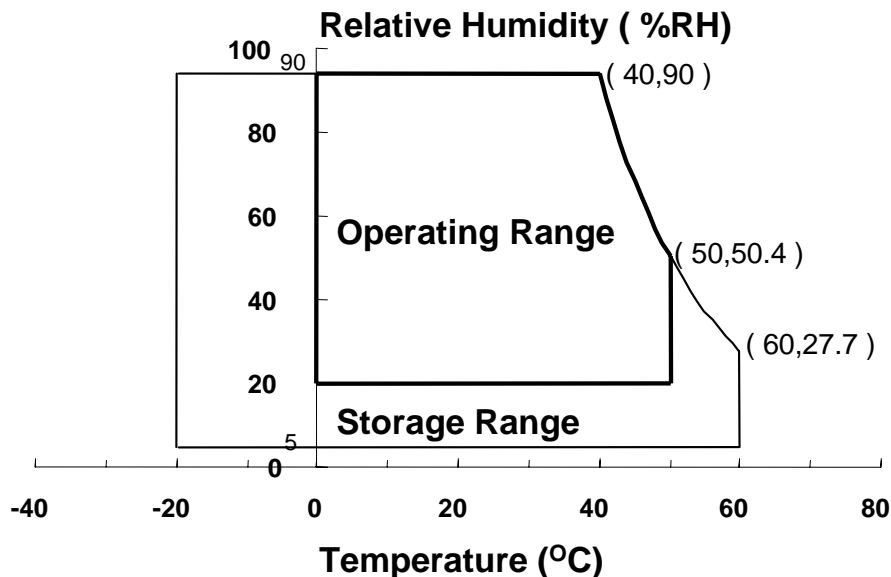
Note (1) Measurement condition of outline dimension
 . Equipment : Vernier Calipers
 . Push Force : 500g · f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

| Item | Symbol | Min. | Max. | Unit | Note |
|---|--------|------|------|------|---------|
| Storage temperate | TSTG | -20 | 60 | °C | (1) |
| 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. ($40\text{ }^{\circ}\text{C} \geq T_a$)
 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.

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 ± 2 °C)

(2) BACK-LIGHT UNIT

 $T_a = 25 \pm 2$ °C

| Item | Symbol | Min. | Max. | Unit | Note |
|-------------|--------|------|------|------|------|
| LED Current | I_L | - | 25 | mA | (1) |
| LED Voltage | V_L | 2.8 | 3.6 | V | (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.

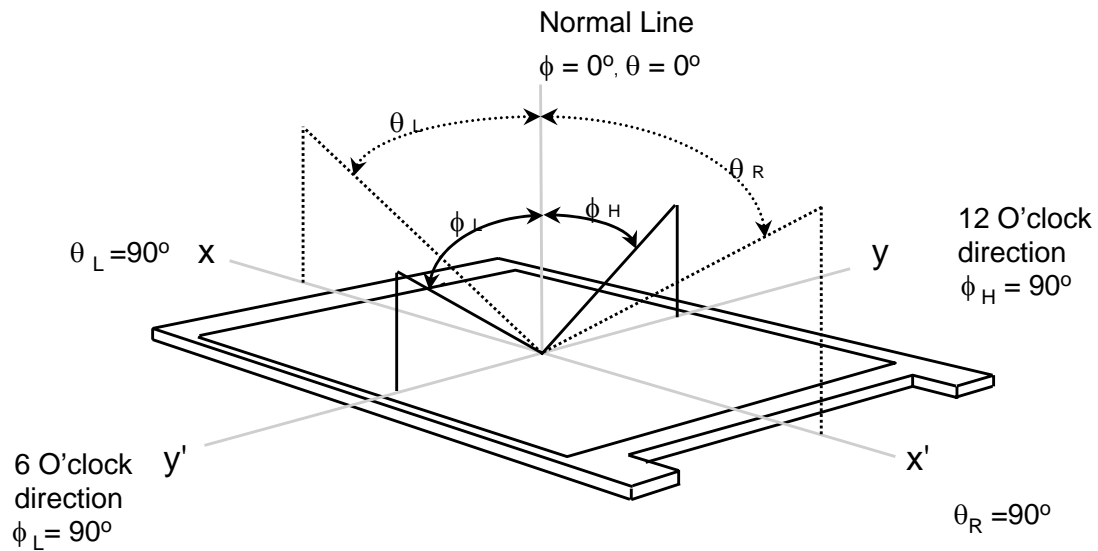
2. OPTICAL CHARACTERISTICS

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 SR-3

* Ta = 25 ± 2 °C, V_{DD}=3.3V, f_v= 60Hz, f_{dCLK} = 96.31MHz, I_L = 19mA

| Item | | Symbol | Condition | Min. | Typ. | Max | Unit | Note |
|---|-------|--------------------|--|-------|-------|-------|-------------------|----------------------------------|
| Contrast Ratio (5 Points) | | CR | Normal Viewing Angle φ = 0 θ = 0 | 450 | 500 | - | - | (1), (2), (5) |
| Response Time at Ta (Rising + Falling) | | T _{RT} | | - | 16 | 20 | msec | (1), (3) |
| Average Luminance of White (5 Points) | | Y _{L,AVE} | | 270 | 300 | - | cd/m ² | I _L =19mA (1), (4) |
| Color Chromaticity (CIE) | Red | R _X | | 0.565 | 0.595 | 0.625 | - | (1), (5) SR-3 |
| | | R _Y | | 0.315 | 0.345 | 0.375 | | |
| | Green | G _X | | 0.290 | 0.320 | 0.350 | | |
| | | G _Y | | 0.525 | 0.555 | 0.585 | | |
| | Blue | B _X | 0.125 | 0.155 | 0.185 | | | |
| | | B _Y | 0.115 | 0.145 | 0.175 | | | |
| | White | W _X | 0.293 | 0.313 | 0.333 | | | |
| | | W _Y | 0.306 | 0.329 | 0.352 | | | |
| Viewing Angle | Hor. | θ _L | CR ≥ 10 | 60 | 65 | - | Degrees | |
| | | θ _H | | 60 | 65 | - | | |
| | Ver. | φ _H | | 55 | 60 | - | | |
| | | φ _L | | 55 | 65 | - | | |
| 13 Points White Variation | | δ _L | | - | - | 1.5 | - | (6) |

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

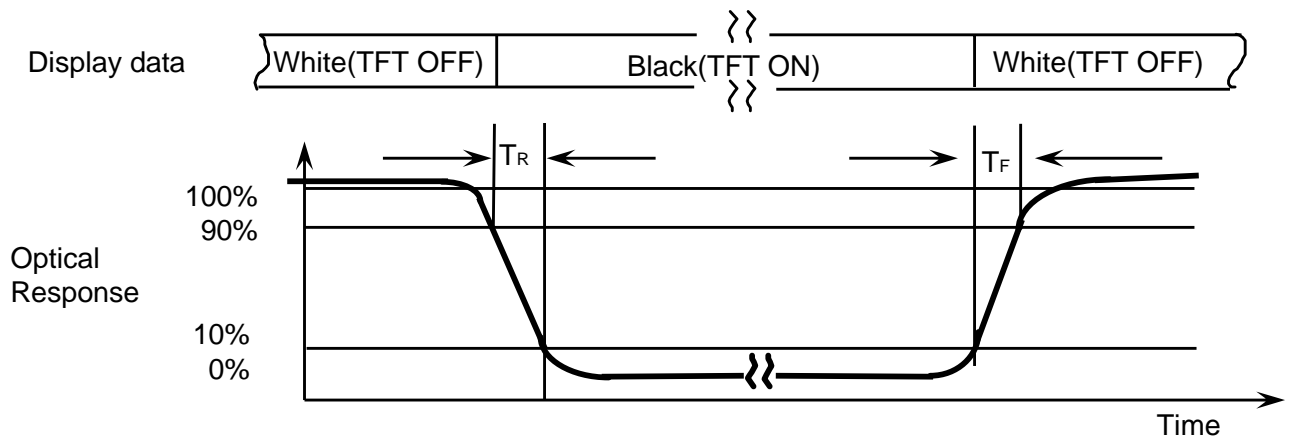


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points(4, 5, 7, 9, 10)

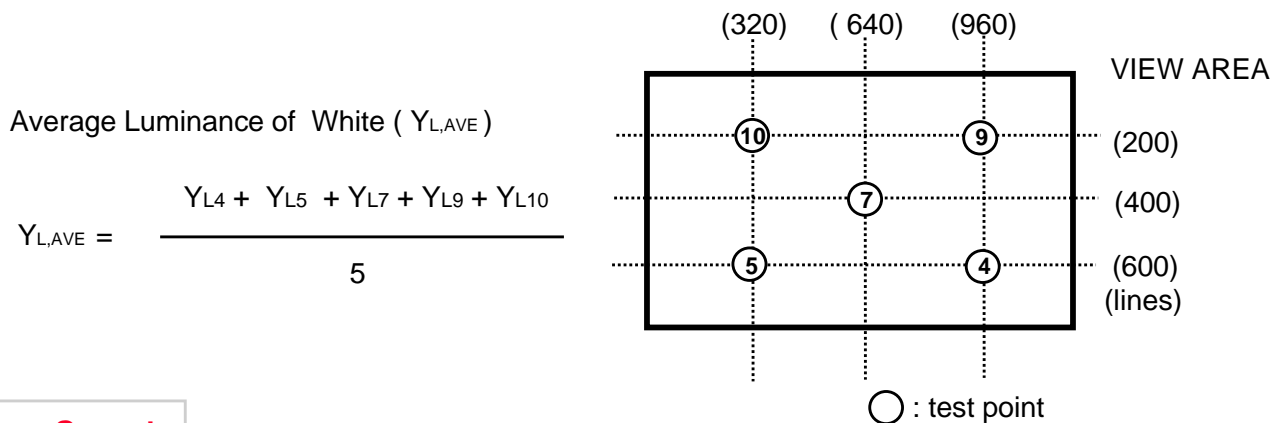
$$CR = \frac{CR(4) + CR(5) + CR(7) + CR(9) + CR(10)}{5}$$

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

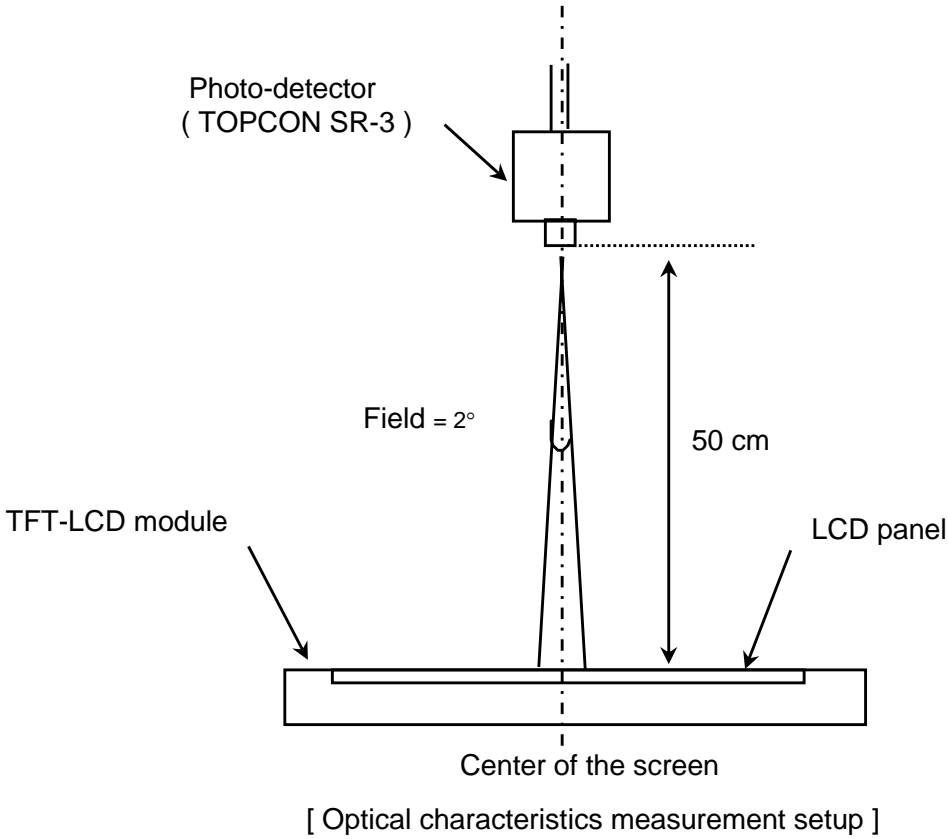
Note 3) Definition of Response time :



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

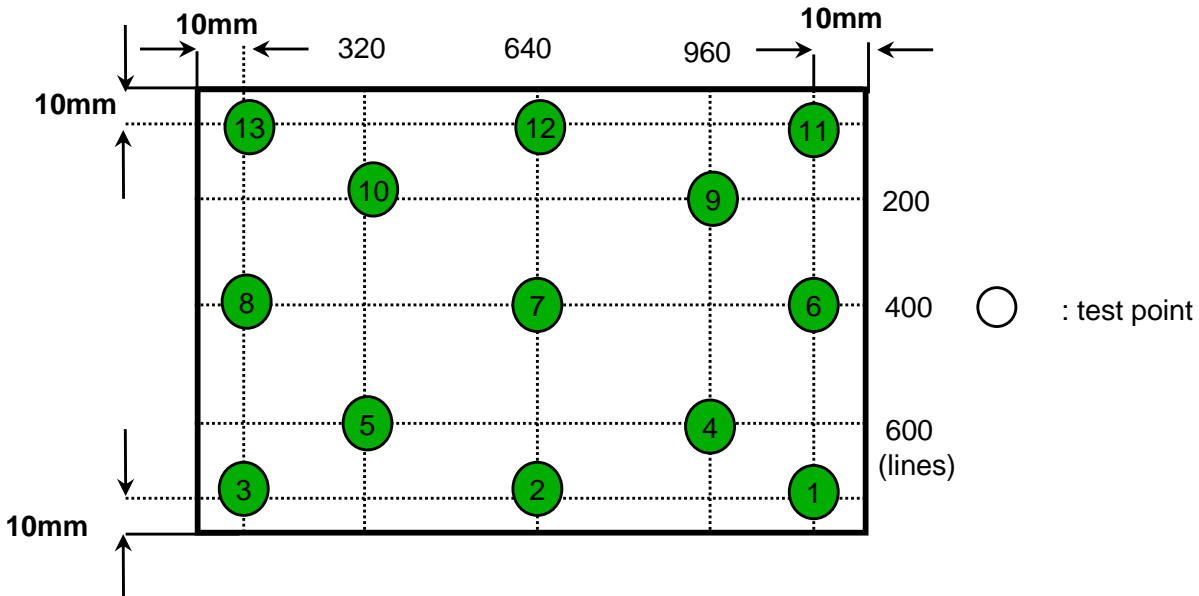


Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.
 LED current : 19.0mA (Inverter : SIC-130T)
 Environment condition : Ta = 25 ± 2 °C



Note 6) Definition of 13 points white variation (δL), [① ~ ⑬]

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



Samsung Secret

3. ELECTRICAL CHARACTERISTICS

Approval

3.1 TFT LCD MODULE

Ta= 25 ± 2°C

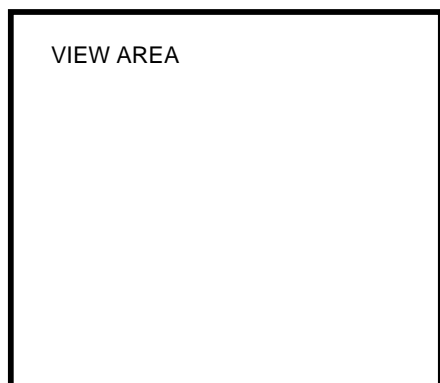
| Item | Symbol | Min. | Typ. | Max. | Unit | Note | |
|--|-------------------|-----------------|--------|------|------|------|-------------------------|
| Voltage of Power Supply | V _{DD} | 3.0 | 3.3 | 3.6 | V | | |
| Differential Input Voltage for LVDS Receiver Threshold | High | V _{IH} | - | - | +100 | mV | V _{CM} = +1.2V |
| | Low | V _{IL} | -100 | - | - | mV | |
| Vsync Frequency | f _v | - | 60 | - | Hz | | |
| Hsync Frequency | f _H | - | 54.67 | - | KHz | | |
| Main Frequency | f _{DCLK} | - | 48.155 | - | MHz | | |
| Rush Current | I _{RUSH} | - | - | 1.5 | A | (4) | |
| Current of Power Supply | White | I _{DD} | - | 320 | - | mA | (2),(3)*a |
| | Mosaic | | - | 330 | - | mA | (2),(3)*b |
| | V. Stripe | | - | 390 | 410 | mA | (2),(3)*c |

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

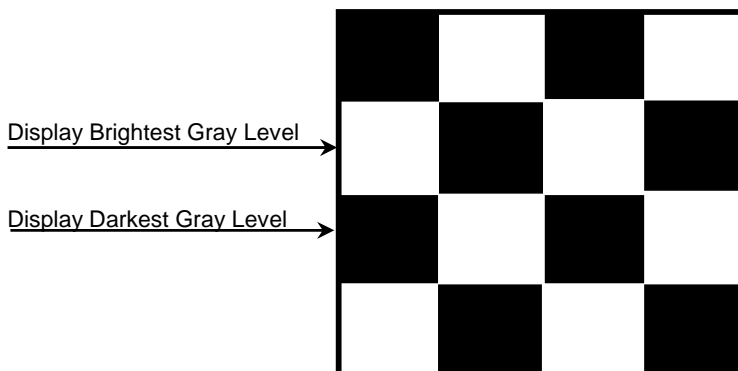
(2) f_v = 60Hz, f_{DCLK} = 48.155MHz, V_{DD} = 3.3V , DC Current.

(3) Power dissipation pattern

*a) White Pattern

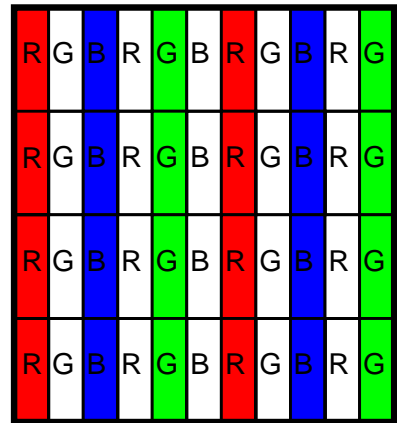
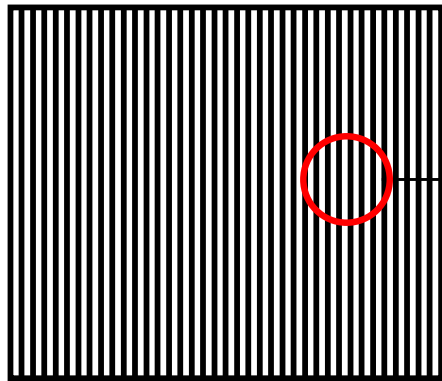


*b) Mosaic Pattern

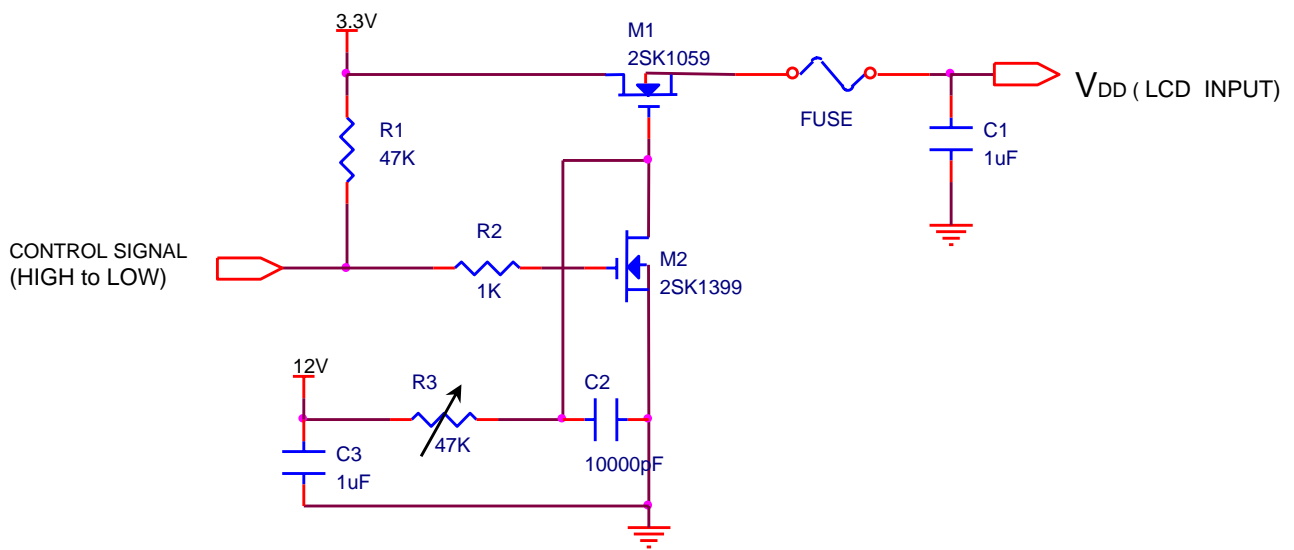


Samsung Secret

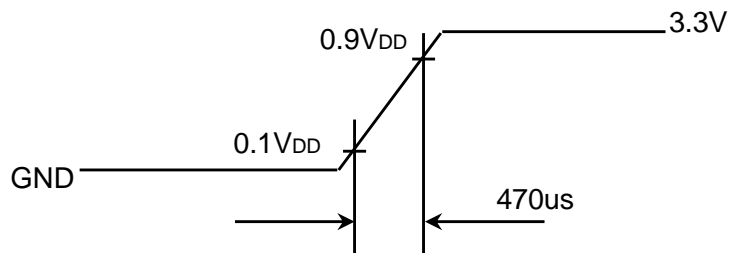
*c) 1dot Vertical stripe pattern



4) Rush current measurement condition



V_{DD} rising time is 470us



3.2 BACK-LIGHT UNIT

Ta= 25 ± 2 °C

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---------------------|--------|------|------|------|------|-------------------|
| LED Forward Current | IF | - | 19 | - | mA | |
| LED Forward Voltage | VF | - | 3.2 | 3.45 | V | |
| LED Array Voltage | VP | - | 32.0 | 34.5 | V | Vf X 10 LEDs |
| Power Consumption | P | - | 3.65 | - | W | If X Vf X 60 LEDs |

3.2 LED Connection

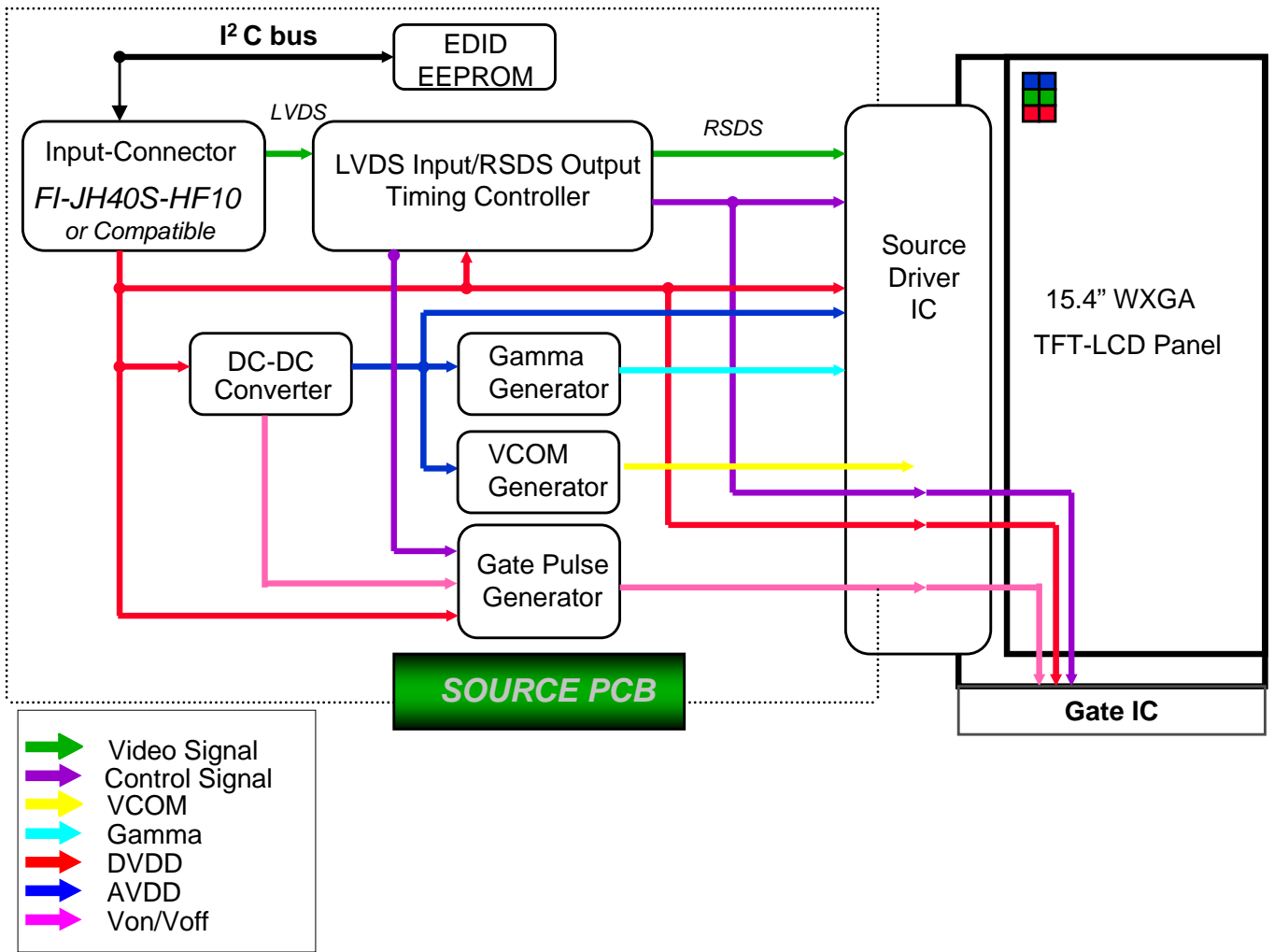
| String | LED1 | LED2 | LED3 | LED4 | LED5 | LED6 | LED7 | LED8 | LED9 | LED10 |
|--------|------|------|------|------|------|------|------|------|------|-------|
| 1 | 1 | 7 | 13 | 19 | 25 | 31 | 37 | 43 | 49 | 55 |
| 2 | 2 | 8 | 14 | 20 | 26 | 32 | 38 | 44 | 50 | 56 |
| 3 | 3 | 9 | 15 | 21 | 27 | 33 | 39 | 45 | 51 | 57 |
| 4 | 4 | 10 | 16 | 22 | 28 | 34 | 40 | 46 | 52 | 58 |
| 5 | 5 | 11 | 17 | 23 | 29 | 35 | 41 | 47 | 53 | 59 |
| 6 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 |

3.3 BLU Connection

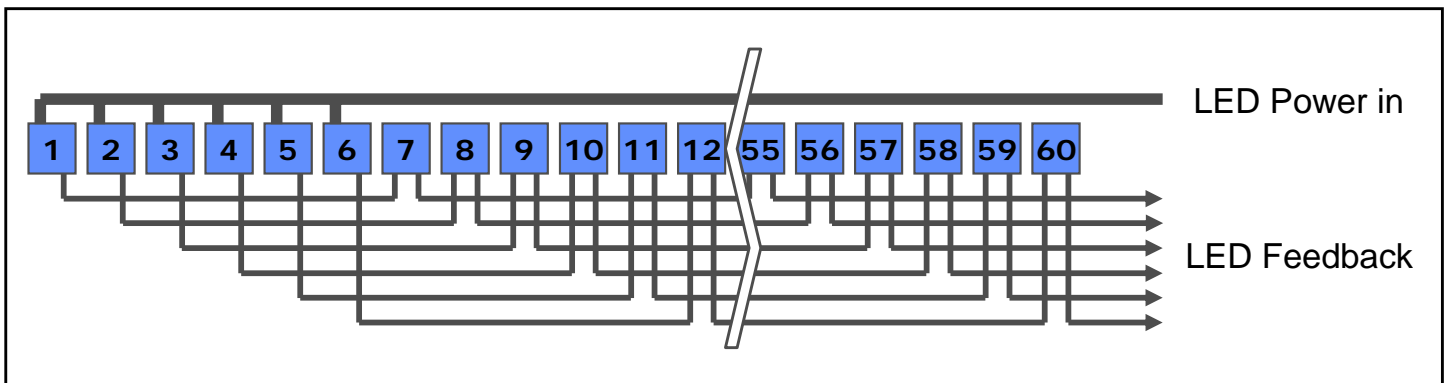
- Refer to the pin assignment (pin 31~40pin)

4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Back light Unit (Stanley - LED)



5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power LVDS, Connector : (JAE, FI-JH40S-HF10 or Compatible)
Mating Connector :(JAE, FI-JH40C 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 | VDD | POWER SUPPLY +3.3V | | |
| 6 | CLKEDID | DDC Clock | | |
| 7 | DATAEDID | DDC data | | |
| 8 | O_RxIN0- | LVDS Differential Data INPUT (Odd R0-R5,G0) | Negative | |
| 9 | O_RxIN0+ | LVDS Differential Data INPUT (Odd R0-R5,G0) | Positive | |
| 10 | GND | Ground | | |
| 11 | O_RxIN1- | LVDS Differential Data INPUT (Odd G1-G5,B0-B1) | Negative | |
| 12 | O_RxIN1+ | LVDS Differential Data INPUT (Odd G1-G5,B0-B1) | Positive | |
| 13 | GND | Ground | | |
| 14 | O_RxIN2- | LVDS Differential Data INPUT (Odd B2-B5,Sync,DE) | Negative | |
| 15 | O_RxIN2+ | LVDS Differential Data INPUT (Odd B-B5,Sync,DE) | Positive | |
| 16 | GND | Ground | | |
| 17 | O_RxCLK- | LVDS Differential Data INPUT (Odd Clock) | Negative | |
| 18 | O_RxCLK+ | LVDS Differential Data INPUT (Odd Clock) | Positive | |
| 19 | GND | Ground | | |
| 20 | E_RxIN0- | LVDS Differential Data INPUT (Even R0-R5,G0) | Negative | |
| 21 | E_RxIN0+ | LVDS Differential Data INPUT (Even R0-R5,G0) | Positive | |
| 22 | GND | Ground | | |
| 23 | E_RxIN1- | LVDS Differential Data INPUT (Even G1-G5,B0-B1) | Negative | |
| 24 | E_RxIN1+ | LVDS Differential Data INPUT (Even G1-G5,B0-B1) | Positive | |
| 25 | GND | Ground | | |
| 26 | E_RxIN2- | LVDS Differential Data INPUT (Even B2-B5,Sync,DE) | Negative | |
| 27 | E_RxIN2+ | LVDS Differential Data INPUT (Even B2-B5,Sync,DE) | Positive | |
| 28 | GND | Ground | | |
| 29 | E_RxCLK- | LVDS Differential Data INPUT (Even Clock) | Negative | |
| 30 | E_RxCLK+ | LVDS Differential Data INPUT (Even Clock) | Positive | |

Samsung Secret

5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power LVDS, Connector : (JAE, FI-JH40S-HF10 or Compatible)
Mating Connector :(JAE, FI-JH40C or Compatible)

| No. | Symbol | Function | Polarity | Remarks |
|-----|-----------|------------------------|----------|---------|
| 31 | Vdc1 | LED Cathode (Negative) | | |
| 32 | Vdc2 | LED Cathode (Negative) | | |
| 33 | Vdc3 | LED Cathode (Negative) | | |
| 34 | Vdc4 | LED Cathode (Negative) | | |
| 35 | Vdc5 | LED Cathode (Negative) | | |
| 36 | Vdc6 | LED Cathode (Negative) | | |
| 37 | NC | NC | | |
| 38 | Vdc (1~6) | LED Anode (Negative) | | |
| 39 | Vdc (1~6) | LED Anode (Negative) | | |
| 40 | Vdc (1~6) | LED Anode (Negative) | | |

5.2 LVDS Interface : Transmitter DS90CF365 or Compatible

LVDS for Odd pixel

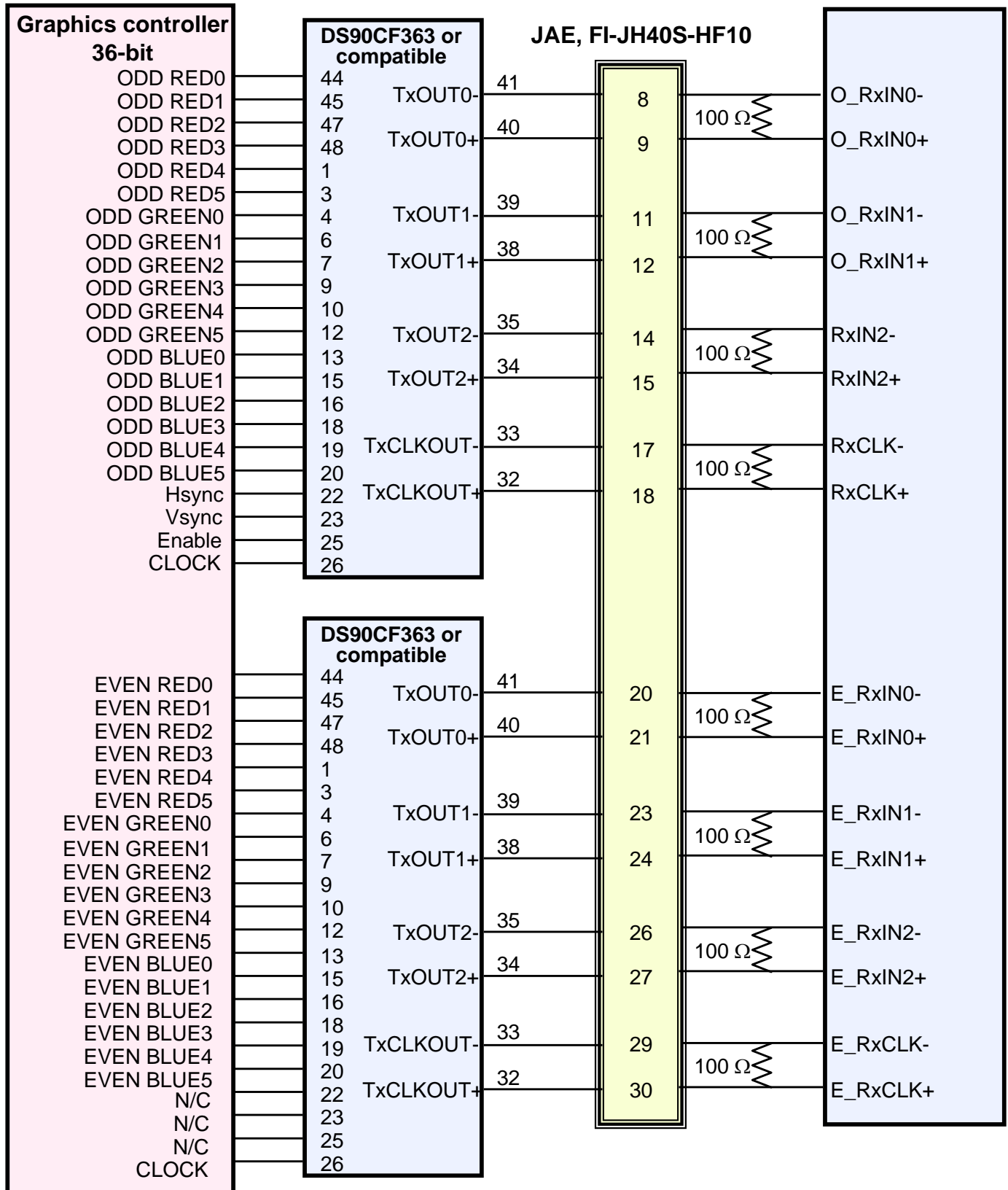
| Pin No. | Name | RGB Signal | Pin No. | Name | RGB Signal |
|---------|--------|------------|---------|----------|------------|
| 44 | TxIN0 | RO0 | 12 | TxIN11 | GO5 |
| 45 | TxIN1 | RO1 | 13 | TxIN12 | BO0 |
| 47 | TxIN2 | RO2 | 15 | TxIN13 | BO1 |
| 48 | TxIN3 | RO3 | 16 | TxIN14 | BO2 |
| 1 | TxIN4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

LVDS for Even pixel

| Pin No. | Name | RGB Signal | Pin No. | Name | RGB Signal |
|---------|--------|------------|---------|----------|------------|
| 44 | TxIN0 | RE0 | 12 | TxIN11 | GE5 |
| 45 | TxIN1 | RE1 | 13 | TxIN12 | BE0 |
| 47 | TxIN2 | RE2 | 15 | TxIN13 | BE1 |
| 48 | TxIN3 | RE3 | 16 | TxIN14 | BE2 |
| 1 | TxIN4 | RE4 | 18 | TxIN15 | BE3 |
| 3 | TxIN5 | RE5 | 19 | TxIN16 | BE4 |
| 4 | TxIN6 | GE0 | 20 | TxIN17 | BE5 |
| 6 | TxIN7 | GE1 | 22 | TxIN18 | N/C |
| 7 | TxIN8 | GE2 | 23 | TxIN19 | N/C |
| 9 | TxIN9 | GE3 | 25 | TxIN20 | N/C |
| 10 | TxIN10 | GE4 | 26 | TxCLK IN | Clock |

Samsung Secret

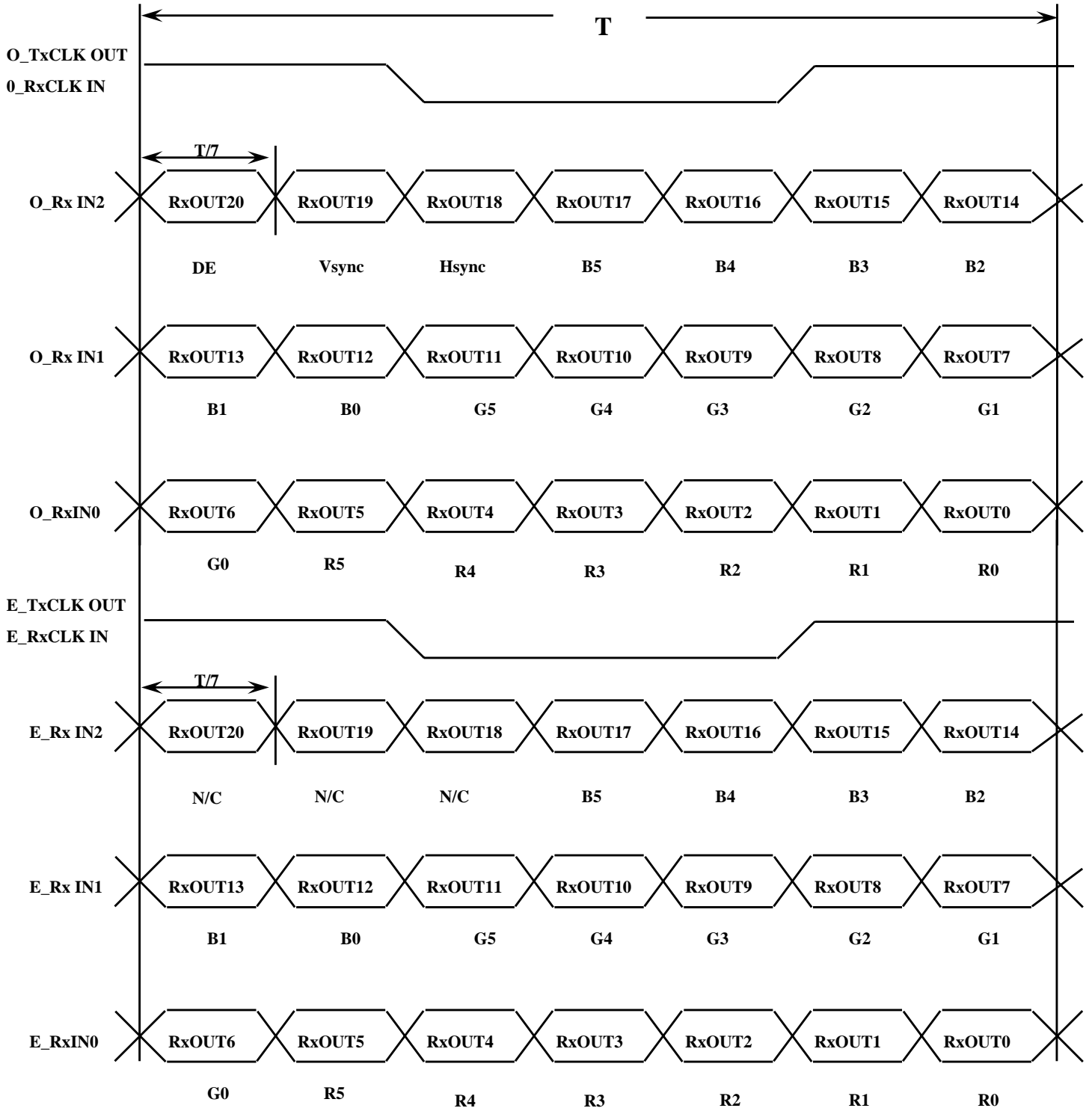
LVDS Interface



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

5.4 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON



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

| Color | Display | Data Signal | | | | | | | | | | | | | | | | | | Gray Scale Level |
|---------------------|---------|-------------|----|----|----|----|----|-------|----|----|----|----|----|------|----|----|----|----|--------|------------------|
| | | Red | | | | | | Green | | | | | | Blue | | | | | | |
| | | R0 | R1 | R2 | R3 | R4 | R5 | G0 | G1 | G2 | G3 | G4 | G5 | B0 | B1 | B2 | B3 | 45 | B5 | |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| Gray Scale Of Red | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | R2 | |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | 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 | G2 | |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | 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 | 1 | 0 | 0 | 0 | 0 | 0 | B1 | |
| | ↑ | 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 | 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 | |

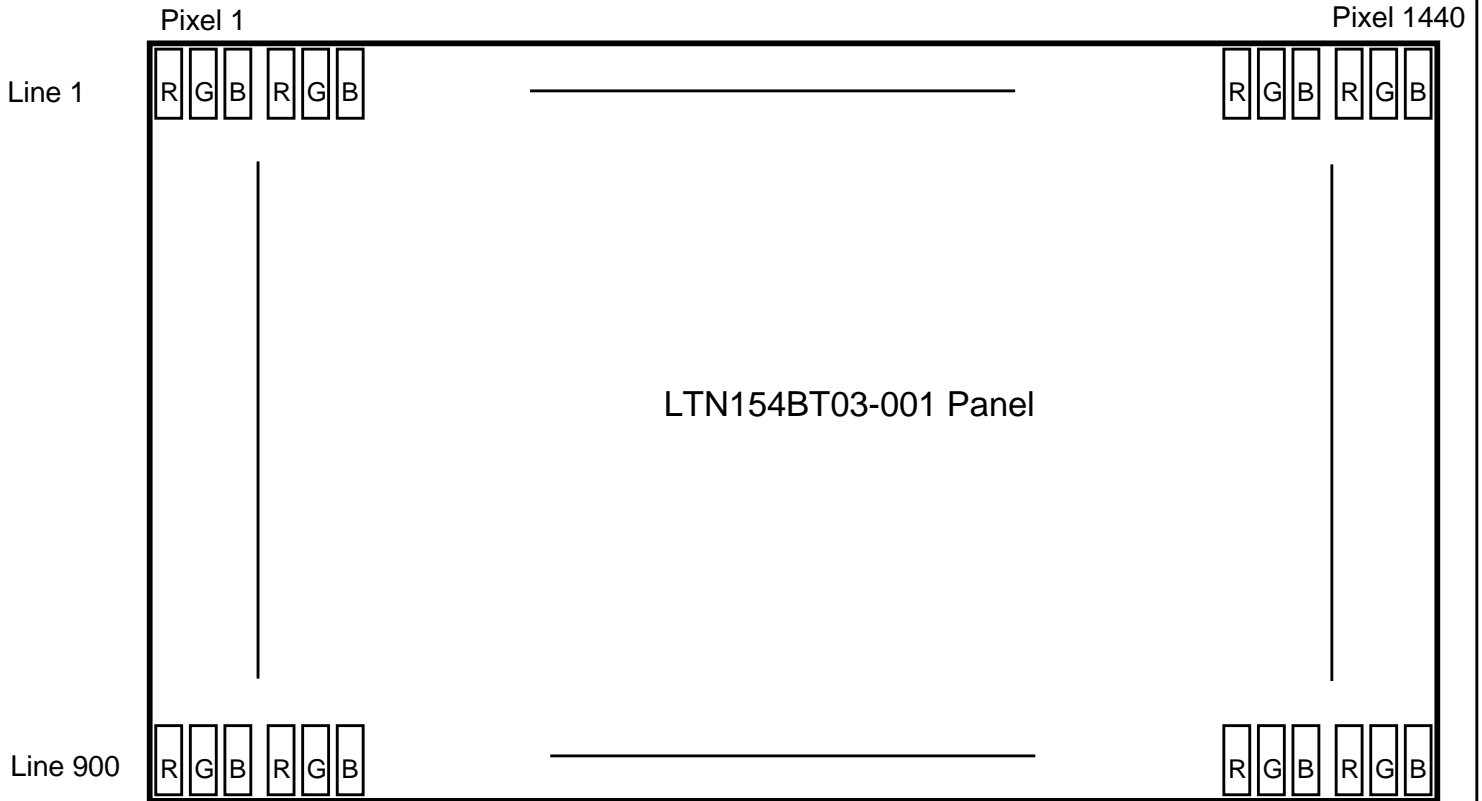
Note 1) Definition of gray :

Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)

Note 2) Input signal: 0 =Low level voltage, 1=High level voltage

Samsung Secret

5.6 Pixel Format in the display



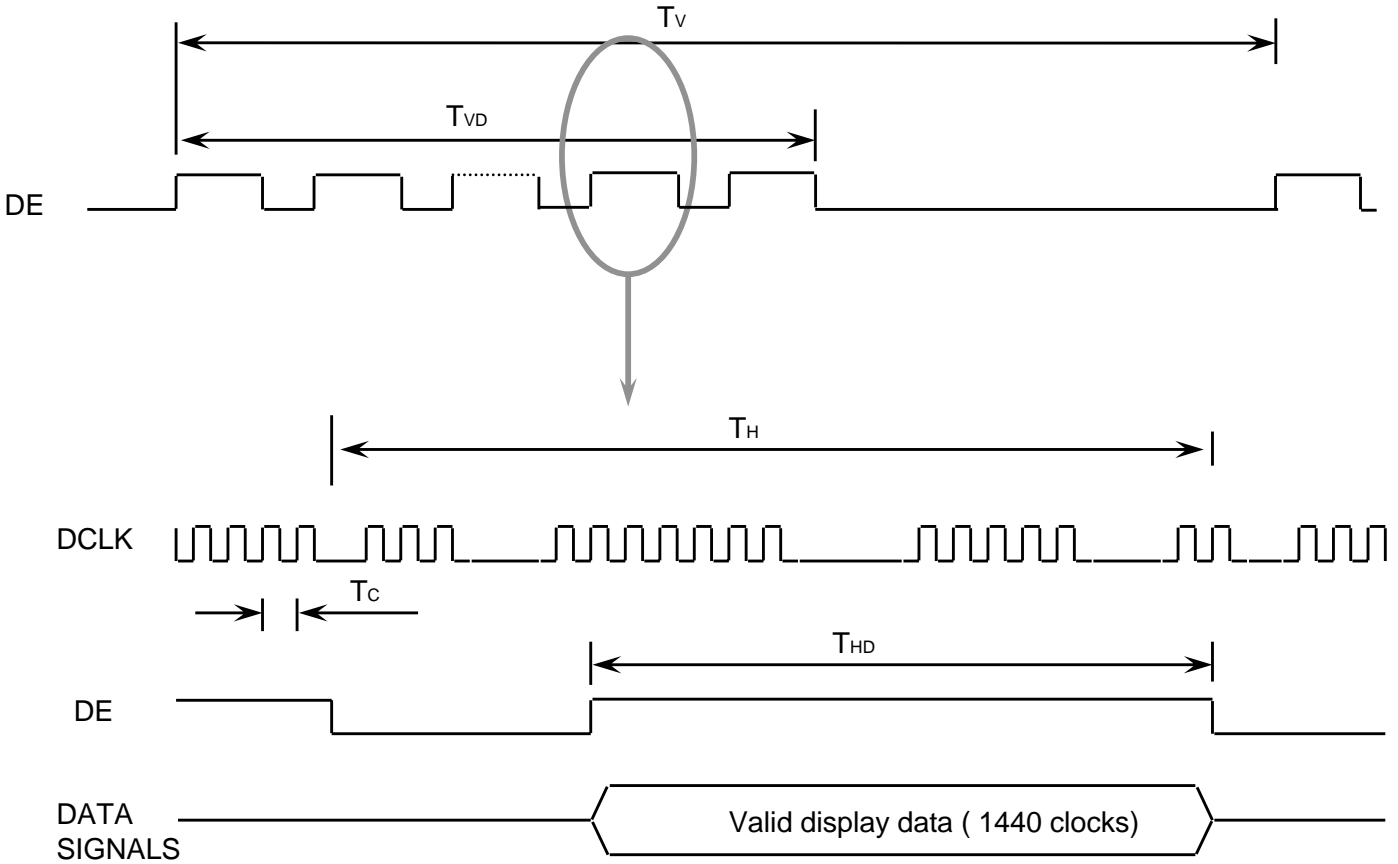
Samsung Secret

6. INTERFACE TIMING

6.1 Timing Parameters

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------------------|----------------|--------|------|------|------|--------|------|
| Frame Frequency | Cycle | TV | - | 912 | - | Lines | - |
| Vertical Active Display Term | Display Period | TVD | - | 900 | - | Lines | - |
| One Line Scanning Time | Cycle | TH | - | 1760 | - | Clocks | - |
| Horizontal Active Display Term | Display Period | THD | - | 1440 | - | Clocks | - |

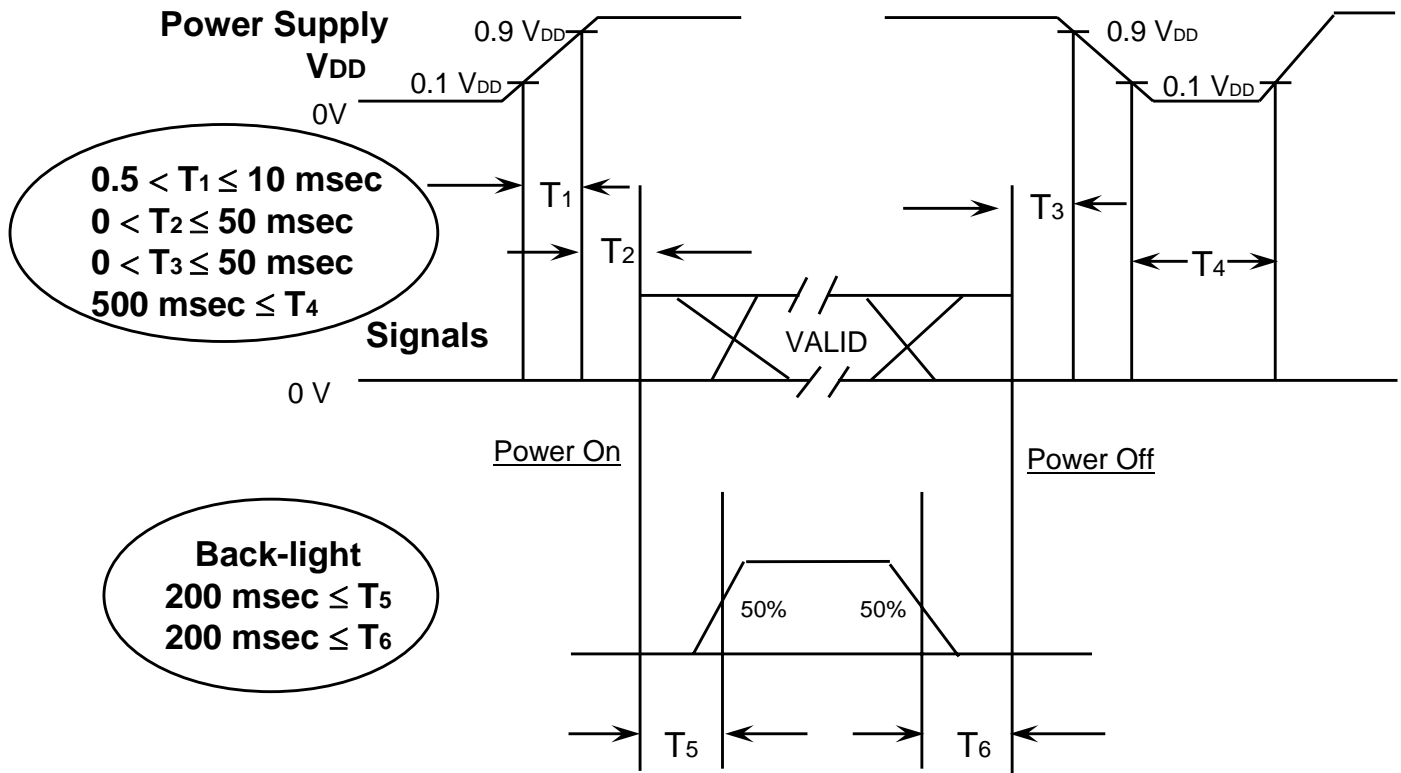
6.2 Timing diagrams of interface signal



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.

Samsung Secret

7. MECHANICAL OUTLINE DIMENSION

Approval

[Refer to the next page]

Samsung Secret

This page will be replaced with the outline drawing after producing PDF file.

Samsung Secret

8. 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 (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.

Samsung Secret

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.

Samsung Secret