

**SAMSUNG****ELECTRONICS**

Approval



TO : HP

DATE : Jan 5. 2011

**SAMSUNG TFT-LCD****MODEL NO : LTN156KT02-301**

NOTE : Extension code [ -301 ]  
→ LTN156KT02-301  
Surface type [ Anti-Glare ]

Any Modification of Spec is not allowed without SEC' permission.

APPROVED BY :

James Lee

PREPARED BY :

Jay Kim

**Technical Customer Support Team, LCD Division**  
**Samsung Electronics Co., Ltd.**

**Samsung Secret**

|         |                |        |                 |      |        |
|---------|----------------|--------|-----------------|------|--------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 1 / 32 |
|---------|----------------|--------|-----------------|------|--------|



Approval

## 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                                                    |              |
| 3.3 LED Driver                                                        |              |
| 4. Block Diagram                                                      | ----- ( 13 ) |
| 4.1 TFT LCD Module                                                    |              |
| 5. Input Terminal Pin Assignment                                      | ----- ( 15 ) |
| 5.1 Input Signal & Power                                              |              |
| 5.2 LVDS Interface                                                    |              |
| 5.3 Timing Diagrams of LVDS For Transmitting                          |              |
| 5.4 Input Signals, Basic Display Colors and Gray Scale of Each Color. |              |
| 5.5 Pixel format                                                      |              |
| 6. Interface Timing                                                   | ----- ( 21 ) |
| 6.1 Timing Parameters                                                 |              |
| 6.2 Timing Diagrams of interface Signal                               |              |
| 6.3 Power ON/OFF Sequence                                             |              |
| 7. Outline Dimension                                                  | ----- ( 23 ) |
| 8. Packing                                                            | ----- ( 25 ) |
| 9. Markings & Others                                                  | ----- ( 26 ) |
| 10. General Precautions                                               | ----- ( 28 ) |
| 11. EDID                                                              | ----- ( 30 ) |

Samsung Secret

|         |                |        |                 |      |        |
|---------|----------------|--------|-----------------|------|--------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 2 / 32 |
|---------|----------------|--------|-----------------|------|--------|



Approval

## GENERAL DESCRIPTION

### DESCRIPTION

LTN156KT02 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 15.6" contains 1600 x 900 pixels and can display up to 262,144 colors. 6 O'clock direction is the Optimum viewing angle.

### FEATURES

- 1600 x 900 pixels resolution (16:9)
- Fast Response Time
- Low power consumption
- LED BLU Structure
- DE (Data enable) only mode
- 3.3V LVDS Interface
- On board EDID chip
- RoHS compliance
- PVC free compliance
- BFR free compliance
- As free compliance

### 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      | 344.232 (H) x 193.536 (V) (15.6" diagonal) | mm    |            |
| Driver element    | a-Si TFT active matrix                     |       |            |
| Display colors    | 262,144                                    |       |            |
| Number of pixel   | 1600 x 900                                 | pixel | 16 : 9     |
| Pixel arrangement | RGB vertical stripe                        |       |            |
| Pixel pitch       | 0.215 (H) x 0.215 (V) (TYP.)               | mm    |            |
| Display Mode      | Normally white                             |       |            |
| Surface treatment | Haze 25%, Hardness 3H                      |       | Anti-Glare |

Samsung Secret

|         |                |        |                 |      |        |
|---------|----------------|--------|-----------------|------|--------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 4 / 32 |
|---------|----------------|--------|-----------------|------|--------|

## Mechanical Information

Approval

| Item        |                | Min.  | Typ.  | Max.  | Unit | Note |
|-------------|----------------|-------|-------|-------|------|------|
| Module size | Horizontal (H) | 358.8 | 359.3 | 359.8 | mm   |      |
|             | Vertical (V)   | 209.0 | 209.5 | 210.0 | mm   |      |
|             | Depth (D)      | -     | -     | 5.8   | mm   | (1)  |
| Weight      |                | -     | -     | 480   | g    |      |

Note (1) Measurement condition of outline dimension

. Equipment : Vernier Calipers

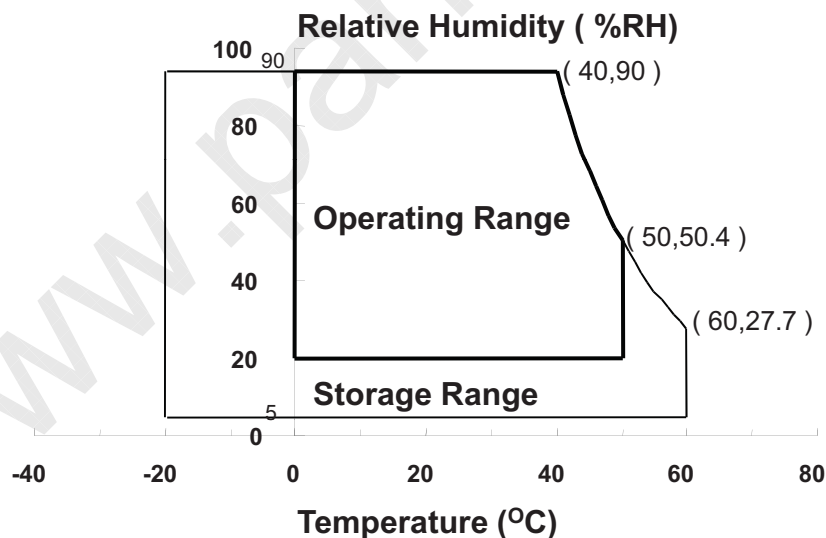
. Push Force : 500g · f (minimum)

## 1. ABSOLUTE MAXIMUM RATINGS

## 1.1 ENVIRONMENTAL ABSOLUTE RATINGS

| Item                                                  | Symbol | Min. | Max. | Unit | Note    |
|-------------------------------------------------------|--------|------|------|------|---------|
| Storage temperate                                     | TSTG   | -20  | 60   | °C   | (1)     |
| Operating temperate<br>(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. ( $40^{\circ}\text{C} \geq T_a$ )Maximum wet - bulb temperature at  $39^{\circ}\text{C}$  or less. ( $T_a > 40^{\circ}\text{C}$ ) 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.

Samsung Secret

|         |                |        |                 |      |        |
|---------|----------------|--------|-----------------|------|--------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 5 / 32 |
|---------|----------------|--------|-----------------|------|--------|

Approval

## 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  $T_a$  ( $25 \pm 2\text{ }^{\circ}\text{C}$  )

Samsung Secret

Approval

## 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<sub>DD</sub>=3.3V, f<sub>V</sub>= 60Hz, f<sub>DCLK</sub> = 53.9 MHz, I<sub>L</sub> = 19 mA

| Item                                        |       | Symbol             | Condition                                                | Min.  | Typ.  | Max   | Unit              | Note                             |
|---------------------------------------------|-------|--------------------|----------------------------------------------------------|-------|-------|-------|-------------------|----------------------------------|
| Contrast Ratio<br>(5 Points)                |       | CR                 | Normal<br>Viewing<br>Angle<br>$\phi = 0$<br>$\theta = 0$ | 400   | -     | -     | -                 | (1), (2),<br>(5)                 |
| Response Time at Ta<br>( Rising + Falling ) |       | T <sub>RT</sub>    |                                                          | -     | 16    | 25    | msec              | (1), (3)                         |
| Average Luminance<br>of White (5 Points)    |       | Y <sub>L,AVE</sub> |                                                          | 170   | 200   | -     | cd/m <sup>2</sup> | I <sub>L</sub> =19mA<br>(1), (4) |
| Color<br>Chromaticity<br>( CIE )            | Red   | R <sub>X</sub>     |                                                          | 0.594 | 0.624 | 0.654 | -                 |                                  |
|                                             |       | R <sub>Y</sub>     |                                                          | 0.310 | 0.340 | 0.370 |                   |                                  |
|                                             | Green | G <sub>X</sub>     |                                                          | 0.297 | 0.327 | 0.357 |                   |                                  |
|                                             |       | G <sub>Y</sub>     |                                                          | 0.548 | 0.578 | 0.608 |                   |                                  |
|                                             | Blue  | B <sub>X</sub>     |                                                          | 0.124 | 0.154 | 0.184 |                   |                                  |
|                                             |       | B <sub>Y</sub>     |                                                          | 0.030 | 0.060 | 0.090 |                   |                                  |
|                                             | White | W <sub>X</sub>     |                                                          | 0.283 | 0.313 | 0.343 |                   |                                  |
|                                             |       | W <sub>Y</sub>     |                                                          | 0.299 | 0.329 | 0.359 |                   |                                  |
| Viewing<br>Angle                            | Hor.  | $\theta_L$         | CR ≥ 10                                                  | 60    | -     | -     | Degrees           | (1), (5)<br>SR-3                 |
|                                             |       | $\theta_R$         |                                                          | 60    | -     | -     |                   |                                  |
|                                             | Ver.  | $\phi_H$           |                                                          | 50    | -     | -     |                   |                                  |
|                                             |       | $\phi_L$           |                                                          | 50    | -     | -     |                   |                                  |
| Color Gamut                                 |       |                    |                                                          | -     | 60    | -     | %                 |                                  |
| 13 Points<br>White Variation                |       | $\delta_L$         |                                                          | -     | -     | 1.6   | -                 | (6)                              |

**Samsung Secret**

**Doc.No.**

LTN156KT02-301

**Rev.No**

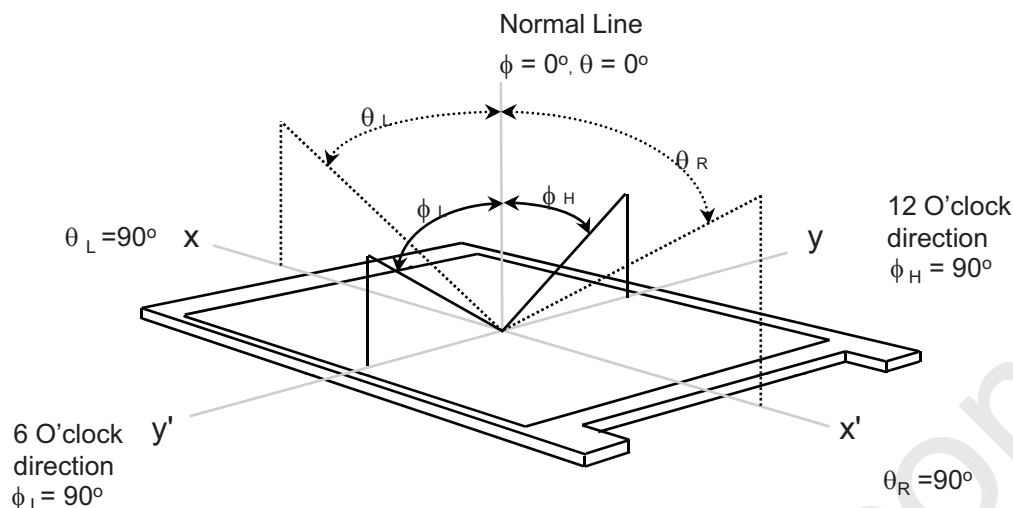
04-A00-S-110105

**Page**

7 / 32

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

Approval

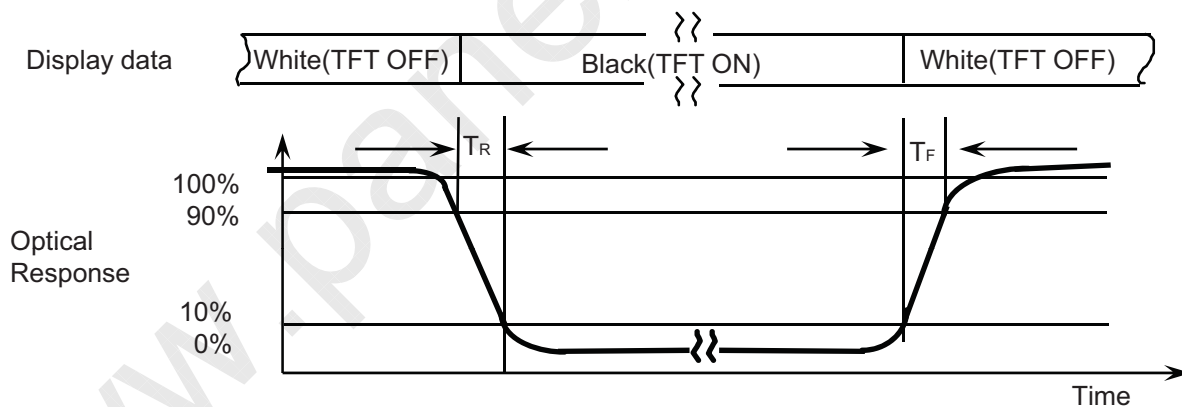


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points (33, 55, 77, 37, 73)

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

Points : 33, 55, 77, 37, 73 at the figure of Note (6).

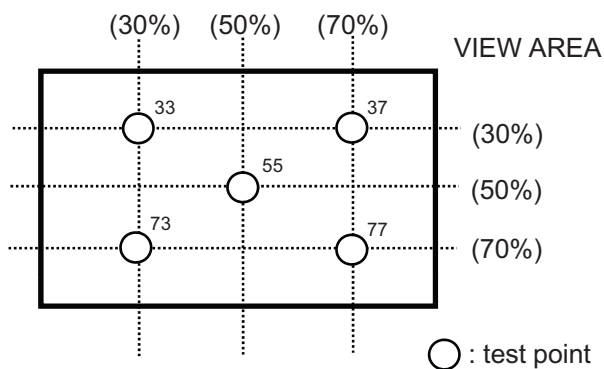
Note 3) Definition of Response time :



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

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

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



Samsung Secret

Doc.No.

LTN156KT02-301

Rev.No

04-A00-S-110105

Page

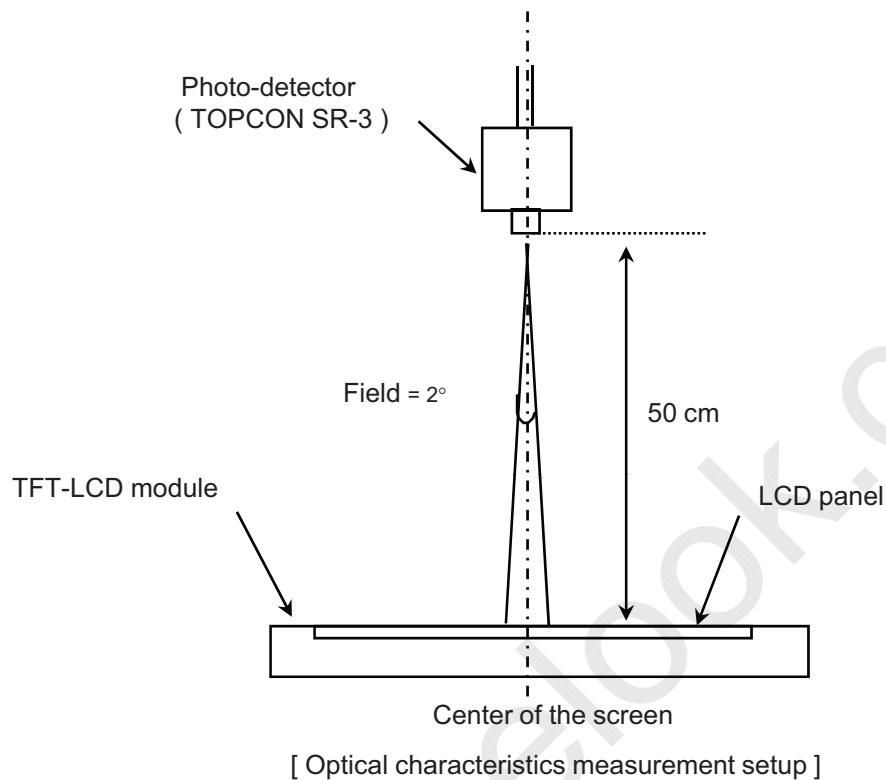
8 / 32

Approval

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 mA

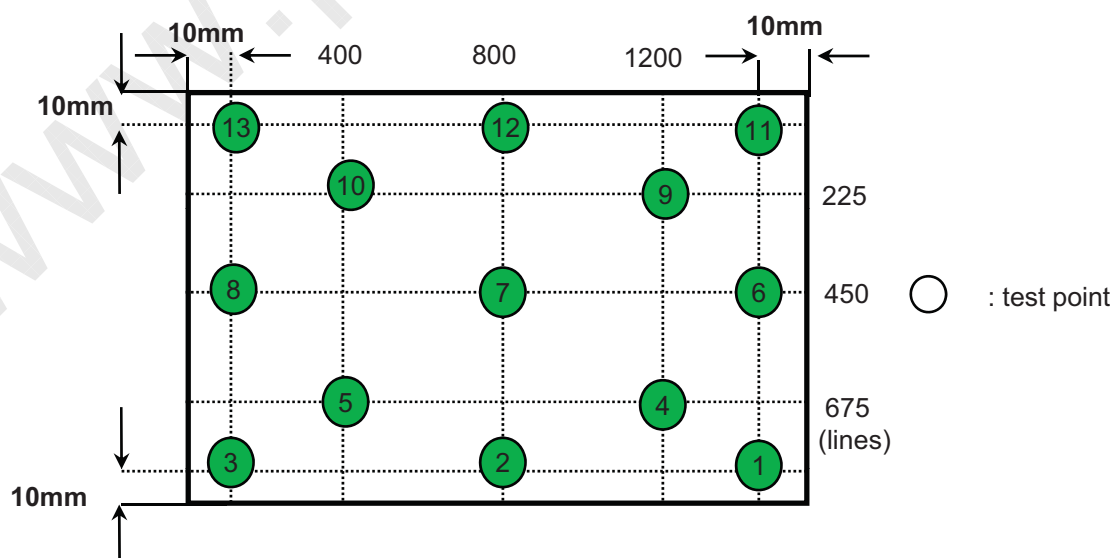
Environment condition :  $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$



Note 6) Definition of 13 points white variation ( $\delta L$ ), CR variation( $C_{VER}$ ) [  $\bigcirc \sim \bigcirc$  ]

Maximum luminance of 13 points

Minimum luminance of 13 points



**Samsung Secret**

Doc.No.

LTN156KT02-301

Rev.No

04-A00-S-110105

Page

9 / 32

### 3. ELECTRICAL CHARACTERISTICS

Approval

#### 3.1 TFT LCD MODULE

Ta= 25 ± 2°C

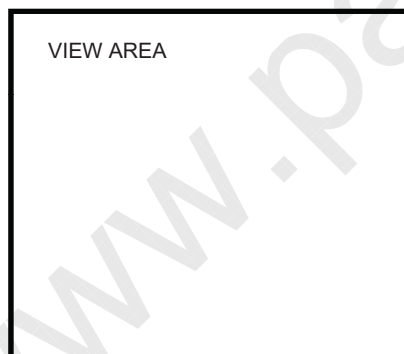
| Item                                                   |           | Symbol            | Min. | Typ. | Max. | Unit | Note                    |
|--------------------------------------------------------|-----------|-------------------|------|------|------|------|-------------------------|
| Voltage of Power Supply                                |           | V <sub>DD</sub>   | 3.0  | 3.3  | 3.6  | V    |                         |
| Differential Input Voltage for LVDS Receiver Threshold | High      | V <sub>IH</sub>   | -    | -    | +100 | mV   | V <sub>CM</sub> = +1.2V |
|                                                        | Low       | V <sub>IL</sub>   | -100 | -    | -    | mV   |                         |
| Vsync Frequency                                        |           | f <sub>v</sub>    | -    | 60   | -    | Hz   |                         |
| Hsync Frequency                                        |           | f <sub>H</sub>    | -    | 55.8 | -    | KHz  |                         |
| Main Frequency                                         |           | f <sub>DCLK</sub> | -    | 53.9 | -    | MHz  |                         |
| Rush Current                                           |           | I <sub>RUSH</sub> | -    | -    | 1.5  | A    | (4)                     |
| Current of Power Supply                                | White     | I <sub>DD</sub>   | -    | 430  | -    | mA   | (2),(3)*a               |
|                                                        | Mosaic    |                   | -    | 470  | 515  | mA   | (2),(3)*b               |
|                                                        | V. Stripe |                   | -    | 570  | 615  | mA   | (2),(3)*c               |

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

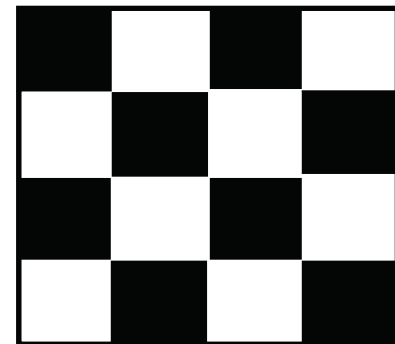
(2) f<sub>v</sub> = 60Hz, f<sub>DCLK</sub> = 53.9 MHz, V<sub>DD</sub> = 3.3V , DC Current.

(3) Power dissipation pattern

\*a) White Pattern



\*b) Mosaic Pattern



Display Brightest Gray Level →

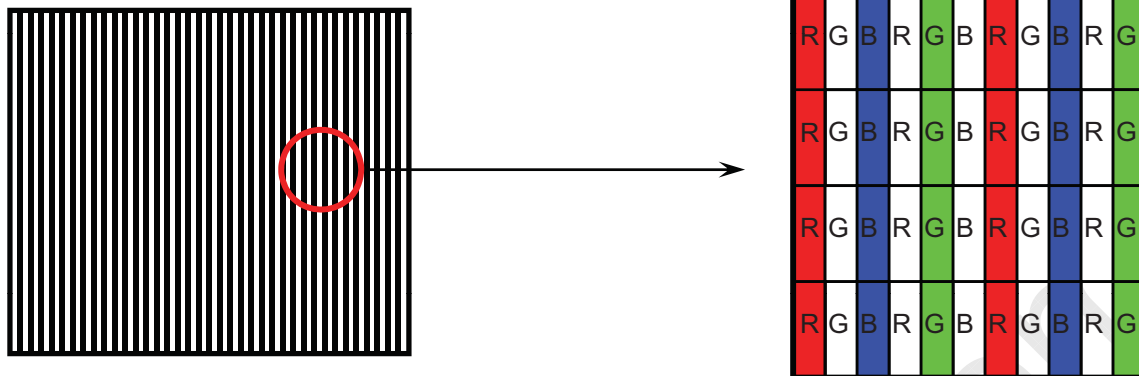
Display Darkest Gray Level →

**Samsung Secret**

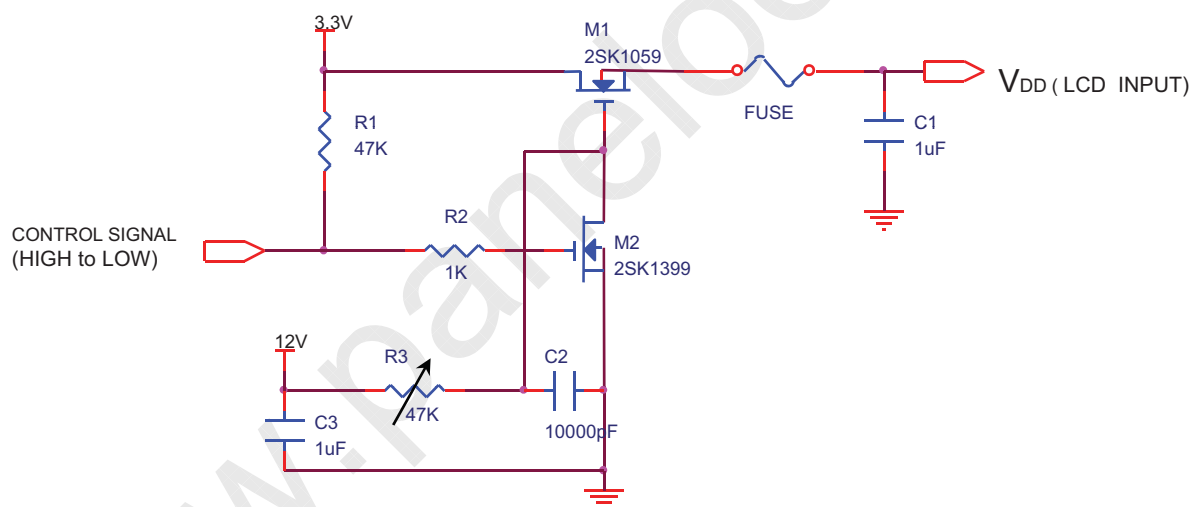
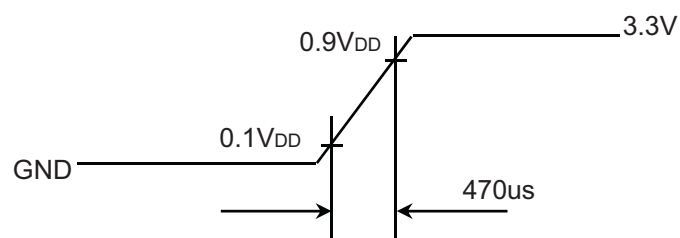
|         |                |        |                 |      |         |
|---------|----------------|--------|-----------------|------|---------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 10 / 32 |
|---------|----------------|--------|-----------------|------|---------|

Approval

\*c) 1dot Vertical stripe pattern



4) Rush current measurement condition

V<sub>DD</sub> rising time is 470us

Samsung Secret

Doc.No.

LTN156KT02-301

Rev.No

04-A00-S-110105

Page

11 / 32

Approval

## 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      | -    | -    | 5.3  | W    |             |

## 3.3 LED Driver

- On board LED Driver (Manufacturer : Richtek)

Ta= 25 ± 2 °C

| Item                   | Symbol           | Min. | Typ. | Max. | Unit | Note                                          |
|------------------------|------------------|------|------|------|------|-----------------------------------------------|
| Input Voltage          | V <sub>in</sub>  | 6    | 12   | 20   | V    |                                               |
| Enable Control Level   | V                | 0    | -    | 5    | V    | ON Level : 2.5V~5V<br>OFF Level : 0V ~ 0.5V   |
| PWM Control Level      | V <sub>PWM</sub> | 0    | -    | 5    | V    | High Level : 2.7V~5V<br>Low Level : 0V ~ 0.3V |
| PWM Control Duty Ratio | %                | 10   | -    | 100  | %    |                                               |
| PWM Input Frequency    | BLIM             | 0.2  | -    | 1    | KHz  |                                               |

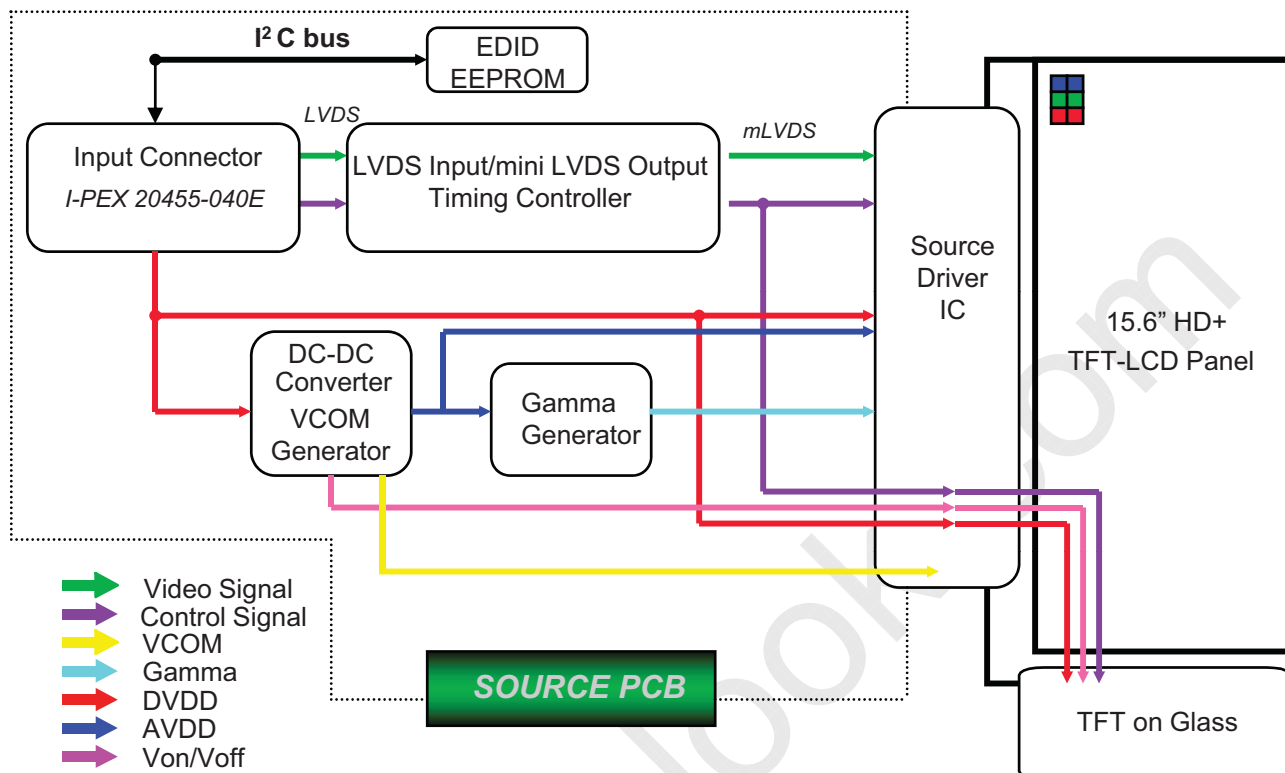
Note - Test Equipment : Fluke 45

Samsung Secret

Approval

## 4. BLOCK DIAGRAM

### 4.1 TFT LCD Module

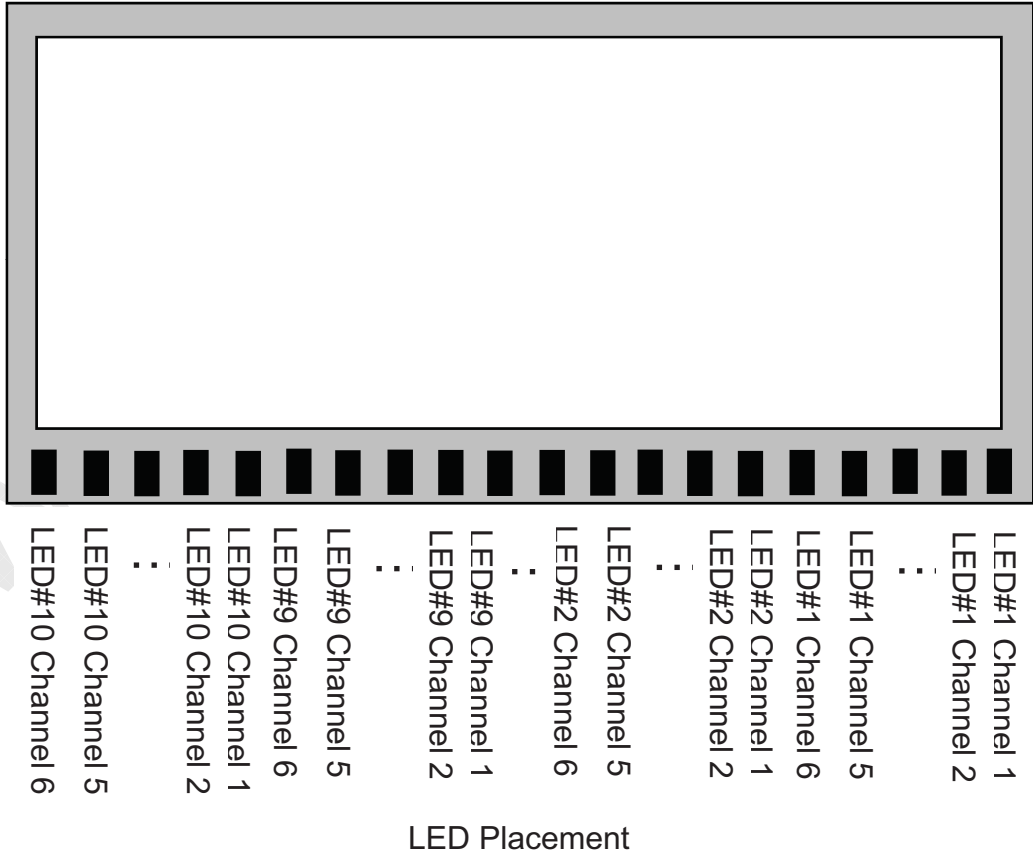
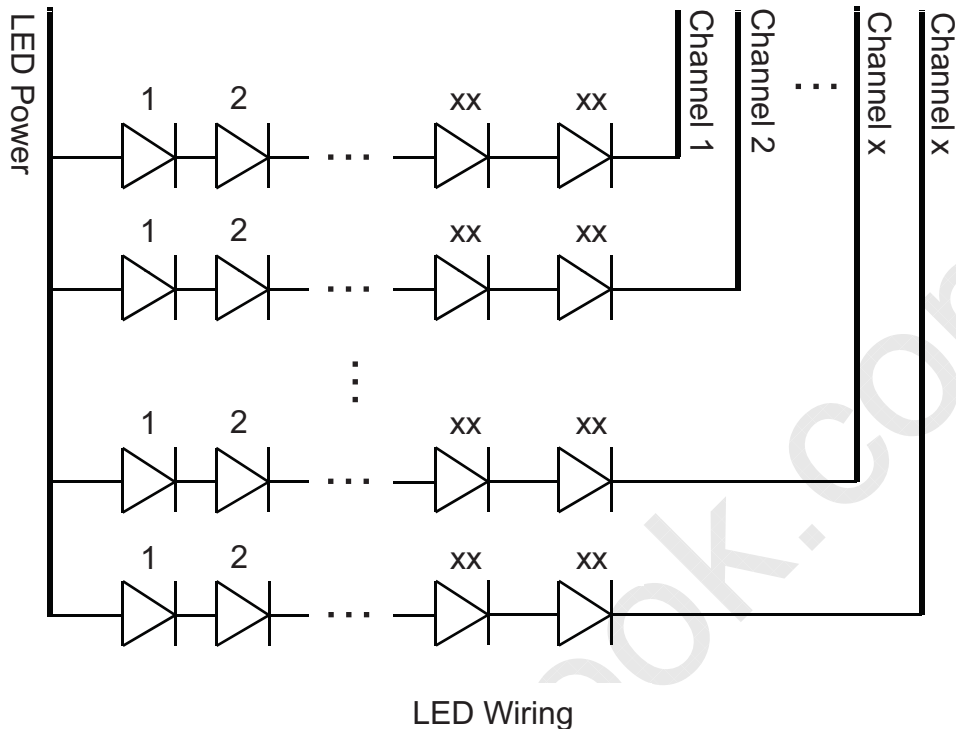


Samsung Secret

Approval

## 4. BLOCK DIAGRAM

### 4.2 LED connection and placement



Samsung Secret

Approval

## 5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power (LVDS, Connector : 20455-040E-0 by I-PEX or equivalent )

| No. | Signal | Description                                       |
|-----|--------|---------------------------------------------------|
| 1   | NC     | No Connection                                     |
| 2   | AVDD   | Power Supply, 3.3V ( typical)                     |
| 3   | AVDD   | Power Supply, 3.3V ( typical)                     |
| 4   | DVDD   | DDC 3.3V power                                    |
| 5   | NC     | No Connection                                     |
| 6   | SCL    | DDC Clock                                         |
| 7   | SDA    | DDC 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  | ClkIN- | -LVDS differential clock input                    |
| 18  | ClkIN+ | +LVDS differential clock input                    |
| 19  | GND    | Ground                                            |
| 20  | NC     | No Connection                                     |
| 21  | NC     | No Connection                                     |
| 22  | GND    | Ground                                            |
| 23  | NC     | No Connection                                     |
| 24  | NC     | No Connection                                     |
| 25  | GND    | Ground                                            |

**Samsung Secret**

|         |                |        |                 |      |         |
|---------|----------------|--------|-----------------|------|---------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 15 / 32 |
|---------|----------------|--------|-----------------|------|---------|



Approval

## 5.1. Input Signal &amp; Power (LVDS, Connector : 20455-040E-0 by I-PEX or equivalent )

| No. | Signal    | Description                                         |
|-----|-----------|-----------------------------------------------------|
| 26  | NC        | No Connection                                       |
| 27  | NC        | No Connection                                       |
| 28  | GND       | Ground                                              |
| 29  | NC        | No Connection                                       |
| 30  | NC        | No Connection                                       |
| 31  | VBL-      | LED Ground                                          |
| 32  | VBL-      | LED Ground                                          |
| 33  | VBL-      | LED Ground                                          |
| 34  | NC        | No Connection                                       |
| 35  | BLIM      | PWM for luminance control (200~1KHz, 3.3V, 10~100%) |
| 36  | BL_Enable | BL On/Off (On:2.0~3.3V, Off: 0~0.5V)                |
| 37  | NC        | No Connection                                       |
| 38  | VBL+      | LED Power Supply 6V~20V                             |
| 39  | VBL+      | LED Power Supply 6V~20V                             |
| 40  | VBL+      | LED Power Supply 6V~20V                             |

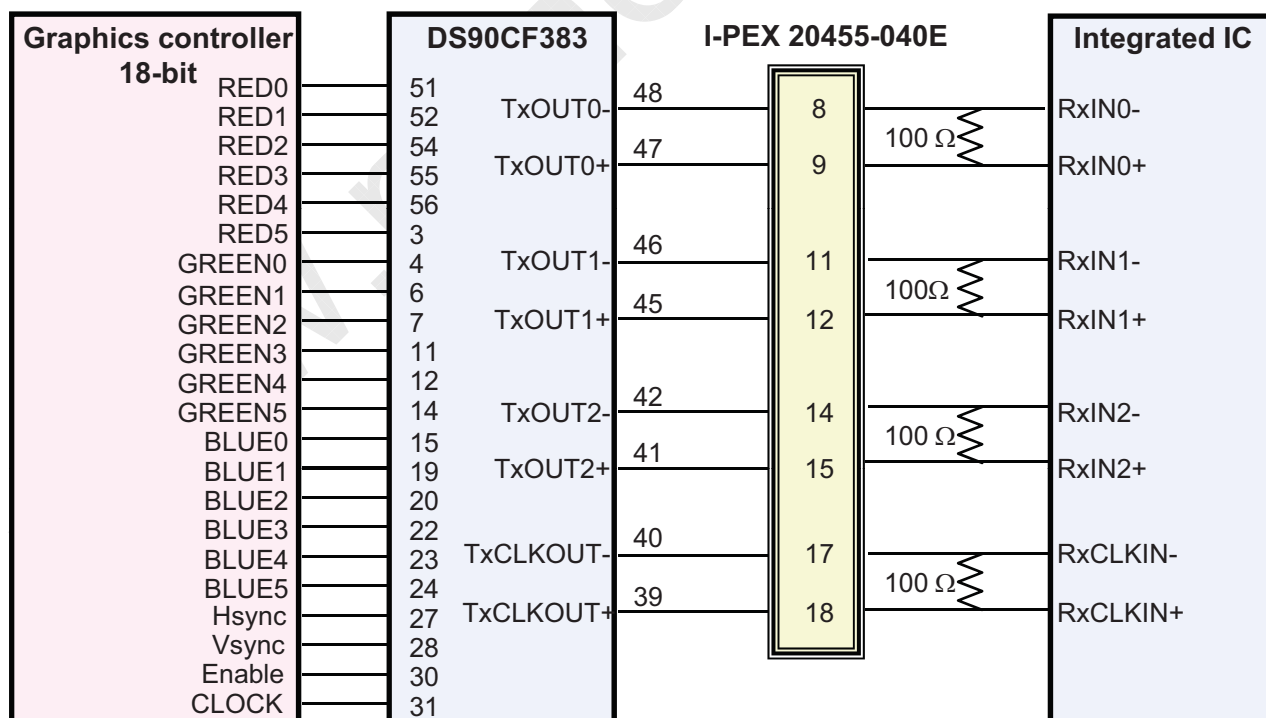
Samsung Secret

Approval

## 5.2 LVDS Interface : Transmitter DS90CF363 or Compatible

| Pin No. | Name   | RGB Signal | Pin No. | Name    | RGB Signal |
|---------|--------|------------|---------|---------|------------|
| 51      | TxIN0  | R0         | 14      | TxIN14  | G5         |
| 52      | TxIN1  | R1         | 15      | TxIN15  | B0         |
| 54      | TxIN2  | R2         | 19      | TxIN18  | B1         |
| 55      | TxIN3  | R3         | 20      | TxIN19  | B2         |
| 56      | TxIN4  | R4         | 22      | TxIN20  | B3         |
| 3       | TxIN6  | R5         | 23      | TxIN21  | B4         |
| 4       | TxIN7  | G0         | 24      | TxIN22  | B5         |
| 6       | TxIN8  | G1         | 27      | TxIN24  | Hsync      |
| 7       | TxIN9  | G2         | 28      | TxIN25  | Vsync      |
| 11      | TxIN12 | G3         | 30      | TxIN26  | DE         |
| 12      | TxIN13 | G4         | 31      | TxCLKIN | Clock      |

## LVDS INTERFACE



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

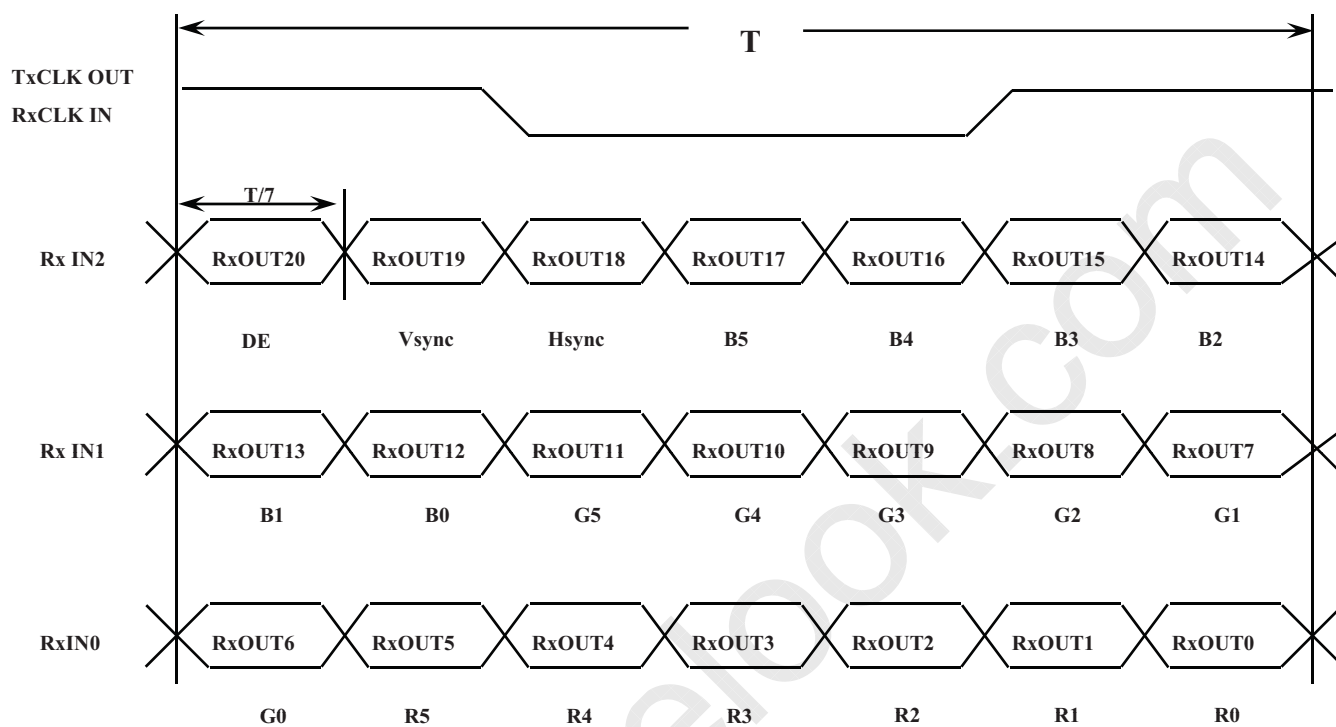
Samsung Secret

| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 17 / 32 |
|---------|----------------|--------|-----------------|------|---------|
|---------|----------------|--------|-----------------|------|---------|

Approval

## 5.3 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON



Samsung Secret

Doc.No.

LTN156KT02-301

Rev.No

04-A00-S-110105

Page

18 / 32

Approval

## 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)

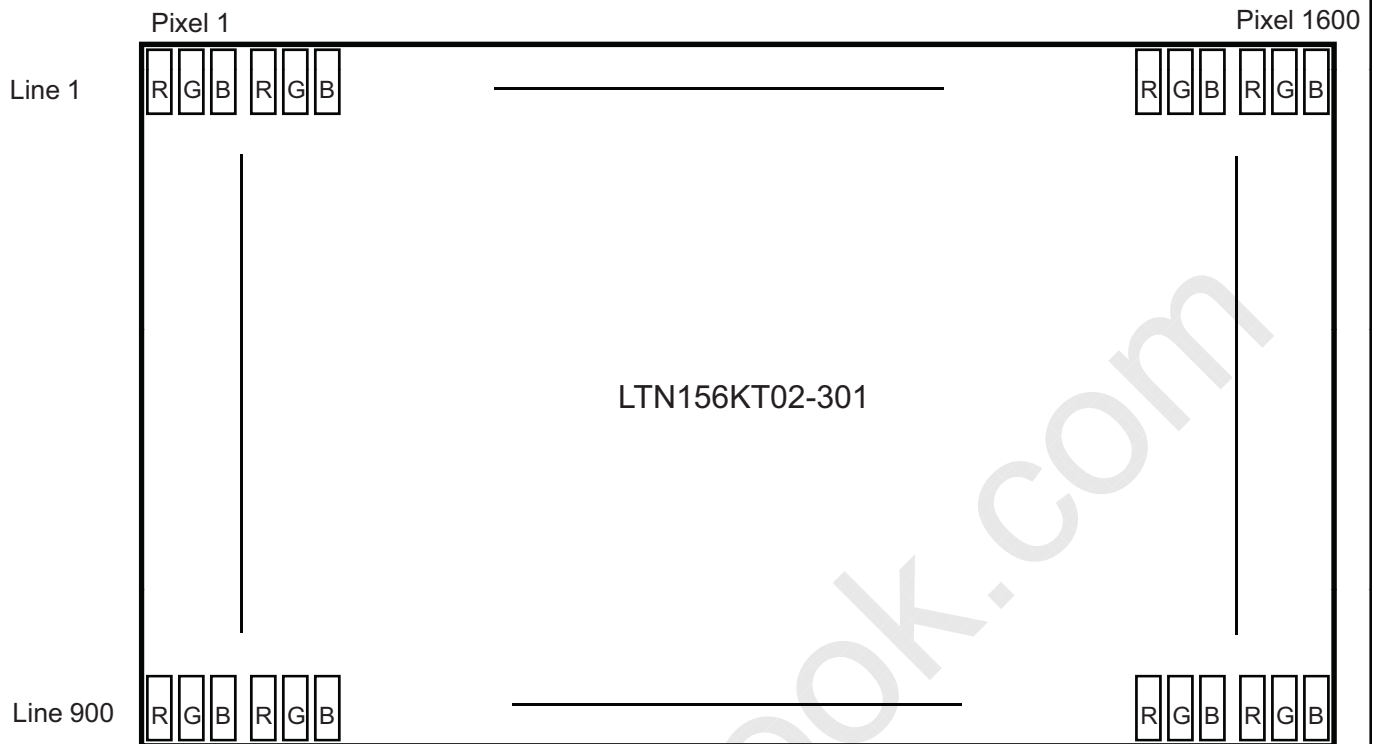
Note 2) Input signal: 0 =Low level voltage, 1=High level voltage

Samsung Secret



Approval

## 5.5 Pixel Format in the display



Samsung Secret

Doc.No.

LTN156KT02-301

Rev.No

04-A00-S-110105

Page

20 / 32

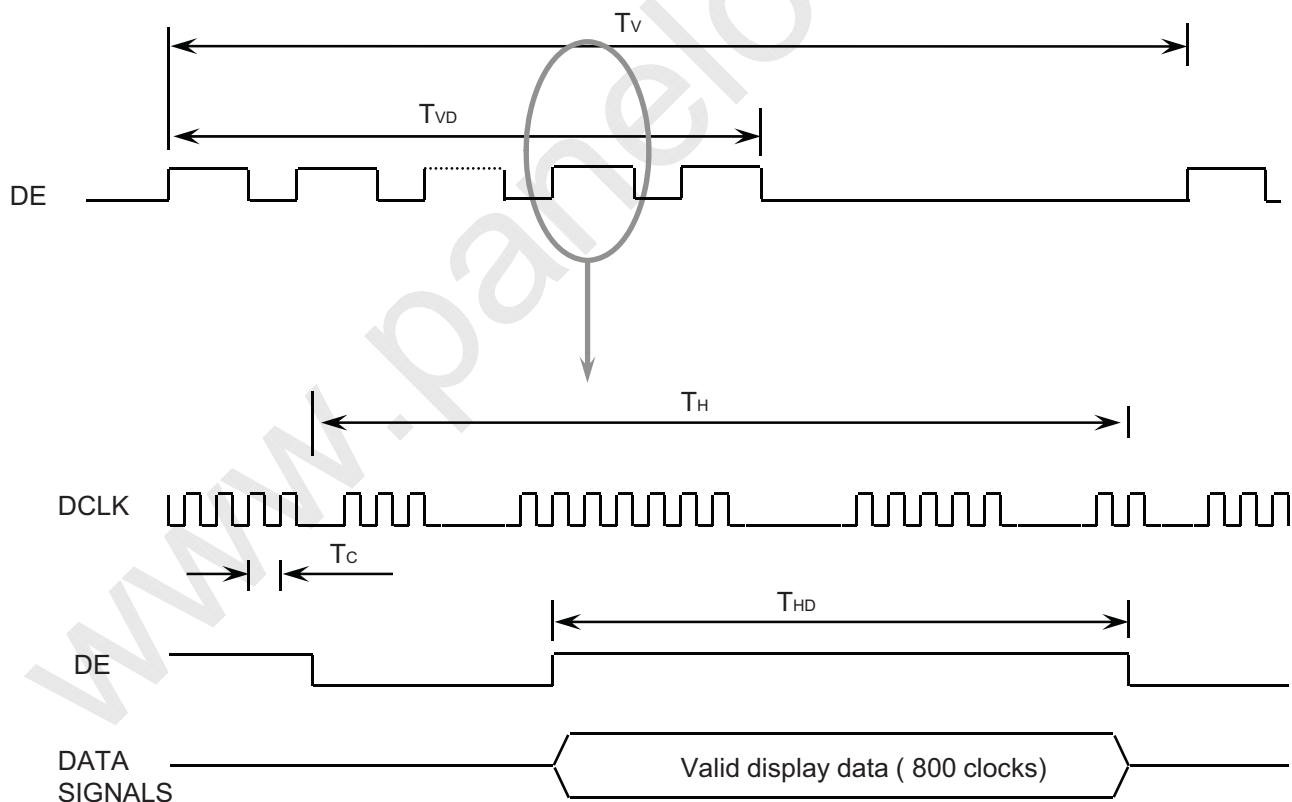
Approval

## 6. INTERFACE TIMING

### 6.1 Timing Parameters

| Signal                         | Item           | Symbol | Min. | Typ. | Max. | Unit   | Note |
|--------------------------------|----------------|--------|------|------|------|--------|------|
| Frame Frequency                | Cycle          | TV     | 912  | 930  | 1140 | Lines  | -    |
| Vertical Active Display Term   | Display Period | TVD    | -    | 900  | -    | Lines  | -    |
| One Line Scanning Time         | Cycle          | TH     | 846  | 966  | 1050 | Clocks | -    |
| Horizontal Active Display Term | Display Period | THD    | -    | 800  | -    | Clocks | -    |

### 6.2 Timing diagrams of interface signal



Samsung Secret

Doc.No.

LTN156KT02-301

Rev.No

04-A00-S-110105

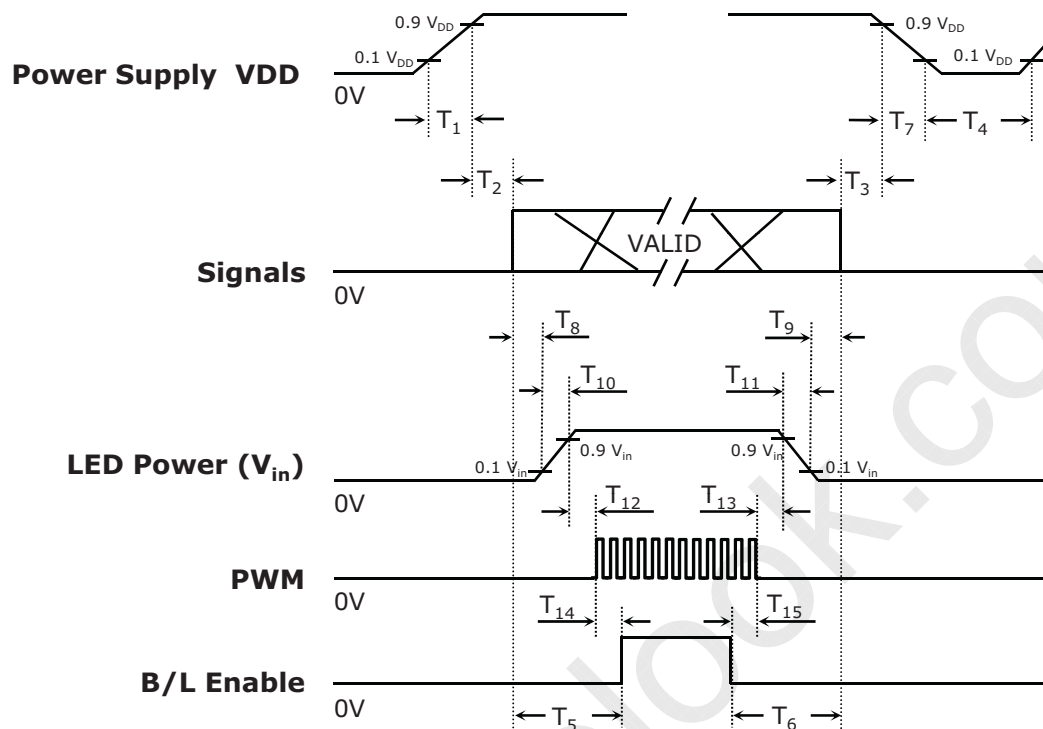
Page

21 / 32

### 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.



| 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%                         |
| $10 < T_{12}$          | Delay from LED driver V <sub>in</sub> rising time 90% to PWM ON          |
| $10 < T_{13}$          | Delay from PWM Off to LED driver V <sub>in</sub> falling time 10%        |
| $10 < T_{14}$          | Delay from PWM ON to B/L Enable ON                                       |
| $10 < T_{15}$          | Delay from B/L Enable Off to PWM Off                                     |

Note : Backlight may flash if interface signal remains floating state at invalid period.

**Samsung Secret**

|         |                |        |                 |      |         |
|---------|----------------|--------|-----------------|------|---------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 22 / 32 |
|---------|----------------|--------|-----------------|------|---------|



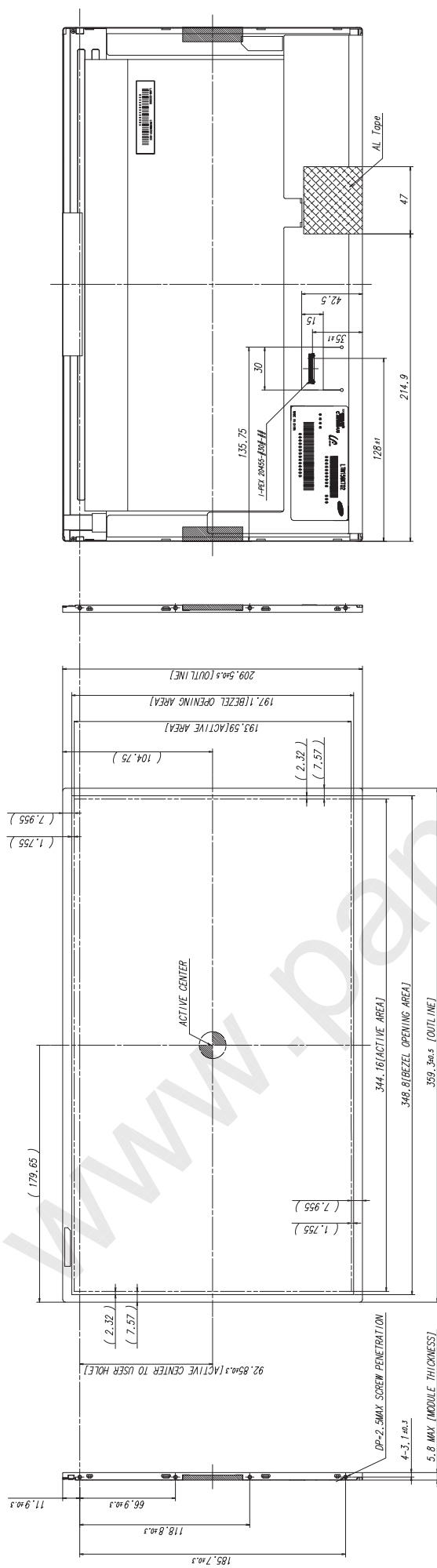
## 7. MECHANICAL OUTLINE DIMENSION

Approval

Refer to the next page

**Samsung Secret**

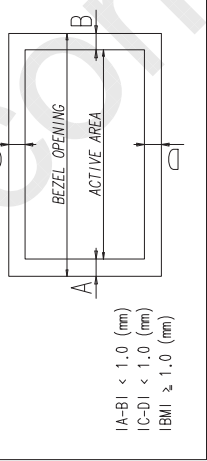
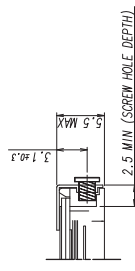
|         |                |        |                 |      |         |
|---------|----------------|--------|-----------------|------|---------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 23 / 32 |
|---------|----------------|--------|-----------------|------|---------|



\* NOTE

- \* NOTE:
  1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
    - MAKER : I-PEX OR COMPATIBLE
    - INPUT CONNECTOR : I-PEX 20455-30F## OR EQUIVALENT
  2. LED CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW.
    - MAKER : UIU Electronics
    - PART NO. : 514441-1041
  3. CALIFERS MEASURING FORCE :  $750 \pm 250$  gf/cm
  4. MAXIMUM SCREW TORQUE : MAX 2.5 kgf-cm (51NMS)
  5. WEIGHT : 480 g MAX
  6. IN ORDER TO AVOID IC DAMAGE, IT IS NOT ALLOW THAT OVERLAPPING OF CABLES OR ANTENNAS, CAMERA, WLAN, OVER THESE COF LOCATIONS.

## BM SHIFT SPEC.

Preliminary Version REV.001  
156HD+ / 5.8MAX

&lt;USER HOLE SCREW HOLE DEPTH&gt;

[illegible]

## 8. PACKING

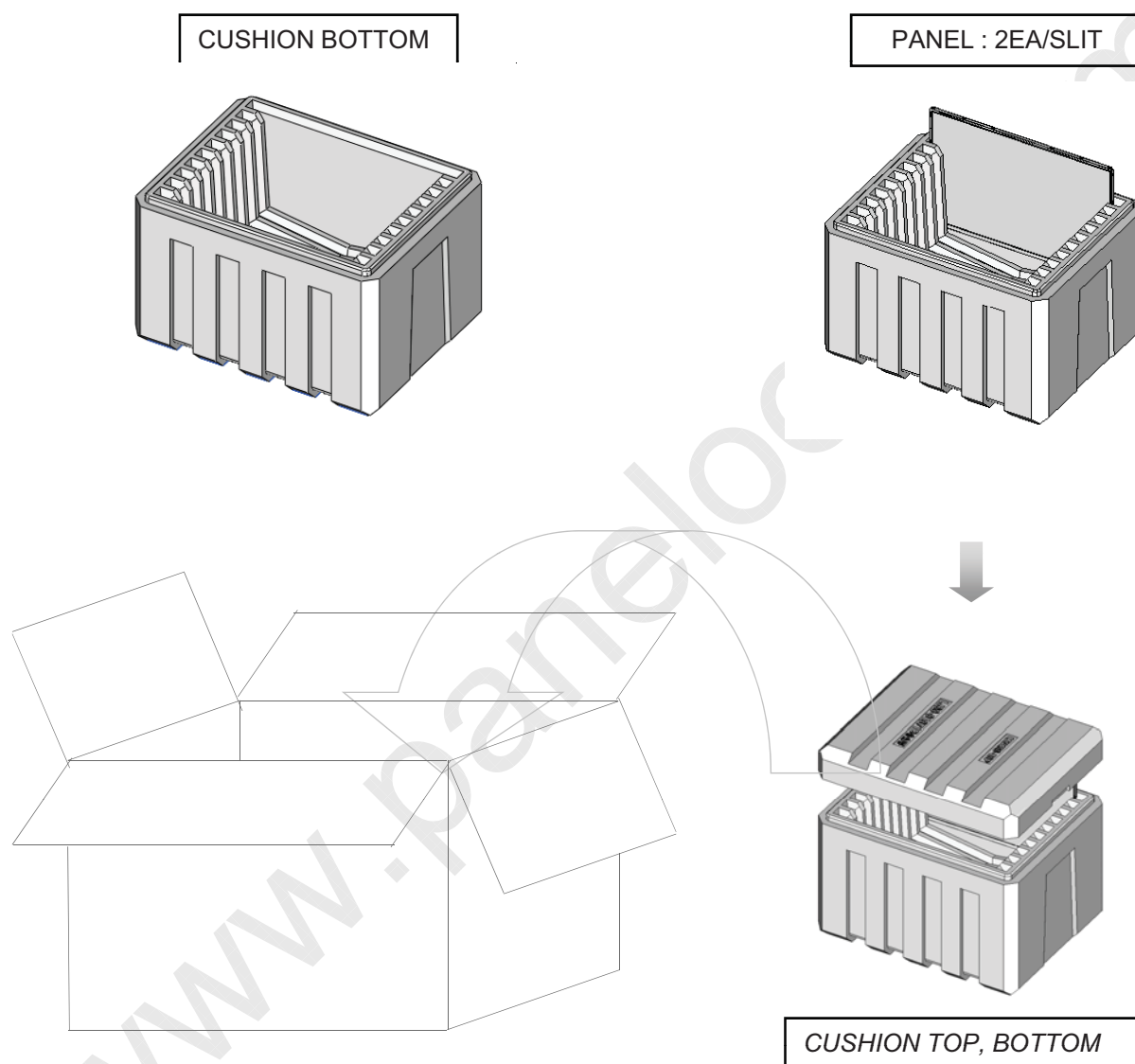
Approval

### 1. CARTON(Internal Package)

#### (1) Packing Form

Corrugated Cardboard box and Corrupad form as shock absorber

#### (2) Packing Method



Note (1) Total : Approx. 12400 g

(2) Acceptance number of piling : 20 sets

(3) Carton size : 359(W) X 463(D) X 333(H)

(4) MAX accumulation quantity : 5 cartons

**Samsung Secret****Doc.No.**

LTN156KT02-301

**Rev.No**

04-A00-S-110105

**Page**

25 / 32

Approval

| No | Part name                                           | Quantity |
|----|-----------------------------------------------------|----------|
| 1  | Static electric protective sack                     | 20       |
| 2  | Packing case (Inner box)<br>included shock absorber | 1 set    |
| 3  | Pictorial marking                                   | 2 pcs    |
| 4  | Carton                                              | 1 set    |

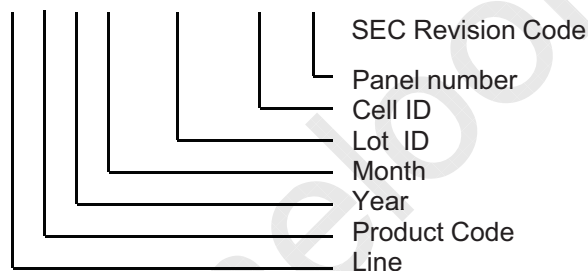
## 9. MARKINGS & OTHERS

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

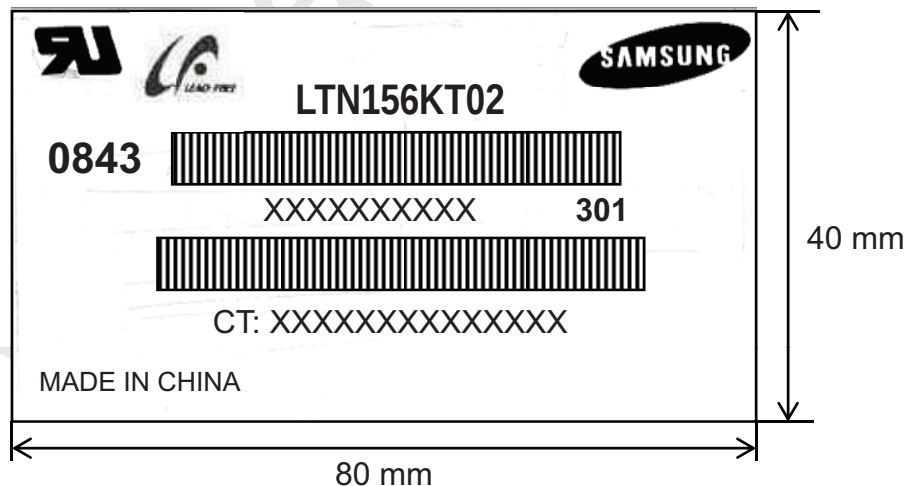
(1)Parts number : LTN156KT02

(2)Revision code : 3 letters

(3)Lot number : X X X X XXX XX X **301**



(4) Nameplate Indication



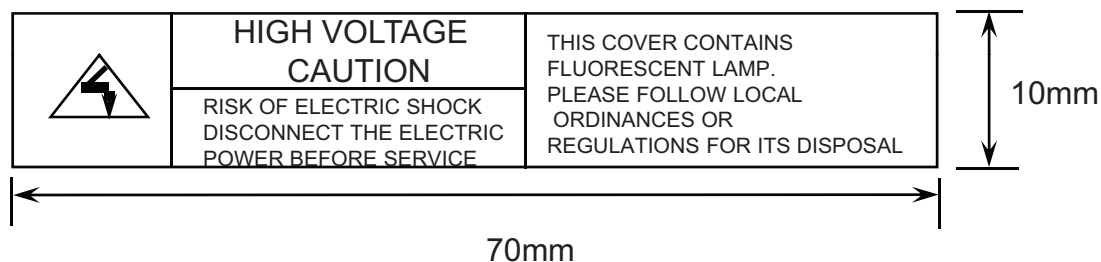
Parts name : LTN156KT02  
 Lot number : XXXXXXXXXXXX  
 Inspected work week : 1043 (2010 year 43rd week)  
 Product Revision Code : **301**  
 CT code : XXXXXXXXXXXXXXXX (Released after HP's approval)

**Samsung Secret**

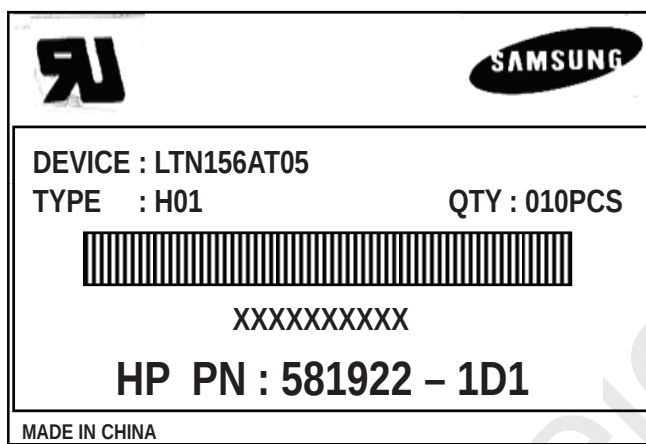
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 26 / 32 |
|---------|----------------|--------|-----------------|------|---------|
|---------|----------------|--------|-----------------|------|---------|

Approval

## (5) High voltage caution notice



## (6) Packing small box attach



Samsung Secret

Doc.No.

LTN156KT02-301

Rev.No

04-A00-S-110105

Page

27 / 32



## 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.
- (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.

**Samsung Secret**

|         |                |        |                 |      |         |
|---------|----------------|--------|-----------------|------|---------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 28 / 32 |
|---------|----------------|--------|-----------------|------|---------|

## 2. STORAGE

Approval

- (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 5 to 40 °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.
- (d) Storage period is recommended not to exceed 1 year.

## 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.

**Samsung Secret**

|         |                |        |                 |      |         |
|---------|----------------|--------|-----------------|------|---------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 29 / 32 |
|---------|----------------|--------|-----------------|------|---------|



## 11. EDID

Approval

| Address<br>(HEX) | FUNCTION               | Value | BIN      | DEC | ASCII<br>or<br>Data | Notes                     |
|------------------|------------------------|-------|----------|-----|---------------------|---------------------------|
|                  |                        | HEX   |          |     |                     |                           |
| 00               | Header                 | 00    | 00000000 | 0   |                     | EDID Header               |
| 01               |                        | FF    | 11111111 | 255 |                     |                           |
| 02               |                        | FF    | 11111111 | 255 |                     |                           |
| 03               |                        | FF    | 11111111 | 255 |                     |                           |
| 04               |                        | FF    | 11111111 | 255 |                     |                           |
| 05               |                        | FF    | 11111111 | 255 |                     |                           |
| 06               |                        | FF    | 11111111 | 255 |                     |                           |
| 07               |                        | 00    | 00000000 | 0   |                     |                           |
| 08               | ID Manufacturer Name   | 4C    | 01001100 | 76  | S                   | 3 character ID            |
| 09               |                        | A3    | 10100011 | 163 | E<br>C              | "SEC"                     |
| 0A               | ID Product Code        | 44    | 01000100 | 68  | [D]                 |                           |
| 0B               |                        | 52    | 01010010 | 82  | [R]                 |                           |
| 0C               | 32-bit serial no.      | 00    | 00000000 | 0   |                     |                           |
| 0D               |                        | 00    | 00000000 | 0   |                     |                           |
| 0E               |                        | 00    | 00000000 | 0   |                     |                           |
| 0F               |                        | 00    | 00000000 | 0   |                     |                           |
| 10               | Week of manufacture    | 00    | 00000000 | 0   |                     |                           |
| 11               | Year of manufacture    | 14    | 00010100 | 20  | 2010                | 2010                      |
| 12               | EDID Structure Ver.    | 01    | 00000001 | 1   | 1                   | EDID Ver. 1.0             |
| 13               | EDID revision #        | 03    | 00000011 | 3   | 3                   | EDID Rev. 3               |
| 14               | Video input definition | 80    | 10000000 | 128 |                     |                           |
| 15               | Max H image size       | 24    | 00100100 | 36  | 36                  | 36 cm(approx)             |
| 16               | Max V image size       | 15    | 00010101 | 21  | 21                  | 21 cm(approx)             |
| 17               | Display Gamma          | 78    | 01111000 | 120 | 2.2                 | Gamma 2.2                 |
| 18               | Feature support        | 0A    | 00001010 | 10  |                     |                           |
| 19               | Red/green low bits     | 85    | 10000101 | 133 |                     | 10000111                  |
| 1A               | Blue/white low bits    | 95    | 10010101 | 149 |                     | 11111110                  |
| 1B               | Red x/ high bits       | 99    | 10011001 | 153 | 0.600               | Red x0.600=<br>10011001   |
| 1C               | Red y                  | 57    | 01010111 | 87  | 0.340               | Red y0.340=<br>01010111   |
| 1D               | Green x                | 4F    | 01001111 | 79  | 0.310               | Green x0.310=<br>01001111 |
| 1E               | Green y                | 8F    | 10001111 | 143 | 0.560               | Green y0.560=<br>10001111 |
| 1F               | Blue x                 | 26    | 00100110 | 38  | 0.150               | Blue x0.150=<br>00100110  |
| 20               | Blue y                 | 21    | 00100001 | 33  | 0.130               | Blue y0.130=<br>00100001  |
| 21               | White x                | 50    | 01010000 | 80  | 0.313               | White x0.313=<br>01010000 |
| 22               | White y                | 54    | 01010100 | 84  | 0.329               | White y0.329=<br>01010100 |
| 23               | Established timing 1   | 00    | 00000000 | 0   |                     |                           |
| 24               | Established timing 2   | 00    | 00000000 | 0   |                     |                           |
| 25               | Established timing 3   | 00    | 00000000 | 0   |                     |                           |

Samsung Secret



Approval

|    |                                       |    |          |     |       |                                 |
|----|---------------------------------------|----|----------|-----|-------|---------------------------------|
| 26 | Standard timing #1                    | 01 | 00000001 | 1   |       | not used                        |
| 27 |                                       | 01 | 00000001 | 1   |       |                                 |
| 28 | Standard timing #2                    | 01 | 00000001 | 1   |       | not used                        |
| 29 |                                       | 01 | 00000001 | 1   |       |                                 |
| 2A | Standard timing #3                    | 01 | 00000001 | 1   |       | not used                        |
| 2B |                                       | 01 | 00000001 | 1   |       |                                 |
| 2C | Standard timing #4                    | 01 | 00000001 | 1   |       | not used                        |
| 2D |                                       | 01 | 00000001 | 1   |       |                                 |
| 2E | Standard timing #5                    | 01 | 00000001 | 1   |       | not used                        |
| 2F |                                       | 01 | 00000001 | 1   |       |                                 |
| 30 | Standard timing #6                    | 01 | 00000001 | 1   |       | not used                        |
| 31 |                                       | 01 | 00000001 | 1   |       |                                 |
| 32 | Standard timing #7                    | 01 | 00000001 | 1   |       | not used                        |
| 33 |                                       | 01 | 00000001 | 1   |       |                                 |
| 34 | Standard timing #8                    | 01 | 00000001 | 1   |       | not used                        |
| 35 |                                       | 01 | 00000001 | 1   |       |                                 |
| 36 | Detailed timing/monitor descriptor #1 | 1C | 00011100 | 28  | 107.8 | Main clock = 107.8(53.9*2 MHz)  |
| 37 |                                       | 2A | 00101010 | 42  |       |                                 |
| 38 |                                       | 40 | 01000000 | 64  | 1600  | Hor active=1600 pixels          |
| 39 |                                       | 4C | 01001100 | 76  | 332   | Hor blanking=114 pixels         |
| 3A |                                       | 61 | 01100001 | 97  |       | 4bit : 4bit                     |
| 3B |                                       | 84 | 10000100 | 132 | 900   | Vertical active=900 lines       |
| 3C |                                       | 1E | 00011110 | 30  | 30    | Vertical blanking=12 lines      |
| 3D |                                       | 30 | 00110000 | 48  |       | 4bit : 4bit                     |
| 3E |                                       | 30 | 00110000 | 48  | 48    | H sync. Offset=48 pixels        |
| 3F |                                       | 20 | 00100000 | 32  | 32    | H sync. Width=32 pixels         |
| 40 |                                       | 25 | 00100101 | 37  | 2     | V sync. Offset=2 lines          |
|    |                                       |    |          |     | 5     | V sync. Width=5 lines           |
| 41 |                                       | 00 | 00000000 | 0   |       | 2bit : 2bit :2bit :2bit         |
| 42 |                                       | 68 | 01101000 | 104 | 360   | H image size= 360 mm(approx)    |
| 43 |                                       | D2 | 11010010 | 210 | 210   | V image size = 210 mm(approx)   |
| 44 |                                       | 10 | 00010000 | 16  |       |                                 |
| 45 |                                       | 00 | 00000000 | 0   |       | No Horizontal Border            |
| 46 |                                       | 00 | 00000000 | 0   |       | No Vertical Border              |
| 47 |                                       | 19 | 00011001 | 25  |       |                                 |
| 48 | Detailed timing/monitor descriptor #2 | 00 | 00000000 | 0   |       | Manufacturer Specified (Timing) |
| 49 |                                       | 00 | 00000000 | 0   |       |                                 |
| 4A |                                       | 00 | 00000000 | 0   |       |                                 |
| 4B |                                       | 0F | 00001111 | 15  |       |                                 |
| 4C |                                       | 00 | 00000000 | 0   |       |                                 |
| 4D |                                       | 00 | 00000000 | 0   |       | Value=HSPWmin / 2               |
| 4E |                                       | 00 | 00000000 | 0   |       | Value=HSPWmax / 2               |
| 4F |                                       | 00 | 00000000 | 0   |       | Value=Thbpmin / 2               |
| 50 |                                       | 00 | 00000000 | 0   |       | Value=Thbpmax / 2               |
| 51 |                                       | 00 | 00000000 | 0   |       | Value=VSPWmin / 2               |
| 52 |                                       | 00 | 00000000 | 0   |       | Value=VSPWmax / 2               |
| 53 |                                       | 00 | 00000000 | 0   |       | Value=Tvpmin / 2                |
| 54 |                                       | 00 | 00000000 | 0   |       | Value=Tvpmax / 2                |
| 55 |                                       | 2E | 00101110 | 46  |       | Thpmin=value*2 + HA pixelclks   |
| 56 |                                       | FA | 11111010 | 250 |       | Thpmax=value*2 + HA pixelclks   |
| 57 |                                       | 06 | 00000110 | 6   |       | Tvpmin=value*2 + VA lines       |
| 58 |                                       | 78 | 01111000 | 120 |       | Tvpmax=value*2 + VA lines       |
| 59 |                                       | 00 | 00000000 | 0   |       | Module revision                 |

Samsung Secret

|         |                |        |                 |      |         |
|---------|----------------|--------|-----------------|------|---------|
| Doc.No. | LTN156KT02-301 | Rev.No | 04-A00-S-110105 | Page | 31 / 32 |
|---------|----------------|--------|-----------------|------|---------|



Approval

|    |                                       |    |          |     |     |                          |
|----|---------------------------------------|----|----------|-----|-----|--------------------------|
| 5A | Detailed timing/monitor descriptor #3 | 00 | 00000000 | 0   |     | ASCII Data String Tag    |
| 5B |                                       | 00 | 00000000 | 0   |     |                          |
| 5C |                                       | 00 | 00000000 | 0   |     |                          |
| 5D |                                       | FE | 11111110 | 254 |     |                          |
| 5E |                                       | 00 | 00000000 | 0   |     |                          |
| 5F |                                       | 53 | 01010011 | 83  | [S] |                          |
| 60 |                                       | 41 | 01000001 | 65  | [A] |                          |
| 61 |                                       | 4D | 01001101 | 77  | [M] |                          |
| 62 |                                       | 53 | 01010011 | 83  | [S] |                          |
| 63 |                                       | 55 | 01010101 | 85  | [U] |                          |
| 64 |                                       | 4E | 01001110 | 78  | [N] |                          |
| 65 |                                       | 47 | 01000111 | 71  | [G] |                          |
| 66 |                                       | 0A | 00001010 | 10  | [^] |                          |
| 67 |                                       | 20 | 00100000 | 32  | []  |                          |
| 68 |                                       | 20 | 00100000 | 32  | []  |                          |
| 69 |                                       | 20 | 00100000 | 32  | []  |                          |
| 6A |                                       | 20 | 00100000 | 32  | []  |                          |
| 6B |                                       | 20 | 00100000 | 32  | []  |                          |
| 6C | Detailed timing/monitor descriptor #4 | 00 | 00000000 | 0   |     | Monitor Name Tag (ASCII) |
| 6D |                                       | 00 | 00000000 | 0   |     |                          |
| 6E |                                       | 00 | 00000000 | 0   |     |                          |
| 6F |                                       | FE | 11111110 | 254 |     |                          |
| 70 |                                       | 00 | 00000000 | 0   |     |                          |
| 71 |                                       | 31 | 00110001 | 49  | [1] |                          |
| 72 |                                       | 35 | 00110101 | 53  | [5] |                          |
| 73 |                                       | 36 | 00110110 | 54  | [6] |                          |
| 74 |                                       | 4B | 01001011 | 75  | [K] |                          |
| 75 |                                       | 54 | 01010100 | 84  | [T] |                          |
| 76 |                                       | 30 | 00110000 | 48  | [0] |                          |
| 77 |                                       | 32 | 00110010 | 50  | [2] |                          |
| 78 |                                       | 2D | 00101101 | 45  | [-] |                          |
| 79 |                                       | 33 | 00110011 | 51  | [3] |                          |
| 7A |                                       | 30 | 00110000 | 48  | [0] |                          |
| 7B |                                       | 31 | 00110001 | 49  | [1] |                          |
| 7C |                                       | 0A | 00001010 | 10  | [^] |                          |
| 7D |                                       | 20 | 00100000 | 32  | []  |                          |
| 7E | Extension Flag                        | 00 | 00000000 | 0   |     |                          |
| 7F | Checksum                              | 6D | 01101101 | 109 |     |                          |

Samsung Secret

Doc.No.

LTN156KT02-301

Rev.No

04-A00-S-110105

Page

32 / 32