



## ASI-T-8801248A5LN/AD

| ITEM                            | SPECIFICATION              |       |       |       |
|---------------------------------|----------------------------|-------|-------|-------|
| Display Area (mm)               | 209.28(W) x 78.48(H)       |       |       |       |
| Number of Pixels                | 1280(H) x 3 (RGB) x 480(V) |       |       |       |
| Pixel Pitch (mm)                | 0.1635(W) x 0.1635(H)      |       |       |       |
| Color Pixel Arrangement         | RGB vertical stripe        |       |       |       |
| Display Mode                    | Normally black             |       |       |       |
| Number of Colors                | 16.7M                      |       |       |       |
| Brightness (cd/m <sup>2</sup> ) | 400 (Min.)/500 (Typ.)      |       |       |       |
| Response Time (ms)              | 25ms(Typ.)                 |       |       |       |
| Optimum Viewing Direction       | Full                       |       |       |       |
| Contrast Ratio                  | 1000:1(Typ.)/ 600:1(min)   |       |       |       |
| Viewing Angle ( CR $\geq$ 10)   | 170degree (Horizontal.)    |       |       |       |
|                                 | 170degree (Vertical)       |       |       |       |
| Power Consumption (W)           | 3.22 W(Typ)                |       |       |       |
| Interface connection            | LVDS                       |       |       |       |
| Module Size (mm)                |                            | Min.  | Typ.  | Max.  |
|                                 | Horizontal(H)              | 229.3 | 229.6 | 229.9 |
|                                 | Vertical(V)                | 97    | 97.3  | 97.6  |
|                                 | Depth(D) (w/o FPC )        | 5.7   | 6     | 6.3   |
| Module Weight (g)               | 215 g                      |       |       |       |
| Backlight Unit                  | LED                        |       |       |       |
| Surface Treatment               | AG 25%                     |       |       |       |



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## 1. OVERVIEW

ASI-T-8801248A5LN/AD is 8.8" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit and LED backlight. By applying 1280×480 images are displayed on the 8.8" diagonal screen. Display 16.7M colors by R.G.B signal input.

General specification are summarized in the following table:

| ITEM                            | SPECIFICATION              |       |       |       |
|---------------------------------|----------------------------|-------|-------|-------|
| Display Area (mm)               | 209.28(W) x 78.48(H)       |       |       |       |
| Number of Pixels                | 1280(H) × 3 (RGB) × 480(V) |       |       |       |
| Pixel Pitch (mm)                | 0.1635(W) x 0.1635(H)      |       |       |       |
| Color Pixel Arrangement         | RGB vertical stripe        |       |       |       |
| Display Mode                    | Normally black             |       |       |       |
| Number of Colors                | 16.7M                      |       |       |       |
| Brightness (cd/m <sup>2</sup> ) | 400 (Min.)/500 (Typ.)      |       |       |       |
| Response Time (ms)              | 25ms(Typ.)                 |       |       |       |
| Optimum Viewing Direction       | Full                       |       |       |       |
| Contrast Ratio                  | 1000:1(Typ.)/ 600:1(min)   |       |       |       |
| Viewing Angle ( CR ≥ 10)        | 170degree (Horizontal.)    |       |       |       |
|                                 | 170degree (Vertical)       |       |       |       |
| Power Consumption (W)           | 3.22 W(Typ)                |       |       |       |
| Interface connection            | LVDS                       |       |       |       |
| Module Size (mm)                |                            | Min.  | Typ.  | Max.  |
|                                 | Horizontal(H)              | 229.3 | 229.6 | 229.9 |
|                                 | Vertical(V)                | 97    | 97.3  | 97.6  |
|                                 | Depth(D) (w/o FPC )        | 5.7   | 6     | 6.3   |
| Module Weight (g)               | 215 g                      |       |       |       |
| Backlight Unit                  | LED                        |       |       |       |
| Surface Treatment               | AG 25%                     |       |       |       |

## 2. ABSOLUTE MAXIMUM RATINGS

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

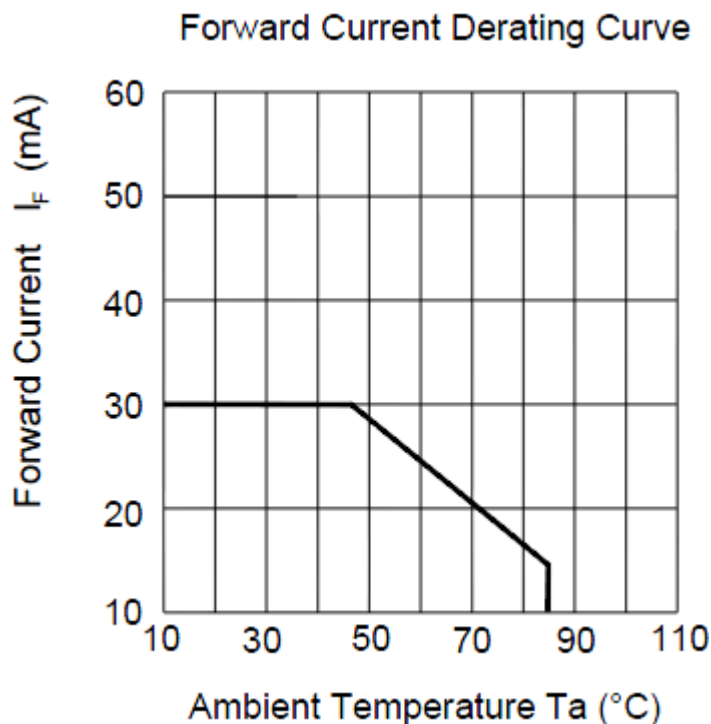
| Item                              | Symbol                                      | Min.    | Max.     | Unit | Note  |
|-----------------------------------|---------------------------------------------|---------|----------|------|-------|
| Digital Supply Voltage            | DVDD<br>DVDD_LVDS                           | 0.3     | 5        | V    |       |
| Analog Supply Voltage             | AVDD                                        | 0.5     | 15       | V    |       |
| Gate On Voltage                   | VGH                                         | -0.3    | VGL+44   | V    |       |
| Gate Off Voltage                  | VGL                                         | VGH-44  | 0.3      | V    |       |
| Gate On-Gate Off Voltage          | VGH-VGL                                     | VGL-0.3 | VGG+0.3  | V    |       |
| Signal Input Voltage              | NIND0 ~ NIND3<br>PIND0 ~ PIND3<br>NINC,PINC | -0.3    | DVDD+0.3 | V    |       |
| Forward Current<br>( per LED )    | If                                          | -       | 80       | mA   |       |
| Pulse forward current ( per LED ) | I <sub>fp</sub>                             | -       | 200      | mA   | 1、2、3 |
| Operating temperature             | Topa                                        | -20     | 70       | °C   | 4     |
| Storage temperature               | Tstg                                        | -30     | 80       | °C   | 4     |

Note :

\*1) If the product were used out of the operation and storage range, it will have quality issue.

\*2) I<sub>fp</sub> Conditions : Pulse Width ≤ 10msec , Duty ≤ 1/10.

\*3) Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward Current.



\*4) If users use the product out off the environmemtal operation range ( temperature and humidity ) , it will have visual quality concerns.

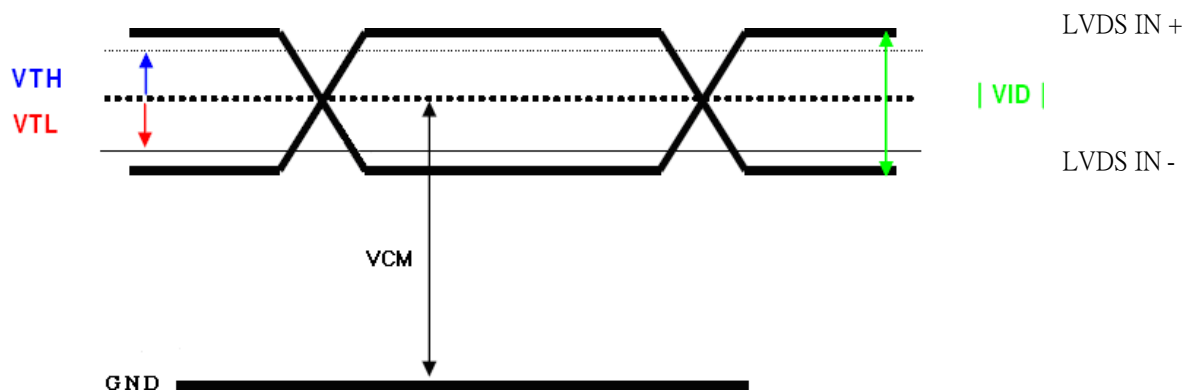
### 3. ELECTRICAL CHARACTERISTICS

#### 3.1 TFT LCD

Ta=25°C

| ITEM                                 | SYMBOL           | MIN      | TYP   | MAX      | UNIT | NOTE              |
|--------------------------------------|------------------|----------|-------|----------|------|-------------------|
| Digital Power Supply Voltage For LCD | DVDD<br>VDD_LVDS | 3        | 3.3   | 3.6      | V    |                   |
| Logic Input Voltage (LVDS:IN+,IN )   | VCM              | VID<br>2 | -     | DVDD-1.2 | V    | Note1             |
|                                      | VID              | 200      | -     | 600      | mV   | Note1             |
|                                      | VTH              | -        | -     | 100      | mV   | VCM=1.2V<br>Note1 |
|                                      | VTL              | -100     | -     | -        | mV   |                   |
| Analog Power Supply Voltage          | AVDD             | 12.8     | 13    | 13.2     | V    |                   |
| Gate On Power Supply Voltage         | VGH              | 19       | 20    | 21       | V    |                   |
| Gate Off Power Supply Voltage        | VGL              | -6.6     | -6    | -5.4     | V    |                   |
| Logic Input Voltage                  | VIH              | 0.7*DVDD | -     | DVDD     | V    |                   |
|                                      | VIL              | GND      | -     | 0.3*DVDD | V    |                   |
| Gamma Voltage                        | V1               | -        | 12.29 | -        | V    | Note2             |
|                                      | V2               | -        | 10.38 | -        | V    |                   |
|                                      | V3               | -        | 9.79  | -        | V    |                   |
|                                      | V4               | -        | 9.09  | -        | V    |                   |
|                                      | V5               | -        | 8.49  | -        | V    |                   |
|                                      | V6               | -        | 8.01  | -        | V    |                   |
|                                      | V7               | -        | 6.96  | -        | V    |                   |
|                                      | V8               | -        | 6.04  | -        | V    |                   |
|                                      | V9               | -        | 4.99  | -        | V    |                   |
|                                      | V10              | -        | 4.51  | -        | V    |                   |
|                                      | V11              | -        | 3.92  | -        | V    |                   |
|                                      | V12              | -        | 3.21  | -        | V    |                   |
|                                      | V13              | -        | 2.62  | -        | V    |                   |
|                                      | V14              | -        | 0.71  | -        | V    |                   |

【Note1】 LVDS signal



【Note2】 (1)Gamma voltage is the reference voltage for customer, it could be adjust by customer.

(2)The voltage of these pins must be:

V1>V2>V3>V4>V5>V6>V7>V8>V9>V10>V11>V12>V13>V14

AVDD-0.1>V1~V7>0.4AVDD ; 0.6AVDD>V8~V14>AGND+0.1

【 Recommend 】 VCOM must be optimized according to each LCM. Please adjust VR to make the flicker level be minimum for getting excellent image.

### 3.2 TFT-LCD Current Consumption

| Item                    | Symbol | Condition   | Min. | Typ.  | Max.  | Unit. | Note.   |
|-------------------------|--------|-------------|------|-------|-------|-------|---------|
| Gate on Current         | IVGH   | VGH =20V    | -    | 0.5   | 1     | mA    | 【Note1】 |
| Gate off Current        | IVGL   | VGL= -6V    | -    | 0.5   | 1     | mA    | 【Note1】 |
| Digital Current         | IDVDD  | DVDD = 3.3V | -    | 25    | 35    | mA    | 【Note1】 |
| Analog Current          | IAVDD  | AVDD = 13V  | -    | 30    | 60    | mA    | 【Note1】 |
| Total Power Consumption | PC     |             | -    | 485.5 | 921.5 | mW    | 【Note1】 |

Note1: Typical: Under 256 gray pattern  
Maximum: Under white pattern



256 gray pattern

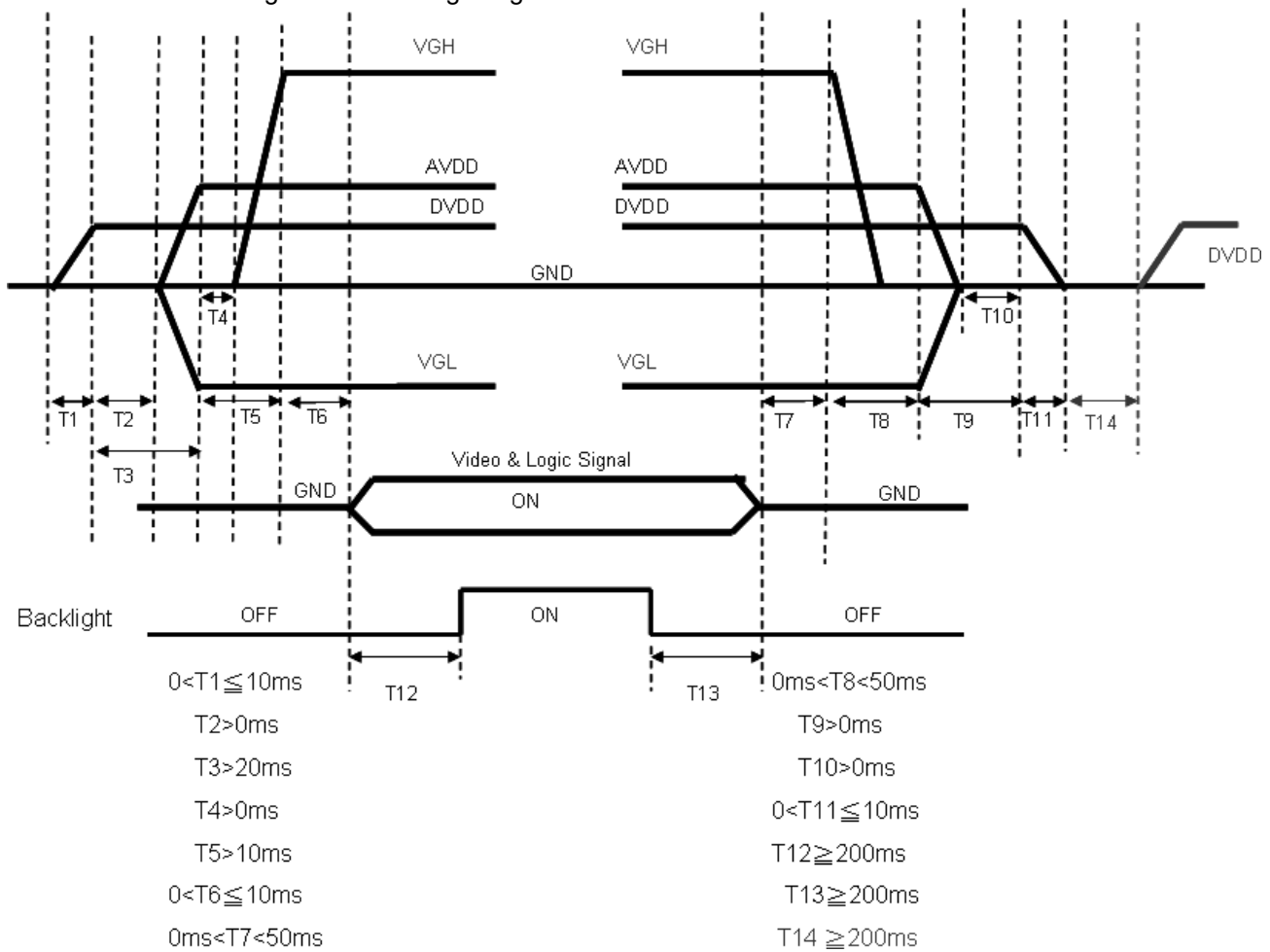


White Pattern

### 3.3 Power 、Signal sequence

Power On : DVDD→AVDD/VGL →VGH →Video &Logic Signal→Backlight

Power Off : Backlight→Video &Logic Signal→ VGH→AVDD/VGL→DVDD



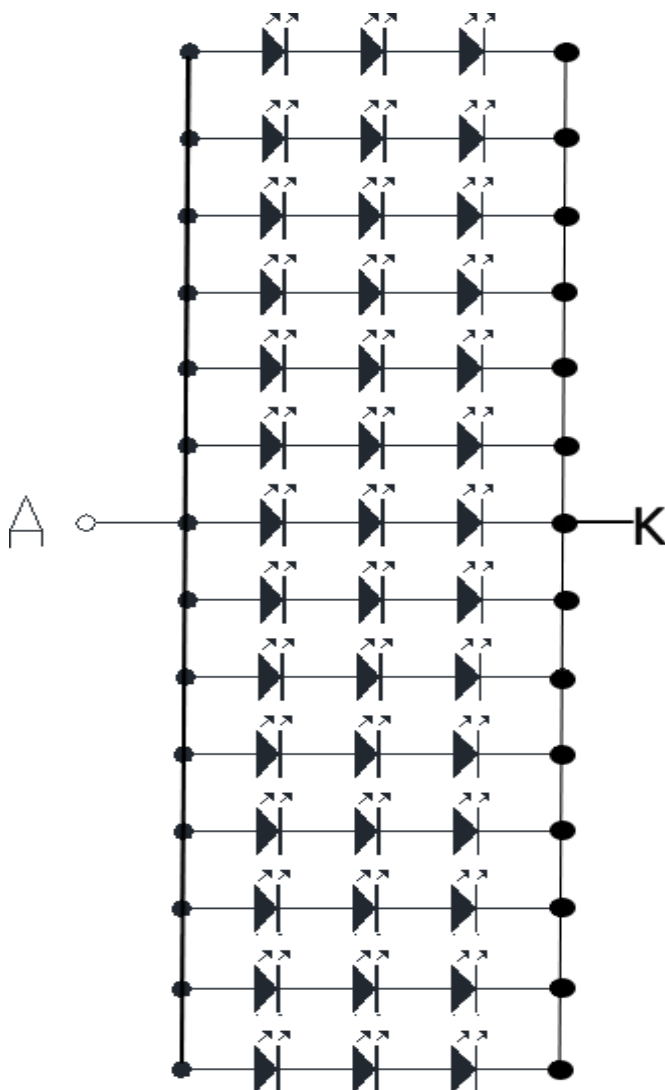
### 3.4 Backlight

Ta=25°C

| ITEM              | SYMBOL | CONDITIONS               | MIN   | TYP  | MAX  | UNIT | NOTE |
|-------------------|--------|--------------------------|-------|------|------|------|------|
| LED current       | IL     | Ta=25°C<br>(20mA/serise) | --    | 280  | --   | mA   |      |
| LED voltage       | VL     | Ta=25°C<br>(20mA/serise) | 8.55  | 9.75 | 10.8 | V    |      |
| Power consumption | WL     | Ta=25°C<br>(20mA/serise) | --    | 2.73 | --   | W    |      |
| LED Lifetime      | -      | Ta=60°C<br>IF=20mA       | 30000 |      |      | Hr   |      |

Remarks :

\*1)LED Circuit Diagram



\*2) A : Anode(+) , K : Cathode(-)

\*3) Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.

\*4) Definition of Led lifetime : Luminance < Initial luminance 50%.



## 4. INTERFACE CONNECTION

### 4.1 CN1 (Input Signal)

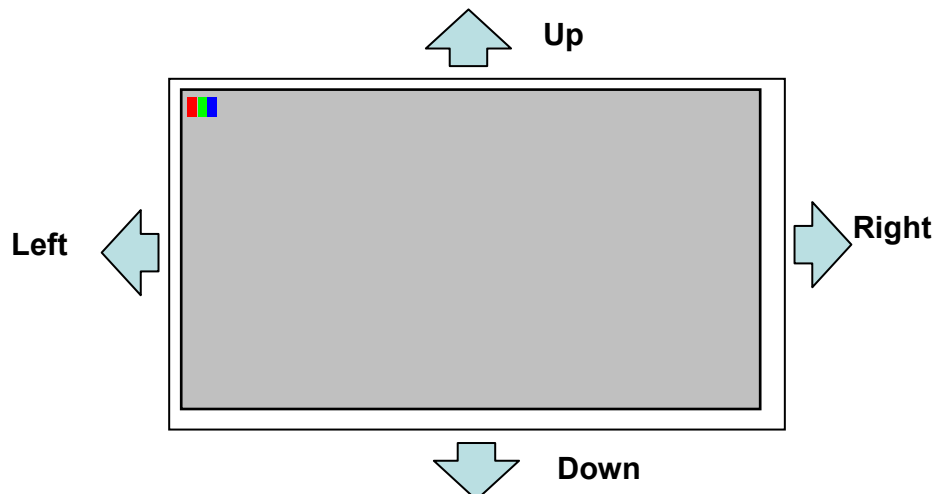
| PIN NO | SYMBOL    | DESCRIPTION                                                                                                                                                                                  |
|--------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | AGND      | Analog ground                                                                                                                                                                                |
| 2      | AVDD      | Analog power                                                                                                                                                                                 |
| 3      | DVDD      | Digital power                                                                                                                                                                                |
| 4      | GND       | Digital ground                                                                                                                                                                               |
| 5      | NC        | Not connect                                                                                                                                                                                  |
| 6      | DVDD      | Digital power                                                                                                                                                                                |
| 7      | GND       | Digital ground                                                                                                                                                                               |
| 8      | V14       | Gamma correction voltage reference                                                                                                                                                           |
| 9      | V13       | Gamma correction voltage reference                                                                                                                                                           |
| 10     | V12       | Gamma correction voltage reference                                                                                                                                                           |
| 11     | V11       | Gamma correction voltage reference                                                                                                                                                           |
| 12     | V10       | Gamma correction voltage reference                                                                                                                                                           |
| 13     | V9        | Gamma correction voltage reference                                                                                                                                                           |
| 14     | V8        | Gamma correction voltage reference                                                                                                                                                           |
| 15     | GND       | Digital ground                                                                                                                                                                               |
| 16     | DVDD_LVDS | LVDS power                                                                                                                                                                                   |
| 17     | GND       | Digital ground                                                                                                                                                                               |
| 18     | PIND3     | Positive LVDS differential data input                                                                                                                                                        |
| 19     | NIND3     | Negative LVDS differential data input                                                                                                                                                        |
| 20     | GND       | Digital ground                                                                                                                                                                               |
| 21     | PINC      | Positive LVDS differential clock input                                                                                                                                                       |
| 22     | NINC      | Negative LVDS differential clock input                                                                                                                                                       |
| 23     | GND       | Digital ground                                                                                                                                                                               |
| 24     | PIND2     | Positive LVDS differential data input                                                                                                                                                        |
| 25     | NIND2     | Negative LVDS differential data input                                                                                                                                                        |
| 26     | GND       | Digital ground                                                                                                                                                                               |
| 27     | PIND1     | Positive LVDS differential data input                                                                                                                                                        |
| 28     | NIND1     | Negative LVDS differential data input                                                                                                                                                        |
| 29     | GND       | Digital ground                                                                                                                                                                               |
| 30     | PIND0     | Positive LVDS differential data input                                                                                                                                                        |
| 31     | NIND0     | Negative LVDS differential data input                                                                                                                                                        |
| 32     | GND       | Digital ground                                                                                                                                                                               |
| 33     | GND_LVDS  | LVDS ground                                                                                                                                                                                  |
| 34     | GRB       | Global reset pin. Active low to enter reset state.<br>Suggest to connecting with an RC reset circuit for stability.<br>Normally pull high. (R=47KΩ , C=1μF)                                  |
| 35     | STBYB     | Standby mode, normally pull high<br>STBYB="1", normal operation<br>STBYB="0", timing control, source driver will turn off, all output are GND, suggest to turn off AVDD power simultaneously |
| 36     | SHLR      | Left or right display control                                                                                                                                                                |
| 37     | DVDD      | Digital power                                                                                                                                                                                |
| 38     | UPDN      | Up / down display control                                                                                                                                                                    |
| 39     | AGND      | Analog ground                                                                                                                                                                                |
| 40     | AVDD      | Analog power                                                                                                                                                                                 |
| 41     | NC        | Not connect                                                                                                                                                                                  |

|    |      |                                                                                                        |
|----|------|--------------------------------------------------------------------------------------------------------|
| 42 | NC   | Not connect                                                                                            |
| 43 | GND  | Digital ground                                                                                         |
| 44 | DVDD | Digital Power                                                                                          |
| 45 | GND  | Digital ground                                                                                         |
| 46 | V7   | Gamma correction voltage reference                                                                     |
| 47 | V6   | Gamma correction voltage reference                                                                     |
| 48 | V5   | Gamma correction voltage reference                                                                     |
| 49 | V4   | Gamma correction voltage reference                                                                     |
| 50 | V3   | Gamma correction voltage reference                                                                     |
| 51 | V2   | Gamma correction voltage reference                                                                     |
| 52 | V1   | Gamma correction voltage reference                                                                     |
| 53 | GND  | Digital ground                                                                                         |
| 54 | DVDD | Digital power                                                                                          |
| 55 | SELB | 6bit/8bit mode select,<br>SELB = "1", LVDS input data is 8bits<br>SELB = "0", LVDS input data is 6bits |
| 56 | VGH  | Positive power for TFT                                                                                 |
| 57 | DVDD | Digital power for Gate IC                                                                              |
| 58 | VGL  | Negative power for TFT                                                                                 |
| 59 | GND  | Digital ground for Gate IC                                                                             |
| 60 | NC   | Not connect                                                                                            |

Remarks : Mating connector : 089K60-000100-G2-R (STARCONN)

Note 1 : UPDN and SHLR control function

| SHLR | UPDN | Data shifting                 |
|------|------|-------------------------------|
| DVDD | GND  | Left→Right , Up→Down(default) |
| GND  | GND  | Right→Left , Up→Down          |
| DVDD | DVDD | Left→Right , Down→Up          |
| GND  | DVDD | Right→Left , Down→Up          |



#### 4.2 CN2 (LED backlight)

| Pin No. | Symbol | Function      | Remark |
|---------|--------|---------------|--------|
| 1       | +      | positive pole | BLACK  |
| 2       |        | negative pole | WHITE  |

Input connector : BHSR 02VS 1(JST)

Outlet connector: SM02B-BHSS-1(JST)

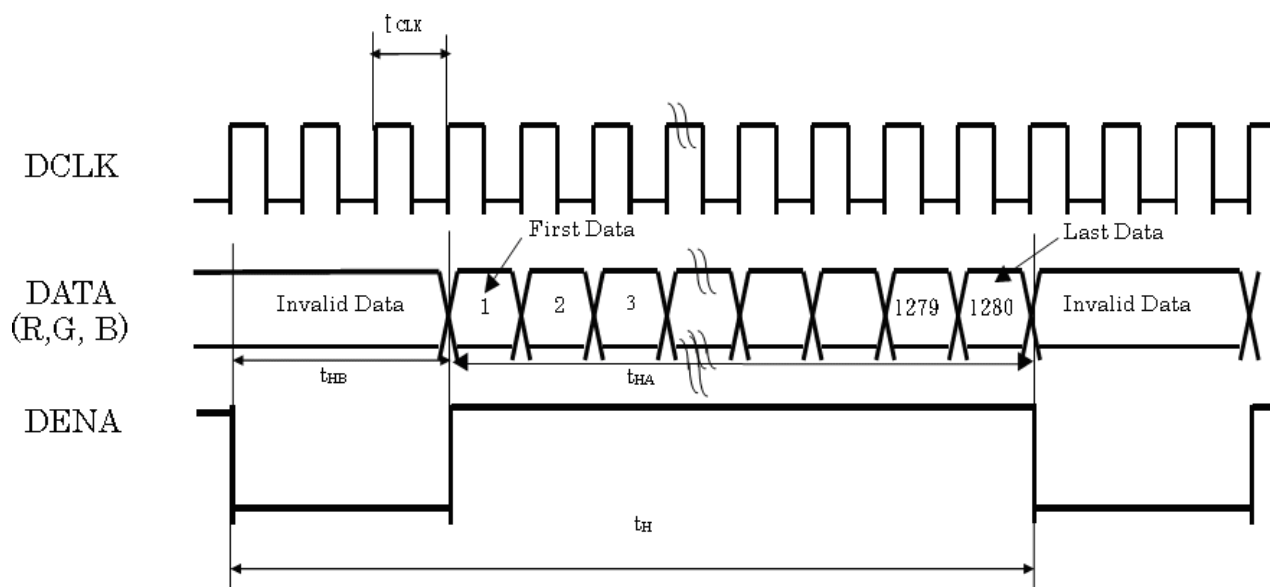
## 5. INPUT SIGNAL(DE ONLY MODE)

### 5.1 Timing Specification

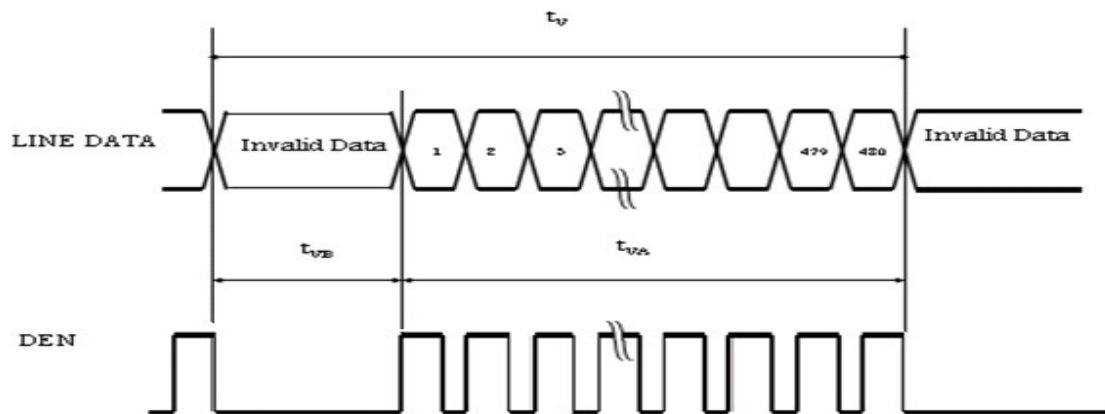
| Item                                                    |               |            |                           | Symbol          | Min. | Typ. | Max. | Unit           |
|---------------------------------------------------------|---------------|------------|---------------------------|-----------------|------|------|------|----------------|
| LVDS input signal sequence                              | CLK Frequency |            |                           | tclk            | 42   | 45   | 60   | MHz            |
| LCD input signal sequence<br>( Input LVDS Transmitter ) | DENA          | Horizontal | Horizontal total Time     | t <sub>H</sub>  | 1373 | 1413 | 1488 | tCLK           |
|                                                         |               |            | Horizontal effective Time | t <sub>HA</sub> | 1280 |      |      | tCLK           |
|                                                         |               |            | Horizontal Blank Time     | t <sub>HB</sub> | 93   | 133  | 208  | tCLK           |
|                                                         |               | Vertical   | Vertical total Time       | t <sub>V</sub>  | 517  | 533  | 672  | t <sub>H</sub> |
|                                                         |               |            | Vertical effective Time   | t <sub>VA</sub> | 480  |      |      | t <sub>H</sub> |
|                                                         |               |            | Vertical Blank Time       | t <sub>VB</sub> | 37   | 53   | 192  | t <sub>H</sub> |

### 5.2 Timing sequence(Timing chart)

#### 5.2.1 Horizontal Timing Sequence

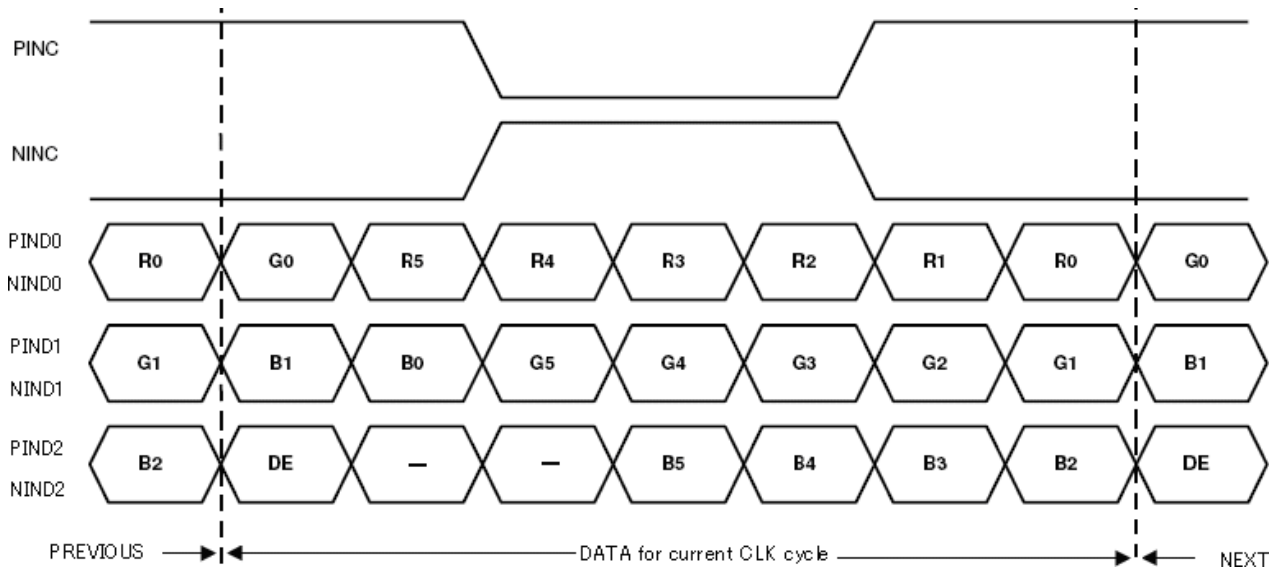


## 5.2.2 Vertical Timing Sequence

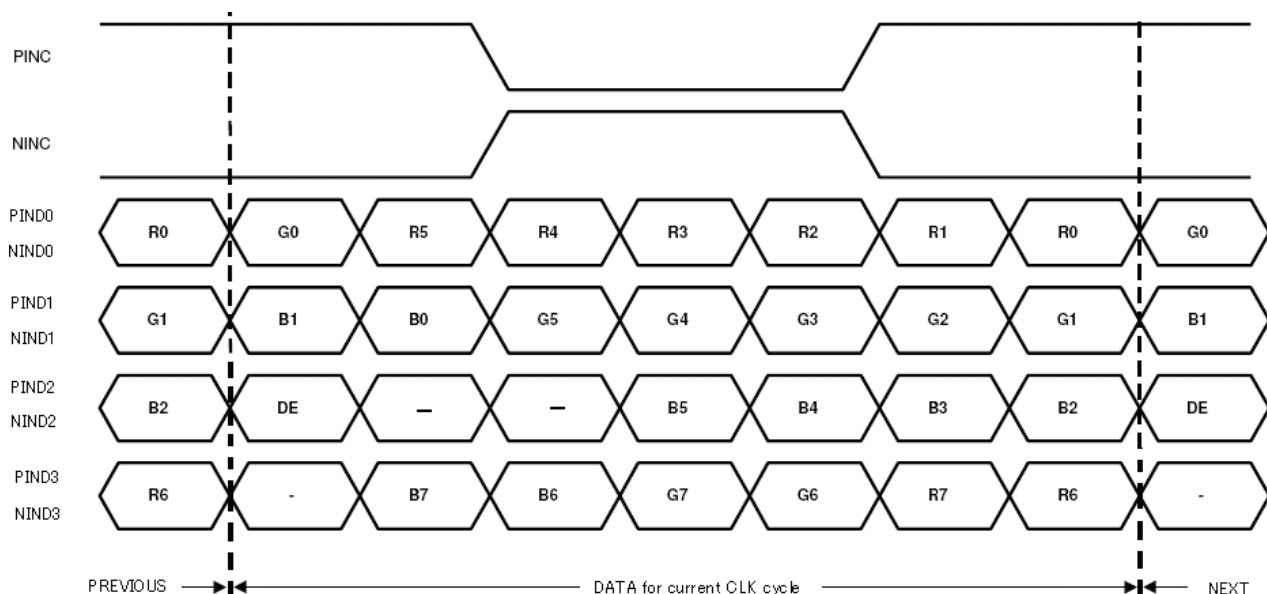


## 5.2.3 LVDS Input Data mapping

### 6 Bit LVDS input



### 8 Bit LVDS input



## 5.2.4 Color Data Reference

| COLOR       | INPUT DATA | R DATA |    |    |    |    |    |    |     | G DATA |    |    |    |    |    |    |     | B DATA |    |    |    |    |    |    |     |   |
|-------------|------------|--------|----|----|----|----|----|----|-----|--------|----|----|----|----|----|----|-----|--------|----|----|----|----|----|----|-----|---|
|             |            | R7     | R6 | R5 | R4 | R3 | R2 | R1 | R0  | G7     | G6 | G5 | G4 | G3 | G2 | G1 | G0  | B7     | B6 | B5 | B4 | B3 | B2 | B1 | B0  |   |
|             |            | MSB    |    |    |    |    |    |    | LSB | MSB    |    |    |    |    |    |    | LSB | MSB    |    |    |    |    |    |    | LSB |   |
| BASIC COLOR | BLACK      | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  |     |   |
|             | RED(255)   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  |     |   |
|             | GREEN(255) | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0  | 0  |     |   |
|             | BLUE(255)  | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1  | 1  |     |   |
|             | CYAN       | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1      | 1  | 1  | 1  | 1  | 1  | 1  |     |   |
|             | MAGENTA    | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1  | 1  |     |   |
|             | YELLOW     | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0      | 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  | 1  | 1  | 1  | 1  | 1  |     |   |
| RED         | RED(0)     | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  |     |   |
|             | RED(1)     | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 1   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  |     |   |
|             | RED(2)     | 0      | 0  | 0  | 0  | 0  | 0  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  |     |   |
|             |            |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |   |
|             |            |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |   |
|             | RED(254)   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   |   |
|             | RED(255)   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   |   |
| GREEN       | GREEN(0)   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   |   |
|             | GREEN(1)   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 1   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   |   |
|             | GREEN(2)   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   |   |
|             |            |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |   |
|             |            |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |   |
|             | GREEN(254) | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0 |
|             | GREEN(255) | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0 |
| BLUE        | BLUE(0)    | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   |   |
|             | BLUE(1)    | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 1  | 0   |   |
|             | BLUE(2)    | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 1  | 0  | 0   |   |
|             |            |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |   |
|             |            |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |        |    |    |    |    |    |    |     |   |
|             | BLUE(254)  | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 0   | 0 |
|             | BLUE(255)  | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1 |

### 【Note】

1) Gray level:

Color(n) : n is level order; higher n means brighter level.

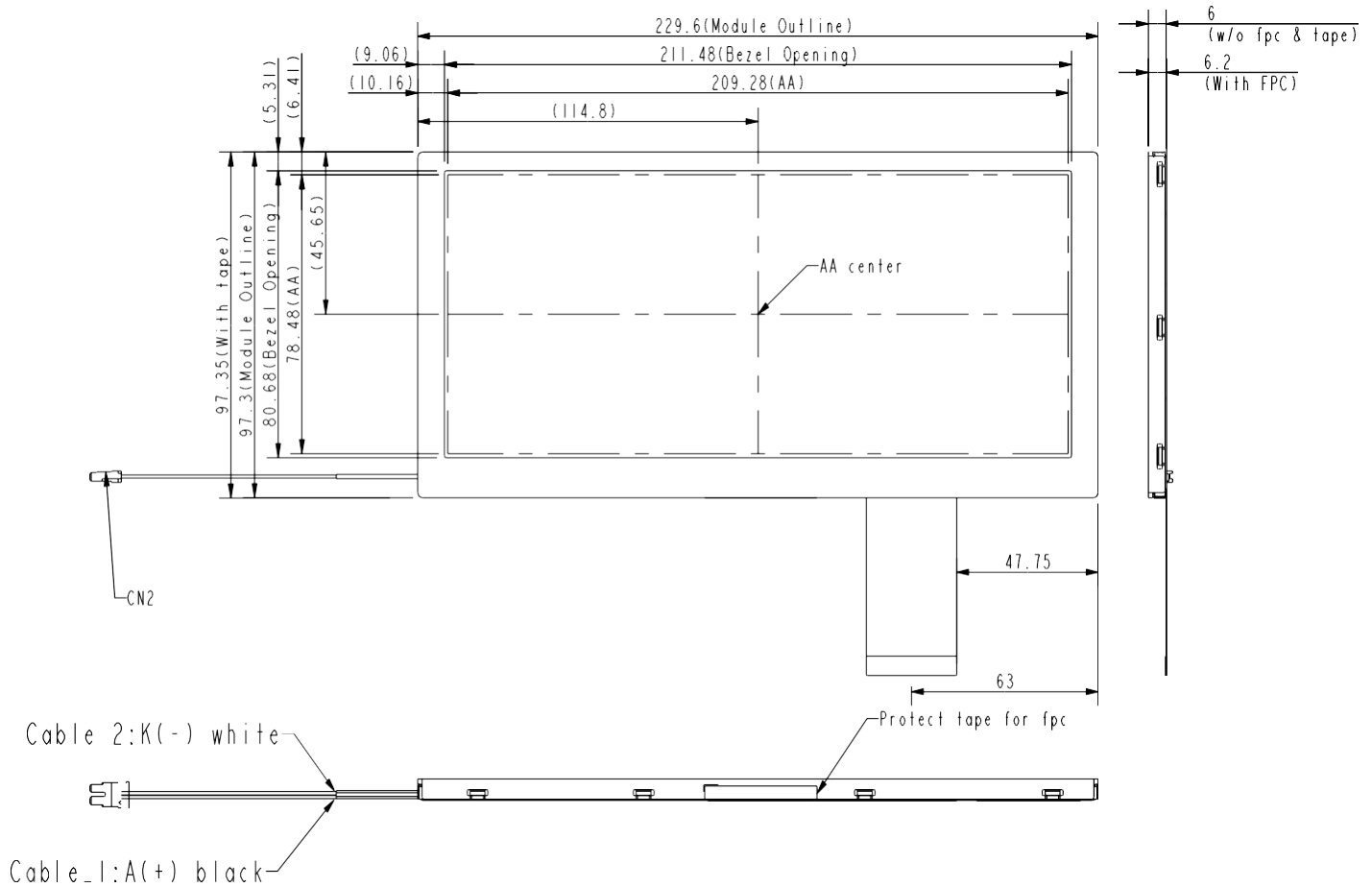
2) DATA:

1: high , 0: low

## 6. MECHANICAL DIMENSION

### 6.1 Front Side

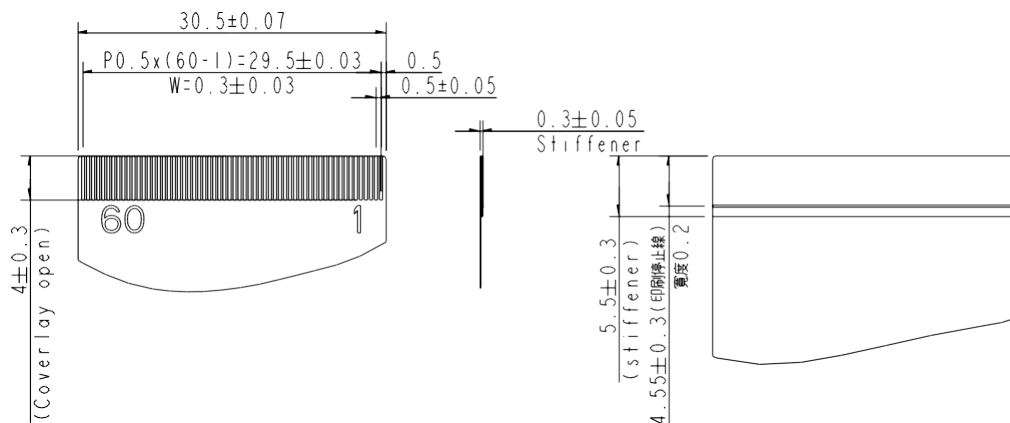
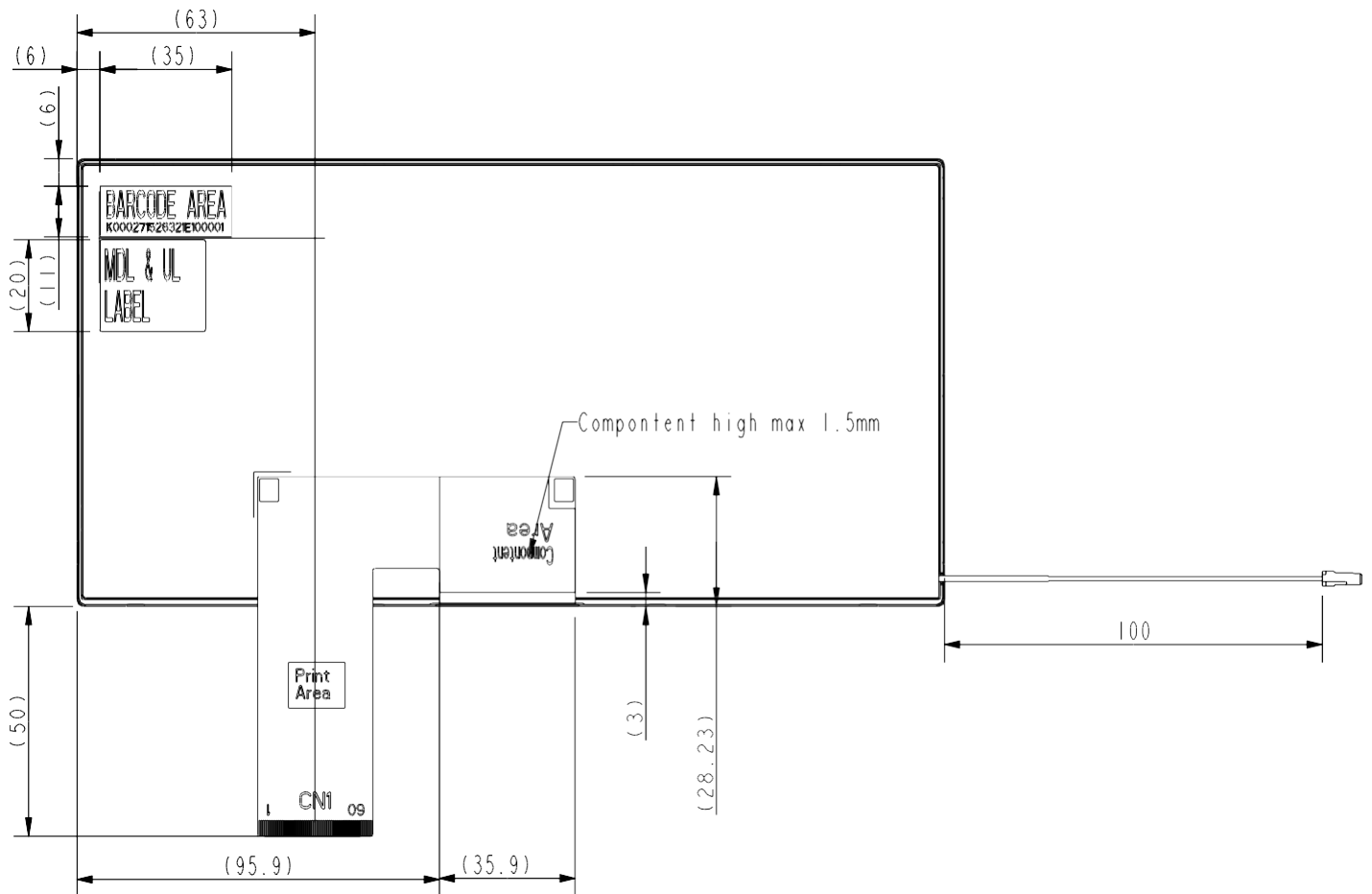
[Unit : mm]



NOTE: General tolerance=±0.3mm

## 6.2 Rear Side

[Unit : mm]



NOTE: General tolerance= $\pm 0.3$ mm

CN1 suggest connector (60pin):089K60-000100-G2-R (STARCONN)

CN2 suggest connector SM02B-BHSS-1(JST)

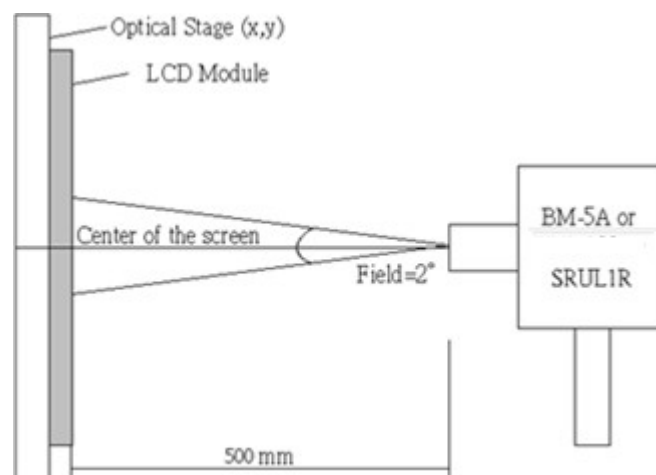


## 7. OPTICAL CHARACTERISTICS

Ta = 25°C, VCC=3.3V

| ITEM                             |            | SYMBOL   | CONDITIONS        | MIN            | TYP            | MAX            | UNIT              | NOTE    |
|----------------------------------|------------|----------|-------------------|----------------|----------------|----------------|-------------------|---------|
| Contrast Ratio                   |            | CR       | Point- 5          | 600            | 1000           |                | --                | 1, 2, 3 |
| Luminance(CEN)                   |            | Lw       | Point- 5          | 400            | 500            |                | cd/m <sup>2</sup> | 1, 3    |
| Luminance Uniformity             |            | ΔL       |                   | 70             | 85             |                | %                 | 1, 3    |
| Response Time<br>(White - Black) |            | Tr +Tf   | Point- 5          | -              | 25             | 35             | ms                | 1, 3, 5 |
| NTSC                             |            | -        | Point- 5          | 60             | 70             | -              | %                 | 1, 4    |
| Viewing<br>Angle                 | Vertical   | Upper(θ) | CR≥ 10<br>Point-5 | 75             | 85             | --             | °                 | 1, 4    |
|                                  |            | Down(θ)  |                   | 75             | 85             |                |                   | 1, 4    |
|                                  | Horizontal | Left(ψ)  |                   | 75             | 85             |                |                   | 1, 4    |
|                                  |            | Right(ψ) |                   | 75             | 85             | --             | °                 | 1, 4    |
| Color<br>Coordinate              | White      | Wx<br>Wy | Point-5           | 0.247<br>0.249 | 0.287<br>0.289 | 0.327<br>0.329 | --                | 1, 3    |
|                                  | Red        | Rx<br>Ry |                   | 0.602<br>0.305 | 0.642<br>0.345 | 0.682<br>0.385 |                   |         |
|                                  | Green      | Gx<br>Gy |                   | 0.281<br>0.588 | 0.321<br>0.628 | 0.361<br>0.668 |                   |         |
|                                  | Blue       | Bx<br>By |                   | 0.107<br>0.036 | 0.147<br>0.076 | 0.187<br>0.116 |                   |         |

Note1: Measure condition : 25°C±2°C , 60±10%RH , under 1 Lux in the dark room color coordinate and color gamut are measured by SRUL1R, and all the other items are measured by BM-5A (TOPCON) , viewing angle 2° , IL=280mA ( Backlight current ) , measurement after lighting on 10 mins.



Note2: Definition of contrast ratio :  
 Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

Note3: Definition of luminance : Measure white luminance on the point 5 as figure.7-1

Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure.7-1

$$\Delta L = [L(\text{MIN})/L(\text{MAX})] \times 100$$

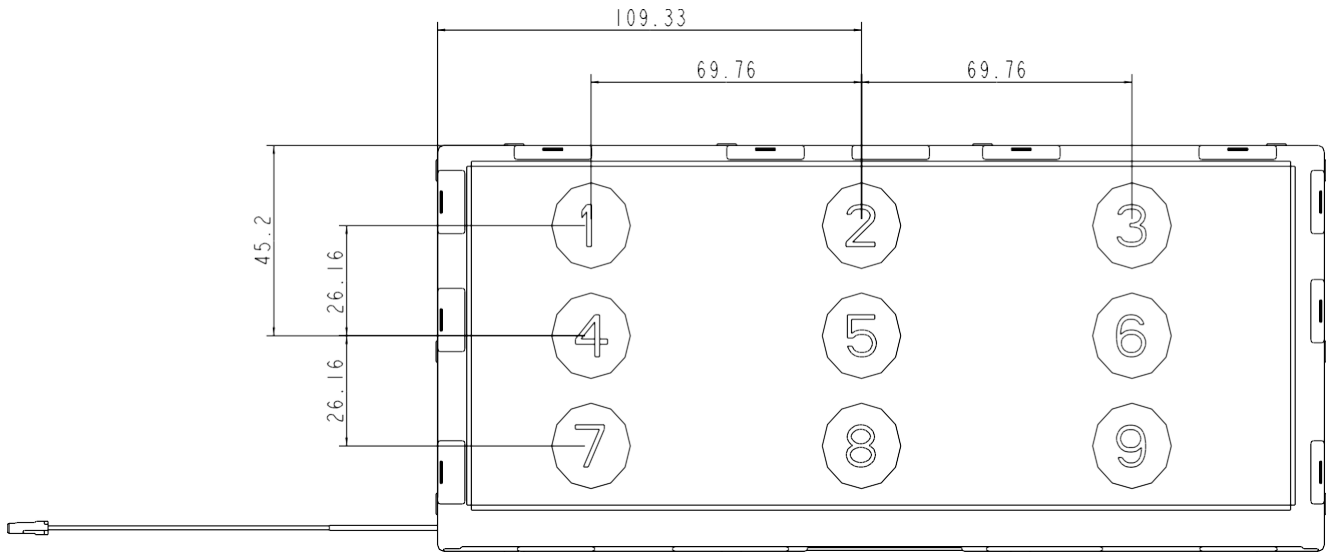


Fig.7 1 Measuring point

Note 4: Definition of Viewing Angle( $\theta, \psi$ ),refer to Fig.7 2 as below :

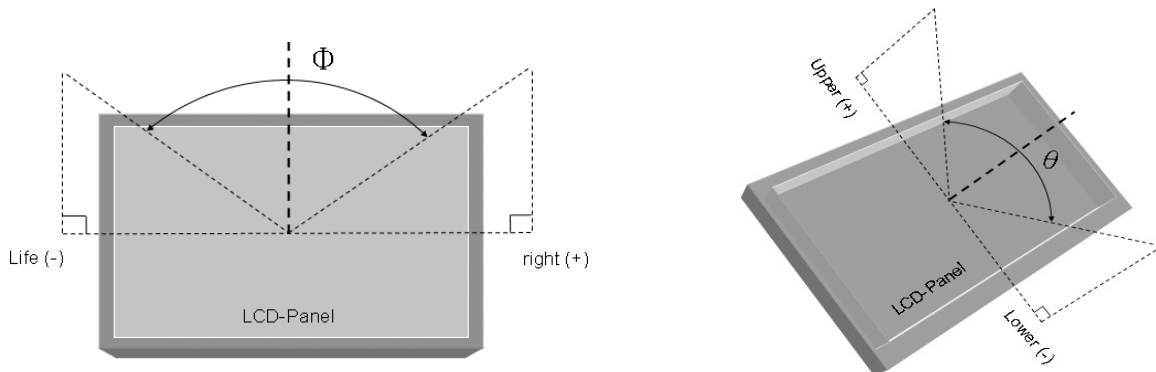


Fig.7-2 Definition of Viewing Angle

Note5: Definition of Response Time.(White-Black)

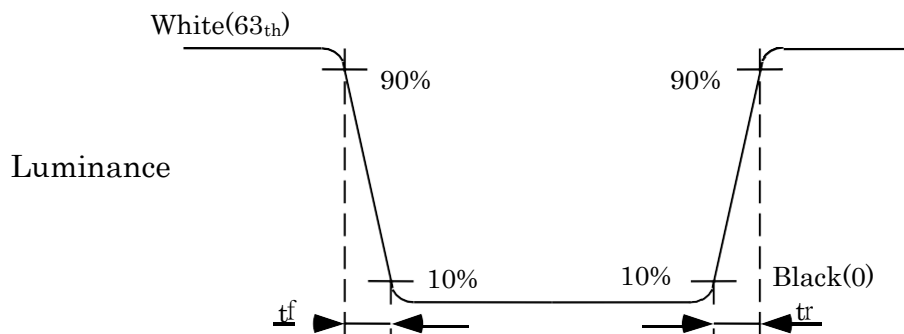


Fig.7-3 Definition of Response Time(White-Black)

## 8. RELIABILITY TEST

### 8.1. Temperature and humidity

| TEST ITEMS                               | CONDITIONS                                     | NOTE            |
|------------------------------------------|------------------------------------------------|-----------------|
| High Temperature Operation               | 70° C ; 240hrs                                 |                 |
| High Temperature Storage                 | 80° C ; 240hrs                                 |                 |
| High Temperature High Humidity Operation | 60° C ; 90% RH ; 240hrs                        | No condensation |
| Low Temperature Operation                | -20° C ; 240hrs                                |                 |
| Low Temperature Storage                  | 30° C ; 240hrs                                 |                 |
| Thermal Shock                            | -30° C (0.5hr) ~ 80° C (0.5hr) ;<br>200 Cycles |                 |
| Image Sticking                           | 25 °C ± 2 °C ; 2hrs                            | Note 1          |

Note 1. :

Condition of Image Sticking test : 25 °C ± 2 °C

Operation with test pattern sustained for 2 hrs, then change to gray pattern immediately.

After 5 mins, the mura must be disappeared completely .

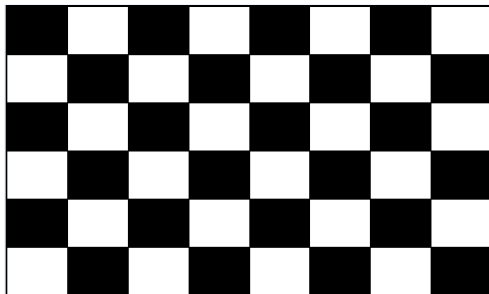


Image Sticking pattern



Mid Gray pattern

### 8.2. Shock and Vibration

| TEST ITEMS                   | CONDITIONS                                                                                                                                                                                                                                                           |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Shock<br>(Non-operation)     | <ul style="list-style-type: none"> <li>Shock level: 980m/s<sup>2</sup>(equal to 100G).</li> <li>Waveform: half sinusoidal wave, 6ms.</li> <li>Number of shocks: +X,+Y,+Z each axis 3 times</li> </ul>                                                                |
| Vibration<br>(Non-operation) | <ul style="list-style-type: none"> <li>Frequency range: 8~33.3Hz</li> <li>Stroke : 1.3 mm</li> <li>Vibration: sinusoidal wave, perpendicular axis(both x, z axis: 2hrs , y axis: 4hrs).</li> <li>Sweep: 2.9G, 33.3 Hz -400 Hz</li> <li>Cycle time: 15 min</li> </ul> |

### 8.3 Electrostatic Discharge

| TEST ITEM | CONDITIONS                                  | Note |
|-----------|---------------------------------------------|------|
| ESD       | 150pF , 330Ω , ±8kV&±15kV air& contact test | 1    |
|           | 200pF , 0Ω , ±200V contact test             | 2    |

Note: Measure

1: LCD glass and metal bezel

2: IF connector pins

### 8.4. Judgment standard

The Judgment of the above test should be made as follow:

Pass: Normal display image with no line defect.

Fail: No display image, Function NG, or line defects.



## **9. WARRANTY**

9.1 The period is within 12 months since the date of shipping out under normal using and storage conditions.

9.2 The warranty will be avoided in case of defect induced by customer