



# Chunghwa Picture Tubes, Ltd.

## Product Specification

To : CAPITAL ELECTRONICS 建都

Date : 090331

**TFT LCD**  
**CLAA070LB01CW**

ACCEPTED BY : (V0.3)

Tentative

| APPROVED BY | CHECKED BY | PREPARED BY |
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|         |                                                    |             |            |
|---------|----------------------------------------------------|-------------|------------|
| Doc.No: | SPEC_CLAA070LB01CW_V0.3_CAPITAL ELECTRONICS_090331 | Issue Date: | 2007/05/24 |
|---------|----------------------------------------------------|-------------|------------|

## REVISION STATUS

[illegible]

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## 1. OVERVIEW

CLAA070LB01CW is 7" color TFT-LCD(Thin Film Transistor Liquid Crystal Display)module composed of LCD panel,driver ICs,control circuit,and backlight.

The 7.0"screen produces a high resolution image that is composed of 800×480 pixel elements in a stripe arrangement.Display 262K colors by 6 Bit R.G.B signal input.Inverter for backlight is not included in this module.

General specifications are summarized in the following table:

| ITEM                           | SPECIFICATION                |
|--------------------------------|------------------------------|
| Panel Size                     | 7 inch(panel diagonal)       |
| Display Area (mm)              | 152.4(W)×91.44(H)            |
| Number of Pixels               | 800 (H) ×3(RGB)×480(V)       |
| Pixel Pitch (mm)               | 0.1905(H)×0.1905(V)          |
| Color Pixel Arrangement        | RGB vertical stripe          |
| Display Mode                   | Normally white               |
| Number of colors               | 262,144                      |
| Brightness(cd/m <sup>2</sup> ) | 185nit(min)/220nit(typ)      |
| Response Time (Tr+Tf)          | 20ms                         |
| Outline Dimension(in mm)       | 165.0(W)×104.0(H)×5.5(D)     |
| Viewing Angle(BL on,CR≥10)     | 140 degree(H) , 100degree(V) |
| Power consumption              | 2.7W(Typ)                    |
| BL unit                        | CCFL , 1 lamp                |
| Electrical Interface(data)     | TTL                          |
| Viewing Direction              | 6 o'clock                    |
| Surface Treatment              | Anti-Glare , Hardness:3H     |
| Weight(g)                      | 130g                         |

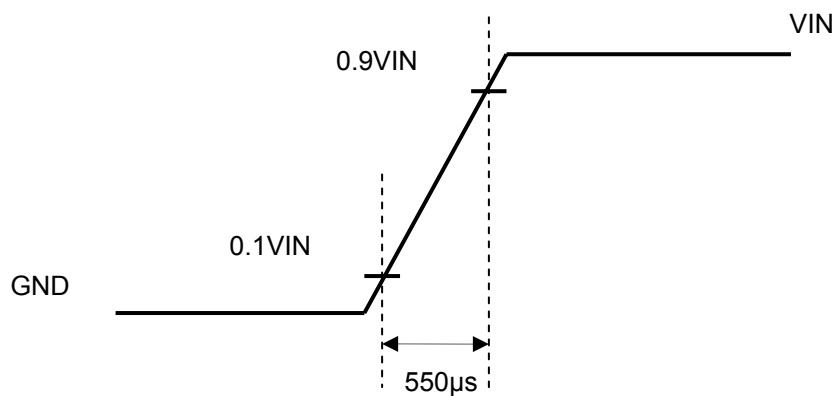
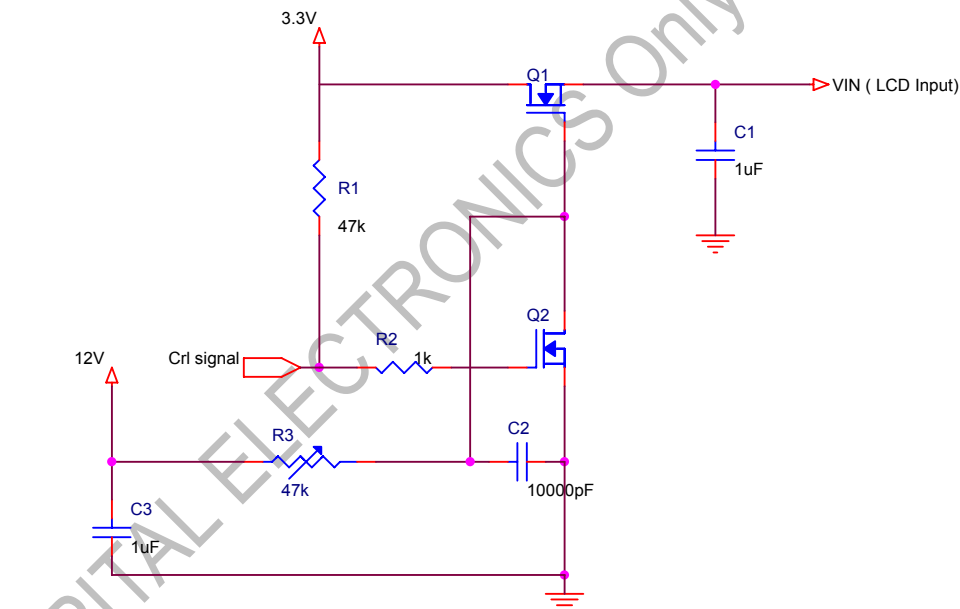
## 2. ABSOLUTE MAXIMUM RATINGS

| Item                 | Symbol | Min. | Max. | Unit | Note    |
|----------------------|--------|------|------|------|---------|
| Power Supply Voltage | Vcc    | -0.3 | 4.6  | V    |         |
| Static Electricity   | VESDc  | -200 | 200  | V    | 【Note1】 |
|                      | VESDm  | -15K | 15K  |      |         |
| ICC Rush Current     | IRUSH  | -    | 1    | A    | 【Note2】 |
| Lamp Voltage         | VL     | -    | 484  | Vrms |         |
| Lamp Current         | IL     | 4.0  | 8.0  | mA   |         |
| Lamp Frequency       | FL     | 30   | 80   | kHz  |         |

[Note]

- \*1) Test Condition: IEC 61000-4-2 ,  
 VESDc : Contact discharge to input connector  
 VESDm : Discontact discharge to module

- \*2) Control signal: High(+3.3V)→Low(GND)  
 Supply Voltage of rising time should be from R3 and C2 tune to 550 us.



### 3. ELECTRICAL CHARACTERISTICS

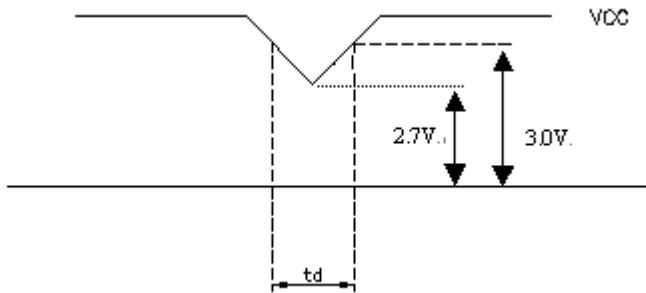
#### 3.1 TFT LCD Power Voltage

Ta=25°C

| Item                         | Symbol | Min.   | Typ | Max.   | Unit | Note    |
|------------------------------|--------|--------|-----|--------|------|---------|
| Power Supply Voltage For LCD | Vcc    | 3.0    | 3.3 | 3.6    | V    | [Note1] |
| Logic Input Voltage          | VIH    | 0.7VCC | -   | VCC    | V    |         |
|                              | VIL    | 0      | -   | 0.3VCC | V    |         |

[Note1]VCC –dip codition:

- 1) When  $2.7\text{ V} \leq \text{VCC} < 3.0\text{ V}$ ,  $t_d \leq 10\text{ ms}$ .
- 2)  $\text{VCC} > 3.0\text{ V}$ , VCC-dip condition should be same as VCC-turn-on condition.



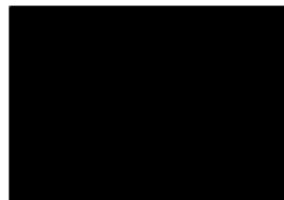
#### 3.2 TFT-LCD current consumption

| Item              | Symbol | Min. | Typ | Max. | Unit | Note    |
|-------------------|--------|------|-----|------|------|---------|
| LCD Power Current | ICC    | -    | 150 | 200  | mA   | 【Note1】 |

[Note1]

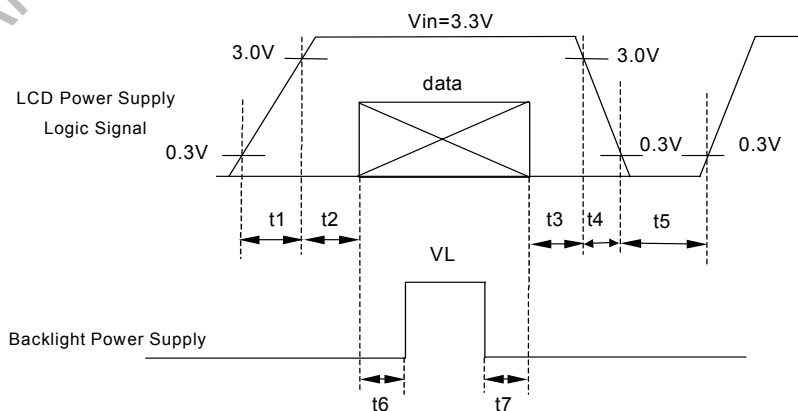
Typical: Under 64 gray pattern

Maximum: Under black pattern



(a) 64 Gray Pattern (b) Black Pattern

#### 3.3 Power 、Signal sequence



Data: RGB DATA, DCLK, DENA

 $t1 \leq 10\text{ ms}$  $1\text{ sec} \leq t5$  $50\text{ ms} \leq t2$  $200\text{ ms} \leq t6$  $0 < t3 \leq 50\text{ ms}$  $200\text{ ms} \leq t7$  $0 < t4 \leq 10\text{ ms}$

## 3.4 Backlight

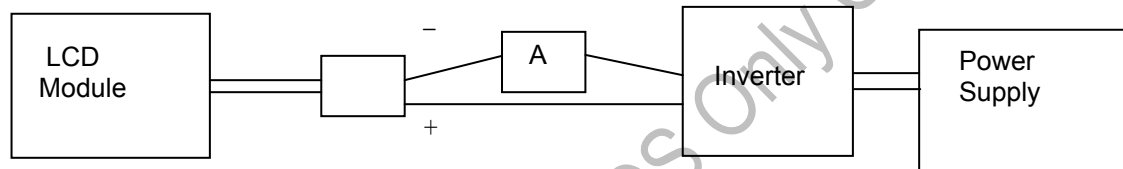
Ta=25°C

| Item                 | Symbol  | Min.    | Typ | Max. | Unit  | Note                                              |
|----------------------|---------|---------|-----|------|-------|---------------------------------------------------|
| Lamp Voltage         | VL      | -       | 400 | 440  | V     | *1) IL=5.5mA                                      |
| Lamp Current         | IL      | 5.0     | 5.5 | 6.0  | mA    | *1) *2)                                           |
| Lamp Frequency       | FI      | 30      | -   | 80   | kHz   | *4)                                               |
| Lamp life time       | LT      | 20,000  | -   | -    | Hr    | *1) *2) *3) IL=5.5mA , operation                  |
| Turn on and off life | -       | 100,000 | -   | -    | Times | *1) *2) *3) IL=5.5mA , operation , time cycle 30s |
| Start Lamp Voltage   | Ta=0°C  | -       | -   | 1050 | Vrms  | *5)                                               |
|                      | Ta=25°C | -       | -   | 800  |       |                                                   |
| Power Consumption    | PBL     | -       | 2.2 | -    | Watt  | VL*IL , IL=5.5mA/1 Lamp                           |

[Note]

\*1) Table of specifications are definition of single lamp.

\*2) Lamp Current measurement method (The current meter is inserted in cold line)



\*3) Definition of the lamp life time : Luminance(L) under 50% of specification starting lamp voltage.

\*4) 1.Frequency in this range can mala the characterisitics of electric and optics maintain in  $\pm 10\%$  except hue.

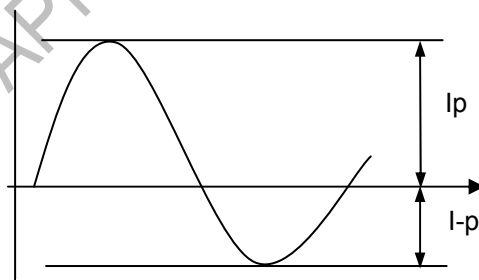
2.Lamp frequency of inverter may produce interference with horizontal synchronous frequency (or vertical synchronous frequency),and this may cause ripple noise on the display. Therefore, please adjust inverter frequency, and keep inverter as far from module as possible or use electronic shielding between inverter and module to avoid the interference.

\*5) 1.Starting Lamp Voltage: Vs = initial value Vs

2.Definition of starting lamp voltage means max. voltage of starting lamp. We suggest the inverter starting voltage greater then max. voltage of starting lamp to certify starting lamp stability.

\*6) If the driving waveform of lamp is asymmetric, the distribution of mercury inside the lamp tube will become unequally or will deplete the Ar gas in it. Then it may cause the abnormal phenomenon of lighting-up. Therefore, designers have to try their best to for fill the conditions under the inverter designing-stage as below:

- The degrees of unbalance :  $< 10\%$

The ratio of wave height :  $< \sqrt{2} \pm 10\%$ 

I p : high side peak

I-p : low side peak

A : The degrees of unbalance =  $|I_p - I-p| / I_{rms} \times 100 (\%)$ B : The ratio of wave height =  $I_p \text{ (or } I-p) / I_{rms}$

## 4. INTERFACE CONNECTION

4.1 Connector type : 40pin / 0.5mm pitch / Bottom contact : 089N40-000R00-G2

| Pin NO. | SYMBOL          | DESCRIPTION               |
|---------|-----------------|---------------------------|
| 1       | V <sub>SS</sub> | Ground                    |
| 2       | V <sub>SS</sub> | Ground                    |
| 3       | NC              | No Connection             |
| 4       | V <sub>CC</sub> | Power Supply              |
| 5       | V <sub>CC</sub> | Power Supply              |
| 6       | V <sub>CC</sub> | Power Supply              |
| 7       | V <sub>CC</sub> | Power Supply              |
| 8       | NC              | No Connection             |
| 9       | DE              | Data Enable Timing Signal |
| 10      | V <sub>SS</sub> | Ground                    |
| 11      | V <sub>SS</sub> | Ground                    |
| 12      | V <sub>SS</sub> | Ground                    |
| 13      | B5              | Blue Data 5 (MSB)         |
| 14      | B4              | Blue Data 4               |
| 15      | B3              | Blue Data 3               |
| 16      | V <sub>SS</sub> | Ground                    |
| 17      | B2              | Blue Data 2               |
| 18      | B1              | Blue Data 1               |
| 19      | B0              | Blue Data 0 (LSB)         |
| 20      | V <sub>SS</sub> | Ground                    |
| 21      | G5              | Green Data 5 (MSB)        |
| 22      | G4              | Green Data 4              |
| 23      | G3              | Green Data 3              |
| 24      | V <sub>SS</sub> | Ground                    |
| 25      | G2              | Green Data 2              |
| 26      | G1              | Green Data 1              |
| 27      | G0              | Green Data 0 (LSB)        |
| 28      | V <sub>SS</sub> | Ground                    |
| 29      | R5              | Red Data 5 (MSB)          |
| 30      | R4              | Red Data 4                |
| 31      | R3              | Red Data 3                |
| 32      | V <sub>SS</sub> | Ground                    |
| 33      | R2              | Red Data 2                |
| 34      | R1              | Red Data 1                |
| 35      | R0              | Red Data 0                |
| 36      | V <sub>SS</sub> | Ground                    |
| 37      | V <sub>SS</sub> | Ground                    |
| 38      | DCLK            | Data Clock                |
| 39      | V <sub>SS</sub> | Ground                    |
| 40      | V <sub>SS</sub> | Ground                    |

Remarks:

- 1) NC Pin must be retain, this pin can't contact GND or other signal.
- 2) Vss Pin must ground contact , can not be floating.

### 4.2 Back Light

Input connector type for back light : BHSR-02VS-1(JST)

Output connector type for Inverter: SM02-BHSS-1-TB

| Pin No. | Symbol | function          |
|---------|--------|-------------------|
| 1       | CTH    | VLH(High-Voltage) |
| 2       | CTL    | VLH(Low-Voltage)  |

[Note]:VLH-VLL=VL

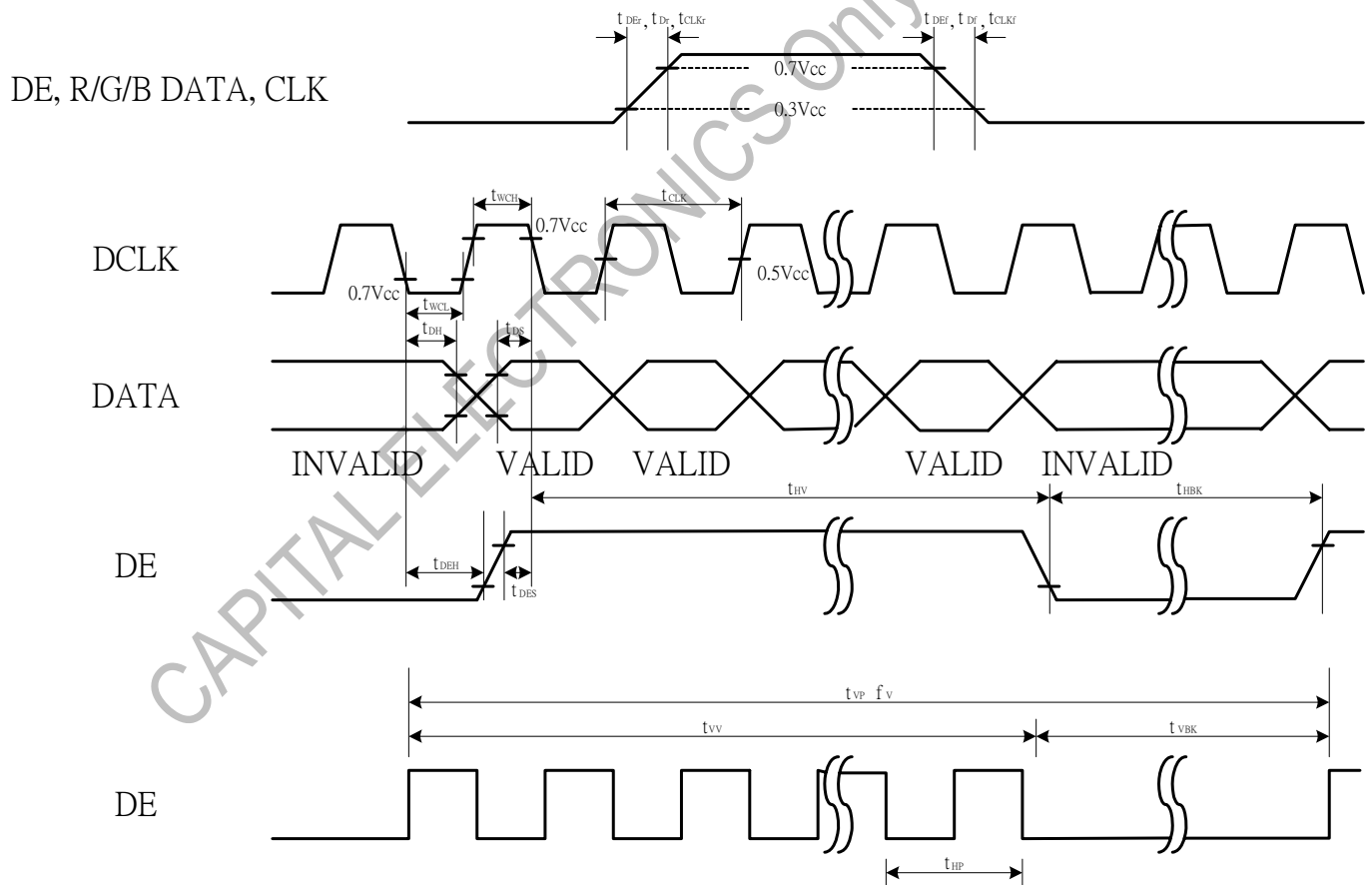
## 5. INPUT SIGNAL(DE ONLY MODE)

### 5.1 Timing Specification

| ITEM |                    | SYMBOL           | MIN. | TYP. | MAX. | UNIT             |
|------|--------------------|------------------|------|------|------|------------------|
| DCLK | Dot Clock          | f <sub>CLK</sub> | 25   | 27   | 32   | MHz              |
|      | Low Level Width    | t <sub>WCL</sub> | 6    | -    | -    | ns               |
|      | High Level Width   | t <sub>WCH</sub> | 6    | -    | -    |                  |
| DE   | Setup Time         | t <sub>DES</sub> | 5    | -    | -    | ns               |
|      | Hold time          | t <sub>DEH</sub> | 10   | -    | -    |                  |
|      | Horizontal Period  | t <sub>HP</sub>  | 850  | 900  | 950  | t <sub>CLK</sub> |
|      | Horizontal Valid   | t <sub>HV</sub>  | 800  |      |      |                  |
|      | Horizontal Blank   | t <sub>HBK</sub> | 50   | 100  | 150  |                  |
|      | Vertical Period    | t <sub>VP</sub>  | 490  | 500  | 520  | t <sub>HP</sub>  |
|      | Vertical Valid     | t <sub>VV</sub>  | 480  |      |      |                  |
|      | Vertical Blank     | t <sub>VBK</sub> | 10   | 20   | 40   |                  |
|      | Vertical Frequency | f <sub>V</sub>   | 55   | 60   | 65   |                  |
| DATA | Setup Time         | t <sub>DS</sub>  | 5    | -    | -    | ns               |
|      | Hold Time          | t <sub>DH</sub>  | 10   | -    | -    |                  |

【Note1】 This module is operated by DE only mode.

### 5.2 Timing Chart



## 5.3 Color Data Assignment

| COLOR       | INPUT DATA | R DATA |    |    |    |    |     | G DATA |    |    |    |    |     | B DATA |    |    |    |    |     |
|-------------|------------|--------|----|----|----|----|-----|--------|----|----|----|----|-----|--------|----|----|----|----|-----|
|             |            | R5     | R4 | R3 | R2 | R1 | R0  | G5     | G4 | G3 | G2 | G1 | G0  | 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   |
|             | RED(63)    | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(63)  | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | BLUE(63)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   |
|             | CYAN       | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   | 1      | 1  | 1  | 1  | 1  | 1   |
|             | 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   |
| RED         | RED(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  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(2)     | 0      | 0  | 0  | 0  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             | RED(62)    | 1      | 1  | 1  | 1  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(63)    | 1      | 1  | 1  | 1  | 1  | 1   | 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   |
|             | GREEN(1)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(2)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             | GREEN(62)  | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(63)  | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   | 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   |
|             | BLUE(1)    | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 1   |
|             | BLUE(2)    | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 1  | 0   |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             | BLUE(62)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 0   |
|             | BLUE(63)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   |

[Note]

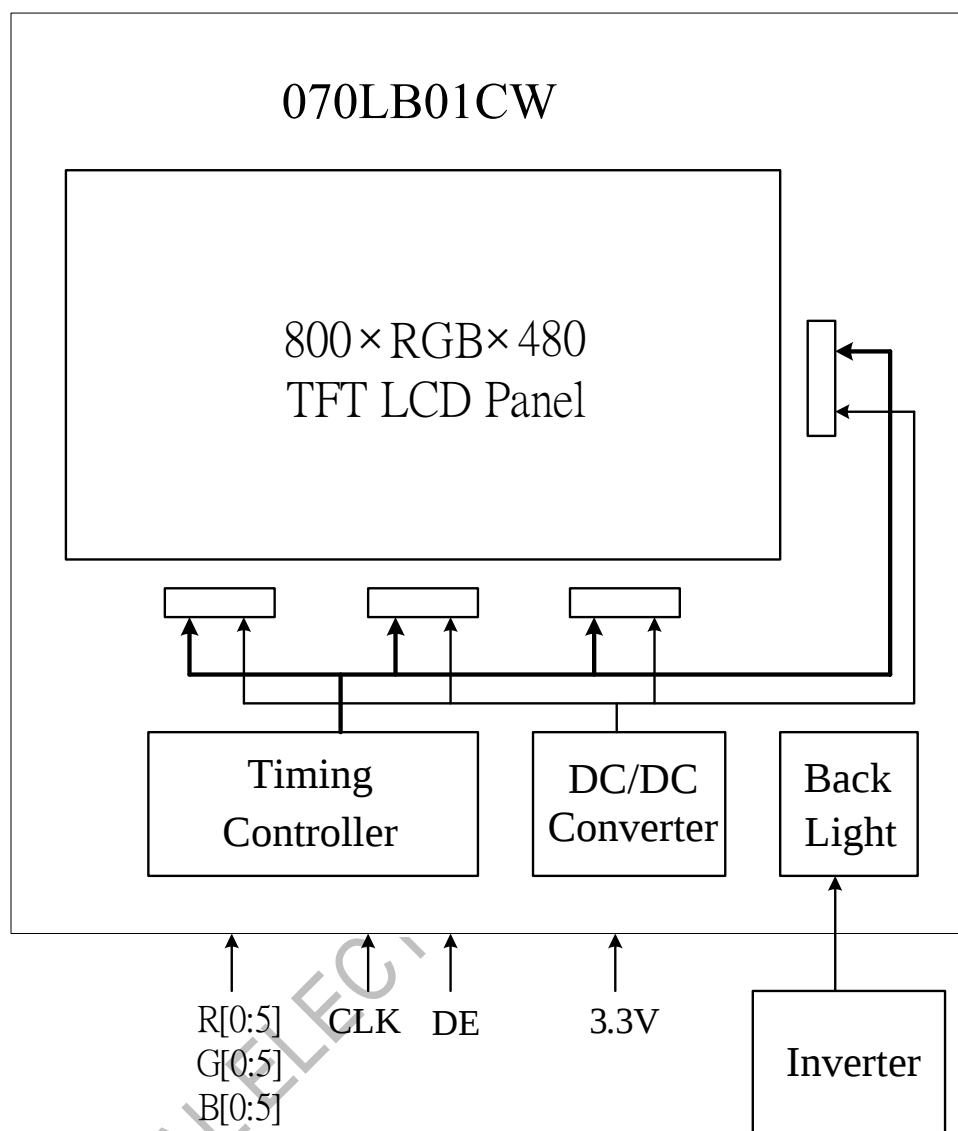
(1) Definition of Gray Scale

color(n) : n is series of Gray Scale

The more n value is, the bright Gray Scale.

(2)Data: 1-High, 0-Low

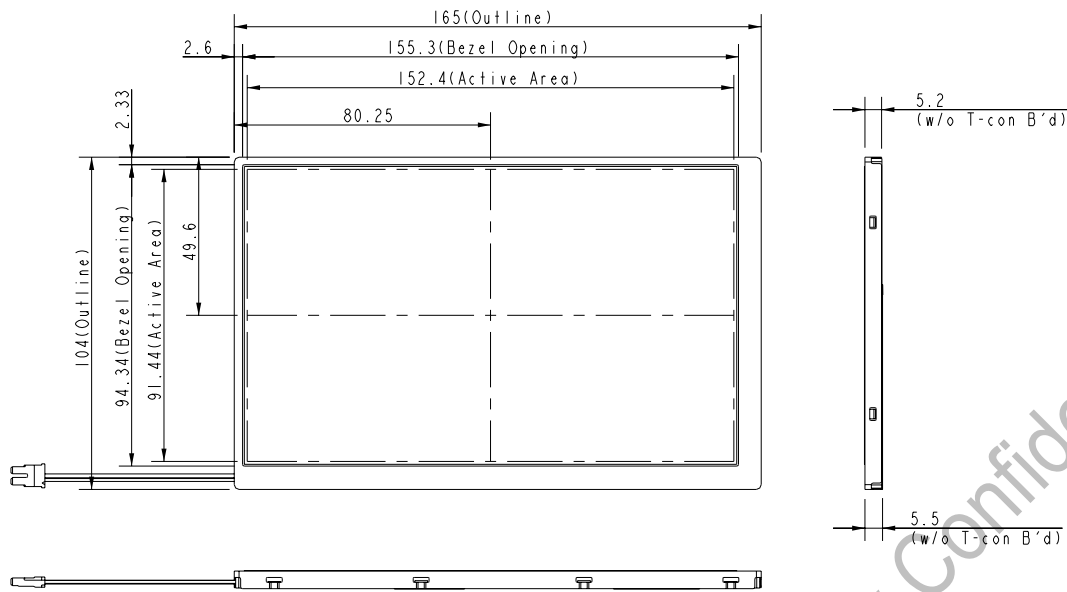
## 6. BLOCK DIAGRAM



## 7. MECHANICAL DIMENSION

### 7.1 Front Side

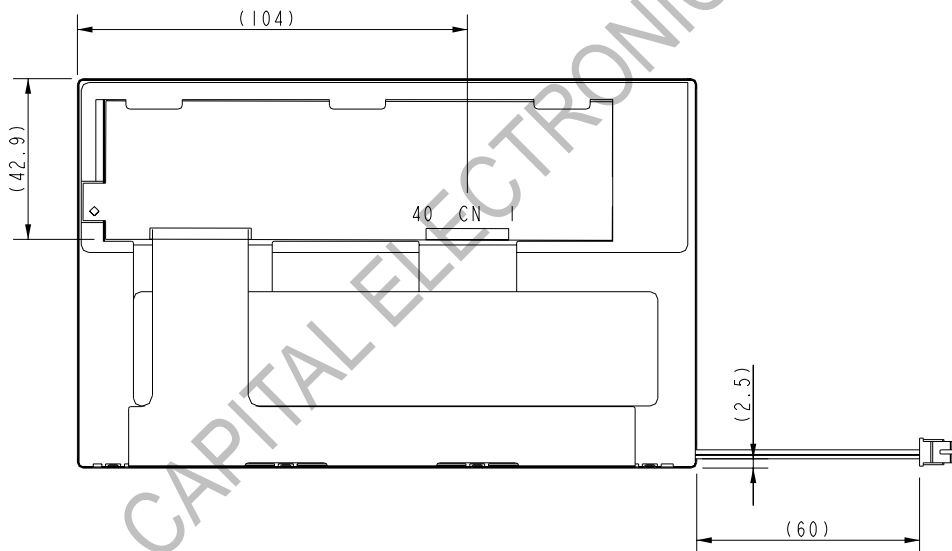
[Unit : mm]



### 7.2 Rear Side

Length of Lamp wire=60±5mm

[Unit : mm]



#### NOTE:

- 1.GENERAL TOLERANCE:  $\pm 0.3\text{mm}$
- 2.CCFL connector: BHSR-02VS-1 (JST)
- 3.CN: STARCONN 089N40-000R00-G2 (or other compatible connectors)

## 8. OPTICAL CHARACTERISTICS

VCC=3.3V

Ta=25°C

| ITEM                             |            | SYMBOL   | CONDITION             | MIN.           | TYP.           | MAX.           | UNIT              | Remarks   |
|----------------------------------|------------|----------|-----------------------|----------------|----------------|----------------|-------------------|-----------|
| Contrast Ratio                   |            | CR       | Point-5               | 300            | 400            | --             | --                | *1)*2)*3) |
| Luminance*)                      |            | Lw       |                       | 185            | 220            | --             | cd/m <sup>2</sup> | *2)*3)    |
| Luminance Uniformity             |            | ΔL       |                       | 70             | 80             |                | %                 | *2)*3)    |
| Response Time<br>(White - Black) |            | Tr       |                       | --             | 7              |                | ms                | *3)*4)    |
|                                  |            | Tf       |                       |                | 13             |                | ms                |           |
| Viewing Angle                    | Horizontal | $\phi$   | CR ≥ 10<br>Point-5    | 120            | 140            | --             | °                 | *2)*3)    |
|                                  | Vertical   | $\theta$ |                       | 80             | 100            | --             | °                 | *2)*3)    |
| Color Coordinate                 | White      | Wx<br>Wy | θ = φ = 0°<br>Point-5 | 0.283<br>0.299 | 0.313<br>0.329 | 0.343<br>0.359 | --                | *2)*3)    |
|                                  | Red        | Rx<br>Ry |                       | 0.550<br>0.284 | 0.580<br>0.314 | 0.610<br>0.344 |                   |           |
|                                  | Green      | Gx<br>Gy |                       | 0.271<br>0.534 | 0.301<br>0.564 | 0.331<br>0.594 |                   |           |
|                                  | Blue       | Bx<br>By |                       | 0.118<br>0.093 | 0.148<br>0.123 | 0.178<br>0.153 |                   |           |

[Note]

- Brightness conditions :  $I_L = 5.5 \text{ mA}$  ,

\*1) Definition of contrast ratio :

Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

\*2) Definition of luminance :

Measure white luminance on the point 5 as figure8-1

Definition of Luminance Uniformity:

Measure white luminance on the point1~5 as figure8-1

$$\Delta L = [L(\text{Min})/L(\text{Max})] \times 100$$

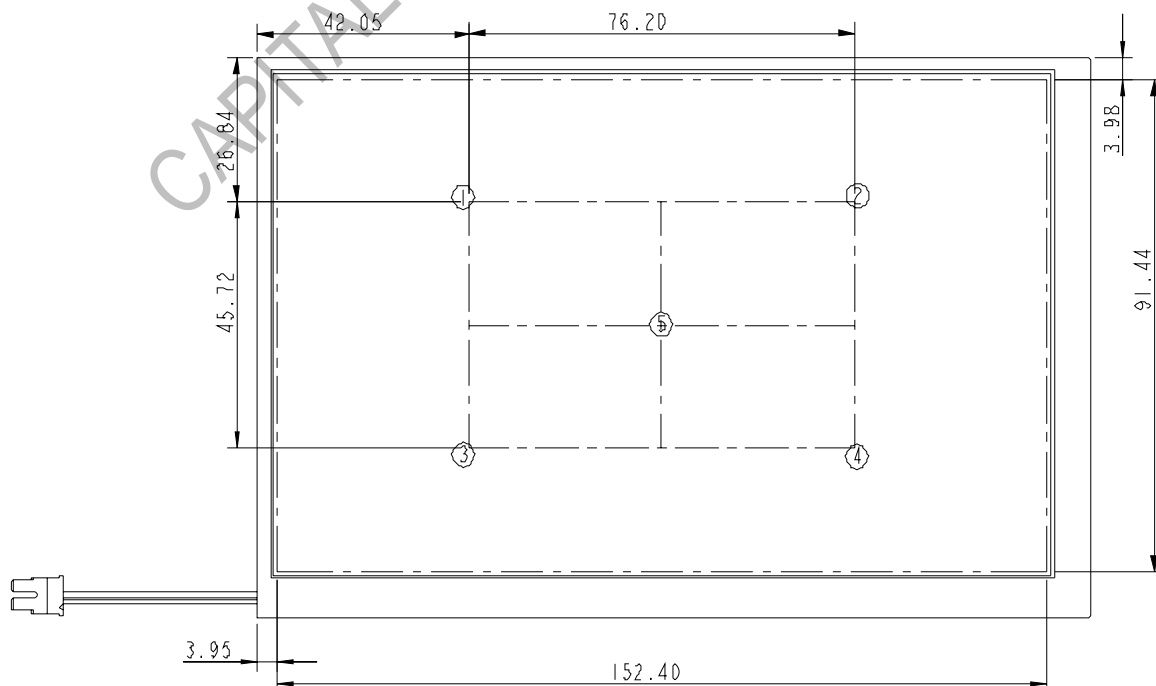


Fig8-1 Measuring point

\*3) Definition of Viewing Angle( $\theta, \psi$ ), refer to Fig8-2 as below :

These items are measured by EZ-CONTRAST(ELDIM) in the dark room. (no ambient light).

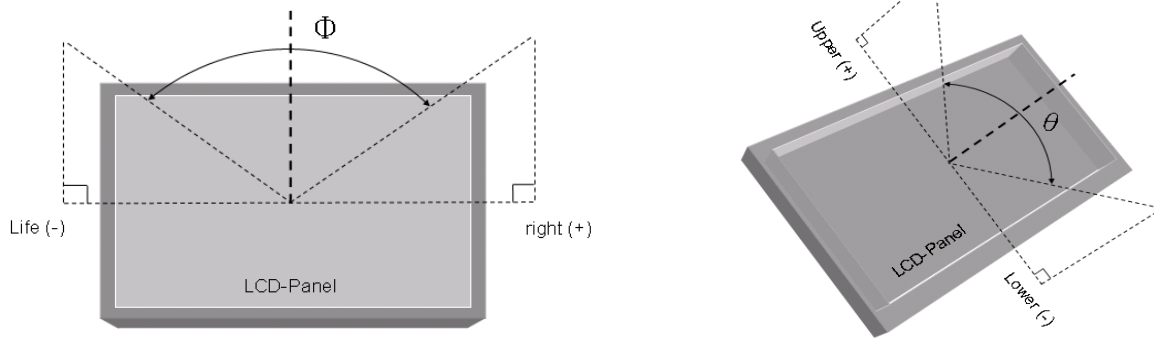


Fig8-2 Definition of Viewing Angle

\*4) Definition of Response Time.(White-Black)

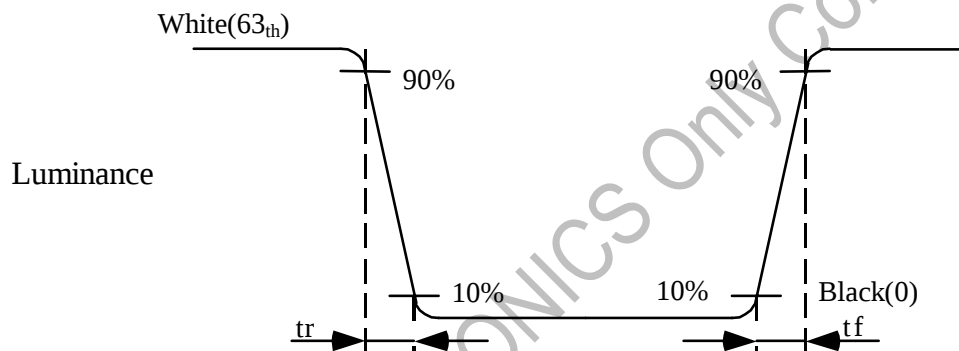


Fig8-3 Definition of Response Time(White-Black)

## 9. RELIABILITY TEST

### 9.1. Temperature and humidity

| TEST ITEMS                               | CONDITIONS                                | REMARK          |
|------------------------------------------|-------------------------------------------|-----------------|
| High Temperature Operation               | 85℃ , 240Hrs                              |                 |
| High Temperature Storage                 | 95℃ , 240Hrs                              |                 |
| High Temperature High Humidity Operation | 60℃ , 90%RH , 240Hrs                      | No condensation |
| Low Temperature Operation                | -30℃ , 240Hrs                             |                 |
| Low Temperature Storage                  | -40℃ , 240Hrs                             |                 |
| Thermal Shock                            | -30℃ ( 0.5Hr ) ~ 85℃(0.5Hr)<br>200 cycles |                 |

### 9.2. 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:one shock input in each direction of three mutually perpendicular axes for a total of three shock inputs.</li> </ul> |
| Vibration<br>(Non-operation) | <ul style="list-style-type: none"> <li>● Frequency range:8~33.3Hz</li> <li>● Stoke:1.3mm</li> <li>● Vibration:sinusoidal wave,perpendicularaxis(both x,z axis:2Hrs,y axis:4Hrs).</li> <li>● Sweep:2.9G,33.3Hz-400Hz</li> <li>● Cycle:15min</li> </ul>                                 |

### 9.3. Judgment standard

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

Pass:Normal display image with no obvious non-uniformity and no line defect.Partial trasformation of the module parts should be ignored.

Fail:No display image,obvious non-uniformity,or line defect.