



Chunghwa Picture Tubes, Ltd.

Product Specification

To :

Date : 20060825

TFT LCD

CLAA057VA01

ACCEPTED BY :

TENTATIVE

| APPROVED BY | CHECKED BY | PREPARED BY |
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1. OVERVIEW

CLAA057VAO1 is 5.7" color TFT-LCD(Thin Film Transistor Liquid Crystal Display)module composed of LCD panel,driver ICs,control circuit,and LED backlight.

The 5.7"screen produces a high resolution image that is composed of 640×480 pixel elements in a stripe arrangement.Display 262K colors by 6 Bit R.G.B signal input.

General specifications are summarized in the following table:

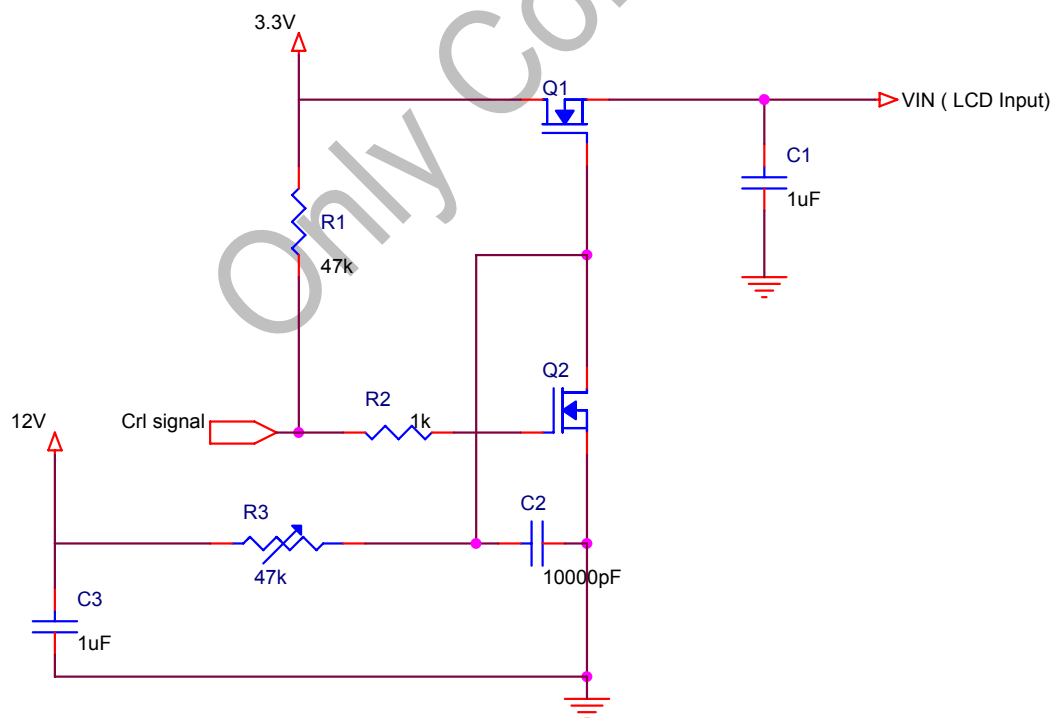
| ITEM | SPECIFICATION |
|--------------------------------|------------------------------|
| Panel Size | 5.7 inch(panel diagonal) |
| Display Area (mm) | 116.16(W)×87.12(H) |
| Number of Pixels | 640×3(H)×480(V) |
| Pixel Pitch (mm) | 0.1815(H)×0.1815(V) |
| Color Pixel Arrangement | RGB vertical stripe |
| Display Mode | Normally white |
| Number of colors | 262,144 |
| Viewing Direction | 6 o'clock |
| Response Time (Tr+Tf) | 30ms |
| Brightness(cd/m ²) | 220nit(typ) |
| NTSC ratio | 50% |
| Viewing Angle(BL on,CR≥10) | 140 degree(H) , 100degree(V) |
| Electrical Interface(data) | TTL |
| Power consumption(W) | TBD |
| Outline Dimension(in mm) | 127(W)×100(H)×7(D) |
| Weight(g) | TBD |
| BL unit | LED |
| Surface Treatment | Anti-Glare , Hardness:3H |

2. ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Min. | Max. | Unit | Note |
|---------------------------------|-------------------------------|------|-----------|------|------|
| Power Supply Voltage | Vcc | -0.5 | 5.0 | V | |
| Signal Input Voltage | DCLK,DE,R0,G0 ,B0~R5,G5,B5 | -0.5 | Vcc + 0.5 | V | |
| Static Electricity | VESDc | -200 | +200 | V | *2) |
| | VESDm | -15K | +15K | V | |
| ICC Rush Current | IRUSH | - | 1 | A | *3) |
| Operation Temperature | T _{op} | -30 | 85 | °C | *1) |
| Storage Temperature | T _{stg} | -40 | 95 | °C | *1) |
| Forward Current (per LED) | I _f | --- | 30 | mA | |
| Reverse Voltage (per LED) | VR | --- | 5 | V | |
| Pulse forward current (per LED) | I _{fp} | --- | 100 | mA | *4) |

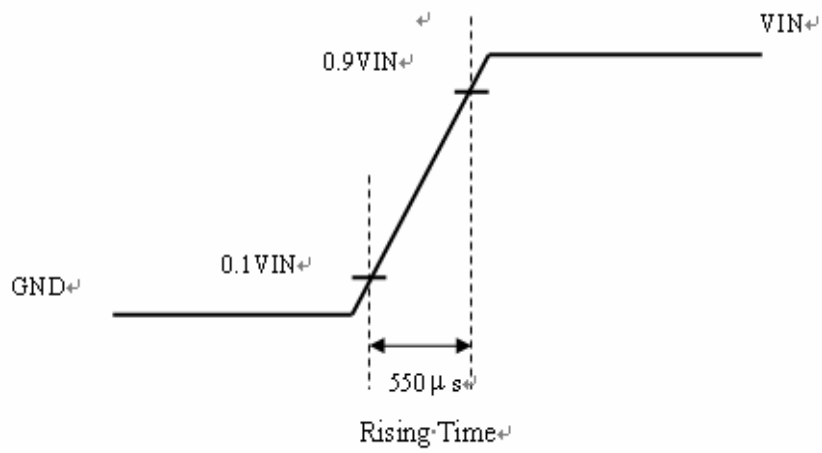
Remarks :

- *1) If users use the product out off the environment operation range (temperature and humidity) ,it will concern for visual quality.
- *2) Test Condition: IEC 61000-4-2 ,
VESDc : Contact discharge to input connector
VESDm : Contact discharge to module
- *3) The input pulse-current measurement system as below :



Control signal: High(+3.3V)→Low(GND)

Supply Voltage of rising time should be from R3 and C2 tune to 550 us.



*4) Ifp Conditions : Pulse Width=0.1msec and Duty=1/10 ◦

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3. ELECTRICAL CHARACTERISTICS

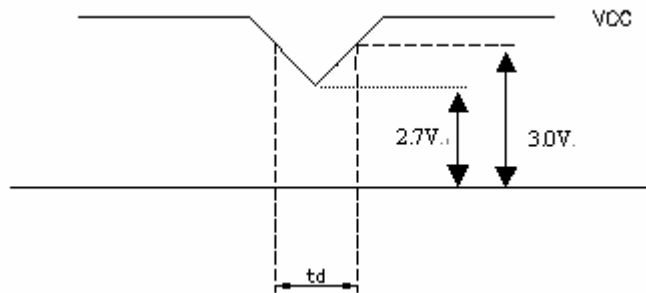
3.1 TFT LCD

Ta=25°C

| Item | Symbol | Min. | Typ | Max. | Unit | Note |
|------------------------------|--------|---------|-----|---------|------|------|
| Power Supply Voltage For LCD | VCC | 3.0 | 3.3 | 3.6 | V | *1) |
| Power Supply Voltage For LED | VDD | 2.7 | 3.3 | 5 | V | |
| Logic Input Voltage | VIH | VCC*0.7 | -- | VCC | V | |
| | VIL | 0 | -- | VCC*0.3 | V | |

Remarks :

*1) VCC -dip condition:

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

3.2TFT-LCD current consumption

| Item | Symbol | Min. | Typ | Max. | Unit | Note |
|-------------------|--------|------|-----|------|------|------|
| LCD power current | ICC | -- | TBD | TBD | mA | *1) |
| LED power current | IDD | | TBD | TBD | mA | *2) |

*1) Typical: Under 64 gray pattern
 Maximum: Under black pattern

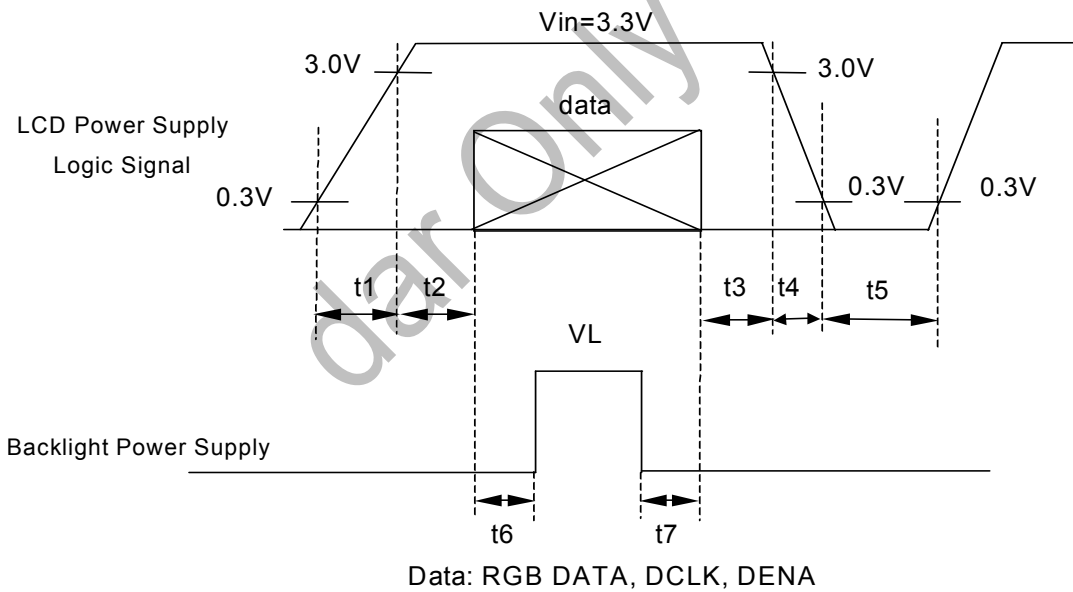


(a) 64 Gray Pattern (b) Black Pattern

*2) Typical: When VDD is 3.3V
 Maximum: When VDD is 2.7V

3.3 Power 、 Signal sequence

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



4. INTERFACE CONNECTION

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

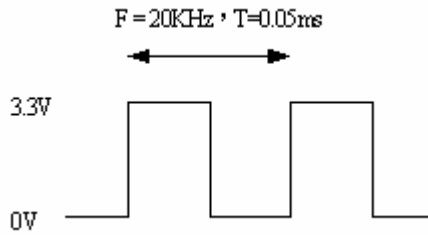
| Pin NO. | SYMBOL | DESCRIPTION |
|---------|-----------------|----------------------------------|
| 1 | U/D | Up or Down Display Control |
| 2 | DMS | Selection DE or SYNC |
| 3 | Hsync | Horizontal SYNC. |
| 4 | Vcc | Power Supply for Digital Circuit |
| 5 | Vcc | Power Supply for Digital Circuit |
| 6 | Vcc | Power Supply for Digital Circuit |
| 7 | Vcc | Power Supply for Digital Circuit |
| 8 | Vsync | Vertical SYNC. |
| 9 | DE | Data Enable |
| 10 | V _{ss} | Power Ground |
| 11 | V _{ss} | Power Ground |
| 12 | ADJ | Adjust for LED brightness |
| 13 | B5 | Blue Data 5 (MSB) |
| 14 | B4 | Blue Data 4 |
| 15 | B3 | Blue Data 3 |
| 16 | V _{ss} | Power Ground |
| 17 | B2 | Blue Data 2 |
| 18 | B1 | Blue Data 1 |
| 19 | B0 | Blue Data 0 (LSB) |
| 20 | V _{ss} | Power Ground |
| 21 | G5 | Green Data 5 (MSB) |
| 22 | G4 | Green Data 4 |
| 23 | G3 | Green Data 3 |
| 24 | V _{ss} | Power Ground |
| 25 | G2 | Green Data 2 |
| 26 | G1 | Green Data 1 |
| 27 | G0 | Green Data 0 (LSB) |
| 28 | V _{ss} | Power Ground |
| 29 | R5 | Red Data 5 (MSB) |
| 30 | R4 | Red Data 4 |
| 31 | R3 | Red Data 3 |
| 32 | V _{ss} | Power Ground |
| 33 | R2 | Red Data 2 |
| 34 | R1 | Red Data 1 |
| 35 | R0 | Red Data 0 (LSB) |
| 36 | V _{ss} | Power Ground |
| 37 | V _{ss} | Power Ground |
| 38 | DCLK | Clock Signals |
| 39 | V _{ss} | Power Ground |
| 40 | L/R | Left or Right Display Control |

Remarks :

1).ADJ adjust brightness to control Pin · Pulse duty the more small the more bright



2) ADJ signal = 0~3.3V , operation frequency: 20KHZ



3) GND Pin must ground contact , can not be floating.

4) U/D and L/R are controlled function

| L/R | U/D | Function |
|-----|-----|--|
| 1 | 0 | Normally display |
| 0 | 0 | Left and Right opposite |
| 1 | 1 | Up and Down opposite |
| 0 | 1 | Left and Right opposite , Up and Down opposite |

5) DMS (Selection DE / SYNC mode)

| DMS | Function |
|-----|-----------|
| 1 | DE Mode |
| 0 | SYNC Mode |

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5. INPUT SIGNAL(DE ONLY MODE)

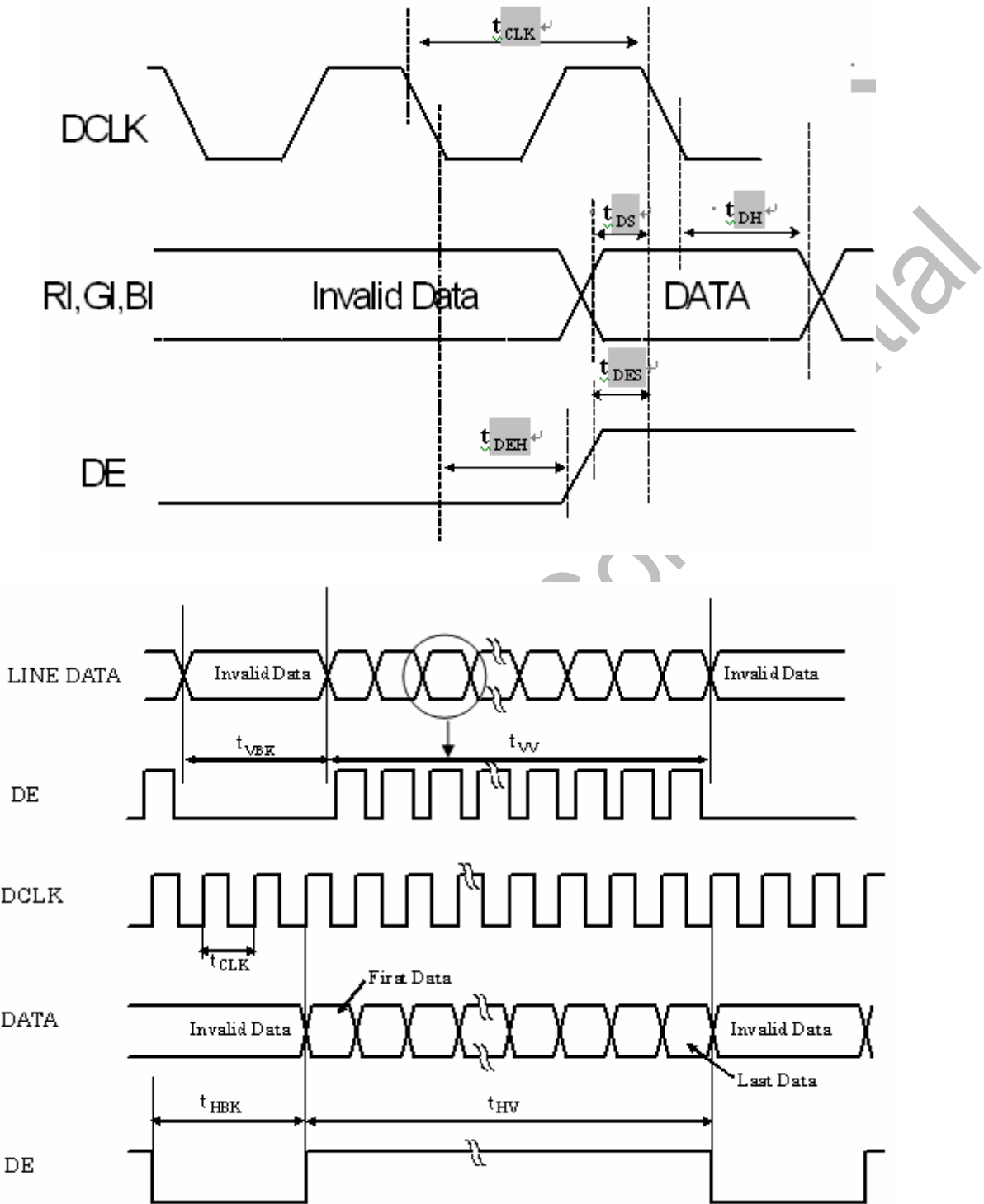
5.1 Timing Specification

| ITEM | | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|------|--------------------|-----------|-------|------|------|-----------|
| DCLK | Period | t_{CLK} | 16.67 | | | ns |
| | Dot Clock | f_{CLK} | 5 | - | 40 | MHz |
| | Low Level Width | t_{WCL} | 0.3 | - | - | ns |
| | High Level Width | t_{WCH} | 0.3 | - | - | |
| DE | Setup Time | t_{DES} | 5 | - | - | ns |
| | Hold time | t_{DEH} | 10 | - | - | |
| | Horizontal Period | t_{HP} | 750 | 800 | 900 | t_{CLK} |
| | Horizontal Valid | t_{HV} | 640 | | | |
| | Horizontal Blank | t_{HBK} | 110 | 160 | 260 | |
| | Vertical Period | t_{VP} | 515 | 525 | 560 | t_{HP} |
| | Vertical Valid | t_{VV} | 480 | | | |
| | Vertical Blank | t_{VBK} | 35 | 45 | 80 | |
| | Vertical Frequency | f_V | 55 | 60 | 65 | |
| DATA | Setup Time | t_{DS} | 4 | - | - | ns |
| | Hold Time | t_{DH} | 8 | - | - | |

Remarks :

- *1) High level of logic signal is 80% ◦ Low level of logic signal is 20% ◦
- *2) This module is operated by DE only mode

5.2 Timing sequence(Timing chart)



5.3 Color Data Assignment

| COLOR | INPUT | R DATA | | | | | | G DATA | | | | | | B DATA | | | | | |
|-------|-----------|--------|----|----|----|----|-----|--------|----|----|----|----|-----|--------|----|----|----|----|-----|
| | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 |
| | DATA | MSB | | | | | LSB | MSB | | | | | LSB | MSB | | | | | LSB |
| | 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 |
| BASIC | GREEN(63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| COLOR | 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(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 | | | | | | | | | | | | | | | | | | | |
| | 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(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 | 1 | 0 | 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 | | | | | | | | | | | | | | | | | | | |
| | 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(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 | | | | | | | | | | | | | | | | | | | |
| | 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 |

Remarks :

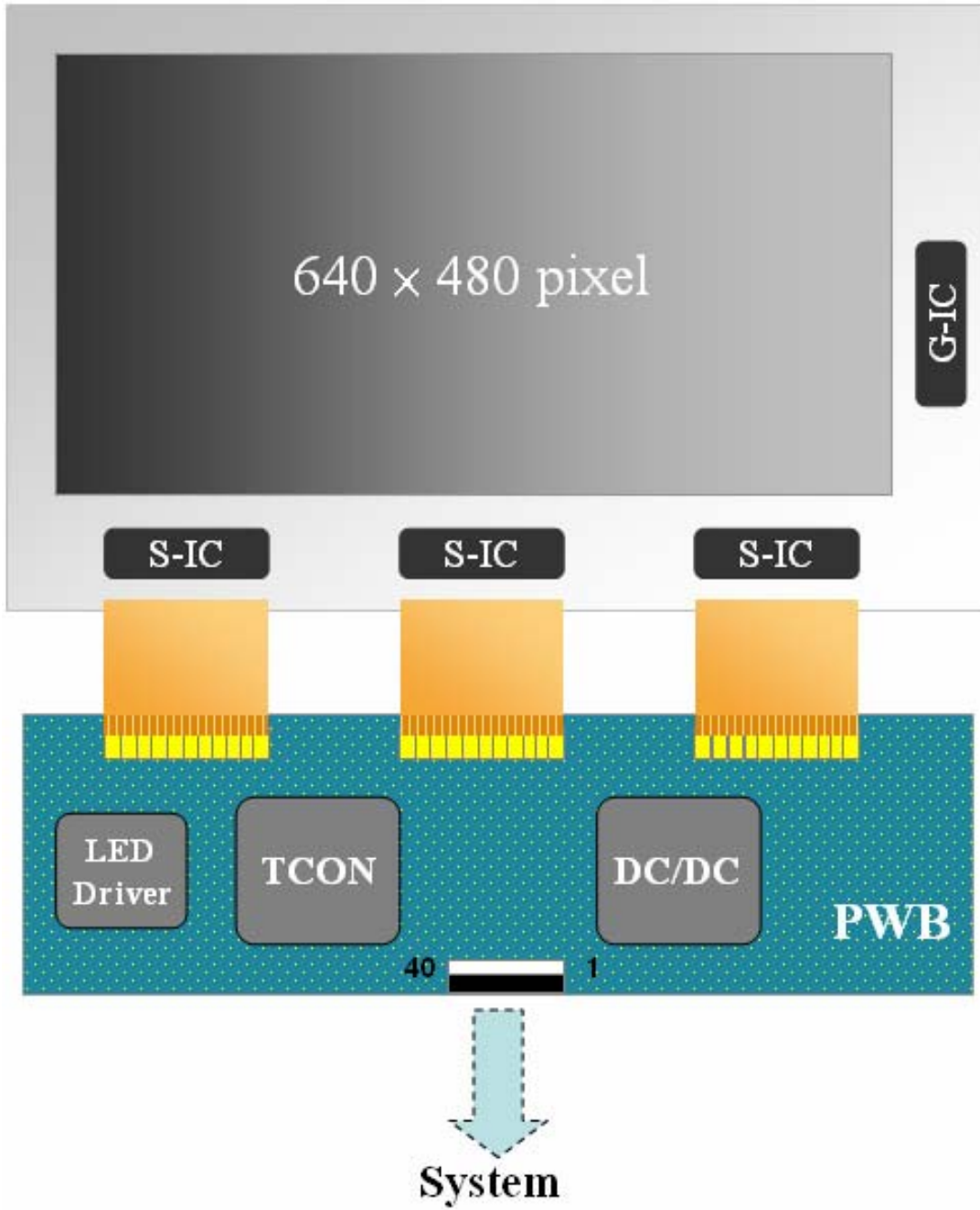
(1) Definition of Gray Scale

color(n) : n is series of Gray Scale

The more n value is, the bright Gray Scale.

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

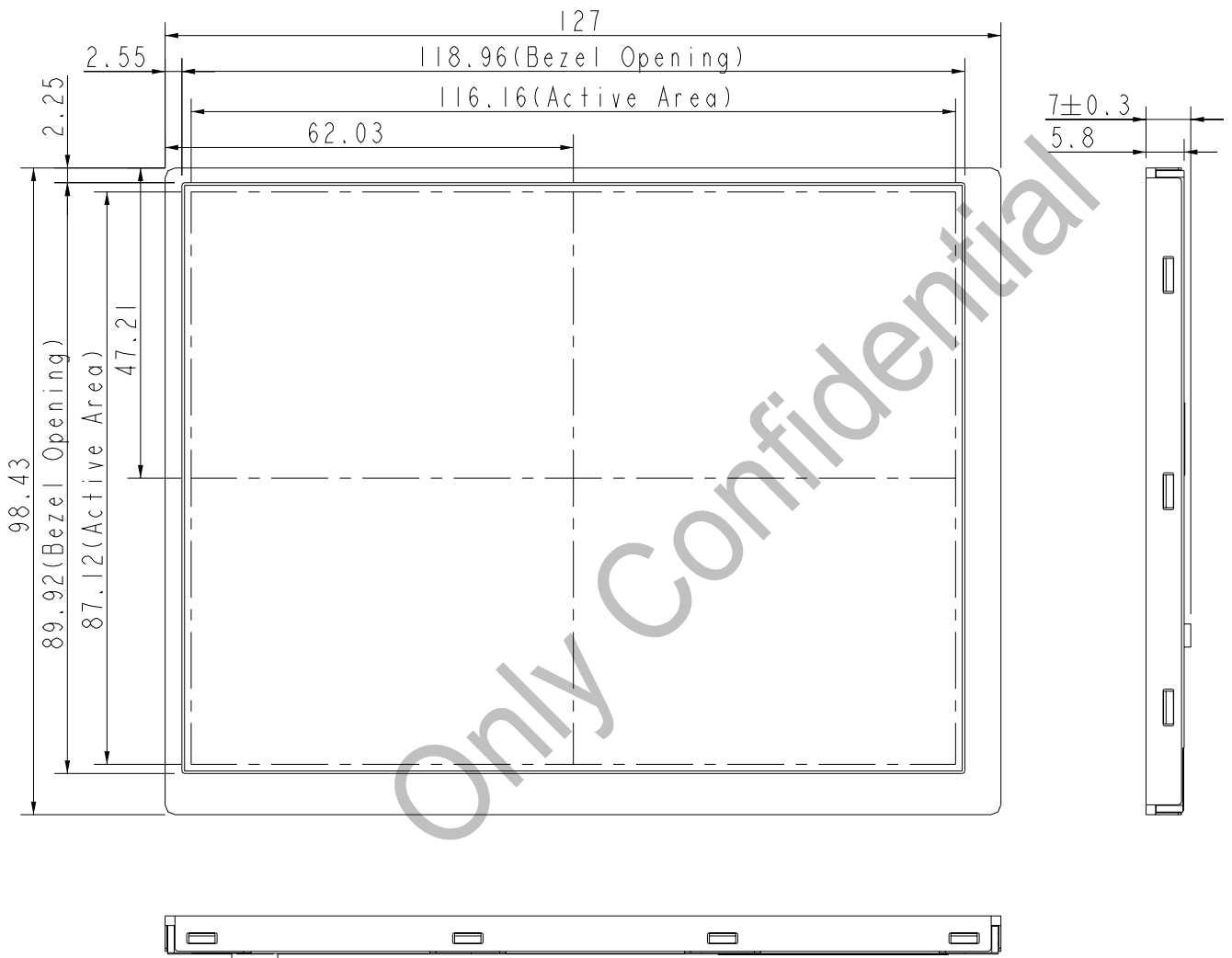
6. BLOCK DIAGRAM



7. MECHANICAL DIMENSION

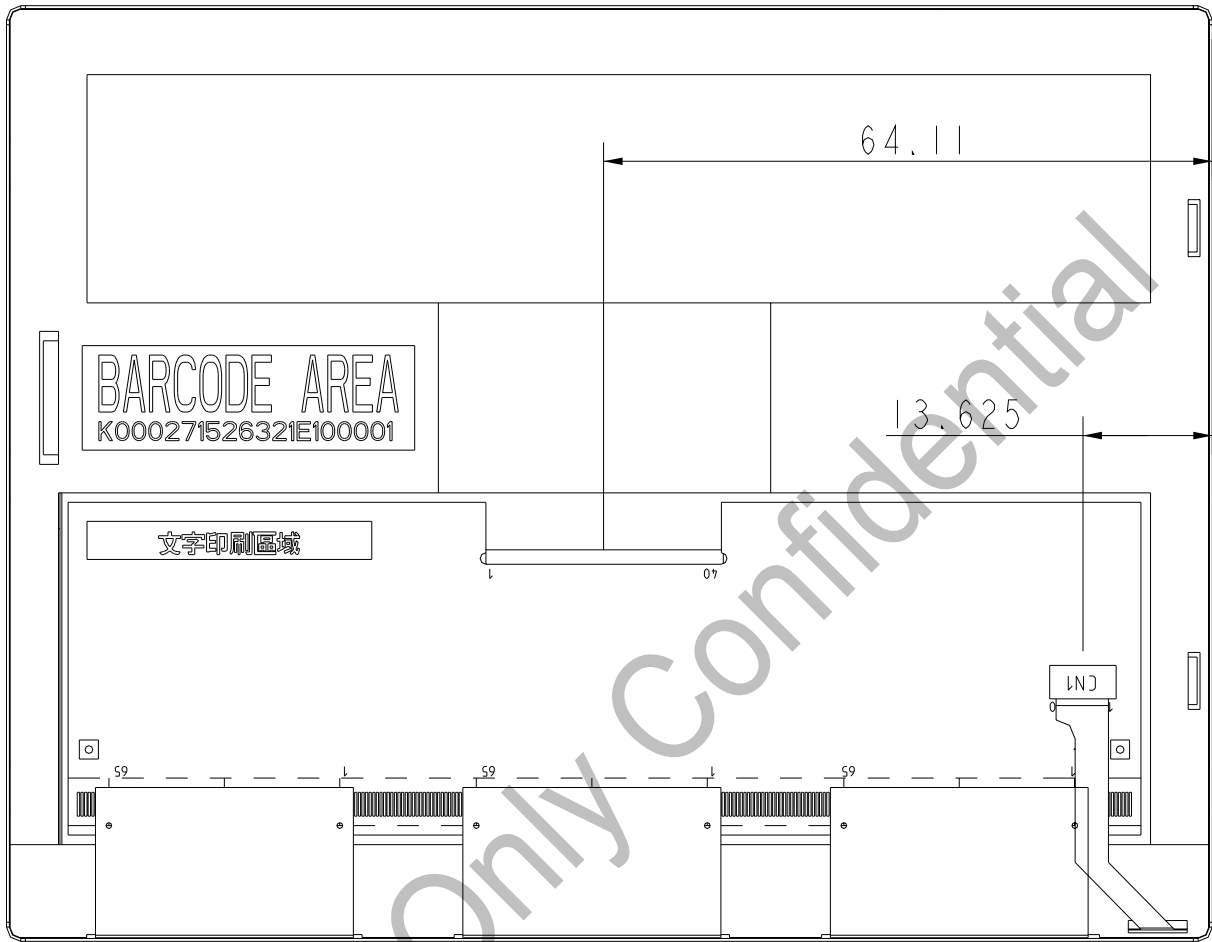
7.1 Front Side

[Unit : mm]



7.2 Rear Side

[Unit : mm]



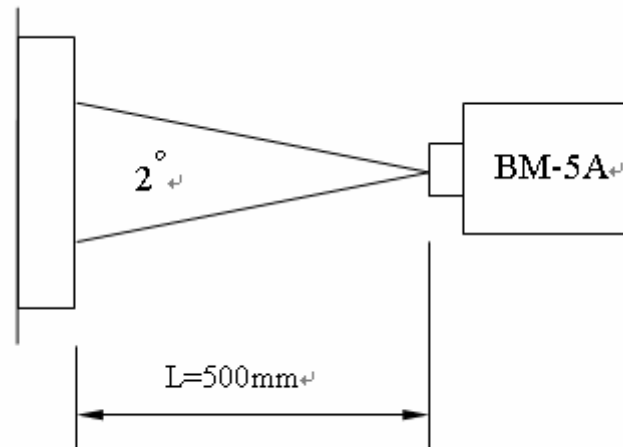
Remark : Un-indication tolerance is $\pm 0.3\text{mm}$

8. OPTICAL CHARACTERISTICS

| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | Remarks |
|----------------------------------|------------|-------------------------|----------------|----------------|----------------|-------------------|-----------|
| Constrast Ratio | CR | Point-5 | 200 | 300 | -- | -- | *1)*2)*3) |
| Luminance | Lw | Point-5 | 180 | 220 | -- | cd/m ² | *1)*3) |
| Luminance Uniformity | ΔL | | 70 | 80 | -- | % | *1)*3) |
| Response Time (White - Black) | Tr+ Tf | Point-5 | -- | 30 | 50 | ms | *1)*3)*5) |
| Viewing Angle | Horizontal | $CR \geq 10$ Point-5 | 120 | 140 | -- | ° | *1)*2)*4) |
| | Vertical | | 80 | 100 | -- | ° | *1)*2)*4) |
| Color Coordinate | White | Wx Wy | 0.273 0.289 | 0.313 0.329 | 0.353 0.369 | -- | *1)*3) |
| | Red | Rx Ry | TBD | TBD | TBD | | |
| | Green | Gx Gy | TBD | TBD | TBD | | |
| | Blue | Bx By | TBD | TBD | TBD | | |

Remarks :

*1)Measure condition : 25°C±2°C , 60±10%RH , under10 Lux in the dark room.BM-5A (TOPCON) , viewing angle2° , VCC=3.3V , VDD=3.3V.



*2) Definition of contrast ratio :

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

*3) Definition of luminance :

Measure white luminance on the point 5 as figure8-1

Definition of Luminance Uniformity:

Measure white luminance on the point1、2、3、4、5 as figure8-1

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

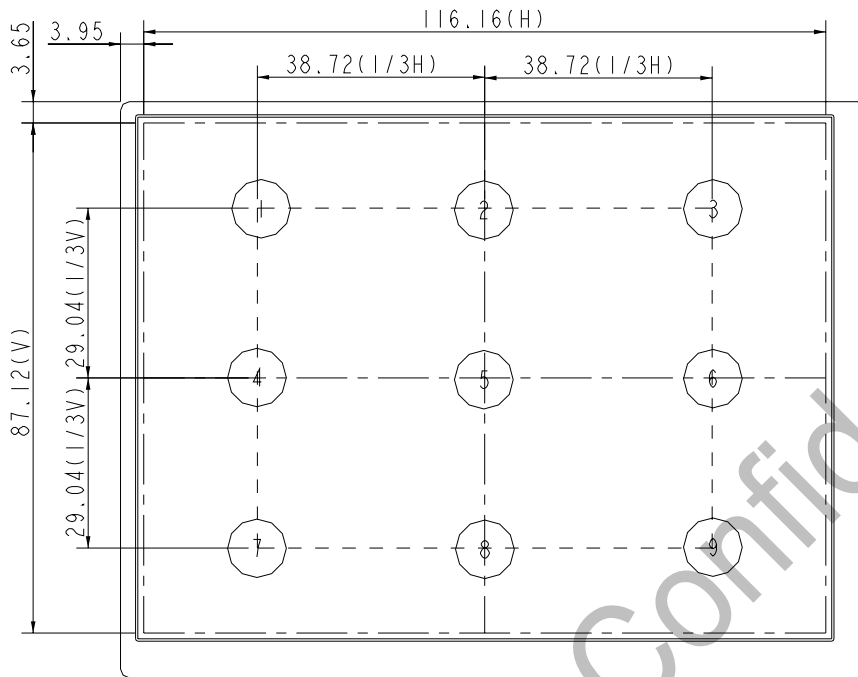


Fig8-1 Measuring point

*4) Definition of Viewing Angle(θ, ψ), refer to Fig8-2 as below :

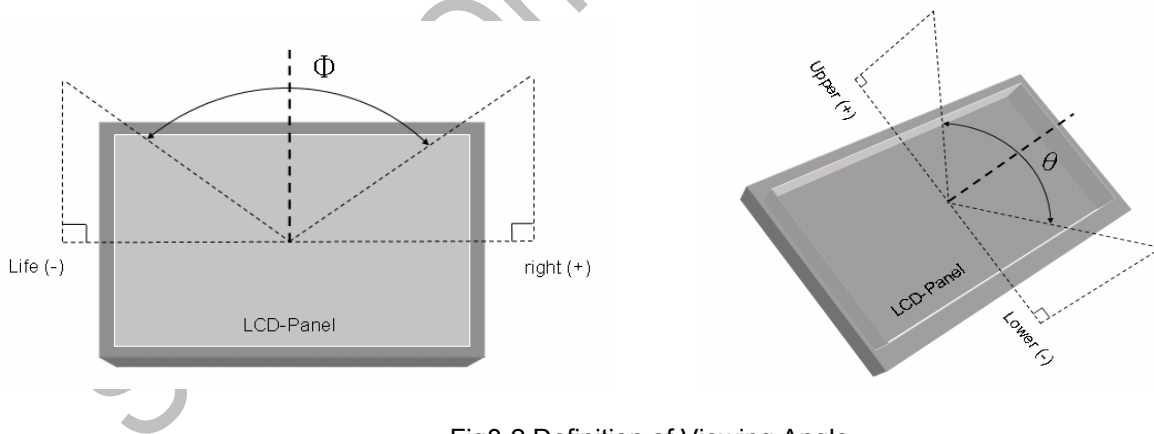


Fig8-2 Definition of Viewing Angle

*5) Definition of Response Time.(White-Black)

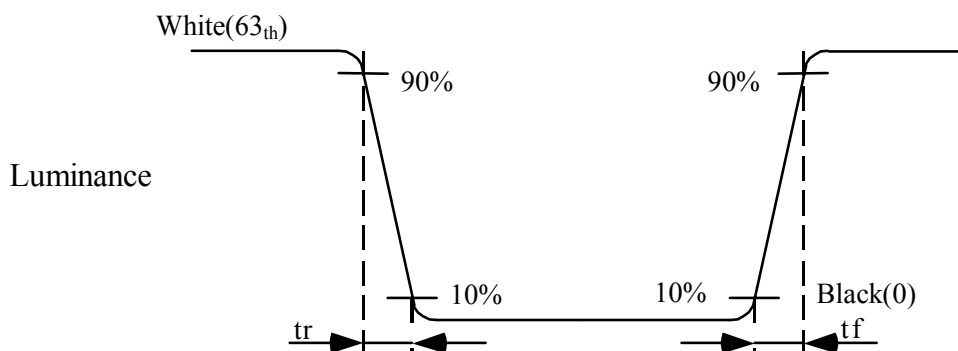


Fig8-3 Definition of Response Time(White-Black)

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9. RELIABILITY TEST

9-1. Temperature and humidity

| TEST ITEMS | CONDITIONS |
|--|--|
| High Temperature Operation | 85°C , 240H |
| High Temperature Storage | 90°C , 240H |
| High Temperature High Humidity Operation | 60°C , 90%RH , 240H |
| Low Temperature Operation | -30°C , 240H |
| Low Temperature Storage | -40°C , 240H |
| Thermal Shock | -30°C (1Hr) ~ 85°C(1Hr) 200 cycles |

9-2. Shock and Vibration

| TEST ITEMS | CONDITIONS |
|------------------------------|---|
| Shock (Non-operation) | <ul style="list-style-type: none"> ● Shock level:980m/s²(equal to 100G) ● Waveform:half sinusoidal wave,6ms. ● Number of shocks:one shock input in each direction of three mutually perpendicular axes for a total of three shock inputs. |
| Vibration (Non-operation) | <ul style="list-style-type: none"> ● Frequency range:8~33.3Hz ● Stoke:1.3mm ● Vibration:sinusodial wave,perpendicularaxis(both x,y,z axis:2Hrs). ● Sweep:2.9G,33.3Hz-400Hz ● Cycle:15min |

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.