



Chunghwa Picture Tubes, Ltd.

Product Specification

To :
Date : 130703

TFT LCD
CLAA104XA02CW

ACCEPTED BY : (V1.0)

| APPROVED BY | CHECKED BY | PREPARED BY |
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REVISION STATUS

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1. OVERVIEW

CLAA104XA02CW is 10.4" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit, and backlight.

The 10.4" screen produces a high resolution image that is composed of 1024×768 pixel elements in a stripe arrangement. Display 262K colors by 6 Bit R.G.B signal input.

General specification are summarized in the following table :

| ITEM | SPECIFICATION |
|--------------------------------|--|
| Panel Size | 10.4 inch(panel diagonal) |
| Display Area (mm) | 211.2(H)×158.4(V) (10.4-inch diagonal) |
| Number of Pixels | 1024(H) × 3(RGB) × 768(V) |
| Pixel Pitch (mm) | 0.20625 x0. 20625 |
| Color Pixel Arrangement | RGB vertical stripe |
| Display Mode | Normally white |
| Number of colors | 262,144 |
| Brightness(cd/m ²) | 400(typ.) |
| Response Time (Tr+Tf) | 25 ms |
| Module Size (mm) | 236(W)×174.3(H)×7.4(D) (with PWB and Component) |
| Viewin Angle(BL on,CR≥10) | 150 degree(H) · 140 degree(V) |
| Power consumption (W) | 4.0W(typ) / 4.3W(max) |
| BL unit | LED |
| Electrical Interface(data) | LVDS |
| Viewing Direction | 6 o'clock (Max contrast ratio, Gray Level Inversion) |
| Weight(g) | 385 (g) |
| Surface Treatment | Anti-Glare · Hardness:3H |

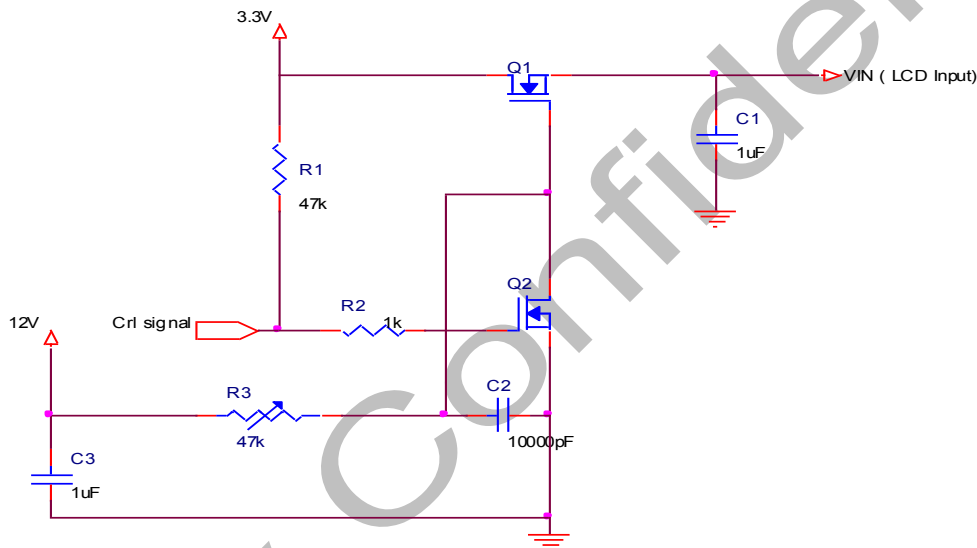
2. ABSOLUTE MAXIMUM RATINGS

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

| ITEM | SYMBOL | MIN. | MAX. | UNIT | NOTE |
|-----------------------------------|------------------|------|-------|------|----------|
| Power Supply Voltage | Vcc | -0.3 | 4.0 | V | |
| LED Supply Voltage | VLED | | 10.65 | V | |
| ICC Rush Current | IRUSH | - | 1 | A | 【Note 2】 |
| Operation Temperature | T _{op} | -20 | 70 | °C | 【Note 1】 |
| Storage Temperature | T _{stg} | -30 | 80 | °C | 【Note 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 | 【Note 3】 |

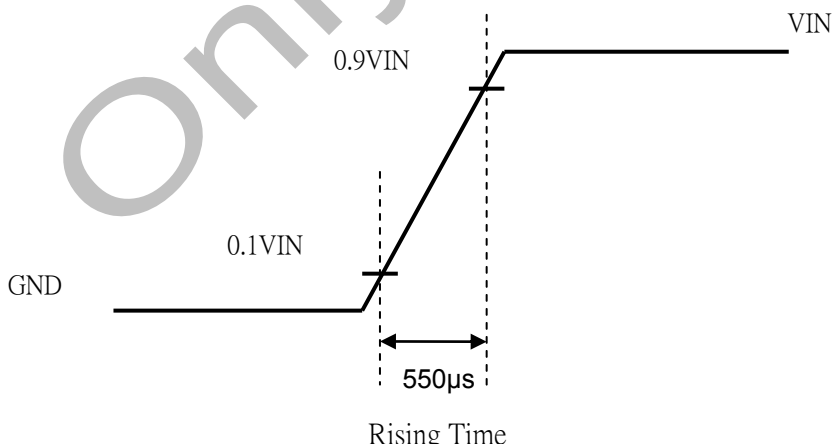
【Note1】 If users use the product out off the environment operation range (temperature and humidity, it will concern for visual quality.

【Note2】 The input pulse-current measurement system as below :



Control signal: High(+3.3V)→Low(GND)

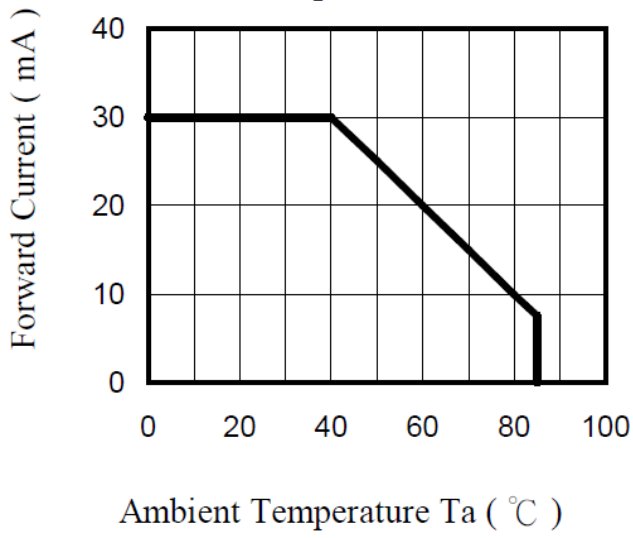
Supply Voltage of rising time should be from R3 and C2 tune to 550 us.



【Note3】 Ifp Conditions : Pulse Width $\leq 10\text{msec}$, Duty $\leq 1/10$.

【Note4】 Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward Current.

Forward Current vs.
Ambient Temperature



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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD Power Voltage

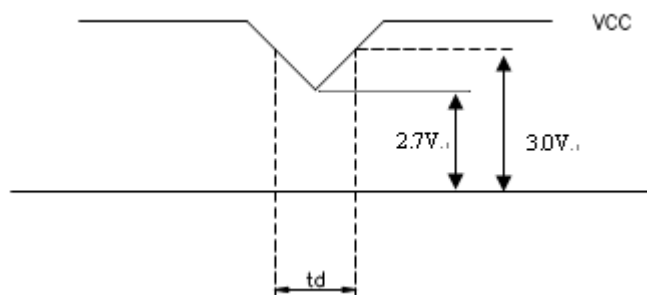
$T_a=25^{\circ}\text{C}$

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | NOTE | |
|---------------------------------------|----------------------------|------------|------|------|------|----------|----------|
| Power Supply Voltage For LCD | V_{CC} | 3.0 | 3.3 | 3.6 | V | 【Note 1】 | |
| Logic Input Voltage (LVDS:IN+,IN-) | Common Mode Voltage | V_{CM} | 1.08 | 1.2 | 1.32 | V | 【Note 2】 |
| | Differential Input Voltage | $ V_{ID} $ | 250 | 350 | 450 | mV | 【Note 2】 |
| | Threshold Voltage(high) | V_{TH} | - | - | 100 | mV | 【Note 2】 |
| | Threshold Voltage(low) | V_{TL} | -100 | - | - | mV | 【Note 2】 |

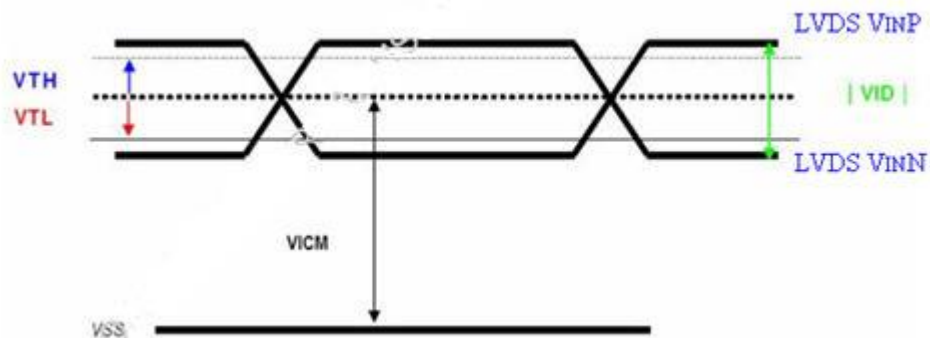
Remarks :

【Note1】 V_{CC} –dip condition:

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



【Note 2】 LVDS signal



3.2 TFT-LCD Current Consumption

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | NOTE |
|-------------------|-----------------|------|------|------|------|---------|
| LCD Power Current | I _{CC} | -- | 450 | 500 | mA | 【Note1】 |

【Note1】 (Frame rate = 60 Hz)

Typical: Under 64 gray pattern @ V_{CC} = 3.3 V

Maximum: Under black pattern @ V_{CC} = 3.0 V

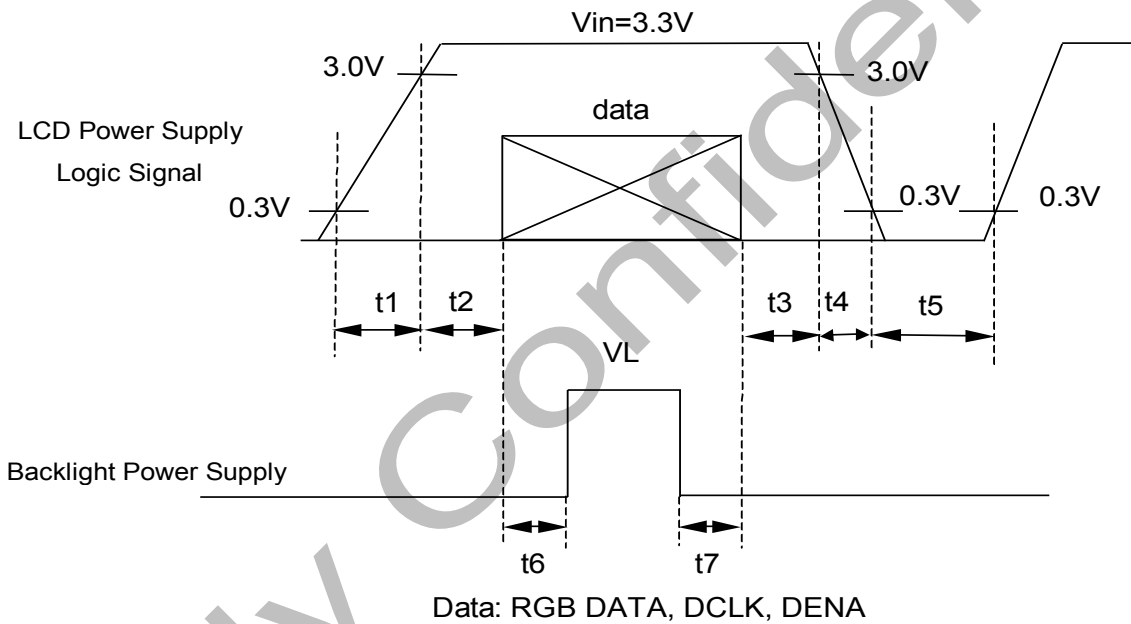


(a) 64 Gray Pattern



(b) Black Pattern

3.3 Power & Signal Sequence



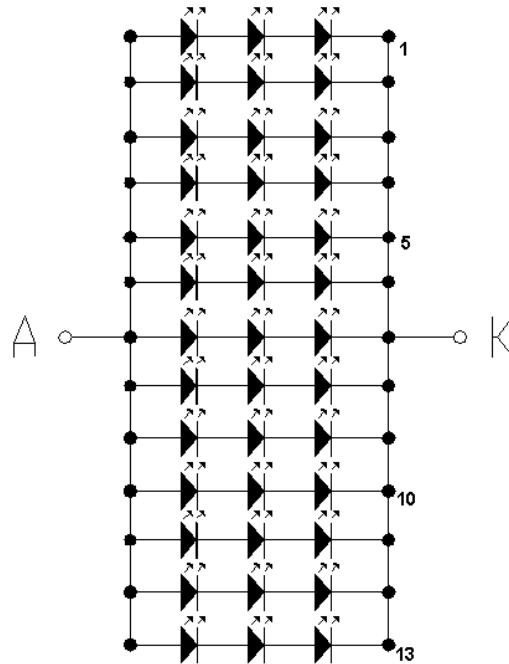
- 0.5 < t1 ≤ 10ms
- 0 < t2 ≤ 50ms
- 0 < t3 ≤ 50ms
- 0 < t4 ≤ 10ms
- 200ms ≤ t5
- 200ms ≤ t6
- 200ms ≤ t7

3.4 BACKLIGHT:

| ITEM | SYMBOL | CONDITION | MIN | TYP | MAX | UNIT | REMARKS |
|-------------------|--------|--------------------------|-------|-------|-------|------|------------|
| LED Current | IL | Ta=25°C (20mA/serise) | -- | 260 | -- | mA | Note 1,2 |
| LED Voltage | VL | Ta=25°C (20mA/serise) | 8.55 | 9.6 | 10.65 | V | Note 1,2 |
| Power Consumption | WL | Ta=25°C (20mA/serise) | -- | 2.496 | 2.769 | W | Note 1,2 |
| LED Lifetime | - | Ta=25°C IF=20mA | 30000 | - | - | Hr | Note 3,4,5 |

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

LCD connector (30pin) : STM · P/N : MSBK2407P30D or other of the same class

| Pin No. | SYMBOL | FUNCTION |
|---------|-----------------|--------------------------|
| 1 | GND | Ground |
| 2 | V _{CC} | +3.3V Power |
| 3 | V _{CC} | +3.3V Power |
| 4 | NC | NC |
| 5 | NC | NC |
| 6 | NC | NC |
| 7 | GND | GND |
| 8 | RXIN0- | LVDS Signal(-)—channel 0 |
| 9 | RXIN0+ | LVDS Signal(+)—channel 0 |
| 10 | GND | Ground |
| 11 | RXIN1- | LVDS Signal(-)—channel 1 |
| 12 | RXIN1+ | LVDS Signal(+)—channel 1 |
| 13 | GND | Ground |
| 14 | RXIN2- | LVDS Signal(-)—channel 2 |
| 15 | RXIN2+ | LVDS Signal(+)—channel 2 |
| 16 | GND | Ground |
| 17 | RXCLKIN- | LVDS Clock Signal(-) |
| 18 | RXCLKIN+ | LVDS Clock Signal(+) |
| 19 | GND | Ground |
| 20 | NC | NC |
| 21 | NC | NC |
| 22 | GND | Ground |
| 23 | GND | Ground |
| 24 | NC | NC |
| 25 | NC | NC |
| 26 | NC | NC |
| 27 | NC | NC |
| 28 | NC | NC |
| 29 | NC | NC |
| 30 | NC | NC |

【Note】

- 1) GND Pin must be connected to ground. Don't be floating.
- 2) NC Pin must be floating.

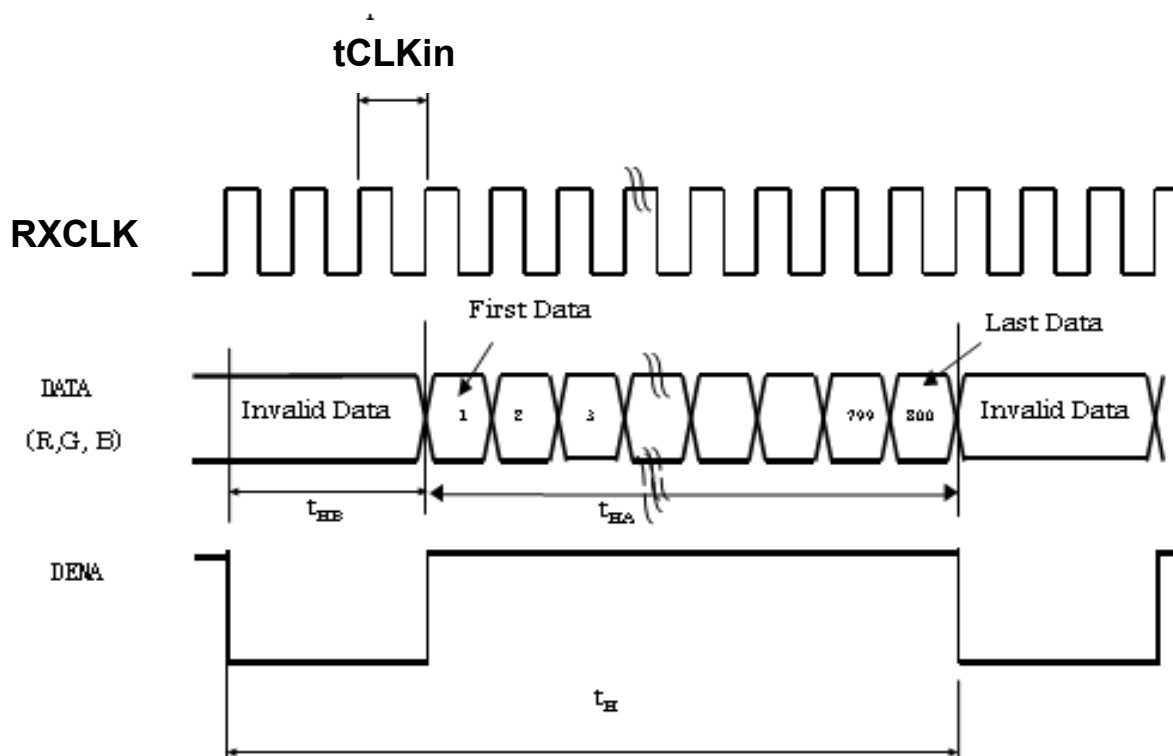
5. INPUT SIGNAL(DE ONLY MODE)

5.1 Timing Specification

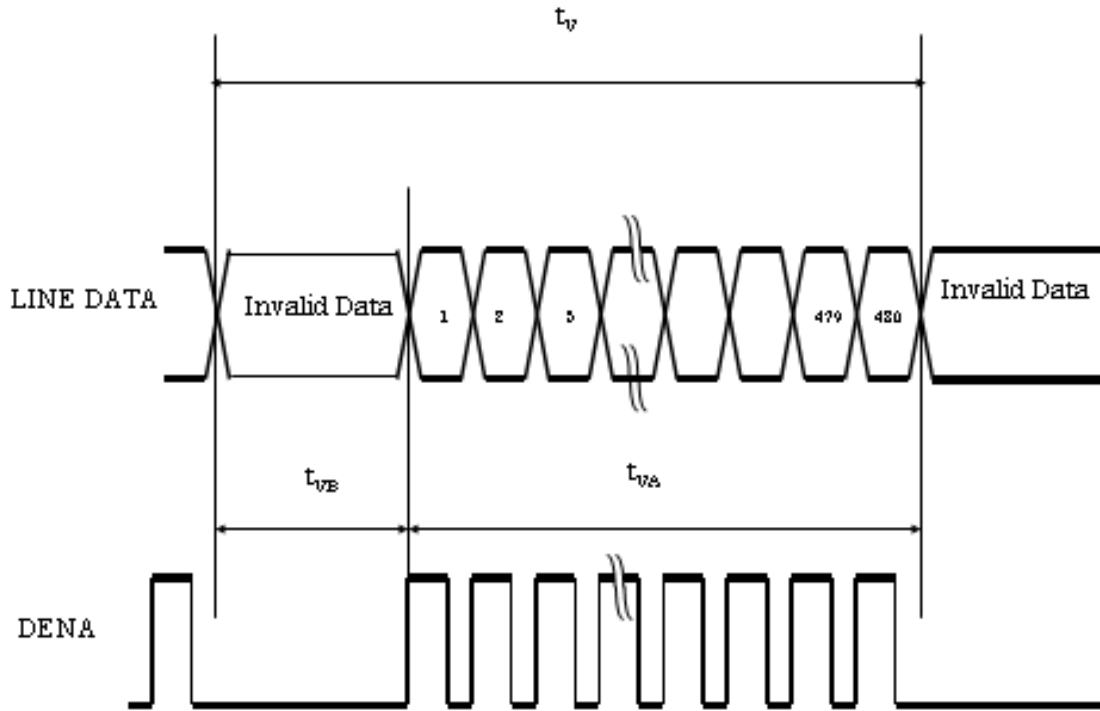
| ITEM | | SYMBOL | MIN. | TYP. | MAX. | UNIT | |
|----------------------------|----------------|-------------------|----------|------|------|----------------|----------------|
| LVDS input signal sequence | CLK Frequency | | fCLKin | 51 | 65 | 71 | MHz |
| LCD input timing | Horizontal | Horizontal Period | t_H | 1160 | 1344 | 1350 | tCLK |
| | | Horizontal Valid | t_{HA} | 1024 | | | tCLK |
| | | Horizontal Blank | t_{HB} | 136 | 320 | 326 | tCLK |
| | Vertical | Frame | fV | 55 | 60 | 65 | Hz |
| | | Vertical Period | t_V | 790 | 806 | 810 | t _H |
| | | Vertical Valid | t_{VA} | 768 | | | t _H |
| | Vertical Blank | t_{VB} | 22 | 38 | 42 | t _H | |

5.2 Timing Sequence (Timing Chart)

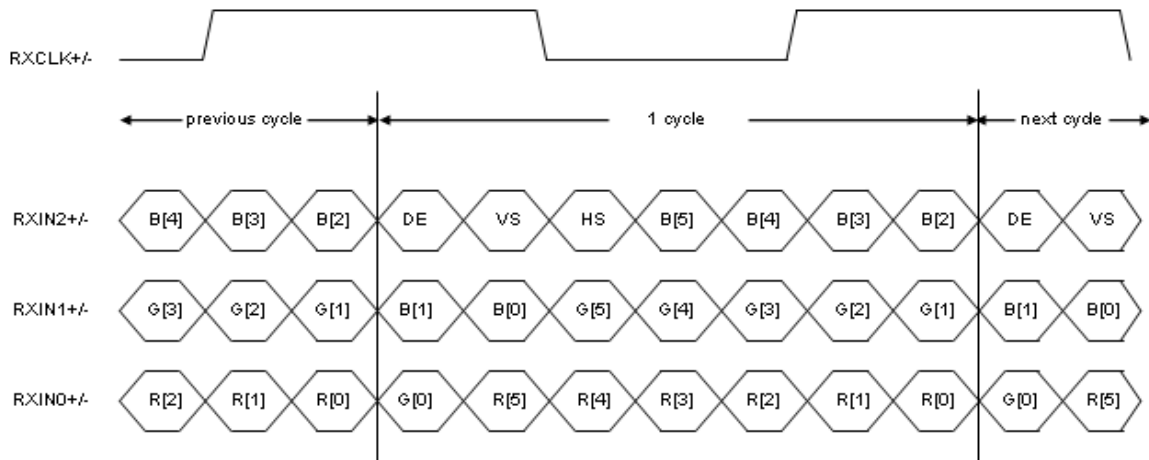
5.2.1 Horizontal Timing Sequence



5.2.2 Vertical Timing Sequence



5.2.3 LVDS Input Data Mapping



5.3 Color Data Assignment

| COLOR | INPUT | R DATA | | | | | | G DATA | | | | | | B DATA | | | | | |
|-------------|-----------|--------|----|----|----|----|-----|--------|----|----|----|----|-----|--------|----|----|----|----|-----|
| | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 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 |

【Note1】 Definition of Gray Scale

color(n) : (n) means the level of gray scale, the larger (n) means the brighter level.

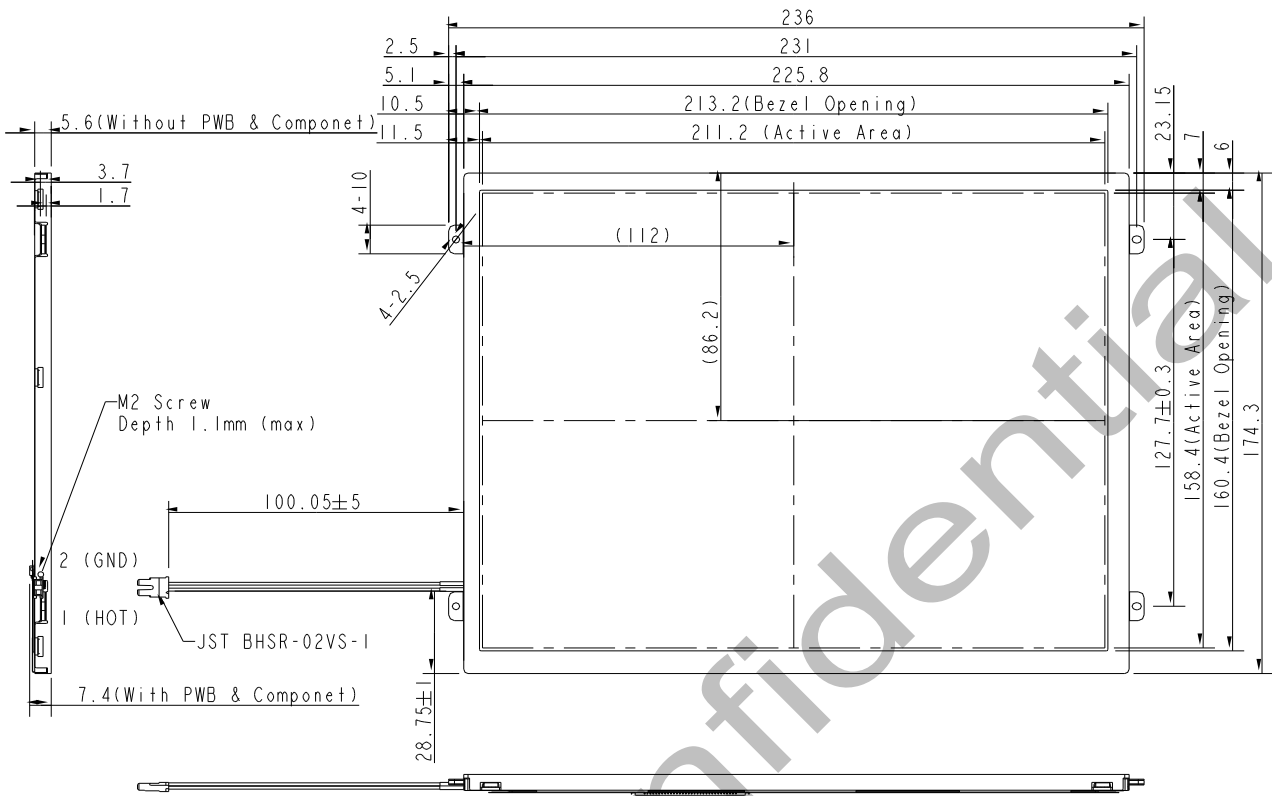
【Note2】 Data:1-High,0-Low



6. MECHANICAL DIMENSION

6.1 Front Side

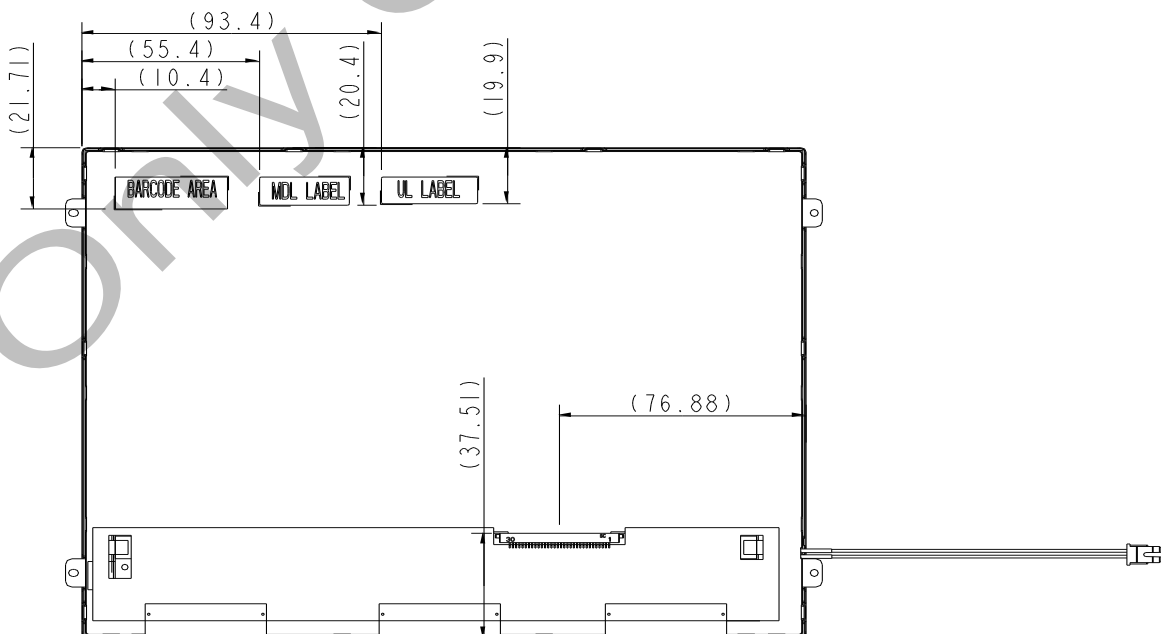
[Unit : mm]



[Note] : Tolerance is $\pm 0.3\text{mm}$ unless noted

6.2 Rear Side

[Unit : mm]



[Note] : Tolerance is $\pm 0.3\text{mm}$ unless noted



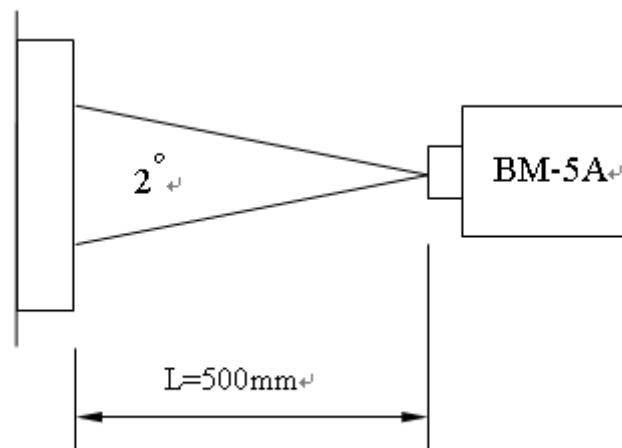
7. OPTICAL CHARACTERISTICS

Ta = 25°C, V_{CC} = 3.3V

| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|----------------------------------|--------|-----------|-----------------------|----------------|----------------|-------------------|--------------|
| Constrast Ratio | CR | Point-5 | 400 | 500 | -- | -- | *1)*2)*3) |
| Luminance*) | Lw | Point-5 | 320 | 400 | -- | cd/m ² | *1)*3) |
| Luminance Uniformity | ΔL | | 70 | 80 | | % | *1)*3) |
| Response Time (White - Black) | Tr+ Tf | Point-5 | | 25 | 30 | ms | *1)*3)*5) |
| Viewing Angle | Left | Deg. | Point-5 CR ≥ 10 | 65 | 75 | | *1)*2)*4) |
| | Right | Deg. | | 65 | 75 | | *1)*2)*4) |
| | Upper | Deg. | | 50 | 60 | | *1)*2)*4) |
| | Lower | Deg. | | 70 | 80 | | *1)*2)*4) |
| NTSC | | | 42 | 47 | -- | % | |
| Color Coordinate | White | Wx Wy | θ = φ = 0° Point-5 | 0.273 0.289 | 0.313 0.329 | 0.353 0.369 | -- *1)*3) |
| | Red | Rx Ry | | 0.528 0.287 | 0.568 0.327 | 0.608 0.367 | |
| | Green | Gx Gy | | 0.308 0.533 | 0.348 0.573 | 0.388 0.613 | |
| | Blue | Bx By | | 0.120 0.064 | 0.160 0.104 | 0.200 0.144 | |

NOTE :

*1) Measure condition : 25°C ± 2°C , 60 ± 10%RH , under 10 Lux in the dark room. BM-5A (TOPCON) , viewing angle 2° , IL = 260mA , after 10 minutes operation.



*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 figure7-1
 Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure7-1

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

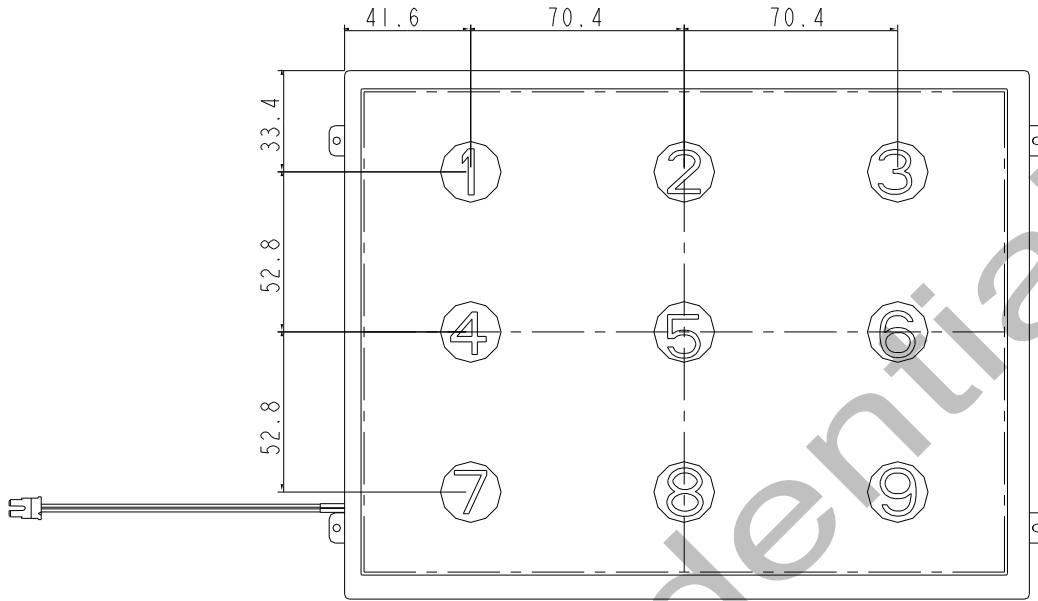


Fig7-1 Measuring point

- *4) Definition of Viewing Angle(θ, ψ), refer to Fig7-2 as below :
 These items are measured by EZ-CONTRAST (ELDIM) in the dark room. (no ambient light).

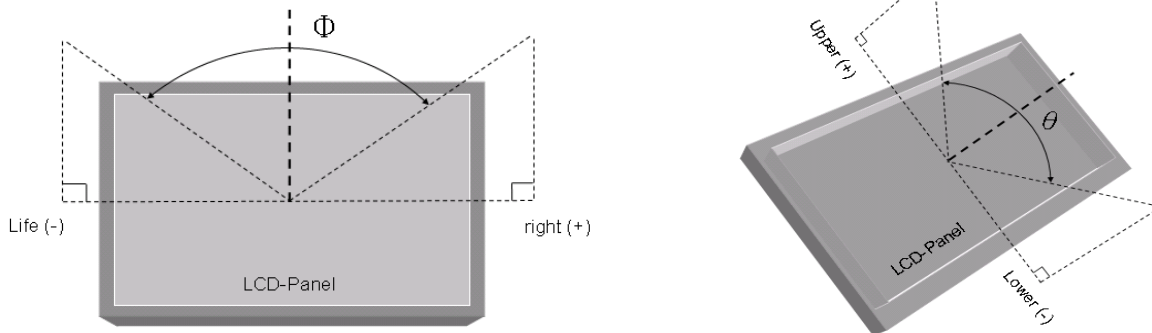


Fig8-2 Definition of Viewing Angle

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

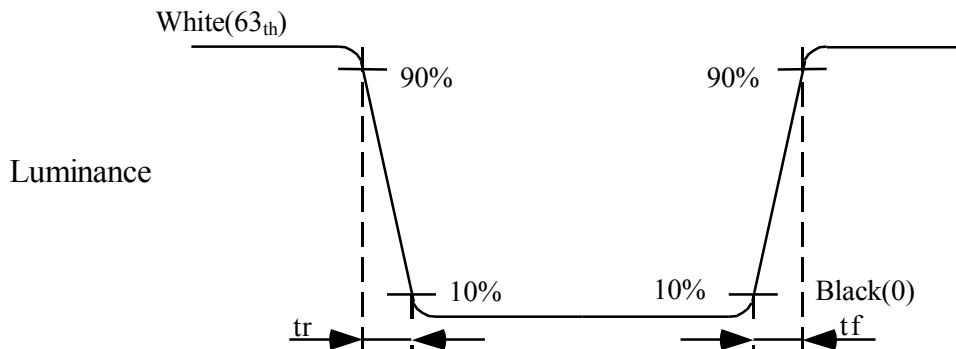


Fig8-3 Definition of Response Time(White-Black)



8. RELIABILITY TEST

8.1. Temperature and Humidity

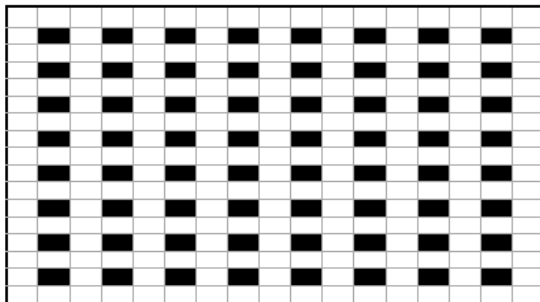
| TEST ITEMS | CONDITIONS | NOTE |
|--|--|-----------------|
| High Temperature Operation | 70°C , 240Hrs | |
| High Temperature Storage | 80°C , 240Hrs | |
| High Temperature High Humidity Operation | 60°C , 90%RH , 240Hrs | No condensation |
| Low Temperature Operation | -20°C , 240Hrs | |
| Low Temperature Storage | -30°C , 240Hrs | |
| Thermal Shock | -30°C (0.5Hr) ~ 80°C (0.5Hr) 200 cycles | |
| Image Sticking | 25°C ; 4hrs | |
| MTBF | 20,000hrs | |

[Note] :

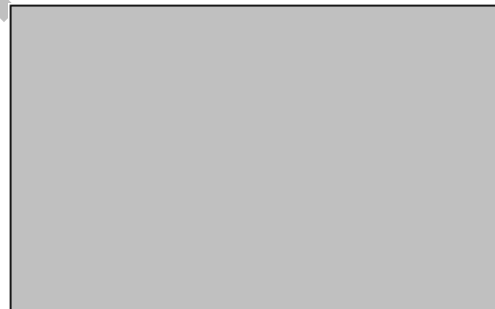
Condition of Image Sticking test : 25 °C ± 2 °C

Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.

After 5 mins, the mura must be disappeared completely .



(a) Test Pattern (chess board Pattern)



(b) Gray Pattern

8.2. 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 ● Stroke:1.3mm ● Vibration:sinusoidal wave,perpendicularaxis(both x, z axis:2Hrs, y axis 4Hrs). ● Sweep:2.9G,33.3Hz-400Hz ● Cycle:15min |

8.3 Electrostatic Discharge

| ITEM | CONDITION | 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 and no line defect. Partial transformation of the module parts should be ignored.

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.

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