# Chunghwa Picture Tubes, Ltd. Product Specification

To :

Date : 100118

**TFT LCD**

# CLAB070JC01CW

ACCEPTED BY : (V0.2)

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| Doc.No: | Issue Date: |
|---|---|

# REVISION STATUS

| Revision Notice | Description | Page | Rev. Date |
|---|---|---|---|
| 0.0 | First revision (Tentative) | -- | 2009/11/05 |
| 0.1 | Revise Power sequence | 7 | 2009/11/24 |
| 0.1 | Revise Timing characteristics of input signals | 8~9 | 2009/11/24 |
| 0.1 | Revise CN1(Note1) | 10~11 | 2009/11/24 |
| 0.2 | Revise Vcom | 6 | 2010/01/15 |
| 0.2 | Revise reliability test | 16 | 2010/01/15 |
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# CONTENTS

# 1. OVERVIEW

**CLAB070JC01CW** is 7.0" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) OLB module (finish outer lead bonding) composed of LCD panel and driver ICs (the backlight is not included in this OLB module).

The 7.0" (17.67cm) screen produces 480(*3)X234 WQVGA resolution image. By applying R.G.B. input signal, full color images are displayed.

General specifications are summarized in the following table:

| ITEM | SPECIFICATION |
|---|---|
| Display Area (mm) | 154.08 (H) × 86.58 (V) |
| Number of Pixels | 480(H) × 3(RGB)× 234(V) |
| Pixel Pitch (mm) | 0.107(H) × 3(RGB) × 0.37(V) |
| Color Pixel Arrangement | RGB vertical stripe |
| Display Mode | Normally white,TN |
| Number of color | Full color |
| Viewing Direction | 6 o'clock |
| Response Time (Tr+Tf) | 20ms (typ.) |
| Panel Transmittance (%) | 8.5 (typ.) |
| Power Consumption(W) | 0.042W (typ) |
| Surface Treatment | Anti-Glare, Hardness:3H |

## 2. ABSOLUTE MAXIMUM RATINGS

| ITEM | SYMBOL | conditions | MIN. | MAX. | UNIT | NOTE |
|---|---|---|---|---|---|---|
| Power Supply Voltage for LCD | VCC | GND=0 | -0.3 | 6 | V | |
| | AVDD | AVSS=0 | -0.3 | 7 | V | |
| | VGH | GND=0 | -0.3 | 32 | V | |
| | VGL | | -22 | 0.3 | V | |
| | VGH-VGL | GND=0 | -0.3 | 40 | V | |
| Signal input voltage | Vi | | -0.2 | AVDD+0.2 | V | Note1 |
| | | | | | | |
| Operating temperature | Topa | | -20 | 70 | ℃ | Note3 |
| Storage temperature | Tstg | | -30 | 80 | ℃ | Note3 |

Note1：Analog input voltage VR, VG, VB

Note2：Logical signal STHL, STHR, OEH, L/R, CPH1~CPH3, STVR, STVL, OEV,CKV, U/D.

Note3：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 Typical operation conditions

GND = Avss = 0V  (Ta=25℃ )

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | NOTE |
|---|---|---|---|---|---|---|
| Power Supply Voltage | VCC | 3.0 | 3.3 | 3.6 | V | Note5 |
| | | 4.5 | 5 | 5.5 | V | |
| | AVDD | 4.5 | 5 | 5.5 | V | |
| | VGH | 17 | 18 | 19 | V | |
| | VGL | -7 | -6 | -5 | V | |
| Signal Amplitude (VR, VG, VB) | $V_{iA}$ | 0.4 | - | AVDD-0.4 | V | Note1 |
| | $V_{iAC}$ | - | 4 | - | V | Note1 |
| | $V_{iDC}$ | - | AVDD/2 | - | V | Note1 |
| VCOM | $V_{CAC}$ | 4 | 4.7 | 5.4 | $V_{P-P}$ | Note1,2 |
| | $V_{CDC}$ | 1.7 | 1.8 | 1.9 | V | Note1,3 |
| Input Signal Voltage | $V_{IH}$ | 0.7VCC | - | VCC | V | Note4 |
| | $V_{IL}$ | GND | - | 0.3VCC | V | |

Note1：Please refer to Fig.1 VCOM-RGB diagram
Note2：Brightness level is adjusted by varying this amplitude $V_{CAC}$
Note3：Please adjust $V_{CDC}$ to make the flicker level be minimum.
Note4：Logical signal STHL,STHR,OEH,L/R,CPH1~CPH3,STVR,STVL,OEV,CKV,U/D.
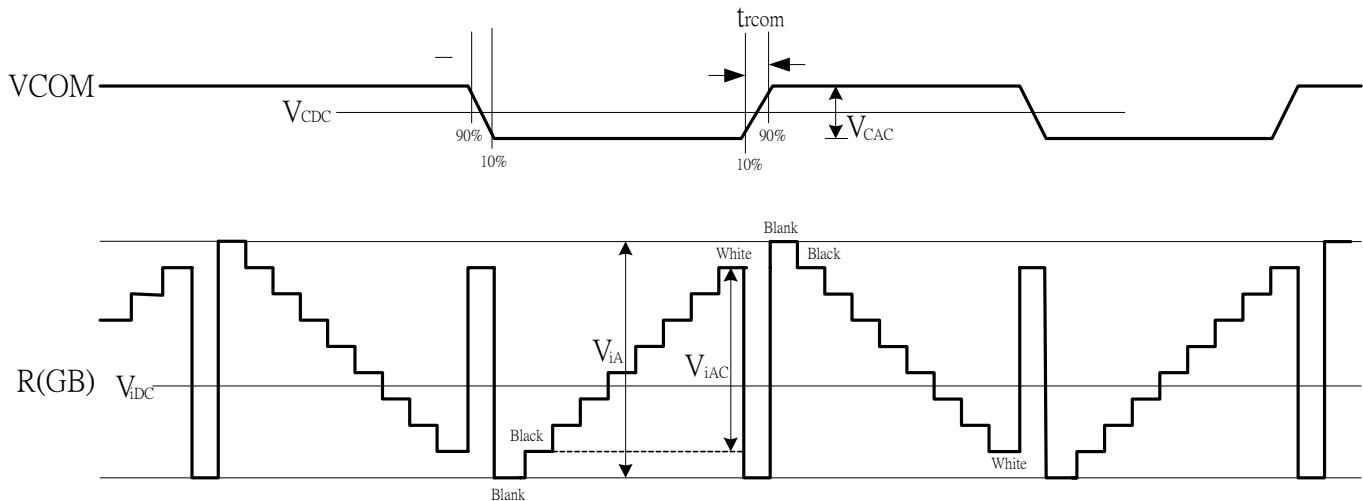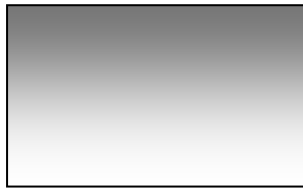Note5：Vcc please refer T-con setup on system
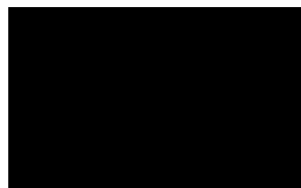


Fig.1 VCOM-RGB

## 3.2 Current consumption

(GND = Avss = 0V )

| ITEM | SYMBOL | conditions | MIN. | TYP. | MAX. | UNIT | NOTE |
|------|--------|-----------|------|------|------|------|------|
| Drive Current | $I_{GH}$ | VGH =18V | - | 0.12 | 1 | mA | Note1 |
| | $I_{GL}$ | VGL = -6V | - | 0.45 | 1 | mA | Note1 |
| | $I_{CC}$ | VCC = 5V | - | 2.5 | 4.5 | mA | Note1 |
| | $I_{DD}$ | AVDD = 5V | - | 5 | 10 | mA | Note1 |

[Note1]：Typ. specification：Gray-level test Pattern
         Max. specification：Black test Pattern

(a)Gray-level Pattern                    (b)Black Pattern

## 3.3 Power、Signal sequence

Power On：VCC→AVDD/VGL→VGH    Video &Logic Signal
Power Off：Video &Logic Signal→VGH          VCC

VGH

AVDD
VCC

T1    T2    T3    T7          Video&Logic Signal          T8    T4    T5    T6

VGL

OFF                    ON                        OFF

0＜T1≦10ms              T5 ＞0ms
T2 ＞20ms               T6 ＞0ms
T3 ＞10ms               0＜T7≦10ms
T4 ＞0ms                0＜T8≦10ms
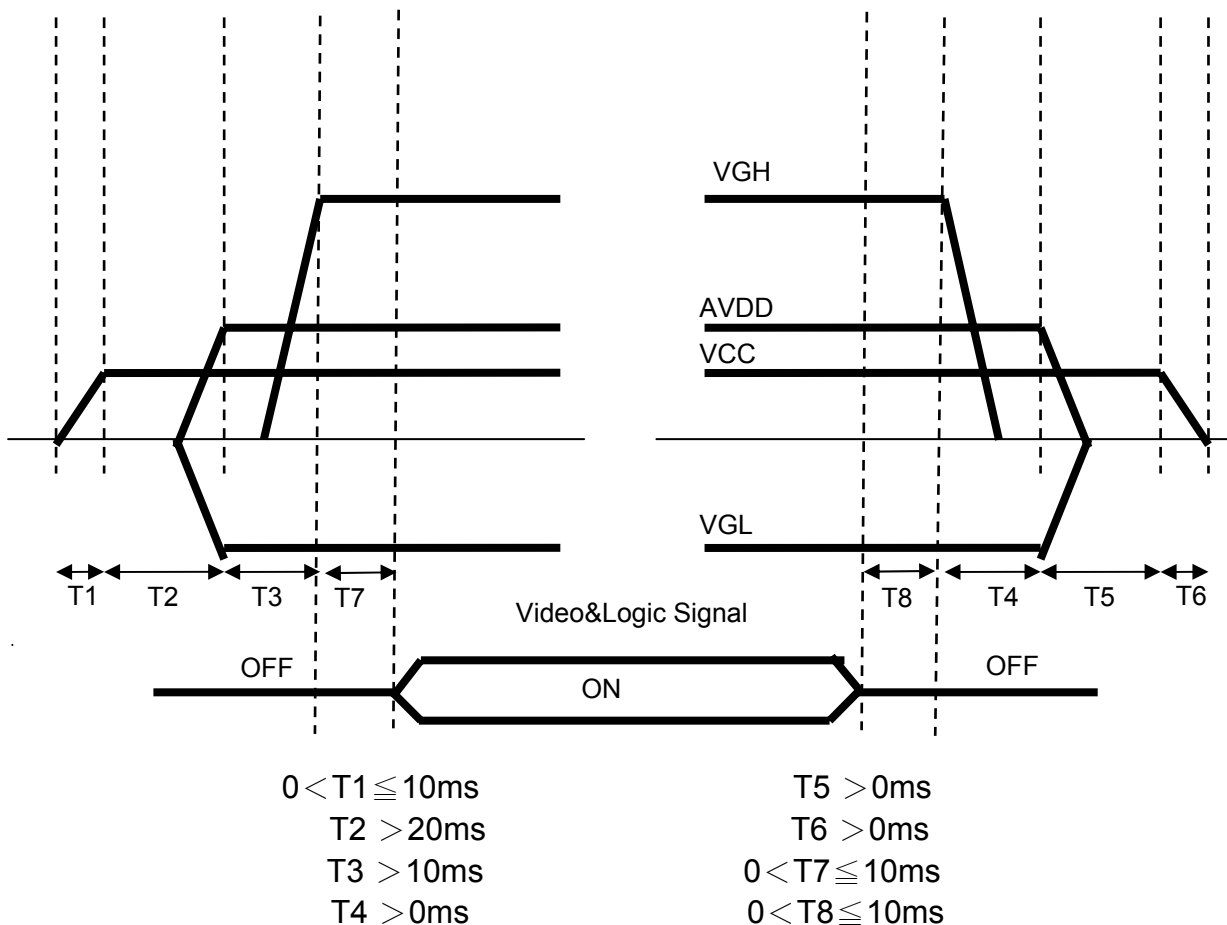
Fig.2 Power sequence

## 3.4 Timing characteristics of input signals

| CHARACTERISTICS | SYMBOL | MIN. | TYP. | MAX. | UNIT | NOTE |
|---|---|---|---|---|---|---|
| Source driver operating frequency | $1/T_{CW}$ | - | 9.4 | - | MHz | |
| CPH pulse width | $T_{CW}$ | 100 | 106 | 108 | ns | CPH1~CPH3 |
| CPH pulse high period | $T_{CWH}$ | 40 | 49 | 60 | ns | CPH1~CPH3 |
| CPH pulse low period | $T_{CWL}$ | 40 | 49 | 60 | ns | CPH1~CPH3 |
| CPH pulse delay | TC12 TC23 TC31 | 32.5 | 35.2 | 38.2 | ns | CPH1~CPH3 |
| STH start pulse width | $T_{STH}$ | 30 | 92.8 | - | ns | STHR,STHL |
| STH start pulse setup time | $T_{SUH}$ | 20 | 56 | - | ns | STHR,STHL |
| STH start pulse hold time | $T_{HDH}$ | 10 | 35 | - | ns | STHR,STHL |
| OEH output enable pulse width | $T_{OEH}$ | 1.5 | 2.3 | 2.5 | µs | OEH |
| Sample and hold disable time OEH& STH | $T_{OEH\text{-}STH}$ | - | 8.6 | - | µs | OEH-STH |
| CKV pulse width | $T_{CKVW}$ | 5 | 64 | - | µs | CKV |
| CKV pulse high period | $T_{CKVH}$ | 2.5 | 11.2 | - | µs | CKV |
| CKV pulse low period | $T_{CKVL}$ | 2.5 | 53.2 | - | µs | CKV |
| STV start pulse width | $T_{STV}$ | 5 | 64 | - | µs | STVR, STVL |
| STV start pulse setup time | $T_{SUV}$ | 2.5 | 52.8 | - | µs | STVR, STVL |
| STV start pulse hold time | $T_{HDV}$ | 2.5 | 11.2 | - | µs | STVR,STVL |
| OEV pulse width | $T_{OEV}$ | 1 | 5.18 | - | µs | OEV |
| OEV setup time | $T_{OEVSU}$ | 0.5 | - | - | µs | OEV |
| OEV hold time | $T_{OEVHD}$ | 0.5 | - | - | µs | OEV |

Note1：1. High level of source driver and gate driver logic signal are 70%
　　　　　2. Low level of source driver and gate driver logic signal are 30%
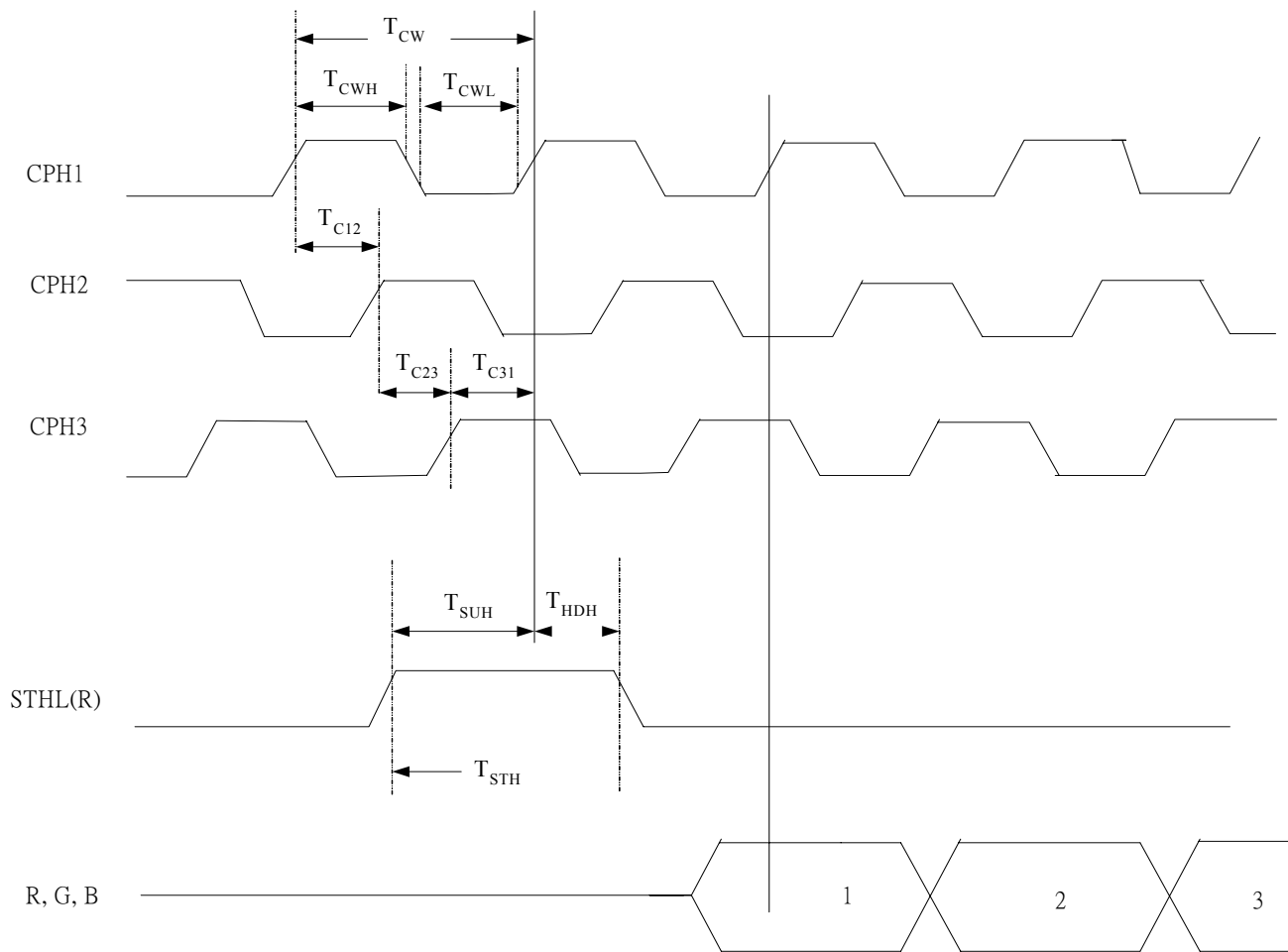
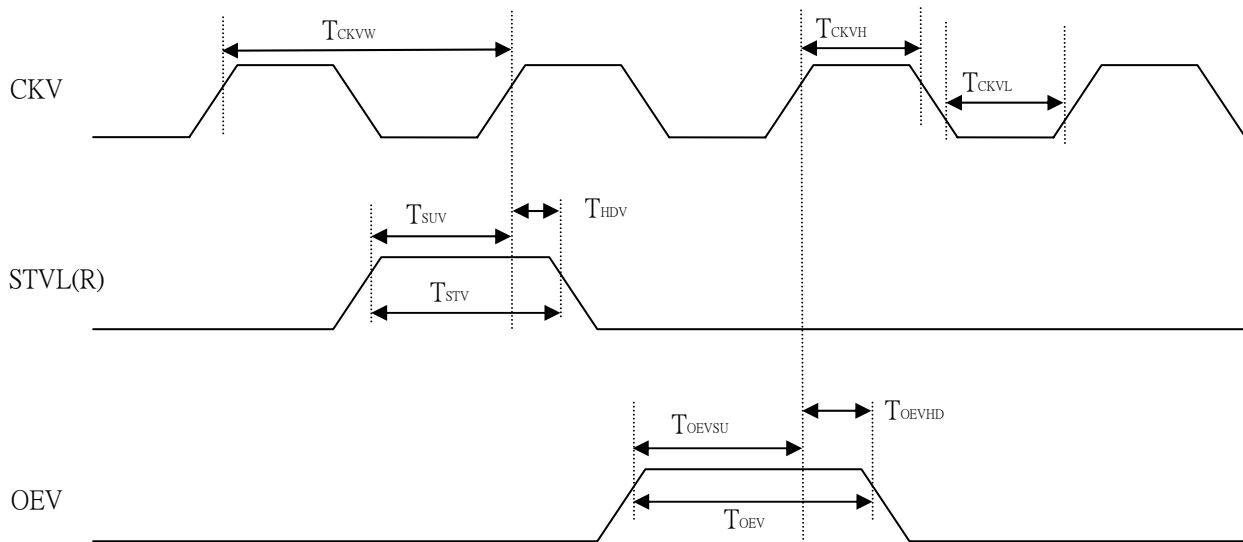Note2：Please refer to Fig.3 and Fig.4
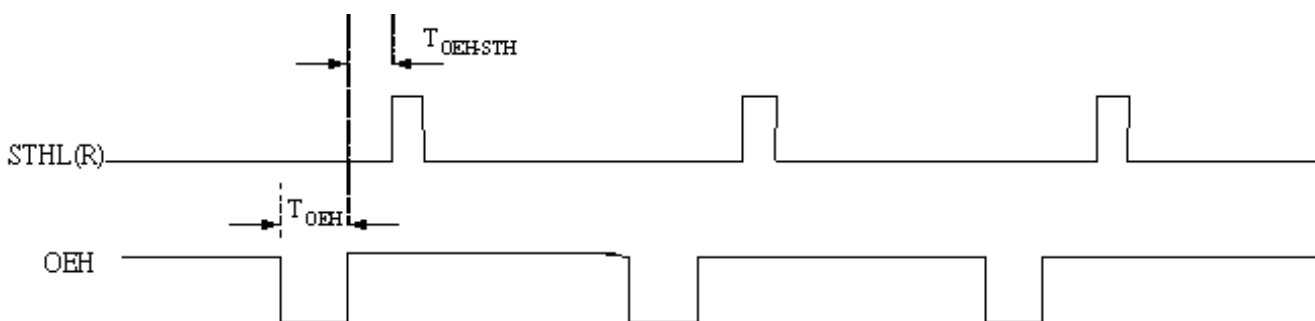
Fig.3 Horizontal Timing



Fig.4 Vertical Timing sequence

# 4. INTERFACE CONNECTION:

## 4.1 CN1(Signal of interface)

| Pin No. | SYMBOL | I/O | FUNCTION | NOTE |
|---------|--------|-----|----------|------|
| 1 | GND | - | Ground for logic circuit | |
| 2 | VCC | \| | Supply voltage of logic control circuit for scan driver | |
| 3 | VGL | \| | Negative power for scan driver | |
| 4 | VGH | \| | Positive power for scan driver | |
| 5 | STVR | I/O | Vertical start pulse | Note 1 |
| 6 | STVL | I/O | Vertical start pulse | Note 1 |
| 7 | CKV | \| | Shift clock input for scan driver | |
| 8 | U/D | \| | UP/DOWN scan control input | Note 1 |
| 9 | OEV | \| | Output enable input for driver | |
| 10 | VCOM | \| | Common electrode driving signal | |
| 11 | VCOM | \| | Common electrode driving signal | |
| 12 | L/R | \| | LEFT/RIGHT scan control input | Note 1 |
| 13 | MOD | \| | Sequential sampling and simultaneous sampling setting | Note 2 |
| 14 | OEH | \| | Output enable input for data driver | |
| 15 | STHL | I/O | Start pulse for horizontal scan line | Note 1 |
| 16 | STHR | I/O | Start pulse for horizontal scan line | Note 1 |
| 17 | CPH3 | \| | Sampling and shifting clock pulse3 for data drive | |
| 18 | CPH2 | \| | Sampling and shifting clock pulse2for data drive | |
| 19 | CPH1 | \| | Sampling and shifting clock pulse1 for data drive | |
| 20 | VCC | \| | Supply voltage of logic control circuit for data driver | |
| 21 | GND | - | Ground for logic circuit | |
| 22 | VR | \| | Alternated video signal input(Red) | |
| 23 | VG | \| | Alternated video signal input(Green) | |
| 24 | VB | \| | Alternated video signal input(Blue) | |
| 25 | AVDD | \| | Supply voltage for analog circuit | |
| 26 | AVSS | - | Ground for analog circuit | |

Note1：

The function of STVR and STVL is changed as follows by the U/D terminal (up/down scanning)

| U/D | STVR | STVL |
|-----|------|------|
| H(VCC) | Signal Input | Signal Output |
| L(GND) | Signal Output | Signal Input |

The function of STHL and STHR is changed as follows by the L/R terminal (right/left scanning)

| L/R | STHL | STHR |
|-----|------|------|
| H(VCC) | Signal Input | Signal Output |
| L(GND) | Signal Output | Signal Input |

| Setting of scan control input | | IN/OUT state for start pulse | | | | Scanning direction |
|---|---|---|---|---|---|---|
| U/D | L/R | STVR | STVL | STHR | STHL | |
| GND | VCC | OUT | IN | OUT | IN | From Up to Down , From Left to Right |
| VCC | GND | IN | OUT | IN | OUT | From Down to Up , From Right to Left |
| GND | GND | OUT | IN | IN | OUT | From Up to Down , From Right to Left |
| VCC | VCC | IN | OUT | OUT | IN | From Down to Up , From Left to Right |
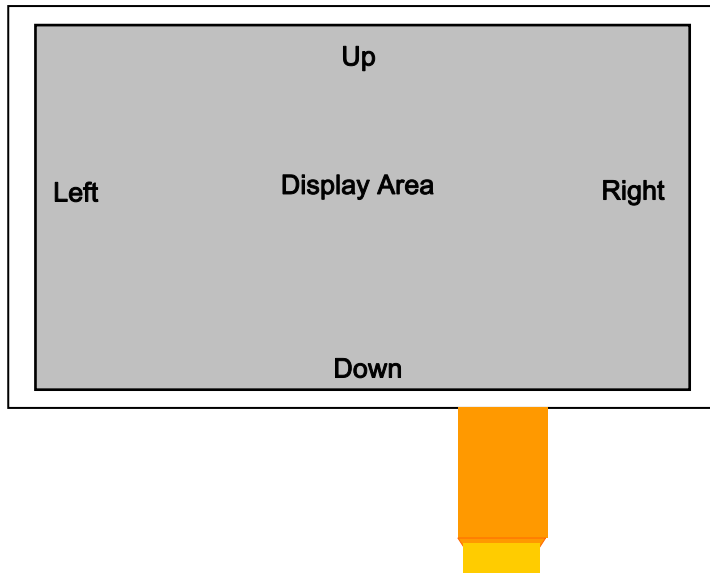
Note2： MOD=H: Simultaneous sampling (Set CPH2 and CPH3 to LOW)
MOD=L: Sequential sampling

# 5. MECHANICAL DIMENSION

(1) Front Side

(Unit： mm)
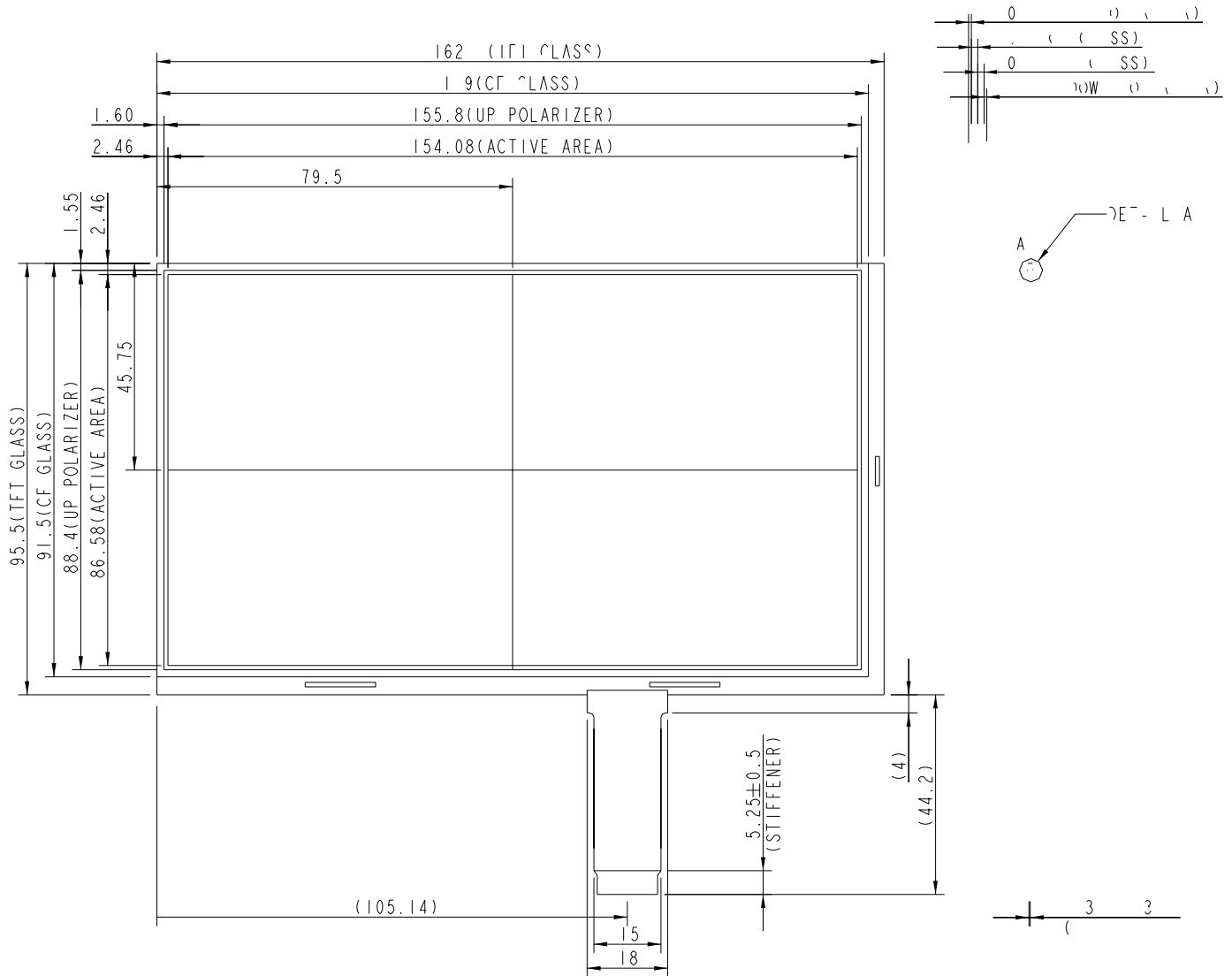


[Note]：Tolerance is ±0.3mm unless noted

## (2) Rear Side

(Unit： mm)

156.2(DOWN POLARIZER)　　1.79　　1.4

89.6(DOWN POLARIZER)

DETAIL B

1　26

1　26

0.5

4

13.5

P0.5X(26-1)=12.5±0.03
W=0.3±0.03

DETAIL B
SCALE 3:1
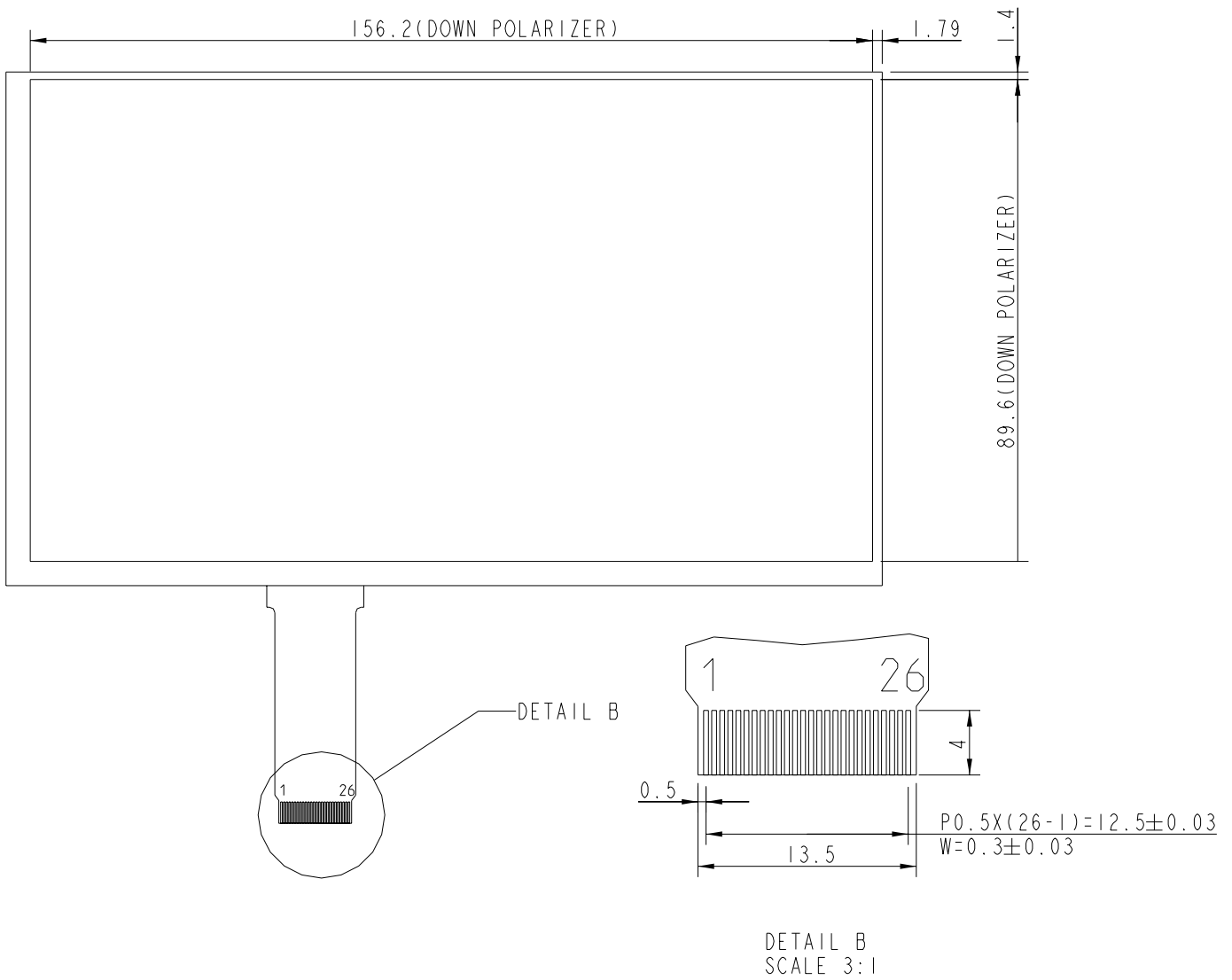
[Note]：Tolerance is ±0.3mm unless noted

# 6. OPTICAL CHARACTERISTICS

Ta=25℃

| ITEM | | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|---|---|---|---|---|---|---|---|---|
| Panel Transmittance | | T | — | 7.8 | 8.5 | -- | % | |
| Contrast Ratio | | CR | Point-5 ) | 300 | 400 | -- | -- | *1 |
| Response Time | | Tr +Tf | Point-5 | -- | 20 | 30 | ms | .*3) |
| Viewing Angle | Horizontal | φ | Point-5 CR≧10 | 120 | 140 | -- | ° | *2) |
| | Vertical | θ | | 100 | 120 | -- | ° | |

[Note]
These items are measured by BM-5A (TOPCON) or CA-1000(MINOLTA) in the dark room.
(no ambient light)

Measuring point：Fig.5 Measurin-point：1~9 points
Measuring Viewing Angle：Fig.6：θ=ψ=0°
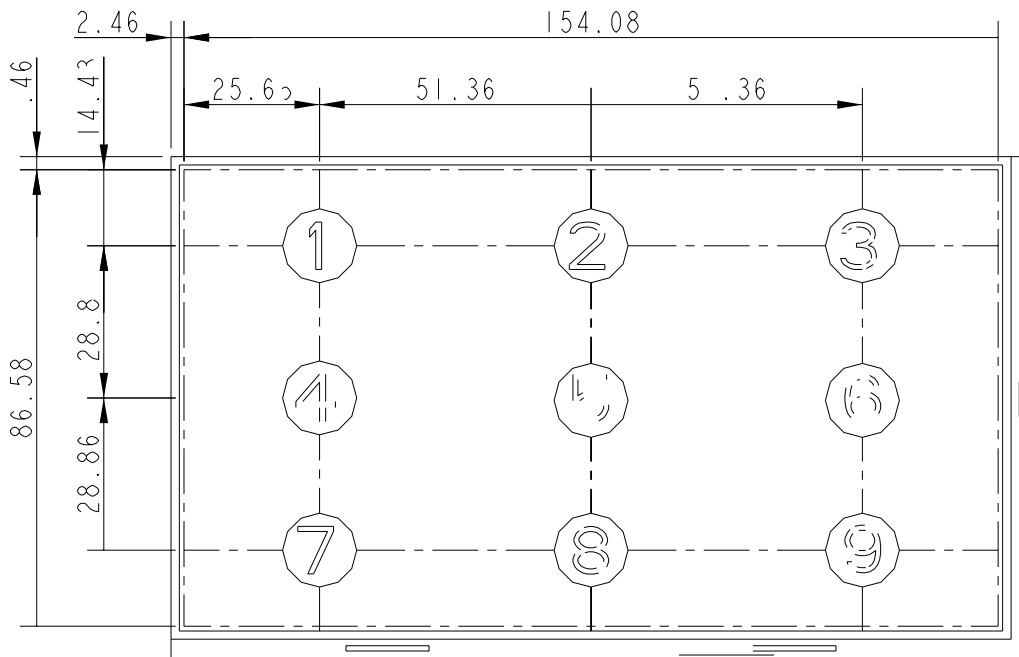


Fig.5 Measuring point

*1) Definition of contrast ratio：
Measure contrast ratio on the Point-5 (refer to figure 5 ) Contrast ratio is calculated with the following formula ：
Contrast Ratio (CR) = (White) Luminance of ON ÷ (Black) Luminance of OFF
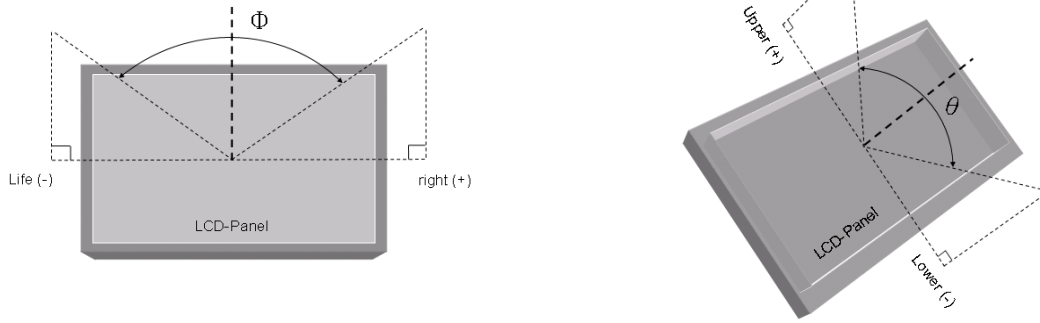
*2) Definition of Viewing Angle(θ,ψ)：



Fig.6 Definition of Viewing Angle

*3) Definition of Response Time
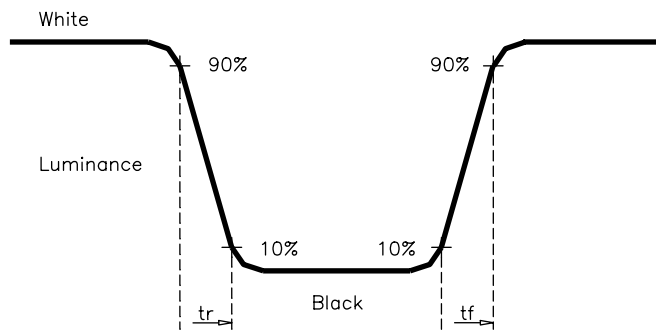   The response time is defined as the time interval between the 10% and 90% amplitudes.Refer to figure 7 as below.



Fig.7 Definition of Response Time

# 7. RELIABILITY TEST

These tests are conducted with CPT backlight.

## 7.1 Temperature and Humidity

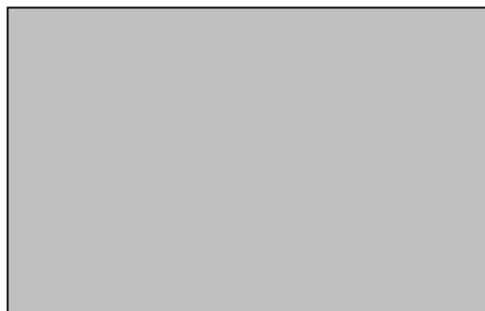| TEST ITEMS | CONDITIONS | NOTE |
|---|---|---|
| High Temperature Operation | 70℃ ; 240hrs | |
| High Temperature Storage | 80℃ ; 240hrs | |
| High Temperature High Humidity Operation | 60℃ ; 90%RH ; 240hrs (No condensation) | |
| Low Temperature Operation | -20℃ ; 240hrs | |
| Low Temperature Storage | -30℃ ; 240hrs | |
| Thermal Shock | –30℃(0.5hr) ~ 80℃(0.5hr) ; 200 Cycles | Non-Operating |
| Image Sticking | 25℃ ; 4hrs | Note (1) |

[Note]：

(1) Condition of Image Sticking test：25    ±

Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.
After 5 mins, the mura must be disappeared completely .
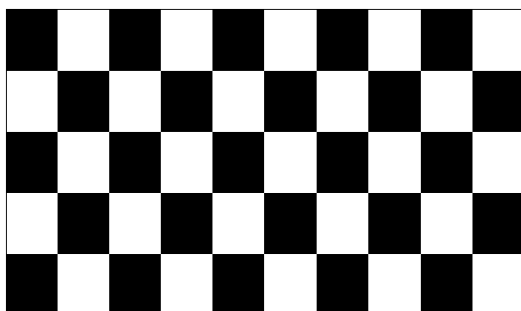


(a) Test Pattern (chess board Pattern )                    (b) Gray Pattern

## 7.2 Shock and Vibration

| ITEMS | CONDITIONS |
|---|---|
| Shock (Non-Operation) | • Shock level： 980m/s$^2$(equal to 100G).<br>• Waveform： 1/2 Sine wave,6msec<br>• ±X，±Y，±Z，each axis 1 times |
| Vibration (Non-Operation) | • Frequency range：8~33.3Hz<br>• Stoke：1.3 mm<br>• Vibration： sinusoidal wave, perpendicular axis (both x, z axis:2Hrs, y axis 4Hrs).<br>• Sweep： 2.9G, 33.3 Hz -400 Hz<br>• Cycle： 15 min |

## 7.3 Electrostatic Discharge

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

[Note]：Measure point :

(1) LCD glass and metal bezel
(2) IF connector pins

## 7.4 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 transformation of the module parts should be ignored.

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