**AUO**

| Version | 7 |
|---|---|
| Total pages | 20 |
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# Product Specification

## 7″ color TFT-LCD module

MODEL NAME: A070VW01 V1

( ◆ ) Preliminary Specification
( ..... ) Final Specification

# Record of Revision

| Version | Revise Date | Page | Content |
|---|---|---|---|
| 0 | 08/May/2003 | 0 | First draft. |
| 1 | 29/Jul/2003 | 6 | To Correct the pin assignment |
| 2 | 23/Feb/2004 | 13 | Remove 4 seals of Bottom Cover |
| 3 | 18/Oct/2005 | 10 | Modify Reliability test items |
| | | | High Temperature Operating: 60℃ for 240 hours |
| | | | Low Temperature Operating: 0℃ for 240 hours |
| | | | High Temperature Storage: 65℃ for 240 hours |
| | | | Low Temperature Storage: -20℃ for 240 hours |
| | | | Thermal Shock Test: -20℃~60℃ for 100 cycles, 1hours/cycle |
| | | | High Temperature and High Humidity: 50℃, 80% for 240 hours |
| | | 12 | Modify outline dimemsion of TFT-LCD module |
| | | | →Add up FPC detail A ( Alignment position) |
| | | | →Add up pull tape on packing form |
| 4 | 20/Oct/2005 | 8 | Add up Power ON/OFF sequence |
| 5 | 31/Dec/2005 | 6 | Remark Backlight driving conditons |
| 6 | 08/Nov/2005 | 6 | Modify AVDD(typ.) 8.4→8.8 V ; VCOM( typ.)2.6→3.7V |
| 7 | 27/Sep/2006 | 5 | Correct absolute Maximum Ratings |
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**Appendix:**

## A. Physical specifications

| NO. | Item | Specification | Remark |
|-----|------|---------------|--------|
| 1 | Display resolution(dot) | 800RGB(W)×480(H) | |
| 2 | Active area(mm) | 152.40W)×91.44(H) | |
| 3 | Screen size(inch) | 7.0(Diagonal) | |
| 4 | Pixel pitch(mm) | 0.1905(W)×0.1905(H) | |
| 5 | Color configuration | R. G. B. stripe | |
| 6 | Overall dimension(mm) | 165(W)×104(H)×6(D) | Note 1 |
| 7 | Weight(g) | 190 ±10 | |
| 8 | Surface treatment | AG(5.5%) with WV film | |
| 9 | Backlight unit | CCFL | |

Note 1: Refer to Fig. 1

## B. Electrical specifications

### 1.Pin assignment

FH12-50S-0.5SH(Hirose) — FPC I/O Pin Assignment and Control Board I/O pin assignment

| Pin no | Symbol | I/O | Description | Remark |
|---|---|---|---|---|
| 1 | GND | P | Ground for gate drive | |
| 2 | VCC | P | Digital voltage for gate driver | |
| 3 | VGL | P | TFT low voltage | |
| 4 | VGH | P | TFT high voltage | |
| 5 | STVL | I/O | Start pulse signal input/output (Vertical) | |
| 6 | STVR | I/o | Start pulse signal input/output (Vertical) | |
| 7 | CKV | I | CLK (Vertical) | |
| 8 | U/D | I | Up or Down display control | |
| 9 | OEV | I | Output enable | |
| 10 | VCOM | I | VCOM voltage | |
| 11 | DIO1 | I/O | Start pulse signal input/output (Horizontal) | |
| 12 | AVDD | P | Analog voltage for source driver | |
| 13 | AVSS | P | Analog ground for source driver | |
| 14 | GND | P | Digital ground for source driver | |
| 15 | VCC (DVDD) | P | Digital voltage for source driver | |
| 16 | EDGSL | I | Select raising edge or raising/falling edge | |
| 17 | CLK | I | Sample CLK | |
| 18 | SHL(R/L) | I | Right or Left display control | |
| 19 | R0 | I | Red data | |
| 20 | R1 | I | Red data | |
| 21 | R2 | I | Red data | |
| 22 | R3 | I | Red data | |
| 23 | R4 | I | Red data | |
| 24 | R5 | I | Red data | |
| 25 | G0 | I | Green Data | |
| 26 | G1 | I | Green Data | |
| 27 | G2 | I | Green Data | |
| 28 | G3 | I | Green Data | |
| 29 | G4 | I | Green Data | |
| 30 | G5 | I | Green Data | |
| 31 | V1 | I | Reference voltage | |
| 32 | V2 | I | Reference voltage | |
| 33 | V3 | I | Reference voltage | |
| 34 | V4 | I | Reference voltage | |
| 35 | V5 | I | Reference voltage | |
| 36 | V6 | I | Reference voltage | |
| 37 | V7 | I | Reference voltage | |
| 38 | V8 | I | Reference voltage | |
| 39 | V9 | I | Reference voltage | |
| 40 | V10 | I | Reference voltage | |
| 41 | B0 | I | Blue Data | |

| 42 | B1 | I | Blue Data | |
|---|---|---|---|---|
| 43 | B2 | I | Blue Data | |
| 44 | B3 | I | Blue Data | |
| 45 | B4 | I | Blue Data | |
| 46 | B5 | I | Blue Data | |
| 47 | LD (OEH) | I | Latch and switch data to output | |
| 48 | REV | I | Control data are inverted or not | |
| 49 | POL | I | Polarity selection | |
| 50 | DIO2 | I/O | Start pulse signal input/output (Horizontal) | |

## 2. Absolute Maximum Ratings

| Items | Symbol | Product Specification | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Power Voltage | Vcc | -0.3 | | 5 | V |
| | AVDD | -0.5 | | 12 | V |
| | VGH | -0.3 | | 18 | V |
| | VGL | -15 | | 0.3 | V |
| | VGH-VGL | | | 33 | V |
| Input Signal Voltage | Vi | -0.3 | | Vcc+0.3 | V |
| | Vref(V1~V5) | 0.4AVDD | | AVDD+0.3 | V |
| | Vref(V6~V10) | -0.3 | | 0.6AVDD | V |
| | Vcom | 3.5 | | 3.9 | V |
| Operating Temperature | Topa | 0 | | 60 | ℃ |
| Storage Temperature | Tstg | -20 | | 65 | ℃ |

## 3. Electrical characteristics

### a. Typical operating conditions (GND=AVSS=0V)

| Items | Symbol | Product Specification | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Power Voltage | Vcc | 3.0 | 3.3 | 3.6 | V |
| | AVDD | 8.4 | 8.8 | 9.2 | V |
| | VGH | 14.0 | 15.0 | 16.0 | V |
| | VCOM | 3.5 | 3.7 | 3.9 | V |
| | VGL | -6.5 | -7 | -7.5 | V |
| Input Reference Voltage | V1~V5 | 0.4AVDD | — | AVDD-0.1 | V |
| | V6~V10 | 0.2 | — | 0.6AVDD | V |
| Input H/L level Voltage | VIH | 0.8VCC | — | VCC | V |
| | VIL | 0 | — | 0.2VCC | V |

### a. Current consumption conditions(GND=Avss=0V)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Current For Driver | IGH | VGH=15V | | 150 | 300 | uA |
| | IGL | VGL=-7V | | -150 | -300 | uA |
| | ICC | VCC=3.3V | | 3.5 | 5 | mA |
| | IDD | AVDD=8.8V | | 20 | 30 | mA |

### b. Backlight driving conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Lamp voltage | $V_L$ | - | 580 | 640 | Vrms | |
| Lamp current | $I_L$ | - | 6 | 7 | mArms | |
| Frequency | $F_L$ | - | 60 | 80 | kHz | Note 3 |
| Lamp starting voltage | $V_S$ | - | - | 1070 | Vrms | Note 1,4 |
| | | - | - | 1,290 | Vrms | Note 2,4 |
| Lamp life time | | 10,000 | - | - | Hr | Note 5 |

Note 1: Ta = 25℃ .
Note 2: Ta = 0℃ .
Note 3: The lamp frequency should be selected as different as possible from display horizontal synchronous signal to avoid interference.
Note 4: For starting the backlight unit, the output voltage of DC/AC's transformer should be larger than the maximum lamp starting voltage.
Note 5: The" Lamp life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ , $I_L$=6mA.

## 4. AC Timing

a. Timing conditions

AC Electrical Characteristics (VCC=3.3V, AVDD=8.8.V, AVSS=GND=0V, TA=25℃)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| CLK frequency | Fclk | | 40 | 42 | MHz |
| CLK pulse width | Tcw | 8 | | | ns |
| Data set-up time | Tsu | 4 | | | ns |
| Data hold time | Thd | 2 | | | ns |
| Propagation delay of DIO2/1 | Tphl | 6 | 10 | 15 | ns |
| Time that the last data to LD | Tld | 1 | | | Tcw |
| Pulse width of LD | Twld | 2 | | | Tcw |
| Time that LD to DIO1/2 | Tlds | 5 | | | Tcw |
| POL set-up time | Tpsu | 6 | | | ns |
| POL hold time | Tphd | 6 | | | ns |
| OEV pulse width | TOEV | | 12 | | Tcw |
| CKV pulse width | TCKV | 16 | 28 | 40 | Tcw |
| Horizontal display start | TSH | | 0 | | Tcw/3 |
| Horizontal display timing range | TDH | | 800 | | Tcw/3 |
| STV setup time | TSUV | 400 | | | ns |
| STV hold time | THDV | 400 | | | ns |
| STV pulse width | TSTV | | | 1 | TDH |
| Horizontal lines per field | TV | 512 | 525 | 610 | TDH |
| Vertical display start | TSV | | 3 | | TDH |
| Vertical display timing range | TDV | | 480 | | TDH |

DC Electrical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | Vcc | 3.0 | 3.3 | 3.6 | V |
| Low Level Input Voltage | Vil | 0 | - | 0.2*Vcc | V |
| High Level Input Voltage | Vih | 0.8*Vcc | - | Vcc | V |
| High Level Output Voltage | Voh | Vcc-0.4 | - | - | V |
| Low Level Output Voltage | Vol | GND | - | GND+0.4 | V |
| Supply Voltage | AVDD | 8.4 | 8 .8 | 9.2 | V |
| Sinking Current of Outputs | IOL | \|-80\| | - | - | uA |
| Driving Current of Outputs | IOH | 80 | - | - | uA |

b. Power on/off sequence

Panel Gate IC is a high-voltage LCD driver, so it may be damaged by a large current flow if an incorrect power sequence is used. Connecting the drive powers, VGL & VGH, after the logical power, VCC, is the recommended sequence. When shutting off the power, shut off the drive power and then the logic system or turn off all powers simultaneously.
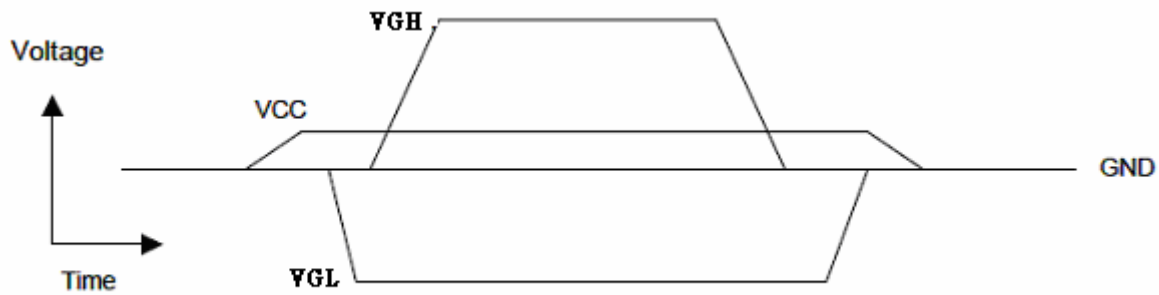


**Fig.  Power on/off sequence**

c. Timing diagram : Appendix on page 14

## C. Optical specification (Note 1, Note 2)

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Response time | Rise<br>Fall | Tr<br>Tf | $\theta=0°$ | -<br>- | 12<br>18 | 50<br>60 | ms<br>ms | Note 3,5 |
| Contrast ratio | | CR | At optimized<br>Viewing angle | 200 | 300 | - | | Note 4, 5 |
| Viewing angle | Top<br>Bottom<br>Left<br>Right | | $CR\geqq10$ | 30<br>50<br>50<br>50 | 40<br>60<br>60<br>60 | -<br>-<br>-<br>- | deg. | Note 5, 6 |
| Viewing angle | Top<br>Bottom<br>Left<br>Right | | $CR\geqq5$ | 40<br>60<br>60<br>60 | 50<br>70<br>70<br>70 | -<br>-<br>-<br>- | deg. | Note 5, 6 |
| Brightness | | $Y_L$ | $I_L$=6mA, 25℃ | 300 | 400 | - | nit | Note 7 |
| White chromaticity | | X | $\theta=0°$ | 0.26 | 0.31 | 0.36 | | Note 7 |
| | | Y | $\theta=0°$ | 0.29 | 0.34 | 0.39 | | |

Note 1 : Ambient temperature =25℃, and lamp current $I_L$ = 6 mArms. To be measured in the dark room.

Note 2 : To be measured on the center area of panel with a viewing cone of 1°by Topcon luminance meter BM-5A, after 10 minutes operation.

Note 3. Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.
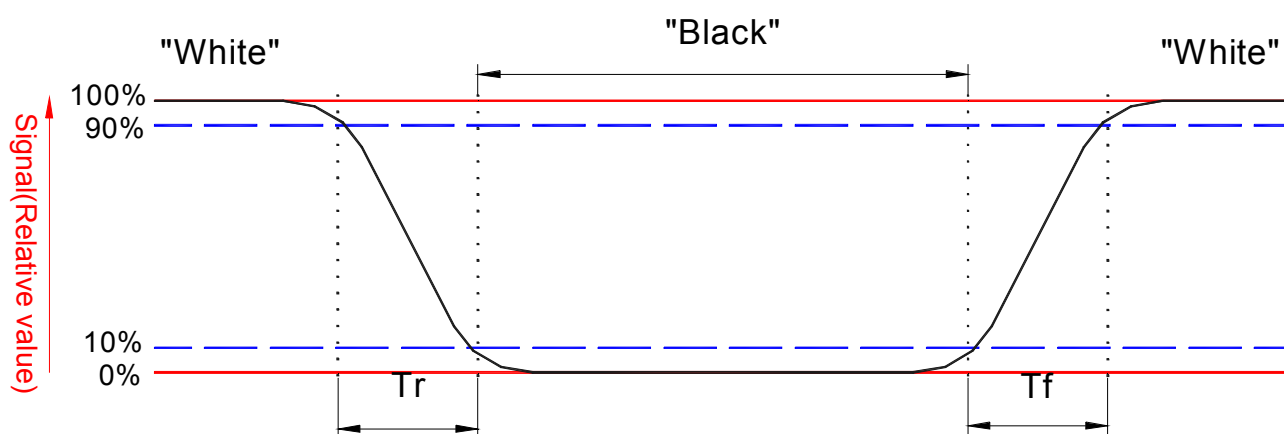
Note 4. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 5. White $Vi = V_{i50} + 1.5V$

Black $Vi = V_{i50} \pm 2.0V$

"$\pm$" means that the analog input signal swings in phase with $V_{COM}$ signal.

"$\mp$" means that the analog input signal swings out of phase with $V_{COM}$ signal.

$V_{i50}$ : The analog input voltage when transmission is 50%

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6. Definition of viewing angle, Refer to figure as below.
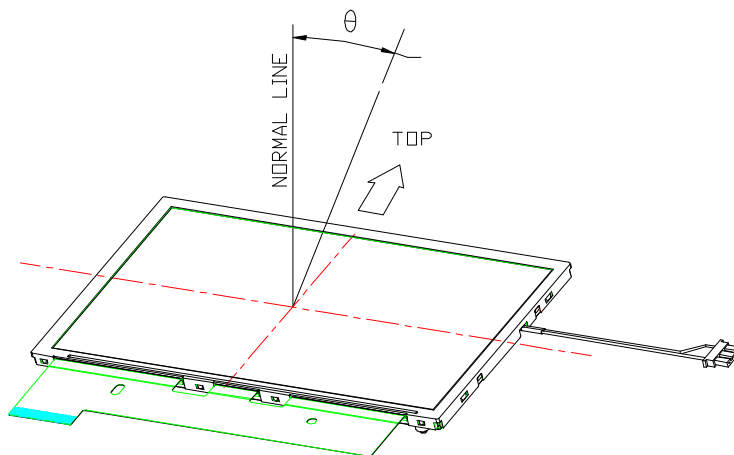


Note 7. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

## D. Reliability test items(Note 2):

| No. | Test items | Conditions | Remark |
|---|---|---|---|
| 1 | High temperature storage | Ta= 65℃      240Hrs | |
| 2 | Low temperature storage | Ta= -20℃      240Hrs | |
| 3 | High temperature operation | Tp= 60℃      240Hrs | |
| 4 | Low temperature operation | Ta= 0℃      240Hrs | |
| 5 | High temperature and high humidity | Tp= 50℃, 80% RH      240Hrs | Operation |
| 6 | Heat shock | -20℃~60℃/100 cycles 1Hrs/cycle | Non-operation |
| 7 | Electrostatic discharge | $\pm$200V,200pF(0$\Omega$), once for each terminal | Non-operation |
| 8 | Vibration | Frequency range     : 8~33.3Hz<br>Stoke             : 1.3mm<br>Sweep           : 2.9G, 33.3 ~ 400Hz<br>Cycle            : 15 minutes<br>2 hours for each direction of X,Z<br>4 hours for Y direction | JIS C7021, A-10 condition A |
| 9 | Mechanical shock | 100G, 6ms, $\pm$X,$\pm$Y,$\pm$Z<br>3 times for each direction | JIS C7021, A-7 condition C |
| 10 | Vibration (with carton) | Random vibration:<br>0.015G$^2$/Hz from 5~200Hz<br>–6dB/octave from 200~500Hz | IEC 68-34 |
| 11 | Drop (with carton) | Height: 60cm<br>1 corner, 3 edges, 6 surfaces | JIS Z0202 |

Note1: Ta: Ambient Temperature.

Note2: Tp: Panel Surface Temperature

Note3: In the standard conditions, there is not display function NG issue occurred. All the

cosmetic specification is judged before the reliability stress.

# E. Packing form



**I**

**H**

**G**

**F**

**E**

**D**

**C**

**B**

**A**

Carton

EPP

EPP(一箱堆叠7層)

(底上層空擺)

Module(背面向上)

(一層放5PCS)
(一箱放30PCS)

Tape

Tape

Module

Antistatic Bag

PULL TAPE

Max. Capacity: 30 Modules
Max. Weight: 8.2 Kg
Meas.: 520mm*340mm*250mm
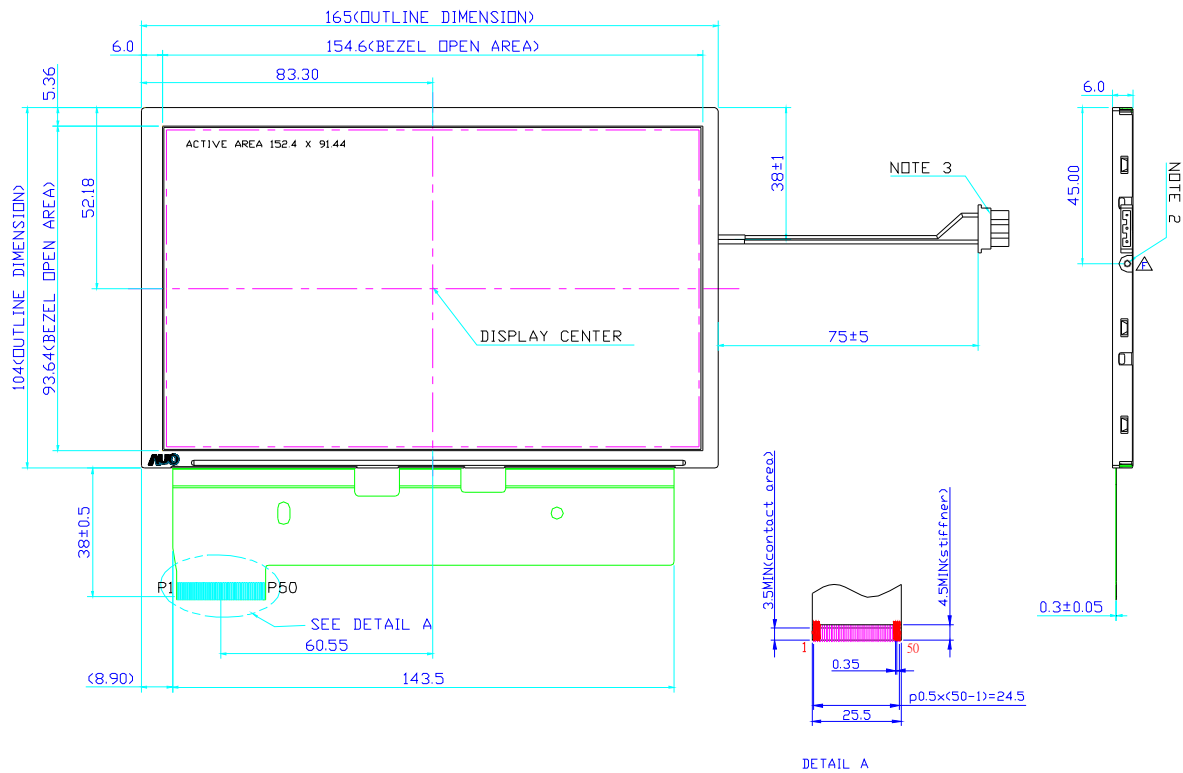
**Fig.1 Outline dimension of TFT-LCD module(Front side)**

NOTES:
1. General Tolerance :±0.3
2. Ground wire Fixed,Using M2.0XP0.4XL1.5mm Screw (Customer side)
3. Lamp connector : JST/BHR-03VS-1
4. TWO SIDE TAPE 80X6 mm

■ **Timing Diagram 1 ( CHNSL="1" , Default )**

<< EDGSL="0" , Default >>



**Fig.3 Operation Mode 1**
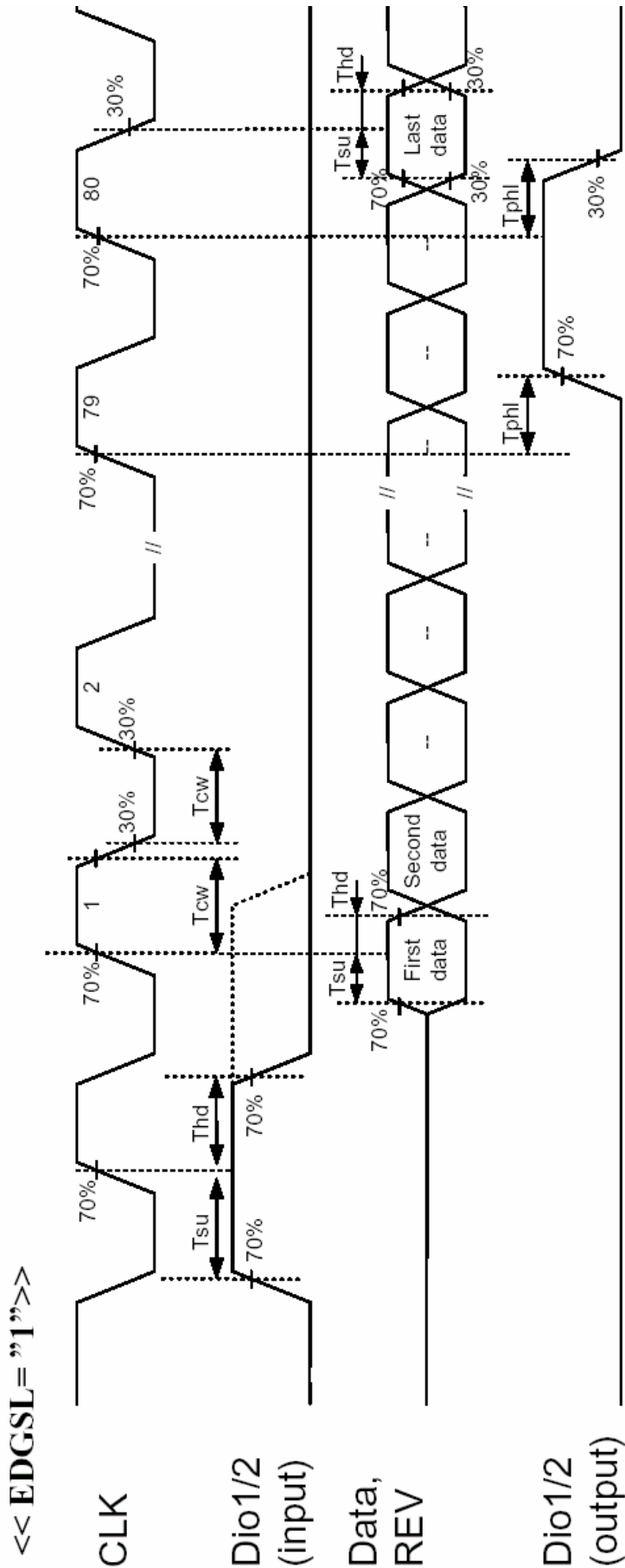
**Fig.4 Operation Mode 2**

**Fig.5 Horizontal timing**

Timing Diagram 2

CLK

LD

Dio1/2 (input)

LD

POL

Odd outputs

Even outputs

Last

70%

Tld

70%

Twld

70%

Tlds

70%

70%

30%

Tpsu Tphd

70%

10%

Tst

High-Z

90%

70%

30%

Tpsu Tphd

70%

90%

Tst

High-Z

10%

70%

30%

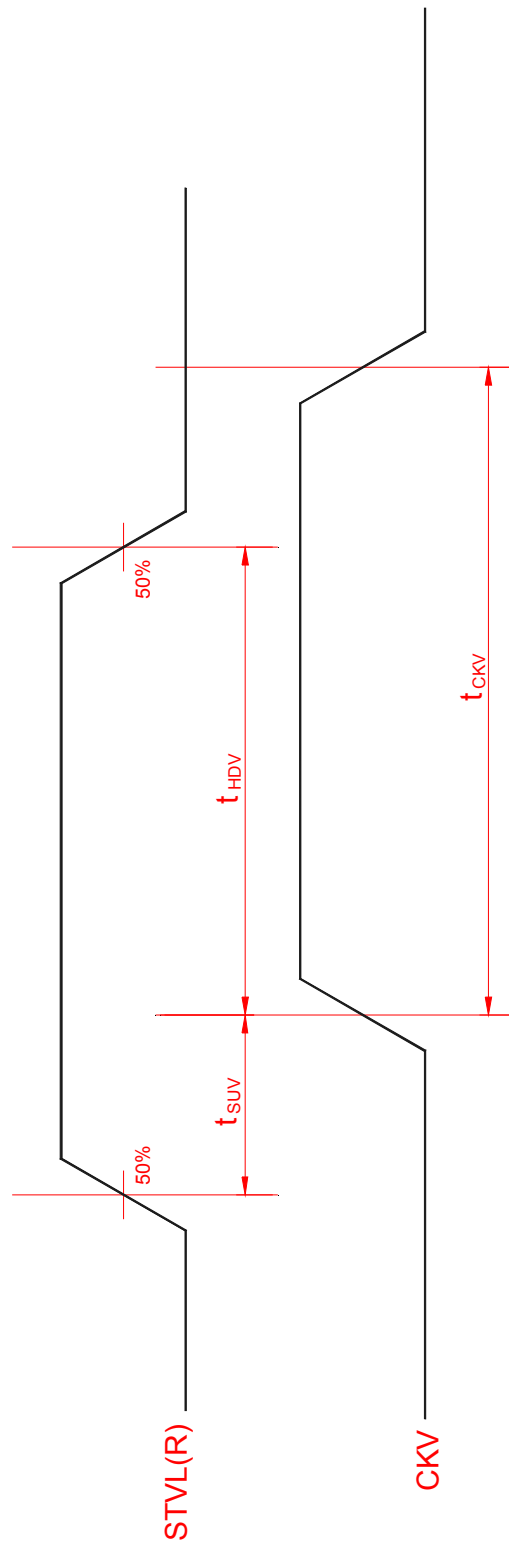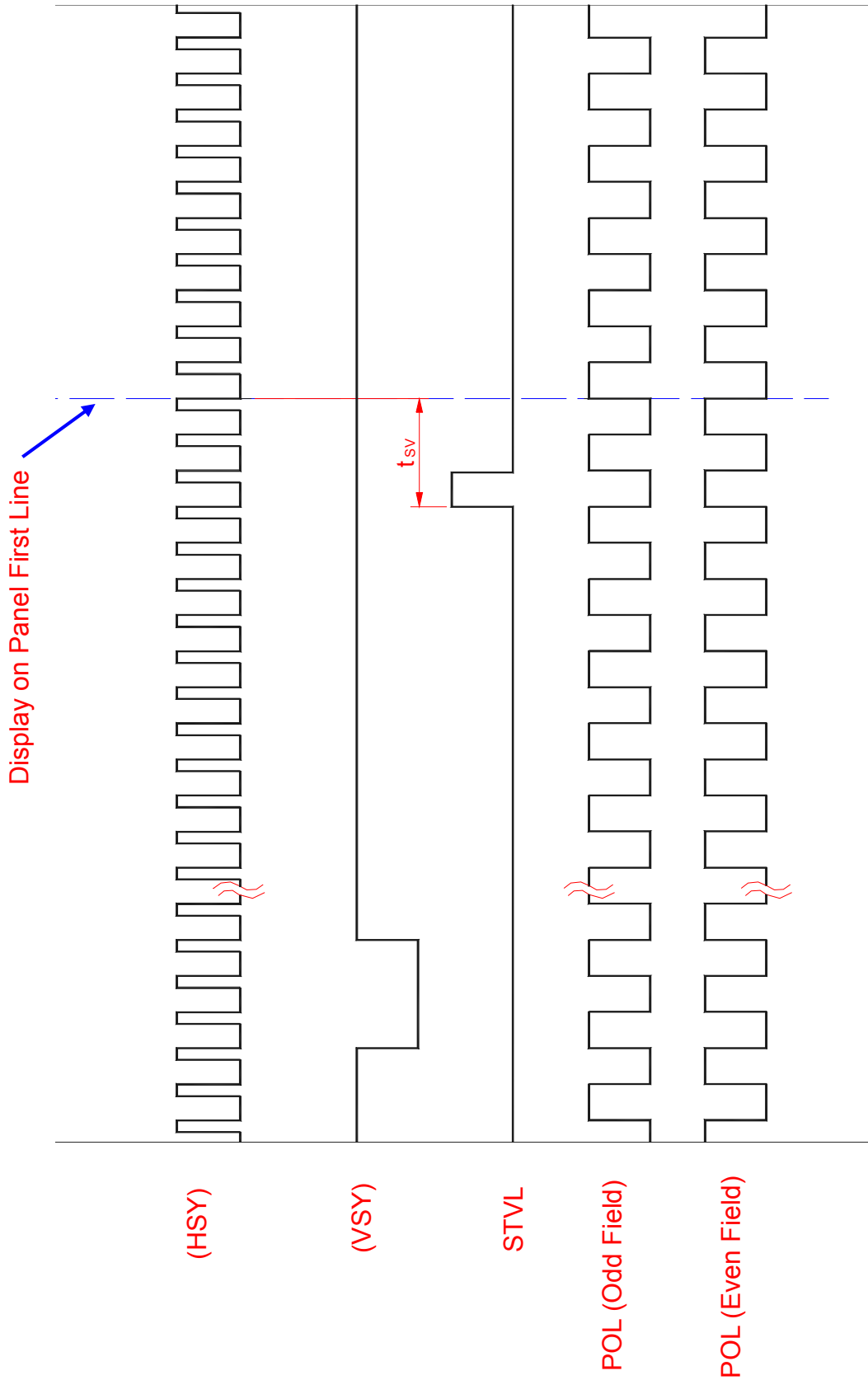Tpsu Tphd

70%

Positive

Tst

High-Z

Negative
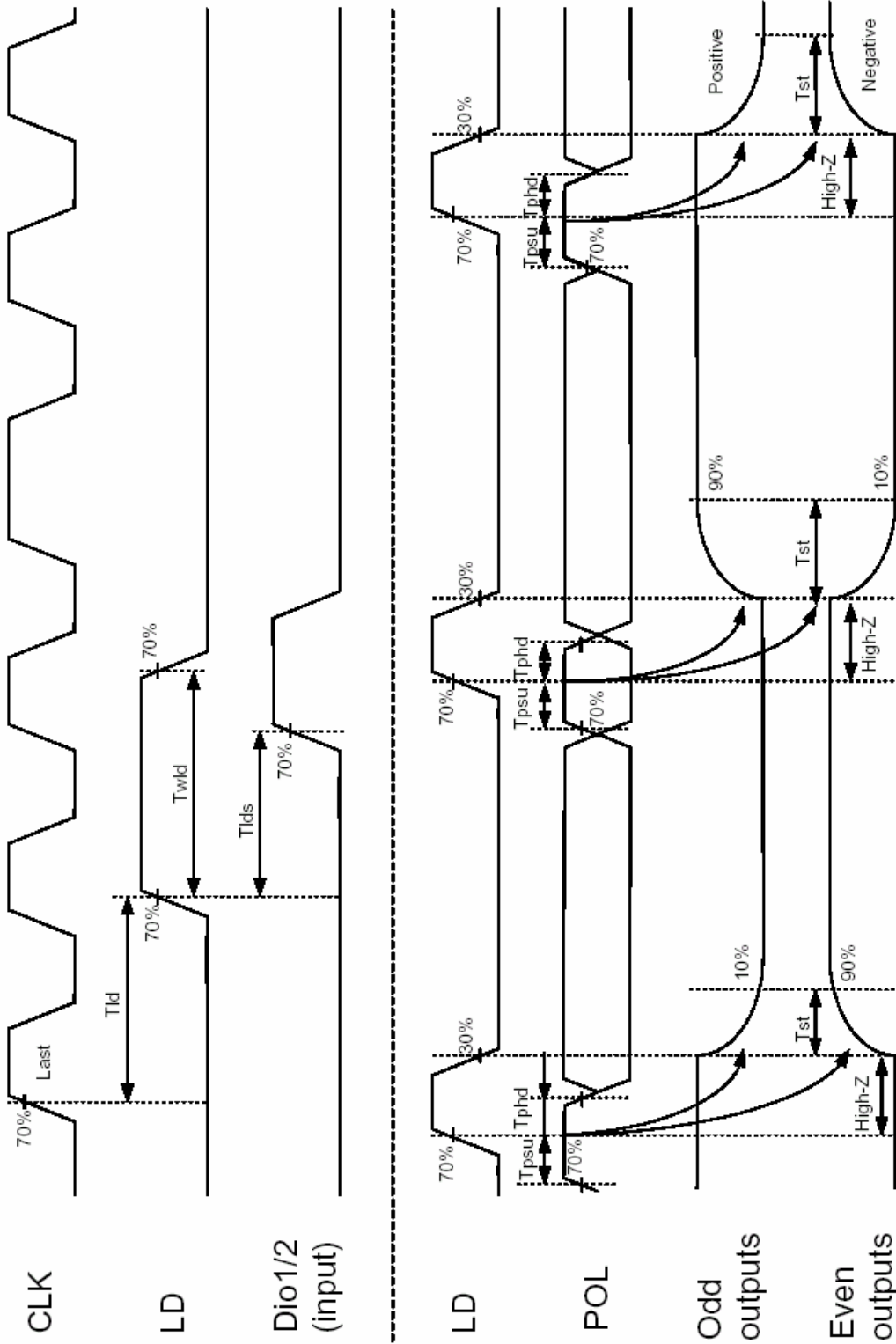
**Fig.6 Virtical shift clock timing**

**Fig.7 Vertical timing (from up to down)**

Display on Panel First Line

$t_{SV}$

(HSY)

(VSY)

STVL

POL (Odd Field)

POL (Even Field)