# Engineering Approval Sheet

| | |
|---|---|
| **CUSTOMER.** | |
| **MODEL.** | **AG080TH-LED1000** ( based on INNOLUX AT080TN03 V.D ) |
| **ITEM** | **LED Type High Brightness TFT-LCD** |
| **DATE.** | **2008-07-02** |

**CUSTOMER'S APPROVAL**

| APPROVED BY | SIGNATURE<br>DATE |
|---|---|
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**PRESENTED**

**BY** _____

## Record of Revision

| Version | Revise Dat | Page | Content |
|---|---|---|---|
| Pre- Spec. 01 | 2008/07/02 | | Initial Release. |

# Contents

1. General Specifications .....1
2. Pin Assignment .....2
2.1. TFT LCD Panel Driving Section.....2
2.2. Backlight Unit Section.....6
3. Operation Specifications .....7
3.1. Absolute Maximum Rating.....7
3.1.1. Typical Operation Conditions.....8
3.1.2. Current Consumption .....9
3.1.3. Backlight Driving Conditions.....9
3.2. Power Sequence .....10
3.3. Timing Characteristics ..... 11
3.3.1. Timing Conditions..... 11
3.3.2. Timing Diagram .....13
4. Optical Specifications.....20
5. Mechanical Drawing.....26
6. LED Driver Spec .....24

# 1. General Specifications

| NO. | Item | Specification | Remark |
|---|---|---|---|
| 1 | LCD size | 8.0 inch(Diagonal) | |
| 2 | Driver element | a-Si TFT active matrix | |
| 3 | Resolution | 800 × 3(RGB) × 480 | |
| 4 | Display mode | Normally White, Transmissive | |
| 5 | Dot pitch | 0.0736(W) × 0.2070(H) mm | |
| 6 | Active area | 176.64(W) × 99.36(H) mm | |
| 7 | Module size | 192.8(W) × 116.9(H) × 6.4(D) mm | Note 1 |
| 8 | Surface treatment | Anti-Glare | |
| 9 | Color arrangement | RGB-stripe | |
| 10 | Interface | Digital | |
| 11 | Backlight Power consumption | TBD | |
| 12 | Panel Power consumption | TBD | |
| 13 | Weight | TBD | |

Note 1: Refer to Mechanical Drawing.

# 2. Pin Assignment

## 2.1. TFT LCD Panel Driving Section

FPC connector is used for the module electronics interface. The recommended model is P-TWO "AF 730L-A2G1T" manufactured by P-TWO.

| Pin No. | Symbol | I/O | Function | Remark |
|---|---|---|---|---|
| 1 | POL | I | Polarity selection | |
| 2 | STVD | I/O | Vertical start pulse input when U/D= H | Note 1 |
| 3 | OEV | I | Output enable | |
| 4 | CKV | I | Vertical clock | |
| 5 | STVU | I/O | Vertical start pulse input when U/D= L | Note 1 |
| 6 | GND | P | Power ground | |
| 7 | EDGSL | I | Select edge | |
| 8 | $V_{CC}$ | P | Power supply for digital circuit | |
| 9 | V9 | I | Gamma voltage level 9 | |
| 10 | $V_{GL}$ | P | Gate OFF voltage | |
| 11 | V2 | I | Gamma voltage level 2 | |
| 12 | $V_{GH}$ | P | Gate ON voltage | |
| 13 | V6 | I | Gamma voltage level 6 | |
| 14 | U/D | I | Up/down selection | Note 1,2 |
| 15 | $V_{COM}$ | I | Common voltage | |
| 16 | GND | P | Power ground | |
| 17 | $AV_{DD}$ | P | Power supply for analog circuit | |
| 18 | V14 | I | Gamma voltage level 14 | |
| 19 | V11 | I | Gamma voltage level 11 | |

| Pin No. | Symbol | I/O | Function | Remark |
|---|---|---|---|---|
| 20 | V8 | I | Gamma voltage level 8 | |
| 21 | V5 | I | Gamma voltage level 5 | |
| 22 | V3 | I | Gamma voltage level 3 | |
| 23 | GND | P | Power ground | |
| 24 | R5 | I | Red data(MSB) | |
| 25 | R4 | I | Red data | |
| 26 | R3 | I | Red data | |
| 27 | R2 | I | Red data | |
| 28 | R1 | I | Red data | |
| 29 | R0 | I | Red data(LSB) | |
| 30 | GND | P | Power groun | |
| 31 | GND | P | Power ground | |
| 32 | G5 | I | Green data(MSB) | |
| 33 | G4 | I | Green data | |
| 34 | G3 | I | Green data | |
| 35 | G2 | I | Green data | |
| 36 | G1 | I | Green data | |
| 37 | G0 | I | Green data(LSB) | |
| 38 | STHL | I/O | Horizontal start pulse input when R/L = L | Note 1 |
| 39 | REV | I | Control signal are inverted or not | Note3 |
| 40 | GND | I | Power ground | |
| 41 | DCLK | I | Sample clock | |
| 42 | Vcc | P | Power supply for digital circuit | |
| 43 | STHR | I/O | Horizontal start pulse input when R/L = H | Note 1 |
| 44 | LD | I | Latches the polarity of outputs and switches the new data to outputs | |

| Pin No. | Symbol | I/O | Function | Remark |
|---|---|---|---|---|
| 45 | B5 | I | Blue data (MSB) | |
| 46 | B4 | I | Blue data | |
| 47 | B3 | I | Blue data | |
| 48 | B2 | I | Blue data | |
| 49 | B1 | I | Blue data | |
| 50 | B0 | I | Blue data (LSB) | |
| 51 | R/L | I | Right/ left selection | Note 1,2 |
| 52 | V1 | I | Gamma voltage level 1 | |
| 53 | V4 | I | Gamma voltage level 4 | |
| 54 | V7 | I | Gamma voltage level 7 | |
| 55 | V10 | I | Gamma voltage level 10 | |
| 56 | V12 | I | Gamma voltage level 12 | |
| 57 | V13 | I | Gamma voltage level 13 | |
| 58 | $AV_{DD}$ | P | Power supply for analog circuit | |
| 59 | GND | P | Power ground | |
| 60 | $V_{COM}$ | I | Common voltage | |

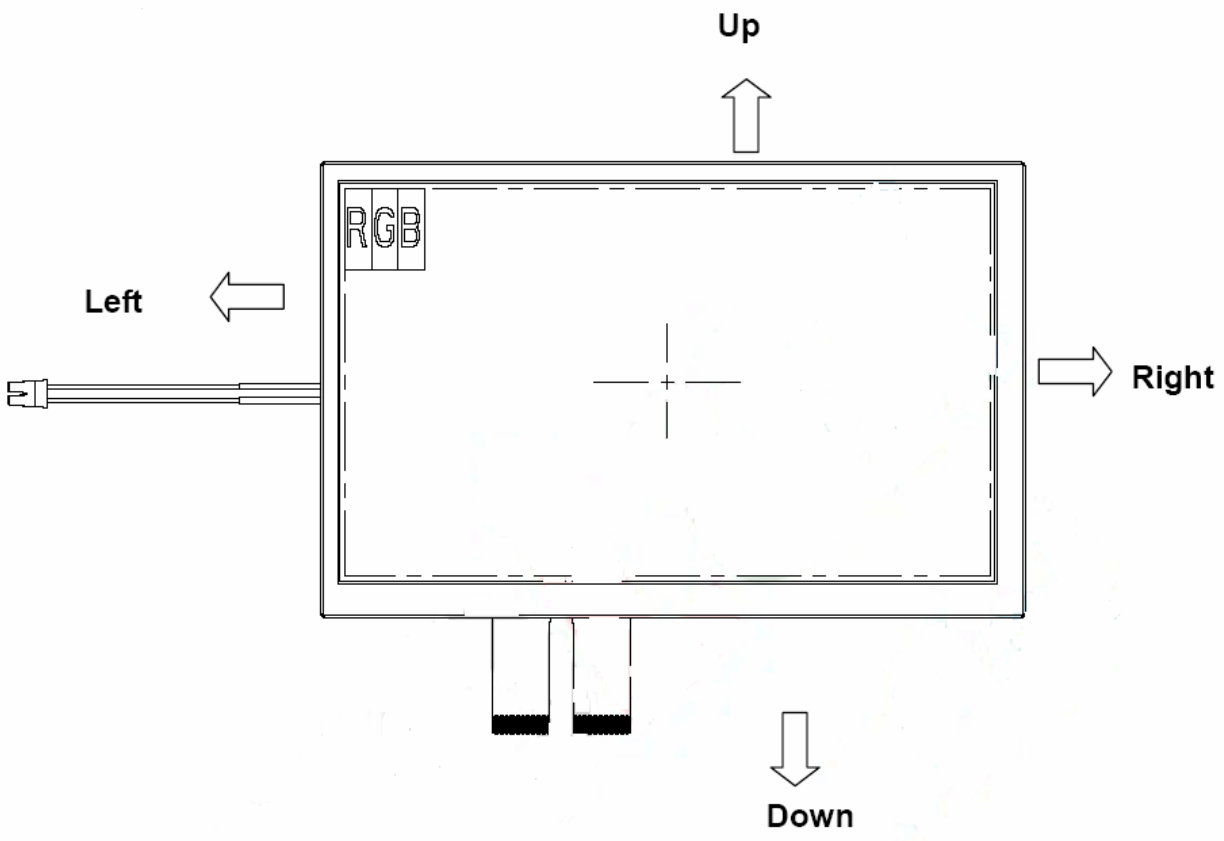
I: input, O: output, P: Power

Note 1: Selection of scanning mode

| Setting of scan control input | | IN/OUT state for start pulse | | | | Scanning direction |
|---|---|---|---|---|---|---|
| U/D | R/L | STVD | STVU | STHR | STHL | |
| GND | $V_{CC}$ | O | I | I | O | Up to down, left to right |
| $V_{CC}$ | GND | I | O | O | I | Down to up, right to left |
| GND | GND | O | I | O | I | Up to down, right to left |
| $V_{CC}$ | $V_{CC}$ | I | O | I | O | Down to up, left to right |

Note 2: Definition of scanning direction.

Refer to the figure as below:




Note 3: When REV="L", normally

REV="H", these data will be inverted.

## 2.2. Backlight Unit Section

| Pin No. | Symbol | I/O | Function | Remark |
|---|---|---|---|---|
| 1 | $V_{LED+}$ | P | Power for LED backlight anode | Pink |
| 2 | $V_{LED-}$ | P | Power for LED backlight cathode | White |

# 3. Operation Specifications

## 3.1. Absolute Maximum Rating

(GND=AVSS=0V, Note 2)

| Item | Symbol | Values | | Unit | Remark |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power voltage | $V_{CC}$ | -0.3 | 5.0 | V | |
| | $AV_{DD}$ | -0.5 | 13.5 | V | |
| | $V_{GH}$ | -0.3 | 18.0 | V | |
| | $V_{GL}$ | -15.0 | 0.3 | V | |
| | $V_{GH}$-$V_{GL}$ | - | 33.0 | V | |
| Input signal voltage | V1~V7 | 0.4 $AV_{DD}$ | $AV_{DD}$+0.3 | V | Note 1 |
| | V8~V14 | -0.3 | 0.6$AV_{DD}$ | V | Note 1 |
| Operation Temperature | $T_{OP}$ | -30 | 85 | ℃ | |
| Storage Temperature | $T_{ST}$ | -30 | 85 | ℃ | |
| LED Reverse Voltage | Vr | - | 2.8 | V | Each LED Note 3 |
| LED Forward Current | If | - | 50 | mA | Each LED |

Note 1: $AV_{DD}$-0.1≥ V1≥ V2≥ V3≥ V4≥ V5≥ V6≥ V7≥ V8≥ V9≥ V10≥ V11≥ V12≥ V13≥ V14≥ $AV_{SS}$+0.1

Note 2: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 3: Vr conditions: Zener Diode 20mA.

### 3.1.1. Typical Operation Conditions

(GND=AVSS=0V, Note 1)

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Power voltage | $V_{CC}$ | 3.0 | 3.3 | 3.6 | V | Note 2 |
| | $AV_{DD}$ | 9.8 | 10.0 | 10.2 | V | |
| | $V_{GH}$ | 14.3 | 15.0 | 15.7 | V | |
| | $V_{GL}$ | -10.5 | -10.0 | -9.5 | V | |
| Input signal voltage | $V_{COM}$ | - | 4.1 | - | V | |
| | V1~V7 | 0.4 $A_{VDD}$ | - | $A_{VDD}$ -0.1 | V | |
| | V8~V14 | 0.1 | - | 0.6 $A_{VDD}$ | V | |
| Input logic high voltage | $V_{IH}$ | 0.7$V_{CC}$ | - | $V_{CC}$ | V | Note 3 |
| Input logic low voltage | $V_{IL}$ | 0 | - | 0.3$V_{CC}$ | V | |

Note 1: Be sure to apply $V_{CC}$ and $V_{GL}$ to the LCD first, and then apply $V_{GH}$.

Note 2: $V_{CC}$ setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: STHL, STHR, OEH, L/R, CPH1~CPH3, STVD, STVU, OEV, CKV, U/D.

### 3.1.2. Current Consumption

(GND=AVSS=0V)

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Current for Driver | $I_{GH}$ | - | 0.2 | 0.5 | mA | VGH =15.0V |
| | $I_{GL}$ | - | 0.2 | 1.0 | mA | VGL = -10.0V |
| | $I_{CC}$ | - | 4.0 | 10.0 | mA | VCC =3.3V |
| | $IAV_{DD}$ | - | 25.0 | 50.0 | mA | AVDD =10.0V |

### 3.1.3. Backlight Driving Conditions

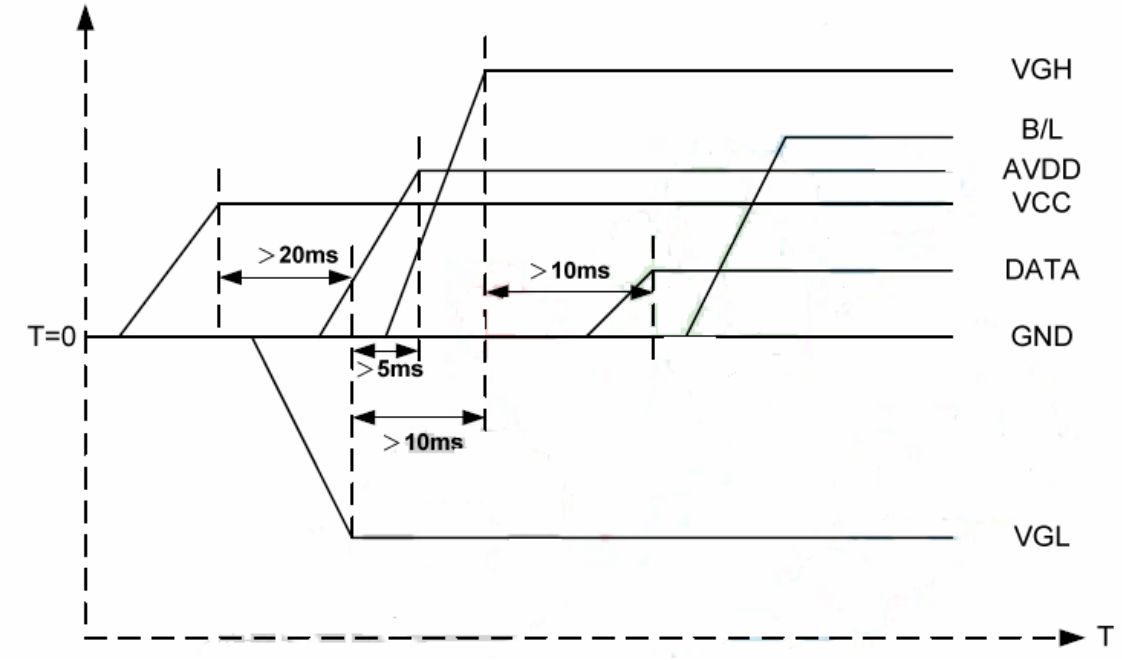
| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| LED voltage | $V_L$ | 23 | 24 | 25 | V | Note 1 |
| LED current | $I_L$ | 190 | 210 | 220 | mA | |
| LED life time | - | | 80,000 | - | Hr | Note 2 |

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and $I_L$ =210mA.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL =210mA. The LED lifetime could be decreased if operating $I_L$ is lager than 210 mA.

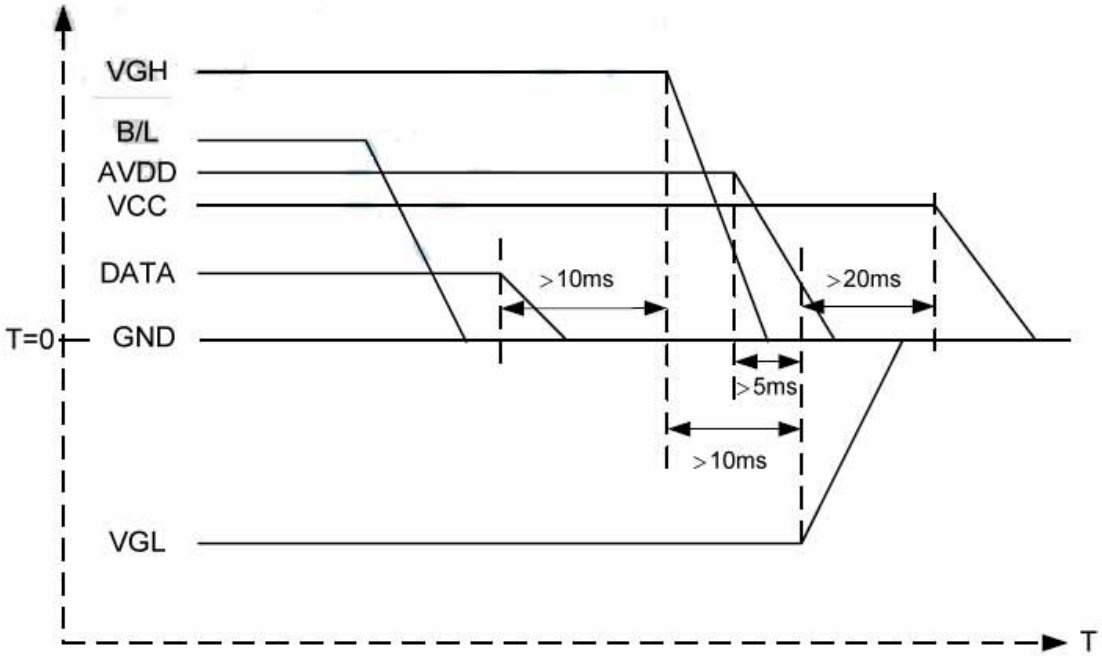
## 3.2. Power Sequence

3.2.1. Power on:




VCC→VGL→VGH→Data→B/L

3.2.2. Power off:




B/L→Data→VGH→VGL→VCC

Note: Data include POL, STVD, OEV, CKV, STVU, R0~R5, B0~B5, GO~G5, STHL, REV, DCLK, STHR, LD.

## 3.3. Timing Characteristics

### 3.3.1. Timing Conditions

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| DCLK frequency | Fdclk | | 33.3 | 45 | | |
| DCLK cycle | Tcph | 22 | 30 | - | | |
| DCLK pulse width | Tcw | 8 | - | - | | |
| Data set-up time | Tsu | 4 | - | - | | |
| Data hold time | Thd | 2 | - | - | | |
| Time that the last data to LD | Tld | 1 | - | - | | |
| Pulse width of LD | Twld | 2 | - | - | | |
| Time that LD to STHL/R | Tlds | 5 | - | - | | |
| POL set-up time | Tpsu | 6 | - | - | | |
| POL hold time | Tphd | 6 | - | - | | |
| CKV frequency | Fvclk | - | - | 200 | | |
| CKV rise time | Trck | - | - | 100 | | |
| CKV falling time | Tfck | - | - | 100 | | |
| CKV pulse width | PWCLK | 500 | - | - | | |
| Horizontal display timing range | Tdh | - | 800 | - | | |
| Horizontal timing range | Th | - | 1056 | - | | |
| STVU/D setup time | Tsuv | 200 | - | - | | |
| STVU/D hold time | Thdv | 300 | - | - | | |
| STVU/D delay time | Tdt | - | - | 500 | | |
| Driver output delay time | Tdo | - | - | 900 | | |
| Output rise time | Ttlh | - | 500 | 1000 | ns | |
| Output falling time | Tthl | - | 400 | 800 | ns | |
| OEV pulse width | Twcl | 1 | - | - | us | |
| OEV to Driver output delay time | Toe | - | - | 900 | ns | |
| Horizontal lines per field | Tv | 512 | 525 | 610 | Line | |
| Vertical display timing range | Tvd | - | 480 | - | Line | |

3.3.2. Timing Diagram

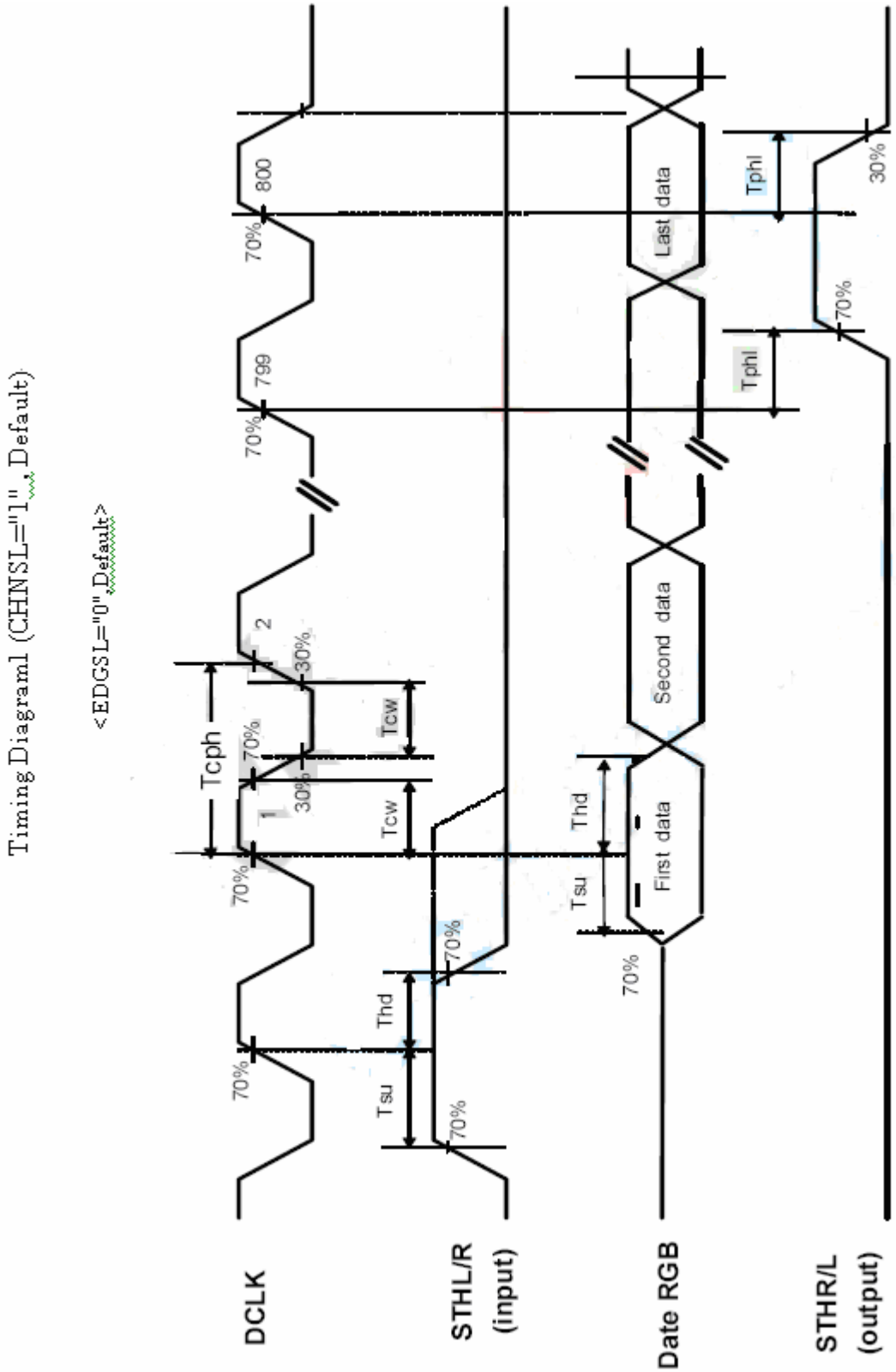



Fig.3-1 operation model 1

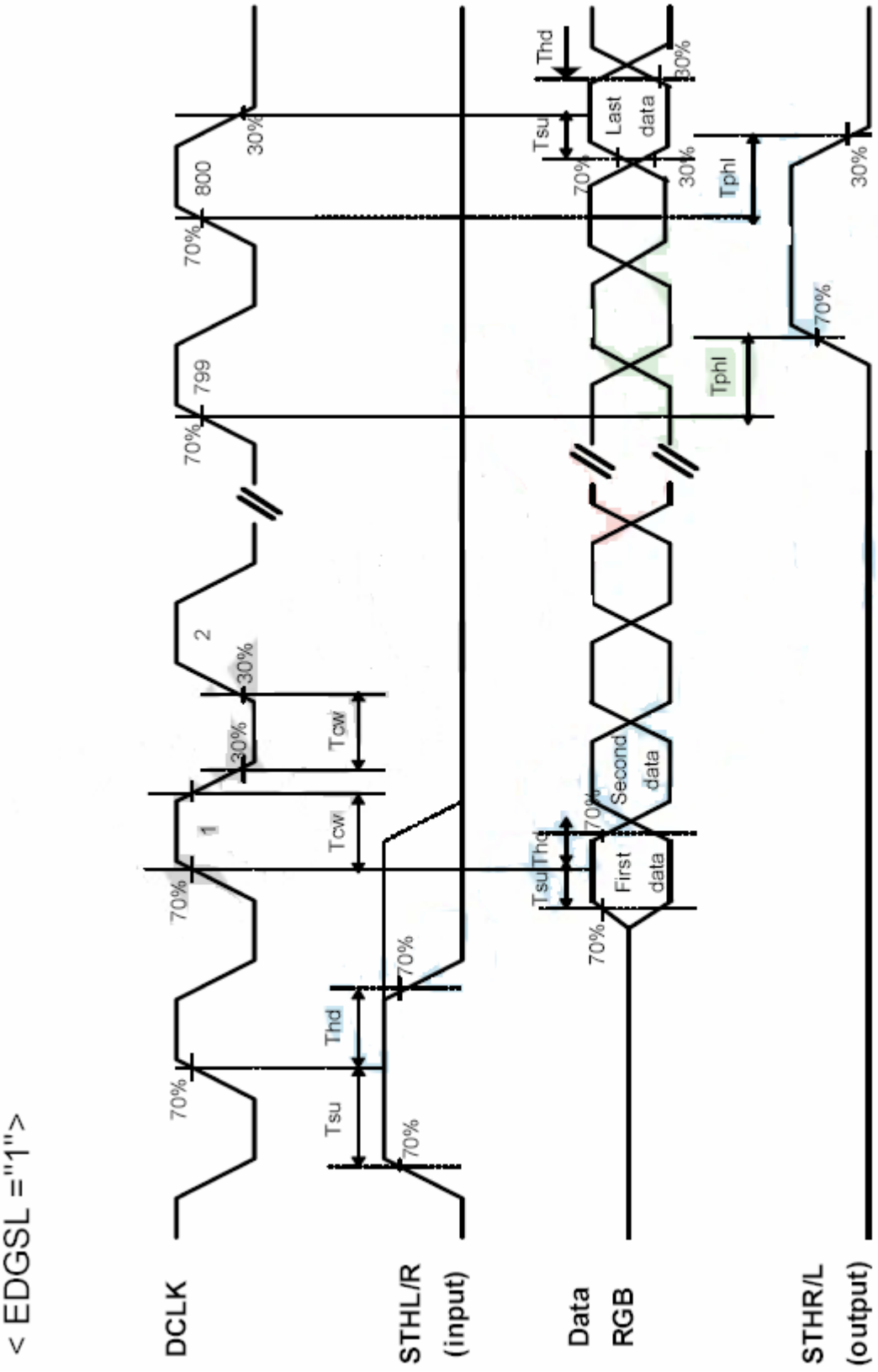



Fig.3-2 operation model 2

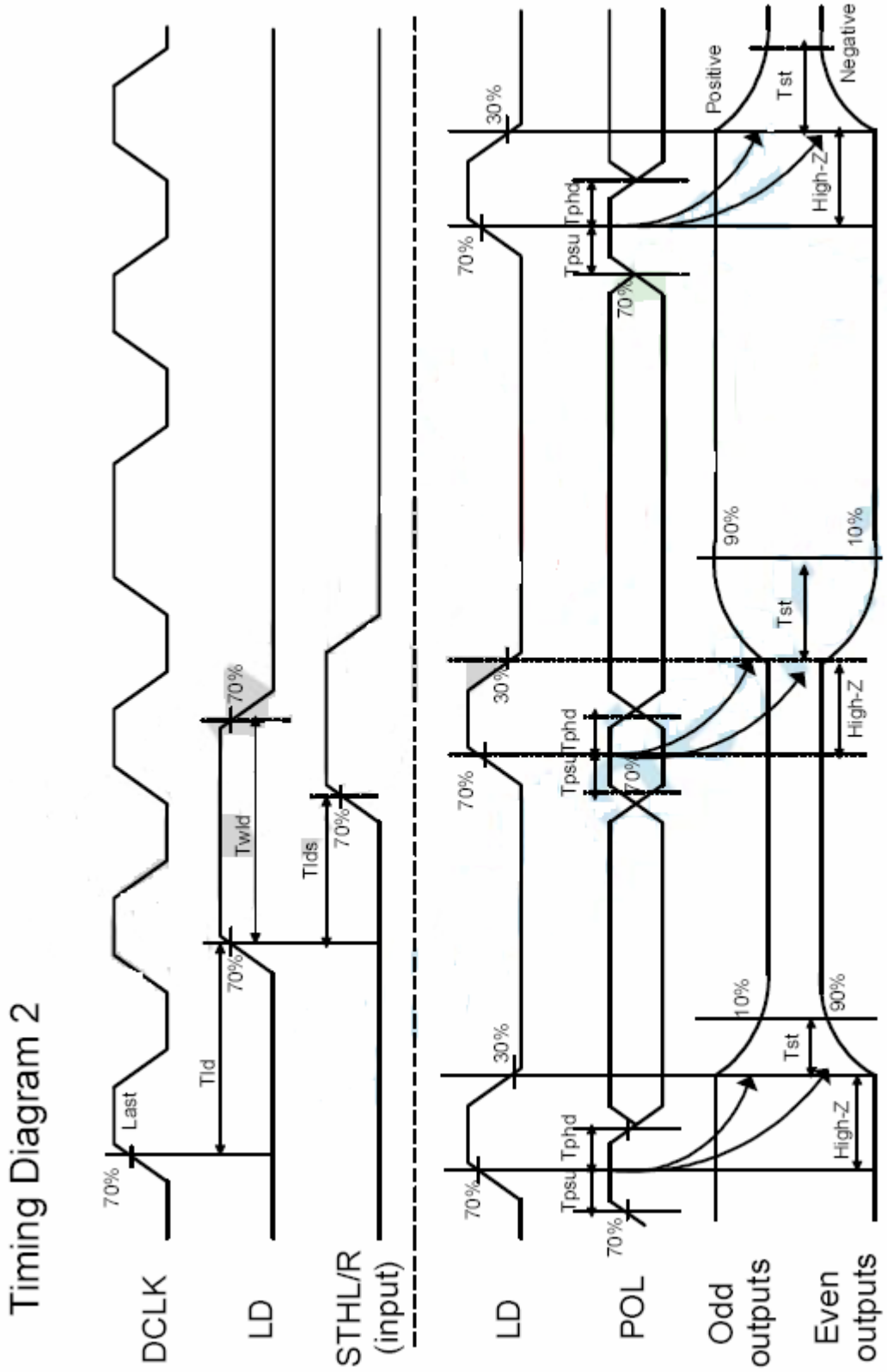



Fig.3-3 Horizontal timing 1

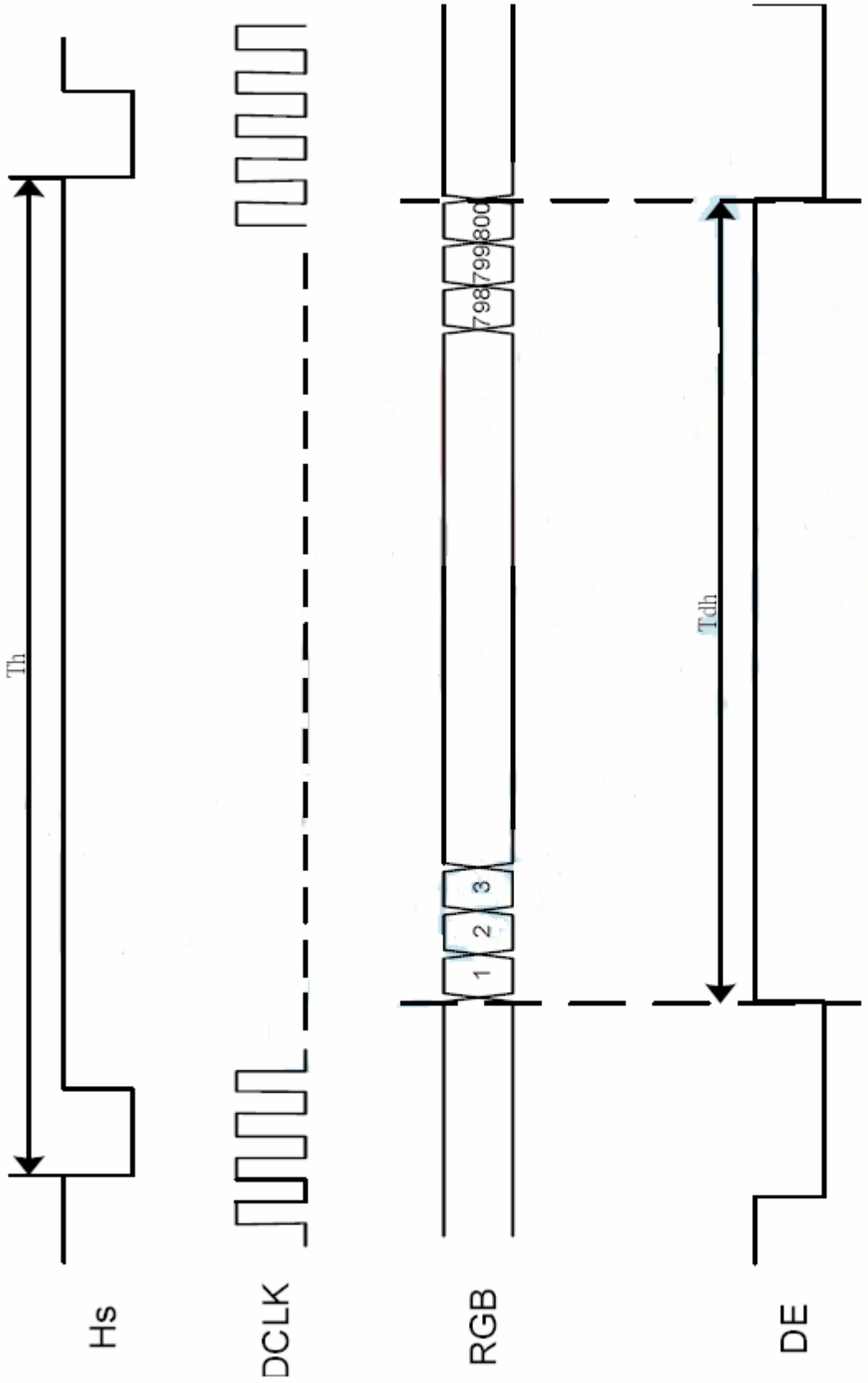



Fig.3-4 Horizontal timing 2

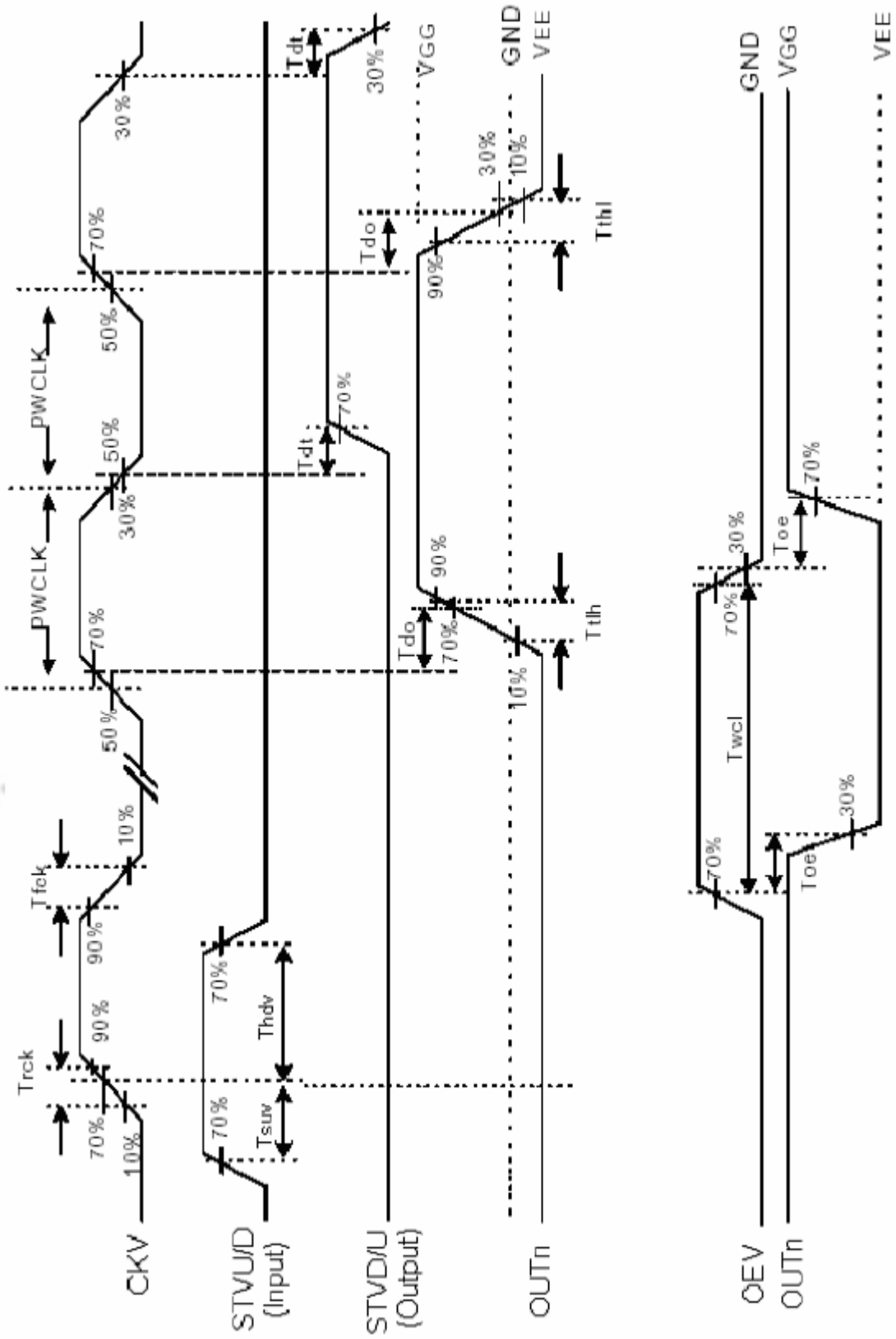



Fig.3-5 Vertical shift clock timing

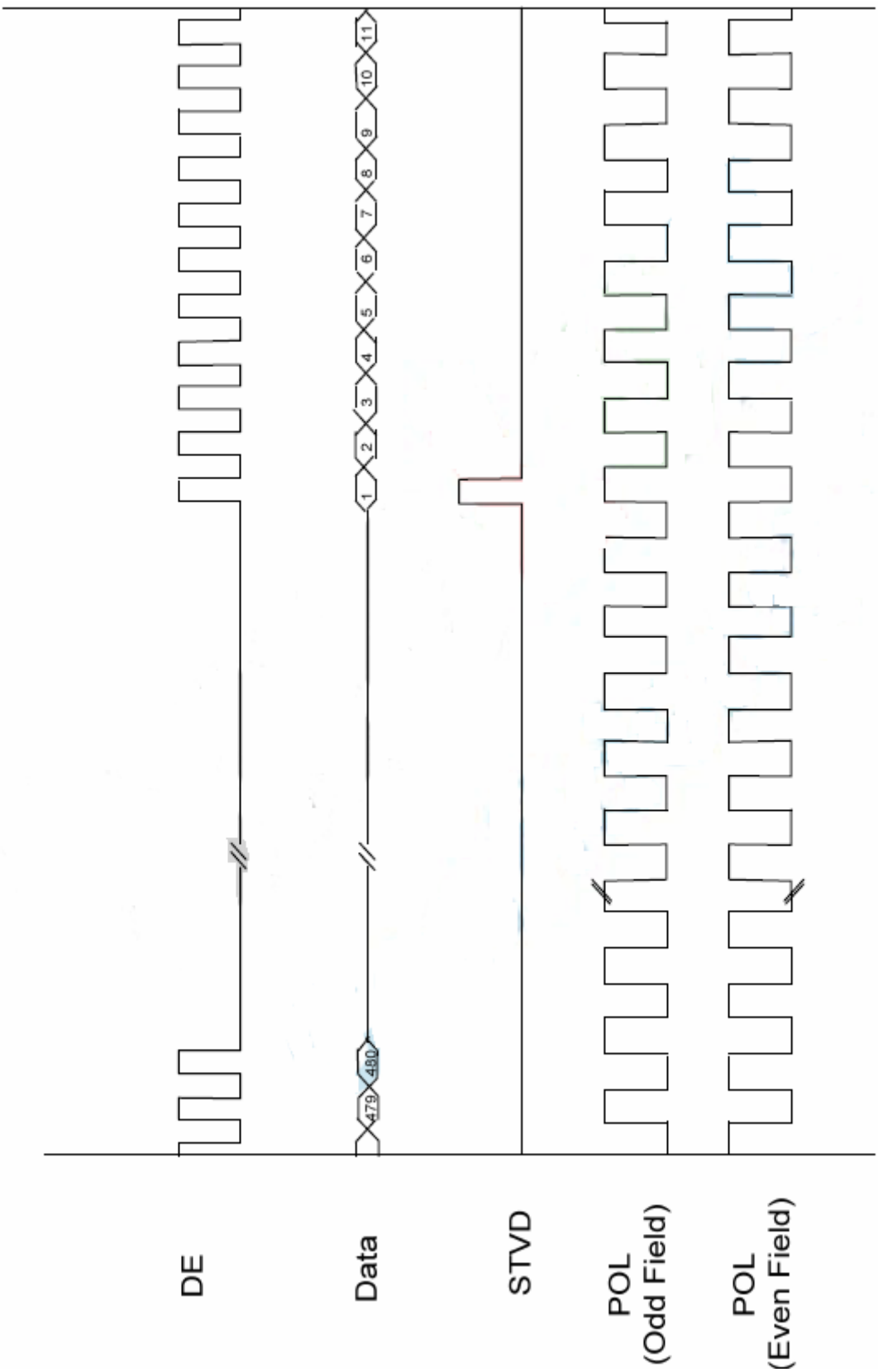



Fig.3-6 Vertical timing (from up to down)

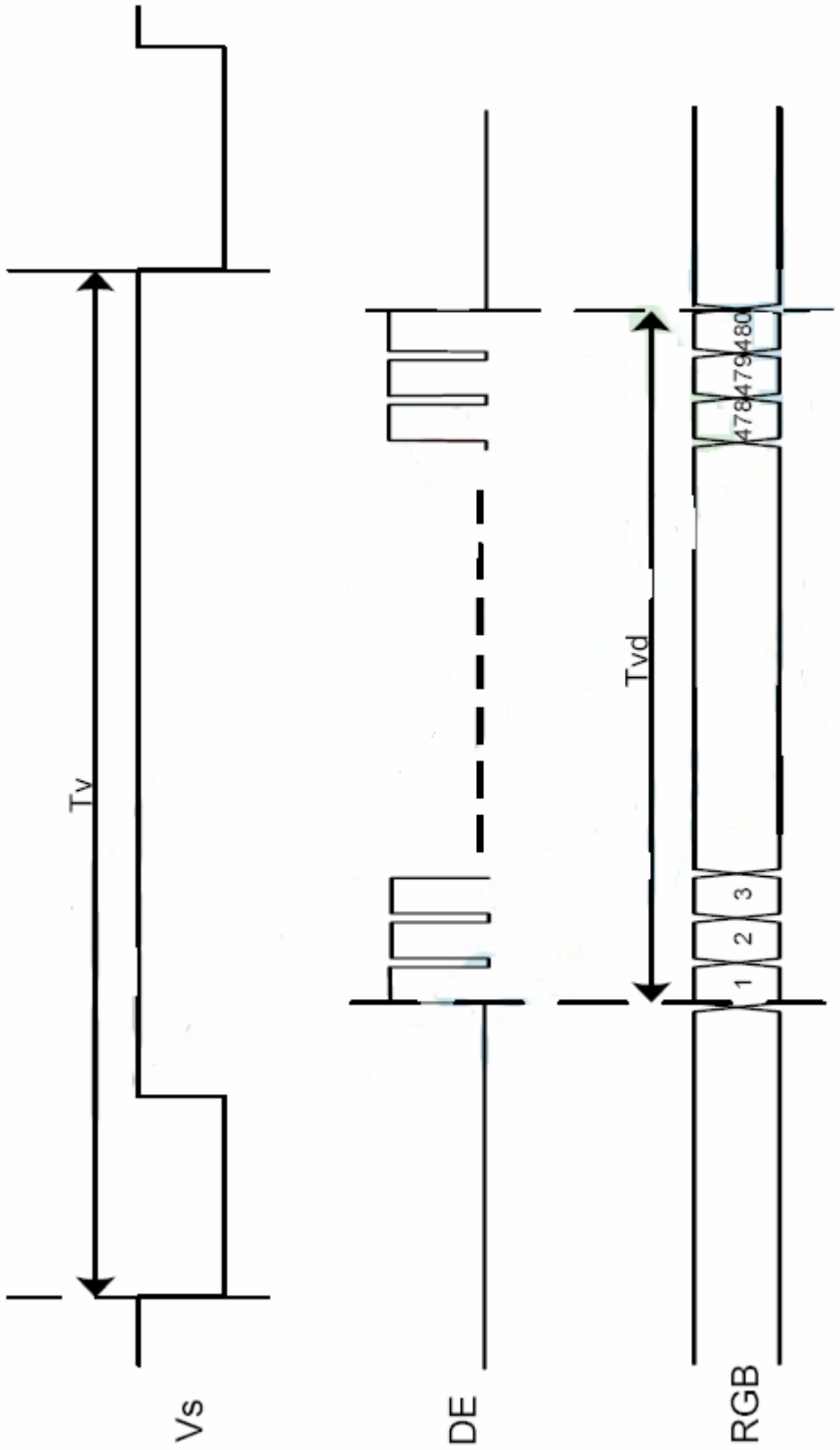



Fig.3-7 Vertical timing

# 4. Optical Specifications

| Item | Symbol | Condition | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Viewing angle (CR≥10) | θL | Φ=180°(9 o'clock) | 55 | 65 | - | degree | Note 1 |
| | θR | Φ=0°(3 o'clock) | 55 | 65 | - | | |
| | θT | Φ=90°(12 o'clock) | 35 | 45 | - | | |
| | θB | Φ=270°(6 o'clock) | 55 | 65 | - | | |
| Response time | TON | Normal θ=Φ=0° | - | 15 | 30 | msec | Note 3 |
| | TOFF | | - | 20 | 40 | msec | Note 3 |
| Contrast ratio | CR | | 250 | 300 | - | - | Note 4 |
| Color chromaticity | WX | | 0.26 | 0.31 | 0.36 | - | Note 2 |
| | WY | | 0.28 | 0.33 | 0.38 | - | Note 5 Note 6 |
| NTSC | Sa | | (60) | (63) | - | % | Note 8 |
| Luminance | L | | - | 1000 | - | cd/m² | Note 6 |
| Luminance uniformity | YU | | 70 | 75 | - | % | Note 7 |

Test Conditions:

1. VCC=3.3V, IL=210mA (Backlight current), the ambient temperature is 25 . ℃
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

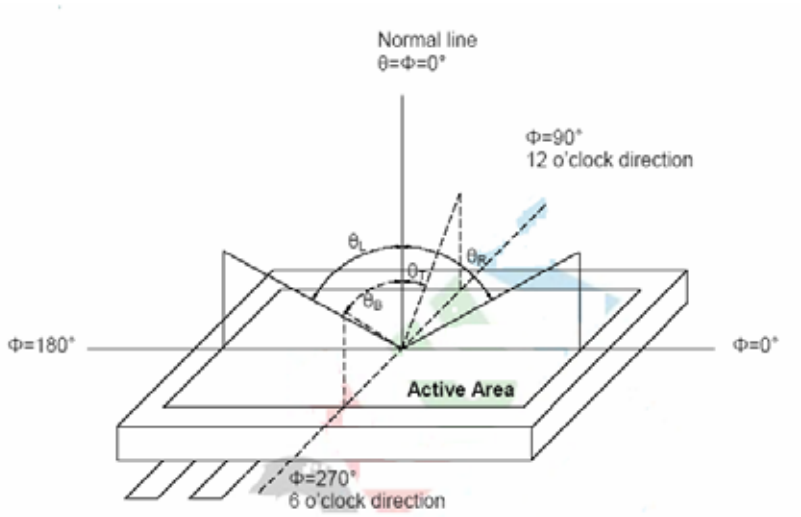



Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. The optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

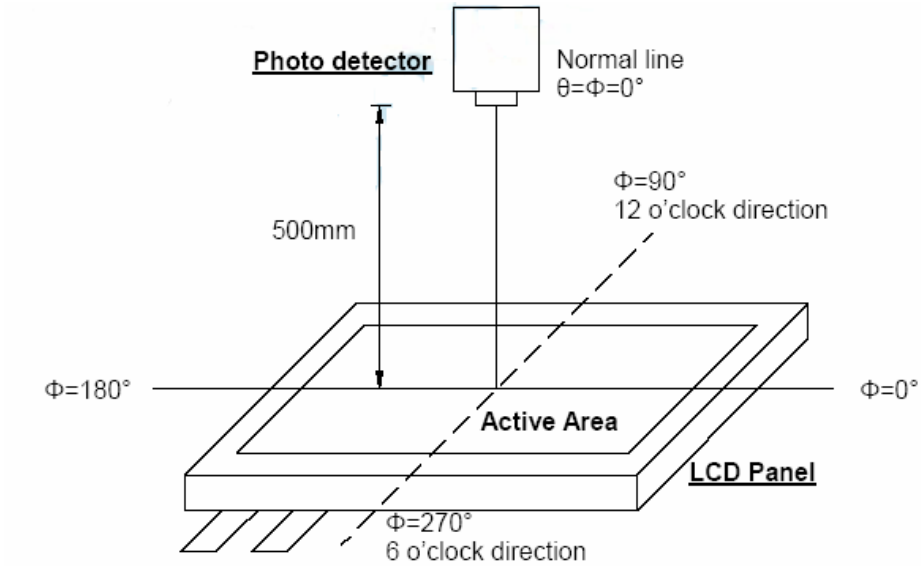



Fig. 4-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

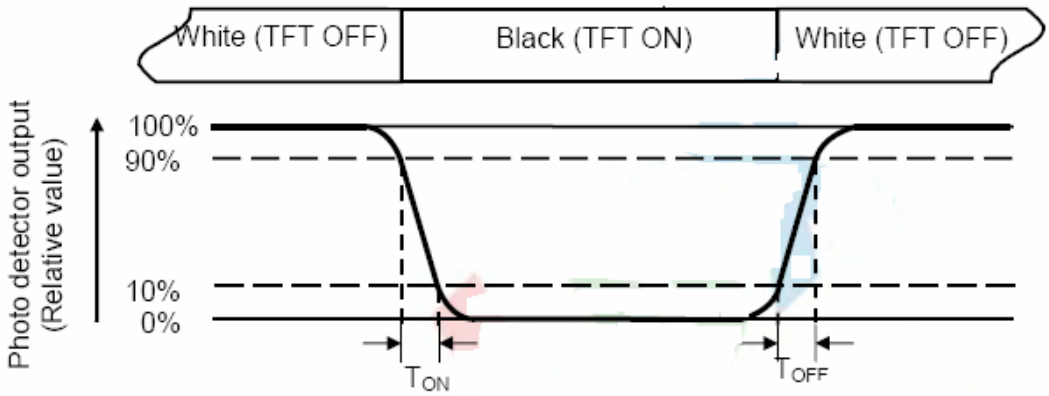



Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contras ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=210mA

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

$$Luminance\ \ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$

L-------Active area length W----- Active area width

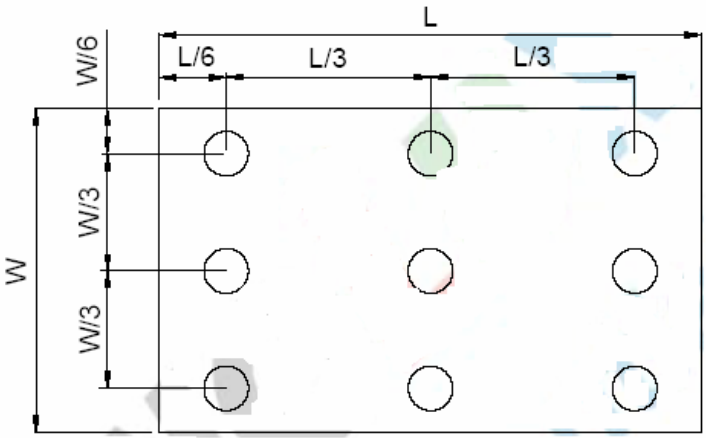


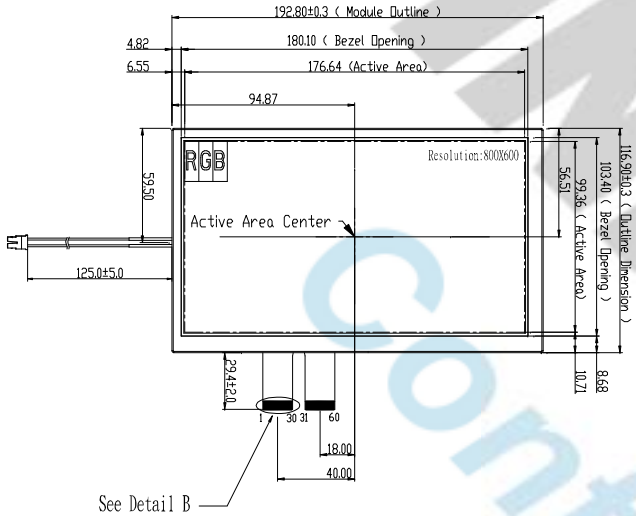

Fig. 4-4 Definition of measuring points

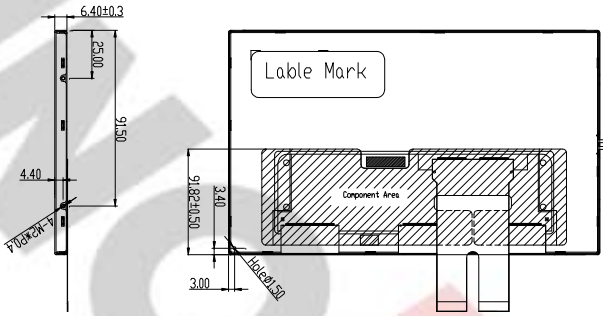
Bmax: The measured maximum luminance of all measurement position.

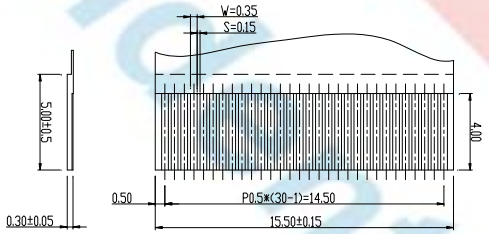
Bmin: The measured minimum luminance of all measurement position.

Note 8: $$NTSC = \frac{\left|x_R(y_G - y_B) + x_G(y_B - y_R) + x_B(y_R - y_G)\right|}{2 * 0.1582}$$

| REV | EC NUMBER | DESCRIPTION | DATE |
|---|---|---|---|
| ▽ | XXXXXXX | XXXXXXX | XXXXXXX |




Detail B

Note:

1. LED Light Bar connector for backlight to be just "BHSR-02VS-1";
2. FPC connetor to be P-TW□ "AF 730L-A2G1T";
3. Allowed depth of user hole screw insertion is 1.2mm Max;
4. General tolerance ±0.30mm;

| LEVEL / DIMENSION | GENERAL LINEAR TOLERANCE 1 | 2 | 3 | SELECT LEVEL |
|---|---|---|---|---|
| 0 ~ 4 | ±0.05 | ±0.1 | ±0.2 | |
| 4 ~ 14 | ±0.1 | ±0.2 | ±0.3 | |
| 14 ~ 63 | ±0.1 | ±0.2 | ±0.4 | |
| 63 ~ 250 | ±0.2 | ±0.4 | ±0.6 | |
| 250 ~ 600 | | ±0.6 | ±1.0 | |
| 600 ~ 4000 | | | ±1.6 | |

| LEVEL | GENERAL ANGULAR TOLERANCE 1 | 2 | 3 | SELECT LEVEL |
|---|---|---|---|---|
| RANGE | ±1° | ±2° | ±3° | N/A |

| | | |
|---|---|---|
| MATERIAL | | |
| N/A | APPROVED | Jack Huang 2008/03/20 |
| | CHECKED | Zhifeng.Fu 2008/03/20 |
| | DESIGNED | Gang.Xu 2008/03/20 |

CRITICAL DIMENSION / SPEC DIMENSION

| UNIT | SCALE | | MODEL NAME |
|---|---|---|---|
| mm | 1:2 | 3rd ANGLE | AT080TN03 V.D |

PART DESCRIPTION: AT080TN03 V.D LCM

INNOLUX

| SIZE | SHEET NUMBER | REVISION |
|---|---|---|
| A3 | 1of1 | 1 |

版權屬於群創所有，禁止在何未經授權的使用

# Preliminary Specifications

## WHITE COLOR LED

**Model : AG080N-LED**

1. **White LED Spec**
2. **White LED Driver Spec**
3. **LED Backlight Driver Spec**
4. **Mechanical Characteristics**

## 1. White LED Spec

### (1) Absolute maximum ratings (Ta=25℃)

| Parameter | Symbol | Absolute maximum rating | Unit | Remark |
|---|---|---|---|---|
| Power Dissipation | $P_D$ | 270 | mW | |
| Forward Current | $I_F$ | 30 | mA | per die |
| Peak Pulse Current(1) | $I_{FP}$ | 80 | mA | per die |
| Reverse Voltage | $V_R$ | 5 | V | $I_R$=10μA |
| Operating Temperature | $T_{OPR}$ | -40 to +85 | ℃ | |
| Storage Temperature | $T_{STG}$ | -40 to +100 | ℃ | |

Notes (1) Duty ratio = 1/10, pulse with = 10msec

### (2) Initial Electrical/Optical Characteristics (Ta=25℃)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage(1) | $V_F$ | $I_F$ = 60mA | 2.8 | | 3.6 | V |
| Luminous Intensity(2) | $I_V$ | $I_F$ = 60mA | | 4,000 | | mcd |
| Reverse Current | $I_R$ | $V_R$ = 5V | | | 10 | μA |

Notes (1) Forward Voltage Measurement allowance is ± 10%.

(2) Luminous Intensity Measurement allowance is ± 10%, Measuring equipment : CAS140B(Instrument System)

### (3) Characteristics Rank

■ Forward voltage & Luminous intensity rank ($T_a$=25℃)

| Parameter | Symbol | Condition | Rank | Min. | Max. | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | $I_F$ = 60mA | 8 | 2.8 | | V |
| | | | 0 | 3.0 | | |
| | | | 2 | 3.2 | | |
| | | | 4 | 3.4 | | |
| Luminous Intensity | $I_V$ | $I_F$ = 60mA | G | 3,500 | 4,000 | mcd |
| | | | H | 4,000 | 4,500 | |
| | | | I | 4,500 | 5,000 | |
| | | | J | 5,000 | 6,000 | |
| Reverse Current | $I_R$ | $I_R$ | $V_R$ = 5V | | 10 | μA |

## 2. White LED Driver Spec

### (1) Features

· Wide Input Voltage from 2.7V to 30V
· Inductor Current Limit up to 3.5A
· 0.5V Reference Voltage with ±3% System Accuracy
· 100mW Integrated N-FET
· Fixed 1.2MHz Switching Frequency
· High Efficiency up to 90%
· Stable with Ceramic Output Capacitors
· Open-LED Protection
· Under Voltage Lockout Protection
· ALS Control Input Pin
· Over Temperature Protection
· <1uA Quiescent Current during Shutdown
· 3mm x 3mm DFN-10 Package
· Lead Free Available (RoHS Compliant)

### (2)Recommended Operating Conditions

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| VIN | Input Voltage | 2.7 to 30 | V |
| VOUT | Output Voltage | up to 30 | V |
| TJ | Operating Ambient Temperature | -40 to 85 | °C |
| TA | Operating Junction Temperature | -40 to 125 | °C |

## 3. LED Backlight Driver Spec

### (1) Recommended operating conditions (R.C.)

| Parameter | Symbol | Recommendation | | | Unit |
|---|---|---|---|---|---|
| | | Min | R.C. | Max | |
| Input supply voltage | VIN | 10 | 12 | 14 | V |
| Power Consumption | - | 4 | 5.4 | 6 | Watts |
| Brightness control voltage range | VBRT | - | - | 5 | V |
| LED on/off control voltage | VSLEEP | 3.3 | 5 | - | V |
| Operating ambient temperature range | TA | -20 | - | 50 | °C |
| Dimming ratio(pwm control) | - | 1000:1(PWM) | | | - |
| Efficiency | - | 90 | 95 | - | % |

(2) Connector and functional pin description

CN1 Connector : 53261-0590 (Molex or Equivalent)

CN1-1,5---------- GND (Power supply return)

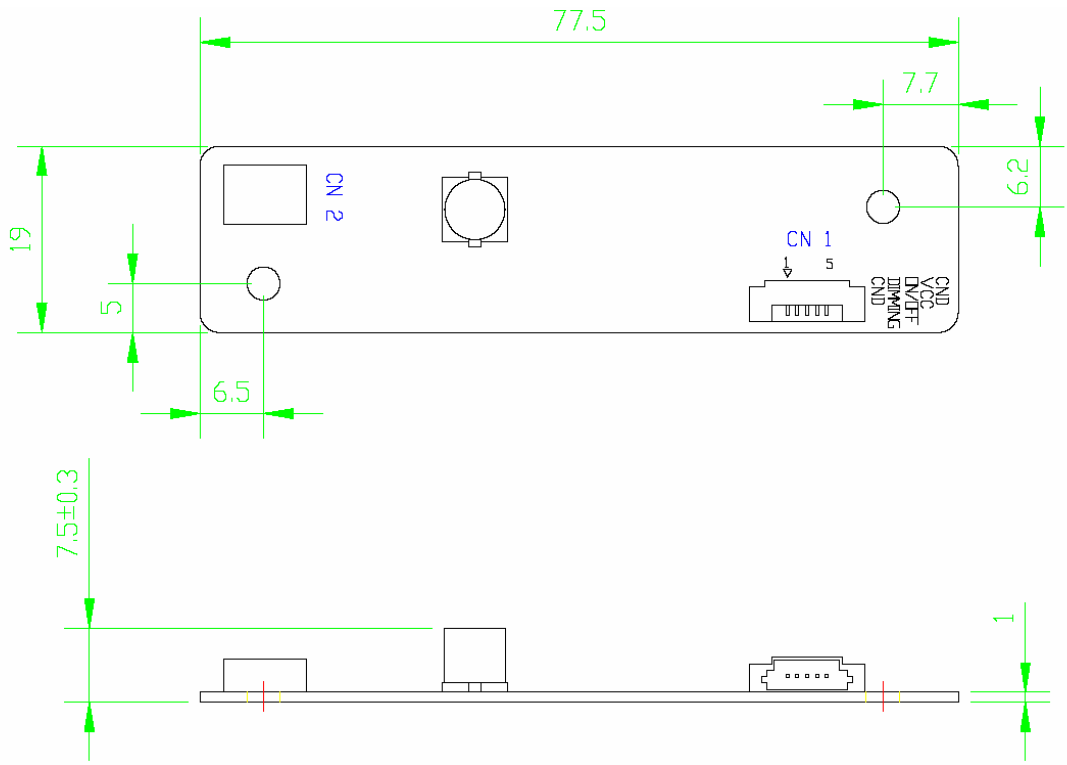
CN1-2---------- VBRT (Bright adjust ; 0 to 5.0V)

CN1-3---------- VSLEEP (LED On/Off control ; Off at Low, On at High)

CN1-4---------- VIN (DC Input ; 12.0V)

CN2 & 3 Connector : SM02B-BHSS-1-TB (JST or Equivalent)

CN2-1----------VCC

CN2-2---------- Cold/FB

## 4. Mechanical Characteristics. (mm)