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|-------------|-----------|
| Version     | 1.1       |
| Total pages | 24        |
| Date        | 2008/10/2 |

## Product Specification

### 10.1" color TFT-LCD module

MODEL NAME: A101VW01 V3

- ( ◆ ) Preliminary Specification
- (   ) Final Specification

Note: The content of this specification is subject to change.

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## Record of Revision

[illegible]

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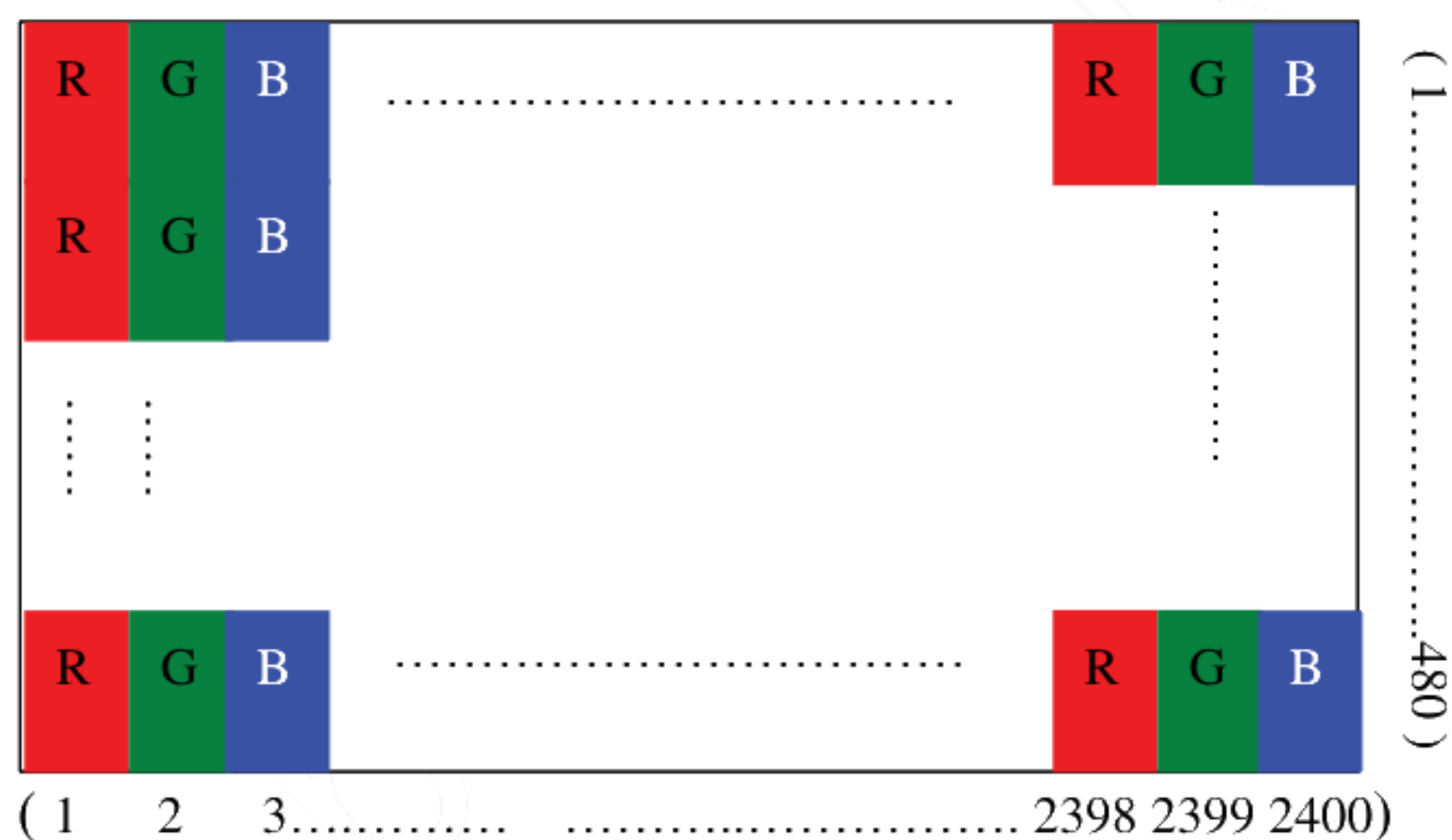
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## A. Physical specifications

| NO. | Item                     | Specification              | Remark |
|-----|--------------------------|----------------------------|--------|
| 1   | Display resolution (dot) | 800 RGB (W) x 480(H)       |        |
| 2   | Active area (mm)         | 219.6(W) x 131.76(H)       |        |
| 3   | Screen size (inch)       | 10.1(Diagonal)             |        |
| 4   | Pixel pitch (mm)         | 0.2745(W) x 0.2745(H)      |        |
| 5   | Color configuration      | R. G. B. stripe            | Note 1 |
| 6   | Overall dimension (mm)   | 235(W) x 145.9(H) x 5.4(D) | Note 2 |
| 7   | Weight (g)               | 315g                       |        |
| 8   | Surface treatment        | Anti-Glare                 |        |
| 9   | Backlight unit           | LED(33pcs)                 |        |

Note 1: Below figure shows the dot stripe arrangement.



Note 2: Refer to Fig.1 and Fig.2

## B. Electrical specifications

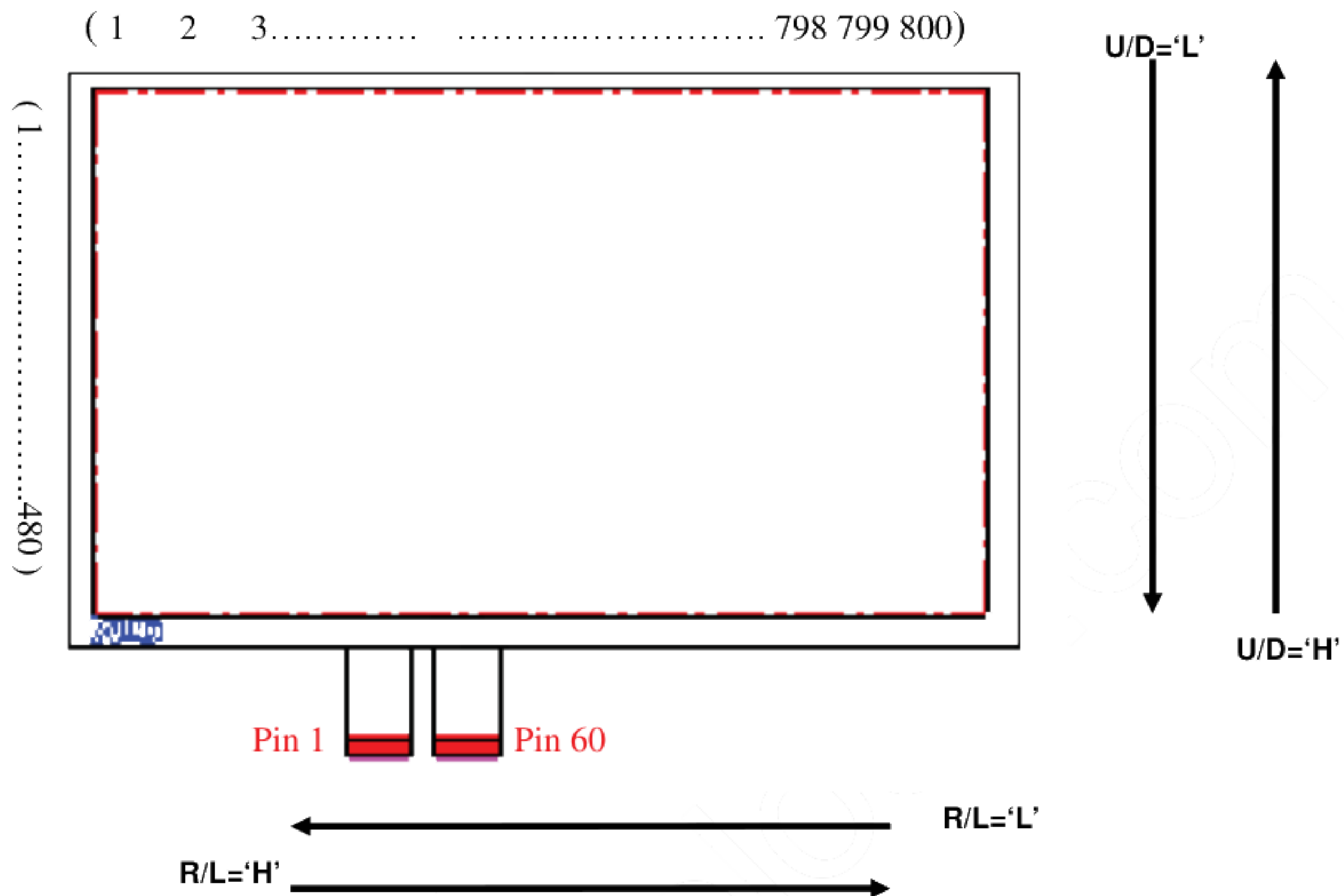
### 1. Pin assignment (suggest connector - Hirose FH12-30S-0.5SH)

| Pin no | Symbol | I/O | Description                                                                                                                                                                                                                          | Remark    |
|--------|--------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1      | POL    | I   | Polarity selection                                                                                                                                                                                                                   | Note 3    |
| 2      | STVD   | I/O | Vertical start pulse signal input or output                                                                                                                                                                                          | Note 1    |
| 3      | OE     | I   | Outputs enable. Active low. The gate driver outputs are disable when OEV = "H".                                                                                                                                                      |           |
| 4      | CKV    | I   | Vertical clock                                                                                                                                                                                                                       |           |
| 5      | STVU   | I/O | Vertical start pulse signal input or output                                                                                                                                                                                          | Note 1    |
| 6      | GND    | P   | Power ground                                                                                                                                                                                                                         |           |
| 7      | EDGSL  | I   | Select raising edge or raising/falling edge<br>When EDGSL = "0", Latching source data onto the line latches at the rising edge.<br>When EDGSL = "1", Latching source data onto the line latches at the rising edge and falling edge. | Page 9.10 |
| 8      | VCC    | P   | Digital voltage for source driver                                                                                                                                                                                                    |           |
| 9      | V9     | I   | Gamma voltage level 9                                                                                                                                                                                                                |           |
| 10     | VGL    | P   | TFT low voltage                                                                                                                                                                                                                      |           |
| 11     | V2     | I   | Gamma voltage level 2                                                                                                                                                                                                                |           |
| 12     | VGH    | P   | TFT high voltage                                                                                                                                                                                                                     |           |
| 13     | V6     | I   | Gamma voltage level 6                                                                                                                                                                                                                |           |
| 14     | U/D    | I   | Up/down selection                                                                                                                                                                                                                    | Note 1    |
| 15     | VCOM   | I   | Common voltage                                                                                                                                                                                                                       |           |
| 16     | GND    | P   | Power ground                                                                                                                                                                                                                         |           |
| 17     | AVDD   | P   | Analog voltage                                                                                                                                                                                                                       |           |
| 18     | V14    | I   | Gamma voltage level 14                                                                                                                                                                                                               |           |
| 19     | V11    | I   | Gamma voltage level 11                                                                                                                                                                                                               |           |
| 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 ground                                                                                                                                                                                                                         |           |

| Pin no | Symbol | I/O | Description                                                                                                                      | Remark        |
|--------|--------|-----|----------------------------------------------------------------------------------------------------------------------------------|---------------|
| 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     | DIO2   | I/O | Horizontal start pulse signal input or output                                                                                    | <b>Note 1</b> |
| 39     | INV    | I   | Control Whether RGB data are inverted or not<br>When "INV" = 1 these data will be inverted. Ex. "00"→"3F", "07"→"38", and so on. |               |
| 40     | GND    | P   | Power ground                                                                                                                     |               |
| 41     | DCLK   | I   | Pixel clock                                                                                                                      |               |
| 42     | VCC    | P   | Voltage for digital circuit                                                                                                      |               |
| 43     | DIO1   | I/O | Horizontal start pulse signal input or output                                                                                    | Note 1        |
| 44     | LD     | I   | Latches the polarity of outputs and switches the new data to outputs                                                             | Note 2        |
| 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                                                                                                            | <b>Note 1</b> |
| 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     | AVDD   | P   | Analog voltage                                                                                                                   |               |
| 59     | GND    | P   | Power ground                                                                                                                     |               |
| 60     | VCOM   | I   | Common voltage                                                                                                                   |               |

□I: Input. O: Output. P: Power.

Note 1:



| U/D | STVU   | STVD   | Direction |
|-----|--------|--------|-----------|
| L   | Input  | Output | U→D       |
| H   | Output | Input  | D→U       |

| R/L | DIO1   | DIO2   | Direction |
|-----|--------|--------|-----------|
| H   | Input  | Output | L→R       |
| L   | Output | Input  | R→L       |

Note 2: LD

Latches the polarity of outputs and switches the new data to outputs.

1. At the rising edge, latches the "POL" signal to control the polarity of the outputs.
2. The pin also controls the switch of the line registers that switches the new incoming data to outputs.

Note 3: POL

"POL" value is latched at the rising edge of "LD" to control the polarity of the even or odd outputs.

POL=1: Even outputs range from V1 ~ V7, and Odd outputs range from V8 ~ V14

POL=0: Even outputs range from V8 ~ V14, and Odd outputs range from V1 ~ V7

## 2. Absolute Maximum Ratings

| Items                 | Symbol       | Product Specification |      |          | Unit | Remark   |
|-----------------------|--------------|-----------------------|------|----------|------|----------|
|                       |              | Min.                  | Typ. | Max.     |      |          |
| Power Voltage         | VCC          | -0.5                  |      | 5        | V    | Pin8.42  |
|                       | AVDD         | -0.5                  |      | 12       | V    | Pin17.58 |
|                       | VGH          | -0.3                  |      | 18       | V    | Pin12    |
|                       | VGL          | -15                   |      | 0.3      | V    | Pin10    |
|                       | VGH-VGL      |                       |      | 33       | V    |          |
| Input Signal Voltage  | Vi           | -0.3                  |      | VCC+0.3  | V    | Note 1   |
|                       | Vref(V1~V7)  | 0.4AVDD               |      | AVDD+0.3 | V    |          |
|                       | Vref(V8~V14) | -0.3                  |      | 0.6AVDD  | V    |          |
|                       | VCOM         | 3.27                  |      | 3.89     | V    | Pin15.60 |
| Operating Temperature | Topa         | -30                   |      | 85       | °C   |          |
| Storage Temperature   | Tstg         | -40                   |      | 85       | °C   |          |

Note 1: Vi denotes digital input signal voltage (Pins 1~5, 7, 14, 24~29, 32~37, 38, 39, 41, 43, 44, and 45~51).

Note 2: Stresses above those listed under "Absolute Maximum Rating" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## 3. Electrical characteristics

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

| Items                   | Symbol | Product Specification |      |          | Unit | Remark         |
|-------------------------|--------|-----------------------|------|----------|------|----------------|
|                         |        | Min.                  | Typ. | Max.     |      |                |
| Power Voltage           | VCC    | 3.0                   | 3.3  | 3.6      | V    | Pin8.42        |
|                         | AVDD   | 8.4                   | 8.8  | 9.2      | V    | Pin17.58       |
|                         | VGH    | 14                    | 15   | 16       | V    | Pin12          |
|                         | VCOM   | 3.5                   | 3.7  | 3.9      | V    | Note, Pin15.60 |
|                         | VGL    | -6.8                  | -7.0 | -7.2     | V    | Pin10          |
| Input Reference Voltage | V1~V7  | 0.4AVDD               | —    | AVDD-0.3 | V    |                |
|                         | V8~V14 | 0.1                   | —    | 0.6AVDD  | V    |                |
| Input H/L level Voltage | VIH    | 0.7VCC                | —    | VCC      | V    |                |
|                         | VIL    | 0                     | —    | 0.3VCC   | V    |                |

Note: The VCOM voltage is determined based on gamma 2.2 (the reference gamma circuit is shown in appendix fig.5). VCOM should be adjusted to minimize LCM display flicker.

**b. Current consumption conditions (GND=AVSS=0V)**

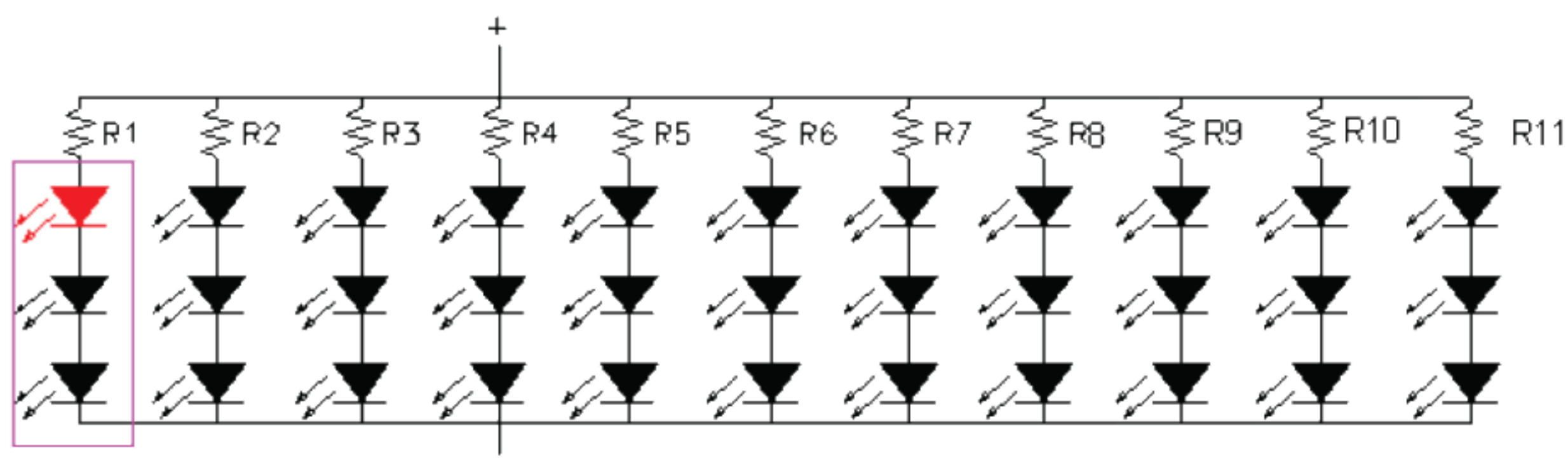
| Parameter                | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|--------------------------|--------|-----------|------|------|------|------|--------|
| Current<br>For<br>Driver | IGH    | VGH=15V   |      | 231  | 242  | uA   | --     |
|                          | IGL    | VGL=-7V   |      | -244 | -256 | uA   | --     |
|                          | ICC    | VCC=3.3V  |      | 3.0  | 5.0  | mA   | --     |
|                          | IDD    | AVDD=8.8V |      | 32.5 | 35.0 | mA   | --     |

Note: Test Condition: 8colorbar+Grayscale pattern, DE mode, DCLK=33MHz, Frame rate: 60Hz.

**c. Backlight electrical characteristics**

| Item            |              | Symbol | Condition              | Min    | Typ | Max | Unit |
|-----------------|--------------|--------|------------------------|--------|-----|-----|------|
| Forward Voltage | Main Side    | $V_F$  | $I_F=220(\text{mA})^*$ |        | 12  |     | V    |
|                 | Sub Side ■NA |        |                        |        |     |     |      |
| Forward Current | Main Side    | $I_F$  | at 25□                 |        | 220 |     | mA   |
|                 | Sub Side ■NA |        |                        |        |     |     |      |
| LED Lifetime    |              | $L_L$  | at 25□                 | 20,000 |     |     | Hr   |

Note 1: LED backlight is 3 series in 11 parallel connection types.



Note 2: Define "LED Lifetime": brightness is decreased to 50% of the initial value.

LED Lifetime is restricted under normal condition, ambient temperature = 25□

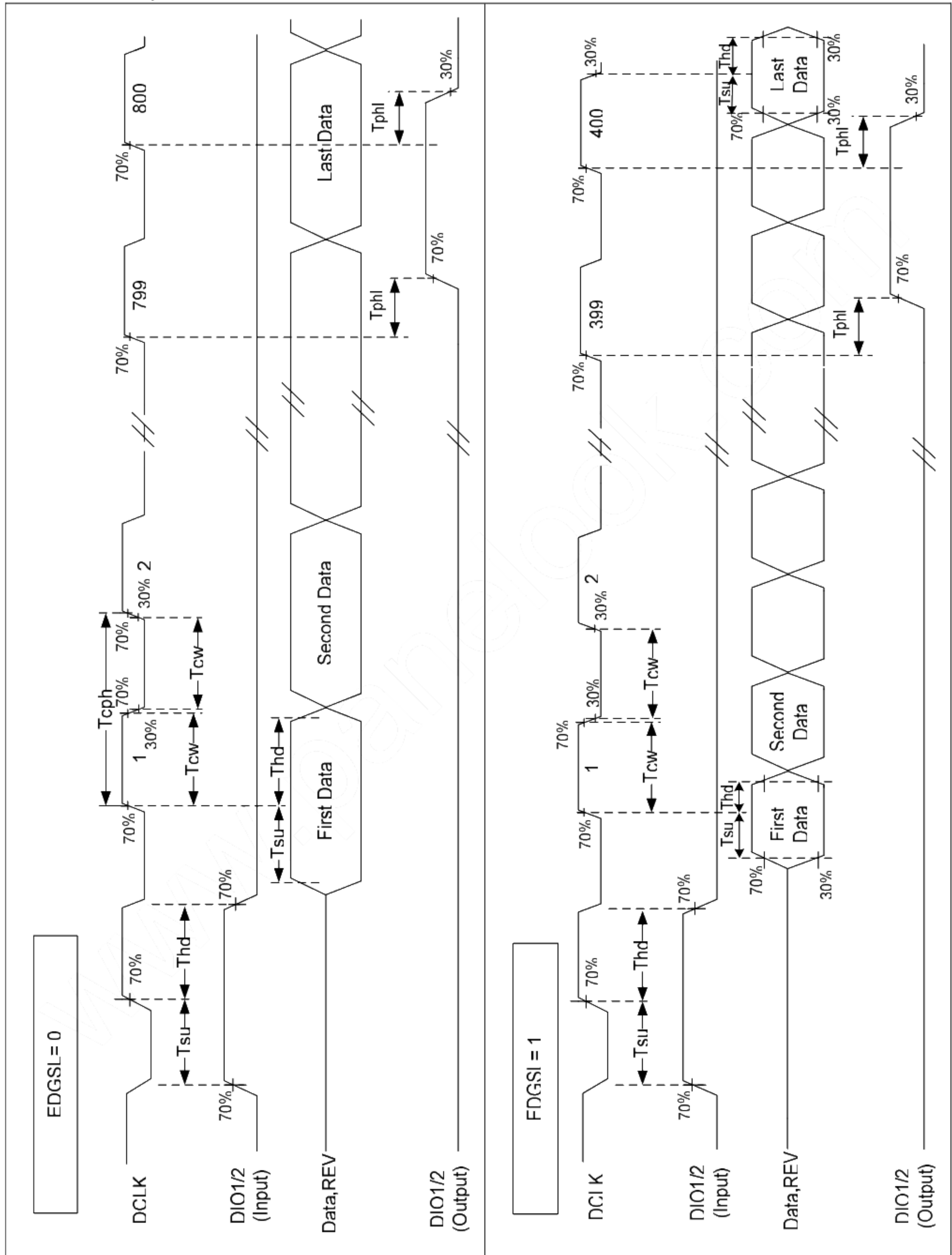
## 4. AC Timing

### a. Digital Signal AC Characteristic

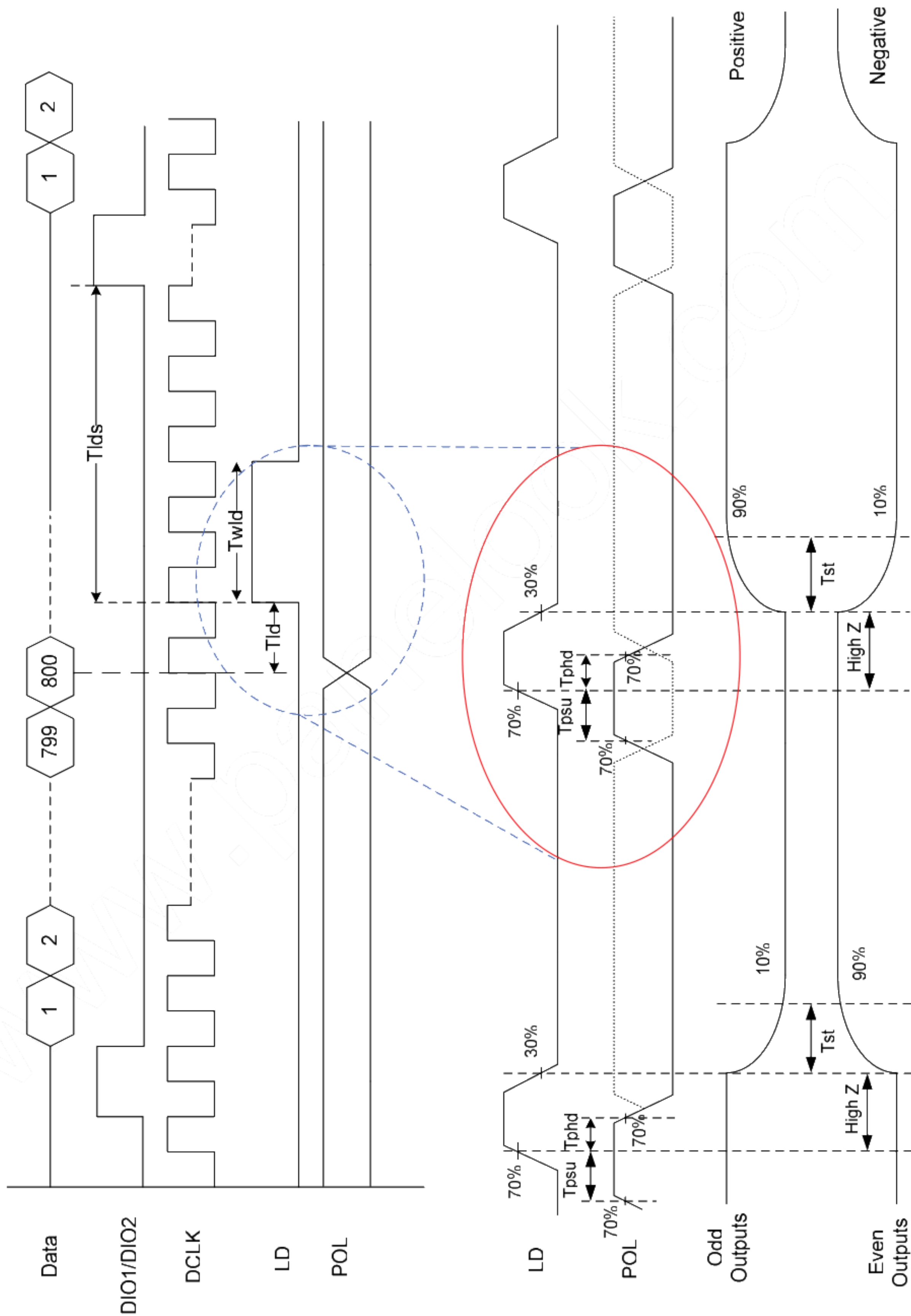
Conditions: (VCC=3.3V, AVDD=8.4V, AVSS=GND=0V, TA=25°C)

| Parameter                     | Symbol | Min. | Typ. | Max. | Unit |
|-------------------------------|--------|------|------|------|------|
| DCLK frequency (EDGSL = '0')  | Fclk   |      | 33   | 44   | MHz  |
| DCLK frequency (EDGSL = '1')  | Fclk   |      | 16.5 | 22   | MHz  |
| DCLK cycle time               | Tcph   | 22.8 | 30   |      | ns   |
| DCLK pulse width              | Tcw    | 40%  |      | 60%  | Tcph |
| 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    |      |      | Tcph |
| Pulse width of LD             | Twld   | 2    |      |      | Tcph |
| Time that LD to DIO1/2        | Tlds   | 5    |      |      | Tcph |
| POL set-up time               | Tpsu   | 6    |      |      | ns   |
| POL hold time                 | Tphd   | 6    |      |      | ns   |
| STV setup time                | Tsuv   | 200  |      |      | ns   |
| STV hold time                 | Thdv   | 300  |      |      | ns   |
| CKV pulse width               | Tckv   | 500  |      |      | ns   |
| Output stable time            | Tst    |      |      | 15   | us   |

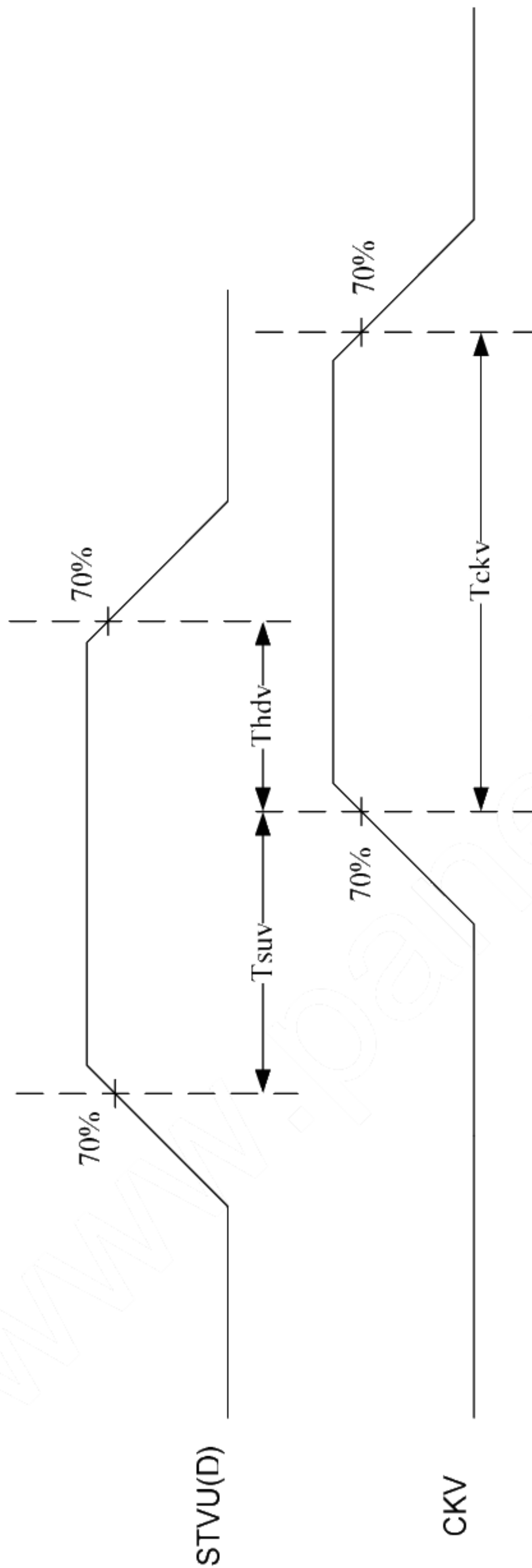
## b. Operation Mode 1



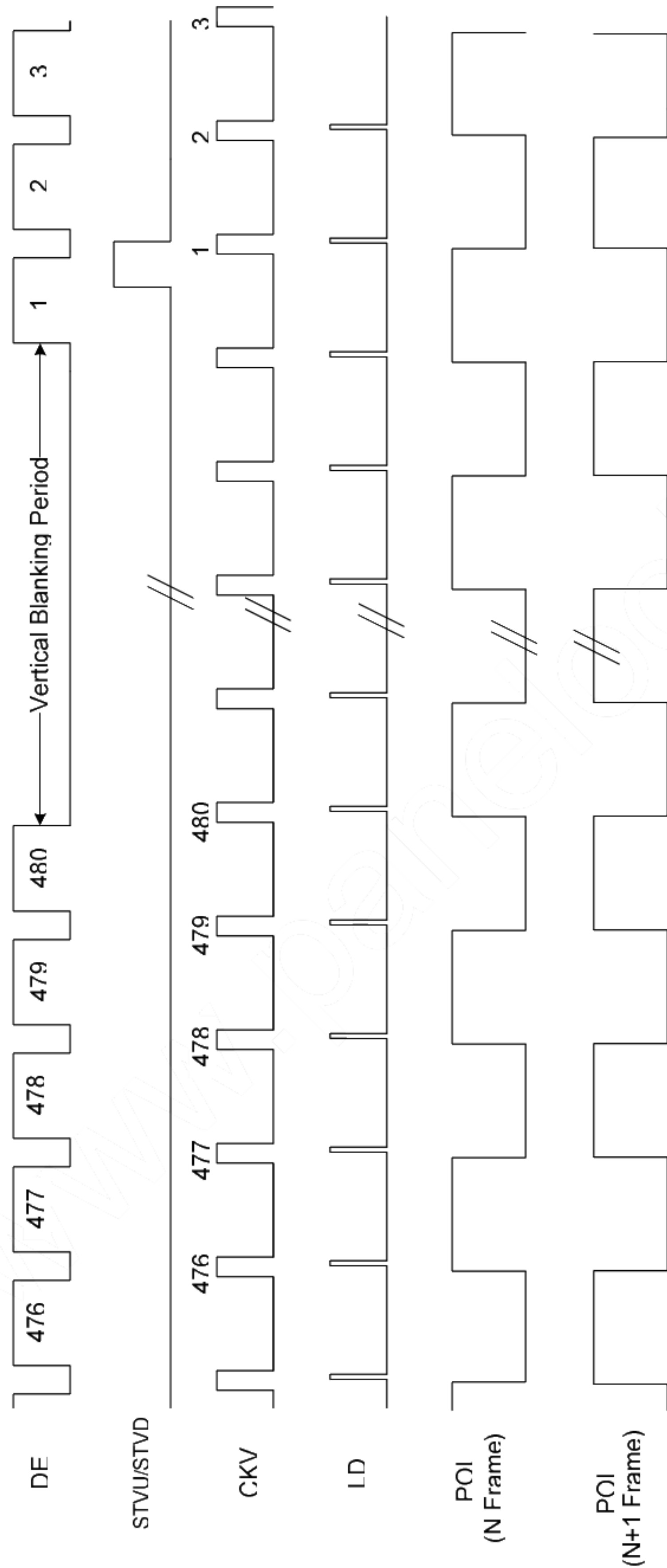
### c. Horizontal timing



d. Vertical shift timing



## e. Vertical timing



\* During vertical blanking period, still have LD & CKV & POL pulse

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

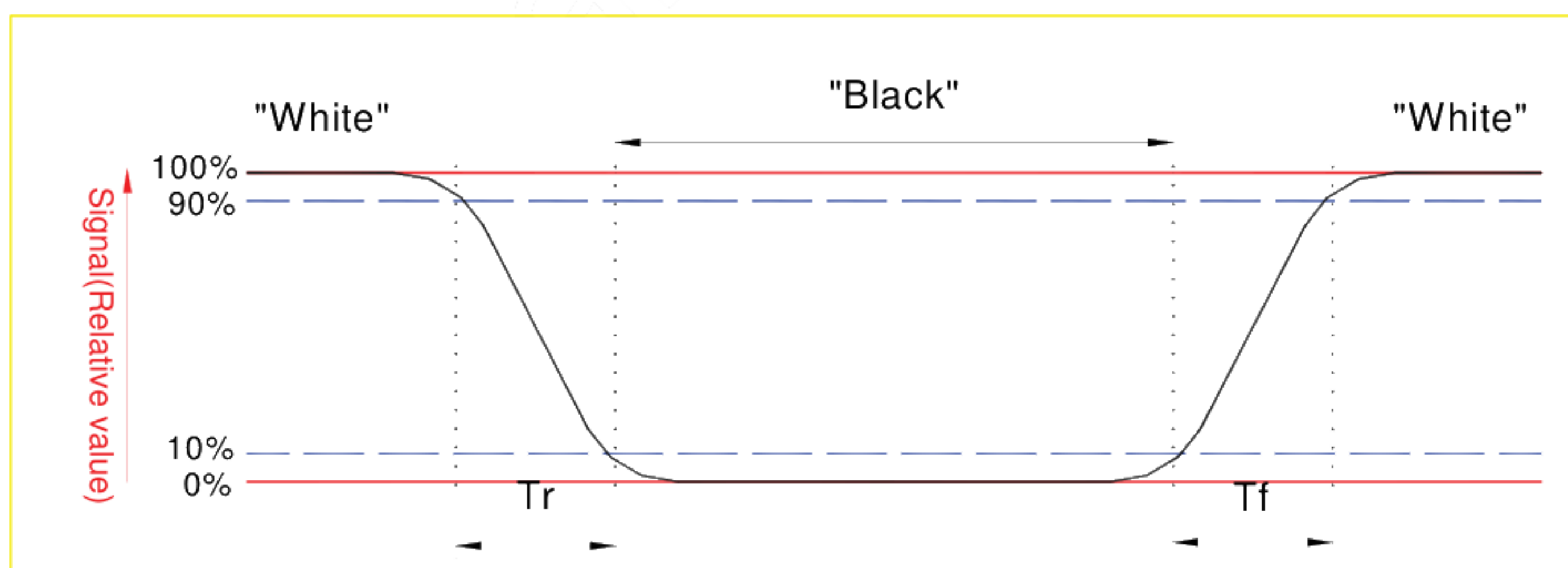
| Item                 |        | Symbol       | Condition                  | Min. | Typ. | Max. | Unit     | Remark    |
|----------------------|--------|--------------|----------------------------|------|------|------|----------|-----------|
| Response time        | Rise   | Tr           | $\theta = 0^\circ$         | -    | 12   | 24   | ms       | Note 3,5  |
|                      | Fall   | Tf           |                            | -    | 18   | 36   | ms       |           |
| Contrast ratio       |        | CR           | At optimized Viewing angle | 300  | 500  | -    |          | Note 4, 5 |
| Viewing angle        | Top    | $CR \geq 10$ |                            | 40   | 45   | -    | deg.     | Note 5, 6 |
|                      | Bottom |              |                            | 55   | 65   | -    |          |           |
|                      | Left   |              |                            | 55   | 65   | -    |          |           |
|                      | Right  |              |                            | 55   | 65   | -    |          |           |
| Brightness           |        | $Y_L$        | $V=12V, 25^\circ C$        | 270  | 320  | -    | $cd/m^2$ | Note 7    |
| Luminance Uniformity |        |              |                            | 70   | 75   | -    | %        | Note 8    |
| White chromaticity   |        | X            | $\theta=0^\circ$           | 0.26 | 0.31 | 0.36 |          | Note 7    |
|                      |        | Y            | $\theta=0^\circ$           | 0.28 | 0.33 | 0.38 |          |           |

Note 1 : Ambient temperature  $=25^\circ C$ , and lamp current  $I_L = 6.5 \text{ mArms}$ . To be measured in the dark room. DC/AC inverter driving frequency: 60 kHz.

Note 2 : To be measured on the center area of panel with a viewing cone of  $1^\circ$  by Topcon luminance meter BM-5, 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:

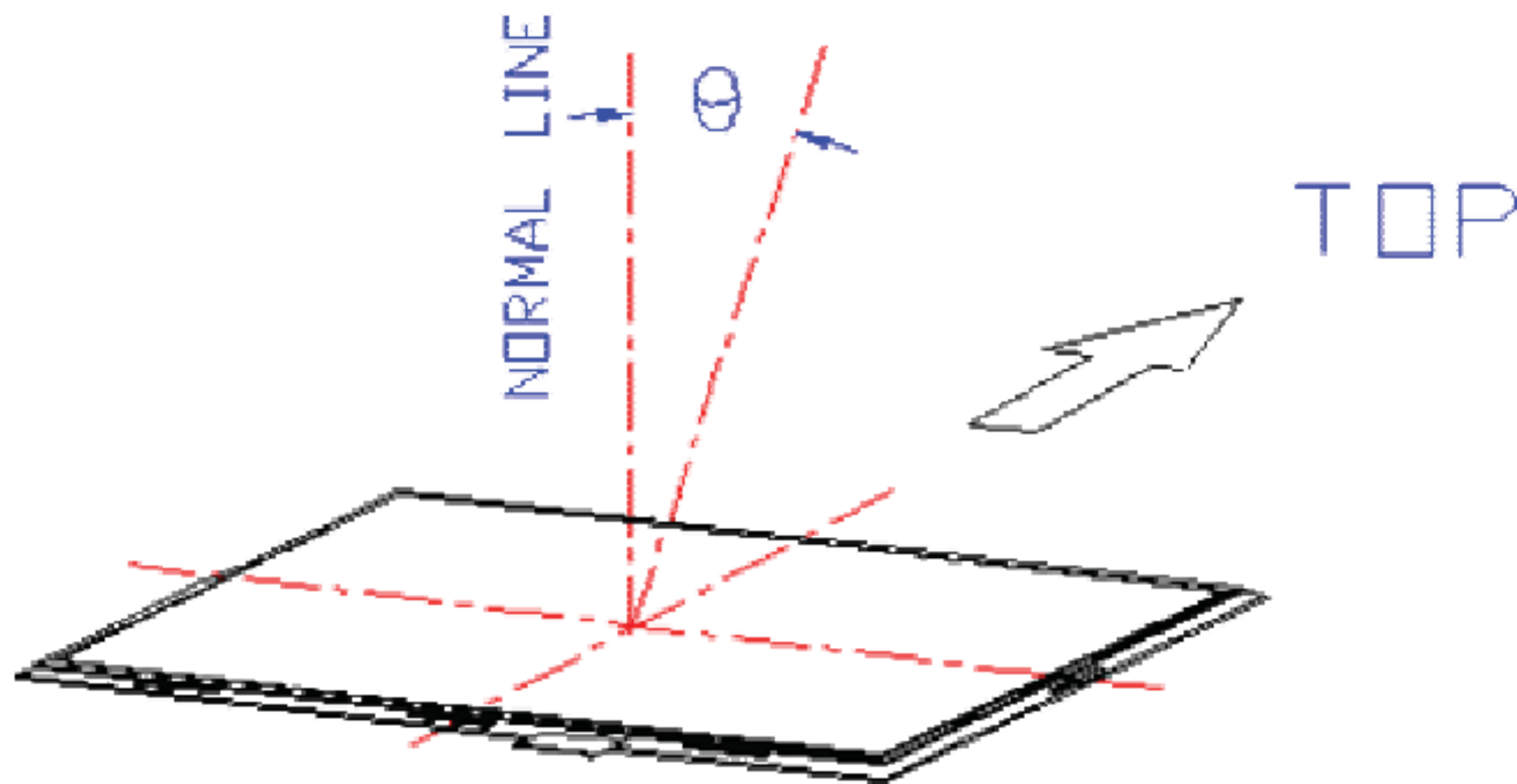
Contrast ratio is calculated with the following formula.

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

Note 5. 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. Transmission is defined as follow: ( $\theta = 0^\circ$ )

$$\text{Transmission} = B1/B2$$

B1=Photo detector output voltage when measuring the brightness of the LCD panel

Placed on the light source with no applied voltage

B2=Photo detector output voltage when measuring the light source.

Note 8. Luminance Uniformity of these 9 points is defined as below:



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

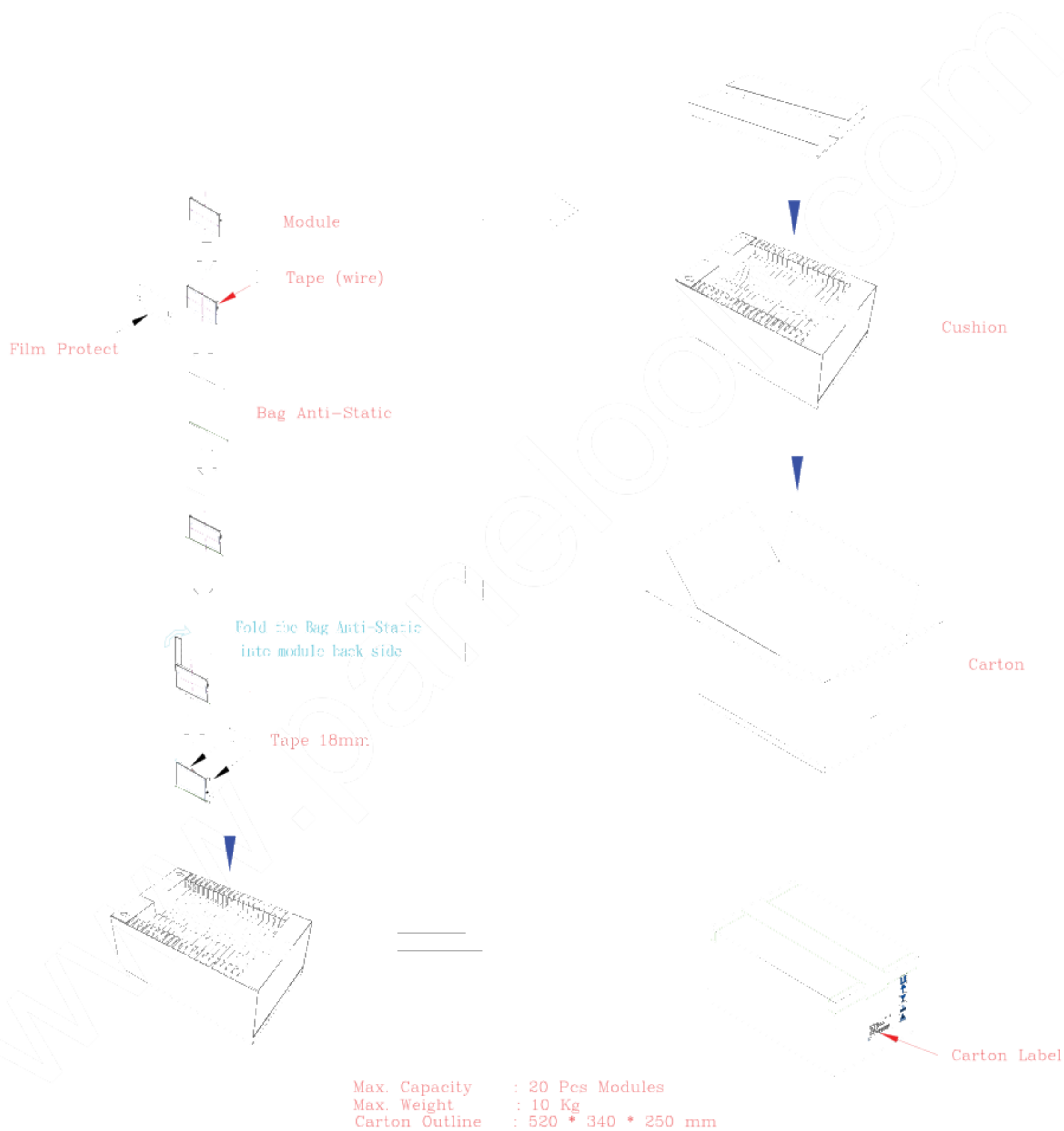
| No. | Test items                         | Conditions                                                                              | Remark                            |
|-----|------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------|
| 1   | High temperature storage           | Ta= 70℃ 240Hrs                                                                          |                                   |
| 2   | Low temperature storage            | Ta= -20℃ 240Hrs                                                                         |                                   |
| 3   | High temperature operation         | Tp= 60℃ 240Hrs                                                                          |                                   |
| 4   | Low temperature operation          | Ta= -10℃ 240Hrs                                                                         |                                   |
| 5   | High temperature and high humidity | Tp= 50℃, 80% RH 240Hrs                                                                  | Operation                         |
| 6   | Thermal shock                      | -30℃~70℃/ 100 cycles 1Hrs/cycle                                                         | Non-operation                     |
| 7   | Electrostatic discharge            | ±200V,200pF(0Ω), once for each terminal                                                 | Non-operation                     |
| 8   | Vibration                          | Frequency range : 10~55Hz<br>Stoke : 1.5mm<br><br>2 hours for each direction of X,Y,Z   | JIS D1601,<br>A-10<br>Condition A |
| 9   | Mechanical shock                   | 100G, 6ms, ±X,±Y,±Z<br>3 times for each direction                                       | JIS C0041,<br>A-7<br>Condition C  |
| 10  | Vibration (with carton)            | Random vibration:<br>0.015G <sup>2</sup> /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.

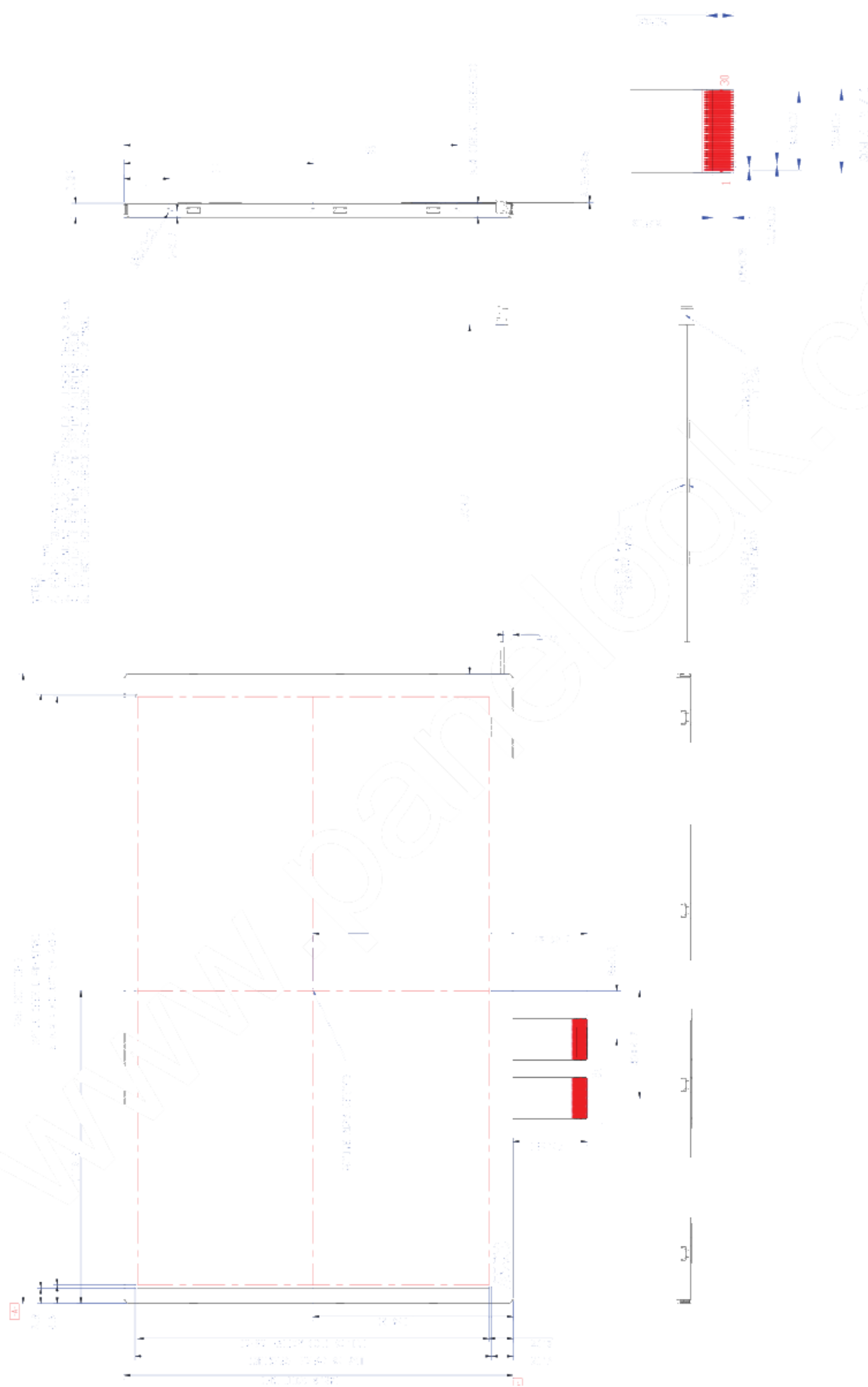
Note2: Tp: Panel Surface Temperature

Note3: All the cosmetic specification is judged before the reliability stress.

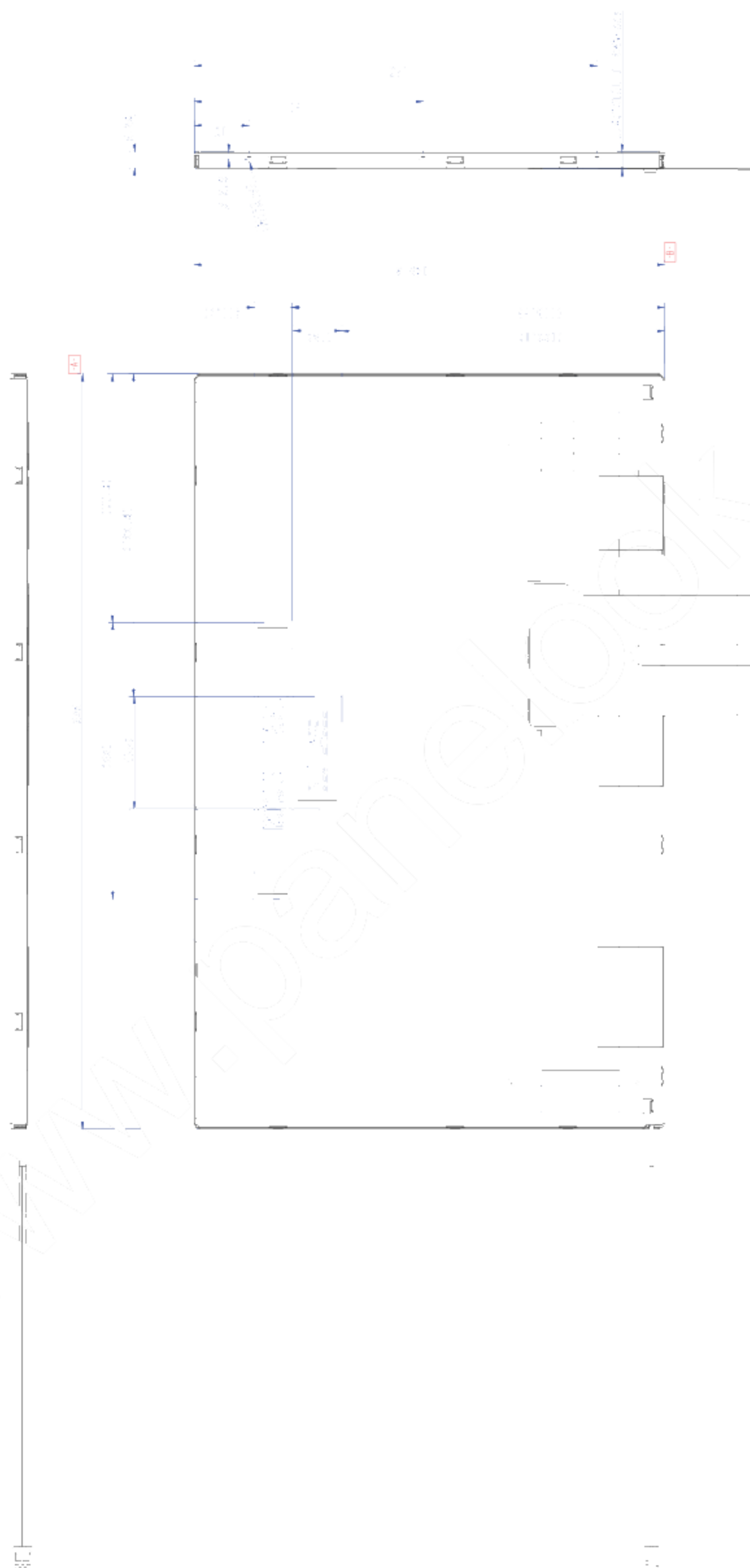
## E. Packing form



## Appendix:



**Fig.1 Outline dimension of TFT-LCD module (Front Side)**



**Fig.2 Outline dimension of TFT-LCD module (Rear Side)**

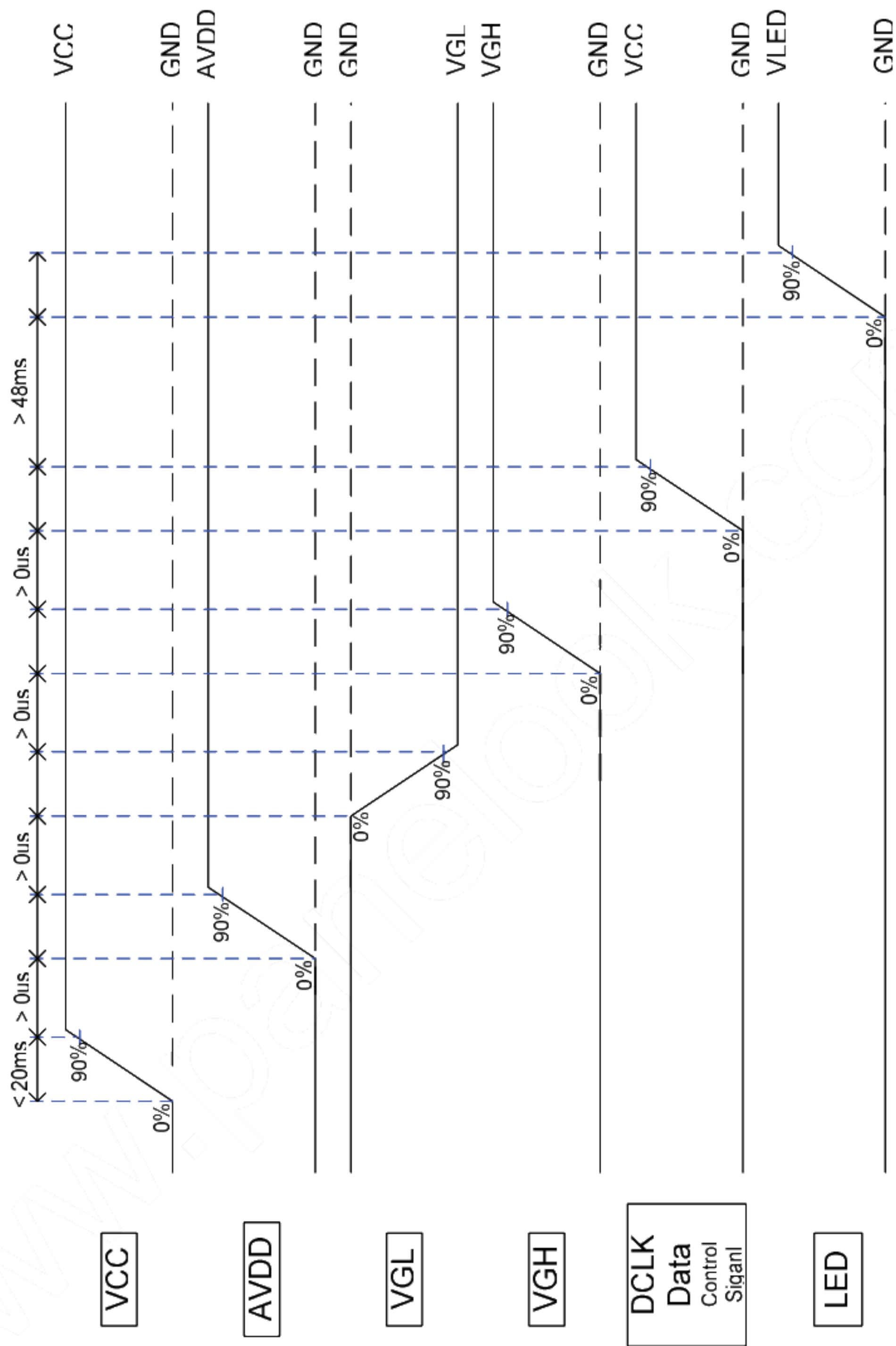


Fig.3 Power On sequence

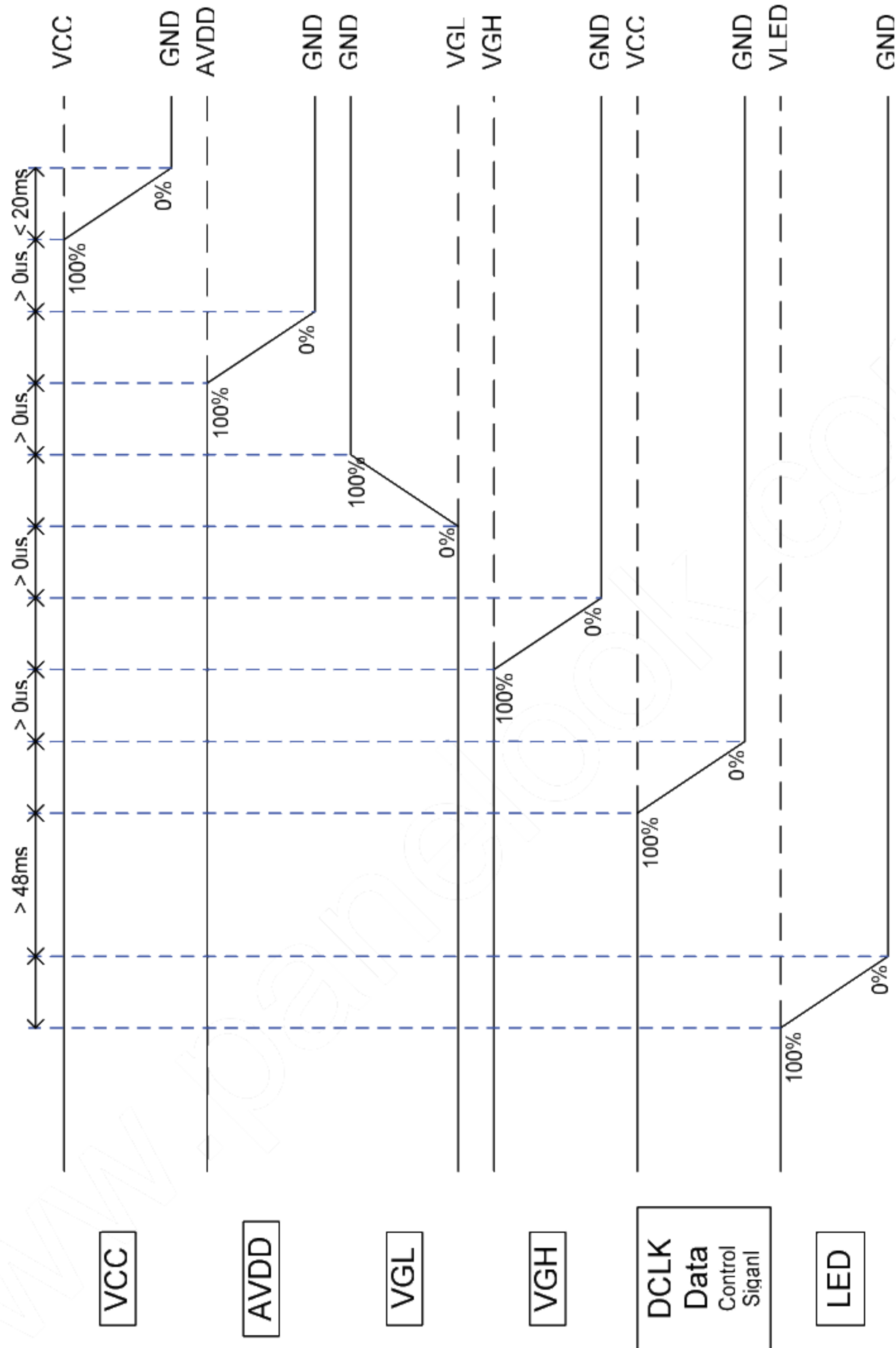
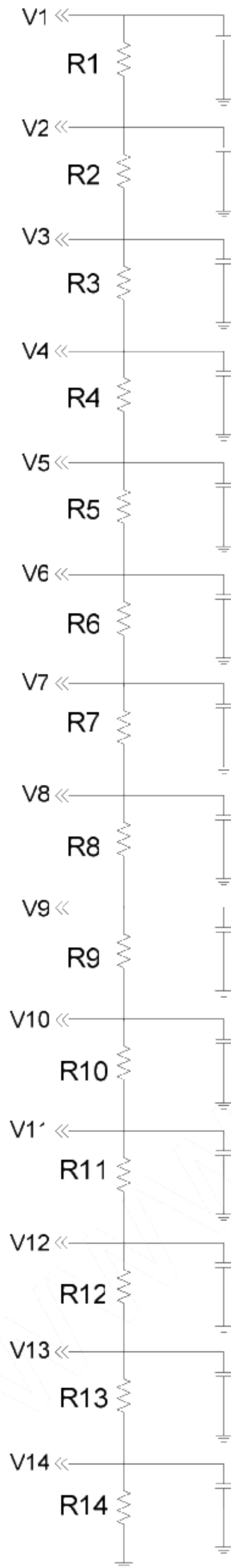


Fig.4 Power Off sequence



|     | Value( $\Omega$ ) |
|-----|-------------------|
| R1  | 14.0              |
| R2  | 127.0             |
| R3  | 68.0              |
| R4  | 52.3              |
| R5  | 60.4              |
| R6  | 91.0              |
| R7  | 86.6              |
| R8  | 215.0             |
| R9  | 102.0             |
| R10 | 56.2              |
| R11 | 51.1              |
| R12 | 133.0             |
| R13 | 17.8              |
| R14 | 19.6              |

|     | Value (V) |
|-----|-----------|
| V1  | 8.60      |
| V2  | 8.48      |
| V3  | 7.32      |
| V4  | 6.72      |
| V5  | 6.27      |
| V6  | 5.73      |
| V7  | 5.15      |
| V8  | 4.29      |
| V9  | 3.35      |
| V10 | 2.50      |
| V11 | 2.03      |
| V12 | 1.57      |
| V13 | 0.36      |
| V14 | 0.15      |

**Fig.5 Reference Gamma Voltage**