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| Doc. Version | 1.1 |
| Total Page | 20 |
| Date | 2006/10/13 |

Product Specification

7.0" COLOR TFT-LCD MODULE

MODEL NAME: C070VW02 V0

RoHS Compliance

<□>Preliminary Specification

< >Final Specification

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Note: The content of this specification is subject to change

Record of Revision

| Version | Revise Date | Page | Description |
|---------|-------------|------|--|
| 0.0 | 8.Dec,2005 | -- | Draft specification |
| 0.1 | 21.Apr,2006 | 5 | General Description – added backlight unit specification |
| | | 6 | 2.1.1 – Updated connector type |
| | | 8 | 2.2 – Modified VCOM |
| | | 8 | 3.1 – Modified AVDD |
| | | 8 | 3.1 – Modified VCOM |
| | | 9 | 3.3 & 3.4 – Modified AVDD condition |
| | | 12 | 5 – Modified response time Tr=6ms, Tf=10ms |
| | | 12 | 5 – Updated viewing angle |
| | | 15 | 7 – Updated front view outline dimension |
| | | 16 | 7 – Updated rear view outline dimension |
| | | 17 | 8 – Updated packing Form |
| | | 18 | 9.1 – Added gamma circuit |
| | | 19 | 9.2 – Modified power on/off sequence |
| 0.2 | 12.May 2006 | 8 | Updated V1~V5 MAX= |
| | | 16 | 6 – Update Outline Dimension – Front View |
| 0.3 | 26.May 2006 | 15 | Updated the vibration test conditions |
| 0.4 | 13.Jul 2006 | 8 | Updated backlight connector type |
| | | 12 | Updated pin description of connector |
| 1.0 | 26.Sep 2006 | 13 | Defined white chromaticity |
| 1.1 | 13 Oct 2006 | 6 | Modified connector type |
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General Description

The AUO Color amorphous silicon Thin Film Transistor LCD module is an active matrix Liquid Crystal Display produced by making the most of AUO's expertise in Flat Panel Display technologies having a 16:9 aspect ratio whose main application is navigation of automotive field.

Features

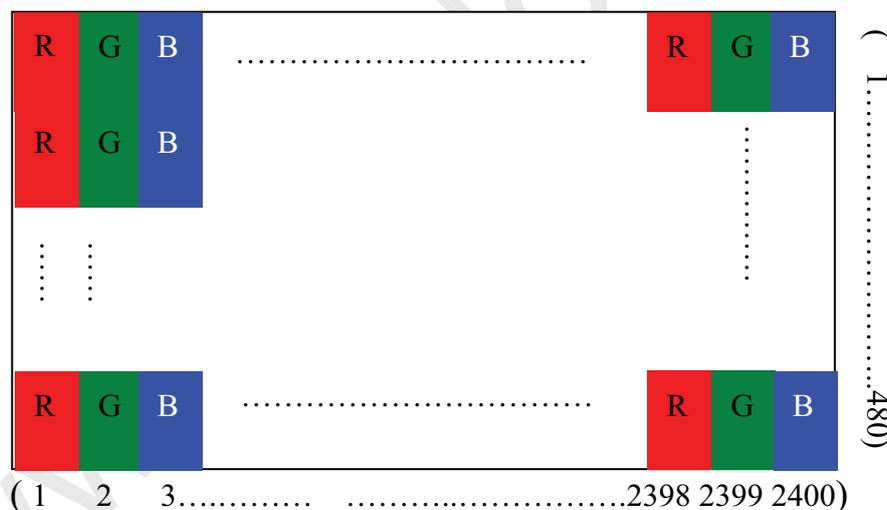
- 15:9 aspect ratio suitable in wide-screen systems
- Higher resolution image composed of 384,000 pixel elements
- Wide viewing angle technology
- High contrast by Super Wide View technology
- Robust module design by using COG mounting technology
- Wide range of options input format by PCB design
- TN-normally white mode
- High power LEDs backlight with Mercury-free solution

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1. General Information

| NO. | Item | Unit | Specification | Remark |
|-----|-------------------------|------|-----------------------------------|--------|
| 1 | Display Resolution | dot | 800RGB(H)×480(V) | |
| 2 | Active Area | mm | 152.40(H)×91.44(V) | |
| 3 | Screen Size | inch | 7.0(Diagonal) | |
| 4 | Pixel Pitch | mm | 0.0635xRGB(H)×0.1905(V) | |
| 5 | Color Configuration | -- | R. G. B. Stripe | Note 1 |
| 6 | Color Depth | -- | 262K Colors | Note 2 |
| 7 | Overall Dimension | mm | 165.0(H) × 104.0(V) × 5.5/9.15(T) | Note 3 |
| 8 | Weight | g | 150 | |
| 9 | Panel surface treatment | -- | AG(5% haze) | |
| 10 | Display Mode | -- | Normally White | |
| 11 | Backlight Unit | -- | High Power LEDs | |

Note 1: Below figure shows the dot stripe arrangement.



Note 2: The 262K color display depends on 6-bit data signal input.

Note 3: The thickness is 5.5mm at the thin side and 9.15mm at the thick side (with PCB).

Please refer to Sec 6, Outline Dimension for more details.

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2. Electrical Specifications

2.1 Pin Assignment

Connector type: [PF050-O50B-C20](#) or compatible

| Pin No | Symbol | I/O | Function | 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 | |

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|----|----------|-----|--|--|
| 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) | |

I: Input pin; O: Output pin; VI: Voltage Input; VO: Voltage Output; P: Power

2.2 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 |

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|-----------------------|--------------|------|------|---------|----|
| | Vref(V6~V10) | -0.3 | | 0.6AVDD | V |
| | VCOM | 4.0 | | 4.4 | V |
| Operating Temperature | Topa | -30 | | 85 | □ |
| Storage Temperature | Tstg | -40 | | 85 | □ |
| LED | Vf | 11.2 | 13.2 | 15.2 | V |
| | If | | 150 | 200 | mA |

3. Electrical Characteristics

3.1 Typical Operating Condition

| Items | Symbol | Product Specification | | | Unit |
|-------------------------|--------|-----------------------|------|----------|------|
| | | Min. | Typ. | Max. | |
| Power Voltage | VCC | 3.0 | 3.3 | 3.6 | V |
| | AVDD | 9.7 | 9.8 | 9.9 | V |
| | VGH | 14.0 | 15.0 | 16.0 | V |
| | VCOM | 4.0 | 4.2 | 4.4 | V |
| | VGL | -6.5 | -7 | -7.5 | V |
| Input Reference Voltage | V1~V5 | 0.4AVDD | — | AVDD-0.1 | V |
| | V6~V10 | 0.1 | — | 0.6AVDD | V |
| Input H/L level Voltage | VIH | 0.8VCC | — | VCC | V |
| | VIL | 0 | — | 0.2VCC | V |

Note: All values should be measured under the condition of GND=AVss=0V

3.2 Current Consumption

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|--------------------|--------|-----------|------|------|------|------|
| Current For Driver | IGH | VGH=15V | | 100 | 150 | uA |
| | IGL | VGL=-7V | | -100 | -150 | uA |
| | ICC | VCC=3.3V | | 3.5 | 5 | mA |
| | IDD | AVDD=9.8V | | 20 | 30 | mA |

3.3 LED Backlight Driving Condition (Connector : JST-PHR-2)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---------------|--------|-----------|--------|------|------|------|
| Voltage | Vf | | | 13.2 | 15.2 | V |
| Current | If | | | 150 | 200 | mA |
| LED life time | | Note 2 | 10,000 | -- | -- | Hrs |

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Note 1: Panel surface temperature should be kept less than content of section 2.2.
 "Absolute maximum ratings"

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$, $I_f=150\text{mA}$

3.4 AC Timing Condition

Characteristics ($V_{CC}=3.3\text{V}$, $AV_{DD}=9.8\text{V}$, $AV_{SS}=\text{GND}=0\text{V}$, $T_A=25^{\circ}\text{C}$)

| 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 for the last data to LD | Tld | 1 | | | Tcw |
| Pulse width of LD | Twld | 2 | | | Tcw |
| Time for LD to DIO1/2 | Tlds | 5 | | | Tcw |
| POL set-up time | Tpsu | 6 | | | ns |
| POL hold time | Tphd | 6 | | | ns |
| CKV pulse width | Tckv | 16 | 28 | 40 | Tcw |
| STV setup time | Tsuv | 400 | | | ns |
| STV hold time | Thdv | 400 | | | ns |
| Vertical display start | Tsv | | 3 | | TDH |
| Output stable time | Tst | | | 15 | us |

Note: The panel is designed to prevent the current leakage for the best display performance. If shorter discharge time is desired when system power off, then extra discharge circuit may be required at customer's side.

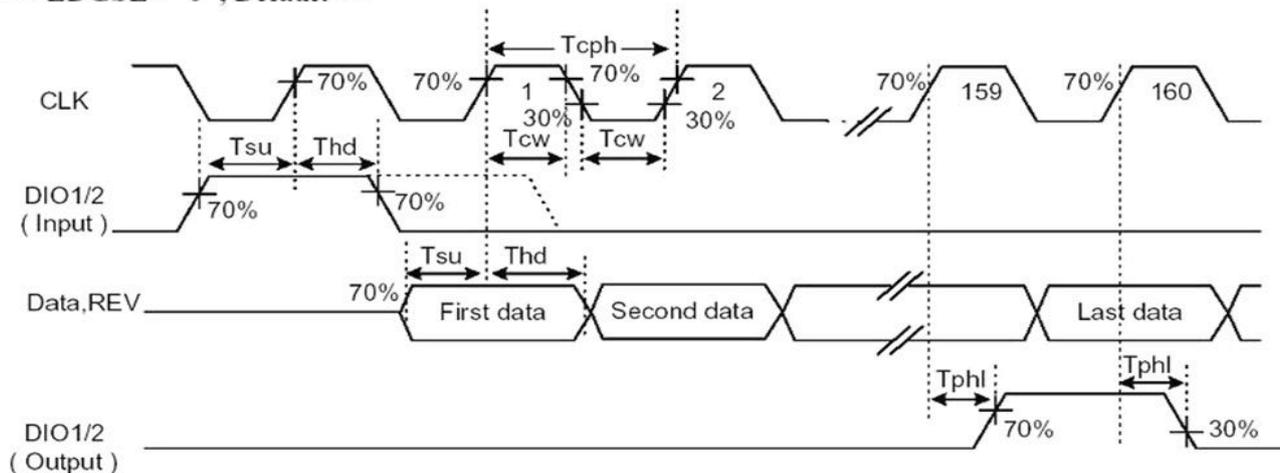
3.5 Timing Diagrams

Operation Mode 1

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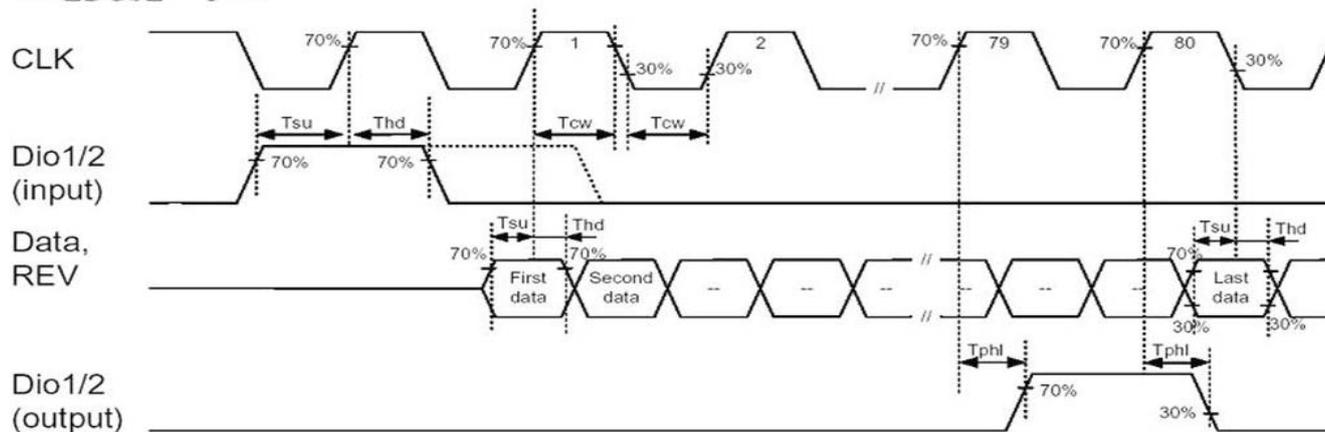
■ Timing Diagram 1 (CHNSL="1" , Default)

<< EDGSL="0", Default >>



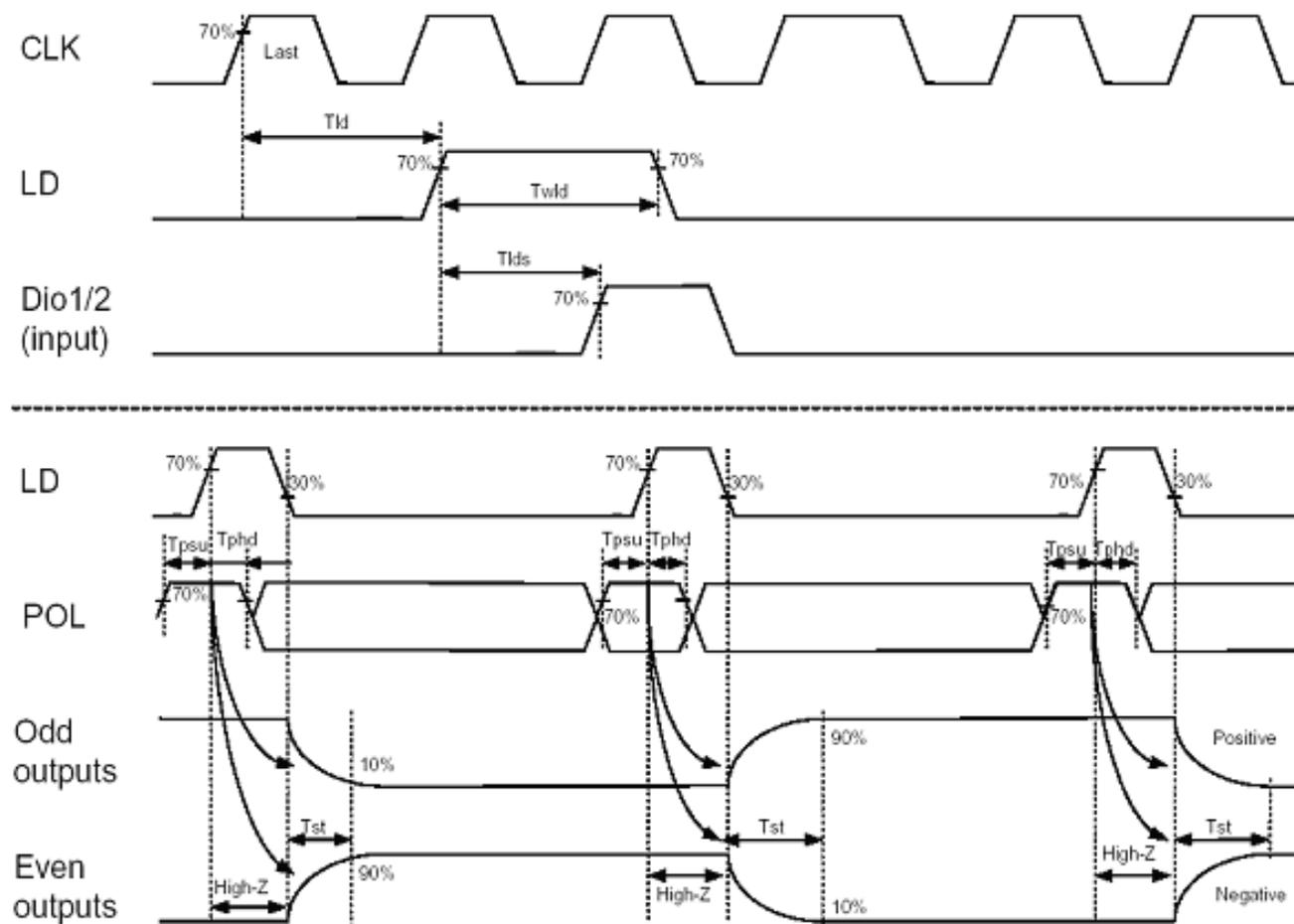
Operation Mode 2

<< EDGSL="1">>

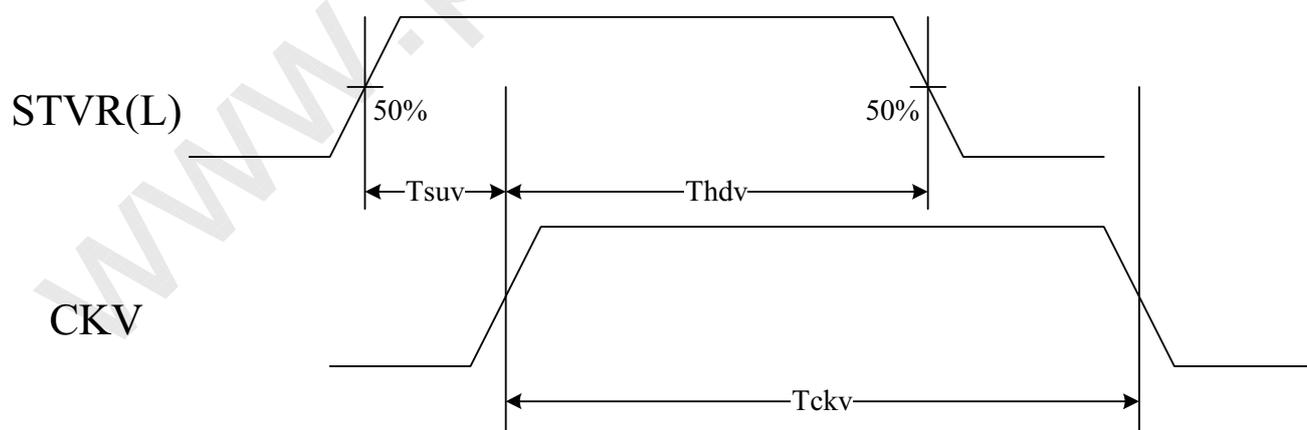


Horizontal timing

Timing Diagram 2



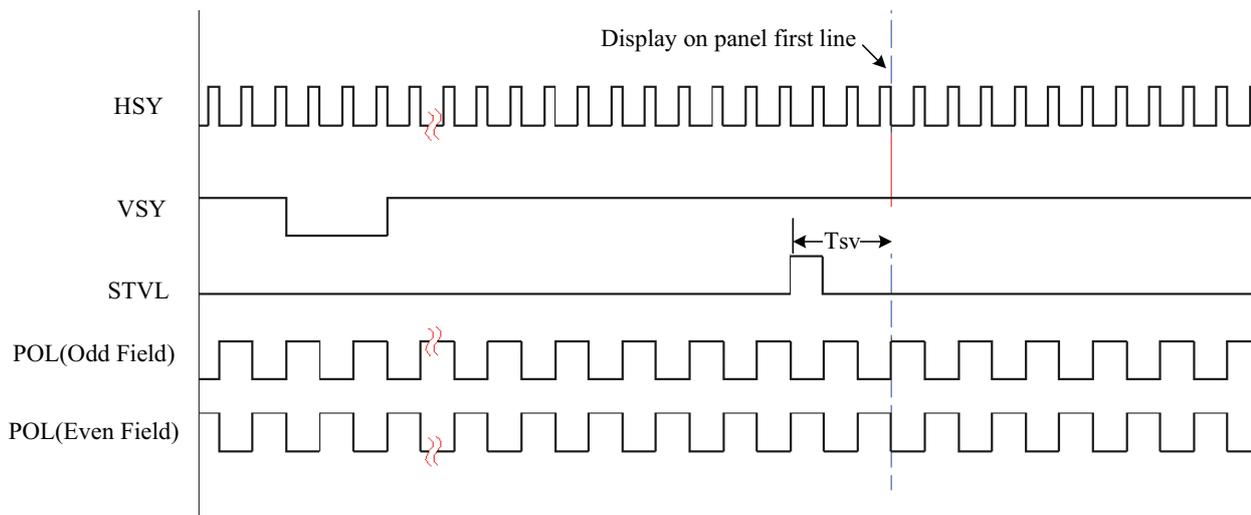
Vertical shift clock timing



Vertical timing (from up to down)



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4. Optical Specifications

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|--------------------|--------|--------|----------------------------|------|------|------|------|-----------|
| Response time | Rise | Tr | $\theta=0^\circ$ | - | 6 | 10 | ms | Note 3,5 |
| | Fall | Tf | | - | 10 | 20 | ms | |
| Contrast ratio | | CR | At optimized Viewing angle | 200 | 300 | - | - | Note 4, 5 |
| Viewing angle | Top | | CR \square 10 | 30 | 40 | | deg. | Note 5 |
| | Bottom | | | 50 | 60 | | | |
| | Left | | | 50 | 60 | | | |
| | Right | | | 50 | 60 | | | |
| Viewing angle | Top | | CR \square 5 | 40 | 50 | | deg. | Note 5 |
| | Bottom | | | 60 | 70 | | | |
| | Left | | | 60 | 70 | | | |
| | Right | | | 60 | 70 | | | |
| Brightness | | Y_L | If=150mA,25 \square | 300 | 400 | - | nit | Note 6 |
| White chromaticity | | x | $\theta=0^\circ$ | 0.26 | 0.31 | 0.36 | | Note 6 |
| | | y | $\theta=0^\circ$ | 0.29 | 0.34 | 0.39 | | |

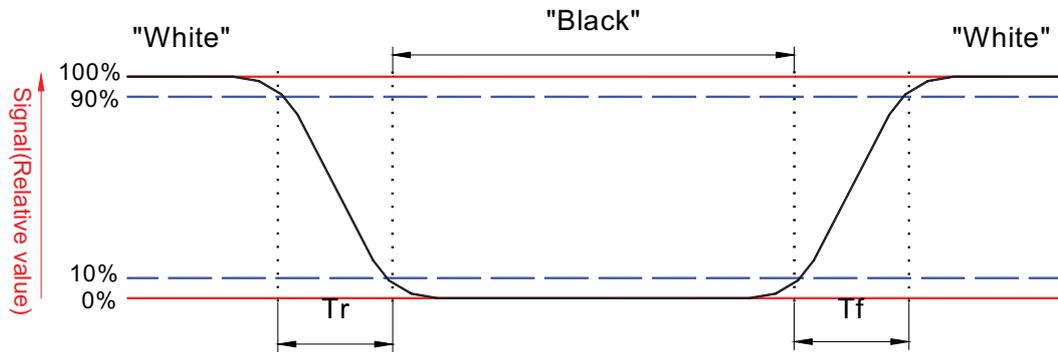
Note 1 : Ambient temperature = 25 $^\circ$ C, and lamp current If = 150 mA. To be measured in the dark room.

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

Note 3: Definition of response time:

The response time is defined as the time interval between the 10% and 90% of amplitudes. 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).

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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 Vdata=V5 or V6

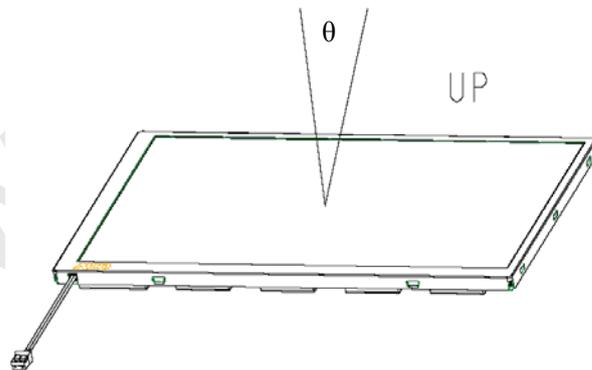
Black Vdata=V1 or V10

(For definition of V1, V5, V6 & V10, please refer to section 9.1)

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

Note 6. Brightness and White Chromaticity are measured at the center area of the panel at white frame.

Note 7. For definition of viewing angle please refer to figure as below.



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5. Reliability Test Items

| No. | Test items | Conditions | | Remark |
|-----|--------------------------|---|---------------------|---------------------------------|
| 1 | High temperature storage | Ta= 85□ | 240Hrs | |
| 2 | Low temperature storage | Ta= -40□ | 240Hrs | |
| 3 | High temperature | Ta= 85□ | 240Hrs | |
| 4 | Low temperature | Ta= -30□ | 240Hrs | |
| 5 | High temperature and | Ta= 60□, 90% RH | 240Hrs | Operation |
| 6 | Heat shock | -30□~85□/100 cycles 1Hrs/cycle | | Non-operation |
| 7 | Electrostatic discharge | ±200V,200pF(0Ω), once for each terminal | | Non-operation |
| 8 | Vibration | Frequency range | 8~33.3Hz | JIS D1601,A10 Condition A |
| | | Stoke | 1.3mm | |
| | | Sweep | 2.9G, 33.3~400Hz | |
| | | Cycle | 15min. | |
| | | 2 hours for each direction of X, Z 4 hours for Y direction | | |
| 9 | Mechanical shock | 100G, 6ms, ±X,±Y,±Z 3 times for each direction | | |
| 10 | Vibration (with carton) | Random vibration: 0.015G ² /Hz from 5~200Hz -6dB/Octave from 200~500Hz | | IEC 68-34 |
| 11 | Drop (with carton) | Height: 60cm 1 corner, 3 edges, 6 surfaces | | |

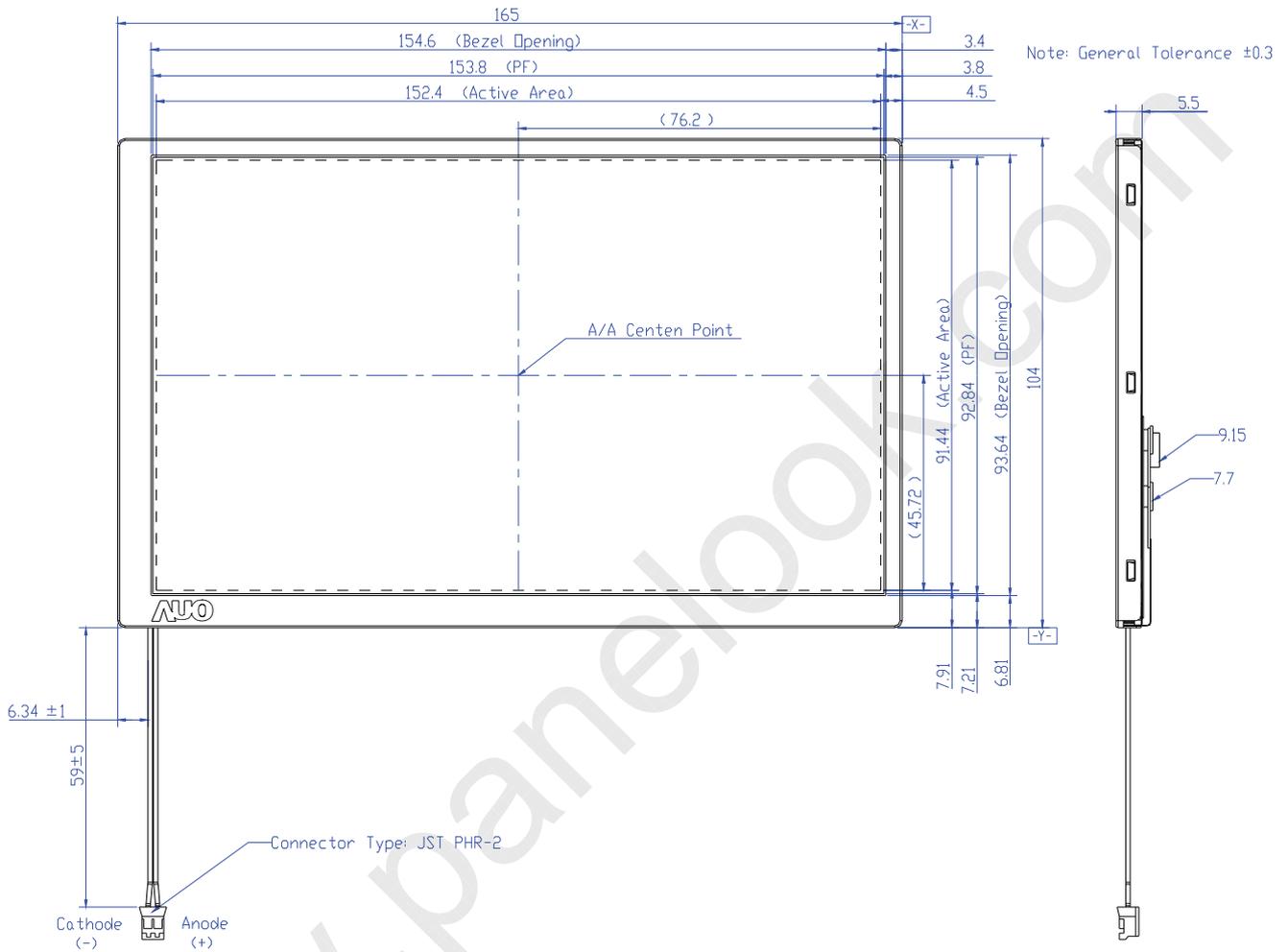
Note 1: Ta: Ambient temperature.

Note 2: In the standard conditions, there is not display function failure issue occurred. All the cosmetic specification is judged before the reliability stress.

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6. Outline Dimension

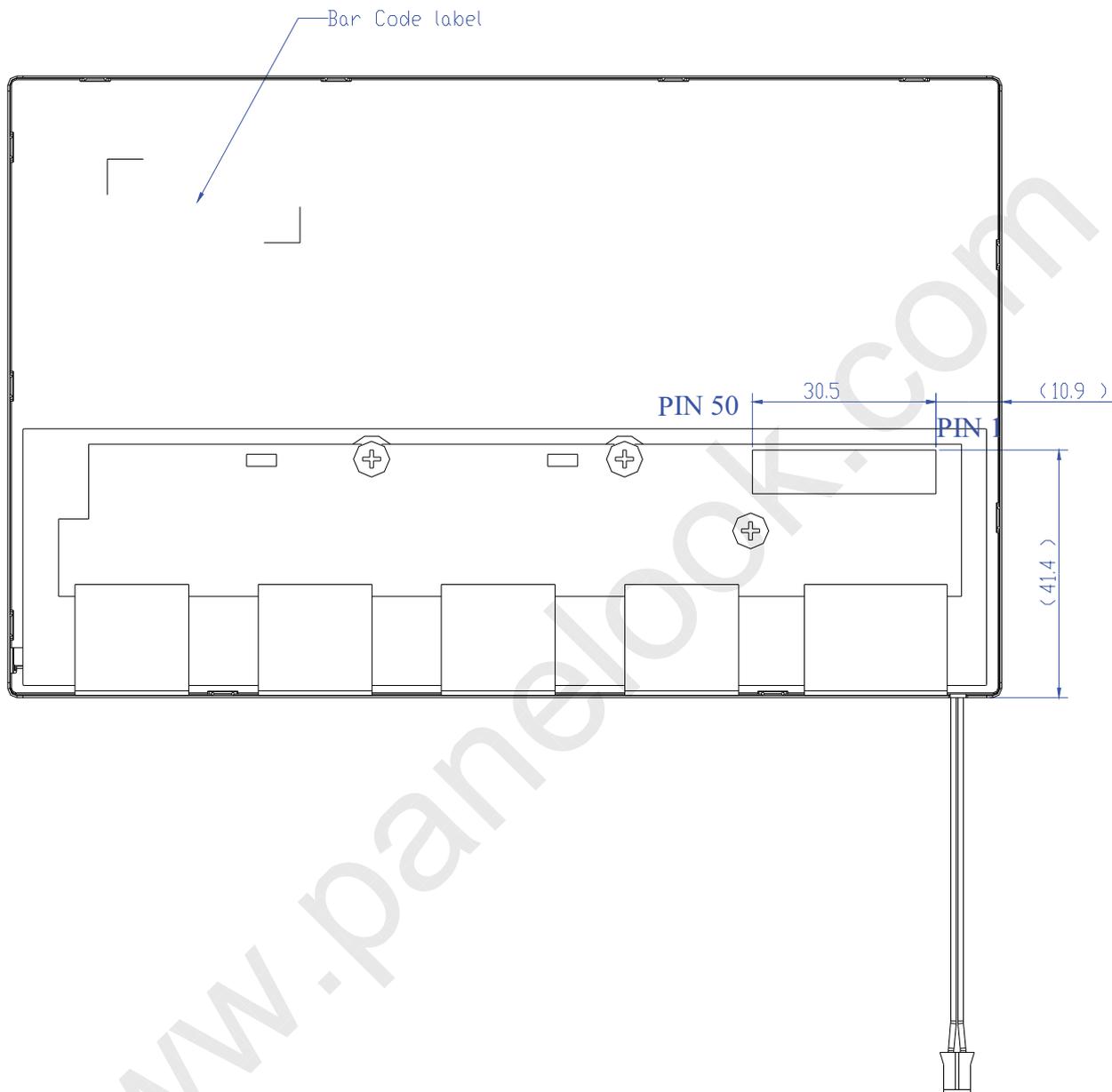
Front View





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Rear View

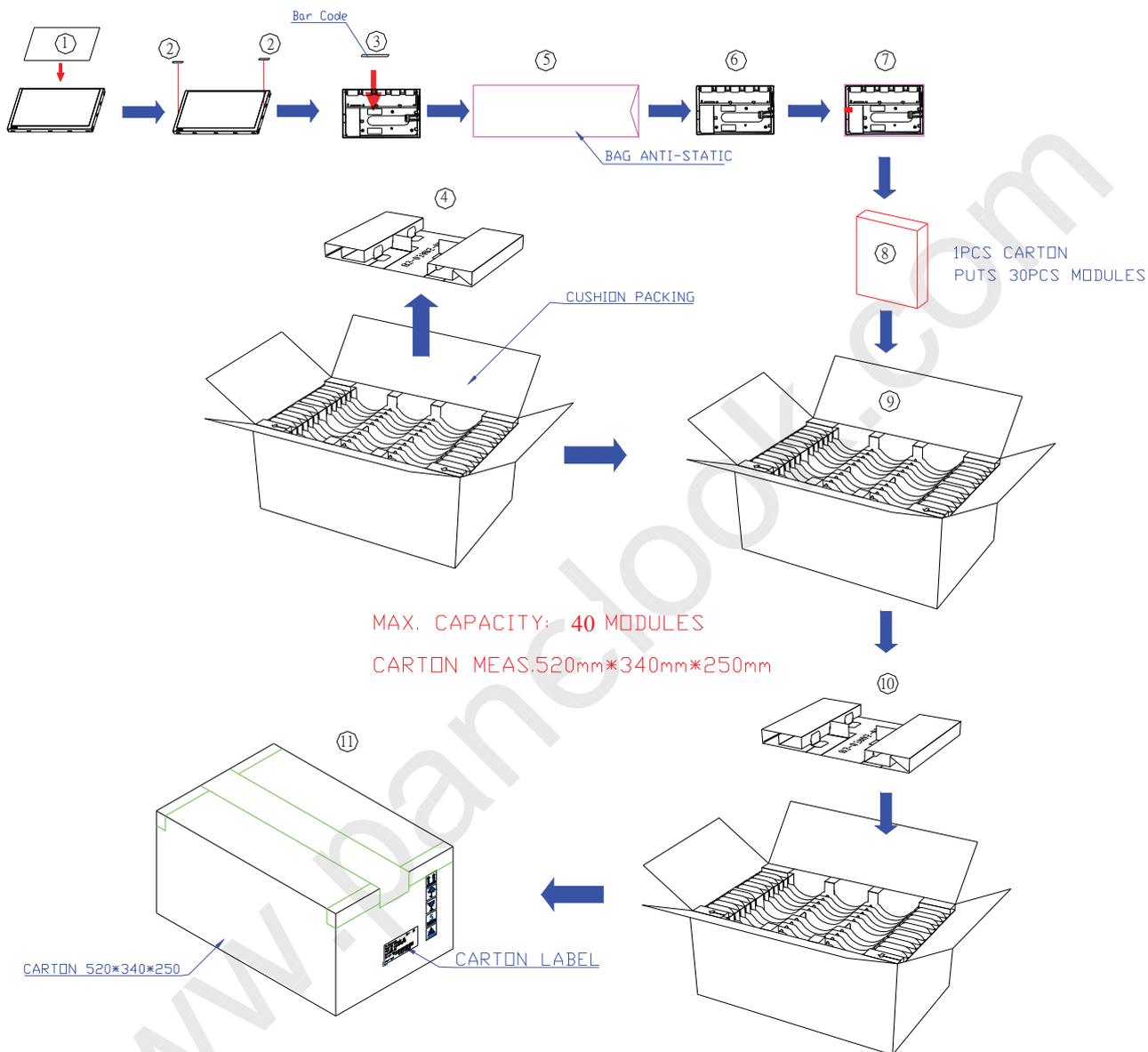


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7. Packing Form

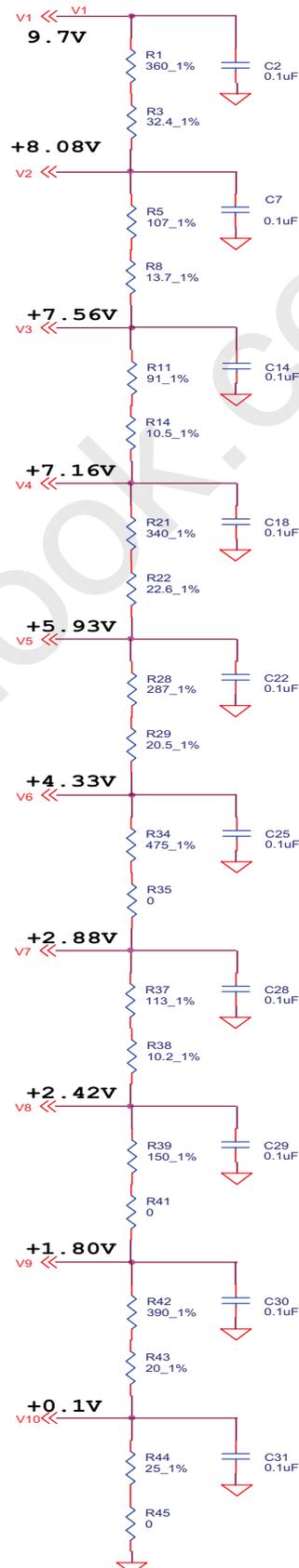


8. Application Notes

8.1 Typical application circuit

Gamma circuit:

| | | |
|-----|------|------|
| | AVDD | 9.80 |
| 00H | V1 | 9.70 |
| 10H | V2 | 8.08 |
| 20H | V3 | 7.56 |
| 30H | V4 | 7.16 |
| 3FH | V5 | 5.93 |
| 3FH | V6 | 4.33 |
| 30H | V7 | 2.88 |
| 20H | V8 | 2.42 |
| 10H | V9 | 1.80 |
| 00H | V10 | 0.10 |



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8.2 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.

* Power on/off Sequence *

