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| Version | 2.2 |
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Product Specification

10.4" SVGA Color TFT-LCD Module

MODEL NAME: A104SN01_V0

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

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

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Contents:

| | |
|--|------------|
| A. Physical specification..... | P3 |
| B. Electrical specifications..... | P4 |
| C. Optical specifications..... | P11 |
| D. Reliability test items..... | P13 |
| E. Packing form..... | P14 |



Appendix:

Fig.1 Outline dimension of TFT-LCD module..... **P15**



A. Physical specifications

| NO. | Item | Specification | Remark |
|-----|--------------------------|---------------------|--------|
| 1 | Display resolution (dot) | 800RGB(H)×600(V) | |
| 2 | Active area (mm) | 211.2(H) x 158.4(V) | |
| 3 | Screen diagonal (inch) | 10.4" | |
| 4 | Pixel pitch (mm) | 0.264(H)×0.264(V) | |
| 5 | Color configuration | R. G. B. stripe | |
| 6 | Overall dimension (mm) | 243.0x184.0x24.0 | Note 1 |
| 7 | Weight (g) | 680 | |

Note 1: Refer to Fig. 1 (P.12)



B. Electrical specifications

1. Absolute maximum ratings

| Item | Symbol | Condition | Min. | Max. | Unit | Remark |
|-----------------------|-----------------|-----------|------|------|------|---------------------|
| Power Voltage | V _{DD} | Ta= 25°C | -0.3 | 3.4 | V | NOTE1 |
| | VBL | | 10.8 | 13.2 | V | |
| | DIMMER | | 0 | 5 | V | |
| | REV | | 0 | 3.4 | V | |
| Operating Temperature | To | - | -10 | 60 | °C | Ambient Temperature |
| Storage Temperature | Ts | - | -20 | 70 | °C | Ambient Temperature |

NOTE1: VBL is for inverter power, and typical is 12V.

2. Electrical characteristics

2.1 Typical operating conditions

| Item | Symbol | Min. | Type | Max. | Unit | Remark |
|----------------------|---------|-----------------|------|------|------|--------|
| Power support | VDD | 3.15 | 3.3 | 3.4 | V | |
| | VBL | 10.8 | 12 | 13.2 | V | |
| | VDIMMER | 5 | - | 0 | | |
| VCDC | | 2.3 | 3.3 | 4.6 | V | NOTE2 |
| Input signal voltage | H level | V _{IH} | 2.0 | VDD | V | |
| | L level | V _{IL} | 0 | 0.8 | V | |

NOTE1: When VDIMMER =0V, is the most brightness, and VDIMMER=5V brightness become weak.

NOTE2:

2.2 Current consumption

| Item | Symbol | Condition | Min. | Type | Max. | Unit |
|----------------------|--------|-----------|------|------|------|------|
| Current for PCB | IVDD | VDD=3.3V | - | 660 | 770 | mA |
| Current for Inverter | IVBL | VBL=12V | - | 600 | 720 | mA |
| | | Vcon=0V | | | | |

2.3 Inrush Current and Inrush time

| Item | Symbol | Condition | Min. | Type | Max. | Unit |
|-----------------------------|---------|--------------------|------|------|-------|------|
| Inrush Current for PCB | Ivdsh | VDD=3.3V | - | 1.0 | 1.2 | A |
| | Tlvdsh | | | 15 | 10 | ms |
| Inrush Current for Inverter | Ivbsh | VBL=12V Vcon=0V | - | 13.7 | 15.07 | A |
| | Tl vbsh | | | 30 | 33 | us |

3 Signal Description

3.1 Connector

Physical interface is described as for the connector on module.

These connectors are capable of accommodating the following signals and will be following components.

| Connector Name / Designation | For Digital Signal Connector |
|------------------------------|------------------------------|
| Manufacturer | Kyocera Elco |
| Type / Part Number | 04 6274 042 000 800 |

3.2 Pin assignment

| Pin No. | Signal Name | Pin No. | Signal Name |
|---------|-------------|---------|-------------|
| 1 | DGND | 2 | RxIN0+ |
| 3 | RxIN0- | 4 | DGND |
| 5 | RxIN1+ | 6 | RxIN1- |
| 7 | DGND | 8 | RxIN2+ |
| 9 | RxIN2- | 10 | DGND |
| 11 | CKIN+ | 12 | CKIN- |
| 13 | DGND | 14 | REVERSE |
| 15 | DGND | 16 | DIMMER |
| 17 | DGND | 18 | DGND |
| 19 | DGND | 20 | DGND |
| 21 | DGND | 22 | DGND |
| 23 | DGND | 24 | DGND |
| 25 | VDD | 26 | VDD |
| 27 | VDD | 28 | VDD |
| 29 | VDD | 30 | VDD |
| 31 | VDD | 32 | VDD |
| 33 | VBL_GND | 34 | VBL_GND |
| 35 | VBL_GND | 36 | VBL_GND |
| 37 | VBL_GND | 38 | VBL |
| 39 | VBL | 40 | VBL |
| 41 | VBL | 42 | VBL |



3.3 Signal Description

| Signal Name | Description |
|---------------------|---|
| RxIN0-, RxIN0+ | LVDS differential data input(Red0-Red5, Green0) |
| RxIN1-, RxIN1+ | LVDS differential data input(Green1-Green5, Blue0-Blue1) |
| RxIN2-, RxIN2+ | LVDS differential data input(Blue2-Blue5, Hsync, Vsync, DE) |
| RxCLKIN-, RxCLKIN0+ | LVDS differential clock input |
| VDD | +3.3V Power Supply |
| DGND | Ground of PCB |
| VBL_GND | Ground of Inverter |
| VBL | +12V Power Supply for inverter |
| REVERSE | Reverse function for Panel display |
| DIMMER | To control brightness of backlight |

Internal circuit of LVDS inputs are as following.

| Signal Name | Description | |
|--|--|--|
| +RED5 +RED4 +RED3 +RED2 +RED1 +RED0 | Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB) Red-pixel Data | Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data. |
| +GREEN 5 +GREEN 4 +GREEN 3 +GREEN 2 +GREEN 1 +GREEN 0 | Green Data 5 (MSB) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB) Green-pixel Data | Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data. |
| +BLUE 5 +BLUE 4 +BLUE 3 +BLUE 2 +BLUE 1 +BLUE 0 | Blue Data 5 (MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB) Blue-pixel Data | Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data. |
| RxCLKIN- | Data Clock | The typical frequency is 40 MHz. The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high. |
| DE | Data Enable | This signal is strobed at the falling edge of -DTCLK. When the signal is high, the pixel data shall be valid to be displayed. |
| VSYNC | Vertical Sync | The signal is synchronized to RxCLKIN-. |
| HSYNC | Horizontal Sync | The signal is synchronized to RxCLKIN- . |

Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

3.4 Signal Electrical Characteristics

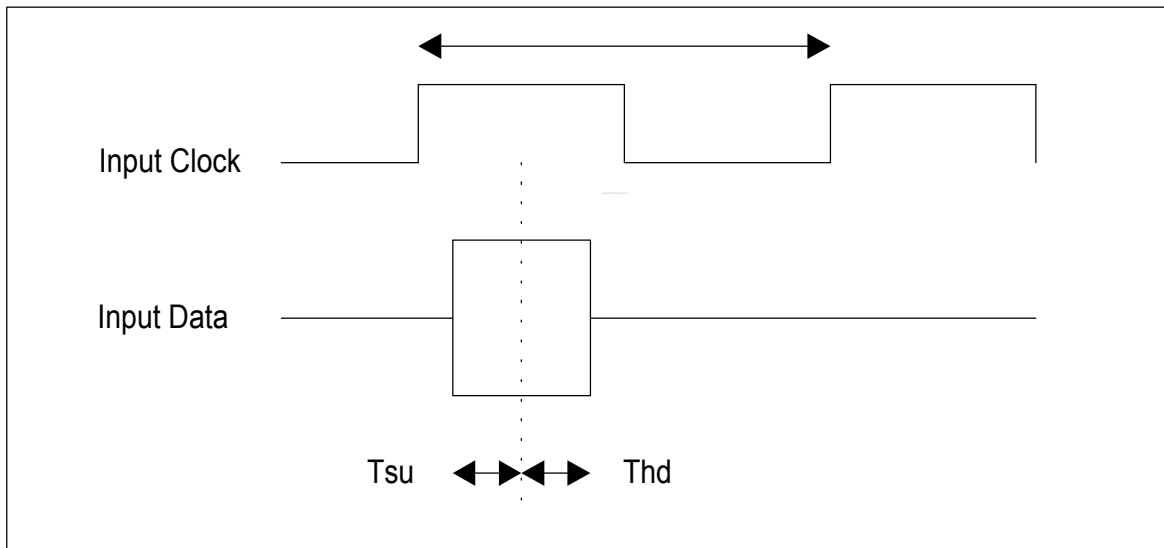
It is recommended to refer the specifications of SN75LVDS86DGG (Texas Instruments) in detail.

Signal electrical characteristics are as follows;

| Parameter | Condition | Min | Max | Unit |
|------------|---|-------------|------------|-------------|
| Vth | Differential Input High Voltage(Vcm=+1.2V) | | 100 | [mV] |
| Vtl | Differential Input Low Voltage(Vcm=+1.2V) | -100 | | [mV] |

LVDS Macro AC characteristics are as follows:

| | Min. | Max. |
|-----------------------|-------|--------------|
| Clock Frequency (F) | 20MHz | 85MHz |
| Data Setup Time (Tsu) | 600ps | |
| Data Hold Time (Thd) | 600ps | |





4. Timing Characteristics

Basically, interface timing should match the VESA 800x600 /60Hz(VG901101) manufacturing guide line timing.

4.1 SVGA MODE

(a) DE mode

| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
|----------------------------|-------------|-----------|------------|------------|------------|--------|
| Clock frequency | Fck | 36 | 40 | 50 | MHz | |
| Horizontal blanking | Thb1 | 18 | 256 | 624 | Clk | |
| Vertical blanking | Tvb1 | 3 | 28 | 184 | Th | |

(b) HV mode

| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
|--------------------------------|-------------|-------------|-------------|-------------|------------|--------|
| Clock frequency | Fck | 36 | 40 | 50 | MHz | |
| Hsync period | Th | 1018 | 1056 | 1424 | Clk | |
| Hsync pulse width | Thw | 2 | 128 | - | Clk | |
| Hsync front porch | Thf | 8 | 40 | - | Clk | |
| Hsync back porch | Thb | 4 | 88 | - | Clk | |
| Hsync Active | | - | 800 | - | Clk | |
| Hsync blanking | Thb1 | 218 | 256 | 624 | Clk | |
| Vsync period | Tv | 625 | 628 | 784 | Th | |
| Vsync pulse width | Tvw | 1 | 4 | - | Th | |
| Vsync front porch | Tvf | 0 | 1 | - | Th | |
| Vsync blanking | Tvb1 | 25 | 28 | 184 | Th | |
| Vsync Active | | - | 600 | - | Th | |
| Hsync/Vsync phase shift | Tvpd | 0 | 320 | - | Clk | |

| Item | Symbol | Value | Unit | Description |
|---------------------------------|------------|------------|------------|---|
| Horizontal display start | The | 216 | Clk | After falling edge of Hsync, counting 216clk, then getting valid data from 217th clk's data. |
| Vertical display start | Tve | 27 | Th | After falling edge of Vsync, counting 27th, then getting 28th Th's data. |



b. VGA MODE

(a) DE mode

| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
|----------------------------|-------------|------|-------------|------------|------------|--------|
| Clock frequency | Fck | - | 25.2 | 36 | MHz | |
| Horizontal blanking | Thb1 | - | 144 | 192 | Clk | |
| Vertical blanking | Tvb1 | - | 29 | 29 | Th | |

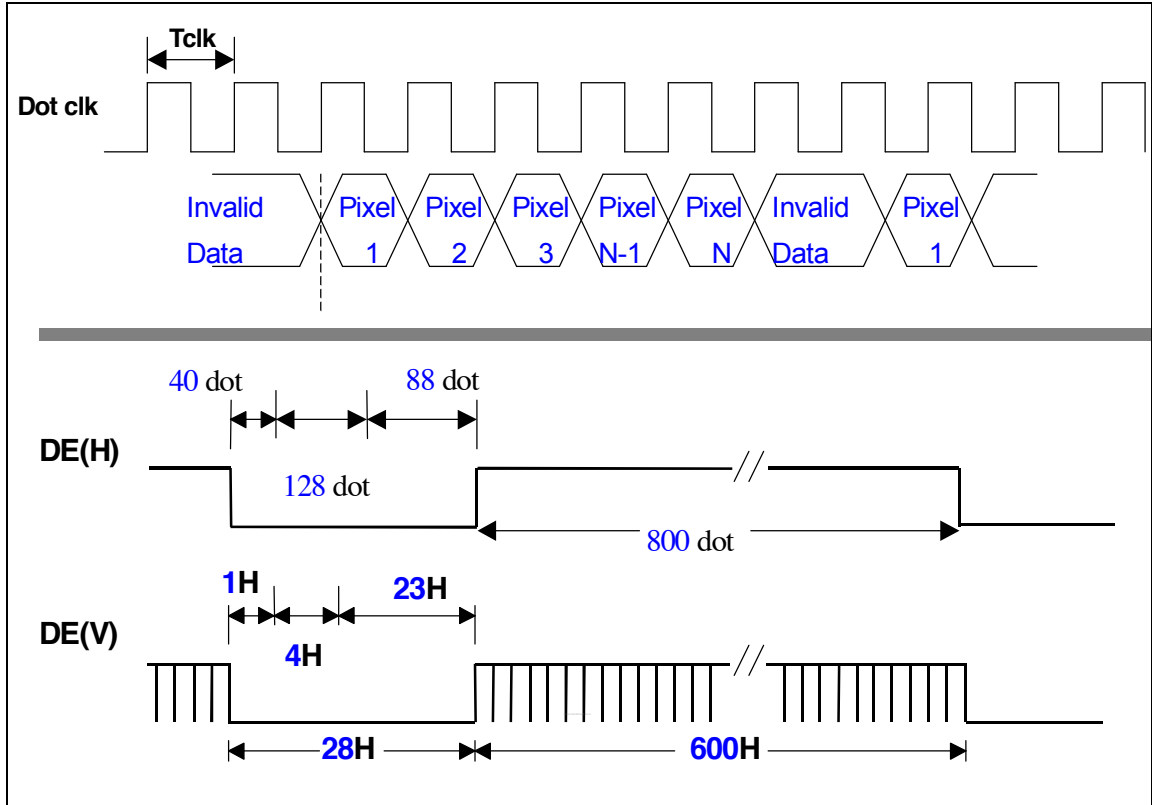
(b) HV mode

| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
|--------------------------------|-------------|------------|-------------|------------|------------|--------|
| Clock frequency | Fck | - | 25.2 | 36 | MHz | |
| Hsync period | Th | 680 | 800 | 832 | Clk | |
| Hsync pulse width | Thw | - | 96 | 120 | Clk | |
| Hsync front porch | Thf | - | 8 | 56 | Clk | |
| Hsync back porch | Thb | - | 40 | 80 | Clk | |
| Hsync blanking | Thb1 | - | 144 | 192 | Clk | |
| Hsync Active | | - | 640 | - | Clk | |
| Hsync left border | | - | 8 | - | Clk | |
| Hsync right border | | - | 8 | - | Clk | |
| Vsync period | Tv | 509 | 525 | - | Th | |
| Vsync pulse width | Tvw | - | 2 | 3 | Th | |
| Vsync front porch | Tvf | - | 2 | - | Th | |
| Vsync blanking | Tvb1 | - | 29 | - | Th | |
| Vsync active | | - | 480 | - | Th | |
| Hsync/Vsync phase shift | Tvpd | 0 | 320 | - | Clk | |
| Vsync top border | | - | 8 | - | Th | |
| Vsync bottom border | | - | 8 | - | Th | |

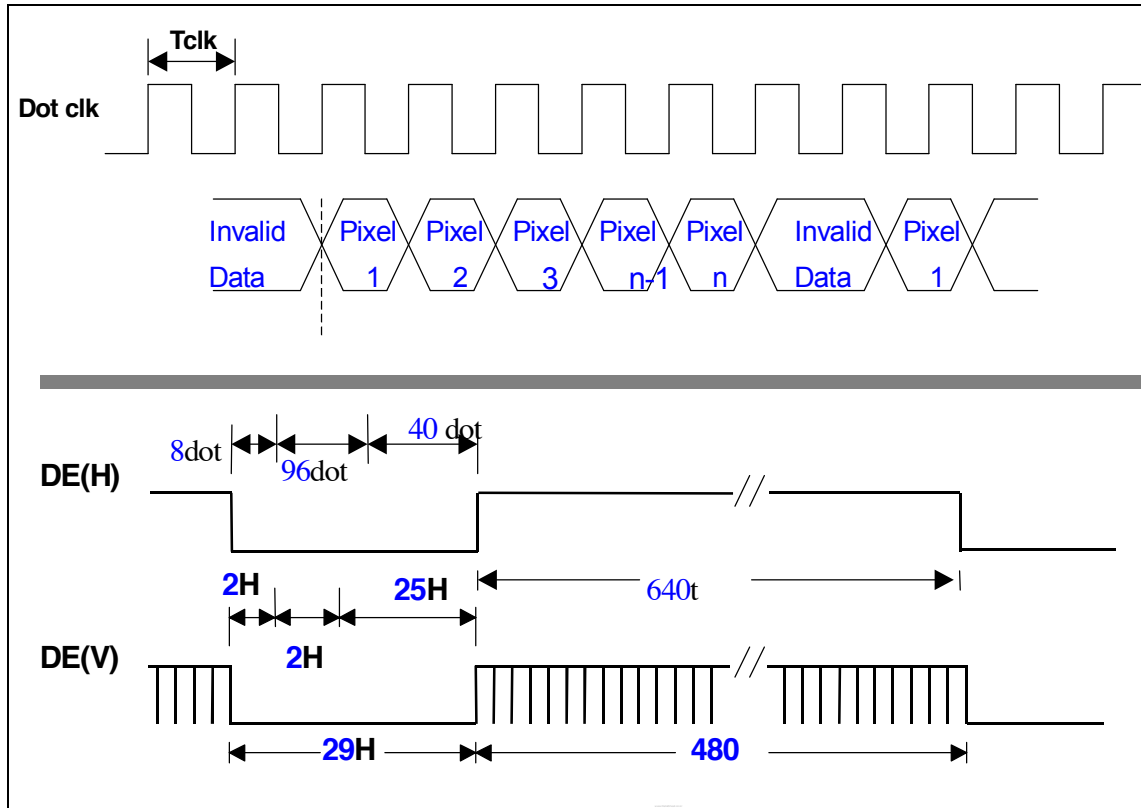
| Item | Symbol | Value | Unit | Description |
|---------------------------------|------------|------------|------------|---|
| Horizontal display start | The | 144 | Clk | After falling edge of Hsync, counting 144clk, then getting valid data from 145th clk's data. |
| Vertical display start | Tve | 35 | Th | After falling edge of Vsync, counting 35th, then getting 36th Th's data. |

5. Timing Definition

a. SVGA mode



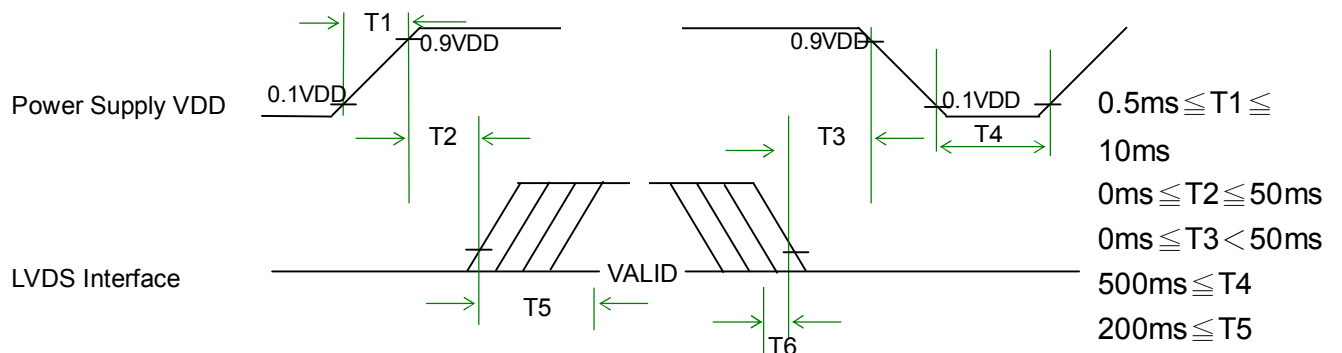
b. VGA Mode



6. Power ON/OFF Sequence

VDD power and lamp on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.

Sequence of Power-on/off and signal-on/off



Apply the lamp voltage within the LCD operating range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal.

C. Optical specification (Note 1, Note 2, Note 3)

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|--------------------|--------|----------------------------|--------|------|------|-------------------|----------|
| Response time | Rise | $\theta = 0^\circ$ | - | 10 | 25 | ms | Note 4,6 |
| | Fall | | - | 25 | 50 | | |
| Contrast ratio | CR | At optimized Viewing angle | 200 | 350 | - | - | Note 5,6 |
| Viewing angle | Upper | $CR \geq 10$ | 30 | 40 | - | Degree | Note 6,7 |
| | Lower | | 50 | 60 | - | | |
| | Left | | 50 | 60 | - | | |
| | Right | | 50 | 60 | - | | |
| Lamp Life Time | - | - | 10,000 | - | - | - | Note 8 |
| Luminance | Y_L | $\theta = 0^\circ$ | 400 | 450 | - | cd/m ² | Note 9 |
| White chromaticity | X | $\theta = 0^\circ$ | 0.28 | 0.33 | 0.38 | - | - |
| | Y | $\theta = 0^\circ$ | 0.30 | 0.35 | 0.40 | - | |

Note 1 : Ambient temperature =25°C . And lamp current $I_L = 5.2$ mArms.

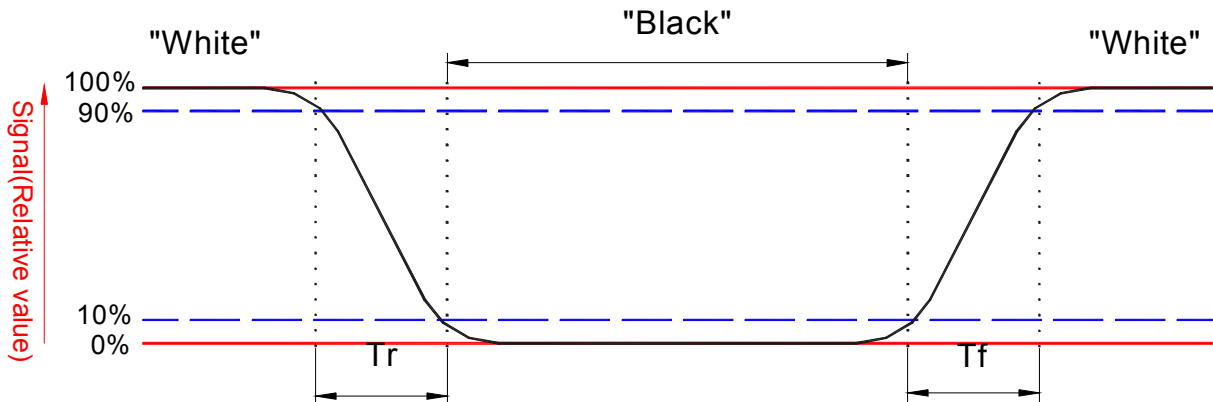
Note 2: To be measured in the dark room.

Note 3 :To be measured on the center area of panel with a viewing cone of 1°by Topcon luminance meter BM-7, after 30 minutes operation.

Note 4. 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 5. 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 6. Note 4. White $V_i = V_{i50} + 1.5V$

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

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

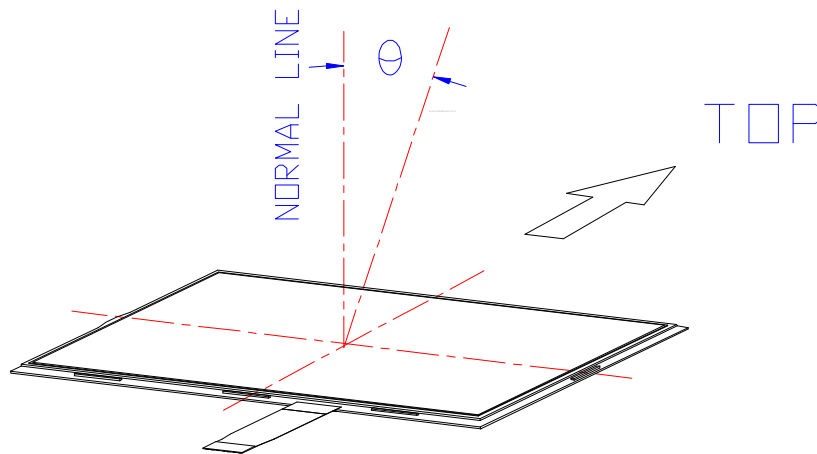
" $\bar{+}$ " means that the analog input signal swings out of phase with V_{COM} signal.

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 7. Definition of viewing angle:

Refer to figure as below.



Note 8. The "Lamp life time" is defined as the module brightness decrease to 50% original brightness at $T_a = 25^\circ C$, $I_L = 5.2mA$.

Note 9. Transmission is defined as follow: ($\theta = 0^\circ$)

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

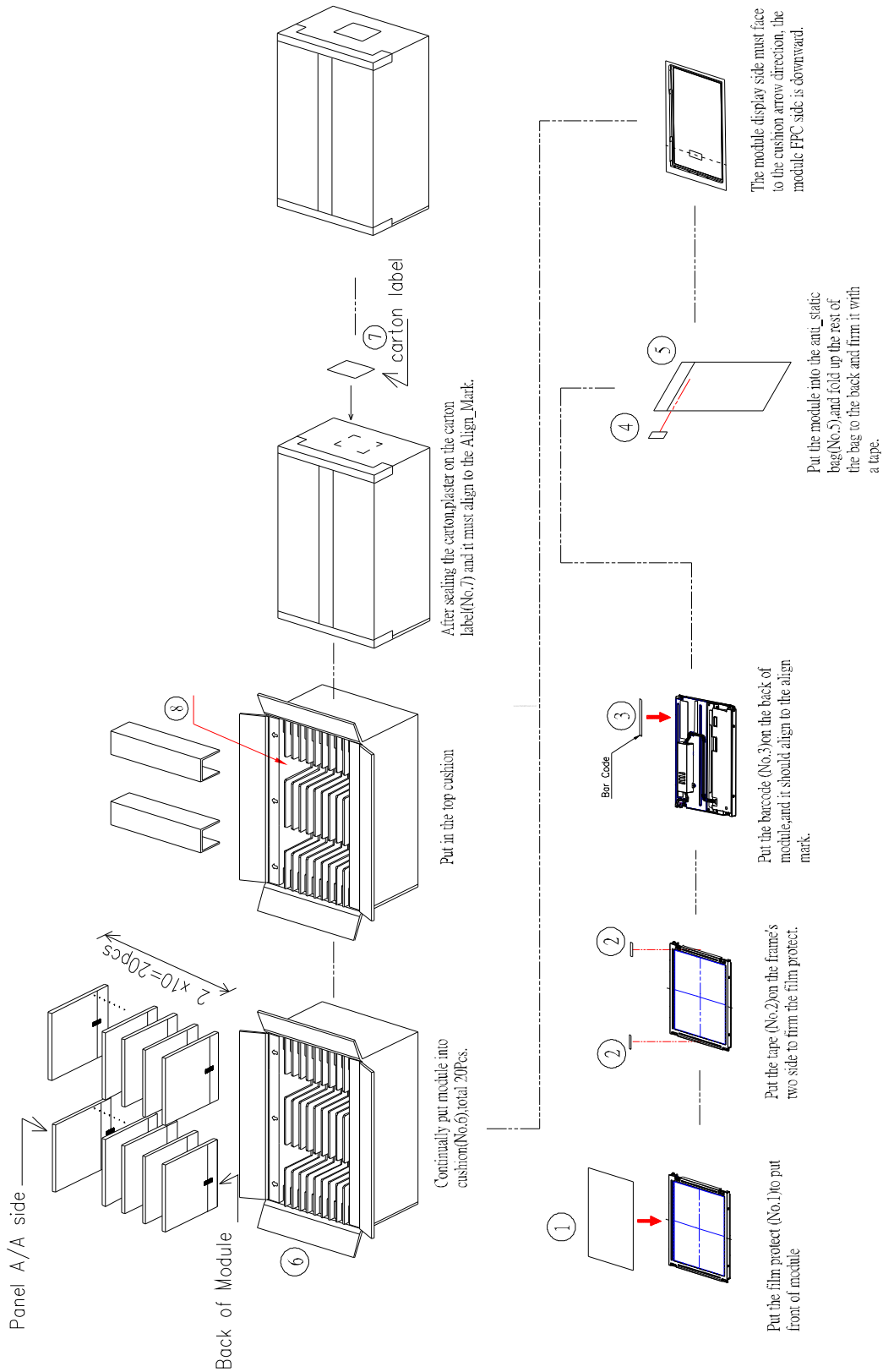
D. Reliability test items:

| No. | Test items | Conditions | Remark |
|-----|------------------------------------|---|---------------|
| 1 | High temperature storage | Ta= 70 °C 240Hrs | |
| 2 | Low temperature storage | Ta= -20°C 240Hrs | |
| 3 | High temperature operation | Ta= 60 °C 240Hrs | |
| 4 | Low temperature operation | Ta= 0 °C 240Hrs | |
| 5 | High temperature and high humidity | Ta= 50 °C, 80% RH 240Hrs | Operation |
| 6 | Heat shock | -20°C~70°C/ 50 cycles 1Hrs/cycle | Non-operation |
| 7 | Electrostatic discharge | ±200V,200pF(0Ω), once for each terminal | Non-operation |
| 8 | Vibration | 1.5G, 10Hz~200Hz~10Hz 30 minutes for each Axis (X, Y, Z) | Non-Operation |
| 9 | Mechanical shock | 100G/6ms,±X,±Y,±Z once for each direction | Non-Operation |
| 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 | JIS Z0202 |

Note1: Ta: Ambient Temperature.

Note2: All the cosmetic and optical specifications are judged before the reliability stress.

E. Packing form



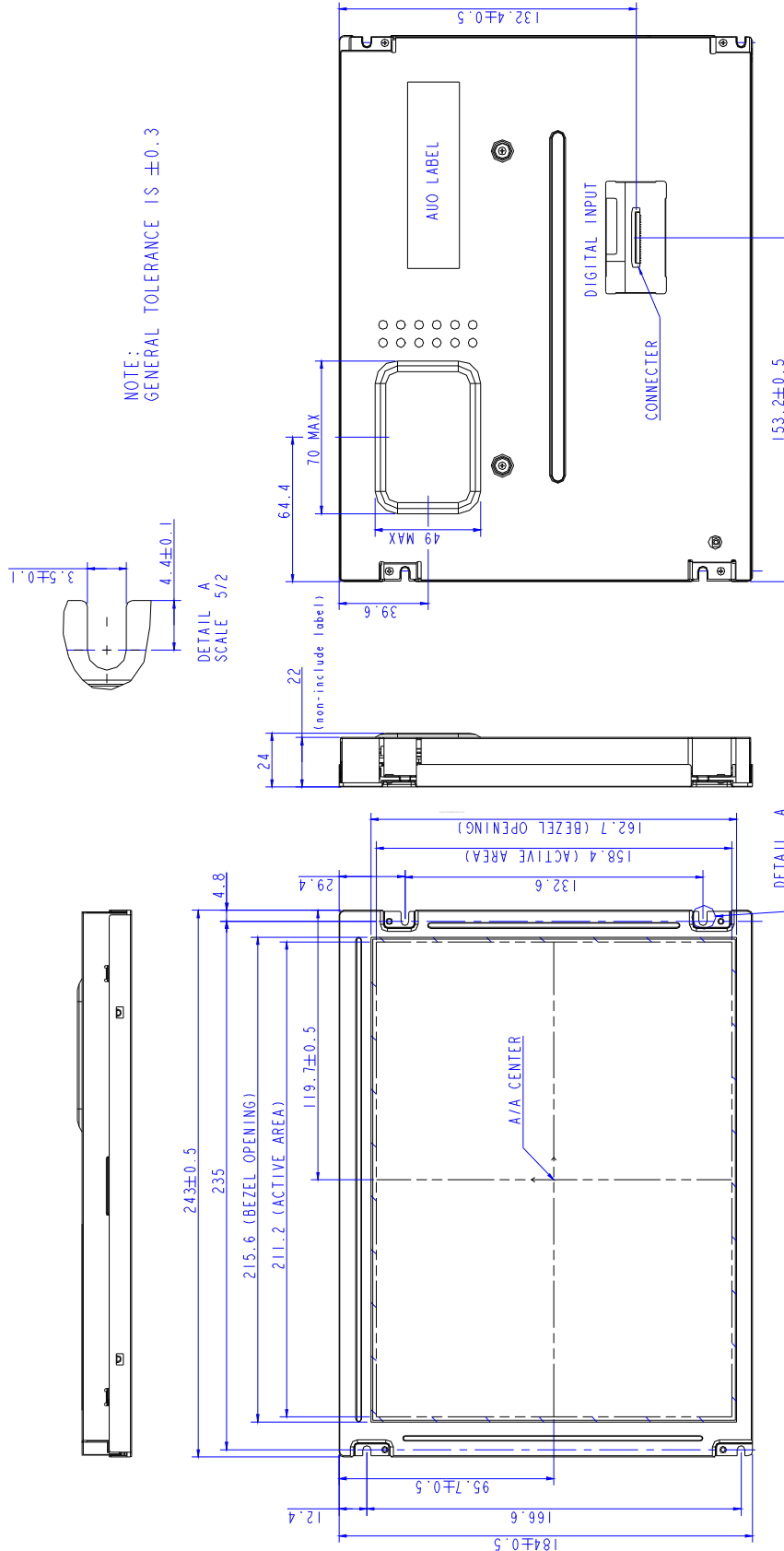


Fig.1 Outline dimension of TFT-LCD module