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**Version: 1.0**

## TECHNICAL SPECIFICATION

**MODEL NO: ED097TC2**

The content of this information is subject to be changed without notice.  
Please contact E Ink or its agent for further information.

☐ Customer's Confirmation

Customer \_\_\_\_\_

Date \_\_\_\_\_

By \_\_\_\_\_

☐ E Ink's Confirmation

Approved By

王号强

Confirmed By

杨文忠

Prepared By

林鳳玲

## Revision History

| Rev. | Issued Date | Revised Contents |
|------|-------------|------------------|
| 1.0  | 2016-07-28  | New              |

# ***TECHNICAL SPECIFICATION***

## **CONTENTS**

|                                                                     |    |
|---------------------------------------------------------------------|----|
| 1. General Description .....                                        | 1  |
| 2. Features.....                                                    | 1  |
| 3. Mechanical Specifications .....                                  | 1  |
| 4. Mechanical Drawing of EPD Module .....                           | 2  |
| 5. Input / Output Interface .....                                   | 3  |
| 6. Display Module Electrical Characteristics .....                  | 5  |
| 7. Power Sequence.....                                              | 10 |
| 8. Optical Characteristics.....                                     | 12 |
| 9. Handling, Safety and Environmental Requirements and Remark ..... | 13 |
| 10. Reliability Test .....                                          | 14 |
| 11. Border Definition.....                                          | 15 |
| 12. Block Diagram.....                                              | 16 |
| 13. Packing .....                                                   | 17 |

## 1. General Description

ED097TC2 is a reflective electrophoretic E Ink® technology display module based on active matrix TFT substrate. It has 9.7" active area with 1200 x 825 pixels, the display is capable to display images at 2-16 gray levels (1-4 bits) depending on the display controller and the associated waveform file it used.

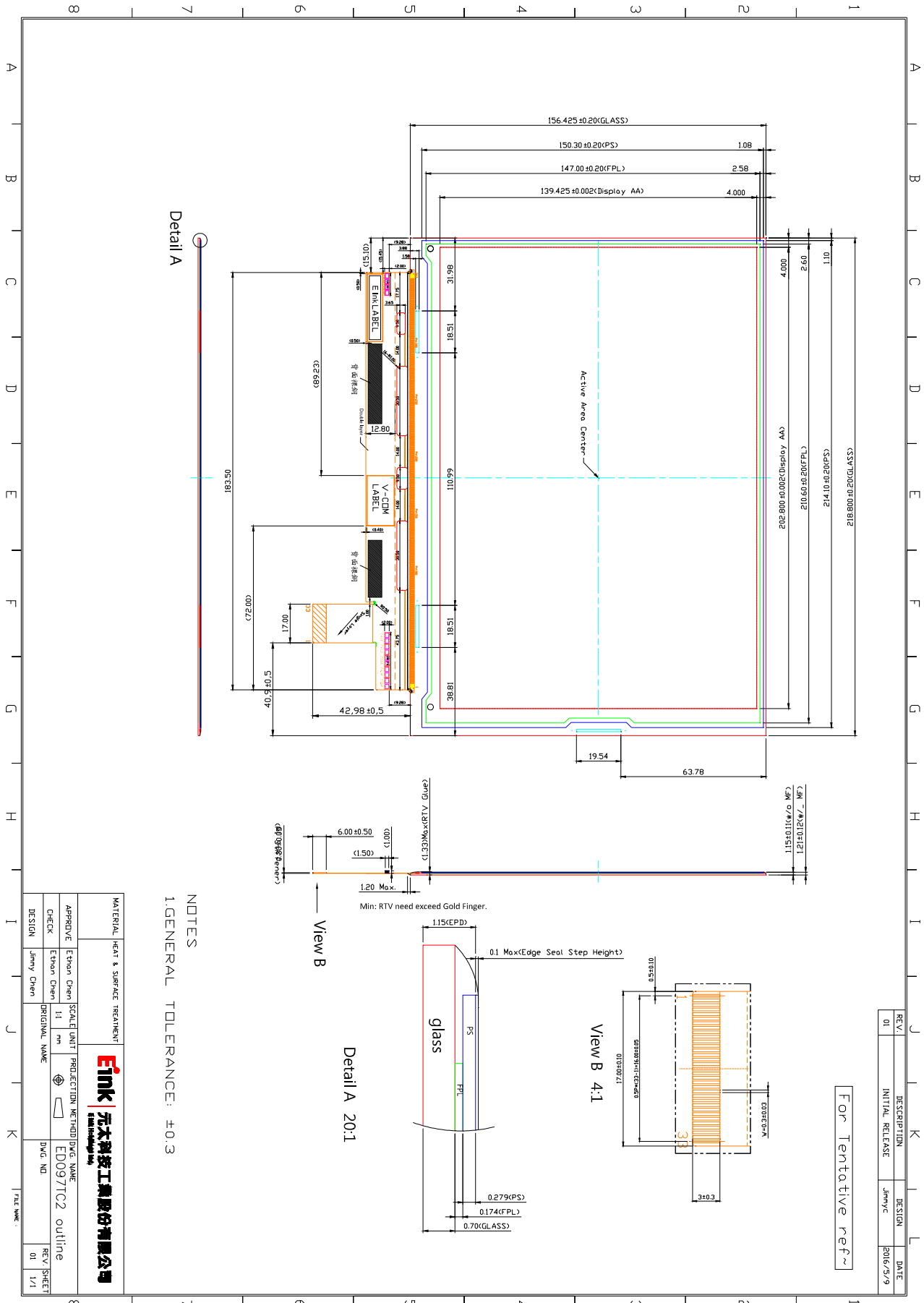
## 2. Features

- High contrast reflective/electrophoretic technology
- 1200x825 display
- High reflectance
- Ultra wide viewing angle
- Ultra low power consumption
- Pure reflective mode
- Bi-stable
- Commercial temperature range
- Landscape, portrait mode
- Antiglare hard-coated front-surface

## 3. Mechanical Specifications

| Parameter              | Specifications              | Unit  | Remark |
|------------------------|-----------------------------|-------|--------|
| Screen Size            | 9.7                         | Inch  |        |
| Display Resolution     | 1200 (H)×825(V)             | Pixel |        |
| Active Area            | 202.8 (H)×139.425 (V)       | mm    |        |
| Pixel Pitch            | 0.169 (H)×0.169 (V)         | mm    |        |
| Pixel Configuration    | Square                      |       |        |
| Outline Dimension      | 218.8(W)×156.425(H)×1.15(D) | mm    |        |
| Module Weight          | 80 ± 8                      | g     |        |
| Number of Grey         | 16 Grey Level (monochrome)  |       |        |
| Display operating mode | Reflective mode             |       |        |
| Surface treatment      | Anti-glare treatment        |       |        |

#### 4. Mechanical Drawing of EPD Module



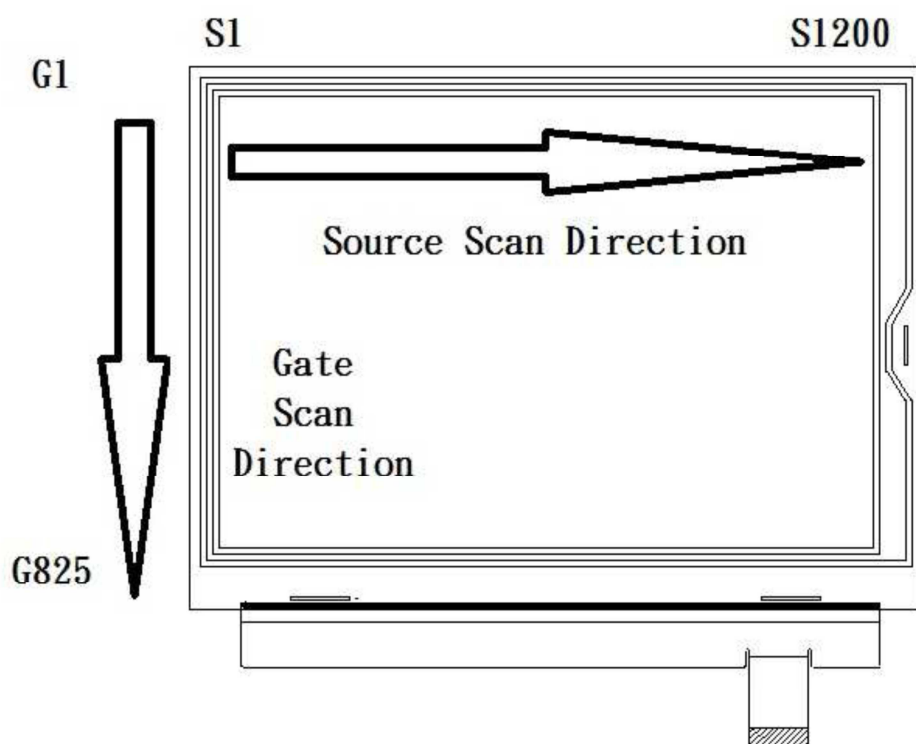
## 5. Input / Output Interface

### 5.1 Pin Assignment

IMSA-9637S-33Y905(IRISO)

| Pin # | Signal | Description                         | Remark |
|-------|--------|-------------------------------------|--------|
| 1     | VNEG   | Negative power supply source driver | -15    |
| 2     | NC     | NO Connection                       |        |
| 3     | VPOS   | Positive power supply source driver | 15     |
| 4     | NC     | NO Connection                       |        |
| 5     | VSS    | Ground                              |        |
| 6     | NC     | NO Connection                       |        |
| 7     | VDD    | Digital power supply drivers        | 3.3    |
| 8     | XCL    | Clock source driver                 |        |
| 9     | XLE    | Latch enable source driver          |        |
| 10    | XOE    | Output enable source driver         |        |
| 11    | VDD    | Digital power supply drivers        | 3.3    |
| 12    | XSTL   | Start pulse source driver           |        |
| 13    | D0     | Data signal source driver           |        |
| 14    | D1     | Data signal source driver           |        |
| 15    | D2     | Data signal source driver           |        |
| 16    | D3     | Data signal source driver           |        |
| 17    | D4     | Data signal source driver           |        |
| 18    | D5     | Data signal source driver           |        |
| 19    | D6     | Data signal source driver           |        |
| 20    | D7     | Data signal source driver           |        |
| 21    | NC     | NO Connection                       |        |
| 22    | VCOM   | Common voltage                      |        |
| 23    | NC     | NO Connection                       |        |
| 24    | VGH    | Positive power supply gate driver   | 27     |
| 25    | NC     | NO Connection                       |        |
| 26    | VGL    | Negative power supply gate driver   | -20    |
| 27    | NC     | NO Connection                       |        |
| 28    | MODE1  | Output mode selection gate driver   |        |
| 29    | MODE1  | Output mode selection gate driver   |        |
| 30    | VDD    | Digital power supply drivers        | 3.3    |
| 31    | SPV    | Start pulse gate driver             |        |
| 32    | CKV    | Clock gate driver                   |        |
| 33    | Border | Border connection                   |        |
|       |        |                                     |        |

## 5.2 Panel Scan Direction



## 6. Display Module Electrical Characteristics

### 6.1 Absolute Maximum Rating

| Parameter                | Symbol              | Rating        | Unit | Remark |
|--------------------------|---------------------|---------------|------|--------|
| Logic Supply Voltage     | $V_{DD}$            | -0.3 to +7    | V    |        |
| Positive Supply Voltage  | $V_{POS}$           | -0.3 to +18   | V    |        |
| Negative Supply Voltage  | $V_{NEG}$           | +0.3 to -18   | V    |        |
| Max .Drive Voltage Range | $V_{POS} - V_{NEG}$ | 36            | V    |        |
| Supply Voltage           | $V_{GH}$            | -0.3 to +45   | V    |        |
| Supply Voltage           | $V_{GL}$            | -25.0 to +0.3 | V    |        |
| Supply Range             | $V_{GH}-V_{GL}$     | -0.3 to +55   | V    |        |
| Operating Temp. Range    | $T_{OTR}$           | 0 to +50      | °C   |        |
| Storage Temperature      | $T_{STG}$           | -25 to +70    | °C   |        |

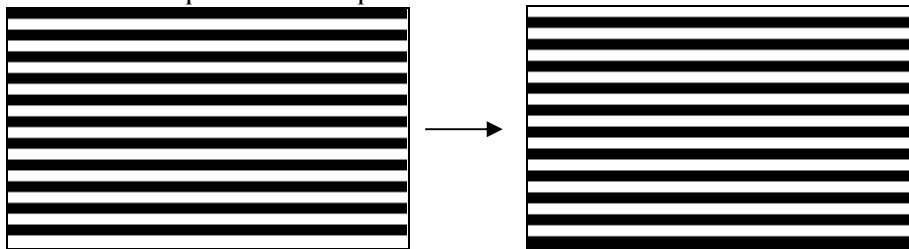
### 6.2 Display Module DC Characteristics

| Parameter              | Symbol     | Conditions        | Min   | Typ      | Max   | Unit |
|------------------------|------------|-------------------|-------|----------|-------|------|
| Signal Ground          | $V_{SS}$   |                   | -     | 0        | -     | V    |
| Logic Voltage Supply   | $V_{DD}$   |                   | 3.0   | 3.3      | 3.6   | V    |
|                        | $I_{DD}$   | $V_{DD}=3.3V$     | -     | 2.7      | 4.2   | mA   |
| Gate Negative Supply   | $V_{GL}$   |                   | -21   | -20      | -19   | V    |
|                        | $I_{GL}$   | $V_{GL}=-20V$     | -     | 1.2      | 6.6   | mA   |
| Gate Positive supply   | $V_{GH}$   |                   | 26    | 27       | 28    | V    |
|                        | $I_{GH}$   | $V_{GH}=27V$      | -     | 1.2      | 6.6   | mA   |
| Source Negative Supply | $V_{NEG}$  |                   | -15.4 | -15      | -14.6 | V    |
|                        | $I_{NEG}$  | $V_{NEG}=-15V$    | -     | 4.4      | 88.9  | mA   |
| Source Positive Supply | $V_{POS}$  |                   | 14.6  | 15       | 15.4  | V    |
|                        | $I_{POS}$  | $V_{POS}=15V$     | -     | 4.4      | 147.9 | mA   |
| Border Supply          | $V_{COM}$  |                   | -4    | Adjusted | -0.3  | V    |
| Asymmetry Source       | $V_{ASM}$  | $V_{POS}+V_{NEG}$ | -800  | 0        | 800   | mV   |
| Common Voltage         | $V_{COM}$  |                   | -4    | Adjusted | -0.3  | V    |
|                        | $I_{COM}$  |                   | -     | 0.43     | -     | mA   |
| Power Panel            | P          |                   | -     | -        | 3980  | mW   |
| Standby Power Panel    | $P_{STBY}$ |                   | -     | -        | 0.6   | mW   |

- The maximum power consumption is measured using 85Hz waveform with following pattern transition: from pattern of repeated 1 consecutive black scan lines followed by 1 consecutive white scan line to that of repeated 1 consecutive white scan lines followed by 1 consecutive black scan lines (Note 6-1).
- The Typical power consumption is measured using 85Hz waveform with following pattern transition: from horizontal 4 grey scale pattern to vertical 4 grey scale patterns (Note 6-2).
- The standby power is the consumed power when the panel controller is in standby mode.
- The listed electrical/optical characteristics are only guaranteed under the controller & waveform provided by E Ink.
- $V_{COM}$  is recommended to be set in the range of assigned value  $\pm 0.1V$
- The maximum  $I_{COM}$  inrush current is about 1.64 mA

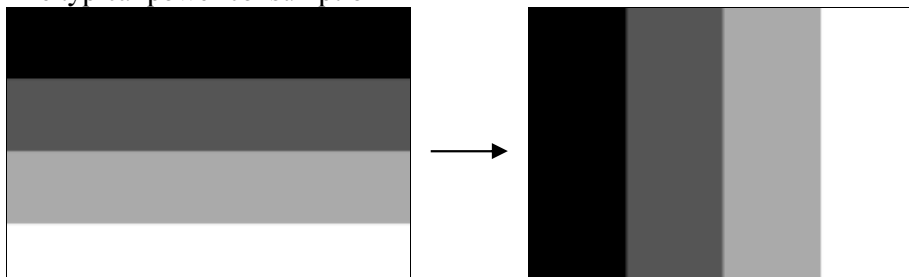
Note6-1

The maximum power consumption



Note6-2

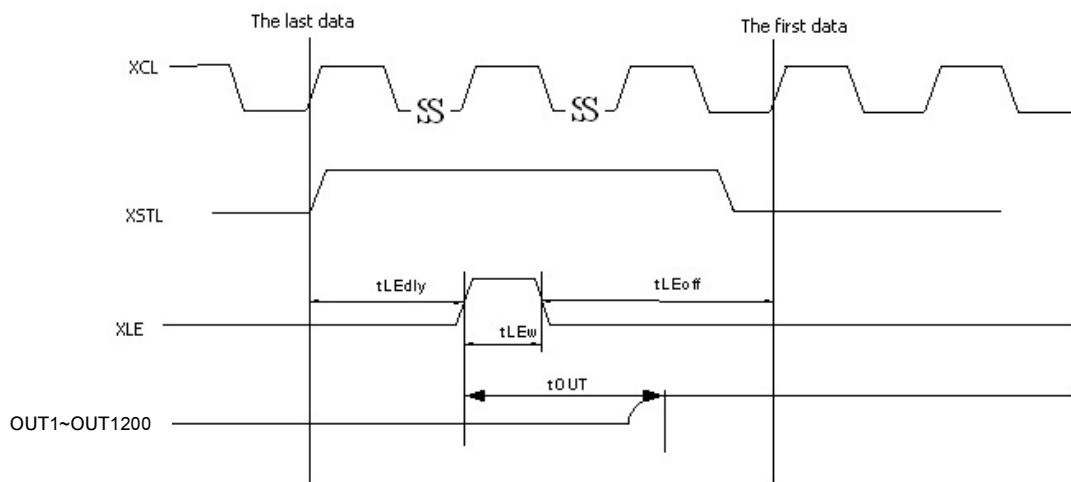
The typical power consumption



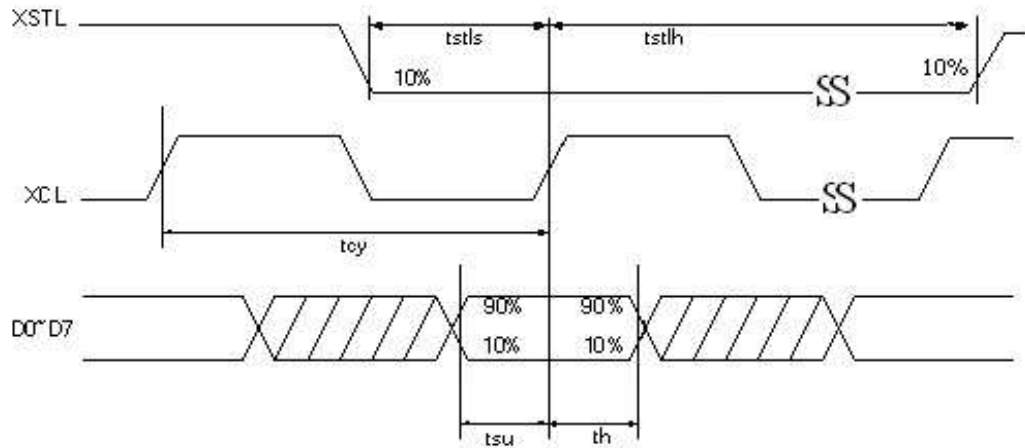
### 6.3 Display Module AC characteristics

| Parameter                                             | Symbol | Min. | Typ. | Max. | Unit |
|-------------------------------------------------------|--------|------|------|------|------|
| Clock frequency                                       | fckv   | -    | -    | 200  | kHz  |
| Minimum “L” clock pulse width                         | twL    | 0.5  | -    | -    | us   |
| Minimum “H” clock pulse width                         | twH    | 0.5  | -    | -    | us   |
| Clock rise time                                       | trckv  | -    | -    | 100  | ns   |
| Clock fall time                                       | tfckv  | -    | -    | 100  | ns   |
| SPV setup time                                        | tSU    | 100  | -    | -    | ns   |
| SPV hold time                                         | tH     | 100  | -    | -    | ns   |
| Pulse rise time                                       | trspv  | -    | -    | 100  | ns   |
| Pulse fall time                                       | tfspv  | -    | -    | 100  | ns   |
| Clock XCL cycle time                                  | tcy    | 16.7 | 20   | -    | ns   |
| D0 .. D7 setup time                                   | tsu    | 8    | -    | -    | ns   |
| D0 .. D7 hold time                                    | th     | 8    | -    | -    | ns   |
| XSTL setup time                                       | tstls  | 8    | -    | -    | ns   |
| XSTL hold time                                        | tstlh  | 8    | -    | -    | ns   |
| XLE on delay time                                     | tLEdly | 40   | -    | -    | ns   |
| XLE high-level pulse width<br>(When VDD=1.7V to 2.1V) | tLEw   | 40   | -    | -    | ns   |
| XLE off delay time                                    | tLEoff | 200  | -    | -    | ns   |
| Output setting time to +/- 30Mv<br>(Cload=200pF)      | tout   | -    | -    | 12   | us   |

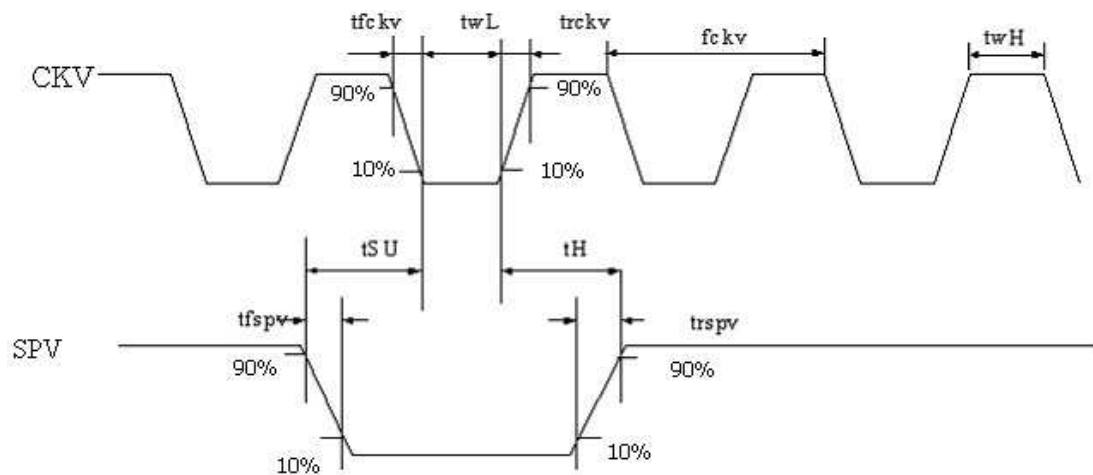
#### OUTPUT LATCH CONTROL SIGNALS



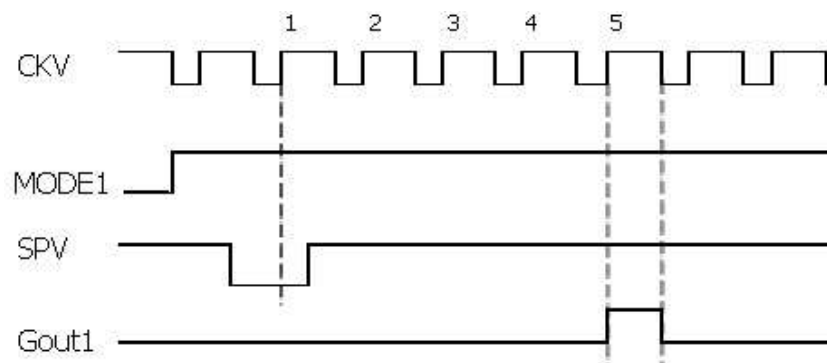
### CLOCK & DATA TIMING



### CKV & SPV TIMING



### GATE OUTPUT TIMING



Note : First gate line on timing

After 5CKV, gate line is on.

#### 6.4 Refresh Rate

The module ED097TC2 is applied at a maximum screen refresh rate of 85Hz.

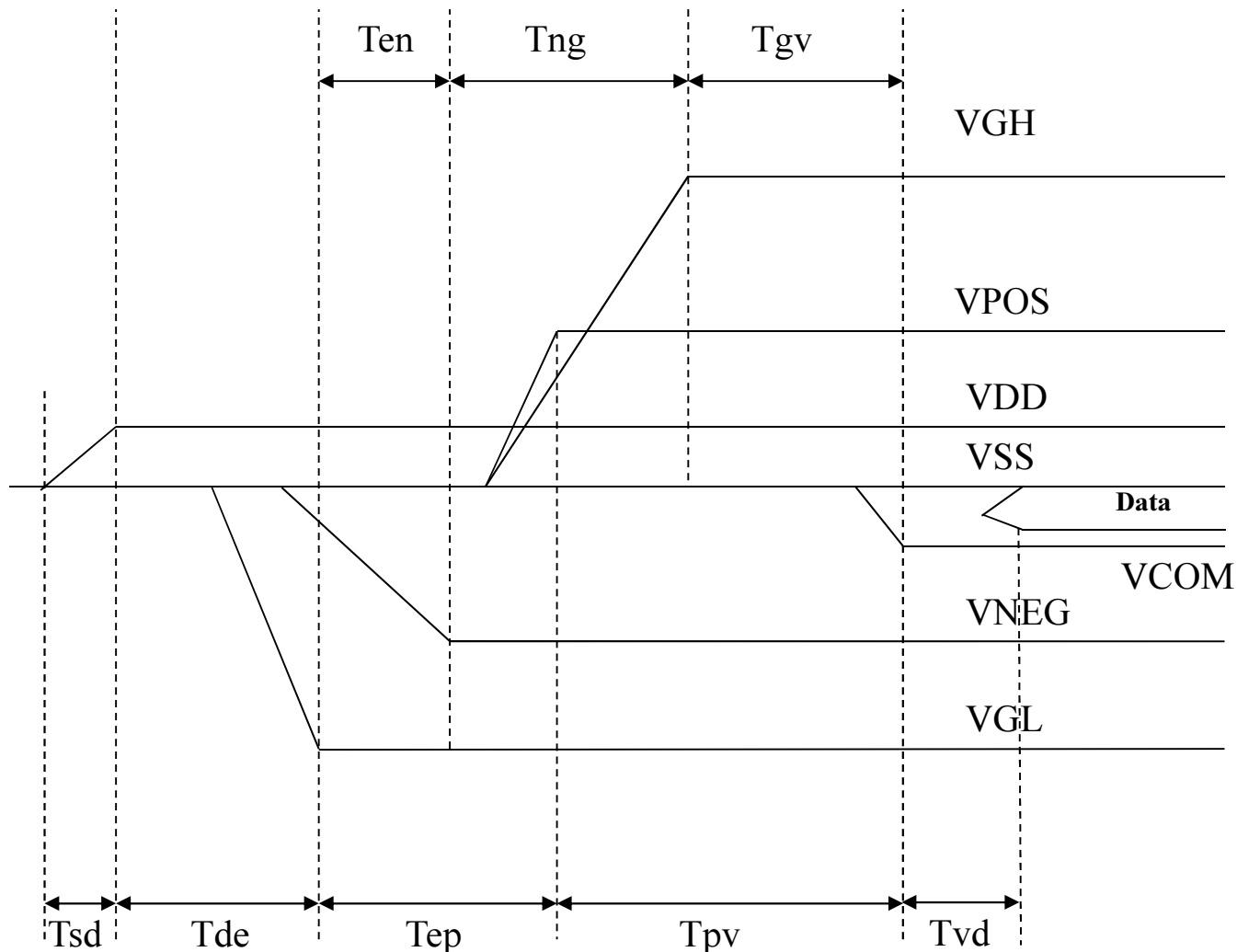
|              | Min. | Max. |
|--------------|------|------|
| Refresh Rate | -    | 85Hz |

## 7. Power Sequence

Power rails must be sequenced in the following order :

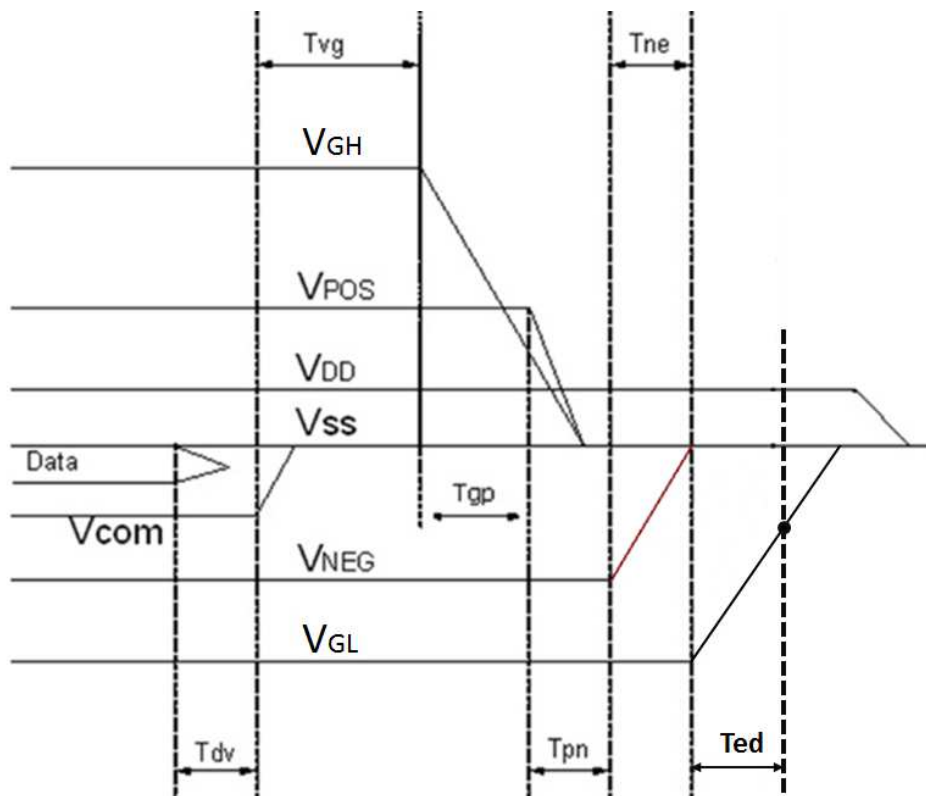
1. VSS → VDD → VNEG → VPOS (Source driver) → VCOM
2. VSS → VDD → VGL → VGH (Gate driver)

### POWER ON



|     | Min.   | Max. |
|-----|--------|------|
| Tsd | 30us   | -    |
| Tde | 100us  | -    |
| Tep | 1000us | -    |
| Tpv | 100us  | -    |
| Tvd | 100us  | -    |
| Ten | 0us    | -    |
| Tng | 1000us | -    |
| Tgv | 100us  | -    |

**POWER OFF**



|     | Min.  | Max. | Remark                       |
|-----|-------|------|------------------------------|
| Tdv | 100μs | -    | -                            |
| Tvg | 0μs   | -    | -                            |
| Tgp | 0μs   | -    | -                            |
| Tpn | 0μs   | -    | -                            |
| Tne | 0μs   | -    | -                            |
| Ted | 0.5s  | -    | Discharged point @ -7.4 Volt |

Note 7-1: Supply voltages decay through pull-down resistors.

Note 7-2: Begin to turn off VGL power after VNEG and VPOS are completely or almost discharged to GND state.

Note 7-3: VGL must remain negative of VCOM during decay period.

## 8. Optical Characteristics

### 8.1 Specifications

Measurements are made with that the illumination is under an angle of 45 degrees, the detector is perpendicular unless otherwise specified.

T = 25°C

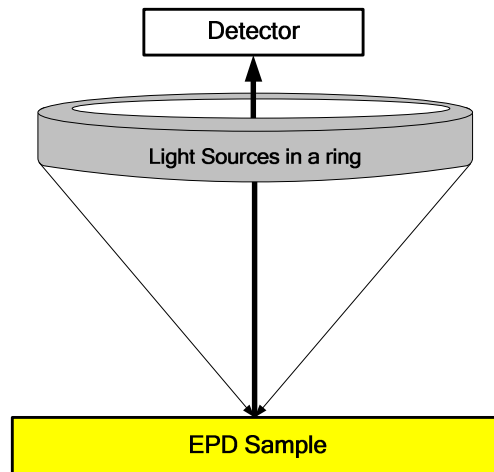
| Symbol | Parameter                  | Conditions | Min. | Typ.                                | Max. | Unit | Note     |
|--------|----------------------------|------------|------|-------------------------------------|------|------|----------|
| R      | Reflectance                | White      | 33   | 42                                  | -    | %    | Note 8-1 |
| Gn     | N <sup>th</sup> Grey Level | -          |      | $DS + (WS - DS) \times n / (m - 1)$ |      | L*   | -        |
| CR     | Contrast Ratio             | -          | 10   | 16                                  | -    |      | -        |

WS: White state , DS: Dark state, Gray state from Dark to White :DS 、G1 、G2... 、Gn... 、Gm-2 、WS  
m:4 、8 、16 when 2 、3 、4 bits mode

Note 8-1: Luminance meter: Eye – One Pro Spectrophotometer

### 8.2 Definition of contrast ratio

The contrast ratio (CR) is the ratio between the reflectance in a full white area (Rl) and the reflectance in a dark area (Rd):  $CR = Rl / Rd$



### 8.3 Reflection Ratio

The reflection ratio is expressed as:

$$R = \text{Reflectance Factor}_{\text{white board}} \times (L_{\text{center}} / L_{\text{white board}})$$

$L_{\text{center}}$  is the luminance measured at center in a white area (R=G=B=1).  $L_{\text{white board}}$  is the luminance of a standard white board. Both are measured with equivalent illumination source. The viewing angle shall be no more than 2 degrees.

## 9. Handling, Safety and Environmental Requirements and Remark

| Warning                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The display glass may break when it is dropped or bumped on a hard surface. Handle with care. Should the display break, do not touch the electrophoretic material. In case of contact with electrophoretic material, wash with water and soap. |

| Caution                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------|
| The display module should not be exposed to harmful gases, such as acid and alkali gases, which corrode electronic components. |
| Disassembling the display module can cause permanent damage and invalidate the warranty agreements.                            |
| IPA solvent can only be applied on active area and the back of a glass. For the rest part, it is not allowed.                  |

| Mounting Precautions                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) It's recommended that you consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module.                                                                                                                                                                                |
| (2) It's recommended that you attach a transparent protective plate to the surface in order to protect the EPD. Transparent protective plate should have sufficient strength in order to resist external force.                                                                                                      |
| (3) You should adopt radiation structure to satisfy the temperature specification.                                                                                                                                                                                                                                   |
| (4) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the PS at high temperature and the latter causes circuit break by electro-chemical reaction.                                                                           |
| (5) Do not touch, push or rub the exposed PS with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of PS for bare hand or greasy cloth. (Some cosmetics deteriorate the PS)                                         |
| (6) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach the PS. Do not use acetone, toluene and alcohol because they cause chemical damage to the PS. |
| (7) Wipe off saliva or water drops as soon as possible. Their long time contact with PS causes deformations and color fading.                                                                                                                                                                                        |

| Data sheet status                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| Product specification                                                                                                                                                                                                                                                                                                                                                                                                                                     | This data sheet contains preliminary product specifications. |
| Limiting values                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                              |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |                                                              |
| Application information                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                              |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                       |                                                              |

| Remark                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All The specifications listed in this document are guaranteed for module only. Post-assembled operation or component(s) may impact module performance or cause unexpected effect or damage and therefore listed specifications is not warranted after any Post-assembled operation. |

## 10. Reliability Test

|    | Test                                      | Condition                                                                                                          | Method                                                   |
|----|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| 1  | High-Temperature Operation                | T = +50°C, RH = 30% for 240 hrs                                                                                    | IEC 60 068-2-2Bp                                         |
| 2  | Low-Temperature Operation                 | T = 0°C for 240 hrs                                                                                                | IEC 60 068-2-2Ab                                         |
| 3  | High-Temperature Storage                  | T = +70°C, RH=23% for 240 hrs<br>(Test In White Pattern)                                                           | IEC 60 068-2-2Bp                                         |
| 4  | Low-Temperature Storage                   | T = -25°C for 240 hrs<br>(Test In White Pattern)                                                                   | IEC 60 068-2-1Ab                                         |
| 5  | High-Temperature, High-Humidity Operation | T = +40°C, RH = 90% for 168 hrs                                                                                    | IEC 60 068-2-3CA                                         |
| 6  | High Temperature, High- Humidity Storage  | T = +60°C, RH=80% for 240hrs<br>(Test In White Pattern)                                                            | IEC 60 068-2-3CA                                         |
| 7  | Temperature Cycle                         | -25°C → +70°C, 100 Cycles<br>30mins 30 mins<br>(Test In White Pattern)                                             | IEC 60 068-2-14                                          |
| 8  | Solar Radiation Test                      | 765 W/m <sup>2</sup> for 168hrs, 40°C<br>(Test In White Pattern)                                                   | IEC60 068-2-5Sa                                          |
| 9  | Package Vibration                         | 1.04G, Frequency: 10~500Hz<br>Direction: X,Y,Z<br>Duration: 1 hours in each direction                              | Full packed for shipment                                 |
| 10 | Package Drop Impact                       | Drop from height of 122 cm on concrete surface.<br>Drop sequence: 1 corner, 3 edges, 6 faces<br>One drop for each. | full packed for shipment                                 |
| 11 | Electrostatic Effect (non-operating)      | (Machine model)+/- 250V<br>0Ω, 200pF                                                                               | IEC 62179, IEC 62180                                     |
| 12 | Stylus Tapping                            | POLYACETAL Pen: Top R:0.8 mm<br>Load: 300gf<br>Speed: 2 times/sec<br>Total 13,500times,                            | Test with bezel and device to simulate full product test |

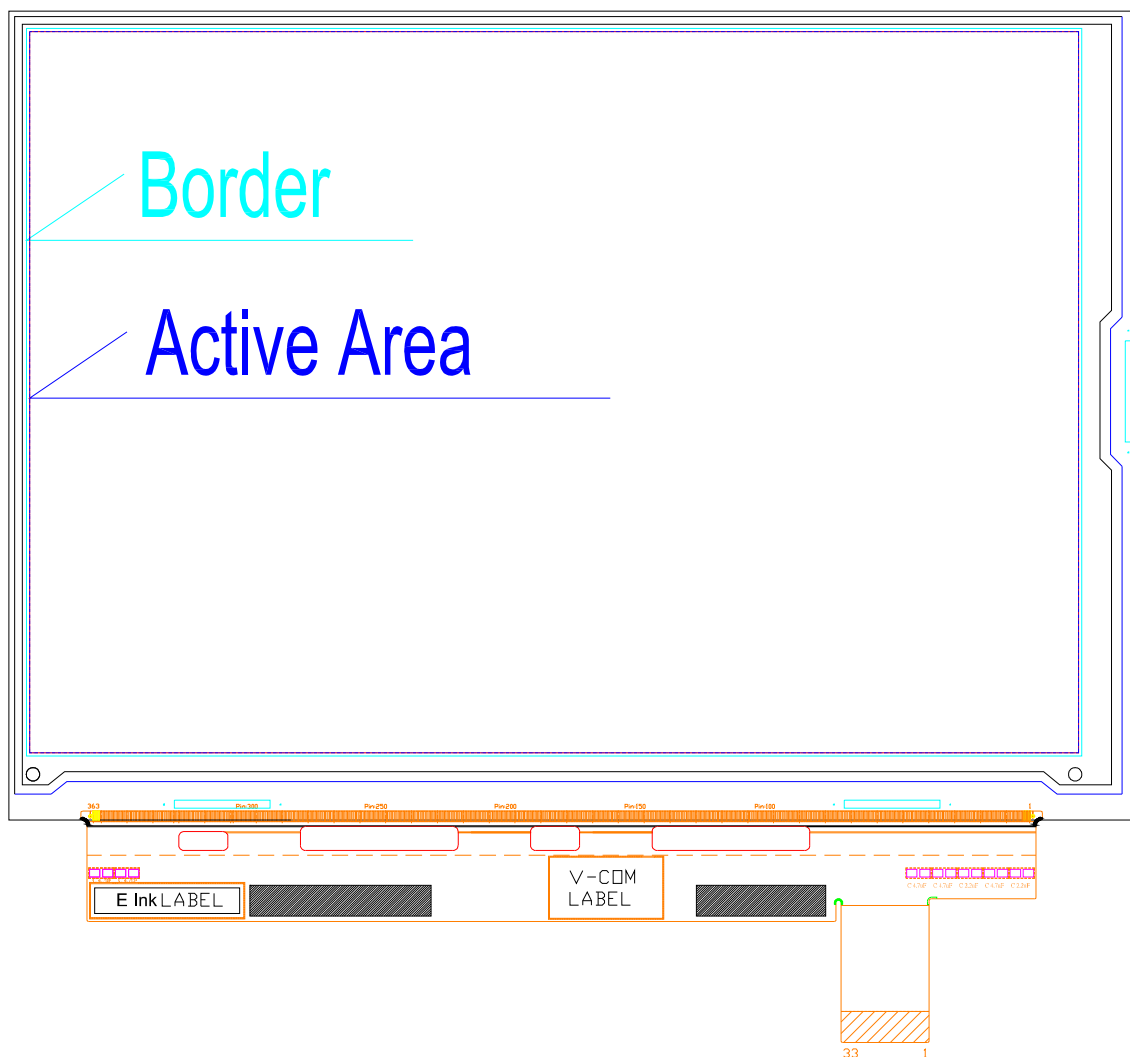
Actual EMC level to be measured on customer application.

Note : The protective film must be removed before temperature test.

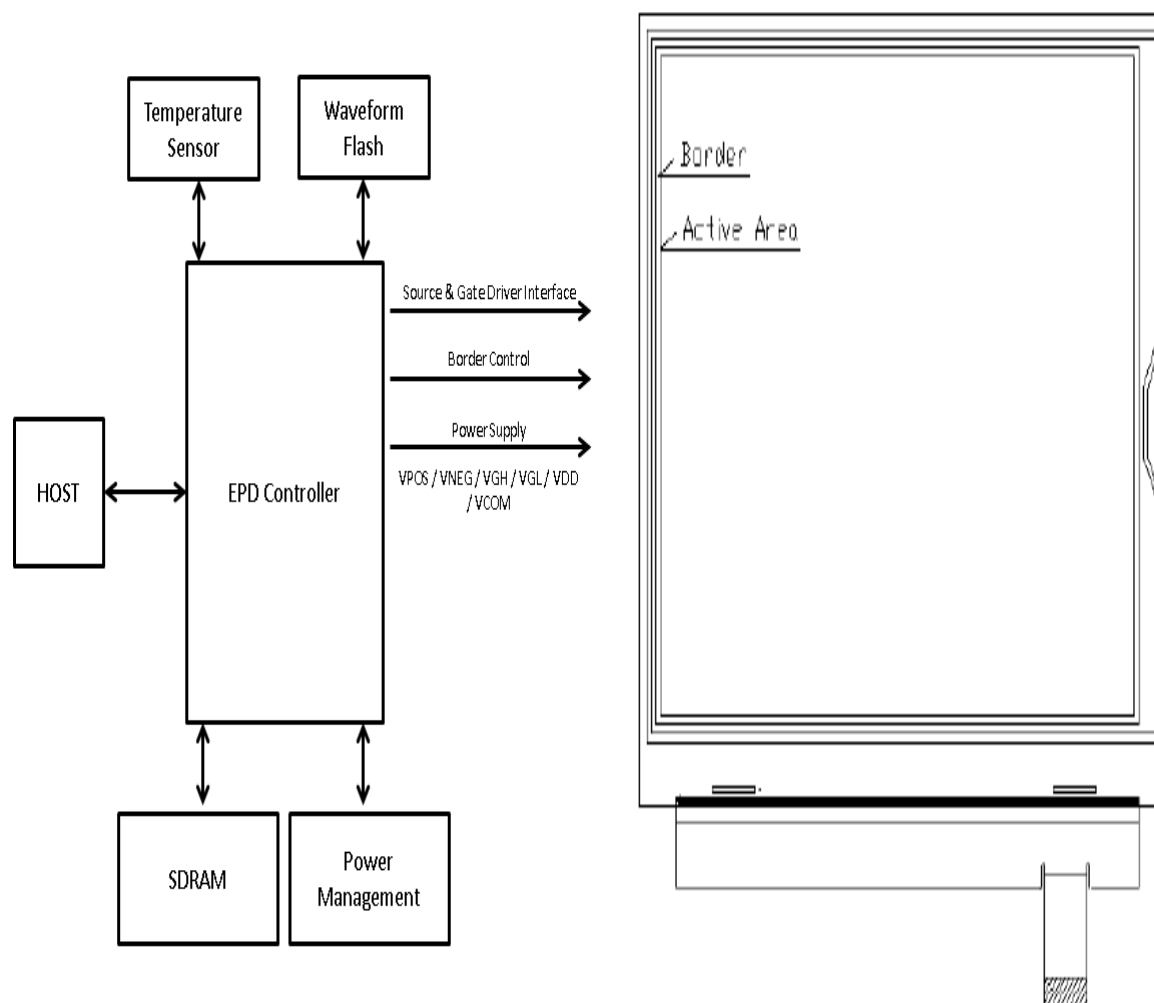
### [Criteria]

In the standard conditions, there is not display function NG issue occurred (Including: line defect, no image).  
All the cosmetic specification is judged before the reliability stress.

## 11. Border Definition



## 12. Block Diagram



### 13. Packing

| REV | DESCRIPTION     | DESIGN  | DATE      |
|-----|-----------------|---------|-----------|
| 00  | INITIAL RELEASE | Jlmmmyc | *16.06.20 |

**NOTE:**

- One layer include:  
2 pcs module & 1 piece of tray.
- Q'TY: 24 pcs panel/carton.
- Dimension: 445\*365\*170mm
- Make sure tray stacked with 180° rotation.  
We can check this by lateral side view.

|      |                       |     |                          |
|------|-----------------------|-----|--------------------------|
| 8    | EASY TAPE             | 24  | For Remove Protect Sheet |
| 7    | 30g 加厚模台紙(模台紙)73*95mm | 2   |                          |
| 6    | 防鐵屑(保護容積25L)          | 3   |                          |
| 5    | CARTON INTERNAL       | 1   |                          |
| 4    | 摺口袋450*380*580mm      | 1   | 抗靜電                      |
| 3    | ED097TC2              | 24  |                          |
| 2    | TRAY                  | 13  | 抗靜電                      |
| 1    | EPE FOAM              | 2   |                          |
| ITEM | DESCRIPTION           | QTY | REMARK                   |

| MTL.SPEC. |  | UNSPECIFIED TOL'S ±5.0mm |  | REMARK |  |
|-----------|--|--------------------------|--|--------|--|
|           |  | ANGLE                    |  |        |  |
|           |  | ROUGHNESS                |  |        |  |

|         |             |           |         |      |        |                      |
|---------|-------------|-----------|---------|------|--------|----------------------|
| APPROVE | Jamie Chung | '16.06.20 | SCALE   | UNIT | SHBET  | DWG.TITLE            |
| CHECK   | Jamie Chung | '16.06.20 | 1:1     | mm   | 1 OF 1 | ED097TC2 PACKING Dim |
| DESIGN  | Jimmy Chen  | '16.06.20 | MTL.NO. |      |        | DWG.NO.              |
|         |             |           |         |      |        | REV. 01              |
|         |             |           |         |      |        | A4 SIZE              |

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