



**4.2 inch  
E-paper Display Series  
GDEQ042T81**

Dalian Good Display Co., Ltd.

# Product Specifications



|                    |                             |
|--------------------|-----------------------------|
| <b>Customer</b>    | <b>Standard</b>             |
| <b>Description</b> | <b>4.2" E-PAPER DISPLAY</b> |
| <b>Model Name</b>  | <b>GDEQ042T81</b>           |
| <b>Date</b>        | <b>2022/11/09</b>           |
| <b>Revision</b>    | <b>1.0</b>                  |

|  | Design Engineering  |   |   |
|--|---|---|---|
|  | Approval  | Check   | Design  |
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| <b>Version</b> | <b>Content</b> | <b>Date</b> | <b>Producer</b> |
|----------------|----------------|-------------|-----------------|
| 1.0            | New release    | 2022/11/09  |                 |
|                |                |             |                 |
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|                |                |             |                 |
|                |                |             |                 |

## 1. General Description

### 1.1 Overview

GDEQ042T81 is a reflective electrophoretic display module on an active matrix TFT substrate, The diagonal length of the active area is 4.2" and contains 400 x300 pixels. The panel is capable of displaying 1-bit black and white images depending on the associated lookup table used. The circuitry on the panel includes an integrated gate and source driver, timing controller, oscillator, DC-DC boost circuit, and memory to store the frame buffer and lookup tables, and additional circuitry to control VCOM and border settings.

### 1.2 Features

- Ultra wide viewing angle
- Ultra low power consumption
- I2C Signal Master Interface to read external temperature sensor.
- On chip display RAM
- Interface: 4-Wire SPI or 3-Wire SPI
- Wide range of operating temperature: 0 to 50
- Wide range of storage temperature: -25 to 60
- High reflectance and contrast TFT electrophoretic.

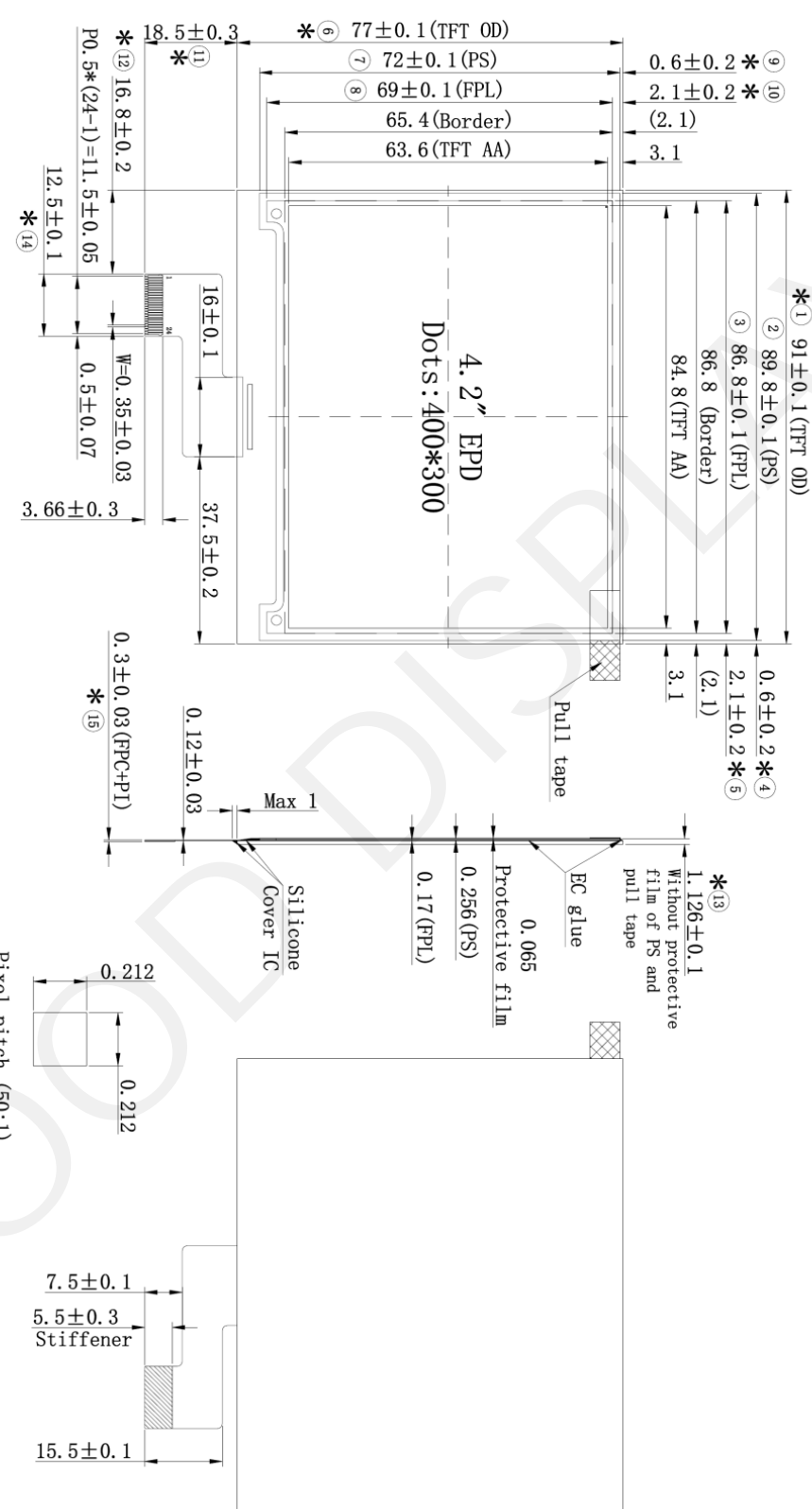
### 1.3 Mechanical Specifications

| NO. | ITEM                | SPECIFICATION               | UNIT |
|-----|---------------------|-----------------------------|------|
| 1   | TFT Area            | 91.0 (H)×77.0 (V)           | mm   |
| 2   | Screen Size         | 4.2                         | Inch |
| 3   | Active Area         | 84.8 (H)×63.6 (V)           | mm   |
| 4   | Pixel Pitch         | 0.212×0.212                 | mm   |
| 5   | Pixels Per Inch     | 111                         | -    |
| 6   | Outline Dimension   | 91.0 (H)×95.5 (V) ×1.126(T) | mm   |
| 7   | Resolution          | 400(H)×300(V)               | -    |
| 8   | Pixel Configuration | Square                      | -    |
| 9   | Driver IC           | SSD1683                     | -    |
| 10  | Module Weight       | 16±10%                      | gram |

# 1.4 Mechanical Drawing of EPD module

如本印章非红色，则表明该文件为非受控版本，不会受到控制和更新。请使用受控文件。  
分发号：

受控章



- Specification
1. Display Type: 4.2" EPD (Black/White)
  2. Format: 400\*300
  3. Driver IC: SSD1683
  4. Operate temp: 0°C~50°C
  5. Storage temp: -25°C~60°C
  6. Dimensions denoted with \* are the key control dimensions, with Ⓢ are the first sample inspection dimensions.
  7. HSF Compliant

|                   |              |              |            |           |           |          |
|-------------------|--------------|--------------|------------|-----------|-----------|----------|
| Customer Approval | Part Name    | Module Ass'y | Date       | Rev.      | Unit      | Sheet    |
| Signature         | Project Code |              | 2022.06.01 | 01        | mm        | 1/1      |
|                   | Part No.     |              | DES' D BY  | CHK' D BY | CHK' D BY | APPROVED |

| Rev. | Date       | Note     |
|------|------------|----------|
| ①    | 2022.06.01 | Primary. |
| ②    |            |          |

| NO. | SYMBOL | Pin Assignment |
|-----|--------|----------------|
| 1   | NC     | NC             |
| 2   | GDR    | GDR            |
| 3   | RESE   | RESE           |
| 4   | NC     | NC             |
| 5   | VSH2   | VSH2           |
| 6   | NC     | NC             |
| 7   | NC     | NC             |
| 8   | BSI    | BSI            |
| 9   | BUSY   | BUSY           |
| 10  | RES#   | RES#           |
| 11  | D/C#   | D/C#           |
| 12  | CS#    | CS#            |
| 13  | SCL    | SCL            |
| 14  | SDA    | SDA            |
| 15  | VDDI0  | VDDI0          |
| 16  | VCI    | VCI            |
| 17  | VSS    | VSS            |
| 18  | VDD    | VDD            |
| 19  | VPP    | VPP            |
| 20  | VSH1   | VSH1           |
| 21  | VGH    | VGH            |
| 22  | VSL    | VSL            |
| 23  | VGL    | VGL            |
| 24  | VCOM   | VCOM           |

## 1.5 Module Interface

| PIN NO. | PIN NAME | DESCRIPTION   |
|---------|----------|---|
| 1       | NC       | No Connection   |
| 2       | GDR      | This pin is N-Channel MOSFET gate drive control pin.  |
| 3       | RESE     | Current Sense Input for the control loop  |
| 4       | NC       | No Connection   |
| 5       | VSH2     | This pin is Positive Source driving voltage, VSH2 connect a stabilizing capacitor between VSH2 and VSS in the application circuit.                                  |
| 6       | NC       | No Connection   |
| 7       | NC       | No Connection   |
| 8       | BS1      | This pin is for selecting 3-wire(H active) or 4-wire(L active) SPI interface.   |
| 9       | BUSY     | This pin indicates the driver status.<br>BUSY= "0" : Driver is busy, data/VCOM is transforming.<br>BUSY= "1" : non-busy. Host side can send command/data to driver. |
| 10      | RES#     | This pin is reset signal input (Active Low).  |
| 11      | D/C#     | This pin is Data/Command control pin connecting to the MCU  |
| 12      | CS#      | This pin is the chip select input connecting to the MCU.  |
| 13      | SCL      | This pin is serial clock pin for interface.   |
| 14      | SDA      | This pin is serial data pin for interface.  |
| 15      | VDDIO    | Power input pin for the Interface. Connect to VCI in the application circuit.   |
| 16      | VCI      | Power input pin for the chip.   |
| 17      | VSS      | Ground  |
| 18      | VDD      | Core logic power pin VDD can be regulated internally from VCI. A capacitor should be connected between VDD and VSS under all circumstances                          |
| 19      | VPP      | Power Supply for OTP Programming.   |
| 20      | VSH1     | This pin is Positive Source driving voltage, VSH1 Connect a stabilizing capacitor between VSH1 and VSS in the application circuit.                                  |
| 21      | VGH      | This pin is Positive Gate driving voltage. Connect a stabilizing capacitor between VGH and VSS in the application circuit.  |
| 22      | VSL      | This pin is Negative Source driving voltage. Connect a stabilizing capacitor between VSL and VSS in the application circuit.  |
| 23      | VGL      | This pin is Negative Gate driving voltage. Connect a stabilizing capacitor between VGL and VSS in the application circuit.  |
| 24      | VCOM     | This pins is VCOM driving voltage Connect a stabilizing capacitor between VCOM and VSS in the application circuit.  |

## 1.6 Matched Development Kit

Our Development Kit designed for SPI E-paper Display aims to help users to learn how to use E-paper Display more easily. It can refresh black-white E-paper Display and three-color (black, white and red/Yellow) Good Display `s E-paper Display. And it is also added the functions of USB serial port, Raspberry Pi and LED indicator light ect.

DESPI Development Kit consists of the development board and the pinboard. More details about the Development Kit, please click to the following link:

<https://www.good-display.com/product/219.html>

GOOD DISPLAY



## 2. Environmental

### 2.1 HANDLING, SAFETY AND ENVIROMENTAL REQUIREMENTS

| <b>WARNING</b>   |
|--|
| 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. |

| <b>CAUTION</b>   |
|--|
| 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.                  |

Observe general precautions that are common to handling delicate electronic components. The glass can break and front surfaces can easily be damaged.

Moreover the display is sensitive to static electricity and other rough environmental conditions.

| <b>Mounting Precautions</b> |  |
|-----------------------------|--|
| (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.  |
| Product specification       | The data sheet contains final 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 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.

**Product Environmental certification**

ROHS

**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.

## 2.2 Reliability test

| NO | Test items                 | Test condition   |
|----|----------------------------|--|
| 1  | Low-Temperature Storage    | T = -25 °C, 240 h<br>Test in complex pattern.  |
| 2  | Low-Temperature Operation  | T = -0 °C, 240 h<br>Test between the complex picture and white pattern every 24 hours.       |
| 3  | Temperature Cycle          | 1 cycle:[-25°C 30min]→[+70 °C 30 min] : 100 cycles<br>Test in complex pattern.               |
| 4  | High-Temperature Operation | T = 50 °C, 30%RH,240 h<br>Test between the complex picture and white pattern every 24 hours. |
| 5  | High-Temperature Storage   | T=60 °C, RH=30%, 240h<br>Test in complex pattern.  |
| 6  | UV exposure Resistance     | 765W/m <sup>2</sup> for 168hrs,40 °C<br>Test in complex pattern.                             |

Note: Put in normal temperature for 1hour after test finished, display performance is ok.

## 2.3 Outgoing Quality Control Specifications

### 2.3.1 Sampling Method

(1)GB/T2828.1, inspection level, normal inspection, single sample inspection

(2)AQL:Major 0.65; Minor 1.0

### 2.3.2 Inspection Conditions

The environmental conditions for test and measurement are performed as follows.

Temperature:  $23 \pm 3C$

Humidity:  $55 \pm 15\%R.H$

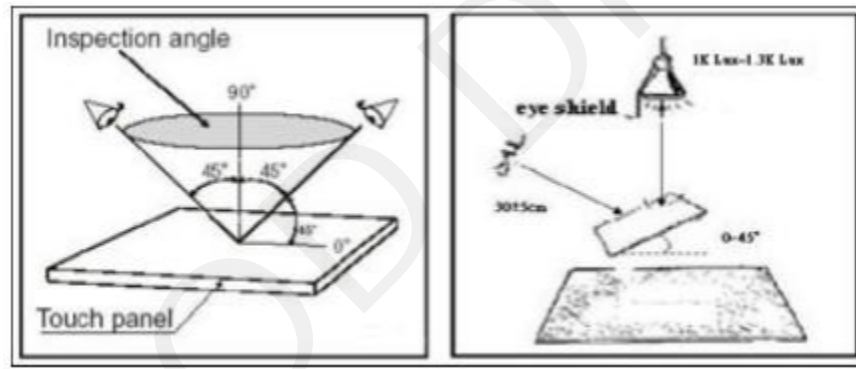
Inspection of illuminance:  $800 \sim 1200Lux$

Inspection time: signal face 5S-10S

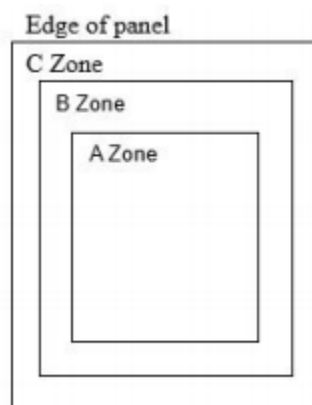
Distance between the Panel & Eyes:  $30 \pm 10cm$

Viewing angle from the vertical in each direction:  $\pm 45^\circ$

(See the sketch below)



### 2.3.3 Quality Assurance Zones

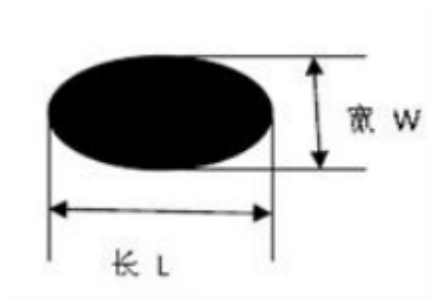


Zone A : Active Area  
 Zone B : Black Frame Area  
 Zone C : Outside Black Frame Area

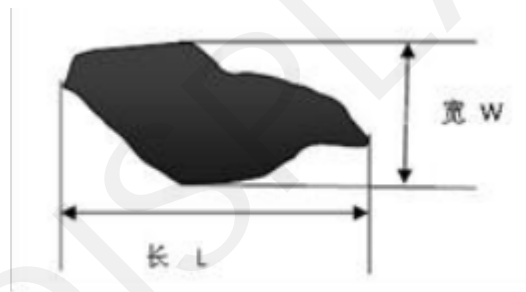
## 2.4 Inspection Standard

Defects Definition of L&W (Unit:mm)

### 2.4.1 Dot defects:

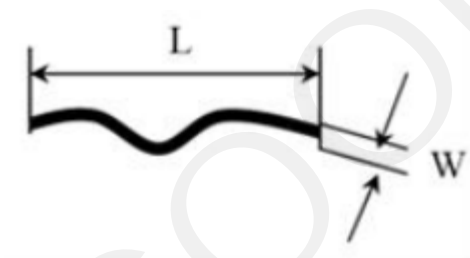


$$\Phi D = \text{Max}(L, W)$$

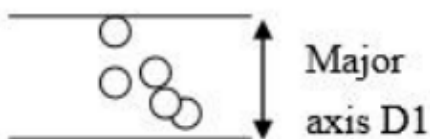


$$\Phi = D_{\text{Max}}(L, W)$$

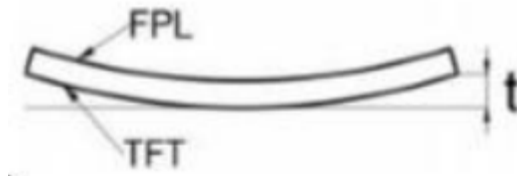
### 2.4.2 Line defect:



### 2.4.3 Small bubble aggregation and large bubble definition:





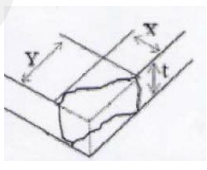
**2.4.4 TFT warpage:**



**Identification and packaging inspection**

| NO. | ITEM                             | CRITERIA   | Method      | Defect level |
|-----|----------------------------------|--|-------------|--------------|
| 1   | Package                          | (1). The products are completely placed in the anti-static tray without overlapping.<br>(2). Products with different models cannot be mixed in one internal packaging bag.<br>(3) There is a desiccant in the packaging bag, with good internal packaging and no expansion of the packaging bag.<br>(4) The Tray model, quantity and way used for packaging meet the requirements of product specifications. | Sight Check | Minor        |
| 2   | Inner and outer packing          | (1) No obvious deformation, damage, dampness or dirt on the packing case;<br>(2) The type, quantity and method of the packing case used shall meet the requirements of the product specification.<br>(3) There is no font or unclear design in the outer packing box.  | Sight Check | Minor        |
| 3   | Labels for inner and outer cases | (1). Any unnecessary marks or marks are not allowed to exist;<br>(2). The label information such as model, specification, quantity, weight, material number, month label and environmental protection label should be clear and correct, which should be in line with product specifications or marked according to customer requirements.   | Sight Check | Minor        |


## Appearance Defects

| NO. | ITEM  | CRITERIA   | Acceptable range       | Method                                       | Defect level | Area     |
|-----|---|--|------------------------|--|--------------|----------|
| 1   | Spotty (black spots, white spots, foreign bodies, air bubbles, bumps) | $D \leq 0.25\text{mm}$   | Ignore                 | Film Card                                    | Minor        | Zone A   |
|     |   | $0.25\text{mm} < D \leq 0.4 \text{ mm}$ , Distance $\geq 5\text{mm}$   | $N \leq 4$             |  |              |          |
|     |   | $D > 0.4 \text{ mm}$   | $N = 0$                |  |              |          |
|     |   | $0.1\text{mm} < D \leq 0.25 \text{ mm}$ (Dense point)  | $N \leq 3/\text{cm}^2$ |  |              |          |
| 2   | POOR LINEAR SHAPE<br>(foreign body, glass scratch)                    | $L \leq 2\text{mm}$ , $W \leq 0.1\text{mm}$  | Ignore                 | Film Card                                    | Minor        | Zone A   |
|     |   | $2\text{mm} < L \leq 8\text{mm}$ , $0.1 < W \leq 0.5\text{mm}$   | $N \leq 4$             |  |              |          |
|     |   | $L > 8\text{mm}$ , $W > 0.5\text{mm}$<br>Note: FPL Lacerations are not allowed   | $N = 0$                |  |              |          |
| 3   | Glass Crack   | Extensional cracks are not allowed<br>  | $N = 0$                | Sight Check                                  | Major        | Zone B,C |
| 4   | Edge breakage   | $X \leq 3\text{mm}$ , $Y \leq 0.5\text{mm}$ , It does not affect the electrode<br>  | $N \leq 2$             | Sight Check/<br><u>Microsc</u><br><u>ope</u> | Minor        | Zone C   |
| 5   | Chip Package<br>Chip Off  | $X \leq 2\text{mm}$ , $Y \leq 2\text{mm}$ , It does not affect the electrode(FPC edge)<br>$X \leq 1\text{mm}$ , $Y \leq 1\text{mm}$ , It does not affect the electrode((Not FPC edge)<br> | $N \leq 2$             | Sight Check/<br><u>Microsc</u><br><u>ope</u> | Minor        | Zone C   |
| 6   | Squalidity  | Can wipe dirt.   | Ignore                 | Sight Check                                  | Minor        | Zone A,B |
| 7   | Silicone  | The maximum diameter of a single bubble cannot exceed 2mm  | $N \leq 2$             | Sight Check/<br>Film card                    | Minor        | Zone C   |
|     |   | Crack is not allowed and there are no visible impurities in the glue of the lead part (Determination of impurities outside IC region by point deficiency)  | $N = 0$                |  |              |          |
|     |   | The adhesive must completely cover the ACF, lead area and IC and should be applied evenly  | $N = 0$                |  |              |          |
|     |   | No glue leakage, no obvious lack of glue in the lead area  | $N = 0$                |  |              |          |

| NO. | ITEM                  | CRITERIA   | Acceptable range | Method                    | Defect level | Area     |
|-----|-----------------------|--|------------------|---------------------------|--------------|----------|
|     |                       | Glue height exceeds PS surface   | N=0              |                           |              |          |
|     |                       | FPC Front overflow glue width>0.5mm or Back side overflow glue width>1mm         | N=0              |                           |              |          |
| 8   | Edge Sealing Adhesive | No glue leakage  | N=0              | Sight Check/<br>Film card | Major        | Zone C   |
|     |                       | The height of sealant exceeds PS surface   | N=0              |                           | Minor        |          |
|     |                       | Judging Ok of water-blocking area $\geq 0.7$ mm of PS edge sealant               | N=0              |                           | Minor        |          |
| 9   | Protective film       | Foreign body in protective film  | N=0              | Sight Check               | Minor        | Zone A   |
|     |                       | The protective film punctures and injures FPL                                    | N=0              |                           |              |          |
| 10  | Pull Tape             | Attachment position is wrong<br>Cannot tear up the protective film               | N=0              | Sight Check               | Minor        | Zone C   |
| 11  | FPC                   | FPC has break, scratch, gold finger stripping or oxidation, dirty, residual glue | N=0              | Sight Check               | Major        | Zone C   |
| 12  | Glass edge bulge      | $X \leq 3\text{mm}$ , $Y \leq 0.3\text{mm}$                                      | $N \leq 1$       | Sight Check               | Minor        | Zone C   |
| 13  | Warping               | $t > 1\text{mm}$ ( 3.5inch below )<br>$t > 3\text{mm}$ ( 3.5inch above )         | N=0              | Plug Gage                 | Minor        | Zone C   |
| 14  | Chromatism            | Color difference in silver paste area (Not in Zone A)                            | Ignore           | Sight Check               | Minor        | Zone C   |
|     |                       | FPL Peeling occurs, chromatic aberration occurs                                  | N=0              | Sight Check               | Major        | Zone A,B |
|     |                       | The color difference of side loss of FPL in zone B $\geq 1/2$ width              | N=0              | Sight Check               | Major        | Zone A,B |
| 15  | Silver pulp point     | FPL and TFT substrate conduction, silver point $< 1.0\text{mm}$                  | N=0              | Film card                 | Major        | Zone C   |



## Displaying Defects

| NO. | ITEM                                       | CRITERIA  | Acceptable range       | Method      | Defect level | Area   |
|-----|--|---|------------------------|-------------|--------------|--------|
| 1   | Poor DOT SHAPE (black, white, group White) | $D \leq 0.25\text{mm}$  | Ignore                 | Film Card   | Major        | Zone A |
|     |  | $0.25\text{mm} < D \leq 0.5\text{mm}$ , Distance $\geq 5\text{mm}$  | $N \leq 4$             |             |              |        |
|     |  | $D > 0.5\text{mm}$  | $N = 0$                |             |              |        |
|     |  | $0.1\text{mm} < D \leq 0.25\text{mm}$ (Dense point)   | $N \leq 3/\text{cm}^2$ |             |              |        |
| 2   | Line defects                               | White or black lines running through the entire screen under any operation interface<br> | $N = 0$                | Sight Check | Major        | Zone A |
| 3   | <u>ghost</u>                               | Ghosts appear only during screen switching  | Ignore                 | Sight Check | Major        | Zone A |
| 4   | Flash Point                                | Flash point occurs during screen switching only   | Ignore                 | Sight Check | Major        | Zone A |
| 5   | Display screen error                       | Unable to display a fixed screen correctly  | $N = 0$                | Sight Check | Major        | Zone A |
| 6   | Display abnormal                           | No display,<br>The red matrix darkens,<br>Note fuzzy, bar code can not be scanned,<br>After refresh, the previous template remains  | $N = 0$                | Sight Check | Major        | Zone A |
| 7   | Residual image                             | Residual Image Inspection (visual, final judgment reference optical specification)  | $N = 0$                | Sight Check | Major        | Zone A |
| 8   | Mura Anomaly                               | White/gray. Mura doesn't allow it   | $N = 0$                | Sight Check | Major        | Zone A |

### 3. ELECTRICAL CHARACTERISTICS

#### 3.1 ABSOLUTE MAXIMUM RATINGS

| ITEM                 | SYMBOL           | MIN  | MAX                  | UNIT | REMARK |
|----------------------|------------------|------|----------------------|------|--------|
| Logic supply voltage | V <sub>CI</sub>  | -0.5 | +6.0                 | V    | -      |
| Logic Input voltage  | V <sub>IN</sub>  | -0.5 | V <sub>CI</sub> +0.5 | V    | -      |
| Logic Output voltage | V <sub>OUT</sub> | -0.5 | V <sub>CI</sub> +0.5 | V    | -      |
| Operating Temp.      | T <sub>op</sub>  | 0    | +50                  | °C   | -      |
| Storage Temp         | T <sub>stg</sub> | -25  | +60                  | °C   | -      |

Note(1):All of the voltages are on the basis of "V<sub>SS</sub>=0V" .

Note(2):Maximum ratings are those values beyond which damages to the device may occur. Functional operation should be restricted to the limits in the Panel DC Characteristics tables.

#### 3.2 DC Characteristics

The following specifications apply for: V<sub>SS</sub> =0V, V<sub>CI</sub> =3.3V, T<sub>OPR</sub> =23°C.

| Parameter                                 | Symbol                | Condition  | Applicable pin  | Min.                | Typ.   | Ma                  | Unit |
|---|-----------------------|--|-----------------|---------------------|--------|---------------------|------|
| Logic supply voltage                      | V <sub>CI</sub>       | -  | V <sub>CI</sub> | 2.2                 | 3.3    | 3.7                 | V    |
| High level input voltage                  | V <sub>IH</sub>       | -  | -               | 0.8V <sub>VCI</sub> | -      | -                   | V    |
| Low level input voltage                   | V <sub>IL</sub>       | -  | -               | -                   | -      | 0.2V <sub>VCI</sub> | V    |
| High level output voltage                 | V <sub>OH</sub>       | I <sub>OH</sub> = - 100uA  | -               | 0.9V <sub>VCI</sub> | -      | -                   | V    |
| Low level output voltage                  | V <sub>OL</sub>       | I <sub>OL</sub> = 100uA  | -               | -                   | -      | 0.1V <sub>VCI</sub> | V    |
| OTP Program voltage                       | V <sub>PP</sub>       | -  | V <sub>PP</sub> | 7.2                 | 7.5    | 7.75                | V    |
| Typical power panel                       | P <sub>TYP</sub>      | V <sub>CI</sub> =3.3V  | -               | -                   | 16.5   | -                   | mW   |
| Standby power panel                       | P <sub>STPY</sub>     | V <sub>CI</sub> =3.3V  | -               | -                   | 0.0066 | -                   | mW   |
| Typical operating current( Complex state) | I <sub>opr_VCI</sub>  | V <sub>CI</sub> =3.3V  | -               | -                   | 4      | -                   | mA   |
| Full update time                          | -                     | 23 °C  | -               | -                   | 3      | -                   | sec  |
| Fast update time                          | -                     | 23 °C  | -               | -                   | 1.5    | -                   | sec  |
| Partial update time                       | -                     | 23 °C  | -               | -                   | 0.42   | -                   | sec  |
| Sleep mode current                        | I <sub>slp_VCI</sub>  | V <sub>CI</sub> =3.3V<br>DC/DC<br>OFF<br>No clock<br>No output load<br>Ram data            | V <sub>CI</sub> | -                   | 40     | 70                  | uA   |
| Deep sleep mode current                   | I <sub>dslp_VCI</sub> | V <sub>CI</sub> =3.3V<br>DC/DC<br>OFF<br>No clock<br>No output load<br>Ram data not retain | V <sub>CI</sub> | -                   | 2      | 6                   | uA   |

Note: The VPP, VCI, VDDIO input must be kept in a stable value; ripple and noise are not allowed.

### 3.3 Panel DC Characteristics (Driver IC Internal Regulators)

The following specifications apply for:  $V_{SS}=0V$ ,  $V_{CI}=3.3V$ ,  $T_{OPR} = 23^{\circ}C$ .

| Parameter                      | Symbol   | Condition | Applicable pin     | Min. | Typ. | Max. | Unit |
|--------------------------------|----------|-----------|--------------------|------|------|------|------|
| VCOM output voltage            | VCOM     | -         | VCOM               | -    | -2.0 | -    | V    |
| Positive Source output voltage | $V_{SH}$ | -         | $V_{SH}$           | -    | +15  | -    | V    |
| Negative Source output voltage | $V_{SL}$ | -         | $V_{SL}$           | -    | -15  | -    | V    |
| Positive gate output voltage   | Vgh      | -         | $G_0 \sim G_{299}$ | 19.5 | +20  | 20.5 | V    |
| Negative gate output voltage   | Vgl      | -         | $G_0 \sim G_{299}$ | -    | -20  | -    | V    |

### 3.4 Optical Specification

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

| Symbol   | Parameter          | Conditions | Min | Typ.                       | Max | Units | Notes |
|----------|--------------------|------------|-----|----------------------------|-----|-------|-------|
| R        | White Reflectivity | White      | 30  | 35                         | -   | %     | 3-1   |
| CR       | Contrast Ratio     | indoor     | 8:1 | -                          | -   |       | 3-2   |
| T update | Image update time  | 23 °C      | -   | 5                          | -   | sec   |       |
| Tlife    | Life               | Topr       | -   | 1000000 times<br>or 5years | -   |       |       |

Notes 3-1: Luminance meter: Eye-One Pro Spectrophotometer.

Notes 3-2: CR=Surface Reflectance with all white pixel/Surface Reflectance with all black pixels.

### 3.5 AC Electrical Characteristics

(1) Serial Peripheral Interface The following specifications apply for:

VDDIO – VSS = 2.2V to 3.7V, T<sub>OPR</sub> = 23°C CL = 20pF

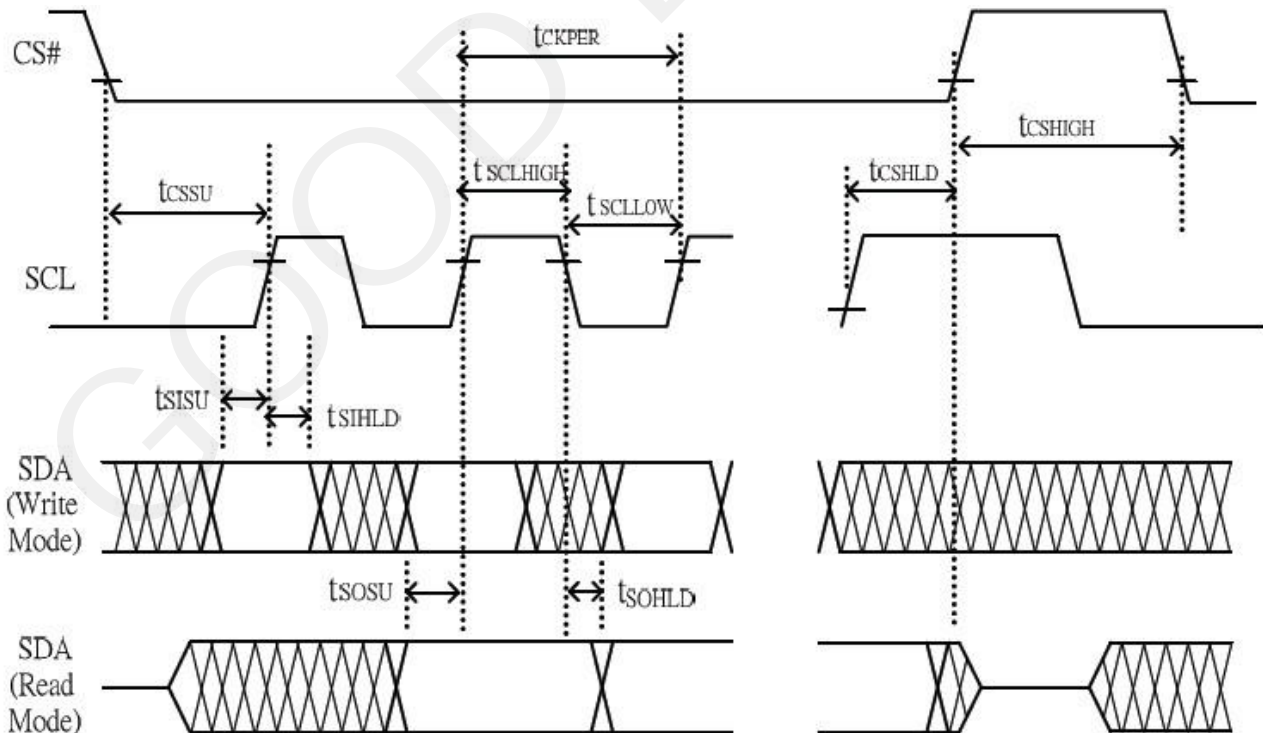
**Write mode**

| Symbol               | Parameter  | Min | Typ | Max | Unit |
|----------------------|--|-----|-----|-----|------|
| f <sub>SCL</sub>     | SCL frequency (Write Mode)   |     |     | 20  | MHz  |
| t <sub>CSSU</sub>    | Time CS# has to be low before the first rising edge of SCLK                  | 60  |     |     | ns   |
| t <sub>CSHLD</sub>   | Time CS# has to remain low after the last falling edge of SCLK               | 65  |     |     | ns   |
| t <sub>CSHIGH</sub>  | Time CS# has to remain high between two transfers                            | 100 |     |     | ns   |
| t <sub>SCLHIGH</sub> | Part of the clock period where SCL has to remain high                        | 25  |     |     | ns   |
| t <sub>SCLLOW</sub>  | Part of the clock period where SCL has to remain low                         | 25  |     |     | ns   |
| t <sub>SISU</sub>    | Time SI (SDA Write Mode) has to be stable before the next rising edge of SCL | 10  |     |     | ns   |
| t <sub>SIHLD</sub>   | Time SI (SDA Write Mode) has to remain stable after the rising edge of SCL   | 40  |     |     | ns   |

**Read mode**

| Symbol               | Parameter  | Min | Typ | Max | Unit |
|----------------------|--|-----|-----|-----|------|
| f <sub>SCL</sub>     | SCL frequency (Read Mode)  |     |     | 2.5 | MHz  |
| t <sub>CSSU</sub>    | Time CS# has to be low before the first rising edge of SCLK              | 100 |     |     | ns   |
| t <sub>CSHLD</sub>   | Time CS# has to remain low after the last falling edge of SCLK           | 50  |     |     | ns   |
| t <sub>CSHIGH</sub>  | Time CS# has to remain high between two transfers                        | 250 |     |     | ns   |
| t <sub>SCLHIGH</sub> | Part of the clock period where SCL has to remain high                    | 180 |     |     | ns   |
| t <sub>SCLLOW</sub>  | Part of the clock period where SCL has to remain low                     | 180 |     |     | ns   |
| t <sub>SOSU</sub>    | Time SO(SDA Read Mode) will be stable before the next rising edge of SCL |     | 50  |     | ns   |
| t <sub>SOHLD</sub>   | Time SO (SDA Read Mode) will remain stable after the falling edge of SCL |     | 0   |     | ns   |

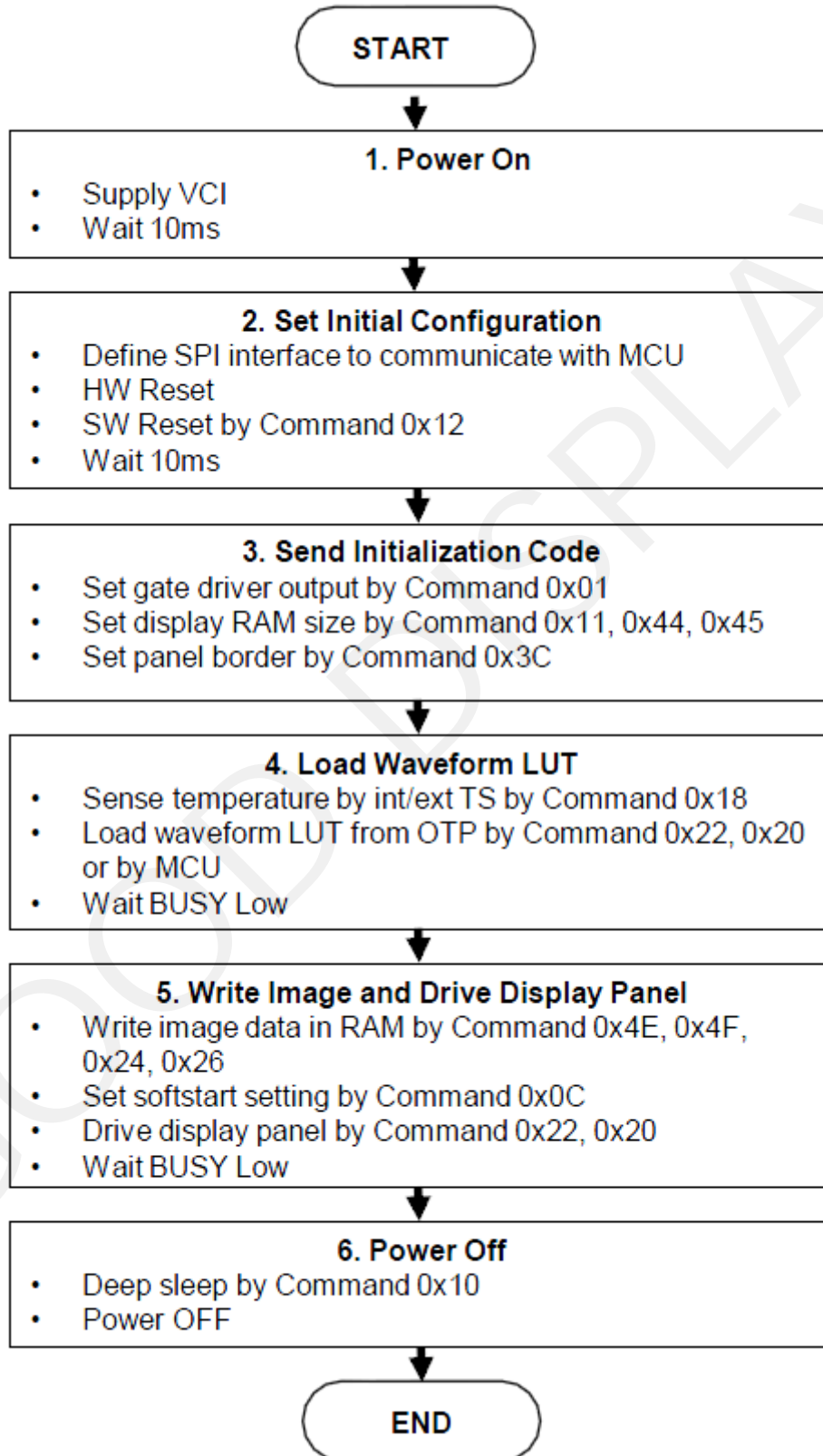
SPI timing diagram



### 3.6 Functional Specification and Application Circuit

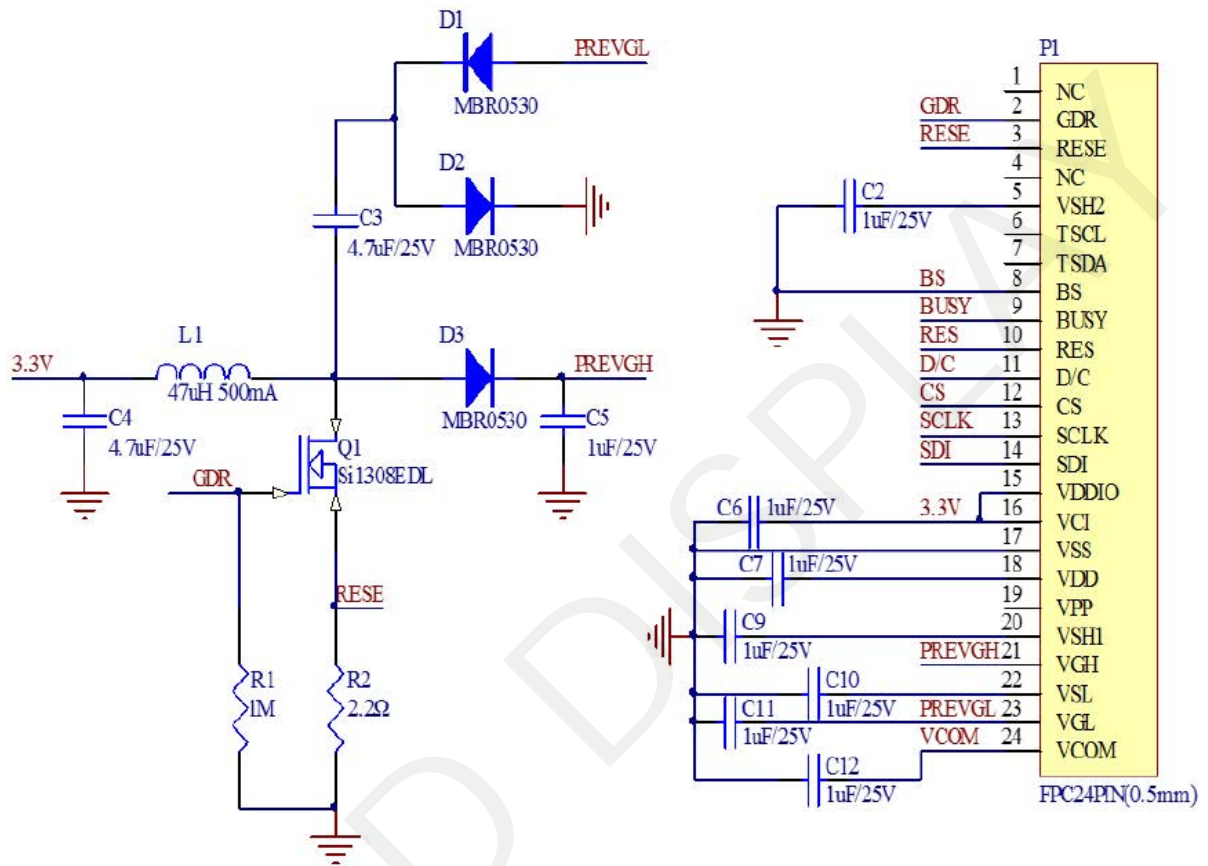
#### 3.6.1 Operation Flow and Code Sequence

General operation flow to drive display panel



### 3.6.2 Typical Application Circuit with SPI Interface

(1) Schematic of application circuit:



### 3.7 Recommended Software Initialization

In order to ensure the reliability and stability of the module, the module must initialize use the following code, Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the initialize code.

#### 3.7.1 Global update mode

| Global update mode |                      |                                   |
|--------------------|----------------------|-----------------------------------|
| DRIVER CONFIG      |                      | DESCRIPTION                       |
| RESET              | RESE# low ->high     | Hardware reset                    |
| Read busy pin      |                      | Wait for busy low                 |
| Command 0x12       |                      | Software reset                    |
| Read busy pin      |                      | Wait for busy low                 |
| Command 0x11       | 0x01                 | Ram data entry mode(Note-1)       |
| Command 0x44       | 0x00, 0x31           | Set Ram X address(Note-1)         |
| Command 0x45       | 0x2B,0x01, 0x00,0x00 | Set Ram Y address(Note-1)         |
| Command 0x4E       | 0x00                 | Set Ram X address counter(Note-1) |
| Command 0x4F       | 0x2B,0x01            | Set Ram Y address counter(Note-1) |
| Command 0x24       | 15000bytes           | Load Global image (Note-2)        |
| Command 0x26       | 15000bytes           | Load Global image (Note-2)        |
| Command 0x22       | 0xF7                 | Global Image update               |
| Command 0x20       |                      |                                   |
| Read busy pin      |                      | Wait for busy low                 |

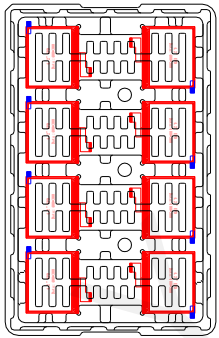
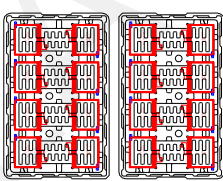
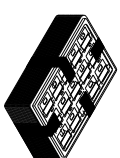
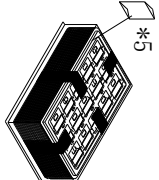
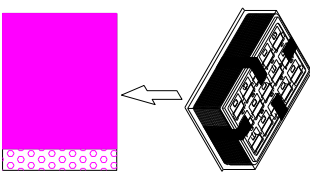
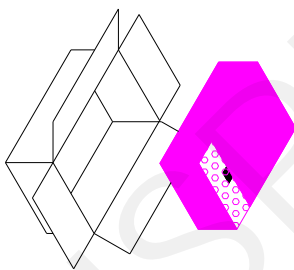
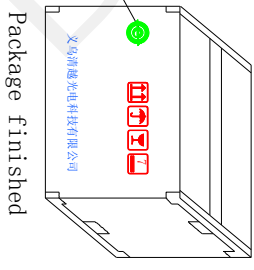
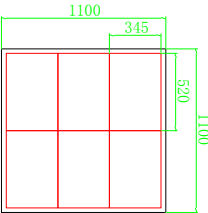
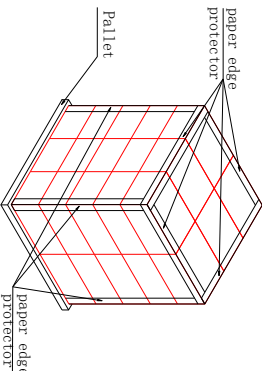
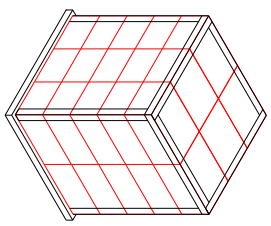
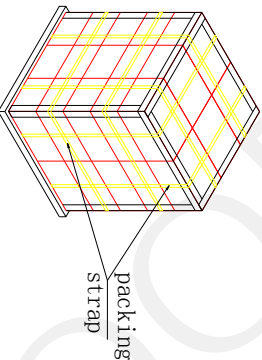
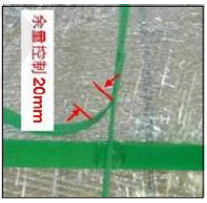
#### 3.7.2 Partial update mode

| Partial update mode |                      |                                   |
|---------------------|----------------------|-----------------------------------|
| DRIVER CONFIG       |                      | DESCRIPTION                       |
| RESET               | RESE# low ->high     | Hardware reset                    |
| Read busy pin       |                      | Wait for busy low                 |
| Command 0x3C        | 0x80                 | Select border for VCOM            |
| Command 0x21        | 0x00,0x00            | Display mode 2                    |
| Command 0x22        | 0xC0                 | Enable internal clock oscillator  |
| Command 0x20        |                      |                                   |
| Read busy pin       |                      | Wait for busy low                 |
| Command 0x11        | 0x01                 | Ram data entry mode(Note-1)       |
| Command 0x44        | 0x00, 0x31           | Set Ram X address(Note-1)         |
| Command 0x45        | 0x2B,0x01, 0x00,0x00 | Set Ram Y address(Note-1)         |
| Command 0x4E        | 0x00                 | Set Ram X address counter(Note-1) |
| Command 0x4F        | 0x2B,0x01            | Set Ram Y address counter(Note-1) |
| Command 0x24        | 15000bytes           | Load Partial image                |
| Command 0x22        | 0xFF                 | Partial Image update              |
| Command 0x20        |                      |                                   |
| Read busy pin       |                      | Wait for busy low                 |


NOTE:

1. You can customize the Settings based on the actual scan mode.
2. Global image data must be the same data.
3. Perform Global update mode before using Partial update mode.
4. Every 10 times the Partial update mode, then must be Perform 1 time Global update mode.

### 3.8 Packing

| Controlled Seal   |  | Packing Process (1) ~ (12)  |   |  |  |
|---|--|---|---|--|--|
| <p>( 1 ) TRAY Type:<br/>P420023-MT1-A</p>    | <p>( 2 )</p>  <p>normal ①<br/>sever ②</p> <p>TRAY</p>   | <p>( 3 ) order ①、②、①、②<br/>fix trays with tape<br/>256 pcs of 1 carton<br/>1 tray contain 8 pcs<br/>32 contained trays, 1 empty tray</p>   | <p>( 4 ) package with plastic bags<br/>add five desiccants<br/>create a power vacuum<br/>*5</p>    |  |  |
| <p>( 5 ) After tray be packed,<br/>wrap the package in a<br/>bubble bag and seal with<br/>scotch tape.</p>    | <p>( 6 )</p>   | <p>( 7 ) 32 contained trays, 1 empty<br/>Package quantity products:<br/>256 pcs of 1 carton.</p>  <p>RoHS标识<br/>Package finished</p>  | <p>( 8 ) Pallet stack<br/>Pallet Type: 1100*1100*150mm<br/>Plastic Pallet</p>  <p>1100, 345, 520, 1100</p> <p>一、The six carton is of one layer.<br/>二、maximum stack of five layers.<br/>三、If the shipment is from the full container, empty container shall be used to fill the current Floor for shipment.<br/>四、Each carton layer should be centered on the pallet.</p> |  |  |
| <p>( 9 ) Use paper edge protector</p> <p>Top face paper edge protector type : P213010-MT1-A<br/>Size: 1035*50*50mm, T=5mm<br/>Side face paper edge protector type : P213010-MT5-A<br/>Size: 1000*50*50mm, T=5mm</p>  <p>paper edge protector<br/>Pallet<br/>paper edge protector</p> | <p>( 10 ) Enwind stretch film</p> <p>Wrap 3 Layers of stretch film around the paper sheath (All around and on top) , Wrap paper pallets, pallets, and boxes underneath</p>  | <p>( 11 ) Pack packing strap</p> <p>The packing tape should be tied to the carton:<br/>If Stack height greater than or equal to 3 layers, 2 turns in length, width and height;<br/>If the stack height is less than 3 layers, the height direction is not used pack.</p>  <p>packing strap</p> | <p>( 12 ) Pack packing strap</p> <p>The surface of the packing belt shall not be twisted, skewed or cracked. After the packaging is completed, the tightness of the packaging belt is suitable. Use the packing iron buckle to fix the belt and cut off the excess packaging belt. The remaining amount is less than or equal to 20mm</p>  <p>余量控制 20mm</p>                |  |  |

NOTE: 1、The inner cartoster carton must be sealed with adhesive tape.

- 2、Fill up the gap with empty tray.
- 3、If the customer has special needs with the RoHS making, the inner carton and master carton need adhesive new RoHS marking at .
- 4、Packaging materials are not recommended for recycling.



## 4. Precautions

- (1) Do not apply pressure to the EPD panel in order to prevent damaging it.
- (2) Do not connect or disconnect the interface connector while the EPD panel is in operation.
- (3) Do not touch IC bonding area. It may scratch TFT lead or damage IC function.
- (4) Please be mindful of moisture to avoid its penetration into the EPD panel, which may cause damage during operation.
- (5) If the EPD Panel / Module is not refreshed every 24 hours, a phenomena known as "Ghosting" or "Image Sticking" may occur. It is recommended to refreshed the ESL /EPD Tag every 24 hours in use case. It is recommended that customer ships or stores the ESL / EPD Tag with a completely white image to avoid this issue
- (6) High temperature, high humidity, sunlight or fluorescent light may degrade the EPD panel's performance. Please do not expose the unprotected EPD panel to high temperature, high humidity, sunlight, or fluorescent for long periods of time.
- (7) For more precautions, please click on the link:  
<https://www.good-display.com/news/80.html>