

Display Elektronik GmbH

# DATA SHEET

## MIP Display

**DE MIP320240B-W**

(4,4“ MIP, Mono)

**Product Specification**

**Ver.: 1**

**06.08.2026**

Revise Records

| Rev. | Date       | Contents                        | Written | Approved |
|------|------------|---------------------------------|---------|----------|
| 0    | 28.05.2026 | Preliminary Specification       | MHI     | MH       |
| 1    | 06.08.2026 | Update Weight<br>Update Drawing | AA      | MH       |
|      |            |                                 |         |          |
|      |            |                                 |         |          |
|      |            |                                 |         |          |
|      |            |                                 |         |          |
|      |            |                                 |         |          |
|      |            |                                 |         |          |

Special Notes

|        |  |
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## 1. General Description and Features

This TFT-LCD module is a reflective active-matrix with slightly transmissive memory liquid crystal display module with CG silicone thin film transistor.

### 1.1 Features

- Reflective active-matrix with slightly transmissive panel of white and black.
- 4.4" QVGA screen has 320 \* 240 resolution.
- Display control by serial data signal communication.
- Super low power consumption TFT panel.

### 1.2 LCD Module

| Item                  | Specification                   | Unit     |
|-----------------------|---------------------------------|----------|
| Screen Size           | 4.4 Inches                      | Diagonal |
| Display Resolution    | 320 x 240                       | Pixel    |
| Active Area           | 89.60 x 67.20                   | mm       |
| Outline Dimension     | 94.80 x 75.20 x 1.64            | mm       |
| Display Mode          | Memory in Pixel, Normally White | --       |
| Pixel Arrangement     | Square                          | --       |
| Pixel Size            | 0.280 x 0.280                   | mm       |
| Surface Hardness      | 3H                              | --       |
| Surface Treatment     | AG (Anti Glare)                 | --       |
| Operating Temperature | -20~70                          | °C       |
| Storage Temperature   | -30~80                          | °C       |

## 2. Mechanical Information

| Item        |                | Min. | Typ.  | Max. | Unit | Note |
|-------------|----------------|------|-------|------|------|------|
| Module Size | Horizontal (H) | --   | 94.80 | --   | mm   | --   |
|             | Vertical (V)   | --   | 75.20 | --   | mm   | --   |
|             | Thickness (T)  | --   | 1.64  | --   | mm   | (1)  |
| Weight      |                | --   | 29    | --   | g    | --   |

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

### 3. Electrical Specifications

#### 3.1 Absolute Max. Ratings

##### 3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

(Ta=25±2°C, V<sub>SS</sub>=GND=0)

| Item                  | Symbol           | Min. | Max. | Unit | Note    |
|-----------------------|------------------|------|------|------|---------|
| Storage Temperature   | T <sub>STG</sub> | -30  | 80   | °C   | (1)     |
| Operating Temperature | T <sub>OPR</sub> | -20  | 70   | °C   | (1,2,3) |

Note (1) 95 % RH Max. (40°C ≥ Ta). Maximum wet-bulb temperature at 39°C or less. (Ta > 40°C)  
No condensation.

Note (2) In case of below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

##### 3.1.2 Electrical Absolute Maximum Ratings

###### 3.1.2.1 TFT-LCD Module

| Parameter                 |        | Symbol | Min. | Max. | Unit | Remark |
|---------------------------|--------|--------|------|------|------|--------|
| Power Supply Voltage      | Analog | VDDA   | -0.3 | 5.8  | V    | --     |
|                           | Logic  | VDD    | -0.3 | 5.8  | V    | (1)    |
| Input Signal Voltage (Hi) |        | VHI    | --   | VDD  | V    | (2)    |
| Input Signal Voltage (Lo) |        | VLI    | -0.3 | --   | V    | --     |

Note (1) Applies to EXTMODE.

Note (2) Applies to SCLK, SI, SCS, DISP, EXTCOMIN.

##### 3.1.3 DC Electrical Characteristics of the TFT LCD

| Item                      |    | Symbol | Min. | Typ. | Max.     | Unit | Remark |
|---------------------------|----|--------|------|------|----------|------|--------|
| Power Supply              |    | VDD    | 4.8  | 5.0  | 5.5      | V    | --     |
|                           |    | VDDA   | 4.8  | 5.0  | 5.5      | V    | --     |
| Input Voltage for Logic   | Hi | VIH    | 2.7  | 3.0  | VDD      | V    | --     |
|                           | Lo | VIL    | VSS  | VSS  | VSS+0.15 | V    | --     |
| Voltage of Backlight Unit |    | IB     | --   | 120  | --       | mA   | --     |
| Current of Backlight Unit |    | VB     | --   | 3    | --       | V    | --     |

(Ta=25±2°C, V<sub>SS</sub>=GND=

### 3.2 AC Timing Characteristic of The LCD

#### 3.2.1 Recommend Operating Conditions and DC Characteristics

| Parameter         | Symbol | Min. | Typ. | Max. | Unit. | Remark                       |
|-------------------|--------|------|------|------|-------|------------------------------|
| Frame frequency   | fSCS   | 1    |      | 20   | Hz    | Where EXTMODE=Lo<br>Note (1) |
|                   |        | --   | --   | 20   | Hz    | Where EXTMODE=Hi<br>Note (1) |
| Clock frequency   | fSCLK  | --   | 1    | 2    | MHz   | --                           |
| Vertical Interval | tV     | 50   | --   | 1000 | ms    | --                           |
| COM frequency     | fCOM   | 0.5  | --   | 5    | Hz    | --                           |

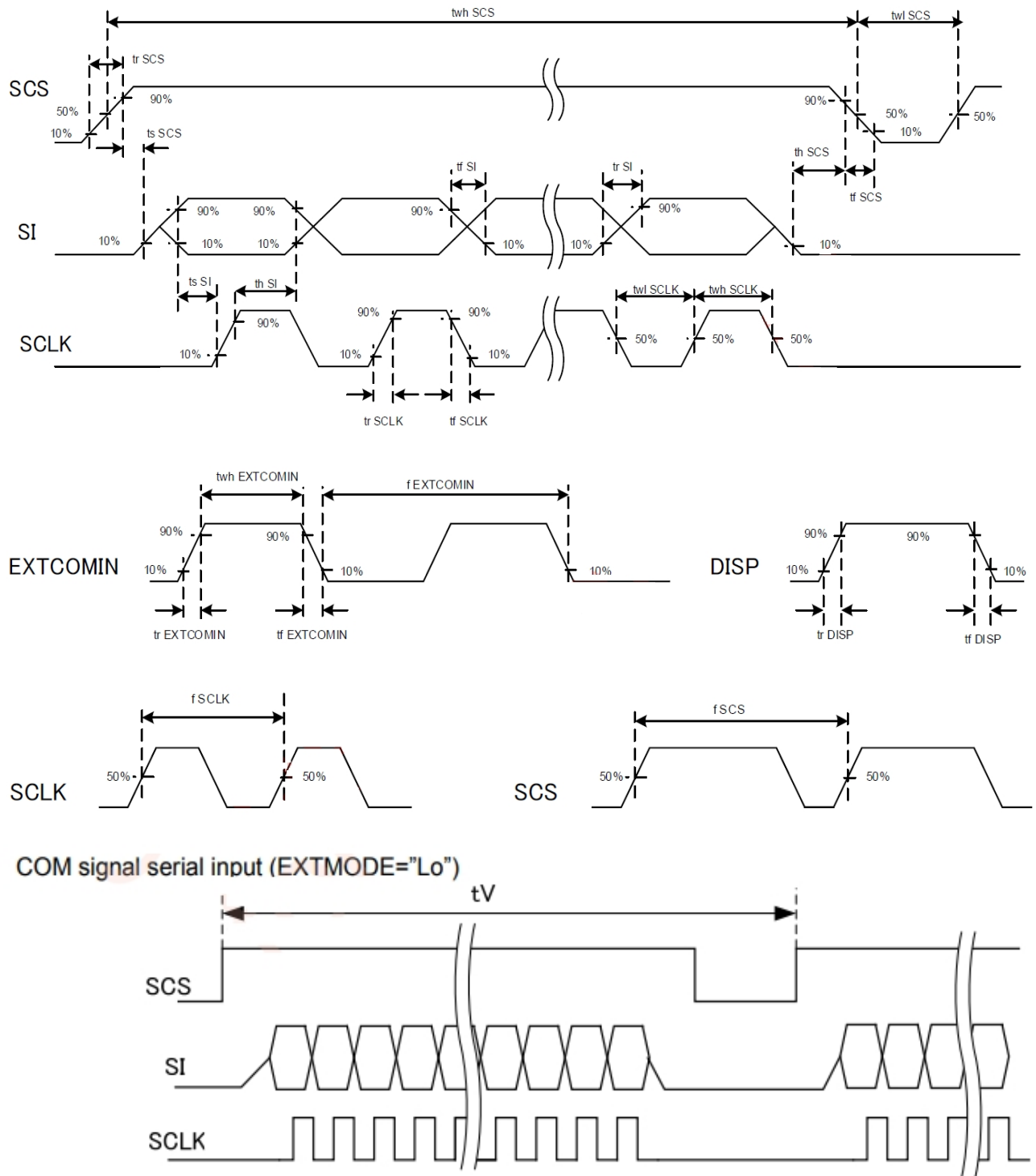
Note (1) Please use a frame frequency in the range where there are no problems with the display quality.

#### 3.2.2 AC Input Signal timing Parameters

VDDA=5.0V、VDD=5.0V、GND=0V、Ta=25°C

| Item     | Item          | Symbol      | Min. | Typ. | Max. | Unit | Remark           |
|----------|---------------|-------------|------|------|------|------|------------------|
| SCS      | Rise time     | trSCS       | --   | --   | 50   | ns   |                  |
|          | Fall time     | tfSCS       | --   | --   | 50   | ns   |                  |
|          | High duration | twhSCS      | 188  | --   | --   | us   | Data update mode |
|          |               |             | 12   | --   | --   | us   | Hold mode        |
|          | Low duration  | twlSCS      | 1    | --   | --   | us   |                  |
|          | Set up time   | tsSCS       | 3    | --   | --   | us   |                  |
|          | Hold time     | thSCS       | 1    | --   | --   | us   |                  |
| SI       | Rise time     | trSI        | --   | --   | 50   | ns   |                  |
|          | Fall time     | trSI        | --   | --   | 50   | ns   |                  |
|          | Set up time   | trSI        | 120  | --   | --   | ns   |                  |
|          | Hold time     | trSI        | 190  | --   | --   | ns   |                  |
| SCLK     | Rise time     | trSCLK      | --   | --   | 50   | ns   |                  |
|          | Fall time     | tfSCLK      | --   | --   | 50   | ns   |                  |
|          | High duration | twhSCLK     | 200  | 450  | --   | ns   |                  |
|          | Low duration  | twlSCLK     | 200  | 450  | --   | ns   |                  |
| EXTCOMIN | Frequency     | fEXTCOMIN   | 1    |      | 20   | Hz   |                  |
|          | Rise time     | trEXTCOMIN  | --   | --   | 50   | ns   |                  |
|          | Fall time     | tfEXTCOMIN  | --   | --   | 50   | ns   |                  |
|          | High duration | twhEXTCOMIN | 1    | --   | --   | us   |                  |
| DISP     | Rise time     | trDISP      | --   | --   | 50   | ns   |                  |
|          | Fall time     | tfDISP      | --   | --   | 50   | ns   |                  |

## 3.2.3 AC Signal Timing

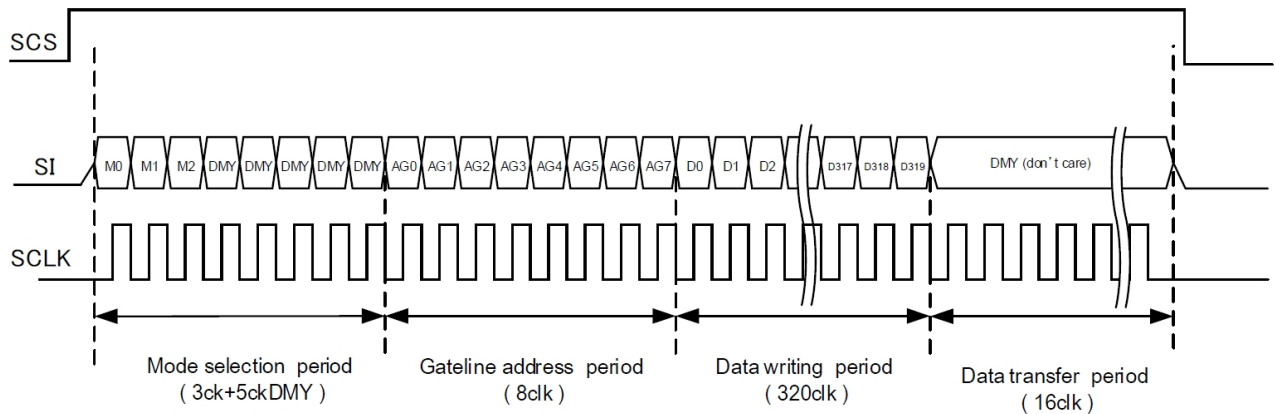


※SCS,SI,SCLK,DISP,EXTCOMIN : 3V input voltage

## 3.2.4 Input Signal Timing Chart

## 3.2.4.1 Data Update Mode ( 1 line )

Updates data of only one specified line. ( M0 = "Hi", M2 = "Lo" )



M0 : Mode flag.

Set for "Hi": Data update mode (Memory internal data update)

Set for "Lo": Hold mode (Maintain memory internal data update)

M1 : Mode flag.

When "Hi", outputs VCOM= "Hi", and when "Lo", outputs VCOM= "Lo".

When EXTMODE= "Hi", it can be "Hi" or "Lo".

M2 : All clear flag.

Refer to All Clear Mode to execute clear.

DUMMY DATA:

Dummy data: It can be "Hi" or "Lo" ("Lo" is recommended.)

D0 – D319:

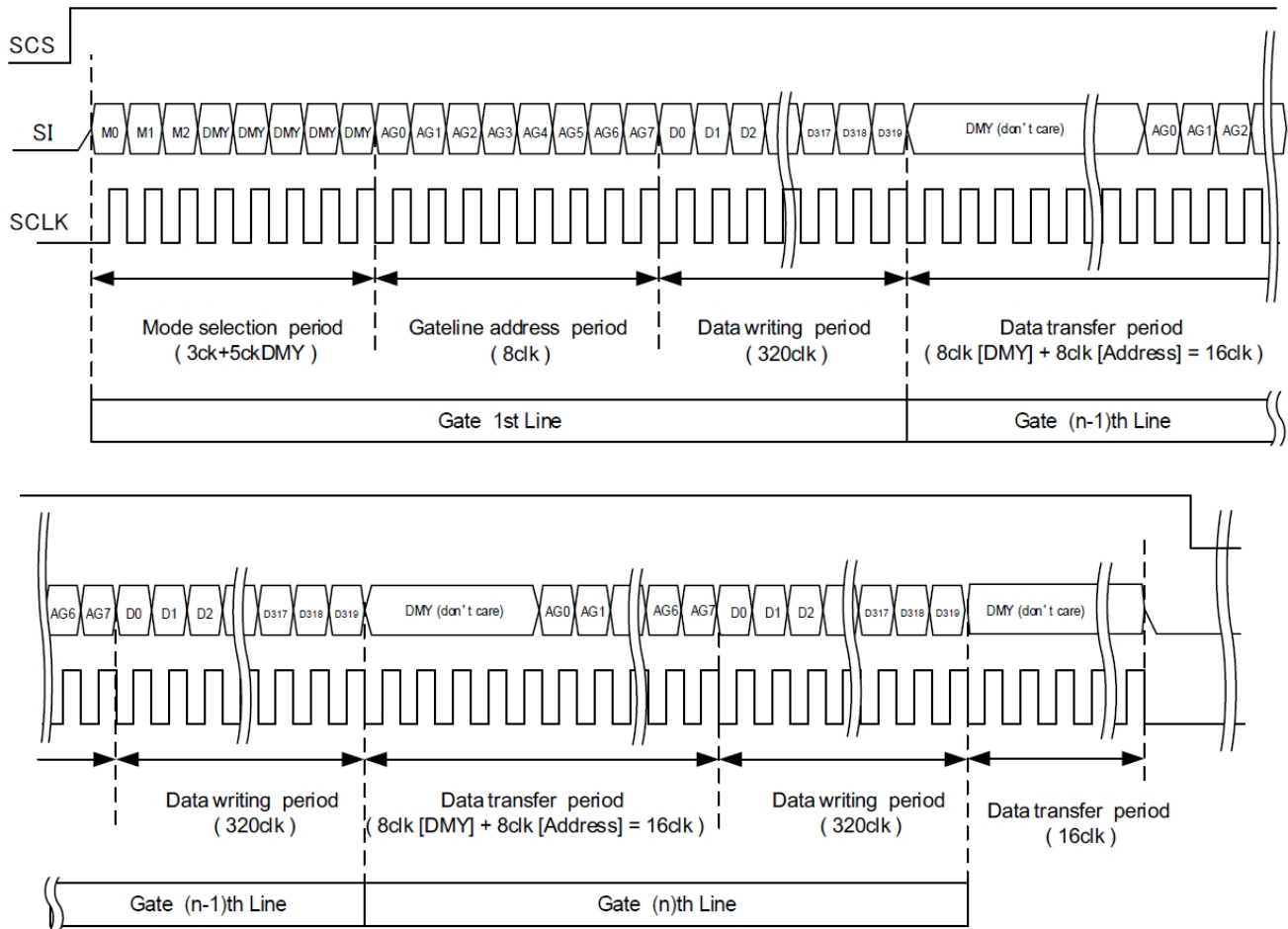
Writing Image data (Horizontal Line data)

Hi : White

Lo : Black

## 3.2.4.2 Data Update Mode ( Multiple lines )

Updates arbitrary multiple lines data. ( M0 = "Hi", M2 = "Lo" )



M0 : Mode flag.

Set for "Hi": Data update mode (Memory internal data update)

Set for "Lo": Hold mode (Maintain memory internal data update)

M1 : Mode flag.

When "Hi", outputs VCOM= "Hi", and when "Lo", outputs VCOM= "Lo".

When EXTMODE= "Hi", it can be "Hi" or "Lo".

M2 : All clear flag.

Refer to All Clear Mode to execute clear.

DUMMY DATA:

Dummy data: It can be "Hi" or "Lo" ("Lo" is recommended.)

D0 – D335:

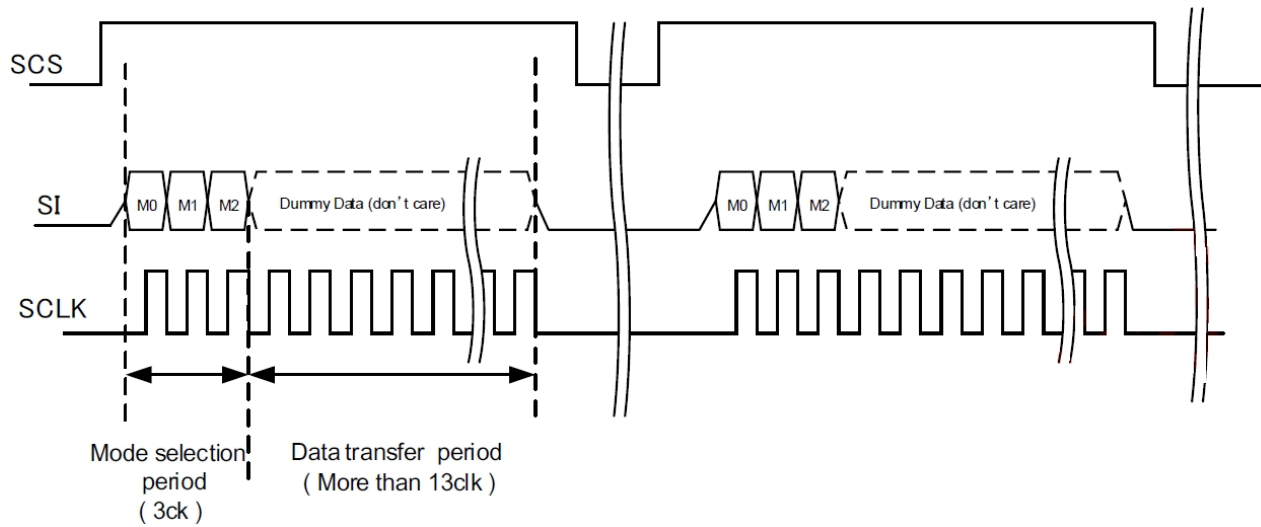
Writing Image data (Horizontal Line data)

Hi : White

Lo : Black

## 3.2.4.3 old Mode

Maintains memory internal data (maintains current display). ( M0 = "Lo", M2 = "Lo" )



M0 : Mode flag.

Set for "Hi": Data update mode (Memory internal data update)

Set for "Lo": Hold mode (Maintain memory internal data update)

M1 : Frame inversion flag.

When "Hi", outputs VCOM= "Hi", and when "Lo", outputs VCOM= "Lo".

When EXTMODE= "Hi", it can be "Hi" or "Lo".

M2 : All clear flag.

Refer to All Clear Mode to execute clear.

DUMMY DATA:

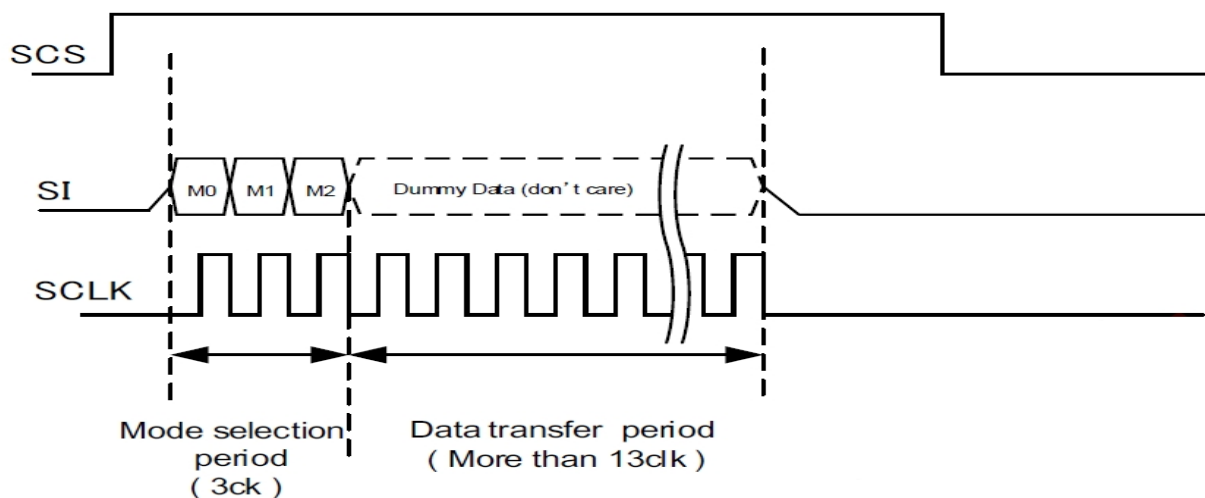
Dummy data: It can be "Hi" or "Lo" ("Lo" is recommended.)

M1 : Frame inversion flag is enabled when EXTMDOE= "Lo".

When SCS becomes "Lo", M0 and M2 are cleared.

## 3.2.4.4 All Clear Mode

Clears memory internal data and writes white. ( M0 = "Lo", M2 = "Hi" )



M0 : Mode flag.  
Set it "Lo".

M1 : Frame inversion flag.  
When "Hi", outputs VCOM= "Hi", and when "Lo", outputs VCOM= "Lo".  
When EXTMODE= "Hi", it can be "Hi" or "Lo".

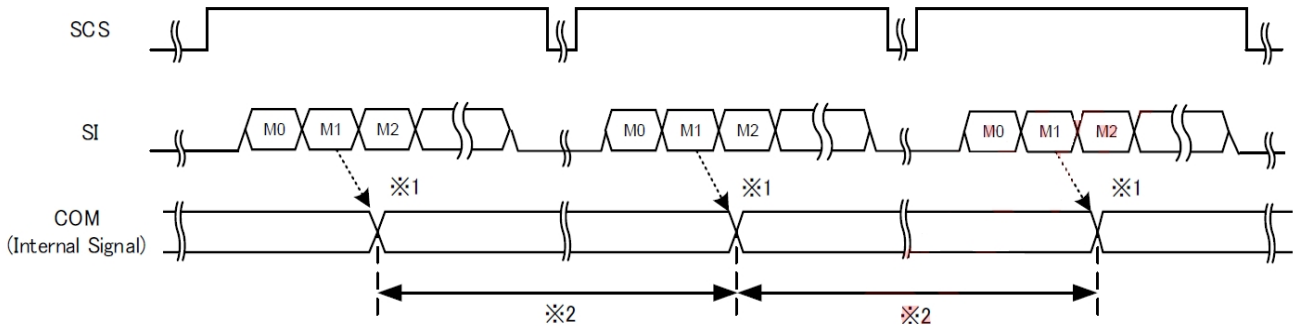
M2 : All clear flag.  
Set it "Hi".

DUMMY DATA:  
Dummy data: It can be "Hi" or "Lo" ("Lo" is recommended.)

M1 : Frame inversion flag is enabled when EXTMDOE= "Lo".  
When SCS becomes "Lo", M0 and M2 are cleared.

## 3.2.4.5 COM Inversion

There are two types of inputs, COM signal serial input (EXTMODE= "Lo") and external COM signal input (EXTMODE= "Hi").

EXTMODE= "Lo"

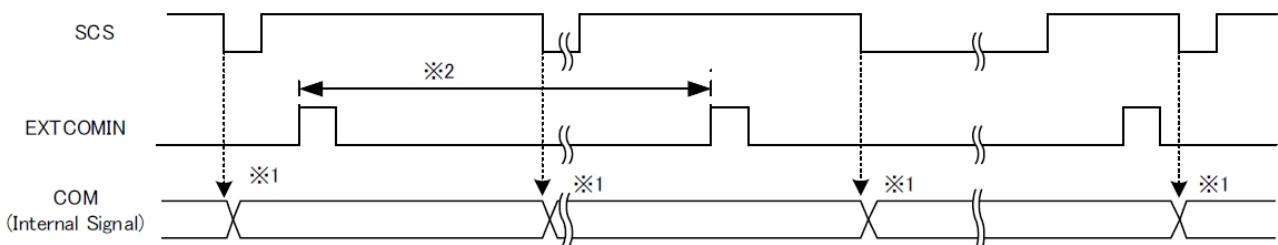
M1 : COM polarity inversion flag.

If M1 is "Hi" then VCOM= "Hi" is output. If M1 is "Lo" then VCOM= "Lo" is output.

COM inversion has been changed by M1 flag statement.

The periods of plus polarity and minus polarity should be same length as much as possible.

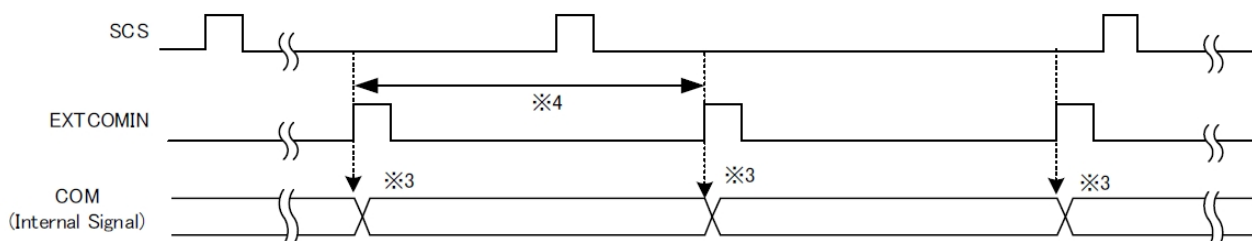
EXTMODE= "Hi" (COM inversion timing has two conditions)



1: Make "COM" reversal depending.

2: The periods of EXTCOMIN should be constant and the period of COM inversion should be constant depending on EXTCOMIN. (with Send a serial data or making the period of "SCS=Lo")

the EXTCOMIN input during low period of the SCS signal.



3: COM inversion polarity has been set by rising edge of EXTCOMIN.

4: The periods of EXTCOMIN should be constant.

### 3.3 Power Consumption

Ta=25°C . EXTCOMIN=+3V , VDD=+5V . VDDA=+5V

| Operating Mode | Power consumption                                                                                 | Min. | Typ. | Max. | Unit | Remark   |
|----------------|---------------------------------------------------------------------------------------------------|------|------|------|------|----------|
| Condition 1    | Hold mode(no display data update<br>Display pattern: Vertical stripe display                      | --   | 100  | 500  | μW   | (Note 1) |
| Condition 2    | Data update modewith display update 1Hz( 1frarm/sec)<br>Display pattern : Vertical stripe display | --   | 600  | 1200 | μW   | (Note 2) |

Note 1: After writed Vertical stripe data,set to (SCLK=L0,SCS=L0,SI=L0), It measures during

Note 2: fSCS=1.0Hz , Except in the time of writing,it is set to SCS=L0

#### 4. Optical Characteristics

##### 4.1 Optical characteristic of the LCD

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods.

Measuring equipment: BM-7A

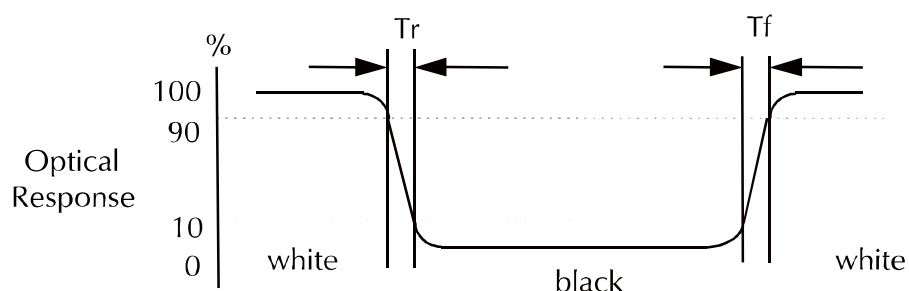
| Item                          |       | Symbol     | Condition                                | Min | Type  | Max | Unit   | Note  |
|-------------------------------|-------|------------|------------------------------------------|-----|-------|-----|--------|-------|
| Response Time                 |       | R          | $\theta=0^\circ$                         |     | 18    | --  | ms     |       |
| Transmission Ratio            |       | T          |                                          | --  | 0.25  | --  | ms     |       |
| Contrast Ratio                |       | CR         | At optimized viewing angle               | --  | 18    | --  | --     |       |
| Color Chromaticity (CIE 1931) | White | Wx         | $\theta=0^\circ$<br>Normal Viewing Angle |     | 0.307 |     | --     | BM-7A |
|                               |       | Wy         |                                          |     | 0.330 |     |        |       |
| Viewing Angle                 | Hor.  | $\theta_R$ | CR $\geq 2$                              | 40  | 60    | --  | Degree |       |
|                               |       | $\theta_L$ |                                          | 40  | 60    | --  |        |       |
|                               | Ver.  | $\theta_U$ |                                          | 40  | 60    | --  |        |       |
|                               |       | $\theta_D$ |                                          | 40  | 60    | --  |        |       |

##### a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of  $2^\circ$  at a distance of 50cm and normal direction.

##### b. Definition of response time: Tr and Tf

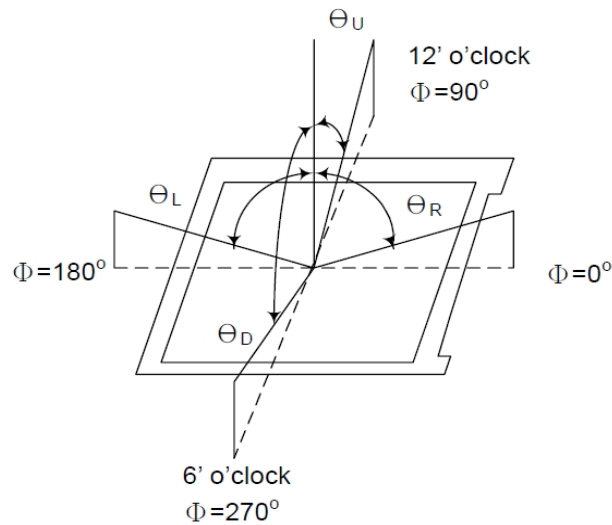
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



##### c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

- d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.
- e. View Angle



- f. Definition of Luminance of White: Luminance of white at the center points

| Light Source of Back-Light Unit | LED Type |
|---------------------------------|----------|
|---------------------------------|----------|

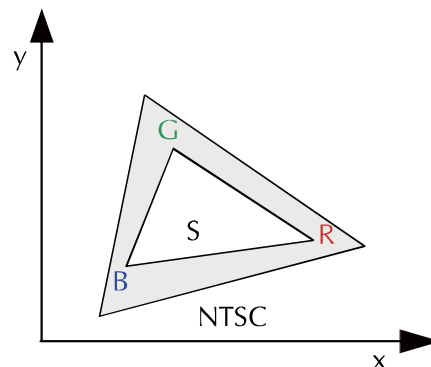
- g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

- h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = ( RGB Triangle Area / NTSC Triangle Area ) x 100



## 5. I/O Terminal

### 5.1 LCM Pin Definition

Recommended Connector : AYF531035 (Panasonic) or FH34SRJ-10-0.5SH(HRS) or compatible

| Pin No. | Symbol   | I/O | Function                           | Remark |
|---------|----------|-----|------------------------------------|--------|
| 1       | SCLK     | I   | Serial clock signal                |        |
| 2       | SI       | I   | Serial input signal                |        |
| 3       | SCS      | I   | Chip select signal                 |        |
| 4       | EXTCOMIN | I   | COM inversion polarity input pin   | (2)    |
| 5       | DISP     | I   | Display ON / OFF switching signal  | (1)    |
| 6       | VDDA     | P   | Power Source for Analog            |        |
| 7       | VDD      | P   | Power Source for Logic             |        |
| 8       | EXTMODE  | I   | COM inversion mode switch terminal | (2)    |
| 9       | VSS      | P   | Logic ground                       |        |
| 10      | VSSA     | P   | Analogue ground                    |        |

I: Input, P: Power

Note (1) The display ON/OFF signal is only for display.

Data in the memory will be saved at the time of ON/OFF.

When it's "Hi", data in the memory will display, when it's "Lo", white color will display and data in the memory will be saved.

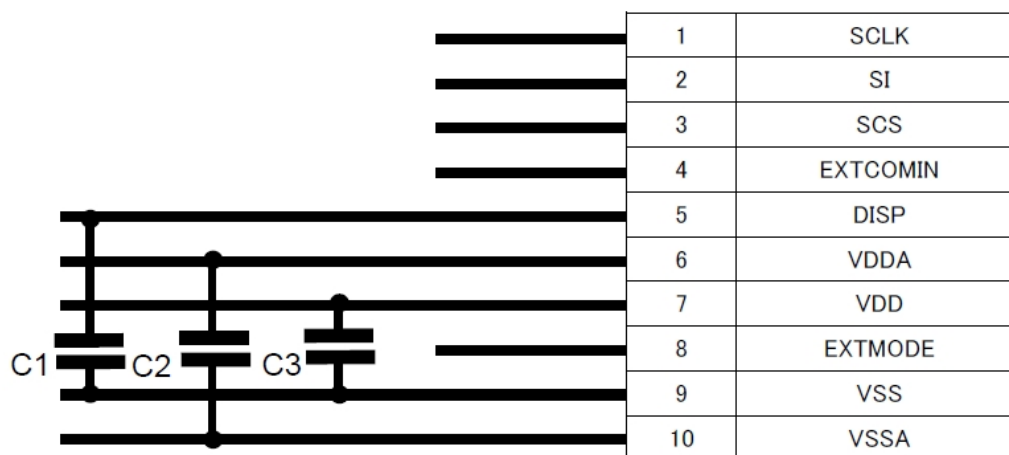
(2) When EXTMODE is "Hi", EXTCOMIN signal is enable.

When EXTMODE is "Lo", serial input flag is enable.

"Hi" mode ; connect the EXTMODE to VDD,

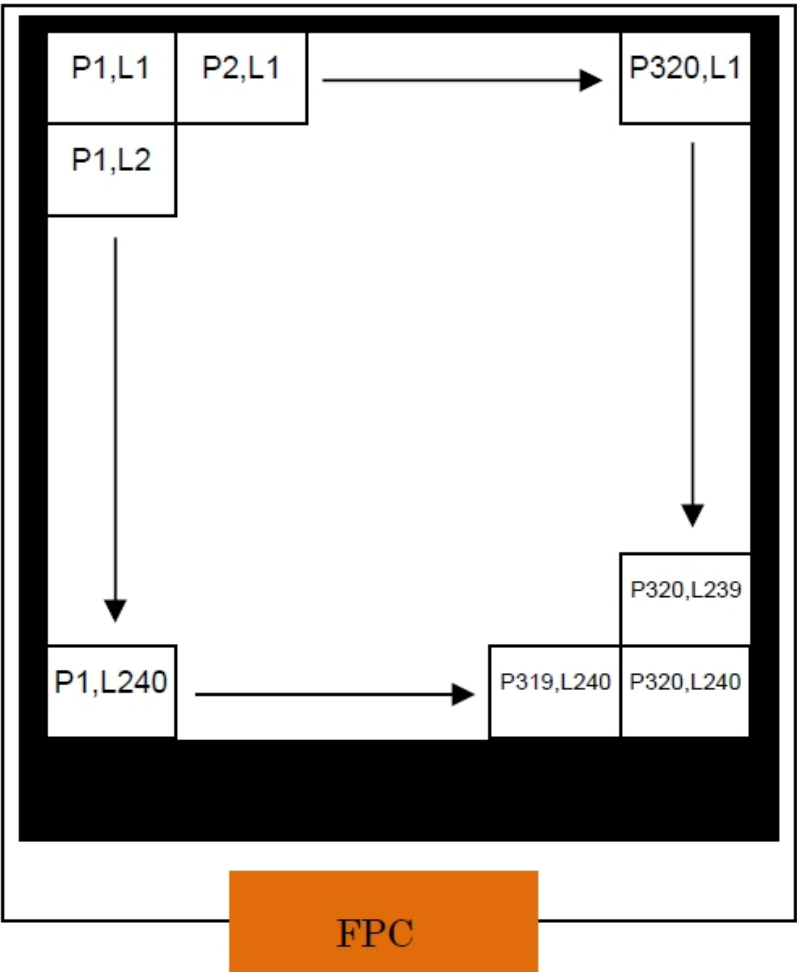
"Lo" mode ; connect the EXTMODE and EXTMIN to VSS.

Recommended Circuit



5.2 Block Diagram

P\*: Pixels position  
L\*:Gate address line



**6. Reliability Condition**

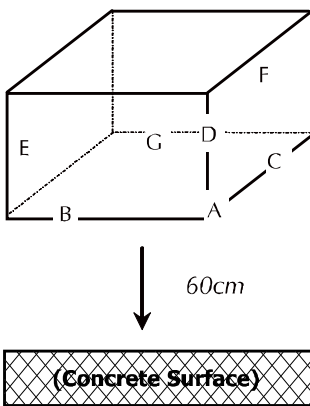
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature:  $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .

Humidity:  $65\% \pm 5\%$  RH.

Tests will be not conducted under functioning state.

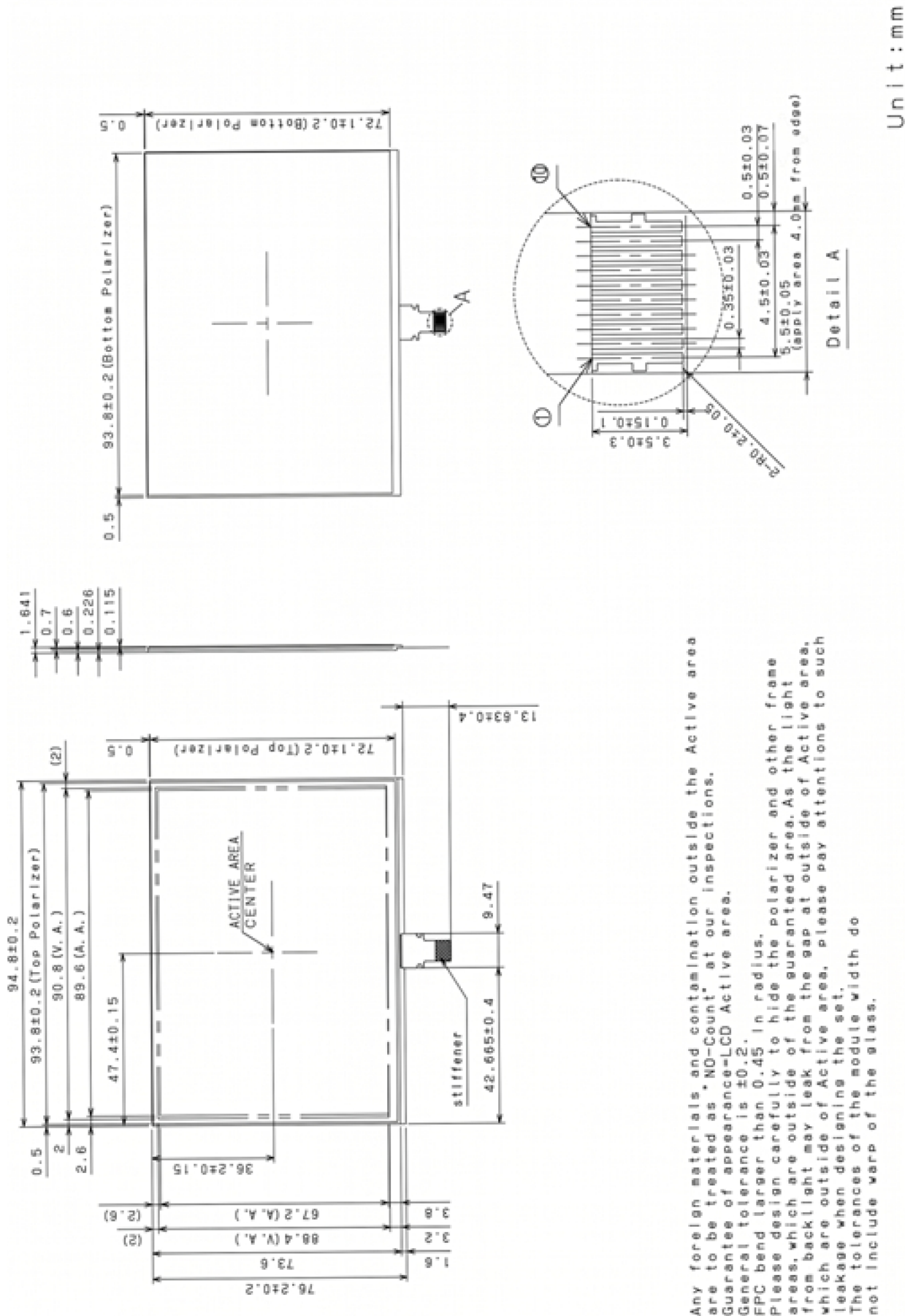
| No. | Parameter                                         | Condition                                                                                                                                                                                                                                                                                                                                                      | Notes |
|-----|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1   | High Temperature Operating                        | $+70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 240hrs (Operation state).                                                                                                                                                                                                                                                                                        |       |
| 2   | Low Temperature Operating                         | $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 240hrs (Operation state).                                                                                                                                                                                                                                                                                        | 1     |
| 3   | High Temperature Storage                          | $+80^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 240hrs.                                                                                                                                                                                                                                                                                                          | 2     |
| 4   | Low Temperature Storage                           | $-30^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 240hrs.                                                                                                                                                                                                                                                                                                          | 1,2   |
| 5   | High Temperature and High Humidity Operation Test | $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 95%, 240hrs.                                                                                                                                                                                                                                                                                                      | 1,2   |
| 6   | Vibration Test                                    | Total fixed amplitude: 1.5mm.<br>Vibration Frequency: 10~55Hz.<br>One cycle 60 seconds to 3 direction of Random 15 minutes.                                                                                                                                                                                                                                    | 3     |
| 7.  | Drop Test                                         | <p>To be measured after dropping from 60cm high on the concrete surface in packing state.</p>  <p><i>Dropping method corner dropping:</i></p> <p><i>A corner: Once edge dropping.</i></p> <p><i>B, C, D edge: Once face dropping.</i></p> <p><i>E, F, G face: Once.</i></p> |       |

Notes: 1. No dew condensation to be observed.

2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.

3. Vibration test will be conducted to the product itself without putting I in a container.

7. Dimensional Outlines



Any foreign materials and contamination outside the Active area are to be treated as "NO-Count" at our inspections. Guarantee of appearance=LCD Active area. General tolerance is ±0.2. FPC bend larger than 0.45 in radius. Please design carefully to hide the polarizer and other frame areas, which are outside of the guaranteed area. As the light from backlight may leak from the gap at outside of Active area, which are outside of Active area, please pay attentions to such leakage when designing the set. The tolerances of the module width do not include warp of the glass.