

# SPECIFICATION



## YMFT-G240160A-2DPFBSN

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Version 1.01





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## 1. GENERAL SPECIFICATIONS :

### 1-1 SCOPE:

This specification covers the delivery requirements for the liquid crystal display delivered by YAOYU TECHNOLOGY to Customer ◦

### 1-2 PRODUCTS:

Liquid Crystal Display Module (LCM)

### 1-3 MODULE NAME:

**YMFT-G240160A-2DPFBSN**

## 2. FEATURES :

### 2-1 MAIN LCD (LARGE)

| Item              | Standard Value      |
|-------------------|---------------------|
| Display Type      | 240×160dots         |
| LCD Type          | ■FSTN               |
| Drive Pattern     | 1/160Duty, 1/14Bias |
| Viewing Direction | 6 O'clock           |
| Backlight Type    | ■Blue-Green EL      |
| Weight            | TBD                 |
| Interface         | LCD Controller      |
| Driver IC         | NT7701,NT7702(TAB)  |

## 3. MACHANICAL SPECIFICATIONS :

| ITEM                   | STANDARD VALUE                  | UNIT |
|------------------------|---------------------------------|------|
| DISPLAY FORMAT         | 240X 160 DOTS                   |      |
| MODULE DIMENSION       | 74.5(W) X 53.0(H) X 4.0(MAX)(T) | mm   |
| EFFECTTVE DISPLAY AREA | 57.58 (W) X38.38(H)             | mm   |
| DOT SIZE               | 0.22(W) X 0.22(H)               | mm   |



|                   |                       |    |
|-------------------|-----------------------|----|
| DOT PITCH         | 0.24(W) X 0.24(H)     | mm |
| LCD TYPE          | FSTN                  |    |
| DUTY AND BIAS     | 1/160 DUTY; 1/14 BIAS |    |
| VIEWING DIRECTION | 6:00                  |    |
| BACK LIGHT        | Blue-Green EL         |    |

#### 4. ABSOLUTE MAXIMUM RATING

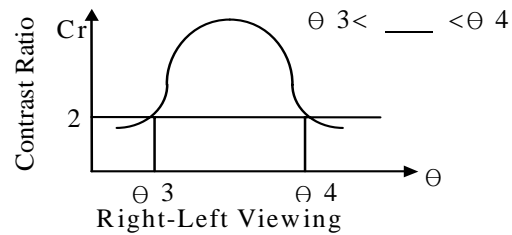
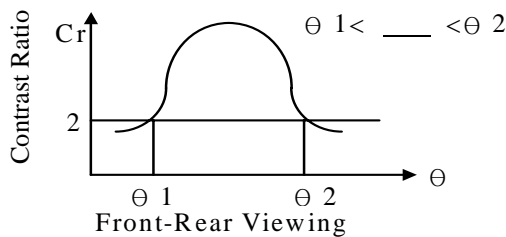
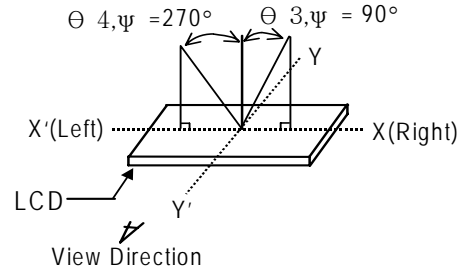
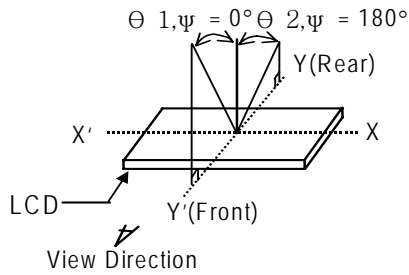
| ITEM                         | SYMBOL         | CONDITION  | STANDARD VALUE |     |         | UNIT |
|------------------------------|----------------|------------|----------------|-----|---------|------|
|                              |                |            | MIN            | TYP | MAX     |      |
| POWER SUPPLY FOR LOGIC       | VDD            | -          | -0.3           | -   | 7.0     | V    |
| INPUT VOLTAGE                | VIN            | -          | -0.3           | —   | VDD+0.3 | V    |
| Module OPERATION TEMPERATURE | TOPR           | ---        | -20            | —   | +70     | °C   |
| Module STORAGE TEMPERATURE   | TSTG           | ---        | -30            | —   | +80     | °C   |
| Storage Humidity             | H <sub>D</sub> | Ta < 40 °C | -              |     | 90      | %RH  |

#### 5. ELECTRICAL CHARACTERISTICS

| ITEM                   | SYMBOL                           | CONDITION | MIN                  | TYP | MAX                | UNIT |
|------------------------|----------------------------------|-----------|----------------------|-----|--------------------|------|
| Supply Voltage (logic) | V <sub>dd</sub> -V <sub>ss</sub> | -         | 2.5                  | 3.3 | 5.5                | V    |
| Supply Voltage (LCD)   | V <sub>lcd</sub>                 | -         | 19                   |     | 23                 | V    |
| Input signal voltage   | V <sub>ih</sub>                  | “H” level | 0.8V <sub>DD</sub>   | -   | -                  | V    |
|                        | V <sub>il</sub>                  | “L” level | -                    | -   | 0.2V <sub>DD</sub> | V    |
| Output signal voltage  | V <sub>oh</sub>                  | “H” level | V <sub>DD</sub> -0.4 | -   | -                  | V    |
|                        | V <sub>ol</sub>                  | “L” level | -                    | -   | +0.4               | V    |
| Supply Current (logic) | I <sub>cc</sub>                  | -         | -                    | 4   | -                  | mA   |
| Supply Current (LCD)   | I <sub>o</sub>                   | -         | -                    | -   | -                  | mA   |
| Supply Voltage (EL)    | V <sub>bl</sub>                  | AC        | 90                   |     | 110                | V    |
| Supply Current (EL)    | I <sub>bl</sub>                  |           | 50                   |     | 80                 | mA   |

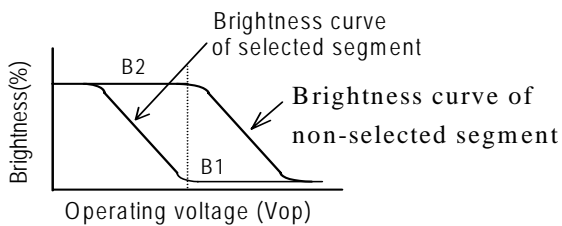
### 6.OPTICAL CHARACTERISTICS

#### (1) DEFINITION OF VIEWING ANGLE

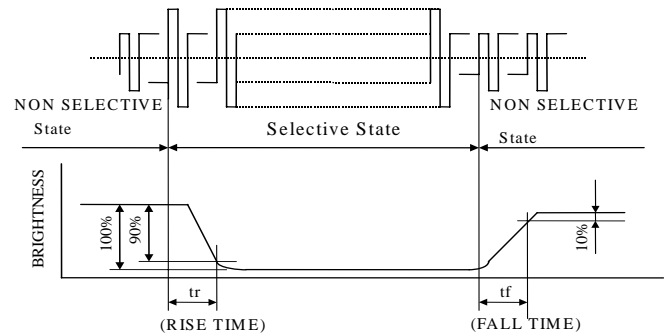


#### (2) DEFINITION OF CONTRAST

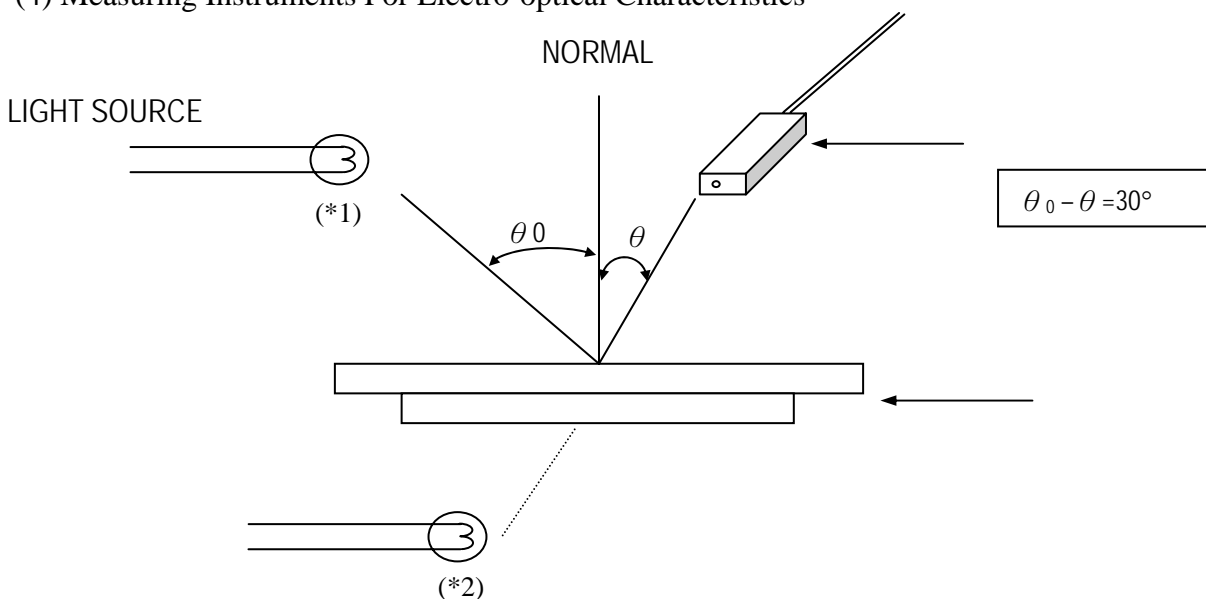
$$C.R = \frac{\text{Brightness of non-selected segment (B2)}}{\text{Brightness of selected segment (B1)}}$$



#### (3) DEFINITION OF RESPONSE



#### (4) Measuring Instruments For Electro-optical Characteristics

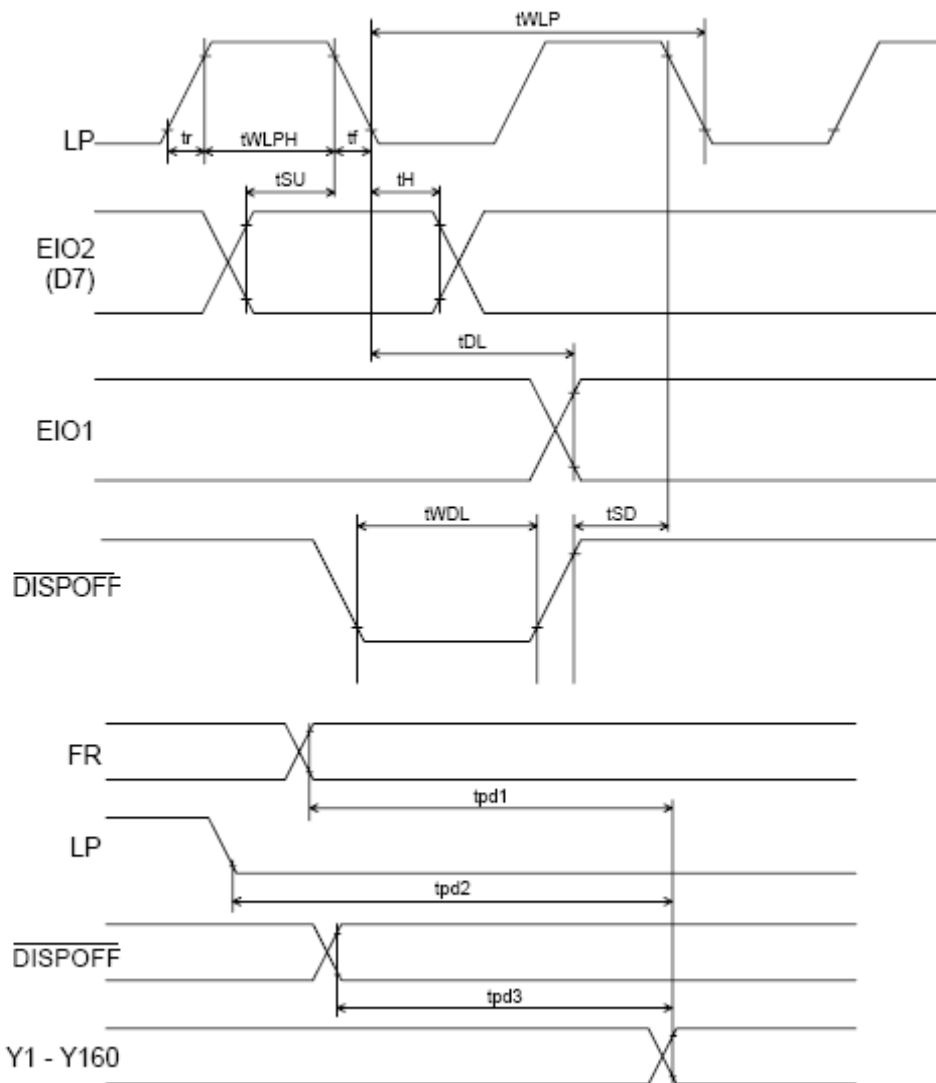




## 7.0 .TIMING CHARACTERISTICS

### Timing Characteristics of Common

| Parameter                                      | Symbol                              | Min. | Typ. | Max. | Unit | Condition                              |
|--|-------------------------------------|------|------|------|------|--|
| Shift clock period                             | t <sub>WLP</sub>                    | 250  | -    | -    | ns   | t <sub>r</sub> , t <sub>f</sub> ≤ 20ns |
| Shift clock "H" pulse width                    | t <sub>WLPH</sub>                   | 15   | -    | -    | ns   | V <sub>DD</sub> = +5.0V ± 10%          |
|  |                                     | 30   | -    | -    | ns   | V <sub>DD</sub> = +2.5 - +4.5V         |
| Data setup time                                | t <sub>SU</sub>                     | 30   | -    | -    | ns   |  |
| Data hold time                                 | t <sub>H</sub>                      | 50   | -    | -    | ns   |  |
| Input signal rise time                         | t <sub>r</sub>                      |      | -    | 50   | ns   |  |
| Input signal fall time                         | t <sub>f</sub>                      |      | -    | 50   | ns   |  |
| $\overline{\text{DISPOFF}}$ Removal time       | t <sub>SD</sub>                     | 100  | -    | -    | ns   |  |
| $\overline{\text{DISPOFF}}$ enable pulse width | t <sub>WDL</sub>                    | 1.2  | -    | -    | μs   |  |
| Output delay time (1)                          | t <sub>DL</sub>                     | -    | -    | 200  | ns   | C <sub>L</sub> = 15pF                  |
| Output delay time (2)                          | t <sub>pd1</sub> , t <sub>pd2</sub> | -    | -    | 1.2  | μs   | C <sub>L</sub> = 15pF                  |
| Output delay time (3)                          | t <sub>pd3</sub>                    | -    | -    | 1.2  | μs   | C <sub>L</sub> = 15pF                  |



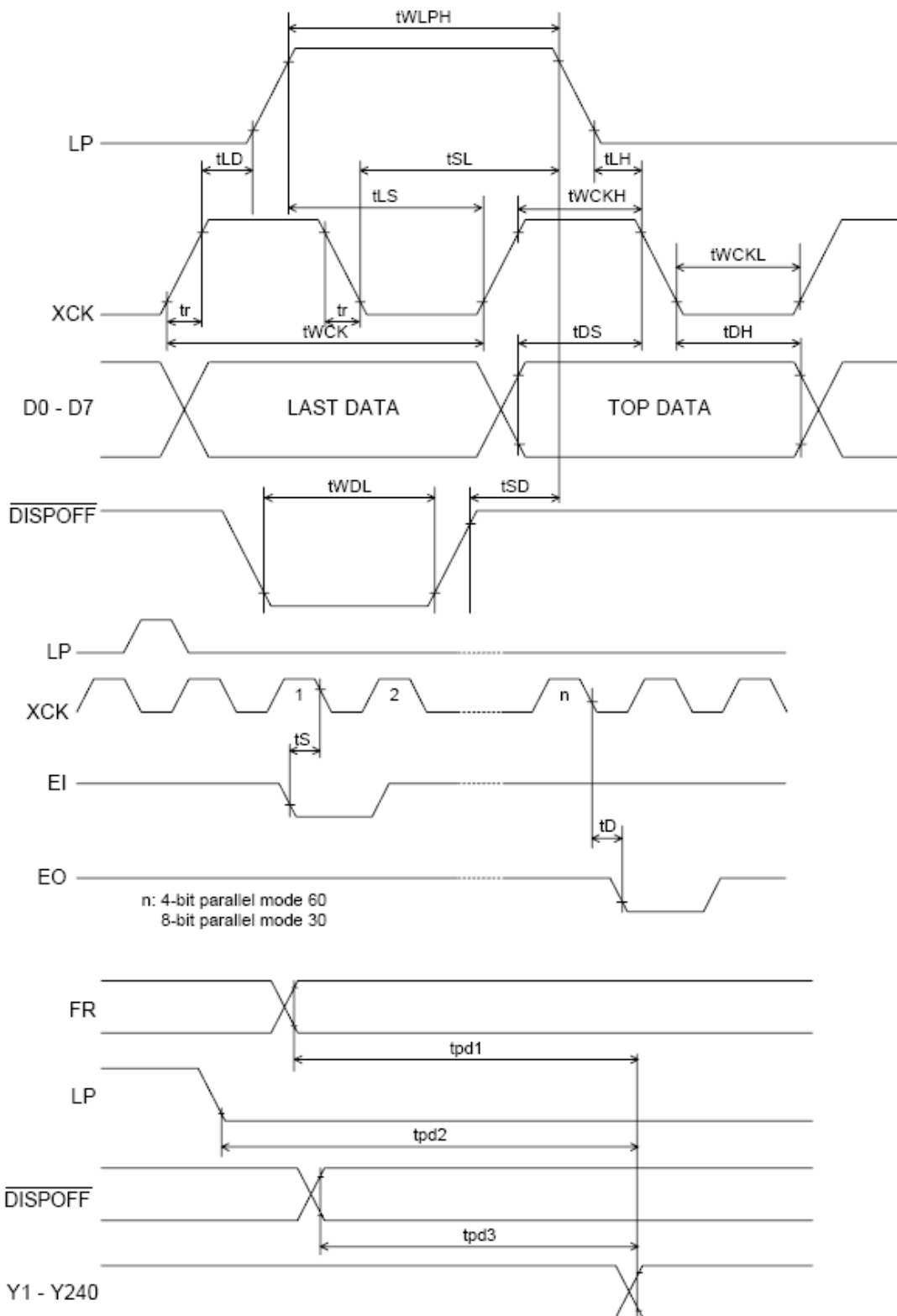


### Timing Characteristics of Segment

| Parameter                                      | Symbol                              | Min. | Typ. | Max. | Unit | Condition                                      |
|--|-------------------------------------|------|------|------|------|--|
| Shift clock period                             | t <sub>wck</sub>                    | 82   | -    |      | ns   | t <sub>r</sub> , t <sub>f</sub> ≤ 10ns, Note 1 |
| Shift clock "H" pulse width                    | t <sub>wckH</sub>                   | 28   | -    |      | ns   |  |
| Shift clock "L" pulse width                    | t <sub>wckL</sub>                   | 28   | -    |      | ns   |  |
| Data setup time                                | t <sub>ds</sub>                     | 20   | -    |      | ns   |  |
| Data hold time                                 | t <sub>dh</sub>                     | 23   | -    |      | ns   |  |
| Latch pulse "H" pulse width                    | t <sub>wlph</sub>                   | 30   | -    |      | ns   |  |
| Shift clock rise to Latch pulse rise time      | t <sub>ld</sub>                     | 0    | -    |      | ns   |  |
| Shift clock fall to Latch pulse fall time      | t <sub>sl</sub>                     | 65   | -    |      | ns   |  |
| Latch pulse rise to Shift clock rise time      | t <sub>ls</sub>                     | 30   | -    |      | ns   |  |
| Latch pulse fall to Shift clock fall time      | t <sub>lh</sub>                     | 30   | -    |      | ns   |  |
| Input signal rise time                         | t <sub>r</sub>                      |      | -    | 50   | ns   | Note 2   |
| Input signal fall time                         | t <sub>f</sub>                      |      | -    | 50   | ns   | Note 2   |
| Enable setup time                              | t <sub>s</sub>                      | 15   | -    |      | ns   |  |
| $\overline{\text{DISPOFF}}$ Removal time       | t <sub>sd</sub>                     | 100  | -    |      | ns   |  |
| $\overline{\text{DISPOFF}}$ enable pulse width | t <sub>wDL</sub>                    | 1.2  | -    |      | μs   |  |
| Output delay time (1)                          | t <sub>o</sub>                      |      | -    | 57   | ns   | CL = 15pF                                      |
| Output delay time (2)                          | t <sub>pd1</sub> , t <sub>pd2</sub> |      | -    | 1.2  | μs   | CL = 15pF                                      |
| Output delay time (3)                          | t <sub>pd3</sub>                    |      | -    | 1.2  | μs   | CL = 15pF                                      |

Note

1. Take the cascade connection into consideration.
2.  $(t_{ck} - t_{wckH} - t_{wckL})/2$  is the maximum in the case of high speed operation.

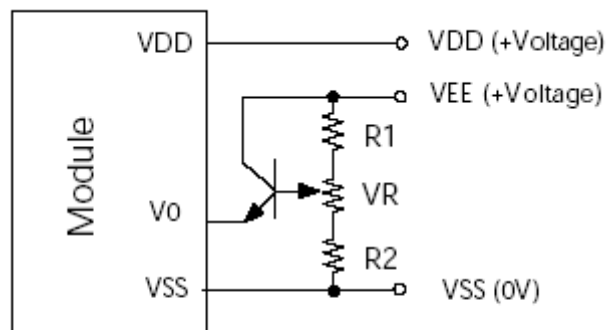
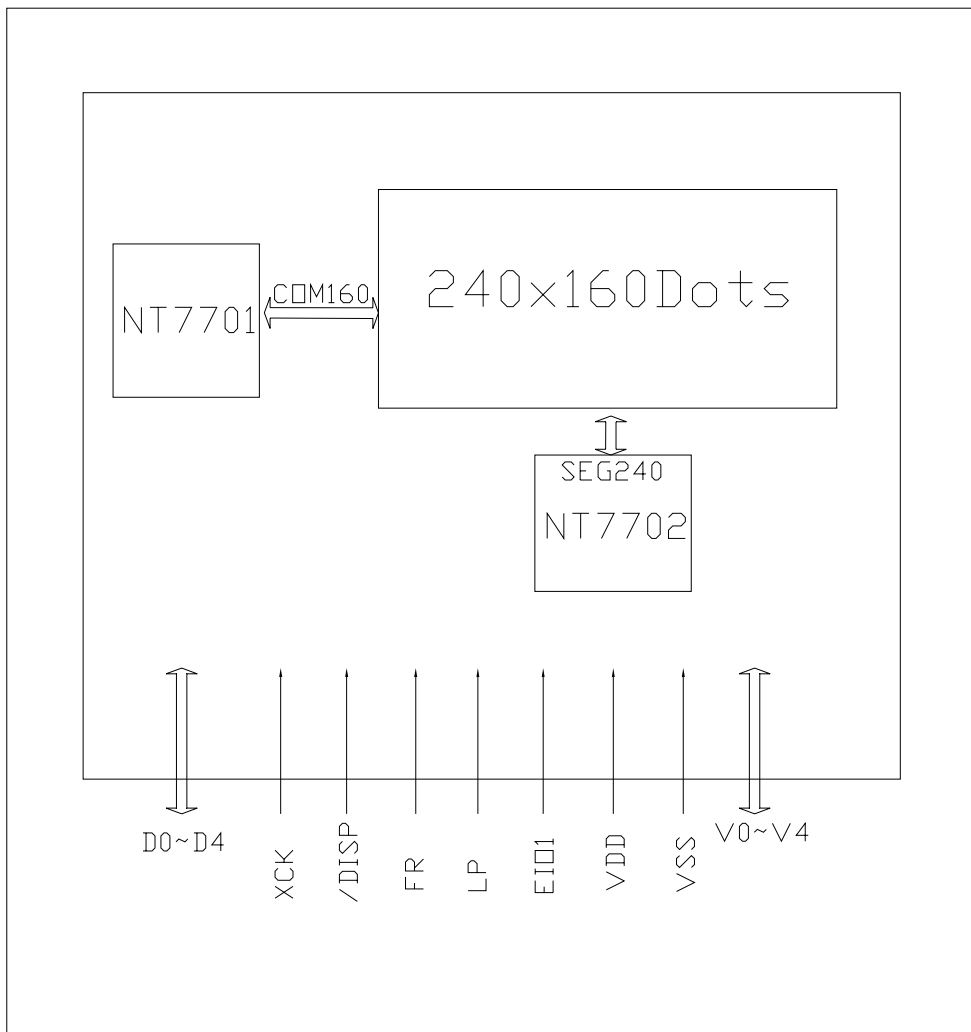




## 8. PIN ASSIGNMENT

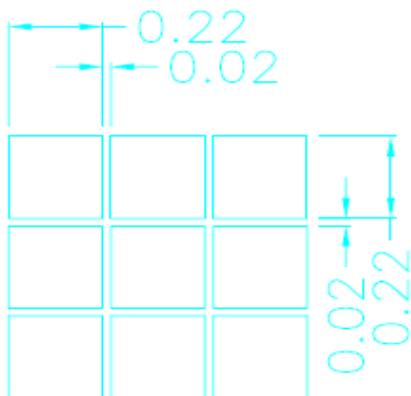
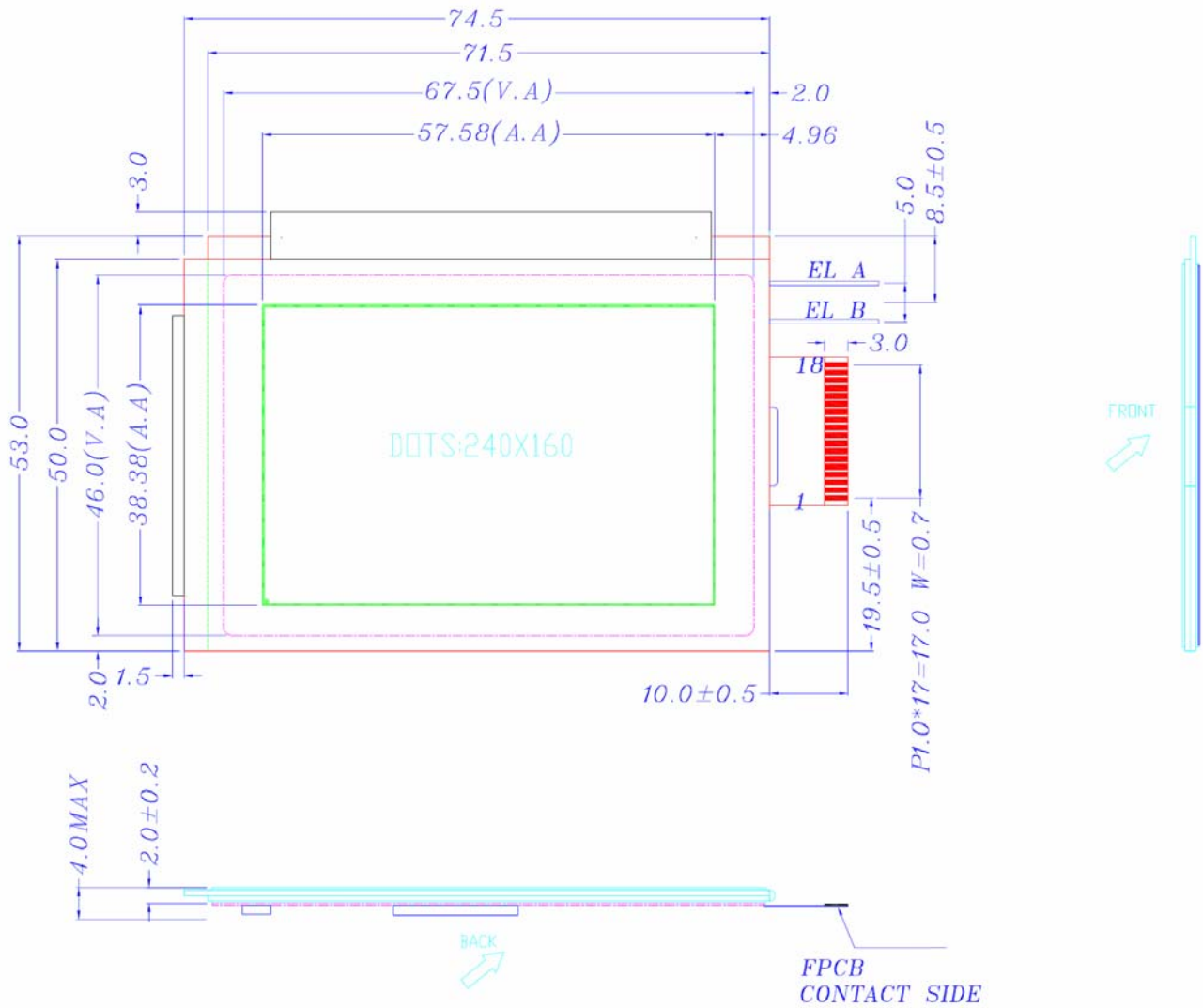
| PIN   | SYMBOL | FUNCTION  |
|-------|--------|---|
| 1     | V4     | Power supply for LCD driver                                 |
| 2     | V1     | Power supply for LCD driver                                 |
| 3     | V0     | Power supply for LCD driver                                 |
| 4     | VDD    | Power supply for the logic system                           |
| 5     | EIO1   | Input/Output for chip select or data for the shift register |
| 6     | VSS    | Ground,these two pad must be connect to each other          |
| 7     | LP     | Latch pulse input/output clock input for the shift register |
| 8     | VSS    | Ground,these two pad must be connect to each other          |
| 9     | FR     | AC-converting signal input for LCD driver waveform          |
| 10    | /DISP  | Control input for deselect output level                     |
| 11    | XCK    | Display data shift clock input for segment mode             |
| 12    | V3     | Power supply for LCD driver                                 |
| 13    | V2     | Power supply for LCD driver                                 |
| 14~17 | D4~D1  | Display data input  |
| 18    | NC     | No connect  |

9. BLOCK DIAGRAM



$R1+R2+VR=10 \sim 20K$   
 $Tr = 2SA1202$  or equivalent

10. OUTLINE DIMENSIONS





## 11. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

| ITEM                  | SYMBOL | CONDITIONS    | CRITERION  |
|-----------------------|--------|---------------|--|
| OPERATING TEMPERATURE | TOPR   | -20°C ~ +70°C | NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION |
| STORAGE TEMPERATURE   | TSTG   | -30°C ~ +80°C | NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION |
| HUMIDITY              | —      | See Note      | WITHOUT CONDENSATION                             |

## 12. RELIABILITY

### 12-1 RELIABILITY TEST

| ITEM                  | CONDITIONS   | CRITERION  |
|-----------------------|--|--|
| OPERATING TEMPERATURE | HIGH TEMPERATURE +70°C 240HRS  | NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION |
|                       | LOW TEMPERATURE -20°C 240HRS   |  |
| STORAGE TEMPERATURE   | HIGH TEMPERATURE +80°C 240HRS  | NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION |
|                       | LOW TEMPERATURE - 30°C 240HRS  |  |
| HUMIDITY              | 40°C 90%RH 240HRS  | NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION |
| VIBRATION             | <ul style="list-style-type: none"> <li>• Operating Time: thirty minutes exposure for each direction (X,Y,Z)</li> <li>• Sweep Frequency: 10~55Hz (1 min)</li> <li>• Amplitude: 1.5mm</li> </ul> | NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION |
| THERMAL SHOCK         | -20°C (30mins) ←→ +70°C (30mins) 10 cycles   | NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION |

\*NOTE: TEST CONDITION

(1) TEMPERATURE AND HUMIDITY: IF NO SPECIFICATION, TEMP. SET AT 25±2°C, HUMIDITY SET AT 60±5%RH

(2) OPERATING STATE: SAMPLES SUBJECT TO THE TESTS SHALL BE IN "OPERATING" CONDITION



### 13. Precaution for Use

The following precautions should be followed, since this module contains precise parts.

- (1) Do not store module for an extended periods of time under the conditions of high temperature and high humidity.
- (2) Avoid using or storing the module in areas that expose it to direct sunlight or ultraviolet rays.
- (3) Use protective finger covers when handling the module to avoid scratching or staining the module.
- (4) Care should be taken not to expose the module to static electricity, because the module contains C-MOS LSI's.
- (5) The LSI is sensitive to light.  
The user's product should be designed so that LSI is not exposed to any light during operation.
- (6) During installation, cover the display area with acrylic protection plates to protect the polarizer plate and LCD cells.
- (7) Do not apply any excessive shocks to the module because the module contains sensitive LCD cells.  
Do not use a module, which has experienced strong mechanical shock.
- (8) Care should be taken when the power supply turns on as following.
  - (a) Do not apply any input signals before the supplying voltage is applied.
  - (b) Do not turn off the power supply while any input signals are applied.

## Caution

- (1) Dangerous. Do not shock glass because glass can break.
- (2) If module breaks, do not touch it directly.  
(Glass could stick or cut skin.)
- (3) Do not swallow Liquid Crystal.  
(In case of broken LCD panel, do not swallow liquid crystal even if there is no proof that liquid crystal is poisonous.)
- (4) If liquid crystal is exposed to skin, wash the area thoroughly with alcohol or soap.
- (5) When disposing of the product, please observe industrial waste disposal laws in each country and district.
- (6) In case of injury, give immediate treatment and consult with a doctor.
- (7) This product is constructed precisely. Don't disassemble or modify.

※ Neglecting this mark can cause injury to humans and damage to materials