

## CDTech ( H.K.) Electronics Limited

### Product Specifications

|                    |                                   |
|--------------------|-----------------------------------|
| <b>Customer</b>    |                                   |
| <b>Model Name</b>  | S028HQ27NN                        |
| <b>Description</b> | 240(RGB)x320 Dots<br>2.8" TFT LCD |
| <b>Date</b>        | 2017/06/30                        |
| <b>Revision</b>    | 1.0                               |

### Customer Approval

|                                                                                                                                     |  |
|-------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                     |  |
| <b>Date</b>                                                                                                                         |  |
| The above signature represents that the product specifications, testing regulation, and warranty in the specifications are accepted |  |

### Engineering

|              |             |                 |             |
|--------------|-------------|-----------------|-------------|
| <b>Check</b> | <b>Date</b> | <b>Prepared</b> | <b>Date</b> |
| Sam huang    | 2017/06/30  | Jack guo        | 2017/06/30  |

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## 1 Record of Revision

| Rev | Issued Date | Description    | Editor   |
|-----|-------------|----------------|----------|
| 1.0 | 2017/06/30  | First Release. | Jack Guo |
|     |             |                |          |
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## 2 General Specifications

| Feature         |                                | Spec                          |
|-----------------|--------------------------------|-------------------------------|
| Characteristics | Size                           | 2.8inch                       |
|                 | Resolution                     | 240(horizontal)*320(Vertical) |
|                 | Interface                      | MCU-18/16/9/8Bit<br>RGB-18Bit |
|                 | Connect type                   | Connector                     |
|                 | Color Depth                    | 65k                           |
|                 | Technology type                | a-Si                          |
|                 | Display Spec. Pixel pitch (mm) | 0.18 x 0.18                   |
|                 | Pixel Configuration            | R.G.B. Vertical Stripe        |
|                 | Display Mode                   | Normally White                |
|                 | Driver IC                      | ILI9341                       |
|                 | Surface Treatment              | 3H                            |
|                 | Viewing Direction              | 6 O'clock                     |
| Mechanical      | LCM (W x H x D) (mm)           | 50.2*69.2*2.75                |
|                 | Active Area(mm)                | 43.2*57.6                     |
|                 | Weight (g)                     | TBD                           |
|                 | LED Numbers                    | 4 LEDs                        |

Note 1: RoHS

Note 2: LCM weight tolerance: +/- 5%

## 3 Input/Output Terminals

| No.   | Symbol    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
|-------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------------------|--------------------------|---------------------------------------|--------------------|-------------|--|--|--|--|--|--|------------------|------|---|---|---|---|--------------------------------|--------|-----------------------------|---|---|---|---|---------------------------------|--------|------------------------------|---|---|---|---|--------------------------------|--------|-----------------------------|---|---|---|---|---------------------------------|--------|------------------------------|---|---|---|---|--------------------------------------|---------------|--|---|---|---|---|--------------------------------------|---------------------|--|---|---|---|---|----------------------------------|--------|---------------------------------------|---|---|---|---|---------------------------------|----------|-------------------------------|---|---|---|---|----------------------------------|--------|------------------------------|---|---|---|---|---------------------------------|----------|------------------------------|---|---|---|---|---------------------------------------|--------------------|--|---|---|---|---|---------------------------------------|--------------------------|--|
| 1     | LEDK      | LED Cathode K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 2     | LEDA1     | LED Anode A1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 3     | LEDA2     | LED Anode A2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 4     | LEDA3     | LED Anode A3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 5     | LEDA4     | LED Anode A4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 6     | IM0       | <table><tr><th>IM3</th><th>IM2</th><th>IM1</th><th>IM0</th><th>MCU-Interface Mode</th><th colspan="2">Pins in use</th></tr><tr><th colspan="5"></th><th>Register/Content</th><th>GRAM</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>8080 MCU 8-bit bus interface I</td><td>D[7:0]</td><td>D[7:0], WRX, RDX, CSX, D/CX</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>8080 MCU 16-bit bus interface I</td><td>D[7:0]</td><td>D[15:0], WRX, RDX, CSX, D/CX</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>8080 MCU 9-bit bus interface I</td><td>D[7:0]</td><td>D[8:0], WRX, RDX, CSX, D/CX</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>8080 MCU 18-bit bus interface I</td><td>D[7:0]</td><td>D[17:0], WRX, RDX, CSX, D/CX</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>3-wire 9-bit data serial interface I</td><td colspan="2">SCL, SDA, CSX</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>4-wire 8-bit data serial interface I</td><td colspan="2">SCL, SDA, D/CX, CSX</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>8080 MCU 16-bit bus interface II</td><td>D[8:1]</td><td>D[17:10], D[8:1], WRX, RDX, CSX, D/CX</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>8080 MCU 8-bit bus interface II</td><td>D[17:10]</td><td>D[17:10], WRX, RDX, CSX, D/CX</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>8080 MCU 18-bit bus interface II</td><td>D[8:1]</td><td>D[17:0], WRX, RDX, CSX, D/CX</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>8080 MCU 9-bit bus interface II</td><td>D[17:10]</td><td>D[17:9], WRX, RDX, CSX, D/CX</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>3-wire 9-bit data serial interface II</td><td colspan="2">SCL, SDI, SDO, CSX</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>4-wire 8-bit data serial interface II</td><td colspan="2">SCL, SDI, D/CX, SDO, CSX</td></tr></table> | IM3 | IM2                                   | IM1                      | IM0                                   | MCU-Interface Mode | Pins in use |  |  |  |  |  |  | Register/Content | GRAM | 0 | 0 | 0 | 0 | 8080 MCU 8-bit bus interface I | D[7:0] | D[7:0], WRX, RDX, CSX, D/CX | 0 | 0 | 0 | 1 | 8080 MCU 16-bit bus interface I | D[7:0] | D[15:0], WRX, RDX, CSX, D/CX | 0 | 0 | 1 | 0 | 8080 MCU 9-bit bus interface I | D[7:0] | D[8:0], WRX, RDX, CSX, D/CX | 0 | 0 | 1 | 1 | 8080 MCU 18-bit bus interface I | D[7:0] | D[17:0], WRX, RDX, CSX, D/CX | 0 | 1 | 0 | 1 | 3-wire 9-bit data serial interface I | SCL, SDA, CSX |  | 0 | 1 | 1 | 0 | 4-wire 8-bit data serial interface I | SCL, SDA, D/CX, CSX |  | 1 | 0 | 0 | 0 | 8080 MCU 16-bit bus interface II | D[8:1] | D[17:10], D[8:1], WRX, RDX, CSX, D/CX | 1 | 0 | 0 | 1 | 8080 MCU 8-bit bus interface II | D[17:10] | D[17:10], WRX, RDX, CSX, D/CX | 1 | 0 | 1 | 0 | 8080 MCU 18-bit bus interface II | D[8:1] | D[17:0], WRX, RDX, CSX, D/CX | 1 | 0 | 1 | 1 | 8080 MCU 9-bit bus interface II | D[17:10] | D[17:9], WRX, RDX, CSX, D/CX | 1 | 1 | 0 | 1 | 3-wire 9-bit data serial interface II | SCL, SDI, SDO, CSX |  | 1 | 1 | 1 | 0 | 4-wire 8-bit data serial interface II | SCL, SDI, D/CX, SDO, CSX |  |
| IM3   | IM2       | IM1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | IM0 | MCU-Interface Mode                    | Pins in use              |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
|       |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                       | Register/Content         | GRAM                                  |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 0     | 0         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0   | 8080 MCU 8-bit bus interface I        | D[7:0]                   | D[7:0], WRX, RDX, CSX, D/CX           |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 0     | 0         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | 8080 MCU 16-bit bus interface I       | D[7:0]                   | D[15:0], WRX, RDX, CSX, D/CX          |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 0     | 0         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0   | 8080 MCU 9-bit bus interface I        | D[7:0]                   | D[8:0], WRX, RDX, CSX, D/CX           |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 0     | 0         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | 8080 MCU 18-bit bus interface I       | D[7:0]                   | D[17:0], WRX, RDX, CSX, D/CX          |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 0     | 1         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | 3-wire 9-bit data serial interface I  | SCL, SDA, CSX            |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 0     | 1         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0   | 4-wire 8-bit data serial interface I  | SCL, SDA, D/CX, CSX      |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 1     | 0         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0   | 8080 MCU 16-bit bus interface II      | D[8:1]                   | D[17:10], D[8:1], WRX, RDX, CSX, D/CX |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 1     | 0         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | 8080 MCU 8-bit bus interface II       | D[17:10]                 | D[17:10], WRX, RDX, CSX, D/CX         |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 1     | 0         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0   | 8080 MCU 18-bit bus interface II      | D[8:1]                   | D[17:0], WRX, RDX, CSX, D/CX          |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 1     | 0         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | 8080 MCU 9-bit bus interface II       | D[17:10]                 | D[17:9], WRX, RDX, CSX, D/CX          |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 1     | 1         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | 3-wire 9-bit data serial interface II | SCL, SDI, SDO, CSX       |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 1     | 1         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0   | 4-wire 8-bit data serial interface II | SCL, SDI, D/CX, SDO, CSX |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 7     | IM1       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 8     | IM2       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 9     | IM3       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 10    | RESET     | Reset signal pin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 11    | VSYNC     | Frame Synchronous Signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 12    | HSYNC     | Line Synchronous Signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 13    | DOTCLK    | Dot-clock signal and oscillator source                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 14    | DE        | Display enable signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 15~32 | DB17~ DB0 | Data bus DB17~ DB0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 33    | SDO       | Serial output signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 34    | SDI       | Serial input signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 35    | RD        | Read signal pin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 36    | WRX/DCX   | Serves as a write signal and writes data at the rising edge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 37    | DCX/SCL   | This pin is used to select “Data or Command” in the parallel interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 38    | CSX       | Chip select pin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 39    | TE        | FMARK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 40    | VDDI      | Interface I/O Power supply ( 1.65~3.3V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 41    | VDDI      | Power supply of the System(2.8V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 42    | VCI       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 43    | GND       | Power Ground                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 44    | X+/XR     | Touch panel right                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 45    | Y+/YD     | Touch panel down                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |
| 46    | X-/XL     | Touch panel left                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                                       |                          |                                       |                    |             |  |  |  |  |  |  |                  |      |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                |        |                             |   |   |   |   |                                 |        |                              |   |   |   |   |                                      |               |  |   |   |   |   |                                      |                     |  |   |   |   |   |                                  |        |                                       |   |   |   |   |                                 |          |                               |   |   |   |   |                                  |        |                              |   |   |   |   |                                 |          |                              |   |   |   |   |                                       |                    |  |   |   |   |   |                                       |                          |  |

|    |       |                |
|----|-------|----------------|
| 47 | Y-/YU | Touch panel up |
| 48 | GND   | Power Ground   |
| 49 | GND   | Power Ground   |
| 50 | GND   | Power Ground   |

## 4 Absolute Maximum Ratings

### Driving TFT LCD Panel

| Item                  | Symbol           | MIN  | MAX | Unit | Remark |
|-----------------------|------------------|------|-----|------|--------|
| Supply Voltage        | V <sub>CC</sub>  | -0.3 | 4.6 | V    |        |
| Operating Temperature | T <sub>OPR</sub> | -20  | 70  | °C   |        |
| Storage Temperature   | T <sub>STG</sub> | -30  | 80  | °C   |        |

## 5 Electrical Characteristics

### 5.1 Driving TFT LCD Panel

T<sub>a</sub> = 25 °C

| Item                   |            | Symbol            | MIN        | TYP | MAX        | Unit | Remark |
|------------------------|------------|-------------------|------------|-----|------------|------|--------|
| Digital Supply Voltage |            | V <sub>CC</sub>   | 2.5        | 2.8 | 3.3        | V    |        |
| Input Signal Voltage   | Low Leve   | V <sub>IL</sub>   | -0.3       | -   | 0.2x IOVCC | V    |        |
|                        | High Level | V <sub>IH</sub>   | 0.8x IOVCC | -   | IOVCC      | V    |        |
| TFT Common Electrode   |            | V <sub>COMH</sub> | 3          | 5   | 5          | V    |        |
| TFT Gata ON Voltage    |            | V <sub>GH</sub>   | 10         | -   | 16         | V    |        |
| TFT Gata ON Voltage    |            | V <sub>GL</sub>   | -10        | -   | -5         | V    |        |

## 5.2 Driving Backlight

| Item                        | Symbol   | MIN | TYP   | MAX | Unit | Remark           |
|-----------------------------|----------|-----|-------|-----|------|------------------|
| Forward Current             | $I_F$    | -   | 80    | -   | mA   | Constant current |
| Forward Voltage             | $V_F$    | -   | 3.2   | -   | V    |                  |
| Backlight Power consumption | $W_{BL}$ | -   | 0.192 | -   | W    |                  |

Note : Each LED :  $I_F = 20 \text{ mA}$ ,  $V_F = 3.2 \text{ V}$ .

Note 2: Optical performance should be evaluated at  $T_a = 25^\circ \text{C}$  only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

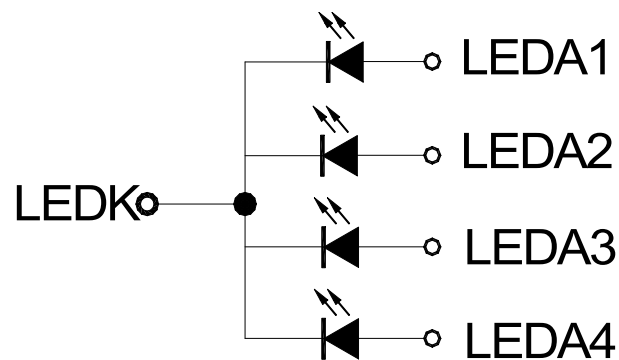
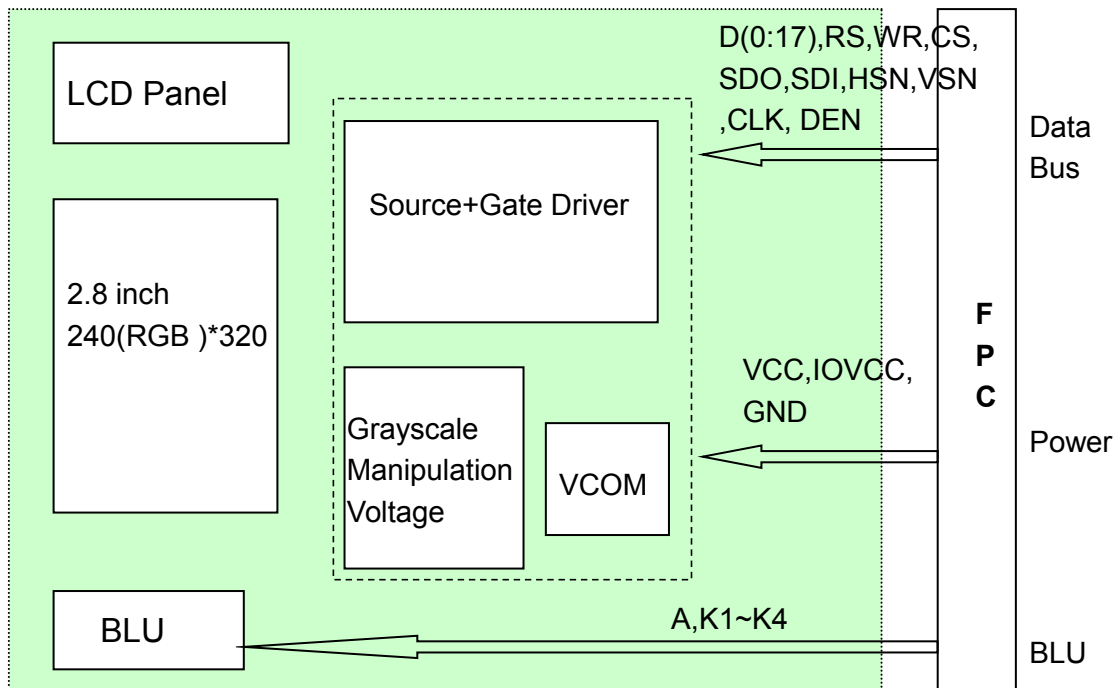


Figure : LED connection of backlight

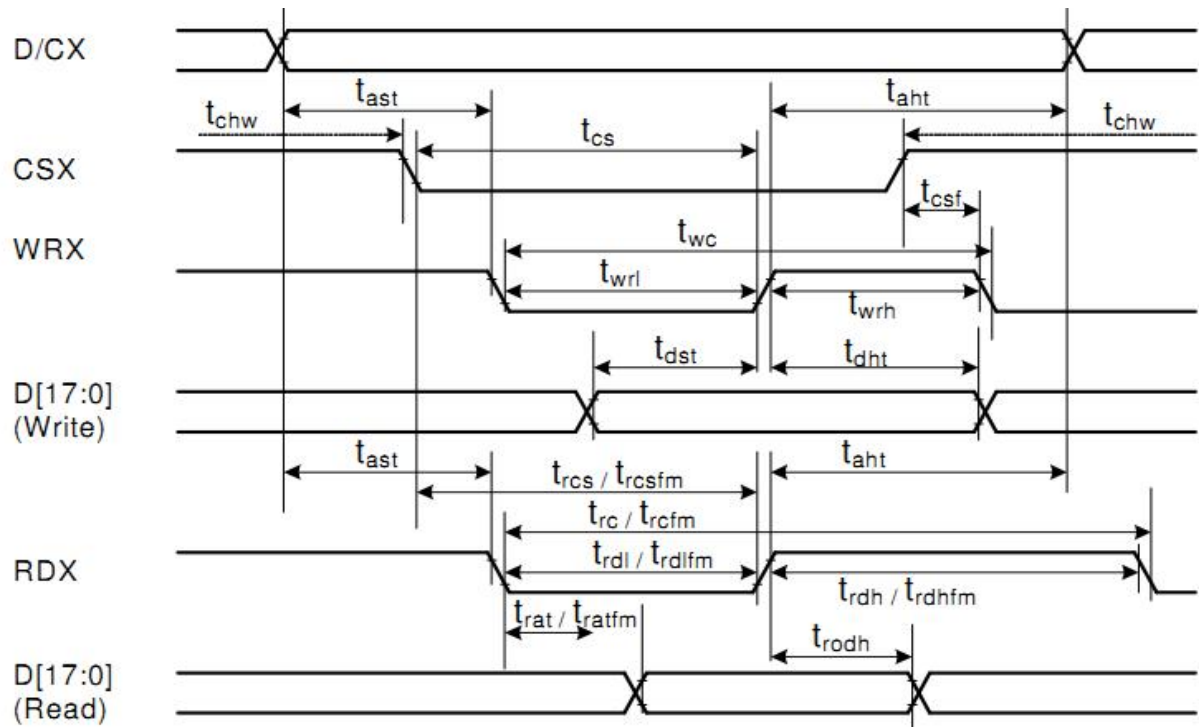
## 5.3 Block Diagram



## 6 Interface Timing

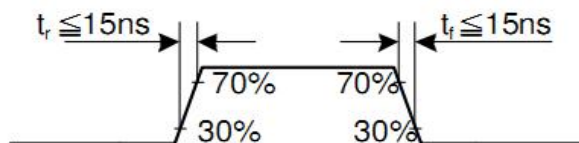
### 6.1 Timing Parameter

#### 6.1.1 Parallel 18/16/9/8 bit interface timing(8080-II system)

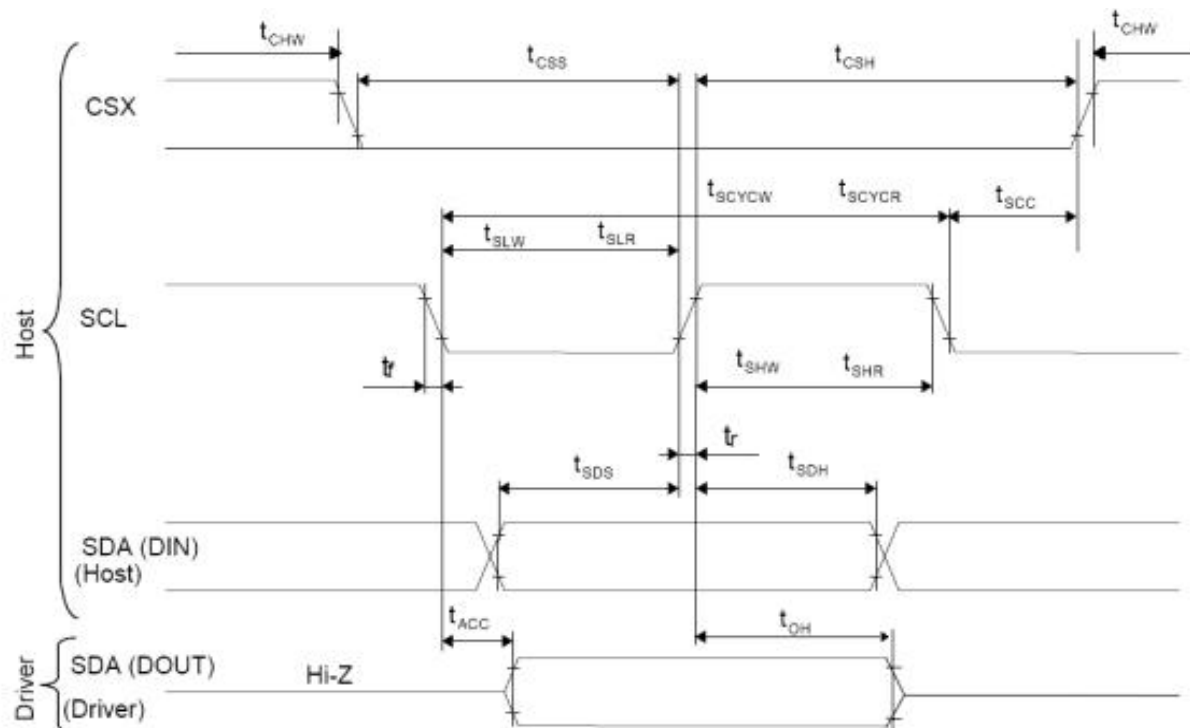


| Signal                                               | Symbol | Parameter                          | min | max | Unit | Description                               |
|------------------------------------------------------|--------|------------------------------------|-----|-----|------|-------------------------------------------|
| DCX                                                  | tast   | Address setup time                 | 0   | -   | ns   |                                           |
|                                                      | taht   | Address hold time (Write/Read)     | 0   | -   | ns   |                                           |
| CSX                                                  | tchwh  | CSX "H" pulse width                | 0   | -   | ns   |                                           |
|                                                      | tcs    | Chip Select setup time (Write)     | 15  | -   | ns   |                                           |
|                                                      | trcs   | Chip Select setup time (Read ID)   | 45  | -   | ns   |                                           |
|                                                      | trcsfm | Chip Select setup time (Read FM)   | 355 | -   | ns   |                                           |
|                                                      | tcsf   | Chip Select Wait time (Write/Read) | 10  | -   | ns   |                                           |
| WRX                                                  | twc    | Write cycle                        | 66  | -   | ns   |                                           |
|                                                      | twrh   | Write Control pulse H duration     | 15  | -   | ns   |                                           |
|                                                      | twrl   | Write Control pulse L duration     | 15  | -   | ns   |                                           |
| RDX (FM)                                             | trcfm  | Read Cycle (FM)                    | 450 | -   | ns   |                                           |
|                                                      | trdhfm | Read Control H duration (FM)       | 90  | -   | ns   |                                           |
|                                                      | trdlfm | Read Control L duration (FM)       | 355 | -   | ns   |                                           |
| RDX (ID)                                             | trc    | Read cycle (ID)                    | 160 | -   | ns   |                                           |
|                                                      | trdh   | Read Control pulse H duration      | 90  | -   | ns   |                                           |
|                                                      | trdl   | Read Control pulse L duration      | 45  | -   | ns   |                                           |
| D[17:0],<br>D[17:10]&D[8:1],<br>D[17:10],<br>D[17:9] | tdst   | Write data setup time              | 10  | -   | ns   | For maximum CL=30pF<br>For minimum CL=8pF |
|                                                      | tdht   | Write data hold time               | 10  | -   | ns   |                                           |
|                                                      | trat   | Read access time                   | -   | 40  | ns   |                                           |
|                                                      | tratfm | Read access time                   | -   | 340 | ns   |                                           |
|                                                      | trod   | Read output disable time           | 20  | 80  | ns   |                                           |

Note:  $T_a = -30$  to  $70\text{ }^{\circ}\text{C}$ ,  $V_{DDI}=1.65\text{V}$  to  $3.3\text{V}$ ,  $V_{CI}=2.5\text{V}$  to  $3.3\text{V}$ ,  $V_{SS}=0\text{V}$ .

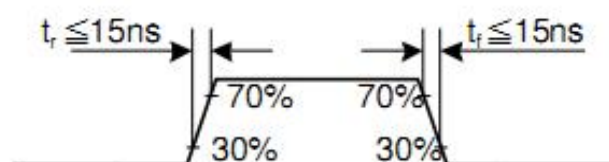


## 6.1.2 Serial interface timing characteristics (3-line SPI system)

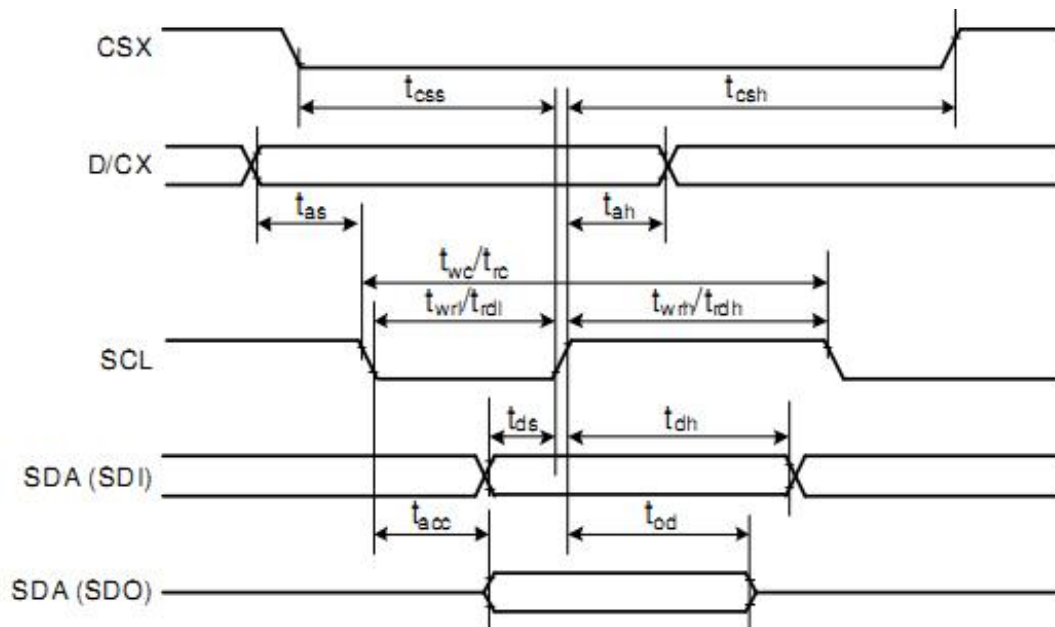


| Signal             | Symbol | Parameter                   | min | max | Unit | Description |
|--------------------|--------|-----------------------------|-----|-----|------|-------------|
| SCL                | tscycw | Serial Clock Cycle (Write)  | 100 | -   | ns   |             |
|                    | tshw   | SCL "H" Pulse Width (Write) | 40  | -   | ns   |             |
|                    | tslw   | SCL "L" Pulse Width (Write) | 40  | -   | ns   |             |
|                    | tscycr | Serial Clock Cycle (Read)   | 150 | -   | ns   |             |
|                    | tshr   | SCL "H" Pulse Width (Read)  | 60  | -   | ns   |             |
|                    | tslr   | SCL "L" Pulse Width (Read)  | 60  | -   | ns   |             |
| SDA / SDI (Input)  | tsds   | Data setup time (Write)     | 30  | -   | ns   |             |
|                    | tsdh   | Data hold time (Write)      | 30  | -   | ns   |             |
| SDA / SDO (Output) | tacc   | Access time (Read)          | 10  | -   | ns   |             |
|                    | toh    | Output disable time (Read)  | 10  | 50  | ns   |             |
| CSX                | tsc    | SCL-CSX                     | 20  | -   | ns   |             |
|                    | tchw   | CSX "H" Pulse Width         | 40  | -   | ns   |             |
|                    | tc     | CSX-SCL Time                | 60  | -   | ns   |             |
|                    | tcsh   | CSX-SCL Time                | 65  | -   | ns   |             |

Note:  $T_a = 25^\circ\text{C}$ ,  $V_{DDI} = 1.65\text{V to } 3.3\text{V}$ ,  $V_{CI} = 2.5\text{V to } 3.3\text{V}$ ,  $AGND = VSS = 0\text{V}$

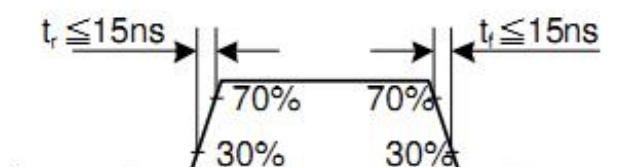


## 6.1.3 Serial interface timing characteristics (4-line SPI system)

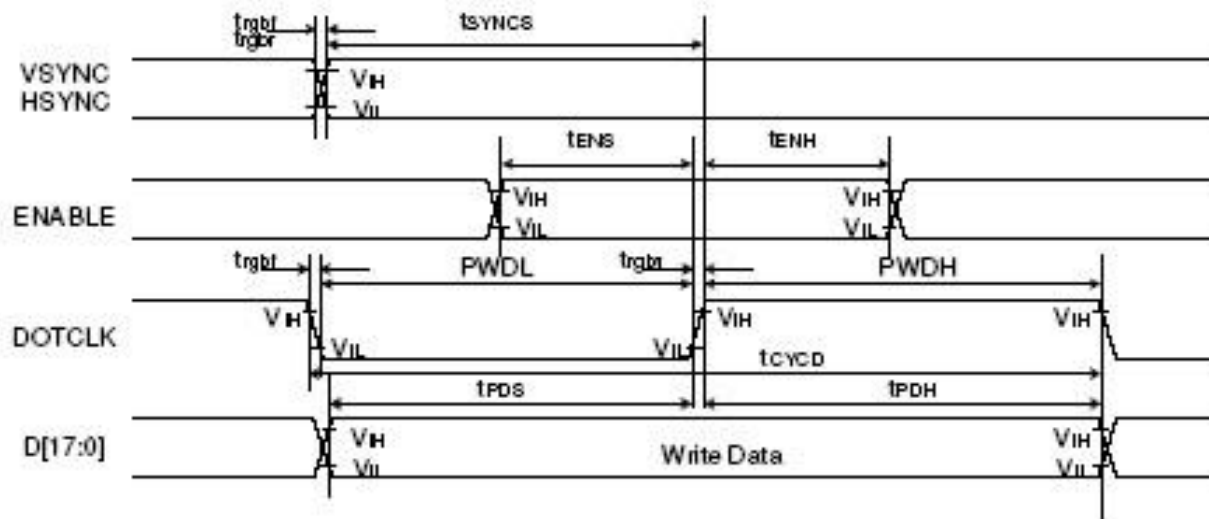


| Signal                | Symbol    | Parameter                     | min | max | Unit | Description            |
|-----------------------|-----------|-------------------------------|-----|-----|------|------------------------|
| CSX                   | $t_{css}$ | Chip select time (Write)      | 40  | -   | ns   |                        |
|                       | $t_{csh}$ | Chip select hold time (Read)  | 40  | -   | ns   |                        |
| SCL                   | $t_{wc}$  | Serial clock cycle (Write)    | 100 | -   | ns   |                        |
|                       | $t_{wrh}$ | SCL "H" pulse width (Write)   | 40  | -   | ns   |                        |
|                       | $t_{wrl}$ | SCL "L" pulse width (Write)   | 40  | -   | ns   |                        |
|                       | $t_{rc}$  | Serial clock cycle (Read)     | 150 | -   | ns   |                        |
|                       | $t_{rdh}$ | SCL "H" pulse width (Read)    | 60  | -   | ns   |                        |
|                       | $t_{rdl}$ | SCL "L" pulse width (Read)    | 60  | -   | ns   |                        |
| D/CX                  | $t_{as}$  | D/CX setup time               | 10  | -   |      |                        |
|                       | $t_{ah}$  | D/CX hold time (Write / Read) | 10  | -   |      |                        |
| SDA / SDI<br>(Input)  | $t_{ds}$  | Data setup time (Write)       | 30  | -   | ns   |                        |
|                       | $t_{dh}$  | Data hold time (Write)        | 30  | -   | ns   |                        |
| SDA / SDO<br>(Output) | $t_{acc}$ | Access time (Read)            | 10  | -   | ns   | For maximum $C_L=30pF$ |
|                       | $t_{od}$  | Output disable time (Read)    | 10  | 50  | ns   | For minimum $C_L=8pF$  |

Note:  $T_a = 25^\circ C$ ,  $V_{DDI}=1.65V$  to  $3.3V$ ,  $V_{CI}=2.5V$  to  $3.3V$ ,  $AGND=VSS=0V$

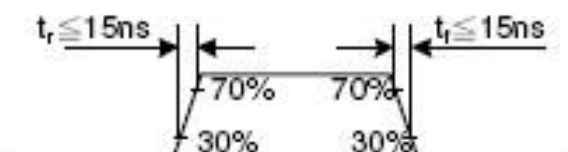


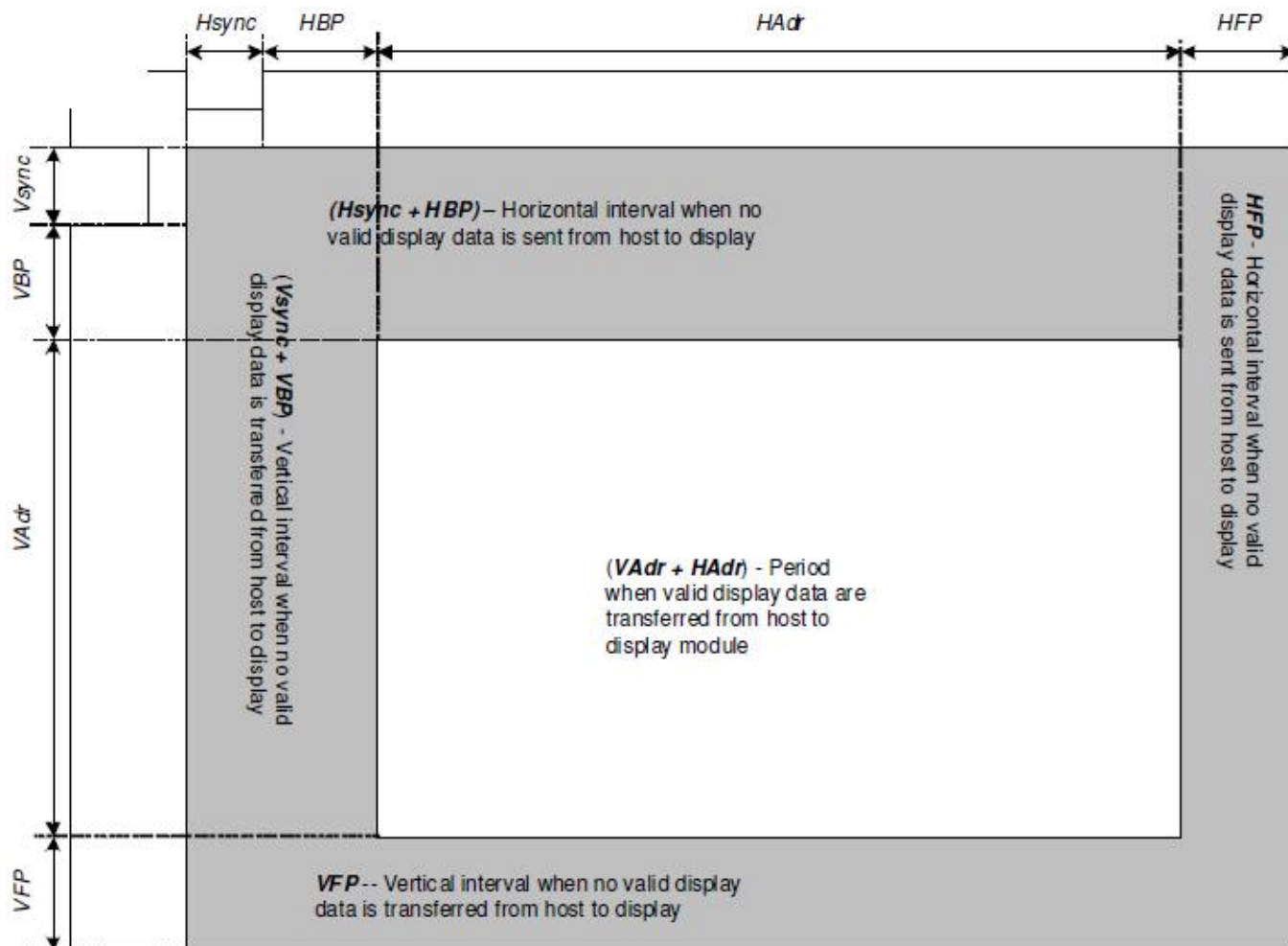
## 6.1.4 Parallel 18/16/9/8 bit RGB interface timing



| Signal        | Symbol               | Parameter                         | min | max | Unit | Description                      |
|---------------|----------------------|-----------------------------------|-----|-----|------|----------------------------------|
| VSYNC / HSYNC | $t_{SYNCS}$          | VSYNC/HSYNC setup time            | 15  | -   | ns   | 18/16-bit bus RGB interface mode |
|               | $t_{SYNCH}$          | VSYNC/HSYNC hold time             | 15  | -   | ns   |                                  |
| DE            | $t_{ENS}$            | DE setup time                     | 15  | -   | ns   |                                  |
|               | $t_{ENH}$            | DE hold time                      | 15  | -   | ns   |                                  |
| D[17:0]       | $t_{PDS}$            | Data setup time                   | 15  | -   | ns   |                                  |
|               | $t_{PDH}$            | Data hold time                    | 15  | -   | ns   |                                  |
| DOTCLK        | PWDH                 | DOTCLK high-level period          | 15  | -   | ns   |                                  |
|               | PWDL                 | DOTCLK low-level period           | 15  | -   | ns   |                                  |
|               | $t_{CYCD}$           | DOTCLK cycle time                 | 100 | -   | ns   |                                  |
|               | $t_{trbr}, t_{trgt}$ | DOTCLK,HSYNC,VSYNC rise/fall time | -   | 15  | ns   |                                  |
| VSYNC / HSYNC | $t_{SYNCS}$          | VSYNC/HSYNC setup time            | 15  | -   | ns   | 6-bit bus RGB interface mode     |
|               | $t_{SYNCH}$          | VSYNC/HSYNC hold time             | 15  | -   | ns   |                                  |
| DE            | $t_{ENS}$            | DE setup time                     | 15  | -   | ns   |                                  |
|               | $t_{ENH}$            | DE hold time                      | 15  | -   | ns   |                                  |
| D[17:0]       | $t_{PDS}$            | Data setup time                   | 15  | -   | ns   |                                  |
|               | $t_{PDH}$            | Data hold time                    | 15  | -   | ns   |                                  |
| DOTCLK        | PWDH                 | DOTCLK high-level pulse period    | 15  | -   | ns   |                                  |
|               | PWDL                 | DOTCLK low-level pulse period     | 15  | -   | ns   |                                  |
|               | $t_{CYCD}$           | DOTCLK cycle time                 | 100 | -   | ns   |                                  |
|               | $t_{trbr}, t_{trgt}$ | DOTCLK,HSYNC,VSYNC rise/fall time | -   | 15  | ns   |                                  |

Note:  $T_a = -30$  to  $70^\circ\text{C}$ ,  $V_{DDI} = 1.85\text{V}$  to  $3.3\text{V}$ ,  $V_{CI} = 2.5\text{V}$  to  $3.3\text{V}$ ,  $AGND = VSS = 0\text{V}$

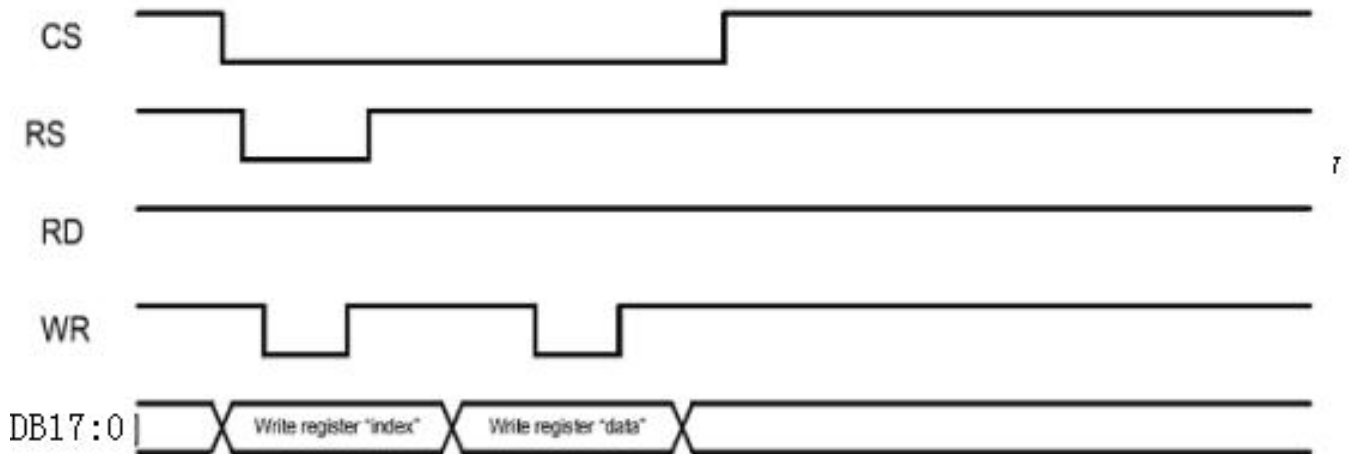




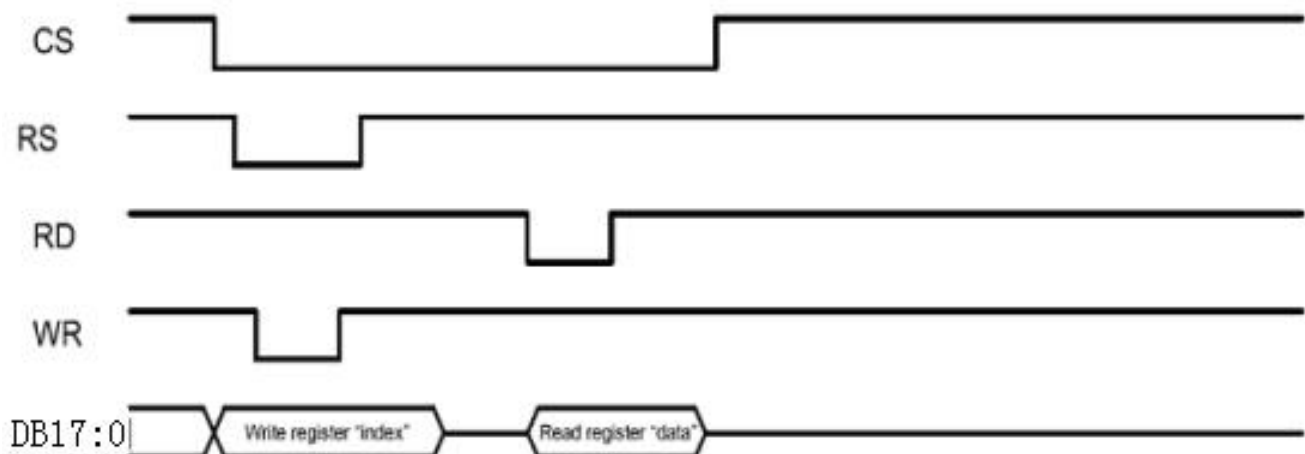
| Parameters                 | Symbols | Condition | Min. | Typ. | Max. | Units  |
|----------------------------|---------|-----------|------|------|------|--------|
| Horizontal Synchronization | Hsync   |           | 2    | 10   | 16   | DOTCLK |
| Horizontal Back Porch      | HBP     |           | 2    | 20   | 24   | DOTCLK |
| Horizontal Address         | HAdr    |           | -    | 240  | -    | DOTCLK |
| Horizontal Front Porch     | HFP     |           | 2    | 10   | 16   | DOTCLK |
| Vertical Synchronization   | Vsync   |           | 1    | 2    | 4    | Line   |
| Vertical Back Porch        | VBP     |           | 1    | 2    | -    | Line   |
| Vertical Address           | VAdr    |           | -    | 320  | -    | Line   |
| Vertical Front Porch       | VFP     |           | 3    | 4    | -    | Line   |

## 6.2 Register Write/Read Timing

### (a) Write to register

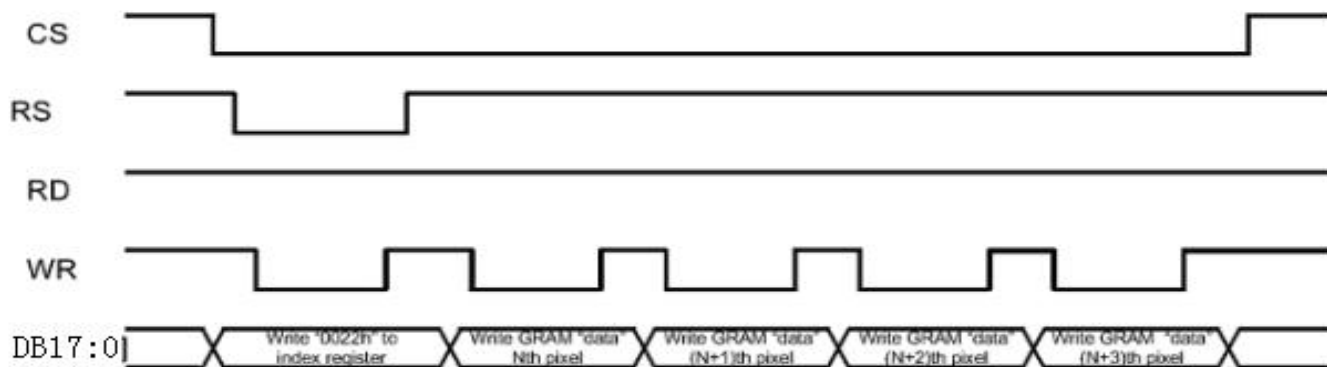


### (b) Read from register

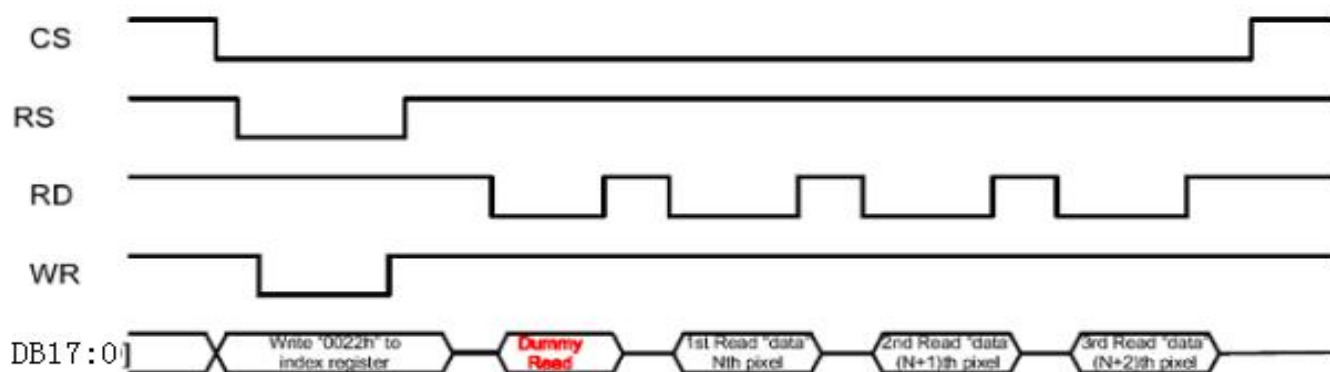


## 6.3 GRAM Wite/Read Timing

### (a) Write to GRAM

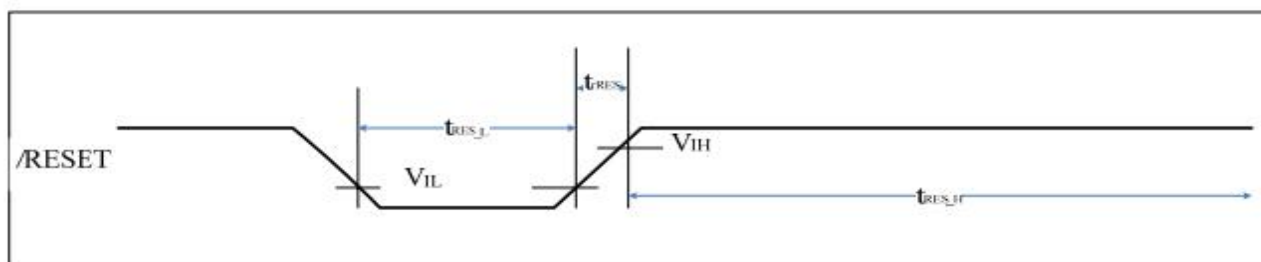


### (b) Read from GRAM



## 6.4 Reset Timing Characteristics

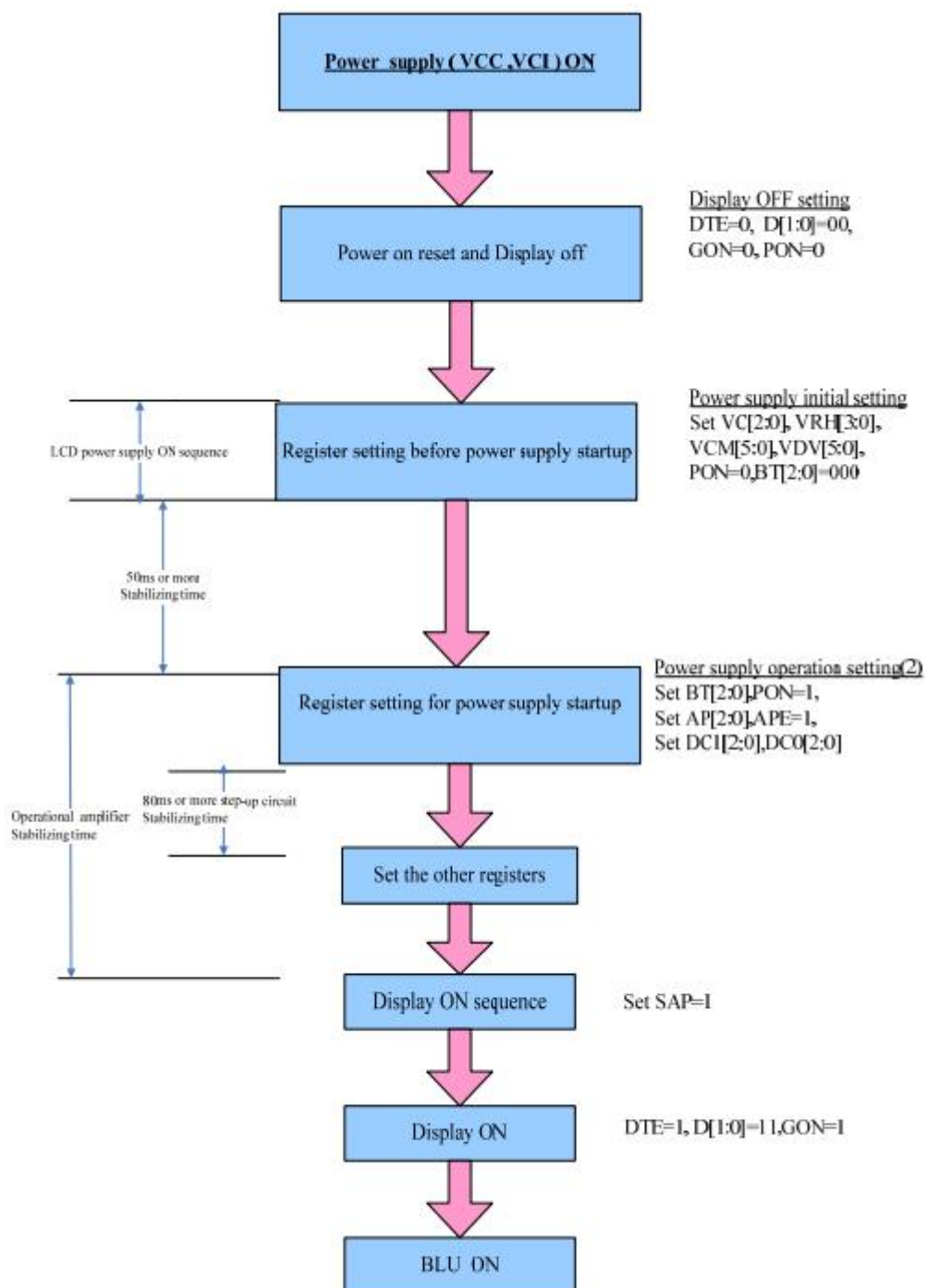
| Item                   | Symbol     | Unit    | Min. | Typ. | Max. |
|------------------------|------------|---------|------|------|------|
| Reset low-level width  | $t_{RESL}$ | ms      | 1    | -    | -    |
| Reset rise time        | $t_{RES}$  | $\mu s$ | -    | -    | 10   |
| Reset high-level width | $t_{RESH}$ | ms      | 50   |      |      |



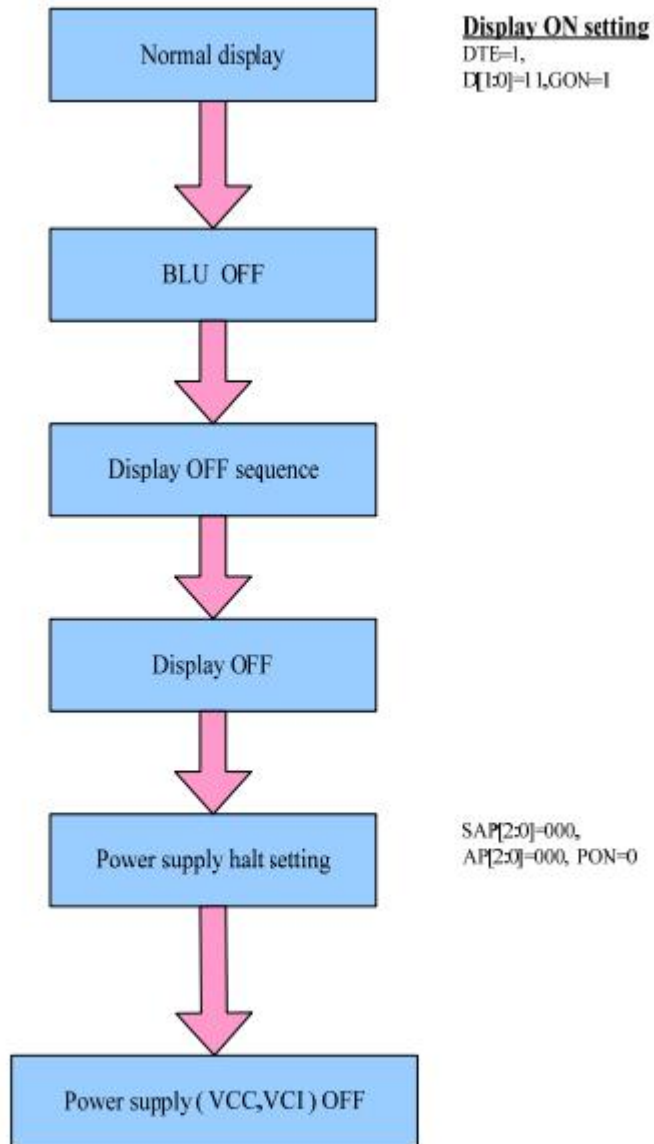
Reset timing

## 6.5 Power On/Off Sequence

### 6.5.1 Power On Sequence



## 6.5.2 Power Off Sequence



## 7 Optical Characteristics

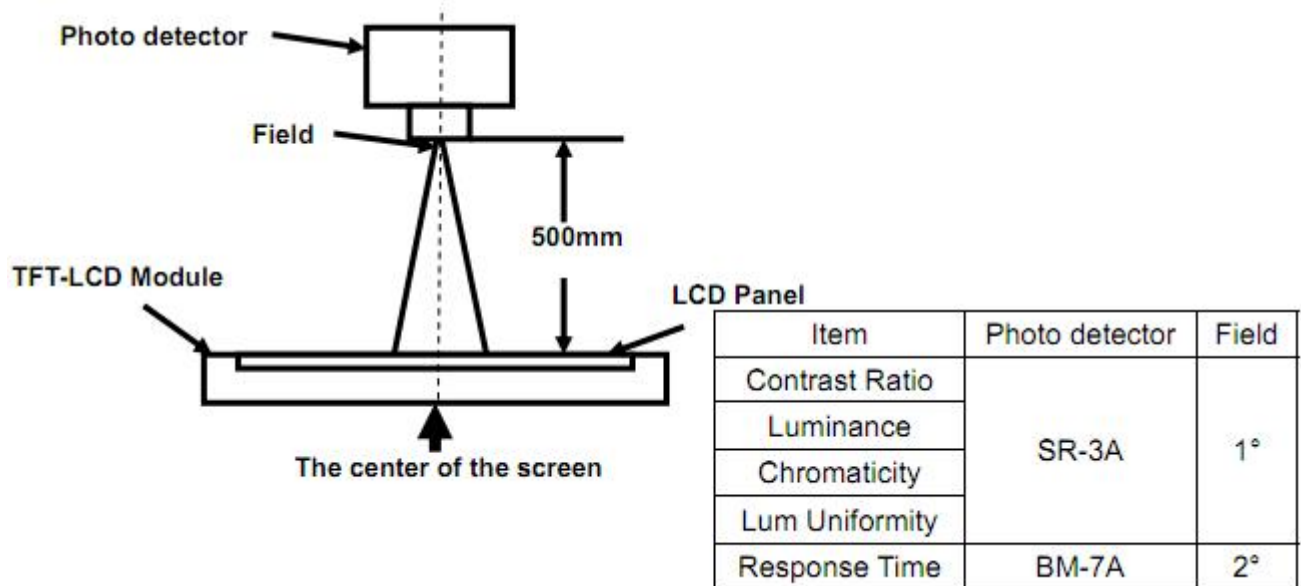
| Items          |       | Symbol           | Condition          | Min.  | Typ.  | Max.  | Unit    | Remark          |
|----------------|-------|------------------|--------------------|-------|-------|-------|---------|-----------------|
| Viewing angles |       | $\theta_T$       | Center<br>CR≥10    | 60    | 70    | -     | Degree. | Note2           |
|                |       | $\theta_B$       |                    | 50    | 60    | -     |         |                 |
|                |       | $\theta_L$       |                    | 60    | 70    | -     |         |                 |
|                |       | $\theta_R$       |                    | 60    | 70    | -     |         |                 |
| Contrast Ratio |       | CR               | $\Theta =0$        | 400   | 500   | -     | -       | Note1,<br>Note3 |
| Response Time  |       | T <sub>ON</sub>  | 25° C              | -     | 25    | 30    | ms      | Note1,<br>Note4 |
|                |       | T <sub>OFF</sub> |                    | -     | 25    | 30    |         |                 |
| Chromaticity   | White | X <sub>W</sub>   | Backlight<br>is on | 0.283 | 0.303 | 0.323 | -       | Note1,<br>Note5 |
|                |       | Y <sub>W</sub>   |                    | 0.305 | 0.325 | 0.345 | -       |                 |
|                | Red   | X <sub>R</sub>   |                    | 0.606 | 0.626 | 0.646 | -       |                 |
|                |       | Y <sub>R</sub>   |                    | 0.314 | 0.334 | 0.354 | -       |                 |
|                | Green | X <sub>G</sub>   |                    | 0.257 | 0.277 | 0.297 | -       |                 |
|                |       | Y <sub>G</sub>   |                    | 0.529 | 0.549 | 0.569 | -       |                 |
|                | Blue  | X <sub>B</sub>   |                    | 0.122 | 0.142 | 0.162 | -       |                 |
|                |       | Y <sub>B</sub>   |                    | 0.102 | 0.122 | 0.142 | -       |                 |
| Uniformity     |       | U                |                    | 75    | 80    | -     | %       | Note1,<br>Note6 |
| NTSC           |       |                  |                    |       | 65    |       | %       | Note5           |
| Luminance      |       | L                |                    | 270   | 300   | -     |         | Note1,<br>Note7 |

### Test Conditions:

1. IF= 20mA(one channel),the ambient temperature is 25
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

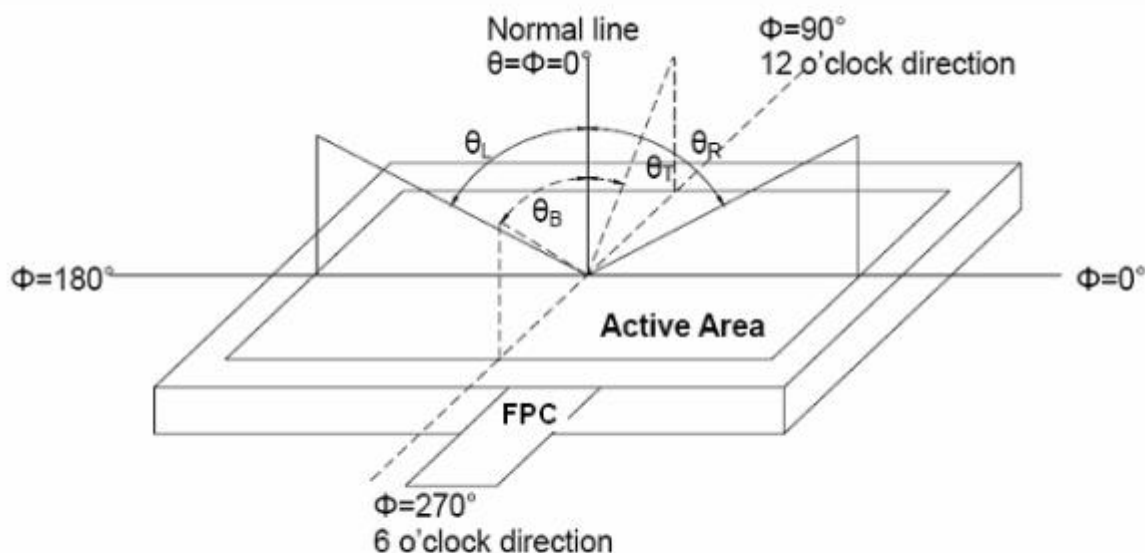


Fig. 1 Definition of viewing angle

## Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

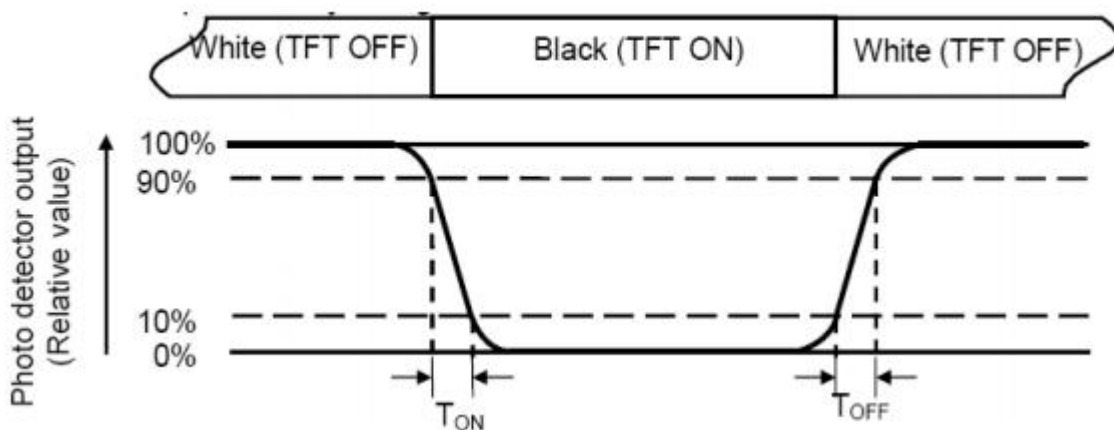
“White state “:The state is that the LCD should driven by  $V_{\text{white}}$ .

“Black state”: The state is that the LCD should driven by  $V_{\text{black}}$ .

$V_{\text{white}}$ : To be determined       $V_{\text{black}}$ : To be determined.

## Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time ( $T_{\text{ON}}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{\text{OFF}}$ ) is the time between photo detector output intensity changed from 10% to 90%.



## Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) =  $L_{min} / L_{max}$

L-----Active area length W----- Active area width

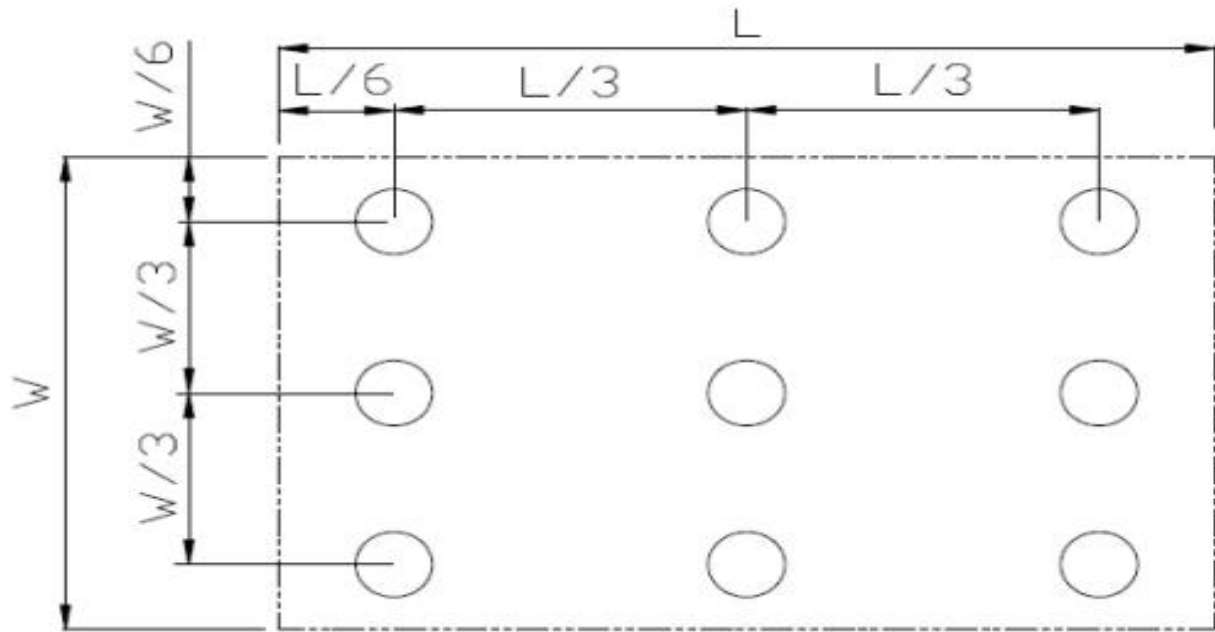


Fig. 2 Definition of uniformity

$L_{max}$ : The measured maximum luminance of all measurement position.

$L_{min}$ : The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance :

Measure the luminance of state at point.

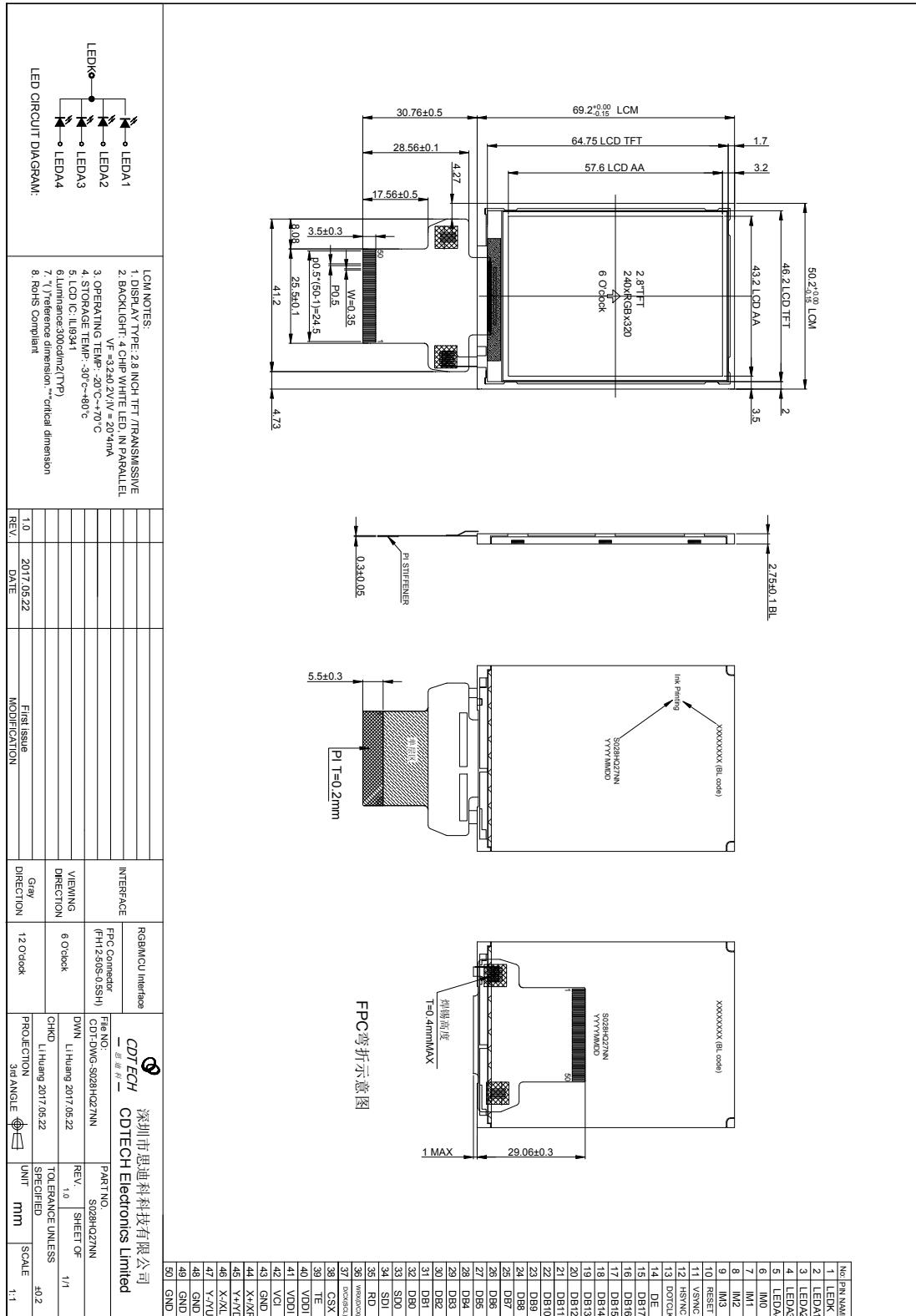
## 8 Environmental / Reliability Tests

| No | Test Item                            | Condition                                                                                                                           | Remarks                                                                                 |
|----|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1  | High Temperature Operation           | Ts= +70℃, 96hrs                                                                                                                     | Note 1<br>IEC60068-2-2,<br>GB2423. 2-89                                                 |
| 2  | Low Temperature Operation            | Ta= -20℃, 96hrs                                                                                                                     | Note 2 IEC60068-2-1<br>GB2423.1-89                                                      |
| 3  | High Temperature Storage             | Ta= +80℃, 120hrs                                                                                                                    | IEC60068-2-2<br>GB2423. 2-89                                                            |
| 4  | Low Temperature Storage              | Ta= -30℃, 120hrs                                                                                                                    | IEC60068-2-1<br>GB/T2423.1-89                                                           |
| 5  | High Temperature & Humidity Storage  | Ta= +60℃, 90% RH max, 160 hours                                                                                                     | IEC60068-2-3<br>GB/T2423.3-2006                                                         |
| 6  | Thermal Shock (Non-operation)        | -30℃ 30 min ~ +80℃ 30 min<br>Change time: 5min, 30 Cycle                                                                            | Start with cold temperature,end with high temperature<br>IEC60068-2-14,<br>GB2423.22-87 |
| 7  | Electro Static Discharge (Opeartion) | C=150pF, R=330 Ω, 5 points/panel<br>Air: ±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15℃ ~ 35℃, 30% ~ 60%, 86Kpa ~ 106Kpa) | IEC61000-4-2<br>GB/T17626.2-1998                                                        |
| 8  | Vibration (Non-operation)            | Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz<br>2 hours for each direction of X .Y. Z. (package condition)          | IEC60068-2-6<br>GB/T2423.5-1995                                                         |
| 9  | Shock (Non-operation)                | 60G 6ms, ± X, ± Y, ± Z<br>3 times for each direction                                                                                | IEC60068-2-27<br>GB/T2423.5-1995                                                        |
| 10 | Package Drop Test                    | Height: 80 cm, 1 corner, 3 edges, 6 surfaces                                                                                        | IEC60068-2-32<br>GB/T2423.8-1995                                                        |

Note: 1. Ts is the temperature of panel's surface.

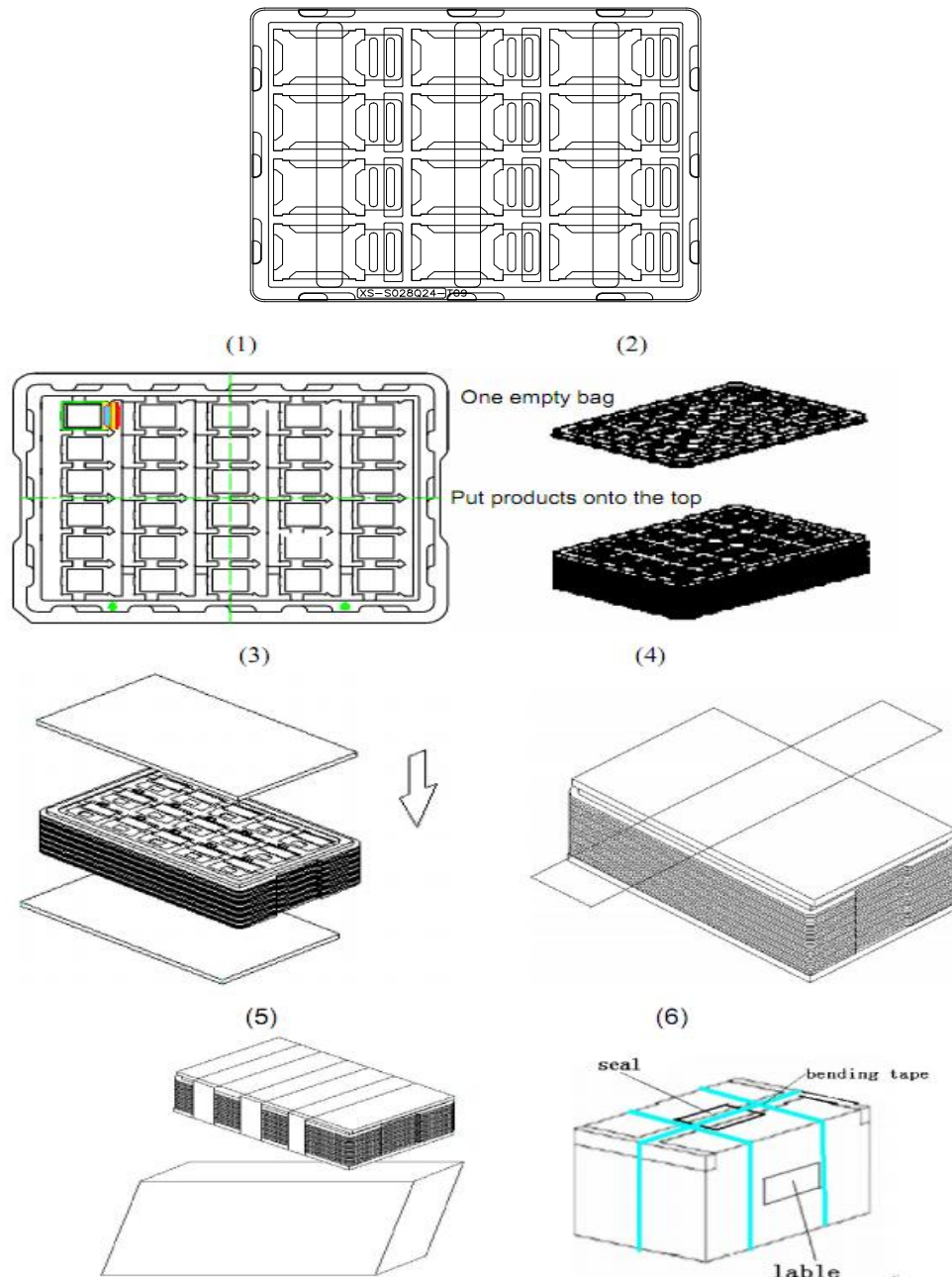
2. Ta is the ambient temperature of sample.

## 9 Mechanical Drawing



## 10 Packing

### Packing Method



1. Put module into tray cavity:
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above:
4. Fix the cardboard to the tray stack with adhesive tape:
5. Put the tray stack into carton.
6. Carton sealing with adhesive tape.

## 11 Precautions For Use of LCD modules

### 11.1 Handling Precautions

11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

11.1.7. If the logic circuit power is off, do not apply the input signals.

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

### 11.2 Storage Precautions

11.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2. The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0°C ~ 40°C      Relatively humidity: ≤80%

11.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.