



深圳市朝显联合光电有限公司  
Shenzhen CX United Opto Electronic Co., Ltd

## SPECIFICATION

**NO.:CXT280H02H34-200P50R**

|                            |  |
|----------------------------|--|
| ACCEPTED<br>BY<br>CUSTOMER |  |
|----------------------------|--|

**Product: 2.8" TFT 240(RGB) \*320 Pixels**

**Verson: V00**

**Date: 2014/01/02**

| APPROVED | CHECKED | PREPARED |
|----------|---------|----------|
|          |         |          |

深圳市朝显联合光电有限公司

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## 1. History Verson

| Sample<br>version | Doc.<br>version | Date       | Discription | Modi fy   |
|-------------------|-----------------|------------|-------------|-----------|
| V00               | V00             | 2014-01-02 | First issue | Haibo_Qin |



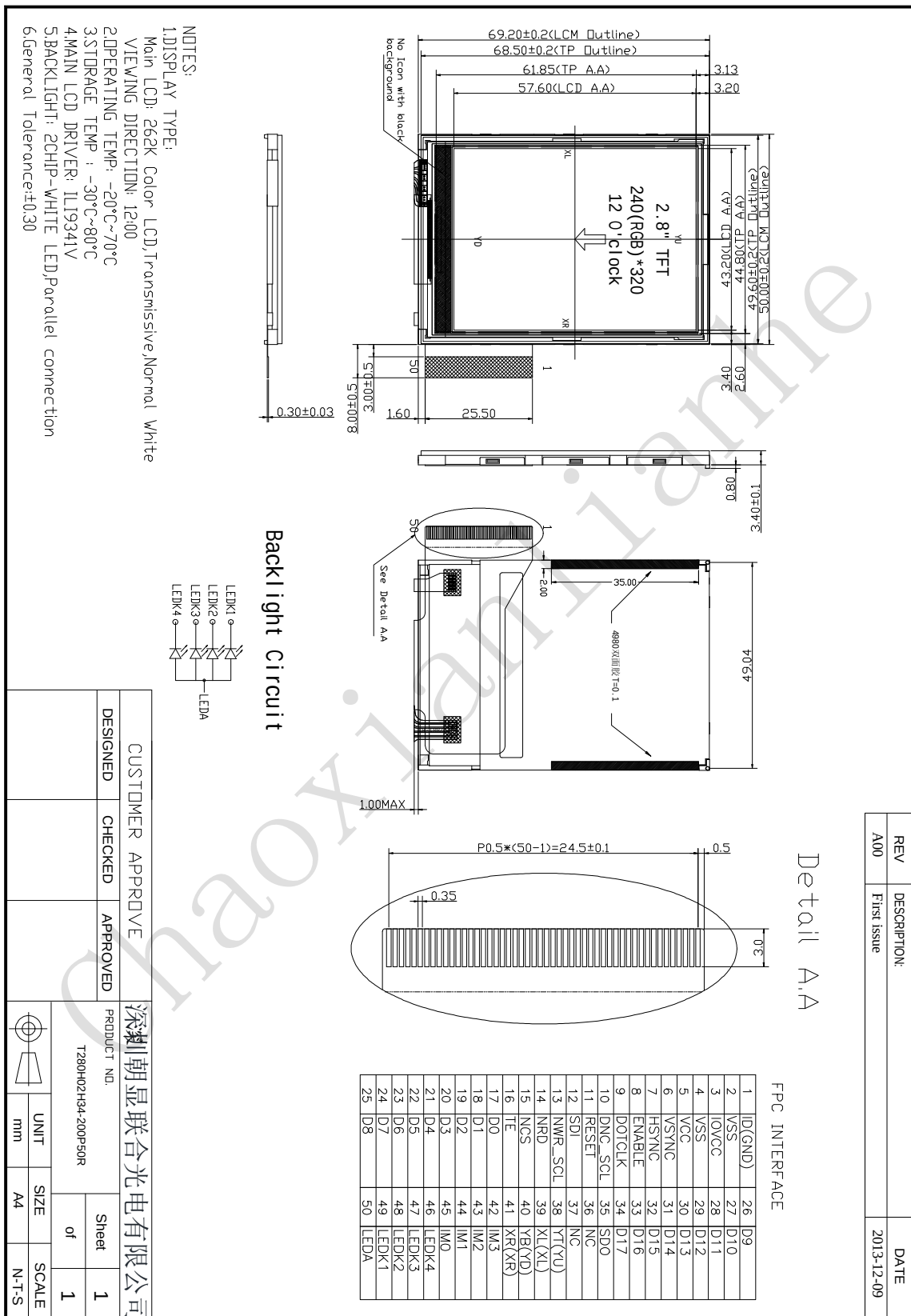
## 2. Mechanical Description

| Name           | Content                        | Unit |
|----------------|--------------------------------|------|
| Outline Size   | 50.00 (W) * 69.20 (H) * 3.4(T) | mm   |
| Module size    | 2.8 (A.A)                      | inch |
| Resolution     | 240(RGB)* 320 Pixels           | -    |
| Viewing size   | 43.20(W) * 57.60(H)            | mm   |
| Pixel size     | 0.180 * 0.180                  | mm   |
| LCD Type       | TFT (262K)/ Transmissive       | -    |
| Viewing Angle  | 12 H                           | -    |
| Driver IC      | ILI9341V                       | -    |
| Backlight Type | 4 Parallel LED                 | -    |
| Interface Type | RGB / MCU / SPI                | -    |



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3. Mechanical Drawing





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#### 4. Interface Definition

| PIN NO. | PIN Name    | Funtion Description                                         |
|---------|-------------|-------------------------------------------------------------|
| 1       | ID(GND)     | Ground                                                      |
| 2       | VSS         | Ground                                                      |
| 3       | IOVCC       | Power supply for logic.                                     |
| 4       | VSS         | Ground                                                      |
| 5       | VCC         | Power supply for system.                                    |
| 6       | VSYNC       | Vertical sync input in RGB mode(short to GND if not used)   |
| 7       | HSYNC       | Horizontal sync input in RGB mode(short to GND if not used) |
| 8       | ENABLE      | Data enable in RGB mode.(short to GND if not used)          |
| 9       | DOTCLK      | Colock signal in RGB mode.(short to GND if not used)        |
| 10      | DNC_SCL     | Data/command selection pin in MCU interface.                |
| 11      | RESET       | Reset pin for system.                                       |
| 12      | SDI         | Serial data input in SPI interface.                         |
| 13      | NWR_SCL     | Write signal in MCU interface/clock input in SPI interface. |
| 14      | NRD         | Read signal in MCU interface.                               |
| 15      | NCS         | Chip selection signal in MCU interface.                     |
| 16      | TE          | Frame mark output pin.                                      |
| 17-34   | D0-D17      | Data bus.                                                   |
| 35      | SDO         | Serial data output in SPI interface.                        |
| 36-37   | NC          | No connection.                                              |
| 38      | YU          | touch panel Y-up                                            |
| 39      | XL          | touch panel X-left                                          |
| 40      | YD          | touch panel Y-bottom                                        |
| 41      | XR          | touch panel X-right                                         |
| 42      | IM3         | Interface selection pin,for detail please see note1.        |
| 43      | IM2         |                                                             |
| 44      | IM1         |                                                             |
| 45      | IM0         |                                                             |
| 46-49   | LEDK4-LEDK1 | back light power supply negative                            |
| 50      | LEDA        | back light power supply positive                            |

Note 1:



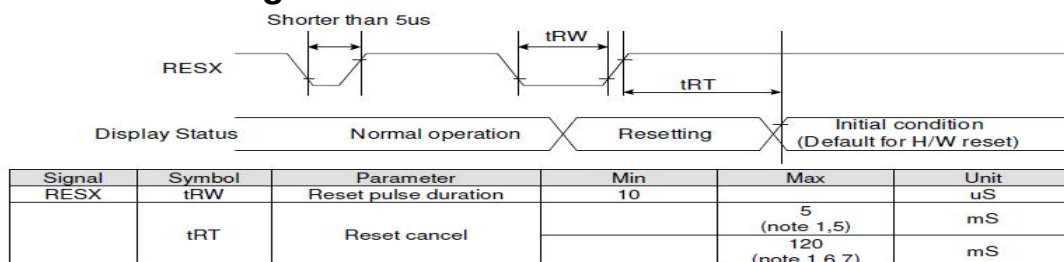
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| IM3 | IM2 | IM1 | IM0 | MCU-Interface Mode                    | DB Pin in use       |                  |
|-----|-----|-----|-----|---------------------------------------|---------------------|------------------|
|     |     |     |     |                                       | Register/Content    | GRAM             |
| 0   | 0   | 0   | 0   | 80 MCU 8-bit bus interface I          | D[7:0]              | D[7:0]           |
| 0   | 0   | 0   | 1   | 80 MCU 16-bit bus interface I         | D[7:0]              | D[15:0]          |
| 0   | 0   | 1   | 0   | 80 MCU 9-bit bus interface I          | D[7:0]              | D[8:0]           |
| 0   | 0   | 1   | 1   | 80 MCU 18-bit bus interface I         | D[7:0]              | D[17:0]          |
| 0   | 1   | 0   | 1   | 3-wire 9-bit data serial interface I  | SDA: In/OUT         |                  |
| 0   | 1   | 1   | 0   | 4-wire 8-bit data serial interface I  | SDA: In/OUT         |                  |
| 1   | 0   | 0   | 0   | 80 MCU 16-bit bus interface II        | D[8:1]              | D[17:10], D[8:1] |
| 1   | 0   | 0   | 1   | 80 MCU 8-bit bus interface II         | D[17:10]            | D[17:10]         |
| 1   | 0   | 1   | 0   | 80 MCU 18-bit bus interface II        | D[8:1]              | D[17:0]          |
| 1   | 0   | 1   | 1   | 80 MCU 9-bit bus interface II         | D[17:10]            | D[17:9]          |
| 1   | 1   | 0   | 1   | 3-wire 9-bit data serial interface II | SDI: In<br>SDO: Out |                  |
| 1   | 1   | 1   | 0   | 4-wire 8-bit data serial interface II | SDI: In<br>SDO: Out |                  |

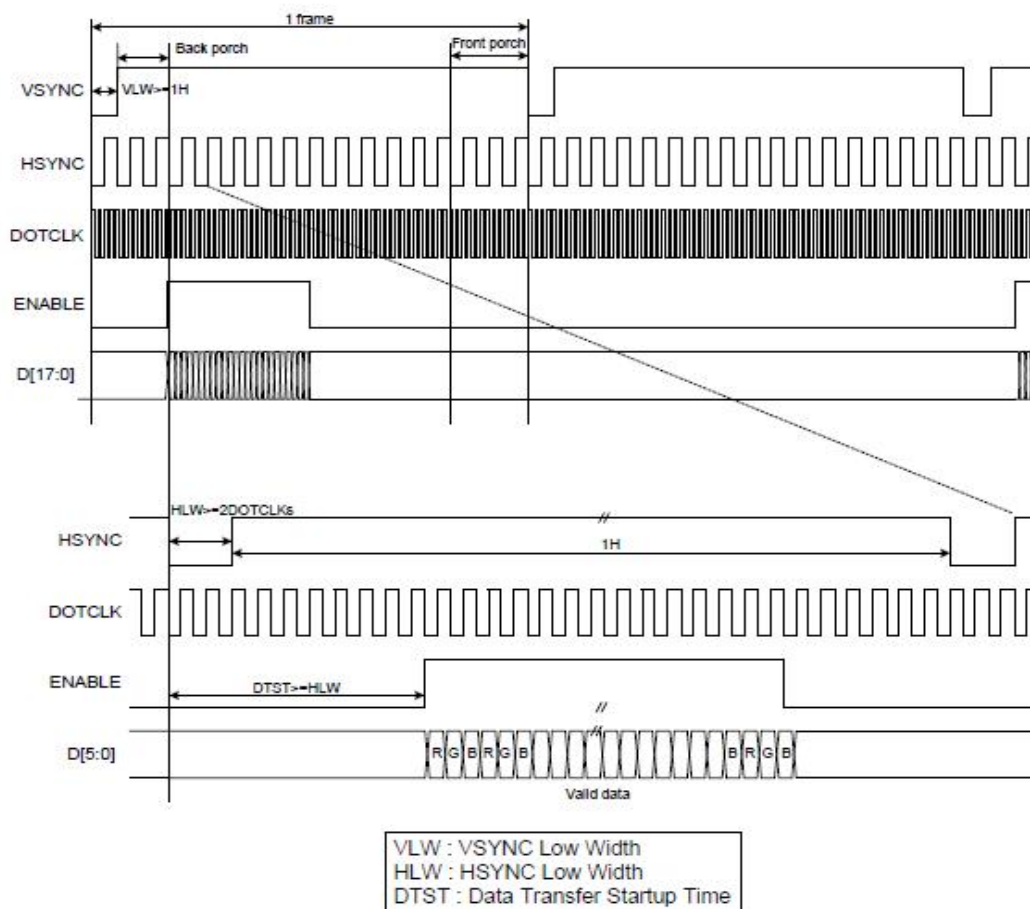


## 5. Interface Timing:

### 5.1 Reset Timing



### 5.2 RGB Interface Timing



| 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   |

### 5.3 MCU Interface Timing





The diagram illustrates the timing for a write operation. The signals and their timing parameters are as follows:

- D/CX**: Data/Command signal. Timing parameters:  $t_{chw}$  (chip enable to write),  $t_{ast}$  (address setup),  $t_{ah}$  (address hold),  $t_{ahf}$  (address hold after write).
- CSX**: Chip Select signal. Timing parameters:  $t_{cs}$  (chip select to write),  $t_{csf}$  (chip select fall time).
- WRX**: Write Enable signal. Timing parameters:  $t_{wc}$  (write enable to write),  $t_{wrl}$  (write enable low to write),  $t_{wrh}$  (write enable high to write),  $t_{dst}$  (data setup),  $t_{dht}$  (data hold).
- D[17:0] (Write)**: Data bus for write. Timing parameters:  $t_{ast}$  (address setup),  $t_{rds} / t_{rcsfm}$  (data setup),  $t_{ah}$  (address hold),  $t_{rdh} / t_{rdhfm}$  (data hold).
- RDX**: Read Data signal. Timing parameters:  $t_{rdl} / t_{rdlfm}$  (data low to read),  $t_{rat} / t_{ratfm}$  (data high to read),  $t_{rodh}$  (read data hold).

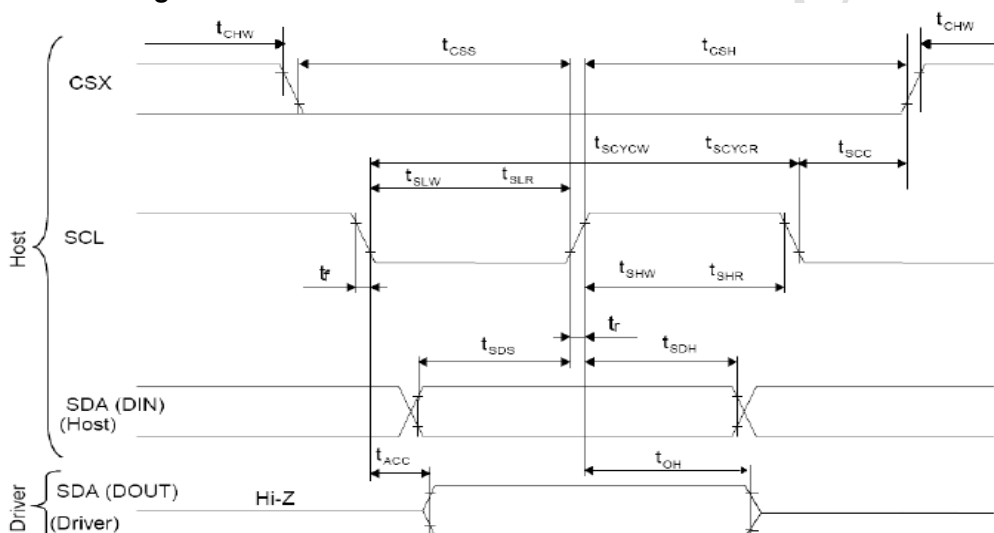


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| Signal                                               | Symbol | Parameter                          | min | max | Unit | Description         |
|------------------------------------------------------|--------|------------------------------------|-----|-----|------|---------------------|
| 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   |                     |
|                                                      | tdst   | Write data setup time              | 10  | -   | ns   |                     |
| D[17:0],<br>D[17:10]&D[8:1],<br>D[17:10],<br>D[17:9] | tdht   | Write data hold time               | 10  | -   | ns   |                     |
|                                                      | trat   | Read access time                   | -   | 40  | ns   | For maximum CL=30pF |
|                                                      | tratfm | Read access time                   | -   | 340 | ns   | For minimum CL=8pF  |
|                                                      | trod   | Read output disable time           | 20  | 80  | ns   |                     |

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

## 2)SPI AC Timing



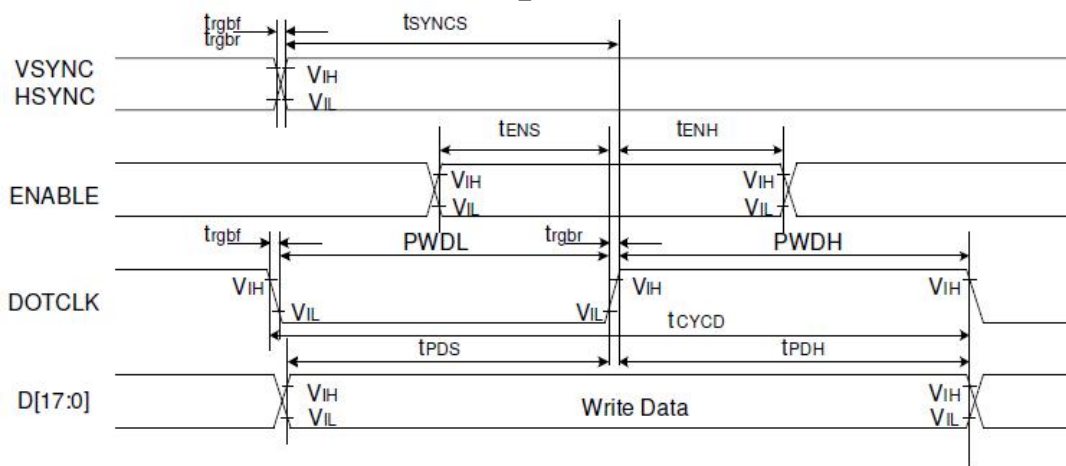
| Signal             | Symbol | Parameter                   | min | max | Unit | Description |
|--------------------|--------|-----------------------------|-----|-----|------|-------------|
| SCL                | tscycw | Serial Clock Cycle (Write)  | 100 | -   | ns   |             |
|                    | 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                | tscc   | SCL-CSX                     | 20  | -   | ns   |             |
|                    | tchwh  | CSX "H" Pulse Width         | 40  | -   | ns   |             |
|                    | tcsw   | CSX-SCL Time                | 60  | -   | ns   |             |
|                    | tcsh   | CSX-SCL Time                | 65  | -   | ns   |             |

Note:  $T_a = 25$  °C,  $V_{DDI}=1.65V$  to  $3.3V$ ,  $V_{CI}=2.5V$  to  $3.3V$ ,  $AGND=V_{SS}=0V$

## 3)RGB AC Timing



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| 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]       | $t_{POS}$              | Data setup time                   | 15  | -   | ns   |                                  |
|               | $t_{PDH}$              | Data hold time                    | 15  | -   | ns   |                                  |
| DOTCLK        | PWDH                   | DOTCLK high-level period          | 15  | -   | ns   | 6-bit bus RGB interface mode     |
|               | PDDL                   | DOTCLK low-level period           | 15  | -   | ns   |                                  |
|               | $t_{CYCD}$             | DOTCLK cycle time                 | 100 | -   | ns   |                                  |
|               | $t_{rgrbr}, t_{rgrbf}$ | DOTCLK,HSYNC,VSYNC rise/fall time | -   | 15  | ns   |                                  |
| VSYNC / HSYNC | $t_{SYNCS}$            | VSYNC/HSYNC setup time            | 15  | -   | ns   |                                  |
|               | $t_{SYNCH}$            | VSYNC/HSYNC hold time             | 15  | -   | ns   |                                  |
| DE            | $t_{ENS}$              | DE setup time                     | 15  | -   | ns   | 6-bit bus RGB interface mode     |
|               | $t_{ENH}$              | DE hold time                      | 15  | -   | ns   |                                  |
| D[17:0]       | $t_{POS}$              | Data setup time                   | 15  | -   | ns   |                                  |
|               | $t_{PDH}$              | Data hold time                    | 15  | -   | ns   |                                  |
| DOTCLK        | PWDH                   | DOTCLK high-level pulse period    | 15  | -   | ns   |                                  |
|               | PDDL                   | DOTCLK low-level pulse period     | 15  | -   | ns   |                                  |
|               | $t_{CYCD}$             | DOTCLK cycle time                 | 100 | -   | ns   |                                  |
|               | $t_{rgrbr}, t_{rgrbf}$ | DOTCLK,HSYNC,VSYNC rise/fall time | -   | 15  | ns   |                                  |

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



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## 6. Absolute Maximum Ratings:

| Name                  | symbol          | Min | Type | Max | Unit |
|-----------------------|-----------------|-----|------|-----|------|
| Operation Temperature | T <sub>OP</sub> | -10 | -    | 60  | °C   |
| Storage Temperature   | T <sub>ST</sub> | -20 | -    | 70  | °C   |

## 7. DC Characteristics

| Name                | Symbol          | Min      | Type | Max      | Unit |
|---------------------|-----------------|----------|------|----------|------|
| System Voltage      | VCC             | 2.6      | 2.8  | 3.0      | V    |
| Logic Voltage       | IOVCC           | 1.8      | -    | 3.3      |      |
| Input High Voltage  | V <sub>IH</sub> | 0.8IOVCC | -    | IOVCC    | V    |
| Input Low Voltage   | V <sub>IL</sub> | -0.3     | -    | 0.2IOVCC | V    |
| Output High Voltage | V <sub>OH</sub> | 0.8IOVCC | -    | -        | V    |
| Output Low Voltage  | V <sub>OL</sub> | -        | -    | 0.2IOVCC | V    |
| Current Consumption | ICC             | -        | -    | 25       | mA   |

## 8. Backlight:

| Name                 | Min  | Type | Max  | Unit                      |
|----------------------|------|------|------|---------------------------|
| Current              | -    | 60   | 70   | mA                        |
| Voltage              | -    | 3.2  | 3.4  | V                         |
| Power Consumption    | -    | 192  | -    | mW                        |
| Luminance            | 150  | 200  | -    | CD/M <sup>2</sup> (Note1) |
| Luminance uniformity | 75%  | 80%  | -    | (Note2)                   |
| X Color Coordinates  | 0.27 | 0.28 | 0.31 | -                         |
| Y Color Coordinates  | 0.27 | 0.28 | 0.31 | -                         |

Note1: This luminance is tested with assembling the LCD.



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Note2: Definition of Luminance Uniformity.

Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{\min}}{B_{\max}}$$

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

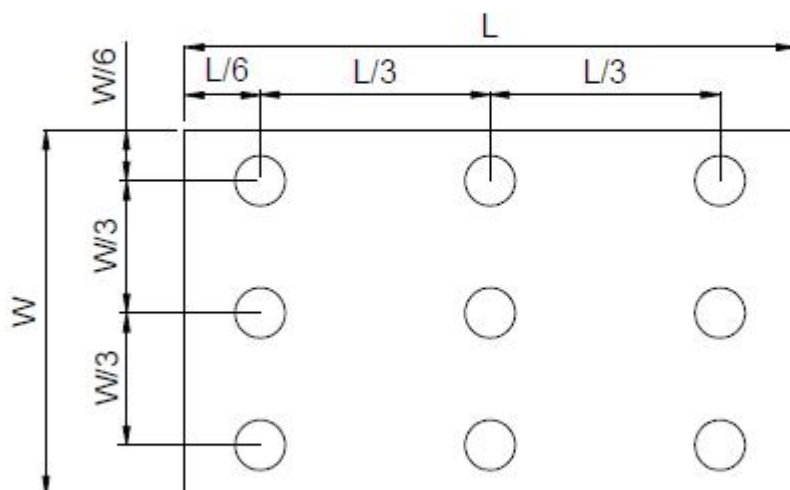


Fig. 4-4 Definition of measuring points

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

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

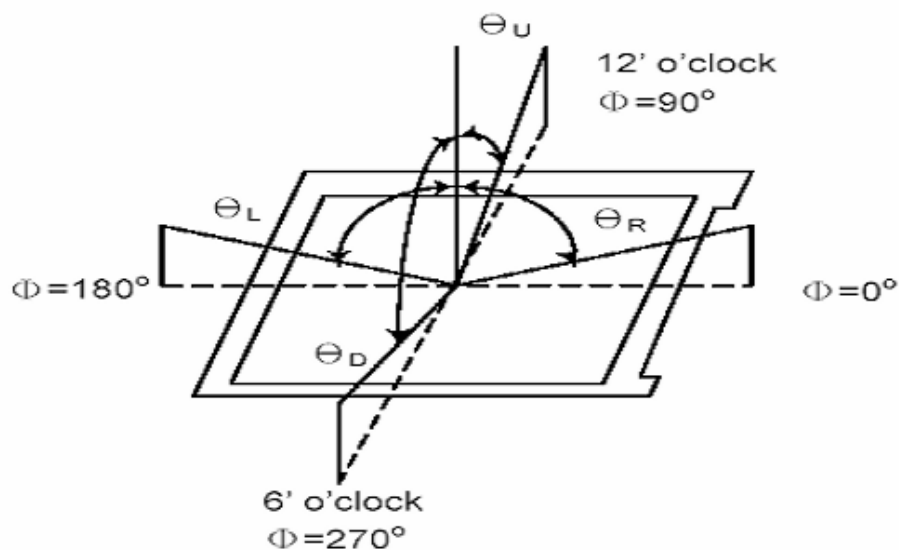
## 9. Optical Specification

| Name               | Symbol     | Min | Type | Max | Unit               |
|--------------------|------------|-----|------|-----|--------------------|
| Transmittance rate | T(%)       | -   | 4.6  | -   | %                  |
| Contrast ratio     | C/R        | 400 | 500  | -   | -                  |
| Response time      | Tr+Tf      | -   | 45   | -   | ms                 |
| Viewing Angle      | $\theta U$ | 40  | 50   | -   | degree<br>(C/R>10) |
|                    | $\theta D$ | 35  | 45   | -   |                    |
|                    | $\theta L$ | 35  | 45   | -   |                    |
|                    | $\theta R$ | 10  | 20   | -   |                    |

\*Viewing angle descriptin:



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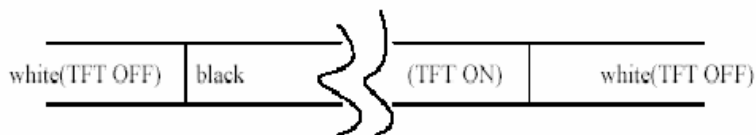


\*Contrast rate description(CR) :

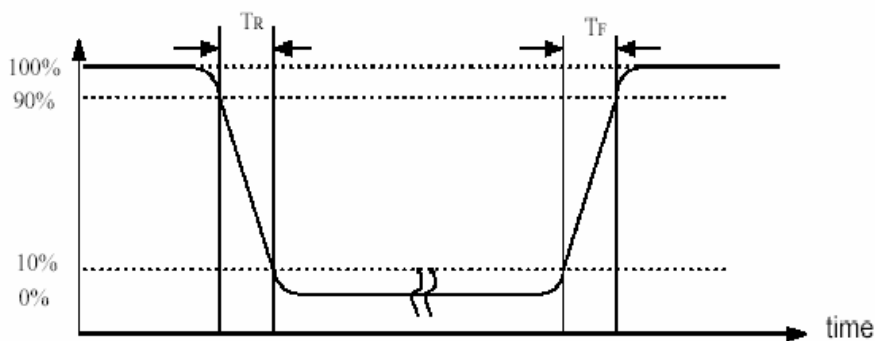
Tested in the center of the LCM panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

\*Response time description : Sum of TR and TF



Optical  
response





**10.Touch Panel:**

| Item               | Description | Unit  |
|--------------------|-------------|-------|
| linearity          | <1.5%       | -     |
| transmittance      | >80%        | -     |
| Response time      | <10         | ms    |
| Life time          | 1,000,000   | times |
| Operation pressure | 60~100      | g     |
| Circuit level      | 3~15        | V     |

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## 11. Reliability testing:

| Item No | Name                                | Condition                                                                                                       | Remark                          |
|---------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1       | High temperature Operating          | 70° C , 168Hours                                                                                                | Finish product (With polarizer) |
| 2       | Low temperature Operating           | -20° C , 168 Hours                                                                                              | Finish product (With polarizer) |
| 3       | High temperature Storage            | 80° C , 168 Hours                                                                                               | Finish product (With polarizer) |
| 4       | Low temperature Storage             | -30° C , 168 Hours                                                                                              | Finish product (With polarizer) |
| 5       | High temperature & humidity Storage | 60° C , 90%RH, 168 Hours                                                                                        | Finish product (With polarizer) |
| 6       | Thermal Shock Storage(No operation) | -20° C , 30min.<=> 70° C , 30min.<br>10 Cycles                                                                  | Finish product (With polarizer) |
| 7       | ESD test                            | Voltage:+8KV<br>R:330 ohm,C:150pF<br>Air discharge,10 times                                                     | Finish product (With polarizer) |
| 8       | Vibration test                      | 10 => 55 =>10 => 55 => 10 Hz,<br>within 1 minute;Amplitude:1.5mm.<br>15 minutes for each Direction<br>( X,Y,Z ) | Finish product (With polarizer) |
| 9       | Drop test                           | Packed, 100CM free fall<br>6 sides, 1 corner, 3edges                                                            | Finish product (With polarizer) |

\*One single product test for only one item.

\* Judgment after test: keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value
- Contrast > 1/2 initial value
- Function: work normally





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## Shenzhen CX United Opto Electronic Co., Ltd

### 12. Inspection Standard

#### 12.1 Defect Definition

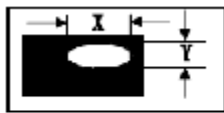
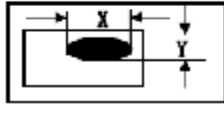
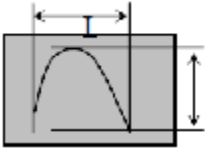
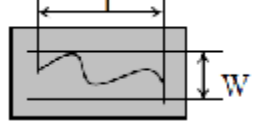
| No. | Defect Class | Defination         | Content                   |
|-----|--------------|--------------------|---------------------------|
| 1   | 重缺陷 (MA)     | 影响显示的功能缺陷          | 短路、断路、缺划、大电流、视角错、漏液、显示不清等 |
|     |              | 严重外观缺陷             | 产品尺寸不符、漏部品等               |
| 2   | 轻缺陷 (MI)     | 不影响产品功能, 但对产品外观有影响 | 反黑 / 反白点、偏光片缺陷、针孔、污点      |

#### 12.2 Standard

| No. | Item | Inspection Standard | Classification of defects |
|-----|------|---------------------|---------------------------|
|-----|------|---------------------|---------------------------|

|   |      |                                                        |     |
|---|------|--------------------------------------------------------|-----|
| 1 | 显示状态 | 不显、显示乱码、多划、少划、少画面、视角错、闪烁等均不允许                          | 重缺陷 |
|   |      | 无法用文字描述的现象, 必要时制定限度样板进行参考。如: 显示不均、显示浓淡、斜纹等             |     |
|   |      | 显示的颜色效果参照开发、工程样品或按限度样板判定                               |     |
|   |      | 画面切换过程中可见(但非画异)之不良现象(暂停画面时不良现象不可见)不作管控, 客户有特殊要求时依客户要求; | 轻缺陷 |
|   |      | 仅点背光不显示画面下可见不良现象(但显示画面时不良现象不可见)不作管控, 客户有特殊要求时依客户要求;    | 轻缺陷 |
| 2 | 背光   | LED 灯不亮或闪烁不稳定不允许                                       | 重缺陷 |
|   |      | 背光电流: 超出规格范围不允许                                        |     |
|   |      | 亮眼、漏光: 进入 LCD 的 A、B 区不允许, 必要时按限度样板做判定                  | 轻缺陷 |
|   |      | 背光颜色: 根据样品、规格书判定                                       | 轻缺陷 |
|   |      | 亮度与发光均匀度参照开发、工程或限度样板判定                                 | 轻缺陷 |



| No. | Item                     | Inspection Standard                                          |      |                                                                                                                                                                          | Classification of defects |
|-----|--------------------------|--------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 3   | 显示黑点<br><br>白点<br><br>针孔 | 直径（ $\Phi = (X+Y) / 2$ ）                                     | 允收数  | 图示                                                                                                                                                                       | 轻缺陷                       |
|     |                          | $\Phi \leq 0.1$ （密集不可）                                       | 不计   | <br> |                           |
|     |                          | $0.1 < \Phi \leq 0.15$ [注2]                                  | 2    |                                                                                                                                                                          |                           |
|     |                          | $0.15 < \Phi \leq 0.2$                                       | 1    |                                                                                                                                                                          |                           |
|     |                          | $\Phi > 0.2$                                                 | 0    |                                                                                                                                                                          |                           |
|     |                          | 注1. 包括：黑点、白点、针孔、异物。<br>注2. 整个产品不允许超过2个点,且间距必须在10mm以上。        |      |                                                                                                                                                                          |                           |
| 4   | 显示黑线<br><br><br>白线       | 尺 寸（L：线长；W：线宽）                                               | 允收数  | 图示                                                                                                                                                                       | 轻缺陷                       |
|     |                          | L 不计 W<0.03（密集不可）                                            | 不计   |                                                                                       |                           |
|     |                          | $L \leq 2$ $0.03 \leq W \leq 0.05$ [注 2]                     | 2    |                                                                                                                                                                          |                           |
|     |                          | L 不计 W>0.05                                                  | 以点判断 |                                                                                      |                           |
|     |                          | 注1. 包括：显示黑线、白线、线状异物。<br>注2. 单个产品不允许超过2个线状缺陷,且缺陷距离必须大于10mm以上。 |      |                                                                                                                                                                          |                           |
| 5   | 触摸屏                      | 点击触摸屏测试点画面无转换不允许                                             |      |                                                                                                                                                                          | 重缺陷                       |

## 13. Precaution

### 13.1 Handling

- (1) Protect the panel from static, it may cause damage to the CMOS Gate Array IC.
- (2) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (3) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
- (4) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Don't use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (5) Pins of I/F connector shall not be touched directly with bare hands.



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(6) Refrain from strong mechanical shock and / or any force to the panel. In addition to damage, this may cause improper operation or damage to the panel.

(7) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a B pencil lead.

(8) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.

(9) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

### 13.2 Storage

(1) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the panel with temperature from 0 to 35°C and relative humidity of less than 70%.

(2) The panel shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

### 13.3 Operation

(1) The LCD shall be operated within the limits specified. Operation at values outside of these limits may shorten life, and/or harm display images.

(2) Do not exceed the absolute maximum rating value. (the supply voltage variation, Input voltage variation in part contents and environmental temperature and so on). Otherwise the panel may be damaged.

(3) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image "Sticks" to the screen.

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