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# Product Specification

Part Name: 3.5 inch TFT Display Module
Customer Part ID:
YOURITECH Part ID: ET035TR01-VT
Ver: A

| Customer: |
| --- |
| Approved by |

| From: YOURITECH TECHNOLOGY |
| --- |
| Approved by |

Notes:

1. Please contact YOURITECH TECHNOLOGY before assigning your product based on this module specification 2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by YOURITECH TECHNOLOGY for any intellectual property claims or other problems that may result from application based on the module described herein.

# REVISION HISTORY

| Revision<br>版本号 | Date<br>日期 | Contents of Revision Change<br>修改内容 | Remark<br>备注 |
|---|---|---|---|
| V1.0 | 2023.12.04 | Preliminary release | |
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# 1. GENERAL INFORMATION

## 1.1 Features

1) Pixel Arrangement：RGB Vertical Stripe
2) Interface Mode：MCU 8/16BIT/SPI
3) Driver IC：ST7365 or Compatible
4) Operation Temperature：-20~70℃
5) Storage Temperature：-30~80℃
6) Backlight Type：White LED
7) Display mode：Transflective Normally BLACK
8) LED life time：30,000 Hours

## 1.2 Mechanical Specification

| Item<br>项目 | Specification<br>规格 | Unit<br>单位 | Remark<br>备注 |
|---|---|---|---|
| **Pixel Driving element** | TFT | - | - |
| **Screen Size** | 3.47 | Inch | Diagonal |
| **Resolution** | 320(H)*3(RGB)*480(V) | Dots | - |
| **Interface** | MCU 8/16BIT/SPI | - | 40PIN |
| **Module Power Consumption** | 0.07 | Watt | Reflective Mode |
| | 0.42 | | Transmissive Mode |
| **Luminance** | 12%*Surrounding illumination | $cd/m^2$ | Reflective Mode |
| | 150+12%*Surrounding illumination | $cd/m^2$ | Transmissive Mode |
| **Active Ar a** | 48.96(W)*73.44(H) | mm | - |
| **Pixel pitch (W*H)** | 0.153(W)*0.153(H) | mm | - |
| **Module Size (W*H*D)** | 52.26(W)*80.6(H)*2.21(D) | mm | Typ |
| **Display Color** | 16.7M | Colors | 18bits |

**Applicate Suggestion:**

Backlight off in Reflective mode @ Surrounding illumination > 1500 $cd/m^2$
Backlight on in Transmissive mode @ Surrounding illumination ≤ 1500 $cd/m^2$
Please contact us for Surrounding illumination (lx) detail information

# 2. ABSOLUTE MAXIMUM RATINGS

| Item<br>项目 | Symbol<br>符号 | Min.<br>最小值 | Max.<br>最大值 | Unit<br>单位 | Remark<br>备注 |
|---|---|---|---|---|---|
| Power supply voltage1 | IOVCC | -0.5 | 4.6 | V | Note1 |
| Power supply voltage2 | VCI | -0.5 | 4.6 | V | Note1 |
| LED forward current | $I_F$ | -0.001 | 120 | mA | For each led,Note1 |
| LED Reverse Voltage | $V_R$ | - | 3.4 | V | For each led,Note1 |
| Operating temperature | $T_{op}$ | -20 | 70 | °C | Note1,2 |
| Storage temperature | $T_{st}$ | -30 | 80 | °C | Note1,2 |
| Humidity | $H_{st}$ | 10 | 90 | %RH | Note1,3 |

(Ta=+25°C,GND=0V)

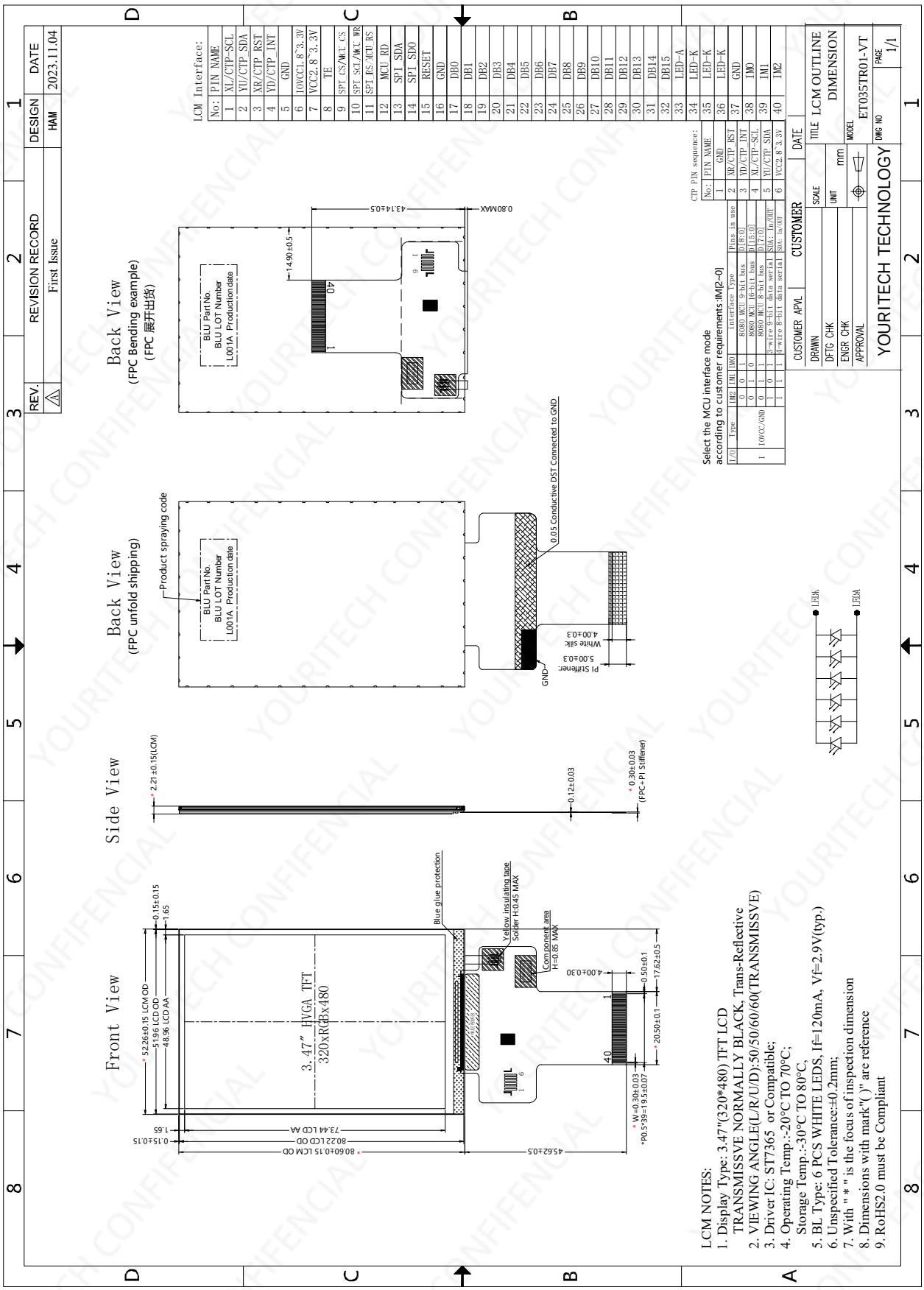
Note1:If the module exceeds the absolute maximum ratings, it may be damaged permanently. Also if the module operates with the absolute maximum ratings for a long time, the reliability may drop.

Note2: In case of temperature below 0℃,the response time of liquid crystal (LC) becomes slower and the color of panel darker than normal one.

Note3: Temp. ≤ 60℃ , 90% RH MAX.

Temp. ＞60℃ , Absolute humidity shall be less than 90% RH at 60℃.

# 3. MECHANICAL DRAWING



# 4. I/O CONNECTION & BLOCK DIAGRAM

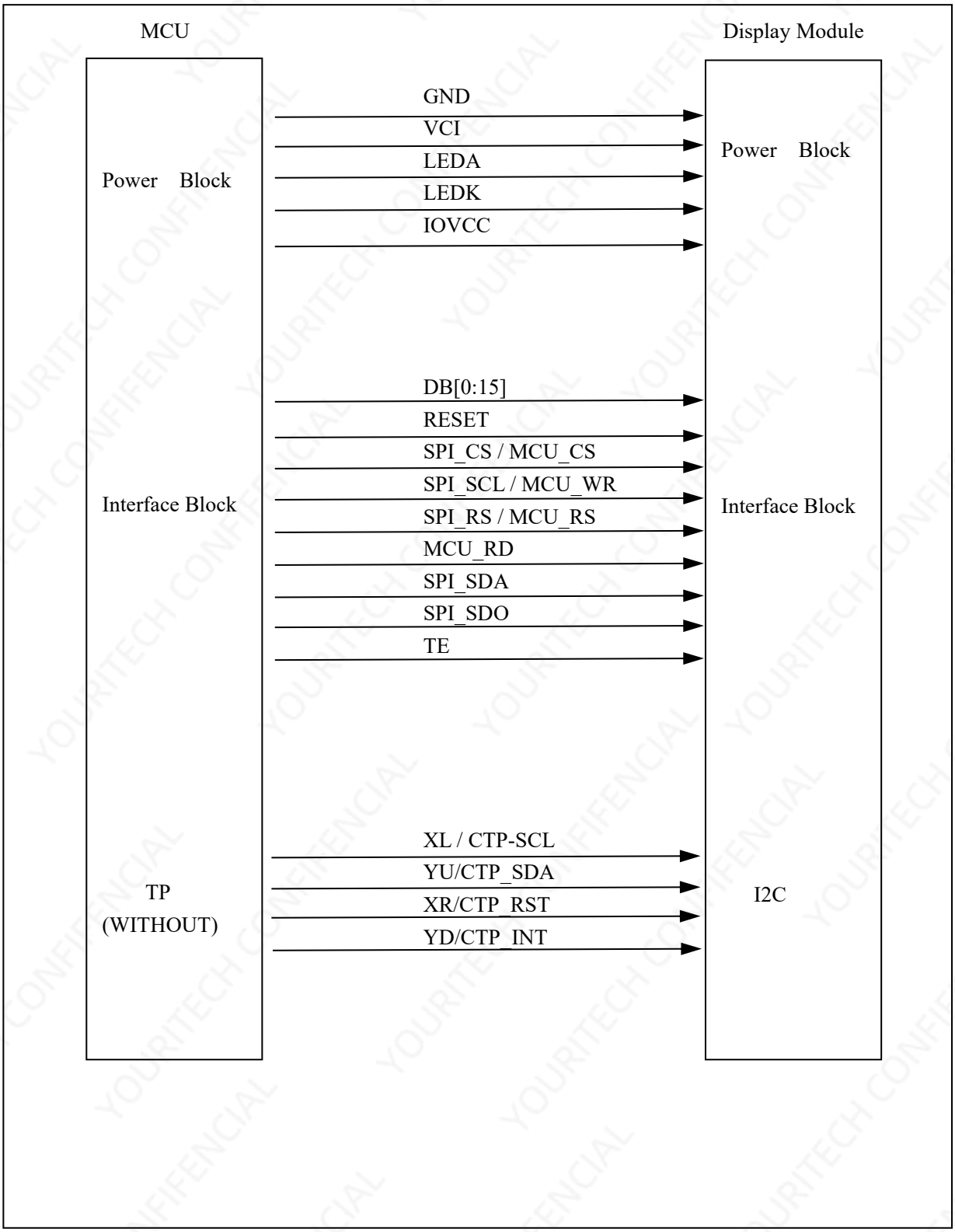
## 4.1 I/O Connection

| Pin No. | Symbol 符号 | I/O | Description 描述 |
|---|---|---|---|
| 1 | XL /CTP-SCL | I | I2C clock signals for CTP; Option XL for RTP |
| 2 | YU /CTP-SDA | I | I2C data signal for CTP, Option YU for RTP |
| 3 | XR /CTP-RST | I | The signal will reset the CTP,Signal is active low, Option XR for RTP |
| 4 | YD /CTP-INT | I/O | Interrupt signals for CTP, Option YD for RTP |
| 5 | GND | P | Power Ground |
| 6 | IOVCC | P | Power supply for I/O system |
| 7 | VCI | P | Power supply for analog circuits |
| 8 | TE | O | Tearing effect signal is used to synchronize MCU to frame memory |
| 9 | SPI_CS /MCU_CS | I | Chip selection pin. Low-active |
| 10 | SPI_SCL /MCU_WR | I | Write enable in MCU parallel interface<br>In SPI mode, this pin is used as SCL |
| 11 | SPI_RS /MCU_RS | I | Display data/command selection pin in MCU interface<br>RS=1 display data or parameter;RS=0 register index / command |
| 12 | MCU_RD | I | Read enable in 8080 MCU parallel interface. Low-active. |
| 13 | SPI_SDA | I/O | Serial communication data input and output, internal pull low. |
| 14 | SPI_SDO | O | SPI interface output pin |
| 15 | RESET | I | The signal will reset the LCM, Signal is active low. |
| 16 | GND | P | Power Ground |
| 17-32 | DB0-DB15 | I/O | data bus for MCU |
| 33 | LED-A | P | Power supply for backlight anode |
| 34-36 | LED-K | P | Power supply for backlight cathode |
| 37 | GND | P | Power Ground |
| 38 | IM0 | I | The MCU interface mode select. |
| 39 | IM1 | I | The MCU interface mode select. |
| 40 | IM2 | I | The MCU interface mode select. |

I：Input；O：Output；P：Power

## 4.2 Block Diagram

MCU and Display Module Interface Configuration



# 5. ELECTRICAL CHARACTERISTICS

## 5.1 TFT-LCD Panel Driving Section

| Item 项目 | Symbol 符号 | Min. 最小值 | Typ. 典型值 | Max. 最大值 | Unit 单位 | Remark 备注 |
|---|---|---|---|---|---|---|
| Power Supply Voltage1 | IOVCC | 1.65 | 1.8 | 3.6 | V | - |
| Power Supply Voltage2 | VCC | 2.5 | 3.3 | 3.6 | V | - |
| Power Supply Current1 | $I_{iovcc}$ | - | 1 | - | mA | Note1 |
| Power Supply Current2 | Ivcc | - | 20 | - | mA | Note1 |
| Logic Input High Voltage | $V_{IH}$ | 0.7VDD | - | VDD | V | - |
| Logic Input Low Voltage | $V_{IL}$ | 0 | - | 0.3VDD | V | - |
| Panel Power Consumption | $P_{VDD}$ | - | 0.07 | - | Watt | Note1 |
| Module Power Consumption | $P_{LCM}$ | - | 0.42 | - | Watt | Note1,2 |

(Ta=+25°C,GND=0V)

Note1:Measurement Conditions (Video Mode): Full Screen Red Pattern,VDD=3.3V,60Hz Refresh.

Note2: $P_{LCM}$= $P_{VDD}$+ $P_{BL}$， About $P_{BL}$ information, inference to 5.2 Back Light Driving Section.

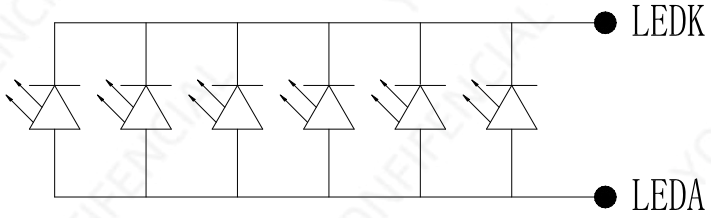
## 5.2 Back Light Driving Section

| Item 项目 | Symbol 符号 | Min. 最小值 | Typ. 典型值 | Max. 最大值 | Unit 单位 | Remark 备注 |
|---|---|---|---|---|---|---|
| Forward Voltage | - | - | 2.9 | - | V | Note1 |
| Forward Current | $I_F$ | - | 120 | - | mA | Note1 |
| Backlight Power consumption | $P_{BL}$ | - | 0.35 | - | Watt | Note1 |
| LED life time | - | 30000 | - | - | Hrs | Note2 |
| LED Quantity | | | 6 | | PCS | |

(Ta=+25°C,GND=0V)

Note1: The LED driving condition is defined for each LED module

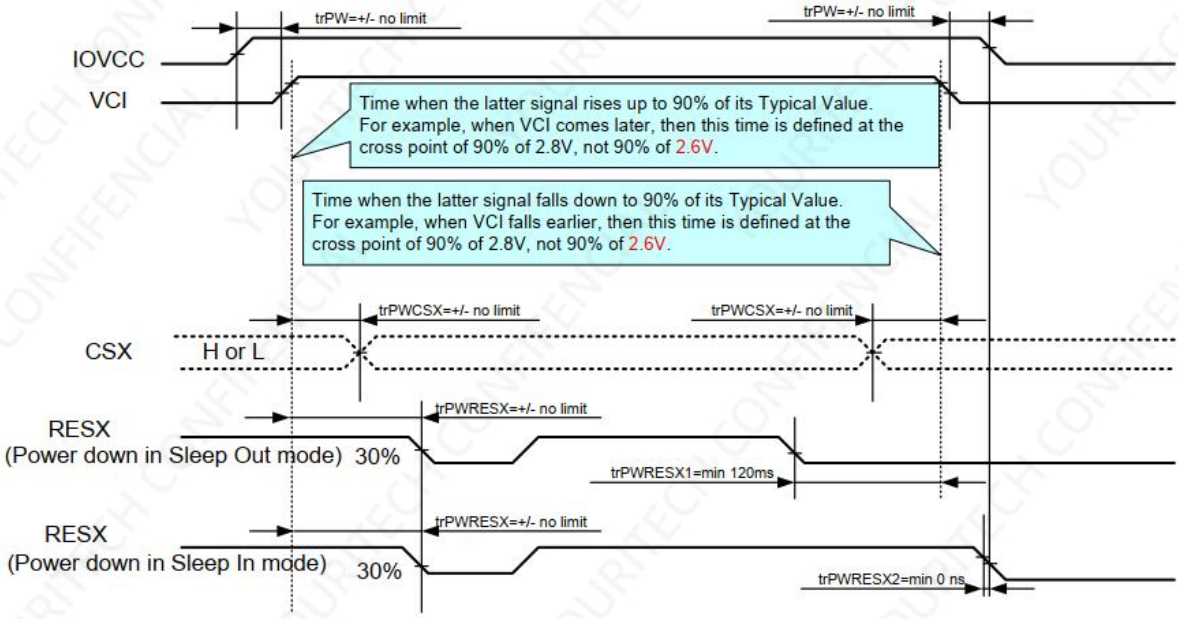
Note2:The “LED life time” is defined as the module brightness decrease to 50% of original brightness at $I_{LED}$=20mA(Per Led). The LED life time could be decreased if operating $I_{LED}$ is larger than 20mA.



## 5.3 Power On/Off

### 5.3.1 Case 1 – RESX Line is Held High or Unstable by Host at Power ON

If the RESX line is held High or unstable by the host during Power On, then Hardware Reset must be applied after both VCI and IOVCC have been applied. Otherwise, the correct functionality is not guaranteed. There is no timing restriction upon this hardware reset.



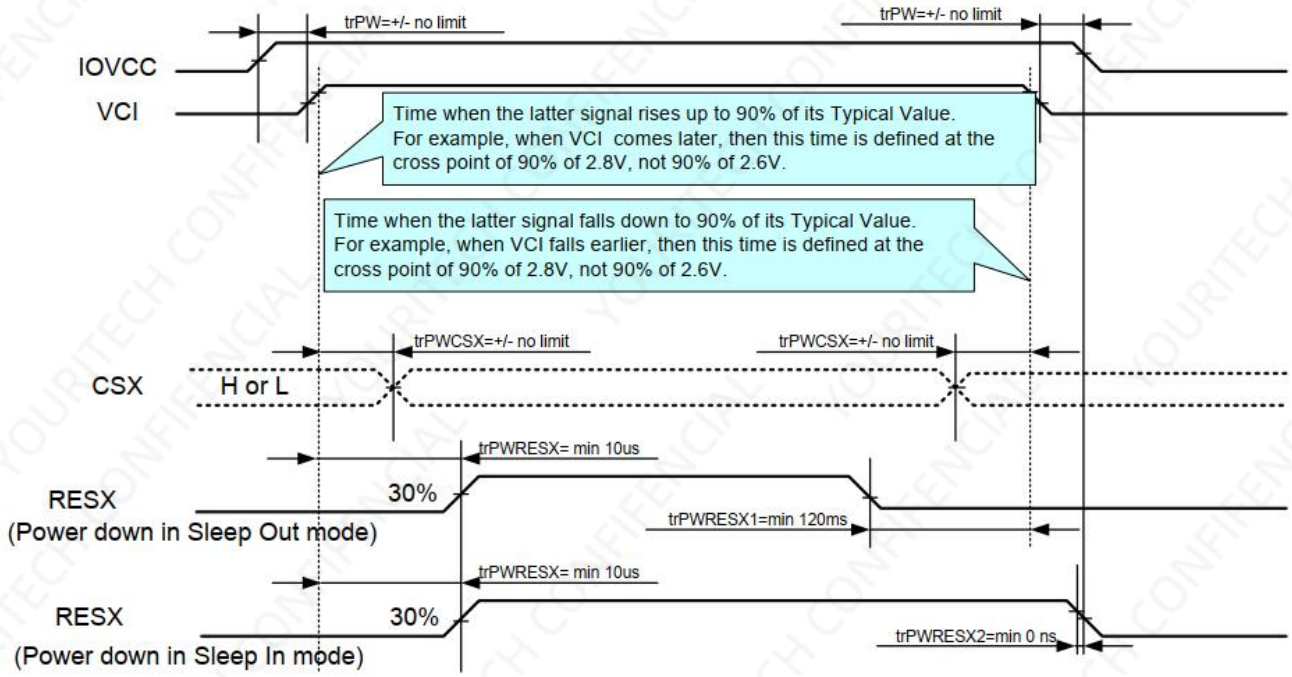

trPWRESX1 is applied to RESX falling in the Sleep Out Mode

trPWRESX2 is applied to RESX falling in the Sleep In Mode

**Note:** Unless otherwise specified, timings herein show the cross point at 50% of the signal power level.

### 5.3.1.2 Case 2 – RESX Line is Held Low by Host at Power ON

If the RESX line is held Low (and stable) by the host during Power On, then the RESX must be held low for a minimum of 10µsec after both VCI and IOVCC have been applied.




trPWRESX1 is applied to RESX falling in the Sleep Out Mode
trPWRESX2 is applied to RESX falling in the Sleep In Mode

# 5.4 Timing Characteristics

## 8080 Series MCU Parallel Interface Timing Characteristics: 16/8-bit Bus

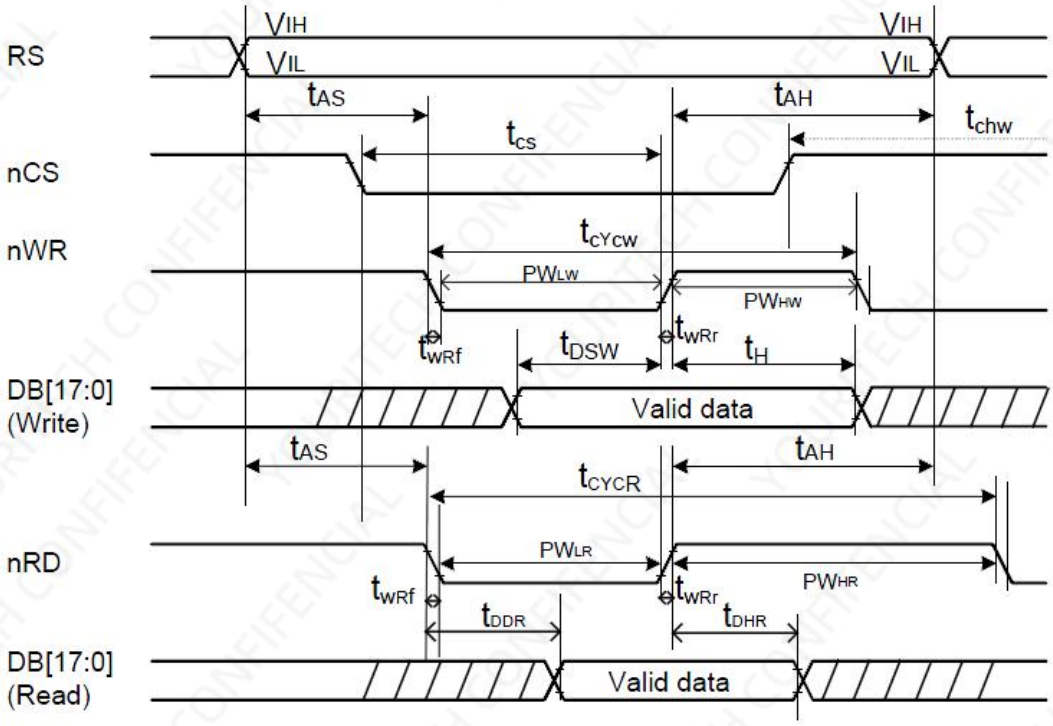
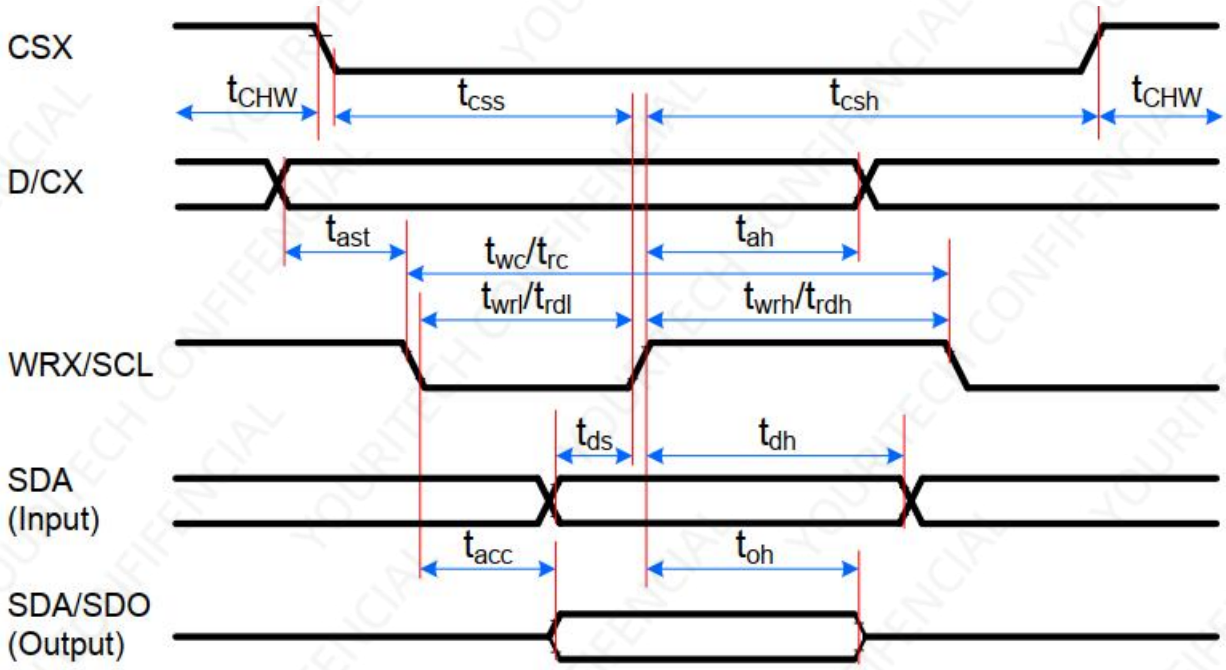



**Figure 48 i80-System Bus Timing**

**Normal Write Mode (IOVCC = 1.65~3.3V)**

| Item | | Symbol | Unit | Min. | Typ. | Max. | Test Condition |
|---|---|---|---|---|---|---|---|
| Bus cycle time | Write | $t_{CYCW}$ | ns | TBD | - | | - |
| | Read | $t_{CYCR}$ | ns | 300 | - | - | - |
| Write low-level pulse width | | $PW_{LW}$ | ns | TBD | - | 500 | - |
| Write high-level pulse width | | $PW_{HW}$ | ns | TBD | - | - | - |
| Read low-level pulse width | | $PW_{LR}$ | ns | 150 | - | - | - |
| Read high-level pulse width | | $PW_{HR}$ | ns | 150 | - | - | |
| Write / Read rise / fall time | | $t_{WRr}/t_{WRf}$ | ns | - | - | 25 | |
| Setup time | Write ( RS to nCS, E/nWR ) | $t_{AS}$ | ns | 10 | - | - | |
| | Read ( RS to nCS, RW/nRD ) | | | 5 | - | - | |
| Address hold time | | $t_{AH}$ | ns | 5 | - | - | |
| Write data set up time | | $t_{DSW}$ | ns | 10 | - | - | |
| Write data hold time | | $t_H$ | ns | 15 | - | - | |
| Read data delay time | | $t_{DDR}$ | ns | - | - | 100 | |
| Read data hold time | | $t_{DHR}$ | ns | 5 | - | - | |

## 5.5 Display Serial Interface Timing Characteristics ( SPI system )




| Signal | Symbol | Parameter | min | max | Unit | Description |
|---|---|---|---|---|---|---|
| CSX | tcss | Chip select time (Write) | 15 | - | ns | |
| | tcsh | Chip select hold time (Read) | 15 | - | ns | |
| | tCHW | CS H pulse width | 40 | - | ns | |
| SCL | twc | Serial clock cycle (Write) | 50 | - | ns | |
| | twrh | SCL H pulse width (Write) | 10 | - | ns | |
| | twrl | SCL L pulse width (Write) | 10 | - | ns | |
| | trc | Serial clock cycle (Read) | 150 | - | ns | |
| | trdh | SCL H pulse width (Read) | 60 | - | ns | |
| | trdl | SCL L pulse width (Read) | 60 | - | ns | |
| D/CX | tas | D/CX setup time | 10 | - | ns | |
| | tah | D/CX hold time (Write/Read) | 10 | - | ns | |
| SDA (Input) | tds | Data setup time (Write) | 10 | - | ns | |
| | tdh | Data hold time (Write) | 10 | - | ns | |
| SDA/SDO (Output) | tacc | Access time (Read) | 10 | 50 | ns | For maximum CL=30pF<br>For minimum CL=8pF |
| | tod | Output disable time (Read) | 15 | 50 | ns | |

**Notes:**

1. Ta = -30 to 70 °C, IOVCC = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = DGND = 0V, T = 10+/-0.5ns.
2. Does not include signal rising and falling times.

# 6. OPTICAL CHARACTERISTICS

## 6.1 Optical Specification (Reflective mode)

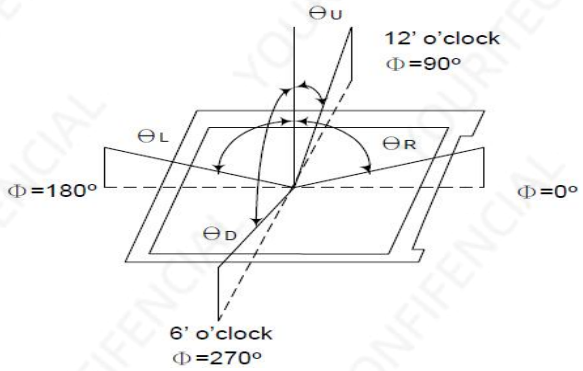
| Parameter 参数 | Symbol 符号 | Condition 条件 | Min. 最小值 | Typ. 典型值 | Max. 最大值 | Unit 单位 | Remark 备注 |
|---|---|---|---|---|---|---|---|
| White Reflectance (with Polarizer) | Rw (%) | θ = 0 | 10 | 12 | - | % | |
| Contrast Ratio | C/R | θ = 0° | - | 10 : 1 | - | - | |
| NTSC Ratio | S | θ =0° | 13 | 16 | - | % | |
| Response Time | $T_R$+ $T_F$ | 25 °C | - | - | 30 | ms | 设备：DMS<br>Tr+Tf<br>W90%/B10% |
| Viewing Angle | θ L | C/R>2 | - | 60 | - | Degree | 设备：DMS<br>Source pad Down<br>CR>2 |
| | θ R | | - | 60 | - | | |
| | θ U | | - | 60 | - | | |
| | θ D | | - | 60 | - | | |

## 6.2 Optical Specification (Transmittance mode)

| Parameter 参数 | Symbol 符号 | Condition 条件 | Min. 最小值 | Typ. 典型值 | Max. 最大值 | Unit 单位 | Remark 备注 |
|---|---|---|---|---|---|---|---|
| Contrast Ratio | C/R | θ = 0° | 30:1 | 45:1 | - | - | SR-UL1R |
| Color Gamut （NTSC） | S | θ =0° | 15 | 18 | | % | |
| Luminance | L | θ =0° | 125 | 150 | - | cd/m2 | |
| Luminance uniformity | Uw | θ =0° | 80 | - | - | % | Note(1) |
| Response Time | TR+ TF | 25 °C | - | - | 30 | ms | Note(2) |
| White Color Coordination | Wx | θ =0° | -+0.04 | 0.29 | +0.04 | (x,y) | Note(3) |
| | Wy | | | 0.28 | | | |
| Viewing Angle | θ L | - | - | 50 | - | Degree | 设备：DMS<br>source pad down |
| | θ R | | - | 50 | - | | |
| | θ U | | - | 60 | - | | |
| | θ D | | - | 60 | - | | |

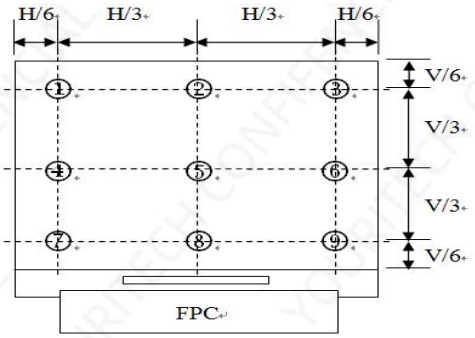
Test Conditions:
1. the ambient temperature is+25℃.
2. The test systems refer to Note 1~4.

Definition of Viewing Angle: The viewing angle range that the CR>2

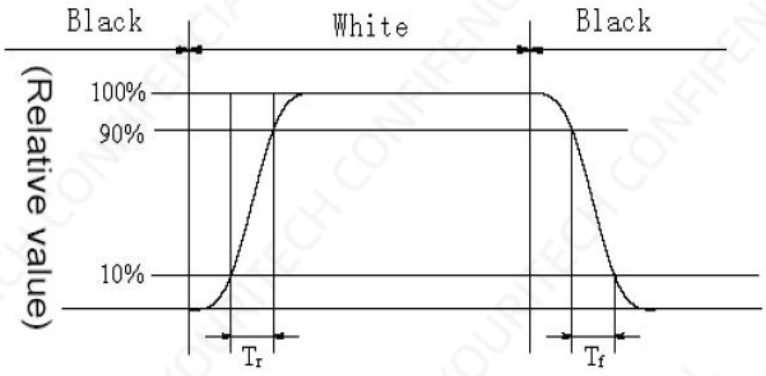


**Note 1:** Definition of Luminance Uniformity: Active area is divided into 9 measuring areas, every measuring point is placed at the center of each measuring area.

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




**Note2:** Definition of Response time: Sum of $T_R$ and $T_F$



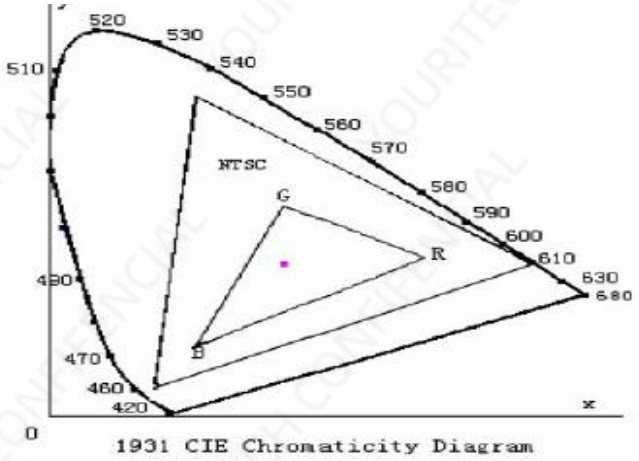

**Note 3:**

Definition of Color Chromaticity (CIE 1931)

Color coordinates of white & red, green, blue measured at center point of LCD.

**Note 4:** Definition of NTSC ratio:

$$\text{NTSC ratio} = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}}$$



# 7. RELIABILITY

| Item<br>项目 | Test Condition<br>测试条件 | Remark<br>备注 |
|---|---|---|
| High Temperature Storage | Ta = +80°C / 96Hours | Note1,2,3 |
| Low Temperature Storage | Ta = -30°C / 96Hours | Note1,2,3 |
| High Temperature Operating | Ta = +70°C / 96Hours | Note1,2,3 |
| Low Temperature Operating | Ta = -20°C / 96Hours | Note1,2,3 |
| Temperature Cycle storage Test | -30°C/30min ⇆+80°C /30min for 30cycles,Transfer time less than 5min | Note2,3 |
| Thermal humidity storage Test | 60°C x 90%RH / 96Hours | Note2,3 |
| Package Vibration Test | Frequency: 10Hz~55Hz,Amplitude:1.5mm, 1 hrs for each direction of X, Y, Z | Note2 |
| Packing shock test | Drop to the ground from 1m height, 1 corner, 3 edges, 6 surfaces. | Note2 |

**Inspection after Test:**

Note1:Ta is the ambient temperature of samples.

Note 2: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.

Note 3: Before cosmetic and function tests , the product must have enough recovery time, at least 2 hours at room temperature.