

SPECIFICATION

CUSTOMER : _____

MODULE NO.: EA TFT050-84ATS

| | |
|---|--|
| <p style="text-align: center;">APPROVED BY:</p> <p>(FOR CUSTOMER USE ONLY)</p> | <p>PCB VERSION: _____</p> <p>DATA: _____</p> |
|---|--|

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| | | | 葉虹蘭 |
| ISSUED DATE: 2018/07/12 | | | |

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1. Summary

EA TFT050-84ATS is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module, It is usually designed for industrial application and this module follows RoHS

1.1. Accessories

ZIF connector for display, bottom contact
ZIF connector for display, top contact
ZIF connector for touch panel, top contact

EA WF050-40S
EA WF050-40ST
EA WF050-10T

2. General Specifications

| Item | Dimension | Unit |
|--------------------------------|---|------|
| Size | 5.0 | inch |
| Dot Matrix | 800× 3(RGB) × 480 | dots |
| Module dimension | 120.7(W) ×75.8(H) ×4.475mm | mm |
| Active area | 108(W) ×64.8 (H) mm | mm |
| Dot pitch | 0.135(W) ×0.135(H) mm | mm |
| LCD type | TFT, Normally White, Transmissive | |
| View Direction | 12 o'clock | |
| Gray Scale Inversion Direction | 6 o'clock | |
| Aspect Ratio | 16:9 | |
| Backlight Type | LED ,Normally White | |
| CTP FW Version | A | |
| With /Without TP | With CTP incl. controller FT5216 (I ² C) | |
| Surface | Glare | |

*Color tone slight changed by temperature and driving voltage.

3. Absolute Maximum Ratings

| Item | Symbol | Min | Typ | Max | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Operating Temperature | TOP | -20 | — | +70 | °C |
| Storage Temperature | TST | -30 | — | +80 | °C |

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

4. Electrical Characteristics

4.1. Typical Operation Conditions

| Item | Symbol | Values | | | Unit | Remark |
|--------------------------------|-----------------|---------|------|---------|------|----------|
| | | Min. | Typ. | Max. | | |
| Power voltage | VDD | 3.1 | 3.3 | 3.5 | V | |
| Supply Voltage For Touch Logic | VDDT | 2.8 | — | 3.3 | V | |
| Current for Driver(Black) | I _{dd} | - | 110 | 170 | mA | VDD=3.3V |
| Input logic high voltage | V _{IH} | 0.7 VDD | - | VDD | V | Note 1 |
| Input logic low voltage | V _{IL} | 0 | - | 0.3 VDD | | |

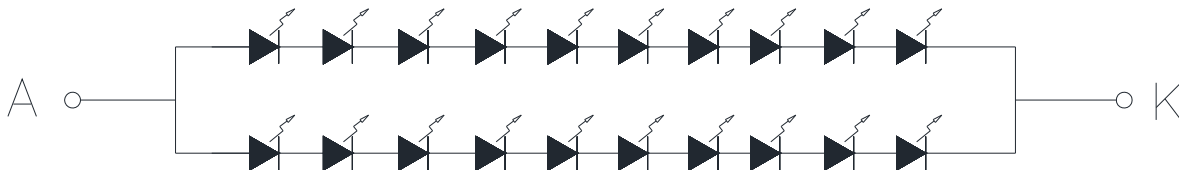
Note1: CLK,DE,R0~R7, G0~7, B0~7.

4.2. Backlight Driving Conditions

| Item | Symbol | Values | | | Unit | Remark |
|---------------------------|----------------|--------|--------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Voltage for LED backlight | V _L | 27 | 30 | 34 | V | Note 1 |
| Current for LED backlight | I _L | -- | 40 | -- | mA | |
| LED life time | - | -- | 50,000 | - | Hr | Note 2 |

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and I_L=20ma/pcs.

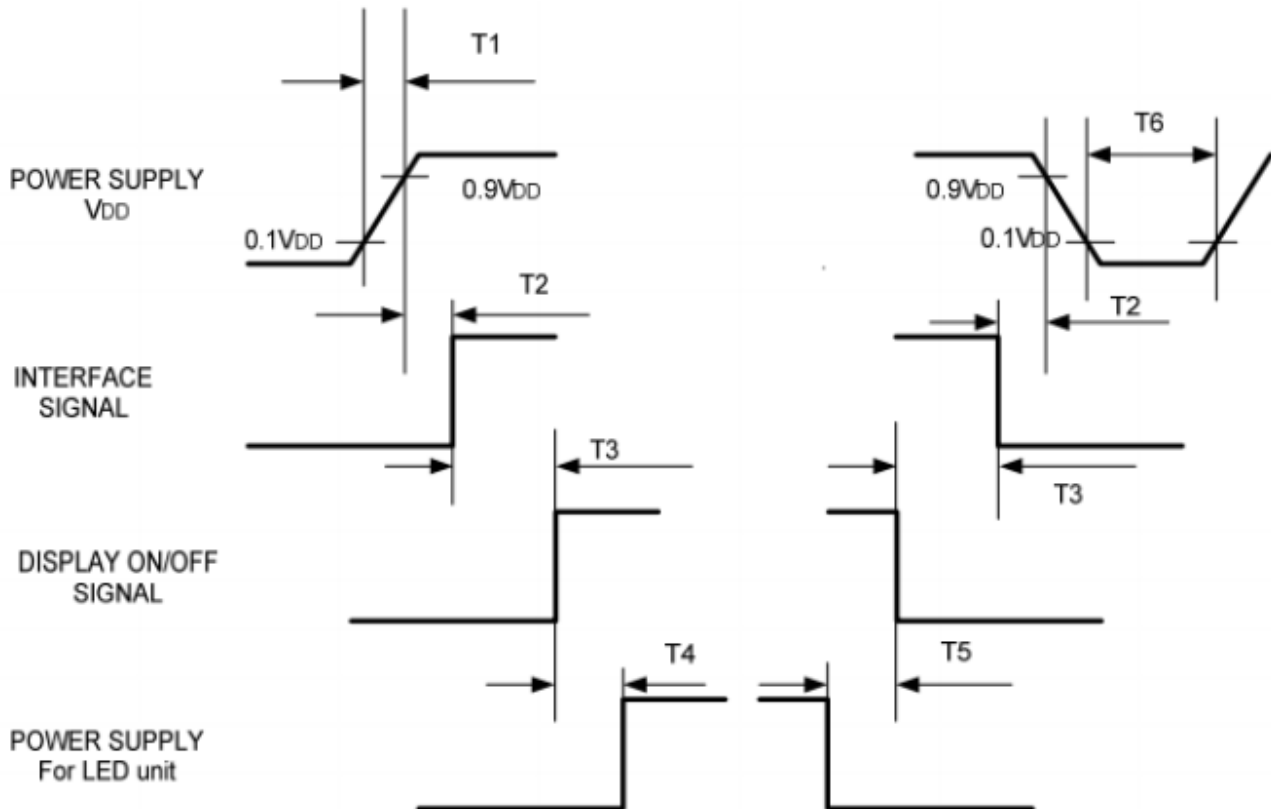
Note 2: The "LED life time" is defined as the module brightness decrease to 50% Original brightness at Ta=25°C and I_L=20mA/pcs. The LED lifetime could be decreased if operating I_L is larger than 25mA/pcs.



CIRCUIT DIAGRAM

4.3. Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



| Symbol | Specification | Symbol | Specification |
|--------|----------------------------|--------|----------------------|
| T1 | $0 \leq T1 \leq 10$ msec | T4 | 200 msec $\leq T4$ |
| T2 | $16 \leq T2 \leq 100$ msec | T5 | 100 msec $\leq T5$ |
| T3 | $0 \leq T3 \leq 200$ msec | T6 | 16 msec $\leq T6$ |

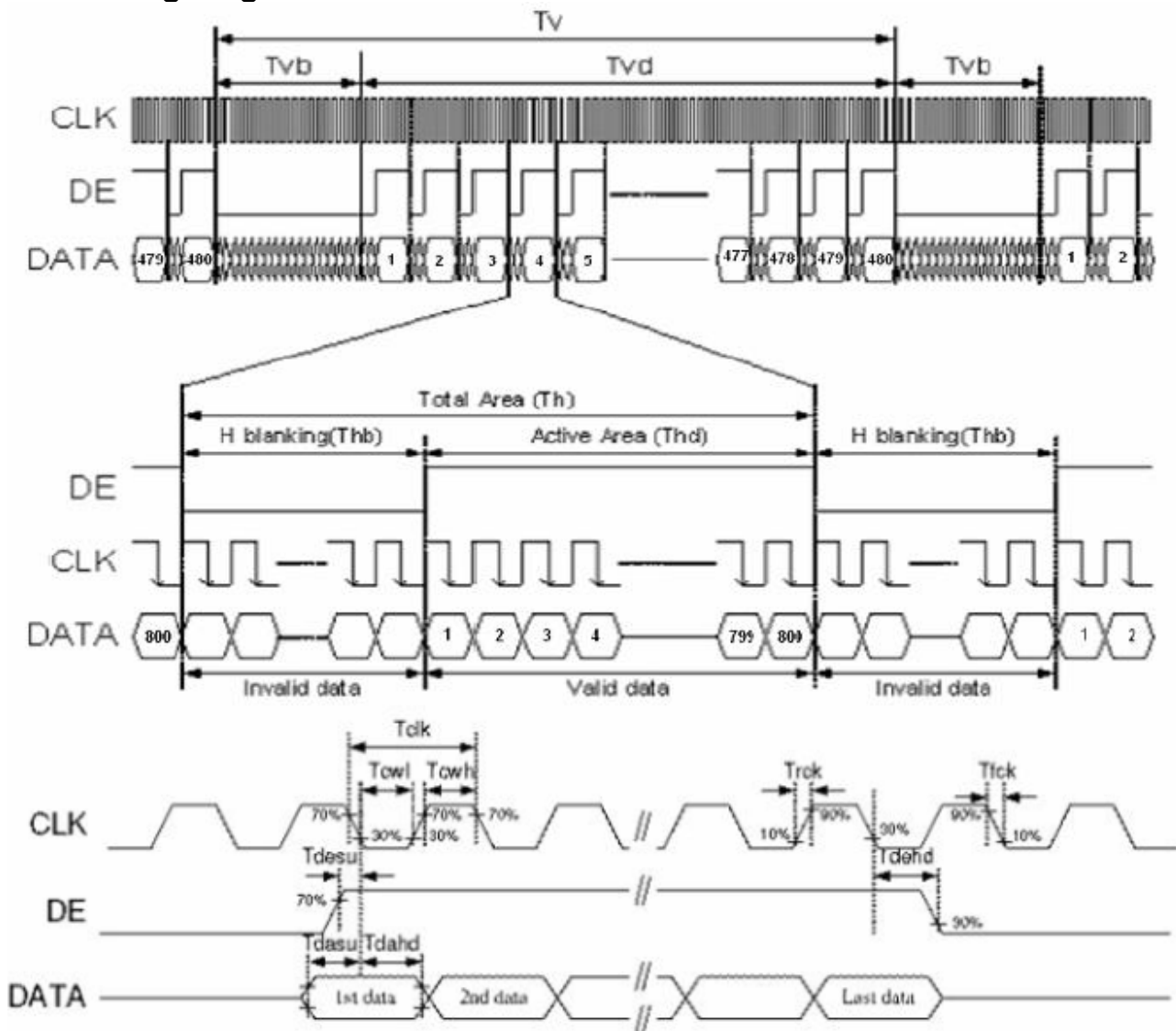
4.4. Timing Characteristics

Timing conditions

Parallel DE mode RGB input timing table

| Parameter | Symbol | Values | | | Unit | Remark |
|---------------------------|--------|--------|------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| CLK frequency | Fclk | 26.4 | 33.3 | 46.8 | MHz | |
| DEV period time | Tv | 510 | 525 | 650 | H | |
| DEV display area | Tvd | 480 | | | H | |
| DEV blanking | Tvd | 30 | 45 | 170 | H | |
| DEH period time | Th | 862 | 1056 | 1200 | CLK | |
| DEH display area | Thd | 800 | | | CLK | |
| DEH blanking | THb | 62 | 256 | 400 | CLK | |
| CLK cycle time | Tclk | 21.3 | 30 | 37.8 | ns | |
| Clock width of high level | Tcwh | 40 | 50 | 60 | % | |
| Clock width of low level | Tcwl | 40 | 50 | 60 | % | |
| Clock rising time | Trck | 8 | - | - | ns | |
| Clock falling time | Tfck | 8 | - | - | ns | |
| Data Setup Time | Tdasu | 8 | - | - | ns | |
| Data Hold Time | Tdahd | 8 | - | - | ns | |
| DE Setup Time | Tdesu | 8 | - | - | ns | |
| DE Hold Time | Tdehd | 8 | - | - | ns | |

4.5. Timing diagram



5. Optical Characteristics

| Item | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark | |
|--|--------|---|-----------------------------------|------|------|-------------------|-------------------|--------|
| Response time | Tr | $\theta = 0^\circ \cdot \Phi = 0^\circ$ | - | 10 | 20 | .ms | Note 3,5 | |
| | Tf | | - | 15 | 30 | .ms | | |
| Contrast ratio | CR | At optimized viewing angle | 400 | 500 | - | - | Note 4,5 | |
| Color Chromaticity | White | Wx | $\theta = 0^\circ \cdot \Phi = 0$ | 0.26 | 0.31 | 0.36 | Note 2,6,7 | |
| | | Wy | | 0.28 | 0.33 | 0.38 | | |
| Viewing angle (Gray Scale Inversion Direction) | Hor. | Θ_R | CR ≥ 10 | 60 | 70 | - | Deg. | Note 1 |
| | | Θ_L | | 60 | 70 | - | | |
| | Ver. | Φ_T | | 40 | 50 | - | | |
| | | Φ_B | | 60 | 70 | - | | |
| Brightness | - | - | 650 | 750 | - | cd/m ² | Center of display | |

Ta=25±2°C

Note 1: Definition of viewing angle range

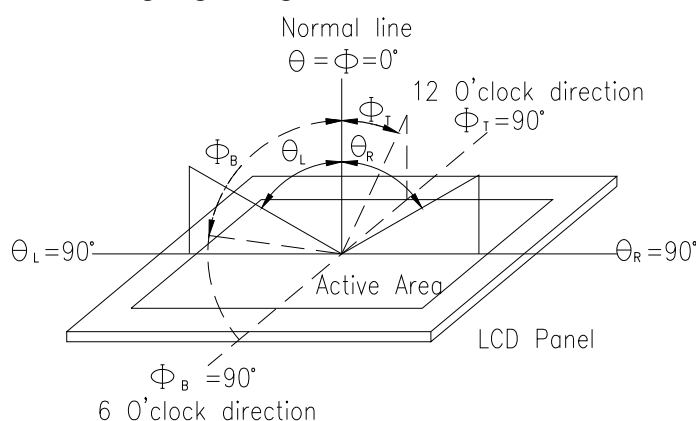


Fig. 5.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

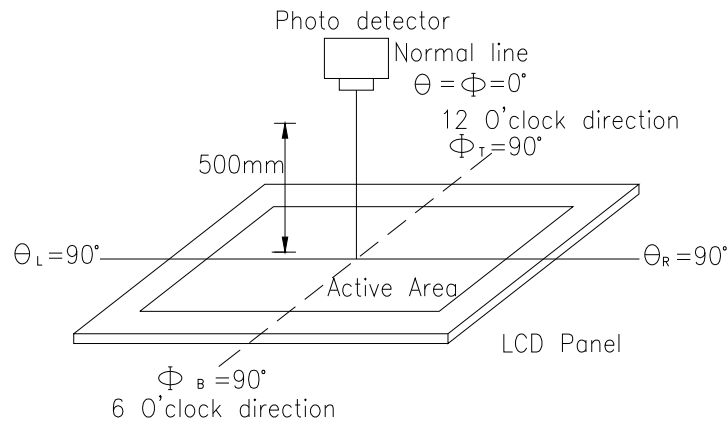
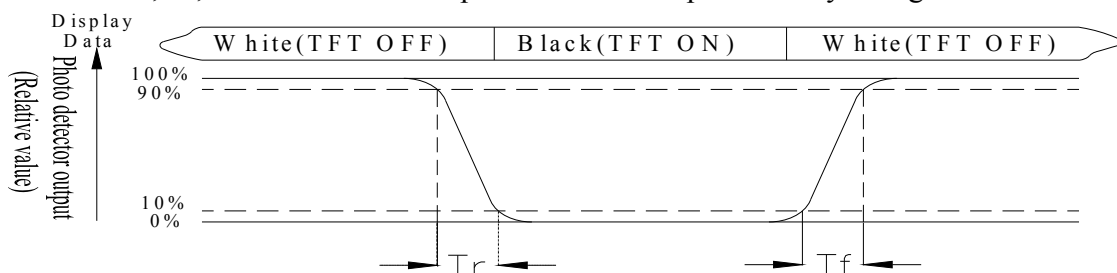


Fig. 5.2. Optical measurement system setup

Note 3: 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_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

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

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

6. Interface

6.1. LCM PIN Definition

FPC Connector is used for the module electronics interface. The recommended model is FH19SC-40S-0.5SH manufactured by HIROSE.

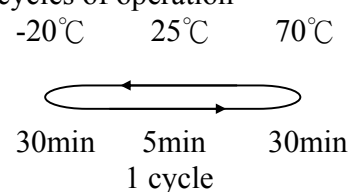
| Pin | Symbol | Function | Remark |
|-----|--------|-----------------------------------|--------|
| 1 | VLED- | Power for LED backlight (Cathode) | |
| 2 | VLED+ | Power for LED backlight (Anode) | |
| 3 | GND | Power Ground | |
| 4 | VDD | Power voltage | |
| 5 | R0 | Red data (LSB) | |
| 6 | R1 | Red data | |
| 7 | R2 | Red data | |
| 8 | R3 | Red data | |
| 9 | R4 | Red data | |
| 10 | R5 | Red data | |
| 11 | R6 | Red data | |
| 12 | R7 | Red data(MSB) | |
| 13 | G0 | Green data(LSB) | |
| 14 | G1 | Green data | |
| 15 | G2 | Green data | |
| 16 | G3 | Green data | |
| 17 | G4 | Green data | |
| 18 | G5 | Green data | |
| 19 | G6 | Green data | |
| 20 | G7 | Green data(MSB) | |
| 21 | B0 | Blue data(LSB) | |
| 22 | B1 | Blue data | |
| 23 | B2 | Blue data | |
| 24 | B3 | Blue data | |
| 25 | B4 | Blue data | |
| 26 | B5 | Blue data | |
| 27 | B6 | Blue data | |
| 28 | B7 | Blue data(MSB) | |
| 29 | GND | Power Ground | |
| 30 | CLK | Sample clock | |
| 31 | DISP | Display on/off | |
| 32 | HS | Horizontal sync input | |
| 33 | VS | Vertical sync input | |
| 34 | DE | Data input enable | |
| 35 | NC | No connection | |
| 36 | GND | Power Ground | |
| 37 | NC | No connection | |
| 38 | NC | No connection | |
| 39 | NC | No connection | |
| 40 | NC | No connection | |

6.2. CTP PIN Definition

| Pin | Symbol | Function | Remark |
|-----|--------|----------------------------------|--------|
| 1 | VSS | Ground for analog circuit | |
| 2 | VDDT | Power Supply : +3.0V | |
| 3 | SCL | I2C clock inputI2C clock input | |
| 4 | NC | No connect | |
| 5 | SDA | I2C data input and output | |
| 6 | NC | No connect | |
| 7 | /RST | External Reset, Low is active | |
| 8 | /WAKE | External interrupt from the host | |
| 9 | /INT | External interrupt to the host | |
| 10 | VSS | Ground for analog circuit | |

7. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

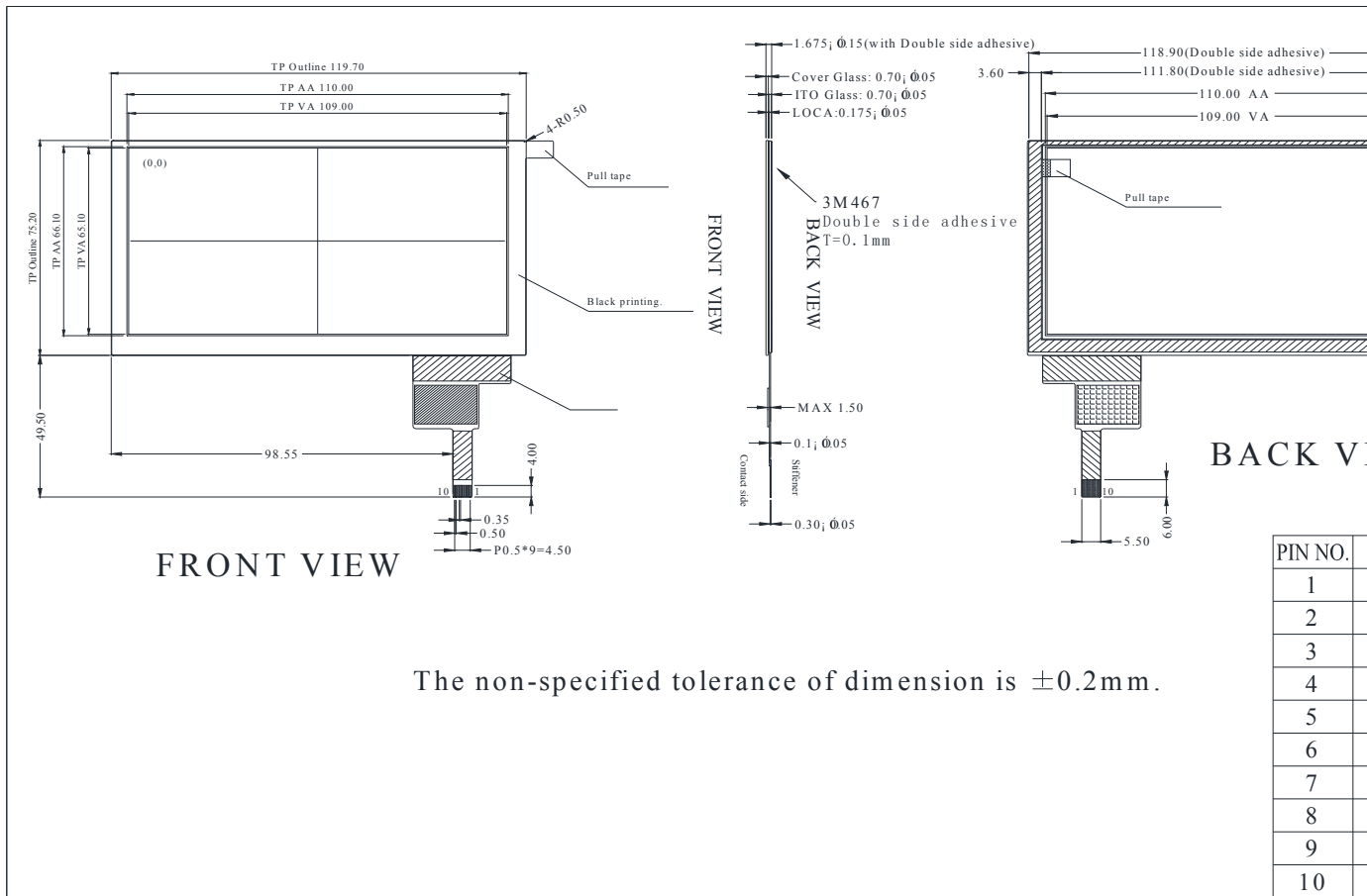
| Environmental Test | | | |
|--------------------------------------|---|---|------|
| Test Item | Content of Test | Test Condition | Note |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | 80°C 200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C 200hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time. | 70°C 200hrs | — |
| Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -20°C 200hrs | 1 |
| High Temperature/ Humidity Operation | The module should be allowed to stand at 60 °C,90%RH max | 60°C,90%RH 96hrs | 1,2 |
| Thermal shock resistance | The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;">  <p>30min 5min 30min 1 cycle</p> </div> | -20°C/70°C 10 cycles | — |
| Vibration test | Endurance test applying the vibration during transportation and using. | Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes | 3 |
| Static electricity test | Endurance test applying the electric stress to the terminal. | VS=±600V(contact), ±800v(air), RS=330 Ω CS=150pF 10 times | — |

Note1: No dew condensation to be observed.

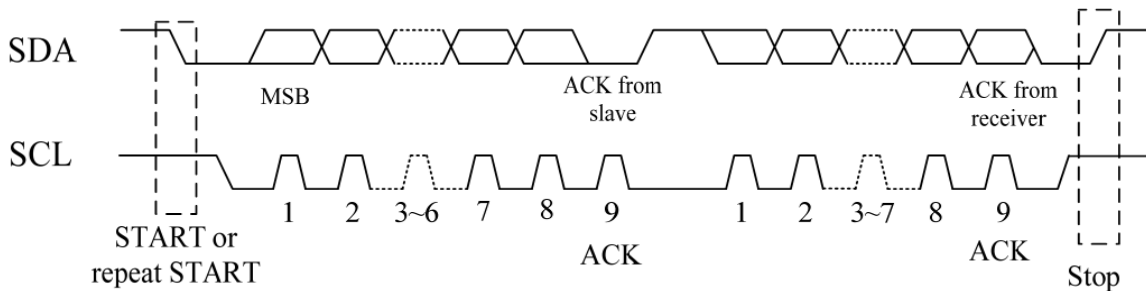
Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

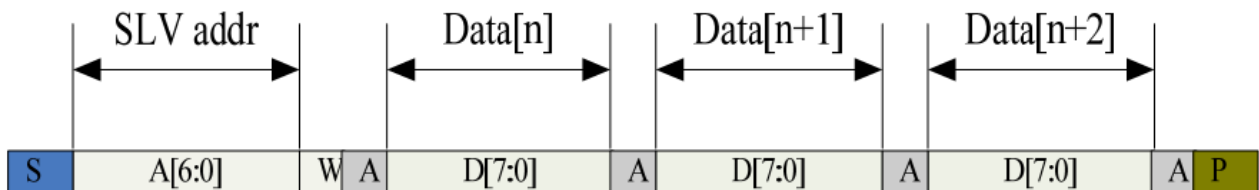
8. Touch Panel Information



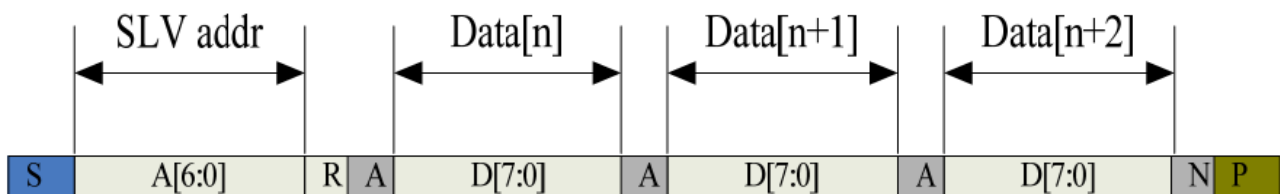
8.1. CTP I2C Timing:



I2C Serial Data Transfer Format



I2C master write, slave read



I2C master read, slave write

| Mnemonics | Description |
|-----------|---|
| S | I2C Start or I2C Restart |
| A[6:0] | Slave address |
| W | 1'b0:Write |
| R | 1'b1:Read |
| A(N) | ACK(NACK) |
| P | STOP :the indication of the end of a packet(if this bit is missing, S will indicate the end of the current packet and beginning of the next packet) |

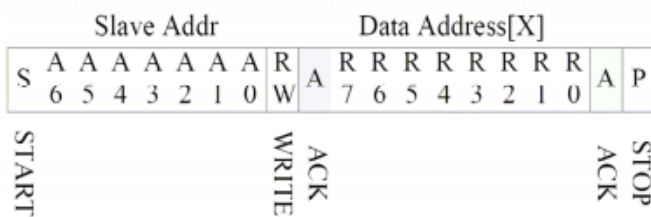
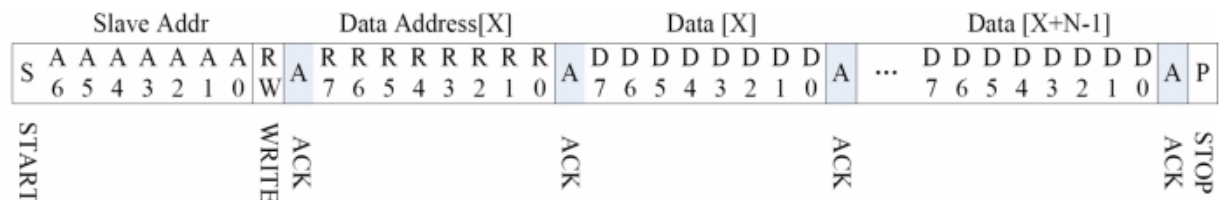
Lists the meanings of the mnemonics used in the above figures

| Parameter | Unit | Min | Max |
|--|------|-----|-----|
| SCL frequency | KHz | 0 | 400 |
| Bus free time between a STOP and START condition | us | 4.7 | \ |
| Hold time (repeated) START condition | us | 4.0 | \ |
| Data setup time | ns | 250 | \ |
| Setup time for a repeated START condition | us | 4.7 | \ |
| Setup time for STOP condition | us | 4.0 | \ |

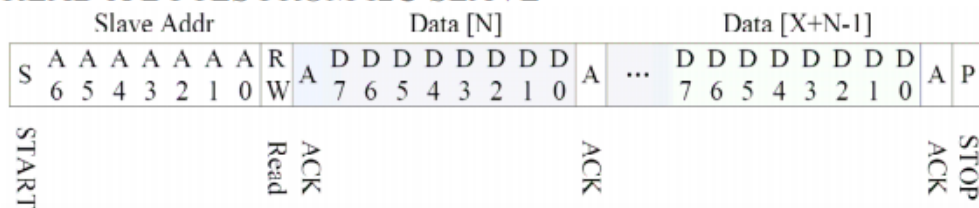
Interface Timing Characteristics

8.2. WRITE BYTES TO I2C SLAVE

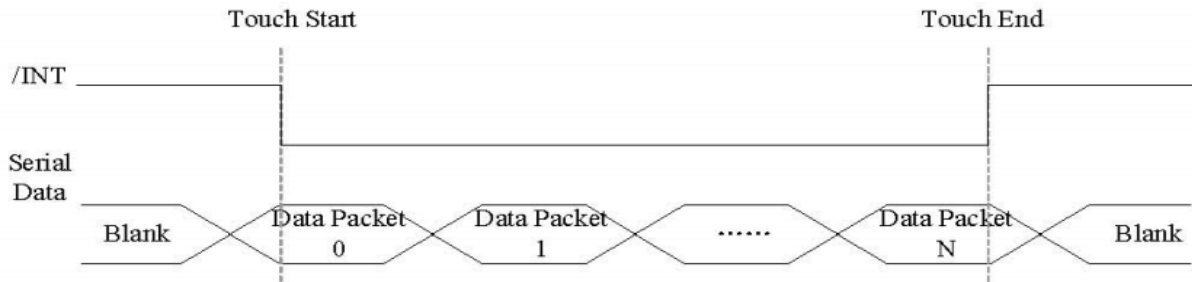
The I²C address is set to 0x70 (0x38). Controller is FT5426DQ8 or compatible and resolution 1792x1024 dots.



READ X BYTES FROM I2C SLAVE



AS FOR STANDARD CTPM, HOST NEED TO USE BOTH INTERRUPT CONTROL SIGNAL AND SERIAL DATA INTERFACE TO GET THE TOUCH DATA, HERE IS THE TIMING TO GET TOUCH DATA.



TOUCH DATA READ PROTOCOL

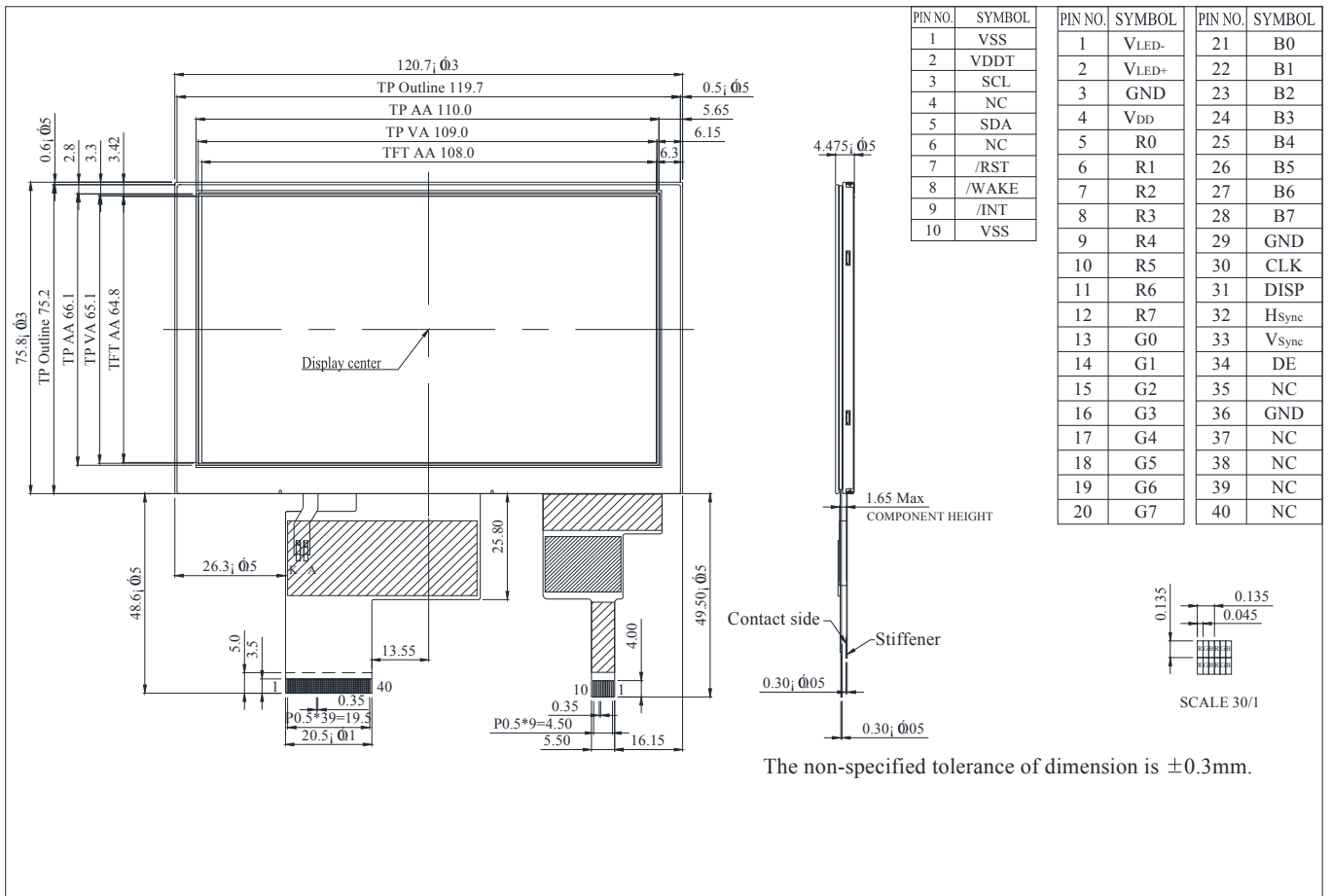
| NAME | VALUE | DESCRIPTION |
|-----------------------------------|-------|--|
| START CH | 0X00 | START COMMAND FOR CTPM TOUCH DATA PACKET,HOST MUST SEND CTPM A START CH COMMAND BEFORE READ TOUCH DATA |
| 1st READ BYTE ~ LAST READ BYTE | | TOUCH DATA PACKET SENT BY CTPM,EACH BYTE HAS 8-BIT DATA ,A TOUCH DATA PACKET CONSISTS OF N BYTE |

| Address | Name | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | Host Access |
|---------|--------------|---------------------------------------|-------------------|------|--|-----------------------------|------|------|------|-------------|
| 00h | Devide__Mode | | Device Model[2:0] | | | | | | | RW |
| 01h | Gest__ID | Gesture ID[7:0] | | | | | | | | R |
| 02h | TD__Status | | | | | Number of touch points[3:0] | | | R | |
| 03h | Touch1__XH | 1 st Event Flag | | | 1 st Touch X Position[11:8] | | | | R | |
| 04h | Touch1__XL | 1 st Touch X Position[7:0] | | | | | | | | R |
| 05h | Touch1__YH | 1 st Touch ID[3:0] | | | 1 st Touch Y Position[11:8] | | | | R | |
| 06h | Touch1__YL | 1 st Touch Y Position[7:0] | | | | | | | | R |
| 09h | Touch2__XH | 2 nd Event Flag | | | 2 nd Touch X Position[11:8] | | | | R | |
| 0Ah | Touch2__XL | 2 nd Touch X Position[7:0] | | | | | | | | R |

| | | | | |
|-----|------------|---------------------------|------------------------------|---|
| 0Bh | Touch2__YH | 2nd Touch ID[3:0] | 2ndTouch Y Position[11:8] | R |
| 0Ch | Touch2__YL | 2nd Touch Y Position[7:0] | | R |

| | | | | | |
|-----|------------|---------------------------|--|------------------------------|---|
| 0Fh | Touch3__XH | 3rdEvent Flag | | 3rdTouch X Position[11:8] | R |
| 10h | Touch3__XL | 3rd Touch X Position[7:0] | | | R |
| 11h | Touch3__YH | 3rdTouch ID[3:0] | | 3rdTouch Y Position[11:8] | R |
| 12h | Touch3__YL | 3rd Touch Y Position[7:0] | | | R |
| 15h | Touch4__XH | 4thEvent Flag | | 4thTouch X Position[11:8] | R |
| 16h | Touch4__XL | 4th Touch X Position[7:0] | | | R |
| 17h | Touch4__YH | 4thTouch ID[3:0] | | 4thTouch Y Position[11:8] | R |
| 18h | Touch4__YL | 4th Touch Y Position[7:0] | | | R |
| 1Bh | Touch5__XH | 5thEvent Flag | | 5thTouch X Position[11:8] | R |
| 1Ch | Touch5__XL | 5th Touch X Position[7:0] | | | R |
| 1Dh | Touch5__YH | 5thTouch ID[3:0] | | 5thTouch Y Position[11:8] | R |
| 1Eh | Touch5__YL | 5th Touch Y Position[7:0] | | | R |

9. Contour Drawing



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