



## Product Specification

### F156PET-TC2

- ☒ Draft Specifications  
☐ Preliminary Specifications  
☐ Final Specifications

|            |                                                  |
|------------|--------------------------------------------------|
| Title      | 15.6-inches Touch Display Product Specifications |
| Model Name | F156PET-TC2                                      |
| Version    | 0                                                |

Customer

\_\_\_\_\_  
Approved by

\_\_\_\_\_  
Date

Notice: This Specification is subject to change without notice.

| Approved By            | Prepared By              |
|------------------------|--------------------------|
| ZOE NIEN<br>2026-05-22 | ALLEN FANG<br>2026-05-22 |



REVISION HISTORY

| Version | ECN No. | Description of Changes | Date       | Prepared   |
|---------|---------|------------------------|------------|------------|
| 0       |         | Draft specification    | 2026-05-22 | Allen Fang |
|         |         |                        |            |            |
|         |         |                        |            |            |
|         |         |                        |            |            |
|         |         |                        |            |            |
|         |         |                        |            |            |



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## 1. GENERAL DESCRIPTION

### 1.1. INTRODUCTION

F156PET-TC2 is a 15.6" TFT LCD module with WLED backlight unit G156HCE-LH1 with projected capacitive multi-touch B156PFU-E10 air bonding and Touch Control Board ETP-MB-EXC84H4254STAG.

The display format is intended to support 1920 (H) x 1080 (V) FHD AAS mode and can display 16.7M colors and 40 pins 2ch-LVDS interface.

### 1.2. FEATURES

- FHD (1920 x 1080 pixels) resolution
- LVDS Interface with 2 pixel / clock
- 8-bit color depth, display 16.7M colors
- High Brightness
- DE (Data Enable) only
- RoHS / Halogen Free

### 1.3. APPLICATION

- TFT LCD Monitor
- Factory Application

### 1.4. GENERAL SPECIFICATIONS

| Parameter               | Specification                          | Unit   | Remarks    |
|-------------------------|----------------------------------------|--------|------------|
| Active Area Size        | 15.6                                   | inch   |            |
| Display Area            | 344.16(H) x 193.59 (V)                 | mm     |            |
| Outline Dimension       | 364.30 (H) x 215.90 (V) x 13.6 (D)     | mm     | D:PCAP+LCM |
| Weight                  | 1265                                   | g      | Typ.       |
| Driver Element          | a-Si TFT active matrix                 | -      |            |
| Display Colors          | 16,7M (RGB 8-bits)                     | Colors |            |
| Electrical Interface    | 2-ch LVDS                              | -      |            |
| Number of Pixels        | 1920 (H) x 1080 (V)                    | pixels |            |
| Pixel Pitch             | 0.17925 (H) x 0.17925(W)               | mm     |            |
| Pixel Arrangement       | RGB vertical stripe                    | -      |            |
| Display Mode            | AHVA / Normal Black                    | -      |            |
| Color Gamut             | 72                                     | %      |            |
| Touch Technology        | Projected Capacitive Multi-Touch Panel | -      |            |
| Touch Method            | Finger or exclusive pen                | -      |            |
| Numbers of Touch        | 10                                     | Points |            |
| Touch FPC Type          | COB                                    | -      |            |
| Touch Sensor Glass Type | Strengthening Glass                    | -      |            |
| Touch Controller Board  | ETP-MB-EXC84H4254STAG                  | -      |            |
| Touch Driver Interface  | USB                                    | -      |            |
| Support OS              | Android, Linux, Win7, Win8, Win10, XP  | -      |            |

### 2. ABSOLUTE MAXIMUM RATINGS

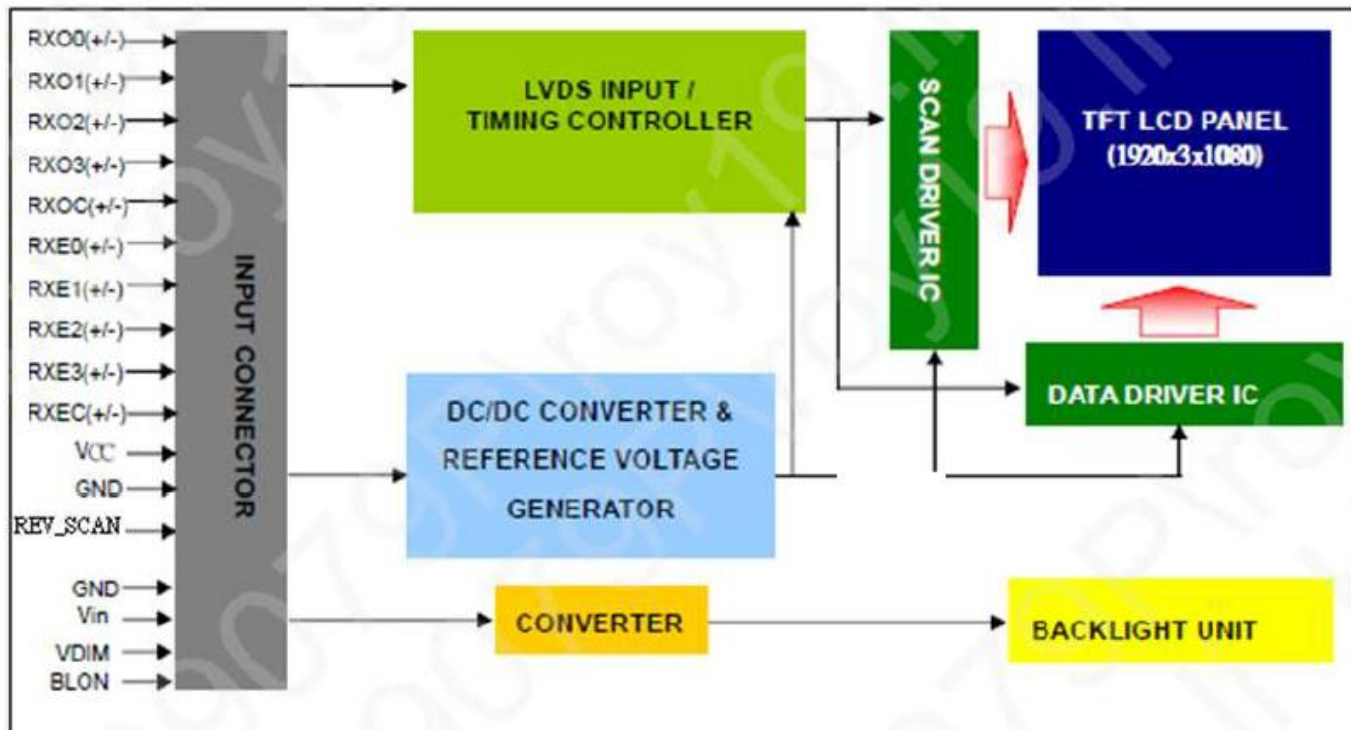
| Parameter               | Symbol              | Min. | Max. | Unit | Remarks   |
|-------------------------|---------------------|------|------|------|-----------|
| Power Supply Voltage    | V <sub>DD</sub>     | -0.3 | 5.5  | V    | Note 1    |
| Logic Input Voltage     | V <sub>IN</sub>     | -0.3 | 4.0  | V    |           |
| Converter Voltage       | V <sub>I</sub>      | -0.3 | 18.0 | V    | Note 1, 2 |
| Enable Voltage          | EN                  | ---  | 5.5  | V    |           |
| Backlight Adjust        | Dimming             | ---  | 5.5  | V    |           |
| Operating Temperature   | T <sub>op</sub>     | -20  | 70   | °C   | Note 3    |
| Operating Humidity      | H <sub>op</sub>     | 10   | 90   | %RH  |           |
| Storage Temperature     | T <sub>st</sub>     | -30  | 80   | °C   |           |
| Storage Humidity        | H <sub>st</sub>     | 10   | 90   | %RH  |           |
| Touch DC Supply Voltage | USB_V <sub>DD</sub> | -0.3 | 6    | V    |           |

Note:

1. Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.
2. Specified values are for LED.
3. Maximum Wet-Bulb temperature should be 39°C and no condensation.  
The relative humidity must not exceed 90% non-condensing at temperatures of 40°C or less. At temperatures greater than 40°C, the wet bulb temperature must not exceed 39°C.

### 3. ELECTRICAL CHARACTERISTICS

#### 3.1. LCD BLOCK DIAGRAM



#### 3.2. LCD INPUT TERMINAL PIN ASSIGNMENT

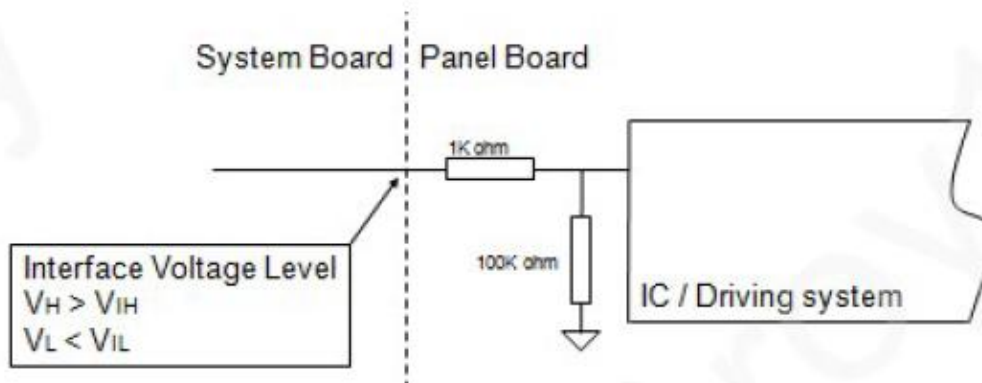
| Pin | Symbol              | Description                     | Note |
|-----|---------------------|---------------------------------|------|
| 1   | LED_V <sub>CC</sub> | +12V Vi power supply            |      |
| 2   | LED_V <sub>CC</sub> | +12V Vi power supply            |      |
| 3   | LED_V <sub>CC</sub> | +12V Vi power supply            |      |
| 4   | LED_V <sub>CC</sub> | +12V Vi power supply            |      |
| 5   | GND                 | Ground                          |      |
| 6   | GND                 | Ground                          |      |
| 7   | GND                 | Ground                          |      |
| 8   | GND                 | Ground                          |      |
| 9   | LED_EN              | Enable pin                      |      |
| 10  | LED_PWM             | Backlight Adjust                |      |
| 11  | LCD_V <sub>CC</sub> | LCD logic and driver power 3.3V |      |
| 12  | LCD_V <sub>CC</sub> | LCD logic and driver power 3.3V |      |

|    |                     |                                                                 |     |
|----|---------------------|-----------------------------------------------------------------|-----|
| 13 | LCD_V <sub>CC</sub> | LCD logic and driver power 3.3V                                 |     |
| 14 | NC                  | No connection, this pin should be open                          |     |
| 15 | NC                  | No connection, this pin should be open                          |     |
| 16 | NC                  | No connection, this pin should be open                          |     |
| 17 | REV_SCAN            | Low → Normal Mode.<br>High → Horizontal & Vertical Reverse Scan | (1) |
| 18 | RXO0-               | Negative LVDS differential data input Channel O0 (odd)          |     |
| 19 | RXO0+               | Positive LVDS differential data input Channel O0 (odd)          |     |
| 20 | RXO1-               | Negative LVDS differential data input Channel O1 (odd)          |     |
| 21 | RXO1+               | Positive LVDS differential data input Channel O1 (odd)          |     |
| 22 | RXO2-               | Negative LVDS differential data input Channel O2 (odd)          |     |
| 23 | RXO2+               | Positive LVDS differential data input Channel O2 (odd)          |     |
| 24 | LCD GND             | LCD logic and driver Ground                                     |     |
| 25 | RXOC-               | Negative LVDS differential clock input (odd)                    |     |
| 26 | RXOC+               | Positive LVDS differential clock input (odd)                    |     |
| 27 | LCD GND             | LCD logic and driver Ground                                     |     |
| 28 | RXO3-               | Negative LVDS differential data input Channel O3 (odd)          |     |
| 29 | RXO3+               | Positive LVDS differential data input Channel O3 (odd)          |     |
| 30 | RXE0-               | Negative LVDS differential data input Channel E0 (even)         |     |
| 31 | RXE0+               | Positive LVDS differential data input Channel E0 (even)         |     |
| 32 | RXE1-               | Negative LVDS differential data input Channel E1 (even)         |     |
| 33 | RXE1+               | Positive LVDS differential data input Channel E1 (even)         |     |
| 34 | LCD GND             | LCD logic and driver Ground                                     |     |
| 35 | RXE2-               | Negative LVDS differential data input Channel E2 (even)         |     |
| 36 | RXE2+               | Positive LVDS differential data input Channel E2 (even)         |     |
| 37 | RXEC-               | Negative LVDS differential clock input (even)                   |     |
| 38 | RXEC+               | Positive LVDS differential clock input (even)                   |     |
| 39 | RXE3-               | Negative LVDS differential data input Channel E3 (even)         |     |
| 40 | RXE3+               | Positive LVDS differential data input Channel E3 (even)         |     |

Note (1) "Low" stands for 0V, "High" stands for 3.3V.

| Connector Name / Designation | Interface Connector / Interface card |
|------------------------------|--------------------------------------|
| Manufacturer                 | IPEX                                 |
| Connector Model Number       | 20455-040E-76 or equivalent          |
| Mating Housing Part Number   | 20453-040T-03 or equivalent          |

REV\_SCAN PIN :

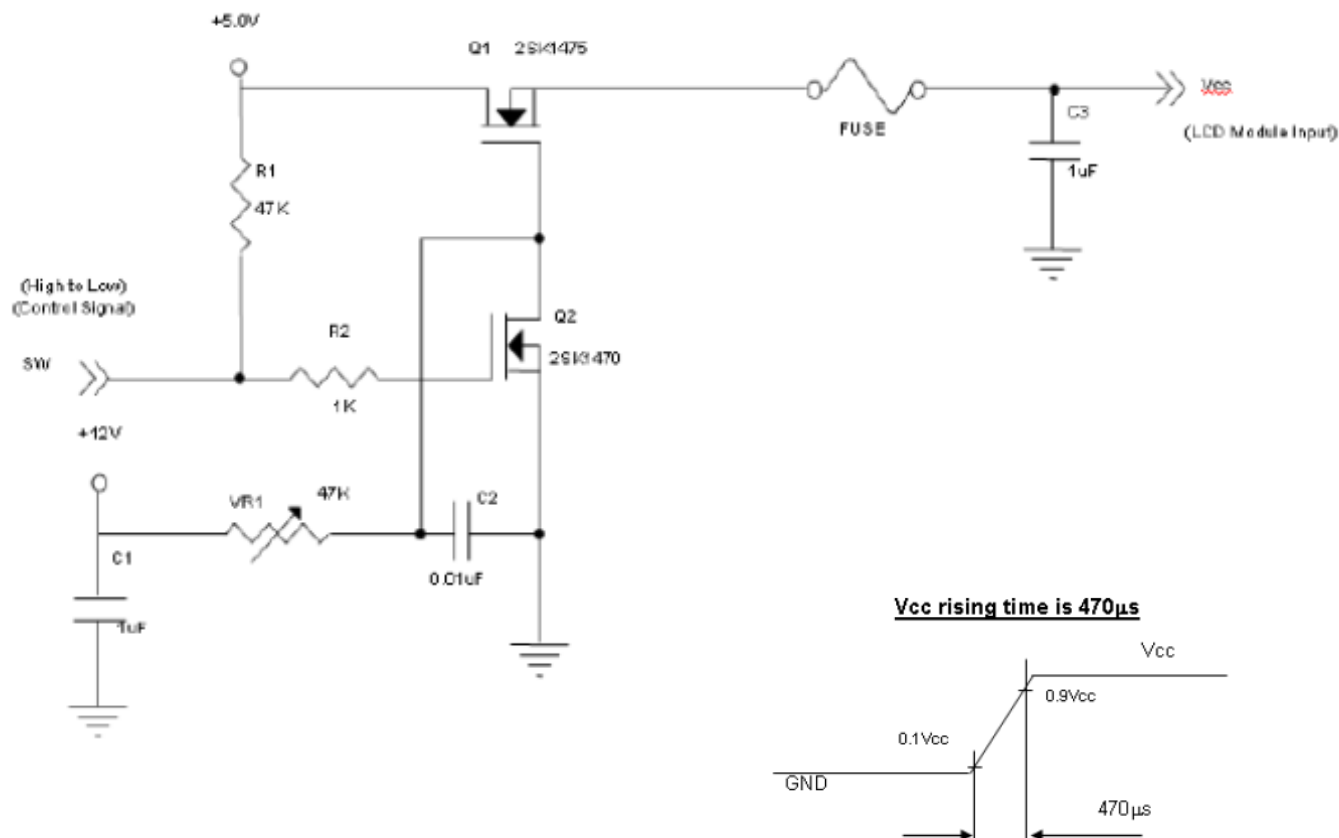


### 3.3. LCD MODULE

| Parameter                                              |           | Symbol     | Values |      |      | Unit | Notes |
|--------------------------------------------------------|-----------|------------|--------|------|------|------|-------|
|                                                        |           |            | Min.   | Typ. | Max. |      |       |
| Power Supply Voltage                                   |           | $V_{CC}$   | 4.5    | 5.0  | 5.3  | V    |       |
| Ripple Voltage                                         |           | $V_{RP}$   | -      | -    | 250  | mV   |       |
| Rush Current                                           |           | $I_{RUSH}$ | -      | -    | 3.0  | A    | (2)   |
| Power Supply Current                                   | White     |            | -      | 0.7  | 0.9  | A    | (3)a  |
|                                                        | Black     |            | -      | 0.5  | 0.6  | A    | (3)b  |
| LVDS Differential Input Voltage                        |           | $V_{id}$   | 100    | -    | 600  | mV   | (4)   |
| LVDS Common Input Voltage                              |           | $V_{ic}$   | 1.0    | 1.2  | 1.4  | mV   | (4)   |
| Differential Input Voltage for LVDS Receiver Threshold | "H" Level | $V_{IH}$   | -      | -    | 100  | mV   |       |
|                                                        | "L" Level | $V_{IL}$   | -100   | -    | -    | mV   |       |
| LVDS terminating resistor                              |           | $R_T$      | -      | 100  | -    | ohm  |       |

Note (1) the module should be always operated within above ranges.

Note (2) Measurement Conditions:



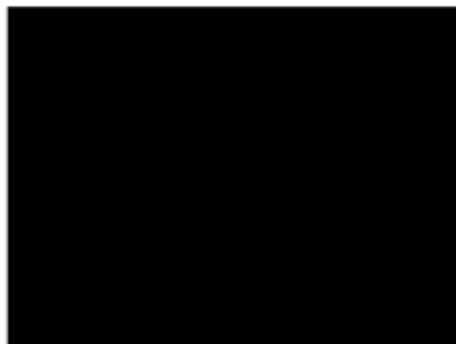
Note (3) The specified power supply current is under the conditions at  $V_{CC} = 3.3\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$ ,  $F_r = 60\text{ Hz}$ , where as a power dissipation check pattern below is displayed.

a. White Pattern



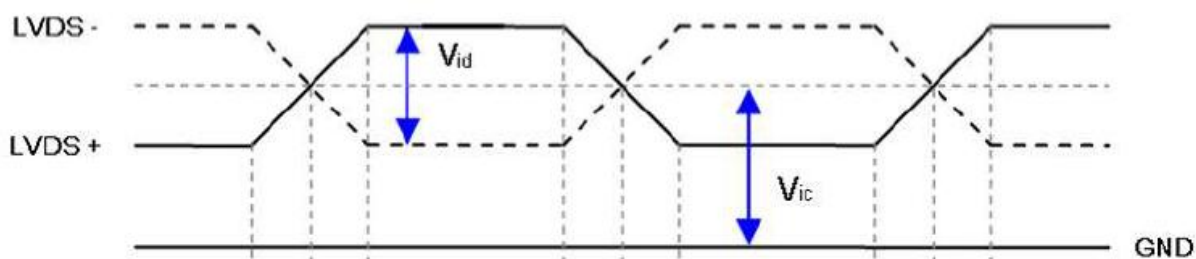
Active Area

b. Black Pattern



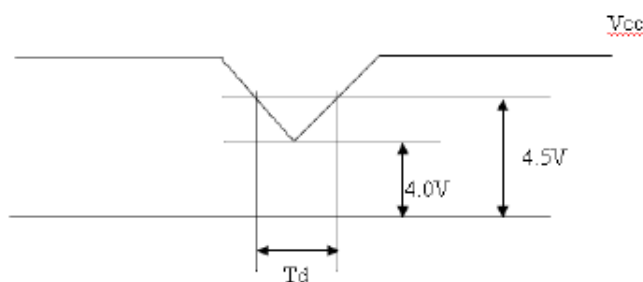
Active Area

Note (4) VID wave form condition



### VCC POWER DIP CONDITION

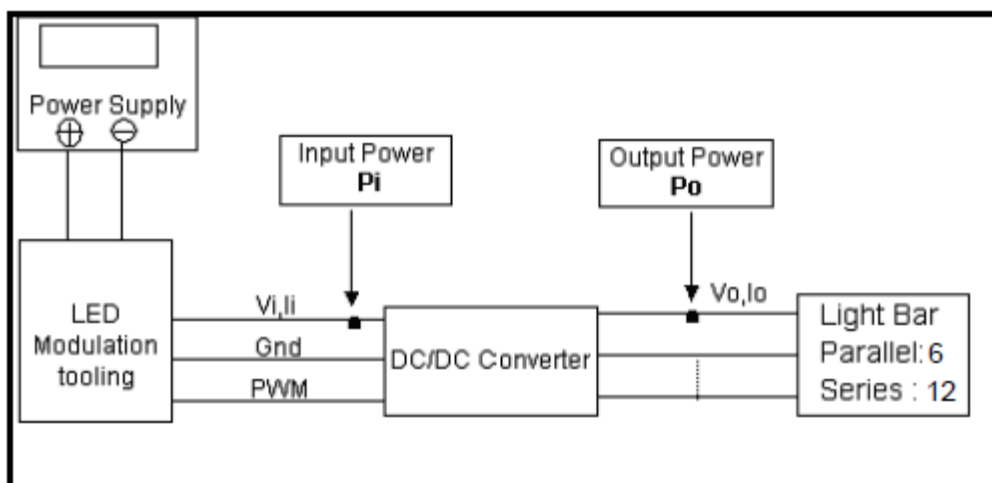
-Dip condition:  $4.0\text{V} \leq V_{CC} \leq 4.5\text{V}$ ,  $T_d \leq 20\text{ms}$



### 3.4. LCD BACKLIGHTUNIT

| Parameter                      |               | Symbol             | Values |      |      | Unit | Notes                                        |
|--------------------------------|---------------|--------------------|--------|------|------|------|----------------------------------------------|
|                                |               |                    | Min.   | Typ. | Max. |      |                                              |
| Converter Power Supply Voltage |               | $V_i$              | 10.8   | 12.0 | 13.2 | V    | (Duty 100%)                                  |
| Converter Input Ripple Voltage |               | $V_{iRP}$          | -      | -    | 500  | mV   |                                              |
| Converter Power Supply Current |               | $I_i$              | 1.5    | 1.7  | 2.0  | A    | @ $V_i=12V$<br>(Duty=100%)                   |
| Converter Input Rush Current   |               | $I_{iRUSH}$        | -      | -    | 5.0  | A    | @ $V_i$ rising time =10ms<br>( $V_i=12V$ )   |
| Power Consumption              |               | $P_i$              | -      | 21   | 24   | W    | (1)                                          |
| EN Control Level               | Backlight On  | ENLED<br>(BLON)    | 2.5    | 3.3  | 5.0  | V    |                                              |
|                                | Backlight Off |                    | 0      |      | 0.3  |      |                                              |
| PWM Control Level              | High Level    | Dimming<br>(E_PWM) | 2.0    | 3.3  | 5.0  | V    |                                              |
|                                | Low Level     |                    | 0      |      | 0.15 |      |                                              |
| PWM Noise Range                |               | $V_{Noise}$        | -      | -    | 0.1  | V    |                                              |
| PWM Control Frequency          |               | $f_{PWM}$          | 190    | 200  | 20K  | Hz   | (2)                                          |
| PWM Dimming Control Duty Ratio |               | -                  | 5      | -    | 100  | %    | (2)<br>@ $190Hz < f_{PWM} < 1\text{ kHz}$    |
|                                |               |                    | 20     | -    | 100  | %    | (2)<br>@ $1kHz \leq f_{PWM} < 20\text{ kHz}$ |
| LED Life Time                  |               | $L_{LED}$          | 50000  |      |      | Hrs  | (3)                                          |

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:



Note (2) The lifetime of LED is estimated data and defined as the time when it continuous to operate under the conditions at  $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$  and duty 100% until the brightness becomes  $\leq 50\%$  of its original value. Operating LED under high temperature environment will reduce life time and lead to color shift.



Note (3) At 190 ~ 1 kHz PWM control frequency, duty ratio range is restricted from 5% to 100%.

1k ~ 20 kHz PWM control frequency, duty ratio range is restricted from 20% to 100%.

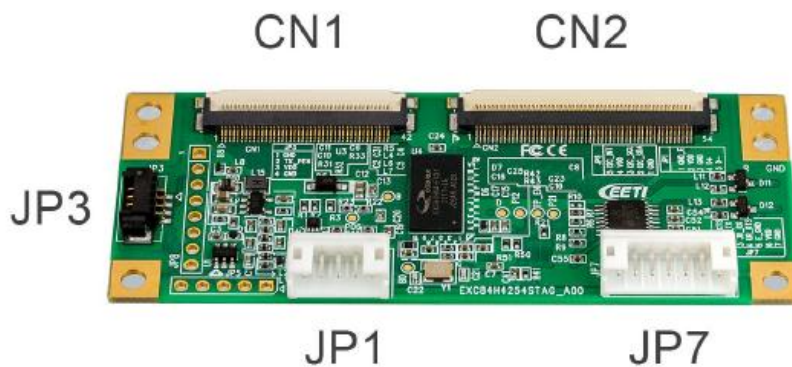
If PWM control frequency is applied in the range from 1 kHz to 20 kHz, the “non-linear” phenomenon on the Backlight Unit may be found. So it's a **suggestion** that PWM control frequency should be **less than 1 kHz**.

### 3.5. TOUCH CONTROL BOARD

ETP-MB-EXC84H4254STAG : JP1-USB

| Interface       | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------|--------|-----------|------|------|------|------|
| CN1 / CN2 / JP1 | VDD    | DC        | 3.5  | 5    | 5.5  | V    |

Product Photo



Connector CN1/CN2



Substitute Vendor for CN1/CN2



### 3.6. TOUCH FPC PIN ASSIGNMENT

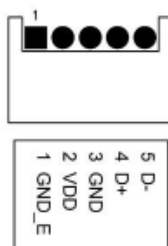
#### FPC Pin Description

| CN1 |       |    |      |    |       |
|-----|-------|----|------|----|-------|
| PN  |       | PN |      | PN |       |
| 1   | TX_S2 | 21 | TX20 | 41 | TX0   |
| 2   | TX39  | 22 | TX19 | 42 | TX_S0 |
| 3   | TX38  | 23 | TX18 |    |       |
| 4   | TX37  | 24 | TX17 |    |       |
| 5   | TX36  | 25 | TX16 |    |       |
| 6   | TX35  | 26 | TX15 |    |       |
| 7   | TX34  | 27 | TX14 |    |       |
| 8   | TX33  | 28 | TX13 |    |       |
| 9   | TX32  | 29 | TX12 |    |       |
| 10  | TX31  | 30 | TX11 |    |       |
| 11  | TX30  | 31 | TX10 |    |       |
| 12  | TX29  | 32 | TX9  |    |       |
| 13  | TX28  | 33 | TX8  |    |       |
| 14  | TX27  | 34 | TX7  |    |       |
| 15  | TX26  | 35 | TX6  |    |       |
| 16  | TX25  | 36 | TX5  |    |       |
| 17  | TX24  | 37 | TX4  |    |       |
| 18  | TX23  | 38 | TX3  |    |       |
| 19  | TX22  | 39 | TX2  |    |       |
| 20  | TX21  | 40 | TX1  |    |       |

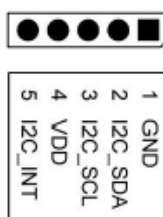
| CN2 |       |    |      |    |       |
|-----|-------|----|------|----|-------|
| PN  |       | PN |      | PN |       |
| 1   | RX_S1 | 21 | RX32 | 41 | RX12  |
| 2   | RX51  | 22 | RX31 | 42 | RX11  |
| 3   | RX50  | 23 | RX30 | 43 | RX10  |
| 4   | RX49  | 24 | RX29 | 44 | RX9   |
| 5   | RX48  | 25 | RX28 | 45 | RX8   |
| 6   | RX47  | 26 | RX27 | 46 | RX7   |
| 7   | RX46  | 27 | RX26 | 47 | RX6   |
| 8   | RX45  | 28 | RX25 | 48 | RX5   |
| 9   | RX44  | 29 | RX24 | 49 | RX4   |
| 10  | RX43  | 30 | RX23 | 50 | RX3   |
| 11  | RX42  | 31 | RX22 | 51 | RX2   |
| 12  | RX41  | 32 | RX21 | 52 | RX1   |
| 13  | RX40  | 33 | RX20 | 53 | RX0   |
| 14  | RX39  | 34 | RX19 | 54 | RX_S0 |
| 15  | RX38  | 35 | RX18 |    |       |
| 16  | RX37  | 36 | RX17 |    |       |
| 17  | RX36  | 37 | RX16 |    |       |
| 18  | RX35  | 38 | RX15 |    |       |
| 19  | RX34  | 39 | RX14 |    |       |
| 20  | RX33  | 40 | RX13 |    |       |

#### Connector Pin Configuration

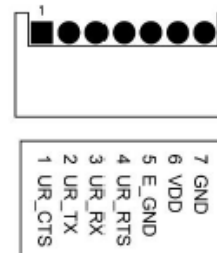
JP1 USB Connector



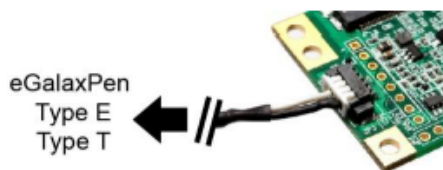
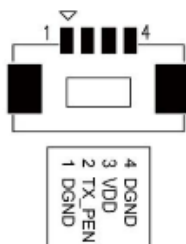
JP5 I2C Connector



JP7 RS232 Connector



JP3 GPIO Connector



\*JP3 connector is reserved for EETI tethered active stylus

Type E: Entry-type active stylus

Type T: Tethered USB active stylus

### 4. LCD INPUT SIGNAL SPECIFICATIONS

#### 4.1. COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

| Color               |                | Data Signal |     |     |     |     |     |     |     |       |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |
|---------------------|----------------|-------------|-----|-----|-----|-----|-----|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|
|                     |                | Red         |     |     |     |     |     |     |     | Green |     |     |     |     |     |     |     | Blue |     |     |     |     |     |     |     |
|                     |                | R7          | R6  | R5  | R4  | R3  | R2  | R1  | R0  | G7    | G6  | G5  | G4  | G3  | G2  | G1  | G0  | B7   | B6  | B5  | B4  | B3  | B2  | B1  | B0  |
| Basic Colors        | Black          | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Red            | 1           | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Green          | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1     | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Blue           | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1    | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
|                     | Cyan           | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1     | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
|                     | Magenta        | 1           | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1    | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
|                     | Yellow         | 1           | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1     | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | White          | 1           | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1     | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
| Gray Scale Of Red   | Red(0) / Dark  | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Red(1)         | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Red(2)         | 0           | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ...            | ...         | ... | ... | ... | ... | ... | ... | ... | ...   | ... | ... | ... | ... | ... | ... | ... | ...  | ... | ... | ... | ... | ... | ... | ... |
|                     | Red(253)       | 1           | 1   | 1   | 1   | 1   | 1   | 0   | 1   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Red(254)       | 1           | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Red(255)       | 1           | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ...            | ...         | ... | ... | ... | ... | ... | ... | ... | ...   | ... | ... | ... | ... | ... | ... | ... | ...  | ... | ... | ... | ... | ... | ... | ... |
| Gray Scale Of Green | Green(0)/Dark  | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Green(1)       | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Green(2)       | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ...            | ...         | ... | ... | ... | ... | ... | ... | ... | ...   | ... | ... | ... | ... | ... | ... | ... | ...  | ... | ... | ... | ... | ... | ... | ... |
|                     | Green(253)     | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1     | 1   | 1   | 1   | 1   | 1   | 0   | 1   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Green(254)     | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1     | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Green(255)     | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1     | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | ...            | ...         | ... | ... | ... | ... | ... | ... | ... | ...   | ... | ... | ... | ... | ... | ... | ... | ...  | ... | ... | ... | ... | ... | ... | ... |
| Gray Scale Of Blue  | Blue(0) / Dark | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
|                     | Blue(1)        | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 0   | 1   |
|                     | Blue(2)        | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0   | 0   | 0   | 0   | 1   | 0   |
|                     | ...            | ...         | ... | ... | ... | ... | ... | ... | ... | ...   | ... | ... | ... | ... | ... | ... | ... | ...  | ... | ... | ... | ... | ... | ... | ... |
|                     | Blue(253)      | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1    | 1   | 1   | 1   | 1   | 1   | 0   | 1   |
|                     | Blue(254)      | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1    | 1   | 1   | 1   | 1   | 1   | 1   | 0   |
|                     | Blue(255)      | 0           | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1    | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
|                     | ...            | ...         | ... | ... | ... | ... | ... | ... | ... | ...   | ... | ... | ... | ... | ... | ... | ... | ...  | ... | ... | ... | ... | ... | ... | ... |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

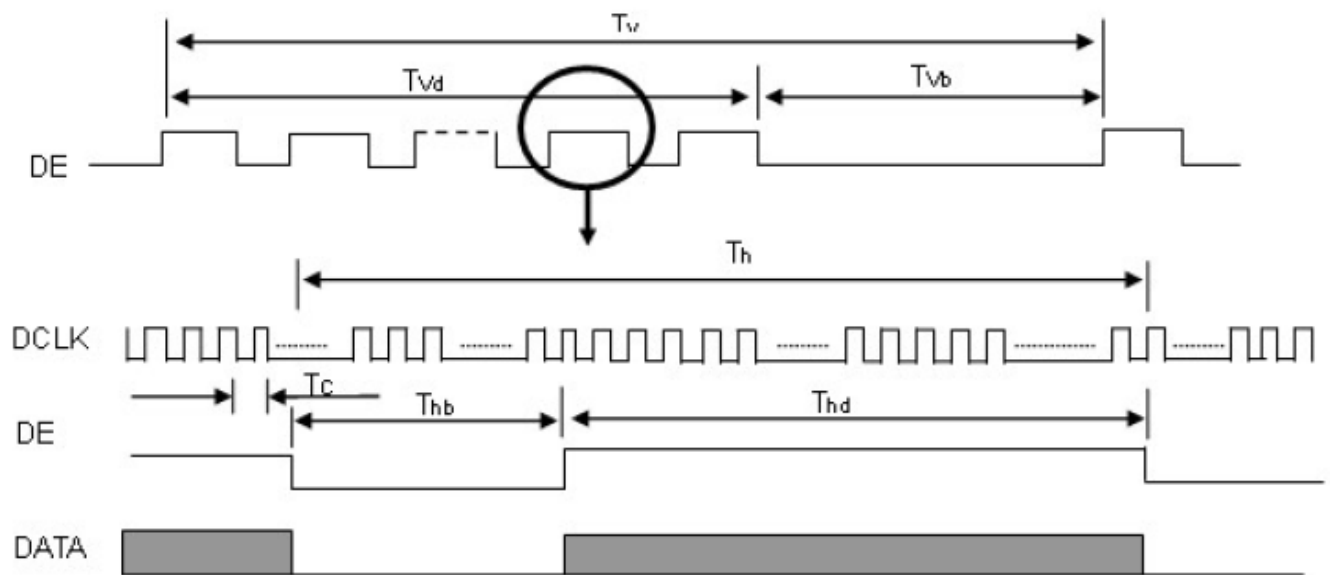
### 4.2. LCD TIMING CHARACTERISTICS

| Signal                  | Item                                 | Symbol     | Min.     | Typ.  | Max.    | Unit | Note        |
|-------------------------|--------------------------------------|------------|----------|-------|---------|------|-------------|
| LVDS Clock              | Frequency                            | Fc         | 60       | 70.93 | 73      | MHz  |             |
|                         | Period                               | Tc         |          | 14.1  |         | ns   |             |
|                         | Input cycle to cycle jitter          | Trcl       | -0.02*Tc |       | 0.02*Tc | ns   | (3)         |
|                         | Input clock to data skew             | TLVCCS     | -0.02*Tc |       | 0.02*Tc | ns   | (4)         |
|                         | Spread spectrum modulation range     | Fclkin_mod | FC*98%   |       | FC*102% | MHz  | (5)         |
|                         | Spread spectrum modulation frequency | Fssm       |          |       | 200     | KHz  |             |
| Vertical Section        | Frame Rate                           | Fr         | 50       | 60    | 60      | Hz   | Tv=Tvd +Tvb |
|                         | Period                               | Tv         | 1090     | 1110  | 1130    | Th   | -           |
|                         | Active Display                       | Tvd        | 1080     | 1080  | 1080    |      | -           |
|                         | Blank                                | Tvb        | 10       | 30    | 50      |      | -           |
| Horizontal Display Term | Period                               | Th         | 1050     | 1065  | 1075    | Tc   | Th=Thd +Thb |
|                         | Active Display                       | Thd        | 960      | 960   | 960     |      | -           |
|                         | Blank                                | Thb        | 90       | 105   | 115     |      | -           |

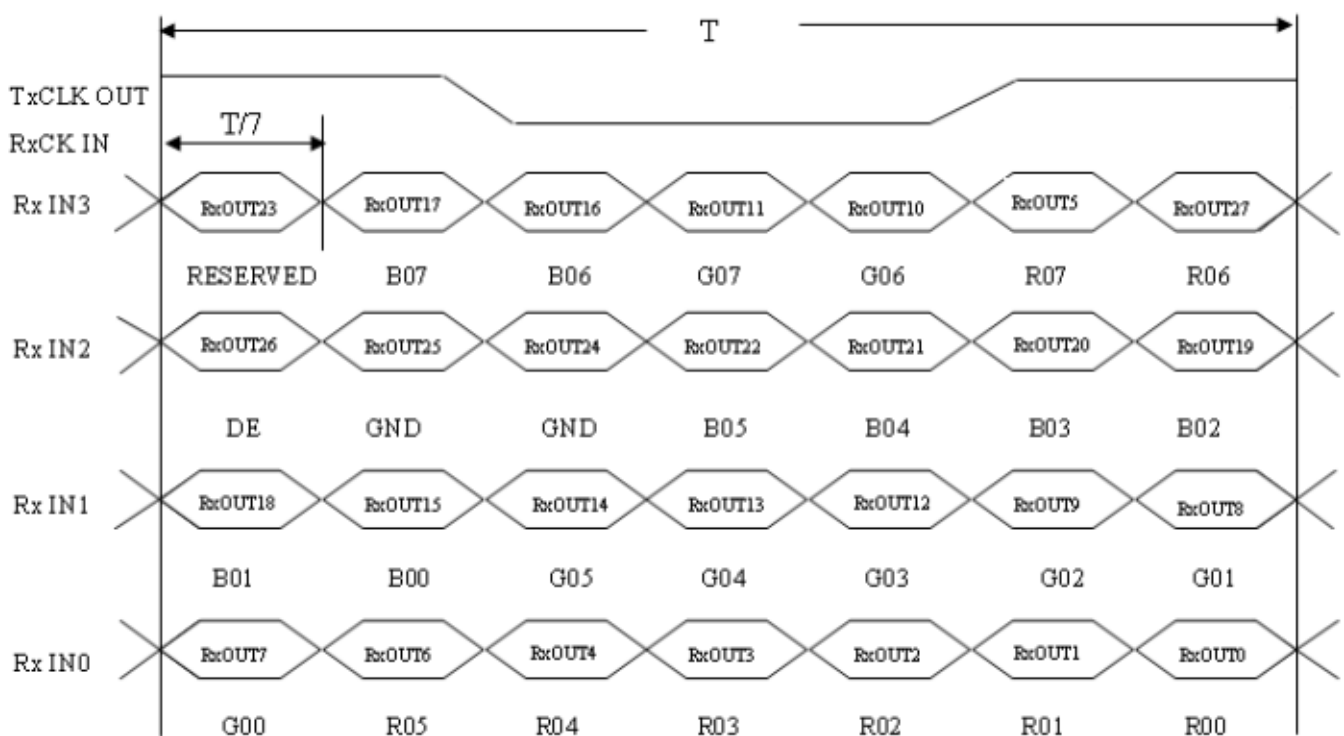
Note (1) because this module is operated by DE mode only, Hsync and Vsync input signals are ignored.

Note (2) the Tv (Tvd +Tvb) must be integer, otherwise, this module would operate abnormally.

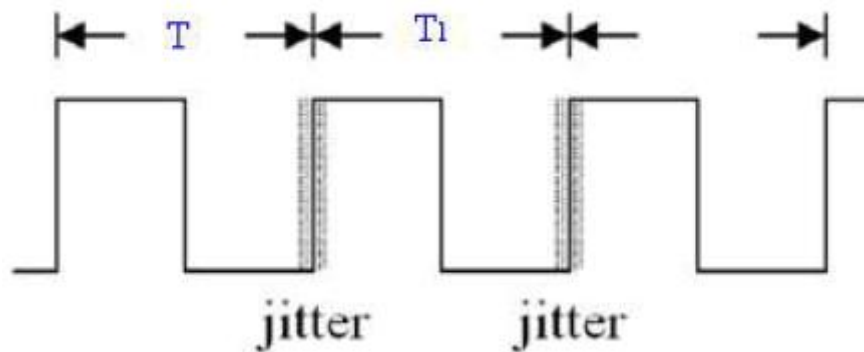
### INPUT SIGNAL TIMING DIAGRAM



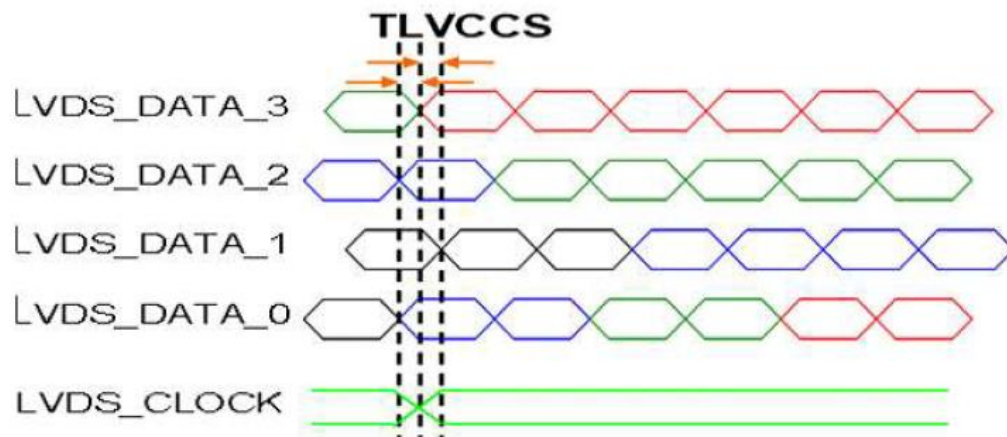
### TIMING DIAGRAM of LVDS



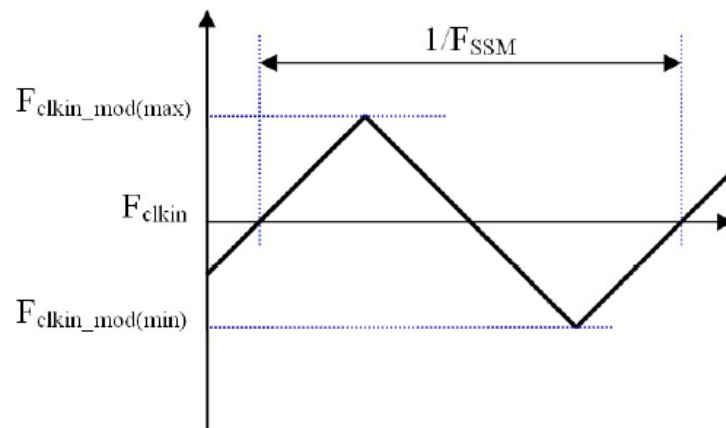
Note (3) the input clock cycle to cycle jitter is defined as below figures,  $T_{rc1} = |T_1 - T|$



Note (4) input Clock to data skew is defined as below figures.

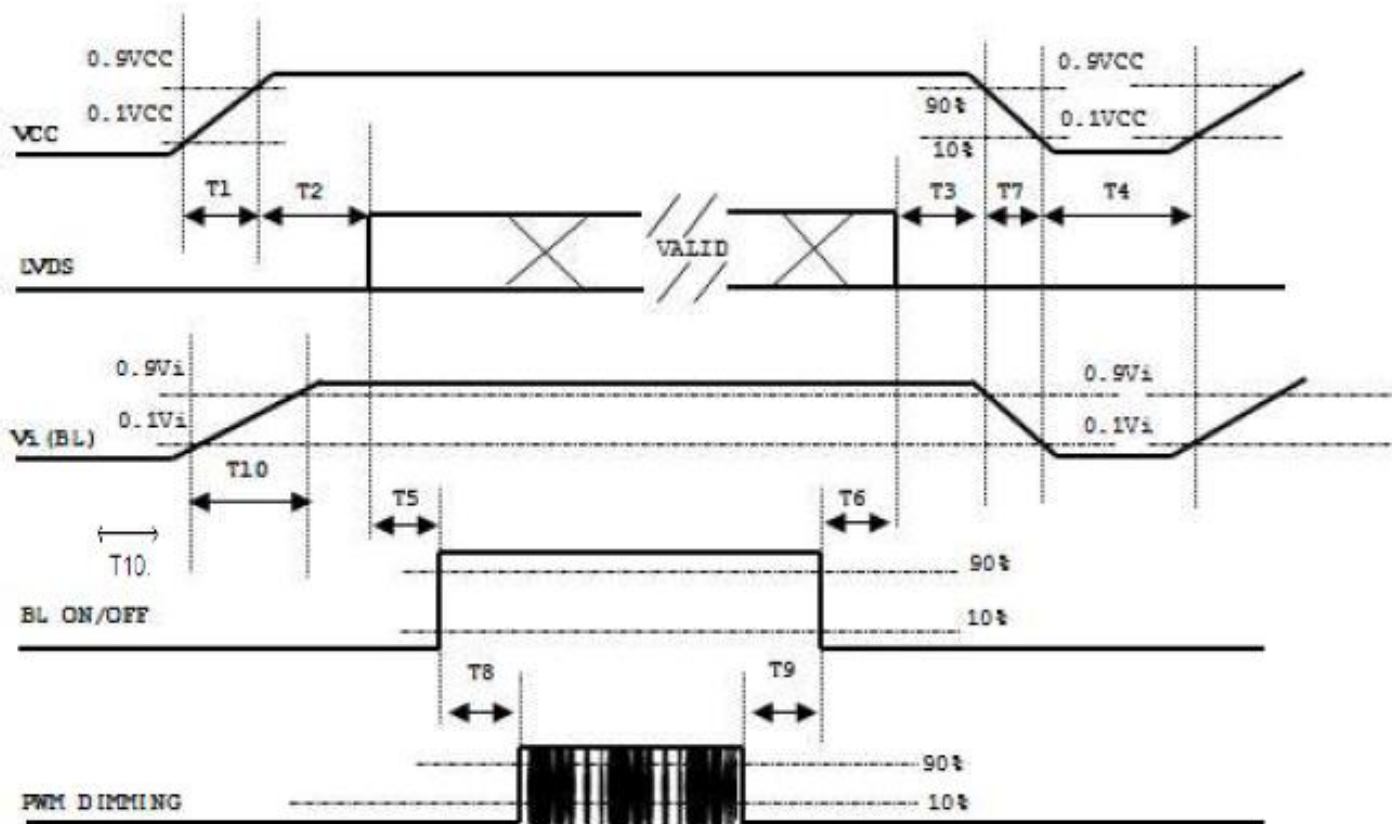


Note (5) the SSCG (Spread spectrum clock generator) is defined as below figures.



### 4.3. POWER SEQUENCE FOR LCD

The power sequence specifications are shown as the following table and diagram.



#### Timing Specifications :

| Parameter | Value |      |      | Units |
|-----------|-------|------|------|-------|
|           | Min.  | Typ. | Max. |       |
| T1        | 0.5   | -    | 10   | ms    |
| T2        | 0     | -    | 50   | ms    |
| T3        | 0     | -    | 50   | ms    |
| T4        | 500   | -    | -    | ms    |
| T5        | 450   | -    | -    | ms    |
| T6        | 200   | -    | -    | ms    |
| T7        | 10    | -    | 100  | ms    |
| T8        | 10    | -    | -    | ms    |
| T9        | 10    | -    | -    | ms    |
| T10       | 20    | -    | 50   | ms    |

Note :

- (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.
- (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.
- (3) In case of Vcc = off level, please keep the level of input signals on the low or keep a high impedance.
- (4) T4 should be measured after the module has been fully discharged between power off and on period.
- (5) Interface signal shall not be kept at high impedance when the power is on.
- (6) INX won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.
- (7) There might be slight electronic noise when LCD is turn off (even backlight unit is also off). To avoid the symptom, we suggest "Vcc falling timing" to follow "T7 spec".

### 4.4. SCANNING DIRECTION

The following figures show the image see from the front view. The arrow indicates the direction of scan.



Fig. 1 Normal scan (PCBA on the bottom side)  
( pin 17, REV\_SCAN = Low )



Fig. 2 Reverse scan (PCBA on the bottom side)  
( pin 17, REV\_SCAN = High )

### 5. OPTICAL CHARACTERISTICS

The relative measurement methods of optical characteristics are shown here and all items are measured at the center point of screen unless otherwise noted. The following items should be measured under the test conditions described above and stable conditions show in Note (5).

| Item              |                           | Symbol          | Condition                                                       | Min.           | Typ.  | Max.  | Unit | Note |
|-------------------|---------------------------|-----------------|-----------------------------------------------------------------|----------------|-------|-------|------|------|
| Color Coordinates | Red                       | R <sub>x</sub>  | Θ <sub>x</sub> =0°, Θ <sub>y</sub> =0°<br><br>Grayscale Maximum | 0.602          | 0.652 | 0.702 | -    | 1, 5 |
|                   |                           | R <sub>y</sub>  |                                                                 | 0.288          | 0.338 | 0.388 |      |      |
|                   | Green                     | G <sub>x</sub>  |                                                                 | 0.283          | 0.333 | 0.383 |      |      |
|                   |                           | G <sub>y</sub>  |                                                                 | 0.563          | 0.613 | 0.663 |      |      |
|                   | Blue                      | B <sub>x</sub>  |                                                                 | 0.100          | 0.150 | 0.200 |      |      |
|                   |                           | B <sub>y</sub>  |                                                                 | 0.000          | 0.050 | 0.100 |      |      |
|                   | White                     | W <sub>x</sub>  |                                                                 | 0.263          | 0.313 | 0.363 |      |      |
|                   |                           | W <sub>y</sub>  |                                                                 | 0.279          | 0.329 | 0.379 |      |      |
|                   | Center Luminance of White |                 |                                                                 | L <sub>C</sub> | 960   | 1200  |      |      |
| Contrast Ratio    |                           | CR              | 600                                                             | 800            | -     |       | 2, 5 |      |
| Response Time     |                           | T <sub>R</sub>  | Θ <sub>x</sub> =0°, Θ <sub>y</sub> =0°                          | -              | 13    | 18    | ms   | 3    |
|                   |                           | T <sub>F</sub>  |                                                                 | -              | 12    | 17    |      |      |
| White Variation   |                           | δ <sub>W</sub>  | Θ <sub>x</sub> =0°, Θ <sub>y</sub> =0°                          | 70             | -     | -     | %    | 5, 6 |
| Viewing Angle     | Horizontal                | θ <sub>X+</sub> | CR≥10                                                           | 85             | 89    | -     | Deg. | 1, 5 |
|                   |                           | θ <sub>X-</sub> |                                                                 | 85             | 89    | -     |      |      |
|                   | Vertical                  | θ <sub>Y+</sub> |                                                                 | 85             | 89    | -     |      |      |
|                   |                           | θ <sub>Y-</sub> |                                                                 | 85             | 89    | -     |      |      |

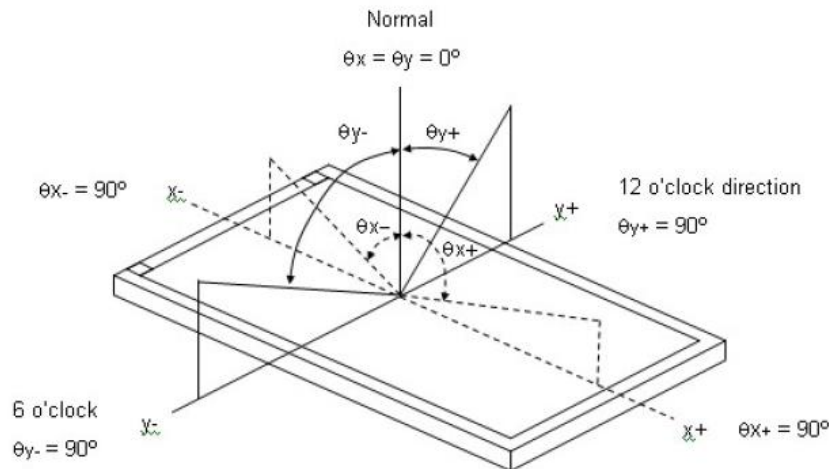
Definition :

Grayscale Maximum : Grayscale 255 (10 bits: grayscale 1023 ; 8 bits: grayscale 255 ; 6 bits: grayscale 63)

White : Luminance of Grayscale Maximum (All R, G, B)

Black : Luminance of Grayscale 0 (All R, G, B)

Note (1) Definition of Viewing Angle ( $\theta_x$ ,  $\theta_y$ ):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

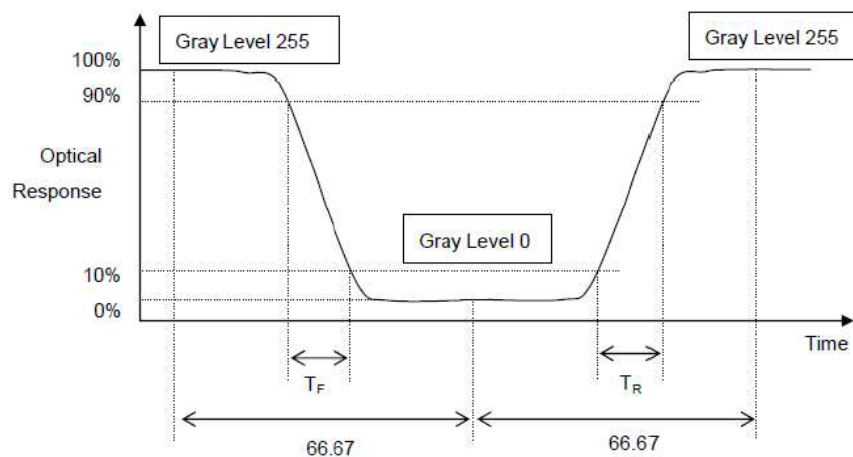
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time ( $T_R$ ,  $T_F$ ):



Note (4) Definition of Luminance of White ( $L_c$ ):

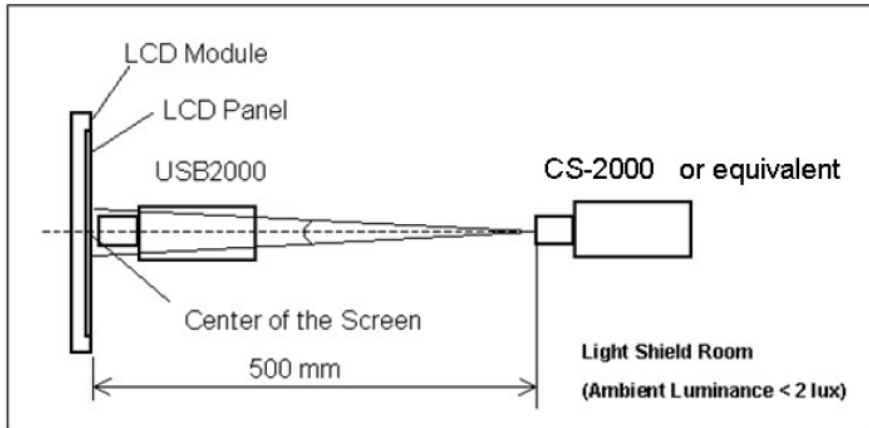
Measure the luminance of gray level 255 at center point

$$L_c = L (5)$$

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

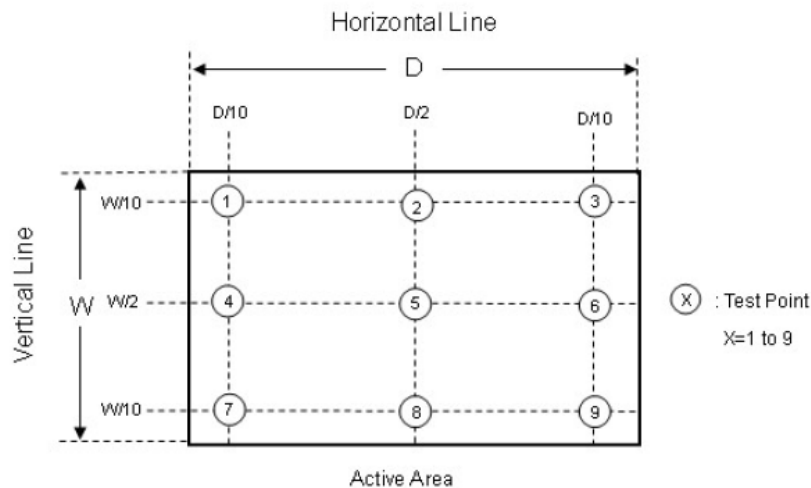
The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



Note (6) Definition of White Variation ( $\delta W$ ):

Measure the luminance of gray level 255 at 9 points

$$\delta W = ( \text{Minimum } [L(1) \sim L(9)] / \text{Maximum } [L(1) \sim L(9)] ) * 100\%$$



### 6. RELIABILITY TEST ITEMS

| Test Item |                                          | Condition                         |
|-----------|------------------------------------------|-----------------------------------|
| 1         | High temperature Storage test            | 80°C, 240hrs                      |
| 2         | Low temperature storage test             | -30°C, 240hrs                     |
| 3         | High temperature/Humidity operation test | 60°C, 90%RH, 240hrs               |
| 4         | High temperature operation test          | 70°C, 240hrs                      |
| 5         | Low temperature operation test           | -20°C, 240hrs                     |
| 6         | Thermal Cycle storage test               | -20°C(30min)~0°C(30min), 10cycles |

### 7. LABEL

Model No. **F156PET-TC2**

條碼

SN 3A Z 20 2 21 0 XXX1

W=14mm



L=32mm

字型:Arial (6)

Code: 128

字型 : Arial(8)

Code1, 2 Production location

Code 3 Production version

Code 4, 5 Production year

Code 6 Production month

Code 7, 8 Production day

Code 9 Production code

Colde 10, 11, 12, 13 Serial number

### 8. MECHANICAL CHARACTERISTICS

| Item                     |              | Dimension               | Unit | Note                                |
|--------------------------|--------------|-------------------------|------|-------------------------------------|
| Outline Dimension        | Horizontal   | 364.30                  | mm   | PCAP :<br>B156PBU-E10               |
|                          | Vertical     | 214.60                  | mm   |                                     |
|                          | Depth        | 2.70                    | mm   |                                     |
|                          | Horizontal   | 363.80                  | mm   | LCD :<br>G156HCE-LH1                |
|                          | Vertical     | 215.90                  | mm   |                                     |
|                          | Depth (min.) | 12                      | mm   |                                     |
| Weight                   |              | 1265                    | g    | F156PET-TC2                         |
| Item                     |              | Specification           |      | Remarks                             |
| PCAP Sensor Area         |              | 363.30 mm x 213.60 mm   |      |                                     |
| PCAP Active Area         |              | 347.50 mm x 196.70 mm   |      |                                     |
| PCAP FPC Length          |              | 96.65 mm                |      |                                     |
| PCAP Input method        |              | Finger or exclusive pen |      |                                     |
| PCAP Light Transmission  |              | $\geq 89 \pm 3 \%$      |      | BYK Gardner, 550nm, ASTMD1003       |
| PCAP Haze                |              | $< 4 \%$                |      |                                     |
| PCAP Operation force     |              | $\leq 10g$              |      | Finger Input                        |
| PCAP Hardness of surface |              | $\geq 6H$               |      | ASTM D3363, Pressure 750gf /45°test |



## Product Specification

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### F156PET-TC2

Front View

TBD

Back View

TBD

### 9. ENGINEERING DRAWING

