

SPECIFICATION

[    ] Target Specification  
[    ] Preliminary Specification  
[ ● ] Final Specification

Description                      15.6" 1920xRGBx1080 TFT-LCD Module  
Part Number                    P1560FHF2MAAA

|             |             |                                                                    |             |
|-------------|-------------|--------------------------------------------------------------------|-------------|
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\* This cover page is for your Comments and Signatures back to TIANMA.

## REVISION HISTORY

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## 1. Summary

### 1.1 General Description

This is a 15.6 inch LTPS TFT-LCD module with Normal-black technology. It is composed of a TFT-LCD panel, driver IC, PCB, and a LED backlight unit.

### 1.2 Features

- Ultra-wide viewing angle
- High resolution
- High luminance
- High contrast ratio
- Interface: eDP 1.2
- Without LED driver
- Compliant with the European RoHS Directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU)

## 2. General Specifications

| Feature                    |                     | Spec                           | Unit              |
|----------------------------|---------------------|--------------------------------|-------------------|
| Display Spec               | Size                | 15.6 inch                      |                   |
|                            | Resolution          | 1920(RGB)*1080                 |                   |
|                            | Pixel Pitch         | 0.17925*0.17925                | mm                |
|                            | TFT Active Area     | 344.16*193.59                  | mm                |
|                            | Technology Type     | a-Si                           |                   |
|                            | Pixel Configuration | R.G.B Vertical Stripe          |                   |
|                            | Display Mode        | SFT, Normally Black            |                   |
|                            | Surface Treatment   | AG                             |                   |
|                            | Viewing Direction   | ALL                            |                   |
| Mechanical Characteristics | LCM (W x H x D)     | 353.16*207.00*3.4              | mm                |
|                            | Weight              | 390                            | g                 |
| Optical Characteristics    | Luminance           | 1000                           | cd/m <sup>2</sup> |
|                            | Contrast Ratio      | 2000:1                         |                   |
|                            | NTSC                | 72                             | %                 |
|                            | Viewing Angle       | 88/88/88/88                    | degree            |
| Electrical Characteristics | Interface           | EDP 1.2                        |                   |
|                            | Color Depth         | 16.7 Million                   | color             |
|                            | Power Consumption   | LCD: 1501.5<br>Backlight: 8640 | mW                |

**Table 2.1 General TFT Specifications**

### 3. Input / Output Terminals

#### 3.1 CN1 Pin assignment (LCD Interface)

| Connector Information |                                 |
|-----------------------|---------------------------------|
| LCD Module connector  | STM MSAK24025P30D               |
| Matching connector    | I-PEX: 20454-230T or equivalent |

**Table 3.1.1 Connector information**

| No | Symbol   | I/O | Description                         | Comment |
|----|----------|-----|-------------------------------------|---------|
| 1  | NC       | -   | No connection                       |         |
| 2  | H_GND    | P   | Ground                              |         |
| 3  | LANE1_N  | I   | Complement Signal Link Line 1       |         |
| 4  | LANE1_P  | I   | Ture Signal Link Line 1             |         |
| 5  | H_GND    | P   | Ground                              |         |
| 6  | LANE0_N  | I   | Complement Signal Link Line 0       |         |
| 7  | LANE0_P  | I   | Ture Signal Link Line 0             |         |
| 8  | H_GND    | P   | Ground                              |         |
| 9  | AUX_CH_P | I   | Ture Signal Auxiliary Channel       |         |
| 10 | AUX_CH_N | I/O | Complement Signal Auxiliary Channel |         |
| 11 | H_GND    | P   | Ground                              |         |
| 12 | LCD_VCC  | P   | LCD power supply(+3.3V)             |         |
| 13 | LCD_VCC  | P   | LCD power supply(+3.3V)             |         |
| 14 | NC       | -   | No connection                       |         |
| 15 | H_GND    | P   | Ground                              |         |
| 16 | H_GND    | P   | Ground                              |         |
| 17 | HPD      | I   | Hot plug detect                     |         |
| 18 | H_GND    | P   | Ground                              |         |
| 19 | NC       | -   | No connection                       |         |
| 20 | NC       | -   | No connection                       |         |
| 21 | NC       | -   | No connection                       |         |
| 22 | NC       | -   | No connection                       |         |
| 23 | NC       | -   | No connection                       |         |
| 24 | NC       | -   | No connection                       |         |
| 25 | NC       | -   | No connection                       |         |
| 26 | NC       | -   | No connection                       |         |
| 27 | NC       | -   | No connection                       |         |
| 28 | NC       | -   | No connection                       |         |
| 29 | NC       | -   | No connection                       |         |
| 30 | NC       | -   | No connection                       |         |

**Table 3.1.2 Pin Assignment for LCD Interface**

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

Note3: A stronger wire should be used for VCC power lines.

Note4: Default display direction.



## 3.2 CN2 Pin assignment (Backlight)

| Connector Information |               |
|-----------------------|---------------|
| Backlight connector   | FPC pin out   |
| Matching connector    | CL800308PP001 |

**Table 3.2.1 Connector for backlight**

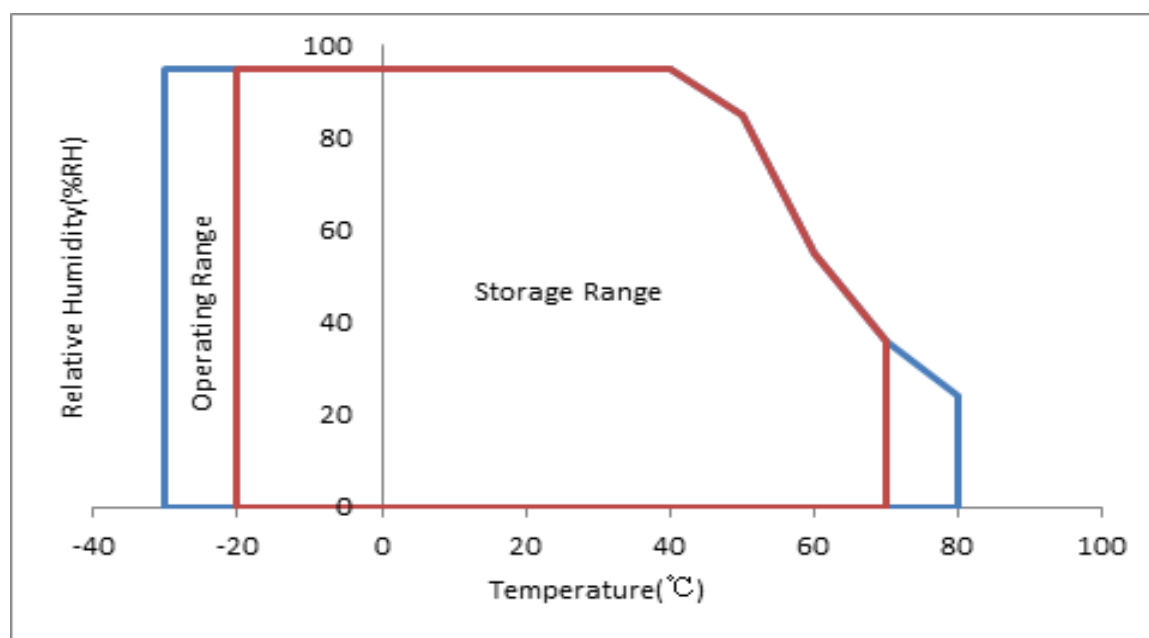
| No | Symbol | I/O | Description               | Comment |
|----|--------|-----|---------------------------|---------|
| 1  | LED_A  | P   | LED driving anode ( + )   |         |
| 2  | LED_K  | P   | LED driving cathode ( - ) |         |

**Table 3.2.2 Backlight pin assignment**

## 4. Absolute Maximum Ratings

| Item                       | Symbol          | MIN  | MAX | Unit             | Remark       |
|----------------------------|-----------------|------|-----|------------------|--------------|
| Power Voltage              | LCD_VCC         | -0.3 | 4   | V                | Note1        |
| Input voltage              | V <sub>IN</sub> | -0.3 | 4   | V                |              |
| Operating Temperature      | Top             | -20  | 70  | °C               |              |
| Storage Temperature        | Tst             | -30  | 80  | °C               |              |
| Relative Humidity<br>Note2 | RH              | --   | ≤95 | %                | Ta≤40°C      |
|                            |                 | --   | ≤85 | %                | 40°C<Ta≤50°C |
|                            |                 | --   | ≤55 | %                | 50°C<Ta≤60°C |
|                            |                 | --   | ≤36 | %                | 60°C<Ta≤70°C |
|                            |                 | --   | ≤24 | %                | 70°C<Ta≤80°C |
| Absolute Humidity          | AH              | --   | ≤70 | g/m <sup>3</sup> | Ta>70°C      |

**Table 4.1 Absolute Maximum Ratings**



Note1: Input voltage include all input data.

Note2: Ta means the ambient temperature. It is necessary to limit the relative humidity to the specified temperature range. Condensation on the module is not allowed.

Note3: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed



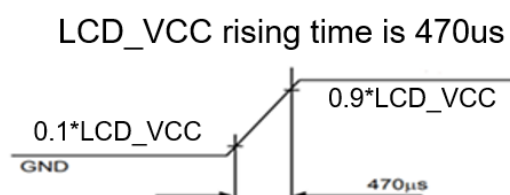
## 5. Electrical Characteristics

### 5.1 DC Characteristics for Panel Driving

| Item                       | Symbol             | MIN | TYP             | MAX              | Unit  | Remark            |
|----------------------------|--------------------|-----|-----------------|------------------|-------|-------------------|
| Supply Voltage             | LCD_VCC            | 3.2 | 3.3             | 3.4              | V     | Without ripple    |
| Supply Current             | $I_{LCD\_VCC}$     | -   | 455             | -                | mA    | All white pattern |
| Power Consumption          | $W_{LCD\_VCC}$     | -   | 1501.5          | -                | mW    |                   |
| Output Signal Voltage      | Low Level          | VOL | -               | 0.15*<br>LCD_VCC | V     | HPD               |
|                            | High Level         | VOH | 0.8*<br>LCD_VCC | VCC              | V     |                   |
| Inrush Current             | Inrush_<br>LCD_VCC | -   | -               | 1.5              | A     | Note1             |
| Permissible ripple voltage | VRPC               | -   | -               | 100              | mVp-p | Note2             |

**Table 5.1.1 Operating Voltages**

Note1: Inrush current should be tested under LCD\_VCC rising time 470us.



Note3: The permissible ripple voltage includes spike noise.

### 5.2 DC Characteristics for Backlight Driving

| Item                           | Symbol    | Min  | Typ   | Max  | Unit | Remark |
|--------------------------------|-----------|------|-------|------|------|--------|
| Backlight power supply voltage | VLED      | 33.6 | 36    | 38.4 | V    | Note1  |
| Backlight power supply current | $I_{LED}$ | -    | 240   | -    | mA   |        |
| Backlight power consumption    | $P_{LED}$ | -    | 8640  | -    | mW   |        |
| Operating Life Time            | --        | --   | 30000 | --   | hrs  | Note3  |

**Table 5.2.1 LED Backlight Characteristics**

Note1: Optical performance should be evaluated at  $T_a=25^{\circ}\text{C}$  only.

Note2: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.

Note3: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.

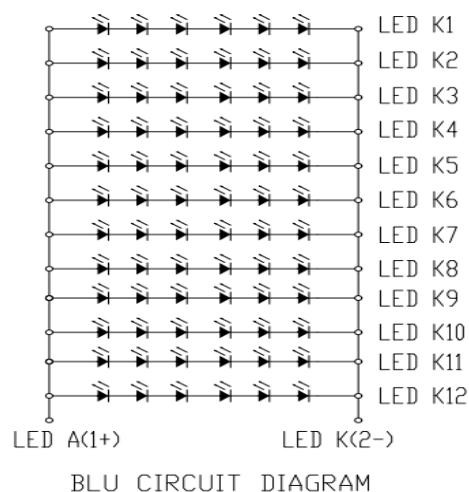


Figure 5.2.1 LED circuit

### 5.3 Recommended Power ON/OFF Sequence

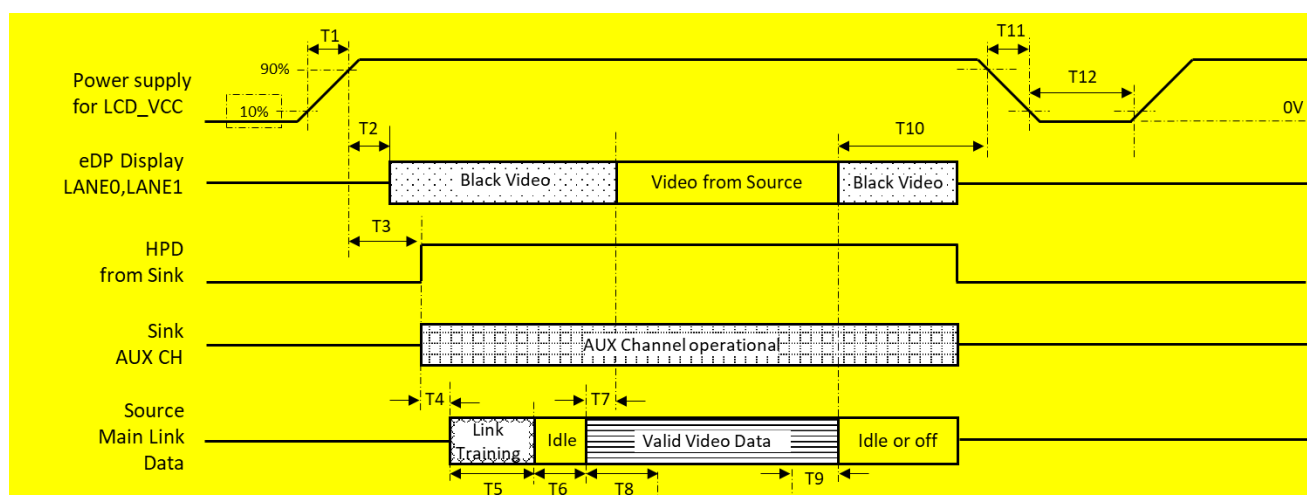


Figure 5.3.1 Power on sequence

| Parameters | Description                                                 | Reqd. by | Value |     | Unit | Notes                                                                                                                                                                                                                                              |
|------------|-------------------------------------------------------------|----------|-------|-----|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            |                                                             |          | Min   | Max |      |                                                                                                                                                                                                                                                    |
| T1         | Power tail rise time, 10% to 90%                            | Source   | 0.5   | 10  | ms   | -                                                                                                                                                                                                                                                  |
| T2         | Delay from LCD_VCC to black video generation                | Sink     | 0     | 200 | ms   | Automatic Black Video generation prevents display noise until valid video data is received from the Source                                                                                                                                         |
| T3         | Delay from LCD_VCC to HPD high                              | Sink     | 0     | 200 | ms   | Sink AUX Channel must be operational upon HPD high                                                                                                                                                                                                 |
| T4         | Delay from HPD high to link training initialization         | Source   | -     | -   | ms   | Allows for source to read Link capacity and initialize                                                                                                                                                                                             |
| T5         | Link training duration                                      | Source   | -     | -   | ms   | Dependent on Source link training Protocol                                                                                                                                                                                                         |
| T6         | Link Idle                                                   | Source   | -     | -   | ms   | Min Accounts for required BS-Idle pattern. Max allows for Source frame synchronization                                                                                                                                                             |
| T7         | Delay from valid video Data from Source to video on display | Sink     | 0     | 50  | ms   | Max value allows for Sink to valid video Data and Timing. At the end of T7, Sink will indicate the detection of valid video data by setting SINK_STATUS bit to logic 1(DPCD 00205h, bit 0), and Sink will no longer generate automatic Black video |
| T8         | Delay from valid video Data from Source to Backlight on     | Source   | 0     | -   | ms   | Source must assure display video is stable                                                                                                                                                                                                         |
| T9         | Delay from Backlight off to end of valid video Data         | Source   | 0     | -   | ms   | Source must assure backlight is no longer illuminated. At the end of T9, Sink will indicate the detection of no valid video data by setting the SINK_STATUS bit to logic 0 (DPCD 00205h, bit 0), and Sink will automatically display Black Video.  |
| T10        | Delay from end of valid video data from Source to Power off | Source   | 0     | 500 | ms   | Black video will be displayed after receiving idle or off signals from Source                                                                                                                                                                      |
| T11        | LCD_VCC power rail fall time, 90% to 10%                    | Source   | -     | 10  | ms   | -                                                                                                                                                                                                                                                  |
| T12        | LCD_VCC Power off time                                      | Source   | 1000  | -   | ms   | -                                                                                                                                                                                                                                                  |

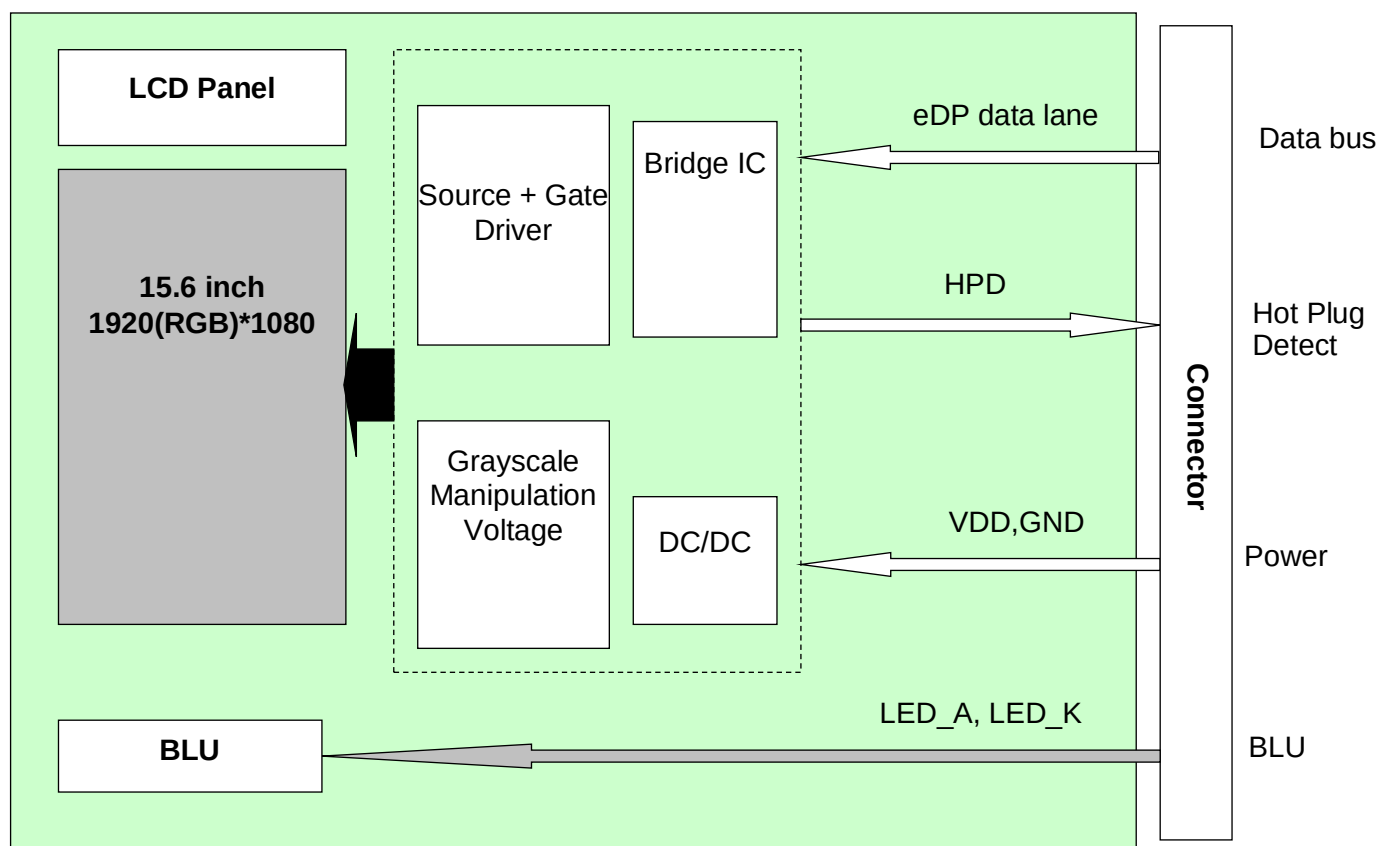
**Table 5.3.2 Power on/off sequence Table**

Note1: If there is a voltage variation (voltage drop) at the rising edge of LCD\_VCC below 3.0V, there is a possibility that a product does not work due to a protection circuit.

Note2: Display signals (LANE0\_P/N, LANE1\_P/N) must be set to Low or High-impedance, except the VALID period (See above sequence diagram), in order to avoid the circuitry damage.

If some of display and function signals of this product are cut while this product is working, even if the signal input to it once again, it might not work normally. If a customer stops the display and function signals, LCD\_VCC also must be shut down.

## 5.4 LCD Module Block Diagram



**Figure 5.4.1 LCD Module Block Diagram**

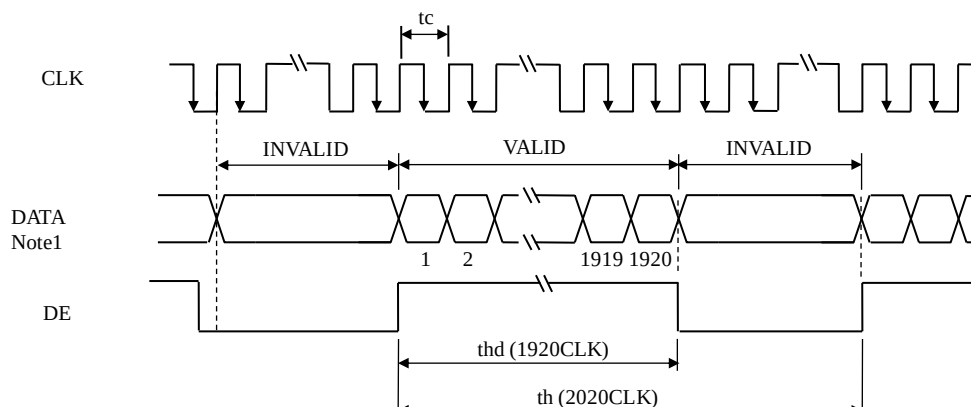
## 6. Timing Characteristics

### 6.1 Data Input Timing Parameter Setting

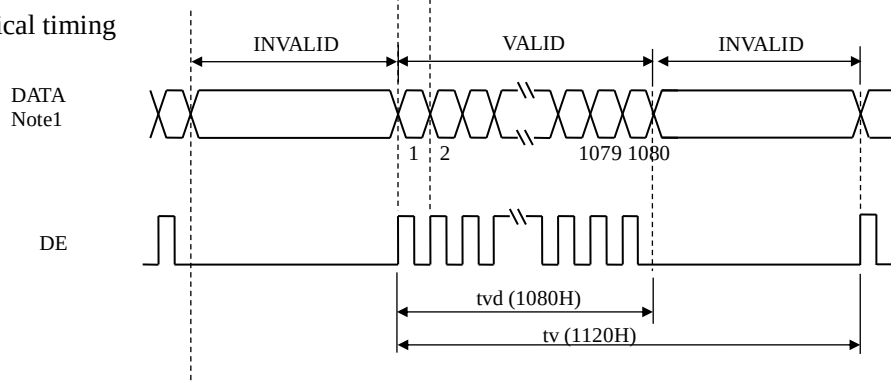
| Parameter                | Symbol      | Min | Typ  | Max | Unit | Remark                        |
|--------------------------|-------------|-----|------|-----|------|-------------------------------|
| CLK frequency            | $1/t_{clk}$ | -   | 135  | -   | MHz  | Calculated at 60HZ frame rate |
| Horizontal blanking time | tHBT        | -   | 100  | -   | tclk |                               |
| Horizontal display area  | tHD         | -   | 1920 | -   | tclk |                               |
| Horizontal period        | tH          | -   | 2020 | -   | tclk |                               |
| Vertical blanking time   | tVBT        | -   | 40   | -   | tH   |                               |
| Vertical display area    | tVD         | -   | 1080 | -   | tH   |                               |
| Vertical period          | tV          | -   | 1120 | -   | tH   |                               |
| Frame Rate               | FR          | -   | 60   | -   | HZ   |                               |

**Table 6.1.1 Input Timing Parameters**

Horizontal timing



Vertical timing



**Figure 6.1.1 Input Signal Timings**

Note1: DATA = R0-R7, G0-G7, B0-B7

## 6.2 eDP data format

### 6.2.1 eDP main link signal characteristics

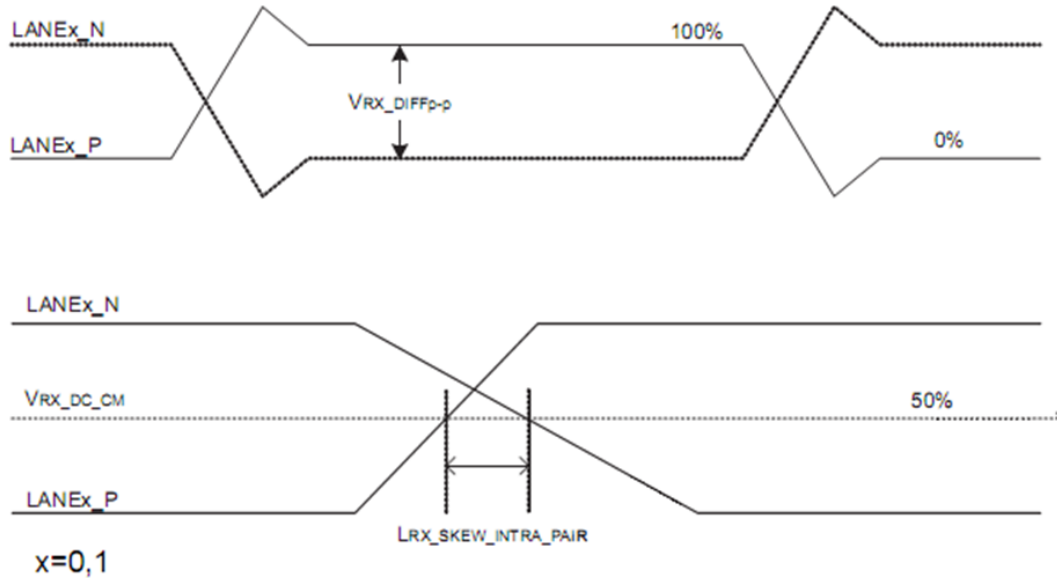


Figure 6.2.1 Timing Specification for Display Port Main Link Signal

| Symbol and Parameter                                                                                          | Test Conditions | Min  | Typ | Max  | Unit     |
|---------------------------------------------------------------------------------------------------------------|-----------------|------|-----|------|----------|
| Spread spectrum clock, down-spreading by SOURCE                                                               |                 |      | 0.5 |      | %        |
| Modulation frequency                                                                                          |                 | 30   |     | 33   | kHz      |
| $V_{RX\_DIFFp-p}$ : Differential peak-to-peak input voltage at package pins                                   |                 | 100  |     | 1360 | mV       |
| Maximum adaptive RX equalization level at 2.7Gbps                                                             |                 |      | 16  |      | dB       |
| $V_{RX\_DC\_CM}$ : RX input DC common mode voltage                                                            |                 |      | GND |      | V        |
| $R_{RX\_DIFF}$ : Differential termination resistance                                                          |                 | 80   | 100 | 120  | $\Omega$ |
| $R_{RX\_SE}$ : Single-ended termination resistance                                                            |                 | 40   | 50  | 60   | $\Omega$ |
| $I_{RX\_SHORT}$ : Rx short circuit current limit                                                              |                 |      |     | 20   | mA       |
| $L_{RX\_SKEW\_INTRA\_PAIR}$ : Intra-pair skew at Rx package pins (HBR)<br>RX intra-pair skew tolerance at HBR |                 |      |     | 150  | ps       |
| $L_{RX\_SKEW\_INTRA\_PAIR}$ : Intra-pair skew at Rx package pins (RBR)<br>RX intra-pair skew tolerance at RBR |                 |      |     | 300  | ps       |
| Receiver Jitter Tolerance for High Bit Rate (HBR)                                                             |                 |      |     |      |          |
| Total jitter tolerance at 2MHz                                                                                |                 | 1227 |     |      | mUI      |
| Total jitter tolerance at 10MHz                                                                               |                 | 548  |     |      | mUI      |
| Total jitter tolerance at 20MHz                                                                               |                 | 505  |     |      | mUI      |
| Total jitter tolerance at 100MHz                                                                              |                 | 491  |     |      | mUI      |
| Receiver Jitter Tolerance for Reduced Bit Rate (RBR)                                                          |                 |      |     |      |          |
| Total jitter tolerance at 2MHz                                                                                |                 | 1648 |     |      | mUI      |
| Total jitter tolerance at 10MHz                                                                               |                 | 778  |     |      | mUI      |
| Total jitter tolerance at 20MHz                                                                               |                 | 747  |     |      | mUI      |

Figure 6.2.1 Timing Specification for Display Port Main Link Signal

## 6.2.2 eDP AUX link signal characteristics

| Parameter                                            | Symbol             | Min | Typ | Max  | Unit    | Remark |
|------------------------------------------------------|--------------------|-----|-----|------|---------|--------|
| Unit interval                                        | UI                 | 0.4 | 0.5 | 0.6  | $\mu$ s | -      |
| AUX differential peak-to-peak voltage When driving   | $V_{AUX-DIFF-P-P}$ | 400 | -   | 1000 | mV      | -      |
| AUX differential peak-to-peak voltage When receiving | $V_{AUX-DIFF-P-P}$ | 200 | -   | 1360 | mV      | -      |
| AUX common-mode voltage When transmitting            | $V_{AUX-DC-CM-TX}$ | -   | 200 | -    | mV      | -      |
| AUX common-mode voltage When receiving               | $V_{AUX-DC-CM-RX}$ | -   | GND | -    | mV      | -      |
| AUX channel short circuit current                    | $I_{AUX-SHORT}$    | -   | -   | 20   | mA      | -      |
| AUX AC coupling capacitor                            | $C_{AUX}$          | 75  | -   | 200  | nF      | -      |

**Table 6.2.2 AUX link signal characteristics**

## 7. Optical Characteristics

| Item           |       | Symbol | Condition       | Min   | Typ   | Max   | Unit              | Remark   |
|----------------|-------|--------|-----------------|-------|-------|-------|-------------------|----------|
| View Angles    |       | θT     | CR≧10           | 78    | 88    | -     | degree            | Note2,3  |
|                |       | θB     |                 | 78    | 88    | -     |                   |          |
|                |       | θL     |                 | 78    | 88    | -     |                   |          |
|                |       | θR     |                 | 78    | 88    | -     |                   |          |
| Contrast Ratio |       | CR     | θ=0°            | 1500  | 2000  | -     |                   | Note 3   |
| Response Time  |       | Tr+f   | 25℃             | -     | 25    | 40    | ms                | Note 4   |
| Chromaticity   | White | x      | Backlight is on | 0.251 | 0.301 | 0.351 |                   | Note 1,5 |
|                |       | y      |                 | 0.292 | 0.342 | 0.392 |                   |          |
|                | Red   | x      |                 | 0.586 | 0.636 | 0.686 |                   | Note 1,5 |
|                |       | y      |                 | 0.303 | 0.353 | 0.403 |                   |          |
|                | Green | x      |                 | 0.278 | 0.328 | 0.378 |                   | Note 1,5 |
|                |       | y      |                 | 0.586 | 0.636 | 0.686 |                   |          |
|                | Blue  | x      |                 | 0.089 | 0.139 | 0.189 |                   | Note 1,5 |
|                |       | y      |                 | 0.009 | 0.059 | 0.109 |                   |          |
| Uniformity     |       | U      |                 | 70    | 75    | -     | %                 | Note 6   |
| NTSC           |       | -      |                 | 67    | 72    | -     | %                 | Note 5   |
| Luminance      |       | L      |                 | 800   | 1000  | -     | cd/m <sup>2</sup> | Note 7   |

**Table 7.1 Optical Parameters**

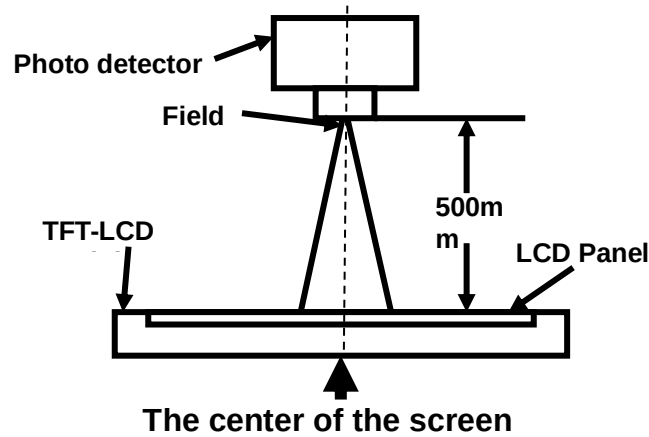
Test Conditions:

1. PWM duty=100%,the ambient temperature is 25℃.
2. The test systems refer to Note1 and Note2.



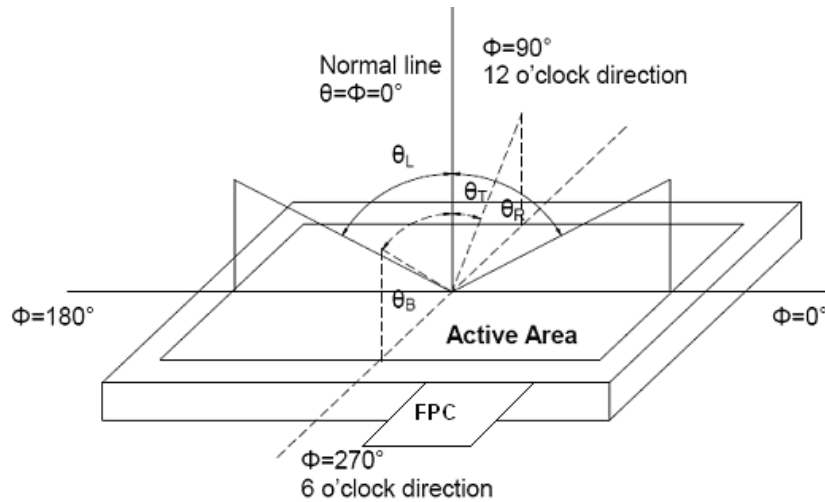
Note1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.



**Fig1. Measurement Set Up**

Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD .



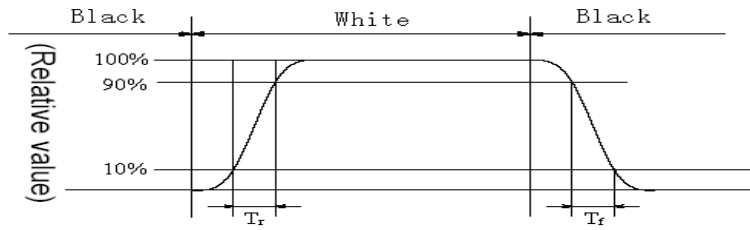
**Fig2. Measurement viewing angle**

Note3: Definition of contrast ratio

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

Note4: 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 10% to 90%. And fall time ( $T_f$ ) is the time between photo detector output intensity changed from 90% to 10%.



**Fig3. Response Time Testing**

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

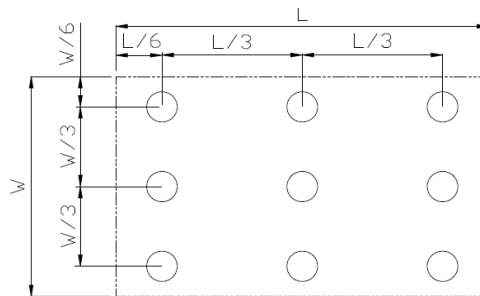
Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

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

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

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

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



**Fig4. Luminance Uniformity Measurement Locations(9 points)**

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

## 8. Reliability Test

| No | Test Item                                               | Condition                                                                                                                                       | Remarks                                                                                         |
|----|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1  | High Temperature Operation                              | +70℃ , 240H                                                                                                                                     | IEC60068-2-1:2007<br>GB2423.2-2008                                                              |
| 2  | Low Temperature Operation                               | -20℃ , 240H                                                                                                                                     | IEC60068-2-1:2007<br>GB2423.1-2008                                                              |
| 3  | High Temperature Storage                                | +80℃ , 240H                                                                                                                                     | IEC60068-2-1:2007<br>GB2423.2-2008                                                              |
| 4  | Low Temperature Storage                                 | -30℃ , 240H                                                                                                                                     | IEC60068-2-1:2007<br>GB2423.1-2008                                                              |
| 5  | Storage at High Temperature and Humidity(non-operation) | +60℃ , 90%RH , 240H                                                                                                                             | IEC60068-2-78 :2001<br>GB/T2423.3—2006                                                          |
| 6  | Thermal Shock (non-operation)                           | -30℃ , 30min~80℃ , 30min , change time : 5min , 100cycle                                                                                        | Start with cold temperature,<br>End with high temperature,<br>IEC60068-2-14:1984,GB2423.22-2002 |
| 7  | ESD                                                     | C=150pF , R=330Ω , 5point/panel<br>Air : ±15kv , 5times ;<br>Contact : ±8kv , 5times ;<br>( Environment : 15℃~35℃ ,<br>30%~60% , 86Kpa~106Kpa ) | IEC61000-4-2:2001<br>GB/T17626.2-2006                                                           |
| 8  | Package Vibration                                       | 5-20-200HZ , PSD : 0.01-0.01-0.001<br>Total:0.781g <sup>2</sup> /HZ, x/y/z 30min )                                                              | GB/T 4857.5-1992                                                                                |
| 9  | Package Drop Test                                       | Height: 60 cm,1 corner, 3edges, 6 surfaces                                                                                                      | IEC60068-2-32:1990<br>GB/T2423.8—1995                                                           |

**Table 8.1 RA test condition**

Note1: Temperature is the ambient temperature of sample

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

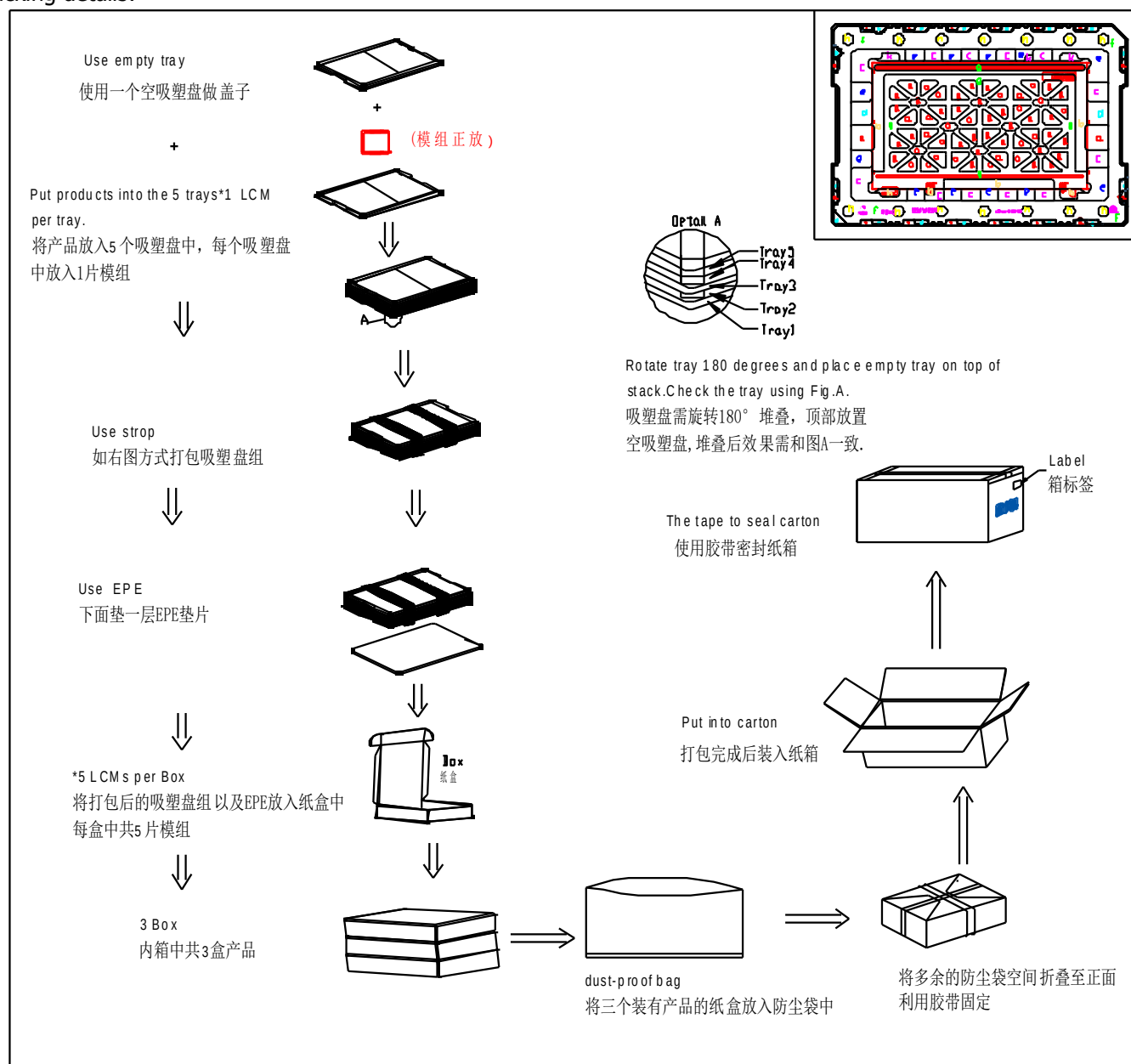


## 10. Packing Instruction

| No | Item           | Model (Material) | Dimensions (mm)   | Unit Weight(Kg) | Q'ty | Remark |
|----|----------------|------------------|-------------------|-----------------|------|--------|
| 1  | LCM module     | P1560FHF2MAAA    | 353.16*207.00*3.4 | 0.390           | 15   |        |
| 2  | Tray           | PET              | 485*330*16.2      | 0.235           | 18   |        |
| 3  | BOX            | CORRUGATED PAPER | 520*345*74        | 0.4             | 3    |        |
| 4  | Dust proof bag | LD-PE            | 700*545*0.05      | 0.05            | 1    |        |
| 5  | Lable          | tagboard         | 100*52            | 0.002           | 1    |        |
| 6  | Carton         | CORRUGATED PAPER | 544*365*250       | 1.01            | 1    |        |
| 7  | EPE            | EPE              | 485*330*5         | 0.01            | 3    |        |
| 8  | Total weight   | 12.37 ± 5%Kg     |                   |                 |      |        |

Table 10.1 Packing instruction

Packing details:



## 11. Precautions for Use of LCD Modules

### 11.1 Handling Precautions

- (1) The display panel is made of glass. Do not subject it to mechanical shock by dropping it, etc.
- (2) If the display panel is damaged and the liquid crystal fluid inside it leaks out be sure not to get any in your mouth. If the fluid comes into contact with your skin or clothes promptly wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the bezel since this may cause the color tone to vary.
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle the polarizer carefully.
- (5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear use a moist cloth with one of the following solvents:
  - Isopropyl alcohol
  - Ethyl alcohol
 Solvents other than those mentioned above may damage the polarizer. Specifically, do not use the following:
  - Water
  - Ketone
  - Aromatic solvents
- (6) Do not disassemble the LCD Module.
- (7) If powered off, do not apply the input signals.
- (8) To prevent destruction of the module by static electricity, be careful to maintain an optimum work environment.
- (9) Be sure to ground your body when handling the LCD Modules.
- (10) Tools used for assembly, must be properly grounded.
- (11) To reduce the amount of static electricity generated, do not conduct assembly or other work under very low humidity conditions.
- (12) The LCD Module is covered with a film to protect the display surface, remove film slowly under the ionizer.

### 11.2 Storage precautions

- (1) When storing the LCD modules avoid exposure to direct sunlight or to the light of fluorescent lamps.
- (2) The LCD modules should be stored within the rated storage temperature range. The recommend condition is:  
Temperature: 0 ~ 35 °C at normal humidity.
- (3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

### 11.3 Transportation Precautions

The LCD modules should not be dropped or subject to violent mechanical shock during transportation. Also they should avoid excessive pressure, water, high humidity and direct sunlight.

### 11.4 Screen saver Precautions

Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

### 11.5 Safety Precautions

- (1) When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned
- (2) Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
- (3) LED driver should be designed to limit or stop its function when over current is detected on the LED.