



SPECIFICATION



P1560FHF1MB00

15.6" - FHD – LVDS

Version: 2.0

Date: 14.06.2023

Note: This specification is subject to change without prior notice

SPECIFICATION

[] Preliminary Specification
 [●] Final Specification

Description **15.6” 1920xRGBx1080 TFT-LCD Module**
Part Number **P1560FHF1MB00**

| | | | |
|------------|--|-----------------------------|-----------|
| Customer | Industrial Product Dept, PDBU Tianma Microelectronics Co., Ltd. | | |
| Signatures | Date | Approved By | Date |
| _____ | _____ | Zhu Guanchen | 2023-6-27 |
| _____ | _____ | Reviewed By Zhu Guanchen | 2023-6-27 |
| Comments: | | Prepared By Wang Fang | 2023-6-14 |

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

REVISION HISTORY

| Rev | Date | Page | Revision Items | Editor |
|-----|-----------|------|------------------|-----------|
| 1.0 | 2022-4-10 | - | Preliminary spec | Wang Fang |
| 2.0 | 2023-6-14 | - | Final spec | Wang Fang |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

CONTENTS

| | |
|--|-----------|
| 1. SUMMARY..... | 1 |
| 1.1 General Description..... | 1 |
| 1.2 Features..... | 1 |
| 2. GENERAL SPECIFICATIONS..... | 2 |
| 3. INPUT / OUTPUT TERMINALS..... | 3 |
| 3.1 CN1 Pin assignment (LCD Interface)..... | 3 |
| 3.2 CN2 Pin assignment (Back Light)..... | 4 |
| 3.3 Positions of Socket..... | 4 |
| 4. ABSOLUTE MAXIMUM RATINGS | 5 |
| 5. ELECTRICAL CHARACTERISTICS | 6 |
| 5.1 DC Characteristics for Panel Driving..... | 6 |
| 5.2 DC Characteristics for Backlight Driving..... | 7 |
| 5.3 Recommended Power ON/OFF Sequence..... | 8 |
| 5.4 LED Driver..... | 9 |
| 5.5 LCD Module Block Diagram..... | 10 |
| 6. INTERFACE TIMING CHARACTERISTICS..... | 11 |
| 6.1 Timing Characteristics..... | 11 |
| 6.2 Input Signal Timing Chart | 12 |
| 6.3 Input Data Mapping..... | 13 |
| 7. OPTICAL CHARACTERISTICS | 14 |
| 8. RELIABILITY TEST..... | 17 |
| 9. MECHANICAL DRAWING | 18 |
| 10. PACKING INSTRUCTION..... | 19 |
| 11. PRECAUTIONS FOR USE OF LCD MODULES..... | 20 |
| 11.1 Handling Precautions..... | 20 |
| 11.2 Storage precautions..... | 20 |
| 11.3 Transportation Precautions | 20 |
| 11.4 Screen saver Precautions..... | 20 |
| 11.5 Safety Precautions | 20 |

1. Summary

1.1 General Description

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

1.2 Features

- Ultra-wide viewing angle
- High resolution
- Interface: LVDS
- Compliant with UL (UL62368-1/CSA C22.2 No.62368-1-03) .
- Acquisition product for 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) x 1080 | |
| | Pixel Pitch | 0.17925 x 0.17925 | mm |
| | TFT Active Area | 344.16 x 193.59 | mm |
| | Technology Type | a-Si | |
| | Pixel Configuration | R.G.B Vertical Stripe | |
| | Display Mode | SFT, Normally Black | |
| | Surface Treatment | Anti-Glare | |
| | Viewing Direction | All Direction | |
| Mechanical Characteristics | LCM (W x H x D) | 363.8 x 215.9 x 6.3 Typ. | mm |
| | Weight | 618 Typ. | g |
| Optical Characteristics | Luminance | 400 Typ. | cd/m ² |
| | Contrast Ratio | 1000:1 Typ. | |
| | NTSC | 72 Typ. | % |
| | Viewing Angle | 88/88/88/88 Typ. | degree |
| Electrical Characteristics | Interface | LVDS (2 port), 8bit | |
| | Color Depth | 16.7 Million | color |
| | Power Consumption | 13.914 Typ. | W |

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

| Connector Information | |
|-----------------------|---------------------------------|
| LCD Module connector | 187034-30091 (P-TWO INDUSTRIES) |
| Matching connector | FI-X30HL (JAE) |

Table 3.1.1 Connector information

| Pin No. | Symbol | Signal | Remarks |
|---------|--------|-------------------|---------|
| 1 | DA0- | Odd pixel data 0 | Note1 |
| 2 | DA0+ | | |
| 3 | DA1- | Odd pixel data 1 | Note1 |
| 4 | DA1+ | | |
| 5 | DA2- | Odd pixel data 2 | Note1 |
| 6 | DA2+ | | |
| 7 | GND | Ground | Note2 |
| 8 | CLKA- | Odd pixel clock | Note1 |
| 9 | CLKA+ | | |
| 10 | DA3- | Odd pixel data 3 | Note1 |
| 11 | DA3+ | | |
| 12 | DB0- | Even pixel data 0 | Note1 |
| 13 | DB0+ | | |
| 14 | GND | Ground | Note2 |
| 15 | DB1- | Even pixel data 1 | Note1 |
| 16 | DB1+ | | |
| 17 | GND | Ground | Note2 |
| 18 | DB2- | Even pixel data 2 | Note1 |
| 19 | DB2+ | | |
| 20 | CLKB- | Even pixel clock | Note1 |
| 21 | CLKB+ | | |
| 22 | DB3- | Even pixel data 3 | Note1 |
| 23 | DB3+ | | |
| 24 | GND | Ground | Note2 |
| 25 | GND | Ground | Note2 |
| 26 | GND | Ground | Note2 |
| 27 | GND | Ground | Note2 |
| 28 | VCC | Power supply | Note2 |
| 29 | | | |
| 30 | | | |

Table 3.1.2 Pin Assignment for LCD Interface

Note1: Twist pair wires with 100Ω(Characteristic impedance) should be used between LCD panel signal processing board and LVDS transmitter.

Note2: All GND and VCC terminals should be used without any non-connected lines.

3.2 CN2 Pin assignment (Back Light)

| Connector Information | |
|-----------------------|--|
| LCD Module connector | DF19L-14P-1H(54) (HIROSE ELECTRIC Co., Ltd.) |
| Matching connector | DF19-14S-1C (HIROSE ELECTRIC Co., Ltd.) |

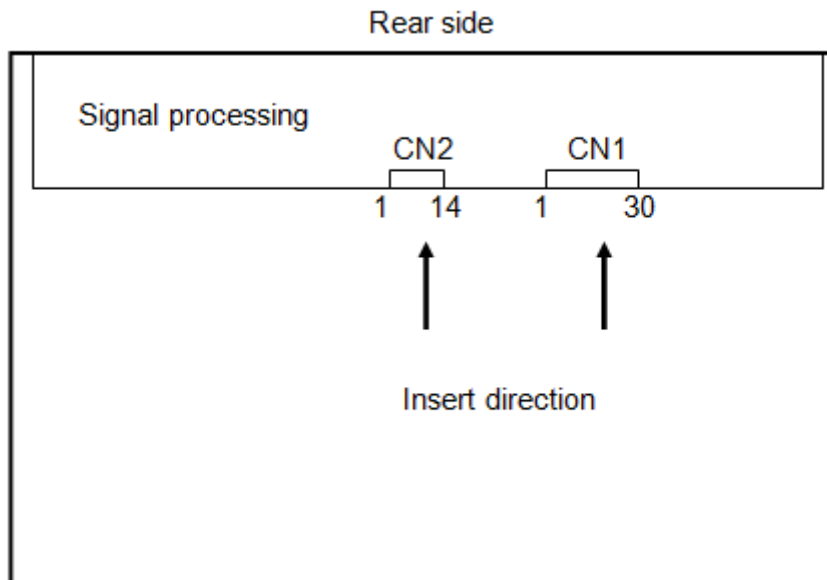
Table 3.2.1 Connector information

| Pin No. | Symbol | Function | Description |
|---------|---------|--------------------------|--|
| 1 | VDD | Power supply | Note1 |
| 2 | VDD | | |
| 3 | VDD | | |
| 4 | VDD | | |
| 5 | VDD | | |
| 6 | GND | LED driver board ground | Note1 |
| 7 | GND | | |
| 8 | GND | | |
| 9 | GND | | |
| 10 | GND | | |
| 11 | Reserve | Keep open | - |
| 12 | BRTC | Backlight ON/OFF control | High or Open: Backlight ON Low: Backlight OFF |
| 13 | PWM | Luminance control | PWM Dimming |
| 14 | GND | LED driver board ground | Note1 |

Table 3.2.2 Pin Assignment for Back Light Interface

Note1:All VDDDB and GNDB terminals should be used without any non-connected lines.

3.3 Positions of Socket



4. Absolute Maximum Ratings

GND=0V

| Parameter | | Symbol | Rating | Unit | Remarks |
|---------------------------|-----------------------------------|--------|----------------|------------------|------------------|
| Power supply voltage | LCD panel signal processing board | VCC | -0.3to +4.0 | V | Ta= 25°C |
| | LED driver | VDD | -0.3to +15.0 | | |
| Input voltage for signals | Display signals Note1 | VD | -0.3to VCC+0.3 | V | |
| | Function signal for LED driver | PWM | -0.3to +5.5 | V | |
| | | BRTC | -0.3to +5.5 | V | |
| Storage temperature | | Tst | -20 to +70 | °C | |
| Operating temperature | Front surface | TopF | -20 to +70 | °C | Note2 |
| | Rear surface | TopR | -20 to +70 | °C | Note3 |
| Relative humidity Note4 | | RH | ≤ 95 | % | Ta ≤ 40°C |
| | | | ≤ 85 | % | 40°C < Ta ≤ 50°C |
| | | | ≤ 55 | % | 50°C < Ta ≤ 60°C |
| | | | ≤ 36 | % | 60°C < Ta ≤ 70°C |
| Absolute humidity Note4 | | AH | ≤ 70 Note5 | g/m ³ | Ta = 70°C |

Table 4.1 Absolute Maximum Ratings

Note1: DA0+/-, DA1+/-, DA2+/-, DA3+/- ,CLKA+/-, DB0+/-, DB1+/-, DB2+/-, DB3+/-, CLKB+/-

Note2: Measured at LCD panel surface (including self-heat)

Note3: Measured at LCD module's rear shield surface (including self-heat)

Note4: No condensation

Note5: Water amount at Ta= 70°C and RH= 36%

Note6: 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

(Ta= 25°C)

| Parameter | Symbol | min. | typ. | max. | Unit | Remarks | |
|--|--------|------|--------------|---------------|-------|-----------------------------------|------------------------------|
| Power supply voltage | VCC | 3.0 | 3.3 | 3.6 | V | - | |
| Power supply current | ICC | - | 580 Note1 | 1000 Note2 | mA | at VCC= 3.3V | |
| Permissible ripple voltage | VRPC | - | - | 100 | mVp-p | for VCC Note3, Note4, Note5 | |
| Differential input threshold voltage | High | VTH | - | - | +100 | mV | at VCM= 1.2V Note6, Note7 |
| | Low | VTL | -100 | - | - | mV | |
| Input Differential Voltage | VID | 100 | 400 | 600 | mV | - | |
| Differential Input Common Mode Voltage | VCM | 0.7 | 1.2 | 1.6 | V | - | |
| Terminating resistance | RT | - | 100 | - | Ω | - | |

Table 5.1.1 Operating Voltages

Note1: Checkered flag pattern [by IEC 61747-6]

Note2: Pattern for maximum current

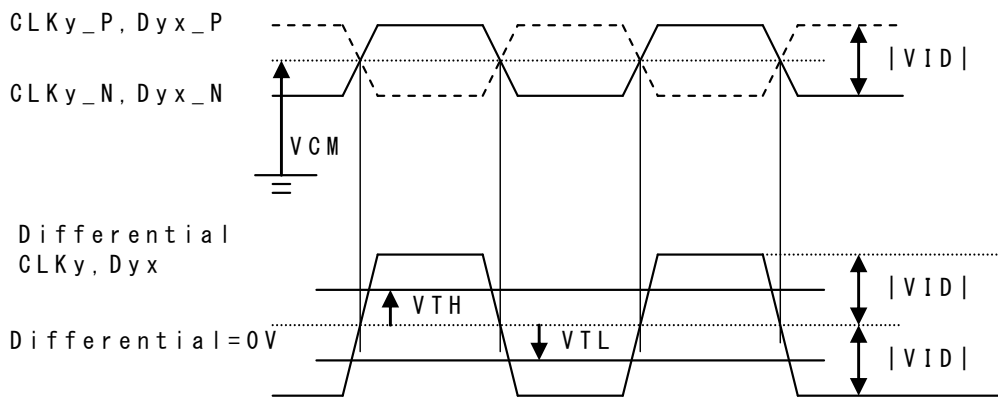
Note3: This product works even if the ripple voltage levels are over the permissible values, but there might be noise on the display image.

Note4: The permissible ripple voltage includes spike noise.

Note5: The load variation influence does not include.

Note6: Common mode voltage for LVDS receiver

Note7: DC characteristics (LVDS receiver part)



CLKy_P, CLKy_N: y = A,B
 Dyx_P, Dyx_N: y = A,B x = 0,1,2,3
 $|VID| = |**_P - **_N|$
 $VCM = (**_P + **_N) / 2$
 P: +, N: -
 **: CLKy or Dxy

5.2 DC Characteristics for Backlight Driving

(Ta= 25°C)

| Parameter | Symbol | min. | typ. | max. | Unit | Remarks | |
|-------------------------------|-------------------|-------|-------|---------------|-------|-----------------------------------|---|
| Power supply voltage | VDD | 10.8 | 12.0 | 13.2 | V | Note1 | |
| Power supply current | IDD | - | 1000 | 1250 Note2 | mA | At the maximum luminance control | |
| Permissible ripple voltage | VRPD | - | - | 200 | mVp-p | for VDD Note3, Note4, Note5 | |
| Input voltage for PWM signal | High | VDFH1 | 2.0 | - | 5.0 | V | - |
| | Low | VDFL1 | 0 | - | 0.4 | | |
| Input voltage for BRTC signal | High | VDFH2 | 2.0 | - | 5.0 | | |
| | Low | VDFL2 | 0 | - | 0.4 | | |
| Input current for PWM signal | High | IBCH1 | - | - | +200 | μA | - |
| | Low | IBCL1 | -200 | - | - | | |
| Input current for BRTC signal | High | IBCH2 | - | - | +200 | | |
| | Low | IBCL2 | -200 | - | - | | |
| PWM frequency | f _{PWM} | 200 | - | 1k | Hz | Note6, Note8 | |
| PWM duty ratio | DR _{PWM} | 1 | - | 100 | % | Note7, Note9, Note10 | |
| PWM pulse width | tPWH | 20 | - | - | μs | Note9, Note10 | |
| LED life time | Hr | - | 50000 | - | Hour | Note 11 | |

Table 5.2.1 LED Backlight Characteristics

Note1: When designing of the power supply, take the measures for prevention of surge voltage.

Note2: This value excludes peak current such as overshoot current.

Note3: This product works even if the ripple voltage levels are over the permissible values, but there might be noise on the display image.

Note4: The permissible ripple voltage includes spike noise.

Note5: The power supply lines (VDD and GND) may have ripple voltage during luminance control of LED. There is the possibility that the ripple voltage produces acoustic noise and signal wave noise in audio circuit and so on.

Note6: A recommended f_{PWM} value is as follows.

$$f_{PWM} = \frac{2n-1}{4} \times fv$$

(n = integer, fv = frame frequency of LCD module)

Note7:

$$DR_{PWM} = \frac{tPWH}{tPW}$$

tPWH: PWM pulse width, tPW: PWM dimming cycle(= 1/f_{PWM})

Note8: Depending on the frequency used, some noise may appear on the screen, please conduct a thorough evaluation.

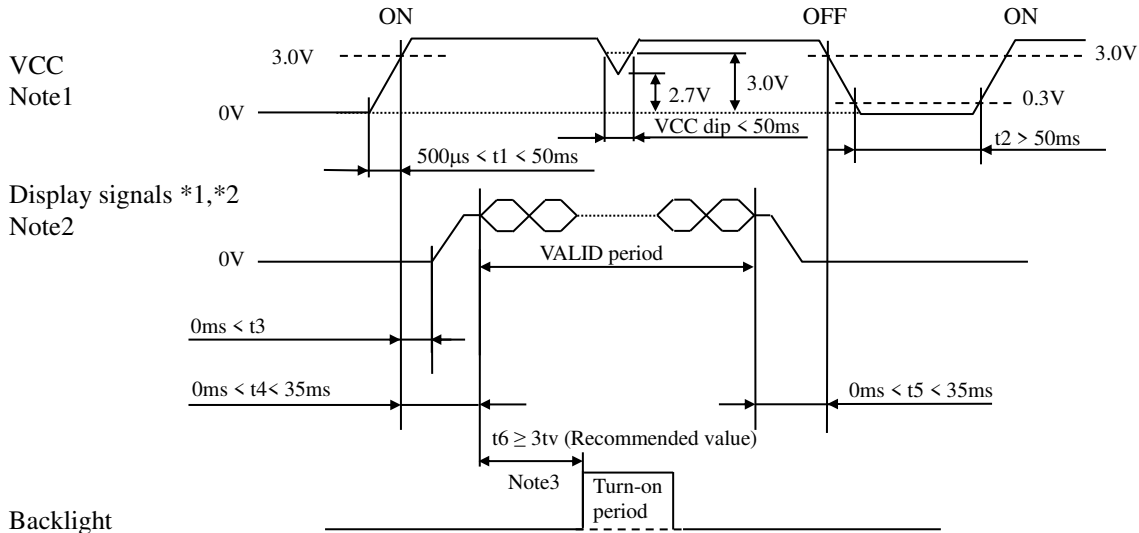
Note9: While the BRTC signal is high, do not set the tPWH (PWM pulse width) is less than minimum value. It may cause abnormal working of the backlight. In this case, turn the backlight off and then on again by BRTC signal.

Note10: Regardless of the PWM frequency, both PWM duty ratio and PWM pulse width must be always more than the minimum values.

Note11: Optical performance should be evaluated at Ta=25°C. Only If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is an estimated data.

5.3 Recommended Power ON/OFF Sequence

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|-----------------------------|--------|-----|-----|-----|------|--------|
| VCC on to VCC stable | t1 | 0.5 | - | 50 | ms | |
| VCC off to next VCC on | t2 | 50 | - | - | ms | |
| VCC stable to Signal on | t3 | 0 | - | - | ms | |
| VCC stable to Signal stable | t4 | 0 | - | 34 | ms | |
| Signal off to VCC off | t5 | 0 | - | 35 | ms | |
| Signal stable to BL on | t6 | 55 | - | - | ms | |



*1 DA0+/-, DA1+/-, DA2+/-, DA3+/-, CLKA+/-, DB0+/-, DB1+/-, DB2+/-, DB3+/-, CLKB+/-

*2 These signals should be measured at the terminal of 100Ω resistance.

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

Note2: Display signals (DA0+/-, DA1+/-, DA2+/-, DA3+/-, CLKA+/-, DB0+/-, DB1+/-, DB2+/-, DB3+/-, CLKB+/-) must be set to Low or High-impedance, except the VALID period (See above sequence diagram), in order to avoid the circuitry damage.

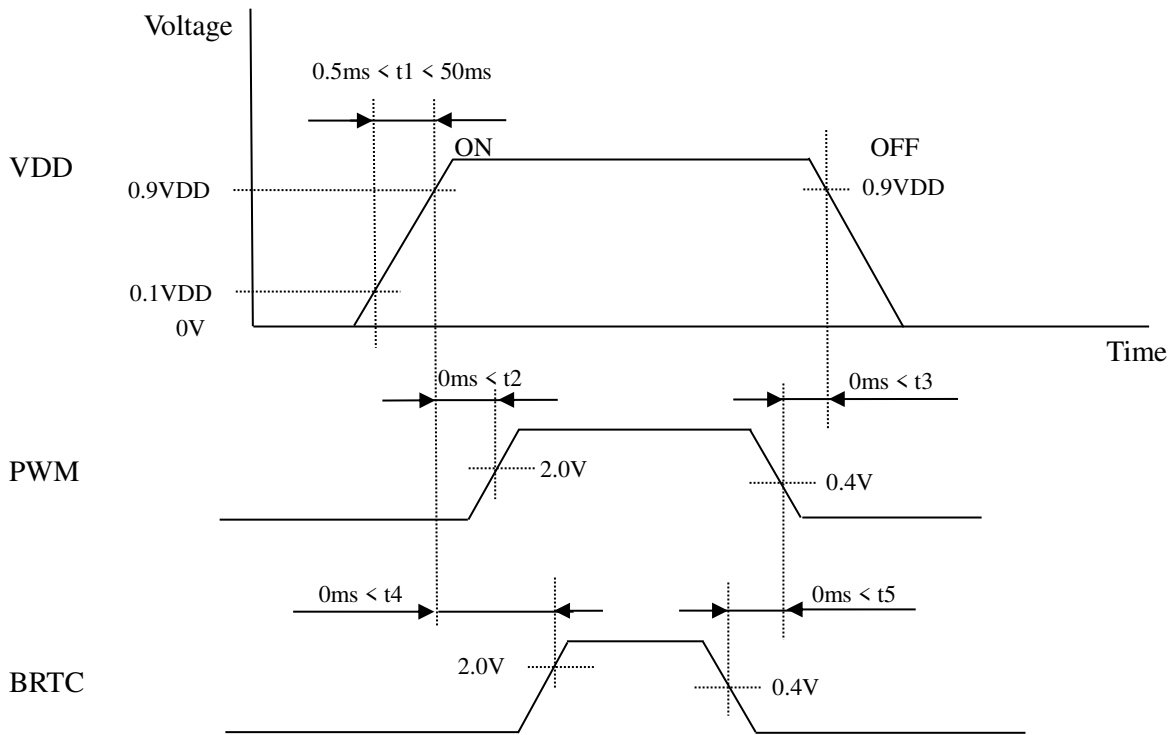
If some of display signals of this product are cut while this product is working, even if the signal input to it once again, it might not work normally. If a customer stops the display signals, VCC also must be shut down.

Note3: In order to avoid unstable data display, the backlight is recommended to turn on within the VALID period of display and function signals.

Recommended value: $t6 \geq 3tv$

(tv is vertical cycle (Please refer to 5.1 Timing characteristics))

5.4 LED Driver



5.5 LCD Module Block Diagram

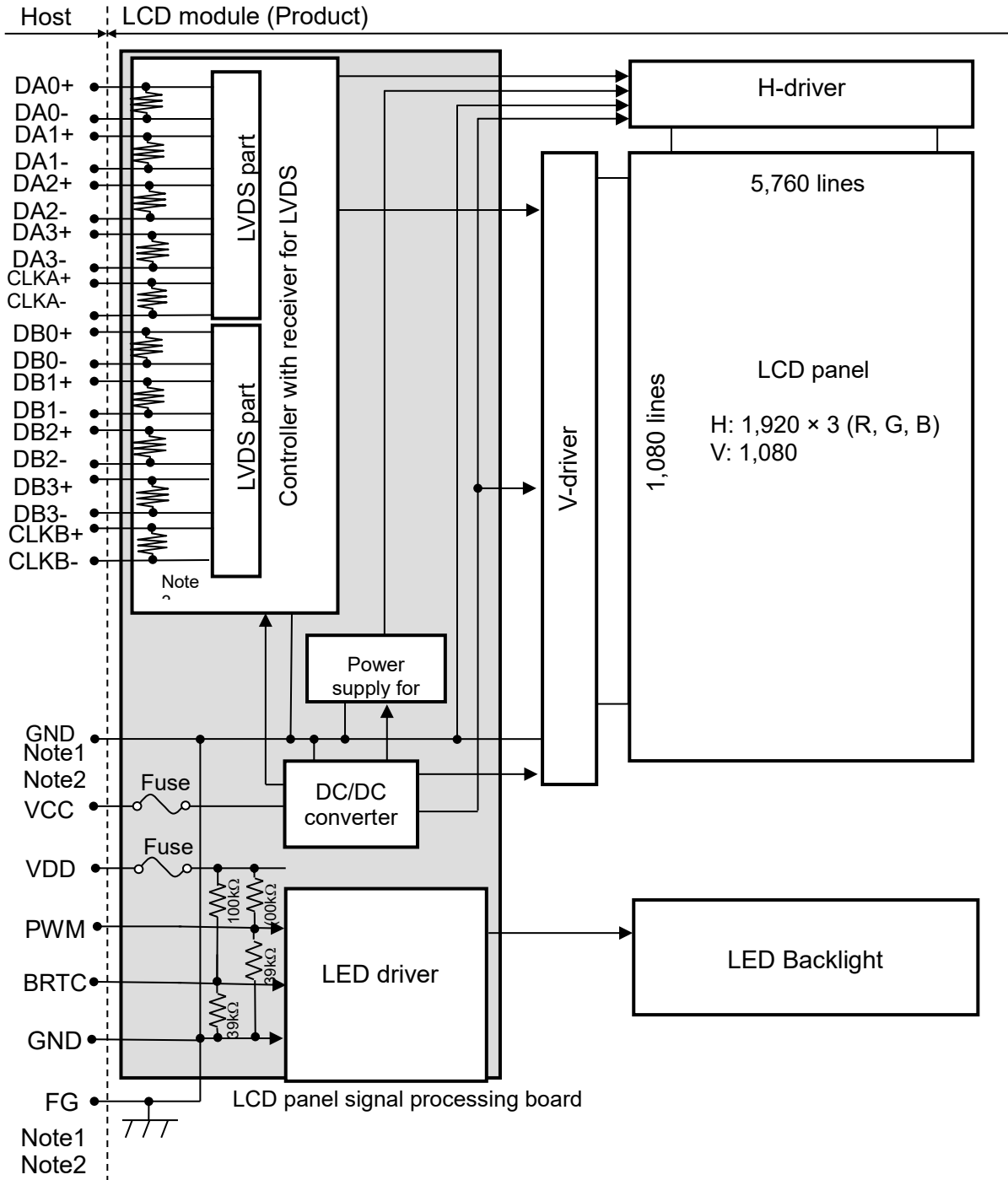


Figure 5.5.1 LCD Module Block Diagram

Note1: Relation between GND (Signal ground and LED driver ground) and FG (Frame ground) in the LCD module is as follows.

| | |
|---------|-----------|
| GND- FG | Connected |
|---------|-----------|

Note2: GND and FG must be connected to customer equipment's ground, and it is recommended that these grounds to be connected together in customer equipment.

Note3: Each pair of the LVDS signal has a 100Ω terminating resistance.

6. Interface Timing Characteristics

6.1 Timing Characteristics

(Note1, Note2, Note3)

| Parameter | | Symbol | min. | typ. | max. | Unit | Remarks |
|-----------|----------------------|----------------|-------|-------|-------|------|-----------------|
| CLK | Frequency | 1/tc | 68.64 | 70.94 | 71.74 | MHz | 14.10ns (typ.) |
| | Duty ratio | - | - | | | - | - |
| | Rise time, Fall time | - | | | | ns | |
| DATA | CLK-DATA | Setup time | - | | | ns | - |
| | | Hold time | | | | ns | |
| | Rise time, Fall time | - | | | | ns | |
| DE | Horizontal | Cycle | 13.19 | 14.83 | 16.53 | μs | 67.43kHz (typ.) |
| | | | 1040 | 1050 | 1060 | CLK | |
| | | Display period | 960 | | | CLK | - |
| | Vertical (One frame) | Cycle | - | 16.7 | - | ms | 60Hz (typ.) |
| | | | 1100 | 1126 | 1128 | H | |
| | | Display period | 1,080 | | | H | - |
| | CLK-DE | Setup time | - | - | | | ns |
| Hold time | | - | ns | | | | |
| | Rise time, Fall time | - | ns | | | | |

Table 6.1.1 Input Setup Timing Parameters Requirement

Note1: Definition of parameters is as follows.

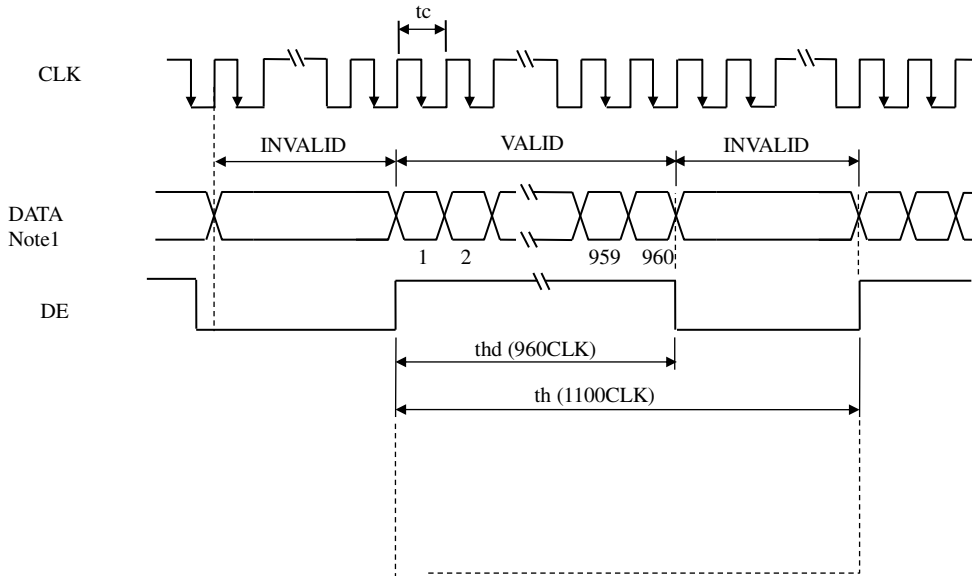
$$tc = 1CLK, th = 1H$$

Note2: See the data sheet of LVDS transmitter.

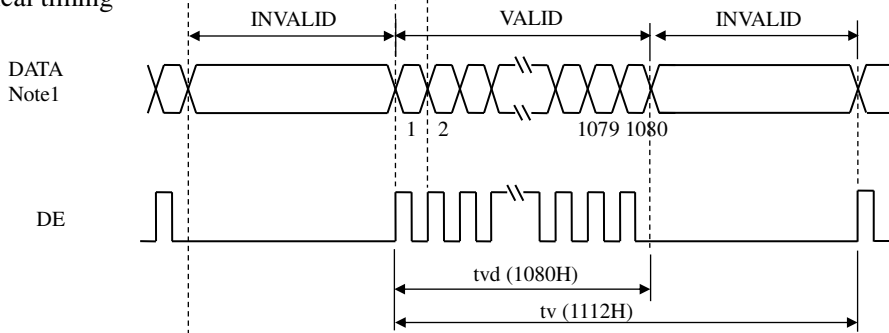
Note3: Vertical cycle (tv) should be specified in integral multiple of Horizontal cycle (th).

6.2 Input Signal Timing Chart

Horizontal timing



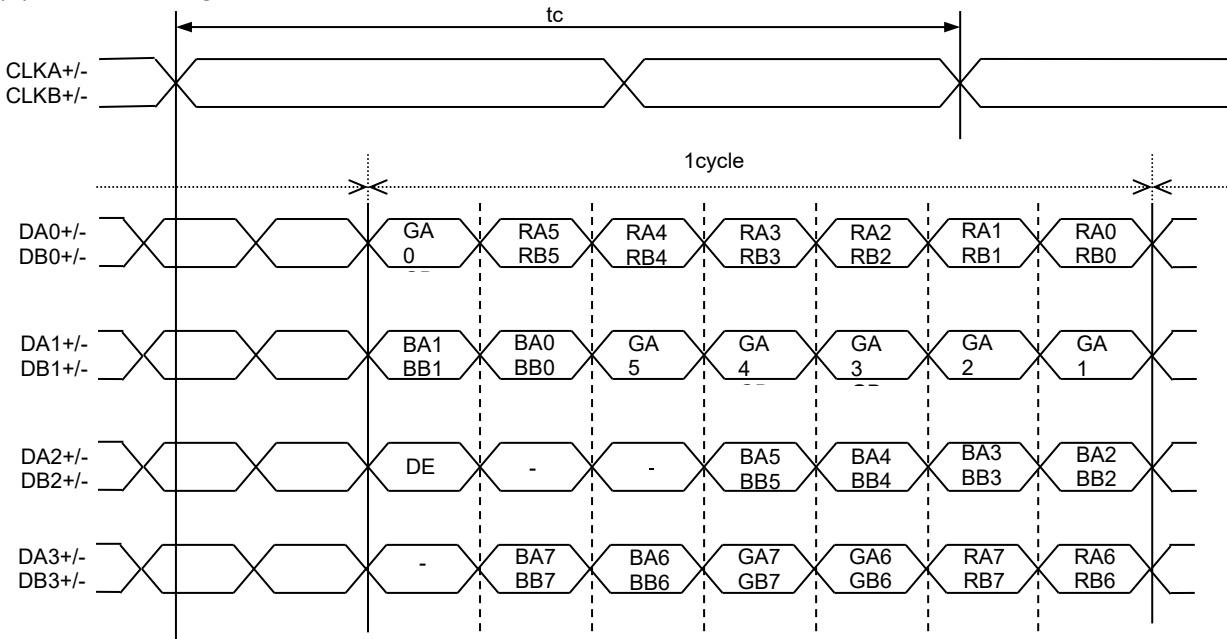
Vertical timing



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

6.3 Input Data Mapping

(1) Input data signal:



7. Optical Characteristics

Ta=25°C

| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark | |
|----------------|-----------------------------------|-----------------|-----|-------|-------|-------------------|----------------|----------------|
| View Angles | θT | CR ≥ 10 | 70 | 88 | - | Degree | Note 2 | |
| | θB | | 70 | 88 | - | | | |
| | θL | | 70 | 88 | - | | | |
| | θR | | 70 | 88 | - | | | |
| Contrast Ratio | CR | θ=0° | 600 | 1000 | - | - | Note1 Note3 | |
| Response Time | T _{ON} +T _{OFF} | 25°C | - | 25 | 40 | ms | Note1 Note4 | |
| Chromaticity | White | Backlight is on | x | 0.247 | 0.297 | 0.347 | - | Note5 Note1 |
| | | | y | 0.276 | 0.326 | 0.376 | | |
| | Red | | x | 0.580 | 0.630 | 0.680 | | |
| | | | y | 0.277 | 0.327 | 0.377 | | |
| | Green | | x | 0.227 | 0.277 | 0.327 | | |
| | | | y | 0.574 | 0.624 | 0.674 | | |
| | Blue | | x | 0.101 | 0.151 | 0.201 | | |
| | | | y | 0.011 | 0.061 | 0.111 | | |
| Uniformity | U | - | 72 | 80 | - | % | Note1 Note6 | |
| NTSC | - | - | 65 | 72 | - | % | Note 5 | |
| Luminance | L | | 280 | 400 | - | cd/m ² | Note1 Note7 | |

Table 7.1 Optical Parameters

Test Conditions:

1. The ambient temperature is 25±2°C .humidity is 65±7%. PWM duty ratio is 100%.
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 20 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

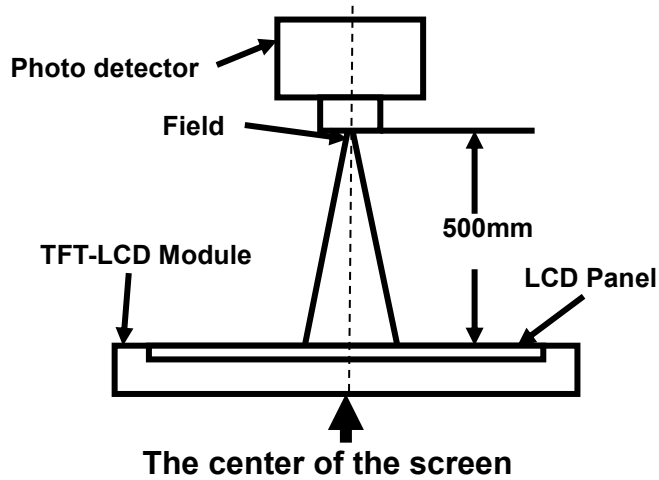


Fig1.Measurement Set Up

Note2: Definition of viewing angle range and measurement system.

Viewing angle is measured at the center point of the LCD .

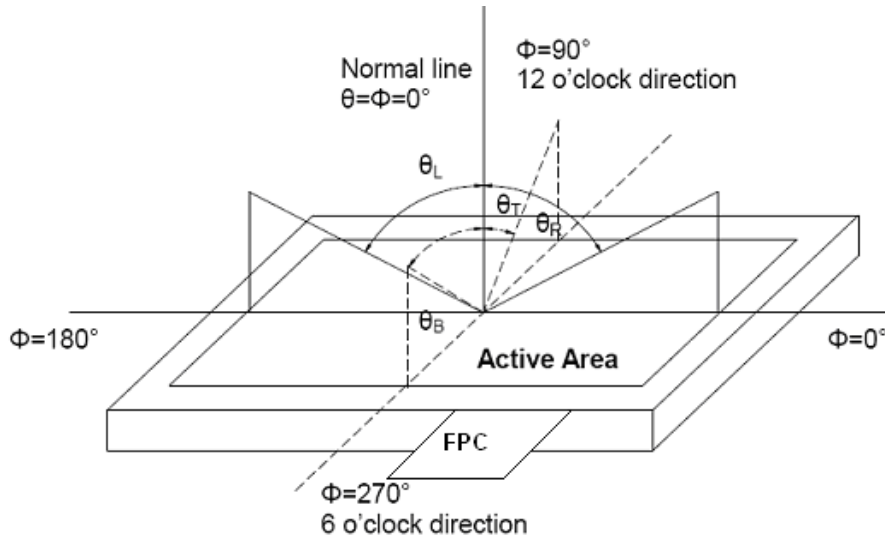


Fig2. Measurement viewing angle

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 “Black” state and “White” state. Fall time (Ton) is the time between photo detector output intensity changed from 10% to 90%. And rise time (Toff) is the time between photo detector output intensity changed from 90% to 10%.

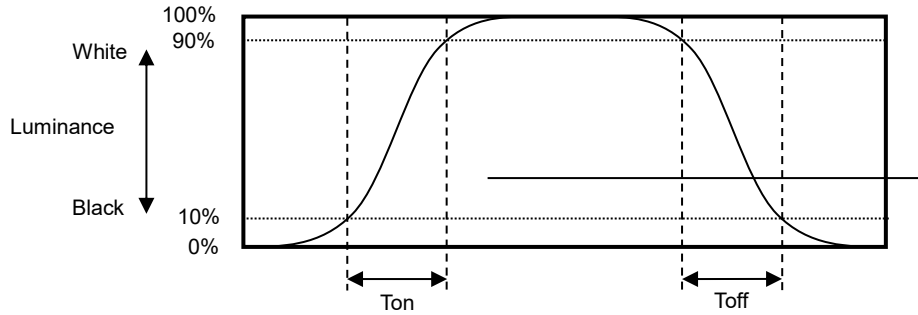


Fig3.Response Time Testing

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

The luminance uniformity is calculated by using following formula.

$$\text{Luminance uniformity (LU)} = \frac{\text{Minimum luminance from ① to ⑤}}{\text{Maximum luminance from ① to ⑤}}$$

The luminance is measured at near the 5 points shown below.

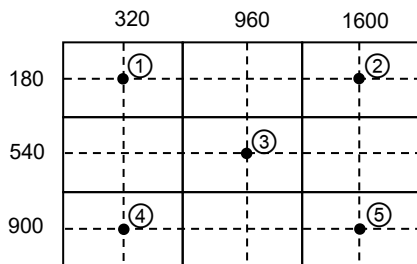


Fig4. Definition of uniformity

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 | ①Ts = $+70 \pm 3^{\circ}\text{C}$, 240 hours (Note1) ②Display data is white. | |
| 2 | Low Temperature Operation | Ts = $-20 \pm 3^{\circ}\text{C}$, 240 hours (Note1) | |
| 3 | High Temperature & High Humidity Operation | ①Ta = $+60^{\circ}\text{C}$, 60% RH max, 240hours ②Display data is white. | |
| 4 | Thermal Shock (non-operation) | ① $-20 \pm 3^{\circ}\text{C}$...30minutes $+60 \pm 3^{\circ}\text{C}$...30minutes ② 100cycles, 1hour/cycle ③ Temperature transition time is within 5 minutes. | No display malfunctions |
| 5 | ESD(Operation) | ① 150pF, R=150Ω,10kV ② 9 places on a panel surface Note2 ③ 10 times each point at 1 sec interval | |
| 6 | Vibration (Non-operation) | ① 5 to 100Hz, 11.76m/s ² ② 1 minute/cycle ③ X, Y, Z directions ④ 50 times each direction | No display malfunctions No physical damages |
| 7 | Shock (Non-operation) | ① 294m/ s ² , 11ms ② $\pm X$, $\pm Y$, $\pm Z$ directions ③ 3 times each direction | |

Table 8.1 RA test condition

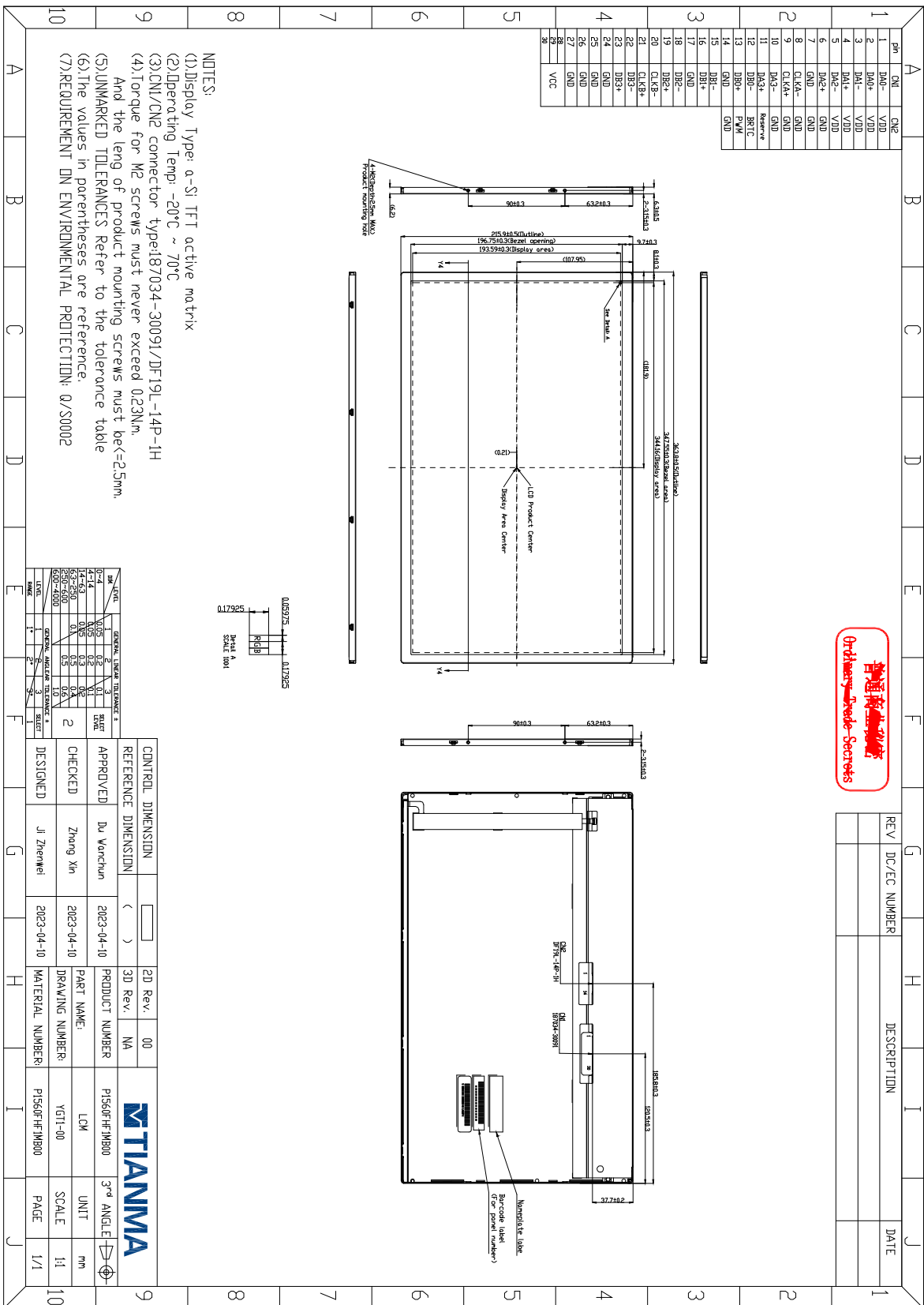
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

9. Mechanical Drawing



普通螺钉规格
Ordinary Screw Specs

10. Packing Instruction

| No | Item | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Q'ty | Remark |
|----|-----------------|------------------|---------------------|-----------------|------|--------|
| 1 | LCM module | P1560FHF1MB00 | 363.8 x 215.9 x 6.3 | 0.618 | 10 | |
| 2 | Partition board | Corrugated paper | 384 x 229 x 5 | 0.05 | 2 | |
| 3 | Anti-static Bag | LD-PE | 435 x 325 x 0.05 | 0.005 | 10 | |
| 4 | EPP1 | EPP | 496 x 80 x 40 | 0.025 | 1 | |
| 5 | EPP2 | EPP | 496 x 375 x 125 | 0.22 | 2 | |
| 6 | Carton | Corrugated paper | 515 x 388 x 520 | 1.15 | 1 | |
| 7 | Barcode Label | Paper | 104x76 | 0.001 | 1 | |
| 8 | Total weight | 7.946 Kg±5 % | | | | |

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

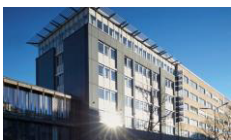
Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

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 carefully to limit or stop its function when over current is detected on the LED.



ALL TECHNOLOGIES. ALL COMPETENCIES. ONE SPECIALIST.



DATA MODUL AG
Landsberger Straße 322
DE-80687 Munich
Phone: +49-89-56017-0

DATA MODUL WEIKERSHEIM GMBH
Lindenstraße 8
DE-97990 Weikersheim
Phone: +49-7934-101-0

