



晶采光電科技股份有限公司
AMPIRE CO., LTD.

/SIMPLEPLUS
Touch Displays

SPECIFICATIONS FOR LCD MODULE

| | |
|--------------------------|----------------------------------|
| CUSTOMER | |
| CUSTOMER PART NO. | |
| AMPIRE PART NO. | AMA-101A08-DU2511-G020-01 |
| APPROVED BY | |
| DATE | |

☐ Preliminary Specification

☒ Formal Specification

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| Approved by | Checked by | Organized by |
|-------------|------------|--------------|
| Kokai | Simon | Tank |

*This specification is subject to change without notice.

RECORD OF REVISION

| Revision Date | Page | Contents | Editor |
|---------------|------|-------------|--------|
| 2021/05/28 | -- | New Release | Tank |
| | | | |

1.0 General Descriptions

1.1 Introduction

The LCM is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, a backlight system, column driver and row driver circuit. This TFT LCD has a 10.1-inch diagonally measured active display area with WXGA resolution (1280 horizontal by 800 vertical pixels array).

1.2 Features

- 10.1" TFT LCD Panel
- LED Backlight System
- Supported WXGA 1280x800 pixels resolution
- Compatible with RoHS Standard
- Projective Capacitive Touch :
 - Interface: USB
 - Touch controller: ILI2511 (ILITEK)
 - Cover Lens: T = 2.0mm
 - Printing : Black border (Pantone: Black)

1.3 Product Summary

| Items | Specifications | Unit |
|------------------------------|------------------------|--------|
| Screen Diagonal | 10.1 | Inch |
| Active Area | 216.96(H) x 135.6(V) | mm |
| Pixel Format | 1280(RGB) x800 | - |
| Pixel Pitch | 0.1695(H)x0.1695 (V) | mm |
| Pixel Arrangement | R.G.B. Vertical Stripe | - |
| Display Mode | Normally Black | - |
| White Luminance | 425(Typ.) | cd /m2 |
| Contrast Ratio | 800 : 1 (Typ.) | - |
| Response Time | 25 | msec |
| Input Voltage | 3.3 | V |
| Electrical Interface (Logic) | LVDS | - |
| Support Color | 16.7M | - |

2.0 Absolute Maximum Ratings

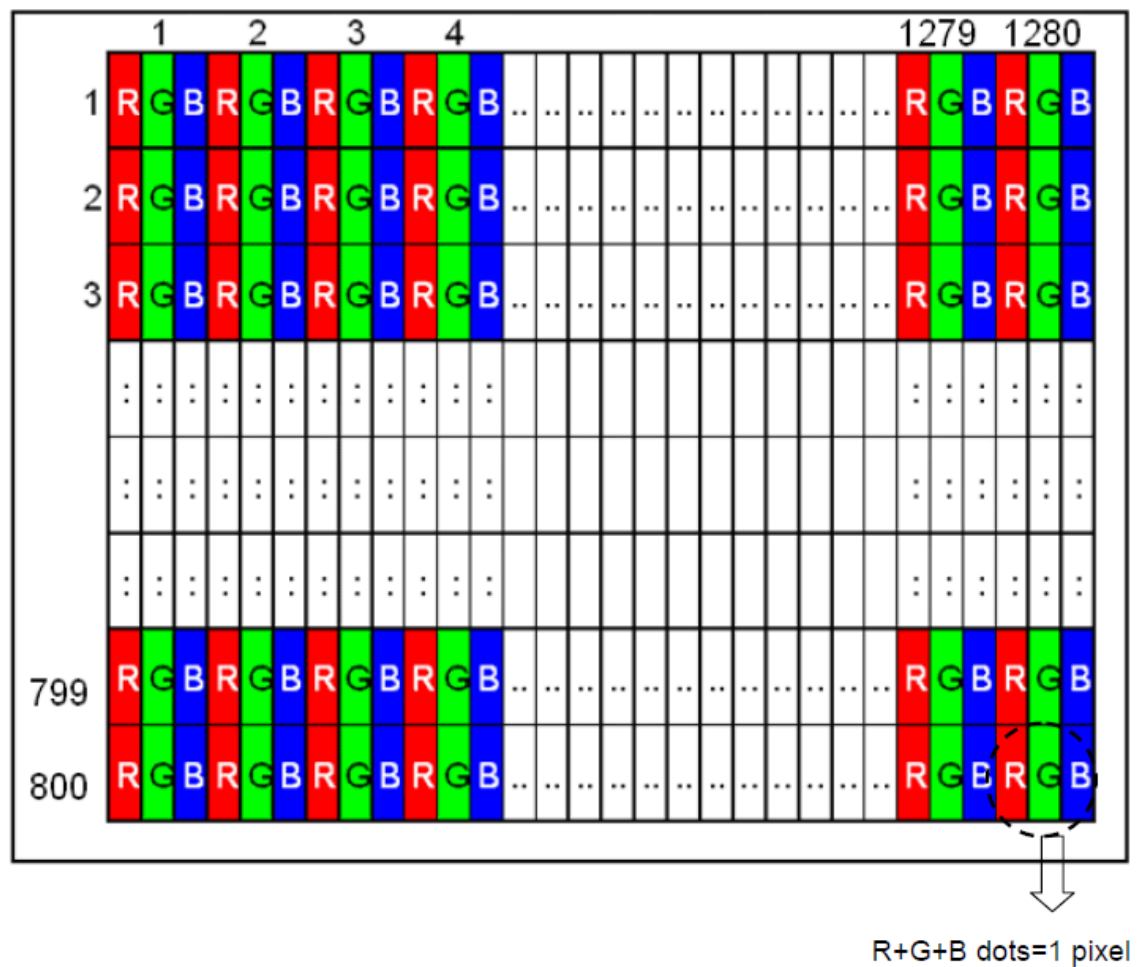
| ITEM | SYMBOL | VALUES | | UNIT | REMARK |
|-----------------------|-----------|--------|-----|------|--------------------|
| | | MIN | MAX | | |
| Power Voltage | V_{DD} | -0.3 | 4.0 | V | VSS=0V, TA=25°C |
| | V_{LED} | -0.3 | 24 | V | |
| Operation Temperature | T_{op} | -20 | 70 | °C | |
| Storage Temperature | T_{st} | -30 | 80 | °C | |

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3.0 Pixel Format Image

Figure 2 shows the relationship of the input signals and LCD pixel format image.

Figure 2 Pixel Format



4.0 Optical Characteristics

The optical characteristics are measured under stable conditions as following notes

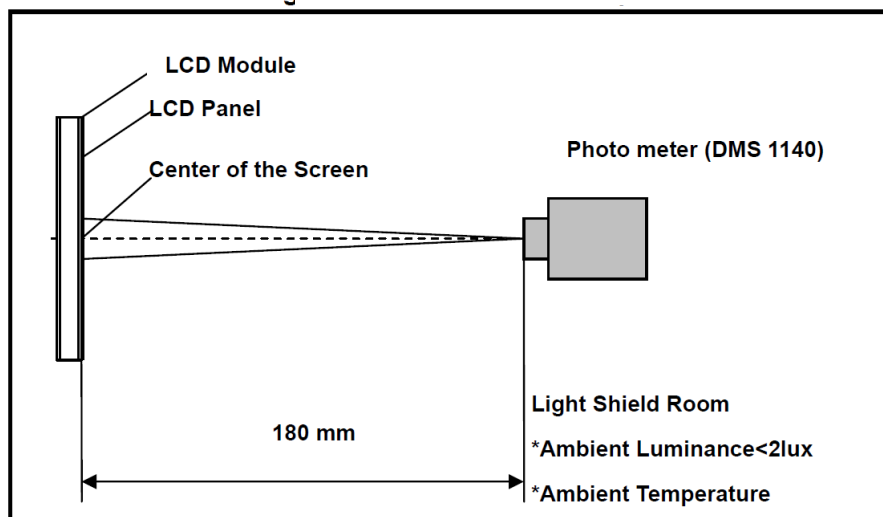
Table 2 Optical Characteristics

| Item | Conditions | | Min. | Typ. | Max. | Unit | Note |
|---------------------------------|------------------|------------|---------------|-------|---------------|-------------------|-------------|
| Viewing Angle (CR>10) | Horizontal | θ_L | (75) | (85) | - | degree | (1),(2),(3) |
| | | θ_R | (75) | (85) | - | | |
| | Vertical | θ_T | (75) | (85) | - | | |
| | | θ_B | (75) | (85) | - | | |
| Contrast Ratio | Center | | (600) | (800) | - | - | (1),(2),(4) |
| Response Time | Rising | | - | - | - | ms | (1),(2),(5) |
| | Falling | | - | - | - | ms | |
| | Rising + Falling | | - | 25 | - | ms | |
| Color Chromaticity (CIE1931) | NTSC | | - | 45 | - | % | (1),(2) |
| | Red | x | Typ. -0.05 | 0.561 | Typ. +0.05 | - | (1),(2) |
| | Red | y | | 0.334 | | - | |
| | Green | x | | 0.341 | | - | |
| | Green | y | | 0.568 | | - | |
| | Blue | x | | 0.161 | | - | |
| | Blue | y | | 0.129 | | - | |
| | White | x | | 0.313 | | - | |
| | White | y | | 0.329 | | - | |
| White Luminance | Center | | 340 | 425 | - | cd/m ² | (1),(2),(6) |
| Luminance Uniformity | 9Points | | 70 | 75 | - | % | (1),(2),(6) |

Note(1) Measurement Setup:

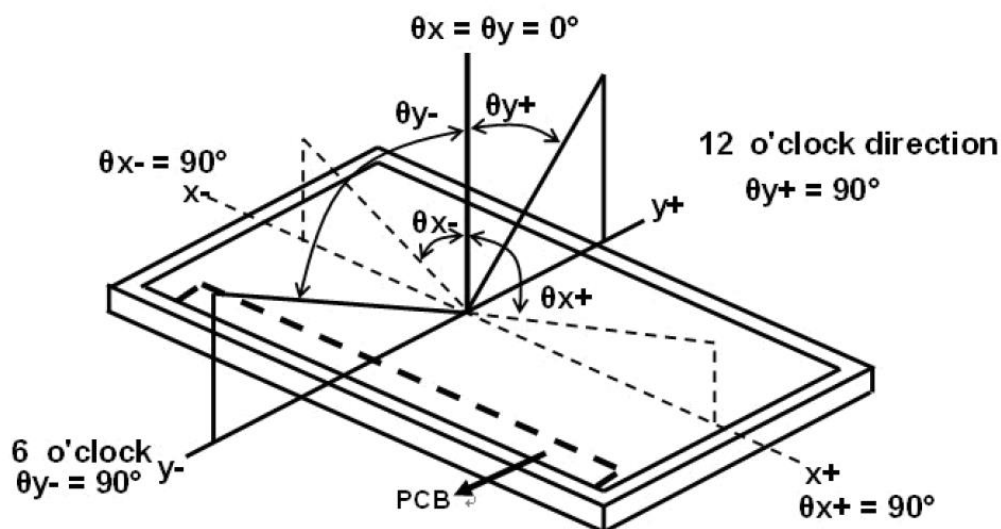
The LCD module should be stabilized at given temperature(25°C) for 15 minutes to Avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.

Fig



Note(2) The back-light driving current $I_{BL} = 180mA$

Note(3) Definition of viewing angle:



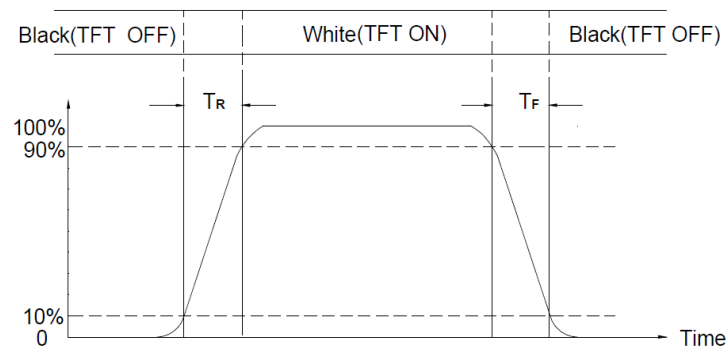
Note(4) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

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

L63: Luminance of gray level 255, L0: Luminance of gray level 0

Note(5) Definition of Response Time (TR, TF)

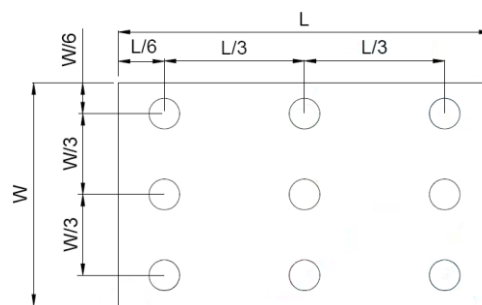


Note(6) Definition of brightness luminance

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

$$\text{Luminance Uniformity (Yu)} = \frac{B_{\min}}{B_{\max}}$$

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



B_{\max} : The measured maximum luminance of all measurement position.

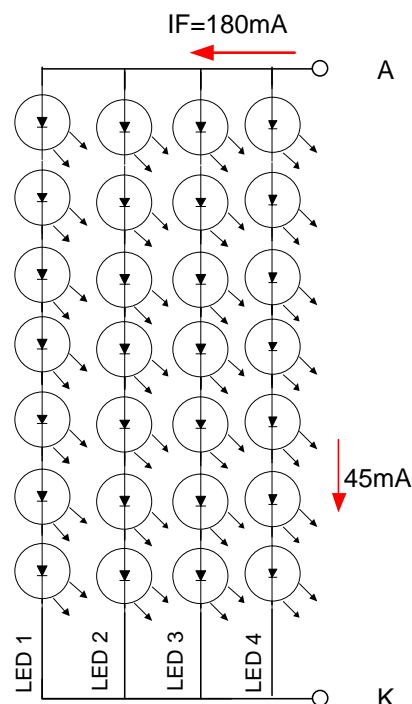
B_{\min} : The measured minimum luminance of all measurement position.

5.0 Backlight Characteristics

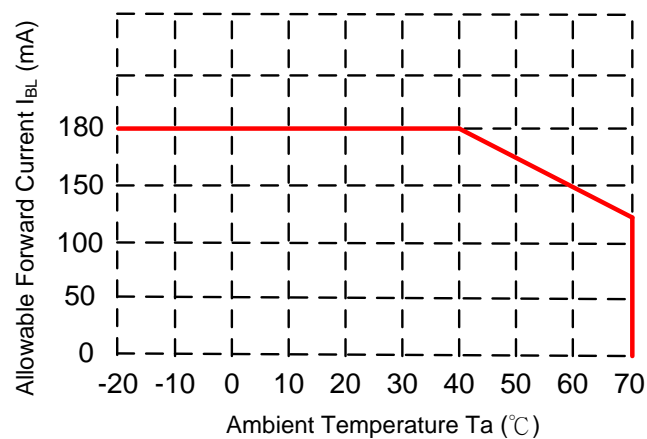
| ITEM | SYMBOL | MIN | TYP | MAX | UNIT | CONDITION |
|-----------------------|----------|-----|-----|------|------|----------------|
| LED Backlight Voltage | V_{BL} | -- | 21 | 23.1 | V | For reference |
| LED Backlight Current | I_{BL} | - | 180 | -- | mA | Ta=25°C |
| LED Life Time | | -- | 50K | - | KHr | Note* |

Note* : Brightness to be decreased to 50% of the initial value.

Ta=25°C



When LCM is operated over 40°C ambient temperature, the I_{BL} should be follow :



6.0 Electrical Characteristics

6.1 TFT LCD Module Interface Connector

Table 4 Connector Name / Designation

| Item | Description |
|----------------------------|-----------------------------|
| Manufacturer / Part Number | Starconn / 300E40-0010RA-G3 |
| Mating Model Number | TBD or compatible |

Table 5 Signal Pin Assignment

| Pin # | Signal Name | Description | Remarks |
|-------|-------------|--|---------|
| 1 | NC | Not Connect | - |
| 2 | VDD | Power Supply, 3.3V (typical) | - |
| 3 | VDD | Power Supply, 3.3V (typical) | |
| 4 | VDD_EDID | Power Supply for EDID I2C Flash IC | |
| 5 | SCL_EDID | I2C Serial Clock for EDID I2C Flash IC | |
| 6 | SDA_EDID | I2C Serial Data for EDID I2C Flash IC | |
| 7 | NC | Not Connect | |
| 8 | LV0N | -LVDS differential data input | |
| 9 | LV0P | +LVDS differential data input | |
| 10 | GND | Ground | |
| 11 | LV1N | -LVDS differential data input | |
| 12 | LV1P | +LVDS differential data input | |
| 13 | GND | Ground | |
| 14 | LV2N | -LVDS differential data input | |
| 15 | LV2P | +LVDS differential data input | |
| 16 | GND | Ground | |
| 17 | LVCLKN | -LVDS differential data input | |
| 18 | LVCLKP | +LVDS differential data input | |
| 19 | GND | Ground | |
| 20 | LV3N | -LVDS differential data input | |
| 21 | LV3P | +LVDS differential data input | |
| 22 | GND | Ground | |
| 23 | NC | Not Connect | |
| 24 | NC | Not Connect | |
| 25 | NC | Not Connect | |
| 26 | NC | Not Connect | |
| 27 | NC | Not Connect | |
| 28 | NC | Not Connect | |
| 29 | NC | Not Connect | |
| 30 | NC | Not Connect | |
| 31 | NC | Not Connect | |
| 32 | NC | Not Connect | |
| 33 | NC | Not Connect | |
| 34 | NC | Not Connect | |
| 35 | BIST | BIST pin. (Keep NC or GND if not use.) | |
| 36 | NC | Not Connect | |
| 37 | NC | Not Connect | |
| 38 | NC | Not Connect | |
| 39 | NC | Not Connect | |
| 40 | NC | Not Connect | |

Note: All input signals shall be low or Hi-resistance state when VDD is off.

6.2 LVDS Receiver

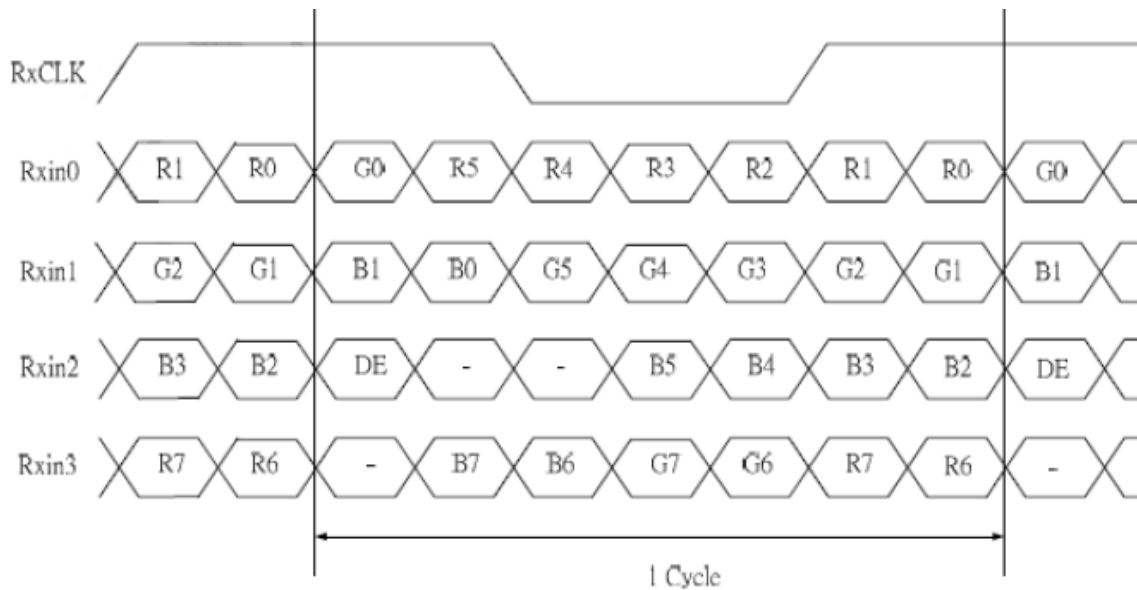
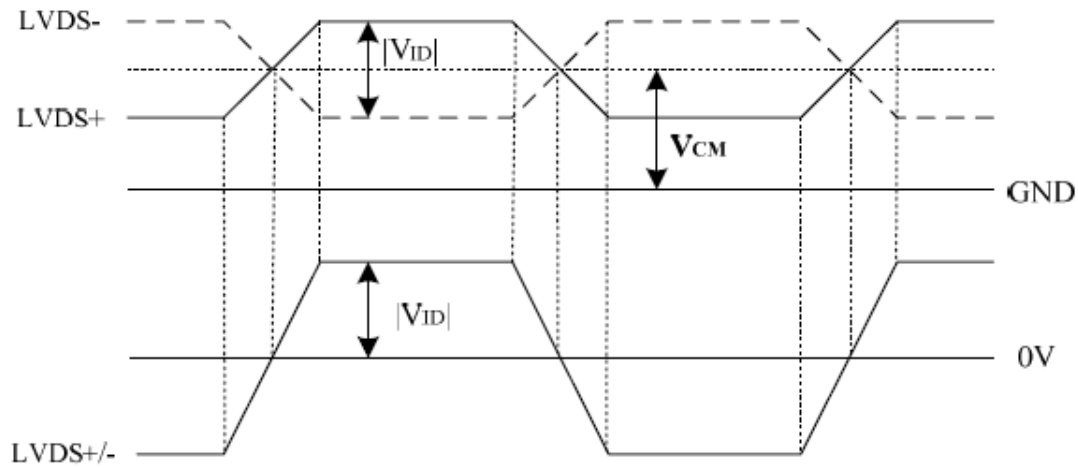
6.2.1 Signal Electrical Characteristics For LVDS Receiver

Table 7 LVDS Receiver Electrical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|------------------------------|-----------------|------------------|------|-------------------------|------|----------------|
| Differential Input High | V_{th} | - | - | +100 | mV | $V_{CM}=+1.2V$ |
| Differential Input Low | V_{tl} | -100 | - | - | mV | $V_{CM}=+1.2V$ |
| Magnitude Differential Input | $ V_{ID} $ | 200 | - | 400 | mV | - |
| Common Mode Voltage | V_{CM} | $0.3+(V_{ID}/2)$ | - | $V_{DD}-1.2-(V_{ID}/2)$ | V | - |
| Common Mode Voltage | ΔV_{CM} | - | - | 50 | mV | $V_{CM}=+1.2V$ |

Note (1) Input signals shall be low or Hi-Z state when VDD is off.

(2) All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.



7.0 Interface Timings

7.1 Timing Characteristics

Interface Timings

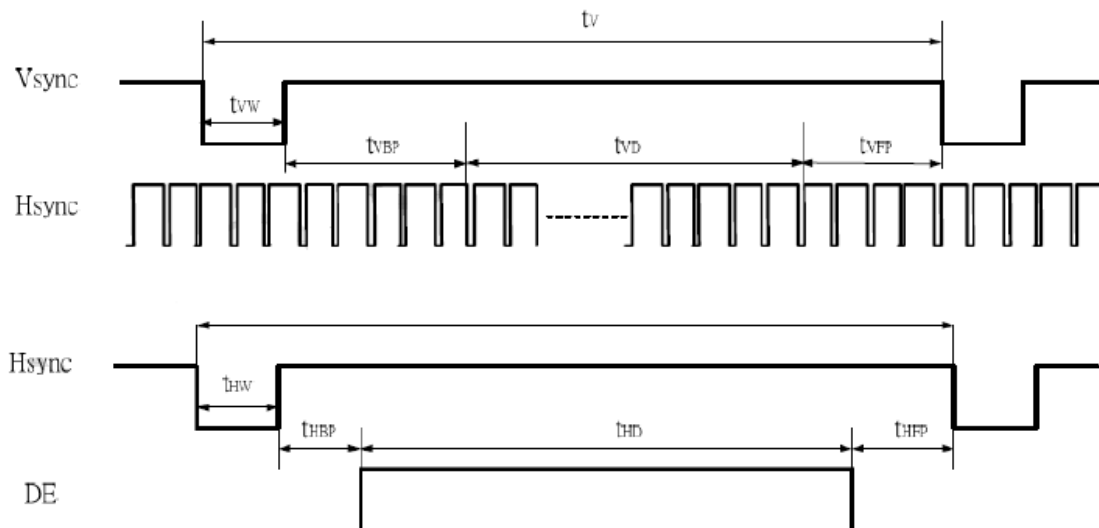
| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|----------------------|--------|---------|---------|---------|--------|
| LVDS Clock Frequency | Fclk | (70.0) | (72.4) | (76.6) | MHz |
| H Total Time | HT | (1,410) | (1,440) | (1,470) | Clocks |
| H Active Time | HA | | 1,280 | | Clocks |
| V Total Time | VT | (828) | (838) | (868) | Lines |
| V Active Time | VA | | 800 | | Lines |
| Frame Rate | FV | - | (60) | - | Hz |

Note1: $HT * VT * \text{Frame Frequency} \leq (76.6) \text{ MHz}$

Note2: All reliabilities are specified for timing specification based on refresh rate of 60Hz.

7.2 Timing Diagram of Interface Signal (DE mode)

Figure 8 Timing Characteristics



8.0 Power Consumption

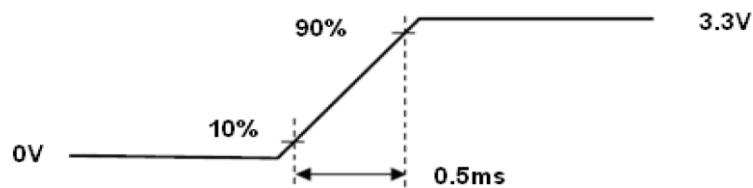
Input power specifications are as follows.

Table 8 Power Consumption

| Item | | Symbol | Min | Typ. | Max | Unit | Note |
|--|---------------|--------|-----|-------|-----|------|-------------|
| LCD Drive Voltage | | VDD | 3.0 | 3.3 | 3.6 | V | (3) |
| VDD Current | White Pattern | IDD | -- | 0.295 | -- | A | (2),(3) |
| VDD Power Consumption | White Pattern | PDD | -- | -- | 1.2 | W | (2),(3) |
| LED Power Consumption | | PLED | | | 8.5 | W | (2),(3) |
| Rush Current | | Irush | | | 1.5 | A | (1),(3),(4) |
| Allowable Logic/LCD Drive Ripple Voltage | | VDDrp | | | 300 | mV | (3) |

Note (1) Measure Condition

Figure 9 VDD rising time

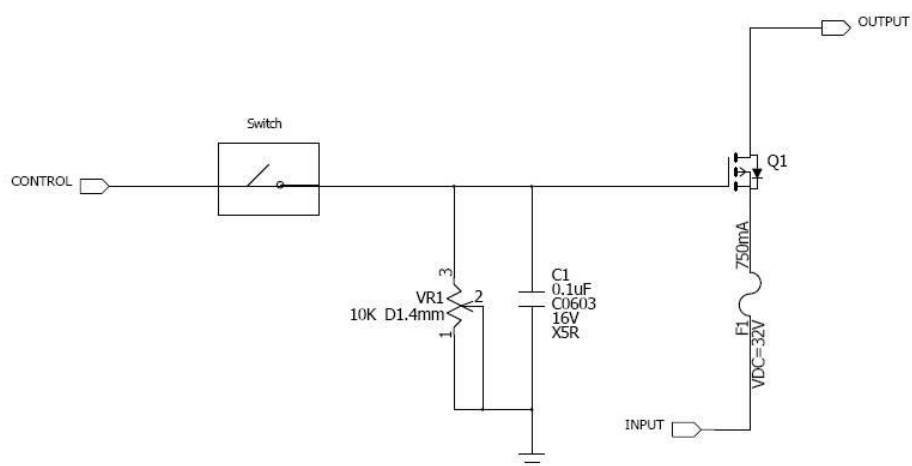


VDD rising time

Note (2) Frame Rate=60Hz, VDD=3.3V, DC Current.

Note (3) Operating temperature 25°C , humidity 55%RH.

Note (4) The reference measurement circuit of rush current.



9.0 Power ON/OFF Sequence

Power on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.

Figure 11 Power Sequence

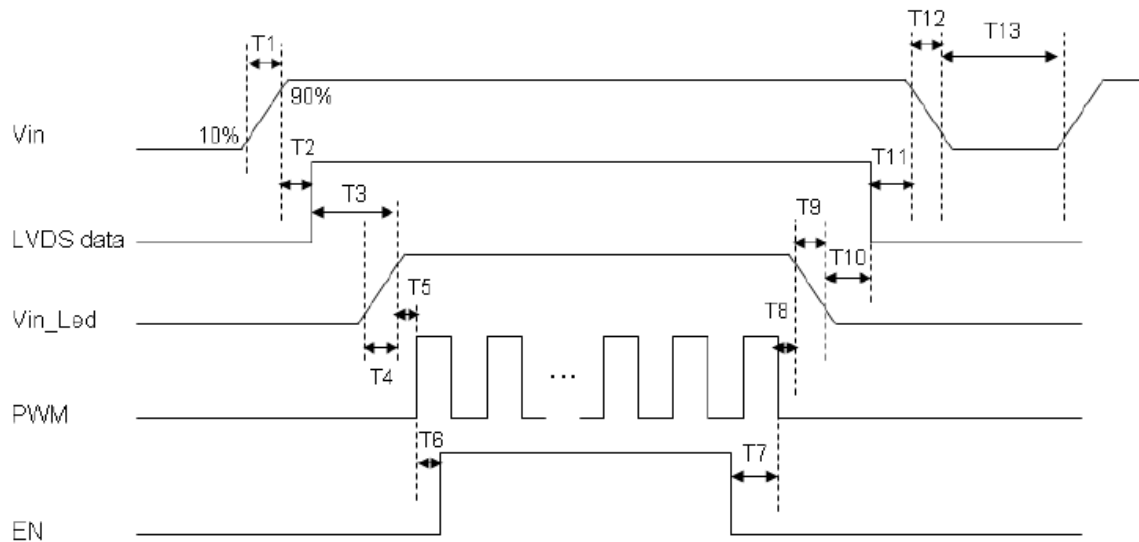


Table 9 Power Sequencing Requirements

| Parameter | Symbol | Unit | Min | Typ. | Max |
|--|--------|------|-----|------|-----|
| VIN Rise Time | T1 | ms | 0.5 | -- | 10 |
| VIN Good to Signal Valid | T2 | ms | 30 | -- | 90 |
| Signal Valid to Backlight On | T3 | ms | 200 | -- | -- |
| Backlight Power On Time | T4 | ms | 0.5 | -- | -- |
| Backlight VDD Good to System PWM On | T5 | ms | 10 | -- | -- |
| System PWM ON to Backlight Enable ON | T6 | ms | 10 | -- | -- |
| Backlight Enable Off to System PWM Off | T7 | ms | 0 | -- | -- |
| System PWM Off to B/L Power Disable | T8 | ms | 10 | -- | -- |
| Backlight Power Off Time | T9 | ms | -- | 10 | 30 |
| Backlight Off to Signal Disable | T10 | ms | 200 | -- | -- |
| Signal Disable to Power Down | T11 | ms | 0 | -- | 50 |
| VIN Fall Time | T12 | ms | -- | 10 | 30 |
| Power Off | T13 | ms | 500 | -- | -- |

10 Touch Panel Unit

10.1 Basic Characteristics

| Item | Specification |
|------------------------|---|
| Interface Type | Projective Capacitive Multi-Touch Panel |
| Activation | Multi-fingers or Single-finger |
| X/Y Position Reporting | Absolute Position |
| Touch Force | No contact pressure required |
| Calibration | No need for calibration |
| Report Rate | Approx. 80 points/sec |
| Interface | USB |
| Control IC | ILI2511 |

10.2 Specify the normal operating condition

(GND=0V)

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|----------------------|------------------|------|-------|------|------|------|
| Power Supply Voltage | VIN | 4.75 | 5.0 | 5.25 | V | |
| Power Consumption | I _{VIN} | | T.B.D | | mA | |

10.3 Interface

| Pin No. | Symbol | Function |
|---------|--------|--------------------|
| 1 | VIN | USB Power Input 5V |
| 2 | D+ | USB Data+ |
| 3 | D- | USB Data- |
| 4 | NC | No connection |
| 5 | NC | No connection |
| 6 | GND | Power Ground |

11 RELIABILITY TEST CONDITIONS

| Test Item | Test Conditions | Note |
|----------------------------|---|------|
| High Temperature Operation | 70±3°C ,Dry t=240 hrs | |
| Low Temperature Operation | -20±3°C, Dry t=240 hrs | |
| High Temperature Storage | 80±3°C , Dry t=240 hrs | 1,2 |
| Low Temperature Storage | -30±3°C ,Dry t=240 hrs | 1,2 |
| Thermal Shock Test | -20°C ~ 25°C ~ 70°C 30 min. 5 min. 30 min. (1 cycle) Total 100 cycle(Dry) | 1,2 |
| Storage Humidity Test | 60 °C, Humidity 90%, 240 hrs | 1,2 |
| Vibration Test (Packing) | Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis | 2 |

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Note 3 : The module shouldn't be tested more than one condition, and all the test conditions are independent.

Note 4 : All the reliability tests should be done without protective film on the module.

Definitions of life end point:

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

12 USE PRECAUTIONS

12.1 Handling precautions

- 1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
- 2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
- 3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
- 4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

12.2 Installing precautions

- 1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. $1\text{M}\Omega$ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
- 2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
- 3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
- 4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

12.3 Storage precautions

- 1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
- 2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
- 3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

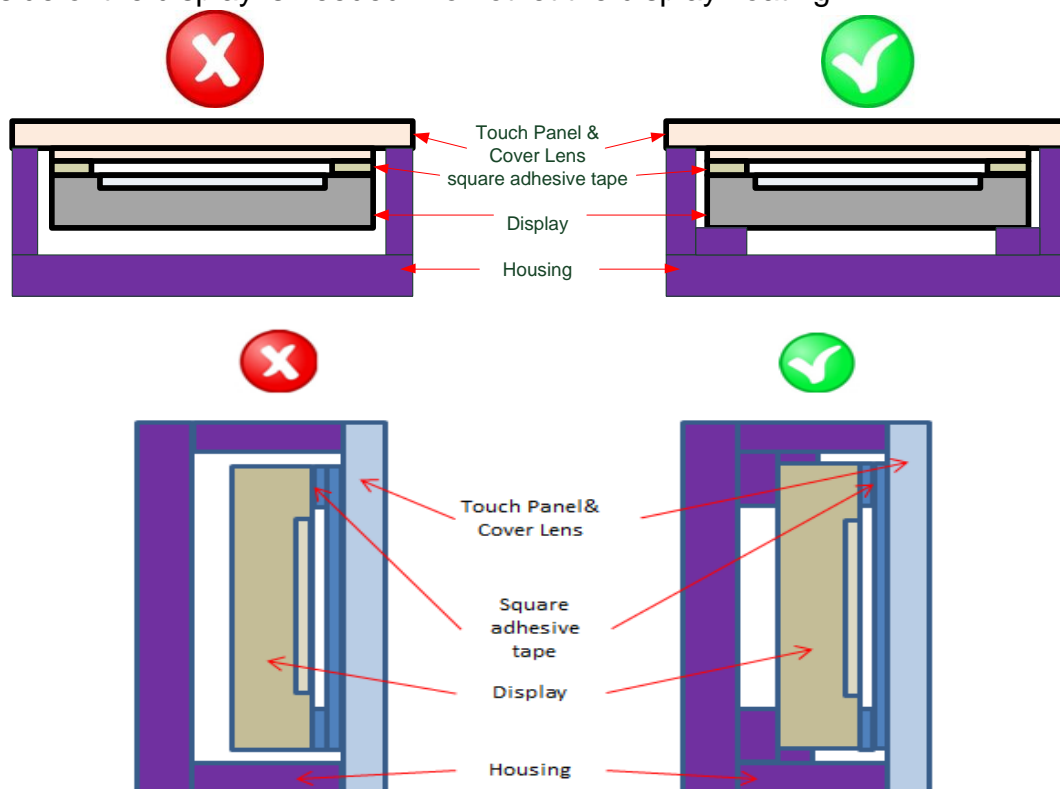
12.4 Operating precautions

- 1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
- 2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
- 3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC drive voltage.
- 4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
- 5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
- 6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.

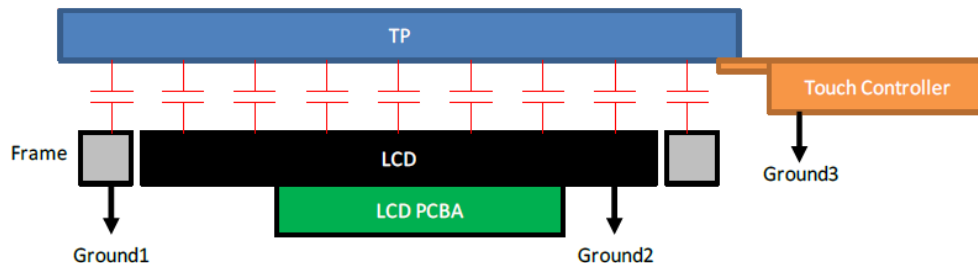
- 7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
- 8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

12.5 Mechanism

- 1) Please mount LCD module by using mounting holes arranged in four corners tightly.
- 2) The square adhesive tape which is between the touch panel and display can't provide well supporting in the long term and high ambient temperature condition. Whether upright or horizontal position the support holder which is in the back side of the display is needed. Do not let the display floating.



- 3) TP needs to work in environment with stable stray capacitance. In order to minimize the variation in stray capacitance, all conductive mechanical parts must not be floating. Intermittent floating any conductive part around the touch sensor may cause significant stray capacitance change and abnormal touch function. It is recommended to keep all conductive parts having same electrical potential as the GND of the touch controller module.

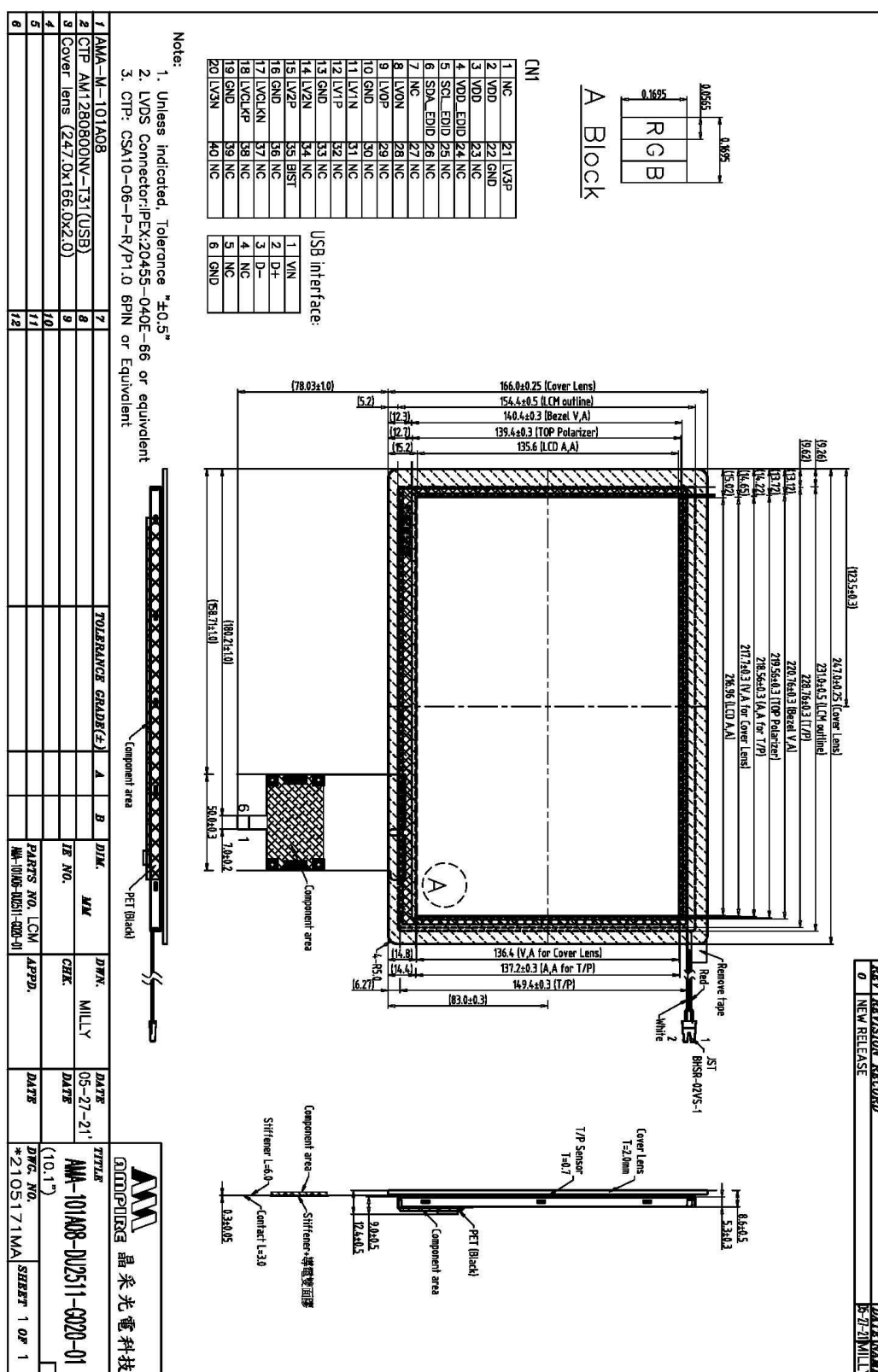


GND1, GND2 and GND3 should be connected together to have the same ground

12.6 Other

- 1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
- 2) Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.
- 3) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

13. MECHANIC DRAWING





| | | | | |
|----|------|------|------|----|
| 1 | NC | 21 | LV3P | |
| 2 | YD0 | 22 | GN0D | |
| 3 | YD0 | 23 | NC | |
| 4 | YD0 | 24 | GN0D | |
| 5 | SQ1 | ED0D | 25 | NC |
| 6 | SQ4 | ED0D | 26 | NC |
| 7 | NC | 27 | GN0D | |
| 8 | LV0N | 28 | NC | |
| 9 | LV0P | 29 | NC | |
| 10 | GN0D | 30 | NC | |
| 11 | LV1N | 31 | NC | |
| 12 | LV1P | 32 | NC | |
| 13 | GN0D | 33 | NC | |
| 14 | LV2N | 34 | NC | |
| 15 | LV2P | 35 | IBST | |
| 16 | GN0D | 36 | NC | |
| 17 | LV3L | KN | 37 | NC |
| 18 | LV3L | KN | 38 | NC |
| 19 | GN0D | 39 | NC | |
| 20 | LV3N | 40 | NC | |

USB interface:

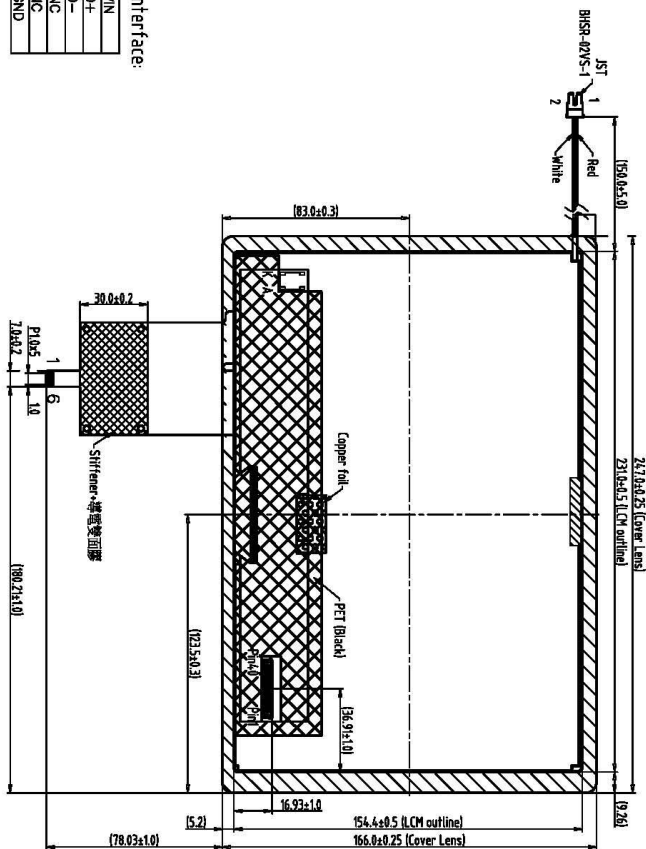
| | |
|---|-----|
| 1 | VIN |
| 2 | D+ |
| 3 | D- |
| 4 | NC |
| 5 | NC |
| 6 | GND |

| | |
|---|-----|
| 1 | VIN |
| 2 | D+ |
| 3 | D- |
| 4 | NC |
| 5 | NC |
| 6 | GND |

1. Unless indicated, Tolerance $\pm 0.5^{\circ}$

2. LVDS Connector: PEEX:20455-040E-66 or equivalent
3. CTP: CSA10-06-P-R/P1.0 6PIN or Equivalent

Back view

[illegible]