# TFT DISPLAY SPECIFICATION




## WINSTAR Display Co.,Ltd.
## 華凌光電股份有限公司

Represented by:

first FC components
**FIRST Components s.r.l.**
www.first-components.com
technical@first-components.com
+39 0332 1888005

# Product Specifications

| | |
|---|---|
| **Customer** | **Standard** |
| **Description** | **4.2” E-PAPER DISPLAY** |
| **Model Name** | **WAA0420BB5#A2N1AA-FC** |
| **Date** | **2025/02/14** |
| **Revision** | **1.0** |

| | Design Engineering | | |
|---|---|---|---|
| | **Approval** | **Check** | **Design** |
| | | | |

## Over View

WAA0420BB5#A2N1AA-FC is an Active Matrix Electrophoretic Display (AM EPD), with interface and a reference system design. The display is capable to display images at 1-bit white, black full display capabilities. The 4.2inch active area contains 400×300 pixels. The module is a TFT-array driving electrophoresis display, with integrated circuits including gate driver, source driver, MCU interface, timing controller, oscillator, DC-DC, SRAM, LUT, VCOM. Module can be used in portable electronic devices, such as Electronic Shelf Label (ESL) System.

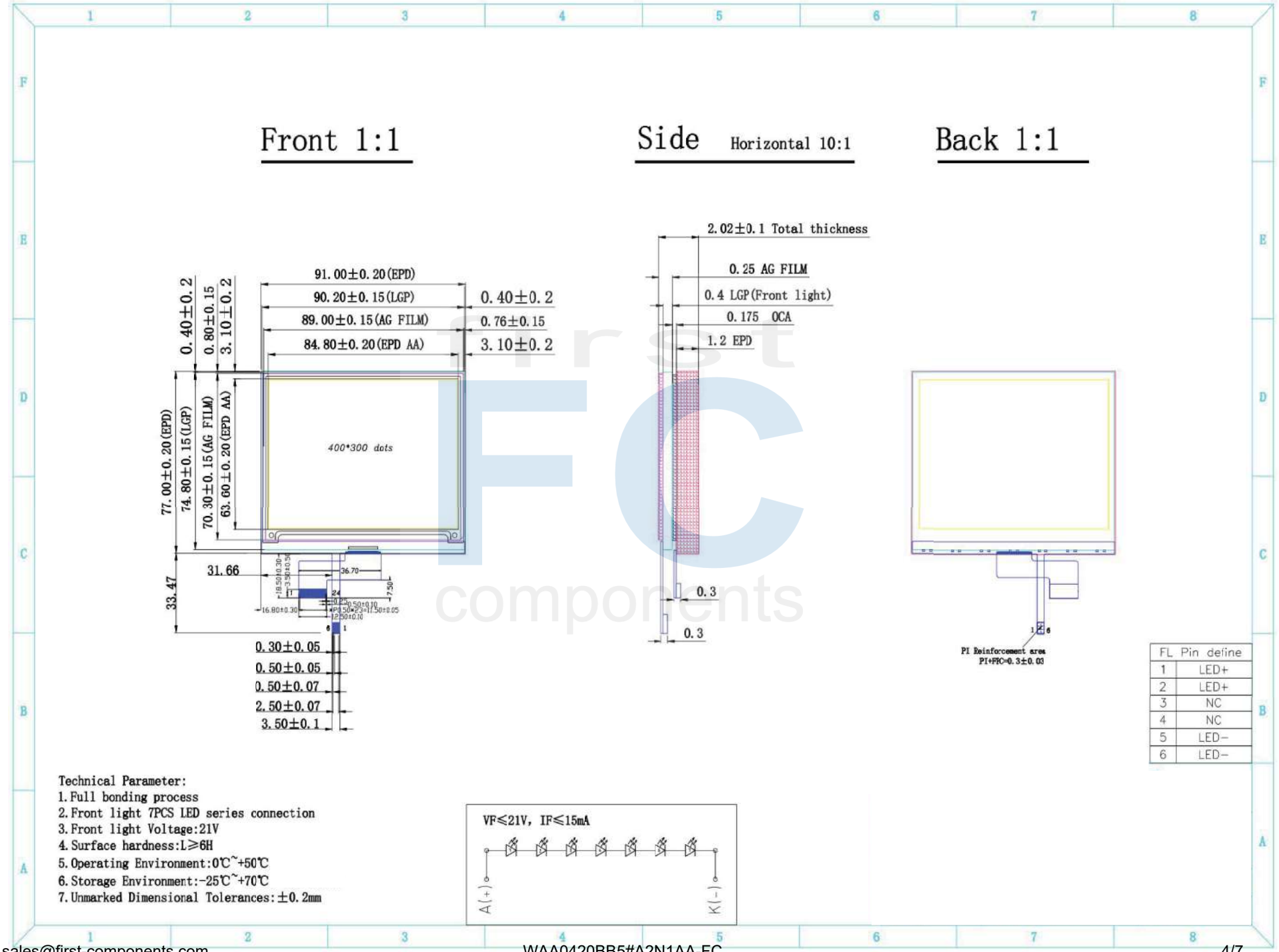
## Features

- 400×300 pixels display
- High contrast High reflectance
- Ultra wide viewing angle Ultra low power consumption
- Pure reflective mode
- Bi-stable display
- Commercial temperature range
- Landscape portrait modes
- Hard-coat antiglare display surface
- Ultra Low current deep sleep mode
- On chip display RAM
- Waveform can stored in On-chip OTP or written by MCU
- Serial peripheral interface available
- On-chip oscillator
- On-chip booster and regulator control for generating VCOM, Gate and Source driving voltage
- I2C signal master interface to read external temperature sensor
- Support partial update mode
- Built-in temperature sensor

## Mechanical Specifications

| Parameter | Specifications | Unit | Remark |
|---|---|---|---|
| Screen Size | 4.2 | Inch | |
| Display Resolution | 400(H)×300(V) | Pixel | Dpi:120 |
| Active Area | 84.8×63.6 | mm | |
| Pixel Pitch | 0.212×0.212 | mm | |
| Pixel Configuration | Rectangle | | |
| Outline Dimension | 91 (H)×77 (V) ×2.02(D) | mm | |
| Weight | 16.1±0.3 | g | |

# Mechanical Drawing of EPD module




| FL Pin define | |
|---|---|
| 1 | LED+ |
| 2 | LED+ |
| 3 | NC |
| 4 | NC |
| 5 | LED− |
| 6 | LED− |

Technical Parameter:
1. Full bonding process
2. Front light 7PCS LED series connection
3. Front light Voltage:21V
4. Surface hardness:L≥6H
5. Operating Environment:0℃~+50℃
6. Storage Environment:-25℃~+70℃
7. Unmarked Dimensional Tolerances:±0.2mm

## Input /Output Pin Assignment

| No. | Name | I/O | Description | Remark |
|---|---|---|---|---|
| 1 | NC | | Do not connect with other NC pins | Keep Open |
| 2 | GDR | O | N-Channel MOSFET Gate Drive Control | |
| 3 | RESE | I | Current Sense Input for the Control Loop | |
| 4 | NC | NC | Do not connect with other NC pins | Keep Open |
| 5 | VSH2 | C | Positive Source driving voltage(Red) | |
| 6 | TSCL | O | $I^2C$ Interface to digital temperature sensor Clock pin | |
| 7 | TSDA | I/O | $I^2C$ Interface to digital temperature sensor Data pin | |
| 8 | BS1 | I | Bus Interface selection pin | Note 5-5 |
| 9 | BUSY | O | Busy state output pin | Note 54 |
| 10 | RES# | I | Reset signal input. Active Low. | Note 5-3 |
| 11 | D/C# | I | Data /Command control pin | Note 5-2 |
| 12 | CS# | I | Chip select input pin | Note 5-1 |
| 13 | SCL | I | Serial Clock pin (SPI) | |
| 14 | SDA | I/O | Serial Data pin (SPI) | |
| 15 | VDDIO | P | Power Supply for interface logic pins It should be connected with VCI | |
| 16 | VCI | P | Power Supply for the chip | |
| 17 | VSS | P | Ground | |
| 18 | VDD | C | Core logic power pin VDD can be regulated internally from VCI. A capacitor should be connected between VDD and VSS | |
| 19 | VPP | P | FOR TEST | |
| 20 | VSH1 | C | Positive Source driving voltage | |
| 21 | VGH | C | Power Supply pin for Positive Gate driving voltage and VSH1 | |
| 22 | VSL | C | Negative Source driving voltage | |
| 23 | VGL | C | Power Supply pin for Negative Gate driving voltage VCOM and VSL | |
| 24 | VCOM | C | VCOM driving voltage | |

I = Input Pin, O =Output Pin, I/O = Bi-directional Pin (Input/output), P = Power Pin, C =Capacitor Pin

**Note 1:** This pin (CS#) is the chip select input connecting to the MCU. The chip is enabled for MCU communication only when CS# is pulled LOW.

**Note 2:** This pin is (D/C#) Data/Command control pin connecting to the MCU in 4-wire SPI mode. When the pin is pulled HIGH, the data at SDA will be interpreted as data. When the pin is pulled LOW, the data at SDA will be interpreted as command.

**Note 3:** This pin (RES#) is reset signal input. The Reset is active low.

**Note 4:** This pin is Busy state output pin. When Busy is High, the operation of chip should not be interrupted, command should not be sent. The chip would put Busy pin High when –Outputting display waveform -Communicating with digital temperature sensor

**Note 5:** Bus interface selection pin

| BS1 State | MCU Interface |
|---|---|
| L | 4-lines serial peripheral interface(SPI) - 8 bits SPI |
| H | 3- lines serial peripheral interface(SPI) - 9 bits SPI |

## Electrical Characteristics

### Absolute Maximum Rating

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Logic supply voltage | VCI | -0.5 to +6.0 | V |
| Logic Input voltage | VIN | -0.5 to VCI +0.5 | V |
| Logic Output voltage | VOUT | -0.5 to VCI +0.5 | V |
| Operating Temp range | TOPR | 0 to +50 | °C |
| Storage Temp range | TSTG | -25 to+70 | |
| Optimal Storage Temp | TSTGo | 23±2 | °C |
| Optimal Storage Humidity | HSTGo | 55±10 | %RH |

**Note:** 1. Maximum ratings are those values beyond which damages to the device may occur. Functional operation should be restricted to the limits in the Panel DC Characteristics tables.

## Optical Specifications

Measurements are made with that the illumination is under an angle of 45 degree, the detection is perpendicular unless otherwise specified

| Symbol | Parameter | Conditions | Min | Typ. | Max | Units | Notes |
|---|---|---|---|---|---|---|---|
| R | White Reflectivity | White | 30 | 35 | - | % | 8-1 |
| CR | Contrast Ratio | Indoor | 8:1 | | - | | 8-2 |
| GN | 2Grey Level | - | | DS+(WS-DS)*n(m-1) | | | 8-3 |
| T update | Image update time | at 25 °C | | 3 | - | sec | |
| Life | | Topr | | 1000000times or 5years | | | |

**Notes:**

1. Luminance meter: Eye-One Pro Spectrophotometer.
2. CR=Surface Reflectance with all white pixel/Surface Reflectance with all black pixels.
3. WS: White state, DS: Dark state

first FC components