



§ SPECIFICATION APPROVAL SHEET §

Fdt Tech Module No LP121L4E~~xx~~-F~~x~~R

Description: 12.1" Digital TFT-LCD Module

SPEC No.: SAS-1211006

Version: 0.1

Issue Date: October 18, 2013

※ This approval sheet contains 31 pages including the cover and appendix.

Customer:

Date: / / 13

APPROVED BY:

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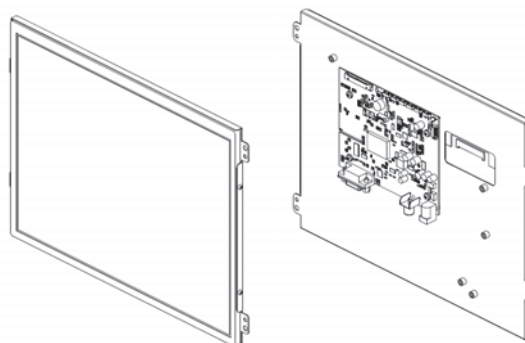
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FLAT DISPLAY TECHNOLOGY

12.1" Digital TFT-LCD Module



■ LP121L4E~~xx~~-F~~x~~R

1. General Description

1.1 Features

- 12.1" Digital TFT LCD
- Ultra Compact
- NTSC/PAL/SECAM Video Auto Switch
- Single Operation Voltage +12V
- CVBS / Analog RGB (PC Mode) Signal Input
- All Functions can be controlled by UART
- Support Touch Screen Function (Option)

1.2 Applications

- Portable product
- Industrial
- Hand-held
- Security
- Instrument Display
- Office Electronics

1.3 Application Precautions

Do not use the products herein for the following equipment which demands extremely high performance in terms of functionality, reliability, or accuracy.

- Aerospace equipment
- Communication equipment for trunk lines.
- Control equipment for the nuclear power industry.
- Medical equipment related to life support, etc.

The other application that demands high reliability and functionality should first contact a sales representative.

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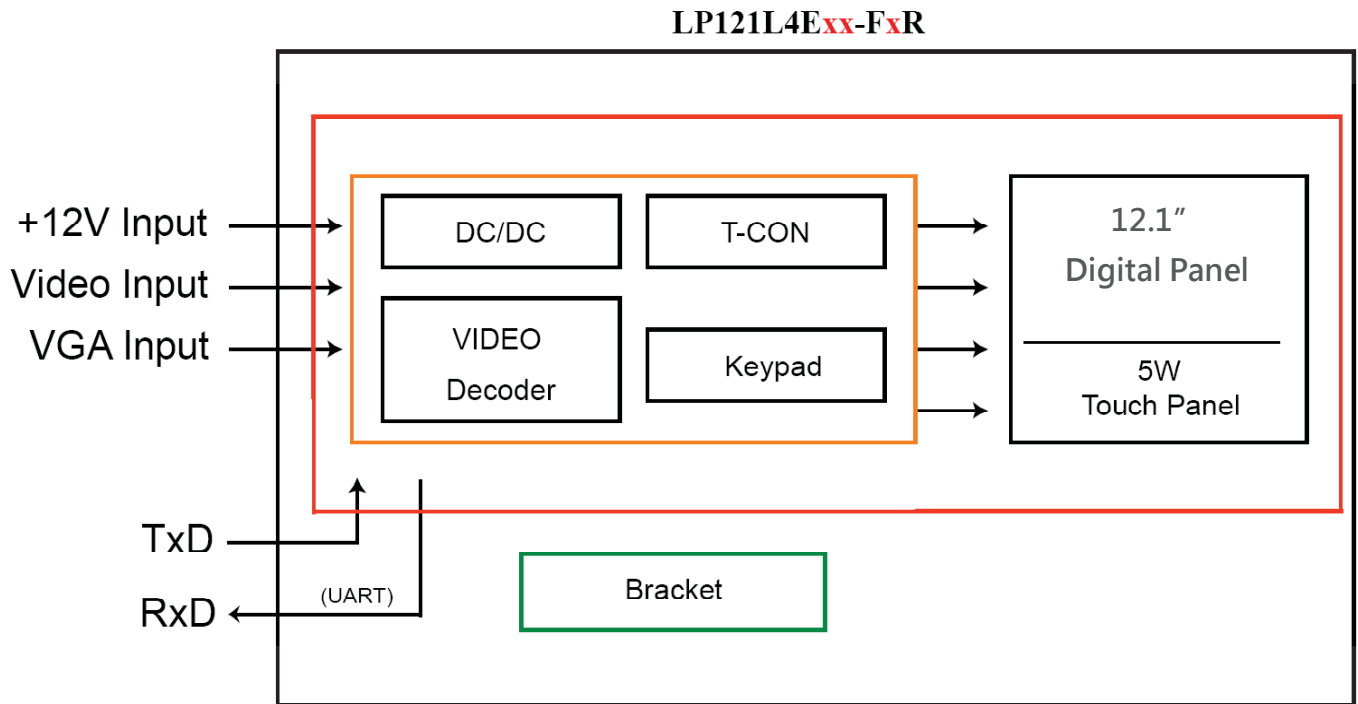
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Preliminary

3. Block Diagram

3.1 Block Diagram



4. TFT-LCD Information

4.1 TFT-LCD Mechanical Specifications

| Parameter | Specifications | Unit |
|--------------------|-----------------------|-------|
| Screen Size | 12.1 (diagonal) | inch |
| Display Format | 1024 x (R.G.B) x 768 | pixel |
| Active Area | 245.76(H) x 184.32(V) | mm |
| Pixel Pitch | 0.240 (H) x 0.240 (V) | mm |
| Pixel Arrangement | RGB vertical stripe | |
| Bezel Opening Area | 249.0 (H) x 187.5 (V) | mm |
| Display Colors | 262k/16.2M | color |
| Surface Treatment | Hard coating (3H),AG | |

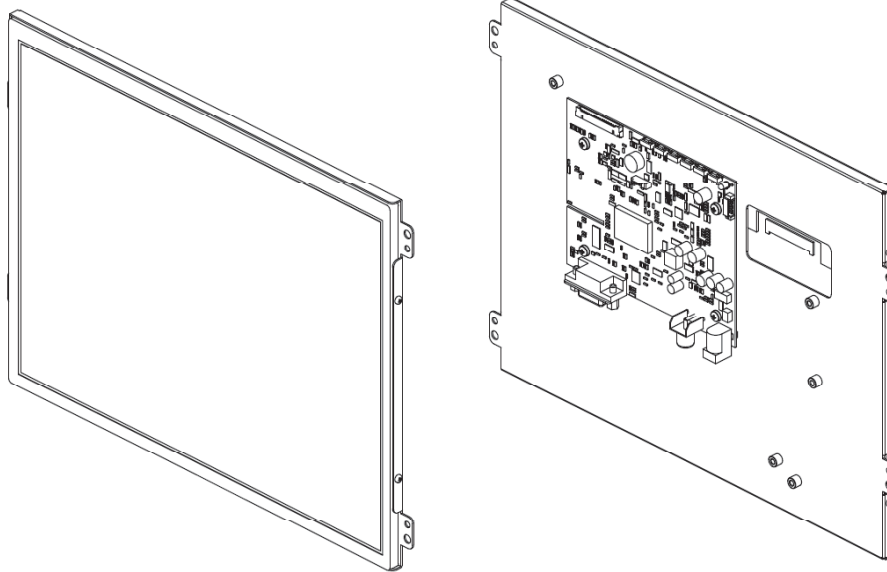
4.2 TFT-LCD Optical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|--------------------|------------|----------------------------|--------------------|-------|-------|-------------------|--------|
| Viewing Angle | Horizontal | Left | 70 | 80 | --- | deg | |
| | | Right | 70 | 80 | --- | | |
| | Vertical | Top | 60 | 70 | --- | deg | |
| | | Bottom | 60 | 70 | --- | deg | |
| Contrast Ratio | CR | At optimized Viewing angle | 500 | 700 | --- | --- | |
| Response time | Rise Fall | Tr | --- | 5 | 10 | ms | |
| | | Tf | $\theta = 0^\circ$ | --- | 11 | 16 | ms |
| Brightness | L | | 400 | 500 | --- | cd/m ² | |
| White Chromaticity | x | $\theta = 0^\circ$ | 0.263 | 0.313 | 0.363 | | |
| | y | $\theta = 0^\circ$ | 0.279 | 0.329 | 0.379 | | |
| LED Life Time | | 25°C | 30000 | --- | --- | Hr | |

5. Order Information

5.1 Unit (Video/ VGA)

Unit



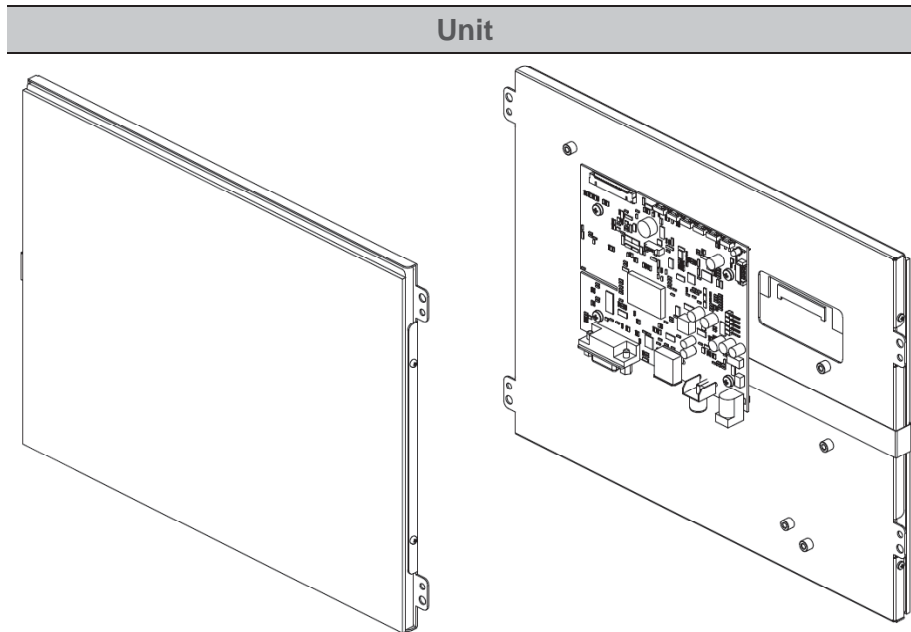
| Parameter | LP121L4EBY-FBR | LP121L4EBY-FNR | Unit |
|--|----------------|----------------|------|
| CVBS | 1 | 1 | |
| VGA (D-Sub15 / 2.0mm 14Pin) | D-Sub15 | D-Sub15 | |
| LVDS Cable | ⊙ | ⊙ | |
| LED Backlight Cable | ⊙ | ⊙ | |
| AC to DC Adapter 12V/3A (LASTD12030-FDR) | ⊙ | - | |
| Power Cord Plug Type B for USA (LAACD18000-FDR) | ⊙ | - | |
| Video Cable (LAVDO18000-FDR) | ⊙ | - | |
| VGA Cable (LAVGA16000-FDR) | ⊙ | - | |

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5.2 Unit (Video/VGA/5W Touch)



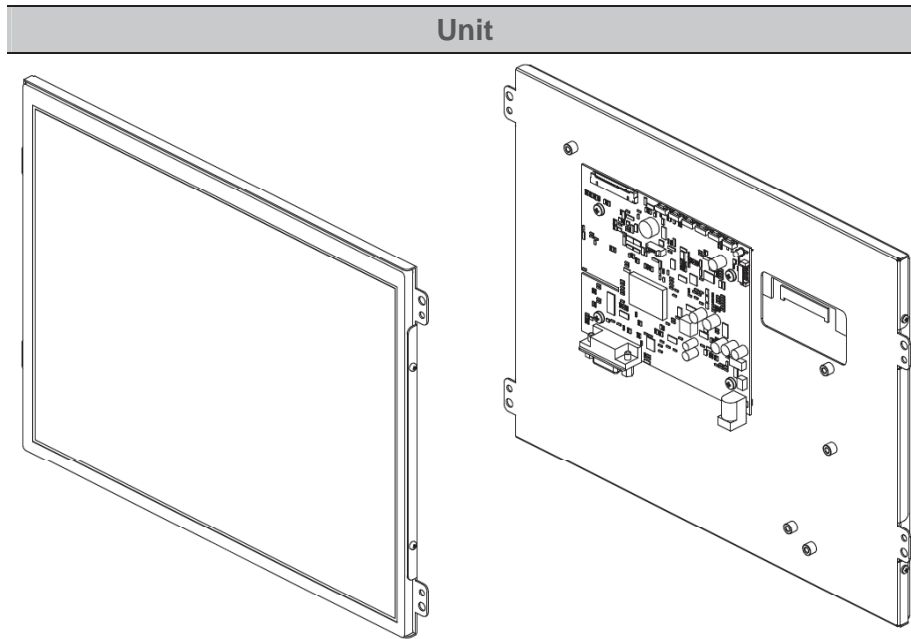
| Parameter | LP121L4EBV-FBR | LP121L4EBU-FBR | LP121L4EBV-FNR | LP121L4EBU-FNR | Unit |
|--|----------------|----------------|----------------|----------------|------|
| CVBS | 1 | 1 | 1 | 1 | |
| VGA (D-Sub15 / 2.0mm 14Pin) | D-Sub15 | D-Sub15 | D-Sub15 | D-Sub15 | |
| Touch Panel Type | 5W Resistive | 5W Resistive | 5W Resistive | 5W Resistive | |
| Touch Screen Interface | USB | RS232 | USB | RS232 | |
| LVDS Cable | ⊙ | ⊙ | ⊙ | ⊙ | |
| LED Backlight Cable | ⊙ | ⊙ | ⊙ | ⊙ | |
| AC to DC Adapter 12V/3A (LASTD12030-FDR) | ⊙ | ⊙ | - | - | |
| Power Cord Plug Type B for USA (LAACD18000-FDR) | ⊙ | ⊙ | - | - | |
| Video Cable (LAVDO18000-FDR) | ⊙ | ⊙ | - | - | |
| VGA Cable (LAVGA16000-FDR) | ⊙ | ⊙ | - | - | |
| USB Cable (LAUSB18000-FDR) | ⊙ | - | - | - | |
| RS-232 Cable (LARS218000-FDR) | - | ⊙ | - | - | |
| Touch Screen Driver CD Disk | ⊙ | ⊙ | ⊙ | ⊙ | |

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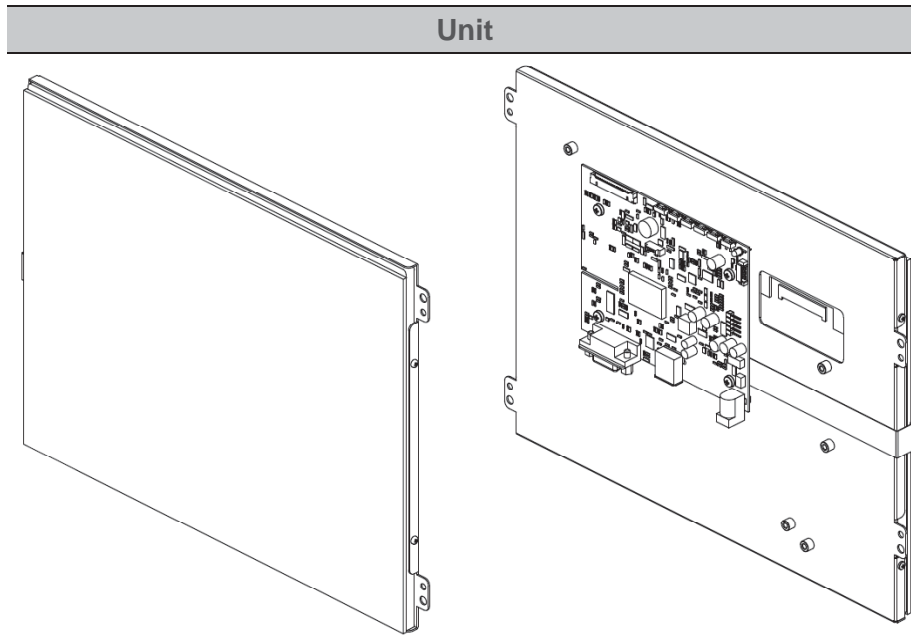


5.3 Unit (VGA Only)



| Parameter | LP121L4ECY-FBR | LP121L4ECY-FNR | Unit |
|---|----------------|----------------|------|
| CVBS | - | - | |
| VGA (D-Sub15 / 2.0mm 14Pin) | D-Sub15 | D-Sub15 | |
| LVDS Cable | ⊙ | ⊙ | |
| LED Backlight Cable (A09WE2-Z61505R) | ⊙ | ⊙ | |
| AC to DC Adapter 12V/3A (LASTD12030-FDR) | ⊙ | - | |
| Power Cord Plug Type B for USA (LAACD18000-FDR) | ⊙ | - | |
| Video Cable (LAVDO18000-FDR) | - | - | |
| VGA Cable (LAVGA16000-FDR) | ⊙ | - | |

5.4 Unit (VGA/5W Touch)



| Parameter | LP121L4ECV-FBR | LP121L4ECU-FBR | LP121L4ECV-FNR | LP121L4ECU-FNR | Unit |
|--|----------------|----------------|----------------|----------------|------|
| CVBS | - | - | - | - | |
| VGA (D-Sub15 / 2.0mm 14Pin) | D-Sub15 | D-Sub15 | D-Sub15 | D-Sub15 | |
| Touch Panel Type | 5W Resistive | 5W Resistive | 5W Resistive | 5W Resistive | |
| Touch Screen Interface | USB | RS232 | USB | RS232 | |
| LVDS Cable | ⊙ | ⊙ | ⊙ | ⊙ | |
| LED Backlight Cable | ⊙ | ⊙ | ⊙ | ⊙ | |
| AC to DC Adapter 12V/3A (LASTD12030-FDR) | ⊙ | ⊙ | - | - | |
| Power Cord Plug Type B for USA (LAACD18000-FDR) | ⊙ | ⊙ | - | - | |
| Video Cable (LAVDO18000-FDR) | - | - | - | - | |
| VGA Cable (LAVGA16000-FDR) | ⊙ | ⊙ | - | - | |
| USB Cable (LAUSB18000-FDR) | ⊙ | - | - | - | |
| RS-232 Cable (LARS218000-FDR) | - | ⊙ | - | - | |
| Touch Screen Driver CD Disk | ⊙ | ⊙ | ⊙ | ⊙ | |

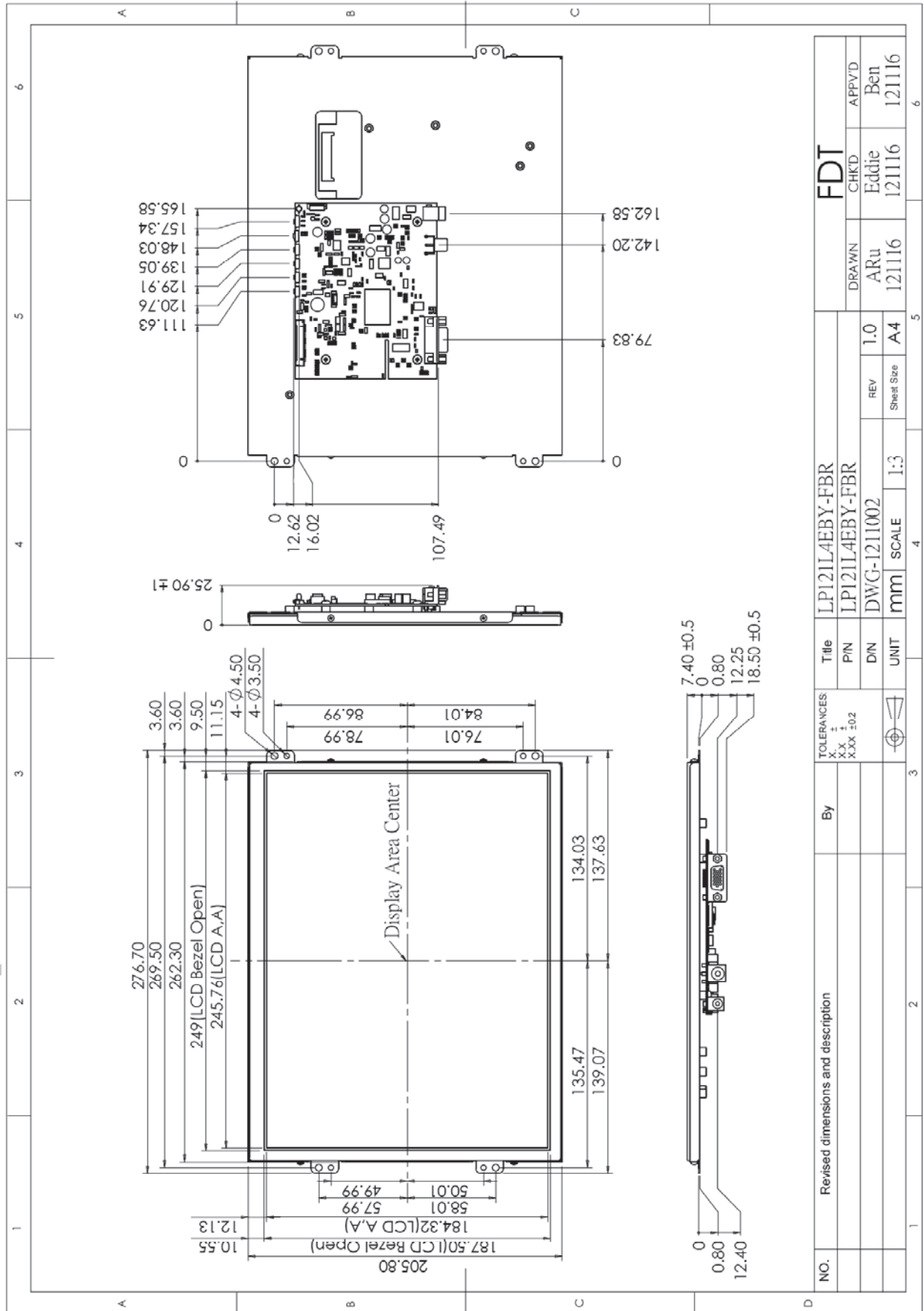
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6. Dimension Information

6.1 Unit (LP121L4EBY-FBR)



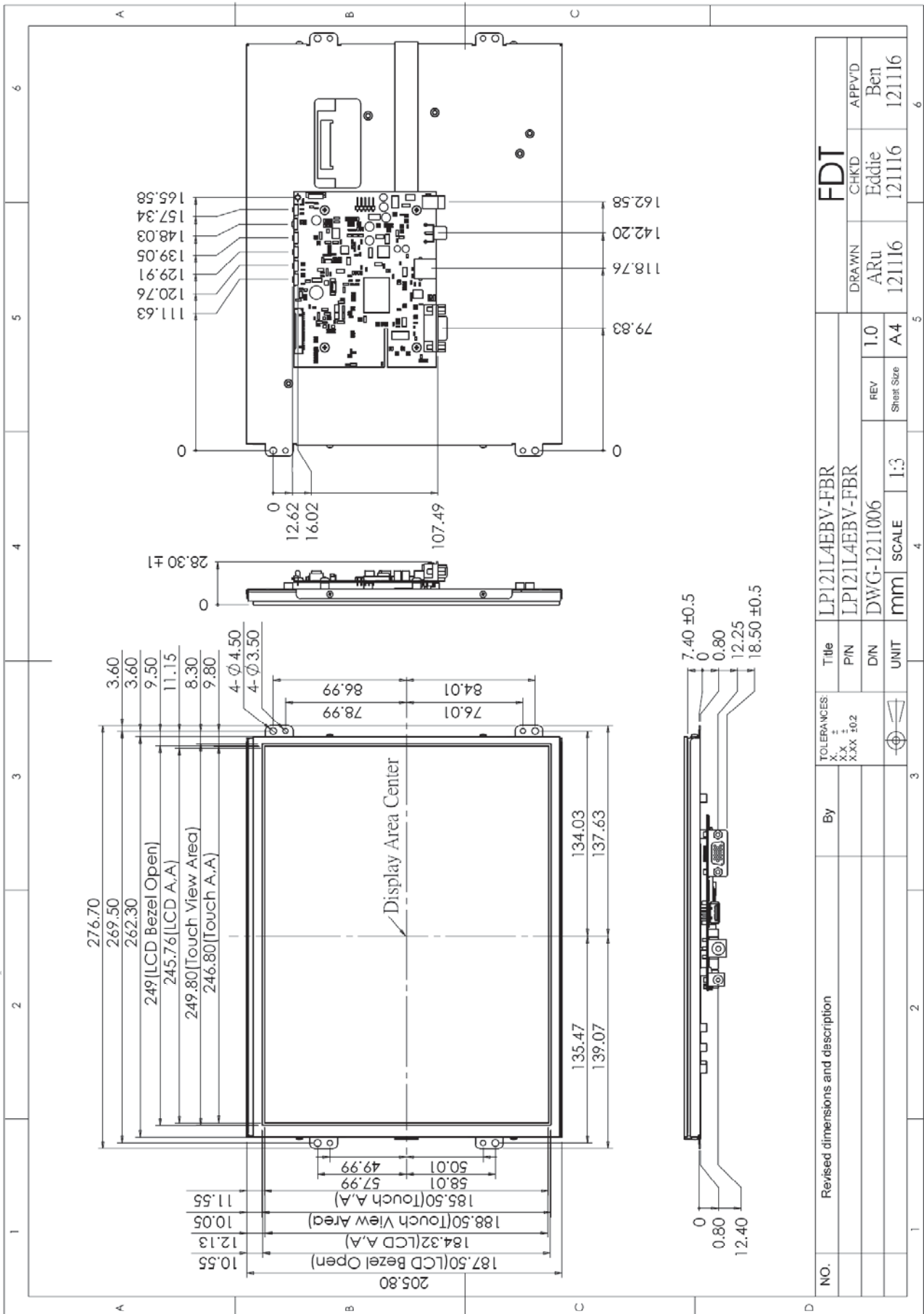
| | | | | | | | | | | | | | | |
|-----|------------------------------------|----|-----------------------------------|------|-------|-----|-----|------------|----|-----|--------|--------|--------|--------|
| NO. | Revised dimensions and description | By | TOLERANCES: X.X ± X.XX ±0.2 | UNIT | SCALE | 1:3 | REV | Sheet Size | A4 | 1.0 | DRAWN | CHK'D | FDT | |
| | | | | | | | | | | | | | APPV'D | 121116 |
| | | | | | | | | | | | ARu | Eddie | Ben | |
| | | | | | | | | | | | 121116 | 121116 | 121116 | |

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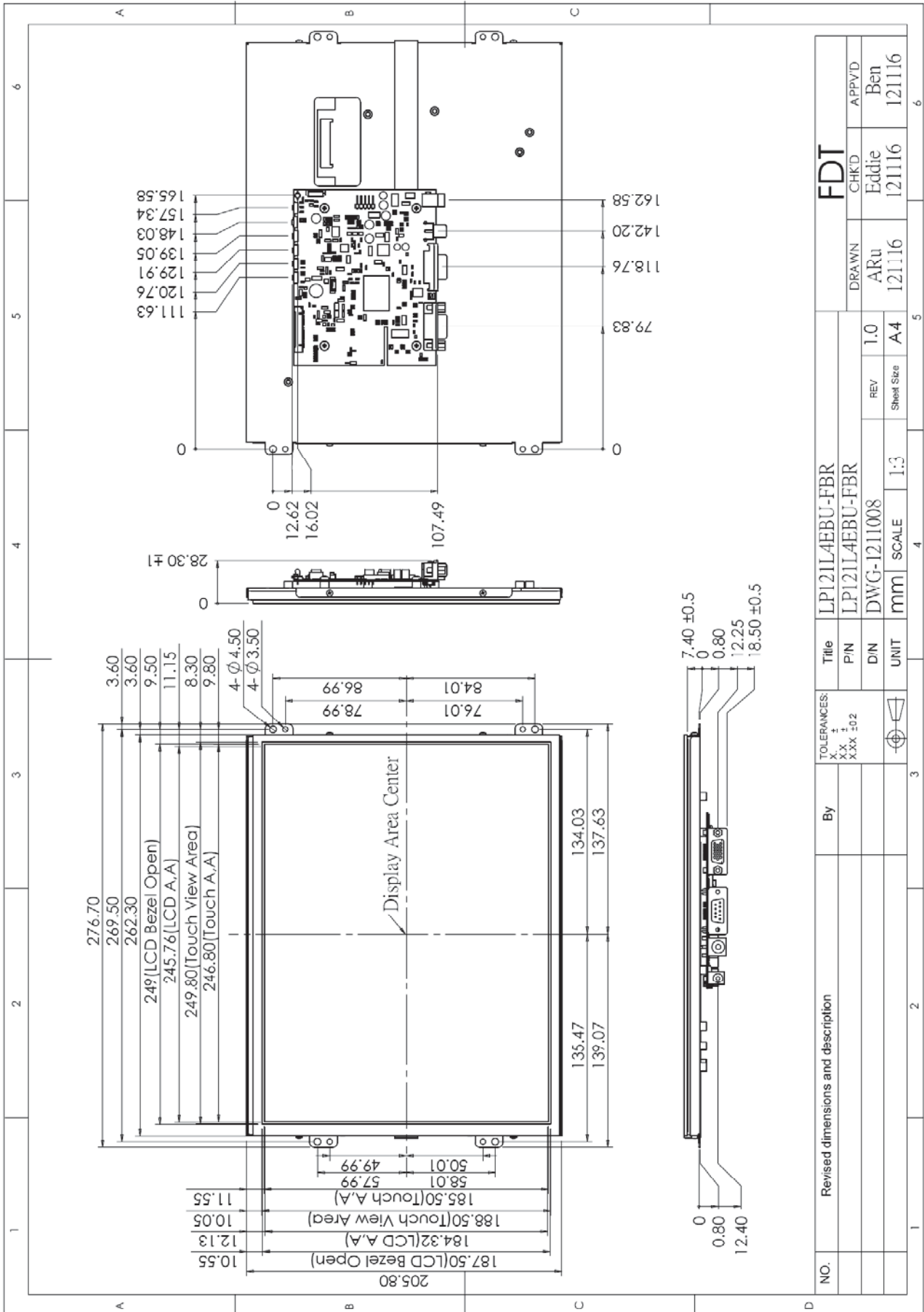
6.2 Unit (LP121L4EBV-FBR)



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| | | | | | | |
|-----|------------------------------------|----|----------------|----------------|------------|--------|
| NO. | Revised dimensions and description | By | Title | | FDT | |
| | | | LP121L4EBV-FBR | LP121L4EBV-FBR | CHK'D | APP'VD |
| | | | P/N | D/N | REV | Ben |
| | | | DWG-1211006 | | 1.0 | Eddie |
| | | | UNIT | SCALE | Sheet Size | 121116 |
| | | | mm | 1:3 | A4 | 121116 |
| | | | DRAWN | | CHK'D | APP'VD |
| | | | ARU | | Eddie | Ben |
| | | | 121116 | | 121116 | 121116 |

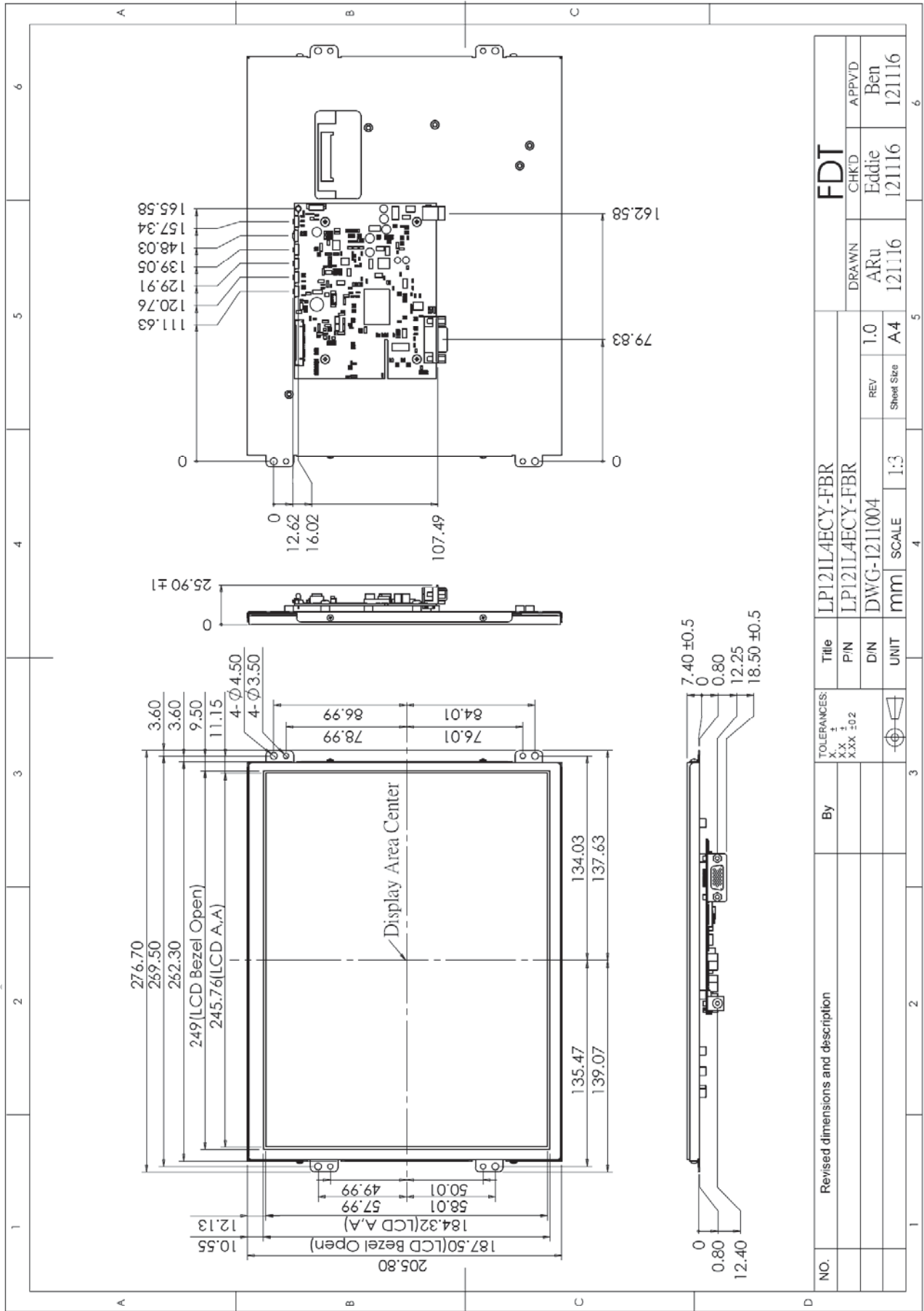
6.3 Unit (LP121L4EBU-FBR)



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6.4 Unit (LP121L4ECY-FBR)

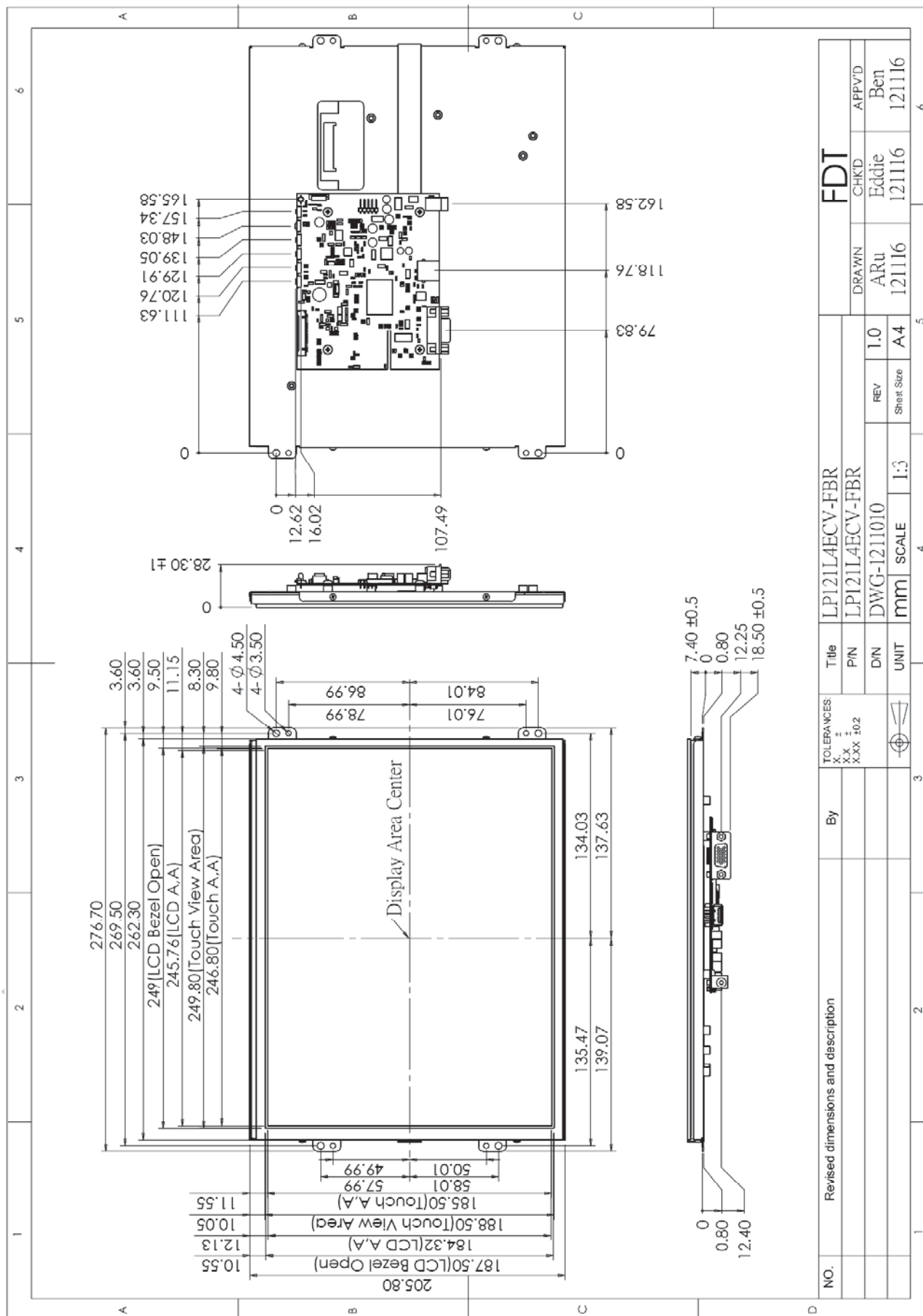


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6.5 Unit (LP121L4ECV-FBR)

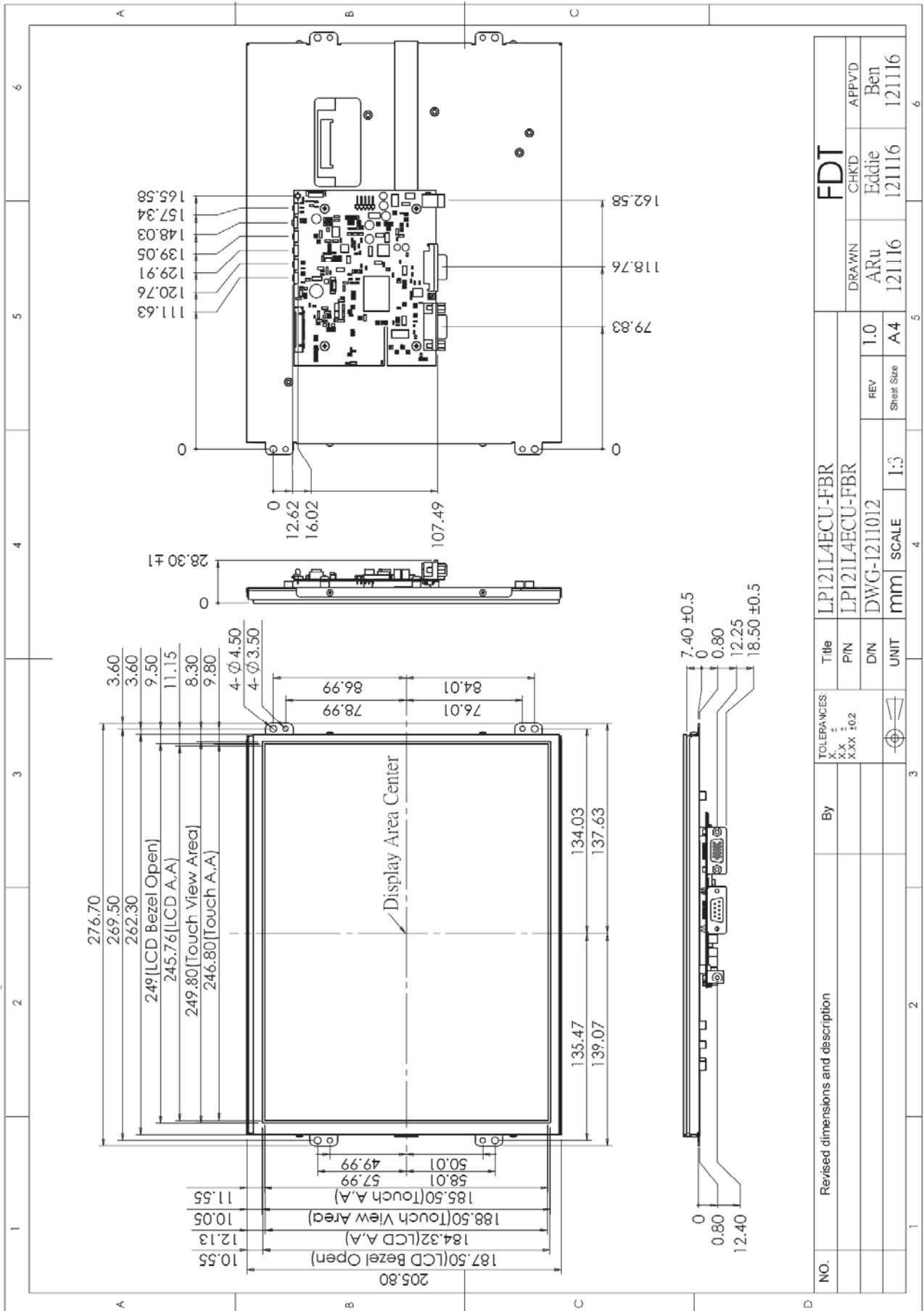


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6.6 Unit (LP121L4ECU-FBR)



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7. Pin Description

7.1 J305 : CMI LCD Panel I/O Terminals (Pitch 1.25mm 20Pin, Side Entry Type)

| Pin No | Symbol | I/O | Description | Remark |
|--------|--------|-----|---|--------|
| 1 | VCC_IN | I | Power Supply (3.3 V) | |
| 2 | VCC_IN | I | Power Supply (3.3 V) | |
| 3 | GND | P | Ground | |
| 4 | GND | P | Ground | |
| 5 | RX0- | I | Differential Data Input, CH0 (Negative) | |
| 6 | RX0+ | I | Differential Data Input, CH0 (Positive) | |
| 7 | GND | P | Ground | |
| 8 | RX1- | I | Differential Data Input, CH1 (Negative) | |
| 9 | RX1+ | I | Differential Data Input, CH1 (Positive) | |
| 10 | GND | P | Ground | |
| 11 | RX2- | I | Differential Data Input, CH2 (Negative) | |
| 12 | RX2+ | I | Differential Data Input, CH2 (Positive) | |
| 13 | GND | P | Ground | |
| 14 | CLK- | I | Differential Clock Input (Negative) | |
| 15 | CLK+ | I | Differential Clock Input (Positive) | |
| 16 | GND | P | Ground | |
| 17 | RX3- | I | Differential Data Input, CH3 (Negative) | |
| 18 | RX3+ | I | Differential Data Input, CH3 (Positive) | |
| 19 | GND | P | Ground | |
| 20 | GND | P | Ground | |

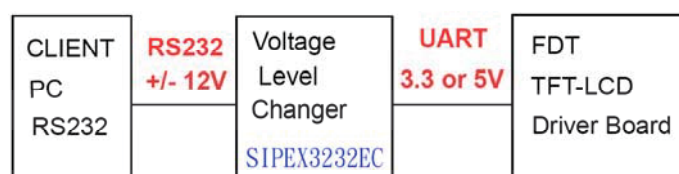
7.2 J104: Pin Assignment of UART (Pitch 1.25mm 4Pin, Top Entry Type)

※ FDT Connector Part No.: MS24014 (STM) [Same as 53398-0471 (MOLEX)];

※ FDT Matching Connector Part No.: P24014 (STM) [Same as 51021-0400 (MOLEX)].

| Pin No | Symbol | I/O | Description | Remark |
|--------|--------|-----|------------------------|--------|
| 1 | TX | O | UART Transmission Data | |
| 2 | RX | I | UART Receive Data | |
| 3 | GND | - | Ground | |
| 4 | +3.3V | O | +3.3V Output Voltage | |

Note: All Functions can be controlled by UART, About UART command list please contact FDT sales.



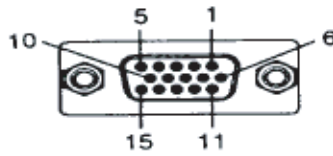
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7.3 J106B : Pin Assignment of Analog RGB Input (D-Sub 15Pin)

| Pin No | Symbol | I/O | Description | Remark |
|--------|--------|-----|---------------------|--------|
| 1 | RI+ | I | Analog Red Signal | |
| 2 | GI+ | I | Analog Green Signal | |
| 3 | BI+ | I | Analog Blue Signal | |
| 4 | NC | - | No Connection | |
| 5 | GND | - | Ground | |
| 6 | AGND | - | Analog Ground | |
| 7 | AGND | - | Analog Ground | |
| 8 | AGND | - | Analog Ground | |
| 9 | NC | - | No Connection | |
| 10 | NC | - | No Connection | |
| 11 | NC | - | No Connection | |
| 12 | NC | - | No Connection | |
| 13 | HS_IN | I | TTL Horizontal sync | |
| 14 | VS_IN | I | TTL Vertical sync | |
| 15 | NC | - | No Connection | |



7.4 DC JACK: Pin Assignment of Power Input (Inside Diameter:2.1 ϕOutside Diameter:5.5 ϕSide Entry Type)

| Pin No | Symbol | I/O | Description | Remark |
|--------|--------|-----|--------------------|--------|
| 1 | VIN | I | +12V Input Voltage | |
| 2 | GND | - | Power Ground | |

7.5 RCA: Pin Assignment of Video Input (RCA JACK Yellow, Side Entry Type)

| Pin No | Symbol | I/O | Description | Remark |
|--------|--------|-----|---------------|--------|
| 1 | Video | I | Video Input | |
| 2 | AGND | - | Analog Ground | |

7.6 J603: Pin Assignment of Panel LED Backlight (Pitch 1.25mm 6Pin, Side Entry Type)

※ FDT Connector Part No.: MS24016 (STM) [Same as 53398-0671 (MOLEX)];

※ FDT Matching Connector Part No.: P24016 (STM) [Same as 51021-0600 (MOLEX)].

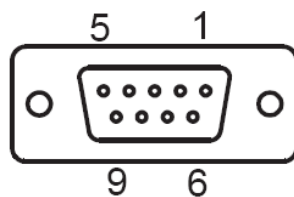
| Pin No | Symbol | I/O | Description | Remark |
|--------|--------|-----|---|--------|
| 1 | DC-IN | O | Panel LED Backlight Power (+12V) | |
| 2 | DC-IN | O | Panel LED Backlight Power (+12V) | |
| 3 | DIMMER | O | Backlight Brightness Adjust (0~3.3V) | |
| 4 | ENABLE | O | Backlight Enable (1: Enable 0: Disable) | |
| 5 | GND | - | Power Ground | |
| 6 | GND | - | Power Ground | |

7.7 USB : Pin Assignment of Touch USB (USBA-Female 2.0mm, Side Entry Type)(Option)

| Pin No | Symbol | I/O | Description | Remark |
|--------|--------|-----|----------------|--------|
| 1 | DGND | - | Digital Ground | |
| 2 | D+ | - | DATA (+) | |
| 3 | D- | - | DATA (-) | |
| 4 | VBUS | - | USB VCC | |

7.8 RS232 : Pin Assignment of Touch RS232 (D-SUB 9 FEMALE)(Option)

| Pin No | Symbol | I/O | Description | Remark |
|--------|--------|-----|---------------|--------|
| 1 | NC | - | No Connection | |
| 2 | TXD | - | Transmit Data | |
| 3 | RXD | - | Receive Data | |
| 4 | NC | - | No Connection | |
| 5 | GND | - | Ground | |
| 6 | NC | - | No Connection | |
| 7 | NC | - | No Connection | |
| 8 | NC | - | No Connection | |
| 9 | NC | - | No Connection | |



8. Absolute Maximum Ratings

8.1 Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit | Remark |
|--------------------------------|---------------|-------|------|------|--------|
| Input Voltage | Vin | +10.8 | +13 | V | |
| Video Input Signal | Video in | 0.5 | 2.0 | Vp-p | @75Ω |
| Analog RGB Input Signal | Analog RGB in | 0.5 | 2.0 | Vp-p | @75Ω |
| Digital Input Signal | TTL | +0.3 | +3.6 | V | |
| Operating Temperature | | -20 | +70 | °C | |
| Storage Temperature | | -40 | +80 | °C | |
| Operating Temperature With TSP | | -10 | +70 | °C | |
| Storage Temperature With TSP | | -30 | +80 | °C | |

9. Recommended operating conditions

9.1 Electrical Characteristics

| Parameter | Symbol | I/O | Min | Typ | Max | Unit | Note |
|-------------------------|---------------|-------|-------|-----|-----|------|-------|
| Input Voltage | Vin | I | +10.8 | +12 | +13 | V | |
| Total Current | Iin (+12V) | I | | 760 | | mA | ±15% |
| Power Consumption | | I | | 9.1 | | W | @+12V |
| Video Input Signal | Video in | I | | 1.0 | | Vp-p | @75Ω |
| Analog RGB Input Signal | Analog RGB in | RGB I | | 0.7 | | Vp-p | @75Ω |

9.2 VGA Mode Characteristics

| Dots per inch | Hor. | Unit | Polarity | Ver. | Unit | Polarity | Note |
|---------------|--------|------|----------|--------|------|----------|------|
| 640*480 | 31.469 | KHz | Negative | 59.941 | Hz | Negative | |
| 800*600 | 37.879 | KHz | Positive | 60.317 | Hz | Positive | |
| 1024*768 | 48.363 | KHz | Negative | 60.004 | Hz | Negative | |

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10.5W Resistive Touch Panel Characteristics

10.1 Pin assignment (Pitch: 2.54 mm)

| Pin No | Symbol | Description | Remark |
|--------|--------|-------------------------|--------|
| 1 | RT | Right & Top electrode | |
| 2 | RL | Right & Lower electrode | |
| 3 | SG | Signal Ground | |
| 4 | LT | Lift & Top electrode | |
| 5 | LL | Lift & Lower electrode | |

10.2 Electrical Performance

| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|----------------------|--------|-----|-----|-----|------------|--------|
| Terminal Resistance | X | 20 | - | 500 | Ω | |
| | Y | 20 | - | 500 | Ω | |
| Linearity | | - | - | 1.5 | % | |
| Insulation Impedance | | 20 | - | - | M Ω | DC 25V |
| Response Time | | - | - | 15 | ms | |

10.3 Optical Performance

| Parameter | Specifications |
|---------------------|-------------------|
| Light Transmittance | 80 \pm 3% (Typ) |
| Haze | 8 \pm 3% (Typ) |

10.4 Mechanical Performance

| Parameter | Specifications |
|------------------|----------------------|
| Input Method | Finger or stylus pen |
| Operating Force | \leq 50g |
| Surface Hardness | 3H or more |

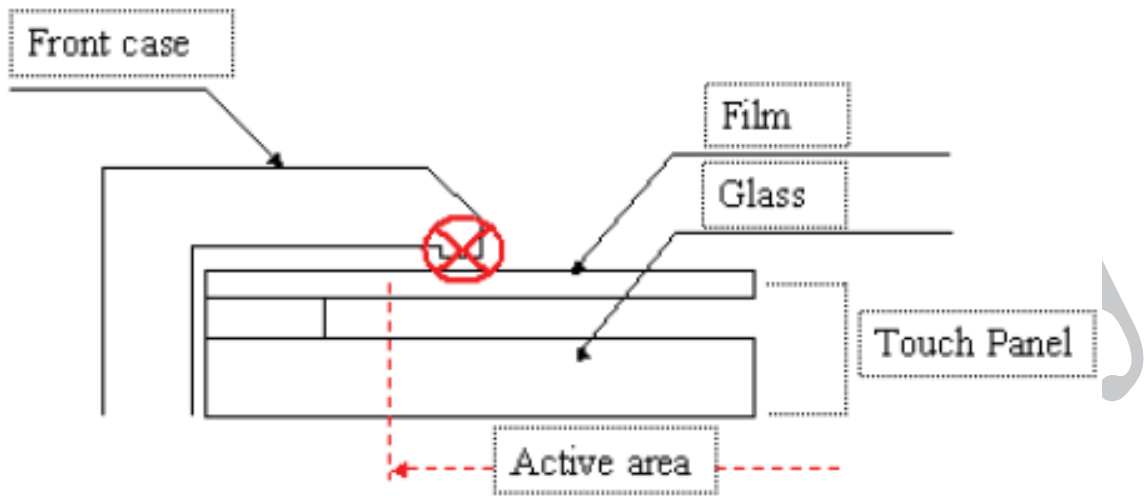
10.5 Durability Performance

| Parameter | Specifications |
|------------|------------------|
| Knock Test | 10,000,000 times |

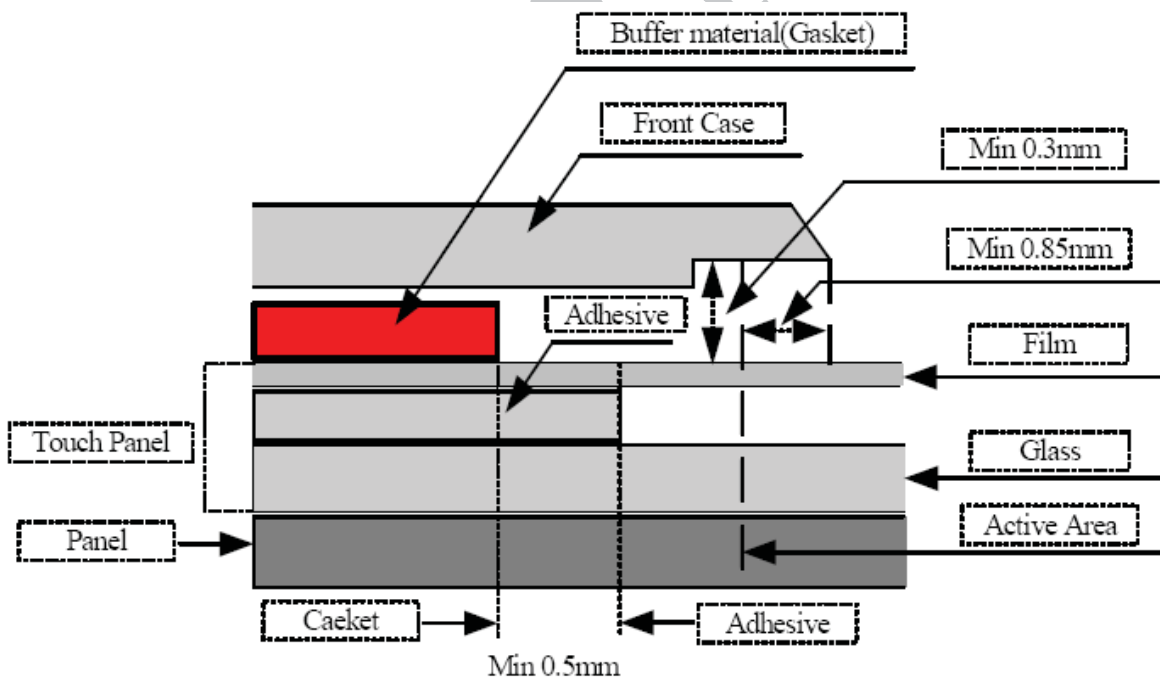
10.6 Touch Screen Integration Design Guide

Avoid the design that Front-case overlap and press on the active area of the touch-panel.

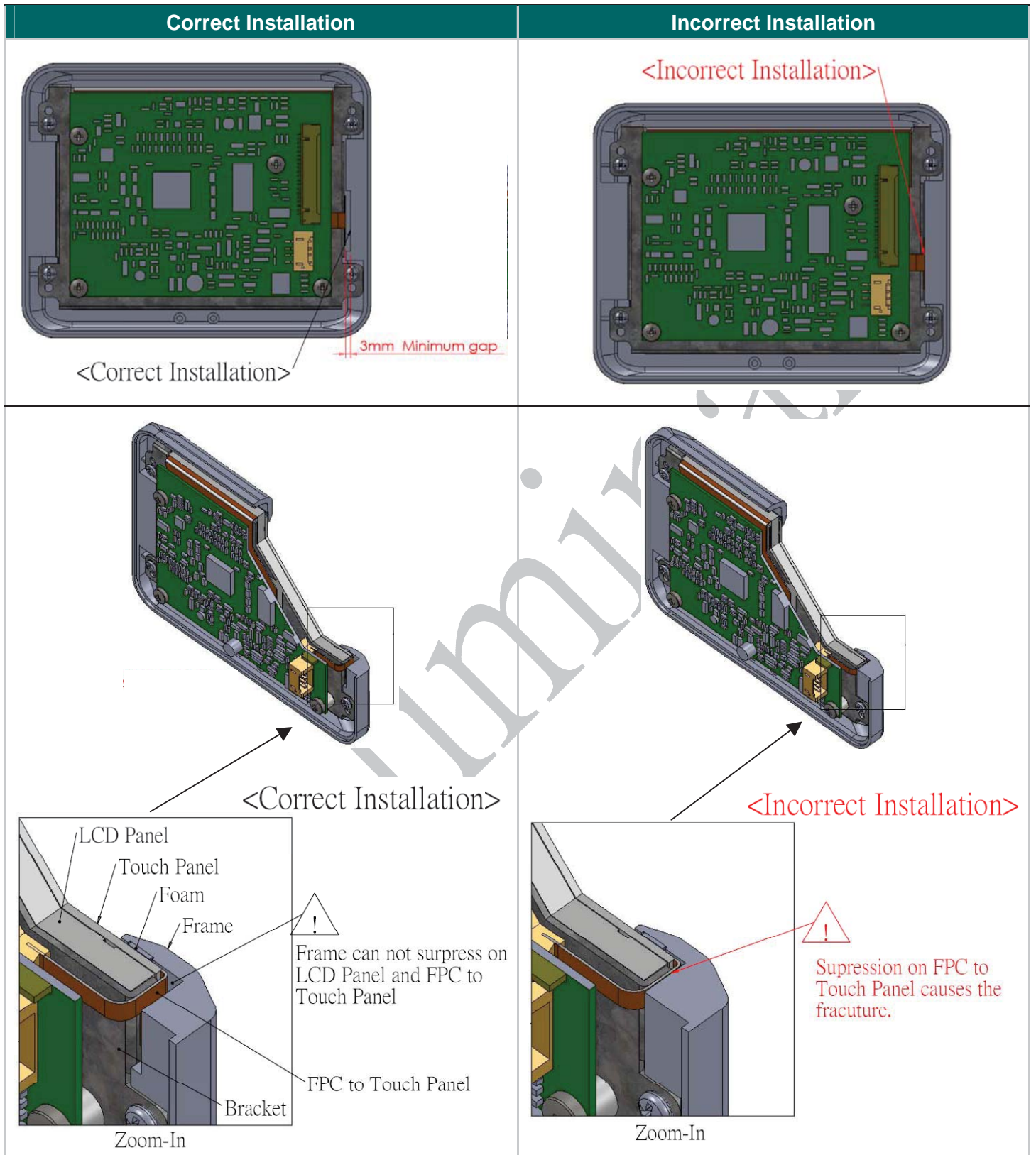
Give enough gap (over 0.5mm at compressed) between the front case and touch-panel to protect wrong operating.



Use a buffer material (Gasket) between the touch-panel and front-case to protect damage and wrong operating. Avoid the design that buffer material overlap and press on the inside of touch-panel viewing area.

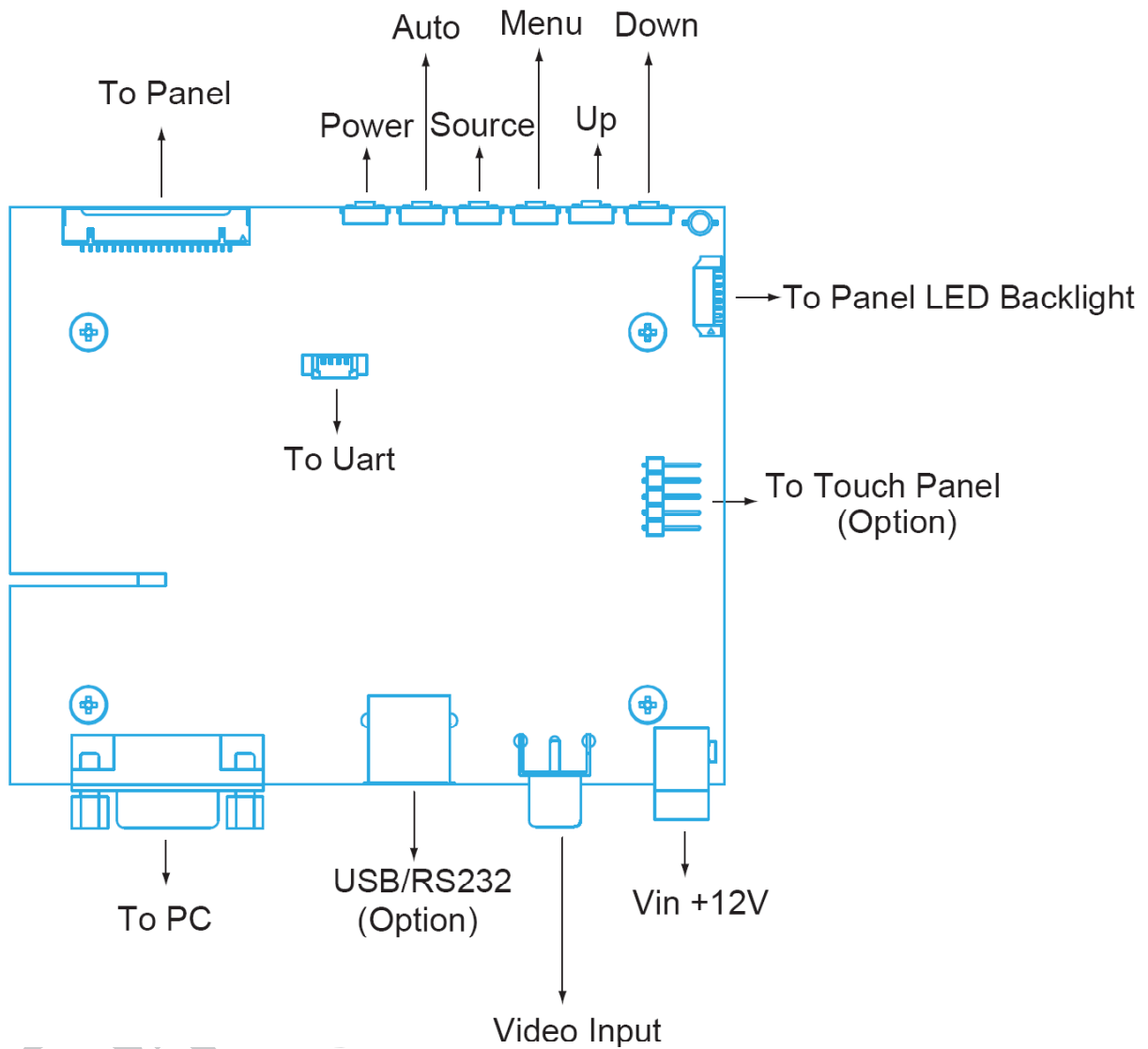


10.7 Mechanical Design Notice For Touch Panel



11. Operation manual

11.1 Driver Board Manual



12. Packing List

Before you begin installing the KIT, please make sure that the following materials have been shipped:



A. LASTD12030-FDR



B. LAACD18000-FDR



C. LAVDO18000-FDR



D. LAVGA16000-FDR



E. LAUSB18000-FDR



F. LARS218000-FDR



G.

- A. AC to DC Adapter (L: 1500mm, 100-240VAC 50-60Hz to +12VDC @ 3A)
- B. Power Cord (L: 1800mm, Plug Type B for USA)
- C. Video Cable (L: 1800mm)
- D. VGA Cable (L: 1600mm)
- E. USB Cable (L: 1800mm, Only LP121L4E~~x~~V-F~~x~~R)
- F. RS-232 Cable (L: 1800mm, Only LP121L4E~~x~~U-F~~x~~R)
- G. Touch Screen Driver CD Disk / User Manual (Only LP121L4E~~x~~V-F~~x~~R, LP121L4E~~x~~U-F~~x~~R)

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

13. Key Function by OSD

13.1 Menu Operation

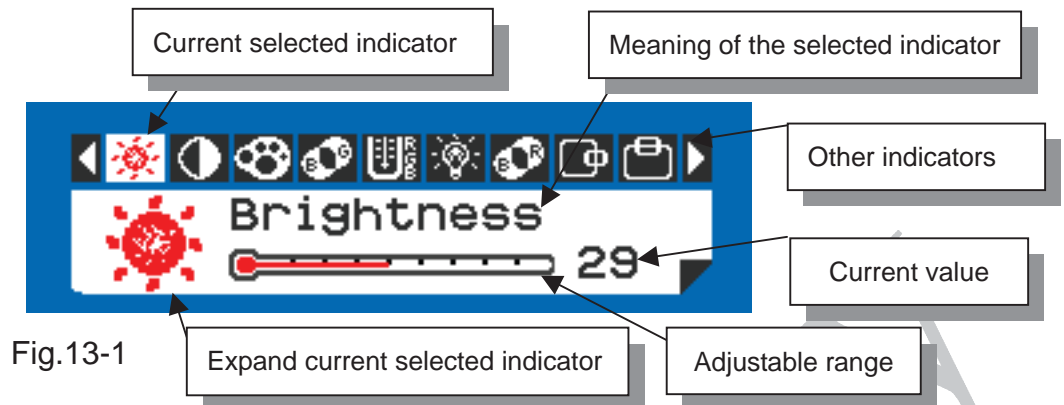
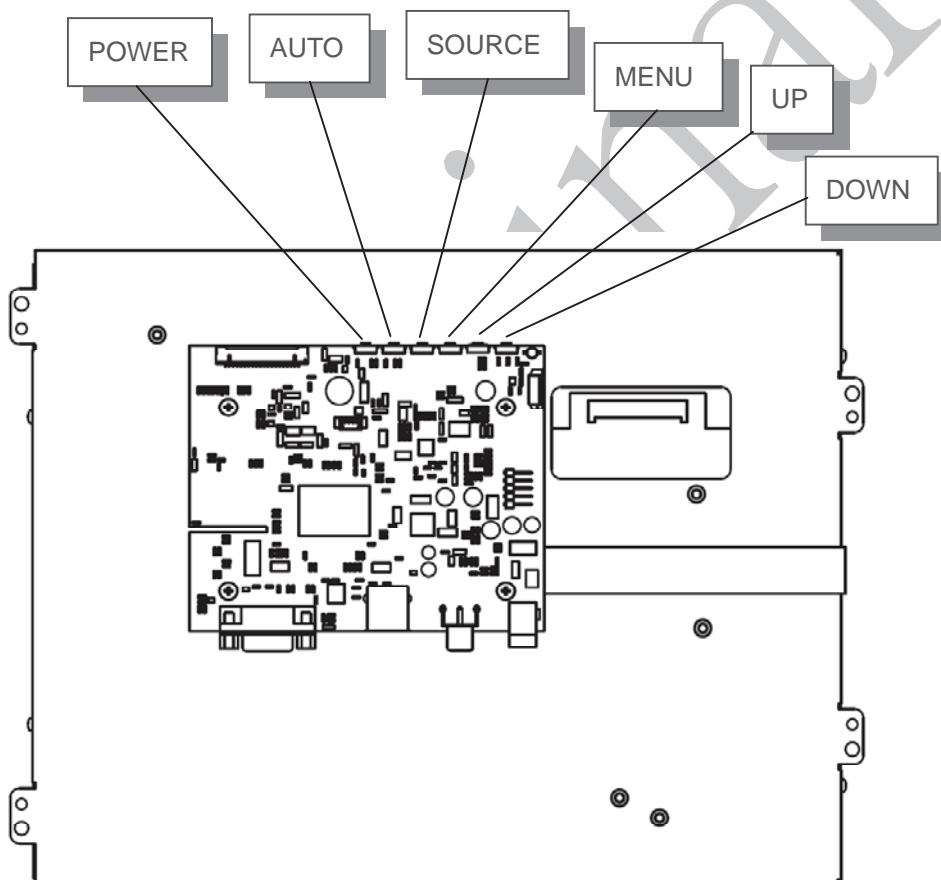


Fig.13-1



Operations of key board :

1. To navigate the menu, press [MENU]. (Fig.13-1)
2. The indicator lighting up in white color is the selected adjustment item.
3. To Next Item of the menu, press [MENU] again.
4. The operations below are only available when “Menu” is started.
5. Press [UP] / [DOWN] to adjust the value of the selected item.

Overview of the menu :

Firmware must be \geq VER 0.26
















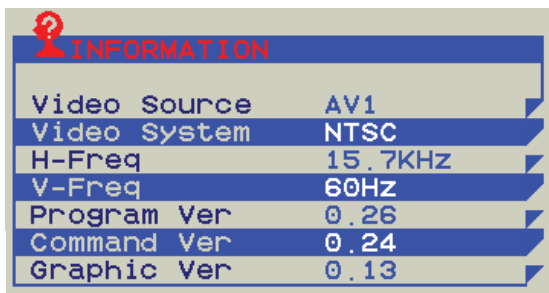
| Indicator | Meaning | Adjustable range | For | Remark |
|---|-------------|------------------------|----------|-------------|
|  | Brightness | 0 ~ 64 | AV / VGA | Adjust-Bar |
|  | Contrast | 0 ~ 64 | AV / VGA | Adjust-Bar |
|  | Color | 0 ~ 64 | AV | Adjust-Bar |
|  | Tint | 0 ~ 32 | AV | Adjust-Bar |
|  | Sharpness | 0 ~ 16 | AV | Adjust-Bar |
|  | Dimmer | 0 ~ 9 | AV / VGA | |
|  | Color Tone | Normal / Warm / Cool | AV / VGA | |
|  | H-Position | -25 ~ +25 | AV / VGA | Balance-Bar |
|  | V-Position | -10 ~ +10 | AV / VGA | Balance-Bar |
|  | Auto | | VGA | |
|  | Scan | Over Scan / Under Scan | AV | |
|  | Information | | AV / VGA | Fig.13-2 |
|  | Setup | | AV / VGA | Fig.13-3 |
|  | Factory Set | | AV / VGA | |
|  | Exit | | AV / VGA | |







Fig.13-2



Setup Menu :



Fig.13-3

| Indicator | Meaning | Adjustable range | Function | Remark |
|---|---------------|---------------------------|--|-------------------------|
|  | Show Status | ON / OFF | Show signal status. | ON: Show OFF: Hidden |
|  | Blue Screen | ON / OFF | If loss signal will put on the blue or black screen. | ON: Blue OFF: Black |
|  | Auto Power On | ON / OFF | Power input module will be auto turn on. | ON: Auto OFF: Manual |
|  | Auto Saving | OFF / 3s / 5s / 15s / 30s | If signal lost over setting times will be power off. | ON: Auto OFF: Normal |
|  | Detect Source | ON / OFF | Auto detection which source is existence and change. | ON: Auto OFF: Normal |
|  | Return | | | |

Note: VGA only type don't have Detect Source function.

13.2 Operations

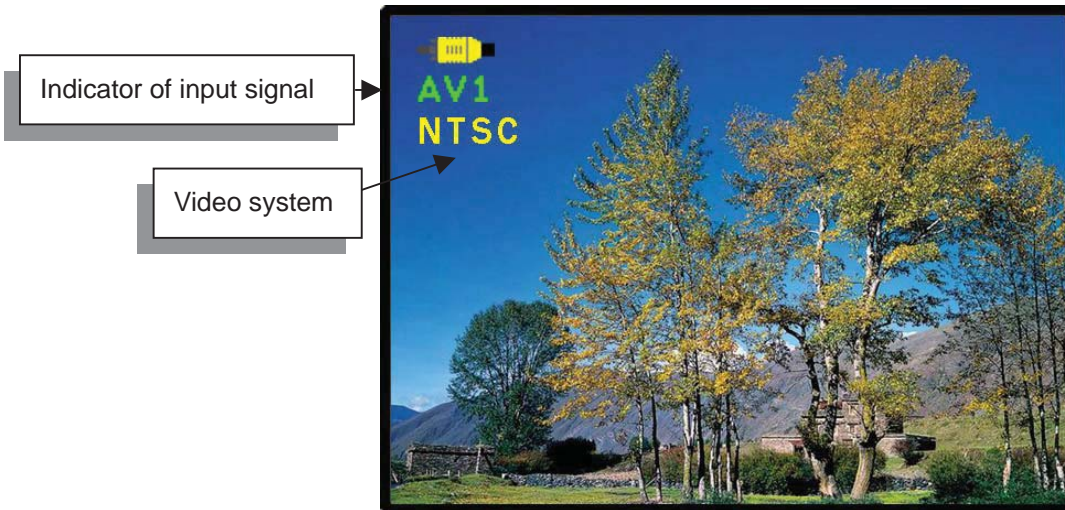




Fig.13-4

[Power] : Monitor power on / off

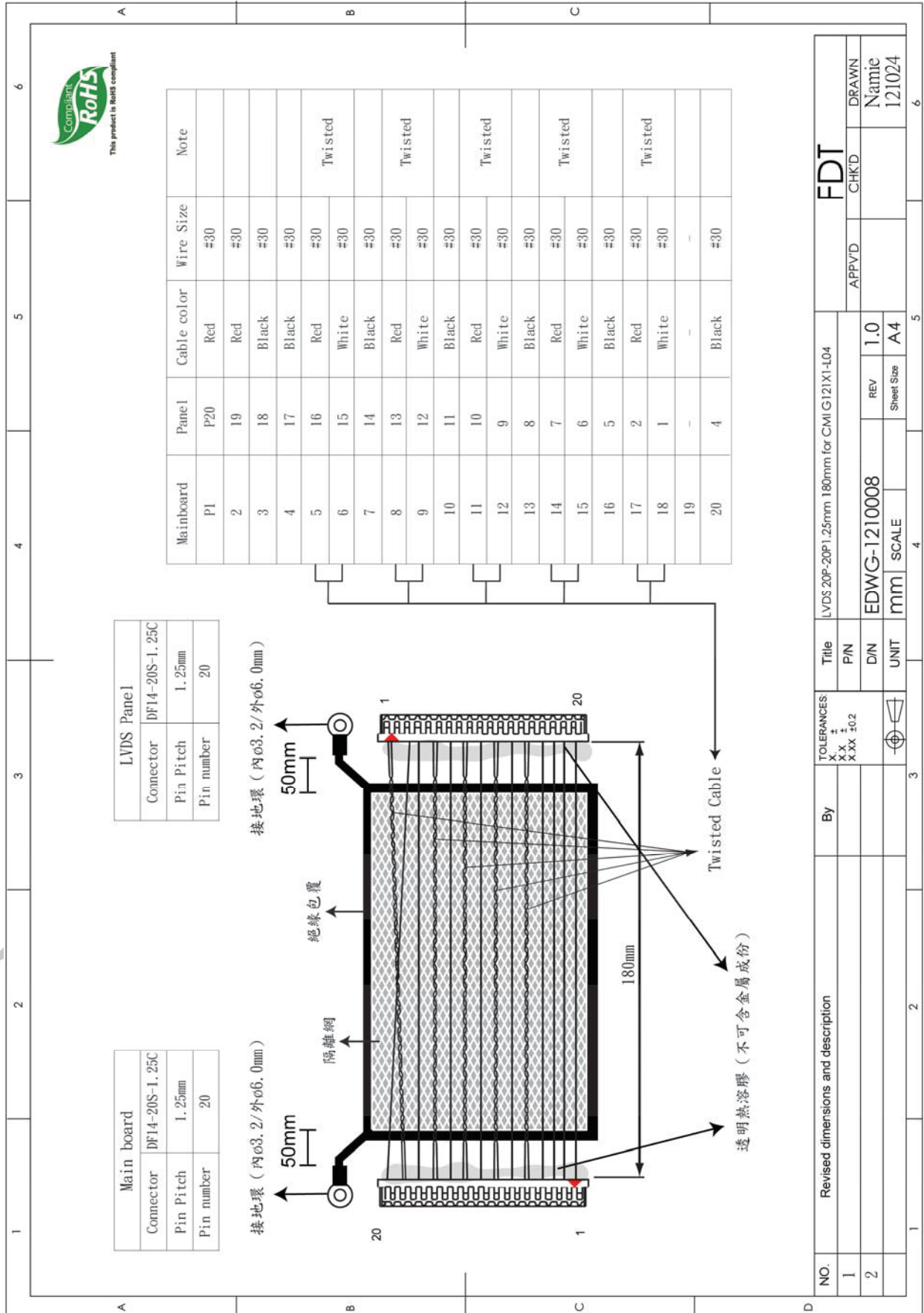
[Source] : Input signal switch

Overview of input signals :

| Indicator | Input signal | Interface | Video system |
|---|--------------|------------|---------------------------------------|
|  | AV1 | Composite | NTSC / PAL / SECAM |
|  | VGA | Analog RGB | 640x480_60 / 800x600_60 / 1024x768_60 |

14. Accessory

14.1 LVDS Cable (20P-20P 1.25mm L: 180mm)

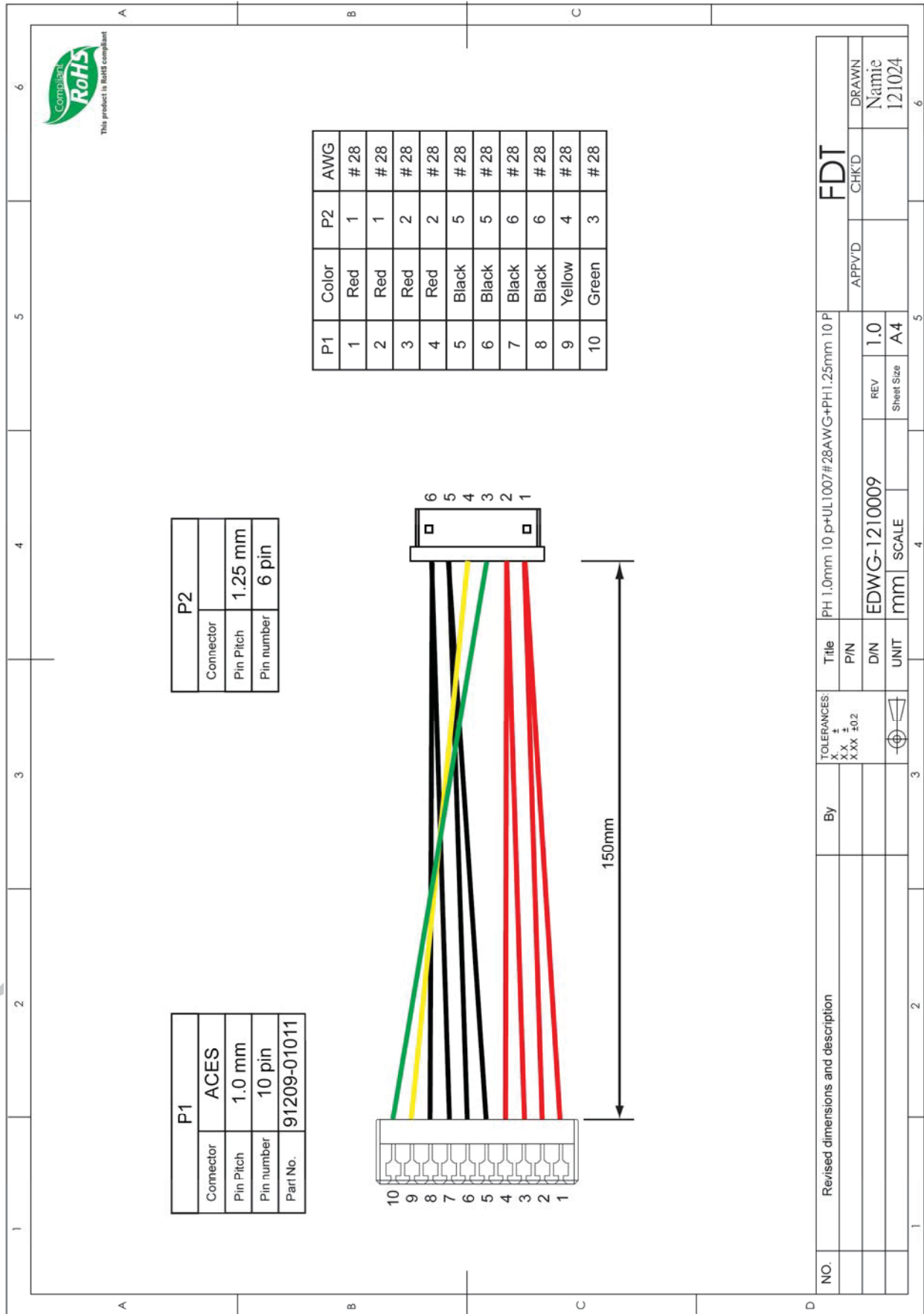


FLAT DISPLAY TECHNOLOGY

■ LP121L4E~~xx~~-F~~x~~R V0.1



14.2 LED Backlight Cable(6P 1.25mm-10P 1.0mm L:150mm)



| | | | | | | | | | |
|-----|------------------------------------|----|-----------------------------------|-------|--------------|--|-------|--------|----------------|
| NO. | Revised dimensions and description | By | TOLERANCES: X.X ± X.XX ±0.2 | Title | | PH 1.0mm 10 p+UL1007#28AWG+PH1.25mm 10 P | | FDT | |
| | | | | PIN | DIN | UNIT | SCALE | APPV'D | CHK'D |
| | | | | | EDWG-1210009 | REV | 1.0 | | |
| | | | | | mm | Sheet Size | A4 | | |
| | | | | | | | | | Name 121024 |

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