# IDP-3500-04A Touch Display Module Datasheet

## 1 Introduction

The IDP-3500-04A is a smart display module featuring a 3.5" TFT LCD panel with a 320x480 resolution, supporting up to 262K colors with a capacitive touch interface. It integrates Bridgetek's proprietary Embedded Video Engine (EVE) Graphics Controller, the FT811, to deliver rich, interactive, multi-touch user experiences. The module is powered by Bridgetek's FT903 System-On-Chip microcontroller, known for its high integration and low power consumption.

Designed for intuitive control and monitoring, the IDP-3500-04A Touch Display allows users to trigger events effortlessly. Unlike mobile devices that require frequent recharging, it can be installed in accessible locations and continuously powered via a CAT5e cable.

### 1.1 Features

- Integrated FT903 32-bit RISC microcontroller (MCU) with 100MHz system clock
- Built-in advanced FT811 graphics controller with display, touch and audio functionality
- 3.5-inch high-brightness 320x480 resolution TFT LCD with capacitive touch (5 touches supported)
- Integrated buzzer for audio notifications
- Two RJ45 Ports supporting RS485 Interface for data communication, allowing daisy chain to another IDP-3500-04A module
- Powered by a 9V-24VDC source via an RJ45 port

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## 1.2 Typical Applications

- Home Automation Systems: Smart Thermostats, Lighting Control.
- Audio Equipment: Mixing Consoles, Hi-Fi Systems.
- Medical Devices: Portable Medical Monitors, Patient Monitoring Devices.
- Industrial Applications: Control Panels, Measurement Instrument.
- Automotive Interfaces: Infotainment Systems, Dashboards
- Consumer Electronics: Smart Speakers and Media Players, portable Gaming Consoles.
- Test and Measurement Equipment such as Oscilloscopes and Multimeters.
- …… and many more.

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# 2 Part Number/Ordering Information/Package Content

| Part No. | Description |
|---|---|
| IDP-3500-04A | Intelligent Display Product 3.5 inch Portrait with Enclosure |

**Table 1 - Part Number/Ordering Information**

| Description | |
|---|---|
| Hardware components | IDP-3500-04A Display Module |
| | Self-Tapping Screws (3.5mm x 15mm)-For Arlington LV1 Wall Mounting x2 |

**Table 2 - Package Content**

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# 3 Hardware Features

## 3.1 Module Overview

The IDP-3500-04A module features a 3.5-inch TFT LCD and Capacitive Touch Panel (CTP) with dimensions of 116mm (L) X 86mm (W) X 17mm (T) and weighing 146g.

**Figure 1 - Front View of IDP-3500-04A Module**

**Figure 2 - Back View of IDP-3500-04A Module**

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## 3.2 PCBA Profile

Dimensions of main board: 97mm (L) X 75mm (W) X 1mm (T) with maximum component height of approximately 13mm.

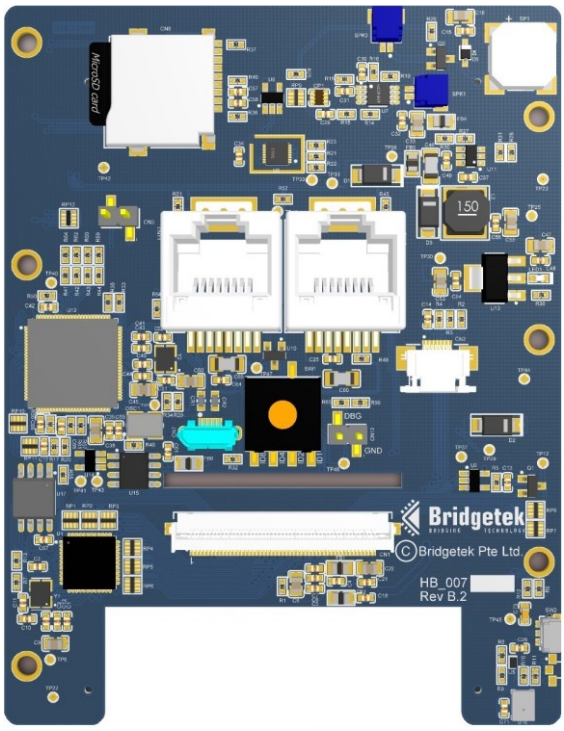


**Figure 3 - Mainboard PCBA Front View**

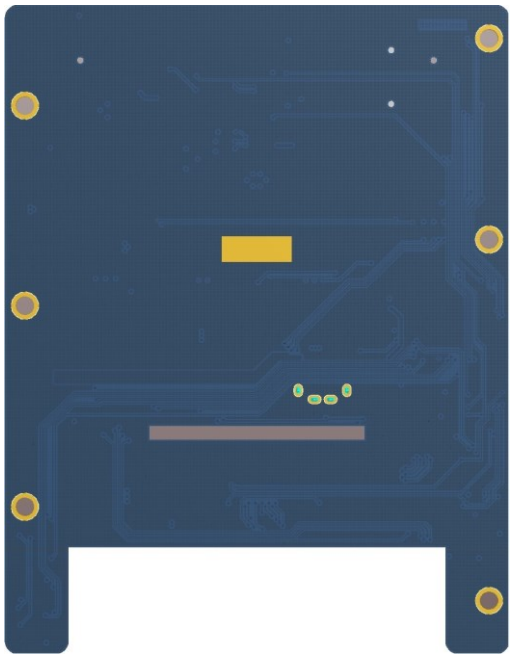

**Figure 4 - Mainboard PCBA Back View**

### 3.2.1 Key Features

- 3.5-inch 320 x 480 TFT-LCD panel with capacitive touch panel
- Bridgetek FT811 EVE chip for graphics, touch, and audio control
- LED backlight driver integrated
- Bridgetek FT903 microcontroller
- 8Mbyte NOR Flash for FT903 data storage
- Micro-SD card socket
- Micro USB port for communication to FT903 MCU
- Two RJ45 ports for I/O supply and RS485 communication
- Built-in audio buzzer for sound notifications
- Built-in smart LED indicator
- ID switch for unique ID setting
- Hardware reset button

## 3.3 PCB Profile

Printed circuit board(PCB) in the IDP-3500-04A module is designed with four layers, stacked as follows:

1. Layer 1: Routing & Component placement (Top)
2. Layer 2: Ground Plane
3. Layer 3: Power Plane
4. Layer 4: Routing & Component placement (Bottom)

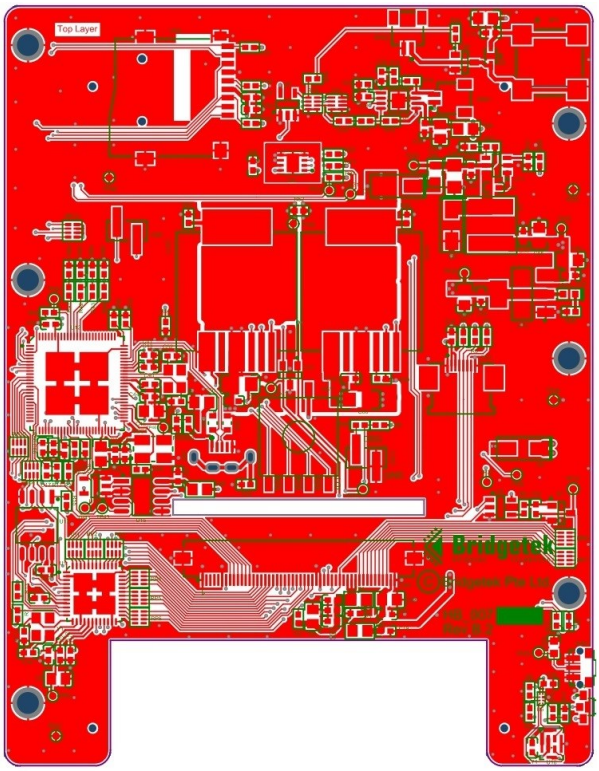


**Figure 5 - Main PCB Top Layer**

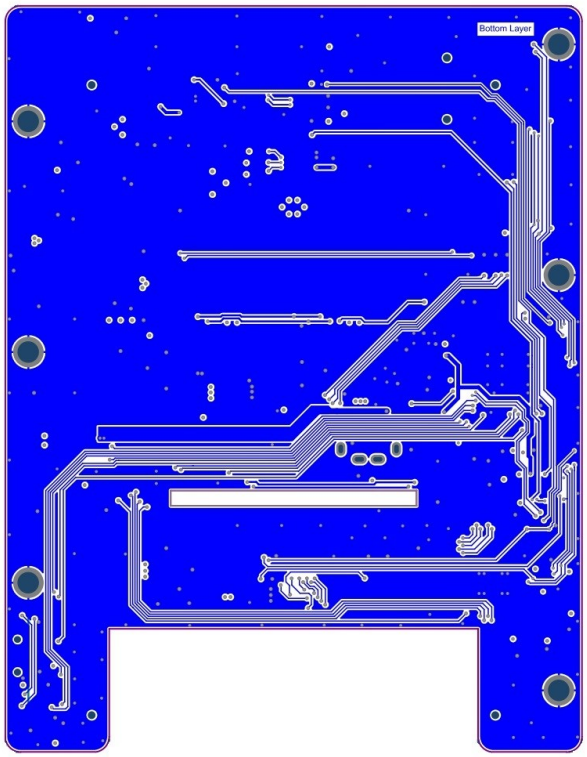


**Figure 6 - Main PCB Bottom Layer**

## 3.4 Connectors, Switches and Buttons

The following section provides details about the connectors, their pin configurations and the functions of the switches and buttons on the boards. Refer to Figure 3 for connector locations.

- **CN1 – LCD Panel Interface**

This 50-position, 0.5mm pitch bottom-contact FPC connector is used for inter-connection to the 3.5-inch LCD panel. The manufacturer's part number for this connector is " 5051105091."

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | GND | P | Ground |
| 2 | NC | NA | No Connection |
| 3 | NC | NA | No Connection |
| 4 | NC | NA | No Connection |
| 5 | NC | NA | No Connection |
| 6 | GND | P | Ground |
| 7 | LCD_3V3 | P | 3.3V output power supply |
| 8 | LCD_R7 | O | Red channel intensity bit 7 |
| 9 | LCD_R6 | O | Red channel intensity bit 6 |
| 10 | LCD_R5 | O | Red channel intensity bit 5 |
| 11 | LCD_R4 | O | Red channel intensity bit 4 |
| 12 | LCD_R3 | O | Red channel intensity bit 3 |
| 13 | LCD_R2 | O | Red channel intensity bit 2 |

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| | | | |
|---|---|---|---|
| 14 | LCD_G7 | O | Green channel intensity bit 7 |
| 15 | LCD_G6 | O | Green channel intensity bit 6 |
| 16 | LCD_G5 | O | Green channel intensity bit 5 |
| 17 | LCD_G4 | O | Green channel intensity bit 4 |
| 18 | LCD_G3 | O | Green channel intensity bit 3 |
| 19 | LCD_G2 | O | Green channel intensity bit 2 |
| 20 | LCD_B7 | O | Blue channel intensity bit 7 |
| 21 | LCD_B6 | O | Blue channel intensity bit 6 |
| 22 | LCD_B5 | O | Blue channel intensity bit 5 |
| 23 | LCD_B4 | O | Blue channel intensity bit 4 |
| 24 | LCD_B3 | O | Blue channel intensity bit 3 |
| 25 | LCD_B2 | O | Blue channel intensity bit 2 |
| 26 | LCD_DE | O | Enable valid pixel data being sent to LCD |
| 27 | LCD_PCLK | O | Pixel clock line to LCD |
| 28 | LCD_HC | O | Horizontal sync signal line to LCD |
| 29 | LCD_VC | O | Vertical sync signal line to LCD |
| 30 | GND | P | Ground |
| 31 | GND | P | Ground |
| 32 | SPIM_SCK | O | SPI Master clock signal line |
| 33 | SPIM_SSn1 | O | Vertical sync signal line to LCD |
| 34 | SPIM_MOSI | O | SPI Master data signal line |
| 35 | NC | NA | No Connection |
| 36 | LCD_RST | O | Reset output to CTP |
| 37 | NC | NA | No Connection |
| 38 | LCD_3V3 | P | 3.3V Input power supply |
| 39 | LCD_3V3 | P | 3.3V Input power supply |
| 40 | LCD_3V3 | P | 3.3V Input power supply |
| 41 | LEDK8 | P | LED Cathode 8 |
| 42 | LEDK7 | P | LED Cathode 7 |
| 43 | LEDK6 | P | LED Cathode 6 |
| 44 | LEDK5 | P | LED Cathode 5 |
| 45 | LEDK4 | P | LED Cathode 4 |
| 46 | LEDK3 | P | LED Cathode 3 |
| 47 | LEDK2 | P | LED Cathode 2 |
| 48 | LEDK1 | P | LED Cathode 1 |
| 49 | LEDA | P | LED Anode |
| 50 | GND | P | Ground |

**Table 3 - CN1 Pinout**

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- **CN2 – Capacitive Touch Panel Interface**

The 8-postion 0.5mm pitch top-contact FFC connector provides support to LCD panels with capacitive touch function.

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | GND | P | Ground |
| 2 | VDD_3V3 | P | 3V3 output power supply |
| 3 | VDD_3V3 | P | 3V3 output power supply |
| 4 | CTP_SCL | O | I2C serial bus, clock line |
| 5 | CTP_SDA | I/O | I2C serial bus, data line |
| 6 | CTP_INT# | I | Interrupt input from CTP |
| 7 | CTP_RST# | O | Reset output to CTP |
| 8 | GND | P | Ground |

**Table 4 - CN2 Pinout**

- **CN7 – Micro-USB Receptacle**

The micro-USB receptacle enables PC communication with FT903 MCU and device firmware debug and updates.

- **CN8 - Micro SD Card Connector**

Supports SPI communication mode with auto card detection.

- **CN10 – RJ45 Interface In**

The 8-position, 1.5mm pitch right-angle RJ45 connector supports an RS485 interface for communication with external host devices and accepts a 24V power input from an external source.

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | RS485_B/Z | I/O | Inverting receiver input and inverting driver output. Pin is an input if DE = 0; pin is an output if DE = 1 |
| 2 | RS485_A/Y | I/O | Non-inverting receiver input and non-inverting driver output. Pin is an input if DE = 0; pin is an output if DE = 1 |
| 3 | NA | I | Pull-low with 470ohm resistor |
| 4 | DC_IN | P | 24V Input power supply |
| 5 | DC_IN | P | 24V Input power supply |
| 6 | NC | NA | No Connection |
| 7 | GND | P | Ground |
| 8 | GND | P | Ground |

**Table 5 - CN6 Pinout**

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- **CN11 – RJ45 Connector Out**

The 8-position right-angle RJ45 connector supports an RS485 interface for communication and supplies power to connected external devices.

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | RS485_B/Z | I/O | Inverting receiver input and inverting driver output. Pin is an input if DE = 0; pin is an output if DE = 1 |
| 2 | RS485_A/Y | I/O | Non-inverting receiver input and non-inverting driver output. Pin is an input if DE = 0; pin is an output if DE = 1 |
| 3 | NA | I | Pull-low with 470ohm resistor |
| 4 | DC_OUT | P | Output power supply from DC_IN |
| 5 | DC_OUT | P | Output power supply from DC_IN |
| 6 | NC | NA | No Connection |
| 7 | GND | P | Ground |
| 8 | GND | P | Ground |

**Table 6 - CN8 Pinout**

- **CN12 – One Wire Debugger Interface**

The 2-postion 2.54mm pitch header is used for debugging the onboard FT903 microcontroller.

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | GND | P | Ground |
| 2 | DBG | I/O | For in-circuit debugging |

**Table 7 - CN12 Pinout**

- **SW1 -** is a 4-position rotary switch use for configuring a unique ID for the device.
- **SW2 -** is hardware reset button to reset FT903 MCU.

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# 4 Board Schematics

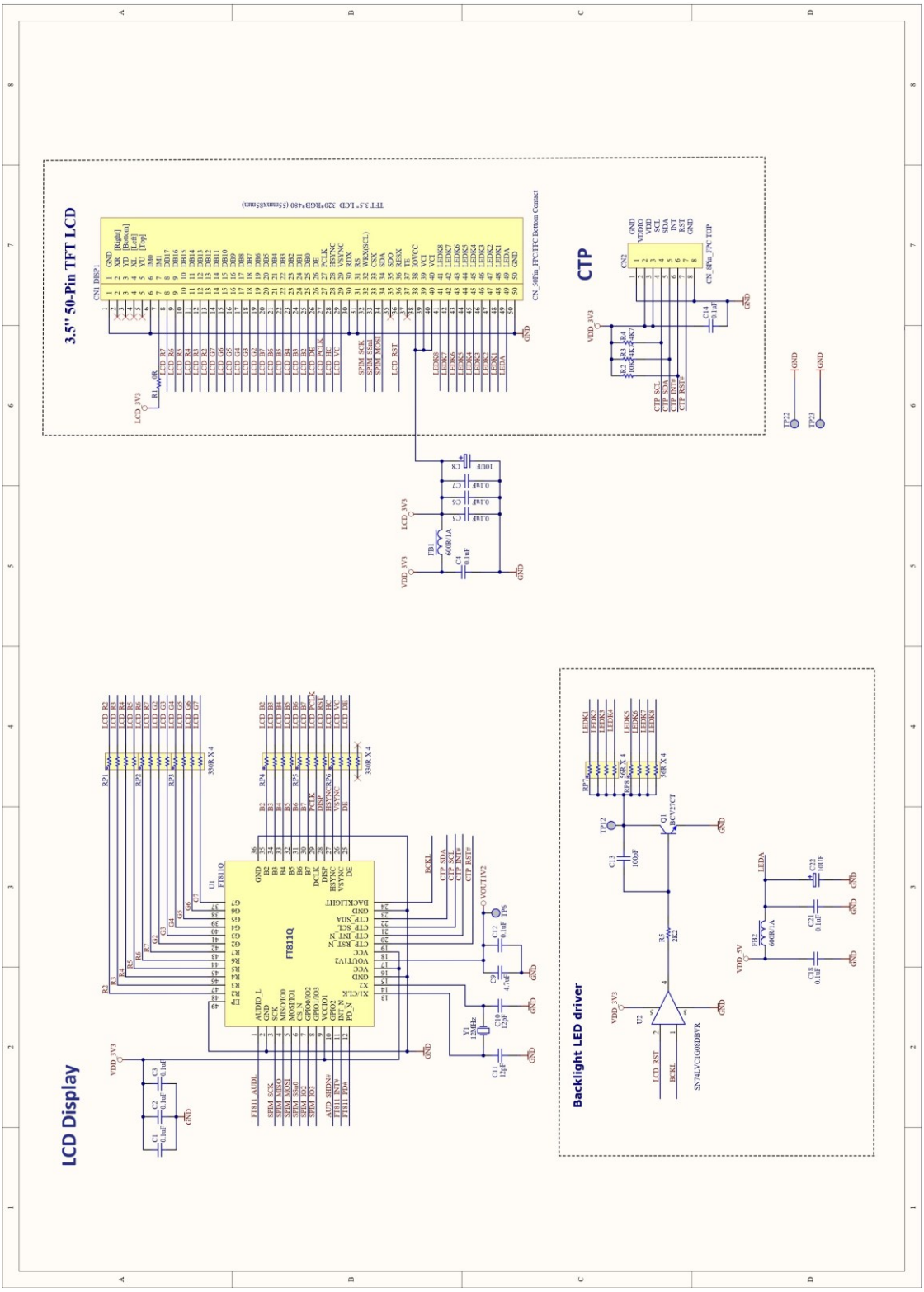


**Figure 7 - 3.5-inch TFT LCD Display**

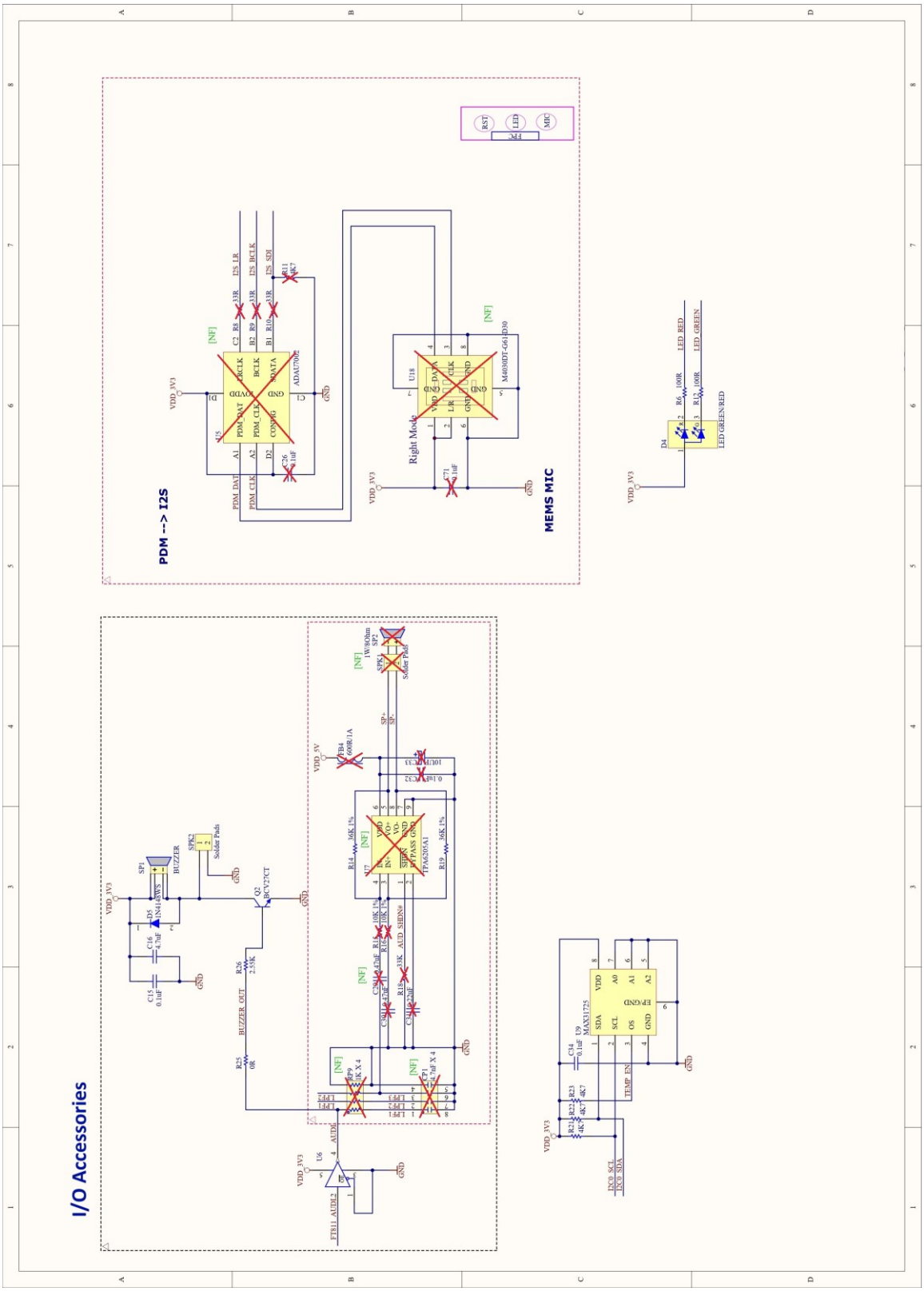


**Figure 8 - I/O Accessories**

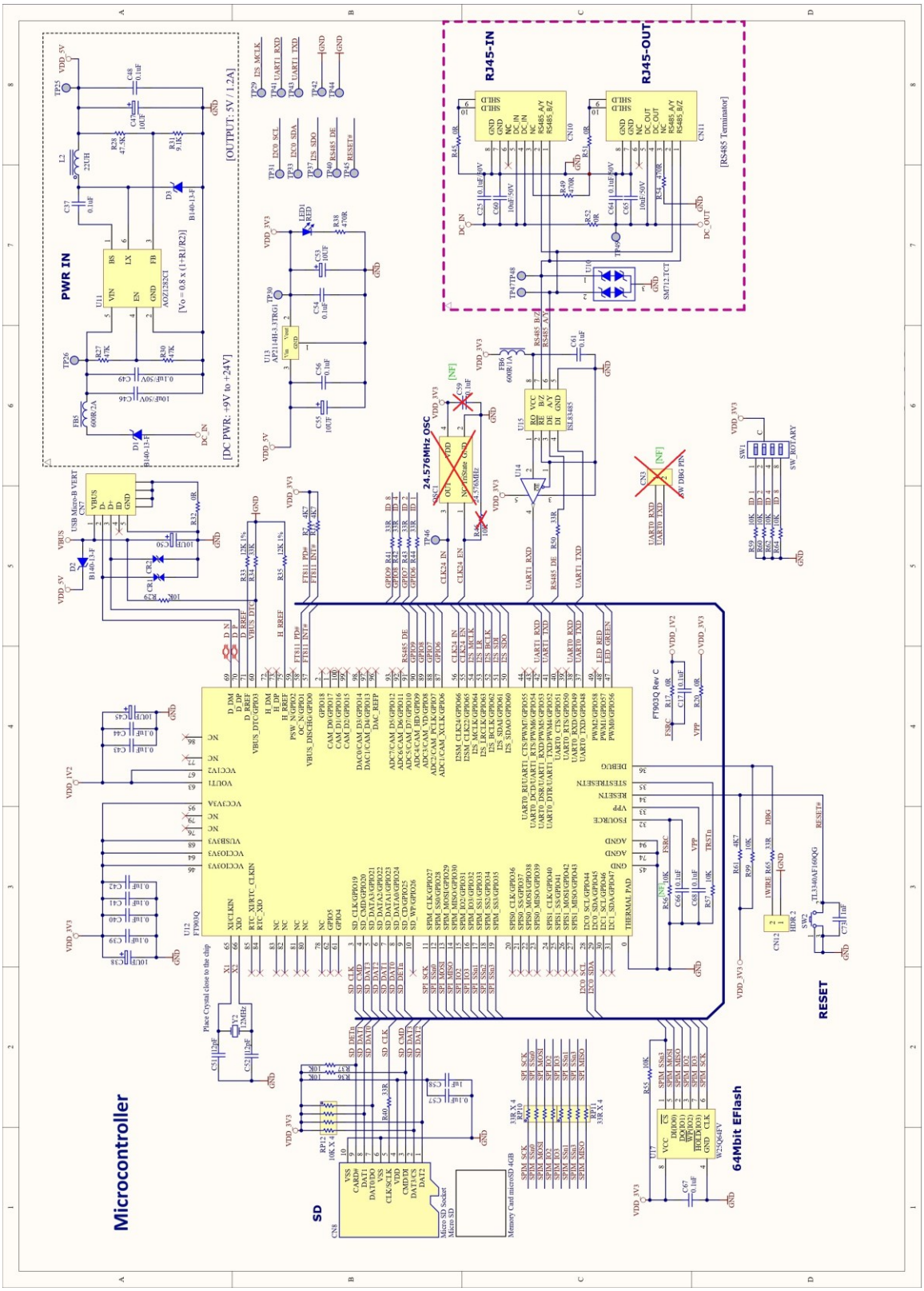


**Figure 9 - MCU Controller**

# 5 Device Description and Configuration

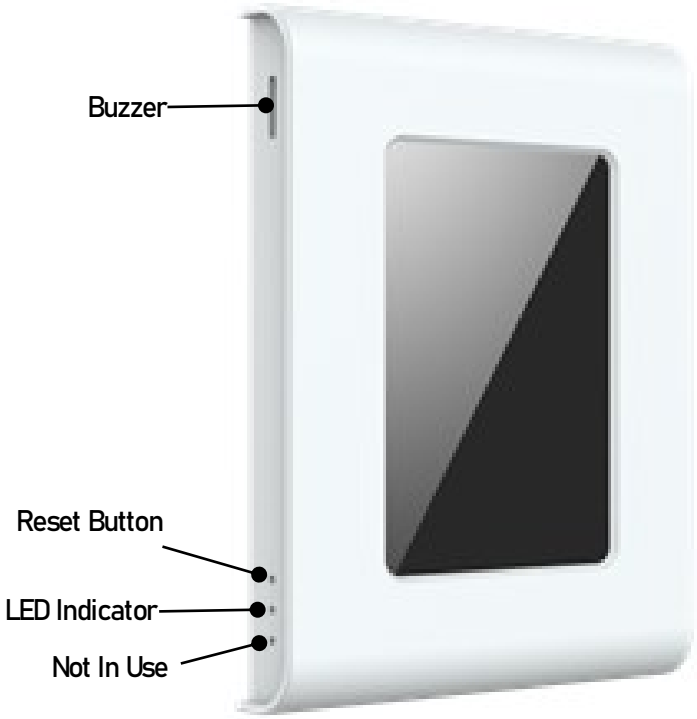


**Figure 10 - IDP-3500-04A Touch Display Front View**

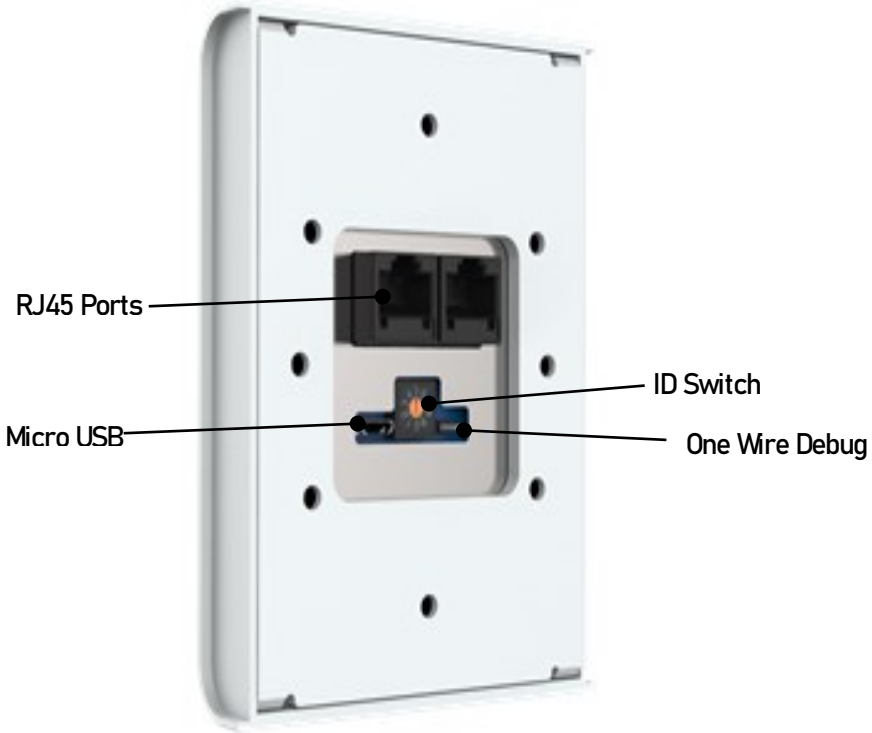


**Figure 11 - IDP-3500-04A Touch Display Rear View**

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## 5.1 Power Supply

The IDP-3500-04A display module is powered through the RJ45 port on its back and can also output power directly from the input source. It supports an input voltage range of 9VDC to 24VDC, with a recommended power source of at least 3W.

## 5.2 Microcontroller

The display module is powered by the FT903, a 32-bit RISC microcontroller from Bridgetek's System-On-Chip series, featuring:

- 32-bit FT32 core processor running at 100MHz
- 256kB on-chip flash memory
- 256kB on-chip shadow program memory
- 64kB of on-chip data memory
- OTP memory for security configuration
- USB 2.0 EHCI-compatible host controller supporting high-speed (480 Mbit/s), full-speed (12 Mbit/s), and low-speed (1.5 Mbit/s)
- USB 2.0 device controller supporting high-speed (480 Mbit/s) and full-speed (12 Mbit/s)

Bridgetek provides a free software toolchain to streamline the creation and downloading of .bin files. The FT9xx-Toolchain is available for download on the Bridgetek website.

## 5.3 Graphic Controller

The IDP-3500-04A utilizes Bridgetek's second-generation Advanced Embedded Video Engine (EVE) FT811 for high-quality Human Machine Interfaces (HMIs), integrating graphic control, audio, and touch interface capabilities.

Bridgetek provides the EVE Toolchains, an essential suite of tools for free, enabling developers to design impressive and highly responsive graphics user interfaces (GUIs) for EVE-based solutions. The toolchain contains the following tools:

- EVE Screen Designer
- EVE Screen Editor
- EVE Asset Builder

## 5.4 RJ45 Ports

### 5.4.1 Pin Definition

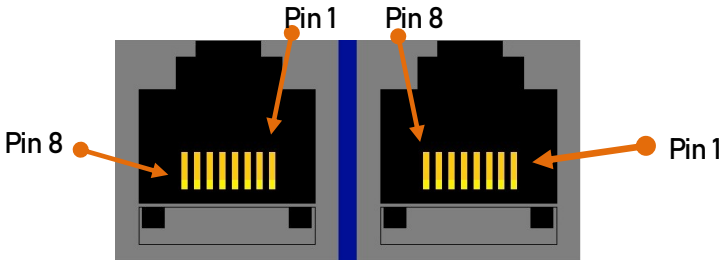


**Figure 12 - RJ45 Ports Pin orientation**

| Pin Number | 1 | 2 | 3 | 4,5 | 6 | 7,8 |
|---|---|---|---|---|---|---|
| Function | RS485 B/Z | RS485 A/Y | NC | DC_IN/OUT | Pull-low to GND | GND |

**Table 8 - RJ45 Ports Pin Function**

### 5.4.2 Powering and Communication

The RJ45 ports support both power and data transmission. Below are two methods for supplying power and communicating with the IDP-3500-04A module.

**Method 1: Use of BRTSys LDSBus Adaptor**

For development purposes, developers can use a BRTSys' s LDSBus USB Adaptor designed for RS485 device applications. It provides a USB-to-RS485 interface with power supplied through its RJ45 port. Refer to the purchase link below for the adaptor and an illustration in Figure 13.

- BRTSys – LDS Bus USB Adaptor

**Figure 13 - BRTSys LDS Bus USB Adaptor**

See Figure 14 for connection details when using the adapter.

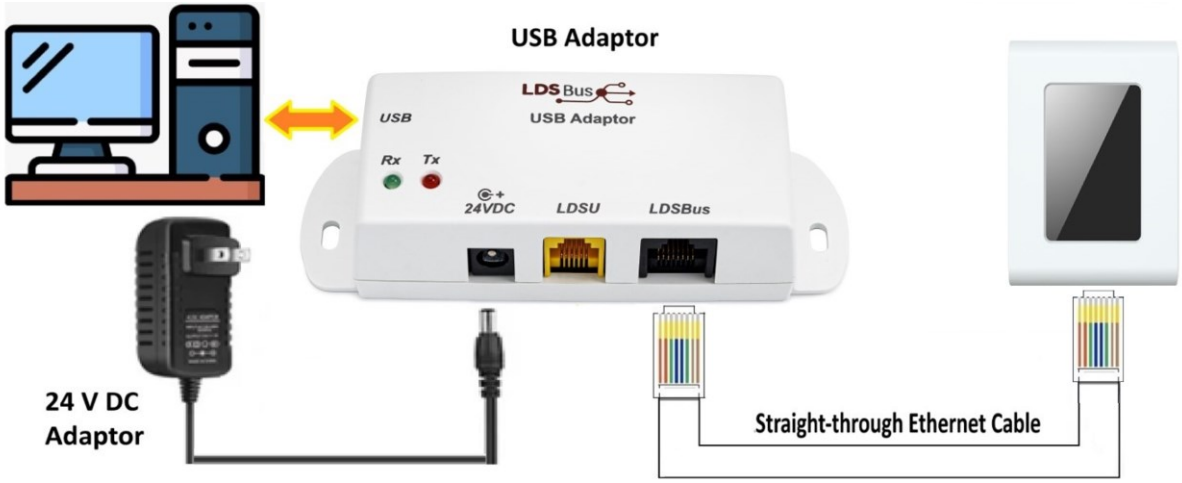


**Figure 14 - Connection to PC and Supply via LDS Bus USB Adaptor**

**Method 2: Use of Power-over-Ethernet (PoE) Splitter**

A Power-over-Ethernet (PoE) splitter can be used to separate power and data for connection to a power source and host controller. Refer to Figure 15 for an image illustration of the PoE and links for purchasing options:

- PoE Splitter - Digikey

- PoE Splitter- AliExpress

**Figure 15 - PoE Splitter**

Refer to Figure 16 for connection details using a PoE splitter.

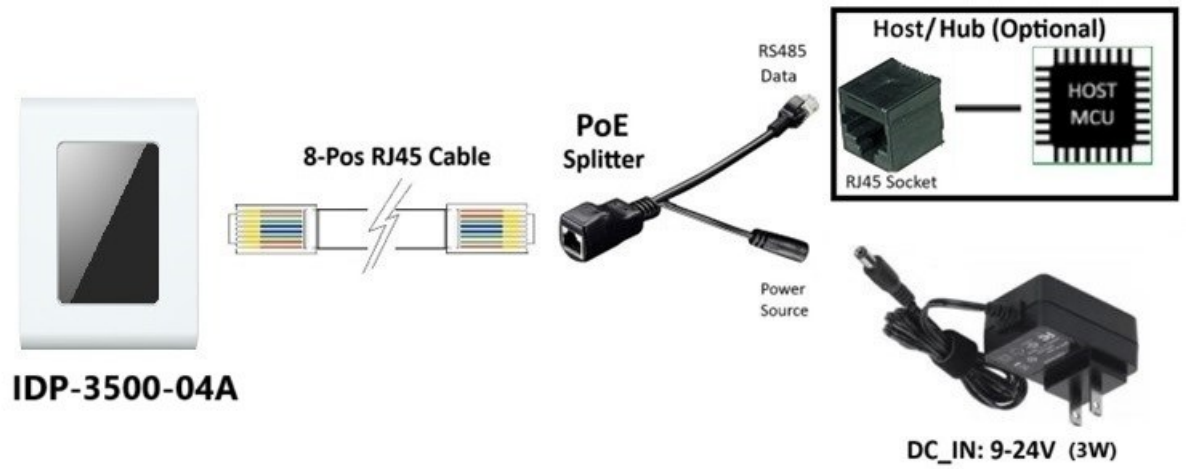


**Figure 16 - Connection to Host and Supply via PoE Splitter**

## 5.4.3 Port Connection

The RJ45 ports share identical connections, with their power lines shorted through a 0-ohm resistor and RS485 signals linked. When a power source or interface is connected to one port, it is automatically routed to the other. Refer to Figure 17 below for a simplified block diagram of the IDP-3500-04A's internal RJ45 connections.

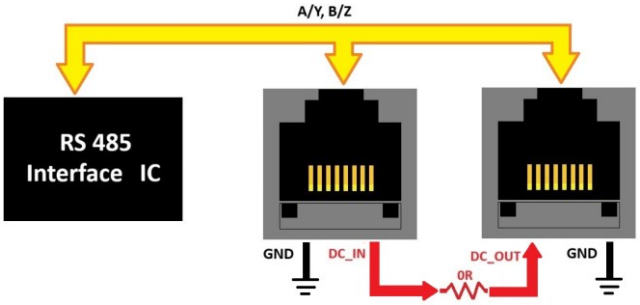


**Figure 17 - PCB Connections of RJ45 Ports**

**Caution:** Only one power source should be supplied at a time.

## 5.4.4 Port Termination

When using IDP-3500-04A module as a standalone device or as the last unit in a Daisy Chain configuration, attach the terminator to the final RJ45 port, as illustrate in Figure 18, to enhance data transmission reliability. The port terminator should include a 120ohm resistor across the RS-485 differential signal lines (pins 1 and 2 of the RJ45 port) to ensure proper RS-485 signal termination. For RS-485 applications, it is recommended to always include the 120Ω port terminator at both ends of the RS-485 bus.

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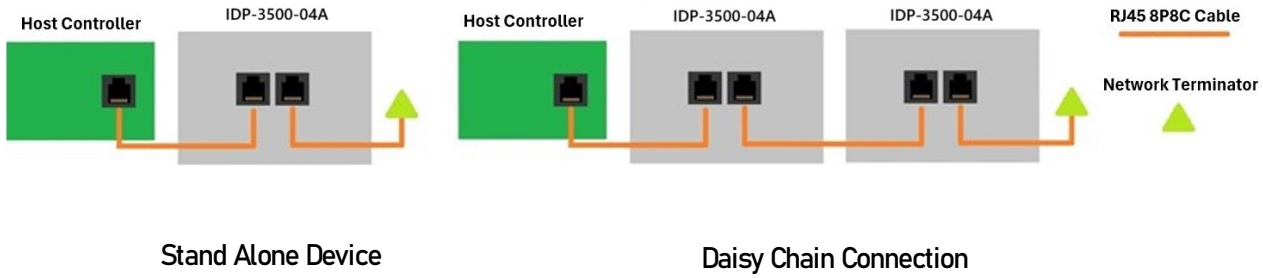


**Figure 18 - Port Termination**

## 5.5 LED Indicator

An integrated smart bi-color LED with red and green emitters offers programmable status indicators. Positioned on the side of the module (Figure 10), it can display red, green, and yellow colors, controlled by the MCU.

## 5.6 ID Switch

The ID switch on the module's back (Figure 11) allows custom configurations or use of the default factory setting (zero). It assists with device management in multi-device setups or boot mode configurations.

## 5.7 Reset Button

The module includes a reset button positioned on the side (Figure 10). The reset function can be activated by pressing through the designated hole.

## 5.8 Micro USB

A micro-USB connector interfaces with the FT903 microcontroller, supporting communication and firmware downloads to the integrated NOR flash. Detailed setup instructions can be found in the Section 8 Software Setup Information.

## 5.9 One Wire Debug

A one-wire debug function is accessible via the 2-position header on the module's back (Figure 11), connecting to the microcontroller. This mode supports code, firmware, and bootloader downloads to the NOR flash. Refer to the Section 8 Software Setup Information for installation details.

## 5.10 Buzzer

The IDP-3500-04A display module includes an integrated buzzer circuit for event notifications.

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# 6 Specifications

## 6.1 Electrical Specifications

| Parameter | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| DC_IN | Input voltage range | 9 | 24.0 | 28 | V |
| DC_OUT | Output voltage range | - | DC_IN | - | V |
| Icc_12V | Operating current, DC_IN=12V: Normal *Note | - | 200 | - | mA |
| $V_{OD1}$ | Driver Differential VOUT (no load) | - | - | 3.3 | V |
| $V_{OD2}$ | Driver Differential VOUT (with load)<br>RL=100Ω (RS-422) (Figure 19)<br>RL = 54Ω (RS-485) (Figure 19)<br>RL = 60Ω, -7V ≤ VCM ≤ 12V | <br>2<br>1.5<br>1.5 | <br>2.7<br>2.3<br>2.6 | <br>-<br>3.3<br>- | V |
| $\Delta V_{OD}$ | Change in Magnitude of Driver Differential VOUT for Complementary Output States<br>RL = 54Ω or 100Ω (Figure 19) | - | 0.01 | 0.2 | V |
| $V_{OC}$ | Driver Common-Mode VOUT<br>RL = 54Ω or 100Ω (Figure 19) | - | 1.8 | 3 | V |
| $\Delta V_{OC}$ | Change in Magnitude of Driver Common-Mode VOUT for Complementary Output States<br>RL = 54Ω or 100Ω (Figure 19) | - | 0.01 | 0.2 | V |
| Temperature | Operating temperature<br>Storage temperature | 0<br>0 | -<br>- | 55<br>70 | ℃ |

**Table 9 - Operating Voltage and Current**

**Note:** Measurement taken with the screen turned on.

***Test Circuits***

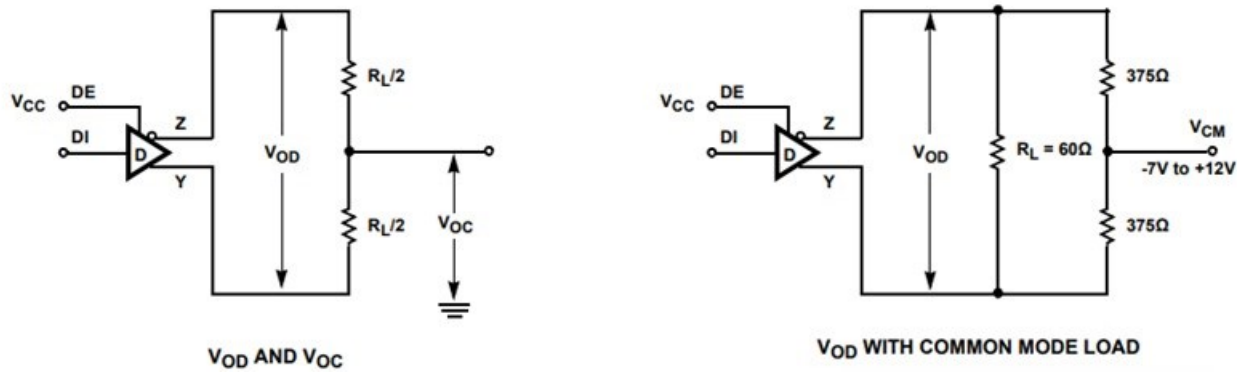


**Figure 19 - DC Driver Test Circuits**

## 6.2 Optical Specifications

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | $\theta$=0° Normal Viewing Angle | - | 500 | - | - |
| Response Time | Rising | $T_R + T_F$ | | - | 35 | 50 | msec |
| | Falling | | | | | | |
| Uniformity | | S(%) | | - | 70 | - | % |
| Color Filter Chromaticity | White | $W_X$ | | - | 0.301 | 0.303 | - |
| | | $W_Y$ | | - | 0.335 | 0.337 | - |
| | Red | $R_X$ | | - | 0.631 | 0.633 | - |
| | | $R_Y$ | | - | 0.334 | 0.335 | - |
| | Green | $G_X$ | | - | 0.316 | 0.318 | - |
| | | $G_Y$ | | - | 0.602 | 0.605 | - |
| | Blue | $B_X$ | | - | 0.151 | 0.152 | - |
| | | $B_Y$ | | - | 0.047 | 0.049 | - |
| Viewing Angle | Hor. | 3:00 | *Cr≥10* | - | 80 | - | Deg |
| | | 6:00 | | - | 80 | - | |
| | Ver. | 9:00 | | - | 80 | - | |
| | | 12:00 | | - | 80 | - | |
| Option View Direction | | Free | | | | | |

**Table 10 - Optical Specifications**

**Note:** The parameter is slightly changed by temperature, driving voltage and material

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# 7 Mechanical Dimensions and Mounting Guide

The following section provides details on the mechanical dimensions and the mounting process of the IDP-3500-04A.

## 7.1 Mechanical Dimensions

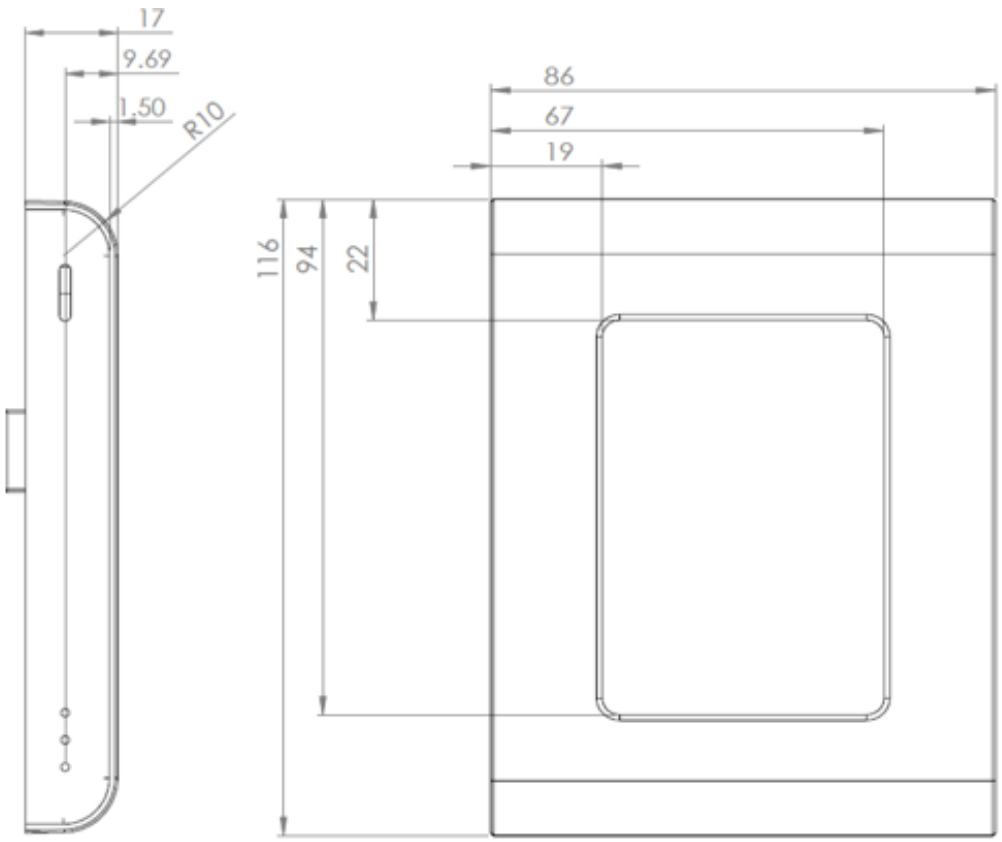


**Figure 20 - IDP-3500-04A Touch Display Dimensions**

**Note**: All dimensions are in millimetres.

## 7.2 Mounting Guide

The IDP-3500-04A package includes accessories to facilitate wall mounting of the display module. Secure the IDP-3500-04A back cover to the Arlington LV1 bracket using the provided self-tapping screws, as shown in Figure 21. And install the IDP-3500-04A display module on back cover and secure the panel.

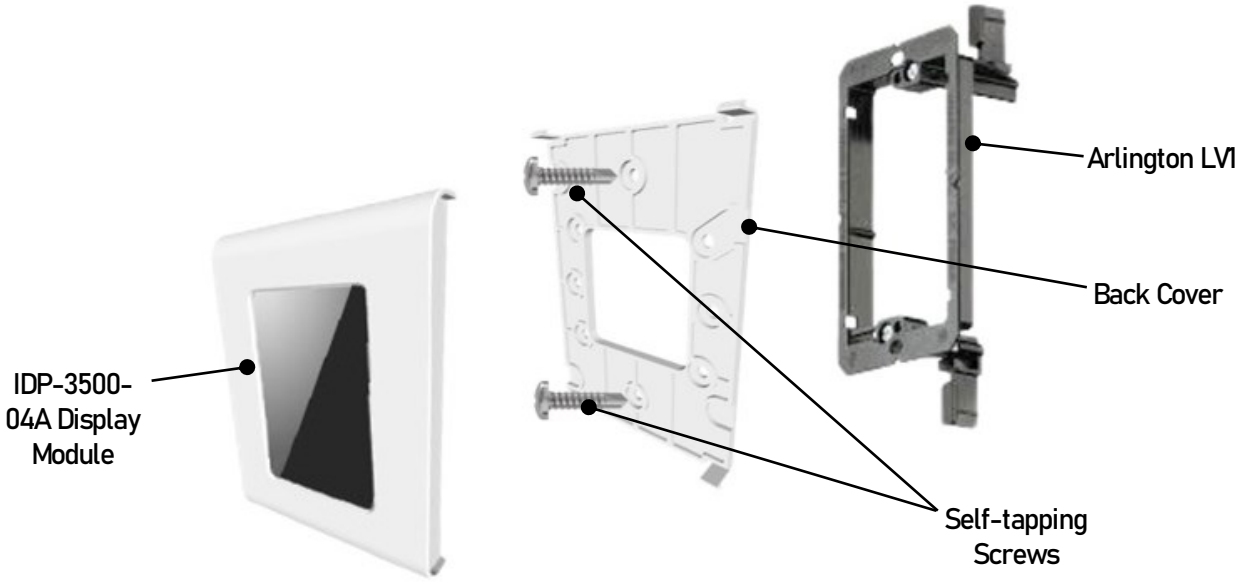


**Figure 21 - Wall Mount**

**Note:** Arlington LV1 mounting bracket is not part of the package.

# 8 Software Setup Information

## 8.1 Startup Test

The device comes preloaded with default firmware stored in the integrated NOR-Flash. Follow these steps to perform an initial test of the set before flashing developers' own code.

**Step 1: Powering Up the Device**

Connect the device to power source via the RJ45 connector. For details, refer to section 5.4.2.

**Step 2 Touch calibration:**

When powered on, the display module's preloaded firmware will prompt the user to perform a touch calibration test, as shown in Figure 22. During the calibration process, an audible beep tone will be activated. Complete the calibration as required for the application.

**Figure 22 - Touch Calibration**

Once the CTP is successfully calibrated, the Bridgetek company logo will be displayed as shown in Figure 23.

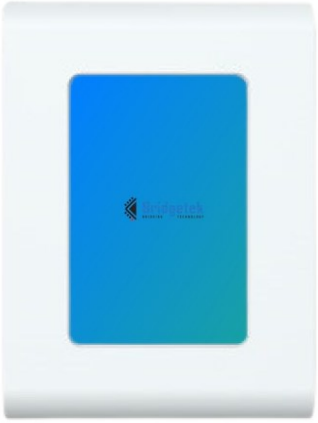

**Figure 23 - Bridgetek Logo**

Conducting this startup test ensures the device is operational before developers load their custom code.

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## 8.2 Downloading Firmware

There are two methods for downloading firmware and debugging with the FT903 MCU:

**Method 1: One Wire Programming Mode**

This method requires additional hardware, specifically the UMFTD2A programming module developed by Bridgetek, which supports downloading of firmware and debugging. For detailed information on the module and hardware pin definitions, refer to the UMFTPD2A link.

To establish the hardware connection, simply connect the **DBG** (CN2/CN3-8) and **GND** (CN2/CN3-7) pins from UMFTPD2A to the **One-Wire Debug** header pins of IDP-3500-04A display module, as shown in Figure 24.

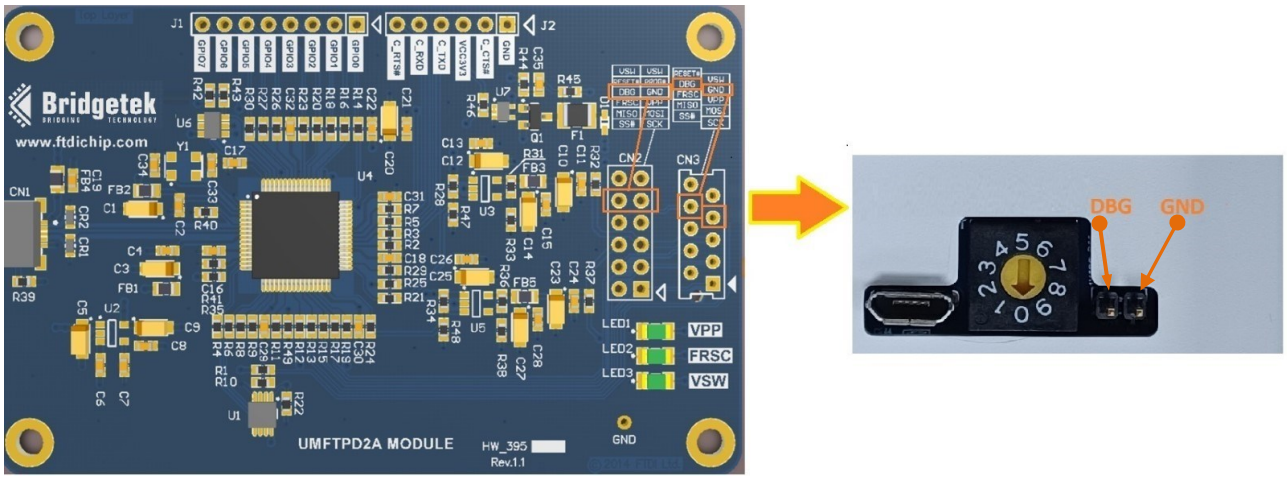


**Figure 24 - One-Wire Debug Mode Hardware Connection**

**Method 2: Device firmware upgrade (DFU) via USB Mode**

The USB-micro connector at the back of the module supports communication with the FT903 MCU, allowing the application code to configure it as either a Device Firmware Upgrade (DFU) port or a USB CDC serial port.

**Figure 25 – USB Mode Communication**

For more details, refer to the FT9xx_Programming-Debugging-and-Troubleshooting Guide.

## 8.3 Software Development Tools and Support

Bridgetek provides free and comprehensive software tools to simplify application development:

- FT9XX Toolchain - Download here
- EVE Toolchain - Download here

For example, projects, documentation, and additional support resources, please refer to the dedicated open-source repository:

https://github.com/Bridgetek/IDP-3500-04A

# 9 Disclaimer Notice: Use of Third-Party Software or Websites

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# 10 Warranty Statement

According to our after-sales policy, the warranty (if applicable) will be void under the following circumstances:

- The device has been damaged due to human factors, such as dropping, impact, water exposure, or unauthorized disassembly/modification.
- The device has malfunctioned due to improper use, mishandling, or usage beyond its intended design.
- The device has been disassembled, repaired, or modified by unauthorized personnel.
- Any other conditions that do not comply with our warranty policy.

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# 11 Contact Information

Refer to https://brtchip.com/contact-us/ for contact information.

**Distributor and Sales Representatives**

Please visit the Distribution Network – IC & Module (brtchip.com) page for the contact details of our distributor sales representative(s) in your country.

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# Appendix A - References

## Document References

DS_FT900/1/2/3

DS_FT81x

## Acronyms and Abbreviations

| Terms | Description |
|---|---|
| CTP | Capacitive Touch Panel |
| DFU | Device Firmware Upgrade |
| EVE | Embedded Video Engine |
| FCC | Federal Communications Commission |
| I/O | Input/Output |
| IC | Integrated Circuit |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| MCU | Microcontroller Unit |
| MIC | Microphone |
| PCB | Printed Circuit Board |
| PCBA | Printed Circuit Board Assembly |
| QFN | Quad Flat No Leads Package |
| RISC | Reduced Instruction Set Computer |
| RGB | Red, Green Blue |
| TFT | Thin Film Transistor |
| USB | Universal Serial Bus |

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# Appendix C – Revision History

Document Title: IDP-3500-04A Touch Display Module Datasheet

Document Reference No.: BRT_000453

Clearance No.: BRT#223

Product Page: https://brtchip.com/product/idp-3500-04a

Document Feedback: Send Feedback

| Revision | Changes | Date |
|---|---|---|
| Version 1.0 | Initial Release | 10-03-2025 |
| Version 1.1 | Updated the following – Product Name; Part Number/Ordering Information; Product page hyperlink; Github hyperlink<br><br>Added Warranty Statement section | 07-04-2025 |

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