HTT101A/G-IPS-1280800A

For all variants of the HTT101A/G-IPS

**Hardware Manual**

Revision 1.0



**PCB Revision: 3.0 or Higher**

# Contents

# 1   Contact

On Shore and In-House Design

In-House Manufacturing

In-House Sales

In-House Support

In Calgary, Canada

**Sales**
Phone: (403) 229-2737
Email: sales@matrixorbital.ca

**Support**
Phone: (403) 229-2737
Email: support@matrixorbital.ca

**Online**
Purchasing: www.matrixorbital.com
Support: www.matrixorbital.com

**Free support forums**

https://www.lcdforums.com/forums

**Example Code on GitHub**

https://github.com/MatrixOrbital

# 2   Customization

Need a custom solution? No problem! Since we manufacture our products in-house, we are highly flexible, have low MOQ`s and provide you what you need. From custom headers to custom cables to entire custom displays, we can make what you need.

## 3    Introduction

The HTT101 is an industrial 10.1" TFT display with an HDMI interface.  Featuring a Sunlight readable 1000nit 1280x800 resolution IPS panel, and video feedback, with 24-bit Full colour capabilities.  The HTT101 can be configured with a resistive, capacitive, or non-touch screen.  Designed with industrial applications in mind, the HTT is perfect for panel mounted applications and HMI interfaces. Compatible with Windows and Linux hosts, including Raspberry Pi, BeagleBone, TinkerBoard

The HTT101G features an easy to mount oversized capacitive touch screen. Panel mounting of the display is seamless and smooth providing a crisp modern look. It easy to clean, sanitize, water and dust resistant.

### Features

- 1000 cd/m2 sunlight readable software-controlled backlight brightness
- Optically Bonded Capacitive touch panel
- IPS Panel
- Auto Dim Backlight, with multiple stages
- Touch Feedback with piezo, or haptic or both
- Industrial 9-35V power input (-VPT) option
- Plug & Play
- Industrial MATE-N-LOK locking headers
- HID touch panel with multi-touch Capacitive touch
- Upgradable touch driver firmware
- DVI/HDMI interface
- Automatic resolution detected provided by EDID
- Available with:
    - No touch panel (-TPN)
    - Resistive touch panel (-TPR)
    - Capacitive touch panel (-TPC)
    - Oversized Capacitive touch panel (G -TPC)

### Functional Diagram
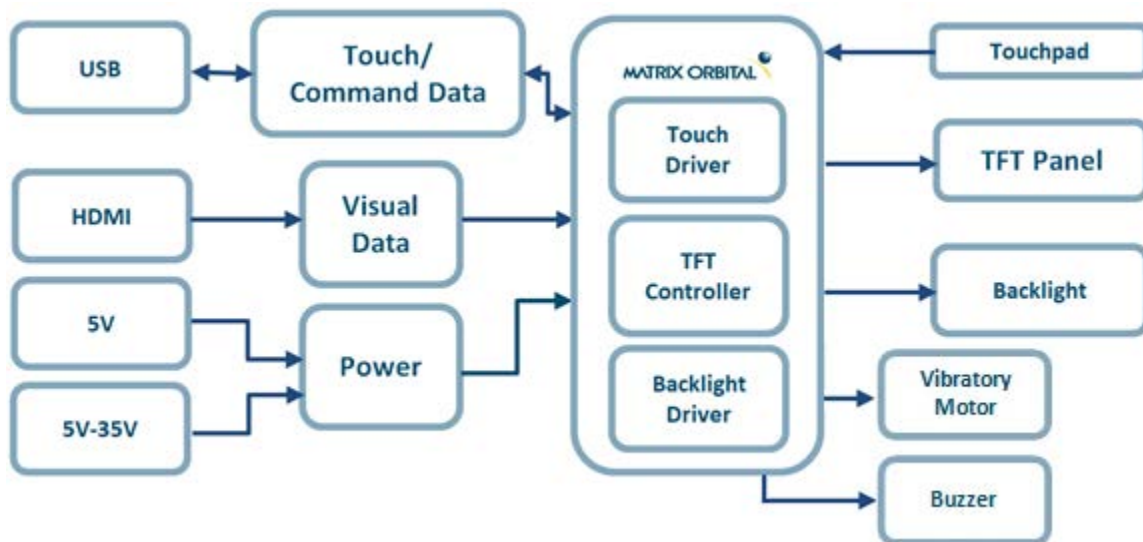
## 4    General Information

| Item | Contents | Unit |
|---|---|---|
| Display Size (Diagonal) | 10.1" | inch |
| Display type | IPS TFT | |
| Resolution | 1280x800 | Pixels |
| Display Mode | Transmissive, Normally Black | |
| Backlight | LED, 1000 cd/m2, 50,000 hours, PWM brightness | |
| | | |
| View Direction | All (160°) | |
| Gray Scale Inversion Direction | None | |
| Module Outline | A: 232.9 (W) x 154.6 (H)<br>G: 258.0 (W) x 168.6 (H) | mm |
| Active Area | 217.0 (W) x 135.6 (H) | mm |
| Pixel Pitch | 0.17 (W) x 0.17 (H) | mm |
| | | |
| Polarizer Surface Treatment | Anti-glare | |
| Display Colors | 16.7M 24-bit | |
| Interface | HDMI 1.0 Type-A or FFC | |
| Display Driver IC | TFP401A or Equivalent | |
| Touch | USB HID, Multi Touch (TPC) | |
| | | |
| Operating Temperature | -20 to 70 | °C |
| Storage Temperature | -30 to 80 | °C |

## 5    Part Numbering

The HTT101 is available with various voltage options and header orientations.

| HTT | 101 | A | -IPS | -TPC | -BLH | -B0 | -H5 | -CH | -V5 |
|-----|-----|---|------|------|------|-----|-----|-----|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

### Addon Options

| *-SPK | *-HAP | *-GG | *-WG |
|-------|-------|------|------|
|  |  |  |  |

| # | Designator | Options |
|---|------------|---------|
| 1 | Product Type | HTT: Graphic TFT Display |
| 2 | Display Size | 101: 10.1" |
| 3 | Screen Type | A: A Type<br>G: G Type |
| 4 | IPS Panel | -IPS |
| 5 | Touch | -TPN: No touch panel<br>-TPR: Resistive touch panel<br>-TPC: Capacitive touch panel<br>-TPC-OPT: Optically Bonded Capacitive touch |
| 6 | Backlight | -BLM: 300 Nit < Brightness < 600 Nit<br>-BLH: 600 Nit < Brightness < 1000 Nit<br>-BLD: 1000 Nit < Brightness < 1500 Nit |
| 7 | Bezel | -B0: None<br>-B1: Aluminum Bezel |
| 8 | Headers | -H5: Horizontal HDMI, Mini-B USB, Vertical Barrel Jack Power<br>-H6: Vertical HDMI, Mini-B USB, Vertical Barrel Jack Power<br>-H7: Horizontal HDMI, MATE-N-LOK USB & Power<br>-H8: Vertical HDMI, MATE-N-LOK USB & Power |
| 9 | Protocol | -CH: HDMI interface |
| 10 | Voltage | -V5: 5.0V<br>-VPT: 9V - 35V |
| | **Designator** | **Addons** |
| | Speaker | -SPK Piezo Speaker |
| | Haptic | -HAP Haptic Motor |
| | Gorilla Glass | -GG Gorilla Glass Gen 3 |
| | Water/Glove | -WG Water/Glove Capable |

# 6 Dimensional Drawings

## 6.1 HTT101A

All dimensions are maximum +/- 0.3mm, typical is +/- 0.15mm maximum
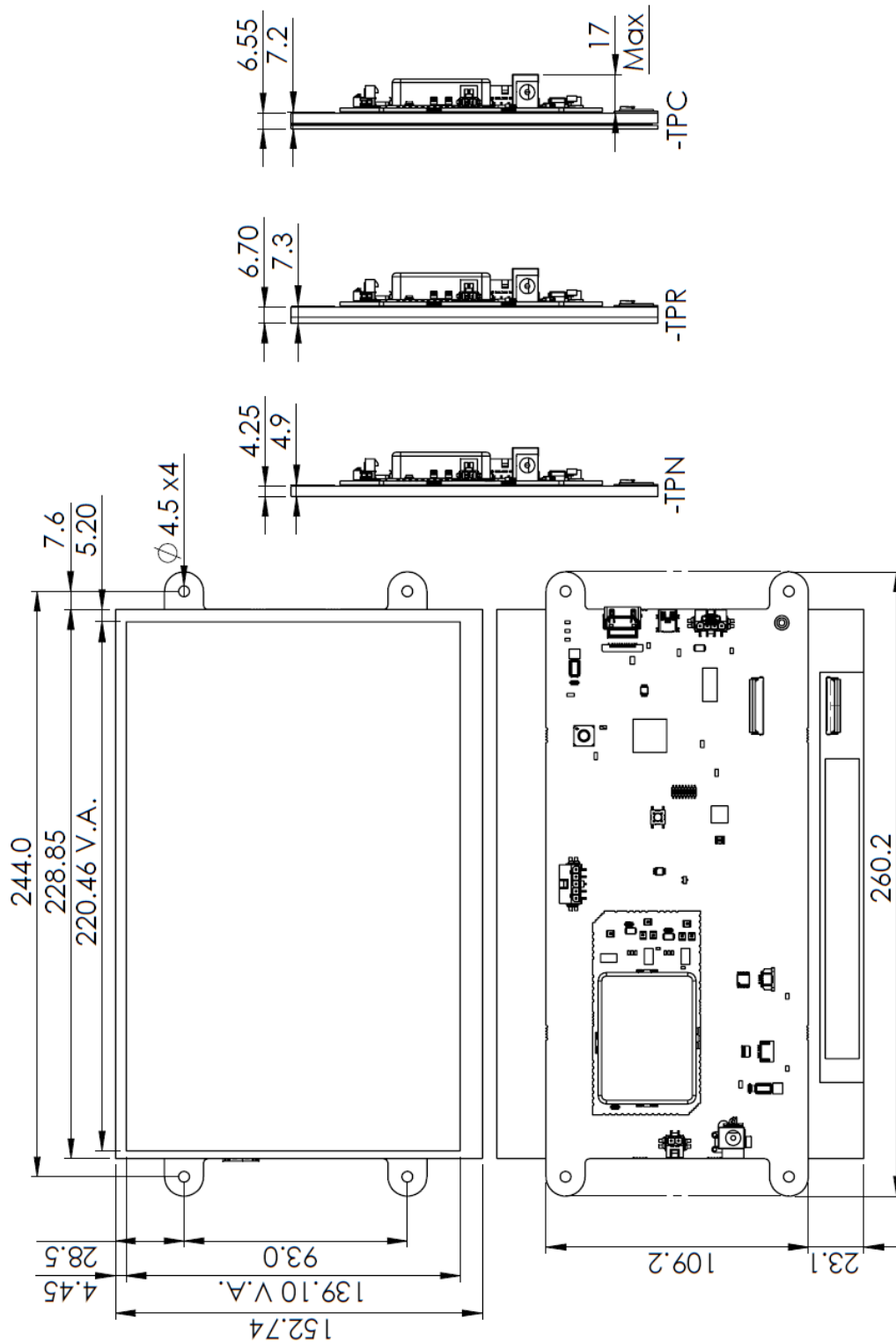
## 6.2    HTT101G

All dimensions are maximum +/- 0.3mm, typical is +/- 0.15mm maximum
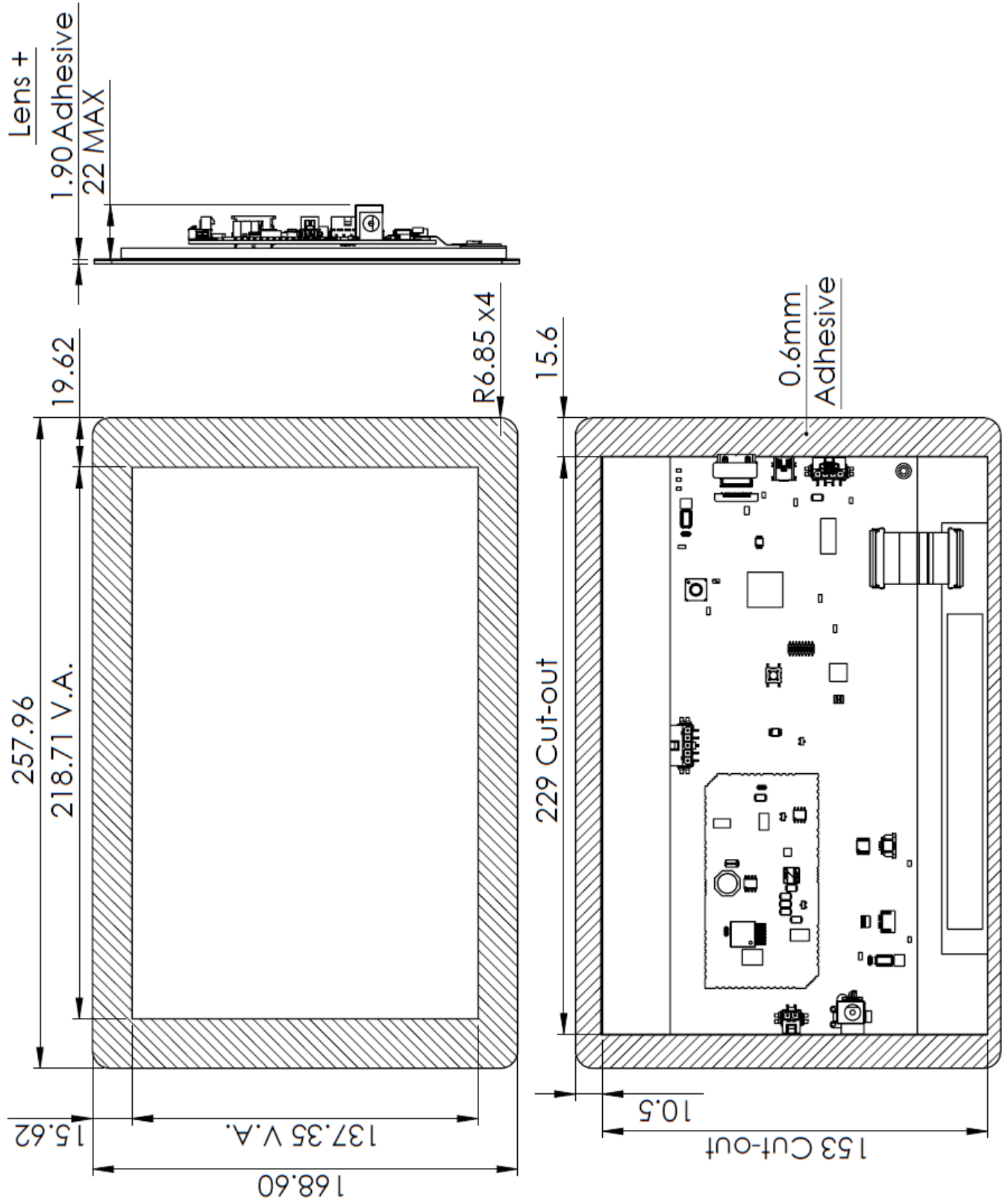
## 7 Characteristics & Specifications

### 7.1 Power

By default, the display must be powered by the 2 pin MATE-N-LOK header or barrel jack and cannot be powered over USB only. If you would like to power the display over USB only, please contact us.

| Parameter | Min | Typ | Max | Unit | Remarks |
|---|---|---|---|---|---|
| Supply Voltage | 4.75 | 5.0 | 5.25 | V | Standard Voltage (V5) |
| | 9.0 | - | 35.0 | V | Wide Voltage (VPT) |

| 5V | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Logic | - | 500 | - | mA @ 5V |
| Backlight | 0 | 360 | 850 | mA @ 5V |
| Haptic | | | 400 | mA @ 5V |
| Speaker | | | 100 | mA @ 5V |

### 7.2 Backlight/Optical Characteristics

**-OPT** is optional bonding of the touch panel to the display, making it stronger and brighter.

The backlight brightness can be software controlled as well as Auto Dimmed.

| Item | TPN | TPR | TPC | Unit |
|---|---|---|---|---|
| Brightness | 1000 | 800 | 900 | nit or cd/m2 |
| Contrast Ratio | 800 | 800 | 800 | |

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Drive method | Constant current | | | | |
| LED Configuration | 42 White LEDs, 7 Serial x 6 Parallel | | | | |
| Backlight life | Minimal 20,000 hours | | Typical 50,000 hours | | |

Values at 25°C, 60% RH, at 30k hours backlight will be at 50% brightness

### 7.3 Touch Panel

**-WG** features is capable of detecting touches through latex gloves and is water capable.

**-GG** uses generation 3 Gorilla Glass for extra hardness.

| Parameter | A Series | | | G Series | |
|---|---|---|---|---|---|
| | -TPR | -TPC | -TPC -WG | -TPC | -TPC -WG |
| IC Driver | | GT928 | ILI2511 | GT928 | ILI2511 |
| Touch Points | 1 | 5 | 5 | 5 | 10 |
| Hardness | 3H | 6H | 6H | 6H | 6H |
| Water/Glove Capable | | | Yes | | Yes |

IC Driver listed or equivalent

### 7.4 Touch Sensitivity

Touch Panel sensitivity can be set on the touch panel. Settings are Normal, High, Extra (thickness is dependent of display)

| | A Series | | G Series | | A/G -WG | |
|---|---|---|---|---|---|---|
| Material | Acrylic | Glass | Acrylic | Glass | Acrylic | Glass |
| **Normal** | 0.2 | 0.6 | 0.5 | 0.6 | 0.5 | 0.6 |
| **High** | 0.7 | 1.5 | 1.2 | 2.0 | 1.2 | 2.0 |
| **Extra High** | 1.2 | 2.5 | | | 2.0 | 5.0 |

*Note: The composition of the Cover Lens may affect the touch panel's operation. The values listed should be taken as reference only.
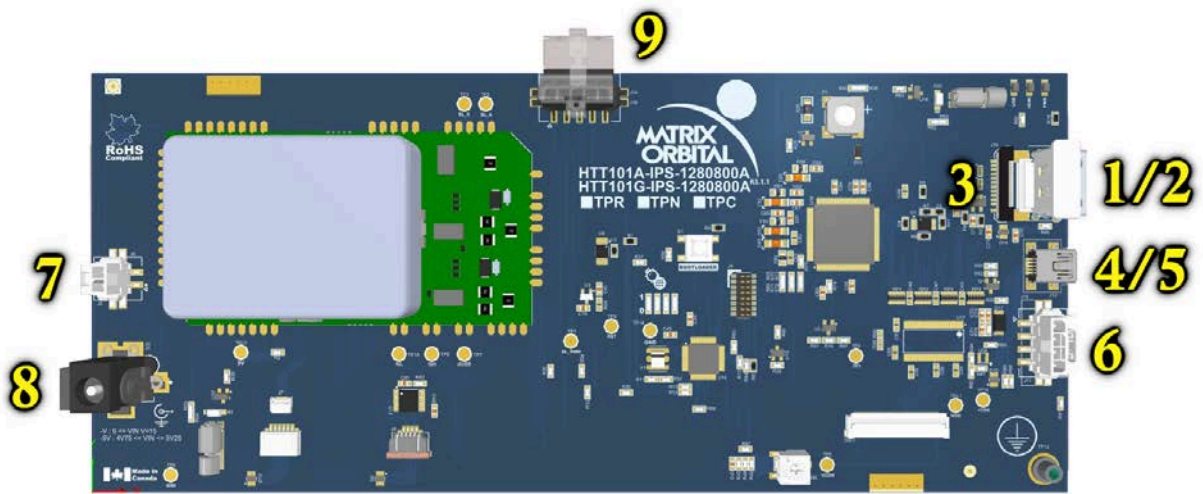
## 7.5    Environmental

| | |
|---|---|
| Operating Temperature | -20°C to +70°C |
| Storage Temperature | -30°C to +80°C |
| Operating Relative Humidity* | 90% (T < 60°C) |

**Note:** No condensation at any temperature

## 8    Headers

The HTT comes in many header configurations, if these do not meet your requirements, please contact us for a custom solution.



Header Description

| # | Header | Standard Mate |
|---|--------|---------------|
| 1 | HDMI, Horizontal, Type A | Type A HDMI Cable |
| 2 | HDMI, Vertical, Type A | Type A HDMI Cable |
| 3 | HDMI, FFC | |
| 4 | Mini USB, Vertical: Touch | Mini-B USB Cable |
| 5 | Mini USB, Horizontal: Touch | Mini-B USB Cable |
| 6 | USB, Horizontal or Vertical, 2-1445057-4 | Micro MATE-N-LOK 1445022-4 |
| 7 | Power, Horizontal or Vertical, 2-1445057-2 | Micro MATE-N-LOK 1445022-2 |
| 8 | Barrel Jack | 2.1mm Center Positive |
| 9 | Expansion Port | |

Header Options

| H | Header |
|---|--------|
| 5 | Horizontal HDMI, Mini-B USB, Vertical Barrel Jack Power |
| 6 | Vertical HDMI, Mini-B USB, Vertical Barrel Jack Power |
| 7 | Horizontal HDMI, MATE-N-LOK USB & Power |
| 8 | Vertical HDMI, MATE-N-LOK USB & Power |

### 8.1    Standard Type A HDMI

Available in horizontal or vertical.

### 8.2    HDMI over FFC

Special order, Available in horizontal or vertical configuration. 20 pin, 0.5mm, bottom contact.

### 8.3    Barrel Jack Power Header

Barrel jack power header available in vertical configuration.  When choosing an adaptor, please ensure it uses a 2.1mm x 5.5mm center positive barrel jack that conforms to the voltage and current requirements of your display.  Please consult the Power section for details. By default, the display must be powered by the 2 pin MATE-N-LOK header or barrel jack.
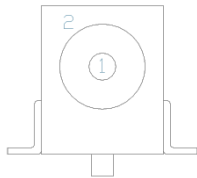
*Figure 1: Barrel Jack Power Header*

*Table 1: Power Adaptor Pinout*

| Pin | Function |
|-----|----------|
| 1 | Vcc |
| 2 | Gnd |

### 8.4     Micro MATE-N-LOK Power Header

Low profile power header available in vertical or horizonal configuration. By default, the display must be powered by the 2 pin MATE-N-LOK header or barrel jack.

| Display Header | Standard Mate |
|----------------|---------------|
| Micro MATE-N-LOK 2-1445057-2 | Micro MATE-N-LOK 1445022-2 |
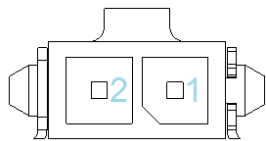


*Table 2: Power Adaptor Pinout*

| Pin | Function |
|-----|----------|
| 1 | Vcc |
| 2 | Gnd |

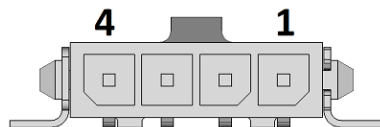Optional Mate-n-Lok to 2.1mm barrel jack cable adapter.



**Part Number:**
CBL-MNL2B21

**Description:**
2 pin Mate-n-Lok to 2.1mm barrel jack

### 8.5     Micro MATE-N-LOK USB Header

Low profile power header available in vertical or horizonal configuration. Custom cables are available. By default, the display cannot be powered over USB through pin 1, but requires to be present for the display to detect USB. If you would like to power the display over USB only, please contact us.

| Display Header | Standard Mate |
|----------------|---------------|
| Micro MATE-N-LOK 2-1445057-4 | Micro MATE-N-LOK 1445022-4 |



| Pin | Function |
|-----|----------|
| 1 | USB 5V |
| 2 | D- |
| 3 | D+ |
| 4 | Gnd |

## 9     Additional Features

The HTT has a number of advanced optional features that are software configured by direct commands to the display or by the HTT Utility. Haptic motor and piezo speaker can be used individually or together for the maximum user experience.

| Settings: | |
|---|---|
| Screen Rotation | 0, 90, 180, 2101 |
| Touch Panel sensitivity | Normal, High, Extra (thickness is dependent of display) |
| Backlight Brightness | 0-255 |
| Haptic Feedback | Duration, ms |
| Piezo | Duration, ms |
| Touch Feedback | 0 none, 1 Haptic, 2 Piezo, 3 Haptic & Piezo |
| Backlight Auto Dim | Dim from last touch, seconds |

## 9.1    Screen Rotation

The display can be rotated 0, 90, 180, 2101 degrees, this allows the display to be in landscape or portrait mode.

## 9.2    Touch Panel Sensitivity

Touch Panel sensitivity can be set on Capacitive touch panels. Settings are Normal, High, Extra (thickness is dependent on display)

| | A Series | | G Series | |
|---|---|---|---|---|
| Material | Acrylic | Glass | Acrylic | Glass |
| Normal | 0.2 | 0.55 | 0.5 | 0.55 |
| High | 0.7 | 1.50 | 1.2 | 2.00 |
| Extra High | 1.2 | 2.50 | | |

## 9.3    Backlight Brightness

The displays backlight brightness can be software controlled by command.

## 9.4    Haptic

Optional haptic motor is available, this will allow users to "feel" when they press the. Duration in ms is configurable.

## 9.5    Piezo Speaker

Optional piezo speaker is available, this will allow the user to hear a beep when they press the. Duration in ms is configurable.

## 9.6    Backlight Auto Dim

The HTT has the ability to setup several brightness levels, this is triggered from last touch. When touch, the display will go back to the original backlight brightness.

Ex:

$$100\% \rightarrow 1m \rightarrow 90\% \rightarrow 5m \rightarrow 50\% \rightarrow 20m \rightarrow 0\% \text{ TOUCH} \rightarrow 100\%$$

## 10   Mounting

For custom mounting options, such a custom touch panel or mounting ears, please contact us.

### 10.1    HTT101G Series

Our G series extended capacitive touch with a double-sided adhesive already applied on the exposed back side of the over-sized cover glass. This provides an extraordinarily strong double-sided foam tape that adheres to a broad range of surfaces such as aluminum, stainless steel, galvanized steel, composites, plastics, acrylic, polycarbonate, ABS and painted or sealed wood and concrete.

Adhesive: 3M VHB 0.6mm (3M 5925) or similar.

The tape can maintain its bond in environments of 100% relative humidity at 38°C, and can withstand temperatures up to 149°C.
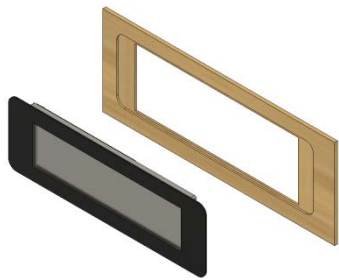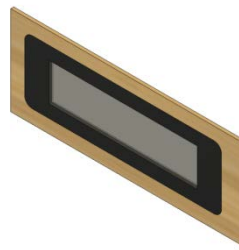
| *Figure 2: Installation* | *Figure 3: Completed Assembly* |

Application Best Practices:

- Prepared by cleaning the surface with a 50:50 mixture of isopropyl alcohol
- Ideal application temperature 21C/70F to 38C/100F. At room temperature 50% bond strength in 20 minutes, 90% 24 hours, 100% after 72 hours.
- Firm application pressure develops better adhesive contact and helps improve bond strength. We recommend applying approximately several kilograms evenly across the entire glass area. The adhesive ideally requires 100 kPa/15psi of pressure for good surface contact.

### 10.2    HTT101A Series

The A series uses 4 mounting points with a 3.05mm diameter. M3 and 4/40 screws can be used. Chassis grounding is optionally provided, please contact us for more information.

## 11    Getting Started

When connecting your HTT display, power must first be applied through the Micro Mate-N-Lok or optional barrel jack header.  Once powered, connect the HTT to your source HDMI cable.

When properly connected…

### Windows

When connected to Windows, the HTT's resolution will be automatically detected and set through the on-board EDID. The HTT display should immediately appear in display settings.  No additional software setup will be required.

### Raspberry Pi

Some setup will be required before the display can be used with a Raspberry Pi unit.  The HDMI resolution will have to be configured through the config.txt file (located in /boot/config.txt).

The following modifications can be made to the Raspberry Pi's config.txt file, forcing the HTT's resolution settings:

```
#Set the Monitor mode to DMT.
hdmi_group=2
#Use a custom resolution.
hdmi_mode=87
#Use an 1280 x 800 resolution @ 60Hz
hdmi_cvt= 1280 800 60 6 0 0 0
#Deliver max current through USB
Max_usb_current=1
```

The configuration lines listed above will configure the Raspberry Pi to drive an 800 x 480 display at 60Hz.

### TinkerBoard & BeagleBone

The HTT will be compatible with TinkerOS-Debian. Once connected, the Tinkerboard will autodetect the HTT's display settings.  No further software configuration is required.

The HTT is not fully compatible with TinkerOS-Android Marshmallow.

The BeagleBone board will autodetect the HTT's EDID display settings automatically.  No further software configuration is required.

## 12   USB Drivers

The touch panel is configured as a HID-Compliant Touch Screen.  The touch panel will respond to finger gestures differently depending on the host features.

Once the HTT is properly installed on Windows, 2 new devices will be present in Device manager.

USB Composite Device
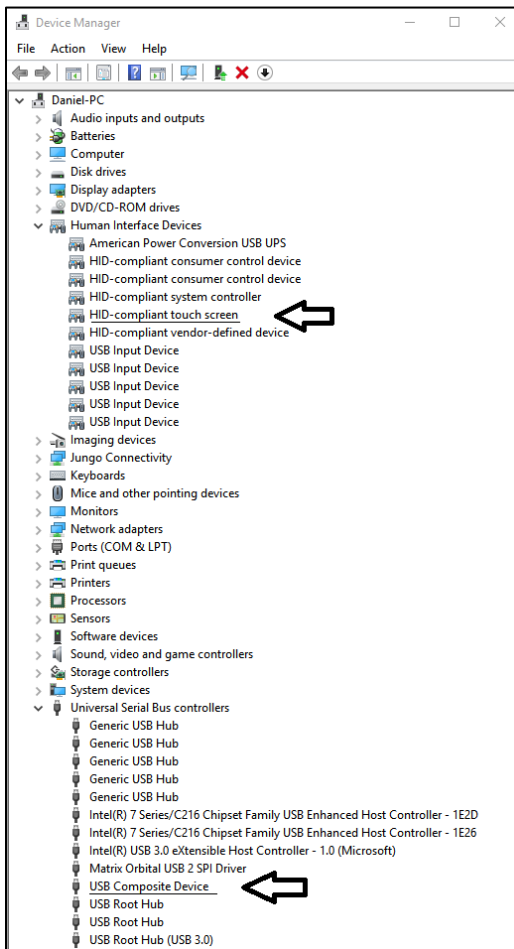


## 13   TFT & Extended Display Information Data

### EDID

The HTT's on-board EDID comes preconfigured, so users won't have to worry about setting up their screen resolution or display timings.  Once plugged in, the EDID settings will be read automatically, setting the HTT's display resolution. For modifications or custom EDID please contact us.

### TFT Display Used

For more detailed information for the TFT's Electro-Optical Characteristics, Reliability Test Conditions, Inspection Criteria, and Handling Precautions. Please consult the Parallel TFT Datasheet

| HTT Display | Parallel TFT Datasheet |
|---|---|
| HTT101A-IPS-1280800A | MOP-TFT1280800A-101A-IPS |
| HTT101G-IPS-1280800A | MOP-TFT1280800A-101G-IPS |

## 14   Troubleshooting

### Power

To function correctly, the HTT must be supplied with the appropriate power.  If the power LED near the top right corner of the board is not illuminated, power is not applied correctly.  Try the tips below.

- HTT devices have specific power requirements.  Ensure the correct voltage and sufficient current are available to your device by consulting the Power table.
- Check the power cable that you are using for continuity.  If you don't have an ohm meter, try using a different power cable; if this does not help try a different power supply.
- Check the power connector in use on your display.  If the connector has become loose or you are unable to resolve the issue, please contact a friendly Matrix Orbital support representative.

### Display

If your display is powered successfully and connected to an HDMI source, the video feed should appear on screen immediately.  The video signal should be clean, and the picture should fit the viewing area of the display.  If this is not the case, check out these tips.

- If you are connected to a single board computer, such as a Raspberry Pi, and your screen displays a white screen on start-up, or slowly fade to white, please check the Config.txt file to ensure that the display is properly configured.
- If the display is flickering, or if the display's backlight is not consistent, try supplying additional power through the display's barrel jack.
- If your display shows picture but there are white lines along the edge(s) of the display, your display may be receiving the incorrect number of pixels.  The HTT does not have a resolution scaler, and therefore the appropriate 800 x 480 resolution must be specified for all the pixels to be used.

### Touch

The HTT101 can be ordered with a touch panel.  When the touch panel is properly configured the touch cursor will accurately follow your finger as it moves across the screen.  If the cursor is not responding to your touches, or if the cursor is offset from your finger, try the following:

- If you are using a resistive touch display, try downloading the HTT Calibration Software, available on our website here: https://www.matrixorbital.com/software/htt-calibration
  Once downloaded, run the calibration program and follow the instructions that appear on screen.
- If you are using a capacitive touch display, make sure the screen is clear of debris or droplets.

## 15    Recommended Accessories

### Mate-n-Lok to 2.1mm barrel jack

**Part Number:**
CBL-MNL2B21

**Description:**
2 pin Mate-n-Lok to 2.1mm barrel jack

### USB Cable

**Part Number:**
EXTMUSB3FT

**Description:**
3ft (1m) Mini-B USB Cable

### Power Adaptor

**Part Number:**
PWR-ACDC-5V2A

**Description:**
9ft (2.7m) AC to DC power adapter with 2.1mm center positive barrel jack.

Input Voltage: 100-240V AC
Output Voltage: 5V DC @ 2A

AC Plugs Included: North American (NEMA), Europlug (Type C), UK (Type G), Australia/China/New Zealand/Argentina (Type I)

## 16    Revision History

| Revision | Date | Description | Author |
|----------|------|-------------|--------|
| 1.0 | March 30 2024 | First Release | Henry |