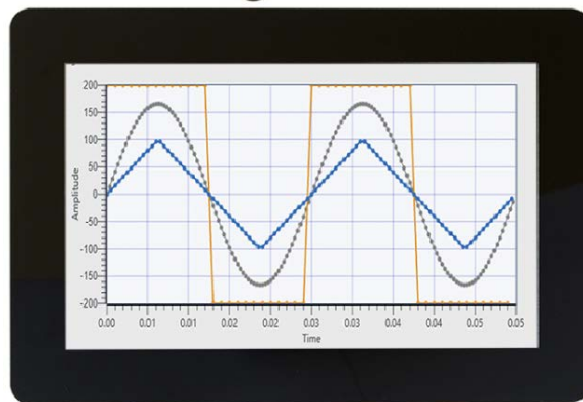


HTT50A/G-IPS

For all variants of the HTT50A/G-IPS

Hardware Manual

Revision 1.0



PCB Revision: 3.0 or Higher

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1 Contact



On Shore and In-House Design

In-House Manufacturing

In-House Sales

In-House Support

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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 HTT50 is an industrial 5.0" TFT display with a HDMI interface. Featuring a Sunlight readable 1000nit 800x480 pixel resolution IPS panel 24-bit Full colour capabilities. The HTT50 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

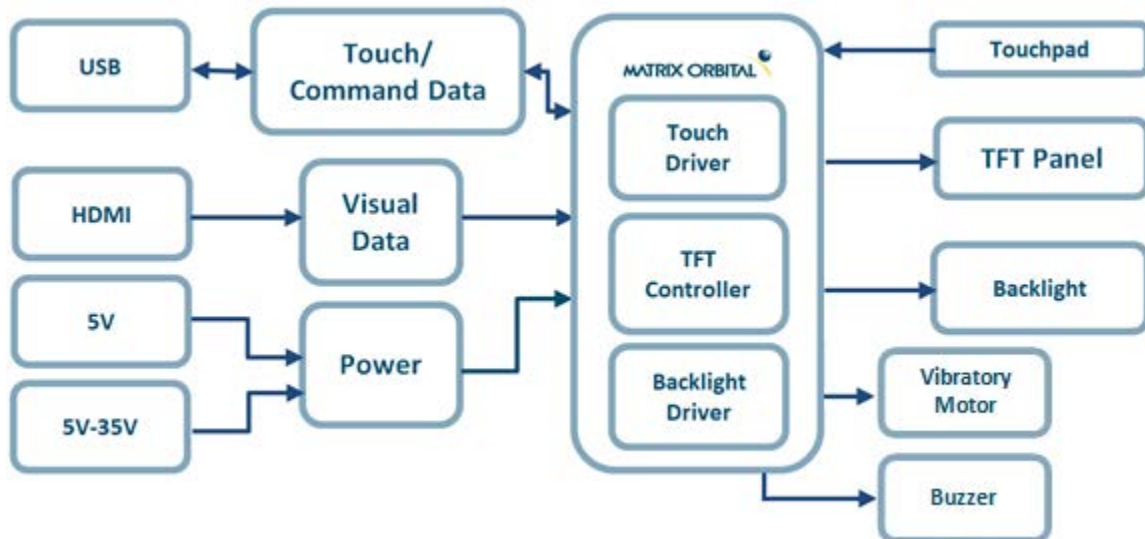
The HTT50G features an easy to mount oversized capacitive touch screen. Panel mounting of the display is seamless and smooth providing a crisp modern look. It easy to clean, sanitize, water and dust resistant.

IPS display technology offers the widest viewing angle with no grey inversion, clearer image and crisp colour.

Features

- 1000 cd/m2 sunlight readable software-controlled backlight brightness
- 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
- HDMI / DVI 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)	5.0"	inch
Display type	IPS TFT	
Resolution	800x480	Pixels
Display Mode	Transmissive, Normally Black	
Backlight	LED, 1000 cd/m2, 50,000 hours, Software brightness control	
View Direction	Free/All 160°	
Gray Scale Inversion Direction	None	
Module Outline	120.7 (W) x 75.8 (H)	mm
Active Area	108.0 (W) x 64.8 (H)	mm
Pixel Pitch	0.135 (W) x 0.135 (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 HTT50 is available with various voltage options and header orientations.

HTT	50	A	-IPS	-TPR	-BLH	-B0	-H5	-CH	-V5
1	2	3	4	5	6	7	8	9	10

Addon Options

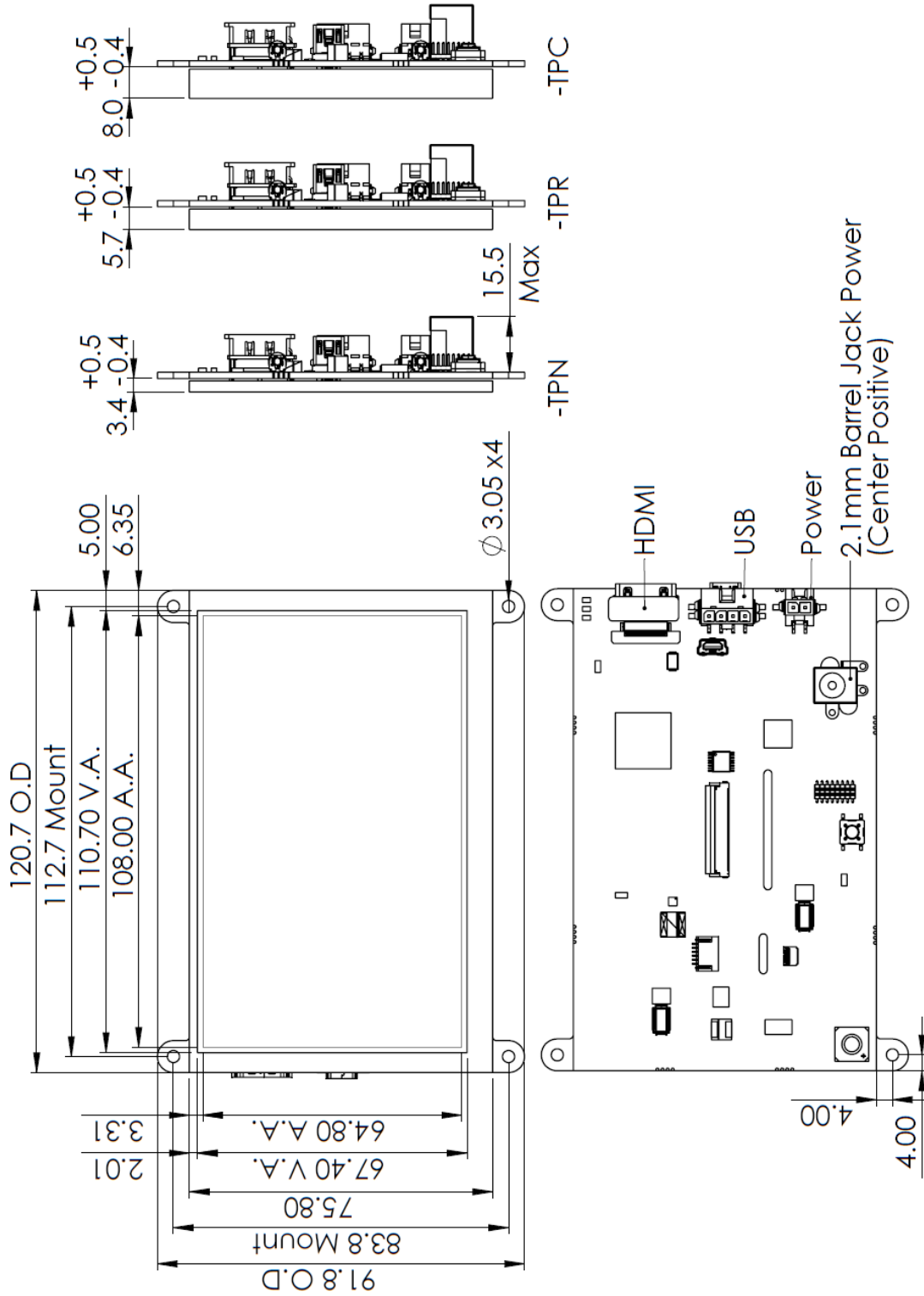
*-SPK	*-HAP	*-OPT	*-GG	*-WG
11	12	13	14	15

#	Designator	Options
1	Product Type	HTT: Graphic TFT Display
2	Display Size	50: 5.0"
3	Screen Type	A: A Type G: G Type
4	IPS Panel	-IPS
5	Touch	-TPN: No touch panel -TPR: Resistive touch panel -TPC: Capacitive touch panel
6	Backlight	-BLM: 300 Nit < Brightness < 600 Nit -BLH: 600 Nit < Brightness < 1000 Nit -BLD: 1000 Nit < Brightness < 1500 Nit
7	Bezel	-B0: None -B1: Aluminum Bezel
8	Headers	-H5: Horizontal HDMI, Mini-B USB, Vertical Barrel Jack Power -H6: Vertical HDMI, Mini-B USB, Vertical Barrel Jack Power -H7: Horizontal HDMI, MATE-N-LOK USB & Power -H8: Vertical HDMI, MATE-N-LOK USB & Power
9	Protocol	-CH: HDMI interface
10	Voltage	-V5: 5.0V -VPT: 9V - 35V
	Designator	Addons
	Speaker	-SPK Piezo Speaker
	Haptic	-HAP Haptic Motor
	Bonding	-OPT Optical Bonding
	Gorilla Glass	-GG Gorilla Glass Gen 3
	Water/Glove	-WG Water/Glove Capable

6 Dimensional Drawings

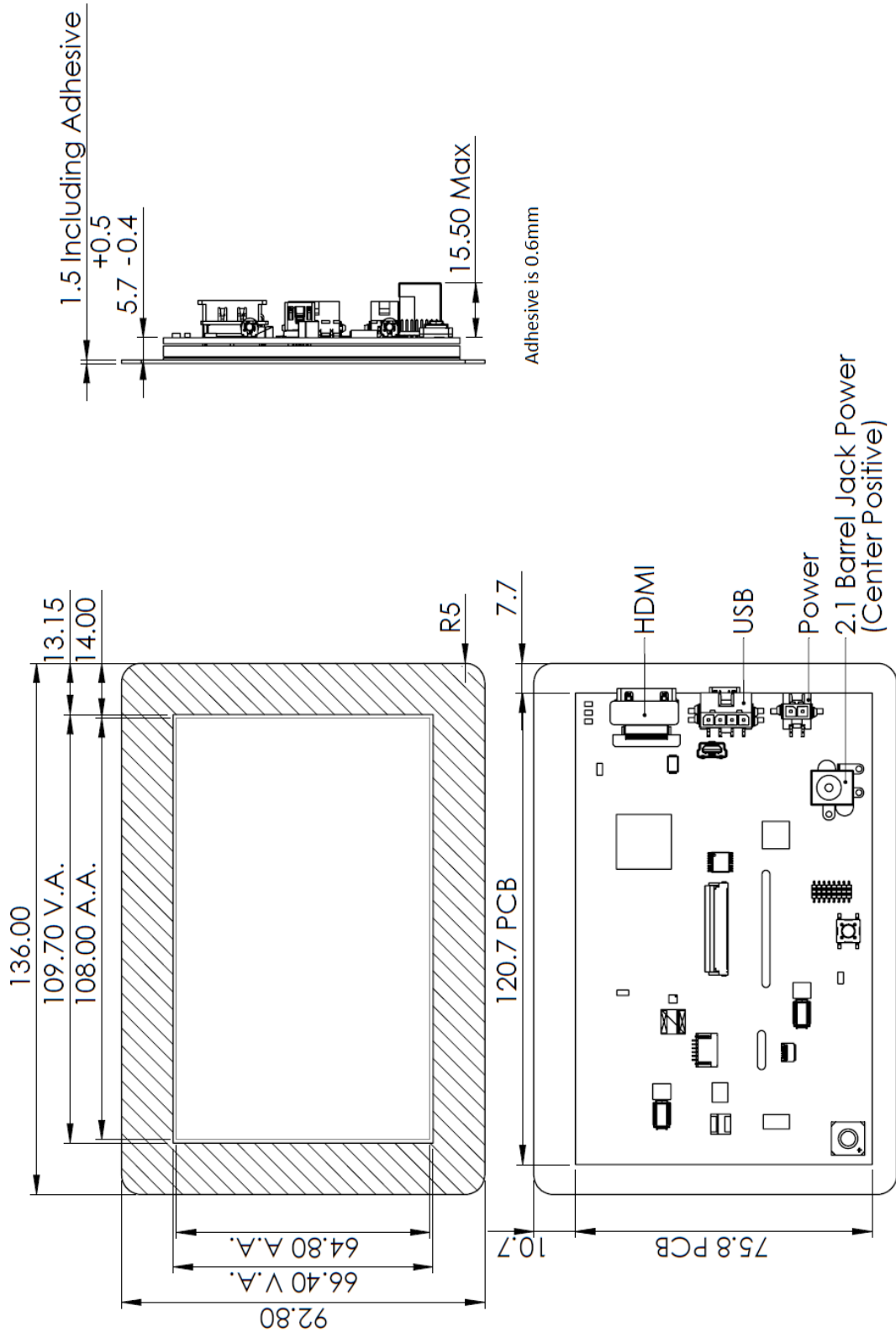
6.1 HTT50A

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



6.2 HTT50G

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	-	240	-	mA @ 5V
Backlight	0	-	200	mA @ 5V
Haptic			400	mA @ 5V
Speaker			70	mA @ 5V

7.2 Backlight/Optical Characteristics

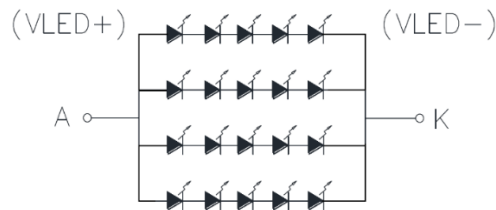
-OPT is optional bonding of the touch panel to the display, making it stronger and brighter.

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		20 White LEDs, 5 Serial x 4 Parallel			
Backlight life		Minimal 30,000 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		MXT366T	ILI2511	GT911	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)

Material	A Series		G Series	
	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		

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

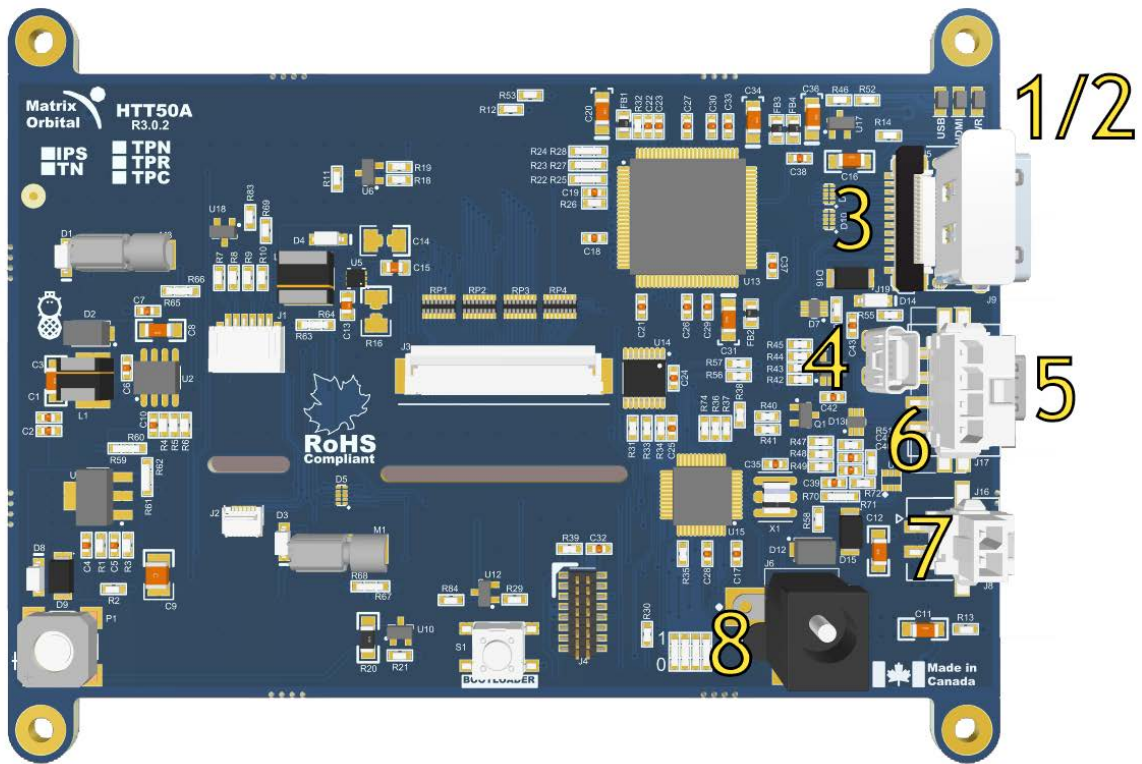
7.5 Environmental

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 over FFC, Horizontal or Vertical	20 pin, 0.5mm, bottom contact
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

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. Pin 1 is closest to the top edge of PCB for both FPC.

Horizontal FPC is the standard bottom contact. Vertical FPC is contact side facing into the PCB.

Pin	1	2	3	4	5	6	7	8	9	10
Description	D2P	GND	D2N	D1P	GND	D1N	D0P	GND	D0N	CLKP
Pin	11	12	13	14	15	16	17	18	19	20
Description	GND	CLKN	NC	NC	SL	SDA	GND	5V HDMI	HP	GND

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. The display must be powered by the 2 pin MATE-N-LOK header or barrel jack.

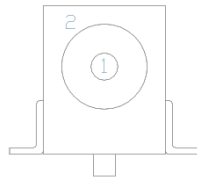


Figure 1: Barrel Jack Power Header

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 horizontal configuration. 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

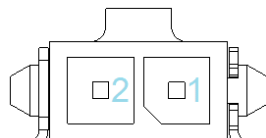


Table 2: Power Adaptor Pinout

Pin	Function
1	Vcc
2	Gnd

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



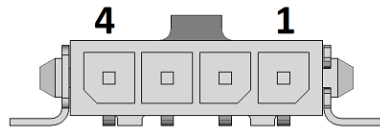
Part Number:
CBL-MNL2B21

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 horizontal 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.

<https://github.com/MatrixOrbital/HTT-Utility>

Settings:	
Screen Rotation	0, 90, 180, 270
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, 270 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)

Material	A Series		G Series	
	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 including auto-dim.

9.4 Haptic

Optional haptic motor is available, this will allow users to “feel” when they press the. The duration is ms and configurable.

9.5 Piezo Speaker

Optional piezo speaker is available, this will allow the user to hear a beep when they press the. The duration is ms and 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% → 1m → 90% → 5m → 50% → 20m → 0% TOUCH → 100%

10 Mounting

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

10.1 HTT50G 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.

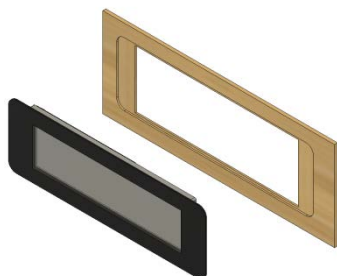


Figure 2: Installation

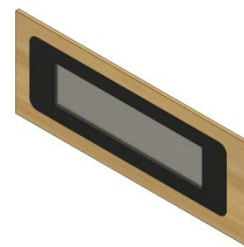


Figure 3: Completed Assembly

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 HTT50A 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 800 x 480 resolution @ 60Hz
hdmi_cvt= 800 480 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.

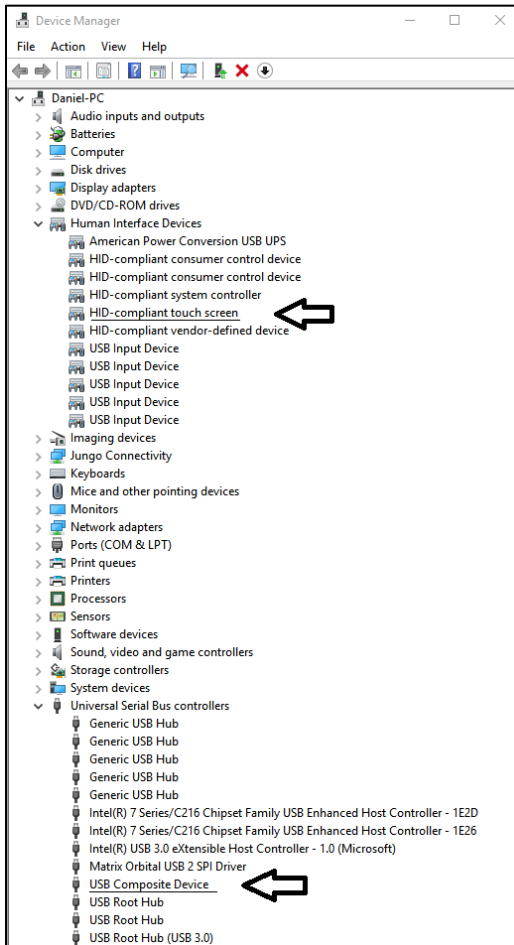
The BeagleBone board will autodetect the HTT's EDID display settings automatically. No further software configuration is required.

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
HTT50A-IPS HTT50G-IPS	MOP-TFT800480-50A-IPS MOP-TFT800480-50G-IPS
HTT70A-IPS HTT70G-IPS	MOP-TFT800480-70A-IPS MOP-TFT800480-70G-IPS
HTT101A-IPS HTT101G-IPS	MOP-TFT1280800-70A-IPS MOP-TFT1280800-70G-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 ohmmeter, try using a different power cable; if this does not help try a different power supply.

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 HTT50 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 31 2020	First Release	Henry