

HTT70

For all variants of the HTT70

Hardware Manual

Revision 1.4



PCB Revision: 1.0 or Higher

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Revision History

Revision	Date	Description	Author
1.4	May 8, 2019	Added new Resources section	Divino
1.3	May 29, 2018	Corrected Header Population and Drawings	Divino
1.2	May 10, 2018	Corrected Header and Mates Table	Divino
1.1	February 22, 2018	Added -TPC variant drawing	Divino
1.0	November 6, 2017	First Release	Divino

Introduction

The HTT70 is a 7.0" TFT display with an HDMI interface. The 800x480 resolution offers crisp images, and video feedback, with 24-bit Full colour capabilities. The HTT70 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.

Features

- Compatible with Windows and Linux hosts, including:
 - Raspberry Pi
 - BeagleBone
 - TinkerBoard
- Plug and Play
- USB for touch screen, HMI touch interface
- Upgradable touch driver firmware
- DVI/HDMI interface
- Automatic resolution detected provided by EDID
- Low profile mounting holes
- Industrial 5-35V power input (-VPT) option
- Available with:
 - No touch panel
 - Resistive touch panel
 - Capacitive touch panel

Functional Diagram

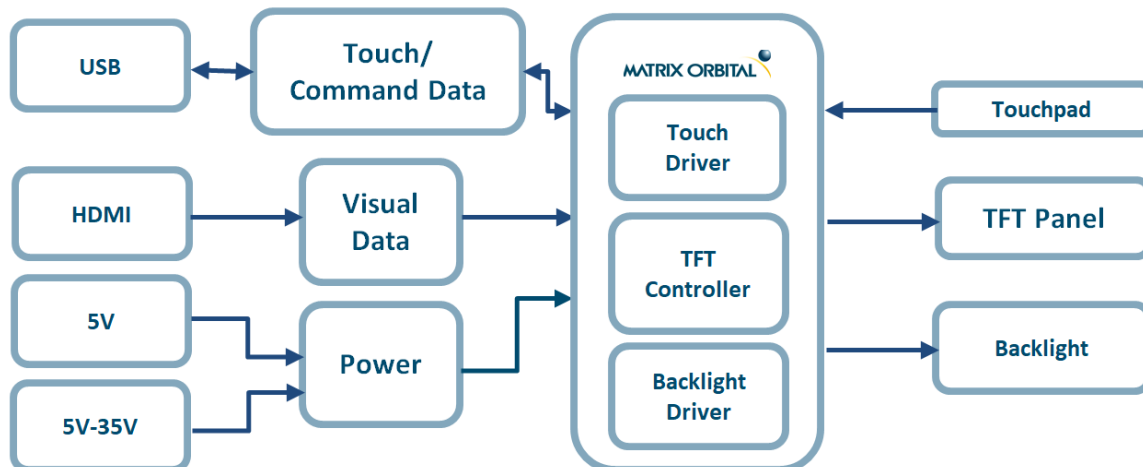


Figure 1: HTT Block Diagram

Ordering

The HTT70 is available with various voltage options and header orientations.

Ordering Part Numbering Scheme

Table 1: Part Numbering Scheme

HTT	70	A	-TPR	-BLM	-B0	-H5	-CH	-V5
1	2	3	4	5	6	7	8	9

Options

Table 2: Display Options

#	Designator	Options
1	Product Type	HTT: Graphic TFT Display
2	Display Size	70: 7.0"
3	Screen Type	A: A Type G: G Type
4	Touch	-TPN: No touch panel -TPR: Resistive touch panel -TPC: Capacitive touch panel
5	Backlight	-BLM: 300 Nit < Brightness < 600 Nit -BLH: 600 Nit < Brightness < 1000 Nit -BLD: Brightness > 1000 Nit
6	Bezel	-B0: None
7	Headers	-H5: Barrel Jack with Horizontal Connectors -H6: Barrel Jack with Vertical Connectors -H7: Micro MATE-N-LOK with Horizontal Connectors -H8: Micro MATE-N-LOK with Vertical Connectors
8	Protocol	-CH: HDMI interface
9	Voltage	-V5: 5V Input Voltage -VPT: Regulated 5V - 35V Input Voltage

Hardware

Available Headers

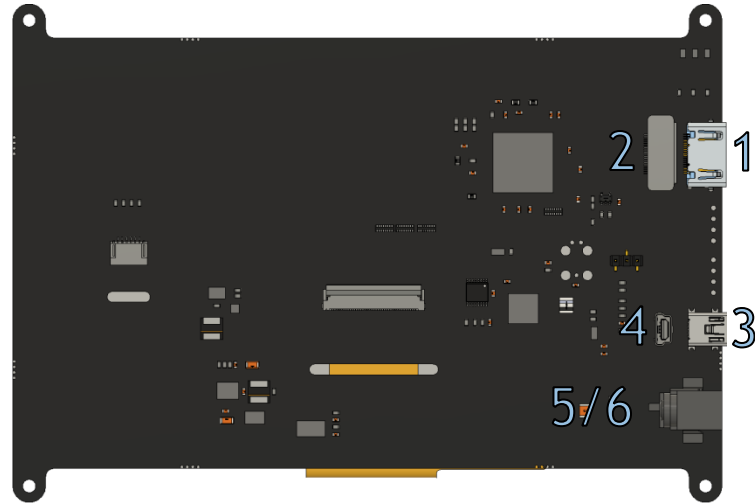


Figure 2: HTT70A Headers

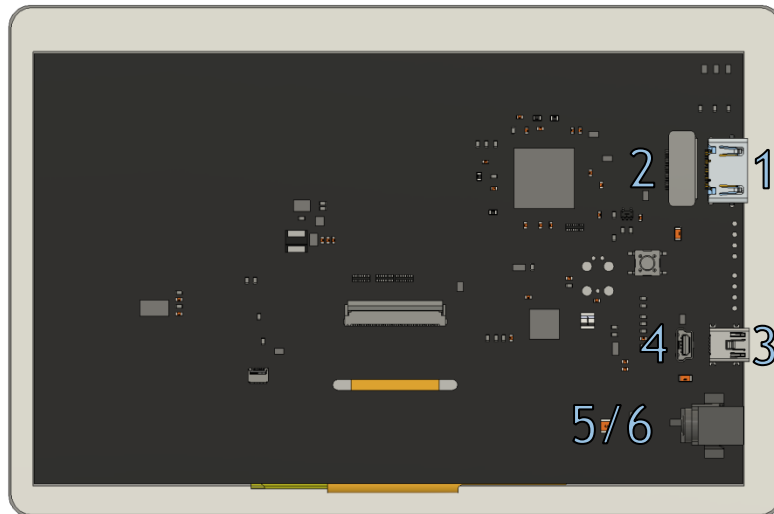


Figure 3: HTT70G Headers

Table 3: HTT70 Headers and Mates

#	Header	Standard Mate	Population
1	HDMI Port, Horizontal, Type A Standard	Type A Standard HDMI Cable	-H5 & H7
2	HDMI Port, Vertical, Type A Standard	Type A Standard HDMI Cable	-H6 & -H8
3	Mini USB, Horizontal: Touch & Power	Mini-B USB Cable	-H5 & H7 (TPC and TPR Only)
4	Mini USB, Vertical: Touch & Power	Mini-B USB Cable	-H6 & -H8 (TPC and TPR Only)
5	Barrel Jack: 2.1mm Center Positive	Power Adaptor	-H5 & -H6
6	External Power, 2-1445057-2	Micro MATE-N-LOK 1445022-2	-H7 & -H8

Type A HDMI Port

The HTT uses a Type A HDMI 1.0 port to receive video data from its host/source and is only compatible with unencrypted video signals. HDCP video signals are not supported.

When properly connected, the HTT will require 5V at 55mA (minimum) from the HDMI source in order to read the display's EDID settings.

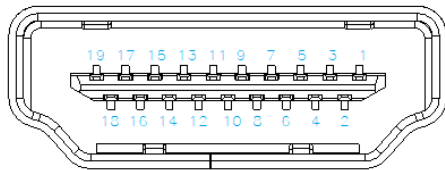


Figure 4: Type A HDMI Port

Table 4: Type A HDMI Port

Pin	Function	Pin	Function
1	TMDS Data 2+	11	TMDS Clock Shield
2	TMDS Data 2 Shield	12	TMDS Clock-
3	TMDS Data 2-	13	CEC (Not connected)
4	TMDS Data 1+	14	Reserved
5	TMDS Data 1 Shield	15	SCL
6	TMDS Data 1-	16	SDA
7	TMDS Data 0+	17	DDC/CEC Ground
8	TMDS Data 0 Shield	18	+5V Power
9	TMDS Data 0-	19	Hot Plug Detect
10	TMDS Clock+		

Mini-B USB Communication Connector

The USB header must be connected to the host in order for the touch screen to be functional, as touch communication occurs over USB. The Mini USB header is also used to access the HTT's touch firmware, and configure certain HTT settings through the HTT Utility Program. If necessary, up to 500mA of power can be provided through the Mini-USB header to power the HTT.

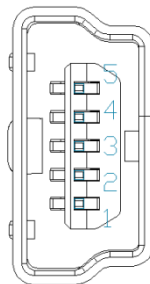


Figure 5: Mini USB Connector

Table 5: Mini USB Pinout

Pin	Function
1	Vcc
2	D-
3	D+
5	Gnd

Barrel Jack Power Adaptor

A Barrel Jack power adaptor is available on the HTT70 as standard to provide power to the display. 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.

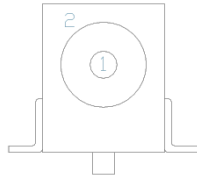


Figure 6: Barrel Jack Power Adaptor

Table 6: Power Adaptor Pinout

Pin	Function
1	Vcc
2	Gnd

Alternate Micro MATE-N-LOK Power Adaptor

Some applications may prefer a lower profile 2-pin power header option as opposed to the standard Barrel Jack. The HTT70 can be populated with a versatile Micro MATE-N-LOK 2-pin header as an alternative to the standard barrel jack. The Micro MATE-N-LOK 2-1445057-2 header used can be mated to a Micro MATE-N-LOK 1445022-2 or similar.

When choosing an adaptor, please ensure that it conforms to the voltage and current requirements of your display. Please consult the Power section for details.

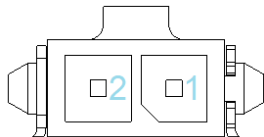


Figure 7: Micro MATE-N-LOK Power Adaptor

Table 7: Power Adaptor Pinout

Pin	Function
1	Vcc
2	Gnd

Getting Started

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

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

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.

BeagleBone

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

USB Drivers

The HTT70's touch panel can be configured as either an HID-Compliant Mouse, or an HID-Compliant Touch Screen. The touch panel will respond to finger gestures differently depending on which firmware is installed.

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

- HID-Compliant Mouse
- USB Composite Device

Table 8: HTT Device VID/PID

VID	0x1B3D
PID	0x14C2

Table 9: HTT Device VID/PID

VID	0x1B3D
PID	0x14C9

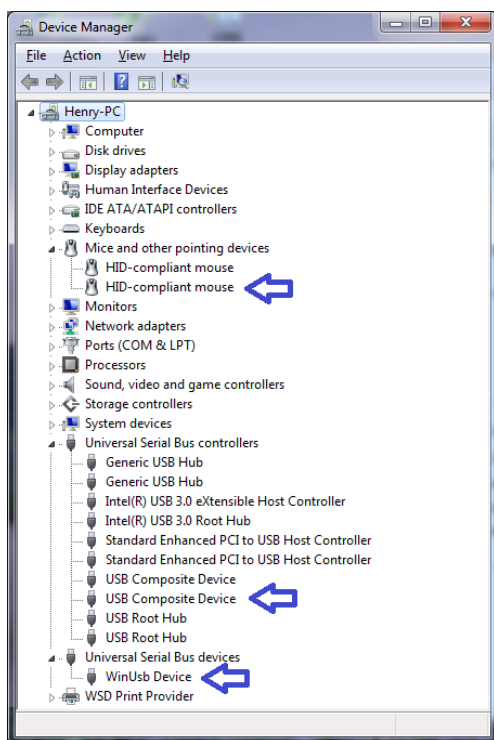


Figure 8: HTT USB Driver Listing

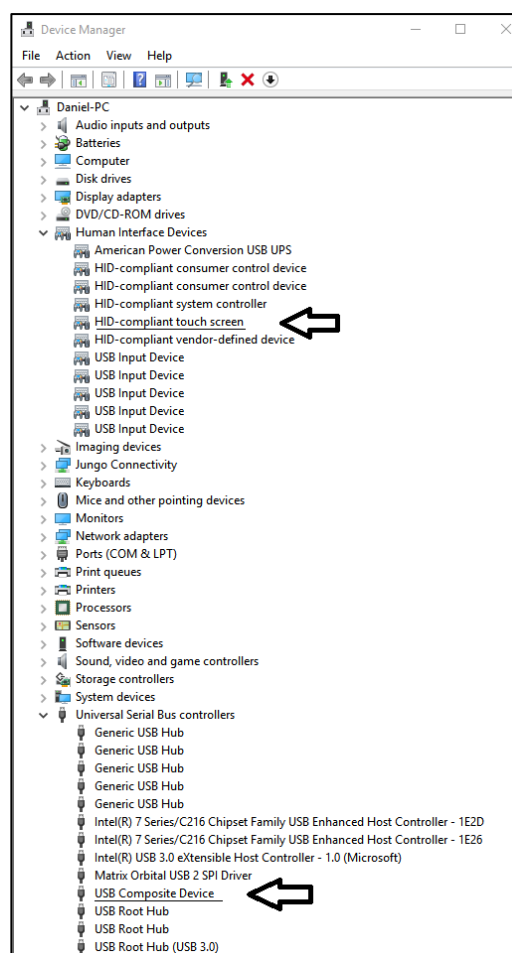


Figure 9: HTT USB Driver Listing

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.

EDID settings can be accessed through the HTT's I2C headers. The default HTT70 EDID data can be found below.

```
static byte[] EDID_HTT70A = {  
    0x00, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0x00, 0x35, 0xE3, 0x02, 0x00, 0x01, 0x00, 0x00, 0x00,  
    0xFF, 0x1B, 0x01, 0x03, 0x80, 0x0F, 0x09, 0x00, 0x0A, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,  
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01,  
    0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0xE4, 0x0C, 0x20, 0x7D, 0x30, 0xE0, 0x2D, 0x10, 0x25, 0x30,  
    0xD3, 0x00, 0x9A, 0x56, 0x00, 0x00, 0x00, 0x18, 0x00, 0x00, 0x00, 0x10, 0x00, 0x00, 0x00, 0x00,  
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x10, 0x00, 0x00,  
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x10,  
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xE1,  
};
```

Touchscreen

The HTT70 can be configured with either a Resistive or Capacitive screen. The HTT70's USB header must be connected in order for the touch panel to operate properly. Once the HTT70 has been connected properly and the touch screen is recognized, the HTT will use the host device's built-in touch drivers. This allows the HTT70 to take advantage of the host device's touch driver and pre-installed touch gestures.

Troubleshooting

Power

To function correctly, the HTT70 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 use the Contact section to reach 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 screen 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.
- If there are large black bars on the edges of the display, or if the video image appears to be offset, please use the Contact section to reach a friendly Matrix Orbital support representative

Touch

The HTT70 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.
- If you are still unable to resolve the issue, please use the Contact section to reach a friendly Matrix Orbital support representative.

Resources

A set of resources are available to help guide new users when they first start their development with the HTT70. These resources can be found on the HTT70 product page on matrixorbital.com.

Multi-touch Firmware

New firmware revisions are available for download on matrixorbital.com. Once installed, the HTT70's touch panel will be recognized as an HID-Compliant Touch screen, allowing the display to take advantage of any touch gestures built into the host's touch driver. Gestures such as one finger scroll and one finger swipe are commonly available on most popular hosts. Multi-touch gestures such as pinch to zoom are available for capacitive touch panels.

HTT Utility Program

The HTT Utility program is compatible with the resistive and capacitive HTT display variants and grants users full control of their displays. Through this program, users will be able to change HTT configuration settings such as the touch panel's software orientation, touch screen calibration, touch sensitivity (capacitive touch panel only), backlight brightness and more.

Dimensional Drawings

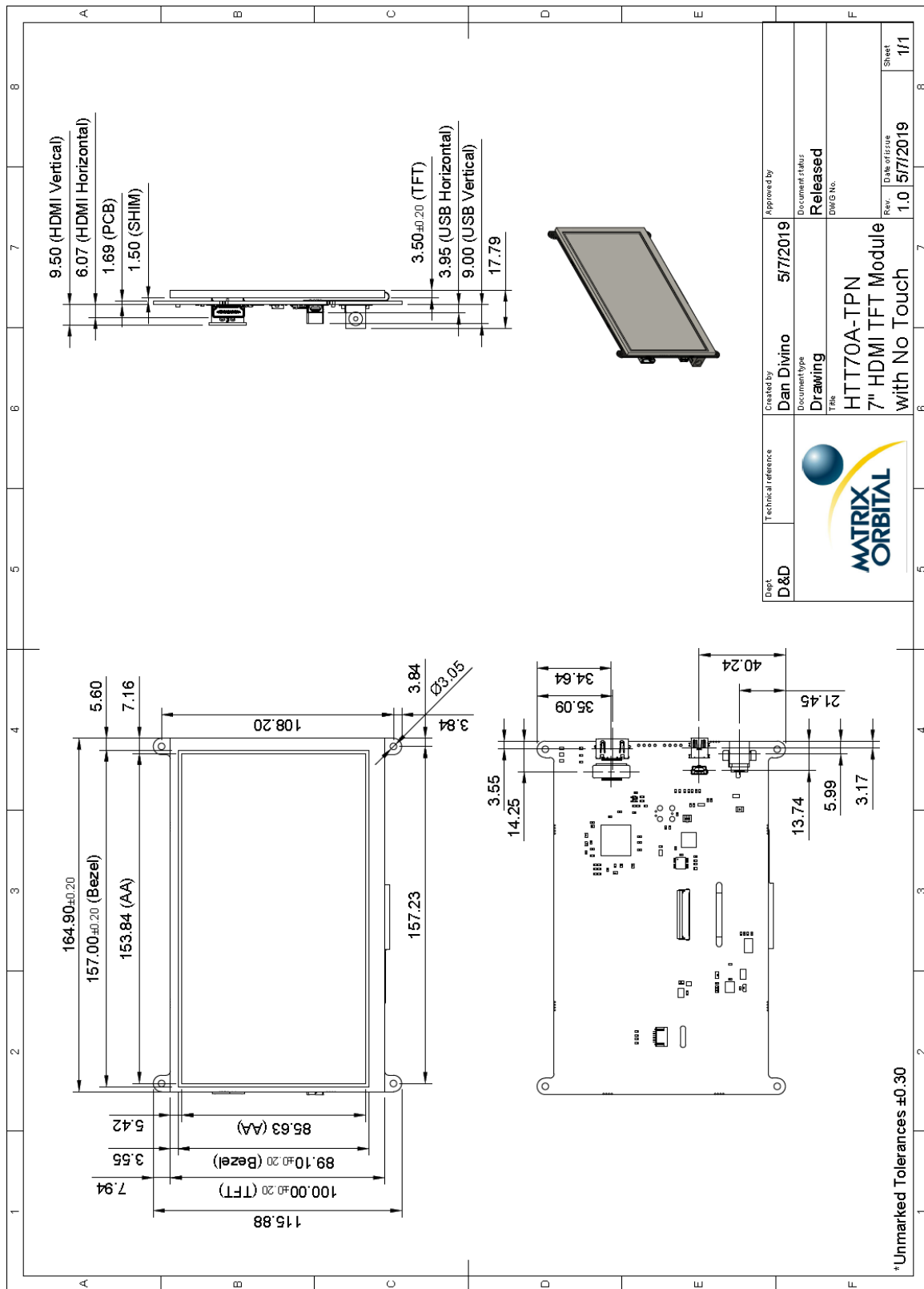


Figure 10: HTT70A-TPN Dimensional Drawing

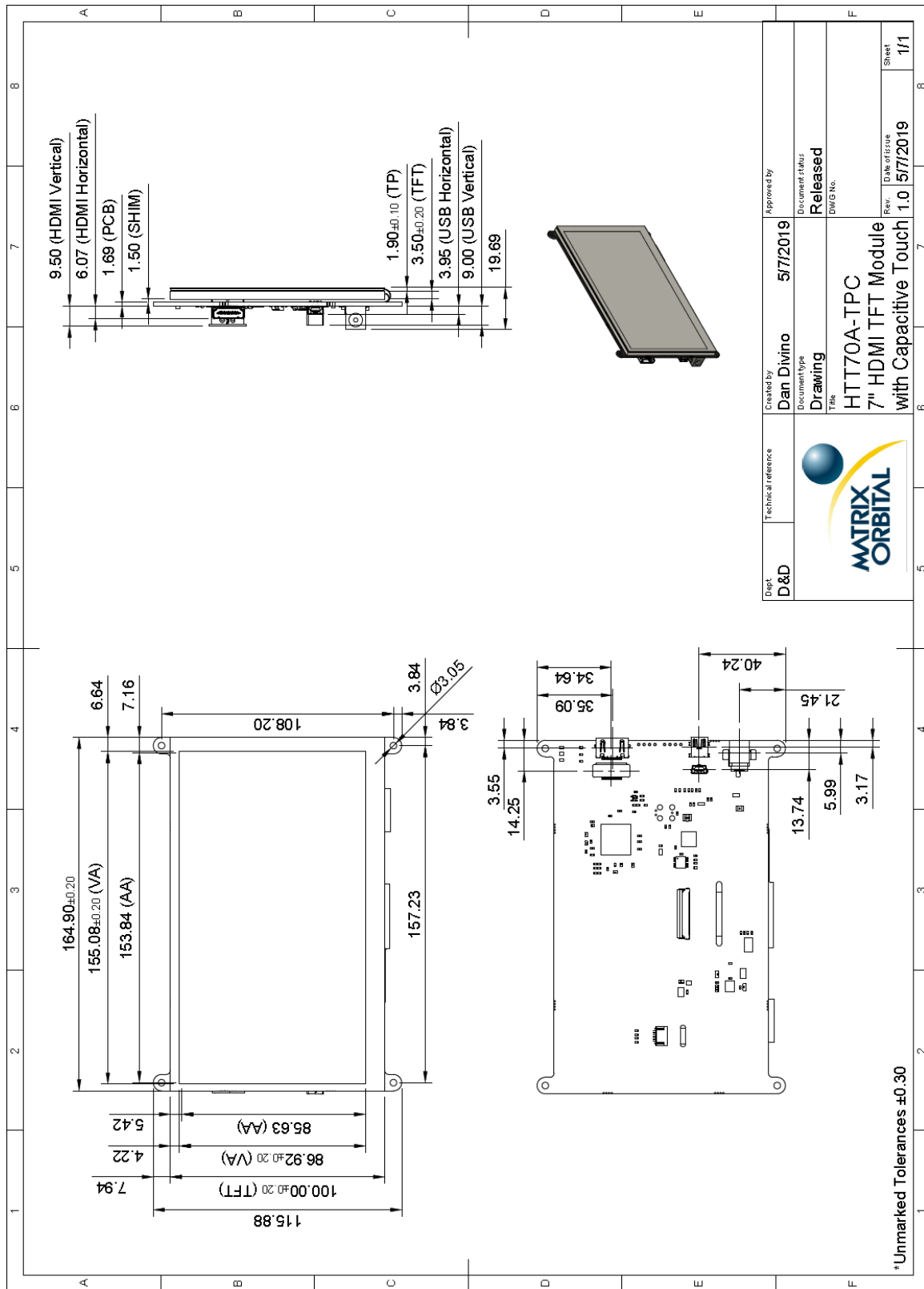


Figure 11: HTT70A-TPC Dimensional Drawing

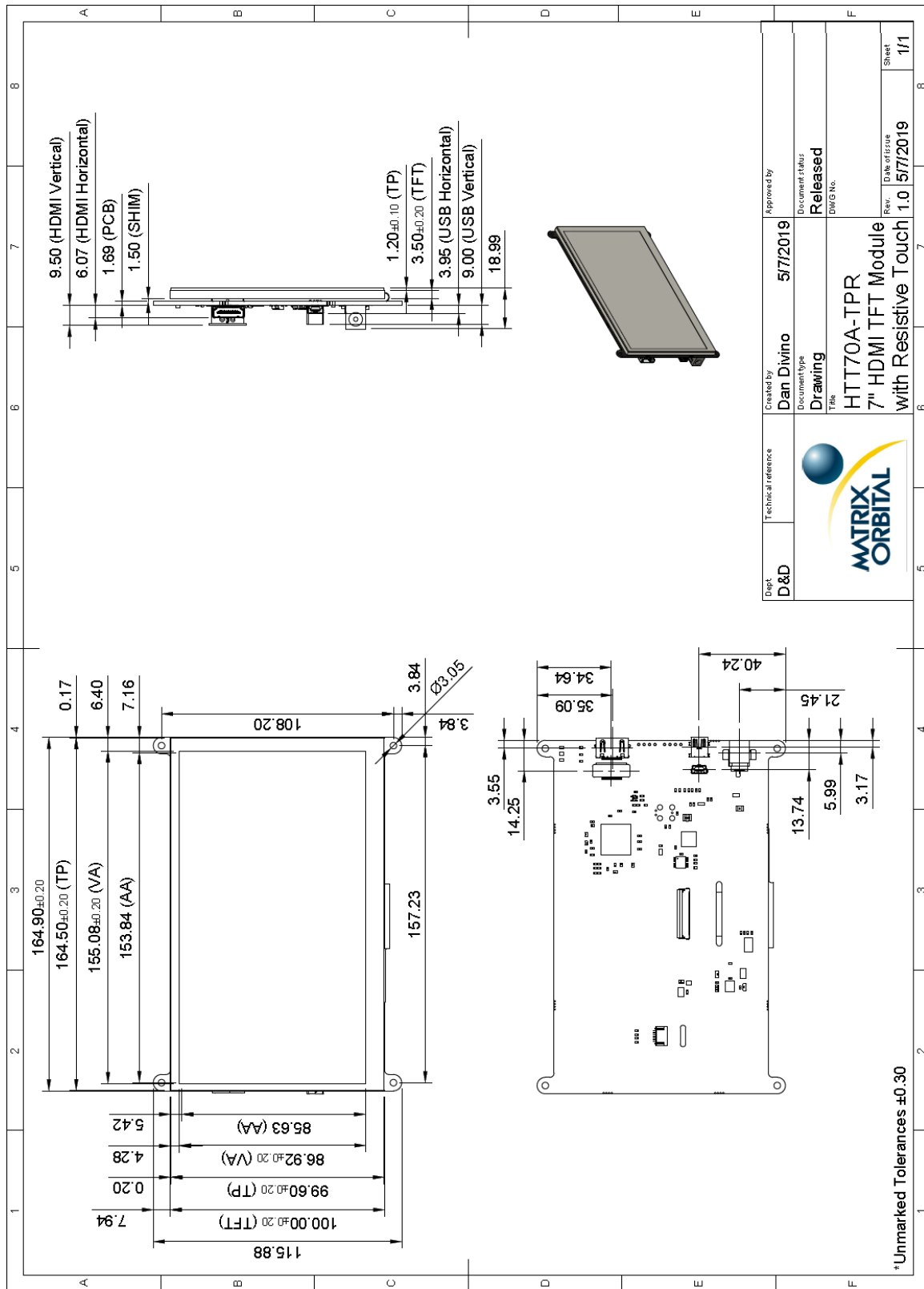


Figure 12: HTT70A-TPR Dimensional Drawing

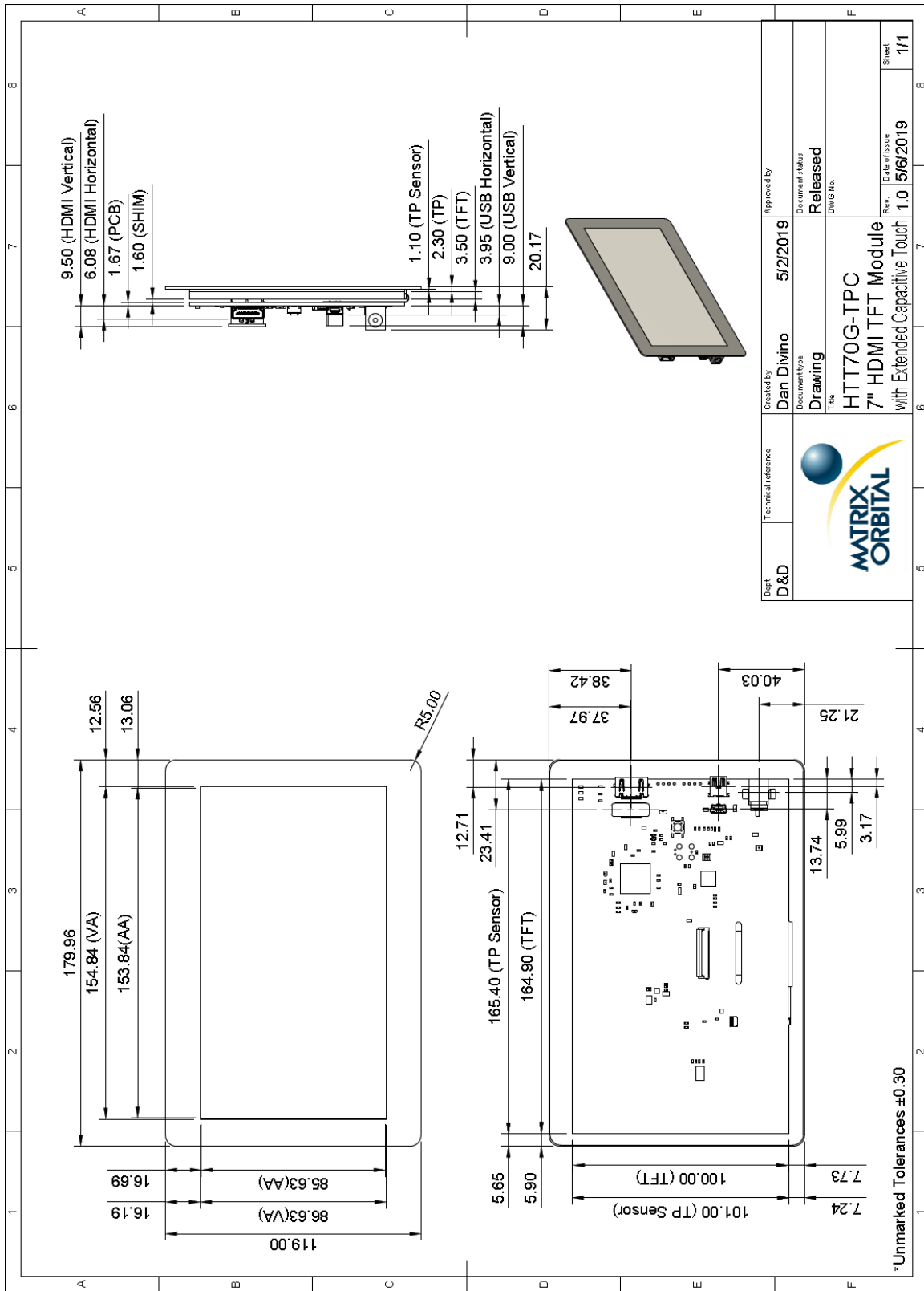


Figure 13: HTT70G-TPC Dimensional Drawing

Characteristics

Optical

Table 10: HTT70 Optical Characteristics

Module Size	A:	TPN	164.90 x 115.88 x 17.79	mm
		TPC	164.90 x 115.88 x 19.69	
		TPR	164.90 x 115.88 x 18.99	
	G:	TPC	179.96 x 119.00 x 20.17	
Viewing Area	A:	TPN	157.00 x 89.10	mm
		TPC	155.08 x 86.92	
		TPR	155.08 x 86.92	
	G:	TPC	154.84 x 86.63	
Active Area	153.84 x 85.63			mm
Pixel Pattern	800 x 480 x 24bit RGB			
Pixel Pitch	0.1923 x 0.1784			mm
Luminance	420			cd/m ²
Viewing Angle	70° Left, Right, Up 60° Down			
Contrast Ratio	500:1			
Backlight Half-Life	20,000 hours			

Touch Panel

Table 11: Touch Panel Characteristics

Parameter	A Series		G Series
	-TPR	-TPC	
IC	NA	GT9xx	GT9xx
Touch Points	1	5	5
Hardness	3H	6H	6H

Power

Table 12: HTT70 Current Characteristics(5V)

Parameter	Min	Typ	Max	Unit	Remarks
Logic	-	375	-	mA	Backlight Off
Backlight	0	-	465	mA	Off, Mid, Max

Table 13: HTT70 Supply Voltage Characteristics

Parameter	Min	Typ	Max	Unit	Remarks
Supply Voltage	4.75	5.0	5.25	V	Standard Voltage (V5)
	5.0	12.0	35.0	V	Wide Voltage (VPT)

Environmental

Table 14: HTT70 Environmental Characteristics

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

Recommended Accessories

USB Cable



Figure 14: EXTMUSB3FT

Part Number:
EXTMUSB3FT

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

Power Adaptor



Figure 15: PWR-ACDC-5V2A

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)

Support

Phone: 403.229.2737

Email: support@matrixorbital.ca

Manuals and Drivers: <http://www.matrixorbital.ca>

Forums: <http://www.lcdforums.com/forums>

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