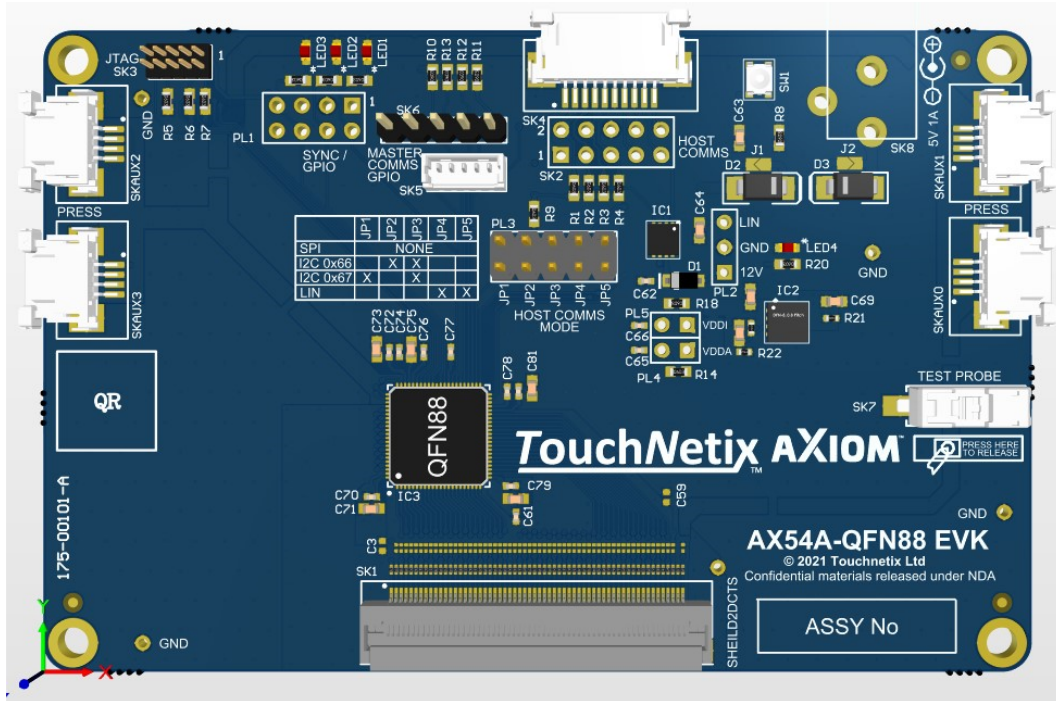


1 Introduction

The aXiom AX54A EVK is intended to serve as a platform, to evaluate the capabilities of the AX54A device. This quick start guide will provide an overview of the EVK, how to setup the EVK system and how to communicate with the AX54A device using TouchHub2.



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2 Terminology

Term / Abbreviation	Description
EVK	aXiom AX54A Evaluation Kit.
FFC	Flat Flex Cable.
FPC	Flexible Printed Circuit.
GPIO	General Purpose Input/Output.
I ² C	Inter-Integrated Circuit, synchronous two wire communication serial bus.
Bridge	The Protocol Bridge board is a module that communicates with the AX54A device over I ² C or SPI and presents a USB HID device to the host system. In effect, it acts as a USB to I ² C/SPI translator.
Report(s)	Messages to the host from the AX54A device.
SPI	Serial Peripheral Interface, synchronous four wire communication serial bus.
Target	Either a proximity, hover or a touch detection.
TouchHub2	TouchNetix proprietary software; used to demo, tune and load firmware/configuration files to the aXiom device via the Bridge.
Touch Screen	This is an assembly comprising of a touch sensor and FPC bonded to a glass lens.

Table 2-1: Application Note Terminology and Abbreviations

3 Getting Started With The AX54A EVK

To start using the AX54A EVK system you will need the following:

1. A PC running Windows 10 operating system (minimum requirement)
2. AX54A EVK board (supplied)
3. Bridge board (supplied)
4. USB A to mini USB B cable (supplied)
5. A TouchNetix touch screen (other compatible touch screens can be used)
6. FFC cable (supplied)
7. TouchHub2 software

The following steps explain how to set up the AX54A EVK system:

1. Connect the touch screen to the AX54A EVK board. (make a note of the number printed on the underside of the touch screen starting '840-' as you will need this later)
 - (a) Lift the latches on connector SK1 on the EVK board.
 - (b) Align the FPC attached to the touch screen with SK1 on the EVK board ensuring that the gold contacts are facing downwards into the connector. (This needs to be done at a slight angle to allow the tabs on the edge of the FPC to engage in the connector).
 - (c) Ensure that the FPC is fully inserted into connector SK1 before fully closing the latches.
2. Connect the EVK board to the TNxAC-009 Bridge board.
 - (a) On both of the PCB's, ensure that you have pulled the tabs on either side of the connectors out, so that the cable can be slid in easily.
 - (b) Before inserting the FFC into the connectors, ensure that the silver contacts are facing upwards.
 - (c) Insert the FFC into each of the connectors until fully inserted and then press the tabs either side back in, to lock the cable in place.
3. Connect the Bridge board to a Windows based host PC using the supplied or compatible USB cable. (The host PC requires a USB2.0 or newer socket.)
 - (a) The Bridge board provides power to the EVK when connected to the host.
 - (b) When the Bridge board is powered, there are 2 LED's that should be on.
 - i. LED1 and LED2, as labeled on the board.
 - (c) When the EVK is powered, there is 1 LED that should be on.
 - i. LED4 - Located near PL2.
4. Install and launch TouchHub2.
 - (a) TouchHub2 will automatically discover the first available Bridge once running.
 - (b) You should then see '**Connected**' in the bottom left hand corner of the window.
 - (c) Select '*Drawing*' from within the '**Main Menu**' at the top of the screen.
 - (d) TouchHub2 also has a 'Quick Start guide' within the software which can be found in the '**Help**' menu.

The EVK setup should look like the the following image.

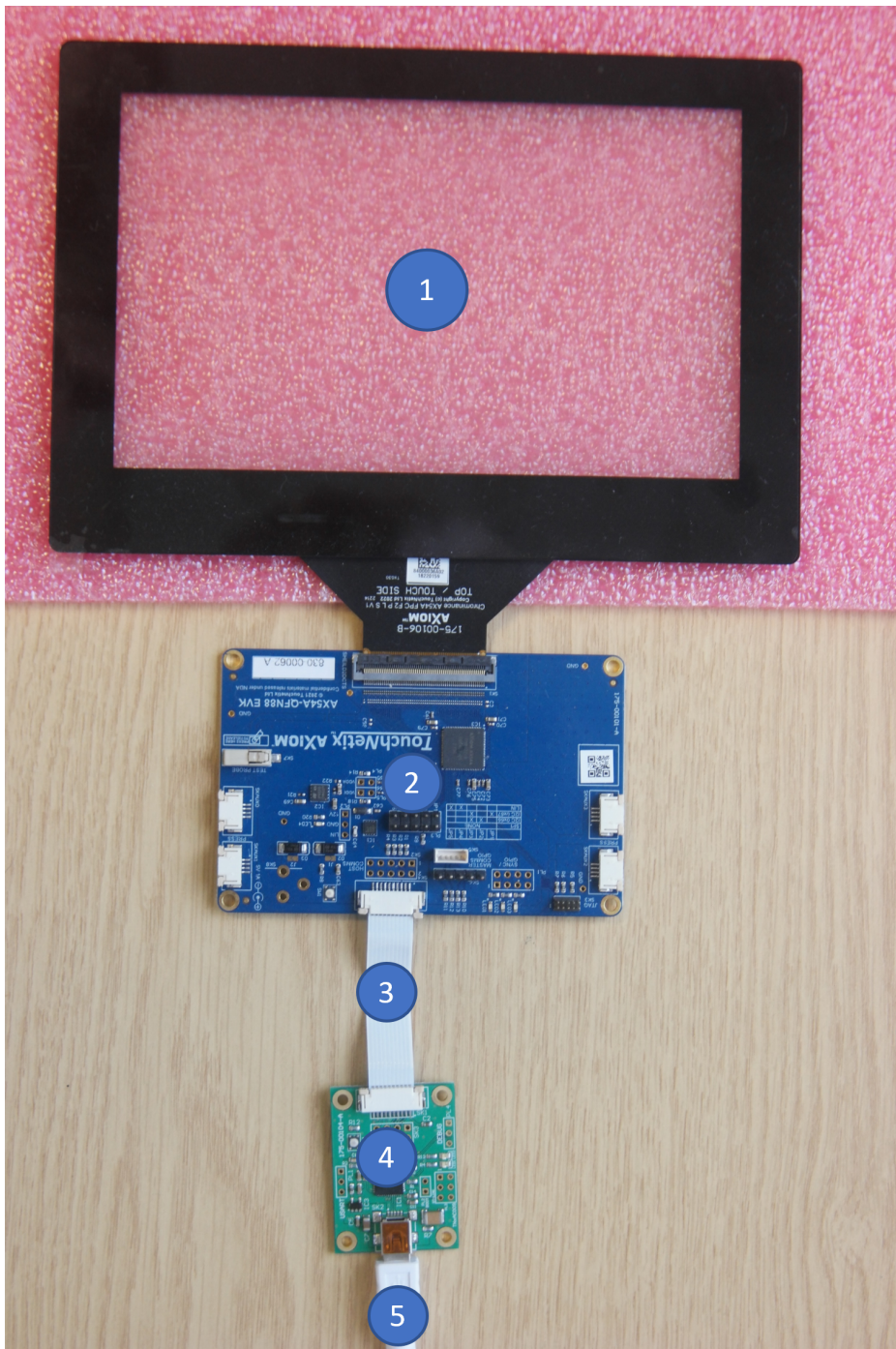


Figure 3-1: AX54A EVK Connection Image

Key	Component
1	Touch Screen.
2	aXiom AX54A EVK board.
3	FFC between AX54A EVK board and the Bridge board.
4	Bridge board (TNxAC-009).
5	USB connection to the host.

Table 3-1: AX54A EVK Connections

The different views seen here, can be selected by opening the **'Report Data Views'** menu. Views that display real-time target data will reference u41 in the view title. The **'Drawing Settings'** in the **'Report Data Views'** menu, will allow for different methods of visualizing the target data.

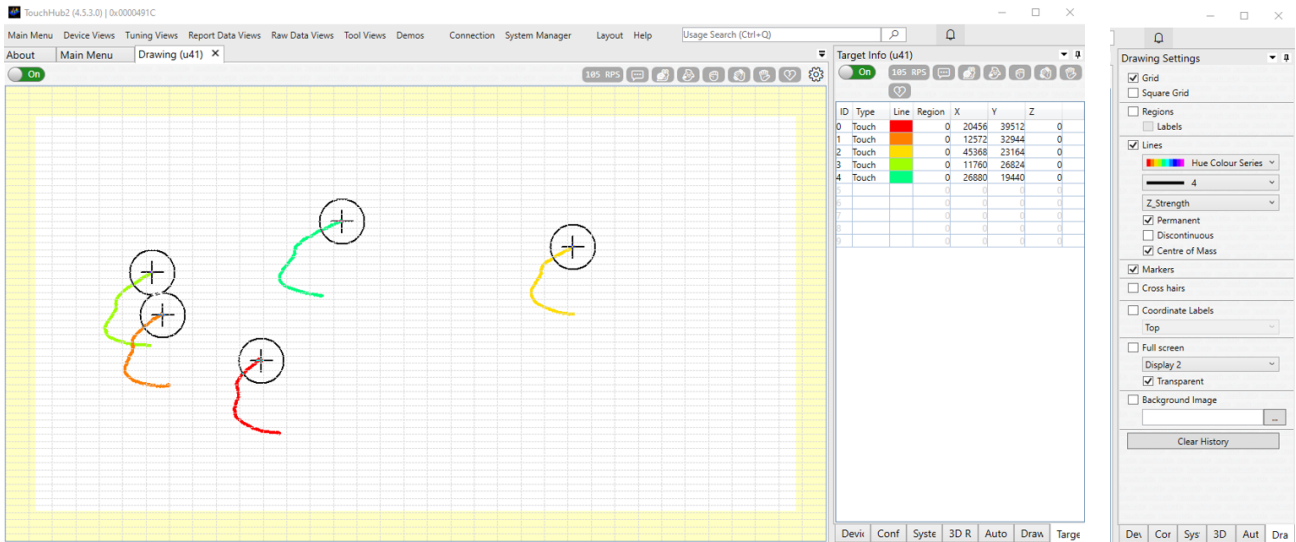


Figure 3-2: TouchHub2 Drawing Window, Target Information and Settings

4 TouchHub2 Software

TouchHub2 is a proprietary TouchNetix application that has been designed to configure the aXiom family of touch controllers. Without a licence key, TouchHub2 will run in a demo mode, which enables the drawing interface and access to information regarding the reports that the aXiom device is generating. With a licence key, different tuning and configuration options will be available, depending on the type of licence you are issued with. TouchHub2 also enables configuration files to be loaded and/or saved, as well as new firmware to be loaded to the device.

4.1 Reports

Reports are data messages that the aXiom device generates, to provide the host with real-time information. There are two main reports that will be observed. (Other reports may be observed, and can be ignored for the sake of this quick start guide.)

- u01 - System Report
 - Heartbeat message from the firmware to notify the host that the aXiom device is functioning.
 - A system report message is also sent at aXiom boot.
 - A typical configuration will generate this heartbeat message once per second.
- u41 - Target Report
 - This report includes all proximity, hover and touch targets and their detection states.
 - All target statuses are reported in a single report.
 - A typical configuration will generate a target report message after every touch panel measurement frame.

4.2 Touch Drawing

The Drawing window in TouchHub2 is used to verify that touches, hover and proximity targets are correctly reported by the aXiom device. Before the drawing mode can become active, it needs to be enabled by moving the switch in the window from 'Off' to 'On'. This will allow TouchHub2 to consume the u41 target reports from the aXiom device and draw the appropriate markers/lines.

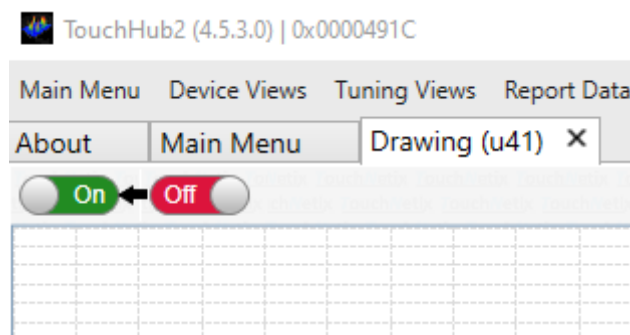


Figure 4.2-1: Enable Drawing

For more help with TouchHub2 use the help guide referred to in the 'Quick Start guide' within the software which can be found in the **Help** menu.

4.3 Loading and Saving AX54A Configurations

The configuration file, `.thc`, contains all the necessary register settings to tune the AX54A to the physical characteristics of the sensor connected to it, configure measurement modes, process measurement results and react to environmental effects such as noise and temperature changes. To load or save configuration files, first open the '**Configuration**' view within the '**Device Views**' menu.

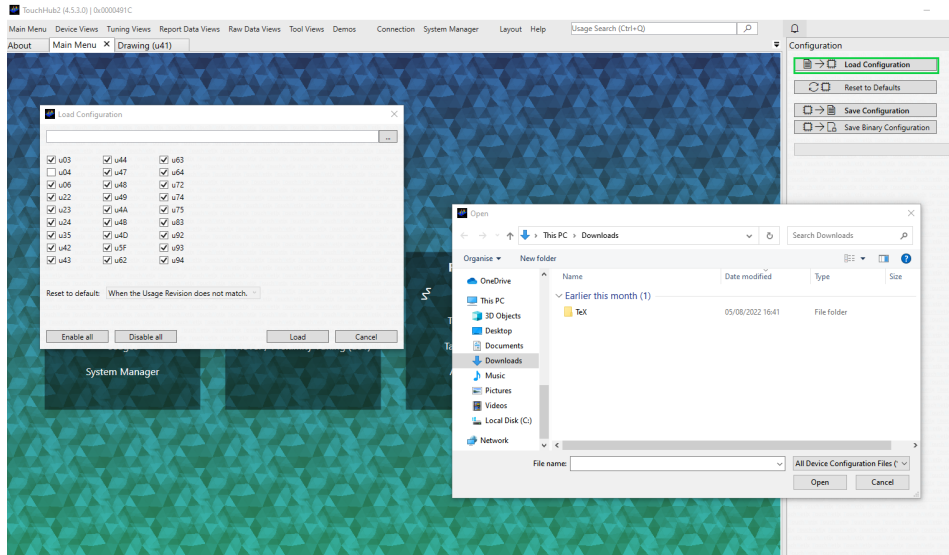


Figure 4.3-1: Loading a New Configuration File in TouchHub2

If loading a new configuration file received from TouchNetix, select '*Load Configuration*' and then browse for the file in the pop-up window that appears, and click '*open*'. On the window that remains open, do not change any of the tick boxes unless instructed to do so by TouchNetix, and click '*Load*' to load the file. Once the new configuration file has been loaded, the EVK board will reset automatically and TouchHub2 will reconnect.

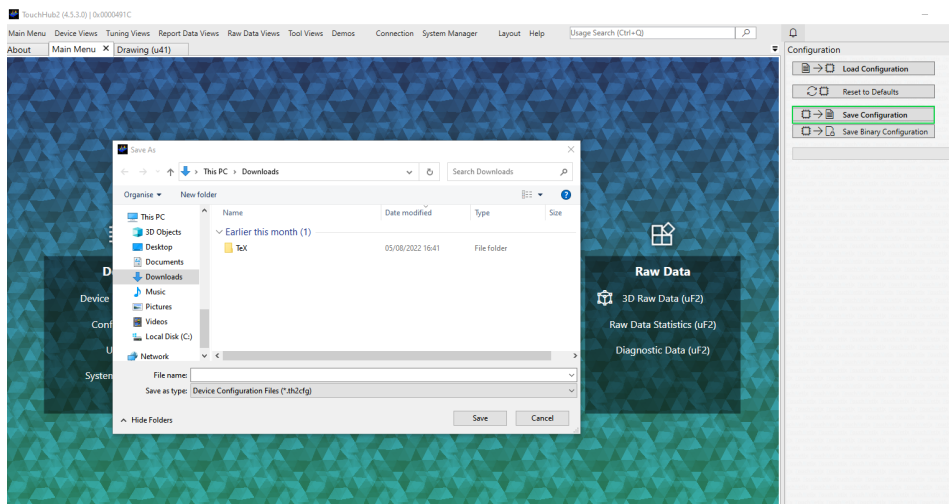


Figure 4.3-2: Saving a Configuration File in TouchHub2

To save a configuration file, select '*Save Configuration*', enter the name and location then click '*Save*'.

4.4 Loading New AX54A Device Firmware

TouchHub2 can be used to update the aXiom firmware. It will handle the update process and automatically reset the device once the download is complete. Depending on the changes in the firmware, the configuration file may need to be reloaded after downloading new firmware. See section **Loading and Saving AX54A Configurations** for how to load configuration files. The firmware is contained within an *.alc* file.

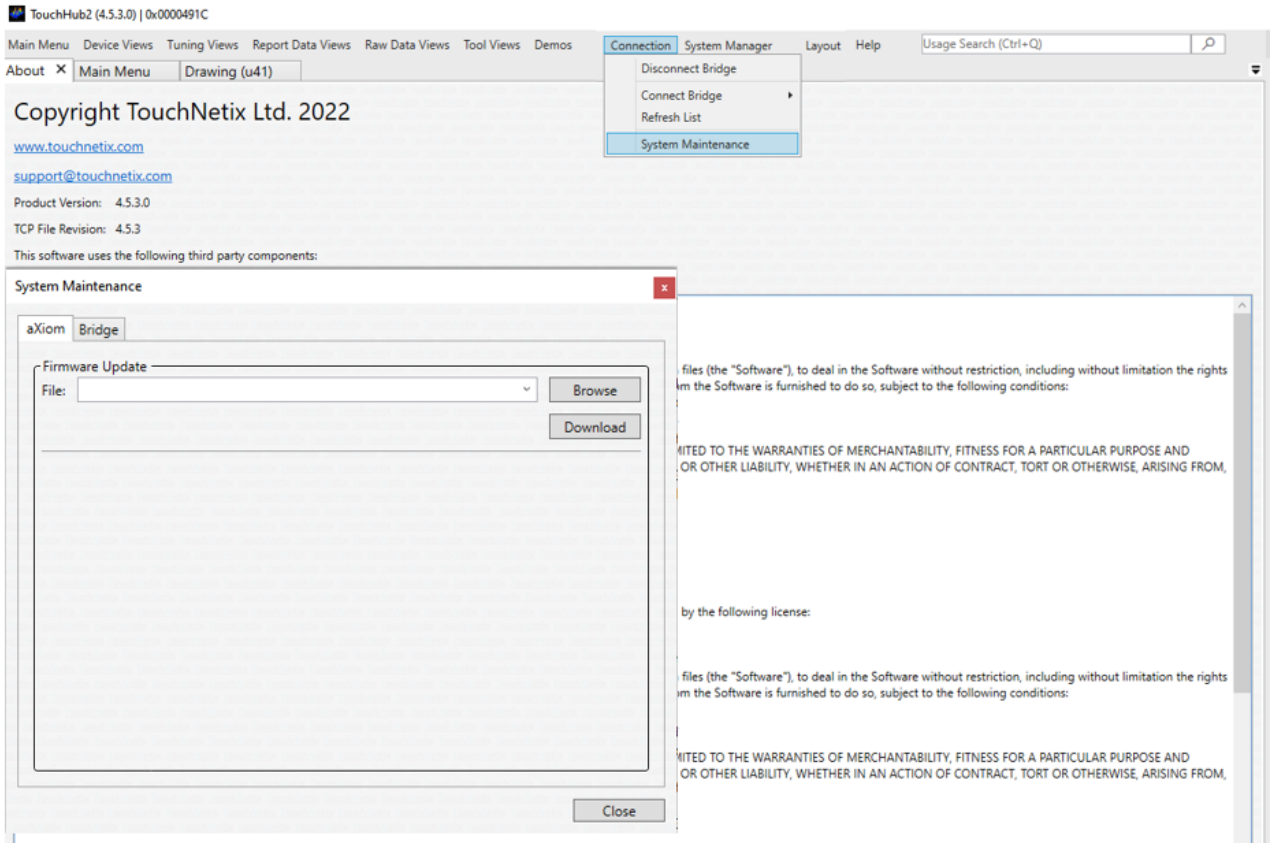


Figure 4.4-1: Loading New aXiom Device Firmware in TouchHub2

4.5 Protocol Bridge Modes

The Bridge can be configured to enumerate as a USB touch digitizer device, whereby touch inputs will generate appropriate HID reports for the host operating system to respond to. To change the Bridge mode, navigate to the **'Connection'** menu and select the **'System Maintenance'** option from the drop down menu. Click the **'OK'** button in the warning pop-up window and then, on the next window, ensure that the **Bridge** tab is selected. The Bridge supports three modes and can be selected as per **Figure 4.5-1 Bridge Mode Select**:

1. *TBP Basic Mode* - Allows TouchHub2 to communicate with the aXiom device being configured and tested.
2. *TBP Digitizer Mode* - The Bridge will enumerate as multi-touch digitizer and allow the first 5 targets to be sent to Windows to process.
3. *TBP Absolute Mouse Mode* - The Bridge will control the mouse based on the state of the targets.

Note: In Digitizer and Absolute Mouse Modes windows will respond to messages sent by the Bridge and treat it as an input device. Therefore, if the aXiom device is not configured correctly you may get unwanted input to the OS. **To avoid this, keep the Bridge in Basic mode until a valid configuration has been loaded into the aXiom device.**

Once the desired mode has been selected, click the **'Apply'** button. The Bridge will reset and re-enumerate with Windows.

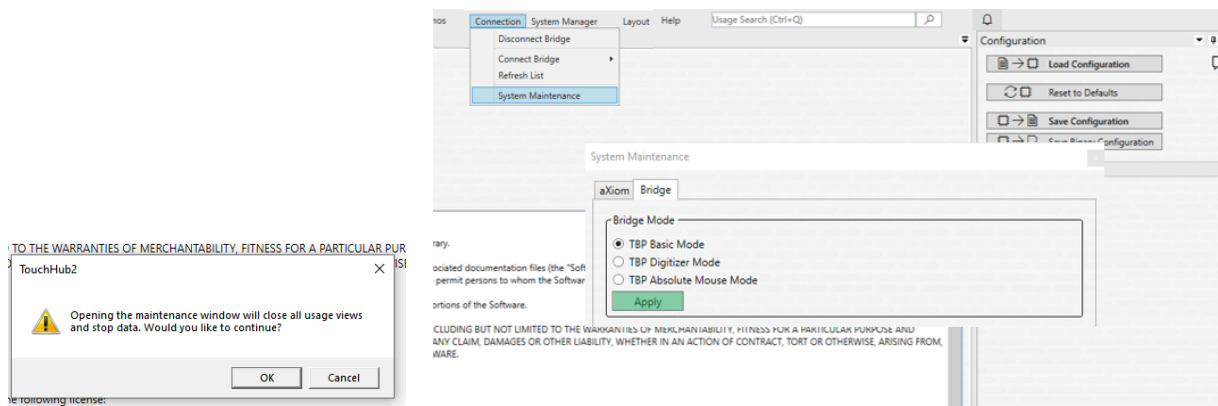


Figure 4.5-1: Bridge Mode Select

4.6 Updating the Protocol Bridge Firmware

It may be necessary to update the Bridge firmware from time to time and this can be done using the TouchHub2 application. To access this option, select the '**Connection**' menu and then the '**System Maintenance**' option from the drop down menu. This will open the System Maintenance window and you should then select the '**Bridge**' tab. Click '**Bridge Reflash**' and a file selector window will open, select from either a *.th2bridgefw, *.elf or *.dfw file which contains the new Bridge firmware.

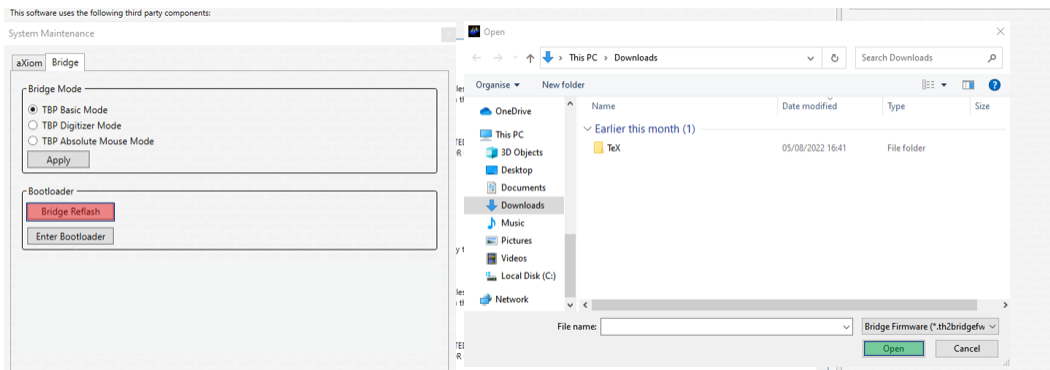


Figure 4.6-1: Bridge Firmware Update

Once the firmware update is complete, the Bridge will reset and TouchHub2 will automatically reconnect to the Bridge. The Bridge firmware version can be verified in the status bar of TouchHub2.

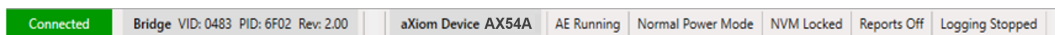


Figure 4.6-2: Bridge Firmware Version

4.7 Licence Key (Optional)

TouchHub2 requires a licence key to access and tune aXiom devices. Without a licence key, TouchHub2 operates in Demo mode. To request a new licence or an extension to an existing licence, please contact TouchNetix. Enter the licence key by selecting the **'Help'** menu and selecting **'Licence'** from the drop down menu.

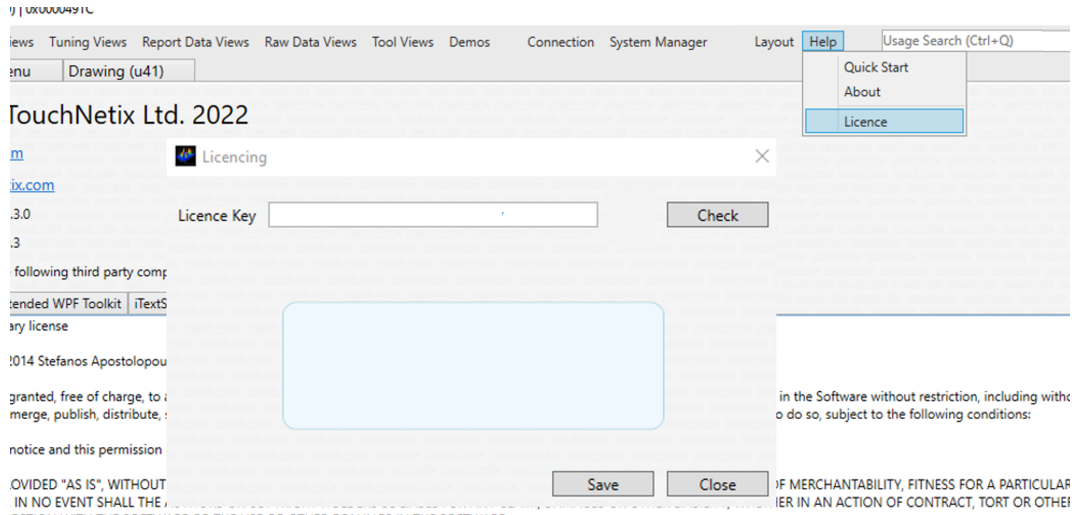


Figure 4.7-1: TouchHub2 Licence Edit

Click on the **'Test'** button to ensure the key is valid and has been inputted correctly. Once the key is verified, click **'Save'**. The licence expiry date is shown in the pop-up.

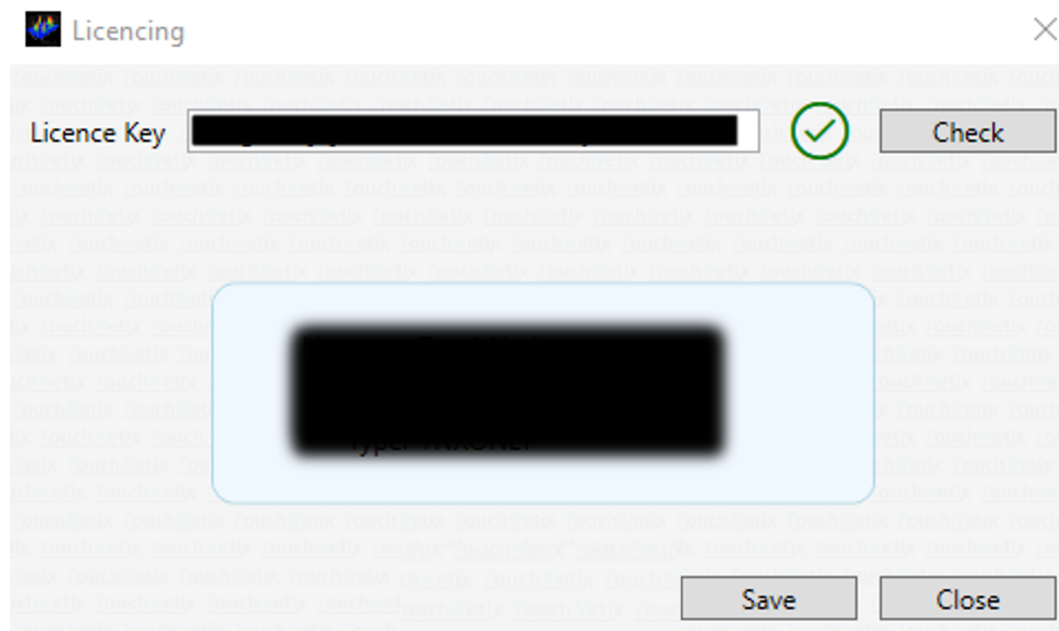


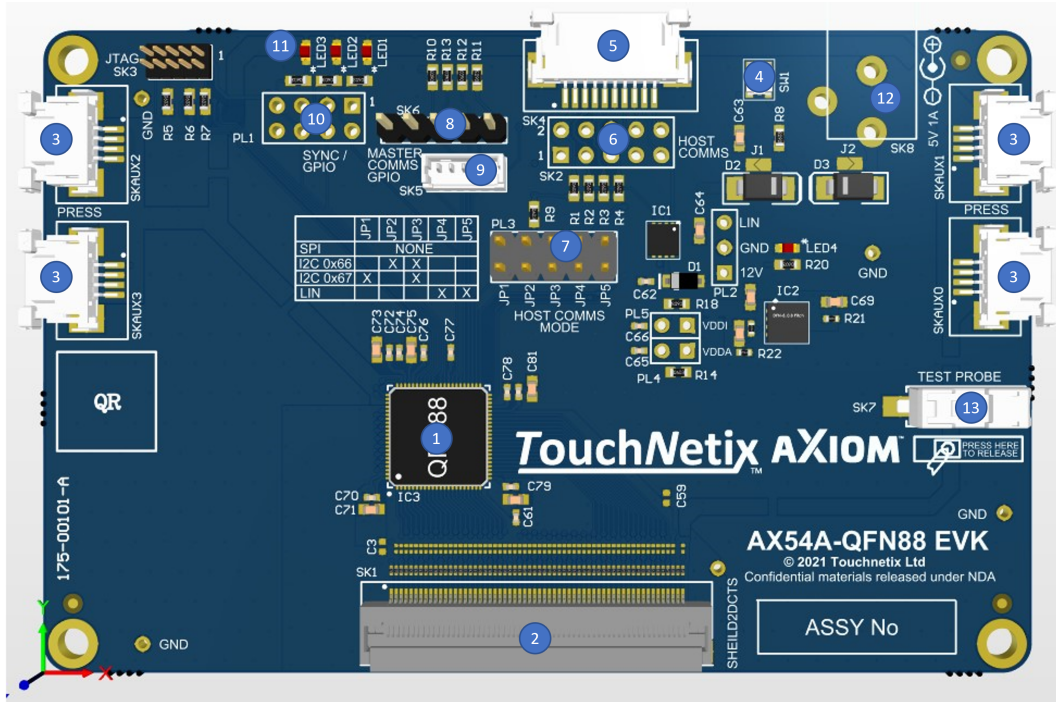
Figure 4.7-2: Licencing Window

5 AX54A EVK Overview

5.1 EVK Contents

The EVK contains a complete system to get up and running with the aXiom AX54A device. The EVK is comprised of:

1. AX54A EVK board featuring the AX54A device.
2. TouchNetix Touch Screen.
3. TNxAC-009 Bridge board with USB cable and a FFC to connect to the EVK board.



Key	Silkscreen Identifier	Name
1	IC3	AX54A Device.
2	SK1	Touch Screen FPC Connector.
3	SKAUX0, SKAUX1, SKAUX2, SKAUX3	Press Sense FPC Connectors.
4	SW1	AX54A Reset Button.
5	SK4	Bridge Board Connector.
6	SK2	Host Comms Header.
7	PL4	Host Comms Mode Select; SPI or I ² C.
8	SK6	Master Comms GPIO Header.
9	SK7	Master Comms I ² C Connector.
10	PL9	Sync / GPIO Header.
11	LED1, LED2, LED3	GPIO LEDs.
12	SK9	Power Barrel Jack, 5V 1A.
13	SK7	Metal touch Ground Wire Connector.

Table 5.1-1: AX54A EVK Overview

5.2 AX54A EVK Headers

5.2.1 Host Comms Header - SK3

Pin	Name	Description
1	VDDIN	5V Power
2	SLVSDA/SCK	SPI: SCK I²C: SDA
3	SLCSCL/nSS	SPI: Slave Select I²C: SCL
4	nReset	Reset AX54A Device
5	SLVnIRQ	Active Low IRQ signal from AX54A Device to Host
6	GND	Ground
7	SLVI2CADDRSEL/MOSI	SPI: MOSI I²C: Address select
8	nSLVI2C/MISO	SPI: MISO I²C: I ² C Comms Select
9	SLVSDA/SCK	SPI: SCK I²C: SDA
10	SLVSCL/nSS	SPI: Slave Select I²C: SCL

Table 5.2.1-1: Host Comms

This host comms header is an exact pin-out of SK4, the FFC connector to the Bridge board. This connector is useful to provide a direct connection to the aXiom AX54A's SPI and I²C interfaces. Some of the pins have multiple functions which are dependent on the **Host Comms mode - PL6**, these are identified in the pin-out table as **SPI** and **I²C**.

5.2.2 Host Comms mode - PL6

Pin	Name	Description
1	SLVI2CADDRSEL/MOSI	SPI: MOSI I2C: Address select
2	VDDI	VDDI
3	SLVI2CADDRSEL/MOSI	SPI: MOSI I2C: Address select
4	GND	Ground
5	nSLVI2C	SPI: MOSI I2C: I ² C Comms select
6	GND	Ground
7	nSLVI2C	SPI: MOSI I2C: I ² C Comms select
8	SLVI2CADDRSEL/MOSI	SPI: MOSI I2C: Address select
9	LIN EN	LIN EN
10	SLVnIRQ	Active Low IRQ signal from AX54A Device to Host

Table 5.2.2-1: Host Comms Mode Select Header

The AX54A EVK board will use the SPI communication interface to the host by default, with nothing set on the header. By fitting jumpers in accordance with the silkscreen diagram in **Figure 5.2.2-1**, you can change the communication mode accordingly.



I²C 0x66 address is selected in the middle image, I²C 0x67 address is selected in the right image.

Figure 5.2.2-1: EVK Communication Mode Select

The Bridge always needs to be set to be the same communication protocol as the AX54A EVK. The board comes with no link fitted on the PL3 'COMM SEL' header which is correct for SPI, should you want I²C then you would need to fit a 2 pin header and jumper.

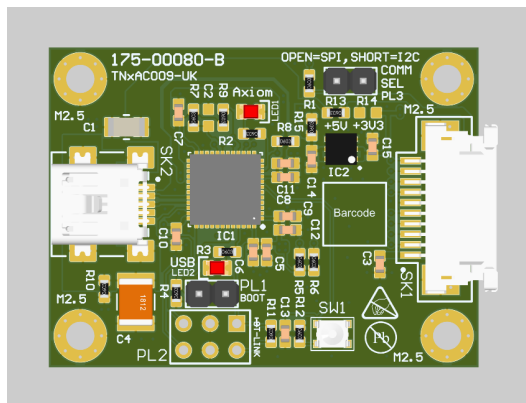


Figure 5.2.2-2: Bridge Board Communication Mode Select

5.2.3 Master Comms GPIO Header - SK6

Pin	Name	Description
1	MSTCOMMS0	GPIO
2	MSTCOMMS1	GPIO
3	MSTCOMMS2	GPIO
4	MSTCOMMS3	GPIO
5	GND	Ground

Table 5.2.3-1: Master Comms GPIO Header

All MSTCOMMS pins have 3K3 ohm pull-up resistors to 3V3. The master comms interface is intended to be connected to a device, that will trigger/control any haptic actuators based, on the haptic hotspots that are defined within the AX54A device configuration file. Refer to **TNxAN00036 aXiom Touch Controller Haptics Drive** for more information.

5.2.4 Master Comms I²C Connector - SK7

Pin	Name	Description
1	VDD	5V power
2	MSTCOMMS0	Master I ² C SDA
3	MSTCOMMS1	Master I ² C SCL
4	MSTCOMMS2	IRQ
5	GND	Ground

Table 5.2.4-1: Master Comms I²C Connector

This I²C bus is independent from the host comms I²C bus. All MSTCOMMS pins have 3K3 ohm pull-up resistors to 3V3. The master comms interface is intended to be connected to a device, that will trigger/control any haptic actuators based, on the haptic hotspots that are defined within the AX54A device configuration file. Refer to **TNxAN00036 aXiom Touch Controller Haptics Drive** for more information.

5.2.5 Sync / GPIO Header - PL9

Pin	Name	Description
1	VDD	5V Power
2	GPIO0	GPIO
3	GND	Ground
4	GPIO1	GPIO
5	3V3	3.3V Power
6	GPIO2	GPIO
7	GPIO2	GPIO
8	Not Connected	Not Connected

Table 5.2.5-1: Sync / GPIO Header

Appendix A References

TNxAN00036 aXiom Touch Controller Haptics Drive

Appendix B EVK Dimensions

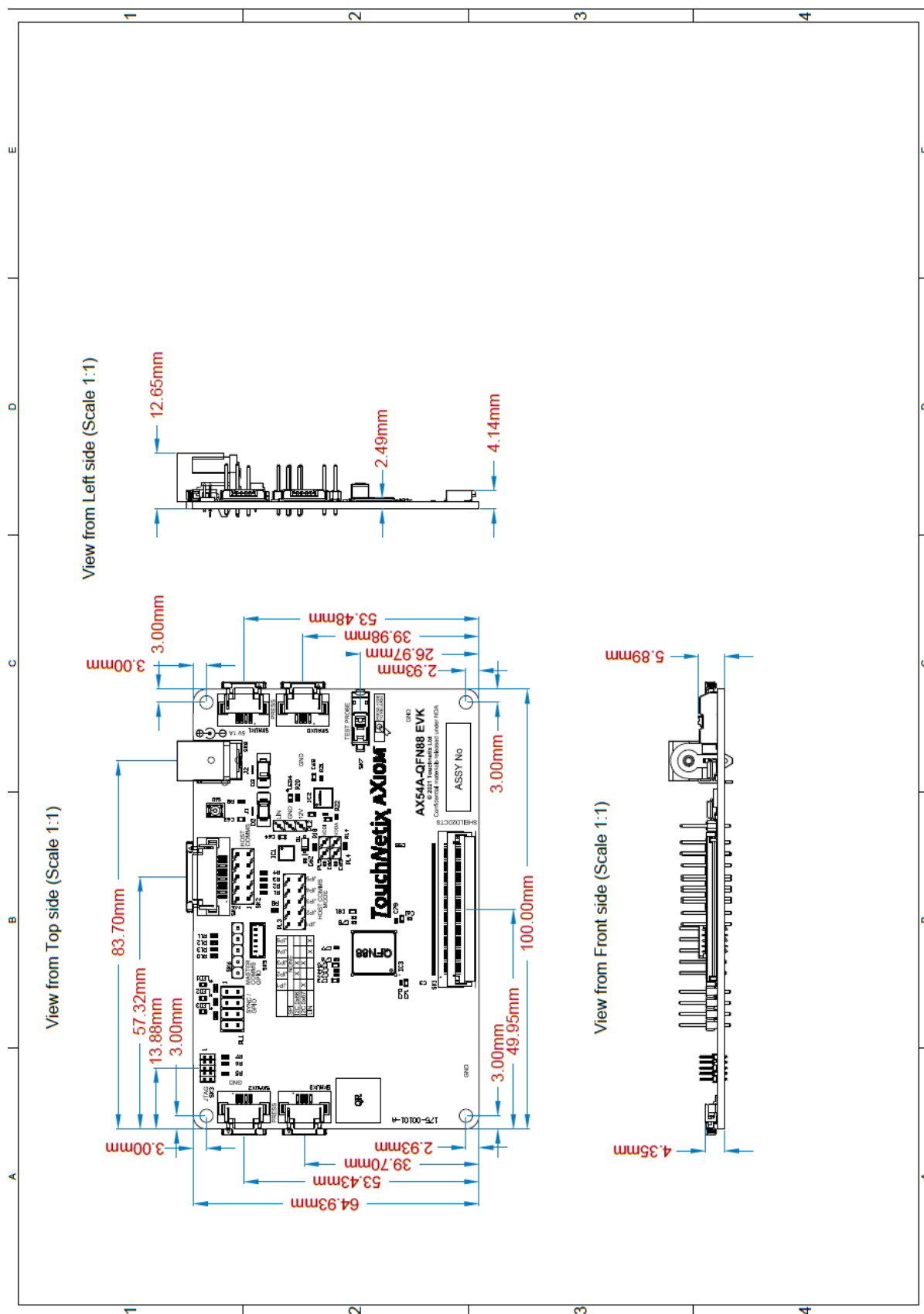


Figure B-1: EVK Dimensions

Appendix C Bridge Board Dimensions

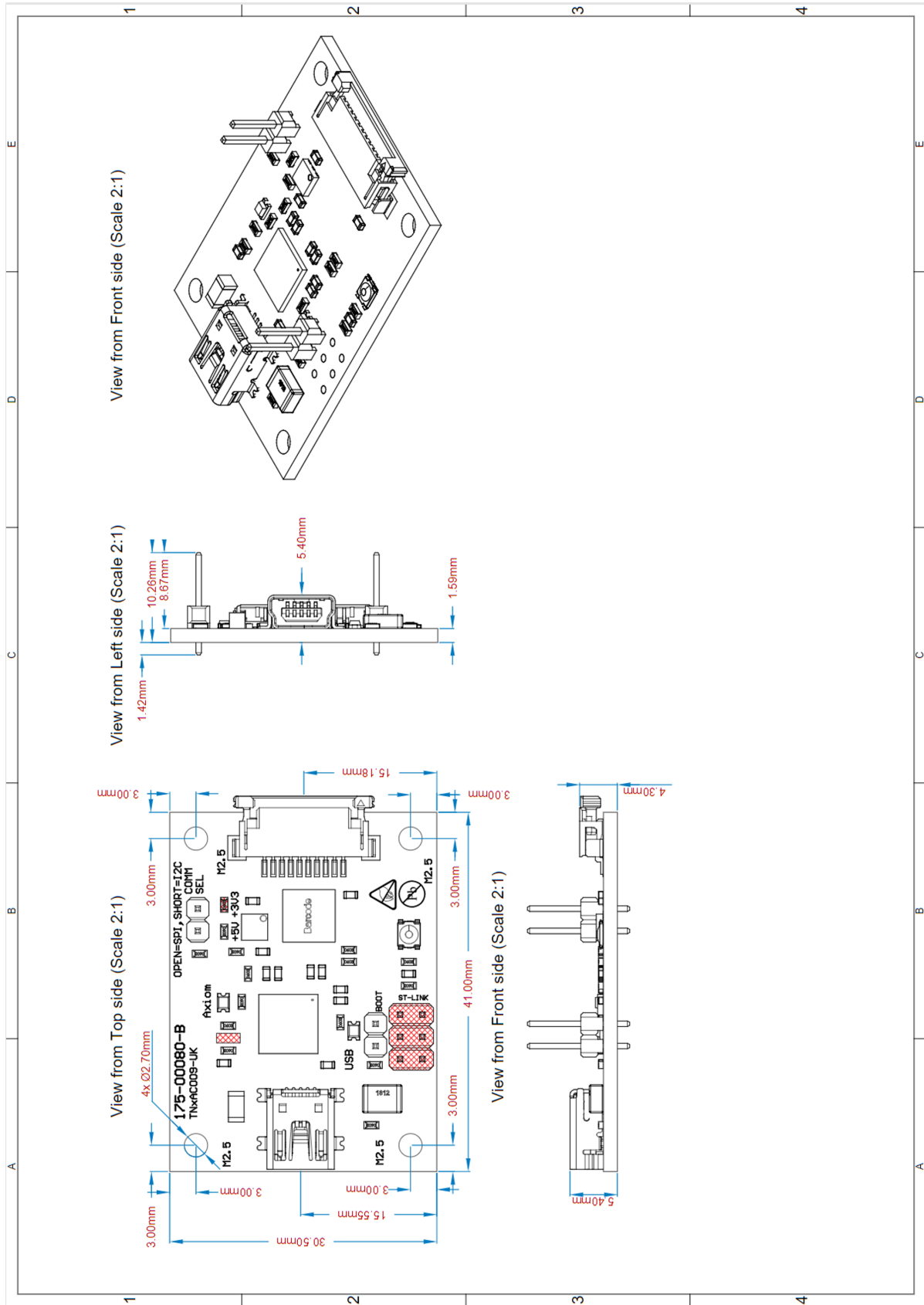


Figure C-1: Bridge Board Dimensions

Appendix D EVK Schematic

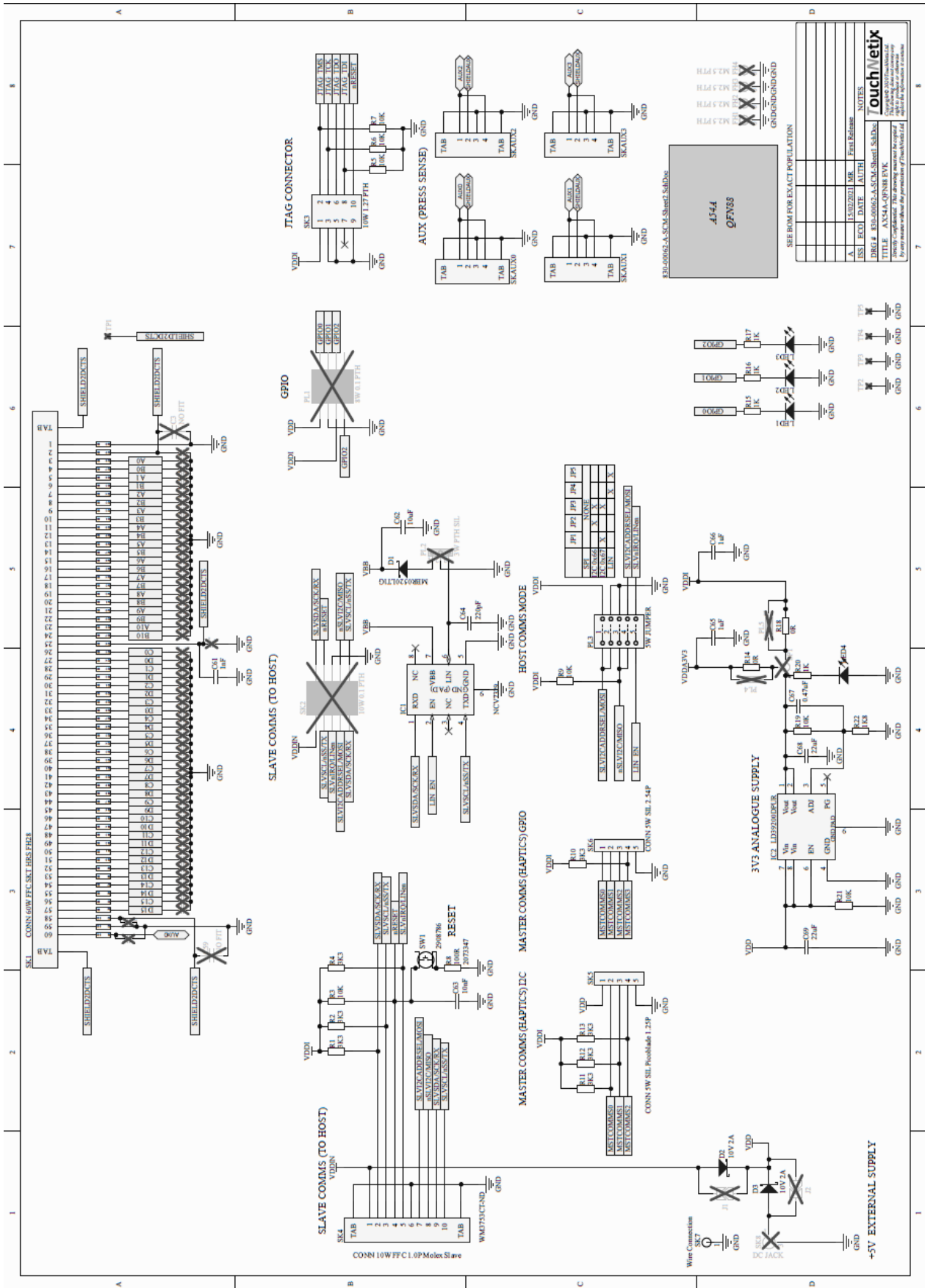


Figure D-1: EVK Schematic - Page 1

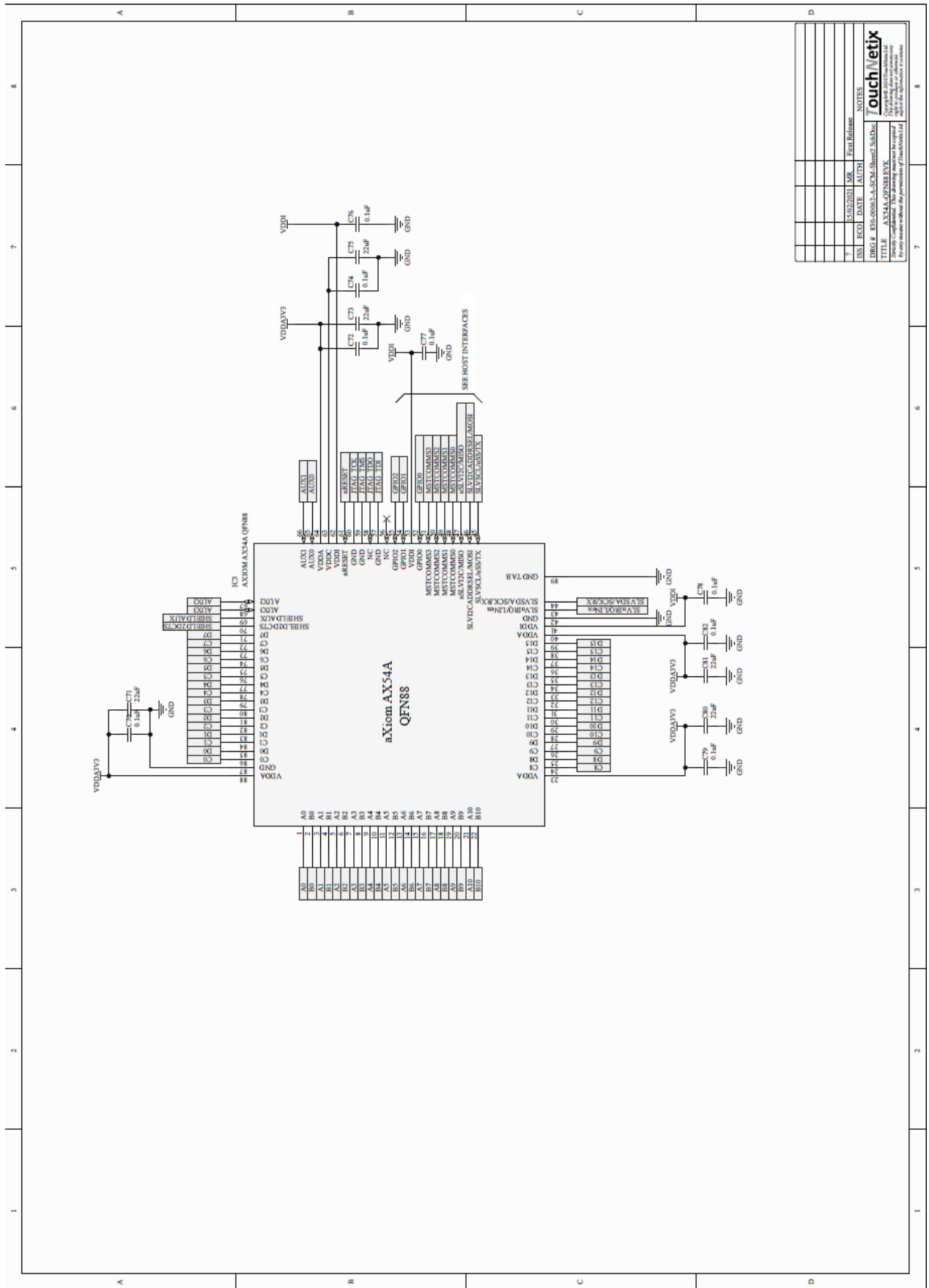


Figure D-2: EVK Schematic - Page 2

Appendix E Legal Copyright and Disclaimer

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Appendix F Document History

Revision	Date	Change summary
A1	16/09/2022	Initial Release.
A2	15/06/2023	Confidential removed from the footer.