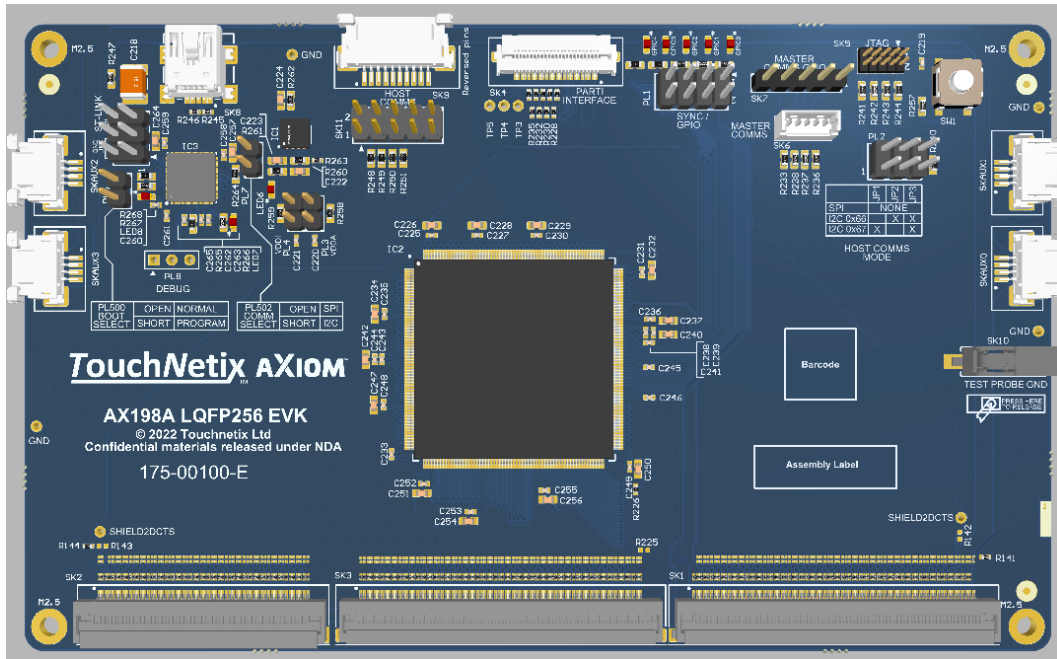


1 Introduction

The aXiom AX198A EVK is intended to serve as a platform, to evaluate the capabilities of the AX198A device. This quick start guide will provide an overview of the EVK, how to setup the EVK system and how to communicate with the AX198A device using TouchHub2.



Contents

1 Introduction **1**

2 Terminology **3**

3 Getting Started With The AX198A EVK **4**

4 TouchHub2 Software **7**

 4.1 Reports 7

 4.2 Touch Drawing 7

 4.3 Loading and Saving AX198A Configurations 8

 4.4 Loading New AX198A Device Firmware 9

 4.5 Protocol Bridge Modes 10

 4.6 Updating the Protocol Bridge Firmware 11

 4.7 Licence Key (Optional) 12

5 AX198A EVK Overview **13**

 5.1 EVK Contents 13

 5.2 AX198A EVK Headers 14

 5.2.1 Host Comms Header - SK11 14

 5.2.2 Host Comms Mode Select Header - PL2 (Optional) 14

 5.2.3 Master Comms GPIO Header - SK7 15

 5.2.4 Master Comms I²C Connector - SK6 15

 5.2.5 Sync / GPIO Header - PL1 16

Appendix A References **17**

Appendix B EVK Dimensions **18**

Appendix C EVK Schematic **19**

Appendix D Legal Copyright and Disclaimer **22**

Appendix E Document History **23**

List of Figures

3-1 AX198A EVK Connection Image 5

3-2 TouchHub2 Drawing Window, Target Information and Settings 6

4.2-1 Enable Drawing 7

4.3-1 Loading a New Configuration File in TouchHub2 8

4.3-2 Saving a Configuration File in TouchHub2 8

4.4-1 Loading New aXiom Device Firmware in TouchHub2 9

4.5-1 Bridge Mode Select 10

4.6-1 Bridge Firmware Update 11

4.6-2 Bridge Firmware Version 11

4.7-1 TouchHub2 Licence Edit 12

4.7-2 Licencing Window 12

5.2.2-1 EVK Communication Mode Select 15

B-1 EVK Dimensions 18

C-1 EVK Schematic - Page 1 19

C-2 EVK Schematic - Page 2 20

C-3 EVK Schematic - Page 3 21

2 Terminology

Term / Abbreviation	Description
EVK	aXiom AX198A 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 is a module that communicates with the AX198A 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 AX198A 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 AX198A EVK

To start using the AX198A EVK system you will need the following:

1. A PC running Windows 10 operating system (minimum requirement)
2. AX198A EVK board (supplied)
3. USB A to mini USB B cable (supplied)
4. A TouchNetix touch screen (other compatible touch screens can be used)
5. FFC cable (supplied)
6. TouchHub2 software

The following steps explain how to set up the AX198A EVK system:

1. Connect the touch screen to the AX198A 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 connectors SK1, SK2 and SK3 on the EVK board.
 - (b) Align the FPC attached to the touch screen with SK1, SK2 and SK3 on the EVK board ensuring that the gold contacts are facing downwards into the connectors. (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 connectors SK1, SK2 and SK3 before fully closing the latches.
2. Connect the EVK board to a Windows host PC using the supplied or compatible USB cable. (The host PC requires a USB2.0 or newer socket.)
 - (a) When the EVK is powered, there are 3 LEDs that should be on, all located around IC3, near the USB connector.
 - i. LED6, LED7 & LED9 - As Labeled on the board.
3. 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.

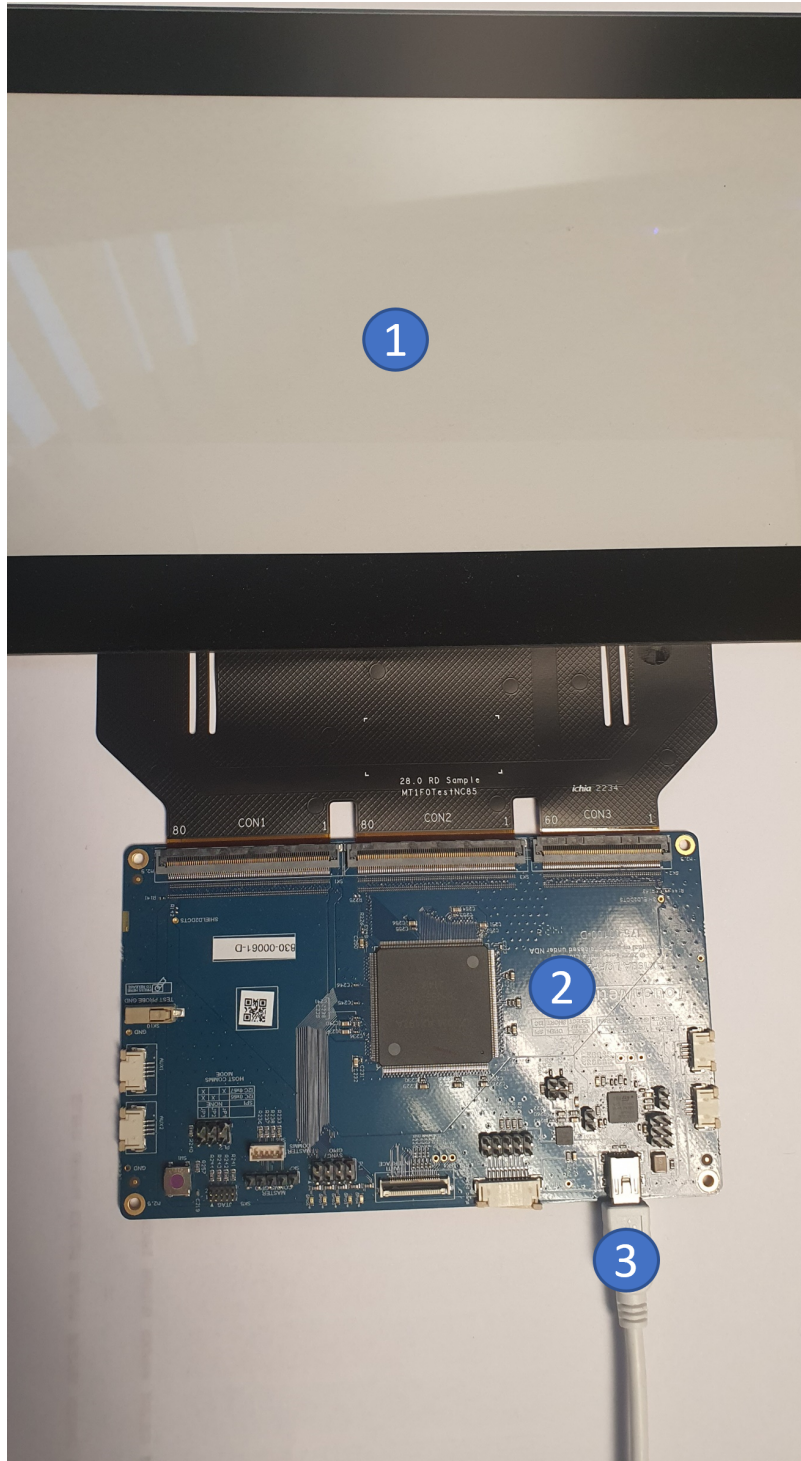


Figure 3-1: AX198A EVK Connection Image

Key	Component
1	Touch Screen.
2	aXiom AX198A EVK board.
3	USB connection to the host.

Table 3-1: AX198A 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.

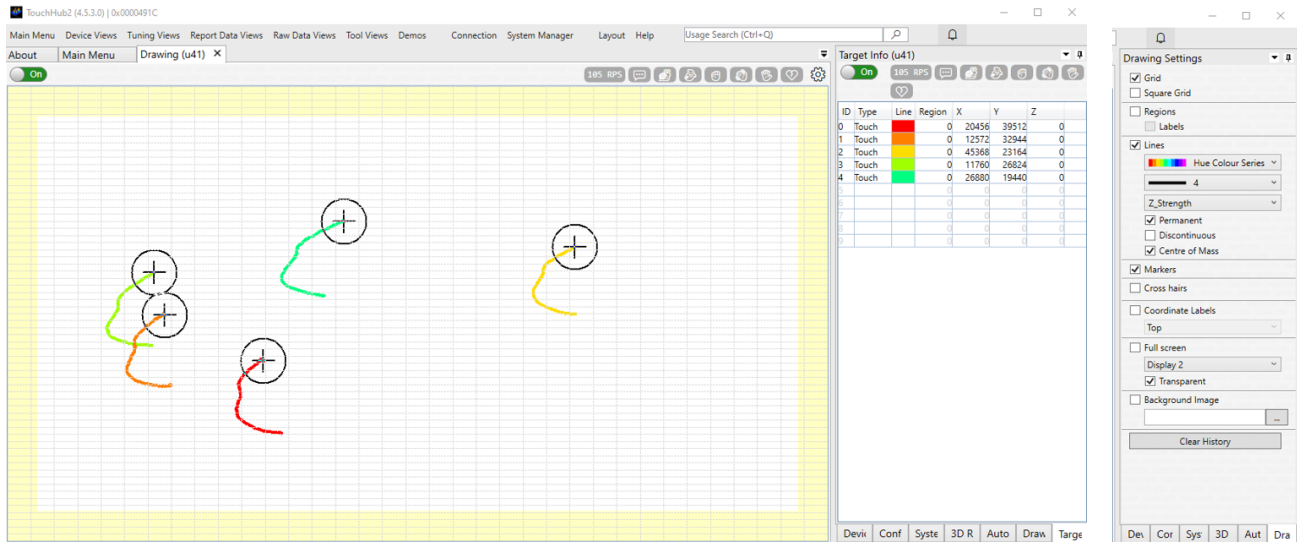


Figure 3-2: TouchHub2 Drawing Window, Target Information and Settings

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 license 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.

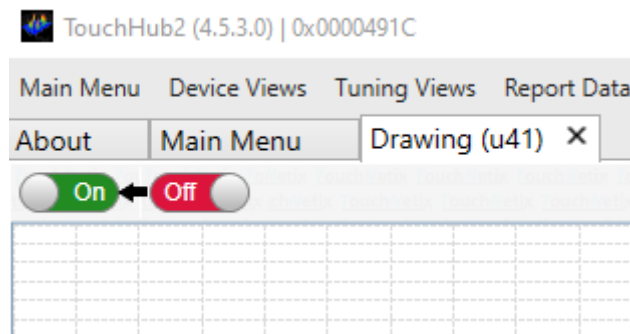


Figure 4.2-1: Enable Drawing

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 AX198A Configurations

The configuration file, contains all the necessary register settings to tune the AX198A 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.

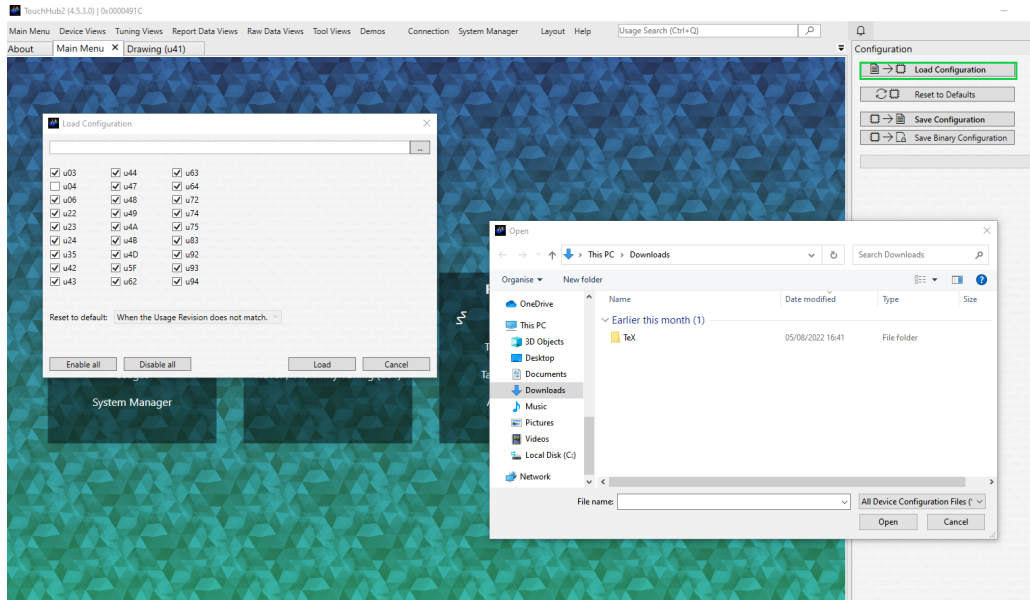


Figure 4.3-1: Loading a New Configuration File in TouchHub2

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.

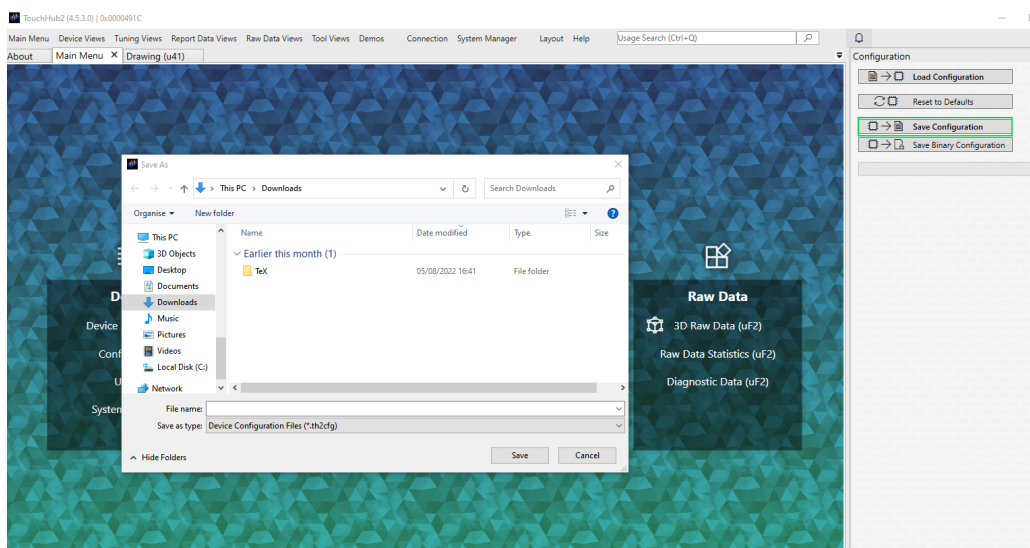


Figure 4.3-2: Saving a Configuration File in TouchHub2

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

4.4 Loading New AX198A 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 AX198A Configurations** for how to load configuration files. The firmware is contained within an *.alc* file.

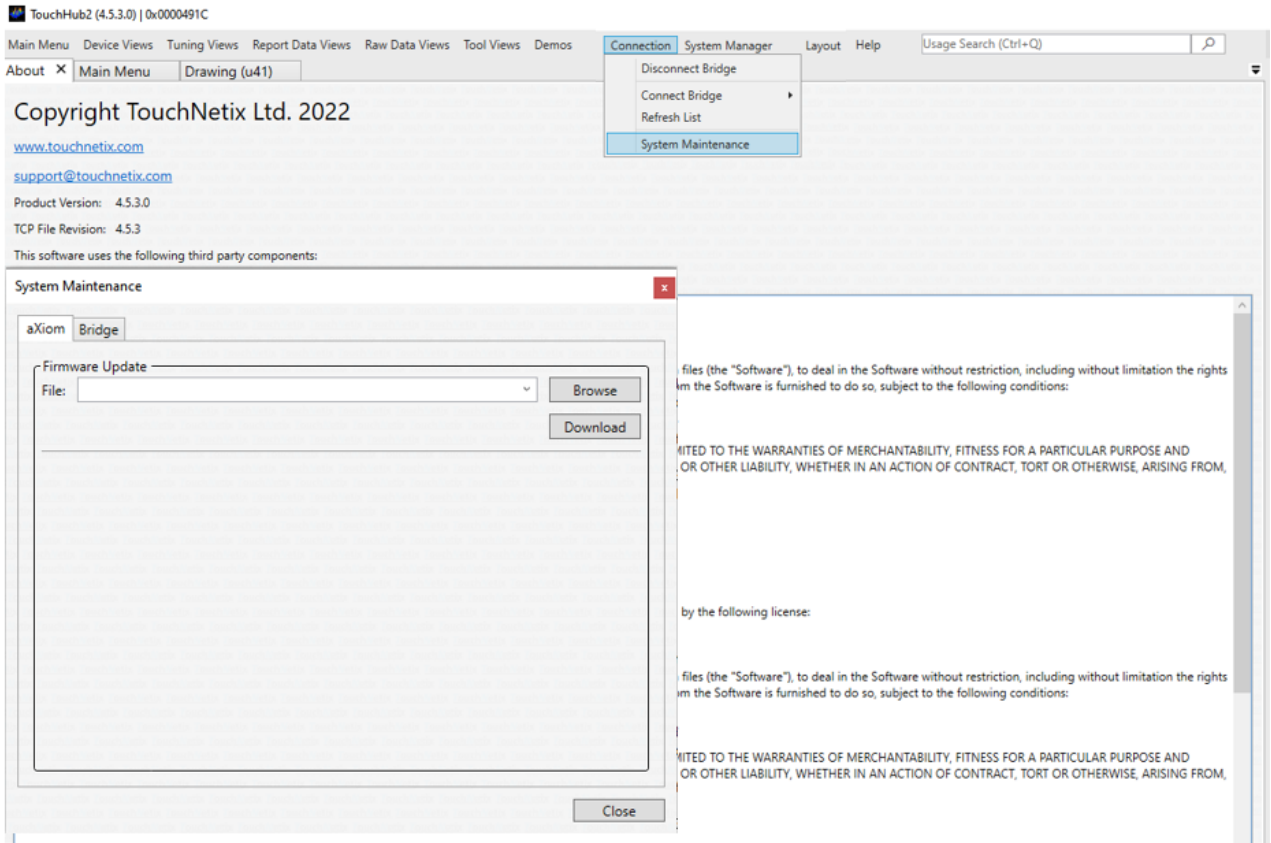


Figure 4.4-1: Loading New aXiom Device Firmware in TouchHub2

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.

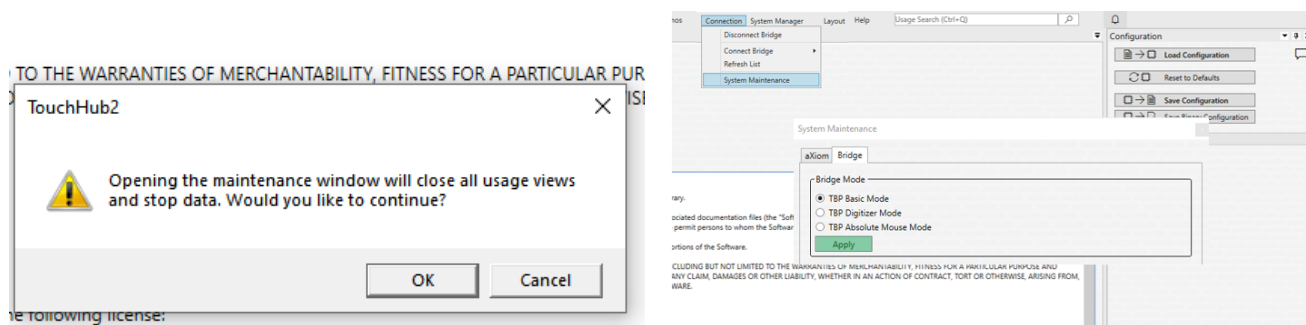


Figure 4.5-1: Bridge Mode Select

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.

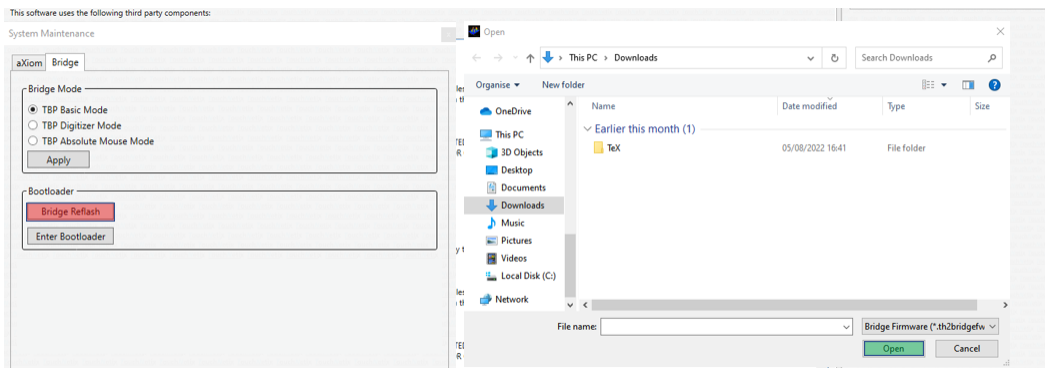


Figure 4.6-1: Bridge Firmware Update

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.

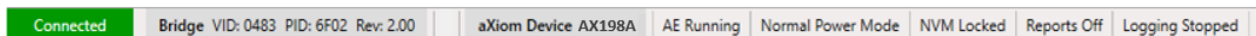


Figure 4.6-2: Bridge Firmware Version

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.

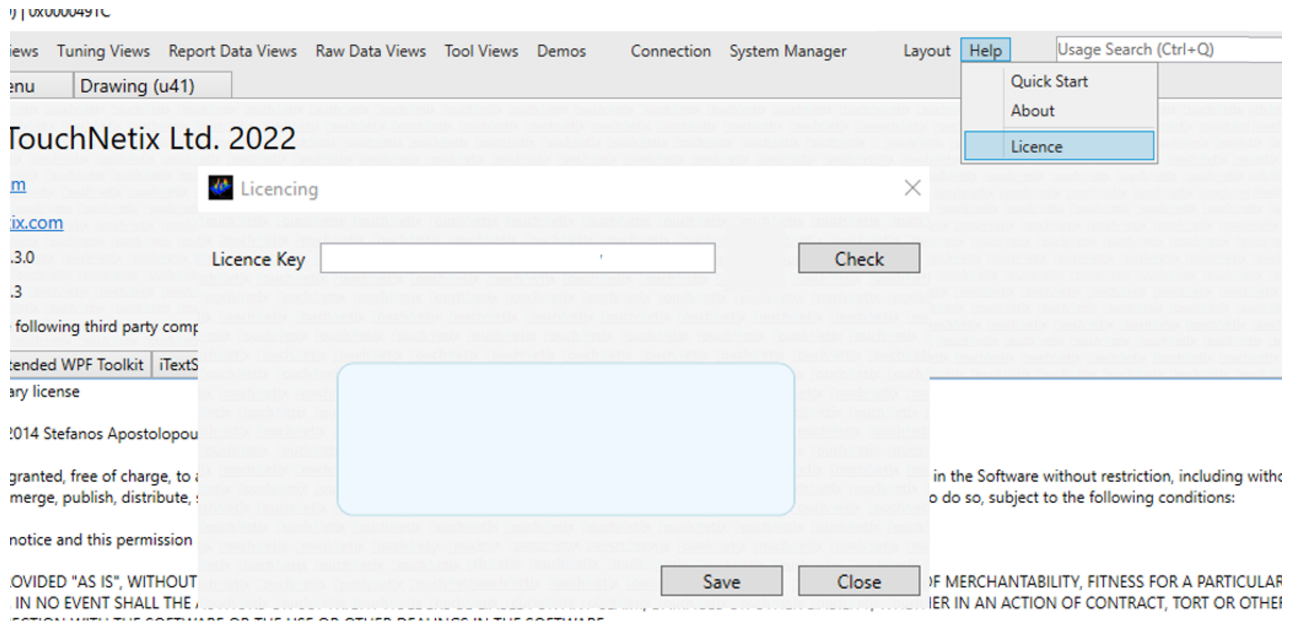


Figure 4.7-1: TouchHub2 Licence Edit

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.

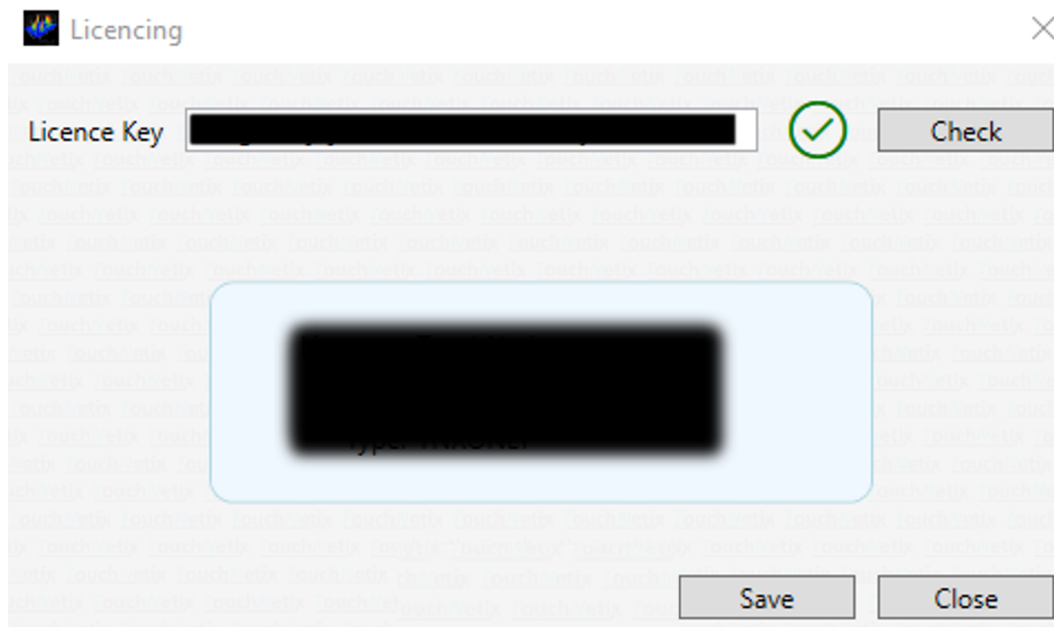


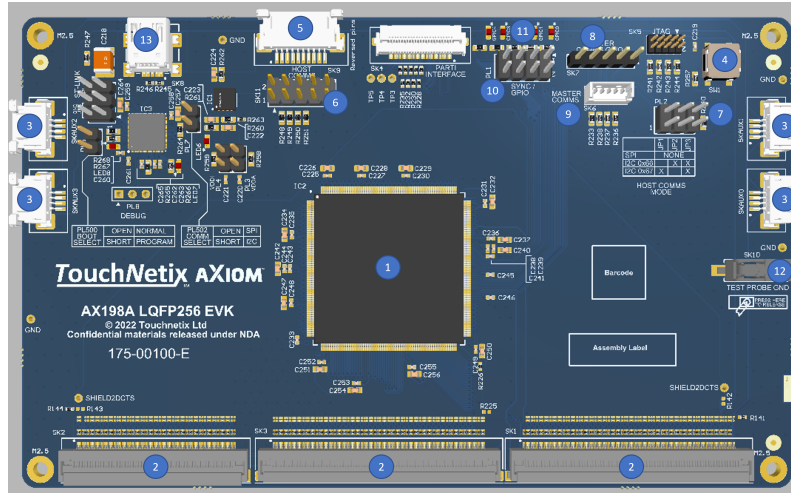
Figure 4.7-2: Licencing Window

5 AX198A EVK Overview

5.1 EVK Contents

The EVK contains a complete system to get up and running with the aXiom AX198A device. The EVK is comprised of:

1. AX198A EVK board featuring the AX198A device.
2. TouchNetix Touch Screen.



Key	Silkscreen Identifier	Name
1	IC2	AX198A Device.
2	SK1, SK2, SK3	Touch Screen FPC Connectors.
3	SKAUX0, SKAUX1, SKAUX2, SKAUX3	Press Sense FPC Connectors.
4	SW1	AX198A Reset Button.
5	SK9	Bridge Board Connector.
6	SK11	Host Comms Header.
7	PL2	Host Comms Mode Select; SPI or I ² C.
8	SK7	Master Comms GPIO Header.
9	SK6	Master Comms I ² C Connector.
10	PL1	Sync / GPIO Header.
11	GPIO0, GPIO1, GPIO2, GPIO3, GPIO4	GPIO LEDs.
12	SK10	Metal touch Ground Wire Connector.
13	SK8	USB Connector.

Table 5.1-1: AX198A EVK Overview

5.2 AX198A EVK Headers

5.2.1 Host Comms Header - SK11

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 AX198A Device
5	SLVnIRQ	Active Low IRQ signal from AX198A 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

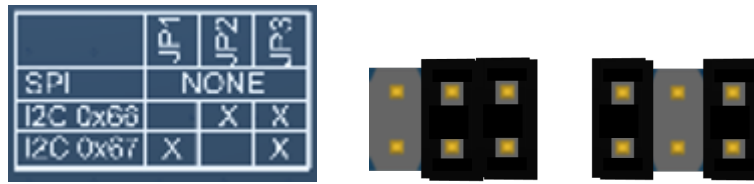
This host comms header is an exact pin-out of SK9, the FFC connector to an optional Bridge board. This connector is useful to provide a direct connection to the aXiom AX198A's SPI and I²C interfaces. Some of the pins have multiple functions which are dependent on the **Host Comms Mode Select Header - PL2 (Optional)**, these are identified in the pin-out table as **SPI** and **I²C**

5.2.2 Host Comms Mode Select Header - PL2 (Optional)

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/MISO	SPI: MISO I²C: I ² C Comms Select
6	GND	Ground

Table 5.2.2-1: Host Comms Mode Select Header

The AX198A 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

5.2.3 Master Comms GPIO Header - SK7

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 AX198A device configuration file. Refer to **TNxAN00036 aXiom Touch Controller Haptics Drive** for more information.

5.2.4 Master Comms I²C Connector - SK6

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 AX198A device configuration file. Refer to **TNxAN00036 aXiom Touch Controller Haptics Drive** for more information.

5.2.5 Sync / GPIO Header - PL1

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	GPIO4	GPIO
8	GPIO3	GPIO

Table 5.2.5-1: Sync / GPIO Header

Appendix A References

TNxAN00036 aXiom Touch Controller Haptics Drive

Appendix B EVK Dimensions

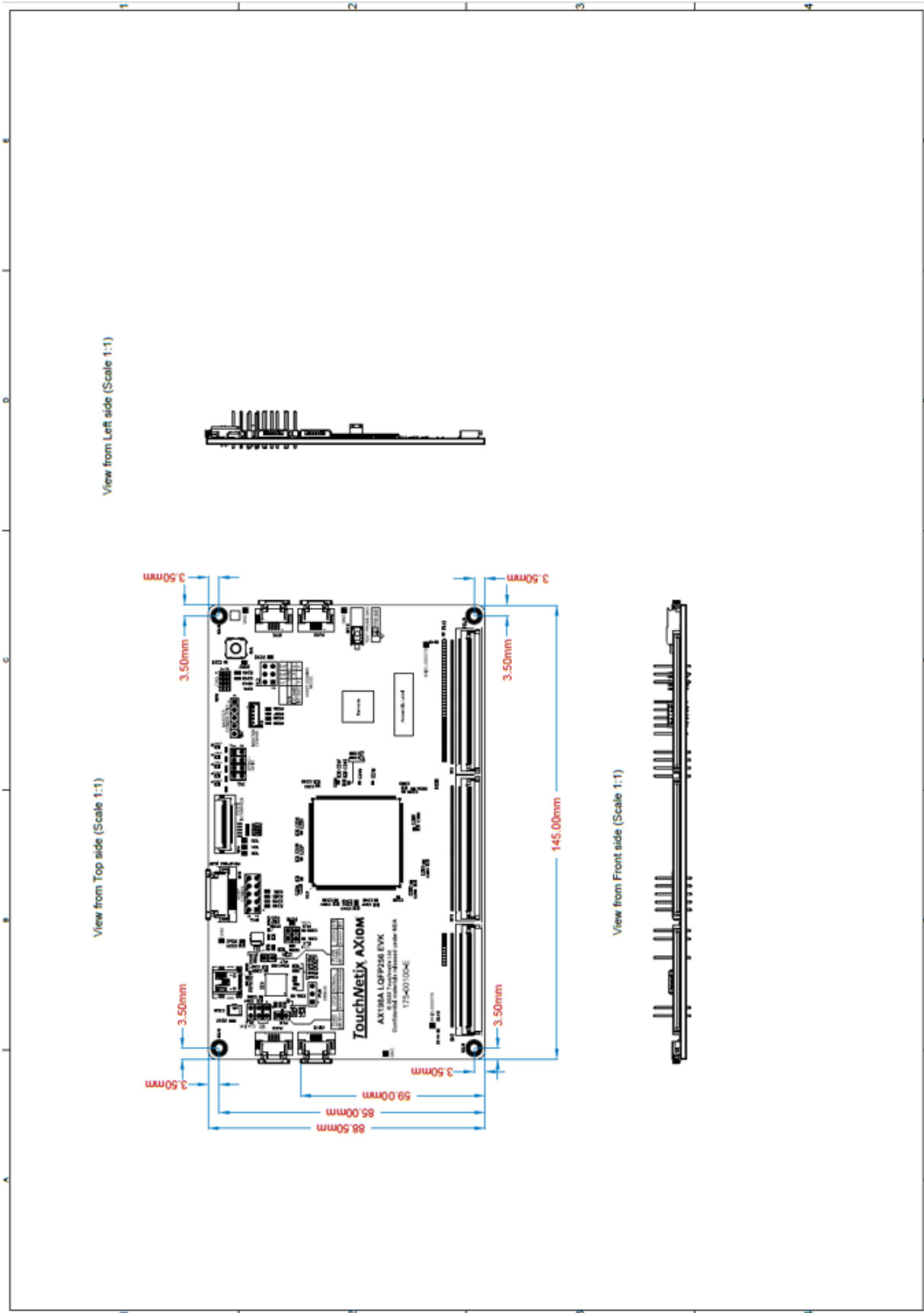
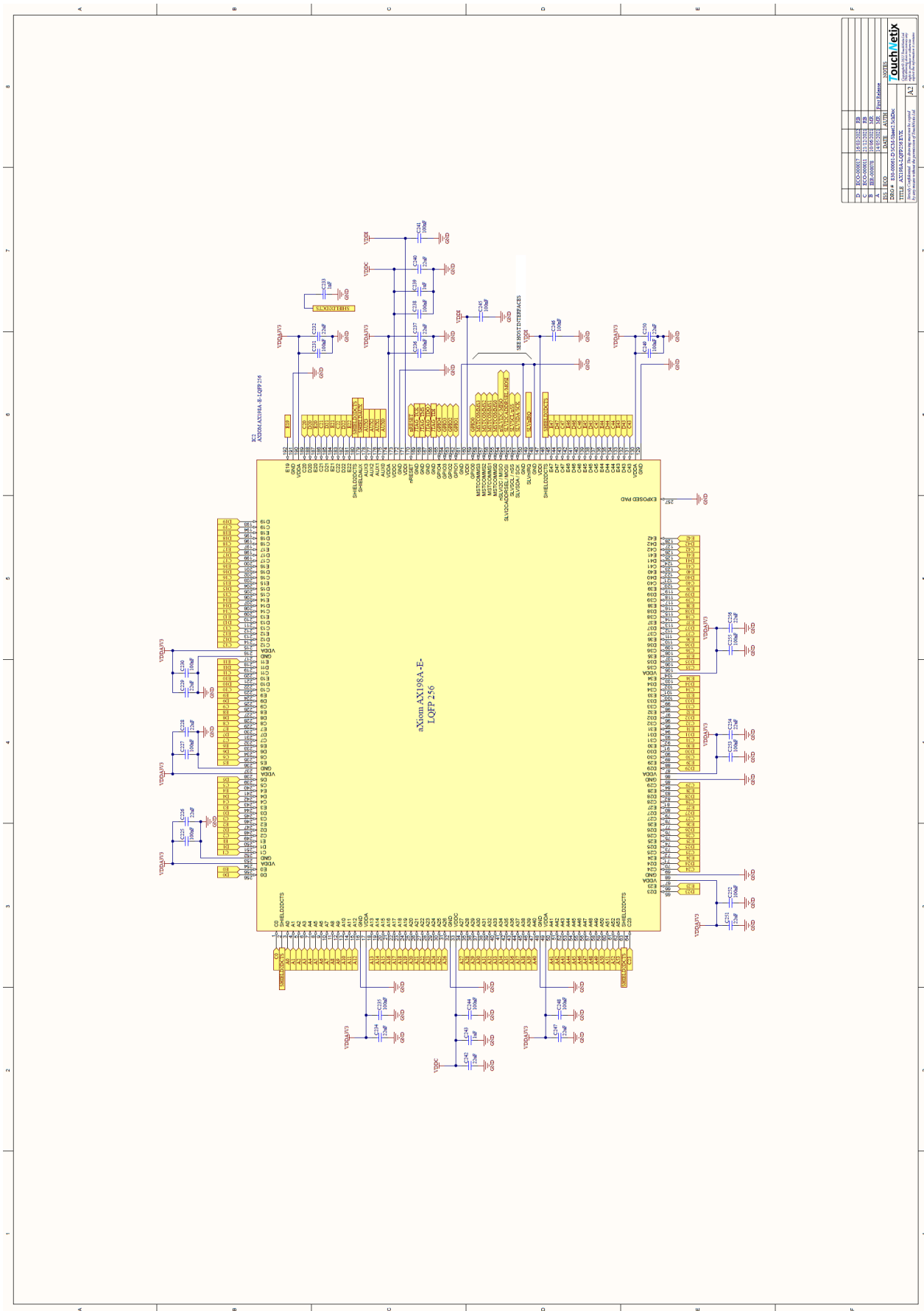


Figure B-1: EVK Dimensions



Appendix D Legal Copyright and Disclaimer

This document is Copyright (c) 2023 TouchNetix Ltd.

The device described in this datasheet (or application note) is covered by one or more UK and corresponding international patents or patents pending.

TouchNetix®, TouchNetix logo aXiom® and aXiom logo and combinations thereof, and others are registered trademarks or trademarks of TouchNetix Ltd in the UK and other countries. **DISCLAIMER:** The information in this document is provided solely in connection with TouchNetix products. No license, express or implied to any intellectual property right is granted through this document or in connection with the sale of any TouchNetix products. EXCEPT AS SET FORTH IN THE TOUCHNETIX TERMS AND CONDITIONS OF SALE WHICH ARE AVAILABLE ON REQUEST, TOUCHNETIX ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY, ANY FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL TOUCHNETIX BE LIABLE FOR ANY DIRECT, INDIRECT, OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS AND PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF THE POSSIBILITY OF SUCH DAMAGES HAS BEEN COMMUNICATED TO TOUCHNETIX. TouchNetix does not make any representations or warranties with respect to the accuracy or completeness of the contents of this document and always reserves the right to make changes to product specifications and descriptions at any time without notice, although without specific commitment to do so. Unless specifically agreed in advance, TouchNetix products are not suitable for, and shall not be used in, automotive applications. TouchNetix products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life. **MISSION or SAFETY-CRITICAL, MILITARY, AND AUTOMOTIVE APPLICATIONS DISCLAIMER:** TouchNetix products are not designed for and will not be used in connection with any applications where the failure of such products would reasonably be expected to result in significant personal injury or death ("Safety-Critical Applications") without the specific written consent of an authorised Director of TouchNetix Ltd. Safety-Critical Applications include, without limitation, systems or devices which are designed to support life. TouchNetix products are not designed nor intended for use in military or aerospace applications or environments unless specifically designated by TouchNetix as being of a suitable grade. TouchNetix products are not designed nor intended for use in automotive applications unless specifically designated by TouchNetix as automotive-grade. It is the duty of the designer using the product(s) described in this document to ensure that they are suitable for the intended application and that the performance of the TouchNetix product has been thoroughly verified and qualified in all expected operating conditions and environments.

Appendix E Document History

Revision	Date	Change summary
A1	22/12/2022	Initial release.
A2	15/06/2023	Confidential removed from the footer.