BOS1901-KIT Development Kit GUI Controller User Manual

1 Features

- Play .WAV files to BOS1901-KIT
- Edit BOS1901 internal registers
- Adjust sensing and playback parameters
- Measure sensing threshold
- Save and restore sessions

2 Description

BOS1901-KIT Controller is a graphical user interface intended to ease evaluation of the BOS1901 IC using BOS1901-KIT development kit. Using this application, all functionalities specific to the BOS1901 IC and BOS1901-KIT are configurable, giving the user direct control over the behaviour of the driven piezoelectric actuator, without the need to modify the firmware source code. It is intended as a first step in evaluating the BOS1901 IC, before getting into system-specific SPI interfacing.

3 Getting Started

3.1 Required Components

This application is distributed as BOS1901-KIT_Controller_Installer.exe installer file.

Each version of the application only supports a restricted number of BOS1901-KIT firmware versions and BOS1901 IC revisions. The following table lists these compatibilities.

Table 1: BOS1901-KIT Controller compatibility

BOS1901-KIT Controller version	BOS1901-KIT Firmware version	BOS1901 IC revisions
1.0	2.3	B, C

3.2 Installation

3.2.1 Software Installation

To install this application, please run the BOS1901-KIT_Controller_Installer.exe installer executable file. Follow the instruction given by the software. A shortcut on the desktop will be created at the end of the installation.

3.2.2 Software Update

To update the application, download the latest installer and run it. The older version will automatically be overwritten.

3.2.3 BOS1901-KIT Firmware Update

The appropriate firmware revision can be downloaded from the Boréas website. For instructions on how to update or install a specific firmware on the BOS1901-KIT development board, please refer to the BOS1901-KIT User Guide.

4 Using the Application

4.1 Overview

BOS1901-KIT Controller is a graphical user interface to help evaluating the BOS1901 IC using BOS1901-KIT development kit. It is intended as a first step in evaluating the BOS1901 IC, before getting into system-specific SPI interfacing.

All features of the BOS1901-KIT can be adjusted though the application, thereby giving the user direct control over the behaviour of the driven piezoelectric actuators, without the need to modify the firmware source code.

The application allows to read and write data from and to the BOS1901-KIT development board. It can also write the new values in the MCU EEPROM so those values are loaded each time the kit is plugged in, even when not connected to the application software. This allows to configure multiple boards with specific parameters to be used stand-alone or as part of a prototype system. In case the user wishes to return all parameters to their default value, he can press the USR button on the development board.

Sessions can be saved to reuse specific parameters values in future sessions. The session is automatically saved when closing the application so it can be restored at the next launch if desired.

The following sections details the interface elements and how to use them.

4.2 Launching the Application

At launch there are three options:

1. Restore Last Session: This is the default option. If will reload the values entered in the last session. If no previous session can be found, it will start a new session.
2. Load File : This option requests the user to select a configuration file save during a previous session.
3. Start a New Session : This option starts a blank session.

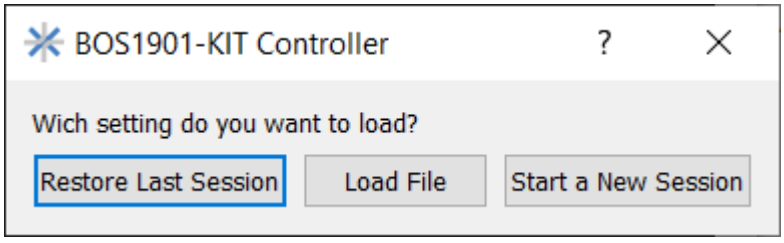

Figure 1: Setting Dialog

4.3 Main Window

The main application window is separated into 4 sections:

1. Menu bar
2. Left panel
3. Status bar
4. Tabs/Tab content

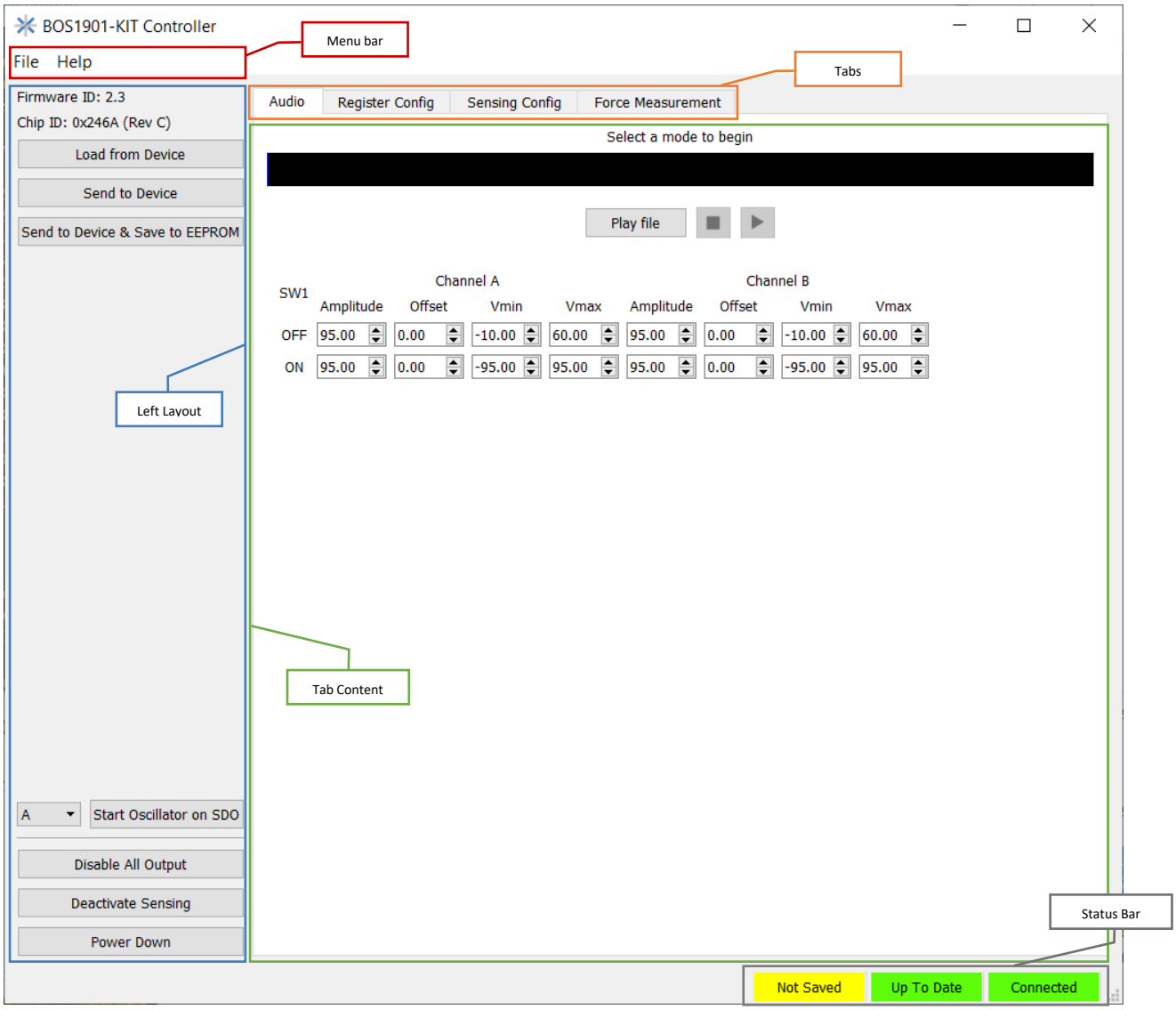

Figure 2: BOS1901-KIT Controller interface overview

4.4 Menu Bar

The menu bar has two menus: File and Help.

The File menu allows to save and open configuration files to and from your computer. Configuration files have .ini extension. The Open item pops up a file dialog to select a previously saved configuration file. The Save item pops up a file dialog to save the current configuration to the computer. The Exit item will close the application.

The Help menu has only one item, the About Box.

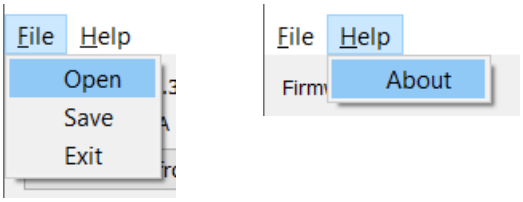

Figure 3: File and Help menus

4.5 Left Panel

The left panel contains buttons that are always accessible, for any selected tab. These functionalities are the most often used. The upper section also includes the firmware and chip ID of the currently connected BOS1901-KIT. If there is no connected board, or if the board connected does not have a compatible firmware, this section will be disabled.

The buttons at the top are for exchanging parameter values with the BOS1901-KIT.

Load from Device

Loads all parameter values currently stored in the connected board. This loads parameters for all tabs (Audio, Register Config, and Sensing Config), not only the selected tab.

Send to Device

Sends the parameter values shown in the application tabs to the board. This sends parameters for all tabs (Audio, Register Config, and Sensing Config), not only the selected tab. It is therefore recommended to first click “Load from Device” before making modifications and sending back the settings to the BOS1901.

Send to Device & Save to EEPROM

Sends the parameter values shown in the application tabs and saves them to the MCU EEPROM. The EEPROM allows the board to reload those values when it is reconnected, even though it is not linked to the BOS1901-KIT Controller software.

The buttons at the bottom directly controls the state of the BOS1901 ICs on the board.

Disable/Enable Output

Disables/enables the BOS1901 signal output. This is equivalent to setting OE to 0 and 1 respectively at the SPI-interface level. Disabling the output also disables sensing.

Start Oscillator on SDO

Outputs the oscillator signal of the selected BOS1901 channel on the MISO pin. When this is activated, no data can be read from the BOS1901. **Do not play any waveform in this mode.**

Deactivate/Activate Sensing

Deactivate/activate sensing on both channels. Audio playback still remains functional.

Power Down/Up

Sets the BOS1901 into sleep or idle mode. This is equivalent to setting DS to 1 and 0 respectively. Powering down also deactivates the sensing.

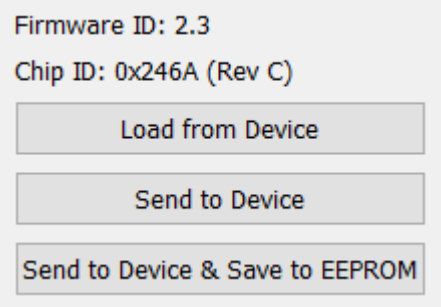

Figure 4: Left layout top buttons

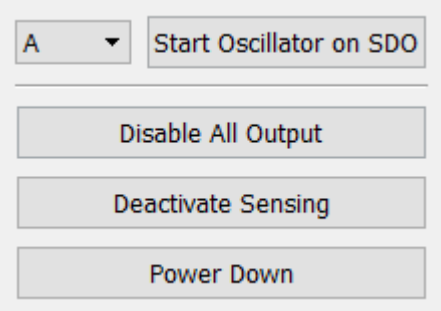

Figure 5: Left layout bottom buttons

4.6 Status Bar

The status bar at the bottom displays the state of the device.

If the device is connected, the “Connected” label will be green, otherwise it will show “Not Connected” in red. If a device is connected but not recognized, it will be shown as Not Connected.

The “Pending Changes” label is yellow whenever the interface has a different configuration than the device. To change the state to “Up to Date”, user must either click “Load from Device” or “Send to Device”

The “Saved” label displays if the current configuration has been saved on the device EEPROM. Saving the configuration to the EEPROM ensures the device keeps its configured parameters when next powered on, whether it is linked to the application software or not.

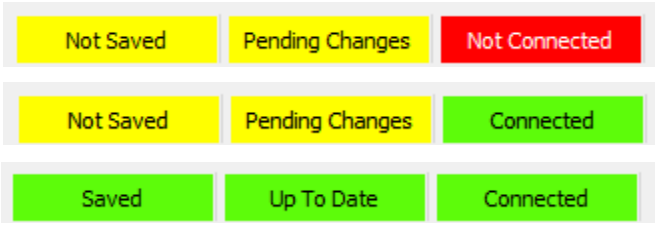

Figure 6: Status Bar in various states

4.7 Audio Tab

4.7.1 Play File

It is possible to play audio .WAV files. Click the “Play file” button to select a file to play. Then click the play/stop buttons to start/stop the playback on the connected board. Left audio channel will play in the channel A piezo, and right audio channel will play in the channel B piezo. A progress bar indicates how much of the file has been played.

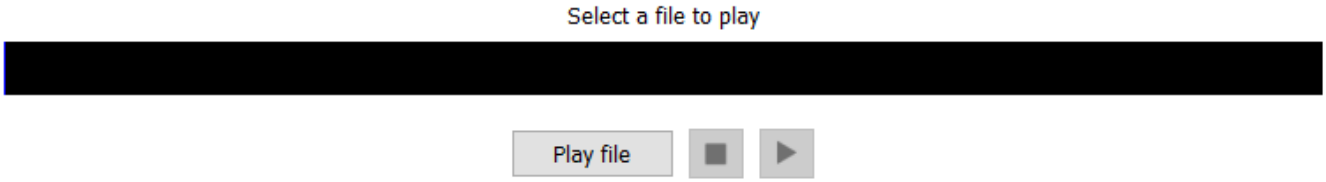

Figure 7: Audio player

4.7.2 Audio Settings

The Audio Tab also features an audio setting configuration section, making the piezo output fully customizable. Settings for each channel can be set independently.

The first row are the parameters used when the DIP switch 1 OFF-state. The second row are the parameters for the ON-state.

Amplitude

This value is the amplitude factor multiplying the audio value to be played. This value represents the voltage amplitude of the signal the BOS1901 applies on the piezoelectric actuator. It is set by default to 95 V, the maximum voltage of the BOS1901.

Offset

This value is the offset value for the signal to be generated on the BOS1901 output. It is set by default to 0 V.

Amplitude and Offset are combined in the following equation to produce the desired voltage for the waveform to be played.

$$Voltage = Amplitude\ x\ value + Offset$$

The value is the .wav point to be played, and Voltage is the resulting voltage on the BOS1901 output.

For example, using Amplitude = 95 V and Offset = 0 V,

a. if the value to be played is 1, the resulting voltage is 95 V;
b. if the value to be played is -1, the resulting voltage is -95 V;
c. if the value to be played is 0, the resulting voltage is 0 V;

Vmin / Vmax

These parameters are bounding values for the voltage. If the calculated voltage using Amplitude and Offset is higher than Vmax or lower than Vmin, then the generated voltage is clipped to those limit values

in order to protect the piezoelectric actuator. Therefore, these values should always be set to the piezo operating range.

These values are set by default to -10 V to 60 V for DIP switch 1 OFF-state, corresponding to TDK PowerHap 2.5G actuators for example.

They are set to ±95 V for DIP switch 1 ON-state, corresponding to the BOS1901 full output range, which can be sustained by Midé Technology PPA-2014 actuator.

Note: These four parameters are set independently for the Audio and Sensing Config tabs. Audio tab parameters are related to audio playback over USB streaming. Sensing Config tab parameters are related to the sensing and feedback when the user presses on the actuator.

SW1	Channel A				Channel B			
	Amplitude	Offset	Vmin	Vmax	Amplitude	Offset	Vmin	Vmax
OFF	95.00	0.00	-10.00	60.00	95.00	0.00	-10.00	60.00
ON	95.00	0.00	-95.00	95.00	95.00	0.00	-95.00	95.00

Figure 8: Audio Playback settings

4.8 Register Config Tab

The Register Config Tab allows to write specific values to any writeable registers on the BOS1901 IC. Before editing any register, it is recommended to first “Load from Device”. Be aware data will be overwritten on the BOS1901, even if not previously loaded. If needed, the default values can be reloaded on the BOS1901-KIT by pressing the USR button on the board. Then those values can be loaded to the BOS1901-KIT Controller application.

When first launching the application, if the user selected to restore the previous session or to load a specific configuration file, the registers will be loaded to fit the correspond IC revision. If the user selected to start a new session, the latest IC revision registers are loaded and displayed.

Once a BOS1901-KIT board is connected and identified, if the currently displayed registers do not match the IC revision on this board, a message is displayed, and then the application is reloaded with the appropriate registers.

The registers are displayed, one per line. The register label is given on the left, then the register address, then the parameters for this registers are given (MSB on the left, LSB on the right), and then there is “Send” button to send the parameter values to the board IC if the register is writeable. When using this button, and only the associated register for the selected channel is written. Sending all registers at once is also possible using the “Send to Device” button on the left panel. Remember this writes not only all registers, but both channels, but also the Audio and Sensing Config tabs parameters as well.

There is one BOS1901 IC per channel (A, B) and its IC registers can be displayed, one channel at a time. The “Channel” dropbox at the top left of this tab selects the channel to display.

The “Display Type” dropbox allow to change the data type of the parameters to display. It is possible to display values in binary, decimal and hexadecimal formats.

When selecting a parameter box to edit, the information for that parameter is given on the right side of the screen. Information include parameter name, its current value, the number of bits of that parameter (Length), the minimum and maximum possible values, and a short description. This information is also displayed as tooltips when hovering the mouse over each parameter box. This allows to also consult the information of read-only registers.

Some warnings and errors may be displayed at times. When entering an invalid value for a given parameter, this parameter’s box will be highlighted in red. Trying to send this register to the BOS1901 will display an error message and the registers will not be sent. If a read-only parameter is out of its defined range, its parameter’s box will he highlighted in orange. This seldom occurs, but if it does it would still be possible to send register data to the ICs.

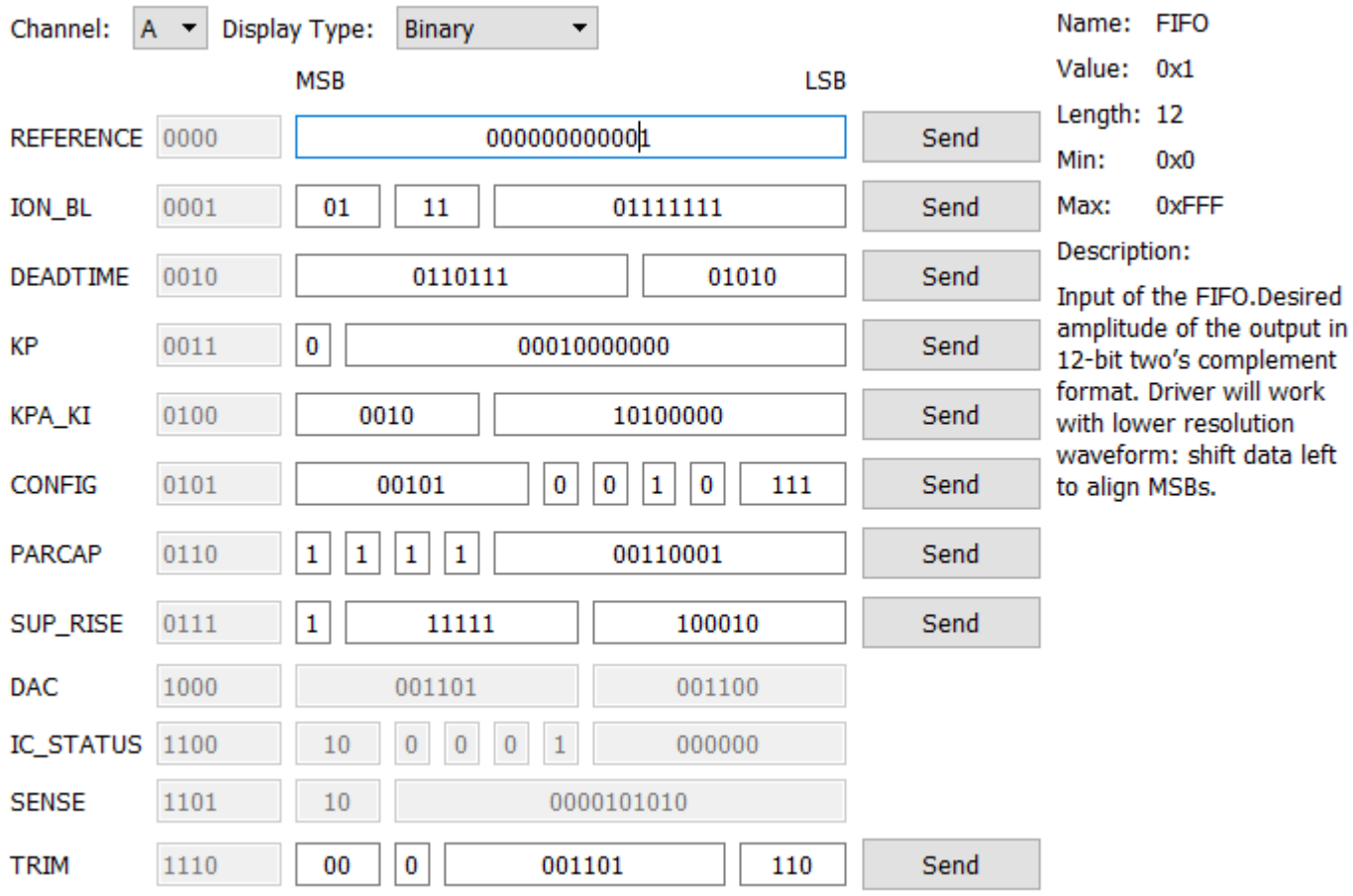

Figure 9: Register Config tab (BOS1901 Revision C registers shown)

4.9 Sensing Config Tab

The Sensing Config tab allows to adjust sensing and feedback parameters of the press/release demonstration mode. In this mode a feedback is produced to indicate to the user it detected a force on the piezo higher than the set threshold. When releasing the force, another feedback is given.

Parameters on the left are associated with the BOS1901 on channel A, and the parameters on the right are associated with the IC on channel B.

Different parameters are given for specific states of the DIP switches, making it possible to set specific values for each state, and therefore create a new sensing/feedback experience on boards. Saving the parameter values to the EEPROM ensures the board retain their values even when not connected to the BOS1901-KIT Controller software.

There are 4 data sets (or configurations) selectable with a dropbox. The “TDK PowerHap 2.5G” and “MIDE PPA-2014” give the recommended settings for the actuators provided with the BOS1901-KIT development kit. These configurations cannot be changed. Configurations “Custom 0” and “Custom 1” can be changed. To use the pre-defined configurations as baseline for custom configurations, one can select the appropriate configuration, send it to the BOS1901-KIT, then select a custom configuration, and then change the values as desired. By default, the BOS1901-KIT is programmed with TDK PowerHap 2.5G setting associated with DIP Switch OFF, and MIDE PPA-2014 settings with DIP Switch ON. Also, once a custom configuration has been set for a channel it can automatically be reused on the other channel by selecting the same configuration.

The following parameters can be changed:

Amplitude Parameters (these parameters are selected using DIP Switch 6)

Higher amplitudes produce more displacement of the actuator and thereby produce higher acceleration which induces a stronger haptic response.

Low amplitude multiplicator

Low amplitude multiplicator changes the amplitude felt when toggling DIP switch 6 to OFF. This value multiplies the high-amplitude values below. Value must be between 0 and 1.

High amplitude press feedback

This value sets the amplitude of the pulse played when a press event is detected, when DIP switch 6 is ON. Value must be between 0 and 1.

High amplitude release feedback

This value sets the amplitude of the pulse played when a release event is detected, when DIP switch 6 is ON. Value must be between 0 and 1.

Frequency Parameters (these parameters are selected using DIP Switch 5)

Higher frequencies produce higher acceleration and provide a sharper haptic response.

Low frequency feedback

This value sets the frequency in Hz of the pulse played on both press and release events when DIP switch 5 is OFF.

High frequency feedback

This value sets the frequency in Hz of the pulse played on both press and release events when DIP switch 5 is ON.

Sensing Threshold Parameters (these parameters are selected using DIP Switch 7)

These parameters adjust the thresholds required for detecting press and release events. All values must be null or positive. The units are LSBs of VFEEDBACK (see BOS1901 datasheet). A lower threshold will cause the piezo to be more sensitive. The “Force Measurement” tab can be used to record the value corresponding to a certain force applied on the actuator.

Low sensitivity press threshold

Threshold value used to detect press events when DIP switch 7 is set OFF.

High sensitivity press threshold

Threshold value used to detect press events when DIP switch 7 is set ON.

Low sensitivity release threshold

Threshold value used to detect release events when DIP switch 7 is set OFF.

High sensitivity release threshold

Threshold value used to detect release events when DIP switch 7 is set ON.

Response Types

Change the response type for a longer or shorter feedback. The value entered corresponds to the number of sine period generated for the feedback. “Long feedback” will have no effect on channel A. On channel B, “Long feedback” will change the behaviour of the last multi-press feedback. The three feedbacks for multi-press are: click, click, long.

Click feedback

When issuing a pulse following a press or release event, this value indicates the number of consecutive pulses played.

Long feedback

When issuing a buzz after the first two press events in the multi-press demo on channel B, this value indicates the number of consecutive pulses played. This parameter has no effect on channel A.

Output Range (these parameters are selected using DIP Switch 1)

The first set of four are the parameters used when the DIP switch 1 OFF-state. The second set of four are the parameters for the ON-state.

Amplitude

This value is the amplitude factor multiplying the feedback value to be played. The feedback signal is a positive-only sine pulse between 0 and 1. The amplitude value represents the voltage amplitude of this pulse the BOS1901 applies on the piezoelectric actuator.

Offset

This value is the offset value for the feedback value to be generated on the BOS1901 output.

Amplitude and Offset are combined in the following equation to produce the designed voltage for the waveform to be played.

$$Voltage = Amplitude\ x\ value + Offset$$

The value is the sine pulse point to be played, and Voltage is the resulting voltage on the BOS1901 output.

For example, using Amplitude = 60 V and Offset = 0 V,

a. if the value to be played is 1, the resulting voltage is 60 V;
b. if the value to be played is 0, the resulting voltage is 0 V;

Vmin / Vmax

These parameters are bounding values for the voltage. If the calculated voltage using Amplitude and Offset is higher than Vmax or lower than Vmin, then the generated voltage is clipped to those limit values in order to protect the piezoelectric actuator. Therefore, these values should always be set to the piezo operating range.

For the sensing/feedback demo mode Amplitude should be the same value as Vmax to avoid distortion in the pulse which would result is audible noise, although it is possible to set them at different values.

Note: These four parameters are set independently for the Audio and Sensing Config tabs. Audio tab parameters are related to audio playback over USB streaming. Sensing Config tab parameters are related to the sensing and feedback when the user presses on the actuator.

Config:	Custom 0	Config:	Custom 1
Channel	A	**Channel**	B
Amplitude Parameters (SW6)		**Amplitude Parameters (SW6)**	
Low amplitude multiplicator:	0.75	Low amplitude multiplicator:	0.75
High amplitude press feedback:	1.00	High amplitude press feedback:	1.00
High amplitude release feedback:	0.75	High amplitude release feedback:	0.75
Frequency Parameters (SW5)		**Frequency Parameters (SW5)**	
Low frequency feedback:	100	Low frequency feedback:	100
High frequency feedback:	180	High frequency feedback:	180
Threshold Parameters (SW7)		**Threshold Parameters (SW7)**	
Low sensitivity press threshold:	15	Low sensitivity press threshold:	15
High sensitivity press threshold:	12	High sensitivity press threshold:	12
Low sensitivity release threshold:	0	Low sensitivity release threshold:	0
High sensitivity release threshold:	0	High sensitivity release threshold:	0
Response Types (number of sine period)		**Response Types (number of sine period)**	
Click feedback:	1	Click feedback:	1
Long feedback:	10	Long feedback:	10
Output Range (SW1)		**Output Range (SW1)**	
OFF Amplitude:	60.00	OFF Amplitude:	60.00
Offset:	0.00	Offset:	0.00
Vmin:	-10.00	Vmin:	-10.00
Vmax:	60.00	Vmax:	60.00
ON Amplitude:	95.00	ON Amplitude:	95.00
Offset:	0.00	Offset:	0.00
Vmin:	-95.00	Vmin:	-95.00
Vmax:	95.00	Vmax:	95.00

Figure 10: Sensing Config Tab

4.10 Force Measurement Tab

This tab provides a simple way to measure the amount of force applied to the piezo by the finger. This value can then be used to set the press and release detection thresholds in the “Sensing Config” tab.

To start, press the “Measure” button, you will then have 6 seconds to press the piezo on channel A. The maximum detected value will be displayed at the end of that time.

5 FAQ and Troubleshooting

Please refer to Boréas website for FAQ and Troubleshooting information, which will be maintained throughout the BOS1901-KIT lifecycle. It will also contain application note documents that will be helpful for the user writing his/her own code to operate the BOS1901.

6 Open-Source Application and Licensing Terms

This application was created using Qt Creator 4.8.1. The source code is licensed under LGPL v3 and is available upon request at support@boreas.ca. Also note that is uses Qt modules that are licensed under LGPL v3 (see Qt_BSD_license.txt in installation directory for details).

7 Document History

ISSUE	DATE	CHANGES
1	2019-06-17	Original document.

BOREAS TECHNOLOGIES INC
STANDARD TERMS FOR DEVELOPMENT KIT

PRIOR TO USING THE DEVELOPMENT KIT, USER MUST REVIEW THE USER DOCUMENTATION PROVIDED ON BOREAS.CA INCLUDING THE FULL VERSION OF BOREAS STANDARD TERMS AND CONDITIONS.

1) DELIVERY

1.1 BORÉAS TECHNOLOGIES ("BORÉAS") delivers BORÉAS Development Kits including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, a "DEV.KIT") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the DEV.KIT is expressly subject to the following terms.

1.2 DEV.KITs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of BORÉAS semiconductors products. DEV.KITs have no direct function and are not finished products. DEV.KITs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the DEV.KIT ("Software") shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software

1.3 DEV.KITs are not intended for consumer or household use. DEV.KITs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2) LIMITED WARRANTY AND RELATED REMEDIES/DISCLAIMERS:

2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

2.2 BORÉAS warrants that the BORÉAS DEV.KIT will conform to BORÉAS's published specifications for ninety (90) days after the date BORÉAS delivers such DEV.KIT to User. Notwithstanding the foregoing, BORÉAS shall not be liable for a nonconforming DEV.KIT if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than BORÉAS, including improper installation or testing, or for any DEV.KITs that have been altered or modified in any way by an entity other than BORÉAS, (b) the nonconformity resulted from User's design, specifications or instructions for such DEV.KITs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent BORÉAS deems necessary. BORÉAS does not test all parameters of each DEV.KIT.

2.3 BORÉAS's sole liability shall be at its option to repair or replace DEV.KITs that fail to conform to the warranty set forth above, or credit User's account for such DEV.KIT. BORÉAS's liability under this warranty shall be limited to DEV.KITs that are returned during the warranty period to the address designated by BORÉAS and that are determined by BORÉAS not to conform to such warranty. If BORÉAS elects to repair or replace such DEV.KIT, BORÉAS shall have a reasonable time to repair such DEV.KIT or provide replacements. Repaired DEV.KITs shall be warranted for the remainder of the original warranty period. Replaced DEV.KITs shall be warranted for a new full ninety (90) day warranty period.

3) DEV.KIT USE RESTRICTIONS AND WARNINGS:

4.1 DEV.KITS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by BORÉAS regarding the DEV.KIT prior to handling or using the DEV.KIT, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 Safety-Related Warnings and Restrictions:

4.3.1 User shall operate the DEV.KIT within BORÉAS's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by BORÉAS, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the DEV.KIT may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a BORÉAS field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the DEV.KIT and/or interface electronics. Please consult the DEV.KIT user guide prior to connecting any load to the DEV.KIT output. If there is uncertainty as to the load specification, please contact a BORÉAS field representative.

During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the DEV.KIT, please be aware that the DEV.KIT may become very warm.

4.3.2 DEV.KITs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the DEV.KIT by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the DEV.KIT and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the DEV.KIT by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the DEV.KIT is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the DEV.KIT and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the DEV.KIT consistent with all applicable international, federal, state, and local requirements.

4) ACCURACY OF INFORMATION:
To the extent BORÉAS provides information on the availability and function of DEV.KITs, BORÉAS attempts to be as accurate as possible. However, BORÉAS does not warrant the accuracy of DEV.KIT descriptions, DEV.KIT availability or other information on its websites as accurate, complete, reliable, current, or error-free.

5) DISCLAIMERS:
6.1 EXCEPT AS SET FORTH ABOVE, DEV.KITS AND ANY MATERIALS PROVIDED WITH THE DEV.KIT (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE DEV.KIT ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." BORÉAS DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD-PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.
6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE DEV.KIT SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF BORÉAS, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE DEV.KIT IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

6) USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.
USER WILL DEFEND, INDEMNIFY AND HOLD BORÉAS, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE DEV.KIT THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE DEV.KIT FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

7) SPECIFIC LIMITATIONS ON DAMAGES AND LIABILITY:
IN NO EVENT SHALL BORÉAS'S AGGREGATE LIABILITY FROM ANY USE OF AN DEV.KIT PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, EXCEED THE TOTAL AMOUNT PAID TO BORÉAS BY USER FOR THE PARTICULAR DEV.KIT(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

8) RETURN POLICY:
Except as otherwise provided, BORÉAS does not offer any refunds, returns, or exchanges. Furthermore, no return of DEV.KIT(s) will be accepted if the package has been opened and no return of the DEV.KIT(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the DEV.KIT(s) it ordered or that delivery violates the applicable order, User should contact BORÉAS. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

9) GOVERNING LAW:
These terms and conditions shall be governed by and interpreted in accordance with laws of the Province of Quebec and federal laws of Canada applicable, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within Quebec Courts, sitting in the judicial district of Bedford.
Notwithstanding the foregoing, any judgment may be enforced in any Canada or foreign court, and BORÉAS may seek injunctive relief in any Canada or foreign court.

BOREAS TECHNOLOGIES INC
WARNING
EXPORT NOTICE

Recipient agrees to not knowingly export or re-export, directly or indirectly, any product or technical data (as defined by the Canada, U.S., EU, and other Export Administration Regulations) including software, or any controlled product restricted by other applicable national regulations, received from BORÉAS TECHNOLOGIES under this Agreement, or any direct product of such technology, to any destination to which such export or re-export is restricted or prohibited by Canada, U.S., E.U. or other applicable laws, without obtaining prior authorization from competent Government authorities to the extent required by those laws.

This provision shall survive termination or expiration of this Agreement.

According to our best knowledge of the state and end use of our product or technology, and in compliance with the export control regulations of dual-use goods in force in the origin and exporting countries, this technology is classified as follows:
US ECCN: 3E991
EU ECCN: EAR99

And may require export or re-export license for shipping in compliance with the applicable regulations of certain countries.