User Manual

Smartcanvas DA9061/2

UM-PM-008

Abstract

This document explains the DA9061/DA9062 Smartcanvas software and its functionality.

Contents

Figures

Tables

1 Terms and Definitions

DUT	Device under test (i.e. DA9061 or DA9062)
PMIC	Power management IC
GUI	Graphical user interface
ULI	USB Lab IO interface IC (Atmel)
CRC	Cyclic redundancy check

2 References

[1] DA9061 Datasheet, Dialog Semiconductor, 2015
[2] DA9062 Datasheet, Dialog Semiconductor, 2015
[3] User Manual: DA9061-63 Motherboard, Dialog Semiconductor, 2015

3 Introduction

The GUI (Graphical User Interface) provides easy access to the DUT and the supporting functionality located on the motherboard. The GUI is used to exercise the DUT using the I^2C interface. Control or measurement of analogue and digital pins is also supported.

The GUI is non-invasive, meaning:

- It will not modify register contents without user interaction
- All ULI activities are stopped when the “Polling Enabled” button is set to “Polling Disabled”.

The document applies equally to DA9061 and DA9062. For brevity, some text refers to DA9062, but this is also applicable to DA9061.

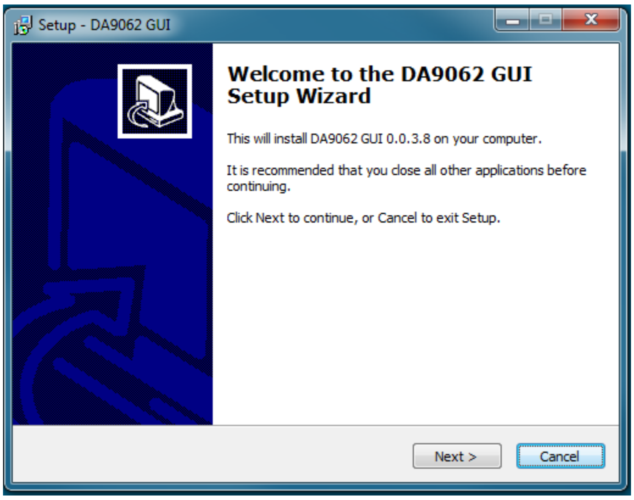
The version of this document available from the GUI ‘Help Menu’ may not include *minor* document revisions. The latest manual is available from the Dialog customer portal.

4 Installation

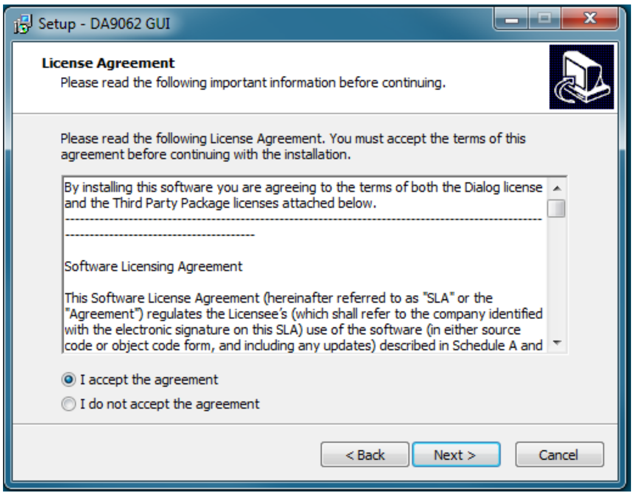
To install the software,

1. Ensure the evaluation board is connected to the PC using a USB cable.

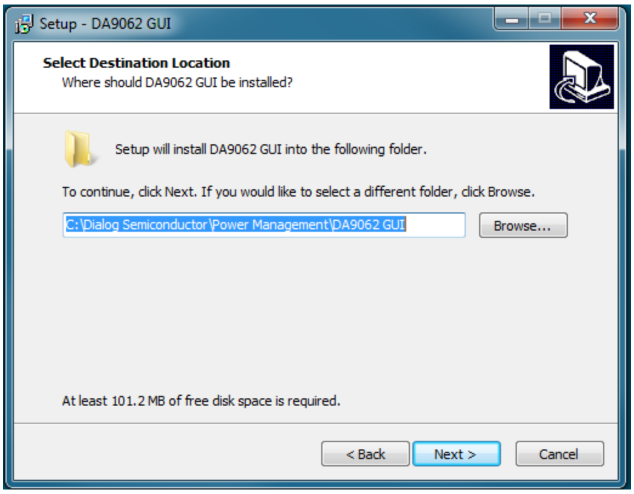
2. Run setup_DA906x_GUI_x.x.exe and click ‘Next’:



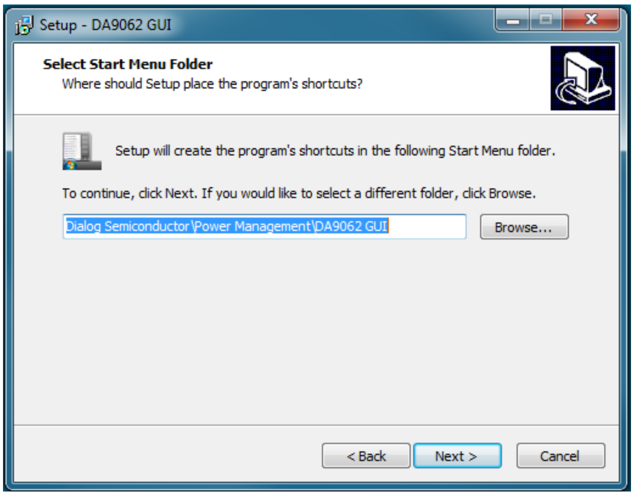
3. Accept the license agreement and click ‘Next’:



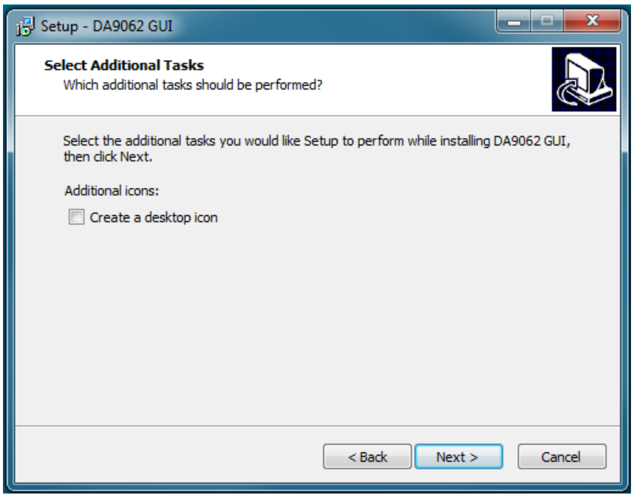
4. Choose the installation path using ‘Browse…’ or leave the default path and click ‘Next’:



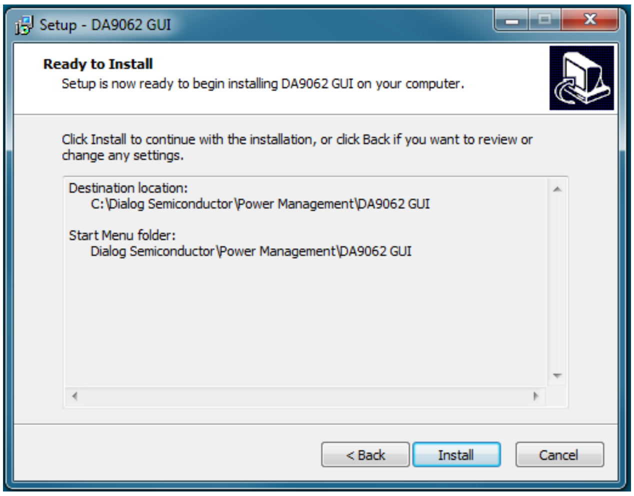
5. Choose the ‘Start Menu Folder’ using ‘Browse…’ or leave the default folder and click ‘Next’:



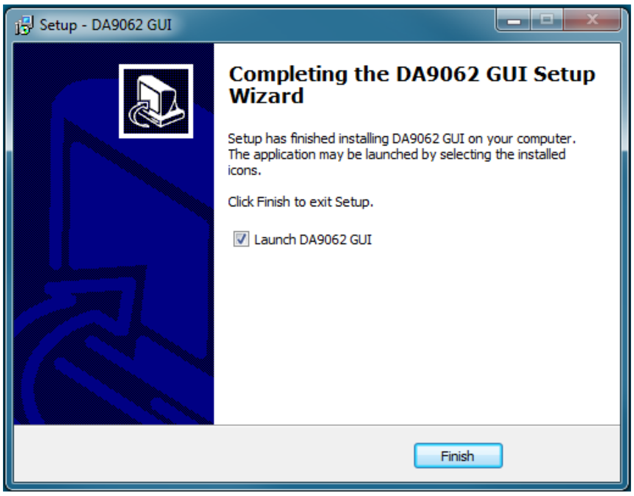
6. Check ‘Create a desktop icon’ to access the software directly from the desktop and click ‘Next’:



7. Review installation information and click ‘Next’:



8. Check ‘Launch DA906x GUI’ if you want to launch the GUI immediately after installation and click ‘Finish’:



Once connected, the hardware will be detected and the drivers will install automatically. In some operating systems the driver installer window may pop up: accept the recommended settings.

5 Power Commander Mode

Power Commander mode (‘PC Mode’) is a powerful feature of Dialog PMICs that allows prototyping of OTP configurations without having to burn a device’s OTP. PC Mode starts a device using the configuration taken from an external .ini file instead of the device’s own programmed (or blank) configuration.

To start a device using PC Mode:

1. Select a project file. This can be done from the ‘DA9062 INI File Control’ section on the ‘Front Panel’ tab or the right-hand-side control
2. Ensure the motherboard toggle switch is to the left (‘TP_ON’)
3. Turn off the device (VSYS = 0 V)
4. Click the ‘Power Commander mode’ button to turn on the feature.
5. Turn on the PMIC
6. The device should start up.
   a. Depending on the configuration in the .ini file, the device may go into the ‘Power Down’ state or ‘Active’ state.
   b. To wake-up a device that is in ‘Power Down’, press the ‘Start Device’ button (which performs an nONKEY pulse).
7. The device will now have started up using the selected project .ini file content.
8. Leaving PC Mode switched on allows the device to continue to use the external ini file contents when moving between certain states (For example, after performing a SHUTDOWN command, or a further wake-up after entering the Power Down state).

Note: Devices with an OTP programmed to a non-default slave address cannot be used with Power Commander mode.

6 GUI Overview

GUI elements (also known as ‘widgets’) are grouped by functions and separated by tabs as described below.

Some elements, such as the ‘Info’ and ‘Status’ widgets, can be undocked from their default locations and resized. Dragging them back to their default locations and holding them there momentarily will automatically create a space for them at which instant they can be dropped and re-docked.

6.1 Front Panel

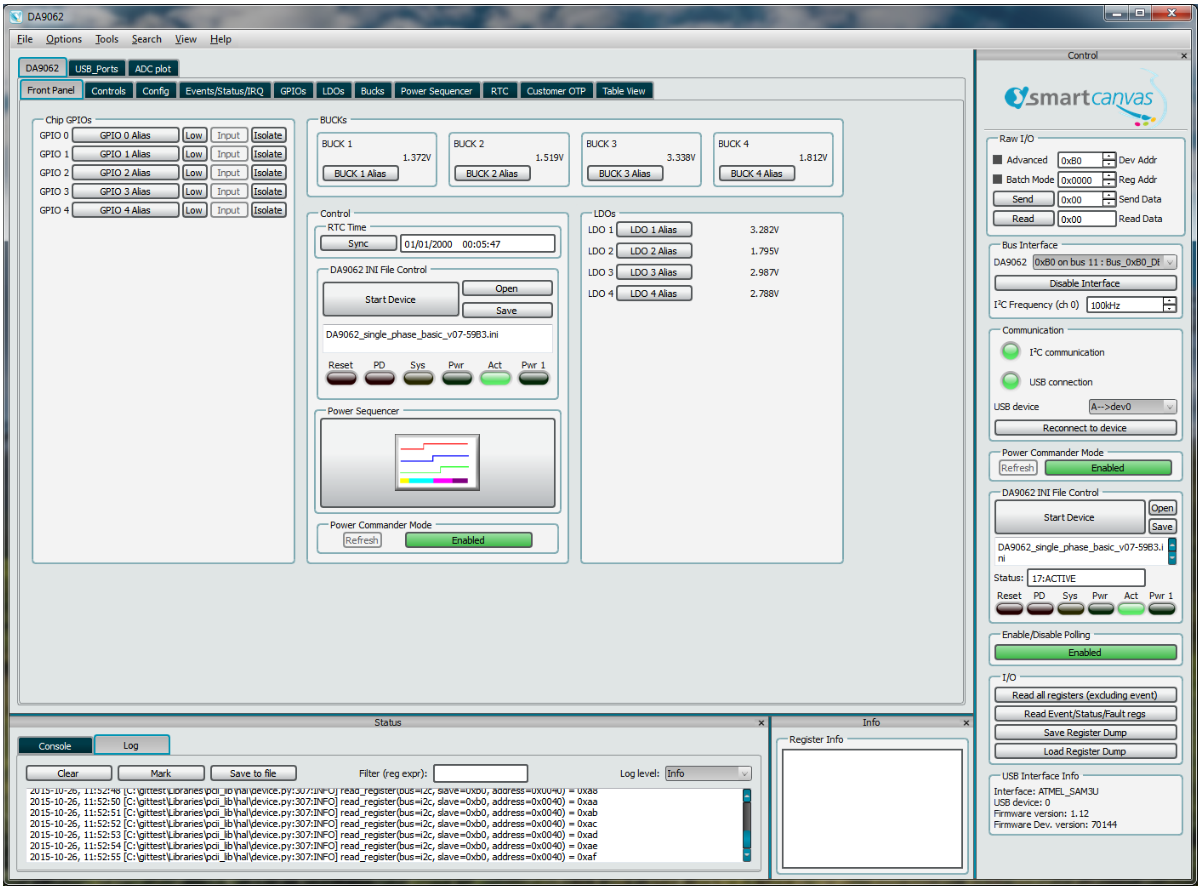


Figure 1: Front Panel

The ‘Front Panel’ (Figure 1) shows an overview of the DUT’s GPIO, LDO and Buck settings; the aliases associated with this project file (.ini format); an RTC that can be synced to the computer’s system time and the Power Sequencer window.

6.1.1 GPIOs

The ‘Chip GPIOs’ (Figure 2) can be used to report the level on DUT GPIO pins configured as outputs, or to drive a level on those DUT GPIOs that are configured as inputs:

- When set to ‘Input’, the ‘High/Low’ button will be available and drives either a logic ‘1’ or ‘0’ onto the DUT input.
- When set to ‘Output’, the ‘High/Low’ is an indicator that reports the level being output from the DUT.
- The ‘Isolate’ button puts the ULI pin into high-Z state so that it does not interfere with the DUT behaviour. Note that this button will override the other settings in this control.

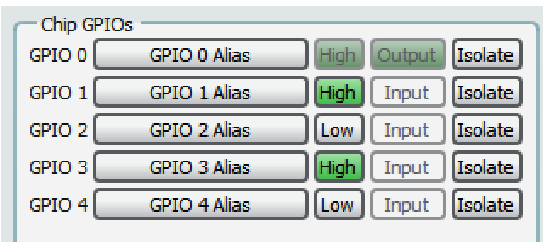


Figure 2: GPIO Controls

Smartcanvas automatically sets the directions for these controls. The configuration is based on the powered DUT register settings. If the DUT is not powered, then the settings are obtained from the project ini file. These 'Chip GPIOs' settings are updated on-the-fly when the GUI is used to change the DUT GPIO register settings.

6.1.2 Bucks and LDOs

The Bucks and LDOs sections on the Front Panel show the aliases associated with these regulators and, with polling enabled, display a live ADC measurement of their output voltages.

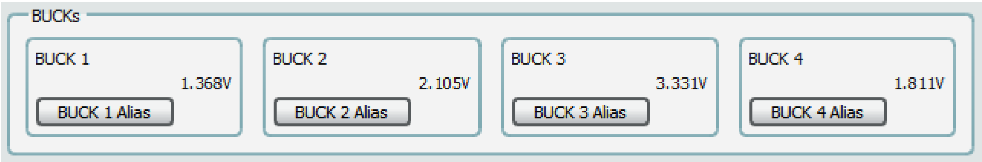


Figure 3: Bucks and LDOs

6.1.3 RTC Time

The RTC on the DUT can be synchronised to the System Clock of the PC controlling the Smartcanvas software. If polling is enabled, the time updates periodically and continues to reflect the System Clock (Figure 4).

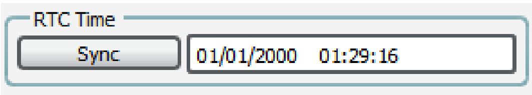


Figure 4: RTC Time

6.1.4 INI File Control

The 'Start Device' button triggers a wake-up event by toggling the nONKEY signal low for a short duration. This wake-up event can be used while using Power Commander mode to progress the DUT state from Power Down to Active, as illustrated by 'PD' and 'Act', respectively, in the series of LED-type indicators along the bottom of this control (Figure 5).

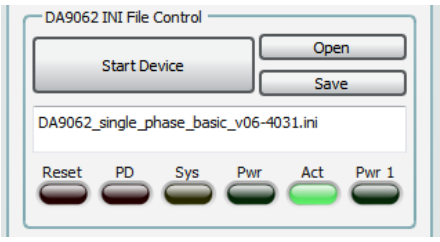


Figure 5: INI File Control

'Open' chooses the project file to be used by Power Commander mode.

NOTE
ini files created by the old 'LabPy' GUI prior to version 1.2 will not load into Smartcanvas. Such files need to be opened in a later version of the LabPy GUI such as 1v42 and resaved in the newer format.

NOTE
When opening an ini file, if a message box is shown stating, '*The file being loaded appears to have been created using a different version of the GUI*', then simply clicking 'OK' to continue will ensure the correct behaviour. See Appendix B.

'Save' is used to create a new project file. The current state of the applicable registers in the device denotes the contents of this newly created .ini file.

The INI file controls are duplicated in the widget on the right side so that they are visible when displaying tabs other than the Front Panel.

6.1.5 Power Sequencer

The Power Sequencer window (Figure 6) can be used to define the boot-up sequence. Edges can be placed by clicking where an edge is desired, or by entering the slot number in the spin-box.

Within the 'Buttons' section at the top, 'Sort Sequence' re-orders the regulators into ascending slot order.

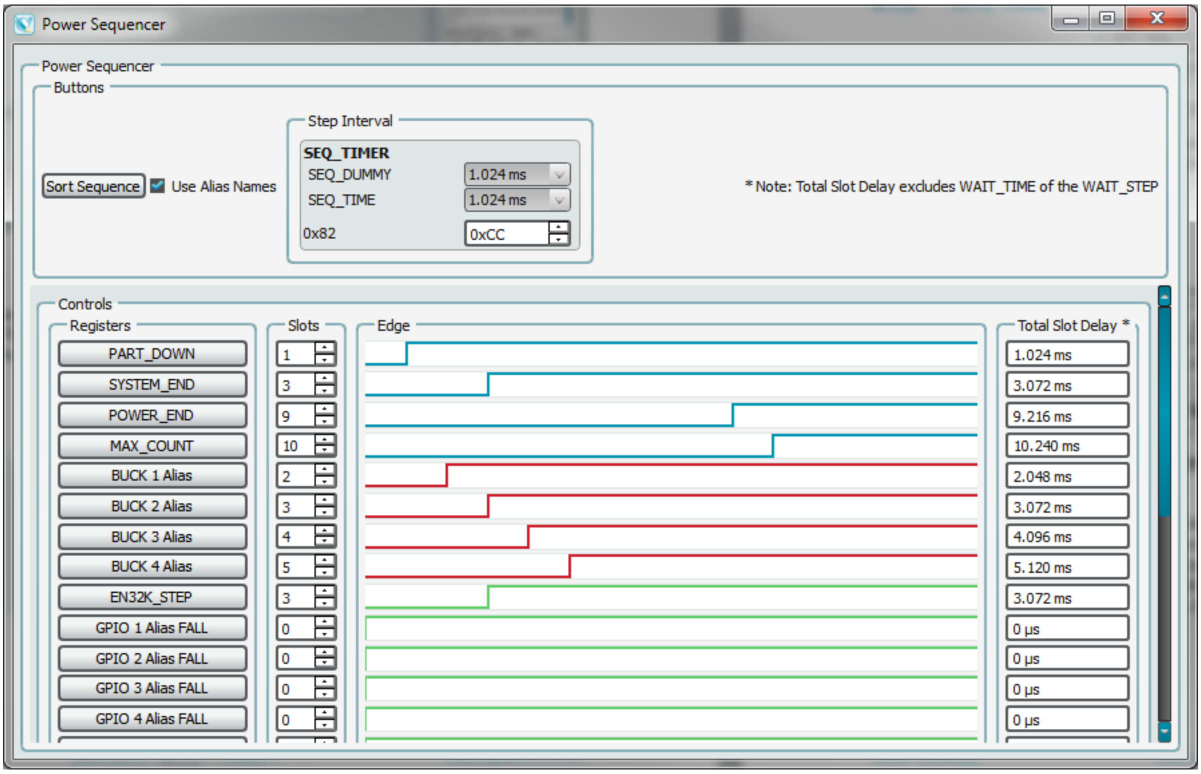


Figure 6: Power Sequencer Controls

The check box 'Use Alias Names' toggles the display between DUT default regulator names and those aliases entered in the Front Panel.

6.2 Register View

The register view presents groups of registers, each group selected using tabs along the top. For example, Figure 7 shows the 'Controls' tab. (The tabs down the left side are not used for DA9062, but allow for future GUI expansion).

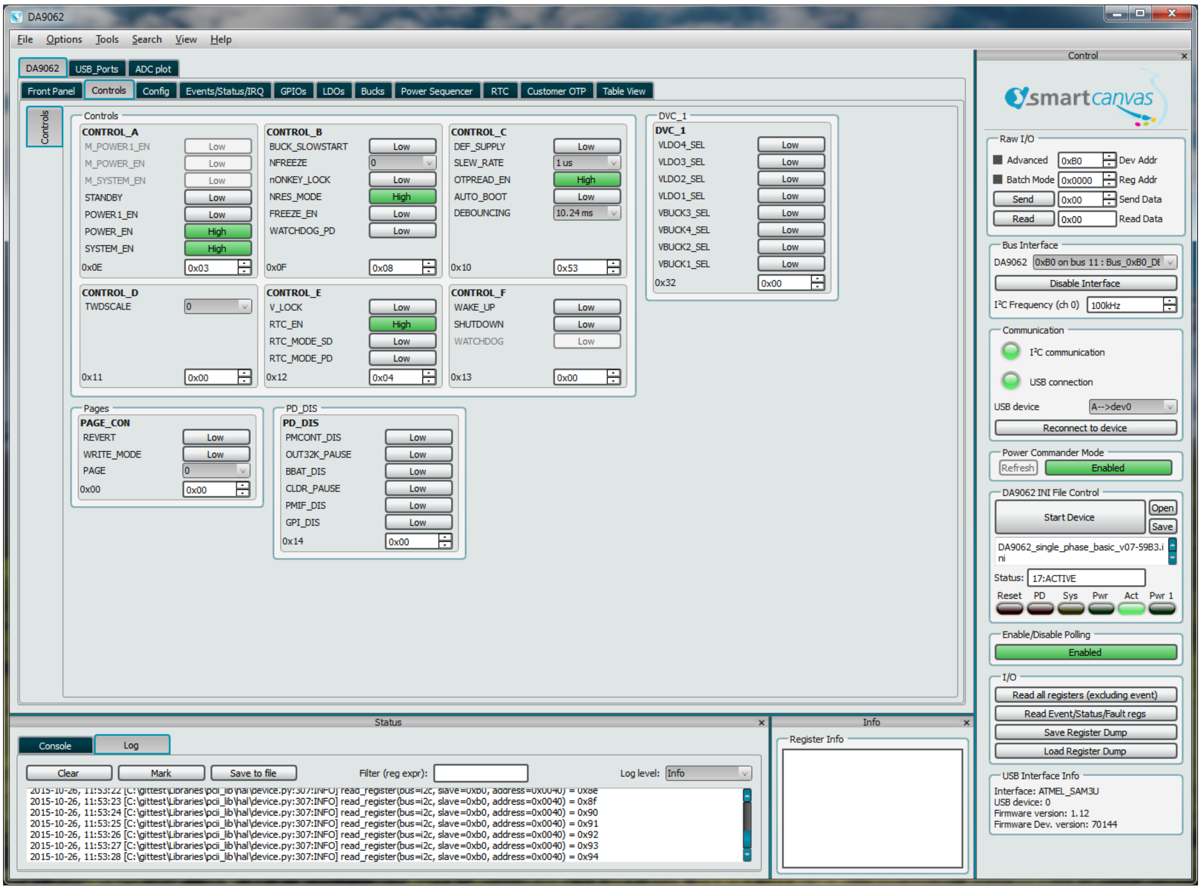


Figure 7: Register View

Greyed-out buttons represent a read-only bit field; drop-down selections represent multiple bit fields; Boolean buttons represent single bit fields. With polling set to 'enabled' on the right-hand side control, these registers are continuously updated from the DUT registers (as long as I²C communication is available). If working offline (for example, running the GUI with no hardware connected), the register changes are stored locally within the GUI. These values can then be saved to an .ini file for use later using the OTP Programmer tool (see Section 7).

Hovering the mouse over a control displays the associated help text in the Info window.

6.3 Control Widgets

The right side panel contains 'Control' widgets (Figure 8). This contains features related to IC communications, I²C communications, file manipulation and miscellaneous I/O control.

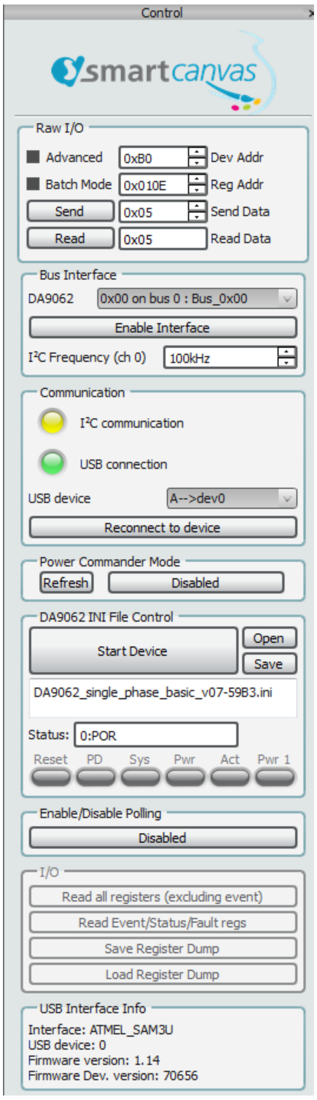


Figure 8: Control Widgets

6.3.1 Raw I/O

This widget allows low-level access to the I²C bus (Figure 9). However, for convenience of writing to all pages of the device, the 'Reg Addr' field manages the page address automatically. For example, to read from address 0x107, set 'Reg Addr' = 0x0107: it is not necessary to manually write a 0x2 to the PAGE_CON register at address 0x00 followed by a read from address 0x07.

The 'Advanced' option allows control of the base address. 'Batch 'Mode' allows multiple reads and writes (Figure 9).

The syntax for a write is: `WRITE [base_address] [register_address] [data]`

The syntax for a read is: `READ [base_address] [register_address]`

The results can be traced in the status window on the 'Log' tab (Log level = 'Info').

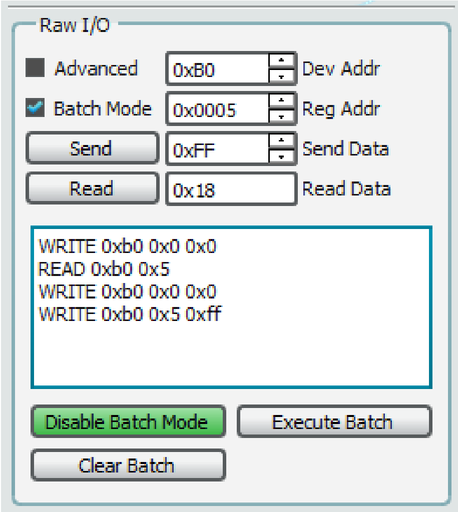


Figure 9: Raw I/O 'Batch Mode'

6.3.2 Bus Interface

This control allows selection of the DUT base address. The default for DA9061/2 is 0xB0 and is marked as 'DEFAULT' in the drop-down list.

The interface can be completely disabled using the 'Disable Interface' button. However, the GUI observes the bus and highlights that a device is available for communications by flashing the 'I^2C communication' LED yellow (See Section 6.3.3).

The I^2C frequency can be selected. 100 kHz is sufficient for normal GUI use.

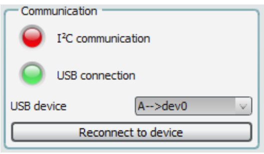
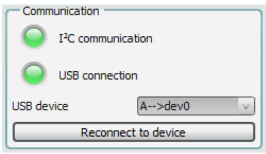
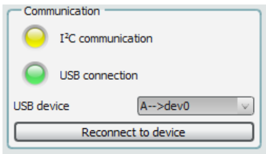
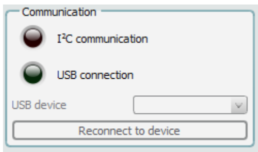
6.3.3 Communication

Two LEDs show the status of the bus and the GUI. There are several modes of the GUI-to-DUT interface, as illustrated in Table 1.

It is recommended to work in 'Offline Mode' when making changes to an ini file. See Appendix A.1.

The 'USB device' selector is not used for the DA9062 GUI. It is only used when there are multiple devices available on the I^2C bus.

Table 1: Communication Modes

			
No DUT comms on I^2C	DUT comms on I^2C	'Offline Mode': DUT comms available but disabled	'Offline Mode': DUT comms unavailable
Eval board connected	Eval board connected	Eval board connected	Eval board disconnected

6.3.4 Power Commander Mode

Please refer to Section 5.

6.3.5 ini file Control

See Section 6.1.4.

6.3.6 Polling

The ‘Enable/Disable Polling’ control is the same as the one accessible from the GUI Options Settings menu. Disabling polling can be useful to silence the bus. This allows direct user control. For example, the ‘Raw I/O’ controls can be used to issue specific I^{2}C commands. See Section 9.3.2 for further details.

6.3.7 I/O

The I/O buttons provide miscellaneous tools. Reading all device registers is useful when polling is disabled.

The ‘Register Dump’ buttons allow a simple transfer of register values to or from a text file.

6.4 USB Ports Table

The USB ports table presents a low-level view of the motherboard SAM3U controller configuration. The SAM3U port name is shown in the left column. The columns on the right show the evaluation motherboard line that each SAM3U port is connected to. Double-clicking the names provides additional information, as shown in Figure 10 for PB25_ONKEY. This configuration is set by the GUI and is read-only for the user.

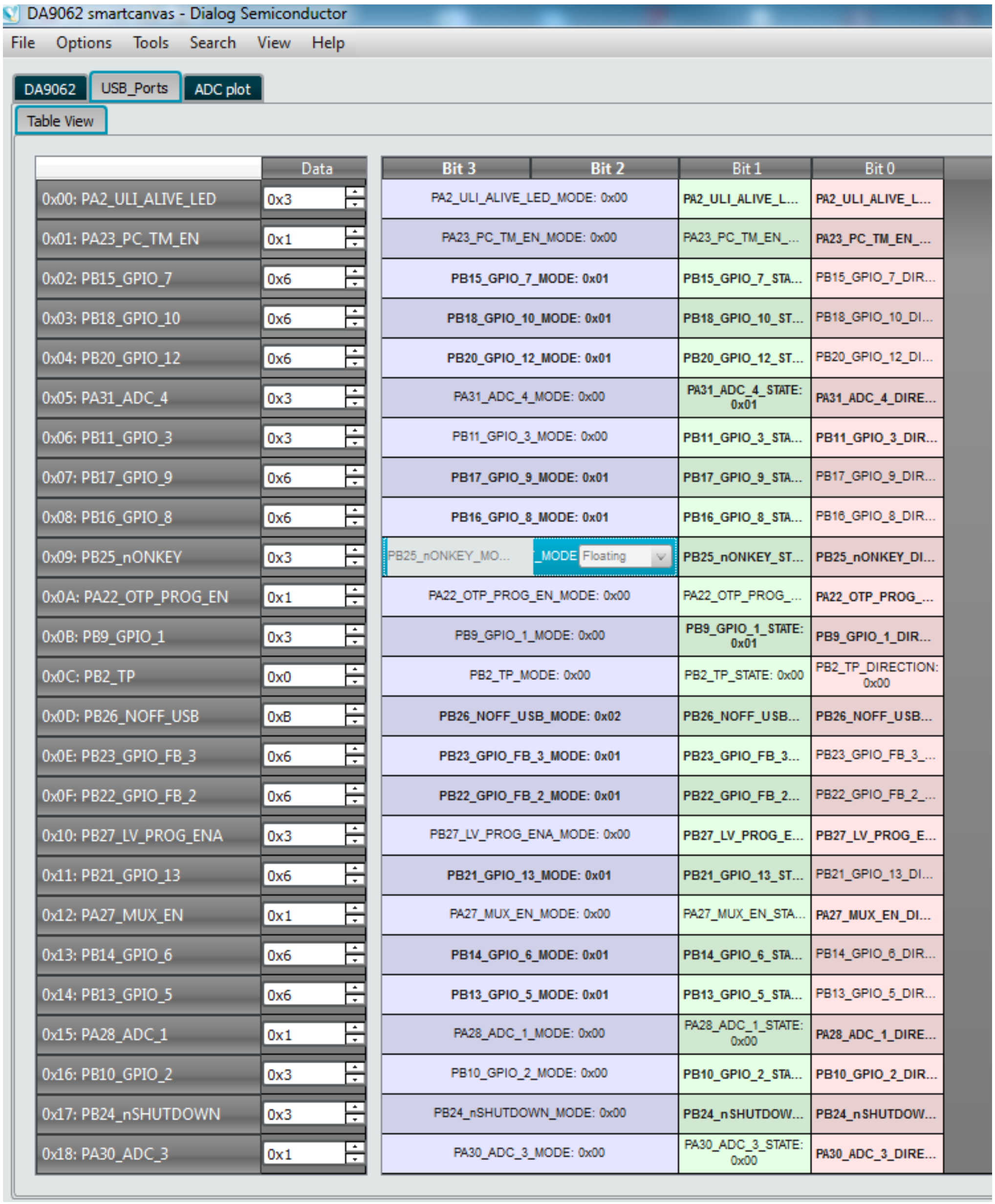


Figure 10: USB_Ports Table View

6.5 ADC Plot

The ADC plot tab provides a utility to plot the PMIC regulator voltages (see Figure 11).

The regulator voltages to be plotted are selected using the check boxes next to the regulator names.

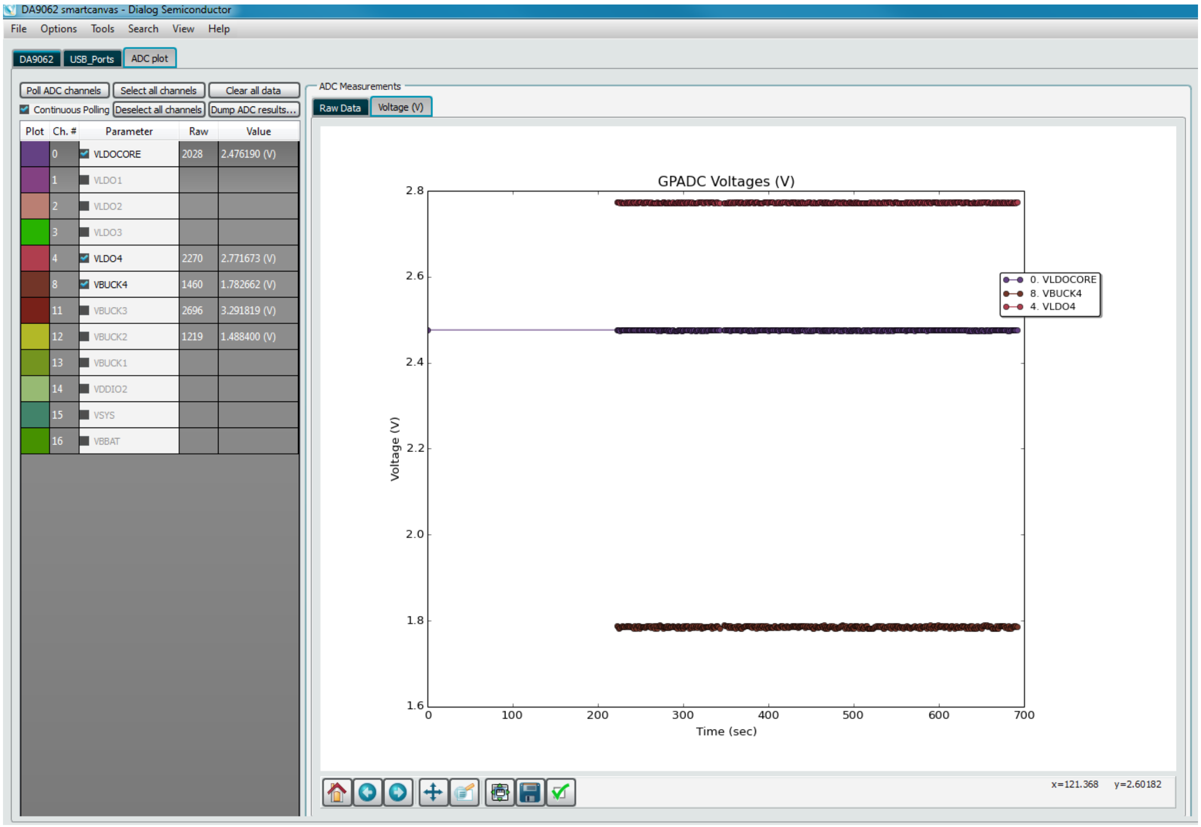


Figure 11: ADC Plot Window

The utility is controlled using the following buttons:

- ‘Poll ADC channels’: performs a single snap-shot measurement of the selected voltages. (Greyed-out if no voltages are selected)
- ‘Continuous Polling’ check-box: enables plotting of each voltage versus time. (This polling uses a separate I²C bus on the motherboard and therefore can be operated independently from the PMIC I²C bus.)
- ‘Dump ADC results…’: saves data to a csv file.

The ‘ADC measurements’ window has two tabs. The ‘Raw Data’ tab plots the raw ADC register value on the graph y-axis. The ‘Voltage (V)’ tab displays the readouts on the y-axis as voltages.

A set of buttons below the graph provides control of the display and the data. Mouse-over the buttons to show context help for each button.

6.6 Table View

The ‘Table View’ tab (Figure 12) displays all the registers on the DUT. The colours only denote difference in bit fields, with grey being the usual colour for ‘unused’ sections. Double-clicking on a bit field brings up its control, allowing the user to change the value for writable registers.

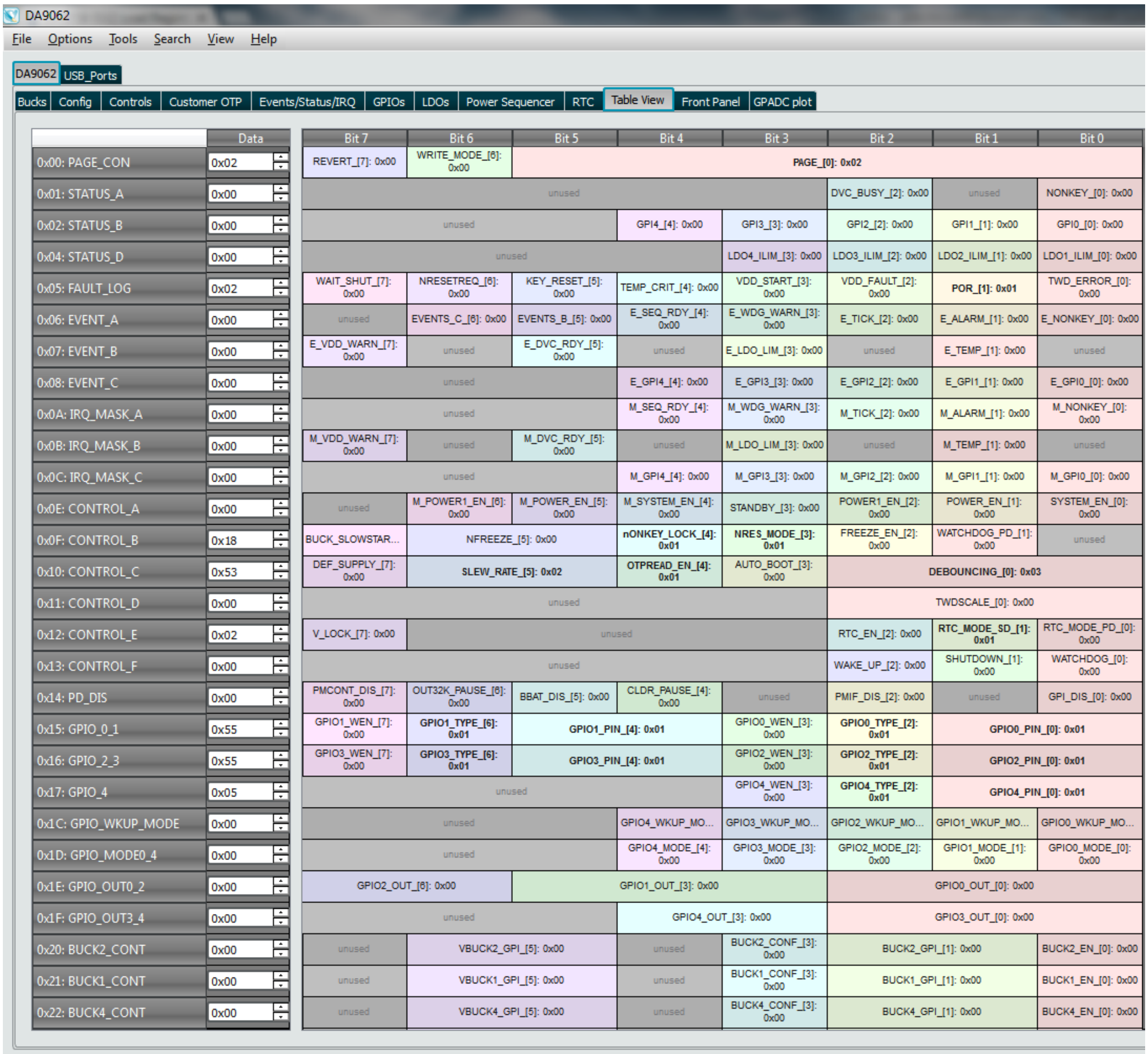


Figure 12: Table View

7 OTP Programmer Tool

The OTP Programmer tool (see Figure 13) is used to program a configuration into a device. It is also used to prepare the configuration, and allows manipulation of register settings.

The three basic steps for programming are outlined in the ‘Info’ area at the top left corner of the window.

Register values can be loaded from an ini file, a device’s OTP or from current register settings.

These can then be manipulated, if required. Programming a device is started using the button at the top right of the window.

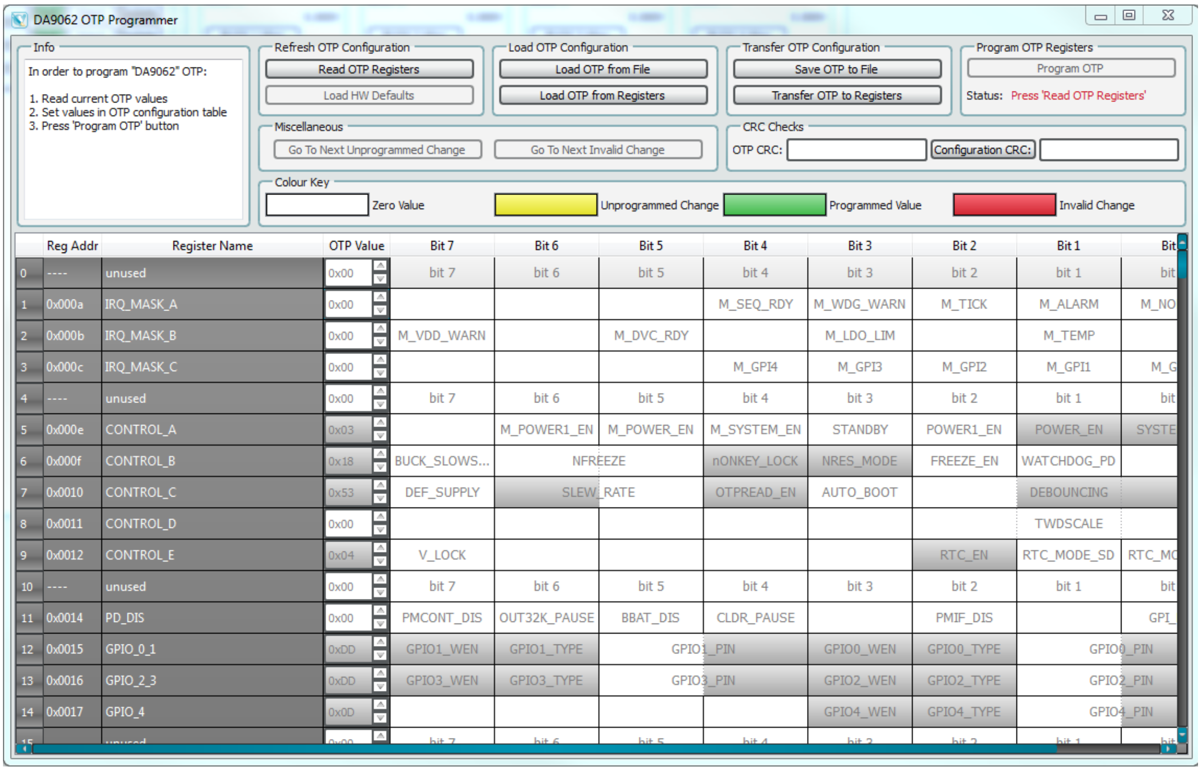


Figure 13: OTP Programmer Tool

The OTP Programmer tool provides a visual comparison of the present OTP content of a DUT and the target configuration. The register table shows the results of this comparison and is colour-coded using the key, which is further explained below:

Unused	The bit has no function or is reserved
Zero Value	Bit is to be set to ‘0’.
Unprogrammed Change	The bit is to be set to ‘1’ but it is presently unprogrammed in the DUT.
Programmed Value	The bit is to be set to ‘1’ and is already programmed in the DUT
Invalid Change	The bit is to be set to ‘0’ but the bit in the DUT has previously been programmed to a ‘1’. Therefore, this bit cannot be correctly configured.

NOTE
It is not possible to program the device if there are one or more bits flagged as ‘Invalid Change’.

The CRCs provide an important tool for checking the configuration. Dialog uses these CRCs for traceability of configuration files. A correctly-programmed device always returns the same CRC as that contained in the corresponding configuration filename. If a different CRC is returned, then a problem has occurred.

8 Project File Comparison Tool

The project file comparison tool (see Figure 14) is accessed under 'Tools' on the menu bar. It allows two sets of register values to be compared. This is particularly useful when checking a set of changes. Values can be loaded from a file, from a device OTP, or from the device registers. Differences are highlighted in red. Matching values are shown as white ('0' bits) or green ('1' bits).

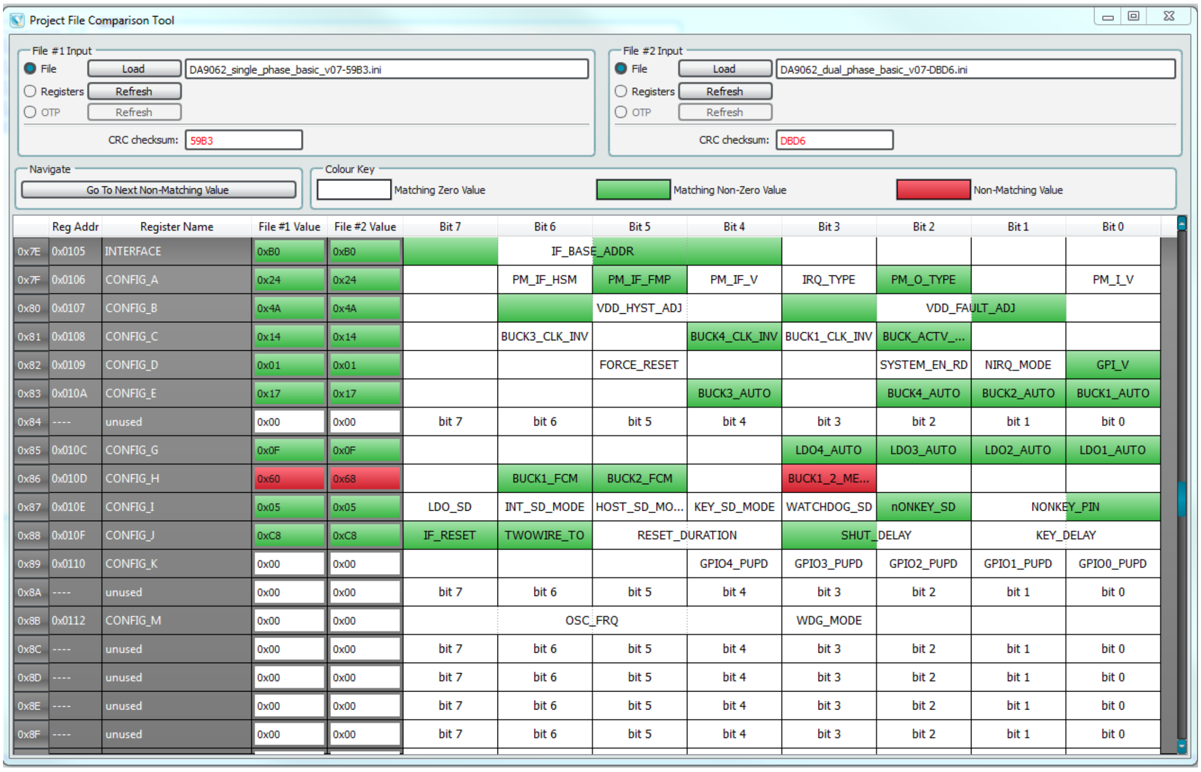


Figure 14: Project File Comparison Tool

9 Menu Bar

The menu bar provides access to the OTP programmer tool (section 7), project file comparison tool (section 8) and other miscellaneous features.

9.1 Scan I²C

This tool scans all 128 I²C addresses (0x00 to 0xFE; read and write). Responding slaves are reported by the tool (Figure 15).

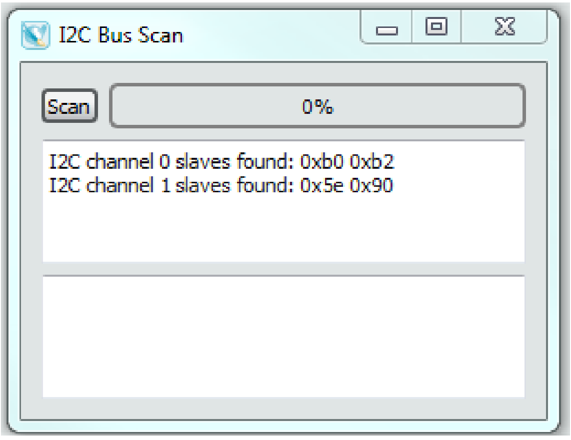


Figure 15: Bus Scan Tool

The DA9062 is usually accessible via its default address of 0xB0. Address 0xB2 provides direct access to Page 2 (register address range 0x100 to 0x1FF) without having to write to the PAGE_CON register.

The DA9061/2 motherboard includes ADCs for regulator voltage readouts. These ADCs are at fixed I²C addresses of 0x5E and 0x90.

9.2 Search

The search tool provides a fast method of finding a register. It performs dynamic string-matching to show all register names that contain the typed string. The advanced search option enables the search of control names as well as register names (see Figure 16). Double-clicking on a search result displays the register in the main window.

The tool can also be opened using CTRL+F.

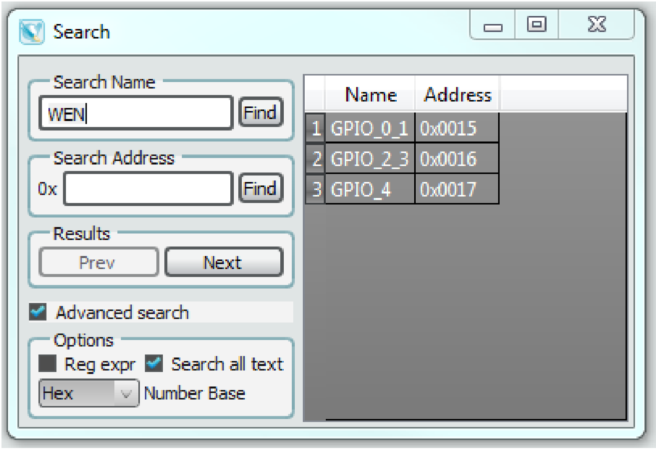


Figure 16: Search Tool

9.3 Settings

General settings are accessible via the menu bar under Options > Settings (see Figure 17).

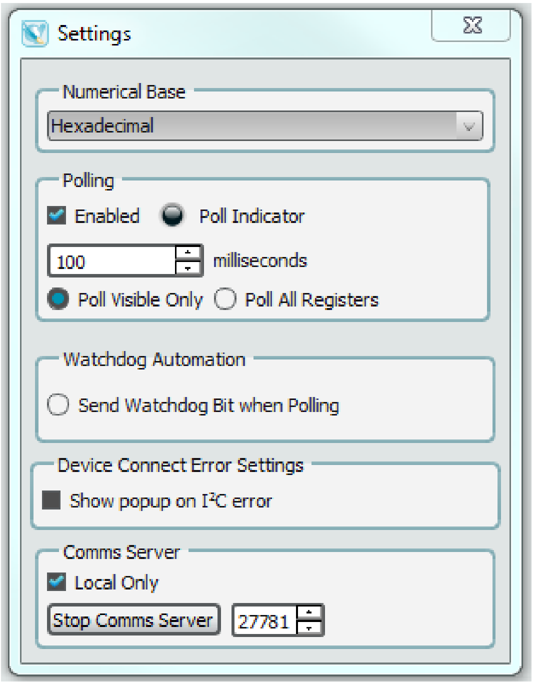


Figure 17: General Settings

9.3.1 Number Base

The default number base is hexadecimal. Binary is occasionally useful for interpreting bit fields.

9.3.2 Polling

The polling 'enabled' control is the same as on the GUI main menu on the right-hand side. Disabling polling can be useful to silence the bus. This allows direct user control. For example, the 'Raw I/O' controls can be used to issue specific I²C commands.

It is usually necessary only to poll the registers that are currently visible in the tab being displayed. This is the default setting of 'Poll Visible Only'. The alternate option is to read all registers. The frequency of polling can also be set. Polling every 100ms is usually adequate.

9.3.3 Watchdog Automation

When a device has the watchdog feature enabled (TWDSCALE ≠ 0), it is necessary for the system to periodically write to the WATCHDOG bit. The GUI can perform these periodic writes by using the Watchdog Automation feature (enabling 'Send Watchdog Bit when Polling').

This feature relies on polling being enabled and in order for the device not to enter POWERDOWN, the polling must be set more than tWDMIN as per the device specification.

9.3.4 Device Connect Error Settings

Setting 'show popup' displays message boxes when there is an I²C error.

9.3.5 Comms Server

The Comms Server allows connection to the GUI over TCP/IP connection and is mainly for internal usage.

Appendix A : Quick-Start Guides

A.1 Modifying an .ini File

1. **Turn off** the device or disable the interface by clicking the button in the ‘Bus Interface’ widget. *It is important to work without a device powered up or with the GUI in ‘Offline Mode’. This ensures the behaviour of the DUT does not automatically change any of the register values.*
2. Always start from a known-good Dialog .ini file.
3. From the ‘INI File Control’ widget, select ‘Open’ and choose the file to load.
4. The configuration can now be changed via the register values in the GUI tabs.
5. Write the new configuration to a file using the ‘Save’ button in the ‘INI File Control’ widget. Note that the new CRC is automatically appended. Dialog recommends leaving this CRC at the end of the filename.

A.2 OTP Programming Procedure

The following is a basic guide to programming a device:

1. Ensure the device is turned off and the motherboard toggle switch is to the left (‘TP_ON’).
2. Insert an unprogrammed (-00 blank) device into the socket.
3. On the GUI Front Panel, enable Power Commander mode.
4. Turn on the PMIC.
5. Open the ‘OTP Programmer Tool’ from the menu bar (under ‘Tools’).
6. Update the GUI’s table from the OTP by clicking the ‘Load from device OTP’ button
7. Open the target ini file using the ‘Load from ini file’ button.
8. Check there are no ‘Invalid Changes’ highlighted (This is unnecessary with a blank device).
9. Click the ‘Program OTP’ button.
10. After a short delay, check that the GUI reports ‘OTP matches table configuration’ (below the ‘Program OTP’ button).
11. Verify that the ‘Read OTP CRC’ matches the ‘Table CRC’.

A.3 Using Power Commander Mode

Power Commander mode allows a device to be started using the configuration taken from an external ini file instead of the device’s own programmed (or blank) configuration. To start a device in Power Command mode (‘PC Mode’):

1. Select a project ini file using the ‘Open’ button in the ‘DA9062 INI File Control’ widget, located on the ‘Front Panel’ tab or the right side of the main window.
2. Ensure the motherboard toggle switch is to the left (‘TP_ON’).
3. Turn off the device (VSYS = 0 V).
4. Click the ‘Power Commander mode’ button to enable PC mode (located on the GUI ‘Front Panel’ tab or the right side of the main window).
5. Turn on the device.
6. The device should now have started up using the selected project ini file contents. (The device will typically power-up into POWERDOWN when the configuration has AUTOBOOT=0, or may power-up into the ACTIVE state. The behaviour is therefore dependent on the OTP configuration).

NOTE
After starting up a device, Power Commander mode can be left enabled. This is useful if power-cycling the device, using commands such as SHUTDOWN, POWERDOWN, using the nRESETREQ button, and so on, as Power Commander mode will continue to service requests from the DUT for configuration transfers.

Appendix B : Legacy SmartCanvas ini Files

SmartCanvas releases up to v0.0.3.15 use different internal reference information compared to later versions of SmartCanvas (The reference information is also known as the 'OTP mask file'). This may result in the message box of Figure 18 being displayed.

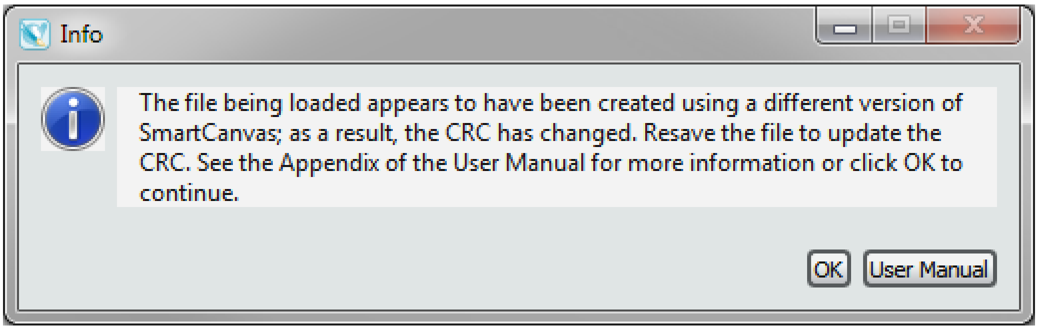


Figure 18: Information Message Box

This is only for information, and clicking 'OK' allows work to continue. Resaving the ini file will prevent this message box showing again.

The same applies when opening ini files in the OTP Programmer Tool (see Section 7) and the File Comparison Tool (see Section 8).

Revision History

Revision	Date	Description
1.0	03-Nov-2015	Initial release.
1.1	22-Dec-2015	Added description of 'project file comparison tool'. Typographical edits.
1.2	05-Jan-2016	Revised installation instructions (Hardware to be plugged in before installation started).
1.3	19-Sep-2016	Added Appendix B to describe the message box relating to OTP masks. Updated 'INI file control' section.
1.4	19-Oct-2016	Revised Section A.1, 'Modifying an .ini file'.
1.5	21-Feb-2022	Rebranded file with new logo, copyright and disclaimer

Status Definitions

Status	Definition
DRAFT	The content of this document is under review and subject to formal approval, which may result in modifications or additions.
APPROVED or unmarked	The content of this document has been approved for publication.

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