User Manual

DA9066 GUI and Evaluation Board

UM-PM-031

Abstract

This document describes the hardware and software used in Dialog Semiconductor to test and evaluate the DA9066 Power Management Controller.

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Tables

1 Terms and Definitions

ADC	Analog-to-Digital Converter
EVB	EValuation Board
GPIO	General Purpose Input/Output
GUI	Graphical User Interface
LDO	Low DropOut voltage regulator
LED	Light Emitting Diode
NTC	Negative Temperature Coefficient (thermistor)
OTP	One Time Programmable (memory)
PC	Personal Computer
PCB	Printed Circuit Board
PFM	Pulse Frequency Modulation
PMIC	Power Management Integrated Circuit
PWM	Pulse Width Modulation
RTC	Real Time Clock
USB	Universal Serial Bus

2 References

[1] DA9066 Datasheet, Dialog Semiconductor.

3 Introduction

The DA9066 Evaluation Board has been designed to allow measurement and evaluation of the DA9066 PMIC.

Both Power Management and Audio Codec functionality is controlled by the Evaluation Board (EVB).

The simple Graphic User Interface (GUI) is called Power Commander which allows the DA9066 to be controlled via a USB port of a PC.

The EVB has a large number of jumper links to enable the user to change the system configuration and to allow appropriate measurements, although, typically, few jumper links are required to be altered for standard operations of the DA9066.

The complete evaluation kit hardware comprises two PCBs:

- EVALUATION MOTHERBOARD 44-179-170-01-B (or -C)
- CUSTOMER REFERENCE BOARD 44-179-183-02-A (DA9066 mini board)

Power Commander GUI requires a PC operating Windows 2000/XP/Vista/Windows 7 with a USB1.1 or USB2 interface.

To run Power Commander under Windows Vista, set the default installation location to C:\Dialog **Semiconductor**.

Note that Dialog recommends connecting the EVB to a 500 mA capable USB port as we cannot guarantee that a USB hub (set to 100 mA) is sufficient to operate the EVB correctly. See Section 4.1.

The GUI can be used to:

- configure the DA9066
- perform write and read operations to any control register
- monitor the device status

DA9066 GUI and Evaluation Board

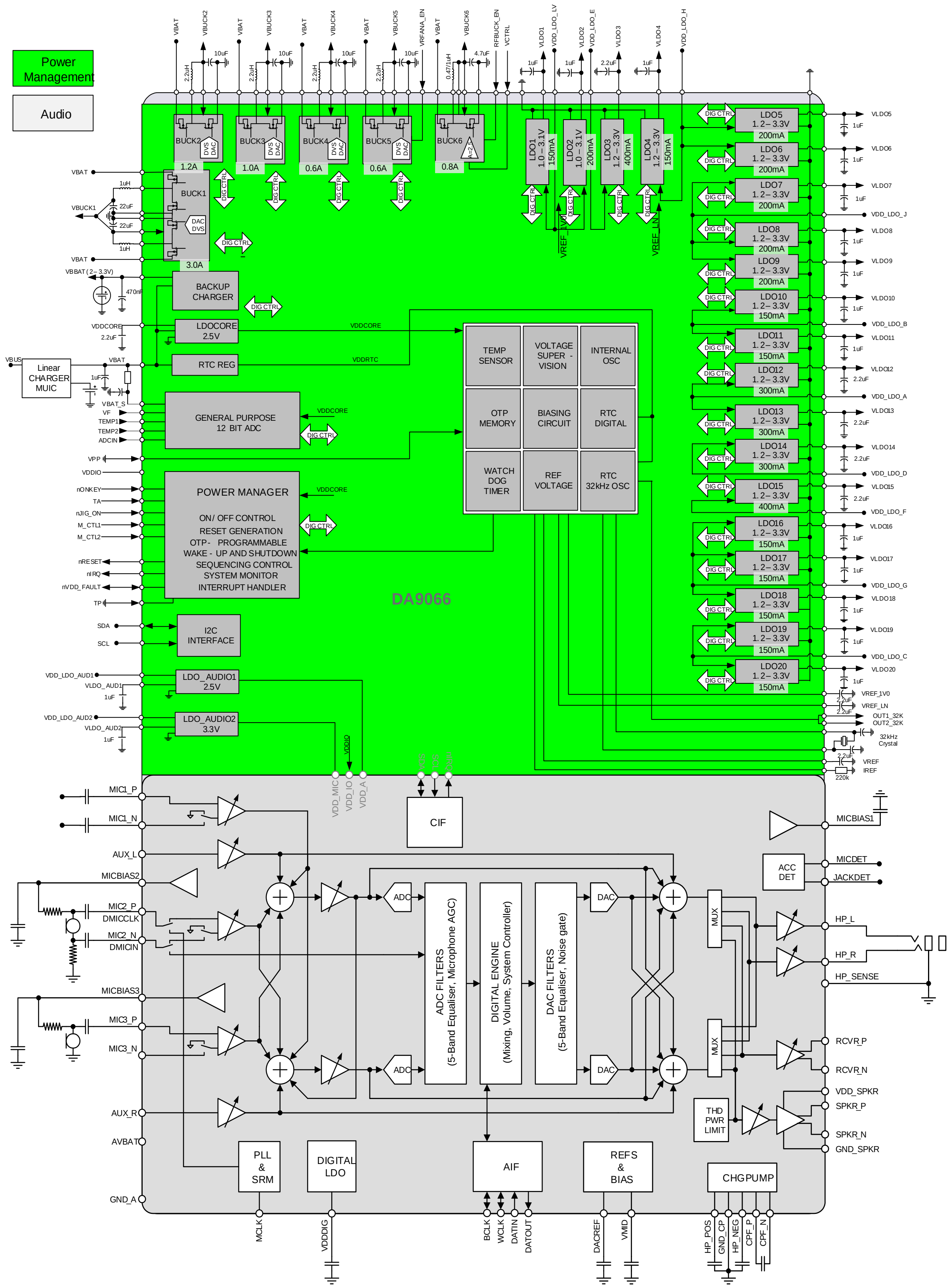


Figure 1: DA9066 Block Diagram

4 Hardware

The DA9066 EVB consists of two boards:

1. A daughterboard containing the DA9066, the essential external components and headers to allow test access. This board could also be used in standalone or as a module for a customer development platform. The term daughterboard is synonymous with mini board.

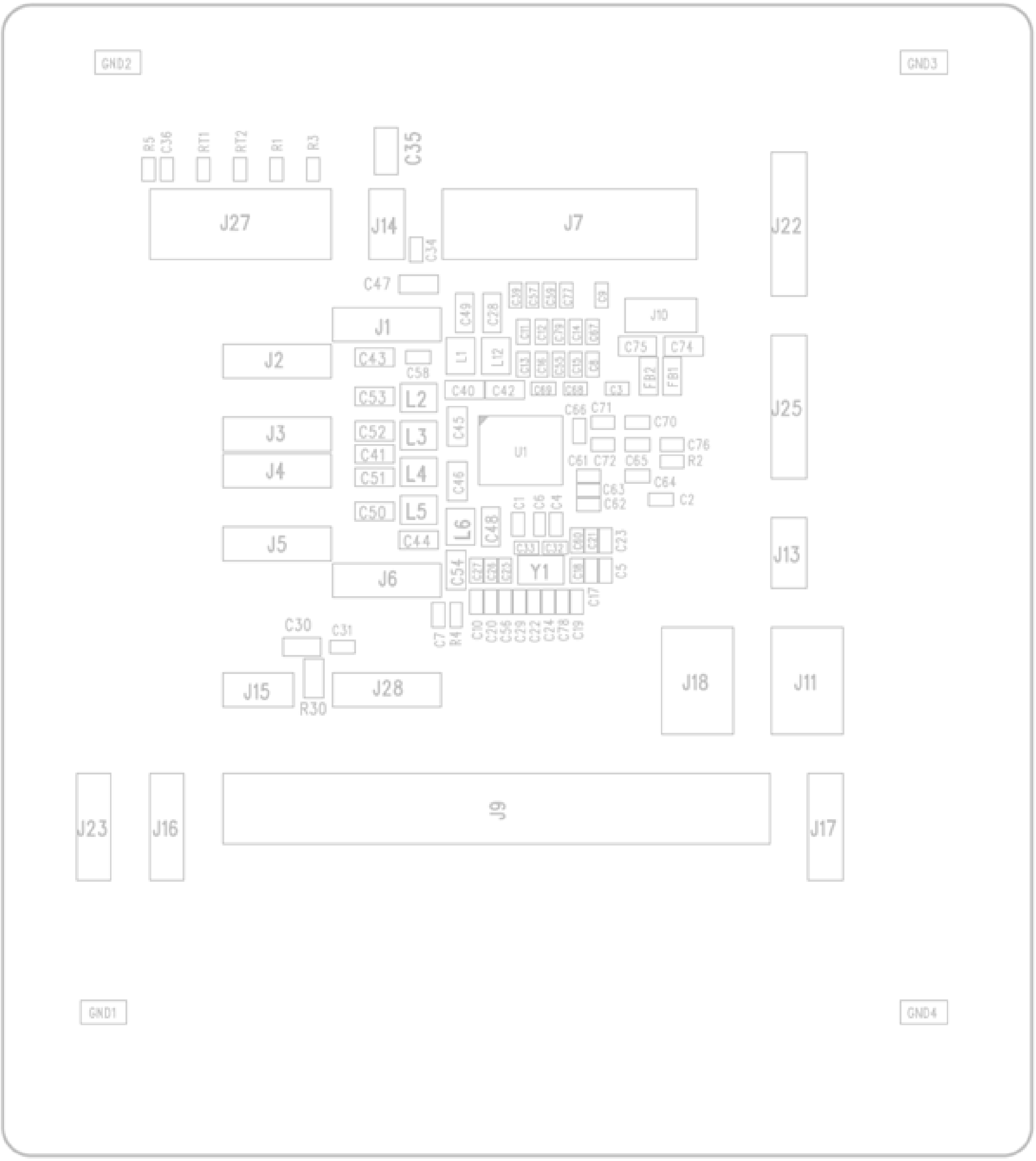


Figure 2: DA9066 Mini Board

NOTE
The EVB has been configured by default to work from the motherboard's on-board regulators.

2. A motherboard containing many circuit blocks that allows for flexible configuration and provides test access to the DA9066. It includes:
   a. USB Interface with Control Interface level shifters
   b. two audio optical input/output interfaces (with selection matrix)
   c. various switches: USB reset, ONKEY, NON2, 3.3 V reset, CODEC reset and TP
   d. headphone output
   e. line out outputs
   f. auxiliary inputs
   g. analogue/digital microphone inputs
   h. master clock input
   i. power supply inputs (VBAT, DCIN and external +5 V (VBUS))
   j. JTAG interface

NOTE
The EVB has been configured by default to rely on an external battery voltage of 3.6 V supplied via sockets J62 (VBAT) and J65 (GND). See Section 4.1 for more details.

A USB-I^2C bridge is used for communication with the device, and there are a number of external active components to reduce the requirement for external circuitry.

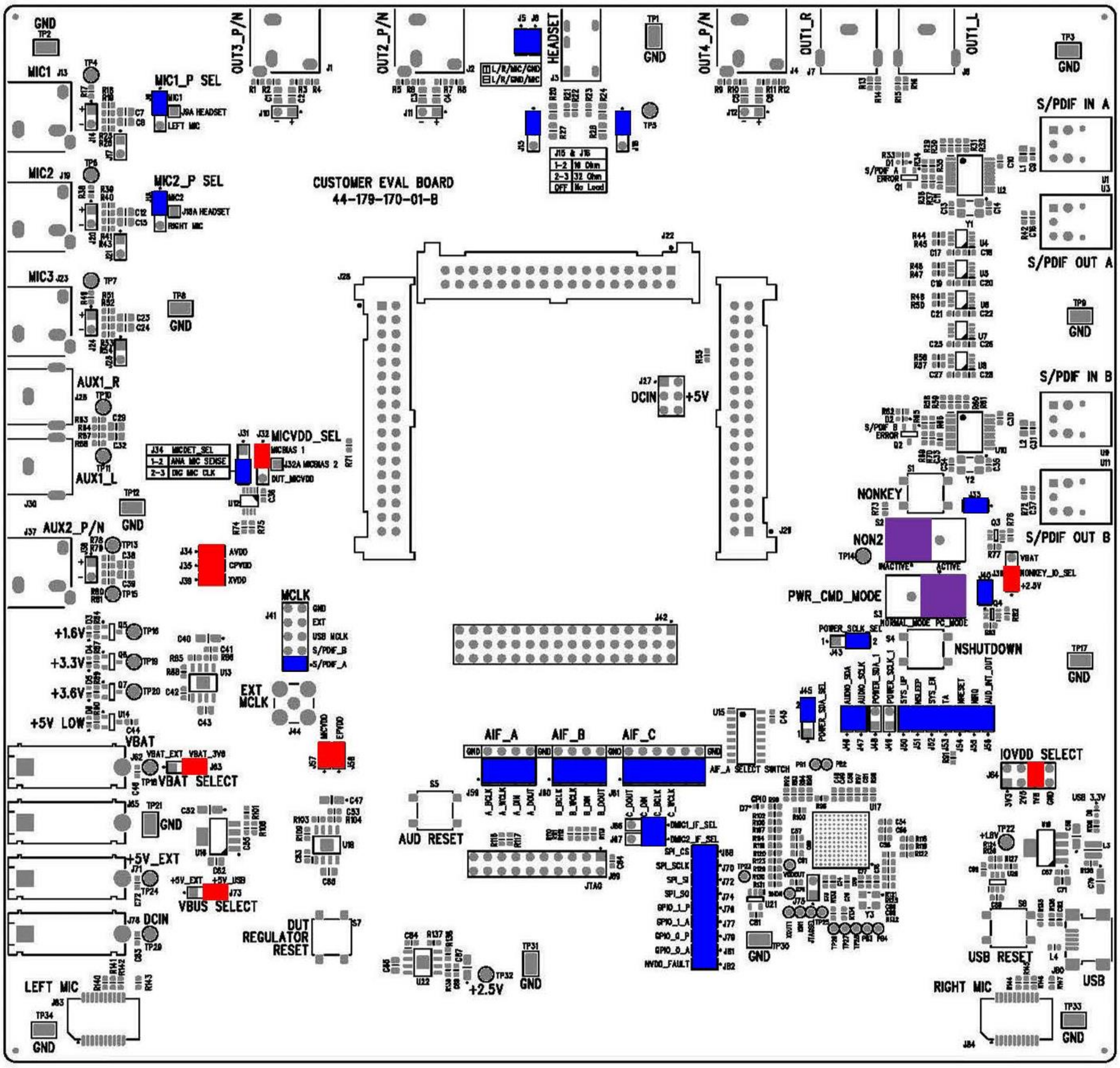


Figure 3: Motherboard

4.1 Power Supplies

The DA9066 is powered from either:

1. +5V_DUT that can be driven from +5V_EXT (external power supply) or +5V_USB.
2. VBAT_DUT that can be driven from VBAT_EXT (external power supply) or VBAT_3V6 (on board regulator).
3. DCIN (external power supply).

By default, the EVB is configured to require an external supply via VBAT_EXT. **Therefore, a battery voltage, VBAT, of 3.6 V should be supplied to the motherboard via sockets J62 (VBAT) and J65 (GND)**. Alternatively, the VBAT supply can be driven from the USB by setting jumper J63 to position 2-3, see Figure 4. However, it should first be verified that the USB interface board can supply sufficient current.

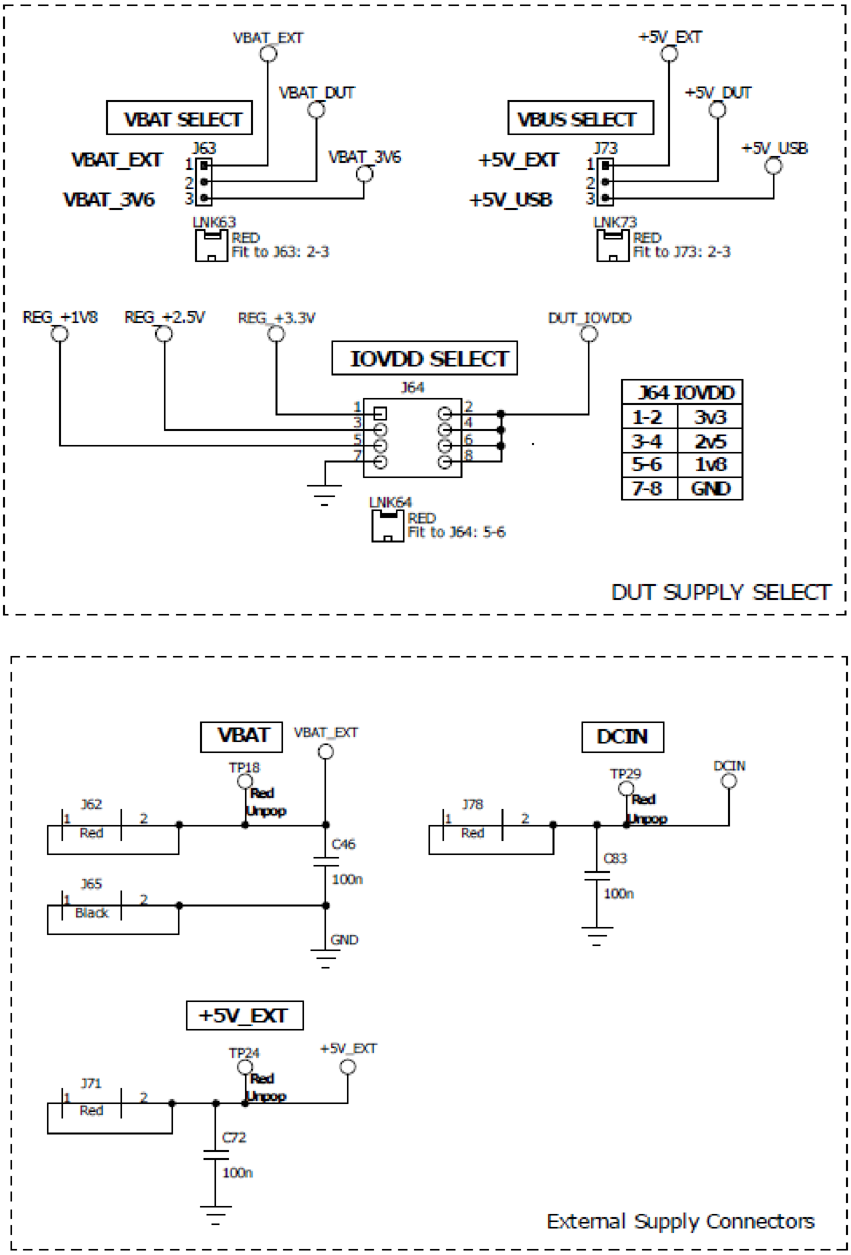


Figure 4: Motherboard Power Configuration

With default jumper settings (J34, J35, J39, J57, and J58), all DA9066 audio voltages are generated on the board, see Figure 5. However, these jumpers can be removed, which allows voltages to be supplied from external supplies. This gives flexibility in verifying voltage dependencies, individual supply currents, or other parameters.

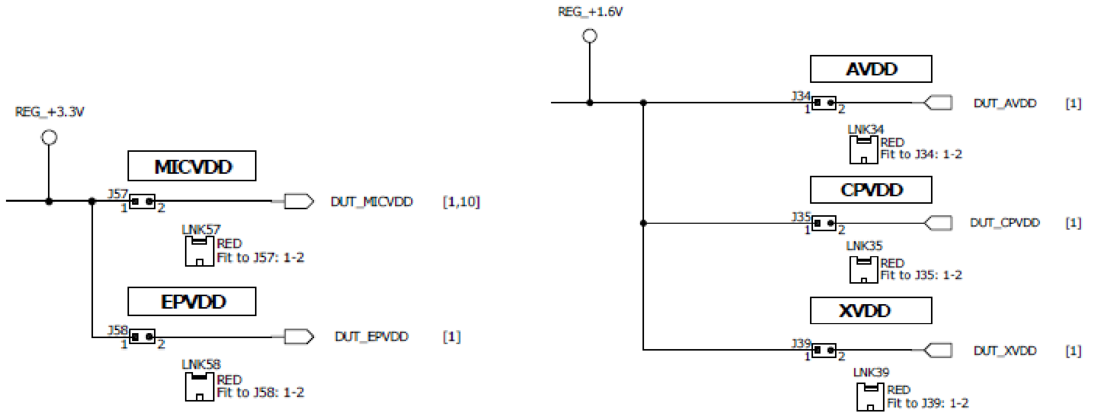


Figure 5: Audio VDD Motherboard Configuration

4.2 Jumper and Link Positions

The mini board has the jumper and link configuration shown in Table 1.

Table 1: 44-179-183-02-A Mini Board Jumpers and Link Positions

Jumper Number	Position	Function
J14	On, (default)	VBBAT connected to backup battery C34
J16	1-2, off	Daughterboard 1.8V rail supplied by VBUCK_2
	2-3, (default)	Daughterboard 1.8V rail supplied by MB_VDDIO (motherboard)
J17	1-2, off	Daughterboard CPVDD rail supplied by DUT_CPVDD (motherboard)
	2-3, (default)	Daughterboard CPVDD rail supplied by PMIC_CPVDD (daughterboard)
J23	1-2, off	PMIC_CPVDD supplied by VLDO_AUD1
	2-3, (default)	PMIC_CPVDD supplied by VBUCK2
J27	1-2, (default)	VBAT_S connected to VBAT
	3-4, (default)	TEMP1 connected to thermistor RT1
	5-6, (default)	TEMP2 connected to thermistor RT2
	7-8, (default)	VF connected to resistor R1
	9-10, (default)	ADC_IN connected to resistor R3
J28	1-2, (default)	NJIG_ON signal connected to motherboard
	2-3, off	Pin 3 is connected to pin 2 on the PCB and allows for probe attachment while the jumper is fitted 1-2

The motherboard has the jumper and link configuration shown in

Table 2: 44-179-170-01-B Motherboard Jumpers and Link Positions

Jumper Number	Position	Function
J73	1-2	VBUS select: +5V_DUT connected to +5V_EXT
	2-3, (default)	VBUS select: +5V_DUT connected to +5V_USB
J63	1-2	VBAT select: VBAT_DUT connected to VBAT_EXT
	2-3, (default)	VBAT select: VBAT_DUT connected to VBAT_3V6
J63J27	1-2Off, (default)	DCIN: No connection
	1-2, 3-4, 5-6	DCIN: drives +5V_DUT
J57	On, (default)	Connects audio MICVDD from on-board REG_+3.3 V
J58	On, (default)	Connects audio EPVDD from on-board REG_+3.3 V
J34	On, (default)	Connects audio AVDD from on-board REG_+1.6 V
J35	On, (default)	Connects audio CPVDD from on-board REG_+1.6 V
J39	On, (default)	Connects audio XVDD from on-board REG_+1.6 V
J64	1-2	Connects DUT_IOVDD to REG_+3.3 V
	3-4	Connects DUT_IOVDD to REG_+2.5 V
	5-6, (default)	Connects DUT_IOVDD to REG_+1V8
	7-8	Connects DUT_IOVDD to ground
J75	Off	Re-initialisation of the SAM3U4 Flash when fitted
J68	On, (default)	Connects DUT_SPI_CS to SAM3U4 MCU
J70	On, (default)	Connects DUT_SPI_SCLK to SAM3U4 MCU
J72	On, (default)	Connects DUT_SPI_MOSI to SAM3U4 MCU
J74	On, (default)	Connects DUT_MIS0 to SAM3U4 MCU
J48	On, (default)	Connects DUT_POWER_SDA_1 to SAM3U4 MCU
J49	On, (default)	Connects DUT_POWER_SCLK_1 to SAM3U4 MCU
J51	On, (default)	Connects DUT_NSLEEP to SAM3U4 MCU
J52	On, (default)	Connects DUT_SYS_EN to SAM3U4 MCU
J82	On, (default)	Connects DUT_NVDD_FAULT to SAM3U4 MCU
J81	On, (default)	Connects DUT_GPIO_0_A to SAM3U4 MCU
J79	On, (default)	Connects DUT_GPIO_0_P to SAM3U4 MCU
J77	On, (default)	Connects DUT_GPIO_1_A to SAM3U4 MCU
J76	On, (default)	Connects DUT_GPIO_1_P to SAM3U4 MCU
J53	On, (default)	Connects DUT_TA to SAM3U4 MCU
J55	On, (default)	Connects DUT_NIRQ to SAM3U4 MCU
J50	On, (default)	Connects DUT_SYS_UP to SAM3U4 MCU
J56	On, (default)	Connects DUT_AUD_INT_OUT to SAM3U4 MCU
J54	On, (default)	Connects DUT_NRESET to SAM3U4 MCU
J33	On, (default)	Connects DUT_NONKEY to SAM3U4 MCU through level shifter
J36	1-2	NONKEY_IO_SEL: Connects level shifter to VBAT_DUT
	2-3, (default)	NONKEY_IO_SEL: Connects level shifter to REG_+2.5 V

Jumper Number	Position	Function
J40	On, (default)	Connects DUT_TP to SAM3U4 MCU through level shifter
J46	On, (default)	Connects DUT_AUDIO_SDA to SAM3U4 MCU
J47	1-2, (default)	Connects DUT_AUDIO_SCLK to SAM3U4
J45	1-2	Connects DUT_POWER_SDA_1 to SAM3U4 MCU
	2-3, (default)	Connects DUT_POWER_SDA_2 to SAM3U4 MCU
J43	1-2	Connects DUT_POWER_SCLK1 to SAM3U4 MCU
	2-3, (default)	Connects DUT_POWER_SCLK_2 to SAM3U4 MCU
J59	1-2, (default)	Connects DUT_A_BCLK to S/PDIF_A
	4-5, (default)	Connects DUT_A_WCLK to S/PDIF_A
	7-8, (default)	Connects DUT_A_DIN to S/PDIF_A
	10-11, (default)	Connects DUT_A_DOUT to S/PDIF_A
J60	1-2, (default)	Connects DUT_B_BCLK to S/PDIF_B
	4-5, (default)	Connects DUT_B_WCLK to S/PDIF_B
	7-8, (default)	Connects DUT_B_DIN to S/PDIF_B
	10-11, (default)	Connects DUT_B_DOUT to S/PDIF_B
J61	1-2, (default)	Connects DUT_C_DOUT to USB_DIN
	4-5, (default)	Connects DUT_C_DIN to USB_DOUT
	7-8, (default)	Connects DUT_C_BLCK to USB_ADC_BCLK
	10-11, (default)	Connects DUT_C_BLCK to USB_DAC_BCLK
	13-14, (default)	Connects DUT_C_WLCK to USB_ADC_WCLK
	16-17, (default)	Connects DUT_C_WLCK to USB_DAC_WCLK
J41	1-2, (default)	Connects DUT_MCLK to SPDIF_A MCLK_LS
	3-4, off	Connects DUT_MCLK to SPDIF_B MCLK_LS
	5-6, off	Connects DUT_MCLK to USB MCLK
	7-8, off	Connects DUT_MCLK to EXT_MCLK
	79-10, off	Connects DUT_MCLK to GND
J9	1-2, (default)	Connects DUT_MIC1_P to MIC1 jack positive
	2-3, off	Connects DUT_MIC1_P to BRD_AMIC1 (analogue MIC1 board)
J17	1-2, off	Connects DUT_MIC1_N to ground
J14	1-2, off	Shorts MIC1 positive and negative
J18	1-2, (default)	Connects DUT_MIC2_P to MIC2 jack negative
	2-3, off	Connects DUT_MIC2_P to BRD_AMIC2 (analogue MIC2 board)
J21	1-2, off	Connects DUT_MIC2_N to ground
J20	1-2, off	Shorts MIC2 positive and negative
J25	1-2, off	Connects DUT_MIC3_N to ground
J24	1-2, off	Shorts MIC3 positive and negative
J31	1-2	MICDET_SEL: MIC_SENSE
	2-3, (default)	MICDET_SEL: MIC_CLK

Jumper Number	Position	Function
J32	1-2, (default)	MICVDD_SEL: MICBIAS1 (analogue MIC VDD)
	2-3, off	MICVDD_SEL: DUT_MICVDD (digital MIC VDD)
J32A	Off, (default)	MICVDD_SEL: MICBIAS2 (analogue MIC VDD)
J66	1-2, (default)	DMIC1 Interface Select DMIC1__DAT : DUT_DMIC1
	2-3, off	DMIC2 Interface Select DMIC1__DAT : DUT_DMIC2
J67	1-2, (default)	DMIC2 Interface Select DMIC2__DAT : DUT_DMIC1
	2-3, off	DMIC2 Interface Select DMIC2__DAT : DUT_DMIC2
J38	1-2, off	Shorts AUX2_P and AUX2_N
J16	1-2, (default)	Headphone left load = 16 ohm
	2-3	Headphone left load = 32 ohm
	OFF	Headphone left load = no load
J15	1-2, (default)	Headphone right load = 16 ohm
	2-3	Headphone right load = 32 ohm
	OFF	Headphone right load = no load
J5	On, (default)	Connects DUT_HPS to MIC
J6	On, (default)	Connects MICDET to GND
J11	Off	OUT2P/N differential connection
J10	Off	OUT3P/N differential connection
J12	Off	OUTP4/N differential connection

Figure 6 shows the default locations of all the jumper links.

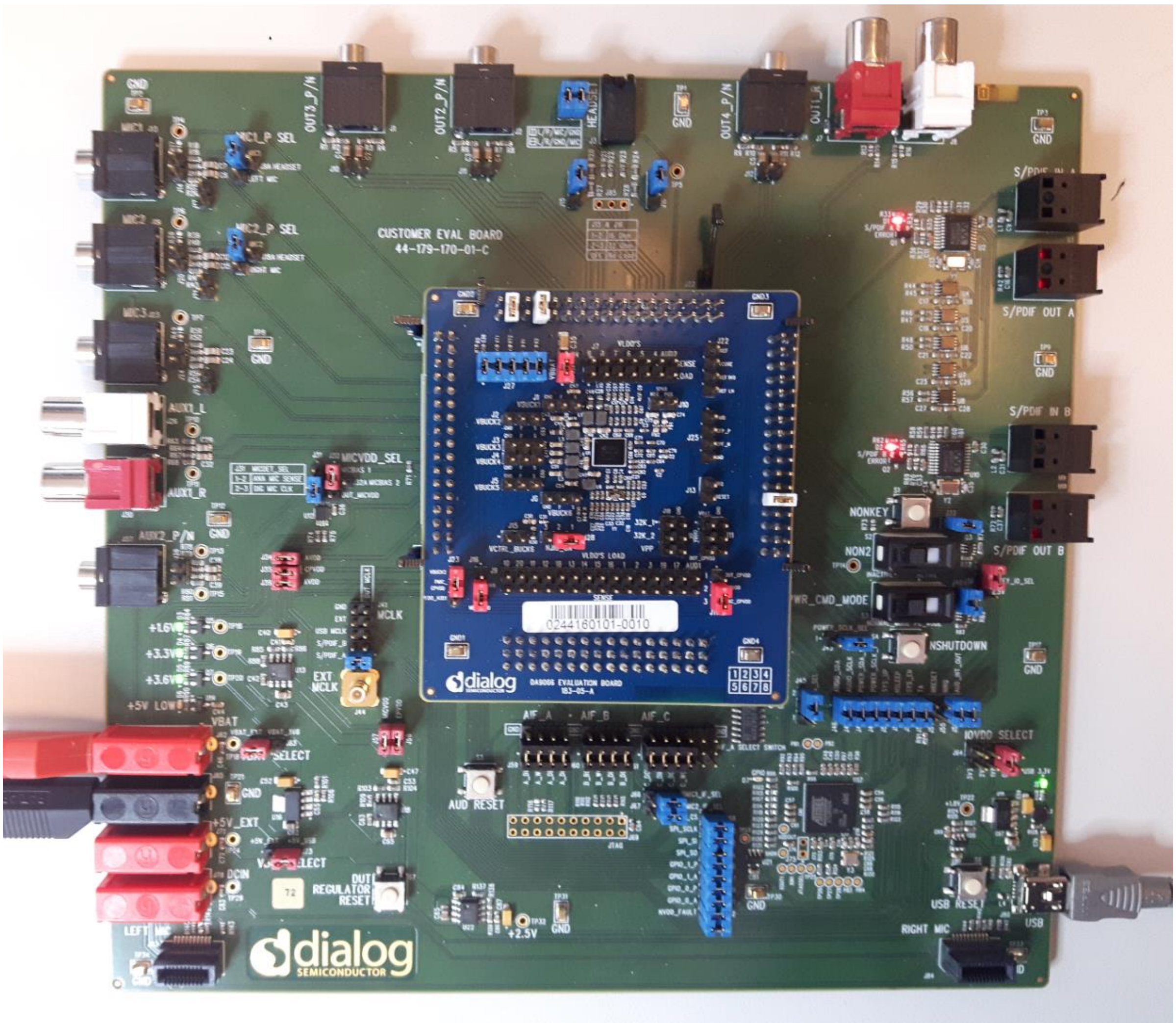
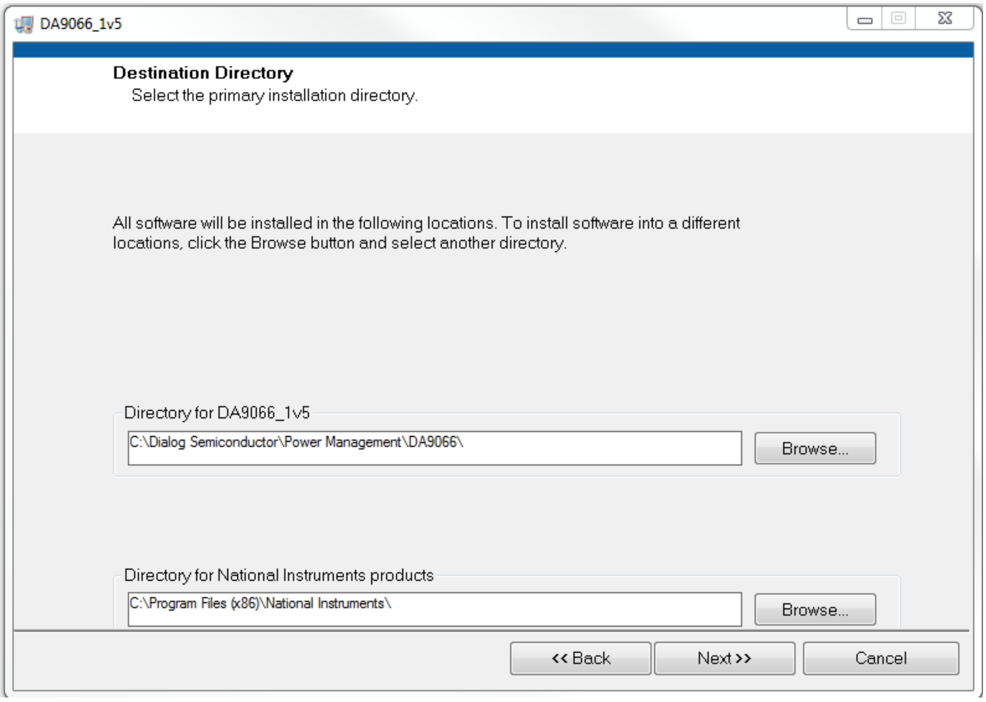


Figure 6: Default Link Locations

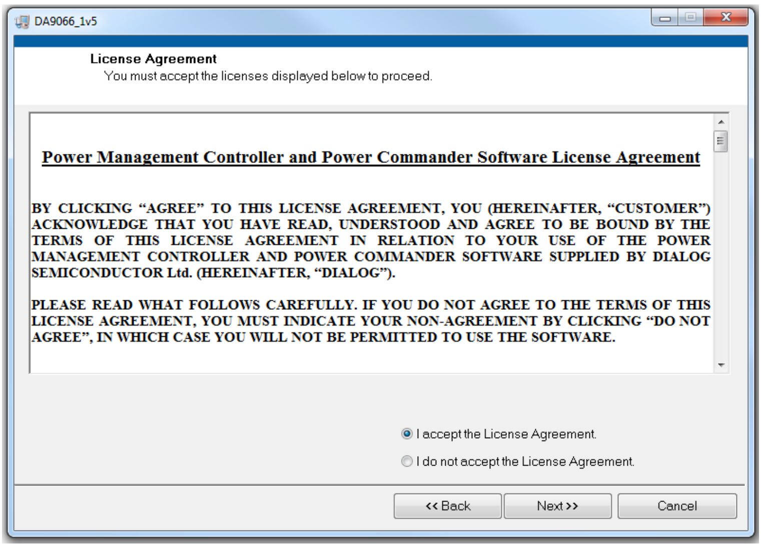
5 Software Installation

Plug the USB stick into a spare port on your computer and run the program **setup.exe** to start the automated script. This file can be found in the Software directory.

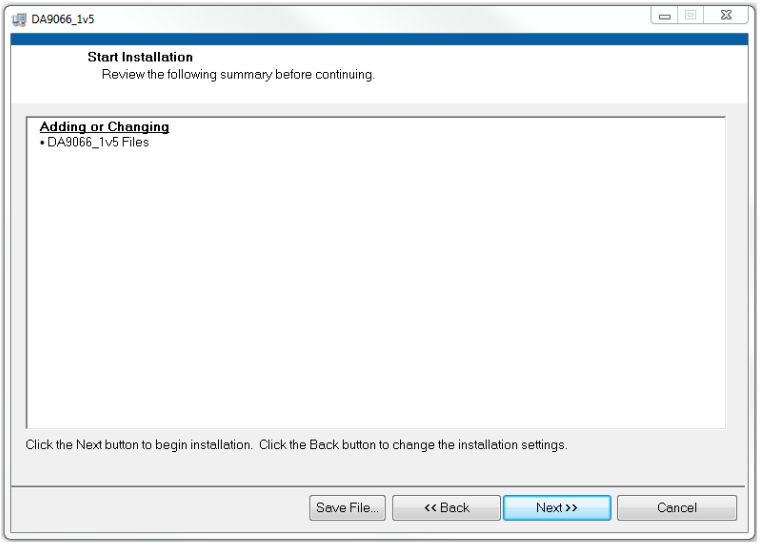
By default, the directory C:\Dialog Semiconductor\Power Management\DA9066 is used.



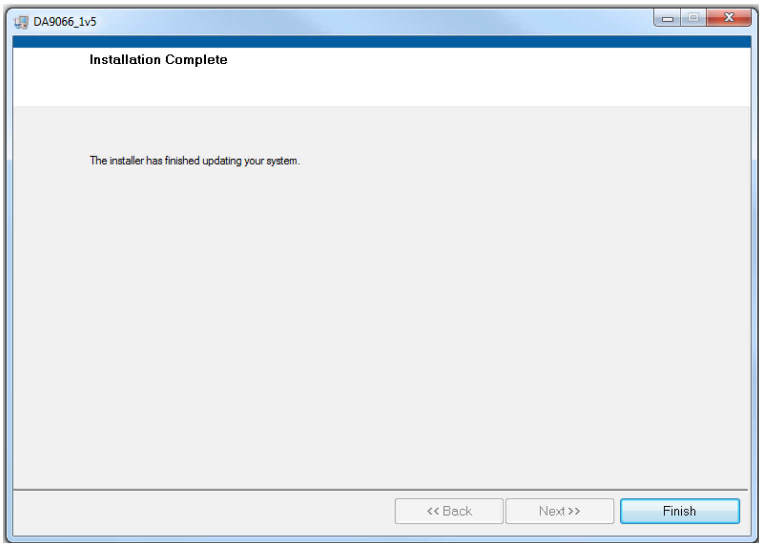
1. Click **Next** to accept the default software installation location.



2. Click the radio button to accept the software license agreements, then **Next** twice.



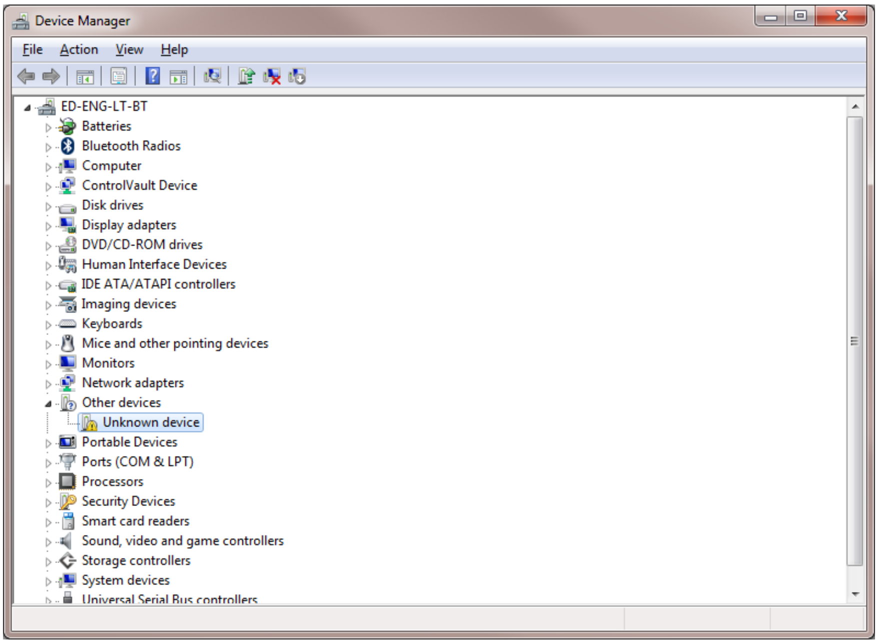
3. Click **Next** to begin the software installation.



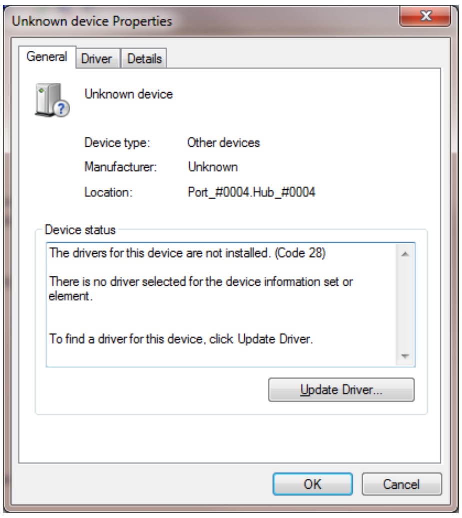
4. When the installer indicates it has finished updating, click **Finish** to complete the process.

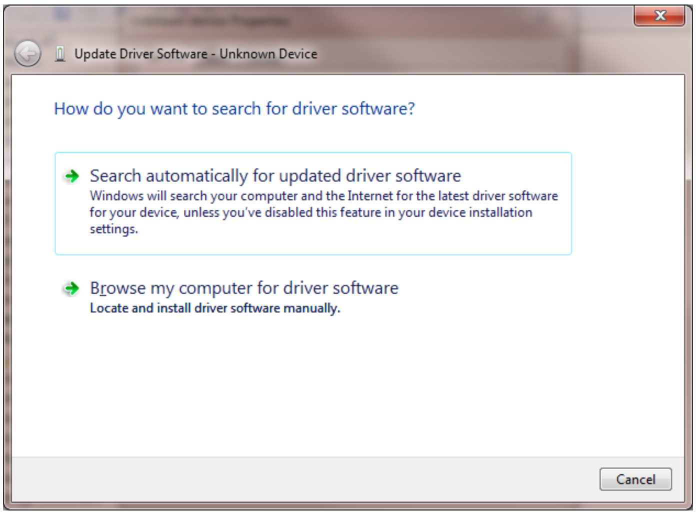
NOTE
After the installation has been completed you need to restart your computer.

5. Plug in the USB cable so that Windows detects the USB device. A prompt for the drivers, which should be automatically located in the **Driver_PID-1011** directory of the media, appears. If this does not happen automatically, open the Device Manager:

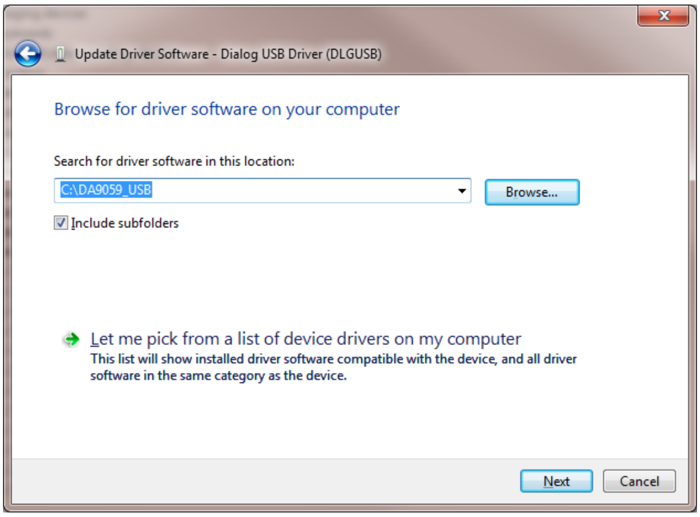


6. Double-click on the unknown Dialog device, and update the driver as shown:

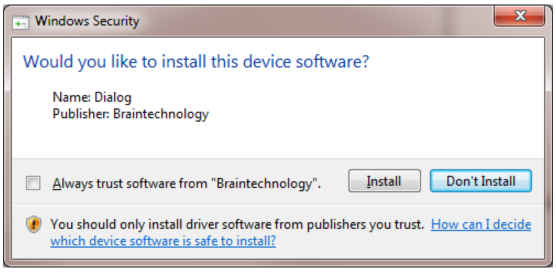




7. Click on **Update Driver** and choose **Browse my computer for driver software**.



8. Click **Browse** to locate the driver in the **DA9066_USB** folder on the memory stick.



9. In the **Windows Security** dialog, click **Install**.

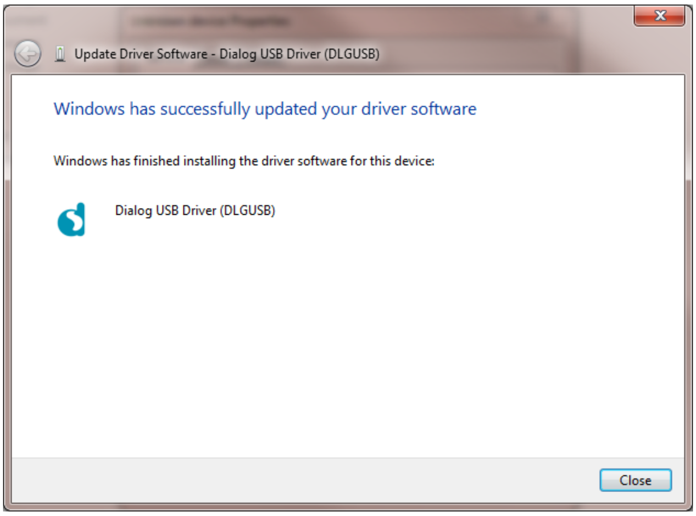


Figure 7: Successful Installation Procedure

The **Device Manager** tab now shows **Dialog USB Devices\Dialog USB Driver (DLGUSB)**.

6 Configuration Tab

Start the DA9066 GUI program by clicking the shortcut in the **Start** menu. The best PC display resolution is 1024 x 768 pixels or higher. Font size on the PC display should be Normal (95 dpi). A display size other than the recommended setting may affect the way in which the panels appear.

Make sure that the Power Commander switch (S3) is in position **PC_MODE** to select Power Commander mode. To start the device, plug in the USB cable. If the USB interface is correctly connected and operational, then the **USB OK?** LED is lit as shown in Figure 8 .

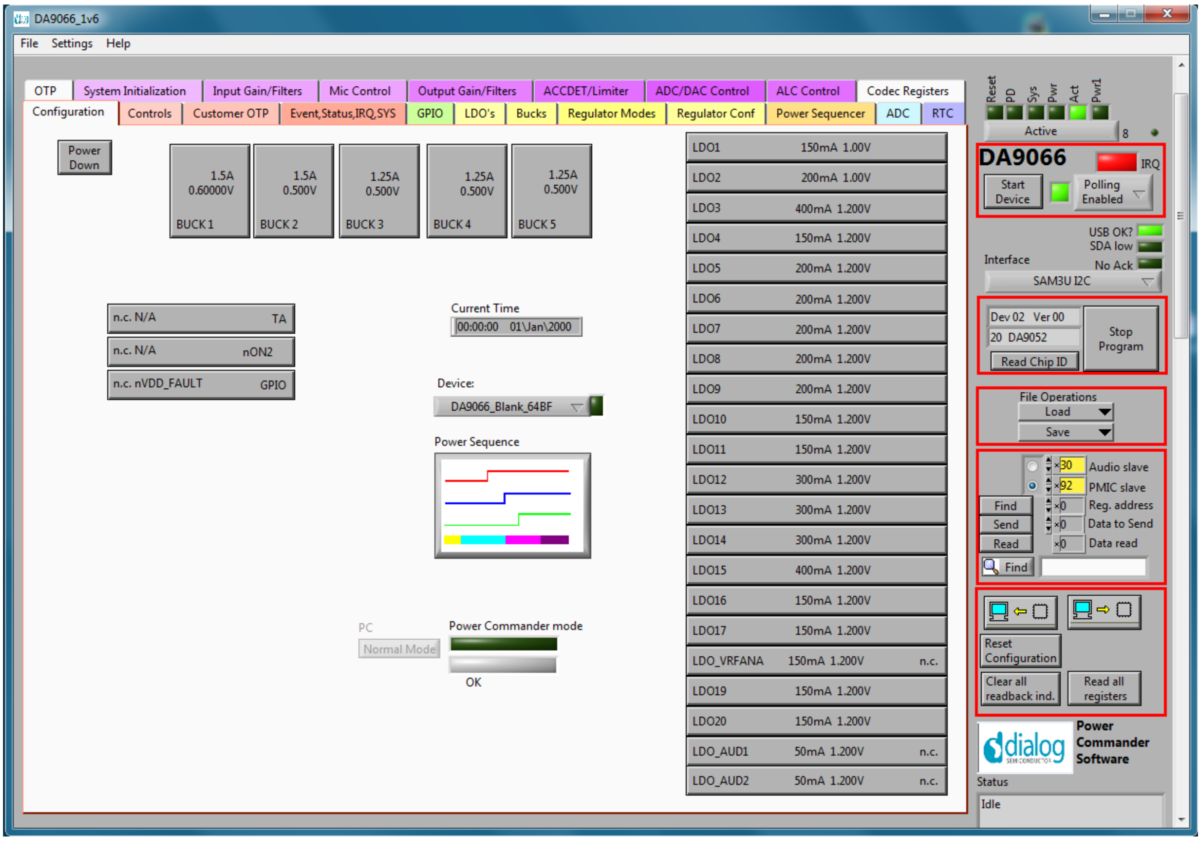


Figure 8: Initial Interface

The device is now in Power Commander mode and is waiting for the data from the template Project file (DA9066.ini) to be downloaded.

The Status LEDs at the top of the screen indicate the device status.

If the Reset LED is blinking yellow, it indicates that the device is not yet communicating via the I^2C interface. See Appendix A for more details.

If **Autostart** mode is selected in Settings (default), then pressing the **Start Device** button (which puts the device directly into ACTIVE mode) sends data and pulses the **nONKEY** control.

If **Autostart** is not selected, the **Download** button will be visible. Pressing this will progress the device from RESET mode to POWERDOWN mode. Further, depending upon the programmed startup mode, the device may progress automatically to ACTIVE mode or remain in POWERDOWN until a wake-up event is received.

Pressing the **Start Device** button toggles the **nONKEY** control. **Start Device** also commences the monitoring of device status, IRQ status and RTC at one second intervals, and loads the RTC and Alarm registers with the present local time and date.

Deselecting **Autostart** allows more options for evaluating wake-up conditions, but is more complicated to use.

The command button **Stop Program** ends the DA9066 program.

6.1 Configuration Tab Details

This screen is used to:

- select a suitable template file for the processor
- allow modifications to regulator alias
- store the modified file as a new project name

The aim of the configuration process is to arrive at a group of setup conditions, which will be permanently programmed into the production device to allow a startup configuration.

The definition of logic interfaces, LDO and buck startup voltages and timing, ADC alarm limits, startup conditions, and so on, are all set on their respective tabs using configuration mode from the **Settings** menu.

Please note that only changes made from this Configuration tab and using configuration mode are stored in the Project file (project.ini). Changes made to other registers on different tabs are not stored in the file and are considered temporary.

After loading a project, a temporary project file temp.tmp is copied from the project and all changes are made to this temporary file. The temporary file can then be saved as a new or existing project using the **Save...** menu item.

The supplied template files are made read-only so that they cannot be inadvertently overwritten.

A project file, which is a standard Windows ini file, can be imported into the program by opening it via the **Open File** dialog. If selected, a prompt is generated to copy it into the directory **C:\Dialog Semiconductor\Power Management\DAxxxx_Vx\data**. The copied file is then opened.

It is not recommended that the ini file be edited.

If the LED next to the **Device:** selection is amber, it indicates that there has been an unsaved change or changes to the device configuration. Select **File**, **Save project** or **Ctrl+S** to save the changes.

6.2 Power Sequence

Click on the Power Sequence Button to bring up the control panel.

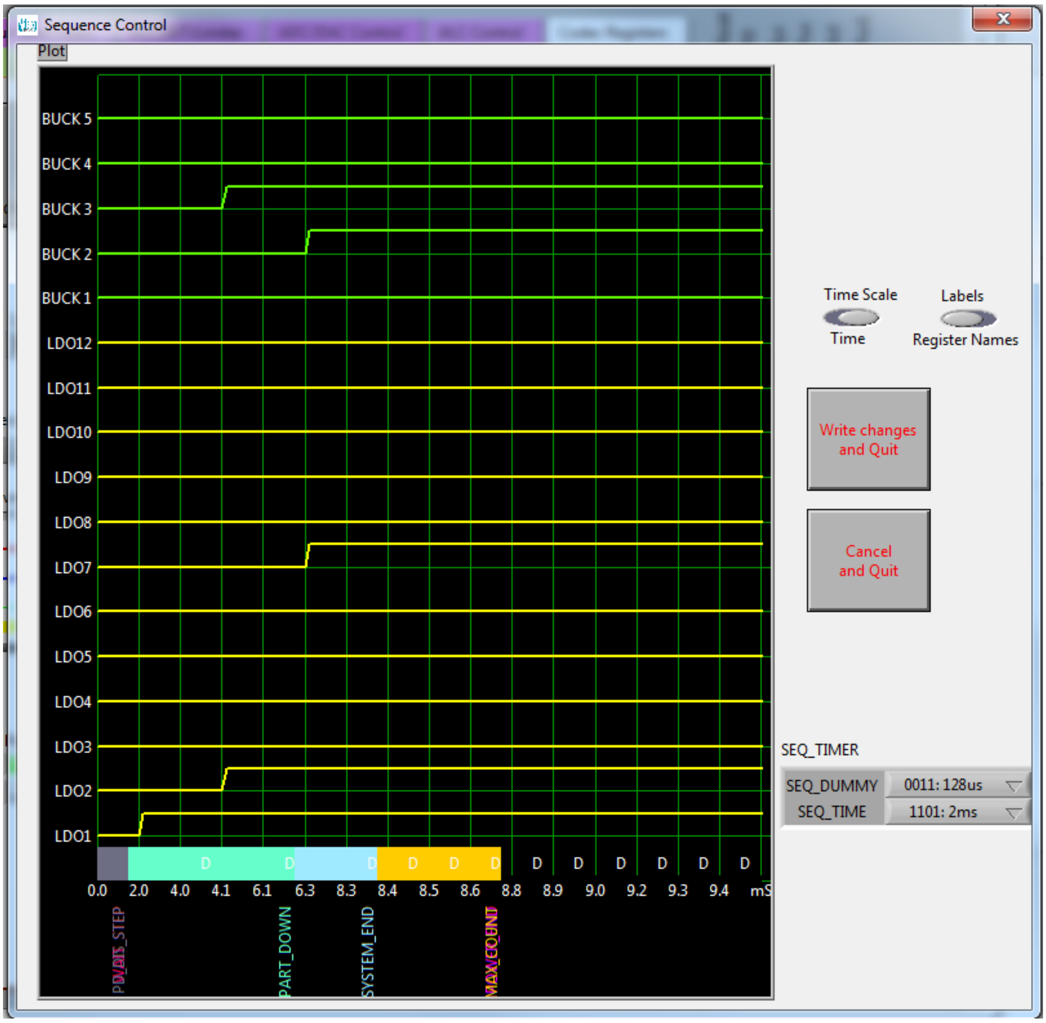


Figure 9: Power Sequence Control Window

This graph shows the relative timing of all the LDO and buck regulators, their placement in the slots, and the positions of the control markers. See the DA9066 datasheet [1] for details.

Changes to relative positions are achieved by clicking the appropriate edge and dragging it left or right.

The control markers (such as **System_End**) are changed by dragging the edge of the colored yellow band. Note that the system markers are shown in the middle of the slot to indicate that they complete at the end of the slot. Also note that it is possible for markers to lie on top of each other.

The Dummy slots are calculated automatically and marked with a “D”. Dummy slots are slots where no programmed transition takes place and whose duration is controlled by the **Seq_Dummy** timing control.

Any LDO or buck that is not used should have its transition set to Slot 0. Any unused regulators are shown as permanently low. Click on any part of the waveform to change this or drag the rising edge to zero to remove the regulator from startup.

Avoid placing multiple regulators into the same slot as this can cause greater than expected inrush currents.

The Power Sequence Control window options are:

Labels	Switches the labels on the left hand Y-axis between alias names and regulator names.
Time Scale	Switches the labels on the lower X-axis between slot numbers and calculated elapsed time.
SEQ_TIMER	Controls the slot duration for occupied slots and dummy slots independently. The effect can be seen when Time Scale is switched to **Time**.
Write Changes and Quit	Stores the changes in the project file and sets the appropriate control on the panel. Note that changes are not transmitted to the device at this time; changes are transmitted only when **Start Device** is executed after powering down the device to the RESET state.
Cancel and Quit	Closes the panel, but does not save the result in the project file.
	Exits **without making any changes**.

6.3 Download

This button writes the device with all the register changes made above if Power Commander mode is set and the device is ready for the download. The device signals this by holding pin nVDD_FAULT low.

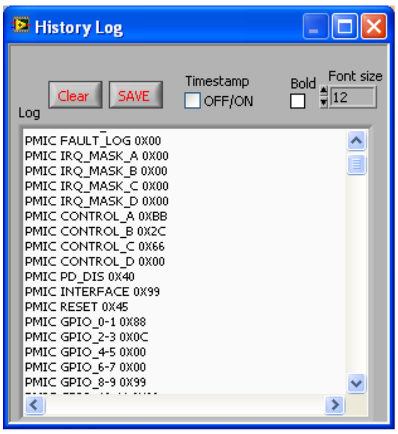
The download is made on the currently activated port of the device overriding any programmed mode until Power Commander mode is exited.

If the **Autoboot** configuration is selected, a second download is made to place the device in ACTIVE mode. If it is not selected, it will wait in power down mode for a wake-up event. A second download is then necessary to reach ACTIVE mode.

6.4 Menu Items

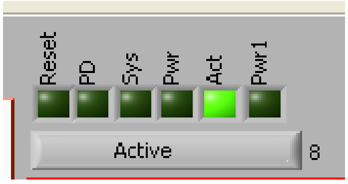
Table 3: Menu Items

Menu/Submenu	**Description**
File->	
New Project	Creates a blank project, not using a template, with all registers set to zero.
Open Project	Selects a project to open. Right-clicking on a filename allows editing, copying, and pasting. Otherwise this option is the same as selecting a project from the dropdown Device selector.
Save Project	Save the current temporary file with a new name, or replaces an existing filename.
Delete Project	Deletes the selected project. This should be used with some care, and is included to allow cleanup of several trial versions.

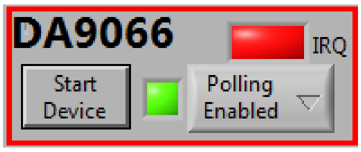
Menu/Submenu	Description
Check Project	This verifies that the project configuration file is complete. This includes all registers that the user may choose not to define an initial condition (“Don’t care”), and GP_ID registers. If any are listed as missing, the most convenient method to include these is as follows: Close the message popup. Select **Change Configuration Register** control on white **Configuration** tab. Select **Copy Current Panel Values**. Select **Save and Quit** From the **File** menu, select **Save project**. To recheck, from the **File** menu, select **Check Project**.
Check Trim	This feature is no longer required for DA9066, as it is a mature product. (This checks to see if trim values are stored in the device. Samples are normally delivered tested and trimmed. If this is the case, a file trim.txt is generated which ensures that correct trim values are used instead of default values for all subsequent operations. This ensures that best accuracy is achieved during evaluation.)
Exit	Closes the program. If there are unsaved changes a dialog box is displayed.
Settings->	
Autostart	Allows single button startup of the device.
Binary Indicators	Changes all indicators from Hex to binary mode if ticked.
Dialog Use->Test Pages	Allows view of internal test pages (only for Dialog Semiconductor use). A password is necessary for access.
Dialog Use->Ignore NVDDFAULT	Allows software to operate if NVDDFAULT signal is not available on some external PCBs (only for Dialog Semiconductor use).
Dialog Use->Enable High Currents	As the socket on the EVB will not support currents greater than 900 mA, charger settings are not available using this EVB. If an external soldered device is in use, with a suitably sized inductor, this item allows access to the higher currents.
Reg Names in File	If activated, uses register names instead of numbers in text files.
History Log  	This enables a popup dialog which logs all manual and file activity. This dialog is extremely useful to capture operations for later scripting, or to verify and understand schematic operations on the codec. This log is interactive. Comments can be added using “//” either as separate lines or inline. Lines can be deleted or modified. The entire contents can be cleared or saved to a file. The log also receives the results from read operations in a text file. The History Log window can be resized and repositioned, and the font size and bold type can be selected. A timestamp is optional.
Help->	
Show Context Help	Opens floating information which updates with information on each control under the mouse cursor. This should be left enabled by default to receive information and comments on all registers.

Menu/Submenu	Description
User Guide	Opens a PDF copy of this document (a suitable PDF reader must be installed).
About	Displays version information and contact details.

6.5 Status and Controls



Device Status information indicates the current mode of the device. A flashing yellow indicator on Reset indicates that the status is invalid, probably due to communication not being established yet. Device status, ChipID, IRQ status, and RTC are read at one second intervals.



Start Device
This button initializes the device (by pulsing ONKEY low) and providing the data downloads automatically.
At the end of startup, a file Host_configuration.txt is loaded and run to emulate the host processor writing immediately to the device.
Device status, ChipID, IRQ status, and RTC are read at one second intervals

Polling Enabled

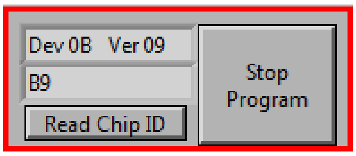
If **disabled**, Chip ID, IRQ status and RTC readback are suppressed. This is used to force the communication over the bus to be silent.
If this is set to **automatic**, the program will only poll the device while the application is the topmost window. If obscured by another program or window, polling is disabled.

LED

If the device is active this is green, else red.

IRQ

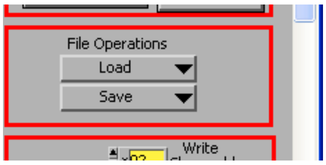
This is an indicator of interrupt status, visible from all tabs. Pressing this LED clears the interrupt events.



Indicates version and trim status when the device is active. When inactive, version and trim status will not be correct.

Stop Program

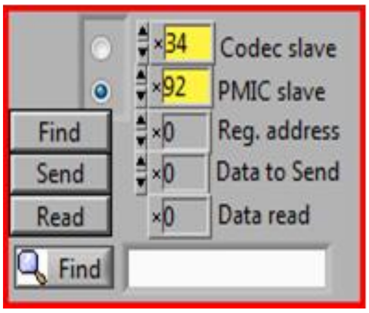
This terminates the program but leaves it inactive on the screen. If there are unsaved changes a dialog box is displayed.



Load: Opens a dialog box to select, view, copy or re-name a file. **Load Codec file** opens a dialog box to allow selection of a codec setup file in the **\Codec Setups** directory.
Save: Save current panel state to text file. Selecting **Save Codec file...** saves only the codec registers. Selecting **Register Dump** option saves current register values to the text file.

Note the difference between **Save** and **Register Dump**. **Save** dumps the contents of all panel controls to the file (a save state operation), while **Register Dump** reads the device contents (including status registers) into the file.

Interface: Select between USB I^{2}C control, offline mode and uWire/SPI. Switching to offline, then back to USB reinitializes the USB interface.
USB OK?: Indicates that the USB is OK and communicating.



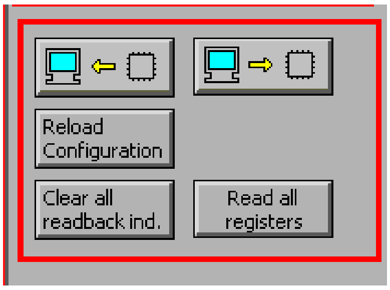
Slave Address: Set slave address of device. This affects all I^2C communications. In Power Commander mode this should be 0x92. In normal mode it should match the port in use (Register INTERFACE).
Note that this is the 8-bit value (92h for Write, 93h for Read).

Send: Send a single byte data to I^2C device using Slave Address, Register Address, and Data to Send.

Read: Read single byte data from I^2C device using Slave Address, and Register Address.

Find: Find a control matching a full or partial register name, a control bit name, a register number (for example, R23 or 17h). Pressing **Find** repetitively steps through all matching items.

NOTE
If **PMIC slave** address is set to a value other than the PMIC address such as 0x92, then this tool can be used to control or read any other device on the I^2C bus. It can therefore be used for generic I^2C debug.



Synchronize Panel from Device
Reads all the register contents of the device and updates the panel to match.

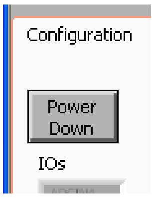
Synchronize Device from Panel
Writes all the device registers to match the panel (refresh operation).

Reload Configuration
Resets registers to values specified in configuration file for the PMIC section and default values for the codec.

Clear all readback indicators
Sets all readback indicators to 0.

Read All Registers: Read all registers, comparing with the panel controls.

6.6 Discrete Controls



Power Down
Invokes a Power Down by sending DEEP_SLEEP Register bit (CONTROL_B bit 6) to the device.

The controls on the Configuration tab, and repeated on the GPIO and Event, Status, IRQ, SYS tabs, indicate the logic levels being applied to DA9066 by the USB interface.

The grayed-out controls are indicators. They show the level at the interface, but do not drive it.

The control is only active when the GPIO is programmed as a GPI input, or the default mode is an input.

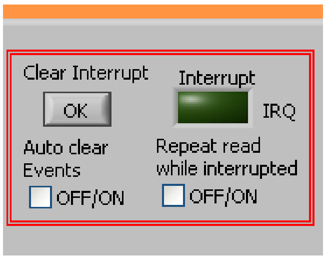
The names of the controls are read from the alias names of the GPIO, or the GPIO number if no alias is present.

The controls will only have an effect if the appropriate jumpers on the board are in the default positions.

6.7 Event,Status,IRQ,SYS Tab

This screen indicates the status of the device, wake-up and interrupts events, and provides the ability to mask events from causing an interrupt.

Note that masking an interrupt does not prevent the event from being flagged. It is assumed that the application software will gate events with the mask register.

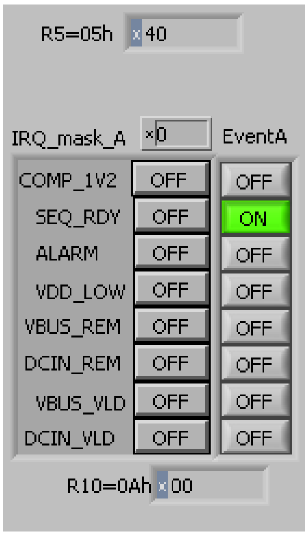


Interrupt indicator
This is not active if polling is disabled.

Pressing **Clear Interrupt** writes all 1s to the Event registers to clear the interrupt.

If the **Auto clear Events** control is set, this is done automatically. The Interrupt pulse is very short, but the system is ready for interrupt without manual intervention.

If the **Repeated read** control is set, the software will read event and status registers repeatedly while the **Interrupt indicator** is active.



The Event Register is labelled with a register number in decimal and its hexadecimal equivalent.

Hex equivalent of mask register bits.

Name of mask register bits, and also event names.
Event bit set. Press to clear and reset.

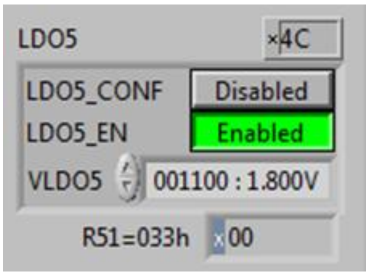
Readback of mask register, visible as hex or binary by using **Binary Indicators** in the **Settings** menu.

6.8 Control Tabs

The tabs GPIO, Customer OTP, LDOs, Bucks, Power Sequencer, ADC, and RTC, all have the same format.

Each register cluster comprises a control with a mixture of Boolean toggle buttons, multi-value ring controls, or slide controls; a hex indicator showing the total equivalent value, a readback indicator showing the current contents of the register. The readback indicator is labelled with the register number in both decimal and hex.

Readback indicators can be switched individually by clicking on the **x** to decimal, octal, hex or binary, or they may all be changed at once between hex and binary by the **View**, **Binary Indicators** menu item.



Hex Indicator

Boolean control Bit 7
Boolean control Bit 6

Ring value control Bits 0-5

Readback Indicator

Changing a register control immediately sends the value to the selected register, and reads the value back again, comparing the result with the hex indicator. Note that all bits of the register are sent at once. Therefore, this does not allow changing multiple bits simultaneously.

If the readback indicator is red, it indicates that the current value does not match. This might be because the value has not been downloaded yet, or because the supply has been interrupted.

NOTE
Changes made to registers on these screens are not saved into the project file, they are purely temporary changes.

6.9 Codec Tabs

The System Initialization, Input Gain/Filters, Mic Control, Output Gain/Filters, ACCDET/Limiter, ADC/DAC Control and ALC Control tabs all have the same format.

Each register cluster comprises a control with a mixture of Boolean toggle buttons, multi-value ring controls, as well as a hexadecimal indicator showing the total equivalent register value and a readback indicator showing the current register settings. The Event Register is labelled with a register number in decimal and its hexadecimal equivalent.

The readback indicator readings can be switched individually to decimal, octal, hexadecimal or binary by clicking on the **x**, or they may all be changed at once between hex and binary by the **Settings**, **Binary Indicators** menu item.

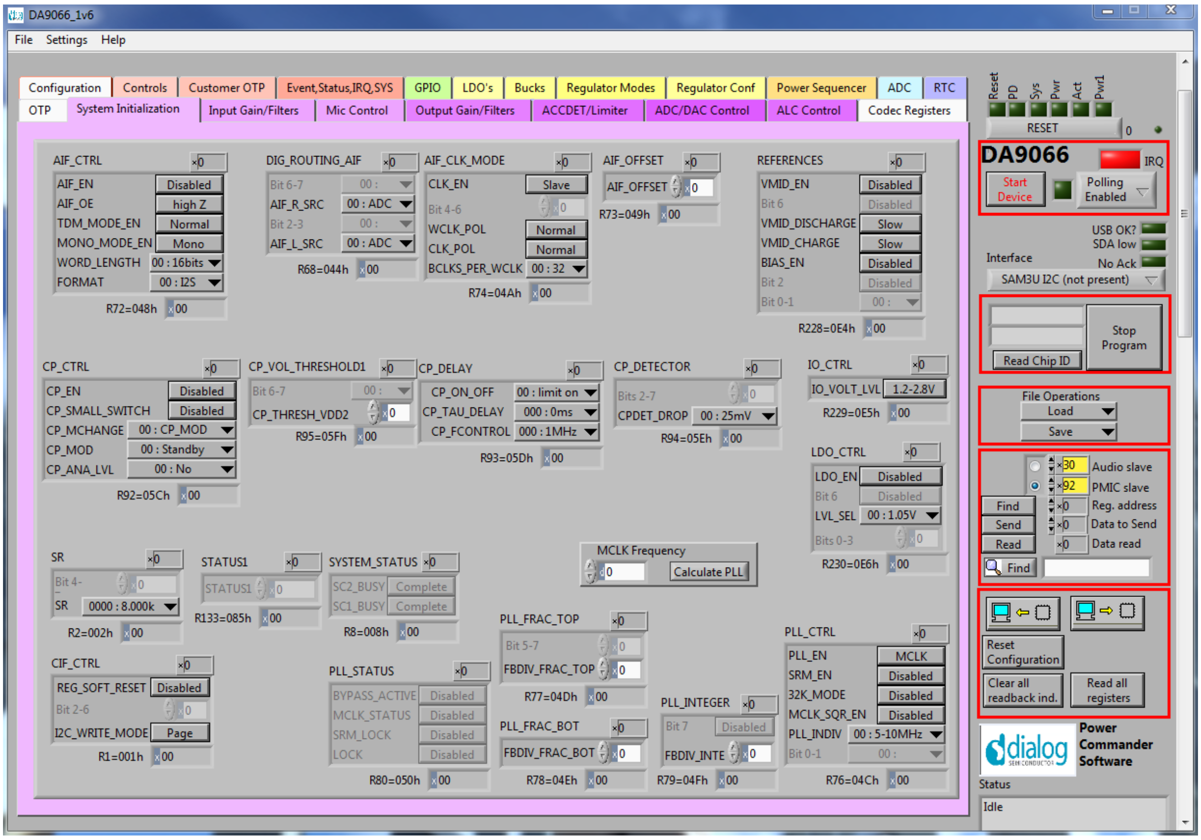


Figure 10: Codec System Initialization Tab

6.10 Codec Register Tab

This screen presents the codec registers in a single table. The table is interactive, both receiving changes made in other controls, and passing values to other controls if changed in the table. In some conditions this register view may be useful.

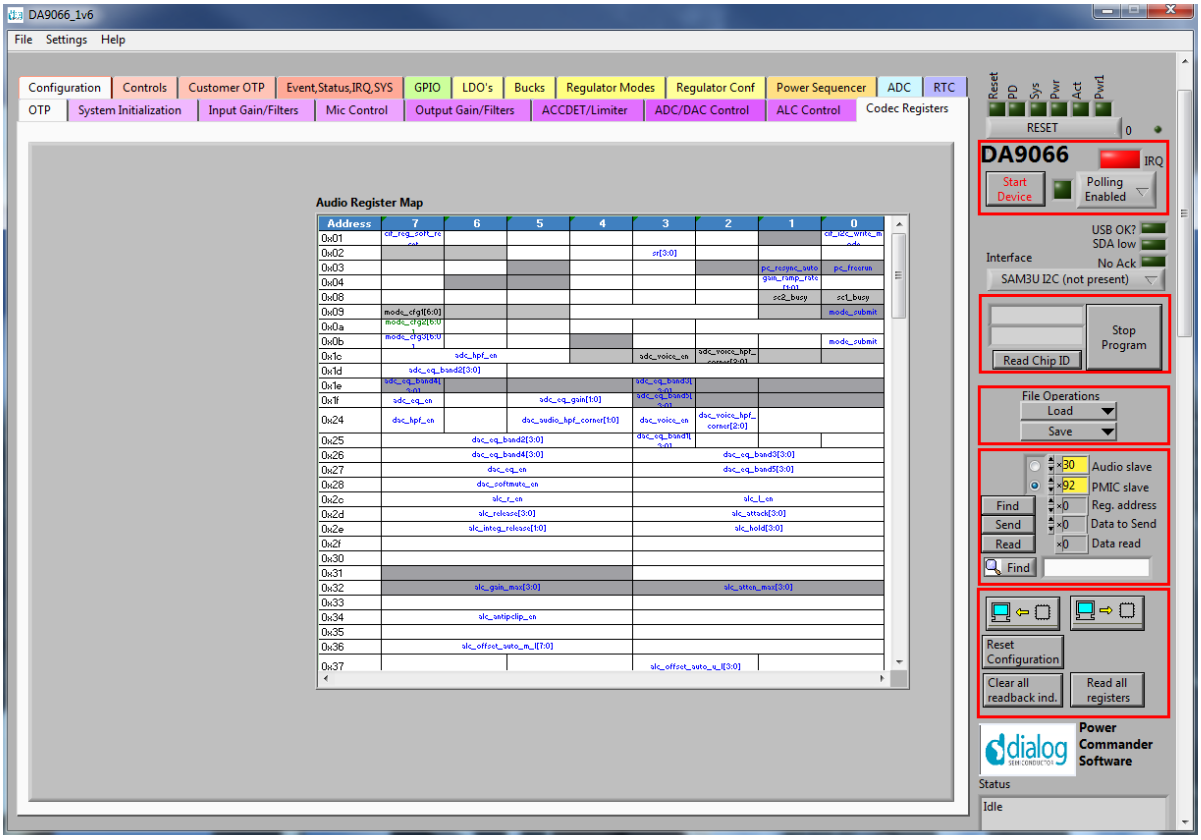


Figure 11: Codec Registers

6.10.1 OTP Programming

The One Time Programmable (OTP) registers in the variant DA9066-00 are blank, and allows the user to set default startup and voltage settings.

All DA9066 devices, including DA9066-00 are shipped after production testing. They have been trimmed for optimized performance.

⚠	CAUTION

Please note that these are One Time Programming registers. Once set they cannot be erased. If mistakes are made the sample may not be usable and may need to be discarded.

The existence of Power Commander mode makes many uses of OTP programming redundant. System development can be achieved very rapidly using this mode. Programming the OTP should be the final step in verifying that a programmed part will achieve the system objectives, and that it is intended to solder the programmed part onto the final system board.

It is necessary to start up the DA9066 GUI with the board powered and a connection to the PC via the USB cable. A 7.5 V supply should also be available to connect to the VPP pin of the daughter board when programming the OTP.

The evaluation board should be powered from an external power supply set to 3.8 V applied to the VBAT terminal during OTP programming procedures. We do not recommend self-powering of the board due to the high risk of incorrect device insertion.

If it is decided to continue with OTP programming, the following procedure should be used.

1. From the **Configuration Panel** click the **OTP** tab.

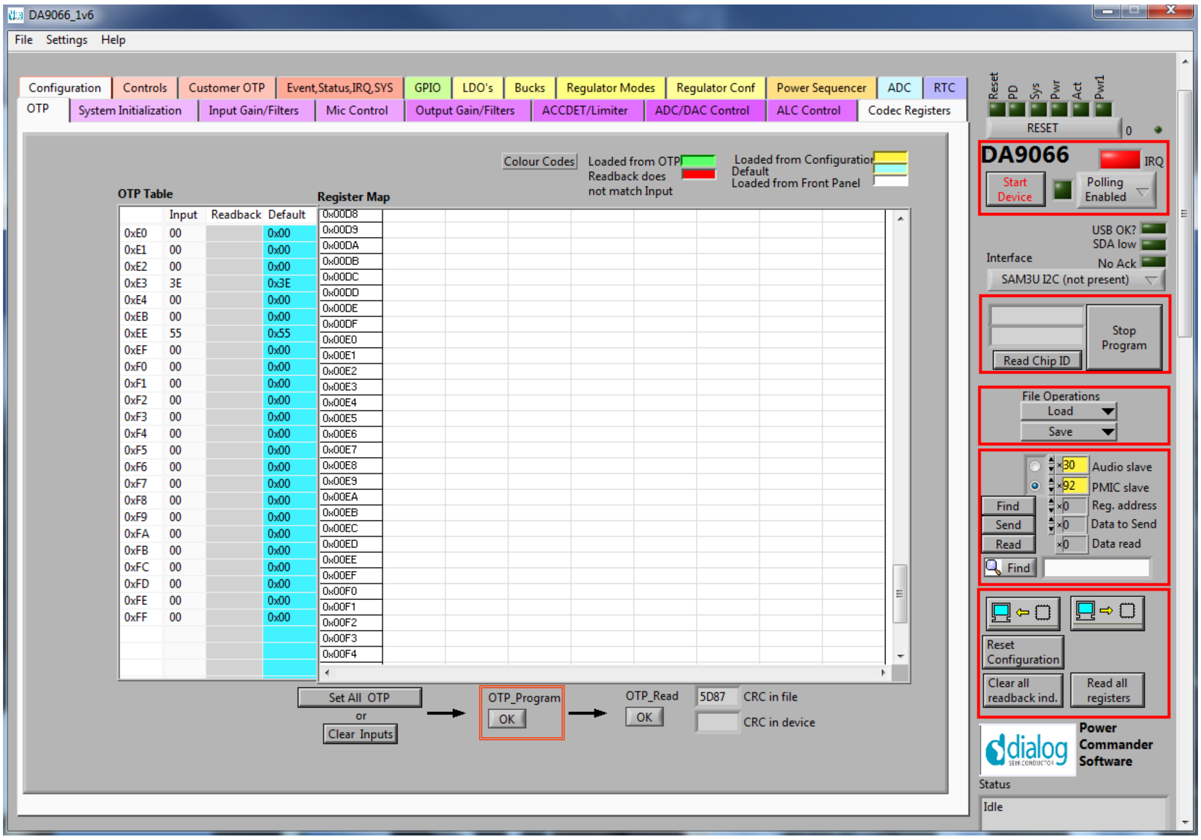


Figure 12: OTP Tab

2. Apply 7.5 V to the VPP header on the daughterboard.

NOTE
The device should be in **Power Commander** mode with the slide switch in the right-hand position.

3. Press **Start Device** to initialize the device into the active mode.
4. Press **Set All OTP**.

NOTES
This will read the configuration file, load the registers and apply defaults to the other registers (trim and internal configuration). The **Readback** column will turn green to indicate the current contents (if any) of the OTP, not the register contents. The OTP_CONF_LOCK bit is treated in a special way. it is only read from OTP following a Power-On-Reset (POR). This means that immediately after programming, this bit will not show the programmed value. The GUI takes this into account when verifying that the programming has been successful. Immediately after programming **CRC in device** matches **CRC in file(unlocked)**. After power cycling the device it is possible to perform an OTP read and verify that **CRC in device** now matches **CRC in file**. The numbers in the second column, labelled **Input**, are the register results of the device loading performed previously. Verify that these values are correct by reference to the specification. If not, and the reason is unclear, it may be necessary to send the configuration file to Dialog Semiconductor Applications for debugging assistance.

5. Press the **OTP_Program** button once.

If the programming has been successful, a green popup appears indicating correct programming. The value in box **CRC in device** matches the value in **CRC in file**. If it has not been successful, a red popup appears. Check first that the 7.5 V supply is present. If it was present, compare the **Input** and **Readback** columns of the table to try to ascertain the problem. Any differences will be highlighted in red. All **Readback** values should be green when programming is successful.

A few values will be light green, and have a value different from the **Input** column. This is because the device does not hold static values in the registers and they are dependent upon operating mode. Light green is still a matching value and is normal.

If any register readback values are red, it indicates that the programmed value does not match the desired value in the input column. This is normally due to one of two reasons:

1. The device has been previously programmed with a configuration different to the currently selected one.
2. One of the registers has been programmed twice, possibly during incremental programming.
   a. Click the **OTP Read** button to allow re-reading of the registers.

6.10.2 OTP Programming of Further Devices

Having successfully followed the procedure in section 6.10.1 you can continue to program another device using the following sequence:

1. Remove 7.5 V VPP supply.
2. Remove 3.8 V VBAT supply.
3. Remove programmed device.
4. Insert new blank device.
5. Apply 3.8 V VBAT supply. Ensure the supply current is <10 mA.
6. Apply 7.5 V VPP supply.
7. Click **Start Device**.
8. Select **Set All OTP**.
9. Click **OTP_Program**.

Under some circumstances it may be desirable to perform this procedure incrementally, for instance, when all registers do not need to be programmed at the same time.

It is possible to load only a limited number of registers. If the input value is zero no change will be made.

To do this, select **Clear Inputs** instead of **Set All OTP**. This will set all registers to zero. The device may power down, but it will maintain communication and can be programmed.

Type the hex value for the register to be changed into the appropriate line on the table. If the OTP cannot be programmed to this value, due to existing content, the **Readback** box will turn red and indicate the value that will be achieved.

NOTE
A value of **1** cannot be reprogrammed to a **0**.

Press **OTP_Program** and OTP_Read will be performed automatically.

The latest content of the OTP is displayed, which should include the modified value.

Appendix A Troubleshooting

This section is an aid to resolving known issues.

A.1 Software Issues

The USB device should install automatically and without difficulty. Make sure that the installation finds and uses the driver contained on the USB stick.

If the program is started before the USB interface board is plugged into the evaluation board, the program defaults to the offline mode. This can be useful for learning about the software in a desk environment without the hardware attached. If the board is subsequently attached, move the Interface control to **USB**. Make sure the USB is connected and then restart the program.

The software can have unpredictable effects when used in conjunction with a USB hub. It is recommended that a direct connection is made to the USB interface board.

The software is optimized for a display resolution of 1024 x 768 pixels or greater, with fonts set to normal (96 dpi). Unpredictable display effects may occur when large fonts (120 dpi) are used. This can be changed by right-clicking on the desktop, select **Properties**. Select the **Settings** tab, select **Advanced**, then **Normal size** from the drop-down box.

If communications are apparently lost, first click the **Start Device** button. This attempts to make the device go active. Also switching the **Interface mode** to **Offline**, then back to **USB** can reinitialize the USB interface. Alternatively, unplug the USB then reconnect so that the software detects it and reinitializes.

A.2 Hardware Issues

Most hardware problems can be traced to incorrect jumper positions. Carefully check jumper positions, compare them with the default positions in Figure 6. Use the jumper table and the board schematic as a guide to the jumper functions and locations.

Many problems can be traced to the Power Commander switch position. This should be in the right-hand position for **Power Commander mode**. Also check the position of jumper J33 (nONKEY).

Revision History

Revision	Date	Description
1.0	04-Jul-2017	Initial version.
1.1	16-Feb-2022	Rebranded to Renesas.

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.

DA9066 GUI and Evaluation Board

Important Notice and Disclaimer

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