

UM12410

PCA9422-EVB evaluation board user manual

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User manual

Document information

Information	Content
Keywords	PCA9422, EVB, EVK, PMIC, RT500, RT600, RT700
Abstract	This user manual provides guidelines on how to use the PCA9422-EVB evaluation board.



1 Introduction

This document is the user manual for the PCA9422-EVB evaluation board. This document is intended for the engineers involved in the evaluation, design, implementation, and validation of multi-channel power management integrated circuit PCA9422.

The scope of this document is to provide the user with information to evaluate the multi-channel power management integrated circuit PCA9422. This document covers connecting the hardware, installing the software and tools, configuring the environment, using the kit and making appropriate measurements.

1.1 PCA9422-EVB (WLCSP) Evaluation Board

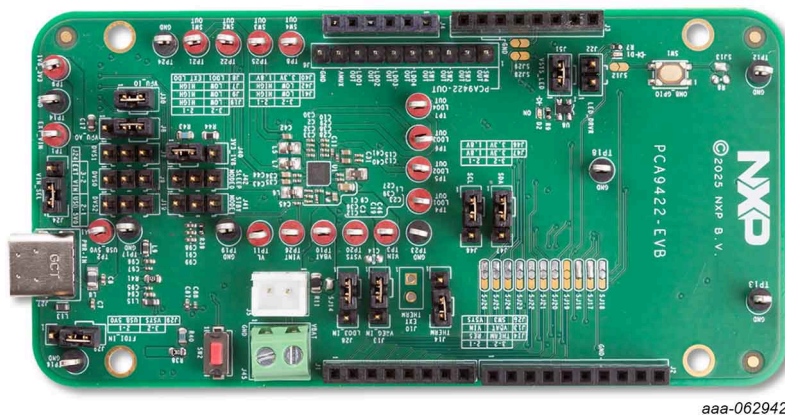


Figure 1. PCA9422-EVB evaluation board

2 Finding kit resources and information on the NXP web site

NXP provides online resources for evaluation boards and its supported device(s) on <https://www.nxp.com/>.

The information page for the evaluation boards are at <https://www.nxp.com/PCA9422-EVB>. The information page provides overview information, documentation, software and tools, parametrics, ordering information and a **Getting Started** tab. The **Getting Started** tab provides quick-reference information applicable to these evaluation boards, including the downloadable assets referenced in this document.

3 Getting ready

3.1 Kit contents

The kit contents include:

- Assembled and tested PCA9422-EVB evaluation board in an anti-static bag
- Available evaluation board revisions:
 - SCH Rev F1 includes the PCA9422B PMIC version, operating all buck regulators at 4 MHz.
 - SCH Rev F2 includes the PCA9422M PMIC version, operating all buck regulators at 2 MHz.
- USB-C Cable
- Spare jumpers

3.2 Required equipment

To use this kit, the equipment needed is:

- 1-cell Li-ion Battery
- 5.0 V power supply or USB with enough current capability (VIN requires 1.2 A or above and VBAT requires 3.2 A or above for maximum power output)
- PCA9422 GUI installed on a Windows PC
- Multimeters to measure regulator outputs or other voltages
- Oscilloscope (optional)
- USB enabled computer running Windows 7, 8, or 10

4 Getting to know the hardware

The PCA9422 is a highly-integrated power management IC (PMIC), targeted to provide a full power management solution for low power microcontroller applications or other similar applications.

The device consists of a linear battery charger capable of charging up to 640 mA current. It has an I²C programmable constant current (CC) and constant voltage (CV) values for flexible configuration. Various built-in protection features such as input overvoltage protection, overcurrent protection, thermal protection, etc. are also provided for safe battery charging. It also features JEITA compliant charging.

The device also integrates three step-down DC/DC converters (bucks) which have I²C programmable output voltage. All buck regulators have integrated high-side and low-side switches and related control circuitry, to minimize the external component counts, a pulse-frequency modulation (PFM) approach is utilized to achieve better efficiency under light load condition. Other protection features such as overcurrent protection, under-voltage lockout (UVLO), etc. are also provided. By default, the input for these regulators is powered from either VIN or VBAT, whichever is greater.

One ultra-low quiescent Buck-Boost converter is designed to power system peripherals that require voltages higher and/or lower than the battery voltage, it seamlessly transitions between buck, buck-boost, and boost modes, minimizing discontinuities and subharmonics in the output voltage ripple.

In addition, four on-chip LDO regulators are provided to power up various voltage rails in the system. One LDO is for SNVS core power supply, two 200 mA NMOS LDOs with load switch feature are capable of regulating to low output voltage from buck regulator output. One 200 mA PMOS LDO is purposed to supply power to microcontroller or peripheral devices.

Other features such as FM+ I²C-bus interface, device enable, interrupt signal, etc. are also provided.

The chip is offered in 2.90 mm x 3.00 mm, 7 x 7 bump, 0.4 mm pitch WLCSP package.

4.1 Key features

- Linear battery charger for charging single cell Li-Ion battery
 - 26 V tolerance on VIN pin
 - Programmable input OVP (5.5 V)
 - Programmable constant current (up to 640 mA) and pre-charge low voltage current threshold
 - Programmable constant voltage regulation
 - Programmable automatic recharge voltage and termination current threshold
 - Built-in protection features such as input over voltage protection (OVP), battery over current protection (OCP), thermal protection
 - JEITA compliant
 - Battery attached detection
 - Over-temperature protection
- Three step-down DC/DC converters
 - Very low quiescent current
 - Programmable output voltage
 - SW1: core buck converter, 0.4 V~1.975 V output, 6.25 mV/step, up to 500 mA
 - SW2: system buck converter, 0.4 V~3.4 V output, 25 mV/step, up to 500 mA
 - SW3: core buck converter, 0.4 V~1.975 V output, 6.25 mV/step, up to 500 mA
 - Low power mode for extra power saving
- One Buck-Boost converter
 - Ultra-low quiescent current
 - High-efficient Boost mode

- Seamlessly transition between Buck, Boost and Buck-Boost modes
- 2.5 V~5.5 V input and 1.8 V~5.0 V output, 25 mV/step, up to 500mA
- Four LDOs
 - Programmable output voltage regulation
 - LDO1: always-on LDO, 0.8 V~3.0 V output, 25 mV/step, up to 10 mA
 - LDO2: system LDO/Load switch, 0.5 V~1.95 V output, 25 mV/step, up to 200 mA
 - LDO3: system LDO/Load switch, 0.5 V~1.95 V output, 25 mV/step, up to 200 mA
 - LDO4: LDO, 0.8 V~3.3 V output, 25 mV/step, up to 200 mA
- 1 MHz I²C-bus target interface
- -40 °C to +85 °C ambient temperature range
- Offered in 7 x 7 bump-array WLCSP

4.2 Board description

Figure 2 describes the main blocks on the board.

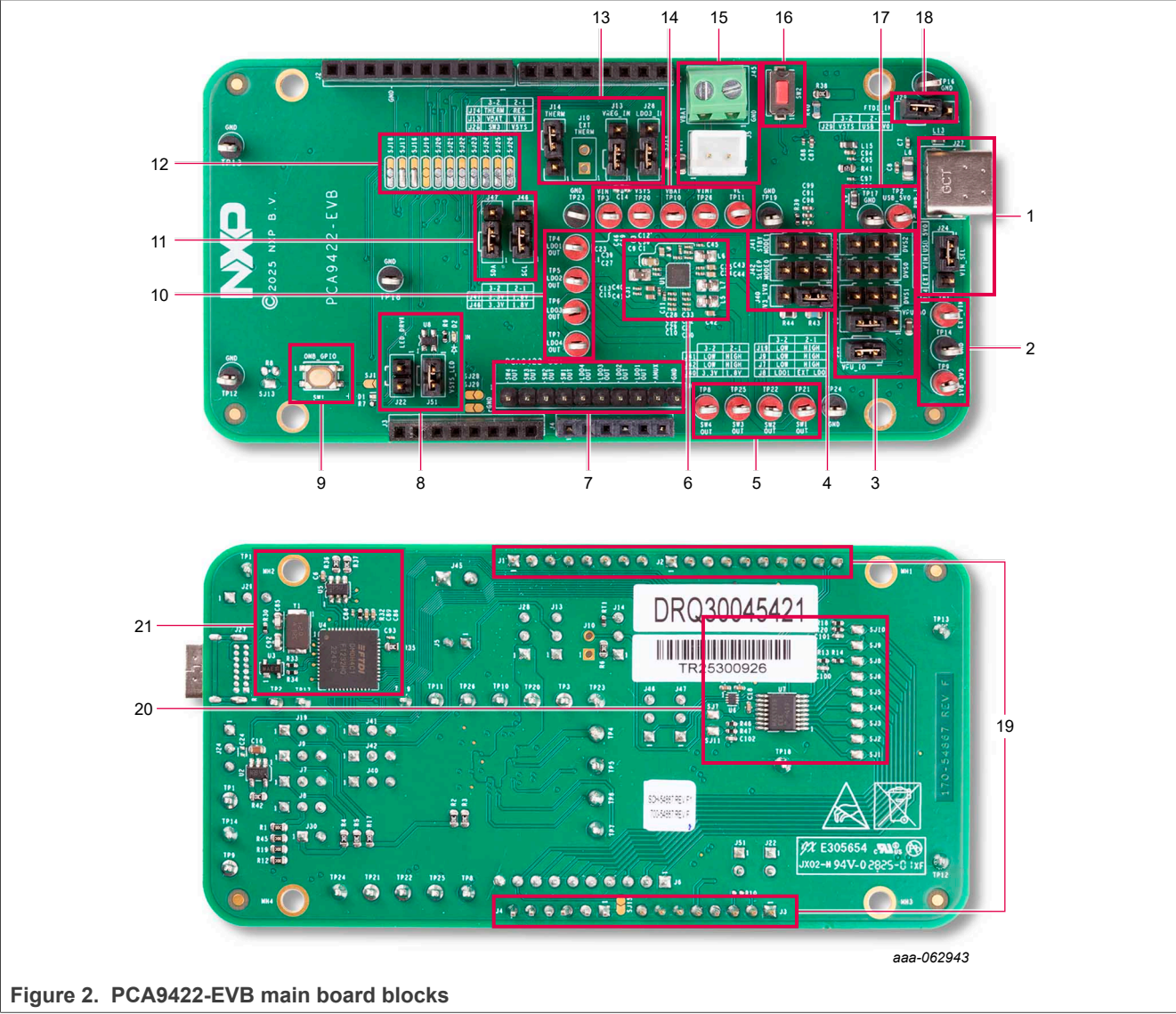


Table 1. Board description

Number	Block	Description
1	USB-C input	5 V USB power supply & communication port for PCA9422B
	VIN_SEL	Vin selection, 5 V from external power supply or from USB
2	Ext PS	External 5 V supply input
	Ext LDO	On board LDO output voltage test point
3	DVS_CTRL	Logic voltage selection for DVS0, DVS1 & DVS2
	Voltage pull ups	Voltage Logic & voltage level selection for interrupts, run modes, DVS and I ² C
4	RUN mode sel	Run mode selection via SLEEP_MODE0 & STBY_MODE1 pins
	Ext LDO vout sel	On board LDO output voltage selection
5	BUCKs vout	SW1-SW4 output voltage test points
6	PMIC	PCA9422 PCB footprint area
7	PMIC_OUT	Header with AMUX and all regulators' output
8	LEDs	Jumpers for VSYS LED & LED_DRVR
9	SWITCH1	Puss button connected to ON pin
10	LDOs vout	LDO1-LDO4 output voltage test points
11	SDA & SCL Voltage	Voltage level selection I ² C lines (3.3 V or 1.8 V)
12	FT_AR	Solder jumpers for FTDI chip or Arduino selection
13	VREG_IN, LDO3_IN	Input selection for external LDO (VBAT or USB_5V0) & LDO3_IN (VSYS or SW3_OUT)
	THERM	Thermistor or resistor selection
14	System voltages	VIN, VBAT, VSYS and internal voltages (VIN, VL) test points
15	VBAT inputs	Connection options for a battery cell
16	SWITCH2	Puss button connected FTDI reset pin
17	USB_5V0	USB-C output voltage test point
18	FTDI_IN	VSYS/5 V USB input selection jumper for FTDI & ADC circuit blocks
19	FRDM/ARDUINO conn	I/O header compatible with NXP Freedom and Arduino UNO boards
20	ADC sensing	ADC area and solder jumpers for regulators and signal monitoring
21	FTDI USB to I ² C comm	On board USB to I ² C communication circuitry

4.3 Default jumper configuration

Figure 3 shows the location of jumpers on the evaluation board.

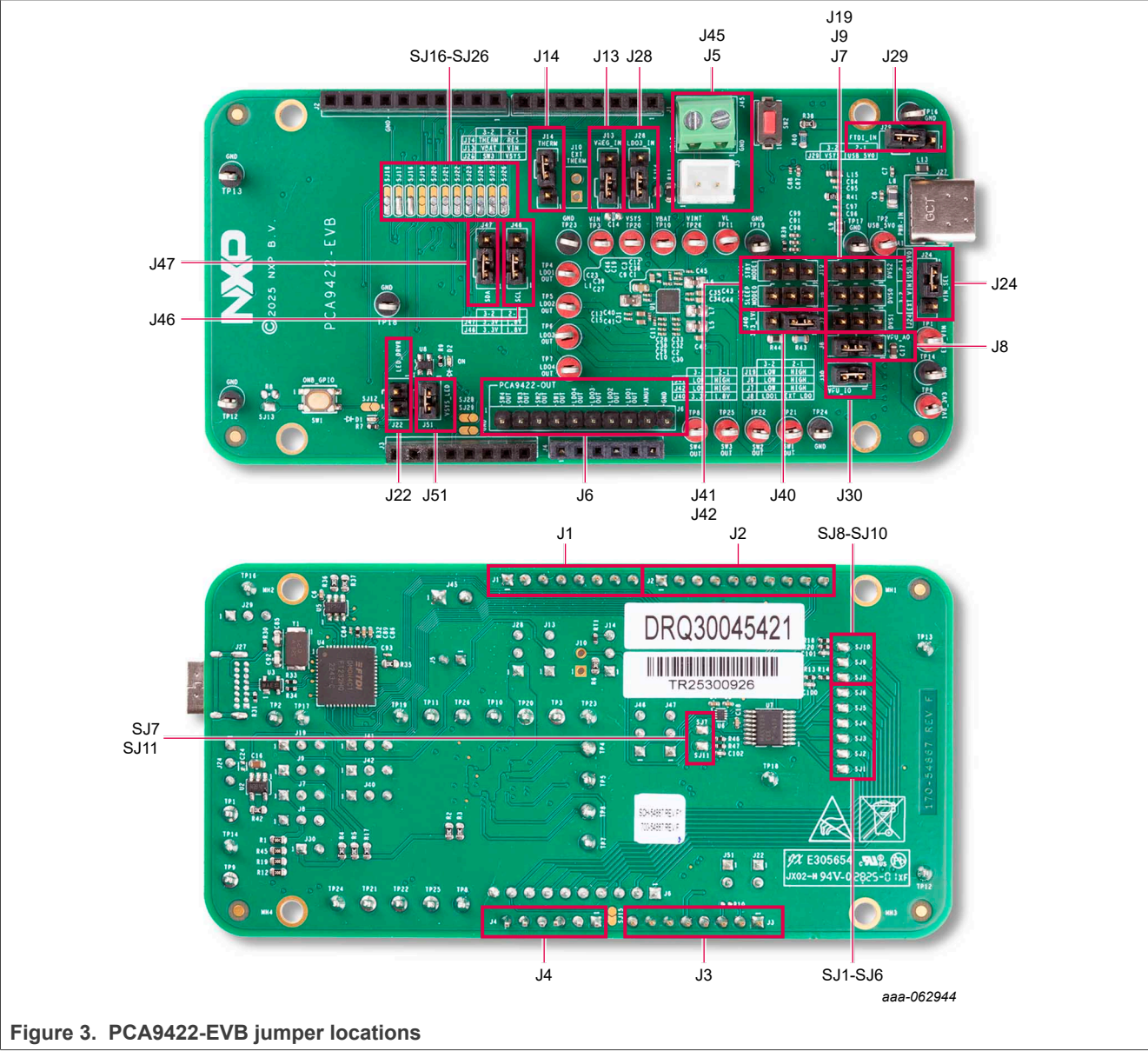


Table 2. Jumper description and default setting

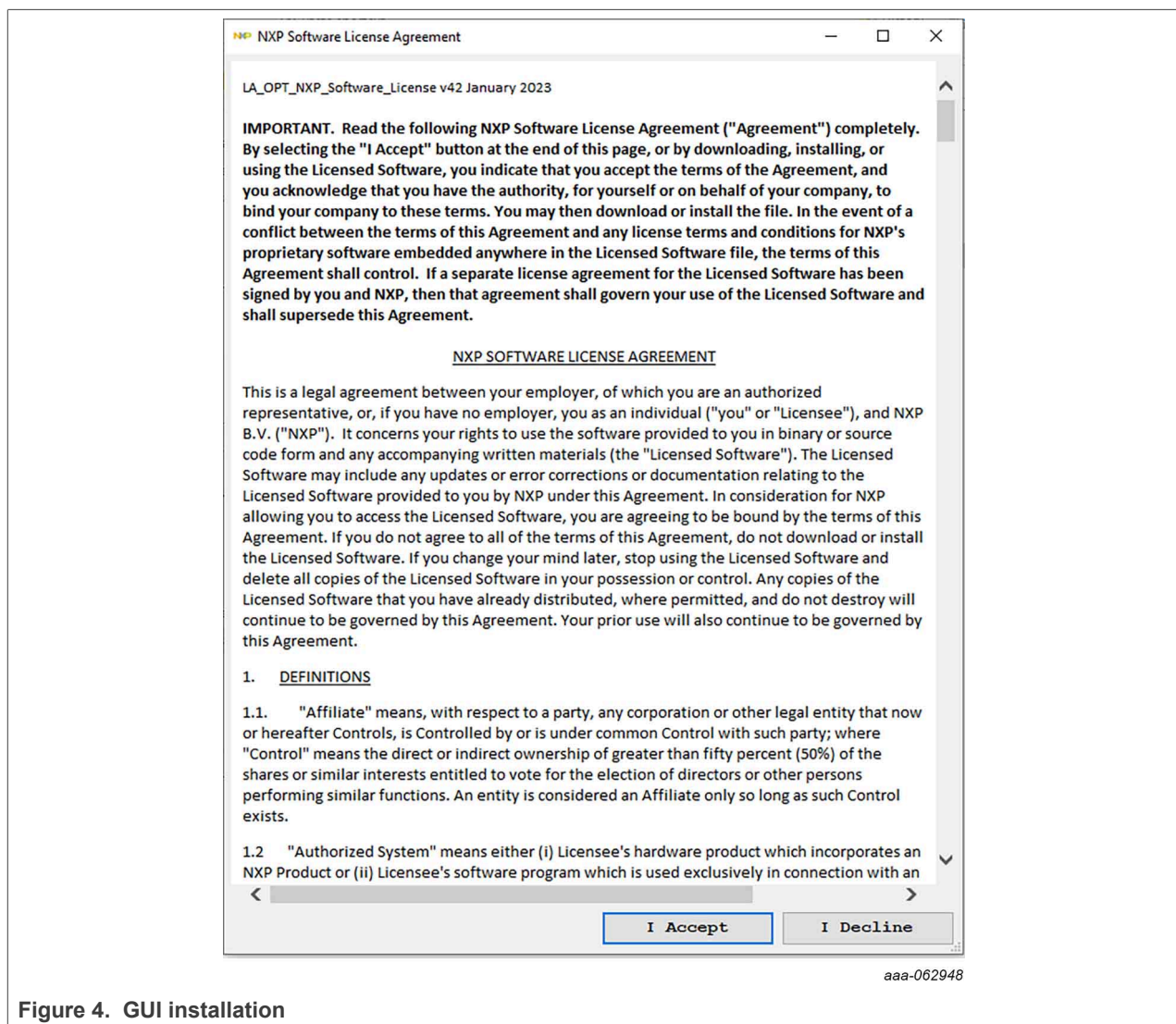
Jumper	Description	Setting	Connection/Result
J24	VIN selection	[1-2]	USB power input
		[2-3]	External power supply input
J8	INTB, SYSRSTn & Run mode pull up voltage selection	[1-2]	Pullup to external LDO (3.3 V or 1.8 V)
		[2-3]	Pullup to LDO1_OUT
J30	I ² C & DVS pins pull up voltage	Closed	Pullup to LDO2_OUT
J40	External LDO voltage selection	[1-2]	1.8 V
		[2-3]	3.3 V
J41	Logic configuration for STBY_MODE1	[1-2]	Logic high
		[2-3]	Logic low
J42	Logic configuration for SLEEP_MODE0	[1-2]	Logic high
		[2-3]	Logic low
J6	Voltage monitoring header for all regulators, including AMUX	–	Pin assignation: 1: BUCK-BOOST output 2: BUCK3 output 3: BUCK2 output 4: BUCK1 output 5: LDO4 output 6: LDO3 output 7: LDO2 output 8: LDO1 output 9: AMUX 10: GND
J51	System voltage LED	Closed	System status indicator LED
J22	LED driver	Open	Close jumper to make LED driver available
J46 - J47	SCL/SDA level voltage selection	[1-2]	1.8 V Logic
		[2-3]	3.3 V Logic
SJ16 - SJ26	FTDI or FRDM/Arduino selection	[1-2]	Connects signal to onboard FTDI
		[2-3]	Connects signal to FRDM/Arduino
J14	Thermistor/Resistor selection	[1-2]	Connects to 10 K onboard resistor
		[2-3]	Connects to 10 K onboard thermistor
J13	On board LDO input selection	[1-2]	Selects VIN as input
		[2-3]	Selects VBAT as input
J28	LDO3 input selection	[1-2]	Selects SW3_OUT as input
		[2-3]	Selects VSYS as input
J45	Battery connection	–	Power connector for VBAT (high current testing)
J51	Battery connection	–	Connector header for VBAT (common in battery cells)
J19, J9, J7	DVS0-DVS2 logic level selection	[1-2]	Logic high
		[2-3]	Logic low
J29	FTDI/ADC input voltage selection	[1-2]	Selects USB_5V0 as input
		[2-3]	Selects VSYS as input
J1-J4	I/O header	–	I/O header compatible with NXP Freedom and Arduino
SJ1 - SJ11	ADC voltage and signals monitoring	Closed	Open connection to reduce standby current consumption

4.4 Schematic, board layout and bill of materials

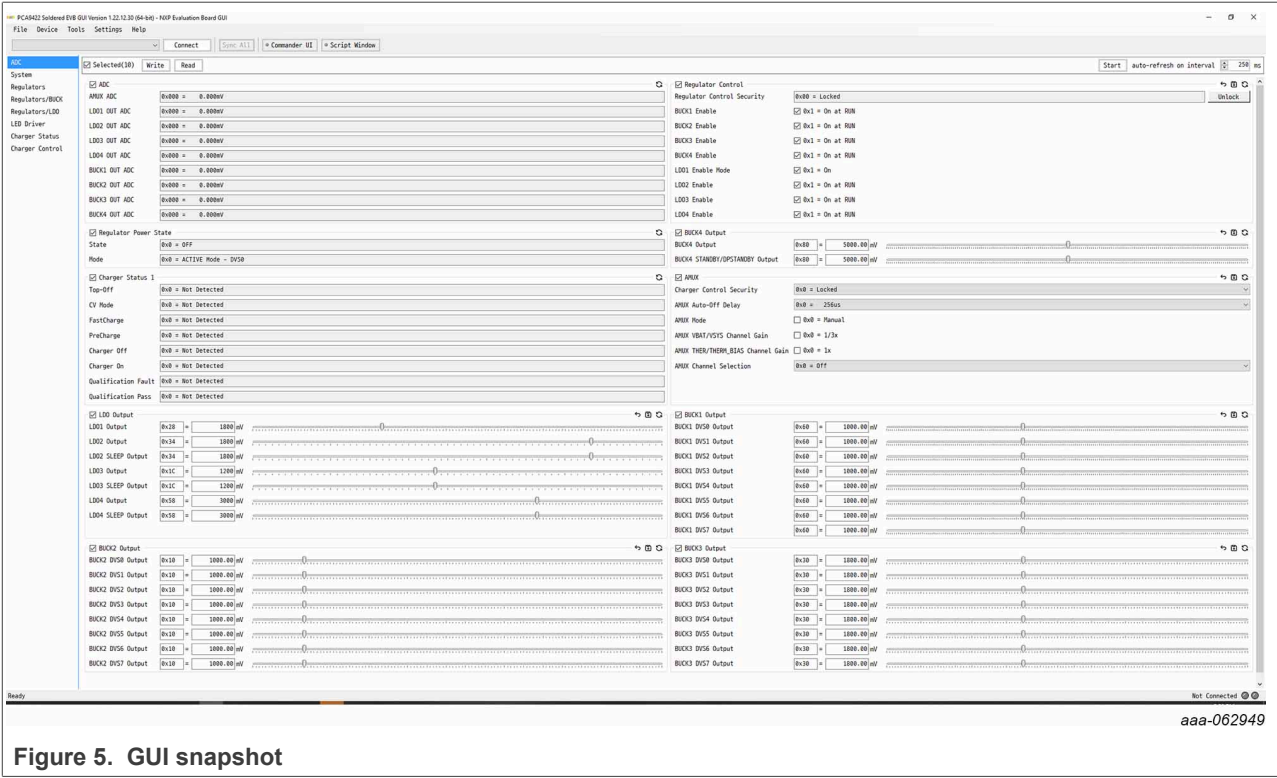
The schematic, board layout and bill of materials for the PCA9422-EVB evaluation board are available at <https://www.nxp.com/PCA9422-EVB>.

5 Installing PCA9420 GUI software

1. Download the PCA9422 Evaluation Kit GUI installation execution file from <https://www.nxp.com/PCA9422-EVB>.
2. Unzip it and accept the license agreement.



3. Once the installation finished, the GUI will be automatically launched. Note that since the standalone evaluation board has not been powered up, no communication channel is established between the computer (GUI). In order to have communication click **Connect** button on top left of the GUI.
4. See the NXP EVB GUI user manual included in the installation files for a more detailed GUI description.



6 Configuring the hardware

6.1 Evaluation board connections

Figure 6 shows the connections of all power sources with the evaluation board.

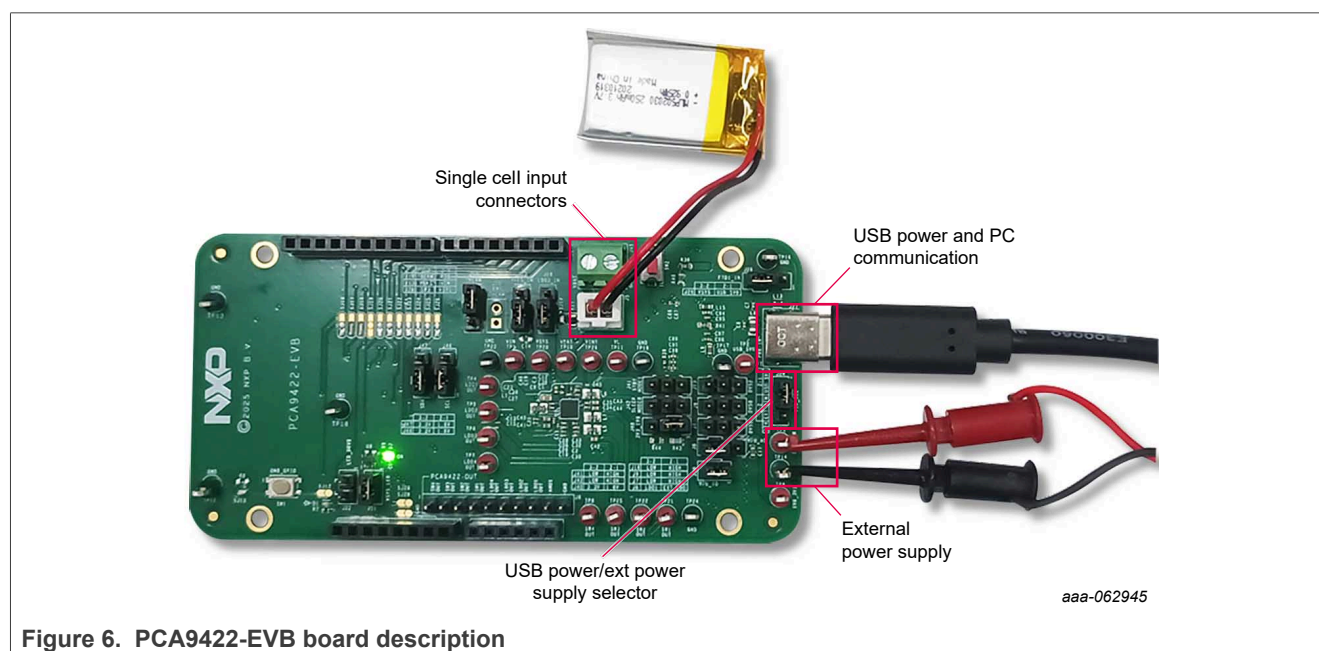


Figure 6. PCA9422-EVB board description

6.1.1 Connections

Connect wires on the following pins as shown in Figure 6, and make sure the power supply is turned off during the wiring stage:

- A Li-ion battery – Connect to VBAT test point or connectors
- VIN Input – Powered by USB-C connector or external power supply.

7 References

PCA9422-EVB — detailed information on this board, including documentation, downloads, and software and tools <https://www.nxp.com/PCA9422-EVB>

8 Revision history

Table 3. Revision history

Document ID	Release date	Description
UM12410 v.1.0	24 October 2025	Initial version

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