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PCA9617ADP-ARD user manual

Rev. 1.0 — 22 July 2022   **User manual**

Document information

Information	Content
Keywords	PCA9617A, I^{2}C-bus, level translator, repeater, Arduino port, EVK
Abstract	The PCA9617ADP-ARD evaluation board is a daughterboard equipped with an Arduino port, designated for easy testing and design of PCA9617A IC, level translating FM+ I^{2}C-bus repeater. The board is fully compliant with IMXRT1050 EVK, LPCXpresso55S69 (LPC55S69-EVK) and i.MX 8M Mini LPDDR4 EVK (8MMINILPD4-EVK, 8MMINID4-EVK), including GUI software control. The board can be attached to any device equipped with an Arduino port.

Revision history

Rev	Date	Description
v.1.0	20220722	Initial version

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This evaluation kit is for use of ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY. It is provided as a sample IC pre-soldered to a printed-circuit board to make it easier to access inputs, outputs and supply terminals. This evaluation board may be used with any development system or other source of I/O signals by connecting it to the host MCU computer board via off-the-shelf cables. This evaluation board is not a Reference Design and is not intended to represent a final design recommendation for any particular application. Final device in an application heavily depends on proper printed-circuit board layout and heat sinking design as well as attention to supply filtering, transient suppression, and I/O signal quality.

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1 Introduction

This document describes the PCA9617ADP-ARD evaluation board. The evaluation board is built around the PCA9617A, a level translating FM+ I^2C-bus repeater, produced by NXP Semiconductors. The evaluation board serves as a daughterboard that can be connected through an Arduino port to various Arduino compatible (including original Arduino Uno R3) EVK/motherboards with the purpose of testing and measuring the characteristics of the PCA9617A Device Under Test (DUT).

The PCA9617ADP-ARD daughterboard tests and measures the static and dynamic characteristics of the DUT by accessing an I^2C EEPROM from the Arduino port through the PCA9617A level translator.

The DUT is tested for different logic levels applied to both sides of the level translator, by supplying the PCA9617A IC with two independent voltage programmable power supplies. The power supplies are controlled by the motherboard (EVK) through the same Arduino port. Power is delivered from the motherboard (EVK) through the Arduino port also.

Additionally, a GUI (Windows platform) is provided to facilitate the evaluation of the daughterboard. The GUI is used with the following NXP evaluation boards: IMXRT1050 EVK Board, LPCXpresso55S69 Development Board, and i.MX 8M Mini LPDDR4 EVK Board.

2 Finding kit resources and information on the NXP web site

NXP Semiconductors provides online resources for evaluation board and its supported device(s) on http://www.nxp.com.

The information page for PCA9617ADP-ARD evaluation board is at http://http://www.nxp.com/PCA9617ADP-ARD. 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 using the PCA9617ADP-ARD evaluation board, including the downloadable assets referenced in this document.

2.1 Collaborate in the NXP community

The NXP community is for sharing ideas and tips, ask and answer technical questions, and receive input on just about any embedded design topic.

The NXP community is at http://community.nxp.com.

3 Getting ready

Working with the PCA9617ADP-ARD requires the kit contents, additional hardware, and a Windows PC workstation with installed software.

3.1 Kit contents

- Assembled and tested evaluation board in an antistatic bag
- Quick Start Guide

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3.2 Assumptions

Familiarity with the I^2C bus is helpful but not required.

3.3 Static handling requirements

CAUTION
⚠ This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling. You must use a ground strap or touch the PC case or other grounded source before unpacking or handling the hardware.

3.4 Minimum system requirements

This evaluation board requires a Windows PC workstation. Meeting these minimum specifications should produce great results when working with this evaluation board.

• Computer with Windows 10
• One USB port (either 3.0 or 2.0 or 1.1 compatible)
• One of three EVK boards (MIMXRT1050-EVK, LPC55S69-EVK, 8MMINILPD4-EVK) along with the associated firmware/GUI software
• USB cable for power and data connection between PC and EVK board (if not included in the EVK package)

4 Getting to know the hardware

4.1 PCA9617ADP-ARD features

• Equipped with I^2C EEPROM for rapid test and measurements;
• Equipped with programmable power supplies for logic level combination;
• Onboard I^2C-bus connector for easy access from external;
• Onboard jumpers for signal isolation of the DUT;
• Equipped with Arduino Uno R3 port for direct connection with Arduino devices;
• Fully compliant with IMXRT1050 EVK board, including GUI (Windows 10);
• Fully compliant with LPCXpresso55S69 dev. board, including GUI (Windows 10);
• Compliant with i.MX Mini LPDDR4 EVK board, including GUI (Windows 10).

Note: For i.MX Mini LPDDR4 EVK Board it is necessary to use an IMX8MMINI-IARD interposer board between the EVK and PCA9617ADP-ARD daughterboard (see IMX8MMINI-IARD User Manual).

4.2 Kit featured components

[Figure 1](#) identifies the main components on the board. The PCA9617A (U6) is placed in center of the board. In the right side, the user can find the EEPROM (U10) and the hardware address jumpers (J11, J16, J17) of the DUT (U6). The output enable jumper (J14) and I^2C-bus external connector (J3) are in the bottom side. The programmable power supplies (LOD 1, LDO 2), along with its additional components, are placed in the top side of the PCB. Here, the user can find the power LEDs (D1-3.3 V, D2-5 V) and LDO enable LED (D3).

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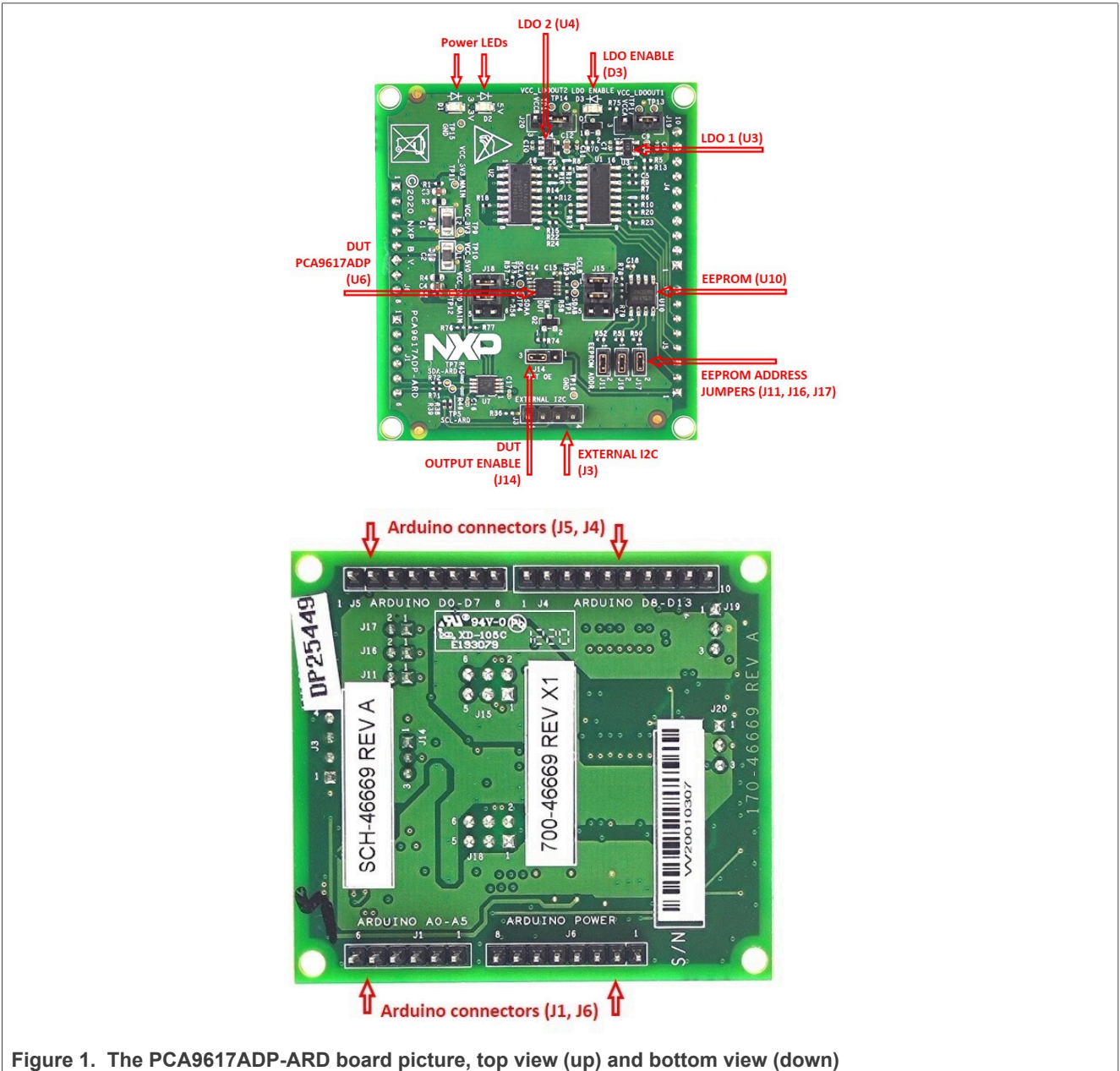The Arduino port connectors (J1, J4, J5, J6) are located on the bottom side of the board.

Figure 1. The PCA9617ADP-ARD board picture, top view (up) and bottom view (down)

4.3 Schematic diagram

The schematic diagram of PCA9617ADP-ARD is available at: http://www.nxp.com/PCA9617ADP-ARD/.

4.4 Arduino port

J1, J4, J5, and J6 are the mated pin headers of the Arduino Uno R3 connectors. The pins have the same electrical function and are placed on the board so the daughterboard can be directly inserted into the Arduino port.

The daughterboard uses only eight signal lines. Table 1 shows the pin chart of connectors, and the lines used in the circuit. See also the SPF-46669_A.pdf schematic file.

Table 1. Arduino connectors pin chart

Ref Des	#	Arduino label	PCA9617ADP-ARD function
J6 (Power)	1	NC	Not used
	2	IOREF	Not used
	3	RESET	Not used
	4	3.3 V	Not used
	5	5 V	Power supply
	6	GND	Power supply return
	7	GND	Power supply return
	8	Vin	Not used
J1 (analog, digital, I^{2}C)	1	A0	Not used
	2	A1	Not used
	3	A2	Not used
	4	A3	Not used
	5	A4/SDA	I^{2}C – SDA
	6	A5/SCL	I^{2}C – SCL
J5 (digital, UART, PWM)	1	D0/RX	DUT OE (output enable)
	2	D1/TX	MUX2_LDO2_S1
	3	D2	MUX2_LDO2_S0
	4	D3/PWM	MUX1_EN_B
	5	D4	MUX1_LDO1_S1
	6	D5/PWM	MUX1_LDO1_S0
	7	D6/PWM	Not used
	8	D7	Not used
J4 (mixed)	1	D8	Not used
	2	D9/PWM	Not used
	3	D10/SS/PWM	Not used
	4	D11/MOSI/PWM	Not used
	5	D12/MISO	Not used
	6	D13/SCK	Not used
	7	GND	Power supply return
	8	AREF	Not used
	9	A4/SDA	Not used
	10	A5/SCL	Not used

The circuit is supplied from the Arduino port through J6 and J4. Pin 4 of J6 is a 3.3 V power supply, while pin 5 of J6 is 5 V power supply. Pin 6 and 7 of J6 and pin 7 of J4 represents the power supply return (ground). LED D1 is the 3.3 V power supply indicator (VCC_3V3_MAIN power net), and D2 is 5 V power supply indicator (VCC_5V_MAIN power net). See the SPF-46669_A.pdf schematic file of PCA9617ADP-ARD daughterboard.

4.5 I²C bus repeater/level translator

Figure 2 shows the I²C-bus repeater and EEPROM section of PCA9617ADP-ARD schematic diagram. The I²C-bus of the Arduino port (A5 – SCL and A4 – SDA), controlled by the EVK goes to side "B" of PCA9617A level translator/repeater (U7). U7 (the same as the DUT) works as an interface between 3.3 V fixed voltage I²C-bus from the Arduino port and variable voltage I²C-bus of the DUT. Side "A" of U7 is connected to side "A" of the DUT (U6). The VCCA pins of both ICs are supplied by the LDO1 programmable power supply (0.8 V to 4.96 V). From side "B" of the DUT (U6), the I²C-bus goes to the EEPROM (U10). This section of the I²C-bus is also voltage variable; the VCCB pin of U6 and VCC pin of U10 are supplied from LDO2 programmable power supply (2.5 V to 4.96 V). In this way, the user can read/write data from/to EEPROM memory using a host (PC and EVK) at different voltages across the DUT (PCA9617A level translator). Note that the EEPROM can operate from 1.7 V to 5.5 V, which is fully compatible with the LDO2 output voltage range. The jumper headers J15 and J18 allow isolation of the signal pins of the DUT, so the user can access the level translator directly from outside of the board.

The output enable input of the DUT (pin 5, U6) can be controlled locally from jumper header J14, or from EVK/GUI. When OE is remote, jumper J14 is placed in position 1-2, and the OE is controlled through pin 1 of the Arduino connector J1. The OE input has an internal pullup resistor connected to VCCB pin. Q1 assures the level translation from 3.3 V to VCCB rail voltage.

Jumpers J11, J16, and J17 set the hardware address of the EEPROM memory. The user should set the I²C control byte accordingly with the hardware address of the EEPROM.

The I²C-bus from the Arduino port can also be accessed from the I²C-bus external connector (J3). For details, see the SPF-46669_A.pdf schematic file.
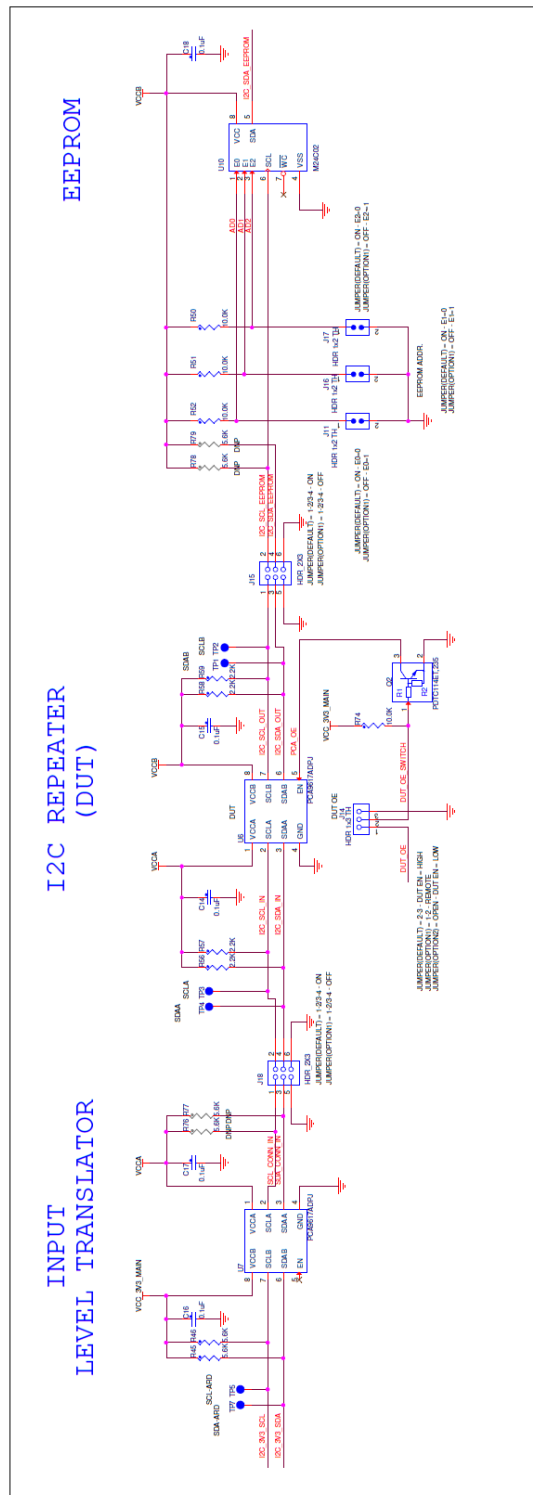
Figure 2. PCA9617ADP-ARD – I²C-bus repeater/level translator section

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4.6 Programmable power supplies

The PCA9617ADP-ARD contains two programmable power supplies: LDO1 and LDO2. Figure 3 depicts the LDO sections of the schematic diagram. LDO1 provides the power for VCCA, and LDO2 supplies VCCB power rail. Both regulators are controlled from the EVK through the Arduino port.

4.6.1 LDO1

The programmable power supply LDO1 consists of an adjustable voltage regulator LDK120M (U3), and the analog switch 74HCT4052D (U1). The analog switch selects the resistor divider ratio in the feedback loop of the voltage regulator (U3). Table 2 shows the output voltages of LDO1 as a function of switch position. U1 is controlled from the Arduino port through "MUX1_LDO1_S0", "MUX1_LDO1_S1", "MUX1_EN_B" (pins 4, 5, and 6 of the Arduino connector J5). The jumper header J19 allows the user to interrupt the VCCA rail, to perform current measurements, or to supply VCCA from external.

Table 2. The VCCA programmable voltages

MUX1_EN_B	MUX1_LDO1_S1	MUX1_LDO1_S0	VCCA
High	X (don't care)	X (don't care)	0.8 V
Low	Low	Low	1.8 V
Low	Low	High	2.5 V
Low	High	Low	3.3 V
Low	High	High	4.96 V

4.6.2 LDO2

The programmable power supply LDO2 is realized with the adjustable voltage regulator MIC5301 (U4), and the analog switch 74HCT4052D (U2). Similarly, the analog switch selects the resistor divider ratio in the feedback loop of the voltage regulator (U4). Table 3 shows the output voltages of LDO2 as a function of switch position. U1 is controlled from the Arduino port through "MUX2_LDO2_S0" and "MUX2_LDO2_S1", (pins 2 and 3 of the Arduino connector J5). The control line "MUX2_EN_B" is connected to ground through pulldown resistor R18. The jumper header J20 allows the user to interrupt the VCCB rail, to perform current measurements, or to supply VCCB from external.

Table 3. VCCB programmable voltages

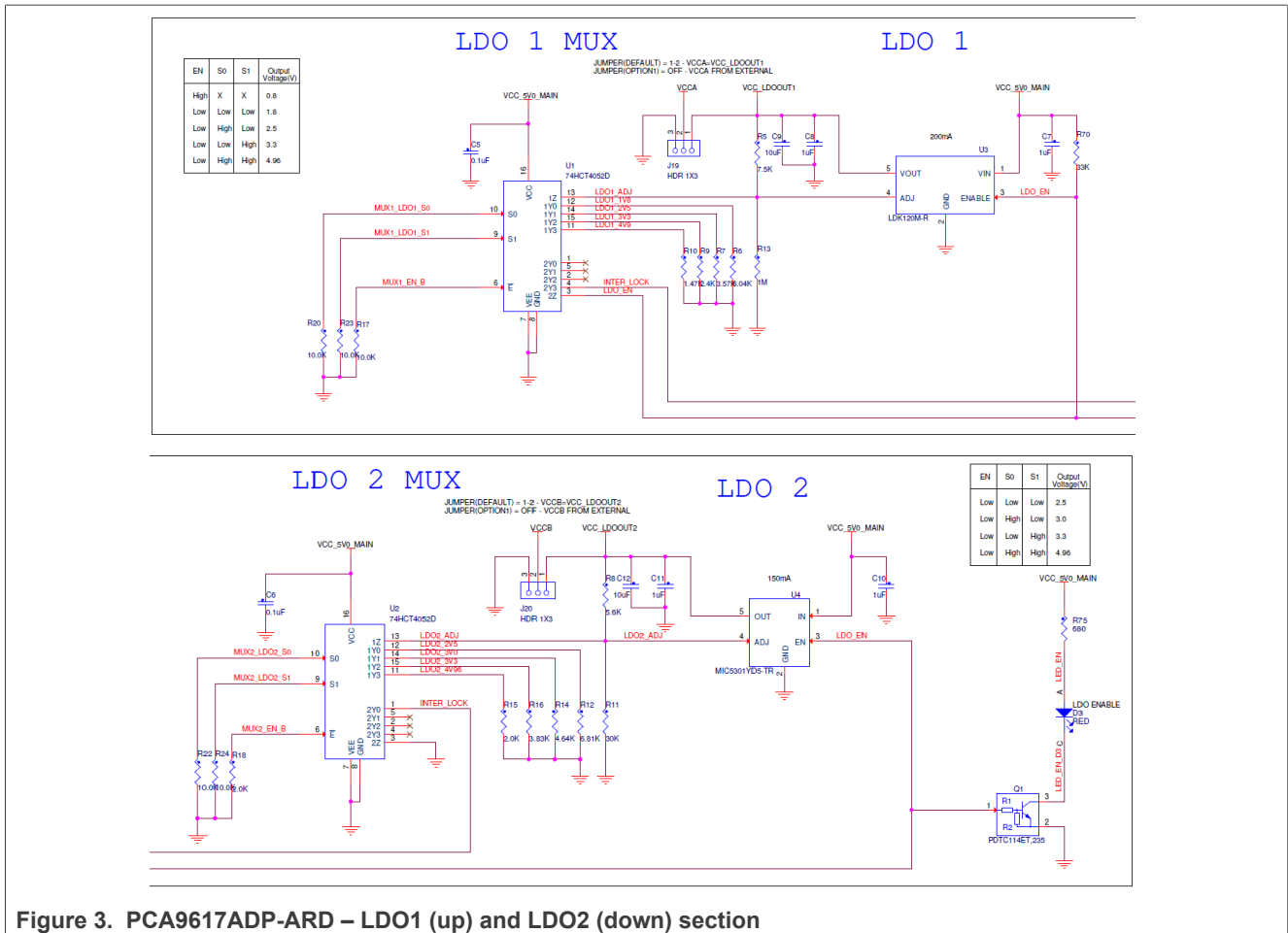| MUX2_LDO2_S1	MUX2_LDO2_S0	VCCB
Low	Low	2.5 V
Low	High	3 V
High	Low	3.3 V
High	High	4.96 V

Figure 3. PCA9617ADP-ARD – LDO1 (up) and LDO2 (down) section

The enable input for both LDOs (U3 and U4) are controlled through an interlock loop circuit. Both regulators are disabled when "LDO_EN" are pulled down. This is accomplished when LDO1 switch (U1) is "2Z/2Y3 – ON" and LDO2 switch (U2) is "2Z/2Y0 – ON". This combination is true for VCCA = 4.96 V, and VCCB = 2.5 V. The onboard LED D3 indicates the LDO enable status.

4.7 Jumpers and test points

The board contains eight jumpers and several test points. Table 4 and Figure 4 detail the jumper locations and their default configurations. Table 5 describes the test points located on the PCA9617ADP-ARD board.

Table 4. PCA9617ADP-ARD jumpers

Ref Des	Label	Default	Description
J19	VCCA	1-2	1-2: VCCA = VCC_LDOOUT1
			OFF: VCCA FROM EXTERNAL
J20	VCCB	1-2	1-2: VCCB = VCC_LDOOUT2
			OFF: VCCB FROM EXTERNAL
J18	Side A (U6)	1-2/3-4: ON	1-2/3-4: ON
			1-2/3-4: OFF

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Table 4. PCA9617ADP-ARD jumpers...*continued*

Ref Des	Label	Default	Description
J15	Side B (U6)	1-2/3-4: ON	1-2/3-4: ON
			1-2/3-4: OFF
J14	DUT OE	2-3	2-3: DUT EN = HIGH
			1-2: REMOTE
			OPEN – DUT EN = LOW
J11	EEPROM ADDR (E0)	ON	ON: E0 = 0
			OFF: E0 = 1
J16	EEPROM ADDR (E1)	ON	ON: E1 = 0
			OFF: E1 = 1
J17	EEPROM ADDR (E2)	ON	ON: E2 = 0
			OFF: E2 = 1
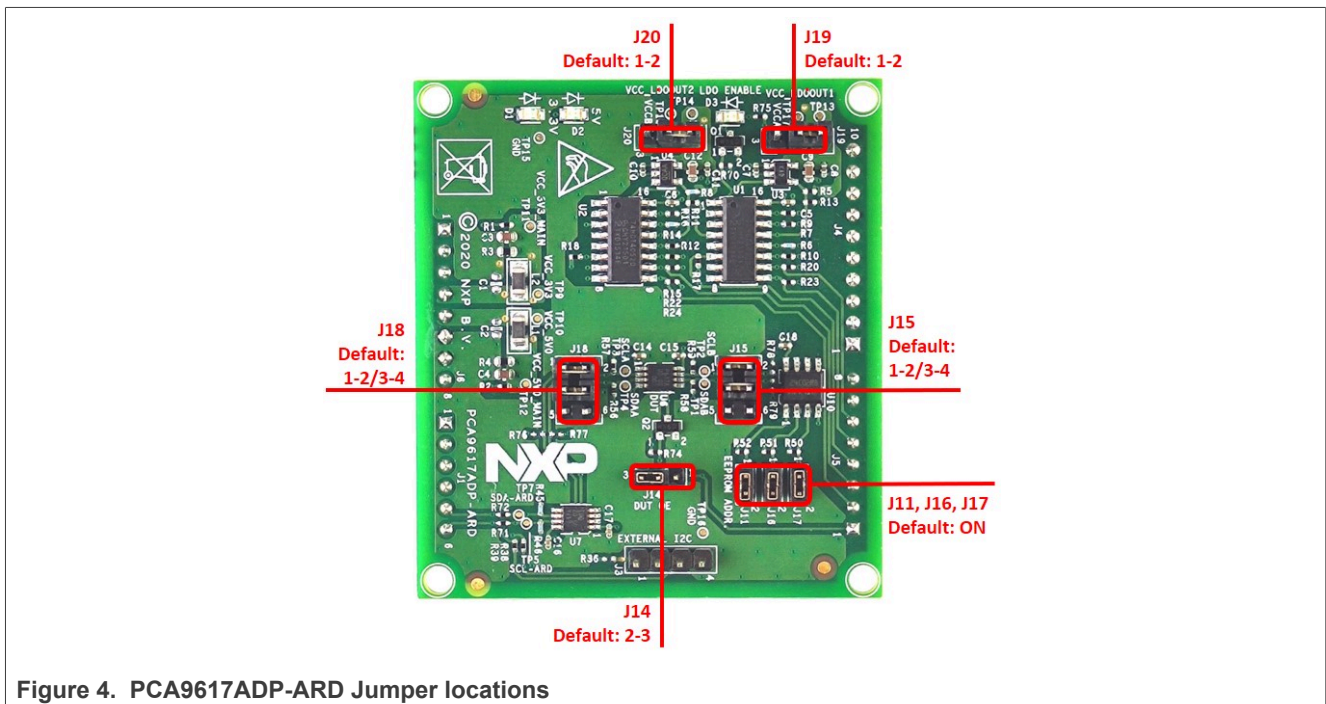
Figure 4. PCA9617ADP-ARD Jumper locations

Table 5. PCA9617ADP-ARD test points

Ref Des	Test point/jumper label	Description
TP1	SDAB	I^2C SDA line, side B
TP2	SCLB	I^2C SCL line, side B
TP3	SCLA	I^2C SCL line, side A
TP4	SDAA	I^2C SDA line, side A

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Table 5. PCA9617ADP-ARD test points...*continued*

Ref Des	Test point/jumper label	Description
TP5	SCL-ARD	I^2C SCL line, Arduino port
TP7	SDA-ARD	I^2C SDA line, Arduino port
TP9	VCC_3V3	VCC_3V3 rail
TP10	VCC_5V0	VCC_5V0 rail
TP11	VCC_3V3_MAIN	VCC_3V3_MAIN rail
TP12	VCC_5V0_MAIN	VCC_5V0_MAIN rail
TP13	VCC_LDOOUT1	VCC_LDOOUT1 rail
TP14	VCC_LDOOUT2	VCC_LDOOUT2 rail
TP15	GND	Ground
TP16	GND	Ground
TP17	VCCA	VCCA rail
TP18	VCCB	VCCB rail

5 Installing and configuring software tools

PCA9617A_ARD evaluation board is designed and built as a daughterboard able to work in conjunction with a motherboard equipped with an Arduino port. The board was built to be fully compatible with the following NXP Evaluation (EVK) boards:

- IMXRT1050 EVK board;
- LPCXpresso55S69 development board;
- i.MX 8M Mini LPDDR4 EVK board

Each of the above-mentioned evaluation/development boards benefit by firmware support, which can be downloaded from www.nxp.com/. Before starting, the EVK motherboard must be programmed with the corresponding firmware package. Additionally, a GUI application (Windows 10) is available for download from the NXP site, allowing rapid testing and operation of PCA9617ADP-ARD daughterboard through the one of above mentioned EVKs. The GUI application is common for all three EVKs. The GUI software is also built to control two daughterboards: the PCA9617ADP-ARD and the PCA9846PW-ARD (both manufactured by NXP Semiconductors). For details regarding installation of the EVK firmware and GUI host software on PC please download *UM11581 - Arduino Shields GUI and firmware installation* available at https://www.nxp.com/docs/en/user-guide/UM11581.pdf. Once the software is installed, the first step is to select the correct combination EVK – PCA9617ADP-ARD daughterboard. The board can be controlled from the GUI interface. See Section 6 and Section 7 for more details regarding the operation of PCA9617ADP-ARD from GUI software.

6 Configuring the hardware

6.1 Using the PCA9617ADP-ARD with an IMXRT1050 EVK board

Figure 5 shows the required hardware for operation of the PCA9617ADP-ARD daughterboard with IMXRT1050 EVK. The following items are necessary:

- One IMXRT1050-EVK board
- One PCA9617ADP-ARD daughterboard
- One USB-A/USB Micro-B cable
- A PC with Windows 10 operating system

The IMXRT1050 EVK motherboard can be powered by one of three methods:

1. Connecting an external 5VDC power supply to the barrel power connector (J2) on the board
2. Connecting a USB cable from the PC to the Micro-B USB connector (J9) on the board
3. Connecting a USB cable from the PC to the USB connector (J28) on the board. When the PC is connected in this fashion, the USB port can simultaneously act as a debug interface. Therefore, by using a single USB cable connected to J28, the EVK can be powered and linked to the PC for data exchange.

Older USB ports (from the PC) are not able to deliver the necessary current (500 mA). Use an external power supply (connected to J2) before establishing the communication.

From J1 on the EVK board (see Figure 5) the user can select the power configuration for the motherboard. For further details, see the *i.MX RT1050 Processor Reference Manual* i.MX RT1050 Processor Reference Manual.
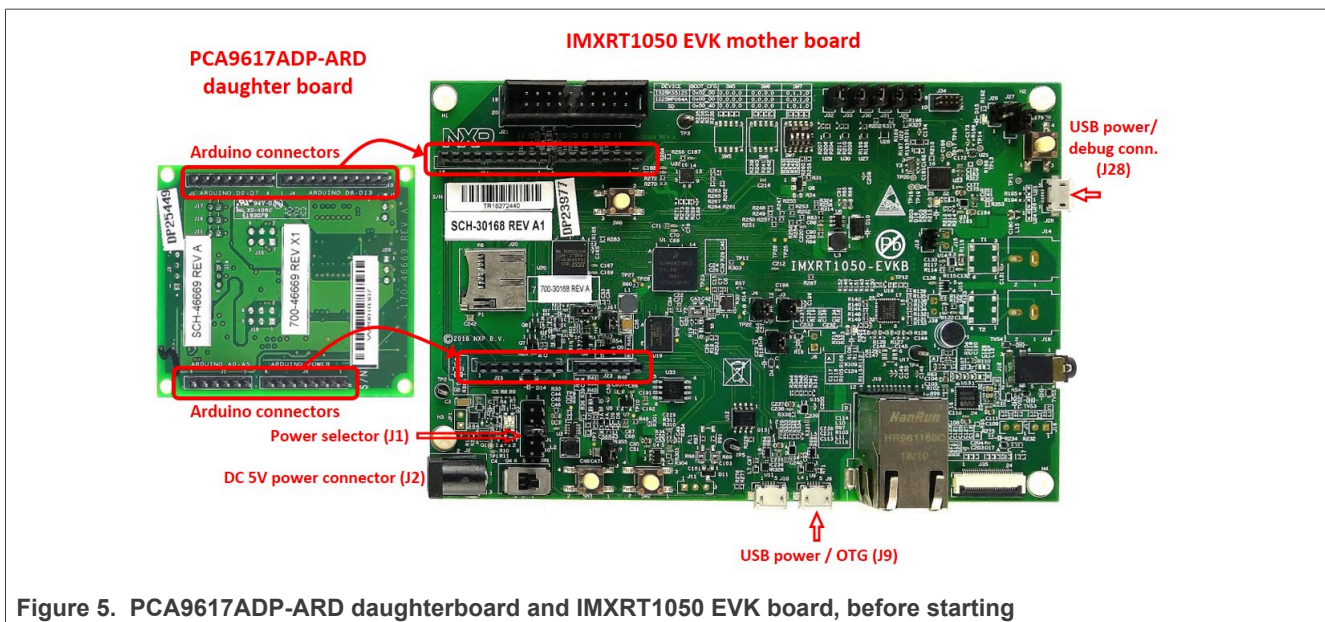

Figure 5. PCA9617ADP-ARD daughterboard and IMXRT1050 EVK board, before starting

To configure the hardware and workstation, complete the following procedure:

1. Configure the suitable power configuration of EVK (J1). If using J28 for power supply, the J1 jumper shall be placed in position 5-6. If using an external power supply (connected to J2), the jumper J1 will be placed in position 1-2.
2. Insert the PCA9617ADP-ARD daughterboard on the Arduino connector of the EVK (see Figure 5).
3. Using USB connector J28, connect the EVK board to a USB port of the computer.
4. Install the IMXRT1050 target firmware (download from NXP site and see Arduino shields GUI and firmware installation manual for step-by-step instructions).
5. Install GUI application (see Arduino shields GUI and firmware installation manual).

6. Open the GUI application to operate the device from the PC. For details regarding GUI operation see Section 7.

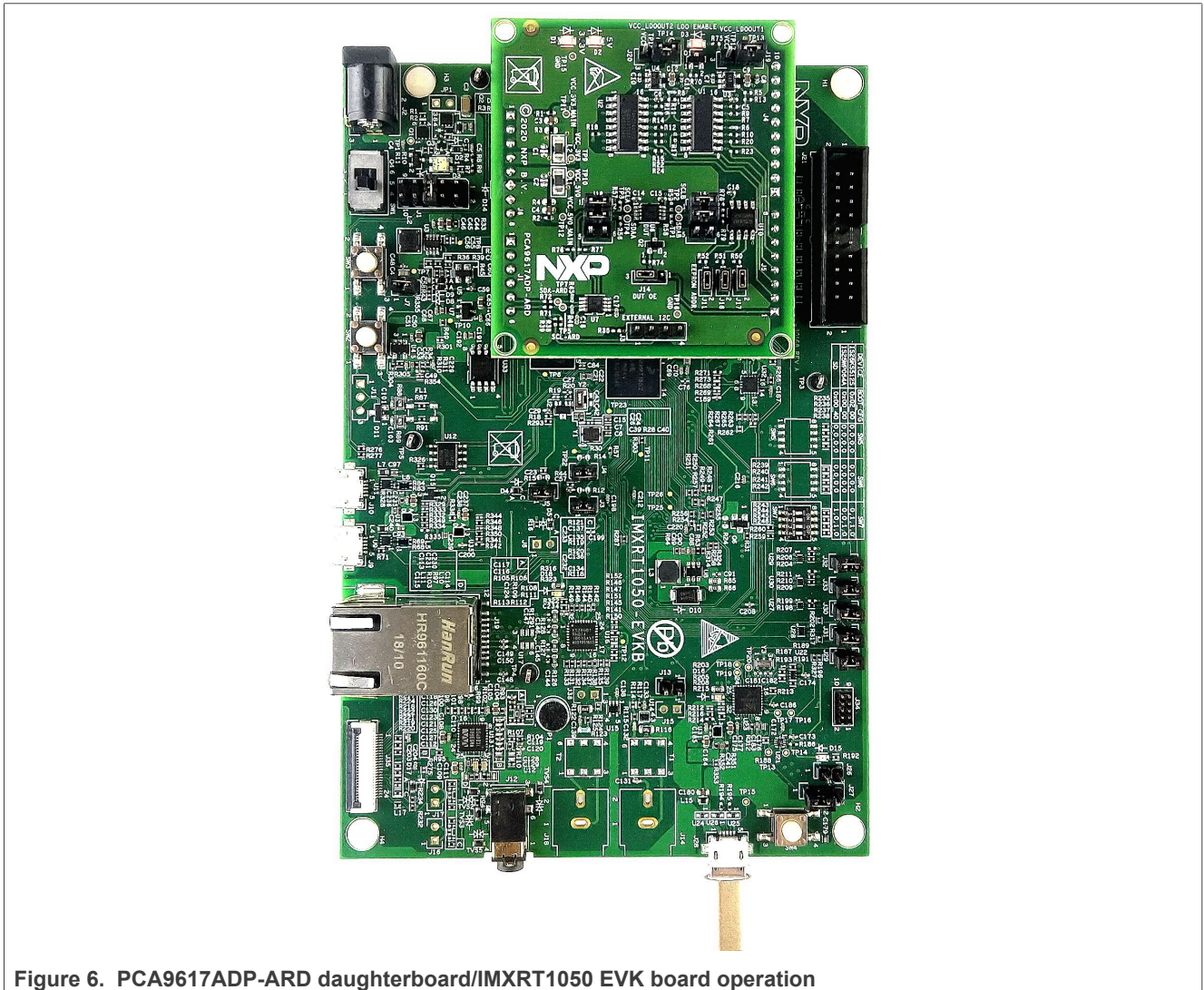Figure 5 shows the boards during the operation.

Figure 6. PCA9617ADP-ARD daughterboard/IMXRT1050 EVK board operation

6.2 Using the PCA9617ADP-ARD with an LPCXpresso55S69 development board

Figure 7 shows the required hardware for operation of the PCA9617ADP-ARD and LPCXpresso55S69 EVK board. This configuration consists of:

- One LPCXpresso55S69 EVK board
- One PCA9617ADP-ARD daughterboard
- One USB-A/USB Micro-B cable
- A PC with Windows 10 operating system

The LPCXpresso55S69 development board is equipped with four USB Micro-B connectors: P5, P6, P9 and P10. The board can be powered through any USB port. Using the P6 USB connector to connect the board to the PC simplifies the start-up

operation because P6 is designated for debugging. The USB cable accomplishes two tasks at the same time: powering the board, and serving as a data link between the EVK board and PC.

For more details regarding power up and operation of the LPCXpresso55S69 development board, see *UM11158 - LPCXpresso55S69/LPCXpresso55S28 Development Boards User Manual*.
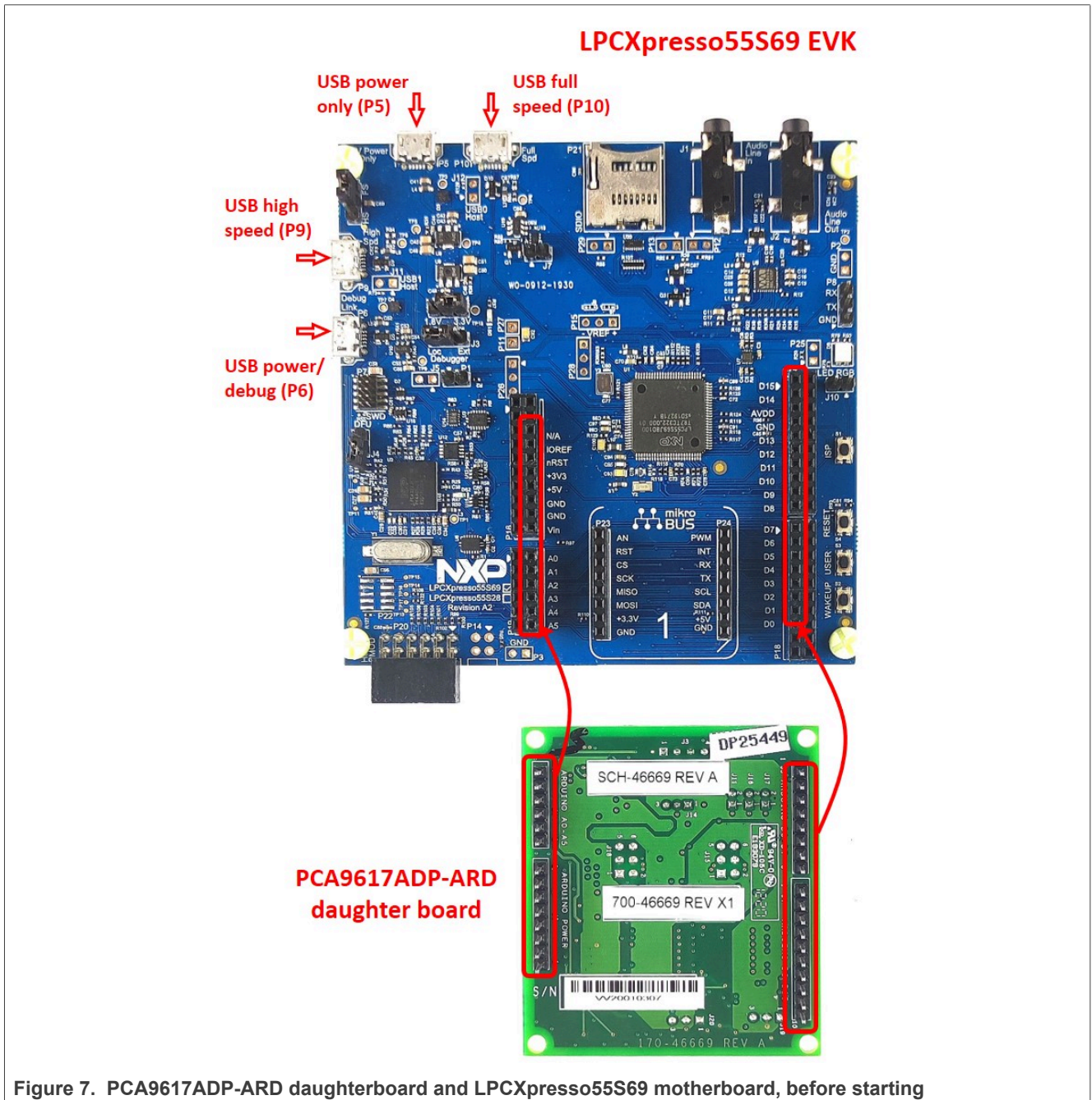

Figure 7. PCA9617ADP-ARD daughterboard and LPCXpresso55S69 motherboard, before starting

The following steps describe how to assemble, program, and operate the configuration shown in Figure 7.

1. Insert the PCA9617ADP-ARD daughterboard to P16 – P19 connectors located on LPCXpresso55S69 development board (see the marked pins of P16 – P19, Figure 7);
2. Connect the development board using port P6 USB port of PC;
3. Install the LPCXpresso55S69 target firmware (download from NXP site and read the *EVK_Firmware_And_GUI_Install_Guide_For_Arduino_Boards.pdf* instruction file);
4. Install GUI application on PC (see the instruction file called out in the previous step);
5. Open the GUI application to operate the device from the PC. For details regarding GUI operation see Section 7;
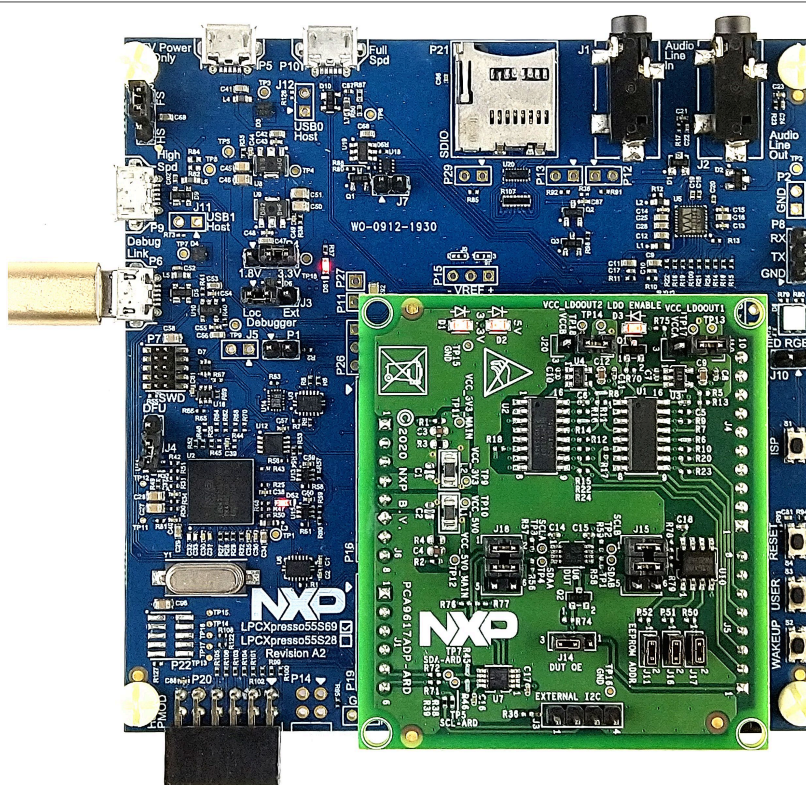
Figure 8 shows the two boards in operation.

Figure 8. PCA9617ADP-ARD daughterboard/LPCXpresso55S69 motherboard operation

6.3 Using the PCA9617ADP-ARD with an i.MX 8M Mini LPDDR4 EVK board

When an i.MX 8M Mini LPDDR4 EVK board is used with the PCA9617ADP-ARD board, a third board (IMX8MMINI-IARD interposer board) must be used, especially designed and built as an EVK – daughterboard interconnection. The EVK board i.MX 8M Mini LPDDR4 is not equipped with an Arduino port; instead it has a 2 x 20 pin expansion connector (J1003, see i.MX 8M Mini LPDDR4 EVK user manual). J1003 is a multipurpose port, containing various digital I/O lines, including specialized I^2C and SPI buses. Starting from the expansion connector pin chart, an Arduino port interposer board was developed with the role of signal-to-signal bridge between the 2 x 20 connector pins on the i.MX 8M Mini LPDDR4 EVK and the mated connectors of the Arduino port present on the PCA9617ADP-ARD daughterboard.

To operate the setup, along with the EVK and the daughterboard, a third board must be included in the setup assembly. Figure 9 shows the necessary boards and how these boards are connected. The configuration consists of:

- One i.MX 8M Mini LPDDR4 EVK board
- One PCA9617ADP-ARD daughterboard
- One IMX8MMINI-IARD interposer board
- One USB-A/USB-C cable
- One USB-A/USB Micro-B cable
- A PC with Windows 10 operating system

It is recommended to attach the PCA9617ADP-ARD to the Arduino connectors of the IMX8MMINI-IARD interposer board first, and then the resulting assembly to the i.MX 8M Mini LPDDR4 EVK. This can be done by plugging J1 connector located on the interposer board to J1003 connector on the EVK.

To power up the EVK, a USB-C cable connected to port 2 of the EVK is used. The power switch SW101 on the EVK board must be set to ON position to power up the setup. Data communication is achieved by routing a separate USB (Micro-B) cable from a USB port on the PC to the debug port (J901) on the EVK (see Figure 9 and Figure 10).

The user may find details regarding power up and operation of the setup assembly in 8MMINILPDDR4-EVK User Manual and IMX8MMINI-IARD User Manual. The files can be downloaded from www.nxp.com/.
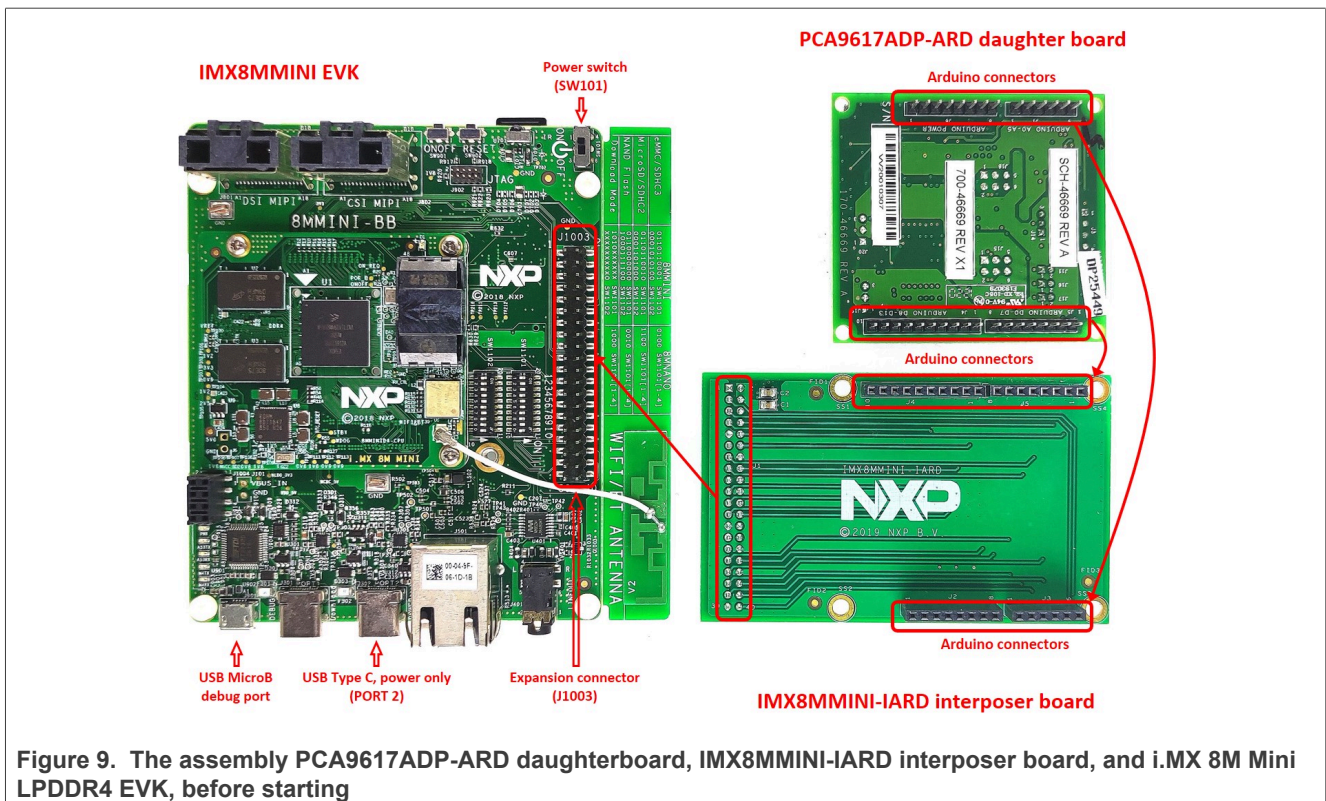

Figure 9. The assembly PCA9617ADP-ARD daughterboard, IMX8MMINI-IARD interposer board, and i.MX 8M Mini LPDDR4 EVK, before starting

To configure and operate the setup, follow the below steps:

1. Insert the PCA9617ADP-ARD onto the IMX8MMINI-IARD interposer board Arduino connectors (located on the top side);

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2. Attach IMXMMINI-IARD connector plug J1 (located on the bottom of the board) into J1003 expansion board located on the top side of i.MX 8M Mini LPDDR4 EVK (see Figure 9);

3. Powerup the EVK board using a USB-C cable attached to port 2;

4. Connect the EVK to the PC, using a USB Micro-B cable, attached to J901 debug port;

5. Place SW101 in ON position to power up the boards;

6. Install the MIMXRT1050 target firmware (download UM11581, Arduino shields GUI and firmware installation manual from NXP site);

7. Install GUI application on the PC (see the instruction file referred in the above step);

8. Open the GUI application to operate the device from the PC. For details regarding GUI operation see Section 7.
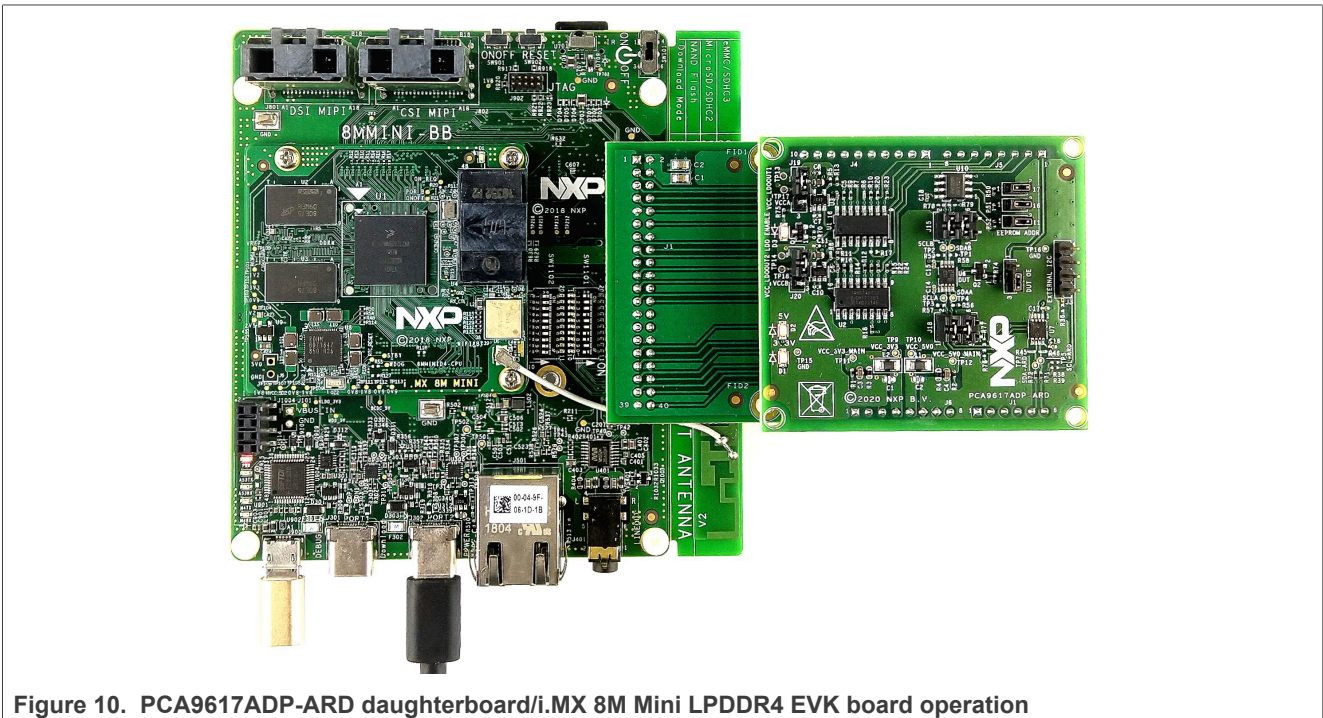

Figure 10. PCA9617ADP-ARD daughterboard/i.MX 8M Mini LPDDR4 EVK board operation

6.4 Using PCA9617ADP-ARD with another device

The PCA9617ADP-ARD daughterboard can be operated with another EVK board, which has an Arduino port. There are two options to connect the board: using another EVK equipped with an Arduino port, and an EVK without an Arduino port. In the first case, firmware shall be developed according to PCA9617A specifications; to operate the board, attach PCA9617ADP-ARD daughterboard to the EVK. In the second case, using the Arduino connectors pin chart (Table 1), make the necessary electrical connections (for power, I^2C-bus and control lines), and develop the desired firmware, assuring that it is compliant with IC specifications. Refer to PCA9617A datasheet to read details about internal registers of the DUT IC and data exchange between internal controller and the EVK. Check for correct electrical connections and avoid data conflicts on the signal lines, to prevent IC damage.

7 GUI description

A GUI application is available for the three EVK boards from NXP Semiconductors. The application is common for all three EVKs described in Section 6, and the following development boards: PCA9617ADP-ARD and PCA9846PW-ARD.

This section describes the GUI application and how the user can control the PCA9617ADP-ARD daughterboard from the graphical interface. First, install the GUI package and software on the PC (Windows 10). For more details, see UM11581.

Once installation is complete, assure that one of the mentioned three EVKs with attached PCA9617A-ARD daughterboard is connected to a PC and powered-on. Open "NXP_GUI(PCA9617A,PCA9846)" GUI application. An interface appears as shown in Figure 11:

The GUI application starts with **Settings** tab (marked with red arrow). The left side of the window displays **Board settings**. The section provides the following settings:

- **Select EVK:** displays the list of EVKs. Selecting a wrong EVK board causes the connection to fail and a pop-up window with the message: *"Unable to Connect with EVK"* appears on the screen.
- **Select COM port:** displays port selected for the communication. The port is automatically selected by the system (COM 3 is selected in Figure 11).
- **Select Board:** allows the user to select the correct daughterboard (the application can support two different boards). In Figure 11, the selected board is PCA9617A. Selecting the wrong daughterboard causes the connection to fail and a pop-up window with the message: *"Unable to Connect with Daughter Card"* appears on the screen.

Assuming the correct parameters are chosen, clicking the **Connect** button establishes the connection with the EVK. In the bottom side of the GUI window, a status bar shows in real time the status regarding connection between PC and the EVK.

In the right side of the window is the **Device setting** section. The following settings are provided:

- **DUT EN:** sets the OE status of the DUT, when this parameter is controlled from remote (J14, jumper in position 1-2). With the **Set** button the value is written in the internal register of PCA9617A IC.
- **I2C Frequency:** displays the I^2C-bus clock frequency (100 kHz, 400 kHz, and 1 MHz). With the **Set** button the value is written in the internal register of PCA9617A IC.
- **EEPROM Address Selection:** allows the user to select the hardware address of PCA9617A.

The **Set** button writes the new values in the internal registers of PCA9617A IC. When the **Set** button is pressed, a pop-up window with the message: *"Setting device Set successfully"* appears on the screen. Click "*OK*" to close the pop-up window.
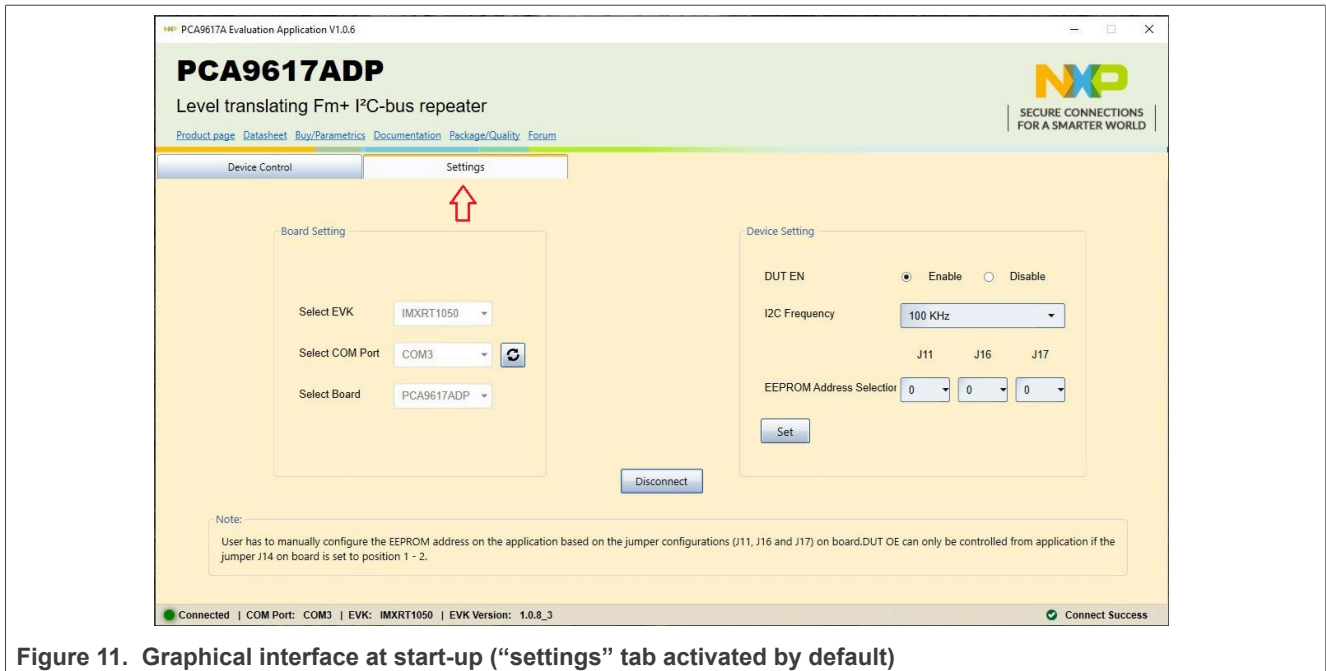
Figure 11. Graphical interface at start-up ("settings" tab activated by default)

The second tab is **Device Control**. Clicking on this new tab, a new window appears (see Figure 12). In upper side of the window, the user can select the VCCA and VCCB power supply voltages from two drop-down lists. The **Set** button sets the selected values for the onboard programmable power supplies, LDO1 and LDO2.

In the bottom side of the window is a chain of blocks connected with bidirectional arrows indicating the data flow through the chain. The **Data** box (in the left side) is the data input. When the **Send Data** button is pressed, any alphanumerical value in the **Data** box is sent through the two PCA9617A ICs and stored in the EEPROM memory. The stored information is displayed in the **Output Data** box (in the right side). If the **Data** box is empty (no character or break/pause typed in the box), when **Send Data** button is pressed a pop-up window with the message: *"Input Data should not be Null or Empty"* appears on the screen. Click "*OK*" to close the pop-up window.
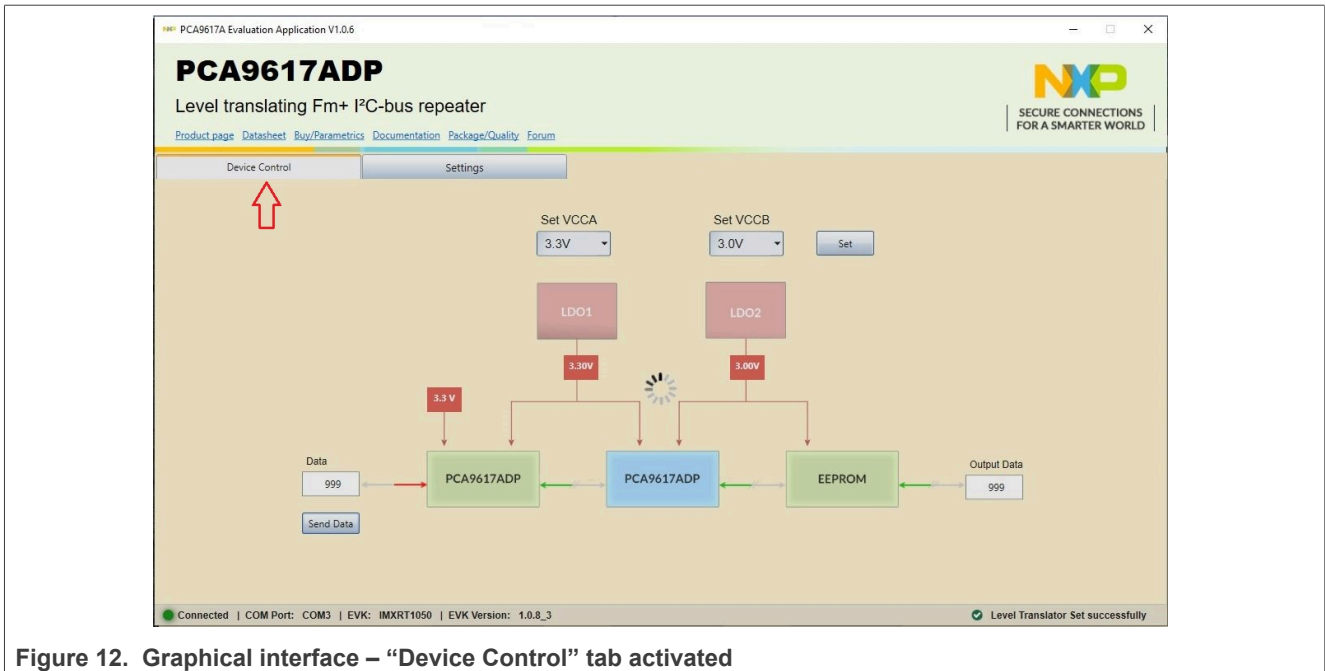
Figure 12. Graphical interface – "Device Control" tab activated

8 Abbreviations

Table 6. Abbreviations

Acronym	Description
DUT	Device Under Test
EEPROM	Electrically Erasable Read-Only Memory
ESD	Electro Static Discharge
EVK	Evaluation Board
GUI	Graphical User Interface
I^{2}C bus	Inter-Integrated Circuit bus
IC	Integrated Circuit
I/O	Input/Output
LED	Light Emitting Diode
PC	Personal Computer
USB	Universal Serial Bus

9 References

1. *PCA9617A, Level translating Fm+ I^{2}C-bus repeater*
   Product data sheet; NXP Semiconductors
2. *MIMXRT1050-EVKB Board Hardware User's Guide*
   User manual; NXP Semiconductors
3. *i.MX RT1050 Crossover Processors Data Sheet for Consumer Products*
   Data sheet; NXP Semiconductors
4. *UM11158 – LPCXpresso55S69/55S28 Development Boards*

User manual; NXP Semiconductors

5. *LPC556x 32-bit ARM Cortex®-M33; M33 coprocessor, TrustZone, PowerQuad, CASPER, 320KB SRAM; 640 KB flash, USB HS, Flexcomm Interface, SDIO, 32-bit counter/timers, SCTimer/PWM, PLU, 16-bit 1.0 Msamples/sec ADC, Comparator, Temperature Sensor, AES, PUF, SHA, CRC, RNG*
   Product data sheet; NXP Semiconductors

6. *i.MX 8M Mini LPDDR4 EVKB Board Hardware User's Guide*
   User guide; NXP Semiconductors

7. *i.MX 8M Mini Application Processor Datasheet for Consumer Products*
   Data sheet; NXP Semiconductors

8. *i.MX 8M Mini Application Processor Reference Manual*
   Reference manual; NXP Semiconductors

9. *Arduino Uno R3 Reference Manual*
   Reference manual; NXP Semiconductors

10. *UM11612 - IMX8MMINI-IARD interposer board*
    User manual; NXP Semiconductors

11. *UM11581 - Arduino Shields GUI and firmware installation*
    User manual; NXP Semiconductors

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