

# UM12202

## P3A1604UK-ARD evaluation board

Rev. 1.0 — 13 March 2025

User manual

### Document information

Information	Content
Keywords	P3A1604UK, I3C Level Shifter, Level Translator, P3A1604 user manual, P3A1604UK-ARD evaluation board
Abstract	The P3A1604 is a quad bidirectional voltage level translator with auto direction sensing, that enables bidirectional voltage level translation. This user manual describes the setup, configuration and operation of the P3A1604UK-ARD evaluation board.



## 1 Introduction

---

The P3A1604UK is a quad bidirectional voltage level translator with auto direction sensing, that enables bidirectional voltage level translation. It includes a reference supply VCCA for port A and VCCB for port B.

The supply voltage of VCCA and VCCB is between 0.72 V to 3.63 V.

Pins A1 to A4 are referenced to VCCA, pins B1 to B4 are referenced to VCCB. Pin OE is used as the device enable input and is referenced to VCCA.

P3A1604UK can be used for both open-drain as well as push-pull application which allows for I3C-bus and other applications like I2C-bus, SMBus and SPI protocols.

This document is intended to help the users to quickly setup, configure and operate the evaluation board in the users' hardware platform.

## 2 Finding kit resources and information on the NXP web site

---

NXP Semiconductors provides online resources for this evaluation board and its supported device(s) on <http://www.nxp.com>. The information page for P3A1604UK-EVB evaluation board is at <http://www.nxp.com/P3A1604UK-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 using the P3A1604UK-EVB 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 P3A1604UK-ARD evaluation board requires the kit contents.

### 3.1 Kit contents

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

## 4 Getting to know the hardware

---

As default, P3A1604UK Port A is configured to operate at 1.8V while Port B is configured to operate at 3.3V via jumper settings shown in [Table 1](#). Port A I2C/I3C interface is available at J21 and J24, while Port B I2C/I3C interface is available on J26 and J27.

Port A signals are routed to the Arduino header (J1) and MCU/Aardvark header (J18) allowing for easy connection to a I2C/I3C controller (MCU).

Port B signals are connected to one on-board 8-bit I2C GPIO expander (PCA9538PW), and one I3C temperature sensor (P3T1750DP). The factory default I2C/I3C addresses for these device are listed in [Table 2](#). The user can also connect their own I2C/I3C target devices to the Port B I2C/I3C interface headers (J26, J27).

GPIO0 and GPIO1 on the PCA9538PW are connected to a pair of LEDs (blue and red). The user can turn on, turn off, or blink the LED by communicating with the PCA9538PW via I2C.

P3A1604UK can be enabled/disabled via J19. It is enabled by default.

P3A1604UK-ARD evaluation board is powered via a USB micro-B connector, J2. There are on-board LDOs to convert 5V from the micro-B connector to other power rails to provide power to VCCA, VCCB other components on the board. VCCA can be configured through J7, J8, J9. VCCB can be configured through J11, J12, J13.

The P3A1604UK-ARD evaluation board is designed to be mated and controlled by a MCU board with standard Arduino headers. The P3A1604UK is then powered by the available 5V rail from the MCU board. [Table 3](#) lists all interface signals the MCU needs to communicate with the P3S0210.

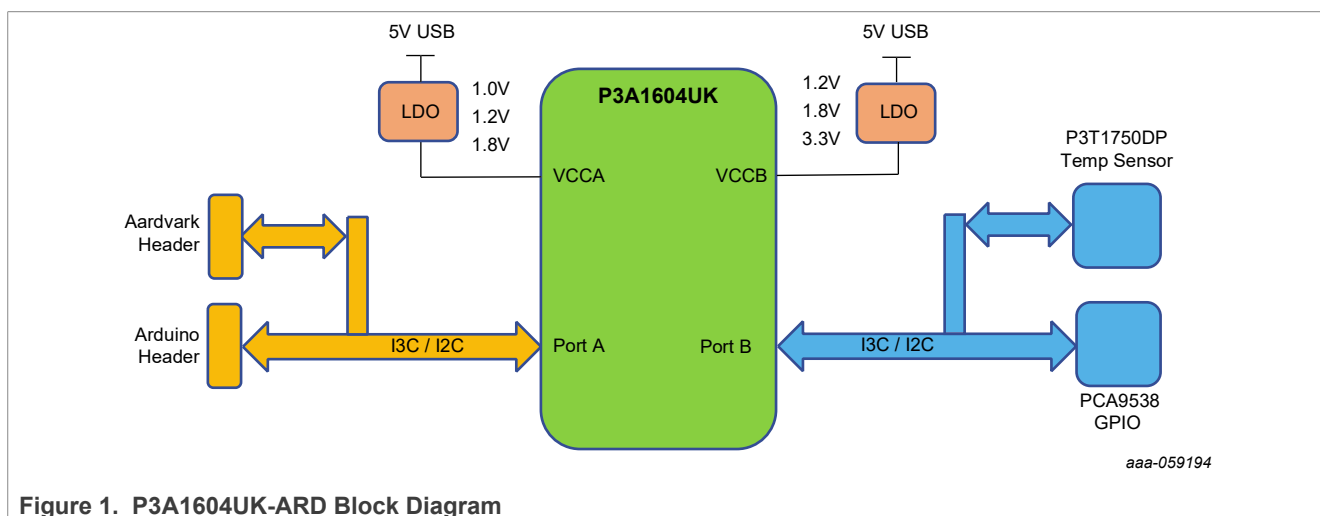
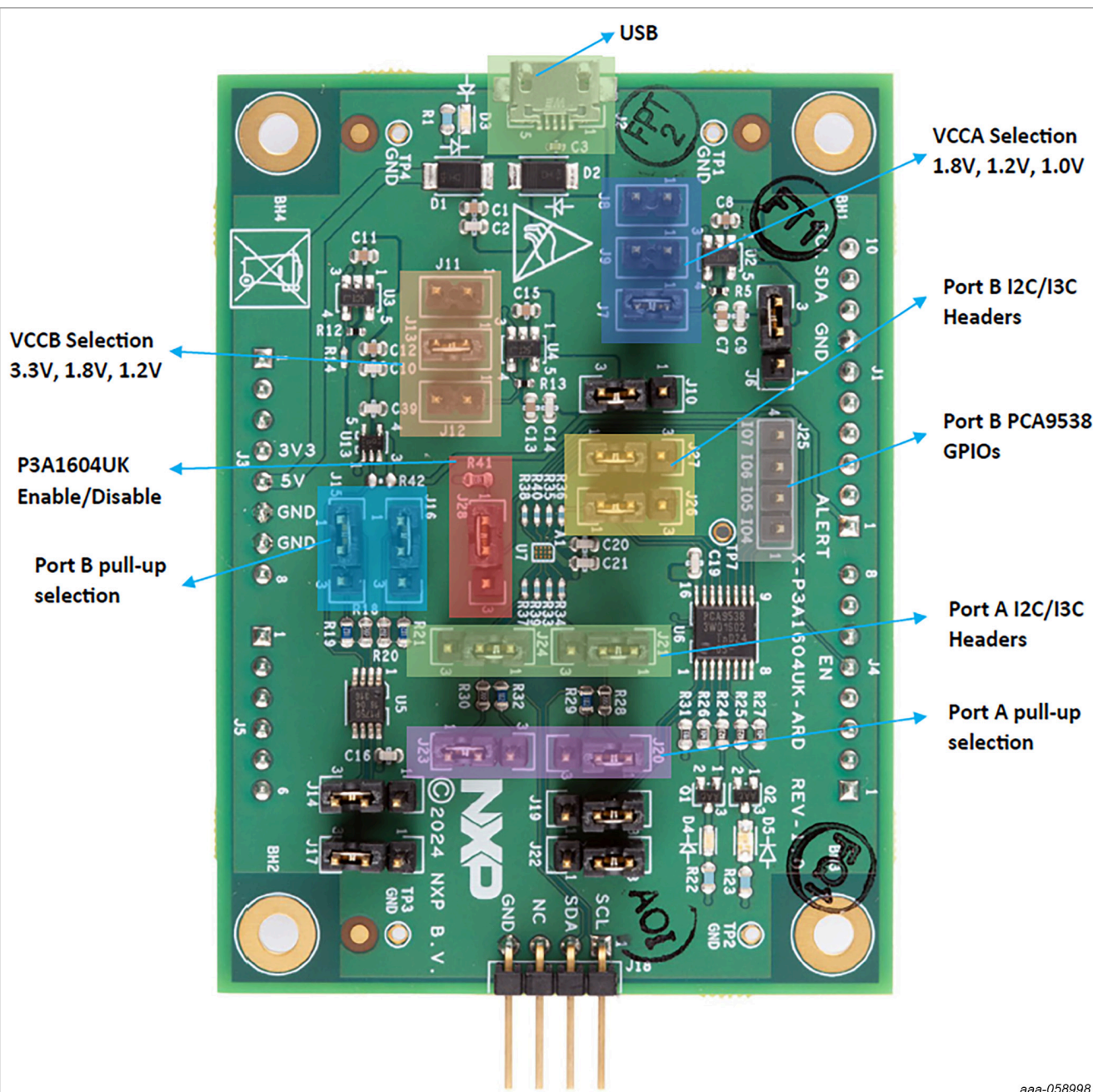


Figure 1. P3A1604UK-ARD Block Diagram

## 5 Kit featured components

### 5.1 Connectors and jumpers

Please refer to [Figure 2](#) to find the location of connectors and jumpers on the evaluation board.



**Figure 2. P3A1604UK-ARD jumper locations**

## 5.2 Jumper settings

### Table 1. Jumper settings

Jumper	Default Setting	Comment
J1, J3, J4, J5	NA	Arduino header
J2	NA	USB micro-B connector
J6	2-3	1-2: VCCA provided externally 2-3: VCCA connected to LDO output

Table 1. Jumper settings...continued

Jumper	Default Setting	Comment
J7	1-2	1-2: VCCA=1.8V (J8 and J9 open)
J8	Open	1-2: VCCA=1.2V (J7 and J9 open)
J9	Open	1-2: VCCA=1.0V (J7 and J8 open)
J10	2-3	1-2: VCCB provided externally 2-3: VCCB connected to LDO output
J11	Open	1-2: VCCB=1.2V (J12 and J13 open)
J12	Open	1-2: VCCB=1.8V (J11 and J13 open)
J13	1-2	1-2: VCCB=3.3V (J11 and J12 open)
J14	2-3	1-2: P3T1750 A0 connect to VCCB 2-3: P3T1750 A0 connect to Gnd
J17	2-3	1-2: P3T1750 A1 connect to VCCB 2-3: P3T1750 A1 connect to Gnd
J15, J16	1-2	1-2: Port B 2.2k pull-ups 2-3: Port B 1k pull-ups
J18	NA	MCU/Aardvark header
J19	2-3	1-2: PCA9538 A0 connect to VCCB 2-3: PCA9538 A0 connect to Gnd
J22	2-3	1-2: PCA9538 A1 connect to VCCB 2-3: PCA9538 A1 connect to Gnd
J20, J23	1-2	1-2: Port A 2.2k pull-ups 2-3: Port A 1k pull-ups
J21	1-2	1-2: Connect Host SCL to pin A1 of P3A1604UK 2-3: Connect Host SCL to pin A3 of P3A1604UK
J24	1-2	1-2: Connect Host SDA to pin A2 of P3A1604UK 2-3: Connect Host SDA to pin A4 of P3A1604UK
J25	NA	Port B GPIOs header
J26	1-2	1-2: Connect Device SCL to pin B1 of P3A1604UK 2-3: Connect Device SCL to pin B3 of P3A1604UK
J27	1-2	1-2: Connect Device SCL to pin B2 of P3A1604UK 2-3: Connect Device SCL to pin B4 of P3A1604UK
J28	1-2	1-2: Enable P3A1604UK 2-3: Disable P3A1604UK

### 5.3 On-board I2C and I3C devices

Table 2. I2C and I3C addresses

Type	Device	Address
I2C	PCA9538PW	U6 – Adr. 0xE0
I3C	P3T1750DP	U5 – Adr. 0x90

The I2C and I3C addresses in the above table are the factory default addresses. These addresses can be changed to other addresses via jumpers.

## 5.4 Arduino headers

The P3A1604UK-ARD evaluation board is designed to be mated and controlled by an MCU board equipped with standard Arduino headers. There are four headers used for this purpose: J1, J3, J4 and J5.

Table 3. Arduino headers

Signal	Header	Pin	Comment
MCU_ALERT	J1	1	Interrupt output from P3T1750DP
MCU_I2C_SCL	J1	10	MCU SCL
MCU_I2C_SDA	J1	9	MCU SDA
5V0_uC	J3	5	5V supply from the MCU board
3V3_uC	J3	4	3V3 supply from the MCU board. Not used.
MCU_EN	J4	5	P3A1604UK Enable control

## 5.5 Schematic, board layout and bill of materials

The schematic, board layout and bill of materials for the P3A1604UK-ARD evaluation board are available at <http://www.nxp.com/P3A1604UK-EVB>.

## 6 Configuring the hardware

1. Unpack the board and power it with the micro-B USB cable
2. Connect a 1.8V I3C controller to Port A via J1 (Arduino) or J18 (MCU/Aardvark). See schematic at <http://www.nxp.com/P3A1604UK-EVB> for wiring connection. By default, both port A has on-board 2.2K pull-ups. If the pull-ups are already present on the I3C controller board, then the on-board pull-ups can be disabled via J20 and J23 (see [Table 1](#)).
3. The I3C controller then can communicate with the 8-bit GPIO PCA9538PW via I2C, or the temperature sensor P3T1750DP via I3C/I2C. These devices are located at different I2C/I3C addresses, see [Table 2](#) for their default factory addresses.

## 7 Errata list

Table 4. Errata

Date	Errata description	Demo impact	Solution
-	None	None	None

## 8 Revision history

Table 5. Revision history

Document ID	Release date	Description
UM12202 v.1.0	13 March 2025	• Initial version



## Legal information

### Definitions

**Draft** — A draft status on a document indicates that the content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included in a draft version of a document and shall have no liability for the consequences of use of such information.

### Disclaimers

**Limited warranty and liability** — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of NXP Semiconductors.

**Right to make changes** — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

**Terms and conditions of commercial sale** — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <https://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

**Suitability for use in non-automotive qualified products** — Unless this document expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

**HTML publications** — An HTML version, if available, of this document is provided as a courtesy. Definitive information is contained in the applicable document in PDF format. If there is a discrepancy between the HTML document and the PDF document, the PDF document has priority.

**Translations** — A non-English (translated) version of a document, including the legal information in that document, is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

**Security** — Customer understands that all NXP products may be subject to unidentified vulnerabilities or may support established security standards or specifications with known limitations. Customer is responsible for the design and operation of its applications and products throughout their lifecycles to reduce the effect of these vulnerabilities on customer's applications and products. Customer's responsibility also extends to other open and/or proprietary technologies supported by NXP products for use in customer's applications. NXP accepts no liability for any vulnerability. Customer should regularly check security updates from NXP and follow up appropriately. Customer shall select products with security features that best meet rules, regulations, and standards of the intended application and make the ultimate design decisions regarding its products and is solely responsible for compliance with all legal, regulatory, and security related requirements concerning its products, regardless of any information or support that may be provided by NXP.

NXP has a Product Security Incident Response Team (PSIRT) (reachable at [PSIRT@nxp.com](mailto:PSIRT@nxp.com)) that manages the investigation, reporting, and solution release to security vulnerabilities of NXP products.

**NXP B.V.** — NXP B.V. is not an operating company and it does not distribute or sell products.

### Trademarks

Notice: All referenced brands, product names, service names, and trademarks are the property of their respective owners.

**NXP** — wordmark and logo are trademarks of NXP B.V.

Tables

Tab. 1.	Jumper settings .....	4	Tab. 4.	Errata .....	6
Tab. 2.	I2C and I3C addresses .....	5	Tab. 5.	Revision history .....	6
Tab. 3.	Arduino headers .....	6			

Figures

Fig. 1.	P3A1604UK-ARD Block Diagram .....	3	Fig. 2.	P3A1604UK-ARD jumper locations .....	4
---------	-----------------------------------	---	---------	--------------------------------------	---



Contents

1 Introduction ..... 2

2 Finding kit resources and information on the NXP web site ..... 2

2.1 Collaborate in the NXP community ..... 2

3 Getting ready ..... 2

3.1 Kit contents ..... 2

4 Getting to know the hardware ..... 2

5 Kit featured components ..... 3

5.1 Connectors and jumpers ..... 3

5.2 Jumper settings ..... 4

5.3 On-board I2C and I3C devices ..... 5

5.4 Arduino headers ..... 6

5.5 Schematic, board layout and bill of materials ..... 6

6 Configuring the hardware ..... 6

7 Errata list ..... 6

8 Revision history ..... 6

Legal information ..... 7

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.