User manual

Getting started with the DA1458x Development Kit – Pro

UM-B-049

Abstract

This document describes the Bluetooth Smart Development Kit - Pro based on DA14580/581/583/585/586. It helps users to set up the hardware development environment, install required software and quickly start product development with help of example source code on SDK v5.x and SDKv6.x.

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1 Terms and definitions

BLE	Bluetooth Low Energy
CS	Chip Select
DK	Development Kit
EEPROM	Electrically Erasable Programmable Memory
FTDI	Brand name of USB – UART interface
GPIO	General Purpose Input Output
OTP	One Time Programmable
PCB	printed circuit board
QFN	Quad-Flat No-leads
SDK	Software Development Kit
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory
SWD	Serial Wire Debug
USB	Universal Serial Bus
UART	Universal Asynchronous Receiver/Transceiver
WLCSP	Wafer Level Chip Scale Packaging
WoW	Way of Working

2 References

1. DA14580, Datasheet, Dialog Semiconductor
2. DA14581, Datasheet, Dialog Semiconductor
3. DA14583, Datasheet, Dialog Semiconductor
4. DA14585, Datasheet, Dialog Semiconductor
5. DA14586, Datasheet, Dialog Semiconductor
6. DA14580_CB PXI QFN40 layout, Dialog Semiconductor
7. DA14580_CB_PXI_QFNP40, Dialog Semiconductor
8. DA14580_CB_PXI_WLCSP, Dialog Semiconductor
9. DA14580_CB_PXI_WLCSP_layout, Dialog Semiconductor
10. DA14580_MB_VB_layout, Dialog Semiconductor
11. DA14580_CB PXI_QFN48, Dialog Semiconductor AN-B-015, DA14580 Supply current measurement, Dialog Semiconductor
12. UM-B-012, DA14580 Creation of a secondary boot loader, User manual, Dialog Semiconductor
13. UM-B-0051, DA1458x Software Platform Reference v1.0

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3 Introduction

The DA1458x is a family of Bluetooth Smart SoC devices, are working at extremely low power levels while providing world-class RF performance, in a small footprint and flexible peripheral configurations for a wide range of applications. The development kit includes a set of hardware (e.g. a development board with on-board debugger), and is supported by a Software Development Kit (SDK) (i.e. development toolchain, source code examples documents and so on) along with documentation.

The mother board can be used to program all the different daughter boards (DA14580/581/583/585/586).

This document helps users to set up hardware/software development environment, by installing the required software to the developer's PC, connecting and setting up the development board to it and quickly start product development with the help of example source code.

Web content can be downloaded at:
www.dialog-semiconductor.com/support.

Product information about the DA14580/581/583/585/586 can be found at:
http://www.dialog-semiconductor.com/products/bluetooth-smart

Product information about the DA14580/581/583/585/586 Development Kit - Pro can be found at:
http://www.dialog-semiconductor.com/products/bluetooth-smart/smartbond-development-tools/da14580-development-kit-pro

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3.1 Order content

In Figure 1 the kit components are shown and contains an overview the parts.

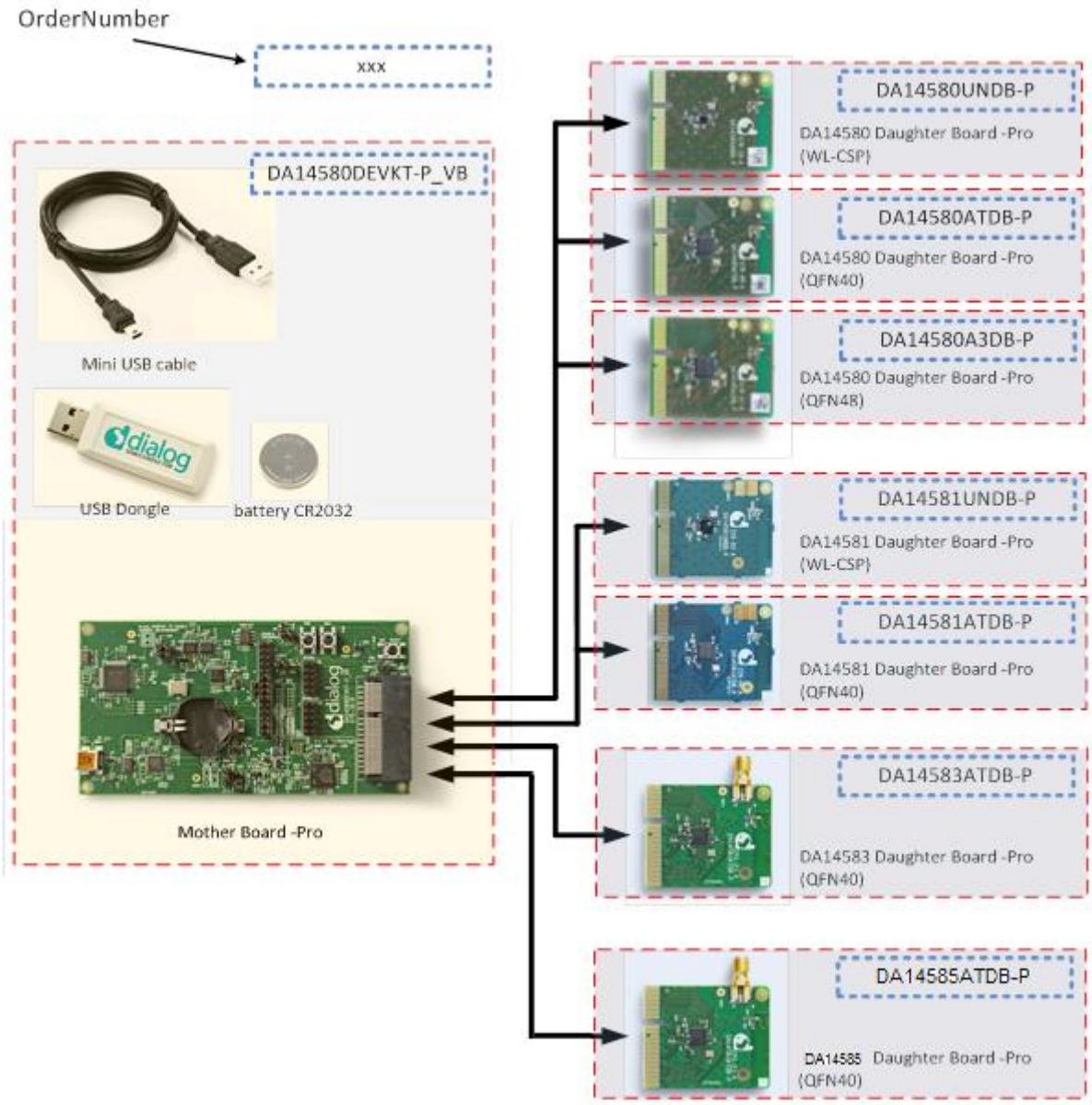

Figure 1: Overview of all DEVKT -Pro parts

Remark on Figure 1.: ordernumbers are to be added in dashedlined blocks

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Table 1: Content of the DA14580/581/583 Pro Kit. Ordernumbers are made Bold.

DA14580/581/583 DEVKT – PRO:	**Included in the kit**	**Separate option for the 580 kit***	**Separate option for the 581 kit***	**Separate option for the 583 kit***
Battery CR2032	X			
Mini USB Cable	X			
DA14580A3DB-P (QFN48)		X		
DA14580ATDB-P (QFN40)		X		
DA14580UNDB-P (WL-CSP)		X		
DA14581UNDB-P (WL-CSP)			X	
DA14581ATDB-P (QFN40)			X	
DA14583ATDB-P (QFN40)				X
DA14580DEVKT-P_VB (Main board)**	X			
USB Dongle	X			
DA14585-00ATDEVKT-P (Main board)**	X			
DA14585-00VVDB-P (WL-CSP)				X
DA14585-00ATDB-P (QFN40)				X
DA14586-00F02ATDB-P (QFN40)				X
DA14586-00VVDB-P (WL-CSP)				X

Note 1 * Not included in the kit, must be bought separately.

Note 2 ** The mainboard is compatible with all boards.

What is needed when ordering parts of the Pro-kit?

First: always needed is the **mother board**. This is part of the DA14580/581/583 Pro Kit. Also part of this Pro-kit are the battery, the USB cable and the dongle.
Second: what kind of daughter-board should be ordered? This depends on the choice of the microcontroller and package.
In Table 1 all the possibilities are displayed. All the possible daughter boards fit on the mother board.

Example: using DA14583

- Battery CR2032 + Mini USB Cable + **mother board** + USB Dongle
- DA14583ATDB-P (QFN40) **daughter board**

How do we order?

Use the numbers in the dashed line blocks of Figure 1 or the Bold numbers in Table 1.

Where to order?

The Pro-kit parts can be ordered via various distributors:
http://www.dialog-semiconductor.com/contact-us/distributors-representatives

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3.2 Pro Kit for DA1458x family

Dialog semiconductor DA1458x BLE SoC family consists of DA14580, DA14581, DA14583, DA14585 and DA14586.

3.2.1 Differences between DA14580, DA14581, DA14583, DA14585 and DA14586

The only hardware difference between the daughter boards of the DEVKT-Pro, is the design in of QFN48 (580) and the QFN40 (581, 583, 585 and 586). The silkscreen may have small textual differences.

The DA14581 uses a dedicated ROM which offers optimisations **targeting A4WP and HCI.**

Table 2: DA14580

Product	Memory size	General Purpose I/Os	Package	Key Features	Applications
WLCSP34	ROM 84kBytes OTP 32kBytes RAM 50kBytes	12	2.5x2.5x0.5mm, pitch 0.4mm	Bluetooth 4.0 + 4.1 Cortex M0 application processor Power supply 0.9 - 3.3V Single pin RF I/O Rich set of analog and digital peripherals	Beacon & Proximity Health & Fitness HID Smart Home
QFN40		24	5x5x0.9mm, pitch 0.4mm		
QFN48		32	6x6x0.9mm, pitch 0.4mm		

Table 3: DA14581

Product	Memory size	General Purpose I/Os	Package	Key Features	Applications
WLCSP34	ROM 84kBytes OTP 32kBytes RAM 50kBytes	12	2.5x2.5x0.5mm, pitch 0.4mm	Bluetooth 4.0 + 4.1 Cortex M0 application processor Power supply 0.9 - 3.3V Single pin RF I/O Rich set of analog and digital peripherals 8 connections Optimized boot time	Wireless charging (A4WP) HCI
QFN40		24	5x5x0.9mm, pitch 0.4mm		

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Table 4: DA14583

Product	Memory size	General Purpose I\O's	Package	Key Features	Applications
QFN40	ROM 84kBytes OTP 32kBytes RAM 50kBytes	24	5x5x0.9mm, pitch 0.4mm	Bluetooth 4.0 + 4.1 Cortex M0 application processor Power supply 2.35 - 3.3V Single pin RF I/O Rich set of analog and digital peripherals	Beacon & Proximity Health & Fitness HID Smart Home

- A4WP wireless charging features:
  - Fast boot time for Power Receiving Unit (PRU)
  - 8 connections for Power Transmitting Unit (PTU)
- HCI features:
  - Optimized code for HCI which fits into the OTP
  - This enables customers/modules makers to provide a pre-programmed HCI module

Remark: DA14583 can run in BUCK mode only!

The DA14583 is a DA14580 plus SPI Flash Memory of 1Mbit in the same package.

Table 5: DA14585

Product	Memory size	General Purpose I\O's	Package	Key Features	Applications
WL-CSP34	ROM 128kBytes OTP 64 kBytes RAM 96 kBytes	14	2.40 mm x 2.66 mm, pitch 0.4mm	• Complies with Bluetooth V5.0, • Cortex M0 application processor • Power supply 0.9 - 3.3V with 1.8V cold boot support • Single pin RF I/O • Rich set of analog and digital peripherals • 8 connections Optimized boot time	Voice-controlled remote controls Beacons (Multi-sensor) Wearable devices: - Fitness trackers - Consumer health Smartwatches Human interface devices: - Keyboard - Mouse Toys, Consumer appliances
QFN40		25	5x5x0.9mm, pitch 0.4mm		

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Table 6: DA14586

Product	Memory size	General Purpose I\O's	Package	Key Features	Applications
QFN40	Flash 2Mbits (256kBytes) ROM 128kBytes OTP 64 kBytes RAM 96 kBytes	24	5x5x0.9mm, pitch 0.4mm	• Complies with Bluetooth V5.0, • Cortex M0 application processor • Power supply 0.9 - 3.3V with 1.8V cold boot support • Single pin RF I/O • Rich set of analog and digital peripherals • 8 connections Optimized boot time	Voice-controlled remote controls Beacons (Multi-sensor) Wearable devices: - Fitness trackers - Consumer health Smartwatches Human interface devices: - Keyboard - Mouse Toys, Consumer appliances

The DA14586 is a DA14585 plus SPI Flash Memory of 2Mbit in the same package.

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3.3 Software Development Tools

3.3.1 SmartSnippets Introduction

Figure 2: SmartSnippets Studio platform

Dialog SmartSnippets Studio™ is a royalty-free software development platform for Smartbond™ devices. It fully supports the DA1468x family of devices.
SmartSnippets Studio™ contains:

- SmartSnippets™ Toolbox: A tool suite covering all software developer needs, including:
  - Power profiling
  - Programming and loading of firmware into SRAM, OTP and Flash
- SmartSnippets™ IDE: Eclipse CDT based IDE pre-configured plugins allowing easy out of the box set-up of build/debug environment
- SmartSnippets™ DA1458x SDK
- SmartSnippets™ Documentation
- RF master which is an implementation of Bluetooth SIG standardized receiver and transmitter HCI commands and additional custom test HCI commands. User can access RF Master by selecting RF Master under the Layout tab of the ribbon menu, which loads RF Master with Log. Alternatively, user can select RF Master tool under Tools tab of the ribbon.

The SmartSnippets™ IDE is supported by an on-board debugger from SEGGER. This offers standard debug capabilities such as single stepping, setting breakpoints, software download and many more. For more details on the debugger capabilities, visit https://www.segger.com/ .

3.3.2 Installation

The description of the needed steps is presented:

- Download the SmartSnippets tools from the Dialog Support Website: https://support.dialogsemiconductor.com (registration required).
- Unzip the zip.
- Run SmartSnippets Studio installer (.msi).
  - Install the recommended version of SEGGER J-Link GDB server.
  - Select the destination folder for the SmartSnippets Studio.
- Run the application.

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3.3.3 Starting SmartSnippets Studio

When SmartSnippets Studio starts for the first time, the user must configure it. The necessary configurations are the following:

- Select the workspace folder for SmartSnippets. The dialog is shown in Figure 9. It is suggested to choose the root directory of the SmartSnippets DA1468x SDK. If this is not done correctly, then the message “you have not selected the latest SDK” will be shown. The correct message should be: “You have not yet selected a SDK. Click the Browse button above and select the SDK location”.

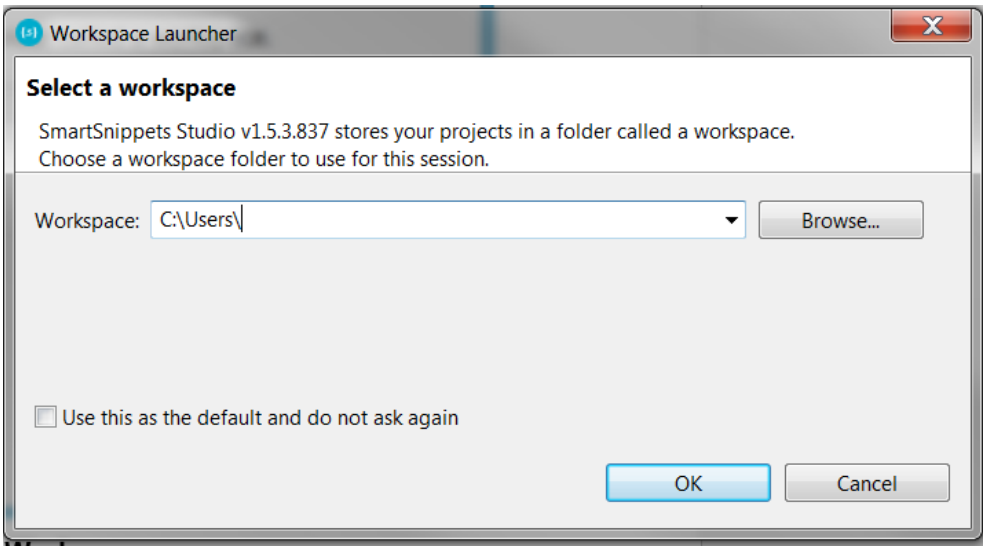

Figure 3: Dialog for Selecting Workspace

If necessary, specify how the selected workspace should be treated. (DA1468x 1.0.8 SDK or DA1458x 5.0.4 SDK)

- A set of tools required for all SDKs are getting automatically detected, such as GNU ARM GCC, SmartSnippets Toolbox, etc. If required version of software cannot be found, they will be downloaded and installed by the SDK Tools Installer (See Figure 10).

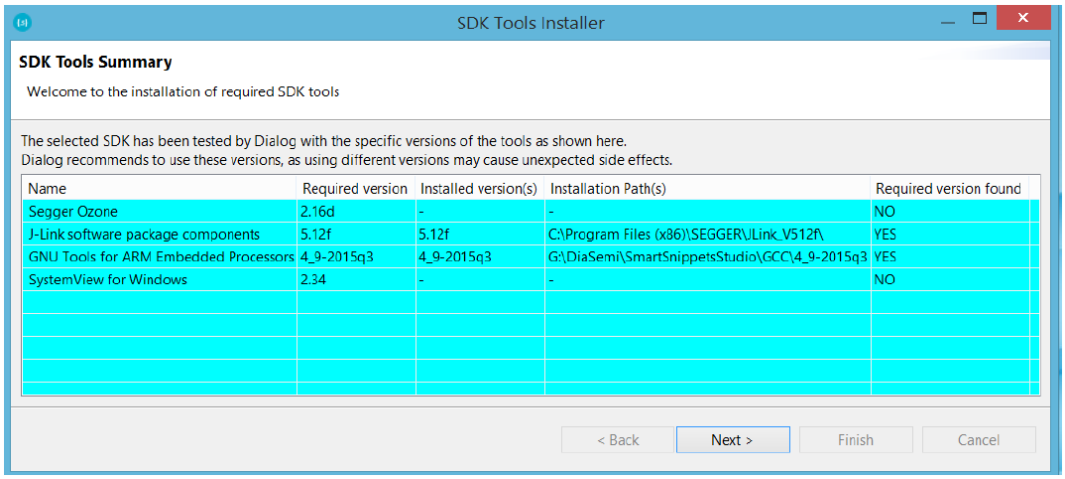

Figure 4: SDK tools installer

And now, the SmartSnippets Studio is ready for use.

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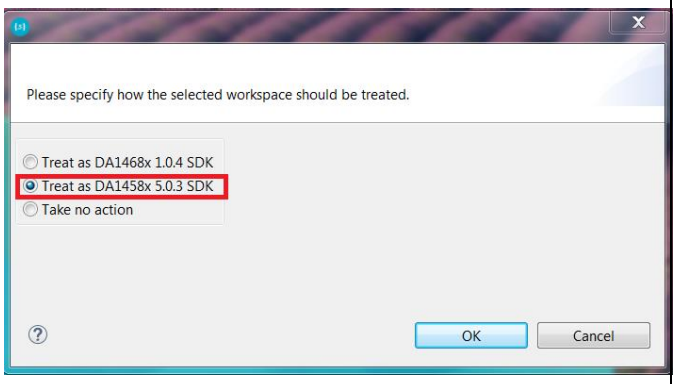
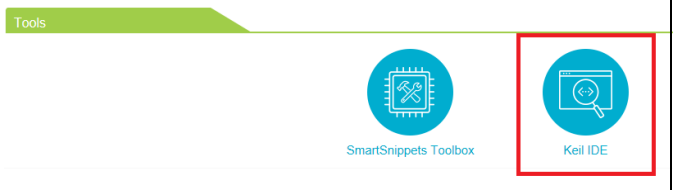
Note, that Ozone and GNU tool chain are not needed for the DA1458x family.

Table 7: Installation tools and drivers

3.4 Setting up your PC	
1	Register yourself on the Dialog website http://support.dialog-semiconductor.com/
2	Dowload the newest SDK http://support.dialog-semiconductor.com/product/da14580 http://support.dialog-semiconductor.com/product/da14585
3	Download SmartSnippets Studio https://support.dialog-semiconductor.com/resource/smartsnippetsstudiov153-windows-os https://support.dialog-semiconductor.com/resource/smartsnippetsstudiov153-linux-os
5	To install the Software development environment, please follow the steps as shown below.
3.4.1 SmartSnippets Studio	
1	Open SmartSnippets Studio and select: Treat as DA1458x	
2	Press: Keil IDE from the Tools section of thw welcome menu	

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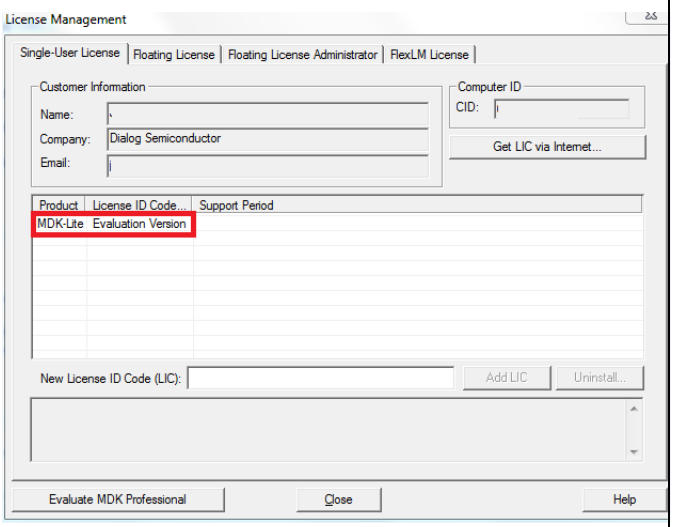
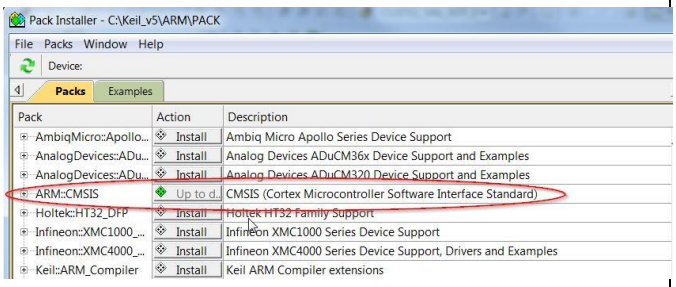
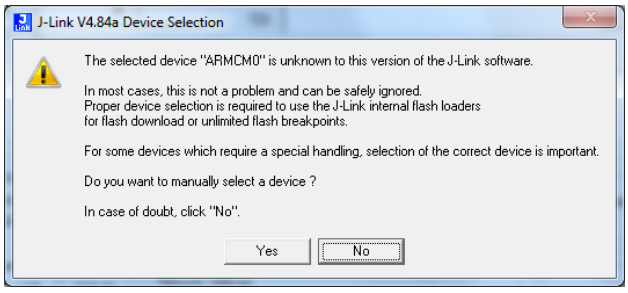
3	The MDK-Lite version (<32kB without a licence) of KEIL must be used.	
4	You should see a list of packs as shown on the right. If you do not see this list, please click the “Packs” menu item and select the “Check for Updates” option to download an updated list. Click on the “Install” or the “Update” button to the right of “ARM::CMSIS” package if not up to date.	
5	If the installation is successful, the pack installer window should look like this.	
6	Having installed the SEGGER JLink Software, this screen may occur, so: Select ‘yes’ and in the next window Select ‘M0’.	

3.4.2 Tera Term

1	Download and install Tera Term on your PC.	Tera Term: http://en.sourceforge.jp/projects/ttssh2/releases/

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3.4.3 Software Development Kit content

3.4.3.1 Tools

Web-link: www.dialog-semiconductor.com/support, go to section **Products** for selecting chip (e.g DA14585) then **Software & Tools**, and finally **Tools** section.

SmartSnippets

SmartSnippets is a framework of PC based tools to control DA14580/581/583/585/586 development kit, consisting of:

- Power Profiler : Real time current consumption measurement to for the DA14580/581/583 motherboard
- OTP Programmer: Tool for OTP memory programming
- UART/JTAG booter: Tool for downloading hex files to DA14580/581/583 SRAM over UART or JTAG
- SPI & EEPROM programmer: A tool for SPI & EEPROM flash programming
- Sleep Mode Advisor: Calculation tool to determine most optimal sleep modes

3.4.3.2 SDK documents

- UM-B-0051, DA1458x Software Platform Reference0_581_583 Software development guide
- UM-B-006, DA14580 Sleep mode configuration
- UM-B-007, DA14580 Software Patching over the Air (SPOTA)
- UM-B-008, DA14580 Production test tool
- UM-B-010, DA14580_581_583 Proximity application
- UM-B-011, DA14580 Memory map – scatter file
- UM-B-012, DA14580 Secondary boot loader
- UM-B-013, DA14580 External Processor Interface over SPI
- UM-B-014, DA14580 Bluetooth Smart Development Kit – Expert
- UM-B-015, DA14580_581_583 Software architecture
- UM-B-016, DA14580 Software Porting Guide
- UM-B-017, DA14580 GTL interface Integrated Processor Application
- UM-B-079 DA14585 & DA14586 Software Platform Reference (SDK 6.0.2)
- UM-B-080 DA14585 & DA14586 Software Developer's Guide (SDK 6.0.2)
- UM-B-082 DA14585/586 SDK5.0.4 to SDK6 Porting Guide_1v0

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3.4.3.3 SDK source code examples (created with Keil IDE)

Web-link:

- **projects.** This folder holds all the necessary folders needed for DA14580/581/583/585/586 application development.
  - **projects\target_apps\ble_examples**

    The folder contains the following subfolders and in each one of them resides the respective project file. DA14585/586, only Keil_5 is supported:

Table 8: SDK Examples

Folder	Project File	Description
prox_monitor_ext\Keil_5	prox_monitor_ext.uvprojx	Proximity Monitor (External processor configuration) (*see below for device selection) USB MONITOR (**see below)
prox_reporter_ext\Keil_5	prox_reporter_ext.uvprojx	Proximity Reporter (External processor configuration) (*see below for device selection) USB MONITOR (**see below)
prox_reporter\Keil_5	prox_reporter.uvprojx	Proximity Reporter (Integrated processor configuration) (*see below for device selection)
ble_app_barebone\Keil_5	ble_app_barebone.uvprojx	Barebone project (Integrated processor configuration) (*see below for device selection)
ble_app_peripheral\Keil_5	ble_app_peripheral.uvprojx	Peripheral (Integrated processor configuration) (*see below for device selection)
ble_app_profile\Keil_5	ble_app_profile.uvprojx	Profiles (Integrated processor configuration) (*see below for device selection)
prox_reporter_ext_spi\Keil_5	prox_reporter_ext_spi.uvprojx	Proximity Reporter (External processor) SPI version (*see below for device selection)

The device can be easily selected as shown below:

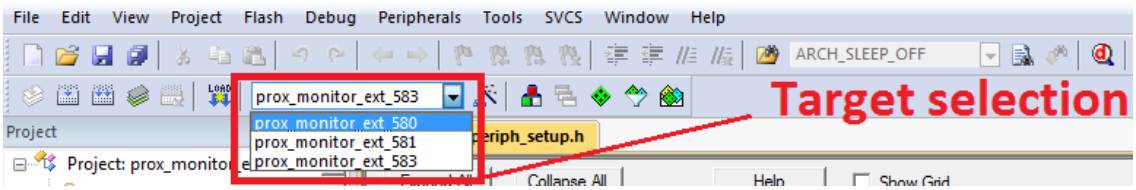

Figure 5: DA14580 Target selection

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Figure 6: da14585 Target selection

**USB MONITOR/USB REPORTER can be easily selected as shown below.

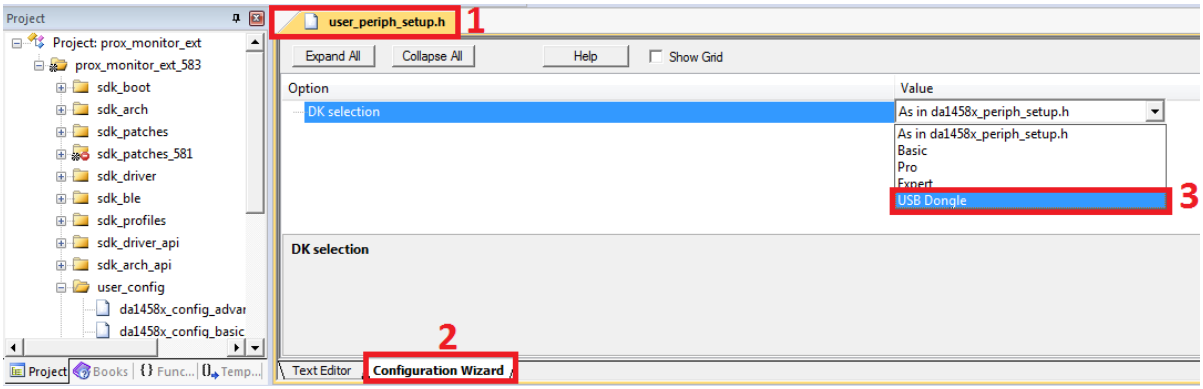

Figure 7: DA14580 USB selection

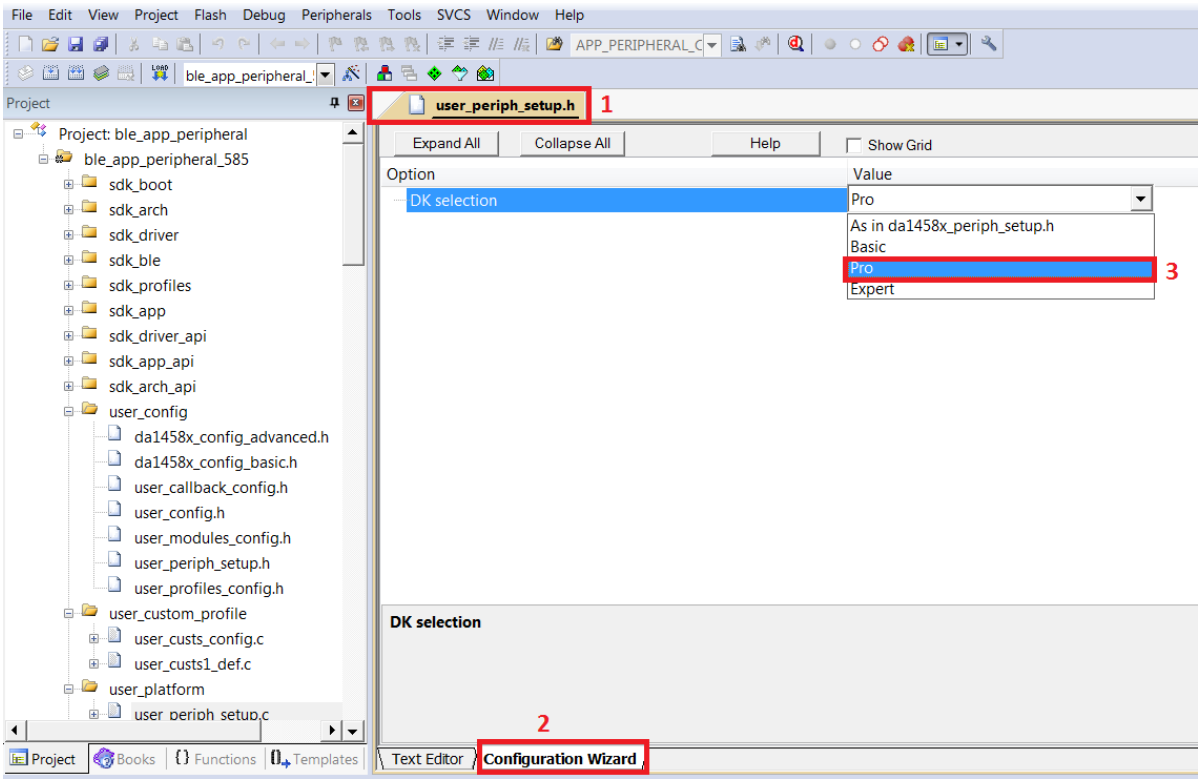

Figure 8: DA14585 USB selection

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- **projects\target_apps\prod_test:** This folder includes the source code of the production test firmware. Refer to UM-B-008_DA14580_581_583_Production_test_tool.pdf for more information how to build and use it.

- **5.0.x:** This folder holds the DA14580/581/583 PC applications:
  - ***projects\host_apps\windows\proximity:*** This folder includes two Windows C applications, with each one acting as part of a proximity monitor and a proximity reporter application. They are placed in subfolders *monitor* and *reporter* respectively. For details, please read the *DA14580 Proximity Application* Guide.
  - **binaries\host\windows\proximity:** This folder includes two pre-compiled Windows executables which correspond to the C applications described right above and are included for user convenience.
  - **projects\target_apps\peripheral_examples:** This folder includes sample code of how to use the peripheral blocks of the DA14580 (e.g. UART, SPI, I2C etc.) bundled to a demo-kit. For details, please refer to [9].

- **6.0.x:** This folder holds the DA14585/586 PC applications:
  - ***projects\host_apps\windows\proximity:*** This folder includes two Windows C applications, with each one acting as part of a proximity monitor and a proximity reporter application. They are placed in subfolders *monitor* and *reporter* respectively.
  - **binaries\host\windows\proximity:** This folder includes two pre-compiled Windows executables which correspond to the C applications described right above and are included for user convenience.
  - **projects\target_apps\peripheral_examples:** This folder includes sample code of how to use the peripheral blocks of the DA14585/586 (e.g. UART, SPI, I2C etc.) bundled to a demo-kit.

- **utilities:**

utilities\prod_test\prod_test_cmds: This folder includes the source code of the production test tool. Refer to UM-B-008_DA14580_581_583_Production_test_tool.pdf for more information how to build and use it.

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3.5 Pinning

In Figure 9 the pinout of the DA14583 is shown. New, compared to the DA14580/581, are the connections to the internal SPI flash memory.

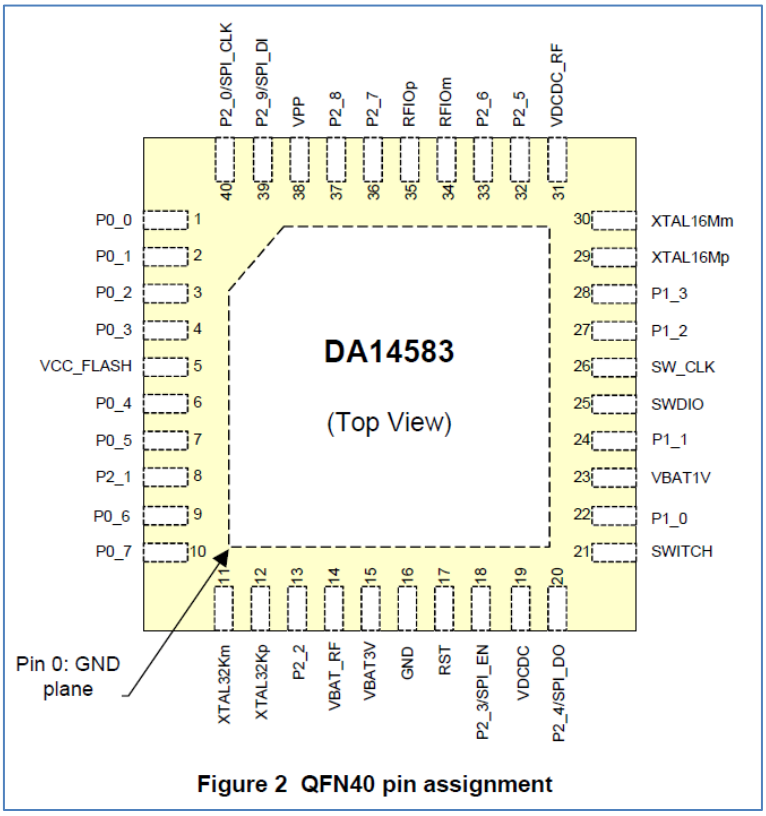

Figure 2 QFN40 pin assignment

Figure 9: QFN40 pin assignment from datasheet

Table 9: SPI connections

port DA14583	function	remark
P2_0	SPI_CLK	SCLK (Note 1)
P2_9	SPI_DI	MOSI (Note 1)
P2_4	SPI_DO	MISO (Note 1)
P2_3	SPI_EN	not to be used for external SPI (!)
	VCC_FLASH	power for internal Flash Memory
	GND	

Note 1 shared with internal flash memory

When external SPI components are used, SPI_EN is occupied for internal use. Another pin should be chosen for SPI_EN of the external component.

By using a Secondary Bootloader the proper pins are programmed to load the booting software from the SPI-memory at startup.
See more info from UM-B-012 [12].

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3.6 DA14585 Pining

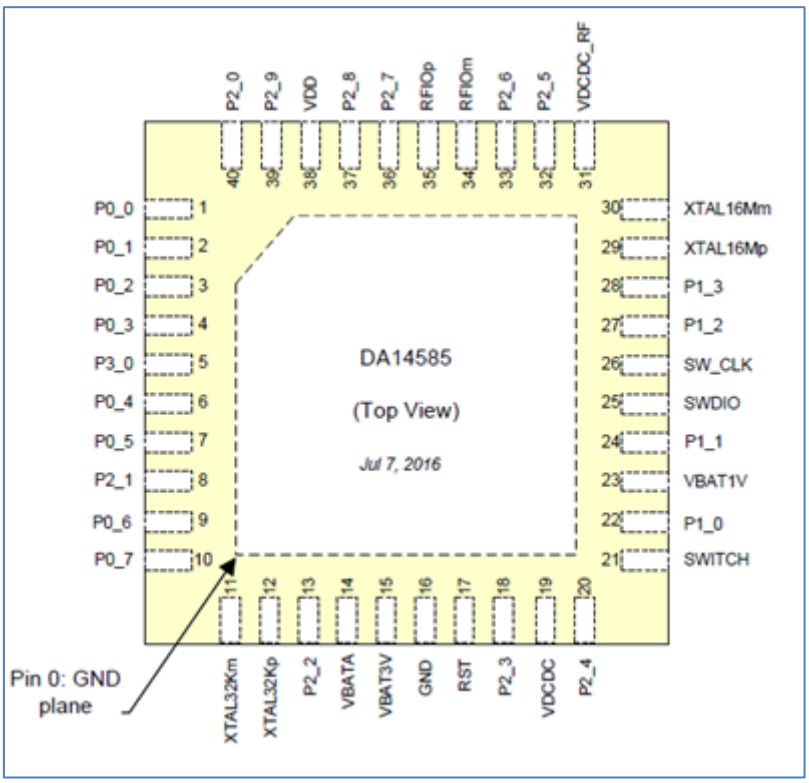

Figure 10: DA14585 - QFN40 pin assignment

DA14585 - QFN40 pins assignment differentiation:

- DA14580/1/3:Pin 38, VDD is assigned instead of VPP. DA14585/6 doesn't need an external 6.8V voltage rail for programming OTP. VDD is input and it is used for testing purposes only. In normal operation this pin must left floating.
- To DA14583/6: Pin 5, is assigned to P3_0 instead of VCC_ Flash for DA14583 and DA14586. On DA14585, this is a general purpose IO pin.

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3.7 DA14586 Pining

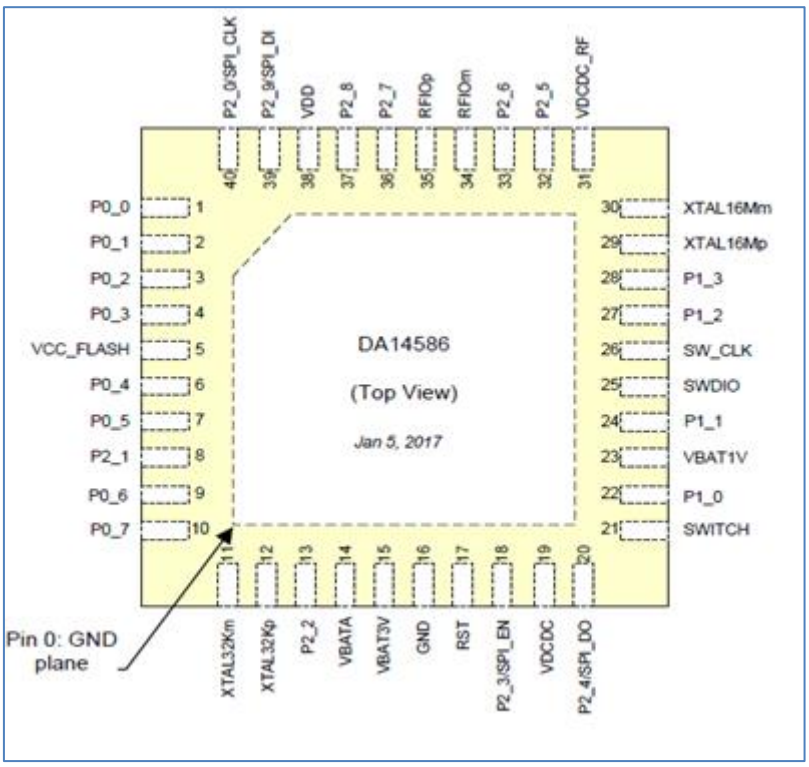

Figure 11: DA14586 - QFN40 pin assignment

DA14586 - QFN40 pins assignment differentiation:
To DA14580/1/3: Pin 38, VDD is assigned instead of VPP. DA14585/6 doesn't need an external 6.8V voltage rail for programming OTP. VDD is input and it is used for testing purposes only. In normal operation this pin must left floating.
To DA14580/1/5: Pin 5, VCC_Flash is assigned instead of P3_0. VCC_ Flash is used for supplying the internal flash memory for DA14586. Same assignment is valid for DA14583.

In addition, as DA14586 incorporates a 2Mbit flash memory, four pins are multiplexed with internal flash data pins :

Table 10: SPI connections

Pin number DA14586	Port DA14586	function	Remark
40	P2_0	SPI_CLK	SCLK (Note 2)
39	P2_9	SPI_DI	MOSI (Note 2)
20	P2_4	SPI_DO	MISO (Note 2)
18	P2_3	SPI_EN	not to be used for external SPI (!)
5		VCC_FLASH	power for internal Flash Memory
		GND	

Note 2: shared with internal flash memory

When external SPI components are used, SPI_EN is occupied for internal use. Another pin should be chosen for SPI_EN of the external component.

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By using a Secondary Bootloader the proper pins are programmed to load the booting software from the SPI-memory at startup.

3.7.1 PCB design and functionalities

The top-screen layer of the pro kit PCB is shown below in Figure 12.

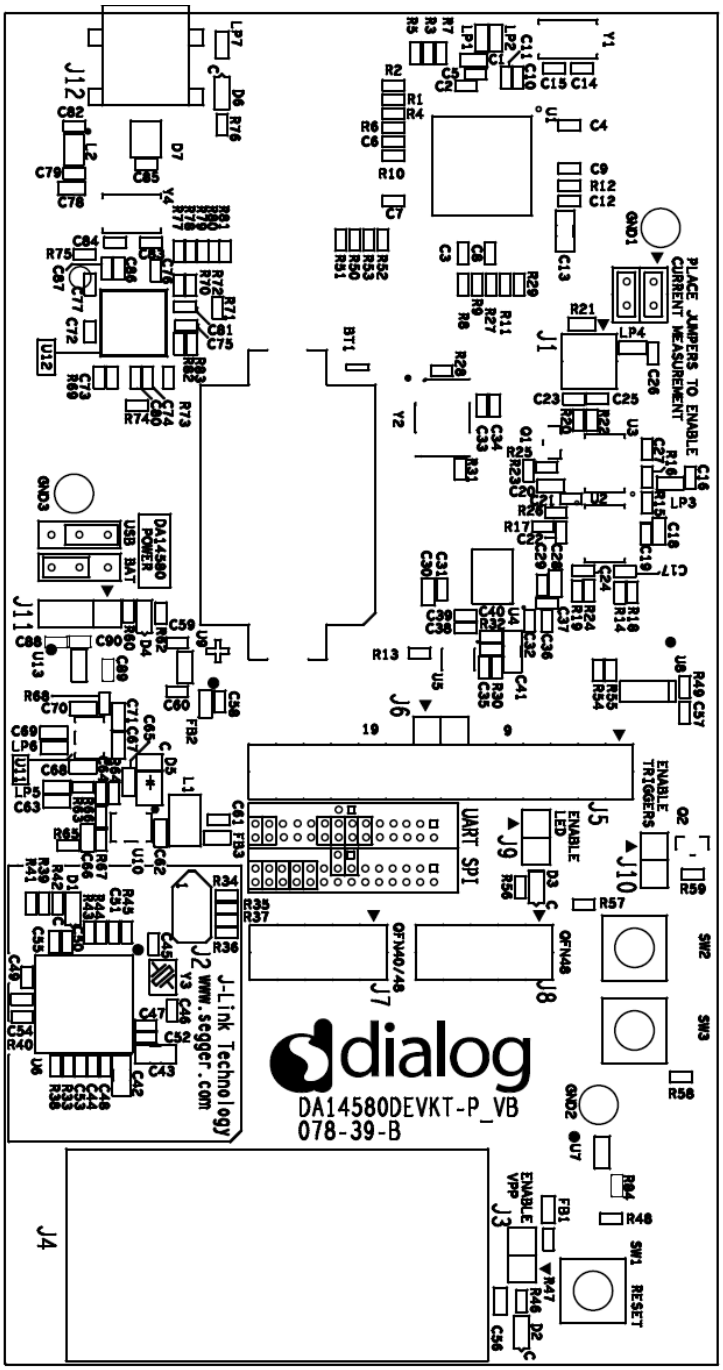

Figure 12: MotherBoard of Development Kit – Pro (PCB topview)

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3.7.2 Configuring the Pro kit-board by jumper settings

There are two configurations that can be switched; the default configuration that supports the boot from UART or the configuration that supports boot from an external SPI flash memory.

The jumper settings are displayed below.

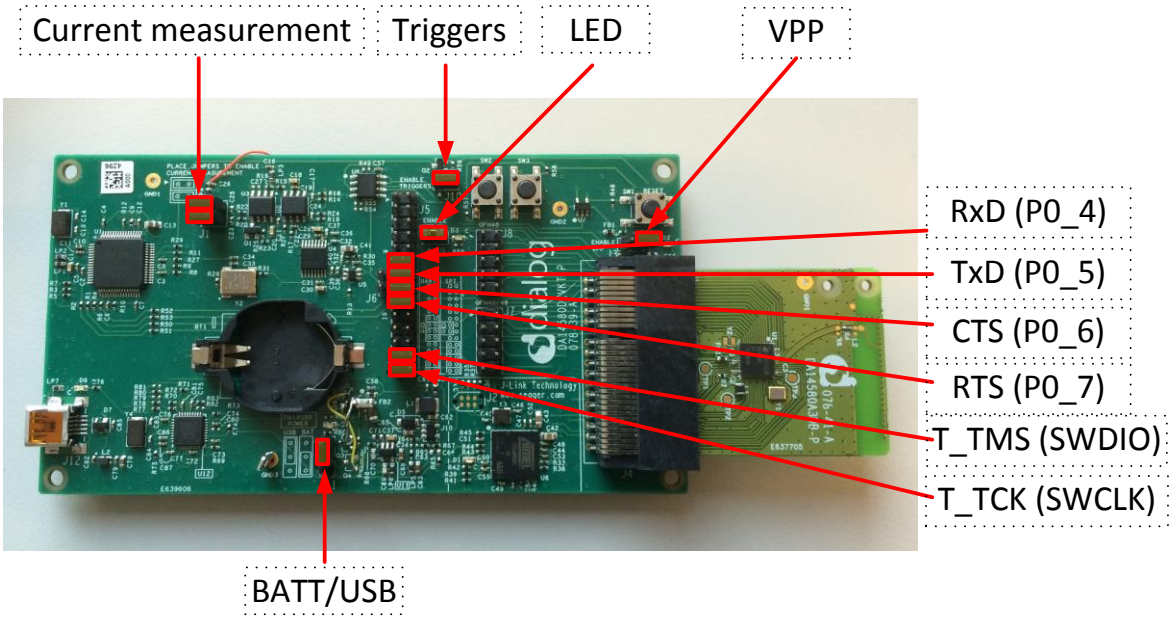

Figure 13: DA14580/581/583 (Fabrication default)
UART boot settings (T_TxD : (P0_5) and T_RxD : (P0_4))

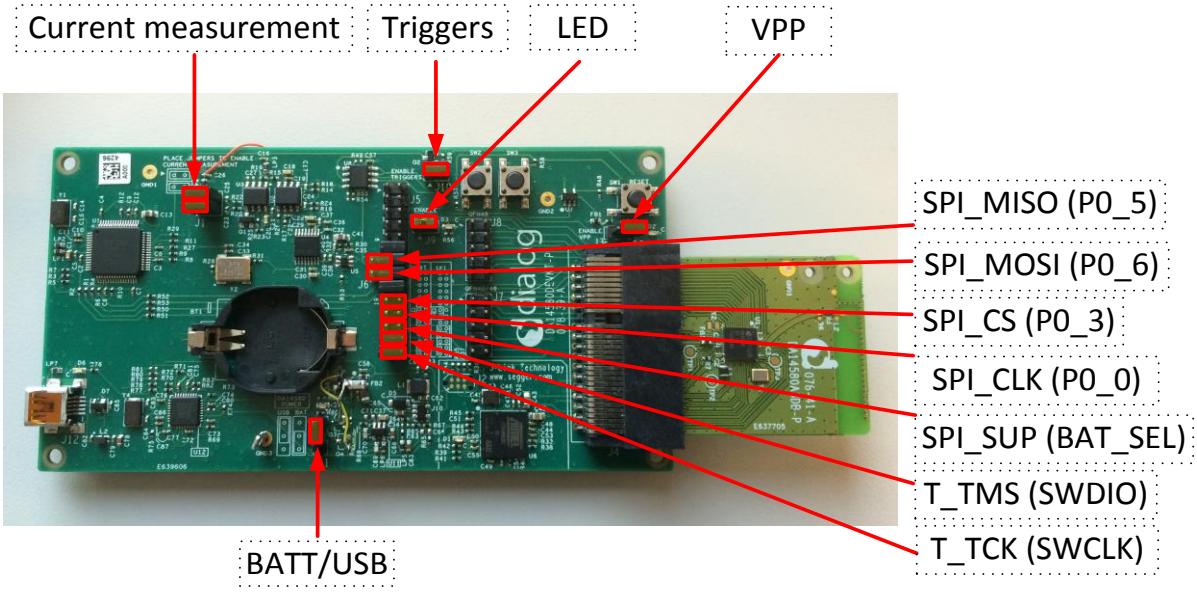

Figure 14: DA14580/581 Boot from external SPI memory

Note 3 These functionalities are shown in detail in Appendix A

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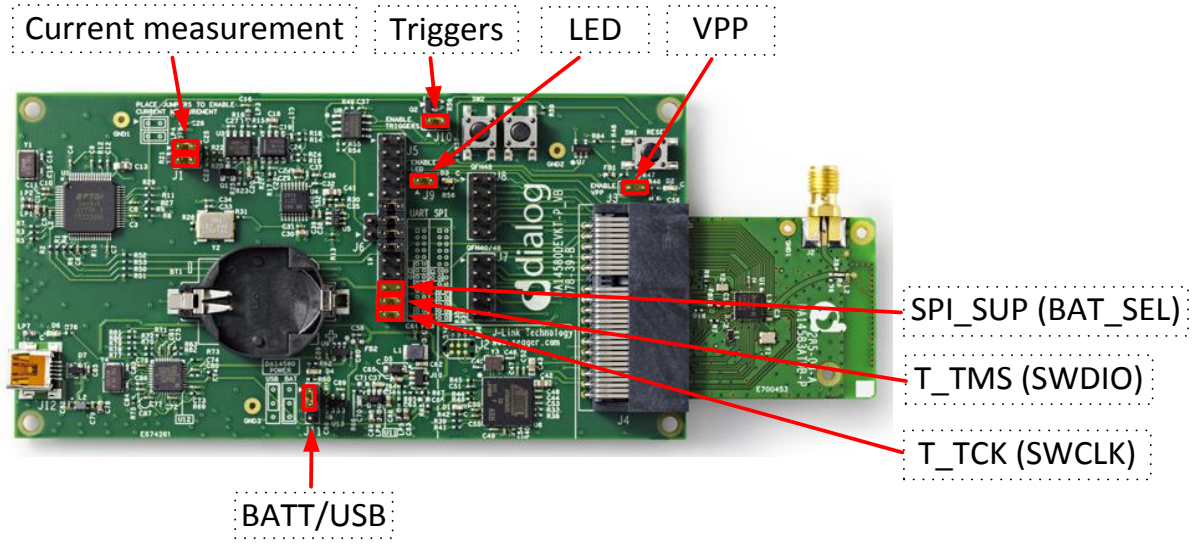

Figure 15: DA14583 Boot from internal SPI memory

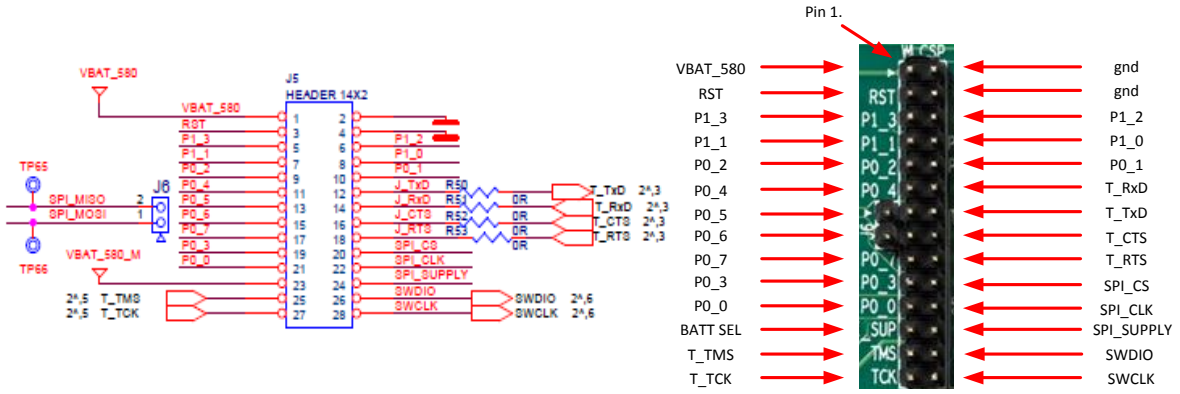

Figure 16: Layout of headers J5 and J6

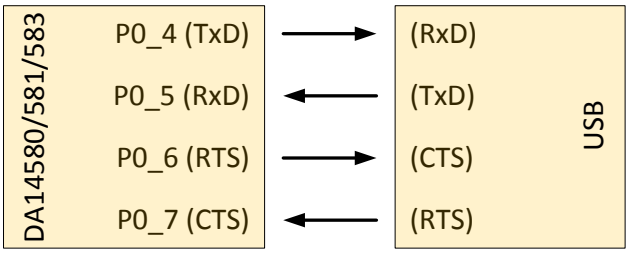

Figure 17: UART Data Direction of Uart within J5

Example: when jumper J5 (27-28) is placed, connection 'T_TCK = SWCLK' is made.

In Figure 13 and Figure 14 the connections are added next to the arrows.

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On this board only the buck mode is used. A choice can be made between 3V3 (via USB: J11 1-2) or Vdd (a coin cell: J11 2-3). No battery is needed when running via the USB-mini-cable.

Remark: For proper battery functionality a small modification should be made. For the details see the workaround in Appendix G.

3.7.3 Block diagram

This is the schematic of the block diagram; all other schematics can be found in Appendix C.

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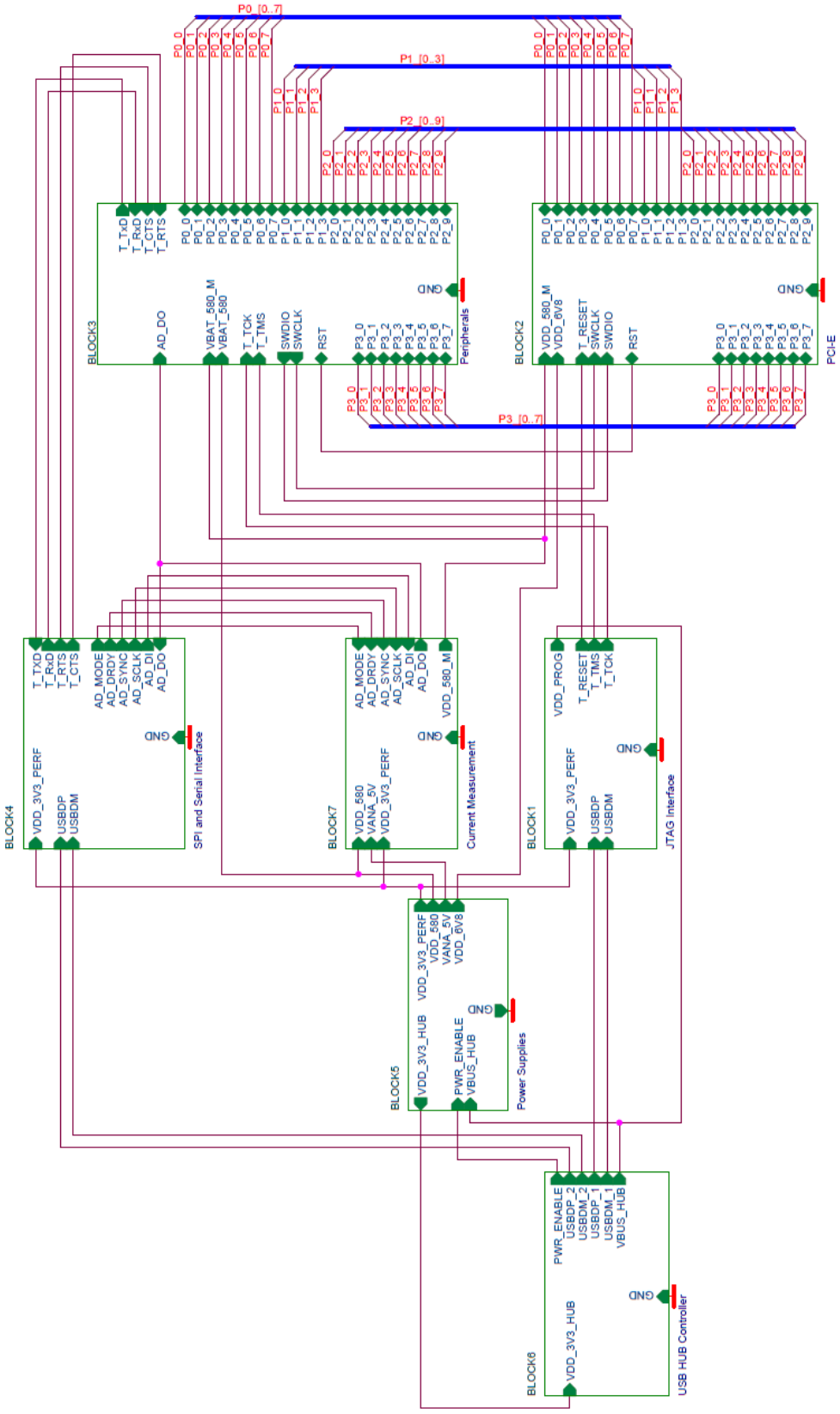

Figure 18: Block diagram of total systemMemory and tools

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The DA14580/DA14581/DA14583DEVKT is equipped with: (on the chip) SRAM (50k) and OTP (32k).
Mounted on the board is external SPI flash memory (2Mbit).

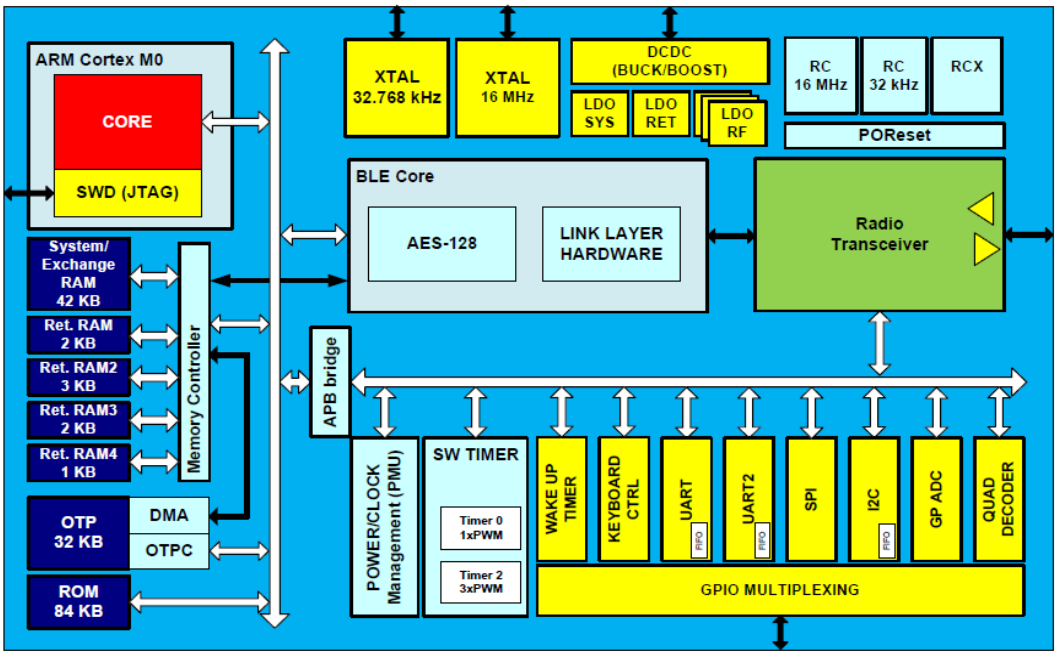

Figure 19: DA14580/581/583 block diagram

Software can be downloaded to:

- SRAM
  - Keil IDE
  - SmartSnippets
  - Command Line Interface (CLI)
  - Connection Manager
- OTP
  - SmartSnippets
  - CLI
- SPI (flash)
  - SmartSnippets
  - CLI

Example: loading software (hex-file) by using SmartSnippets

- PC → UART → DA14580/581/583
- PC → UART → DA14580/581/583→ SPI (flash)
- PC → UART → DA14580/581/583→ OTP

For the settings of the jumpers see Figure 13.

An example of the **CLI** is shown in Appendix D

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The DA14585/DA14586 is equipped with: (on the chip) SRAM (96k) and OTP (64k).
Mounted on the board is external SPI flash memory (2Mbit). External Falsh is not used for DA14586.

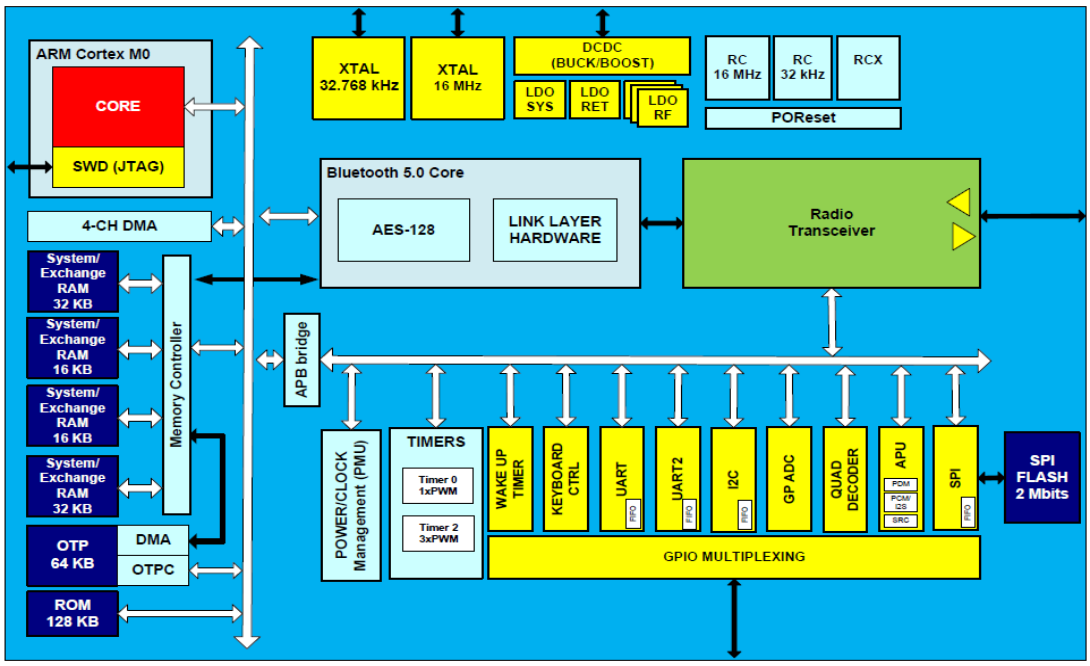

Figure 20: DA14585/586 block diagram

Software can be downloaded to:

- SRAM
  - Keil IDE
  - SmartSnippets
  - Command Line Interface (CLI)
  - Connection Manager
- OTP
  - SmartSnippets
  - CLI
- SPI (flash)
  - SmartSnippets
  - CLI

Example: loading software (hex-file) by using SmartSnippets

- PC → UART → DA14585/586
- PC → UART → DA14585/586 → SPI (flash)
- PC → UART → DA14585/586 → OTP

For the settings of the jumpers see Figure 13.

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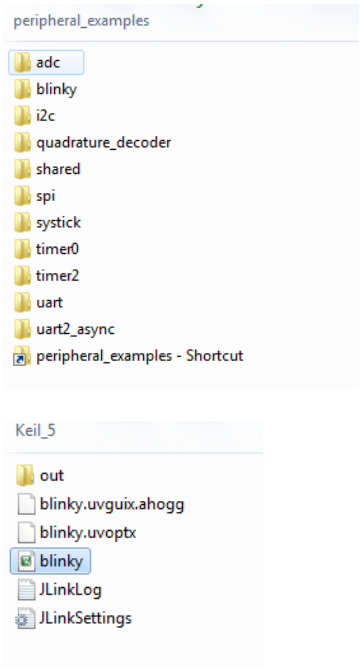
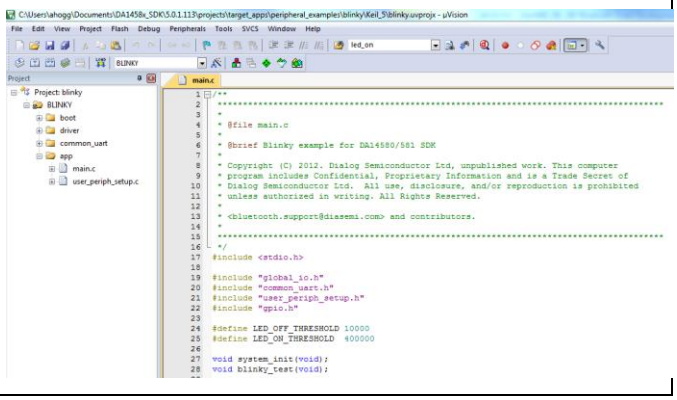
An example of the **CLI** is shown in Appendix D

4 Using the demo kit

Follow the steps shown in Table 11 to easily create a working demo kit.

Table 11: Run an example on DA14580/581/583

4.1 Run an example on the DA14580/581/583		
1	After you download the SDK at www.dialog-semiconductor.com/support The source code example can be found in the example directory called "*peripheral_examples*\". Go to projects\target_apps\peripheral_examples\blinky\Keil_5 Double click "blinky.**uvproj**	
2	The development environment should look like this when the project is opened with Keil.	

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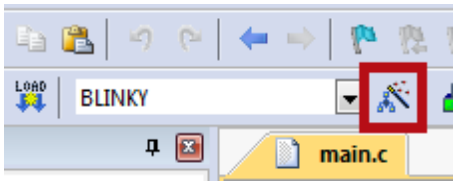
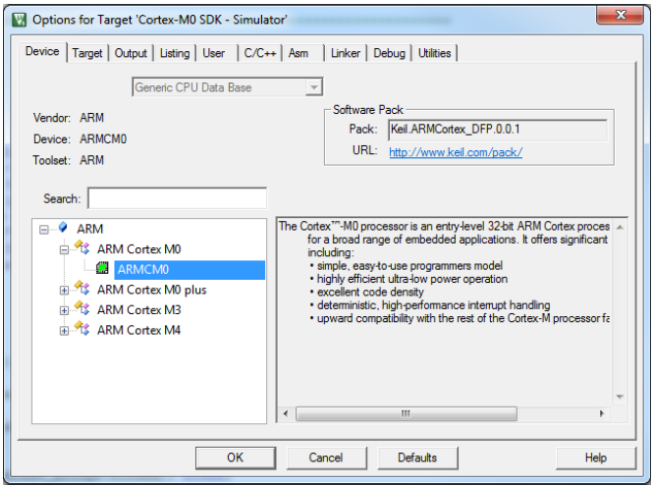
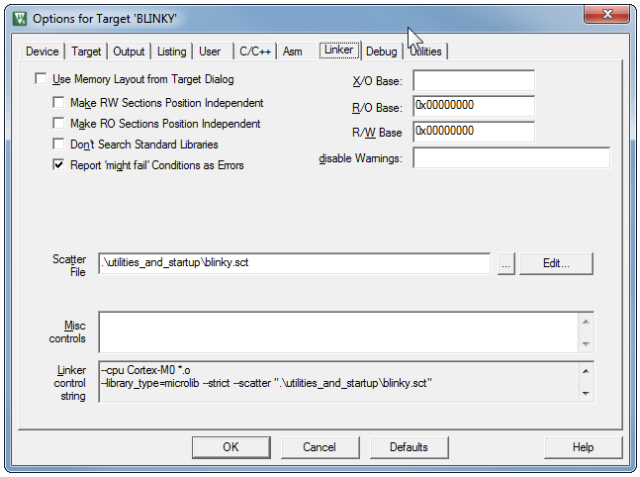
3	Click on the “Target Options” button	
4	‘Options for Target’ → ‘Device’ -screen should look like this.	
5	Scatterfiles (.sct) are used for selecting memory areas.	 scatter file selection in ‘Options for Target’

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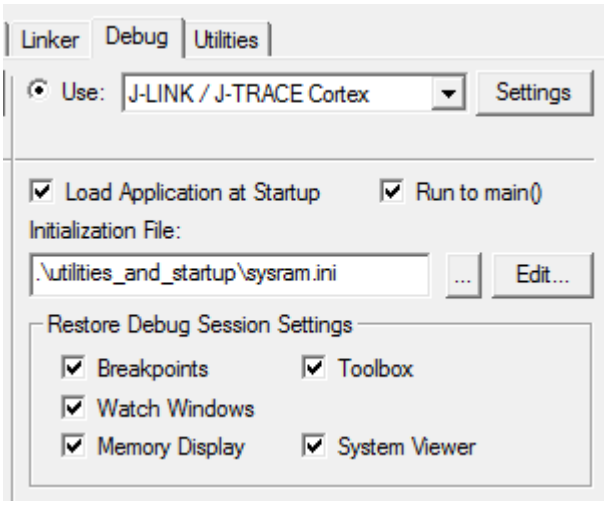
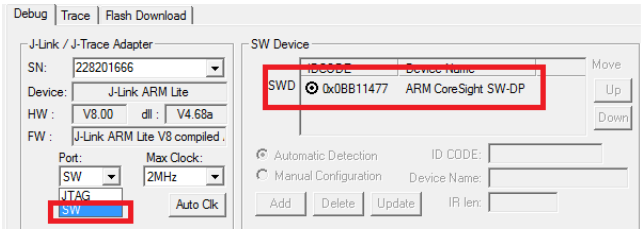
6	Make sure “J-LINK/J-Trace Cortex” is selected as shown and the initialization file field is set correctly to “.\sysram.ini”. Click on “**Settings**” for next screen.	
7	After clicking the “**Settings**”-button above, make sure the SW Device has been detected correctly.	
8	Click “**OK**” to save the settings.	All settings have been saved properly now, and you can continue to build the example.
9	Build the project by pressing “F7” key, or click the build button as shown in following picture	
10	Make sure you have a UART connection between your PC and a mother board, as shown in 6.1.5. Check the “COM” number on you PC.	Go to the Windows Control Panel →Administrative Tools →Computer Management → Device Manager → Ports → USB Serial Port # (connect or disconnect to see the COM port of that module)
11	Open the “**Tera Term**” serial terminal on you PC.	

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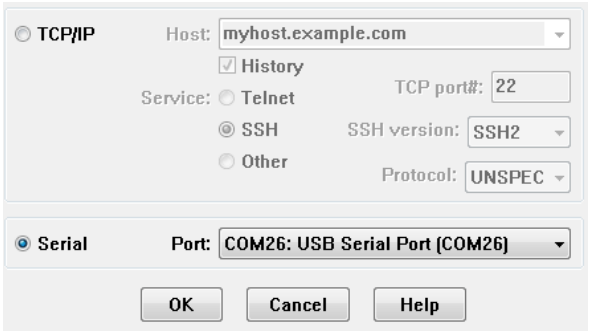
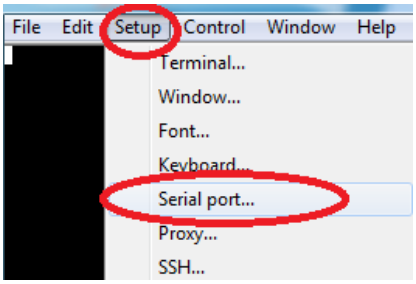
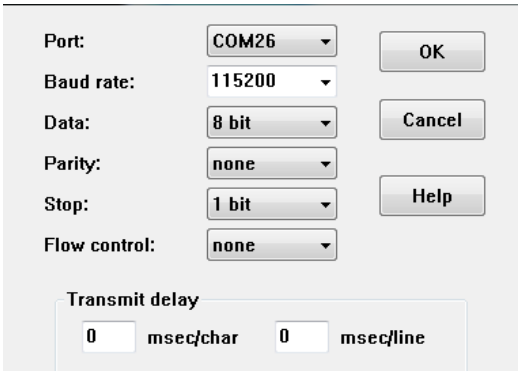
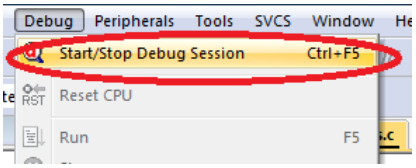
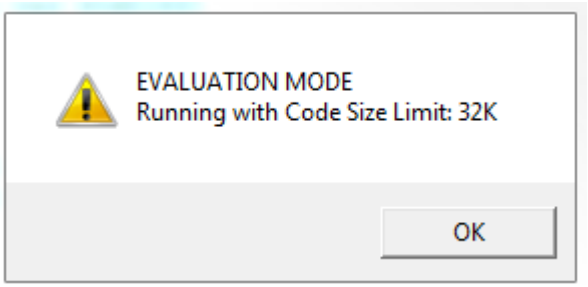
12	Open Tera Term and choose a COM port, which you have found in step 3, and click OK	
13	Choose Setup->Serial port to configure the Baud rate etc.	
14	Set “Baud rate” to 115200, ”Data” to 8 bit, ”Parity” to None, ”Stop” to 1 bit and “Flow control” to none. Click OK. Now we have a properly configured UART terminal on our PC.	
15	Go back to Keil Project. In the menu bar, select Debug->Start/Stop Debug Session.	
16	A dialog window pops up, like the one on the right. Please click “OK”	

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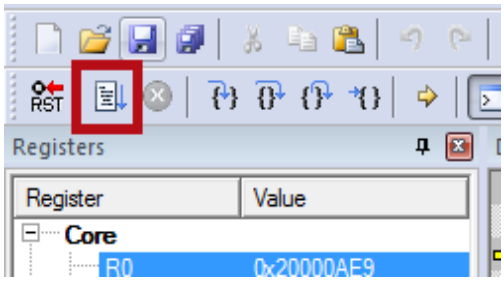
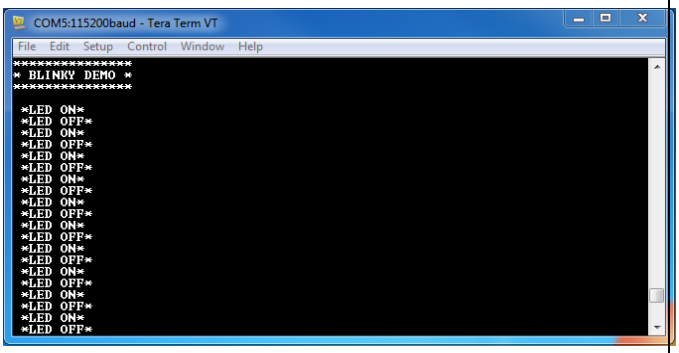
17	Press F5 key or click execution button as shown in following picture, to start code execution.	
18	Then you can see a *blinky* message on your UART terminal screen. That means you have successfully programmed and started the blinky program on DA14580/581/583 Demo board.	

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Appendix A Layout

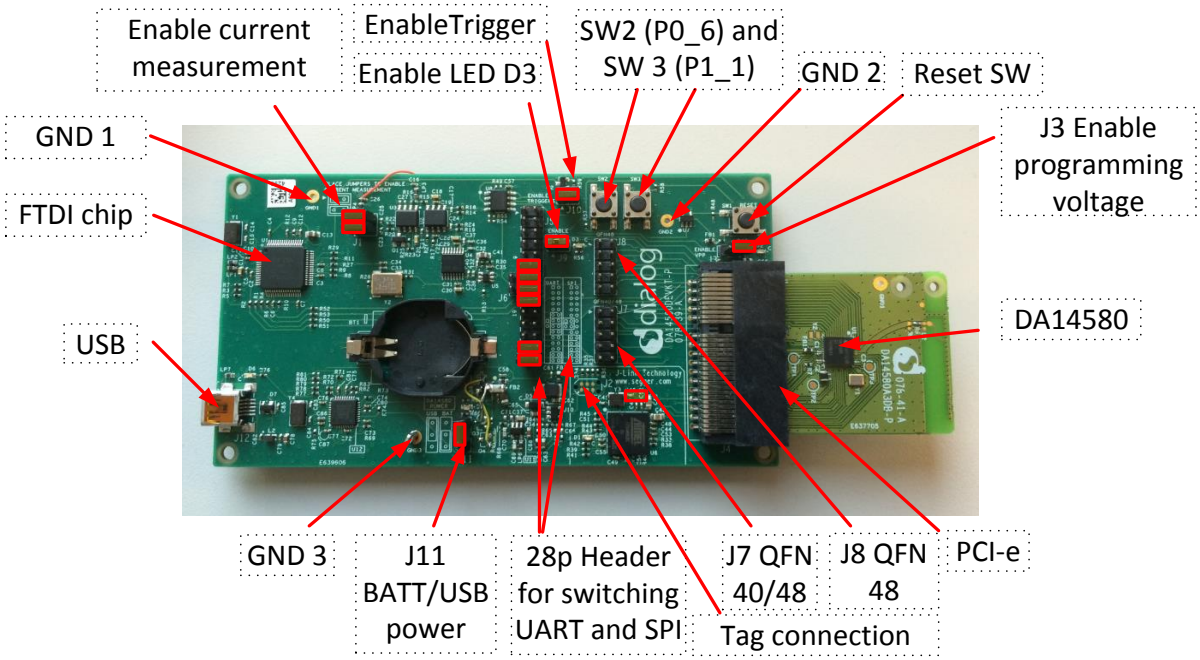

Figure 21: **Board layout**

Appendix B Connections of J7 and J8

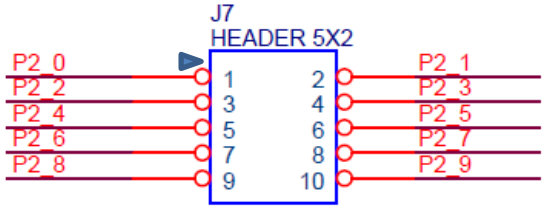

Figure 22: IO breakout available on QFN40 and QFN48

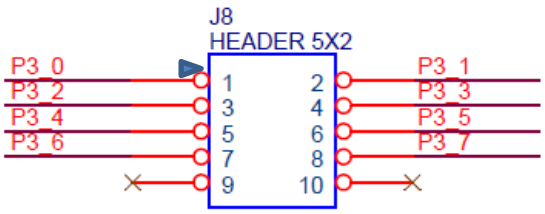

Figure 23: IO breakout available on QFN48

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Appendix C Schematics Motherboard and Daughterboards

C.1 Peripherals

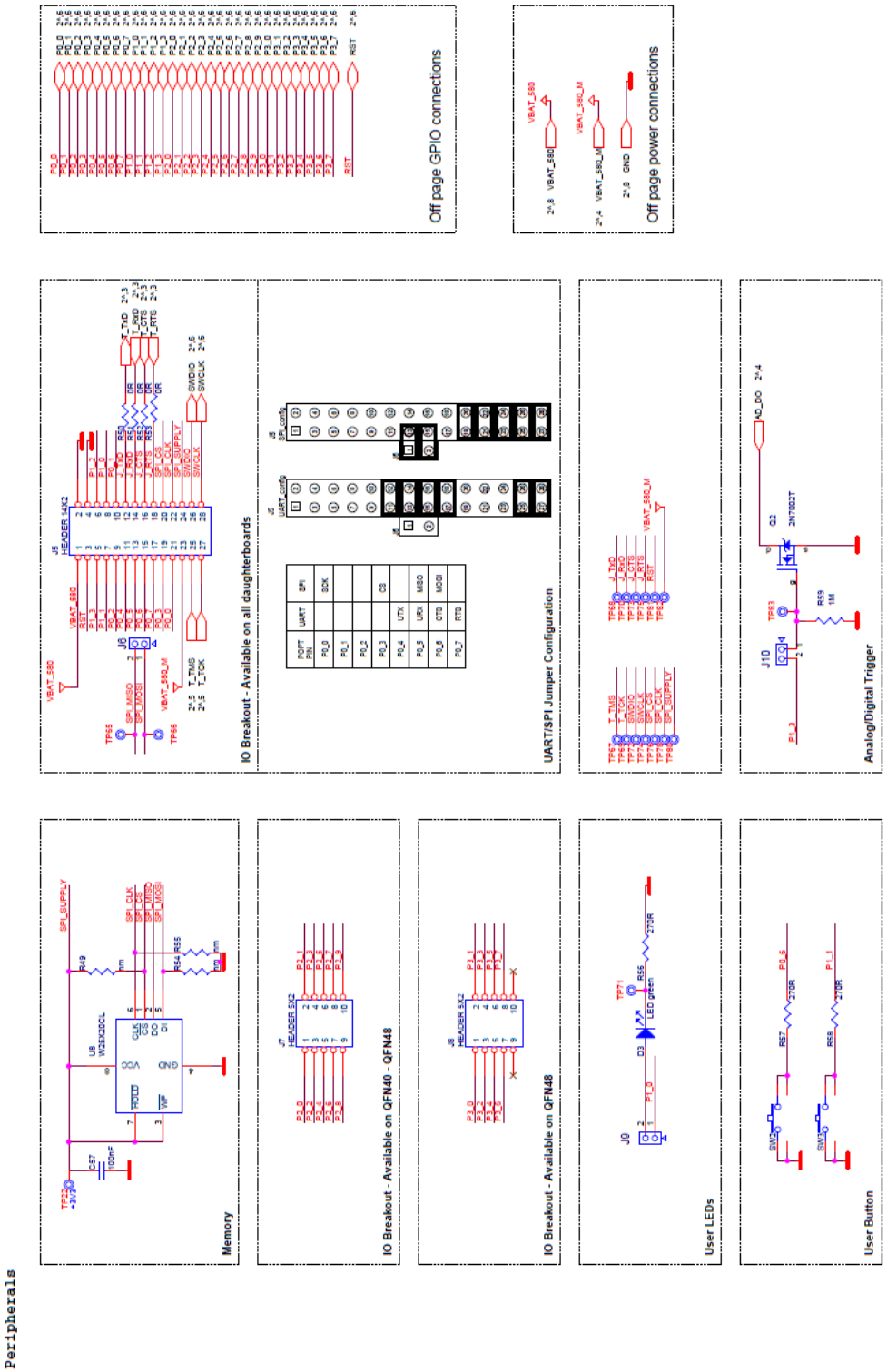

Figure 24: Peripherals schematic of Motherboard

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C.2 SPI and serial

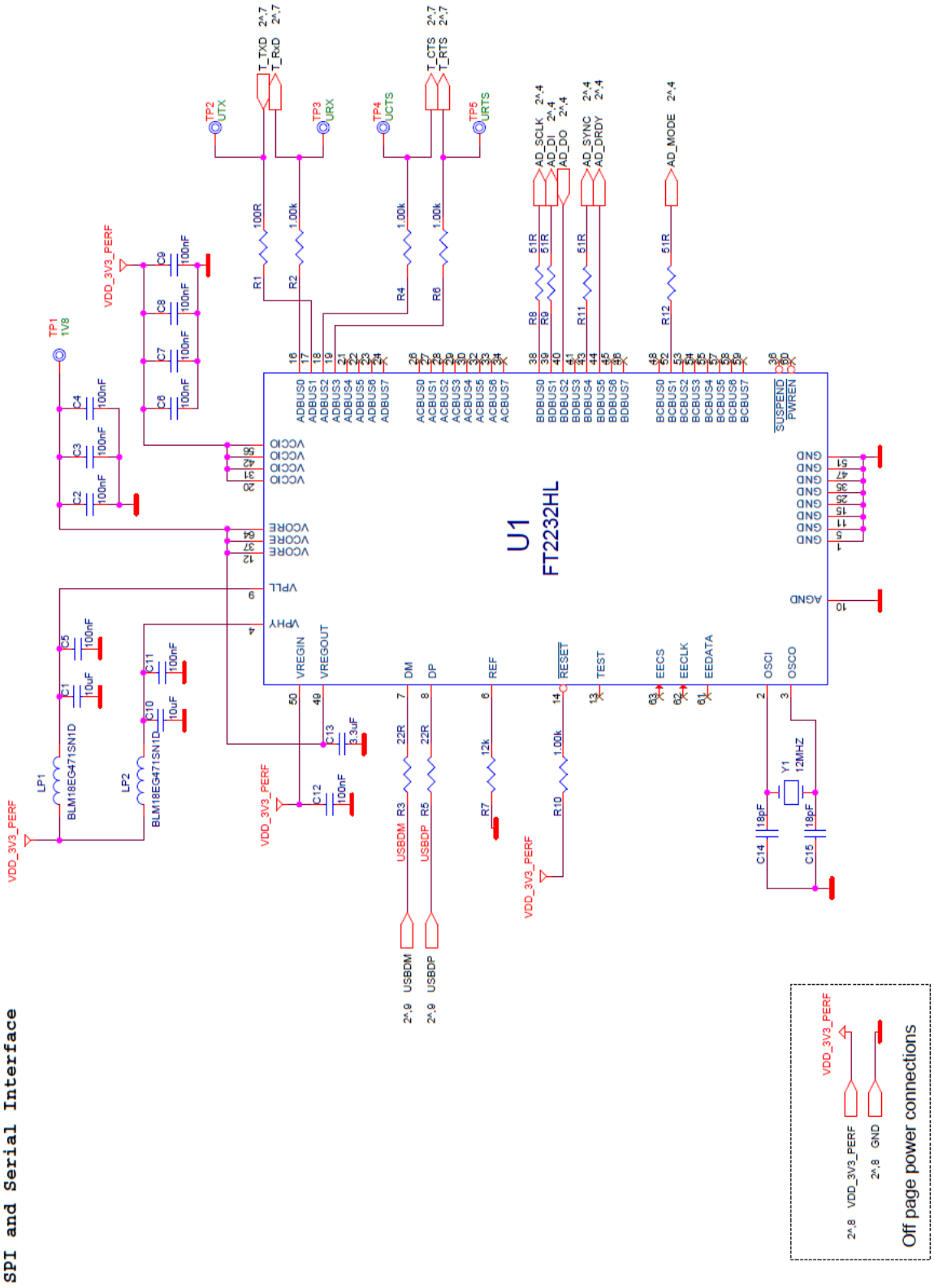

Figure 25: SPI and serial schematic of Motherboard

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C.3 Current measurement

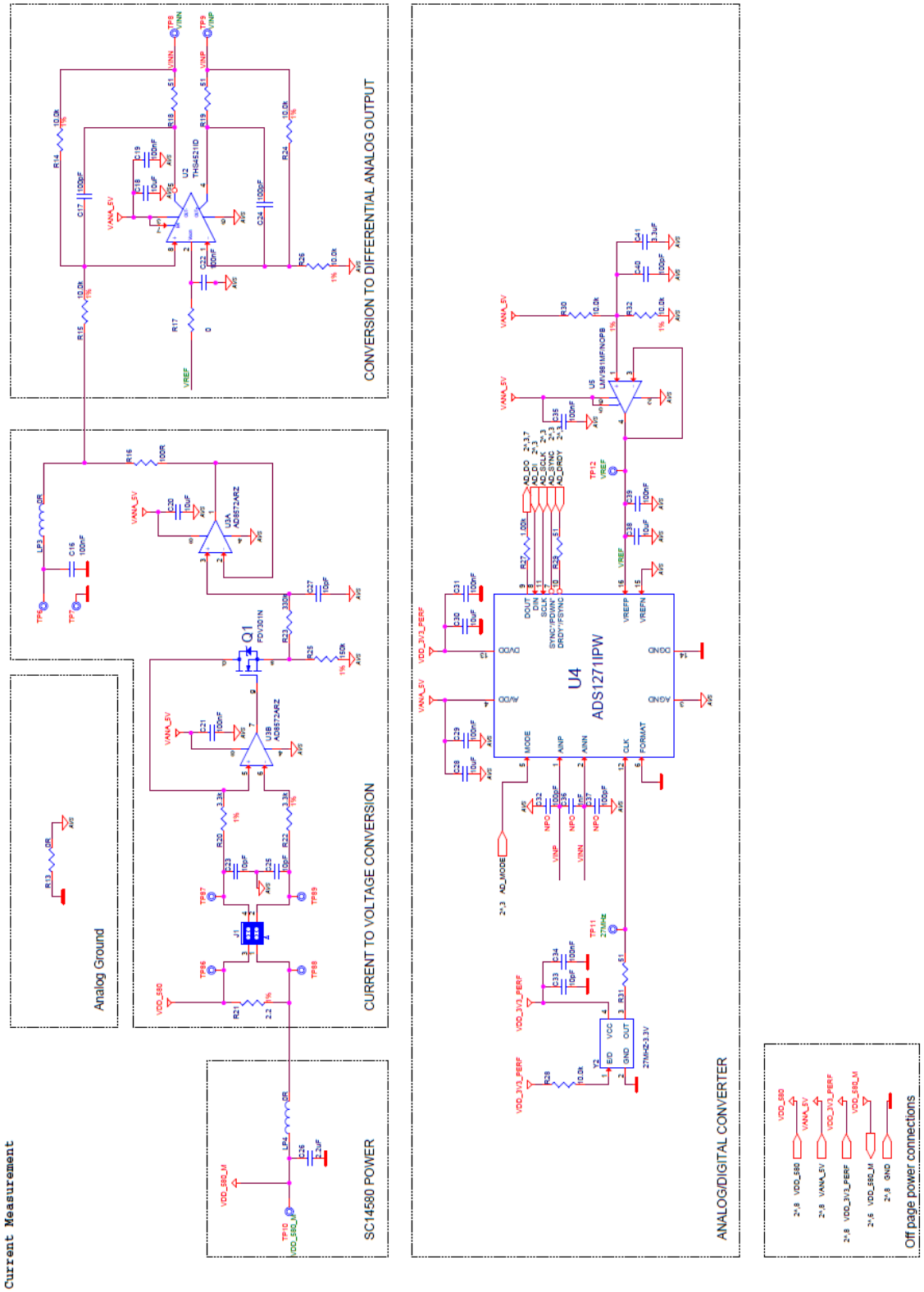

Figure 26: Current measurement schematic of Motherboard

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C.4 JTAG Interface

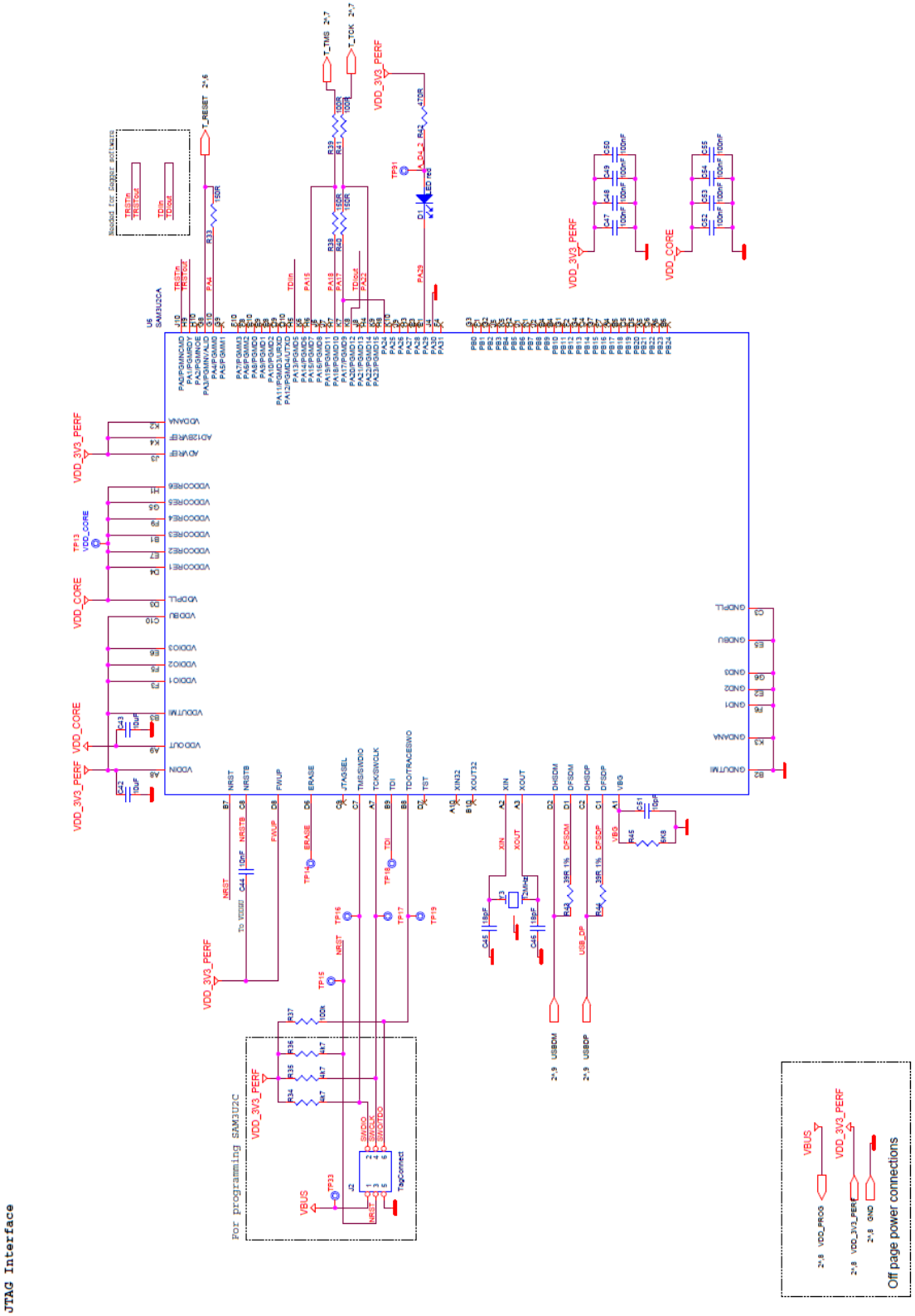

Figure 27: JTAG interface schematic of Motherboard

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C.5 PCI-e

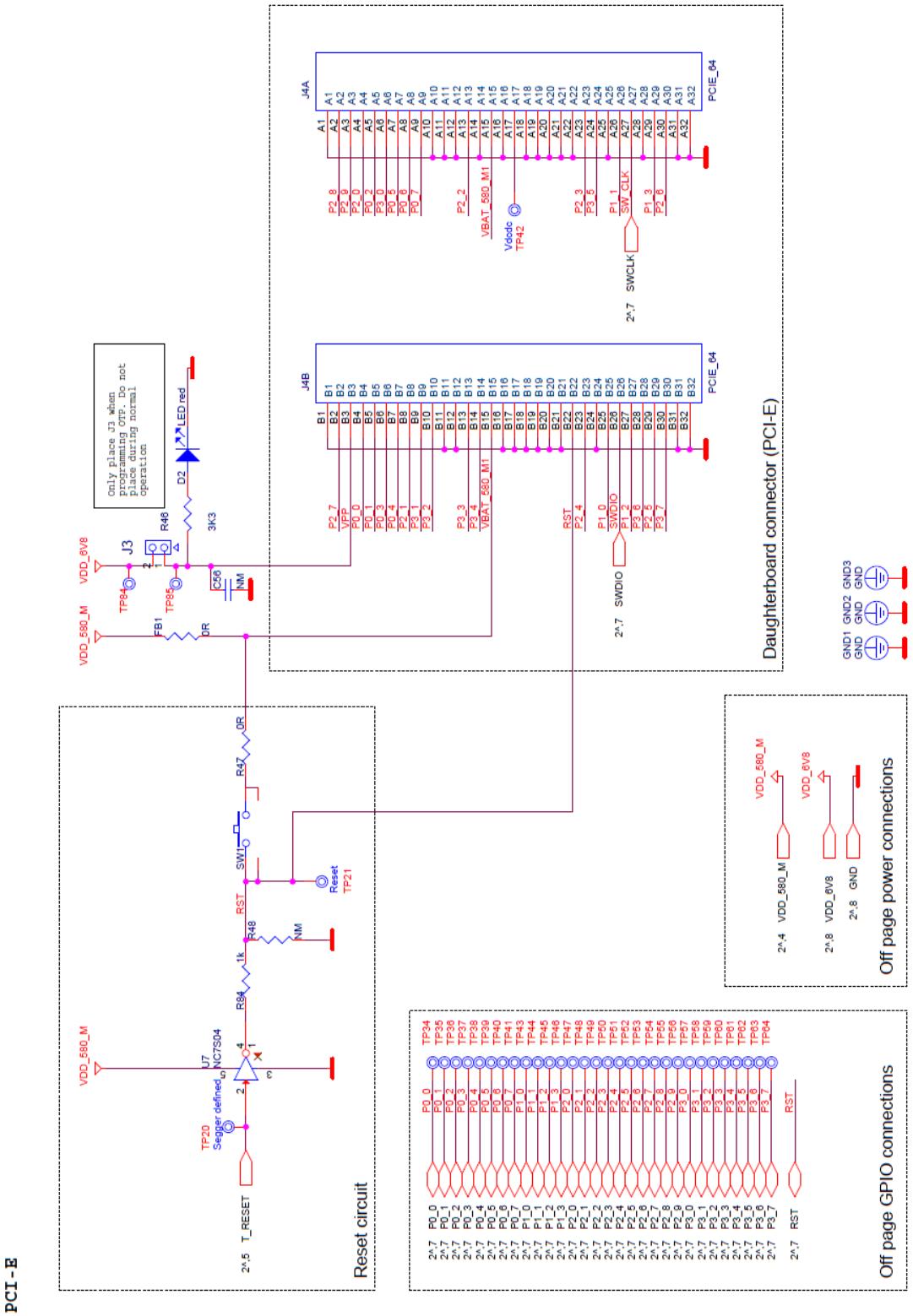

Figure 28: PCI-e schematic of Motherboard

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C.6 Power supplies

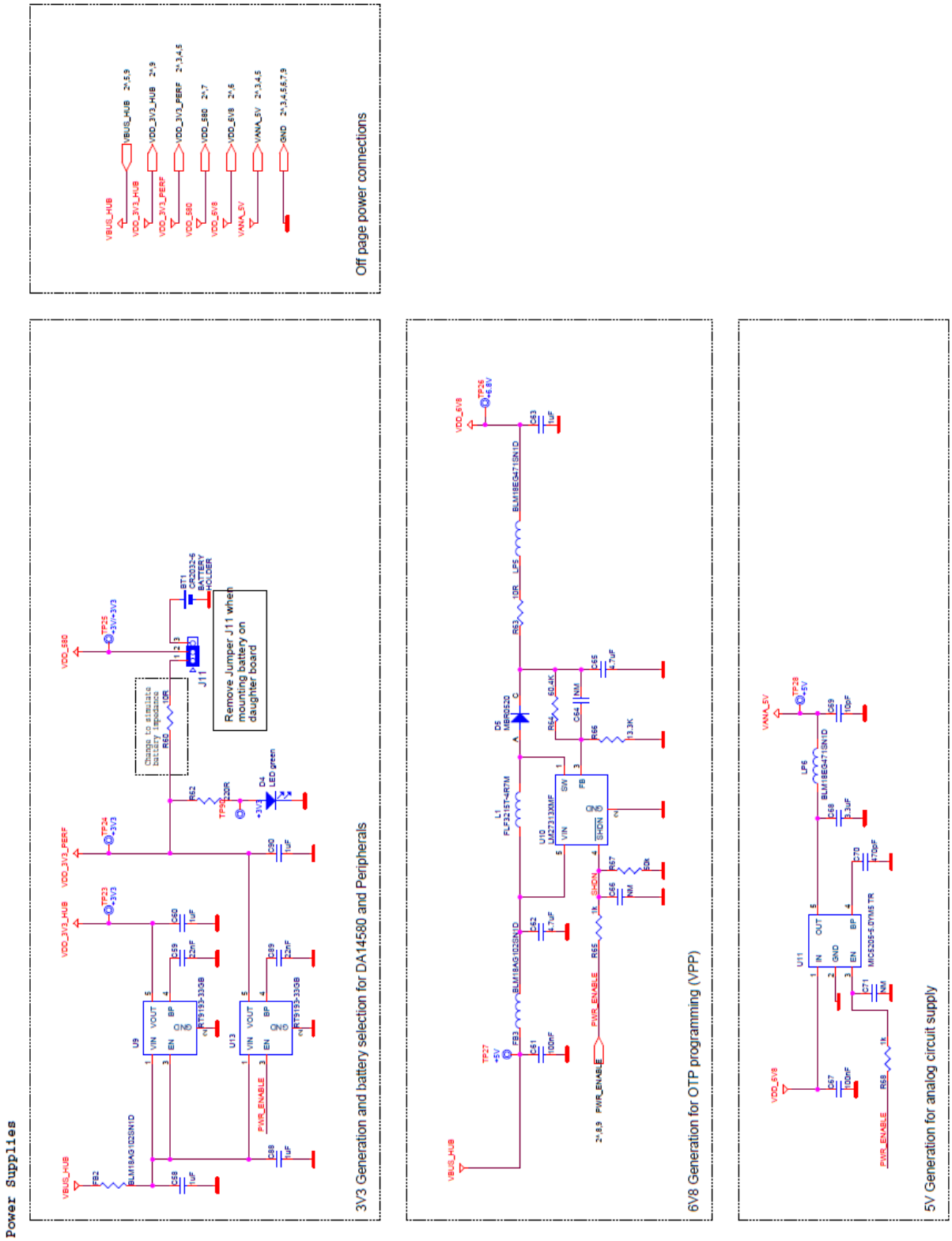

Figure 29: Power supplies schematics of Motherboard

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C.7 USB HUB Controller

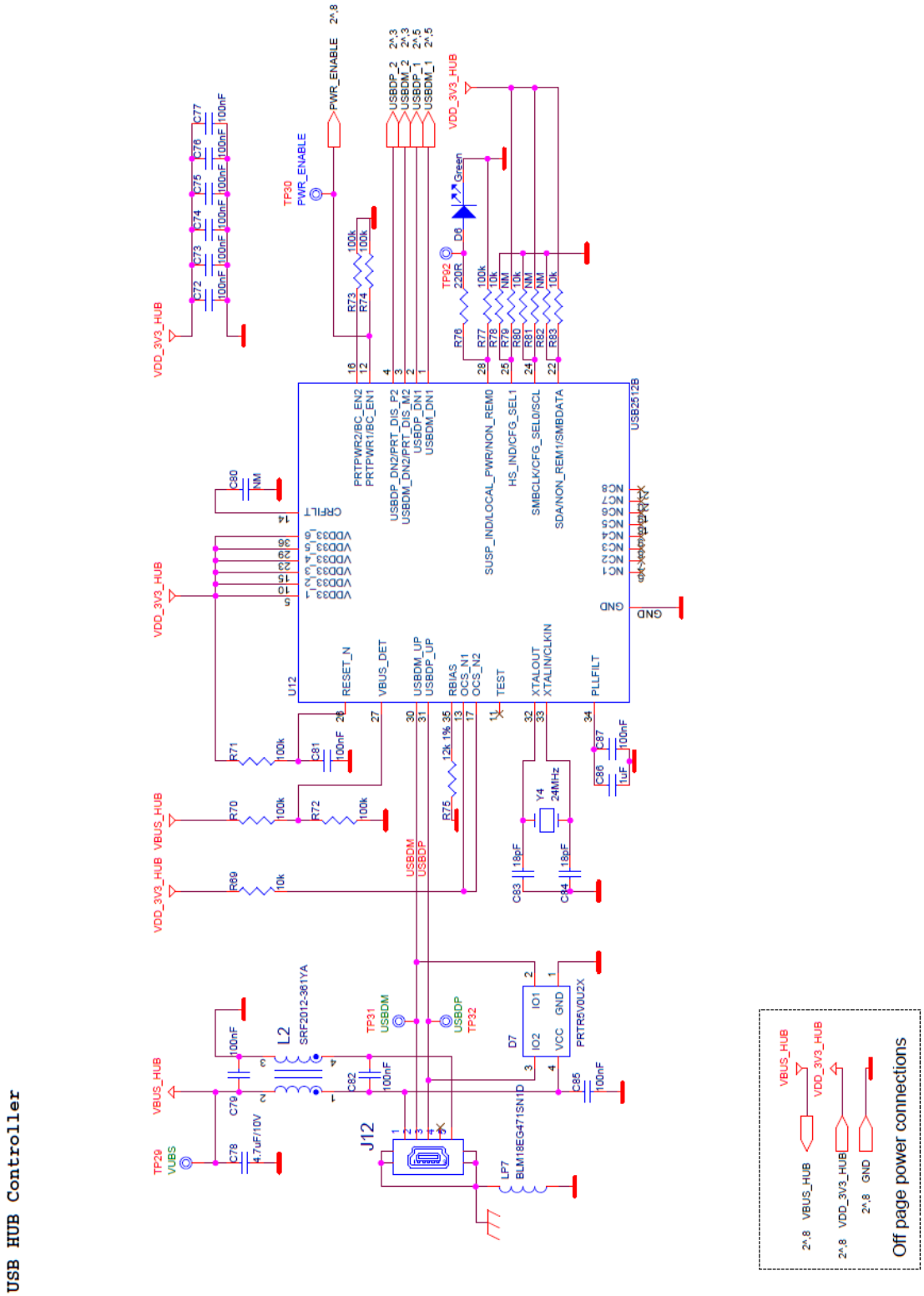

Figure 30: USB HUB controller schematic of Motherboard

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C.8 DA14580 WLCSP Daughter board

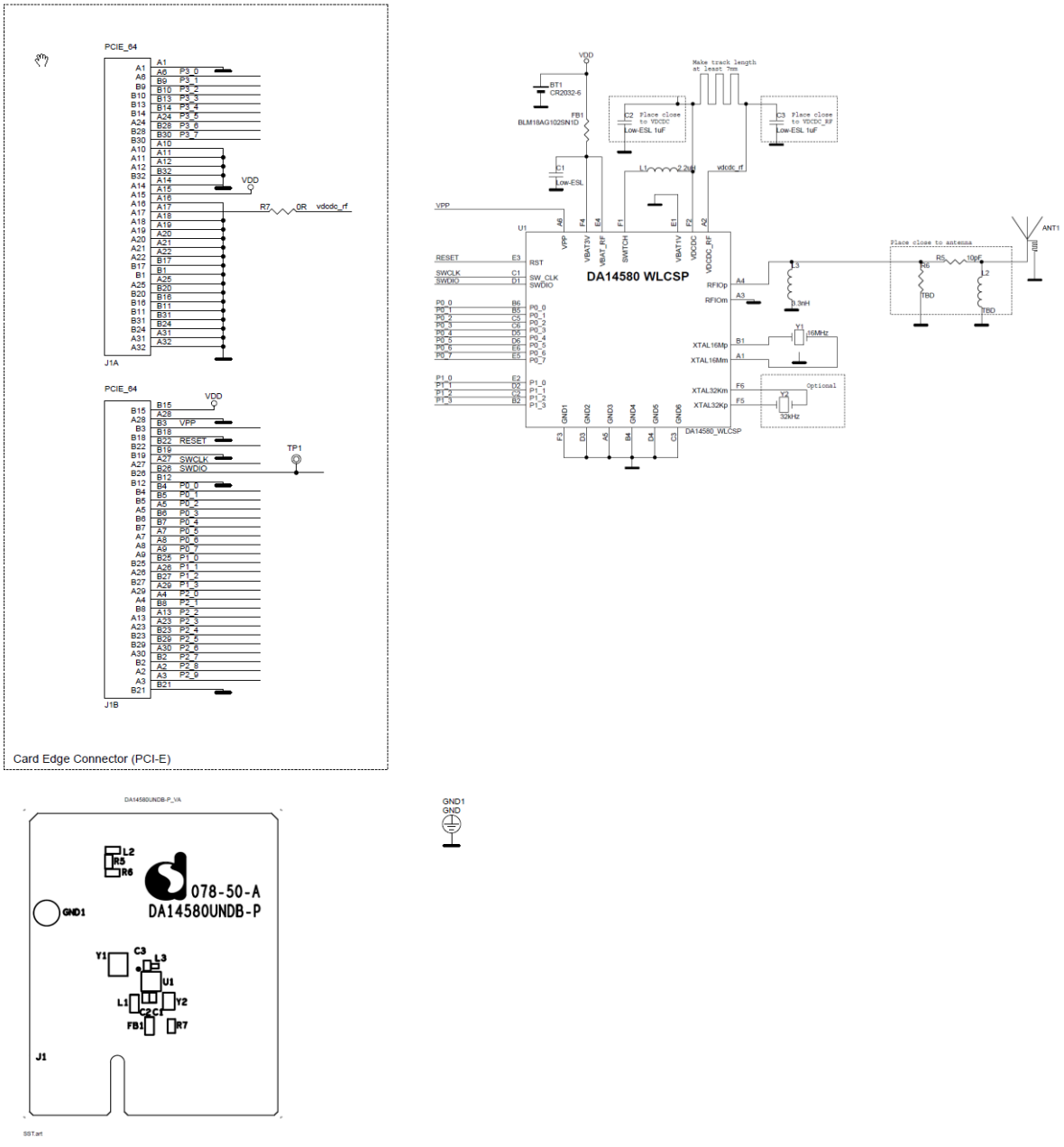

Figure 31: DA14580 WLCSP Daughter board

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C.9 DA14580 QFN40 Daughterboard

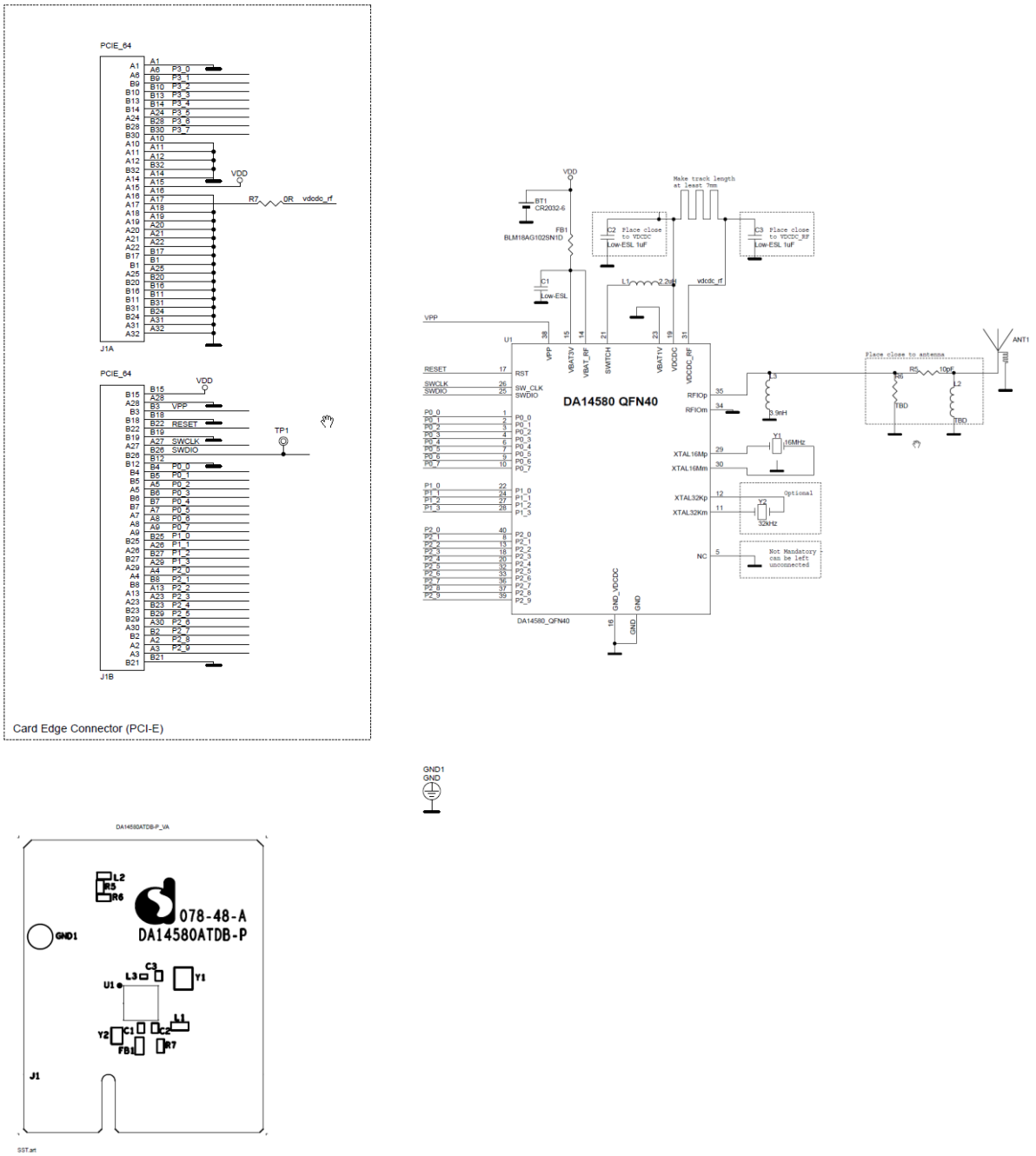

Figure 32: DA14580 QFN40 Daughterboard

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C.10 DA14580 QFN48 Daughterboard

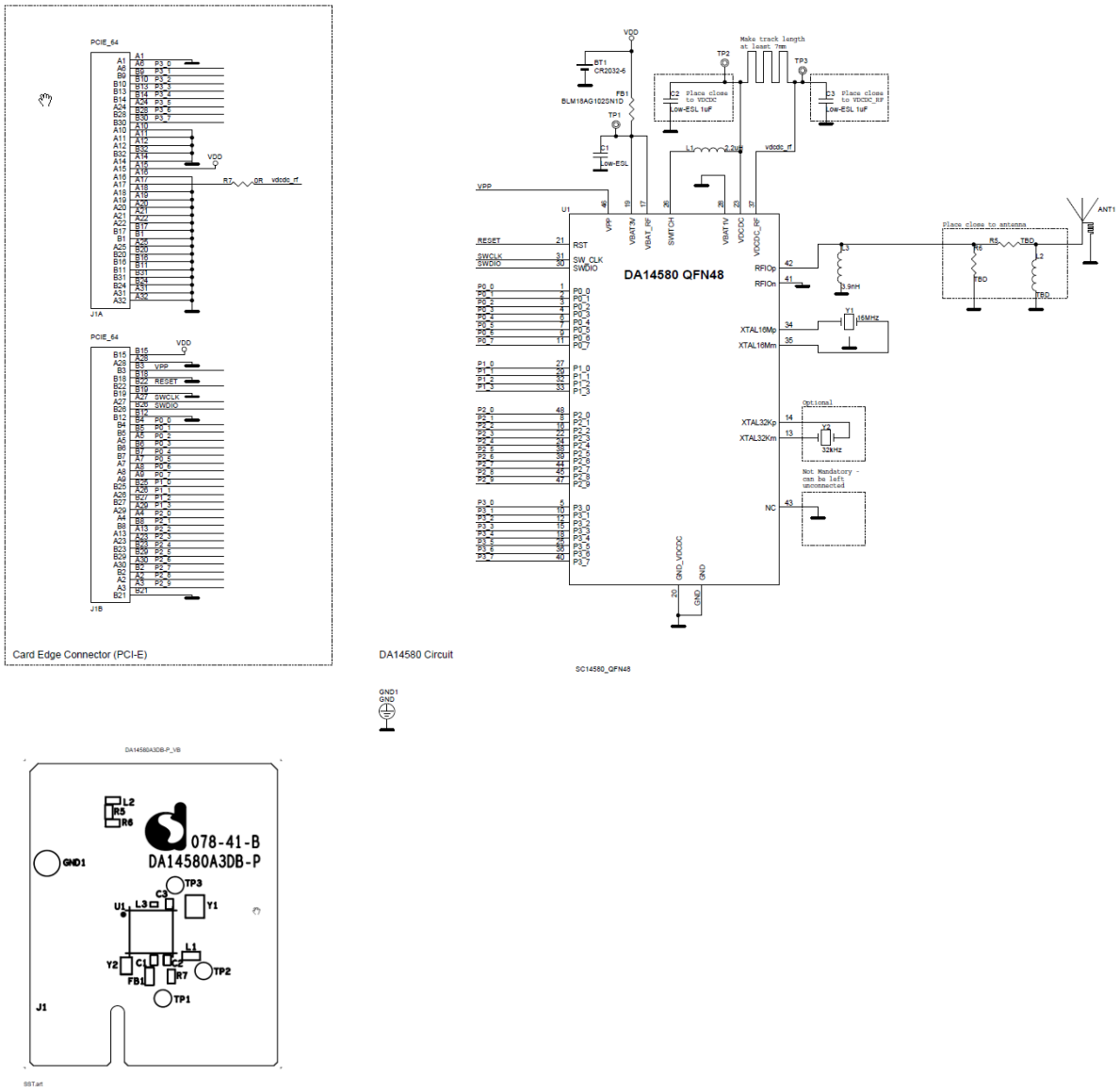

Figure 33: DA14580 QFN48 Daughterboard

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C.11 DA14581 WLCSP Daughterboard

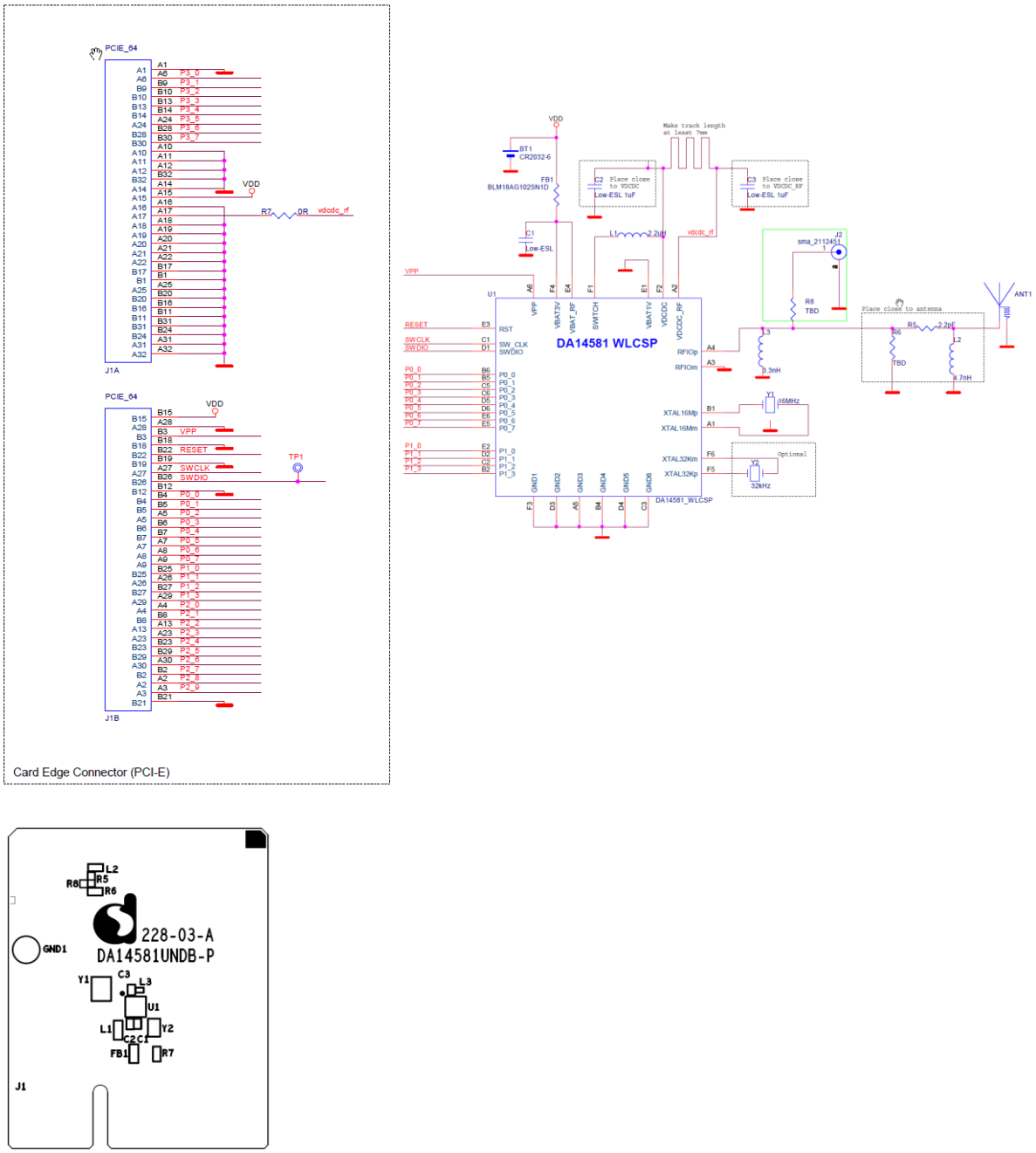

Figure 34: DA14581 WLCSP Daughterboard

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C.12 DA14581 QFN40 Daughterboard

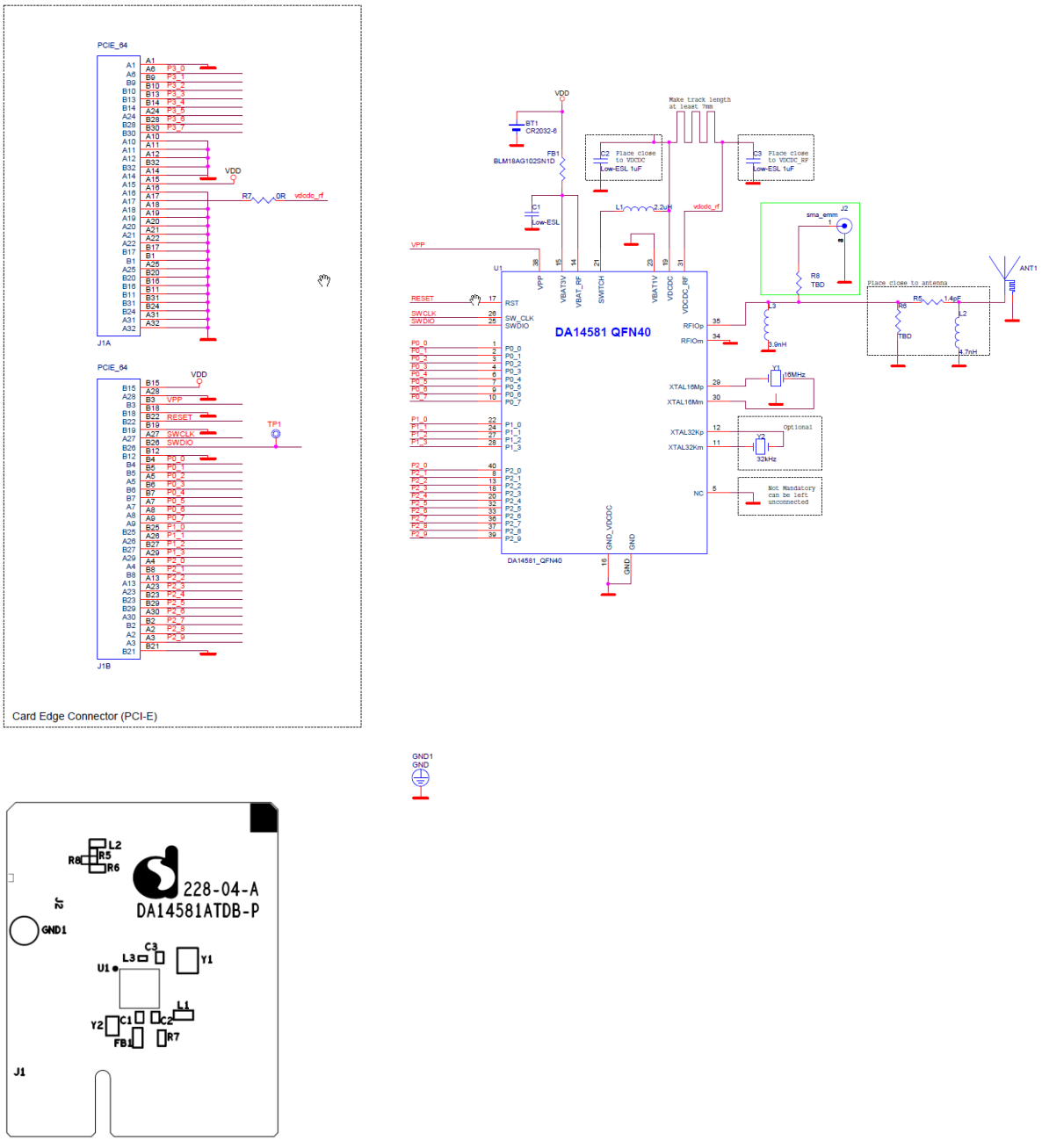

Figure 35: DA14581 QFN40 Daughterboard

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C.13 DA14583 QFN40 Daughterboard

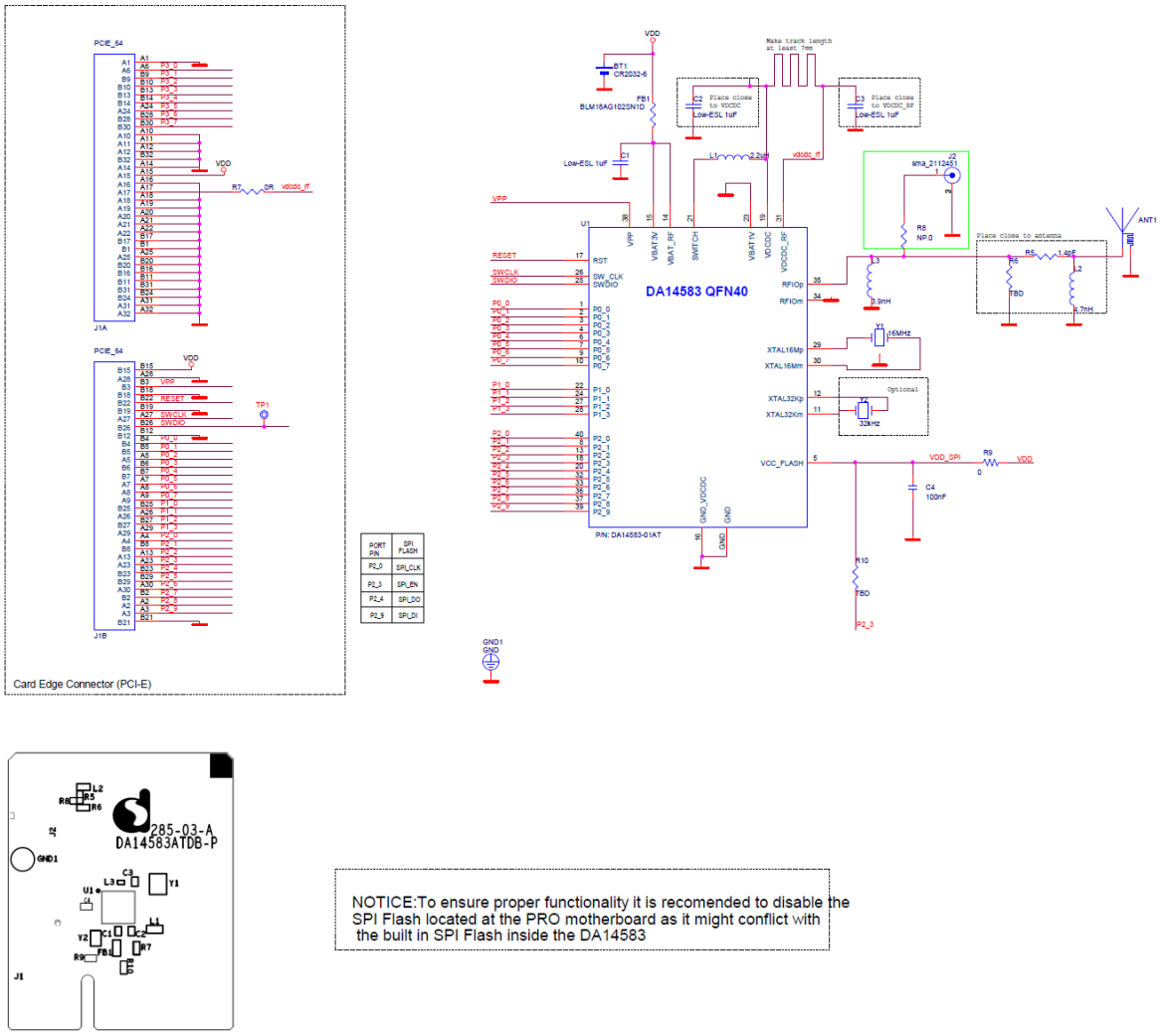

Figure 36: DA14583 QFN40 Daughterboard

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C.14 DA14585 WLCSP34 Daughterboard (321-3-x)

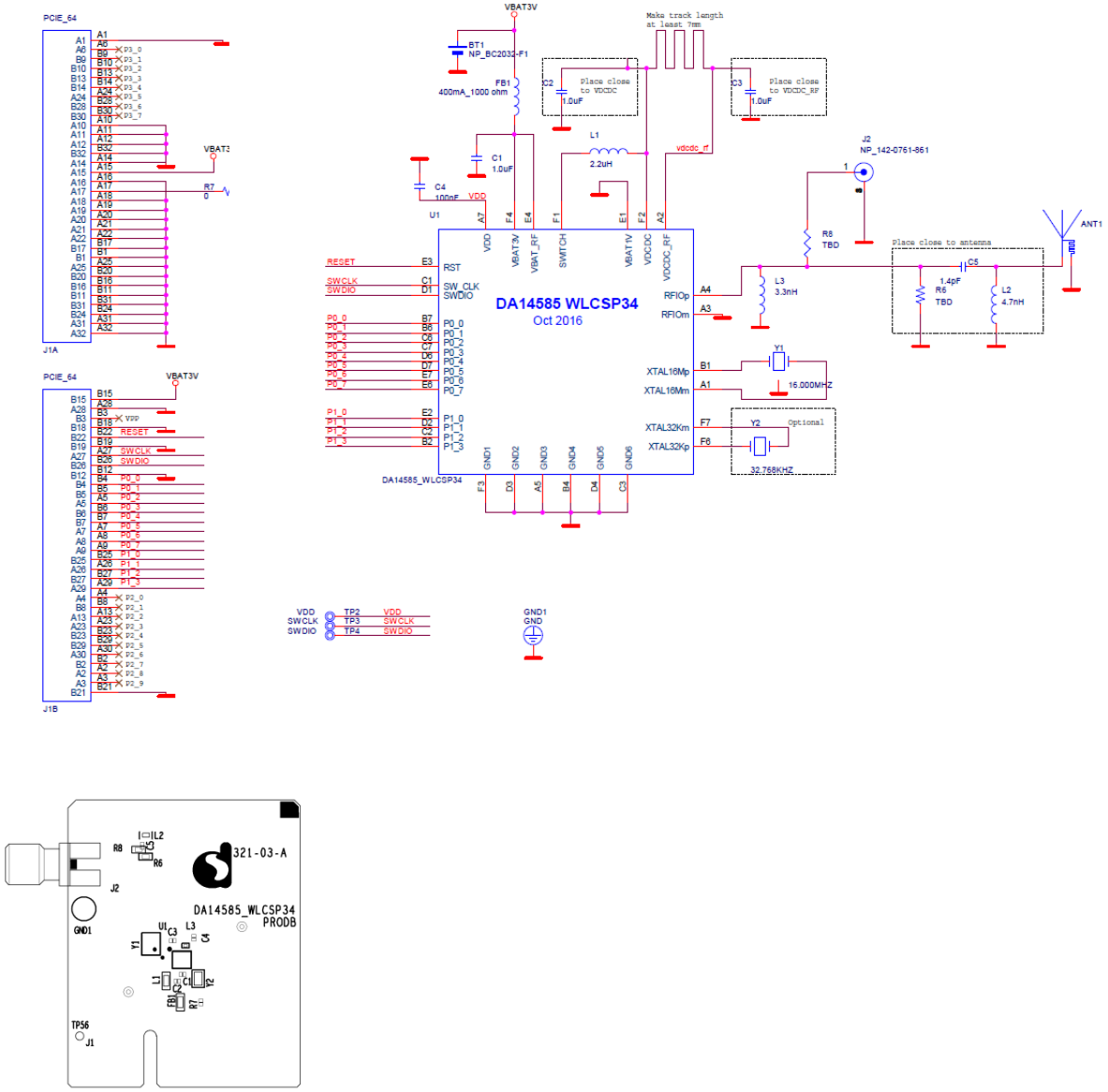

Figure 37: DA14585 WLCSP34 Daughterboard

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C.15 DA14585 QFN40 Daughterboard (321-2-x)

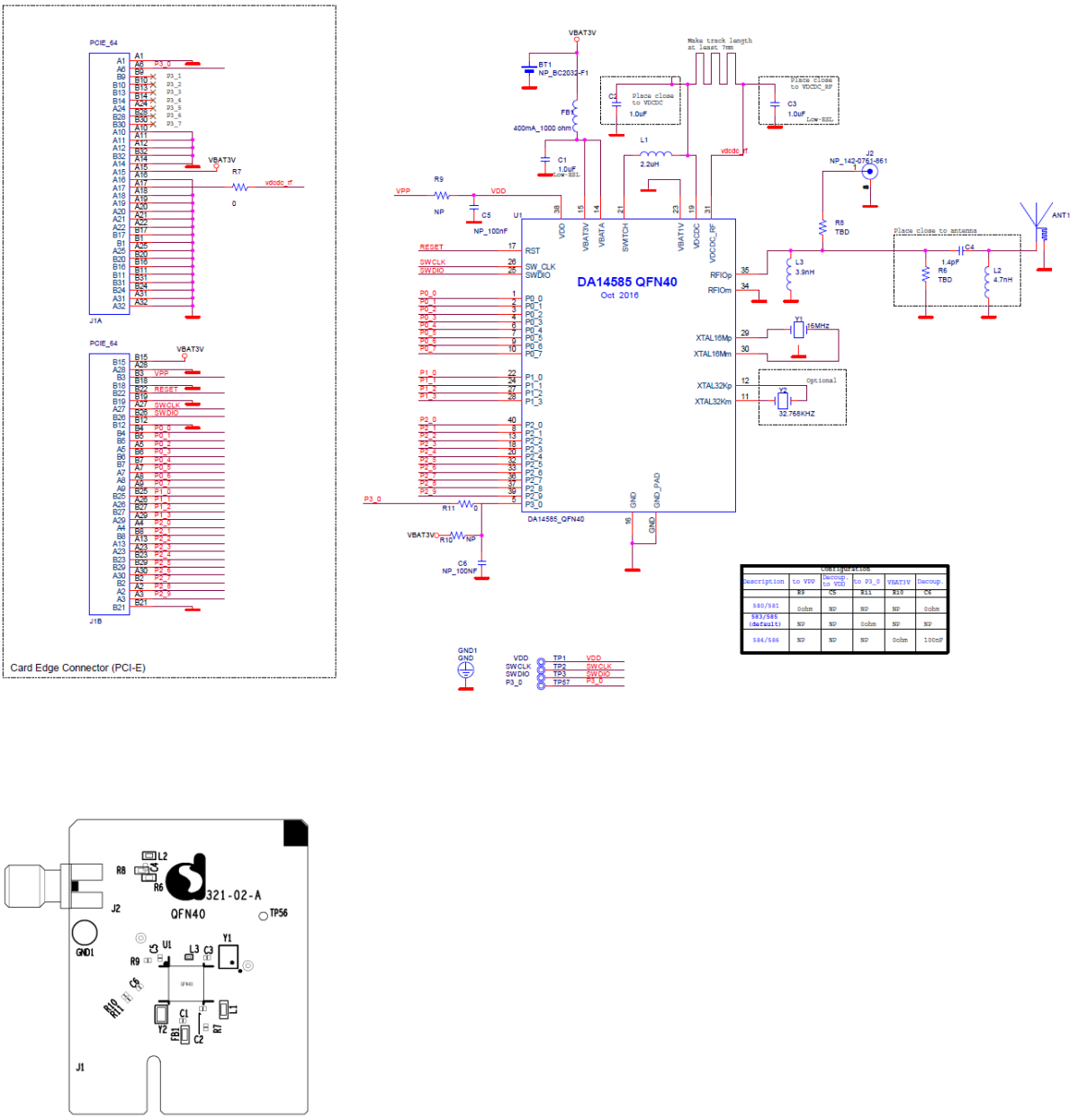

Figure 38: DA14585 QFN40 Daughterboard

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C.16 DA14586 QFN40 Daughterboard (321-2-x)

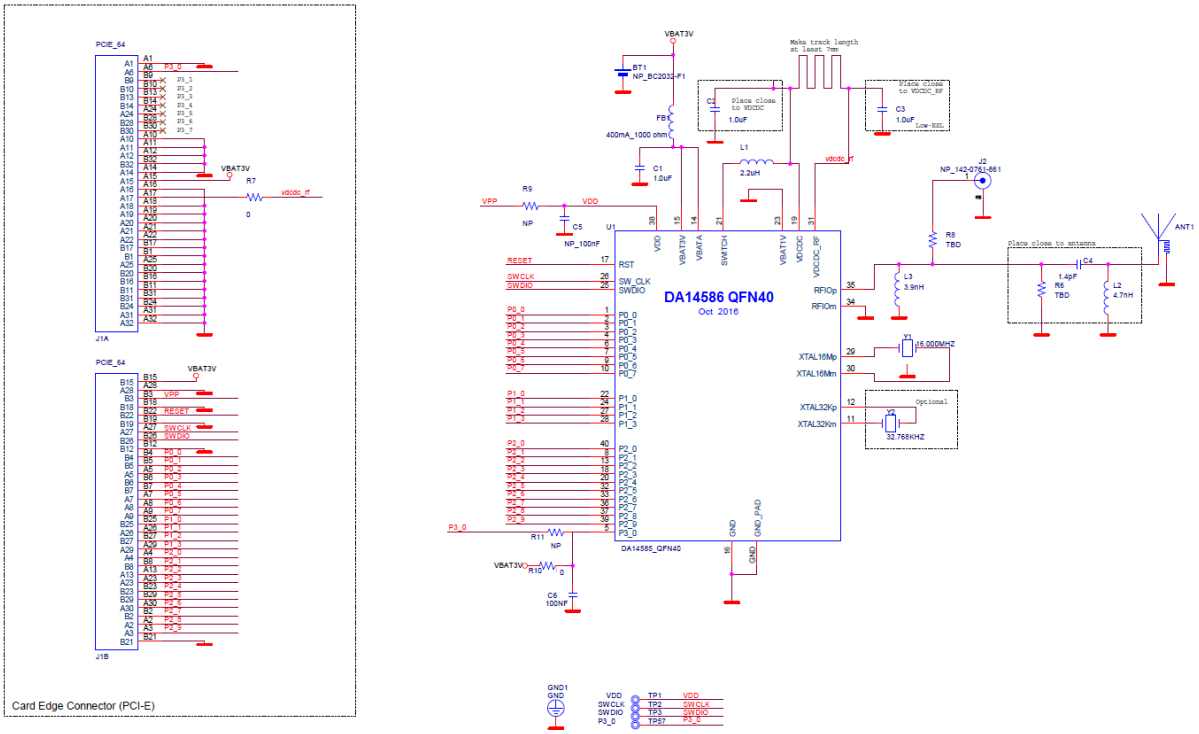

Figure 39: DA14586 QFN40 Daughterboard

Please notice that DA14585 – QFN40 and DA14586 – QFN40 designs are similar except few components assembly. Consequently same PCB is used with bill of materials (BOM) modifications:

Table 12: BOM diifferences between DA14585 and DA14586 designs

Component	DA14585 QFN40 Daughterboard	DA14586 QFN40 Daughterboard
U1	DA14585 – QFN40	DA14586 – QFN40
R11	0 Ohm	No mount
R10	Not mount	0 Ohm
C5	Not mount	100nF

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Appendix D Using the SmartSnippets CLI

All the information/syntaxes about the CLI can be found from the **HELP** tab in the SmartSnippets GUI or by written **Smartsnippets –help** in the CLI.
In this example, it is supposed that the SPI memory is using P0_0 as SCK, P0_3 as CS, P0_5 as MISO and P0_6 as MOSI.

First of all, the CLI can send the commands either via UART or JTAG according to the binary file which has to be loaded.

On the one hand, if the commands are going to be sent via UART, the following binary file which can be found from the resources folder of SmartSnippets has to be downloaded into the DA14580/DA14581/DA14583 using SmartSnippets:

- *flash_programmer.bin*

On the other hand, if the commands are going to be sent via JTAG, the following binary file which can be found from the resources folder of SmartSnippets, has to be downloaded into the DA14580/DA14581/DA14583 using SmartSnippets:

- *jtag_programmer.bin*

For additional help, please see the “HELP” in SmartSnippets as shown below:

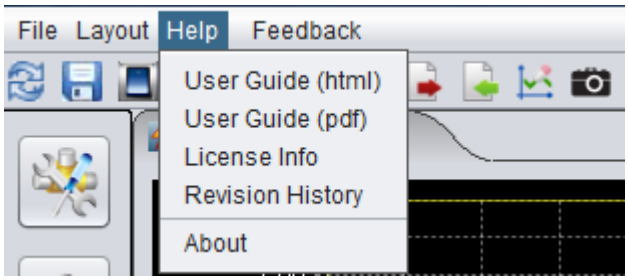

Figure 40: SmartSnippets HELP

Secondly, open the CLI by pushing the Shift button and right click on the **‘bin’** folder of the SmartSnippet and select ‘**Open command window here’** as follow:

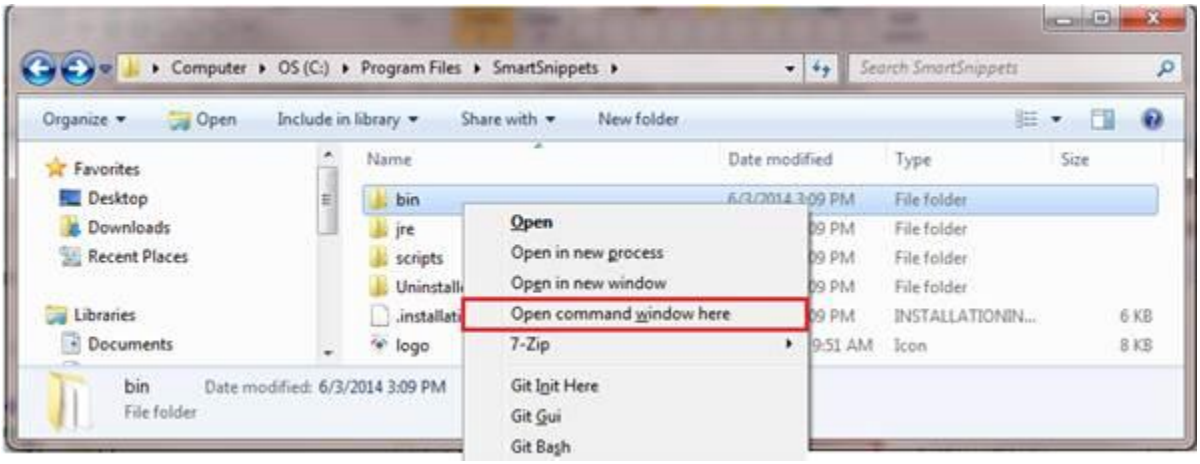

Figure 41: Open the CLI of SmartSnippets

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Finally, in order to write a value 0x1347 (example of a 53luetooth device address) at the address 0x93 for instance, the following command line can be written:

SmartSnippets.exe –type spi –chip DA14580/DA14581-01 –jtag 228202458 -cmd write_field –offset 0x93 –data 1347 –firmware "D:\SmartSnippets\resources\jtag_programmer.bin"

The answers should be as shown below:

Figure 42: Smart snippet CMD window

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Appendix E Latency Timer of FTDI cable

If an external FTDI cable is used to burn the OTP (or to download the image into the external memory), the Latency Timer of the FTDI cable has to be changed from 15ms to <10ms.
To change the Latency Timer:
Device Manager → COM port → Right click on the COM port chosen → Properties → Port Settings → Advanced → Latency Timer: set it <10ms.

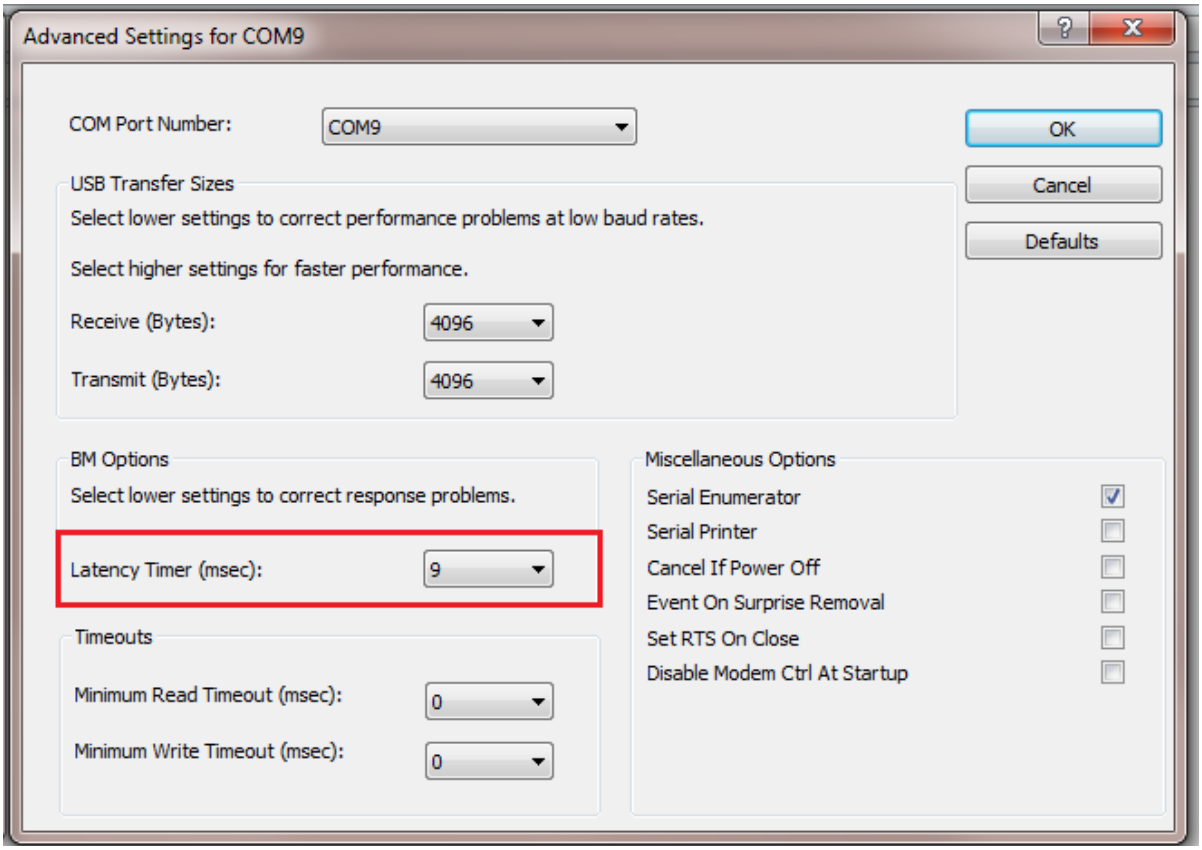

Figure 43: FTDI Latency Timer

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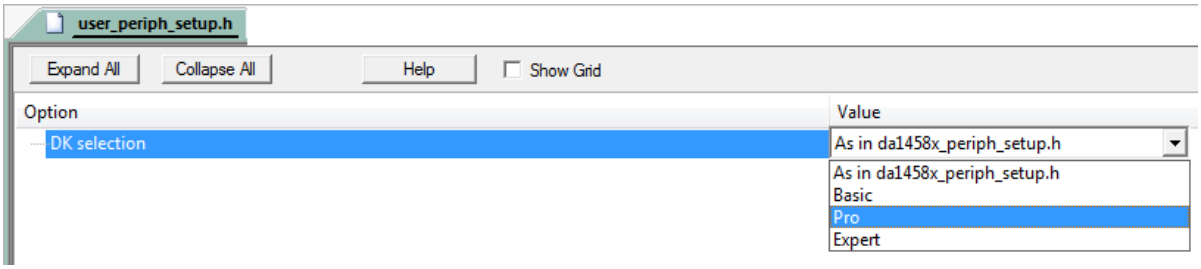
Appendix F RF-Testing DEVKT – Pro

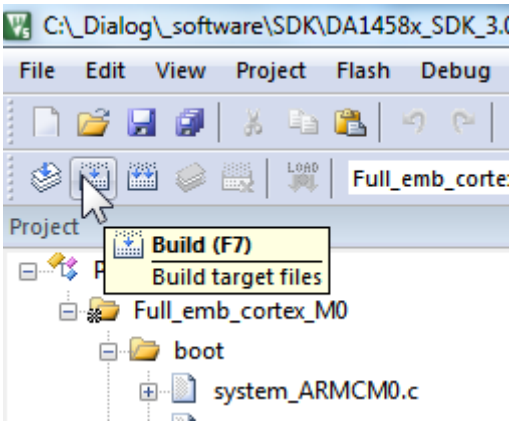
Follow steps to start example from SDK:

- Step 0. Connect DEVKT- Pro to USB-port.

- Step 1. For DA1458x: start KEIL via double click on project name:
  … DA1458x_SDK\5.0.x\projects\target_apps\ble_examples\prox_reporter\Keil_5
- Step 2. Define HW_CONFIG_PRO_DK // Pro DK
  see: user_periph_setup.h



- Step 3. KEIL is started and press F7 for ‘Building‘ the software.
  When the build-result is ‘no errors’, then got the next step.



- Step 4. Start Debug Session (Ctrl + F5)

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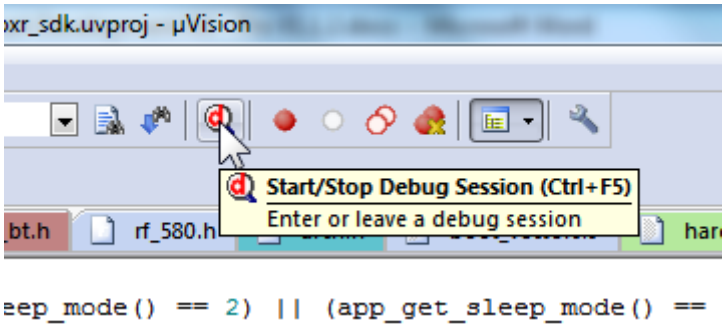
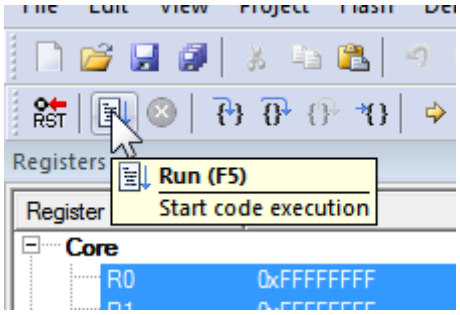
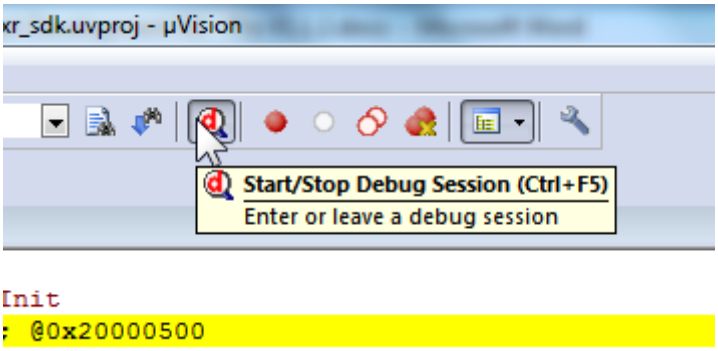


- Step 5. Run the software by pressing ‘F5’



- Step 6. Stop Debug Session by pressing ‘Ctrl + F5’
  Software will start running now!



- Step 7. Check via ‘Bluetooth scanning software’ whether the RF-part of the DEVKT – Pro is working.
  This software is available for iPhone and Android phone as an App.

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Appendix G Battery connection 'workaround'

There is a small hardware malfunction. When the board operates on battery (J11 jumper on 2-3), the RST-signal is permanently high. When USB is disconnected, then T_RESET becomes low. After invertor U7 RST is high. In this case the board will not operate.

Workaround is the dismounting of R84.

In Figure 44 the Reset circuitry is shown.

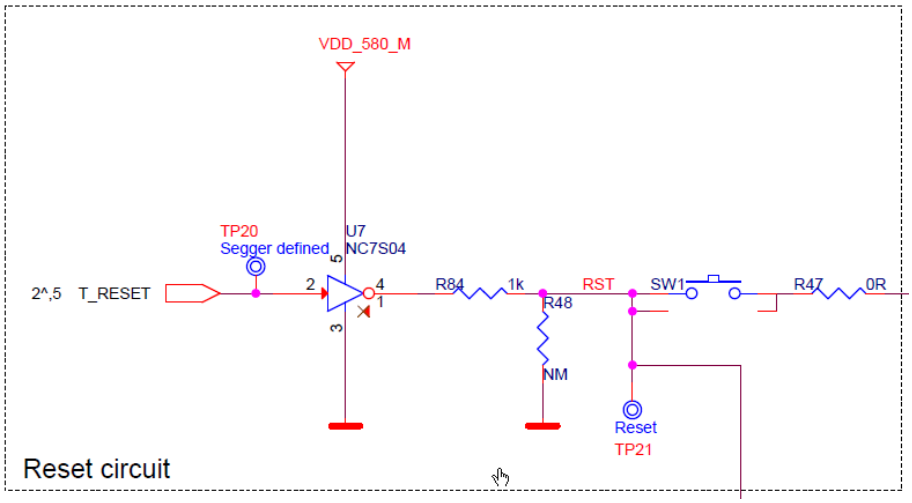

Figure 44: Reset circuitry. R84 to be dismounted.

In Figure 45 the location of R84 is shown.

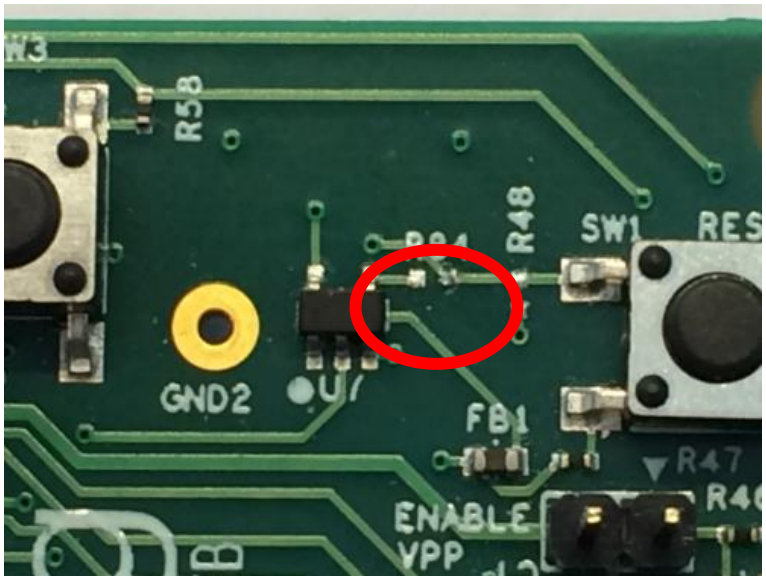

Figure 45: Location of R84

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Appendix H Power bouncing workaround

DA14585/6 daughterboards are supplied from PRO-Motherboard thru a jumper in header J11.

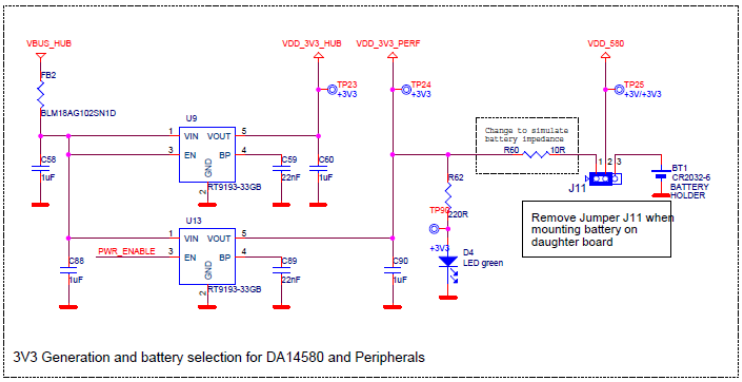
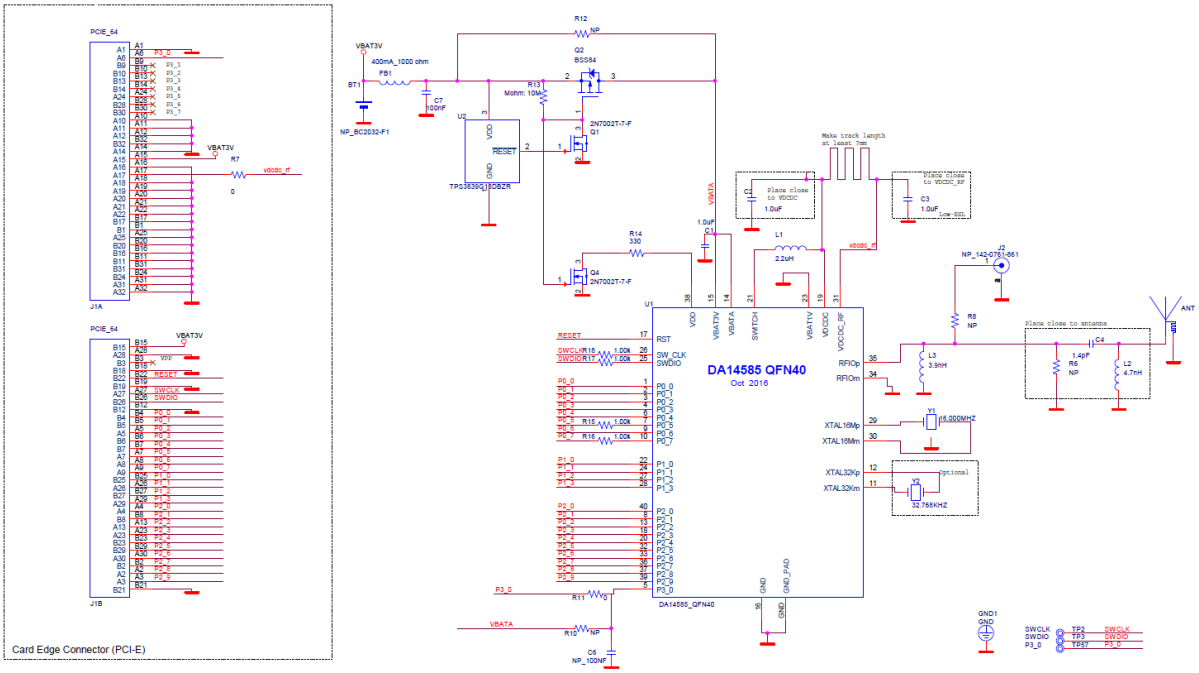


Figure 46: PRO-Motherboard power jumper

Insertion of this jumper when the daughterboards is mounted on the PRO-motherboard may cause bouncing issues. A hardware workaround is implemented on DA14585 and DA14586 QFN40 daughterboards.



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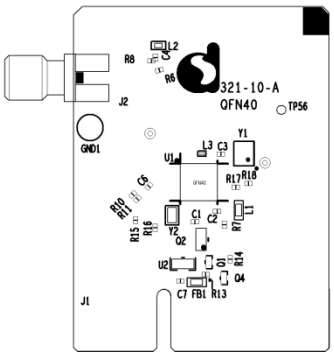

Figure 47: DA14585/6 QFN40 Daughterboard (321-10-x)

5 Web-Link

All support info:

- http://support.dialog-semiconductor.com

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Revision history

Revision	Date	Description
1.0	27-Aug-2015	Initial version for DA1458x family with SDK 5.
1.1	20-Oct-2015	Minor Update in Keil installation instructions.
1.2	30-Mar-2017	Add DA14585/586

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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.
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