EVBUM2529/D

RSL10 Evaluation and Development Board User's Manual

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EVAL BOARD USER'S MANUAL

INTRODUCTION

Purpose

This manual provides detailed information about the configuration and use of the RSL10 Evaluation and Development Board, both the wafer level chip scale package (WLCSP) and the quad flat no-leads (QFN) package. The Evaluation and Development Board is designed to be used with the software development tools to evaluate the performance and capabilities of the RSL10 radio System-on-Chip (SoC).

Intended Audience

This manual is for engineers, developers, and anyone else who requires technical information about the Evaluation and Development Board.

Conventions

The following conventions are used in this manual to signify particular types of information:

`monospace font` Connector and pin names.

Manual Organization

The *Evaluation and Development Board Manual* contains the following chapters and appendices:

- **Chapter 1: Introduction** describes the purpose of this manual, describes the target reader, explains how the book is organized, and provides a list of suggested reading for more information.
- **Chapter 2: Overview** provides an overview of the Evaluation and Development Board described in this manual.
- **Chapter 3: Evaluation and Development Board** provides the details of the Evaluation and Development Board. The chapter is divided into the following topics:
  - Development Board Setup
  - Development Board Design
  - Power Supply
  - Level Translators
  - LED Circuitry
  - RSL10 SoC
  - Measuring the Current Consumption
  - SWJ−DP Debug Port
  - Digital Input/Output (DIO)
  - Power Supply and Test Points
- **Appendix A: WLCSP Connectors** provides a complete list of the connectors and jumpers on the WLCSP Evaluation and Development Board. The appendix is divided into the following sections:
  - Configuration Header Jumpers
  - Headers
  - Switches
  - Connectors
- **Appendix B: QFN Connectors** provides a complete list of the connectors and jumpers on the QFN Evaluation and Development Board.
- **Appendix C: WLCSP Schematics** contains the schematics for the WLCSP Evaluation and Development Board.
- **Appendix D: QFN Schematics** contains the schematics for the QFN Evaluation and Development Board.
- **Appendix E: WLCSP Bill of Materials** contains a list of the parts that are used to manufacture the WLCSP Evaluation and Development Board.
- **Appendix F: QFN Bill of Materials** contains a list of the parts that are used to manufacture the QFN Evaluation and Development Board.

Further Reading

For more information, refer to the following documents:

- *RSL10 Software Development Tools User's Guide*
- *Firmware Reference Manual for RSL10*
- *Hardware Reference Manual for RSL10*
- RSL10 Datasheet

OVERVIEW

Introduction

The RSL10 Evaluation and Development Board is used for evaluating the RSL10 SoC and for application development. The board provides access to all input and output connections via 0.1″ standard headers. The on-board communication interface circuit provides communication to the board from a host PC. The communication interface translates RSL10 SWJ−DP debug port signals to the USB of the host PC. There is also an on-board 4-bit level shifter for debugging; it translates the I/O signal level of RSL10 to the 3.3 V digital logic level. It is not enabled by default; you enable it when it is needed.

Evaluation and Development Board Features

The Evaluation and Development Board enables developers to evaluate the performance and capabilities of the RSL10 radio SoC in addition to developing, demonstrating and debugging applications.

Key features of the board include:

- J−Link onboard solution provides a SWJ−DP (serial-wire and/or JTAG) interface that enables you to debug the board via a USB connection with the PC
- Alternate onboard SWJ−DP (serial-wire and/or JTAG) interface for Arm® Cortex®−M3 processor debugging
- Access to all RSL10 peripherals via standard 0.1″ headers
- Onboard 4-bit level translator to translate the LPDSP32 debug interface at low voltage to a 3.3 V JTAG debugger
- Antenna matching and filtering network
- Integrated PCB antenna

In addition, the QFN board provides:

- Compliance with the Arduino form factor
- Support for PMOD (i.e., J4 is a standard connector)

EVALUATION AND DEVELOPMENT BOARD

Evaluation and Development Board Setup

This section is an overview of how to configure the Evaluation and Development Board. Details of the development board configuration are discussed later in this manual.

Figure 1 represents an overview of the board setup.

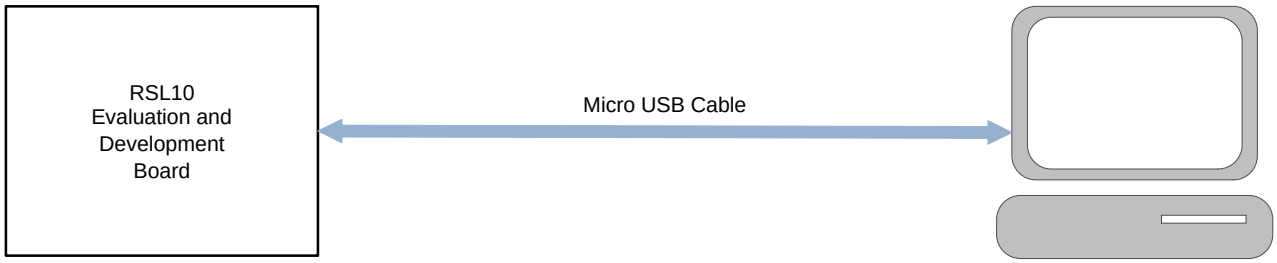

Figure 1. Evaluation and Development Board Setup

If you want to use an external J−Link debugger instead of the onboard one, connect the debugger to the JTAG port of the WLCSP board, or to connector P2 on the QFN board, as shown in Figure 2. Notice that for this setup, you also need a power supply.

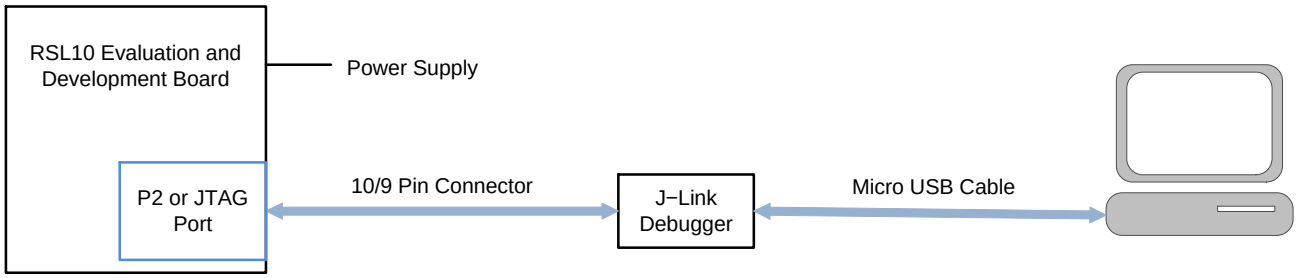

Figure 2. Evaluation and Development Board Setup with External J−Link Debugger

Evaluation and Development Board Design

The following sections detail the various sub-circuits of the RSL10 Evaluation and Development Board. The block diagram in Figure 3 shows the locations of the various circuit sections for the WLCSP board. The block diagrams in Figure 4 and Figure 5 show the locations of the circuit sections for the QFN board. Figure 6 and Figure 7 provide 3-dimensional illustrations of the QFN board.

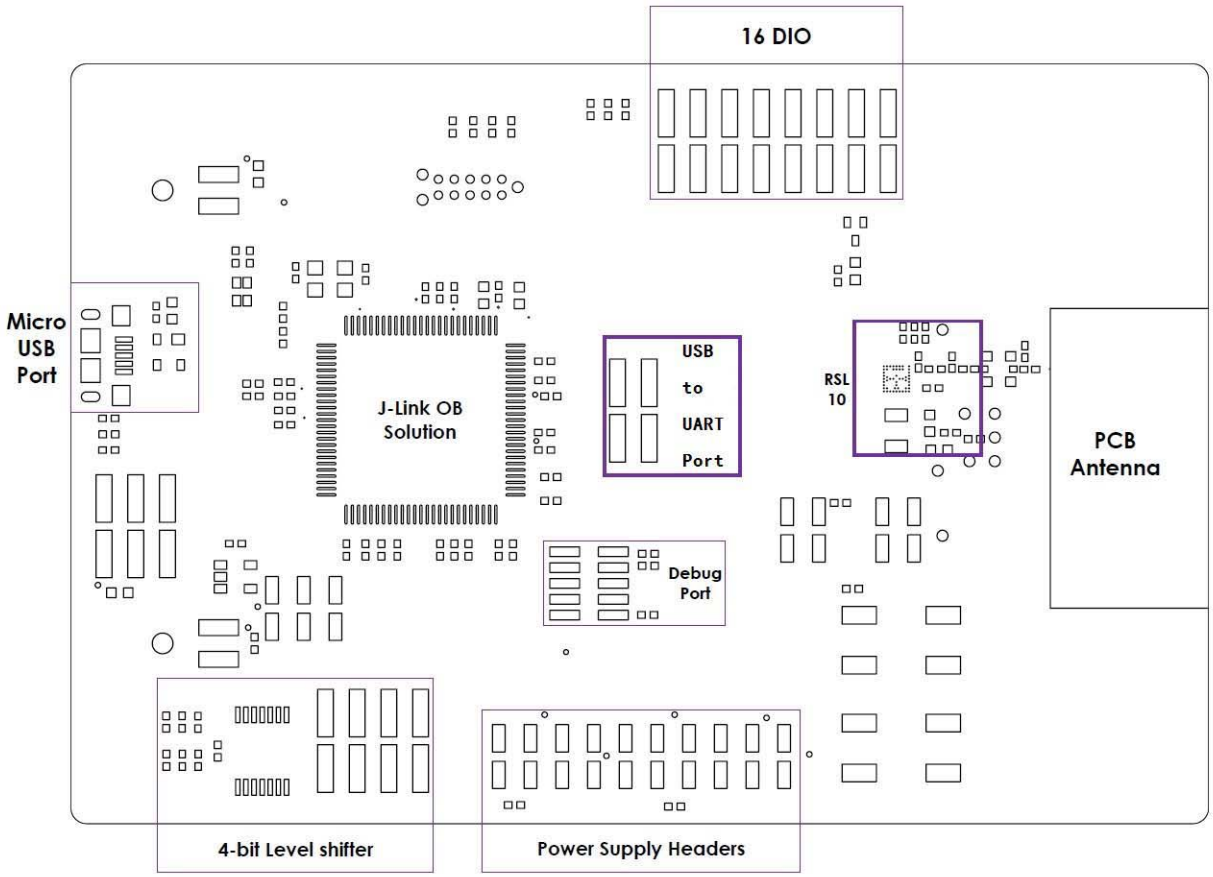

Figure 3. Circuit Location Block Diagram for WLCSP Board

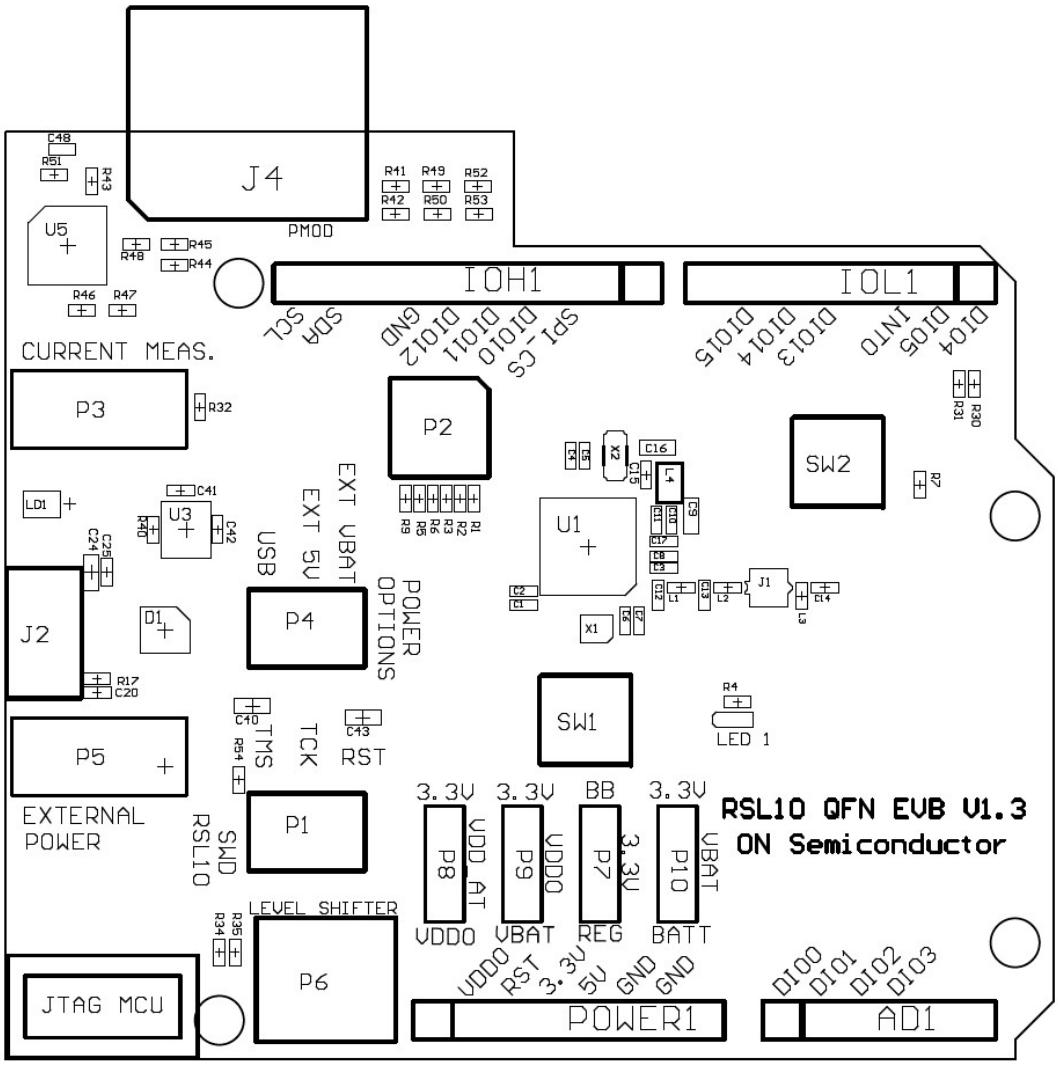

Figure 4. Circuit Location Block Diagram for QFN Board (Top View)

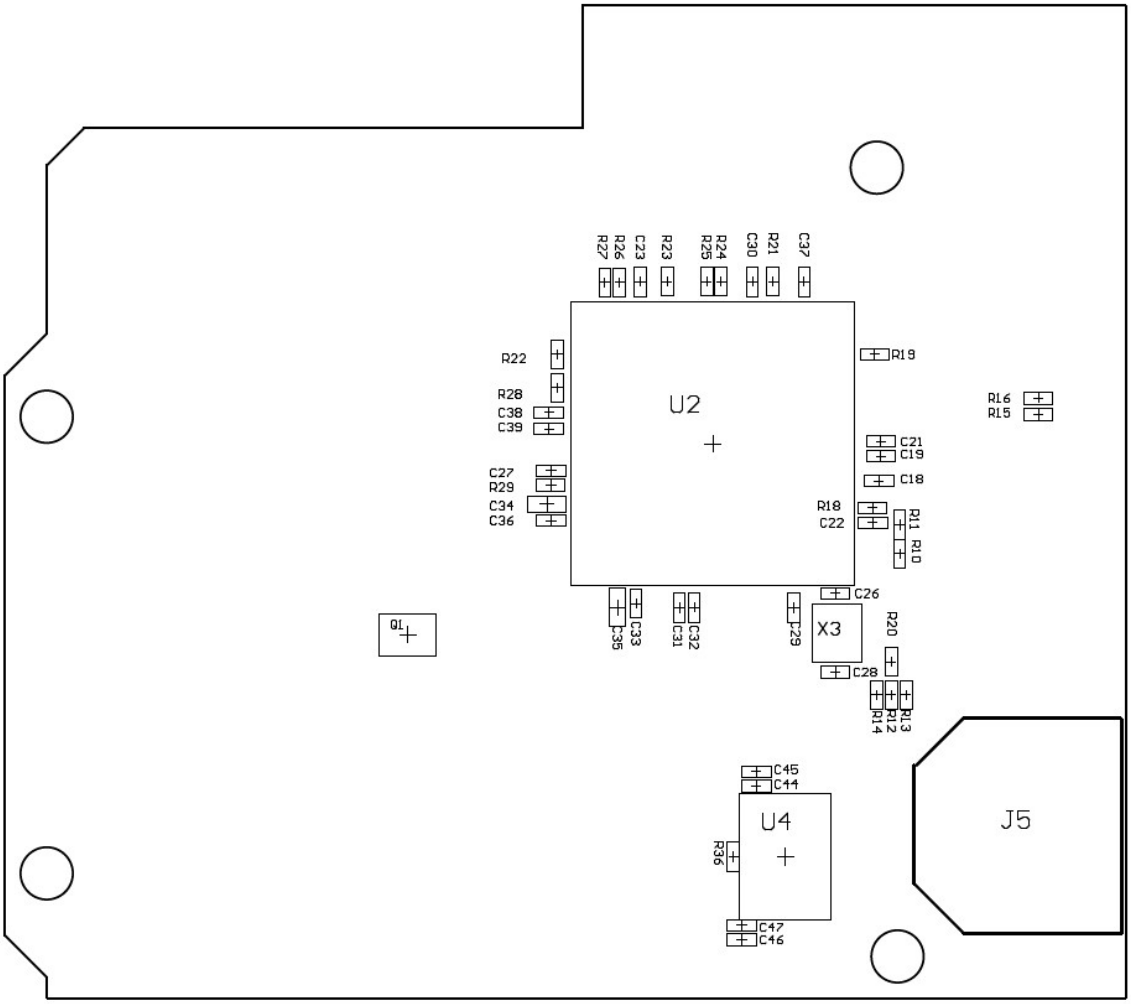

Figure 5. Circuit Location Block Diagram for QFN Board (Bottom View)

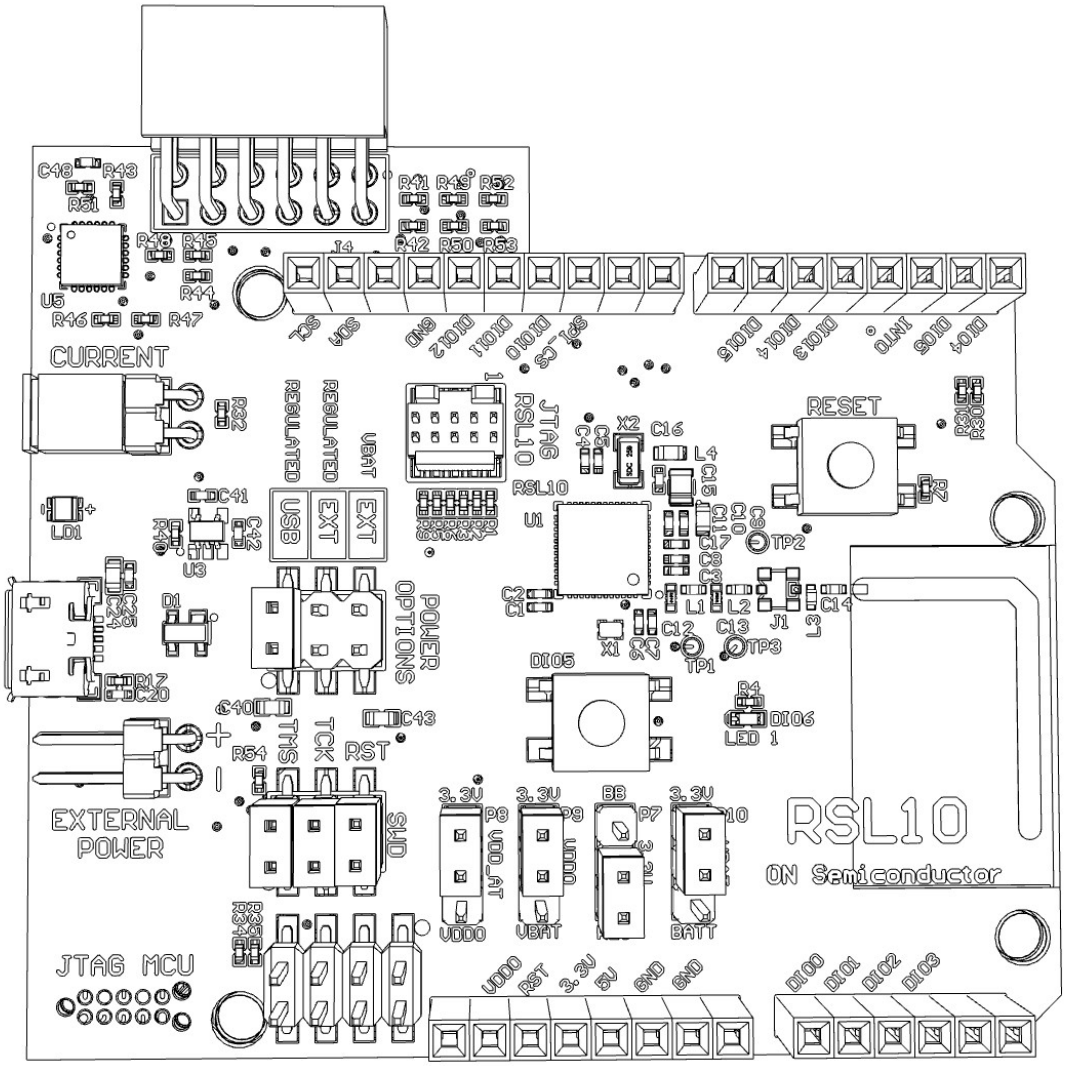

Figure 6. Three-Dimensional Line Drawing of the QFN Board (Top View)

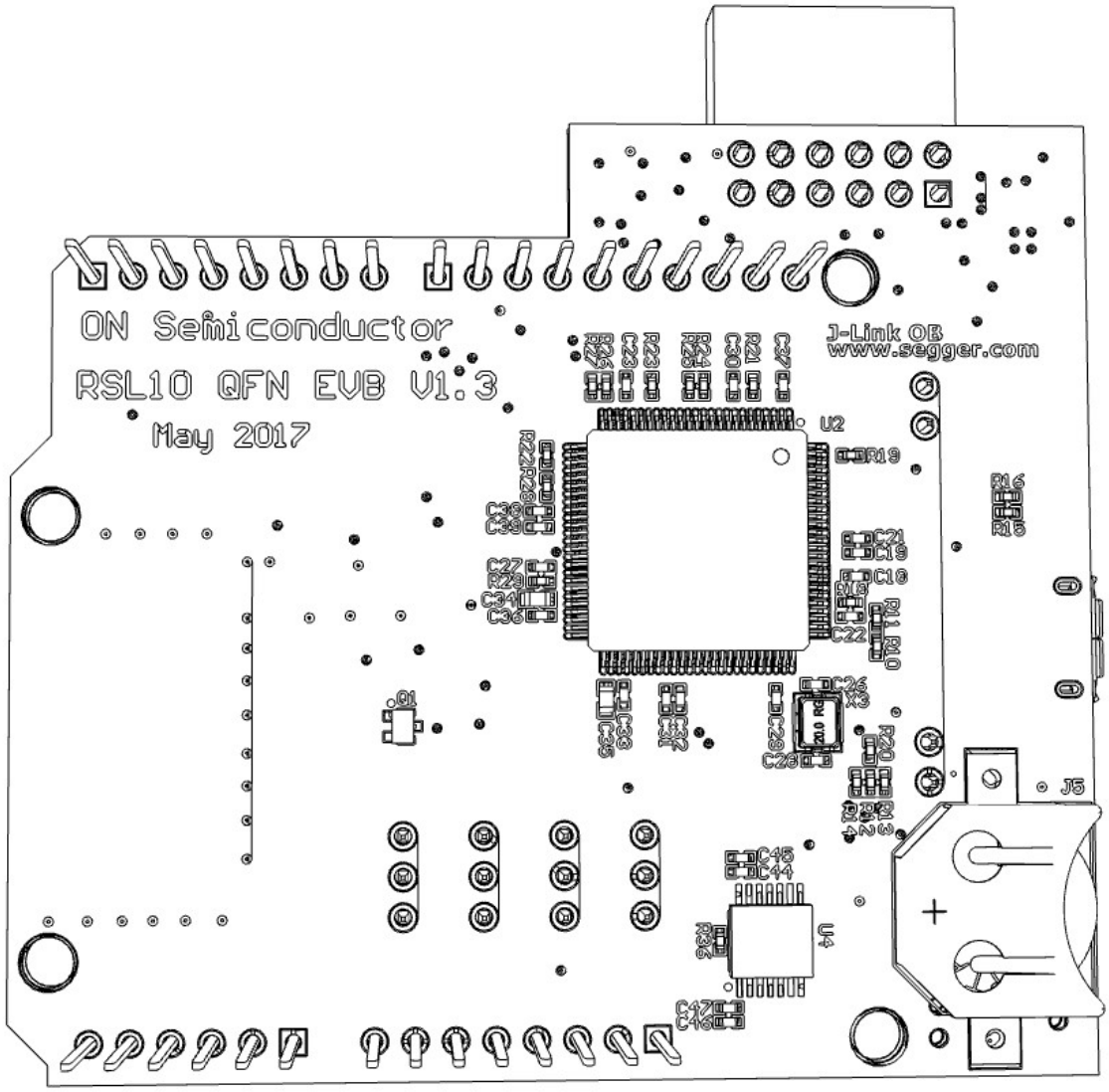

Figure 7. Three-Dimensional Line Drawing of the QFN Board (Bottom View)

Power Supply

The Evaluation and Development Board can be powered by one of the following:

- Micro USB port with regulator
- External power supply connector (`P5` for QFN, `P9` for WLCSP) with regulator
- External power supply connector (`P5` for QFN, `P9` for WLCSP) without regulator

For the WLCSP board, use the jumpers on pin headers `P6` and `P8` to select a power supply option as shown in Table 1.

Table 1. POWER SUPPLY SELECTION FOR WLCSP

Power Source	Jumper Position on P6	Jumper Position on P8
Micro USB Port with Regulator	1&2	1&2
External Power Supply with Regulator	1&2	3&4
External Power Supply without Regulator	2&3	5&6

For the QFN board, use the jumpers on pin headers P4, P7 and P10 to select a power supply option as show in Table 2.

Table 2. POWER SUPPLY SELECTION FOR QFN

Power Source	Jumper Position on P4	Jumper Position on P7	Jumper Position on P10
Micro USB Port with Regulator	1&2	2&3	1&2
External Power Supply with Regulator	3&4	2&3	1&2
External Power Supply without Regulator	1&2, 5&6	2&3	2&3

Table 3. MINIMUM/MAXIMUM EXTERNAL REGULATED VOLTAGES

Power Supply	Header	Input Voltage		
		Minimum	Typical	Maximum
RSL10 and J−Link OB MCU	EXT−PSU Regulated	3.3 V	3.6 V	12.0 V
RSL10 and J−Link OB MCU	USB	−	5.0 V	−
RSL10	EXT−PSU Unregulated	1.1 V	1.25 V	3.6 V

Level Translators

The board has level translators for the DIO signals of RSL10, including the clock signal. The level translators facilitate interfacing to external devices that operate at a higher voltage than RSL10.

VDDO and 3.3 V are two different power rails. The translator allows a logic signal on the VDDO side to be translated to either a higher or a lower logic signal voltage on the 3.3 V side, and vice-versa.

The level translation circuitry consists of components U4 and the 2x4 header. Signals are translated from the VDDO voltage reference to 3.3 V (default) voltage provided by the regulator output or by an external supply. The VDDO voltage is configured by the pin on header P11 (located on the board edge) to either VBAT_DUT, 3.3 V or other level within the VDDO voltage range, which is 1.1 to 3.3 V.

The NLSX5014 level translators are bi-directional. They have the following features:

- Wide voltage operating range: 0.9 V to 4.5 V
- VDDO and 3.3 V are independent
- VDDO can be equal to, or less than, 3.3 V when connected to the power rail

To enable the level translators, populate positions R34 and R35 with 0 ohms. By default, the level translators are disabled. NOTE: Enabling the level translator affects power consumption.

LED Circuitry

There are two LEDs on the board. One is a dual color LED, called LD1, connected to the J−Link emulator microcontroller unit (MCU). The other is the green LED, connected to DIO 6 of RSL10. You can use this LED within your applications as an indication LED by programming DIO 6. If DIO 6 is high, this LED is on.

Measuring the Current Consumption

This section deals with measuring current consumption for both WLCSP and QFN versions of the Evaluation and Development Board.

Measuring Current Consumption for WLCSP

The RSL10 VBAT main system supply can be the USB's 5 V ±5% through the 3.3 V regulator, or the external regulated 3.3 V supply, or the supply can be an external power source without regulator. For more information, refer to Section "Power Supply" on page 7.

The current measurement header (P7) located on the board is provided to measure the current consumption of RSL10. For normal operation, short the current measurement header. When using an external supply, ensure that the recommended voltage level for RSL10 is not exceeded. Refer to Table 3 on page 8 for minimum and maximum voltages.

Headers are provided for each of the regulated voltages for additional capacitance and/or for measurements. RSL10 has 16 digital I/Os. The VDDO pin in header P11 configures the I/O voltages for power domains to either VBAT or to some other voltage.

To measure the current consumption of RSL10 only, you must use an unregulated external power supply, and remove the jumpers that connect nRESET, SWDIO and SWCLK between the MCU and RSL10, preventing leakage from the JTAG interface. For WLCSP boards, remove the jumpers on header P12.

Measuring Current Consumption for QFN

The current measurement header (P3) located on the board is provided to measure the current consumption of RSL10. For normal operation, short the current measurement header. When using an external supply, ensure that the recommended voltage level for RSL10 is not

exceeded. Refer to Table 3 on page 8 for minimum and maximum voltages.

Headers are provided for each of the regulated voltages for additional capacitance and/or for measurements. RSL10 has 16 digital I/Os. The VDDO pin in header P9 configures the I/O voltages for power domains to VBAT.

To measure the current consumption of RSL10 only, you must use an unregulated external power supply, and remove the jumpers on header SWD. Removing the jumpers between the MCU and RSL10 that connect nRESET, SWDIO and SWCLK prevents current leakage from the JTAG interface, avoiding inaccurate current measurements.

SWJ−DP DEBUG Port

The J−Link adapters are typically used to communicate with RSL10 using the standard Coresight SWJ−DP debug port in a JTAG/SW communication protocol. The 9-pin 0.05 in Samtec FTSH header (P3 for WLCSP, P1 for QFN), defined by the Arm Cortex−M3 core on the board, connects RSL10 to external adapters compatible with the Arm Cortex−M3 processor's SWJ−DP interface. Alternatively, you can connect the micro USB port on the board to a PC.

DIGITAL Input/Output (DIO)

RSL10 contains 16 digital I/O (DIO) signals. The DIO voltage domain is VDDO, while the input voltage can be VBAT or external voltage as outlined in Section "Measuring the Current Consumption" on page 8.

The DIO signals on RSL10 are multiplexed with several interfaces, including:

- One I^2C interface (on DIO [7:8] for QFN)
- Four external inputs to the low-speed analog to digital converters (on DIO [0:3] for QFN)
- One PCM interface
- Two PWM drivers
- Two SPI interfaces (on DIO [9:12] and DIO [13:15] for QFN)
- One UART interface (on DIO [4:5] for QFN)
- Support interfaces that can be used to monitor control of the RF front-end and Bluetooth® baseband controller

For more information about the DIO multiplexed signals, refer to the *Hardware Reference Manual for RSL10*.

The WLCSP board provides access to any of the DIOs or their multiplexed signals via the DIO0−15 headers. One 16-pin protected header, organized in a 2x8 configuration, is provided on the board.

The QFN board provides access to any of the DIOs or their multiplexed signals via the Arduino Headers (Power1, AD1, IOL1, and IOH1).

The LED circuit provides visual monitoring of the DIOs; refer to Section "LED Circuitry" on page 8 for further information.

Power Supplies and Test Points

There are several external power supplies available on your Evaluation and Development Board. Depending on what type of board you are working with, test points might also be present.

The user can also access signals on various headers on boards, as described throughout this document.

WLCSP Power Supply and Test Points

External power supplies available for WLCSP boards are:

- VBUS, 5 V from USB connection − available only when USB is plugged in
- V3.3, 3.3 V from LDO − available when regulated supply is selected
- VEXT, unregulated external supply − available when unregulated supply is selected

The user can also access signals on various headers on boards, as described throughout this document.

The WLCSP board includes several test points which the user can access to measure the following internal power supplies:

- VDDA
- VDDC
- VDDM
- VDDPA
- VCC
- VDDRF
- VPP

QFN Power Supplies

The external power supplies available for QFN boards are:

- VBUS, 5 V from USB connection − available only when USB is plugged in
- V3.3, 3.3 V from LDO − available when regulated supply is selected
- VEXT, (P5 header) unregulated external supply − available when unregulated supply is selected
- Battery (J5 Battery Holder, 12 mm coin cell battery)

APPENDIX A − WLCSP CONNECTORS

Overview

This appendix lists all connectors on the Evaluation and Development Board. The sections that follow provide descriptions for:

- Jumpers and their possible configurations
- Headers
- Switches and their possible configurations
- Connectors

Configuration Header Jumpers

Table 4. JUMPER DESCRIPTIONS

Designator	Description
P6	Regulated or Unregulated power supply selection (see Table 1 on page 7)
P8	Power Source Selection (see Table 1 on page 7)
P11	VDDO selection between VBAT_DUT and V3.3
	VDD_AT selection between 3.3 V and VEXT, removing R39

Headers

Table 5. HEADER DESCRIPTIONS

Designator	Description
P1	DIO signals
P2	External slow clock input header
P3	JTAG debug connection header
P4	Virtual UART port from PC
P5	Analog test header
P7	Current measurement header
P9	External power supply header
P10	Input and output of level shifter
P11	Power supply on board and supply voltage configuration header

Switches

Table 6. SWITCH DESCRIPTIONS

Designator	Description
RESET	Pushbutton switch to reset RSL10
DIO5	Pushbutton switch for DIO5

Connectors

Table 7. CONNECTOR DESCRIPTIONS

Designator	Description
J1	Micro USB port for power supply, JTAG and UART emulation

APPENDIX B − QFN CONNECTORS

Overview

This appendix lists all connectors on the QFN Evaluation and Development Board. The sections that follow provide descriptions for:

- Jumpers and their possible configurations
- Headers
- Switches and their possible configurations
- Connectors

Configuration Header Jumpers

Table 8. JUMPER DESCRIPTIONS

Designator	Description
P4	Regulated or Unregulated power supply selection
P10	VBAT Power Source selection (3.3 V, Vext or Battery)
P9	VDDO selection (VBAT_DUT, 3.3 V)
P8	VDD_AT selection (3.3 V, VDDO)
P1	Onboard JTAG debugger connection

Headers

Table 9. HEADER DESCRIPTIONS

Designator	Description
POWER1	Arduino Power header 3.3 V, VDDO, nRESET, GND
AD1	Arduino Analog Inputs header A [0:3]
IOL1	Arduino IOL header UART, INT [0:1], SPI2
IOH1	Arduino IOH header I2C, SPI1
P2	External JTAG debug connection header
P3	Current measurement header
P5	External power supply header
P6	Input and output of level shifter

Switches

Table 10. SWITCH DESCRIPTIONS

Designator	Description
SW1	Pushbutton switch to reset RSL10
SW2	Pushbutton switch for DIO5

Connectors

Table 11. CONNECTOR DESCRIPTIONS

Designator	Description
J1	RF switch connector
J2	Micro USB port for power supply, JTAG and UART emulation
J3	MCU programming connector
J4	Digilent PMOD peripheral connector I2C, SPI1, INT0
J5	Battery Holder (12 mm coin cell)

APPENDIX C − WLCSP SCHEMATICS

This appendix contains schematics for the WLCSP Evaluation and Development Board:

- The Interface MCU schematic
- The RSL10 schematic
- The Power Supply schematic

These schematics are for Version 1.1 and Version 1.2 of the WLCSP board.

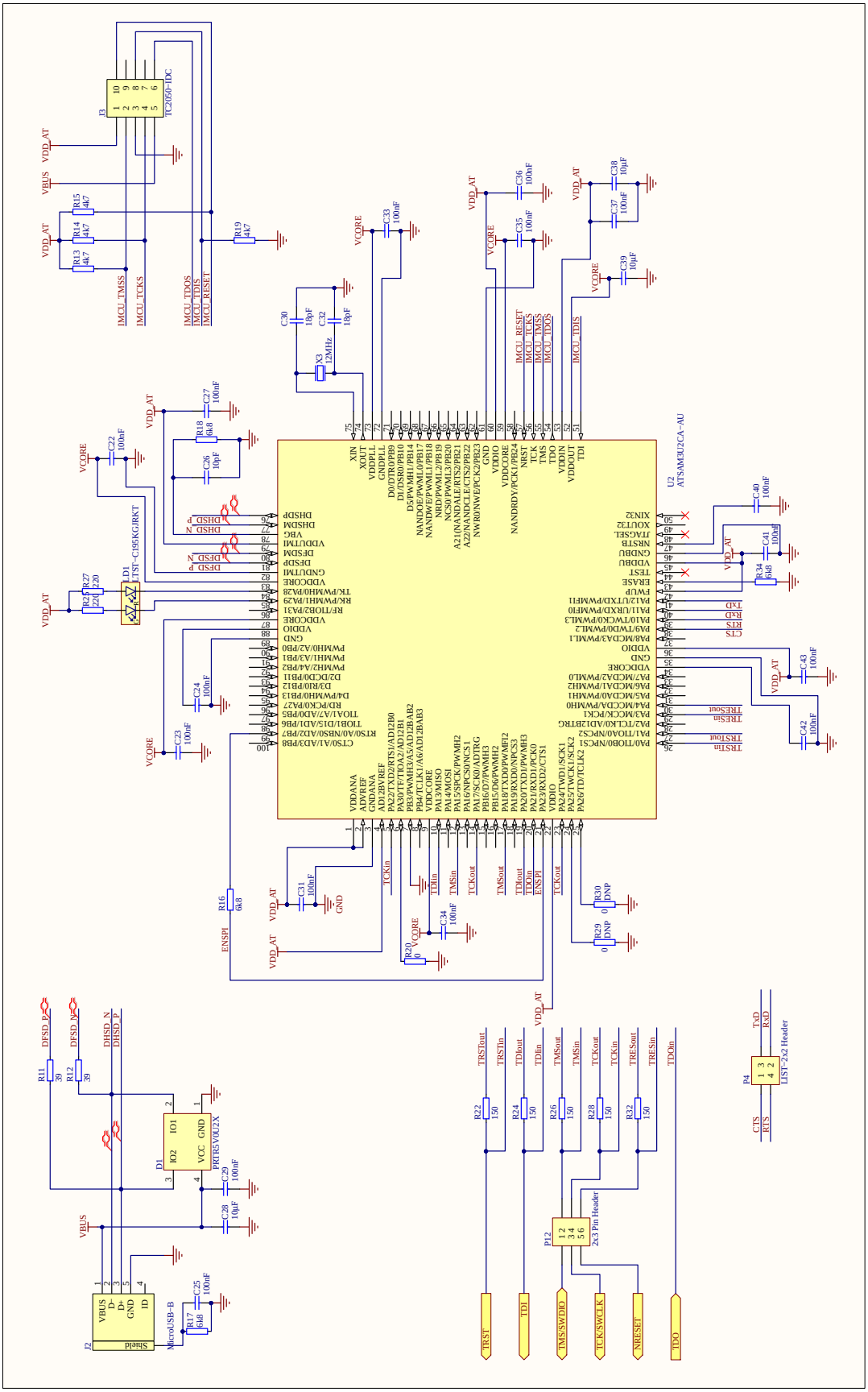

Figure 8. Interface MCU Schematic

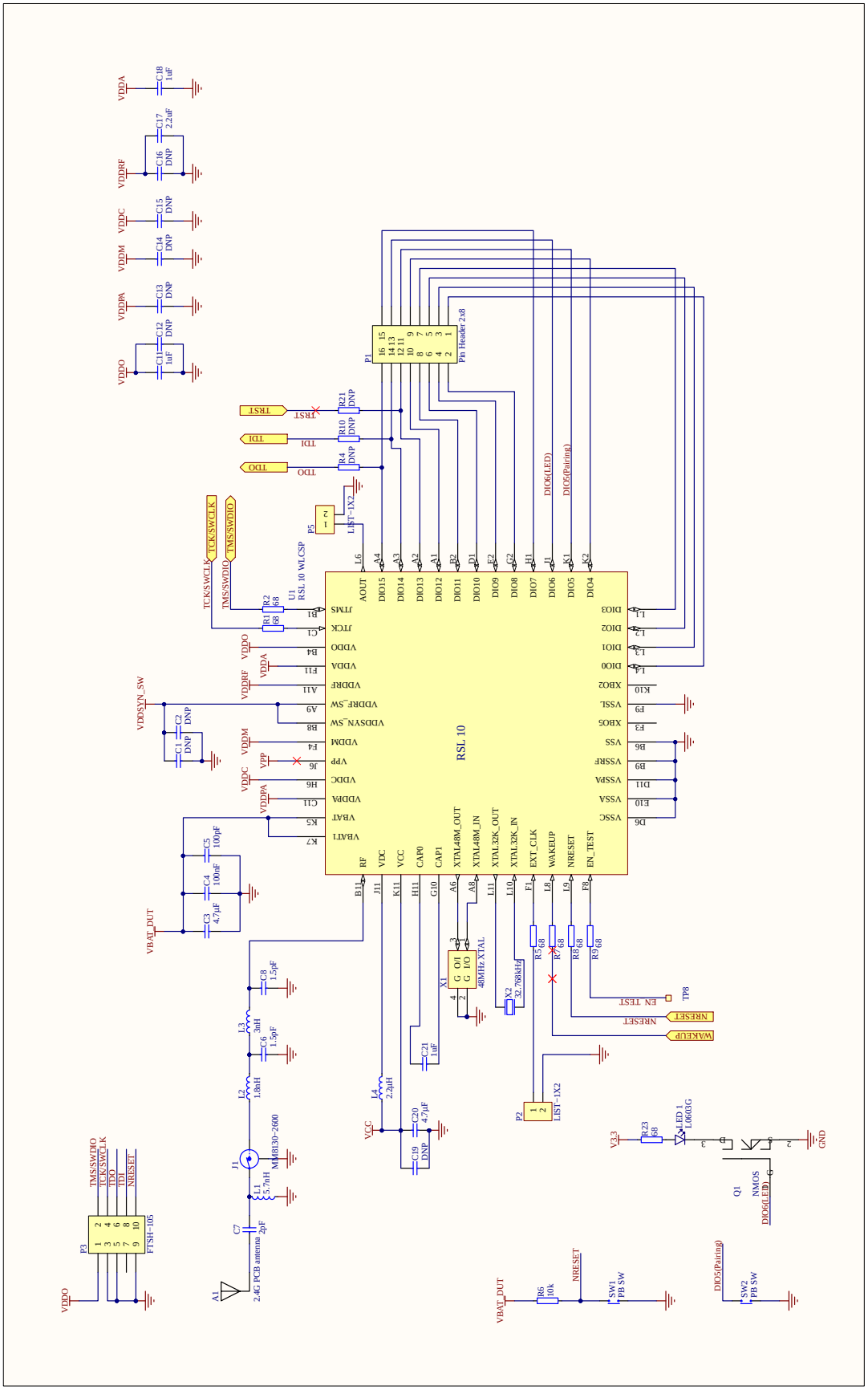

Figure 9. RSL10 Schematic

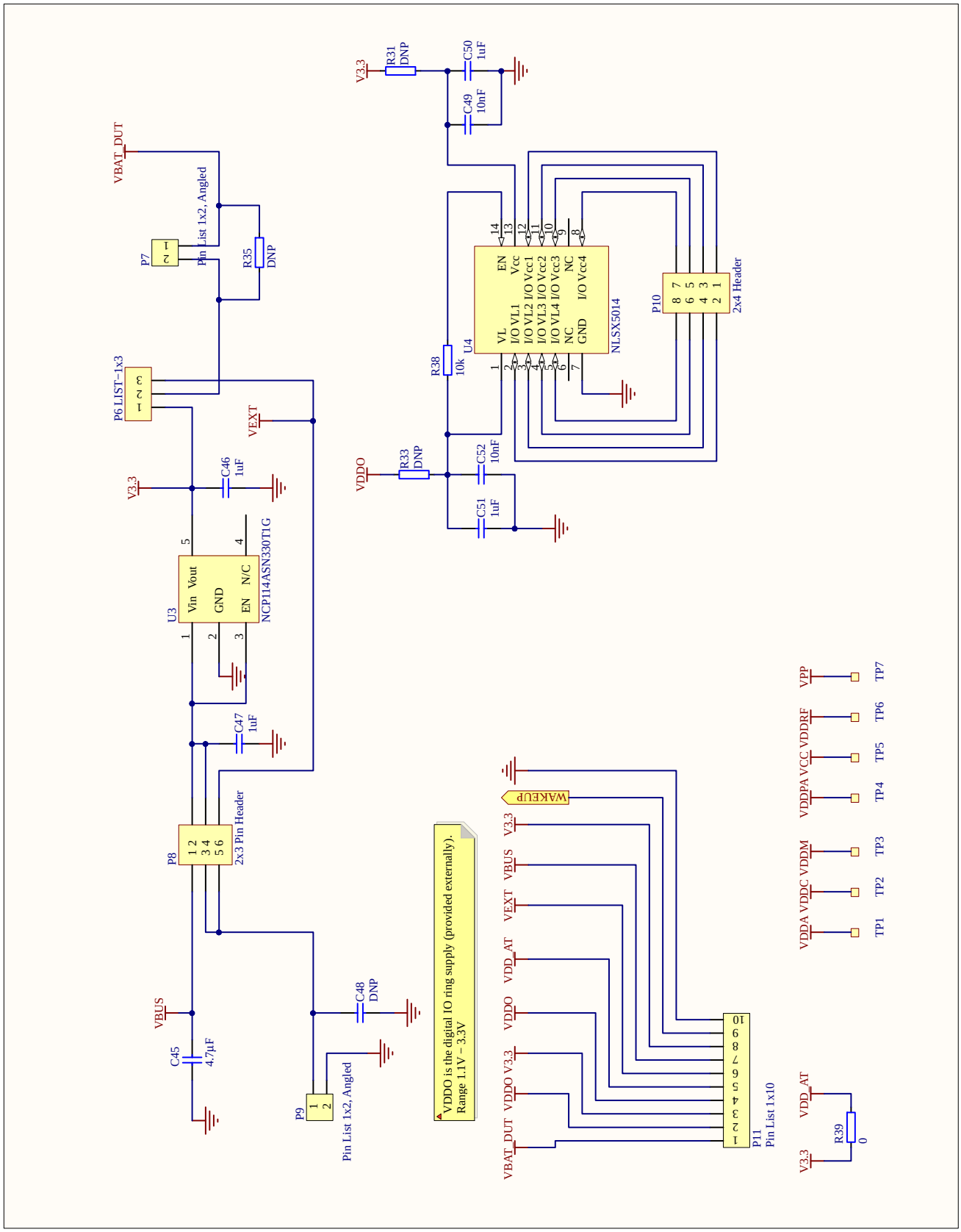

Figure 10. Power Supply Schematic

APPENDIX D − QFN SCHEMATICS

This appendix contains schematics for the QFN Evaluation and Development Board, version 1.3:

- The Top-level (Arduino interface) schematic
- The RSL10 schematic
- The Interface MCU schematic
- The Power Supply schematic

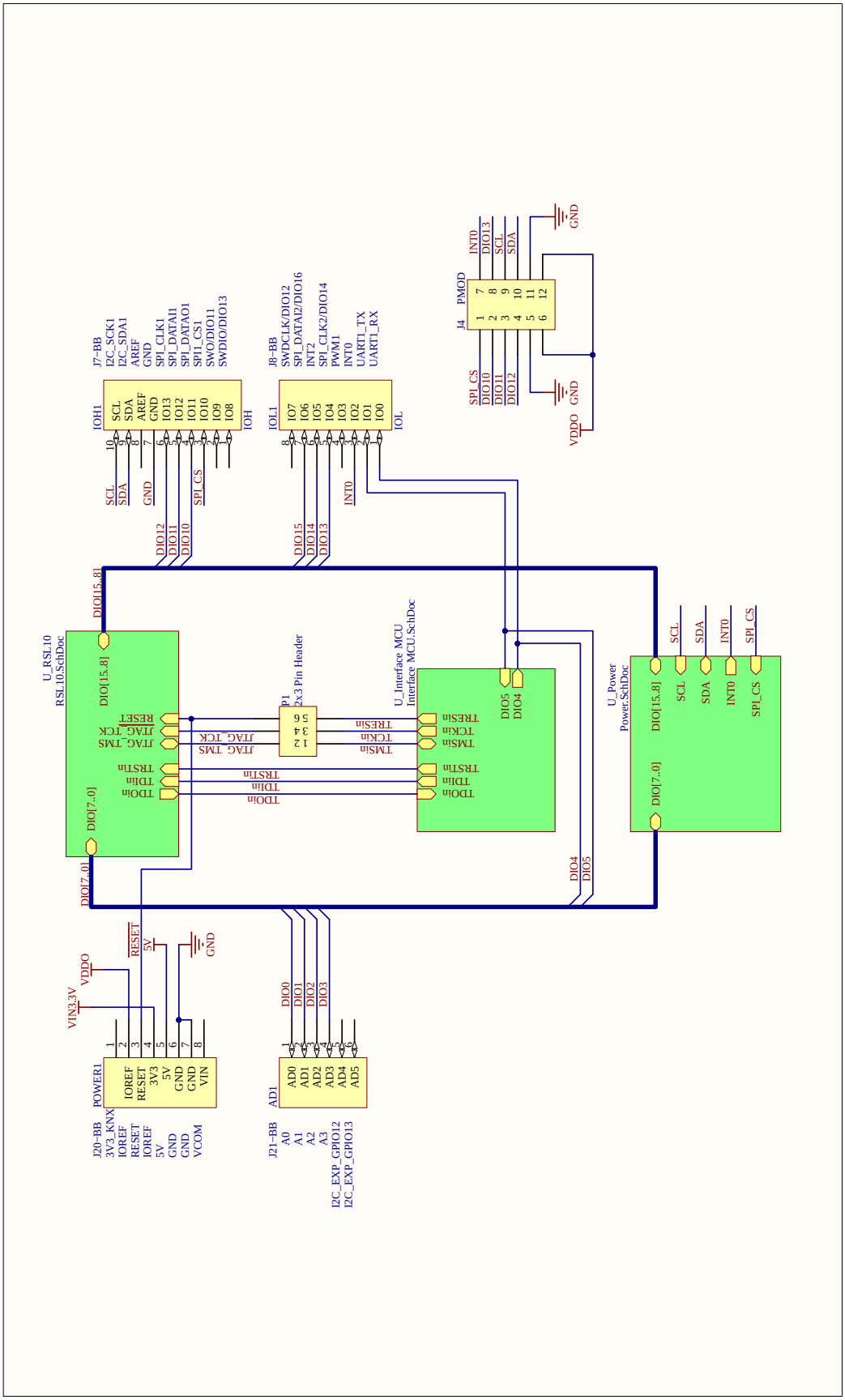

Figure 11. Top-Level (Arduino Interface) Schematic

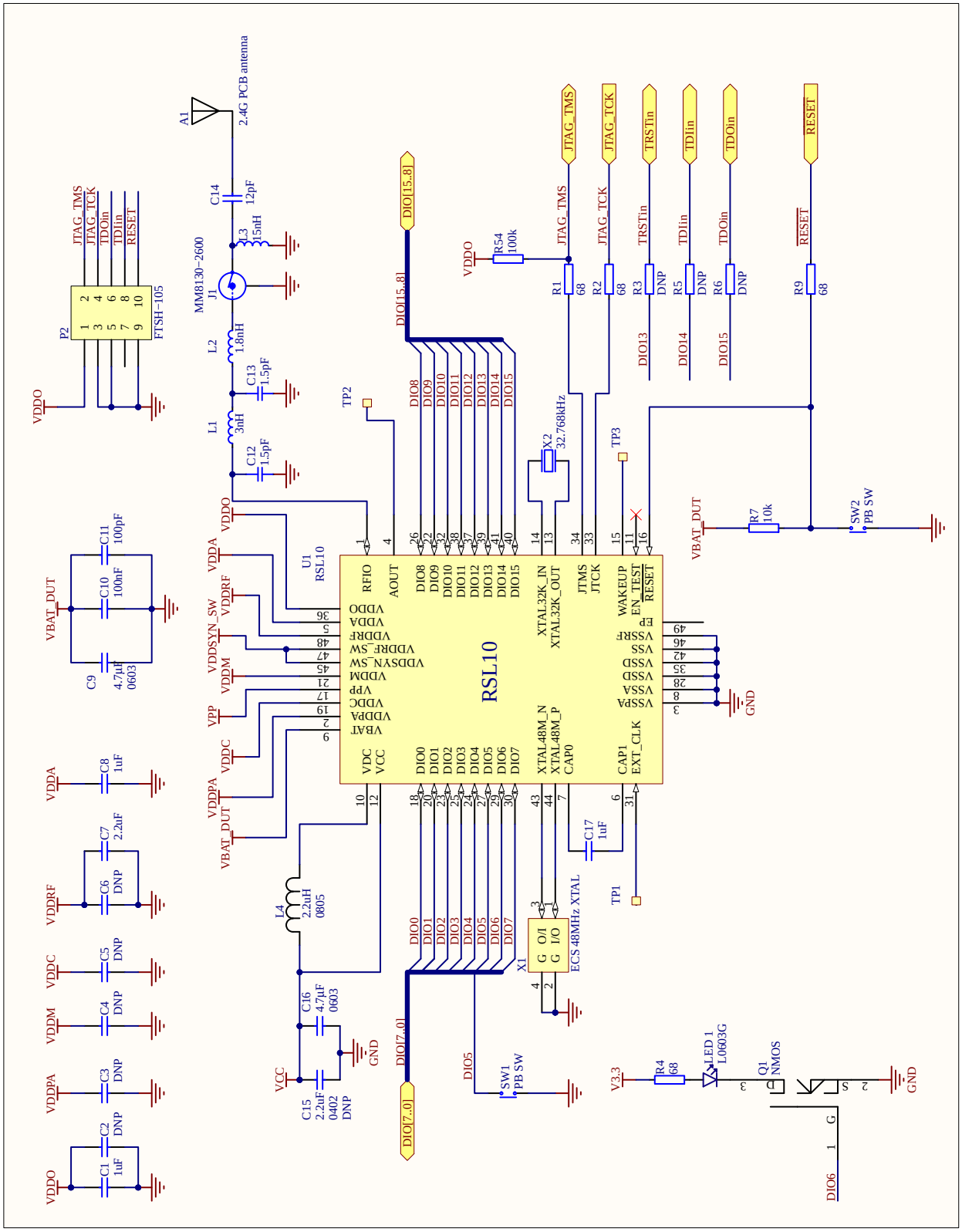

Figure 12. RSL10 SoC Schematic

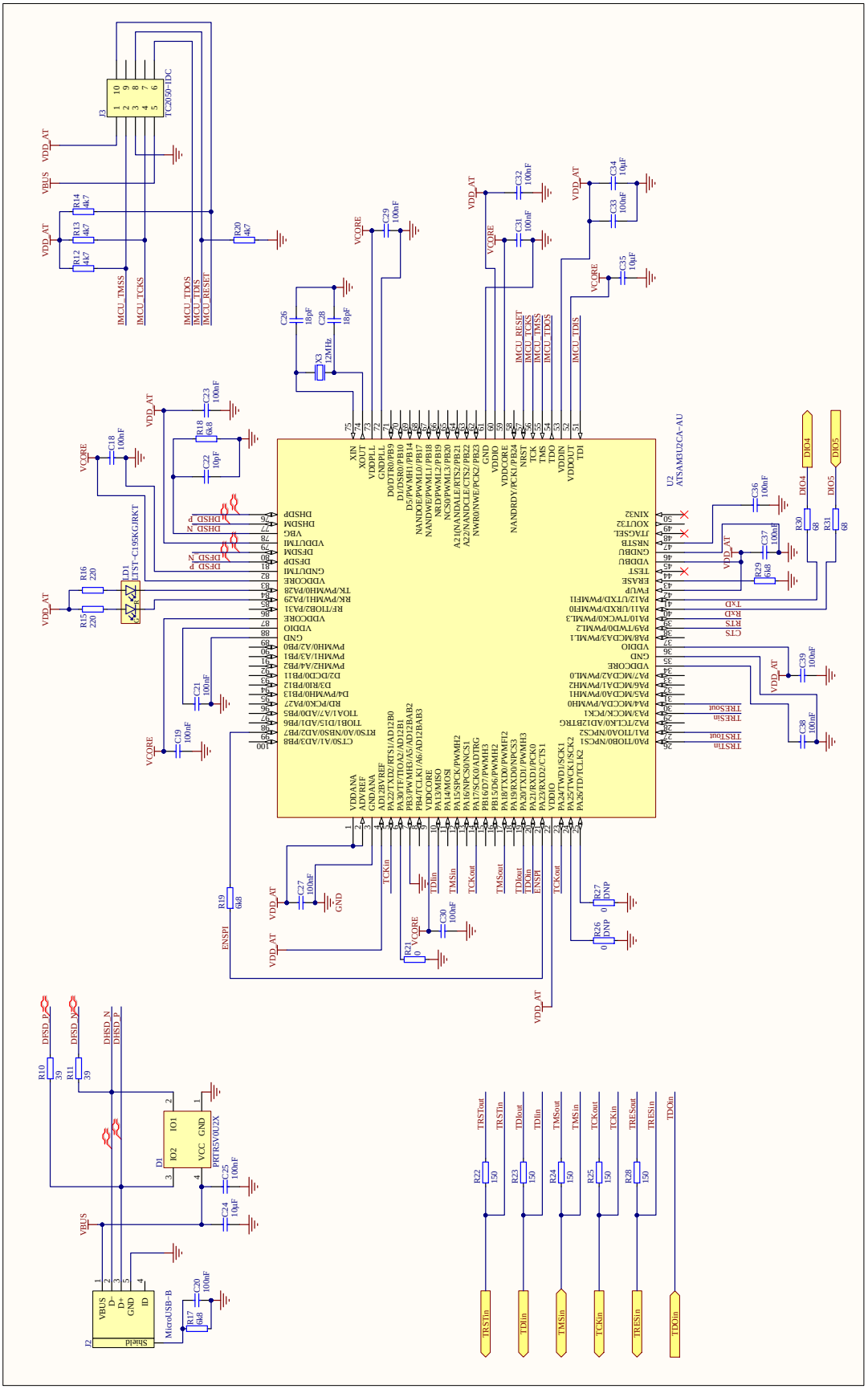

Figure 13. Interface MCU Schematic

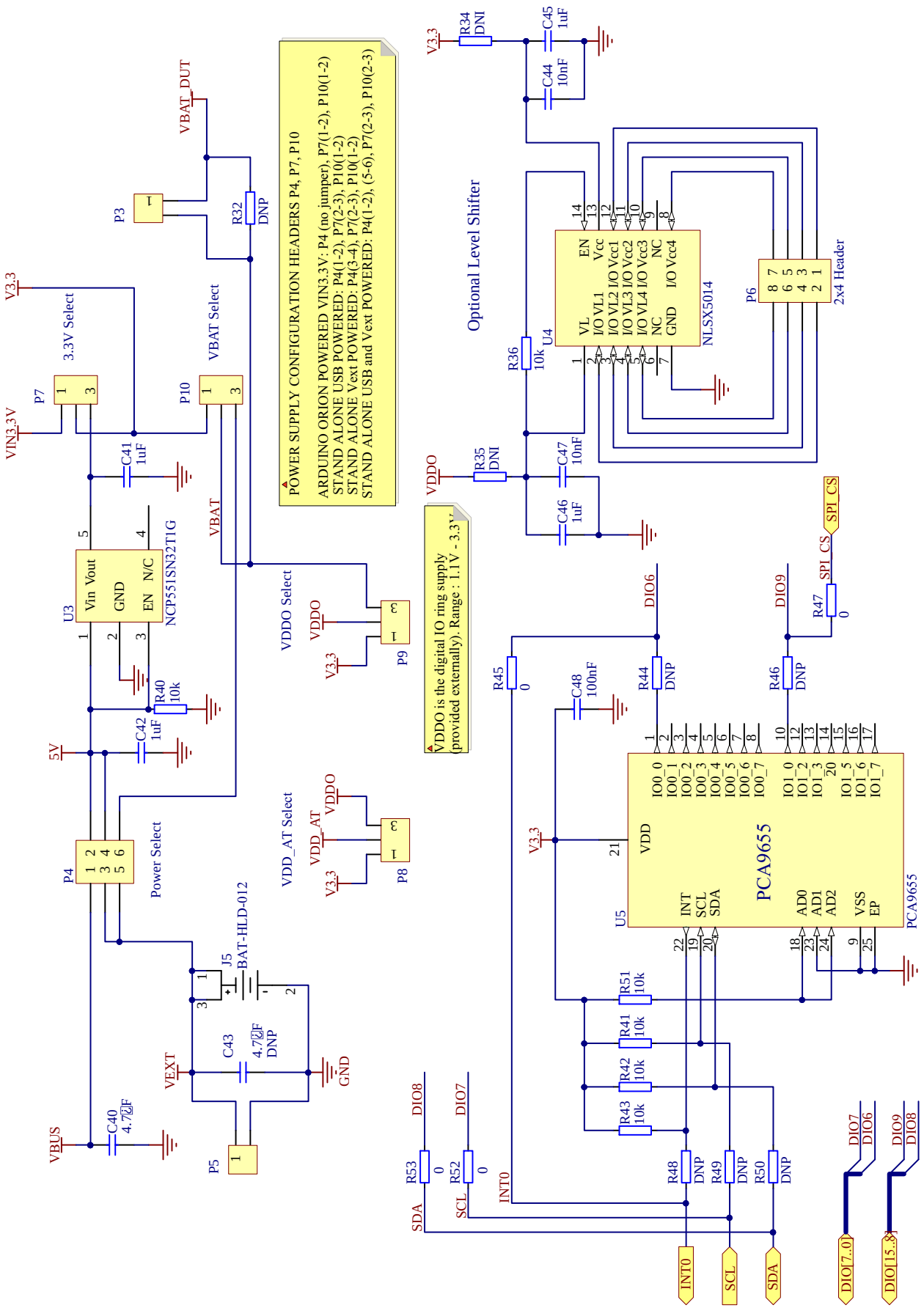

Figure 14. Power Supply Schematic

APPENDIX E − WLCSP BILL OF MATERIALS

This appendix lists the parts that were used to make the WLCSP Evaluation and Development Board.

Table 12. BILL OF MATERIALS FOR RSL10 WLCSP EVALUATION AND DEVELOPMENT BOARD VERSION 1.2

Designator	Description	Footprint Doc	Manufacturer Part Number	Supplier Part Number
C3, C20	Capacitor, X5R, ±10%	0603	GRM188R61A475KE15D	490−10477−1−ND
C5, C45	Capacitor, NP0, ±2%	0402	GRM1555C1H101JA01J	490−7754−1−ND
C6, C8	Capacitor, NP0, ±2%	0402	GJM1555C1H1R5BB01D	490−8087−1−ND
C7	Capacitor, NP0, ±2%	0402	GRM1555C1E120GA01D	490−8169−1−ND
C11, C18, C21, C46, C47, C50, C51	Capacitor, NP0, ±2%	0402	GRM155R61A105KE15D	490−3890−1−ND
C17	Capacitor, NP0, ±2%	0402	GRM155R61A225KE95D	490−10451−1−ND
C4, C22, C23, C24, C25, C27, C29, C31, C33, C34, C35, C36, C37, C40, C41, C42, C43	Capacitor, NP0, ±2%	0402	GRM155R61E104KA87D	490−5920−1−ND
C26	Capacitor, NP0, ±2%	0402	GRM1555C1E100JA01D	490−6168−1−ND
C28, C38, C39	Capacitor, X5R, ±10%	0603	GRM188R61A106KE69D	490−10474−1−ND
C30, C32	Capacitor, NP0, ±2%	0402	GRM1555C1E180JA01D	490−6172−1−ND
C49, C52	Capacitor, NP0, ±2%	0402	GRM155R71H103KA88D	490−4516−1−ND
D1	TVS DIODE 5.5 VWM SOT143B	SOT−143B	PRTR5V0U2X,215	1727−3884−1−ND
J1	Coaxial Connector with Switch	COAXIAL−SWF	MM8130−2600RA2	490−4981−1−ND
J2	MicroUSB−B−SMT	FCI_10118193−0001LF	10118193−0001LF	609−4616−1−ND
L1	Inductor, 320 mA, ±5%	0402	HK100515NJ−T	587−1521−1−ND
L2	Inductor, 320 mA, ±5%	0402	LQG15HS1N8S02D	490−2613−1−ND
L3	Inductor, 320 mA, ±5%	0402	LQG15HS3N0S02D	490−6570−1−ND
L4	Inductor, 80 mA, ±10%	0603	CBMF1608T2R2M	587−1718−1−ND
LD1	Ultra bright AlInGaP Bi-Color LED	LED_DUAL_0606	LTST−C195KGJRKT	160−1452−1−ND
LED 1	LED SMARTLED GREEN 570 NM 0603	0603	LNJ337W83RA	LNJ337W83RACT−ND
P1	Headers 16P STR SMT DR GOLD 5.3 MM MATING PIN	HDR_2x8	961216−6300−AR−PR	517−9612166300ARPR
P2, P5	CONN HEADER 2POS .100″ SNGL SMD	HDR_2x1	TSM−102−01−L−SV	SAM8979−ND
P3	SAMTEC − CONN HEADER 10POS DUAL .05″ SMD KEYING SHROUD	FTSH−105	FTSH−105−01−F−DV−K	FTSH−105−01−F−DV−K−P−TR−ND
P4	CONN HEADER 4POS BRKWAY DL GOLD	HDR_2x2	1241050−2	A121785CT−ND
P6	CONN HEADER 3POS .100 SMT GOLD	HDR_3x1'	1241150−3	A110955CT−ND
P7, P9	Pin List 1 x 2, 2.54 mm (100 mil), Right Angled, SMD	LIST_ANG_1x2−SMD−2.54MM	TSM−102−01−L−SH−A	TSM−102−01−L−SH−A
P8, P12	CONN HEADER 6POS .100″ VERT 15AU	HDR_2x3	15910060	WM17457−ND
P10	CONN HEADER 8POS .100″ VERT 15AU	HDR_2x4	15−91−0080	WM17458−ND
P11	Pin List 1x10, 2.54 mm (100 mil), SMD	LIST_1x10_SMD	61001018221	20X0852
Q1	NMOS Transistor	SOT65P210X105−3N	RU1J002YNTCL	RU1J002YNTCLCT−ND
R1, R2, R5, R7, R8, R23	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF68R0X	P68.0LCT−ND
R6, R38	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF1002X, ERJ−2GEJ103X	P10.0KLCT−ND
R9	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF68R0X	P68.0LCT−ND
R11, R12	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF39R0X	P39.0LCT−ND

Table 12. BILL OF MATERIALS FOR RSL10 WLCSP EVALUATION AND DEVELOPMENT BOARD VERSION 1.2

Designator	Description	Footprint Doc	Manufacturer Part Number	Supplier Part Number
R13, R14, R15, R19	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF4701X	P4.70KLCT−ND
R16, R17, R18, R34	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF6801X	P6.80KLCT−ND
R20, R39	Resistor, ±1%, 0.063 W	0402	ERJ−2GE0R00X	P0.0JCT−ND, 173−8862
R22, R24, R26, R28, R32	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF1500X	173−8862
R25, R27	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF2200X	P220LCT−ND
R29, R30, R33	Resistor, ±1%, 0.063 W	0402	ERJ−2GE0R00X	P0.0JCT−ND
SW1, SW2	ALPS − SKHUALE010 − Tactile Switch, SPNO, SMD, 6.5 x 6.2 x 2.5 mm	ALPS_SKHUxxx010_WO_GND	SKHUALE010	35−790−00
U1	RSL 10 WLCSP51 SV3			
U2	IC MCU 32 bit 128 kB flash 100LQFP	LQFP−100	ATSAM3U2CA−AU	ATSAM3U2CA−AU−ND
U3	3.3 V 300 mA CMOS Low Dropout Regulator	TSOP−5IPC	NCP114ASN330T1G	NCP114ASN330T1GOSCT−ND
U4	TRANSLATOR LEVEL 4BIT 14−TSSOP	TSOP65P640X120−14N	NLSX5014DTR2G	NLSX5014DTR2GOSCT−ND
X1	48MHz XTAL size 1612	XTAL 4 pads	ECS−480−8−47−JTN−TR	XC1969CT−ND
X2	EPSON TOYOCOM − FC−135 32.768 KHz ±20PPM, 9.0 PF − CRYSTAL, SM, WATCH	XTAL_3215	FC−135 32.768 KHZ ±20 PPM, 9.0 PF	FC−135 32.7680KA−AC−ND
X3	XTAL SMD 3225, 12 MHz, 18 pF, ±30 ppm	BT−XTAL_3225	7M−12.000MAAJ−T	887−1121−1−ND
See installation next page	CONN JUMPER (2.54 mm) Gold	n/a	SPC02SYAN	S9001−ND
See installation next page	BUMPER CYLINDRICAL 0.25″ DIA CLR	n/a	RBS−40	RPC1622−ND

APPENDIX F − QFN BILL OF MATERIALS

This appendix lists the parts that were used to make the WLCSP Evaluation and Development Board.

Table 13. BILL OF MATERIALS FOR RSL10 QFN EVALUATION AND DEVELOPMENT BOARD VERSION 1.3

Designator	Description	Footprint Doc	Manufacturer Part Number	Supplier Part Number
AD1	Arduino Stackable Header 6-pin	n/a	SSQ−106−03−G−S	SAM1198−06−ND
C2, C3, C4, C5, C6	Capacitor, NP0, ±2%	0402	GRM1555C1E120GA01D	490−8169−1−ND
C7	CAP CER 2.2 μF 10 V X5R 0402	0402	GRM155R61A225KE95D	490−10451−1−ND
C9, C16,C40	CAP CER 4.7 μF 10 V X5R 0603, CAP CER 4.7 μF 25 V X5R 0603	0603	GRM188R61A475KE15D	490−10477−1−ND
C11	Capacitor, NP0, ±2%	0402	GRM1555C1H101JA01J	490−7754−1−ND
C12, C13	CAP CER 1.5 PF 50 V NP0 0402	0402	GCM1555C1H1R5CA16D	490−13289−1−ND
C14	Capacitor, NP0, ±2%	0402	GRM1555C1E120GA01D	490−8169−1−ND
C10,C18, C19, C20, C21, C23, C25, C27, C29, C30, C31, C32, C33, C36, C37, C38, C39,C48	Capacitor, NP0, ±2%	0402	GRM155R61E104KA87D	490−5920−1−ND
C22	Capacitor, NP0, ±2%	0402	GRM1555C1E100JA01D	490−6168−1−ND
C24, C34, C35	Capacitor, X5R, ±10%	0603	GRM188R61A106KE69D	490−10474−1−ND
C26, C28	Capacitor, NP0, ±2%	0402	GRM1555C1E180JA01D	490−6172−1−ND
C1, C8, C17, C41, C42, C45, C46	Capacitor, NP0, ±10%	0402	GRM155R61A105KE15D	490−3890−1−ND
C44, C47	Capacitor, NP0, ±2%	0402	GRM155R71H103KA88D	490−4516−1−ND
D1	Ultra low capacitance double rail-to-rail ESD protection diode	SOT−143B	PRTR5V0U2X,215	568−4140−1−ND
IOH1	Arduino Stackable Header 10-pin		SSQ−110−03−G−S	SAM1198−10−ND
IOL1, POWER1	Arduino Stackable Header 8-Pin		SSQ−108−03−G−S	SAM1198−08−ND
J1	Coaxial Connector with Switch	COAXIAL−SWF	MM8130−2600RA2	490−4981−1−ND
J2	MicroUSB−B−SMT	FCI_10118193−0001LF	10118193−0001LF	609−4616−1−ND
J4	WR−PHD 2.54 mm Angled Dual Socket Header, 12p		613012243121	S5559−ND
J5	HOLDER BATTERY 12 MM COIN		2996	36−2996−ND
L1	FIXED IND 3NH 800MA 170 MOHM SMD	0402	LQG15HS3N0S02D	490−6570−1−ND
L2	FIXED IND 1.8NH 950MA 100 MOHM	0402	LQG15HS1N8S02D	490−2613−1−ND
L3	Inductor, 320 mA, ±5%	0402	HK100515NJ−T	587−1521−1−ND
L4	Imported	0805	CKP2012N2R2M−T	587−2771−1−ND
LD1	Ultra bright AlInGaP Bi-Color LED	LED_DUAL_0606	LTST−C195KGJRKT	160−1452−1−ND
LED 1	LED SMARTLED GREEN 570NM 0603	0603	LNJ337W83RA	LNJ337W83RACT−ND
P1, P4	Header 2x3 SMT		15−91−2060	WM17449−ND
P2	SAMTEC − CONN HEADER 10POS DUAL .05″ SMD KEYING SHROUD	FTSH−105	FTSH−105−01−F−DV−K	SAM8796−ND
P3, P5	HEADER, 2POS, 1ROW; Series: 961; Pitch Spacing: 2.54 mm; RA		961102−5604−AR	3M9467−ND
P6	2x4 Pin Header		15−91−2080	WM17450−ND
P7, P8, P9, P10	HEADER, 3POS, 1ROW; Series: 961; Pitch Spacing: 2.54 mm;		961103−6404−AR	3M9448−ND
Q1	NMOS Transistor	SOT65P210X105−3N	RU1J002YNTCL	RU1J002YNTCLCT−ND
R1, R2, R4, R9, R30, R31	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF68R0X	P68.0LCT−ND

Table 13. BILL OF MATERIALS FOR RSL10 QFN EVALUATION AND DEVELOPMENT BOARD VERSION 1.3

Designator	Description	Footprint Doc	Manufacturer Part Number	Supplier Part Number
R3, R5, R6, R26, R27, R32,R44, R46, R48, R49, R50,	Resistor, ±1%, 0.063 W	0402	ERJ−2RKF68R0X, ERJ−2RKF68R0X, ERJ−2RKF68R0X, ERJ−2GE0R00X, ERJ−2GE0R00X, ERJ−2GE0R00X, ERJ−2GEJ103X, ERJ−2GEJ103X, ERJ−2GEJ103X, ERJ−2GE0R00X, ERJ−2GE0R00X, ERJ−2GE0R00X, ERJ−2GE0R00X, ERJ−2GE0R00X, ERJ−2GEJ103X	P68.0LCT−ND, P68.0LCT−ND, P68.0LCT−ND, P0.0JCT−ND, P0.0JCT−ND, 173−8862, P10KJCT−ND, P10KJCT−ND, P10KJCT−ND, 173−8862, 173−8862, 173−8862, 173−8862, 173−8862, P10KJCT−ND
R7, R36, R40, R41,R42, R43, R51	Resistor, ±1%, 0.1 W	0402	ERJ−2GEJ103X	P10KJCT−ND
R10, R11	Resistor, ±1%, 0.1 W	0402	ERJ−2RKF39R0X	P39.0LCT−ND
R12, R13, R14, R20	Resistor, ±1%, 0.1 W	0402	ERJ−2RKF4701X	P4.70KLCT−ND
R15, R16	Resistor, ±1%, 0.1 W	0402	ERJ−2RKF2200X	P220LCT−ND
R17, R18, R19, R29	Resistor, ±1%, 0.1 W	0402	ERJ−2RKF6801X	P6.80KLCT−ND
R21, R45, R47, R52, R53	Resistor, ±1%, 0.1 W	0402	ERJ−2GE0R00X	P0.0JCT−ND
R22, R23, R24, R25, R28	Resistor, ±1%, 0.1 W	0402	ERJ−2RKF1500X	173−8862
R54	Resistor, ±1%, 0.1 W	0402	ERJ−2RKF1003X	P100KLCT−ND
SW1, SW2	ALPS − SKHUALE010 − Tactile Switch, SPNO, SMD, 6.5 x 6.2 x 2.5 mm	ALPS_SKHUxxx010_WO_GND	SKHUALE010	35−790−00
U1	RSL10 QFN			
U2	IC MCU 32 bit 128 kB flash 100LQFP	LQFP−100	ATSAM3U2CA−AU	ATSAM3U2CA−AU−ND
U3	IC REG LIN 3.3 V 600MA 5TSOP	TSOP−5IPC	NCP114ASN330T1G	NCP114ASN330T1GOSCT−ND
U4	TRANSLATOR LEVEL 4BIT 14−TSSOP	TSOP65P640X120−14N	NLSX5014DTR2G	NLSX5014DTR2GOSCT−ND
U5	Remote 16-bit expander	QFN50P400X400	PCA9655EMTTXG	PCA9655EMTTXGOSDKR−ND
X1	ECS 48 MHz Crystal	XTAL 4 pads	ECS−480−8−47−JTN−TR	XC1969CT−ND
X2	EPSON TOYOCOM − FC−135 32.768 kHz ±20 PPM	XTAL_3215	FC−135 32.768KHZ ⍰20PPM	FC−135 32.7680KA−AC−ND
X3	XTAL SMD 3225, 12 MHz, 18 pF, ±30 ppm	BT−XTAL_3225	7M−12.000MAAJ−T	887−1121−1−ND
See Jumper Location	CONN JUMPER SHORTING GOLD FLASH	CONN JUMPER (2.54mm) Gold	SPC02SYAN	S9001−ND
See Installation	MACHINE SCREW PAN PHILLIPS 4−40	n/a	NY PMS 440 0025 PH	H542−ND
See Installation	HEX STANDOFF 4−40 NYLON 3/8″	n/a	1902B	36−1902B−ND

NOTE: Designators C2, C3, C4, C5, C6 and R3, R5, R6, R26, R27, R32,R44, R46, R48, R49, R50 are not populated.

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