ARROW ARIS Board

Hardware User's Guide

Outline

Revisions

REVISION	DATE	DESCRIPTION	STATUS	AUTHOR	REVISER
0.1	24/05/2016	Document created	draft	L. Dal Bello	
0.2	30/05/2016	Connector descriptions added	draft	L. Dal Bello	A. Ricci
0.1	31/05/2016	Document released	release	L. Dal Bello	A. Ricci

Disclaimer

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1. Introduction

1.1. Description

ARIS board, developed by RELOC for Arrow Electronics, is a ready-to-use Internet of Things (IoT) hardware and software platform that enables users to get their IoT applications up and running quickly, exploiting the Renesas Synergy development framework.

Based around a Renesas Synergy S7 MCU with 240 MHz ARM Cortex-M4 core, the ARIS board has a host of features that equip it for IoT operation. Communication with other devices and the cloud is enabled via Bluetooth Low Energy (BLE 4.1/4.2), Wi-Fi b/g/n support as well as an Ethernet 10/100 port. NFC tag functionality is also included along with a crypto bootloader and support for over-the-air (OTA) firmware updates. Board sensing capabilities include motion detection, i.e. 3-axes accelerometer and 2-axes gyroscope, environmental temperature and humidity sampling.

The Renesas Synergy Platform helps to accelerate IoT designs: a proven combination of hardware and software makes development easier and faster, thus encouraging innovation and product differentiation. The combination of Arrow ARIS board and Renesas Synergy software platform enables developers to reduce time–to–market and decreases the total cost of ownership of a product over its lifetime.

1.2. Kit contents

The following items are included in the box:

- 1x ARIS board
- 1x USB type A-male to mini-B-male cable

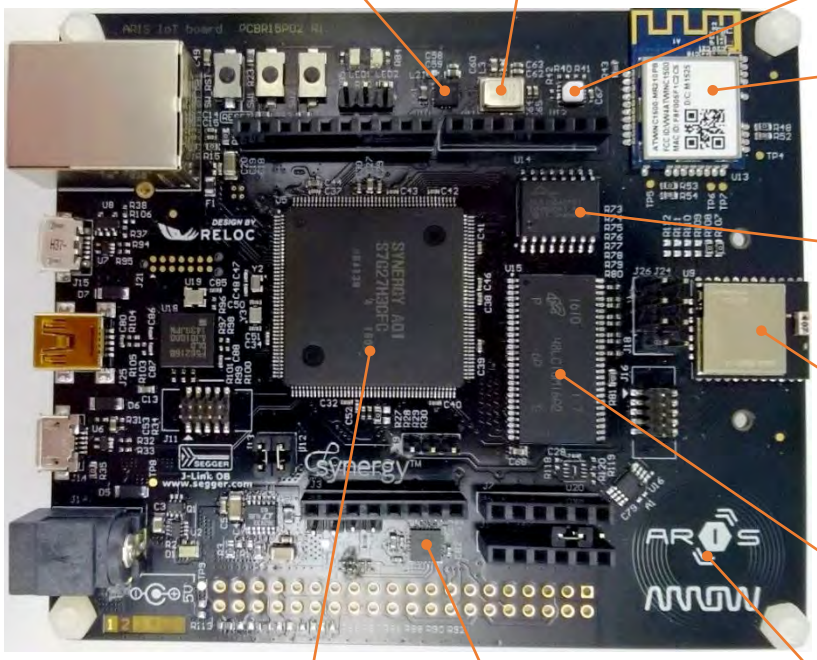
1.3. Getting started

Please refer to ARIS Software User's Guide to learn how to get started with the ARIS board.

2. System overview

2.1. Board layout

The layout of ARROW ARIS board is shown in the picture below.



Analog Devices ADXL362

Ultralow power 3-axis MEMS accelerometer

Analog Devices ADXRS290

High performance MEMS pitch and roll (dual-axis in-plane) angular rate sensor (gyroscope)

Silicon Labs Si70130

Humidity and temperature sensor

Atmel WINC1500

Wi-Fi 802.11 b/g/n Internet of Things module specifically optimized for low power IoT applications

Spansion S25FL512S

512 Mbit (64 Mbyte) QSPI Flash Memory with advanced security features

Silicon Labs BGM111

BLE 4.1 module (upgradable to BLE 4.2)

Micron MT48LC16M16A2

256 Mbit (32 Mbyte) SDRAM memory

Renesas Synergy S7

ARM Cortex-M4 core with Floating Point Unit (FPU)

- Up to 240 MHz core clock
- 4096 KB code flash
- 640 KB SRAM

Semtech SX8656IWLTRT

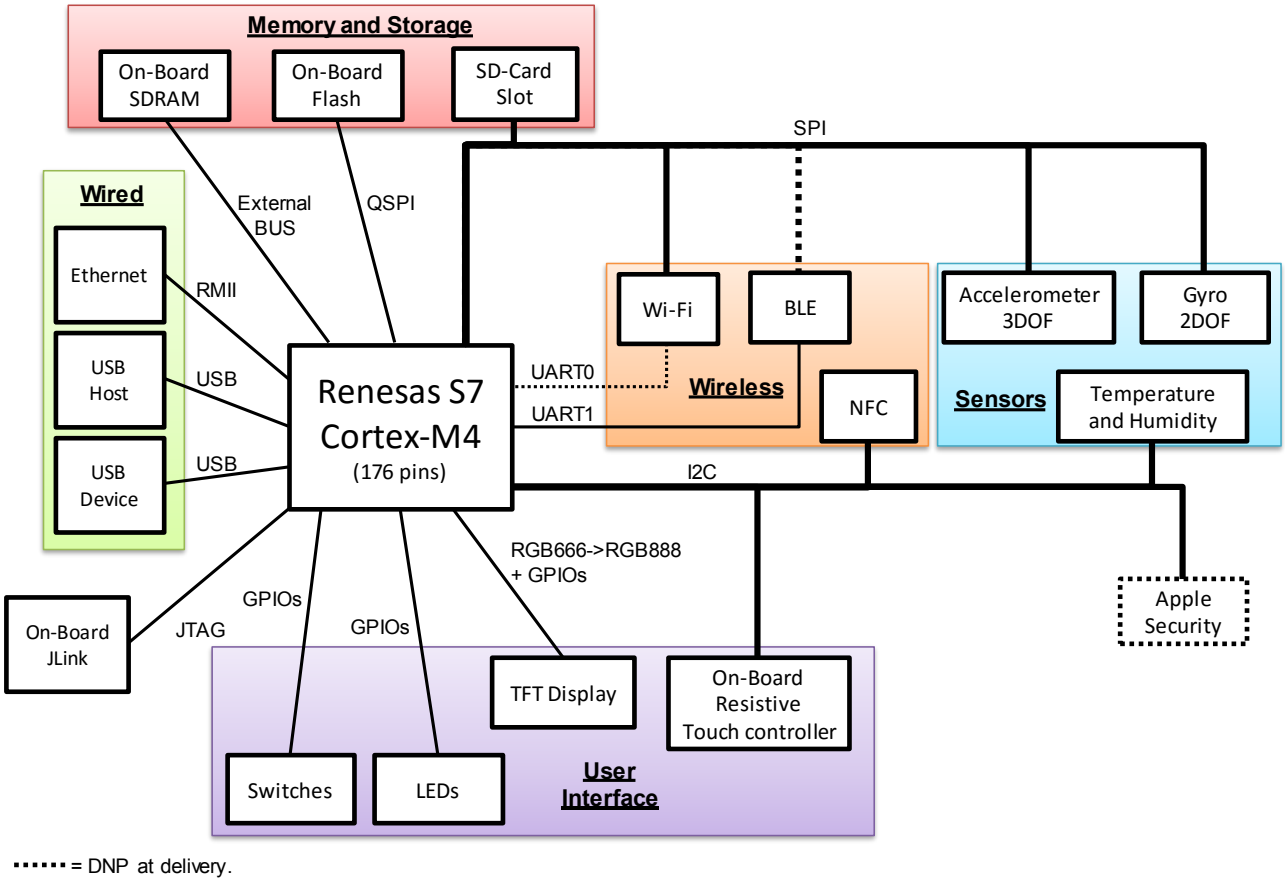
Multitouch 4/5-Wire Resistive Touchscreen Controller with Proximity Sensing

NXP NT3H1201

Energy harvesting NFC Forum Type 2 Tag with field detection pin and I2C interface

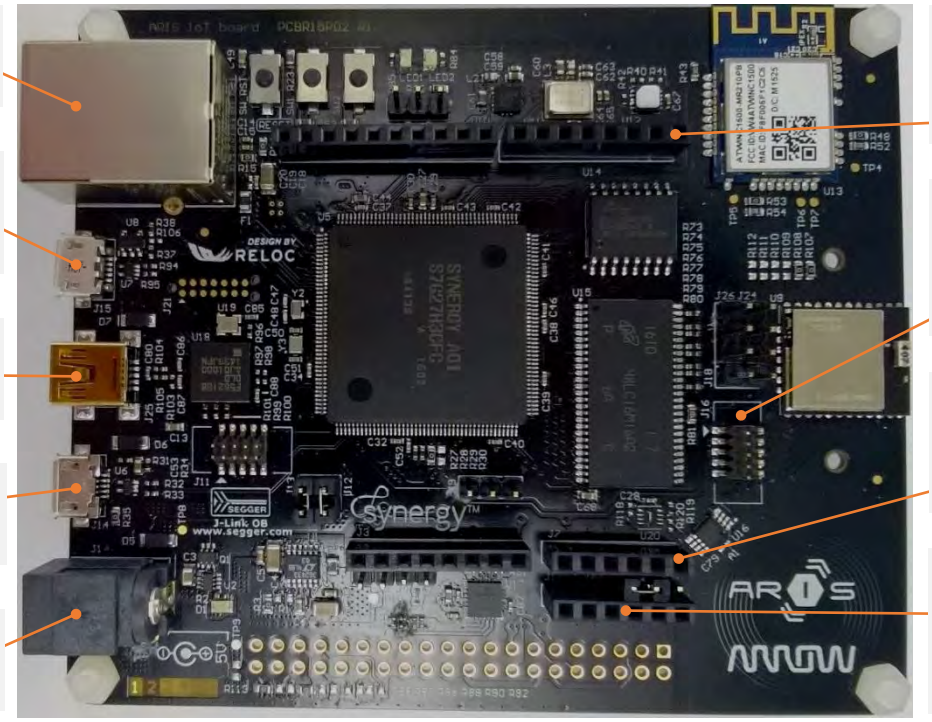
2.2. Block diagram

An overview of the functions of ARIS board is shown in the figure below:



3. Connectors

This chapter gives you an overview of the ARIS connectivity. Connectors' placement is depicted in the figure below.



Ethernet
10/100 Mbit/s

Micro USB A/B
Host/Device port

Mini USB B
J-Link port

Micro USB B
Device port

Power supply
5 V input

Arduino interface
Allows the connection of standard shields

JTAG connectors
For direct reprogramming of microcontrollers

Arduino interface
Allows the connection of standard shields

I2C Expansion
For optional external capacitive touch controller or other I2C devices

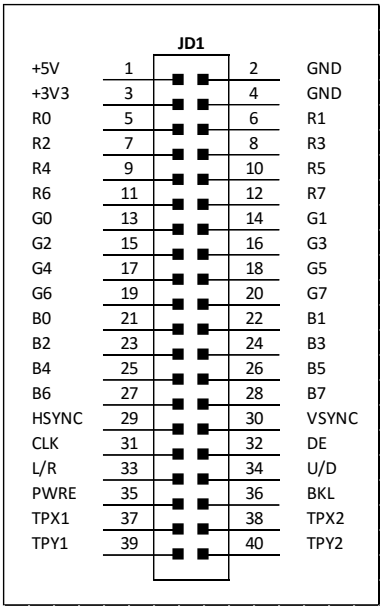
Coin battery
For backup power domain

Micro SD
Interface for additional storage

LCD port
24bit RGB888 interface (18bit + dithering)

3.1. LCD connector

JD1 (bottom side) provides connection to an optional LCD display, such as the LCD-OLinuXino-7TS.

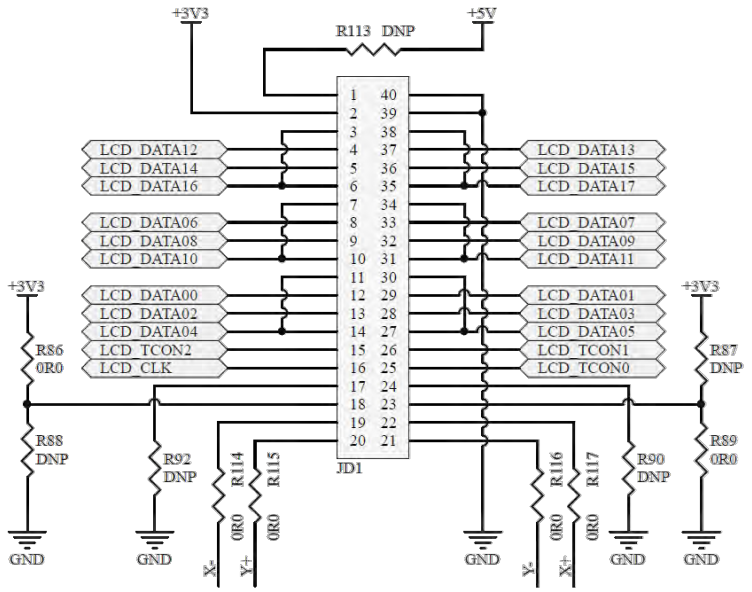


Signal	Description
+5V	Power supply for backlight
+3V3	Power supply for logic
GND	Ground connection
R0-7	Digital data for RED
G0-7	Digital data for GREEN
B0-7	Digital data for BLUE
HSYNC	Horizontal SYNC signal
VSYNC	Vertical SYNC signal
CLK	Communication clock
DE	Data enable
L/R	Left/Right scan direction
U/D	Up/Down scan direction
PWRE	PWRE
BKL	BKL
TPX1-2	Resistive touch interface X direction
TPY1-2	Resistive touch interface Y direction

According to the schematic, display +5V power supply (JD1 pin 1) is not connected to the +5V ARIS bus, but should be provided directly to the LCD (e.g. through a dedicated power supply).

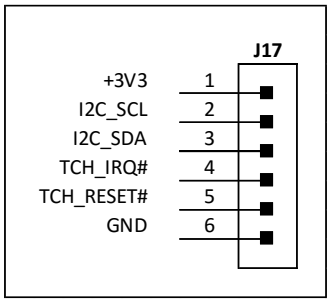
Color data signals provided by Synergy S7 TFT controller are 6-bits wide, so least significant pins on display connector are shorted to most significant pins, obtaining a dithering effect.

Configuration signals are set in standard position, but additional resistors (R86-R90, R92, R114-R117) allow a further customization.



3.2. Expansion header

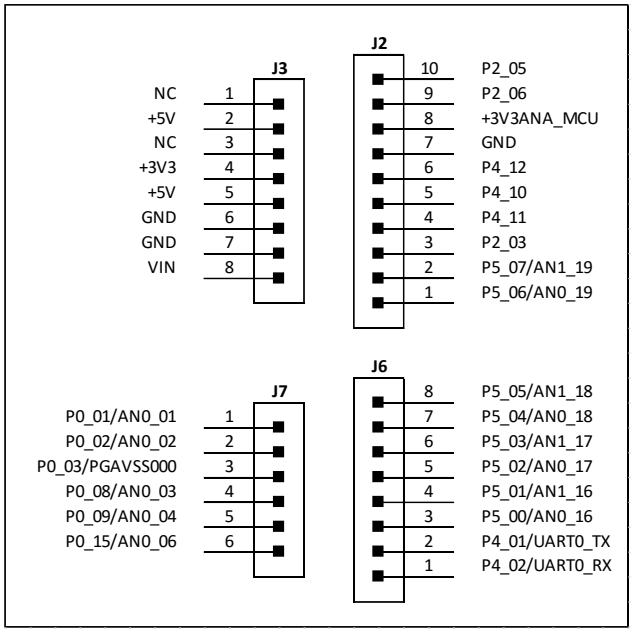
The expansion header J17 is mainly used for connecting an optional capacitive touch controller to the ARIS board.



Signal	Description
+3V3	+3.3V power supply
I2C_SCL	I2C interface shared with NFC and combined temperature/humidity sensor
I2C_SDA	
TCH_IRQ#	Interrupt request from touch controller (if J20 has jumper on 2-3)
TCH_RESET#	Reset signal to touch controller
GND	Ground connection

3.3. Arduino connector

The connectors J2, J3, J7, J8 provides user with a standard Arduino shield slot.



Signal	Description
+5V	+5V power supply (depending on J5 jumper)
+3V3	+3.3V power supply (depending on J4 jumper)
GND	Ground connections
VIN	Input voltage
P0_xx	Analog inputs directly connected to MCU
P4_01-02	UART shared with WiFi module (if R45-R51 are fitted
P5_00-05	Digital I/O shared with Flash memory
P5_06	Digital I/O shared with NFC chip
P5_07	Digital I/O shared with WiFi module
P2_03	Digital I/O directly connected to MCU
P4_10-12	SPI port shared with microSD, WiFi, accelerometer, gyroscope, bluetooth (if R111 and R112 are fitted)
+3V3ANA_MCU	Analog reference
P2_05-06	I2C interface shared with NFC and combined temperature/humidity sensor

3.4. JTAG connectors

The ARIS board features an on-board SEGGER J-Link debugger (see Mini US port), which can be used to program and debug the Synergy S7 microcontroller.

The ARIS board includes additional JTAG connectors, which are generally not required for a "standard" usage. Nevertheless, the following description is provided for reference:

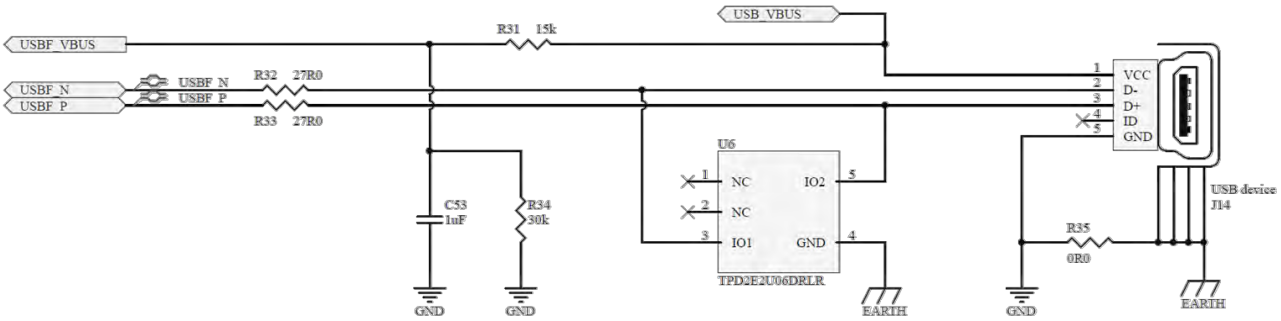
- J11 – JTAG connection which can be used to program and debug Synergy S7 with an external J-Link debugger;
- J16 – JTAG connector routed to the Silicon Labs Bluetooth system-on-chip;
- J21 – E1 programmer connector routed to the Renesas RX621 chip. Such a chip provides users with the on-board SEGGER J-Link facility, thus it should not be erased and/or re-programmed.

3.5. Ethernet 10/100

ARIS board includes a Micrel KSZ8091 10/100 Ethernet physical interface. Ethernet connection is provided through the RJ-45 standard connector T1.

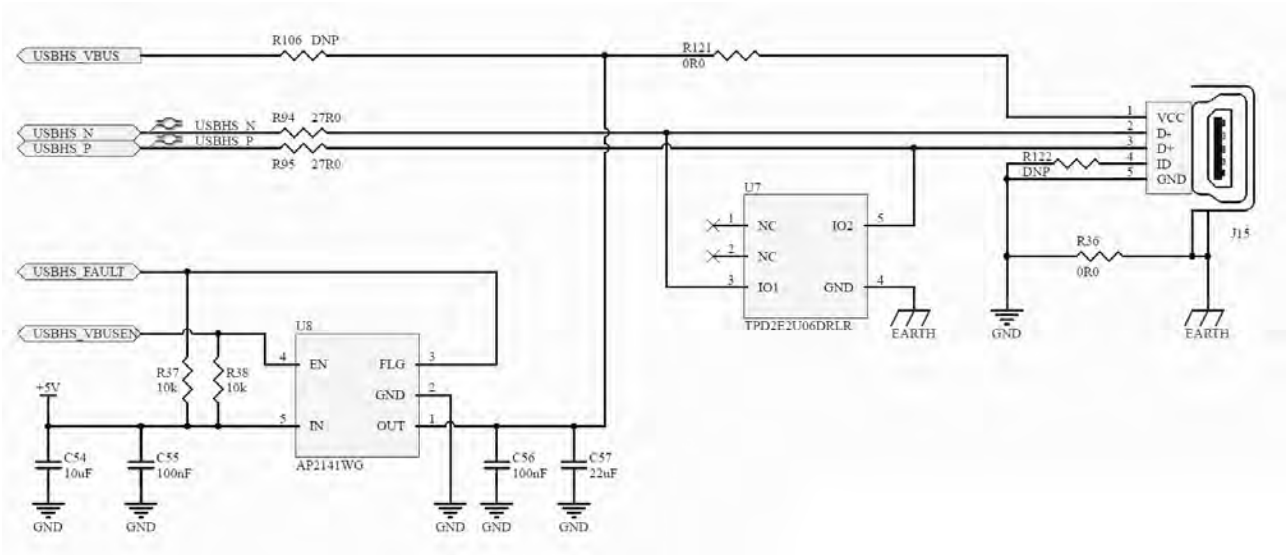
3.6. USB device

The board is equipped with a USB Full-Speed (12 Mbps) device port on J14 connector. ARIS can be powered through this interface.



3.7. USB host/device

The SK-S7G2 is equipped with an USB High-Speed (480-Mbps) host/device port on J15 connector. This host port can source current to devices connected to it, and over-consumption conditions on devices can be detected.


USBHS_VBUS
R106 DNP
R121
0R0
USBHS_N
USBHS_P
USBHS_N
USBHS_P
R94 27R0
R95 27R0
VCC
D-
D+
ID
GND
R122
DNP
U7
NC
NC
IO1
IO2
GND
TPD2E2U06DRLR
EARTH
GND
R36
0R0
J15
EARTH
USBHS_FAULT
USBHS_VBUSEN
U8
EN
FLG
GND
IN
OUT
AP2141WG
+5V
R37
10k
R38
10k
C54
10uF
C55
100nF
C56
100nF
C57
22uF
GND
GND
GND
GND
GND

4. Usage

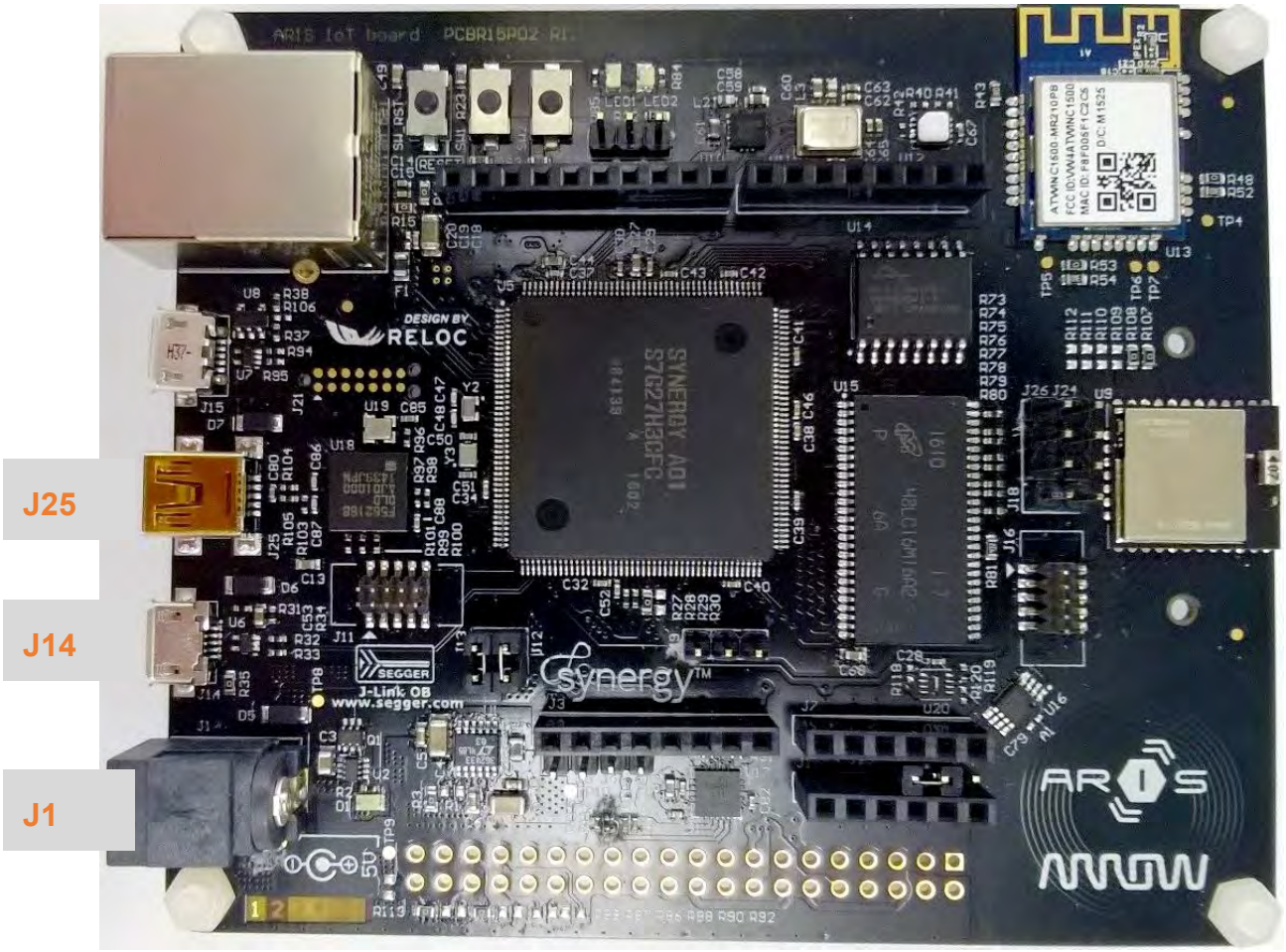
This chapter describes how to connect, configure and interact with the ARIS board.

4.1. Power supply

The ARIS board can be supplied with power from

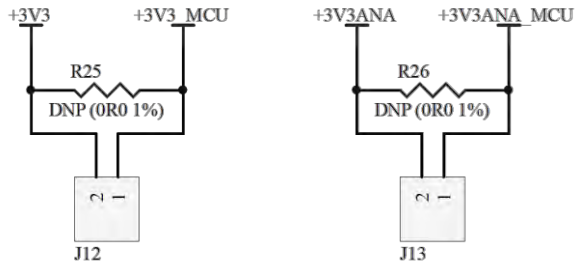
- the DC power jack J1 (5V only),
- the mini-USB port J25,
- or the micro-USB port J14.

It is not recommended to use more than one power supply source at the same time.



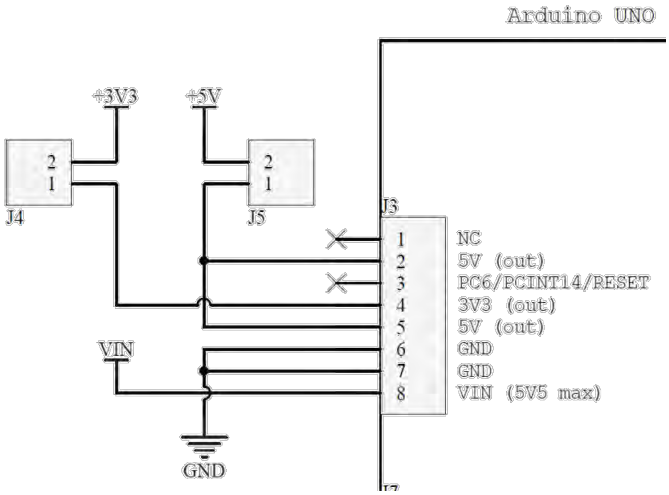
4.2. Power enable and measurement

J12 and J13 (populated in the default configuration) provide power to the Synergy MCU. They can also be used to measure the current consumption of the S7 device.

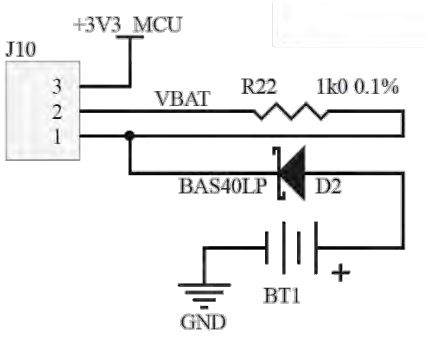


Current Measurement

J4 and J5 (*not* populated in the default configuration) provide power to the Arduino connectors; before placing a jumper please check that current consumption of the shield is within maximum values provided by the +5V input and +3.3V regulated power supply.



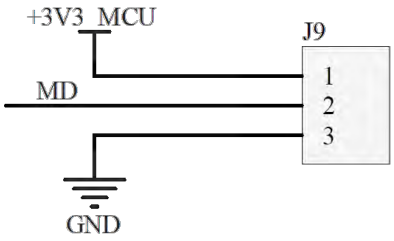
J10 allows to connect VBAT power domain directly to coin battery (jumper on 1-2), through a shunt resistance (open position) or directly to standard +3.3 V power supply (jumper on 2-3)



4.3. Configuration headers

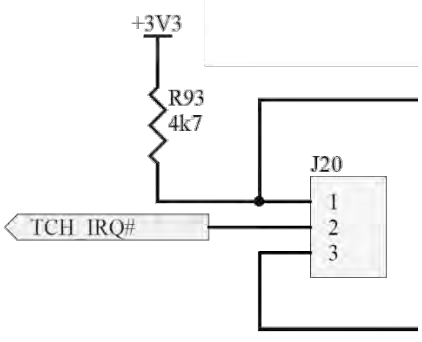
J9 allows the selection of boot mode:

- Internal ROM (jumper between pins 1-2),
- USB boot (jumper between pins 2-3).



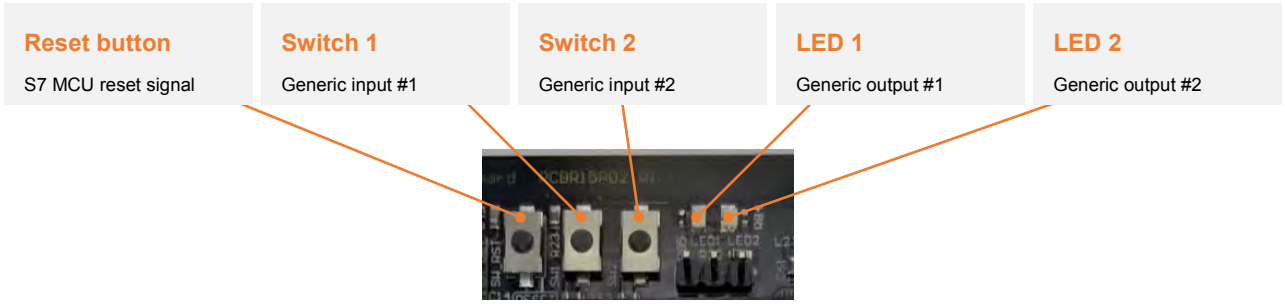

```
Boot Select
Boot from internal ROM (Between 1 and 2)
Boot from USB (Between 2 and 3)Text
```

If an external touch controller is used, J20 can be used to route the IRQ signal from integrated resistive touch controller (jumper 1-2) to the expansion connector J17 - pin 4 (jumper 2-3).



4.4. Push buttons and LEDs

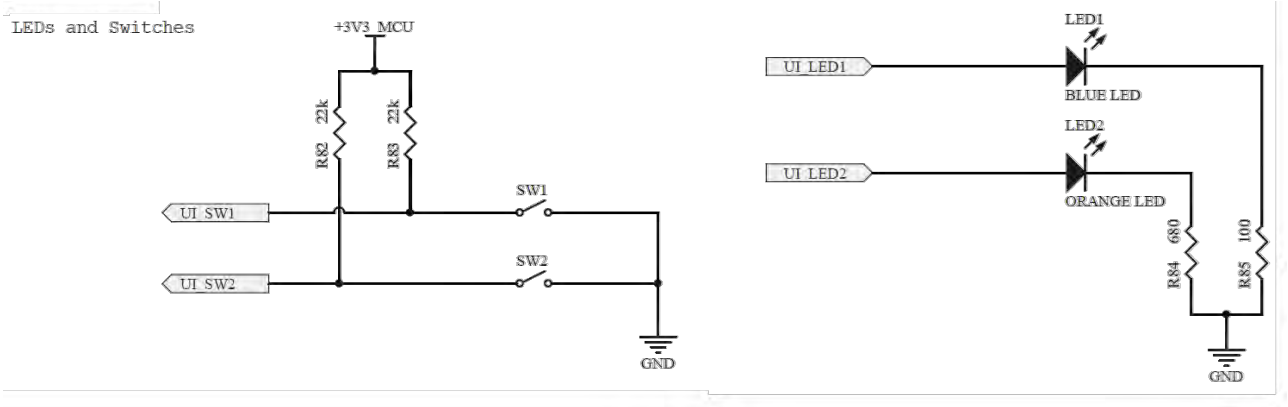
A basic user interface is provided through on-board buttons and LEDs.



Mapping of the user interface to the microcontroller pins is provided below.

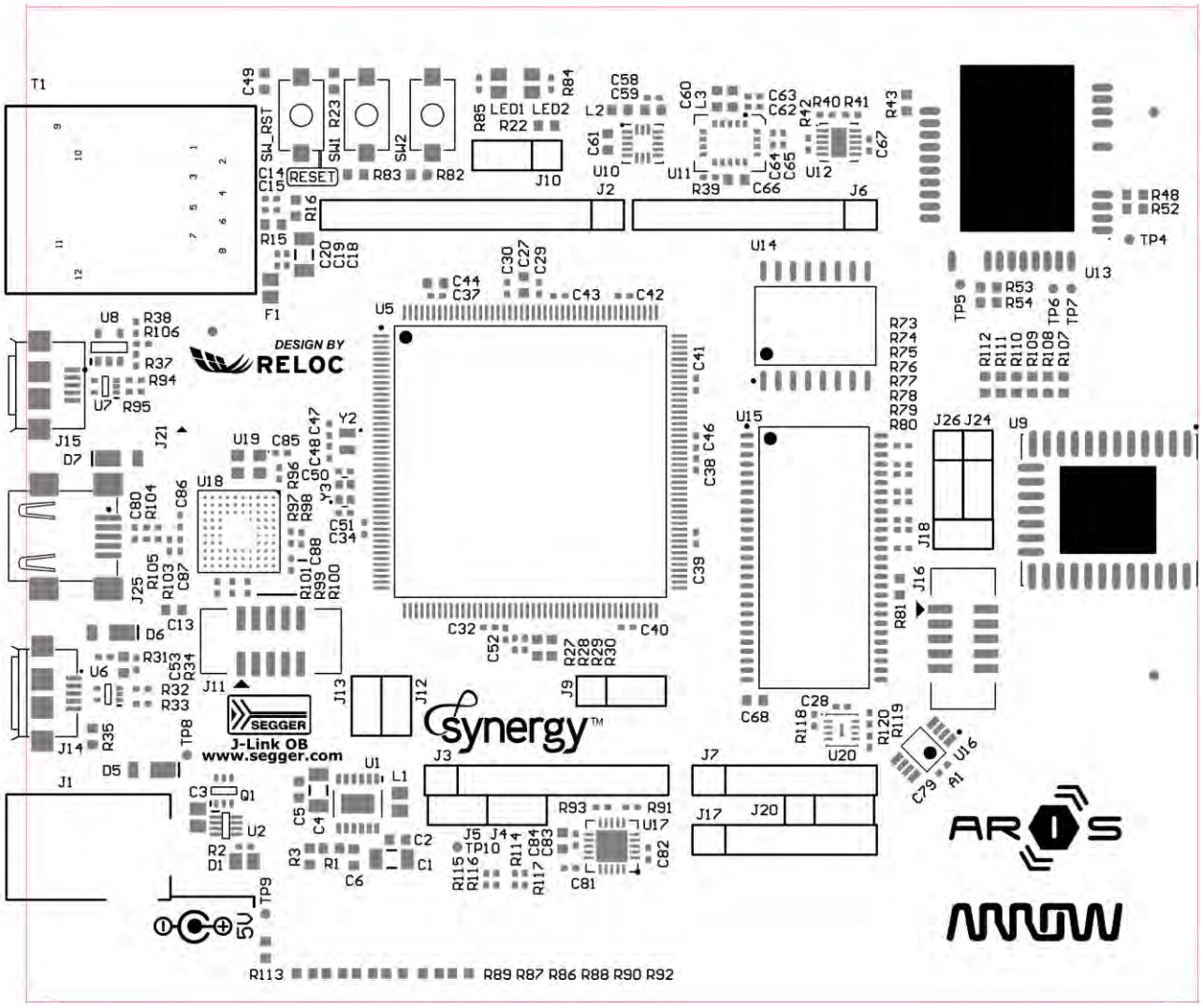
Port	Signal	Description
P0_10/AN1_03	UI_SW1	Generic input #1
P0_00/AN0_00	UI_SW2	Generic input #2
P6_00	UI_LED1	Generic output #1
P0_14/DA0	UI_LED2	Generic output #2

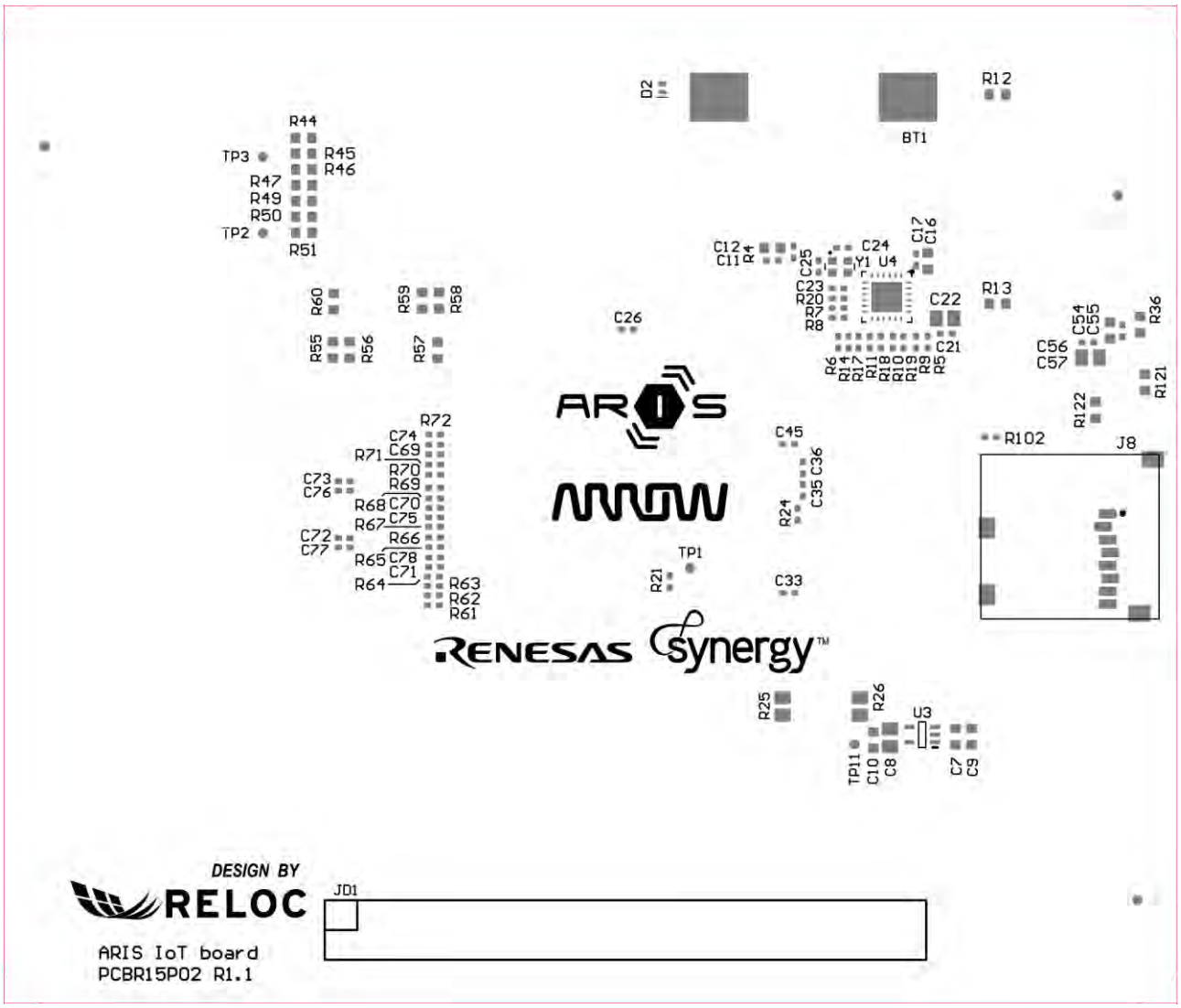
Schematic extract is provided as an additional reference.



5. Board layout

Top and bottom board layouts (component placement and overlay) are provided for reference purposes.




D2
BT1
R12
R44
TP3
R45
R46
R47
R49
R50
TP2
R51
C12
C11
R4
C24
C25
Y1
U4
C17
C16
C23
R20
R7
R8
C22
R13
C26
R60
R59
R58
R55
R56
R57
C21
R6
R14
R17
R11
R18
R10
R19
R9
R5
C54
C55
R36
C56
C57
R121
R122
R72
C74
R71
C69
R70
R69
C73
C76
R68
C70
R67
C75
R66
C72
C77
R65
C78
R64
C71
R63
R62
R61
C45
C35
C36
R24
R102
J8
TP1
R21
C33
RENESAS
synergy™
R25
R26
U3
TP11
C10
C8
C7
C9
DESIGN BY
RELOC
ARIS IoT board
PCBR15P02 R1.1
JD1