INVENTEK SYSTEMS

ISM43907-L170-EVB

Embedded SiP SoC
802.11 a/b/g/n

Evaluation Board
User's Manual

Table of Contents

1 PART NUMBER DETAIL DESCRIPTION

1.1 Ordering Information

Device	Description	Ordering Number
ISM43907-L170	2.4/5G Wi-Fi SiP Module	ISM43907-L170
ISM43907-L170-EVB	2.4/5G Wi-Fi SiP EVB, SDIO I/F Evaluation Board	ISM43907-L170-EVB

2 OVERVIEW

The Inventek ISM43907 single-chip Dual Band, 2.4G/5G (802.11a/b/g/n). radio device provides the highest level of integration for a wireless system, with integrated dual band Wi-Fi based on Cypress' IEEE802.11 a/b/g/n single-stream with support for antenna diversity and provisions for supporting future specifications. Thus, the ISM43907 can be used to enable wireless connectivity to the simplest existing sensor products with minimal engineering effort. The ISM43907 also includes integrated power amplifiers, LNAs and T/R switches for the 2.4 GHz and 5 GHz WLAN bands, greatly reducing the external part count, PCB footprint, and cost of the solution. The ISM43907 also integrates an embedded ARM CortexTM-R4 MCU, clock, and front end with the Dual Band radio.

The ISM43907 is provided in the smallest LGA form-factor solution with minimal external components to drive down cost for mass volumes and allows for handheld device flexibility in size, form and function. Comprehensive power management circuitry and software ensure the system can meet the needs of high mobile devices that require minimal power consumption and reliable operations.

The ISM43907 also enables coexistence support for external radios such as cellular and LTE, GPS, and Ultra-Wideband. For the WLAN section, the host interface is a SDIO v2.0 interface.

The ISM43907 is a complete WiFi & MCU SiP which is designed for embedded wireless solution and a cost-effective, low power capabilities high performance MCU in M2M applications.

The ISM43907 includes standards-based wireless technologies to enable IP infrastructures for smart grid, smart home, security, building automation, toys, robots, remote health and wellness monitoring and other M2M and IoT applications.

The ISM43907 enables customers to reduce development time, lower manufacturing costs, save board space, ease certification, and minimize RF expertise required. Additionally, the ISM43907 is provided as a complete platform solution including software drivers, sample applications, API guide, user documentation and a world-class support community from Broadcom WICED Platform.

3 FEATURES

The ISM43907 supports the following WLAN functions:

- Dual-band 2.4 GHz and 5 GHz IEEE 802.11 a/b/g/n Frequency Band
- IEEE802.11 a / b / g / n (single-stream), dual-band radio with internal Power Amplifiers, LNAs and T/R switches
- On-chip WLAN driver execution capable of supporting IEEE 802.11 functionality
- Single and dual-antenna support
- WLAN host interface :
  - o SDIO v2.0, including default and high-speed timing.
- ARM 32-bit CortexTM-R4 embedded processor
- SPI, UART serial interface options
- JTAG debug interface
- 2MB of application SRAM, 640KB of ROM containing WICED SDK
- Sensor applications support with ADC, I2C, I2S, GPIO, USB, PWM
- Single-chip MAC/BB/RF On-chip functionality
- Modulation Modes: WiFi: CCK and OFDM with BPSK, QPSK, 16 QAM, 64QAM
- Hardware   Encryption: WEP, WPA/WPA2
- Supported Data Rates:
  - o IEEE 802.11b 1 – 11 Mbps
  - o IEEE 802.11a 6 – 54 Mbps
  - o IEEE 802.11g 6 – 54 Mbps
  - o IEEE 802.11n (2.4 GHz & 5GHz) 7.2 – 150Mbps
- Advanced 1x1 802.11n features:
  - o Full/Half Guard Interval
  - o Frame Aggregation
  - o Space Time Block Coding (STBC)
  - o Low Density Parity Check (LDPC) Encoding
- Two antenna configurations supporting antenna diversity.
- WICED Fully compatible
- MSL level 3
- Supports BT/BLE COEX
- Operating Temperature: -40C to +85C
- RoHS compliant
- Pb-Free

3.1 Limitations

Inventek Systems products are not authorized for use in safety-critical applications (such as life support) where a failure of the Inventek Systems product would reasonably be expected to cause severe personal injury or death.

4 ISM43907 EVB USER's MANUAL OVERIVEW

4.1 Overview:

This document provides information describing the ISM43907-L170-EVB (Evaluation Board), development platform.

The ISM43907-L170-EVB User's Manual is intended for engineers planning to use the Inventek ISM43907-L170-EVB in order to utilize and evaluate the Inventek ISM43907-L170 SiP radio.

4.2 Antenna Options
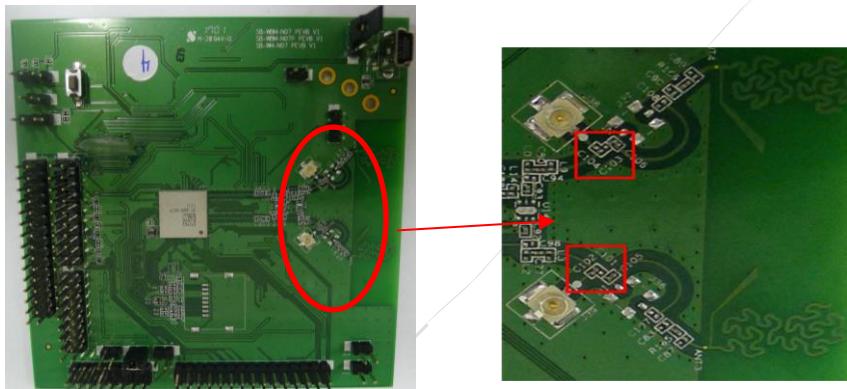
- RF Test ports include U.Fl RF connector
    - HIROSE U.FL RF connector, part number U.FL-R-SMT-1 (10)
    - All boards are currently configured to use connector J38 with an external antenna
- PCB Etched Antenna
    - The PCB etched antenna (ANT4) can be used by removing C104 and placing an 8.2pF capacitor in location C103.
- External Antenna
    - The Inventek W2.4-5P-U dual band PCB antenna is included with the EVB
    - More information on this antenna, please visit:
        - http://www.inventeksys.com/products-page/wifi-antennas/wi-fi-2-4-5ghz/

# 5 ISM43907 EVALUATION BOARD INTRODUCTION

5.1 Introduction

ISM43907-L170-EVB Development System

The ISM43907-L170 SiP radio is a development system that facilitates Wireless Internet Connectivity for Embedded Devices.

The ISM43907-L170-EVB development system, shown in Figure 1, is comprised of:

• A software Development Kit with a tool chain and build system, a WiFi driver and software stack together with example applications. The SDK runs on a Windows or Linux PC.

• A EVB. Applications developed using the WICED SDK is downloaded via USB to the Inventek ISM43907-L170 SiP on the ISM43907-L170-EVB Board. The ISM43907-L170 SiP consists of a Broadcom IEEE802.11 a/b/g/n WiFi chip and high-performance ARM CortexTM-R4 32-bit microcontroller.

USB

WICED SDK
- Toolchain
- Build system
- Software Stack
- WiFi Driver
- Example APPs

WICED Promotion EVB
- WICED SiP Module
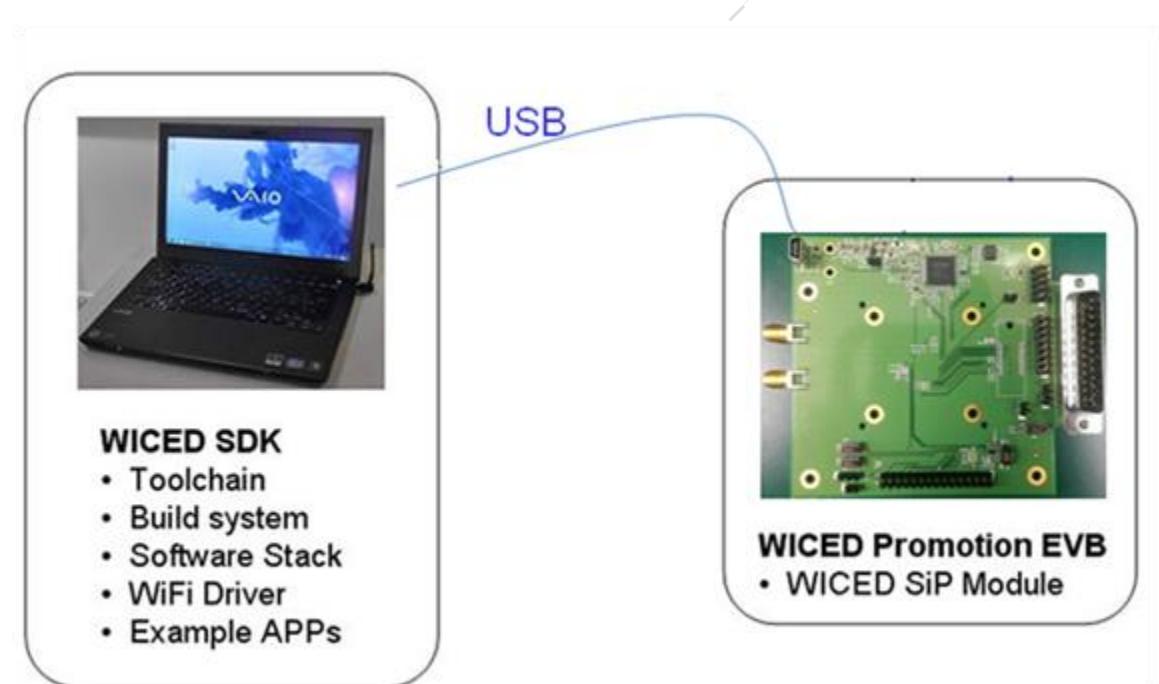
6 ISM43907 EVALUATION BOARD FEATURES

6.1 Feature List

The ISM43907-L170-EVB provides a platform for the design and development of applications that run on a ISM43907-L170 SiP.

| Features	Detail
ISM43907-L170 SiP	The ISM43907-L170 SiP includes and Cypress host microprocessor, and Cypress WiFi Chip -Cypress Microprocessor: ARM-based 32-bit , 2MB of application SRAM, 640KB of ROM containing WICED SDK. -Wi-FI SoC IEEE802.11 a/b/g/n
ISM43907-L170-EVB	The ISM43907-L170-EVB is a complete WiFi networking solution and includes t h e ISM43907-L170 SiP, RF SMA connector and power supply
Program & Debug Interface	Applications are downloaded to the Cypress R4 embedded host and debugged using either the USB or the JTAG interface
USB-Serial UART Interface	A UART on the host microprocessor connects to the EVB USB-serial interface to enable serial communications with a PC terminal application
Expansion Header	The expansion header facilitates custom sensor interfaces and expansion boards
Reset Switch	Enable manual reset of the MCU
Power Supply	The EVB may be powered directly from the USB interface or from an external +5V power supply.

7 ISM43907 EVALUATION BOARD HW LAYOUT & CONFIGURATION

## 7.1 ISM43907-L170-EVB Diagram
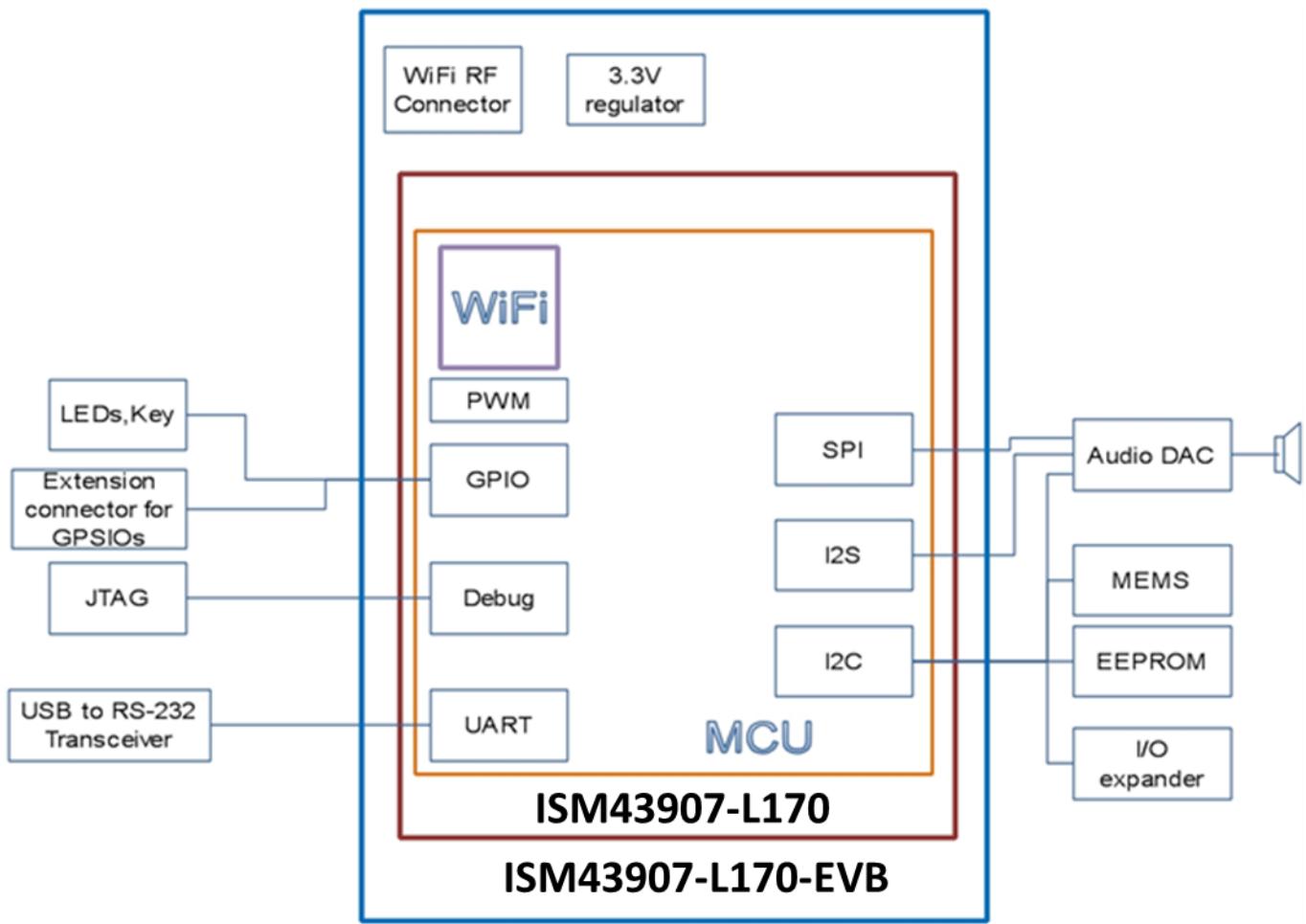
## 7.2 ISM43907-L170 Block Diagram

ISM43907-L170-EVB Diagram
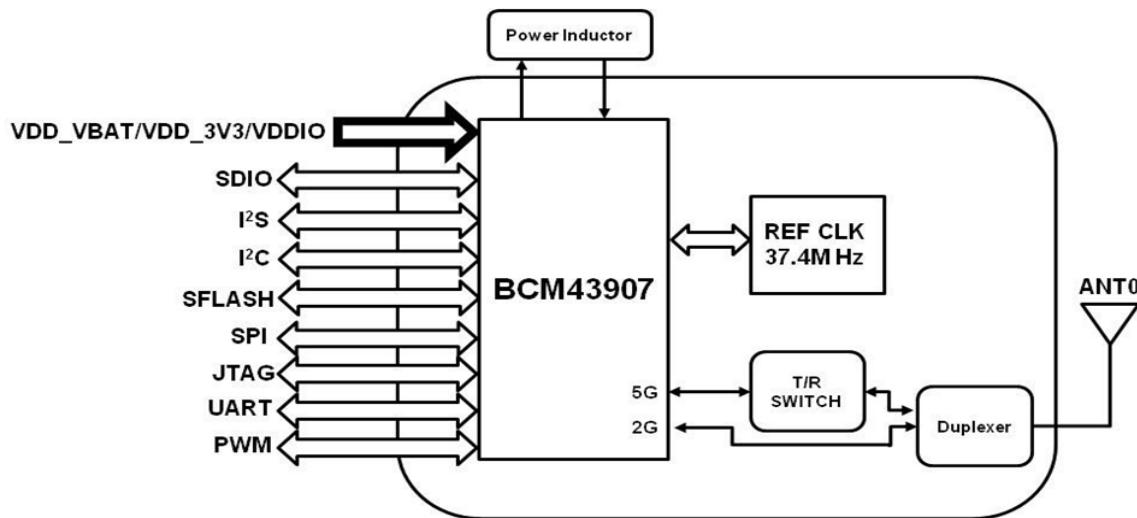
I2C	Intelligent Interface Controller
SPI	Serial Peripheral Interface
UART	Universal asynchronous receiver transmitters
PWM	Pulse Width Modulation
I2S	Inter-integrated sound

7.2 ISM43907-L170-EVB HW Interface Layout Placement

7.2.1 Top View
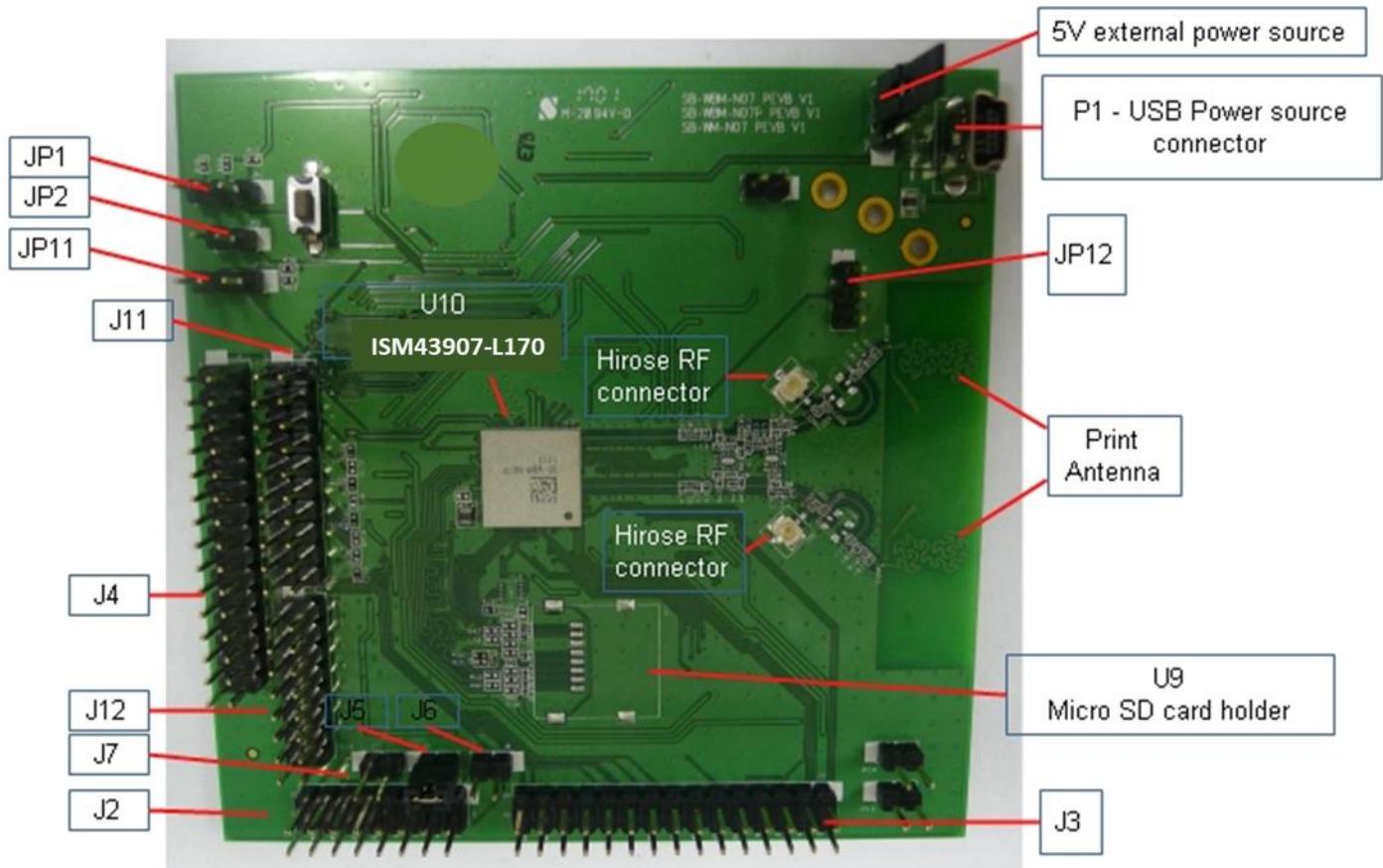
7.2.1 Bottom View
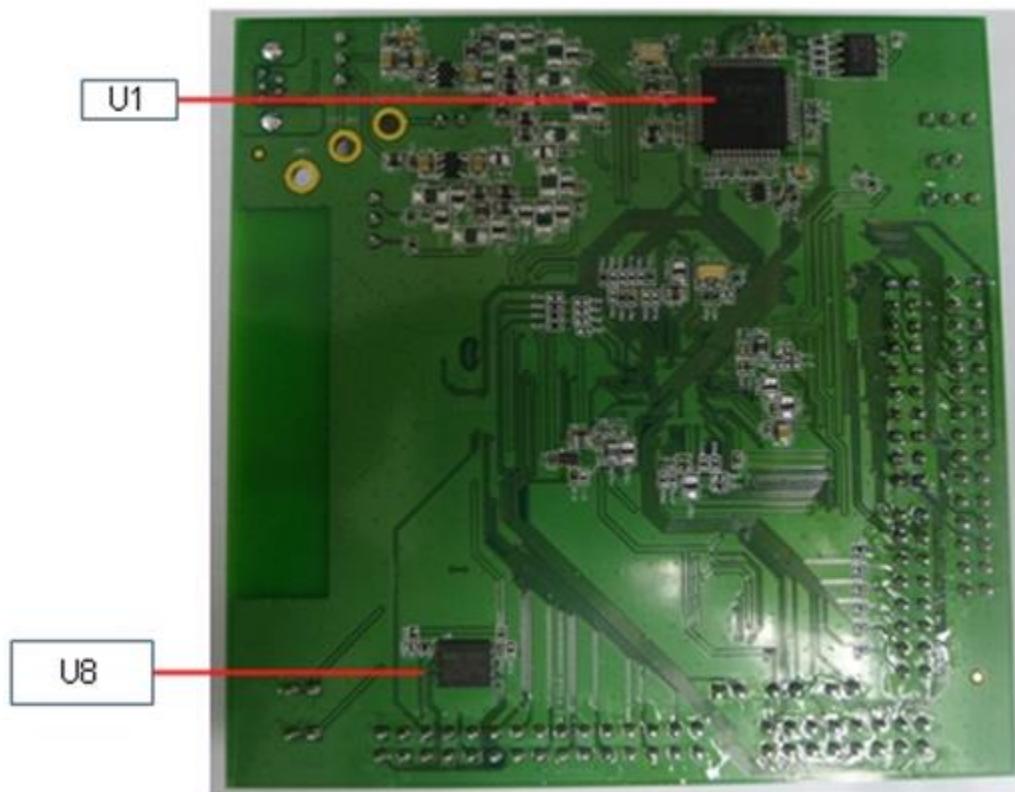
8 POWER SUPPLY

8.1 Power source

The ISM43907-L170-EVB is designed to be powered by a 5 V DC power supply.
It is possible to configure the evaluation board to use any of following two sources for the power supply:

•5 V External power source hole on the board. The JP4 need connect Pin1 and pin2
•5 V DC power with 500 mA limitation from P1, the USB Micro-AB connecter, The JP4 need connect Pin2 and pin3

8.2 Reset source

The reset signal of the ISM43907-L170-EVB board is low active and the reset source includes:

•Reset button SW1.

8.3 Audio

The ISM43907-L170-EVB board enables two channels of I2S function, one channel is connection to header (J4) and another is connection to header (J3).

8.4 UART

The ISM43907-L170-EVB board enables one fast channel of UART and two slow channels of UART communication. Fast UART is connect to Header J12 (Pin8, pin 10, pin12, and pin14).
1st channel of slow UART (UART1) connects to R6, R8 & U1 (USB to UART IC), and Header J4 (Pin17, Pin19). 2nd Channel of slow UART connects to header J4 (Pin23 & Pin25).

8.5 PWM

The ISM43907-L170-EVB board enables PWM control signal and connects to header J4.

8.6 I2C

The ISM43907-L170-EVB board enables two channels of I2C function. One channel connects to J3 (Pin26 & Pin28). Another channel connects to J3 (pin27 & Pin29).
•I2C signal traces need to pull high.
•I2C signal traces need to pull high.

8.7 SPI

The ISM43907-L170-EVB board enables two channels of SPI function. The First channel connects to J3 ((Pin16, Pin18, Pin20, & Pin22). The Second channel connects to J3 (Pin1, Pin3, Pin5, & Pin7).

8.8 GPIO

The ISM43907-L170-EVB board release GPIO function.

The function is connecting to J2.

9.0 CONNECTORS

9.1 Power Supply Connector (Micro USB: P1)

The ISM43907-L170-EVB board can be powered from 5V DC power supply via the external Mini USB connector (P1) or external power supply hole.

-Micro USB Connector (P1)

Pin	Description	Pin	Description
1	VBUS (5V)	4	NC
2	D- (connect to U1 pin 7)	5	GND
3	D+(connect to U1 pin 8)		
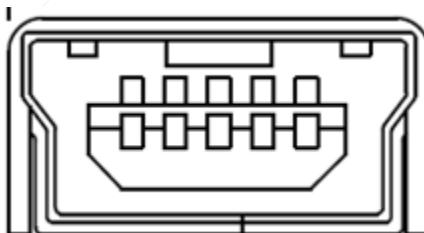
Front View

9.2 Functional Pin Header

The ISM43907-L170-EVB board enables I2S, I2C, SPI, UART, PWM, BT_ADC, GPIO function.
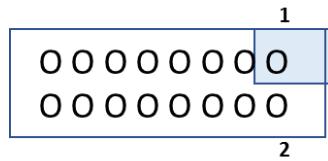
Pin	Description	Pin	Description
1	NC	2	GPIO_13_SDIO_MODE
3	NC	4	GPIO_12_CODEC_PDN
5	NC	6	GPIO_11_ACPU_BOOT_MODE
7	NC	8	GPIO10_DEEP_RST
9	NC	10	GPIO_9_USB_SEL
11	GPIO_16_USB_EN_AUD_SW	12	GPIO_7_WCPU_BOOT_MODE
13	GPIO_15	14	GPIO_1_GSPI_MODE
15	GPIO_14	16	GPIO_0_USB_CLT
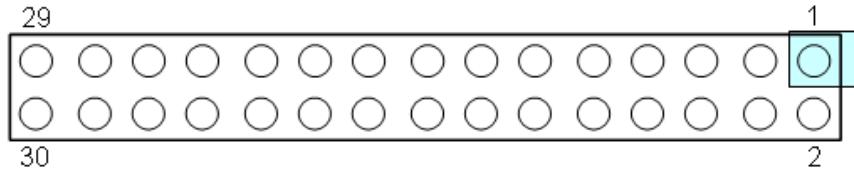
J3

Pin	Description	Pin	Description
1	SPI_1_CS	2	SFLASH_MOSI_3
3	SPI_1_MOSI	4	SFLASH_MOSI_2
5	SPI_1_MISO	6	SFLASH_MOSI_1
7	SPI_1_CLK	8	SFLASH_MOSI_0
9	GND	10	SFLASH_CSN
11	I2S1_SD_OUT	12	SFLASH_CLK
13	I2S1_SD_IN_C	14	GND
15	GND	16	SPI_0_CS
17	I2S1_MCK	18	SPI_0_MOSI
19	GND	20	SPI_0_MISO
21	I2S1_WS_LRCK	22	SPI_0_CLK
23	I2S1_SCK_BCLK	24	GND
25	GND	26	I2C_1_SCL
27	I2C_0_SCL	28	I2C_1_SDA
29	I2C_0_SDA	30	GND
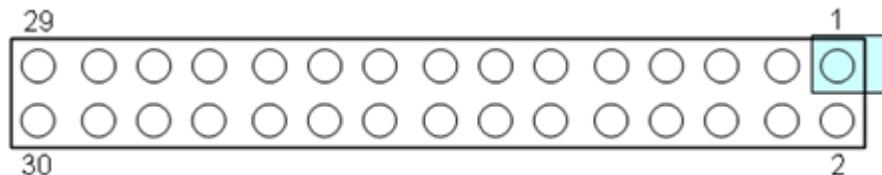
J4

Pin	Description	Pin	Description
1	USB2_HOST_DEV_SEL	2	PWM_5
3	GND	4	PWM_4
5	HIB_WAKE	6	PWM_3
7	HIB_REG_ON_IN	8	PWM_2
9	HIB_LPO_SEL	10	PWM_1
11	GND	12	PWM_0
13	RF_GPAIO_OUT	14	GND
15	GND	16	I2S0_SD_OUT
17	RF_SW_CTRL_7_UART_TX_OUT	18	I2S0_SD_IN_C
19	RF_SW_CTRL_6_UART_RX_IN	20	GND
21	GND	22	I2S0_MCK
23	RF_SW_CTRL_9_BT_SEC_OUT	24	GND
25	RF_SW_CTRL_8_BT_SEC_IN	26	I2S0_WS_LRCK
27	GND	28	GND
29	GND	30	I2S0_SCK_BCLK
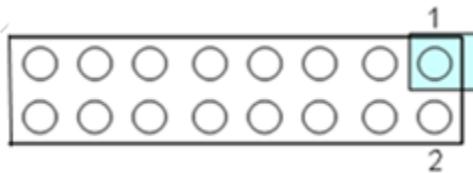
J12

Pin	Description	Pin	Description
1	USB2_DP	2	ANT1_DIV_RF_SW_CTRL_5
3	USB2_DN	4	ANT0_DIV_RF_SW_CTRL_4
5	PULL HIGH	6	NC
7	GND	8	UART0_CTS_IN
9	GND	10	UART0_RTS_OUT
11	GND	12	UART0_RXD_IN
13	GND	14	UART0_TXD_OUT
15	GND	16	NC
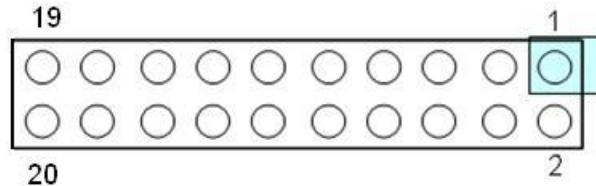
J11

Pin	Description	Pin	Description
1	GPIO_2_JTAG_TCK	2	GND
3	GPIO_3_JTAG_TMS	4	NC
5	GPIO_4_JTAG_TDI	6	NC
7	GPIO_5_JTAG_TDO	8	NC
9	GPIO_6_JTAG_TRST	10	NC
11	NC	12	NC
13	NC	14	NC
15	NC	16	GND
17	GND	18	NC
19	NC	20	NC

-JP4
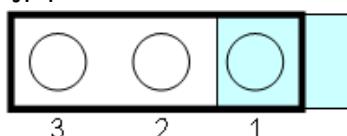
Pin	Description
1	EXT_5V
2	5V_Input
3	VDD_5V-USB

-JP11
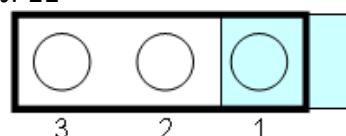
Pin	Description
1	VDDIO
2	JTAG_SEL
3	GND

-JP12
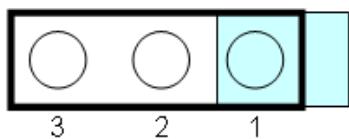
Pin	Description
1	GND
2	GPIO_8_TAP_SEL
3	VDDIO

-J5
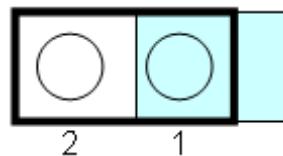
Pin	Description
1	GPIO_15
2	NC

- J6
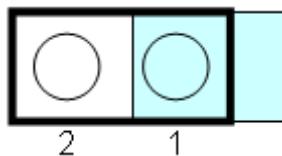
Pin	Description
1	GPIO1_GSPI_MODE
2	NC

-J7
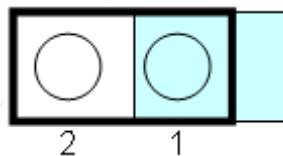
Pin	Description
1	GPIO_14
2	NC

9 SCHEMATICS

9.1 Application schematic
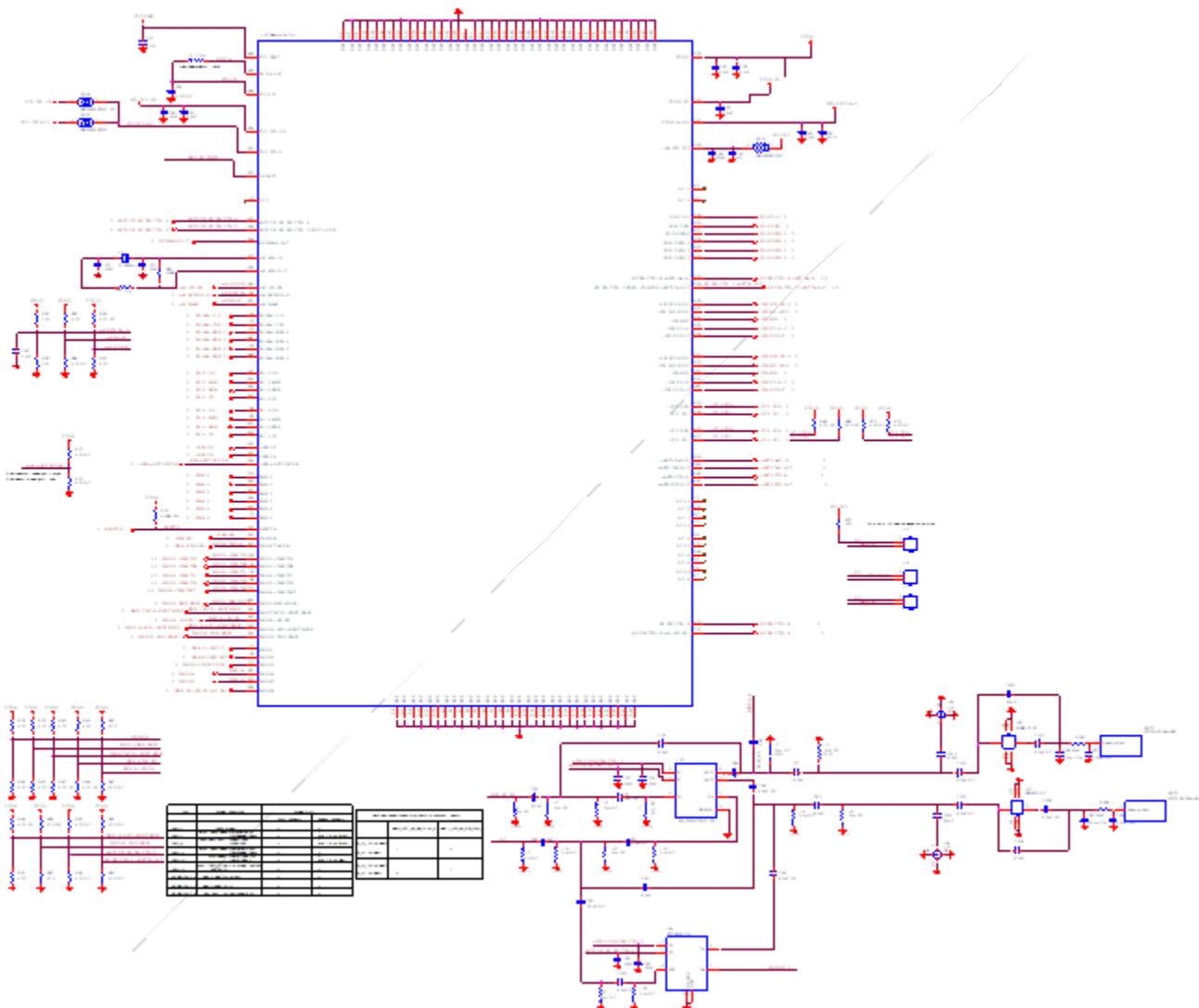
9.1.1 Power Schematic
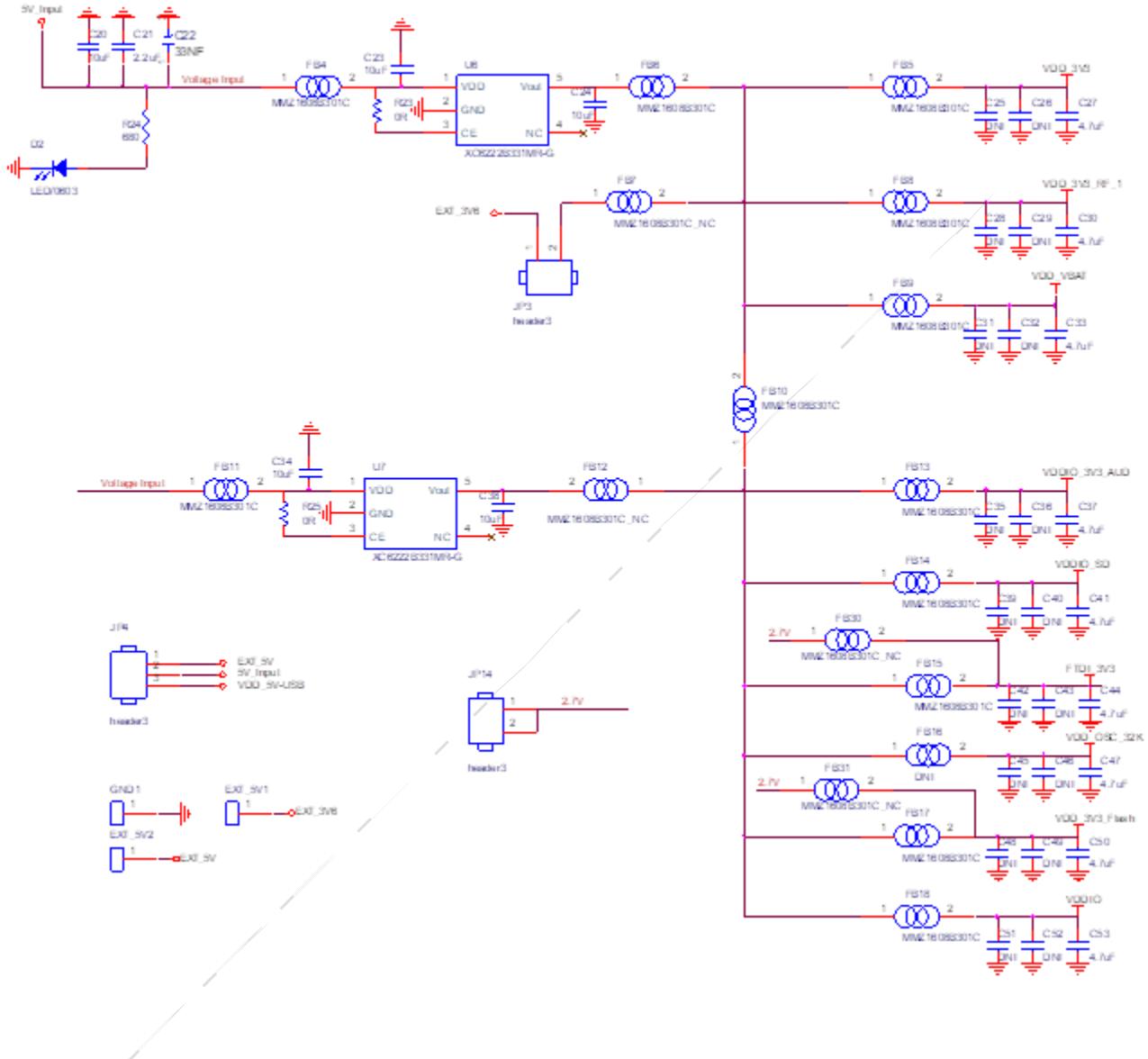
9.1.2 USB to URAT, JTAG,& Reset

USB to UART 1
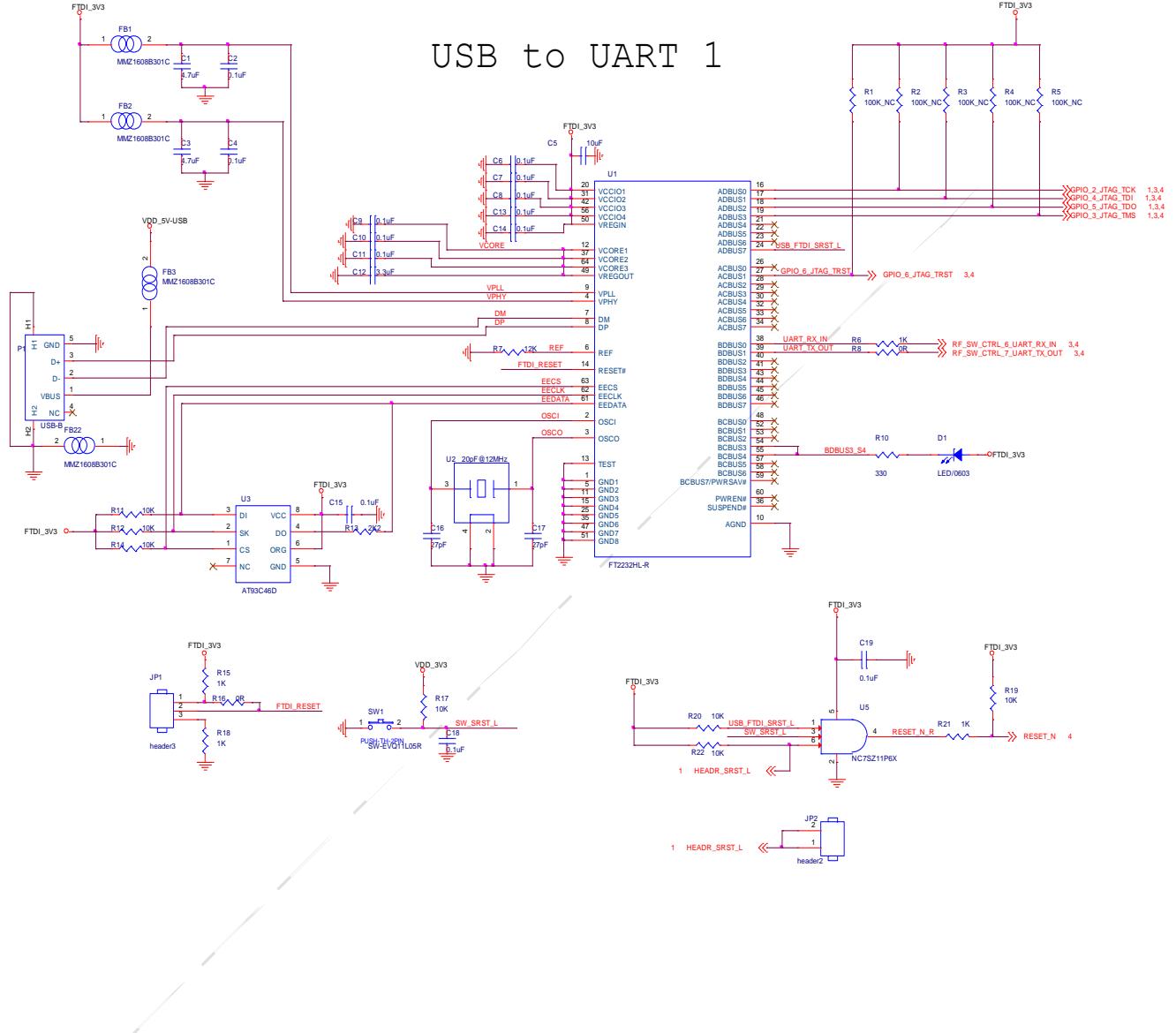
9.1.3 External Flash

FLASH
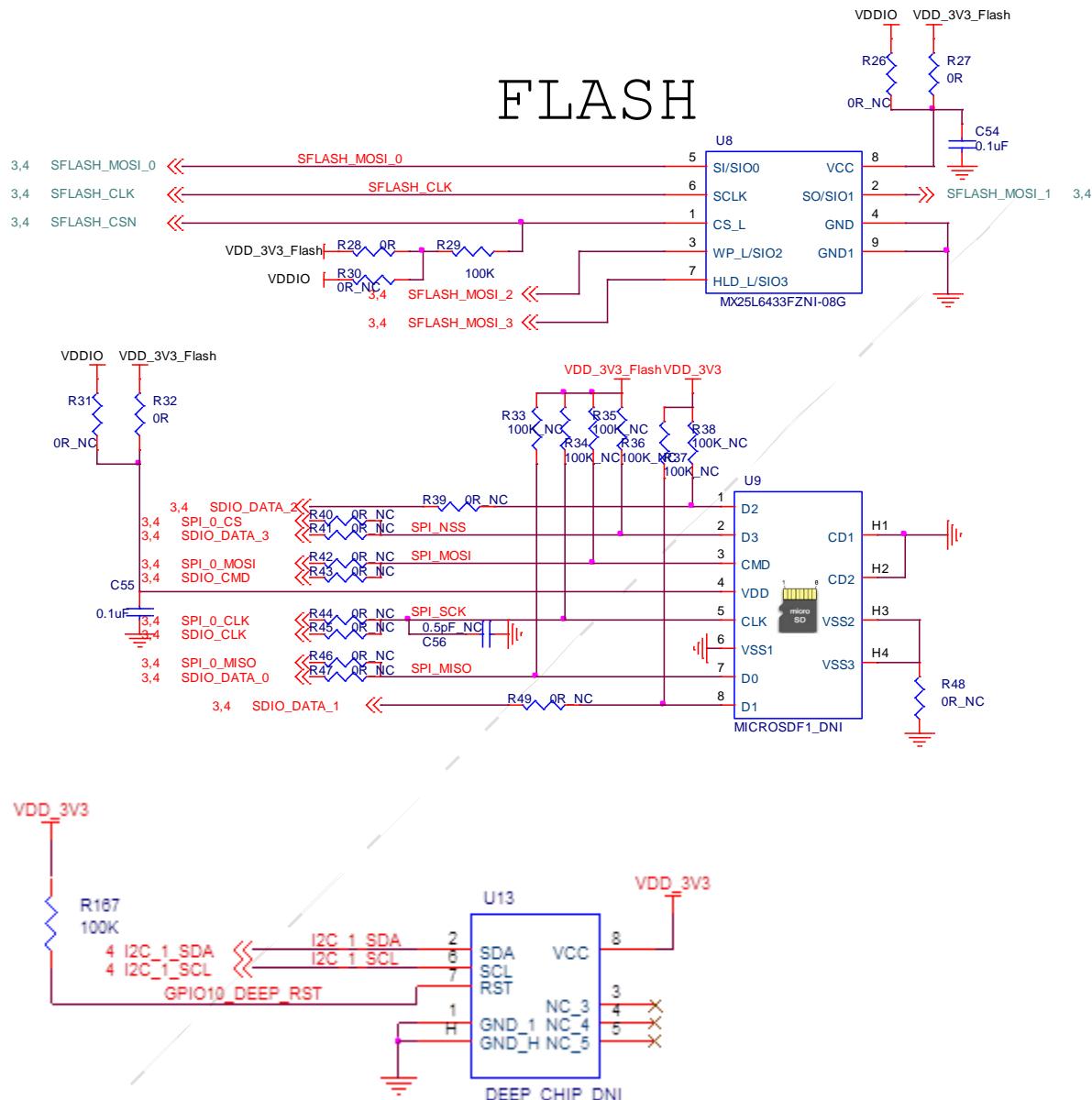
9.1.4 I/O
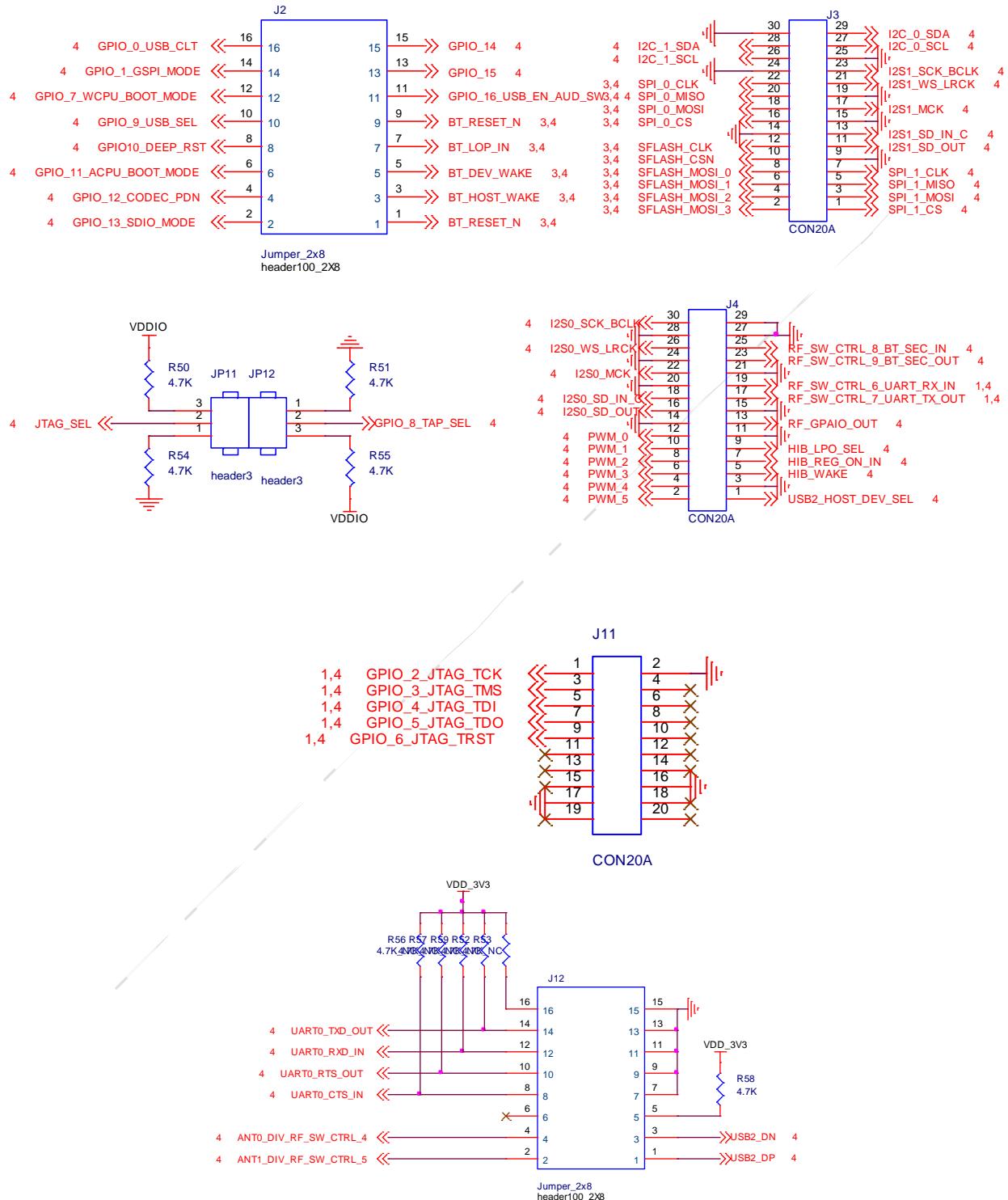
10 REVISION CONTROL

Document: ISM43907-L170-EVB	802.11a/b/g/n Wi-Fi Evaluation Board
External Release	DOC-907UM-2017-1.0

Date	Author	Revision	Comment
3/08/2016	AS	1.0	Preliminary
6/23/2016	AS	1.0.1	Electrical Parameters Validation Testing
10/03/2016	AS	1.1	Characterization
11/14/16	AS	1.8	Final Preliminary
2/17/17	AS	2.0	Release
8/22/17	KT	2.1	Updated Antenna Options

11 CONTACT INFORMATION

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