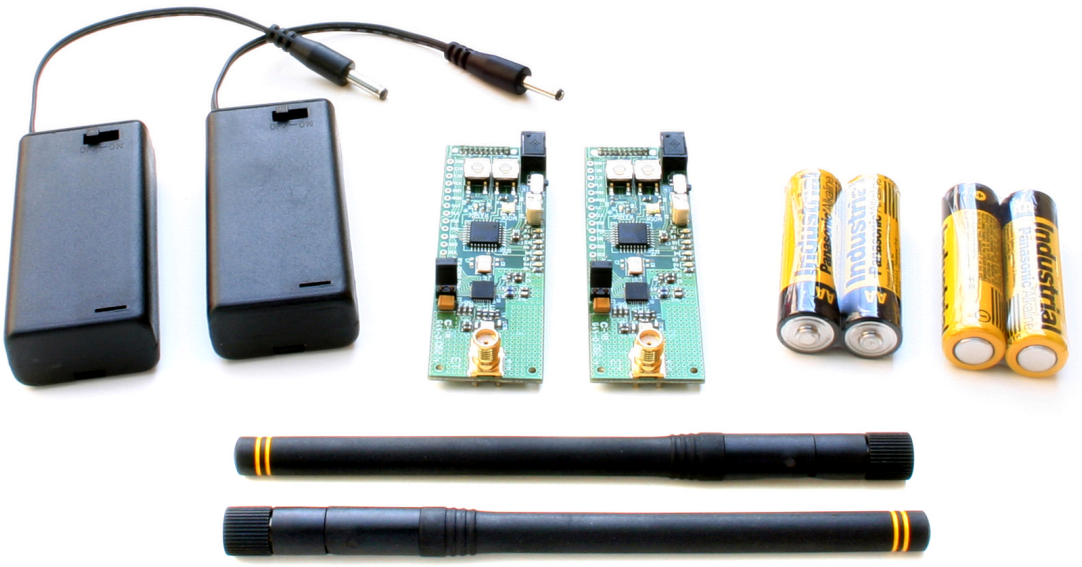
DR-TRC103-EV Evaluation Kit User's Guide



DR-TRC103-868-EV
DR-TRC103-915-EV
DR-TRC103-950-EV

Introduction

The DR-TRC103 series evaluation kits include the radio boards, antennas and battery packs used in the DR-TRC103 series development kits. The evaluation kits can be used for initial evaluation of TRC103 radio technology and to prototype applications that will use the TRC103 RFIC. This user guide covers the following evaluation kits:

Evaluation Kit Part Number	Operating Frequency Range
DR-TRC103-868-EV	863 - 870 MHz
DR-TRC103-915-EV	902 - 928 MHz
DR-TRC103-950-EV	950 - 960 MHz

Table 1 - Evaluation Kit Part Numbers

Each DR-TRC103 evaluation kit contains the following items:

- 2 DR-TRC103 Evaluation Boards
- 2 Dipole Antennas
- 2 AA Battery Packs
- 4 AA Batteries

The DR-TRC103 radio board connectors and user controls are shown in Figure 1.

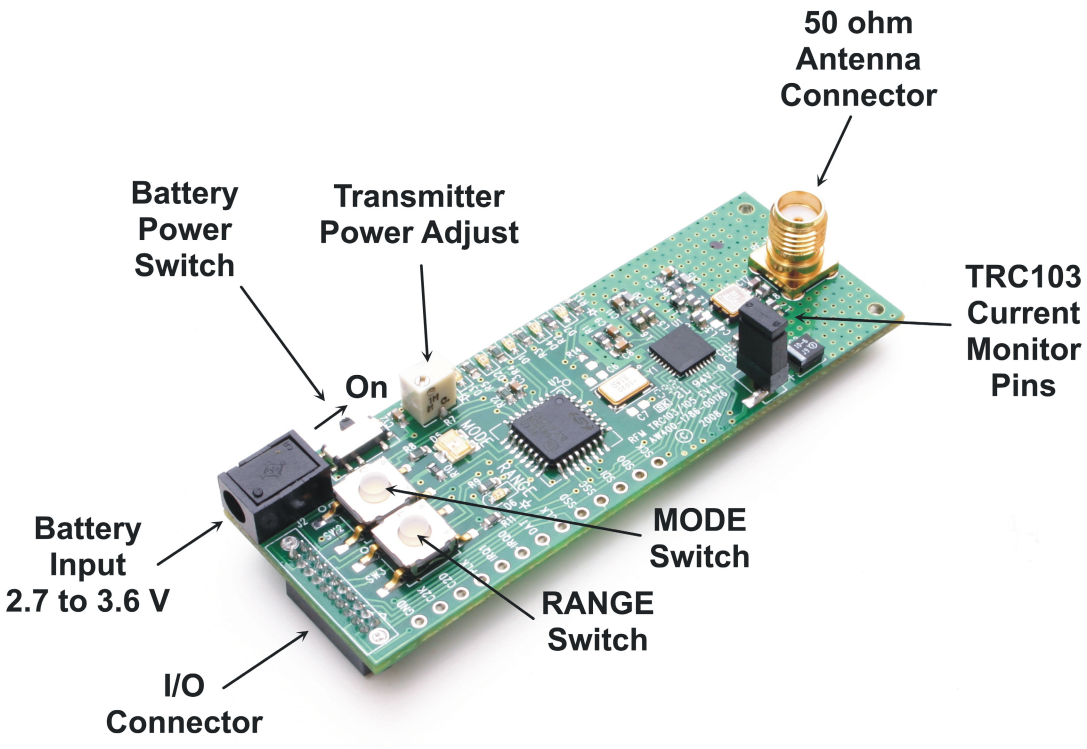


Figure 1 - DR-TRC103 Radio Board Connectors and Controls

The DR-TRC103 radio board LED indicator names and locations are shown in Figure 2.

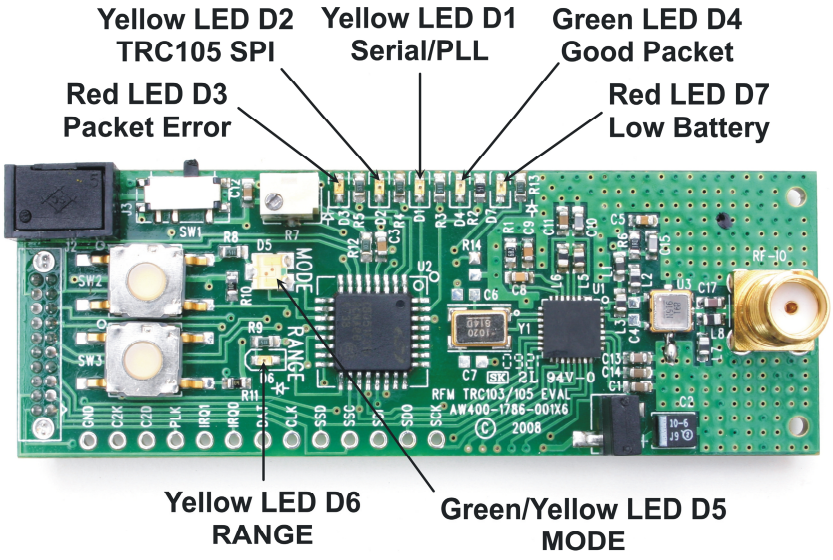


Figure 2 - DR-TRC103 Radio Board LED Indicators

Table 2 summarizes the functions of the DR-TRC103 connectors, user controls and LED indicators.

Control/Indicator	Designator	Function
I/O Connector	J2	20-pin connector for power and logic signal I/O
Battery Connector	J3	Radio board “battery” power connector, 2.7 to 3.6 V
Battery Power Switch	SW1	On/off switch, in line with the battery connector
Mode Switch	SW2	Used to set the radio mode
Range Switch	SW3	Used to set up range testing and data terminal functions
TX Power Adj Pot	R7	Transmitter power adjustment potentiometer
Antenna Connector	RF-IO	50 ohm antenna connector, standard SMA
Current Monitor Pins	J1	Remove jumper from these pins to measure TRC103 current
Serial/PLL LED	D1	Yellow LED blinks to indicate serial activity and PLL locking
TRC103 SPI LED	D2	Yellow LED blinks to indicate SPI activity to/from the TRC103
Packet Error LED	D3	Red LED blinks to indicate received packet failed CRC check
Good Packet LED	D4	Green LED blinks to indicate received packet passed CRC check
MODE LED	D5	Green/yellow LED color indicates mode of operation
RANGE LED	D6	Yellow LED blinks to indicate range test or data terminal operation
Low Battery LED	D7	Red LED illuminates to indicate low battery (must be configured)

Table 2 - DR-TRC103 Connector, Control and Indicator Functions

Powering the Radio Boards

Two AA battery packs are supplied in the evaluation kit to power the radio boards, as shown in Figure 3. Alternately, a regulated power supply in the range of 2.7 to 3.6 volts

can be used to power the radio boards. Note - there are no voltage regulators on the radio boards. Applying a voltage outside the specified power supply range can damage the boards. Do not attempt to power a radio board directly through its battery connector using one of the 4.5 volt wall-plug power supplies provided in a DR-TRC103-DK series development kit. The 4.5 volt power supplies are used to power the development kit interface boards, which in turn provide regulated 3 volts to the radio boards. See the DR-TRC103-DK User's Guide for additional details.

Figure 3 - Powering the Radio Board from a Battery Pack

Initial Testing Using the Range Test Function

1. Install batteries in both battery cases and plug the cases into the radio boards.
2. Turn on the boards by sliding the switch as indicated in Figure 1. All LED's will flash and the MODE LED will be green.
3. On one board, briefly press and release the RANGE button. The RANGE LED will illuminate continuously. This is the "receiving" board.
4. On the other board, press and hold the RANGE button until the LED's begin flashing. This board is the "transmitting" board.
5. If the radio boards are receiving good packets then the green Good Packet LEDs will be flashing alternately on each board (plus various yellow LEDs).
6. To verify that the radio boards are operating properly, disable the "receiving" board by pressing and releasing the RANGE button twice. The RANGE LED will turn off. On the transmitting board, you should observe the red Packet Error LED flashing. This indicates that the transmitter sent a packet but did not receive an acknowl-edgment back from the "receiving" radio board.

Radio Board Configuration

When a DR-TRC103 radio board is initially power on, it is configured as follows:

Operating Frequency:

DR-TRC103-868-EV	868.35 MHz
DR-TRC103-915-EV	916.50 MHz
DR-TRC103-950-EV	950.00 MHz

Power: +10 dBm

Frequency Deviation: ±50 kHz

Data Rate: 25 kb/s

Receiver Baseband Bandwidth: 100 kHz

The radio board is also initially configured in *Receive Continuous Mode* (see the TRC103 datasheet for an explanation of continuous data mode, buffered data mode, packet data mode, etc.). In receive continuous mode, the MODE LED will be green. Receive continuous mode allows the user to connect a modulated signal from an RF signal generator onto the board through a short coaxial cable and verify the demodulated signal with an oscilloscope at the DAT pin.

Briefly pressing the MODE button once configures the board into *Transmit Continuous Mode*. The Mode LED will change color from green to yellow. This mode turns on the transmitter. The frequency and output power may be verified with a spectrum analyzer. A square-wave modulating signal may be applied to the DAT pin and the spectrum observed on a spectrum analyzer.

Briefly pressing the MODE button again configures the board into *Sleep Mode*. The Mode LED will turn off. By connecting an ammeter across the terminals of J1, with the jumper removed, the user can verify the very low sleep current of the TRC103 device.

As shown in Figure 4, potentiometer R7 can be used to adjust the transmit power level. To increase the output power, rotate the potentiometer screw clockwise. To decrease the power, rotate the potentiometer screw counterclockwise. The transmit power is divided into 8 levels. Adjusting R7 adjusts the voltage level to the A-to-D converter (ADC) in the host microcontroller. The microcontroller periodically samples R7 for a change, and updates the transmit power register when it detects a change in voltage level. Each time the microprocessor updates the transmit power register the SPI LED will flash indicating an SPI write.

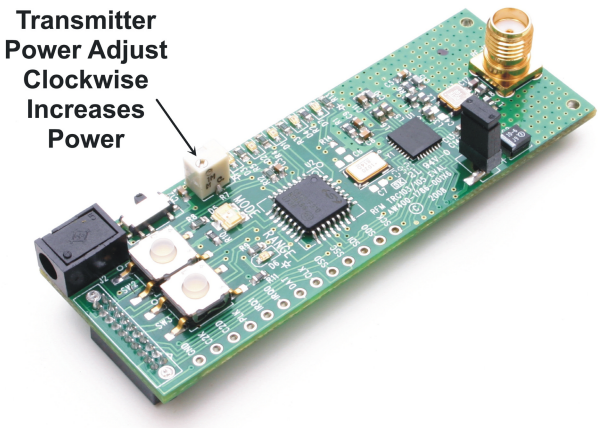


Figure 4 - Radio Board Transmit Power Adjustment

Radio Board Interface Connector

Figure 5 shows the pin numbering detail of connector J2 on the edge of the DR-TRC103 radio boards. Figure 5 can be used with the schematics in the last section of this manual to design an application interface for the radio boards. Note that all signal levels into and out of this connector are nominally 3 V logic level. Attempting to use RS232 signal levels to directly interface the radio board can damage it.

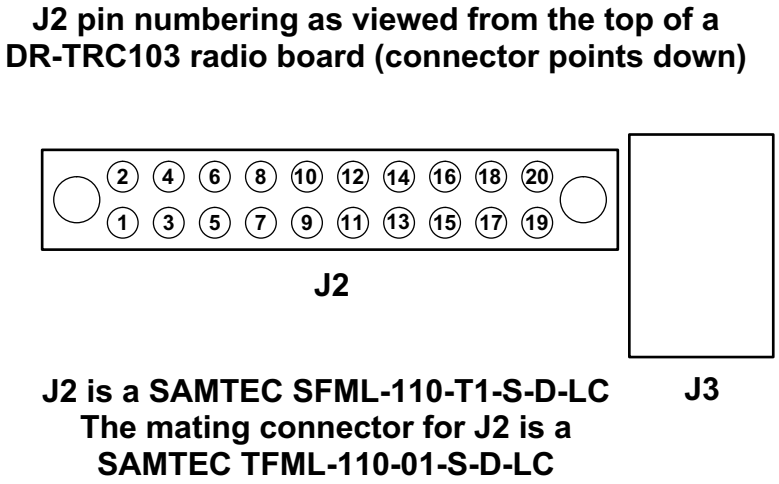
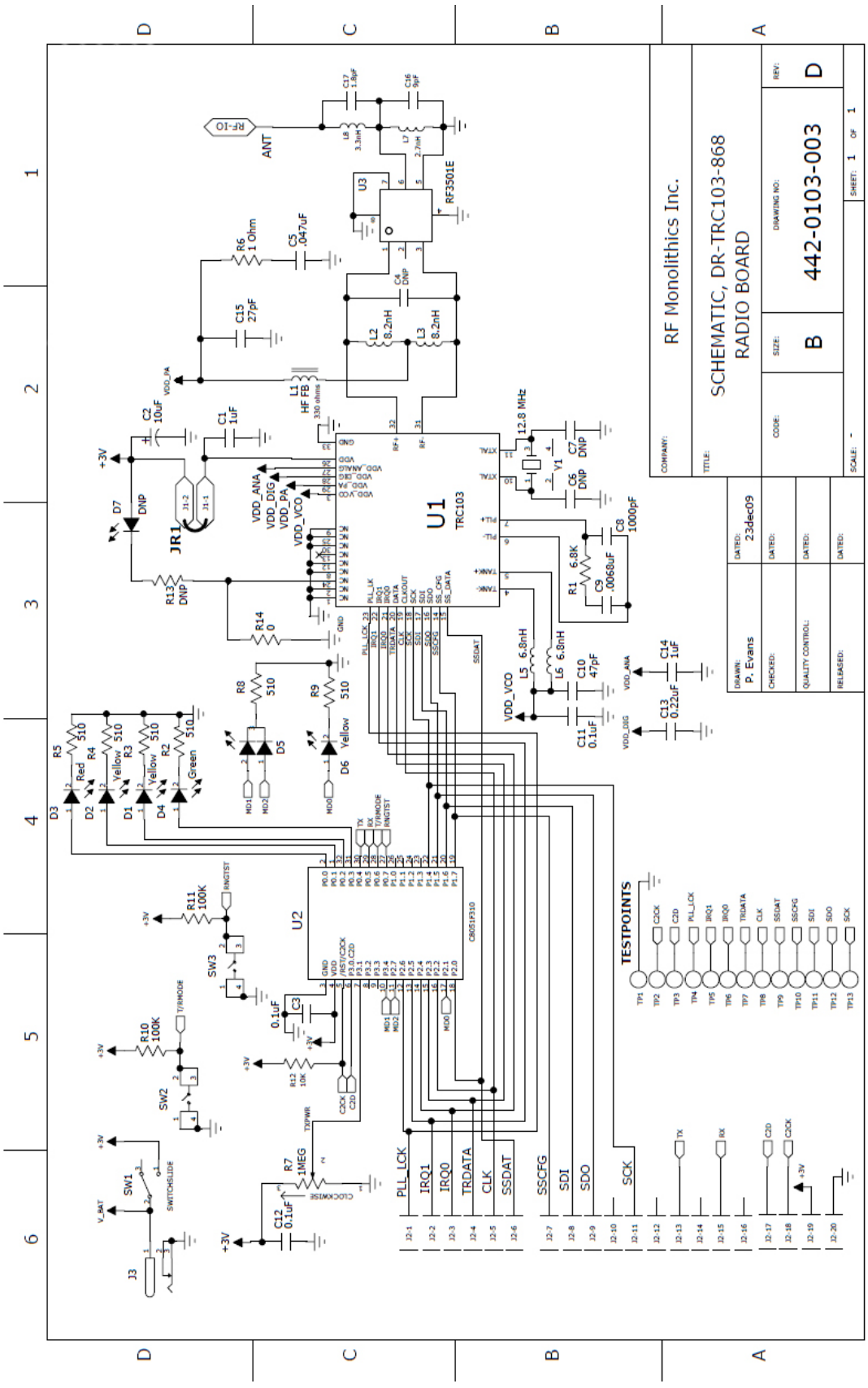


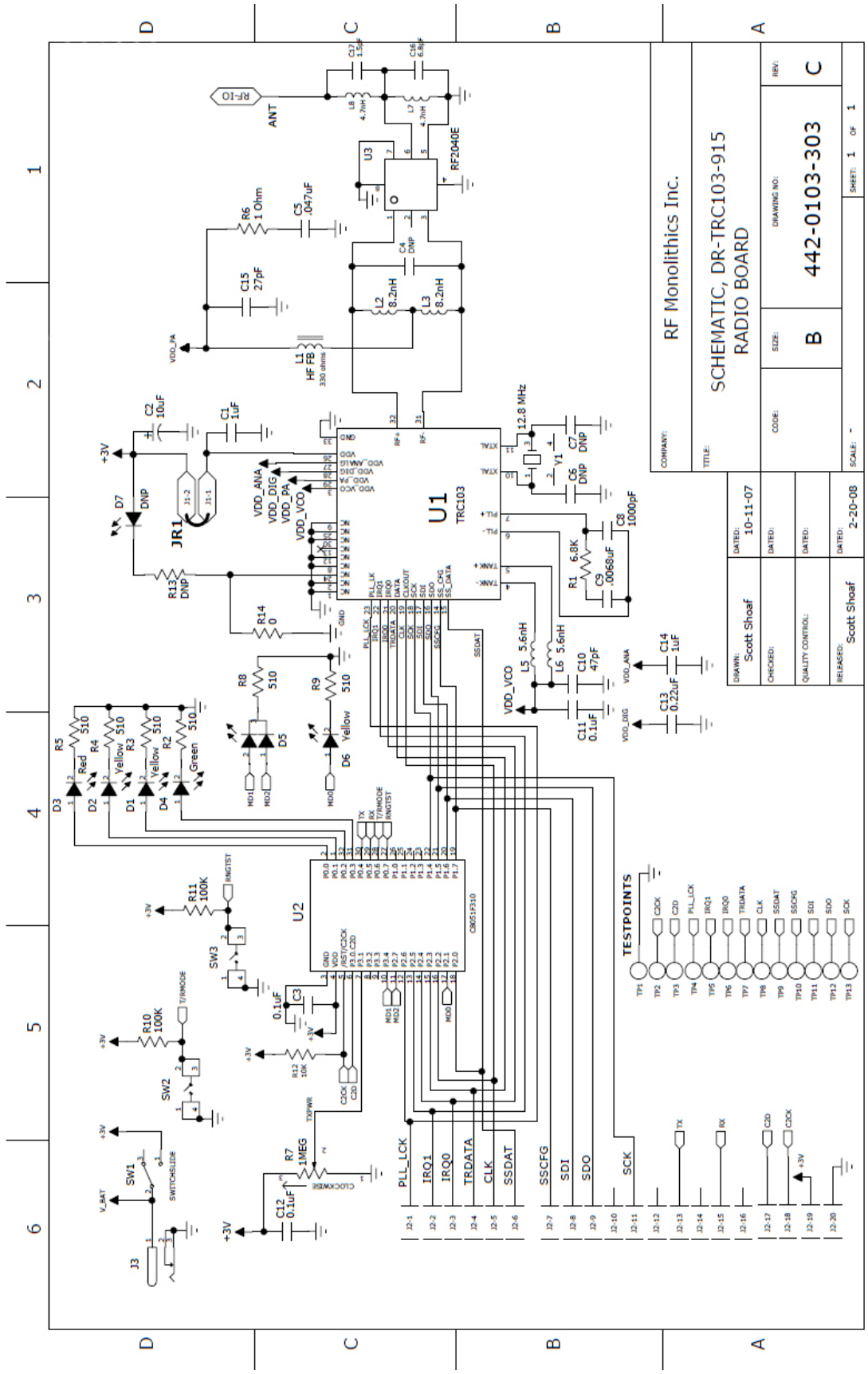
Figure 5 - Radio Board J2 Pin Numbering Detail

Radio Board Documentation

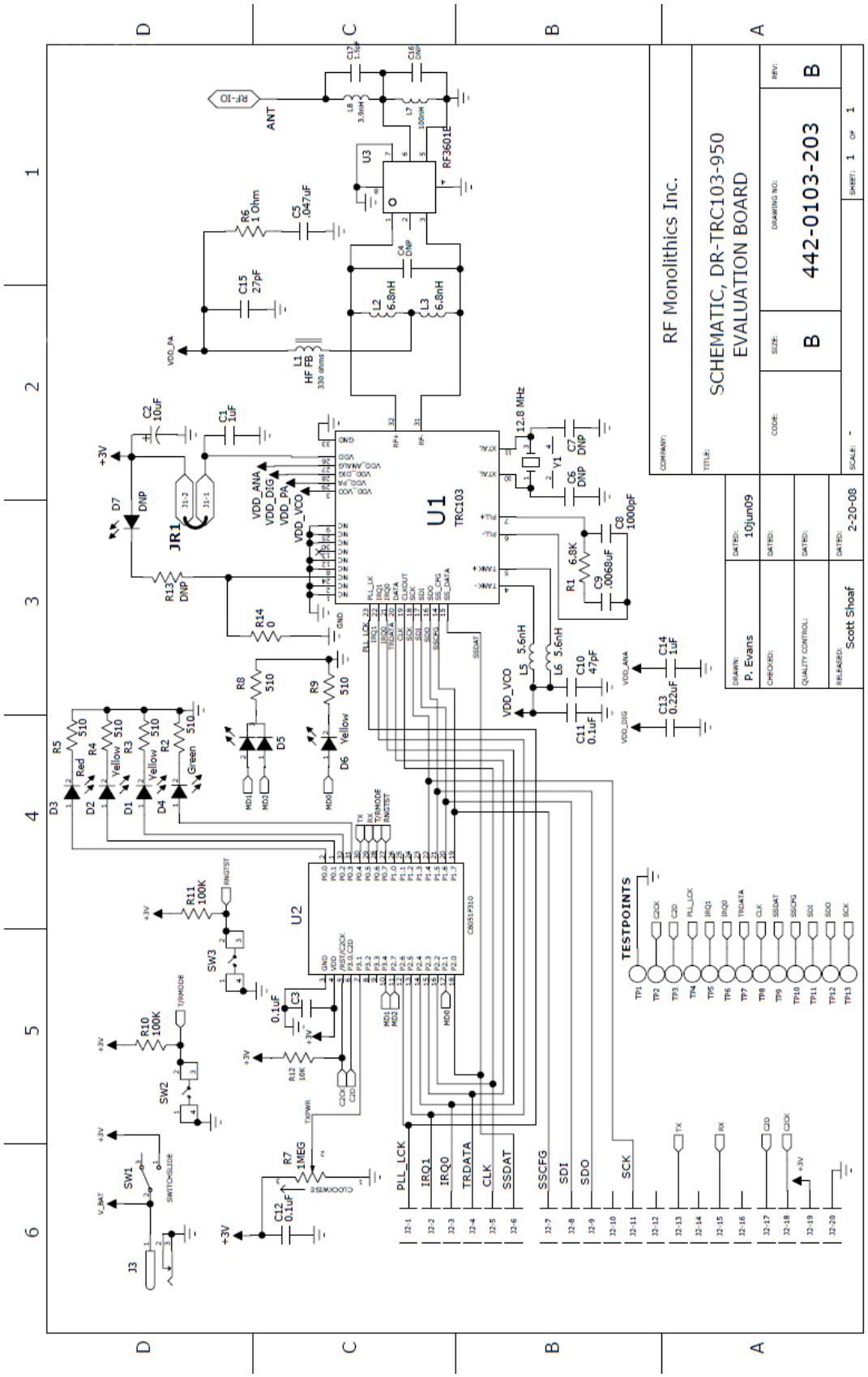
The schematics of each radio board and the top assembly view are provided on the following pages. Also see the TRC103 Data Sheet, the DR-TRC103-DK Development Kit User's Guide and the RFIC Design Assistant utility software and related User's Guide. The latest versions of the Data Sheet, User's Guides and the RFIC Design Assistant utility software can be downloaded from RFM's web site, www.rfm.com.

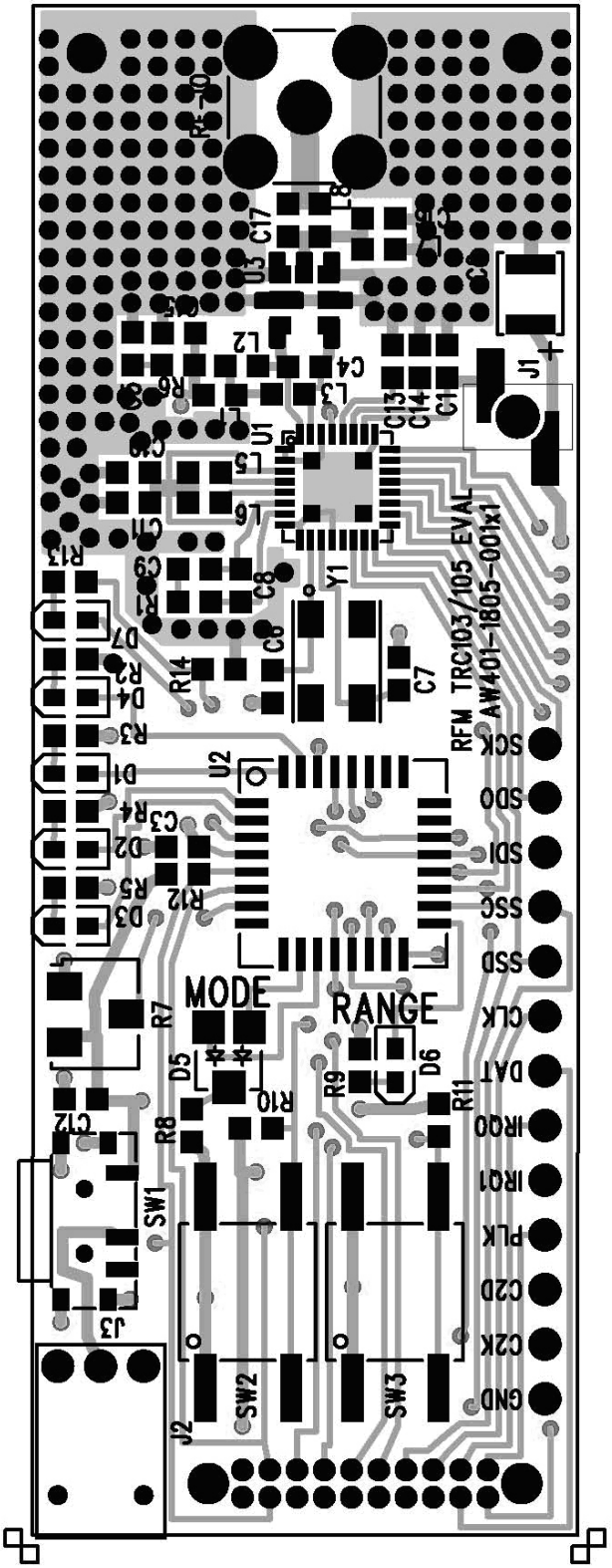


868 MHz Schematic



915 MHz Schematic





Circuit board dimensions: 1.00 x 2.80 x 0.65 inches (25.4 x 71.1 x 16.5 mm)

Bands on inductors as shown:

L2, L3 L5 L6