

TRC103 915 MHz Transceiver Reference Design

Introduction

This application note presents a PCB reference design for Murata's TRC103 transceiver IC operating in the 902 to 928 MHz band. The reference design includes an integrated PCB antenna. The reference design schematic is shown in Figure 1 below.

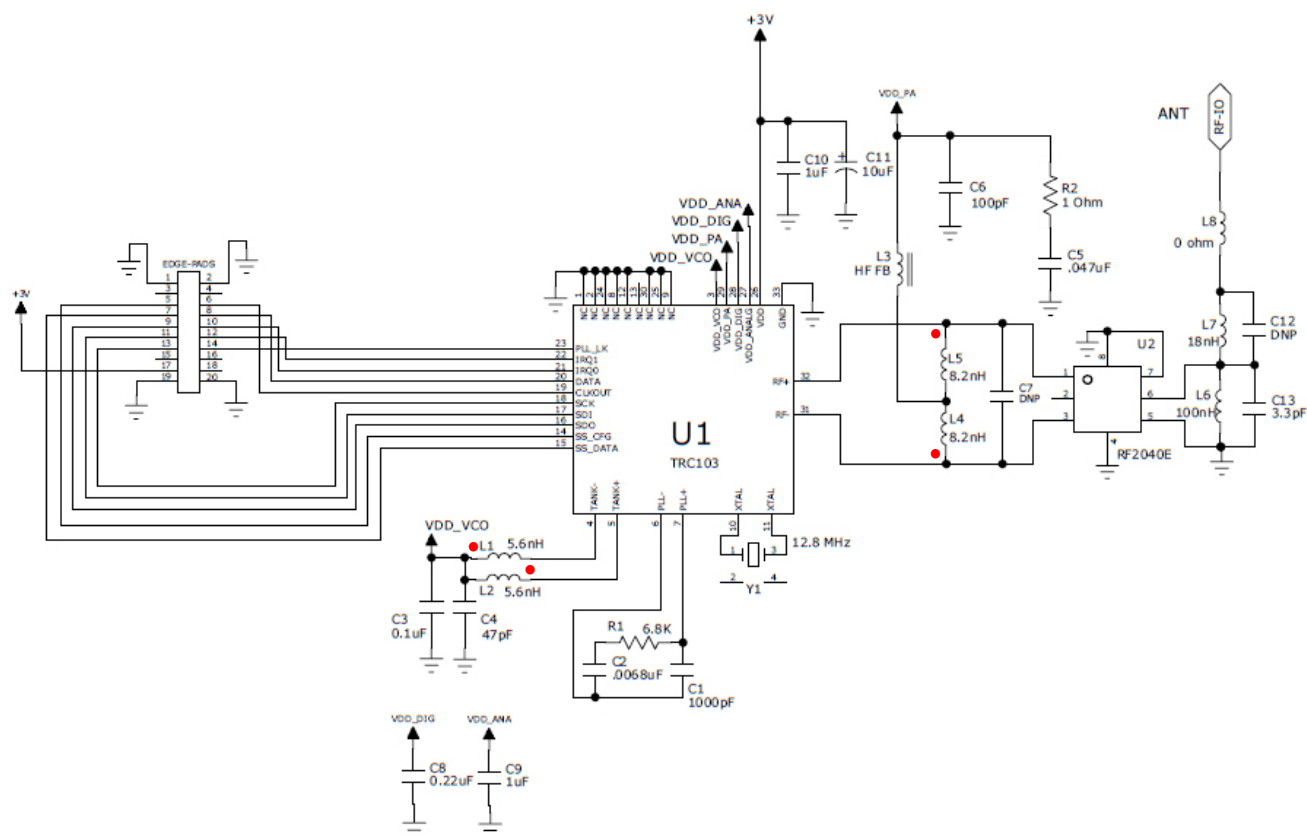


Figure 1 - TRC103 915 MHz Reference Design Schematic

Note the dot (band) orientation of L1 with respect to L2, and the orientation of L4 with respect to L5.

Bill of Materials

The TRC103 915 MHz Reference Design BOM is presented below:

U1	Murata TRC103 Transceiver IC
U2	Murata RF2040E Low-loss SAW Filter
Y1	Murata XTL1020 Crystal, 12.80000 MHz
L1	5.6 nH $\pm 5\%$, 0603 RF inductor
L2	5.6 nH $\pm 5\%$, 0603 RF inductor
L3	RF Bead, 300 ohm, Fair Rite 2506033017Y0, 0603
L4	8.2 nH $\pm 5\%$, 0603 RF inductor
L5	8.2 nH $\pm 5\%$, 0603 RF inductor
L6	100 nH $\pm 5\%$, 0603 RF inductor
L7	18 nH $\pm 5\%$, 0603 RF inductor
L8	zero ohm resistor, 0603
C1	1,000 pF $\pm 5\%$, COG, 50 V, 0603 capacitor
C2	0.0068 μ F $\pm 10\%$, X7R, 50 V, 0603 capacitor
C3	0.1 μ F $\pm 10\%$, X5R, 50 V, 0603 capacitor
C4	47 pF $\pm 5\%$, COG, 50 V, 0603 capacitor
C5	0.047 μ F $\pm 10\%$, X7R, 50 V, 0603 capacitor
C6	100 pF $\pm 5\%$, COG, 50 V, 0603 capacitor
C7	not used
C8	0.22 μ F $\pm 10\%$, X7R, 50 V, 0603 capacitor
C9	1 μ F $\pm 10\%$, X5R, 50 V, 0603 capacitor
C10	1 μ F $\pm 10\%$, X5R, 50 V, 0603 capacitor
C11	10 μ F $\pm 10\%$, Tantalum, 16 V, B case capacitor
C12	not used
C13	3.3 ± 0.25 pF, COG, 50 V, 0603 capacitor
R1	6.8K $\pm 5\%$, 0.1 W, 0603 film resistor
R2	1 ohm $\pm 5\%$, 0.1 W, 0603 film resistor
PCB	see http://wireless.murata.com/RFM/data/trc103_pcb.zip

Circuit Board Layers

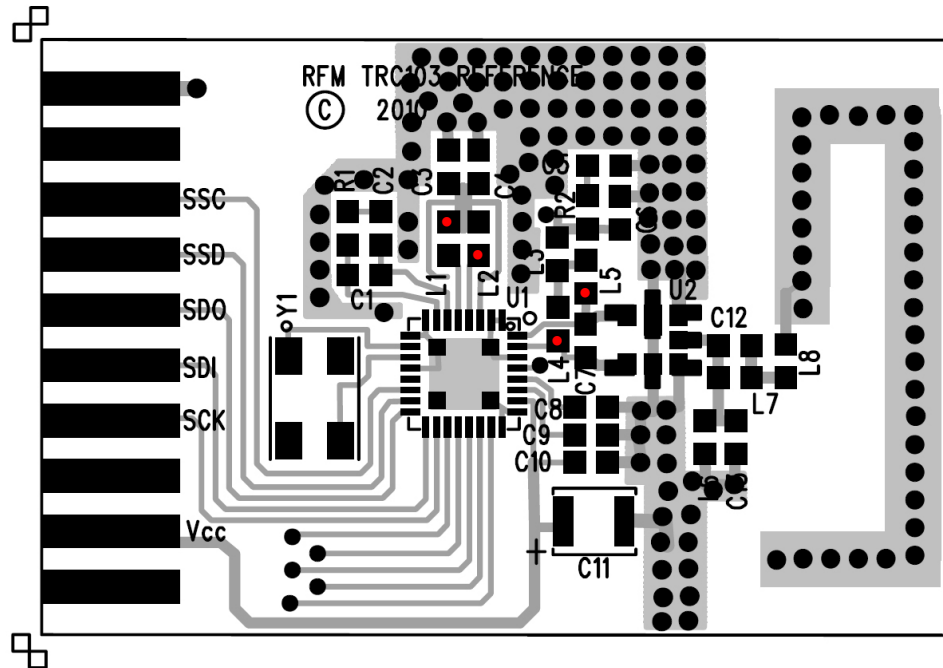


Figure 2 - Top Assembly

Figure 2 shows the TRC103 reference design top assembly. Power supply and digital I/O signals are organized on the left, the printed antenna is on the right. Note the dot (band) orientation of L1 with respect to L2, and the orientation of L4 with respect to L5. A wide variety of microcontrollers can be used to control the TRC103. PADs PCB design files and Gerber files of the reference design layout are available at http://wireless.murata.com/RFM/data/trc103_pcb.zip.

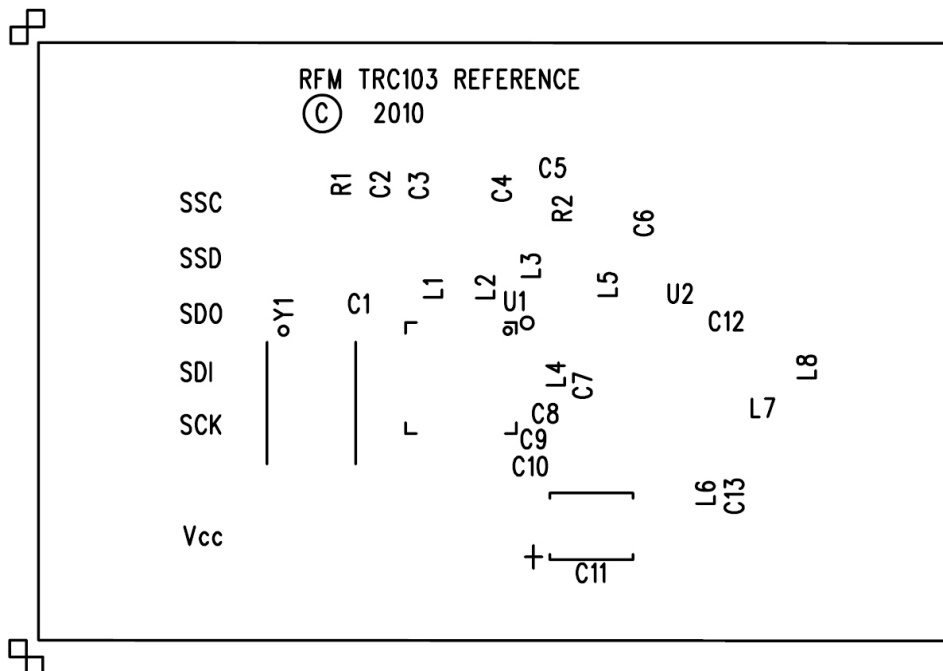


Figure 3 - Top Silkscreen

The top silkscreen is shown in Figure 3.

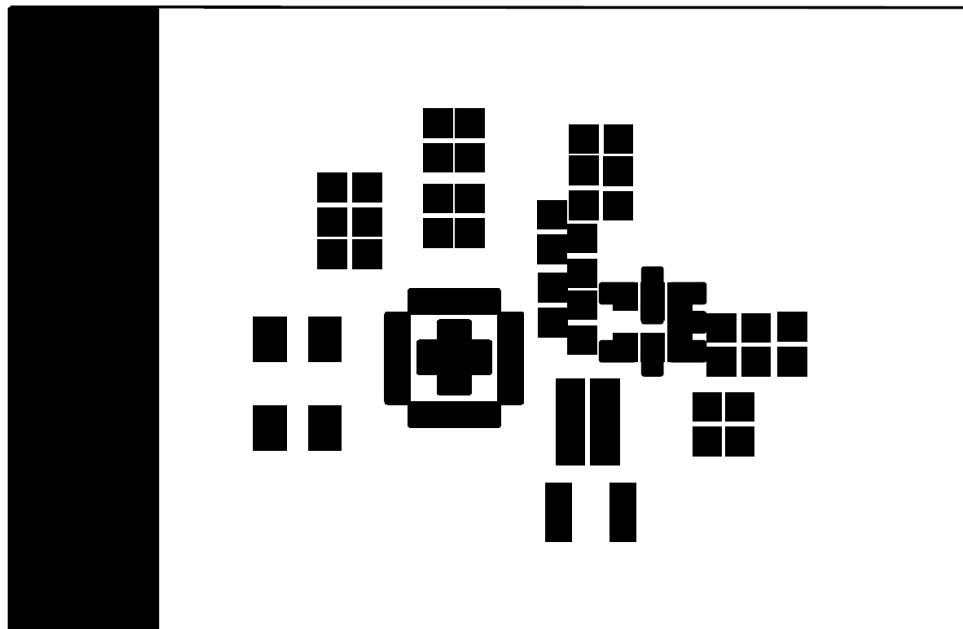


Figure 4 - Top Solder Mask

The top solder mask is shown in Figure 4.

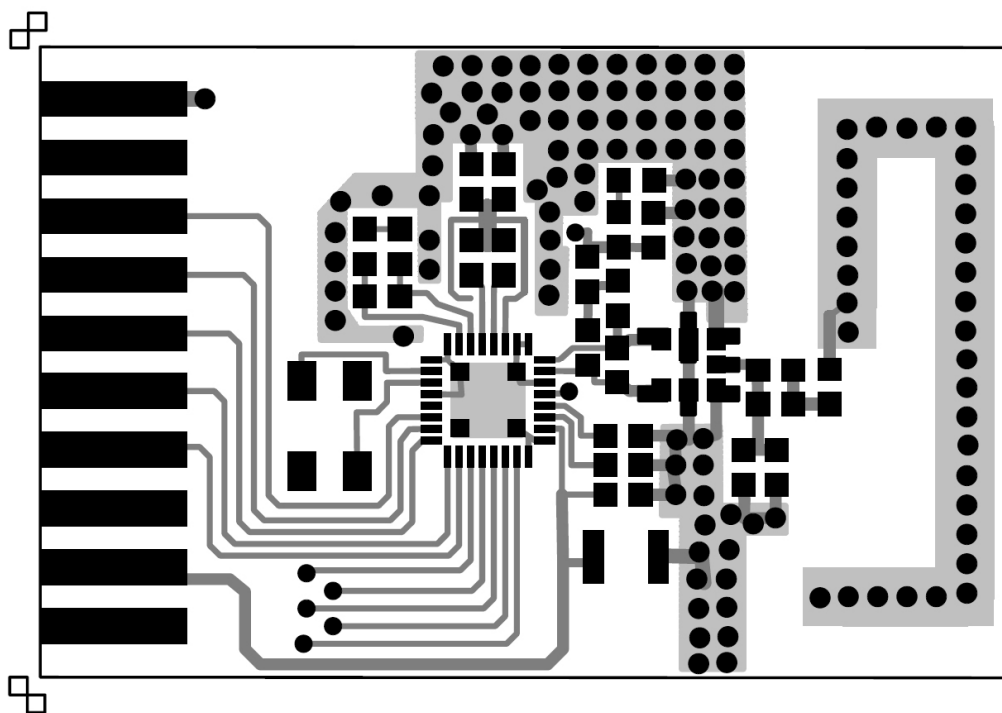


Figure 5 - Top Etch

The top etch pattern is shown in Figure 5. Using $\pm 5\%$ COG RF capacitors where specified in the bill of materials is important to reference design performance.

SIZE	QTY	SYM	PLATED	TOL
10	141	+	YES	+/-0.003

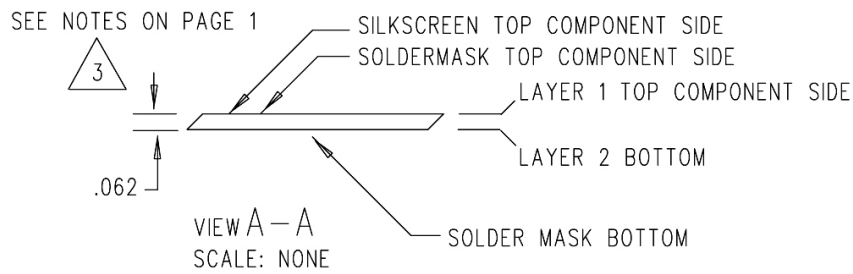
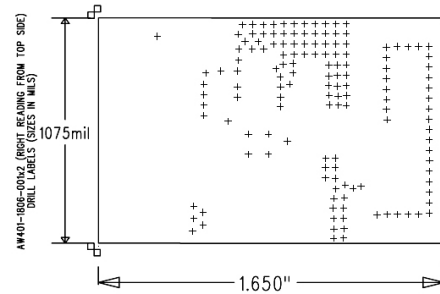


Figure 6 - Drill & Layer Data

The drill and layer data is provided in Figure 6. The reference design is implemented on a two-sided 0.031 inch board with 1 ounce copper traces.

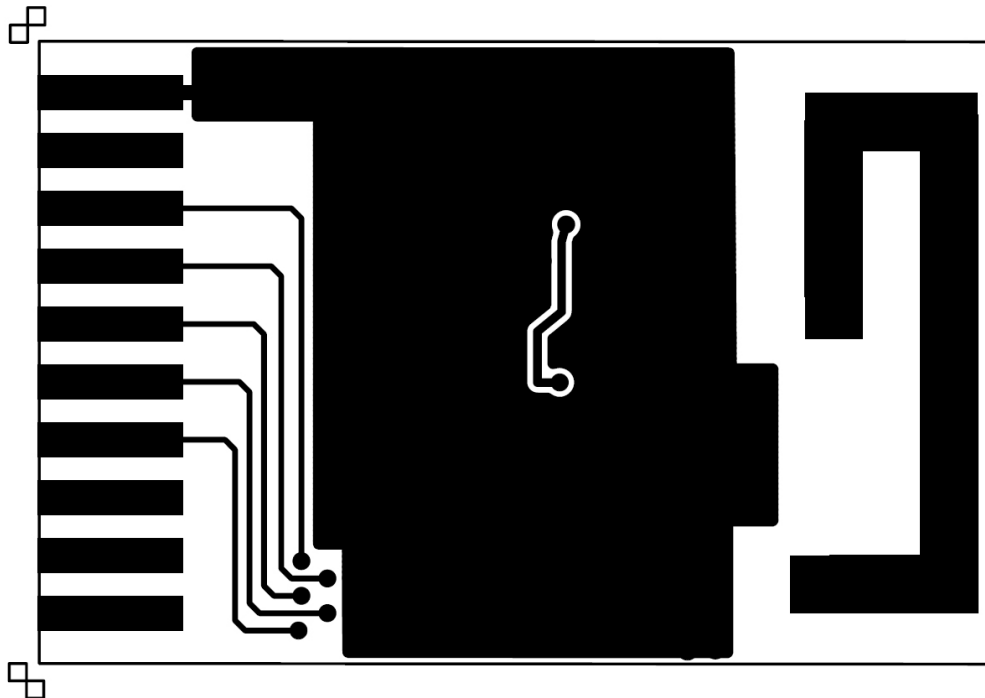


Figure 7 - Bottom Etch

Figure 7 shows the reference design bottom etch pattern.

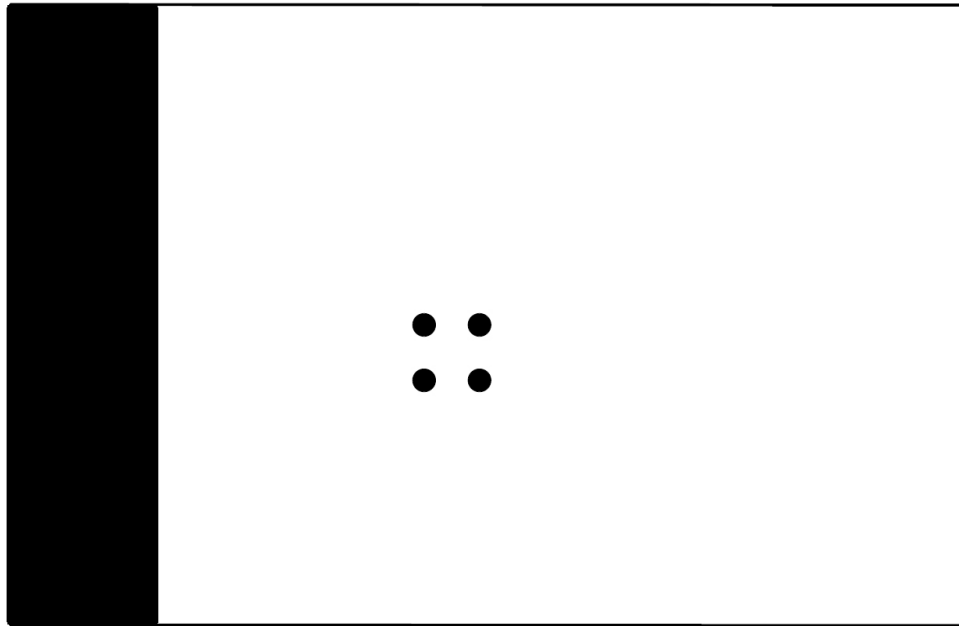


Figure 8 - Bottom Solder Mask

Figure 8 shows the reference design bottom solder mask.

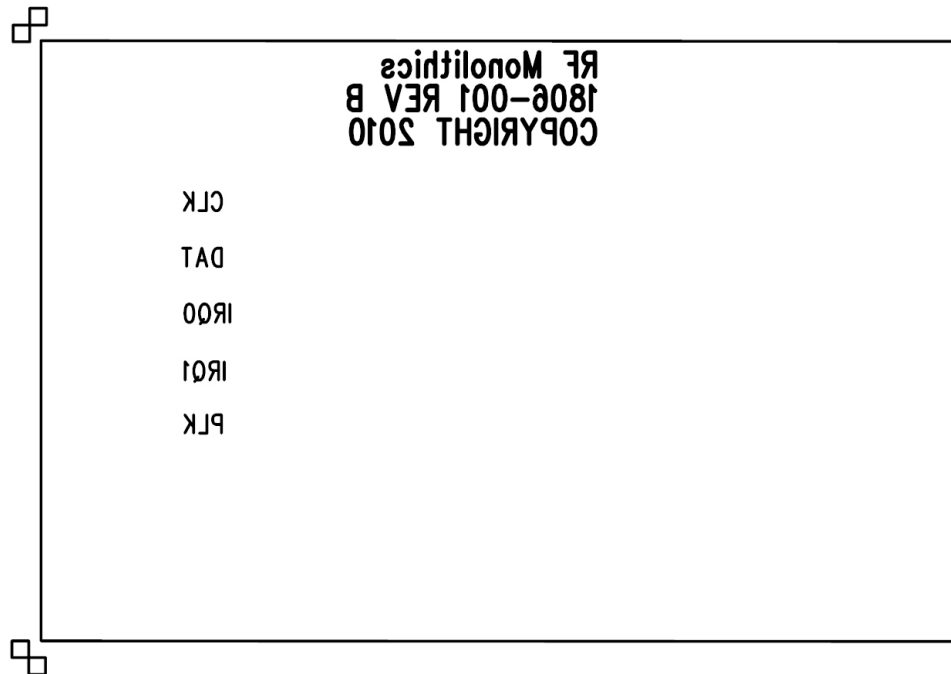


Figure 9 - Bottom Silkscreen

Figure 9 shows the bottom silkscreen.

Figure 10 shows the assembled TRC103 915 MHz reference design PCB.

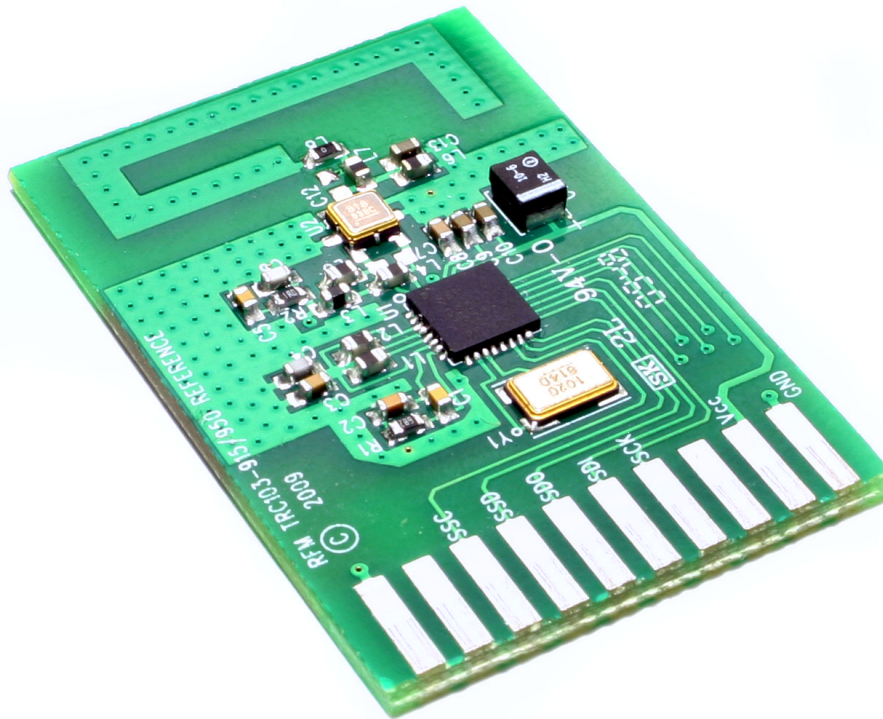


Figure 10 - Assembled Reference Design PCB

Reference Design Range Testing

The TRC103 915 MHz reference design achieves a typical range of 1200 feet (365 meters) in “open field” conditions 3.5 feet (1 meter) off the ground, using a data rate of 50 kb/s.